

APPENDIX F

Radiological Analytical Data Packages, Q16 through Q19

Appendix F is available via separate attachment.



June 07, 2022

Ms. Candace Christensen
Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607

Re: Project # 080153.007 Air Monitoring at SSFL
Work Order: 579287

Dear Ms. Christensen:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on May 09, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4422.

Sincerely,

Jake Crook
Project Manager

Purchase Order: 8-00000942
Chain of Custody: 05032022-2
Enclosures



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Case Narrative

**Receipt Narrative
for
North Wind Solutions
SDG: 579287**

June 07, 2022

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on May 09, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
579287001	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303
579287002	DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311
579287003	DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322
579287004	DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331
579287005	BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink, appearing to read "Jake H. Crook". The signature is written in a cursive, slightly slanted style.

Jake Crook
Project Manager

Chain of Custody and Supporting Documentation

Client Name: North Wind Portage, Inc.

Project/Site Name: Baseline Air Monitoring / DOE SSFL- ETEC

Address: 5800 Woolsey Canyon Rd Canoga Park, CA 91304

Collected By: Lucas Ray

Send Results To: cochristsensen@northwindgrp.com,
lucas ray@envirachem.com

Phone # 805-587-0691

Fax # N/A

Sample ID	* For composites - indicate start and stop date/time	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hh:mm)	QC Code (a)	Field Filtered (b)	Sample Matrix (c)	Should this sample be considered: (If yes, please supply isotopic info)	Total number of containers	Sample Analysis Requested (d) (Fill in the number of containers for each test)										Comments
									Gamma Spec (GA-01-R)	Si-90 (SR-03-RC)	Iso-Po-210 (Alpha Spec)(A-01-R)	Iso-Th (Alpha Spec)(A-01-R)	Iso-U (Alpha Spec)(A-01-R)	Iso-Am-241 (Alpha Spec)(A-01-R)	Iso-Pu (Alpha Spec)(A-01-R)	Pu-241 (STL-RC-0245) (Ra-02-RC Modified)	Ra-226 (Ra-02-RC Modified)	Ra-228 (Ra-02-RC Modified)	
DOE-1 Qtr 16 S (1/4/22 0833-3/29/22 1303)		03-29-22	1303 C		N/A	F	No	1	X	X	X	X	X	X	X	X	X	X	Gamma Spec to include:
DOE-2 Qtr 16 S (1/4/22 0843-3/29/22 1311)		03-29-22	1311 C		N/A	F	No	1	X	X	X	X	X	X	X	X	X	X	Be-7, K-40, Co-60, Cs-137,
DOE-3 Qtr 16 S (1/4/22 0856-3/29/22 1322)		03-29-22	1322 C		N/A	F	No	1	X	X	X	X	X	X	X	X	X	X	Ac-228
DOE-4 Qtr 16 S (1/4/22 0903-3/29/22 1331)		03-29-22	1331 C		N/A	F	No	1	X	X	X	X	X	X	X	X	X	X	
BLANK Qtr 16 S (1/4/22 0930-3/29/22 0930)		03-29-22	0930 C		N/A	F	No	1	X	X	X	X	X	X	X	X	X	X	

Chain of Custody Signatures

Relinquished By (Signed) Date Time Received by (Signed) Date Time

1 5-3-2022 10:00 1 5-4-22 0915

2 5-3-2022 10:00 2 5-4-22 0915

3 5-3-2022 10:00 3 5-4-22 0915

TAT Requested: Normal: ☒ Rush: ☐ Specify: ☐

Fax Results: ☐ Yes ☒ No

Select Deliverable: ☐ C of A ☐ QC Summary ☐ Level 1 ☐ Level 2 ☐ Level 3 ☐ Level 4

Additional Remarks:

For Lab Receiving Use Only: Custody Seal Intact? ☐ Yes ☐ No Cooler Temp: ☐ °C

Sample Collection Time Zone: ☐ Eastern ☒ Pacific ☐ Central ☐ Mountain ☐ Other.

1.) Chain of Custody Number = Client Determined

2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite

3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.

4.) Matrix Codes: DW=Drinking Water, GW=Groundwater, SW=Surface Water, WW=Waste Water, W=Water, ML=Misc Liquid, SO=Soil, SD=Sediment, SL=Sludge, SS=Solid Waste, O=Oil, F=Filter, P=Wipe, U=Urine, F=Fecal, N=Nasal

5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).

6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate, If no preservative is added = leave field blank

7.) KNOWN OR POSSIBLE HAZARDS

RCRA Metals
As = Arsenic
Ba = Barium
Cd = Cadmium
Cr = Chromium
Pb = Lead

Characteristic Hazards
FL = Flammable/Ignitable
CO = Corrosive
RE = Reactive

Listed Waste
LW = Listed Waste
(F, K, P and U-listed wastes.)
Waste code(s):

Other
OT = Other / Unknown
(i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.)
Description:

Please provide any additional details below regarding handling and/or disposal concerns. (i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)



Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

JHC

Client: NORW		SDG/AR/COC/Work Order: 579287 579287	
Received By: DC		Date Received: 5-9-22	
Carrier and Tracking Number		Circle Applicable: ☒ FedEx Express ☐ FedEx Ground ☐ UPS ☐ Field Services ☐ Courier ☐ Other 7767 5583 8792	
Suspected Hazard Information		Yes	No
		*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.	
A) Shipped as a DOT Hazardous?		☒	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples to be received as radioactive?		☒	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		☒	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		☒	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		☒	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:
Sample Receipt Criteria		Yes	NA
Comments/Qualifiers (Required for Non-Conforming Items)			
1	Shipping containers received intact and sealed?	☒	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	☒	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ deg. C)?*	☒	Preservation Method: Wet Ice Ice Packs Dry Ice <u>None</u> Other: *all temperatures are recorded in Celsius
4	Daily check performed and passed on IR temperature gun?	☒	Temperature Device Serial #: <u>IR2-22</u> Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	☒	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	☒	Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?	☒	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
8	Samples received within holding time?	☒	ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	☒	ID's and containers affected:
10	Date & time on COC match date & time on bottles?	☒	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	☒	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	☒	
13	COC form is properly signed in relinquished/received sections?	☒	Circle Applicable: Not relinquished Other (describe)
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials

AM

Date

5/11/22

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of 1

Laboratory Certifications

List of current GEL Certifications as of 07 June 2022

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122022-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
North Wind Solutions
SDG #: 579287**

Product: Alphaspec Pu, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2265049

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579287001	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303
579287002	DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311
579287003	DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322
579287004	DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331
579287005	BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930
1205090027	Method Blank (MB)
1205090028	Laboratory Control Sample (LCS)
1205090029	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The tracer peak centroid for sample 579287002 (DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311) is greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest.

Product: Alphaspec U, Filter

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2265052

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579287001	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303
579287002	DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311
579287003	DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322
579287004	DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331
579287005	BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930
1205090053	Method Blank (MB)
1205090054	Laboratory Control Sample (LCS)
1205090055	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec Th, Filter

Analytical Method: DOE EML HASL-300, Th-01-RC Modified

Analytical Procedure: GL-RAD-A-038 REV# 18

Analytical Batch: 2265053

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579287001	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303
579287002	DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311
579287003	DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322
579287004	DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331
579287005	BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930
1205090056	Method Blank (MB)
1205090057	Laboratory Control Sample (LCS)
1205090058	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Samples 579287002 (DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311), 579287003 (DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322), 579287004 (DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331) and 579287005 (BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930) were recounted due to high MDCs. The recounts are reported.

Product: Alphaspec Po210, Filter

Analytical Method: DOE EML HASL-300, Po-01-RC Modified

Analytical Procedure: GL-RAD-A-016 REV# 19

Analytical Batch: 2265054

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#

Client Sample Identification

579287001	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303
579287002	DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311
579287003	DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322
579287004	DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331
579287005	BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930
1205090059	Method Blank (MB)
1205090060	Laboratory Control Sample (LCS)
1205090061	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

Sample (See Below) did not meet the detection limit due to limited sample volume. Sample was counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
579287005 (BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930)	Polonium-210	Result 0.528 < MDA 0.584 > RDL 0.5 pCi/Sample

Technical Information

Recounts

Samples 1205090059 (MB) and 579287005 (BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930)) were recounted due to high MDCs. The recounts are reported.

Miscellaneous Information**Additional Comments**

The tracer peak centroid for sample 579287002 (DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311)) is greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest.

Product: Alphaspec Am241, Filter

Analytical Method: DOE EML HASL-300, Am-05-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2272481

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#**Client Sample Identification**

579287001	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303
579287002	DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311
579287003	DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322
579287004	DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331
579287005	BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930
1205104985	Method Blank (MB)
1205104986	Laboratory Control Sample (LCS)
1205104987	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information**RDL Met**

Samples (See Below) did not meet the detection limits due to limited sample volume. Samples were counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
579287004 (DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331))	Americium-241	Result -0.194 < MDA 1.48 > RDL 1 pCi/Sample

579287005 (BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930))	Americium-241	Result -0.175 < MDA 1.68 > RDL 1 pCi/Sample
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Technical Information

Sample Re-prep/Re-analysis

Samples were reprepared due to low carrier/tracer yield. The re-analysis is being reported.

Recounts

Samples 579287001 (DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303), 579287002 (DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311), 579287003 (DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322), 579287004 (DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331) and 579287005 (BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930)) were recounted due to high MDCs. The recounts are reported.

Miscellaneous Information

Manual Integration

Manual integration of alpha spectroscopy spectra 1205104987 (LCSD) was performed to fully separate counts in Regions of Interest which would have been biased.

Additional Comments

Sample 579287004 (DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331) did not meet the resolution requirement of having a full width half maximum of 100 keV or less for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest.

Product: Gammaspec, Gamma, Filter

Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R

Analytical Procedure: GL-RAD-A-013 REV# 27

Analytical Batch: 2264689

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579287001	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303
579287002	DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311
579287003	DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322
579287004	DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331
579287005	BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930
1205089187	Method Blank (MB)
1205089188	579287001(DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303) Sample Duplicate (DUP)
1205089189	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Qualifier Information

Qualifier	Reason	Analyte	Sample	Client Sample
UI	Results are considered a false positive due to high counting uncertainty.	Beryllium-7	1205089188	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303
		Potassium-40	579287005	BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930
UI	Results are considered a false positive due to no valid peak.	Potassium-40	1205089188	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303

Product: GFPC Ra228, Filter

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2269287

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579287001	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303
579287002	DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311
579287003	DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322
579287004	DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331
579287005	BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930
1205098586	Method Blank (MB)
1205098587	Laboratory Control Sample (LCS)
1205098588	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Duplication Criteria between LCS and LCSD

The Laboratory Control Sample and Laboratory Control Sample Duplicate (See Below) do not meet the duplication requirement; however, they both meet the spiked recovery requirement.

Sample	Analyte	Value
1205098587 (LCS) and 1205098588 (LCSD)	Radium-228	RPD 21.4* (0%-20%)

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205098586 (MB)	Radium-228	Result 2.49 < MDA 4.11 > RDL 1 pCi/Sample

Samples (See Below) did not meet the detection limits due to limited sample volume. Samples were counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
579287001 (DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303))	Radium-228	Result 4.84 < MDA 6.89 > RDL 1 pCi/Sample
579287004 (DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331))	Radium-228	Result 4.83 < MDA 5.88 > RDL 1 pCi/Sample
579287005 (BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930))	Radium-228	Result -0.277 < MDA 3.71 > RDL 1 pCi/Sample

Technical Information

Recounts

Samples were re-eluted and recounted due to low recovery. The recounts are reported.

Product: GFPC, Sr90, Filter

Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified

Analytical Procedure: GL-RAD-A-004 REV# 22

Analytical Batch: 2269288

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579287001	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303
579287002	DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311
579287003	DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322
579287004	DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331
579287005	BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930
1205098589	Method Blank (MB)
1205098590	Laboratory Control Sample (LCS)
1205098591	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Sample 1205098590 (LCS) was recounted due to high recovery. The recount is reported.

Product: GFPC Total Alpha Radium, Filter

Analytical Method: EPA 900.1 Mod/ EPA 903.0 Mod

Analytical Procedure: GL-RAD-A-010 REV# 21

Analytical Batch: 2269289

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579287001	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303
579287002	DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311
579287003	DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322
579287004	DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331
579287005	BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930
1205098592	Method Blank (MB)
1205098593	Laboratory Control Sample (LCS)
1205098594	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and

procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205098592 (MB)	Total Radium	Result -12.1 < MDA 18.8 > RDL 1 pCi/Sample

Samples (See Below) did not meet the detection limits due to limited sample volume. Samples were counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
579287002 (DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311))	Total Radium	Result 3.42 < MDA 11.3 > RDL 1 pCi/Sample
579287003 (DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322))	Total Radium	Result 6.7 < MDA 6.88 > RDL 1 pCi/Sample
579287004 (DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331))	Total Radium	Result 1.92 < MDA 12.6 > RDL 1 pCi/Sample

Product: Liquid Scint Pu241, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-035 REV# 23

Analytical Batch: 2265050

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579287001	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303
579287002	DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311
579287003	DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322
579287004	DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331
579287005	BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930
1205090030	Method Blank (MB)
1205090031	Laboratory Control Sample (LCS)
1205090032	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information**RDL Met**

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205090030 (MB)	Plutonium-241	Result 15.4 < MDA 35.7 > RDL 5 pCi/Sample

Sample did not meet the detection limits due to limited sample volume.

Sample	Analyte	Value
579287001 (DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303))	Plutonium-241	Result 26.9 < MDA 40.2 > RDL 5 pCi/Sample
579287002 (DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311))	Plutonium-241	Result 18.5 < MDA 33.1 > RDL 5 pCi/Sample
579287003 (DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322))	Plutonium-241	Result -5.43 < MDA 40.9 > RDL 5 pCi/Sample
579287004 (DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331))	Plutonium-241	Result 18.1 < MDA 31 > RDL 5 pCi/Sample
579287005 (BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930))	Plutonium-241	Result 20.7 < MDA 32.2 > RDL 5 pCi/Sample

Miscellaneous Information**Additional Comments**

The tracer peak centroid for sample 579287002 (DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311)) is greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Prep Logbook

The Preparation of Special Matrices for the Determination of Radionuclides

Batch ID: 2264620

Analyst: Christine Carter (CXC1)

Method: Filter Prep

Lab SOP: GL-RAD-A-026 REV# 18

Instrument: NONE

SP-39020004

Due Dates for Lab: 04-JUN-2022

Package: 06-JUN-2022

SDG: 07-JUN-2022

Type Sample Id Description

Serial Number

Spike Amount

Spike Units

#	Sample ID	Prep Date	Min RDL ()	Number of Filters	Container Wt (g)	Weight of total filter with container (g)	Weight of filter Diluted with container (g)	Not Saved Final Volume of filter diluted to in Liters (mL)	Total Filter Weight (g)	Weight of Filter Diluted (g)
1	579287001	11-MAY-2022		1	100.589	104.051	103.155	200	3.462	2.566
2	579287002	11-MAY-2022		1	101.818	105.295	104.495	200	3.477	2.677
3	579287003	11-MAY-2022		1	104.244	107.722	106.888	200	3.478	2.644
4	579287004	11-MAY-2022		1	101.031	104.512	103.704	200	3.481	2.673
5	579287005	11-MAY-2022		1	102.654	106.097	105.229	200	3.443	2.575
6	579289001	11-MAY-2022		1	102.053	104.29	103.706	200	2.237	1.653
7	579289002	11-MAY-2022		1	103.177	105.462	104.906	200	2.285	1.729
8	579289003	11-MAY-2022		1	105.162	107.403	106.828	200	2.241	1.666
9	1205089021 MFB	11-MAY-2022		1	0	1	1	200	1	1

Reagent/Solvent Lot ID	Description	Amount	Comments:
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GEL LABORATORIES LLC

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Qualifier Definition Report for

NORW002 North Wind Solutions

Client SDG: 579287 GEL Work Order: 579287

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- UI Gamma Spectroscopy--Uncertain identification

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Theresa Austin

Date: 07 JUN 2022

Title: Group Leader

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303) Project: NORW00219
Sample ID: 579287001 Client ID: NORW002
Matrix: Filter
Collect Date: 29-MAR-22 13:03
Receive Date: 09-MAY-22
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	-0.193	+/-0.655	1.39	1.00	pCi/Sample			MP2	06/06/22	1320	2272481	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		14.0	+/-2.24	0.769	0.500	pCi/Sample			MP2	06/01/22	0842	2265054	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	-0.0464	+/-0.210	0.529	1.00	pCi/Sample			MP2	05/31/22	0923	2265049	3
Plutonium-239/240	U	-0.0490	+/-0.148	0.416	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.586	+/-0.881	1.37	1.00	pCi/Sample			MP2	05/31/22	1035	2265053	4
Thorium-230	U	1.22	+/-1.05	1.25	1.00	pCi/Sample							
Thorium-232		0.656	+/-0.731	0.617	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		1.30	+/-0.610	0.557	1.00	pCi/Sample			MP2	05/30/22	1217	2265052	5
Uranium-235/236	U	0.0396	+/-0.220	0.422	1.00	pCi/Sample							
Uranium-238		0.621	+/-0.444	0.497	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	26.9	+/-24.1	40.2	5.00	pCi/Sample			MP2	06/05/22	2211	2265050	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	9.81	+/-26.5	38.0		pCi/Sample			RXF2	05/17/22	0756	2264689	7
Beryllium-7		239	+/-105	80.6		pCi/Sample							
Cesium-137	U	0.815	+/-3.59	7.05	20.0	pCi/Sample							
Cobalt-60	U	-0.757	+/-3.54	7.20		pCi/Sample							
Potassium-40	U	10.1	+/-53.5	108		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228	U	4.84	+/-4.21	6.89	1.00	pCi/Sample			JXC9	06/01/22	1049	2269287	8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium		9.94	+/-5.46	7.61	1.00	pCi/Sample			JXC9	05/31/22	1851	2269289	9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	-0.230	+/-1.32	2.29	3.00	pCi/Sample			KP1	05/26/22	1910	2269288	10

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	05/11/22	1427	2264620

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303) Project: NORW00219
Sample ID: 579287001 Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			31	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			73.8	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			78.3	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			38.7	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			85.3	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			78.3	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			52.4	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			95.4	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			96.7	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311) Project: NORW00219
Sample ID: 579287002 Client ID: NORW002
Matrix: Filter
Collect Date: 29-MAR-22 13:11
Receive Date: 09-MAY-22
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.108	+/-0.632	1.19	1.00	pCi/Sample			MP2	06/06/22	1320	2272481	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		12.3	+/-2.25	1.09	0.500	pCi/Sample			MP2	06/01/22	0842	2265054	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.0731	+/-0.201	0.349	1.00	pCi/Sample			MP2	05/31/22	0923	2265049	3
Plutonium-239/240	U	-0.151	+/-0.145	0.510	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.524	+/-0.432	0.608	1.00	pCi/Sample			MP2	06/02/22	1427	2265053	4
Thorium-230		0.901	+/-0.454	0.466	1.00	pCi/Sample							
Thorium-232	U	0.344	+/-0.318	0.425	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		0.629	+/-0.456	0.572	1.00	pCi/Sample			MP2	05/30/22	1217	2265052	5
Uranium-235/236	U	0.177	+/-0.281	0.389	1.00	pCi/Sample							
Uranium-238		0.813	+/-0.465	0.440	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	18.5	+/-19.7	33.1	5.00	pCi/Sample			MP2	06/05/22	2312	2265050	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	3.22	+/-15.9	30.1		pCi/Sample			RXF2	05/17/22	0756	2264689	7
Beryllium-7		163	+/-91.9	98.1		pCi/Sample							
Cesium-137	U	1.39	+/-3.66	6.66	20.0	pCi/Sample							
Cobalt-60	U	-1.95	+/-2.96	5.25		pCi/Sample							
Potassium-40	U	39.0	+/-59.6	55.9		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228		7.36	+/-3.66	5.55	1.00	pCi/Sample			JXC9	06/01/22	1049	2269287	8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium	U	3.42	+/-6.43	11.3	1.00	pCi/Sample			JXC9	05/31/22	1851	2269289	9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	2.28	+/-1.64	2.73	3.00	pCi/Sample			KP1	05/26/22	1910	2269288	10

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	05/11/22	1427	2264620

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Contact: Greenville, South Carolina 29607
Project: Ms. Candace Christensen
Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-2_Qtr 16_S (1/4/22 0843-3/29/22 1311
Sample ID: 579287002

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			27.6	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			67.7	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			91.3	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			36.2	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			87.9	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			91.3	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			65.8	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			86.4	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			94.3	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322) Project: NORW00219
Sample ID: 579287003 Client ID: NORW002
Matrix: Filter
Collect Date: 29-MAR-22 13:22
Receive Date: 09-MAY-22
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.113	+/-0.588	1.09	1.00	pCi/Sample			MP2	06/06/22	1320	2272481	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		13.6	+/-2.27	0.818	0.500	pCi/Sample			MP2	06/01/22	0842	2265054	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.0614	+/-0.173	0.184	1.00	pCi/Sample			MP2	05/31/22	0923	2265049	3
Plutonium-239/240	U	0.0956	+/-0.252	0.453	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228		0.845	+/-0.478	0.545	1.00	pCi/Sample			MP2	06/02/22	1427	2265053	4
Thorium-230		1.46	+/-0.615	0.692	1.00	pCi/Sample							
Thorium-232		0.681	+/-0.415	0.475	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.265	+/-0.371	0.604	1.00	pCi/Sample			MP2	05/30/22	1217	2265052	5
Uranium-235/236	U	-0.0142	+/-0.213	0.498	1.00	pCi/Sample							
Uranium-238		0.738	+/-0.459	0.482	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	-5.43	+/-23.7	40.9	5.00	pCi/Sample			MP2	06/06/22	0013	2265050	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-9.47	+/-19.7	36.4		pCi/Sample			RXF2	05/17/22	0757	2264689	7
Beryllium-7		113	+/-96.4	108		pCi/Sample							
Cesium-137	U	0.908	+/-4.77	8.27	20.0	pCi/Sample							
Cobalt-60	U	-0.524	+/-3.55	7.19		pCi/Sample							
Potassium-40		127	+/-72.1	65.4		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228		9.57	+/-3.49	4.80	1.00	pCi/Sample			JXC9	06/01/22	1049	2269287	8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium	U	6.70	+/-4.63	6.88	1.00	pCi/Sample			JXC9	05/31/22	1851	2269289	9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	-1.30	+/-1.24	2.24	3.00	pCi/Sample			KP1	05/26/22	1910	2269288	10

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	05/11/22	1427	2264620

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Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-3_Qtr 16_S (1/4/22 0856-3/29/22 1322) Project: NORW00219
Sample ID: 579287003 Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			26.1	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			69.5	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			75.3	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			34.2	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			82.4	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			75.3	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			65.4	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			100	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			73.1	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331
Sample ID: 579287004
Matrix: Filter
Collect Date: 29-MAR-22 13:31
Receive Date: 09-MAY-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	-0.194	+/-0.657	1.48	1.00	pCi/Sample			MP2	06/06/22	1320	2272481	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		15.8	+/-2.47	0.831	0.500	pCi/Sample			MP2	06/01/22	0842	2265054	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.0524	+/-0.179	0.332	1.00	pCi/Sample			MP2	05/31/22	0923	2265049	3
Plutonium-239/240	U	-0.0101	+/-0.151	0.353	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228		0.781	+/-0.471	0.586	1.00	pCi/Sample			MP2	06/02/22	1427	2265053	4
Thorium-230		0.620	+/-0.442	0.609	1.00	pCi/Sample							
Thorium-232		0.559	+/-0.375	0.451	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		0.511	+/-0.412	0.506	1.00	pCi/Sample			MP2	05/30/22	1217	2265052	5
Uranium-235/236	U	0.0560	+/-0.210	0.354	1.00	pCi/Sample							
Uranium-238		0.616	+/-0.429	0.462	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	18.1	+/-18.5	31.0	5.00	pCi/Sample			MP2	06/06/22	0114	2265050	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-2.31	+/-28.5	49.1		pCi/Sample			RXF2	05/17/22	0758	2264689	7
Beryllium-7	U	118	+/-173	130		pCi/Sample							
Cesium-137	U	4.09	+/-4.13	9.69	20.0	pCi/Sample							
Cobalt-60	U	-5.46	+/-5.44	7.70		pCi/Sample							
Potassium-40	U	-16.8	+/-79.0	159		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228	U	4.83	+/-3.64	5.88	1.00	pCi/Sample			JXC9	06/01/22	1049	2269287	8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium	U	1.92	+/-7.08	12.6	1.00	pCi/Sample			JXC9	05/31/22	1852	2269289	9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	0.0165	+/-1.55	2.68	3.00	pCi/Sample			KP1	05/26/22	1910	2269288	10

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	05/11/22	1427	2264620

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Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-4_Qtr 16_S (1/4/22 0903-3/29/22 1331
Sample ID: 579287004

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			30.9	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			68.6	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			97.9	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			36.4	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			83.6	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			97.9	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			64.9	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			96.6	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			68.4	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930) Project: NORW00219
Sample ID: 579287005 Client ID: NORW002
Matrix: Filter
Collect Date: 29-MAR-22 09:30
Receive Date: 09-MAY-22
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	-0.175	+/-0.767	1.68	1.00	pCi/Sample			MP2	06/06/22	1320	2272481	1
Alphaspec Po210, Filter "As Received"													
Polonium-210	U	0.528	+/-0.398	0.584	0.500	pCi/Sample			MP2	06/02/22	1432	2265054	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.112	+/-0.199	0.301	1.00	pCi/Sample			MP2	05/31/22	0923	2265049	3
Plutonium-239/240	U	-0.154	+/-0.130	0.466	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.730	+/-0.542	0.757	1.00	pCi/Sample			MP2	06/02/22	1427	2265053	4
Thorium-230		1.05	+/-0.573	0.706	1.00	pCi/Sample							
Thorium-232		0.549	+/-0.351	0.217	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		1.22	+/-0.569	0.483	1.00	pCi/Sample			MP2	05/30/22	1217	2265052	5
Uranium-235/236	U	0.00291	+/-0.215	0.479	1.00	pCi/Sample							
Uranium-238		0.753	+/-0.451	0.412	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	20.7	+/-19.2	32.2	5.00	pCi/Sample			MP2	06/06/22	0324	2265050	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	5.84	+/-20.0	37.1		pCi/Sample			RXF2	05/17/22	0759	2264689	7
Beryllium-7	U	62.3	+/-56.1	109		pCi/Sample							
Cesium-137	U	0.353	+/-3.73	7.37	20.0	pCi/Sample							
Cobalt-60	U	1.98	+/-4.63	10.6		pCi/Sample							
Potassium-40	UI	88.6	+/-91.8	79.8		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228	U	-0.277	+/-1.96	3.71	1.00	pCi/Sample			JXC9	06/01/22	1050	2269287	8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium		21.9	+/-7.78	9.30	1.00	pCi/Sample			JXC9	05/31/22	1852	2269289	9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	1.23	+/-1.06	1.75	3.00	pCi/Sample			KP1	05/26/22	1910	2269288	10

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	05/11/22	1427	2264620

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Contact: Greenville, South Carolina 29607
Project: Ms. Candace Christensen
Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: BLANK_Qtr 16_S (1/4/22 0930-3/29/22 0930
Sample ID: 579287005

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			17.2	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			69.8	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			101	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			34.1	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			83	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			101	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			81.4	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			97.7	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			87.3	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: June 7, 2022

Page 1 of 6

Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina
Ms. Candace Christensen

Contact:
Workorder: 579287

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2265049										
QC1205090028	LCS			0.296 pCi/Sample					MP2	05/31/22	09:23
Plutonium-238				+/-0.254							
	Uncertainty										
Plutonium-239/240	17.8			16.2 pCi/Sample			90.9	(75%-125%)			
	Uncertainty			+/-1.69							
QC1205090029	LCSD										
Plutonium-238			U	0.238 pCi/Sample		45.7				05/31/22	09:23
	Uncertainty			+/-0.314							
Plutonium-239/240	17.8			18.2 pCi/Sample		11.4	102	(0%-20%)			
	Uncertainty			+/-2.03							
QC1205090027	MB										
Plutonium-238			U	0.0887 pCi/Sample						05/31/22	09:23
	Uncertainty			+/-0.204							
Plutonium-239/240			U	0.236 pCi/Sample							
	Uncertainty			+/-0.287							
Batch	2265050										
QC1205090031	LCS			614 pCi/Sample			97	(75%-125%)	MP2	06/06/22	08:29
Plutonium-241	633			+/-57.6							
	Uncertainty										
QC1205090032	LCSD										
Plutonium-241	633			664 pCi/Sample		7.81	105	(0%-20%)		06/06/22	08:44
	Uncertainty			+/-57.4							
QC1205090030	MB										
Plutonium-241			U	15.4 pCi/Sample						06/06/22	07:28
	Uncertainty			+/-21.1							
Batch	2265052										
QC1205090054	LCS			22.6 pCi/Sample					MP2	05/30/22	12:17
Uranium-233/234				+/-2.24							
	Uncertainty										
Uranium-235/236				1.49 pCi/Sample							
	Uncertainty			+/-0.653							

GEL LABORATORIES LLC

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QC Summary

Workorder: 579287

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2265052										
Uranium-238	24.0			26.0 pCi/Sample			108	(75%-125%)	MP2	05/30/22	12:17
	Uncertainty			+/-2.40							
QC1205090055	LCSD										
Uranium-233/234				19.9 pCi/Sample		12.7				05/30/22	12:17
	Uncertainty			+/-2.03							
Uranium-235/236				1.39 pCi/Sample		7.26					
	Uncertainty			+/-0.608							
Uranium-238	24.0			23.2 pCi/Sample		11.6	96.4	(0%-20%)			
	Uncertainty			+/-2.19							
QC1205090053	MB										
Uranium-233/234			U	-0.0691 pCi/Sample						05/30/22	12:19
	Uncertainty			+/-0.235							
Uranium-235/236			U	0.0407 pCi/Sample							
	Uncertainty			+/-0.226							
Uranium-238			U	0.0836 pCi/Sample							
	Uncertainty			+/-0.262							
Batch	2265053										
QC1205090057	LCS										
Thorium-228				19.2 pCi/Sample					MP2	05/31/22	10:36
	Uncertainty			+/-1.84							
Thorium-230				2.76 pCi/Sample				(75%-125%)			
	Uncertainty			+/-0.732							
Thorium-232	17.2			17.4 pCi/Sample			101	(75%-125%)			
	Uncertainty			+/-1.74							
QC1205090058	LCSD										
Thorium-228				17.9 pCi/Sample		7.04				05/31/22	10:36
	Uncertainty			+/-1.89							
Thorium-230				3.05 pCi/Sample		9.8		(0%-20%)			
	Uncertainty			+/-0.797							
Thorium-232	17.2			17.7 pCi/Sample		1.22	103	(0%-20%)			
	Uncertainty			+/-1.86							

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QC Summary

Workorder: 579287

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2265053										
QC1205090056	MB										
Thorium-228			U	-0.0776 pCi/Sample					MP2	05/31/22	10:36
	Uncertainty			+/-0.123							
Thorium-230			U	0.298 pCi/Sample							
	Uncertainty			+/-0.333							
Thorium-232			U	-0.0329 pCi/Sample							
	Uncertainty			+/-0.112							
Batch	2265054										
QC1205090060	LCS										
Polonium-210	44.4			42.0 pCi/Sample			94.6	(75%-125%)	MP2	06/01/22	08:42
	Uncertainty			+/-3.44							
QC1205090061	LCSD										
Polonium-210	44.4			41.5 pCi/Sample		1.05	93.6	(0%-20%)		06/01/22	08:42
	Uncertainty			+/-3.48							
QC1205090059	MB										
Polonium-210			U	-0.0744 pCi/Sample						06/02/22	14:32
	Uncertainty			+/-0.161							
Batch	2272481										
QC1205104986	LCS										
Americium-241	50.1			40.0 pCi/Sample			79.7	(75%-125%)	MP2	06/05/22	14:38
	Uncertainty			+/-3.42							
QC1205104987	LCSD										
Americium-241	50.1			45.5 pCi/Sample		13.1	90.9	(0%-20%)		06/05/22	14:38
	Uncertainty			+/-3.86							
QC1205104985	MB										
Americium-241			U	-0.121 pCi/Sample						06/05/22	14:38
	Uncertainty			+/-0.498							
Rad Gamma Spec											
Batch	2264689										
QC1205089188	579287001	DUP									
Actinium-228	U	9.81	U	4.16 pCi/Sample		N/A			N/A	RXF2	05/17/22 10:06
	Uncertainty	+/-26.5		+/-17.7							
Beryllium-7		239	UI	134 pCi/Sample		56.3		(0% - 100%)			
	Uncertainty	+/-105		+/-138							

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QC Summary

Workorder: 579287

Page 4 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	2264689										
Cesium-137	U	0.815	U	0.428 pCi/Sample		N/A		N/A	RXF2	05/17/22	10:06
	Uncertainty	+/-3.59		+/-3.75							
Cobalt-60	U	-0.757	U	3.72 pCi/Sample		N/A		N/A			
	Uncertainty	+/-3.54		+/-4.07							
Potassium-40	U	10.1	UI	66.9 pCi/Sample		N/A		N/A			
	Uncertainty	+/-53.5		+/-66.2							
QC1205089189	LCS										
Americium-241	74100			77900 pCi/Sample			105	(75%-125%)		05/17/22	09:22
	Uncertainty			+/-1610							
Actinium-228			U	146 pCi/Sample							
	Uncertainty			+/-296							
Beryllium-7			U	405 pCi/Sample							
	Uncertainty			+/-621							
Cesium-137	22200			22700 pCi/Sample			102	(75%-125%)			
	Uncertainty			+/-473							
Cobalt-60	8620			9120 pCi/Sample			106	(75%-125%)			
	Uncertainty			+/-360							
Potassium-40			U	279 pCi/Sample							
	Uncertainty			+/-228							
QC1205089187	MB										
Actinium-228			U	-41.0 pCi/Sample						05/17/22	09:21
	Uncertainty			+/-29.0							
Beryllium-7			U	4.39 pCi/Sample							
	Uncertainty			+/-35.7							
Cesium-137			U	3.08 pCi/Sample							
	Uncertainty			+/-8.34							
Cobalt-60			U	-1.73 pCi/Sample							
	Uncertainty			+/-5.33							
Potassium-40			U	52.6 pCi/Sample							
	Uncertainty			+/-110							

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QC Summary

Workorder: 579287

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2269287										
QC1205098587	LCS										
Radium-228	121			135 pCi/Sample			112	(75%-125%)	JXC9	06/01/22	10:49
	Uncertainty			+/-9.32							
QC1205098588	LCSD										
Radium-228	121			109 pCi/Sample		21.4*	90.6	(0%-20%)		06/01/22	10:49
	Uncertainty			+/-10.2							
QC1205098586	MB										
Radium-228			U	2.49 pCi/Sample						06/01/22	10:49
	Uncertainty			+/-2.47							
Batch	2269288										
QC1205098590	LCS										
Strontium-90	204			254 pCi/Sample			125	(75%-125%)	KP1	05/27/22	10:47
	Uncertainty			+/-12.7							
QC1205098591	LCSD										
Strontium-90	204			217 pCi/Sample		15.9	107	(0%-20%)		05/26/22	16:27
	Uncertainty			+/-12.7							
QC1205098589	MB										
Strontium-90			U	-1.26 pCi/Sample						05/26/22	19:10
	Uncertainty			+/-1.05							
Batch	2269289										
QC1205098593	LCS										
Total Radium	28100			27600 pCi/Sample			98.1	(75%-125%)	JXC9	05/31/22	17:29
	Uncertainty			+/-607							
QC1205098594	LCSD										
Total Radium	28100			23200 pCi/Sample		17.3	82.5	(0%-20%)		05/31/22	17:27
	Uncertainty			+/-589							
QC1205098592	MB										
Total Radium			U	-12.1 pCi/Sample						05/31/22	18:51
	Uncertainty			+/-9.77							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- ** Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported

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QC Summary

Workorder: 579287

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
BD	Results are either below the MDC or tracer recovery is low										
FA	Failed analysis.										
H	Analytical holding time was exceeded										
J	See case narrative for an explanation										
J	Value is estimated										
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.										
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.										
M	M if above MDC and less than LLD										
M	REMP Result > MDC/CL and < RDL										
N/A	RPD or %Recovery limits do not apply.										
N1	See case narrative										
ND	Analyte concentration is not detected above the detection limit										
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.										
R	Sample results are rejected										
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.										
UI	Gamma Spectroscopy--Uncertain identification										
UJ	Gamma Spectroscopy--Uncertain identification										
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.										
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.										
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.										
h	Preparation or preservation holding time was exceeded										

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Alpha Spectroscopy Raw Data

Batch 2265052 Check-list

This check-list was completed on 01-JUN-22 by Melanie Aycock

This batch was reviewed by Melanie Aycock on 01-JUN-22 and Jessica Davis on 02-JUN-22.

Batch ID:
2265052

Product:
ASP__UUF

Description: Alpha Spec Uranium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Uranium

Batch ID: 2265052
Analyst: Michael Potts (MP2)
Method: DOE EML HASL-300, U-02-RC
 Modified
Lab SOP: GL-RAD-A-011 REV# 28
Instrument: ASP-33005595

Due Dates for Lab: 05-JUN-2022			Package: 06-JUN-2022	SDG: 07-JUN-2022		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205090054	Uranium-238 AS SPIKE		1600-M	.1	mL
LCSD	1205090055	Uranium-238 AS SPIKE		1600-M	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	579287001	25-MAY-2022	1	30	0.11118
2	579287002	25-MAY-2022	1	30	0.11549
3	579287003	25-MAY-2022	1	30	0.11403
4	579287004	25-MAY-2022	1	30	0.11518
5	579287005	25-MAY-2022	1	30	0.11218
6	579289001	25-MAY-2022	1	30.1	0.11121
7	579289002	25-MAY-2022	1	30	0.1135
8	579289003	25-MAY-2022	1	30	0.11151
9	1205090053 MB	25-MAY-2022	1		0.11549
10	1205090054 LCS	25-MAY-2022	1		0.11549
11	1205090055 LCSD	25-MAY-2022	1		0.11549

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1564-DD	Uranium-232 AS TRACER	.1 ml	Pipet ID: RAD-ASP-184002Z Pu-236 Tracer Used: No Analyzed With: Am , Pu Data Entry Date2: 25-MAY-2022 00:00

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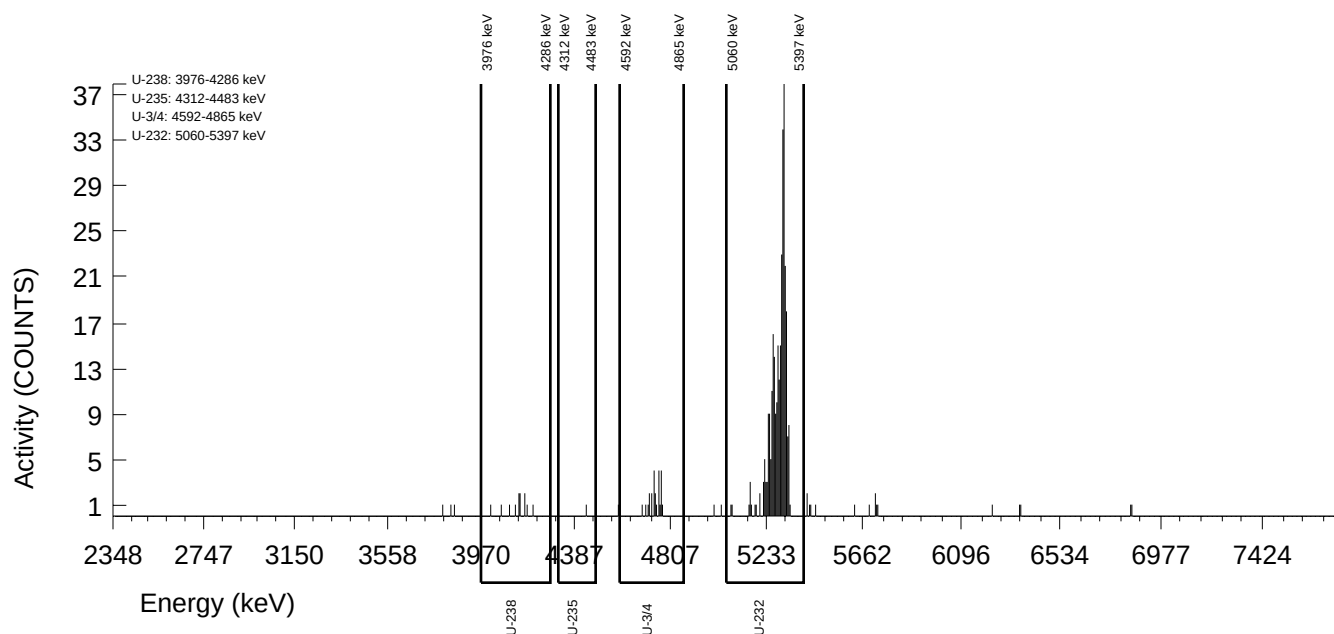
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265052 SAMPLE ID : S0579287001_UU SAMPLE QTY : 0.111 F +/-1.345 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 85.3 +/-6.634 %	CHAMBER : 003 DETECTOR S/N : 149012 AVERAGE %EFFICIENCY : 32.1282 AVERAGE %EFF ERROR : 0.6205 COUNT DATE : 30-May-2022 12:17:16 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B003.CNF;2457 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W003.CNF;702 CAL DATE : 02-May-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5328E+00 dpm RESULTS : 3.8667E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5287.24	21.074	301.000	297.640	3.360	1.8330	100.000	1.84E+01	3.29E+00	5.99E-01	2.07E-01	2.10E+00
U-3/4	4763.02	4743.48	35.536	24.000	21.085	1.920	1.3856	100.000	1.30E+00	6.38E-01	5.57E-01	1.86E-01	6.10E-01
U-235	4391.00	4438.87	4.958	1.000	0.520	0.480	0.6928	80.900	3.96E-02	2.20E-01	4.22E-01	9.66E-02	2.20E-01
U-238	4184.73	4133.09	29.751	12.000	10.080	1.920	1.3856	100.000	6.21E-01	4.52E-01	4.97E-01	1.56E-01	4.44E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.995 +/-0.030)



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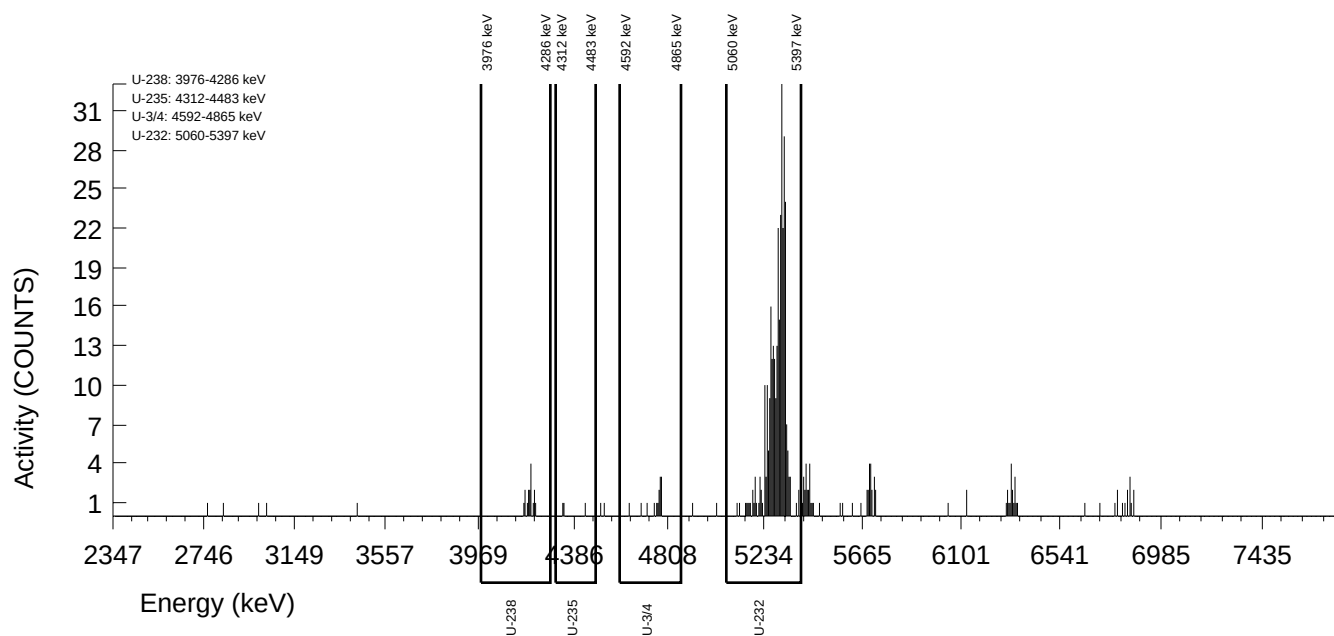
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265052 SAMPLE ID : S0579287002_UU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 87.9 +/-6.609 %	CHAMBER : 004 DETECTOR S/N : 79994 AVERAGE %EFFICIENCY : 32.5685 AVERAGE %EFF ERROR : 0.6289 COUNT DATE : 30-May-2022 12:17:16 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B004.CNF;2472 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W004.CNF;717 CAL DATE : 02-May-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5328E+00 dpm RESULTS : 3.9826E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5288.55	34.940	323.000	310.760	12.240	3.4986	100.000	1.77E+01	3.16E+00	9.00E-01	3.65E-01	2.02E+00
U-3/4	4763.02	4737.10	14.863	15.000	11.082	2.880	1.6971	100.000	6.29E-01	4.65E-01	5.72E-01	2.01E-01	4.56E-01
U-235	4391.00	4374.13	99.088	3.000	2.520	0.480	0.6928	80.900	1.77E-01	2.82E-01	3.89E-01	8.91E-02	2.81E-01
U-238	4184.73	4193.85	7.432	16.000	14.320	1.680	1.2961	100.000	8.13E-01	4.78E-01	4.40E-01	1.35E-01	4.65E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (1.038 +/-0.031)



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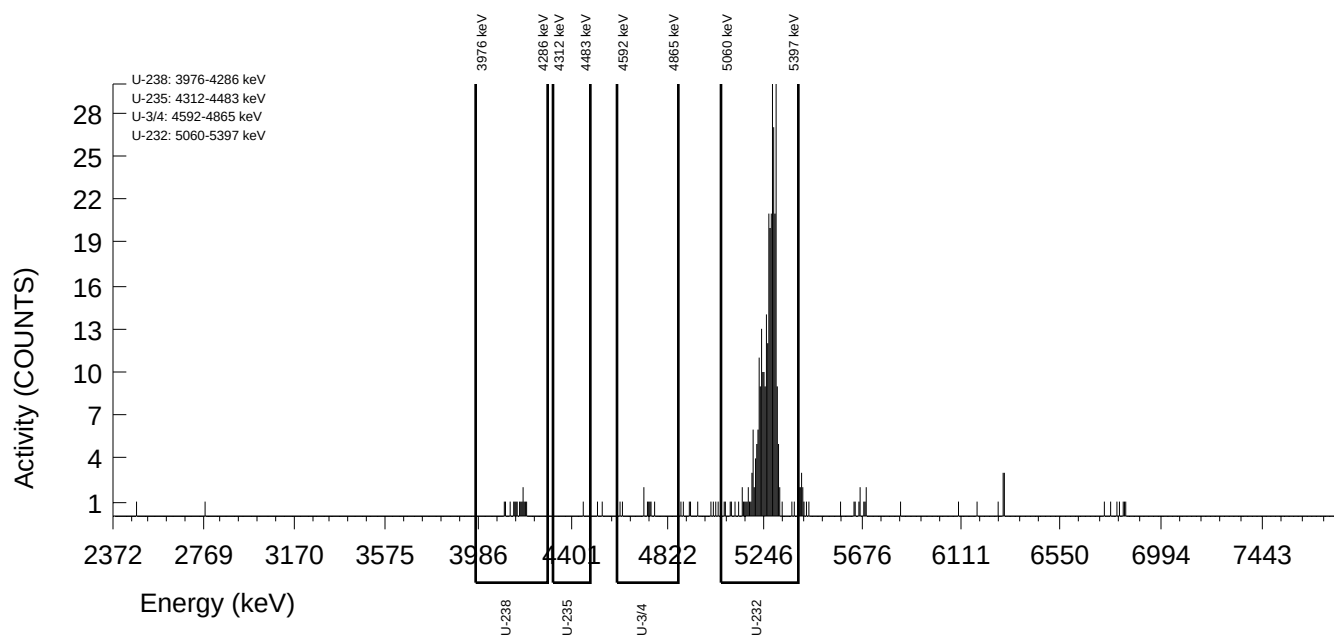
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265052 SAMPLE ID : S0579287003_UU SAMPLE QTY : 0.114 F +/-1.330 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 82.4 +/-6.577 %	CHAMBER : 005 DETECTOR S/N : 101453 AVERAGE %EFFICIENCY : 34.7543 AVERAGE %EFF ERROR : 0.6701 COUNT DATE : 30-May-2022 12:17:16 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B005.CNF;2437 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W005.CNF;770 CAL DATE : 02-May-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5328E+00 dpm RESULTS : 3.7335E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5262.60	36.329	320.000	310.880	9.120	3.0199	100.000	1.79E+01	3.18E+00	8.10E-01	3.19E-01	2.03E+00
U-3/4	4763.02	4709.60	4.922	9.000	4.601	3.360	1.8330	100.000	2.65E-01	3.74E-01	6.04E-01	2.16E-01	3.71E-01
U-235	4391.00	4448.40	4.922	1.000	-0.200	1.200	1.0954	80.900	-1.42E-02	2.14E-01	4.98E-01	1.43E-01	2.13E-01
U-238	4184.73	4159.18	9.844	15.000	12.840	2.160	1.4697	100.000	7.38E-01	4.70E-01	4.82E-01	1.55E-01	4.59E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (1.039 +/-0.031)



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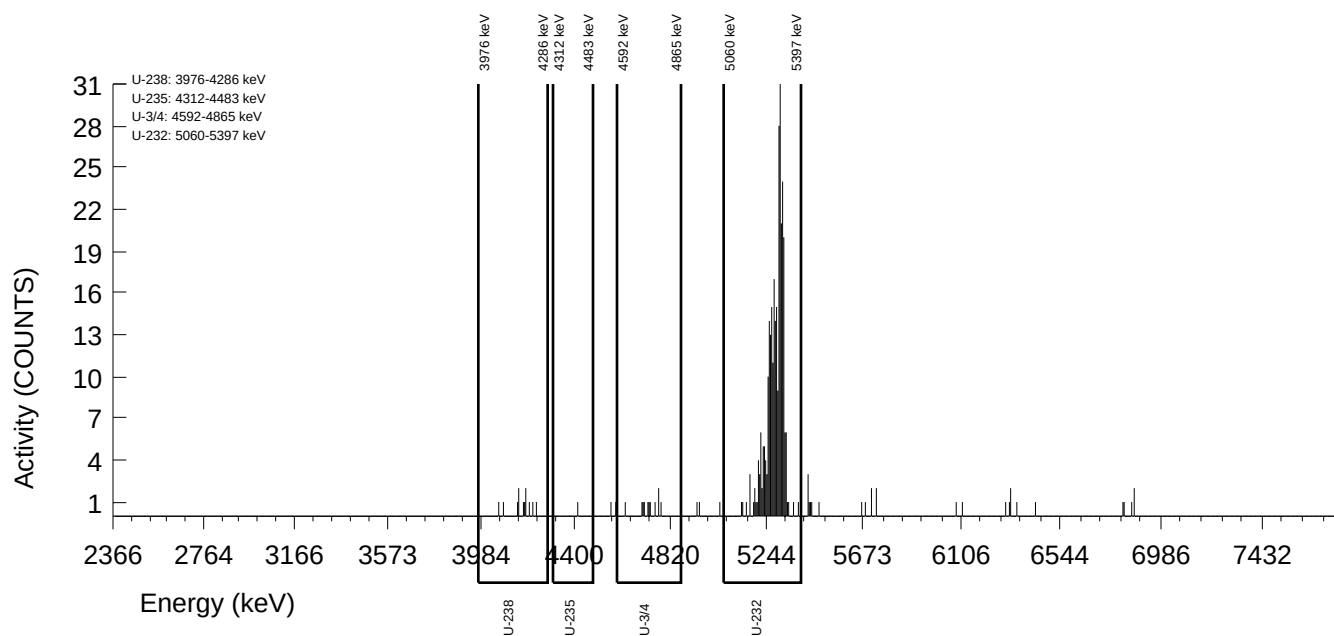
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265052 SAMPLE ID : S0579287004_UU SAMPLE QTY : 0.115 F +/-1.324 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 83.6 +/-6.652 %	CHAMBER : 006 DETECTOR S/N : 158094 AVERAGE %EFFICIENCY : 32.6615 AVERAGE %EFF ERROR : 0.6306 COUNT DATE : 30-May-2022 12:17:16 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B006.CNF;2452 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W006.CNF;756 CAL DATE : 02-May-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5328E+00 dpm RESULTS : 3.7913E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5286.07	42.389	301.000	296.680	4.320	2.0785	100.000	1.77E+01	3.19E+00	6.34E-01	2.27E-01	2.04E+00
U-3/4	4763.02	4728.21	4.945	11.000	8.569	1.440	1.2000	100.000	5.11E-01	4.19E-01	5.06E-01	1.64E-01	4.12E-01
U-235	4391.00	4415.44	4.945	1.000	0.760	0.240	0.4899	80.900	5.60E-02	2.10E-01	3.54E-01	6.62E-02	2.10E-01
U-238	4184.73	4166.35	37.090	12.000	10.320	1.680	1.2961	100.000	6.16E-01	4.37E-01	4.62E-01	1.42E-01	4.29E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.991 +/-0.030)



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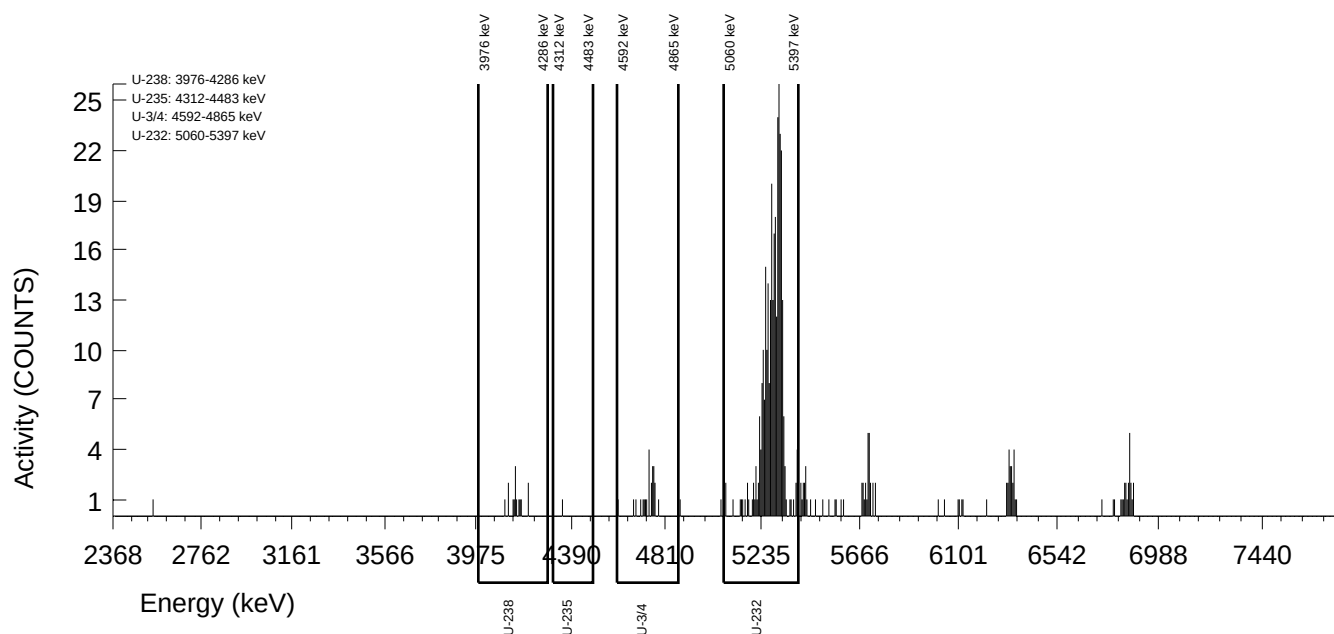
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265052 SAMPLE ID : S0579287005_UU SAMPLE QTY : 0.112 F +/-1.340 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 83.0 +/-6.630 %	CHAMBER : 008 DETECTOR S/N : 78788 AVERAGE %EFFICIENCY : 34.2935 AVERAGE %EFF ERROR : 0.6614 COUNT DATE : 30-May-2022 12:17:17 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B008.CNF;2464 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W008.CNF;660 CAL DATE : 02-May-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5328E+00 dpm RESULTS : 3.7613E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5283.16	69.683	322.000	309.040	12.960	3.6000	100.000	1.82E+01	3.26E+00	9.53E-01	3.88E-01	2.08E+00
U-3/4	4763.02	4729.82	26.895	23.000	20.767	1.200	1.0954	100.000	1.22E+00	5.95E-01	4.83E-01	1.54E-01	5.69E-01
U-235	4391.00	4353.61	4.890	1.000	0.040	0.960	0.9798	80.900	2.91E-03	2.16E-01	4.79E-01	1.30E-01	2.15E-01
U-238	4184.73	4149.87	85.575	14.000	12.800	1.200	1.0954	100.000	7.53E-01	4.63E-01	4.12E-01	1.18E-01	4.51E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (1.033 +/-0.031)



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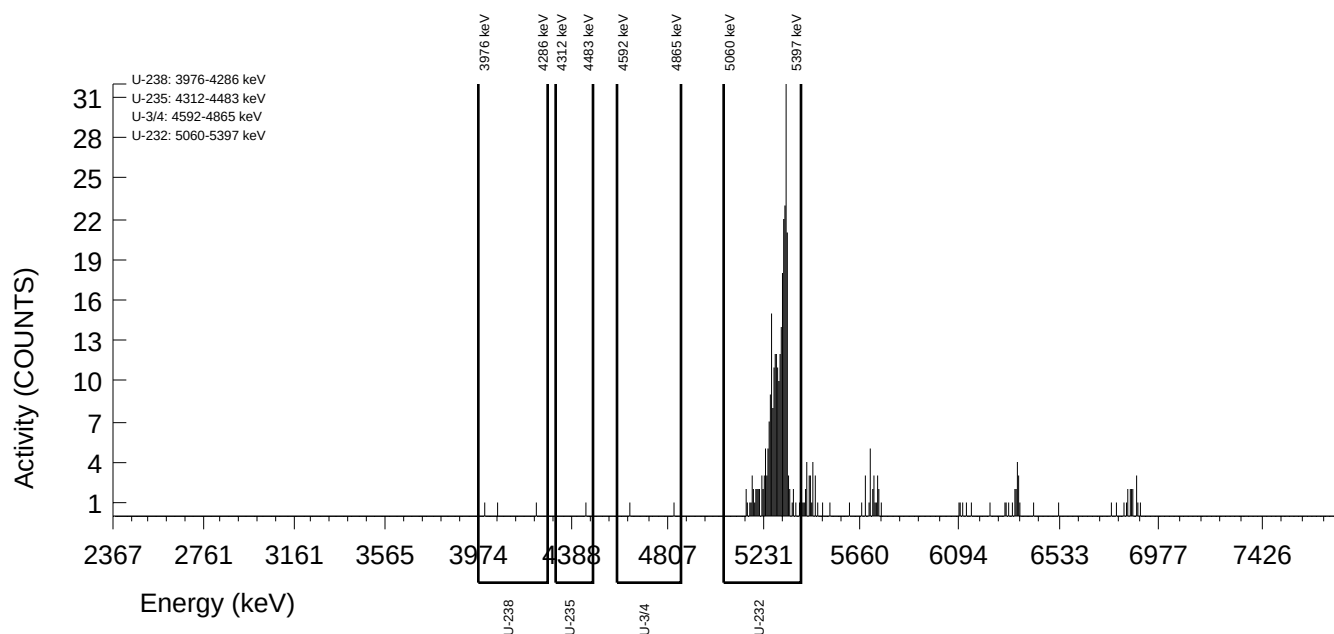
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265052 SAMPLE ID : S1205090053_UU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 73.8 +/-6.879 %	CHAMBER : 014 DETECTOR S/N : 83289 AVERAGE %EFFICIENCY : 34.7454 AVERAGE %EFF ERROR : 0.6699 COUNT DATE : 30-May-2022 12:19:31 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B014.CNF;2425 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W014.CNF;675 CAL DATE : 02-May-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5257E+00 dpm RESULTS : 3.3420E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5296.16	23.388	288.000	278.640	9.360	3.0594	100.000	1.77E+01	3.29E+00	9.00E-01	3.55E-01	2.12E+00
U-3/4	4763.02	4741.22	186.019	2.000	-1.091	2.160	1.4697	100.000	-6.91E-02	2.35E-01	5.86E-01	1.98E-01	2.35E-01
U-235	4391.00	4450.50	4.895	1.000	0.520	0.480	0.6928	80.900	4.07E-02	2.26E-01	4.34E-01	9.94E-02	2.26E-01
U-238	4184.73	4099.29	220.286	3.000	1.320	1.680	1.2961	100.000	8.36E-02	2.62E-01	4.91E-01	1.50E-01	2.62E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.931 +/-0.028)



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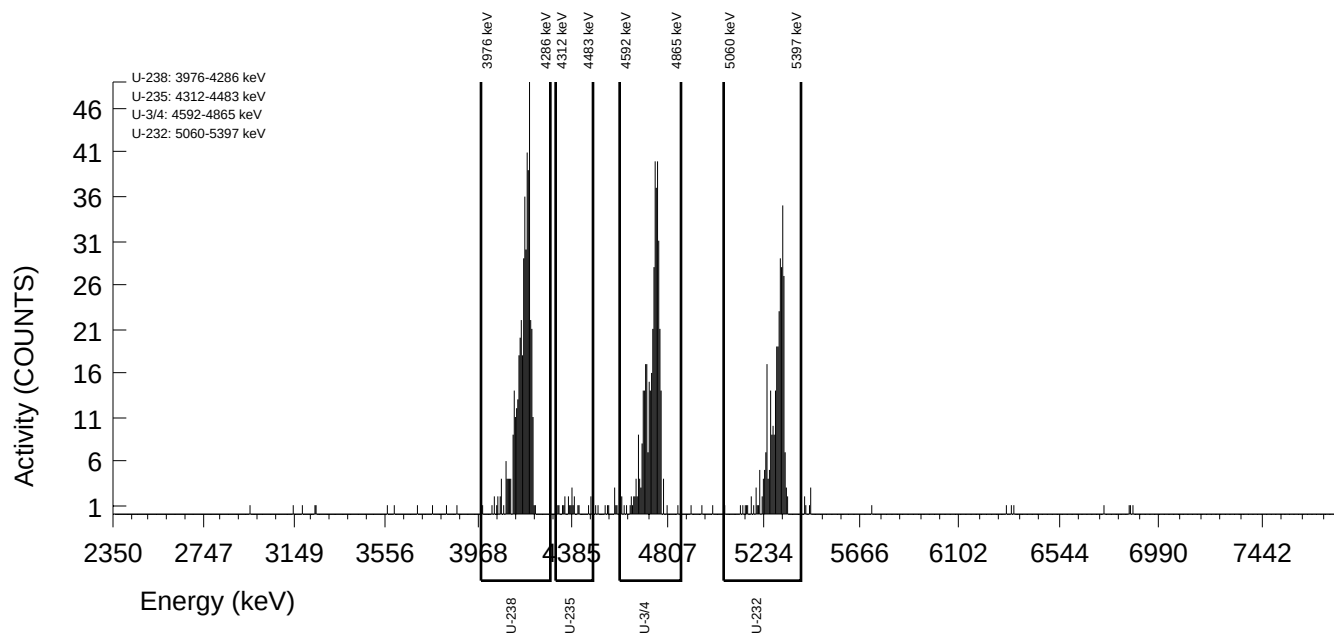
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265052 SAMPLE ID : S1205090054_UU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 81.1 +/-6.552 %	CHAMBER : 009 DETECTOR S/N : 149015 AVERAGE %EFFICIENCY : 34.8926 AVERAGE %EFF ERROR : 0.6728 COUNT DATE : 30-May-2022 12:17:17 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B009.CNF;2448 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W009.CNF;661 CAL DATE : 02-May-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5257E+00 dpm RESULTS : 3.6714E+00 dpm	LCS ID : 1600-M NUCLIDE : U-238 NOMINAL (pCi/F) : 2.4016E+01 % RECOVERY : 108.366	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			1.96-sigma
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5288.76	33.423	311.000	307.400	3.600	1.8974	100.000	1.77E+01	3.12E+00	5.71E-01	2.00E-01	1.99E+00
U-3/4	4763.02	4739.32	31.291	396.000	393.053	1.920	1.3856	100.000	2.26E+01	3.81E+00	5.21E-01	1.74E-01	2.24E+00
U-235	4391.00	4385.93	112.232	21.000	21.000	0.000	1.0000	80.900	1.49E+00	6.84E-01	2.13E-01	1.30E-01	6.53E-01
U-238	4184.73	4168.22	31.161	454.000	453.280	0.720	0.8485	100.000	2.60E+01	4.28E+00	3.51E-01	8.92E-02	2.40E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (1.027 +/-0.031)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

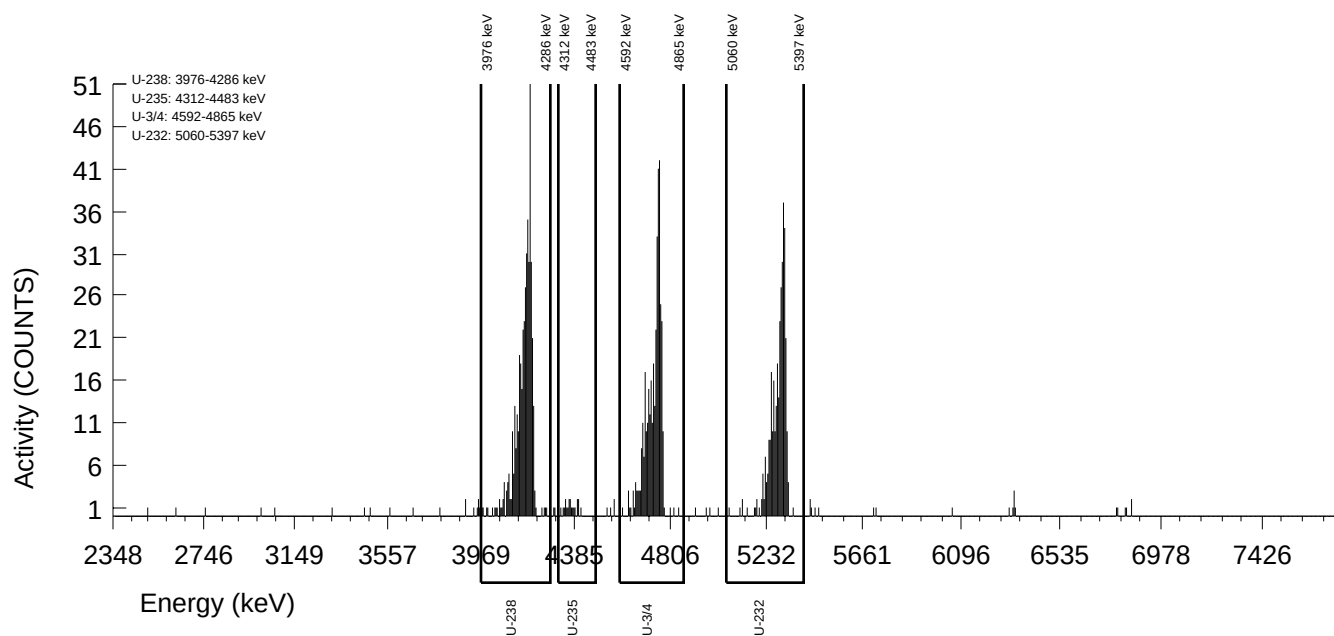
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265052 SAMPLE ID : S1205090055_UU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 90.8 +/-6.404 %	CHAMBER : 010 DETECTOR S/N : 149014 AVERAGE %EFFICIENCY : 33.5407 AVERAGE %EFF ERROR : 0.6472 COUNT DATE : 30-May-2022 12:17:17 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B010.CNF;2497 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W010.CNF;668 CAL DATE : 02-May-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5257E+00 dpm RESULTS : 4.1071E+00 dpm	LCSD ID 1600-M NUCLIDE U-238 NOMINAL (pCi/F) 2.4016E+01 % RECOVERY 96.443	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5286.76	28.365	338.000	330.560	7.440	2.7276	100.000	1.77E+01	3.05E+00	6.94E-01	2.67E-01	1.93E+00
U-3/4	4763.02	4736.53	26.076	376.000	372.255	2.640	1.6248	100.000	1.99E+01	3.35E+00	5.28E-01	1.84E-01	2.03E+00
U-235	4391.00	4369.65	61.909	21.000	21.000	0.000	1.0000	80.900	1.39E+00	6.35E-01	1.98E-01	1.21E-01	6.08E-01
U-238	4184.73	4164.30	29.097	435.000	433.800	1.200	1.0954	100.000	2.32E+01	3.79E+00	3.74E-01	1.07E-01	2.19E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (1.105 +/-0.033)



Batch 2265053 Check-list

This check-list was completed on 03-JUN-22 by Melanie Aycock

This batch was reviewed by Jessica Davis on 03-JUN-22 and Melanie Aycock on 03-JUN-22.

Batch ID:
2265053

Product:
ASP__THF

Description: Alpha Spec Thorium
GL-RAD-A-038

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Thorium

Batch ID: 2265053

Analyst: Michael Potts (MP2)

Method: DOE EML HASL-300, Th-01-RC
Modified

Lab SOP: GL-RAD-A-038 REV# 18

Instrument: ASP-33005595

Due Dates for Lab: 05-JUN-2022

Package: 06-JUN-2022

SDG: 07-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205090057	Thorium-232 AS SPIKE	1513-C	.1	mL
LCSD	1205090058	Thorium-232 AS SPIKE	1513-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	579287001	25-MAY-2022	1	30.1	0.11155
2	579287002	25-MAY-2022	1	30	0.11549
3	579287003	25-MAY-2022	1	30.1	0.11441
4	579287004	25-MAY-2022	1	30	0.11518
5	579287005	25-MAY-2022	1	30	0.11218
6	579289001	25-MAY-2022	1	30.1	0.11121
7	579289002	25-MAY-2022	1	30.1	0.11388
8	579289003	25-MAY-2022	1	30.1	0.11188
9	1205090056 MB	25-MAY-2022	1		0.11549
10	1205090057 LCS	25-MAY-2022	1		0.11549
11	1205090058 LCSD	25-MAY-2022	1		0.11549

Reagent/Solvent Lot ID	Description	Amount
WORK 1845-G	Thorium-229 AS TRACER, RASP	.1 mL

Comments:

Pipet ID: RAD-ASP-184002Z
Data Entry Date2: 25-MAY-2022 00:00

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Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-038

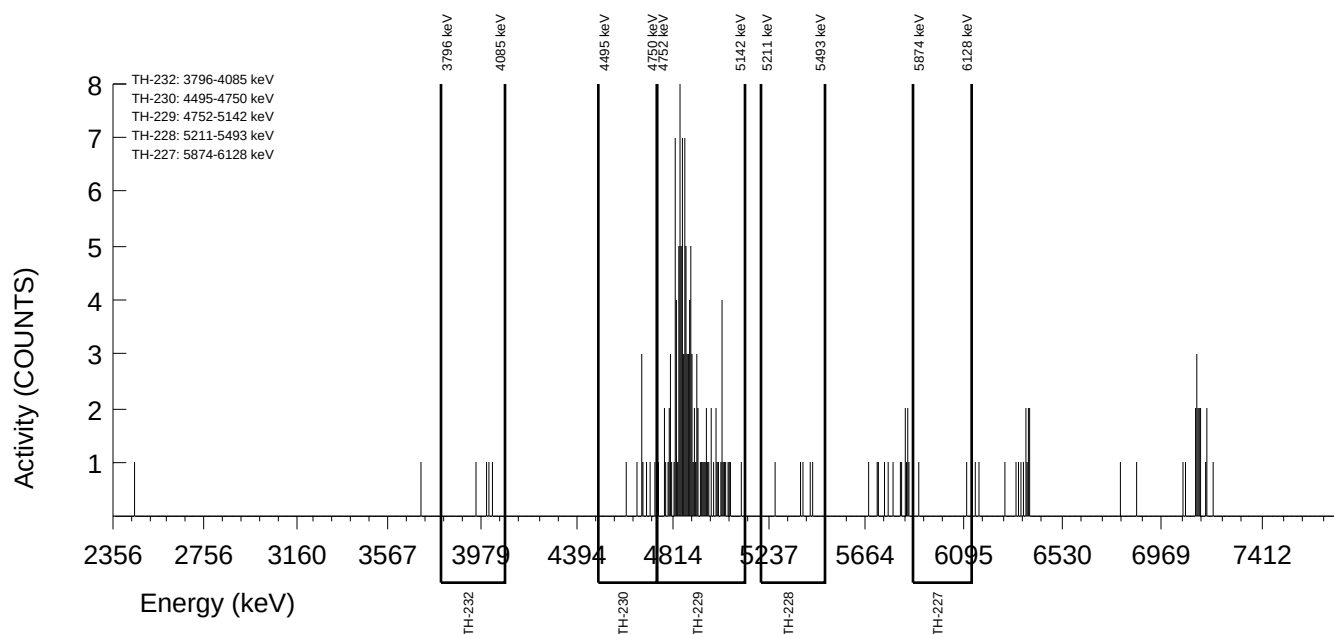
BATCH NUMBER : 2265053 SAMPLE ID : S0579287001_TH SAMPLE QTY : 0.112 F +/-1.343 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 38.7 +/-9.643 %	CHAMBER : 170 DETECTOR S/N : 155787 AVERAGE %EFFICIENCY : 26.2077 AVERAGE %EFF ERROR : 0.5089 COUNT DATE : 31-May-2022 10:35:51 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH(2) BKG FILE : B170.CNF;1487 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W170.CNF;58 CAL DATE : 13-May-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8638E+00 dpm RESULTS : 1.8819E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	6005.92	198.853	2.000	0.800	1.200	1.0954	57.440	2.44E+00	1.10E+01	2.14E+01	6.12E+00	1.09E+01
TH-228	5363.00	5379.48	159.082	5.000	3.312	1.680	1.2961	99.940	5.86E-01	8.88E-01	1.37E+00	4.21E-01	8.81E-01
TH-229	4900.00	4895.96	69.598	119.000	117.800	1.200	1.0954	99.520	1.96E+01	5.24E+00	1.17E+00	3.35E-01	3.58E+00
TH-230	4671.39	4685.55	6.214	9.000	7.331	0.960	0.9798	99.700	1.22E+00	1.08E+00	1.25E+00	3.77E-01	1.05E+00
TH-232	3972.00	3996.83	74.570	4.000	3.953	0.000	1.0000	100.000	6.56E-01	7.43E-01	6.17E-01	3.10E-01	7.31E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.008 +/-0.000)
TH-230 (0.709 +/-0.011)
TH-232 (0.047 +/-0.001)



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ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-038

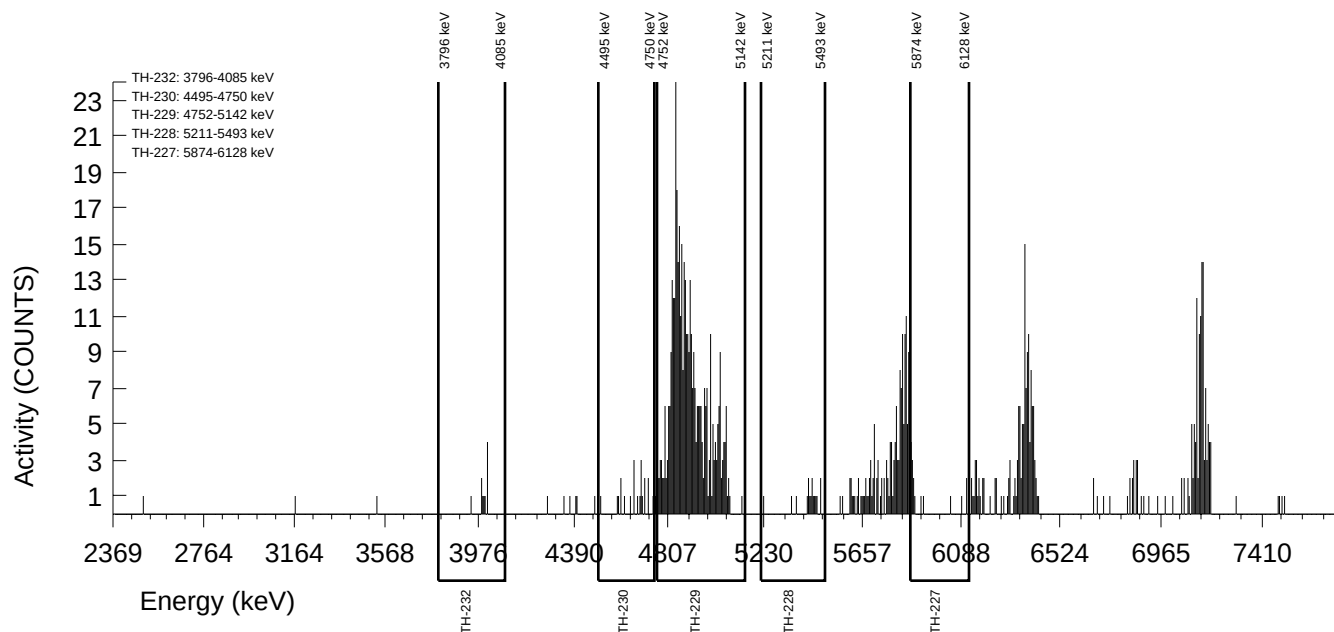
BATCH NUMBER : 2265053 SAMPLE ID : S0579287002_TH SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 36.2 +/-5.482 %	CHAMBER : 025 DETECTOR S/N : 149007 AVERAGE %EFFICIENCY : 33.3448 AVERAGE %EFF ERROR : 0.6435 COUNT DATE : 02-Jun-2022 14:27:39 ELAPSED LIVE TIME(SEC) : 43199.99	LIB FILE : TH(2) BKG FILE : B025.CNF;2451 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W025.CNF;716 CAL DATE : 03-May-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8638E+00 dpm RESULTS : 1.7621E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5947.36	0.000	17.000	4.040	12.960	3.6000	57.440	3.63E+00	9.31E+00	1.67E+01	6.98E+00	9.30E+00
TH-228	5363.00	5417.61	56.439	16.000	10.933	5.040	2.2450	99.940	5.24E-01	4.36E-01	6.08E-01	2.32E-01	4.32E-01
TH-229	4900.00	4897.86	76.479	421.000	421.000	0.000	1.0000	99.520	1.90E+01	2.86E+00	1.35E-01	9.72E-02	1.82E+00
TH-230	4671.39	4667.44	141.097	24.000	20.027	1.440	1.2000	99.700	9.01E-01	4.70E-01	4.66E-01	1.66E-01	4.54E-01
TH-232	3972.00	3995.47	4.908	10.000	7.671	2.160	1.4697	100.000	3.44E-01	3.20E-01	4.25E-01	1.45E-01	3.18E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.027 +/-0.000)
TH-230 (2.533 +/-0.039)
TH-232 (0.169 +/-0.003)



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ALPHA SPECTROSCOPY REPORT

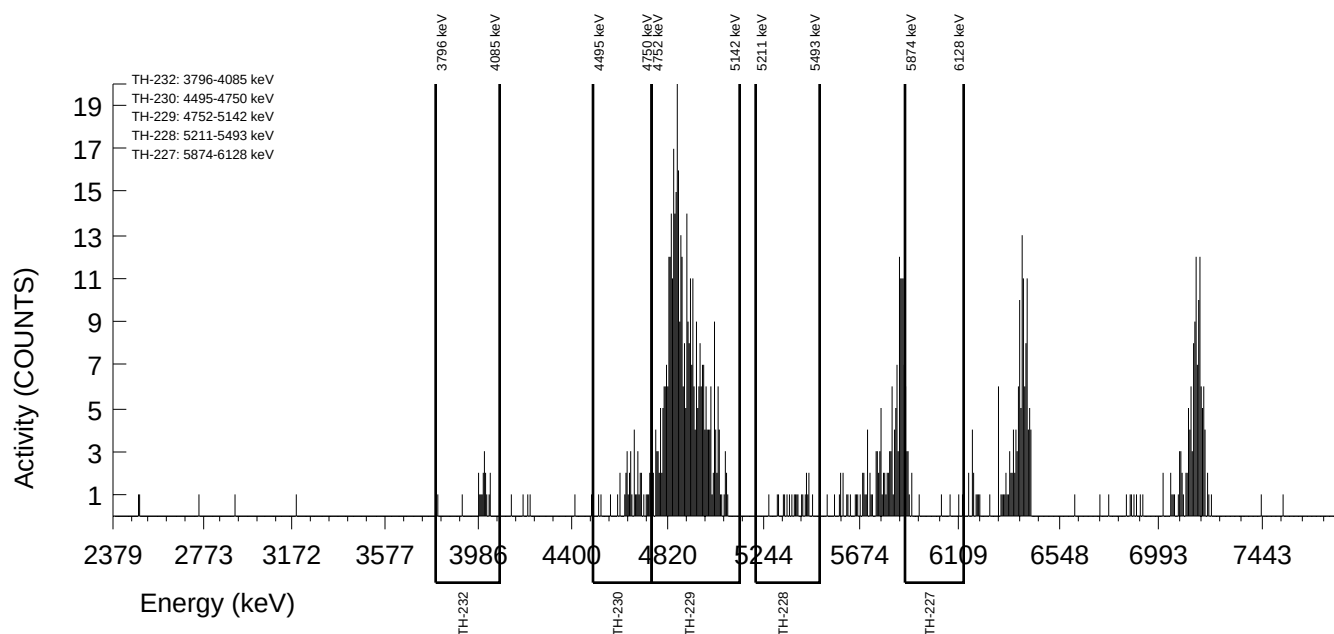
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2265053 SAMPLE ID : S0579287003_TH SAMPLE QTY : 0.114 F +/-1.328 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 34.2 +/-5.531 %	CHAMBER : 026 DETECTOR S/N : 82217 AVERAGE %EFFICIENCY : 35.1399 AVERAGE %EFF ERROR : 0.6774 COUNT DATE : 02-Jun-2022 14:27:39 ELAPSED LIVE TIME(SEC) : 43199.99	LIB FILE : TH(2) BKG FILE : B026.CNF;2442 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W026.CNF;657 CAL DATE : 03-May-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8638E+00 dpm RESULTS : 1.6628E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5934.83	0.000	21.000	-2.040	23.040	4.8000	57.440	-1.86E+00	1.12E+01	2.16E+01	9.45E+00	1.12E+01
TH-228	5363.00	5388.75	17.135	21.000	17.373	3.600	1.8974	99.940	8.45E-01	4.88E-01	5.45E-01	1.99E-01	4.78E-01
TH-229	4900.00	4902.09	100.527	423.000	418.680	4.320	2.0785	99.520	1.91E+01	2.92E+00	5.47E-01	2.05E-01	1.85E+00
TH-230	4671.39	4671.67	51.406	41.000	32.001	6.480	2.5456	99.700	1.46E+00	6.42E-01	6.92E-01	2.78E-01	6.15E-01
TH-232	3972.00	3999.09	51.406	18.000	14.952	2.880	1.6971	100.000	6.81E-01	4.22E-01	4.75E-01	1.69E-01	4.15E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.027 +/-0.000)
TH-230 (2.519 +/-0.039)
TH-232 (0.168 +/-0.003)



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ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-038

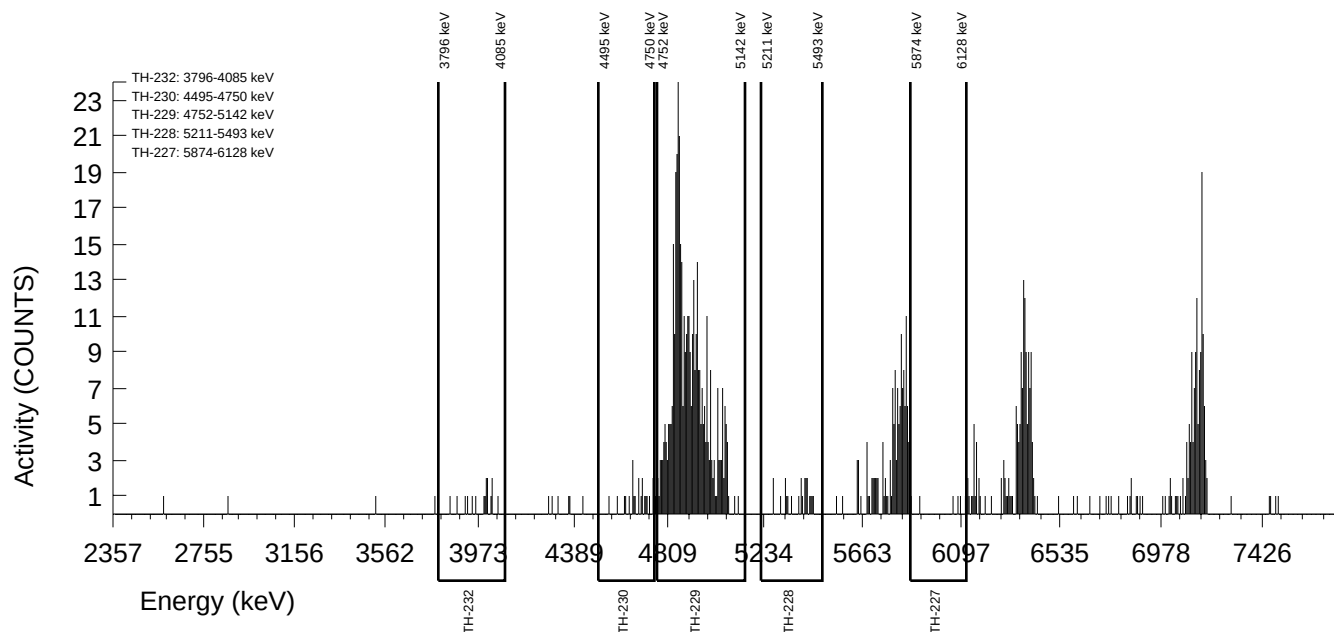
BATCH NUMBER : 2265053 SAMPLE ID : S0579287004_TH SAMPLE QTY : 0.115 F +/-1.324 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 36.4 +/-5.424 %	CHAMBER : 027 DETECTOR S/N : 140238 AVERAGE %EFFICIENCY : 34.5272 AVERAGE %EFF ERROR : 0.6658 COUNT DATE : 02-Jun-2022 14:27:39 ELAPSED LIVE TIME(SEC) : 43199.99	LIB FILE : TH(2) BKG FILE : B027.CNF;2465 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W027.CNF;727 CAL DATE : 03-May-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8638E+00 dpm RESULTS : 1.7720E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	6002.96	0.000	13.000	2.920	10.080	3.1749	57.440	2.53E+00	7.92E+00	1.45E+01	5.93E+00	7.92E+00
TH-228	5363.00	5378.72	143.085	22.000	16.932	5.040	2.2450	99.940	7.81E-01	4.80E-01	5.86E-01	2.24E-01	4.71E-01
TH-229	4900.00	4900.35	101.969	442.000	438.400	3.600	1.8974	99.520	1.90E+01	2.84E+00	4.85E-01	1.78E-01	1.80E+00
TH-230	4671.39	4671.65	87.578	22.000	14.323	5.040	2.2450	99.700	6.20E-01	4.50E-01	6.09E-01	2.40E-01	4.42E-01
TH-232	3972.00	3975.93	32.071	16.000	12.944	2.880	1.6971	100.000	5.59E-01	3.80E-01	4.51E-01	1.61E-01	3.75E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.028 +/-0.000)
TH-230 (2.637 +/-0.041)
TH-232 (0.176 +/-0.003)



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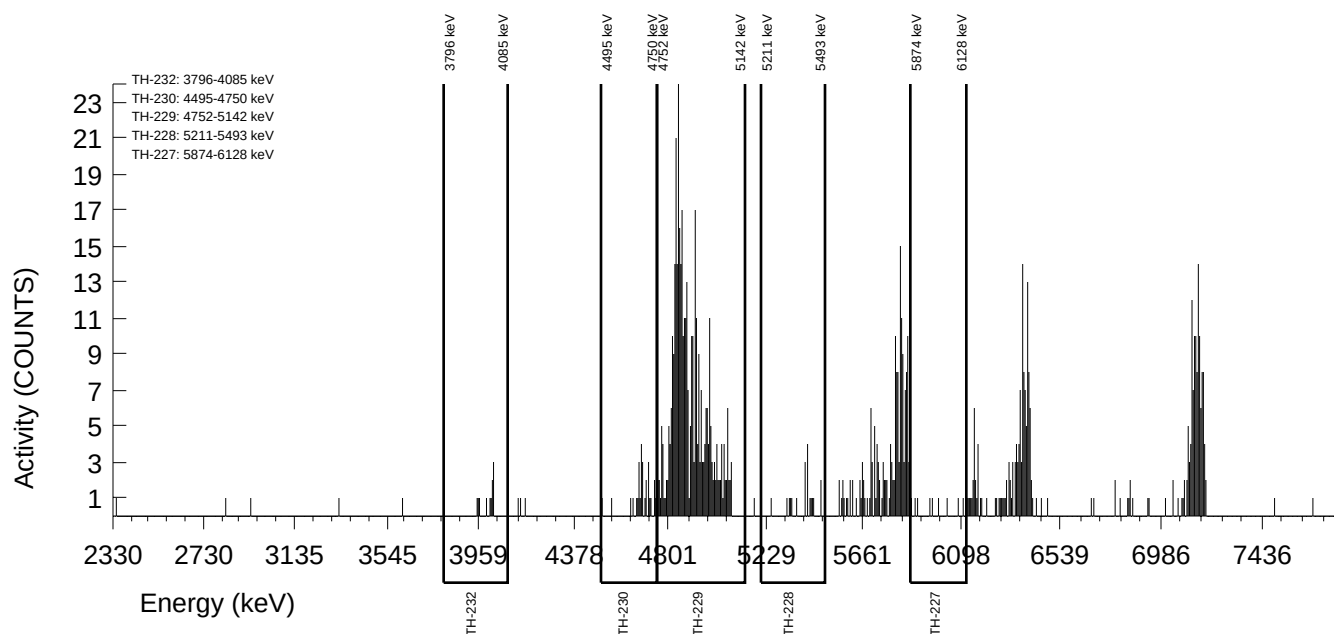
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2265053 SAMPLE ID : S0579287005_TH SAMPLE QTY : 0.112 F +/-1.340 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 34.1 +/-5.792 %	CHAMBER : 028 DETECTOR S/N : 78792 AVERAGE %EFFICIENCY : 32.2660 AVERAGE %EFF ERROR : 0.6231 COUNT DATE : 02-Jun-2022 14:27:39 ELAPSED LIVE TIME(SEC) : 43199.99	LIB FILE : TH(2) BKG FILE : B028.CNF;2447 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W028.CNF;667 CAL DATE : 03-May-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8638E+00 dpm RESULTS : 1.6606E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5985.76	0.000	11.000	4.520	6.480	2.5456	57.440	4.59E+00	8.26E+00	1.42E+01	5.57E+00	8.24E+00
TH-228	5363.00	5388.57	14.098	20.000	13.495	6.480	2.5456	99.940	7.30E-01	5.50E-01	7.57E-01	2.97E-01	5.42E-01
TH-229	4900.00	4892.91	90.722	394.000	383.920	10.080	3.1749	99.520	1.95E+01	3.12E+00	8.49E-01	3.48E-01	2.00E+00
TH-230	4671.39	4677.30	44.781	28.000	20.650	5.040	2.2450	99.700	1.05E+00	5.91E-01	7.06E-01	2.77E-01	5.73E-01
TH-232	3972.00	3996.73	9.951	11.000	10.846	0.000	1.0000	100.000	5.49E-01	3.58E-01	2.17E-01	1.14E-01	3.51E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.025 +/-0.000)
TH-230 (2.310 +/-0.036)
TH-232 (0.154 +/-0.002)



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Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-038

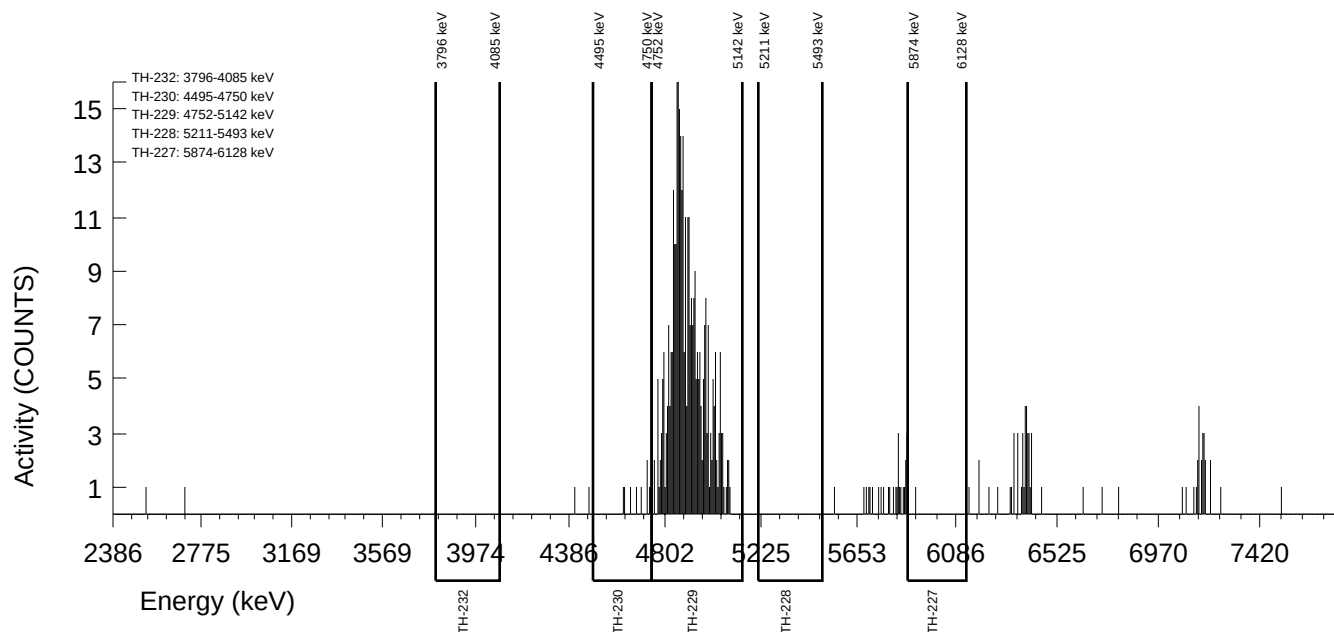
BATCH NUMBER : 2265053 SAMPLE ID : S1205090056_TH SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 75.5 +/-5.859 %	CHAMBER : 185 DETECTOR S/N : 140610 AVERAGE %EFFICIENCY : 40.8506 AVERAGE %EFF ERROR : 0.7850 COUNT DATE : 31-May-2022 10:36:07 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH(2) BKG FILE : B185.CNF;1480 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W185.CNF;393 CAL DATE : 17-May-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 3.6724E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5906.55	4.825	1.000	-3.080	4.080	2.0199	57.440	-3.60E-01	3.99E-01	1.22E+00	4.32E-01	3.99E-01
TH-228	5363.00	5351.70	0.000	0.000	-1.463	1.440	1.2000	99.940	-7.76E-02	1.23E-01	3.94E-01	1.17E-01	1.23E-01
TH-229	4900.00	4908.08	91.265	360.000	358.320	1.680	1.2961	99.520	1.90E+01	3.06E+00	4.10E-01	1.26E-01	1.97E+00
TH-230	4671.39	4693.00	4.825	9.000	5.644	1.200	1.0954	99.700	2.98E-01	3.37E-01	4.90E-01	1.66E-01	3.33E-01
TH-232	3972.00	3940.34	0.000	0.000	-0.624	0.480	0.6928	100.000	-3.29E-02	1.12E-01	3.07E-01	7.45E-02	1.12E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.023 +/-0.000)
TH-230 (2.156 +/-0.033)
TH-232 (0.144 +/-0.002)



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ALPHA SPECTROSCOPY REPORT

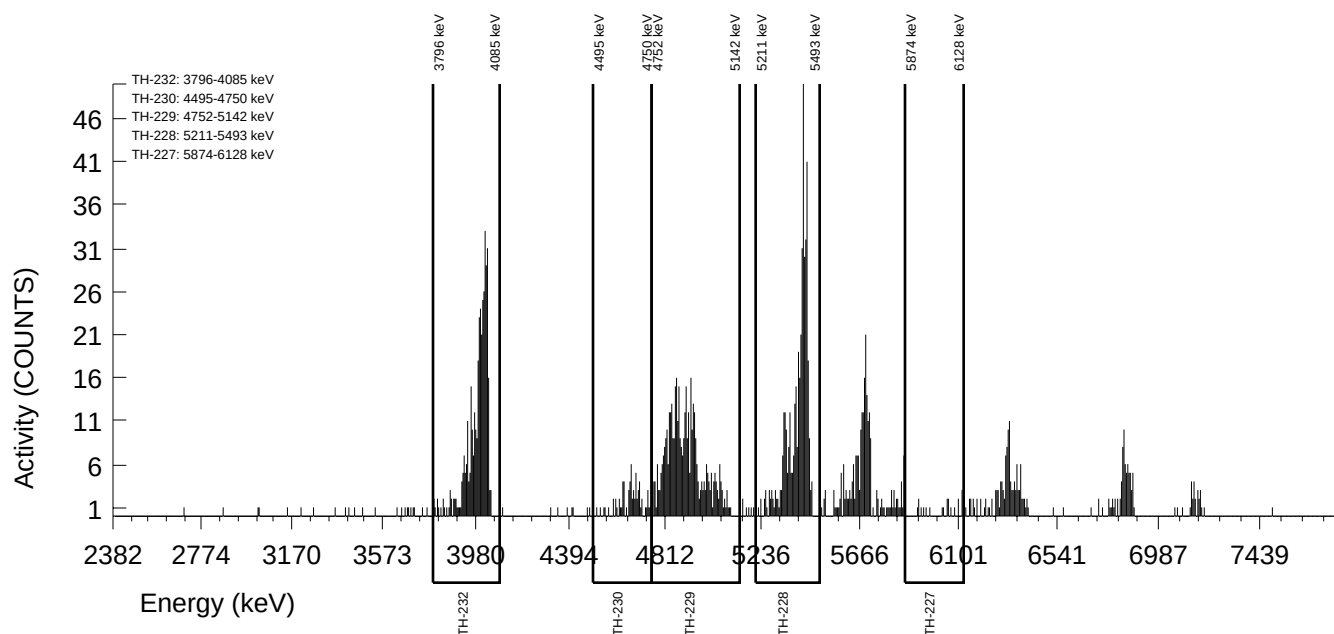
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2265053 SAMPLE ID : S1205090057_TH SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 89.7 +/-5.503 %	CHAMBER : 186 DETECTOR S/N : 140611 AVERAGE %EFFICIENCY : 40.3225 AVERAGE %EFF ERROR : 0.7752 COUNT DATE : 31-May-2022 10:36:10 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH(2) BKG FILE : B186.CNF;1444 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W186.CNF;81 CAL DATE : 17-May-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 4.3651E+00 dpm	LCS ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.7196E+01 % RECOVERY 101.421	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
TH-227	5994.04	6019.60	0.000	22.000	16.960	5.040	2.2450	57.440	1.69E+00	9.82E-01	1.12E+00	4.10E-01	9.62E-01
TH-228	5363.00	5398.62	25.719	427.000	424.813	2.160	1.4697	99.940	1.92E+01	2.90E+00	3.80E-01	1.22E-01	1.84E+00
TH-229	4900.00	4903.55	127.891	424.000	420.400	3.600	1.8974	99.520	1.90E+01	2.88E+00	4.49E-01	1.57E-01	1.83E+00
TH-230	4671.39	4659.09	71.231	67.000	61.351	3.120	1.7664	99.700	2.76E+00	8.06E-01	5.10E-01	1.87E-01	7.32E-01
TH-232	3972.00	3988.10	44.357	389.000	388.351	0.480	0.6928	100.000	1.74E+01	2.68E+00	2.64E-01	6.46E-02	1.74E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.027 +/-0.000)
TH-230 (2.529 +/-0.039)
TH-232 (0.169 +/-0.003)



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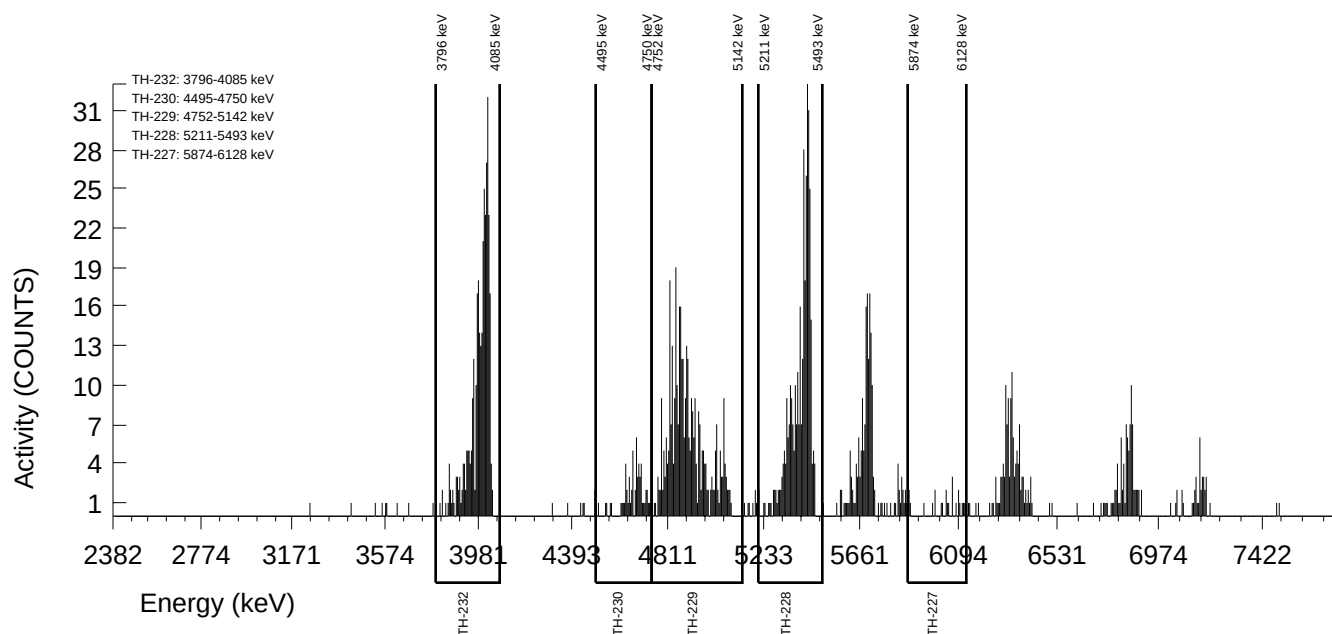
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2265053 SAMPLE ID : S1205090058_TH SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 83.0 +/-5.788 %	CHAMBER : 189 DETECTOR S/N : 84061 AVERAGE %EFFICIENCY : 38.3394 AVERAGE %EFF ERROR : 0.7377 COUNT DATE : 31-May-2022 10:36:12 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH(2) BKG FILE : B189.CNF;1465 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W189.CNF;397 CAL DATE : 17-May-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 4.0388E+00 dpm	LCSD ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.7196E+01 % RECOVERY 102.669	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
TH-227	5994.04	6028.78	0.000	23.000	20.600	2.400	1.5492	57.440	2.33E+00	1.14E+00	9.82E-01	3.21E-01	1.10E+00
TH-228	5363.00	5398.45	31.975	350.000	348.296	1.680	1.2961	99.940	1.79E+01	2.89E+00	4.00E-01	1.23E-01	1.89E+00
TH-229	4900.00	4905.74	78.227	372.000	369.840	2.160	1.4697	99.520	1.90E+01	3.03E+00	4.30E-01	1.38E-01	1.94E+00
TH-230	4671.39	4661.59	66.526	62.000	59.535	0.240	0.4899	99.700	3.05E+00	8.86E-01	4.21E-01	1.34E-01	7.97E-01
TH-232	3972.00	3989.70	54.615	346.000	345.851	0.000	1.0000	100.000	1.77E+01	2.85E+00	2.18E-01	9.90E-02	1.86E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.024 +/-0.000)
 TH-230 (2.225 +/-0.034)
 TH-232 (0.149 +/-0.002)



Batch 2272481 Check-list

This check-list was completed on 07-JUN-22 by Jessica Davis

This batch was reviewed by Jessica Davis on 07-JUN-22 and Melanie Aycock on 07-JUN-22.

Batch ID:
2272481

Product:
ASPAMCMF

Description: Alpha Spec Am241Curium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?		No	
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?	Yes		
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Americium/Curium

Batch ID: 2272481
Analyst: Michael Potts (MP2)
Method: DOE EML HASL-300, Am-05-RC
 Modified
Lab SOP: GL-RAD-A-011 REV# 28
Instrument: ASP-33005595

Due Dates for Lab: 05-JUN-2022			Package: 06-JUN-2022	SDG: 07-JUN-2022		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205104986	Americium-241 SPIKE		0533-II	.1	mL
LCSD	1205104987	Americium-241 SPIKE		0533-II	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	579287001 - 2	03-JUN-2022	1	10.1	0.03743
2	579287002 - 2	03-JUN-2022	1	10.2	0.03927
3	579287003 - 2	03-JUN-2022	1	10.1	0.03839
4	579287004 - 2	03-JUN-2022	1	5	0.0192
5	579287005 - 2	03-JUN-2022	1	10	0.03739
6	579289001 - 2	03-JUN-2022	1	10	0.03695
7	579289002 - 2	03-JUN-2022	1	10	0.03783
8	579289003 - 2	03-JUN-2022	1	10	0.03717
9	1205104985 MB	03-JUN-2022	1		0.03927
10	1205104986 LCS	03-JUN-2022	1		0.03927
11	1205104987 LCSD	03-JUN-2022	1		0.03927

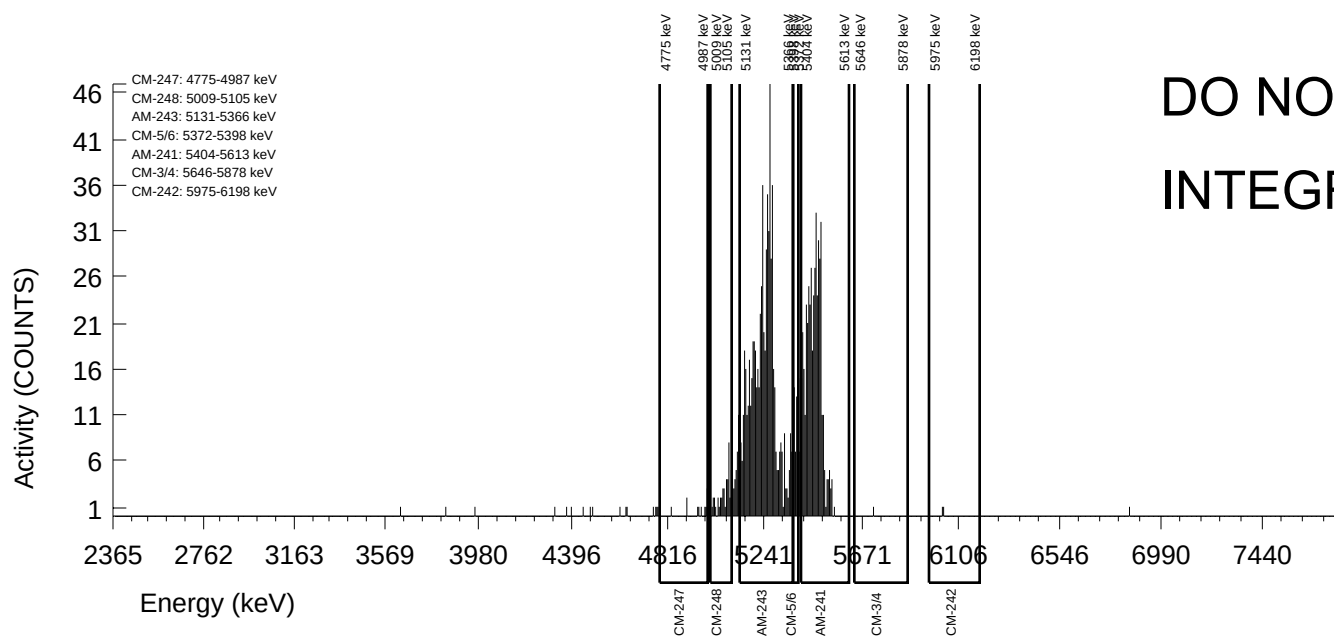
Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1752-I	Americium-243 AS TRACER	.1 ml	Pipet ID: RAD-ASP-184002Z Analyzed With: N/A Data Entry Date2: 03-JUN-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S1205104987_AM SAMPLE QTY : 0.039 F +/-2.736 % SAMPLE DATE : 03-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 59.4 +/-4.721 %	CHAMBER : 082 DETECTOR S/N : 149008 AVERAGE %EFFICIENCY : 34.3414 AVERAGE %EFF ERROR : 0.6623 COUNT DATE : 05-Jun-2022 14:38:46 ELAPSED LIVE TIME(SEC) : 43200.00	LIB FILE : AM BKG FILE : B082.CNF;2361 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W082.CNF;609 CAL DATE : 09-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 2.7366E+00 dpm	LCSD ID 0533-II NUCLIDE AM-241 NOMINAL (pCi/F) 5.0110E+01 % RECOVERY 72.506	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5460.26	80.957	461.000	458.120	2.880	1.6971	98.525	3.63E+01	5.31E+00	8.19E-01	2.90E-01	3.35E+00
AM-243	5269.50	5236.96	49.865	683.000	676.520	6.480	2.5456	99.980	5.29E+01	7.22E+00	1.09E+00	4.29E-01	4.02E+00
CM-242	6102.00	6032.52	9.850	2.000	1.280	0.720	0.8485	100.000	1.01E-01	3.12E-01	5.27E-01	1.45E-01	3.11E-01
CM-3/4	5795.02	5725.45	4.925	1.000	-1.880	2.880	1.6971	100.000	-1.47E-01	3.28E-01	8.07E-01	2.86E-01	3.28E-01
CM-5/6	5386.00	5383.25	0.000	63.000	62.280	0.720	0.8485	86.090	5.65E+00	1.57E+00	6.05E-01	1.66E-01	1.43E+00
CM-247	4946.00	4915.39	4.925	9.000	-3.240	12.240	3.4986	79.300	-3.19E-01	8.49E-01	1.78E+00	7.44E-01	8.49E-01
CM-248	5078.60	5070.14	19.700	47.000	44.840	2.160	1.4697	91.000	3.85E+00	1.27E+00	8.02E-01	2.72E-01	1.19E+00



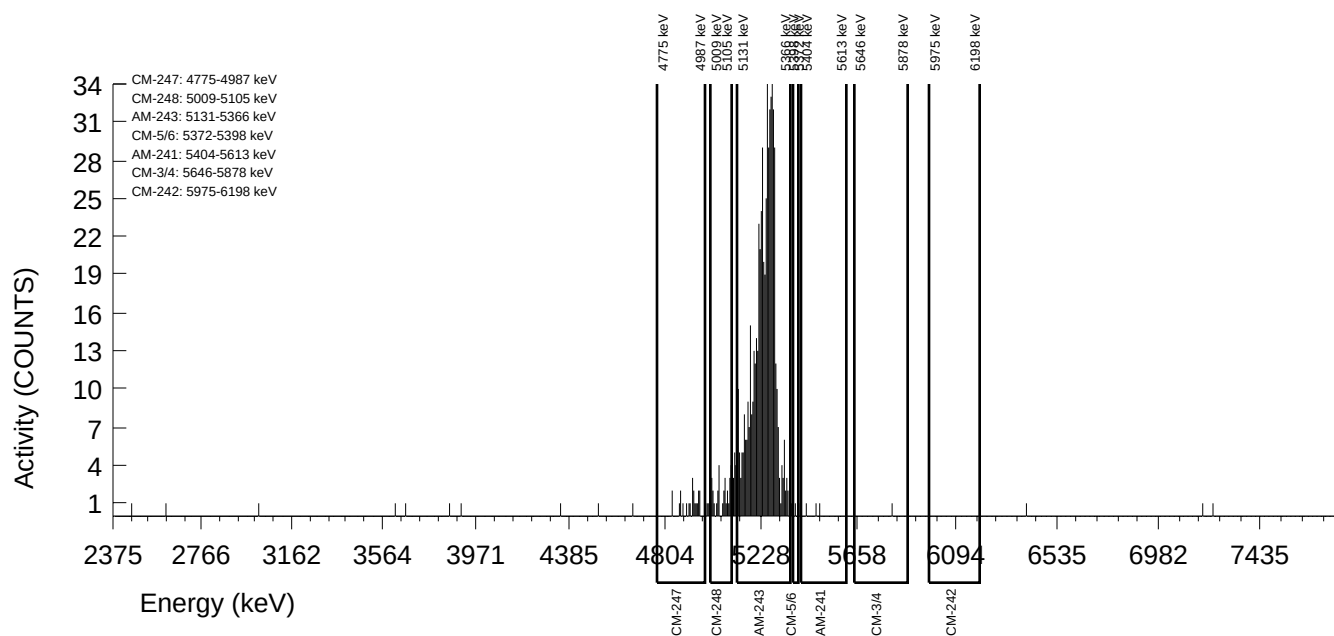
DO NOT REPORT
INTEGRATED

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S0579287001_AM SAMPLE QTY : 0.037 F +/-2.853 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 31.0 +/-4.968 %	CHAMBER : 245 DETECTOR S/N : 140604 AVERAGE %EFFICIENCY : 40.8435 AVERAGE %EFF ERROR : 0.7850 COUNT DATE : 06-Jun-2022 13:20:24 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : AM BKG FILE : B245.CNF;1075 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W245.CNF;55 CAL DATE : 19-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 1.4302E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5450.48	0.000	4.000	-2.000	6.000	2.4495	98.525	-1.93E-01	6.55E-01	1.39E+00	5.49E-01	6.55E-01
AM-243	5269.50	5246.45	69.360	589.000	584.000	5.000	2.2361	99.980	5.55E+01	7.99E+00	1.27E+00	4.94E-01	4.54E+00
CM-242	6102.00	6086.53	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	3.55E-01	3.84E-01	2.97E-01	3.54E-01
CM-3/4	5795.02	5810.04	4.848	1.000	-4.000	5.000	2.2361	100.000	-3.83E-01	5.30E-01	1.28E+00	4.98E-01	5.30E-01
CM-5/6	5386.00	5383.33	4.848	1.000	0.000	1.000	1.0000	86.090	0.00E+00	4.33E-01	8.44E-01	2.57E-01	4.32E-01
CM-247	4946.00	4917.74	113.936	21.000	17.000	4.000	2.0000	79.300	2.04E+00	1.24E+00	1.47E+00	5.57E-01	1.22E+00
CM-248	5078.60	5064.32	0.000	34.000	33.000	1.000	1.0000	91.000	3.44E+00	1.31E+00	7.99E-01	2.43E-01	1.24E+00

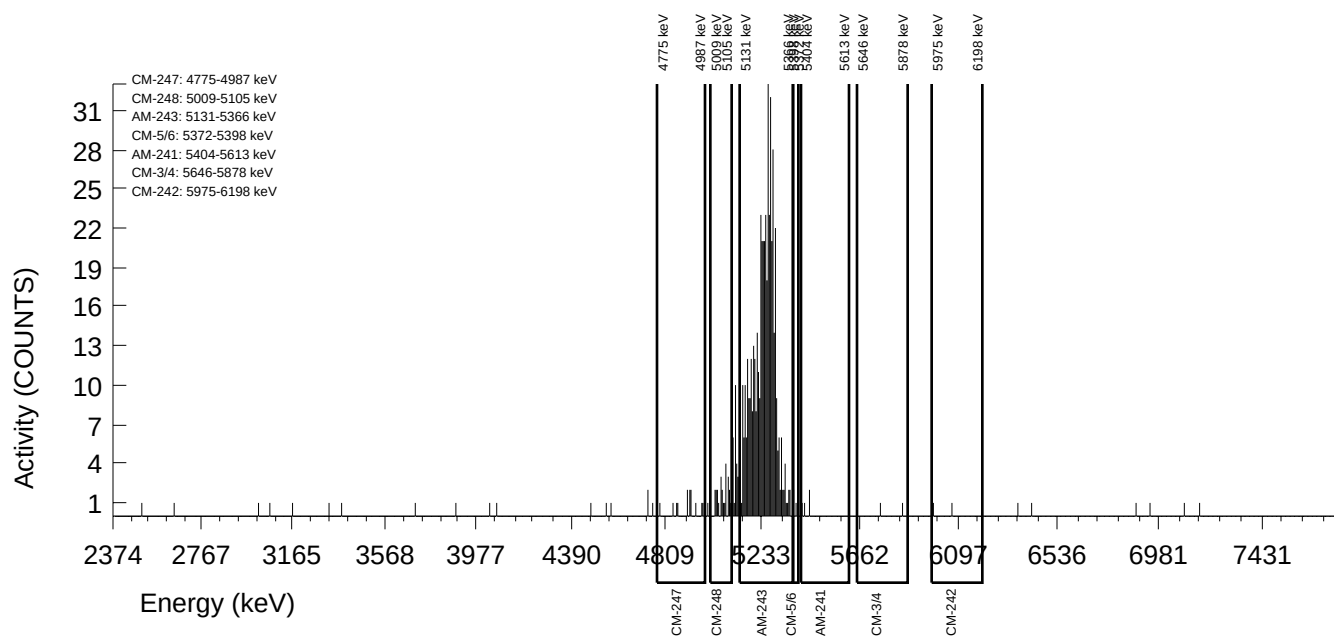


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S0579287002_AM SAMPLE QTY : 0.039 F +/-2.736 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 27.6 +/-5.251 %	CHAMBER : 246 DETECTOR S/N : 140605 AVERAGE %EFFICIENCY : 39.2945 AVERAGE %EFF ERROR : 0.7557 COUNT DATE : 06-Jun-2022 13:20:25 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : AM BKG FILE : B246.CNF;1076 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W246.CNF;279 CAL DATE : 19-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 1.2702E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5428.40	4.879	4.000	1.000	3.000	1.7321	98.525	1.08E-01	6.33E-01	1.19E+00	4.33E-01	6.32E-01
AM-243	5269.50	5240.53	62.876	502.000	499.000	3.000	1.7321	99.980	5.29E+01	7.97E+00	1.17E+00	4.27E-01	4.68E+00
CM-242	6102.00	6028.57	78.062	2.000	1.000	1.000	1.0000	100.000	1.43E-01	6.25E-01	1.09E+00	3.32E-01	6.25E-01
CM-3/4	5795.02	5803.01	92.699	2.000	-7.000	9.000	3.0000	100.000	-7.47E-01	7.54E-01	1.81E+00	7.45E-01	7.54E-01
CM-5/6	5386.00	5375.72	0.000	3.000	3.000	0.000	1.0000	86.090	3.69E-01	5.41E-01	3.69E-01	2.86E-01	5.39E-01
CM-247	4946.00	4900.11	19.516	13.000	11.000	2.000	1.4142	79.300	1.47E+00	1.09E+00	1.28E+00	4.40E-01	1.08E+00
CM-248	5078.60	5073.15	0.000	34.000	31.000	3.000	1.7321	91.000	3.61E+00	1.49E+00	1.29E+00	4.69E-01	1.42E+00

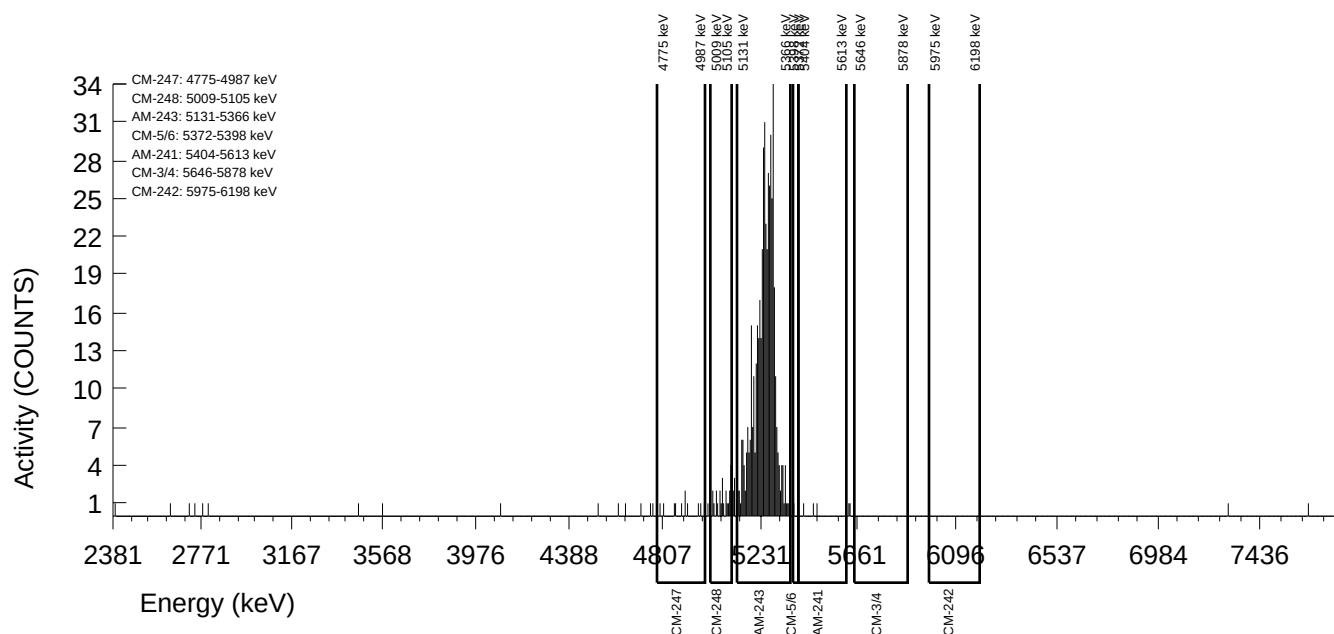


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S0579287003_AM SAMPLE QTY : 0.038 F +/-2.790 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 26.1 +/-5.327 %	CHAMBER : 252 DETECTOR S/N : 158114 AVERAGE %EFFICIENCY : 40.3091 AVERAGE %EFF ERROR : 0.7749 COUNT DATE : 06-Jun-2022 13:20:28 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : AM BKG FILE : B252.CNF;251 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W252.CNF;57 CAL DATE : 19-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 1.2010E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5457.65	58.092	3.000	1.000	2.000	1.4142	98.525	1.13E-01	5.88E-01	1.09E+00	3.73E-01	5.88E-01
AM-243	5269.50	5251.47	51.868	489.000	484.000	5.000	2.2361	99.980	5.41E+01	8.28E+00	1.50E+00	5.81E-01	4.88E+00
CM-242	6102.00	6086.53	0.000	0.000	-2.000	2.000	1.4142	100.000	-3.01E-01	5.90E-01	1.44E+00	4.95E-01	5.90E-01
CM-3/4	5795.02	5761.55	0.000	0.000	-8.000	8.000	2.8284	100.000	-9.00E-01	6.98E-01	1.82E+00	7.40E-01	6.97E-01
CM-5/6	5386.00	5380.71	4.841	1.000	0.000	1.000	1.0000	86.090	0.00E+00	5.09E-01	9.93E-01	3.02E-01	5.09E-01
CM-247	4946.00	4893.60	4.841	11.000	6.000	5.000	2.2361	79.300	8.45E-01	1.18E+00	1.89E+00	7.33E-01	1.17E+00
CM-248	5078.60	5062.66	0.000	26.000	24.000	2.000	1.4142	91.000	2.95E+00	1.37E+00	1.18E+00	4.04E-01	1.32E+00



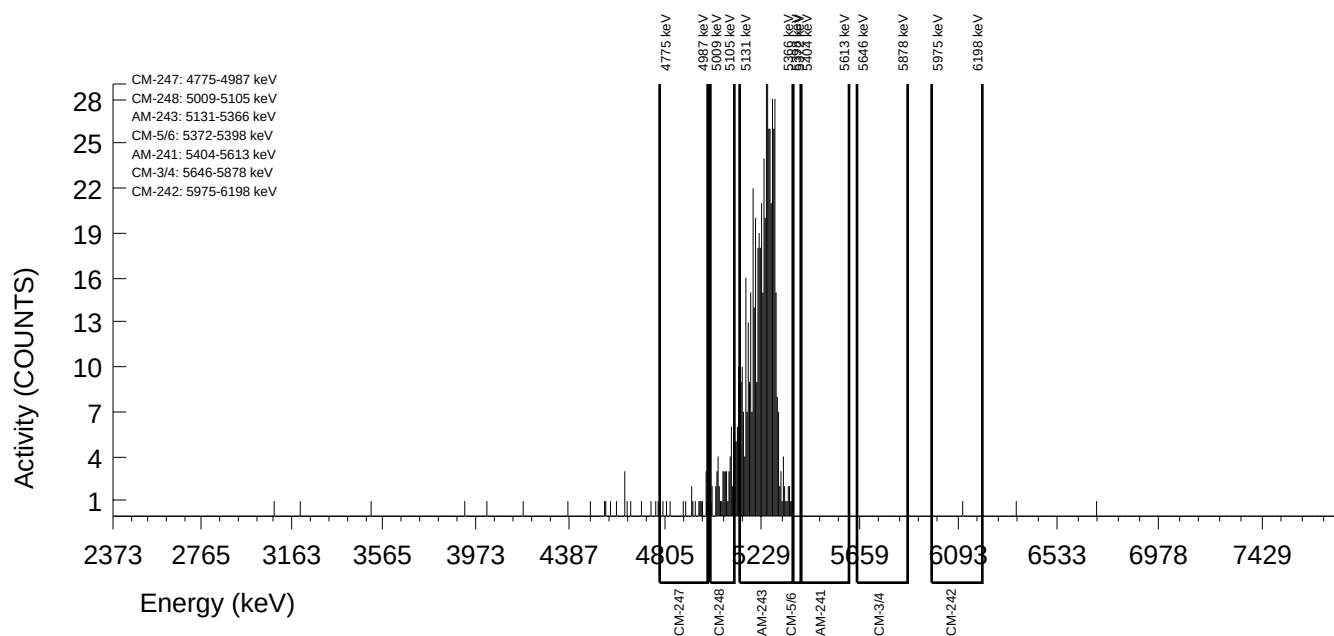
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S0579287004_AM SAMPLE QTY : 0.019 F +/-1.128 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 30.9 +/-5.003 %	CHAMBER : 254 DETECTOR S/N : 158088 AVERAGE %EFFICIENCY : 39.7791 AVERAGE %EFF ERROR : 0.7649 COUNT DATE : 06-Jun-2022 13:20:30 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : AM BKG FILE : B254.CNF;1083 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W254.CNF;53 CAL DATE : 19-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 1.4257E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5508.45	0.000	0.000	-1.000	1.000	1.0000	98.525	-1.94E-01	6.58E-01	1.48E+00	4.50E-01	6.57E-01
AM-243	5269.50	5235.38	122.652	569.000	567.000	2.000	1.4142	99.980	1.08E+02	1.47E+01	1.83E+00	6.28E-01	8.95E+00
CM-242	6102.00	6115.02	4.868	1.000	0.000	1.000	1.0000	100.000	0.00E+00	1.01E+00	1.96E+00	5.97E-01	1.01E+00
CM-3/4	5795.02	5761.56	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	5.33E-01	5.76E-01	4.47E-01	5.32E-01
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	6.14E-01	6.65E-01	5.15E-01	6.14E-01
CM-247	4946.00	4911.24	0.000	17.000	17.000	0.000	1.0000	79.300	4.09E+00	2.10E+00	7.21E-01	5.59E-01	2.05E+00
CM-248	5078.60	5064.83	62.065	45.000	45.000	0.000	1.0000	91.000	9.43E+00	2.99E+00	6.29E-01	4.87E-01	2.82E+00

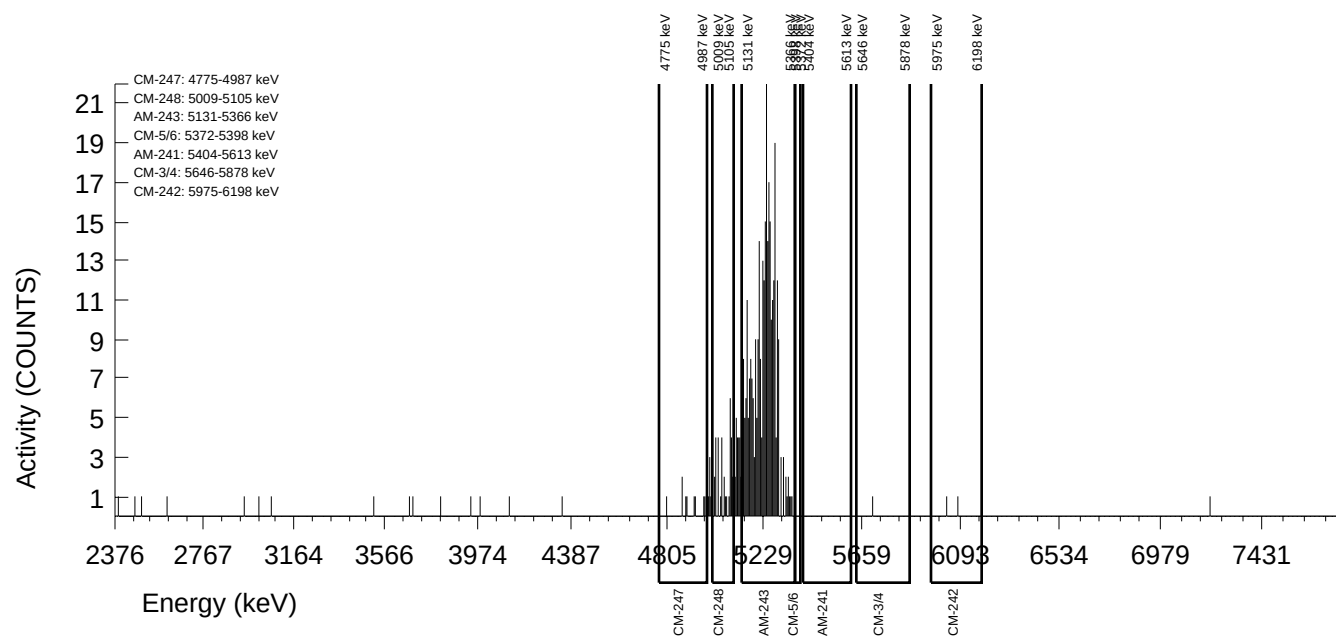


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S0579287005_AM SAMPLE QTY : 0.037 F +/-2.855 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 17.2 +/-6.217 %	CHAMBER : 256 DETECTOR S/N : 158090 AVERAGE %EFFICIENCY : 40.5418 AVERAGE %EFF ERROR : 0.7792 COUNT DATE : 06-Jun-2022 13:20:33 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : AM BKG FILE : B256.CNF;1085 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W256.CNF;57 CAL DATE : 19-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 7.9442E-01 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5405.70	0.000	1.000	-1.000	2.000	1.4142	98.525	-1.75E-01	7.67E-01	1.68E+00	5.76E-01	7.67E-01
AM-243	5269.50	5233.44	77.367	323.000	322.000	1.000	1.0000	99.980	5.55E+01	9.85E+00	1.32E+00	4.01E-01	6.10E+00
CM-242	6102.00	6063.37	48.557	2.000	2.000	0.000	1.0000	100.000	4.64E-01	9.12E-01	6.96E-01	5.40E-01	9.10E-01
CM-3/4	5795.02	5712.67	4.856	1.000	1.000	0.000	1.0000	100.000	1.74E-01	5.90E-01	5.21E-01	4.04E-01	5.90E-01
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	5.56E-01	6.01E-01	4.66E-01	5.55E-01
CM-247	4946.00	4912.38	4.856	10.000	9.000	1.000	1.0000	79.300	1.96E+00	1.56E+00	1.66E+00	5.06E-01	1.54E+00
CM-248	5078.60	5062.97	67.979	35.000	34.000	1.000	1.0000	91.000	6.44E+00	2.46E+00	1.45E+00	4.41E-01	2.29E+00



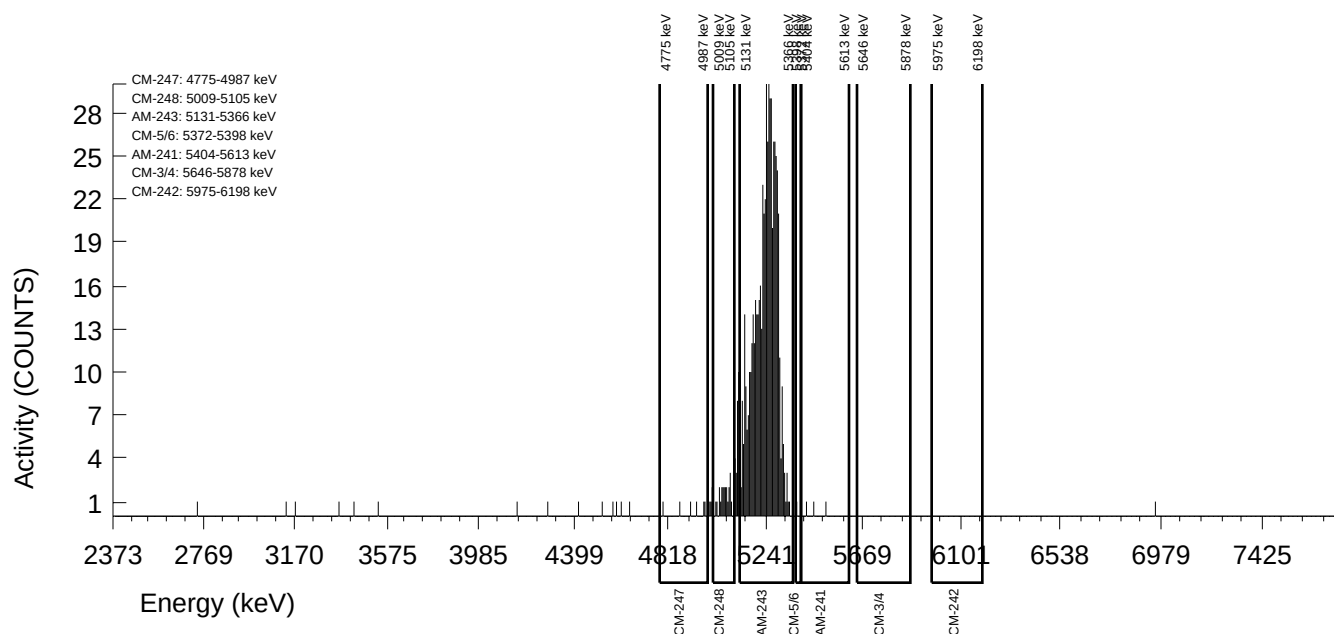
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S1205104985_AM SAMPLE QTY : 0.039 F +/-2.736 % SAMPLE DATE : 03-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 50.5 +/-4.994 %	CHAMBER : 080 DETECTOR S/N : 79197 AVERAGE %EFFICIENCY : 34.8127 AVERAGE %EFF ERROR : 0.6712 COUNT DATE : 05-Jun-2022 14:38:46 ELAPSED LIVE TIME(SEC) : 43200.00	LIB FILE : AM BKG FILE : B080.CNF;2346 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W080.CNF;596 CAL DATE : 09-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 2.3261E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5461.77	83.748	3.000	-1.320	4.320	2.0785	98.525	-1.21E-01	4.98E-01	1.10E+00	4.13E-01	4.98E-01
AM-243	5269.50	5242.18	81.777	593.000	582.920	10.080	3.1749	99.980	5.29E+01	7.60E+00	1.51E+00	6.21E-01	4.36E+00
CM-242	6102.00	6086.56	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	2.22E-01	2.75E-01	1.98E-01	2.22E-01
CM-3/4	5795.02	5761.59	0.000	0.000	-3.600	3.600	1.8974	100.000	-3.27E-01	3.61E-01	1.01E+00	3.71E-01	3.60E-01
CM-5/6	5386.00	5379.86	4.926	1.000	1.000	0.000	1.0000	86.090	1.05E-01	3.28E-01	3.16E-01	2.27E-01	3.28E-01
CM-247	4946.00	4909.40	177.348	6.000	-0.480	6.480	2.5456	79.300	-5.49E-02	7.82E-01	1.60E+00	6.28E-01	7.82E-01
CM-248	5078.60	5061.47	0.000	28.000	25.840	2.160	1.4697	91.000	2.58E+00	1.13E+00	9.31E-01	3.16E-01	1.09E+00

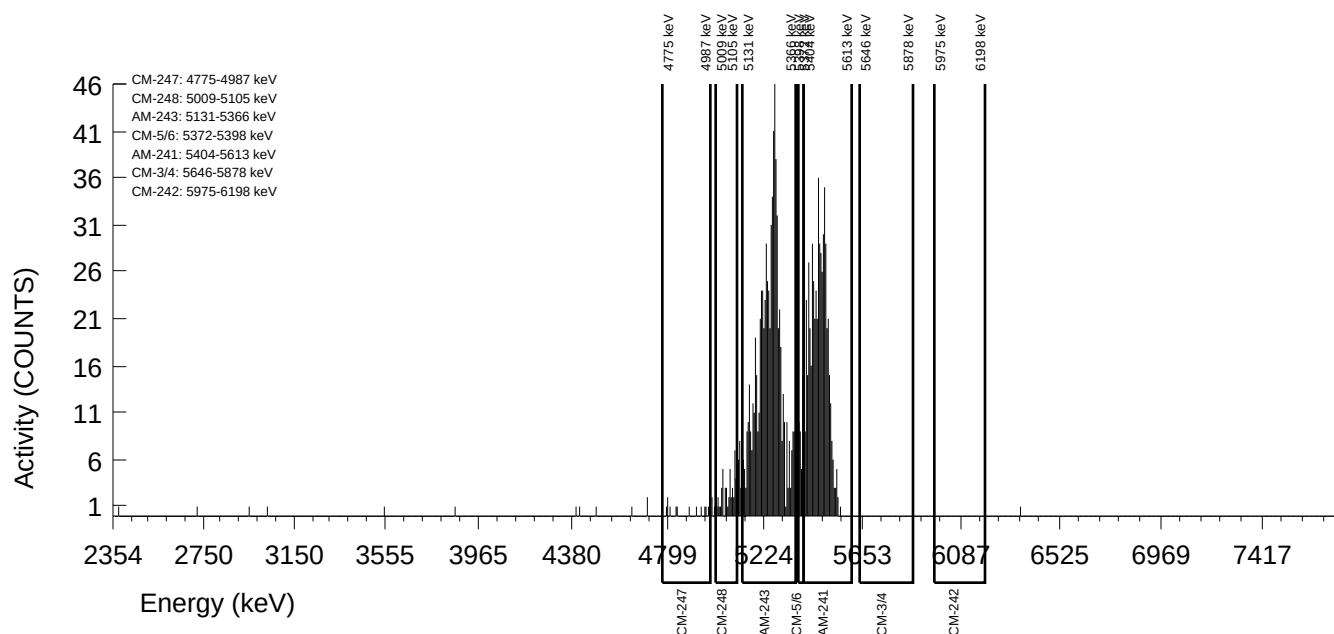


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S1205104986_AM SAMPLE QTY : 0.039 F +/-2.736 % SAMPLE DATE : 03-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 64.6 +/-4.634 %	CHAMBER : 081 DETECTOR S/N : 148987 AVERAGE %EFFICIENCY : 33.4831 AVERAGE %EFF ERROR : 0.6462 COUNT DATE : 05-Jun-2022 14:38:46 ELAPSED LIVE TIME(SEC) : 43200.00	LIB FILE : AM BKG FILE : B081.CNF;2363 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W081.CNF;610 CAL DATE : 09-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 2.9751E+00 dpm	LCS ID 0533-II NUCLIDE AM-241 NOMINAL (pCi/F) 5.0110E+01 % RECOVERY 79.729	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5467.23	92.649	539.000	533.960	5.040	2.2450	98.525	4.00E+01	5.63E+00	9.49E-01	3.62E-01	3.42E+00
AM-243	5269.50	5249.42	69.194	725.000	717.080	7.920	2.8142	99.980	5.29E+01	7.10E+00	1.12E+00	4.48E-01	3.91E+00
CM-242	6102.00	6086.56	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.80E-01	2.24E-01	1.61E-01	1.80E-01
CM-3/4	5795.02	5761.58	0.000	0.000	-2.880	2.880	1.6971	100.000	-2.12E-01	2.74E-01	7.61E-01	2.70E-01	2.74E-01
CM-5/6	5386.00	5389.29	0.000	55.000	55.000	0.000	1.0000	86.090	4.71E+00	1.37E+00	2.57E-01	1.85E-01	1.26E+00
CM-247	4946.00	4894.90	179.332	14.000	5.360	8.640	2.9394	79.300	4.98E-01	8.51E-01	1.46E+00	5.90E-01	8.50E-01
CM-248	5078.60	5069.98	0.000	56.000	55.280	0.720	0.8485	91.000	4.48E+00	1.31E+00	5.40E-01	1.48E-01	1.21E+00



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ALPHA SPECTROSCOPY REPORT

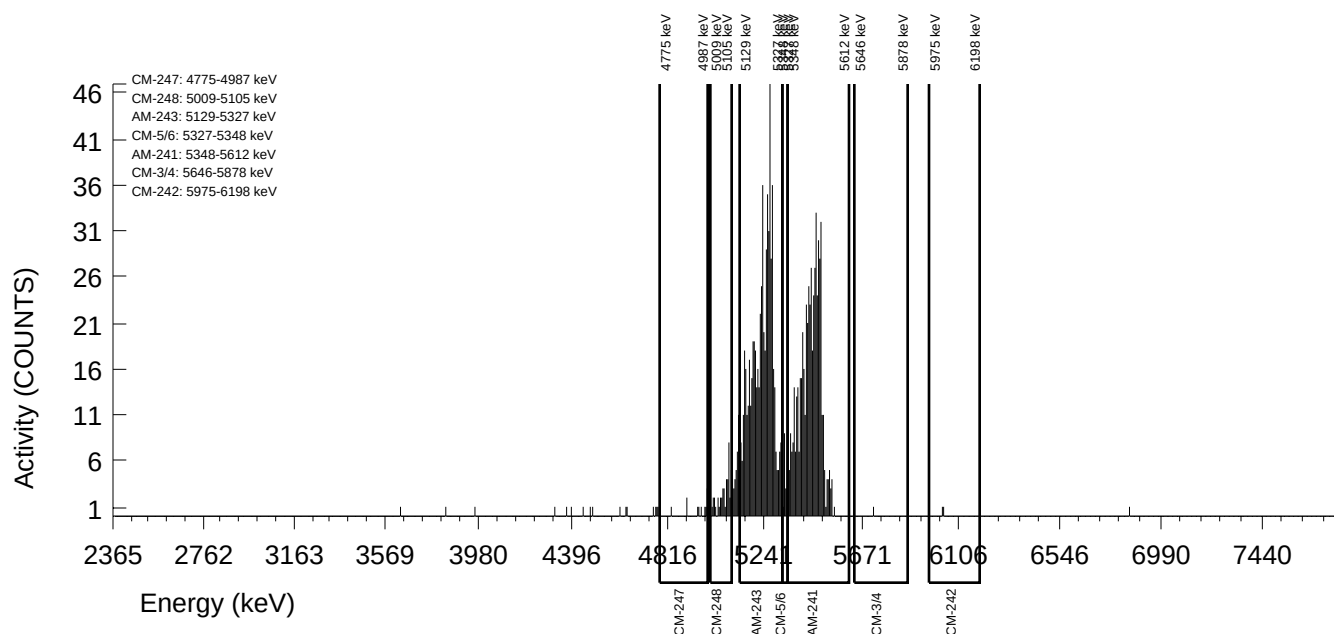
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S1205104987_AM SAMPLE QTY : 0.039 F +/-2.736 % SAMPLE DATE : 03-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 56.1 +/-4.812 %	CHAMBER : 082 DETECTOR S/N : 149008 AVERAGE %EFFICIENCY : 34.3414 AVERAGE %EFF ERROR : 0.6623 COUNT DATE : 05-Jun-2022 14:38:46 ELAPSED LIVE TIME(SEC) : 43200.00	LIB FILE : AM BKG FILE : B082.CNF;2361 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W082.CNF;609 CAL DATE : 09-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 2.5858E+00 dpm	LCSD ID 0533-II NUCLIDE AM-241 NOMINAL (pCi/F) 5.0110E+01 % RECOVERY 90.898	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5447.11	80.957	547.000	542.680	4.320	2.0785	98.525	4.55E+01	6.50E+00	1.00E+00	3.76E-01	3.86E+00
AM-243	5269.50	5230.34	49.865	645.000	639.240	5.760	2.4000	99.980	5.29E+01	7.35E+00	1.10E+00	4.28E-01	4.14E+00
CM-242	6102.00	6032.52	9.850	2.000	1.280	0.720	0.8485	100.000	1.07E-01	3.30E-01	5.58E-01	1.53E-01	3.30E-01
CM-3/4	5795.02	5725.45	4.925	1.000	-1.880	2.880	1.6971	100.000	-1.56E-01	3.48E-01	8.54E-01	3.03E-01	3.47E-01
CM-5/6	5386.00	5336.44	6.464	18.000	18.000	0.000	1.0000	86.090	1.73E+00	8.55E-01	2.88E-01	2.07E-01	8.32E-01
CM-247	4946.00	4915.39	4.925	9.000	-3.240	12.240	3.4986	79.300	-3.38E-01	8.99E-01	1.89E+00	7.87E-01	8.99E-01
CM-248	5078.60	5070.14	19.700	47.000	44.840	2.160	1.4697	91.000	4.07E+00	1.34E+00	8.49E-01	2.88E-01	1.26E+00

NOTES:

* Regions have been manually adjusted



Batch 2265049 Check-list

This check-list was completed on 31-MAY-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 31-MAY-22 and Jessica Davis on 02-JUN-22.

Batch ID:
2265049

Product:
ASP_PUF

Description: Alpha Spec Plutonium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium

Batch ID: 2265049

Analyst: Michael Potts (MP2)

Method: DOE EML HASL-300, Pu-11-RC
Modified

Lab SOP: GL-RAD-A-011 REV# 28

Instrument: ASP-33005595

Due Dates for Lab: 05-JUN-2022

Package: 06-JUN-2022

SDG: 07-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205090028	Plutonium-239 AS SPIKE	1472-C	.1	mL
LCSD	1205090029	Plutonium-239 AS SPIKE	1472-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	579287001	25-MAY-2022	1	30	0.11118
2	579287002	25-MAY-2022	1	30	0.11549
3	579287003	25-MAY-2022	1	30	0.11403
4	579287004	25-MAY-2022	1	30	0.11518
5	579287005	25-MAY-2022	1	30	0.11218
6	579289001	25-MAY-2022	1	30.1	0.11121
7	579289002	25-MAY-2022	1	30	0.1135
8	579289003	25-MAY-2022	1	30	0.11151
9	1205090027 MB	25-MAY-2022	1		0.11549
10	1205090028 LCS	25-MAY-2022	1		0.11549
11	1205090029 LCSD	25-MAY-2022	1		0.11549

Reagent/Solvent Lot ID	Description	Amount
WORK 2010-A	Plutonium-242 AS TRACER	.1 ml

Comments:

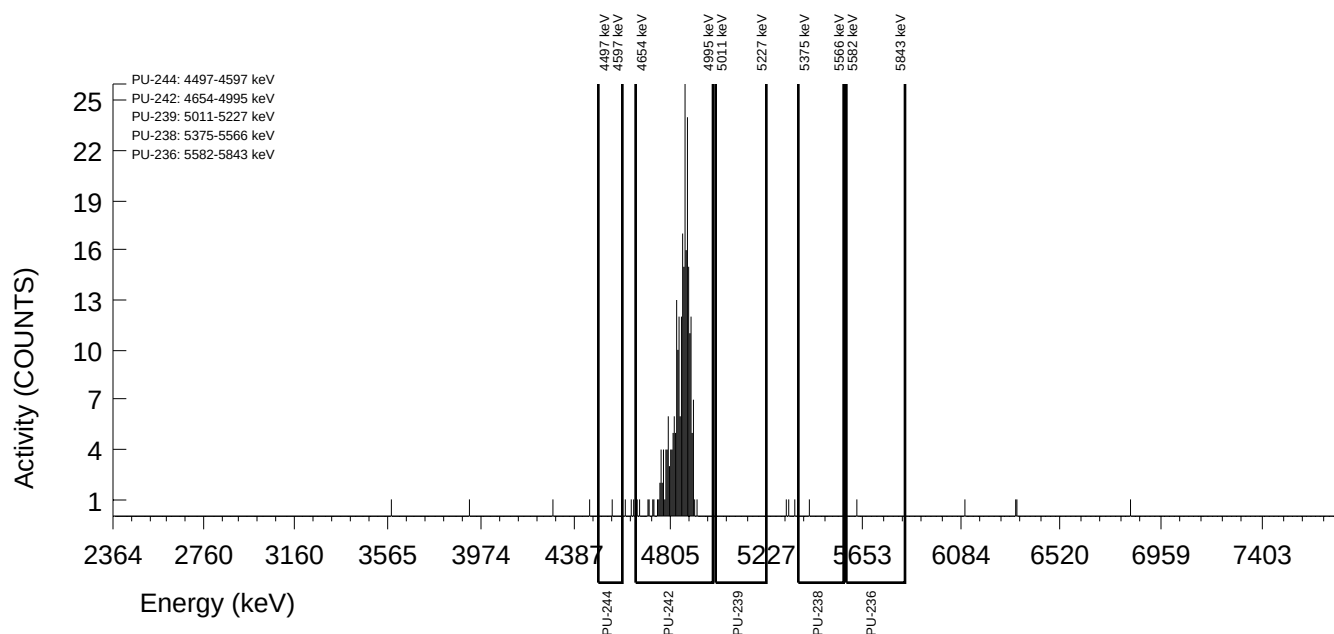
Pipet ID: RAD-ASP-184002Z
Analyzed With: Am , U
Data Entry Date2: 25-MAY-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265049 SAMPLE ID : S0579287001_PU SAMPLE QTY : 0.111 F +/-1.345 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 78.3 +/-6.735 %	CHAMBER : 088 DETECTOR S/N : 83291 AVERAGE %EFFICIENCY : 31.6604 AVERAGE %EFF ERROR : 0.6118 COUNT DATE : 31-May-2022 09:23:01 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B088.CNF;2342 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W088.CNF;613 CAL DATE : 09-May-2022
TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 3.3486E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5626.66	4.920	1.000	-1.160	2.160	1.4697	100.000	-8.23E-02	2.24E-01	5.95E-01	1.91E-01	2.23E-01
PU-238	5486.00	5418.32	4.920	1.000	-0.680	1.680	1.2961	99.900	-4.64E-02	2.10E-01	5.29E-01	1.62E-01	2.10E-01
PU-239	5155.00	5118.68	0.000	0.000	-0.720	0.720	0.8485	99.900	-4.90E-02	1.48E-01	4.16E-01	1.06E-01	1.48E-01
PU-242	4890.00	4853.65	30.998	265.000	254.440	10.560	3.2496	100.000	1.73E+01	3.26E+00	1.01E+00	4.05E-01	2.19E+00
PU-244	4589.00	4553.58	4.920	1.000	0.520	0.480	0.6928	99.900	3.54E-02	1.97E-01	3.77E-01	8.65E-02	1.97E-01

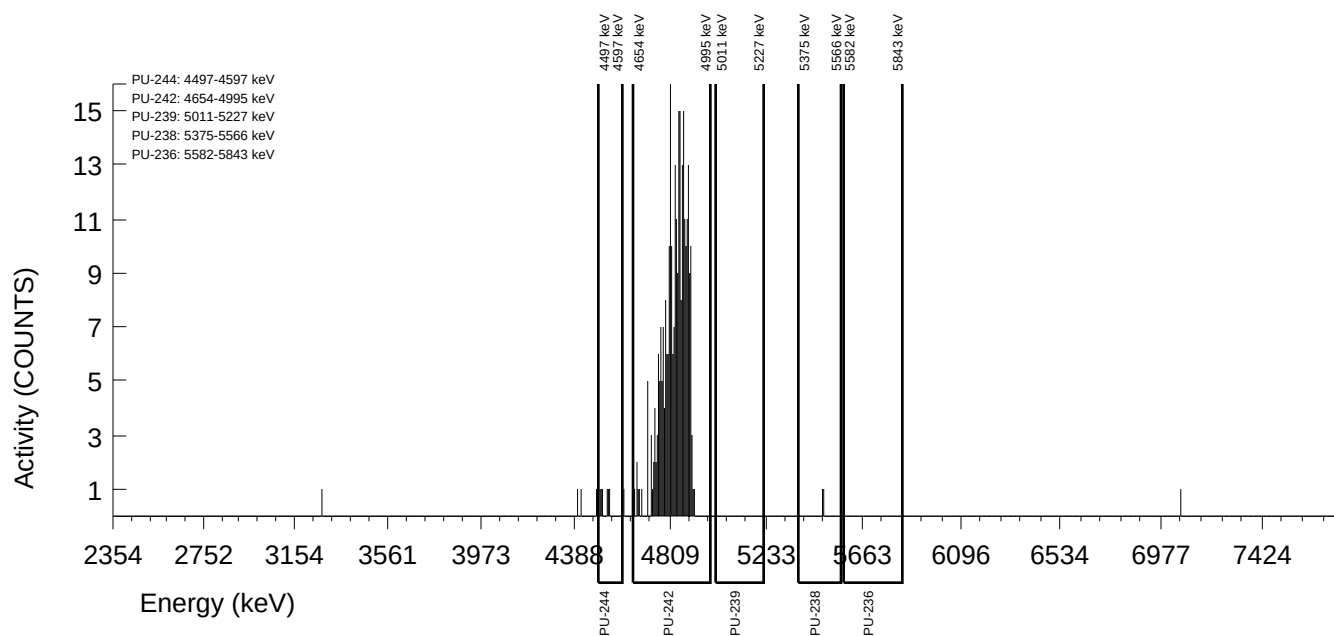


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265049 SAMPLE ID : S0579287002_PU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 91.3 +/-6.228 %	CHAMBER : 089 DETECTOR S/N : 79988 AVERAGE %EFFICIENCY : 31.2662 AVERAGE %EFF ERROR : 0.6043 COUNT DATE : 31-May-2022 09:23:02 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B089.CNF;2048 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W089.CNF;536 CAL DATE : 10-May-2022
TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 3.9004E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.25	0.000	0.000	-1.200	1.200	1.0954	100.000	-7.13E-02	1.35E-01	4.17E-01	1.19E-01	1.35E-01
PU-238	5486.00	5487.75	9.891	2.000	1.280	0.720	0.8485	99.900	7.31E-02	2.01E-01	3.49E-01	8.87E-02	2.01E-01
PU-239	5155.00	5118.68	0.000	0.000	-2.640	2.640	1.6248	99.900	-1.51E-01	1.46E-01	5.10E-01	1.70E-01	1.45E-01
PU-242	4890.00	4832.23	92.905	297.000	292.680	4.320	2.0785	100.000	1.67E+01	2.91E+00	6.05E-01	2.17E-01	1.93E+00
PU-244	4589.00	4524.52	44.509	6.000	5.280	0.720	0.8485	99.900	3.01E-01	3.03E-01	3.48E-01	8.86E-02	3.00E-01

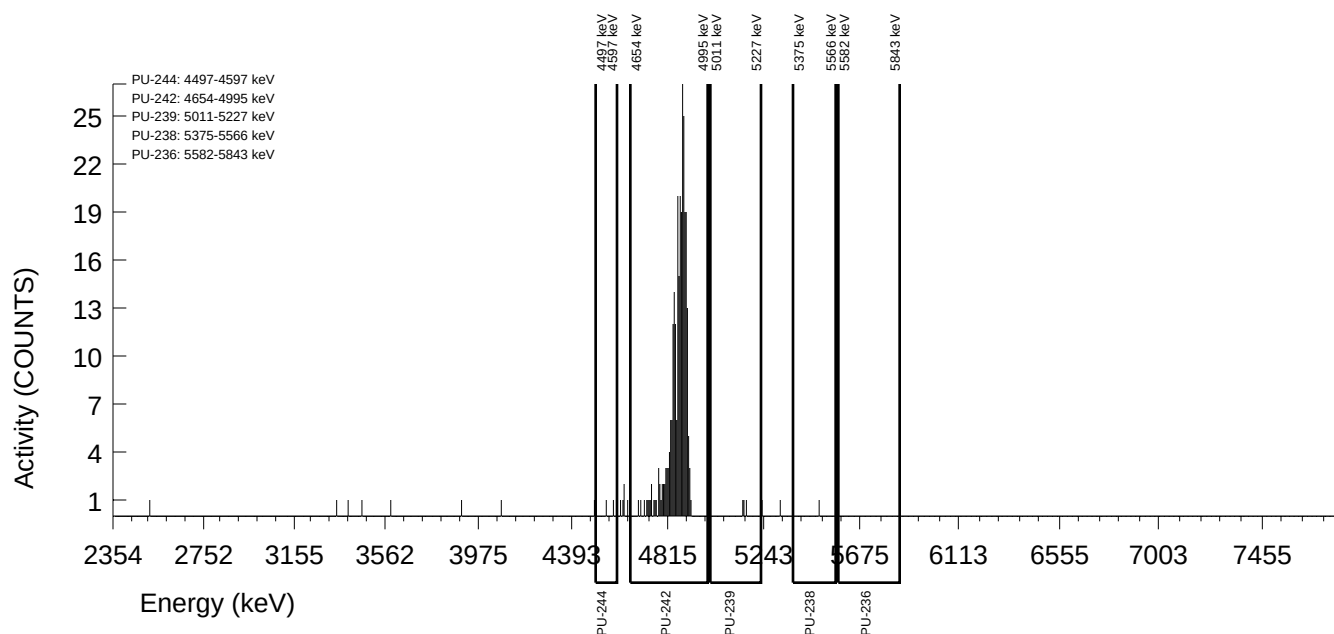


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265049 SAMPLE ID : S0579287003_PU SAMPLE QTY : 0.114 F +/-1.330 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 75.3 +/-6.389 %	CHAMBER : 090 DETECTOR S/N : 158119 AVERAGE %EFFICIENCY : 35.6880 AVERAGE %EFF ERROR : 0.6877 COUNT DATE : 31-May-2022 09:23:02 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B090.CNF;2049 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W090.CNF;528 CAL DATE : 10-May-2022
TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 3.2182E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.23	0.000	0.000	-0.960	0.960	0.9798	100.000	-6.13E-02	1.42E-01	4.21E-01	1.15E-01	1.42E-01
PU-238	5486.00	5490.93	4.941	1.000	1.000	0.000	1.0000	99.900	6.14E-02	1.73E-01	1.84E-01	1.12E-01	1.73E-01
PU-239	5155.00	5158.71	19.766	3.000	1.560	1.440	1.2000	99.900	9.56E-02	2.52E-01	4.53E-01	1.35E-01	2.52E-01
PU-242	4890.00	4863.73	55.180	279.000	275.640	3.360	1.8330	100.000	1.69E+01	3.02E+00	5.95E-01	2.06E-01	2.01E+00
PU-244	4589.00	4561.10	34.590	2.000	2.000	0.000	1.0000	99.900	1.23E-01	2.11E-01	1.84E-01	1.12E-01	2.10E-01

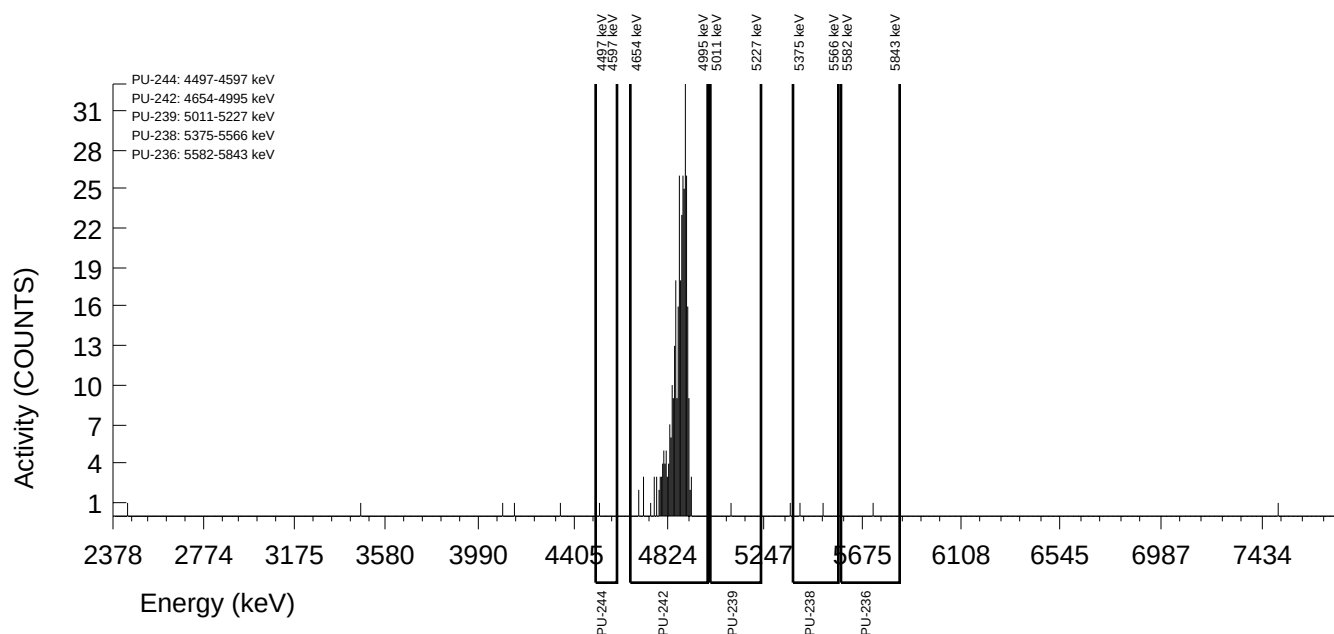


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265049 SAMPLE ID : S0579287004_PU SAMPLE QTY : 0.115 F +/-1.324 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 97.9 +/-5.905 %	CHAMBER : 092 DETECTOR S/N : 158160 AVERAGE %EFFICIENCY : 33.1152 AVERAGE %EFF ERROR : 0.6392 COUNT DATE : 31-May-2022 09:23:02 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B092.CNF;2057 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W092.CNF;574 CAL DATE : 10-May-2022
TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 4.1844E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5723.74	4.922	1.000	-1.400	2.400	1.5492	100.000	-7.34E-02	1.67E-01	4.55E-01	1.49E-01	1.67E-01
PU-238	5486.00	5452.60	98.442	2.000	1.040	0.960	0.9798	99.900	5.24E-02	1.79E-01	3.32E-01	9.04E-02	1.79E-01
PU-239	5155.00	5098.33	4.922	1.000	-0.200	1.200	1.0954	99.900	-1.01E-02	1.51E-01	3.53E-01	1.01E-01	1.51E-01
PU-242	4890.00	4866.80	50.452	340.000	332.560	7.440	2.7276	100.000	1.67E+01	2.77E+00	6.53E-01	2.51E-01	1.82E+00
PU-244	4589.00	4519.28	4.922	1.000	0.760	0.240	0.4899	99.900	3.82E-02	1.44E-01	2.41E-01	4.51E-02	1.43E-01

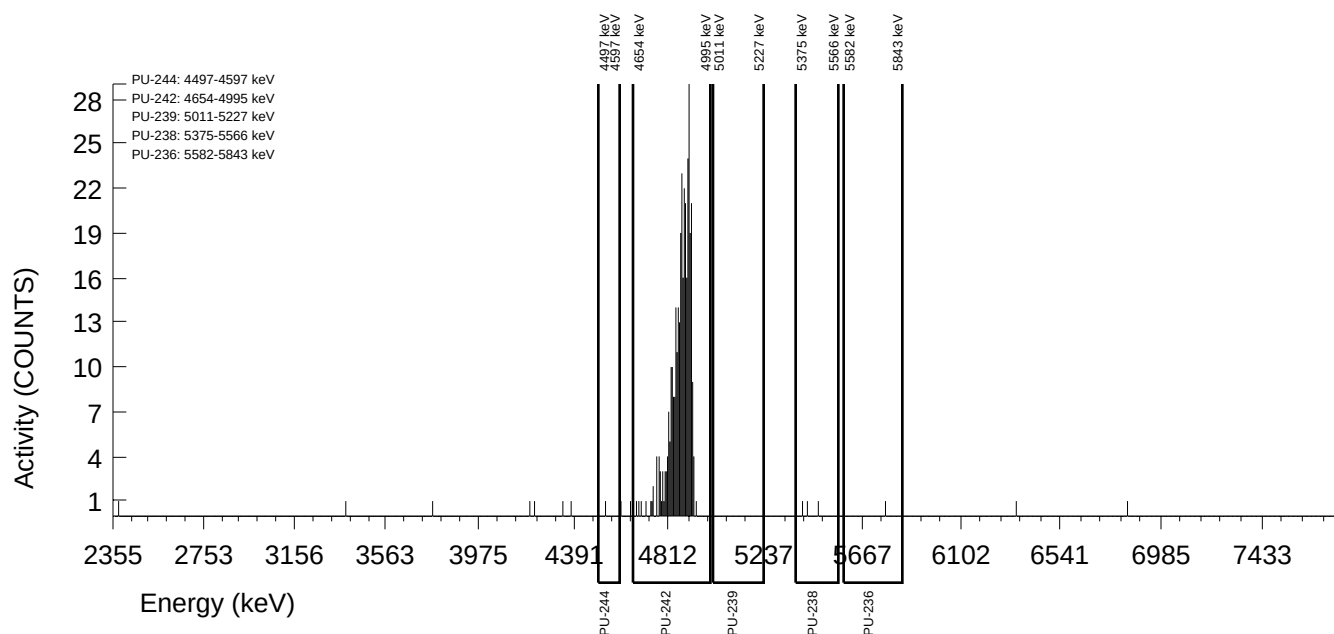


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265049 SAMPLE ID : S0579287005_PU SAMPLE QTY : 0.112 F +/-1.340 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 101 +/-5.791 %	CHAMBER : 093 DETECTOR S/N : 155764 AVERAGE %EFFICIENCY : 33.7411 AVERAGE %EFF ERROR : 0.6510 COUNT DATE : 31-May-2022 09:23:02 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B093.CNF;2042 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W093.CNF;532 CAL DATE : 10-May-2022
TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 4.3083E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5770.23	4.946	1.000	0.520	0.480	0.6928	100.000	2.67E-02	1.48E-01	2.84E-01	6.51E-02	1.48E-01
PU-238	5486.00	5433.91	69.243	3.000	2.280	0.720	0.8485	99.900	1.12E-01	1.99E-01	3.01E-01	7.66E-02	1.99E-01
PU-239	5155.00	5118.68	0.000	0.000	-3.120	3.120	1.7664	99.900	-1.54E-01	1.30E-01	4.66E-01	1.59E-01	1.30E-01
PU-242	4890.00	4864.99	50.902	358.000	348.880	9.120	3.0199	100.000	1.72E+01	2.79E+00	6.92E-01	2.72E-01	1.83E+00
PU-244	4589.00	4532.54	4.946	1.000	1.000	0.000	1.0000	99.900	4.92E-02	1.39E-01	1.48E-01	9.02E-02	1.38E-01

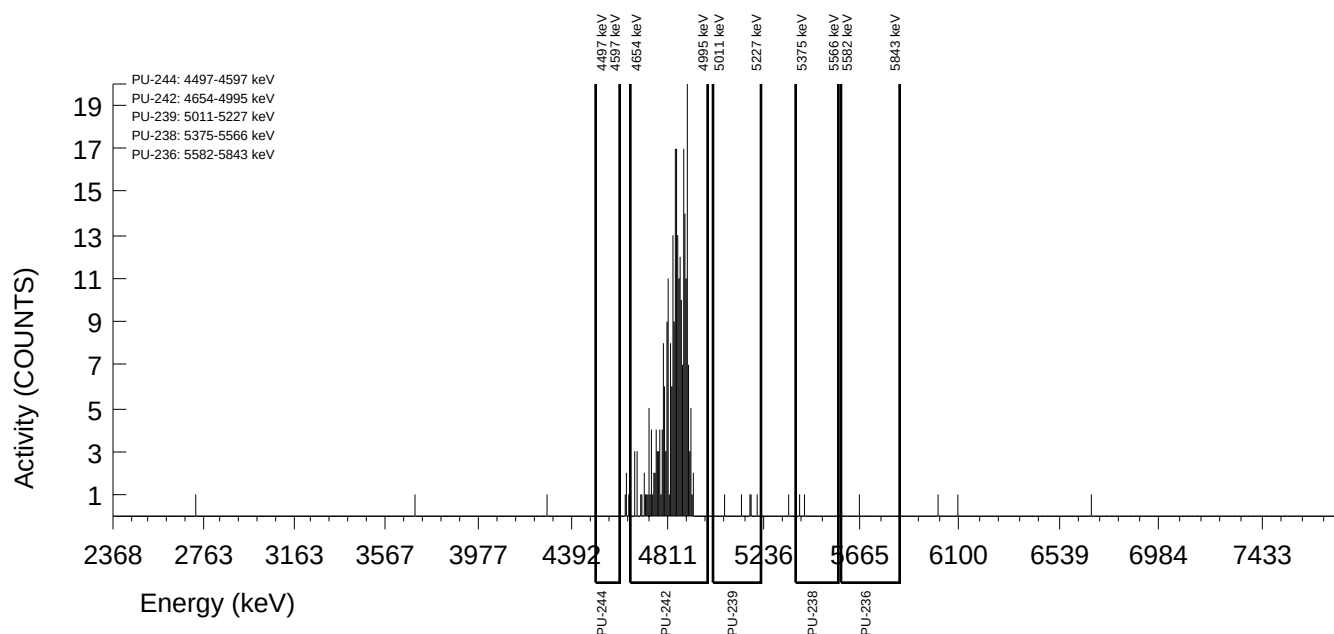


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265049 SAMPLE ID : S1205090027_PU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 85.5 +/-6.265 %	CHAMBER : 110 DETECTOR S/N : 83292 AVERAGE %EFFICIENCY : 32.6024 AVERAGE %EFF ERROR : 0.6296 COUNT DATE : 31-May-2022 09:23:03 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B110.CNF;2047 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W110.CNF;601 CAL DATE : 10-May-2022
TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 3.6562E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5659.93	4.904	1.000	1.000	0.000	1.0000	100.000	5.85E-02	1.65E-01	1.76E-01	1.07E-01	1.65E-01
PU-238	5486.00	5407.04	24.519	2.000	1.520	0.480	0.6928	99.900	8.87E-02	2.04E-01	3.23E-01	7.40E-02	2.04E-01
PU-239	5155.00	5154.79	137.308	5.000	4.040	0.960	0.9798	99.900	2.36E-01	2.88E-01	3.84E-01	1.05E-01	2.87E-01
PU-242	4890.00	4841.87	84.686	288.000	286.080	1.920	1.3856	100.000	1.67E+01	2.92E+00	4.71E-01	1.48E-01	1.94E+00
PU-244	4589.00	4546.96	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00	1.18E-01	1.75E-01	1.07E-01	1.18E-01

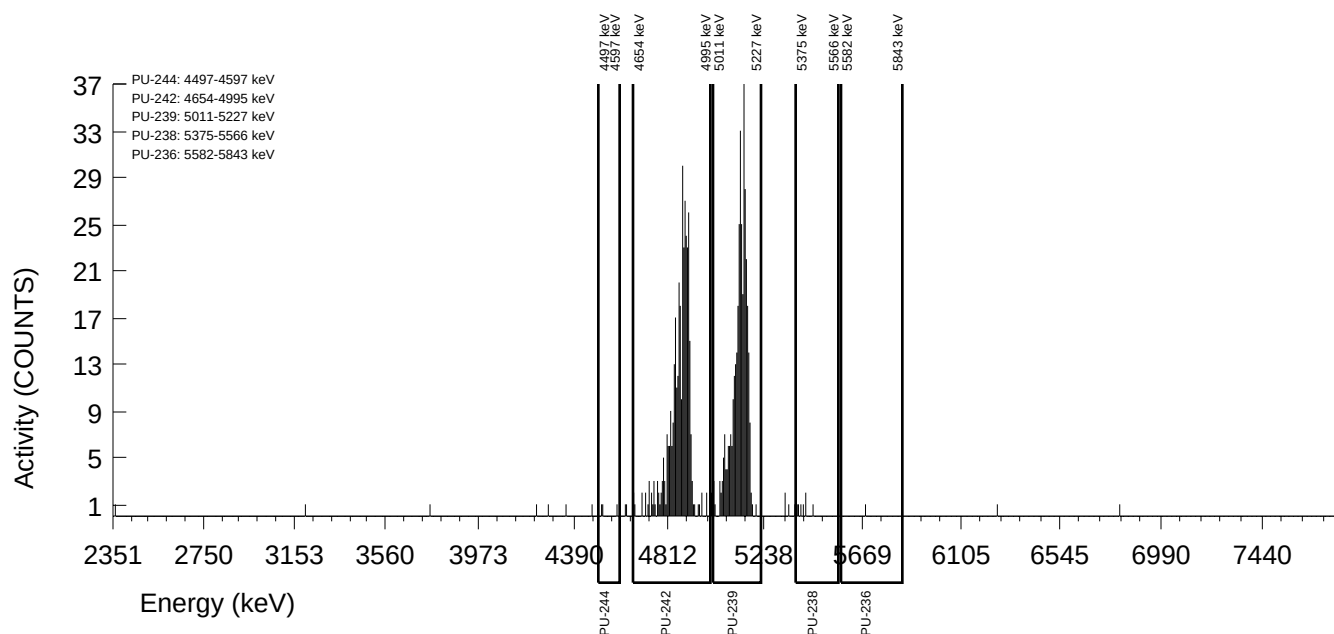


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265049 SAMPLE ID : S1205090028_PU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 101 +/-5.600 %	CHAMBER : 111 DETECTOR S/N : 140587 AVERAGE %EFFICIENCY : 35.3171 AVERAGE %EFF ERROR : 0.6807 COUNT DATE : 31-May-2022 09:23:03 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B111.CNF;2065 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W111.CNF;605 CAL DATE : 10-May-2022
TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 4.3369E+00 dpm	LCS ID 1472-C NUCLIDE PU-239 NOMINAL (pCi/F) 1.7825E+01 % RECOVERY 90.867	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5685.24	4.949	1.000	0.520	0.480	0.6928	100.000	2.37E-02	1.32E-01	2.52E-01	5.78E-02	1.32E-01
PU-238	5486.00	5410.54	4.949	7.000	6.520	0.480	0.6928	99.900	2.96E-01	2.57E-01	2.51E-01	5.76E-02	2.54E-01
PU-239	5155.00	5126.82	38.617	358.000	356.800	1.200	1.0954	99.900	1.62E+01	2.56E+00	3.18E-01	9.11E-02	1.69E+00
PU-242	4890.00	4860.78	61.858	370.000	367.600	2.400	1.5492	100.000	1.67E+01	2.62E+00	3.93E-01	1.29E-01	1.71E+00
PU-244	4589.00	4540.37	69.281	3.000	3.000	0.000	1.0000	99.900	1.36E-01	1.80E-01	1.36E-01	8.32E-02	1.79E-01

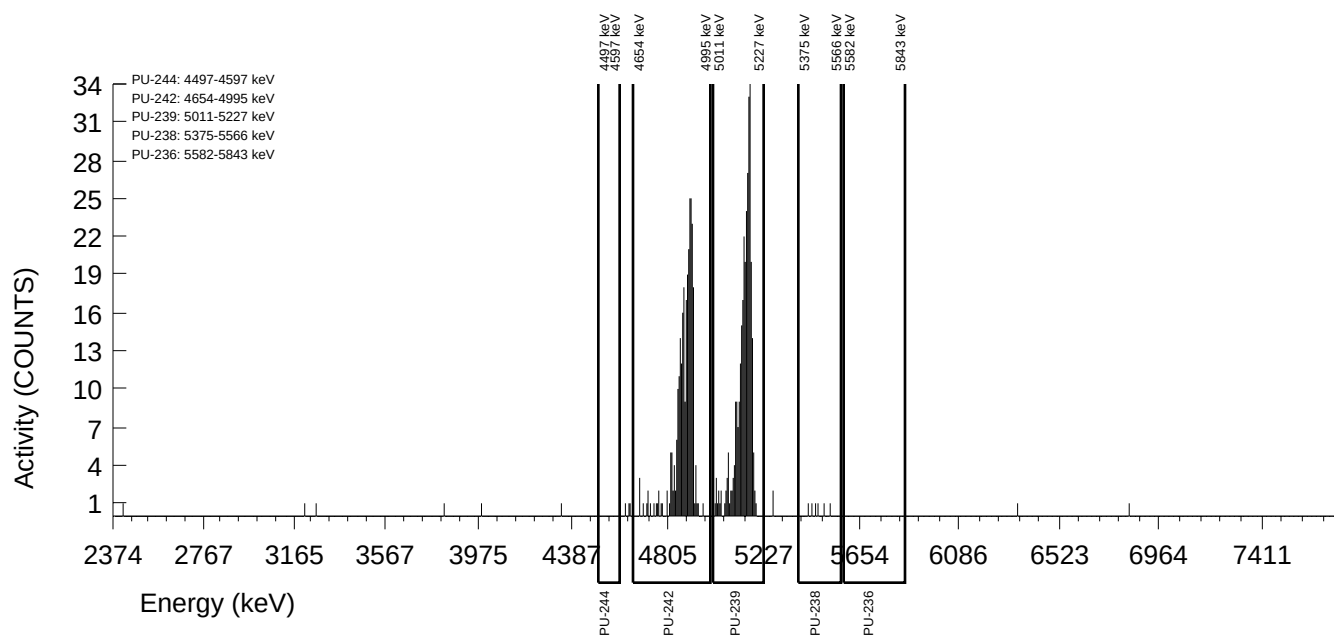


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265049 SAMPLE ID : S1205090029_PU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 80.7 +/-6.280 %	CHAMBER : 112 DETECTOR S/N : 1558116 AVERAGE %EFFICIENCY : 34.5489 AVERAGE %EFF ERROR : 0.6662 COUNT DATE : 31-May-2022 09:23:03 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B112.CNF;2056 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W112.CNF;624 CAL DATE : 10-May-2022
TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 3.4478E+00 dpm	LCSD ID 1472-C NUCLIDE PU-239 NOMINAL (pCi/F) 1.7825E+01 % RECOVERY 101.869	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.23	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.41E-02	1.21E-01	2.81E-01	5.26E-02	1.21E-01
PU-238	5486.00	5466.29	92.686	6.000	4.080	1.920	1.3856	99.900	2.38E-01	3.15E-01	4.71E-01	1.48E-01	3.14E-01
PU-239	5155.00	5141.61	36.587	313.000	311.080	1.920	1.3856	99.900	1.82E+01	3.13E+00	4.71E-01	1.48E-01	2.03E+00
PU-242	4890.00	4877.60	57.678	289.000	285.880	3.120	1.7664	100.000	1.67E+01	2.93E+00	5.52E-01	1.89E-01	1.95E+00
PU-244	4589.00	4595.30	0.000	2.000	1.520	0.480	0.6928	99.900	8.87E-02	2.04E-01	3.23E-01	7.41E-02	2.04E-01



Batch 2265054 Check-list

This check-list was completed on 03-JUN-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 03-JUN-22 and Jessica Davis on 03-JUN-22.

Batch ID: 2265054

Product: ASP10POF

Description: Alpha Spec Polonium

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?		No	
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Polonium

Batch ID: 2265054
Analyst: Michael Potts (MP2)
Method: DOE EML HASL-300, Po-01-RC
 Modified
Lab SOP: GL-RAD-A-016 REV# 19
Instrument: BAL-18550299

Due Dates for Lab: 05-JUN-2022

Package: 06-JUN-2022

SDG: 07-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205090060	Polonium-210 AS SPIKE	2012-A	.1	mL
LCSD	1205090061	Polonium-210 AS SPIKE	2012-A	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (g)	Aliquot (Filter)
1	579287001	25-MAY-2022	.5	0.356	0.10283
2	579287002	25-MAY-2022	.5	0.352	0.10124
3	579287003	25-MAY-2022	.5	0.358	0.10293
4	579287004	25-MAY-2022	.5	0.354	0.10169
5	579287005	25-MAY-2022	.5	0.359	0.10427
6	579289001	25-MAY-2022	.5	0.232	0.10371
7	579289002	25-MAY-2022	.5	0.236	0.10328
8	579289003	25-MAY-2022	.5	0.237	0.10576
9	1205090059 MB	25-MAY-2022	.5		0.10576
10	1205090060 LCS	25-MAY-2022	.5		0.10576
11	1205090061 LCSD	25-MAY-2022	.5		0.10576

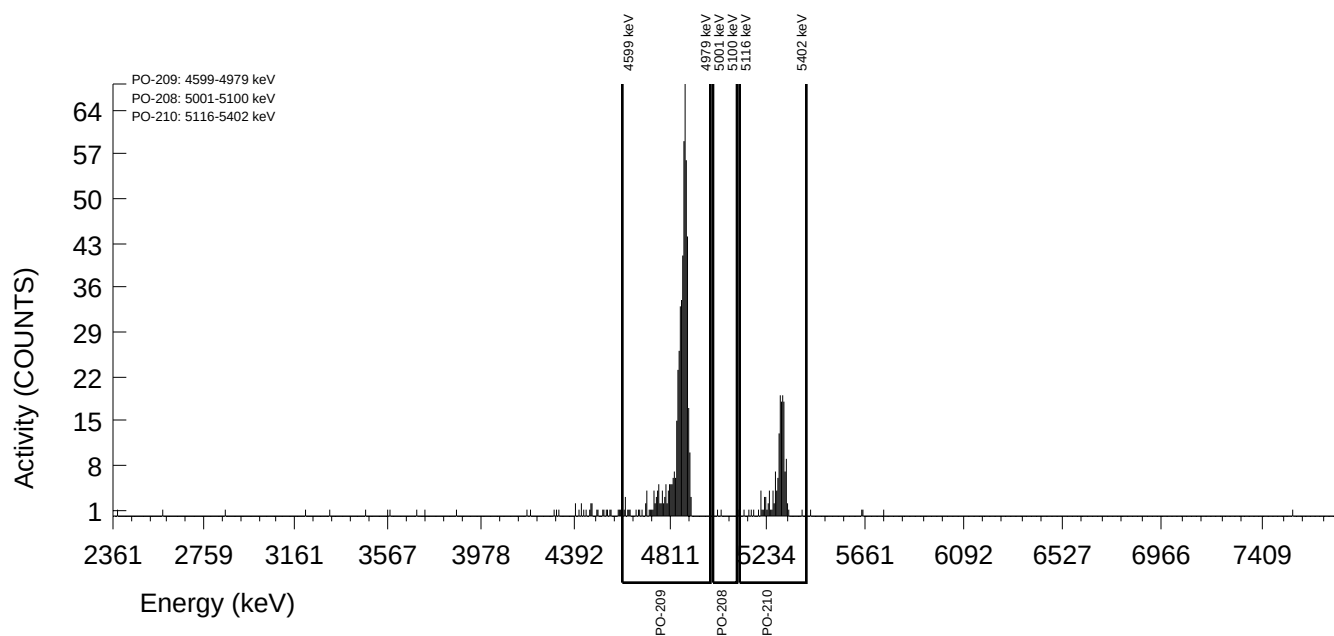
Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1720-D	Polonium-209 AS TRACER	.1 ml	Data Entry Date2: 25-MAY-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2265054 SAMPLE ID : S0579287001_PO SAMPLE QTY : 0.103 F +/-1.395 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 73.8 +/-4.961 %	CHAMBER : 125 DETECTOR S/N : 84060 AVERAGE %EFFICIENCY : 26.3728 AVERAGE %EFF ERROR : 0.5120 COUNT DATE : 01-Jun-2022 08:42:37 ELAPSED LIVE TIME(SEC) : 20532.10	LIB FILE : PO BKG FILE : B125.CNF;1755 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W125.CNF;492 CAL DATE : 11-May-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8901E+00 dpm RESULTS : 5.8226E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5024.45	19.794	2.000	1.658	0.342	0.5850	100.000	1.14E-01	2.42E-01	3.59E-01	7.65E-02	2.42E-01
PO-209	4882.00	4849.16	26.575	526.000	523.605	2.395	1.5477	99.740	3.46E+01	4.77E+00	5.87E-01	1.95E-01	2.97E+00
PO-210	5304.38	5283.65	26.092	156.000	153.947	2.053	1.4329	100.000	1.40E+01	2.70E+00	7.69E-01	2.48E-01	2.24E+00

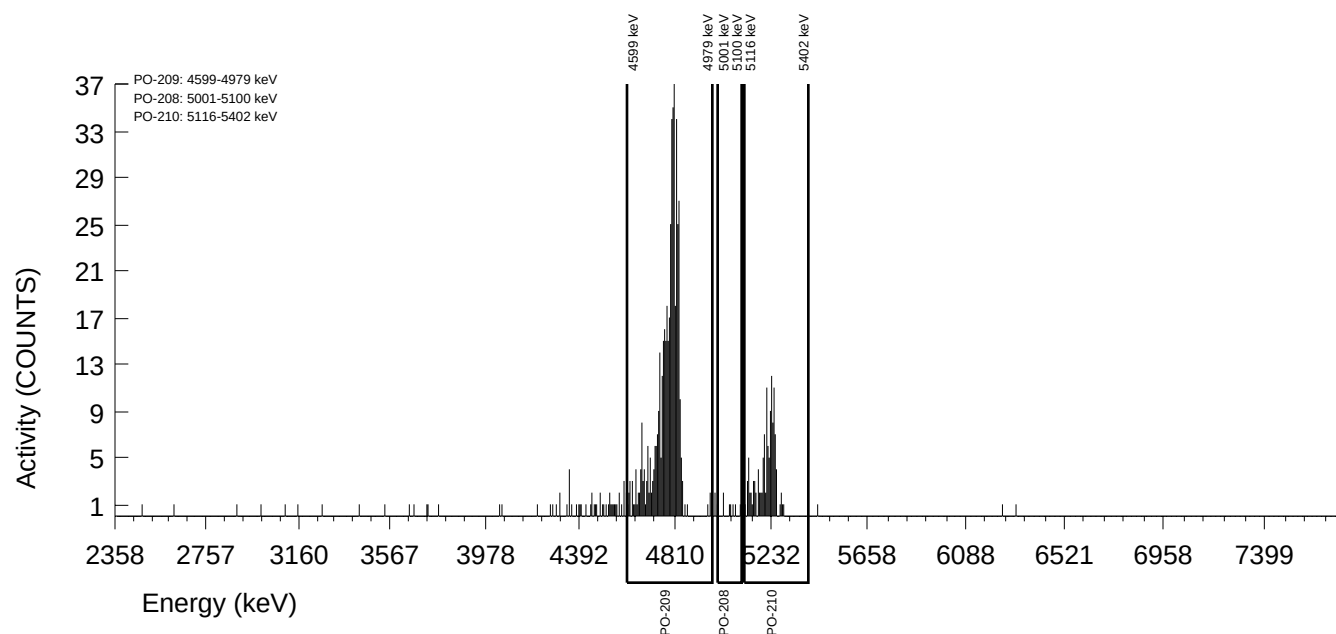


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2265054 SAMPLE ID : S0579287002_PO SAMPLE QTY : 0.101 F +/-1.406 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 67.7 +/-5.160 %	CHAMBER : 126 DETECTOR S/N : 126133 AVERAGE %EFFICIENCY : 26.1104 AVERAGE %EFF ERROR : 0.5071 COUNT DATE : 01-Jun-2022 08:42:39 ELAPSED LIVE TIME(SEC) : 20563.68	LIB FILE : PO BKG FILE : B126.CNF;1751 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W126.CNF;63 CAL DATE : 11-May-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8901E+00 dpm RESULTS : 5.3408E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
PO-208	5080.00	5051.16	4.967	8.000	7.657	0.343	0.5854	100.000	5.87E-01	4.61E-01	4.01E-01	8.55E-02	4.56E-01
PO-209	4882.00	4779.10	41.292	480.000	476.230	3.770	1.9417	99.740	3.51E+01	5.04E+00	7.67E-01	2.73E-01	3.17E+00
PO-210	5304.38	5214.04	48.846	125.000	120.887	4.113	2.0280	100.000	1.23E+01	2.63E+00	1.09E+00	3.92E-01	2.25E+00

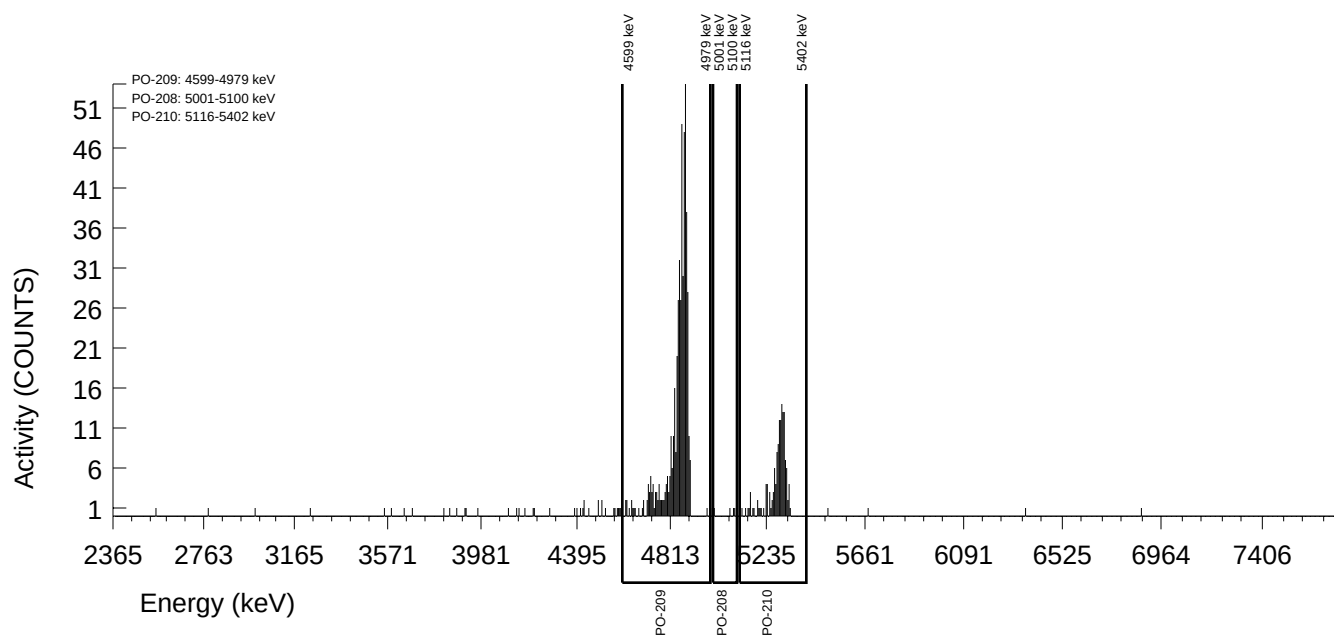


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2265054 SAMPLE ID : S0579287003_PO SAMPLE QTY : 0.103 F +/-1.394 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 69.5 +/-5.082 %	CHAMBER : 128 DETECTOR S/N : 101458 AVERAGE %EFFICIENCY : 26.1126 AVERAGE %EFF ERROR : 0.5071 COUNT DATE : 01-Jun-2022 08:42:41 ELAPSED LIVE TIME(SEC) : 20757.56	LIB FILE : PO BKG FILE : B128.CNF;1757 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W128.CNF;67 CAL DATE : 11-May-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8901E+00 dpm RESULTS : 5.4866E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5070.92	0.000	5.000	4.654	0.346	0.5882	100.000	3.38E-01	3.58E-01	3.81E-01	8.16E-02	3.56E-01
PO-209	4882.00	4842.79	39.858	497.000	493.886	3.114	1.7645	99.740	3.45E+01	4.88E+00	6.81E-01	2.35E-01	3.06E+00
PO-210	5304.38	5278.07	35.872	143.000	140.924	2.076	1.4407	100.000	1.36E+01	2.72E+00	8.18E-01	2.65E-01	2.27E+00

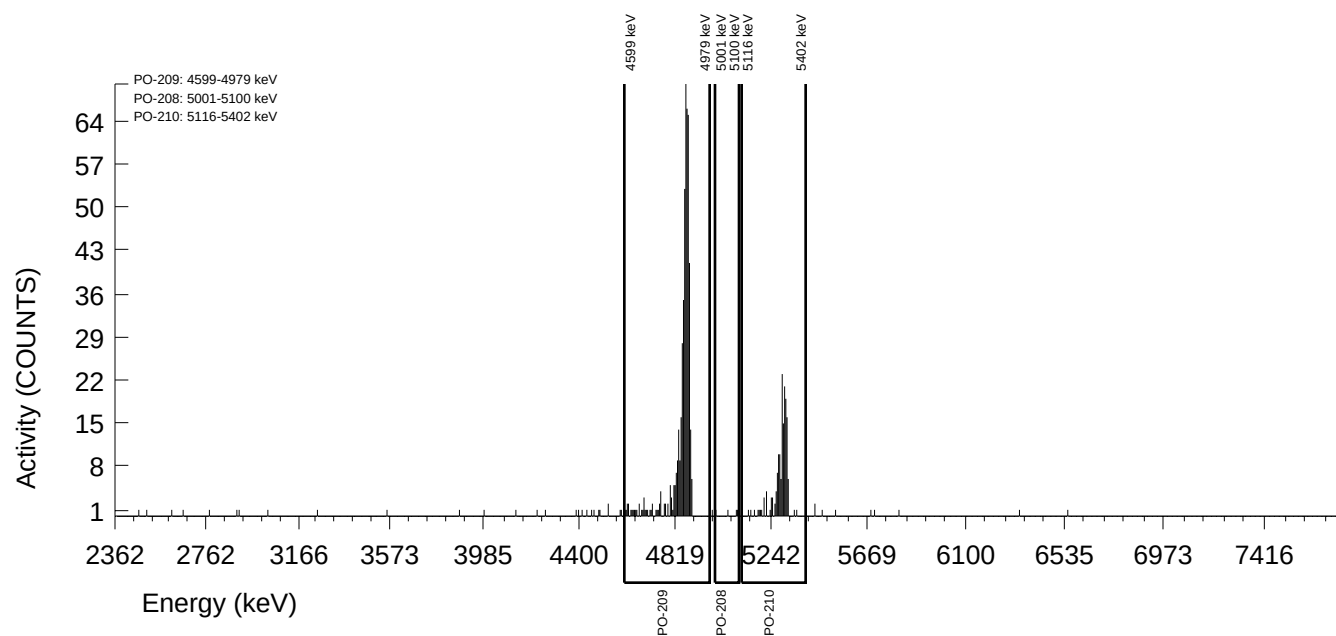


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2265054 SAMPLE ID : S0579287004_PO SAMPLE QTY : 0.102 F +/-1.402 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 68.6 +/-5.091 %	CHAMBER : 129 DETECTOR S/N : 101459 AVERAGE %EFFICIENCY : 26.4233 AVERAGE %EFF ERROR : 0.5130 COUNT DATE : 01-Jun-2022 08:42:43 ELAPSED LIVE TIME(SEC) : 20645.93	LIB FILE : PO BKG FILE : B129.CNF;361 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W129.CNF;66 CAL DATE : 11-May-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8901E+00 dpm RESULTS : 5.4151E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5063.45	0.000	4.000	4.000	0.000	1.0000	100.000	2.96E-01	3.30E-01	2.22E-01	1.41E-01	3.28E-01
PO-209	4882.00	4854.41	25.975	493.000	490.591	2.409	1.5520	99.740	3.49E+01	4.95E+00	6.35E-01	2.11E-01	3.11E+00
PO-210	5304.38	5288.11	25.499	163.000	160.935	2.065	1.4369	100.000	1.58E+01	3.02E+00	8.31E-01	2.69E-01	2.47E+00

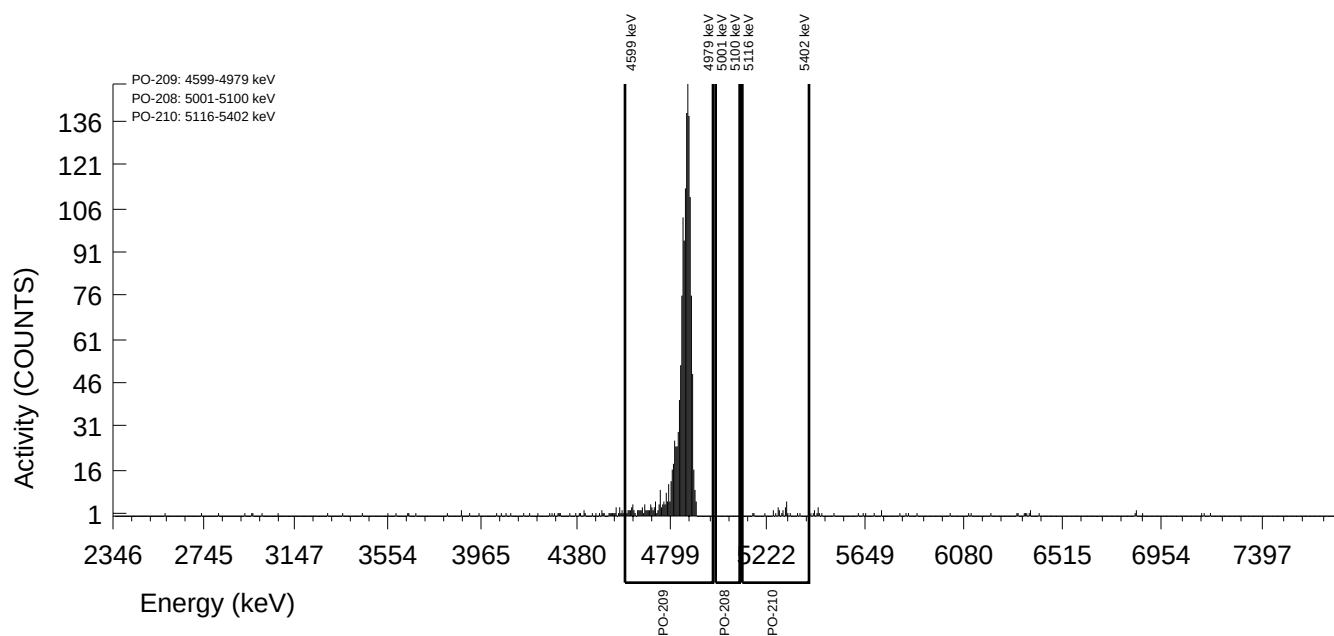


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2265054 SAMPLE ID : S0579287005_PO SAMPLE QTY : 0.104 F +/-1.386 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 69.8 +/-3.524 %	CHAMBER : 113 DETECTOR S/N : 67598 AVERAGE %EFFICIENCY : 26.1052 AVERAGE %EFF ERROR : 0.5070 COUNT DATE : 02-Jun-2022 14:32:46 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B113.CNF;1769 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W113.CNF;472 CAL DATE : 11-May-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8901E+00 dpm RESULTS : 5.5091E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5099.64	0.000	1.000	1.000	0.000	1.0000	100.000	2.47E-02	8.40E-02	7.42E-02	5.76E-02	8.40E-02
PO-209	4882.00	4850.04	40.239	1440.000	1433.000	7.000	2.6458	99.740	3.41E+01	3.35E+00	3.64E-01	1.46E-01	1.77E+00
PO-210	5304.38	5280.94	38.621	26.000	16.000	10.000	3.1623	100.000	5.28E-01	4.01E-01	5.84E-01	2.43E-01	3.98E-01

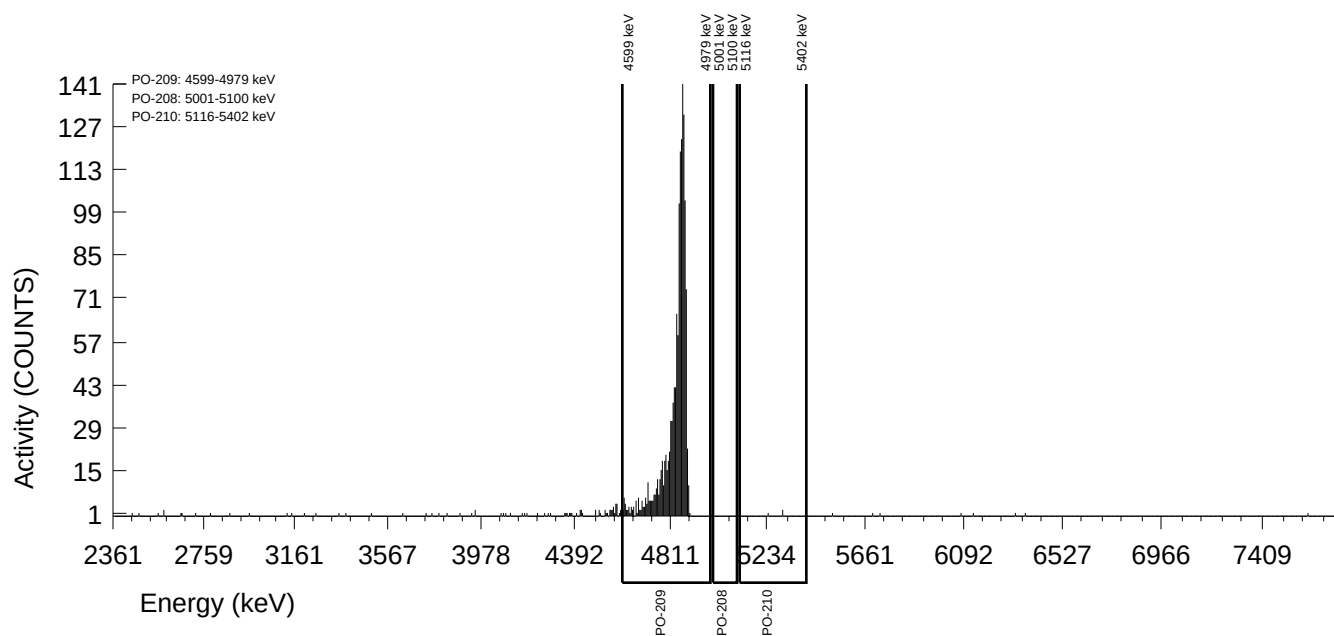


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2265054 SAMPLE ID : S1205090059_PO SAMPLE QTY : 0.106 F +/-1.376 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 68.1 +/-3.538 %	CHAMBER : 125 DETECTOR S/N : 84060 AVERAGE %EFFICIENCY : 26.3728 AVERAGE %EFF ERROR : 0.5120 COUNT DATE : 02-Jun-2022 14:32:48 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B125.CNF;1755 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W125.CNF;492 CAL DATE : 11-May-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8833E+00 dpm RESULTS : 5.3687E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5050.47	0.000	0.000	-1.000	1.000	1.0000	100.000	-2.39E-02	8.10E-02	1.83E-01	5.55E-02	8.10E-02
PO-209	4882.00	4832.27	33.649	1419.000	1412.000	7.000	2.6458	99.740	3.36E+01	3.31E+00	3.64E-01	1.46E-01	1.76E+00
PO-210	5304.38	5281.50	4.949	3.000	-3.000	6.000	2.4495	100.000	-7.44E-02	1.61E-01	3.57E-01	1.41E-01	1.61E-01

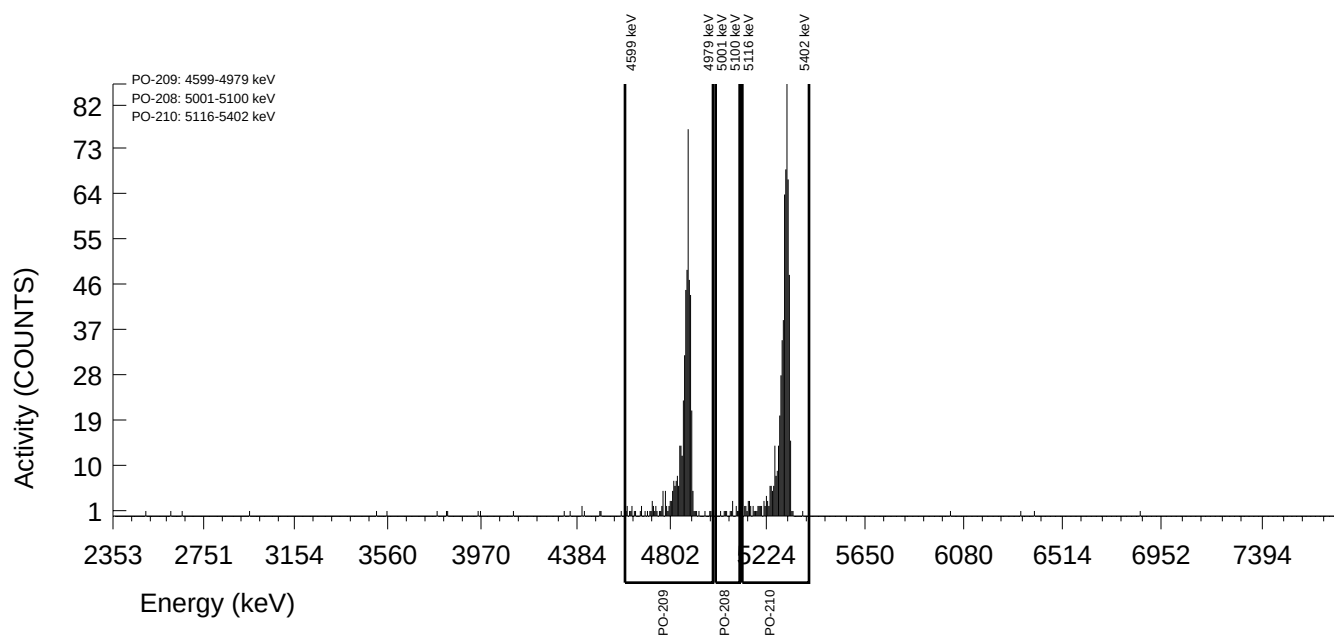


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2265054 SAMPLE ID : S1205090060_PO SAMPLE QTY : 0.106 F +/-1.376 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 67.6 +/-5.140 %	CHAMBER : 135 DETECTOR S/N : 80005 AVERAGE %EFFICIENCY : 26.1031 AVERAGE %EFF ERROR : 0.5069 COUNT DATE : 01-Jun-2022 08:42:57 ELAPSED LIVE TIME(SEC) : 20678.69	LIB FILE : PO BKG FILE : B135.CNF;1761 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W135.CNF;477 CAL DATE : 11-May-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8833E+00 dpm RESULTS : 5.3308E+00 dpm	LCS ID 2012-A NUCLIDE PO-210 NOMINAL (pCi/F) 4.4363E+01 % RECOVERY 94.628	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5064.29	21.052	13.000	12.311	0.689	0.8302	100.000	8.66E-01	5.31E-01	4.34E-01	1.11E-01	5.23E-01
PO-209	4882.00	4852.38	23.474	480.000	478.277	1.723	1.3127	99.740	3.36E+01	4.80E+00	5.62E-01	1.76E-01	3.02E+00
PO-210	5304.38	5289.72	24.725	582.000	577.520	4.480	2.1167	100.000	4.20E+01	5.80E+00	8.05E-01	2.93E-01	3.44E+00

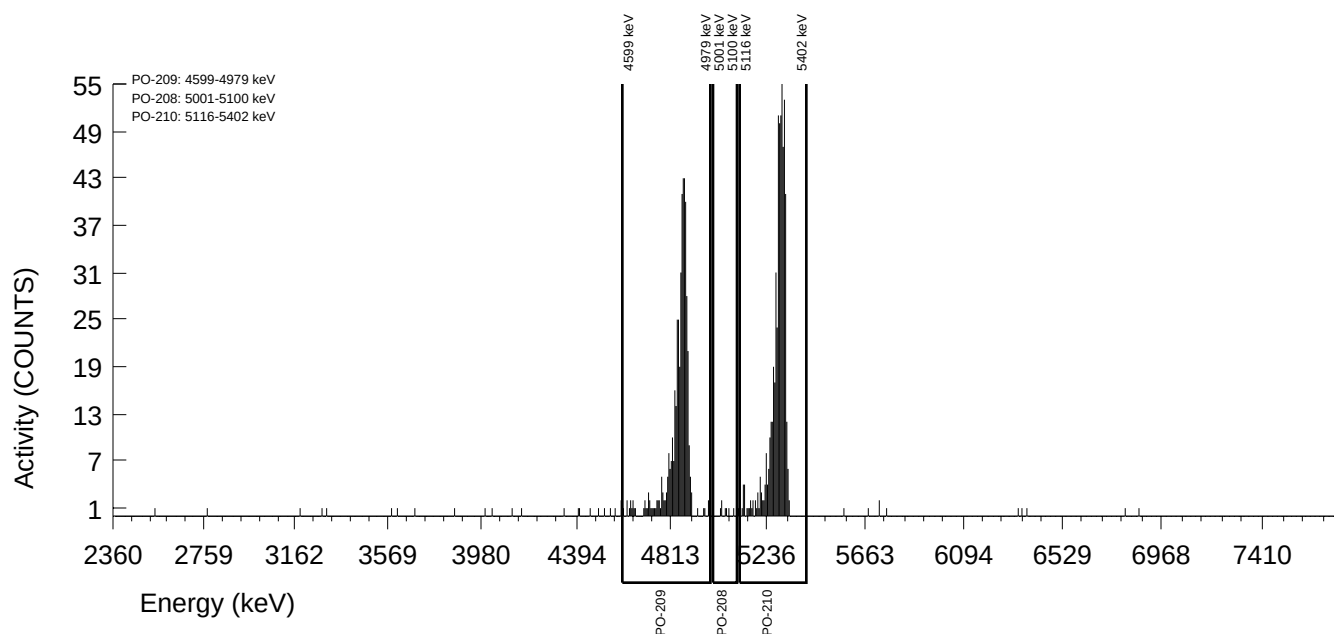


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2265054 SAMPLE ID : S1205090061_PO SAMPLE QTY : 0.106 F +/-1.376 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 63.9 +/-5.217 %	CHAMBER : 136 DETECTOR S/N : 140243 AVERAGE %EFFICIENCY : 26.5746 AVERAGE %EFF ERROR : 0.5158 COUNT DATE : 01-Jun-2022 08:42:59 ELAPSED LIVE TIME(SEC) : 20686.36	LIB FILE : PO BKG FILE : B136.CNF;377 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W136.CNF;70 CAL DATE : 11-May-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8833E+00 dpm RESULTS : 5.0339E+00 dpm	LCSD ID 2012-A NUCLIDE PO-210 NOMINAL (pCi/F) 4.4363E+01 % RECOVERY 93.642	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
PO-208	5080.00	5051.32	7.438	7.000	6.655	0.345	0.5872	100.000	4.87E-01	4.15E-01	3.83E-01	8.19E-02	4.12E-01
PO-209	4882.00	4844.40	45.851	461.000	459.966	1.034	1.0170	99.740	3.36E+01	4.87E+00	5.02E-01	1.42E-01	3.08E+00
PO-210	5304.38	5282.04	43.217	551.000	549.621	1.379	1.1743	100.000	4.15E+01	5.82E+00	5.65E-01	1.69E-01	3.48E+00



Continuing Calibration Data

Review of Alpha Spectrometer QA results (Daily checks) 30-MAY-2022 11:03:10.39

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
30-MAY-2022	18	PSFWHM-5000	Above
30-MAY-2022	18	PSCTSS-5000	Below
30-MAY-2022	23	PSFWHM-5000	Above
30-MAY-2022	23	PSCTSS-5000	Below
30-MAY-2022	46	PSFWHM-5000	Below
30-MAY-2022	46	PSCTSS-5000	Below
30-MAY-2022	91	PSENERGY-5000	Above
30-MAY-2022	91	PSCENTRD-5000	Above
30-MAY-2022	94	PSFWHM-5000	Below
30-MAY-2022	94	PSCTSS-5000	Below
30-MAY-2022	101	PSFWHM-5000	Below
30-MAY-2022	101	PSCTSS-5000	Below
30-MAY-2022	143	PSENERGY-5000	Above
30-MAY-2022	143	PSCENTRD-5000	Above
30-MAY-2022	145	PSENERGY-5000	Below
30-MAY-2022	162	PSENERGY-5000	Above
30-MAY-2022	172	PSENERGY-5000	Above
30-MAY-2022	173	PSCTSS-5000	Below
30-MAY-2022	176	PSFWHM-5000	Above
30-MAY-2022	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transferred to the QA file

115 may not have run since 30-MAY-2022
116 may not have run since 30-MAY-2022
119 may not have run since 30-MAY-2022
120 may not have run since 30-MAY-2022
147 may not have run since 30-MAY-2022
148 may not have run since 30-MAY-2022
157 may not have run since 30-MAY-2022
158 may not have run since 30-MAY-2022
163 may not have run since 30-MAY-2022
164 may not have run since 30-MAY-2022
183 may not have run since 30-MAY-2022
184 may not have run since 30-MAY-2022
198 may not have run since 30-MAY-2022
221 may not have run since 30-MAY-2022
227 may not have run since 30-MAY-2022
228 may not have run since 30-MAY-2022
241 may not have run since 30-MAY-2022
242 may not have run since 30-MAY-2022
247 may not have run since 30-MAY-2022
248 may not have run since 30-MAY-2022

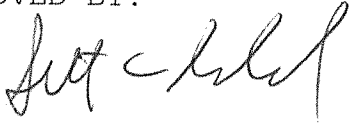
APPROVAL DATE:

5/30/22

APPROVAL TIME:

1110

APPROVED BY:



PROCEDURE # GL-RAD-I-009

Report completed at 30-MAY-2022 11:05:31.51

Review of Alpha Spectrometer QA results (Daily checks) 31-MAY-2022 10:13:21.48

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
31-MAY-2022	23	PSFWHM-5000	Above
31-MAY-2022	23	PSCTSS-5000	Below
31-MAY-2022	46	PSFWHM-5000	Below
31-MAY-2022	46	PSCTSS-5000	Below
31-MAY-2022	91	PSENERGY-5000	Above
31-MAY-2022	91	PSCENTRD-5000	Above
31-MAY-2022	94	PSFWHM-5000	Below
31-MAY-2022	94	PSCTSS-5000	Below
31-MAY-2022	101	PSFWHM-5000	Below
31-MAY-2022	101	PSCTSS-5000	Below
31-MAY-2022	143	PSENERGY-5000	Above
31-MAY-2022	143	PSCENTRD-5000	Above
31-MAY-2022	144	PSENERGY-5000	Below
31-MAY-2022	145	PSENERGY-5000	Below
31-MAY-2022	162	PSENERGY-5000	Above
31-MAY-2022	172	PSENERGY-5000	Above
31-MAY-2022	173	PSCTSS-5000	Below
31-MAY-2022	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transferred to the QA file

115 may not have run since 31-MAY-2022
116 may not have run since 31-MAY-2022
119 may not have run since 31-MAY-2022

120 may not have run since 31-MAY-2022
147 may not have run since 31-MAY-2022
148 may not have run since 31-MAY-2022
157 may not have run since 31-MAY-2022
158 may not have run since 31-MAY-2022
163 may not have run since 31-MAY-2022
164 may not have run since 31-MAY-2022
183 may not have run since 31-MAY-2022
184 may not have run since 31-MAY-2022
198 may not have run since 31-MAY-2022
211 may not have run since 31-MAY-2022
212 may not have run since 31-MAY-2022
221 may not have run since 31-MAY-2022
227 may not have run since 31-MAY-2022
228 may not have run since 31-MAY-2022
241 may not have run since 31-MAY-2022
242 may not have run since 31-MAY-2022
247 may not have run since 31-MAY-2022
248 may not have run since 31-MAY-2022

APPROVAL DATE: 5/31/22

APPROVAL TIME: 1017

APPROVED BY:



PROCEDURE # GL-RAD-I-009

Report completed at 31-MAY-2022 10:15:55.39

Review of Alpha Spectrometer QA results (Daily checks) 1-JUN-2022 09:18:37.67

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
1-JUN-2022	23	PSFWHM-5000	Above
1-JUN-2022	23	PSCTSS-5000	Below
1-JUN-2022	46	PSFWHM-5000	Below
1-JUN-2022	46	PSCTSS-5000	Below
1-JUN-2022	91	PSENERGY-5000	Above
1-JUN-2022	91	PSCENTRD-5000	Above
1-JUN-2022	94	PSFWHM-5000	Below
1-JUN-2022	94	PSCTSS-5000	Below
1-JUN-2022	101	PSFWHM-5000	Below
1-JUN-2022	101	PSCTSS-5000	Below
1-JUN-2022	143	PSENERGY-5000	Above
1-JUN-2022	143	PSCENTRD-5000	Above
1-JUN-2022	144	Second Check Required for D	
1-JUN-2022	145	PSENERGY-5000	Below
1-JUN-2022	162	PSENERGY-5000	Above
1-JUN-2022	172	PSENERGY-5000	Above
1-JUN-2022	173	PSCTSS-5000	Below
1-JUN-2022	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

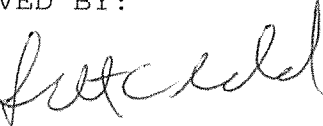
The following detectors that may not have properly transferred to the QA file

115 may not have run since 1-JUN-2022
116 may not have run since 1-JUN-2022
119 may not have run since 1-JUN-2022

120 may not have run since 1-JUN-2022
147 may not have run since 1-JUN-2022
148 may not have run since 1-JUN-2022
157 may not have run since 1-JUN-2022
158 may not have run since 1-JUN-2022
163 may not have run since 1-JUN-2022
164 may not have run since 1-JUN-2022
183 may not have run since 1-JUN-2022
184 may not have run since 1-JUN-2022
198 may not have run since 1-JUN-2022
221 may not have run since 1-JUN-2022
227 may not have run since 1-JUN-2022
228 may not have run since 1-JUN-2022
241 may not have run since 1-JUN-2022
242 may not have run since 1-JUN-2022
247 may not have run since 1-JUN-2022
248 may not have run since 1-JUN-2022

APPROVAL DATE:
6/1/22

APPROVAL TIME:
1000

APPROVED BY:


PROCEDURE # GL-RAD-I-009

Report completed at 1-JUN-2022 09:21:25.03

Review of Alpha Spectrometer QA results (Daily checks) 2-JUN-2022 23:00:00.85

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
2-JUN-2022	23	PSFWHM-5000	Above
2-JUN-2022	23	PSCTSS-5000	Below
2-JUN-2022	46	PSFWHM-5000	Below
2-JUN-2022	46	PSCTSS-5000	Below
2-JUN-2022	91	PSENERGY-5000	Above
2-JUN-2022	91	PSCENTRD-5000	Above
2-JUN-2022	94	PSFWHM-5000	Below
2-JUN-2022	94	PSCTSS-5000	Below
2-JUN-2022	101	PSFWHM-5000	Below
2-JUN-2022	101	PSCTSS-5000	Below
2-JUN-2022	143	PSENERGY-5000	Above
2-JUN-2022	143	PSCENTRD-5000	Above
2-JUN-2022	145	PSENERGY-5000	Below
2-JUN-2022	162	PSENERGY-5000	Above
2-JUN-2022	172	PSENERGY-5000	Above
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transferred to the QA file

115	may not have run since 2-JUN-2022
116	may not have run since 2-JUN-2022
119	may not have run since 2-JUN-2022
120	may not have run since 2-JUN-2022
147	may not have run since 2-JUN-2022
148	may not have run since 2-JUN-2022
157	may not have run since 2-JUN-2022
158	may not have run since 2-JUN-2022
163	may not have run since 2-JUN-2022

164 may not have run since 2-JUN-2022
183 may not have run since 2-JUN-2022
184 may not have run since 2-JUN-2022
198 may not have run since 2-JUN-2022
221 may not have run since 2-JUN-2022
227 may not have run since 2-JUN-2022
228 may not have run since 2-JUN-2022
241 may not have run since 2-JUN-2022
242 may not have run since 2-JUN-2022
243 may not have run since 2-JUN-2022
247 may not have run since 2-JUN-2022
248 may not have run since 2-JUN-2022

APPROVAL DATE:

6/2/2022

APPROVAL TIME:

23:10

APPROVED BY:



PROCEDURE # GL-RAD-I-009

Report completed at 2-JUN-2022 23:04:31.82

Review of Alpha Spectrometer QA results (Daily checks) 5-JUN-2022 08:20:48.90

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
5-JUN-2022	18	PSFWHM-5000	Above
5-JUN-2022	18	PSCTSS-5000	Below
5-JUN-2022	23	PSFWHM-5000	Above
5-JUN-2022	46	PSFWHM-5000	Below
5-JUN-2022	46	PSCTSS-5000	Below
5-JUN-2022	91	PSENERGY-5000	Above
5-JUN-2022	91	PSCENTRD-5000	Above
5-JUN-2022	94	PSFWHM-5000	Below
5-JUN-2022	94	PSCTSS-5000	Below
5-JUN-2022	101	PSFWHM-5000	Below
5-JUN-2022	101	PSCTSS-5000	Below
5-JUN-2022	143	PSENERGY-5000	Above
5-JUN-2022	143	PSCENTRD-5000	Above
5-JUN-2022	144	PSENERGY-5000	Below
5-JUN-2022	145	PSENERGY-5000	Below
5-JUN-2022	153	Second Check Required for D	
5-JUN-2022	162	PSENERGY-5000	Above
5-JUN-2022	172	PSFWHM-5000	Above
5-JUN-2022	172	PSENERGY-5000	Above
5-JUN-2022	173	PSCTSS-5000	Below
5-JUN-2022	176	PSFWHM-5000	Above
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
5-JUN-2022	199	PSCTSS-5000	Below
5-JUN-2022	212	PSFWHM-5000	Above
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below

20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transferred to the QA file

115	may not have run since 5-JUN-2022
116	may not have run since 5-JUN-2022
119	may not have run since 5-JUN-2022
120	may not have run since 5-JUN-2022
147	may not have run since 5-JUN-2022
148	may not have run since 5-JUN-2022
157	may not have run since 5-JUN-2022
158	may not have run since 5-JUN-2022
163	may not have run since 5-JUN-2022
164	may not have run since 5-JUN-2022
183	may not have run since 5-JUN-2022
184	may not have run since 5-JUN-2022
198	may not have run since 5-JUN-2022
221	may not have run since 5-JUN-2022
227	may not have run since 5-JUN-2022
228	may not have run since 5-JUN-2022
241	may not have run since 5-JUN-2022
242	may not have run since 5-JUN-2022
247	may not have run since 5-JUN-2022
248	may not have run since 5-JUN-2022

APPROVAL DATE: 6/5/2022 APPROVAL TIME: 8:30

APPROVED BY:  PROCEDURE # GL-RAD-I-009

Report completed at 5-JUN-2022 08:23:43.49

Review of Alpha Spectrometer QA results (Daily checks) 6-JUN-2022 23:00:00.91

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
6-JUN-2022	18	PSFWHM-5000	Above
6-JUN-2022	18	PSCTSS-5000	Below
6-JUN-2022	23	PSFWHM-5000	Above
6-JUN-2022	46	PSFWHM-5000	Below
6-JUN-2022	46	PSCTSS-5000	Below
6-JUN-2022	91	PSENERGY-5000	Above
6-JUN-2022	91	PSCENTRD-5000	Above
6-JUN-2022	94	PSFWHM-5000	Below
6-JUN-2022	94	PSCTSS-5000	Below
6-JUN-2022	101	PSFWHM-5000	Below
6-JUN-2022	101	PSCTSS-5000	Below
6-JUN-2022	143	PSENERGY-5000	Above
6-JUN-2022	143	PSCENTRD-5000	Above
6-JUN-2022	144	PSENERGY-5000	Below
6-JUN-2022	145	PSENERGY-5000	Below
6-JUN-2022	161	PSFWHM-5000	Above
6-JUN-2022	162	PSENERGY-5000	Above
6-JUN-2022	172	PSFWHM-5000	Above
6-JUN-2022	172	PSENERGY-5000	Above
6-JUN-2022	173	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
6-JUN-2022	212	PSFWHM-5000	Above
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transfered to the QA file

115	may not have run since 6-JUN-2022
116	may not have run since 6-JUN-2022
119	may not have run since 6-JUN-2022
120	may not have run since 6-JUN-2022
147	may not have run since 6-JUN-2022
148	may not have run since 6-JUN-2022
157	may not have run since 6-JUN-2022
158	may not have run since 6-JUN-2022
163	may not have run since 6-JUN-2022
164	may not have run since 6-JUN-2022
183	may not have run since 6-JUN-2022
184	may not have run since 6-JUN-2022
198	may not have run since 6-JUN-2022
221	may not have run since 6-JUN-2022
227	may not have run since 6-JUN-2022
228	may not have run since 6-JUN-2022
241	may not have run since 6-JUN-2022
242	may not have run since 6-JUN-2022
247	may not have run since 6-JUN-2022
248	may not have run since 6-JUN-2022

APPROVAL DATE: 6/6/2022

APPROVAL TIME: 23:10

APPROVED BY:

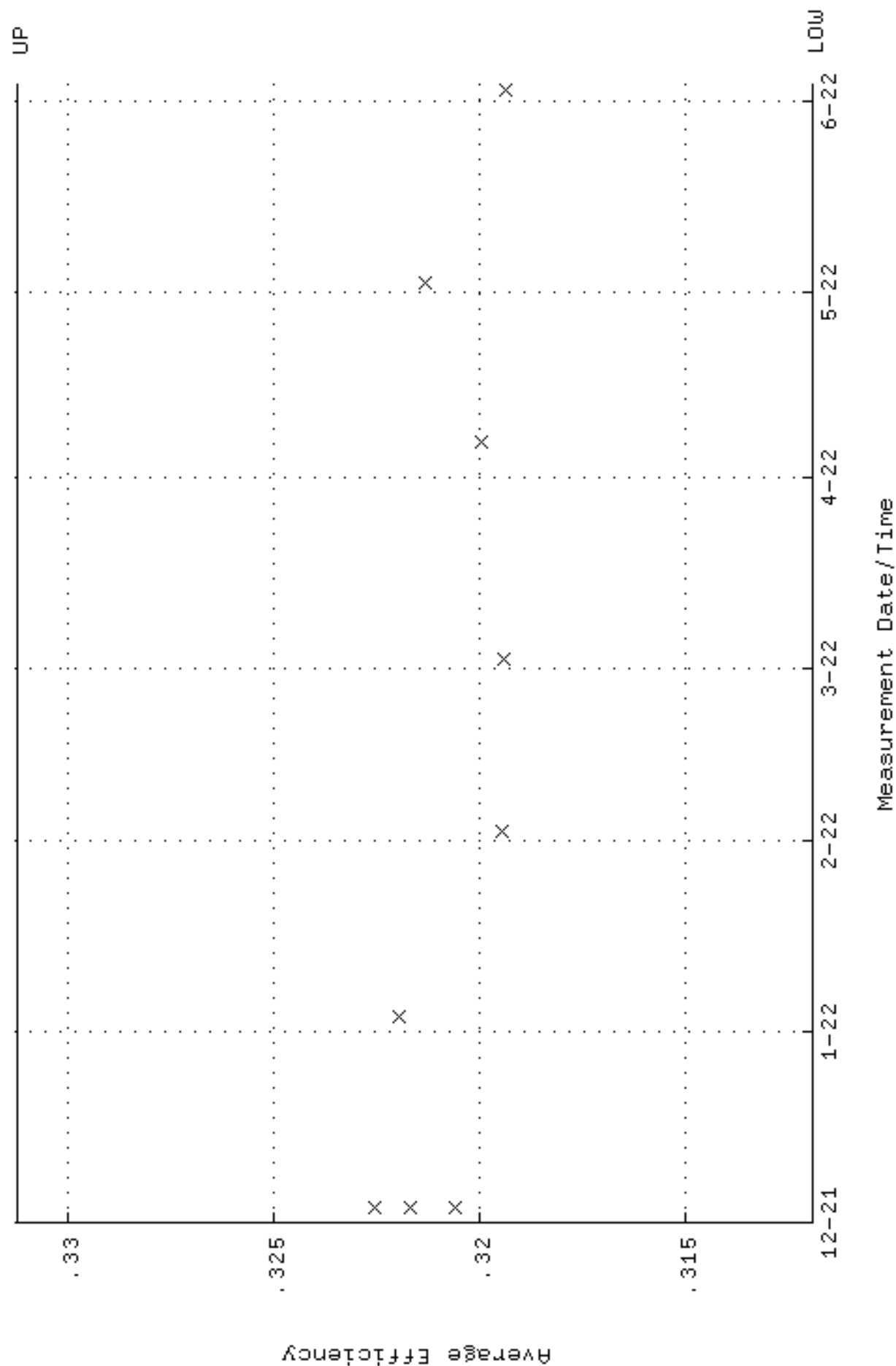


PROCEDURE # GL-RAD-I-009

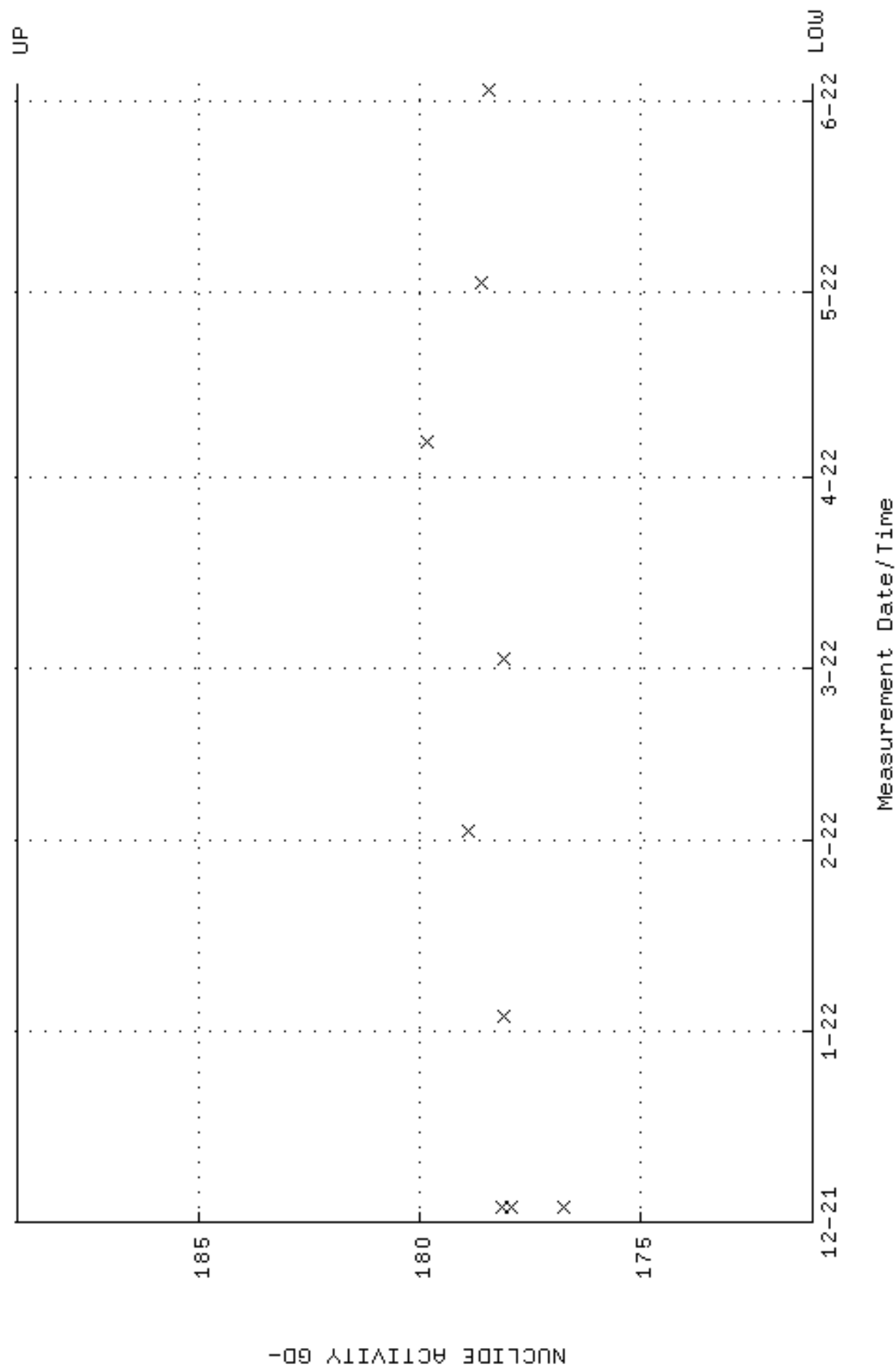
Report completed at 6-JUN-2022 23:02:17.86

Background and Efficiency Data

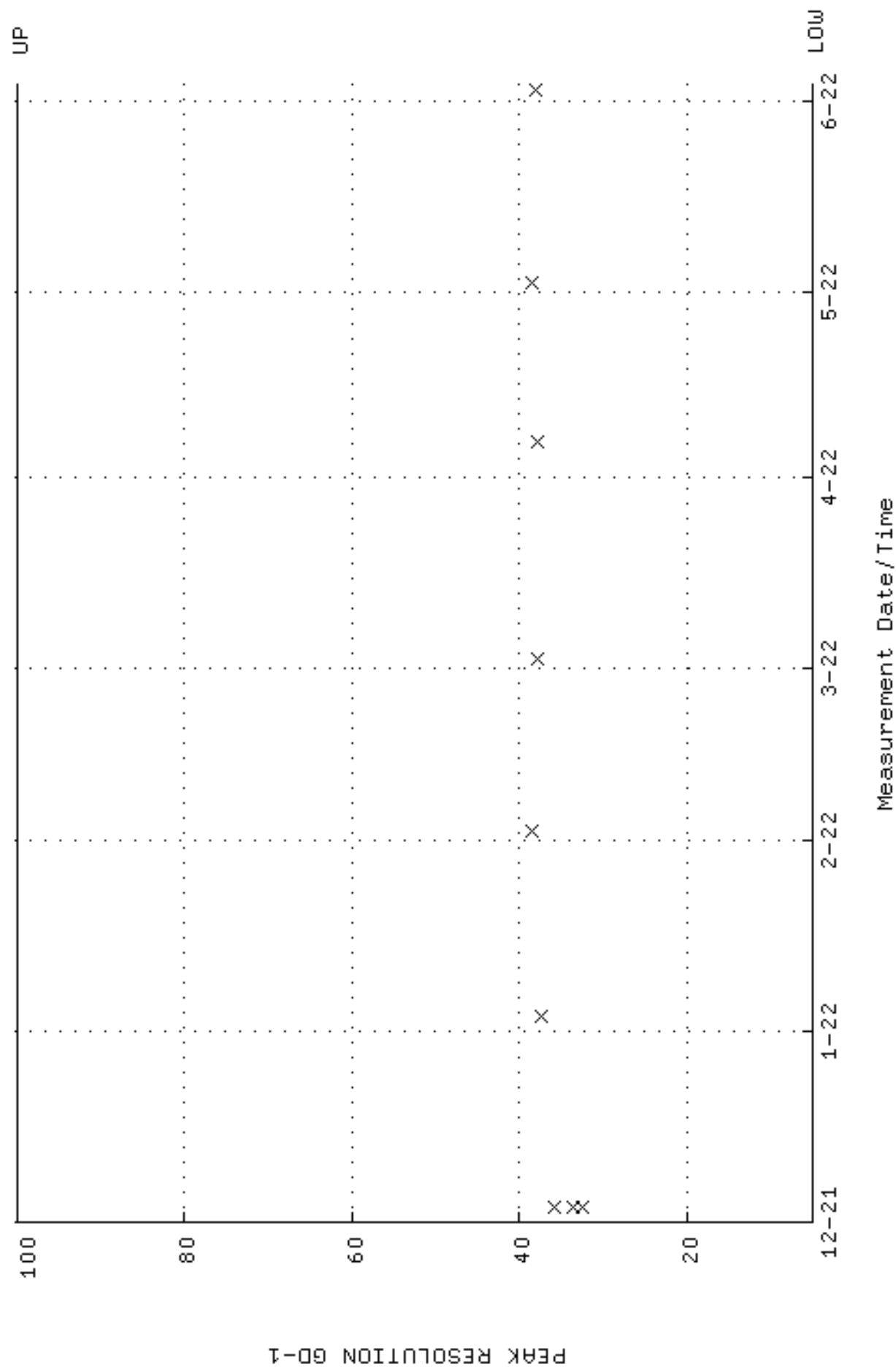
QA filename : DKA100:[ENV_ALPHA.QA.W]W003.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-DEC-2021 07:41:23 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.311924 through 0.331220



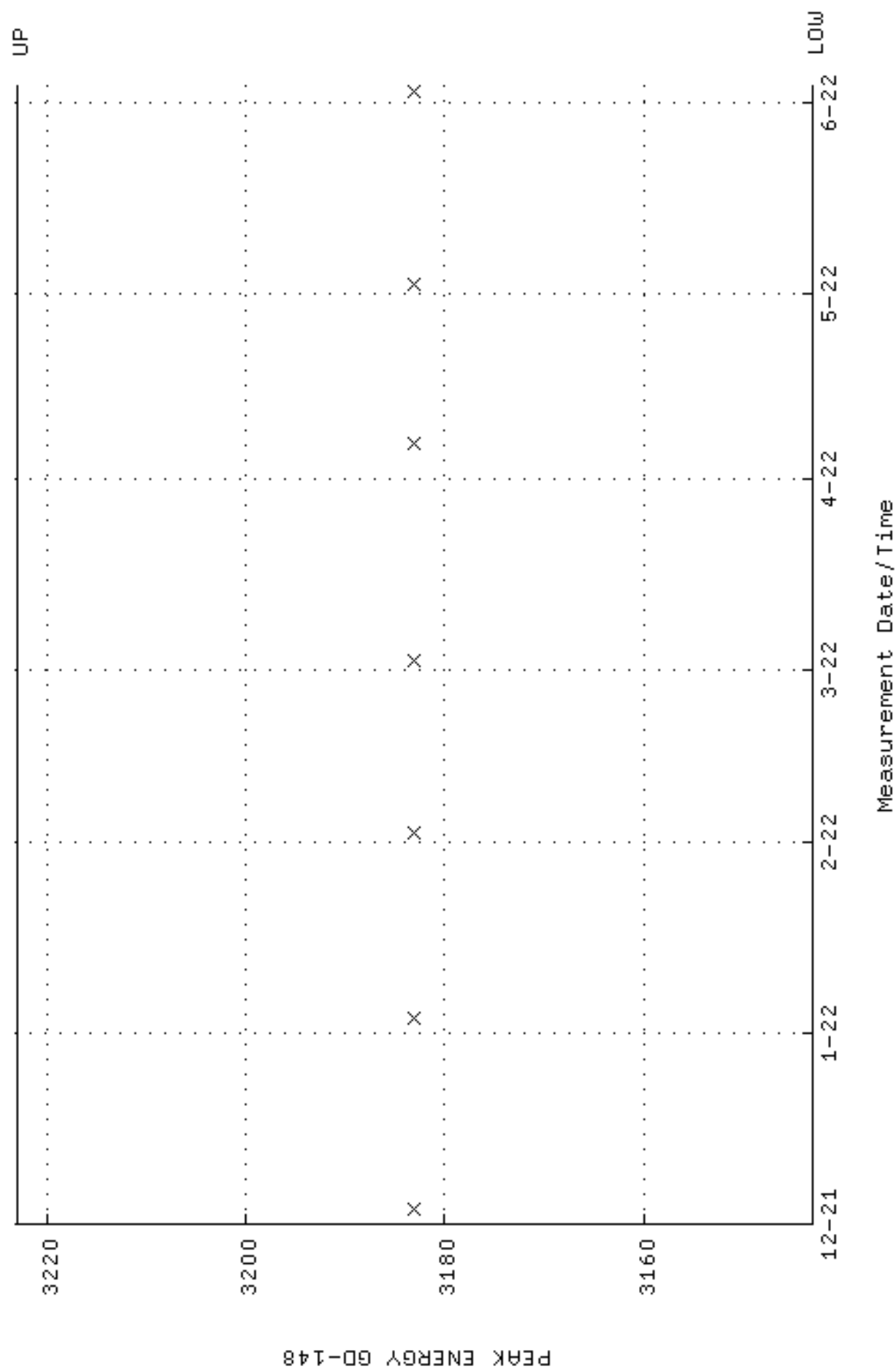
QA filename : DKA100:[ENV_ALPHA.QA.W]W003.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-DEC-2021 07:41:23 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



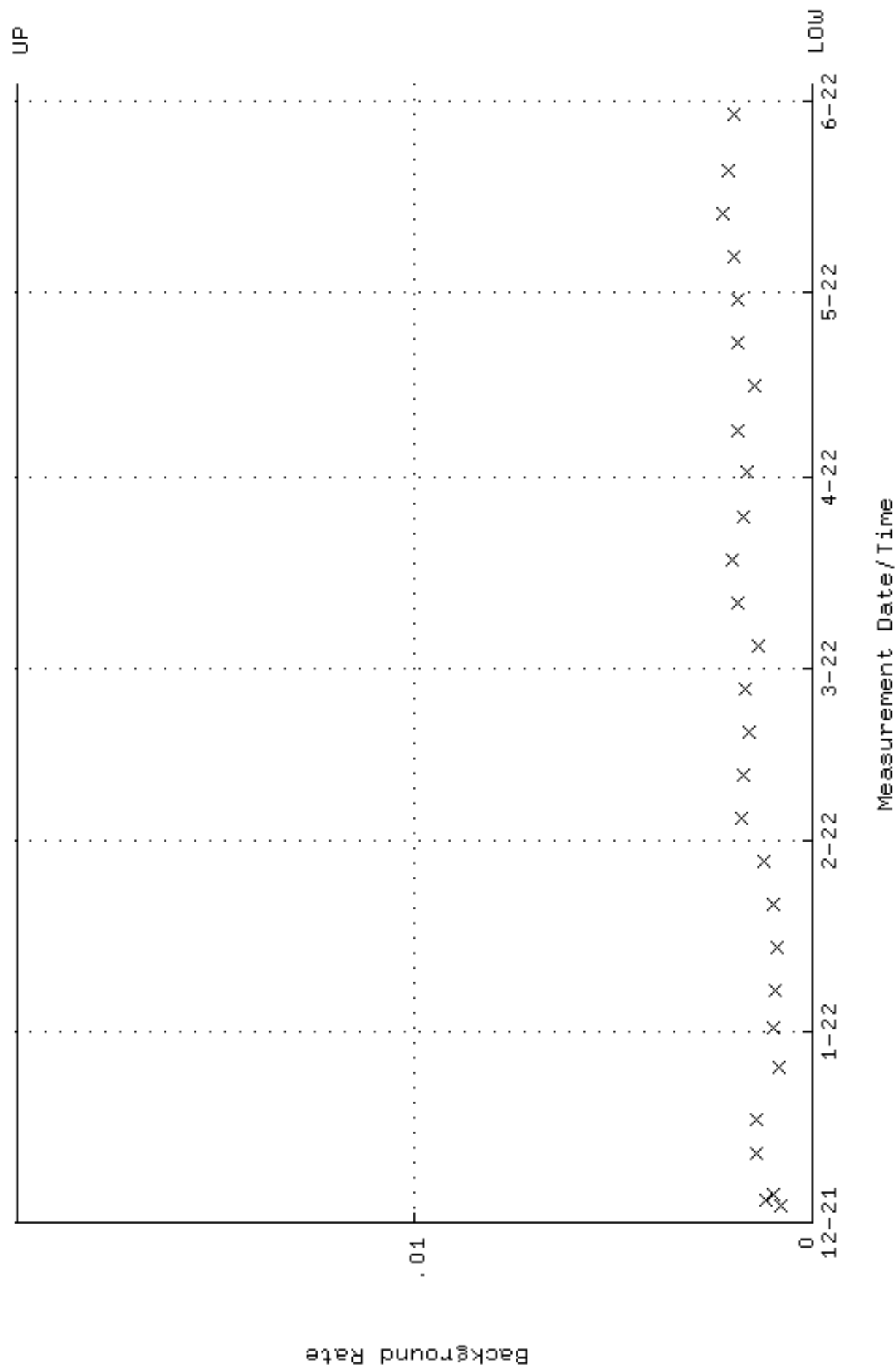
QA filename : DKA100:[ENV_ALPHA.QA.W]W003.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-DEC-2021 07:41:23 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



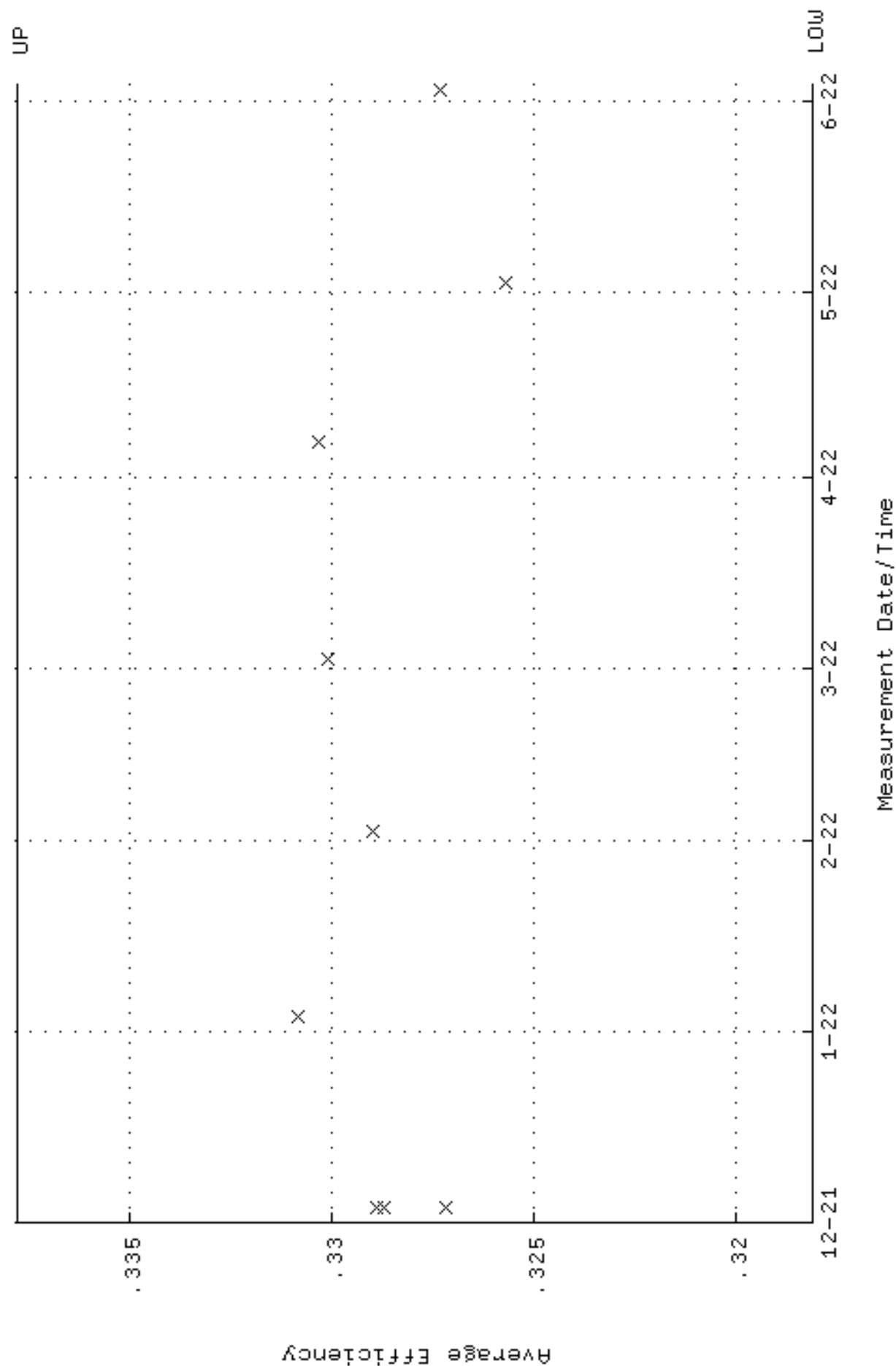
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-DEC-2021 07:41:23 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



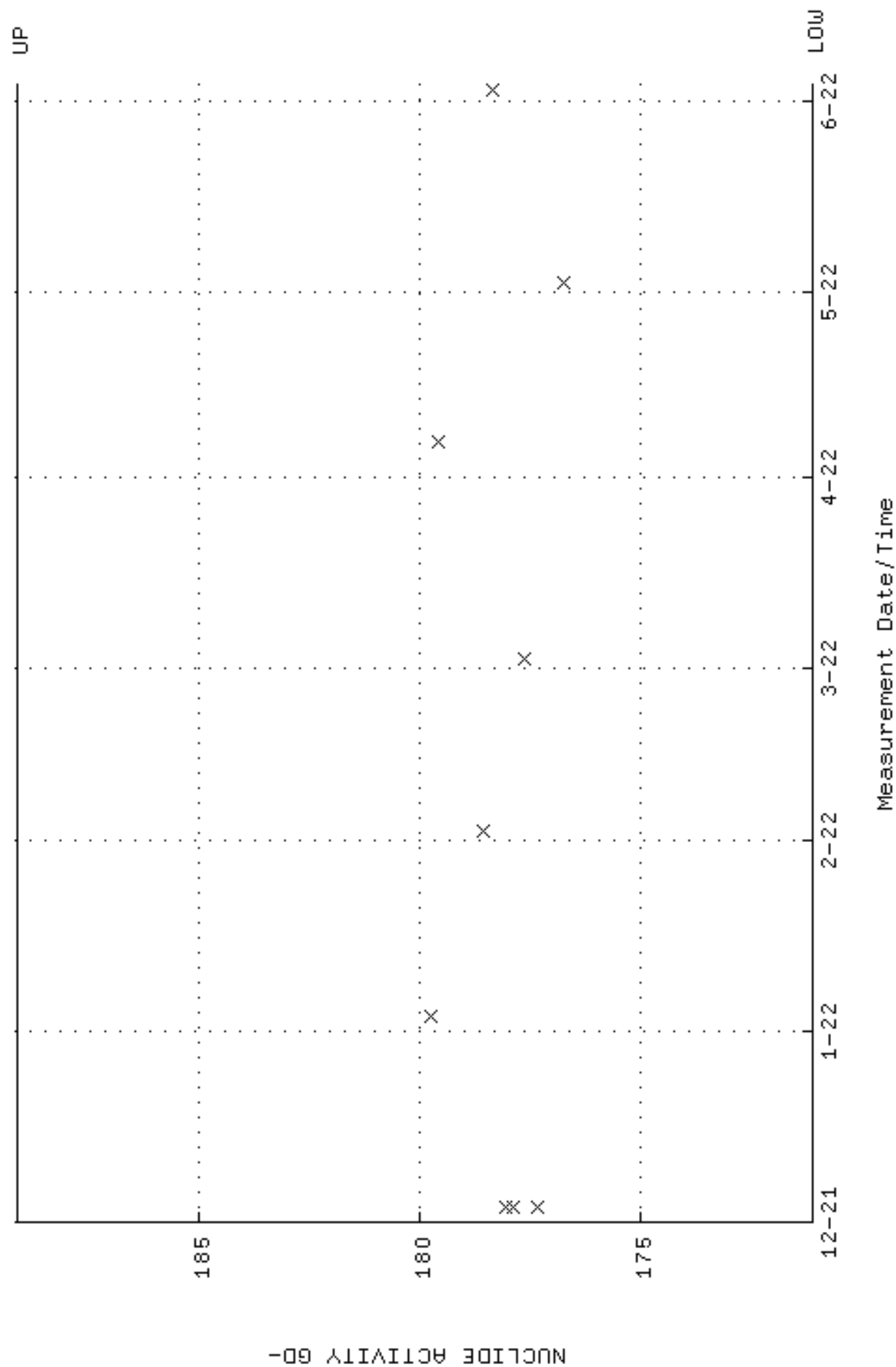
QA filename : DKA100:[ENV_ALPHA.QA.B]B003.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 3-DEC-2021 15:56:08 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



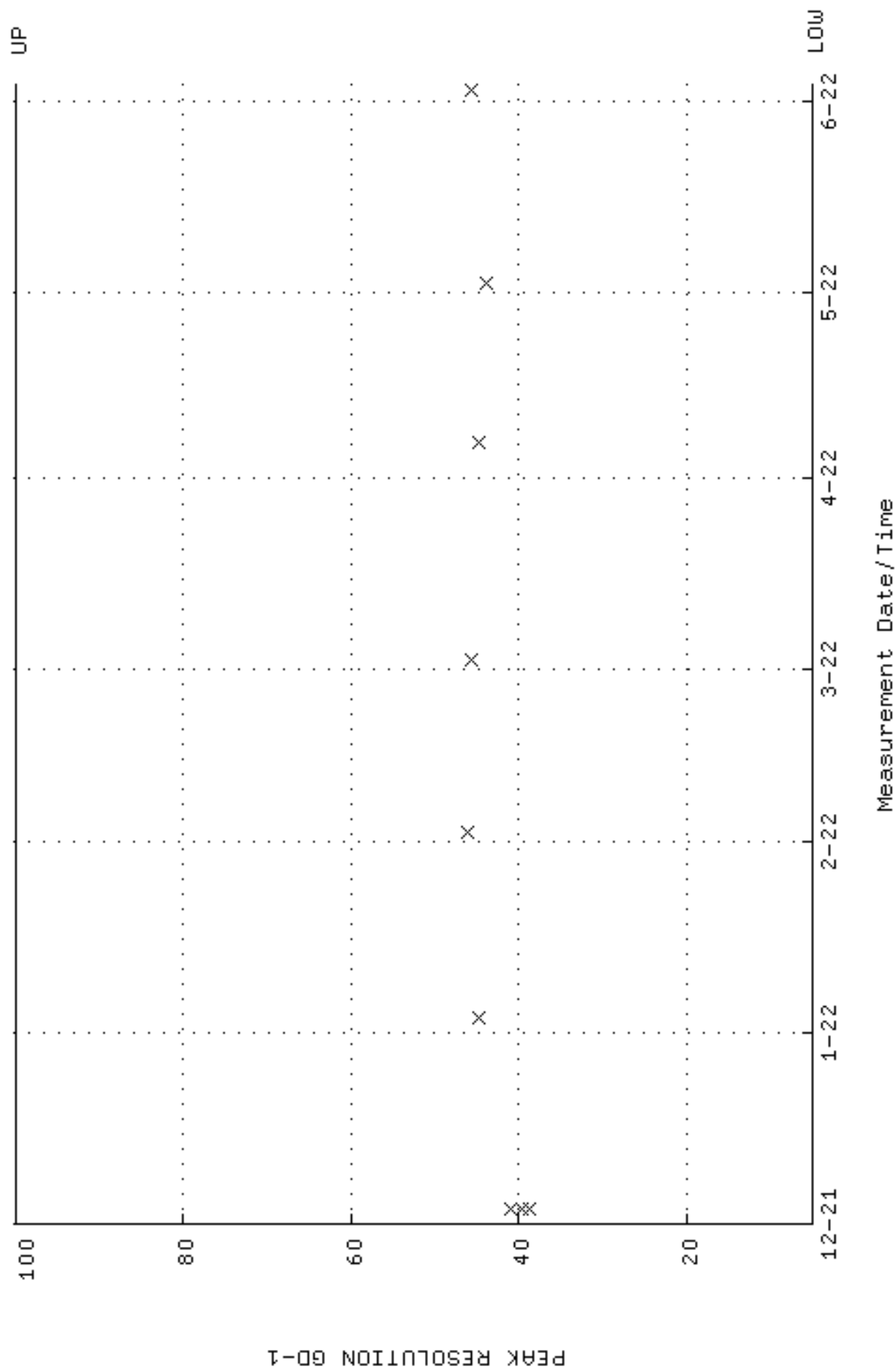
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 Parameter Name : AVRGEFF (Average Efficiency)
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 Lower/Upper Lmts: 0.318087 through 0.337796



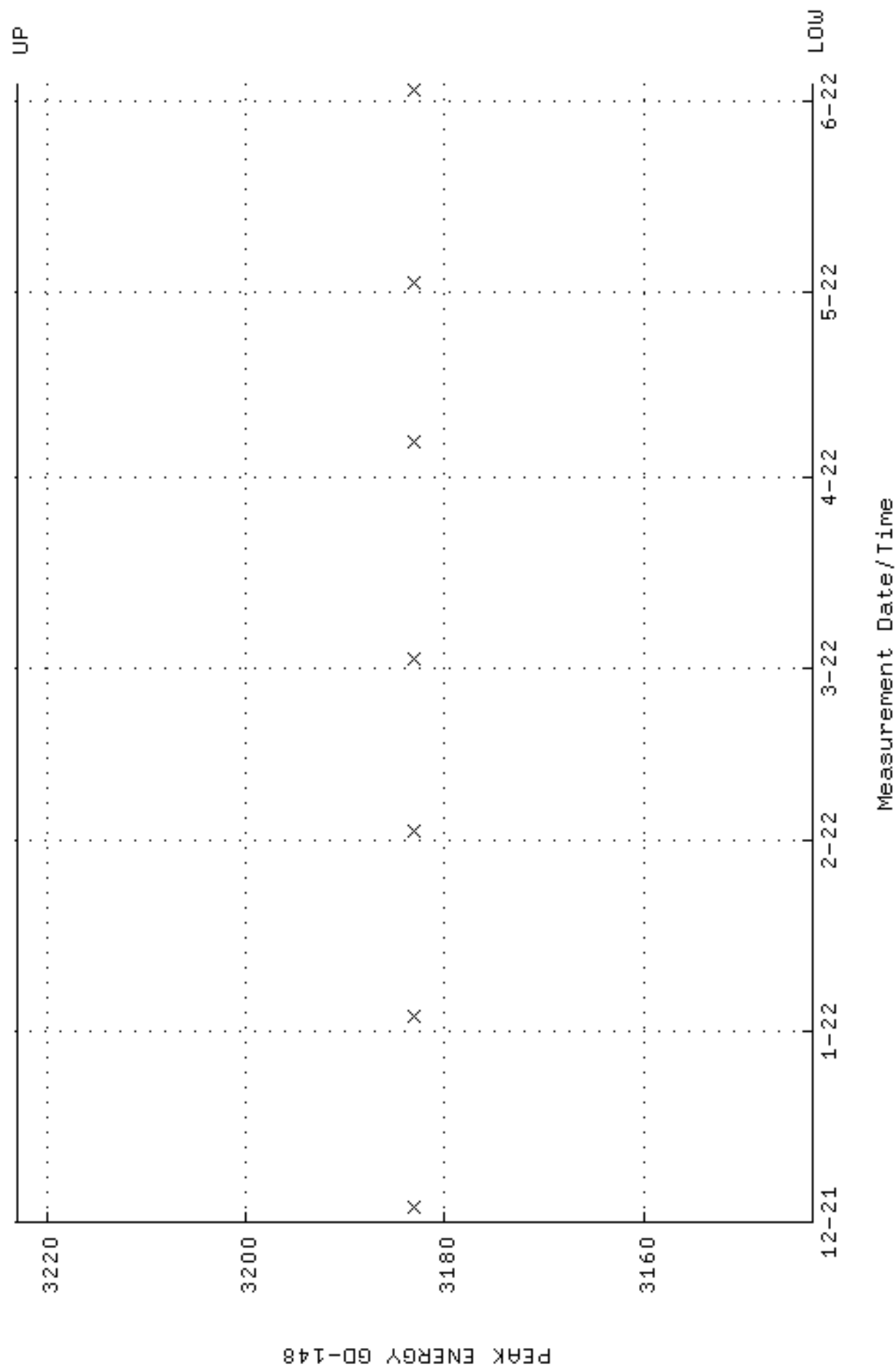
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-DEC-2021 07:41:23 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W004.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-DEC-2021 07:41:23 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



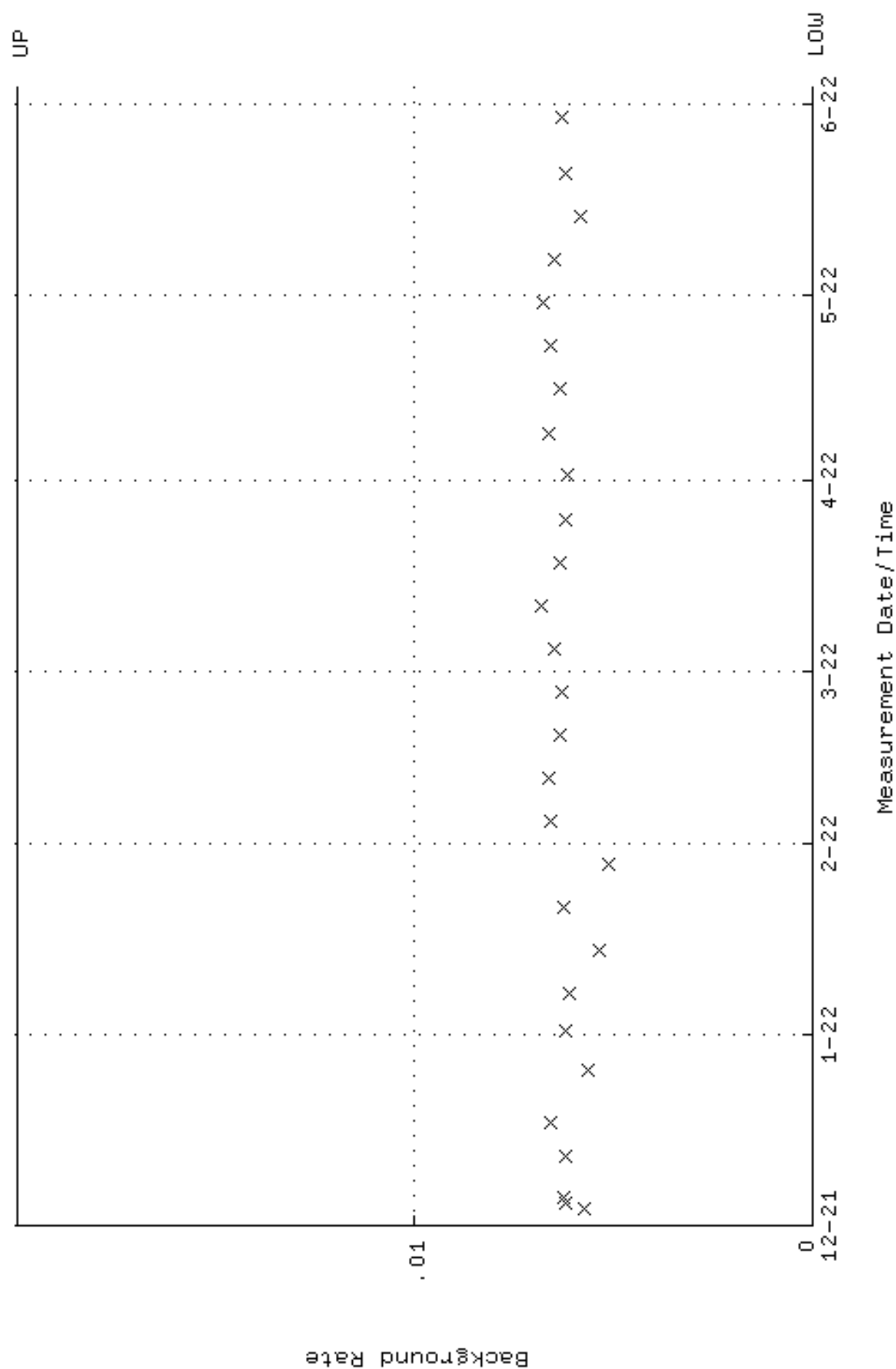
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-DEC-2021 07:41:23 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



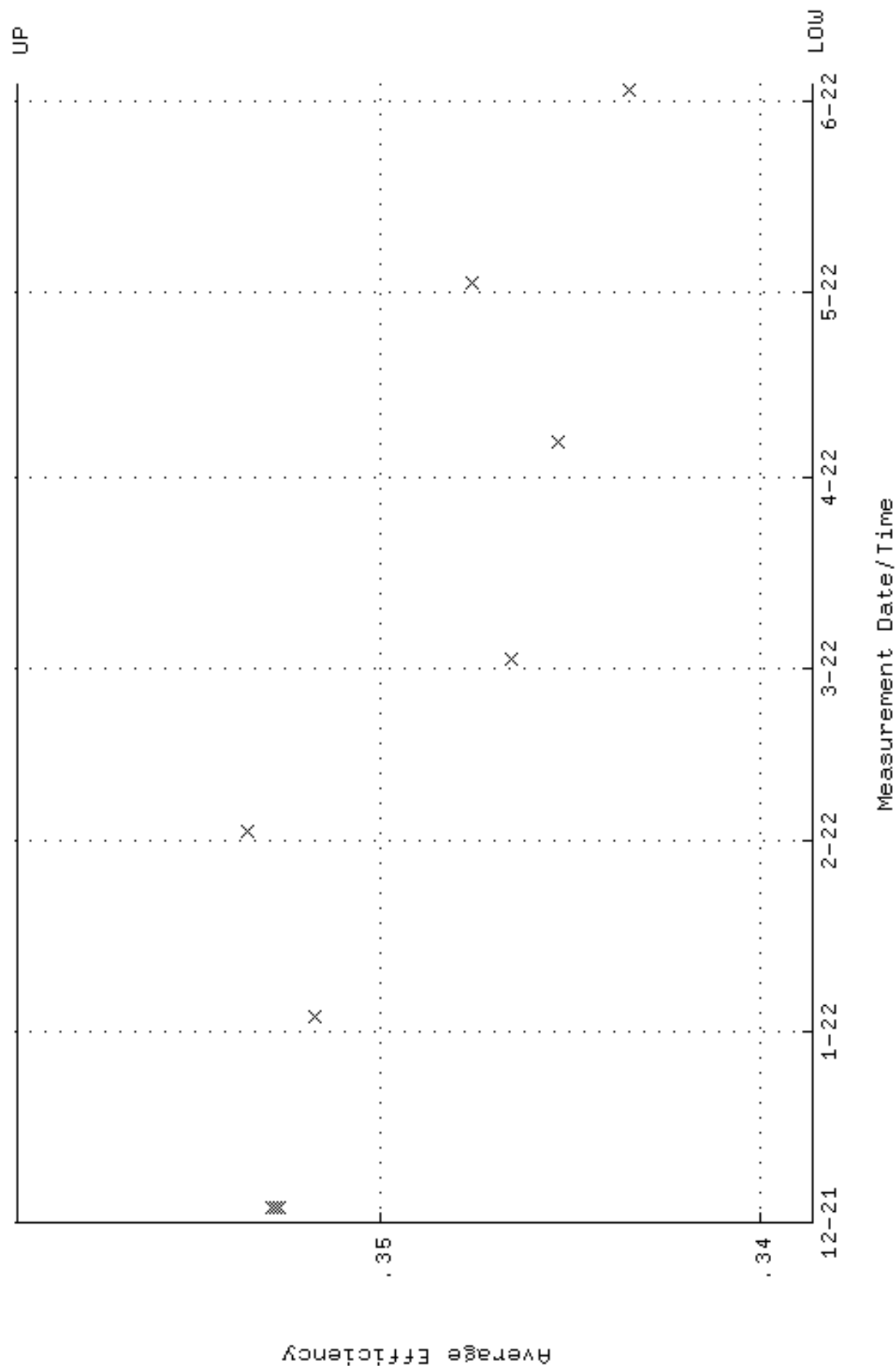
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QA filename      : DKA100:[ENV_ALPHA.QA.B]B004.QAF;4
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Start/End Dates  : 3-DEC-2021 15:56:08 through 3-JUN-
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02

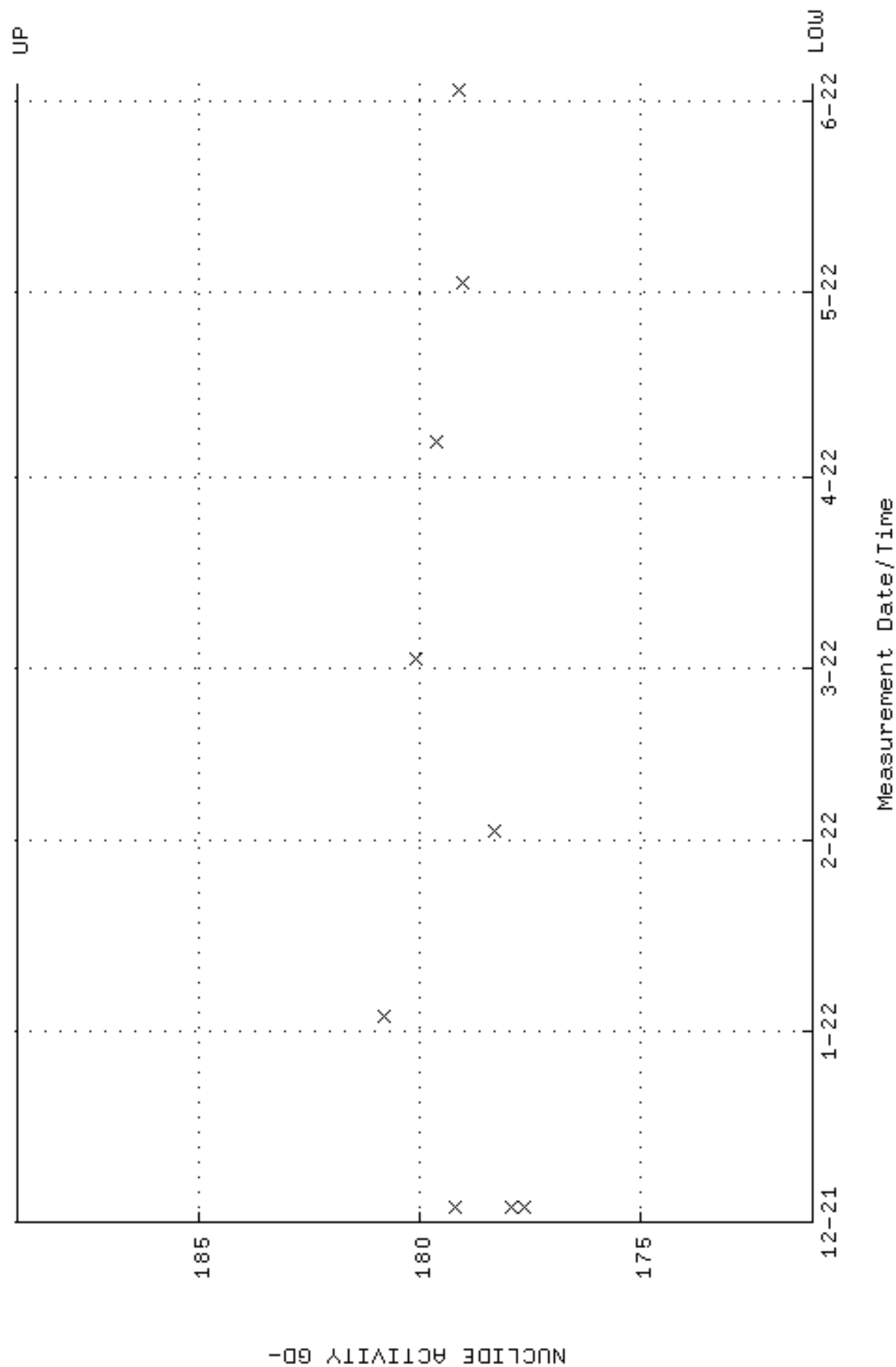
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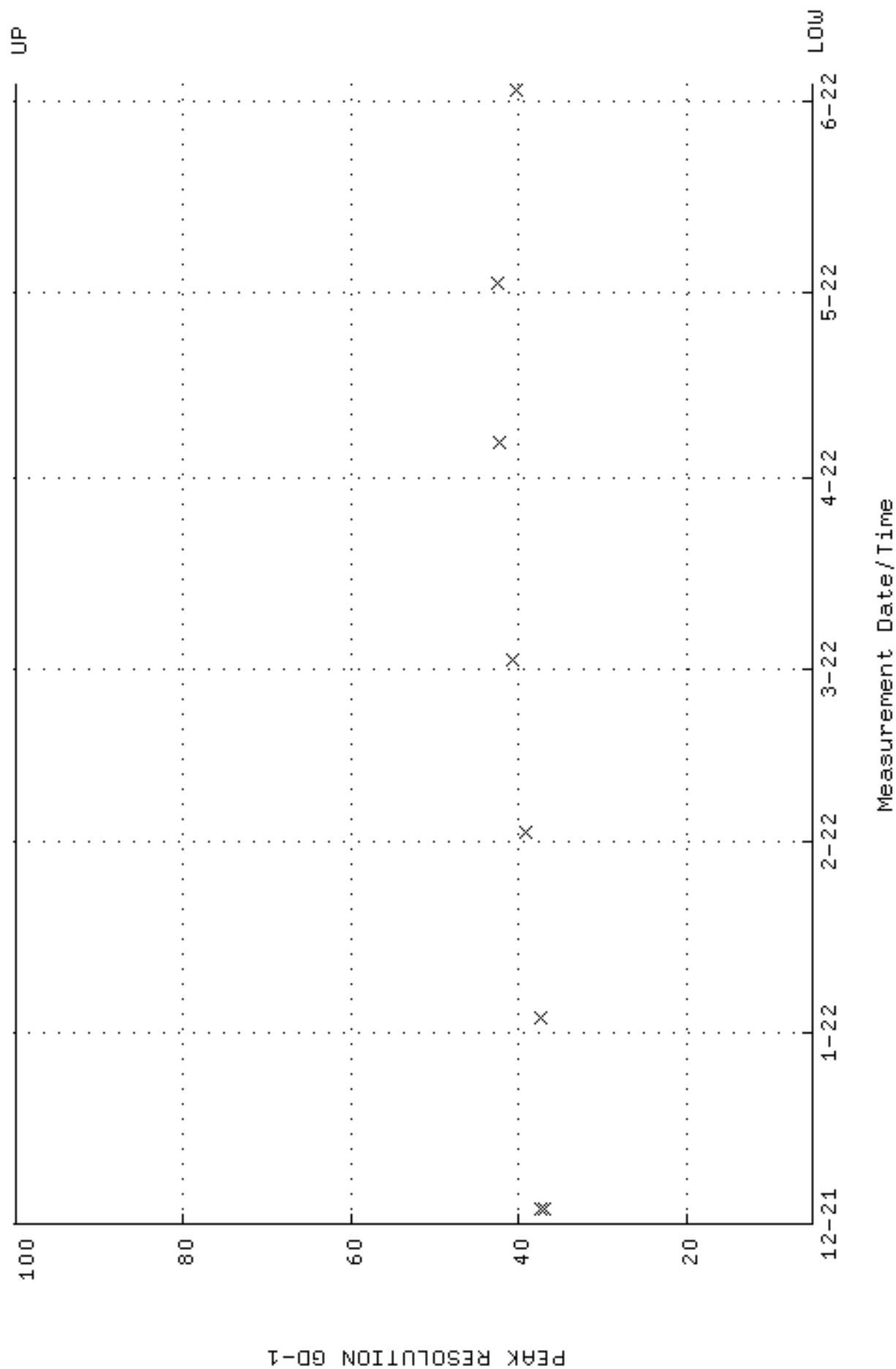
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 Parameter Name : AVRGEFF (Average Efficiency)
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 Lower/Upper Lmts: 0.338600 through 0.359540



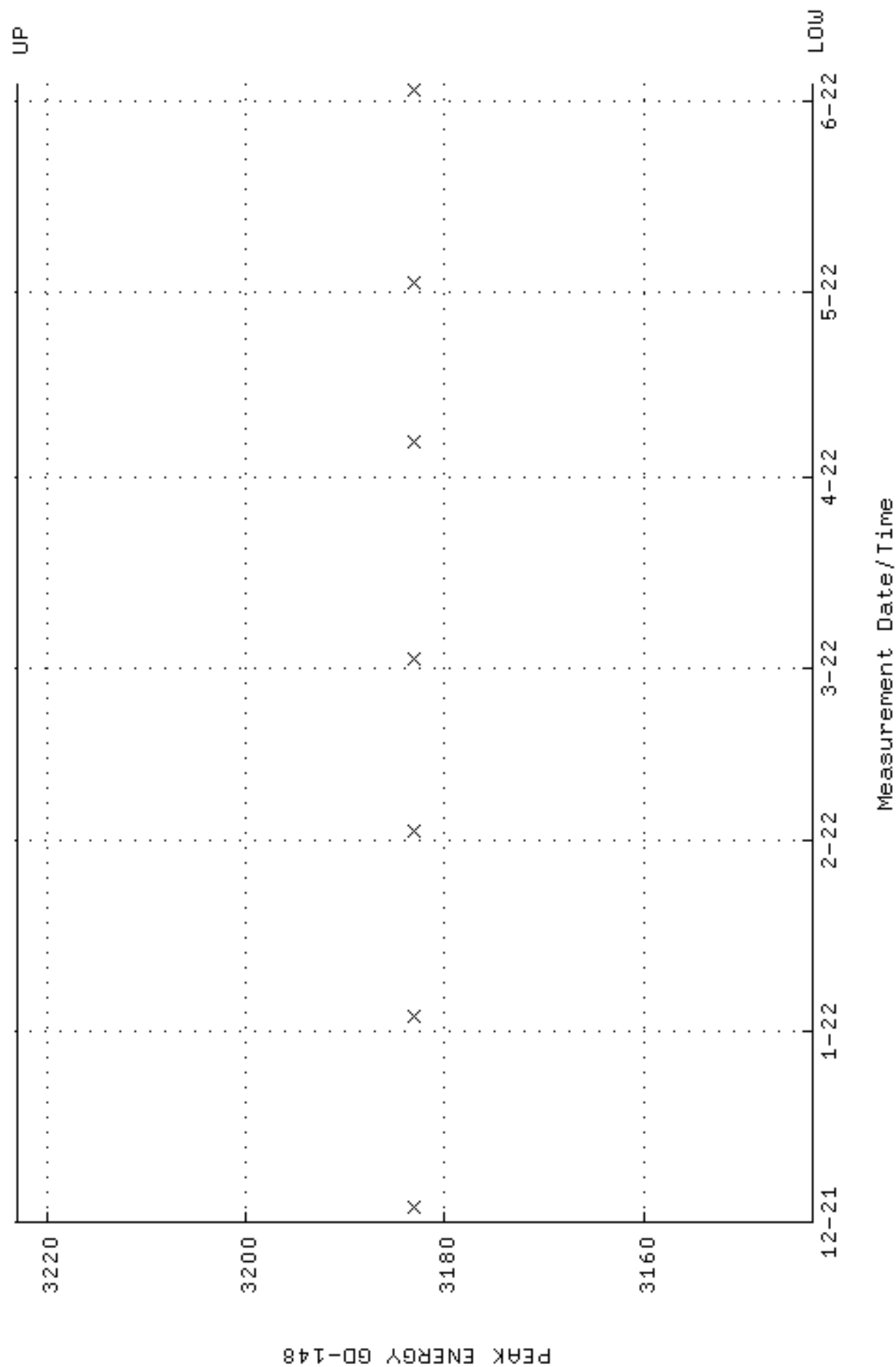
QA filename : DKA100:[ENV_ALPHA.QA.W]W005.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-DEC-2021 07:41:23 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W005.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-DEC-2021 07:41:23 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



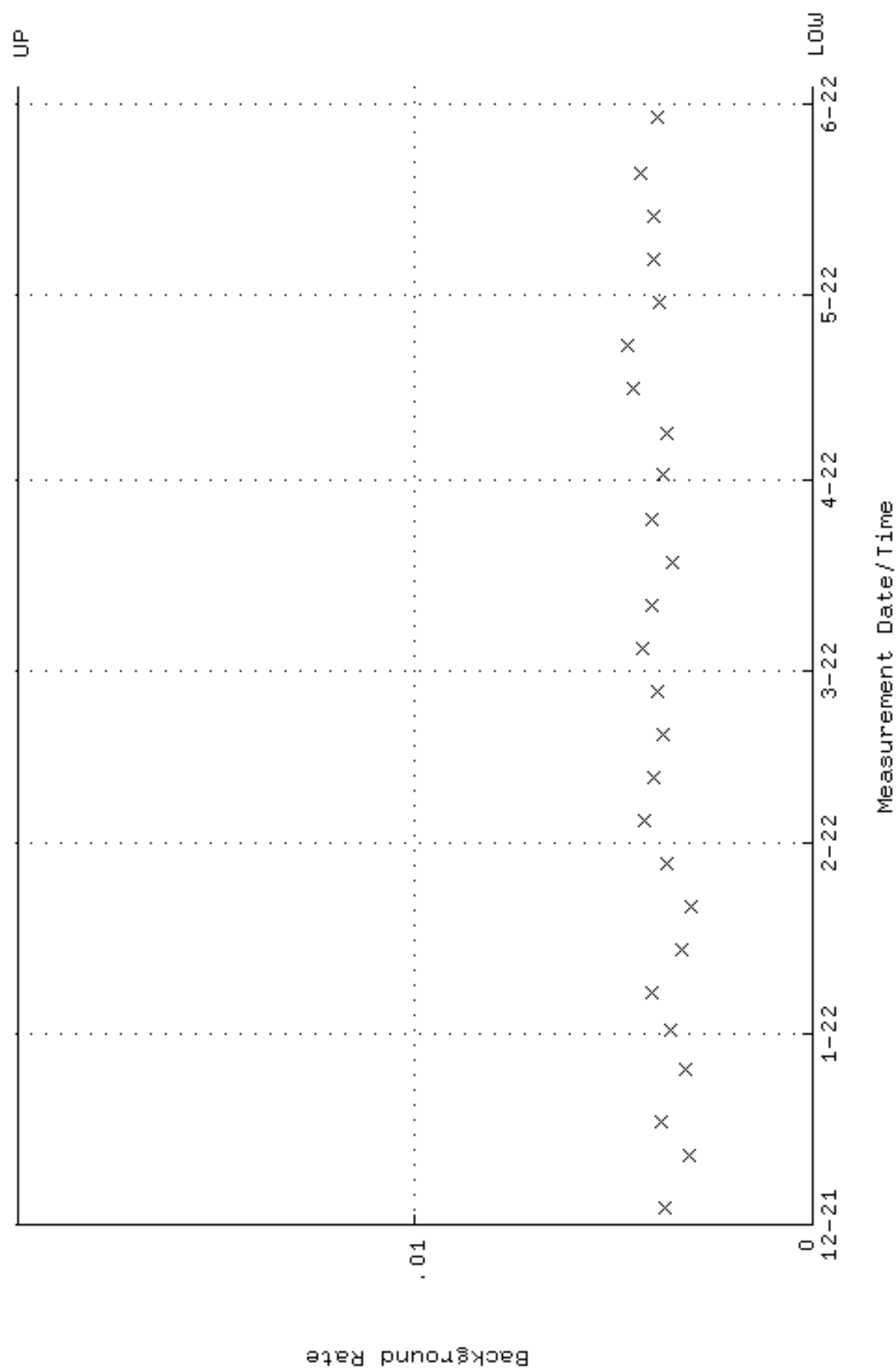
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-DEC-2021 07:41:23 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



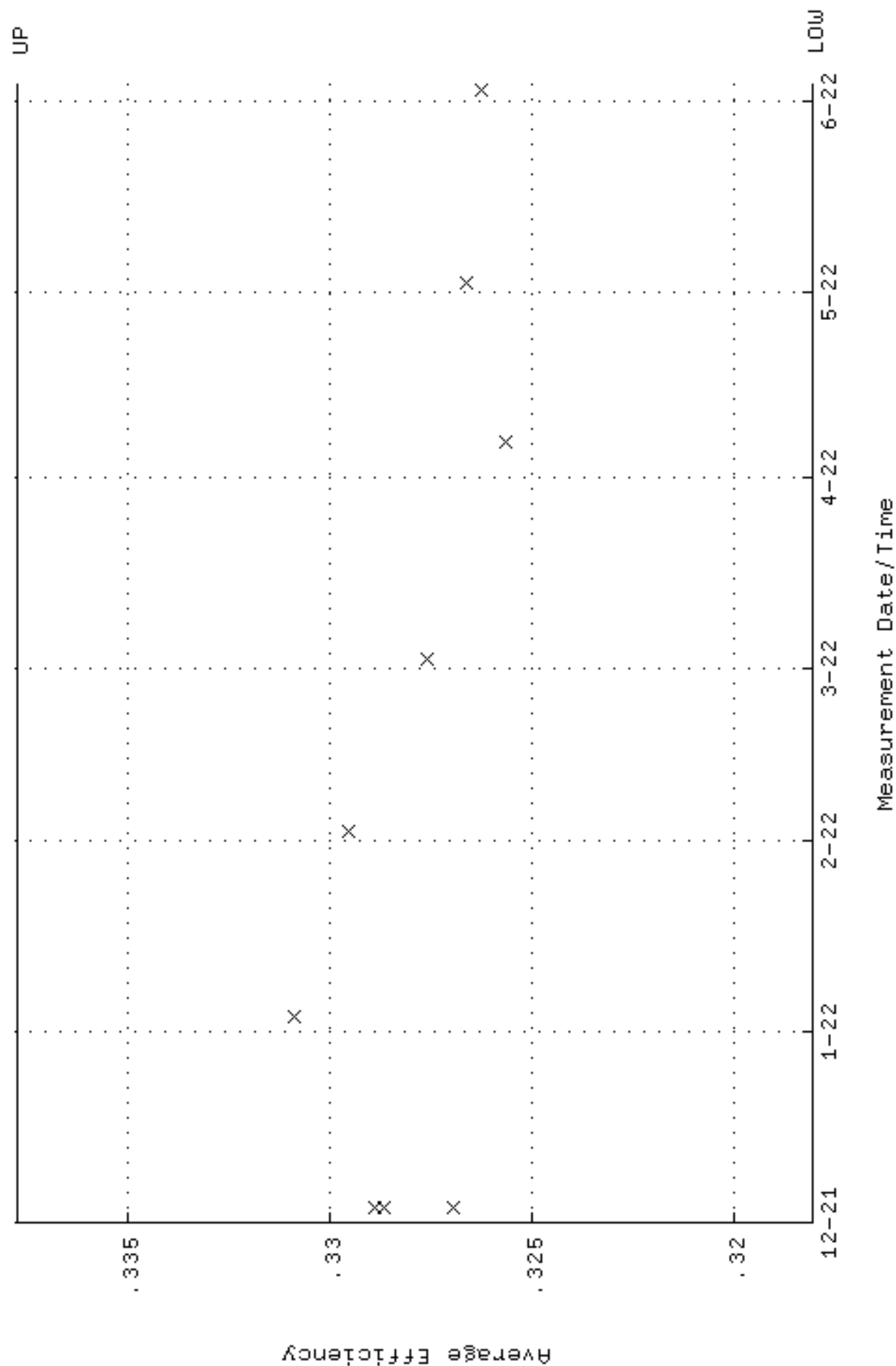
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QA filename      : DKA100:[ENV_ALPHA.QA.B]B005.QAF;4
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Start/End Dates  : 3-DEC-2021 15:56:08 through 3-JUN-
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02

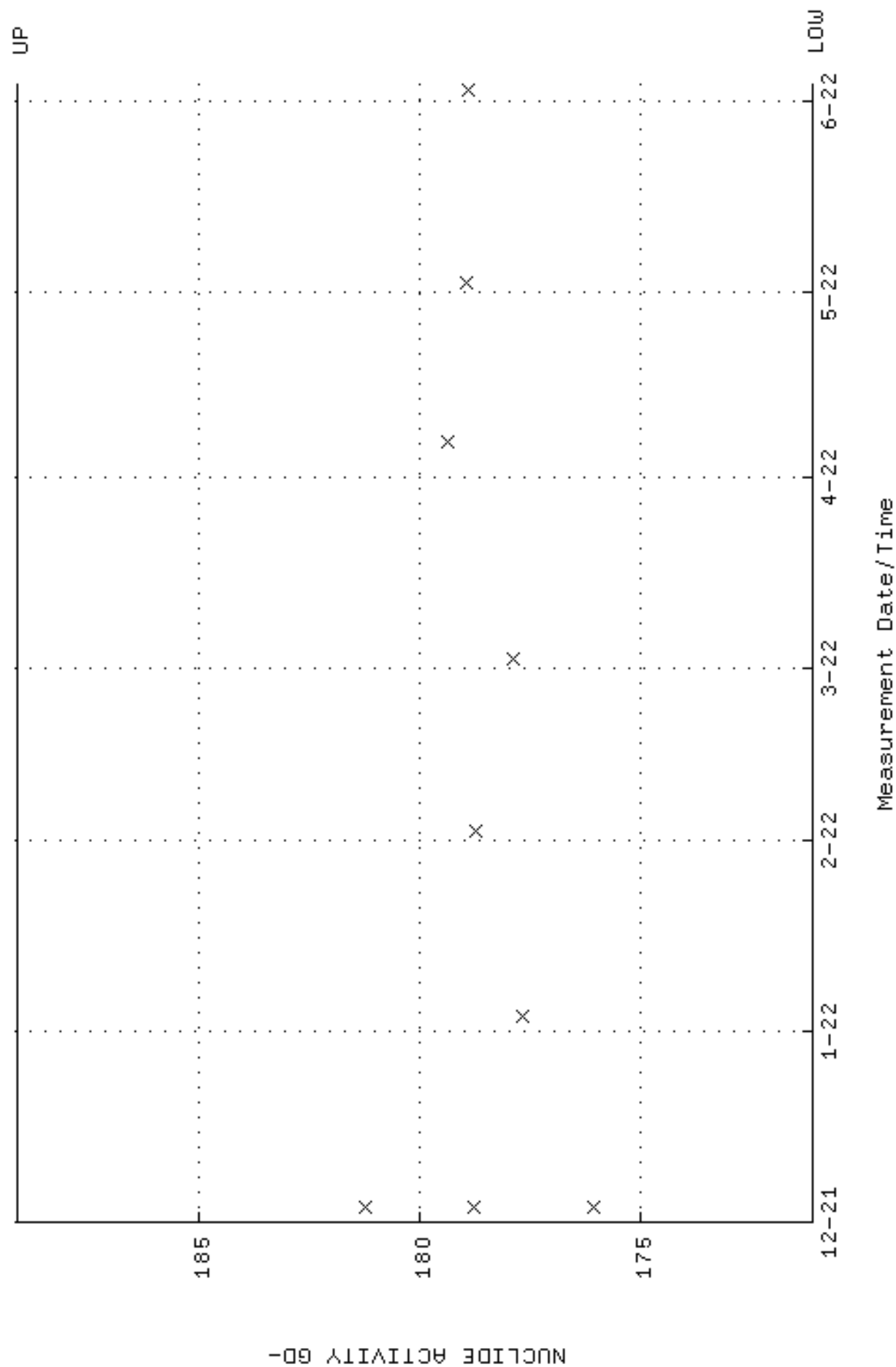
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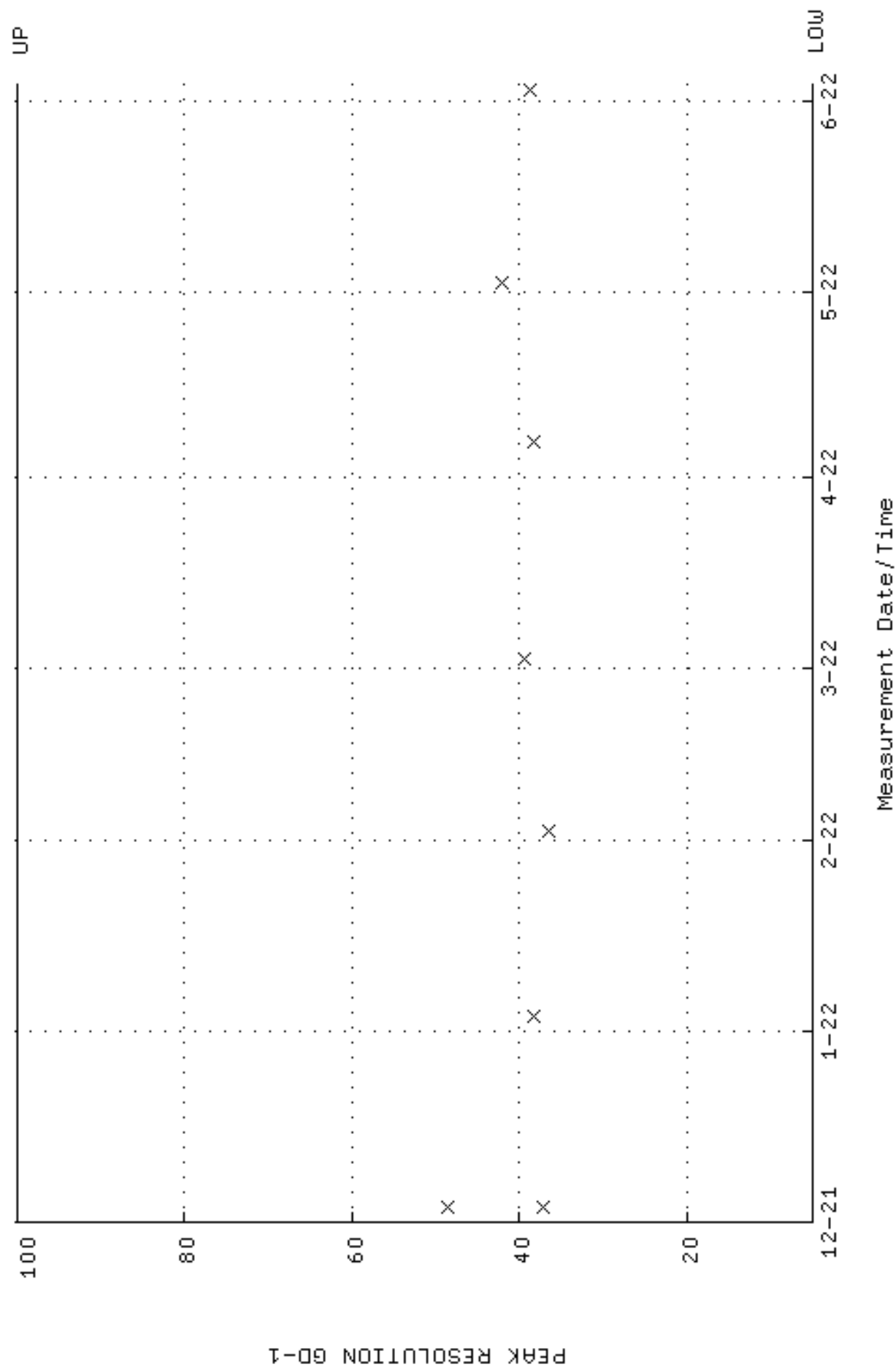
QA filename : DKA100:[ENV_ALPHA.QA.W]W006.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
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 Lower/Upper Lmts: 0.318049 through 0.337723



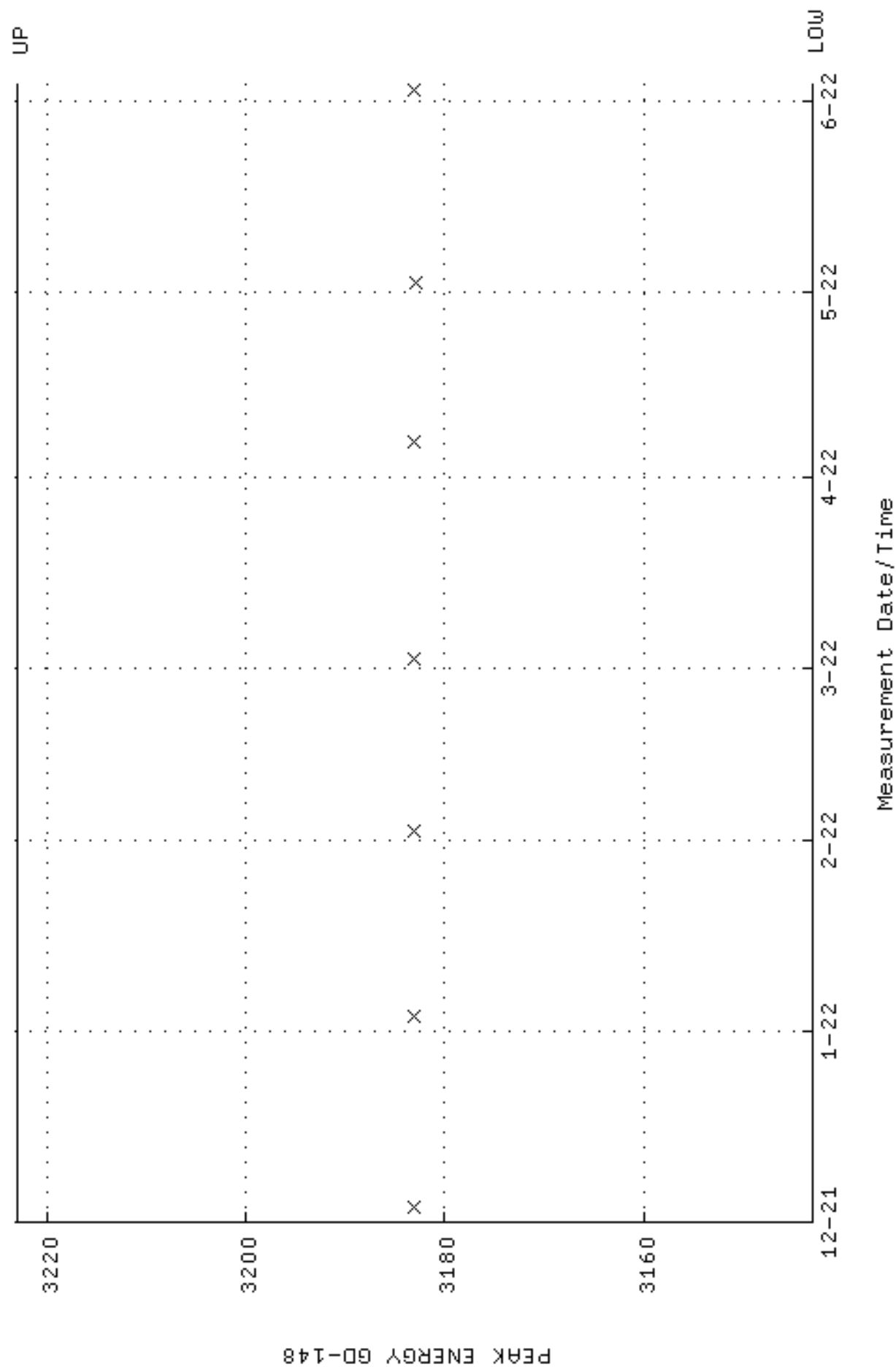
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-DEC-2021 07:41:23 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



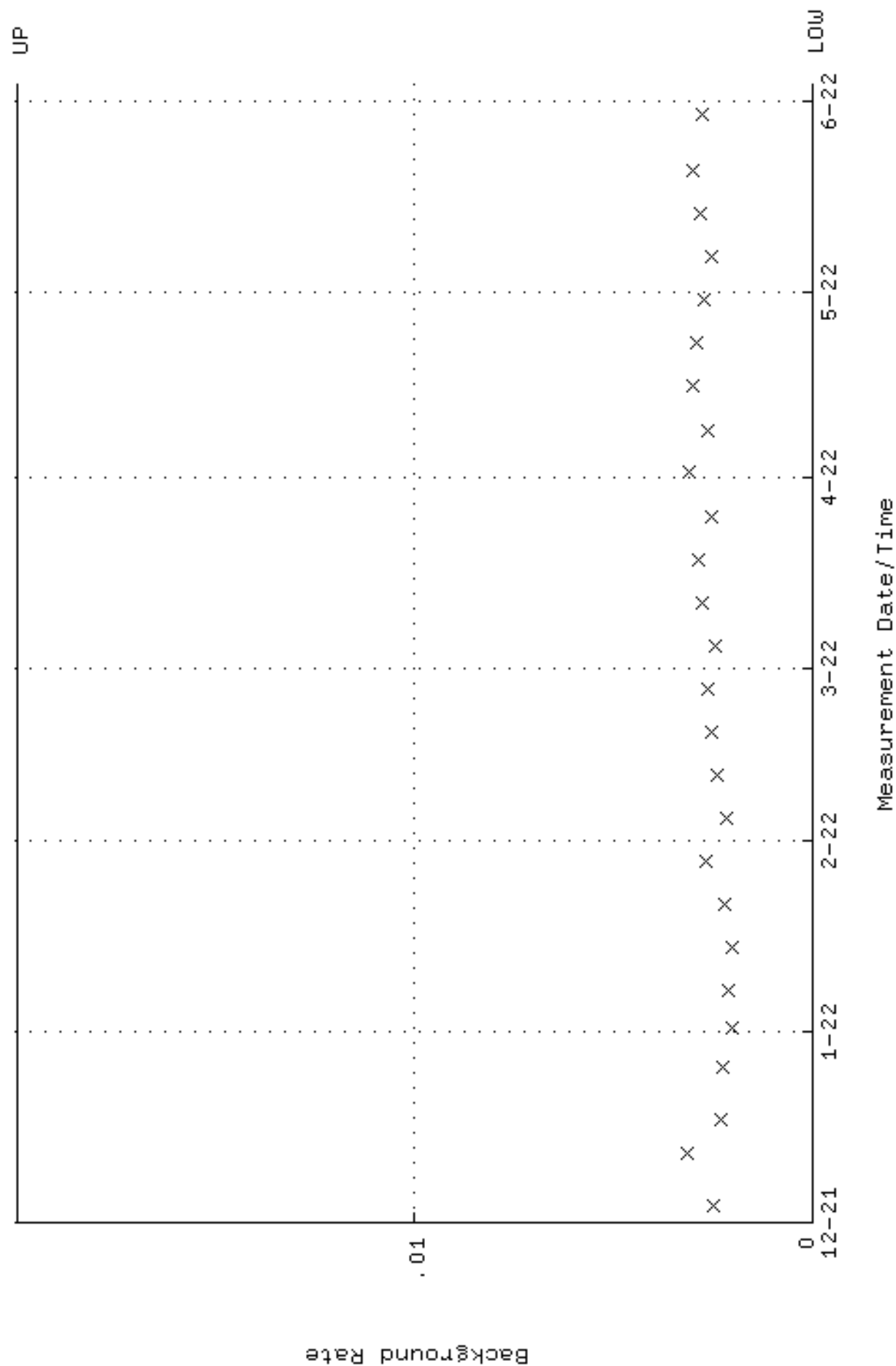
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-DEC-2021 07:41:23 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



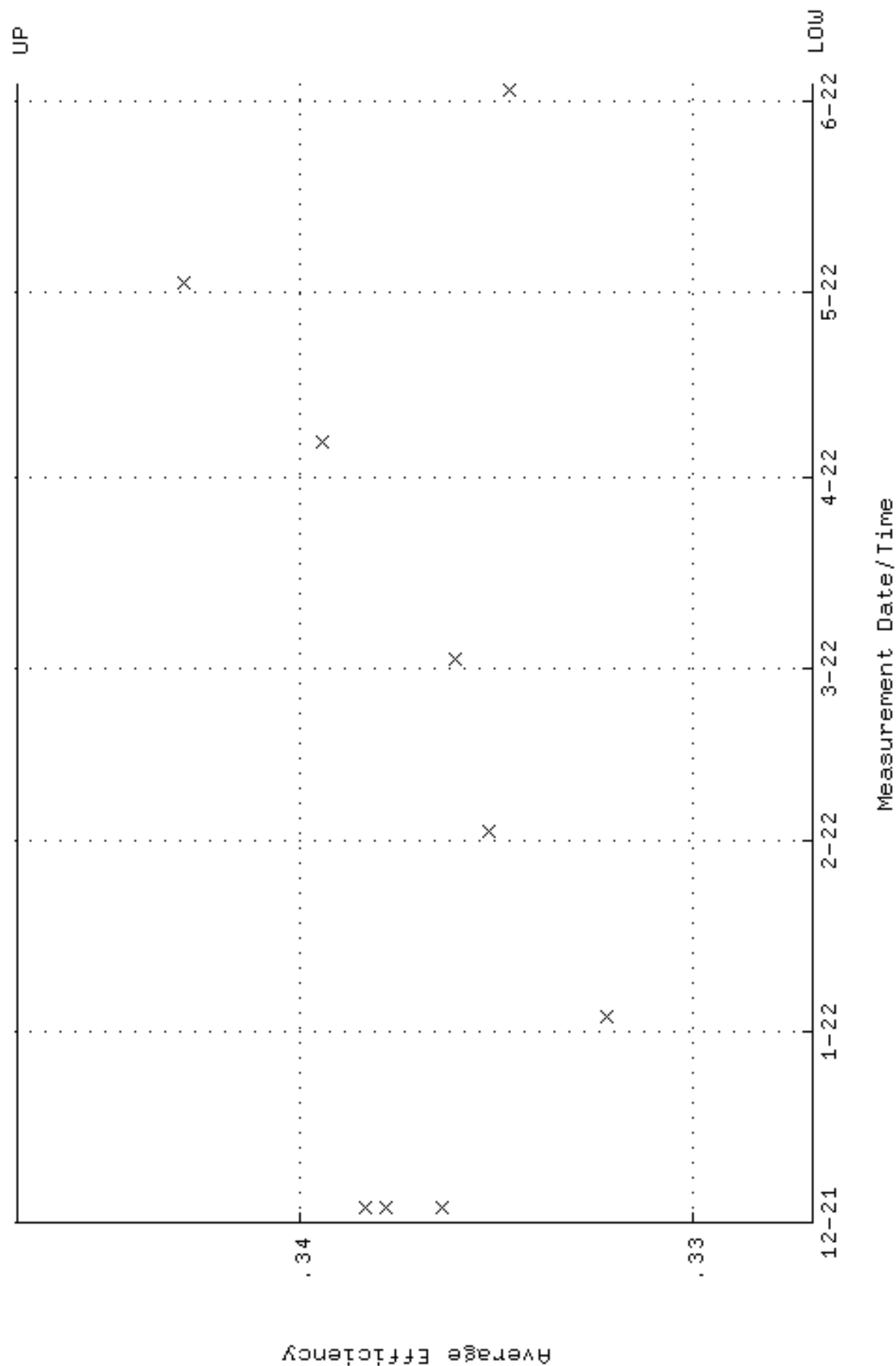
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-DEC-2021 07:41:23 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



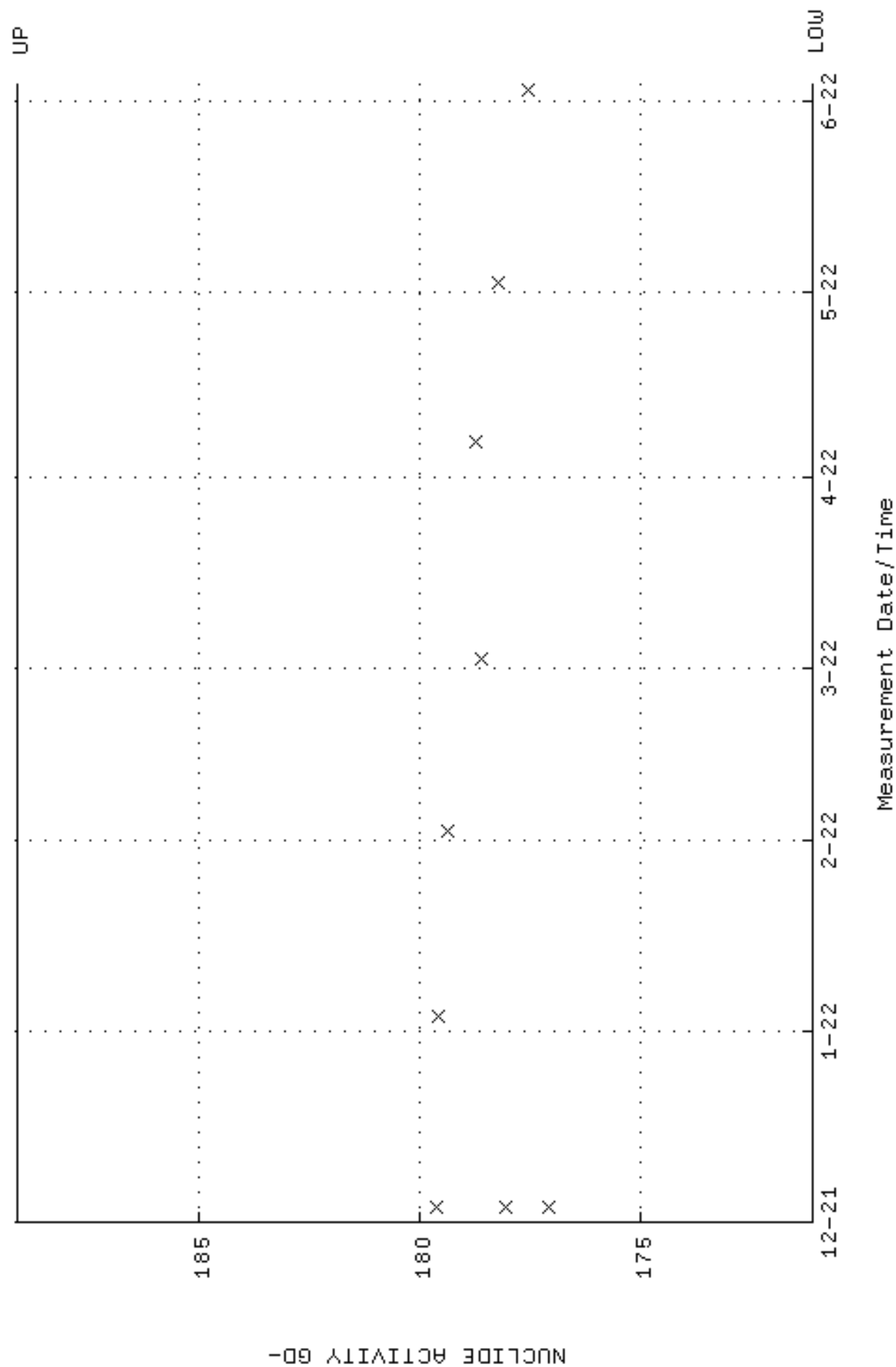
QA filename : DKA100:[ENV_ALPHA.QA.B]B006.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 3-DEC-2021 15:56:08 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



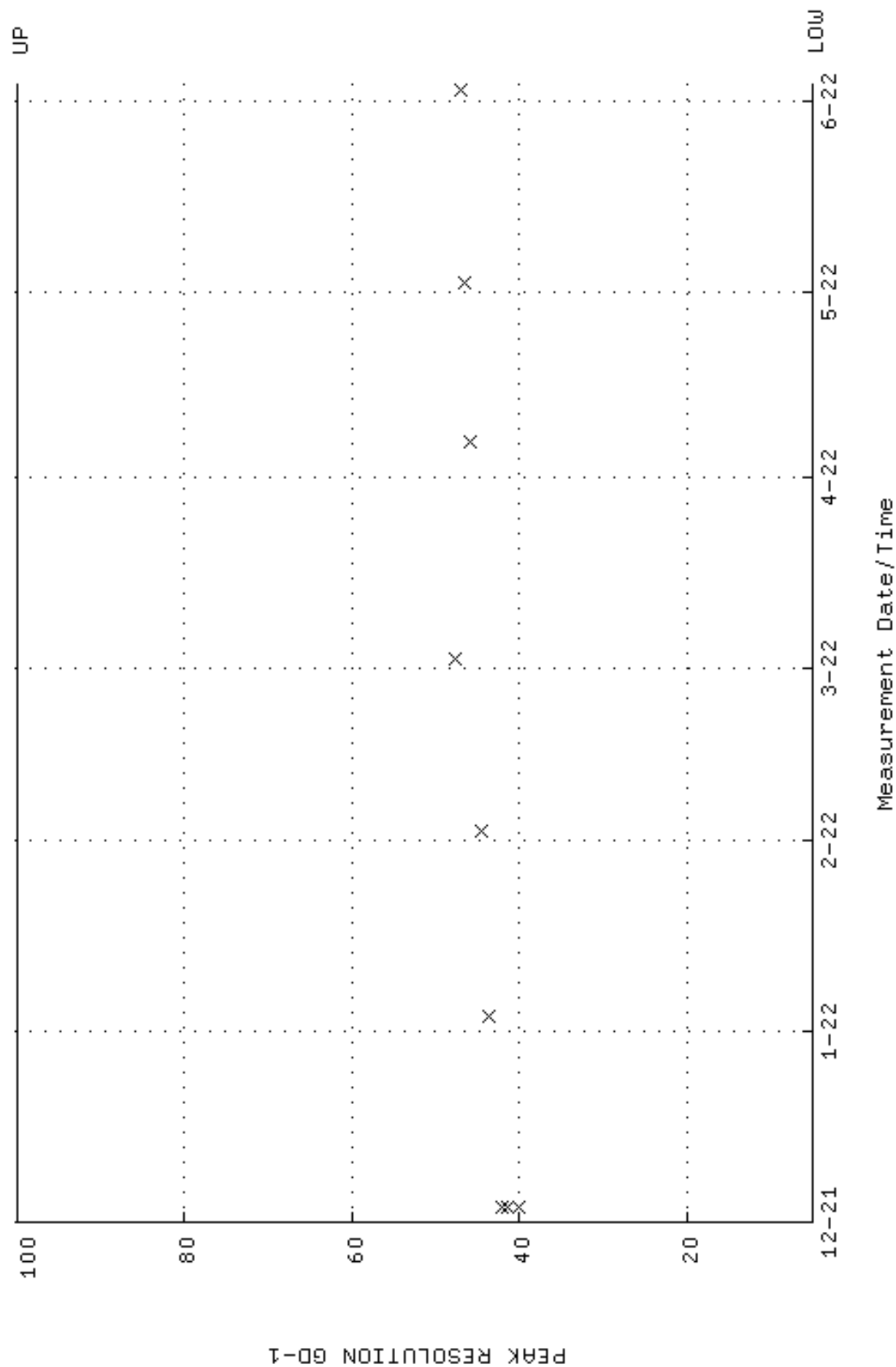
QA filename : DKA100:[ENV_ALPHA.QA.W]W008.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.326971 through 0.347195



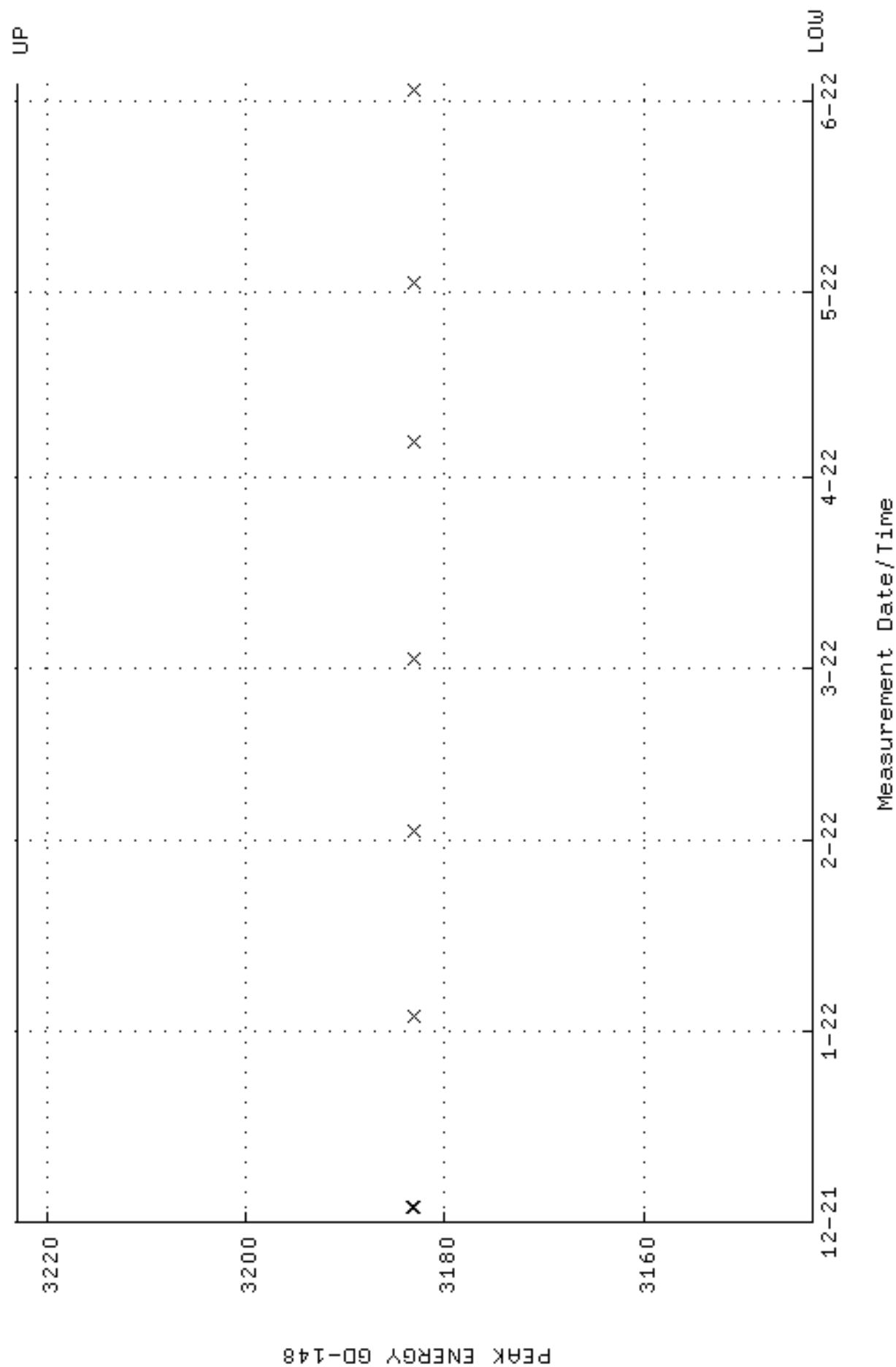
QA filename : DKA100:[ENV_ALPHA.QA.W]W008.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



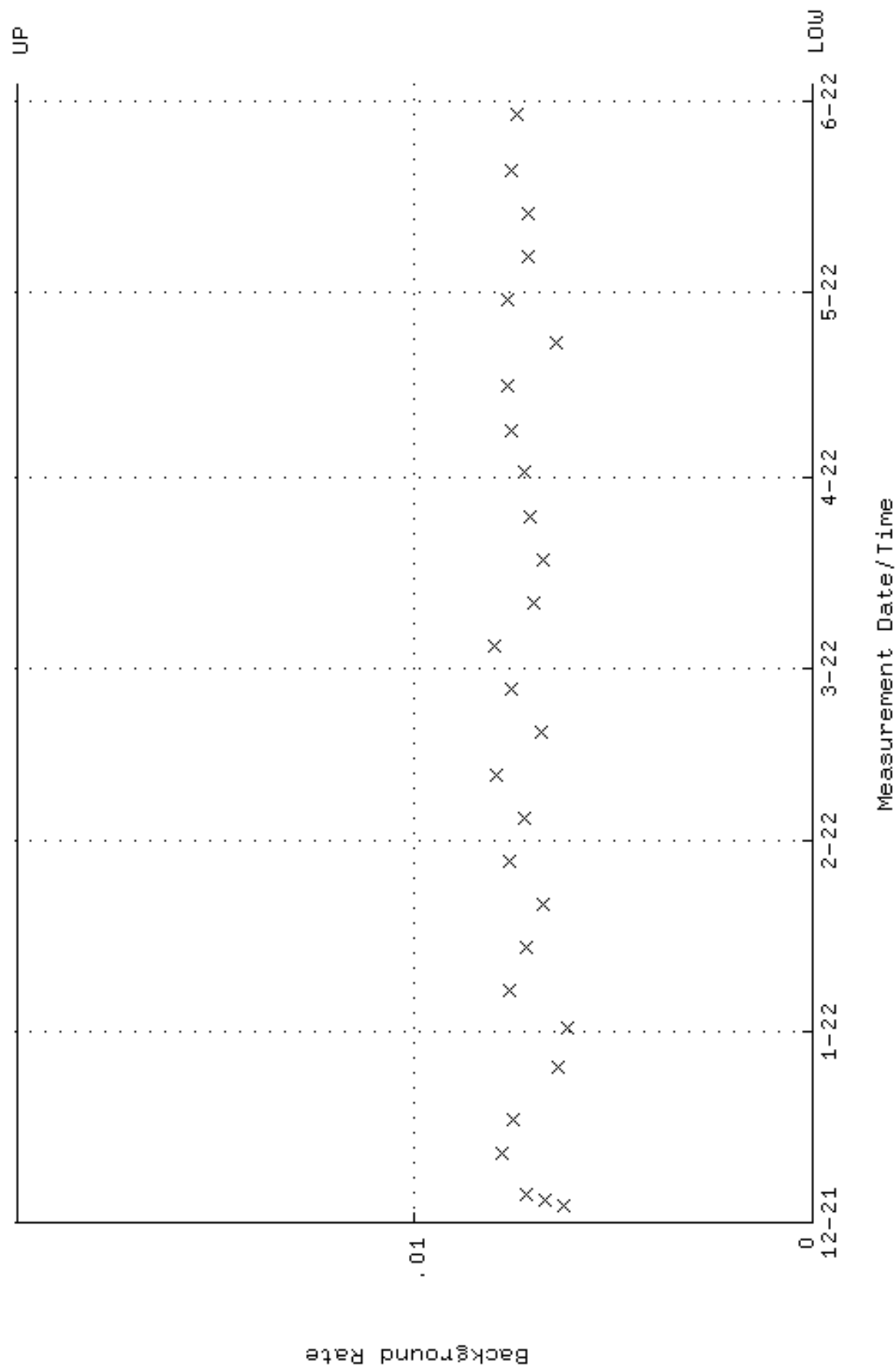
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



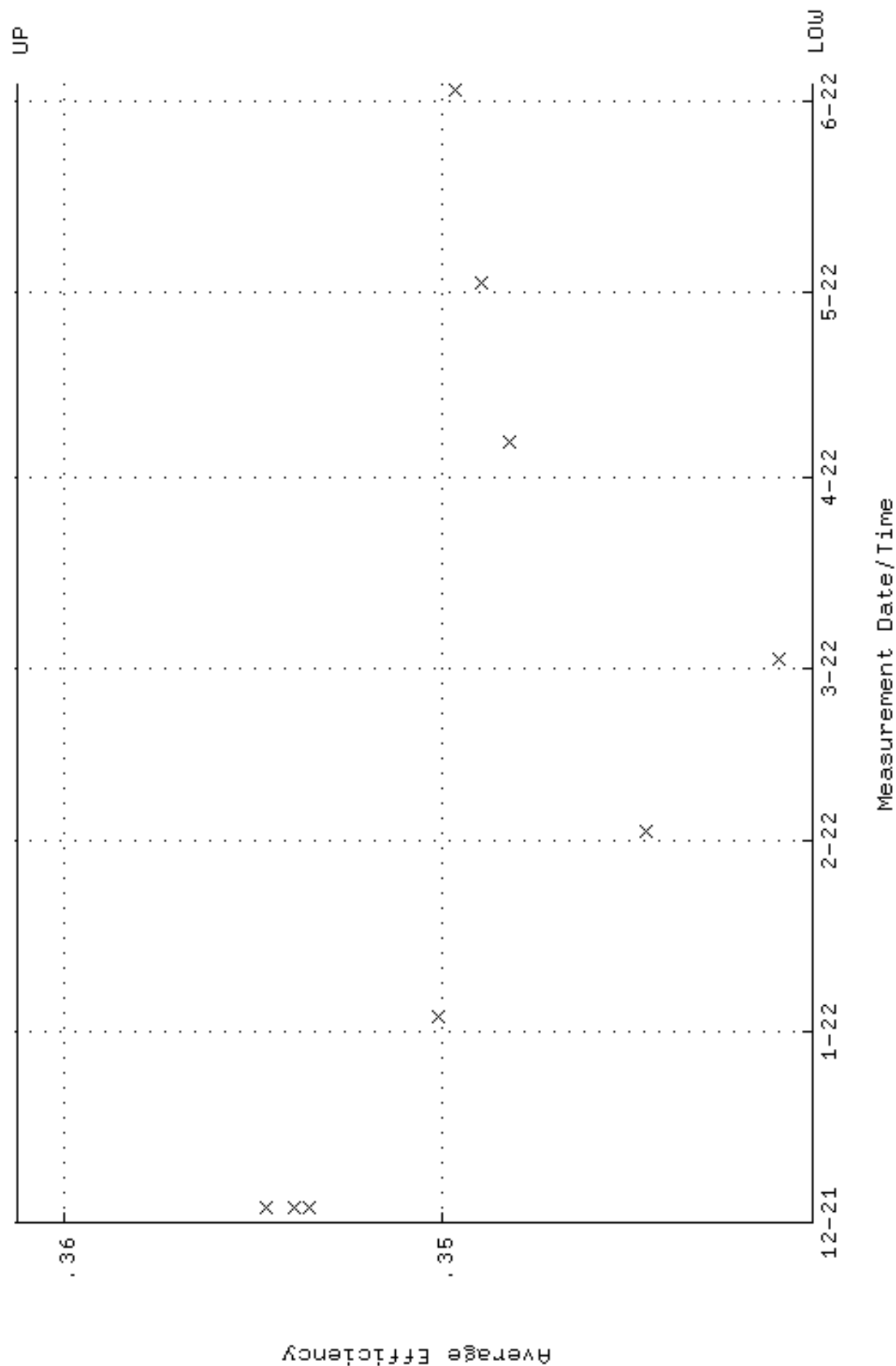
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



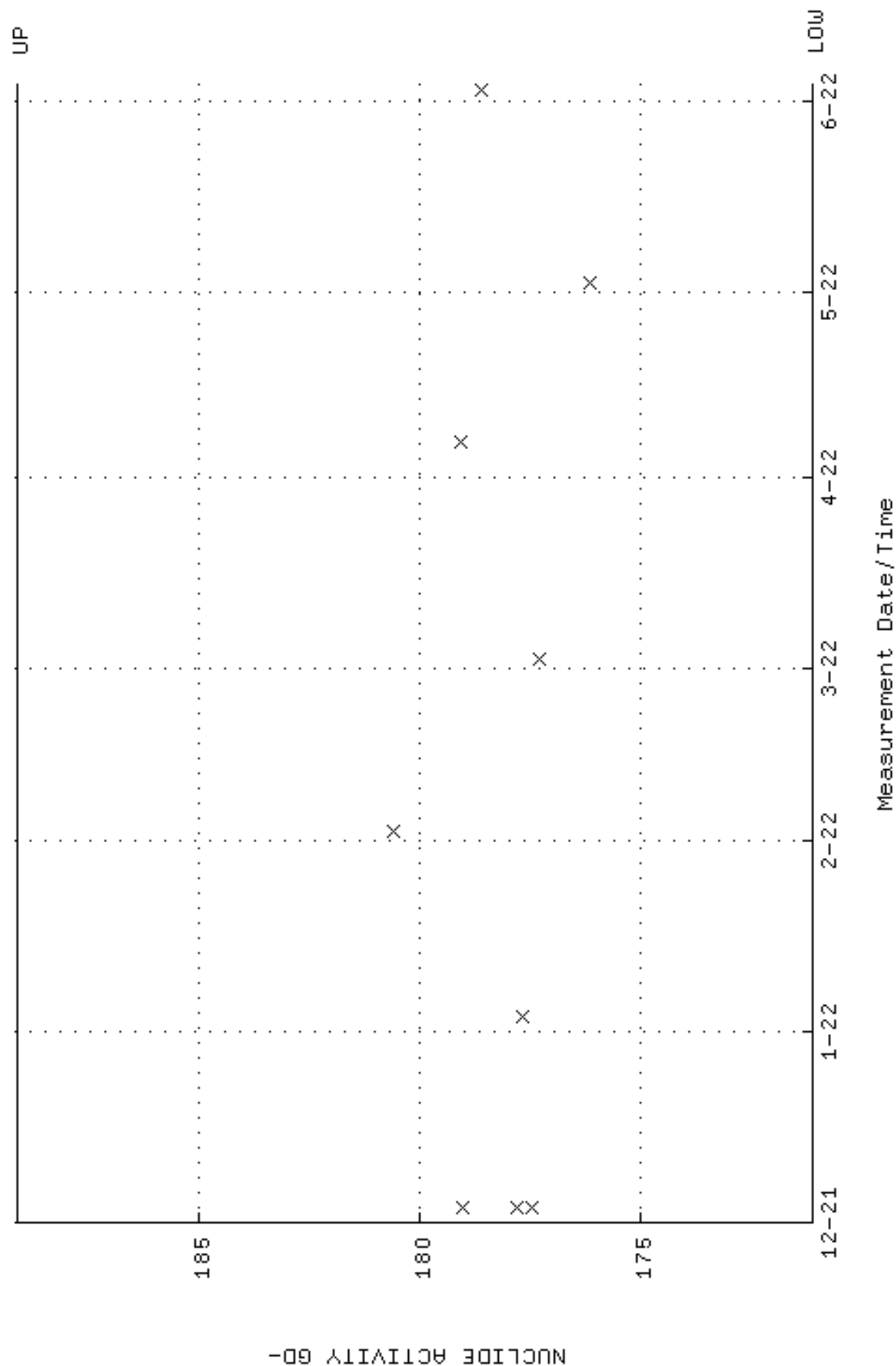
QA filename : DKA100:[ENV_ALPHA.QA.B]B008.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 3-DEC-2021 15:54:20 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



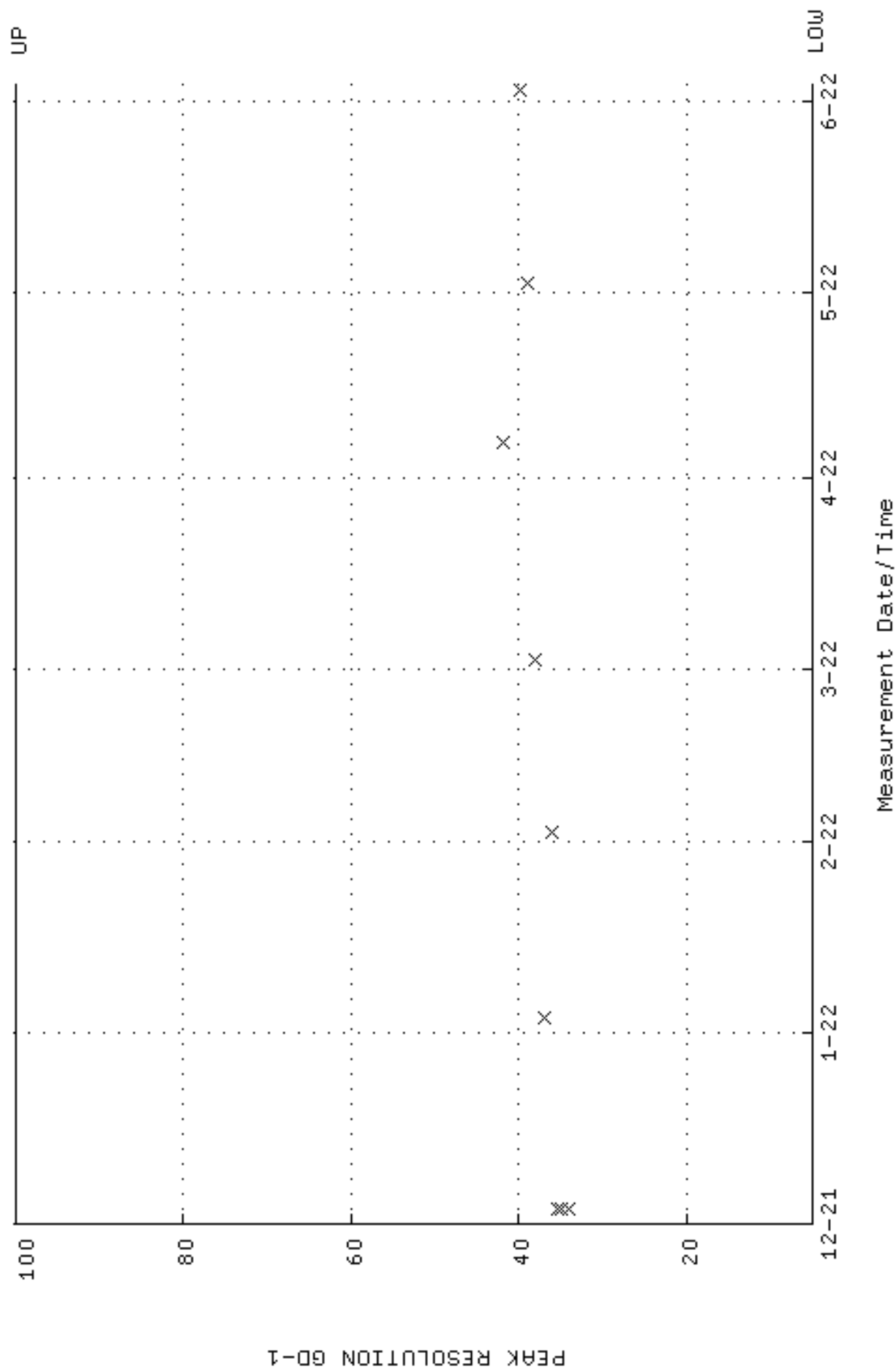
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.340180 through 0.361220



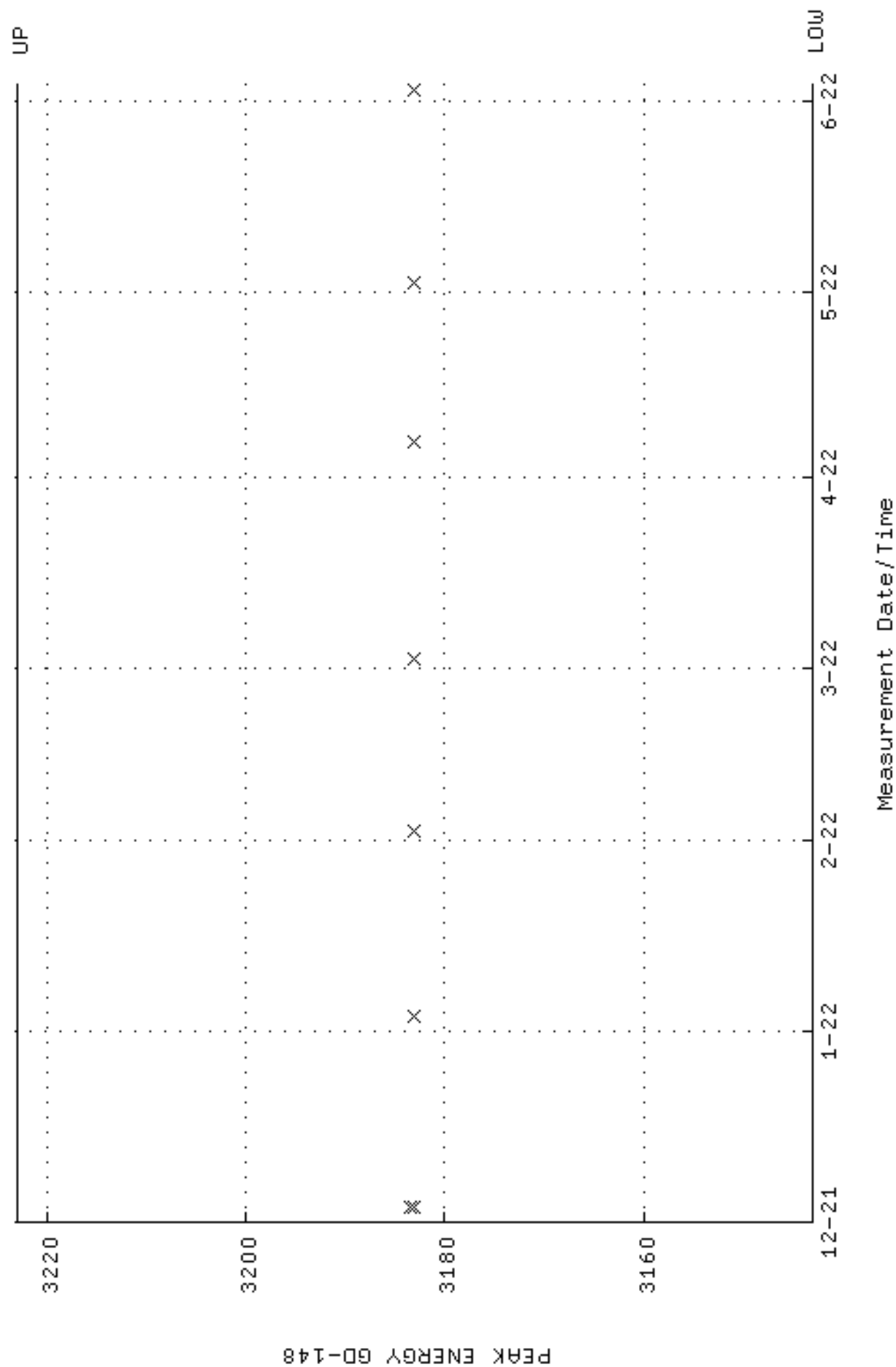
QA filename : DKA100:[ENV_ALPHA.QA.W]W009.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



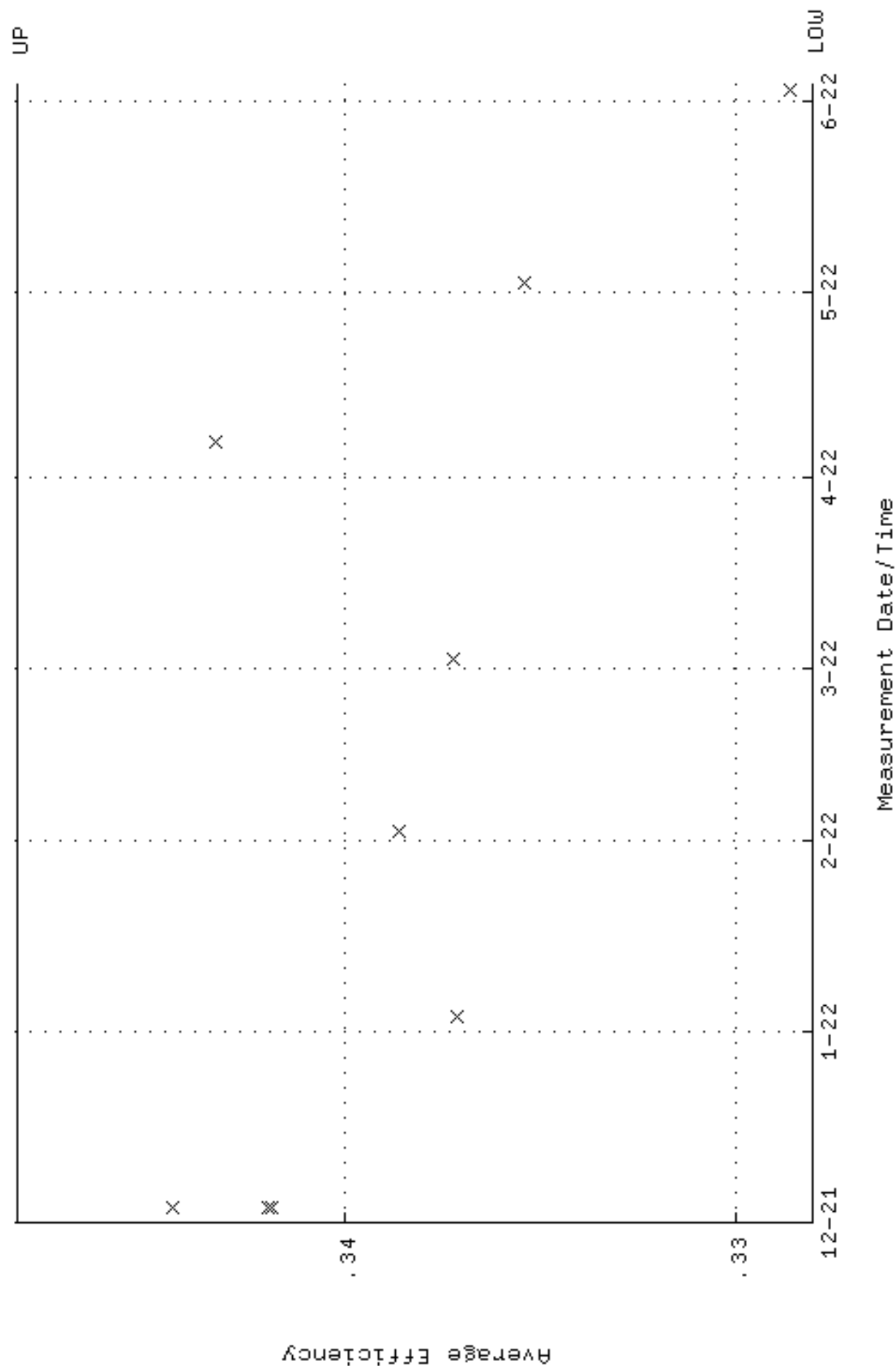
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



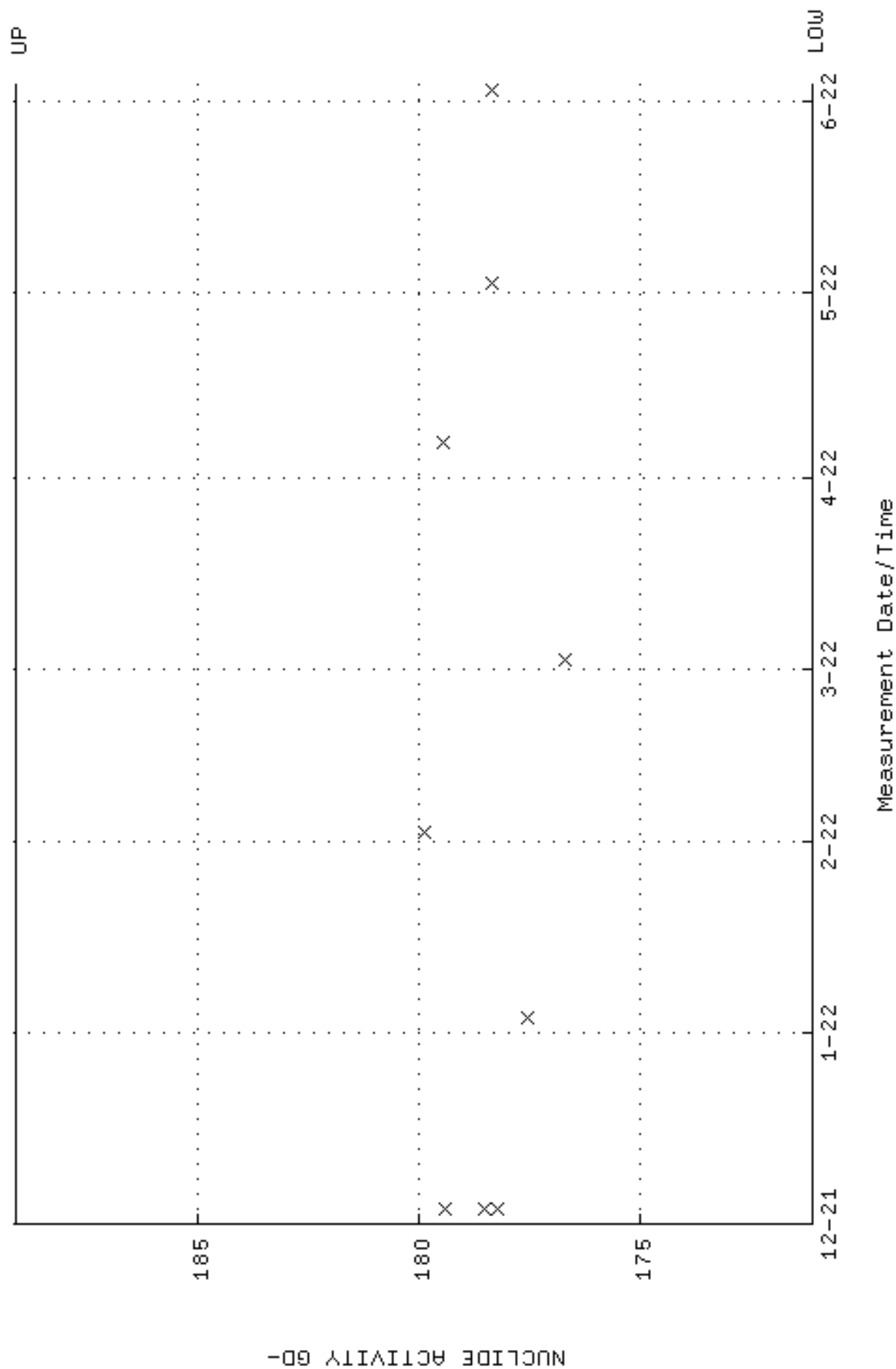
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



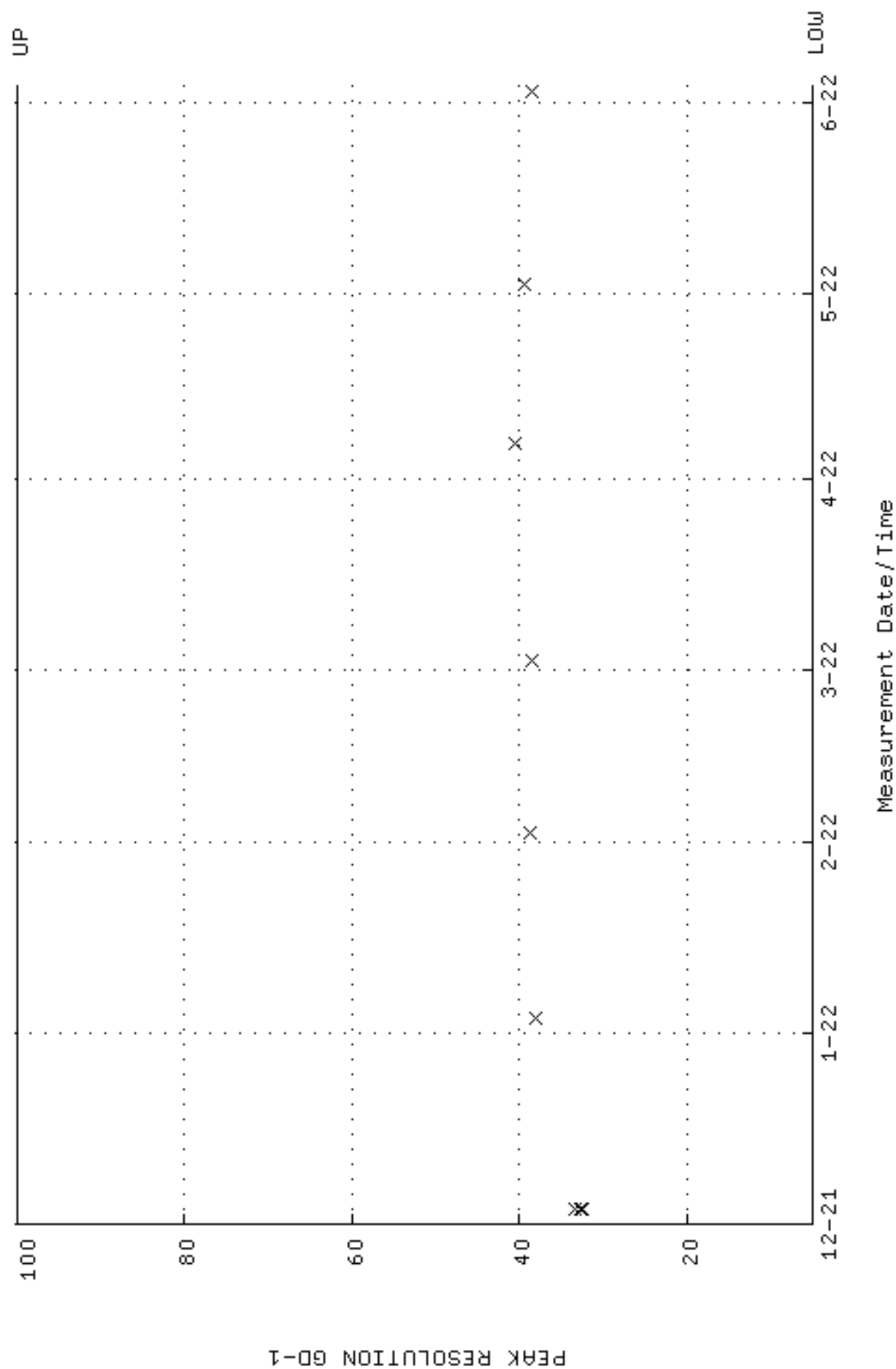
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 Parameter Name : AVRGEFF (Average Efficiency)
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 Lower/Upper Lmts: 0.328050 through 0.348350



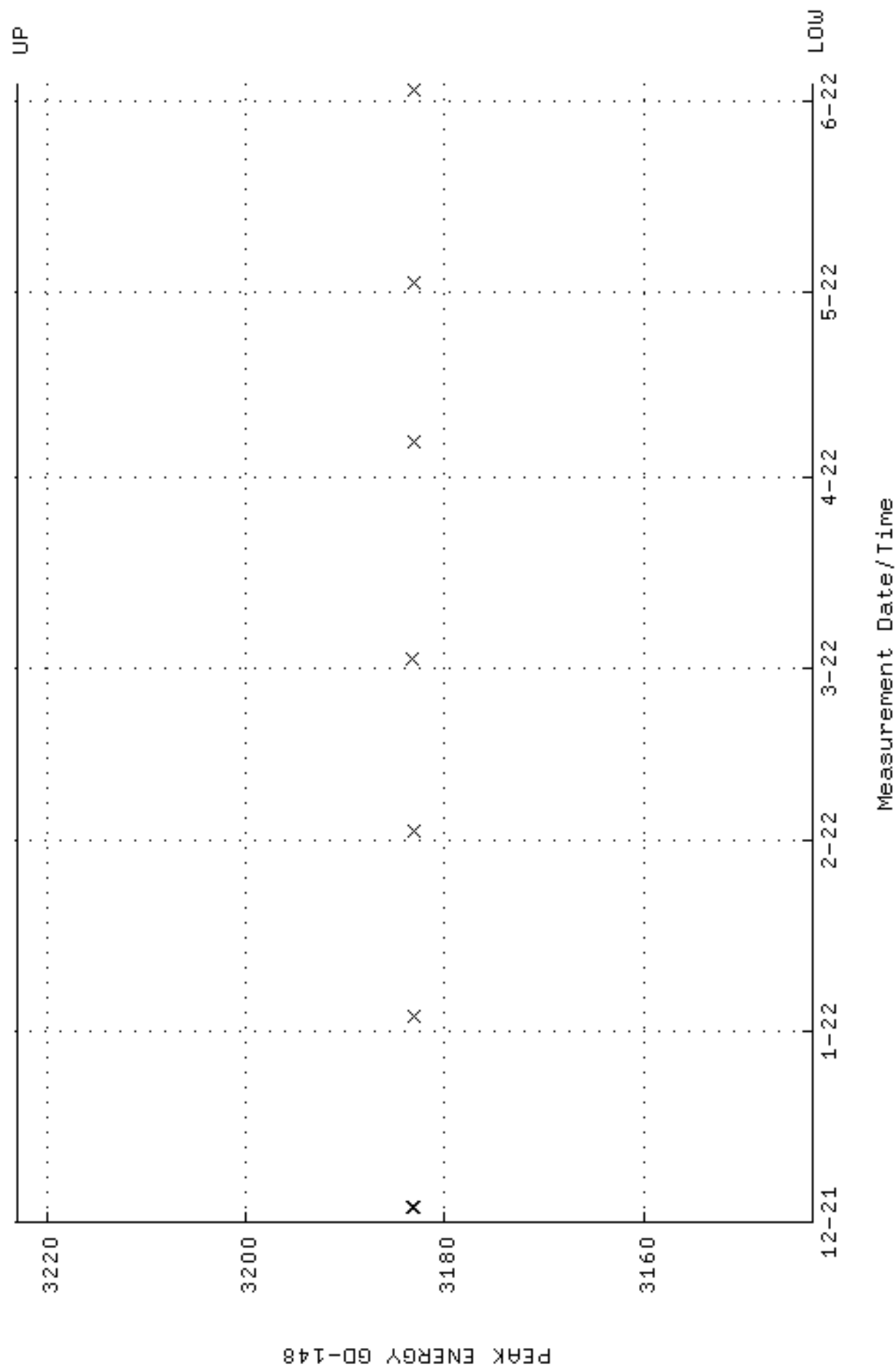
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



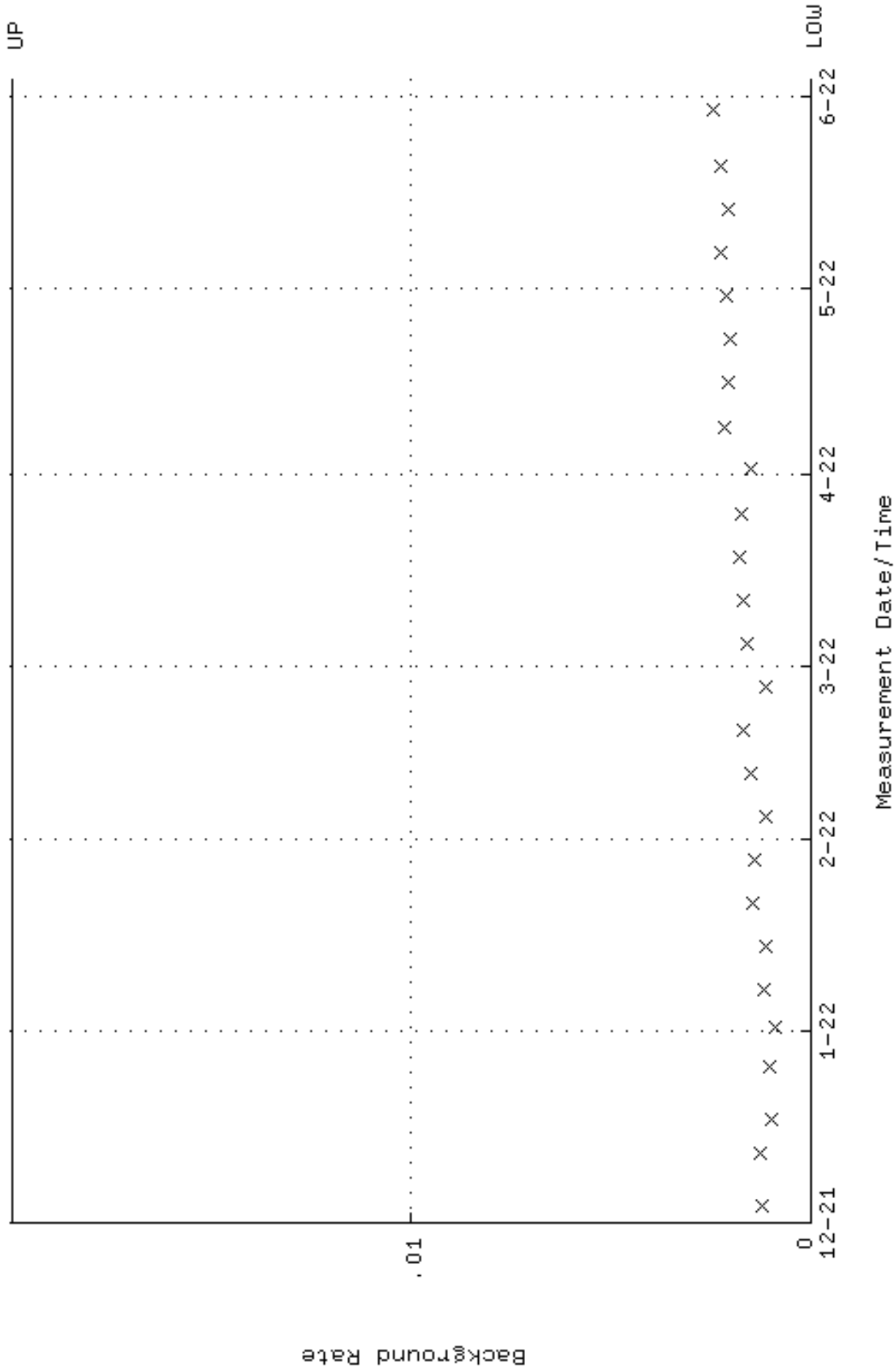
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



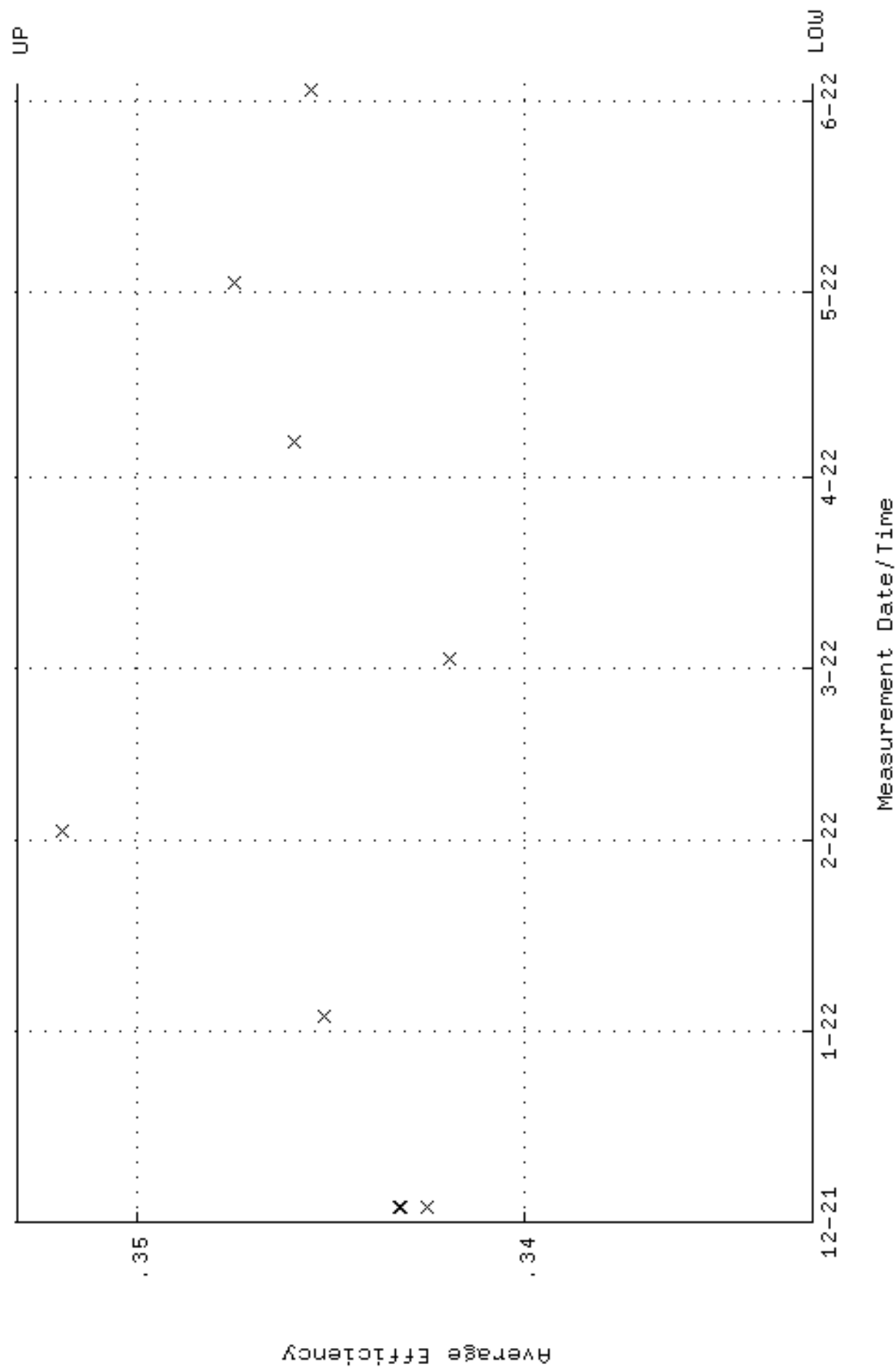
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



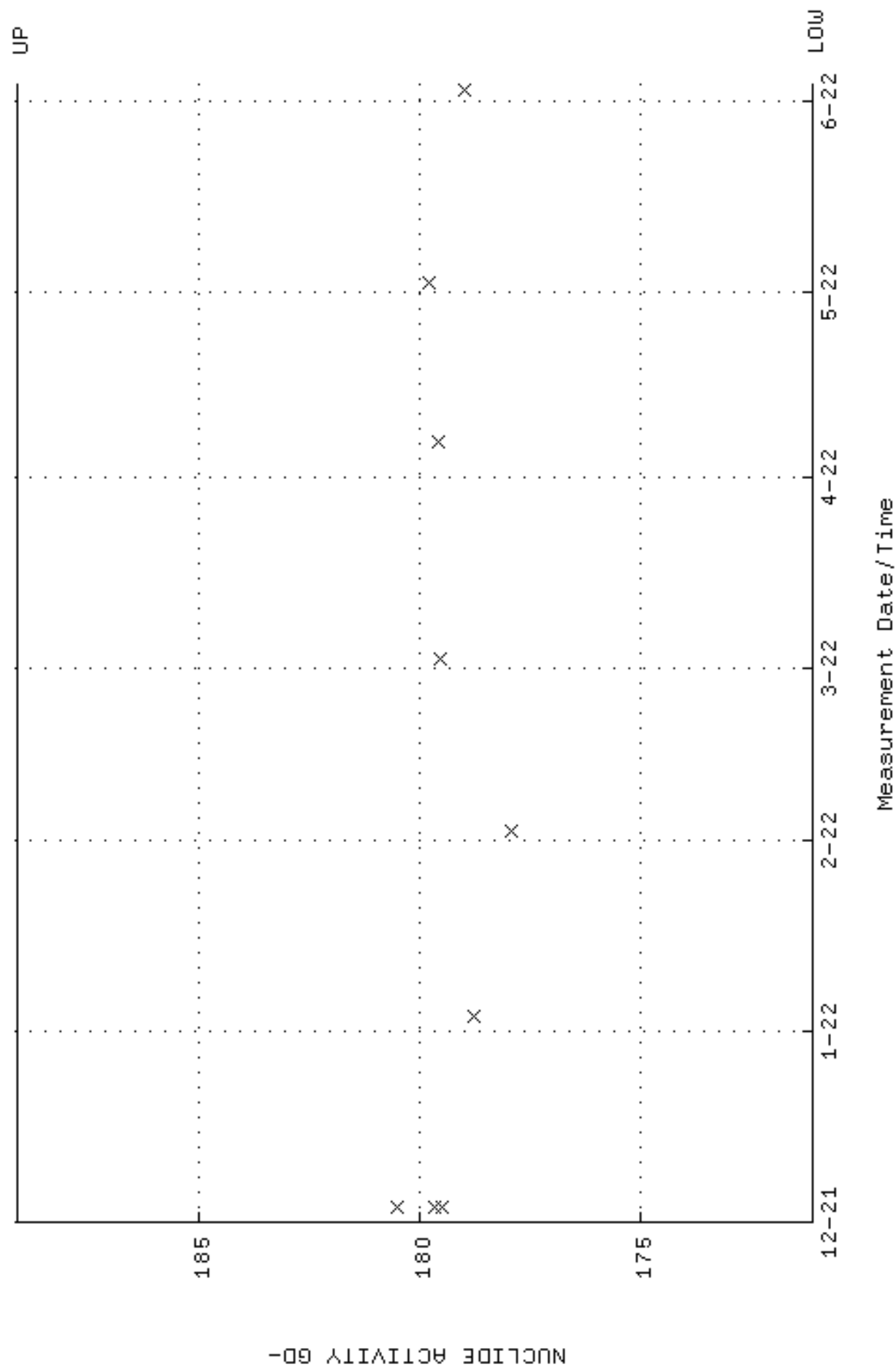
QA filename : DKA100:[ENV_ALPHA.QA.B]B010.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 3-DEC-2021 15:54:20 through 3-JUN-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



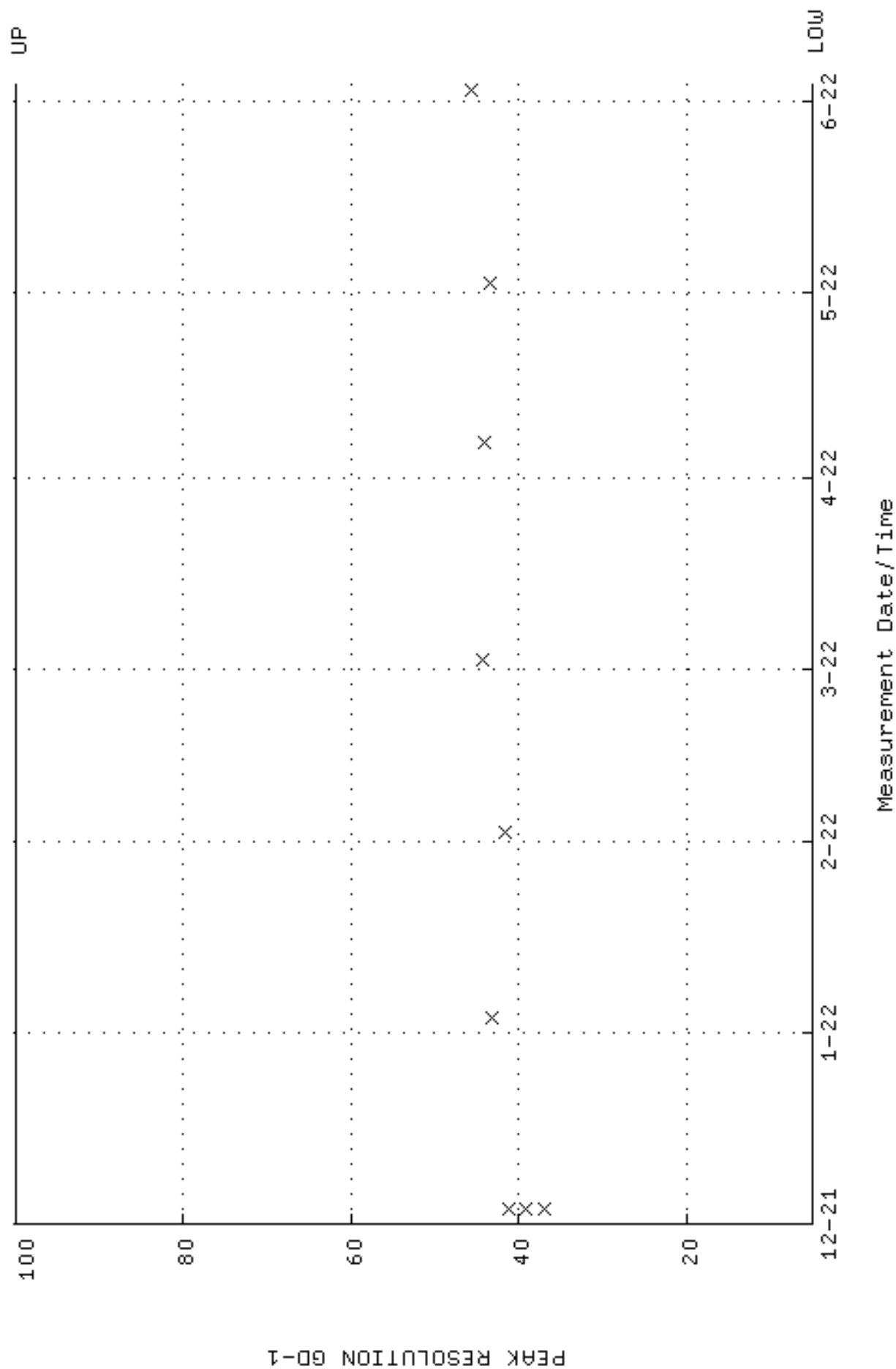
QA filename : DKA100:[ENV_ALPHA.QA.W]W014.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-DEC-2021 07:44:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.332527 through 0.353095



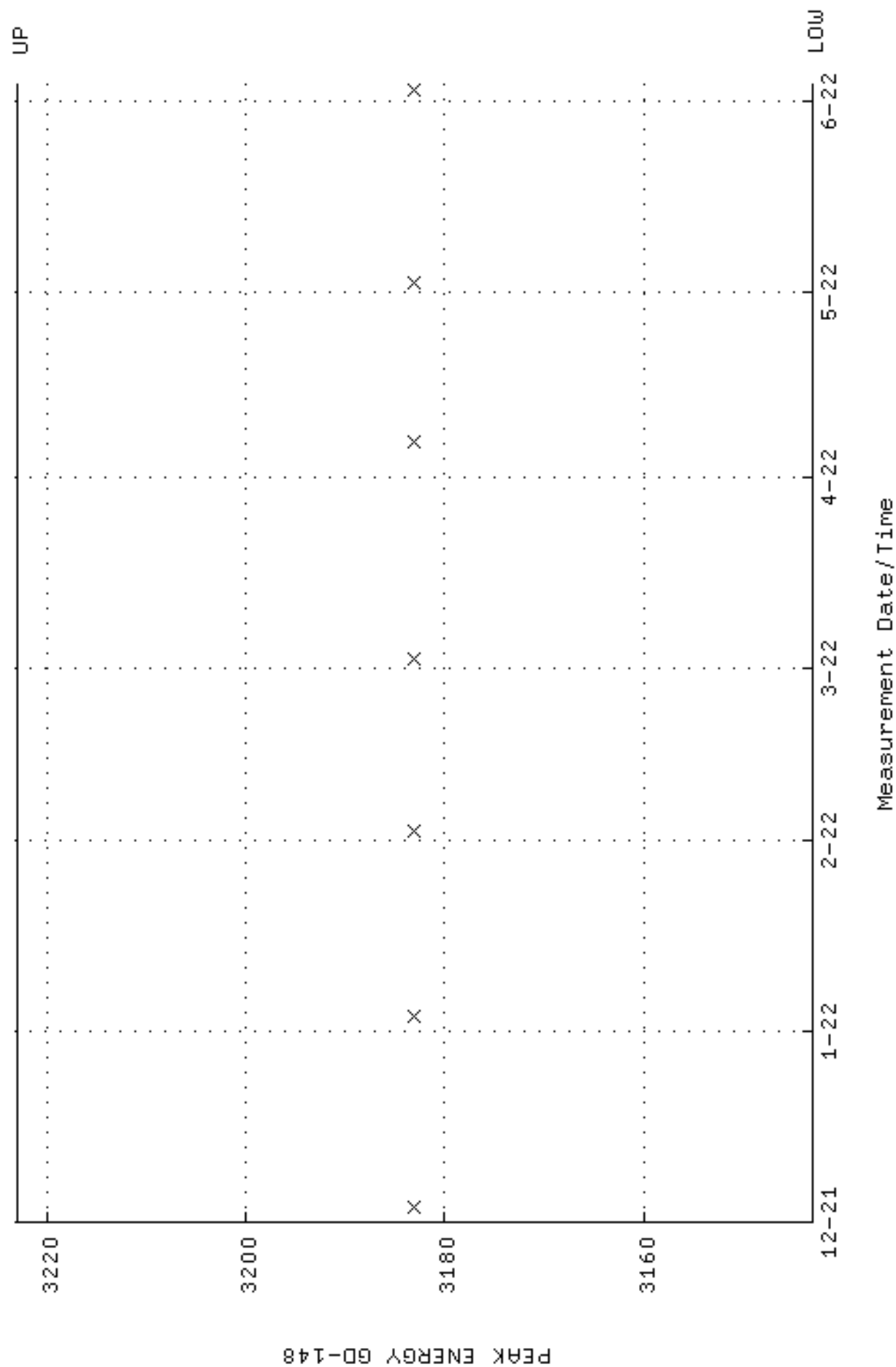
QA filename : DKA100:[ENV_ALPHA.QA.W]W014.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-DEC-2021 07:44:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



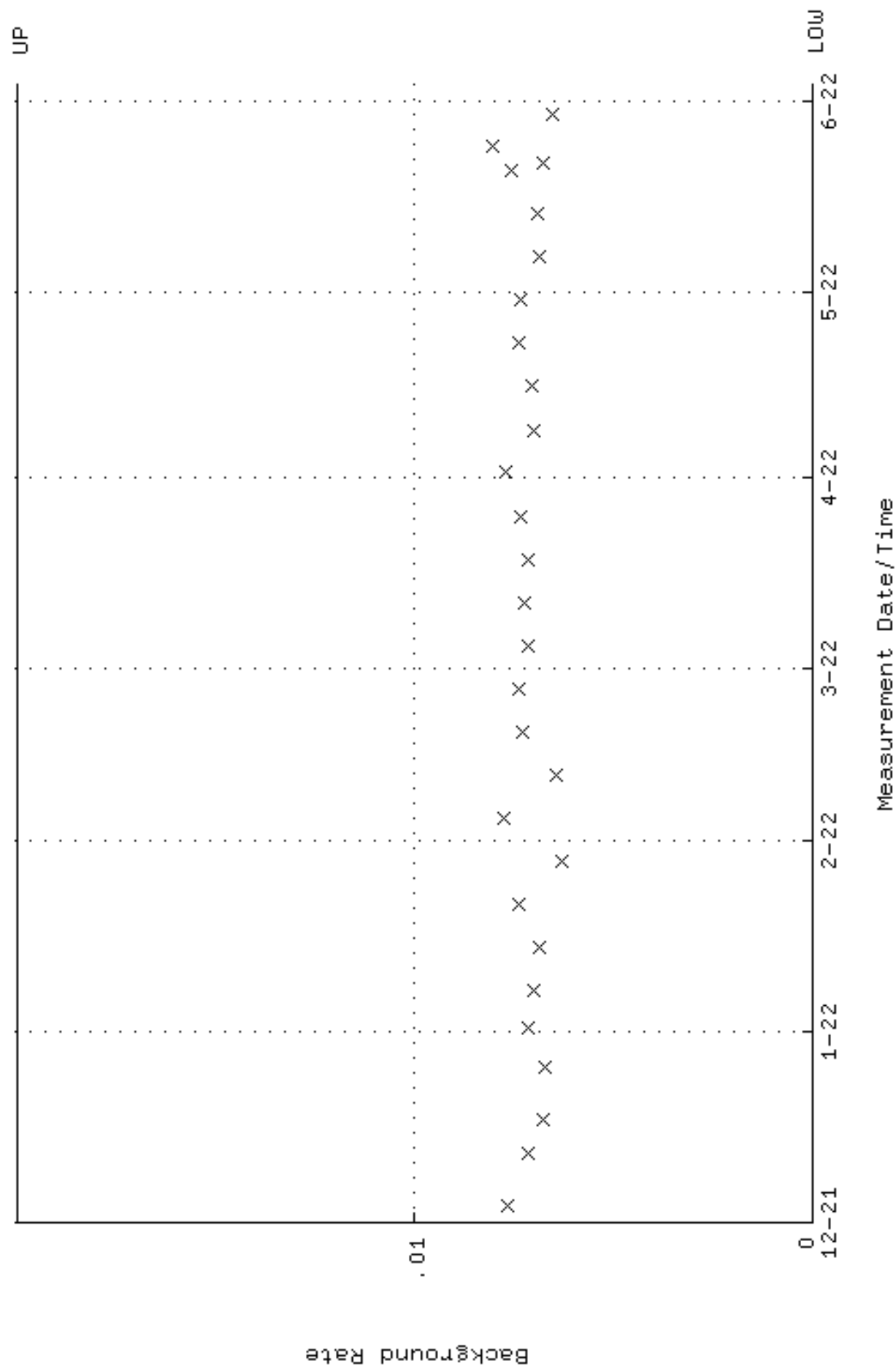
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-DEC-2021 07:44:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



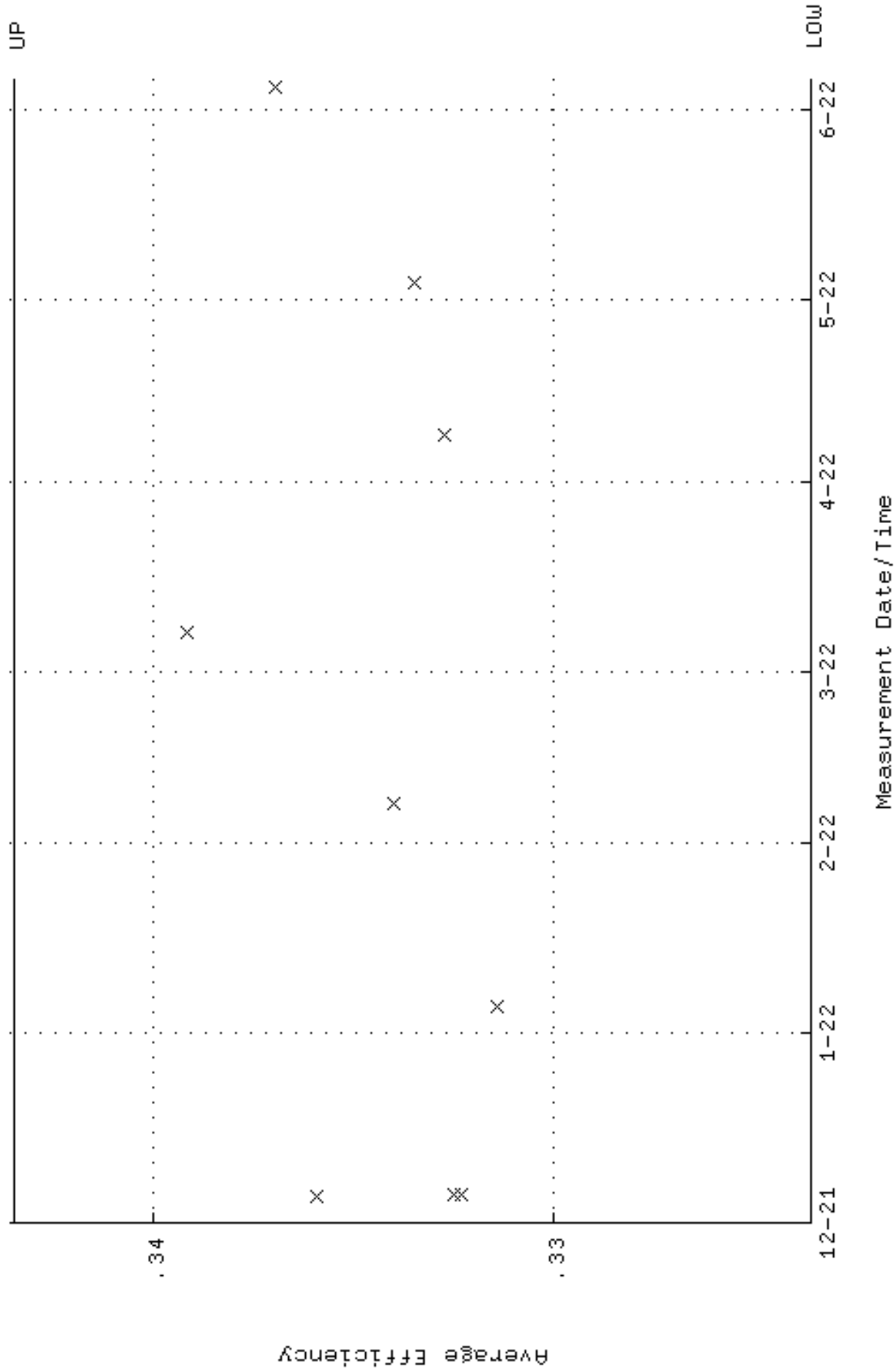
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-DEC-2021 07:44:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



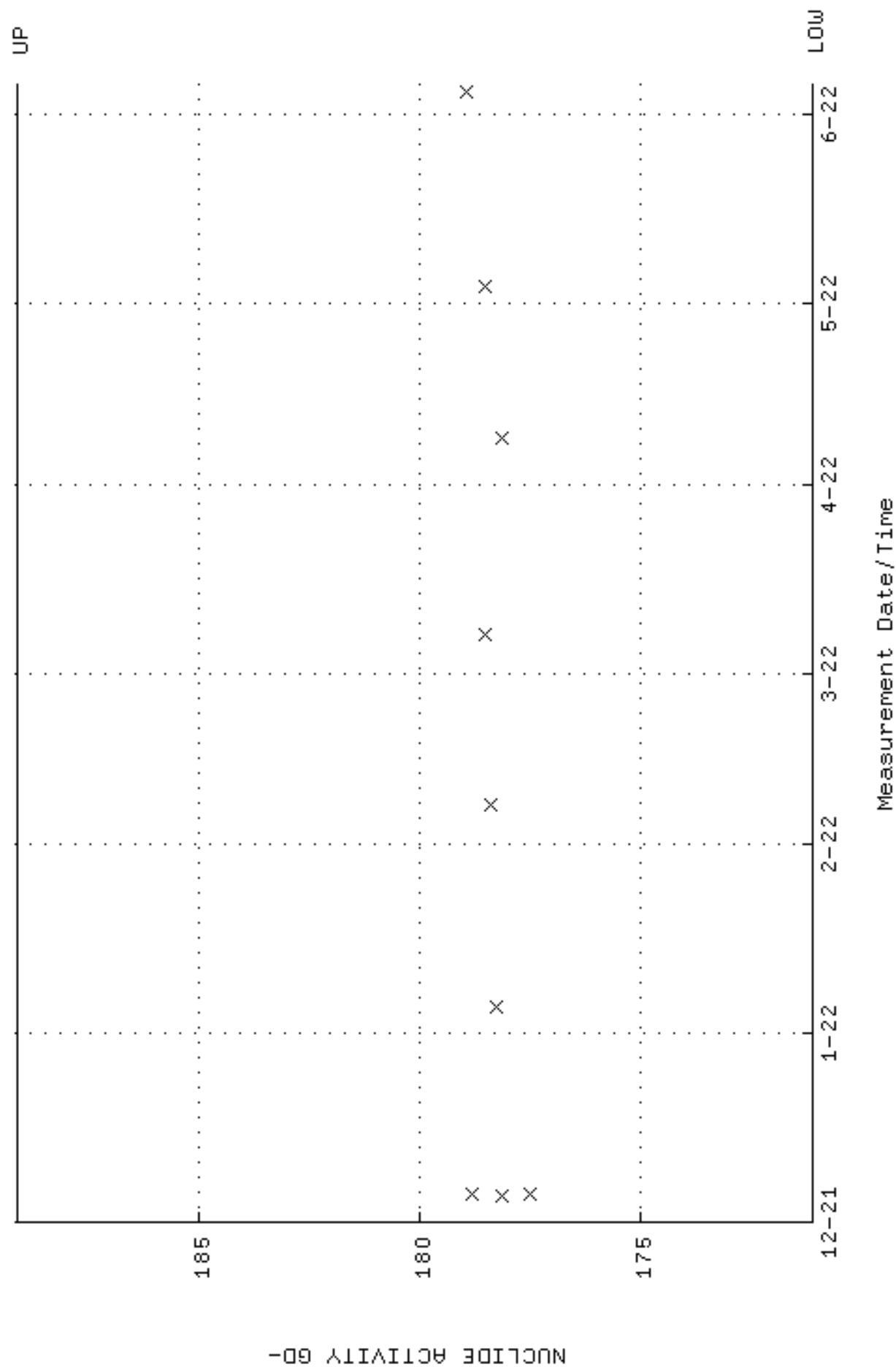
QA filename : DKA100:[ENV_ALPHA.QA.B]B014.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 3-DEC-2021 15:42:26 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



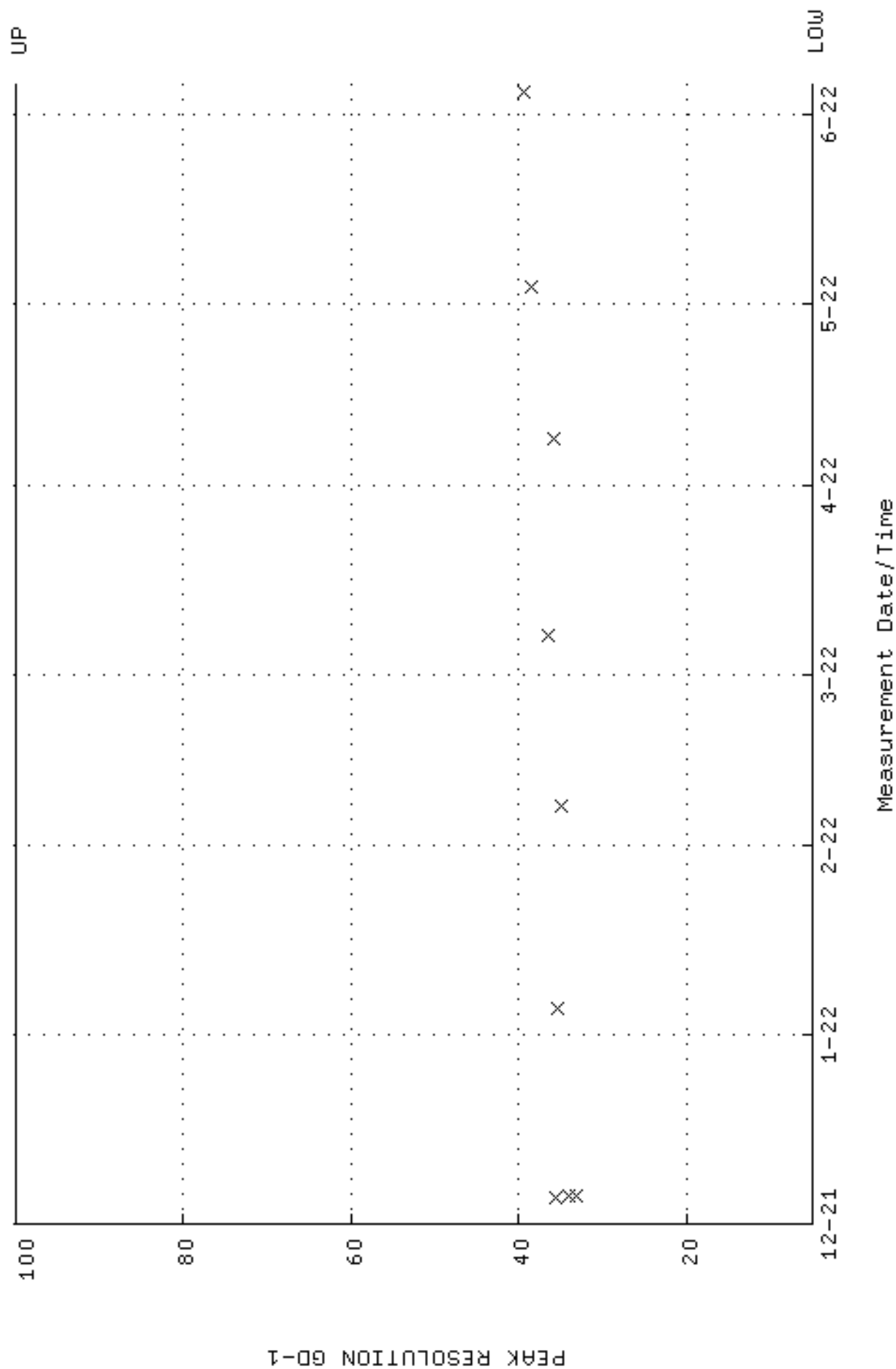
QA filename : DKA100:[ENV_ALPHA.QA.W]W025.QAF;8
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
Lower/Upper Lmts: 0.323536 through 0.343548



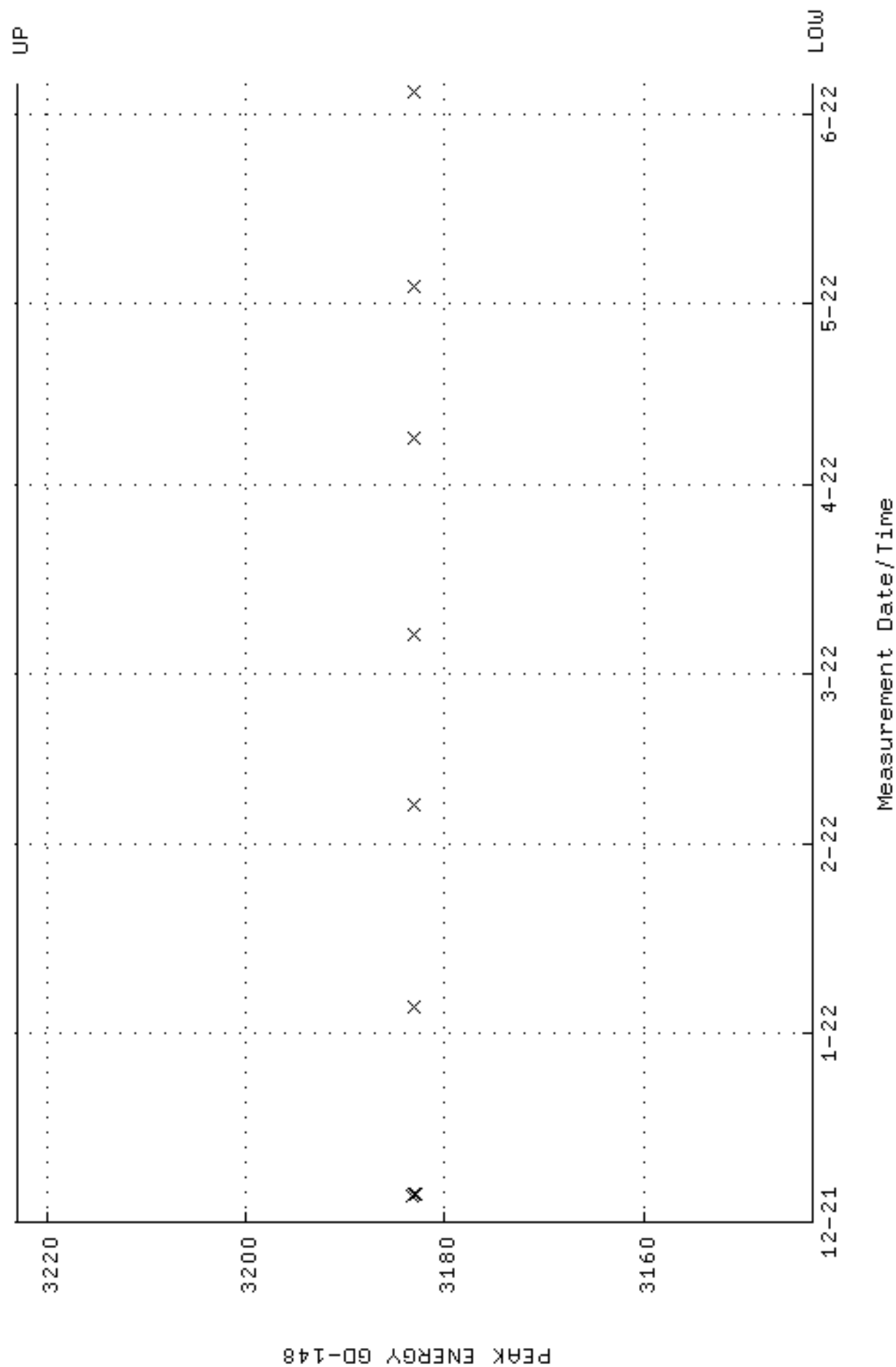
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



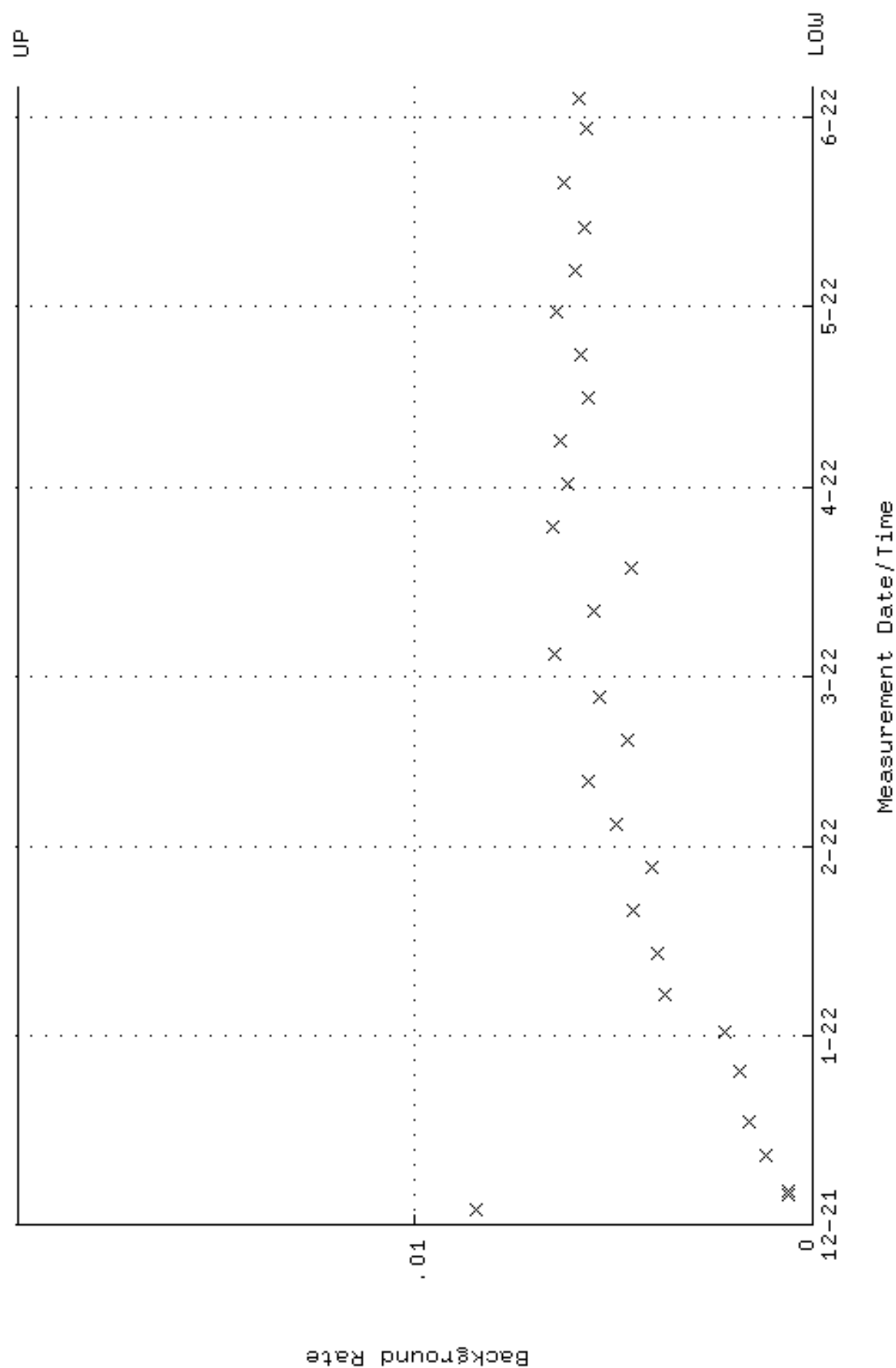
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



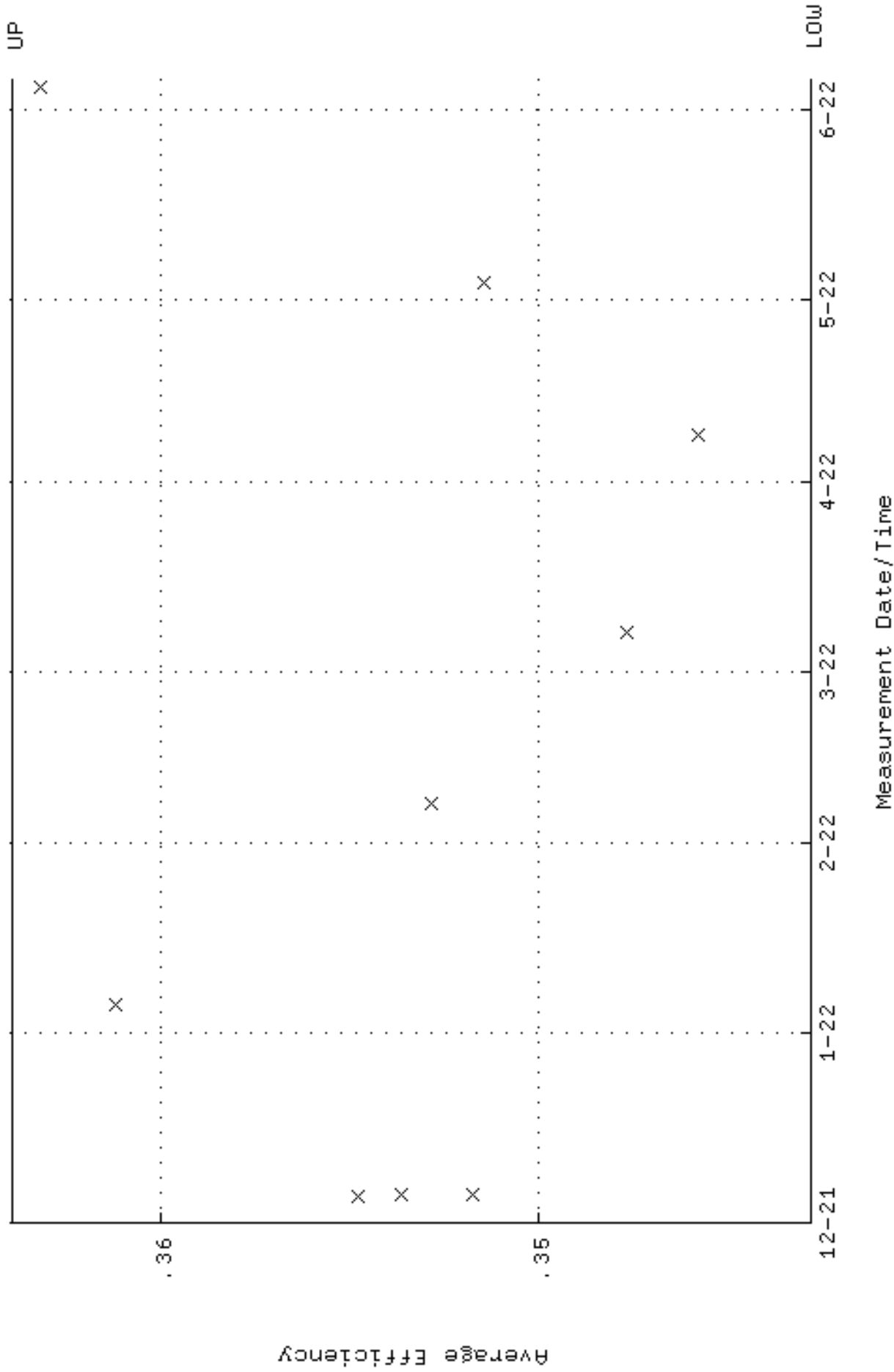
QA filename : DKA100:[ENV_ALPHA.QA.W]W025.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



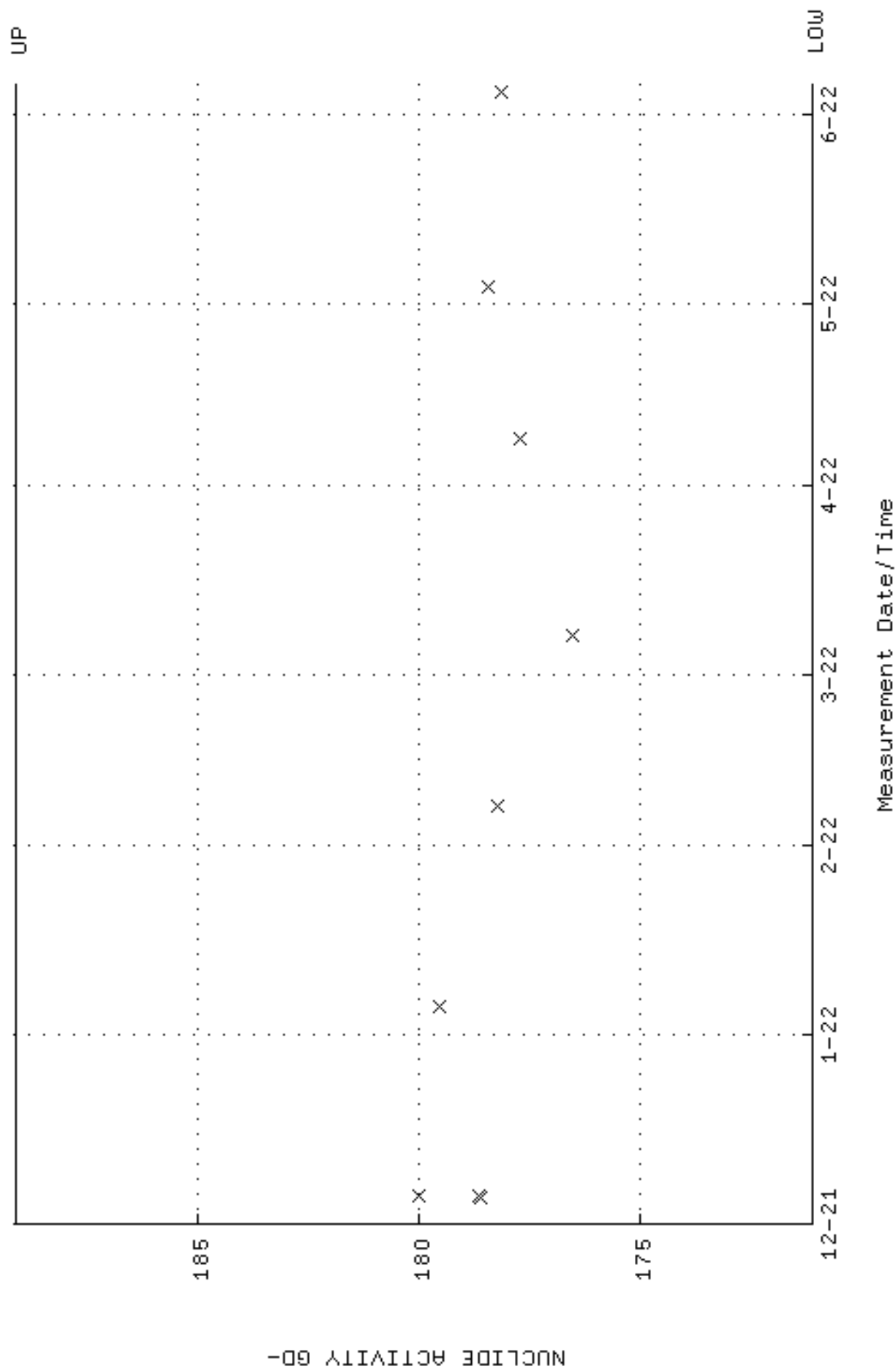
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



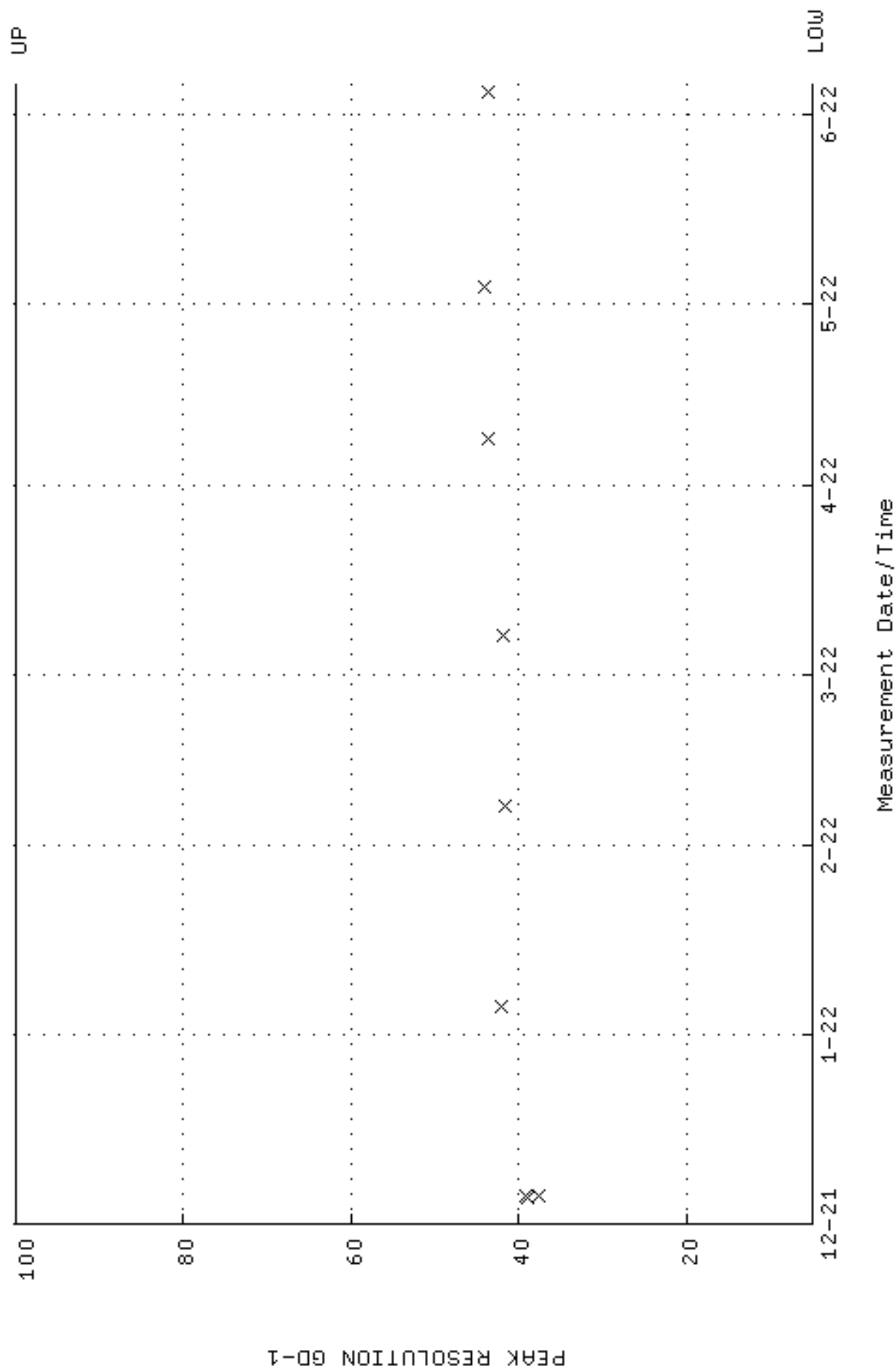
QA filename : DKA100:[ENV_ALPHA.QA.W]W026.QAF;7
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
Lower/Upper Lmts: 0.342755 through 0.363957



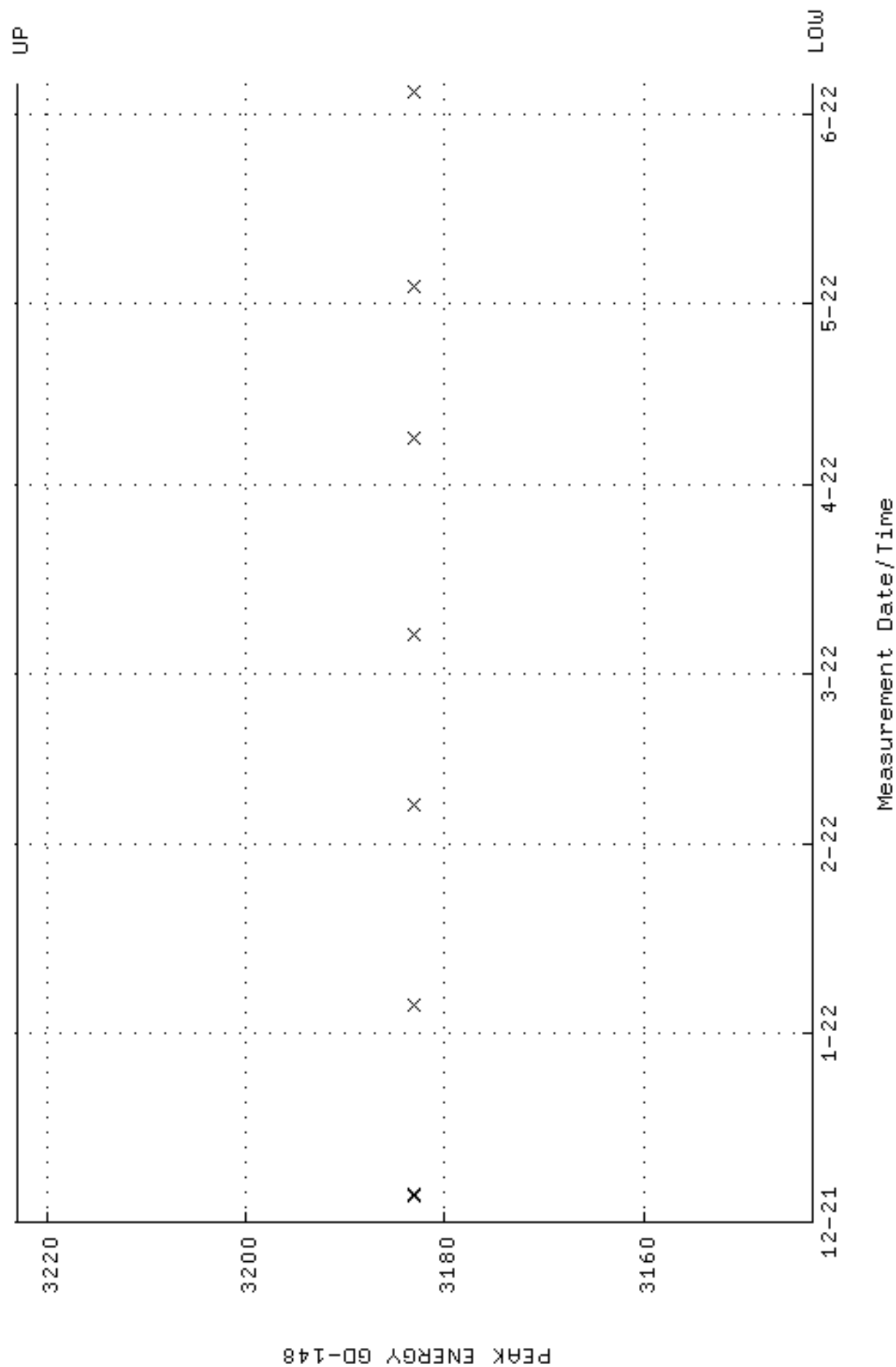
QA filename : DKA100:[ENV_ALPHA.QA.W]W026.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



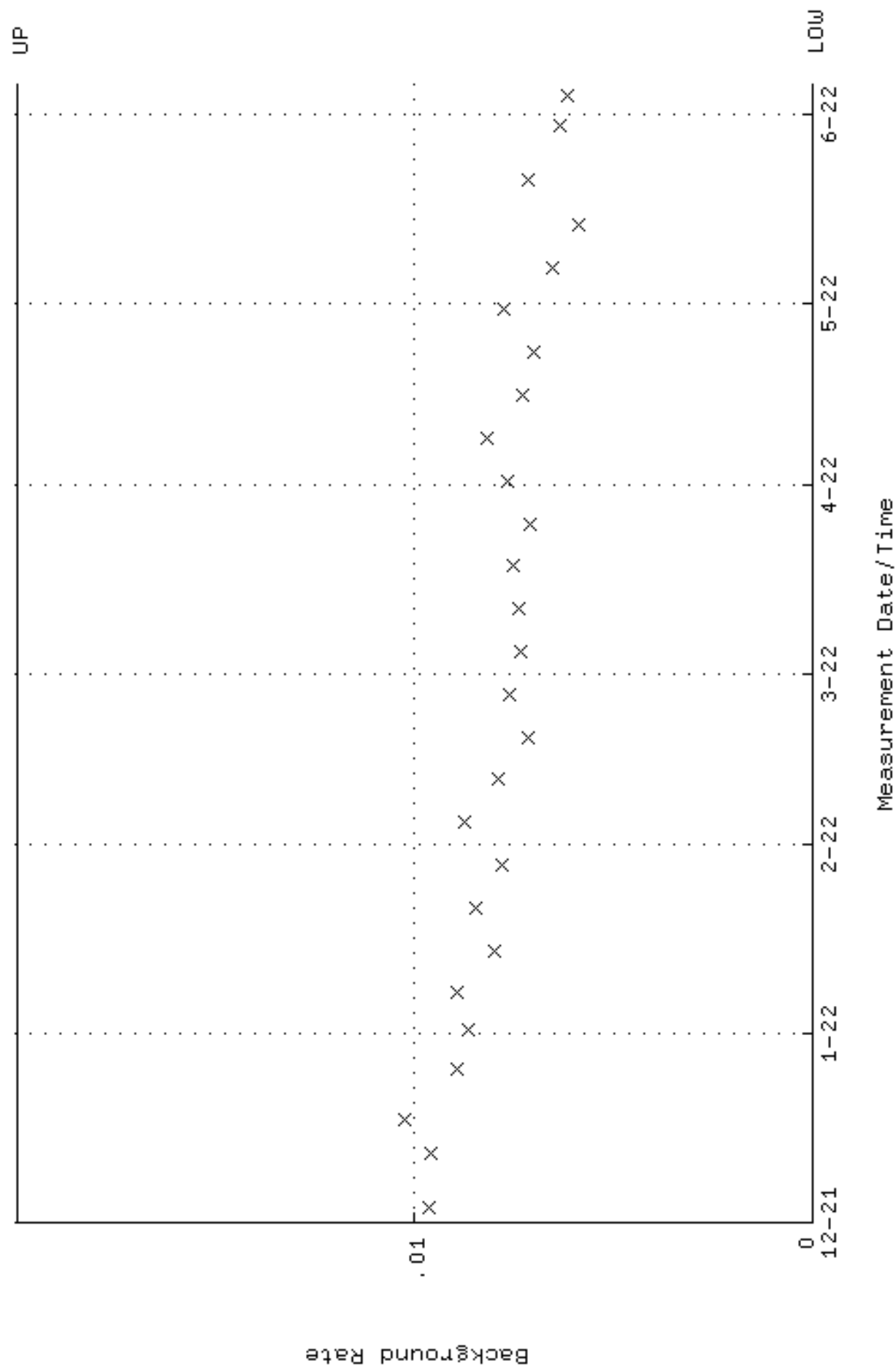
QA filename : DKA100:[ENV_ALPHA.QA.W]W026.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



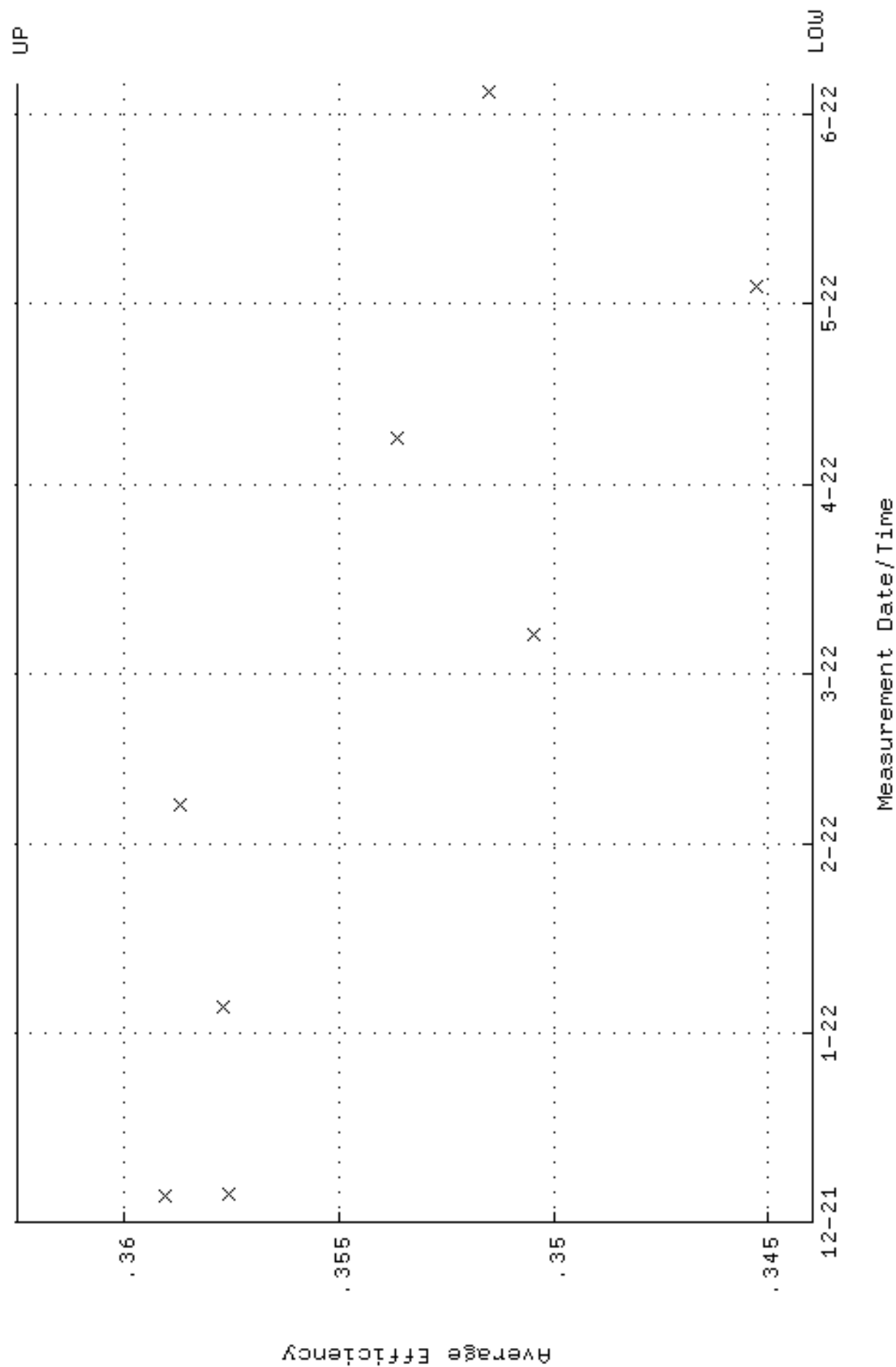
QA filename : DKA100:[ENV_ALPHA.QA.W]W026.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



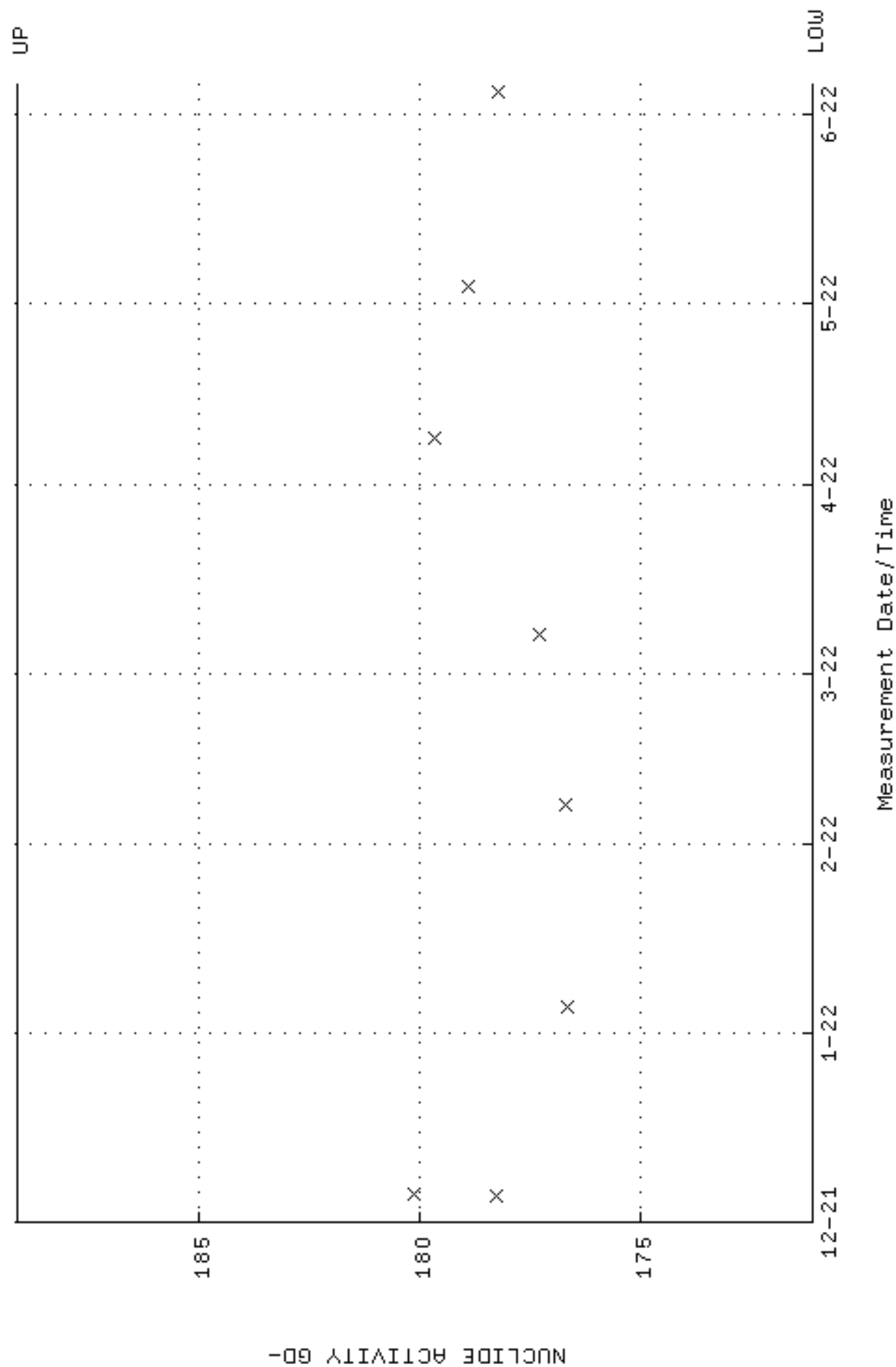
QA filename : DKA100:[ENV_ALPHA.QA.B]B026.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 3-DEC-2021 13:20:55 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



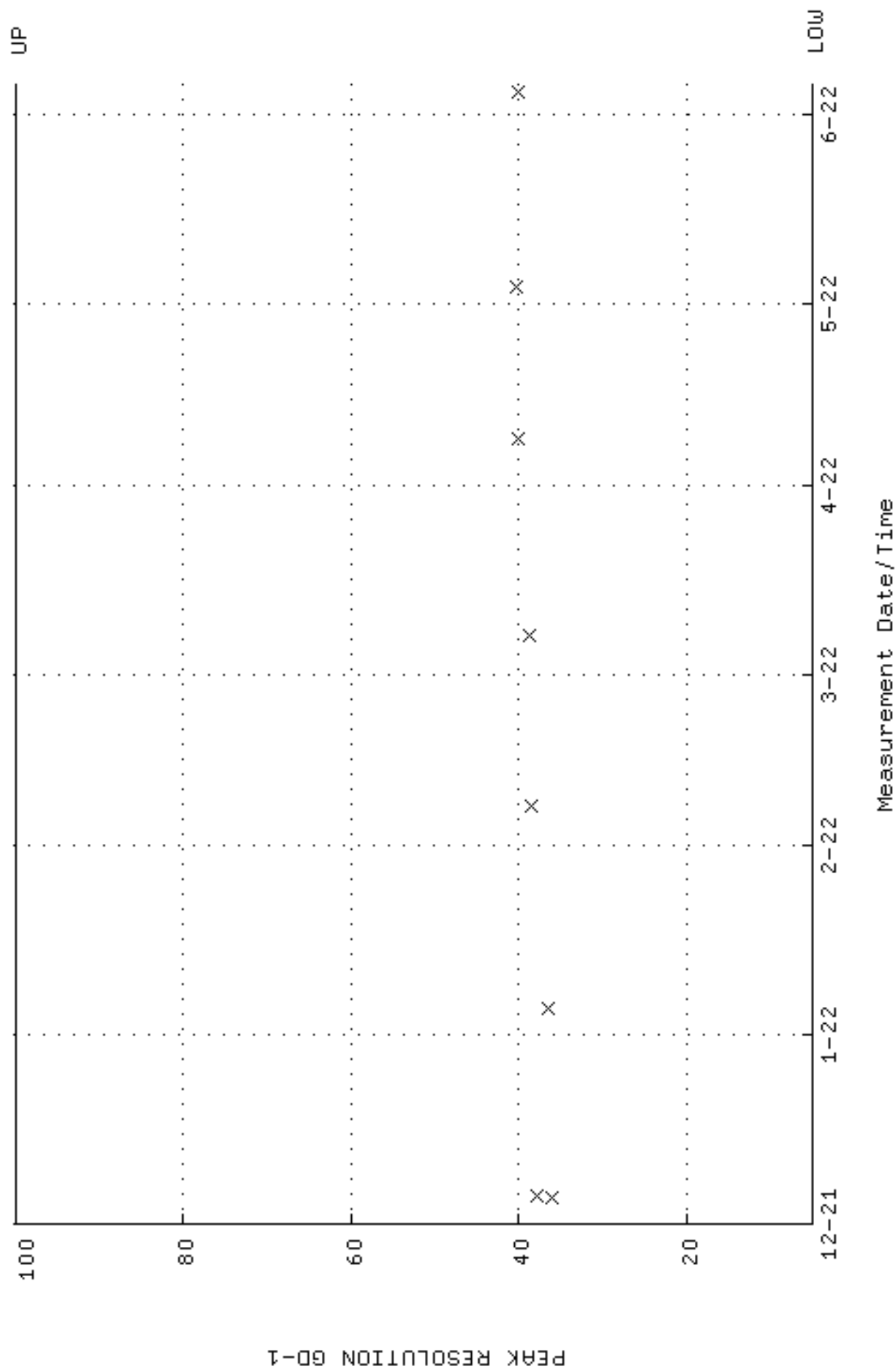
QA filename : DKA100:[ENV_ALPHA.QA.W]W027.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.343970 through 0.362500



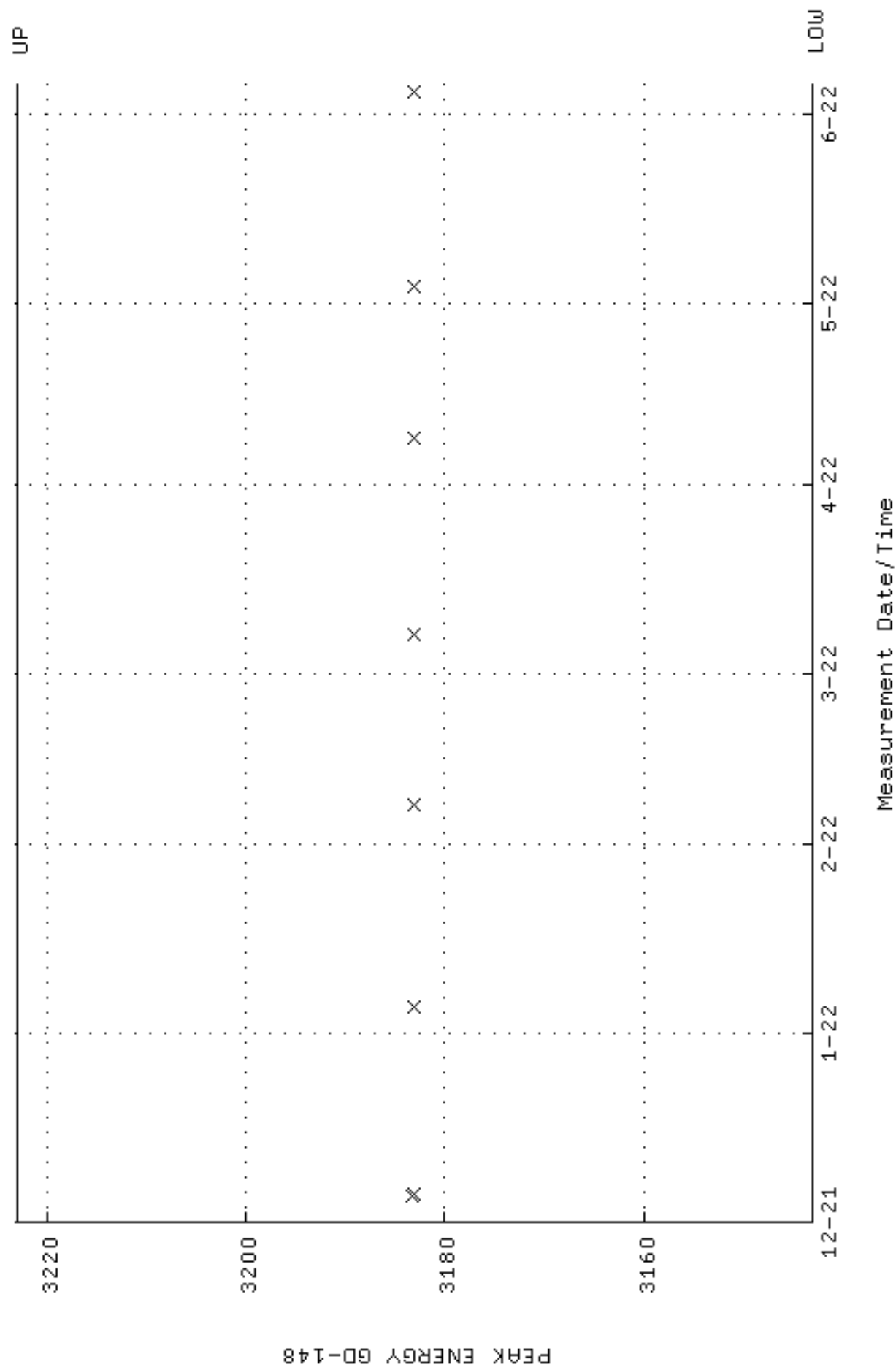
QA filename : DKA100:[ENV_ALPHA.QA.W]W027.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



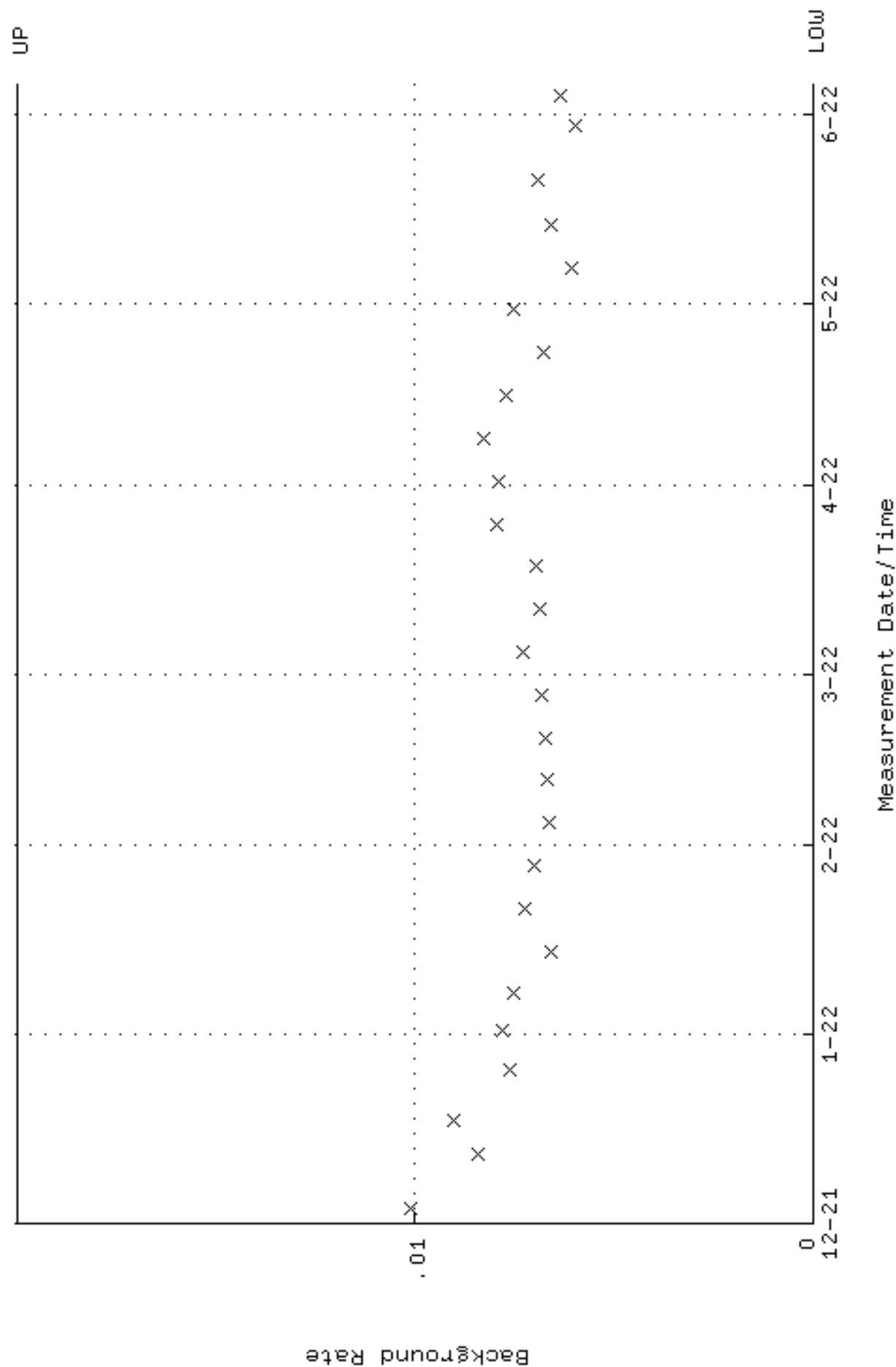
QA filename : DKA100:[ENV_ALPHA.QA.W]W027.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



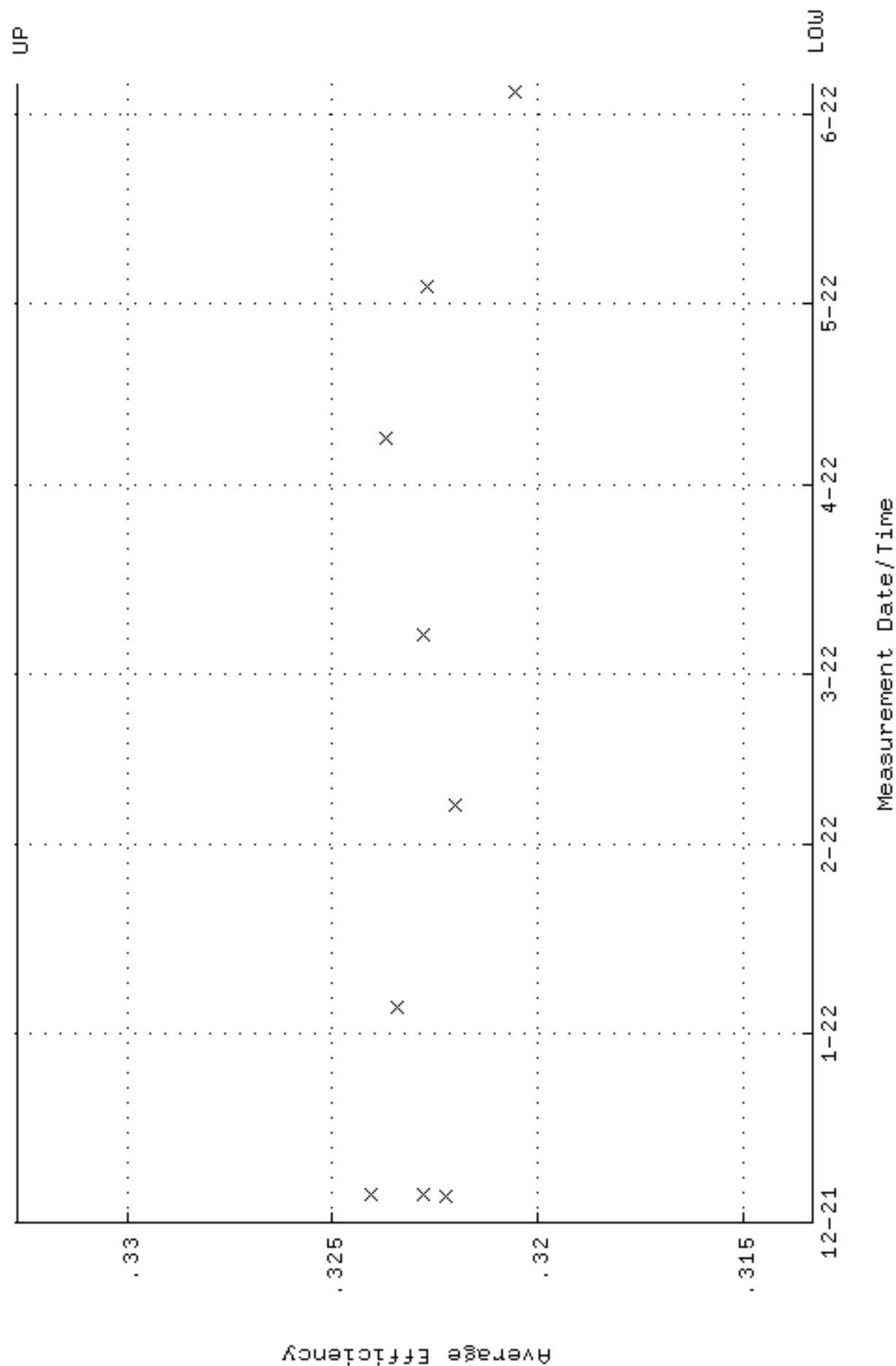
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



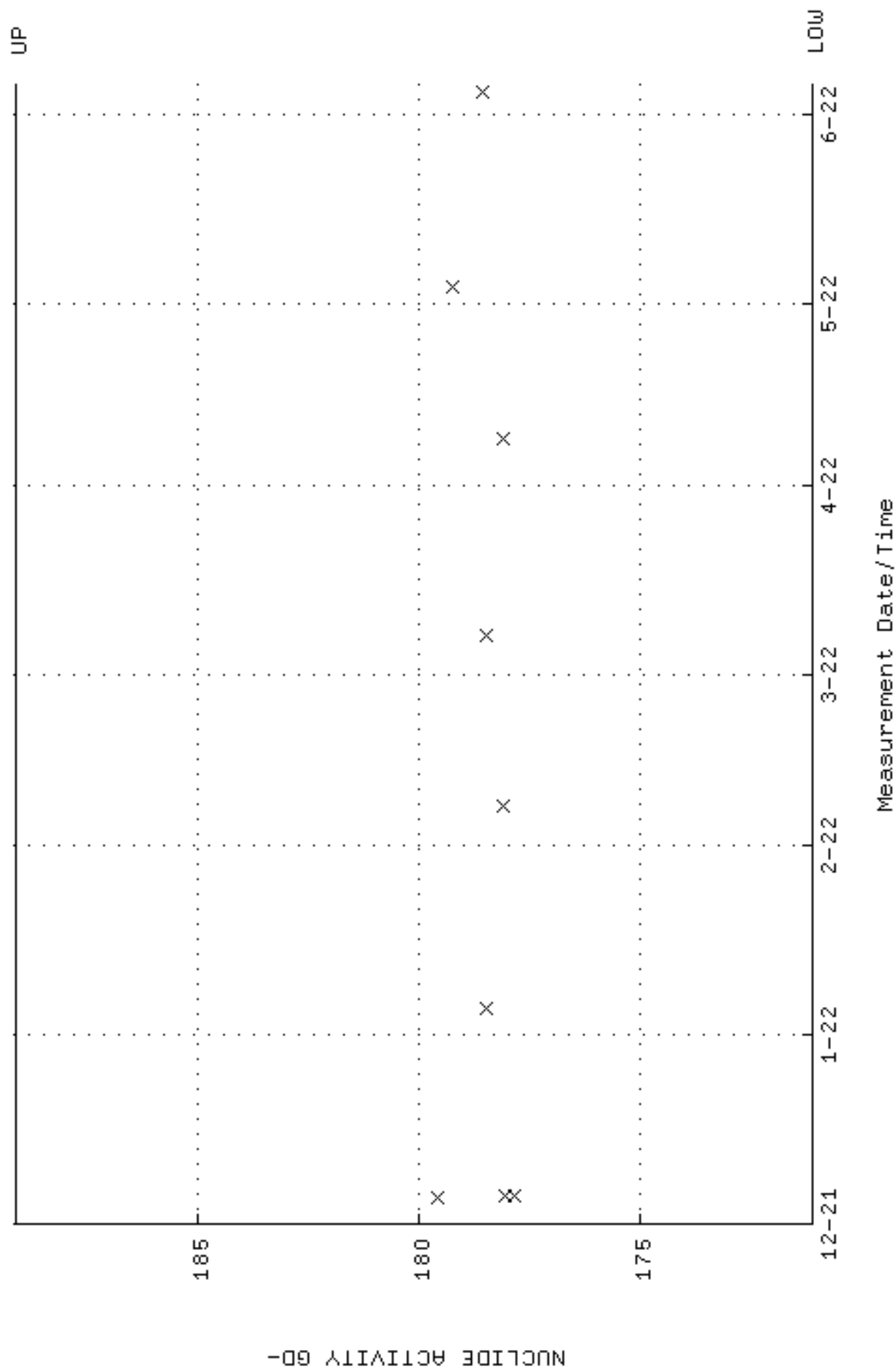
QA filename : DKA100:[ENV_ALPHA.QA.B]B027.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 3-DEC-2021 13:20:55 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



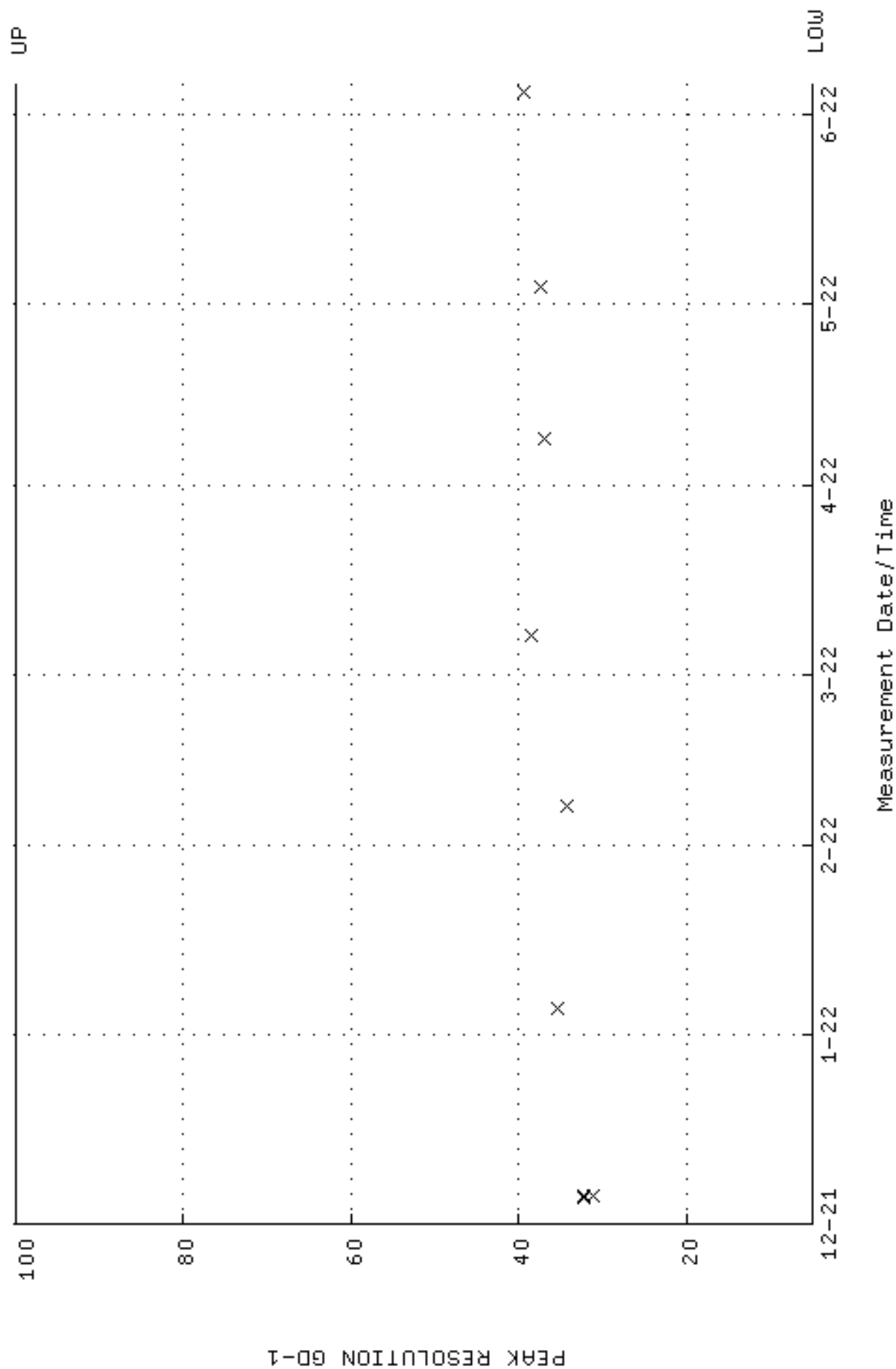
QA filename : DKA100:[ENV_ALPHA.QA.W]W028.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.313300 through 0.332680



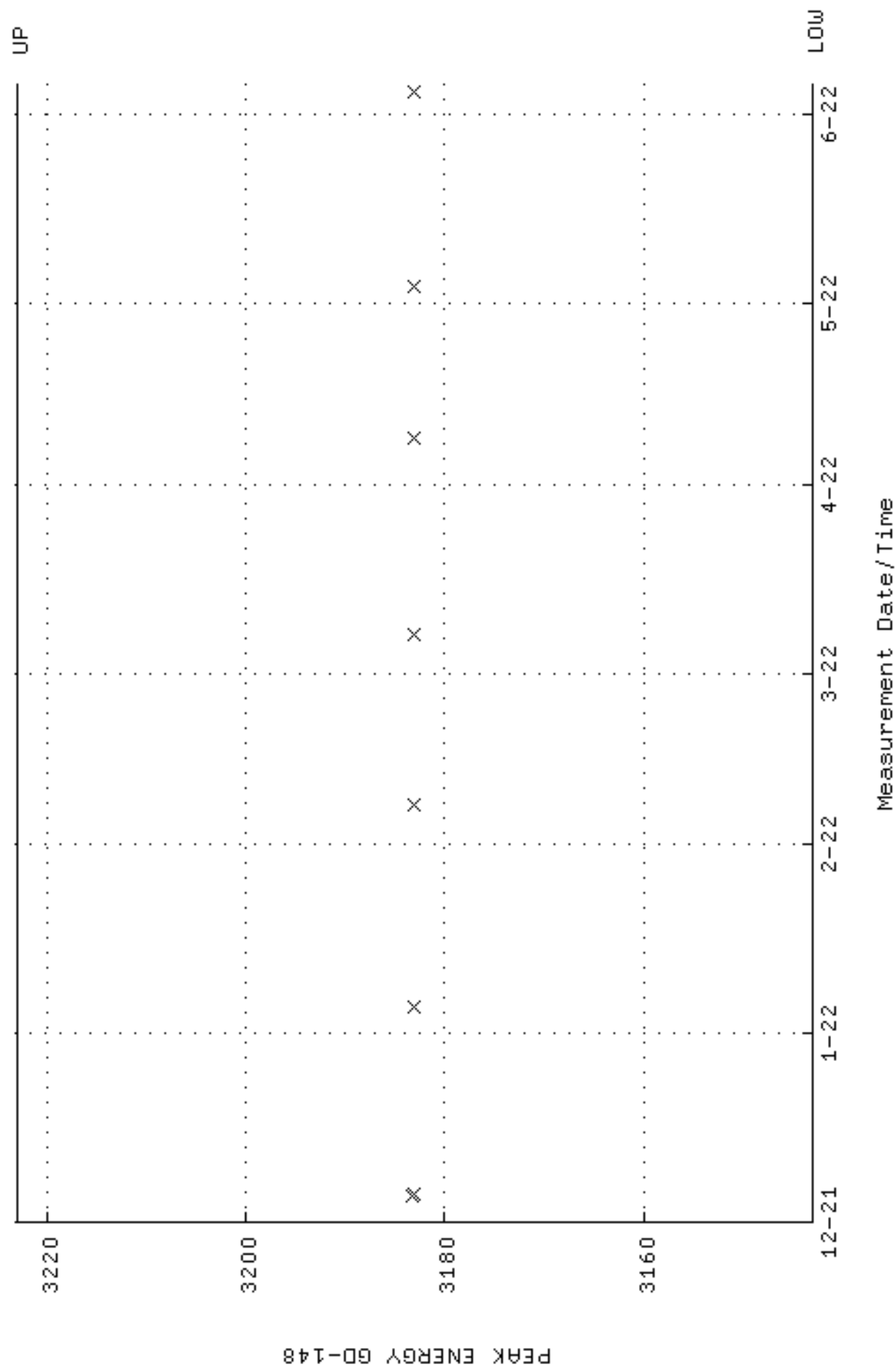
QA filename : DKA100:[ENV_ALPHA.QA.W]W028.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



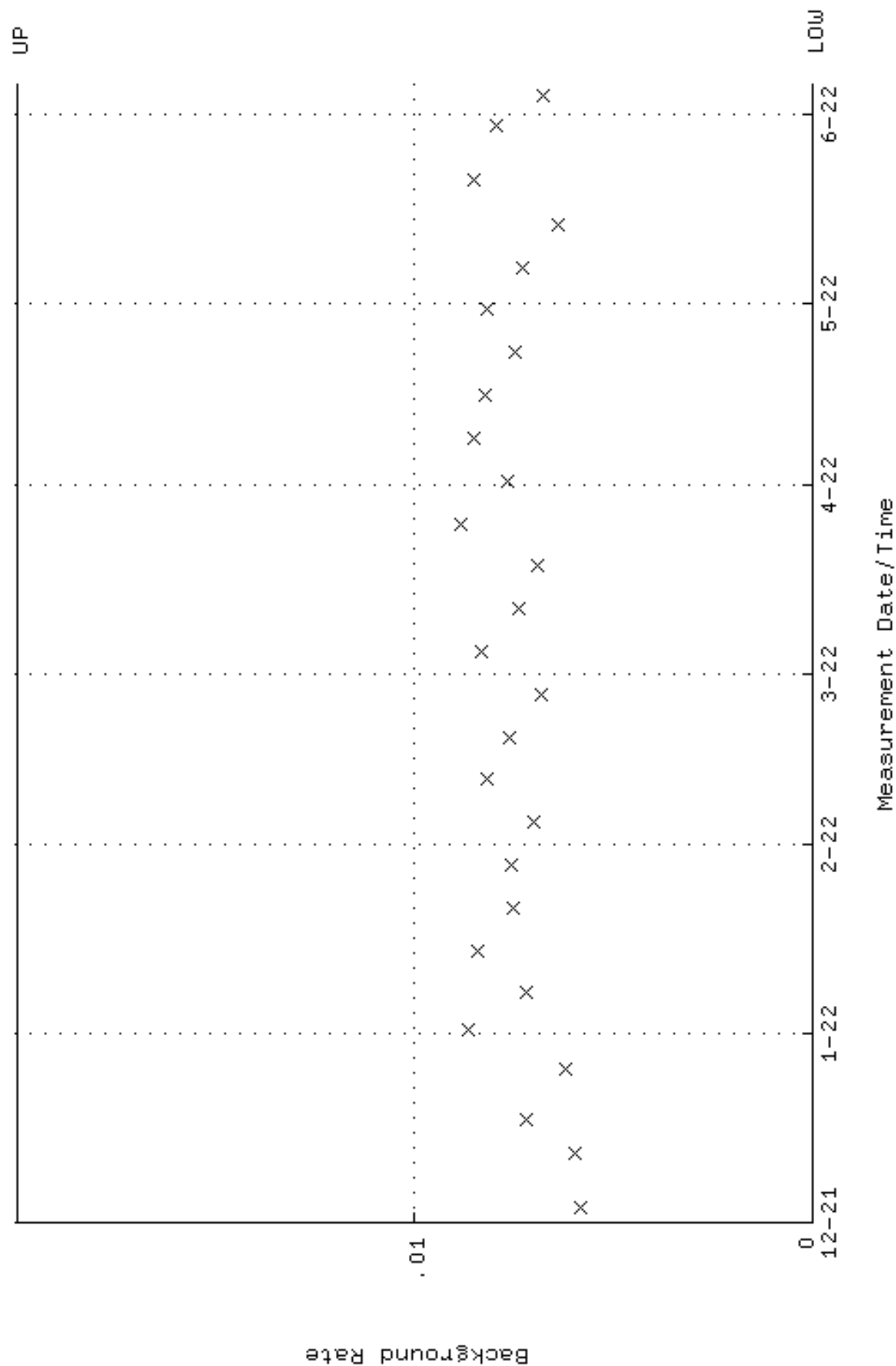
QA filename : DKA100:[ENV_ALPHA.QA.W]W028.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



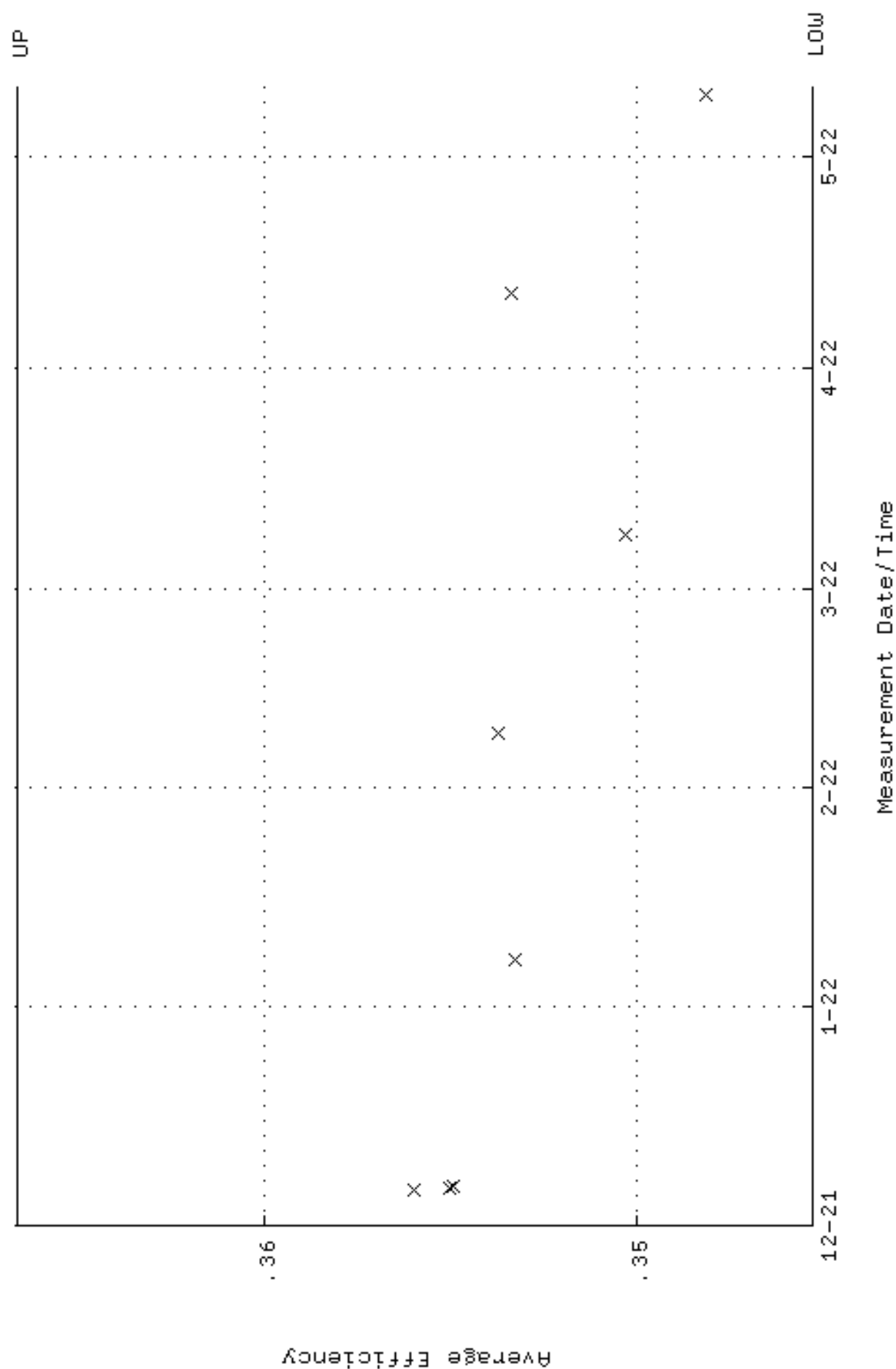
QA filename : DKA100:[ENV_ALPHA.QA.W]W028.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



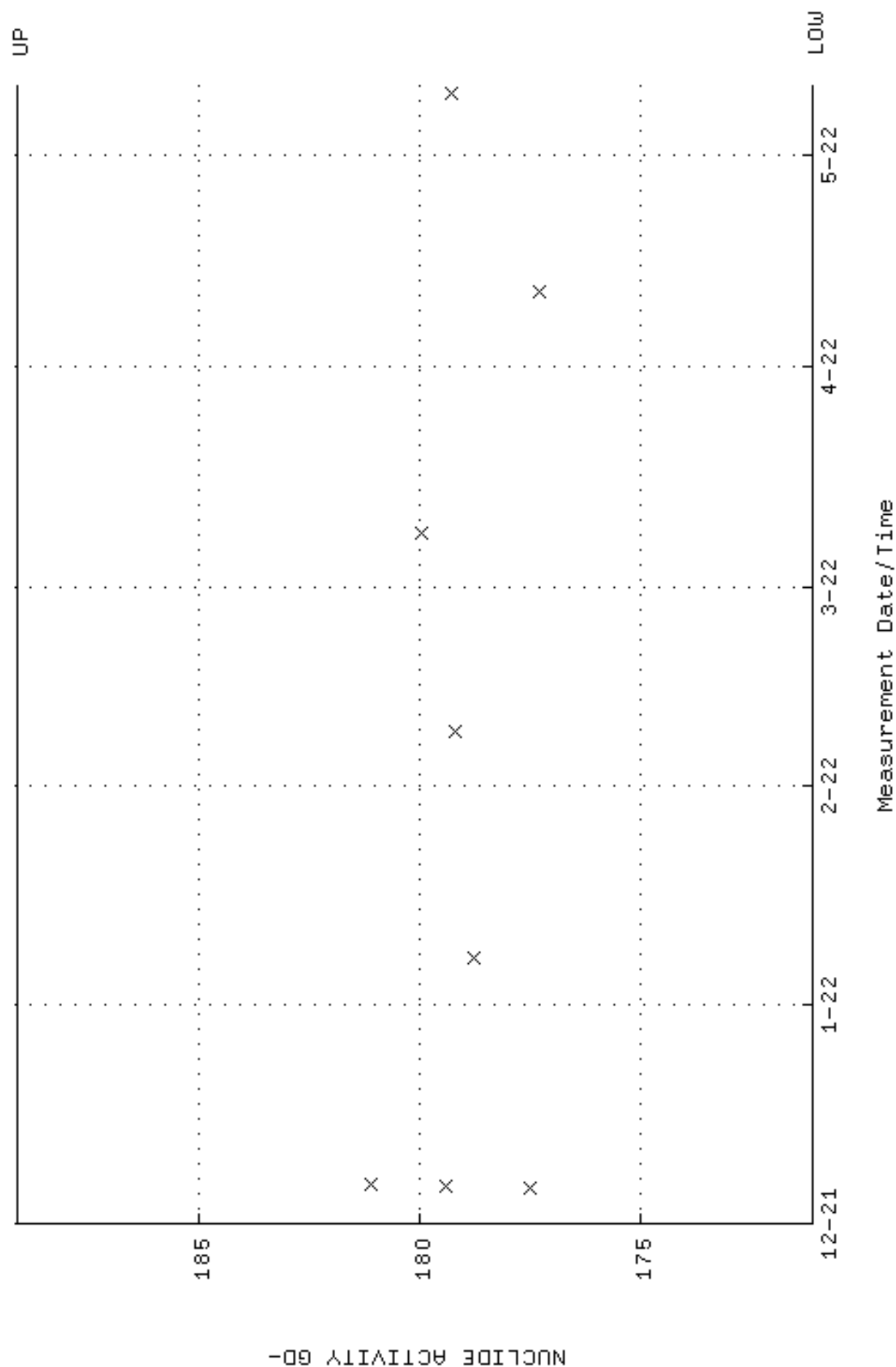
QA filename : DKA100:[ENV_ALPHA.QA.B]B028.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 3-DEC-2021 13:20:55 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



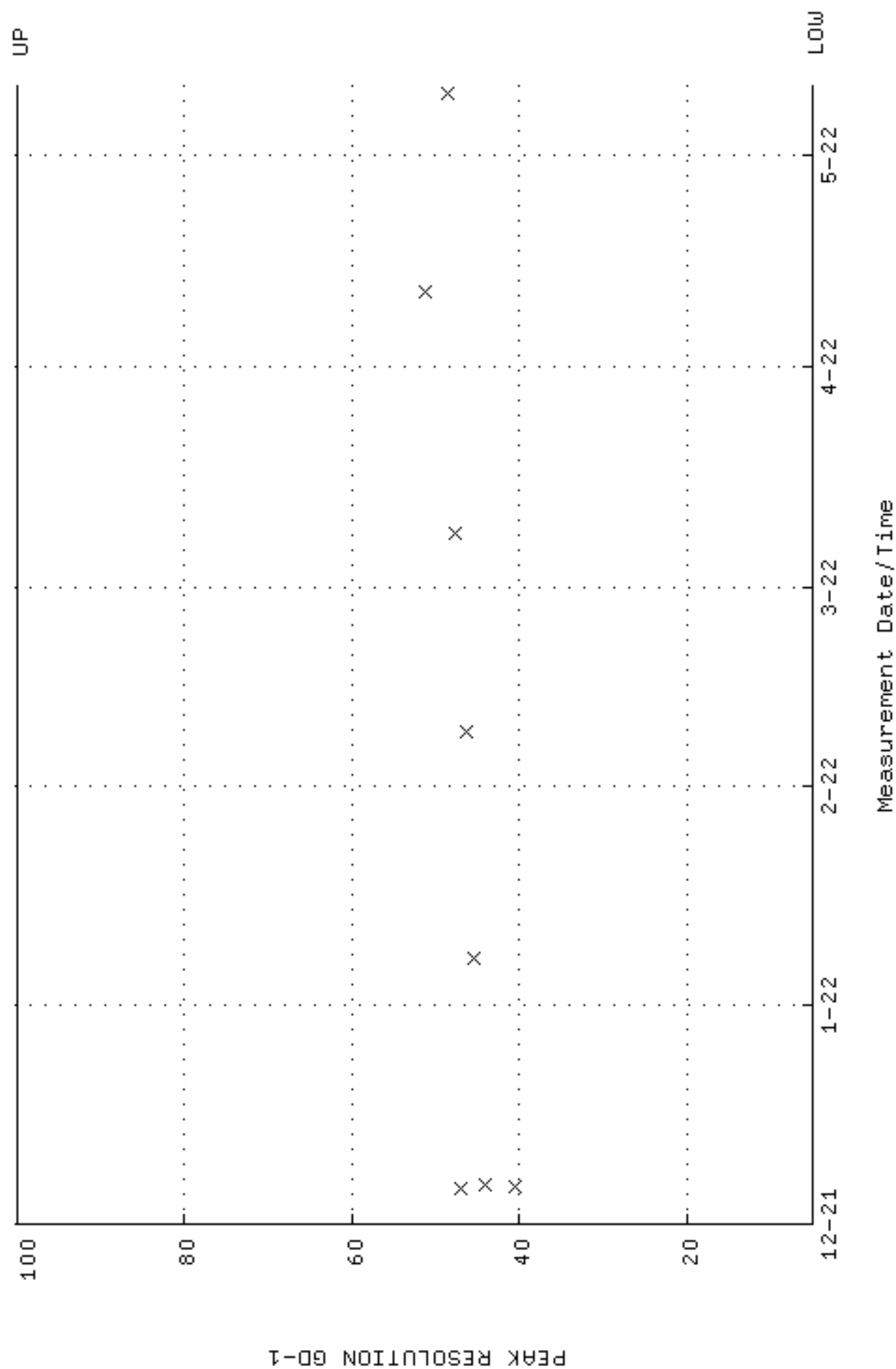
QA filename : DKA100:[ENV_ALPHA.QA.W]W080.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.345260 through 0.366620



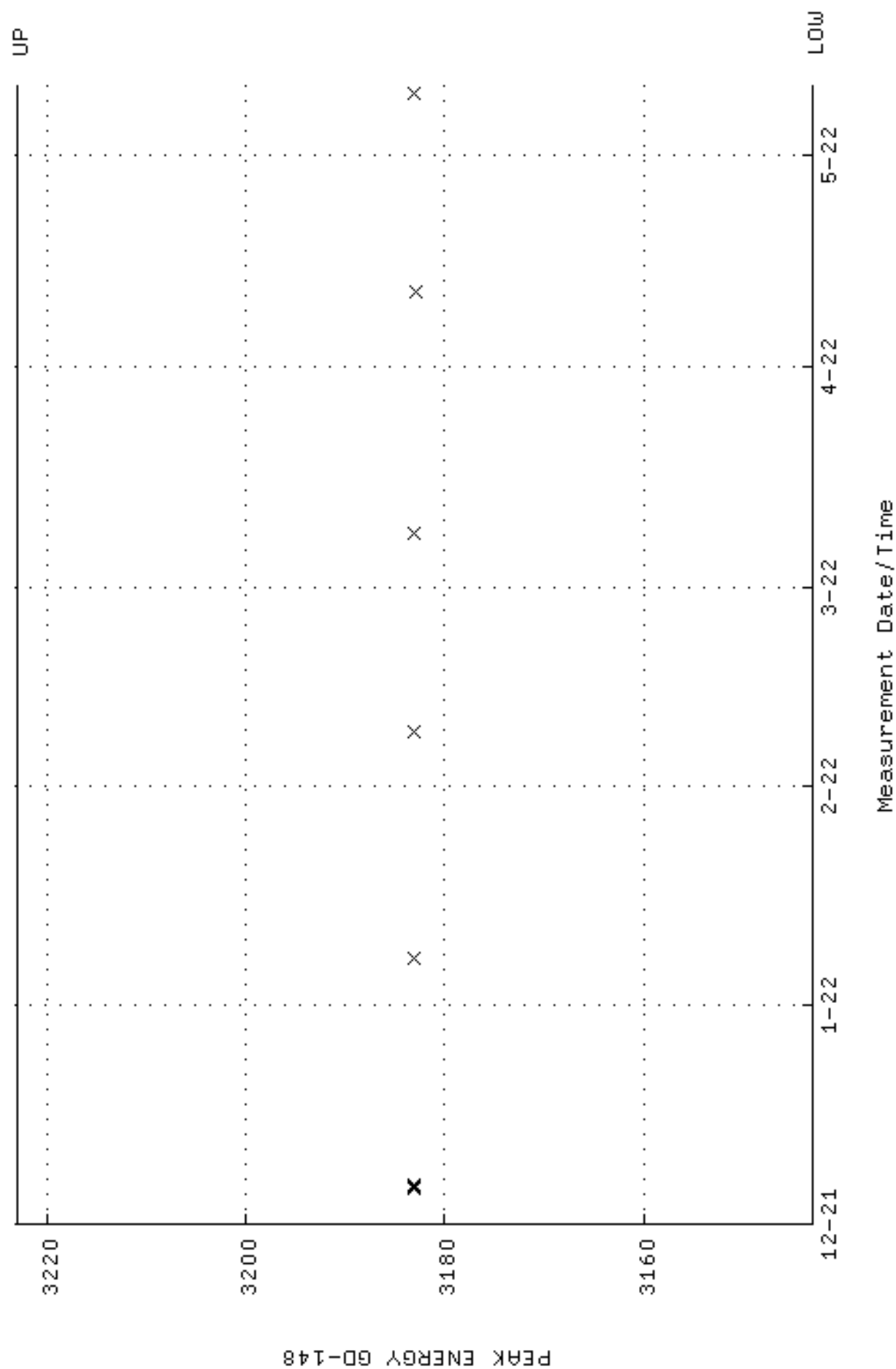
QA filename : DKA100:[ENV_ALPHA.QA.W]W080.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



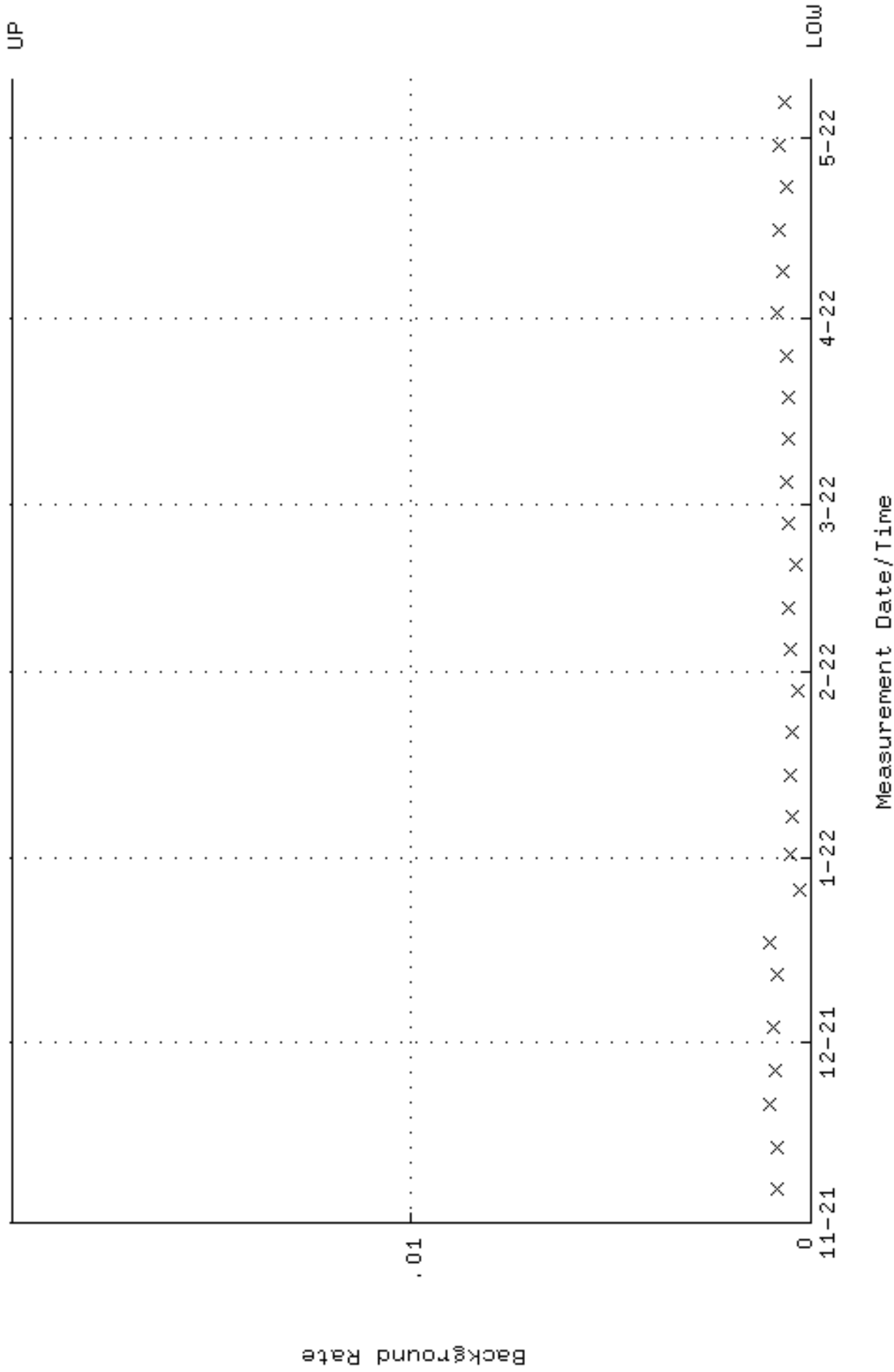
QA filename : DKA100:[ENV_ALPHA.QA.W]W080.QAF;10
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



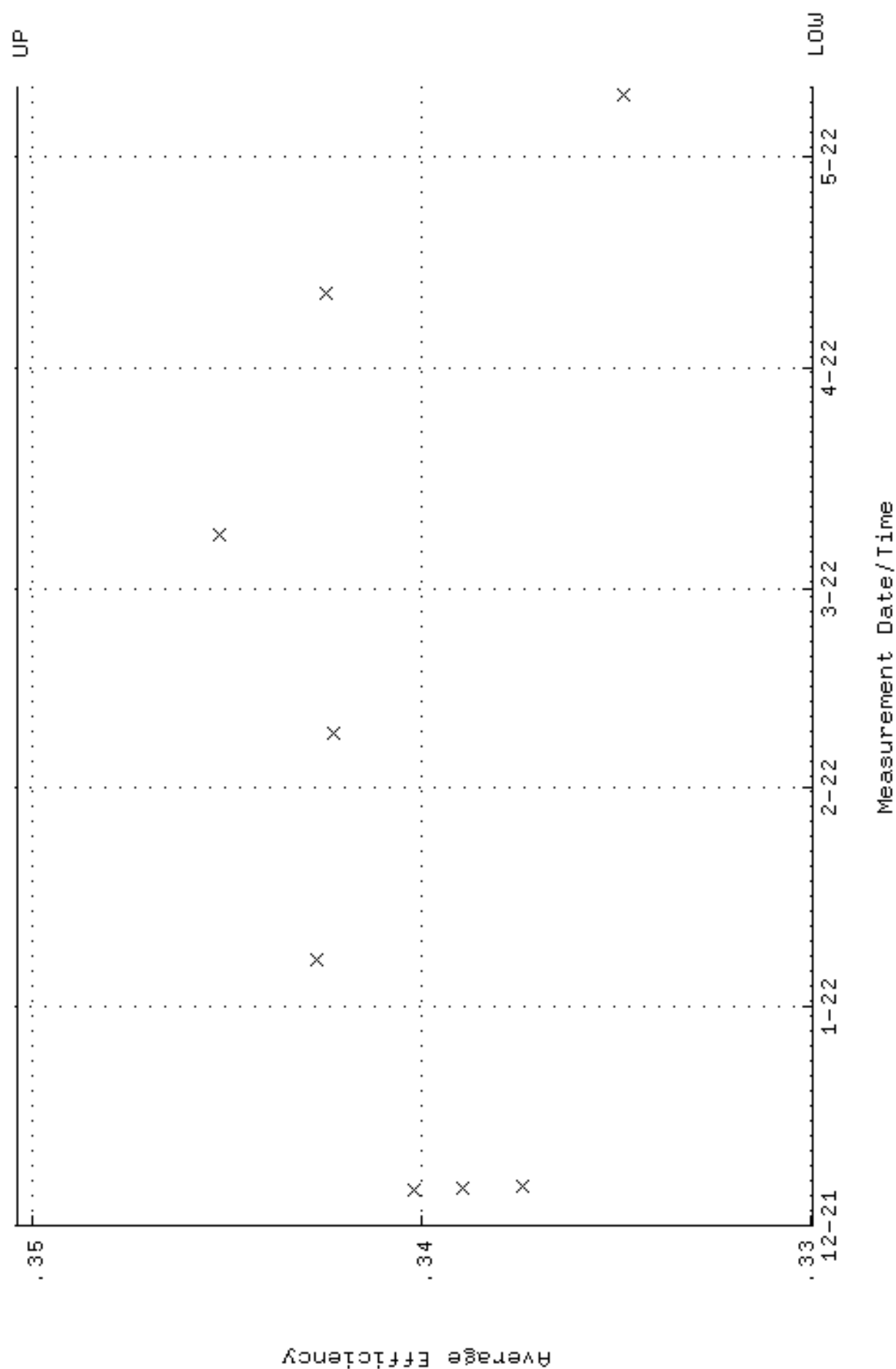
QA filename : DKA100:[ENV_ALPHA.QA.W]W080.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



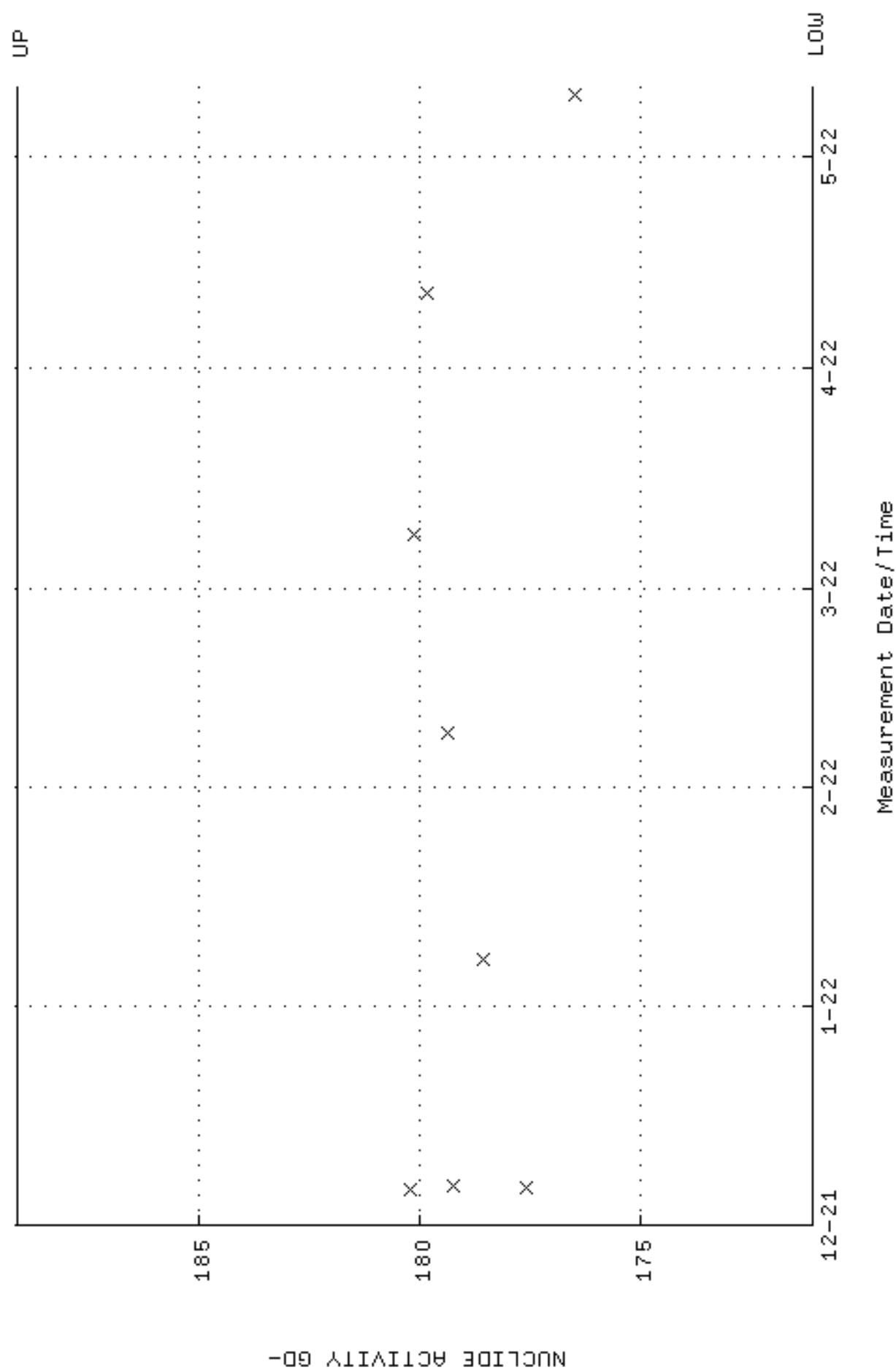
QA filename : DKA100:[ENV_ALPHA.QA.B]B080.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-NOV-2021 16:55:28 through 10-MAY-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



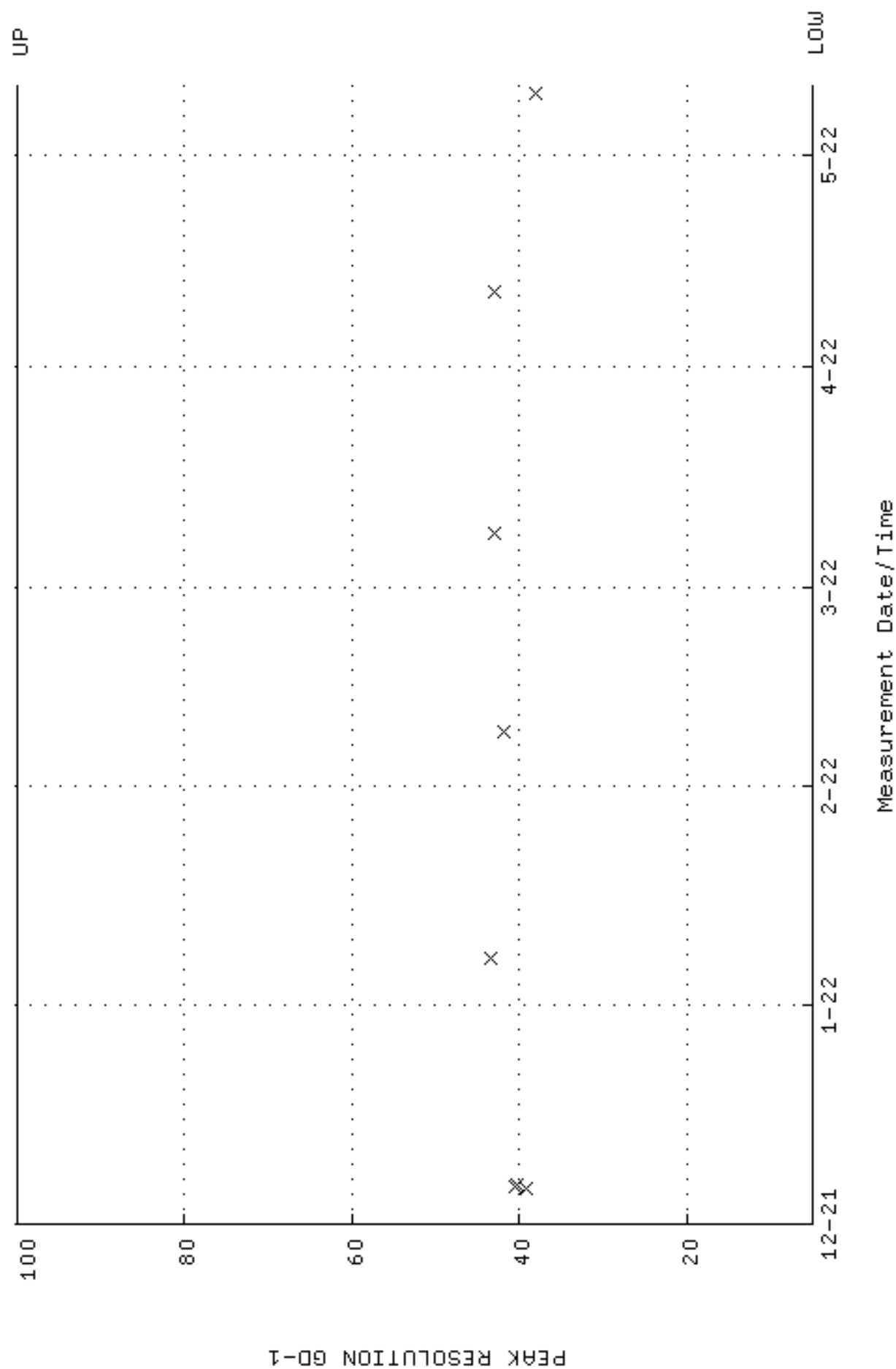
QA filename : DKA100:[ENV_ALPHA.QA.W]W081.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.329970 through 0.350380



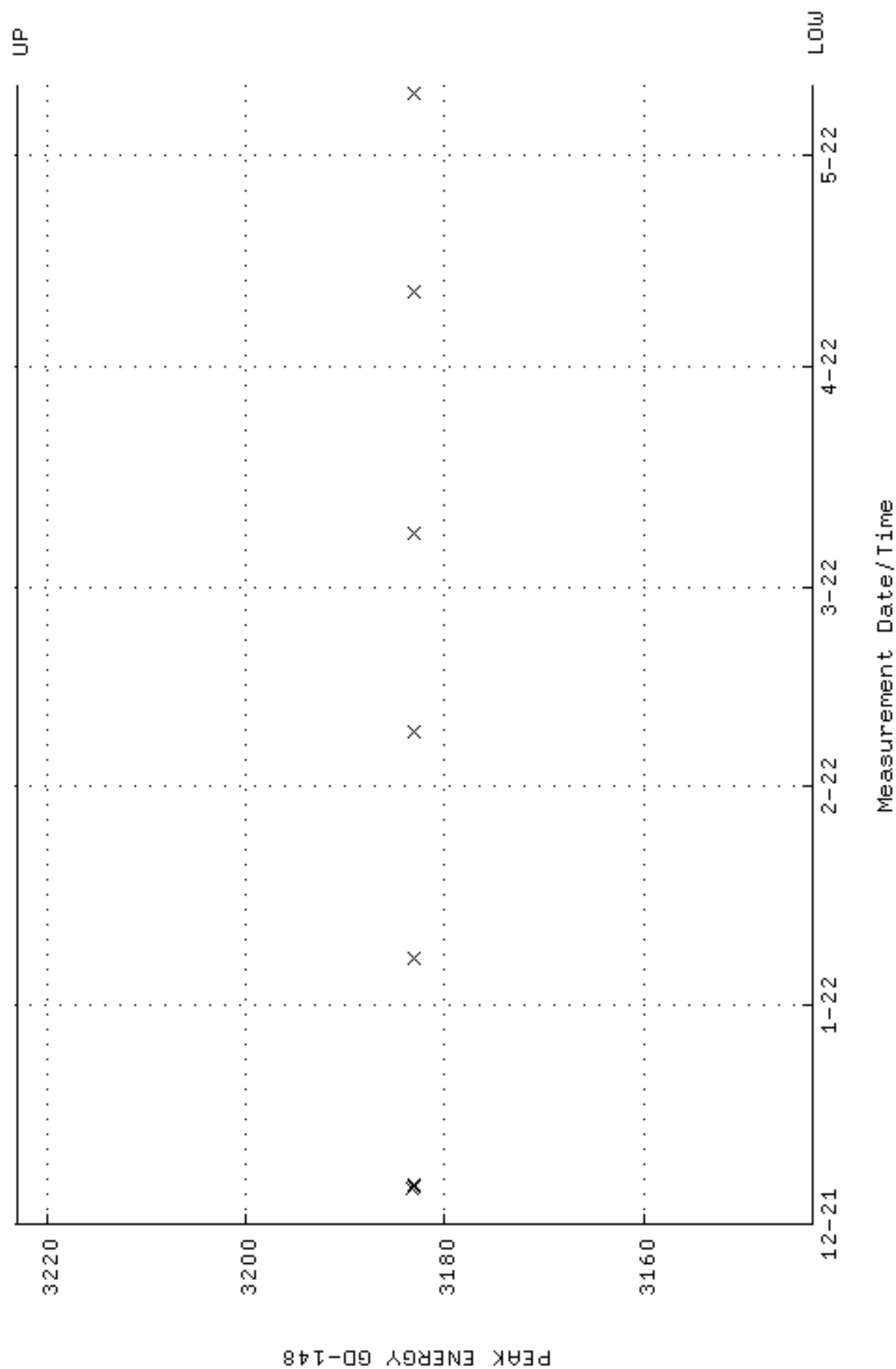
QA filename : DKA100:[ENV_ALPHA.QA.W]W081.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



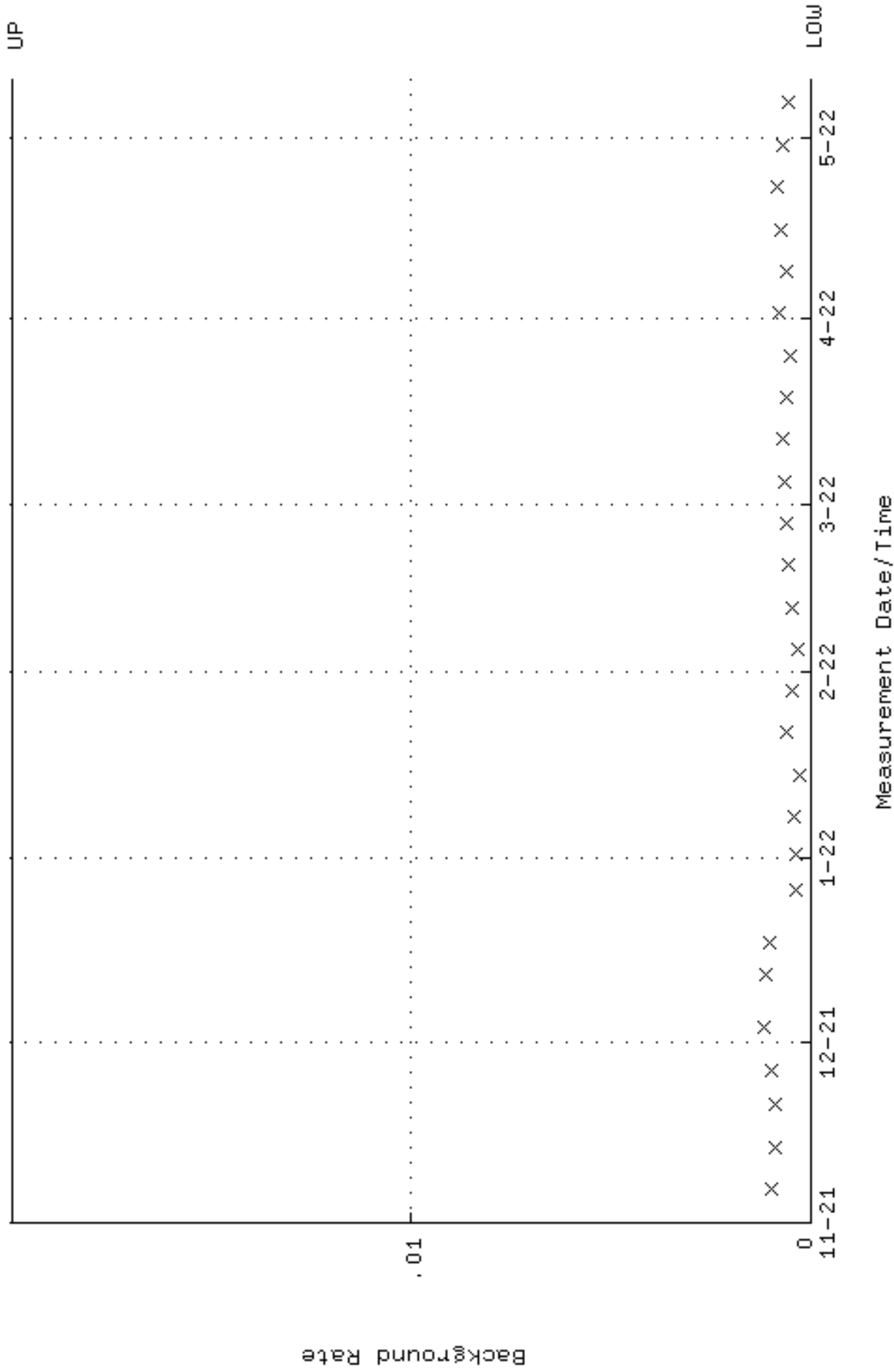
QA filename : DKA100:[ENV_ALPHA.QA.W]W081.QAF;9
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



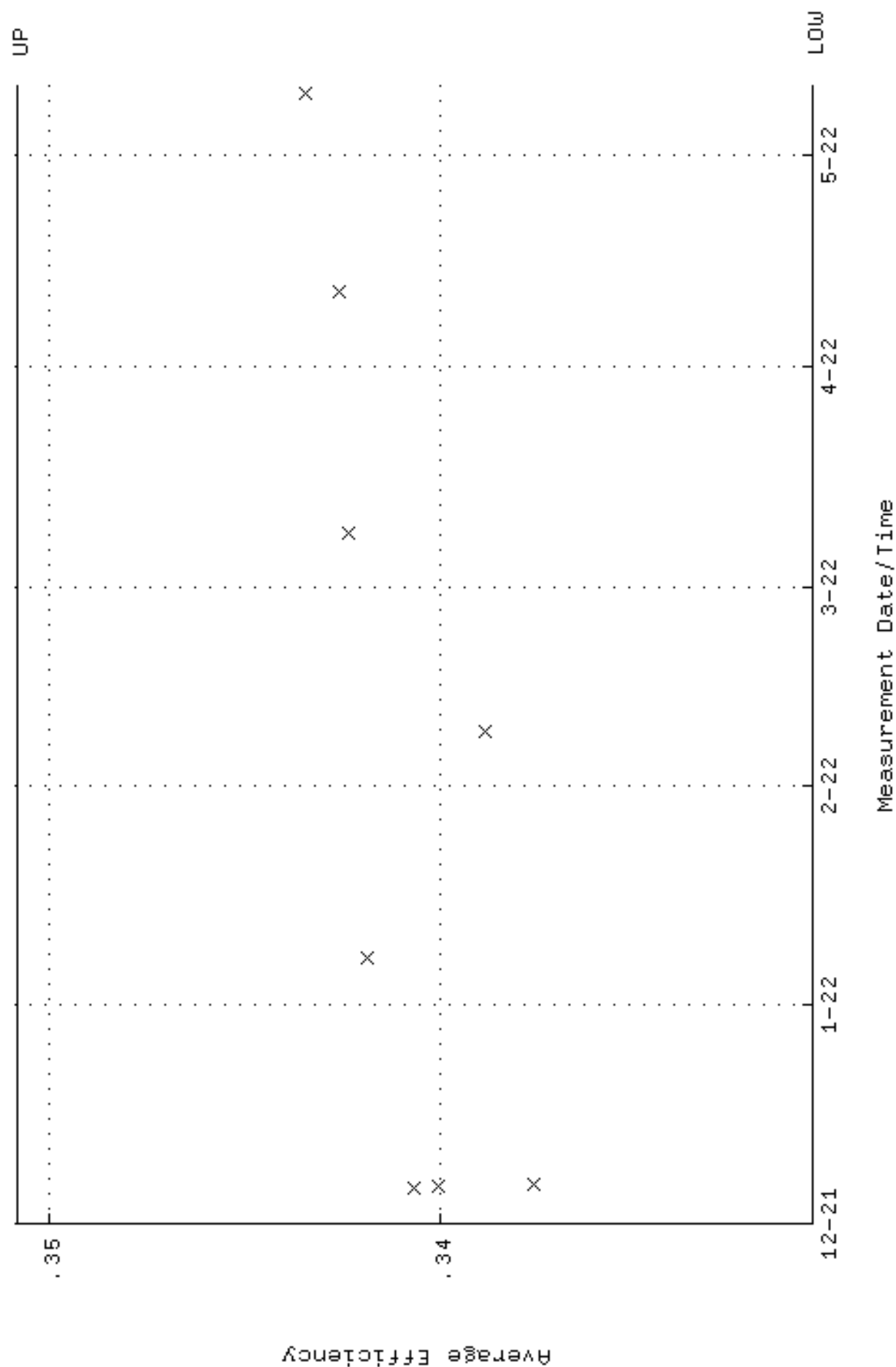
QA filename : DKA100:[ENV_ALPHA.QA.W]W081.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



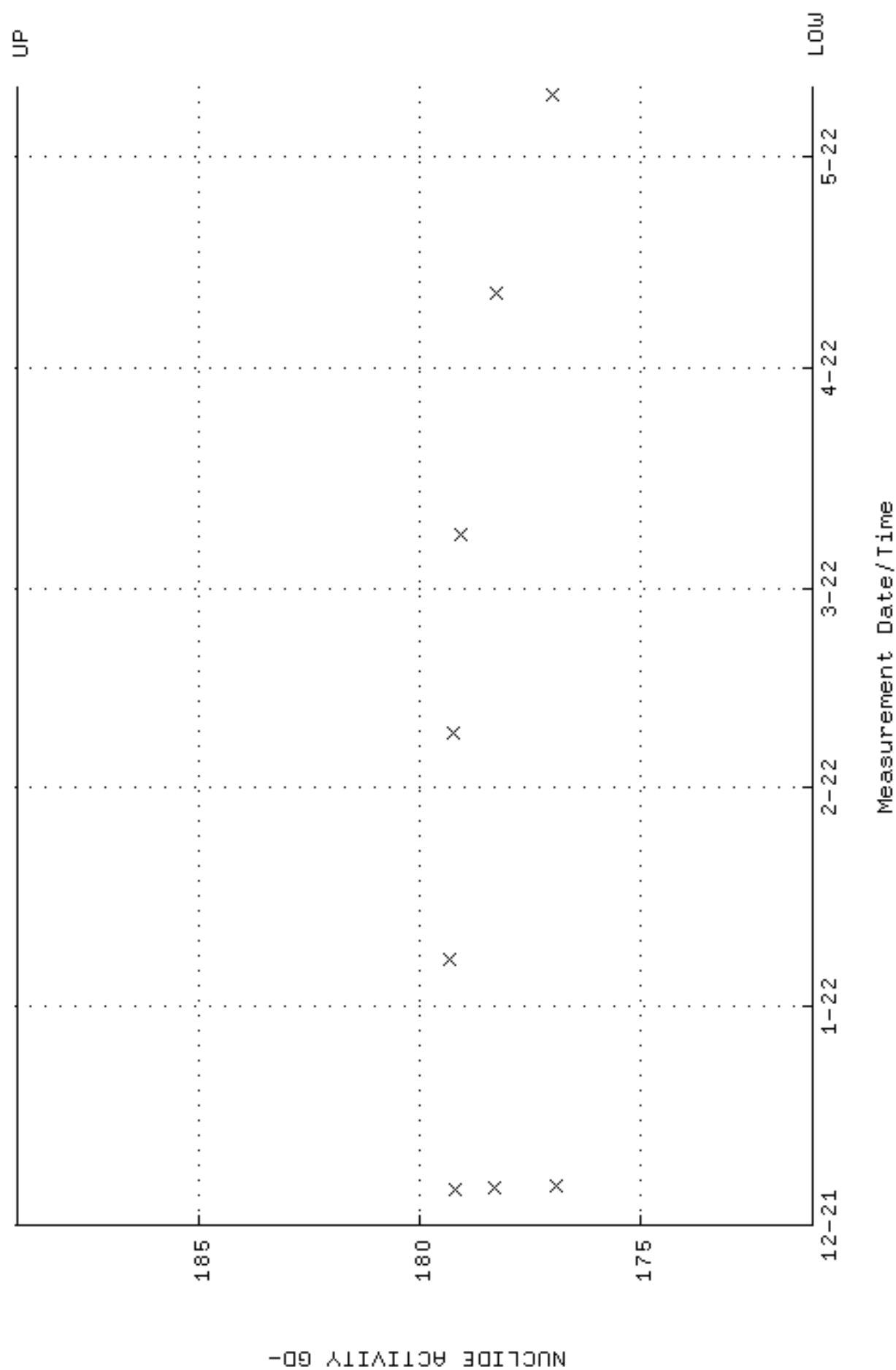
QA filename : DKA100:[ENV_ALPHA.QA.B]B081.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-NOV-2021 16:55:28 through 10-MAY-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



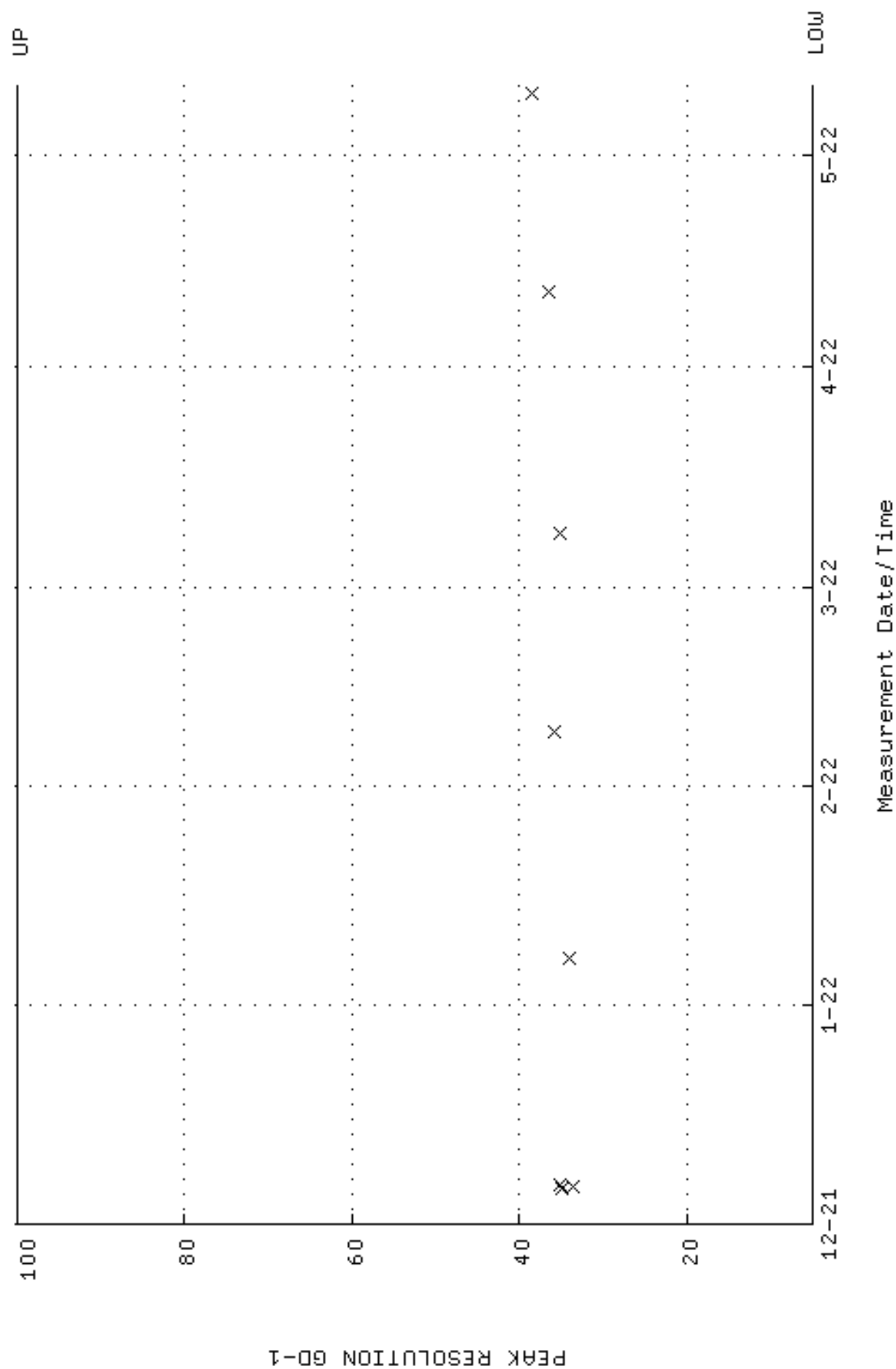
QA filename : DKA100:[ENV_ALPHA.QA.W]W082.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.330410 through 0.350840



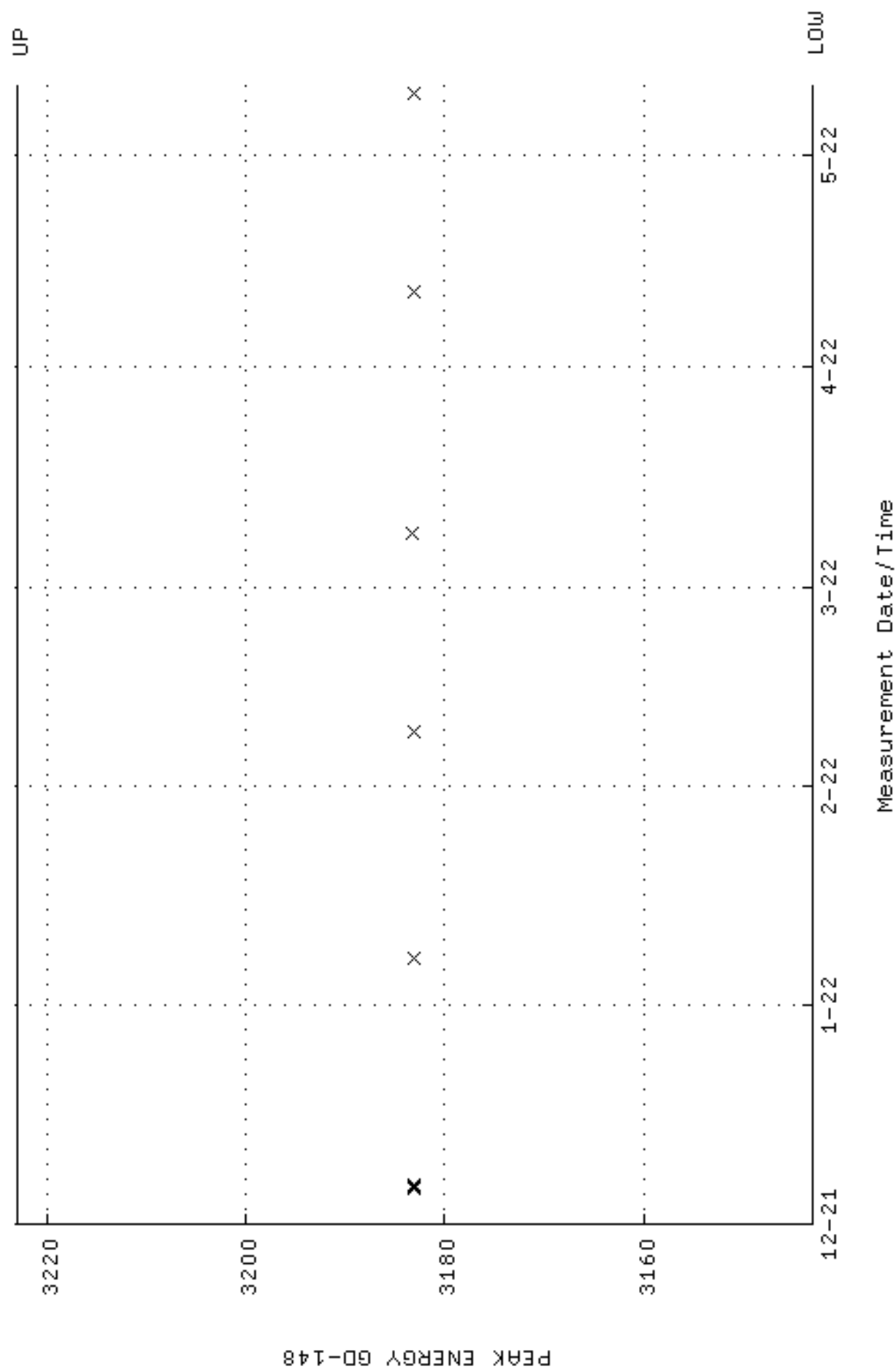
QA filename : DKA100:[ENV_ALPHA.QA.W]W082.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W082.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



QA filename : DKA100:[ENV_ALPHA.QA.W]W082.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



Background Rate

Measurement Date/Time

UP

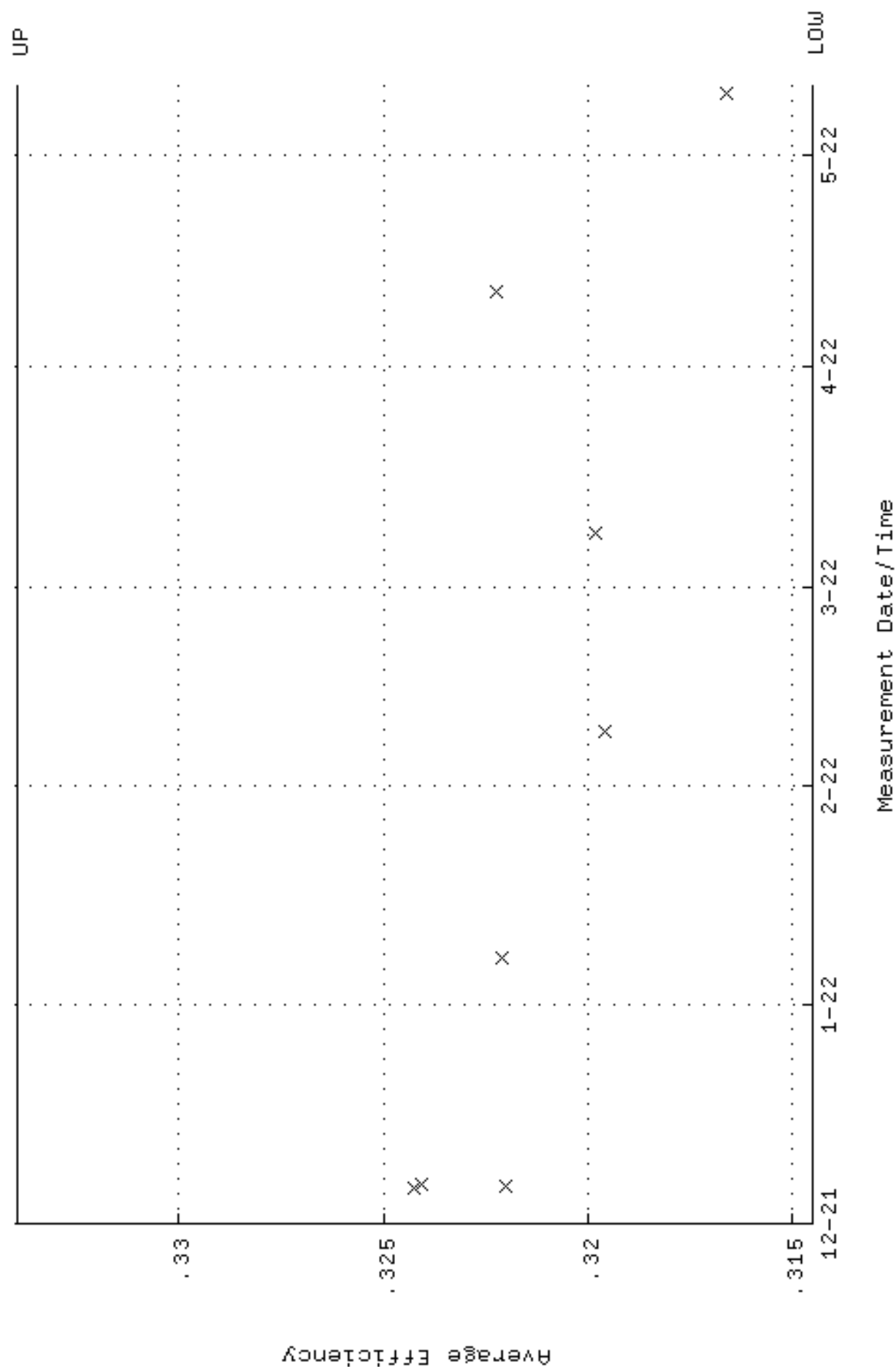
LOW

11-21 12-21 1-22 2-22 3-22 4-22 5-22

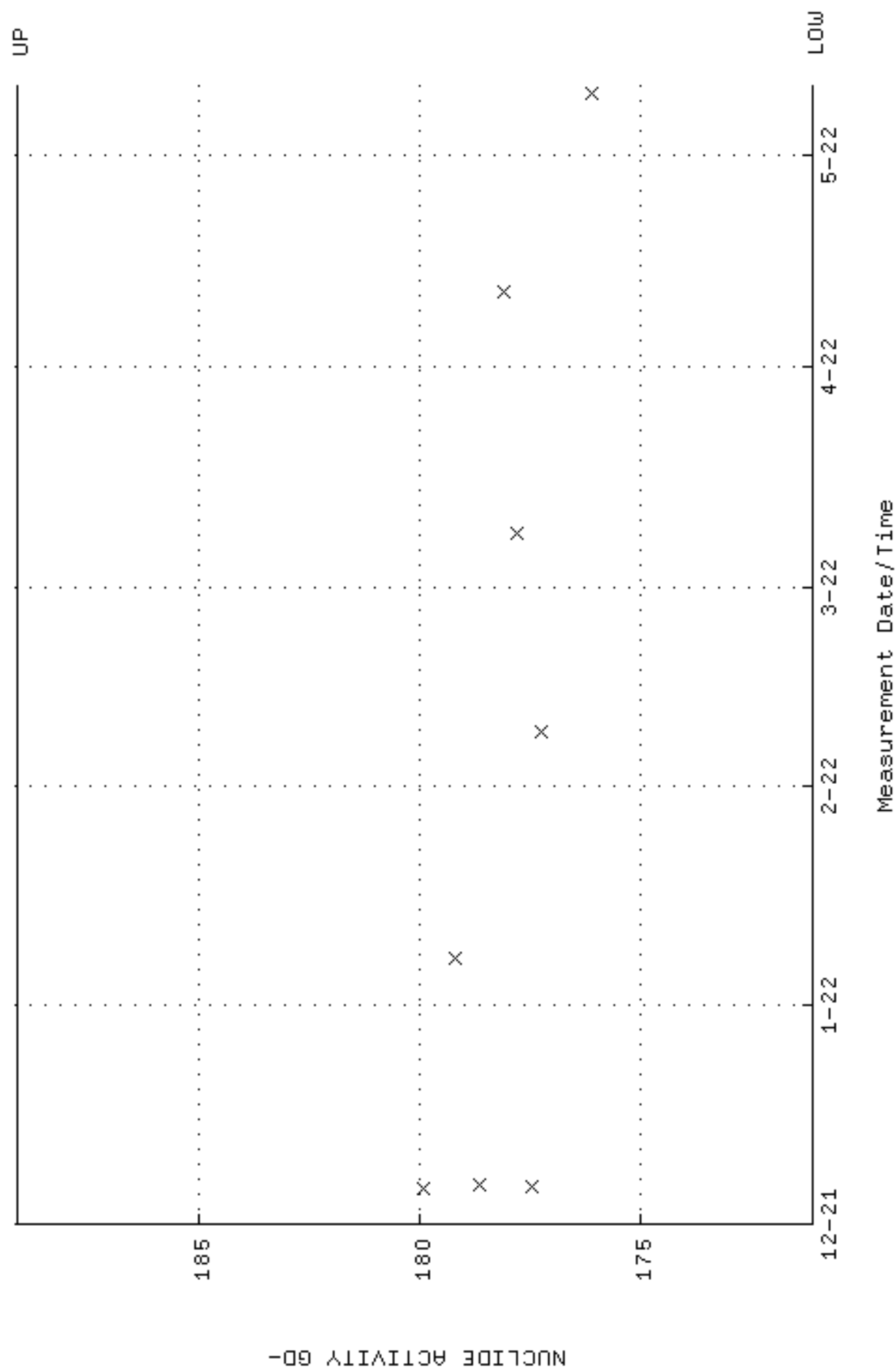
.01

0

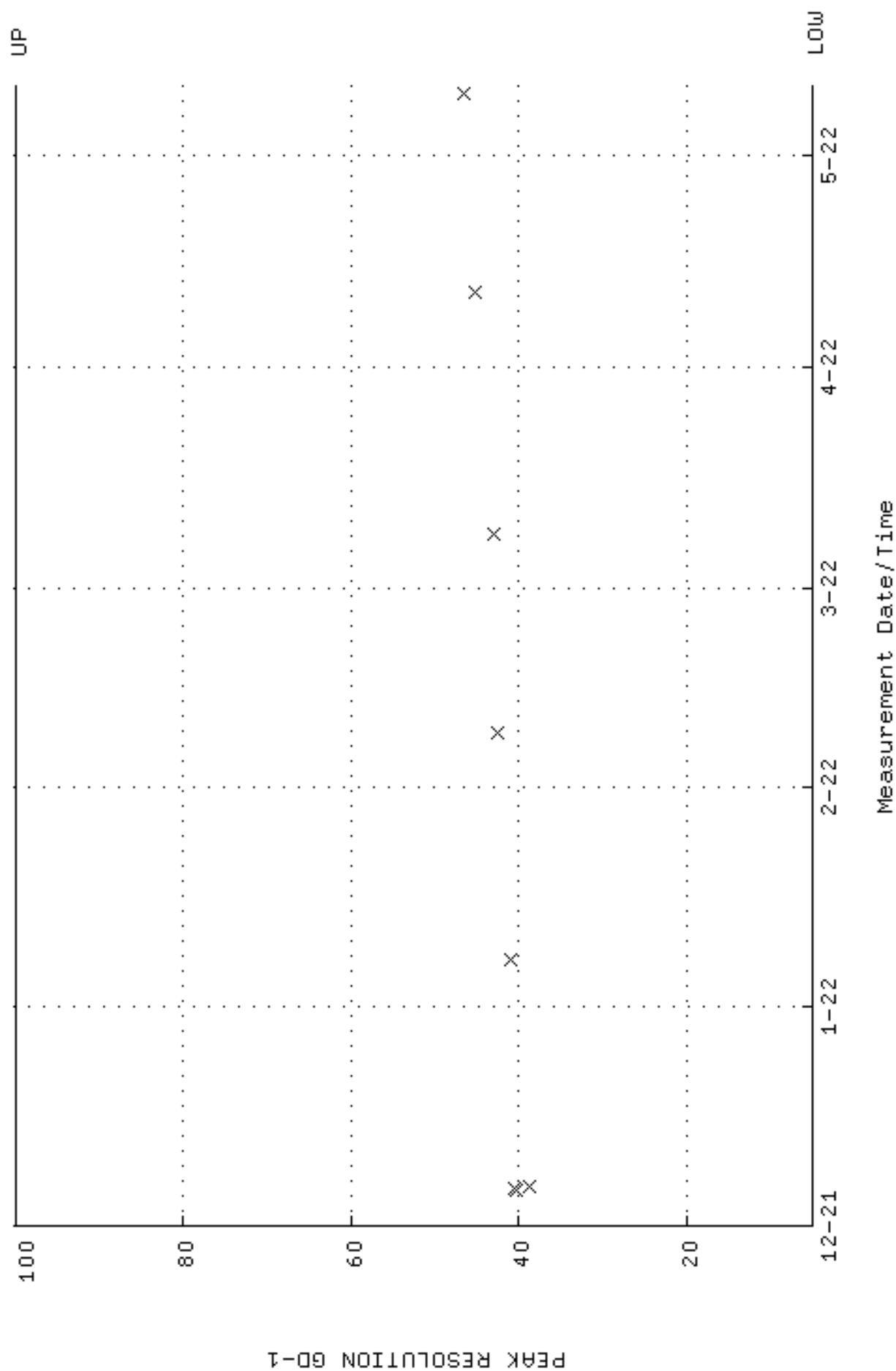
QA filename : DKA100:[ENV_ALPHA.QA.W]W088.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-DEC-2021 21:23:02 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.314500 through 0.333950



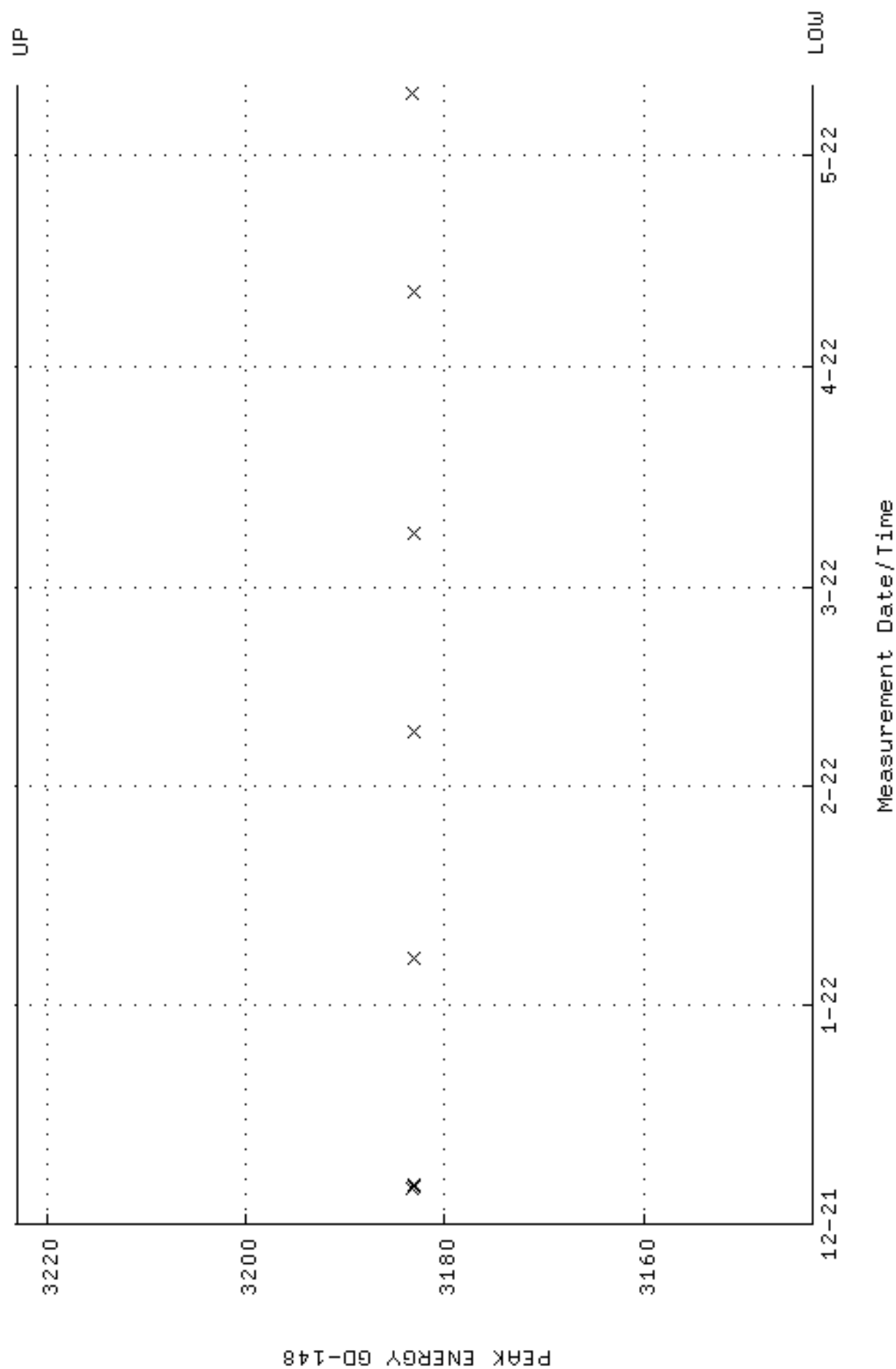
QA filename : DKA100:[ENV_ALPHA.QA.W]W088.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:02 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



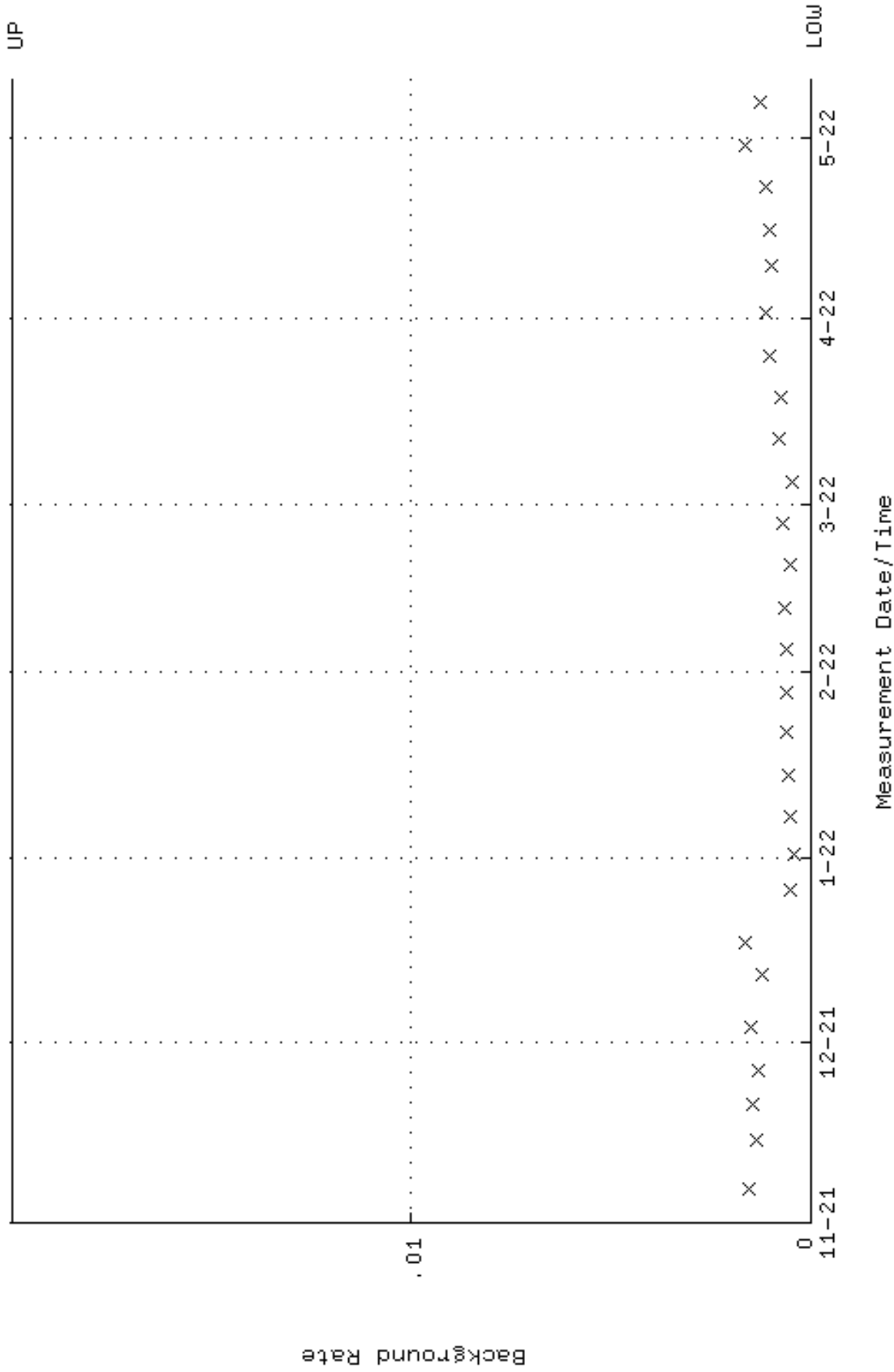
QA filename : DKA100:[ENV_ALPHA.QA.W]W088.QAF;11
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-DEC-2021 21:23:02 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



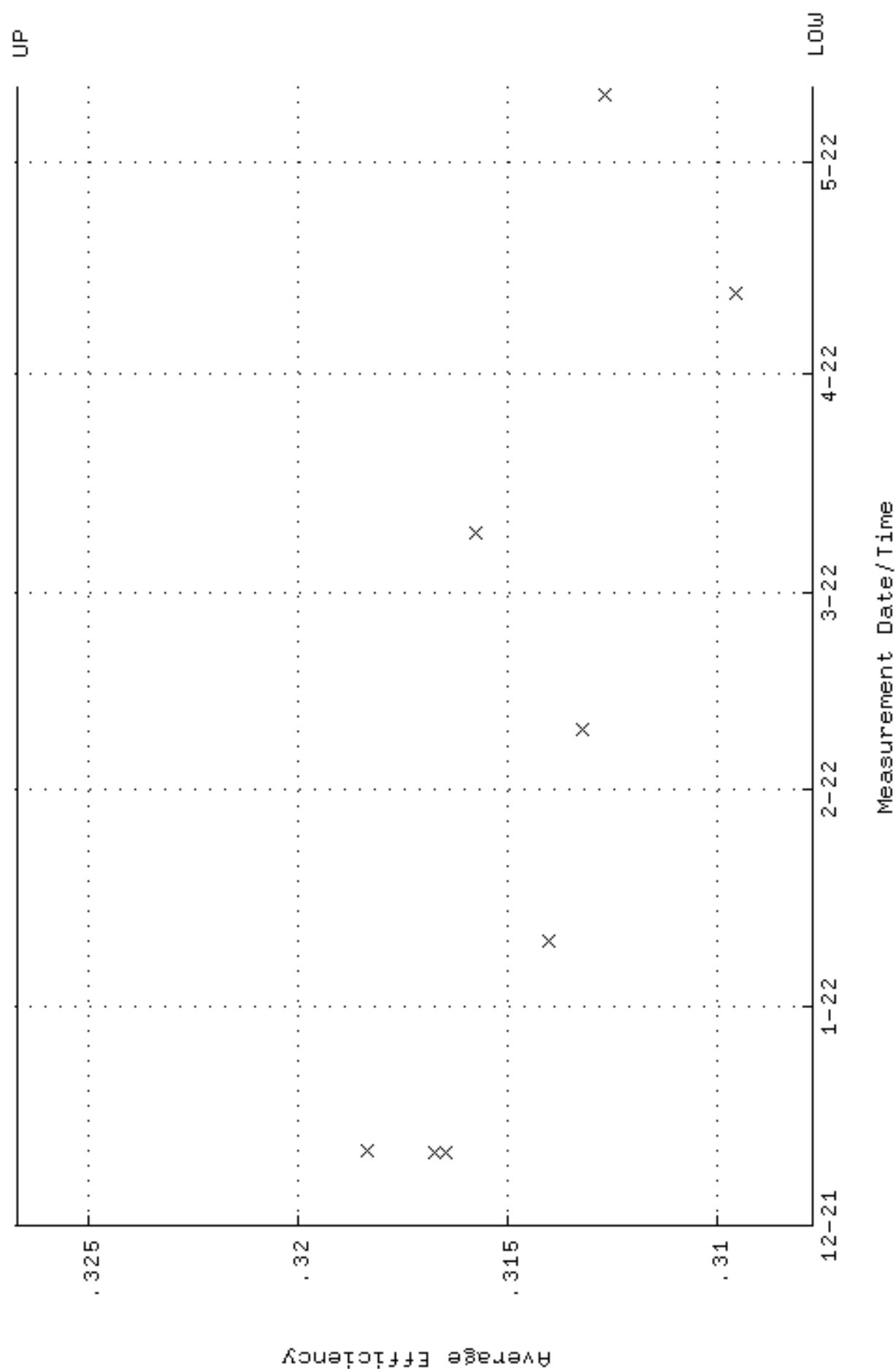
QA filename : DKA100:[ENV_ALPHA.QA.W]W088.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:02 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



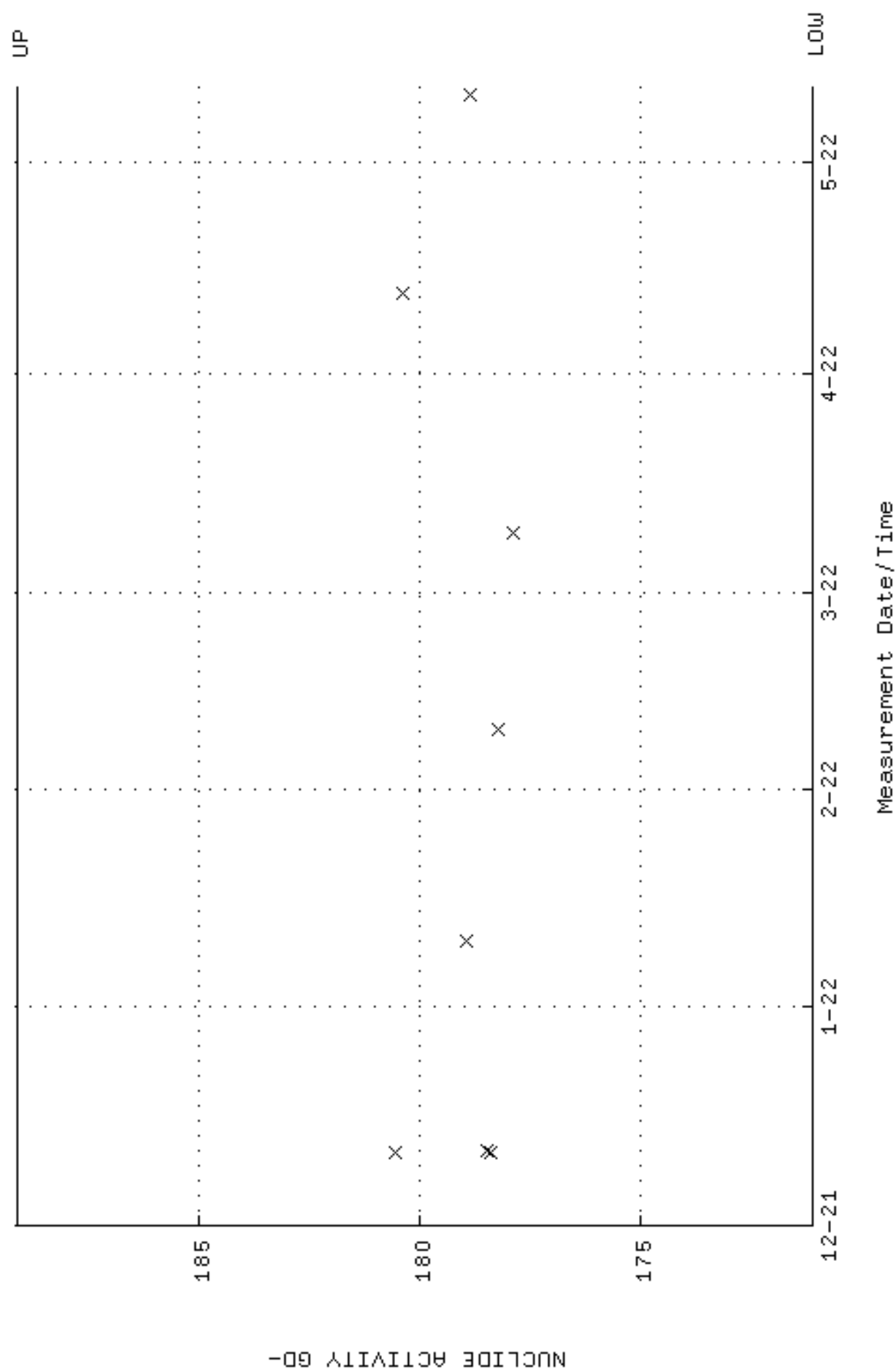
QA filename : DKA100:[ENV_ALPHA.QA.B]B088.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-NOV-2021 16:55:29 through 10-MAY-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



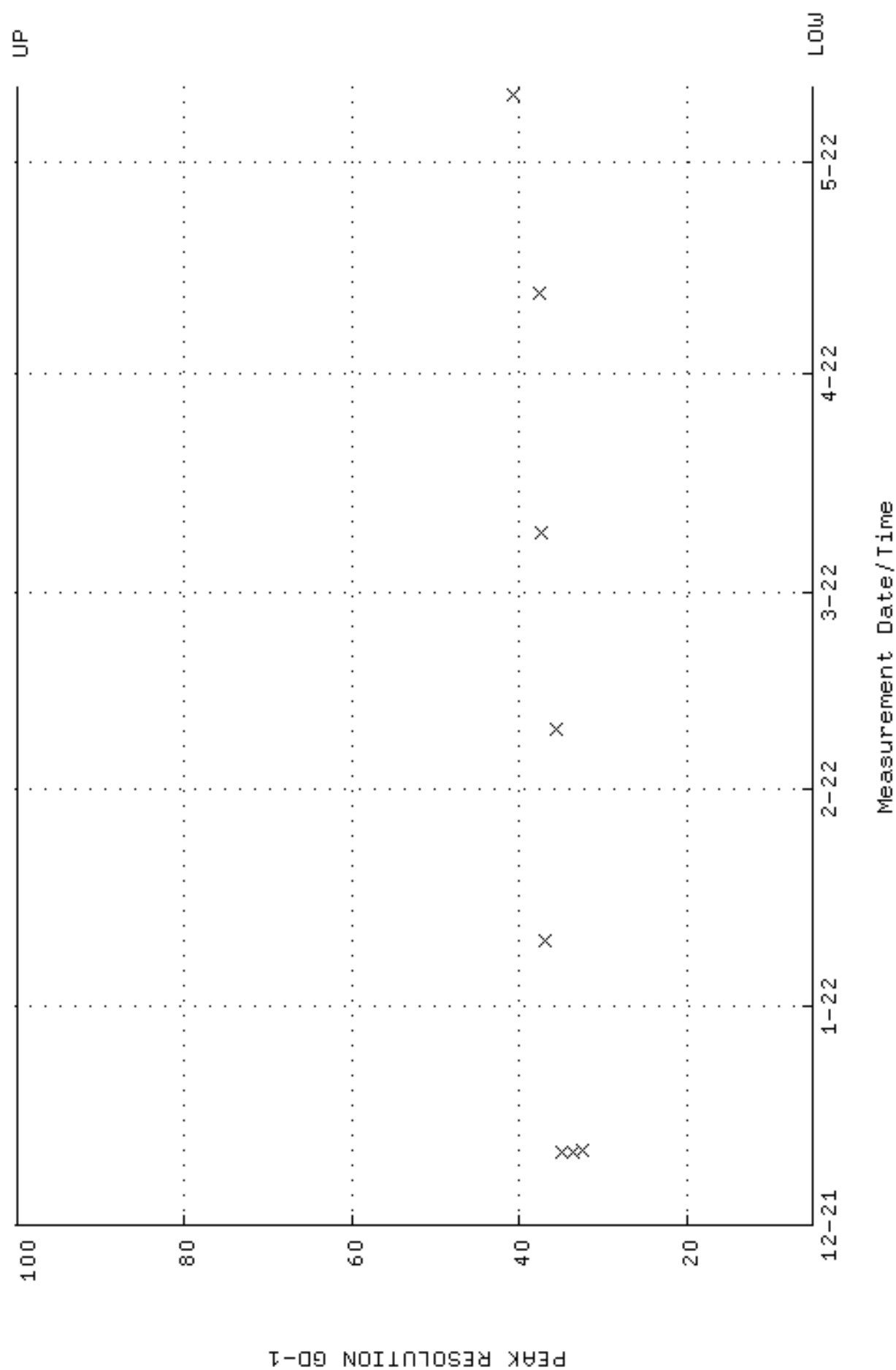
QA filename : DKA100:[ENV_ALPHA.QA.W]W089.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.307700 through 0.326700



QA filename : DKA100:[ENV_ALPHA.QA.W]W089.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W089.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



QA filename : DKA100:[ENV_ALPHA.QA.W]W089.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00

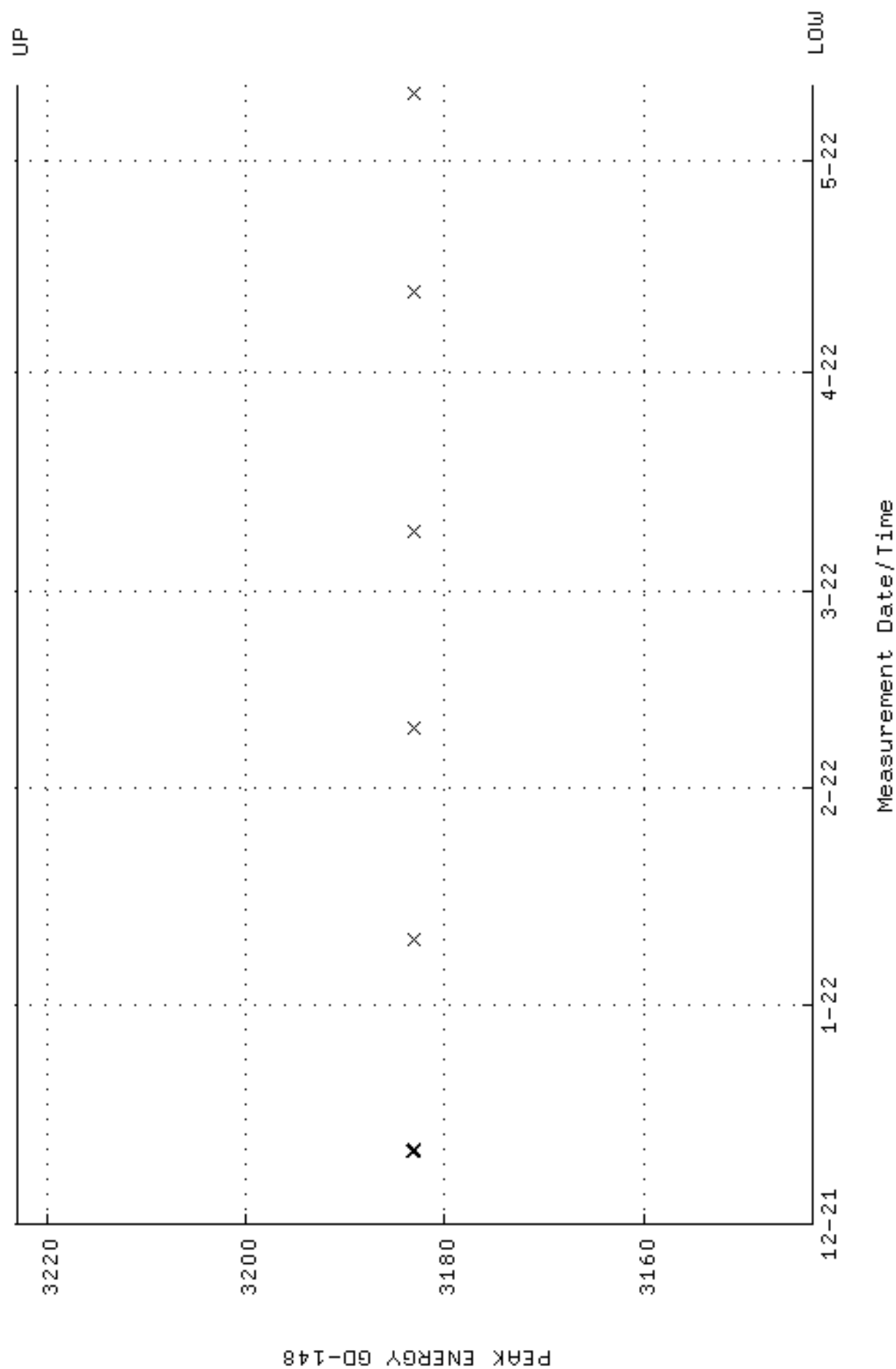
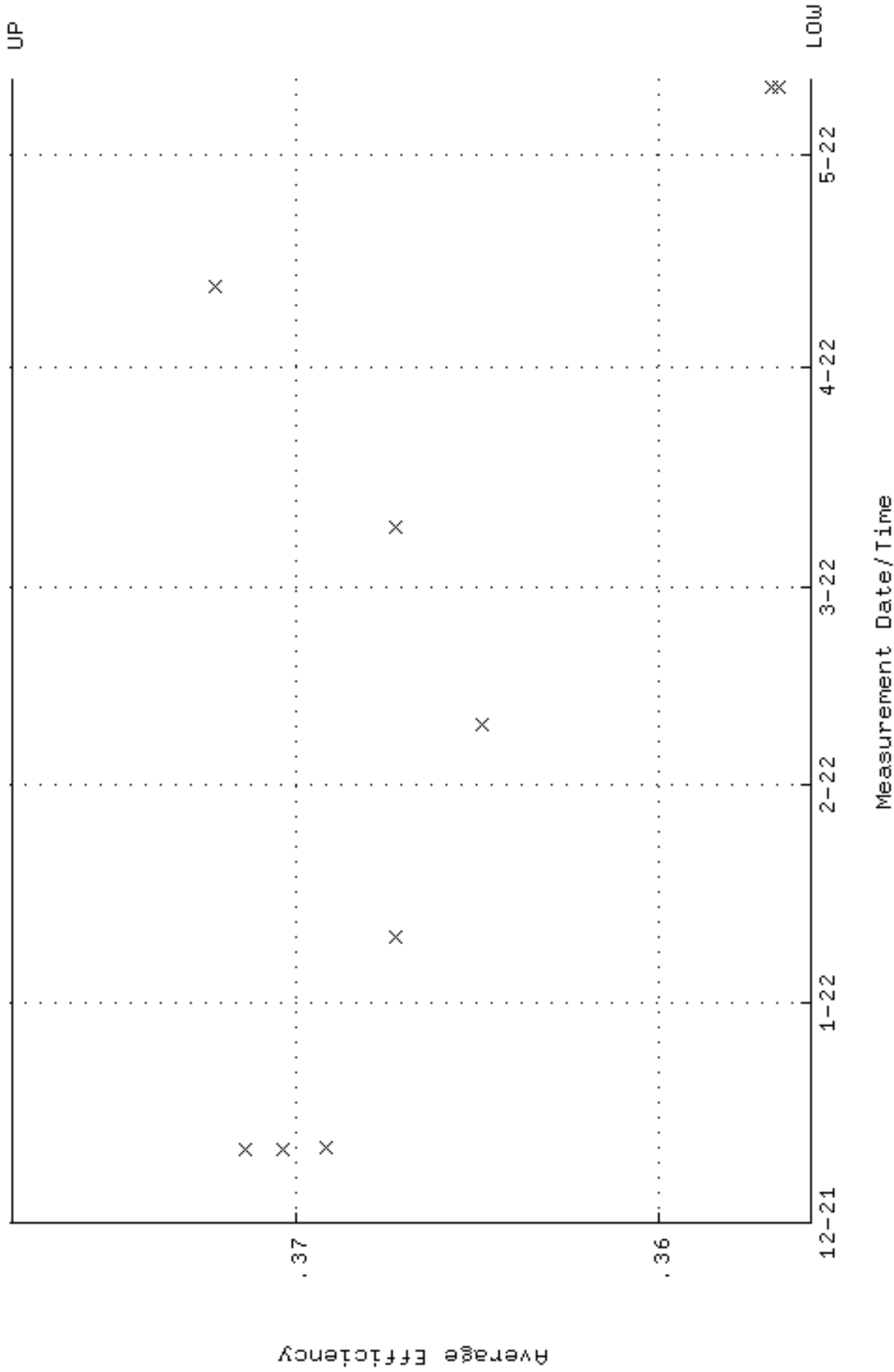
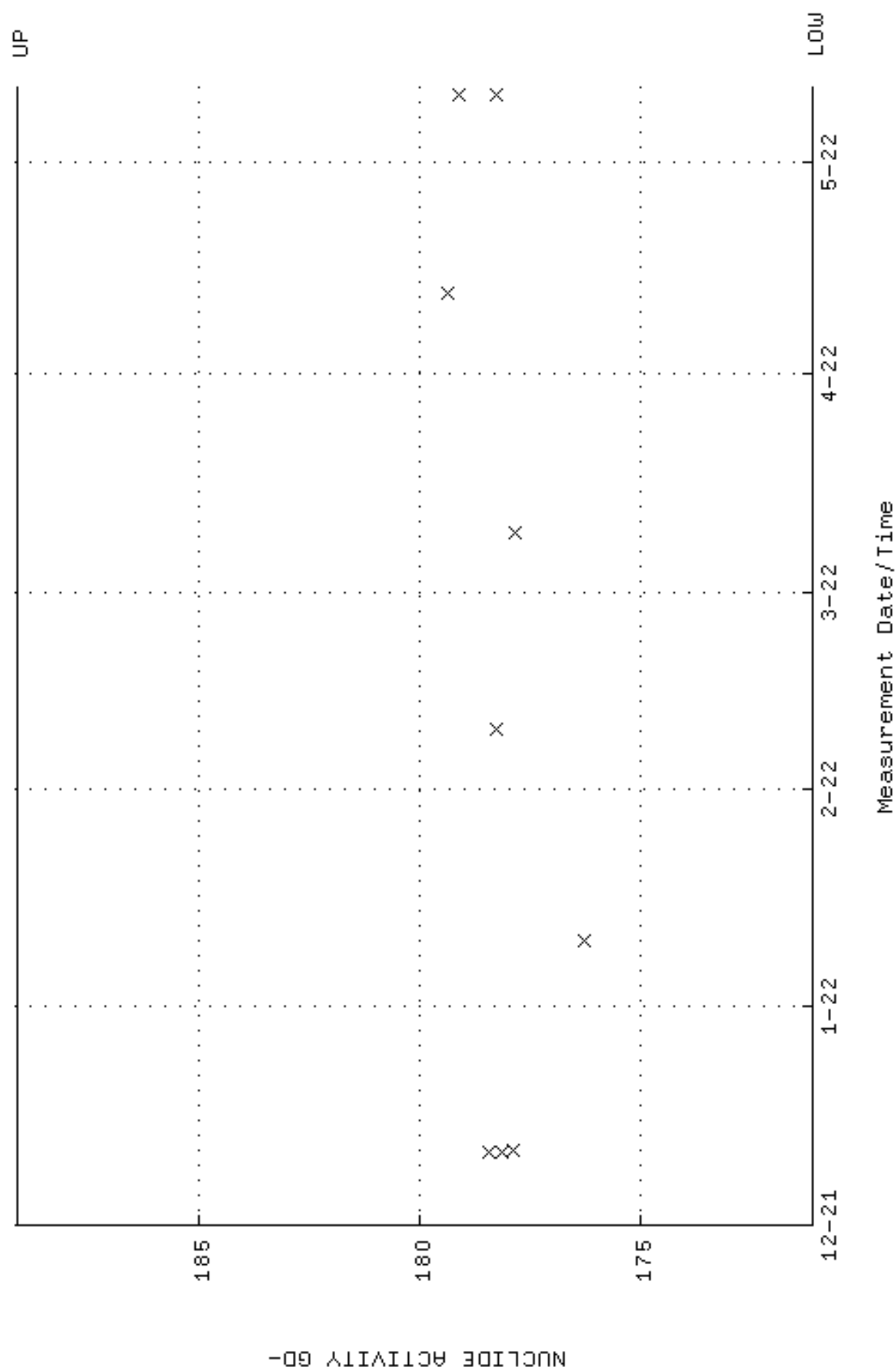


Figure 1 is a line graph showing the Background Rate (Y-axis, ranging from 0 to 0.08) versus the number of days since the last observation (X-axis, ranging from 11-21 to 5-22). The graph displays a decreasing trend in the background rate over time, with a dashed line indicating a linear fit. The rate starts at approximately 0.075 on 11-21 and decreases to near 0 by 5-22.

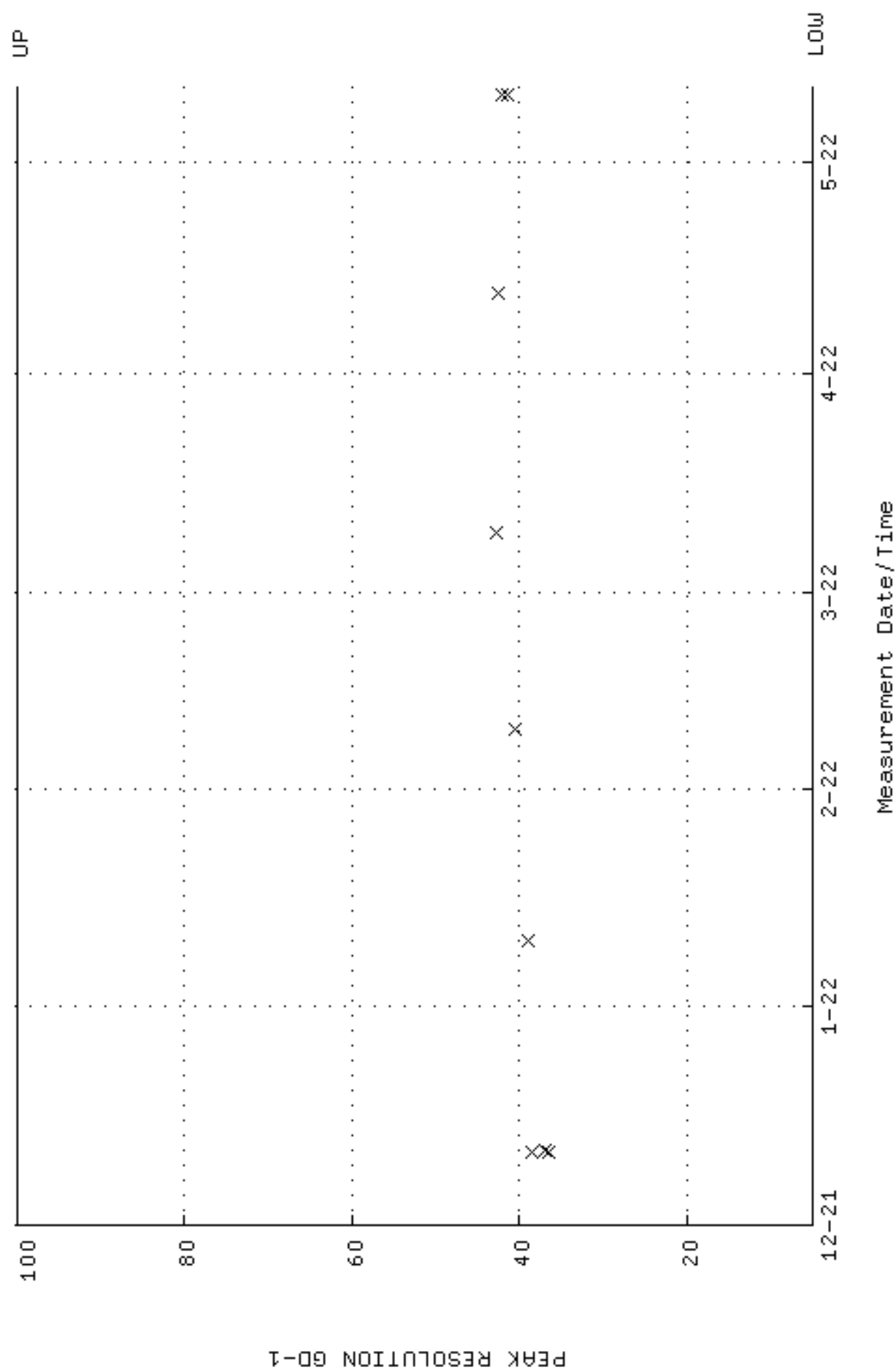
QA filename : DKA100:[ENV_ALPHA.QA.W]W090.QAF;9
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
Lower/Upper Lmts: 0.355780 through 0.377800



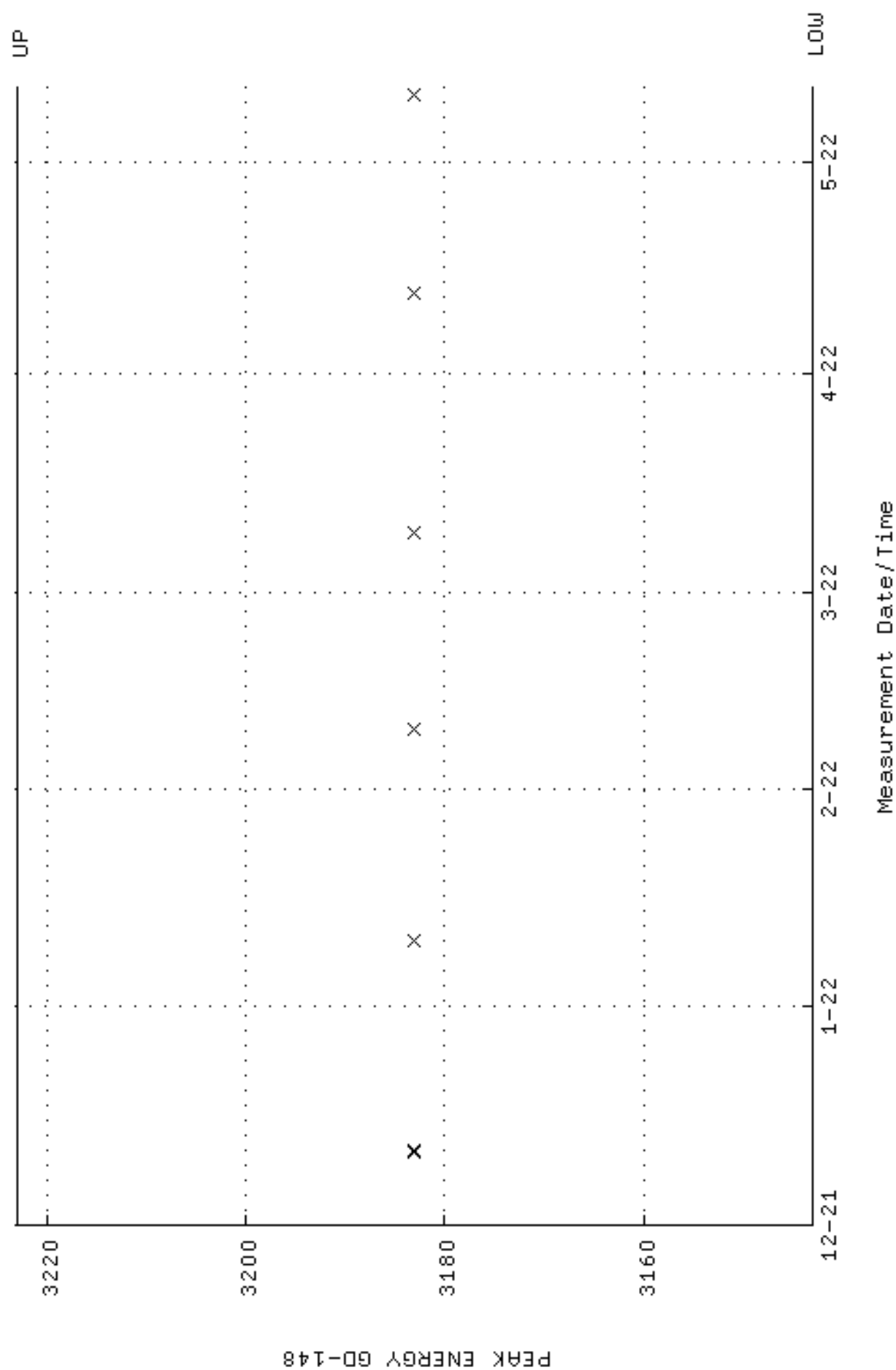
QA filename : DKA100:[ENV_ALPHA.QA.W]W090.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



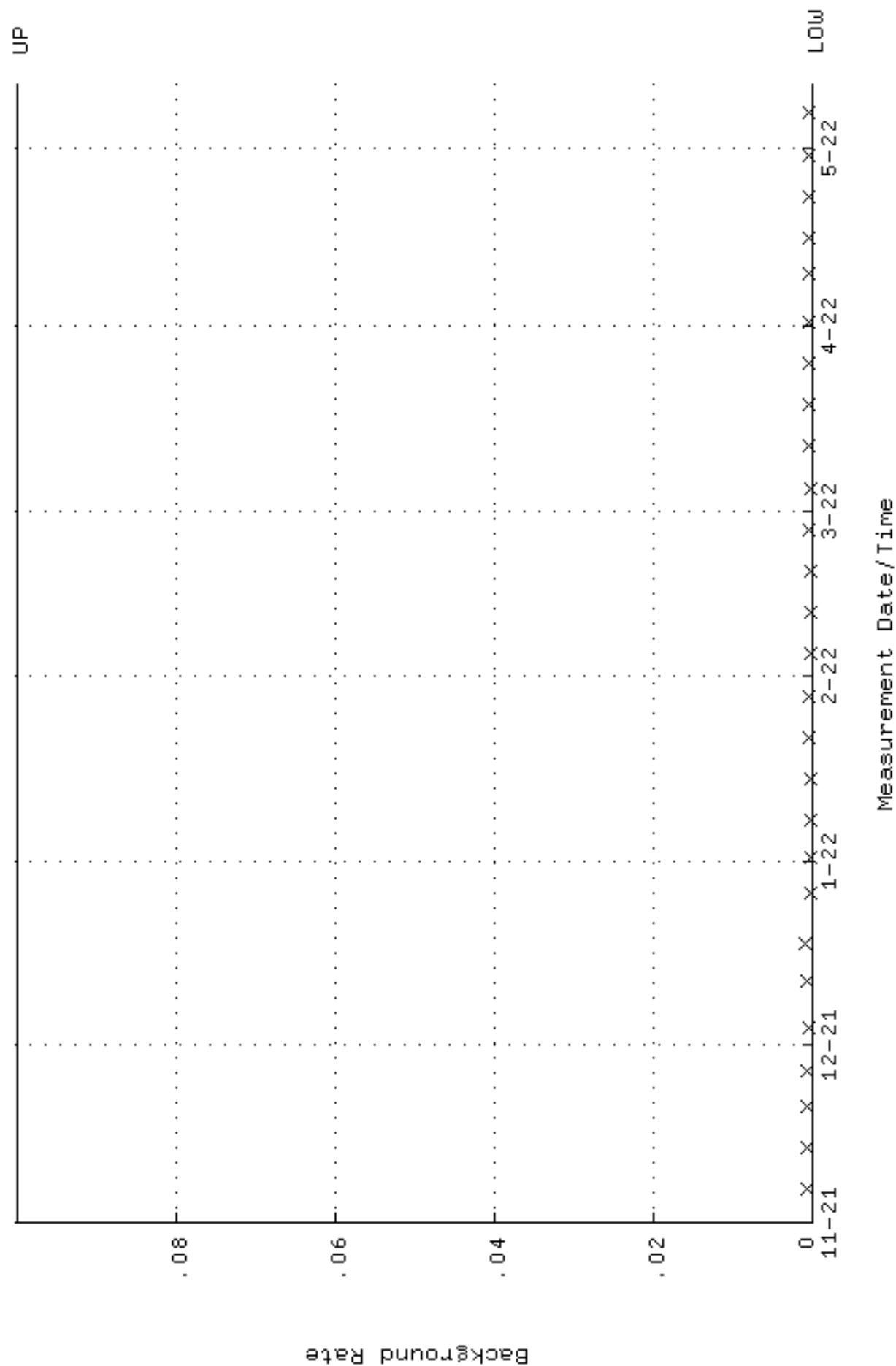
QA filename : DKA100:[ENV_ALPHA.QA.W]W090.QAF;9
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



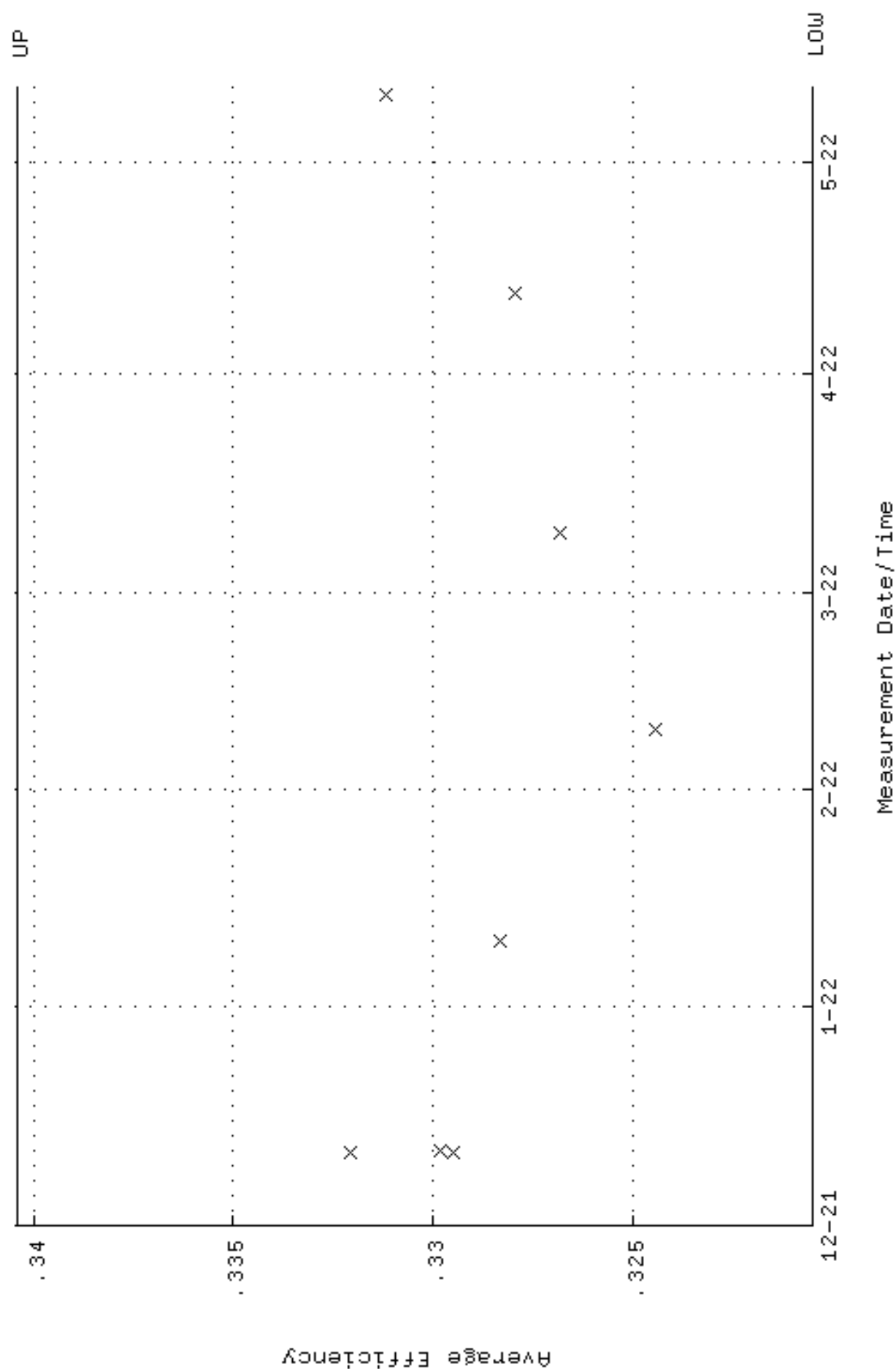
QA filename : DKA100:[ENV_ALPHA.QA.W]W090.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



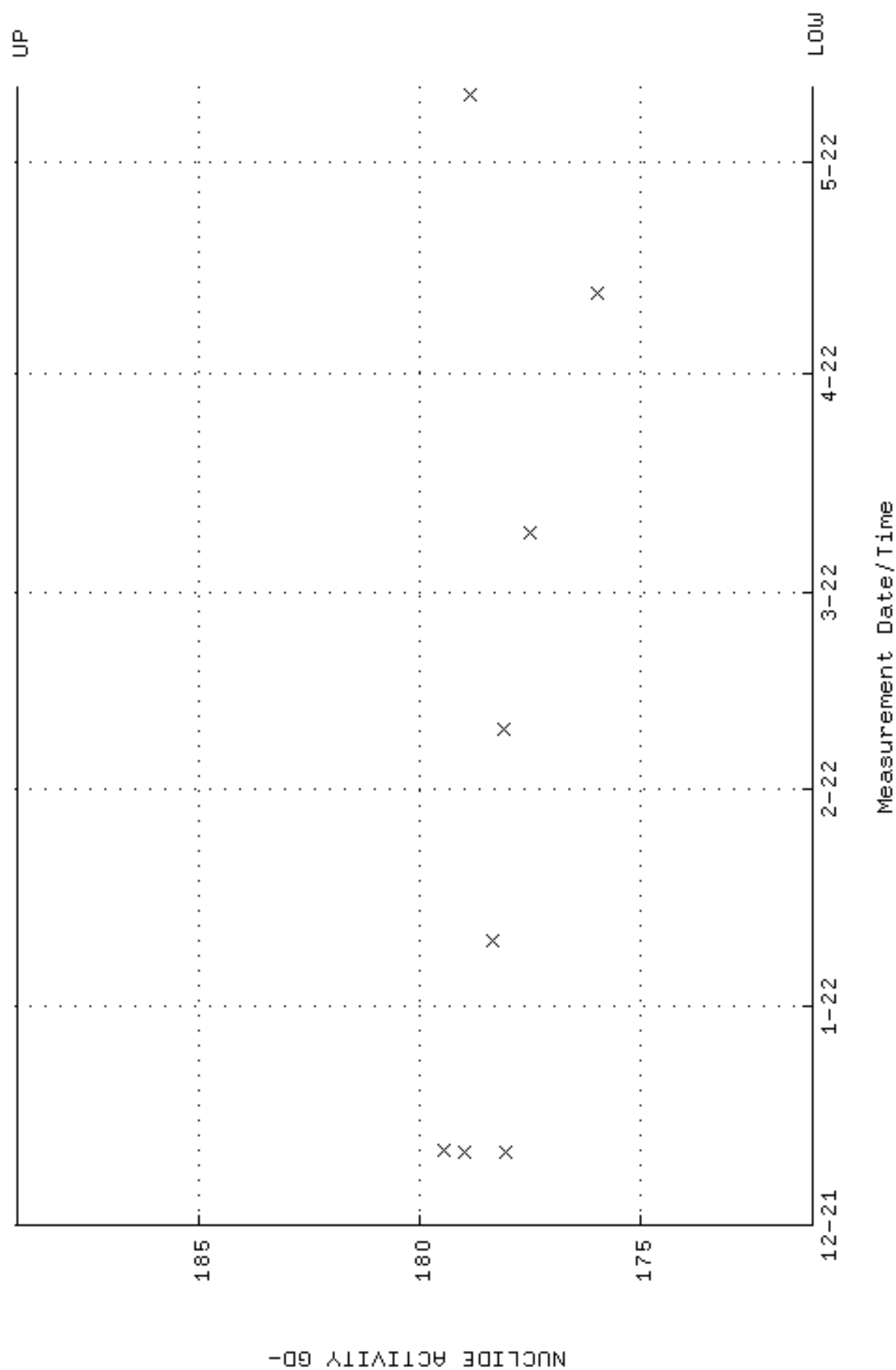
QA filename : DKA100:[ENV_ALPHA.QA.B]B090.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 16:55:30 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



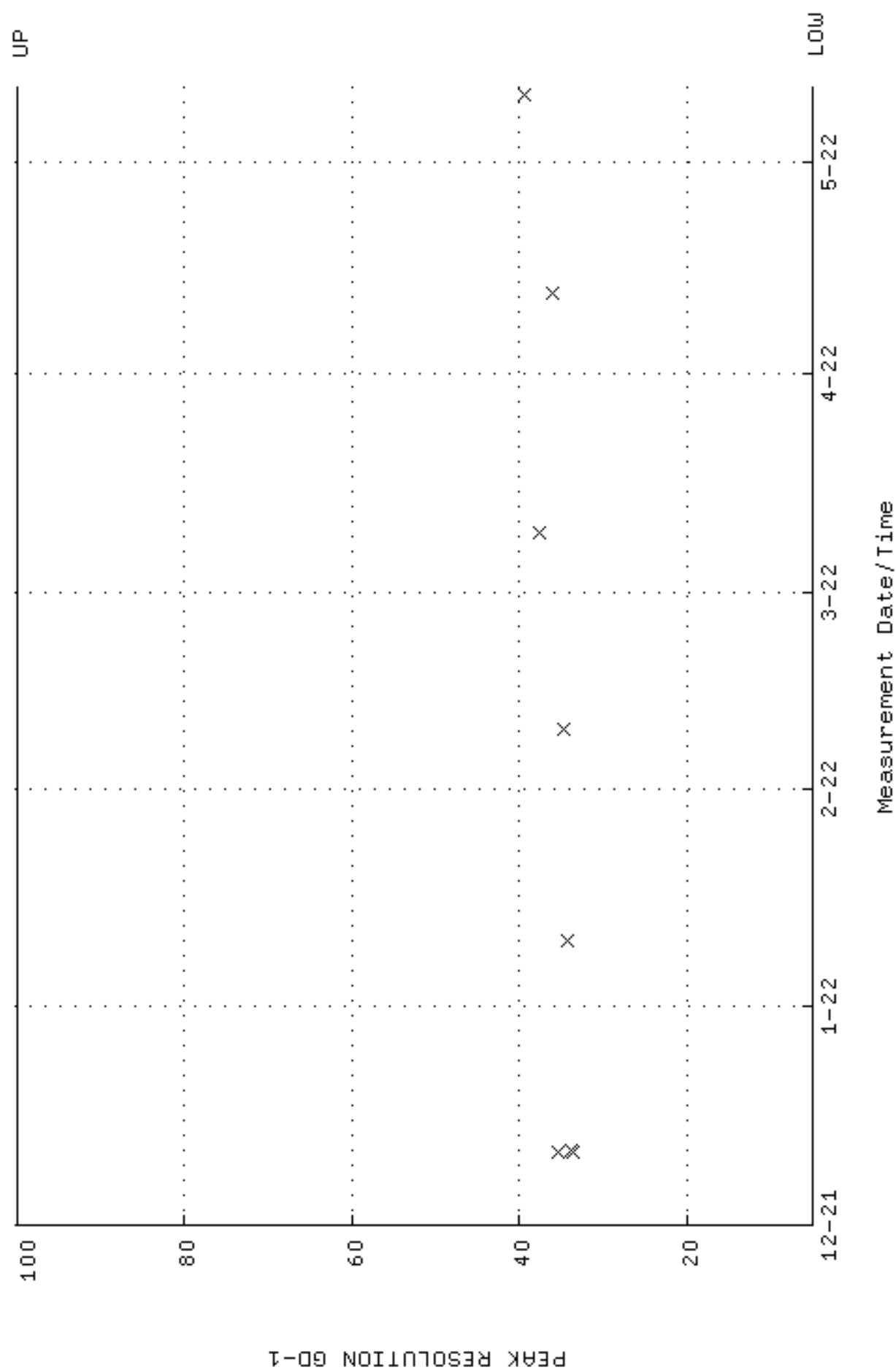
QA filename : DKA100:[ENV_ALPHA.QA.W]W092.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.320500 through 0.340400



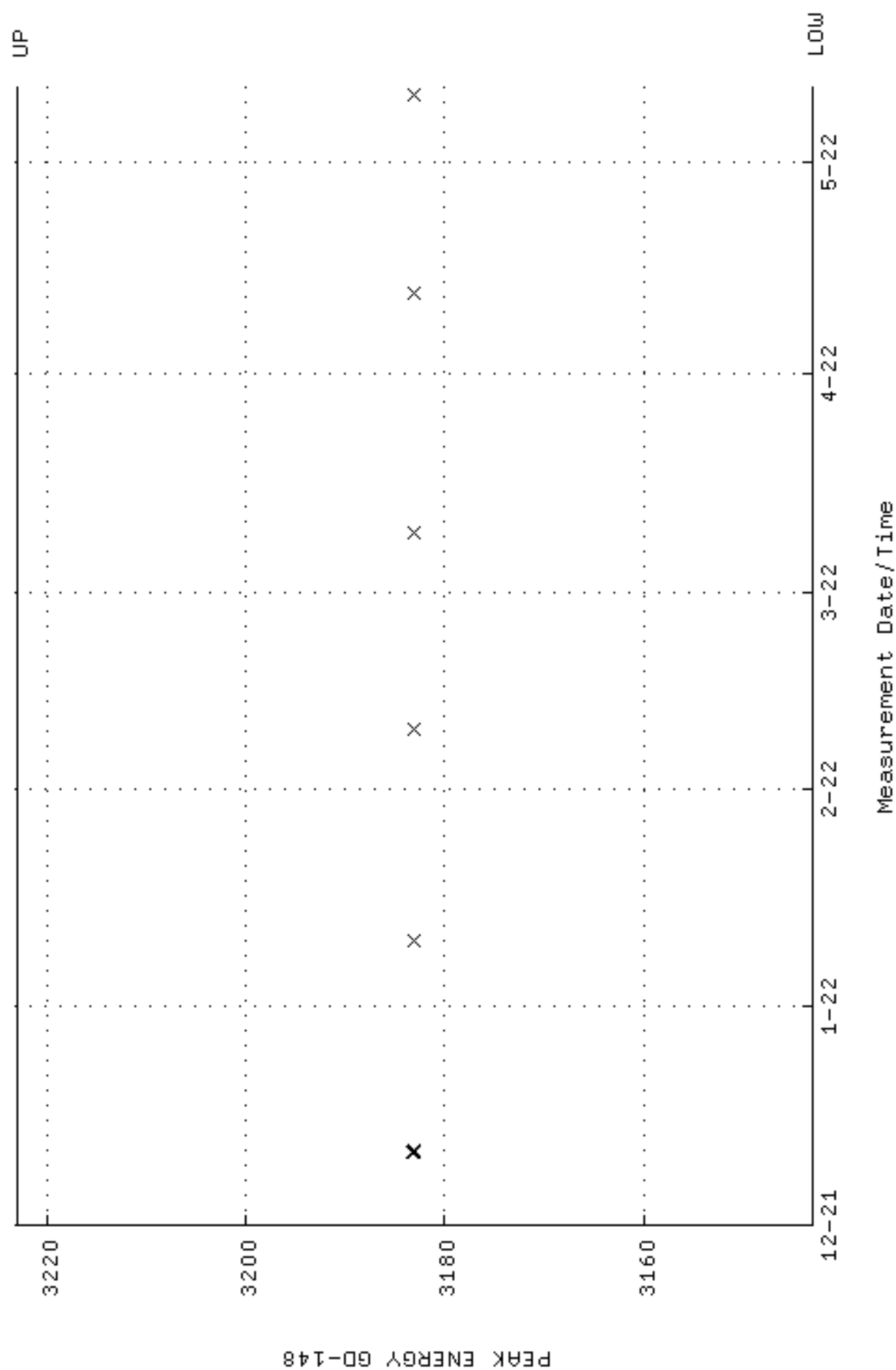
QA filename : DKA100:[ENV_ALPHA.QA.W]W092.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



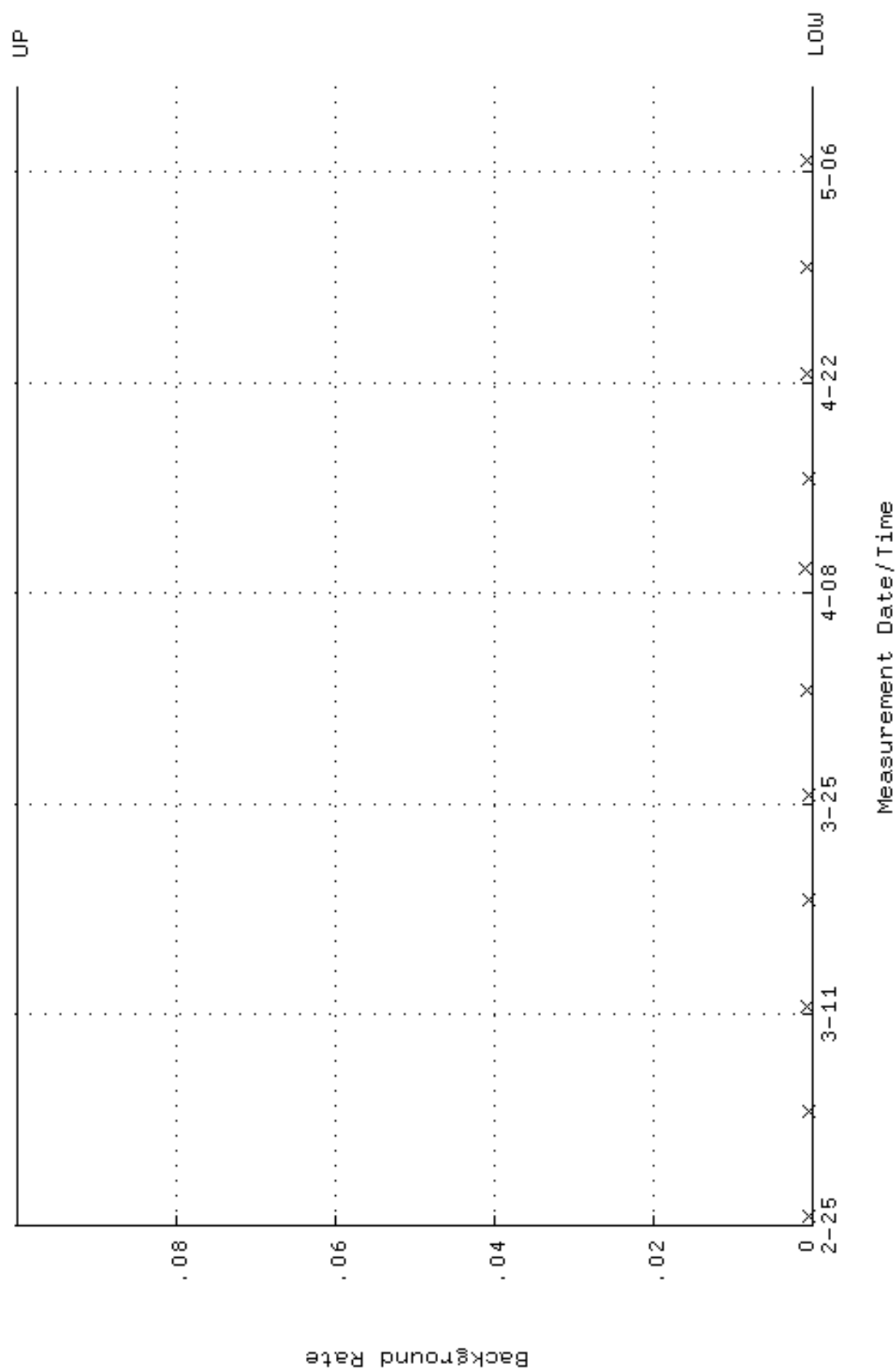
QA filename : DKA100:[ENV_ALPHA.QA.W]W092.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



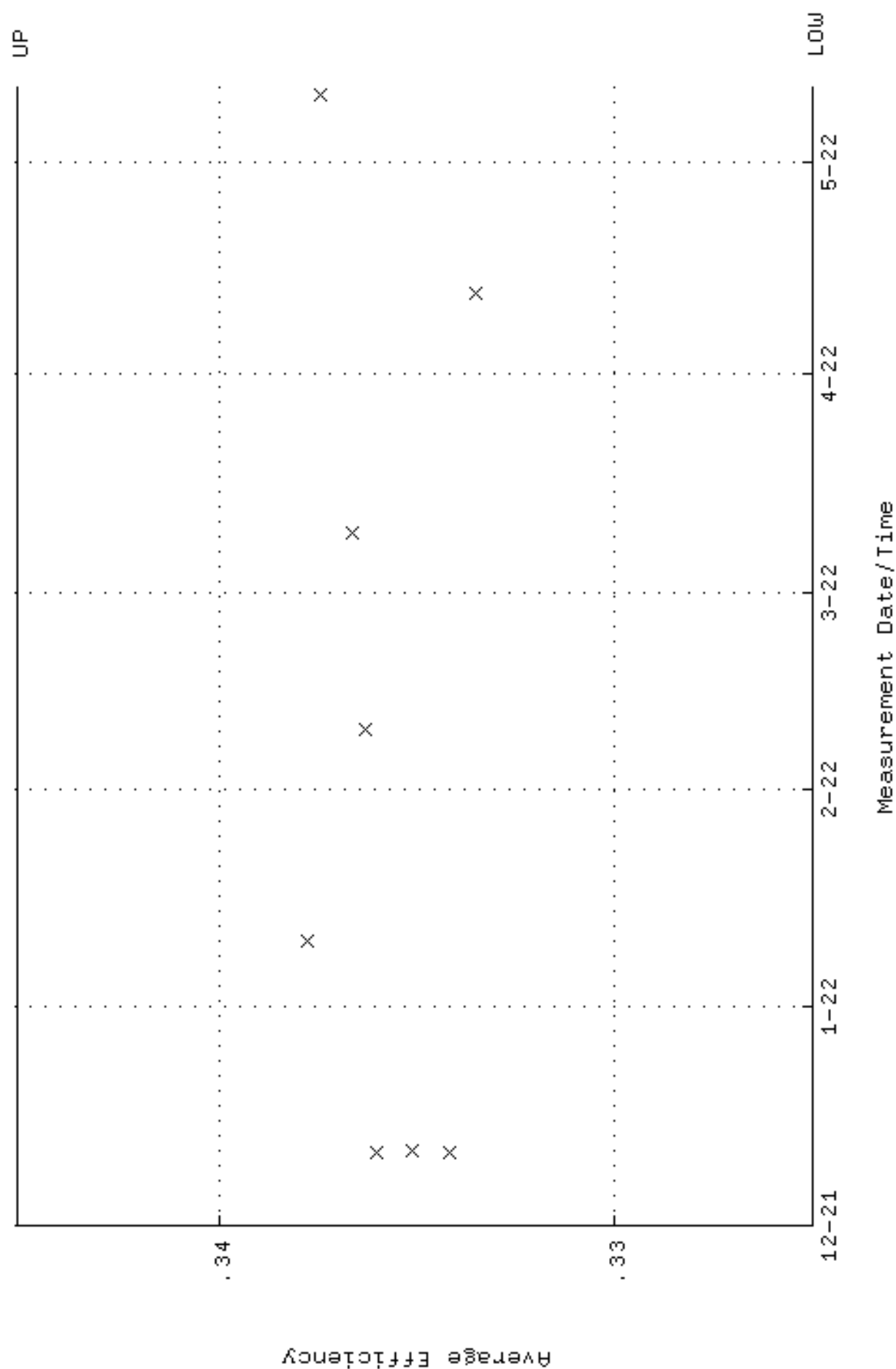
QA filename : DKA100:[ENV_ALPHA.QA.W]W092.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



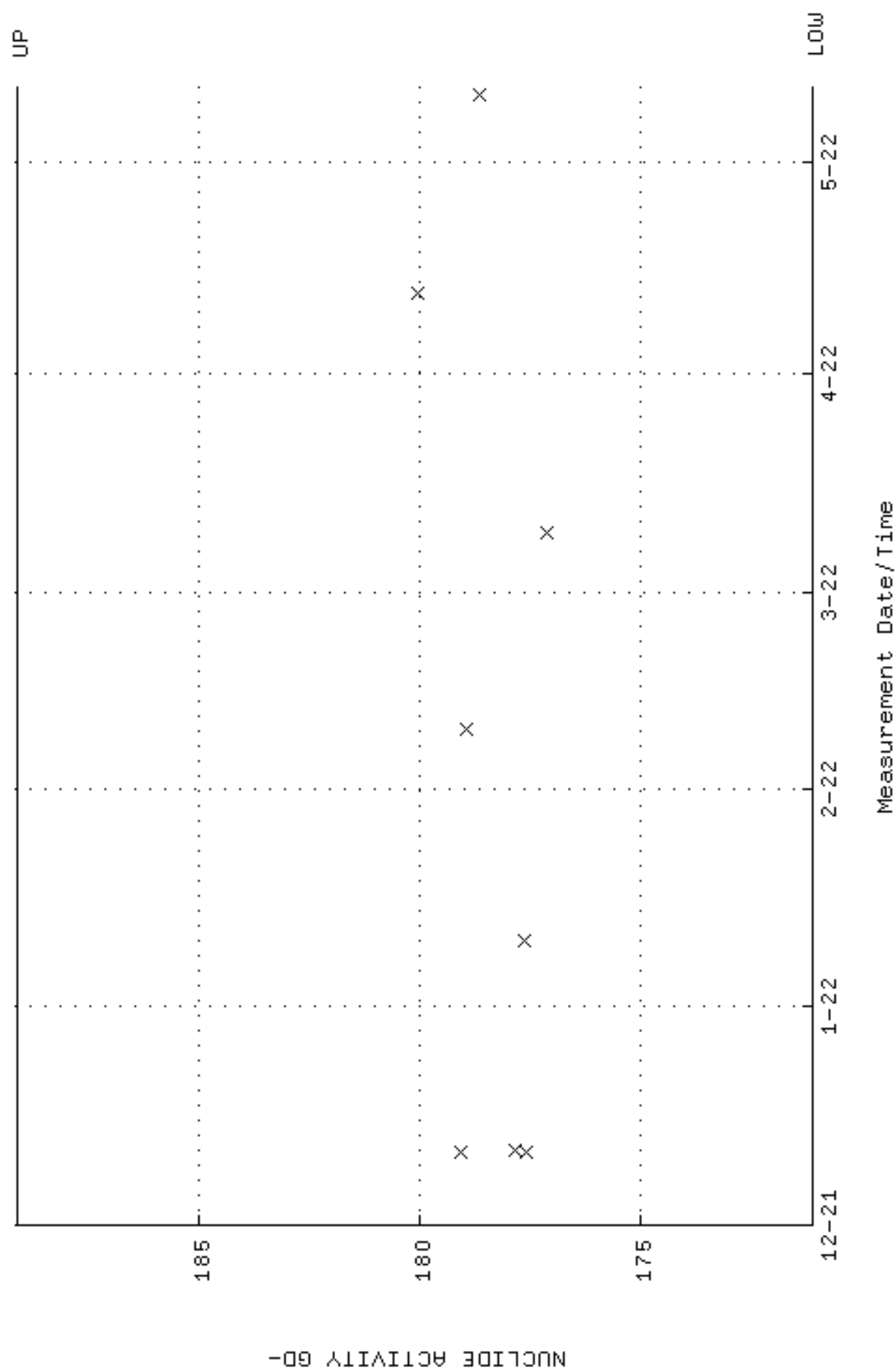
QA filename : DKA100:[ENV_ALPHA.QA.B]B092.QAF;3
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 25-FEB-2022 13:41:45 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



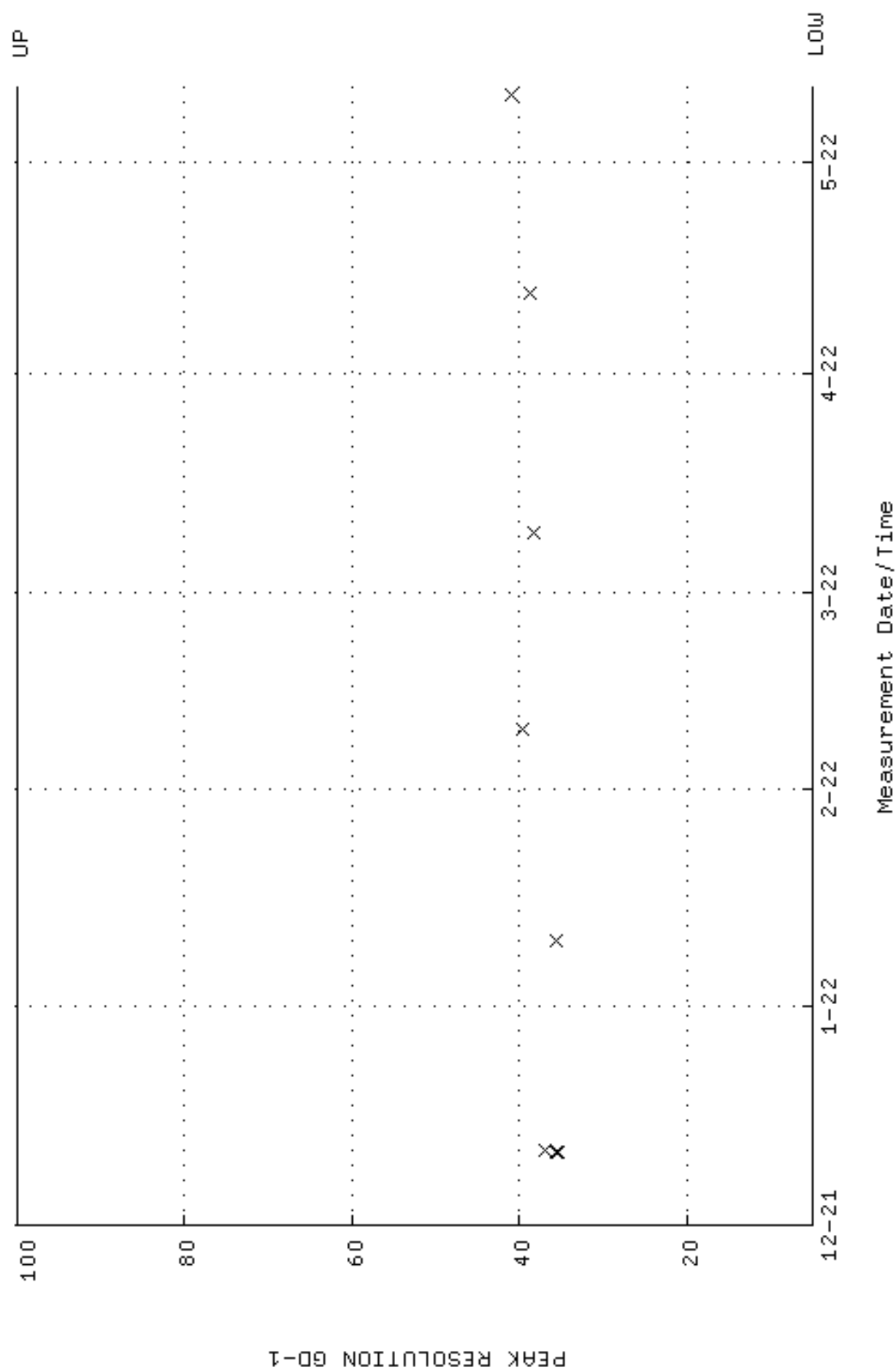
QA filename : DKA100:[ENV_ALPHA.QA.W]W093.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.325000 through 0.345100



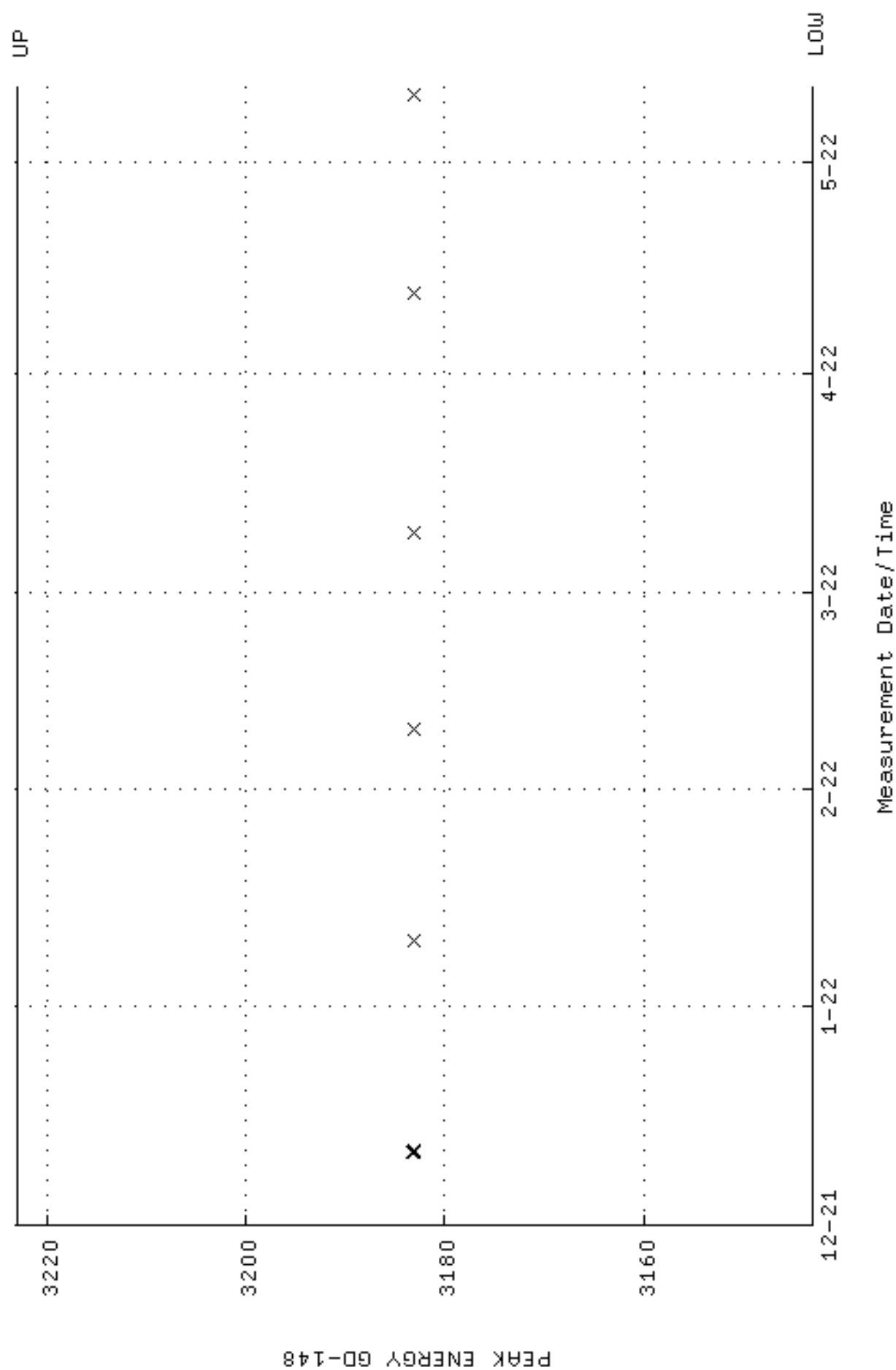
QA filename : DKA100:[ENV_ALPHA.QA.W]W093.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



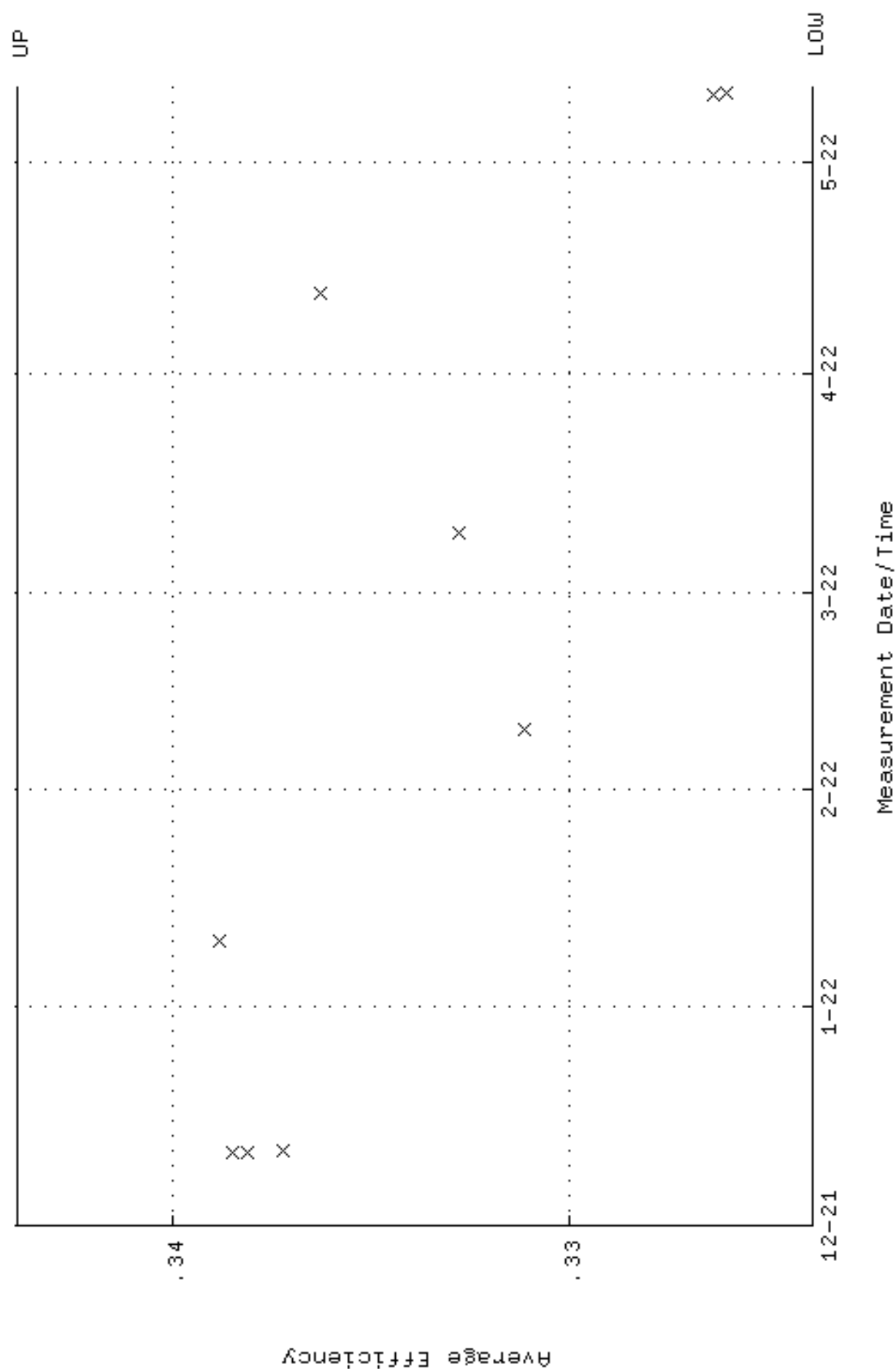
QA filename : DKA100:[ENV_ALPHA.QA.W]W093.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



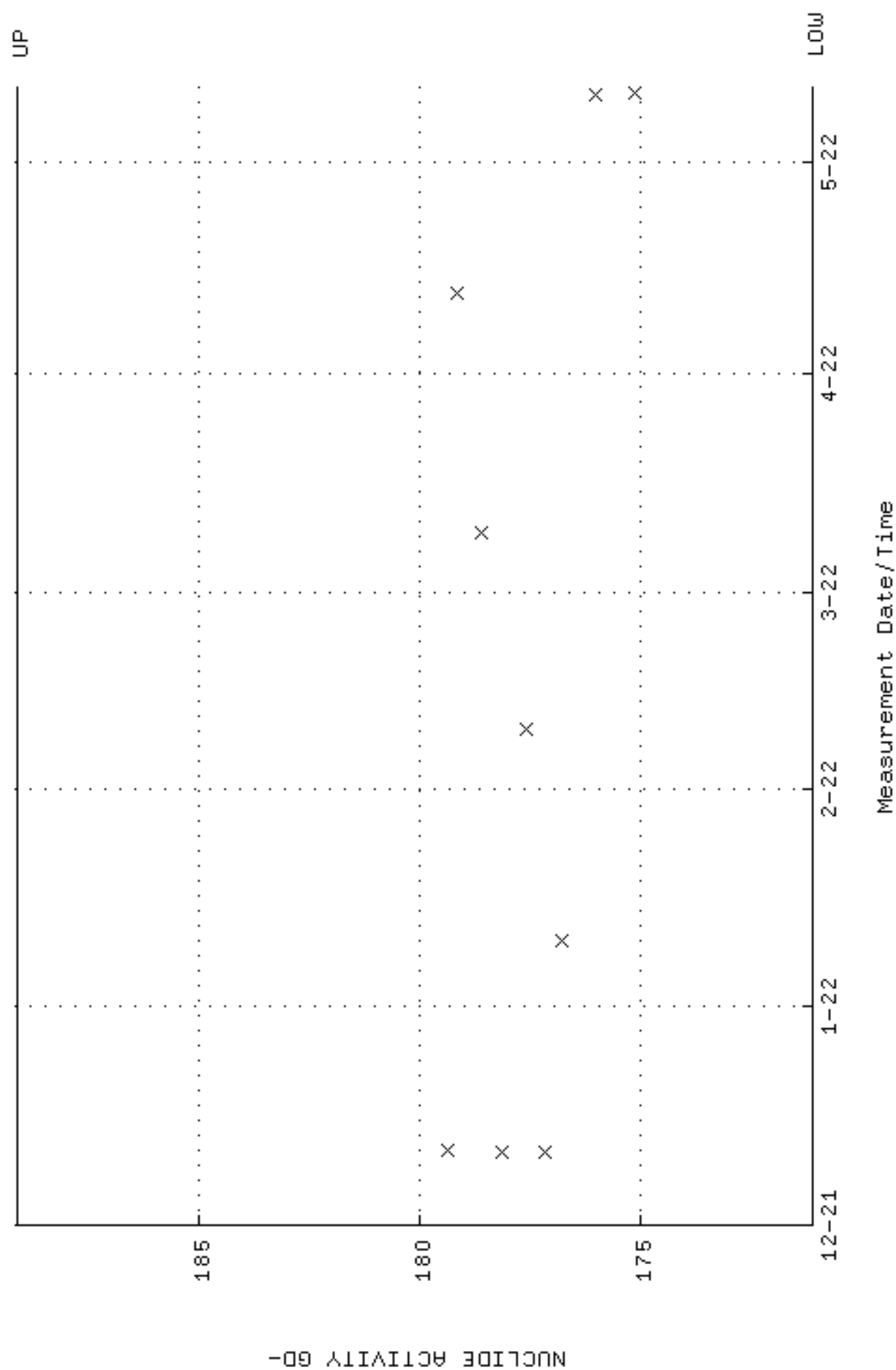
QA filename : DKA100:[ENV_ALPHA.QA.W]W093.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:29 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



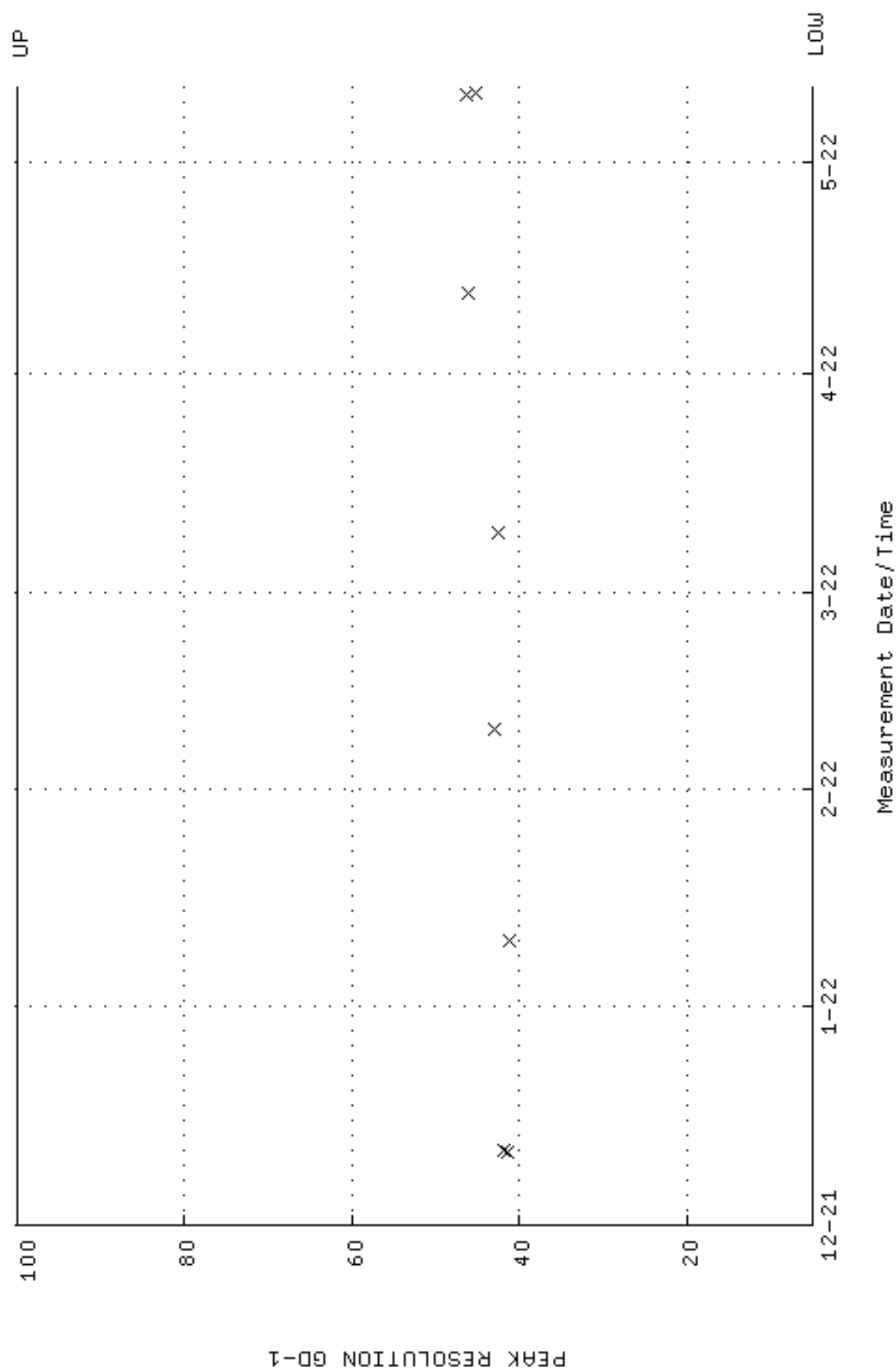
QA filename : DKA100:[ENV_ALPHA.QA.W]W110.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.323870 through 0.343904



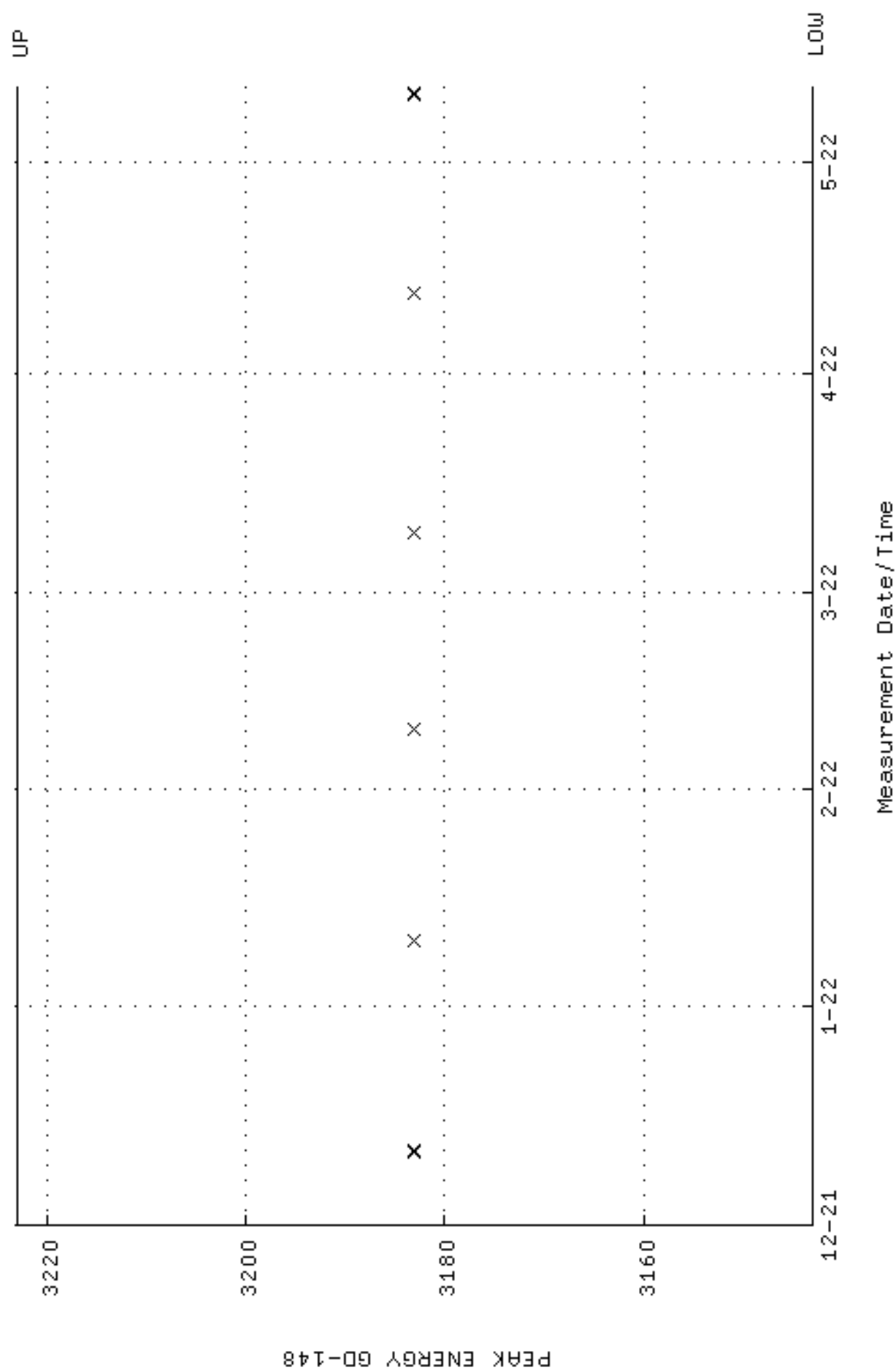
QA filename : DKA100:[ENV_ALPHA.QA.W]W110.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



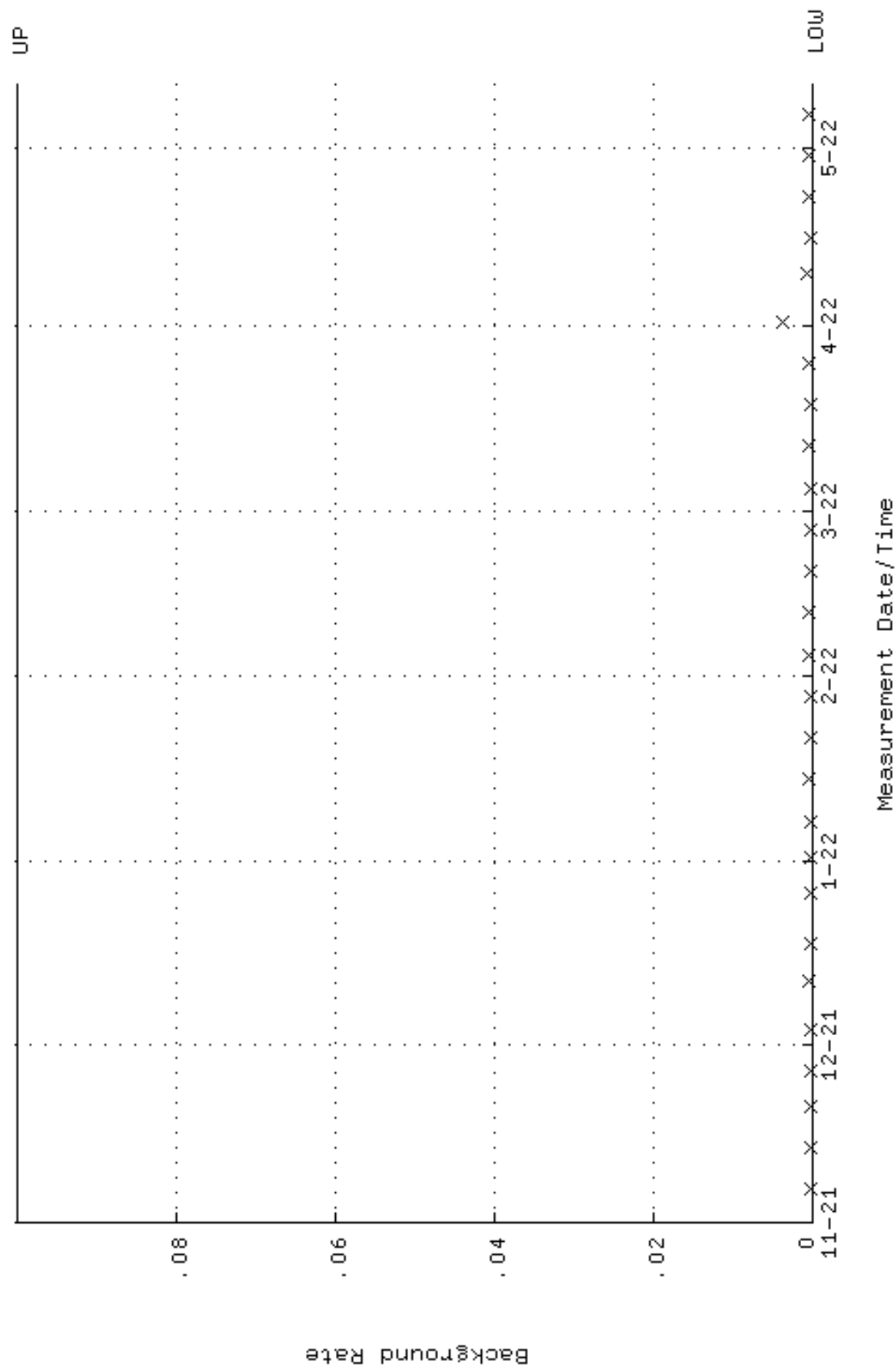
QA filename : DKA100:[ENV_ALPHA.QA.W]W110.QAF;11
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



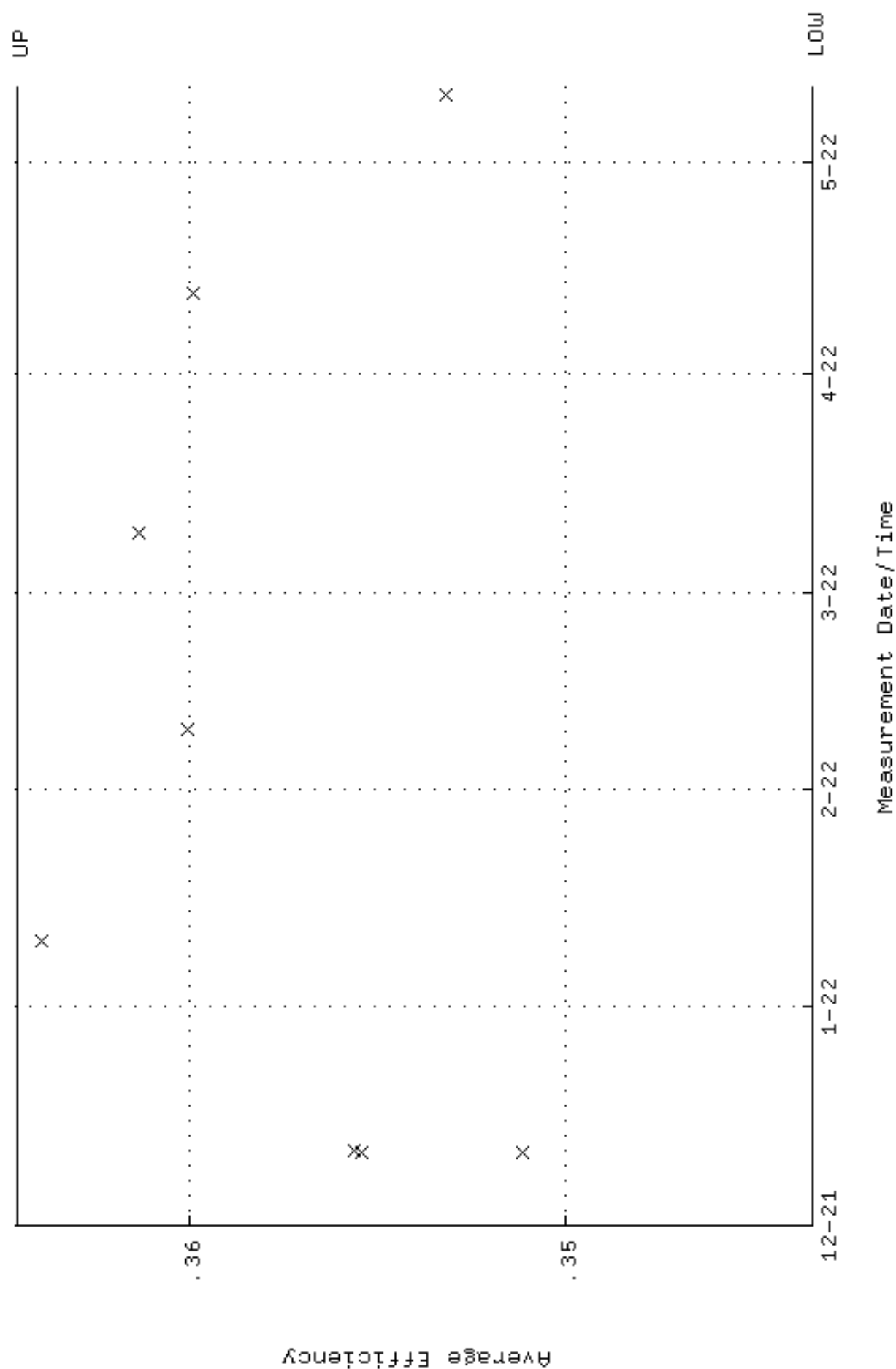
QA filename : DKA100:[ENV_ALPHA.QA.W]W110.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



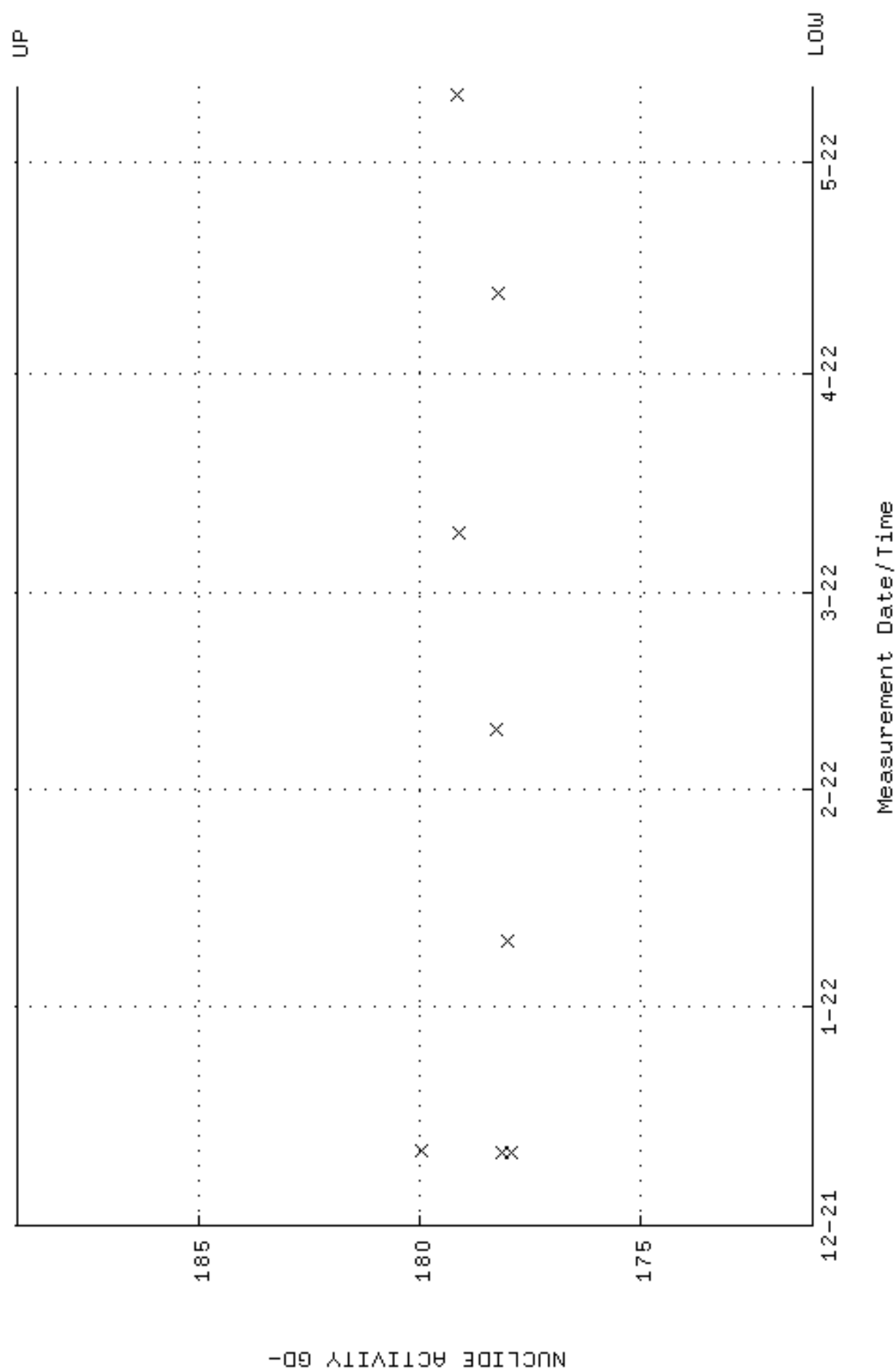
QA filename : DKA100:[ENV_ALPHA.QA.B]B110.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 16:55:34 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



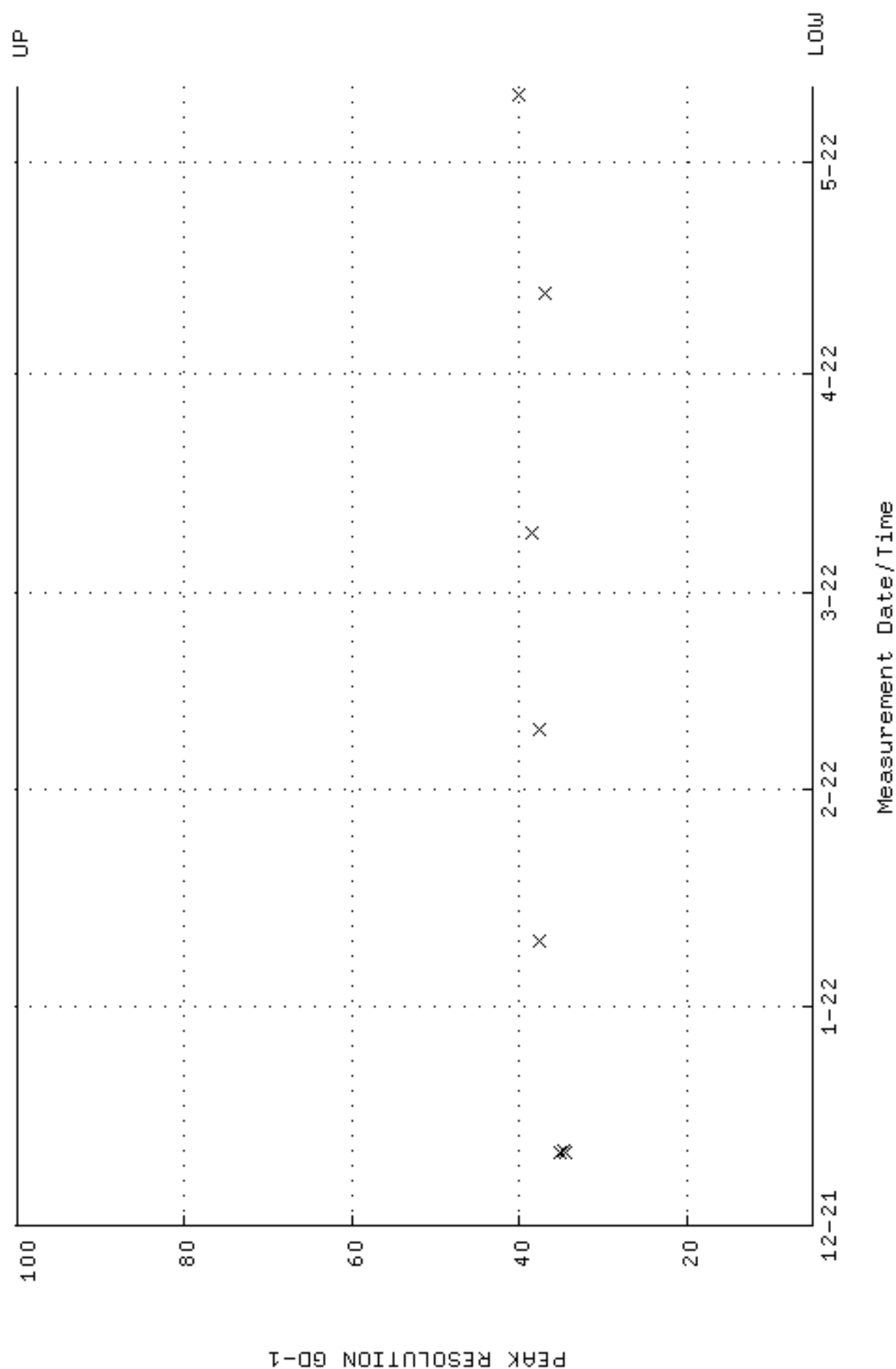
QA filename : DKA100:[ENV_ALPHA.QA.W]W111.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.343400 through 0.364600



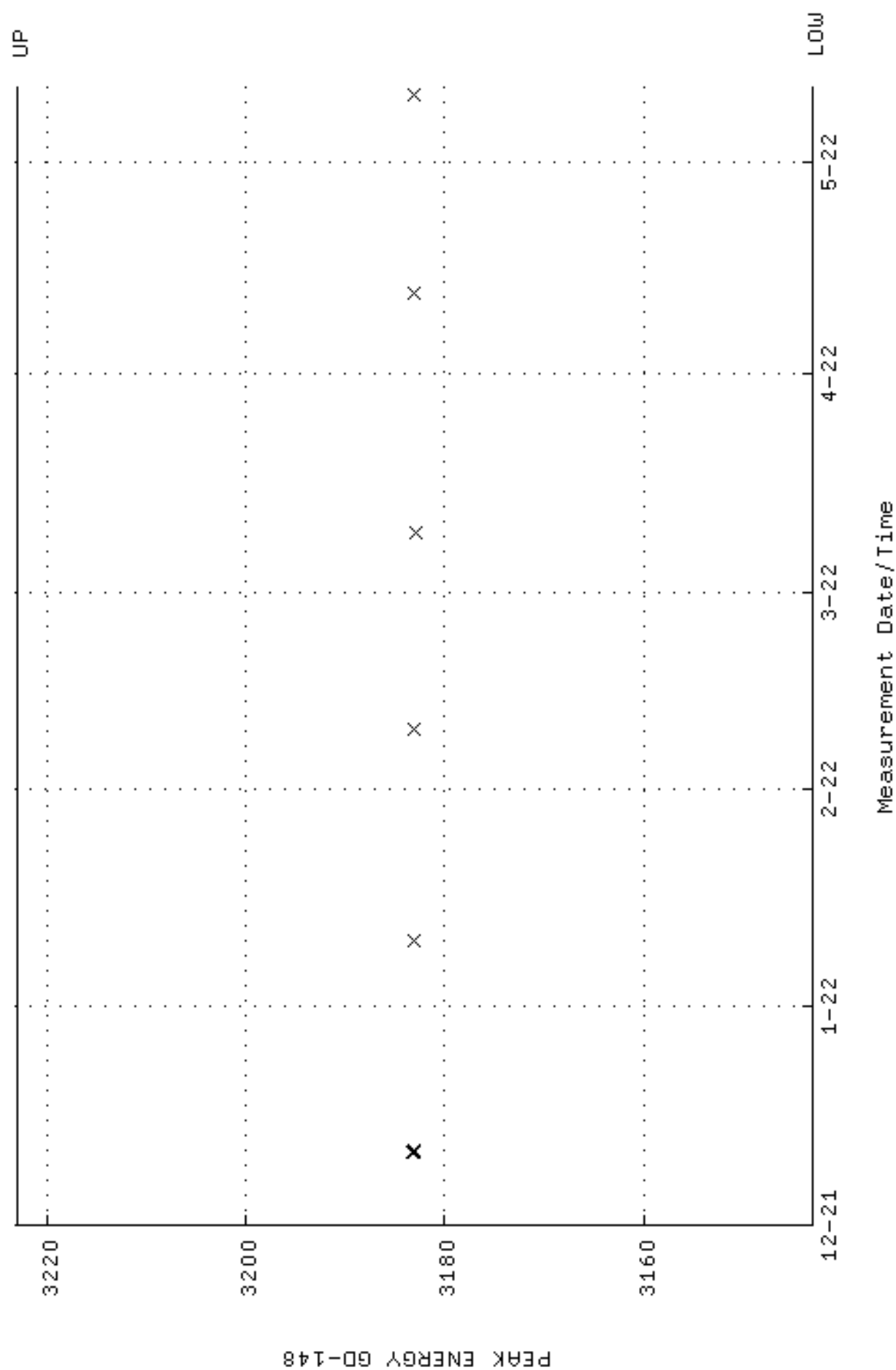
QA filename : DKA100:[ENV_ALPHA.QA.W]W111.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



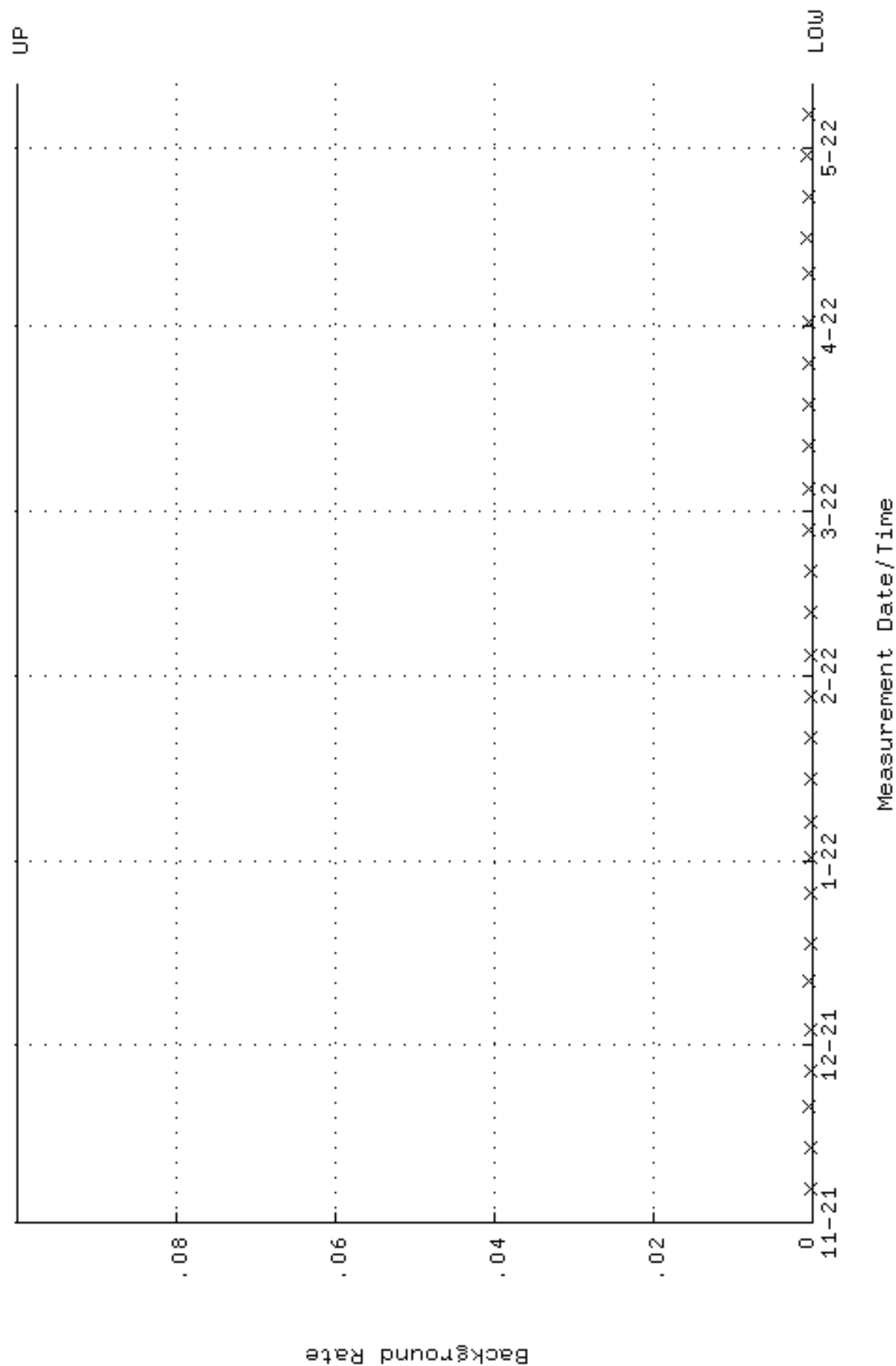
QA filename : DKA100:[ENV_ALPHA.QA.W]W111.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



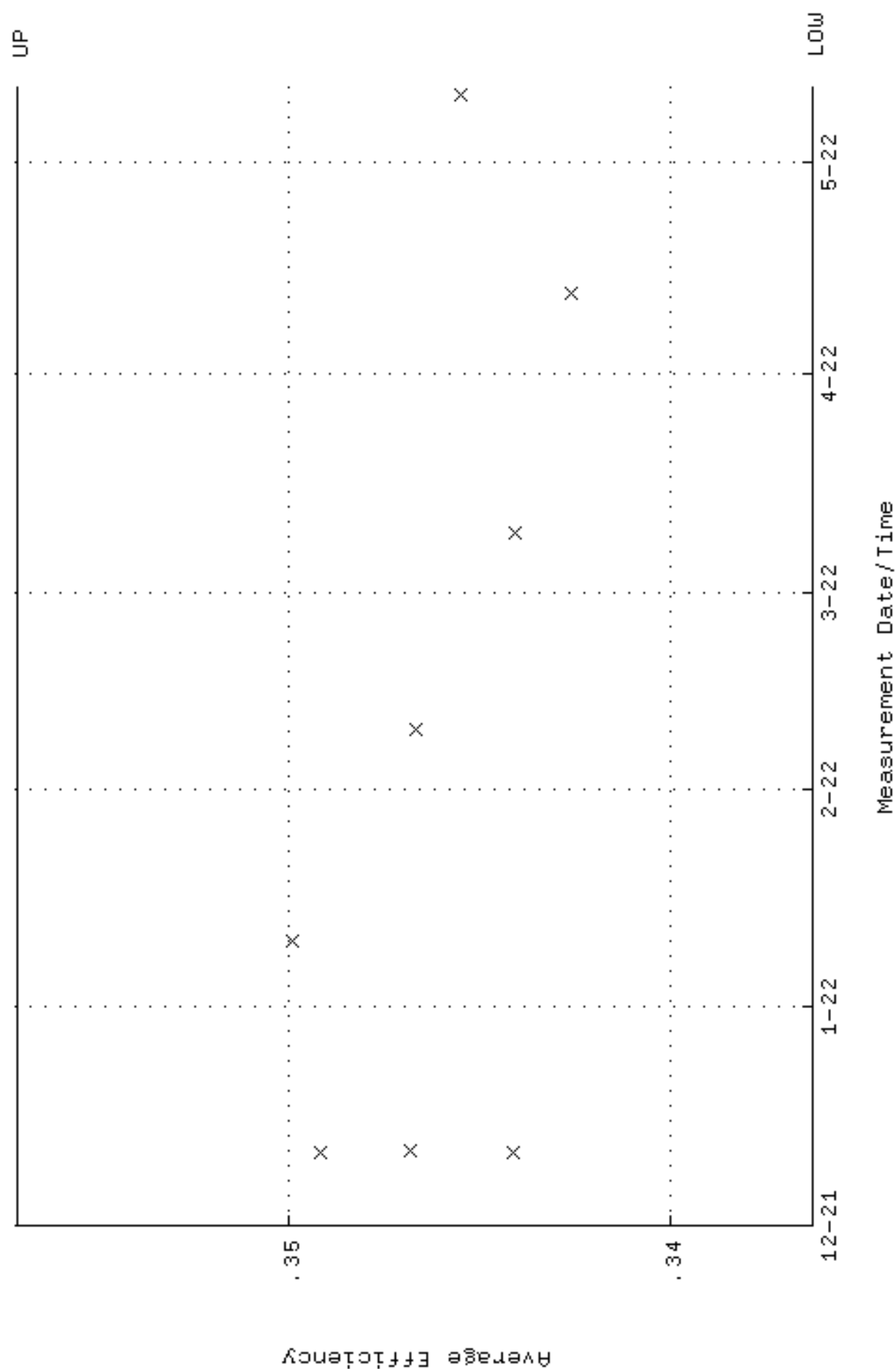
QA filename : DKA100:[ENV_ALPHA.QA.W]W111.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



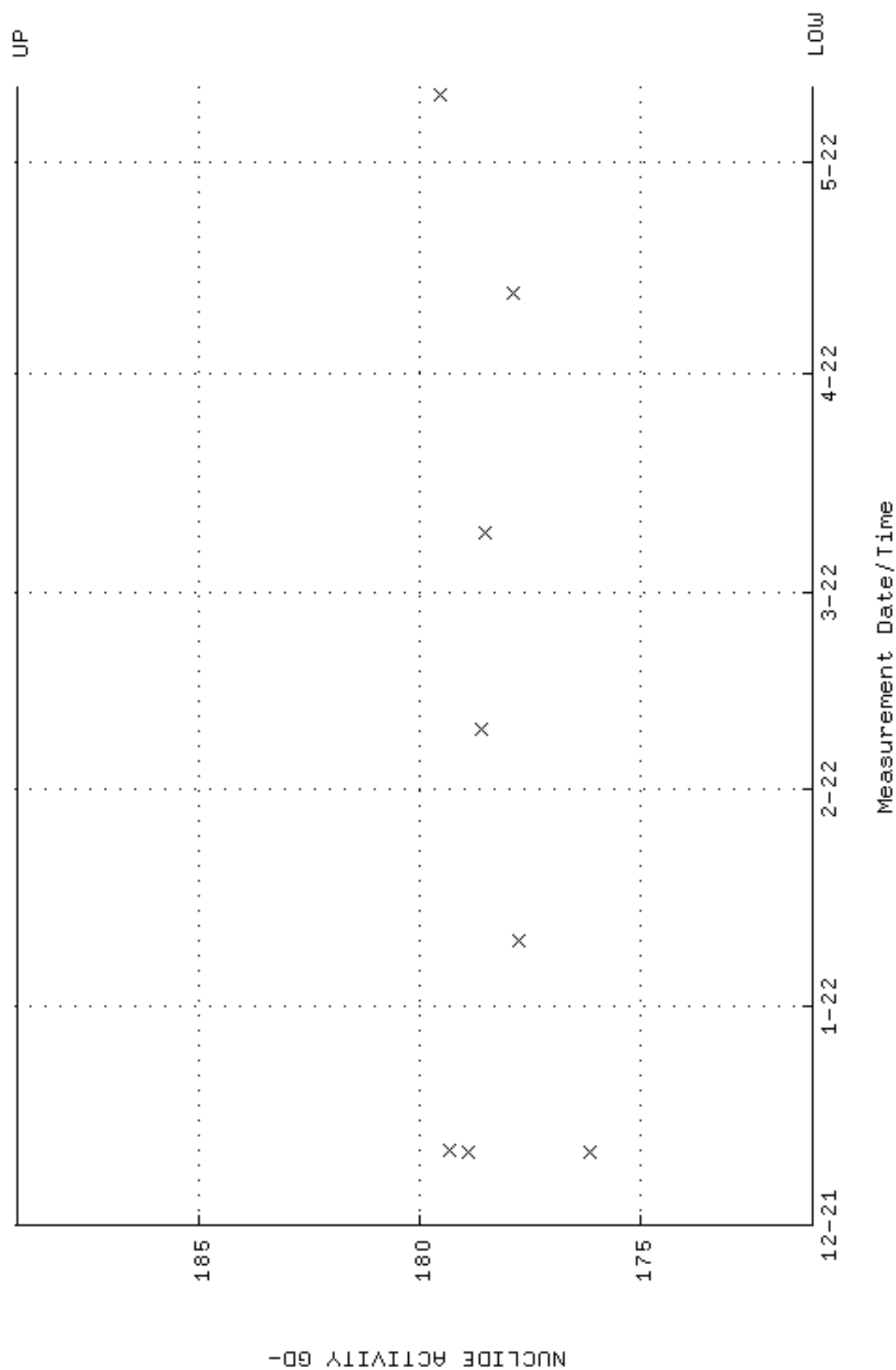
QA filename : DKA100:[ENV_ALPHA.QA.B]B111.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 16:55:34 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



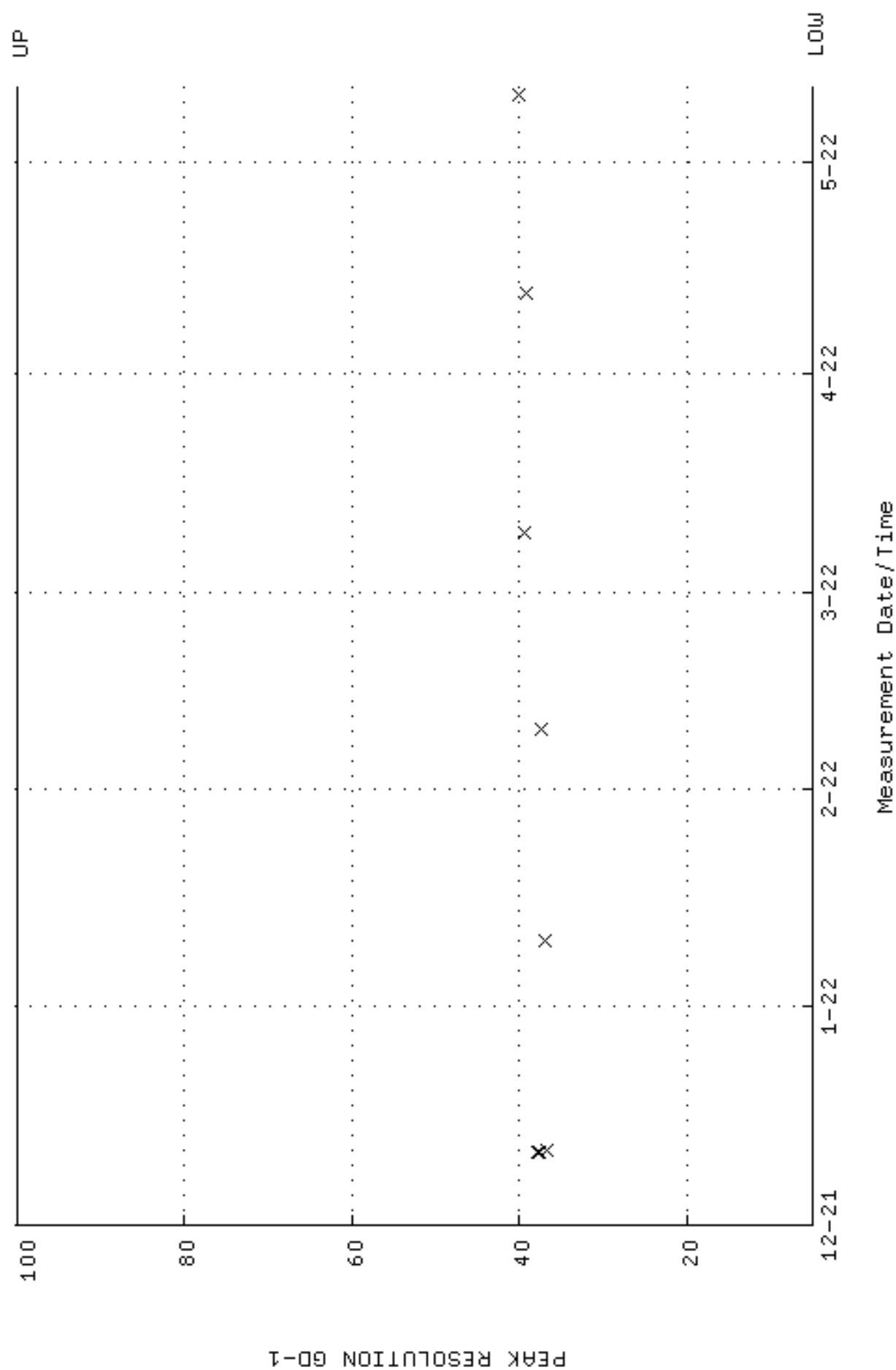
QA filename : DKA100:[ENV_ALPHA.QA.W]W112.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.336300 through 0.357100



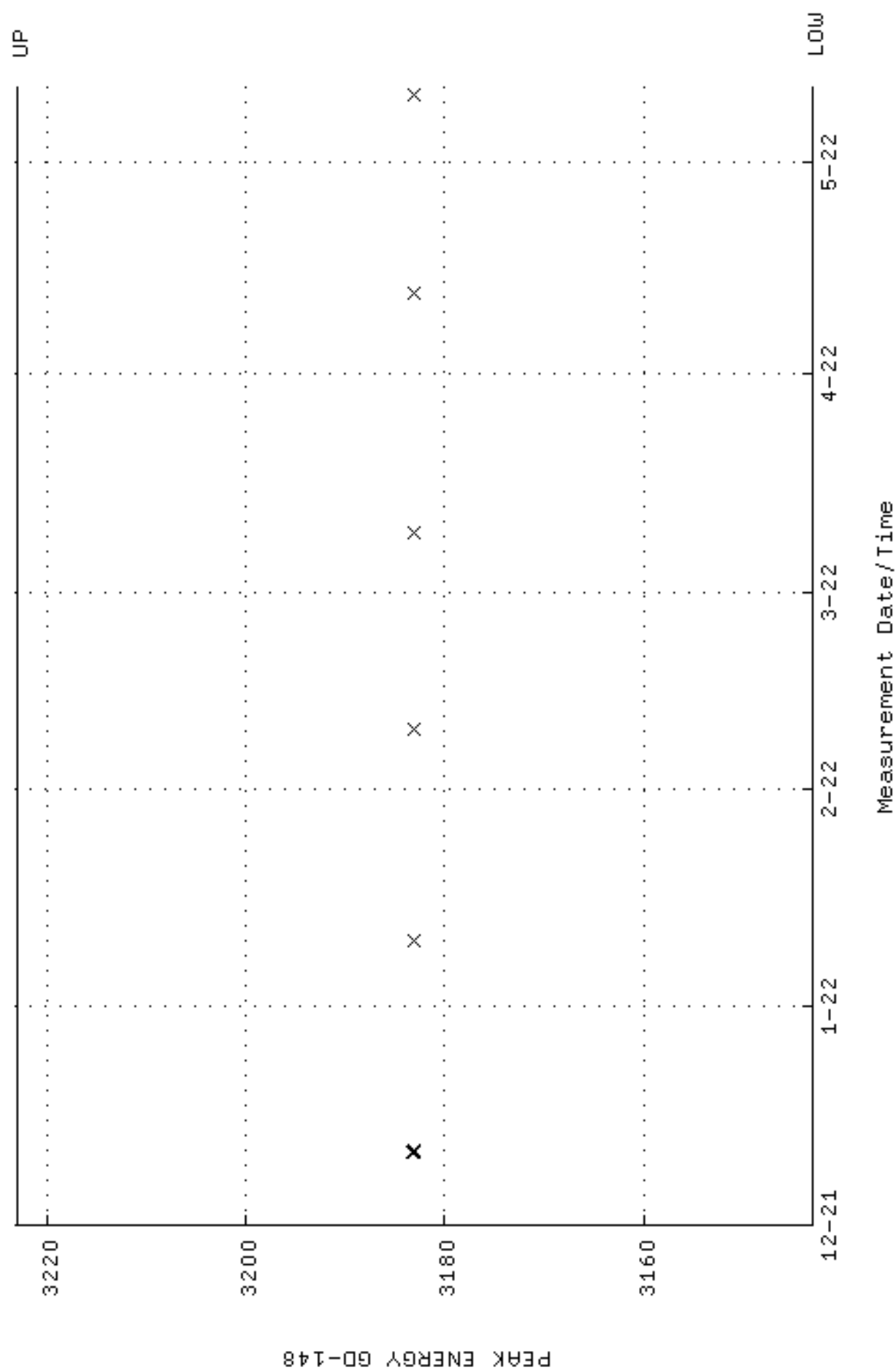
QA filename : DKA100:[ENV_ALPHA.QA.W]W112.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



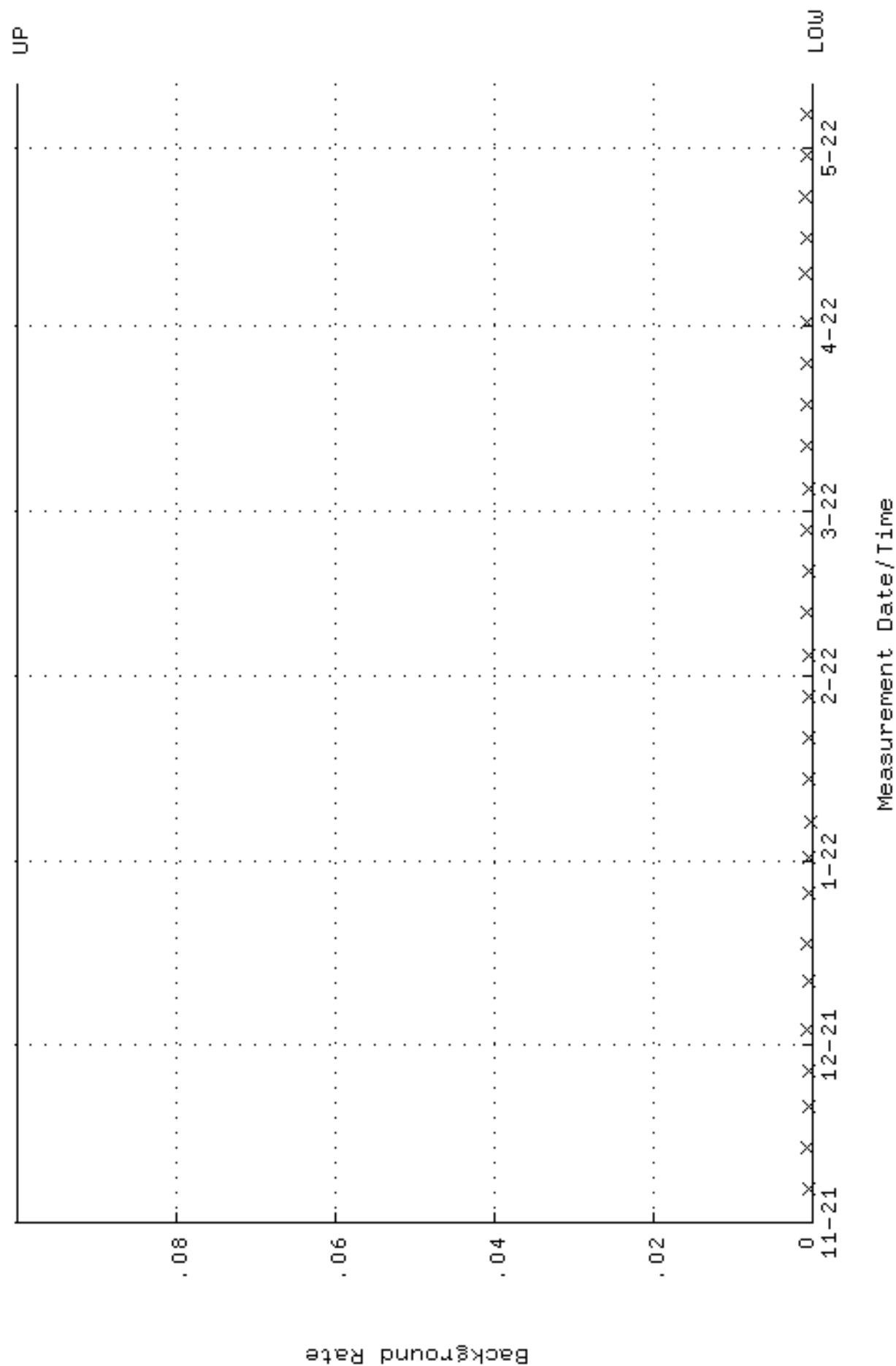
QA filename : DKA100:[ENV_ALPHA.QA.W]W112.QAF;11
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



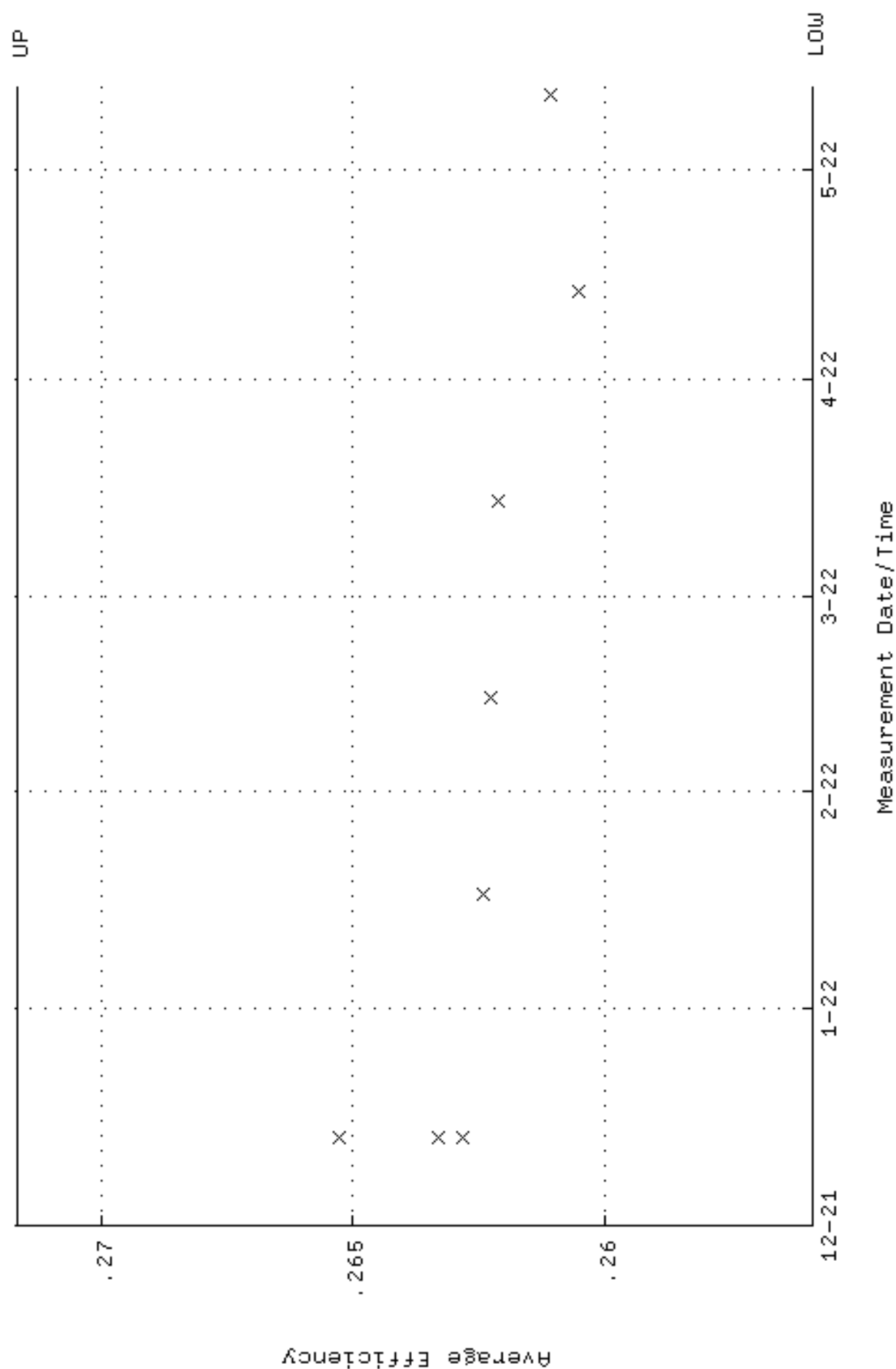
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



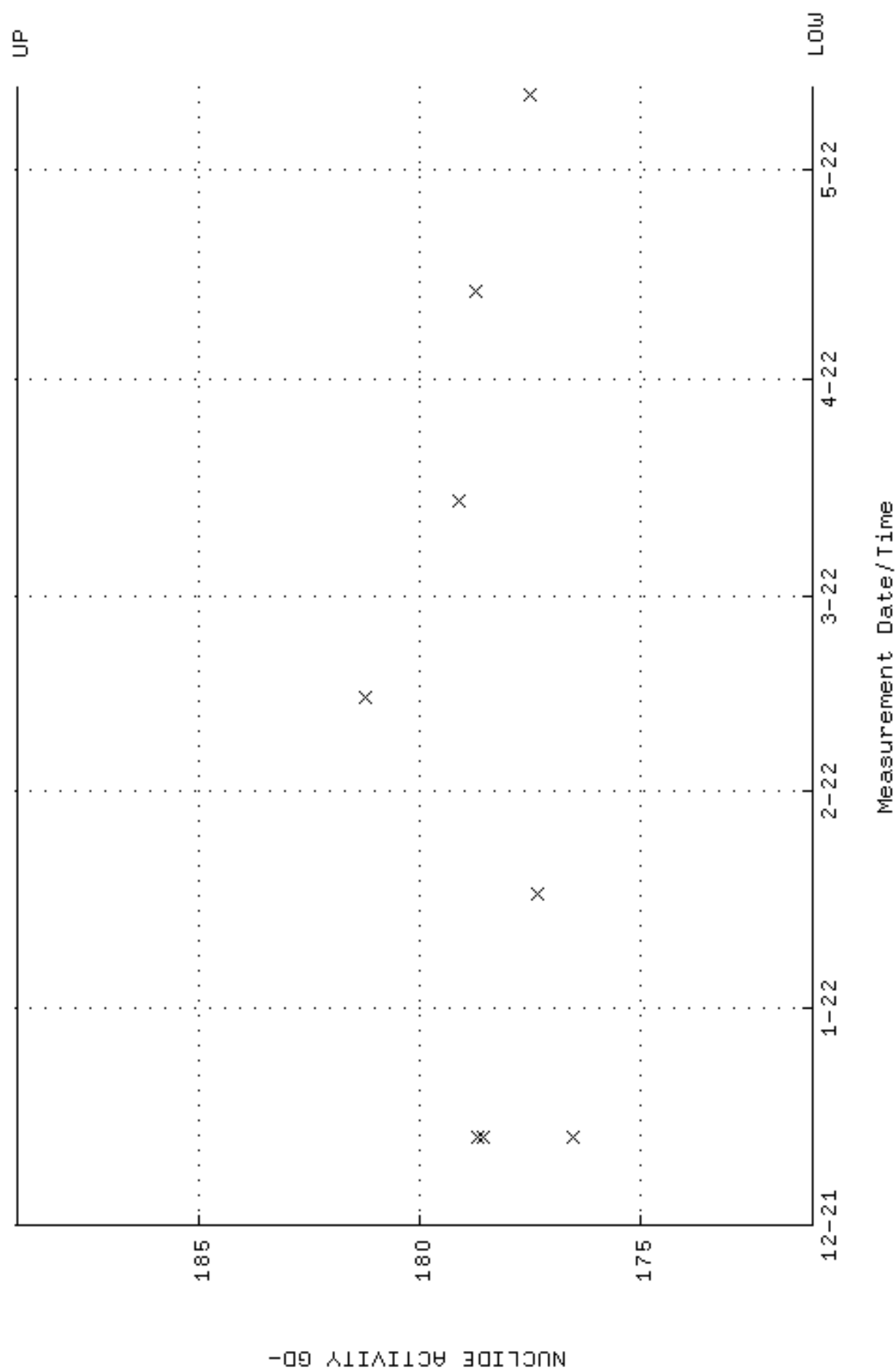
QA filename : DKA100:[ENV_ALPHA.QA.B]B112.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 16:55:34 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



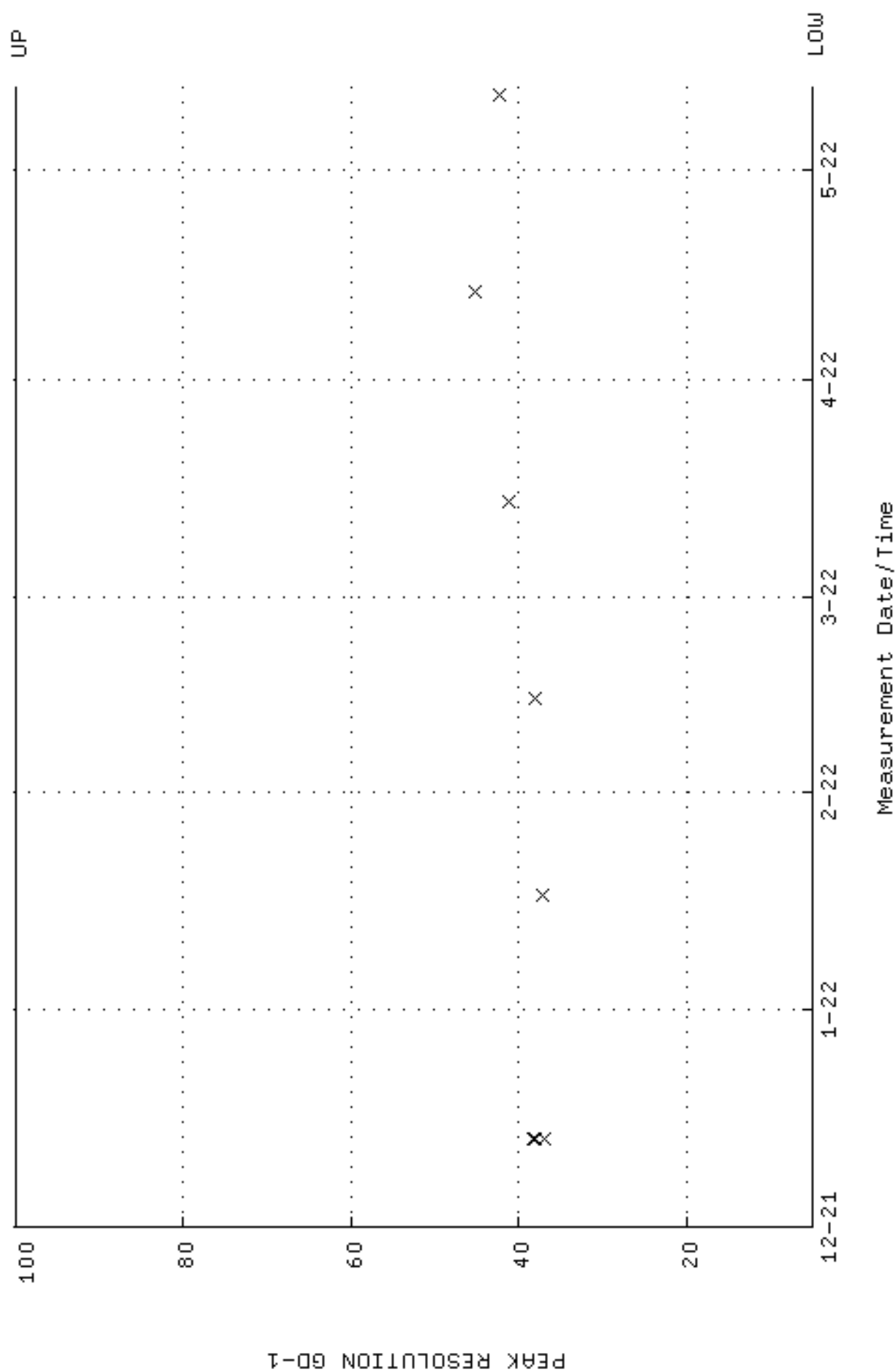
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-DEC-2021 10:27:54 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.255850 through 0.271680



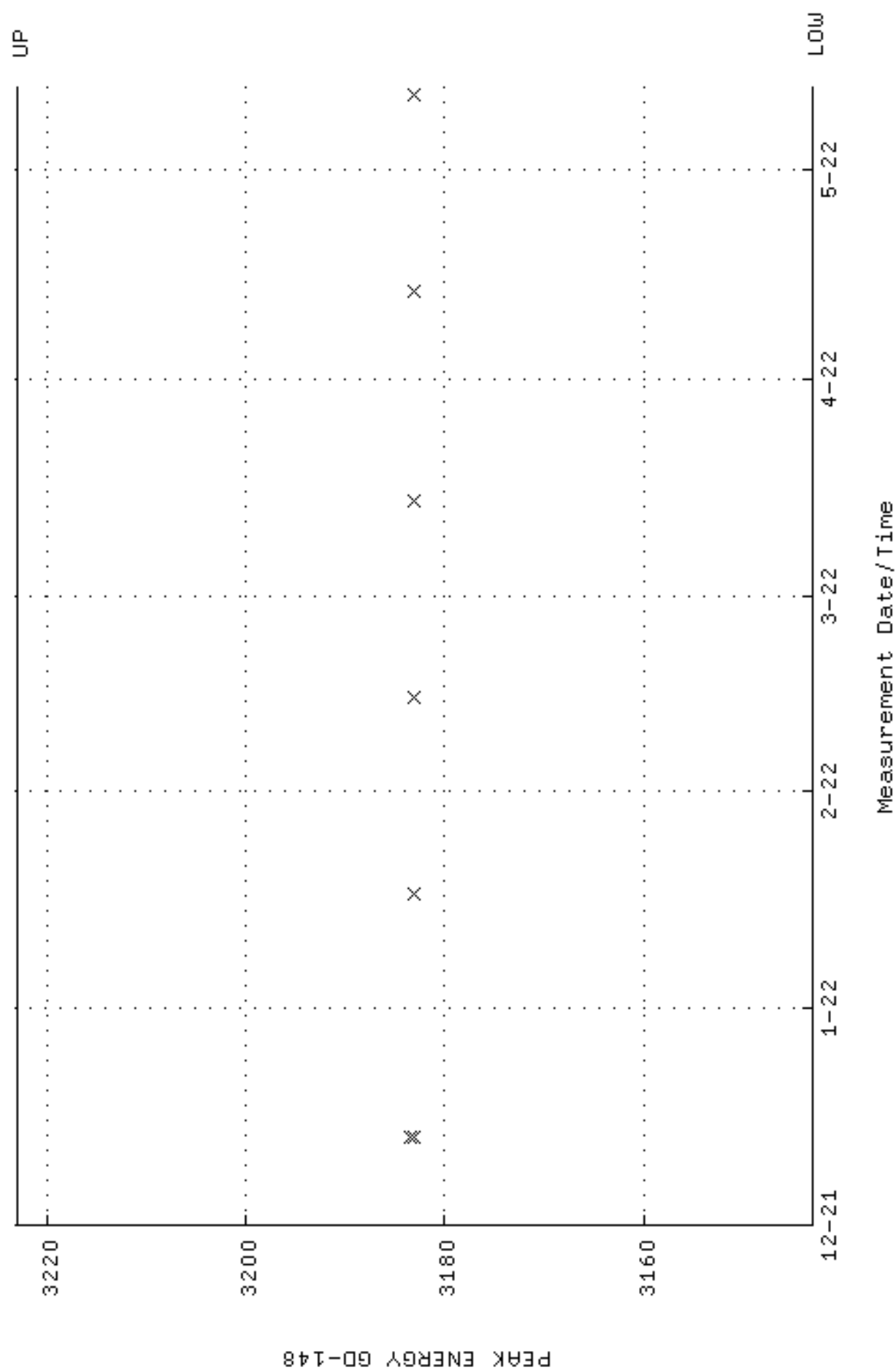
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-DEC-2021 10:27:54 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



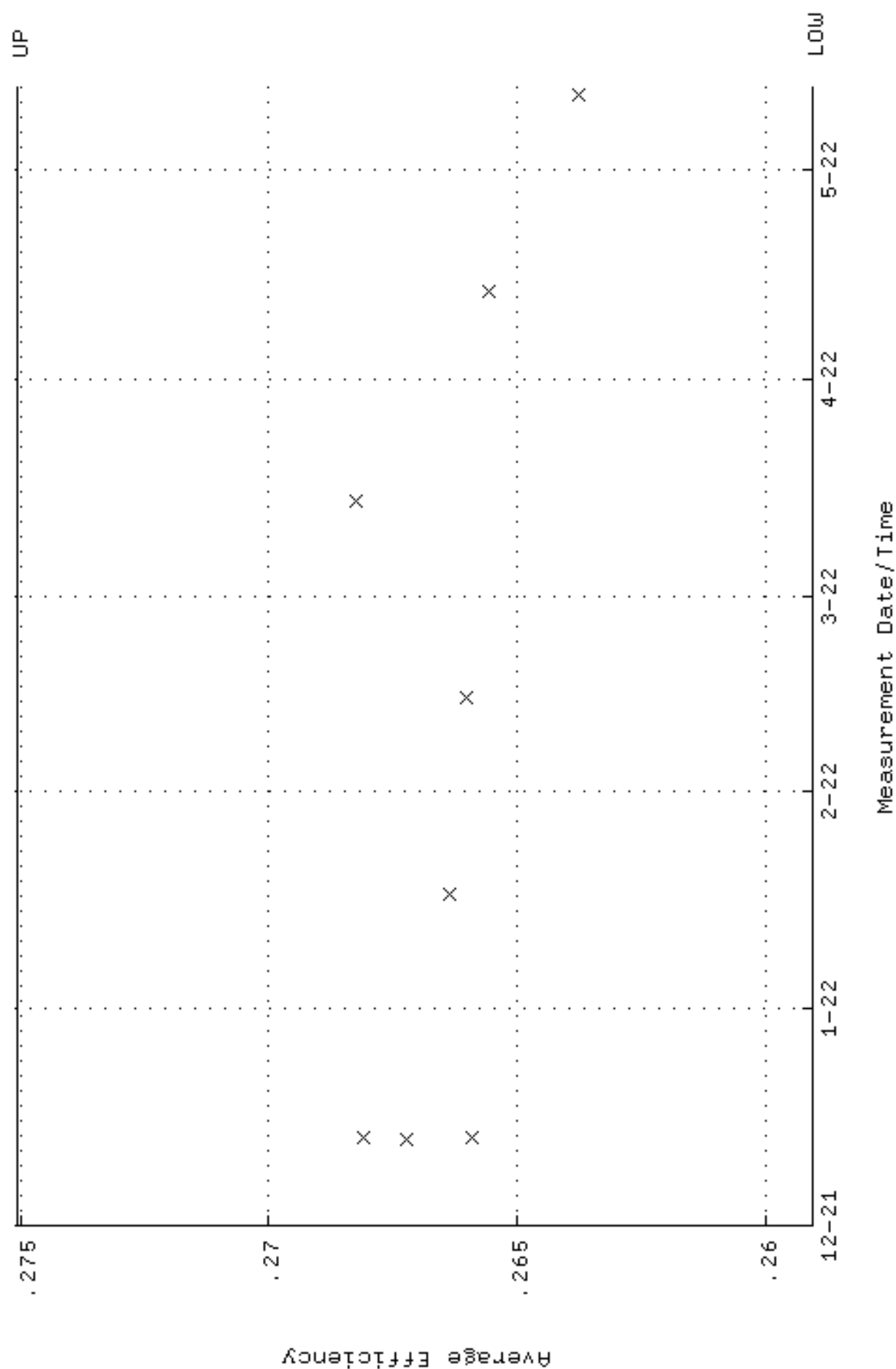
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-DEC-2021 10:27:54 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



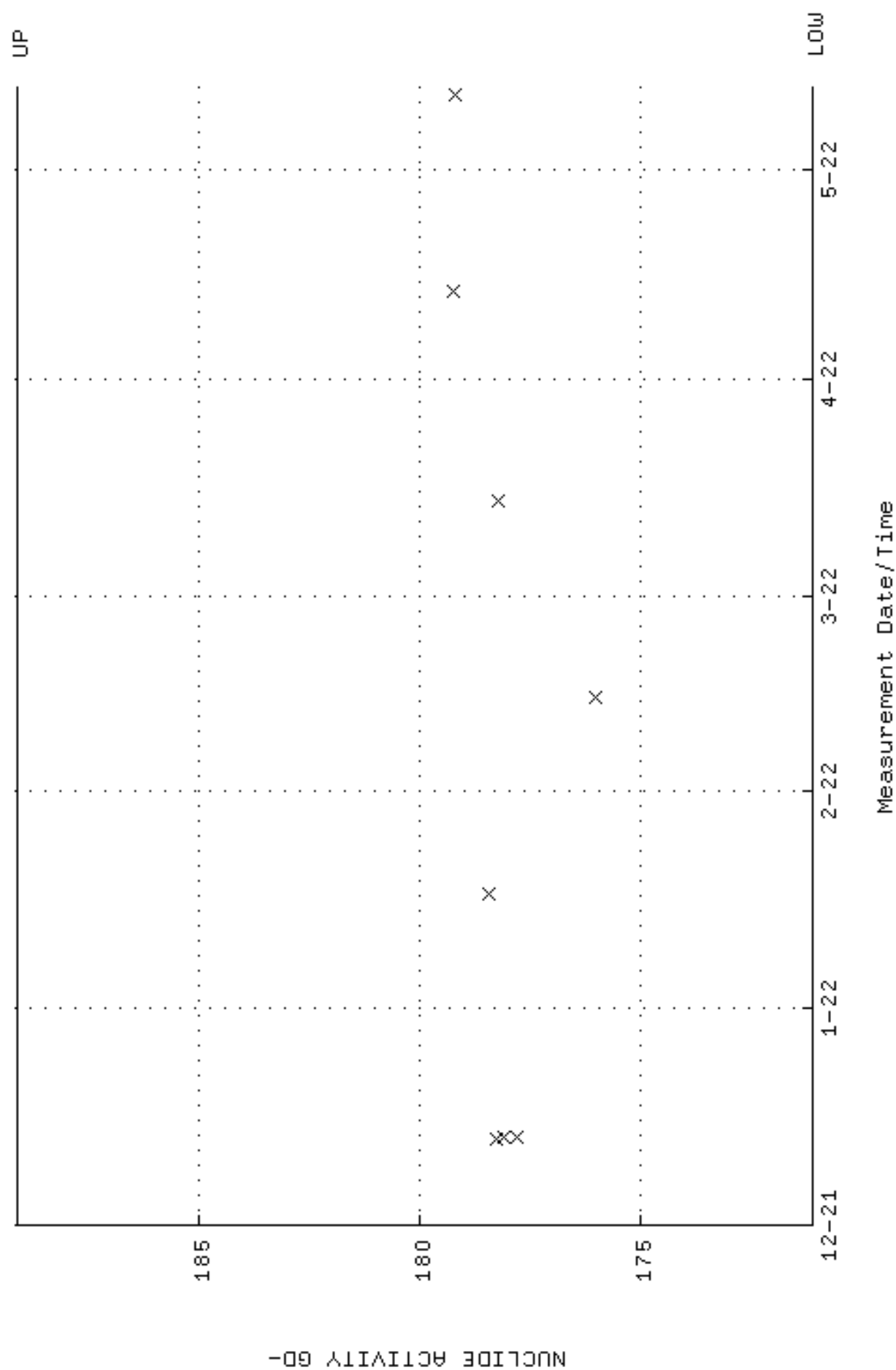
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-DEC-2021 10:27:54 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



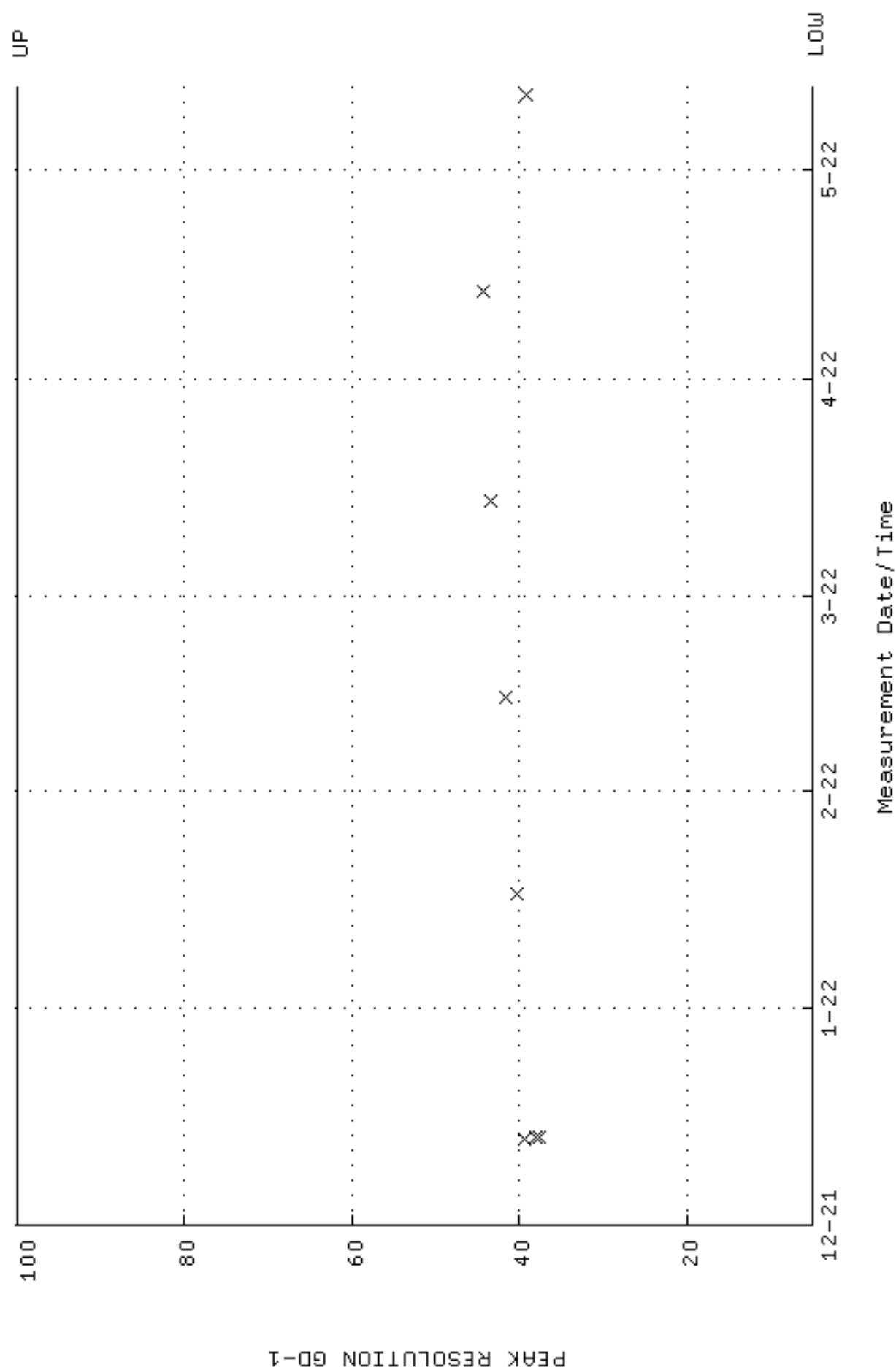
QQA filename : DKA100:[ENV_ALPHA.QA.W]W125.QAF;6
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 13-DEC-2021 08:05:03 through 12-MAR-2022 08:05:03
Lower/Upper Lmts: 0.259040 through 0.275060



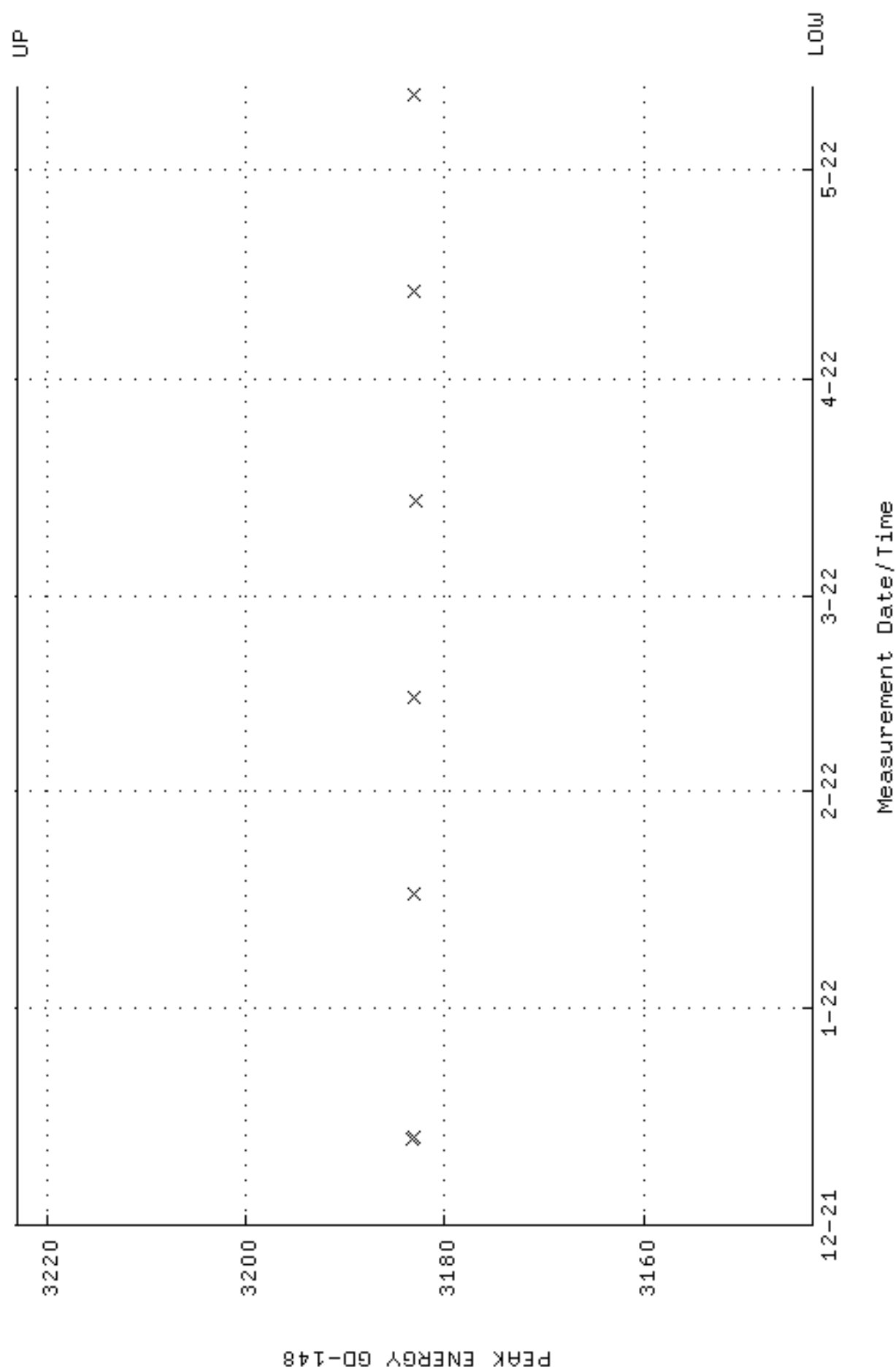
QA filename : DKA100:[ENV_ALPHA.QA.W]W125.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-DEC-2021 08:05:03 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



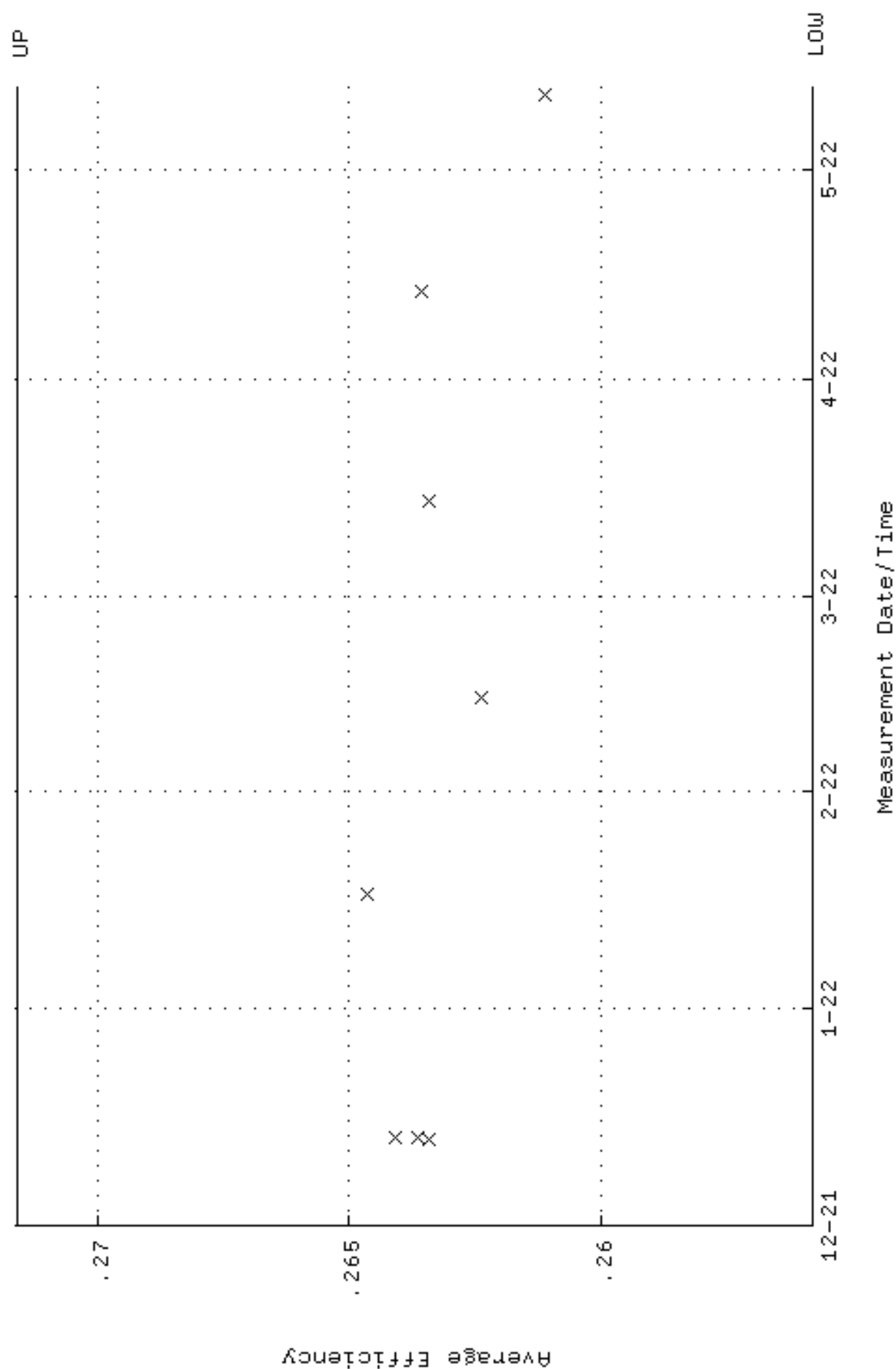
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-DEC-2021 08:05:03 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



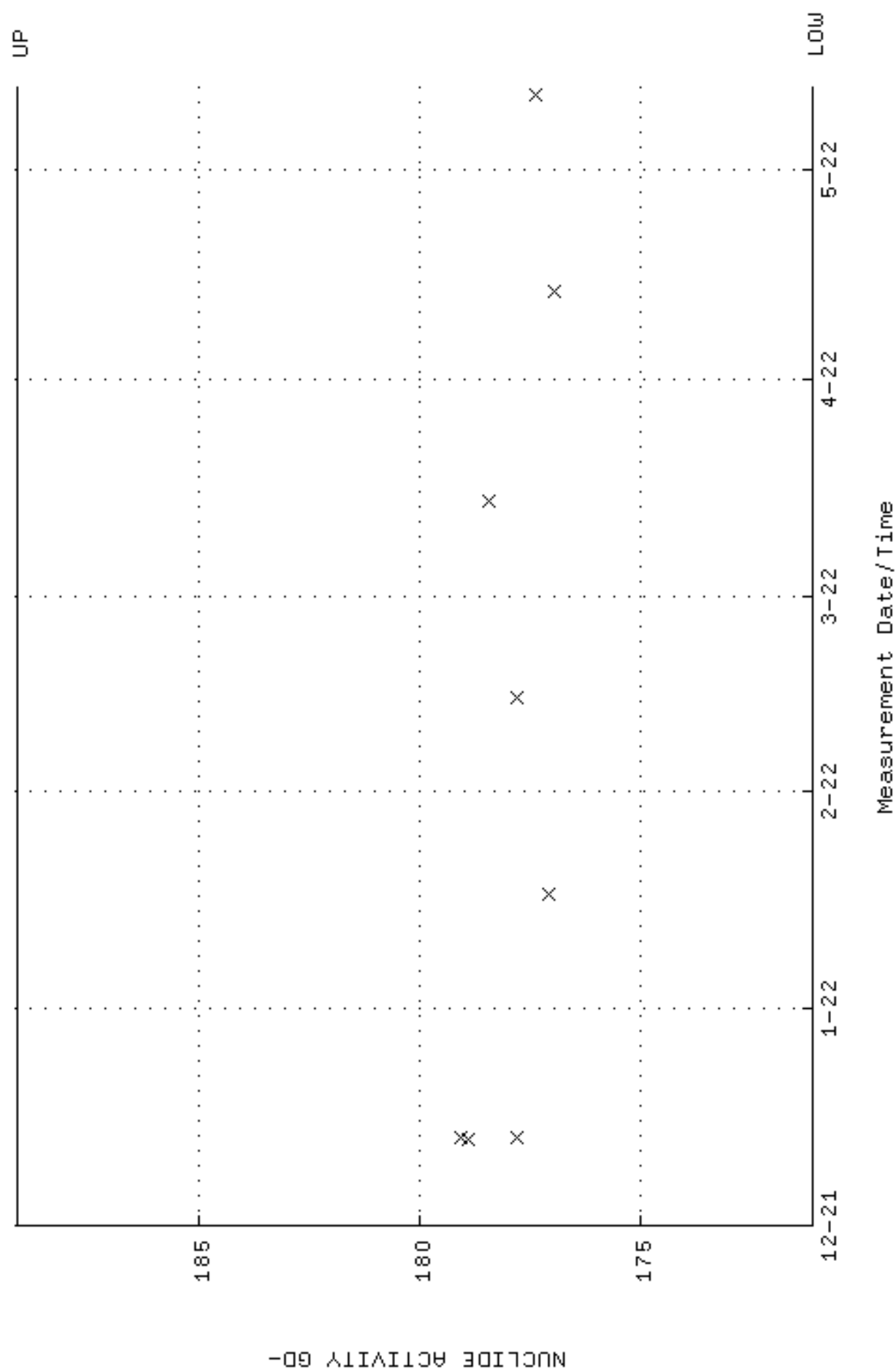
QA filename : DKA100:[ENV_ALPHA.QA.W]W125.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-DEC-2021 08:05:03 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



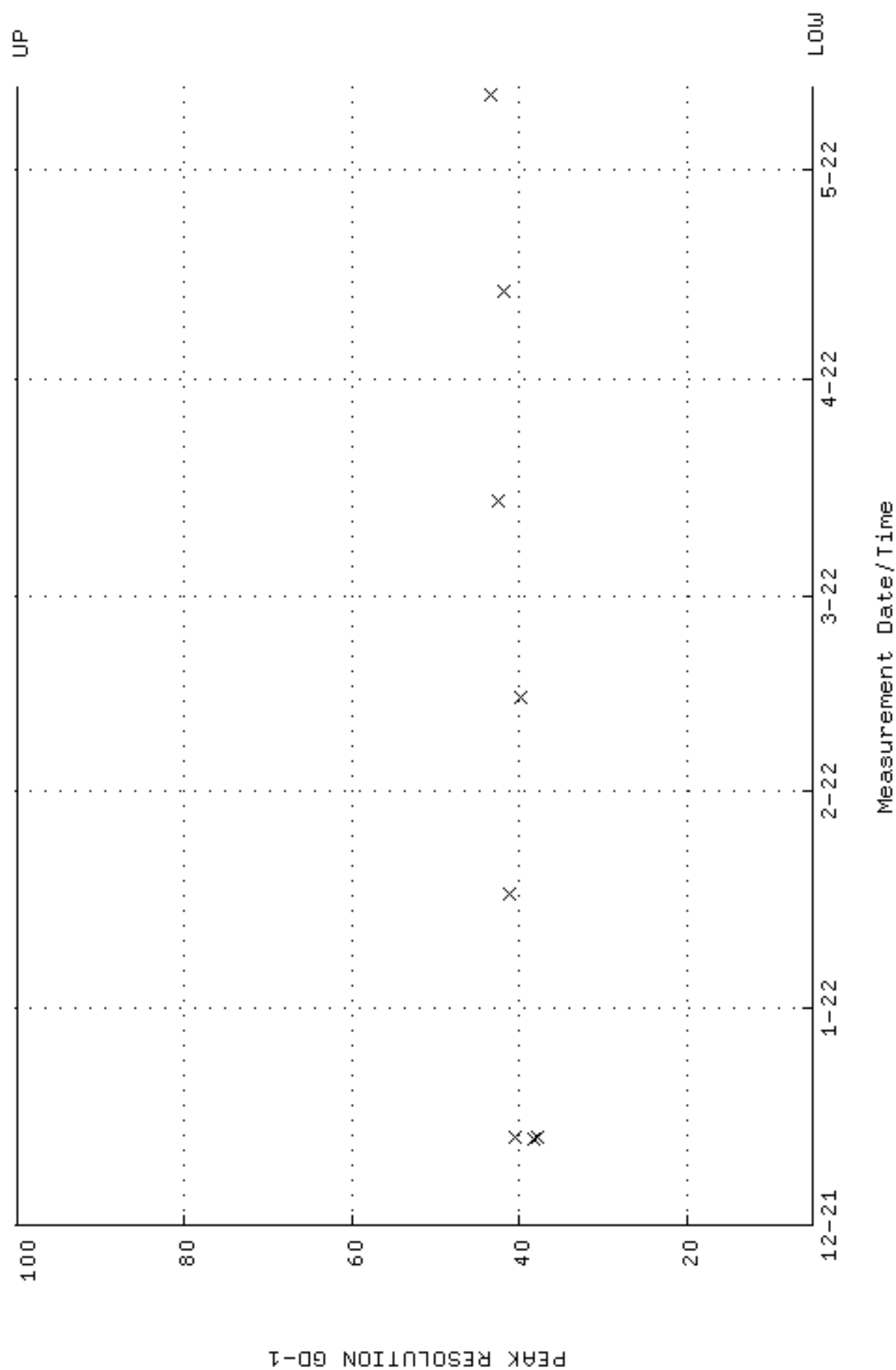
QA filename : DKA100:[ENV_ALPHA.QA.W]W126.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-DEC-2021 07:41:38 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.255780 through 0.271600



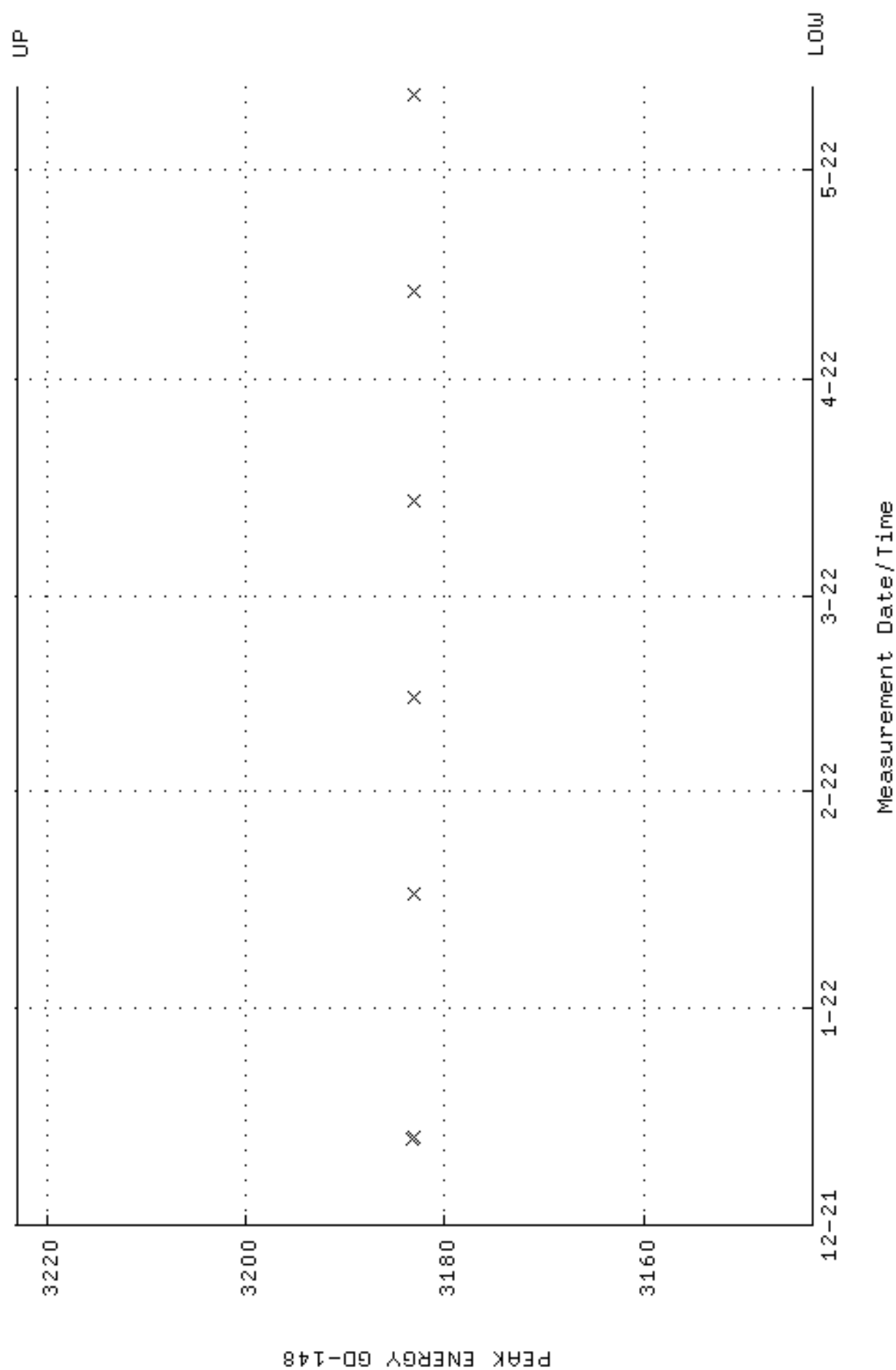
QA filename : DKA100:[ENV_ALPHA.QA.W]W126.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-DEC-2021 07:41:38 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



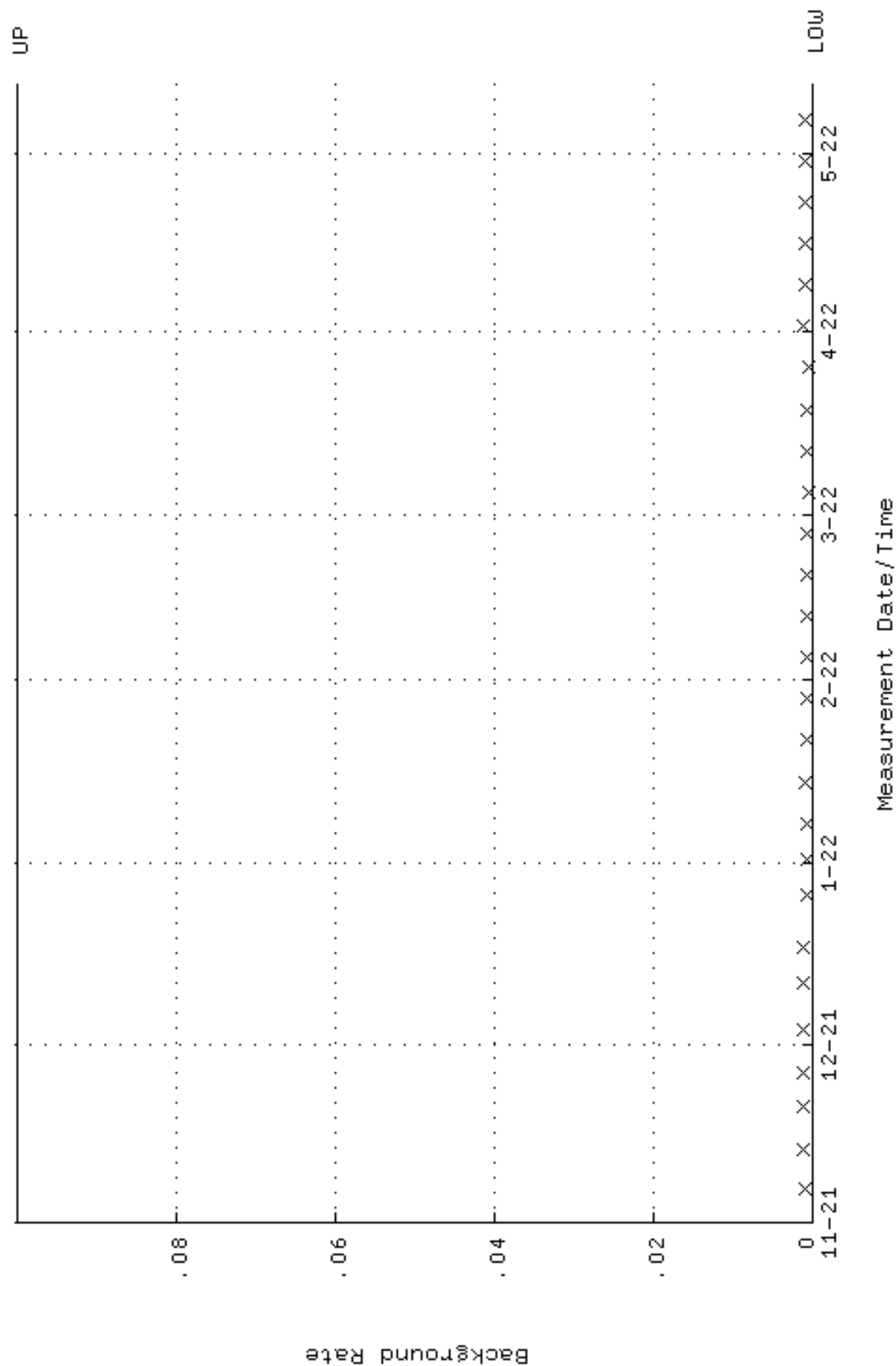
QA filename : DKA100:[ENV_ALPHA.QA.W]W126.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-DEC-2021 07:41:38 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



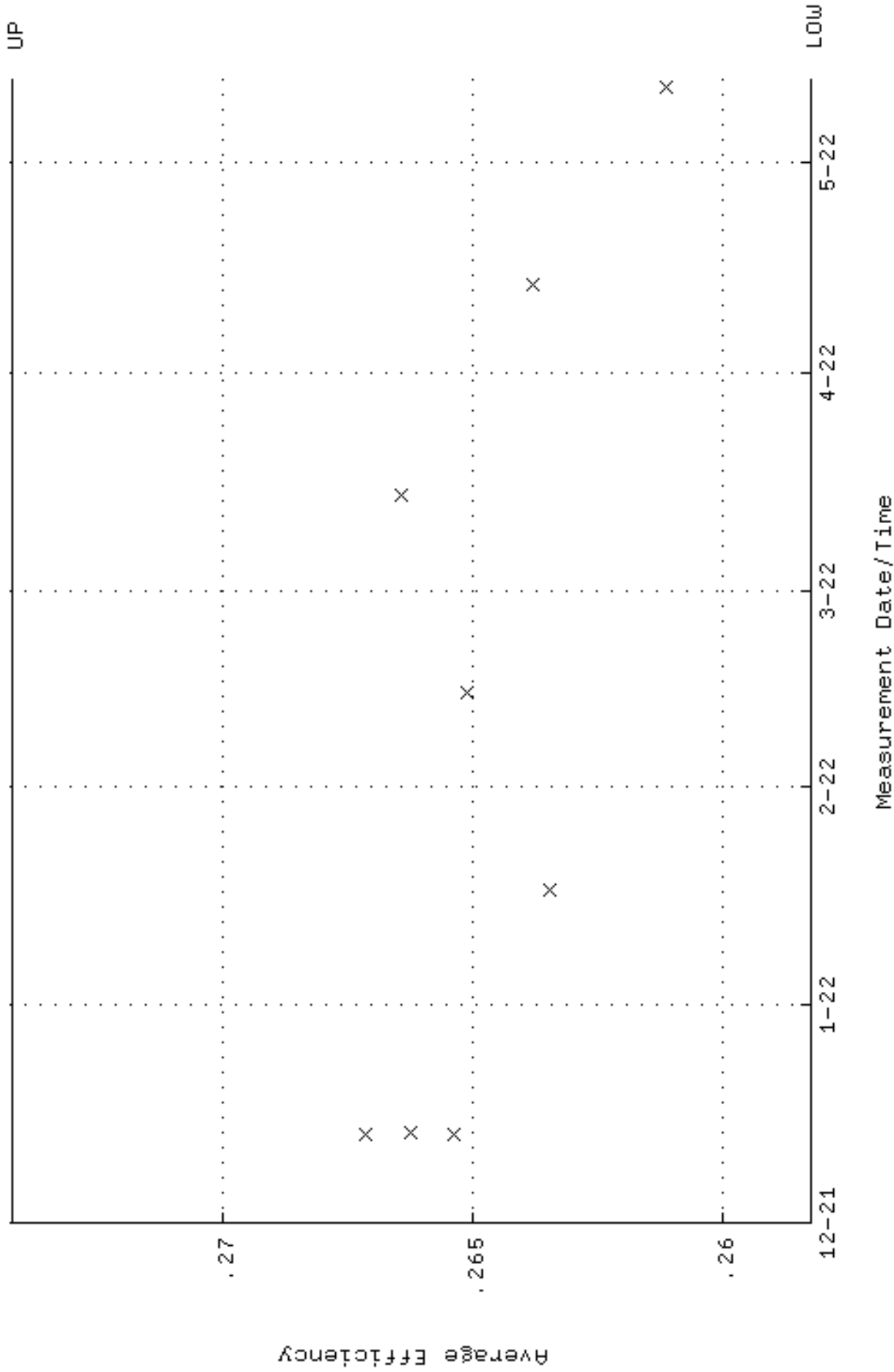
QA filename : DKA100:[ENV_ALPHA.QA.W]W126.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-DEC-2021 07:41:38 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



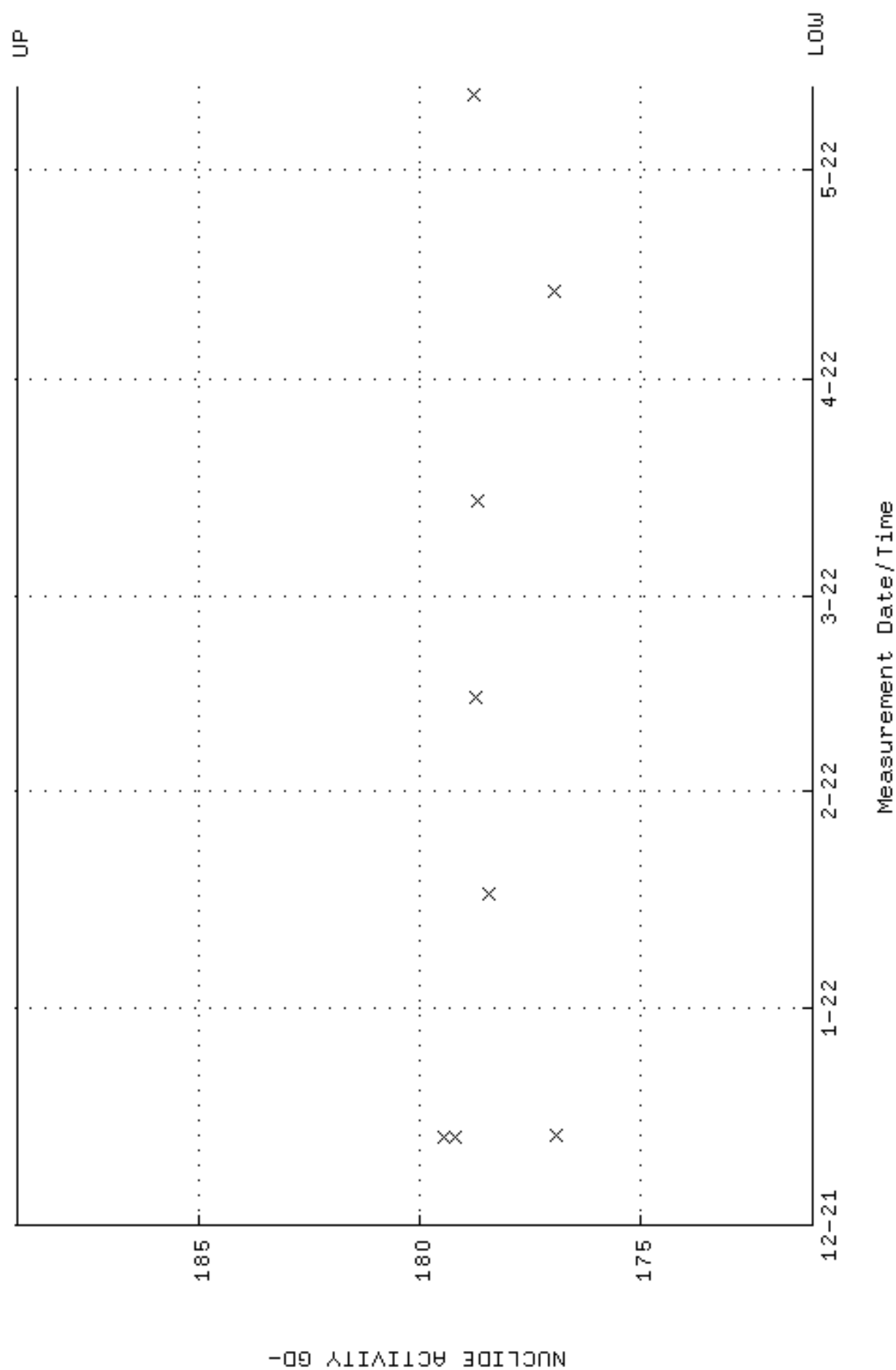
QA filename : DKA100:[ENV_ALPHA.QA.B]B126.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 17:00:20 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



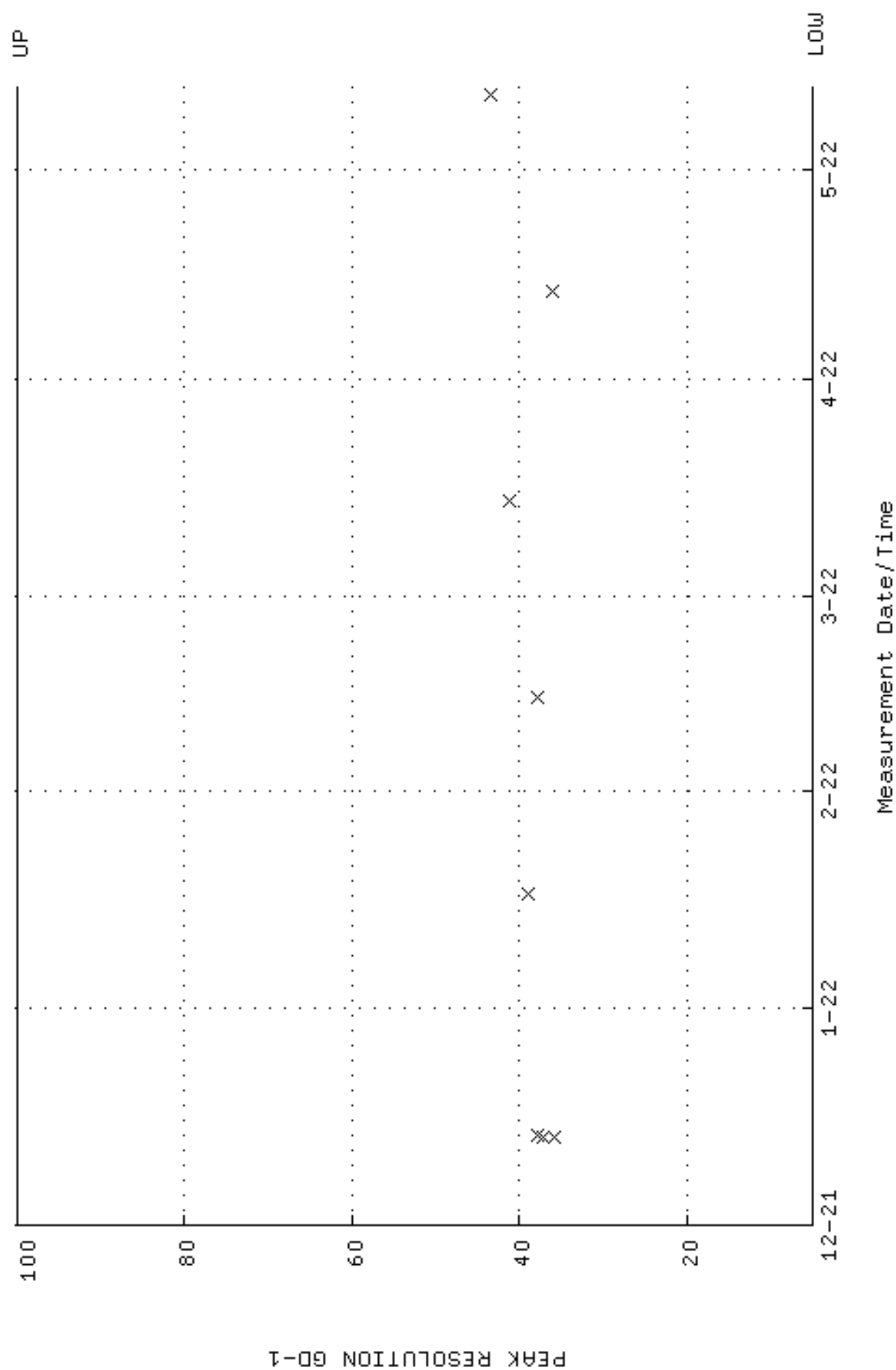
QA filename : DKA100:[ENV_ALPHA.QA.W]W128.QAF;6
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 13-DEC-2021 13:53:40 through 12-MAY-2022 12:00:00
Lower/Upper Lmts: 0.258250 through 0.274220



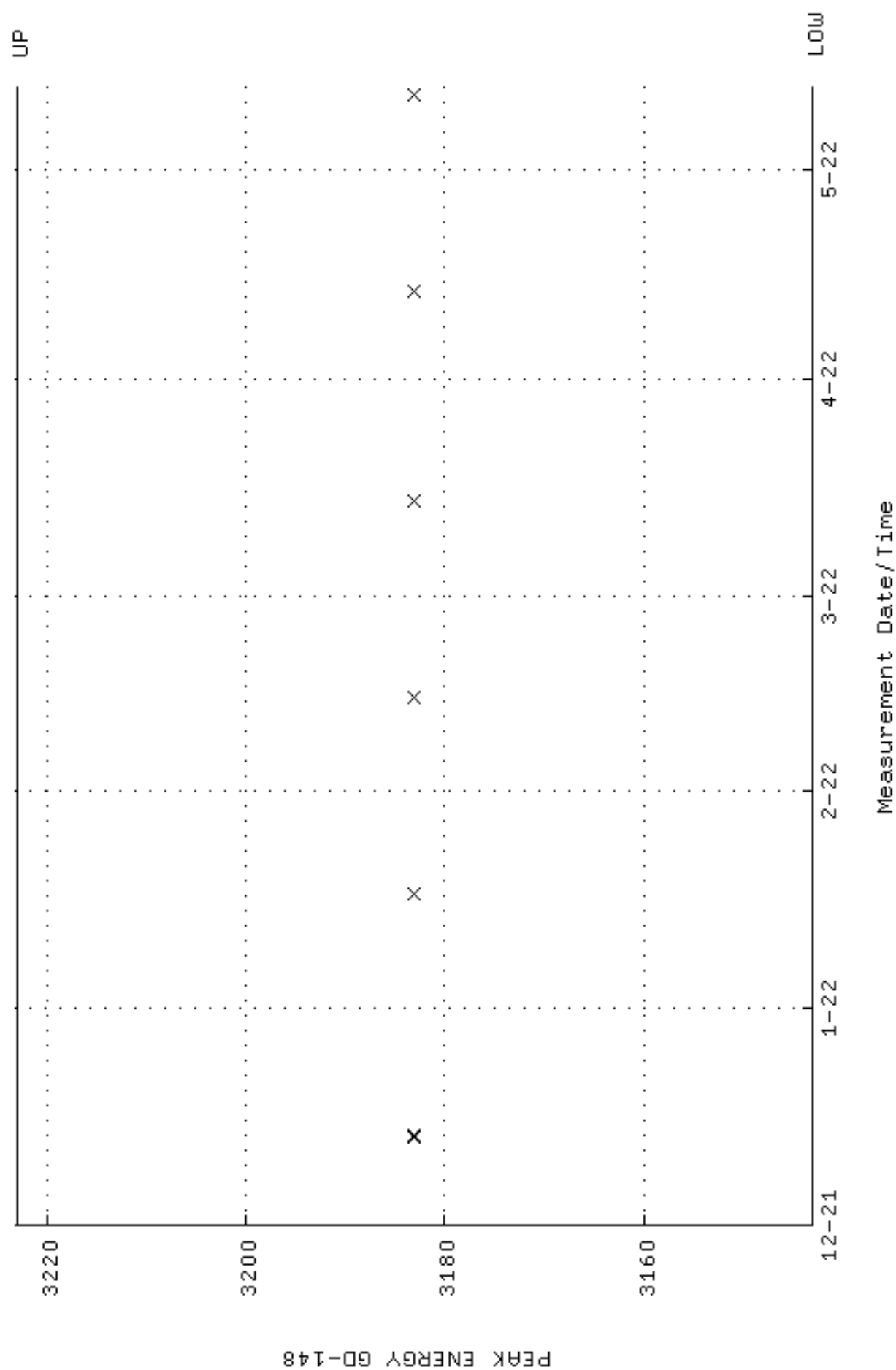
QA filename : DKA100:[ENV_ALPHA.QA.W]W128.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-DEC-2021 13:53:40 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



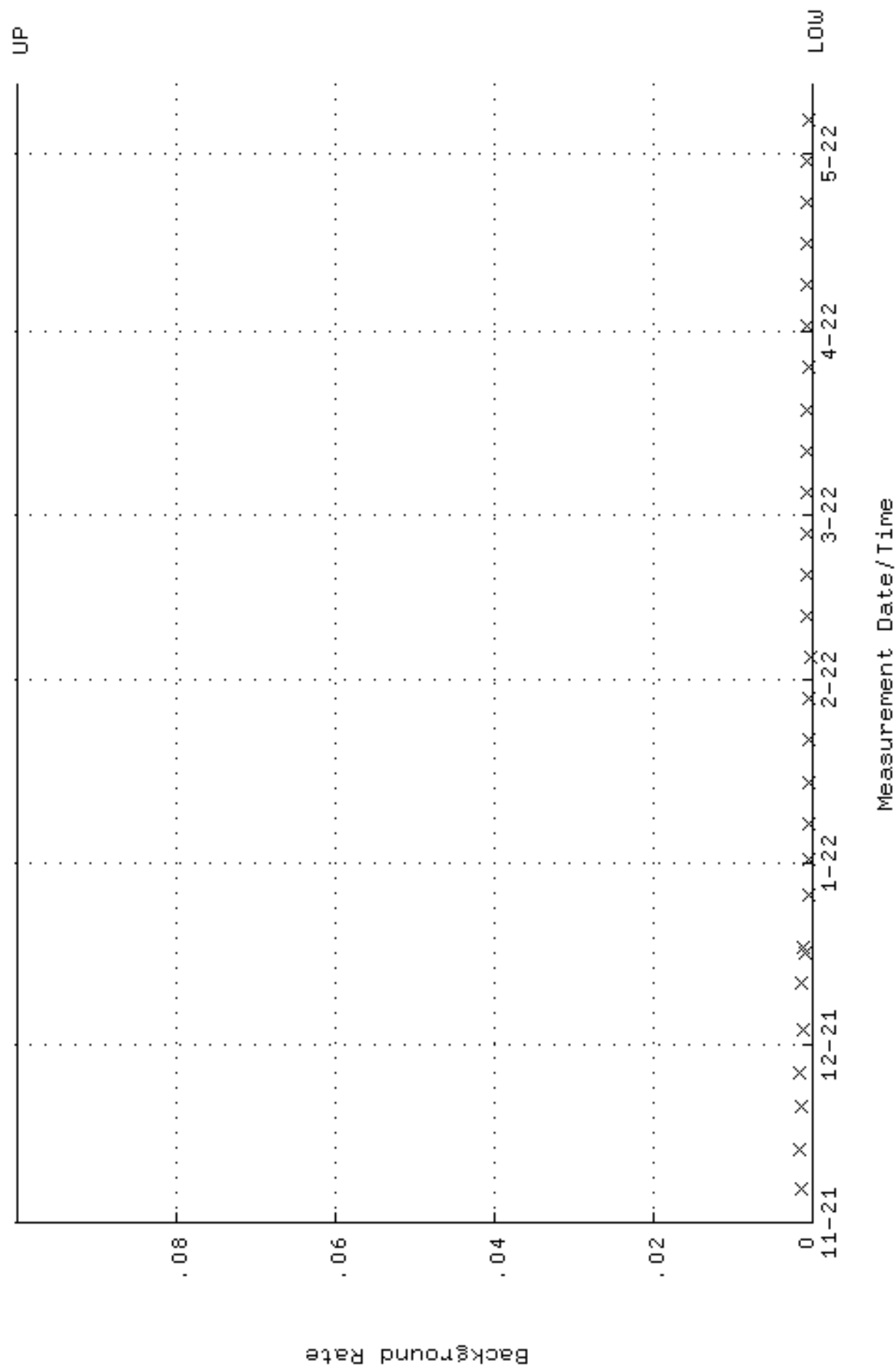
QA filename : DKA100:[ENV_ALPHA.QA.W]W128.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-DEC-2021 13:53:40 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



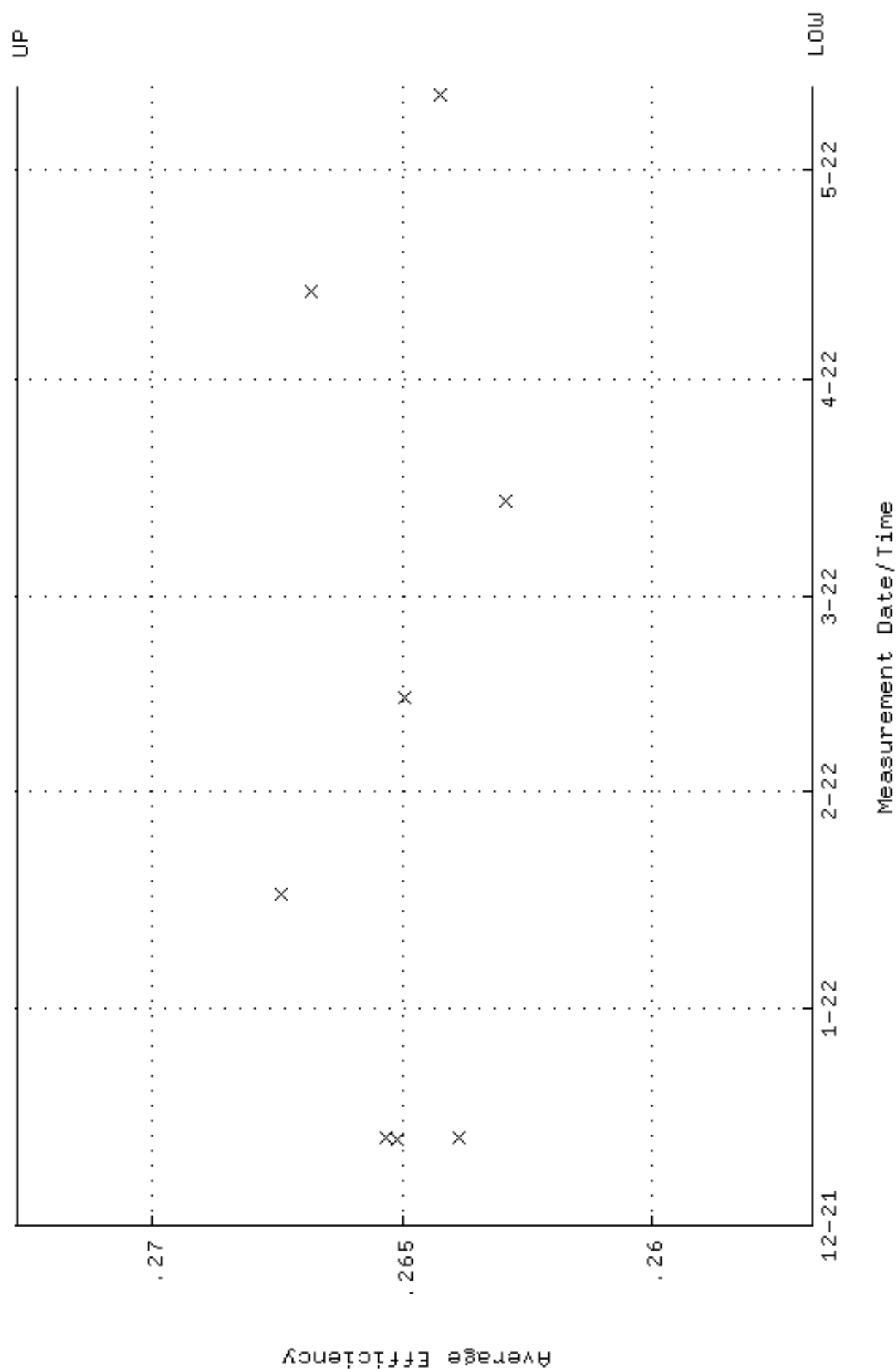
QA filename : DKA100:[ENV_ALPHA.QA.W]W128.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-DEC-2021 13:53:40 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



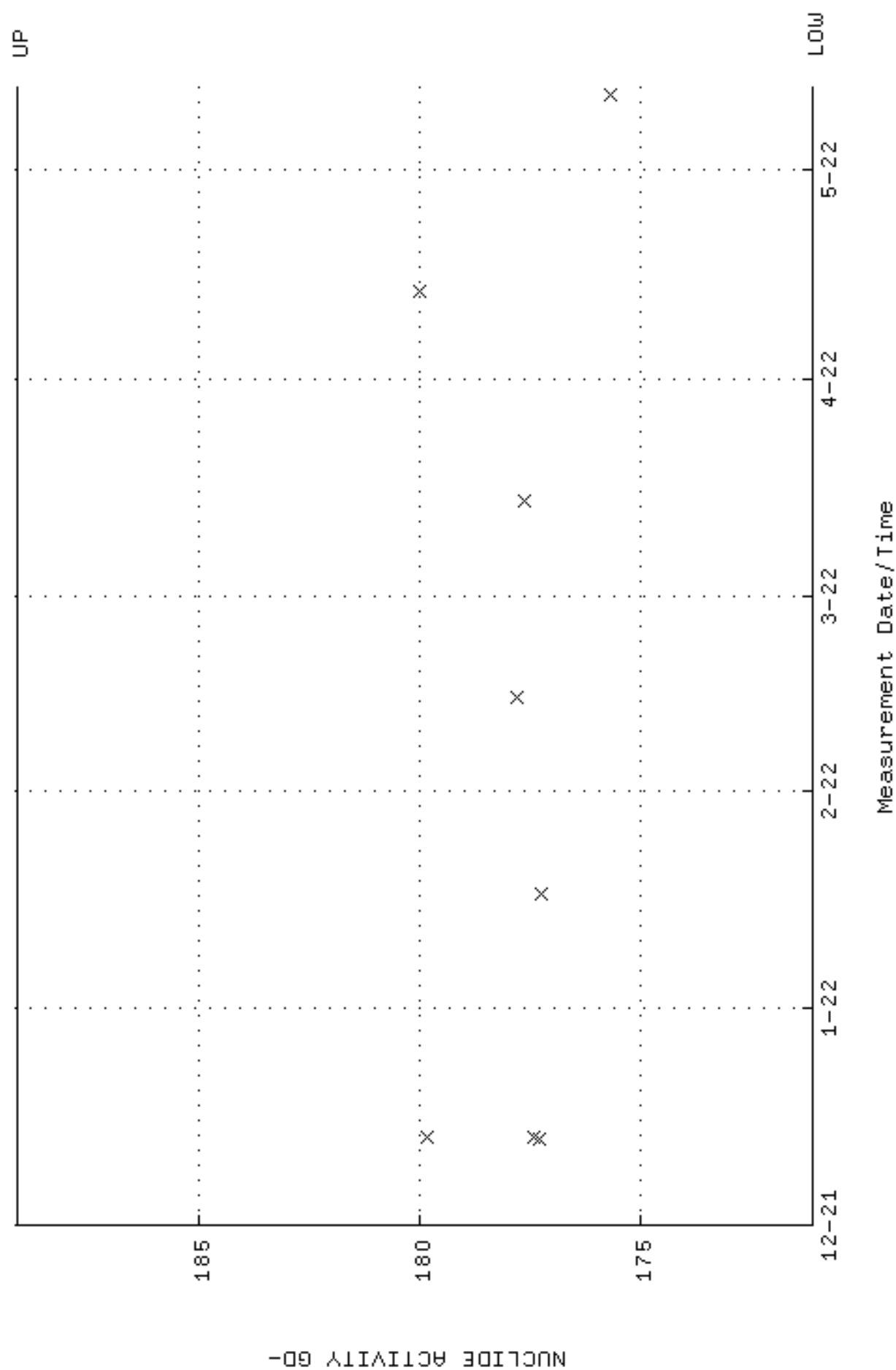
QA filename : DKA100:[ENV_ALPHA.QA.B]B128.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 17:00:28 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



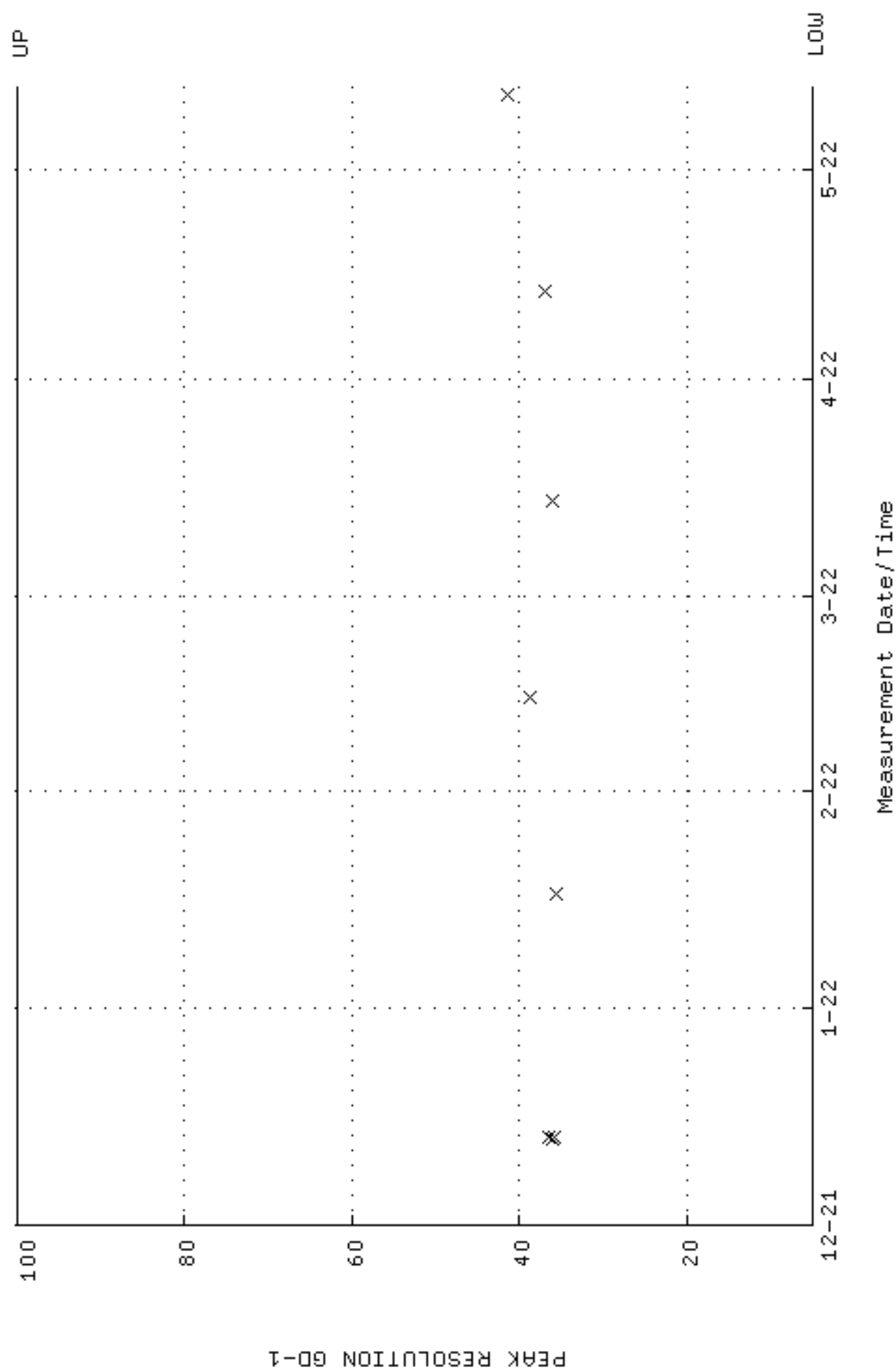
QA filename : DKA100:[ENV_ALPHA.QA.W]W129.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-DEC-2021 07:41:54 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.256800 through 0.272690



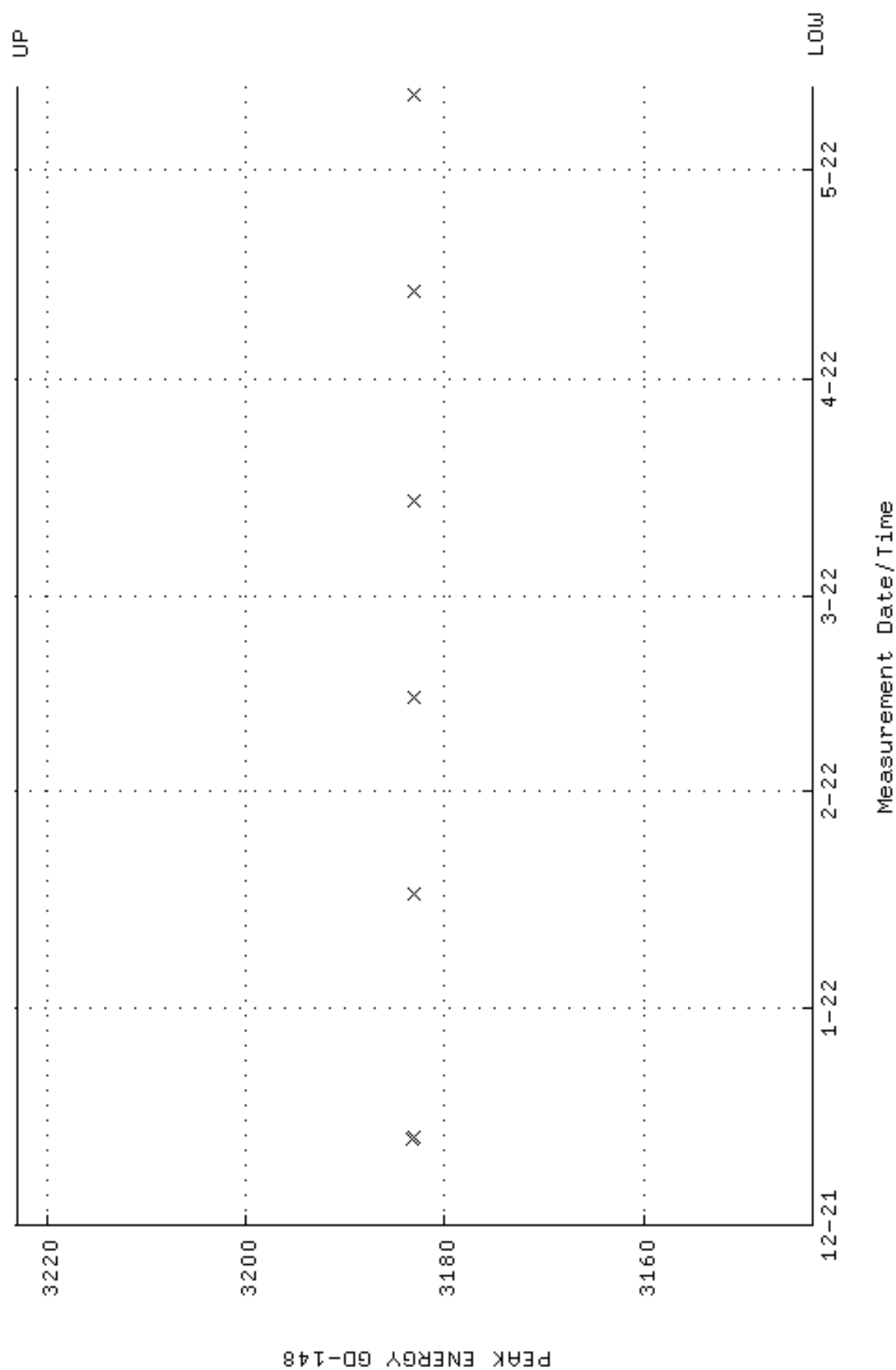
QA filename : DKA100:[ENV_ALPHA.QA.W]W129.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-DEC-2021 07:41:54 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



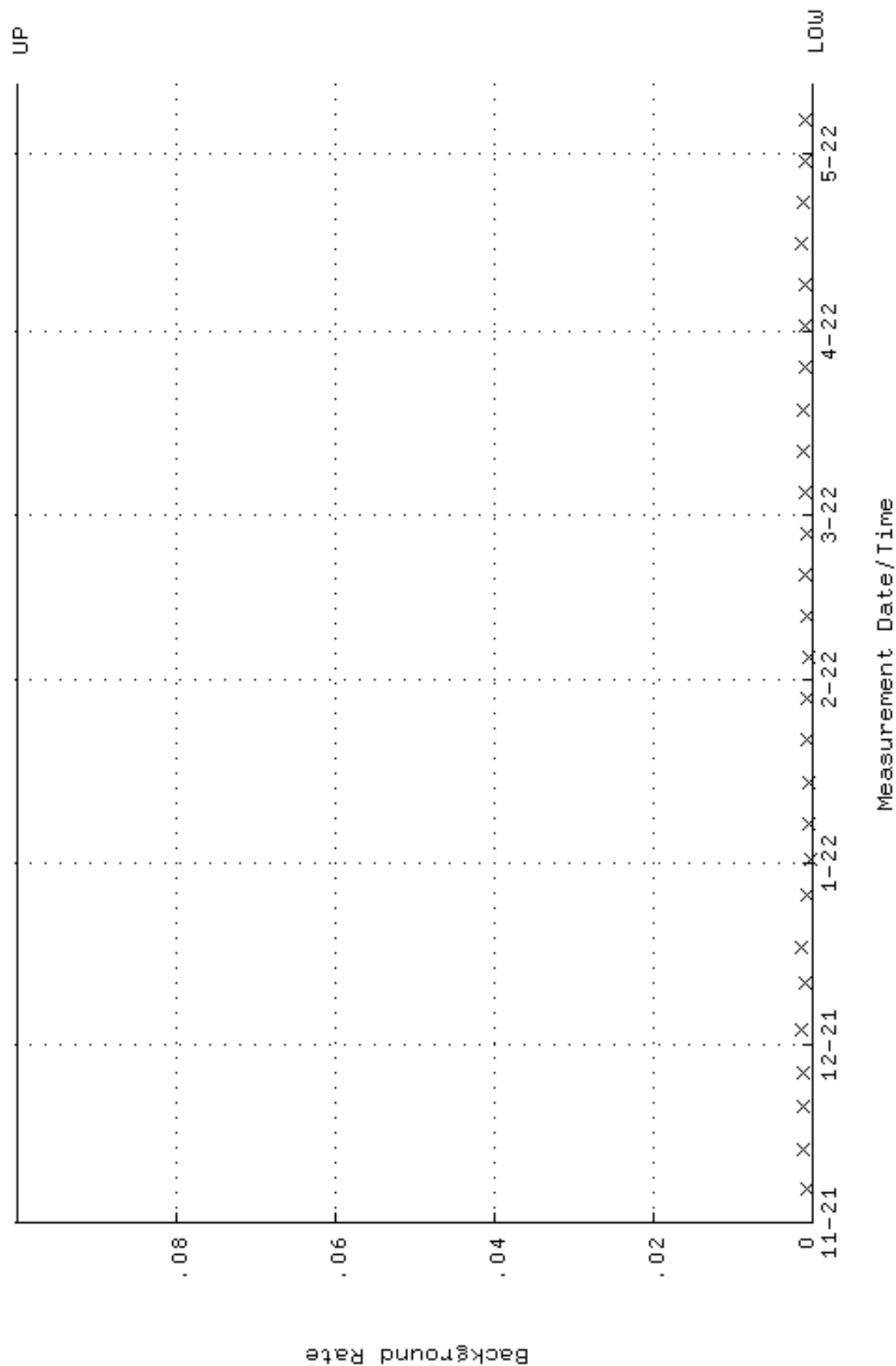
QA filename : DKA100:[ENV_ALPHA.QA.W]W129.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-DEC-2021 07:41:54 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



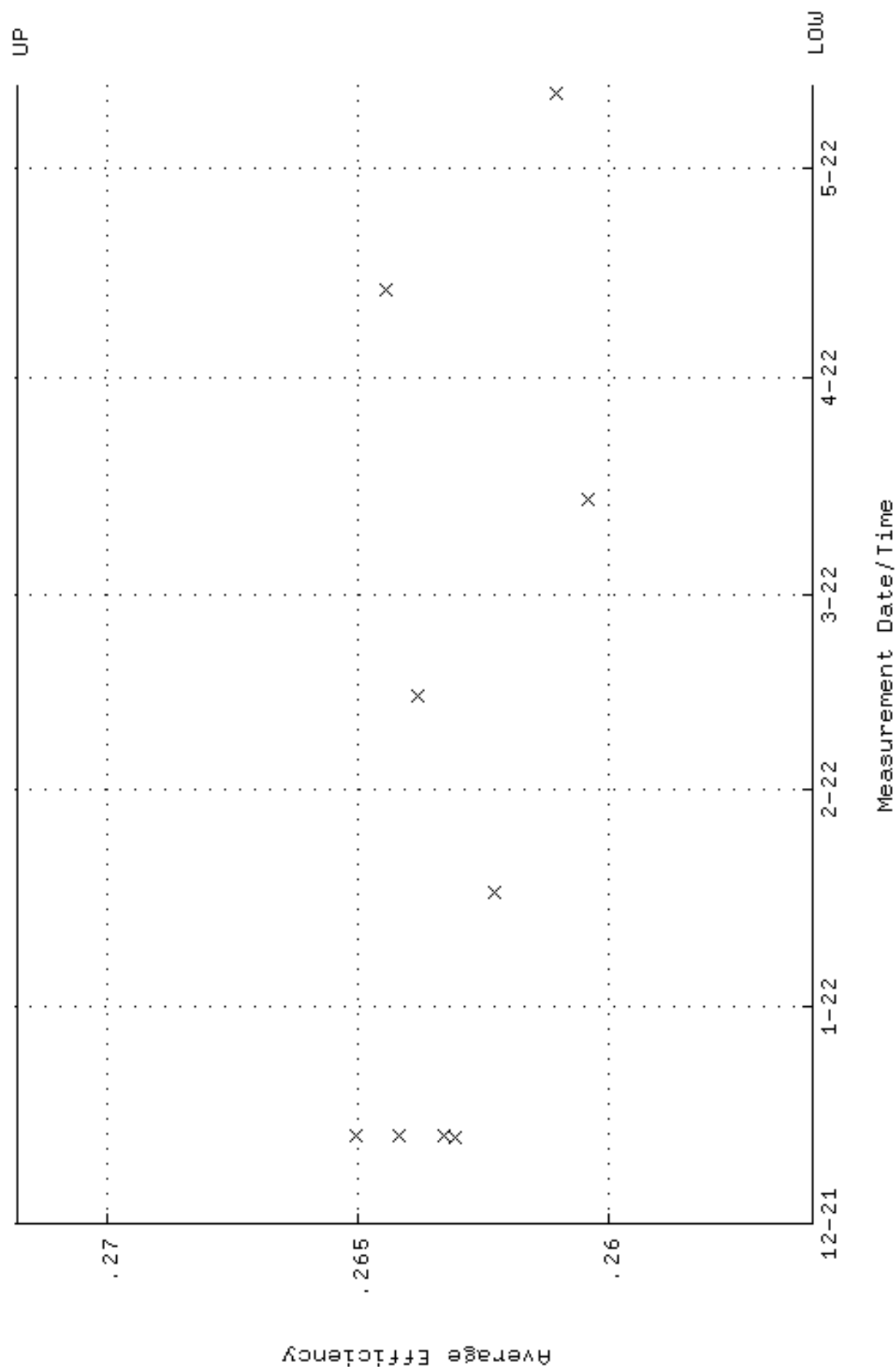
QA filename : DKA100:[ENV_ALPHA.QA.W]W129.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-DEC-2021 07:41:54 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



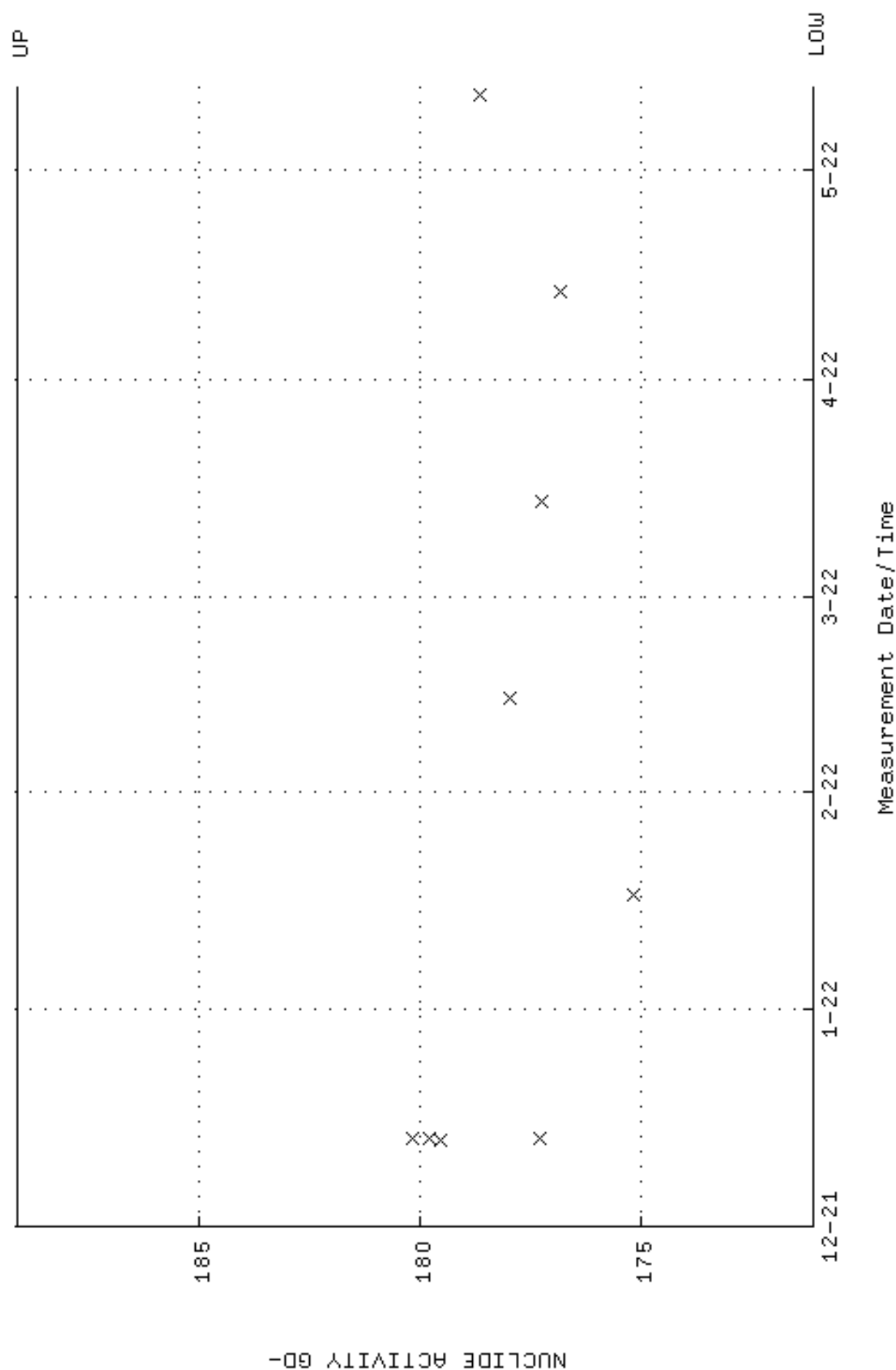
QA filename : DKA100:[ENV_ALPHA.QA.B]B129.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 17:00:32 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



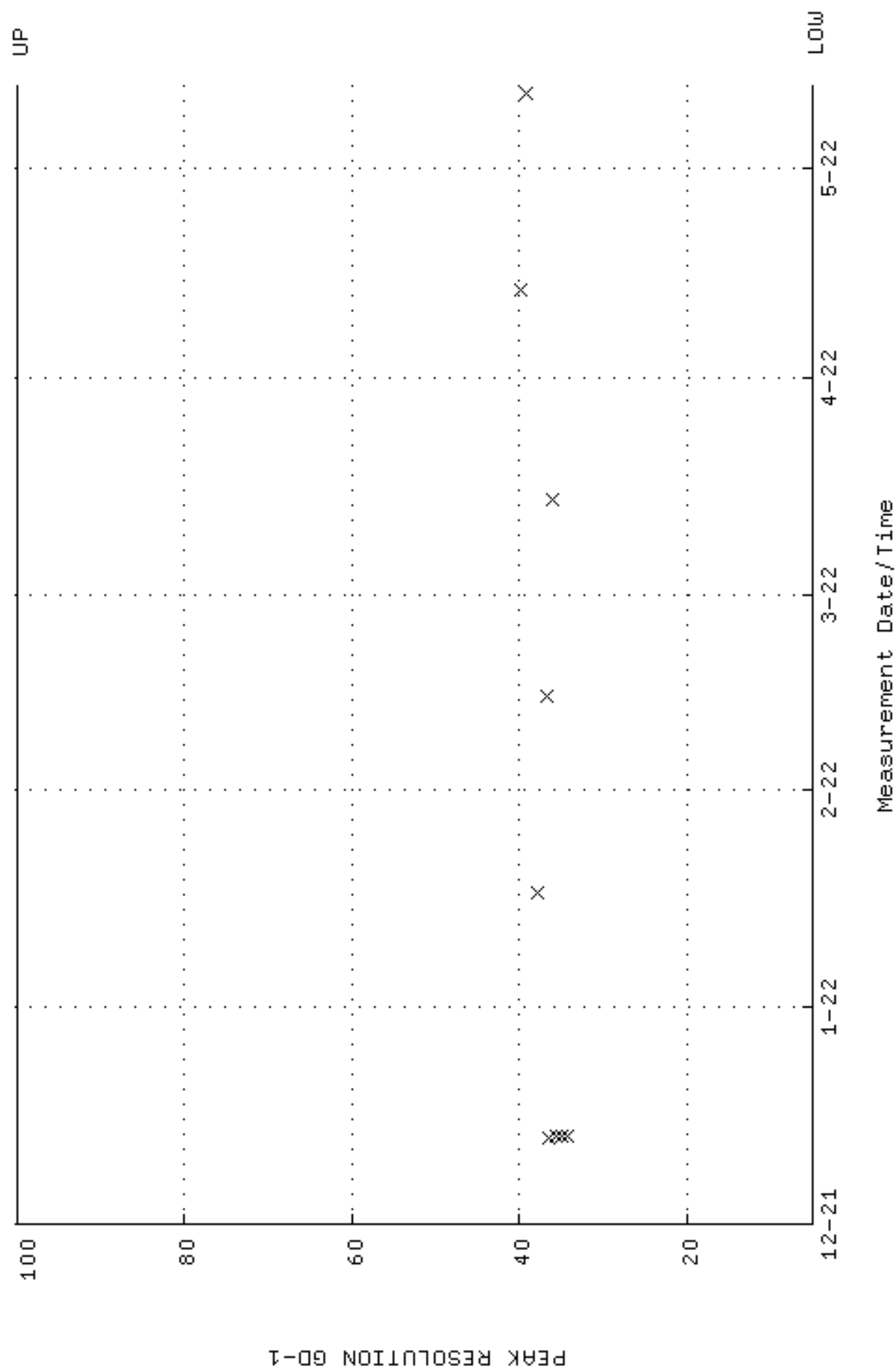
QA filename : DKA100:[ENV_ALPHA.QA.W]W135.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-DEC-2021 07:42:28 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.255950 through 0.271780



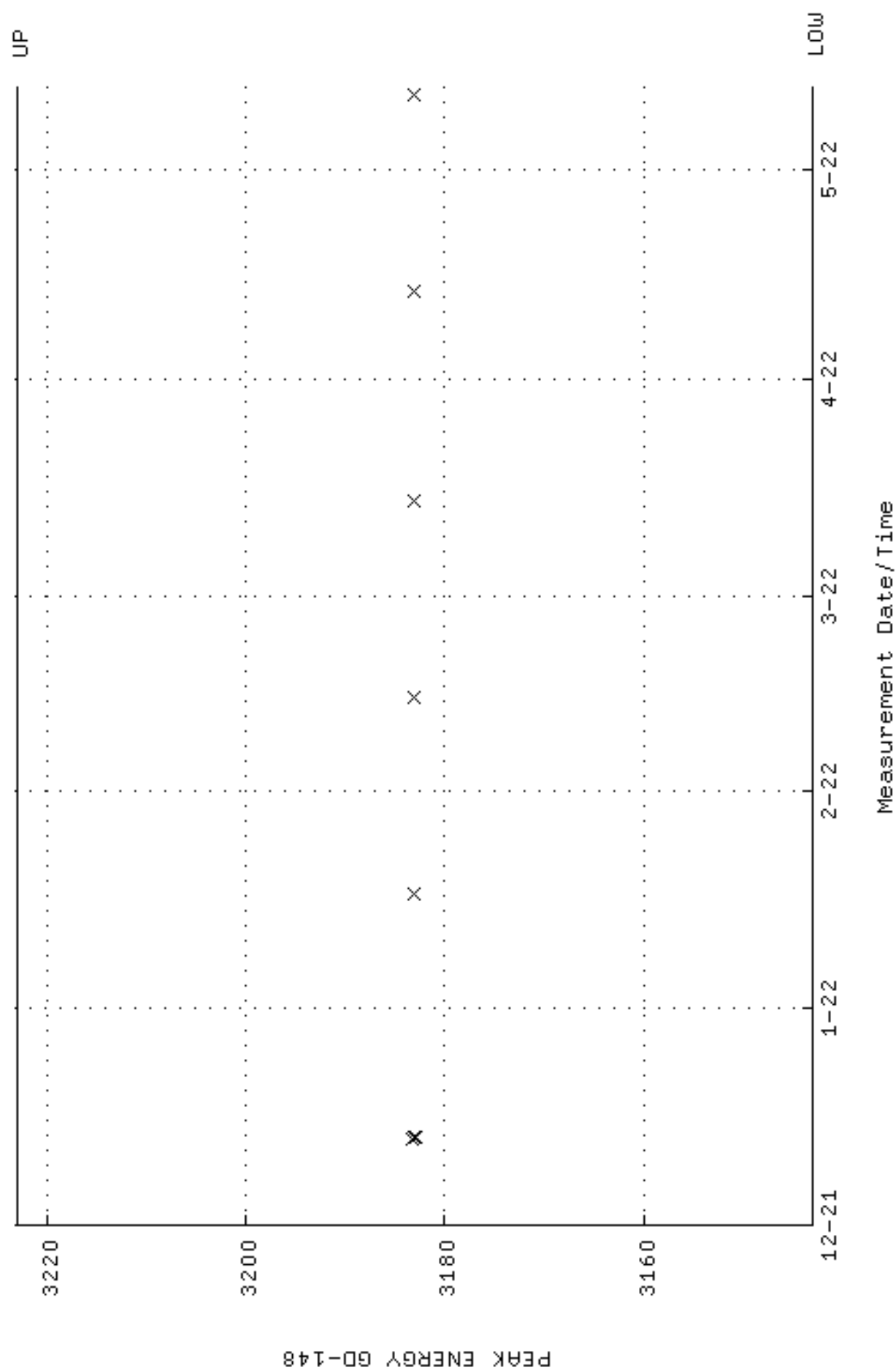
QA filename : DKA100:[ENV_ALPHA.QA.W]W135.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-DEC-2021 07:42:28 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



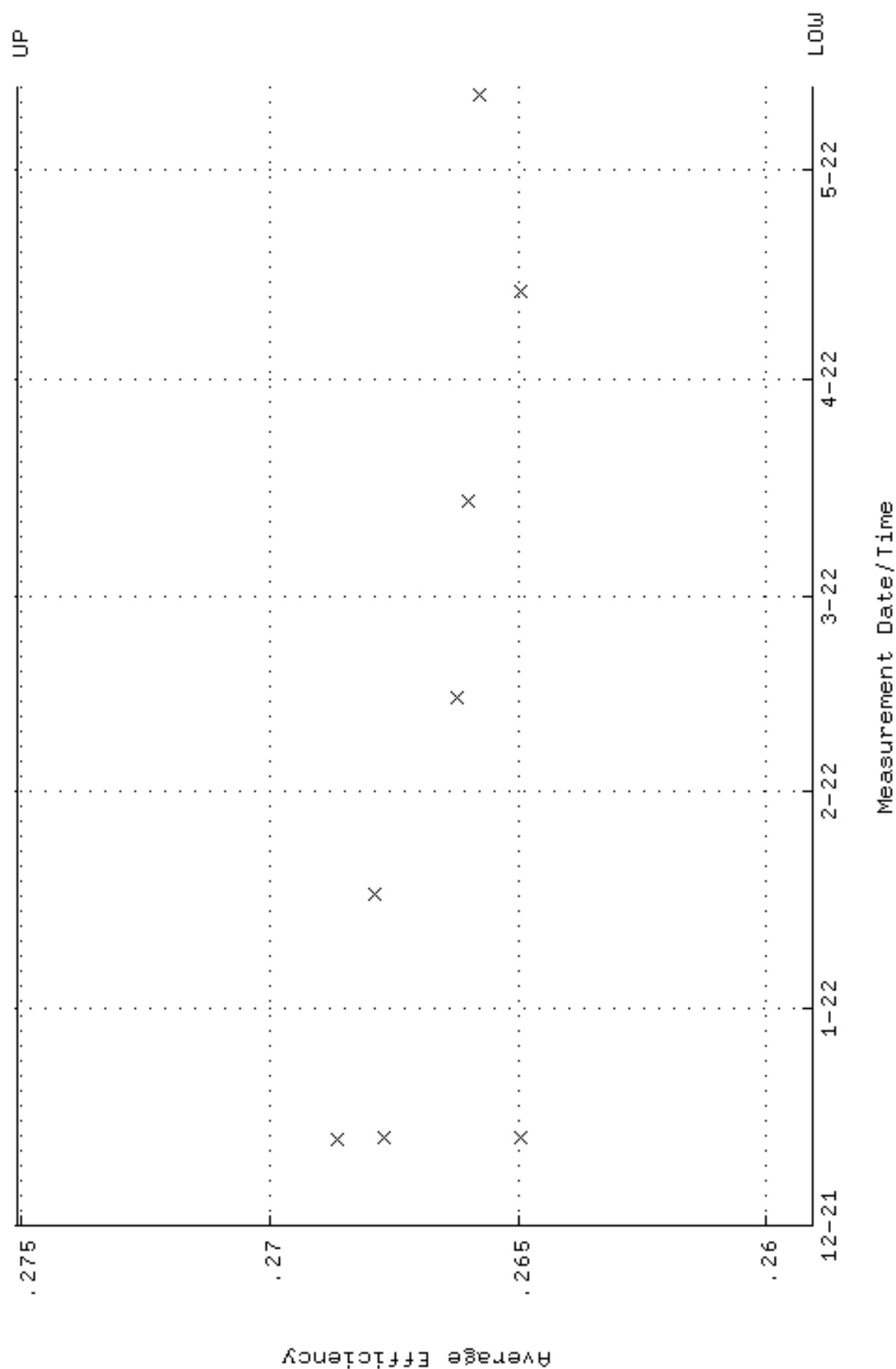
QA filename : DKA100:[ENV_ALPHA.QA.W]W135.QAF;7
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-DEC-2021 07:42:28 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



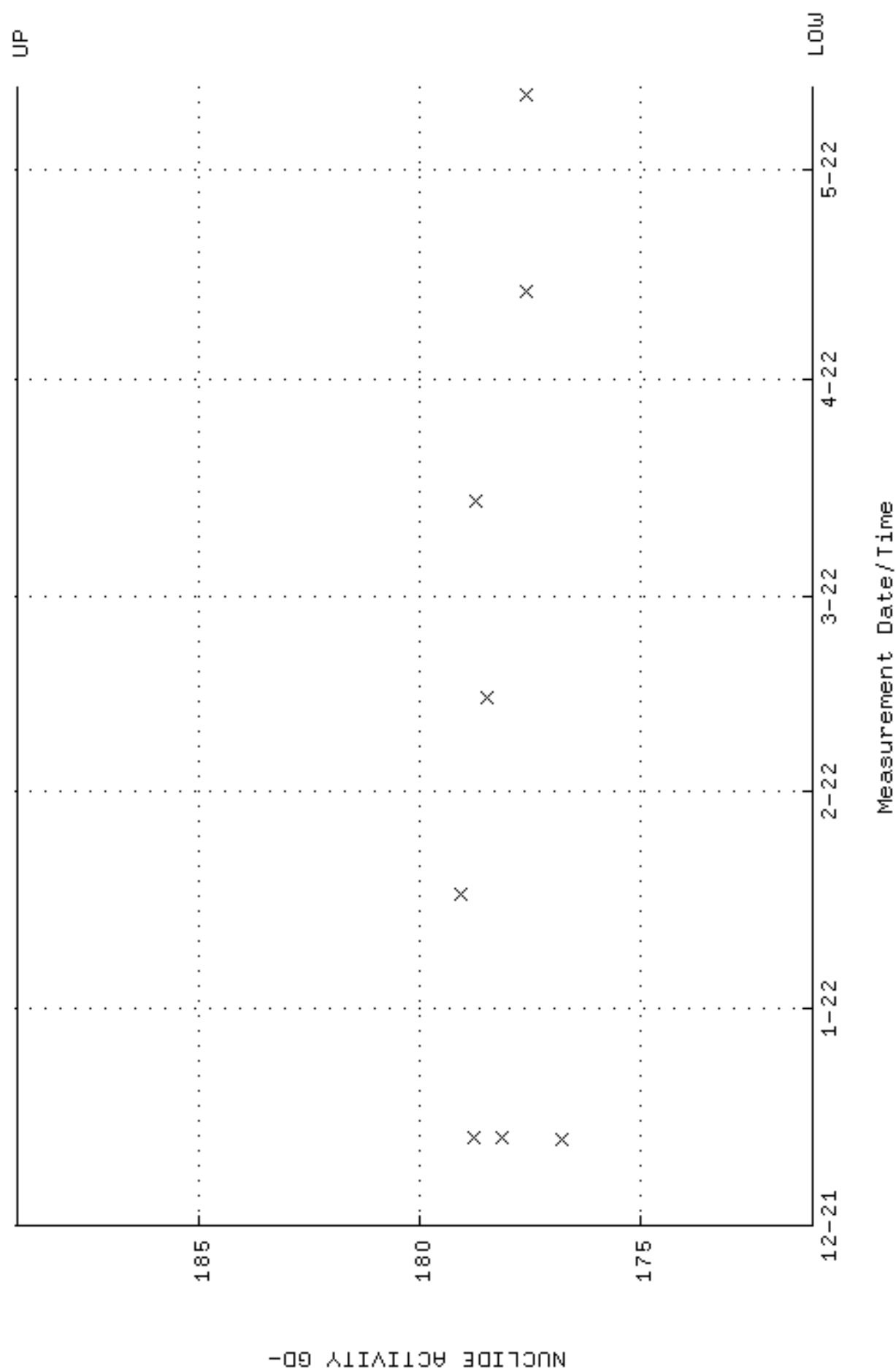
QA filename : DKA100:[ENV_ALPHA.QA.W]W135.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-DEC-2021 07:42:28 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



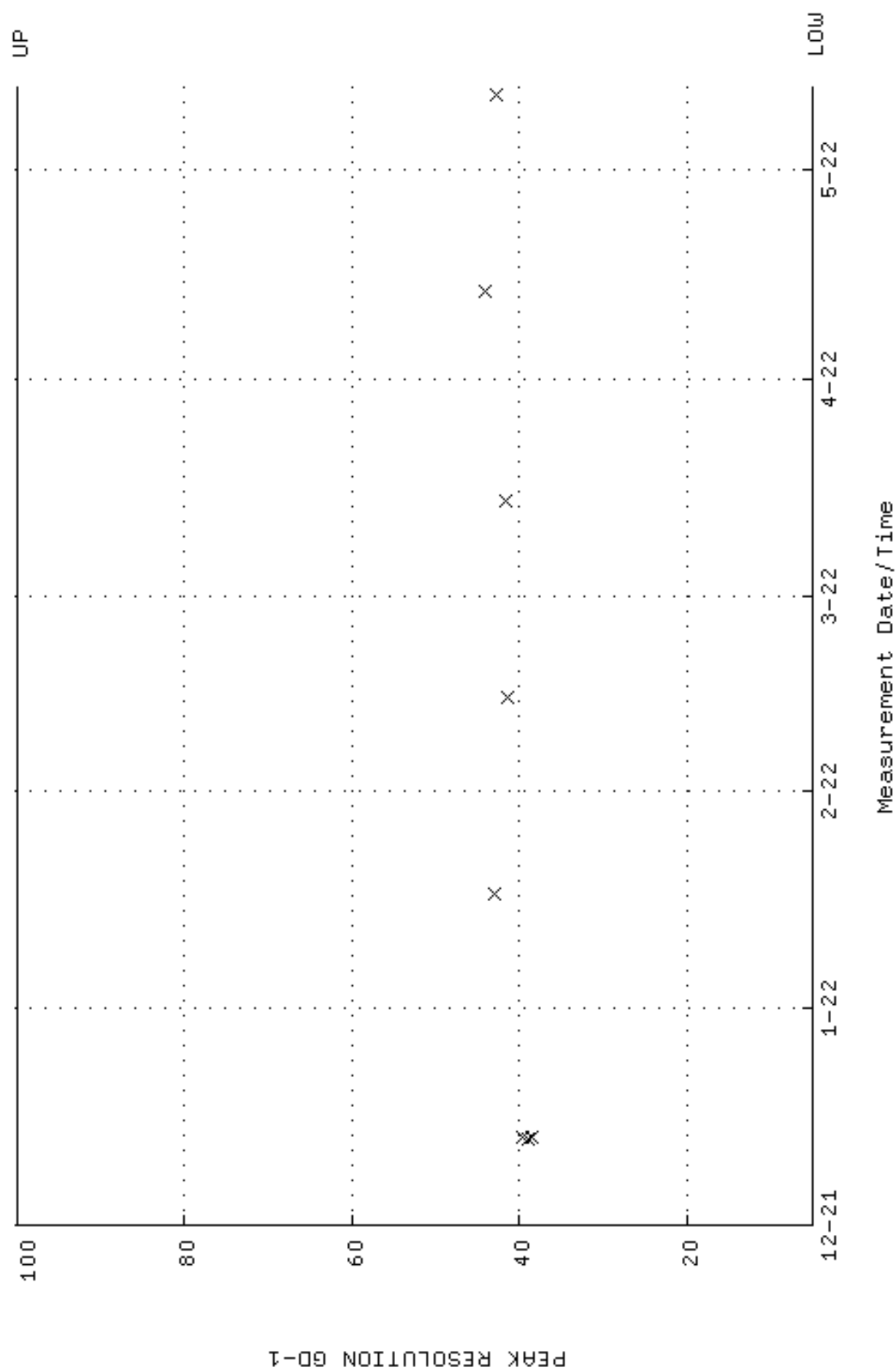
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-DEC-2021 07:42:34 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.259070 through 0.275090



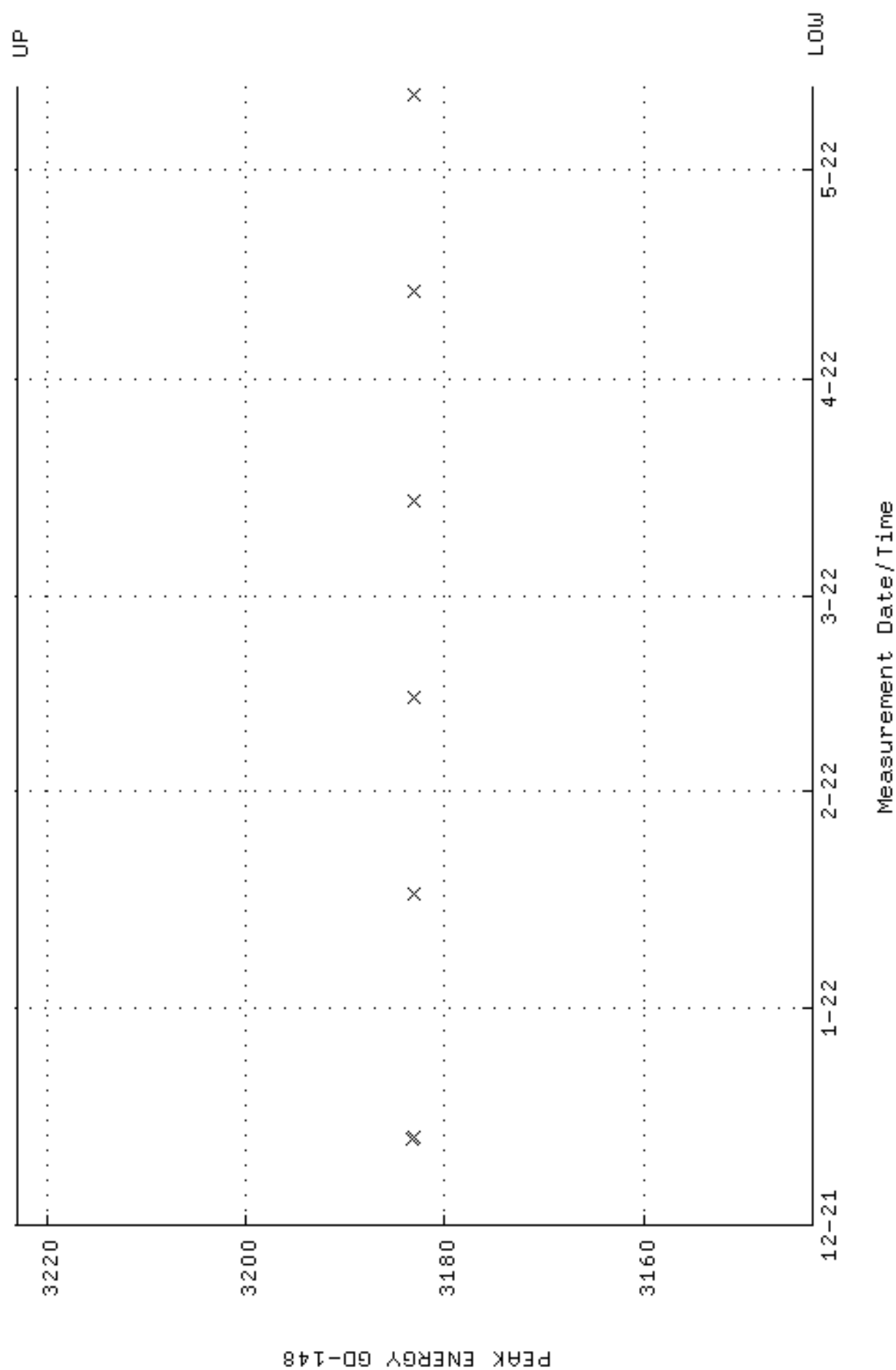
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-DEC-2021 07:42:34 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



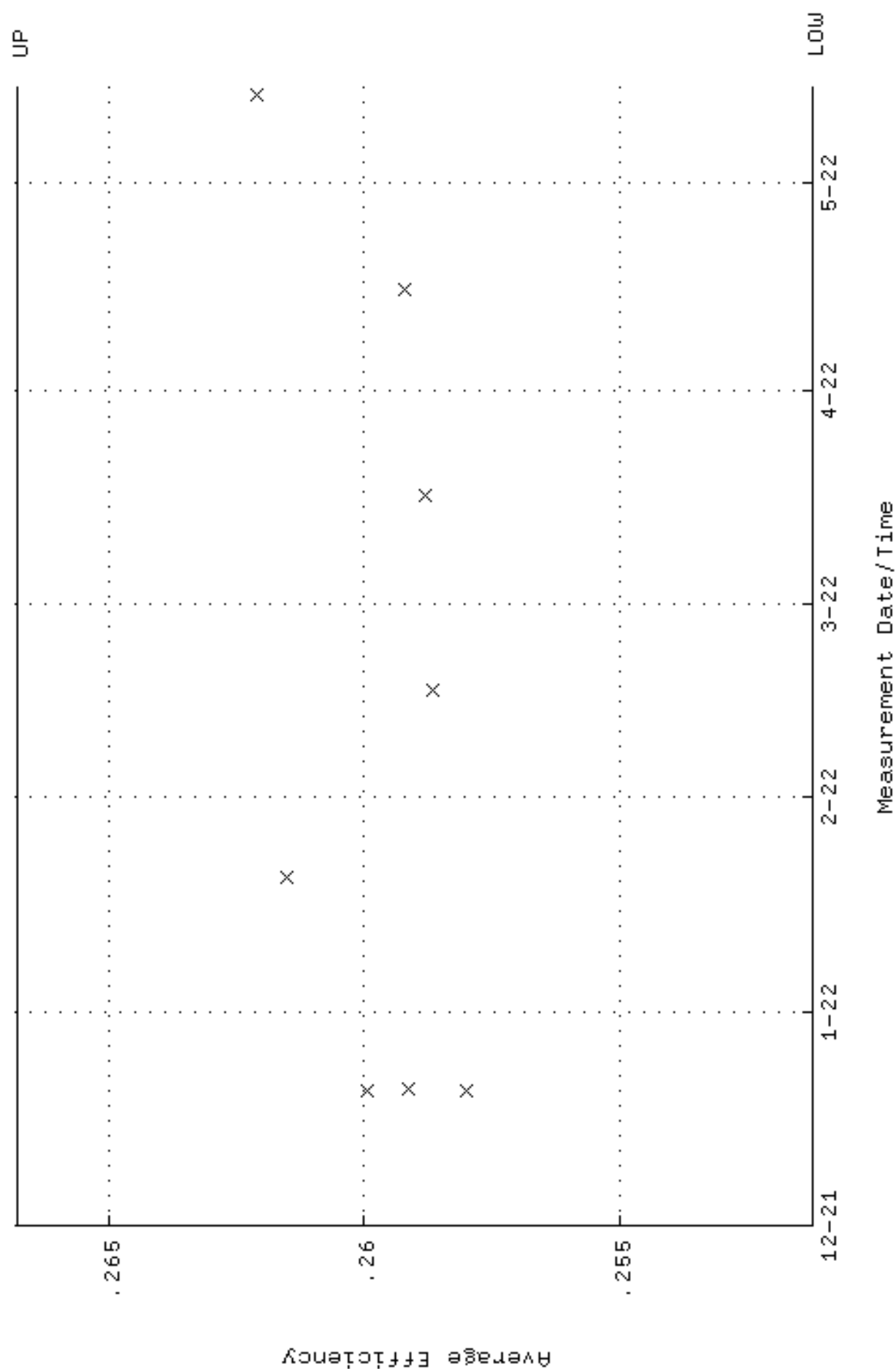
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-DEC-2021 07:42:34 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



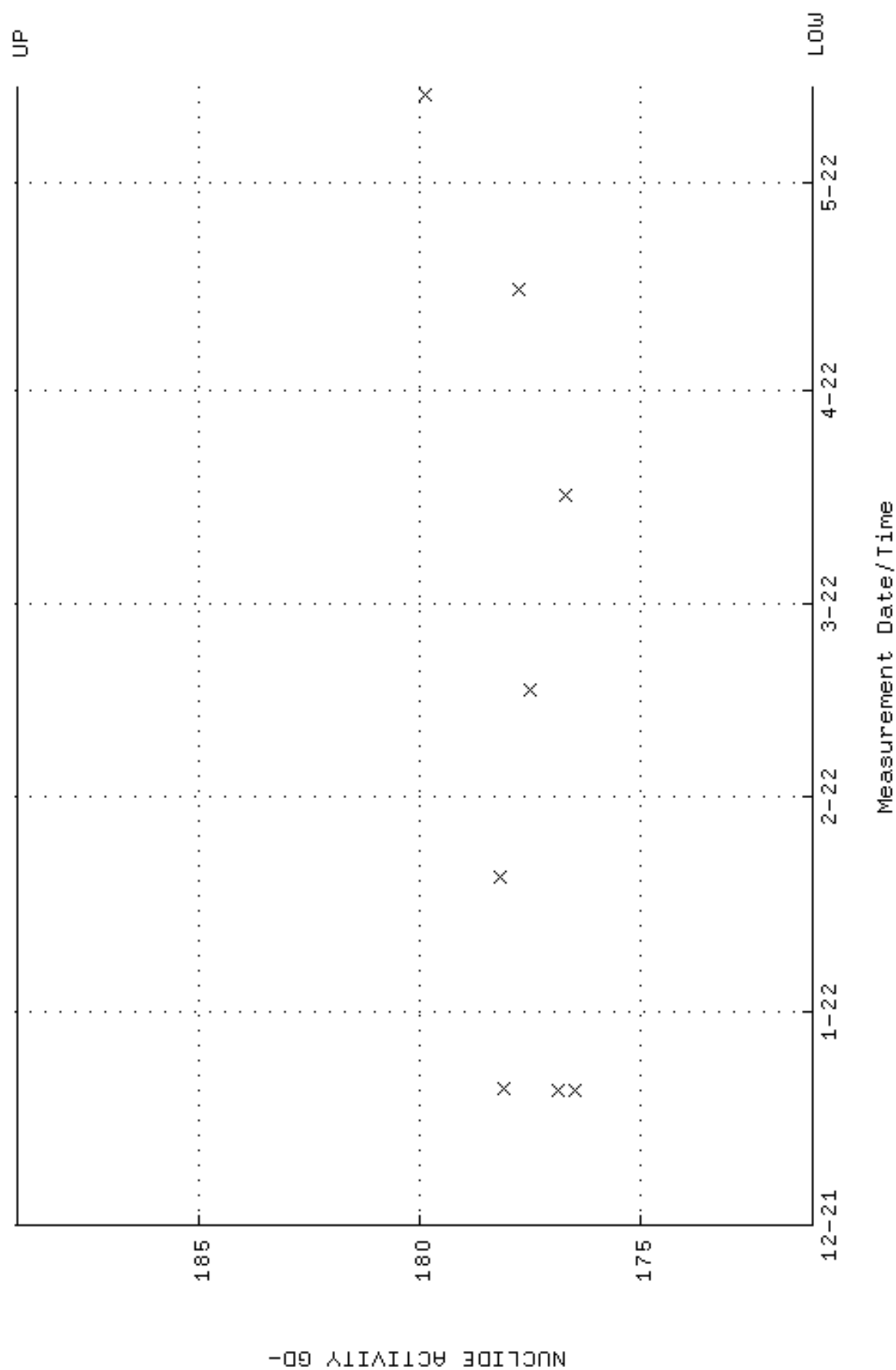
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-DEC-2021 07:42:34 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



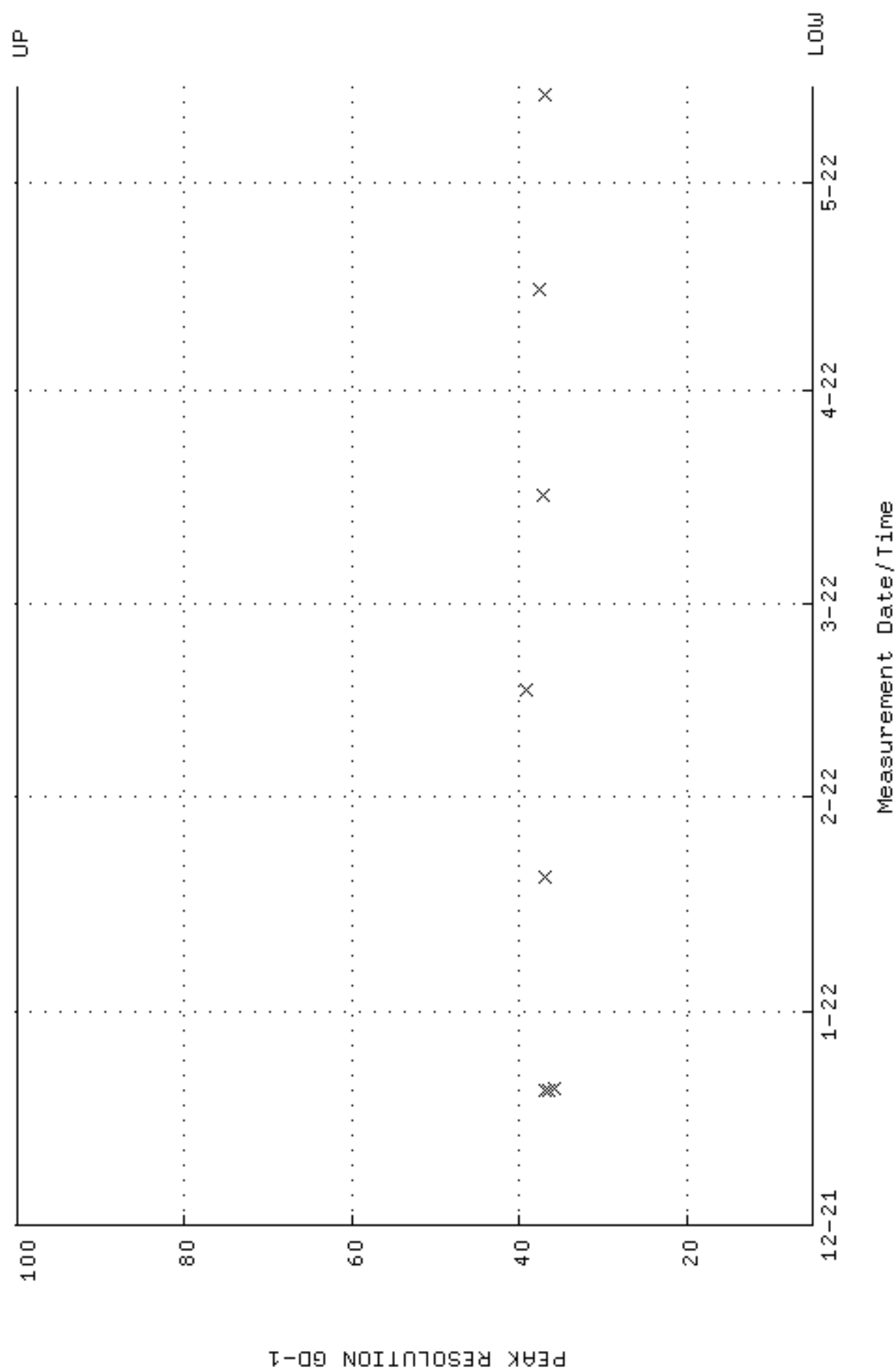
QA filename : DKA100:[ENV_ALPHA.QA.W]W170.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 20-DEC-2021 09:44:59 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.251240 through 0.266780



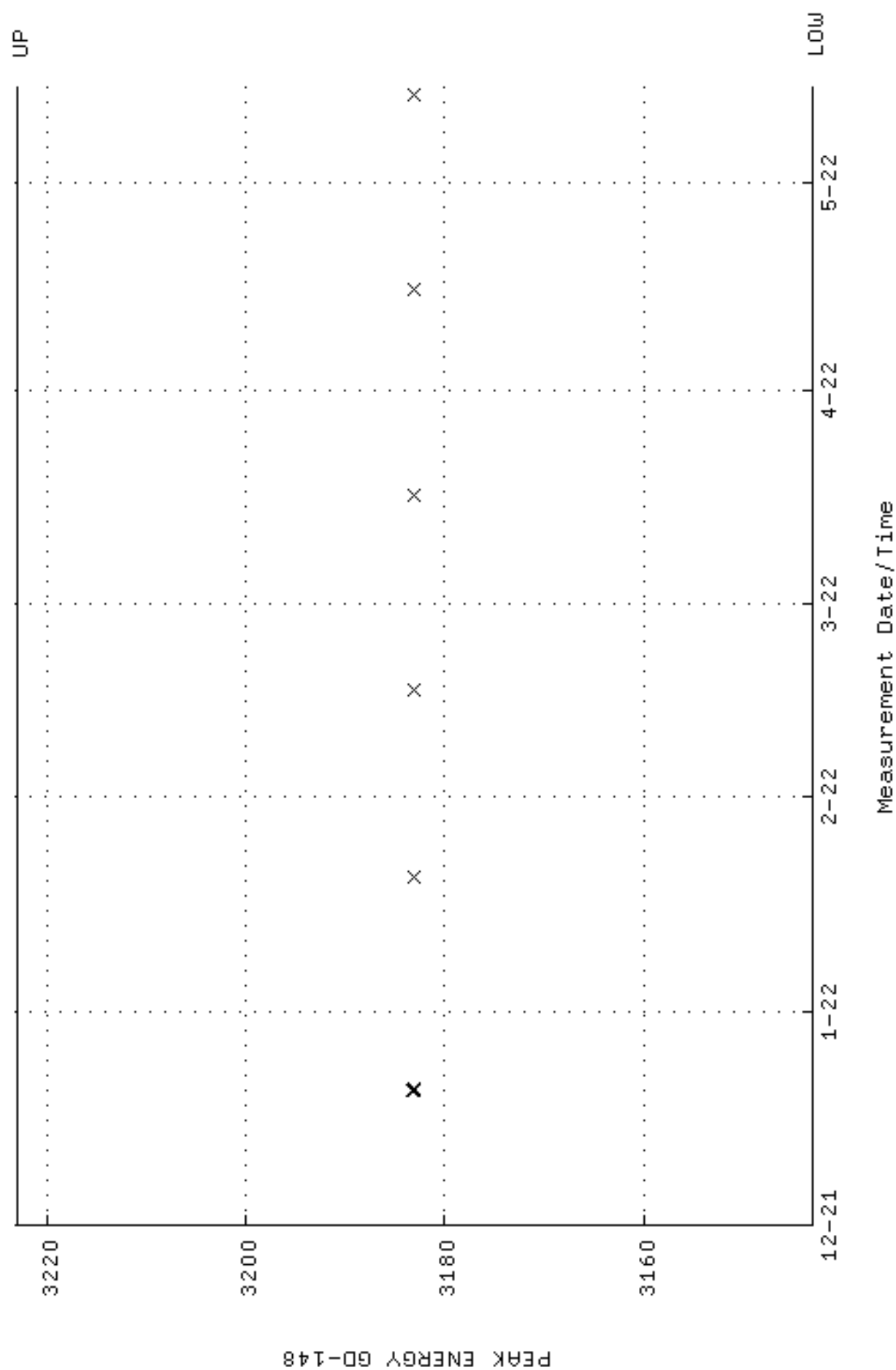
QA filename : DKA100:[ENV_ALPHA.QA.W]W170.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 20-DEC-2021 09:44:59 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



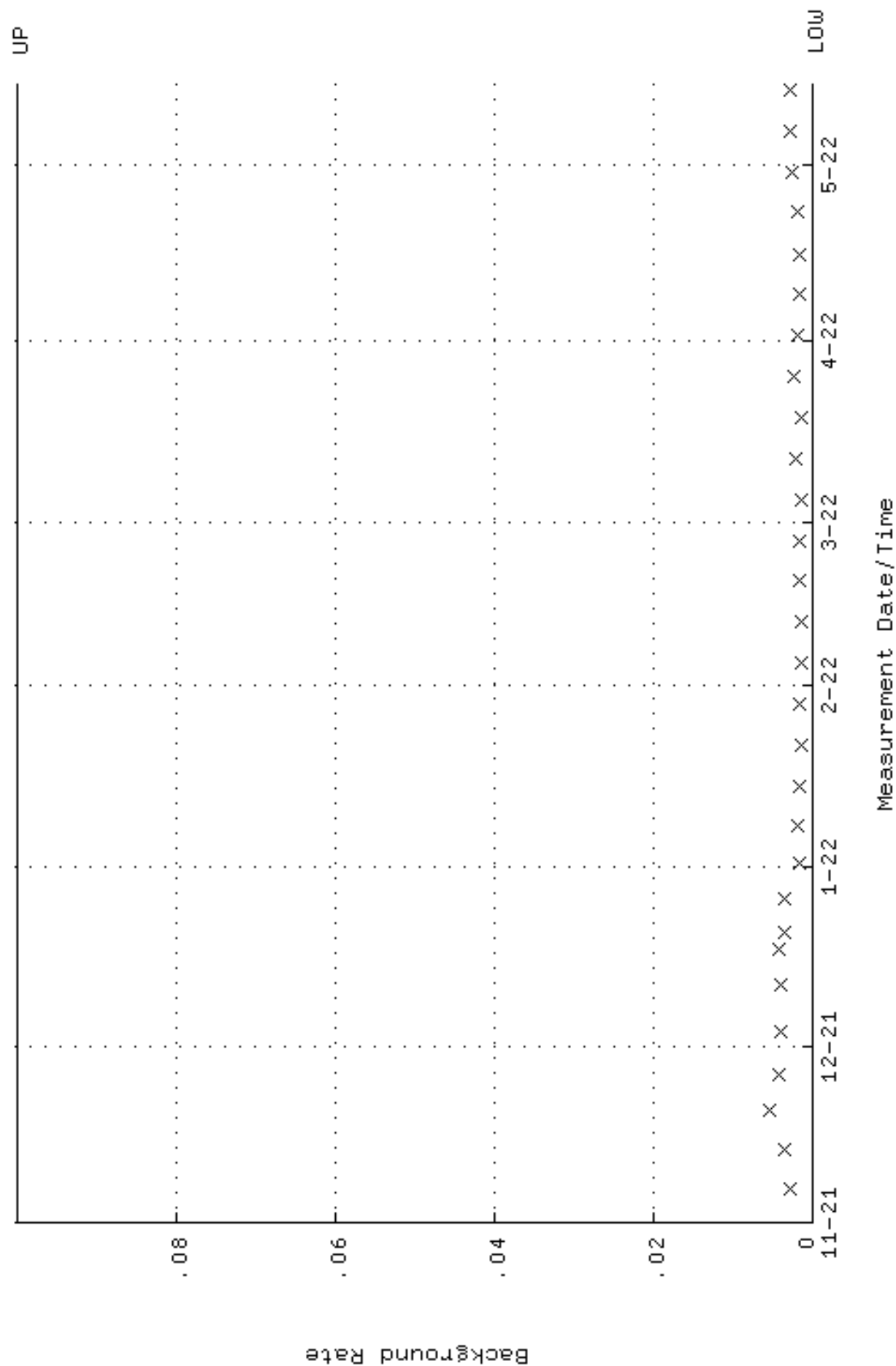
QA filename : DKA100:[ENV_ALPHA.QA.W]W170.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 20-DEC-2021 09:44:59 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



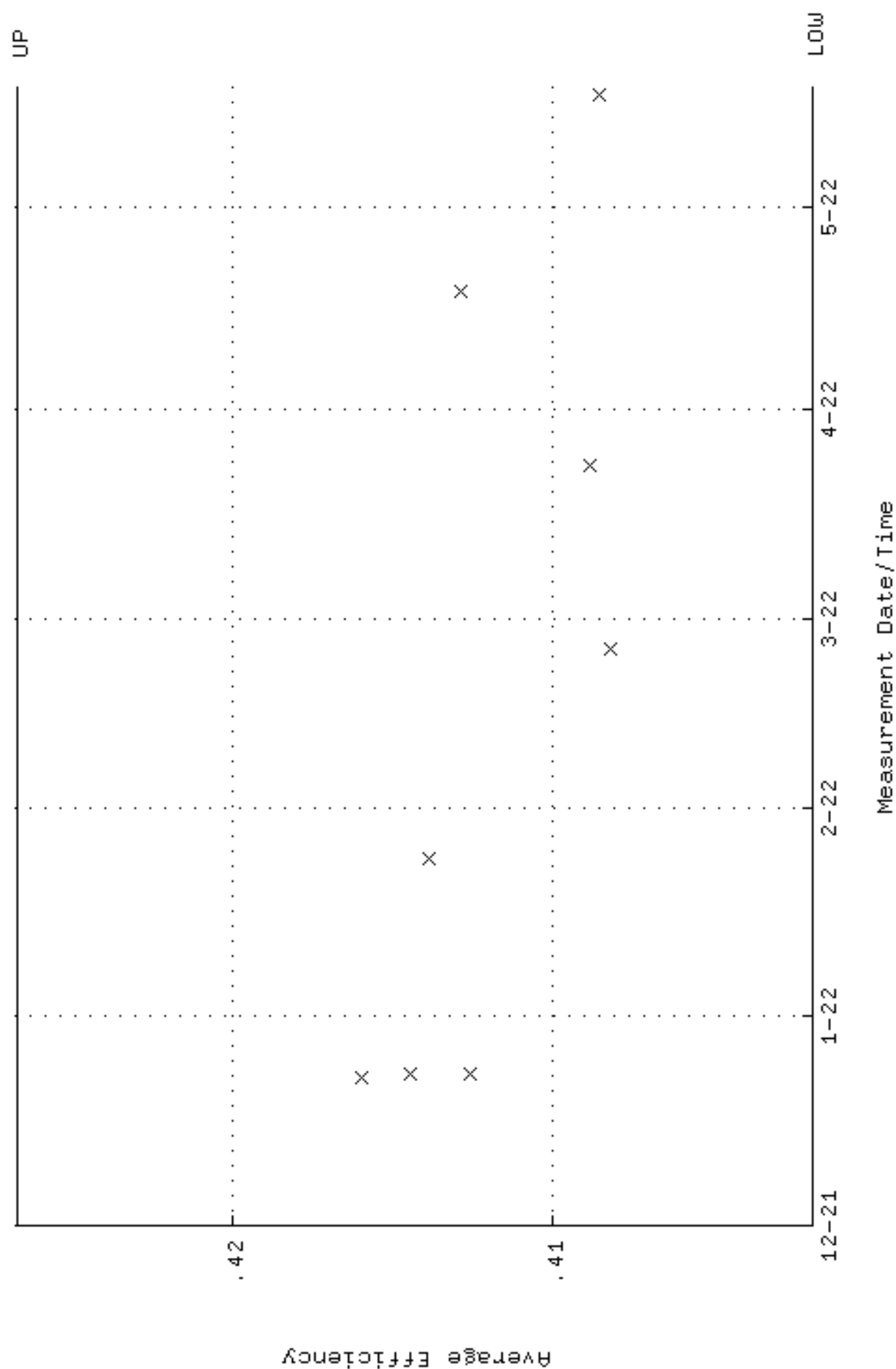
QA filename : DKA100:[ENV_ALPHA.QA.W]W170.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 20-DEC-2021 09:44:59 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



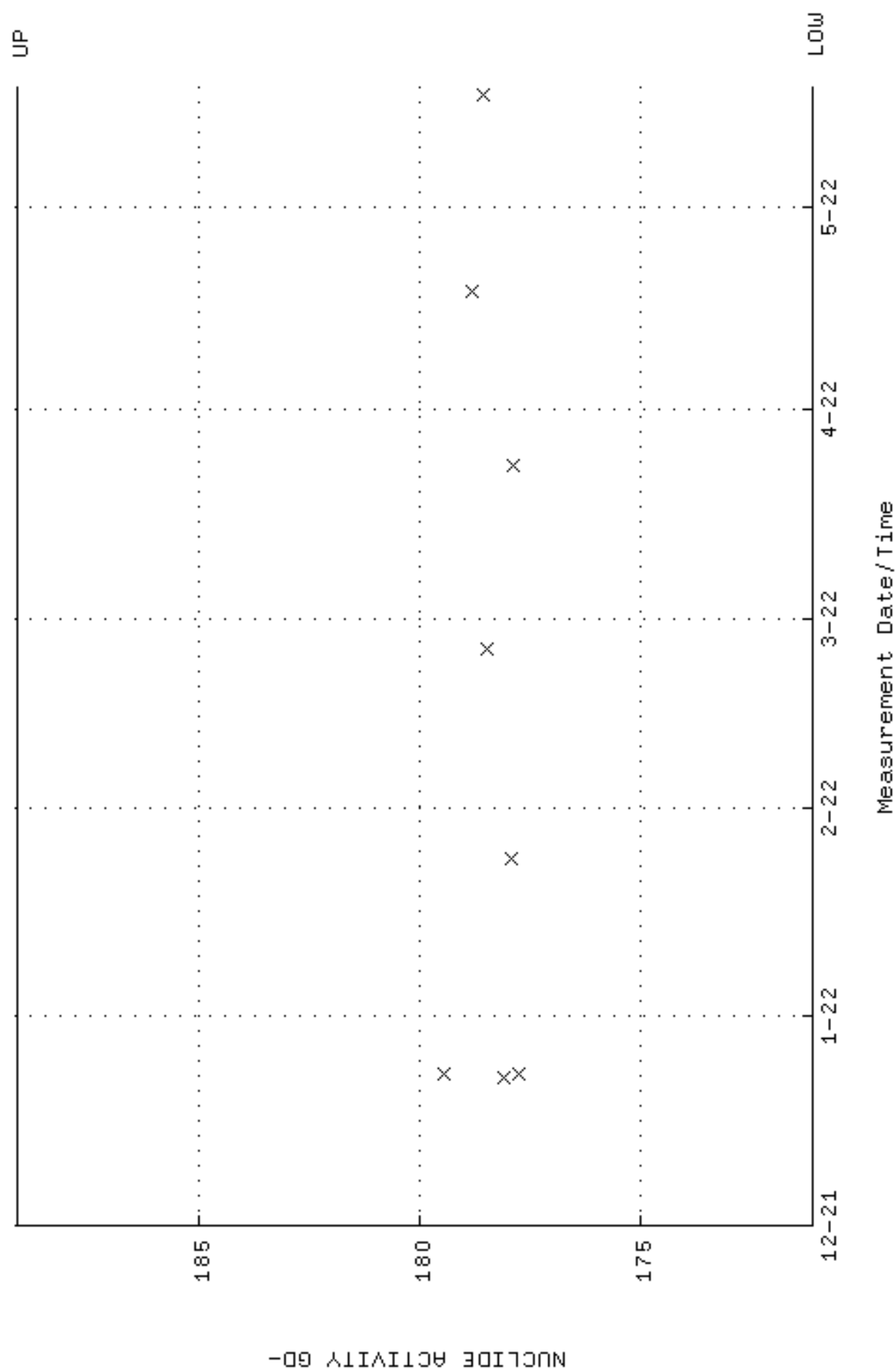
QA filename : DKA100:[ENV_ALPHA.QA.B]B170.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 17:07:56 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



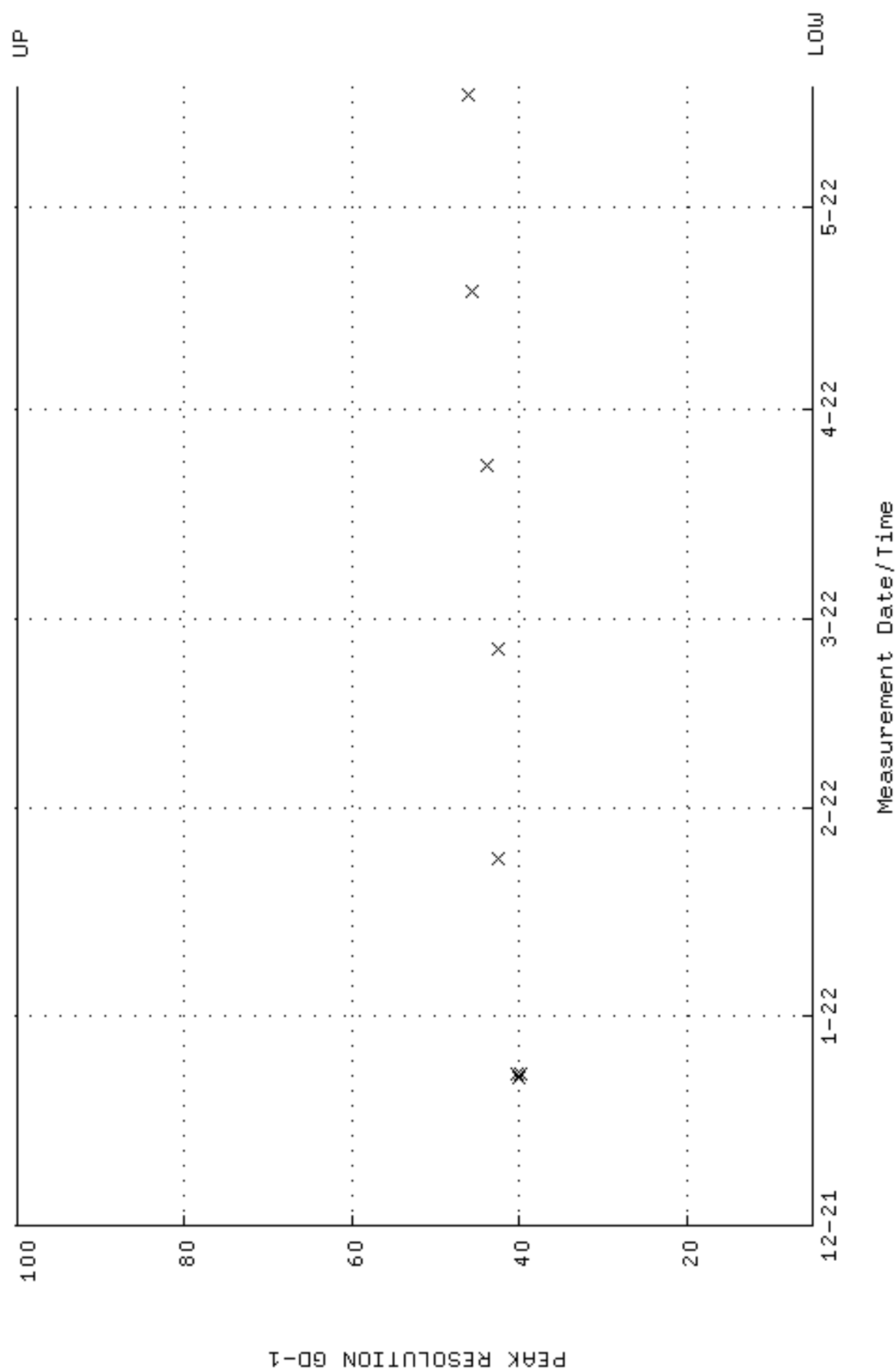
QA filename : DKA100:[ENV_ALPHA.QA.W]W185.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 22-DEC-2021 21:18:48 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.401860 through 0.426710



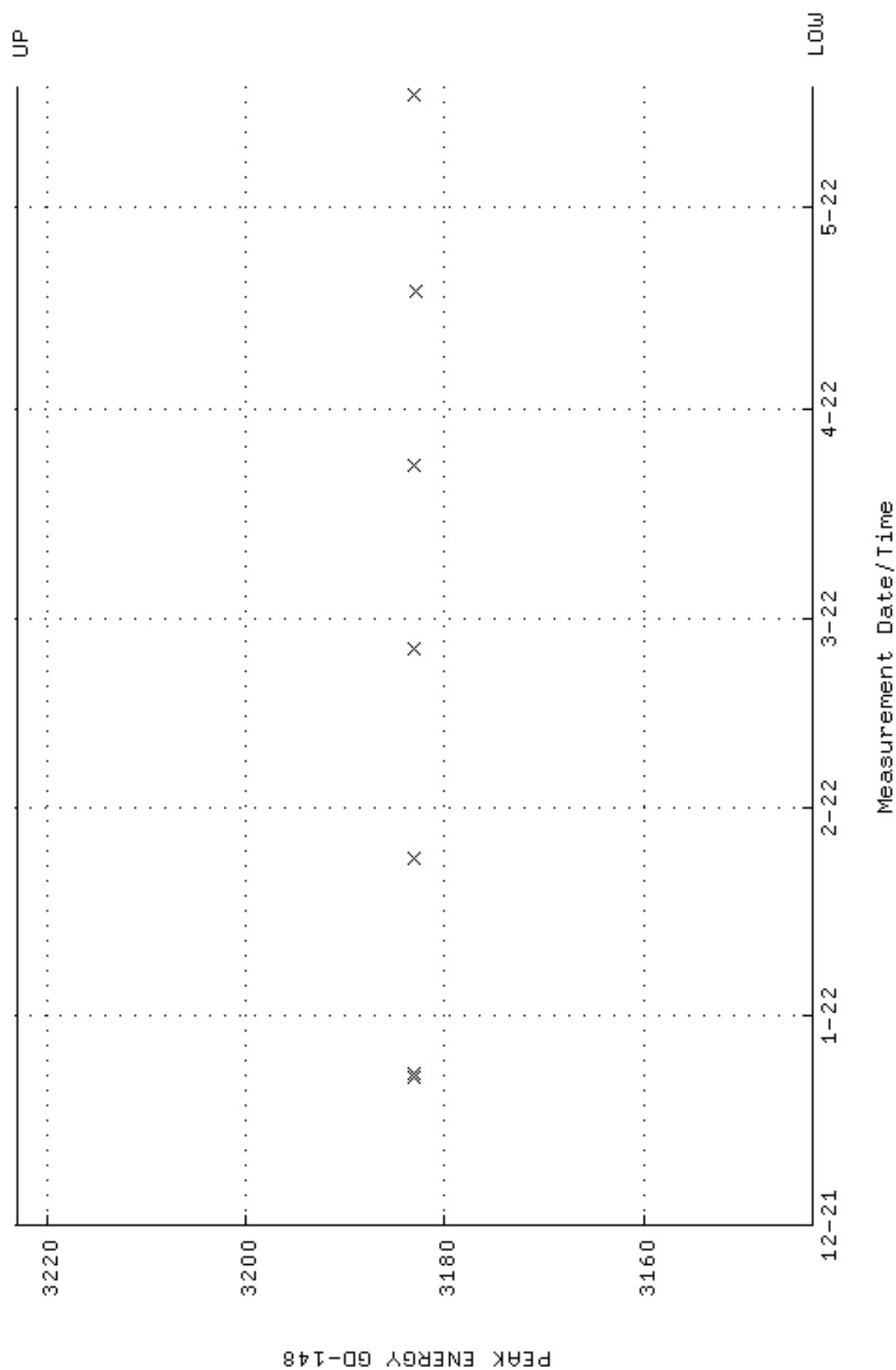
QA filename : DKA100:[ENV_ALPHA.QA.W]W185.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 22-DEC-2021 21:18:48 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



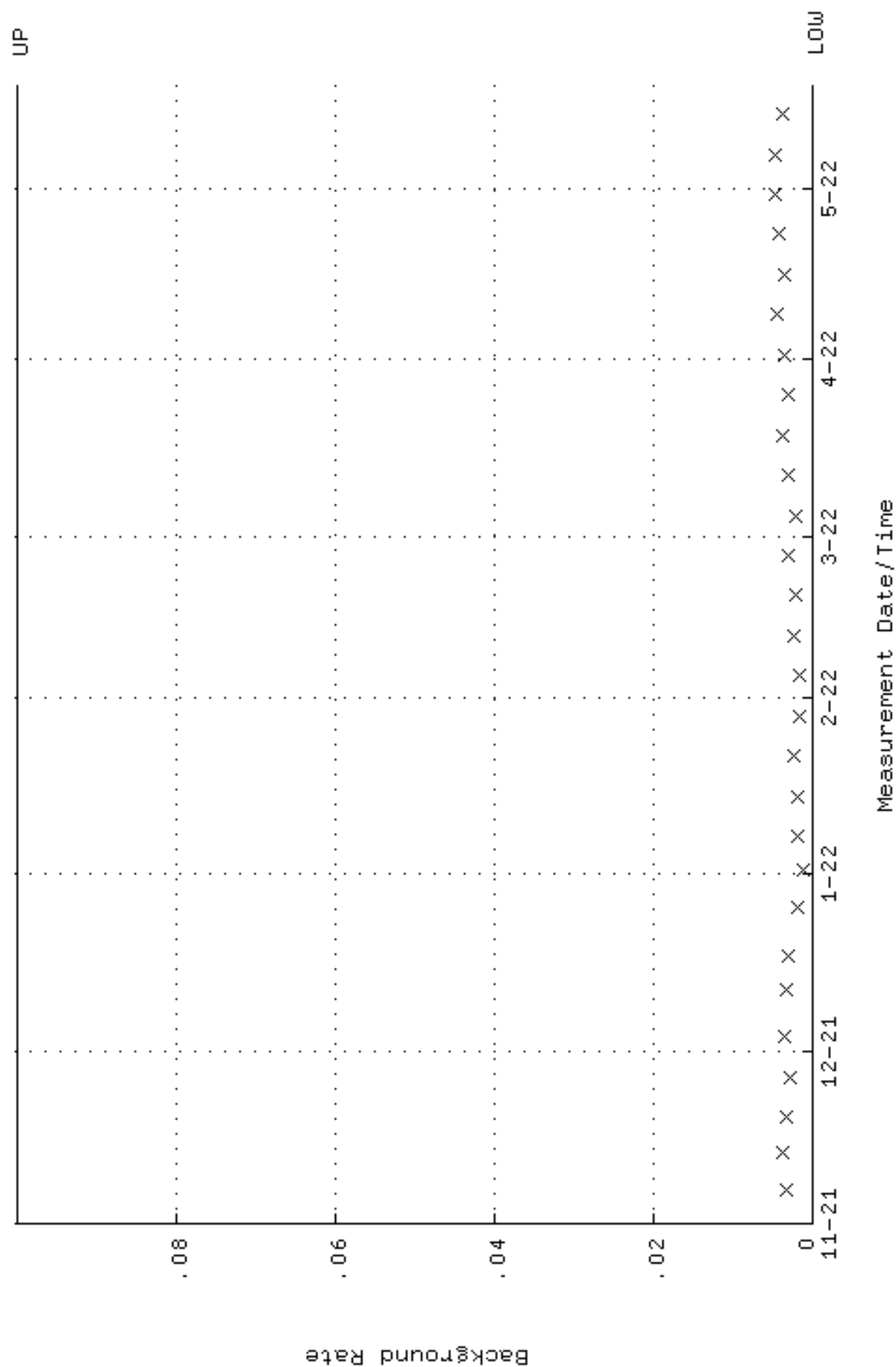
QA filename : DKA100:[ENV_ALPHA.QA.W]W185.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 22-DEC-2021 21:18:48 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



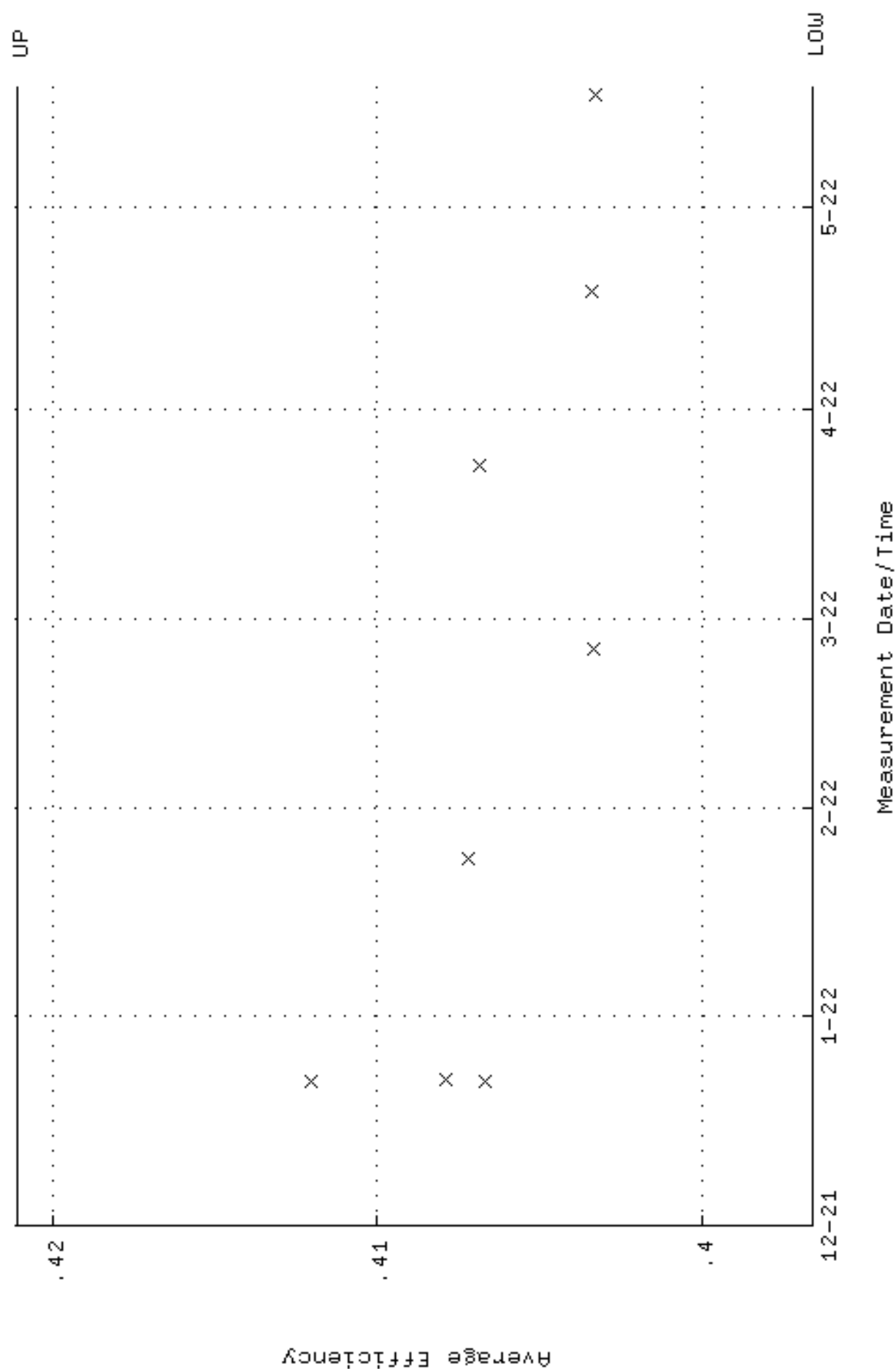
QA filename : DKA100:[ENV_ALPHA.QA.W]W185.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 22-DEC-2021 21:18:48 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



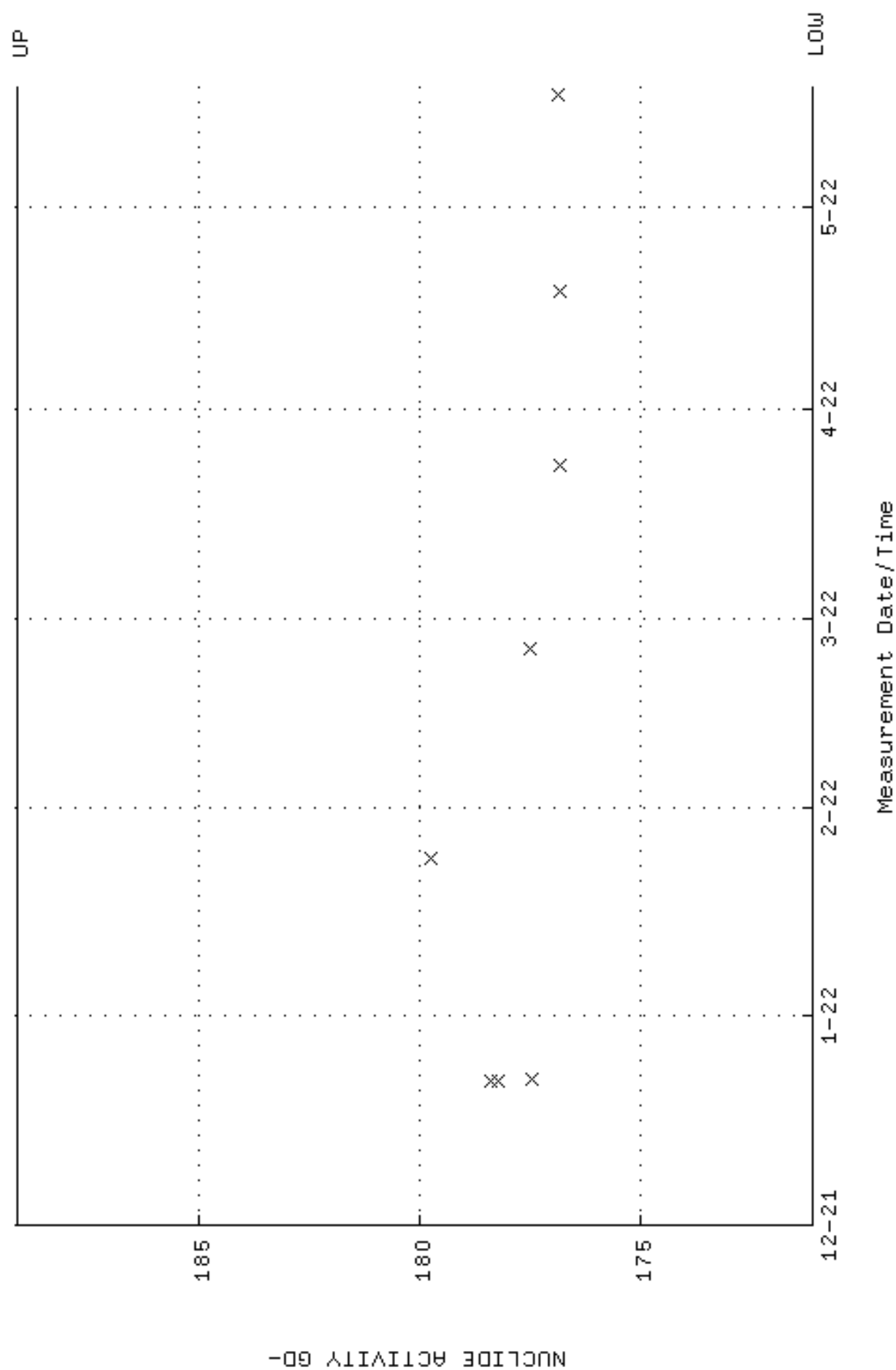
QA filename : DKA100:[ENV_ALPHA.QA.B]B185.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 17:27:19 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



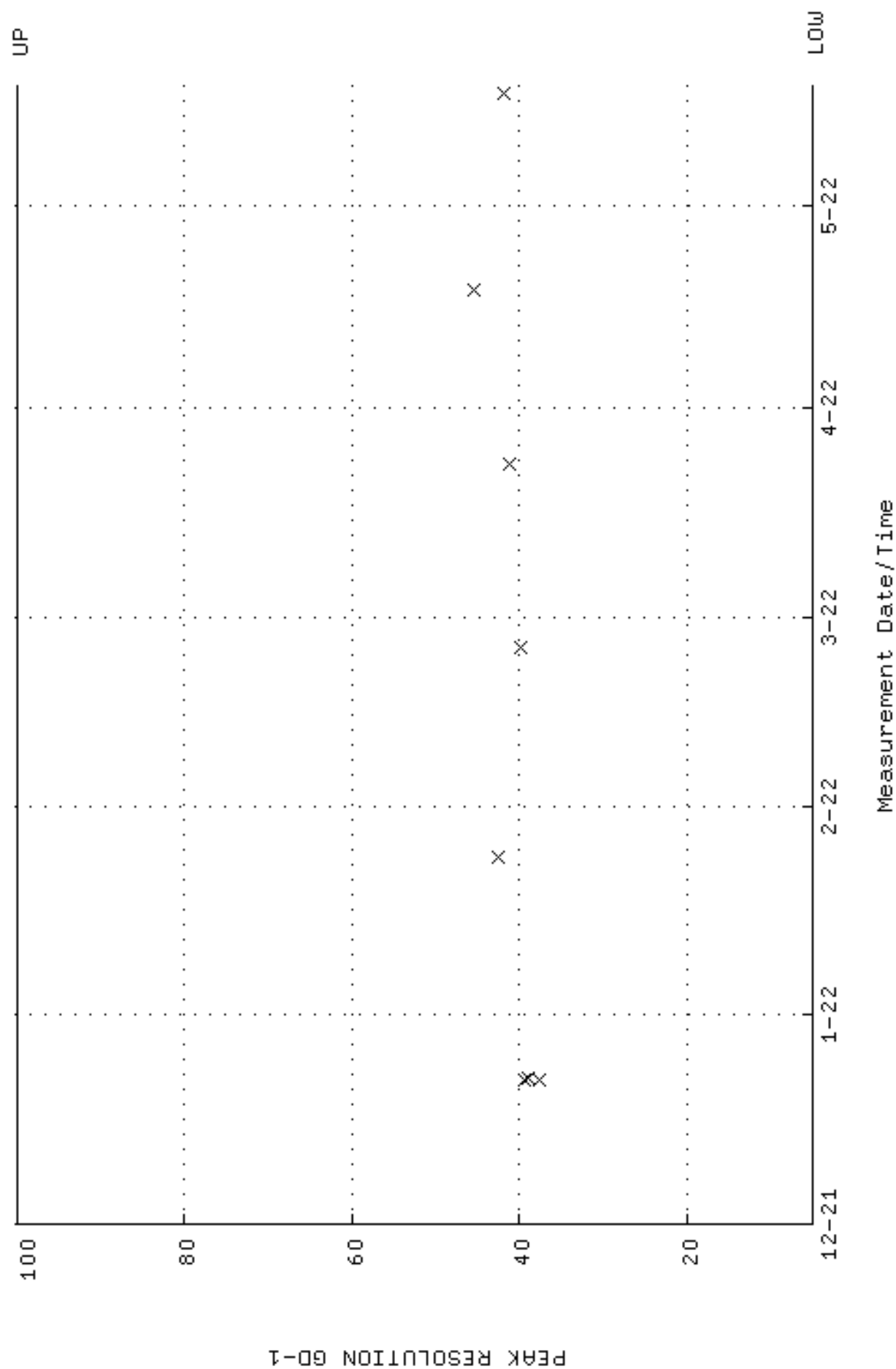
QA filename : DKA100:[ENV_ALPHA.QA.W]W186.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 22-DEC-2021 09:07:47 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.396570 through 0.421090



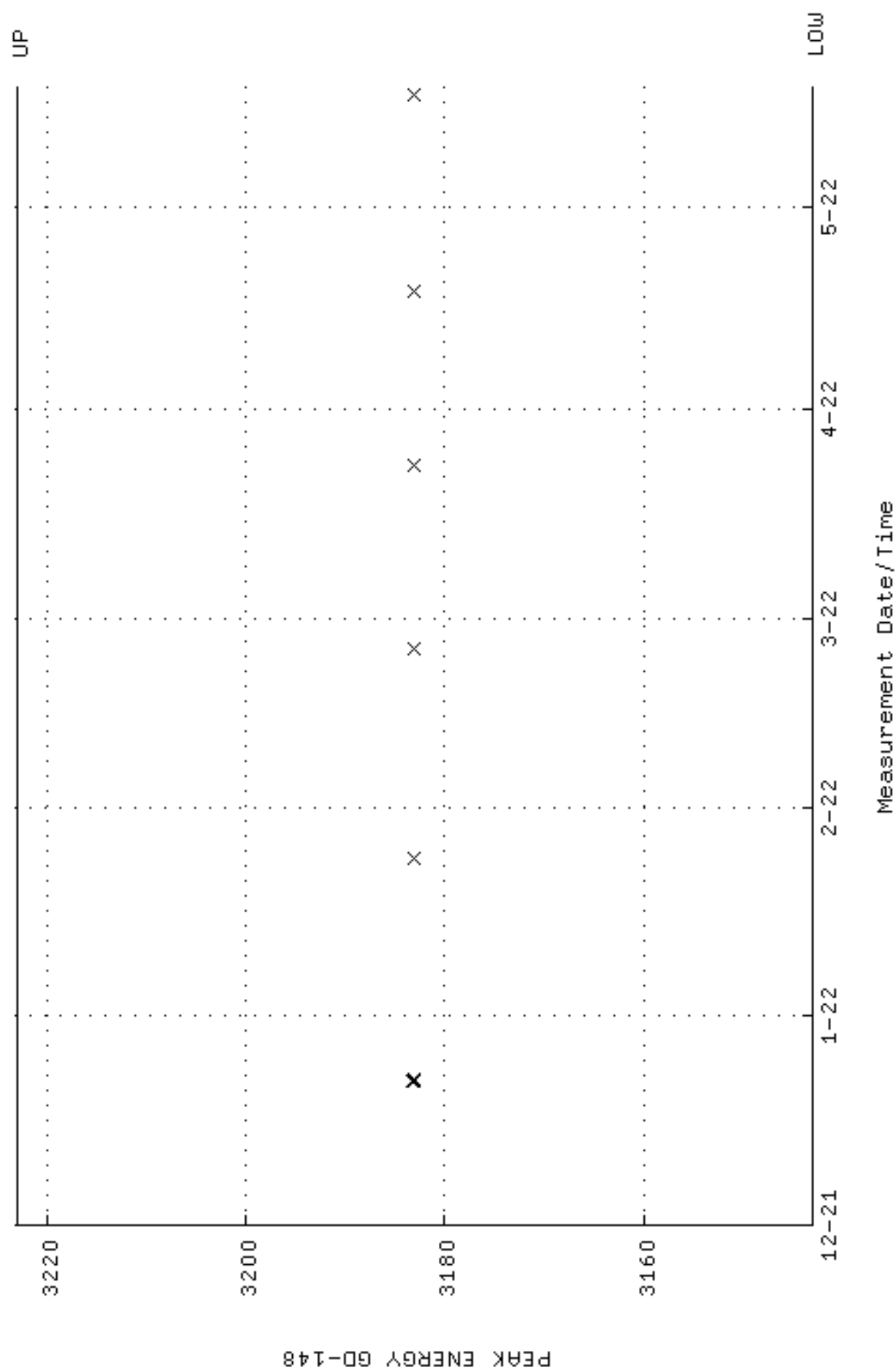
QA filename : DKA100:[ENV_ALPHA.QA.W]W186.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 22-DEC-2021 09:07:47 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



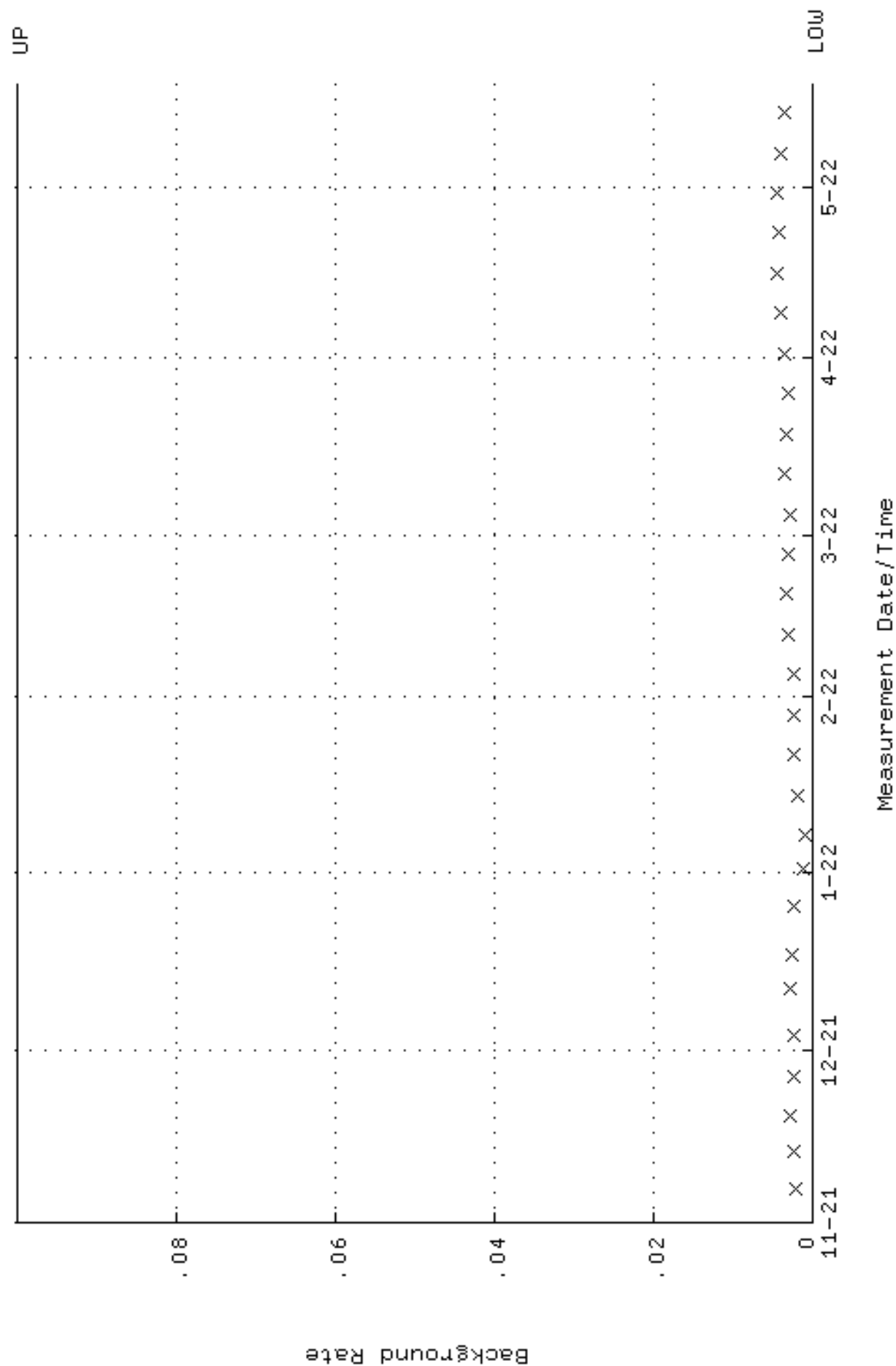
QA filename : DKA100:[ENV_ALPHA.QA.W]W186.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 22-DEC-2021 09:07:47 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



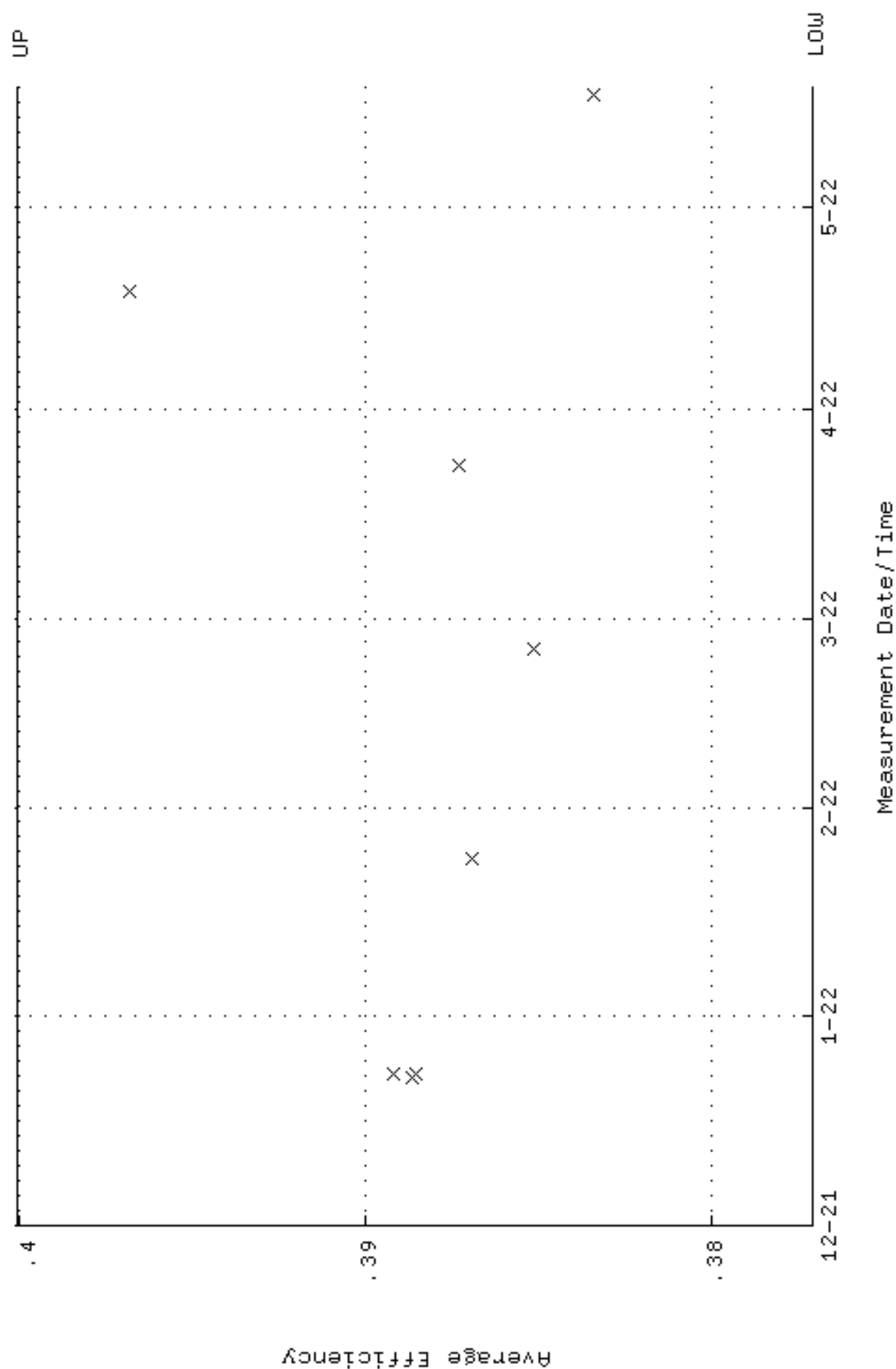
QA filename : DKA100:[ENV_ALPHA.QA.W]W186.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 22-DEC-2021 09:07:47 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



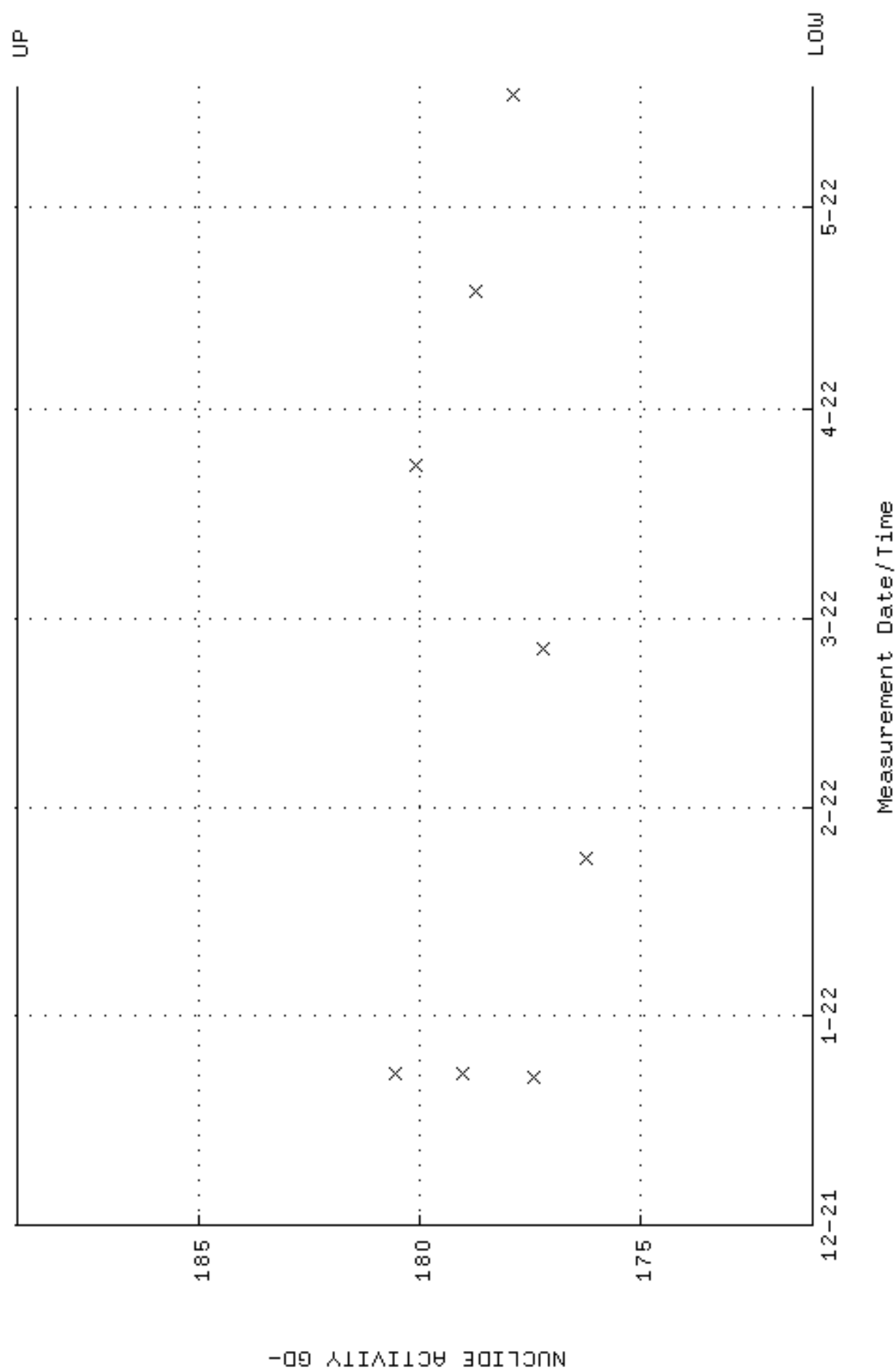
QA filename : DKA100:[ENV_ALPHA.QA.B]B186.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 17:27:24 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



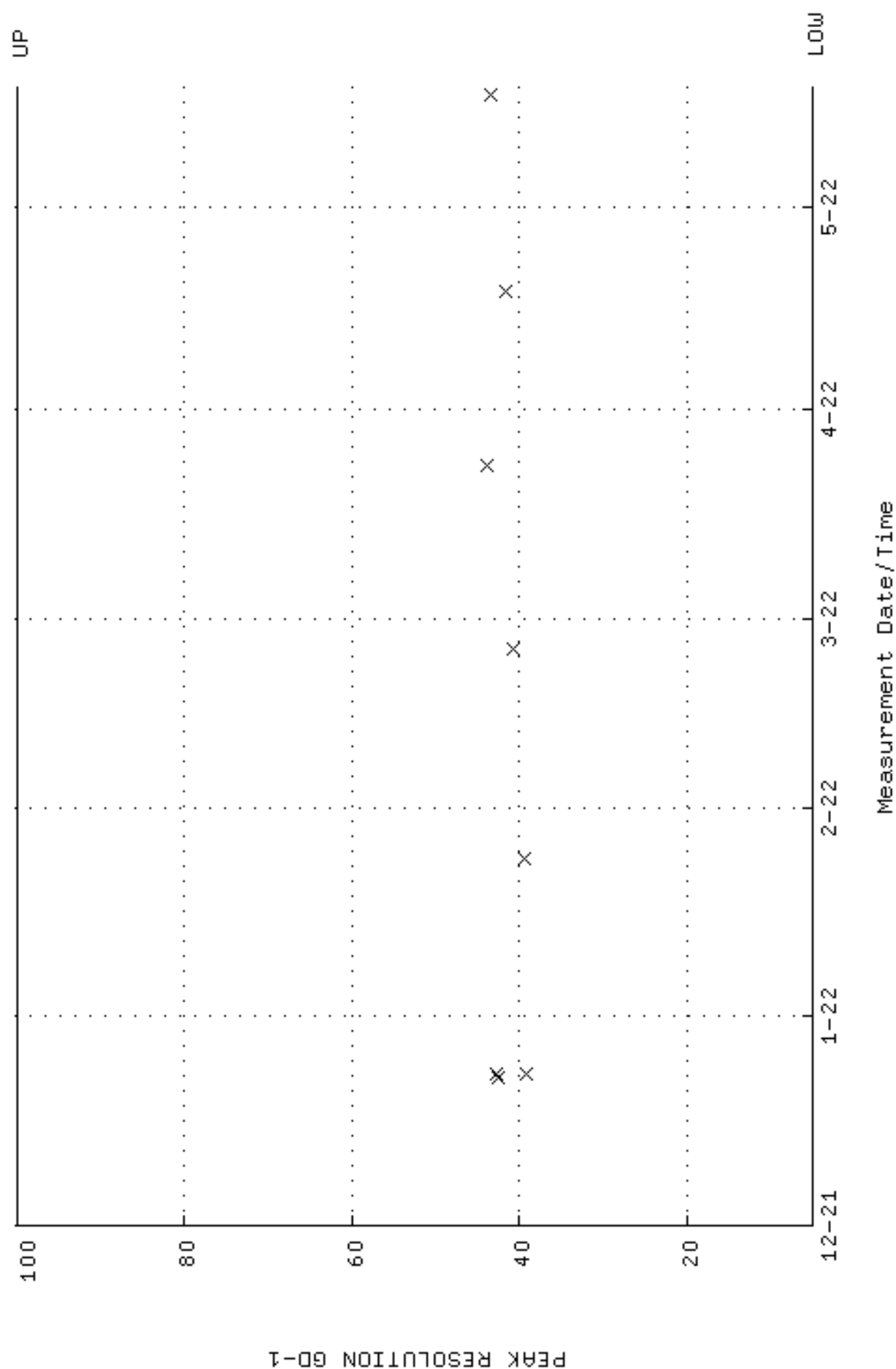
QA filename : DKA100:[ENV_ALPHA.QA.W]W189.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 22-DEC-2021 21:18:56 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.377090 through 0.400040



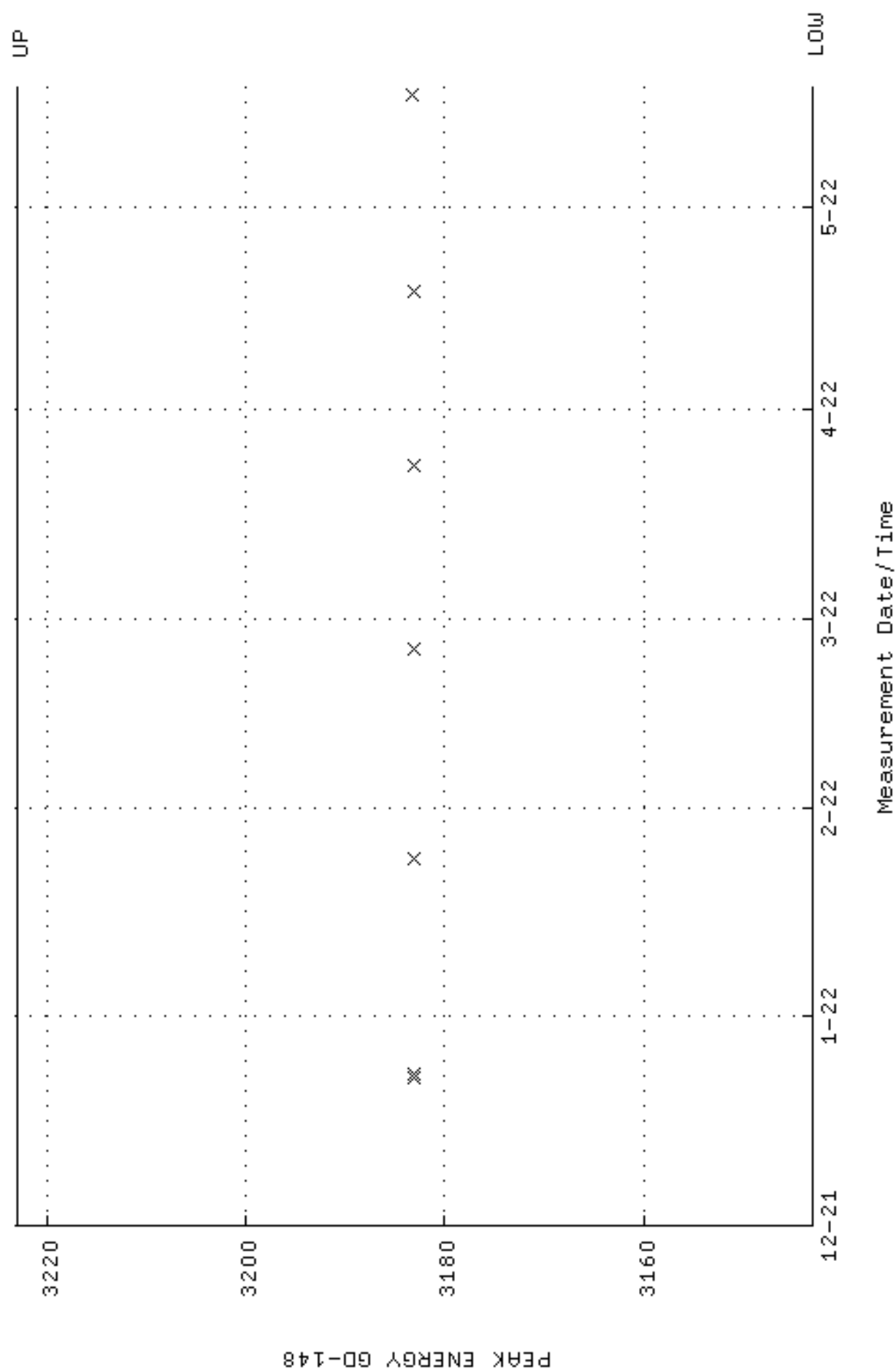
QA filename : DKA100:[ENV_ALPHA.QA.W]W189.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 22-DEC-2021 21:18:56 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W189.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 22-DEC-2021 21:18:56 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



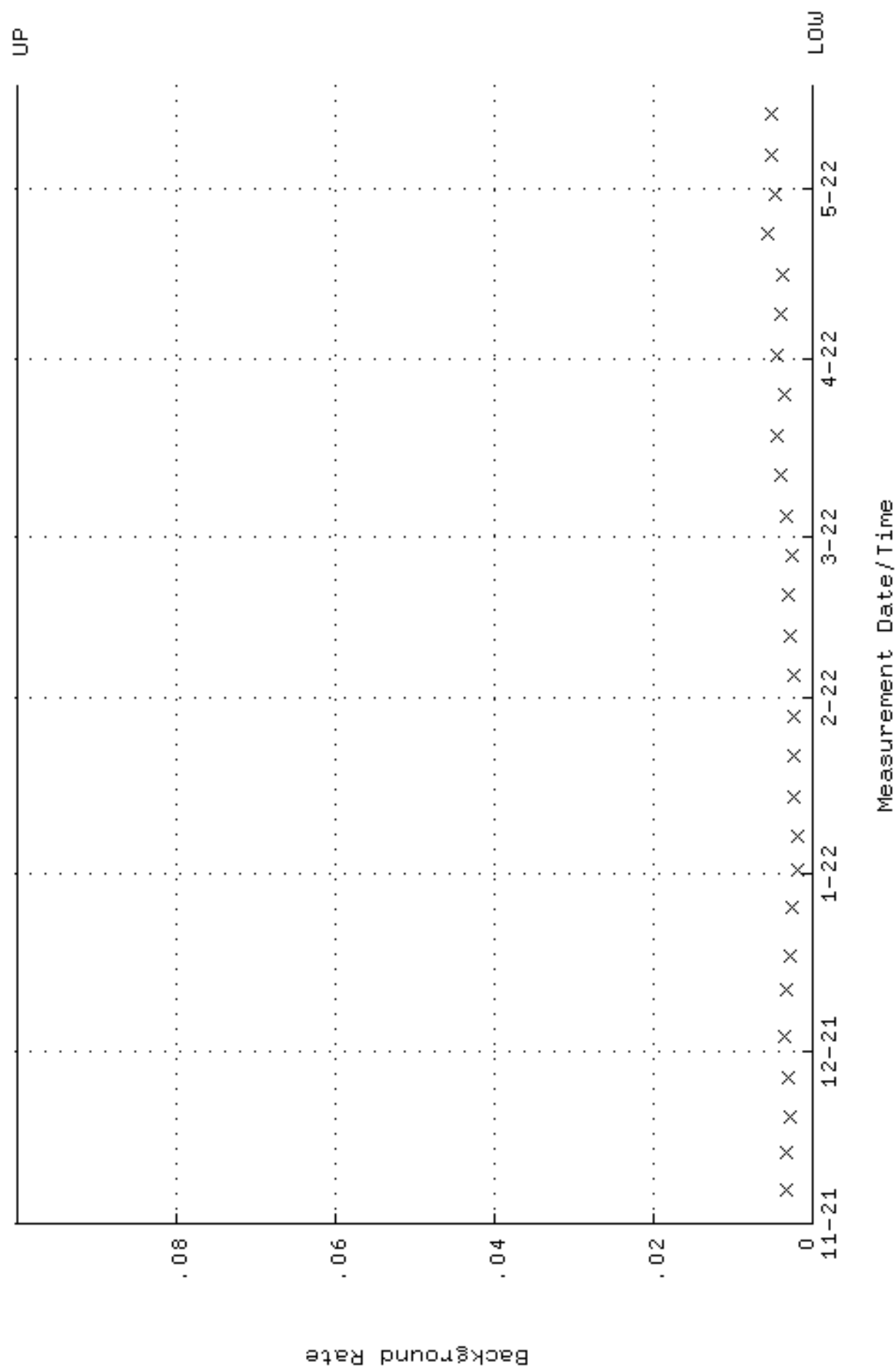
QA filename : DKA100:[ENV_ALPHA.QA.W]W189.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 22-DEC-2021 21:18:56 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



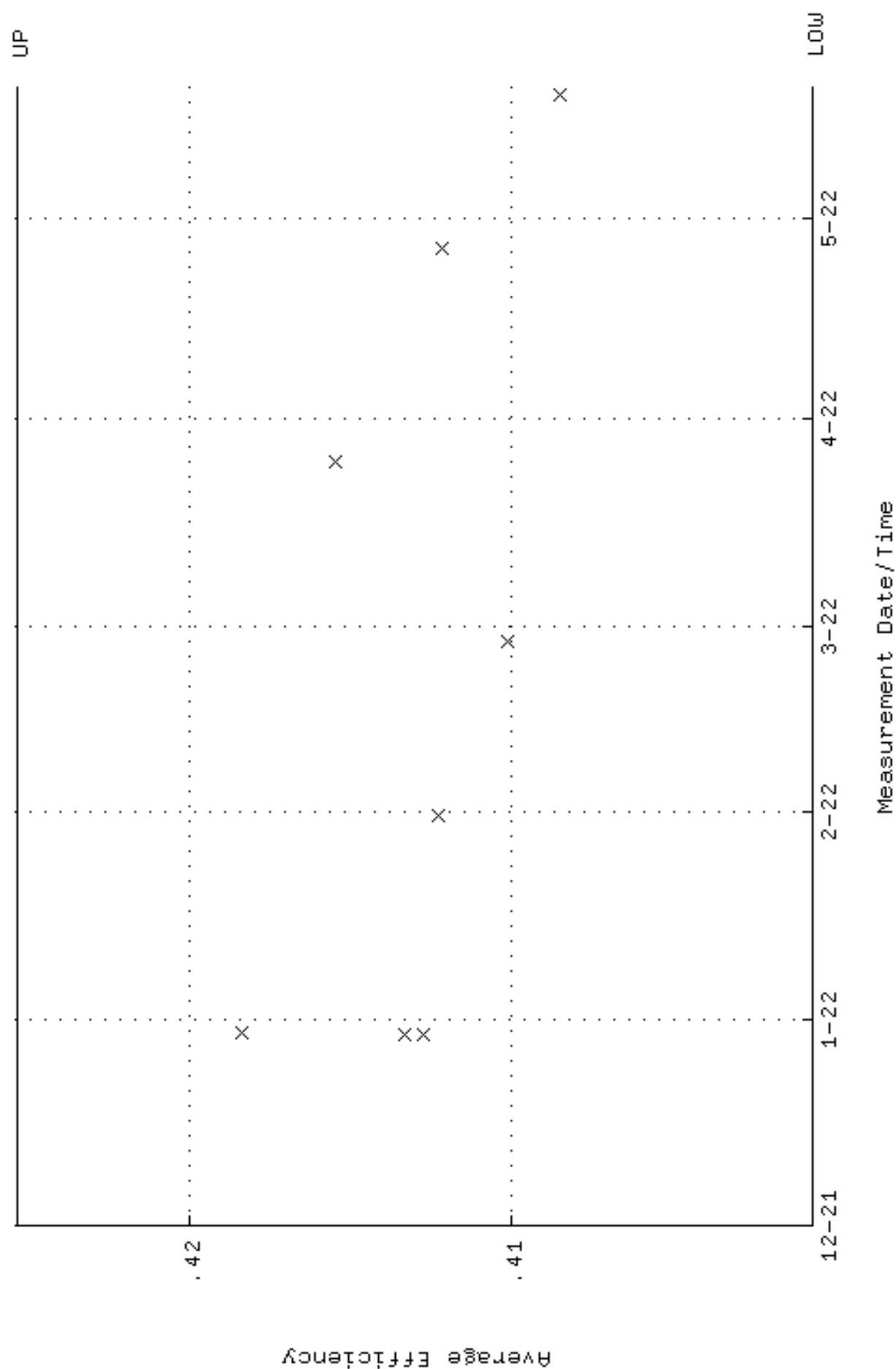
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QA filename      : DKA100:[ENV_ALPHA.QA.B]B189.QAF;4
Parameter Name   : BACKRATE (Background Rate)
Start/End Dates  : 6-NOV-2021 17:27:36 through 18-MAR-2022 17:27:36
Lower/Upper Lmts: 0.000000E+00 through 0.100000

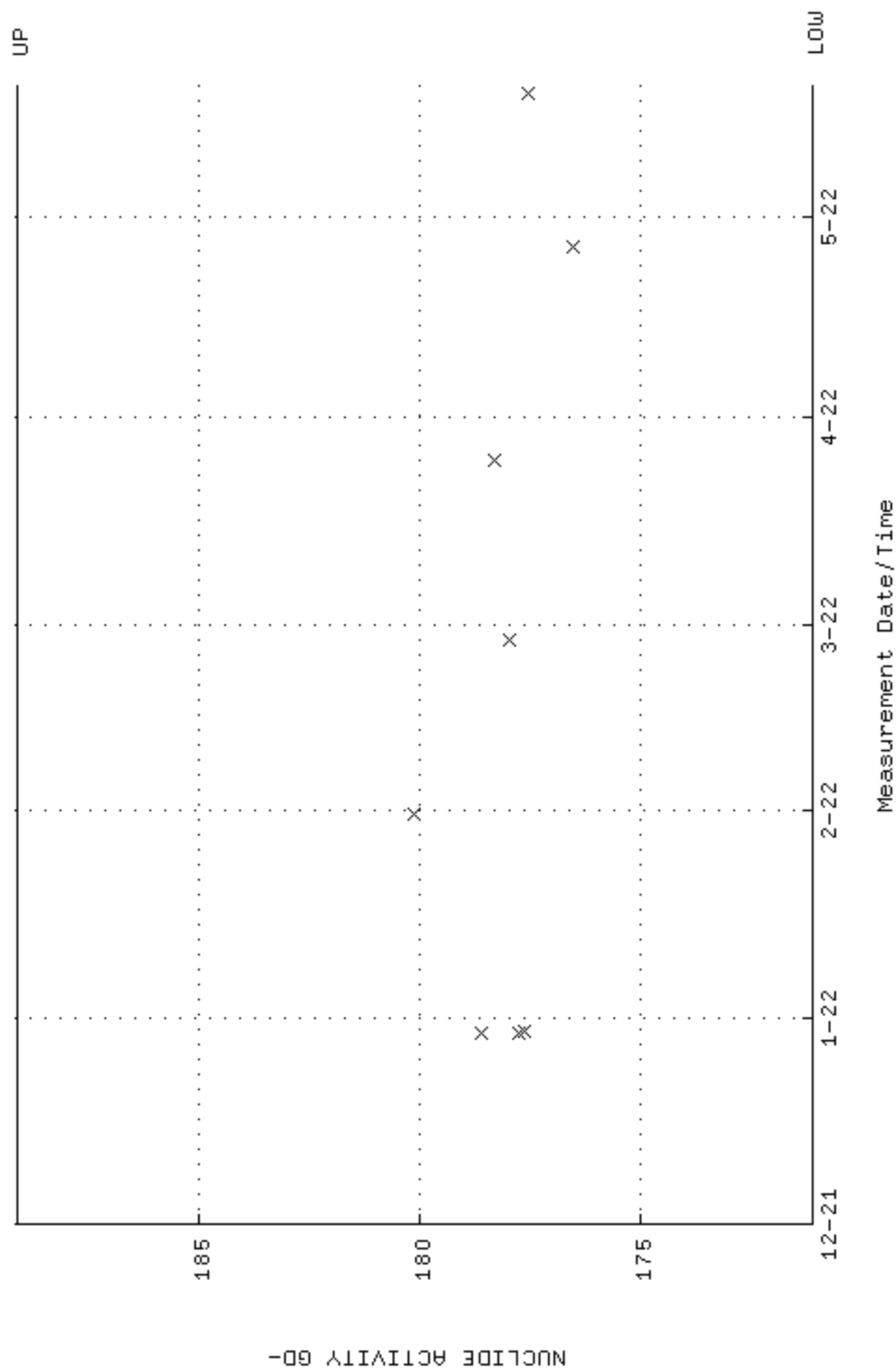
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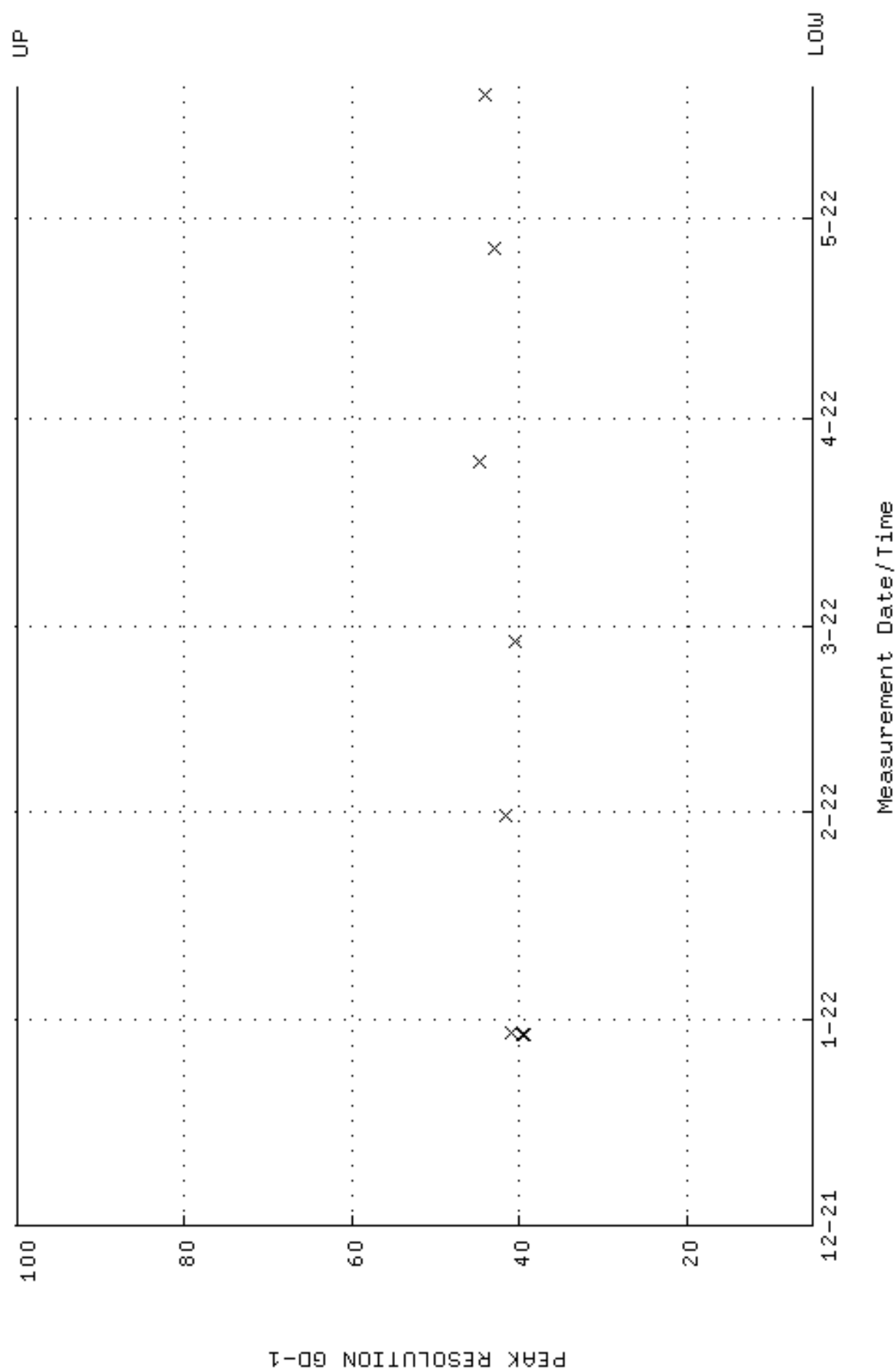
QA filename : DKA100:[ENV_ALPHA.QA.W]W245.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 29-DEC-2021 11:26:21 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.400590 through 0.425370



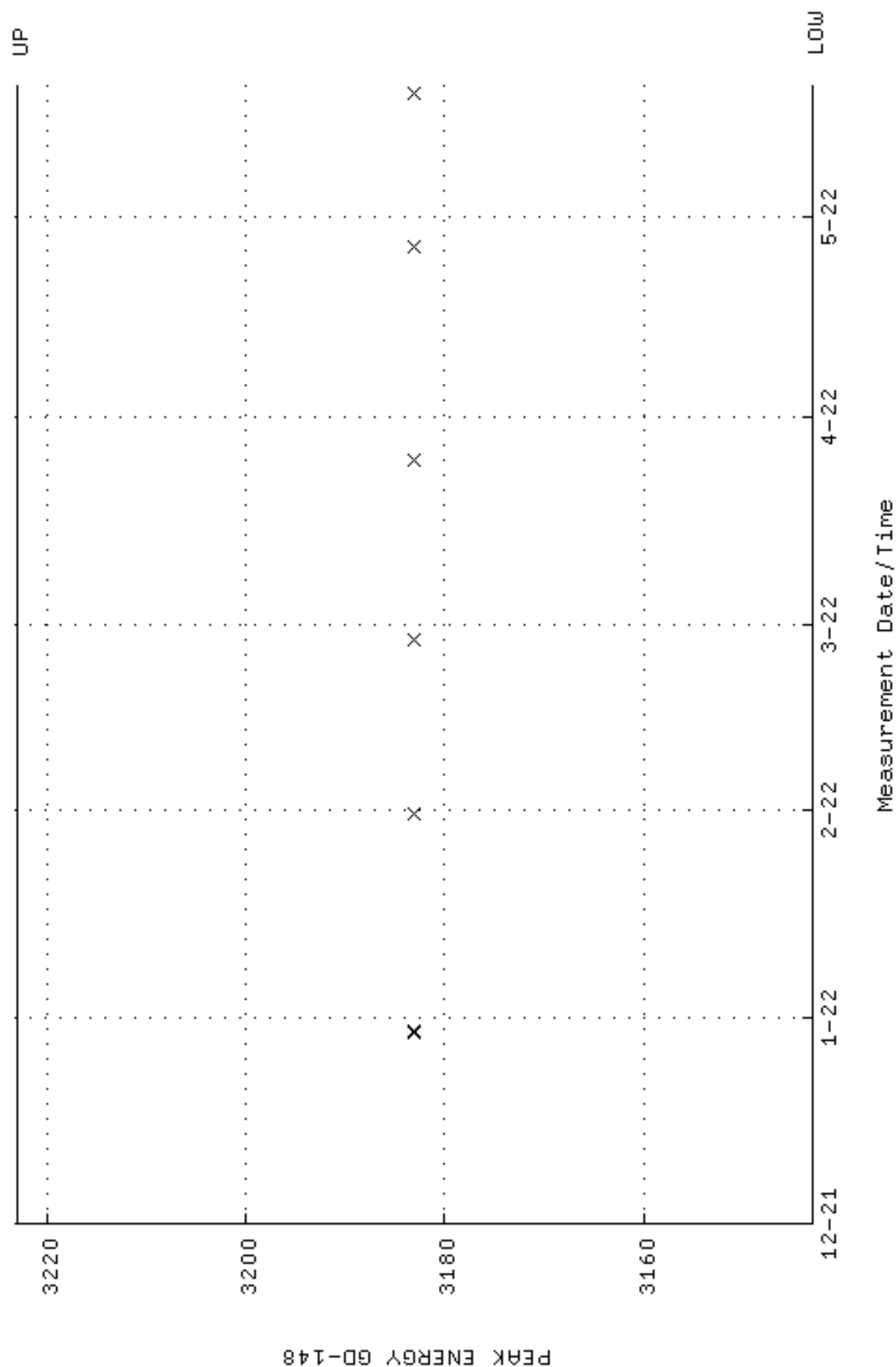
QA filename : DKA100:[ENV_ALPHA.QA.W]W245.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 29-DEC-2021 11:26:21 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



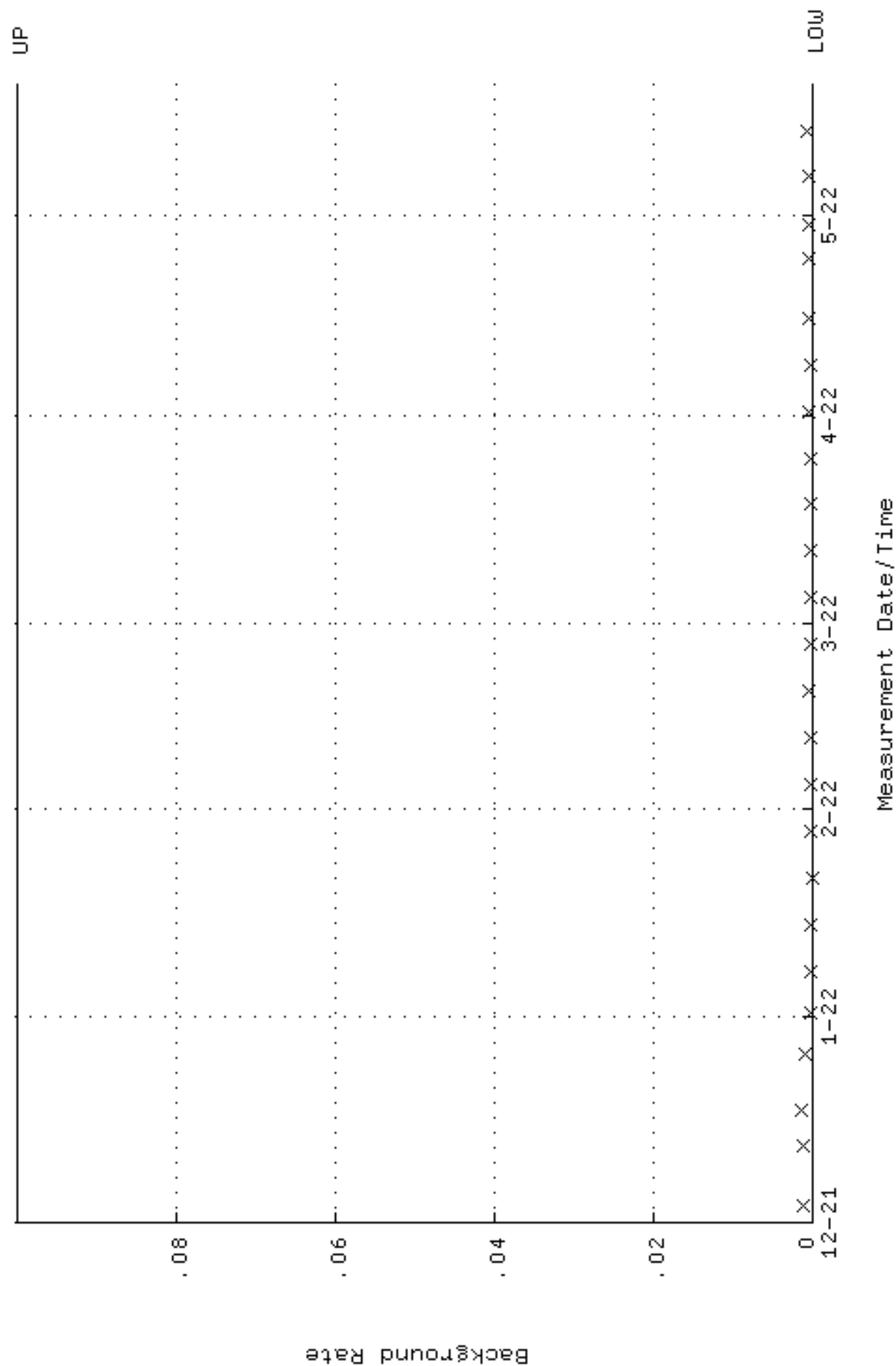
QA filename : DKA100:[ENV_ALPHA.QA.W]W245.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 29-DEC-2021 11:26:21 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



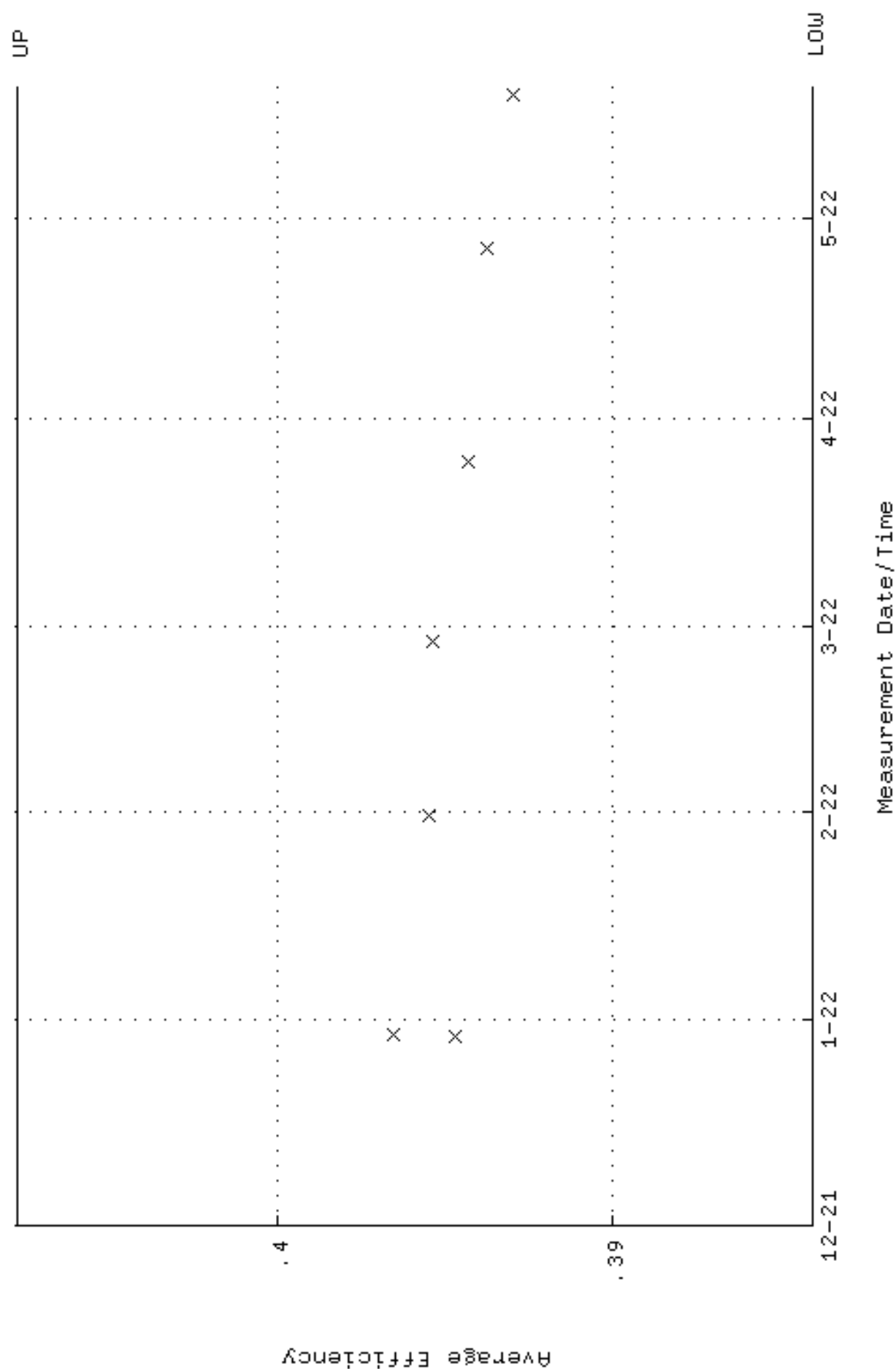
QA filename : DKA100:[ENV_ALPHA.QA.W]W245.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 29-DEC-2021 11:26:21 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



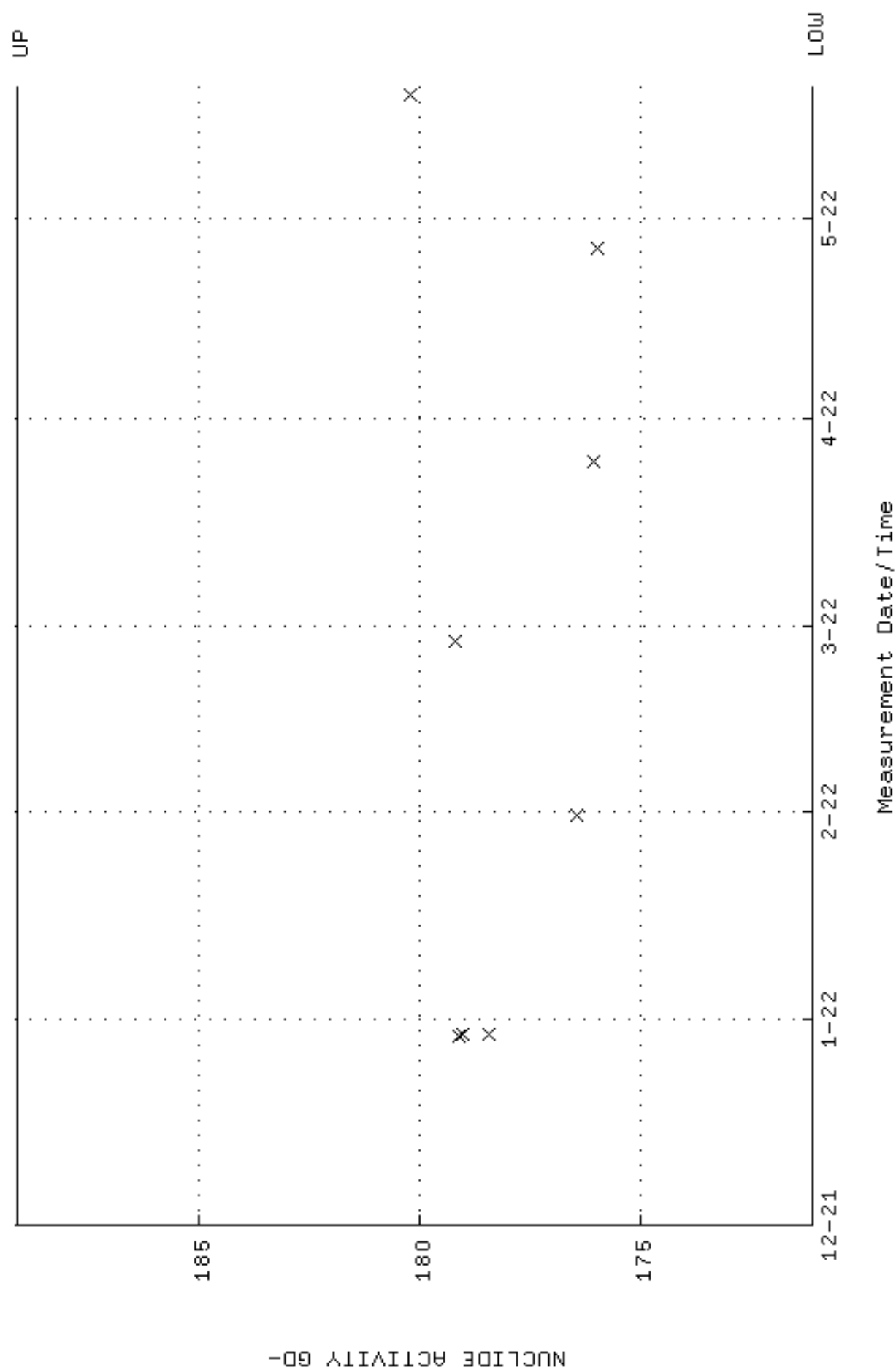
QA filename : DKA100:[ENV_ALPHA.QA.B]B245.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 3-DEC-2021 11:48:12 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



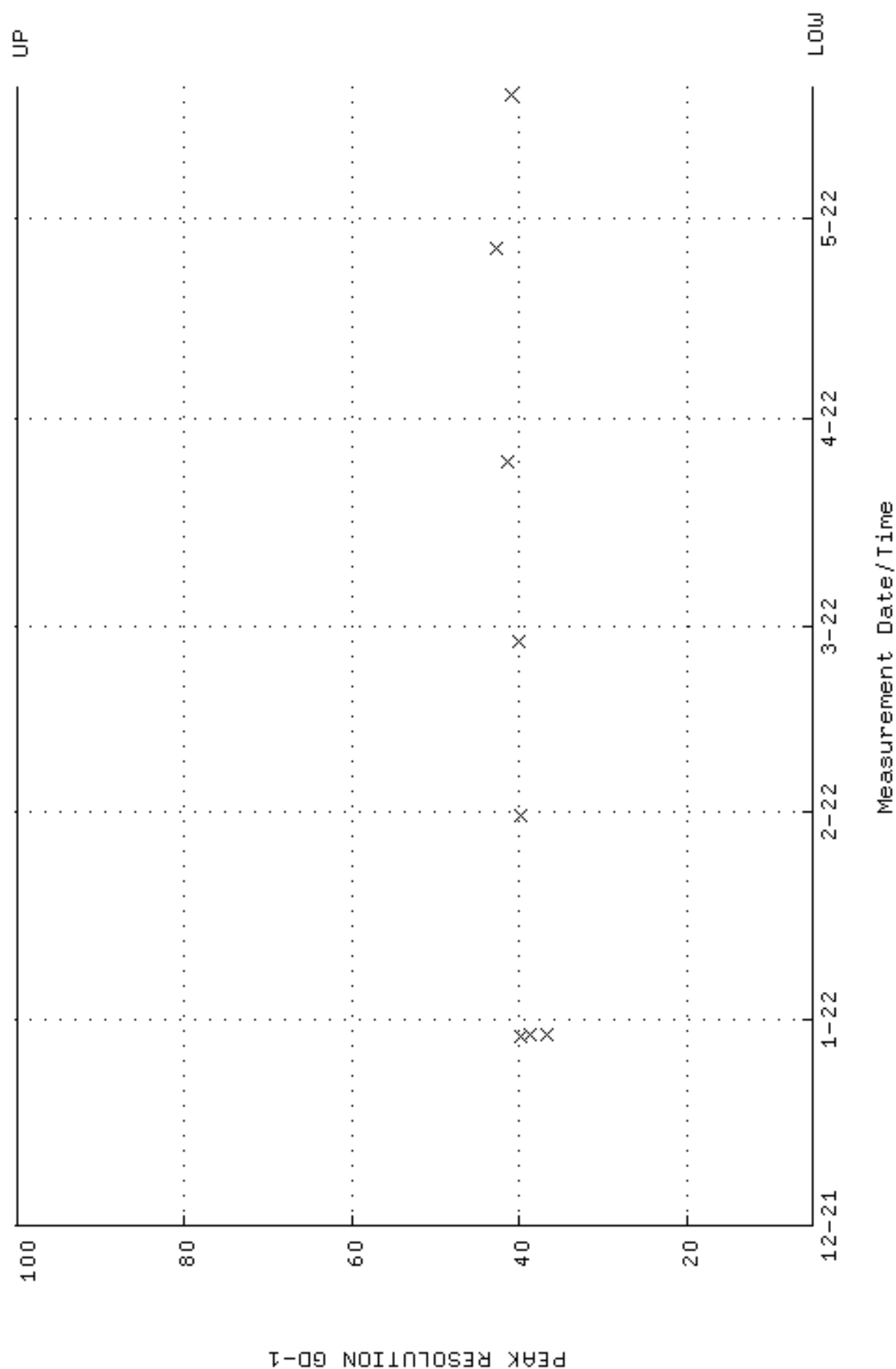
QA filename : DKA100:[ENV_ALPHA.QA.W]W246.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 29-DEC-2021 09:36:38 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.384030 through 0.407790



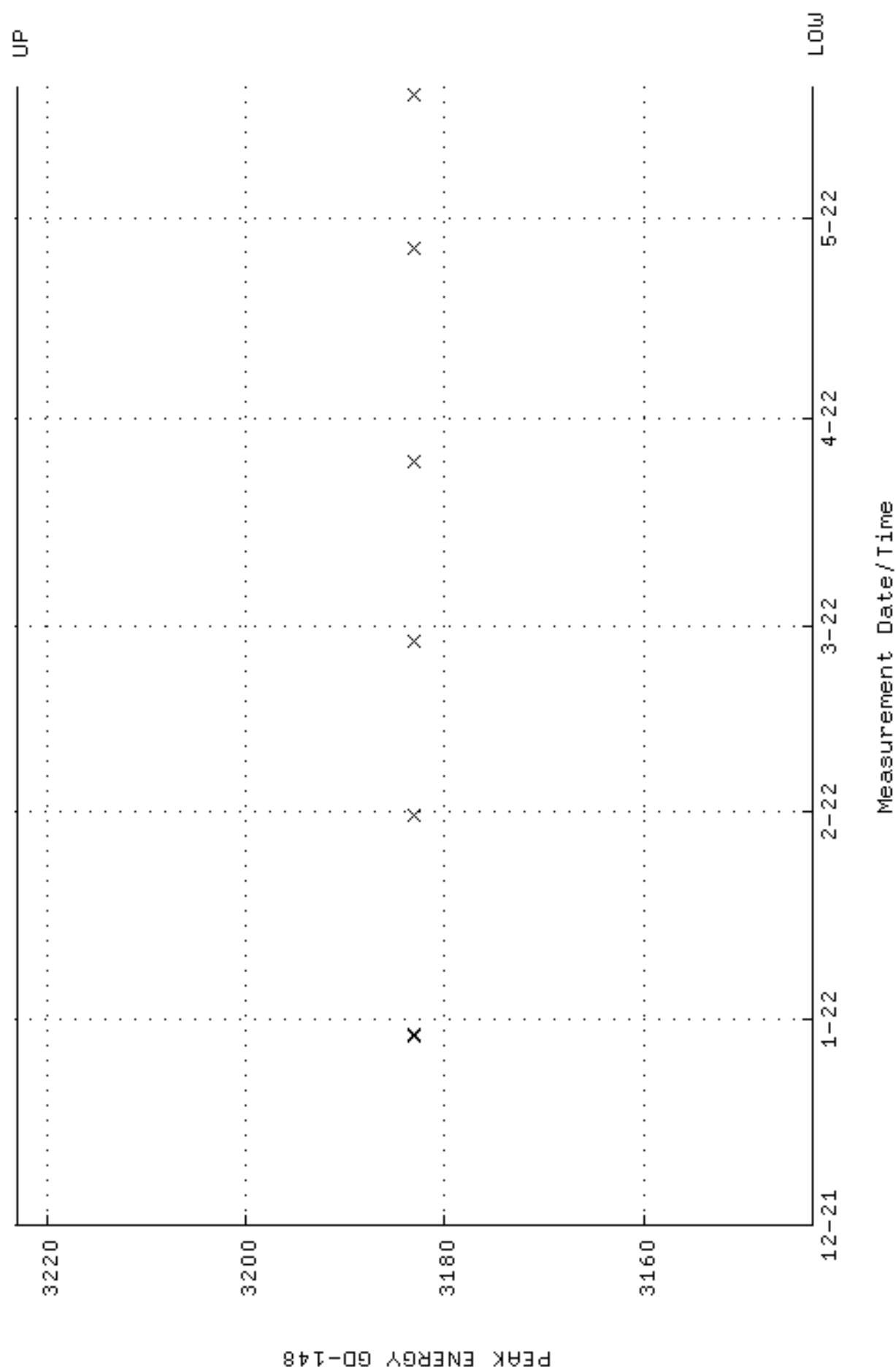
QA filename : DKA100:[ENV_ALPHA.QA.W]W246.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 29-DEC-2021 09:36:38 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



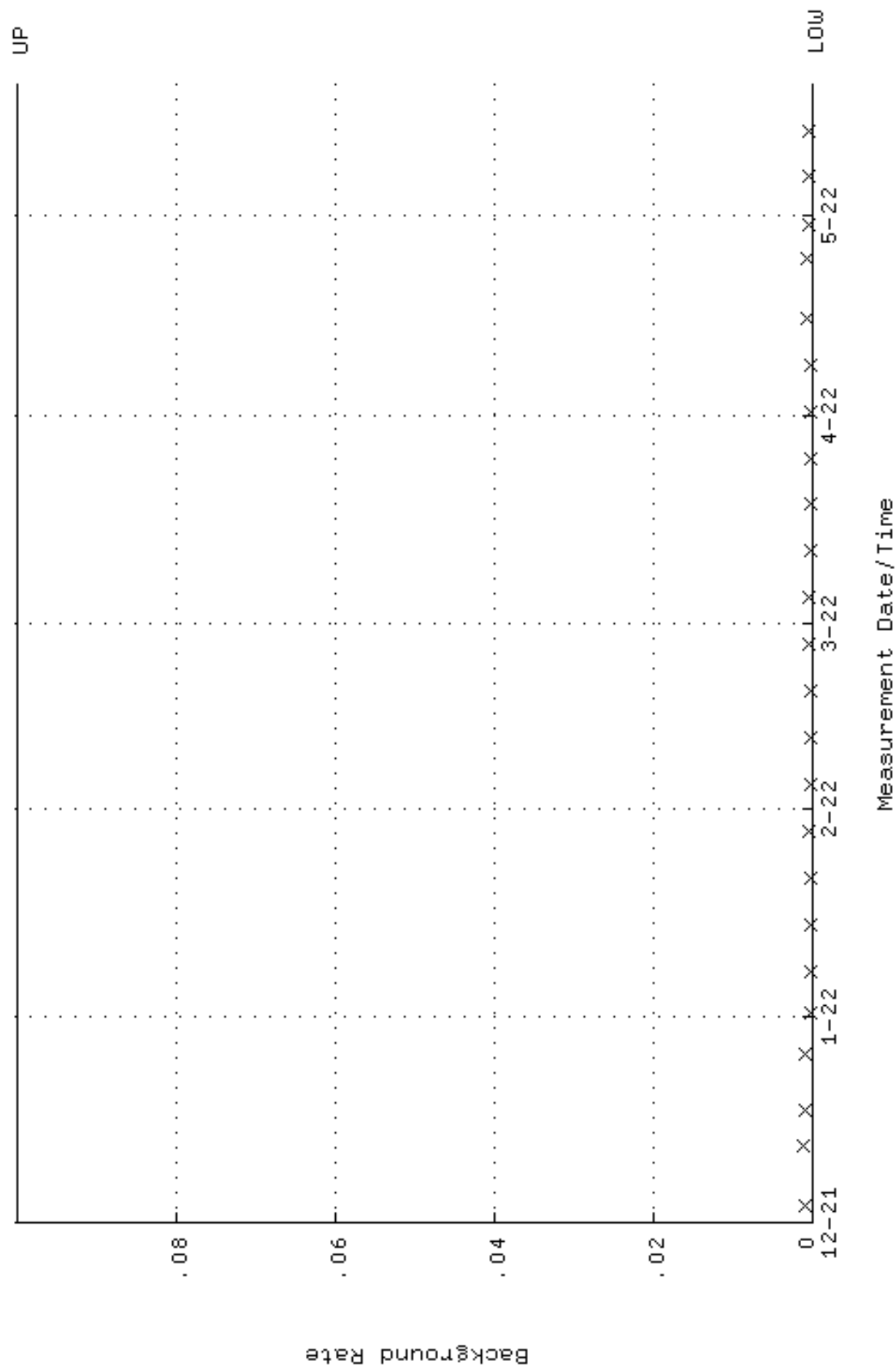
QA filename : DKA100:[ENV_ALPHA.QA.W]W246.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 29-DEC-2021 09:36:38 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



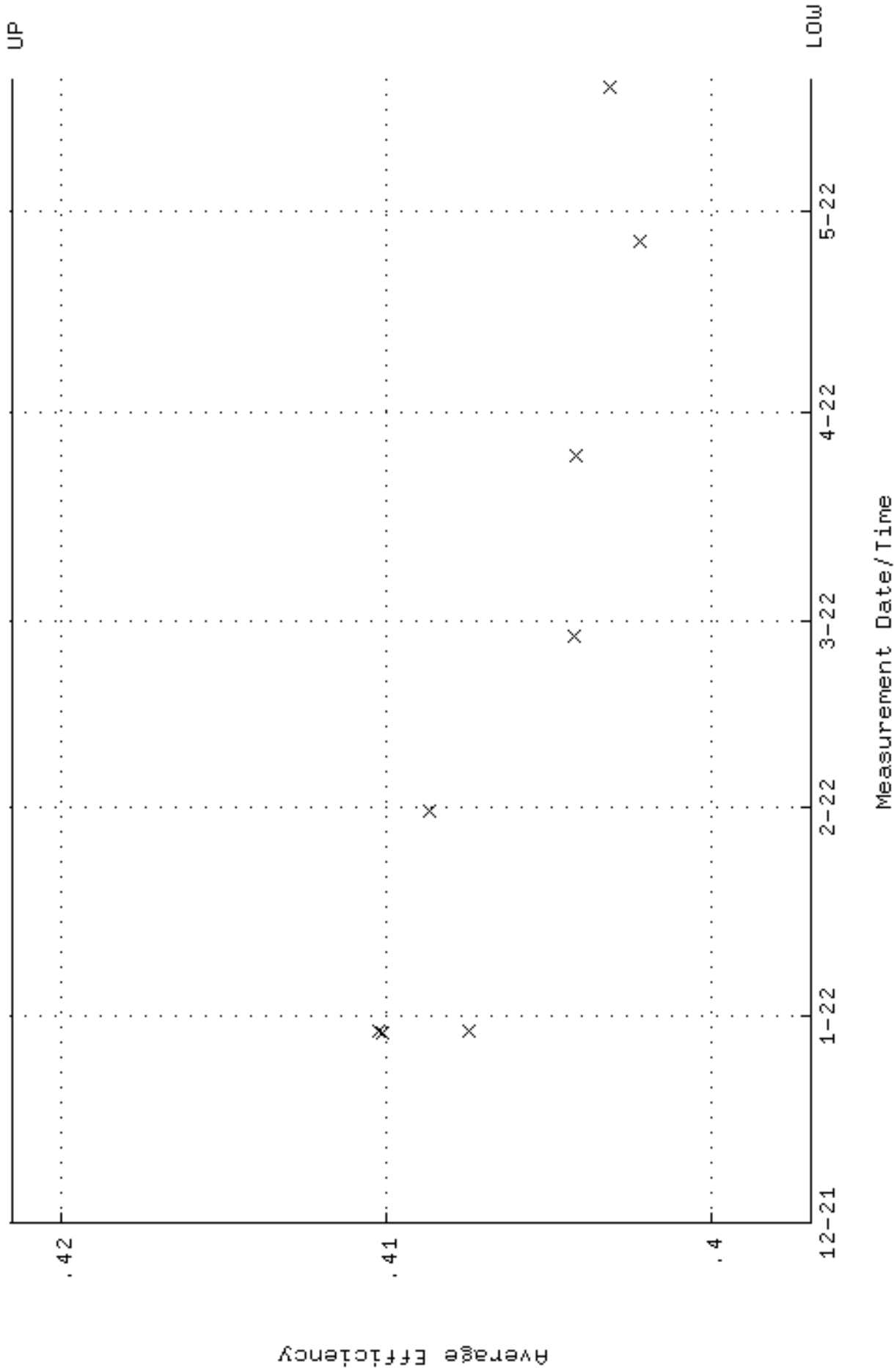
QA filename : DKA100:[ENV_ALPHA.QA.W]W246.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 29-DEC-2021 09:36:38 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



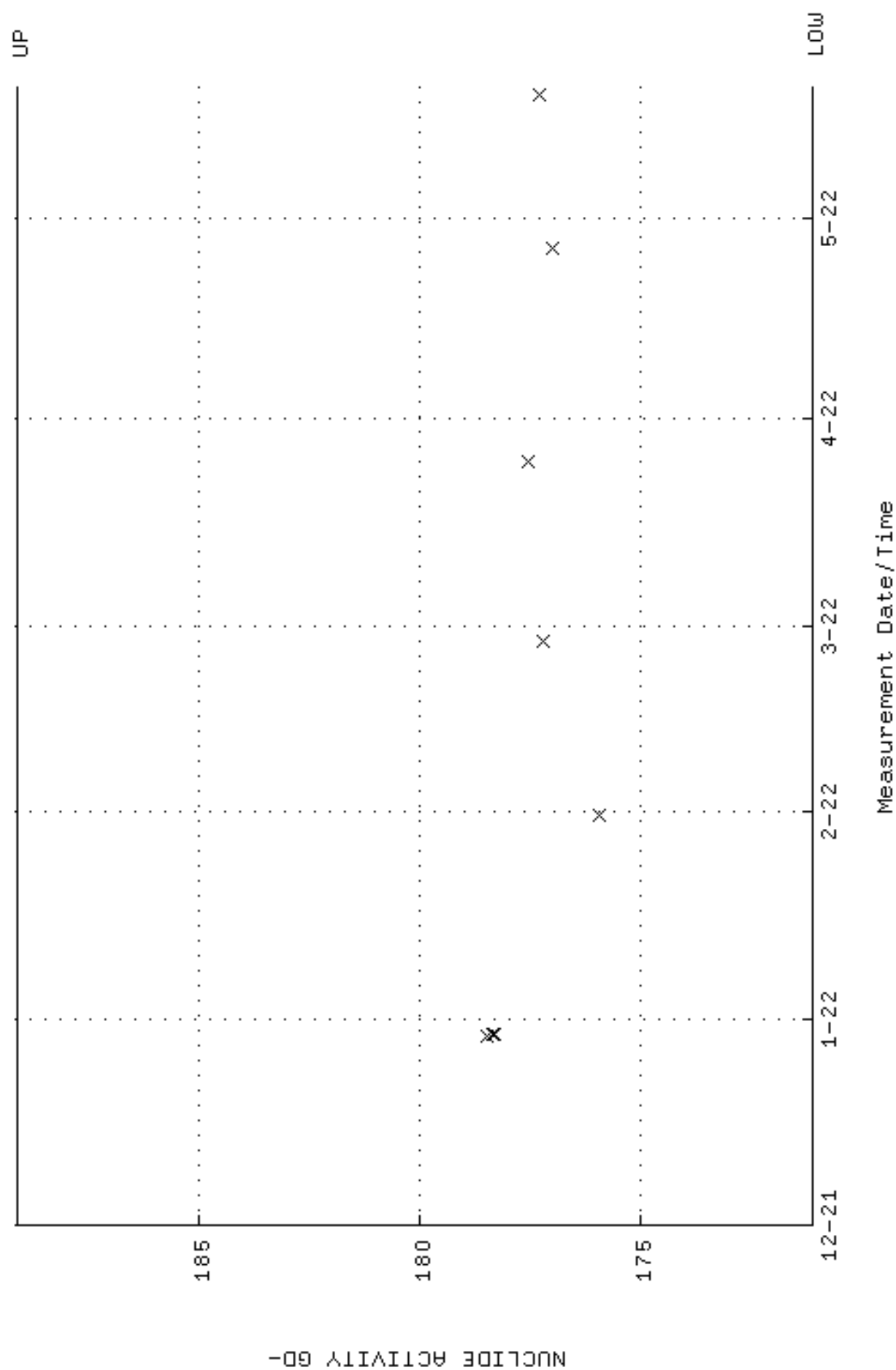
QA filename : DKA100:[ENV_ALPHA.QA.B]B246.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 3-DEC-2021 11:48:16 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



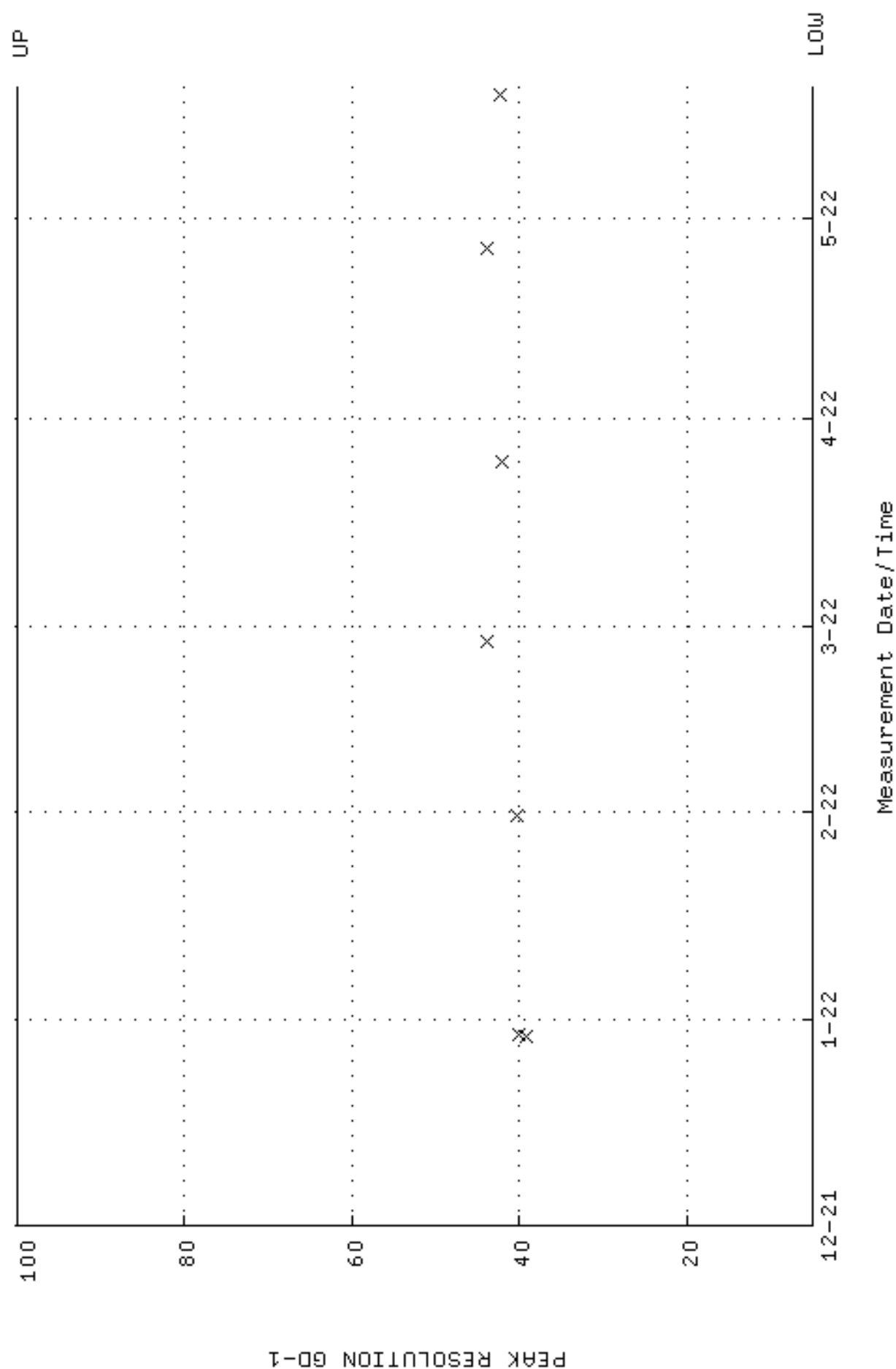
QA filename : DKA100:[ENV_ALPHA.QA.W]W252.QAF;3
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 29-DEC-2021 09:21:56 through 20-MAY-2022 12:00:00
Lower/Upper Lmts: 0.396930 through 0.421480



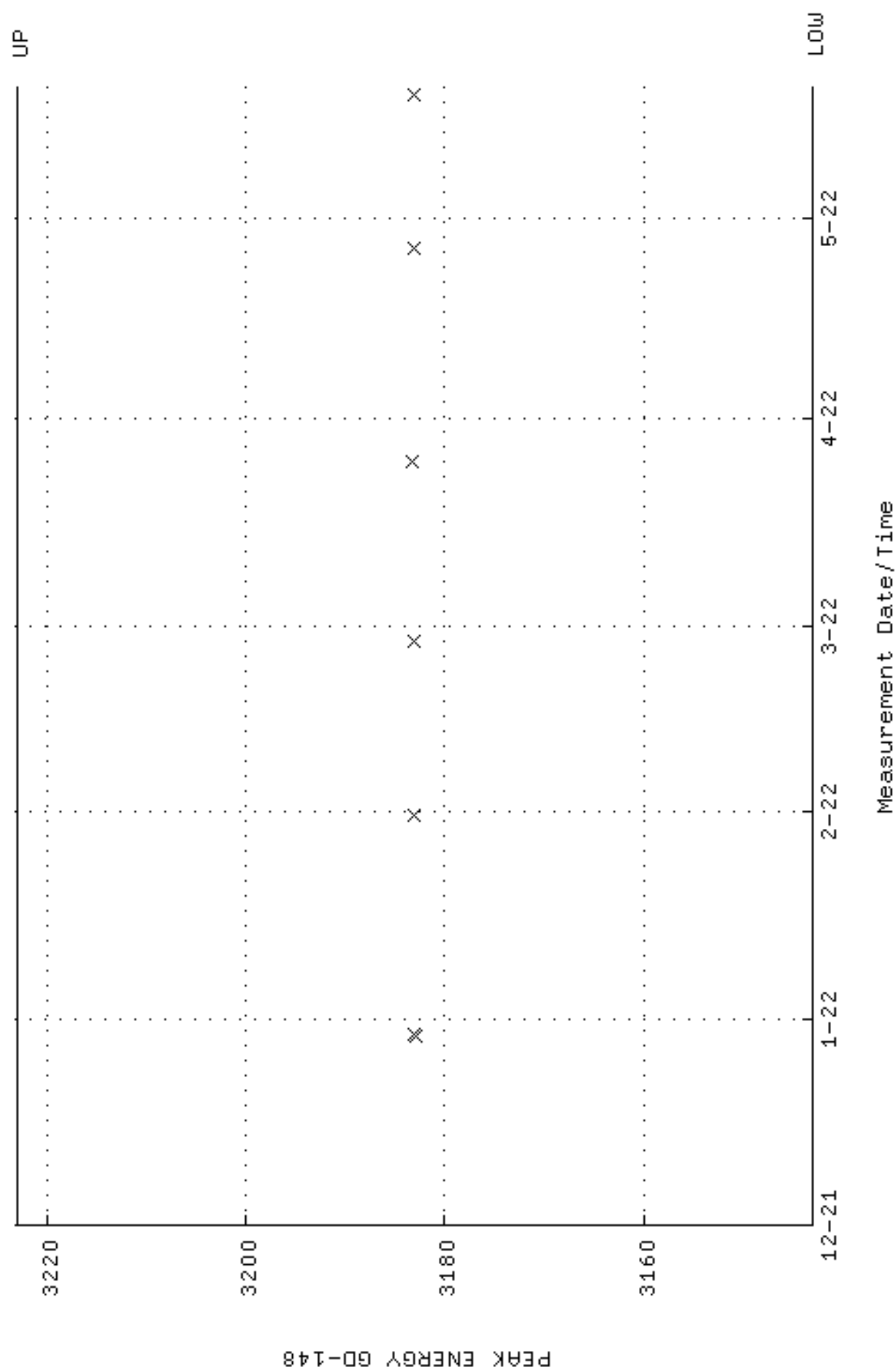
QA filename : DKA100:[ENV_ALPHA.QA.W]W252.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 29-DEC-2021 09:21:56 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



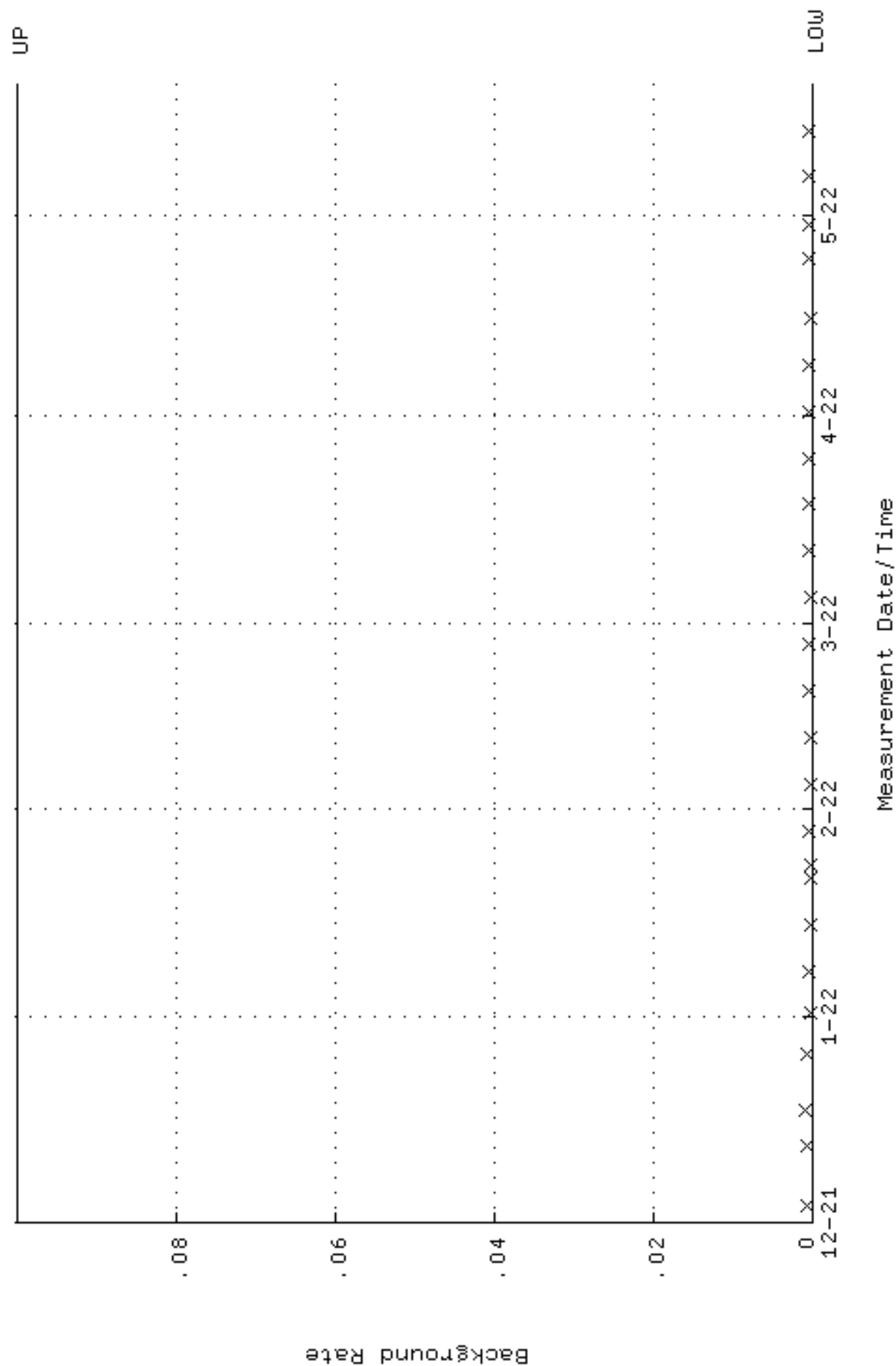
QA filename : DKA100:[ENV_ALPHA.QA.W]W252.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 29-DEC-2021 09:21:56 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



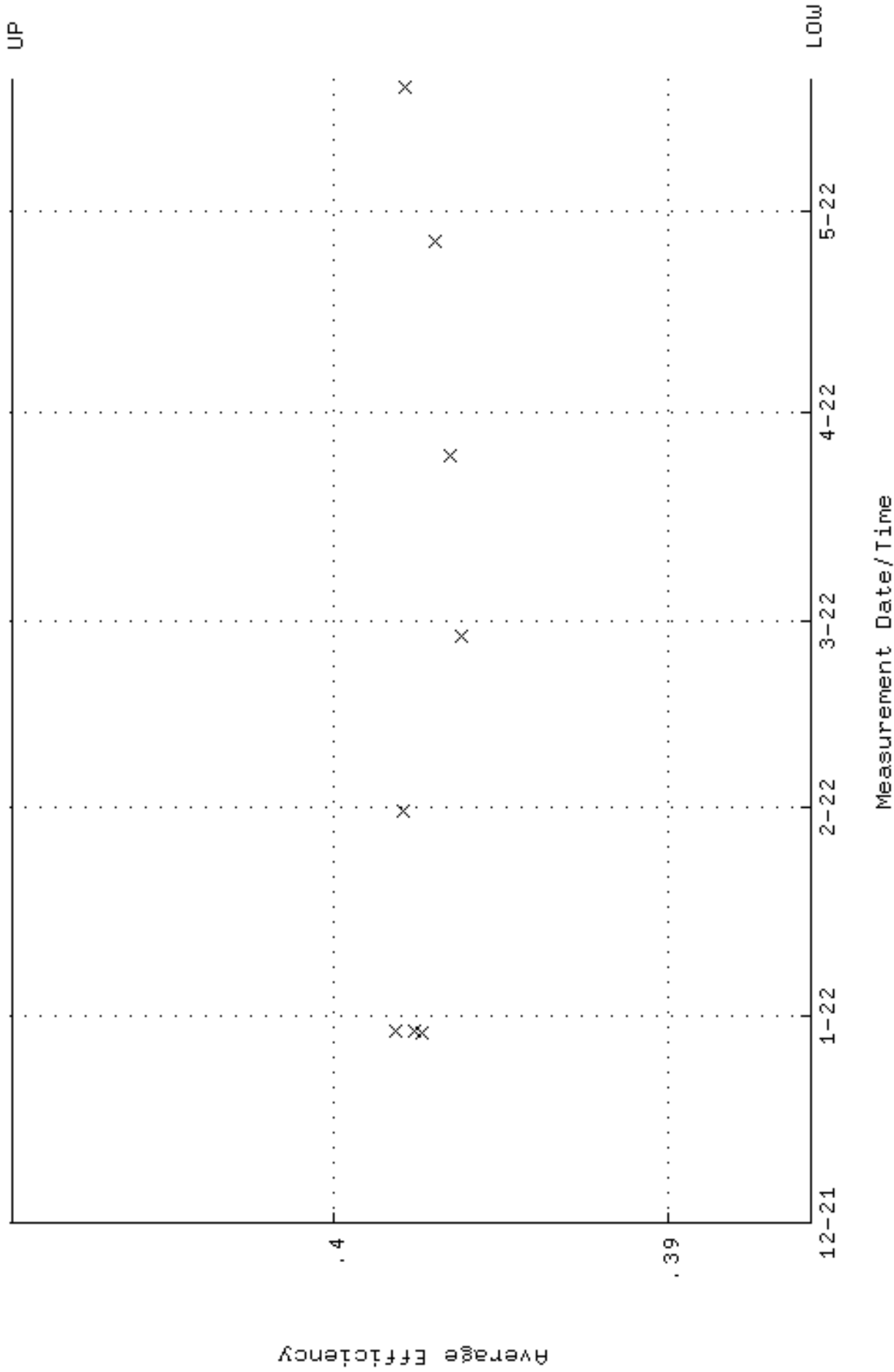
QA filename : DKA100:[ENV_ALPHA.QA.W]W252.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 29-DEC-2021 09:21:56 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



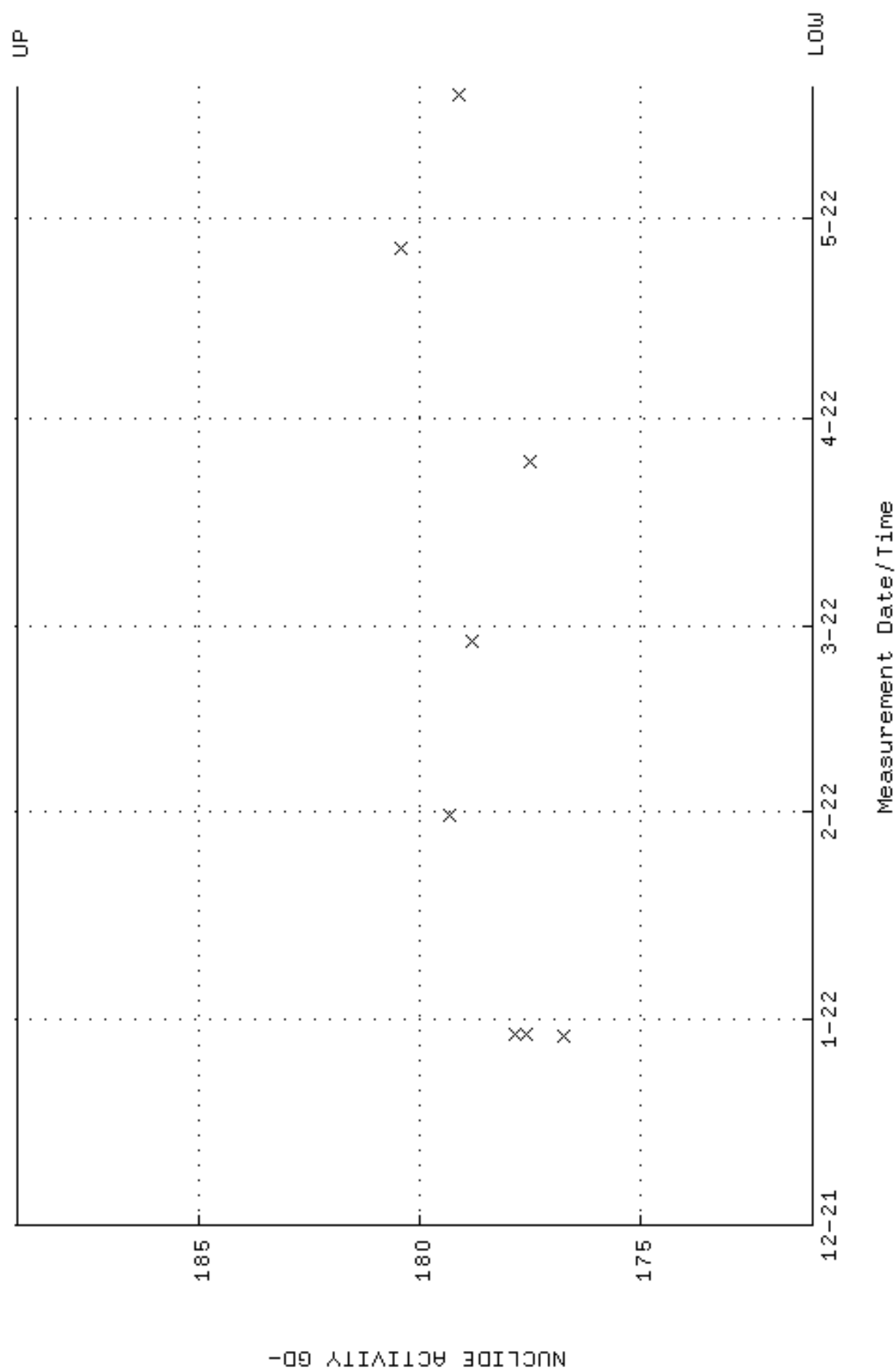
QA filename : DKA100:[ENV_ALPHA.QA.B]B252.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 3-DEC-2021 11:48:32 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



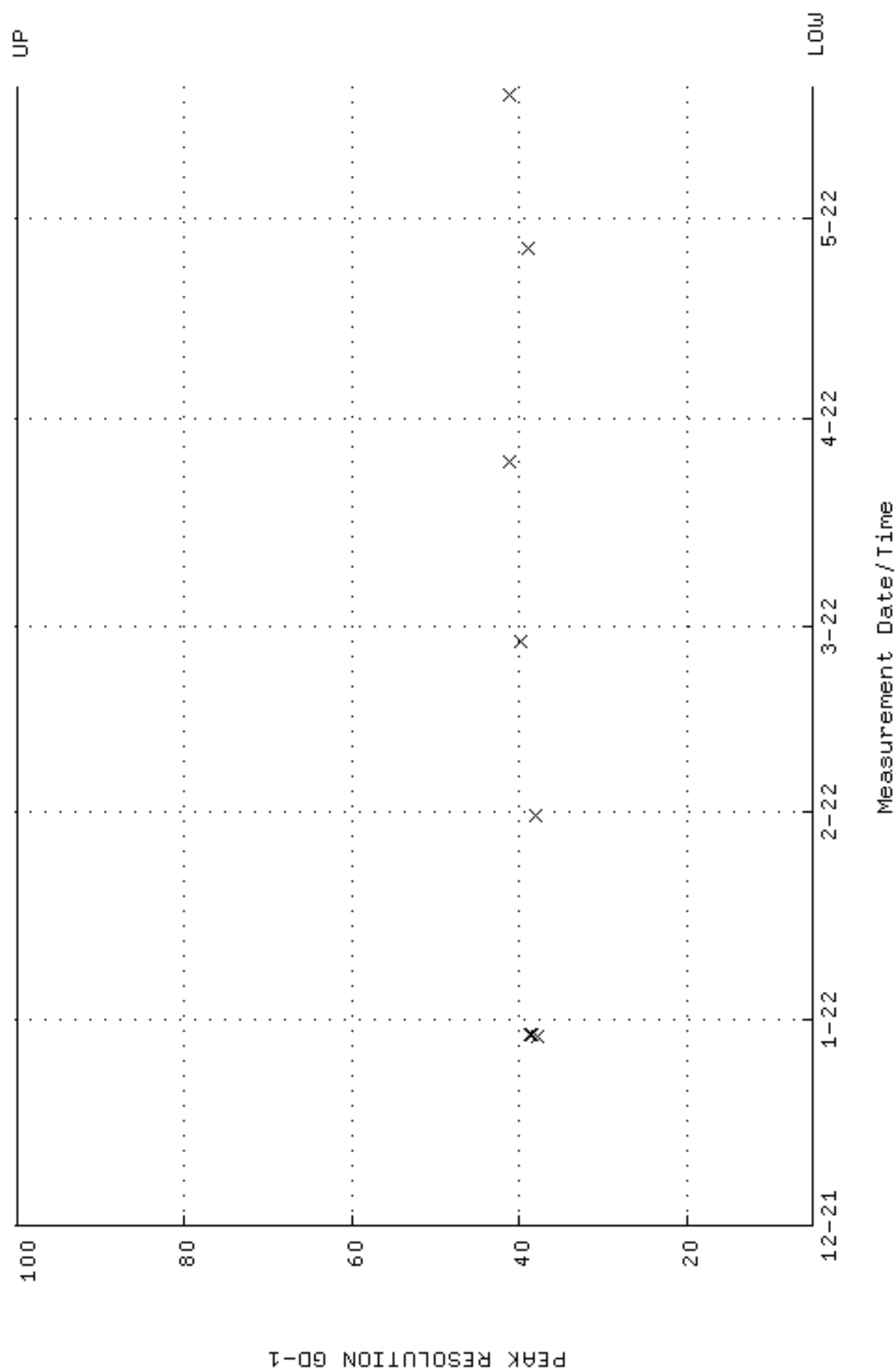
QA filename : DKA100:[ENV_ALPHA.QA.W]W254.QAF;3
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 29-DEC-2021 09:22:04 through 20-MAY-2022 12:00:00
Lower/Upper Lmts: 0.385720 through 0.409580



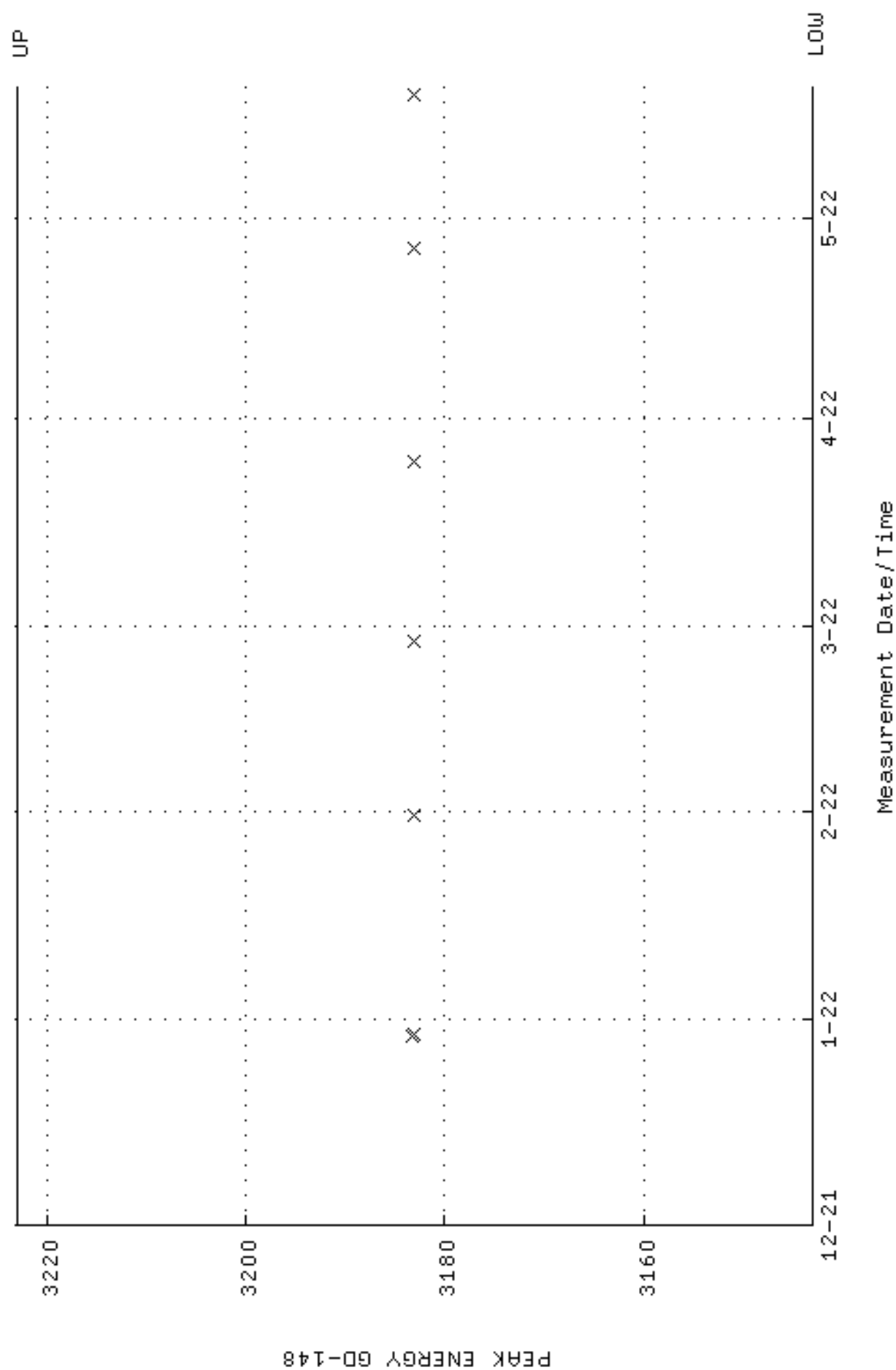
QA filename : DKA100:[ENV_ALPHA.QA.W]W254.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 29-DEC-2021 09:22:04 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



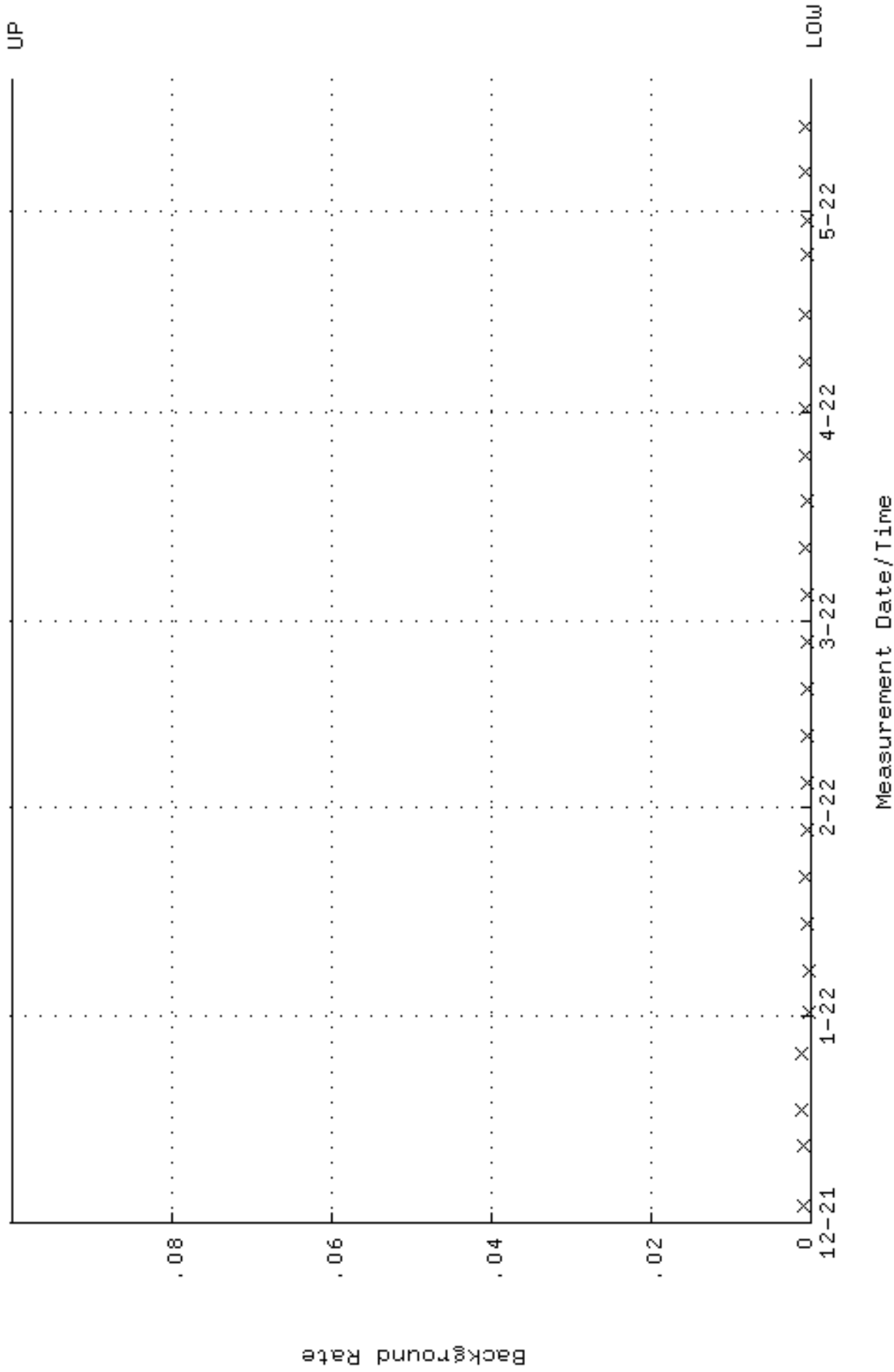
QA filename : DKA100:[ENV_ALPHA.QA.W]W254.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 29-DEC-2021 09:22:04 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



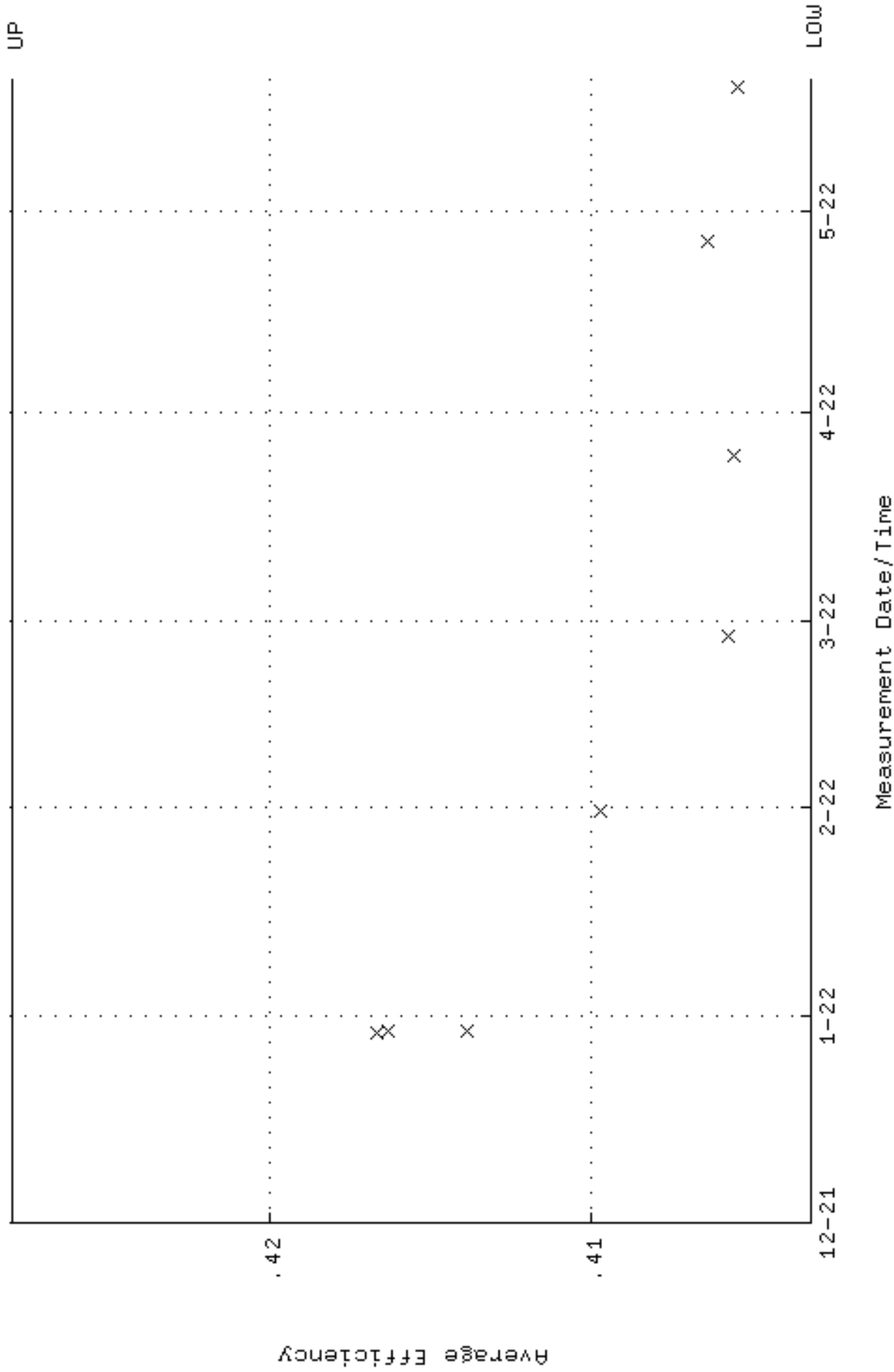
QA filename : DKA100:[ENV_ALPHA.QA.W]W254.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 29-DEC-2021 09:22:04 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



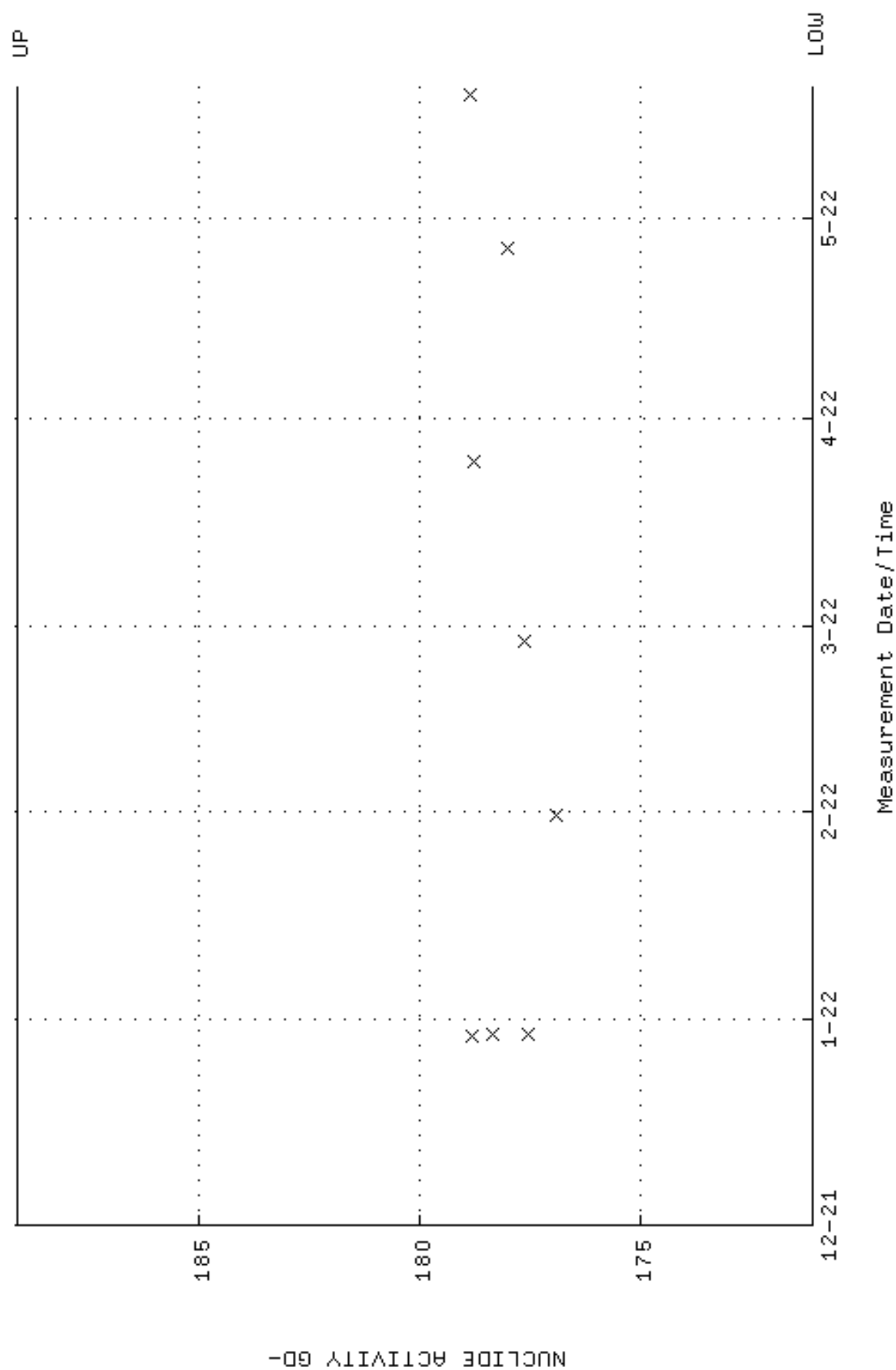
QA filename : DKA100:[ENV_ALPHA.QA.B]B254.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 3-DEC-2021 11:48:40 through 20-MAY-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 0.100000



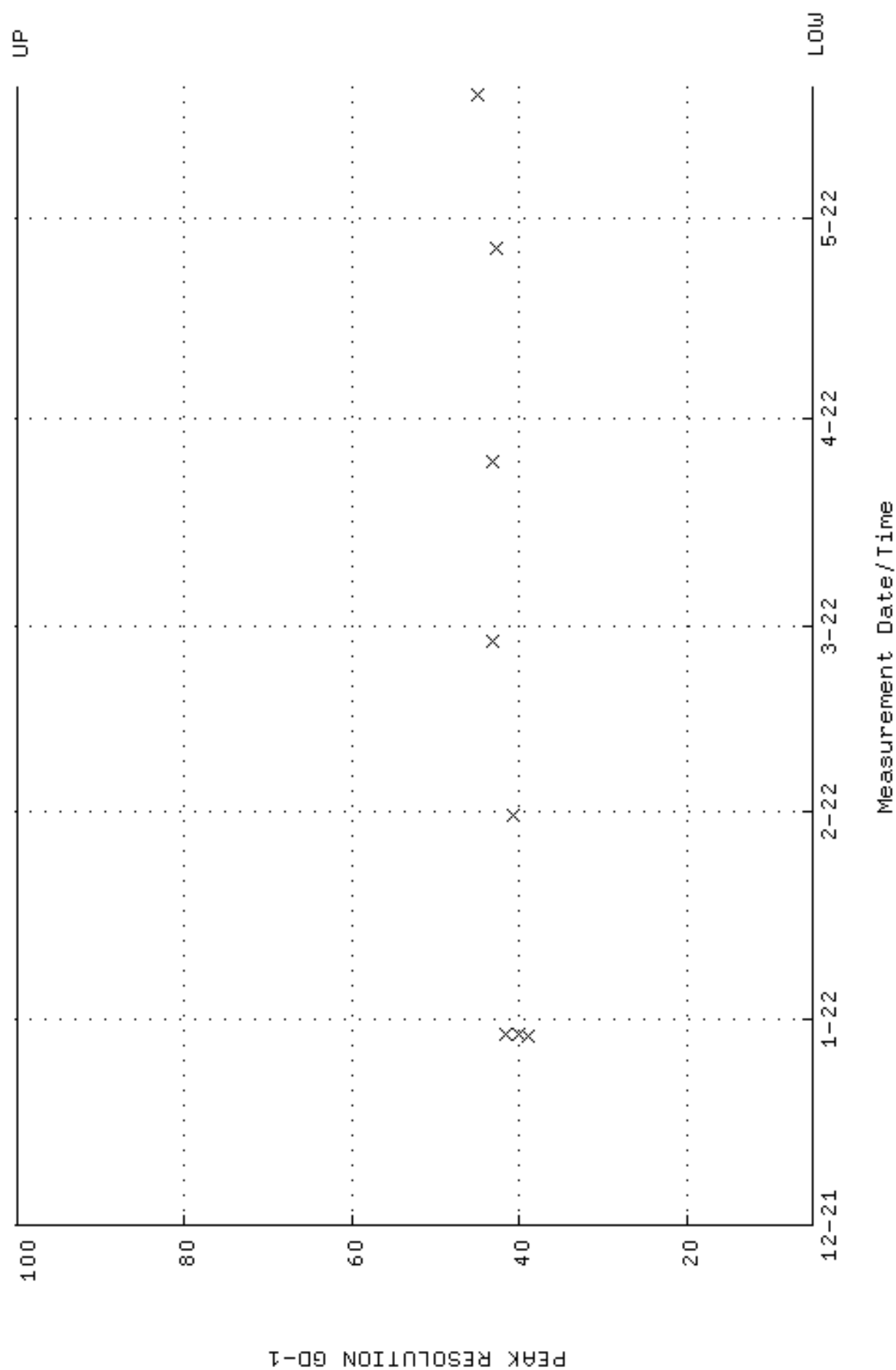
QA filename : DKA100:[ENV_ALPHA.QA.W]W256.QAF;5
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 29-DEC-2021 09:27:50 through 20-MAY-2022 12:00:00
Lower/Upper Lmts: 0.403120 through 0.428050



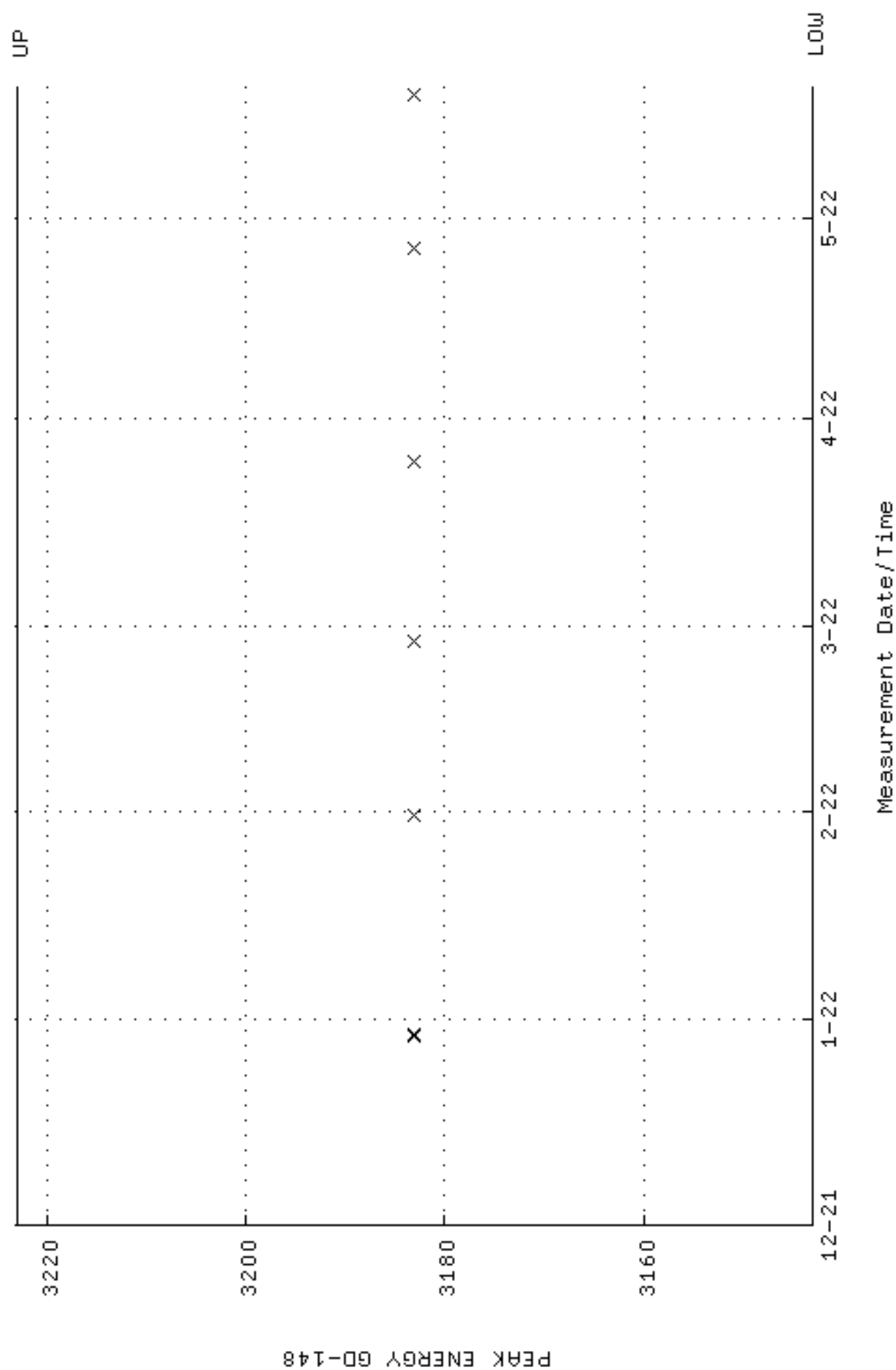
QA filename : DKA100:[ENV_ALPHA.QA.W]W256.QAF;5
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 29-DEC-2021 09:27:50 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



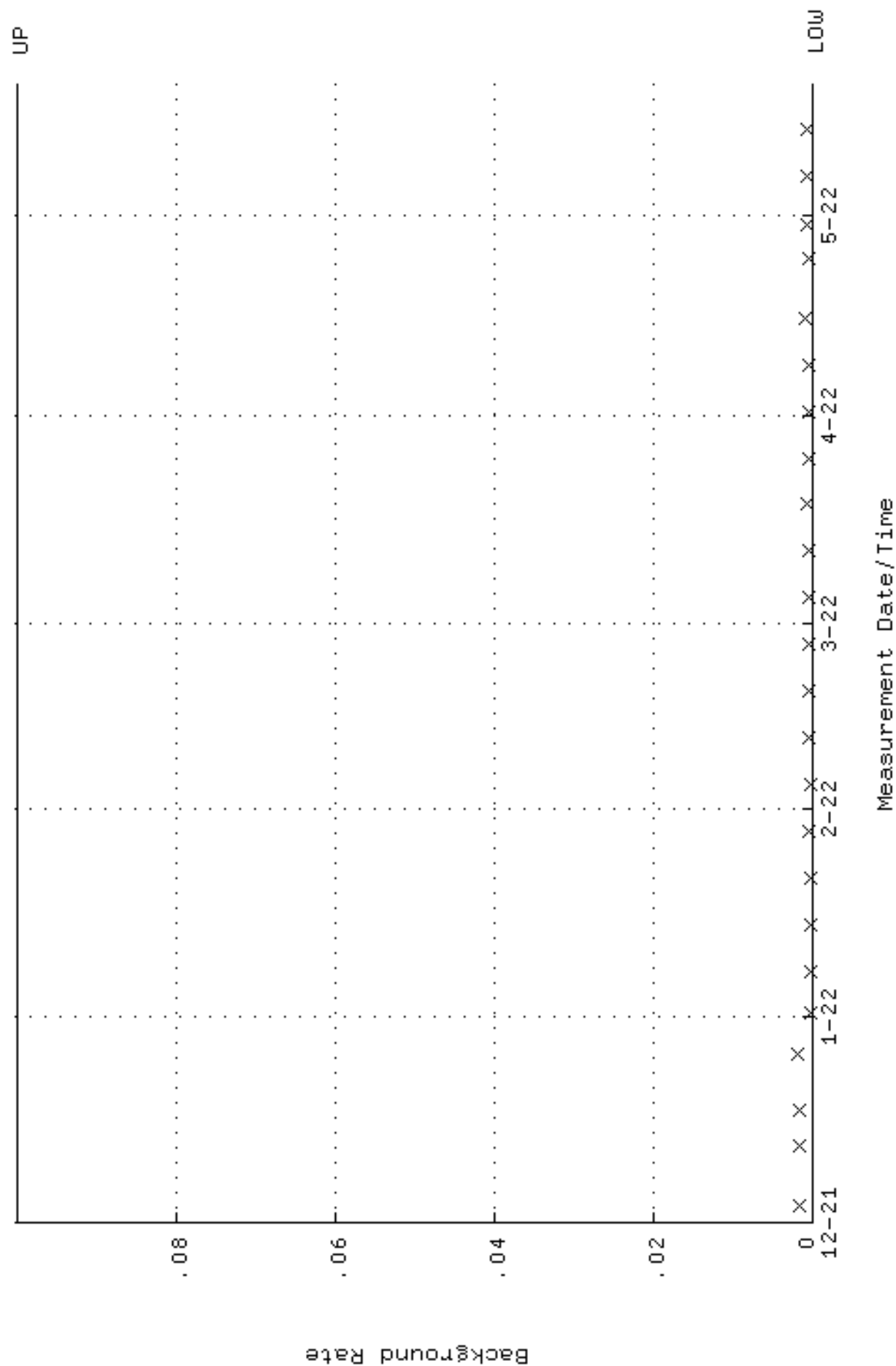
QA filename : DKA100:[ENV_ALPHA.QA.W]W256.QAF;5
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 29-DEC-2021 09:27:50 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



QA filename : DKA100:[ENV_ALPHA.QA.W]W256.QAF;5
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 29-DEC-2021 09:27:50 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



QA filename : DKA100:[ENV_ALPHA.QA.B]B256.QAF;3
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 3-DEC-2021 11:48:48 through 20-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



RAD Standards Traceability

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

65338-278

Am-241 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Am-241
ACTIVITY (dps):	3.920 E4
HALF-LIFE:	4.322 E2 years
CALIBRATION DATE:	January 15, 2003 12:00 EST
TOTAL UNCERTAINTY*:	3.2%
SYSTEMATIC:	2.2%
RANDOM:	1.0%

*99% confidence level.

5.10649 grams 1M HCl solution.

Impurities: γ -impurities <0.1%
 α -impurities <0.1%

P O NUMBER 3213 RD, Item 1

SOURCE PREPARED BY: M. Taskaeva
M. Taskaeva, Radiochemist

Q A APPROVED:

UM [Signature] 1-16-03

RC-S-035-046a

Standard Logbook

Serial ID: 0533 **Open/Reference Date:** 15 JAN 2003 **Aliquot :** 5.10649 g
Name: Americium-241 **Received:** 27 JAN 2003 **Density :** Hand Calculated
Type: Source Material **Expires:** 05 FEB 2020 **Logbook Num :** RC S 035 048
Employee: Angela Johnson **Lot Number :** 65338-278
Supplier: Analytics **Solvent :** 1 M HCL
Uncertainty : 1.25 percent
Description: 65338-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	39200 dps		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	0533
Prepared By:	Angela Johnson
Carrier Conc:	1 M HCL
Reference Date:	01/15/2003
Ampoule Mass (g):	5.10649 g
Uncertainty:	+/- 1.25 %
LogBook No:	RC S 035 048
Supplier:	Analytics

A Solution Material Info	
Isotope:	Americium-241
Prepared By:	Angela Johnson
Prep Date:	02/05/2003
Verification Date:	06/03/2021
Expiration Date:	06/03/2022
Primary Code:	0533-A
Dilution(mL):	100 mL
Mass of Parent(g):	4.8225 g
Density(g/mL):	1.0139
Balance ID:	

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (5.10649 \text{ g} * 100 \text{ mL}) = 22211.9695 \text{ dpm/mL}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (1.0139 \text{ g/mL}) / (5.10649 \text{ g} * 100 \text{ mL}) = 21907.2185 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/20/2003	Angela Johnson	1.0151	100	0533-B	222.38 dpm/mL	03/01/2006	03/01/2007
01/16/2015	Christina Kimball	.005081	500	0533-BB	.22263 dpm/mL	01/14/2016	01/14/2017
02/20/2003	Angela Johnson	.6819	250	0533-C	59.754 dpm/mL	02/20/2004	02/20/2005
05/04/2015	Tim Chandler	1.02	500	0533-CC	44.6907 dpm/mL	04/17/2017	04/17/2018
05/07/2003	Tim Chandler	.1245	100	0533-D	27.2745 dpm/mL	05/03/2004	05/03/2005
01/22/2016	Christina Kimball	.103	500	0533-DD	4.51289 dpm/mL	01/05/2022	01/05/2023
09/10/2004	Amanda Fehr	.6933	250	0533-E	60.753 dpm/mL	09/10/2005	09/10/2006
10/31/2016	Christina Kimball	.00508	500	0533-EE	.22259 dpm/mL	10/30/2017	10/30/2018

12/17/2004	Brenda Burke	.0093	100	0533-F	2.0374 dpm/mL	12/20/2004	12/20/2005
10/13/2017	Tim Chandler	1.0219	500	0533-FF	44.774 dpm/mL	10/01/2019	10/01/2020
12/21/2004	Brenda Burke	.009273	100	0533-G	2.0315 dpm/mL	12/07/2005	12/07/2006
11/13/2017	Christina Kimball	.00507	500	0533-GG	.2222 dpm/mL	11/09/2018	11/09/2019
04/28/2005	Brenda Burke	.1347	100	0533-H	29.4598 dpm/mL	04/27/2006	04/27/2007
01/23/2018	Tim Chandler	1.2536	100	0533-HH	274.6289 dpm/mL	01/23/2018	01/23/2019
10/19/2005	Mary Aders	.6948	250	0533-I	60.7831 dpm/mL	10/18/2006	10/18/2007
01/30/2020	Tim Chandler	1.0284	500	0533-II	45.0588 dpm/mL	01/18/2022	01/18/2023
05/08/2006	Julie Strock	.0711	100	0533-J	15.576 dpm/mL	05/10/2008	05/10/2009
05/11/2006	Brenda Burke	.00092601	100	0533-K	.20286 dpm/mL	08/02/2007	07/28/2007
11/15/2006	Tara Sides	.132	1000	0533-L	2.88586 dpm/mL	09/15/2015	09/15/2016
06/12/2007	Julie Strock	.000979	100	0533-M	.21448 dpm/mL	05/20/2009	05/20/2010
08/03/2007	Daniel Roy	.7042	250	0533-N	61.7083 dpm/ml	08/02/2008	08/02/2009
09/25/2008	Daniel Roy	1.4561	500	0533-O	63.7982 dpm/ml	09/07/2010	09/07/2011
09/29/2008	Tara Sides	.1004	100	0533-P	21.9948 dpm/mL	09/07/2010	09/07/2011
06/03/2009	Julie Strock	.0009751	100	0533-Q	.2136 dpm/mL	06/01/2010	06/01/2011
11/08/2010	Ashley Drochter	1.4675	500	0533-R	64.2977 dpm/mL	11/08/2010	11/08/2011
11/09/2010	Ashley Drochter	.7295	500	0533-S	31.9626 dpm/mL	10/31/2011	10/31/2012
01/03/2011	Christina Kimball	.097	100	0533-T	21.25 dpm/mL	01/03/2011	01/03/2012
01/05/2011	Christina Kimball	.1009	100	0533-U	22.10438 dpm/mL	12/18/2013	12/18/2014
05/23/2011	Christina Kimball	.001008999	100	0533-V	.2210438 dpm/mL	05/11/2012	05/11/2013
05/11/2012	Christina Kimball	.001016	100	0533-W	.222676 dpm/mL	05/01/2014	05/01/2015

06/13/2012	Ashley Drochter	.728	500	0533-X	31.8969 dpm/mL	06/02/2014	06/02/2015
01/23/2013	Salina Pizarro	2	500	1641	.1498555 dpm/mL	12/19/2013	12/01/2038
07/16/2013	Julie Strock	1	500	1641-A	.07492775 dpm/mL	07/16/2038	07/16/2039
03/17/2014	Christina Kimball	.1013	100	0533-Y	22.19201 dpm/mL	02/26/2019	02/26/2020
05/05/2014	Christina Kimball	.00101595	100	0533-Z	.222567 dpm/mL	05/05/2014	05/05/2015

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Am-241 Standard 0533-II

v1.2

Analyst	MXS2
Verification Prep Date	1/18/2022

Tracer Information	
Isotope	Am-243
Serial Number	1752-H
Amount of Std. (mL)	0.2
Expiration Date	6/18/2022

Standard Information	
Isotope	Am-241
Serial Number	0533-II
Isotope Halflife	432.6000 Y
Reference Date	1/15/2003
Ref. Act. (dpm/mL)	45.0588
Amount of Std. (mL)	0.2
Standard Prep Date	1/30/2020

Std #	Count Date	Activity pCi	Standard dpm/mL
1	1/18/2022	3.910	43.40
2	1/18/2022	3.790	42.07
3	1/18/2022	3.890	43.18

Mean Value = 3.863 42.883
Stdev = 0.064291005 0.713630156

	pCi	dpm/mL
Certificate Value* =	3.9376	43.7071
Two sigma =	0.1286	1.4273
10 % of Mean =	0.3863	4.2883
Rule A (Pass/Fail)	Pass	Pass
% Recovery	98.11%	98.11%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	1/18/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

*** Certificate Value is decay corrected to Verification Prep Date.**

The analyst prepared three standard verification sources for Am-241 standard 0533-II using 0.2 mL for each source. Each standard was combined with 0.2 mL of Am-243 standard 1752-H and was diluted in a centrifuge tube containing 20 mL 3M/HCl and 20 mL DI water. 0.1g of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-241 were calculated by comparison to Am-243 certified values.

CERTIFICATE OF CALIBRATION
Standard Reference Source

1752

101294

Am-243 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL1511998, Item 1 **Product Code:** 8243



This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
Am-243	2.692E+06	3.809E+04	0.5	1.8	3.7	09/01/2015

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

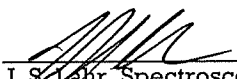
Comments:

Impurities: γ -impurities (other than decay products) < 0.1%.
5.10528 g 1M HCl solution, carrier free.

Source Prepared by:


Z. Dimitrova, Radiochemist

QC Approved:


J. S. Lehr, Spectroscopist

Date: 28 AUG 15

Standard Logbook

Serial ID: 1752 **Open/Reference Date:** 01 SEP 2015 **Aliquot :** 5.10528 g
Name: Americium-243 **Received:** 01 SEP 2015 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18 SEP 2025 **Logbook Num :** GL-CED-297-045
Employee: Gregory Ramsay **Lot Number :** 101294
Supplier: Eckert & Ziegler **Solvent :** 1M HCl
Uncertainty : 1.85 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-243	38090 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1752
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HCl
Reference Date:	09/01/2015
Ampoule Mass (g):	5.10528 g
Uncertainty:	+/- 1.85 %
LogBook No:	GL-CED-297-045
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Americium-243		
Prepared By:	Tim Chandler		
Prep Date:	11/23/2015		
Verification Date:	01/06/2017		
Expiration Date:	01/20/2022		
Primary Code:	1752-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0826 g		
Density(g/mL):	1.0282	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22752.4720 \text{ dpm/mL}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0282 \text{ g/mL}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22128.4498 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/23/2015	Tim Chandler	1.0432	500	1752-B	46.1688 dpm/mL	11/24/2015	11/23/2016
05/26/2016	Tim Chandler	1.072	500	1752-C	47.4434 dpm/mL	05/26/2016	05/26/2017
01/06/2017	Tim Chandler	2.1043	1000	1752-D	46.5649 dpm/mL	12/20/2017	12/20/2018
05/30/2018	Tim Chandler	2.3853	1000	1752-E	52.783 dpm/mL	05/21/2019	05/21/2020
08/05/2019	Tim Chandler	2.2432	1000	1752-F	49.6385 dpm/mL	08/03/2020	08/03/2021
08/12/2020	Tim Chandler	2.2247	1000	1752-G	49.2292 dpm/mL	08/12/2020	08/12/2021
06/18/2021	Tim Chandler	2.2608	1000	1752-H	50.028 dpm/mL	06/18/2021	06/18/2022
01/20/2022	Matelon DeFreese	2.0841	1000	1752-I	46.1179022 dpm/mL	01/21/2022	01/21/2023

Verification for Am-243 Standard 1752-I

v1.2

Analyst	MXS2
Verification Prep Date	1/21/2022

Tracer Information	
Isotope	Cm-244
Serial Number	1216-N
Amount of Std. (mL)	0.2
Expiration Date	4/12/2022

Standard Information	
Isotope	Am-243
Serial Number	1752-I
Isotope Half-life	7.3700E+03 Y
Reference Date	9/1/2015
Ref. Act. (dpm/mL)	46.1179022
Amount of Std. (mL)	0.5
Standard Prep Date	1/20/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	1/23/2022	10.300	45.73
2	1/23/2022	10.700	47.51
3	1/23/2022	10.500	46.62

Mean Value = 10.500 46.620
Stddev = 0.2 0.888

Certificate Value* = 10.3807 pCi
Two sigma = 0.4000
10 % of Mean = 1.0500
Rule A (Pass/Fail) Pass
% Recovery 101.15%
Rule B (Pass/Fail) Pass
Expiration Date 1/21/2023

dpm/mL
46.0902
1.7760
4.6620
Pass
101.15%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Am-243 standard 1752-I using 0.5 mL for each source. Each standard was combined with 0.2 mL of Cm-244 standard 1216-N and was diluted in a centrifuge tube containing 20 mL of 3M HCl and 20 mL of DI water. 0.1 mL of neodymium carrier and five mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-243 were calculated by comparison to Cm-244 certified values.

1/24/22



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010

Fax 661•257•8303

1521

CERTIFICATE OF CALIBRATION GAMMA STANDARD SOLUTION

Radionuclide:	Pb-210	Customer:	GENERAL ENGINEERING LABS.
Half-life:	22.3 ± 0.2 years	P.O. No.:	936803 RD
Catalog No.:	7210	Reference Date:	15-Feb-11 12:00 PST
Source No.:	1476-99	Contained Radioactivity:	4.973 μCi 184.0 kBq

Physical Description:

A. Mass of solution:	5.21292 g in 5 mL flame-sealed ampoule
B. Chemical form:	Pb(NO ₃) ₂ in 1M HNO ₃
C. Carrier content:	10 μg Pb/mL of solution
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.9540 μCi/g, 35.30 kBq/g

Method of Calibration:

This source was prepared from a weighed aliquot of solution whose activity in μCi/g was determined using gamma ray spectrometry.

Peak energy used for integration:	46.5 keV
Branching ratio used:	0.0418 gammas per decay

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5 %
B. Type B (systematic) uncertainty:	± 7.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 7.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.



Daniel James Van Dalsen
Quality Control

11-Jan-11
Date

EZIP Ref. No.: 1476-99

ISO 9001 CERTIFIED

Medical Imaging Laboratory

Industrial Gauging Laboratory

Standard Logbook

Serial ID: 1521 **Open/Reference Date:** 15 FEB 2011 **Aliquot :** 5.21292 g
Name: Lead-210 **Received:** 14 JAN 2011 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 02 MAR 2013 **Logbook Num :** RC-S-060-066
Employee: Gregory Ramsay **Lot Number :** 1426-99
Supplier: Eckert & Ziegler **Solvent :** 1M HNO₃
Uncertainty : 7 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Lead-210	35.3 kBq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1521
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	02/15/2011
Ampoule Mass (g):	5.21292 g
Uncertainty:	+/- 7 %
LogBook No:	RC-S-060-066
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Lead-210		
Prepared By:	Bethany Fiem		
Prep Date:	03/22/2011		
Verification Date:	12/03/2020		
Expiration Date:	12/23/2021		
Primary Code:	1521-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0705 g		
Density(g/mL):	1.0272	Balance ID:	1113021018

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 107393.1900 \text{ dpm/mL}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0272 \text{ g/mL}) / (100 \text{ mL}) = 104549.4451 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/07/2013	Ashley Drochter	.5177	100	1521-B	541.2525 dpm/mL	10/29/2013	10/29/2014
10/29/2013	Tim Chandler	5.1002	100	1521-C	5332.2308 dpm/mL	08/09/2018	08/09/2019
02/01/2019	Bethany Fiem	5.0359	100	1521-D	5265.0055 dpm/mL	11/30/2021	11/30/2022
06/05/2018	Tim Chandler	.6059	200	1867-A		06/06/2018	06/05/2019
06/14/2018	Tim Chandler	.6646	200	1867-B		06/15/2018	06/14/2019
06/14/2018	Tim Chandler	.6646	200	1868-A		06/14/2018	06/14/2019
06/13/2019	Tim Chandler	.6984	200	1907-A		06/15/2021	06/15/2022
06/13/2019	Tim Chandler	.6984	200	1907-A1		06/15/2021	06/15/2022
11/06/2019	Tim Chandler	15.0553	100	1920-A		11/07/2019	11/07/2020
12/14/2021	Matelon DeFreese	.6276	200	2012-A		12/15/2021	12/15/2022

Verification for Po-210 Standard 2012-A

v1.2

Analyst	MXS2
Verification Prep Date	12/15/2021

Tracer Information	
Isotope	Po-209
Serial Number	1720-C
Amount of Std. (mL)	0.2
Expiration Date	11/11/2022

Standard Information	
Isotope	Po-210
Serial Number	2012-A
Isotope Half-life	138.3800 D
Reference Date	12/14/2021
Ref. Act. (dpm/mL)	233.932217
Amount of Std. (mL)	0.2
Standard Prep Date	12/14/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	12/16/2021	20.500	227.55
2	12/16/2021	19.700	218.67
3	12/16/2021	20.000	222.00

Mean Value = 20.067 222.740
 Stdev = 0.404145188 4.486011592

pCi
 Certificate Value* = 20.9697
 Two sigma = 0.8083
 10 % of Mean = 2.0067
 Rule A (Pass/Fail) Pass
 % Recovery 95.69%
 Rule B (Pass/Fail) Pass
 Expiration Date 12/15/2022

dpm/mL
 232.7634
 8.9720
 22.2740
 Pass
 95.69%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-210 standard 2012-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-209 standard 1720-C and was diluted in a centrifuge tube containing 15 mL of 0.05M HNO₃. Precipitated by adding 0.1mL of 30% H₂O₂, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-210 were calculated by comparison to Po-209 certified values.

12/16/2021

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

82308-278

Pu-239 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: 7340 RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u_A	u_B	U	
Pu-239	8.803E+06	3.758E+04	0.1	0.9	1.8	05/07/2010

*Uncertainty: U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities < 0.1 %, α -impurities < 0.1 %, Am-241 330.1 Bq. 5.56111 g 3M HNO₃ solution, carrier free.

Source Prepared by: W. Mao

W. Mao, Radiochemist

QA Approved: J. D. McCorvey

J. D. McCorvey, QA Manager Alternate

Date: 5/10/10



Standard Logbook

Serial ID: 1472 **Open/Reference Date:** 07 MAY 2010 **Aliquot :** 5.56111 g
Name: Plutonium-239 **Received:** 12 MAY 2010 **Density :** Hand Calculated
Type: Source Material **Expires:** 03 JUN 2030 **Logbook Num :** RC-S-060-019
Employee: Ashley Drochter **Lot Number :** 82308-278
Supplier: Eckert & Zeigler Analytics **Solvent :** 3M HNO₃
Uncertainty : .9 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-239	37580 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1472
Prepared By:	Ashley Drochter
Carrier Conc:	3M HNO3
Reference Date:	05/07/2010
Ampoule Mass (g):	5.56111 g
Uncertainty:	+/- .9 %
LogBook No:	RC-S-060-019
Supplier:	Eckert & Zeigler Analytics

A Solution Material Info			
Isotope:	Plutonium-239		
Prepared By:	Julie Strock		
Prep Date:	10/20/2020		
Verification Date:	08/17/2021		
Expiration Date:	08/17/2022		
Primary Code:	1472-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.5071 g		
Density(g/mL):	1.1056	Balance ID:	BIOFA-B952846238

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.56111 \text{ g} * 100 \text{ mL}) = 22329.0118 \text{ dpm/mL}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.1056 \text{ g/mL}) / (5.56111 \text{ g} * 100 \text{ mL}) = 20195.4985 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
10/20/2020	Julie Strock	.0117	1000	1472-B	.2363 dpm/mL	10/14/2021	10/14/2022
08/17/2021	Tim Chandler	1.1318	500	1472-C	45.7145 dpm/mL	08/17/2021	08/17/2022
04/07/2022	Christina Kimball	.01	1000	1472-D	.20195 dpm/mL	04/07/2022	04/07/2023
04/15/2022	Christina Kimball	.011283	1000	1472-E	.2279 dpm/mL	04/15/2022	04/15/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-239 Standard 1472-C

v1.2

Analyst	TC1
Verification Prep Date	8/17/2021

Tracer Information	
Isotope	Pu-236
Serial Number	1980-B
Amount of Std. (mL)	0.2
Expiration Date	5/10/2022

Standard Information	
Isotope	Pu-239
Serial Number	1472-C
Isotope Halflife	2.4131E+04 Y
Reference Date	5/7/2010
Ref. Act. (dpm/mL)	45.7145
Amount of Std. (mL)	0.2
Standard Prep Date	8/17/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	8/17/2021	4.140	45.95
2	8/17/2021	4.330	48.06
3	8/17/2021	4.200	46.62

Mean Value = 4.223 46.879
Stdev = 0.097125349 1.078091369

	pCi	dpm/mL
Certificate Value* =	4.1171	45.6997
Two sigma =	0.1943	2.1562
10 % of Mean =	0.4223	4.6879
Rule A (Pass/Fail)	Pass	Pass
% Recovery	102.58%	102.58%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	8/17/2022	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-239 standard 1472-C using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-236 standard 1980-B and was diluted in a 50 mL plastic centrifuge tube containing 15 mL of 2M HCl. 100 micrograms of neodymium carrier, 6 drops of 25% hydrazine dichloride and five mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-239 were calculated by comparison to Pu-236 certified values.



National Institute of Standards & Technology

Certificate

Standard Reference Material® 4334j

Plutonium-242 Radioactivity Standard

2010

Revised
8-12-21

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterweger, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Steven J. Choquette, Director
Office of Reference Materials

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

GL CED-297-302a

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq•g^{-1(a)}
Relative expanded uncertainty ($k = 2$)	0.51 %^(b)

^(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

^(b) The uncertainties on certified values are expanded uncertainties, $U = k u_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

GL-CED-297-3026

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ^{-1(a,b,c,d)}
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ^{-1(a,d)}
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π α liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

^(a) The stated uncertainty is two times the standard uncertainty [5].

^(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

^(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,

0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and

0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

^(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclidic impurities follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ^{-6 (3)}	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ^{-5 (3)}	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

^(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,

5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and

3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

^(f) The stated uncertainty is the standard uncertainty. See reference 6.

GLCEN-297-302c

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ^{242}Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	^{242}Pu decay corrections for half-life uncertainty of 0.22 %.	B	$< 10^{-10}$
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty ($k = 2$)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

GC-CED-297-302d

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

GL-CED-297-302e

Standard Logbook

Serial ID: 2010 **Open/Reference Date:** 09 AUG 2017 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 12 AUG 2021 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 12 AUG 2035 **Logbook Num :** GL-CED-297-302
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
Uncertainty : .255 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2010
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO ₃
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-302
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	04/14/2022		
Verification Date:	04/14/2022		
Expiration Date:	04/14/2023		
Primary Code:	2010-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.4626 g		
Density(g/mL):	1.0315	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.4626 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 42.7394 \text{ dpm/mL}$
$(5.4626 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0315 \text{ g/mL}) / (200 \text{ mL}) = 41.4342 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
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GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2010-A

v1.2

Analyst	MXS2
Verification Prep Date	4/14/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.2
Expiration Date	8/17/2022

Standard Information	
Isotope	Pu-242
Serial Number	2010-A
Isotope Half-life	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	42.7394
Amount of Std. (mL)	0.2
Standard Prep Date	4/14/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	4/14/2022	3.920	43.51
2	4/14/2022	3.880	43.07
3	4/14/2022	3.960	43.96

Mean Value = 3.920 43.512
Stdev = 0.04 0.444

Certificate Value* = 3.8504 pCi
Two sigma = 0.0800
10 % of Mean = 0.3920
Rule A (Pass/Fail) Pass
% Recovery 101.81%
Rule B (Pass/Fail) Pass
Expiration Date 4/14/2023

dpm/mL
42.7390
0.8880
4.3512
Pass
101.81%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2010-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL of 2M HCl diluted to 40 mL with DI water. Added 0.1 mL of neodymium carrier, 3 to 4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

Signature



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661-309-1010
Fax 661-257-8303

1720

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Po-209	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	102 ± 5 years	P.O. No.:	GEL1408569	
Catalog No.:	7209	Reference Date:	1-Oct-14	12:00 PST
Source No.:	1760-53-1	Contained Radioactivity:	0.05281 µCi	1.954 kBq

Physical Description:

A. Mass of solution:	5.21650 g in 5 mL flame-sealed ampoule
B. Chemical form:	Po(NO ₃) ₄ in 1M HNO ₃
C. Carrier content:	None
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.01012 µCi/g, 0.3744 kBq/g

Method of Calibration:

This source was prepared from a weighed aliquot of solution whose activity in µCi/g was determined using a liquid scintillation counter.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.4 %
D. Total uncertainty at the 99% confidence level:	± 3.1 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.

Daniel James Van Dorem
Quality Control

11-Sep-14
Date

EZIP Ref. No.: 1760-53



ISO 9001 CERTIFIED

GL-CED-297-013

Standard Logbook

Serial ID: 1720 **Open/Reference Date:** 01 OCT 2014 **Aliquot :** 5.2165 g
Name: Polonium-209 **Received:** 22 SEP 2014 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 22 SEP 2035 **Logbook Num :** GL-CED-297-013
Employee: Gregory Ramsay **Lot Number :** 1760-53-1
Supplier: Eckert & Ziegler **Solvent :** 1M HNO3
Uncertainty : 1.211 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Polonium-209	1.954 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1720
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	10/01/2014
Ampoule Mass (g):	5.2165 g
Uncertainty:	+/- 1.211 %
LogBook No:	GL-CED-297-013
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Polonium-209		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2016		
Verification Date:	07/12/2017		
Expiration Date:	12/06/2019		
Primary Code:	1720-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1896 g		
Density(g/mL):	1.0290	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1166.3543 \text{ dpm/mL}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0290 \text{ g/mL}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1133.4833 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
12/06/2018	Tim Chandler	14.42	200	1720-B	81.7241 dpm/mL	12/07/2018	12/07/2019
11/26/2019	Tim Chandler	14.5183	200	1720-C	82.2813 dpm/mL	11/11/2021	11/11/2022
11/26/2019	Tim Chandler	14.5183	200	1720-C1	82.2813 dpm/mL	11/11/2021	11/11/2022
02/21/2022	Matelon DeFreese	14.5109	200	1720-D	82.239314 dpm/mL	03/07/2022	03/07/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Po-209 Standard 1720-D

v1.2

Analyst	MXS2
Verification Prep Date	3/7/2022

Tracer Information	
Isotope	Po-210
Serial Number	2012-A
Amount of Std. (mL)	0.2
Expiration Date	12/15/2022

Standard Information	
Isotope	Po-209
Serial Number	1720-D
Isotope Half-life	125.3000 Y
Reference Date	10/1/2014
Ref. Act. (dpm/mL)	82.239314
Amount of Std. (mL)	0.2
Standard Prep Date	2/21/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	3/7/2022	7.180	79.70
2	3/7/2022	7.480	83.03
3	3/7/2022	7.700	85.47

Mean Value = 7.453 82.732
Stdev = 0.261023626 2.897362249

Certificate Value* = 7.1106 pCi
Two sigma = 0.5220
10 % of Mean = 0.7453
Rule A (Pass/Fail) Pass
% Recovery 104.82%
Rule B (Pass/Fail) Pass
Expiration Date 3/7/2023

dpm/mL
78.9274
5.7947
8.2732
Pass
104.82%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-209 standard 1720-D using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-210 standard 2012-A and was diluted in a centrifuge tube containing 15mL of 0.05M HNO3. Precipitated by adding 0.1mL of 30% H2O2, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-209 were calculated by comparison to Po-210 certified values.

3/15/22



Eckert & Ziegler

Analytics

1845

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

Received: 12-1-17 12:00

SRS Number: 108018

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8229

Customer: GEL Laboratories LLC

P.O. Number: GEL1718798, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 29-November-2017 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Th-229	2.897E+06	1.999E+04	0.5	1.5	3.1	4π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 108018

Comments:

5.21561 g of 0.5 M HNO₃ solution, carrier free.

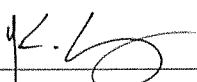
Impurities:

γ-impurities (other than decay products) < 0.1%

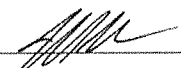
α-impurities: Th-228 6.6E+00 Bq, Th-230 1.2E+02 Bq, Th-232 8.0E+00 Bq

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Hardley, Radiochemist

QC Approved by:


J. Lahr, Spectroscopist

Date: 27-Nov-17

Standard Logbook

Serial ID: 1845 **Open/Reference Date:** 29 NOV 2017 **Aliquot :** 5.21561 g
Name: Thorium-229 **Received:** 01 DEC 2017 **Density :** Hand Calculated
Type: Source Material **Expires:** 01 DEC 2018 **Logbook Num :** GL-CED-297-138
Employee: Tim Chandler **Lot Number :** 108018
Supplier: Eckert & Ziegler **Solvent :** 0.5M HNO₃
Uncertainty : 1.55 percent
Description: 1 ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-229	19990 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1845
Prepared By:	Tim Chandler
Carrier Conc:	0.5M HNO3
Reference Date:	11/29/2017
Ampoule Mass (g):	5.21561 g
Uncertainty:	+/- 1.55 %
LogBook No:	GL-CED-297-138
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-229		
Prepared By:	Tim Chandler		
Prep Date:	06/08/2018		
Verification Date:	07/07/2020		
Expiration Date:	11/10/2022		
Primary Code:	1845-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1906 g		
Density(g/mL):	1.0291	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11936.4861 \text{ dpm/mL}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0291 \text{ g/mL}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11598.7987 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/08/2018	Tim Chandler	2.0385	1000	1845-B	23.6442 dpm/mL	06/01/2020	06/01/2021
07/10/2019	Tim Chandler	4.0198	1000	1845-C	46.62485 dpm/mL	07/07/2020	07/07/2021
10/26/2020	Tim Chandler	4.0184	1000	1845-D	46.6086 dpm/mL	10/27/2020	10/27/2021
04/23/2021	Tim Chandler	4.2911	1000	1845-E	49.7716 dpm/mL	04/26/2021	04/26/2022
11/10/2021	Matelon DeFreese	4.211	1000	1845-F	48.8425 dpm/mL	11/10/2021	11/10/2022
05/11/2022	Matelon DeFreese	4.1951	1000	1845-G	48.6581 dpm/mL	05/12/2022	05/11/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Th-229 Standard 1845-G

v1.2

Analyst	MXS2
Verification Prep Date	5/12/2022

Tracer Information	
Isotope	Th-232
Serial Number	1513-C
Amount of Std. (mL)	0.1
Expiration Date	12/22/2022

Standard Information	
Isotope	Th-229
Serial Number	1845-G
Isotope Half-life	7.3400E+03 Y
Reference Date	11/29/2017
Ref. Act. (dpm/mL)	48.6581
Amount of Std. (mL)	0.1
Standard Prep Date	5/11/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	5/12/2022	2.190	48.62
2	5/12/2022	2.070	45.95
3	5/12/2022	2.120	47.06

Mean Value = 2.127 47.212
Stdev = 0.060277138 1.338152458

Certificate Value* = 2.1909 pCi
Two sigma = 0.1206
10 % of Mean = 0.2127
Rule A (Pass/Fail) Pass
% Recovery 97.07%
Rule B (Pass/Fail) Pass
Expiration Date 5/12/2023
dpm/mL
48.6377
2.6763
4.7212
Pass
97.07%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-229 standard 1845-G using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-232 standard 1513-C and was diluted in a centrifuge tube containing 10 mL 8M HNO₃. The standard was isolated following the standard operating procedure for the separation of thorium (GL-RAD-A-038). After dissolving the sources in 5 mL of 2M HCl, the sources were diluted to 40 mL with deionized water. 100 micrograms of neodymium carrier and five mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-229 were calculated by comparison to Th-232 certified values.

5/16/22

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Th-232	Customer:	GEL LABORATORIES, LLC		
Half-life:	(1.405 ± 0.006)E+10 years	P.O. No.:	7347RD		
Catalog No.:	7232	Reference Date:	1-Nov-10	12:00	PST
Source No.:	1451-62	Contained Radioactivity:	50.26	nCi	1860 Bq
		(Th-232 only)			

Physical Description:

A. Mass of solution:	5.73256 g in 5 mL flame-sealed ampoule
B. Chemical form:	Th(NO ₃) ₄ in H ₂ O
C. Carrier content:	None
D. Density:	1.15 g/mL @ 20°C

Radioimpurities:

Not determined

Radionuclide Concentration: 8.767 nCi/g, 324.4 Bq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.


Quality Control

15-OCT-10
Date

EZIP Ref. No.: 1451-62

RC-S-060-058

ISO 9001 CERTIFIED

Standard Logbook

Serial ID: 1513 **Open/Reference Date:** 01 NOV 2010 **Aliquot :** 5.73256 g
Name: Thorium-232 **Received:** 21 OCT 2010 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 30 NOV 2011 **Logbook Num :** RC-S-060-058
Employee: Gregory Ramsay **Verified:** 28 APR 2011 **Lot Number :** 1451-62
Supplier: Eckert & Ziegler **Solvent :** DI water
Uncertainty : 1.172 PERCENT

Description: in water
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-232	324.4 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1513
Prepared By:	Gregory Ramsay
Carrier Conc:	DI water
Reference Date:	11/01/2010
Ampoule Mass (g):	5.73256 g
Uncertainty:	+/- 1.172 %
LogBook No:	RC-S-060-058
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-232		
Prepared By:	Christina Kimball		
Prep Date:	04/19/2011		
Verification Date:	02/21/2020		
Expiration Date:	02/21/2021		
Primary Code:	1513-A		
Dilution(mL):	250 mL		
Mass of Parent(g):	5.672 g		
Density(g/mL):	1.0020	Balance ID:	60108592

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (250 \text{ mL}) = 441.5992 \text{ dpm/mL}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0020 \text{ g/mL}) / (250 \text{ mL}) = 440.7354 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
04/19/2011	Christina Kimball	5.0665	100	1513-B	22.3299 dpm/mL	04/11/2013	04/11/2014
02/26/2014	Matelon DeFreese	100.0316	1000	1513-C	44.08747 dpm/mL	12/22/2021	12/22/2022
04/18/2014	Christina Kimball	5.0477	100	1513-D	22.247 dpm/mL	06/22/2021	06/22/2022
01/04/2016	Christina Kimball	.2487	100	1513-E	1.096117 dpm/mL	02/11/2020	02/11/2021
08/01/2016	Christina Kimball	2.053	250	1513-F	3.61932 dpm/mL	07/26/2021	07/26/2022
02/21/2020	Christina Kimball	.248	100	1513-G	1.093 dpm/mL	02/23/2022	02/23/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Th-232 Standard 1513-C

v1.2

Analyst	MXS2
Verification Prep Date	12/22/2021

Tracer Information	
Isotope	Th-229
Serial Number	1845-F
Amount of Std. (mL)	0.1
Expiration Date	11/10/2022

Standard Information	
Isotope	Th-232
Serial Number	1513-C
Isotope Half-life	1.4050E+10 Y
Reference Date	11/1/2010
Ref. Act. (dpm/mL)	44.08747
Amount of Std. (mL)	0.1
Standard Prep Date	2/26/2014

Std #	Count Date	Activity pCi	Standard dpm/mL
1	12/22/2021	1.970	43.73
2	12/22/2021	2.070	45.95
3	12/22/2021	1.920	42.62

Mean Value = 1.987 44.104

Stdev = 0.076376262 1.695553007

Certificate Value* = 1.9859 pCi
 Two sigma = 0.1528
 10 % of Mean = 0.1987
 Rule A (Pass/Fail) Pass
 % Recovery 100.04%
 Rule B (Pass/Fail) Pass
 Expiration Date 12/22/2022

dpm/mL
 44.0875
 3.3911
 4.4104
 Pass
 100.04%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-232 standard 1513-C using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-229 standard 1845-F and was diluted in a centrifuge tube containing 10 mL of 8M HNO₃, then poured onto AG columns following SOP 038. 0.1 mL of neodymium carrier and 2 mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-232 were calculated by comparison to Th-229 certified values.

2/14/22



Eckert & Ziegler

Analytics

1564

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION Standard Radionuclide Source

85621-278

5 mL Liquid in Flame Sealed Vial

Customer: General Engineering Labs/Charleston, SC
P.O. No.: 936814RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
U-232	2.517E+04	3.393E+04	0.5	2.4	4.9	09/12/2011

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

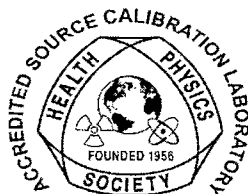
Impurities: γ -impurities (other than decay products) < 0.1 %, U-233 < 1.20E2 Bq, Am-241 < 5.8E1 Bq. 5.06048 grams 2M HNO3 solution.

Source Prepared by: M. I. Taskaeva
M. I. Taskaeva, Radiochemist

QA Approved: J. D. McCorvey
J. D. McCorvey, QA Manager Alternate

Date: 9/12/11

RECEIVED
9/14/11
AM



Standard Logbook

Serial ID: 1564 **Open/Reference Date:** 12 SEP 2011 **Aliquot :** 5.06048 g
Name: Uranium-232 **Received:** 14 SEP 2011 **Density :** Hand Calculated
Type: Source Material **Expires:** 26 SEP 2014 **Logbook Num :** RC-S-060-109
Employee: Ashley Drochter **Lot Number :** 85621-278
Supplier: Eckert & Ziegler **Solvent :** 2M HNO3
Uncertainty : 2.45 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-232	33930 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1564
Prepared By:	Ashley Drochter
Carrier Conc:	2M HNO3
Reference Date:	09/12/2011
Ampoule Mass (g):	5.06048 g
Uncertainty:	+/- 2.45 %
LogBook No:	RC-S-060-109
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-232		
Prepared By:	Ashley Drochter		
Prep Date:	11/15/2012		
Verification Date:	07/26/2021		
Expiration Date:	07/26/2022		
Primary Code:	1564-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9067 g		
Density(g/mL):	1.0615	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.06048 \text{ g} * 100 \text{ mL}) = 19739.3525 \text{ dpm/mL}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0615 \text{ g/mL}) / (5.06048 \text{ g} * 100 \text{ mL}) = 18595.7160 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/16/2012	Ashley Drochter	2.6179	1000	1564-B	48.6817 dpm/mL	11/13/2013	11/13/2014
07/26/2021	Christina Kimball	.635	500	1564-BB	23.6166 dpm/mL	07/26/2021	07/26/2022
07/26/2021	Christina Kimball	.635	500	1564-BB Spike	23.6166 dpm/mL	07/26/2021	07/26/2022
01/15/2013	Christina Kimball	.265	250	1564-C	19.7115 dpm/mL	01/13/2014	01/13/2015
12/14/2021	Tim Chandler	2.6412	1000	1564-CC	49.115 dpm/mL	12/15/2021	12/15/2022
02/18/2013	Christina Kimball	.116	500	1564-D	4.31421 dpm/mL	02/16/2015	02/13/2016
04/13/2022	Matelon DeFreese	2.7103	1000	1564-DD	50.4 dpm/mL	04/13/2022	04/13/2023
01/02/2014	Gregory Ramsay	2.6936	1000	1564-E	50.08942 dpm/mL	12/10/2014	12/10/2015

03/17/2014	Christina Kimball	.266	250	1564-F	19.78584 dpm/mL	03/25/2015	03/25/2016
12/10/2014	Tim Chandler	2.6312	1000	1564-G	48.929 dpm/mL	12/10/2014	12/10/2015
07/20/2015	Christina Kimball	.266	250	1564-H	19.78584 dpm/mL	07/25/2016	07/25/2017
11/23/2015	Tim Chandler	2.6117	1000	1564-I	48.5664 dpm/mL	11/23/2015	11/23/2016
01/05/2016	Christina Kimball	.119	500	1564-J	4.4258 dpm/mL	12/27/2017	12/27/2018
01/05/2016	Christina Kimball	.119	500	1564-J Spike	4.4258 dpm/mL	12/27/2017	12/27/2018
09/20/2016	Tim Chandler	2.6389	1000	1564-K	49.0722 dpm/mL	09/18/2017	09/18/2018
12/20/2016	Christina Kimball	.276	250	1564-L	20.52974 dpm/mL	12/21/2017	12/21/2018
06/20/2017	Tim Chandler	2.6611	1000	1564-M	49.4851 dpm/mL	06/19/2018	06/19/2019
01/18/2018	Tim Chandler	2.6367	1000	1564-N	49.0313 dpm/mL	04/25/2018	04/25/2019
04/25/2018	Tim Chandler	2.6505	1000	1564-O	49.2879 dpm/mL	04/25/2018	04/25/2019
08/06/2018	Christina Kimball	.106	500	1564-P	3.9423 dpm/mL	12/19/2019	12/19/2020
08/06/2018	Christina Kimball	.106	500	1564-P Spike	3.9423 dpm/mL	12/19/2019	12/19/2020
12/13/2018	Tim Chandler	2.6502	1000	1564-Q	49.2824 dpm/mL	12/13/2018	12/13/2019
01/08/2019	Christina Kimball	.29	250	1564-R	21.571 dpm/mL	01/08/2019	01/08/2020
01/08/2019	Christina Kimball	.29	250	1564-R Spike	21.571 dpm/mL	01/08/2019	01/08/2020
10/01/2019	Tim Chandler	2.6957	1000	1564-S	50.1285 dpm/mL	10/01/2019	10/01/2020
12/18/2019	Christina Kimball	.307	250	1564-T	22.83554 dpm/mL	12/19/2019	12/19/2020
12/18/2019	Christina Kimball	.307	250	1564-T Spike	22.83554 dpm/mL	12/19/2019	12/19/2020
03/31/2020	Tim Chandler	2.6645	1000	1564-U	49.5483 dpm/mL	03/31/2020	03/31/2021
08/14/2020	Christina Kimball	.111	500	1564-V	4.1282 dpm/mL	08/14/2020	08/14/2021
08/14/2020	Christina Kimball	.111	500	1564-V Spike	4.1282 dpm/mL	08/14/2020	08/14/2021

10/13/2020	Tim Chandler	2.6983	1000	1564-W	50.1768 dpm/mL	10/13/2020	10/13/2021
11/04/2020	Christina Kimball	.315	250	1564-X	23.4306 dpm/mL	11/04/2020	11/04/2021
11/04/2020	Christina Kimball	.315	250	1564-X Spike	23.4306 dpm/mL	11/04/2020	11/04/2021
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Y	51.32232 dpm/mL	03/19/2021	03/19/2022
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Z	51.32232 dpm/mL	03/20/2021	03/20/2022

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-232 Standard 1564-DD

v1.2

Analyst	MXS2
Verification Prep Date	4/13/2022

Tracer Information	
Isotope	U-238
Serial Number	1600-M
Amount of Std. (mL)	0.2
Expiration Date	1/21/2023

Standard Information	
Isotope	U-232
Serial Number	1564-DD
Isotope Half-life	68.9000 Y
Reference Date	9/12/2011
Ref. Act. (dpm/mL)	50.4
Amount of Std. (mL)	0.2
Standard Prep Date	4/13/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	4/13/2022	3.880	43.07
2	4/13/2022	4.090	45.40
3	4/13/2022	3.840	42.62

Mean Value = 3.937 43.697
Stdev = 0.134288247 1.490599544

pCi
4.0819
Certificate Value* =
Two sigma = 0.2686
10 % of Mean = 0.3937
Rule A (Pass/Fail) Pass
% Recovery 96.44%
Rule B (Pass/Fail) Pass
Expiration Date 4/13/2023
dpm/mL
45.3091
2.9812
4.3697
Pass
96.44%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-232 standard 1564-DD using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-238 standard 1600-M and was diluted in a centrifuge tube containing 15 mL of 0.1M HCl diluted to 40 mL with DI water. 0.1 mL of neodymium carrier, 0.5 mL of titanium chloride and five mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-232 were calculated by comparison to U-238 certified values.

for 4/6/22

15 Apr 3/24/12
1600

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide: U-238 (Nat)
Half-life: (4.468 ± 0.005)E+09 years
Catalog No.: 7338
Source No.: 1577-71-2

Customer: GENERAL ENGINEERING LABS.
P.O. No.: 936823 RD
Reference Date: 15-Apr-12 12:00 PST
Contained Radioactivity: 1.023 µCi 37.85 kBq
(Total Uranium)

Physical Description:

A. Mass of solution: 7.05210 g in 10 mL flame-sealed ampoule
B. Chemical form: $\text{UO}_2(\text{NO}_3)_2$ in dilute HNO_3
C. Carrier content: None
D. Density: Approximately 1.41 g/mL @ 20°C

Radioimpurities:

See Technical Data Sheet

Radionuclide Concentration: 0.1451 µCi/g, 5.369 kBq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.


Quality Control

21-Mar-12
Date

EZIP Ref. No.: 1577-71

RC-S-065-030a

ISO 9001 CERTIFIED

U-238 Natural Technical Data

The U-238 Natural used to prepare your order was taken from Eckert & Ziegler Isotope Products Lot #4550102. It had the following composition as of 9 Feb 10:

<u>Nuclide</u>	<u>Atom %</u>	<u>Activity %</u>
U-234	0.0055	49.086
U-235	0.7200	2.241
U-238	99.274	48.673

Isotopic composition provided by New Brunswick Laboratory.

If you have any question, please contact Eckert & Ziegler Isotope Products Technical Service: (661) 309-1010

Standard Logbook

Serial ID: 1600 **Open/Reference Date:** 15 APR 2012 **Aliquot :** 7.0521 g
Name: Uranium-238 **Received:** 24 MAR 2012 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 26 MAR 2015 **Logbook Num :** RC-S-065-030
Employee: Ashley Drochter **Lot Number :** 4550102
Supplier: Eckert & Ziegler **Solvent :** UO₂(NO₃)₂ in dilute HNO₃
Uncertainty : 1.17 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-238	18.42 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1600
Prepared By:	Ashley Drochter
Carrier Conc:	UO ₂ (NO ₃) ₂ in dilute HNO ₃
Reference Date:	04/15/2012
Ampoule Mass (g):	7.0521 g
Uncertainty:	+/- 1.17 %
LogBook No:	RC-S-065-030
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-238		
Prepared By:	Ashley Drochter		
Prep Date:	09/04/2012		
Verification Date:	05/20/2022		
Expiration Date:	05/20/2023		
Primary Code:	1600-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	6.8204 g		
Density(g/mL):	1.0789	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (7.0521 \text{ g} * 100 \text{ mL}) = 10688.8814 \text{ dpm/mL}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0789 \text{ g/mL}) / (7.0521 \text{ g} * 100 \text{ mL}) = 9907.0626 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
09/04/2012	Ashley Drochter	1.4579	500	1600-B	28.8913 dpm/mL	09/04/2012	09/04/2013
09/11/2012	Ashley Drochter	3.0288	500	1600-C	60.0219 dpm/mL	09/04/2013	09/04/2014
03/27/2014	Tim Chandler	3.0445	500	1600-D	60.3241 dpm/mL	03/18/2015	03/18/2016
07/24/2015	Tim Chandler	3.0177	500	1600-E	59.7931 dpm/mL	07/10/2017	07/10/2018
02/16/2017	Tim Chandler	3.0261	500	1600-F	59.9595 dpm/mL	02/06/2018	02/06/2019
10/10/2017	Christina Kimball	.539	250	1600-G	21.3596 dpm/mL	07/26/2021	07/26/2022

04/02/2018	Tim Chandler	3.0544	500	1600-H	60.5203 dpm/mL	03/29/2019	03/29/2020
06/21/2019	Tim Chandler	3.0536	500	1600-I	60.5044 dpm/mL	06/21/2019	06/21/2020
01/30/2020	Tim Chandler	3.0563	500	1600-J	60.5579 dpm/mL	01/26/2021	01/26/2022
03/13/2020	Christina Kimball	.01222	500	1600-K	.24207 dpm/mL	03/15/2022	03/15/2023
04/23/2021	Tim Chandler	3.0507	500	1600-L	60.4469 dpm/mL	04/26/2021	04/26/2022
01/21/2022	Matelon DeFreese	3.1075	500	1600-M	61.5723941 dpm/mL	01/21/2022	01/21/2023
05/19/2022	Christina Kimball	.01275	500	1600-N	.2527 dpm/mL	05/20/2022	05/20/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-238 Standard 1600-M

v1.2

Analyst	MXS2
Verification Prep Date	1/21/2022

Tracer Information	
Isotope	U-232
Serial Number	1564-CC
Amount of Std. (mL)	0.2
Expiration Date	12/15/2022

Standard Information	
Isotope	U-238
Serial Number	1600-M
Isotope Half-life	4.4680E+09 Y
Reference Date	4/15/2012
Ref. Act. (dpm/mL)	61.5723941
Amount of Std. (mL)	0.2
Standard Prep Date	1/20/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	1/23/2022	5.500	61.05
2	1/23/2022	5.370	59.61
3	1/23/2022	5.410	60.05

Mean Value = 5.427 60.236
 Stdev = 0.066583281 0.739074421

Certificate Value* = 5.5471 pCi
 Two sigma = 0.1332
 10 % of Mean = 0.5427
 Rule A (Pass/Fail) Pass
 % Recovery 97.83%
 Rule B (Pass/Fail) Pass
 Expiration Date 1/21/2023

dpm/mL
 61.5724
 1.4781
 6.0236
 Pass
 97.83%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-238 standard 1600-M using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-232 standard 1564-CC and was diluted in a centrifuge tube containing 15 mL 0.1M HCl and 25 mL of DI water 0.1 mL of neodymium carrier, 0.5 mL titanium chloride, and five mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-238 were calculated by comparison to U-232 certified values.

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Runlogs

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2265049

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
579287001	SAMPLE	MP2	1088	MAY-31-22 09:23:01	DONE		09-MAY-22 12:01
579287002	SAMPLE	MP2	1089	MAY-31-22 09:23:02	DONE		10-MAY-22 13:31
579287003	SAMPLE	MP2	1090	MAY-31-22 09:23:02	DONE		10-MAY-22 16:35
579287004	SAMPLE	MP2	1092	MAY-31-22 09:23:02	DONE		10-MAY-22 13:32
579287005	SAMPLE	MP2	1093	MAY-31-22 09:23:02	DONE		10-MAY-22 13:32
579289001	SAMPLE	MP2	1107	MAY-31-22 09:23:03	DONE		10-MAY-22 14:00
579289002	SAMPLE	MP2	1108	MAY-31-22 09:23:03	DONE		10-MAY-22 16:36
579289003	SAMPLE	MP2	1109	MAY-31-22 09:23:03	DONE		10-MAY-22 14:01
1205090027	MB	MP2	1110	MAY-31-22 09:23:03	DONE		10-MAY-22 16:36
1205090028	LCS	MP2	1111	MAY-31-22 09:23:03	DONE		10-MAY-22 14:01
1205090029	LCSD	MP2	1112	MAY-31-22 09:23:03	DONE		10-MAY-22 14:01

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2265052

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
579287001	SAMPLE	MP2	1003	MAY-30-22 12:17:16	DONE		02-MAY-22 11:50
579287002	SAMPLE	MP2	1004	MAY-30-22 12:17:16	DONE		02-MAY-22 11:50
579287003	SAMPLE	MP2	1005	MAY-30-22 12:17:16	DONE		02-MAY-22 11:50
579287004	SAMPLE	MP2	1006	MAY-30-22 12:17:16	DONE		02-MAY-22 11:50
579287005	SAMPLE	MP2	1008	MAY-30-22 12:17:17	DONE		02-MAY-22 11:51
579289001	SAMPLE	MP2	1011	MAY-30-22 12:17:17	DONE		02-MAY-22 11:52
579289002	SAMPLE	MP2	1012	MAY-30-22 12:17:17	DONE		02-MAY-22 11:52
1205090054	LCS	MP2	1009	MAY-30-22 12:17:17	DONE		02-MAY-22 11:52
1205090055	LCSD	MP2	1010	MAY-30-22 12:17:17	DONE		02-MAY-22 11:52
579289003	SAMPLE	MP2	1013	MAY-30-22 12:19:31	DONE		02-MAY-22 11:52
1205090053	MB	MP2	1014	MAY-30-22 12:19:31	DONE		02-MAY-22 11:52

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2265053

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
579287001	SAMPLE	MP2	1170	MAY-31-22 10:35:51	DONE		13-MAY-22 11:55
579289002	SAMPLE	MP2	1181	MAY-31-22 10:36:04	DONE		13-MAY-22 11:50
579289003	SAMPLE	MP2	1182	MAY-31-22 10:36:05	DONE		13-MAY-22 11:50
1205090056	MB	MP2	1185	MAY-31-22 10:36:07	DONE		17-MAY-22 13:26
1205090057	LCS	MP2	1186	MAY-31-22 10:36:10	DONE		17-MAY-22 13:12
1205090058	LCSD	MP2	1189	MAY-31-22 10:36:12	DONE		17-MAY-22 13:12
579287002	SAMPLE	MP2	1025	JUN-02-22 14:27:39	DONE		03-MAY-22 12:04
579287003	SAMPLE	MP2	1026	JUN-02-22 14:27:39	DONE		03-MAY-22 12:04
579287004	SAMPLE	MP2	1027	JUN-02-22 14:27:39	DONE		03-MAY-22 18:01
579287005	SAMPLE	MP2	1028	JUN-02-22 14:27:39	DONE		03-MAY-22 12:05
579289001	SAMPLE	MP2	1029	JUN-02-22 14:27:39	DONE		03-MAY-22 12:05

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2265054

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
579287001	SAMPLE	MP2	1125	JUN-01-22 08:42:37	DONE		11-MAY-22 11:56
579287002	SAMPLE	MP2	1126	JUN-01-22 08:42:39	DONE		11-MAY-22 11:33
579287003	SAMPLE	MP2	1128	JUN-01-22 08:42:41	DONE		11-MAY-22 11:33
579287004	SAMPLE	MP2	1129	JUN-01-22 08:42:43	DONE		11-MAY-22 11:33
579289001	SAMPLE	MP2	1131	JUN-01-22 08:42:48	DONE		11-MAY-22 11:33
579289002	SAMPLE	MP2	1132	JUN-01-22 08:42:50	DONE		11-MAY-22 11:34
1205090060	LCS	MP2	1135	JUN-01-22 08:42:57	DONE		11-MAY-22 12:39
1205090061	LCSD	MP2	1136	JUN-01-22 08:42:59	DONE		11-MAY-22 11:34
579287005	SAMPLE	MP2	1113	JUN-02-22 14:32:46	DONE		11-MAY-22 12:37
1205090059	MB	MP2	1125	JUN-02-22 14:32:48	DONE		11-MAY-22 11:56
579289003	SAMPLE	MP2	1114	JUN-02-22 14:32:51	DONE		11-MAY-22 12:38

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2272481

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
579289002	SAMPLE	MP2	1078	JUN-05-22 14:38:46	DONE		09-MAY-22 12:27
579289003	SAMPLE	MP2	1079	JUN-05-22 14:38:46	DONE		09-MAY-22 12:28
1205104985	MB	MP2	1080	JUN-05-22 14:38:46	DONE		09-MAY-22 12:28
1205104986	LCS	MP2	1081	JUN-05-22 14:38:46	DONE		09-MAY-22 12:28
1205104987	LCSD	MP2	1082	JUN-05-22 14:38:46	DONE		09-MAY-22 12:28
579287001	SAMPLE	MP2	1245	JUN-06-22 13:20:24	DONE		19-MAY-22 12:18
579287002	SAMPLE	MP2	1246	JUN-06-22 13:20:25	DONE		19-MAY-22 12:18
579287003	SAMPLE	MP2	1252	JUN-06-22 13:20:28	DONE		19-MAY-22 12:18
579287004	SAMPLE	MP2	1254	JUN-06-22 13:20:30	DONE		19-MAY-22 12:19
579287005	SAMPLE	MP2	1256	JUN-06-22 13:20:33	DONE		19-MAY-22 12:19
579289001	SAMPLE	MP2	1200	JUN-06-22 13:20:35	DONE		17-MAY-22 13:15

Gamma Spectroscopy Raw Data

Batch 2264689 Check-list

This check-list was completed on 17-MAY-22 by Michael Hilton

This batch was reviewed by Michael Hilton on 17-MAY-22 and Spencer Collins on 18-MAY-22.

Batch ID: 2264689

Product: GSCGAMMF

Description: Gamma Spec Filter RAD A-013

#	Criteria	Yes	No	Comments
Preparation Information				
1	Did any sample(s) require dilution?		No	
2	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
3	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
4	Are instrument source checks within limits?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were any additional radionuclides added that were not requested by the client?		No	
7	Were all the samples prepared/analyzed within the required holding time period?	Yes		
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Gamma Spectroscopy

Batch ID: 2264689
Analyst: Rebekah Futch (RXF2)
Method: DOE HASL 300, 4.5.2.3/Ga-01-R
Lab SOP: GL-RAD-A-013 REV# 27
Instrument: No instrument-manual method

Due Dates for Lab: 05-JUN-2022 **Package:** 06-JUN-2022 **SDG:** 07-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205089189	78962-278	1298	1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	579287001	17-MAY-2022	20	200	0.74119
2	579287002	17-MAY-2022	20	200	0.76992
3	579287003	17-MAY-2022	20	200	0.76021
4	579287004	17-MAY-2022	20	200	0.76788
5	579287005	17-MAY-2022	20	200	0.74789
6	579289001	17-MAY-2022	20	200	0.73894
7	579289002	17-MAY-2022	20	200	0.75667
8	579289003	17-MAY-2022	20	200	0.74342
9	1205089187 MB	17-MAY-2022	20		0.76992
10	1205089188 DUP (579287001)	17-MAY-2022	20	200	0.74119
11	1205089189 LCS	17-MAY-2022	20		0.76992

Reagent/Solvent Lot ID	Description	Amount	Comments:
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VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 09:56:37.25

```
*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287001.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM14.CNF;822
Background date    : 15-MAY-2022 09:12:25
Sample date       : 29-MAR-2022 13:03:00 Acquisition date : 17-MAY-2022 07:56:16
Sample ID        : G579287001 Sample quantity : 7.41190E-01 FILTER
Detector name    : GAM14 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:00.73 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : RXF2
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID         : 2264689 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.34*	20	64	1.01	92.99	89	8	2.80E-03	78.8	
2	3	182.51	25	47	1.44	365.29	361	19	3.53E-03	61.0	8.13E-01
3	0	240.75	39	82	4.98	481.77	475	14	5.46E-03	51.9	
4	0	352.54	20	23	1.01	705.33	701	8	2.76E-03	48.1	
5	0	409.78	17	8	1.51	819.79	817	6	2.31E-03	37.3	
6	0	448.98	29	5	2.90	898.18	894	9	3.96E-03	23.0	
7	0	452.97	8	9	0.54	906.16	902	6	1.14E-03	67.1	
8	0	477.92	59	30	1.05	956.05	951	11	8.13E-03	22.4	
9	0	568.02*	2	25	2.86	1136.24	1126	12	2.95E-04	496.4	
10	0	570.37*	8	14	2.21	1140.95	1137	10	1.11E-03	101.8	
11	0	583.66*	20	17	0.60	1167.52	1164	12	2.73E-03	55.2	
12	0	713.62	8	16	3.45	1427.43	1421	12	1.06E-03	115.2	
13	0	724.22	7	8	1.45	1448.61	1444	7	9.72E-04	78.7	
14	0	773.91	4	7	0.61	1548.00	1544	7	5.56E-04	120.5	
15	0	836.70	11	14	0.64	1673.58	1667	11	1.57E-03	70.0	
16	0	911.90*	6	15	0.92	1823.97	1820	10	9.01E-04	137.6	
17	0	918.49	7	4	1.13	1837.15	1833	7	9.03E-04	61.8	
18	0	942.30*	6	4	0.57	1884.77	1880	8	8.06E-04	86.4	
19	0	1121.82	8	10	1.41	2243.81	2238	8	1.12E-03	76.5	
20	0	1255.37	11	0	1.06	2510.91	2507	8	1.53E-03	30.2	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 09:56:38

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287001.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 29-MAR-2022 13:03:00	Acquisition date	: 17-MAY-2022 07:56:16
Sample ID	: G579287001	Sample quantity	: 0.74119 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA14	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.73 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	59	10.44*	2.248E+00	1.264E+02	2.387E+02	44.82
TL-208	277.37	-----	6.60	3.299E+00	-----	Line Not Found	-----
	583.19	20	85.00*	1.929E+00	6.076E+00	6.378E+00	110.35
	860.56	-----	12.50	1.390E+00	-----	Line Not Found	-----
PB-210	46.54	20	4.25*	3.520E-01	6.825E+02	6.853E+02	157.62
BI-211	72.87	-----	1.23	2.699E+00	-----	Line Not Found	-----
	351.06	20	12.92*	2.797E+00	2.781E+01	2.792E+01	96.18
RA-224	240.99	39	4.10*	3.623E+00	1.339E+02	1.406E+02	103.72

Flag: "*" = Keyline

```

*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287001.CNF;1  *
* Acquisition date   : 17-MAY-2022 07:56:16 Sensitivity      : 3.000          *
* Detector ID        : GAM14 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 02:00:00.73 Half life ratio : *****          *
* Sample date        : 29-MAR-2022 13:03:00 Analyst initials: RXF2          *
* Sample ID          : G579287001 Sample Quantity : 7.4119E-01 FILTER      *
* Batch Number       : 2264689 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 9-MAY-2022 05:17:58 Eff. Geometry   : JAR            *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	2.387E+02	1.049E+02	8.062E+01
TL-208	6.378E+00	6.897E+00	5.518E+00
PB-210	6.853E+02	1.059E+03	1.034E+03
BI-211	2.792E+01	2.632E+01	3.172E+01
RA-224	1.406E+02	1.429E+02	1.180E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	2.443E+00	3.815E+00	8.984E+00	NOT IDENT.
NA-24	0.000E+00	8.705E+23	0.000E+00	SHORT HLIF
AL-26	-6.835E-01	2.935E+00	6.187E+00	NOT IDENT.
K-40	1.012E+01	5.351E+01	1.079E+02	NOT IDENT.
SC-46	-2.418E+00	4.657E+00	8.138E+00	FAIL ABUN
V-48	-3.002E+01	3.107E+01	4.690E+01	NOT IDENT.
CR-51	3.839E+01	9.970E+01	1.759E+02	NOT IDENT.
MN-52	-1.630E+01	1.695E+03	3.547E+03	NOT IDENT.
MN-54	6.867E-01	3.739E+00	7.503E+00	NOT IDENT.
CO-56	-9.987E-01	4.869E+00	9.174E+00	NOT IDENT.
CO-57	9.525E-01	2.300E+00	4.427E+00	NOT IDENT.
NI-57	0.000E+00	2.698E+10	0.000E+00	SHORT HLIF
CO-58	1.500E+00	4.314E+00	9.301E+00	NOT IDENT.
FE-59	-4.511E-01	1.283E+01	2.525E+01	NOT IDENT.
CO-60	-7.567E-01	3.539E+00	7.199E+00	NOT IDENT.
ZN-65	1.563E+00	8.677E+00	1.694E+01	NOT IDENT.
CU-67	0.000E+00	2.721E+06	0.000E+00	SHORT HLIF
GE-68	5.126E-01	1.189E+02	2.369E+02	NOT IDENT.
AS-73	5.022E+00	1.437E+02	2.737E+02	NOT IDENT.
AS-74	1.246E+01	3.170E+01	6.562E+01	NOT IDENT.
SE-75	6.075E-01	4.980E+00	9.079E+00	NOT IDENT.
BR-77	0.000E+00	2.046E+07	0.000E+00	SHORT HLIF
SR-82	-2.967E+01	8.673E+01	1.384E+02	NOT IDENT.
RB-83	-5.067E+00	7.240E+00	1.274E+01	NOT IDENT.
RB-84	-2.132E+00	1.114E+01	2.147E+01	NOT IDENT.

KR-85	-3.436E+03	1.169E+03	1.575E+03	NOT IDENT.
SR-85	-2.572E+01	8.748E+00	1.179E+01	NOT IDENT.
RB-86	2.265E+01	2.457E+02	4.972E+02	NOT IDENT.
Y-88	7.977E-01	5.456E+00	1.206E+01	NOT IDENT.
Y-91	7.274E+02	2.466E+03	5.467E+03	NOT IDENT.
NB-94	-1.510E+00	2.617E+00	4.609E+00	NOT IDENT.
NB-95	-2.358E+00	5.679E+00	1.019E+01	NOT IDENT.
NB-95M	6.829E+00	1.612E+01	2.834E+01	NOT IDENT.
TC-95M	-4.962E+00	6.843E+00	1.044E+01	NOT IDENT.
ZR-95	6.947E+00	8.722E+00	1.975E+01	FAIL ABUN
MO-99	0.000E+00	5.252E+06	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
RH-101	-7.193E-01	2.691E+00	4.803E+00	NOT IDENT.
RH-102M	-2.287E+00	3.157E+00	4.783E+00	NOT IDENT.
RU-103	-5.887E+00	6.497E+00	1.101E+01	NOT IDENT.
RH-106	-1.187E+01	2.959E+01	5.434E+01	NOT IDENT.
RU-106	-1.187E+01	2.959E+01	5.434E+01	NOT IDENT.
AG-108M	-1.733E+00	2.574E+00	4.605E+00	FAIL ABUN
CD-109	-2.267E+01	6.448E+01	1.158E+02	NOT IDENT.
AG-110	-1.021E+01	7.493E+01	1.247E+02	NOT IDENT.
AG-110M	1.480E+00	5.184E+00	1.069E+01	NOT IDENT.
IN-111	0.000E+00	4.414E+05	0.000E+00	SHORT HLIF
SN-113	1.118E+00	5.045E+00	1.013E+01	NOT IDENT.
IN-114M	5.069E+00	3.122E+01	5.254E+01	NOT IDENT.
CD-115	0.000E+00	3.206E+07	0.000E+00	SHORT HLIF
SN-117M	-1.570E+01	2.727E+01	4.632E+01	NOT IDENT.
SB-122	0.000E+00	1.020E+06	0.000E+00	SHORT HLIF
I-123	0.000E+00	1.138E+27	0.000E+00	SHORT HLIF
TE-123M	-2.157E+00	3.099E+00	5.185E+00	NOT IDENT.
SB-124	2.367E+00	4.640E+00	1.742E+01	FAIL ABUN
SB-125	3.817E+00	7.723E+00	1.634E+01	NOT IDENT.
TE-125M	-3.588E+02	1.295E+03	2.317E+03	NOT IDENT.
I-126	-1.361E+01	1.101E+02	1.981E+02	NOT IDENT.
SB-126	-5.120E+01	1.057E+02	1.624E+02	NOT IDENT.
SN-126	2.159E+00	5.676E+00	1.105E+01	NOT IDENT.
SB-127	0.000E+00	4.669E+04	0.000E+00	SHORT HLIF
TE-129	-8.861E+00	8.472E+01	1.649E+02	NOT IDENT.
I-131	-3.909E+01	1.888E+02	3.629E+02	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	9.866E+04	0.000E+00	SHORT HLIF
BA-133	1.334E+00	3.975E+00	7.455E+00	NOT IDENT.
I-133	0.000E+00	2.432E+17	0.000E+00	SHORT HLIF
CS-134	1.824E+00	3.568E+00	7.726E+00	FAIL ABUN
I-135	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
CS-136	3.312E+01	4.292E+01	1.064E+02	NOT IDENT.
BA-137M	7.710E-01	3.394E+00	6.674E+00	NOT IDENT.
CS-137	8.145E-01	3.585E+00	7.050E+00	NOT IDENT.
LA-138	-1.312E-01	5.607E+00	1.187E+01	NOT IDENT.
CE-139	5.628E-01	3.078E+00	5.692E+00	NOT IDENT.
BA-140	1.630E+02	1.567E+02	3.487E+02	NOT IDENT.
LA-140	-1.896E+01	5.533E+01	1.081E+02	NOT IDENT.
CE-141	-6.456E+00	1.333E+01	2.186E+01	NOT IDENT.
CE-143	0.000E+00	2.590E+11	0.000E+00	SHORT HLIF
CE-144	-2.475E+00	1.850E+01	3.338E+01	NOT IDENT.
PM-144	-1.110E+00	3.960E+00	7.247E+00	FAIL ABUN
PR-144	-8.351E+01	3.018E+02	5.526E+02	NOT IDENT.
PM-146	2.791E+00	3.668E+00	8.146E+00	FAIL ABUN
ND-147	-5.504E+01	3.864E+02	7.531E+02	NOT IDENT.
PM-147	-5.072E+03	6.223E+04	1.140E+05	NOT IDENT.
PM-149	0.000E+00	3.100E+08	0.000E+00	SHORT HLIF
EU-152	1.984E+00	8.267E+00	1.552E+01	NOT IDENT.
GD-153	-1.862E+00	7.372E+00	1.339E+01	NOT IDENT.
EU-154	6.979E+00	1.067E+01	2.516E+01	FAIL ABUN
EU-155	3.374E+00	7.970E+00	1.564E+01	NOT IDENT.
TB-160	2.103E+00	1.344E+01	2.853E+01	FAIL ABUN
HO-166M	1.175E+00	5.264E+00	1.077E+01	FAIL ABUN
TM-171	-2.963E+02	2.450E+03	4.594E+03	NOT IDENT.
LU-176	1.752E+00	2.369E+00	4.712E+00	NOT IDENT.
LU-177	-3.046E+03	3.312E+03	5.269E+03	NOT IDENT.
HF-181	3.137E-01	7.309E+00	1.311E+01	NOT IDENT.
W-181	7.917E+00	2.588E+01	5.092E+01	NOT IDENT.
TA-182	-7.344E+00	1.444E+01	2.765E+01	FAIL ABUN
RE-183	-9.625E+00	3.494E+01	5.835E+01	NOT IDENT.
RE-184	0.000E+00	1.864E+01	3.774E+01	NOT IDENT.
RE-188	-3.407E+00	1.882E+01	3.365E+01	FAIL ABUN
W-188	-8.970E+02	1.028E+03	1.601E+03	NOT IDENT.
OS-191	1.144E+01	6.208E+01	1.159E+02	NOT IDENT.
IR-192	-5.162E-01	4.673E+00	8.182E+00	NOT IDENT.

PB-201	0.000E+00	2.343E+38	0.000E+00	SHORT HLIF
TL-201	0.000E+00	1.232E+06	0.000E+00	SHORT HLIF
TL-202	-5.360E+00	3.989E+01	7.739E+01	NOT IDENT.
HG-203	1.257E+00	5.538E+00	1.027E+01	NOT IDENT.
PB-203	0.000E+00	1.682E+07	0.000E+00	SHORT HLIF
TL-204	-1.162E+02	4.376E+02	8.002E+02	NOT IDENT.
BI-207	-1.110E+00	5.777E+00	1.059E+01	FAIL ABUN
PB-211	1.085E+01	5.631E+01	1.152E+02	NOT IDENT.
BI-212	-3.181E+01	6.062E+01	9.555E+01	NOT IDENT.
PB-212	-2.277E+00	7.466E+00	1.269E+01	NOT IDENT.
BI-213	1.560E+00	9.262E+00	1.864E+01	NOT IDENT.
BI-214	8.092E-01	8.270E+00	1.480E+01	NOT IDENT.
PB-214	1.009E+01	9.512E+00	1.478E+01	FAIL ABUN
RN-219	-2.768E+01	3.114E+01	5.400E+01	NOT IDENT.
FR-221	8.927E+00	1.881E+01	3.564E+01	NOT IDENT.
RA-223	6.474E+01	6.141E+01	1.250E+02	NOT IDENT.
AC-225	2.634E+02	5.551E+02	1.052E+03	NOT IDENT.
RA-226	-5.400E+01	7.894E+01	1.409E+02	NOT IDENT.
AC-227	-9.795E+00	2.211E+01	3.733E+01	NOT IDENT.
TH-227	-9.795E+00	2.211E+01	3.733E+01	NOT IDENT.
AC-228	9.807E+00	2.645E+01	3.801E+01	FAIL ABUN
RA-228	9.807E+00	2.645E+01	3.801E+01	FAIL ABUN
TH-228	-2.277E+00	7.466E+00	1.269E+01	NOT IDENT.
TH-229	1.360E+01	4.439E+01	8.321E+01	NOT IDENT.
TH-230	-1.270E+03	1.190E+03	1.918E+03	NOT IDENT.
PA-231	-1.381E+01	4.028E+01	6.865E+01	NOT IDENT.
TH-231	-2.488E+01	3.964E+01	6.400E+01	NOT IDENT.
TH-232	-1.947E+03	2.214E+03	3.744E+03	NOT IDENT.
PA-233	7.482E-01	5.660E+00	1.041E+01	NOT IDENT.
PA-234	2.995E-01	2.340E+01	4.335E+01	FAIL ABUN
PA-234M	1.071E+02	4.436E+02	8.921E+02	NOT IDENT.
TH-234	-7.207E+01	1.578E+02	2.773E+02	NOT IDENT.
U-234	9.803E+02	8.164E+03	1.570E+04	NOT IDENT.
U-235	-1.660E+01	2.081E+01	3.301E+01	NOT IDENT.
NP-237	7.482E-01	5.660E+00	1.041E+01	NOT IDENT.
NP-238	0.000E+00	1.094E+08	0.000E+00	SHORT HLIF
U-238	-7.207E+01	1.578E+02	2.773E+02	NOT IDENT.
NP-239	-9.325E+00	2.198E+01	3.874E+01	NOT IDENT.
AM-241	-1.299E+01	1.848E+01	2.938E+01	NOT IDENT.
AM-242	-7.948E+00	5.221E+01	9.559E+01	NOT IDENT.
AM-243	1.625E-01	4.730E+00	8.839E+00	NOT IDENT.
CM-243	-1.158E+01	8.207E+00	1.267E+01	NOT IDENT.
BK-247	-7.468E-01	7.329E+00	1.297E+01	NOT IDENT.
CM-247	-1.787E+00	2.820E+00	5.121E+00	NOT IDENT.
CF-249	1.561E+00	3.644E+00	7.497E+00	NOT IDENT.
CF-251	-1.151E+01	1.208E+01	1.942E+01	NOT IDENT.
CF-252	-1.849E+03	1.536E+04	2.814E+04	NOT IDENT.
ANH-511	-1.409E+01	6.888E+00	1.332E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.34	31	64	1.01	92.99	89	8	4.31E-03	49.0	8.13E-01
2	0	92.81	63	137	1.06	185.92	181	11	8.79E-03	38.2	
3	3	182.51	25	47	1.44	365.29	361	19	3.53E-03	61.0	
4	3	185.80	38	75	1.44	371.87	361	19	5.23E-03	43.6	
5	0	240.75	39	82	4.98	481.77	475	14	5.46E-03	51.9	
6	0	352.54	20	23	1.01	705.33	701	8	2.76E-03	48.1	
7	0	409.78	17	8	1.51	819.79	817	6	2.31E-03	37.3	
8	0	448.98	29	5	2.90	898.18	894	9	3.96E-03	23.0	
9	0	452.97	8	9	0.54	906.16	902	6	1.14E-03	67.1	
10	0	477.92	59	30	1.05	956.05	951	11	8.13E-03	22.4	
11	0	511.09	145	66	2.22	1022.39	1014	19	2.02E-02	15.5	
12	0	568.02	7	25	2.86	1136.24	1126	12	1.00E-03	141.3	
13	0	570.37	13	14	2.21	1140.95	1137	10	1.81E-03	58.5	
14	0	583.66	26	17	0.60	1167.52	1164	12	3.55E-03	40.2	
15	0	713.62	8	16	3.45	1427.43	1421	12	1.06E-03	115.2	
16	0	724.22	7	8	1.45	1448.61	1444	7	9.72E-04	78.7	
17	0	773.91	4	7	0.61	1548.00	1544	7	5.56E-04	120.5	
18	0	836.70	11	14	0.64	1673.58	1667	11	1.57E-03	70.0	
19	0	911.90	17	15	0.92	1823.97	1820	10	2.36E-03	49.0	
20	0	918.49	7	4	1.13	1837.15	1833	7	9.03E-04	61.8	
21	0	942.30	9	4	0.57	1884.77	1880	8	1.30E-03	48.8	
22	0	1121.82	8	10	1.41	2243.81	2238	8	1.12E-03	76.5	
23	0	1255.37	11	0	1.06	2510.91	2507	8	1.53E-03	30.2	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	59	10.44*	2.248E+00	1.264E+02	2.387E+02	44.82
TL-208	277.37	-----	6.60	3.299E+00	-----	Line Not Found	-----
	583.19	20	85.00*	1.929E+00	6.076E+00	6.378E+00	110.35
	860.56	-----	12.50	1.390E+00	-----	Line Not Found	-----
PB-210	46.54	20	4.25*	3.520E-01	6.825E+02	6.853E+02	157.62
BI-211	72.87	-----	1.23	2.699E+00	-----	Line Not Found	-----
	351.06	20	12.92*	2.797E+00	2.781E+01	2.792E+01	96.18
RA-224	240.99	39	4.10*	3.623E+00	1.339E+02	1.406E+02	103.72

Flag: "*" = Keyline

Total number of lines in spectrum 20
Number of unidentified lines 6
Number of lines tentatively identified by NID 14 70.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.89	1.264E+02	2.387E+02	1.070E+02	44.82	
TL-208	1.91Y	1.05	6.076E+00	6.378E+00	7.038E+00	110.35	
PB-210	22.20Y	1.00	6.825E+02	6.853E+02	10.80E+02	157.62	
BI-211	21.77Y	1.00	2.781E+01	2.792E+01	2.686E+01	96.18	
RA-224	1.91Y	1.05	1.339E+02	1.406E+02	1.458E+02	103.72	

Total Activity : 9.766E+02 1.099E+03

Grand Total Activity : 9.766E+02 1.099E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
3	182.51	25	47	1.44	365.29	361	19	3.53E-03	****	4.27E+00	T
0	409.78	17	8	1.51	819.79	817	6	2.31E-03	74.6	2.51E+00	T
0	448.98	29	5	2.90	898.18	894	9	3.96E-03	46.1	2.35E+00	
0	452.97	8	9	0.54	906.16	902	6	1.14E-03	****	2.34E+00	T
0	568.02	2	25	2.86	1136.24	1126	12	2.95E-04	****	1.97E+00	
0	570.37	8	14	2.21	1140.95	1137	10	1.11E-03	****	1.96E+00	T
0	713.62	8	16	3.45	1427.43	1421	12	1.06E-03	****	1.64E+00	
0	724.22	7	8	1.45	1448.61	1444	7	9.72E-04	****	1.62E+00	T
0	773.91	4	7	0.61	1548.00	1544	7	5.56E-04	****	1.53E+00	T
0	836.70	11	14	0.64	1673.58	1667	11	1.57E-03	****	1.43E+00	T
0	911.90	6	15	0.92	1823.97	1820	10	9.01E-04	****	1.32E+00	T
0	918.49	7	4	1.13	1837.15	1833	7	9.03E-04	****	1.31E+00	
0	942.30	6	4	0.57	1884.77	1880	8	8.06E-04	****	1.28E+00	
0	1121.82	8	10	1.41	2243.81	2238	8	1.12E-03	****	1.09E+00	T
0	1255.37	11	0	1.06	2510.91	2507	8	1.53E-03	60.3	9.88E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287001.CNF;1  *
* Acquisition date   : 17-MAY-2022 07:56:16 Sensitivity      : 3.000          *
* Detector ID        : GAM14 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 02:00:00.73 Half life ratio : *****          *
* Sample date        : 29-MAR-2022 13:03:00 Nuclide Library : LIQUID         *
* Sample ID          : G579287001 Analyst initials: RXF2           *
* Batch Number       : 2264689 Sample Quantity : 7.4119E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 9-MAY-2022 05:17:58 Eff. Geometry    : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.481E+01
TL-208	2.321E+00
PB-210	4.726E+02
BI-211	1.397E+01
RA-224	5.420E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	3.765E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.192E+00	NOT IDENT.
K-40	4.661E+01	NOT IDENT.
SC-46	3.310E+00	FAIL ABUN
V-48	1.882E+01	NOT IDENT.
CR-51	8.014E+01	NOT IDENT.
MN-52	1.444E+03	NOT IDENT.
MN-54	3.218E+00	NOT IDENT.
CO-56	3.835E+00	NOT IDENT.
CO-57	2.023E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.894E+00	NOT IDENT.
FE-59	1.030E+01	NOT IDENT.
CO-60	2.857E+00	NOT IDENT.
ZN-65	7.053E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	9.721E+01	NOT IDENT.
AS-73	1.249E+02	NOT IDENT.
AS-74	2.871E+01	NOT IDENT.
SE-75	4.088E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	5.788E+01	NOT IDENT.
RB-83	5.300E+00	NOT IDENT.
RB-84	8.685E+00	NOT IDENT.
KR-85	7.125E+02	NOT IDENT.

SR-85	5.333E+00	NOT IDENT.
RB-86	2.057E+02	NOT IDENT.
Y-88	4.779E+00	NOT IDENT.
Y-91	2.275E+03	NOT IDENT.
NB-94	1.891E+00	NOT IDENT.
NB-95	4.340E+00	NOT IDENT.
NB-95M	1.290E+01	NOT IDENT.
TC-95M	4.750E+00	NOT IDENT.
ZR-95	8.504E+00	FAIL ABUN
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.184E+00	NOT IDENT.
RH-102M	2.065E+00	NOT IDENT.
RU-103	4.690E+00	NOT IDENT.
RH-106	2.306E+01	NOT IDENT.
RU-106	2.306E+01	NOT IDENT.
AG-108M	1.989E+00	FAIL ABUN
CD-109	5.274E+01	NOT IDENT.
AG-110	5.241E+01	NOT IDENT.
AG-110M	4.553E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	4.523E+00	NOT IDENT.
IN-114M	2.419E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	2.107E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.355E+00	NOT IDENT.
SB-124	5.507E+00	FAIL ABUN
SB-125	7.197E+00	NOT IDENT.
TE-125M	1.059E+03	NOT IDENT.
I-126	8.261E+01	NOT IDENT.
SB-126	6.906E+01	NOT IDENT.
SN-126	5.039E+00	NOT IDENT.
SB-127	0.000E+00	SHORT HLIF
TE-129	7.193E+01	NOT IDENT.
I-131	1.607E+02	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	3.328E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.301E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	4.356E+01	NOT IDENT.
BA-137M	2.900E+00	NOT IDENT.
CS-137	3.063E+00	NOT IDENT.
LA-138	4.754E+00	NOT IDENT.
CE-139	2.602E+00	NOT IDENT.
BA-140	1.550E+02	NOT IDENT.
LA-140	4.156E+01	NOT IDENT.
CE-141	1.007E+01	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.523E+01	NOT IDENT.
PM-144	3.172E+00	FAIL ABUN
PR-144	2.419E+02	NOT IDENT.
PM-146	3.615E+00	FAIL ABUN
ND-147	3.217E+02	NOT IDENT.
PM-147	5.174E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	6.852E+00	NOT IDENT.
GD-153	6.060E+00	NOT IDENT.
EU-154	1.055E+01	FAIL ABUN
EU-155	7.087E+00	NOT IDENT.
TB-160	1.160E+01	FAIL ABUN
HO-166M	4.616E+00	FAIL ABUN
TM-171	2.096E+03	NOT IDENT.
LU-176	2.119E+00	NOT IDENT.
LU-177	2.365E+03	NOT IDENT.
HF-181	5.711E+00	NOT IDENT.
W-181	2.313E+01	NOT IDENT.
TA-182	1.046E+01	FAIL ABUN
RE-183	2.659E+01	NOT IDENT.
RE-184	1.536E+01	NOT IDENT.
RE-188	1.527E+01	FAIL ABUN
W-188	7.141E+02	NOT IDENT.
OS-191	5.305E+01	NOT IDENT.
IR-192	3.658E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF

TL-201	0.000E+00	SHORT HLIF
TL-202	3.381E+01	NOT IDENT.
HG-203	4.609E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	3.648E+02	NOT IDENT.
BI-207	4.491E+00	FAIL ABUN
PB-211	5.043E+01	NOT IDENT.
BI-212	4.109E+01	NOT IDENT.
PB-212	5.897E+00	NOT IDENT.
BI-213	8.216E+00	NOT IDENT.
BI-214	6.593E+00	NOT IDENT.
PB-214	6.704E+00	FAIL ABUN
RN-219	2.292E+01	NOT IDENT.
FR-221	1.627E+01	NOT IDENT.
RA-223	5.672E+01	NOT IDENT.
AC-225	4.800E+02	NOT IDENT.
RA-226	6.597E+01	NOT IDENT.
AC-227	1.659E+01	NOT IDENT.
TH-227	1.659E+01	NOT IDENT.
AC-228	1.697E+01	FAIL ABUN
RA-228	1.697E+01	FAIL ABUN
TH-228	5.897E+00	NOT IDENT.
TH-229	3.786E+01	NOT IDENT.
TH-230	8.778E+02	NOT IDENT.
PA-231	3.023E+01	NOT IDENT.
TH-231	2.913E+01	NOT IDENT.
TH-232	1.728E+03	NOT IDENT.
PA-233	4.621E+00	NOT IDENT.
PA-234	1.720E+01	FAIL ABUN
PA-234M	3.789E+02	NOT IDENT.
TH-234	1.283E+02	NOT IDENT.
U-234	7.161E+03	NOT IDENT.
U-235	1.518E+01	NOT IDENT.
NP-237	4.621E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.283E+02	NOT IDENT.
NP-239	1.754E+01	NOT IDENT.
AM-241	1.333E+01	NOT IDENT.
AM-242	4.343E+01	NOT IDENT.
AM-243	4.064E+00	NOT IDENT.
CM-243	5.598E+00	NOT IDENT.
BK-247	5.815E+00	NOT IDENT.
CM-247	2.188E+00	NOT IDENT.
CF-249	3.353E+00	NOT IDENT.
CF-251	8.800E+00	NOT IDENT.
CF-252	1.283E+04	NOT IDENT.
ANH-511	6.344E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287001.CNF;1
* Acquisition date   : 17-MAY-2022 07:56:16 Sensitivity      : 3.000
* Detector ID        : GAM14 Energy tolerance: 1.500
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 02:00:00.73 Half life ratio  : *****
* Sample date        : 29-MAR-2022 13:03:00 Nuclide Library : LIQUID
* Sample ID          : G579287001 Analyst initials: RXF2
* Batch Number       : 2264689 Sample Quantity : 7.4119E-01 FILTER
* Wet wt corr        : 1.00000 Quantity Err(%) : 1.0000E+00 %
* Wet Weight         : 0.00000
* Dry Weight         : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 9-MAY-2022 05:17:58 Eff. Geometry    : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	2.387E+02	1.068E+02	1.069E+02
TL-208	6.378E+00	6.918E+00	6.919E+00
PB-210	6.853E+02	1.061E+03	1.061E+03
BI-211	2.792E+01	2.643E+01	2.643E+01
RA-224	1.406E+02	1.434E+02	1.434E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	2.443E+00	3.822E+00	3.977E+00	NOT IDENT.
NA-24	-5.194E+23	8.728E+23	0.000E+00	SHORT HLIF
AL-26	-6.835E-01	2.936E+00	2.952E+00	NOT IDENT.
K-40	1.012E+01	5.352E+01	5.371E+01	NOT IDENT.
SC-46	-2.418E+00	4.663E+00	4.789E+00	FAIL ABUN
V-48	-3.002E+01	3.120E+01	3.401E+01	NOT IDENT.
CR-51	3.839E+01	9.975E+01	1.012E+02	NOT IDENT.
MN-52	-1.630E+01	1.695E+03	1.695E+03	NOT IDENT.
MN-54	6.867E-01	3.739E+00	3.752E+00	NOT IDENT.
CO-56	-9.987E-01	4.870E+00	4.891E+00	NOT IDENT.
CO-57	9.525E-01	2.301E+00	2.341E+00	NOT IDENT.
NI-57	-1.435E+10	2.705E+10	2.781E+10	SHORT HLIF
CO-58	1.500E+00	4.316E+00	4.369E+00	NOT IDENT.
FE-59	-4.511E-01	1.283E+01	1.283E+01	NOT IDENT.
CO-60	-7.567E-01	3.540E+00	3.556E+00	NOT IDENT.
ZN-65	1.563E+00	8.678E+00	8.707E+00	NOT IDENT.
CU-67	-4.588E+06	2.752E+06	3.444E+06	SHORT HLIF
GE-68	5.126E-01	1.189E+02	1.189E+02	NOT IDENT.
AS-73	5.022E+00	1.437E+02	1.437E+02	NOT IDENT.
AS-74	1.246E+01	3.173E+01	3.222E+01	NOT IDENT.
SE-75	6.075E-01	4.980E+00	4.988E+00	NOT IDENT.
BR-77	-7.475E+06	2.047E+07	2.075E+07	SHORT HLIF
SR-82	-2.967E+01	8.677E+01	8.780E+01	NOT IDENT.
RB-83	-5.067E+00	7.283E+00	7.634E+00	NOT IDENT.
RB-84	-2.132E+00	1.114E+01	1.118E+01	NOT IDENT.

KR-85	-3.436E+03	1.204E+03	1.963E+03	NOT IDENT.
SR-85	-2.572E+01	9.012E+00	1.469E+01	NOT IDENT.
RB-86	2.265E+01	2.457E+02	2.459E+02	NOT IDENT.
Y-88	7.977E-01	5.456E+00	5.468E+00	NOT IDENT.
Y-91	7.274E+02	2.467E+03	2.488E+03	NOT IDENT.
NB-94	-1.510E+00	2.620E+00	2.707E+00	NOT IDENT.
NB-95	-2.358E+00	5.683E+00	5.781E+00	NOT IDENT.
NB-95M	6.829E+00	1.613E+01	1.643E+01	NOT IDENT.
TC-95M	-4.962E+00	6.857E+00	7.213E+00	NOT IDENT.
ZR-95	6.947E+00	8.744E+00	9.289E+00	FAIL ABUN
MO-99	1.787E+05	5.252E+06	5.253E+06	SHORT HLIF
TC-99M	-1.000E+41	6.222E+41	0.000E+00	SHORT HLIF
RH-101	-7.193E-01	2.694E+00	2.714E+00	NOT IDENT.
RH-102M	-2.287E+00	3.168E+00	3.332E+00	NOT IDENT.
RU-103	-5.887E+00	6.517E+00	7.038E+00	NOT IDENT.
RH-106	-1.187E+01	2.962E+01	3.010E+01	NOT IDENT.
RU-106	-1.187E+01	2.962E+01	3.010E+01	NOT IDENT.
AG-108M	-1.733E+00	2.578E+00	2.694E+00	FAIL ABUN
CD-109	-2.267E+01	6.451E+01	6.532E+01	NOT IDENT.
AG-110	-1.021E+01	7.494E+01	7.508E+01	NOT IDENT.
AG-110M	1.480E+00	5.186E+00	5.229E+00	NOT IDENT.
IN-111	4.488E+05	4.430E+05	4.871E+05	SHORT HLIF
SN-113	1.118E+00	5.045E+00	5.070E+00	NOT IDENT.
IN-114M	5.069E+00	3.122E+01	3.130E+01	NOT IDENT.
CD-115	1.615E+06	3.206E+07	3.207E+07	SHORT HLIF
SN-117M	-1.570E+01	2.730E+01	2.820E+01	NOT IDENT.
SB-122	1.467E+05	1.020E+06	1.022E+06	SHORT HLIF
I-123	-7.883E+26	1.140E+27	0.000E+00	SHORT HLIF
TE-123M	-2.157E+00	3.103E+00	3.252E+00	NOT IDENT.
SB-124	2.367E+00	4.644E+00	4.766E+00	FAIL ABUN
SB-125	3.817E+00	7.729E+00	7.919E+00	NOT IDENT.
TE-125M	-3.588E+02	1.295E+03	1.305E+03	NOT IDENT.
I-126	-1.361E+01	1.101E+02	1.103E+02	NOT IDENT.
SB-126	-5.120E+01	1.059E+02	1.084E+02	NOT IDENT.
SN-126	2.159E+00	5.679E+00	5.762E+00	NOT IDENT.
SB-127	-1.014E+04	4.675E+04	4.697E+04	SHORT HLIF
TE-129	-8.861E+00	8.473E+01	8.483E+01	NOT IDENT.
I-131	-3.909E+01	1.888E+02	1.897E+02	NOT IDENT.
I-132	-1.000E+41	4.219E+41	0.000E+00	SHORT HLIF
TE-132	2.981E+04	9.872E+04	9.964E+04	SHORT HLIF
BA-133	1.334E+00	3.976E+00	4.022E+00	NOT IDENT.
I-133	-1.691E+17	2.488E+17	0.000E+00	SHORT HLIF
CS-134	1.824E+00	3.572E+00	3.666E+00	FAIL ABUN
I-135	1.000E+41	8.070E+41	0.000E+00	SHORT HLIF
CS-136	3.312E+01	4.310E+01	4.562E+01	NOT IDENT.
BA-137M	7.710E-01	3.395E+00	3.412E+00	NOT IDENT.
CS-137	8.145E-01	3.586E+00	3.605E+00	NOT IDENT.
LA-138	-1.312E-01	5.607E+00	5.607E+00	NOT IDENT.
CE-139	5.628E-01	3.081E+00	3.091E+00	NOT IDENT.
BA-140	1.630E+02	1.573E+02	1.736E+02	NOT IDENT.
LA-140	-1.896E+01	5.536E+01	5.601E+01	NOT IDENT.
CE-141	-6.456E+00	1.334E+01	1.365E+01	NOT IDENT.
CE-143	1.023E+11	2.592E+11	2.632E+11	SHORT HLIF
CE-144	-2.475E+00	1.850E+01	1.853E+01	NOT IDENT.
PM-144	-1.110E+00	3.961E+00	3.993E+00	FAIL ABUN
PR-144	-8.351E+01	3.019E+02	3.042E+02	NOT IDENT.
PM-146	2.791E+00	3.679E+00	3.889E+00	FAIL ABUN
ND-147	-5.504E+01	3.864E+02	3.872E+02	NOT IDENT.
PM-147	-5.072E+03	6.223E+04	6.227E+04	NOT IDENT.
PM-149	1.171E+07	3.100E+08	3.100E+08	SHORT HLIF
EU-152	1.984E+00	8.269E+00	8.317E+00	NOT IDENT.
GD-153	-1.862E+00	7.373E+00	7.421E+00	NOT IDENT.
EU-154	6.979E+00	1.069E+01	1.115E+01	FAIL ABUN
EU-155	3.374E+00	7.976E+00	8.120E+00	NOT IDENT.
TB-160	2.103E+00	1.344E+01	1.347E+01	FAIL ABUN
HO-166M	1.175E+00	5.265E+00	5.292E+00	FAIL ABUN
TM-171	-2.963E+02	2.450E+03	2.453E+03	NOT IDENT.
LU-176	1.752E+00	2.373E+00	2.502E+00	NOT IDENT.
LU-177	-3.046E+03	3.320E+03	3.593E+03	NOT IDENT.
HF-181	3.137E-01	7.309E+00	7.311E+00	NOT IDENT.
W-181	7.917E+00	2.596E+01	2.620E+01	NOT IDENT.
TA-182	-7.344E+00	1.446E+01	1.483E+01	FAIL ABUN
RE-183	-9.625E+00	3.496E+01	3.523E+01	NOT IDENT.
RE-184	0.000E+00	1.864E+01	0.000E+00	NOT IDENT.
RE-188	-3.407E+00	1.882E+01	1.889E+01	FAIL ABUN
W-188	-8.970E+02	1.035E+03	1.111E+03	NOT IDENT.
OS-191	1.144E+01	6.209E+01	6.230E+01	NOT IDENT.
IR-192	-5.162E-01	4.673E+00	4.679E+00	NOT IDENT.

PB-201	2.430E+37	2.347E+38	0.000E+00	SHORT HLIF
TL-201	-8.930E+05	1.233E+06	1.298E+06	SHORT HLIF
TL-202	-5.360E+00	3.989E+01	3.996E+01	NOT IDENT.
HG-203	1.257E+00	5.539E+00	5.568E+00	NOT IDENT.
PB-203	3.820E+06	1.683E+07	1.692E+07	SHORT HLIF
TL-204	-1.162E+02	4.377E+02	4.409E+02	NOT IDENT.
BI-207	-1.110E+00	5.778E+00	5.800E+00	FAIL ABUN
PB-211	1.085E+01	5.631E+01	5.653E+01	NOT IDENT.
BI-212	-3.181E+01	6.069E+01	6.236E+01	NOT IDENT.
PB-212	-2.277E+00	7.468E+00	7.538E+00	NOT IDENT.
BI-213	1.560E+00	9.262E+00	9.289E+00	NOT IDENT.
BI-214	8.092E-01	8.270E+00	8.278E+00	NOT IDENT.
PB-214	1.009E+01	9.549E+00	1.058E+01	FAIL ABUN
RN-219	-2.768E+01	3.140E+01	3.379E+01	NOT IDENT.
FR-221	8.927E+00	1.883E+01	1.926E+01	NOT IDENT.
RA-223	6.474E+01	6.172E+01	6.828E+01	NOT IDENT.
AC-225	2.634E+02	5.559E+02	5.685E+02	NOT IDENT.
RA-226	-5.400E+01	7.906E+01	8.272E+01	NOT IDENT.
AC-227	-9.795E+00	2.216E+01	2.260E+01	NOT IDENT.
TH-227	-9.795E+00	2.216E+01	2.260E+01	NOT IDENT.
AC-228	9.807E+00	2.646E+01	2.683E+01	FAIL ABUN
RA-228	9.807E+00	2.646E+01	2.683E+01	FAIL ABUN
TH-228	-2.277E+00	7.468E+00	7.538E+00	NOT IDENT.
TH-229	1.360E+01	4.440E+01	4.482E+01	NOT IDENT.
TH-230	-1.270E+03	1.211E+03	1.340E+03	NOT IDENT.
PA-231	-1.381E+01	4.040E+01	4.088E+01	NOT IDENT.
TH-231	-2.488E+01	3.980E+01	4.136E+01	NOT IDENT.
TH-232	-1.947E+03	2.228E+03	2.395E+03	NOT IDENT.
PA-233	7.482E-01	5.660E+00	5.670E+00	NOT IDENT.
PA-234	2.995E-01	2.340E+01	2.340E+01	FAIL ABUN
PA-234M	1.071E+02	4.437E+02	4.464E+02	NOT IDENT.
TH-234	-7.207E+01	1.587E+02	1.620E+02	NOT IDENT.
U-234	9.803E+02	8.165E+03	8.176E+03	NOT IDENT.
U-235	-1.660E+01	2.085E+01	2.216E+01	NOT IDENT.
NP-237	7.482E-01	5.660E+00	5.670E+00	NOT IDENT.
NP-238	-7.089E+07	1.096E+08	1.142E+08	SHORT HLIF
U-238	-7.207E+01	1.587E+02	1.620E+02	NOT IDENT.
NP-239	-9.325E+00	2.199E+01	2.239E+01	NOT IDENT.
AM-241	-1.299E+01	1.852E+01	1.943E+01	NOT IDENT.
AM-242	-7.948E+00	5.223E+01	5.235E+01	NOT IDENT.
AM-243	1.625E-01	4.730E+00	4.731E+00	NOT IDENT.
CM-243	-1.158E+01	8.301E+00	9.807E+00	NOT IDENT.
BK-247	-7.468E-01	7.331E+00	7.338E+00	NOT IDENT.
CM-247	-1.787E+00	2.839E+00	2.951E+00	NOT IDENT.
CF-249	1.561E+00	3.648E+00	3.715E+00	NOT IDENT.
CF-251	-1.151E+01	1.217E+01	1.323E+01	NOT IDENT.
CF-252	-1.849E+03	1.545E+04	1.547E+04	NOT IDENT.
ANH-511	-1.409E+01	6.989E+00	9.449E+00	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	27.3639	133.52	27.9369	116.30	0.0000
879.38	37.8461	364.49	33.5289	116.74	37.6649
46.54	37.9446	80.22	0.0000	117.23	27.7736
228.16	0.0000	711.68	28.8934	119.76	40.8226
52.39	34.9399	356.01	28.9173	120.54	39.8727
53.20	34.2278	323.87	28.9213	120.90	34.9073
53.44	36.0048	82.35	0.0000	264.66	33.9209
57.53	34.4904	82.47	27.1280	121.22	33.9261
293.27	0.0000	82.47	0.0000	344.28	30.9579
57.53	28.3855	83.79	38.4494	122.06	30.9707
482.18	28.3856	265.00	38.4644	1274.44	38.0200
57.98	34.6322	84.21	31.9100	123.68	37.0525
59.32	40.0876	84.86	0.0000	1377.63	0.0000
59.54	39.2170	193.51	36.6860	127.23	38.2483
155.04	51.9304	105.31	35.8195	129.43	36.3488
63.00	41.3284	86.79	34.8924	131.20	42.5121
129.43	38.6586	86.94	34.9020	133.02	39.5755
63.29	38.6586	87.09	33.0245	133.52	38.5874
290.67	37.7842	87.57	30.2205	135.34	0.0000
63.81	45.0046	88.03	40.6429	136.00	33.6239
87.57	52.2603	306.78	40.6658	136.28	32.6172
64.99	60.4652	88.47	40.6753	136.47	32.6260
65.08	53.2563	531.02	98.8465	739.50	0.0000
66.73	30.8019	184.58	0.0000	140.51	0.0000
66.98	30.8187	92.59	43.8353	140.88	39.9992
67.24	40.8125	93.31	0.0000	143.76	42.2099
67.67	49.9285	94.56	81.2802	144.24	38.1162
1221.41	48.1210	311.90	77.4676	145.44	38.1754
439.51	38.2275	946.00	77.4701	152.32	27.0632
70.82	38.2275	97.43	34.5951	152.43	27.0672
167.43	0.0000	98.43	32.7287	1048.07	39.6003
97.43	36.4679	98.44	32.7292	154.21	35.4744
70.82	0.0000	99.53	35.6826	155.04	35.5113
70.82	40.2120	103.37	35.6826	158.56	33.4629
279.20	0.0000	116.74	35.6826	158.97	0.0000
1063.66	38.5438	100.11	42.4746	159.00	45.1311
72.87	0.0000	100.20	37.6536	162.33	44.2597
351.06	38.5486	102.03	26.1474	537.26	42.1686
74.66	43.2962	103.18	40.7509	163.33	29.5419
238.63	40.5457	103.37	40.7634	165.86	34.9225
351.93	40.5457	105.31	25.3145	167.43	0.0000
238.63	40.5457	106.12	38.0214	245.35	0.0000
74.97	40.5580	106.47	39.9937	427.87	34.2778
77.11	38.8812	109.28	43.1124	176.60	47.1475
256.23	31.6353	111.00	39.2993	177.52	48.2691
79.82	0.0000	111.76	0.0000	181.07	0.0000
80.02	31.6558	208.37	40.4038	184.41	35.6708
80.03	31.6561	116.24	40.6077	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	35.7221	300.09	21.6359	477.60	13.4854
186.21	35.7413	300.13	21.6365	477.99	13.4882
190.27	42.0639	301.36	22.8605	482.18	14.8712
193.51	29.4744	302.85	15.6593	487.02	15.3620
197.03	31.7758	304.50	20.5034	492.35	0.0000
198.01	36.1955	304.85	22.9220	497.08	20.8962
201.83	29.7327	306.78	16.9151	511.00	40.2693
204.12	44.1522	308.46	24.1949	514.00	91.6667
205.31	27.6287	311.90	19.4067	520.40	14.7148
208.37	41.0181	316.51	25.5598	520.69	0.0000
210.85	24.4499	319.41	19.5161	667.71	0.0000
215.65	33.5005	320.08	23.1870	527.90	0.0000
218.12	29.1040	321.04	31.7518	529.59	13.8599
222.11	33.7120	323.87	17.1330	529.87	0.0000
227.09	27.0989	325.23	30.6252	531.02	12.9456
227.38	29.3651	1596.21	30.7037	537.26	10.2033
228.16	0.0000	331.15	0.0000	1260.41	0.0000
228.18	30.5175	333.37	24.6448	552.55	13.0851
235.69	27.3182	334.37	25.8956	795.86	5.6372
235.96	34.9151	338.28	32.1509	564.24	0.0000
238.63	42.2297	911.20	32.1517	569.33	0.0000
238.98	0.0000	340.48	24.7705	569.50	0.0000
240.99	42.3211	340.55	24.7717	569.70	18.3781
242.00	42.3595	344.28	16.1437	582.08	19.9080
244.70	32.1345	345.93	18.6488	583.19	9.4853
245.35	0.0000	351.06	18.2998	595.83	12.4038
459.60	34.6124	351.93	21.2241	600.60	20.0806
685.70	0.0000	356.01	18.7798	604.72	18.2029
388.16	38.1467	361.25	0.0000	609.32	14.4006
256.23	27.8267	364.49	22.6653	610.33	18.2493
527.90	0.0000	366.42	0.0000	614.28	14.4330
264.66	25.6933	383.85	16.1549	618.01	16.3850
265.00	26.8689	388.16	18.7577	621.93	14.4830
269.46	26.9707	666.33	21.3221	630.19	0.0000
401.81	32.8826	391.70	20.5093	631.29	11.6348
273.65	23.5352	400.66	16.3285	632.98	11.6436
276.40	24.7683	401.32	0.0000	633.25	8.7338
583.19	21.2465	401.81	19.7806	634.78	8.7396
277.60	16.5284	402.40	18.0670	635.95	14.5734
402.40	20.0765	404.85	14.6481	636.99	16.5241
278.43	24.8093	410.95	12.9736	657.50	8.8260
279.20	0.0000	720.70	20.8057	884.68	13.7311
279.54	24.8318	423.72	18.3045	661.66	5.8945
280.46	21.3003	427.09	17.4683	664.57	0.0000
301.36	22.5428	427.87	13.1073	666.33	7.8750
284.31	20.1802	433.94	21.0474	666.50	7.8757
285.41	21.3860	439.51	17.5968	667.71	0.0000
285.90	0.0000	440.45	16.7263	677.62	10.8800
287.50	21.4222	453.88	21.2920	685.70	0.0000
290.67	36.9875	459.60	16.9111	692.65	0.0000
293.27	0.0000	463.37	16.9470	695.00	13.9476
295.22	20.3566	468.07	18.7805	696.49	19.9373
316.51	25.1605	473.00	0.0000	696.51	19.9373
298.58	16.8083	475.06	22.8930	697.00	19.9414
299.98	21.6343	696.49	13.4793	697.49	17.9509

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	11.9922	903.28	6.4551	1291.59	0.9020
706.68	9.0088	907.67	0.0000	1298.22	0.0000
711.68	10.0301	911.20	6.4719	1312.11	9.0662
720.70	16.6094	984.45	0.0000	1332.49	6.3779
721.93	0.0000	926.36	3.2522	1365.19	2.7550
1690.97	10.5786	935.54	6.5239	1368.63	0.0000
722.91	10.5790	937.49	4.8961	1377.63	0.0000
723.31	11.0846	983.53	6.5420	1384.29	8.3029
756.73	12.0967	945.96	0.0000	1408.01	7.4214
727.33	13.6258	946.00	4.9094	1434.09	6.5326
733.00	11.1271	949.00	6.5522	1435.80	5.6016
735.93	11.1401	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	9.8701	1460.82	4.6945
1434.09	13.2084	964.08	5.4865	1489.16	5.6693
747.24	13.2238	966.17	8.7842	1596.21	5.8015
752.31	9.1729	968.97	7.6930	1620.50	4.8593
753.82	11.2180	983.53	14.3521	1678.03	0.0000
756.73	6.1257	984.45	0.0000	1690.97	0.0000
763.94	13.3089	996.26	2.2167	1757.55	0.0000
765.80	15.3674	1001.03	2.2200	1764.49	5.0006
1001.03	14.3464	1004.73	8.8900	1770.23	3.0037
766.84	11.2739	1025.87	0.0000	1771.35	3.0044
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	12.3438	1037.84	4.4896	1808.65	3.0258
777.92	0.0000	1038.76	0.0000	1836.06	4.0552
778.90	12.3550	1046.59	5.6266		
783.70	0.0000	1048.07	2.2516		
1435.80	10.3337	1050.41	9.0130		
903.28	11.3809	1063.66	12.4412		
795.86	7.2526	1077.00	4.5417		
801.95	8.3073	1077.34	4.5420		
802.10	8.3076	1083.85	2.2754		
810.29	4.1663	1085.87	6.8301		
810.45	4.1665	1099.25	6.8560		
810.76	6.2505	1111.64	8.0271		
815.77	7.3056	1112.07	9.1745		
818.51	6.2681	1112.84	11.4705		
832.01	6.2986	1115.54	6.8877		
834.85	10.5082	1120.29	10.3455		
835.15	10.5090	1120.55	9.1966		
836.80	0.0000	1121.30	8.6237		
846.77	10.5526	1808.65	8.0675		
856.80	7.4127	1131.51	0.0000		
860.56	8.4827	1332.49	4.6654		
871.09	9.5775	1177.95	1.7517		
873.19	11.7144	1189.05	7.0278		
875.33	0.0000	1204.77	6.1750		
879.38	5.3361	1221.41	6.2023		
880.51	8.5410	1231.02	5.3295		
881.60	7.4762	1235.36	8.0030		
883.24	7.4802	1238.28	4.4495		
884.68	8.5531	1260.41	0.0000		
889.28	10.7080	1271.87	11.6686		
894.76	11.8003	1274.44	4.4907		
1836.06	7.5178	1274.54	4.4910		

VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 09:57:27.34

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287002.CNF;1
Background file     : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM24.CNF;629
Background date      : 15-MAY-2022 09:13:07
Sample date         : 29-MAR-2022 13:11:00 Acquisition date : 17-MAY-2022 07:56:54
Sample ID          : G579287002 Sample quantity : 7.69920E-01 FILTER
Detector name       : GAM24 Detector geometry: JAR
Elapsed live time   : 0 02:00:00.00 Elapsed real time: 0 02:00:08.55 0.1%
Energy tolerance    : 1.50000 keV Analyst Initials : RXF2
Abundance limit     : 75.00000 Sensitivity : 3.00000
Batch ID            : 2264689 Detector SN# :
Matrix Spike ID     : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	62.75*	8	124	1.39	125.68	120	12	1.16E-03	306.6	
2	0	66.62	18	57	0.99	133.42	131	6	2.51E-03	70.6	
3	0	92.91*	37	139	1.25	186.03	180	13	5.14E-03	75.8	
4	0	129.59	25	154	3.30	259.45	245	16	3.43E-03	115.8	
5	0	133.76	51	77	2.27	267.78	261	11	7.06E-03	36.2	
6	0	239.56*	27	90	2.58	479.53	470	15	3.80E-03	83.0	
7	0	259.20	15	100	0.86	518.84	513	14	2.10E-03	141.8	
8	0	279.88	15	53	2.09	560.22	552	10	2.06E-03	96.8	
9	0	295.25*	24	37	1.97	590.99	587	9	3.33E-03	55.4	
10	0	365.48	18	67	5.41	731.56	720	15	2.53E-03	100.8	
11	0	434.30	81	84	13.86	869.31	850	34	1.12E-02	36.9	
12	0	449.48	8	44	0.50	899.69	893	13	1.15E-03	166.8	
13	0	477.31	48	39	1.62	955.38	950	11	6.72E-03	28.7	
14	0	547.72	19	19	3.00	1096.31	1090	11	2.60E-03	50.9	
15	0	610.62*	39	22	4.29	1222.22	1214	16	5.47E-03	34.9	
16	0	664.38	12	19	1.30	1329.82	1325	9	1.62E-03	75.1	
17	0	768.60	9	20	1.62	1538.44	1532	10	1.25E-03	98.8	
18	0	803.11*	22	8	4.18	1607.53	1599	18	3.10E-03	43.4	
19	0	975.73	8	6	1.26	1953.08	1943	12	1.07E-03	73.3	
20	0	1001.43	21	7	2.11	2004.54	1997	14	2.98E-03	33.8	
21	0	1047.97	19	4	4.10	2097.69	2090	14	2.57E-03	31.6	
22	0	1231.51	7	2	0.69	2465.14	2459	11	9.18E-04	61.6	
23	0	1460.83*	9	3	1.02	2924.26	2916	14	1.25E-03	78.0	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 09:57:28

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287002.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 29-MAR-2022 13:11:00	Acquisition date	: 17-MAY-2022 07:56:54
Sample ID	: G579287002	Sample quantity	: 0.76992 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA24	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:08.55 0.1%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	48	10.44*	2.612E+00	8.649E+01	1.634E+02	57.42
K-40	1460.82	9	10.66*	1.058E+00	3.900E+01	3.900E+01	156.02
I-131	80.19	-----	2.62	4.975E+00	-----	Line Not Found	-----
	284.31	-----	6.12	3.674E+00	-----	Line Not Found	-----
	364.49	18	81.50*	3.129E+00	3.487E+00	2.359E+02	201.61
	636.99	-----	7.16	2.110E+00	-----	Line Not Found	-----
CE-144	80.12	-----	1.36	4.971E+00	-----	Line Not Found	-----
	133.52	51	11.09*	5.443E+00	4.109E+01	4.627E+01	72.47
HG-203	70.83	-----	3.69	4.341E+00	-----	Line Not Found	-----
	72.87	-----	6.19	4.504E+00	-----	Line Not Found	-----
RA-224	279.20	15	81.56*	3.710E+00	2.386E+00	4.934E+00	193.60
	240.99	27	4.10*	4.081E+00	7.970E+01	8.367E+01	166.01
TH-230	67.67	18	0.38*	3.959E+00	5.855E+02	5.855E+02	141.23
TH-232	63.81	8	0.26*	3.552E+00	4.418E+02	4.418E+02	613.24
	140.88	-----	0.02	5.353E+00	-----	Line Not Found	-----
TH-234	63.29	8	3.70*	3.552E+00	3.105E+01	3.105E+01	613.24
	92.59	37	4.23	5.442E+00	7.840E+01	7.840E+01	151.59
U-238	63.29	8	3.70*	3.552E+00	3.105E+01	3.105E+01	613.24
	92.59	37	4.23	5.442E+00	7.840E+01	7.840E+01	151.59

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                          *
*****
*                                     DETECTOR AND SAMPLE DATA                      *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287002.CNF;1      *
* Acquisition date   : 17-MAY-2022 07:56:54 Sensitivity      : 3.000                *
* Detector ID        : GAM24 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:08.55 Half life ratio : *****      *
* Sample date        : 29-MAR-2022 13:11:00 Analyst initials: RXF2        *
* Sample ID          : G579287002 Sample Quantity : 7.6992E-01 FILTER *
* Batch Number       : 2264689 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000           *
* Nuclide Library    : LIQUID.NLB;26                                           *
*****
*                                     CALIBRATION INFORMATION                      *
*
* Eff. Cal. date    : 6-JUL-2021 06:54:13 Eff. Geometry   : JAR           *
* Eff. File         : DKA100:[CANBERRA.GAMMA]EFF_GAM24_JAR.CNF;16          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.634E+02	9.192E+01	9.806E+01
K-40	3.900E+01	5.963E+01	5.590E+01
I-131	2.359E+02	4.662E+02	3.764E+02
CE-144	4.627E+01	3.286E+01	3.686E+01
HG-203	4.934E+00	9.361E+00	9.810E+00
RA-224	8.367E+01	1.361E+02	1.114E+02
TH-230	5.855E+02	8.104E+02	1.030E+03
TH-232	4.418E+02	2.655E+03	2.072E+03
TH-234	3.105E+01	1.866E+02	1.478E+02
U-238	3.105E+01	1.866E+02	1.478E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-1.358E+00	3.598E+00	6.798E+00	NOT IDENT.
NA-24	0.000E+00	1.285E+24	0.000E+00	SHORT HLIF
AL-26	9.283E-01	3.914E+00	8.342E+00	NOT IDENT.
SC-46	5.362E-01	4.621E+00	9.077E+00	NOT IDENT.
V-48	-4.124E+00	3.164E+01	5.837E+01	NOT IDENT.
CR-51	-1.499E+01	9.081E+01	1.597E+02	NOT IDENT.
MN-52	6.535E+02	1.357E+03	3.099E+03	NOT IDENT.
MN-54	2.556E+00	3.724E+00	7.763E+00	NOT IDENT.
CO-56	-2.152E+00	5.836E+00	1.038E+01	NOT IDENT.
CO-57	-4.126E-01	2.848E+00	4.644E+00	NOT IDENT.
NI-57	0.000E+00	4.273E+10	0.000E+00	SHORT HLIF
CO-58	3.179E+00	4.841E+00	9.836E+00	NOT IDENT.
FE-59	4.630E+00	1.629E+01	3.170E+01	NOT IDENT.
CO-60	-1.946E+00	2.960E+00	5.250E+00	NOT IDENT.
ZN-65	-2.508E+00	9.698E+00	1.732E+01	NOT IDENT.
CU-67	0.000E+00	3.009E+06	0.000E+00	SHORT HLIF
GE-68	-8.392E+01	1.367E+02	2.291E+02	NOT IDENT.
AS-73	1.714E+01	7.079E+01	1.137E+02	NOT IDENT.
AS-74	3.792E+00	3.359E+01	6.486E+01	NOT IDENT.
SE-75	2.000E+00	6.011E+00	1.010E+01	FAIL ABUN

BR-77	0.000E+00	3.516E+07	0.000E+00	SHORT HLIF
SR-82	1.605E+01	8.753E+01	1.691E+02	NOT IDENT.
RB-83	1.893E+00	9.182E+00	1.794E+01	NOT IDENT.
RB-84	1.249E+01	1.439E+01	3.053E+01	NOT IDENT.
KR-85	-2.337E+03	1.174E+03	1.847E+03	NOT IDENT.
SR-85	-1.749E+01	8.788E+00	1.382E+01	NOT IDENT.
RB-86	-1.460E+02	2.697E+02	4.597E+02	NOT IDENT.
Y-88	-1.589E+00	5.107E+00	9.681E+00	NOT IDENT.
Y-91	1.213E+03	2.385E+03	5.222E+03	NOT IDENT.
NB-94	3.284E+00	3.260E+00	6.923E+00	NOT IDENT.
NB-95	4.246E+00	6.115E+00	1.156E+01	NOT IDENT.
NB-95M	-6.980E+00	1.756E+01	2.695E+01	NOT IDENT.
TC-95M	1.138E+00	6.168E+00	1.136E+01	NOT IDENT.
ZR-95	2.481E+00	1.038E+01	2.029E+01	NOT IDENT.
MO-99	0.000E+00	5.490E+06	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
RH-101	1.350E-01	3.177E+00	5.282E+00	NOT IDENT.
RH-102M	1.363E+00	3.343E+00	5.971E+00	FAIL ABUN
RU-103	-2.891E+00	7.192E+00	1.313E+01	FAIL ABUN
RH-106	-1.131E+01	3.169E+01	5.778E+01	NOT IDENT.
RU-106	-1.131E+01	3.169E+01	5.778E+01	NOT IDENT.
AG-108M	0.000E+00	1.128E+01	5.066E+00	FAIL ABUN
CD-109	1.073E+01	6.212E+01	1.063E+02	NOT IDENT.
AG-110	-3.015E+01	7.508E+01	1.356E+02	NOT IDENT.
AG-110M	1.852E-01	5.654E+00	1.073E+01	NOT IDENT.
IN-111	0.000E+00	4.438E+05	0.000E+00	SHORT HLIF
SN-113	-1.841E+00	5.782E+00	9.918E+00	NOT IDENT.
IN-114M	1.142E+01	2.798E+01	5.250E+01	NOT IDENT.
CD-115	0.000E+00	3.671E+07	0.000E+00	SHORT HLIF
SN-117M	-6.279E+00	3.350E+01	5.401E+01	NOT IDENT.
SB-122	0.000E+00	8.719E+05	0.000E+00	SHORT HLIF
I-123	0.000E+00	1.370E+27	0.000E+00	SHORT HLIF
TE-123M	8.789E-01	3.758E+00	6.263E+00	NOT IDENT.
SB-124	6.489E+00	1.007E+01	2.547E+01	NOT IDENT.
SB-125	5.582E+00	9.608E+00	1.836E+01	NOT IDENT.
TE-125M	9.578E+01	1.261E+03	2.346E+03	NOT IDENT.
I-126	1.545E+01	1.309E+02	2.267E+02	NOT IDENT.
SB-126	-1.554E+01	7.780E+01	1.461E+02	NOT IDENT.
SN-126	-3.536E+00	6.305E+00	9.991E+00	NOT IDENT.
SB-127	0.000E+00	4.908E+04	0.000E+00	SHORT HLIF
TE-129	-6.039E+00	1.038E+02	1.959E+02	FAIL ABUN
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	1.038E+05	0.000E+00	SHORT HLIF
BA-133	-1.986E+00	4.261E+00	7.220E+00	NOT IDENT.
I-133	0.000E+00	2.761E+17	0.000E+00	SHORT HLIF
CS-134	1.212E-01	4.344E+00	7.327E+00	FAIL ABUN
I-135	0.000E+00	1.380E+41	0.000E+00	SHORT HLIF
CS-136	1.061E+02	6.578E+01	1.277E+02	FAIL ABUN
BA-137M	1.320E+00	3.463E+00	6.299E+00	NOT IDENT.
CS-137	1.394E+00	3.658E+00	6.655E+00	NOT IDENT.
LA-138	-4.768E-01	5.164E+00	1.043E+01	NOT IDENT.
CE-139	1.340E+00	3.378E+00	6.344E+00	NOT IDENT.
BA-140	-8.811E+01	1.529E+02	2.728E+02	NOT IDENT.
LA-140	5.947E+00	3.718E+01	8.591E+01	NOT IDENT.
CE-141	-9.930E+00	1.221E+01	2.092E+01	NOT IDENT.
CE-143	0.000E+00	3.045E+11	0.000E+00	SHORT HLIF
PM-144	3.017E+00	3.474E+00	7.312E+00	FAIL ABUN
PR-144	2.315E+02	2.649E+02	5.577E+02	NOT IDENT.
PM-146	-2.383E+00	4.928E+00	7.716E+00	NOT IDENT.
ND-147	-9.746E+01	4.540E+02	8.478E+02	NOT IDENT.
PM-147	-1.939E+04	7.824E+04	1.263E+05	NOT IDENT.
PM-149	0.000E+00	3.308E+08	0.000E+00	SHORT HLIF
EU-152	-4.162E+00	9.979E+00	1.703E+01	NOT IDENT.
GD-153	6.623E-01	8.084E+00	1.367E+01	NOT IDENT.
EU-154	-5.233E+00	1.018E+01	1.865E+01	NOT IDENT.
EU-155	6.941E+00	9.036E+00	1.767E+01	NOT IDENT.
TB-160	-9.054E+00	1.955E+01	3.423E+01	NOT IDENT.
HO-166M	3.129E+00	6.182E+00	1.240E+01	FAIL ABUN
TM-171	-1.973E+03	1.242E+03	1.621E+03	FAIL ABUN
LU-176	-1.505E+00	2.835E+00	4.797E+00	NOT IDENT.
LU-177	-1.997E+03	3.688E+03	6.357E+03	NOT IDENT.
HF-181	-3.244E+00	8.504E+00	1.350E+01	FAIL ABUN
W-181	6.865E+00	1.515E+01	2.539E+01	FAIL ABUN
TA-182	4.319E+00	1.879E+01	3.896E+01	FAIL ABUN
RE-183	9.878E+00	1.720E+01	2.919E+01	FAIL ABUN
RE-184	-3.139E-01	2.174E+01	4.164E+01	NOT IDENT.
RE-188	2.081E+01	2.129E+01	4.175E+01	FAIL ABUN
W-188	1.059E+03	9.856E+02	1.843E+03	FAIL ABUN

OS-191	7.455E+01	1.692E+02	1.119E+02	FAIL ABUN
IR-192	3.795E-03	4.985E+00	8.936E+00	FAIL ABUN
PB-201	0.000E+00	2.205E+38	0.000E+00	SHORT HLIF
TL-201	0.000E+00	1.463E+06	0.000E+00	SHORT HLIF
TL-202	4.243E+01	5.006E+01	9.764E+01	NOT IDENT.
PB-203	0.000E+00	2.839E+07	0.000E+00	SHORT HLIF
TL-204	-2.243E+02	2.912E+02	4.895E+02	NOT IDENT.
BI-207	-3.292E-01	5.447E+00	1.011E+01	NOT IDENT.
TL-208	-1.507E+00	4.515E+00	7.238E+00	NOT IDENT.
PB-210	-1.836E+02	2.246E+02	3.366E+02	NOT IDENT.
BI-211	7.276E+00	2.422E+01	4.369E+01	NOT IDENT.
PB-211	3.736E+01	6.848E+01	1.313E+02	NOT IDENT.
BI-212	-1.295E+01	5.339E+01	9.115E+01	NOT IDENT.
PB-212	7.868E+00	1.280E+01	1.198E+01	FAIL ABUN
BI-213	7.372E+00	1.063E+01	1.919E+01	NOT IDENT.
BI-214	0.000E+00	1.325E+01	1.662E+01	FAIL ABUN
PB-214	3.372E+00	9.022E+00	1.634E+01	FAIL ABUN
RN-219	-3.949E+01	4.130E+01	6.462E+01	NOT IDENT.
FR-221	-6.583E-01	2.036E+01	3.671E+01	NOT IDENT.
RA-223	-1.619E+01	6.771E+01	1.180E+02	NOT IDENT.
AC-225	-1.942E+01	6.004E+02	1.083E+03	NOT IDENT.
RA-226	-7.302E+01	7.959E+01	1.365E+02	NOT IDENT.
AC-227	-1.482E+01	2.818E+01	4.223E+01	NOT IDENT.
TH-227	-1.482E+01	2.818E+01	4.223E+01	NOT IDENT.
AC-228	3.215E+00	1.591E+01	3.012E+01	NOT IDENT.
RA-228	3.215E+00	1.591E+01	3.012E+01	NOT IDENT.
TH-228	7.868E+00	1.280E+01	1.198E+01	FAIL ABUN
TH-229	2.673E+00	5.089E+01	9.268E+01	NOT IDENT.
PA-231	2.104E+01	5.128E+01	9.505E+01	NOT IDENT.
TH-231	-1.410E+01	3.600E+01	5.928E+01	NOT IDENT.
PA-233	-2.911E-01	7.241E+00	1.286E+01	NOT IDENT.
PA-234	-1.154E+01	2.905E+01	5.151E+01	NOT IDENT.
PA-234M	8.598E+02	5.698E+02	9.764E+02	FAIL ABUN
U-234	-2.260E+03	4.261E+03	6.323E+03	NOT IDENT.
U-235	1.264E+00	2.164E+01	3.728E+01	NOT IDENT.
NP-237	-2.911E-01	7.241E+00	1.286E+01	NOT IDENT.
NP-238	0.000E+00	1.257E+08	0.000E+00	SHORT HLIF
NP-239	6.629E+00	2.329E+01	4.398E+01	NOT IDENT.
AM-241	1.485E+00	9.520E+00	1.536E+01	NOT IDENT.
AM-242	-1.100E+01	5.401E+01	9.863E+01	NOT IDENT.
AM-243	-3.410E+00	4.536E+00	7.117E+00	NOT IDENT.
CM-243	-1.353E+00	9.048E+00	1.659E+01	NOT IDENT.
BK-247	-2.946E+00	9.436E+00	1.453E+01	NOT IDENT.
CM-247	-1.186E+00	3.728E+00	6.405E+00	NOT IDENT.
CF-249	2.247E+00	4.080E+00	7.758E+00	NOT IDENT.
CF-251	8.203E+00	1.321E+01	2.504E+01	NOT IDENT.
CF-252	4.915E+03	1.537E+04	2.913E+04	NOT IDENT.
ANH-511	-1.078E+01	6.758E+00	1.250E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	62.75	61	124	1.39	125.68	120	12	8.52E-03	38.4	
2	0	66.62	18	57	0.99	133.42	131	6	2.51E-03	70.6	
3	0	92.91	123	139	1.25	186.03	180	13	1.71E-02	21.7	
4	0	129.59	25	154	3.30	259.45	245	16	3.43E-03	115.8	
5	0	133.76	51	77	2.27	267.78	261	11	7.06E-03	36.2	
6	0	186.42	42	95	0.93	373.18	366	10	5.84E-03	46.4	
7	0	239.56	48	90	2.58	479.53	470	15	6.73E-03	45.0	
8	0	259.20	15	100	0.86	518.84	513	14	2.10E-03	141.8	
9	0	279.88	15	53	2.09	560.22	552	10	2.06E-03	96.8	
10	0	295.25	36	37	1.97	590.99	587	9	5.06E-03	34.1	
11	0	365.48	18	67	5.41	731.56	720	15	2.53E-03	100.8	
12	0	434.30	81	84	13.86	869.31	850	34	1.12E-02	36.9	
13	0	449.48	8	44	0.50	899.69	893	13	1.15E-03	166.8	
14	0	477.31	48	39	1.62	955.38	950	11	6.72E-03	28.7	
15	0	511.40	165	60	2.46	1023.63	1016	16	2.30E-02	13.0	
16	0	547.72	19	19	3.00	1096.31	1090	11	2.60E-03	50.9	
17	0	610.62	54	22	4.29	1222.22	1214	16	7.46E-03	24.4	
18	0	664.38	12	19	1.30	1329.82	1325	9	1.62E-03	75.1	
19	0	768.60	9	20	1.62	1538.44	1532	10	1.25E-03	98.8	
20	0	803.11	28	8	4.18	1607.53	1599	18	3.94E-03	30.8	
21	0	975.73	8	6	1.26	1953.08	1943	12	1.07E-03	73.3	
22	0	1001.43	21	7	2.11	2004.54	1997	14	2.98E-03	33.8	
23	0	1047.97	19	4	4.10	2097.69	2090	14	2.57E-03	31.6	
24	0	1231.51	7	2	0.69	2465.14	2459	11	9.18E-04	61.6	
25	0	1460.83	22	3	1.02	2924.26	2916	14	3.07E-03	27.6	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	48	10.44*	2.612E+00	8.649E+01	1.634E+02	57.42
K-40	1460.82	9	10.66*	1.058E+00	3.900E+01	3.900E+01	156.02
I-131	80.19	-----	2.62	4.975E+00	-----	Line Not Found	-----
	284.31	-----	6.12	3.674E+00	-----	Line Not Found	-----
	364.49	18	81.50*	3.129E+00	3.487E+00	2.359E+02	201.61
	636.99	-----	7.16	2.110E+00	-----	Line Not Found	-----
CE-144	80.12	-----	1.36	4.971E+00	-----	Line Not Found	-----
	133.52	51	11.09*	5.443E+00	4.109E+01	4.627E+01	72.47
HG-203	70.83	-----	3.69	4.341E+00	-----	Line Not Found	-----
	72.87	-----	6.19	4.504E+00	-----	Line Not Found	-----
	279.20	15	81.56*	3.710E+00	2.386E+00	4.934E+00	193.60
RA-224	240.99	27	4.10*	4.081E+00	7.970E+01	8.367E+01	166.01
TH-230	67.67	18	0.38*	3.959E+00	5.855E+02	5.855E+02	141.23
TH-232	63.81	8	0.26*	3.552E+00	4.418E+02	4.418E+02	613.24
	140.88	-----	0.02	5.353E+00	-----	Line Not Found	-----
TH-234	63.29	8	3.70*	3.552E+00	3.105E+01	3.105E+01	613.24
	92.59	37	4.23	5.442E+00	7.840E+01	7.840E+01	151.59
U-238	63.29	8	3.70*	3.552E+00	3.105E+01	3.105E+01	613.24
	92.59	37	4.23	5.442E+00	7.840E+01	7.840E+01	151.59

Flag: "*" = Keyline

Total number of lines in spectrum 23
Number of unidentified lines 4
Number of lines tentatively identified by NID 19 82.61%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.89	8.649E+01	1.634E+02	0.938E+02	57.42	
K-40	1.25E+09Y	1.00	3.900E+01	3.900E+01	6.084E+01	156.02	
I-131	8.03D	67.7	3.487E+00	2.359E+02	4.757E+02	201.61	
CE-144	284.91D	1.13	4.109E+01	4.627E+01	3.353E+01	72.47	
HG-203	46.59D	2.07	2.386E+00	4.934E+00	9.552E+00	193.60	
RA-224	1.91Y	1.05	7.970E+01	8.367E+01	13.89E+01	166.01	
TH-230	7.54E+04Y	1.00	5.855E+02	5.855E+02	8.269E+02	141.23	
TH-232	1.41E+10Y	1.00	4.418E+02	4.418E+02	27.09E+02	613.24	
TH-234	4.47E+09Y	1.00	3.105E+01	3.105E+01	19.04E+01	613.24	
U-238	4.47E+09Y	1.00	3.105E+01	3.105E+01	19.04E+01	613.24	
Total Activity :			1.342E+03	1.663E+03			

Grand Total Activity : 1.342E+03 1.663E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	129.59	25	154	3.30	259.45	245	16	3.43E-03	****	5.49E+00	T
0	259.20	15	100	0.86	518.84	513	14	2.10E-03	****	3.89E+00	
0	295.25	24	37	1.97	590.99	587	9	3.33E-03	****	3.59E+00	T
0	434.30	81	84	13.86	869.31	850	34	1.12E-02	73.9	2.79E+00	T
0	449.48	8	44	0.50	899.69	893	13	1.15E-03	****	2.72E+00	
0	547.72	19	19	3.00	1096.31	1090	11	2.60E-03	****	2.37E+00	T
0	610.62	39	22	4.29	1222.22	1214	16	5.47E-03	69.8	2.18E+00	T
0	664.38	12	19	1.30	1329.82	1325	9	1.62E-03	****	2.04E+00	T
0	768.60	9	20	1.62	1538.44	1532	10	1.25E-03	****	1.81E+00	
0	803.11	22	8	4.18	1607.53	1599	18	3.10E-03	86.9	1.75E+00	T
0	975.73	8	6	1.26	1953.08	1943	12	1.07E-03	****	1.48E+00	
0	1001.43	21	7	2.11	2004.54	1997	14	2.98E-03	67.6	1.45E+00	T
0	1047.97	19	4	4.10	2097.69	2090	14	2.57E-03	63.3	1.39E+00	T
0	1231.51	7	2	0.69	2465.14	2459	11	9.18E-04	****	1.21E+00	T

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287002.CNF;1  *
* Acquisition date   : 17-MAY-2022 07:56:54 Sensitivity      : 3.000          *
* Detector ID        : GAM24 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000      *
* Elapsed real time  : 0 02:00:08.55 Half life ratio : *****      *
* Sample date        : 29-MAR-2022 13:11:00 Nuclide Library : LIQUID      *
* Sample ID          : G579287002 Analyst initials: RXF2          *
* Batch Number       : 2264689 Sample Quantity : 7.6992E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 6-JUL-2021 06:54:13 Eff. Geometry    : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM24_JAR.CNF;16          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	4.448E+01
K-40	2.210E+01
I-131	1.708E+02
CE-144	1.721E+01
HG-203	4.457E+00
RA-224	5.156E+01
TH-230	4.722E+02
TH-232	9.674E+02
TH-234	6.901E+01
U-238	6.901E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	2.819E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	3.459E+00	NOT IDENT.
SC-46	3.924E+00	NOT IDENT.
V-48	2.546E+01	NOT IDENT.
CR-51	7.327E+01	NOT IDENT.
MN-52	1.288E+03	NOT IDENT.
MN-54	3.449E+00	NOT IDENT.
CO-56	4.579E+00	NOT IDENT.
CO-57	2.166E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	4.303E+00	NOT IDENT.
FE-59	1.398E+01	NOT IDENT.
CO-60	2.034E+00	NOT IDENT.
ZN-65	7.528E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	9.750E+01	NOT IDENT.
AS-73	5.277E+01	NOT IDENT.
AS-74	2.906E+01	NOT IDENT.
SE-75	4.664E+00	FAIL ABUN
BR-77	0.000E+00	SHORT HLIF

SR-82	7.534E+01	NOT IDENT.
RB-83	8.089E+00	NOT IDENT.
RB-84	1.361E+01	NOT IDENT.
KR-85	8.615E+02	NOT IDENT.
SR-85	6.447E+00	NOT IDENT.
RB-86	1.954E+02	NOT IDENT.
Y-88	3.850E+00	NOT IDENT.
Y-91	2.245E+03	NOT IDENT.
NB-94	3.124E+00	NOT IDENT.
NB-95	5.165E+00	NOT IDENT.
NB-95M	1.239E+01	NOT IDENT.
TC-95M	5.277E+00	NOT IDENT.
ZR-95	9.030E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.461E+00	NOT IDENT.
RH-102M	2.715E+00	FAIL ABUN
RU-103	5.890E+00	FAIL ABUN
RH-106	2.551E+01	NOT IDENT.
RU-106	2.551E+01	NOT IDENT.
AG-108M	2.273E+00	FAIL ABUN
CD-109	4.956E+01	NOT IDENT.
AG-110	5.968E+01	NOT IDENT.
AG-110M	4.722E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	4.505E+00	NOT IDENT.
IN-114M	2.446E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	2.522E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.929E+00	NOT IDENT.
SB-124	1.020E+01	NOT IDENT.
SB-125	8.370E+00	NOT IDENT.
TE-125M	1.095E+03	NOT IDENT.
I-126	9.990E+01	NOT IDENT.
SB-126	6.313E+01	NOT IDENT.
SN-126	4.661E+00	NOT IDENT.
SB-127	0.000E+00	SHORT HLIF
TE-129	8.923E+01	FAIL ABUN
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	3.275E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.206E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	5.611E+01	FAIL ABUN
BA-137M	2.791E+00	NOT IDENT.
CS-137	2.949E+00	NOT IDENT.
LA-138	4.276E+00	NOT IDENT.
CE-139	2.963E+00	NOT IDENT.
BA-140	1.204E+02	NOT IDENT.
LA-140	3.308E+01	NOT IDENT.
CE-141	9.734E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
PM-144	3.287E+00	FAIL ABUN
PR-144	2.508E+02	NOT IDENT.
PM-146	3.478E+00	NOT IDENT.
ND-147	3.787E+02	NOT IDENT.
PM-147	5.886E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	7.751E+00	NOT IDENT.
GD-153	6.364E+00	NOT IDENT.
EU-154	7.708E+00	NOT IDENT.
EU-155	8.271E+00	NOT IDENT.
TB-160	1.496E+01	NOT IDENT.
HO-166M	5.573E+00	FAIL ABUN
TM-171	7.455E+02	FAIL ABUN
LU-176	2.198E+00	NOT IDENT.
LU-177	2.947E+03	NOT IDENT.
HF-181	6.052E+00	FAIL ABUN
W-181	1.177E+01	FAIL ABUN
TA-182	1.679E+01	FAIL ABUN
RE-183	1.356E+01	FAIL ABUN
RE-184	1.798E+01	NOT IDENT.
RE-188	1.955E+01	FAIL ABUN
W-188	8.481E+02	FAIL ABUN
OS-191	5.188E+01	FAIL ABUN

IR-192	4.102E+00	FAIL ABUN
PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF
TL-202	4.477E+01	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	2.251E+02	NOT IDENT.
BI-207	4.413E+00	NOT IDENT.
TL-208	3.259E+00	NOT IDENT.
PB-210	1.578E+02	NOT IDENT.
BI-211	2.026E+01	NOT IDENT.
PB-211	5.969E+01	NOT IDENT.
BI-212	4.012E+01	NOT IDENT.
PB-212	5.604E+00	FAIL ABUN
BI-213	8.677E+00	NOT IDENT.
BI-214	7.652E+00	FAIL ABUN
PB-214	7.594E+00	FAIL ABUN
RN-219	2.891E+01	NOT IDENT.
FR-221	1.702E+01	NOT IDENT.
RA-223	5.414E+01	NOT IDENT.
AC-225	5.020E+02	NOT IDENT.
RA-226	6.440E+01	NOT IDENT.
AC-227	1.935E+01	NOT IDENT.
TH-227	1.935E+01	NOT IDENT.
AC-228	1.341E+01	NOT IDENT.
RA-228	1.341E+01	NOT IDENT.
TH-228	5.604E+00	FAIL ABUN
TH-229	4.312E+01	NOT IDENT.
PA-231	4.406E+01	NOT IDENT.
TH-231	2.772E+01	NOT IDENT.
PA-233	5.937E+00	NOT IDENT.
PA-234	2.215E+01	NOT IDENT.
PA-234M	4.341E+02	FAIL ABUN
U-234	2.930E+03	NOT IDENT.
U-235	1.752E+01	NOT IDENT.
NP-237	5.937E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
NP-239	2.051E+01	NOT IDENT.
AM-241	7.106E+00	NOT IDENT.
AM-242	4.604E+01	NOT IDENT.
AM-243	3.348E+00	NOT IDENT.
CM-243	7.732E+00	NOT IDENT.
BK-247	6.695E+00	NOT IDENT.
CM-247	2.892E+00	NOT IDENT.
CF-249	3.548E+00	NOT IDENT.
CF-251	1.174E+01	NOT IDENT.
CF-252	1.363E+04	NOT IDENT.
ANH-511	5.989E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287002.CNF;1
Acquisition date : 17-MAY-2022 07:56:54 Sensitivity : 3.000
Detector ID : GAM24 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:08.55 Half life ratio : *****
Sample date : 29-MAR-2022 13:11:00 Nuclide Library : LIQUID
Sample ID : G579287002 Analyst initials: RXF2
Batch Number : 2264689 Sample Quantity : 7.6992E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 6-JUL-2021 06:54:13 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM24_JAR.CNF;16

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.634E+02	9.300E+01	9.305E+01
K-40	3.900E+01	5.974E+01	5.974E+01
I-131	2.359E+02	4.667E+02	4.667E+02
CE-144	4.627E+01	3.306E+01	3.307E+01
HG-203	4.934E+00	9.373E+00	9.374E+00
RA-224	8.367E+01	1.363E+02	1.363E+02
TH-230	5.855E+02	8.175E+02	8.176E+02
TH-232	4.418E+02	2.656E+03	2.656E+03
TH-234	3.105E+01	1.867E+02	1.867E+02
U-238	3.105E+01	1.867E+02	1.867E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-1.358E+00	3.600E+00	3.651E+00	NOT IDENT.
NA-24	7.498E+22	1.285E+24	0.000E+00	SHORT HLIF
AL-26	9.283E-01	3.915E+00	3.937E+00	NOT IDENT.
SC-46	5.362E-01	4.622E+00	4.628E+00	NOT IDENT.
V-48	-4.124E+00	3.164E+01	3.170E+01	NOT IDENT.
CR-51	-1.499E+01	9.082E+01	9.107E+01	NOT IDENT.
MN-52	6.535E+02	1.358E+03	1.390E+03	NOT IDENT.
MN-54	2.556E+00	3.731E+00	3.905E+00	NOT IDENT.
CO-56	-2.152E+00	5.840E+00	5.920E+00	NOT IDENT.
CO-57	-4.126E-01	2.848E+00	2.854E+00	NOT IDENT.
NI-57	1.994E+10	4.281E+10	4.374E+10	SHORT HLIF
CO-58	3.179E+00	4.849E+00	5.057E+00	NOT IDENT.
FE-59	4.630E+00	1.630E+01	1.643E+01	NOT IDENT.
CO-60	-1.946E+00	2.965E+00	3.093E+00	NOT IDENT.
ZN-65	-2.508E+00	9.701E+00	9.766E+00	NOT IDENT.
CU-67	-3.009E+06	3.022E+06	3.313E+06	SHORT HLIF
GE-68	-8.392E+01	1.369E+02	1.420E+02	NOT IDENT.
AS-73	1.714E+01	7.089E+01	7.131E+01	NOT IDENT.
AS-74	3.792E+00	3.359E+01	3.364E+01	NOT IDENT.
SE-75	2.000E+00	6.014E+00	6.082E+00	FAIL ABUN

BR-77	2.161E+07	3.523E+07	3.656E+07	SHORT HLIF
SR-82	1.605E+01	8.754E+01	8.784E+01	NOT IDENT.
RB-83	1.893E+00	9.187E+00	9.227E+00	NOT IDENT.
RB-84	1.249E+01	1.443E+01	1.549E+01	NOT IDENT.
KR-85	-2.337E+03	1.191E+03	1.591E+03	NOT IDENT.
SR-85	-1.749E+01	8.916E+00	1.191E+01	NOT IDENT.
RB-86	-1.460E+02	2.700E+02	2.779E+02	NOT IDENT.
Y-88	-1.589E+00	5.108E+00	5.158E+00	NOT IDENT.
Y-91	1.213E+03	2.387E+03	2.449E+03	NOT IDENT.
NB-94	3.284E+00	3.271E+00	3.591E+00	NOT IDENT.
NB-95	4.246E+00	6.126E+00	6.419E+00	NOT IDENT.
NB-95M	-6.980E+00	1.757E+01	1.785E+01	NOT IDENT.
TC-95M	1.138E+00	6.168E+00	6.190E+00	NOT IDENT.
ZR-95	2.481E+00	1.039E+01	1.045E+01	NOT IDENT.
MO-99	2.101E+06	5.493E+06	5.575E+06	SHORT HLIF
TC-99M	1.000E+41	4.298E+41	0.000E+00	SHORT HLIF
RH-101	1.350E-01	3.177E+00	3.177E+00	NOT IDENT.
RH-102M	1.363E+00	3.347E+00	3.403E+00	FAIL ABUN
RU-103	-2.891E+00	7.197E+00	7.314E+00	FAIL ABUN
RH-106	-1.131E+01	3.171E+01	3.211E+01	NOT IDENT.
RU-106	-1.131E+01	3.171E+01	3.211E+01	NOT IDENT.
AG-108M	1.558E+01	1.136E+01	1.336E+01	FAIL ABUN
CD-109	1.073E+01	6.214E+01	6.232E+01	NOT IDENT.
AG-110	-3.015E+01	7.512E+01	7.634E+01	NOT IDENT.
AG-110M	1.852E-01	5.654E+00	5.655E+00	NOT IDENT.
IN-111	2.953E+05	4.446E+05	4.642E+05	SHORT HLIF
SN-113	-1.841E+00	5.784E+00	5.843E+00	NOT IDENT.
IN-114M	1.142E+01	2.799E+01	2.846E+01	NOT IDENT.
CD-115	2.557E+07	3.679E+07	3.856E+07	SHORT HLIF
SN-117M	-6.279E+00	3.350E+01	3.362E+01	NOT IDENT.
SB-122	4.662E+05	8.728E+05	8.978E+05	SHORT HLIF
I-123	3.042E+26	1.370E+27	0.000E+00	SHORT HLIF
TE-123M	8.789E-01	3.758E+00	3.779E+00	NOT IDENT.
SB-124	6.489E+00	1.008E+01	1.050E+01	NOT IDENT.
SB-125	5.582E+00	9.620E+00	9.944E+00	NOT IDENT.
TE-125M	9.578E+01	1.261E+03	1.262E+03	NOT IDENT.
I-126	1.545E+01	1.309E+02	1.311E+02	NOT IDENT.
SB-126	-1.554E+01	7.782E+01	7.814E+01	NOT IDENT.
SN-126	-3.536E+00	6.315E+00	6.513E+00	NOT IDENT.
SB-127	-1.622E+04	4.923E+04	4.977E+04	SHORT HLIF
TE-129	-6.039E+00	1.038E+02	1.038E+02	FAIL ABUN
I-132	-1.000E+41	4.586E+41	0.000E+00	SHORT HLIF
TE-132	-3.037E+03	1.038E+05	1.038E+05	SHORT HLIF
BA-133	-1.986E+00	4.265E+00	4.358E+00	NOT IDENT.
I-133	2.838E+16	2.763E+17	0.000E+00	SHORT HLIF
CS-134	1.212E-01	4.344E+00	4.344E+00	FAIL ABUN
I-135	-1.000E+41	1.770E+41	0.000E+00	SHORT HLIF
CS-136	1.061E+02	6.692E+01	8.228E+01	FAIL ABUN
BA-137M	1.320E+00	3.464E+00	3.515E+00	NOT IDENT.
CS-137	1.394E+00	3.660E+00	3.713E+00	NOT IDENT.
LA-138	-4.768E-01	5.164E+00	5.169E+00	NOT IDENT.
CE-139	1.340E+00	3.389E+00	3.443E+00	NOT IDENT.
BA-140	-8.811E+01	1.531E+02	1.582E+02	NOT IDENT.
LA-140	5.947E+00	3.718E+01	3.728E+01	NOT IDENT.
CE-141	-9.930E+00	1.224E+01	1.303E+01	NOT IDENT.
CE-143	-6.773E+10	3.045E+11	3.061E+11	SHORT HLIF
PM-144	3.017E+00	3.483E+00	3.740E+00	FAIL ABUN
PR-144	2.315E+02	2.656E+02	2.854E+02	NOT IDENT.
PM-146	-2.383E+00	4.935E+00	5.051E+00	NOT IDENT.
ND-147	-9.746E+01	4.541E+02	4.563E+02	NOT IDENT.
PM-147	-1.939E+04	7.826E+04	7.874E+04	NOT IDENT.
PM-149	5.298E+07	3.309E+08	3.318E+08	SHORT HLIF
EU-152	-4.162E+00	9.988E+00	1.016E+01	NOT IDENT.
GD-153	6.623E-01	8.084E+00	8.090E+00	NOT IDENT.
EU-154	-5.233E+00	1.019E+01	1.046E+01	NOT IDENT.
EU-155	6.941E+00	9.060E+00	9.586E+00	NOT IDENT.
TB-160	-9.054E+00	1.957E+01	1.999E+01	NOT IDENT.
HO-166M	3.129E+00	6.188E+00	6.347E+00	FAIL ABUN
TM-171	-1.973E+03	1.262E+03	1.544E+03	FAIL ABUN
LU-176	-1.505E+00	2.838E+00	2.919E+00	NOT IDENT.
LU-177	-1.997E+03	3.692E+03	3.800E+03	NOT IDENT.
HF-181	-3.244E+00	8.509E+00	8.634E+00	FAIL ABUN
W-181	6.865E+00	1.526E+01	1.557E+01	FAIL ABUN
TA-182	4.319E+00	1.879E+01	1.889E+01	FAIL ABUN
RE-183	9.878E+00	1.725E+01	1.782E+01	FAIL ABUN
RE-184	-3.139E-01	2.174E+01	2.174E+01	NOT IDENT.
RE-188	2.081E+01	2.135E+01	2.332E+01	FAIL ABUN
W-188	1.059E+03	9.969E+02	1.106E+03	FAIL ABUN

OS-191	7.455E+01	1.693E+02	1.726E+02	FAIL ABUN
IR-192	3.795E-03	4.985E+00	4.985E+00	FAIL ABUN
PB-201	-9.612E+37	2.274E+38	0.000E+00	SHORT HLIF
TL-201	-9.230E+05	1.465E+06	1.523E+06	SHORT HLIF
TL-202	4.243E+01	5.019E+01	5.372E+01	NOT IDENT.
PB-203	1.497E+07	2.843E+07	2.922E+07	SHORT HLIF
TL-204	-2.243E+02	2.924E+02	3.094E+02	NOT IDENT.
BI-207	-3.292E-01	5.447E+00	5.449E+00	NOT IDENT.
TL-208	-1.507E+00	4.516E+00	4.567E+00	NOT IDENT.
PB-210	-1.836E+02	2.253E+02	2.401E+02	NOT IDENT.
BI-211	7.276E+00	2.423E+01	2.445E+01	NOT IDENT.
PB-211	3.736E+01	6.856E+01	7.060E+01	NOT IDENT.
BI-212	-1.295E+01	5.341E+01	5.372E+01	NOT IDENT.
PB-212	7.868E+00	1.282E+01	1.330E+01	FAIL ABUN
BI-213	7.372E+00	1.065E+01	1.116E+01	NOT IDENT.
BI-214	1.936E+01	1.335E+01	1.595E+01	FAIL ABUN
PB-214	3.372E+00	9.027E+00	9.154E+00	FAIL ABUN
RN-219	-3.949E+01	4.170E+01	4.534E+01	NOT IDENT.
FR-221	-6.583E-01	2.036E+01	2.036E+01	NOT IDENT.
RA-223	-1.619E+01	6.774E+01	6.813E+01	NOT IDENT.
AC-225	-1.942E+01	6.004E+02	6.005E+02	NOT IDENT.
RA-226	-7.302E+01	7.981E+01	8.634E+01	NOT IDENT.
AC-227	-1.482E+01	2.828E+01	2.906E+01	NOT IDENT.
TH-227	-1.482E+01	2.828E+01	2.906E+01	NOT IDENT.
AC-228	3.215E+00	1.591E+01	1.598E+01	NOT IDENT.
RA-228	3.215E+00	1.591E+01	1.598E+01	NOT IDENT.
TH-228	7.868E+00	1.282E+01	1.330E+01	FAIL ABUN
TH-229	2.673E+00	5.089E+01	5.091E+01	NOT IDENT.
PA-231	2.104E+01	5.151E+01	5.238E+01	NOT IDENT.
TH-231	-1.410E+01	3.607E+01	3.663E+01	NOT IDENT.
PA-233	-2.911E-01	7.241E+00	7.242E+00	NOT IDENT.
PA-234	-1.154E+01	3.192E+01	3.234E+01	NOT IDENT.
PA-234M	8.598E+02	5.753E+02	6.939E+02	FAIL ABUN
U-234	-2.260E+03	4.268E+03	4.388E+03	NOT IDENT.
U-235	1.264E+00	2.164E+01	2.165E+01	NOT IDENT.
NP-237	-2.911E-01	7.241E+00	7.242E+00	NOT IDENT.
NP-238	-3.843E+07	1.257E+08	1.269E+08	SHORT HLIF
NP-239	6.629E+00	2.329E+01	2.349E+01	NOT IDENT.
AM-241	1.485E+00	9.522E+00	9.545E+00	NOT IDENT.
AM-242	-1.100E+01	5.405E+01	5.427E+01	NOT IDENT.
AM-243	-3.410E+00	4.548E+00	4.801E+00	NOT IDENT.
CM-243	-1.353E+00	9.049E+00	9.070E+00	NOT IDENT.
BK-247	-2.946E+00	9.458E+00	9.551E+00	NOT IDENT.
CM-247	-1.186E+00	3.735E+00	3.773E+00	NOT IDENT.
CF-249	2.247E+00	4.087E+00	4.211E+00	NOT IDENT.
CF-251	8.203E+00	1.325E+01	1.375E+01	NOT IDENT.
CF-252	4.915E+03	1.600E+04	1.616E+04	NOT IDENT.
ANH-511	-1.078E+01	6.822E+00	8.378E+00	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	62.9092	133.52	59.6553	116.30	0.0000
879.38	64.4212	364.49	59.6624	116.74	58.5128
46.54	74.1318	80.22	0.0000	117.23	55.8485
228.16	0.0000	711.68	52.0251	119.76	73.7495
52.39	50.7791	356.01	50.3559	120.54	65.1394
53.20	55.8437	323.87	50.3619	120.90	71.9583
53.44	40.0828	82.35	0.0000	264.66	69.2628
57.53	56.2154	82.47	64.1695	121.22	69.2717
293.27	0.0000	82.47	0.0000	344.28	66.6034
57.53	44.1105	83.79	55.7354	122.06	67.9874
482.18	44.1107	265.00	57.4701	1274.44	66.7144
57.98	44.1519	84.21	57.4899	123.68	61.3164
59.32	59.0322	84.86	0.0000	1377.63	0.0000
59.54	47.5752	193.51	57.6050	127.23	61.5930
155.04	65.8803	105.31	69.7684	129.43	49.4105
63.00	66.0786	86.79	69.7952	131.20	35.7635
129.43	66.1164	86.94	71.3635	133.02	66.1721
63.29	66.1164	87.09	78.6222	133.52	66.2131
290.67	66.1541	87.57	78.9418	135.34	0.0000
63.81	66.1839	88.03	59.5738	136.00	56.7266
87.57	66.2447	306.78	59.6033	136.28	70.5865
64.99	29.8513	88.47	72.5754	136.47	70.6028
65.08	29.8564	531.02	59.8644	739.50	0.0000
66.73	58.6543	184.58	0.0000	140.51	0.0000
66.98	38.2891	92.59	60.0023	140.88	72.3649
67.24	38.3081	93.31	0.0000	143.76	58.6453
67.67	41.2563	94.56	60.1841	144.24	54.9524
1221.41	41.2623	311.90	60.1925	145.44	78.3458
439.51	42.6040	946.00	60.1943	152.32	60.1589
70.82	42.6040	97.43	59.1315	152.43	60.1667
167.43	0.0000	98.43	63.1681	1048.07	65.8671
97.43	55.2148	98.44	63.1688	154.21	54.6334
70.82	0.0000	99.53	70.3011	155.04	51.8551
70.82	59.3558	103.37	70.3011	158.56	66.0686
279.20	0.0000	116.74	70.3011	158.97	0.0000
1063.66	63.1050	100.11	63.3252	159.00	62.4960
72.87	0.0000	100.20	63.3333	162.33	68.4229
351.06	63.1119	102.03	71.4407	537.26	63.6938
74.66	79.3536	103.18	74.2101	163.33	72.3007
238.63	79.3761	103.37	66.2773	165.86	58.1865
351.93	79.3761	105.31	54.9416	167.43	0.0000
238.63	79.3761	106.12	61.2152	245.35	0.0000
74.97	76.0185	106.47	71.8967	427.87	53.9965
77.11	68.6738	109.28	64.1602	176.60	52.0834
256.23	65.5731	111.00	68.7790	177.52	60.8198
79.82	0.0000	111.76	0.0000	181.07	0.0000
80.02	59.6453	208.37	65.3802	184.41	69.0138
80.03	59.6457	116.24	65.6706	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	53.5302	300.09	48.1009	477.60	32.0273
186.21	61.3453	300.13	53.8750	477.99	32.0334
190.27	53.7663	301.36	46.0042	482.18	31.3871
193.51	58.8354	302.85	43.9095	487.02	24.1326
197.03	61.9829	304.50	48.2492	492.35	0.0000
198.01	60.0705	304.85	49.3326	497.08	31.4373
201.83	61.2715	306.78	50.4730	511.00	41.5945
204.12	53.4781	308.46	43.0054	514.00	115.0007
205.31	56.5106	311.90	49.5722	520.40	25.4305
208.37	65.6146	316.51	42.1595	520.69	0.0000
210.85	63.7682	319.41	33.5770	667.71	0.0000
215.65	64.0404	320.08	44.4275	527.90	0.0000
218.12	55.1544	321.04	43.3724	529.59	21.8914
222.11	42.2640	323.87	45.6265	529.87	0.0000
227.09	33.3495	325.23	40.2309	531.02	26.4698
227.38	33.3575	1596.21	37.0547	537.26	26.5459
228.16	0.0000	331.15	0.0000	1260.41	0.0000
228.18	52.5993	333.37	27.3280	552.55	17.6971
235.69	51.9131	334.37	37.1903	795.86	21.3007
235.96	51.9245	338.28	35.0911	564.24	0.0000
238.63	44.8965	911.20	35.0918	569.33	22.2861
238.98	0.0000	340.48	36.2388	569.50	19.5016
240.99	52.1398	340.55	36.2401	569.70	18.5748
242.00	58.3214	344.28	41.8300	582.08	23.3437
244.70	38.1460	345.93	37.4663	583.19	24.2893
245.35	0.0000	351.06	35.3763	595.83	23.4810
459.60	40.1815	351.93	37.6074	600.60	36.7041
685.70	0.0000	356.01	39.9207	604.72	25.6436
388.16	44.3792	361.25	0.0000	609.32	26.4482
256.23	51.2251	364.49	32.3259	610.33	26.4594
527.90	0.0000	366.42	0.0000	614.28	15.1445
264.66	42.1859	383.85	29.3188	618.01	20.5851
265.00	53.1364	388.16	29.3923	621.93	23.7381
269.46	41.8164	666.33	32.7932	630.19	0.0000
401.81	56.5280	391.70	38.5156	631.29	26.6884
273.65	36.1804	400.66	36.4362	632.98	15.2607
276.40	47.2888	401.32	0.0000	633.25	16.2166
583.19	39.9614	401.81	39.8777	634.78	20.0445
277.60	39.9676	402.40	34.1925	635.95	21.0090
402.40	39.9799	404.85	25.1094	636.99	29.6159
278.43	39.9923	410.95	33.2121	657.50	23.1160
279.20	0.0000	720.70	34.4287	884.68	19.2651
279.54	47.3978	423.72	31.1396	661.66	15.4360
280.46	44.2678	427.09	26.5750	664.57	0.0000
301.36	35.9209	427.87	26.5863	666.33	17.0103
284.31	33.8229	433.94	26.6733	666.50	17.0113
285.41	42.3128	439.51	26.7528	667.71	0.0000
285.90	0.0000	440.45	19.2017	677.62	18.4439
287.50	51.9110	453.88	36.5650	685.70	0.0000
290.67	25.4839	459.60	36.1446	692.65	0.0000
293.27	0.0000	463.37	27.3814	695.00	15.6348
295.22	41.5454	468.07	34.5303	696.49	15.6436
316.51	43.1656	473.00	0.0000	696.51	15.6436
298.58	44.8472	475.06	27.0110	697.00	19.5581
299.98	48.0972	696.49	32.0142	697.49	22.4960

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	15.6797	903.28	13.6348	1291.59	9.3047
706.68	24.5361	907.67	0.0000	1298.22	0.0000
711.68	19.6655	911.20	12.6167	1312.11	9.3486
720.70	15.7847	984.45	0.0000	1332.49	8.4529
721.93	0.0000	926.36	7.3937	1365.19	10.4076
1690.97	15.7969	935.54	14.8284	1368.63	0.0000
722.91	15.7974	937.49	20.1359	1377.63	0.0000
723.31	18.7623	983.53	13.8046	1384.29	10.4516
756.73	18.7681	945.96	0.0000	1408.01	2.8652
727.33	17.8006	946.00	16.9995	1434.09	4.8022
733.00	16.8464	949.00	15.9512	1435.80	7.6863
735.93	17.8566	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	16.0139	1460.82	4.8293
1434.09	18.9049	964.08	24.5674	1489.16	7.7730
747.24	15.9370	966.17	22.4445	1596.21	2.9783
752.31	22.9509	968.97	11.9803	1620.50	3.9898
753.82	17.9709	983.53	17.1870	1678.03	0.0000
756.73	18.9890	984.45	0.0000	1690.97	2.0219
763.94	16.0313	996.26	22.4250	1757.55	0.0000
765.80	14.4374	1001.03	15.1143	1764.49	4.0986
1001.03	12.8359	1004.73	15.5624	1770.23	5.1287
766.84	12.8379	1025.87	0.0000	1771.35	5.1296
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	20.1270	1037.84	8.7261	1808.65	6.1966
777.92	0.0000	1038.76	0.0000	1836.06	7.2642
778.90	19.1363	1046.59	10.9338		
783.70	0.0000	1048.07	10.9387		
1435.80	17.1800	1050.41	14.0102		
903.28	20.2350	1063.66	16.4777		
795.86	16.2085	1077.00	16.5372		
801.95	12.1816	1077.34	17.6416		
802.10	12.1824	1083.85	12.1494		
810.29	16.2876	1085.87	11.0510		
810.45	16.2886	1099.25	15.5261		
810.76	9.5028	1111.64	17.8018		
815.77	18.3576	1112.07	13.3528		
818.51	16.3325	1112.84	13.3557		
832.01	19.4813	1115.54	17.8203		
834.85	13.3420	1120.29	14.4973		
835.15	20.5280	1120.55	13.3828		
836.80	0.0000	1121.30	14.5004		
846.77	23.6966	1808.65	11.1786		
856.80	17.5717	1131.51	0.0000		
860.56	23.8023	1332.49	14.4680		
871.09	17.6516	1177.95	10.8639		
873.19	15.5855	1189.05	8.1703		
875.33	0.0000	1204.77	8.2024		
879.38	21.8626	1221.41	10.9811		
880.51	15.6216	1231.02	6.4203		
881.60	12.5013	1235.36	16.8330		
883.24	14.5926	1238.28	6.1253		
884.68	17.7274	1260.41	0.0000		
889.28	12.5314	1271.87	10.1879		
894.76	20.9216	1274.44	12.0472		
1836.06	19.8958	1274.54	11.1211		

VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 09:58:21.31

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287003.CNF:1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM33.CNF:524
Background date    : 15-MAY-2022 09:13:32
Sample date       : 29-MAR-2022 13:22:00 Acquisition date : 17-MAY-2022 07:57:56
Sample ID        : G579287003 Sample quantity : 7.60210E-01 FILTER
Detector name    : GAM33 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:01.52 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : RXF2
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID        : 2264689 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	60.01	16	88	1.42	119.58	106	30	2.20E-03	109.6	2.15E+00
2	3	63.36*	7	87	1.43	126.29	106	30	9.82E-04	280.7	
3	0	143.81*	20	80	0.95	287.36	282	10	2.72E-03	95.4	
4	0	171.21	26	50	1.02	342.23	338	8	3.63E-03	51.3	
5	0	238.84*	10	45	1.05	477.63	472	9	1.36E-03	153.7	
6	0	351.60*	27	36	1.11	703.42	698	11	3.81E-03	50.5	
7	0	470.17	14	17	2.01	940.83	937	8	1.97E-03	55.9	
8	0	477.45	26	31	0.78	955.42	951	10	3.66E-03	43.6	
9	0	511.30*	46	20	2.45	1023.20	1016	19	6.43E-03	43.2	
10	0	657.55	13	6	0.88	1316.04	1312	8	1.84E-03	42.0	
11	0	718.34	25	11	4.38	1437.79	1431	15	3.52E-03	34.9	
12	0	745.93	10	4	0.73	1493.04	1490	6	1.35E-03	46.9	
13	0	821.48	8	3	0.94	1644.32	1641	6	1.15E-03	47.6	
14	0	1000.78*	16	7	1.02	2003.39	1996	14	2.26E-03	48.5	
15	0	1014.50	6	7	0.76	2030.87	2026	9	8.39E-04	87.9	
16	0	1346.43	8	0	0.96	2695.63	2693	6	1.11E-03	35.4	
17	0	1460.68*	24	0	2.16	2924.44	2919	11	3.27E-03	28.9	
18	0	1578.77	12	3	1.85	3160.96	3153	13	1.62E-03	43.2	
19	0	1709.35	8	0	1.19	3422.50	3418	9	1.11E-03	35.4	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 09:58:22

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287003.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 29-MAR-2022 13:22:00	Acquisition date	: 17-MAY-2022 07:57:56
Sample ID	: G579287003	Sample quantity	: 0.76021 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA33	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:01.52 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	26	10.44*	2.088E+00	5.970E+01	1.127E+02	87.20
K-40	1460.82	24	10.66*	8.567E-01	1.274E+02	1.274E+02	57.75
AG-110	657.50	13	4.50*	1.654E+00	8.798E+01	1.007E+02	83.96
BI-211	72.87	-----	1.23	2.321E+00	-----	Line Not Found	-----
	351.06	27	12.92*	2.560E+00	4.093E+01	4.110E+01	100.96
TH-232	63.81	7	0.26*	1.496E+00	8.983E+02	8.983E+02	561.41
	140.88	-----	0.02	4.179E+00	-----	Line Not Found	-----
AM-241	59.54	16	35.90*	1.203E+00	1.808E+01	1.808E+01	219.30
ANH-511	511.00	46	100.00*	1.991E+00	1.149E+01	1.149E+01	86.50

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287003.CNF;1
Acquisition date : 17-MAY-2022 07:57:56 Sensitivity : 3.000
Detector ID : GAM33 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:01.52 Half life ratio : *****
Sample date : 29-MAR-2022 13:22:00 Analyst initials: RXF2
Sample ID : G579287003 Sample Quantity : 7.6021E-01 FILTER
Batch Number : 2264689 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 27-JUL-2021 10:51:23 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM33_JAR.CNF;12

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.127E+02	9.635E+01	1.076E+02
K-40	1.274E+02	7.208E+01	6.544E+01
AG-110	1.007E+02	8.289E+01	1.373E+02
BI-211	4.110E+01	4.067E+01	3.861E+01
TH-232	8.983E+02	4.942E+03	4.427E+03
AM-241	1.808E+01	3.886E+01	4.220E+01
ANH-511	1.149E+01	9.741E+00	4.369E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-4.743E-01	2.348E+00	5.057E+00	NOT IDENT.
NA-24	0.000E+00	1.421E+24	0.000E+00	SHORT HLIF
AL-26	-3.378E+00	4.580E+00	7.401E+00	NOT IDENT.
SC-46	1.992E+00	5.245E+00	1.123E+01	NOT IDENT.
V-48	2.564E+01	2.727E+01	6.515E+01	NOT IDENT.
CR-51	-5.854E+01	9.603E+01	1.689E+02	NOT IDENT.
MN-52	-5.155E+02	1.913E+03	3.634E+03	NOT IDENT.
MN-54	7.535E-01	4.649E+00	8.827E+00	NOT IDENT.
CO-56	-1.666E+00	5.829E+00	1.033E+01	NOT IDENT.
CO-57	-2.127E+00	3.031E+00	4.885E+00	NOT IDENT.
NI-57	0.000E+00	4.337E+10	0.000E+00	SHORT HLIF
CO-58	-1.885E+00	5.778E+00	1.020E+01	NOT IDENT.
FE-59	-4.327E+00	1.427E+01	2.734E+01	NOT IDENT.
CO-60	-5.238E-01	3.549E+00	7.185E+00	NOT IDENT.
ZN-65	4.153E+00	8.919E+00	1.949E+01	NOT IDENT.
CU-67	0.000E+00	3.801E+06	0.000E+00	SHORT HLIF
GE-68	-6.665E+01	1.366E+02	2.510E+02	NOT IDENT.
AS-73	-1.084E+02	2.156E+02	3.356E+02	NOT IDENT.
AS-74	2.152E+01	3.444E+01	7.169E+01	NOT IDENT.
SE-75	6.531E-01	5.620E+00	1.079E+01	NOT IDENT.
BR-77	0.000E+00	2.931E+07	0.000E+00	SHORT HLIF
SR-82	-4.074E+01	8.558E+01	1.384E+02	NOT IDENT.
RB-83	3.591E+00	7.068E+00	1.531E+01	NOT IDENT.

RB-84	2.876E+00	1.414E+01	2.953E+01	NOT IDENT.
KR-85	1.806E+03	8.240E+02	1.902E+03	NOT IDENT.
SR-85	1.351E+01	6.167E+00	1.423E+01	NOT IDENT.
RB-86	-8.309E+01	2.612E+02	5.001E+02	NOT IDENT.
Y-88	-1.238E+00	4.923E+00	9.691E+00	NOT IDENT.
Y-91	8.077E+02	1.893E+03	4.553E+03	NOT IDENT.
NB-94	1.995E+00	3.979E+00	7.879E+00	NOT IDENT.
NB-95	2.934E+00	7.681E+00	1.468E+01	NOT IDENT.
NB-95M	7.174E+00	1.612E+01	2.965E+01	NOT IDENT.
TC-95M	3.932E-01	6.954E+00	1.321E+01	NOT IDENT.
ZR-95	4.657E+00	1.045E+01	2.136E+01	NOT IDENT.
MO-99	0.000E+00	6.688E+06	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
RH-101	-9.425E-01	3.154E+00	5.350E+00	NOT IDENT.
RH-102M	3.357E+00	3.438E+00	6.817E+00	NOT IDENT.
RU-103	-2.245E+00	8.415E+00	1.519E+01	NOT IDENT.
RH-106	-3.916E+01	3.133E+01	4.423E+01	NOT IDENT.
RU-106	-3.916E+01	3.133E+01	4.423E+01	NOT IDENT.
AG-108M	4.329E+00	3.369E+00	7.259E+00	NOT IDENT.
CD-109	-7.103E+01	1.029E+02	1.636E+02	NOT IDENT.
AG-110M	-5.712E-01	5.347E+00	1.067E+01	FAIL ABUN
IN-111	0.000E+00	4.528E+05	0.000E+00	SHORT HLIF
SN-113	3.772E+00	6.192E+00	1.242E+01	NOT IDENT.
IN-114M	2.270E+00	2.901E+01	5.566E+01	NOT IDENT.
CD-115	0.000E+00	5.063E+07	0.000E+00	SHORT HLIF
SN-117M	-1.985E+01	3.591E+01	5.811E+01	NOT IDENT.
SB-122	0.000E+00	1.204E+06	0.000E+00	SHORT HLIF
I-123	0.000E+00	1.363E+27	0.000E+00	SHORT HLIF
TE-123M	1.300E+00	3.771E+00	6.767E+00	NOT IDENT.
SB-124	4.027E+00	1.477E+01	3.272E+01	NOT IDENT.
SB-125	7.125E+00	9.063E+00	1.912E+01	NOT IDENT.
TE-125M	-2.442E+02	1.864E+03	3.079E+03	NOT IDENT.
I-126	-7.917E+01	1.457E+02	2.479E+02	NOT IDENT.
SB-126	2.201E+01	9.804E+01	1.765E+02	NOT IDENT.
SN-126	-1.983E+00	9.310E+00	1.550E+01	FAIL ABUN
SB-127	0.000E+00	6.212E+04	0.000E+00	SHORT HLIF
TE-129	6.933E+01	9.979E+01	2.069E+02	NOT IDENT.
I-131	-1.904E+02	2.391E+02	4.075E+02	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	1.158E+05	0.000E+00	SHORT HLIF
BA-133	1.977E+00	5.124E+00	9.158E+00	NOT IDENT.
I-133	0.000E+00	3.468E+17	0.000E+00	SHORT HLIF
CS-134	-1.389E+00	3.384E+00	5.969E+00	NOT IDENT.
I-135	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
CS-136	2.617E+01	6.811E+01	1.441E+02	NOT IDENT.
BA-137M	8.593E-01	4.511E+00	7.826E+00	NOT IDENT.
CS-137	9.078E-01	4.765E+00	8.268E+00	NOT IDENT.
LA-138	9.079E-01	5.720E+00	1.236E+01	NOT IDENT.
CE-139	7.836E-01	3.946E+00	6.949E+00	NOT IDENT.
BA-140	1.036E+02	1.827E+02	3.709E+02	NOT IDENT.
LA-140	3.537E+00	5.334E+01	1.151E+02	NOT IDENT.
CE-141	-4.387E+00	1.547E+01	2.369E+01	NOT IDENT.
CE-143	0.000E+00	3.555E+11	0.000E+00	SHORT HLIF
CE-144	2.281E+01	2.178E+01	4.246E+01	NOT IDENT.
PM-144	-3.163E+00	4.266E+00	6.950E+00	FAIL ABUN
PR-144	-2.419E+02	3.248E+02	5.287E+02	NOT IDENT.
PM-146	4.394E+00	4.769E+00	9.966E+00	FAIL ABUN
ND-147	-4.292E+02	5.821E+02	9.725E+02	NOT IDENT.
PM-147	-6.063E+04	8.728E+04	1.408E+05	NOT IDENT.
PM-149	0.000E+00	3.859E+08	0.000E+00	SHORT HLIF
EU-152	2.380E+00	1.025E+01	1.991E+01	NOT IDENT.
GD-153	-8.566E+00	1.212E+01	1.869E+01	NOT IDENT.
EU-154	-2.881E+00	7.110E+00	1.394E+01	NOT IDENT.
EU-155	-1.333E+00	1.363E+01	2.293E+01	NOT IDENT.
TB-160	4.712E+00	1.927E+01	4.016E+01	NOT IDENT.
HO-166M	2.117E+00	6.485E+00	1.239E+01	NOT IDENT.
TM-171	-3.172E+03	3.796E+03	5.637E+03	NOT IDENT.
LU-176	-2.520E+00	2.927E+00	5.004E+00	NOT IDENT.
LU-177	3.965E+03	3.622E+03	7.547E+03	NOT IDENT.
HF-181	-4.376E+00	9.531E+00	1.464E+01	NOT IDENT.
W-181	-3.223E+01	3.760E+01	6.140E+01	NOT IDENT.
TA-182	-1.403E+01	2.033E+01	3.523E+01	NOT IDENT.
RE-183	-2.588E+01	4.252E+01	7.151E+01	FAIL ABUN
RE-184	-1.713E+01	2.140E+01	3.721E+01	NOT IDENT.
RE-188	3.955E+00	2.541E+01	4.461E+01	FAIL ABUN
W-188	-7.539E+02	1.218E+03	2.144E+03	FAIL ABUN
OS-191	3.242E+01	7.228E+01	1.332E+02	FAIL ABUN
IR-192	2.300E+00	5.541E+00	1.083E+01	NOT IDENT.

PB-201	0.000E+00	2.288E+38	0.000E+00	SHORT HLIF
TL-201	0.000E+00	1.804E+06	0.000E+00	SHORT HLIF
TL-202	-3.693E+00	4.996E+01	9.338E+01	NOT IDENT.
HG-203	4.494E+00	7.036E+00	1.402E+01	NOT IDENT.
PB-203	0.000E+00	2.130E+07	0.000E+00	SHORT HLIF
TL-204	-3.514E+01	6.337E+02	1.115E+03	NOT IDENT.
BI-207	-3.079E+00	5.490E+00	9.909E+00	NOT IDENT.
TL-208	-2.286E+00	4.633E+00	8.083E+00	NOT IDENT.
PB-210	6.611E+01	7.724E+02	1.408E+03	NOT IDENT.
PB-211	-4.110E+01	7.370E+01	1.293E+02	NOT IDENT.
BI-212	2.158E+01	5.277E+01	1.068E+02	NOT IDENT.
PB-212	3.549E+00	1.069E+01	1.486E+01	FAIL ABUN
BI-213	-2.849E+00	1.150E+01	2.097E+01	NOT IDENT.
BI-214	1.515E+00	1.061E+01	1.936E+01	NOT IDENT.
PB-214	1.486E+01	1.470E+01	1.962E+01	FAIL ABUN
RN-219	-7.485E+00	4.064E+01	7.542E+01	NOT IDENT.
FR-221	-5.713E+00	1.946E+01	3.615E+01	NOT IDENT.
RA-223	1.615E+00	6.861E+01	1.300E+02	FAIL ABUN
RA-224	2.007E+01	6.469E+01	1.160E+02	NOT IDENT.
AC-225	-1.684E+02	5.737E+02	1.066E+03	NOT IDENT.
RA-226	-5.672E+01	1.118E+02	2.104E+02	NOT IDENT.
AC-227	9.363E+00	2.651E+01	5.199E+01	NOT IDENT.
TH-227	9.363E+00	2.651E+01	5.199E+01	NOT IDENT.
AC-228	-9.469E+00	1.970E+01	3.637E+01	NOT IDENT.
RA-228	-9.469E+00	1.970E+01	3.637E+01	NOT IDENT.
TH-228	3.549E+00	1.069E+01	1.486E+01	FAIL ABUN
TH-229	-2.529E+01	4.774E+01	8.695E+01	NOT IDENT.
TH-230	-8.408E+02	1.641E+03	2.465E+03	NOT IDENT.
PA-231	4.362E+01	5.664E+01	1.132E+02	NOT IDENT.
TH-231	4.322E+00	5.619E+01	9.549E+01	NOT IDENT.
PA-233	-1.784E+00	6.615E+00	1.219E+01	NOT IDENT.
PA-234	-2.362E+00	2.803E+01	5.648E+01	NOT IDENT.
PA-234M	8.213E+02	7.806E+02	1.310E+03	FAIL ABUN
TH-234	6.312E+01	3.473E+02	4.234E+02	FAIL ABUN
U-234	-7.610E+03	1.231E+04	1.886E+04	NOT IDENT.
U-235	2.116E+01	3.956E+01	4.677E+01	FAIL ABUN
NP-237	-1.784E+00	6.615E+00	1.219E+01	NOT IDENT.
NP-238	0.000E+00	1.093E+08	0.000E+00	SHORT HLIF
U-238	6.312E+01	3.473E+02	4.234E+02	FAIL ABUN
NP-239	-3.742E+00	3.159E+01	5.433E+01	NOT IDENT.
AM-242	3.040E+01	8.074E+01	1.387E+02	NOT IDENT.
AM-243	9.538E-01	7.044E+00	1.202E+01	NOT IDENT.
CM-243	-9.034E-01	1.190E+01	2.074E+01	NOT IDENT.
BK-247	3.874E+00	7.889E+00	1.581E+01	NOT IDENT.
CM-247	-9.208E-01	3.678E+00	6.768E+00	NOT IDENT.
CF-249	-2.892E+00	4.308E+00	7.444E+00	NOT IDENT.
CF-251	-4.115E+00	1.372E+01	2.286E+01	NOT IDENT.
CF-252	7.052E+03	2.048E+04	3.719E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	60.01	16	88	1.42	119.58	106	30	2.20E-03	109.6	2.15E+00
2	3	63.36	45	87	1.43	126.29	106	30	6.27E-03	41.1	
3	0	92.86	144	121	1.21	185.36	181	10	2.00E-02	16.6	
4	0	143.81	39	80	0.95	287.36	282	10	5.42E-03	45.8	
5	0	171.21	26	50	1.02	342.23	338	8	3.63E-03	51.3	
6	0	185.85	104	71	1.07	371.54	368	9	1.45E-02	17.5	
7	0	238.84	44	45	1.05	477.63	472	9	6.12E-03	31.3	
8	0	351.60	37	36	1.11	703.42	698	11	5.13E-03	35.4	
9	0	470.17	14	17	2.01	940.83	937	8	1.97E-03	55.9	
10	0	477.45	26	31	0.78	955.42	951	10	3.66E-03	43.6	
11	0	511.30	212	20	2.45	1023.20	1016	19	2.94E-02	8.8	
12	0	657.55	13	6	0.88	1316.04	1312	8	1.84E-03	42.0	
13	0	718.34	25	11	4.38	1437.79	1431	15	3.52E-03	34.9	
14	0	745.93	10	4	0.73	1493.04	1490	6	1.35E-03	46.9	
15	0	821.48	8	3	0.94	1644.32	1641	6	1.15E-03	47.6	
16	0	1000.78	25	7	1.02	2003.39	1996	14	3.53E-03	29.6	
17	0	1014.50	6	7	0.76	2030.87	2026	9	8.39E-04	87.9	
18	0	1346.43	8	0	0.96	2695.63	2693	6	1.11E-03	35.4	
19	0	1460.68	36	0	2.16	2924.44	2919	11	5.00E-03	16.7	
20	0	1578.77	12	3	1.85	3160.96	3153	13	1.62E-03	43.2	
21	0	1709.35	8	0	1.19	3422.50	3418	9	1.11E-03	35.4	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	26	10.44*	2.088E+00	5.970E+01	1.127E+02	87.20
K-40	1460.82	24	10.66*	8.567E-01	1.274E+02	1.274E+02	57.75
AG-110	657.50	13	4.50*	1.654E+00	8.798E+01	1.007E+02	83.96
BI-211	72.87	-----	1.23	2.321E+00	-----	Line Not Found	-----
	351.06	27	12.92*	2.560E+00	4.093E+01	4.110E+01	100.96
TH-232	63.81	7	0.26*	1.496E+00	8.983E+02	8.983E+02	561.41
	140.88	-----	0.02	4.179E+00	-----	Line Not Found	-----
AM-241	59.54	16	35.90*	1.203E+00	1.808E+01	1.808E+01	219.30
ANH-511	511.00	46	100.00*	1.991E+00	1.149E+01	1.149E+01	86.50

Flag: "*" = Keyline

Total number of lines in spectrum 19
Number of unidentified lines 7
Number of lines tentatively identified by NID 12 63.16%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.89	5.970E+01	1.127E+02	0.983E+02	87.20	
K-40	1.25E+09Y	1.00	1.274E+02	1.274E+02	0.736E+02	57.75	
AG-110	249.76D	1.15	8.798E+01	1.007E+02	0.846E+02	83.96	
BI-211	21.77Y	1.00	4.093E+01	4.110E+01	4.150E+01	100.96	
TH-232	1.41E+10Y	1.00	8.983E+02	8.983E+02	50.43E+02	561.41	
AM-241	432.60Y	1.00	1.808E+01	1.808E+01	3.966E+01	219.30	
ANH-511	1.00E+09Y	1.00	1.149E+01	1.149E+01	0.994E+01	86.50	
Total Activity :			1.244E+03	1.310E+03			

Grand Total Activity : 1.244E+03 1.310E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	143.81	20	80	0.95	287.36	282	10	2.72E-03	****	4.16E+00	T
0	171.21	26	50	1.02	342.23	338	8	3.63E-03	****	3.93E+00	T
0	238.84	10	45	1.05	477.63	472	9	1.36E-03	****	3.27E+00	T
0	470.17	14	17	2.01	940.83	937	8	1.97E-03	****	2.11E+00	
0	718.34	25	11	4.38	1437.79	1431	15	3.52E-03	69.8	1.54E+00	
0	745.93	10	4	0.73	1493.04	1490	6	1.35E-03	93.8	1.50E+00	T
0	821.48	8	3	0.94	1644.32	1641	6	1.15E-03	95.2	1.38E+00	
0	1000.78	16	7	1.02	2003.39	1996	14	2.26E-03	97.0	1.17E+00	T
0	1014.50	6	7	0.76	2030.87	2026	9	8.39E-04	****	1.15E+00	
0	1346.43	8	0	0.96	2695.63	2693	6	1.11E-03	70.7	9.10E-01	
0	1578.77	12	3	1.85	3160.96	3153	13	1.62E-03	86.4	8.15E-01	
0	1709.35	8	0	1.19	3422.50	3418	9	1.11E-03	70.7	7.81E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287003.CNF;1  *
* Acquisition date   : 17-MAY-2022 07:57:56 Sensitivity      : 3.000          *
* Detector ID        : GAM33 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000      *
* Elapsed real time  : 0 02:00:01.52 Half life ratio  : *****          *
* Sample date        : 29-MAR-2022 13:22:00 Nuclide Library : LIQUID       *
* Sample ID          : G579287003 Analyst initials:  RXF2          *
* Batch Number       : 2264689 Sample Quantity  : 7.6021E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight       : 0.00000         *
*                                     Dry Weight    : 0.00000         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 27-JUL-2021 10:51:23 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM33_JAR.CNF;12          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	4.804E+01
K-40	2.541E+01
AG-110	5.841E+01
BI-211	1.728E+01
TH-232	2.047E+03
AM-241	1.951E+01
ANH-511	1.850E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	1.799E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.823E+00	NOT IDENT.
SC-46	4.842E+00	NOT IDENT.
V-48	2.789E+01	NOT IDENT.
CR-51	7.609E+01	NOT IDENT.
MN-52	1.490E+03	NOT IDENT.
MN-54	3.869E+00	NOT IDENT.
CO-56	4.398E+00	NOT IDENT.
CO-57	2.233E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	4.327E+00	NOT IDENT.
FE-59	1.132E+01	NOT IDENT.
CO-60	2.851E+00	NOT IDENT.
ZN-65	8.318E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	1.041E+02	NOT IDENT.
AS-73	1.533E+02	NOT IDENT.
AS-74	3.159E+01	NOT IDENT.
SE-75	4.909E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	5.761E+01	NOT IDENT.
RB-83	6.541E+00	NOT IDENT.
RB-84	1.268E+01	NOT IDENT.

KR-85	8.723E+02	NOT IDENT.
SR-85	6.528E+00	NOT IDENT.
RB-86	2.067E+02	NOT IDENT.
Y-88	3.628E+00	NOT IDENT.
Y-91	1.817E+03	NOT IDENT.
NB-94	3.515E+00	NOT IDENT.
NB-95	6.565E+00	NOT IDENT.
NB-95M	1.345E+01	NOT IDENT.
TC-95M	6.096E+00	NOT IDENT.
ZR-95	9.275E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.436E+00	NOT IDENT.
RH-102M	3.066E+00	NOT IDENT.
RU-103	6.742E+00	NOT IDENT.
RH-106	1.785E+01	NOT IDENT.
RU-106	1.785E+01	NOT IDENT.
AG-108M	3.300E+00	NOT IDENT.
CD-109	7.604E+01	NOT IDENT.
AG-110M	4.527E+00	FAIL ABUN
IN-111	0.000E+00	SHORT HLIF
SN-113	5.633E+00	NOT IDENT.
IN-114M	2.556E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	2.677E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	3.124E+00	NOT IDENT.
SB-124	1.322E+01	NOT IDENT.
SB-125	8.534E+00	NOT IDENT.
TE-125M	1.431E+03	NOT IDENT.
I-126	1.070E+02	NOT IDENT.
SB-126	7.580E+01	NOT IDENT.
SN-126	7.210E+00	FAIL ABUN
SB-127	0.000E+00	SHORT HLIF
TE-129	9.242E+01	NOT IDENT.
I-131	1.816E+02	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	4.153E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	2.409E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	6.231E+01	NOT IDENT.
BA-137M	3.462E+00	NOT IDENT.
CS-137	3.657E+00	NOT IDENT.
LA-138	5.003E+00	NOT IDENT.
CE-139	3.208E+00	NOT IDENT.
BA-140	1.653E+02	NOT IDENT.
LA-140	4.524E+01	NOT IDENT.
CE-141	1.091E+01	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.962E+01	NOT IDENT.
PM-144	3.010E+00	FAIL ABUN
PR-144	2.289E+02	NOT IDENT.
PM-146	4.502E+00	FAIL ABUN
ND-147	4.291E+02	NOT IDENT.
PM-147	6.466E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.984E+00	NOT IDENT.
GD-153	8.643E+00	NOT IDENT.
EU-154	4.938E+00	NOT IDENT.
EU-155	1.066E+01	NOT IDENT.
TB-160	1.737E+01	NOT IDENT.
HO-166M	5.403E+00	NOT IDENT.
TM-171	2.574E+03	NOT IDENT.
LU-176	2.248E+00	NOT IDENT.
LU-177	3.481E+03	NOT IDENT.
HF-181	6.431E+00	NOT IDENT.
W-181	2.794E+01	NOT IDENT.
TA-182	1.424E+01	NOT IDENT.
RE-183	3.271E+01	FAIL ABUN
RE-184	1.503E+01	NOT IDENT.
RE-188	2.061E+01	FAIL ABUN
W-188	9.794E+02	FAIL ABUN
OS-191	6.122E+01	FAIL ABUN
IR-192	4.952E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF

TL-201	0.000E+00	SHORT HLIF
TL-202	4.154E+01	NOT IDENT.
HG-203	6.443E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	5.173E+02	NOT IDENT.
BI-207	4.144E+00	NOT IDENT.
TL-208	3.587E+00	NOT IDENT.
PB-210	6.478E+02	NOT IDENT.
PB-211	5.706E+01	NOT IDENT.
BI-212	4.652E+01	NOT IDENT.
PB-212	6.944E+00	FAIL ABUN
BI-213	9.321E+00	NOT IDENT.
BI-214	8.848E+00	NOT IDENT.
PB-214	9.081E+00	FAIL ABUN
RN-219	3.339E+01	NOT IDENT.
FR-221	1.639E+01	NOT IDENT.
RA-223	5.878E+01	FAIL ABUN
RA-224	5.277E+01	NOT IDENT.
AC-225	4.831E+02	NOT IDENT.
RA-226	1.003E+02	NOT IDENT.
AC-227	2.375E+01	NOT IDENT.
TH-227	2.375E+01	NOT IDENT.
AC-228	1.611E+01	NOT IDENT.
RA-228	1.611E+01	NOT IDENT.
TH-228	6.944E+00	FAIL ABUN
TH-229	3.940E+01	NOT IDENT.
TH-230	1.139E+03	NOT IDENT.
PA-231	5.221E+01	NOT IDENT.
TH-231	4.454E+01	NOT IDENT.
PA-233	5.468E+00	NOT IDENT.
PA-234	2.371E+01	NOT IDENT.
PA-234M	5.871E+02	FAIL ABUN
TH-234	1.997E+02	FAIL ABUN
U-234	8.594E+03	NOT IDENT.
U-235	2.193E+01	FAIL ABUN
NP-237	5.468E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.997E+02	FAIL ABUN
NP-239	2.515E+01	NOT IDENT.
AM-242	6.455E+01	NOT IDENT.
AM-243	5.609E+00	NOT IDENT.
CM-243	9.559E+00	NOT IDENT.
BK-247	7.183E+00	NOT IDENT.
CM-247	2.989E+00	NOT IDENT.
CF-249	3.301E+00	NOT IDENT.
CF-251	1.043E+01	NOT IDENT.
CF-252	1.722E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287003.CNF;1
* Acquisition date   : 17-MAY-2022 07:57:56 Sensitivity      : 3.000
* Detector ID        : GAM33 Energy tolerance: 1.500
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 02:00:01.52 Half life ratio  : *****
* Sample date        : 29-MAR-2022 13:22:00 Nuclide Library : LIQUID
* Sample ID          : G579287003 Analyst initials: RXF2
* Batch Number       : 2264689 Sample Quantity : 7.6021E-01 FILTER
* Quantity Err(%)    : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
* Dry Weight         : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 27-JUL-2021 10:51:23 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM33_JAR.CNF;12

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.127E+02	9.682E+01	9.685E+01
K-40	1.274E+02	7.305E+01	7.309E+01
AG-110	1.007E+02	8.330E+01	8.333E+01
BI-211	4.110E+01	4.082E+01	4.083E+01
TH-232	8.983E+02	4.944E+03	4.944E+03
AM-241	1.808E+01	3.892E+01	3.892E+01
ANH-511	1.149E+01	9.790E+00	9.792E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-4.743E-01	2.348E+00	2.358E+00	NOT IDENT.
NA-24	-9.986E+23	1.425E+24	0.000E+00	SHORT HLIF
AL-26	-3.378E+00	4.587E+00	4.834E+00	NOT IDENT.
SC-46	1.992E+00	5.248E+00	5.325E+00	NOT IDENT.
V-48	2.564E+01	2.737E+01	2.972E+01	NOT IDENT.
CR-51	-5.854E+01	9.615E+01	9.971E+01	NOT IDENT.
MN-52	-5.155E+02	1.914E+03	1.928E+03	NOT IDENT.
MN-54	7.535E-01	4.649E+00	4.662E+00	NOT IDENT.
CO-56	-1.666E+00	5.831E+00	5.879E+00	NOT IDENT.
CO-57	-2.127E+00	3.036E+00	3.185E+00	NOT IDENT.
NI-57	-8.830E+09	4.339E+10	4.357E+10	SHORT HLIF
CO-58	-1.885E+00	5.781E+00	5.843E+00	NOT IDENT.
FE-59	-4.327E+00	1.427E+01	1.441E+01	NOT IDENT.
CO-60	-5.238E-01	3.549E+00	3.557E+00	NOT IDENT.
ZN-65	4.153E+00	8.927E+00	9.121E+00	NOT IDENT.
CU-67	-8.916E+06	3.906E+06	5.607E+06	SHORT HLIF
GE-68	-6.665E+01	1.367E+02	1.400E+02	NOT IDENT.
AS-73	-1.084E+02	2.170E+02	2.224E+02	NOT IDENT.
AS-74	2.152E+01	3.452E+01	3.586E+01	NOT IDENT.
SE-75	6.531E-01	5.620E+00	5.628E+00	NOT IDENT.
BR-77	9.730E+06	2.932E+07	2.965E+07	SHORT HLIF
SR-82	-4.074E+01	8.566E+01	8.761E+01	NOT IDENT.
RB-83	3.591E+00	7.090E+00	7.273E+00	NOT IDENT.

RB-84	2.876E+00	1.414E+01	1.420E+01	NOT IDENT.
KR-85	1.806E+03	8.382E+02	1.169E+03	NOT IDENT.
SR-85	1.351E+01	6.273E+00	8.748E+00	NOT IDENT.
RB-86	-8.309E+01	2.613E+02	2.640E+02	NOT IDENT.
Y-88	-1.238E+00	4.924E+00	4.956E+00	NOT IDENT.
Y-91	8.077E+02	1.894E+03	1.929E+03	NOT IDENT.
NB-94	1.995E+00	3.982E+00	4.083E+00	NOT IDENT.
NB-95	2.934E+00	7.685E+00	7.798E+00	NOT IDENT.
NB-95M	7.174E+00	1.614E+01	1.646E+01	NOT IDENT.
TC-95M	3.932E-01	6.954E+00	6.956E+00	NOT IDENT.
ZR-95	4.657E+00	1.045E+01	1.066E+01	NOT IDENT.
MO-99	-3.752E+06	6.697E+06	6.908E+06	SHORT HLIF
TC-99M	-1.000E+41	4.820E+41	0.000E+00	SHORT HLIF
RH-101	-9.425E-01	3.159E+00	3.188E+00	NOT IDENT.
RH-102M	3.357E+00	3.460E+00	3.777E+00	NOT IDENT.
RU-103	-2.245E+00	8.417E+00	8.478E+00	NOT IDENT.
RH-106	-3.916E+01	3.155E+01	3.616E+01	NOT IDENT.
RU-106	-3.916E+01	3.155E+01	3.616E+01	NOT IDENT.
AG-108M	4.329E+00	3.388E+00	3.911E+00	NOT IDENT.
CD-109	-7.103E+01	1.032E+02	1.080E+02	NOT IDENT.
AG-110M	-5.712E-01	5.347E+00	5.353E+00	FAIL ABUN
IN-111	-1.113E+05	4.529E+05	4.557E+05	SHORT HLIF
SN-113	3.772E+00	6.200E+00	6.429E+00	NOT IDENT.
IN-114M	2.270E+00	2.901E+01	2.903E+01	NOT IDENT.
CD-115	-3.327E+05	5.063E+07	5.063E+07	SHORT HLIF
SN-117M	-1.985E+01	3.595E+01	3.705E+01	NOT IDENT.
SB-122	-1.486E+05	1.204E+06	1.206E+06	SHORT HLIF
I-123	4.578E+26	1.363E+27	0.000E+00	SHORT HLIF
TE-123M	1.300E+00	3.773E+00	3.818E+00	NOT IDENT.
SB-124	4.027E+00	1.477E+01	1.488E+01	NOT IDENT.
SB-125	7.125E+00	9.083E+00	9.635E+00	NOT IDENT.
TE-125M	-2.442E+02	1.864E+03	1.868E+03	NOT IDENT.
I-126	-7.917E+01	1.459E+02	1.502E+02	NOT IDENT.
SB-126	2.201E+01	9.807E+01	9.858E+01	NOT IDENT.
SN-126	-1.983E+00	9.312E+00	9.355E+00	FAIL ABUN
SB-127	-3.458E+04	6.266E+04	6.458E+04	SHORT HLIF
TE-129	6.933E+01	1.005E+02	1.053E+02	NOT IDENT.
I-131	-1.904E+02	2.397E+02	2.546E+02	NOT IDENT.
I-132	1.000E+41	4.903E+41	0.000E+00	SHORT HLIF
TE-132	4.824E+04	1.159E+05	1.179E+05	SHORT HLIF
BA-133	1.977E+00	5.126E+00	5.203E+00	NOT IDENT.
I-133	1.920E+17	3.519E+17	0.000E+00	SHORT HLIF
CS-134	-1.389E+00	3.386E+00	3.444E+00	NOT IDENT.
I-135	1.000E+41	2.322E+41	0.000E+00	SHORT HLIF
CS-136	2.617E+01	6.818E+01	6.919E+01	NOT IDENT.
BA-137M	8.593E-01	4.511E+00	4.528E+00	NOT IDENT.
CS-137	9.078E-01	4.766E+00	4.783E+00	NOT IDENT.
LA-138	9.079E-01	5.720E+00	5.735E+00	NOT IDENT.
CE-139	7.836E-01	3.949E+00	3.965E+00	NOT IDENT.
BA-140	1.036E+02	1.829E+02	1.888E+02	NOT IDENT.
LA-140	3.537E+00	5.334E+01	5.337E+01	NOT IDENT.
CE-141	-4.387E+00	1.547E+01	1.560E+01	NOT IDENT.
CE-143	-1.471E+11	3.557E+11	3.618E+11	SHORT HLIF
CE-144	2.281E+01	2.188E+01	2.418E+01	NOT IDENT.
PM-144	-3.163E+00	4.275E+00	4.506E+00	FAIL ABUN
PR-144	-2.419E+02	3.254E+02	3.433E+02	NOT IDENT.
PM-146	4.394E+00	4.790E+00	5.184E+00	FAIL ABUN
ND-147	-4.292E+02	5.833E+02	6.146E+02	NOT IDENT.
PM-147	-6.063E+04	8.743E+04	9.161E+04	NOT IDENT.
PM-149	-2.149E+08	3.872E+08	3.992E+08	SHORT HLIF
EU-152	2.380E+00	1.025E+01	1.031E+01	NOT IDENT.
GD-153	-8.566E+00	1.214E+01	1.274E+01	NOT IDENT.
EU-154	-2.881E+00	7.114E+00	7.232E+00	NOT IDENT.
EU-155	-1.333E+00	1.363E+01	1.364E+01	NOT IDENT.
TB-160	4.712E+00	1.928E+01	1.939E+01	NOT IDENT.
HO-166M	2.117E+00	6.488E+00	6.558E+00	NOT IDENT.
TM-171	-3.172E+03	3.819E+03	4.079E+03	NOT IDENT.
LU-176	-2.520E+00	2.934E+00	3.147E+00	NOT IDENT.
LU-177	3.965E+03	3.638E+03	4.054E+03	NOT IDENT.
HF-181	-4.376E+00	9.539E+00	9.741E+00	NOT IDENT.
W-181	-3.223E+01	3.861E+01	4.126E+01	NOT IDENT.
TA-182	-1.403E+01	2.037E+01	2.133E+01	NOT IDENT.
RE-183	-2.588E+01	4.267E+01	4.424E+01	FAIL ABUN
RE-184	-1.713E+01	2.150E+01	2.284E+01	NOT IDENT.
RE-188	3.955E+00	2.541E+01	2.547E+01	FAIL ABUN
W-188	-7.539E+02	1.222E+03	1.268E+03	FAIL ABUN
OS-191	3.242E+01	7.234E+01	7.380E+01	FAIL ABUN
IR-192	2.300E+00	5.544E+00	5.640E+00	NOT IDENT.

PB-201	-1.479E+37	2.290E+38	0.000E+00	SHORT HLIF
TL-201	-2.744E+04	1.804E+06	1.804E+06	SHORT HLIF
TL-202	-3.693E+00	4.996E+01	4.998E+01	NOT IDENT.
HG-203	4.494E+00	7.045E+00	7.331E+00	NOT IDENT.
PB-203	1.360E+07	2.133E+07	2.219E+07	SHORT HLIF
TL-204	-3.514E+01	6.337E+02	6.339E+02	NOT IDENT.
BI-207	-3.079E+00	5.497E+00	5.670E+00	NOT IDENT.
TL-208	-2.286E+00	4.637E+00	4.750E+00	NOT IDENT.
PB-210	6.611E+01	7.724E+02	7.730E+02	NOT IDENT.
PB-211	-4.110E+01	7.379E+01	7.608E+01	NOT IDENT.
BI-212	2.158E+01	5.281E+01	5.370E+01	NOT IDENT.
PB-212	3.549E+00	1.070E+01	1.082E+01	FAIL ABUN
BI-213	-2.849E+00	1.151E+01	1.158E+01	NOT IDENT.
BI-214	1.515E+00	1.061E+01	1.064E+01	NOT IDENT.
PB-214	1.486E+01	1.475E+01	1.620E+01	FAIL ABUN
RN-219	-7.485E+00	4.066E+01	4.080E+01	NOT IDENT.
FR-221	-5.713E+00	1.947E+01	1.964E+01	NOT IDENT.
RA-223	1.615E+00	6.861E+01	6.862E+01	FAIL ABUN
RA-224	2.007E+01	6.472E+01	6.535E+01	NOT IDENT.
AC-225	-1.684E+02	5.740E+02	5.790E+02	NOT IDENT.
RA-226	-5.672E+01	1.120E+02	1.148E+02	NOT IDENT.
AC-227	9.363E+00	2.655E+01	2.688E+01	NOT IDENT.
TH-227	9.363E+00	2.655E+01	2.688E+01	NOT IDENT.
AC-228	-9.469E+00	1.972E+01	2.018E+01	NOT IDENT.
RA-228	-9.469E+00	1.972E+01	2.018E+01	NOT IDENT.
TH-228	3.549E+00	1.070E+01	1.082E+01	FAIL ABUN
TH-229	-2.529E+01	4.779E+01	4.914E+01	NOT IDENT.
TH-230	-8.408E+02	1.648E+03	1.691E+03	NOT IDENT.
PA-231	4.362E+01	5.748E+01	6.075E+01	NOT IDENT.
TH-231	4.322E+00	5.619E+01	5.622E+01	NOT IDENT.
PA-233	-1.784E+00	6.616E+00	6.665E+00	NOT IDENT.
PA-234	-2.362E+00	2.816E+01	2.818E+01	NOT IDENT.
PA-234M	8.213E+02	7.843E+02	8.675E+02	FAIL ABUN
TH-234	6.312E+01	3.476E+02	3.488E+02	FAIL ABUN
U-234	-7.610E+03	1.235E+04	1.282E+04	NOT IDENT.
U-235	2.116E+01	3.960E+01	4.074E+01	FAIL ABUN
NP-237	-1.784E+00	6.616E+00	6.665E+00	NOT IDENT.
NP-238	9.667E+07	1.097E+08	1.180E+08	SHORT HLIF
U-238	6.312E+01	3.476E+02	3.488E+02	FAIL ABUN
NP-239	-3.742E+00	3.159E+01	3.164E+01	NOT IDENT.
AM-242	3.040E+01	8.093E+01	8.209E+01	NOT IDENT.
AM-243	9.538E-01	7.045E+00	7.058E+00	NOT IDENT.
CM-243	-9.034E-01	1.190E+01	1.191E+01	NOT IDENT.
BK-247	3.874E+00	7.931E+00	8.122E+00	NOT IDENT.
CM-247	-9.208E-01	3.682E+00	3.705E+00	NOT IDENT.
CF-249	-2.892E+00	4.320E+00	4.513E+00	NOT IDENT.
CF-251	-4.115E+00	1.373E+01	1.385E+01	NOT IDENT.
CF-252	7.052E+03	2.145E+04	2.169E+04	NOT IDENT.

* GEL Laboratories LLC *
* 2040 Savage Road *
* Charleston, SC 29407 *
* GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	46.4663	133.52	42.0870	116.30	0.0000
879.38	39.4260	364.49	42.0916	116.74	54.8300
46.54	42.6289	80.22	0.0000	117.23	53.6967
228.16	0.0000	711.68	48.7675	119.76	49.1829
52.39	44.8292	356.01	59.8918	120.54	51.5749
53.20	47.8158	323.87	53.2434	120.90	53.9431
53.44	47.8395	82.35	0.0000	264.66	56.3038
57.53	49.8853	82.47	58.9202	121.22	56.3108
293.27	0.0000	82.47	0.0000	344.28	51.6538
57.53	50.0094	83.79	51.2443	122.06	51.6716
482.18	50.0096	265.00	43.4605	1274.44	44.6806
57.98	50.0537	84.21	49.0485	123.68	32.9471
59.32	50.1847	84.86	0.0000	1377.63	0.0000
59.54	50.2061	193.51	62.5433	127.23	40.1788
155.04	50.3938	105.31	62.6509	129.43	35.5449
63.00	50.5370	86.79	66.0315	131.20	49.8660
129.43	50.5644	86.94	60.4497	133.02	30.9353
63.29	50.5644	87.09	58.2239	133.52	30.9532
290.67	50.5916	87.57	54.9052	135.34	0.0000
63.81	50.6132	88.03	65.0349	136.00	42.9807
87.57	50.6572	306.78	56.0909	136.28	44.1887
64.99	50.7232	88.47	56.1020	136.47	44.1983
65.08	50.7317	531.02	167.8455	739.50	0.0000
66.73	50.8838	184.58	0.0000	140.51	0.0000
66.98	49.1015	92.59	56.4468	140.88	40.0172
67.24	49.1244	93.31	0.0000	143.76	37.3352
67.67	53.4999	94.56	152.8442	144.24	37.3551
1221.41	53.5074	311.90	163.0558	145.44	51.4811
439.51	56.5144	946.00	163.0602	152.32	46.1913
70.82	56.5144	97.43	60.2530	152.43	46.1971
167.43	0.0000	98.43	48.9537	1048.07	36.5030
97.43	56.5921	98.44	48.9544	154.21	56.0281
70.82	0.0000	99.53	44.4686	155.04	46.3241
70.82	56.7056	103.37	44.4686	158.56	39.0498
279.20	0.0000	116.74	44.4686	158.97	0.0000
1063.66	60.1827	100.11	45.6458	159.00	41.6191
72.87	0.0000	100.20	45.6516	162.33	57.7295
351.06	59.0946	102.03	53.7765	537.26	44.2332
74.66	53.7855	103.18	43.5476	163.33	40.5742
238.63	53.7997	103.37	48.1443	165.86	44.3760
351.93	53.7997	105.31	45.9726	167.43	0.0000
238.63	53.7997	106.12	46.0228	245.35	0.0000
74.97	57.1083	106.47	51.7999	427.87	41.0979
77.11	55.1071	109.28	47.3722	176.60	42.3553
256.23	38.7373	111.00	56.7434	177.52	42.3926
79.82	0.0000	111.76	0.0000	181.07	0.0000
80.02	42.0800	208.37	38.3118	184.41	84.5037
80.03	42.0806	116.24	55.9614	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	39.3713	300.09	31.1494	477.60	23.2850
186.21	44.4179	300.13	31.1508	477.99	23.2892
190.27	41.2196	301.36	33.9272	482.18	24.3506
193.51	39.6539	302.85	34.8782	487.02	24.4067
197.03	48.2433	304.50	38.5923	492.35	0.0000
198.01	46.5914	304.85	26.6530	497.08	24.5225
201.83	48.4492	306.78	39.5706	511.00	10.2835
204.12	46.8427	308.46	29.4805	514.00	10.2974
205.31	46.0388	311.90	29.5469	520.40	7.2293
208.37	29.0641	316.51	31.4876	520.69	0.0000
210.85	44.5457	319.41	31.5457	667.71	0.0000
215.65	33.5454	320.08	37.1289	527.90	0.0000
218.12	36.2006	321.04	31.5789	529.59	14.5178
222.11	41.5093	323.87	29.7747	529.87	0.0000
227.09	48.6252	325.23	26.0757	531.02	29.0550
227.38	48.6366	1596.21	28.0005	537.26	15.6079
228.16	0.0000	331.15	0.0000	1260.41	0.0000
228.18	39.9772	333.37	29.0171	552.55	12.5698
235.69	24.9178	334.37	28.0981	795.86	18.9412
235.96	24.9233	338.28	29.1054	564.24	0.0000
238.63	37.6823	911.20	29.1060	569.33	22.1553
238.98	0.0000	340.48	32.9051	569.50	26.3774
240.99	28.9727	340.55	32.9065	569.70	26.3794
242.00	27.6772	344.28	25.4427	582.08	15.9094
244.70	29.0559	345.93	22.6382	583.19	11.6723
245.35	0.0000	351.06	24.6009	595.83	11.7332
459.60	37.1482	351.93	24.6136	600.60	20.3058
685.70	0.0000	356.01	25.6223	604.72	24.6219
388.16	44.2968	361.25	0.0000	609.32	24.6677
256.23	31.9761	364.49	34.3337	610.33	28.9688
527.90	0.0000	366.42	0.0000	614.28	22.5671
264.66	32.1753	383.85	17.3584	618.01	10.7621
265.00	25.9255	388.16	29.9669	621.93	18.3240
269.46	41.2570	666.33	27.0743	630.19	0.0000
401.81	39.5133	391.70	23.2461	631.29	14.0643
273.65	37.7822	400.66	17.5206	632.98	20.5694
276.40	38.7579	401.32	0.0000	633.25	20.5710
583.19	38.7842	401.81	22.4015	634.78	17.3333
277.60	31.5742	402.40	22.4085	635.95	10.8382
402.40	27.9733	404.85	26.3408	636.99	10.8427
278.43	27.0795	410.95	32.3004	657.50	10.9281
279.20	0.0000	720.70	30.4034	884.68	14.7546
279.54	33.4236	423.72	24.6358	661.66	13.1348
280.46	40.6769	427.09	9.8716	664.57	0.0000
301.36	31.7088	427.87	13.8260	666.33	19.7366
284.31	34.4421	433.94	15.8506	666.50	18.6415
285.41	36.2826	439.51	22.8503	667.71	0.0000
285.90	0.0000	440.45	24.8494	677.62	13.2134
287.50	29.0677	453.88	17.0121	685.70	0.0000
290.67	48.2480	459.60	15.0534	692.65	0.0000
293.27	0.0000	463.37	17.0923	695.00	19.9468
295.22	40.1794	468.07	16.6276	696.49	23.2841
316.51	38.3727	473.00	0.0000	696.51	23.2841
298.58	45.7621	475.06	13.6505	697.00	18.8525
299.98	33.8956	696.49	23.2756	697.49	16.6370

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	16.6681	903.28	12.4589	1291.59	8.8528
706.68	20.0310	907.67	0.0000	1298.22	0.0000
711.68	12.0401	911.20	15.1640	1312.11	4.9408
720.70	10.0657	984.45	0.0000	1332.49	5.9557
721.93	0.0000	926.36	8.9600	1365.19	6.9979
1690.97	15.1095	935.54	11.6789	1368.63	0.0000
722.91	15.1100	937.49	7.1912	1377.63	0.0000
723.31	16.7914	983.53	5.4036	1384.29	7.0269
756.73	8.3984	945.96	0.0000	1408.01	6.0531
727.33	11.2101	946.00	9.9120	1434.09	9.1296
733.00	11.2325	949.00	10.8226	1435.80	5.0739
735.93	14.6171	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	10.8636	1460.82	4.0798
1434.09	6.7659	964.08	12.6807	1489.16	3.0776
747.24	11.8527	966.17	11.7816	1596.21	4.1902
752.31	9.0462	968.97	9.0701	1620.50	4.2095
753.82	12.4448	983.53	4.5537	1678.03	0.0000
756.73	10.1924	984.45	0.0000	1690.97	4.2646
763.94	22.7051	996.26	11.6984	1757.55	0.0000
765.80	13.6318	1001.03	10.9819	1764.49	3.2408
1001.03	13.6343	1004.73	4.3972	1770.23	4.3254
766.84	14.7726	1025.87	0.0000	1771.35	2.1631
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	11.4006	1037.84	9.2432	1808.65	8.7085
777.92	0.0000	1038.76	0.0000	1836.06	4.3748
778.90	12.5509	1046.59	14.8242		
783.70	0.0000	1048.07	10.1957		
1435.80	11.4469	1050.41	9.2743		
903.28	8.0217	1063.66	13.9600		
795.86	9.1790	1077.00	10.2729		
801.95	5.7485	1077.34	12.1423		
802.10	5.7487	1083.85	10.2917		
810.29	13.8335	1085.87	8.4249		
810.45	13.8345	1099.25	10.3320		
810.76	13.8359	1111.64	11.3071		
815.77	10.3934	1112.07	12.2510		
818.51	3.4675	1112.84	8.4831		
832.01	6.9651	1115.54	7.5454		
834.85	15.1048	1120.29	7.5547		
835.15	15.1058	1120.55	7.5552		
836.80	0.0000	1121.30	6.6121		
846.77	13.9951	1808.65	1.8931		
856.80	16.6714	1131.51	0.0000		
860.56	15.8121	1332.49	7.6543		
871.09	8.8132	1177.95	9.5789		
873.19	7.0549	1189.05	5.7627		
875.33	0.0000	1204.77	2.8922		
879.38	11.4861	1221.41	11.6140		
880.51	15.0255	1231.02	3.8801		
881.60	10.6095	1235.36	9.7101		
883.24	12.3842	1238.28	8.7451		
884.68	11.5043	1260.41	0.0000		
889.28	9.7482	1271.87	4.8962		
894.76	15.0898	1274.44	3.9192		
1836.06	13.3278	1274.54	2.9396		

VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 09:58:57.38

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                   *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287004.CNF:1
Background file : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM38.CNF:5
Background date : 15-MAY-2022 09:13:42
Sample date     : 29-MAR-2022 13:31:00 Acquisition date : 17-MAY-2022 07:58:19
Sample ID      : G579287004 Sample quantity : 7.67880E-01 FILTER
Detector name   : GAM38 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:00.31 0.0%
Energy tolerance: 1.50000 keV Analyst Initials : RXF2
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2264689 Detector SN# :
Matrix Spike ID : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.73*	40	98	0.95	93.56	89	10	5.54E-03	56.6	
2	0	63.88*	5	88	0.96	127.88	123	10	6.74E-04	426.4	
3	0	75.04*	5	60	1.03	150.21	147	6	7.28E-04	280.3	
4	0	84.82*	6	75	0.89	169.79	166	7	7.85E-04	289.5	
5	0	163.62	21	60	0.61	327.44	322	10	2.98E-03	70.9	
6	0	186.44*	20	65	1.16	373.10	367	11	2.81E-03	90.1	
7	4	236.95	12	23	1.40	474.14	472	18	1.64E-03	59.9	1.77E+00
8	4	238.77*	25	49	1.45	477.79	472	18	3.54E-03	58.7	
9	0	248.09	17	42	0.81	496.43	491	9	2.40E-03	72.2	
10	0	258.69	14	15	1.07	517.63	515	6	1.96E-03	49.7	
11	0	344.50	27	45	0.59	689.30	681	15	3.75E-03	57.5	
12	0	478.69	21	47	0.75	957.73	952	14	2.88E-03	74.6	
13	0	559.62	11	9	1.77	1119.60	1115	8	1.51E-03	58.0	
14	5	580.27*	4	6	1.73	1160.90	1159	13	5.90E-04	116.8	2.59E+00
15	5	583.70*	11	12	1.93	1167.77	1159	13	1.57E-03	65.6	
16	0	613.44	8	18	2.29	1227.24	1221	10	1.18E-03	103.0	
17	0	656.44	14	6	1.89	1313.25	1310	7	1.87E-03	39.3	
18	0	684.15	6	18	1.77	1368.67	1360	11	7.99E-04	152.5	
19	0	763.14	11	11	3.93	1526.64	1520	11	1.53E-03	65.7	
20	0	783.96	9	16	1.42	1568.28	1560	15	1.28E-03	97.8	
21	0	805.18*	40	0	8.41	1610.71	1598	25	5.57E-03	18.5	
22	0	826.60	13	0	3.16	1653.54	1649	9	1.81E-03	27.7	
23	0	830.17	13	0	1.66	1660.69	1658	6	1.81E-03	27.7	
24	0	1407.74	9	0	0.56	2815.44	2811	10	1.25E-03	33.3	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 09:58:58

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287004.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 29-MAR-2022 13:31:00	Acquisition date	: 17-MAY-2022 07:58:19
Sample ID	: G579287004	Sample quantity	: 0.76788 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA38	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.31 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	21	10.44*	1.550E+00	6.265E+01	1.183E+02	149.27
NB-95M	235.69	12	24.80*	2.933E+00	7.936E+00	1.346E+01	119.75
AG-110	657.50	14	4.50*	1.147E+00	1.278E+02	1.464E+02	78.65
TL-208	277.37	-----	6.60	2.565E+00	-----	Line Not Found	-----
	583.19	11	85.00*	1.283E+00	5.062E+00	5.314E+00	131.17
	860.56	-----	12.50	8.897E-01	-----	Line Not Found	-----
PB-210	46.54	40	4.25*	4.519E+00	1.015E+02	1.019E+02	113.18
RA-226	186.21	20	3.59*	3.538E+00	7.794E+01	7.794E+01	180.26
TH-231	84.21	6	6.60*	5.145E+00	8.137E+00	8.137E+00	579.08
TH-232	63.81	5	0.26*	5.125E+00	1.780E+02	1.780E+02	852.84
	140.88	-----	0.02	4.252E+00	-----	Line Not Found	-----
U-235	143.76	-----	10.96*	4.202E+00	-----	Line Not Found	-----
	163.33	21	5.08	3.876E+00	5.325E+01	5.325E+01	141.75
	185.72	20	57.20	3.538E+00	4.891E+00	4.891E+00	180.26
	205.31	-----	5.01	3.290E+00	-----	Line Not Found	-----
AM-243	43.53	-----	5.90	4.302E+00	-----	Line Not Found	-----
	74.66	5	67.20*	5.195E+00	7.340E-01	7.340E-01	560.52

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287004.CNF;1
Acquisition date : 17-MAY-2022 07:58:19 Sensitivity : 3.000
Detector ID : GAM38 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.31 Half life ratio : *****
Sample date : 29-MAR-2022 13:31:00 Analyst initials: RXF2
Sample ID : G579287004 Sample Quantity : 7.6788E-01 FILTER
Batch Number : 2264689 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 22-APR-2022 08:42:40 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM38_JAR.CNF;2

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.183E+02	1.731E+02	1.300E+02
NB-95M	1.346E+01	1.580E+01	3.121E+01
AG-110	1.464E+02	1.128E+02	2.129E+02
TL-208	5.314E+00	6.831E+00	9.974E+00
PB-210	1.019E+02	1.131E+02	7.421E+01
RA-226	7.794E+01	1.377E+02	1.168E+02
TH-231	8.137E+00	4.617E+01	4.885E+01
TH-232	1.780E+02	1.487E+03	1.082E+03
U-235	-4.876E+00	2.047E+01	3.573E+01
AM-243	7.340E-01	4.032E+00	4.866E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	4.774E+00	5.089E+00	1.288E+01	NOT IDENT.
NA-24	0.000E+00	1.909E+24	0.000E+00	SHORT HLIF
AL-26	-9.911E-01	3.521E+00	7.803E+00	NOT IDENT.
K-40	-1.679E+01	7.900E+01	1.585E+02	NOT IDENT.
SC-46	1.813E+00	5.936E+00	1.322E+01	NOT IDENT.
V-48	3.564E+00	4.240E+01	8.728E+01	NOT IDENT.
CR-51	-2.557E+01	9.575E+01	1.805E+02	NOT IDENT.
MN-52	-1.447E+03	2.542E+03	4.352E+03	NOT IDENT.
MN-54	-1.346E+00	5.409E+00	9.702E+00	NOT IDENT.
CO-56	1.946E+00	8.456E+00	1.738E+01	NOT IDENT.
CO-57	1.884E+00	2.537E+00	4.973E+00	NOT IDENT.
NI-57	0.000E+00	5.994E+10	0.000E+00	SHORT HLIF
CO-58	-1.959E-01	7.473E+00	1.358E+01	NOT IDENT.
FE-59	0.000E+00	2.034E+01	4.120E+01	NOT IDENT.
CO-60	-5.459E+00	5.442E+00	7.704E+00	NOT IDENT.
ZN-65	-6.640E+00	1.066E+01	1.864E+01	NOT IDENT.
CU-67	0.000E+00	2.937E+06	0.000E+00	SHORT HLIF
GE-68	-1.273E+02	1.635E+02	2.721E+02	NOT IDENT.
AS-73	-5.198E+00	2.524E+01	4.428E+01	NOT IDENT.
AS-74	-1.278E+00	4.950E+01	9.334E+01	NOT IDENT.

SE-75	2.705E+00	6.856E+00	1.261E+01	NOT IDENT.
BR-77	0.000E+00	3.238E+07	0.000E+00	SHORT HLIF
SR-82	-3.442E+01	1.032E+02	1.844E+02	NOT IDENT.
RB-83	-4.078E+00	1.102E+01	2.005E+01	NOT IDENT.
RB-84	-1.261E+00	1.752E+01	3.571E+01	NOT IDENT.
KR-85	-2.072E+03	1.567E+03	2.470E+03	NOT IDENT.
SR-85	-1.551E+01	1.172E+01	1.848E+01	NOT IDENT.
RB-86	-1.296E+02	3.126E+02	5.880E+02	NOT IDENT.
Y-88	-5.372E+00	6.278E+00	1.091E+01	NOT IDENT.
Y-91	-4.570E+02	4.733E+03	7.765E+03	NOT IDENT.
NB-94	-5.092E-01	5.517E+00	9.639E+00	NOT IDENT.
NB-95	-3.299E+00	9.617E+00	1.459E+01	NOT IDENT.
TC-95M	4.983E+00	6.587E+00	1.284E+01	NOT IDENT.
ZR-95	4.306E+00	1.615E+01	3.051E+01	NOT IDENT.
MO-99	0.000E+00	9.139E+06	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	1.878E+41	0.000E+00	SHORT HLIF
RH-101	3.478E-01	2.886E+00	5.352E+00	NOT IDENT.
RH-102M	-1.839E+00	4.988E+00	7.883E+00	NOT IDENT.
RU-103	-2.097E-02	9.996E+00	1.907E+01	NOT IDENT.
RH-106	-3.018E+01	4.540E+01	7.586E+01	NOT IDENT.
RU-106	-3.018E+01	4.540E+01	7.586E+01	NOT IDENT.
AG-108M	6.210E-01	2.953E+00	6.075E+00	FAIL ABUN
CD-109	-1.357E+01	5.429E+01	8.540E+01	NOT IDENT.
AG-110M	1.515E+00	7.295E+00	1.545E+01	FAIL ABUN
IN-111	0.000E+00	6.161E+05	0.000E+00	SHORT HLIF
SN-113	-3.331E+00	7.114E+00	1.284E+01	NOT IDENT.
IN-114M	6.262E+00	3.423E+01	5.774E+01	NOT IDENT.
CD-115	0.000E+00	5.326E+07	0.000E+00	SHORT HLIF
SN-117M	1.245E+00	2.788E+01	5.102E+01	NOT IDENT.
SB-122	0.000E+00	1.326E+06	0.000E+00	SHORT HLIF
I-123	0.000E+00	1.292E+27	0.000E+00	SHORT HLIF
TE-123M	-1.461E+00	3.598E+00	5.687E+00	NOT IDENT.
SB-124	-6.515E+00	1.702E+01	3.424E+01	NOT IDENT.
SB-125	-4.490E+00	1.036E+01	1.888E+01	NOT IDENT.
TE-125M	6.613E+01	1.105E+03	2.068E+03	NOT IDENT.
I-126	1.798E+01	1.364E+02	2.798E+02	NOT IDENT.
SB-126	-4.914E+00	1.467E+02	2.727E+02	NOT IDENT.
SN-126	-9.019E-01	5.337E+00	8.524E+00	FAIL ABUN
SB-127	0.000E+00	9.104E+04	0.000E+00	SHORT HLIF
TE-129	-5.195E+01	1.190E+02	2.148E+02	NOT IDENT.
I-131	-1.849E+02	2.684E+02	4.729E+02	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	1.148E+05	0.000E+00	SHORT HLIF
BA-133	1.382E+00	4.333E+00	8.876E+00	NOT IDENT.
I-133	0.000E+00	3.773E+17	0.000E+00	SHORT HLIF
CS-134	8.842E-01	4.757E+00	9.424E+00	NOT IDENT.
I-135	0.000E+00	1.702E+41	0.000E+00	SHORT HLIF
CS-136	-1.305E+01	7.409E+01	1.480E+02	NOT IDENT.
BA-137M	3.872E+00	3.912E+00	9.171E+00	NOT IDENT.
CS-137	4.090E+00	4.133E+00	9.689E+00	NOT IDENT.
LA-138	-8.463E-01	8.622E+00	1.724E+01	NOT IDENT.
CE-139	1.015E+00	3.190E+00	5.671E+00	NOT IDENT.
BA-140	-1.709E+01	2.361E+02	4.442E+02	FAIL ABUN
LA-140	-1.807E+01	8.490E+01	1.743E+02	NOT IDENT.
CE-141	-1.528E+01	1.405E+01	2.236E+01	NOT IDENT.
CE-143	0.000E+00	3.359E+11	0.000E+00	SHORT HLIF
CE-144	-1.186E+00	1.887E+01	3.441E+01	NOT IDENT.
PM-144	3.403E+00	6.183E+00	1.233E+01	NOT IDENT.
PR-144	2.547E+02	4.702E+02	9.371E+02	NOT IDENT.
PM-146	5.089E+00	5.492E+00	1.184E+01	NOT IDENT.
ND-147	3.752E+02	5.685E+02	1.223E+03	NOT IDENT.
PM-147	-2.491E+04	7.092E+04	1.254E+05	NOT IDENT.
PM-149	0.000E+00	4.103E+08	0.000E+00	SHORT HLIF
EU-152	2.367E+01	2.666E+01	2.428E+01	FAIL ABUN
GD-153	-2.906E+00	6.994E+00	1.140E+01	NOT IDENT.
EU-154	1.375E+01	1.431E+01	3.625E+01	NOT IDENT.
EU-155	5.929E+00	7.733E+00	1.555E+01	NOT IDENT.
TB-160	-1.067E+01	2.438E+01	4.570E+01	FAIL ABUN
HO-166M	-2.150E+00	7.747E+00	1.403E+01	NOT IDENT.
TM-171	6.083E+01	3.764E+02	6.845E+02	NOT IDENT.
LU-176	-1.005E+00	3.350E+00	6.245E+00	NOT IDENT.
LU-177	4.205E+03	4.033E+03	7.993E+03	NOT IDENT.
HF-181	-5.440E+00	1.158E+01	1.793E+01	FAIL ABUN
W-181	1.745E+00	6.840E+00	1.337E+01	FAIL ABUN
TA-182	9.570E+00	2.443E+01	5.540E+01	NOT IDENT.
RE-183	2.146E+00	7.590E+00	1.491E+01	FAIL ABUN
RE-184	1.864E+01	3.022E+01	6.918E+01	NOT IDENT.
RE-188	-1.417E+00	2.143E+01	3.865E+01	FAIL ABUN

W-188	-4.962E+02	1.174E+03	2.172E+03	FAIL ABUN
OS-191	-4.558E+00	7.132E+01	1.289E+02	FAIL ABUN
IR-192	2.052E+00	4.898E+00	1.011E+01	NOT IDENT.
PB-201	0.000E+00	2.585E+38	0.000E+00	SHORT HLIF
TL-201	0.000E+00	1.596E+06	0.000E+00	SHORT HLIF
TL-202	1.682E+01	5.469E+01	1.108E+02	NOT IDENT.
HG-203	-4.401E+00	8.393E+00	1.360E+01	NOT IDENT.
PB-203	0.000E+00	2.536E+07	0.000E+00	SHORT HLIF
TL-204	-4.095E+01	2.094E+02	3.896E+02	NOT IDENT.
BI-207	-5.410E+00	8.112E+00	1.403E+01	FAIL ABUN
BI-211	-8.261E-03	2.614E+01	4.665E+01	NOT IDENT.
PB-211	9.077E+01	8.429E+01	1.851E+02	NOT IDENT.
BI-212	1.582E+01	7.800E+01	1.517E+02	NOT IDENT.
PB-212	1.029E+01	1.183E+01	1.561E+01	FAIL ABUN
BI-213	-3.771E-01	1.311E+01	2.515E+01	NOT IDENT.
BI-214	-7.110E+00	1.314E+01	2.012E+01	NOT IDENT.
PB-214	3.064E-01	9.952E+00	1.786E+01	FAIL ABUN
RN-219	-4.860E+01	5.055E+01	8.441E+01	NOT IDENT.
FR-221	-2.703E+00	2.167E+01	3.809E+01	NOT IDENT.
RA-223	-4.355E+01	6.902E+01	1.242E+02	FAIL ABUN
RA-224	3.429E+00	7.731E+01	1.266E+02	NOT IDENT.
AC-225	-7.965E+01	6.387E+02	1.123E+03	NOT IDENT.
AC-227	1.251E+01	2.582E+01	4.691E+01	FAIL ABUN
TH-227	1.251E+01	2.582E+01	4.691E+01	FAIL ABUN
AC-228	-2.306E+00	2.852E+01	4.910E+01	NOT IDENT.
RA-228	-2.306E+00	2.852E+01	4.910E+01	NOT IDENT.
TH-228	1.029E+01	1.183E+01	1.561E+01	FAIL ABUN
TH-229	-1.946E+01	5.363E+01	9.194E+01	FAIL ABUN
TH-230	6.678E+01	4.337E+02	7.832E+02	NOT IDENT.
PA-231	-2.319E+01	6.195E+01	1.089E+02	NOT IDENT.
PA-233	-2.010E+00	6.343E+00	1.201E+01	NOT IDENT.
PA-234	-1.970E+01	3.465E+01	6.302E+01	NOT IDENT.
PA-234M	-1.332E+02	4.553E+02	9.027E+02	NOT IDENT.
TH-234	1.250E+01	1.045E+02	1.210E+02	FAIL ABUN
U-234	2.874E+02	1.419E+03	2.591E+03	NOT IDENT.
NP-237	-2.010E+00	6.343E+00	1.201E+01	NOT IDENT.
NP-238	0.000E+00	1.812E+08	0.000E+00	SHORT HLIF
U-238	1.250E+01	1.045E+02	1.210E+02	FAIL ABUN
NP-239	7.654E+00	2.153E+01	4.134E+01	NOT IDENT.
AM-241	6.996E-01	4.821E+00	8.731E+00	NOT IDENT.
AM-242	2.509E+01	5.002E+01	9.004E+01	NOT IDENT.
CM-243	-1.002E+00	7.530E+00	1.390E+01	NOT IDENT.
BK-247	7.814E-01	1.037E+01	1.831E+01	FAIL ABUN
CM-247	-2.948E+00	4.436E+00	7.783E+00	NOT IDENT.
CF-249	-2.291E+00	4.762E+00	8.621E+00	NOT IDENT.
CF-251	-2.313E+00	1.265E+01	2.236E+01	NOT IDENT.
CF-252	-5.326E+03	1.272E+04	2.276E+04	NOT IDENT.
ANH-511	-2.121E+01	8.500E+00	1.499E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.73	124	98	0.95	93.56	89	10	1.73E-02	17.4	
2	0	63.88	76	88	0.96	127.88	123	10	1.05E-02	25.8	
3	0	75.04	46	60	1.03	150.21	147	6	6.34E-03	30.8	
4	0	84.82	28	75	0.89	169.79	166	7	3.82E-03	56.0	
5	0	93.07	101	80	0.96	186.28	182	10	1.41E-02	19.7	
6	0	163.62	21	60	0.61	327.44	322	10	2.98E-03	70.9	
7	0	186.44	59	65	1.16	373.10	367	11	8.25E-03	29.4	
8	4	236.95	12	23	1.40	474.14	472	18	1.64E-03	59.9	1.77E+00
9	4	238.77	37	49	1.45	477.79	472	18	5.15E-03	37.9	
10	0	248.09	17	42	0.81	496.43	491	9	2.40E-03	72.2	
11	0	258.69	14	15	1.07	517.63	515	6	1.96E-03	49.7	
12	0	344.50	27	45	0.59	689.30	681	15	3.75E-03	57.5	
13	0	478.69	21	47	0.75	957.73	952	14	2.88E-03	74.6	
14	0	511.26	70	55	1.69	1022.88	1015	14	9.69E-03	25.7	
15	0	559.62	11	9	1.77	1119.60	1115	8	1.51E-03	58.0	
16	5	580.27	8	6	1.73	1160.90	1159	13	1.14E-03	50.4	2.59E+00
17	5	583.70	15	12	1.93	1167.77	1159	13	2.09E-03	45.5	
18	0	613.44	8	18	2.29	1227.24	1221	10	1.18E-03	103.0	
19	0	656.44	14	6	1.89	1313.25	1310	7	1.87E-03	39.3	
20	0	684.15	6	18	1.77	1368.67	1360	11	7.99E-04	152.5	
21	0	763.14	11	11	3.93	1526.64	1520	11	1.53E-03	65.7	
22	0	783.96	9	16	1.42	1568.28	1560	15	1.28E-03	97.8	
23	0	805.18	45	0	8.41	1610.71	1598	25	6.25E-03	14.9	
24	0	826.60	13	0	3.16	1653.54	1649	9	1.81E-03	27.7	
25	0	830.17	13	0	1.66	1660.69	1658	6	1.81E-03	27.7	
26	0	1407.74	9	0	0.56	2815.44	2811	10	1.25E-03	33.3	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	21	10.44*	1.550E+00	6.265E+01	1.183E+02	149.27
NB-95M	235.69	12	24.80*	2.933E+00	7.936E+00	1.346E+01	119.75
AG-110	657.50	14	4.50*	1.147E+00	1.278E+02	1.464E+02	78.65
TL-208	277.37	-----	6.60	2.565E+00	-----	Line Not Found	-----
	583.19	11	85.00*	1.283E+00	5.062E+00	5.314E+00	131.17
	860.56	-----	12.50	8.897E-01	-----	Line Not Found	-----
PB-210	46.54	40	4.25*	4.519E+00	1.015E+02	1.019E+02	113.18
RA-226	186.21	20	3.59*	3.538E+00	7.794E+01	7.794E+01	180.26
TH-231	84.21	6	6.60*	5.145E+00	8.137E+00	8.137E+00	579.08
TH-232	63.81	5	0.26*	5.125E+00	1.780E+02	1.780E+02	852.84
	140.88	-----	0.02	4.252E+00	-----	Line Not Found	-----
U-235	143.76	-----	10.96*	4.202E+00	-----	Line Not Found	-----
	163.33	21	5.08	3.876E+00	5.325E+01	5.325E+01	141.75
	185.72	20	57.20	3.538E+00	4.891E+00	4.891E+00	180.26
	205.31	-----	5.01	3.290E+00	-----	Line Not Found	-----
AM-243	43.53	-----	5.90	4.302E+00	-----	Line Not Found	-----
	74.66	5	67.20*	5.195E+00	7.340E-01	7.340E-01	560.52

Flag: "*" = Keyline

Total number of lines in spectrum 24
Number of unidentified lines 8
Number of lines tentatively identified by NID 16 66.67%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.89	6.265E+01	1.183E+02	1.766E+02	149.27	
NB-95M	64.03D	1.70	7.936E+00	1.346E+01	1.612E+01	119.75	
AG-110	249.76D	1.15	1.278E+02	1.464E+02	1.151E+02	78.65	
TL-208	1.91Y	1.05	5.062E+00	5.314E+00	6.970E+00	131.17	
PB-210	22.20Y	1.00	1.015E+02	1.019E+02	1.154E+02	113.18	
RA-226	1600.00Y	1.00	7.794E+01	7.794E+01	14.05E+01	180.26	
TH-231	7.04E+08Y	1.00	8.137E+00	8.137E+00	47.12E+00	579.08	
TH-232	1.41E+10Y	1.00	1.780E+02	1.780E+02	15.18E+02	852.84	
U-235	7.04E+08Y	1.00	4.891E+00	4.891E+00	8.817E+00	180.26	K
AM-243	7370.00Y	1.00	7.340E-01	7.340E-01	41.14E-01	560.52	
Total Activity :			5.746E+02	6.550E+02			

Grand Total Activity : 5.746E+02 6.550E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
4	238.77	25	49	1.45	477.79	472	18	3.54E-03	****	2.91E+00	T
0	248.09	17	42	0.81	496.43	491	9	2.40E-03	****	2.82E+00	
0	258.69	14	15	1.07	517.63	515	6	1.96E-03	99.4	2.72E+00	
0	344.50	27	45	0.59	689.30	681	15	3.75E-03	****	2.11E+00	T
0	559.62	11	9	1.77	1119.60	1115	8	1.51E-03	****	1.34E+00	
5	580.27	4	6	1.73	1160.90	1159	13	5.90E-04	****	1.29E+00	
0	613.44	8	18	2.29	1227.24	1221	10	1.18E-03	****	1.22E+00	T
0	684.15	6	18	1.77	1368.67	1360	11	7.99E-04	****	1.10E+00	
0	763.14	11	11	3.93	1526.64	1520	11	1.53E-03	****	9.95E-01	T
0	783.96	9	16	1.42	1568.28	1560	15	1.28E-03	****	9.71E-01	T
0	805.18	40	0	8.41	1610.71	1598	25	5.57E-03	37.0	9.47E-01	
0	826.60	13	0	3.16	1653.54	1649	9	1.81E-03	55.5	9.24E-01	
0	830.17	13	0	1.66	1660.69	1658	6	1.81E-03	55.5	9.20E-01	
0	1407.74	9	0	0.56	2815.44	2811	10	1.25E-03	66.7	5.72E-01	T

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287004.CNF;1  *
* Acquisition date   : 17-MAY-2022 07:58:19 Sensitivity      : 3.000          *
* Detector ID        : GAM38 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:00.31 Half life ratio : *****      *
* Sample date        : 29-MAR-2022 13:31:00 Nuclide Library : LIQUID      *
* Sample ID          : G579287004 Analyst initials: RXF2        *
* Batch Number       : 2264689 Sample Quantity : 7.6788E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 22-APR-2022 08:42:40 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM38_JAR.CNF;2          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	5.733E+01
NB-95M	1.407E+01
AG-110	9.181E+01
TL-208	4.353E+00
PB-210	3.365E+01
RA-226	5.324E+01
TH-231	2.249E+01
TH-232	4.914E+02
U-235	1.644E+01
AM-243	2.245E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	5.342E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.467E+00	NOT IDENT.
K-40	6.806E+01	NOT IDENT.
SC-46	5.462E+00	NOT IDENT.
V-48	3.666E+01	NOT IDENT.
CR-51	8.028E+01	NOT IDENT.
MN-52	1.676E+03	NOT IDENT.
MN-54	4.047E+00	NOT IDENT.
CO-56	7.556E+00	NOT IDENT.
CO-57	2.297E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	5.651E+00	NOT IDENT.
FE-59	1.709E+01	NOT IDENT.
CO-60	2.730E+00	NOT IDENT.
ZN-65	7.183E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	1.039E+02	NOT IDENT.
AS-73	2.013E+01	NOT IDENT.
AS-74	4.071E+01	NOT IDENT.
SE-75	5.751E+00	NOT IDENT.

BR-77	0.000E+00	SHORT HLIF
SR-82	7.521E+01	NOT IDENT.
RB-83	8.506E+00	NOT IDENT.
RB-84	1.477E+01	NOT IDENT.
KR-85	1.128E+03	NOT IDENT.
SR-85	8.443E+00	NOT IDENT.
RB-86	2.291E+02	NOT IDENT.
Y-88	3.450E+00	NOT IDENT.
Y-91	3.191E+03	NOT IDENT.
NB-94	4.205E+00	NOT IDENT.
NB-95	6.163E+00	NOT IDENT.
TC-95M	5.871E+00	NOT IDENT.
ZR-95	1.320E+01	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.454E+00	NOT IDENT.
RH-102M	3.486E+00	NOT IDENT.
RU-103	8.387E+00	NOT IDENT.
RH-106	3.190E+01	NOT IDENT.
RU-106	3.190E+01	NOT IDENT.
AG-108M	2.608E+00	FAIL ABUN
CD-109	3.896E+01	NOT IDENT.
AG-110M	6.524E+00	FAIL ABUN
IN-111	0.000E+00	SHORT HLIF
SN-113	5.692E+00	NOT IDENT.
IN-114M	2.647E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	2.319E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.580E+00	NOT IDENT.
SB-124	1.213E+01	NOT IDENT.
SB-125	8.111E+00	NOT IDENT.
TE-125M	9.427E+02	NOT IDENT.
I-126	1.156E+02	NOT IDENT.
SB-126	1.183E+02	NOT IDENT.
SN-126	3.914E+00	FAIL ABUN
SB-127	0.000E+00	SHORT HLIF
TE-129	9.283E+01	NOT IDENT.
I-131	2.091E+02	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	3.914E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.868E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	5.944E+01	NOT IDENT.
BA-137M	3.939E+00	NOT IDENT.
CS-137	4.161E+00	NOT IDENT.
LA-138	6.825E+00	NOT IDENT.
CE-139	2.561E+00	NOT IDENT.
BA-140	1.944E+02	FAIL ABUN
LA-140	6.799E+01	NOT IDENT.
CE-141	1.026E+01	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.568E+01	NOT IDENT.
PM-144	5.496E+00	NOT IDENT.
PR-144	4.175E+02	NOT IDENT.
PM-146	5.285E+00	NOT IDENT.
ND-147	5.334E+02	NOT IDENT.
PM-147	5.751E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	1.096E+01	FAIL ABUN
GD-153	5.178E+00	NOT IDENT.
EU-154	1.506E+01	NOT IDENT.
EU-155	7.122E+00	NOT IDENT.
TB-160	1.883E+01	FAIL ABUN
HO-166M	5.865E+00	NOT IDENT.
TM-171	3.117E+02	NOT IDENT.
LU-176	2.822E+00	NOT IDENT.
LU-177	3.680E+03	NOT IDENT.
HF-181	7.783E+00	FAIL ABUN
W-181	6.142E+00	FAIL ABUN
TA-182	2.262E+01	NOT IDENT.
RE-183	6.835E+00	FAIL ABUN
RE-184	2.929E+01	NOT IDENT.
RE-188	1.762E+01	FAIL ABUN
W-188	9.780E+02	FAIL ABUN

OS-191	5.942E+01	FAIL ABUN
IR-192	4.500E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF
TL-202	4.870E+01	NOT IDENT.
HG-203	6.146E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	1.783E+02	NOT IDENT.
BI-207	5.806E+00	FAIL ABUN
BI-211	2.086E+01	NOT IDENT.
PB-211	8.290E+01	NOT IDENT.
BI-212	6.588E+01	NOT IDENT.
PB-212	7.260E+00	FAIL ABUN
BI-213	1.106E+01	NOT IDENT.
BI-214	8.882E+00	NOT IDENT.
PB-214	8.038E+00	FAIL ABUN
RN-219	3.672E+01	NOT IDENT.
FR-221	1.720E+01	NOT IDENT.
RA-223	5.465E+01	FAIL ABUN
RA-224	5.746E+01	NOT IDENT.
AC-225	5.070E+02	NOT IDENT.
AC-227	2.092E+01	FAIL ABUN
TH-227	2.092E+01	FAIL ABUN
AC-228	2.147E+01	NOT IDENT.
RA-228	2.147E+01	NOT IDENT.
TH-228	7.260E+00	FAIL ABUN
TH-229	4.163E+01	FAIL ABUN
TH-230	3.581E+02	NOT IDENT.
PA-231	4.931E+01	NOT IDENT.
PA-233	5.265E+00	NOT IDENT.
PA-234	2.475E+01	NOT IDENT.
PA-234M	3.497E+02	NOT IDENT.
TH-234	5.706E+01	FAIL ABUN
U-234	1.182E+03	NOT IDENT.
NP-237	5.265E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	5.706E+01	FAIL ABUN
NP-239	1.890E+01	NOT IDENT.
AM-241	4.002E+00	NOT IDENT.
AM-242	4.134E+01	NOT IDENT.
CM-243	6.304E+00	NOT IDENT.
BK-247	8.331E+00	FAIL ABUN
CM-247	3.390E+00	NOT IDENT.
CF-249	3.782E+00	NOT IDENT.
CF-251	1.014E+01	NOT IDENT.
CF-252	1.032E+04	NOT IDENT.
ANH-511	7.044E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287004.CNF;1
Acquisition date : 17-MAY-2022 07:58:19 Sensitivity : 3.000
Detector ID : GAM38 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.31 Half life ratio : *****
Sample date : 29-MAR-2022 13:31:00 Nuclide Library : LIQUID
Sample ID : G579287004 Analyst initials: RXF2
Batch Number : 2264689 Sample Quantity : 7.6788E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 22-APR-2022 08:42:40 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM38_JAR.CNF;2

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.183E+02	1.734E+02	1.734E+02
NB-95M	1.346E+01	1.586E+01	1.587E+01
AG-110	1.464E+02	1.135E+02	1.135E+02
TL-208	5.314E+00	6.847E+00	6.848E+00
PB-210	1.019E+02	1.135E+02	1.135E+02
RA-226	7.794E+01	1.379E+02	1.379E+02
TH-231	8.137E+00	4.619E+01	4.619E+01
TH-232	1.780E+02	1.487E+03	1.487E+03
U-235	-4.876E+00	2.047E+01	2.047E+01
AM-243	7.340E-01	4.032E+00	4.032E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	4.774E+00	5.104E+00	5.540E+00	NOT IDENT.
NA-24	-1.352E+23	1.909E+24	0.000E+00	SHORT HLIF
AL-26	-9.911E-01	3.522E+00	3.551E+00	NOT IDENT.
K-40	-1.679E+01	7.902E+01	7.938E+01	NOT IDENT.
SC-46	1.813E+00	5.938E+00	5.994E+00	NOT IDENT.
V-48	3.564E+00	4.240E+01	4.243E+01	NOT IDENT.
CR-51	-2.557E+01	9.577E+01	9.646E+01	NOT IDENT.
MN-52	-1.447E+03	2.545E+03	2.627E+03	NOT IDENT.
MN-54	-1.346E+00	5.410E+00	5.444E+00	NOT IDENT.
CO-56	1.946E+00	8.458E+00	8.503E+00	NOT IDENT.
CO-57	1.884E+00	2.541E+00	2.680E+00	NOT IDENT.
NI-57	1.950E+10	5.999E+10	6.064E+10	SHORT HLIF
CO-58	-1.959E-01	7.473E+00	7.473E+00	NOT IDENT.
FE-59	0.000E+00	2.034E+01	0.000E+00	NOT IDENT.
CO-60	-5.459E+00	5.462E+00	5.992E+00	NOT IDENT.
ZN-65	-6.640E+00	1.068E+01	1.109E+01	NOT IDENT.
CU-67	-4.291E+06	2.971E+06	3.546E+06	SHORT HLIF
GE-68	-1.273E+02	1.638E+02	1.736E+02	NOT IDENT.
AS-73	-5.198E+00	2.527E+01	2.538E+01	NOT IDENT.
AS-74	-1.278E+00	4.950E+01	4.950E+01	NOT IDENT.

SE-75	2.705E+00	6.859E+00	6.967E+00	NOT IDENT.
BR-77	2.816E+07	3.251E+07	3.491E+07	SHORT HLIF
SR-82	-3.442E+01	1.032E+02	1.044E+02	NOT IDENT.
RB-83	-4.078E+00	1.104E+01	1.119E+01	NOT IDENT.
RB-84	-1.261E+00	1.752E+01	1.753E+01	NOT IDENT.
KR-85	-2.072E+03	1.577E+03	1.834E+03	NOT IDENT.
SR-85	-1.551E+01	1.180E+01	1.372E+01	NOT IDENT.
RB-86	-1.296E+02	3.128E+02	3.182E+02	NOT IDENT.
Y-88	-5.372E+00	6.290E+00	6.741E+00	NOT IDENT.
Y-91	-4.570E+02	4.733E+03	4.738E+03	NOT IDENT.
NB-94	-5.092E-01	5.517E+00	5.522E+00	NOT IDENT.
NB-95	-3.299E+00	9.621E+00	9.736E+00	NOT IDENT.
TC-95M	4.983E+00	6.606E+00	6.979E+00	NOT IDENT.
ZR-95	4.306E+00	1.615E+01	1.627E+01	NOT IDENT.
MO-99	3.228E+06	9.144E+06	9.260E+06	SHORT HLIF
TC-99M	1.000E+41	1.882E+41	0.000E+00	SHORT HLIF
RH-101	3.478E-01	2.887E+00	2.891E+00	NOT IDENT.
RH-102M	-1.839E+00	4.993E+00	5.062E+00	NOT IDENT.
RU-103	-2.097E-02	9.996E+00	9.996E+00	NOT IDENT.
RH-106	-3.018E+01	4.550E+01	4.749E+01	NOT IDENT.
RU-106	-3.018E+01	4.550E+01	4.749E+01	NOT IDENT.
AG-108M	6.210E-01	2.953E+00	2.967E+00	FAIL ABUN
CD-109	-1.357E+01	5.430E+01	5.465E+01	NOT IDENT.
AG-110M	1.515E+00	7.296E+00	7.328E+00	FAIL ABUN
IN-111	-8.666E+04	6.161E+05	6.173E+05	SHORT HLIF
SN-113	-3.331E+00	7.119E+00	7.276E+00	NOT IDENT.
IN-114M	6.262E+00	3.424E+01	3.435E+01	NOT IDENT.
CD-115	-5.126E+06	5.326E+07	5.331E+07	SHORT HLIF
SN-117M	1.245E+00	2.788E+01	2.788E+01	NOT IDENT.
SB-122	-1.792E+05	1.326E+06	1.329E+06	SHORT HLIF
I-123	-5.202E+26	1.293E+27	0.000E+00	SHORT HLIF
TE-123M	-1.461E+00	3.601E+00	3.661E+00	NOT IDENT.
SB-124	-6.515E+00	1.703E+01	1.728E+01	NOT IDENT.
SB-125	-4.490E+00	1.036E+01	1.056E+01	NOT IDENT.
TE-125M	6.613E+01	1.105E+03	1.105E+03	NOT IDENT.
I-126	1.798E+01	1.364E+02	1.366E+02	NOT IDENT.
SB-126	-4.914E+00	1.467E+02	1.467E+02	NOT IDENT.
SN-126	-9.019E-01	5.338E+00	5.353E+00	FAIL ABUN
SB-127	-8.186E+04	9.313E+04	1.002E+05	SHORT HLIF
TE-129	-5.195E+01	1.194E+02	1.217E+02	NOT IDENT.
I-131	-1.849E+02	2.689E+02	2.815E+02	NOT IDENT.
I-132	-1.000E+41	7.385E+42	0.000E+00	SHORT HLIF
TE-132	-1.482E+04	1.148E+05	1.150E+05	SHORT HLIF
BA-133	1.382E+00	4.334E+00	4.379E+00	NOT IDENT.
I-133	2.157E+17	3.832E+17	0.000E+00	SHORT HLIF
CS-134	8.842E-01	4.758E+00	4.775E+00	NOT IDENT.
I-135	-1.000E+41	2.031E+41	0.000E+00	SHORT HLIF
CS-136	-1.305E+01	7.411E+01	7.434E+01	NOT IDENT.
BA-137M	3.872E+00	3.926E+00	4.297E+00	NOT IDENT.
CS-137	4.090E+00	4.148E+00	4.540E+00	NOT IDENT.
LA-138	-8.463E-01	8.622E+00	8.630E+00	NOT IDENT.
CE-139	1.015E+00	3.198E+00	3.230E+00	NOT IDENT.
BA-140	-1.709E+01	2.362E+02	2.363E+02	FAIL ABUN
LA-140	-1.807E+01	8.491E+01	8.530E+01	NOT IDENT.
CE-141	-1.528E+01	1.411E+01	1.570E+01	NOT IDENT.
CE-143	-1.059E+11	3.360E+11	3.394E+11	SHORT HLIF
CE-144	-1.186E+00	1.887E+01	1.888E+01	NOT IDENT.
PM-144	3.403E+00	6.190E+00	6.377E+00	NOT IDENT.
PR-144	2.547E+02	4.707E+02	4.846E+02	NOT IDENT.
PM-146	5.089E+00	5.518E+00	5.977E+00	NOT IDENT.
ND-147	3.752E+02	5.695E+02	5.941E+02	NOT IDENT.
PM-147	-2.491E+04	7.095E+04	7.183E+04	NOT IDENT.
PM-149	-2.897E+06	4.103E+08	4.103E+08	SHORT HLIF
EU-152	2.367E+01	2.675E+01	2.880E+01	FAIL ABUN
GD-153	-2.906E+00	6.998E+00	7.120E+00	NOT IDENT.
EU-154	1.375E+01	1.436E+01	1.564E+01	NOT IDENT.
EU-155	5.929E+00	7.753E+00	8.202E+00	NOT IDENT.
TB-160	-1.067E+01	2.440E+01	2.487E+01	FAIL ABUN
HO-166M	-2.150E+00	7.750E+00	7.810E+00	NOT IDENT.
TM-171	6.083E+01	3.765E+02	3.775E+02	NOT IDENT.
LU-176	-1.005E+00	3.351E+00	3.382E+00	NOT IDENT.
LU-177	4.205E+03	4.050E+03	4.473E+03	NOT IDENT.
HF-181	-5.440E+00	1.159E+01	1.184E+01	FAIL ABUN
W-181	1.745E+00	6.855E+00	6.900E+00	FAIL ABUN
TA-182	9.570E+00	2.444E+01	2.482E+01	NOT IDENT.
RE-183	2.146E+00	7.593E+00	7.655E+00	FAIL ABUN
RE-184	1.864E+01	3.029E+01	3.143E+01	NOT IDENT.
RE-188	-1.417E+00	2.143E+01	2.144E+01	FAIL ABUN

W-188	-4.962E+02	1.176E+03	1.197E+03	FAIL ABUN
OS-191	-4.558E+00	7.132E+01	7.135E+01	FAIL ABUN
IR-192	2.052E+00	4.901E+00	4.988E+00	NOT IDENT.
PB-201	-8.499E+37	2.630E+38	0.000E+00	SHORT HLIF
TL-201	-3.107E+05	1.596E+06	1.603E+06	SHORT HLIF
TL-202	1.682E+01	5.470E+01	5.523E+01	NOT IDENT.
HG-203	-4.401E+00	8.400E+00	8.632E+00	NOT IDENT.
PB-203	-1.330E+07	2.538E+07	2.608E+07	SHORT HLIF
TL-204	-4.095E+01	2.095E+02	2.103E+02	NOT IDENT.
BI-207	-5.410E+00	8.124E+00	8.483E+00	FAIL ABUN
BI-211	-8.261E-03	2.614E+01	2.614E+01	NOT IDENT.
PB-211	9.077E+01	8.468E+01	9.407E+01	NOT IDENT.
BI-212	1.582E+01	7.802E+01	7.834E+01	NOT IDENT.
PB-212	1.029E+01	1.187E+01	1.274E+01	FAIL ABUN
BI-213	-3.771E-01	1.311E+01	1.311E+01	NOT IDENT.
BI-214	-7.110E+00	1.316E+01	1.354E+01	NOT IDENT.
PB-214	3.064E-01	9.952E+00	9.953E+00	FAIL ABUN
RN-219	-4.860E+01	5.104E+01	5.556E+01	NOT IDENT.
FR-221	-2.703E+00	2.168E+01	2.171E+01	NOT IDENT.
RA-223	-4.355E+01	6.914E+01	7.188E+01	FAIL ABUN
RA-224	3.429E+00	7.731E+01	7.733E+01	NOT IDENT.
AC-225	-7.965E+01	6.388E+02	6.398E+02	NOT IDENT.
AC-227	1.251E+01	2.589E+01	2.650E+01	FAIL ABUN
TH-227	1.251E+01	2.589E+01	2.650E+01	FAIL ABUN
AC-228	-2.306E+00	2.852E+01	2.854E+01	NOT IDENT.
RA-228	-2.306E+00	2.852E+01	2.854E+01	NOT IDENT.
TH-228	1.029E+01	1.187E+01	1.274E+01	FAIL ABUN
TH-229	-1.946E+01	5.366E+01	5.437E+01	FAIL ABUN
TH-230	6.678E+01	4.339E+02	4.349E+02	NOT IDENT.
PA-231	-2.319E+01	6.216E+01	6.304E+01	NOT IDENT.
PA-233	-2.010E+00	6.345E+00	6.410E+00	NOT IDENT.
PA-234	-1.970E+01	4.136E+01	4.230E+01	NOT IDENT.
PA-234M	-1.332E+02	4.555E+02	4.594E+02	NOT IDENT.
TH-234	1.250E+01	1.046E+02	1.047E+02	FAIL ABUN
U-234	2.874E+02	1.419E+03	1.425E+03	NOT IDENT.
NP-237	-2.010E+00	6.345E+00	6.410E+00	NOT IDENT.
NP-238	1.215E+07	1.812E+08	1.813E+08	SHORT HLIF
U-238	1.250E+01	1.046E+02	1.047E+02	FAIL ABUN
NP-239	7.654E+00	2.154E+01	2.181E+01	NOT IDENT.
AM-241	6.996E-01	4.822E+00	4.832E+00	NOT IDENT.
AM-242	2.509E+01	5.023E+01	5.149E+01	NOT IDENT.
CM-243	-1.002E+00	7.531E+00	7.545E+00	NOT IDENT.
BK-247	7.814E-01	1.037E+01	1.037E+01	FAIL ABUN
CM-247	-2.948E+00	4.469E+00	4.663E+00	NOT IDENT.
CF-249	-2.291E+00	4.769E+00	4.880E+00	NOT IDENT.
CF-251	-2.313E+00	1.266E+01	1.270E+01	NOT IDENT.
CF-252	-5.326E+03	1.361E+04	1.382E+04	NOT IDENT.
ANH-511	-2.121E+01	8.707E+00	1.294E+01	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	34.6058	133.52	34.8418	116.30	0.0000
879.38	31.7415	364.49	34.8486	116.74	32.2598
46.54	31.8672	80.22	0.0000	117.23	45.0156
228.16	0.0000	711.68	37.5697	119.76	44.2746
52.39	37.3659	356.01	39.4067	120.54	37.4486
53.20	26.1796	323.87	39.4144	120.90	45.3669
53.44	30.2978	82.35	0.0000	264.66	45.3876
57.53	34.7579	82.47	41.9673	121.22	47.3708
293.27	0.0000	82.47	0.0000	344.28	35.5699
57.53	38.2411	83.79	45.1294	122.06	35.5905
482.18	38.2415	265.00	45.1553	1274.44	36.6559
57.98	35.8050	84.21	45.1813	123.68	35.7100
59.32	35.9758	84.86	0.0000	1377.63	0.0000
59.54	37.9574	193.51	39.8918	127.23	38.9662
155.04	39.3394	105.31	29.1001	129.43	48.1707
63.00	33.0461	86.79	27.9054	131.20	43.3044
129.43	33.0785	86.94	27.9166	133.02	42.4480
63.29	33.0785	87.09	27.9278	133.52	36.4197
290.67	33.1107	87.57	32.8269	135.34	0.0000
63.81	33.1361	88.03	27.9978	136.00	27.4458
87.57	33.1883	306.78	46.6001	136.28	29.4943
64.99	33.2663	88.47	46.6160	136.47	29.5053
65.08	33.2764	531.02	98.4790	739.50	0.0000
66.73	36.6019	184.58	0.0000	140.51	0.0000
66.98	32.0526	92.59	42.4982	140.88	27.7000
67.24	26.3509	93.31	0.0000	143.76	29.9107
67.67	35.5656	94.56	95.6352	144.24	36.1311
1221.41	35.5746	311.90	78.9398	145.44	44.4868
439.51	45.7818	946.00	78.9443	152.32	39.8004
70.82	45.7818	97.43	33.6654	152.43	39.8085
167.43	0.0000	98.43	30.9357	1048.07	43.0126
97.43	32.9059	98.44	30.9365	154.21	31.5257
70.82	0.0000	99.53	26.3188	155.04	36.8329
70.82	42.5838	103.37	26.3188	158.56	33.7329
279.20	0.0000	116.74	26.3188	158.97	0.0000
1063.66	37.3073	100.11	32.9447	159.00	39.5562
72.87	0.0000	100.20	38.6005	162.33	29.8342
351.06	37.3141	102.03	33.0964	537.26	29.8508
74.66	47.4811	103.18	30.3420	163.33	29.8842
238.63	47.5038	103.37	34.1502	165.86	24.2936
351.93	47.5038	105.31	27.6349	167.43	0.0000
238.63	47.5038	106.12	29.5961	245.35	0.0000
74.97	47.5252	106.47	36.3083	427.87	29.4278
77.11	25.9795	109.28	34.6187	176.60	33.8027
256.23	35.6915	111.00	36.6835	177.52	34.9434
79.82	0.0000	111.76	0.0000	181.07	0.0000
80.02	38.4045	208.37	35.8728	184.41	35.3154
80.03	38.4048	116.24	37.1076	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	35.3857	300.09	25.4724	477.60	18.7395
186.21	35.4116	300.13	25.4736	477.99	18.7445
190.27	37.1114	301.36	33.1578	482.18	20.7783
193.51	36.9155	302.85	38.3176	487.02	17.8700
197.03	38.2287	304.50	24.7348	492.35	0.0000
198.01	40.5341	304.85	24.7437	497.08	17.9934
201.83	40.7552	306.78	34.1960	511.00	37.3339
204.12	26.1221	308.46	25.6903	514.00	63.6947
205.31	36.4041	311.90	20.6235	520.40	14.2142
208.37	27.4189	316.51	17.2648	520.69	0.0000
210.85	52.7320	319.41	21.6426	667.71	0.0000
215.65	33.4604	320.08	25.1219	527.90	0.0000
218.12	31.2558	321.04	22.5442	529.59	11.2350
222.11	32.5844	323.87	26.0840	529.87	0.0000
227.09	32.7958	325.23	29.6013	531.02	9.2007
227.38	33.9795	1596.21	27.9544	537.26	17.4489
228.16	0.0000	331.15	0.0000	1260.41	0.0000
228.18	31.6686	333.37	20.1802	552.55	12.4355
235.69	28.4187	334.37	26.3470	795.86	10.9533
235.96	30.0076	338.28	15.8665	564.24	0.0000
238.63	31.6919	911.20	15.8668	569.33	8.3763
238.98	0.0000	340.48	26.4984	569.50	7.3301
240.99	31.7843	340.55	26.4999	569.70	9.4255
242.00	31.8237	344.28	21.2732	582.08	15.8264
244.70	28.7355	345.93	21.3057	583.19	15.8368
245.35	0.0000	351.06	16.9458	595.83	15.9552
459.60	27.3327	351.93	19.6372	600.60	15.9991
685.70	0.0000	356.01	15.2299	604.72	24.5910
388.16	38.6875	361.25	0.0000	609.32	19.2957
256.23	16.1849	364.49	28.8841	610.33	17.6978
527.90	0.0000	366.42	0.0000	614.28	14.5129
264.66	29.4177	383.85	19.2735	618.01	9.0494
265.00	33.1073	388.16	23.0281	621.93	16.1951
269.46	36.9717	666.33	22.1152	630.19	0.0000
401.81	33.3405	391.70	26.7910	631.29	15.1946
273.65	28.4777	400.66	22.3354	632.98	8.6908
276.40	29.8066	401.32	0.0000	633.25	8.6921
583.19	26.1084	401.81	27.0140	634.78	17.3991
277.60	24.8712	402.40	23.2992	635.95	16.3220
402.40	27.3704	404.85	12.1394	636.99	11.9766
278.43	29.8733	410.95	15.9524	657.50	13.2119
279.20	0.0000	720.70	14.1174	884.68	13.2134
279.54	36.1403	423.72	18.0089	661.66	4.4137
280.46	28.6917	427.09	8.5529	664.57	0.0000
301.36	29.2094	427.87	17.1160	666.33	6.6370
284.31	27.5584	433.94	10.5085	666.50	6.6377
285.41	32.6079	439.51	14.3903	667.71	0.0000
285.90	0.0000	440.45	18.2404	677.62	5.0074
287.50	30.1670	453.88	12.6054	685.70	0.0000
290.67	33.6320	459.60	18.5002	692.65	0.0000
293.27	0.0000	463.37	13.6690	695.00	17.9648
295.22	27.8787	468.07	13.7152	696.49	15.7312
316.51	33.8184	473.00	0.0000	696.51	15.7312
298.58	31.3670	475.06	25.1052	697.00	15.7352
299.98	25.4700	696.49	19.2215	697.49	13.4907

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	12.3992	903.28	5.5556	1291.59	4.2383
706.68	18.0716	907.67	0.0000	1298.22	0.0000
711.68	11.3232	911.20	14.8628	1312.11	3.1981
720.70	14.7869	984.45	0.0000	1332.49	8.5791
721.93	0.0000	926.36	10.2806	1365.19	5.4126
1690.97	12.5245	935.54	13.1323	1368.63	0.0000
722.91	12.5254	937.49	8.4488	1377.63	0.0000
723.31	13.6670	983.53	7.5295	1384.29	4.3535
756.73	13.6729	945.96	0.0000	1408.01	2.1912
727.33	12.5527	946.00	8.4771	1434.09	7.7238
733.00	12.5876	949.00	3.7720	1435.80	5.5197
735.93	18.3359	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	9.4791	1460.82	5.5569
1434.09	8.0542	964.08	12.3311	1489.16	3.3593
747.24	12.6749	966.17	10.4424	1596.21	5.5233
752.31	17.3260	968.97	11.4038	1620.50	2.7782
753.82	11.5588	983.53	8.6006	1678.03	0.0000
756.73	11.1121	984.45	0.0000	1690.97	3.7672
763.94	6.9688	996.26	3.8408	1757.55	0.0000
765.80	13.9497	1001.03	5.7715	1764.49	3.8314
1001.03	15.6978	1004.73	4.8163	1770.23	7.6730
766.84	6.9783	1025.87	0.0000	1771.35	4.7969
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	9.3467	1037.84	2.9251	1808.65	1.9348
777.92	0.0000	1038.76	0.0000	1836.06	2.9196
778.90	8.4214	1046.59	16.6275		
783.70	0.0000	1048.07	6.8505		
1435.80	9.8694	1050.41	1.9589		
903.28	11.4730	1063.66	13.7770		
795.86	5.6580	1077.00	6.9210		
801.95	6.2057	1077.34	8.8995		
802.10	6.2062	1083.85	5.9462		
810.29	8.5427	1085.87	5.9506		
810.45	8.5433	1099.25	7.9707		
810.76	8.5444	1111.64	7.0043		
815.77	7.1362	1112.07	3.0022		
818.51	7.1450	1112.84	4.0039		
832.01	4.3126	1115.54	8.0151		
834.85	10.7948	1120.29	7.0248		
835.15	11.3104	1120.55	7.0252		
836.80	0.0000	1121.30	7.0269		
846.77	12.6593	1808.65	9.0604		
856.80	9.9896	1131.51	0.0000		
860.56	10.0057	1332.49	9.1917		
871.09	12.7913	1177.95	7.1598		
873.19	13.7173	1189.05	3.0795		
875.33	0.0000	1204.77	4.1267		
879.38	11.0021	1221.41	4.1484		
880.51	10.0903	1231.02	8.3218		
881.60	8.2592	1235.36	4.1665		
883.24	10.1017	1238.28	12.5105		
884.68	8.2700	1260.41	0.0000		
889.28	5.5237	1271.87	10.5334		
894.76	4.6136	1274.44	2.1083		
1836.06	7.3916	1274.54	2.1083		

VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 09:59:49.37

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287005.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM40.CNF;402
Background date    : 15-MAY-2022 09:13:46
Sample date       : 29-MAR-2022 09:30:00 Acquisition date : 17-MAY-2022 07:59:24
Sample ID        : G579287005 Sample quantity : 7.47890E-01 FILTER
Detector name     : GAM40 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:00.44 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : RXF2
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2264689 Detector SN# :
Matrix Spike ID   : LCS ID :
*****

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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	92.85*	2	82	1.65	186.79	182	9	3.27E-04	811.3	
2	0	186.38*	15	71	0.93	374.03	370	9	2.13E-03	118.9	
3	0	220.66	74	77	6.69	442.64	435	17	1.02E-02	29.6	
4	0	318.61	34	18	2.13	638.68	635	8	4.75E-03	28.1	
5	0	479.00	13	9	1.74	959.63	956	8	1.86E-03	46.0	
6	1	483.82	14	14	1.57	969.29	964	34	1.95E-03	57.1	1.35E+00
7	1	486.18	16	15	1.43	974.00	964	34	2.25E-03	51.4	
8	0	500.67	8	19	1.61	1002.99	999	8	1.08E-03	102.1	
9	0	511.28*	26	38	2.68	1024.22	1018	15	3.67E-03	75.1	
10	0	585.45	13	42	0.83	1172.62	1165	14	1.81E-03	109.3	
11	0	739.51	7	16	0.91	1480.78	1475	10	1.04E-03	109.6	
12	0	842.15	9	16	2.81	1686.05	1681	10	1.27E-03	90.9	
13	0	883.86	18	7	1.00	1769.48	1764	10	2.45E-03	37.5	
14	0	1057.87	11	6	1.36	2117.39	2113	9	1.48E-03	53.1	
15	0	1126.58	19	3	3.32	2254.76	2248	14	2.63E-03	30.9	
16	0	1136.22	5	2	0.80	2274.03	2271	6	7.54E-04	56.0	
17	0	1461.29*	14	5	1.91	2923.70	2918	11	2.01E-03	52.9	
18	0	1496.78	4	3	1.37	2994.61	2987	9	6.15E-04	78.4	
19	0	1697.03	7	3	0.98	3394.66	3386	12	9.44E-04	64.1	
20	0	1765.87*	4	3	1.44	3532.16	3526	12	5.46E-04	137.1	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 09:59:50

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287005.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 29-MAR-2022 09:30:00	Acquisition date	: 17-MAY-2022 07:59:24
Sample ID	: G579287005	Sample quantity	: 0.74789 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA40	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.44 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	13	10.44*	1.958E+00	3.292E+01	6.231E+01	91.94
K-40	1460.82	14	10.66*	7.688E-01	8.857E+01	8.857E+01	105.81
CR-51	320.08	34	9.91*	2.609E+00	6.637E+01	2.261E+02	56.10
RA-226	186.21	15	3.59*	3.655E+00	5.877E+01	5.877E+01	237.78
ANH-511	511.00	26	100.00*	1.866E+00	7.105E+00	7.105E+00	150.16

Flag: "*" = Keyline

```

*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                           *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287005.CNF;1      *
* Acquisition date   : 17-MAY-2022 07:59:24 Sensitivity      : 3.000                *
* Detector ID        : GAM40 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:00.44 Half life ratio : *****      *
* Sample date        : 29-MAR-2022 09:30:00 Analyst initials: RXF2      *
* Sample ID          : G579287005 Sample Quantity : 7.4789E-01 FILTER *
* Batch Number       : 2264689 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000           *
* Nuclide Library    : LIQUID.NLB;26                                           *
*****
*                                     CALIBRATION INFORMATION                       *
*
* Eff. Cal. date     : 13-OCT-2021 04:34:22 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM40_JAR.CNF;17          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	6.231E+01	5.614E+01	1.089E+02
K-40	8.857E+01	9.184E+01	7.980E+01
CR-51	2.261E+02	1.243E+02	1.708E+02
RA-226	5.877E+01	1.370E+02	1.340E+02
ANH-511	7.105E+00	1.046E+01	6.623E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	1.856E+00		4.155E+00	9.505E+00	NOT IDENT.
NA-24	0.000E+00		2.131E+24	0.000E+00	SHORT HLIF
AL-26	1.601E+00		3.717E+00	9.159E+00	NOT IDENT.
SC-46	-3.227E+00		5.409E+00	9.064E+00	NOT IDENT.
V-48	-1.205E+01		4.138E+01	7.311E+01	NOT IDENT.
MN-52	5.513E+01		1.343E+03	3.058E+03	NOT IDENT.
MN-54	-2.224E+00		4.972E+00	8.611E+00	NOT IDENT.
CO-56	6.375E+00		4.709E+00	1.176E+01	NOT IDENT.
CO-57	-8.829E-01		3.202E+00	5.581E+00	NOT IDENT.
NI-57	0.000E+00		5.350E+10	0.000E+00	SHORT HLIF
CO-58	-3.383E+00		6.434E+00	1.104E+01	NOT IDENT.
FE-59	-3.643E+00		1.214E+01	2.434E+01	NOT IDENT.
CO-60	1.977E+00		4.627E+00	1.060E+01	NOT IDENT.
ZN-65	1.092E+01		9.781E+00	2.357E+01	NOT IDENT.
CU-67	0.000E+00		3.854E+06	0.000E+00	SHORT HLIF
GE-68	1.209E+02		1.502E+02	3.462E+02	NOT IDENT.
AS-73	-1.691E+02		2.488E+02	4.320E+02	NOT IDENT.
AS-74	-4.546E+00		4.350E+01	8.104E+01	NOT IDENT.
SE-75	3.522E+00		6.759E+00	1.248E+01	NOT IDENT.
BR-77	0.000E+00		3.112E+07	0.000E+00	SHORT HLIF
SR-82	3.004E+01		7.617E+01	1.632E+02	NOT IDENT.
RB-83	1.502E+00		1.086E+01	2.117E+01	NOT IDENT.
RB-84	2.248E+00		1.789E+01	3.148E+01	NOT IDENT.
KR-85	6.232E+02		9.874E+02	1.828E+03	NOT IDENT.
SR-85	4.671E+00		7.402E+00	1.370E+01	NOT IDENT.

RB-86	1.416E+02	3.227E+02	6.986E+02	NOT IDENT.
Y-88	-1.300E-01	4.184E+00	9.604E+00	NOT IDENT.
Y-91	1.446E+03	2.673E+03	6.196E+03	NOT IDENT.
NB-94	1.242E+00	4.070E+00	8.020E+00	NOT IDENT.
NB-95	-7.144E-01	5.082E+00	9.764E+00	NOT IDENT.
NB-95M	-1.278E+01	2.278E+01	3.697E+01	NOT IDENT.
TC-95M	1.133E+01	7.694E+00	1.543E+01	NOT IDENT.
ZR-95	9.740E-01	9.736E+00	1.953E+01	NOT IDENT.
MO-99	0.000E+00	1.106E+07	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	1.254E+41	0.000E+00	SHORT HLIF
RH-101	1.603E+00	3.742E+00	6.949E+00	NOT IDENT.
RH-102M	4.963E-01	3.541E+00	6.301E+00	NOT IDENT.
RU-103	4.482E+00	9.639E+00	1.544E+01	NOT IDENT.
RH-106	-1.339E+01	4.238E+01	7.646E+01	NOT IDENT.
RU-106	-1.339E+01	4.238E+01	7.646E+01	NOT IDENT.
AG-108M	-2.963E+00	2.909E+00	4.787E+00	NOT IDENT.
CD-109	6.270E+01	8.754E+01	1.707E+02	NOT IDENT.
AG-110	-7.918E+01	9.604E+01	1.577E+02	NOT IDENT.
AG-110M	1.169E+01	8.599E+00	1.536E+01	FAIL ABUN
IN-111	0.000E+00	5.655E+05	0.000E+00	SHORT HLIF
SN-113	3.526E+00	6.071E+00	1.245E+01	NOT IDENT.
IN-114M	2.995E+01	3.782E+01	6.695E+01	NOT IDENT.
CD-115	0.000E+00	4.812E+07	0.000E+00	SHORT HLIF
SN-117M	-5.490E+00	3.334E+01	5.822E+01	NOT IDENT.
SB-122	0.000E+00	1.245E+06	0.000E+00	SHORT HLIF
I-123	0.000E+00	1.739E+27	0.000E+00	SHORT HLIF
TE-123M	-9.126E-01	3.927E+00	6.788E+00	NOT IDENT.
SB-124	-9.575E+00	1.609E+01	2.156E+01	NOT IDENT.
SB-125	-2.811E+00	1.073E+01	1.991E+01	NOT IDENT.
TE-125M	-1.486E+03	1.811E+03	2.993E+03	NOT IDENT.
I-126	7.100E+01	1.394E+02	2.916E+02	NOT IDENT.
SB-126	-2.972E+01	1.014E+02	1.849E+02	NOT IDENT.
SN-126	2.126E+00	8.677E+00	1.613E+01	NOT IDENT.
SB-127	0.000E+00	5.852E+04	0.000E+00	SHORT HLIF
TE-129	-9.818E+00	1.184E+02	2.234E+02	NOT IDENT.
I-131	1.046E+02	2.186E+02	4.498E+02	NOT IDENT.
I-132	0.000E+00	1.395E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	1.139E+05	0.000E+00	SHORT HLIF
BA-133	6.198E-01	4.526E+00	8.874E+00	NOT IDENT.
I-133	0.000E+00	3.513E+17	0.000E+00	SHORT HLIF
CS-134	-2.511E+00	5.297E+00	8.612E+00	NOT IDENT.
I-135	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
CS-136	9.066E+00	6.713E+01	1.410E+02	NOT IDENT.
BA-137M	3.340E-01	3.529E+00	6.974E+00	NOT IDENT.
CS-137	3.528E-01	3.728E+00	7.367E+00	NOT IDENT.
LA-138	-7.322E+00	6.103E+00	8.033E+00	NOT IDENT.
CE-139	-9.250E-02	4.279E+00	7.513E+00	NOT IDENT.
BA-140	-1.863E+02	1.907E+02	3.104E+02	NOT IDENT.
LA-140	-2.654E+00	6.455E+01	1.348E+02	FAIL ABUN
CE-141	-3.528E+00	1.474E+01	2.552E+01	NOT IDENT.
CE-143	0.000E+00	3.302E+11	0.000E+00	SHORT HLIF
CE-144	-7.132E-01	2.464E+01	4.382E+01	NOT IDENT.
PM-144	4.090E-02	4.750E+00	8.905E+00	NOT IDENT.
PR-144	5.423E+00	3.622E+02	6.795E+02	NOT IDENT.
PM-146	3.181E+00	4.618E+00	9.693E+00	NOT IDENT.
ND-147	-3.195E+02	5.933E+02	1.003E+03	FAIL ABUN
PM-147	3.578E+04	8.797E+04	1.639E+05	NOT IDENT.
PM-149	0.000E+00	4.576E+08	0.000E+00	SHORT HLIF
EU-152	-4.688E-05	1.109E+01	2.129E+01	NOT IDENT.
GD-153	-3.342E+00	9.708E+00	1.709E+01	NOT IDENT.
EU-154	4.831E+00	1.148E+01	2.619E+01	NOT IDENT.
EU-155	2.672E+00	1.238E+01	2.282E+01	NOT IDENT.
TB-160	-3.416E+01	2.873E+01	3.235E+01	NOT IDENT.
HO-166M	8.370E+00	6.174E+00	1.456E+01	NOT IDENT.
TM-171	-7.242E+02	4.043E+03	7.461E+03	NOT IDENT.
LU-176	3.905E-01	3.208E+00	6.203E+00	NOT IDENT.
LU-177	1.247E+00	4.058E+03	7.154E+03	NOT IDENT.
HF-181	2.790E+00	8.494E+00	1.364E+01	NOT IDENT.
W-181	-4.186E+00	5.093E+01	9.345E+01	NOT IDENT.
TA-182	8.690E+00	2.733E+01	5.691E+01	FAIL ABUN
RE-183	2.817E+01	5.461E+01	1.060E+02	NOT IDENT.
RE-184	3.549E+00	2.759E+01	5.411E+01	NOT IDENT.
RE-188	2.201E+01	2.395E+01	4.675E+01	FAIL ABUN
W-188	-3.284E+02	1.131E+03	2.114E+03	NOT IDENT.
OS-191	5.478E+00	8.628E+01	1.546E+02	NOT IDENT.
IR-192	-2.423E+00	5.892E+00	9.626E+00	NOT IDENT.
PB-201	0.000E+00	3.732E+38	0.000E+00	SHORT HLIF
TL-201	0.000E+00	1.775E+06	0.000E+00	SHORT HLIF

TL-202	2.752E+01	5.306E+01	1.082E+02	NOT IDENT.
HG-203	-2.387E-01	7.247E+00	1.386E+01	NOT IDENT.
PB-203	0.000E+00	2.305E+07	0.000E+00	SHORT HLIF
TL-204	3.922E+02	6.956E+02	1.337E+03	NOT IDENT.
BI-207	1.338E+00	5.313E+00	1.122E+01	NOT IDENT.
TL-208	-3.520E-01	6.262E+00	1.160E+01	NOT IDENT.
PB-210	9.246E+02	1.352E+03	2.503E+03	NOT IDENT.
BI-211	-2.864E+01	2.597E+01	4.092E+01	NOT IDENT.
PB-211	5.325E+00	8.338E+01	1.606E+02	NOT IDENT.
BI-212	-9.919E+00	6.536E+01	1.202E+02	NOT IDENT.
PB-212	-5.839E+00	1.062E+01	1.794E+01	NOT IDENT.
BI-213	1.989E+00	1.202E+01	2.350E+01	NOT IDENT.
BI-214	-8.790E+00	1.078E+01	1.912E+01	FAIL ABUN
PB-214	-5.324E+00	9.547E+00	1.617E+01	NOT IDENT.
RN-219	-2.649E+00	5.147E+01	9.715E+01	NOT IDENT.
FR-221	1.935E+01	2.376E+01	4.541E+01	NOT IDENT.
RA-223	-5.618E+00	7.438E+01	1.414E+02	NOT IDENT.
RA-224	-1.255E+02	9.056E+01	1.326E+02	NOT IDENT.
AC-225	5.769E+02	7.084E+02	1.354E+03	NOT IDENT.
AC-227	7.088E+00	3.670E+01	6.433E+01	NOT IDENT.
TH-227	7.088E+00	3.670E+01	6.433E+01	NOT IDENT.
AC-228	5.837E+00	1.996E+01	3.711E+01	NOT IDENT.
RA-228	5.837E+00	1.996E+01	3.711E+01	NOT IDENT.
TH-228	-5.839E+00	1.062E+01	1.794E+01	NOT IDENT.
TH-229	-7.618E+01	6.416E+01	9.759E+01	NOT IDENT.
TH-230	5.473E+02	1.475E+03	2.827E+03	NOT IDENT.
PA-231	-2.928E+00	5.889E+01	1.035E+02	NOT IDENT.
TH-231	2.300E+01	5.231E+01	9.341E+01	NOT IDENT.
TH-232	-2.737E+03	3.470E+03	5.364E+03	NOT IDENT.
PA-233	-5.322E+00	7.524E+00	1.340E+01	NOT IDENT.
PA-234	5.774E-01	3.259E+01	6.309E+01	FAIL ABUN
PA-234M	-2.325E+02	5.493E+02	9.965E+02	NOT IDENT.
TH-234	-1.307E+02	2.583E+02	4.133E+02	FAIL ABUN
U-234	-1.041E+03	1.366E+04	2.549E+04	NOT IDENT.
U-235	-1.964E+01	2.355E+01	3.611E+01	FAIL ABUN
NP-237	-5.322E+00	7.524E+00	1.340E+01	NOT IDENT.
NP-238	0.000E+00	1.610E+08	0.000E+00	SHORT HLIF
U-238	-1.307E+02	2.583E+02	4.133E+02	FAIL ABUN
NP-239	5.818E+00	3.003E+01	5.508E+01	NOT IDENT.
AM-241	-3.746E+00	2.839E+01	5.184E+01	NOT IDENT.
AM-242	-7.814E+00	6.922E+01	1.246E+02	NOT IDENT.
AM-243	-2.844E+00	6.580E+00	1.155E+01	NOT IDENT.
CM-243	-7.680E+00	1.196E+01	2.022E+01	NOT IDENT.
BK-247	7.417E+00	9.904E+00	1.876E+01	NOT IDENT.
CM-247	-1.869E+00	4.706E+00	8.545E+00	NOT IDENT.
CF-249	-4.227E-01	4.563E+00	8.663E+00	NOT IDENT.
CF-251	-1.089E-01	1.519E+01	2.672E+01	NOT IDENT.
CF-252	1.072E+04	1.824E+04	3.554E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	92.85	61	82	1.65	186.79	182	9	8.51E-03	29.7	
2	0	186.38	55	71	0.93	374.03	370	9	7.67E-03	30.7	
3	0	220.66	74	77	6.69	442.64	435	17	1.02E-02	29.6	
4	0	238.71	54	77	1.05	478.78	473	10	7.49E-03	33.1	
5	0	318.61	34	18	2.13	638.68	635	8	4.75E-03	28.1	
6	0	479.00	13	9	1.74	959.63	956	8	1.86E-03	46.0	
7	1	483.82	14	14	1.57	969.29	964	34	1.95E-03	57.1	1.35E+00
8	1	486.18	16	15	1.43	974.00	964	34	2.25E-03	51.4	
9	0	500.67	8	19	1.61	1002.99	999	8	1.08E-03	102.1	
10	0	511.28	154	38	2.68	1024.22	1018	15	2.13E-02	11.9	
11	0	585.45	13	42	0.83	1172.62	1165	14	1.81E-03	109.3	
12	0	739.51	7	16	0.91	1480.78	1475	10	1.04E-03	109.6	
13	0	842.15	9	16	2.81	1686.05	1681	10	1.27E-03	90.9	
14	0	883.86	18	7	1.00	1769.48	1764	10	2.45E-03	37.5	
15	0	1057.87	11	6	1.36	2117.39	2113	9	1.48E-03	53.1	
16	0	1120.92	7	9	0.79	2243.45	2239	7	9.90E-04	78.5	
17	0	1126.58	19	3	3.32	2254.76	2248	14	2.63E-03	30.9	
18	0	1136.22	5	2	0.80	2274.03	2271	6	7.54E-04	56.0	
19	0	1461.29	31	5	1.91	2923.70	2918	11	4.26E-03	23.3	
20	0	1496.78	4	3	1.37	2994.61	2987	9	6.15E-04	78.4	
21	0	1697.03	7	3	0.98	3394.66	3386	12	9.44E-04	64.1	
22	0	1765.87	13	3	1.44	3532.16	3526	12	1.82E-03	38.2	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	13	10.44*	1.958E+00	3.292E+01	6.231E+01	91.94
K-40	1460.82	14	10.66*	7.688E-01	8.857E+01	8.857E+01	105.81
CR-51	320.08	34	9.91*	2.609E+00	6.637E+01	2.261E+02	56.10
RA-226	186.21	15	3.59*	3.655E+00	5.877E+01	5.877E+01	237.78
ANH-511	511.00	26	100.00*	1.866E+00	7.105E+00	7.105E+00	150.16

Flag: "*" = Keyline

Total number of lines in spectrum 20
Number of unidentified lines 9
Number of lines tentatively identified by NID 11 55.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.89	3.292E+01	6.231E+01	5.729E+01	91.94	
K-40	1.25E+09Y	1.00	8.857E+01	8.857E+01	9.371E+01	105.81	
CR-51	27.70D	3.41	6.637E+01	2.261E+02	1.268E+02	56.10	
RA-226	1600.00Y	1.00	5.877E+01	5.877E+01	13.97E+01	237.78	
ANH-511	1.00E+09Y	1.00	7.105E+00	7.105E+00	10.67E+00	150.16	

Total Activity : 2.537E+02 4.428E+02

Grand Total Activity : 2.537E+02 4.428E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	92.85	2	82	1.65	186.79	182	9	3.27E-04	****	3.24E+00	T
0	220.66	74	77	6.69	442.64	435	17	1.02E-02	59.1	3.32E+00	T
1	483.82	14	14	1.57	969.29	964	34	1.95E-03	****	1.94E+00	
1	486.18	16	15	1.43	974.00	964	34	2.25E-03	****	1.94E+00	T
0	500.67	8	19	1.61	1002.99	999	8	1.08E-03	****	1.90E+00	
0	585.45	13	42	0.83	1172.62	1165	14	1.81E-03	****	1.68E+00	
0	739.51	7	16	0.91	1480.78	1475	10	1.04E-03	****	1.39E+00	T
0	842.15	9	16	2.81	1686.05	1681	10	1.27E-03	****	1.24E+00	
0	883.86	18	7	1.00	1769.48	1764	10	2.45E-03	75.1	1.19E+00	T
0	1057.87	11	6	1.36	2117.39	2113	9	1.48E-03	****	1.01E+00	
0	1126.58	19	3	3.32	2254.76	2248	14	2.63E-03	61.9	9.57E-01	
0	1136.22	5	2	0.80	2274.03	2271	6	7.54E-04	****	9.50E-01	
0	1496.78	4	3	1.37	2994.61	2987	9	6.15E-04	****	7.55E-01	
0	1697.03	7	3	0.98	3394.66	3386	12	9.44E-04	****	6.97E-01	
0	1765.87	4	3	1.44	3532.16	3526	12	5.46E-04	****	6.84E-01	T

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287005.CNF;1  *
* Acquisition date   : 17-MAY-2022 07:59:24 Sensitivity      : 3.000          *
* Detector ID        : GAM40 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 02:00:00.44 Half life ratio : *****          *
* Sample date        : 29-MAR-2022 09:30:00 Nuclide Library : LIQUID       *
* Sample ID          : G579287005 Analyst initials: RXF2          *
* Batch Number       : 2264689 Sample Quantity : 7.4789E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 13-OCT-2021 04:34:22 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM40_JAR.CNF;17          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	4.818E+01
K-40	3.162E+01
CR-51	7.647E+01
RA-226	6.185E+01
ANH-511	2.949E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	3.933E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	3.574E+00	NOT IDENT.
SC-46	3.674E+00	NOT IDENT.
V-48	3.131E+01	NOT IDENT.
MN-52	1.151E+03	NOT IDENT.
MN-54	3.703E+00	NOT IDENT.
CO-56	5.028E+00	NOT IDENT.
CO-57	2.566E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	4.663E+00	NOT IDENT.
FE-59	9.537E+00	NOT IDENT.
CO-60	4.464E+00	NOT IDENT.
ZN-65	1.019E+01	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	1.492E+02	NOT IDENT.
AS-73	1.952E+02	NOT IDENT.
AS-74	3.585E+01	NOT IDENT.
SE-75	5.726E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	6.875E+01	NOT IDENT.
RB-83	9.372E+00	NOT IDENT.
RB-84	1.342E+01	NOT IDENT.
KR-85	8.286E+02	NOT IDENT.
SR-85	6.211E+00	NOT IDENT.
RB-86	3.007E+02	NOT IDENT.

Y-88	3.403E+00	NOT IDENT.
Y-91	2.581E+03	NOT IDENT.
NB-94	3.543E+00	NOT IDENT.
NB-95	4.028E+00	NOT IDENT.
NB-95M	1.703E+01	NOT IDENT.
TC-95M	7.180E+00	NOT IDENT.
ZR-95	8.214E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	3.220E+00	NOT IDENT.
RH-102M	2.779E+00	NOT IDENT.
RU-103	6.791E+00	NOT IDENT.
RH-106	3.357E+01	NOT IDENT.
RU-106	3.357E+01	NOT IDENT.
AG-108M	2.037E+00	NOT IDENT.
CD-109	7.878E+01	NOT IDENT.
AG-110	6.763E+01	NOT IDENT.
AG-110M	6.783E+00	FAIL ABUN
IN-111	0.000E+00	SHORT HLIF
SN-113	5.606E+00	NOT IDENT.
IN-114M	3.110E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	2.668E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	3.120E+00	NOT IDENT.
SB-124	7.190E+00	NOT IDENT.
SB-125	8.851E+00	NOT IDENT.
TE-125M	1.377E+03	NOT IDENT.
I-126	1.271E+02	NOT IDENT.
SB-126	7.863E+01	NOT IDENT.
SN-126	7.447E+00	NOT IDENT.
SB-127	0.000E+00	SHORT HLIF
TE-129	9.976E+01	NOT IDENT.
I-131	2.010E+02	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	3.982E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.672E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	5.958E+01	NOT IDENT.
BA-137M	2.992E+00	NOT IDENT.
CS-137	3.161E+00	NOT IDENT.
LA-138	2.685E+00	NOT IDENT.
CE-139	3.476E+00	NOT IDENT.
BA-140	1.330E+02	NOT IDENT.
LA-140	5.327E+01	FAIL ABUN
CE-141	1.177E+01	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	2.021E+01	NOT IDENT.
PM-144	3.942E+00	NOT IDENT.
PR-144	3.009E+02	NOT IDENT.
PM-146	4.326E+00	NOT IDENT.
ND-147	4.386E+02	FAIL ABUN
PM-147	7.578E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	9.610E+00	NOT IDENT.
GD-153	7.762E+00	NOT IDENT.
EU-154	1.081E+01	NOT IDENT.
EU-155	1.053E+01	NOT IDENT.
TB-160	1.317E+01	NOT IDENT.
HO-166M	6.412E+00	NOT IDENT.
TM-171	3.374E+03	NOT IDENT.
LU-176	2.832E+00	NOT IDENT.
LU-177	3.264E+03	NOT IDENT.
HF-181	5.859E+00	NOT IDENT.
W-181	4.294E+01	NOT IDENT.
TA-182	2.467E+01	FAIL ABUN
RE-183	4.882E+01	NOT IDENT.
RE-184	2.309E+01	NOT IDENT.
RE-188	2.159E+01	FAIL ABUN
W-188	9.586E+02	NOT IDENT.
OS-191	7.155E+01	NOT IDENT.
IR-192	4.319E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF
TL-202	4.850E+01	NOT IDENT.

HG-203	6.328E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	6.192E+02	NOT IDENT.
BI-207	4.705E+00	NOT IDENT.
TL-208	5.305E+00	NOT IDENT.
PB-210	1.161E+03	NOT IDENT.
BI-211	1.830E+01	NOT IDENT.
PB-211	7.216E+01	NOT IDENT.
BI-212	5.255E+01	NOT IDENT.
PB-212	8.456E+00	NOT IDENT.
BI-213	1.050E+01	NOT IDENT.
BI-214	8.649E+00	FAIL ABUN
PB-214	7.305E+00	NOT IDENT.
RN-219	4.394E+01	NOT IDENT.
FR-221	2.093E+01	NOT IDENT.
RA-223	6.413E+01	NOT IDENT.
RA-224	6.081E+01	NOT IDENT.
AC-225	6.241E+02	NOT IDENT.
AC-227	2.980E+01	NOT IDENT.
TH-227	2.980E+01	NOT IDENT.
AC-228	1.625E+01	NOT IDENT.
RA-228	1.625E+01	NOT IDENT.
TH-228	8.456E+00	NOT IDENT.
TH-229	4.452E+01	NOT IDENT.
TH-230	1.297E+03	NOT IDENT.
PA-231	4.708E+01	NOT IDENT.
TH-231	4.300E+01	NOT IDENT.
TH-232	2.467E+03	NOT IDENT.
PA-233	6.034E+00	NOT IDENT.
PA-234	2.651E+01	FAIL ABUN
PA-234M	4.226E+02	NOT IDENT.
TH-234	1.910E+02	FAIL ABUN
U-234	1.154E+04	NOT IDENT.
U-235	1.652E+01	FAIL ABUN
NP-237	6.034E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.910E+02	FAIL ABUN
NP-239	2.537E+01	NOT IDENT.
AM-241	2.378E+01	NOT IDENT.
AM-242	5.694E+01	NOT IDENT.
AM-243	5.292E+00	NOT IDENT.
CM-243	9.221E+00	NOT IDENT.
BK-247	8.620E+00	NOT IDENT.
CM-247	3.849E+00	NOT IDENT.
CF-249	3.881E+00	NOT IDENT.
CF-251	1.232E+01	NOT IDENT.
CF-252	1.625E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287005.CNF;1
* Acquisition date   : 17-MAY-2022 07:59:24 Sensitivity      : 3.000
* Detector ID        : GAM40 Energy tolerance: 1.500
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 02:00:00.44 Half life ratio  : *****
* Sample date        : 29-MAR-2022 09:30:00 Nuclide Library : LIQUID
* Sample ID          : G579287005 Analyst initials: RXF2
* Batch Number       : 2264689 Sample Quantity : 7.4789E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 13-OCT-2021 04:34:22 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM40_JAR.CNF;17

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	6.231E+01	5.639E+01	5.640E+01
K-40	8.857E+01	9.224E+01	9.226E+01
CR-51	2.261E+02	1.260E+02	1.261E+02
RA-226	5.877E+01	1.371E+02	1.371E+02
ANH-511	7.105E+00	1.047E+01	1.047E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	1.856E+00	4.159E+00	4.242E+00	NOT IDENT.
NA-24	1.229E+24	2.136E+24	0.000E+00	SHORT HLIF
AL-26	1.601E+00	3.719E+00	3.789E+00	NOT IDENT.
SC-46	-3.227E+00	5.416E+00	5.608E+00	NOT IDENT.
V-48	-1.205E+01	4.140E+01	4.175E+01	NOT IDENT.
MN-52	5.513E+01	1.343E+03	1.344E+03	NOT IDENT.
MN-54	-2.224E+00	4.976E+00	5.076E+00	NOT IDENT.
CO-56	6.375E+00	4.741E+00	5.545E+00	NOT IDENT.
CO-57	-8.829E-01	3.203E+00	3.227E+00	NOT IDENT.
NI-57	-1.431E+10	5.354E+10	5.392E+10	SHORT HLIF
CO-58	-3.383E+00	6.441E+00	6.619E+00	NOT IDENT.
FE-59	-3.643E+00	1.214E+01	1.225E+01	NOT IDENT.
CO-60	1.977E+00	4.631E+00	4.716E+00	NOT IDENT.
ZN-65	1.092E+01	9.823E+00	1.099E+01	NOT IDENT.
CU-67	-4.445E+06	3.880E+06	4.368E+06	SHORT HLIF
GE-68	1.209E+02	1.506E+02	1.602E+02	NOT IDENT.
AS-73	-1.691E+02	2.521E+02	2.633E+02	NOT IDENT.
AS-74	-4.546E+00	4.350E+01	4.355E+01	NOT IDENT.
SE-75	3.522E+00	6.767E+00	6.951E+00	NOT IDENT.
BR-77	-2.919E+07	3.128E+07	3.394E+07	SHORT HLIF
SR-82	3.004E+01	7.621E+01	7.741E+01	NOT IDENT.
RB-83	1.502E+00	1.086E+01	1.088E+01	NOT IDENT.
RB-84	2.248E+00	1.789E+01	1.792E+01	NOT IDENT.
KR-85	6.232E+02	9.888E+02	1.028E+03	NOT IDENT.
SR-85	4.671E+00	7.412E+00	7.706E+00	NOT IDENT.

RB-86	1.416E+02	3.229E+02	3.292E+02	NOT IDENT.
Y-88	-1.300E-01	4.184E+00	4.184E+00	NOT IDENT.
Y-91	1.446E+03	2.676E+03	2.754E+03	NOT IDENT.
NB-94	1.242E+00	4.071E+00	4.109E+00	NOT IDENT.
NB-95	-7.144E-01	5.082E+00	5.092E+00	NOT IDENT.
NB-95M	-1.278E+01	2.282E+01	2.354E+01	NOT IDENT.
TC-95M	1.133E+01	7.773E+00	9.303E+00	NOT IDENT.
ZR-95	9.740E-01	9.736E+00	9.746E+00	NOT IDENT.
MO-99	5.149E+06	1.107E+07	1.131E+07	SHORT HLIF
TC-99M	1.000E+41	1.260E+41	0.000E+00	SHORT HLIF
RH-101	1.603E+00	3.755E+00	3.824E+00	NOT IDENT.
RH-102M	4.963E-01	3.542E+00	3.549E+00	NOT IDENT.
RU-103	4.482E+00	9.647E+00	9.857E+00	NOT IDENT.
RH-106	-1.339E+01	4.240E+01	4.283E+01	NOT IDENT.
RU-106	-1.339E+01	4.240E+01	4.283E+01	NOT IDENT.
AG-108M	-2.963E+00	2.920E+00	3.211E+00	NOT IDENT.
CD-109	6.270E+01	8.787E+01	9.231E+01	NOT IDENT.
AG-110	-7.918E+01	9.625E+01	1.027E+02	NOT IDENT.
AG-110M	1.169E+01	8.665E+00	1.014E+01	FAIL ABUN
IN-111	1.512E+05	5.657E+05	5.698E+05	SHORT HLIF
SN-113	3.526E+00	6.078E+00	6.283E+00	NOT IDENT.
IN-114M	2.995E+01	3.791E+01	4.025E+01	NOT IDENT.
CD-115	-2.384E+07	4.818E+07	4.937E+07	SHORT HLIF
SN-117M	-5.490E+00	3.335E+01	3.344E+01	NOT IDENT.
SB-122	-7.484E+05	1.246E+06	1.291E+06	SHORT HLIF
I-123	-4.207E+26	1.739E+27	0.000E+00	SHORT HLIF
TE-123M	-9.126E-01	3.928E+00	3.949E+00	NOT IDENT.
SB-124	-9.575E+00	1.611E+01	1.668E+01	NOT IDENT.
SB-125	-2.811E+00	1.073E+01	1.081E+01	NOT IDENT.
TE-125M	-1.486E+03	1.816E+03	1.936E+03	NOT IDENT.
I-126	7.100E+01	1.395E+02	1.432E+02	NOT IDENT.
SB-126	-2.972E+01	1.015E+02	1.024E+02	NOT IDENT.
SN-126	2.126E+00	8.680E+00	8.733E+00	NOT IDENT.
SB-127	-1.601E+04	5.864E+04	5.909E+04	SHORT HLIF
TE-129	-9.818E+00	1.184E+02	1.185E+02	NOT IDENT.
I-131	1.046E+02	2.188E+02	2.239E+02	NOT IDENT.
I-132	1.000E+41	3.326E+41	0.000E+00	SHORT HLIF
TE-132	7.419E+03	1.139E+05	1.139E+05	SHORT HLIF
BA-133	6.198E-01	4.526E+00	4.535E+00	NOT IDENT.
I-133	1.646E+17	3.550E+17	0.000E+00	SHORT HLIF
CS-134	-2.511E+00	5.301E+00	5.421E+00	NOT IDENT.
I-135	1.000E+41	2.489E+41	0.000E+00	SHORT HLIF
CS-136	9.066E+00	6.714E+01	6.727E+01	NOT IDENT.
BA-137M	3.340E-01	3.529E+00	3.532E+00	NOT IDENT.
CS-137	3.528E-01	3.728E+00	3.731E+00	NOT IDENT.
LA-138	-7.322E+00	6.141E+00	6.973E+00	NOT IDENT.
CE-139	-9.250E-02	4.279E+00	4.280E+00	NOT IDENT.
BA-140	-1.863E+02	1.914E+02	2.090E+02	NOT IDENT.
LA-140	-2.654E+00	6.455E+01	6.456E+01	FAIL ABUN
CE-141	-3.528E+00	1.474E+01	1.483E+01	NOT IDENT.
CE-143	-5.460E+10	3.303E+11	3.312E+11	SHORT HLIF
CE-144	-7.132E-01	2.464E+01	2.464E+01	NOT IDENT.
PM-144	4.090E-02	4.750E+00	4.750E+00	NOT IDENT.
PR-144	5.423E+00	3.622E+02	3.622E+02	NOT IDENT.
PM-146	3.181E+00	4.630E+00	4.847E+00	NOT IDENT.
ND-147	-3.195E+02	5.940E+02	6.112E+02	FAIL ABUN
PM-147	3.578E+04	8.802E+04	8.948E+04	NOT IDENT.
PM-149	1.369E+08	4.581E+08	4.623E+08	SHORT HLIF
EU-152	-4.688E-05	1.109E+01	1.109E+01	NOT IDENT.
GD-153	-3.342E+00	9.713E+00	9.829E+00	NOT IDENT.
EU-154	4.831E+00	1.149E+01	1.169E+01	NOT IDENT.
EU-155	2.672E+00	1.239E+01	1.245E+01	NOT IDENT.
TB-160	-3.416E+01	2.892E+01	3.277E+01	NOT IDENT.
HO-166M	8.370E+00	6.219E+00	7.276E+00	NOT IDENT.
TM-171	-7.242E+02	4.045E+03	4.058E+03	NOT IDENT.
LU-176	3.905E-01	3.209E+00	3.213E+00	NOT IDENT.
LU-177	1.247E+00	4.058E+03	4.058E+03	NOT IDENT.
HF-181	2.790E+00	8.498E+00	8.591E+00	NOT IDENT.
W-181	-4.186E+00	5.094E+01	5.098E+01	NOT IDENT.
TA-182	8.690E+00	2.734E+01	2.762E+01	FAIL ABUN
RE-183	2.817E+01	5.478E+01	5.624E+01	NOT IDENT.
RE-184	3.549E+00	2.760E+01	2.764E+01	NOT IDENT.
RE-188	2.201E+01	2.402E+01	2.599E+01	FAIL ABUN
W-188	-3.284E+02	1.132E+03	1.142E+03	NOT IDENT.
OS-191	5.478E+00	8.628E+01	8.632E+01	NOT IDENT.
IR-192	-2.423E+00	5.896E+00	5.996E+00	NOT IDENT.
PB-201	1.248E+38	3.801E+38	0.000E+00	SHORT HLIF
TL-201	4.061E+05	1.775E+06	1.784E+06	SHORT HLIF

TL-202	2.752E+01	5.311E+01	5.454E+01	NOT IDENT.
HG-203	-2.387E-01	7.247E+00	7.248E+00	NOT IDENT.
PB-203	-7.593E+05	2.305E+07	2.305E+07	SHORT HLIF
TL-204	3.922E+02	6.974E+02	7.195E+02	NOT IDENT.
BI-207	1.338E+00	5.314E+00	5.348E+00	NOT IDENT.
TL-208	-3.520E-01	6.262E+00	6.264E+00	NOT IDENT.
PB-210	9.246E+02	1.356E+03	1.419E+03	NOT IDENT.
BI-211	-2.864E+01	2.610E+01	2.912E+01	NOT IDENT.
PB-211	5.325E+00	8.339E+01	8.342E+01	NOT IDENT.
BI-212	-9.919E+00	6.537E+01	6.552E+01	NOT IDENT.
PB-212	-5.839E+00	1.064E+01	1.096E+01	NOT IDENT.
BI-213	1.989E+00	1.202E+01	1.205E+01	NOT IDENT.
BI-214	-8.790E+00	1.081E+01	1.151E+01	FAIL ABUN
PB-214	-5.324E+00	9.559E+00	9.856E+00	NOT IDENT.
RN-219	-2.649E+00	5.147E+01	5.148E+01	NOT IDENT.
FR-221	1.935E+01	2.384E+01	2.539E+01	NOT IDENT.
RA-223	-5.618E+00	7.439E+01	7.443E+01	NOT IDENT.
RA-224	-1.255E+02	9.133E+01	1.075E+02	NOT IDENT.
AC-225	5.769E+02	7.119E+02	7.580E+02	NOT IDENT.
AC-227	7.088E+00	3.672E+01	3.686E+01	NOT IDENT.
TH-227	7.088E+00	3.672E+01	3.686E+01	NOT IDENT.
AC-228	5.837E+00	1.997E+01	2.014E+01	NOT IDENT.
RA-228	5.837E+00	1.997E+01	2.014E+01	NOT IDENT.
TH-228	-5.839E+00	1.064E+01	1.096E+01	NOT IDENT.
TH-229	-7.618E+01	6.450E+01	7.309E+01	NOT IDENT.
TH-230	5.473E+02	1.478E+03	1.499E+03	NOT IDENT.
PA-231	-2.928E+00	5.889E+01	5.891E+01	NOT IDENT.
TH-231	2.300E+01	5.244E+01	5.346E+01	NOT IDENT.
TH-232	-2.737E+03	3.496E+03	3.708E+03	NOT IDENT.
PA-233	-5.322E+00	7.541E+00	7.914E+00	NOT IDENT.
PA-234	5.774E-01	3.260E+01	3.260E+01	FAIL ABUN
PA-234M	-2.325E+02	5.497E+02	5.596E+02	NOT IDENT.
TH-234	-1.307E+02	2.603E+02	2.669E+02	FAIL ABUN
U-234	-1.041E+03	1.366E+04	1.367E+04	NOT IDENT.
U-235	-1.964E+01	2.361E+01	2.522E+01	FAIL ABUN
NP-237	-5.322E+00	7.541E+00	7.914E+00	NOT IDENT.
NP-238	3.143E+07	1.610E+08	1.616E+08	SHORT HLIF
U-238	-1.307E+02	2.603E+02	2.669E+02	FAIL ABUN
NP-239	5.818E+00	3.003E+01	3.015E+01	NOT IDENT.
AM-241	-3.746E+00	2.840E+01	2.845E+01	NOT IDENT.
AM-242	-7.814E+00	6.924E+01	6.933E+01	NOT IDENT.
AM-243	-2.844E+00	6.587E+00	6.711E+00	NOT IDENT.
CM-243	-7.680E+00	1.199E+01	1.248E+01	NOT IDENT.
BK-247	7.417E+00	1.003E+01	1.058E+01	NOT IDENT.
CM-247	-1.869E+00	4.718E+00	4.793E+00	NOT IDENT.
CF-249	-4.227E-01	4.564E+00	4.567E+00	NOT IDENT.
CF-251	-1.089E-01	1.519E+01	1.519E+01	NOT IDENT.
CF-252	1.072E+04	2.068E+04	2.124E+04	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	32.9734	133.52	37.7895	116.30	0.0000
879.38	57.1082	364.49	37.7944	116.74	42.2531
46.54	31.3960	80.22	0.0000	117.23	45.4546
228.16	0.0000	711.68	40.8073	119.76	48.8041
52.39	27.1117	356.01	49.8051	120.54	49.9210
53.20	31.9314	323.87	49.8116	120.90	47.8214
53.44	40.4073	82.35	0.0000	264.66	42.5211
57.53	36.8981	82.47	36.9560	121.22	42.5272
293.27	0.0000	82.47	0.0000	344.28	48.9452
57.53	44.5970	83.79	38.0467	122.06	48.9648
482.18	44.5971	265.00	38.0612	1274.44	45.8368
57.98	37.0445	84.21	30.0597	123.68	49.0771
59.32	43.8278	84.86	0.0000	1377.63	0.0000
59.54	43.8497	193.51	49.2060	127.23	45.0313
155.04	50.7443	105.31	45.2798	129.43	50.5449
63.00	38.4253	86.79	50.3323	131.20	31.2621
129.43	38.4496	86.94	50.3460	133.02	51.8716
63.29	38.4496	87.09	50.3593	133.52	47.5805
290.67	38.4739	87.57	44.3538	135.34	0.0000
63.81	38.4931	88.03	35.3103	136.00	48.8226
87.57	54.9087	306.78	44.4142	136.28	41.2430
64.99	57.8870	88.47	44.4243	136.47	41.2534
65.08	57.8979	531.02	48.6861	739.50	0.0000
66.73	41.6395	184.58	0.0000	140.51	0.0000
66.98	35.8483	92.59	43.7253	140.88	46.9499
67.24	35.8677	93.31	0.0000	143.76	43.8354
67.67	34.9299	94.56	32.6487	144.24	41.6692
1221.41	40.7583	311.90	32.6536	145.44	51.6164
439.51	46.6915	946.00	32.6545	152.32	52.0589
70.82	46.6915	97.43	38.9559	152.43	52.0653
167.43	0.0000	98.43	34.9126	1048.07	56.5532
97.43	42.8694	98.44	34.9133	154.21	39.9661
70.82	0.0000	99.53	40.1188	155.04	32.2276
70.82	41.9935	103.37	40.1188	158.56	46.7290
279.20	0.0000	116.74	40.1188	158.97	0.0000
1063.66	44.1228	100.11	32.9490	159.00	48.0122
72.87	0.0000	100.20	28.8346	162.33	58.2889
351.06	44.1283	102.03	35.1167	537.26	61.6761
74.66	48.2213	103.18	51.7368	163.33	53.8682
238.63	46.2674	103.37	47.6123	165.86	51.7753
351.93	46.2674	105.31	43.6054	167.43	0.0000
238.63	46.2674	106.12	57.1745	245.35	0.0000
74.97	46.2810	106.47	47.8446	427.87	54.6665
77.11	52.4064	109.28	61.6324	176.60	54.6841
256.23	43.7210	111.00	46.0833	177.52	46.7562
79.82	0.0000	111.76	0.0000	181.07	0.0000
80.02	37.7826	208.37	45.1682	184.41	47.4896
80.03	37.7829	116.24	46.4445	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	48.3235	300.09	30.5728	477.60	19.9511
186.21	48.3484	300.13	30.5742	477.99	14.2538
190.27	40.0775	301.36	27.2018	482.18	8.5715
193.51	60.3194	302.85	35.7426	487.02	8.5935
197.03	47.7322	304.50	38.3432	492.35	0.0000
198.01	53.6065	304.85	29.8303	497.08	11.5186
201.83	53.8136	306.78	34.9941	511.00	22.2356
204.12	31.6588	308.46	37.6021	514.00	21.7859
205.31	48.1313	311.90	38.5547	520.40	18.4565
208.37	36.5022	316.51	32.2372	520.69	0.0000
210.85	24.7872	319.41	29.7207	667.71	0.0000
215.65	45.8524	320.08	24.5635	527.90	0.0000
218.12	32.0930	321.04	25.8740	529.59	12.6858
222.11	32.2141	323.87	32.8410	529.87	0.0000
227.09	25.5716	325.23	25.9521	531.02	18.5539
227.38	27.5768	1596.21	32.0882	537.26	23.5088
228.16	0.0000	331.15	0.0000	1260.41	0.0000
228.18	29.9969	333.37	28.7119	552.55	17.7627
235.69	57.9888	334.37	32.2147	795.86	11.9023
235.96	77.3369	338.28	24.4453	564.24	0.0000
238.63	49.6628	911.20	24.4459	569.33	23.8730
238.98	0.0000	340.48	29.7286	569.50	20.8906
240.99	71.6155	340.55	29.7299	569.70	20.8923
242.00	26.7279	344.28	28.9294	582.08	21.0128
244.70	41.4053	345.93	28.9623	583.19	18.0205
245.35	0.0000	351.06	32.5858	595.83	21.1453
459.60	41.6186	351.93	29.0804	600.60	18.1633
685.70	0.0000	356.01	23.8579	604.72	12.1313
388.16	34.3382	361.25	0.0000	609.32	17.2214
256.23	49.1983	364.49	17.7718	610.33	18.2432
527.90	0.0000	366.42	0.0000	614.28	25.3815
264.66	32.2056	383.85	27.8919	618.01	21.3555
265.00	29.7363	388.16	26.1632	621.93	21.3922
269.46	32.3334	666.33	20.7562	630.19	0.0000
401.81	38.6062	391.70	19.8918	631.29	12.2744
273.65	26.2045	400.66	25.4570	632.98	17.4012
276.40	36.6837	401.32	0.0000	633.25	17.4033
583.19	34.2092	401.81	30.9336	634.78	11.2681
277.60	34.2159	402.40	33.6750	635.95	7.1743
402.40	31.7223	404.85	25.5220	636.99	19.4816
278.43	31.7332	410.95	14.6377	657.50	21.7212
279.20	0.0000	720.70	20.1720	884.68	21.7238
279.54	36.7759	423.72	23.9672	661.66	11.3975
280.46	35.1299	427.09	22.1670	664.57	0.0000
301.36	39.4124	427.87	24.9494	666.33	10.3817
284.31	33.5596	433.94	22.2554	666.50	11.4203
285.41	41.1454	439.51	18.6055	667.71	0.0000
285.90	0.0000	440.45	21.4076	677.62	11.4731
287.50	38.6899	453.88	15.0052	685.70	0.0000
290.67	36.2559	459.60	24.4612	692.65	0.0000
293.27	0.0000	463.37	30.1686	695.00	25.2090
295.22	32.1522	468.07	19.8490	696.49	19.9695
316.51	29.6309	473.00	0.0000	696.51	19.9695
298.58	31.3866	475.06	17.0779	697.00	15.7684
299.98	30.5706	696.49	17.0936	697.49	16.8229

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	15.8038	903.28	10.1927	1291.59	4.7379
706.68	12.6636	907.67	0.0000	1298.22	0.0000
711.68	5.2869	911.20	10.2191	1312.11	4.7617
720.70	13.7945	984.45	0.0000	1332.49	3.8279
721.93	0.0000	926.36	10.2689	1365.19	10.6086
1690.97	18.0535	935.54	11.4437	1368.63	0.0000
722.91	18.0549	937.49	9.1605	1377.63	0.0000
723.31	16.9954	983.53	10.3271	1384.29	8.7188
756.73	12.7510	945.96	0.0000	1408.01	11.6880
727.33	18.0860	946.00	9.1852	1434.09	2.9394
733.00	13.8606	949.00	10.3433	1435.80	8.8215
735.93	9.6068	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	9.2321	1460.82	4.9283
1434.09	6.4248	964.08	8.0826	1489.16	5.6676
747.24	11.7922	966.17	19.6417	1596.21	5.0728
752.31	11.8151	968.97	9.2513	1620.50	2.0392
753.82	8.5977	983.53	15.1005	1678.03	0.0000
756.73	8.6071	984.45	0.0000	1690.97	4.9635
763.94	11.8665	996.26	5.8305	1757.55	0.0000
765.80	8.6364	1001.03	8.7582	1764.49	0.0000
1001.03	9.7181	1004.73	8.7680	1770.23	3.3600
766.84	10.7996	1025.87	0.0000	1771.35	4.2007
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	6.5029	1037.84	2.6563	1808.65	2.1151
777.92	0.0000	1038.76	0.0000	1836.06	2.1257
778.90	13.0171	1046.59	8.8770		
783.70	0.0000	1048.07	8.8806		
1435.80	7.6209	1050.41	12.4414		
903.28	3.2700	1063.66	7.1367		
795.86	13.0981	1077.00	8.9551		
801.95	10.9391	1077.34	6.2690		
802.10	7.6577	1083.85	7.1777		
810.29	12.0688	1085.87	8.9777		
810.45	12.0693	1099.25	6.3079		
810.76	15.3626	1111.64	13.5635		
815.77	10.9928	1112.07	14.4697		
818.51	20.9073	1112.84	16.2817		
832.01	8.8447	1115.54	4.5261		
834.85	17.7070	1120.29	7.2510		
835.15	19.9226	1120.55	7.2515		
836.80	0.0000	1121.30	4.3518		
846.77	1.6669	1808.65	2.9080		
856.80	14.4959	1131.51	0.0000		
860.56	14.5144	1332.49	3.6777		
871.09	14.5663	1177.95	4.6030		
873.19	10.0917	1189.05	8.3095		
875.33	0.0000	1204.77	4.6353		
879.38	15.1688	1221.41	11.1724		
880.51	13.4883	1231.02	3.7334		
881.60	3.3733	1235.36	6.5407		
883.24	11.2504	1238.28	8.4155		
884.68	10.1305	1260.41	0.0000		
889.28	11.2732	1271.87	10.3729		
894.76	10.1642	1274.44	4.7180		
1836.06	7.9140	1274.54	4.7180		

VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 11:22:25.01

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089187.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM17.CNF;682
Background date    : 16-MAY-2022 04:38:38
Sample date       : 17-MAY-2022 00:00:00 Acquisition date : 17-MAY-2022 09:21:48
Sample ID        : G1205089187 Sample quantity : 7.69920E-01 FILTER
Detector name     : GAM17 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:00.88 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : RXF2
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2264689 Detector SN# :
Matrix Spike ID   : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	5	46.92*	1	57	1.82	94.01	90	15	1.36E-04	*****	1.27E+00
2	5	49.77	26	57	1.83	99.72	90	15	3.59E-03	69.6	
3	0	63.64*	12	121	1.03	127.52	123	11	1.67E-03	199.2	
4	0	69.71	26	72	1.25	139.66	135	8	3.58E-03	60.4	
5	0	81.26	20	64	1.03	162.80	158	8	2.78E-03	72.8	
6	0	84.16*	20	61	1.08	168.62	165	8	2.80E-03	76.5	
7	0	93.06*	63	87	1.54	186.43	180	14	8.73E-03	38.2	
8	0	186.27*	30	51	1.17	373.11	369	11	4.21E-03	57.8	
9	0	239.93*	5	125	1.71	480.56	472	18	7.42E-04	514.3	
10	0	296.66	23	29	1.40	594.17	590	7	3.17E-03	45.4	
11	0	353.75	33	38	3.56	708.49	702	14	4.59E-03	43.4	
12	0	449.82	23	23	1.62	900.82	896	10	3.22E-03	43.6	
13	0	521.60	20	26	1.87	1044.51	1037	14	2.71E-03	58.6	
14	0	583.43*	1	17	0.71	1168.29	1162	10	1.75E-04	794.1	
15	0	632.95	20	13	4.01	1267.41	1260	13	2.84E-03	42.4	
16	0	679.69	11	16	0.57	1360.95	1357	9	1.51E-03	72.8	
17	0	823.53	12	3	3.76	1648.81	1643	11	1.73E-03	38.2	
18	0	882.52	8	18	1.80	1766.84	1758	10	1.18E-03	98.5	
19	0	918.43	10	8	1.83	1838.70	1832	10	1.45E-03	58.0	
20	0	1015.46	9	6	2.20	2032.83	2029	8	1.21E-03	59.7	
21	0	1092.64	8	5	1.64	2187.23	2180	11	1.09E-03	67.6	
22	0	1122.36	8	20	4.98	2246.68	2233	16	1.13E-03	128.2	
23	0	1151.84	13	7	3.29	2305.65	2296	14	1.78E-03	52.1	
24	0	1240.29	18	3	1.86	2482.54	2475	13	2.44E-03	32.0	
25	0	1255.84	11	2	1.10	2513.64	2509	10	1.52E-03	40.2	
26	0	1323.80	9	0	1.46	2649.56	2646	8	1.25E-03	33.3	
27	0	1461.07*	7	7	2.05	2924.05	2916	13	9.30E-04	107.0	
28	0	1636.48	8	0	0.99	3274.75	3269	11	1.11E-03	35.4	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 11:22:25

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089187.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 17-MAY-2022 00:00:00	Acquisition date	: 17-MAY-2022 09:21:48
Sample ID	: G1205089187	Sample quantity	: 0.76992 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA17	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.88 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	7	10.66*	5.823E-01	5.259E+01	5.259E+01	214.07
BR-77	238.98	5	23.10*	2.793E+00	4.038E+00	4.580E+00	1028.59
	520.69	20	22.40	1.437E+00	2.953E+01	3.349E+01	117.28
RB-84	881.60	8	68.90*	8.911E-01	6.735E+00	6.796E+00	196.95
TL-201	68.89	26	22.00	4.639E+00	1.230E+01	1.358E+01	120.80
	70.82	26	37.00	4.639E+00	7.315E+00	8.072E+00	120.80
	79.82	20	4.40	4.633E+00	4.783E+01	5.278E+01	145.60
	80.22	20	8.50	4.633E+00	2.476E+01	2.732E+01	145.60
	82.47	20	3.10	4.633E+00	6.789E+01	7.492E+01	145.60
	135.34	-----	2.57	4.000E+00	-----	Line Not Found	-----
	167.43	-----	10.00*	3.569E+00	-----	Line Not Found	-----
TL-204	68.89	26	0.47	4.639E+00	5.771E+02	5.772E+02	120.80
	70.82	26	0.79*	4.639E+00	3.430E+02	3.431E+02	120.80
	80.03	20	0.28	4.633E+00	7.598E+02	7.600E+02	145.60
	82.47	20	0.07	4.633E+00	3.194E+03	3.195E+03	145.60
TL-208	277.37	-----	6.60	2.493E+00	-----	Line Not Found	-----
	583.19	1	85.00*	1.297E+00	5.556E-01	5.558E-01	1588.19
	860.56	-----	12.50	9.113E-01	-----	Line Not Found	-----
PB-210	46.54	1	4.25*	4.159E+00	2.694E+00	2.694E+00	3526.73
RA-224	240.99	5	4.10*	2.793E+00	2.275E+01	2.276E+01	1028.59
RA-226	186.21	30	3.59*	3.339E+00	1.232E+02	1.232E+02	115.64
TH-231	84.21	20	6.60*	4.617E+00	3.224E+01	3.224E+01	152.94
TH-232	63.81	12	0.26*	4.593E+00	4.918E+02	4.918E+02	398.49
	140.88	-----	0.02	3.923E+00	-----	Line Not Found	-----
TH-234	63.29	12	3.70*	4.593E+00	3.456E+01	3.456E+01	398.49
	92.59	63	4.23	4.546E+00	1.593E+02	1.593E+02	76.41
U-238	63.29	12	3.70*	4.593E+00	3.456E+01	3.456E+01	398.49
	92.59	63	4.23	4.546E+00	1.593E+02	1.593E+02	76.41

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                       *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089187.CNF;1 *
* Acquisition date   : 17-MAY-2022 09:21:48 Sensitivity      : 3.000          *
* Detector ID        : GAM17 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 02:00:00.88 Half life ratio : *****          *
* Sample date        : 17-MAY-2022 00:00:00 Analyst initials: RXF2          *
* Sample ID          : G1205089187 Sample Quantity : 7.6992E-01 FILTER *
* Batch Number       : 2264689 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                       *
* Eff. Cal. date     : 6-DEC-2021 05:10:21 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM17_JAR.CNF;16          *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
K-40	5.259E+01	1.103E+02	1.048E+02
BR-77	4.580E+00	4.616E+01	2.365E+01
RB-84	6.796E+00	1.312E+01	1.642E+01
TL-201	-1.571E+01	2.360E+01	4.190E+01
TL-204	3.431E+02	4.062E+02	5.080E+02
TL-208	5.558E-01	8.651E+00	1.038E+01
PB-210	2.694E+00	9.311E+01	8.371E+01
RA-224	2.276E+01	2.294E+02	1.184E+02
RA-226	1.232E+02	1.397E+02	1.295E+02
TH-231	3.224E+01	4.833E+01	5.328E+01
TH-232	4.918E+02	1.921E+03	1.470E+03
TH-234	3.456E+01	1.350E+02	1.034E+02
U-238	3.456E+01	1.350E+02	1.034E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	4.390E+00	3.567E+01	6.836E+01	NOT IDENT.
NA-22	-1.932E+00	5.011E+00	9.428E+00	NOT IDENT.
NA-24	6.785E+00	9.281E+00	2.177E+01	NOT IDENT.
AL-26	-6.141E-01	5.726E+00	1.164E+01	NOT IDENT.
SC-46	-9.443E-01	5.189E+00	1.008E+01	NOT IDENT.
V-48	1.196E-01	5.656E+00	1.133E+01	NOT IDENT.
CR-51	-1.218E+01	3.786E+01	6.760E+01	NOT IDENT.
MN-52	8.565E-02	7.055E+00	1.411E+01	NOT IDENT.
MN-54	-1.016E+00	4.989E+00	9.669E+00	NOT IDENT.
CO-56	-4.150E-01	5.552E+00	1.086E+01	NOT IDENT.
CO-57	1.005E+00	2.388E+00	4.705E+00	NOT IDENT.
NI-57	-3.802E+00	7.176E+00	1.288E+01	NOT IDENT.
CO-58	-1.011E+00	4.505E+00	8.799E+00	NOT IDENT.
FE-59	7.580E+00	1.124E+01	2.457E+01	NOT IDENT.
CO-60	-1.730E+00	5.328E+00	1.013E+01	NOT IDENT.
ZN-65	1.070E+01	1.274E+01	2.693E+01	NOT IDENT.
CU-67	-1.266E+01	8.154E+00	1.293E+01	FAIL ABUN

GE-68	6.064E+01	1.600E+02	3.488E+02	NOT IDENT.
AS-73	7.290E+00	2.230E+01	3.773E+01	NOT IDENT.
AS-74	-6.167E+00	8.189E+00	1.329E+01	NOT IDENT.
SE-75	-1.988E+00	5.436E+00	9.743E+00	NOT IDENT.
SR-82	-1.763E+00	3.071E+01	6.135E+01	NOT IDENT.
RB-83	1.475E+01	1.695E+01	2.068E+01	FAIL ABUN
KR-85	-2.593E+03	1.583E+03	2.339E+03	NOT IDENT.
SR-85	-1.167E+01	7.123E+00	1.052E+01	NOT IDENT.
RB-86	6.004E+00	6.664E+01	1.357E+02	NOT IDENT.
Y-88	-1.595E+00	6.305E+00	1.207E+01	NOT IDENT.
Y-91	-5.434E+02	1.528E+03	2.980E+03	NOT IDENT.
NB-94	-8.115E-01	5.395E+00	9.684E+00	NOT IDENT.
NB-95	-1.925E+00	5.151E+00	9.666E+00	NOT IDENT.
NB-95M	3.166E+00	1.180E+01	2.074E+01	NOT IDENT.
TC-95M	2.335E+00	4.562E+00	8.878E+00	FAIL ABUN
ZR-95	1.568E+00	9.187E+00	1.871E+01	NOT IDENT.
MO-99	-5.591E+00	4.208E+01	8.281E+01	NOT IDENT.
TC-99M	-3.563E+00	8.764E+00	1.490E+01	NOT IDENT.
RH-101	-9.241E-03	3.190E+00	6.044E+00	NOT IDENT.
RH-102M	-2.153E+00	4.553E+00	7.875E+00	NOT IDENT.
RU-103	-1.415E+00	5.051E+00	8.956E+00	NOT IDENT.
RH-106	-4.634E+00	4.632E+01	8.487E+01	NOT IDENT.
RU-106	-4.634E+00	4.632E+01	8.487E+01	NOT IDENT.
AG-108M	9.373E-01	4.379E+00	8.356E+00	NOT IDENT.
CD-109	7.499E+00	6.924E+01	9.849E+01	NOT IDENT.
AG-110	-6.246E+01	1.218E+02	2.052E+02	NOT IDENT.
AG-110M	2.464E+00	8.398E+00	1.564E+01	NOT IDENT.
IN-111	-8.591E-01	3.833E+00	6.241E+00	NOT IDENT.
SN-113	8.607E-01	5.571E+00	1.060E+01	NOT IDENT.
IN-114M	-4.303E+00	1.841E+01	3.021E+01	NOT IDENT.
CD-115	-1.470E+01	1.650E+01	2.622E+01	NOT IDENT.
SN-117M	1.068E+00	2.748E+00	5.365E+00	NOT IDENT.
SB-122	-2.217E+00	6.928E+00	1.225E+01	NOT IDENT.
I-123	-4.083E-01	4.754E+00	8.917E+00	NOT IDENT.
TE-123M	-3.214E-01	2.737E+00	5.121E+00	NOT IDENT.
SB-124	7.553E+00	1.122E+01	2.789E+01	NOT IDENT.
SB-125	2.147E+00	1.214E+01	2.331E+01	NOT IDENT.
TE-125M	1.831E+02	7.772E+02	1.381E+03	NOT IDENT.
I-126	-1.739E+01	2.005E+01	3.090E+01	NOT IDENT.
SB-126	1.763E+00	9.656E+00	1.849E+01	NOT IDENT.
SN-126	5.474E+00	6.109E+00	1.002E+01	FAIL ABUN
SB-127	9.529E+00	1.366E+01	2.856E+01	NOT IDENT.
TE-129	2.843E+01	5.390E+01	1.068E+02	NOT IDENT.
I-131	-3.923E+00	4.248E+00	6.961E+00	FAIL ABUN
I-132	-1.645E+02	1.506E+02	2.234E+02	FAIL ABUN
TE-132	9.036E-01	3.567E+00	6.831E+00	FAIL ABUN
BA-133	-2.926E+00	6.589E+00	1.017E+01	FAIL ABUN
I-133	1.343E+00	5.717E+00	1.135E+01	NOT IDENT.
CS-134	-2.121E+00	5.537E+00	1.044E+01	NOT IDENT.
I-135	-2.643E+01	5.514E+01	8.292E+01	NOT IDENT.
CS-136	1.059E+00	5.645E+00	1.224E+01	NOT IDENT.
BA-137M	2.912E+00	7.892E+00	1.484E+01	NOT IDENT.
CS-137	3.076E+00	8.337E+00	1.567E+01	NOT IDENT.
LA-138	-5.589E+00	1.162E+01	2.039E+01	NOT IDENT.
CE-139	-2.704E-01	2.674E+00	5.041E+00	NOT IDENT.
BA-140	-5.577E-01	1.607E+01	3.017E+01	NOT IDENT.
LA-140	9.206E-01	3.364E+00	8.982E+00	NOT IDENT.
CE-141	2.969E-01	4.752E+00	9.028E+00	NOT IDENT.
CE-143	2.835E+00	1.035E+01	1.798E+01	NOT IDENT.
CE-144	-2.140E+00	1.988E+01	3.731E+01	FAIL ABUN
PM-144	7.098E-02	5.329E+00	9.842E+00	NOT IDENT.
PR-144	-1.612E-02	3.949E+02	7.280E+02	NOT IDENT.
PM-146	1.908E+00	7.034E+00	1.219E+01	FAIL ABUN
ND-147	1.296E+01	2.775E+01	5.706E+01	NOT IDENT.
PM-147	1.161E+04	7.146E+04	1.379E+05	NOT IDENT.
PM-149	-8.490E+01	1.208E+02	2.079E+02	NOT IDENT.
EU-152	7.856E+00	1.319E+01	2.617E+01	NOT IDENT.
GD-153	1.684E+00	7.750E+00	1.272E+01	FAIL ABUN
EU-154	-5.086E+00	1.443E+01	2.738E+01	NOT IDENT.
EU-155	3.332E+00	9.704E+00	1.748E+01	NOT IDENT.
TB-160	1.670E+01	1.980E+01	4.079E+01	FAIL ABUN
HO-166M	-3.955E+00	1.004E+01	1.724E+01	FAIL ABUN
TM-171	-6.835E+00	4.652E+02	7.577E+02	NOT IDENT.
LU-176	1.606E+00	3.465E+00	6.793E+00	NOT IDENT.
LU-177	-1.731E+01	2.620E+01	4.603E+01	NOT IDENT.
HF-181	8.085E-03	4.998E+00	9.329E+00	NOT IDENT.
W-181	-5.115E+00	7.032E+00	1.137E+01	FAIL ABUN
TA-182	1.448E+01	2.194E+01	4.944E+01	FAIL ABUN

RE-183	-3.517E+00	6.460E+00	1.066E+01	NOT IDENT.
RE-184	4.894E+00	1.271E+01	2.742E+01	NOT IDENT.
RE-188	-3.879E+00	1.472E+01	2.718E+01	FAIL ABUN
W-188	-5.359E+02	7.536E+02	1.295E+03	FAIL ABUN
OS-191	-4.445E+00	8.258E+00	1.494E+01	FAIL ABUN
IR-192	1.934E-01	4.166E+00	7.784E+00	FAIL ABUN
PB-201	3.067E+00	9.917E+00	1.903E+01	NOT IDENT.
TL-202	1.232E+00	4.030E+00	7.894E+00	FAIL ABUN
HG-203	1.232E+00	3.829E+00	7.392E+00	FAIL ABUN
PB-203	1.417E+00	4.404E+00	8.503E+00	FAIL ABUN
BI-207	2.238E+00	7.113E+00	1.522E+01	NOT IDENT.
BI-211	1.744E+01	3.324E+01	5.620E+01	NOT IDENT.
PB-211	5.424E+01	1.021E+02	2.016E+02	NOT IDENT.
BI-212	9.272E+01	8.674E+01	1.830E+02	NOT IDENT.
PB-212	2.140E+00	2.157E+01	1.750E+01	FAIL ABUN
BI-213	-3.509E+00	1.418E+01	2.564E+01	NOT IDENT.
BI-214	-2.329E+00	1.365E+01	2.260E+01	NOT IDENT.
PB-214	-1.962E+00	1.241E+01	2.059E+01	FAIL ABUN
RN-219	-6.706E+00	5.975E+01	1.091E+02	NOT IDENT.
FR-221	2.354E+00	2.252E+01	4.291E+01	NOT IDENT.
RA-223	3.427E+01	9.157E+01	1.759E+02	FAIL ABUN
AC-225	2.425E+00	2.320E+01	4.422E+01	NOT IDENT.
AC-227	4.450E+00	3.406E+01	6.402E+01	NOT IDENT.
TH-227	4.450E+00	3.406E+01	6.402E+01	NOT IDENT.
AC-228	-4.100E+01	2.897E+01	4.283E+01	NOT IDENT.
RA-228	-4.100E+01	2.897E+01	4.283E+01	NOT IDENT.
TH-228	2.140E+00	2.157E+01	1.750E+01	FAIL ABUN
TH-229	3.000E+01	5.968E+01	1.169E+02	FAIL ABUN
TH-230	1.919E+01	6.466E+02	9.404E+02	NOT IDENT.
PA-231	5.356E+01	6.098E+01	1.240E+02	NOT IDENT.
PA-233	-3.280E+00	8.992E+00	1.604E+01	NOT IDENT.
PA-234	-4.798E+00	4.315E+01	8.513E+01	FAIL ABUN
PA-234M	-6.240E+01	5.652E+02	1.133E+03	NOT IDENT.
U-234	-2.939E+01	1.948E+03	3.153E+03	NOT IDENT.
U-235	1.314E+01	1.990E+01	3.983E+01	FAIL ABUN
NP-237	-3.280E+00	8.992E+00	1.604E+01	NOT IDENT.
NP-238	-5.973E+00	2.613E+01	4.997E+01	NOT IDENT.
NP-239	2.079E+01	2.580E+01	5.225E+01	NOT IDENT.
AM-241	7.795E+00	6.329E+00	1.173E+01	NOT IDENT.
AM-242	4.383E+01	6.064E+01	1.125E+02	NOT IDENT.
AM-243	-9.613E-01	3.969E+00	6.528E+00	NOT IDENT.
CM-243	-4.328E+00	9.056E+00	1.483E+01	NOT IDENT.
BK-247	-7.161E+00	1.068E+01	1.851E+01	FAIL ABUN
CM-247	8.214E-01	5.369E+00	1.015E+01	NOT IDENT.
CF-249	5.210E-01	5.811E+00	1.089E+01	NOT IDENT.
CF-251	-2.229E+00	1.366E+01	2.542E+01	NOT IDENT.
CF-252	-7.033E+03	1.762E+04	2.899E+04	NOT IDENT.
ANH-511	-1.571E+01	9.156E+00	1.736E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	7	36.80	43	8	1.72	73.75	70	20	6.00E-03	25.4	2.22E+00
2	7	40.24	39	40	1.80	80.64	70	20	5.45E-03	39.9	
3	7	43.08	18	45	1.54	86.34	70	20	2.46E-03	62.5	
4	5	46.92	81	57	1.82	94.01	90	15	1.13E-02	20.0	1.27E+00
5	5	49.77	26	57	1.83	99.72	90	15	3.59E-03	69.6	
6	0	63.64	85	121	1.03	127.52	123	11	1.18E-02	27.3	
7	0	69.71	26	72	1.25	139.66	135	8	3.58E-03	60.4	
8	0	81.26	20	64	1.03	162.80	158	8	2.78E-03	72.8	
9	0	84.16	30	61	1.08	168.62	165	8	4.13E-03	48.9	
10	0	93.06	153	87	1.54	186.43	180	14	2.12E-02	15.3	
11	0	186.27	84	51	1.17	373.11	369	11	1.16E-02	19.7	
12	0	239.93	47	125	1.71	480.56	472	18	6.60E-03	56.5	
13	0	296.66	23	29	1.40	594.17	590	7	3.17E-03	45.4	
14	0	353.75	33	38	3.56	708.49	702	14	4.59E-03	43.4	
15	0	449.82	23	23	1.62	900.82	896	10	3.22E-03	43.6	
16	0	511.73	121	49	2.74	1024.77	1017	20	1.68E-02	17.9	
17	0	521.60	20	26	1.87	1044.51	1037	14	2.71E-03	58.6	
18	0	583.43	21	17	0.71	1168.29	1162	10	2.87E-03	43.8	
19	0	609.27	12	16	1.46	1220.00	1216	8	1.67E-03	64.5	
20	0	632.95	20	13	4.01	1267.41	1260	13	2.84E-03	42.4	
21	0	679.69	11	16	0.57	1360.95	1357	9	1.51E-03	72.8	
22	0	823.53	12	3	3.76	1648.81	1643	11	1.73E-03	38.2	
23	0	882.52	8	18	1.80	1766.84	1758	10	1.18E-03	98.5	
24	0	918.43	10	8	1.83	1838.70	1832	10	1.45E-03	58.0	
25	0	1015.46	9	6	2.20	2032.83	2029	8	1.21E-03	59.7	
26	0	1092.64	8	5	1.64	2187.23	2180	11	1.09E-03	67.6	
27	0	1122.36	8	20	4.98	2246.68	2233	16	1.13E-03	128.2	
28	0	1151.84	13	7	3.29	2305.65	2296	14	1.78E-03	52.1	
29	0	1240.29	18	3	1.86	2482.54	2475	13	2.44E-03	32.0	
30	0	1255.84	11	2	1.10	2513.64	2509	10	1.52E-03	40.2	
31	0	1323.80	9	0	1.46	2649.56	2646	8	1.25E-03	33.3	
32	0	1461.07	18	7	2.05	2924.05	2916	13	2.56E-03	36.9	
33	0	1636.48	8	0	0.99	3274.75	3269	11	1.11E-03	35.4	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	7	10.66*	5.823E-01	5.259E+01	5.259E+01	214.07
BR-77	238.98	5	23.10*	2.793E+00	4.038E+00	4.580E+00	1028.59
	520.69	20	22.40	1.437E+00	2.953E+01	3.349E+01	117.28
RB-84	881.60	8	68.90*	8.911E-01	6.735E+00	6.796E+00	196.95
TL-201	68.89	26	22.00	4.639E+00	1.230E+01	1.358E+01	120.80
	70.82	26	37.00	4.639E+00	7.315E+00	8.072E+00	120.80
	79.82	20	4.40	4.633E+00	4.783E+01	5.278E+01	145.60
	80.22	20	8.50	4.633E+00	2.476E+01	2.732E+01	145.60
	82.47	20	3.10	4.633E+00	6.789E+01	7.492E+01	145.60
	135.34	-----	2.57	4.000E+00	-----	Line Not Found	-----
	167.43	-----	10.00*	3.569E+00	-----	Line Not Found	-----
TL-204	68.89	26	0.47	4.639E+00	5.771E+02	5.772E+02	120.80
	70.82	26	0.79*	4.639E+00	3.430E+02	3.431E+02	120.80
	80.03	20	0.28	4.633E+00	7.598E+02	7.600E+02	145.60
	82.47	20	0.07	4.633E+00	3.194E+03	3.195E+03	145.60
TL-208	277.37	-----	6.60	2.493E+00	-----	Line Not Found	-----
	583.19	1	85.00*	1.297E+00	5.556E-01	5.558E-01	1588.19
	860.56	-----	12.50	9.113E-01	-----	Line Not Found	-----
PB-210	46.54	1	4.25*	4.159E+00	2.694E+00	2.694E+00	3526.73
RA-224	240.99	5	4.10*	2.793E+00	2.275E+01	2.276E+01	1028.59
RA-226	186.21	30	3.59*	3.339E+00	1.232E+02	1.232E+02	115.64
TH-231	84.21	20	6.60*	4.617E+00	3.224E+01	3.224E+01	152.94
TH-232	63.81	12	0.26*	4.593E+00	4.918E+02	4.918E+02	398.49
	140.88	-----	0.02	3.923E+00	-----	Line Not Found	-----
TH-234	63.29	12	3.70*	4.593E+00	3.456E+01	3.456E+01	398.49
	92.59	63	4.23	4.546E+00	1.593E+02	1.593E+02	76.41
U-238	63.29	12	3.70*	4.593E+00	3.456E+01	3.456E+01	398.49
	92.59	63	4.23	4.546E+00	1.593E+02	1.593E+02	76.41

Flag: "*" = Keyline

Total number of lines in spectrum 28
Number of unidentified lines 12
Number of lines tentatively identified by NID 16 57.14%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
K-40	1.25E+09Y	1.00	5.259E+01	5.259E+01	11.26E+01	214.07	
BR-77	57.04H	1.13	4.038E+00	4.580E+00	47.11E+00	1028.59	
RB-84	32.82D	1.01	6.735E+00	6.796E+00	13.39E+00	196.95	
TL-201	3.04D	1.10	7.315E+00	8.072E+00	9.751E+00	120.80	K
TL-204	3.78Y	1.00	3.430E+02	3.431E+02	4.145E+02	120.80	
TL-208	1.91Y	1.00	5.556E-01	5.558E-01	88.27E-01	1588.19	
PB-210	22.20Y	1.00	2.694E+00	2.694E+00	95.01E+00	3526.73	
RA-224	1.91Y	1.00	2.275E+01	2.276E+01	23.41E+01	1028.59	
RA-226	1600.00Y	1.00	1.232E+02	1.232E+02	1.425E+02	115.64	
TH-231	7.04E+08Y	1.00	3.224E+01	3.224E+01	4.931E+01	152.94	
TH-232	1.41E+10Y	1.00	4.918E+02	4.918E+02	19.60E+02	398.49	
TH-234	4.47E+09Y	1.00	3.456E+01	3.456E+01	13.77E+01	398.49	
U-238	4.47E+09Y	1.00	3.456E+01	3.456E+01	13.77E+01	398.49	
Total Activity :			1.156E+03	1.158E+03			

Grand Total Activity : 1.156E+03 1.158E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
5	49.77	26	57	1.83	99.72	90	15	3.59E-03	****	4.28E+00	T
0	296.66	23	29	1.40	594.17	590	7	3.17E-03	90.8	2.36E+00	T
0	353.75	33	38	3.56	708.49	702	14	4.59E-03	86.7	2.03E+00	
0	449.82	23	23	1.62	900.82	896	10	3.22E-03	87.3	1.64E+00	
0	632.95	20	13	4.01	1267.41	1260	13	2.84E-03	84.9	1.20E+00	T
0	679.69	11	16	0.57	1360.95	1357	9	1.51E-03	****	1.13E+00	
0	823.53	12	3	3.76	1648.81	1643	11	1.73E-03	76.4	9.48E-01	
0	918.43	10	8	1.83	1838.70	1832	10	1.45E-03	****	8.60E-01	
0	1015.46	9	6	2.20	2032.83	2029	8	1.21E-03	****	7.88E-01	
0	1092.64	8	5	1.64	2187.23	2180	11	1.09E-03	****	7.39E-01	
0	1122.36	8	20	4.98	2246.68	2233	16	1.13E-03	****	7.23E-01	T
0	1151.84	13	7	3.29	2305.65	2296	14	1.78E-03	****	7.07E-01	
0	1240.29	18	3	1.86	2482.54	2475	13	2.44E-03	63.9	6.65E-01	
0	1255.84	11	2	1.10	2513.64	2509	10	1.52E-03	80.3	6.58E-01	
0	1323.80	9	0	1.46	2649.56	2646	8	1.25E-03	66.7	6.30E-01	
0	1636.48	8	0	0.99	3274.75	3269	11	1.11E-03	70.7	5.34E-01	

Flags: "T" = Tentatively associated


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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089187.CNF;1 *
* Acquisition date   : 17-MAY-2022 09:21:48 Sensitivity      : 3.000          *
* Detector ID        : GAM17 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 02:00:00.88 Half life ratio : *****          *
* Sample date        : 17-MAY-2022 00:00:00 Nuclide Library : LIQUID          *
* Sample ID          : G1205089187 Analyst initials: RXF2          *
* Batch Number       : 2264689 Sample Quantity : 7.6992E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 6-DEC-2021 05:10:21 Eff. Geometry    : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM17_JAR.CNF;16          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
K-40	4.179E+01
BR-77	1.067E+01
RB-84	7.129E+00
TL-201	1.892E+01
TL-204	2.361E+02
TL-208	4.592E+00
PB-210	3.813E+01
RA-224	5.342E+01
RA-226	5.929E+01
TH-231	2.448E+01
TH-232	6.799E+02
TH-234	4.782E+01
U-238	4.782E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	3.011E+01	NOT IDENT.
NA-22	3.698E+00	NOT IDENT.
NA-24	9.150E+00	NOT IDENT.
AL-26	4.487E+00	NOT IDENT.
SC-46	4.293E+00	NOT IDENT.
V-48	4.838E+00	NOT IDENT.
CR-51	3.077E+01	NOT IDENT.
MN-52	5.879E+00	NOT IDENT.
MN-54	4.131E+00	NOT IDENT.
CO-56	4.713E+00	NOT IDENT.
CO-57	2.169E+00	NOT IDENT.
NI-57	4.822E+00	NOT IDENT.
CO-58	3.708E+00	NOT IDENT.
FE-59	1.069E+01	NOT IDENT.
CO-60	4.015E+00	NOT IDENT.
ZN-65	1.167E+01	NOT IDENT.
CU-67	6.015E+00	FAIL ABUN
GE-68	1.470E+02	NOT IDENT.

AS-73	1.741E+01	NOT IDENT.
AS-74	5.754E+00	NOT IDENT.
SE-75	4.440E+00	NOT IDENT.
SR-82	2.625E+01	NOT IDENT.
RB-83	9.324E+00	FAIL ABUN
KR-85	1.064E+03	NOT IDENT.
SR-85	4.790E+00	NOT IDENT.
RB-86	5.752E+01	NOT IDENT.
Y-88	4.677E+00	NOT IDENT.
Y-91	1.115E+03	NOT IDENT.
NB-94	4.240E+00	NOT IDENT.
NB-95	4.178E+00	NOT IDENT.
NB-95M	9.432E+00	NOT IDENT.
TC-95M	4.107E+00	FAIL ABUN
ZR-95	8.166E+00	NOT IDENT.
MO-99	3.561E+01	NOT IDENT.
TC-99M	6.834E+00	NOT IDENT.
RH-101	2.787E+00	NOT IDENT.
RH-102M	3.495E+00	NOT IDENT.
RU-103	3.993E+00	NOT IDENT.
RH-106	3.702E+01	NOT IDENT.
RU-106	3.702E+01	NOT IDENT.
AG-108M	3.750E+00	NOT IDENT.
CD-109	4.538E+01	NOT IDENT.
AG-110	9.000E+01	NOT IDENT.
AG-110M	6.802E+00	NOT IDENT.
IN-111	2.837E+00	NOT IDENT.
SN-113	4.755E+00	NOT IDENT.
IN-114M	1.382E+01	NOT IDENT.
CD-115	1.119E+01	NOT IDENT.
SN-117M	2.472E+00	NOT IDENT.
SB-122	5.347E+00	NOT IDENT.
I-123	4.090E+00	NOT IDENT.
TE-123M	2.347E+00	NOT IDENT.
SB-124	1.127E+01	NOT IDENT.
SB-125	1.037E+01	NOT IDENT.
TE-125M	6.345E+02	NOT IDENT.
I-126	1.367E+01	NOT IDENT.
SB-126	8.074E+00	NOT IDENT.
SN-126	4.626E+00	FAIL ABUN
SB-127	1.256E+01	NOT IDENT.
TE-129	4.804E+01	NOT IDENT.
I-131	3.058E+00	FAIL ABUN
I-132	9.869E+01	FAIL ABUN
TE-132	3.133E+00	FAIL ABUN
BA-133	4.559E+00	FAIL ABUN
I-133	4.919E+00	NOT IDENT.
CS-134	4.433E+00	NOT IDENT.
I-135	3.104E+01	NOT IDENT.
CS-136	5.023E+00	NOT IDENT.
BA-137M	6.786E+00	NOT IDENT.
CS-137	7.169E+00	NOT IDENT.
LA-138	8.493E+00	NOT IDENT.
CE-139	2.291E+00	NOT IDENT.
BA-140	1.311E+01	NOT IDENT.
LA-140	3.189E+00	NOT IDENT.
CE-141	4.159E+00	NOT IDENT.
CE-143	8.192E+00	NOT IDENT.
CE-144	1.718E+01	FAIL ABUN
PM-144	4.321E+00	NOT IDENT.
PR-144	3.194E+02	NOT IDENT.
PM-146	5.476E+00	FAIL ABUN
ND-147	2.488E+01	NOT IDENT.
PM-147	6.348E+04	NOT IDENT.
PM-149	9.396E+01	NOT IDENT.
EU-152	1.190E+01	NOT IDENT.
GD-153	5.855E+00	FAIL ABUN
EU-154	1.079E+01	NOT IDENT.
EU-155	8.036E+00	NOT IDENT.
TB-160	1.794E+01	FAIL ABUN
HO-166M	7.496E+00	FAIL ABUN
TM-171	3.469E+02	NOT IDENT.
LU-176	3.091E+00	NOT IDENT.
LU-177	2.087E+01	NOT IDENT.
HF-181	4.132E+00	NOT IDENT.
W-181	5.227E+00	FAIL ABUN
TA-182	2.109E+01	FAIL ABUN
RE-183	4.906E+00	NOT IDENT.

RE-184	1.171E+01	NOT IDENT.
RE-188	1.246E+01	FAIL ABUN
W-188	5.793E+02	FAIL ABUN
OS-191	6.853E+00	FAIL ABUN
IR-192	3.536E+00	FAIL ABUN
PB-201	8.660E+00	NOT IDENT.
TL-202	3.508E+00	FAIL ABUN
HG-203	3.369E+00	FAIL ABUN
PB-203	3.876E+00	FAIL ABUN
BI-207	6.441E+00	NOT IDENT.
BI-211	2.562E+01	NOT IDENT.
PB-211	9.119E+01	NOT IDENT.
BI-212	8.220E+01	NOT IDENT.
PB-212	8.212E+00	FAIL ABUN
BI-213	1.131E+01	NOT IDENT.
BI-214	1.014E+01	NOT IDENT.
PB-214	9.393E+00	FAIL ABUN
RN-219	4.910E+01	NOT IDENT.
FR-221	1.954E+01	NOT IDENT.
RA-223	8.046E+01	FAIL ABUN
AC-225	2.013E+01	NOT IDENT.
AC-227	2.941E+01	NOT IDENT.
TH-227	2.941E+01	NOT IDENT.
AC-228	1.847E+01	NOT IDENT.
RA-228	1.847E+01	NOT IDENT.
TH-228	8.212E+00	FAIL ABUN
TH-229	5.389E+01	FAIL ABUN
TH-230	4.329E+02	NOT IDENT.
PA-231	5.673E+01	NOT IDENT.
PA-233	7.265E+00	NOT IDENT.
PA-234	3.601E+01	FAIL ABUN
PA-234M	4.684E+02	NOT IDENT.
U-234	1.452E+03	NOT IDENT.
U-235	1.838E+01	FAIL ABUN
NP-237	7.265E+00	NOT IDENT.
NP-238	2.126E+01	NOT IDENT.
NP-239	2.418E+01	NOT IDENT.
AM-241	5.464E+00	NOT IDENT.
AM-242	5.217E+01	NOT IDENT.
AM-243	3.054E+00	NOT IDENT.
CM-243	6.705E+00	NOT IDENT.
BK-247	8.411E+00	FAIL ABUN
CM-247	4.572E+00	NOT IDENT.
CF-249	4.915E+00	NOT IDENT.
CF-251	1.161E+01	NOT IDENT.
CF-252	1.337E+04	NOT IDENT.
ANH-511	8.234E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089187.CNF;1
* Acquisition date   : 17-MAY-2022 09:21:48 Sensitivity      : 3.000
* Detector ID        : GAM17 Energy tolerance: 1.500
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 02:00:00.88 Half life ratio  : *****
* Sample date        : 17-MAY-2022 00:00:00 Nuclide Library : LIQUID
* Sample ID          : G1205089187 Analyst initials: RXF2
* Batch Number       : 2264689 Sample Quantity : 7.6992E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 6-DEC-2021 05:10:21 Eff. Geometry    : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM17_JAR.CNF;16

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
K-40	5.259E+01	1.104E+02	1.104E+02
BR-77	4.580E+00	4.616E+01	4.617E+01
RB-84	6.796E+00	1.313E+01	1.313E+01
TL-201	-1.571E+01	2.363E+01	2.363E+01
TL-204	3.431E+02	4.076E+02	4.077E+02
TL-208	5.558E-01	8.651E+00	8.651E+00
PB-210	2.694E+00	9.312E+01	9.312E+01
RA-224	2.276E+01	2.294E+02	2.294E+02
RA-226	1.232E+02	1.400E+02	1.400E+02
TH-231	3.224E+01	4.855E+01	4.856E+01
TH-232	4.918E+02	1.922E+03	1.922E+03
TH-234	3.456E+01	1.352E+02	1.352E+02
U-238	3.456E+01	1.352E+02	1.352E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	4.390E+00	3.567E+01	3.572E+01	NOT IDENT.
NA-22	-1.932E+00	5.013E+00	5.089E+00	NOT IDENT.
NA-24	6.785E+00	9.297E+00	9.788E+00	NOT IDENT.
AL-26	-6.141E-01	5.726E+00	5.732E+00	NOT IDENT.
SC-46	-9.443E-01	5.190E+00	5.207E+00	NOT IDENT.
V-48	1.196E-01	5.656E+00	5.656E+00	NOT IDENT.
CR-51	-1.218E+01	3.788E+01	3.828E+01	NOT IDENT.
MN-52	8.565E-02	7.055E+00	7.055E+00	NOT IDENT.
MN-54	-1.016E+00	4.990E+00	5.011E+00	NOT IDENT.
CO-56	-4.150E-01	5.552E+00	5.555E+00	NOT IDENT.
CO-57	1.005E+00	2.389E+00	2.432E+00	NOT IDENT.
NI-57	-3.802E+00	7.186E+00	7.388E+00	NOT IDENT.
CO-58	-1.011E+00	4.506E+00	4.529E+00	NOT IDENT.
FE-59	7.580E+00	1.127E+01	1.177E+01	NOT IDENT.
CO-60	-1.730E+00	5.330E+00	5.387E+00	NOT IDENT.
ZN-65	1.070E+01	1.277E+01	1.365E+01	NOT IDENT.
CU-67	-1.266E+01	8.213E+00	1.000E+01	FAIL ABUN

GE-68	6.064E+01	1.600E+02	1.624E+02	NOT IDENT.
AS-73	7.290E+00	2.236E+01	2.260E+01	NOT IDENT.
AS-74	-6.167E+00	8.218E+00	8.676E+00	NOT IDENT.
SE-75	-1.988E+00	5.439E+00	5.512E+00	NOT IDENT.
SR-82	-1.763E+00	3.071E+01	3.072E+01	NOT IDENT.
RB-83	1.475E+01	1.712E+01	1.836E+01	FAIL ABUN
KR-85	-2.593E+03	1.601E+03	1.983E+03	NOT IDENT.
SR-85	-1.167E+01	7.205E+00	8.923E+00	NOT IDENT.
RB-86	6.004E+00	6.665E+01	6.670E+01	NOT IDENT.
Y-88	-1.595E+00	6.306E+00	6.347E+00	NOT IDENT.
Y-91	-5.434E+02	1.528E+03	1.548E+03	NOT IDENT.
NB-94	-8.115E-01	5.396E+00	5.408E+00	NOT IDENT.
NB-95	-1.925E+00	5.153E+00	5.226E+00	NOT IDENT.
NB-95M	3.166E+00	1.180E+01	1.189E+01	NOT IDENT.
TC-95M	2.335E+00	4.566E+00	4.686E+00	FAIL ABUN
ZR-95	1.568E+00	9.188E+00	9.215E+00	NOT IDENT.
MO-99	-5.591E+00	4.208E+01	4.216E+01	NOT IDENT.
TC-99M	-3.563E+00	8.774E+00	8.921E+00	NOT IDENT.
RH-101	-9.241E-03	3.190E+00	3.190E+00	NOT IDENT.
RH-102M	-2.153E+00	4.561E+00	4.663E+00	NOT IDENT.
RU-103	-1.415E+00	5.053E+00	5.093E+00	NOT IDENT.
RH-106	-4.634E+00	4.633E+01	4.637E+01	NOT IDENT.
RU-106	-4.634E+00	4.633E+01	4.637E+01	NOT IDENT.
AG-108M	9.373E-01	4.380E+00	4.400E+00	NOT IDENT.
CD-109	7.499E+00	6.924E+01	6.932E+01	NOT IDENT.
AG-110	-6.246E+01	1.219E+02	1.251E+02	NOT IDENT.
AG-110M	2.464E+00	8.400E+00	8.473E+00	NOT IDENT.
IN-111	-8.591E-01	3.834E+00	3.853E+00	NOT IDENT.
SN-113	8.607E-01	5.572E+00	5.585E+00	NOT IDENT.
IN-114M	-4.303E+00	1.841E+01	1.851E+01	NOT IDENT.
CD-115	-1.470E+01	1.657E+01	1.785E+01	NOT IDENT.
SN-117M	1.068E+00	2.749E+00	2.791E+00	NOT IDENT.
SB-122	-2.217E+00	6.930E+00	7.002E+00	NOT IDENT.
I-123	-4.083E-01	4.754E+00	4.757E+00	NOT IDENT.
TE-123M	-3.214E-01	2.737E+00	2.741E+00	NOT IDENT.
SB-124	7.553E+00	1.124E+01	1.174E+01	NOT IDENT.
SB-125	2.147E+00	1.214E+01	1.218E+01	NOT IDENT.
TE-125M	1.831E+02	7.773E+02	7.817E+02	NOT IDENT.
I-126	-1.739E+01	2.012E+01	2.159E+01	NOT IDENT.
SB-126	1.763E+00	9.658E+00	9.691E+00	NOT IDENT.
SN-126	5.474E+00	6.126E+00	6.606E+00	FAIL ABUN
SB-127	9.529E+00	1.368E+01	1.434E+01	NOT IDENT.
TE-129	2.843E+01	5.414E+01	5.564E+01	NOT IDENT.
I-131	-3.923E+00	4.264E+00	4.616E+00	FAIL ABUN
I-132	-1.645E+02	1.513E+02	1.685E+02	FAIL ABUN
TE-132	9.036E-01	3.568E+00	3.592E+00	FAIL ABUN
BA-133	-2.926E+00	6.595E+00	6.726E+00	FAIL ABUN
I-133	1.343E+00	5.718E+00	5.750E+00	NOT IDENT.
CS-134	-2.121E+00	5.539E+00	5.621E+00	NOT IDENT.
I-135	-2.643E+01	5.520E+01	5.648E+01	NOT IDENT.
CS-136	1.059E+00	5.646E+00	5.667E+00	NOT IDENT.
BA-137M	2.912E+00	7.896E+00	8.004E+00	NOT IDENT.
CS-137	3.076E+00	8.341E+00	8.456E+00	NOT IDENT.
LA-138	-5.589E+00	1.163E+01	1.190E+01	NOT IDENT.
CE-139	-2.704E-01	2.674E+00	2.677E+00	NOT IDENT.
BA-140	-5.577E-01	1.607E+01	1.607E+01	NOT IDENT.
LA-140	9.206E-01	3.364E+00	3.390E+00	NOT IDENT.
CE-141	2.969E-01	4.752E+00	4.753E+00	NOT IDENT.
CE-143	2.835E+00	1.035E+01	1.043E+01	NOT IDENT.
CE-144	-2.140E+00	1.988E+01	1.991E+01	FAIL ABUN
PM-144	7.098E-02	5.329E+00	5.329E+00	NOT IDENT.
PR-144	-1.612E-02	3.949E+02	3.949E+02	NOT IDENT.
PM-146	1.908E+00	7.037E+00	7.089E+00	FAIL ABUN
ND-147	1.296E+01	2.778E+01	2.839E+01	NOT IDENT.
PM-147	1.161E+04	7.147E+04	7.166E+04	NOT IDENT.
PM-149	-8.490E+01	1.215E+02	1.274E+02	NOT IDENT.
EU-152	7.856E+00	1.321E+01	1.368E+01	NOT IDENT.
GD-153	1.684E+00	7.752E+00	7.789E+00	FAIL ABUN
EU-154	-5.086E+00	1.443E+01	1.461E+01	NOT IDENT.
EU-155	3.332E+00	9.709E+00	9.825E+00	NOT IDENT.
TB-160	1.670E+01	1.985E+01	2.123E+01	FAIL ABUN
HO-166M	-3.955E+00	1.004E+01	1.020E+01	FAIL ABUN
TM-171	-6.835E+00	4.652E+02	4.652E+02	NOT IDENT.
LU-176	1.606E+00	3.469E+00	3.544E+00	NOT IDENT.
LU-177	-1.731E+01	2.624E+01	2.737E+01	NOT IDENT.
HF-181	8.085E-03	4.998E+00	4.998E+00	NOT IDENT.
W-181	-5.115E+00	7.155E+00	7.518E+00	FAIL ABUN
TA-182	1.448E+01	2.197E+01	2.292E+01	FAIL ABUN

RE-183	-3.517E+00	6.472E+00	6.663E+00	NOT IDENT.
RE-184	4.894E+00	1.272E+01	1.291E+01	NOT IDENT.
RE-188	-3.879E+00	1.472E+01	1.482E+01	FAIL ABUN
W-188	-5.359E+02	7.572E+02	7.949E+02	FAIL ABUN
OS-191	-4.445E+00	8.266E+00	8.505E+00	FAIL ABUN
IR-192	1.934E-01	4.166E+00	4.167E+00	FAIL ABUN
PB-201	3.067E+00	9.932E+00	1.003E+01	NOT IDENT.
TL-202	1.232E+00	4.032E+00	4.070E+00	FAIL ABUN
HG-203	1.232E+00	3.830E+00	3.870E+00	FAIL ABUN
PB-203	1.417E+00	4.406E+00	4.452E+00	FAIL ABUN
BI-207	2.238E+00	7.115E+00	7.187E+00	NOT IDENT.
BI-211	1.744E+01	3.328E+01	3.420E+01	NOT IDENT.
PB-211	5.424E+01	1.023E+02	1.051E+02	NOT IDENT.
BI-212	9.272E+01	8.710E+01	9.663E+01	NOT IDENT.
PB-212	2.140E+00	2.157E+01	2.160E+01	FAIL ABUN
BI-213	-3.509E+00	1.418E+01	1.427E+01	NOT IDENT.
BI-214	-2.329E+00	1.365E+01	1.369E+01	NOT IDENT.
PB-214	-1.962E+00	1.241E+01	1.244E+01	FAIL ABUN
RN-219	-6.706E+00	5.976E+01	5.983E+01	NOT IDENT.
FR-221	2.354E+00	2.252E+01	2.254E+01	NOT IDENT.
RA-223	3.427E+01	9.164E+01	9.294E+01	FAIL ABUN
AC-225	2.425E+00	2.320E+01	2.323E+01	NOT IDENT.
AC-227	4.450E+00	3.407E+01	3.413E+01	NOT IDENT.
TH-227	4.450E+00	3.407E+01	3.413E+01	NOT IDENT.
AC-228	-4.100E+01	2.915E+01	3.453E+01	NOT IDENT.
RA-228	-4.100E+01	2.915E+01	3.453E+01	NOT IDENT.
TH-228	2.140E+00	2.157E+01	2.160E+01	FAIL ABUN
TH-229	3.000E+01	5.973E+01	6.124E+01	FAIL ABUN
TH-230	1.919E+01	6.466E+02	6.466E+02	NOT IDENT.
PA-231	5.356E+01	6.219E+01	6.672E+01	NOT IDENT.
PA-233	-3.280E+00	8.997E+00	9.118E+00	NOT IDENT.
PA-234	-4.798E+00	4.350E+01	4.355E+01	FAIL ABUN
PA-234M	-6.240E+01	5.652E+02	5.659E+02	NOT IDENT.
U-234	-2.939E+01	1.948E+03	1.948E+03	NOT IDENT.
U-235	1.314E+01	1.993E+01	2.079E+01	FAIL ABUN
NP-237	-3.280E+00	8.997E+00	9.118E+00	NOT IDENT.
NP-238	-5.973E+00	2.613E+01	2.627E+01	NOT IDENT.
NP-239	2.079E+01	2.586E+01	2.751E+01	NOT IDENT.
AM-241	7.795E+00	6.362E+00	7.269E+00	NOT IDENT.
AM-242	4.383E+01	6.117E+01	6.429E+01	NOT IDENT.
AM-243	-9.613E-01	3.970E+00	3.994E+00	NOT IDENT.
CM-243	-4.328E+00	9.069E+00	9.277E+00	NOT IDENT.
BK-247	-7.161E+00	1.079E+01	1.127E+01	FAIL ABUN
CM-247	8.214E-01	5.371E+00	5.384E+00	NOT IDENT.
CF-249	5.210E-01	5.812E+00	5.817E+00	NOT IDENT.
CF-251	-2.229E+00	1.366E+01	1.370E+01	NOT IDENT.
CF-252	-7.033E+03	1.874E+04	1.901E+04	NOT IDENT.
ANH-511	-1.571E+01	9.272E+00	1.167E+01	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	49.4021	81.00	59.0260	120.90	41.9228
45.60	45.1013	81.07	59.0316	121.12	41.9329
46.54	35.0194	82.35	23.9752	121.22	41.9378
49.72	35.2373	82.47	23.9793	121.78	39.4459
51.35	47.1285	167.43	23.9793	122.06	39.4581
52.39	39.6040	82.47	23.9793	123.07	36.9804
53.20	45.7652	83.79	48.0475	265.00	39.5284
53.44	41.2068	84.00	43.2554	127.16	47.2755
56.28	44.8701	84.21	43.2680	127.23	47.2789
57.36	55.3303	84.86	43.3070	129.43	50.7751
57.53	58.8059	85.43	59.3933	131.20	40.6963
57.53	58.8061	86.55	40.1924	133.02	38.2256
57.98	55.3903	86.79	40.2054	133.52	47.5946
59.32	38.5550	86.94	40.2138	135.34	43.4266
59.54	35.4840	87.09	40.2219	136.00	46.0124
61.49	61.9163	87.57	28.9788	57.53	44.3215
63.00	51.2102	88.03	43.4951	136.47	41.7724
63.29	51.2348	88.34	41.9019	140.51	37.6643
63.58	51.2594	88.47	40.2974	140.88	38.5345
63.81	51.2788	91.11	32.7563	143.76	36.0694
64.28	51.3185	91.27	32.7631	144.24	42.1009
64.99	51.3781	92.59	32.8201	145.44	44.7314
65.08	51.3856	93.31	32.8510	152.32	42.4334
66.73	28.1034	94.56	32.9046	152.43	42.4379
66.98	28.1146	94.65	32.9083	153.25	49.4053
67.24	28.1263	94.67	32.9091	323.87	52.0532
67.67	28.1455	97.43	40.7725	155.04	45.1482
67.75	28.1492	98.43	48.9893	156.02	40.8448
68.89	39.1665	98.44	48.9899	158.56	39.2001
68.89	39.1668	99.53	40.4720	158.97	42.7005
69.67	39.2146	100.11	55.2293	159.00	42.7020
70.82	58.1411	100.20	55.2355	162.33	42.8336
70.82	58.1411	102.03	39.3679	162.66	42.8466
70.83	58.1422	103.18	45.5835	163.33	35.8729
72.81	77.2329	103.37	38.2003	165.86	35.0789
72.87	77.2404	105.31	37.0555	167.43	39.5197
74.66	67.5705	106.12	42.0375	171.28	33.4870
74.82	64.0294	106.47	48.2397	176.31	29.2097
74.97	68.7878	109.28	38.4730	176.60	29.2171
77.11	58.6947	111.00	48.4995	177.52	39.8730
79.69	73.2460	111.76	34.8511	181.07	31.9962
79.82	58.9266	112.95	33.6530	184.41	44.1197
80.02	58.9432	116.24	43.3722	184.58	44.1262
80.03	58.9435	116.30	43.3751	185.72	39.2609
80.12	58.9518	116.74	37.5549	186.21	39.2770
80.19	58.9575	117.23	35.9057	190.27	42.9932
80.22	58.9605	119.76	53.5931	193.51	37.7194
80.57	58.9894	99.53	50.2872	197.03	38.7282

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
198.01	31.5479	256.23	36.8774	492.35	19.2129
201.83	43.3984	304.85	35.9145	497.08	26.7390
204.12	41.6655	306.78	27.2099	511.00	33.3528
205.31	39.8916	308.46	29.1833	514.00	67.8655
208.37	42.7138	311.90	37.0413	520.40	17.2819
210.85	34.6010	316.51	32.2548	520.69	17.2839
215.65	35.6425	319.41	40.1425	522.65	17.2982
218.12	32.9626	320.08	40.1583	527.90	21.6691
222.11	27.5513	321.04	31.3607	529.59	14.0950
227.09	30.4185	323.87	32.3937	529.87	11.9279
227.38	33.1908	325.23	38.3137	531.02	10.8488
228.16	36.8998	328.76	32.4850	537.26	15.2265
228.18	36.9006	331.15	29.5721	546.56	16.3757
116.74	36.9006	333.37	39.4800	552.55	16.4148
235.69	29.2179	334.37	33.5767	563.25	15.3854
235.96	32.0068	338.28	35.6301	564.24	19.7886
238.63	28.8146	338.32	30.6821	569.33	27.5391
238.98	28.8219	311.90	33.6922	946.00	22.0329
240.99	28.8632	340.55	33.6936	569.70	22.0345
242.00	28.8837	344.28	24.8266	582.08	19.9263
244.70	40.6073	345.93	23.8550	583.19	19.9343
245.35	37.8241	351.06	17.9418	595.83	23.3687
250.62	32.8072	351.93	30.9149	427.87	17.8366
252.40	35.6629	356.01	32.9825	604.72	20.0969
252.80	43.1826	361.25	27.0621	609.32	15.6577
256.23	40.4610	364.49	30.1208	610.33	17.9010
260.90	45.3086	366.42	22.1115	614.28	14.5658
264.66	41.6367	356.01	29.4136	618.01	15.7078
265.00	44.4861	388.16	27.4455	621.93	16.8542
269.46	37.0227	388.63	24.4023	630.19	8.4525
271.23	36.1152	391.70	23.4221	631.29	11.2744
273.65	29.5090	264.66	26.5967	155.04	11.2813
276.40	37.1901	401.32	26.6051	633.25	11.2821
277.37	41.0299	401.81	28.6591	634.78	11.8531
277.60	40.0817	402.40	25.5956	635.95	10.1638
278.00	31.5008	404.85	22.5519	636.99	15.2518
278.43	31.5095	410.95	23.6481	657.50	23.8976
279.20	30.5697	414.70	20.6010	657.76	22.7620
279.54	34.3989	423.72	22.7605	661.66	18.2344
280.46	38.2430	427.09	25.9059	664.57	28.5197
283.69	32.5736	427.87	19.6958	666.33	21.6881
284.31	42.1702	433.94	22.8715	666.50	21.6897
285.41	40.2816	439.51	17.7197	667.71	25.1251
285.90	41.2538	440.45	21.8985	677.62	12.0325
287.50	20.1673	453.88	22.0352	685.70	10.3422
290.67	34.6414	459.60	19.9884	692.65	23.0363
293.27	30.3599	463.37	23.1839	695.00	19.5968
351.93	43.4244	468.07	22.1771	696.49	17.2998
295.96	28.9624	473.00	21.1674	696.51	17.2998
879.38	34.8113	475.06	27.5430	697.00	19.6099
299.98	30.4855	476.78	21.2028	697.49	25.3811
300.09	30.4874	477.60	16.9684	702.65	18.4909
300.13	30.4887	477.99	20.1535	706.68	18.5163
301.36	25.1838	482.18	20.1906	711.68	19.7061
302.85	36.8403	487.02	13.8440	720.70	13.9512

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
721.93	10.4678	935.54	6.5055	1368.63	4.1106
722.78	12.7975	937.49	13.0178	1377.63	6.1769
722.91	12.7980	944.13	5.5889	1384.29	6.1853
723.31	23.2723	945.96	11.1833	1408.01	11.3934
724.19	26.7706	946.00	11.1833	1434.09	8.3281
727.33	12.8163	949.00	4.6635	1435.80	9.3724
733.00	17.5092	667.71	11.2090	1457.56	8.3662
735.93	12.2679	962.31	7.4880	1460.82	5.2322
739.50	14.0366	964.08	7.4915	1489.16	4.2083
744.23	19.3299	966.17	9.3695	1596.21	1.0730
747.24	19.3487	968.97	4.6883	1620.50	7.5435
752.31	22.0222	983.53	11.2947	1678.03	4.3540
753.82	22.0329	984.45	13.1801	1690.97	2.1819
756.73	14.1143	996.26	7.5547	1757.55	3.3096
763.94	14.1460	1001.03	8.5095	1764.49	4.4180
765.80	17.6929	1274.44	8.5174	1063.66	4.4221
766.42	15.0421	1025.87	9.5148	1771.35	4.4229
766.84	11.5043	1028.54	8.5688	1791.20	3.3281
772.60	12.4115	1037.84	5.7261	1808.65	4.4500
776.52	12.4265	1038.76	4.7726	1836.06	5.5872
739.50	9.7680	475.06	11.4771		
778.90	7.9945	1048.07	5.7404		
783.70	14.2334	1050.41	3.8293		
788.74	15.1463	1063.66	7.6836		
792.07	10.7025	1077.00	9.6356		
795.86	14.2866	1077.34	6.7454		
802.10	13.4189	459.60	1.9303		
810.29	13.4523	1085.87	12.3602		
344.28	13.4528	1099.25	8.7188		
810.76	11.6602	1111.64	9.9938		
815.77	11.6777	1112.07	10.3646		
1048.07	11.5074	1112.84	6.2199		
832.01	7.2209	1115.54	6.2238		
834.85	13.5507	1120.29	15.5771		
835.15	11.7448	1120.55	15.5781		
836.80	11.7507	1221.41	15.5811		
846.77	15.4109	1129.67	6.8300		
856.80	15.4555	1131.51	11.7136		
860.56	15.4727	1173.23	7.8848		
871.09	5.4774	1177.95	3.9465		
873.19	5.4805	1189.05	10.8798		
875.33	14.6240	1204.77	4.9628		
879.38	8.7844	1221.41	5.9773		
880.51	15.5609	1231.02	5.9901		
881.60	14.6499	1235.36	6.3953		
883.24	11.7254	1238.28	5.9996		
884.68	11.7301	1260.41	6.4305		
889.28	12.8464	1271.87	9.0648		
894.76	19.2991	1274.44	7.0543		
898.04	11.0380	1274.54	7.0543		
903.28	8.2906	1291.59	10.1141		
907.67	10.1453	1298.22	9.1154		
911.20	21.1014	1312.11	9.1423		
923.98	3.7057	1332.49	7.1406		
926.36	9.2703	1365.19	13.3499		

VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 12:07:06.08

```
*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089188.CNF;1
Background file : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM24.CNF;629
Background date : 15-MAY-2022 09:13:07
Sample date     : 29-MAR-2022 13:03:00 Acquisition date : 17-MAY-2022 10:06:23
Sample ID      : G1205089188 Sample quantity : 7.41190E-01 FILTER
Detector name   : GAM24 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:09.43 0.1%
Energy tolerance: 1.50000 keV Analyst Initials : RXF2
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2264689 Detector SN# :
Matrix Spike ID : LCS ID :
*****
```

BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.52*	26	103	1.30	93.19	90	9	3.58E-03	80.5	
2	0	72.43	36	60	1.00	145.05	143	5	5.01E-03	36.4	
3	0	75.10*	10	125	2.86	150.39	148	9	1.42E-03	218.7	
4	0	85.84*	31	148	3.84	171.89	164	14	4.30E-03	89.9	
5	0	92.85*	26	124	1.42	185.92	182	11	3.56E-03	99.2	
6	0	160.32*	16	84	0.78	320.94	316	9	2.17E-03	114.7	
7	0	191.05	57	62	1.48	382.44	377	11	7.93E-03	30.0	
8	6	235.77	18	16	1.17	471.94	470	13	2.48E-03	37.1	2.57E+00
9	6	238.84*	19	75	1.95	478.09	470	13	2.60E-03	96.8	
10	0	352.40*	16	22	1.76	705.37	702	7	2.19E-03	67.5	
11	0	477.96	38	73	1.45	956.69	949	16	5.29E-03	52.4	
12	0	489.51	15	12	1.47	979.81	974	10	2.04E-03	51.9	
13	0	497.17	20	7	1.26	995.13	992	6	2.72E-03	31.6	
14	0	510.99*	3	39	3.51	1022.80	1013	17	3.59E-04	855.8	
15	0	580.86	10	27	0.93	1162.65	1156	10	1.38E-03	103.3	
16	0	583.88*	11	15	2.29	1168.70	1165	9	1.59E-03	82.8	
17	0	628.97	23	14	3.24	1258.96	1253	12	3.25E-03	38.7	
18	0	712.92	16	10	1.10	1426.99	1424	7	2.25E-03	41.1	
19	0	717.25	12	9	1.41	1435.66	1432	7	1.66E-03	50.3	
20	0	742.95	21	10	0.82	1487.10	1480	13	2.96E-03	37.2	
21	0	838.55*	4	20	3.56	1678.48	1671	13	5.83E-04	248.2	
22	0	897.18	6	12	0.69	1795.84	1791	9	8.68E-04	105.3	
23	0	922.69	12	33	5.16	1846.91	1828	22	1.70E-03	122.7	
24	0	962.31	14	12	0.76	1926.21	1919	15	1.88E-03	60.7	
25	0	1197.41	22	0	2.64	2396.86	2391	14	3.06E-03	21.3	
26	0	1263.93	22	0	0.83	2530.05	2521	18	3.06E-03	21.3	
27	0	1461.05*	15	4	3.43	2924.71	2916	14	2.07E-03	50.5	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 12:07:06

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089188.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 29-MAR-2022 13:03:00	Acquisition date	: 17-MAY-2022 10:06:23
Sample ID	: G1205089188	Sample quantity	: 0.74119 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA24	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:09.43 0.1%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	38	10.44*	2.609E+00	7.083E+01	1.339E+02	104.86
K-40	1460.82	15	10.66*	1.058E+00	6.687E+01	6.687E+01	100.98
NB-95M	235.69	18	24.80*	4.120E+00	8.843E+00	1.502E+01	74.14
RU-103	497.08	20	91.00*	2.538E+00	4.289E+00	1.017E+01	63.25
	610.33	-----	5.76	2.181E+00	-----	Line Not Found	-----
IN-114M	190.27	57	15.56*	4.651E+00	3.995E+01	7.924E+01	59.97
TE-123M	159.00	16	84.00*	5.081E+00	1.853E+00	2.463E+00	229.31
TL-208	277.37	-----	6.60	3.731E+00	-----	Line Not Found	-----
	583.19	11	85.00*	2.256E+00	3.022E+00	3.172E+00	165.56
	860.56	-----	12.50	1.649E+00	-----	Line Not Found	-----
PB-210	46.54	26	4.25*	1.468E+00	2.094E+02	2.103E+02	160.94
BI-211	72.87	36	1.23	4.470E+00	3.326E+02	3.340E+02	72.77
	351.06	16	12.92*	3.204E+00	1.927E+01	1.935E+01	135.01
AM-243	43.53	-----	5.90	1.097E+00	-----	Line Not Found	-----
	74.66	10	67.20*	4.666E+00	1.656E+00	1.656E+00	437.37
ANH-511	511.00	3	100.00*	2.488E+00	5.264E-01	5.264E-01	1711.64

Flag: "*" = Keyline

```

*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                          *
*****
*                                     DETECTOR AND SAMPLE DATA                      *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089188.CNF;1      *
* Acquisition date   : 17-MAY-2022 10:06:23 Sensitivity      : 3.000                *
* Detector ID        : GAM24 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:09.43 Half life ratio : *****      *
* Sample date        : 29-MAR-2022 13:03:00 Analyst initials: RXF2      *
* Sample ID          : G1205089188 Sample Quantity : 7.4119E-01 FILTER *
* Batch Number       : 2264689 Wet Weight : 0.00000        *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000         *
* Nuclide Library    : LIQUID.NLB;26                                           *
*****
*                                     CALIBRATION INFORMATION                      *
*
* Eff. Cal. date     : 6-JUL-2021 06:54:13 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM24_JAR.CNF;16          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.339E+02	1.376E+02	1.007E+02
K-40	6.687E+01	6.618E+01	6.244E+01
NB-95M	1.502E+01	1.091E+01	2.963E+01
RU-103	1.017E+01	6.305E+00	1.417E+01
IN-114M	7.924E+01	4.657E+01	5.055E+01
TE-123M	2.463E+00	5.535E+00	5.352E+00
TL-208	3.172E+00	5.147E+00	7.508E-01
PB-210	2.103E+02	3.317E+02	3.145E+02
BI-211	1.935E+01	2.561E+01	3.695E+01
AM-243	1.656E+00	7.096E+00	6.084E+00
ANH-511	5.264E-01	8.831E+00	5.642E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-4.462E-01		3.590E+00	7.174E+00	NOT IDENT.
NA-24	0.000E+00		1.639E+24	0.000E+00	SHORT HLIF
AL-26	1.589E+00		3.255E+00	7.719E+00	NOT IDENT.
SC-46	5.620E+00		5.518E+00	1.192E+01	NOT IDENT.
V-48	2.404E+01		3.125E+01	6.634E+01	NOT IDENT.
CR-51	-2.179E+01		8.641E+01	1.514E+02	NOT IDENT.
MN-52	4.208E+02		1.651E+03	3.506E+03	FAIL ABUN
MN-54	1.902E+00		4.158E+00	7.639E+00	NOT IDENT.
CO-56	5.681E-01		5.588E+00	1.073E+01	NOT IDENT.
CO-57	-2.727E+00		2.540E+00	4.286E+00	NOT IDENT.
NI-57	0.000E+00		3.679E+10	0.000E+00	SHORT HLIF
CO-58	-7.861E-01		5.831E+00	1.081E+01	NOT IDENT.
FE-59	-1.004E+01		1.296E+01	2.074E+01	NOT IDENT.
CO-60	3.721E+00		4.073E+00	9.345E+00	NOT IDENT.
ZN-65	-1.612E+00		9.544E+00	1.742E+01	NOT IDENT.
CU-67	0.000E+00		3.226E+06	0.000E+00	SHORT HLIF
GE-68	-6.307E+01		1.353E+02	2.347E+02	NOT IDENT.
AS-73	-3.046E+01		8.408E+01	1.286E+02	NOT IDENT.
AS-74	-9.163E+00		3.163E+01	5.857E+01	NOT IDENT.

SE-75	-5.970E-02	5.365E+00	9.702E+00	NOT IDENT.
BR-77	0.000E+00	2.995E+07	0.000E+00	SHORT HLIF
SR-82	-4.137E+00	7.065E+01	1.363E+02	NOT IDENT.
RB-83	-2.073E-02	8.582E+00	1.657E+01	NOT IDENT.
RB-84	6.180E+00	1.381E+01	2.822E+01	NOT IDENT.
KR-85	0.000E+00	8.737E+02	1.845E+03	NOT IDENT.
SR-85	0.000E+00	6.545E+00	1.382E+01	NOT IDENT.
RB-86	-1.664E+02	2.786E+02	4.690E+02	NOT IDENT.
Y-88	-3.159E+00	5.761E+00	1.014E+01	FAIL ABUN
Y-91	6.809E+02	2.495E+03	4.956E+03	NOT IDENT.
NB-94	5.099E-01	3.549E+00	6.806E+00	NOT IDENT.
NB-95	-2.546E+00	6.215E+00	1.106E+01	NOT IDENT.
TC-95M	-2.982E+00	6.596E+00	1.148E+01	FAIL ABUN
ZR-95	-1.403E+00	1.098E+01	2.039E+01	NOT IDENT.
MO-99	0.000E+00	6.165E+06	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
RH-101	7.494E-01	3.011E+00	5.645E+00	NOT IDENT.
RH-102M	7.519E-01	3.719E+00	6.408E+00	NOT IDENT.
RH-106	-4.360E+00	3.449E+01	6.258E+01	NOT IDENT.
RU-106	-4.360E+00	3.449E+01	6.258E+01	NOT IDENT.
AG-108M	-1.546E+00	3.168E+00	5.293E+00	NOT IDENT.
CD-109	-3.931E+01	7.558E+01	1.090E+02	NOT IDENT.
AG-110	-3.805E+01	7.879E+01	1.405E+02	NOT IDENT.
AG-110M	-5.818E+00	5.009E+00	7.450E+00	NOT IDENT.
IN-111	0.000E+00	4.717E+05	0.000E+00	SHORT HLIF
SN-113	-3.079E+00	6.068E+00	1.016E+01	NOT IDENT.
CD-115	0.000E+00	4.201E+07	0.000E+00	SHORT HLIF
SN-117M	3.172E+01	3.509E+01	5.753E+01	NOT IDENT.
SB-122	0.000E+00	1.136E+06	0.000E+00	SHORT HLIF
I-123	0.000E+00	2.276E+27	0.000E+00	SHORT HLIF
SB-124	5.798E+00	1.013E+01	2.552E+01	NOT IDENT.
SB-125	-1.130E+00	1.008E+01	1.773E+01	NOT IDENT.
TE-125M	3.670E+02	1.224E+03	2.329E+03	NOT IDENT.
I-126	3.574E+01	1.429E+02	2.779E+02	NOT IDENT.
SB-126	1.559E+02	9.092E+01	2.048E+02	NOT IDENT.
SN-126	-1.716E+00	6.405E+00	1.046E+01	FAIL ABUN
SB-127	0.000E+00	5.741E+04	0.000E+00	SHORT HLIF
TE-129	3.977E+01	8.917E+01	1.810E+02	NOT IDENT.
I-131	7.031E+01	2.415E+02	4.441E+02	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	1.078E+05	0.000E+00	SHORT HLIF
BA-133	-2.873E+00	4.948E+00	7.158E+00	NOT IDENT.
I-133	0.000E+00	3.168E+17	0.000E+00	SHORT HLIF
CS-134	-1.258E+00	4.089E+00	7.429E+00	NOT IDENT.
I-135	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
CS-136	-2.634E+01	5.639E+01	9.848E+01	NOT IDENT.
BA-137M	4.054E-01	3.553E+00	6.860E+00	NOT IDENT.
CS-137	4.282E-01	3.754E+00	7.247E+00	NOT IDENT.
LA-138	-2.640E+00	5.842E+00	1.078E+01	NOT IDENT.
CE-139	3.345E+00	3.549E+00	6.920E+00	NOT IDENT.
BA-140	3.126E+01	1.520E+02	3.017E+02	NOT IDENT.
LA-140	-3.164E+01	5.107E+01	8.971E+01	NOT IDENT.
CE-141	4.452E+00	1.268E+01	2.376E+01	NOT IDENT.
CE-143	0.000E+00	3.193E+11	0.000E+00	SHORT HLIF
CE-144	-5.131E-01	2.024E+01	3.714E+01	NOT IDENT.
PM-144	9.585E-01	4.226E+00	8.101E+00	FAIL ABUN
PR-144	7.041E+01	3.216E+02	6.160E+02	NOT IDENT.
PM-146	7.403E-01	3.728E+00	7.413E+00	NOT IDENT.
ND-147	-2.437E+02	4.717E+02	8.478E+02	NOT IDENT.
PM-147	-2.820E+04	6.814E+04	1.219E+05	NOT IDENT.
PM-149	0.000E+00	3.768E+08	0.000E+00	SHORT HLIF
EU-152	4.880E+00	1.105E+01	2.056E+01	NOT IDENT.
GD-153	2.344E+00	8.353E+00	1.441E+01	NOT IDENT.
EU-154	-1.296E+00	9.986E+00	1.994E+01	NOT IDENT.
EU-155	-2.041E+00	8.591E+00	1.572E+01	FAIL ABUN
TB-160	5.209E+00	1.867E+01	3.701E+01	FAIL ABUN
HO-166M	7.858E+00	6.336E+00	1.337E+01	FAIL ABUN
TM-171	-2.248E+02	1.335E+03	2.081E+03	NOT IDENT.
LU-176	8.155E-01	2.836E+00	5.239E+00	NOT IDENT.
LU-177	-1.940E+03	3.916E+03	6.774E+03	NOT IDENT.
HF-181	5.617E+00	8.354E+00	1.562E+01	NOT IDENT.
W-181	-1.675E+01	1.627E+01	2.489E+01	NOT IDENT.
TA-182	-5.181E+00	1.903E+01	3.649E+01	NOT IDENT.
RE-183	-2.089E+00	1.706E+01	2.894E+01	NOT IDENT.
RE-184	-5.235E+00	2.428E+01	4.456E+01	NOT IDENT.
RE-188	-5.902E+00	2.148E+01	3.667E+01	FAIL ABUN
W-188	-4.605E+02	1.091E+03	1.873E+03	NOT IDENT.
OS-191	-1.441E+01	6.897E+01	1.248E+02	NOT IDENT.

IR-192	2.926E+00	5.223E+00	9.879E+00	NOT IDENT.
PB-201	0.000E+00	2.814E+38	0.000E+00	SHORT HLIF
TL-201	0.000E+00	1.536E+06	0.000E+00	SHORT HLIF
TL-202	-9.602E-01	4.973E+01	8.853E+01	NOT IDENT.
HG-203	4.931E-01	7.305E+00	1.311E+01	FAIL ABUN
PB-203	0.000E+00	2.281E+07	0.000E+00	SHORT HLIF
TL-204	3.804E+02	3.673E+02	6.781E+02	NOT IDENT.
BI-207	-8.717E-02	5.096E+00	9.661E+00	FAIL ABUN
PB-211	-2.739E+01	8.526E+01	1.453E+02	NOT IDENT.
BI-212	-3.715E+00	4.511E+01	7.795E+01	NOT IDENT.
PB-212	5.587E+00	1.060E+01	1.379E+01	FAIL ABUN
BI-213	-5.039E+00	1.167E+01	1.960E+01	NOT IDENT.
BI-214	-9.428E-01	8.783E+00	1.581E+01	NOT IDENT.
PB-214	6.994E+00	9.254E+00	1.626E+01	FAIL ABUN
RN-219	-2.239E+01	4.713E+01	7.899E+01	NOT IDENT.
FR-221	-9.025E+00	1.953E+01	3.396E+01	NOT IDENT.
RA-223	-4.807E+01	6.325E+01	1.038E+02	NOT IDENT.
RA-224	4.738E+01	7.676E+01	1.314E+02	NOT IDENT.
AC-225	-2.680E+02	5.799E+02	1.008E+03	NOT IDENT.
RA-226	-1.414E+01	8.987E+01	1.521E+02	NOT IDENT.
AC-227	-3.934E-01	2.515E+01	4.546E+01	FAIL ABUN
TH-227	-3.934E-01	2.515E+01	4.546E+01	FAIL ABUN
AC-228	4.159E+00	1.768E+01	3.117E+01	NOT IDENT.
RA-228	4.159E+00	1.768E+01	3.117E+01	NOT IDENT.
TH-228	5.587E+00	1.060E+01	1.379E+01	FAIL ABUN
TH-229	7.038E+00	5.070E+01	8.472E+01	FAIL ABUN
TH-230	-6.967E+02	6.754E+02	1.173E+03	NOT IDENT.
PA-231	-3.735E-01	4.406E+01	7.982E+01	NOT IDENT.
TH-231	6.584E+00	4.051E+01	7.008E+01	NOT IDENT.
TH-232	1.748E+02	1.769E+03	2.773E+03	NOT IDENT.
PA-233	2.325E+00	7.362E+00	1.355E+01	NOT IDENT.
PA-234	1.767E+01	3.004E+01	6.238E+01	NOT IDENT.
PA-234M	5.387E+01	3.979E+02	7.865E+02	NOT IDENT.
TH-234	-4.087E-01	1.285E+02	2.002E+02	FAIL ABUN
U-234	-1.051E+03	4.774E+03	7.405E+03	NOT IDENT.
U-235	-1.835E+00	2.305E+01	3.937E+01	NOT IDENT.
NP-237	2.325E+00	7.362E+00	1.355E+01	NOT IDENT.
NP-238	0.000E+00	1.314E+08	0.000E+00	SHORT HLIF
U-238	-4.087E-01	1.285E+02	2.002E+02	FAIL ABUN
NP-239	1.574E+01	2.481E+01	4.789E+01	NOT IDENT.
AM-241	8.269E+00	9.541E+00	1.774E+01	NOT IDENT.
AM-242	-4.863E+01	5.121E+01	8.817E+01	NOT IDENT.
CM-243	-4.945E+00	8.386E+00	1.490E+01	NOT IDENT.
BK-247	2.949E-01	7.785E+00	1.417E+01	NOT IDENT.
CM-247	-2.638E+00	4.243E+00	6.980E+00	NOT IDENT.
CF-249	-8.998E-01	4.693E+00	8.144E+00	NOT IDENT.
CF-251	6.793E+00	1.189E+01	2.282E+01	NOT IDENT.
CF-252	4.471E+03	1.425E+04	2.727E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.52	50	103	1.30	93.19	90	9	6.96E-03	38.9	
2	0	63.15	48	104	1.11	126.46	123	8	6.72E-03	39.0	
3	0	72.43	36	60	1.00	145.05	143	5	5.01E-03	36.4	
4	0	75.10	37	125	2.86	150.39	148	9	5.17E-03	56.0	
5	0	85.84	53	148	3.84	171.89	164	14	7.32E-03	51.2	
6	0	92.85	112	124	1.42	185.92	182	11	1.55E-02	21.5	
7	0	160.32	17	84	0.78	320.94	316	9	2.31E-03	102.0	
8	0	186.46	51	100	1.88	373.26	366	11	7.06E-03	40.8	
9	0	191.05	57	62	1.48	382.44	377	11	7.93E-03	30.0	
10	6	235.77	18	16	1.17	471.94	470	13	2.48E-03	37.1	2.57E+00
11	6	238.84	40	75	1.95	478.09	470	13	5.53E-03	42.7	
12	0	352.40	29	22	1.76	705.37	702	7	3.98E-03	34.3	
13	0	477.96	38	73	1.45	956.69	949	16	5.29E-03	52.4	
14	0	489.51	15	12	1.47	979.81	974	10	2.04E-03	51.9	
15	0	497.17	20	7	1.26	995.13	992	6	2.72E-03	31.6	
16	0	510.99	189	39	3.51	1022.80	1013	17	2.62E-02	10.5	
17	0	580.86	10	27	0.93	1162.65	1156	10	1.38E-03	103.3	
18	0	583.88	20	15	2.29	1168.70	1165	9	2.83E-03	39.6	
19	0	628.97	23	14	3.24	1258.96	1253	12	3.25E-03	38.7	
20	0	712.92	16	10	1.10	1426.99	1424	7	2.25E-03	41.1	
21	0	717.25	12	9	1.41	1435.66	1432	7	1.66E-03	50.3	
22	0	742.95	21	10	0.82	1487.10	1480	13	2.96E-03	37.2	
23	0	838.55	11	20	3.56	1678.48	1671	13	1.46E-03	92.0	
24	0	897.18	6	12	0.69	1795.84	1791	9	8.68E-04	105.3	
25	0	922.69	12	33	5.16	1846.91	1828	22	1.70E-03	122.7	
26	0	962.31	14	12	0.76	1926.21	1919	15	1.88E-03	60.7	
27	0	1197.41	22	0	2.64	2396.86	2391	14	3.06E-03	21.3	
28	0	1263.93	22	0	0.83	2530.05	2521	18	3.06E-03	21.3	
29	0	1461.05	28	4	3.43	2924.71	2916	14	3.88E-03	23.8	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	38	10.44*	2.609E+00	7.083E+01	1.339E+02	104.86
K-40	1460.82	15	10.66*	1.058E+00	6.687E+01	6.687E+01	100.98
NB-95M	235.69	18	24.80*	4.120E+00	8.843E+00	1.502E+01	74.14
RU-103	497.08	20	91.00*	2.538E+00	4.289E+00	1.017E+01	63.25
	610.33	-----	5.76	2.181E+00	-----	Line Not Found	-----
IN-114M	190.27	57	15.56*	4.651E+00	3.995E+01	7.924E+01	59.97
TE-123M	159.00	16	84.00*	5.081E+00	1.853E+00	2.463E+00	229.31
TL-208	277.37	-----	6.60	3.731E+00	-----	Line Not Found	-----
	583.19	11	85.00*	2.256E+00	3.022E+00	3.172E+00	165.56
	860.56	-----	12.50	1.649E+00	-----	Line Not Found	-----
PB-210	46.54	26	4.25*	1.468E+00	2.094E+02	2.103E+02	160.94
BI-211	72.87	36	1.23	4.470E+00	3.326E+02	3.340E+02	72.77
	351.06	16	12.92*	3.204E+00	1.927E+01	1.935E+01	135.01
AM-243	43.53	-----	5.90	1.097E+00	-----	Line Not Found	-----
	74.66	10	67.20*	4.666E+00	1.656E+00	1.656E+00	437.37
ANH-511	511.00	3	100.00*	2.488E+00	5.264E-01	5.264E-01	1711.64

Flag: "*" = Keyline

Total number of lines in spectrum 27
Number of unidentified lines 5
Number of lines tentatively identified by NID 22 81.48%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.89	7.083E+01	1.339E+02	1.404E+02	104.86	
K-40	1.25E+09Y	1.00	6.687E+01	6.687E+01	6.753E+01	100.98	
NB-95M	64.03D	1.70	8.843E+00	1.502E+01	1.113E+01	74.14	
RU-103	39.26D	2.37	4.289E+00	1.017E+01	0.643E+01	63.25	
IN-114M	49.51D	1.98	3.995E+01	7.924E+01	4.752E+01	59.97	
TE-123M	119.20D	1.33	1.853E+00	2.463E+00	5.648E+00	229.31	
TL-208	1.91Y	1.05	3.022E+00	3.172E+00	5.252E+00	165.56	
PB-210	22.20Y	1.00	2.094E+02	2.103E+02	3.384E+02	160.94	
BI-211	21.77Y	1.00	1.927E+01	1.935E+01	2.613E+01	135.01	
AM-243	7370.00Y	1.00	1.656E+00	1.656E+00	7.241E+00	437.37	
ANH-511	1.00E+09Y	1.00	5.264E-01	5.264E-01	90.11E-01	1711.64	
Total Activity :			4.265E+02	5.427E+02			

Grand Total Activity : 4.265E+02 5.427E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	85.84	31	148	3.84	171.89	164	14	4.30E-03	****	5.23E+00	T
0	92.85	26	124	1.42	185.92	182	11	3.56E-03	****	5.44E+00	T
6	238.84	19	75	1.95	478.09	470	13	2.60E-03	****	4.09E+00	T
0	489.51	15	12	1.47	979.81	974	10	2.04E-03	****	2.57E+00	
0	580.86	10	27	0.93	1162.65	1156	10	1.38E-03	****	2.26E+00	T
0	628.97	23	14	3.24	1258.96	1253	12	3.25E-03	77.5	2.13E+00	T
0	712.92	16	10	1.10	1426.99	1424	7	2.25E-03	82.3	1.93E+00	T
0	717.25	12	9	1.41	1435.66	1432	7	1.66E-03	****	1.92E+00	
0	742.95	21	10	0.82	1487.10	1480	13	2.96E-03	74.3	1.87E+00	T
0	838.55	4	20	3.56	1678.48	1671	13	5.83E-04	****	1.69E+00	
0	897.18	6	12	0.69	1795.84	1791	9	8.68E-04	****	1.59E+00	T
0	922.69	12	33	5.16	1846.91	1828	22	1.70E-03	****	1.55E+00	T
0	962.31	14	12	0.76	1926.21	1919	15	1.88E-03	****	1.50E+00	T
0	1197.41	22	0	2.64	2396.86	2391	14	3.06E-03	42.6	1.24E+00	
0	1263.93	22	0	0.83	2530.05	2521	18	3.06E-03	42.6	1.19E+00	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089188.CNF;1
* Acquisition date   : 17-MAY-2022 10:06:23 Sensitivity      : 3.000
* Detector ID        : GAM24 Energy tolerance: 1.500
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 02:00:09.43 Half life ratio : *****
* Sample date        : 29-MAR-2022 13:03:00 Nuclide Library : LIQUID
* Sample ID          : G1205089188 Analyst initials: RXF2
* Batch Number       : 2264689 Sample Quantity : 7.4119E-01 FILTER
* Wet wt corr        : 1.00000 Wet Weight : 0.00000
*                                     Dry Weight : 0.00000
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 6-JUL-2021 06:54:13 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM24_JAR.CNF;16
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	4.561E+01
K-40	2.515E+01
NB-95M	1.368E+01
RU-103	6.385E+00
IN-114M	2.341E+01
TE-123M	2.464E+00
TL-208	0.000E+00
PB-210	1.463E+02
BI-211	1.682E+01
AM-243	2.824E+00
ANH-511	2.547E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	2.984E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	3.120E+00	NOT IDENT.
SC-46	5.324E+00	NOT IDENT.
V-48	2.928E+01	NOT IDENT.
CR-51	6.881E+01	NOT IDENT.
MN-52	1.478E+03	FAIL ABUN
MN-54	3.369E+00	NOT IDENT.
CO-56	4.733E+00	NOT IDENT.
CO-57	1.981E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	4.767E+00	NOT IDENT.
FE-59	8.427E+00	NOT IDENT.
CO-60	4.059E+00	NOT IDENT.
ZN-65	7.530E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	9.960E+01	NOT IDENT.
AS-73	6.010E+01	NOT IDENT.
AS-74	2.577E+01	NOT IDENT.
SE-75	4.451E+00	NOT IDENT.

BR-77	0.000E+00	SHORT HLIF
SR-82	5.852E+01	NOT IDENT.
RB-83	7.371E+00	NOT IDENT.
RB-84	1.239E+01	NOT IDENT.
KR-85	8.579E+02	NOT IDENT.
SR-85	6.427E+00	NOT IDENT.
RB-86	1.986E+02	NOT IDENT.
Y-88	4.039E+00	FAIL ABUN
Y-91	2.097E+03	NOT IDENT.
NB-94	3.053E+00	NOT IDENT.
NB-95	4.889E+00	NOT IDENT.
TC-95M	5.319E+00	FAIL ABUN
ZR-95	9.035E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.636E+00	NOT IDENT.
RH-102M	2.923E+00	NOT IDENT.
RH-106	2.778E+01	NOT IDENT.
RU-106	2.778E+01	NOT IDENT.
AG-108M	2.376E+00	NOT IDENT.
CD-109	5.077E+01	NOT IDENT.
AG-110	6.182E+01	NOT IDENT.
AG-110M	3.055E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	4.607E+00	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	2.690E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
SB-124	1.013E+01	NOT IDENT.
SB-125	8.023E+00	NOT IDENT.
TE-125M	1.083E+03	NOT IDENT.
I-126	1.249E+02	NOT IDENT.
SB-126	9.207E+01	NOT IDENT.
SN-126	4.882E+00	FAIL ABUN
SB-127	0.000E+00	SHORT HLIF
TE-129	8.143E+01	NOT IDENT.
I-131	2.038E+02	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	3.230E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.240E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	4.115E+01	NOT IDENT.
BA-137M	3.058E+00	NOT IDENT.
CS-137	3.230E+00	NOT IDENT.
LA-138	4.413E+00	NOT IDENT.
CE-139	3.243E+00	NOT IDENT.
BA-140	1.342E+02	NOT IDENT.
LA-140	3.454E+01	NOT IDENT.
CE-141	1.112E+01	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.730E+01	NOT IDENT.
PM-144	3.667E+00	FAIL ABUN
PR-144	2.788E+02	NOT IDENT.
PM-146	3.312E+00	NOT IDENT.
ND-147	3.766E+02	NOT IDENT.
PM-147	5.651E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	9.489E+00	NOT IDENT.
GD-153	6.716E+00	NOT IDENT.
EU-154	8.290E+00	NOT IDENT.
EU-155	7.270E+00	FAIL ABUN
TB-160	1.627E+01	FAIL ABUN
HO-166M	6.032E+00	FAIL ABUN
TM-171	9.732E+02	NOT IDENT.
LU-176	2.412E+00	NOT IDENT.
LU-177	3.144E+03	NOT IDENT.
HF-181	7.083E+00	NOT IDENT.
W-181	1.148E+01	NOT IDENT.
TA-182	1.545E+01	NOT IDENT.
RE-183	1.339E+01	NOT IDENT.
RE-184	1.933E+01	NOT IDENT.
RE-188	1.696E+01	FAIL ABUN
W-188	8.605E+02	NOT IDENT.
OS-191	5.816E+01	NOT IDENT.
IR-192	4.560E+00	NOT IDENT.

PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF
TL-202	4.003E+01	NOT IDENT.
HG-203	6.090E+00	FAIL ABUN
PB-203	0.000E+00	SHORT HLIF
TL-204	3.187E+02	NOT IDENT.
BI-207	4.161E+00	FAIL ABUN
PB-211	6.647E+01	NOT IDENT.
BI-212	3.330E+01	NOT IDENT.
PB-212	6.493E+00	FAIL ABUN
BI-213	8.848E+00	NOT IDENT.
BI-214	7.216E+00	NOT IDENT.
PB-214	7.535E+00	FAIL ABUN
RN-219	3.596E+01	NOT IDENT.
FR-221	1.559E+01	NOT IDENT.
RA-223	4.681E+01	NOT IDENT.
RA-224	6.141E+01	NOT IDENT.
AC-225	4.629E+02	NOT IDENT.
RA-226	7.205E+01	NOT IDENT.
AC-227	2.089E+01	FAIL ABUN
TH-227	2.089E+01	FAIL ABUN
AC-228	1.387E+01	NOT IDENT.
RA-228	1.387E+01	NOT IDENT.
TH-228	6.493E+00	FAIL ABUN
TH-229	3.902E+01	FAIL ABUN
TH-230	5.425E+02	NOT IDENT.
PA-231	3.631E+01	NOT IDENT.
TH-231	3.305E+01	NOT IDENT.
TH-232	1.315E+03	NOT IDENT.
PA-233	6.264E+00	NOT IDENT.
PA-234	2.744E+01	NOT IDENT.
PA-234M	3.370E+02	NOT IDENT.
TH-234	9.500E+01	FAIL ABUN
U-234	3.462E+03	NOT IDENT.
U-235	1.852E+01	NOT IDENT.
NP-237	6.264E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	9.500E+01	FAIL ABUN
NP-239	2.241E+01	NOT IDENT.
AM-241	8.274E+00	NOT IDENT.
AM-242	4.067E+01	NOT IDENT.
CM-243	6.866E+00	NOT IDENT.
BK-247	6.494E+00	NOT IDENT.
CM-247	3.167E+00	NOT IDENT.
CF-249	3.728E+00	NOT IDENT.
CF-251	1.060E+01	NOT IDENT.
CF-252	1.266E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089188.CNF;1
Acquisition date : 17-MAY-2022 10:06:23 Sensitivity : 3.000
Detector ID : GAM24 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:09.43 Half life ratio : *****
Sample date : 29-MAR-2022 13:03:00 Nuclide Library : LIQUID
Sample ID : G1205089188 Analyst initials: RXF2
Batch Number : 2264689 Sample Quantity : 7.4119E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 6-JUL-2021 06:54:13 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM24_JAR.CNF;16

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.339E+02	1.381E+02	1.381E+02
K-40	6.687E+01	6.648E+01	6.649E+01
NB-95M	1.502E+01	1.103E+01	1.104E+01
RU-103	1.017E+01	6.371E+00	6.374E+00
IN-114M	7.924E+01	4.701E+01	4.703E+01
TE-123M	2.463E+00	5.538E+00	5.538E+00
TL-208	3.172E+00	5.154E+00	5.155E+00
PB-210	2.103E+02	3.324E+02	3.324E+02
BI-211	1.935E+01	2.567E+01	2.567E+01
AM-243	1.656E+00	7.098E+00	7.098E+00
ANH-511	5.264E-01	8.831E+00	8.831E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-4.462E-01	3.590E+00	3.596E+00	NOT IDENT.
NA-24	1.760E+24	1.651E+24	0.000E+00	SHORT HLIF
AL-26	1.589E+00	3.257E+00	3.335E+00	NOT IDENT.
SC-46	5.620E+00	5.542E+00	6.095E+00	NOT IDENT.
V-48	2.404E+01	3.133E+01	3.315E+01	NOT IDENT.
CR-51	-2.179E+01	8.643E+01	8.699E+01	NOT IDENT.
MN-52	4.208E+02	1.651E+03	1.662E+03	FAIL ABUN
MN-54	1.902E+00	4.161E+00	4.249E+00	NOT IDENT.
CO-56	5.681E-01	5.588E+00	5.594E+00	NOT IDENT.
CO-57	-2.727E+00	2.548E+00	2.829E+00	NOT IDENT.
NI-57	1.285E+10	3.683E+10	3.729E+10	SHORT HLIF
CO-58	-7.861E-01	5.832E+00	5.842E+00	NOT IDENT.
FE-59	-1.004E+01	1.300E+01	1.377E+01	NOT IDENT.
CO-60	3.721E+00	4.086E+00	4.418E+00	NOT IDENT.
ZN-65	-1.612E+00	9.545E+00	9.573E+00	NOT IDENT.
CU-67	-4.015E+06	3.248E+06	3.719E+06	SHORT HLIF
GE-68	-6.307E+01	1.354E+02	1.384E+02	NOT IDENT.
AS-73	-3.046E+01	8.434E+01	8.545E+01	NOT IDENT.
AS-74	-9.163E+00	3.164E+01	3.191E+01	NOT IDENT.

SE-75	-5.970E-02	5.365E+00	5.365E+00	NOT IDENT.
BR-77	1.578E+07	2.999E+07	3.083E+07	SHORT HLIF
SR-82	-4.137E+00	7.065E+01	7.067E+01	NOT IDENT.
RB-83	-2.073E-02	8.582E+00	8.582E+00	NOT IDENT.
RB-84	6.180E+00	1.382E+01	1.410E+01	NOT IDENT.
KR-85	1.933E+03	8.894E+02	1.246E+03	NOT IDENT.
SR-85	1.448E+01	6.663E+00	9.333E+00	NOT IDENT.
RB-86	-1.664E+02	2.790E+02	2.889E+02	NOT IDENT.
Y-88	-3.159E+00	5.766E+00	5.940E+00	FAIL ABUN
Y-91	6.809E+02	2.496E+03	2.515E+03	NOT IDENT.
NB-94	5.099E-01	3.549E+00	3.557E+00	NOT IDENT.
NB-95	-2.546E+00	6.219E+00	6.324E+00	NOT IDENT.
TC-95M	-2.982E+00	6.601E+00	6.737E+00	FAIL ABUN
ZR-95	-1.403E+00	1.098E+01	1.100E+01	NOT IDENT.
MO-99	4.698E+05	6.165E+06	6.169E+06	SHORT HLIF
TC-99M	-1.000E+41	3.998E+41	0.000E+00	SHORT HLIF
RH-101	7.494E-01	3.014E+00	3.033E+00	NOT IDENT.
RH-102M	7.519E-01	3.720E+00	3.735E+00	NOT IDENT.
RH-106	-4.360E+00	3.450E+01	3.455E+01	NOT IDENT.
RU-106	-4.360E+00	3.450E+01	3.455E+01	NOT IDENT.
AG-108M	-1.546E+00	3.171E+00	3.247E+00	NOT IDENT.
CD-109	-3.931E+01	7.572E+01	7.777E+01	NOT IDENT.
AG-110	-3.805E+01	7.885E+01	8.070E+01	NOT IDENT.
AG-110M	-5.818E+00	5.040E+00	5.683E+00	NOT IDENT.
IN-111	-4.464E+05	4.735E+05	5.146E+05	SHORT HLIF
SN-113	-3.079E+00	6.073E+00	6.230E+00	NOT IDENT.
CD-115	8.287E+06	4.201E+07	4.218E+07	SHORT HLIF
SN-117M	3.172E+01	3.517E+01	3.797E+01	NOT IDENT.
SB-122	7.418E+05	1.138E+06	1.186E+06	SHORT HLIF
I-123	1.013E+27	2.278E+27	0.000E+00	SHORT HLIF
SB-124	5.798E+00	1.014E+01	1.047E+01	NOT IDENT.
SB-125	-1.130E+00	1.008E+01	1.010E+01	NOT IDENT.
TE-125M	3.670E+02	1.225E+03	1.236E+03	NOT IDENT.
I-126	3.574E+01	1.429E+02	1.438E+02	NOT IDENT.
SB-126	1.559E+02	9.296E+01	1.166E+02	NOT IDENT.
SN-126	-1.716E+00	6.407E+00	6.454E+00	FAIL ABUN
SB-127	6.142E+04	5.926E+04	6.542E+04	SHORT HLIF
TE-129	3.977E+01	8.944E+01	9.122E+01	NOT IDENT.
I-131	7.031E+01	2.415E+02	2.436E+02	NOT IDENT.
I-132	1.000E+41	4.644E+41	0.000E+00	SHORT HLIF
TE-132	-3.789E+04	1.079E+05	1.093E+05	SHORT HLIF
BA-133	-2.873E+00	4.954E+00	5.121E+00	NOT IDENT.
I-133	-1.649E+17	3.209E+17	0.000E+00	SHORT HLIF
CS-134	-1.258E+00	4.091E+00	4.130E+00	NOT IDENT.
I-135	-1.000E+41	1.863E+42	0.000E+00	SHORT HLIF
CS-136	-2.634E+01	5.647E+01	5.771E+01	NOT IDENT.
BA-137M	4.054E-01	3.553E+00	3.558E+00	NOT IDENT.
CS-137	4.282E-01	3.754E+00	3.759E+00	NOT IDENT.
LA-138	-2.640E+00	5.847E+00	5.967E+00	NOT IDENT.
CE-139	3.345E+00	3.618E+00	3.920E+00	NOT IDENT.
BA-140	3.126E+01	1.520E+02	1.527E+02	NOT IDENT.
LA-140	-3.164E+01	5.114E+01	5.309E+01	NOT IDENT.
CE-141	4.452E+00	1.268E+01	1.284E+01	NOT IDENT.
CE-143	1.883E+11	3.198E+11	3.309E+11	SHORT HLIF
CE-144	-5.131E-01	2.024E+01	2.024E+01	NOT IDENT.
PM-144	9.585E-01	4.226E+00	4.249E+00	FAIL ABUN
PR-144	7.041E+01	3.216E+02	3.232E+02	NOT IDENT.
PM-146	7.403E-01	3.728E+00	3.743E+00	NOT IDENT.
ND-147	-2.437E+02	4.722E+02	4.848E+02	NOT IDENT.
PM-147	-2.820E+04	6.817E+04	6.935E+04	NOT IDENT.
PM-149	-4.064E+07	3.768E+08	3.773E+08	SHORT HLIF
EU-152	4.880E+00	1.106E+01	1.128E+01	NOT IDENT.
GD-153	2.344E+00	8.356E+00	8.423E+00	NOT IDENT.
EU-154	-1.296E+00	9.986E+00	1.000E+01	NOT IDENT.
EU-155	-2.041E+00	8.593E+00	8.642E+00	FAIL ABUN
TB-160	5.209E+00	1.868E+01	1.883E+01	FAIL ABUN
HO-166M	7.858E+00	6.375E+00	7.295E+00	FAIL ABUN
TM-171	-2.248E+02	1.335E+03	1.339E+03	NOT IDENT.
LU-176	8.155E-01	2.837E+00	2.861E+00	NOT IDENT.
LU-177	-1.940E+03	3.919E+03	4.015E+03	NOT IDENT.
HF-181	5.617E+00	8.368E+00	8.744E+00	NOT IDENT.
W-181	-1.675E+01	1.687E+01	1.849E+01	NOT IDENT.
TA-182	-5.181E+00	1.904E+01	1.918E+01	NOT IDENT.
RE-183	-2.089E+00	1.707E+01	1.709E+01	NOT IDENT.
RE-184	-5.235E+00	2.428E+01	2.440E+01	NOT IDENT.
RE-188	-5.902E+00	2.148E+01	2.165E+01	FAIL ABUN
W-188	-4.605E+02	1.093E+03	1.112E+03	NOT IDENT.
OS-191	-1.441E+01	6.898E+01	6.929E+01	NOT IDENT.

IR-192	2.926E+00	5.231E+00	5.395E+00	NOT IDENT.
PB-201	1.816E+38	3.004E+38	0.000E+00	SHORT HLIF
TL-201	-5.195E+05	1.536E+06	1.554E+06	SHORT HLIF
TL-202	-9.602E-01	4.973E+01	4.974E+01	NOT IDENT.
HG-203	4.931E-01	7.305E+00	7.309E+00	FAIL ABUN
PB-203	1.540E+06	2.281E+07	2.282E+07	SHORT HLIF
TL-204	3.804E+02	3.699E+02	4.077E+02	NOT IDENT.
BI-207	-8.717E-02	5.096E+00	5.096E+00	FAIL ABUN
PB-211	-2.739E+01	8.529E+01	8.618E+01	NOT IDENT.
BI-212	-3.715E+00	4.511E+01	4.514E+01	NOT IDENT.
PB-212	5.587E+00	1.062E+01	1.091E+01	FAIL ABUN
BI-213	-5.039E+00	1.168E+01	1.190E+01	NOT IDENT.
BI-214	-9.428E-01	8.783E+00	8.793E+00	NOT IDENT.
PB-214	6.994E+00	9.276E+00	9.798E+00	FAIL ABUN
RN-219	-2.239E+01	4.724E+01	4.831E+01	NOT IDENT.
FR-221	-9.025E+00	1.955E+01	1.997E+01	NOT IDENT.
RA-223	-4.807E+01	6.345E+01	6.706E+01	NOT IDENT.
RA-224	4.738E+01	7.689E+01	7.980E+01	NOT IDENT.
AC-225	-2.680E+02	5.807E+02	5.932E+02	NOT IDENT.
RA-226	-1.414E+01	8.988E+01	9.011E+01	NOT IDENT.
AC-227	-3.934E-01	2.515E+01	2.515E+01	FAIL ABUN
TH-227	-3.934E-01	2.515E+01	2.515E+01	FAIL ABUN
AC-228	4.159E+00	1.768E+01	1.778E+01	NOT IDENT.
RA-228	4.159E+00	1.768E+01	1.778E+01	NOT IDENT.
TH-228	5.587E+00	1.062E+01	1.091E+01	FAIL ABUN
TH-229	7.038E+00	5.071E+01	5.081E+01	FAIL ABUN
TH-230	-6.967E+02	6.874E+02	7.559E+02	NOT IDENT.
PA-231	-3.735E-01	4.406E+01	4.406E+01	NOT IDENT.
TH-231	6.584E+00	4.053E+01	4.064E+01	NOT IDENT.
TH-232	1.748E+02	1.769E+03	1.770E+03	NOT IDENT.
PA-233	2.325E+00	7.366E+00	7.440E+00	NOT IDENT.
PA-234	1.767E+01	3.624E+01	3.710E+01	NOT IDENT.
PA-234M	5.387E+01	3.979E+02	3.987E+02	NOT IDENT.
TH-234	-4.087E-01	1.285E+02	1.285E+02	FAIL ABUN
U-234	-1.051E+03	4.775E+03	4.799E+03	NOT IDENT.
U-235	-1.835E+00	2.305E+01	2.307E+01	NOT IDENT.
NP-237	2.325E+00	7.366E+00	7.440E+00	NOT IDENT.
NP-238	-6.229E+06	1.314E+08	1.314E+08	SHORT HLIF
U-238	-4.087E-01	1.285E+02	1.285E+02	FAIL ABUN
NP-239	1.574E+01	2.484E+01	2.583E+01	NOT IDENT.
AM-241	8.269E+00	9.585E+00	1.029E+01	NOT IDENT.
AM-242	-4.863E+01	5.200E+01	5.644E+01	NOT IDENT.
CM-243	-4.945E+00	8.405E+00	8.696E+00	NOT IDENT.
BK-247	2.949E-01	7.785E+00	7.786E+00	NOT IDENT.
CM-247	-2.638E+00	4.271E+00	4.434E+00	NOT IDENT.
CF-249	-8.998E-01	4.694E+00	4.711E+00	NOT IDENT.
CF-251	6.793E+00	1.192E+01	1.231E+01	NOT IDENT.
CF-252	4.471E+03	1.481E+04	1.495E+04	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	44.3134	133.52	79.2563	116.30	0.0000
879.38	55.6727	364.49	79.2658	116.74	57.6126
46.54	59.7837	80.22	0.0000	117.23	65.7571
228.16	0.0000	711.68	81.8755	119.76	65.0731
52.39	62.8694	356.01	75.5339	120.54	54.2828
53.20	64.3416	323.87	75.5429	120.90	63.3595
53.44	66.8047	82.35	0.0000	264.66	62.4723
57.53	64.7700	82.47	64.1695	121.22	62.4804
293.27	0.0000	82.47	0.0000	344.28	69.7750
57.53	71.0669	83.79	65.1675	122.06	72.5199
482.18	71.0672	265.00	65.1900	1274.44	59.9068
57.98	53.9634	84.21	65.2124	123.68	54.5035
59.32	43.0443	84.86	0.0000	1377.63	0.0000
59.54	45.5245	193.51	65.3430	127.23	61.1367
155.04	108.7025	105.31	65.4617	129.43	67.7106
63.00	63.1877	86.79	65.4868	131.20	64.1909
129.43	63.2238	86.94	65.5027	133.02	64.3340
63.29	63.2238	87.09	65.5185	133.52	62.5346
290.67	57.0579	87.57	72.4712	135.34	0.0000
63.81	57.0836	88.03	75.9781	136.00	59.9549
87.57	69.5569	306.78	76.0157	136.28	67.3570
64.99	104.4795	88.47	67.3915	136.47	67.3726
65.08	104.4976	531.02	65.9376	739.50	0.0000
66.73	62.3981	184.58	0.0000	140.51	0.0000
66.98	61.1793	92.59	71.3071	140.88	71.4371
67.24	61.2096	93.31	0.0000	143.76	65.1614
67.67	71.6776	94.56	71.5231	144.24	67.0605
1221.41	71.6881	311.90	71.5331	145.44	64.3555
439.51	72.1762	946.00	71.5352	152.32	61.0988
70.82	72.1762	97.43	56.5034	152.43	61.1068
167.43	0.0000	98.43	68.4321	1048.07	59.2804
97.43	51.4502	98.44	68.4329	154.21	50.8656
70.82	0.0000	99.53	66.7861	155.04	56.5692
70.82	56.5892	103.37	66.7861	158.56	59.4618
279.20	0.0000	116.74	66.7861	158.97	0.0000
1063.66	76.9881	100.11	50.1324	159.00	45.4517
72.87	0.0000	100.20	50.1388	162.33	75.5502
351.06	76.9965	102.03	54.6830	537.26	75.5769
74.66	55.7164	103.18	60.0748	163.33	75.6303
238.63	55.7321	103.37	57.4403	165.86	53.4172
351.93	55.7321	105.31	55.8277	167.43	0.0000
238.63	55.7321	106.12	58.5536	245.35	0.0000
74.97	70.9506	106.47	50.5940	427.87	50.1396
77.11	77.5759	109.28	53.4668	176.60	41.4738
256.23	66.4247	111.00	58.9535	177.52	45.3735
79.82	0.0000	111.76	0.0000	181.07	0.0000
80.02	79.2431	208.37	70.7540	184.41	68.0418
80.03	79.2436	116.24	58.4738	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	42.3375	300.09	49.1698	477.60	31.1377
186.21	55.5029	300.13	48.1027	477.99	31.1436
190.27	52.7888	301.36	34.2357	482.18	21.4003
193.51	42.6557	302.85	43.9095	487.02	18.5910
197.03	57.0637	304.50	39.6716	492.35	0.0000
198.01	52.1924	304.85	41.8255	497.08	27.8445
201.83	66.2128	306.78	39.7340	511.00	28.9353
204.12	63.3815	308.46	40.8551	514.00	18.8348
205.31	44.6136	311.90	44.1839	520.40	21.7976
208.37	66.6088	316.51	37.8355	520.69	0.0000
210.85	56.7936	319.41	34.6602	667.71	0.0000
215.65	44.0278	320.08	37.9259	527.90	0.0000
218.12	51.1432	321.04	46.6253	529.59	25.5399
222.11	63.3961	323.87	41.2811	529.87	0.0000
227.09	55.5824	325.23	34.7943	531.02	28.2953
227.38	55.5959	1596.21	45.7734	537.26	19.2229
228.16	0.0000	331.15	0.0000	1260.41	0.0000
228.18	53.6108	333.37	38.2592	552.55	22.1213
235.69	48.8594	334.37	47.0347	795.86	21.3007
235.96	48.8701	338.28	32.8979	564.24	0.0000
238.63	60.2022	911.20	32.8986	569.33	27.8577
238.98	0.0000	340.48	48.3184	569.50	29.7168
240.99	53.6733	340.55	48.3202	569.70	30.6485
242.00	50.6476	344.28	39.6284	582.08	0.0000
244.70	61.5259	345.93	36.3643	583.19	0.0000
245.35	0.0000	351.06	34.8235	595.83	21.6025
459.60	39.1512	351.93	34.2891	600.60	24.4694
685.70	0.0000	356.01	39.9207	604.72	32.0545
388.16	48.5075	361.25	0.0000	609.32	24.5591
256.23	43.4637	364.49	36.7846	610.33	18.8995
527.90	0.0000	366.42	0.0000	614.28	31.2356
264.66	41.6650	383.85	34.9570	618.01	26.5439
265.00	39.5918	388.16	42.9580	621.93	22.7886
269.46	49.1343	666.33	33.9240	630.19	0.0000
401.81	46.0598	391.70	40.7813	631.29	21.3507
273.65	65.0198	400.66	34.1589	632.98	18.3129
276.40	53.5940	401.32	0.0000	633.25	18.3152
583.19	50.4775	401.81	43.2958	634.78	12.7266
277.60	57.8478	402.40	43.3105	635.95	18.1442
402.40	57.8657	404.85	44.5121	636.99	20.0624
278.43	64.1982	410.95	35.5025	657.50	24.0791
279.20	0.0000	720.70	32.1335	884.68	25.0447
279.54	58.9839	423.72	24.2197	661.66	21.2245
280.46	44.2678	427.09	26.5750	664.57	0.0000
301.36	51.7684	427.87	32.3659	666.33	23.1958
284.31	49.6774	433.94	33.6316	666.50	23.1973
285.41	41.2550	439.51	30.2424	667.71	0.0000
285.90	0.0000	440.45	36.0758	677.62	18.4439
287.50	48.7327	453.88	21.0952	685.70	0.0000
290.67	50.9678	459.60	21.1578	692.65	0.0000
293.27	0.0000	463.37	31.7977	695.00	20.5206
295.22	58.5897	468.07	29.2179	696.49	27.3762
316.51	44.7643	473.00	0.0000	696.51	27.3762
298.58	36.3048	475.06	32.6975	697.00	31.2930
299.98	49.1661	696.49	31.1249	697.49	29.3427

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	23.5195	903.28	16.7813	1291.59	7.4437
706.68	22.5732	907.67	0.0000	1298.22	0.0000
711.68	20.4521	911.20	11.7756	1312.11	7.4789
720.70	6.3139	984.45	0.0000	1332.49	6.5745
721.93	0.0000	926.36	16.8999	1365.19	13.2460
1690.97	18.7588	935.54	12.7101	1368.63	0.0000
722.91	18.7594	937.49	10.5978	1377.63	0.0000
723.31	15.7998	983.53	13.8046	1384.29	9.5015
756.73	19.7559	945.96	0.0000	1408.01	5.7305
727.33	8.9003	946.00	11.6872	1434.09	7.6836
733.00	12.8826	949.00	15.9512	1435.80	10.5687
735.93	14.5498	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	10.6760	1460.82	5.7952
1434.09	15.9199	964.08	20.5084	1489.16	9.7163
747.24	15.9370	966.17	22.2308	1596.21	7.9422
752.31	21.9530	968.97	10.2688	1620.50	2.9924
753.82	19.9677	983.53	10.7419	1678.03	0.0000
756.73	21.9872	984.45	0.0000	1690.97	2.0219
763.94	22.0430	996.26	12.9375	1757.55	0.0000
765.80	25.0648	1001.03	10.7959	1764.49	1.0247
1001.03	23.0646	1004.73	14.0493	1770.23	9.2316
766.84	22.0651	1025.87	0.0000	1771.35	5.1296
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	13.0825	1037.84	15.2706	1808.65	3.0983
777.92	0.0000	1038.76	0.0000	1836.06	9.3397
778.90	15.1076	1046.59	12.0272		
783.70	0.0000	1048.07	13.1265		
1435.80	17.1800	1050.41	14.2291		
903.28	20.2350	1063.66	13.1821		
795.86	19.2476	1077.00	16.5372		
801.95	23.3481	1077.34	15.4364		
802.10	19.2888	1083.85	17.6719		
810.29	18.3235	1085.87	11.0510		
810.45	18.3246	1099.25	13.3081		
810.76	20.3632	1111.64	8.9009		
815.77	18.3576	1112.07	8.9019		
818.51	16.3325	1112.84	10.0168		
832.01	18.0458	1115.54	15.5928		
834.85	13.1367	1120.29	16.7276		
835.15	14.7801	1120.55	16.7285		
836.80	0.0000	1121.30	13.3850		
846.77	17.5149	1808.65	7.8250		
856.80	13.4372	1131.51	0.0000		
860.56	17.5930	1332.49	9.0425		
871.09	15.5750	1177.95	8.1479		
873.19	19.7416	1189.05	9.9859		
875.33	0.0000	1204.77	7.8118		
879.38	14.5751	1221.41	12.8112		
880.51	10.4144	1231.02	14.6750		
881.60	12.5013	1235.36	10.0998		
883.24	13.5503	1238.28	10.1068		
884.68	18.7701	1260.41	0.0000		
889.28	11.4871	1271.87	6.6155		
894.76	11.7161	1274.44	9.2671		
1836.06	16.7544	1274.54	9.2676		

VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 09:38:23.99

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089189.CNF;1
Background file  : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM30.CNF;611
Background date  : 15-MAY-2022 09:13:17
Sample date      : 17-MAY-2022 00:00:00 Acquisition date : 17-MAY-2022 09:22:49
Sample ID        : G1205089189 Sample quantity : 7.69920E-01 FILTER
Detector name     : GAM30 Detector geometry: JAR
Elapsed live time : 0 00:15:00.00 Elapsed real time: 0 00:15:03.59 0.4%
Energy tolerance  : 1.50000 keV Analyst Initials : RXF2
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2264689 Detector SN# :
Matrix Spike ID   : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.45*	6645	3698	1.06	93.41	87	11	7.38E+00	2.2	
2	0	49.59	72	2383	1.33	99.69	99	7	7.99E-02	112.9	
3	0	59.54	15878	2850	1.05	119.61	114	12	1.76E+01	1.1	
4	0	83.64*	70	606	0.71	167.85	165	8	7.83E-02	61.5	
5	0	152.00	47	427	1.30	304.70	301	8	5.21E-02	77.7	
6	0	329.17	24	236	1.85	659.34	658	7	2.65E-02	105.9	
7	0	333.81	30	349	3.43	668.64	664	10	3.34E-02	117.5	
8	0	441.24	46	443	2.19	883.69	879	11	5.11E-02	89.8	
9	0	584.11*	6	121	0.97	1169.69	1165	8	7.03E-03	303.7	
10	0	661.78	9490	166	1.54	1325.17	1318	14	1.05E+01	1.1	
11	0	712.49	31	91	1.71	1426.69	1419	11	3.42E-02	63.3	
12	0	726.63	11	66	0.87	1454.99	1450	8	1.26E-02	127.8	
13	0	904.46	71	87	1.14	1811.00	1805	12	7.91E-02	28.8	
14	3	908.52	61	42	2.24	1819.11	1816	37	6.76E-02	17.5	4.08E+00
15	3	912.76	48	98	1.96	1827.60	1816	37	5.33E-02	44.7	
16	3	915.45	43	80	1.69	1833.00	1816	37	4.75E-02	43.4	
17	0	978.68	16	71	0.54	1959.58	1954	7	1.75E-02	94.2	
18	0	1026.26	25	96	0.58	2054.83	2045	12	2.80E-02	80.4	
19	0	1032.67	52	88	2.29	2067.65	2061	13	5.79E-02	39.6	
20	0	1060.52	16	92	1.70	2123.41	2122	9	1.73E-02	113.3	
21	0	1166.44	9	36	0.68	2335.46	2331	7	1.03E-02	112.8	
22	0	1173.42	2687	45	1.86	2349.43	2342	15	2.99E+00	2.0	
23	0	1189.02	33	40	5.34	2380.67	2369	23	3.70E-02	52.4	
24	0	1206.37	12	15	1.24	2415.40	2409	10	1.28E-02	69.3	
25	0	1274.87	14	2	1.34	2552.53	2549	7	1.59E-02	30.4	
26	0	1332.70	2526	12	2.06	2668.32	2662	17	2.81E+00	2.0	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 09:38:26

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089189.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 17-MAY-2022 00:00:00	Acquisition date	: 17-MAY-2022 09:22:49
Sample ID	: G1205089189	Sample quantity	: 0.76992 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA30	Detector geometry	: JAR
Elapsed live time	: 0 00:15:00.00	Elapsed real time	: 0 00:15:03.59 0.4%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
NA-22	1274.54	14	99.94*	1.119E+00	5.001E+01	5.002E+01	60.88
CO-60	1173.23	2687	99.85	1.198E+00	8.765E+03	8.766E+03	4.01
	1332.49	2526	99.98*	1.081E+00	9.119E+03	9.120E+03	4.03
BA-137M	661.66	9490	89.90*	1.920E+00	2.145E+04	2.145E+04	2.13
CS-137	661.66	9490	85.10*	1.920E+00	2.266E+04	2.266E+04	2.13
TL-208	277.37	-----	6.60	3.585E+00	-----	Line Not Found	-----
	583.19	6	85.00*	2.114E+00	1.374E+01	1.374E+01	607.32
	860.56	-----	12.50	1.552E+00	-----	Line Not Found	-----
PB-210	46.54	6645	4.25*	8.167E-01	7.468E+05	7.468E+05	4.30
BI-212	727.33	11	6.67*	1.782E+00	3.711E+02	3.713E+02	255.61
	1620.50	-----	1.47	9.387E-01	-----	Line Not Found	-----
BI-213	440.45	46	25.94*	2.600E+00	2.660E+02	2.660E+02	179.65
TH-231	84.21	70	6.60*	4.340E+00	9.593E+02	9.593E+02	123.00
AM-241	59.54	15878	35.90*	2.215E+00	7.789E+04	7.789E+04	2.11

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                           *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089189.CNF;1      *
* Acquisition date   : 17-MAY-2022 09:22:49 Sensitivity      : 3.000                *
* Detector ID       : GAM30 Energy tolerance: 1.500          *
* Elapsed live time : 0 00:15:00.00 Abundance limit : 75.000    *
* Elapsed real time : 0 00:15:03.59 Half life ratio : *****          *
* Sample date       : 17-MAY-2022 00:00:00 Analyst initials: RXF2          *
* Sample ID         : G1205089189 Sample Quantity : 7.6992E-01 FILTER *
* Batch Number      : 2264689 Wet Weight : 0.00000          *
* Wet wt corr       : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library   : LIQUID.NLB;26
*****
*                                     CALIBRATION INFORMATION                       *
*
* Eff. Cal. date    : 27-SEP-2021 06:08:34 Eff. Geometry   : JAR              *
* Eff. File         : DKA100:[CANBERRA.GAMMA]EFF_GAM30_JAR.CNF;11          *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
NA-22	5.002E+01	2.984E+01	4.776E+01
CO-60	9.120E+03	3.602E+02	6.133E+01
BA-137M	2.145E+04	4.481E+02	1.089E+02
CS-137	2.266E+04	4.734E+02	1.150E+02
TL-208	1.374E+01	8.180E+01	1.024E+02
PB-210	7.468E+05	3.150E+04	1.861E+04
BI-212	3.713E+02	9.301E+02	1.273E+03
BI-213	2.660E+02	4.682E+02	4.130E+02
TH-231	9.593E+02	1.156E+03	1.122E+03
AM-241	7.789E+04	1.612E+03	7.165E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	4.046E+02	6.213E+02	1.128E+03	NOT IDENT.
NA-24	2.747E+01	3.918E+01	9.349E+01	NOT IDENT.
AL-26	-4.965E+00	1.992E+01	4.122E+01	NOT IDENT.
K-40	2.791E+02	2.277E+02	6.087E+02	NOT IDENT.
SC-46	-2.247E+01	6.728E+01	1.137E+02	NOT IDENT.
V-48	-2.870E+01	7.308E+01	1.220E+02	NOT IDENT.
CR-51	1.513E+02	4.605E+02	8.453E+02	NOT IDENT.
MN-52	-7.039E+00	2.667E+01	5.254E+01	NOT IDENT.
MN-54	2.559E+00	6.117E+01	1.072E+02	NOT IDENT.
CO-56	-1.221E+01	5.495E+01	9.478E+01	NOT IDENT.
CO-57	1.213E+01	3.942E+01	6.821E+01	NOT IDENT.
NI-57	2.373E+00	3.641E+01	7.768E+01	NOT IDENT.
CO-58	-3.098E+01	5.445E+01	9.112E+01	NOT IDENT.
FE-59	8.910E+01	1.292E+02	2.488E+02	NOT IDENT.
ZN-65	3.139E+01	1.444E+02	2.696E+02	NOT IDENT.
CU-67	2.631E+01	9.456E+01	1.608E+02	NOT IDENT.
GE-68	-3.149E+03	1.967E+03	3.179E+03	NOT IDENT.
AS-73	-1.818E+03	2.840E+03	4.475E+03	NOT IDENT.
AS-74	5.411E+01	8.686E+01	1.608E+02	NOT IDENT.
SE-75	-3.215E+01	7.773E+01	1.252E+02	NOT IDENT.

BR-77	-1.310E+02	2.231E+02	3.591E+02	NOT IDENT.
SR-82	1.891E+02	3.492E+02	6.451E+02	NOT IDENT.
RB-83	1.242E+01	1.276E+02	2.272E+02	NOT IDENT.
RB-84	2.398E+01	9.002E+01	1.606E+02	NOT IDENT.
KR-85	1.612E+04	1.291E+04	2.439E+04	NOT IDENT.
SR-85	7.252E+01	5.806E+01	1.097E+02	NOT IDENT.
RB-86	-1.104E+03	7.563E+02	1.241E+03	NOT IDENT.
Y-88	-1.629E+01	2.349E+01	3.882E+01	NOT IDENT.
Y-91	1.125E+04	1.415E+04	3.065E+04	NOT IDENT.
NB-94	4.324E+00	4.451E+01	8.031E+01	NOT IDENT.
NB-95	1.952E+01	5.269E+01	9.596E+01	NOT IDENT.
NB-95M	-3.991E+01	1.836E+02	3.004E+02	NOT IDENT.
TC-95M	-1.513E+01	7.079E+01	1.166E+02	NOT IDENT.
ZR-95	2.183E+01	9.283E+01	1.678E+02	NOT IDENT.
MO-99	-2.655E+02	4.497E+02	7.569E+02	NOT IDENT.
TC-99M	5.378E+00	1.211E+02	2.060E+02	NOT IDENT.
RH-101	-2.527E+01	5.206E+01	8.675E+01	NOT IDENT.
RH-102M	-2.582E+01	7.400E+01	1.286E+02	NOT IDENT.
RU-103	-8.157E-01	6.483E+01	1.148E+02	NOT IDENT.
RH-106	-2.740E+02	4.913E+02	8.385E+02	NOT IDENT.
RU-106	-2.740E+02	4.913E+02	8.385E+02	NOT IDENT.
AG-108M	2.227E-01	6.784E+01	1.205E+02	NOT IDENT.
CD-109	8.292E+02	1.159E+03	2.050E+03	NOT IDENT.
AG-110	1.223E+03	1.339E+03	2.288E+03	NOT IDENT.
AG-110M	-6.164E+01	8.821E+01	1.446E+02	NOT IDENT.
IN-111	-8.120E+00	5.328E+01	8.732E+01	NOT IDENT.
SN-113	1.950E+01	8.412E+01	1.519E+02	NOT IDENT.
IN-114M	6.845E+00	2.834E+02	4.729E+02	NOT IDENT.
CD-115	-1.925E+02	2.153E+02	3.626E+02	NOT IDENT.
SN-117M	-1.617E+01	3.988E+01	6.614E+01	NOT IDENT.
SB-122	1.378E+01	7.776E+01	1.401E+02	NOT IDENT.
I-123	4.098E+00	6.653E+01	1.129E+02	NOT IDENT.
TE-123M	2.930E+00	4.020E+01	6.828E+01	NOT IDENT.
SB-124	2.795E+01	4.740E+01	1.194E+02	NOT IDENT.
SB-125	5.554E+01	1.991E+02	3.583E+02	NOT IDENT.
TE-125M	3.855E+03	1.268E+04	2.204E+04	NOT IDENT.
I-126	1.814E+02	1.505E+02	2.726E+02	NOT IDENT.
SB-126	-5.660E+01	8.636E+01	1.449E+02	NOT IDENT.
SN-126	2.941E+01	1.269E+02	2.043E+02	NOT IDENT.
SB-127	5.288E+01	1.218E+02	2.276E+02	NOT IDENT.
TE-129	3.178E+02	8.491E+02	1.525E+03	NOT IDENT.
I-131	2.230E+00	6.426E+01	1.157E+02	NOT IDENT.
I-132	2.880E+02	8.621E+02	1.511E+03	NOT IDENT.
TE-132	-1.709E+01	5.568E+01	9.085E+01	FAIL ABUN
BA-133	3.562E+00	7.823E+01	1.412E+02	NOT IDENT.
I-133	-2.840E+01	8.315E+01	1.449E+02	NOT IDENT.
CS-134	3.737E+01	6.737E+01	1.234E+02	NOT IDENT.
I-135	1.417E+01	2.877E+02	5.852E+02	NOT IDENT.
CS-136	1.223E+01	8.510E+01	1.592E+02	FAIL ABUN
LA-138	-1.790E+01	3.297E+01	6.056E+01	NOT IDENT.
CE-139	2.726E+01	4.733E+01	8.166E+01	NOT IDENT.
BA-140	-2.241E+02	2.168E+02	3.618E+02	NOT IDENT.
LA-140	2.179E-02	2.114E+01	4.744E+01	FAIL ABUN
CE-141	-2.448E+01	7.329E+01	1.223E+02	NOT IDENT.
CE-143	1.204E+01	1.258E+02	2.293E+02	NOT IDENT.
CE-144	2.501E+02	3.141E+02	5.521E+02	NOT IDENT.
PM-144	8.590E+00	4.711E+01	8.525E+01	NOT IDENT.
PR-144	6.759E+02	3.502E+03	6.342E+03	NOT IDENT.
PM-146	9.653E+01	1.019E+02	1.869E+02	NOT IDENT.
ND-147	3.502E+02	4.070E+02	7.596E+02	NOT IDENT.
PM-147	-6.531E+05	1.198E+06	1.997E+06	NOT IDENT.
PM-149	-3.260E+02	1.544E+03	2.785E+03	NOT IDENT.
EU-152	-4.394E+01	1.818E+02	3.243E+02	NOT IDENT.
GD-153	-1.176E+02	1.277E+02	2.114E+02	NOT IDENT.
EU-154	1.428E+02	8.519E+01	2.121E+02	FAIL ABUN
EU-155	9.510E+01	1.698E+02	2.979E+02	NOT IDENT.
TB-160	-1.287E+02	2.198E+02	3.642E+02	FAIL ABUN
HO-166M	1.225E+02	1.520E+02	1.798E+02	FAIL ABUN
TM-171	-4.424E+04	6.495E+04	1.023E+05	NOT IDENT.
LU-176	1.019E+01	4.753E+01	8.695E+01	NOT IDENT.
LU-177	6.079E+01	4.312E+02	7.219E+02	NOT IDENT.
HF-181	7.800E-01	7.072E+01	1.257E+02	NOT IDENT.
W-181	0.000E+00	6.554E+02	1.310E+03	FAIL ABUN
TA-182	-1.990E+01	1.457E+02	2.783E+02	FAIL ABUN
RE-183	0.000E+00	6.795E+02	1.422E+03	FAIL ABUN
RE-184	0.000E+00	2.780E+02	3.340E+02	FAIL ABUN
RE-188	1.689E+01	2.392E+02	3.747E+02	NOT IDENT.
W-188	-3.512E+03	1.064E+04	1.908E+04	NOT IDENT.

OS-191	1.439E+02	1.342E+02	2.386E+02	NOT IDENT.
IR-192	-3.692E+01	5.352E+01	9.412E+01	NOT IDENT.
PB-201	0.000E+00	1.372E+02	2.205E+02	FAIL ABUN
TL-201	-1.054E+02	4.122E+02	6.854E+02	FAIL ABUN
TL-202	3.277E+00	7.711E+01	1.231E+02	FAIL ABUN
HG-203	5.015E+01	5.272E+01	9.948E+01	NOT IDENT.
PB-203	5.706E+01	5.999E+01	1.132E+02	FAIL ABUN
TL-204	1.476E+03	7.241E+03	1.267E+04	FAIL ABUN
BI-207	-1.882E+01	1.094E+02	1.752E+02	NOT IDENT.
BI-211	1.513E+02	3.828E+02	7.013E+02	NOT IDENT.
PB-211	-5.042E+02	1.440E+03	2.534E+03	NOT IDENT.
PB-212	-3.637E+01	1.063E+02	1.731E+02	NOT IDENT.
BI-214	-6.982E+01	1.110E+02	1.889E+02	NOT IDENT.
PB-214	9.688E+01	1.366E+02	2.536E+02	NOT IDENT.
RN-219	8.278E+00	8.357E+02	1.494E+03	NOT IDENT.
FR-221	4.286E+01	3.815E+02	6.367E+02	NOT IDENT.
RA-223	2.717E+02	1.143E+03	2.090E+03	FAIL ABUN
RA-224	-7.873E+00	1.125E+03	1.857E+03	NOT IDENT.
AC-225	4.405E+01	3.921E+02	6.545E+02	NOT IDENT.
RA-226	7.308E+02	1.178E+03	2.030E+03	NOT IDENT.
AC-227	-7.282E+01	4.956E+02	8.103E+02	FAIL ABUN
TH-227	-7.282E+01	4.956E+02	8.103E+02	FAIL ABUN
AC-228	1.462E+02	2.956E+02	4.787E+02	NOT IDENT.
RA-228	1.462E+02	2.956E+02	4.787E+02	NOT IDENT.
TH-228	-3.637E+01	1.063E+02	1.731E+02	NOT IDENT.
TH-229	-2.179E+02	9.912E+02	1.636E+03	NOT IDENT.
TH-230	-1.426E+03	1.571E+04	2.727E+04	NOT IDENT.
PA-231	-5.161E+01	8.197E+02	1.484E+03	NOT IDENT.
TH-232	-4.678E+03	2.871E+04	4.626E+04	NOT IDENT.
PA-233	-5.196E+01	1.157E+02	2.058E+02	NOT IDENT.
PA-234	1.361E+02	6.899E+02	1.197E+03	NOT IDENT.
PA-234M	-3.953E+03	8.243E+03	1.369E+04	NOT IDENT.
TH-234	4.507E+01	2.041E+03	3.320E+03	NOT IDENT.
U-234	-1.840E+05	2.467E+05	3.878E+05	NOT IDENT.
U-235	2.487E+02	3.219E+02	5.646E+02	NOT IDENT.
NP-237	-5.196E+01	1.157E+02	2.058E+02	NOT IDENT.
NP-238	2.207E+01	3.098E+02	5.391E+02	FAIL ABUN
U-238	4.507E+01	2.041E+03	3.320E+03	NOT IDENT.
NP-239	2.391E+02	4.499E+02	7.849E+02	NOT IDENT.
AM-242	4.656E+02	1.027E+03	1.799E+03	NOT IDENT.
AM-243	-2.538E+01	7.681E+01	1.315E+02	NOT IDENT.
CM-243	4.478E+01	1.736E+02	3.010E+02	NOT IDENT.
BK-247	-5.826E+01	1.526E+02	2.463E+02	FAIL ABUN
CM-247	-1.624E+01	7.686E+01	1.361E+02	NOT IDENT.
CF-249	-1.688E+01	7.859E+01	1.395E+02	FAIL ABUN
CF-251	1.626E+02	2.144E+02	3.731E+02	NOT IDENT.
CF-252	-6.690E+04	2.876E+05	4.892E+05	NOT IDENT.
ANH-511	-6.124E+01	5.514E+01	9.538E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.45	6646	3698	1.06	93.41	87	11	7.38E+00	2.2	
2	0	49.59	72	2383	1.33	99.69	99	7	7.99E-02	112.9	
3	0	59.54	15878	2850	1.05	119.61	114	12	1.76E+01	1.1	
4	0	83.64	71	606	0.71	167.85	165	8	7.93E-02	60.7	
5	0	152.00	47	427	1.30	304.70	301	8	5.21E-02	77.7	
6	0	329.17	24	236	1.85	659.34	658	7	2.65E-02	105.9	
7	0	333.81	30	349	3.43	668.64	664	10	3.34E-02	117.5	
8	0	441.24	46	443	2.19	883.69	879	11	5.11E-02	89.8	
9	0	584.11	8	121	0.97	1169.69	1165	8	9.26E-03	230.5	
10	0	661.78	9490	166	1.54	1325.17	1318	14	1.05E+01	1.1	
11	0	712.49	31	91	1.71	1426.69	1419	11	3.42E-02	63.3	
12	0	726.63	11	66	0.87	1454.99	1450	8	1.26E-02	127.8	
13	0	904.46	71	87	1.14	1811.00	1805	12	7.91E-02	28.8	
14	3	908.52	61	42	2.24	1819.11	1816	37	6.76E-02	17.5	4.08E+00
15	3	912.76	48	98	1.96	1827.60	1816	37	5.33E-02	44.7	
16	3	915.45	43	80	1.69	1833.00	1816	37	4.75E-02	43.4	
17	0	978.68	16	71	0.54	1959.58	1954	7	1.75E-02	94.2	
18	0	1026.26	25	96	0.58	2054.83	2045	12	2.80E-02	80.4	
19	0	1032.67	52	88	2.29	2067.65	2061	13	5.79E-02	39.6	
20	0	1060.52	16	92	1.70	2123.41	2122	9	1.73E-02	113.3	
21	0	1166.44	9	36	0.68	2335.46	2331	7	1.03E-02	112.8	
22	0	1173.42	2687	45	1.86	2349.43	2342	15	2.99E+00	2.0	
23	0	1189.02	33	40	5.34	2380.67	2369	23	3.70E-02	52.4	
24	0	1206.37	12	15	1.24	2415.40	2409	10	1.28E-02	69.3	
25	0	1274.87	14	2	1.34	2552.53	2549	7	1.59E-02	30.4	
26	0	1332.70	2526	12	2.06	2668.32	2662	17	2.81E+00	2.0	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
NA-22	1274.54	14	99.94*	1.119E+00	5.001E+01	5.002E+01	60.88
CO-60	1173.23	2687	99.85	1.198E+00	8.765E+03	8.766E+03	4.01
	1332.49	2526	99.98*	1.081E+00	9.119E+03	9.120E+03	4.03
BA-137M	661.66	9490	89.90*	1.920E+00	2.145E+04	2.145E+04	2.13
CS-137	661.66	9490	85.10*	1.920E+00	2.266E+04	2.266E+04	2.13
TL-208	277.37	-----	6.60	3.585E+00	-----	Line Not Found	-----
	583.19	6	85.00*	2.114E+00	1.374E+01	1.374E+01	607.32
	860.56	-----	12.50	1.552E+00	-----	Line Not Found	-----
PB-210	46.54	6645	4.25*	8.167E-01	7.468E+05	7.468E+05	4.30
BI-212	727.33	11	6.67*	1.782E+00	3.711E+02	3.713E+02	255.61
	1620.50	-----	1.47	9.387E-01	-----	Line Not Found	-----
BI-213	440.45	46	25.94*	2.600E+00	2.660E+02	2.660E+02	179.65
TH-231	84.21	70	6.60*	4.340E+00	9.593E+02	9.593E+02	123.00
AM-241	59.54	15878	35.90*	2.215E+00	7.789E+04	7.789E+04	2.11

Flag: "*" = Keyline

Total number of lines in spectrum 26
Number of unidentified lines 7
Number of lines tentatively identified by NID 19 73.08%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
NA-22	2.60Y	1.00	5.001E+01	5.002E+01	3.045E+01	60.88	
CO-60	1925.28D	1.00	9.119E+03	9.120E+03	0.368E+03	4.03	
BA-137M	30.08Y	1.00	2.145E+04	2.145E+04	0.046E+04	2.13	
CS-137	30.08Y	1.00	2.266E+04	2.266E+04	0.048E+04	2.13	
TL-208	1.91Y	1.00	1.374E+01	1.374E+01	8.347E+01	607.32	
PB-210	22.20Y	1.00	7.468E+05	7.468E+05	0.321E+05	4.30	
BI-212	1.91Y	1.00	3.711E+02	3.713E+02	9.491E+02	255.61	
BI-213	7340.00Y	1.00	2.660E+02	2.660E+02	4.778E+02	179.65	
TH-231	7.04E+08Y	1.00	9.593E+02	9.593E+02	11.80E+02	123.00	
AM-241	432.60Y	1.00	7.789E+04	7.789E+04	0.164E+04	2.11	
Total Activity :			8.795E+05	8.796E+05			

Grand Total Activity : 8.795E+05 8.796E+05

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	49.59	72	2383	1.33	99.69	99	7	7.99E-02	****	1.12E+00	T
0	152.00	47	427	1.30	304.70	301	8	5.21E-02	****	5.00E+00	T
0	329.17	24	236	1.85	659.34	658	7	2.65E-02	****	3.19E+00	T
0	333.81	30	349	3.43	668.64	664	10	3.34E-02	****	3.16E+00	T
0	712.49	31	91	1.71	1426.69	1419	11	3.42E-02	****	1.81E+00	T
0	904.46	71	87	1.14	1811.00	1805	12	7.91E-02	57.5	1.49E+00	T
3	908.52	61	42	2.24	1819.11	1816	37	6.76E-02	34.9	1.48E+00	T
3	912.76	48	98	1.96	1827.60	1816	37	5.33E-02	89.4	1.48E+00	
3	915.45	43	80	1.69	1833.00	1816	37	4.75E-02	86.8	1.47E+00	
0	978.68	16	71	0.54	1959.58	1954	7	1.75E-02	****	1.39E+00	
0	1026.26	25	96	0.58	2054.83	2045	12	2.80E-02	****	1.34E+00	T
0	1032.67	52	88	2.29	2067.65	2061	13	5.79E-02	79.1	1.33E+00	
0	1060.52	16	92	1.70	2123.41	2122	9	1.73E-02	****	1.30E+00	
0	1166.44	9	36	0.68	2335.46	2331	7	1.03E-02	****	1.20E+00	
0	1189.02	33	40	5.34	2380.67	2369	23	3.70E-02	****	1.18E+00	T
0	1206.37	12	15	1.24	2415.40	2409	10	1.28E-02	****	1.17E+00	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089189.CNF;1 *
* Acquisition date   : 17-MAY-2022 09:22:49 Sensitivity      : 3.000          *
* Detector ID        : GAM30 Energy tolerance: 1.500          *
* Elapsed live time  : 0 00:15:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 00:15:03.59 Half life ratio  : *****          *
* Sample date        : 17-MAY-2022 00:00:00 Nuclide Library : LIQUID          *
* Sample ID          : G1205089189 Analyst initials:  RXF2          *
* Batch Number       : 2264689 Sample Quantity  : 7.6992E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight       : 0.00000          *
*                                     Dry Weight     : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 27-SEP-2021 06:08:34 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM30_JAR.CNF;11          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
NA-22	1.917E+01
CO-60	2.579E+01
BA-137M	5.142E+01
CS-137	5.432E+01
TL-208	4.827E+01
PB-210	9.159E+03
BI-212	5.926E+02
BI-213	1.988E+02
TH-231	5.429E+02
AM-241	3.518E+02

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	5.438E+02	NOT IDENT.
NA-24	3.902E+01	NOT IDENT.
AL-26	1.460E+01	NOT IDENT.
K-40	2.553E+02	NOT IDENT.
SC-46	5.336E+01	NOT IDENT.
V-48	5.714E+01	NOT IDENT.
CR-51	4.063E+02	NOT IDENT.
MN-52	2.085E+01	NOT IDENT.
MN-54	5.033E+01	NOT IDENT.
CO-56	4.404E+01	NOT IDENT.
CO-57	3.294E+01	NOT IDENT.
NI-57	3.147E+01	NOT IDENT.
CO-58	4.231E+01	NOT IDENT.
FE-59	1.170E+02	NOT IDENT.
ZN-65	1.265E+02	NOT IDENT.
CU-67	7.783E+01	NOT IDENT.
GE-68	1.463E+03	NOT IDENT.
AS-73	2.205E+03	NOT IDENT.
AS-74	7.606E+01	NOT IDENT.
SE-75	6.022E+01	NOT IDENT.
BR-77	1.731E+02	NOT IDENT.

SR-82	3.018E+02	NOT IDENT.
RB-83	1.086E+02	NOT IDENT.
RB-84	7.524E+01	NOT IDENT.
KR-85	1.167E+04	NOT IDENT.
SR-85	5.250E+01	NOT IDENT.
RB-86	5.725E+02	NOT IDENT.
Y-88	1.331E+01	NOT IDENT.
Y-91	1.359E+04	NOT IDENT.
NB-94	3.728E+01	NOT IDENT.
NB-95	4.489E+01	NOT IDENT.
NB-95M	1.449E+02	NOT IDENT.
TC-95M	5.638E+01	NOT IDENT.
ZR-95	7.830E+01	NOT IDENT.
MO-99	3.512E+02	NOT IDENT.
TC-99M	9.960E+01	NOT IDENT.
RH-101	4.190E+01	NOT IDENT.
RH-102M	6.208E+01	NOT IDENT.
RU-103	5.499E+01	NOT IDENT.
RH-106	3.930E+02	NOT IDENT.
RU-106	3.930E+02	NOT IDENT.
AG-108M	5.805E+01	NOT IDENT.
CD-109	9.945E+02	NOT IDENT.
AG-110	1.084E+03	NOT IDENT.
AG-110M	6.755E+01	NOT IDENT.
IN-111	4.209E+01	NOT IDENT.
SN-113	7.313E+01	NOT IDENT.
IN-114M	2.290E+02	NOT IDENT.
CD-115	1.719E+02	NOT IDENT.
SN-117M	3.182E+01	NOT IDENT.
SB-122	6.628E+01	NOT IDENT.
I-123	5.438E+01	NOT IDENT.
TE-123M	3.288E+01	NOT IDENT.
SB-124	4.750E+01	NOT IDENT.
SB-125	1.726E+02	NOT IDENT.
TE-125M	1.064E+04	NOT IDENT.
I-126	1.278E+02	NOT IDENT.
SB-126	6.687E+01	NOT IDENT.
SN-126	9.908E+01	NOT IDENT.
SB-127	1.056E+02	NOT IDENT.
TE-129	7.356E+02	NOT IDENT.
I-131	5.560E+01	NOT IDENT.
I-132	7.067E+02	NOT IDENT.
TE-132	4.384E+01	FAIL ABUN
BA-133	6.781E+01	NOT IDENT.
I-133	6.882E+01	NOT IDENT.
CS-134	5.799E+01	NOT IDENT.
I-135	2.484E+02	NOT IDENT.
CS-136	7.451E+01	FAIL ABUN
LA-138	2.239E+01	NOT IDENT.
CE-139	3.948E+01	NOT IDENT.
BA-140	1.712E+02	NOT IDENT.
LA-140	1.776E+01	FAIL ABUN
CE-141	5.899E+01	NOT IDENT.
CE-143	1.103E+02	NOT IDENT.
CE-144	2.670E+02	NOT IDENT.
PM-144	3.976E+01	NOT IDENT.
PR-144	2.958E+03	NOT IDENT.
PM-146	9.033E+01	NOT IDENT.
ND-147	3.618E+02	NOT IDENT.
PM-147	9.633E+05	NOT IDENT.
PM-149	1.338E+03	NOT IDENT.
EU-152	1.558E+02	NOT IDENT.
GD-153	1.021E+02	NOT IDENT.
EU-154	9.262E+01	FAIL ABUN
EU-155	1.441E+02	NOT IDENT.
TB-160	1.706E+02	FAIL ABUN
HO-166M	8.458E+01	FAIL ABUN
TM-171	5.039E+04	NOT IDENT.
LU-176	4.181E+01	NOT IDENT.
LU-177	3.488E+02	NOT IDENT.
HF-181	6.017E+01	NOT IDENT.
W-181	6.472E+02	FAIL ABUN
TA-182	1.223E+02	FAIL ABUN
RE-183	7.039E+02	FAIL ABUN
RE-184	1.577E+02	FAIL ABUN
RE-188	1.806E+02	NOT IDENT.
W-188	9.168E+03	NOT IDENT.
OS-191	1.155E+02	NOT IDENT.

IR-192	4.513E+01	NOT IDENT.
PB-201	1.059E+02	FAIL ABUN
TL-201	3.309E+02	FAIL ABUN
TL-202	5.934E+01	FAIL ABUN
HG-203	4.794E+01	NOT IDENT.
PB-203	5.455E+01	FAIL ABUN
TL-204	6.140E+03	FAIL ABUN
BI-207	8.218E+01	NOT IDENT.
BI-211	3.375E+02	NOT IDENT.
PB-211	1.217E+03	NOT IDENT.
PB-212	8.355E+01	NOT IDENT.
BI-214	8.883E+01	NOT IDENT.
PB-214	1.220E+02	NOT IDENT.
RN-219	7.185E+02	NOT IDENT.
FR-221	3.075E+02	NOT IDENT.
RA-223	1.004E+03	FAIL ABUN
RA-224	8.962E+02	NOT IDENT.
AC-225	3.160E+02	NOT IDENT.
RA-226	9.831E+02	NOT IDENT.
AC-227	3.907E+02	FAIL ABUN
TH-227	3.907E+02	FAIL ABUN
AC-228	2.257E+02	NOT IDENT.
RA-228	2.257E+02	NOT IDENT.
TH-228	8.355E+01	NOT IDENT.
TH-229	7.916E+02	NOT IDENT.
TH-230	1.319E+04	NOT IDENT.
PA-231	7.133E+02	NOT IDENT.
TH-232	2.238E+04	NOT IDENT.
PA-233	9.882E+01	NOT IDENT.
PA-234	5.682E+02	NOT IDENT.
PA-234M	6.387E+03	NOT IDENT.
TH-234	1.607E+03	NOT IDENT.
U-234	1.911E+05	NOT IDENT.
U-235	2.730E+02	NOT IDENT.
NP-237	9.882E+01	NOT IDENT.
NP-238	2.525E+02	FAIL ABUN
U-238	1.607E+03	NOT IDENT.
NP-239	3.799E+02	NOT IDENT.
AM-242	8.704E+02	NOT IDENT.
AM-243	6.367E+01	NOT IDENT.
CM-243	1.456E+02	NOT IDENT.
BK-247	1.185E+02	FAIL ABUN
CM-247	6.542E+01	NOT IDENT.
CF-249	6.700E+01	FAIL ABUN
CF-251	1.801E+02	NOT IDENT.
CF-252	2.366E+05	NOT IDENT.
ANH-511	4.545E+01	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089189.CNF;1
* Acquisition date   : 17-MAY-2022 09:22:49 Sensitivity      : 3.000
* Detector ID        : GAM30 Energy tolerance: 1.500
* Elapsed live time  : 0 00:15:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 00:15:03.59 Half life ratio  : *****
* Sample date        : 17-MAY-2022 00:00:00 Nuclide Library : LIQUID
* Sample ID          : G1205089189 Analyst initials: RXF2
* Batch Number       : 2264689 Sample Quantity : 7.6992E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 27-SEP-2021 06:08:34 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM30_JAR.CNF;11

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
NA-22	5.002E+01	3.012E+01	3.014E+01
CO-60	9.120E+03	8.364E+02	8.553E+02
BA-137M	2.145E+04	1.913E+03	1.958E+03
CS-137	2.266E+04	2.020E+03	2.068E+03
TL-208	1.374E+01	8.181E+01	8.181E+01
PB-210	7.468E+05	7.664E+04	7.803E+04
BI-212	3.713E+02	9.307E+02	9.307E+02
BI-213	2.660E+02	4.688E+02	4.688E+02
TH-231	9.593E+02	1.165E+03	1.165E+03
AM-241	7.789E+04	6.882E+03	7.049E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	4.046E+02	6.223E+02	6.485E+02	NOT IDENT.
NA-24	2.747E+01	3.925E+01	4.116E+01	NOT IDENT.
AL-26	-4.965E+00	1.992E+01	2.005E+01	NOT IDENT.
K-40	2.791E+02	2.290E+02	2.614E+02	NOT IDENT.
SC-46	-2.247E+01	6.731E+01	6.806E+01	NOT IDENT.
V-48	-2.870E+01	7.312E+01	7.426E+01	NOT IDENT.
CR-51	1.513E+02	4.607E+02	4.657E+02	NOT IDENT.
MN-52	-7.039E+00	2.667E+01	2.686E+01	NOT IDENT.
MN-54	2.559E+00	6.117E+01	6.118E+01	NOT IDENT.
CO-56	-1.221E+01	5.497E+01	5.524E+01	NOT IDENT.
CO-57	1.213E+01	3.943E+01	3.980E+01	NOT IDENT.
NI-57	2.373E+00	3.641E+01	3.643E+01	NOT IDENT.
CO-58	-3.098E+01	5.452E+01	5.628E+01	NOT IDENT.
FE-59	8.910E+01	1.296E+02	1.357E+02	NOT IDENT.
ZN-65	3.139E+01	1.444E+02	1.451E+02	NOT IDENT.
CU-67	2.631E+01	9.458E+01	9.533E+01	NOT IDENT.
GE-68	-3.149E+03	1.985E+03	2.441E+03	NOT IDENT.
AS-73	-1.818E+03	2.866E+03	2.981E+03	NOT IDENT.
AS-74	5.411E+01	8.706E+01	9.042E+01	NOT IDENT.
SE-75	-3.215E+01	7.777E+01	7.912E+01	NOT IDENT.

BR-77	-1.310E+02	2.234E+02	2.311E+02	NOT IDENT.
SR-82	1.891E+02	3.497E+02	3.599E+02	NOT IDENT.
RB-83	1.242E+01	1.276E+02	1.277E+02	NOT IDENT.
RB-84	2.398E+01	9.005E+01	9.070E+01	NOT IDENT.
KR-85	1.612E+04	1.298E+04	1.488E+04	NOT IDENT.
SR-85	7.252E+01	5.840E+01	6.694E+01	NOT IDENT.
RB-86	-1.104E+03	7.620E+02	9.103E+02	NOT IDENT.
Y-88	-1.629E+01	2.352E+01	2.465E+01	NOT IDENT.
Y-91	1.125E+04	1.418E+04	1.506E+04	NOT IDENT.
NB-94	4.324E+00	4.451E+01	4.455E+01	NOT IDENT.
NB-95	1.952E+01	5.272E+01	5.345E+01	NOT IDENT.
NB-95M	-3.991E+01	1.836E+02	1.845E+02	NOT IDENT.
TC-95M	-1.513E+01	7.080E+01	7.113E+01	NOT IDENT.
ZR-95	2.183E+01	9.285E+01	9.337E+01	NOT IDENT.
MO-99	-2.655E+02	4.504E+02	4.661E+02	NOT IDENT.
TC-99M	5.378E+00	1.211E+02	1.212E+02	NOT IDENT.
RH-101	-2.527E+01	5.227E+01	5.350E+01	NOT IDENT.
RH-102M	-2.582E+01	7.406E+01	7.498E+01	NOT IDENT.
RU-103	-8.157E-01	6.483E+01	6.483E+01	NOT IDENT.
RH-106	-2.740E+02	4.920E+02	5.073E+02	NOT IDENT.
RU-106	-2.740E+02	4.920E+02	5.073E+02	NOT IDENT.
AG-108M	2.227E-01	6.784E+01	6.784E+01	NOT IDENT.
CD-109	8.292E+02	1.162E+03	1.221E+03	NOT IDENT.
AG-110	1.223E+03	1.343E+03	1.452E+03	NOT IDENT.
AG-110M	-6.164E+01	8.840E+01	9.267E+01	NOT IDENT.
IN-111	-8.120E+00	5.328E+01	5.341E+01	NOT IDENT.
SN-113	1.950E+01	8.414E+01	8.459E+01	NOT IDENT.
IN-114M	6.845E+00	2.834E+02	2.834E+02	NOT IDENT.
CD-115	-1.925E+02	2.161E+02	2.329E+02	NOT IDENT.
SN-117M	-1.617E+01	3.990E+01	4.056E+01	NOT IDENT.
SB-122	1.378E+01	7.777E+01	7.802E+01	NOT IDENT.
I-123	4.098E+00	6.653E+01	6.656E+01	NOT IDENT.
TE-123M	2.930E+00	4.020E+01	4.022E+01	NOT IDENT.
SB-124	2.795E+01	4.745E+01	4.910E+01	NOT IDENT.
SB-125	5.554E+01	1.992E+02	2.007E+02	NOT IDENT.
TE-125M	3.855E+03	1.268E+04	1.280E+04	NOT IDENT.
I-126	1.814E+02	1.515E+02	1.722E+02	NOT IDENT.
SB-126	-5.660E+01	8.665E+01	9.034E+01	NOT IDENT.
SN-126	2.941E+01	1.269E+02	1.276E+02	NOT IDENT.
SB-127	5.288E+01	1.219E+02	1.242E+02	NOT IDENT.
TE-129	3.178E+02	8.509E+02	8.629E+02	NOT IDENT.
I-131	2.230E+00	6.426E+01	6.427E+01	NOT IDENT.
I-132	2.880E+02	8.625E+02	8.722E+02	NOT IDENT.
TE-132	-1.709E+01	5.571E+01	5.624E+01	FAIL ABUN
BA-133	3.562E+00	7.823E+01	7.824E+01	NOT IDENT.
I-133	-2.840E+01	8.319E+01	8.418E+01	NOT IDENT.
CS-134	3.737E+01	6.746E+01	6.953E+01	NOT IDENT.
I-135	1.417E+01	2.877E+02	2.877E+02	NOT IDENT.
CS-136	1.223E+01	8.511E+01	8.529E+01	FAIL ABUN
LA-138	-1.790E+01	3.300E+01	3.397E+01	NOT IDENT.
CE-139	2.726E+01	4.768E+01	4.924E+01	NOT IDENT.
BA-140	-2.241E+02	2.177E+02	2.400E+02	NOT IDENT.
LA-140	2.179E-02	2.114E+01	2.114E+01	FAIL ABUN
CE-141	-2.448E+01	7.331E+01	7.414E+01	NOT IDENT.
CE-143	1.204E+01	1.258E+02	1.259E+02	NOT IDENT.
CE-144	2.501E+02	3.147E+02	3.343E+02	NOT IDENT.
PM-144	8.590E+00	4.711E+01	4.727E+01	NOT IDENT.
PR-144	6.759E+02	3.502E+03	3.516E+03	NOT IDENT.
PM-146	9.653E+01	1.024E+02	1.113E+02	NOT IDENT.
ND-147	3.502E+02	4.081E+02	4.376E+02	NOT IDENT.
PM-147	-6.531E+05	1.199E+06	1.235E+06	NOT IDENT.
PM-149	-3.260E+02	1.545E+03	1.552E+03	NOT IDENT.
EU-152	-4.394E+01	1.818E+02	1.829E+02	NOT IDENT.
GD-153	-1.176E+02	1.280E+02	1.386E+02	NOT IDENT.
EU-154	1.428E+02	8.602E+01	1.075E+02	FAIL ABUN
EU-155	9.510E+01	1.700E+02	1.753E+02	NOT IDENT.
TB-160	-1.287E+02	2.202E+02	2.277E+02	FAIL ABUN
HO-166M	1.225E+02	1.524E+02	1.621E+02	FAIL ABUN
TM-171	-4.424E+04	6.509E+04	6.808E+04	NOT IDENT.
LU-176	1.019E+01	4.754E+01	4.776E+01	NOT IDENT.
LU-177	6.079E+01	4.312E+02	4.320E+02	NOT IDENT.
HF-181	7.800E-01	7.072E+01	7.072E+01	NOT IDENT.
W-181	6.788E+03	1.876E+03	3.592E+03	FAIL ABUN
TA-182	-1.990E+01	1.457E+02	1.460E+02	FAIL ABUN
RE-183	1.105E+04	1.412E+03	5.184E+03	FAIL ABUN
RE-184	4.932E+02	2.830E+02	3.601E+02	FAIL ABUN
RE-188	1.689E+01	2.392E+02	2.393E+02	NOT IDENT.
W-188	-3.512E+03	1.065E+04	1.077E+04	NOT IDENT.

OS-191	1.439E+02	1.346E+02	1.494E+02	NOT IDENT.
IR-192	-3.692E+01	5.360E+01	5.613E+01	NOT IDENT.
PB-201	3.063E+02	1.471E+02	2.018E+02	FAIL ABUN
TL-201	-1.054E+02	4.123E+02	4.151E+02	FAIL ABUN
TL-202	3.277E+00	7.711E+01	7.712E+01	FAIL ABUN
HG-203	5.015E+01	5.287E+01	5.751E+01	NOT IDENT.
PB-203	5.706E+01	6.015E+01	6.543E+01	FAIL ABUN
TL-204	1.476E+03	7.242E+03	7.273E+03	FAIL ABUN
BI-207	-1.882E+01	1.094E+02	1.097E+02	NOT IDENT.
BI-211	1.513E+02	3.830E+02	3.890E+02	NOT IDENT.
PB-211	-5.042E+02	1.441E+03	1.459E+03	NOT IDENT.
PB-212	-3.637E+01	1.063E+02	1.076E+02	NOT IDENT.
BI-214	-6.982E+01	1.112E+02	1.155E+02	NOT IDENT.
PB-214	9.688E+01	1.368E+02	1.436E+02	NOT IDENT.
RN-219	8.278E+00	8.357E+02	8.357E+02	NOT IDENT.
FR-221	4.286E+01	3.815E+02	3.820E+02	NOT IDENT.
RA-223	2.717E+02	1.144E+03	1.150E+03	FAIL ABUN
RA-224	-7.873E+00	1.125E+03	1.125E+03	NOT IDENT.
AC-225	4.405E+01	3.921E+02	3.926E+02	NOT IDENT.
RA-226	7.308E+02	1.180E+03	1.225E+03	NOT IDENT.
AC-227	-7.282E+01	4.957E+02	4.968E+02	FAIL ABUN
TH-227	-7.282E+01	4.957E+02	4.968E+02	FAIL ABUN
AC-228	1.462E+02	2.959E+02	3.032E+02	NOT IDENT.
RA-228	1.462E+02	2.959E+02	3.032E+02	NOT IDENT.
TH-228	-3.637E+01	1.063E+02	1.076E+02	NOT IDENT.
TH-229	-2.179E+02	9.914E+02	9.962E+02	NOT IDENT.
TH-230	-1.426E+03	1.572E+04	1.573E+04	NOT IDENT.
PA-231	-5.161E+01	8.198E+02	8.201E+02	NOT IDENT.
TH-232	-4.678E+03	2.872E+04	2.879E+04	NOT IDENT.
PA-233	-5.196E+01	1.158E+02	1.182E+02	NOT IDENT.
PA-234	1.361E+02	7.073E+02	7.100E+02	NOT IDENT.
PA-234M	-3.953E+03	8.250E+03	8.441E+03	NOT IDENT.
TH-234	4.507E+01	2.041E+03	2.041E+03	NOT IDENT.
U-234	-1.840E+05	2.473E+05	2.608E+05	NOT IDENT.
U-235	2.487E+02	3.225E+02	3.415E+02	NOT IDENT.
NP-237	-5.196E+01	1.158E+02	1.182E+02	NOT IDENT.
NP-238	2.207E+01	3.098E+02	3.100E+02	FAIL ABUN
U-238	4.507E+01	2.041E+03	2.041E+03	NOT IDENT.
NP-239	2.391E+02	4.503E+02	4.630E+02	NOT IDENT.
AM-242	4.656E+02	1.030E+03	1.051E+03	NOT IDENT.
AM-243	-2.538E+01	7.683E+01	7.768E+01	NOT IDENT.
CM-243	4.478E+01	1.736E+02	1.748E+02	NOT IDENT.
BK-247	-5.826E+01	1.531E+02	1.554E+02	FAIL ABUN
CM-247	-1.624E+01	7.692E+01	7.726E+01	NOT IDENT.
CF-249	-1.688E+01	7.861E+01	7.898E+01	FAIL ABUN
CF-251	1.626E+02	2.155E+02	2.276E+02	NOT IDENT.
CF-252	-6.690E+04	2.940E+05	2.955E+05	NOT IDENT.
ANH-511	-6.124E+01	5.539E+01	6.190E+01	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	1293.8320	80.22	315.6689	117.23	283.8629
45.60	1249.4762	80.57	364.2472	119.76	263.4320
46.54	1252.4211	81.00	348.3817	120.54	270.1436
49.72	1134.6967	81.07	348.4265	53.20	278.8545
51.35	1292.3954	82.35	300.6680	121.12	273.5736
52.39	1439.0531	82.47	300.7315	121.22	273.6106
53.20	1529.5469	82.47	300.7315	121.78	258.7838
53.44	1530.3845	323.87	298.0375	122.06	248.1410
56.28	1540.1908	84.00	298.1451	123.07	256.0054
57.36	1619.6393	84.21	298.2528	123.68	275.5918
57.53	946.3190	84.86	298.5848	127.16	289.8412
57.53	946.3228	85.43	303.6182	127.23	289.8637
57.98	947.2443	86.55	335.4290	129.43	246.2238
59.54	950.4359	879.38	335.5621	131.20	281.5740
61.49	954.3618	87.57	335.6501	482.18	268.0640
155.04	289.8740	87.09	335.7330	133.52	247.5158
63.29	290.0470	87.57	325.1216	135.34	272.1272
63.58	299.3294	88.03	307.3313	264.66	277.8241
63.81	299.4704	88.34	307.4898	136.28	272.4501
64.28	302.3642	193.51	298.3603	122.06	287.8369
129.43	283.8757	91.11	348.9182	140.51	276.0786
65.08	277.0732	91.27	349.0089	63.81	283.9079
66.73	295.6722	63.29	330.2108	143.76	244.0422
66.98	304.6643	184.58	324.4136	144.24	253.0231
67.24	293.0232	94.56	315.7750	145.44	264.4514
67.67	294.2551	94.65	315.8193	152.32	245.4086
67.75	294.3008	94.67	315.8310	152.43	245.4388
68.89	279.1762	97.43	298.5469	153.25	250.1406
68.89	279.1784	311.90	279.2841	154.21	213.1501
69.67	338.8810	946.00	279.2882	155.04	232.7495
167.43	315.8653	99.53	272.4792	156.02	230.7724
70.82	315.8653	1221.41	297.7043	158.56	230.3153
439.51	315.8653	100.20	297.7458	158.97	219.1786
70.83	315.8726	265.00	277.6956	159.00	219.1875
72.81	323.0238	103.18	276.0870	162.33	232.4164
279.20	323.0610	99.53	276.1655	162.66	221.2148
72.87	323.0610	103.37	276.1655	143.76	262.0408
74.66	323.1447	116.74	276.1655	165.86	254.8416
74.82	323.2411	105.31	265.4249	167.43	268.8925
1063.66	307.3632	106.12	254.1894	171.28	239.2493
238.63	351.6481	106.47	262.7278	176.31	288.6372
351.93	351.6481	109.28	249.0341	1048.07	281.8475
79.69	310.0021	111.00	279.2714	177.52	224.7797
79.82	310.0749	228.16	254.1577	739.50	223.3060
80.02	315.5542	112.95	269.4390	711.68	295.6797
80.03	315.5565	116.24	256.8311	184.58	277.2473
80.12	315.6091	116.30	256.8531	185.72	284.5088
80.19	315.6498	116.74	274.0723	186.21	278.8659

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
190.27	310.2099	301.36	205.8024	482.18	166.8978
193.51	307.7113	302.85	205.1726	1596.21	159.7046
197.03	273.6832	304.50	213.0890	527.90	188.7308
127.23	287.9922	537.26	219.1078	497.08	171.0245
306.78	297.2796	306.78	200.6288	511.00	152.0049
204.12	299.1058	316.51	216.2534	514.00	124.2864
205.31	298.2641	311.90	209.9238	520.40	149.8031
208.37	262.4699	316.51	206.3037	238.98	131.4567
210.85	276.1115	531.02	192.9375	522.65	150.9282
215.65	245.1971	320.08	192.1669	527.90	137.7301
218.12	255.2940	427.87	189.7070	520.40	128.1328
222.11	276.5648	323.87	194.3939	529.87	130.0960
290.67	260.9523	325.23	195.4418	531.02	107.8248
177.52	246.5874	328.76	201.5454	537.26	132.4971
228.16	266.0154	331.15	104.1919	546.56	115.4648
228.18	266.0188	388.16	208.6914	552.55	104.0116
235.69	256.8546	334.37	208.8330	563.25	87.7579
256.23	256.9128	338.28	236.8610	564.24	97.6626
238.63	264.7860	338.32	236.8665	795.86	105.7983
238.98	264.8659	340.48	212.3036	569.50	105.8071
240.99	253.1477	340.55	202.7026	569.70	102.8490
242.00	226.5655	344.28	209.3292	204.12	99.9398
344.28	227.0792	345.93	217.4491	583.19	91.5321
245.35	243.0809	351.06	198.8213	595.83	86.0385
250.62	250.2779	351.93	184.8480	600.60	95.2397
252.40	213.7856	356.01	195.0386	604.72	97.4184
252.80	221.2289	331.15	179.7520	609.32	98.6181
256.23	245.2641	364.49	204.9636	497.08	88.5908
260.90	230.1046	366.42	194.5523	433.94	97.8170
264.66	225.8282	383.85	208.3195	696.49	81.8108
265.00	225.8893	388.16	200.7599	621.93	89.0277
269.46	232.9111	388.63	204.4210	667.71	83.2479
271.23	225.7473	391.70	209.3060	475.06	75.1593
273.65	219.9248	400.66	214.9500	632.98	91.4758
356.01	223.7259	401.32	217.7539	453.88	94.5364
277.37	201.3384	401.81	210.5568	595.83	108.8330
277.60	204.7150	402.40	216.0797	635.95	81.4128
278.00	204.7798	404.85	210.0205	636.99	85.5176
459.60	193.9753	410.95	209.8507	657.50	80.0789
279.20	196.5983	414.70	227.6776	657.76	80.0884
279.54	204.1822	423.72	210.4618	661.66	95.6414
280.46	226.9360	404.85	234.8032	664.57	66.4080
283.69	188.8733	427.87	215.5569	666.33	46.3641
364.49	204.0771	433.94	231.9983	720.70	52.5502
285.41	214.3340	439.51	230.8589	667.71	61.8530
285.90	209.3693	440.45	218.9165	884.68	43.4680
402.40	204.5665	453.88	230.7886	685.70	46.7212
290.67	210.1140	459.60	228.6805	564.24	41.6423
293.27	213.0505	463.37	253.5535	695.00	57.3096
295.22	214.2048	468.07	251.3555	696.49	60.4710
295.96	227.8718	685.70	235.9568	696.51	60.4710
298.58	213.0324	475.06	272.1094	697.00	58.3971
299.98	208.9989	476.78	224.1210	697.49	50.0645
300.09	224.3076	477.60	207.1883	702.65	54.3444
300.13	224.3130	477.99	201.5509	706.68	58.0925

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
711.68	53.4840	911.20	75.8276	1312.11	9.3884
720.70	62.0849	923.98	93.0475	1332.49	9.4336
721.93	58.4290	926.36	96.5006	1365.19	7.6035
722.78	56.8674	1434.09	92.8139	1368.63	3.8047
722.91	56.8696	937.49	92.8706	1377.63	5.7188
1274.44	53.7185	944.13	105.5408	1384.29	3.8181
724.19	45.8347	945.96	106.7368	1408.01	4.7980
727.33	60.1288	946.00	110.1433	1434.09	6.7560
733.00	50.7422	949.00	120.4749	1435.80	5.7931
735.93	61.3796	954.55	109.2930	1457.56	8.7303
739.50	68.8800	962.31	101.5591	1460.82	0.9708
744.23	56.2607	964.08	87.9127	696.51	2.9299
747.24	53.1352	966.17	93.6814	1596.21	2.9951
752.31	56.4268	968.97	93.7581	727.33	4.0129
753.82	67.1118	983.53	83.8300	1678.03	6.0872
756.73	59.7165	984.45	71.2183	1690.97	2.0341
763.94	70.5654	996.26	74.9235	1757.55	4.1194
765.80	62.0522	1001.03	76.1809	1764.49	3.0934
766.42	64.2065	1004.73	46.2207	1770.23	1.0322
766.84	69.5677	1025.87	48.8291	1771.35	2.0649
772.60	65.4231	1028.54	52.3572	1791.20	3.1086
776.52	57.9946	846.77	80.4888	1808.65	3.1185
777.92	53.7252	1038.76	87.5122	1836.06	5.2231
778.90	54.8204	1046.59	72.7972		
783.70	50.6069	1048.07	68.4404		
788.74	59.3260	621.93	65.8493		
792.07	73.4342	1063.66	81.7834		
795.86	68.1244	1077.00	78.7224		
801.95	71.5188	1077.34	77.8433		
802.10	71.5215	1083.85	70.8936		
810.29	78.2461	1085.87	80.6859		
810.45	69.5547	1099.25	67.6318		
810.76	69.5625	1111.64	73.2164		
815.77	82.7477	1112.07	79.4720		
818.51	73.0168	1112.84	70.5571		
832.01	81.0158	1115.54	72.3977		
834.85	76.7106	609.32	51.0126		
835.15	75.6204	889.28	51.0161		
1260.41	82.2418	1121.30	65.3498		
846.77	62.7125	1129.67	60.1094		
856.80	67.3368	1131.51	53.8550		
860.56	55.2633	1173.23	30.8519		
702.65	98.7054	1177.95	30.5259		
873.19	102.1037	1189.05	20.0436		
529.87	82.1841	1204.77	11.8915		
879.38	88.9616	1221.41	19.2889		
880.51	81.2072	1231.02	14.7314		
881.60	67.8829	1235.36	10.1386		
883.24	70.1444	1238.28	9.2236		
884.68	84.6589	1260.41	10.2010		
889.28	87.0168	1271.87	4.4637		
903.28	91.6394	1274.44	4.6524		
898.04	66.0029	1274.54	5.5833		
903.28	58.8297	1099.25	9.3433		
907.67	40.3960	1298.22	9.3579		

Continuing Calibration Data

Review of Gamma Spectrometer QA results (Daily calibration & background checks)
17-MAY-2022 10:20:13

Run Date	Detector	Parameter	Flag	Status	Comments
17-MAY-22	GAM01	All Parameters Passed			
17-MAY-22	GAM03	Cal Check PSFWHM-662	Investigate		
17-MAY-22	GAM04	Cal Check NLACTVTY-1332	Investigate		
17-MAY-22	GAM06	Cal Check NLACTVTY-662	Action	Lockout	Detector locked out.
17-MAY-22	GAM06	Cal Check NLACTVTY-1332	Investigate		
17-MAY-22	GAM06	Cal Check NLACTVTY-59	Action	Lockout	Detector locked out.
17-MAY-22	GAM06	Bkg Check BACKRATE	Investigate		
17-MAY-22	GAM07	All Parameters Passed			
17-MAY-22	GAM08	Cal Check PSFWHM-59	Action	Lockout	Detector locked out.
08-MAY-22	GAM08	Bkg Check may not have run since 17-MAY-2022			Detector locked out.
17-MAY-22	GAM09	All Parameters Passed			
17-MAY-22	GAM10	Cal Check NLACTVTY-59	Investigate		
14-MAY-22	GAM11	Cal Check may not have run since 17-MAY-2022			Detector locked out.
15-MAY-22	GAM11	Bkg Check may not have run since 17-MAY-2022			Detector locked out.
14-MAY-22	GAM12	Cal Check may not have run since 17-MAY-2022			Detector locked out.
15-MAY-22	GAM12	Bkg Check may not have run since 17-MAY-2022			Detector locked out.
17-MAY-22	GAM14	All Parameters Passed			
17-MAY-22	GAM16	Cal Check NLACTVTY-662	Action	Lockout	Detector locked out.
17-MAY-22	GAM16	Cal Check NLACTVTY-1332	Action	Lockout	Detector locked out.
17-MAY-22	GAM16	Cal Check NLACTVTY-59	Action	Lockout	Detector locked out.
17-MAY-22	GAM17	All Parameters Passed			
17-MAY-22	GAM18	Bkg Check BACKRATE	Investigate		
17-MAY-22	GAM19	All Parameters Passed			
17-MAY-22	GAM20	All Parameters Passed			
17-MAY-22	GAM21	All Parameters Passed			
17-MAY-22	GAM23	All Parameters Passed			
17-MAY-22	GAM24	All Parameters Passed			
17-MAY-22	GAM26	Cal Check NLACTVTY-1332	Investigate		
17-MAY-22	GAM28	All Parameters Passed			
17-MAY-22	GAM30	Cal Check PSFWHM-662	Investigate		
17-MAY-22	GAM31	Cal Check PSFWHM-662	Investigate		
17-MAY-22	GAM32	All Parameters Passed			
17-MAY-22	GAM33	All Parameters Passed			
17-MAY-22	GAM34	All Parameters Passed			
17-MAY-22	GAM36	All Parameters Passed			
17-MAY-22	GAM38	Bkg Check BACKRATE	Above		approved
17-MAY-22	GAM40	Cal Check NLACTVTY-662	Investigate		
17-MAY-22	GAM41	All Parameters Passed			
17-MAY-22	GAM43	All Parameters Passed			
16-MAY-22	GAM44	Cal Check may not have run since 17-MAY-2022			Detector locked out.
15-MAY-22	GAM44	Bkg Check may not have run since 17-MAY-2022			Detector locked out.
17-MAY-22	GAM45	Cal Check PSFWHM-662	Investigate		
22-FEB-22	GAM46	Cal Check may not have run since 17-MAY-2022			Detector locked out.
21-FEB-22	GAM46	Bkg Check may not have run since 17-MAY-2022			Detector locked out.
14-MAY-22	GAM47	Cal Check may not have run since 17-MAY-2022			Detector locked out.
15-MAY-22	GAM47	Bkg Check may not have run since 17-MAY-2022			Detector locked out.

17-MAY-22	XRAY1	All Parameters Passed			
17-MAY-22	XRAY2	All Parameters Passed			
17-MAY-22	XRAY3	All Parameters Passed			
17-MAY-22	XRAY4	All Parameters Passed			
17-MAY-22	XRAY6	All Parameters Passed			
17-MAY-22	XRAY7	All Parameters Passed			

APPROVAL DATE: 17-MAY-2022

APPROVAL TIME: 10:30:04

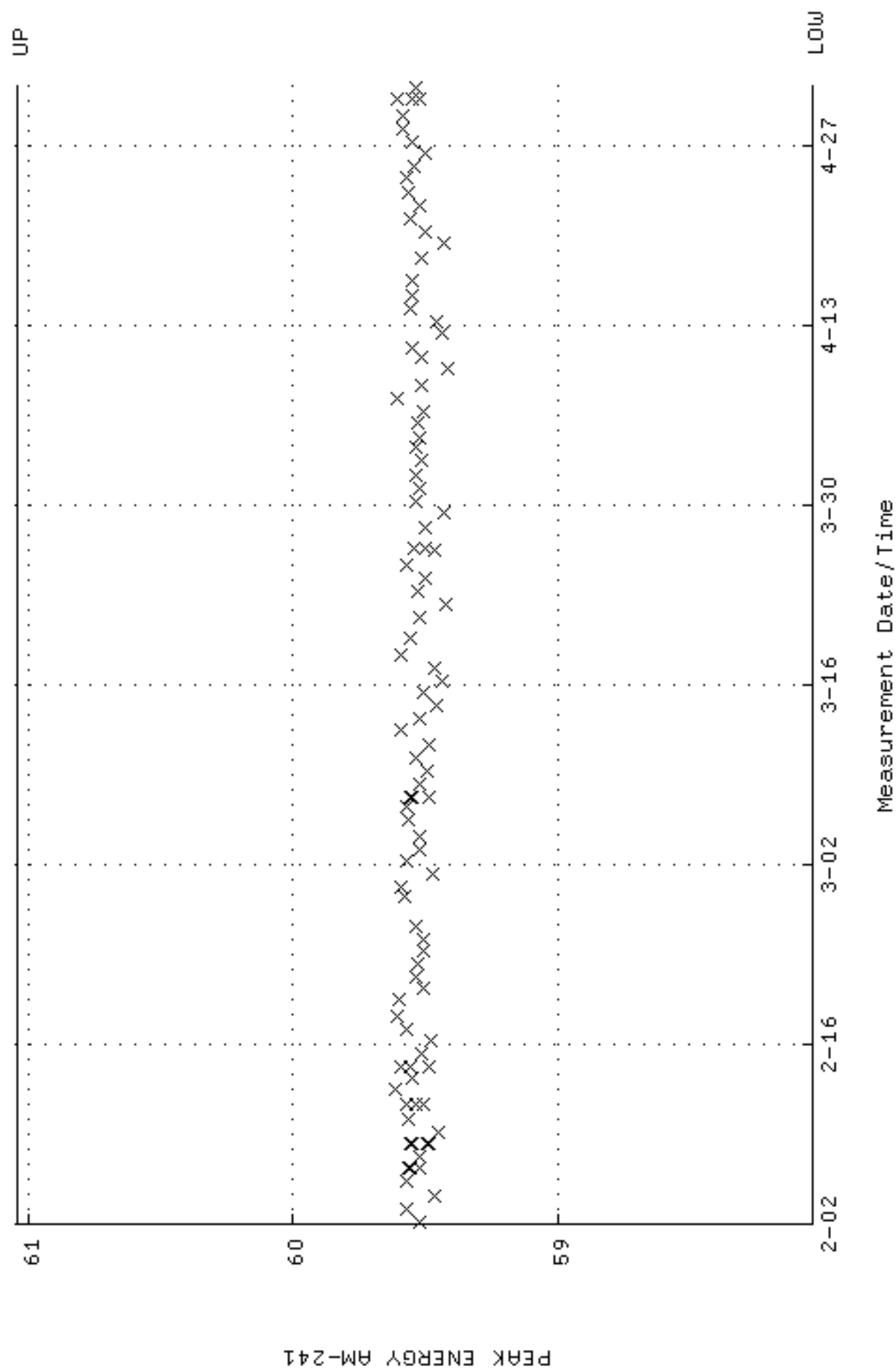
APPROVED BY: Rebekah Futch

PROCEDURE # GL-RAD-I-001

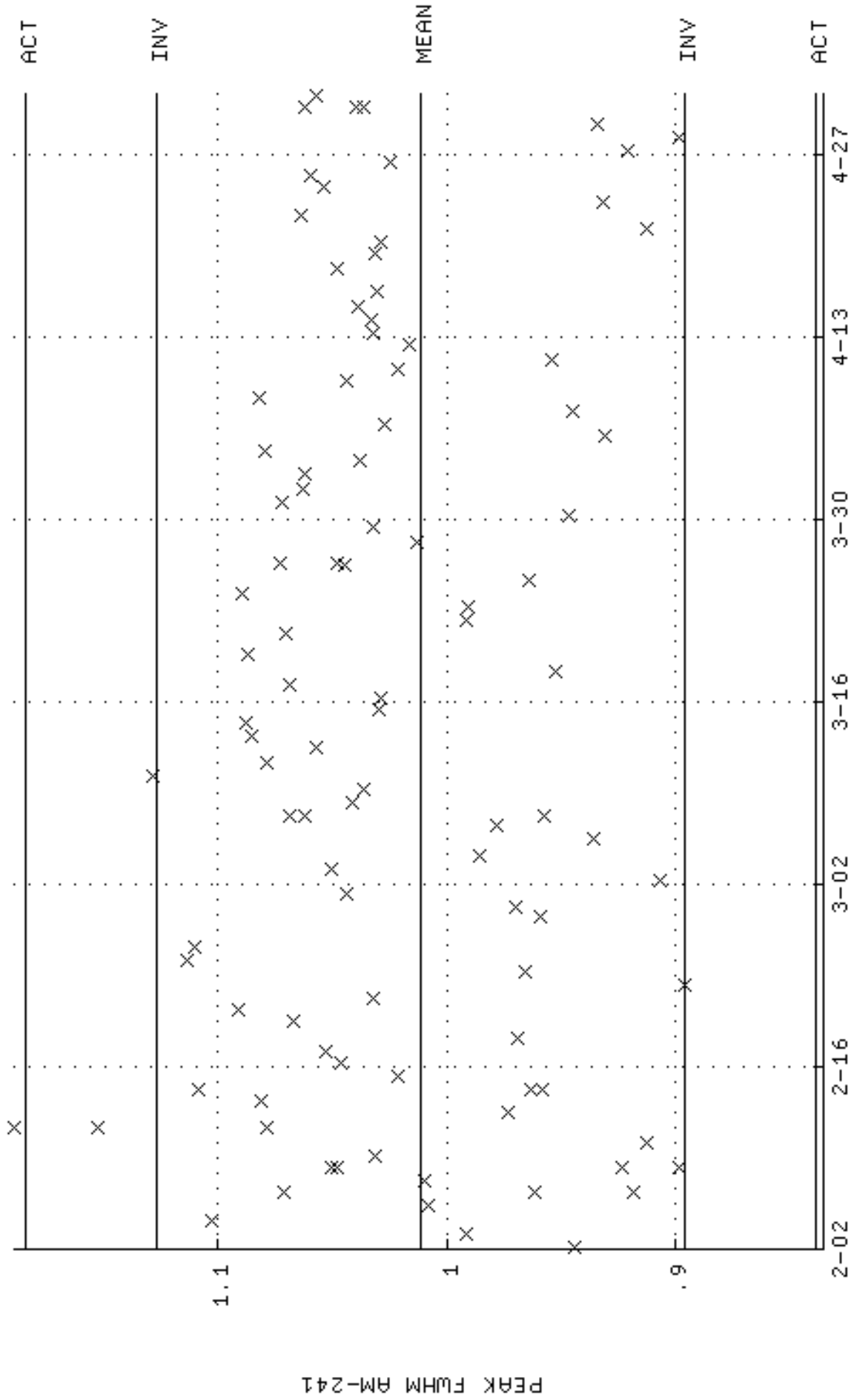
The Investigate flag does not indicate a lockout and is approved for use. Action flags that have not been approved are locked out of service.

Background and Efficiency Data

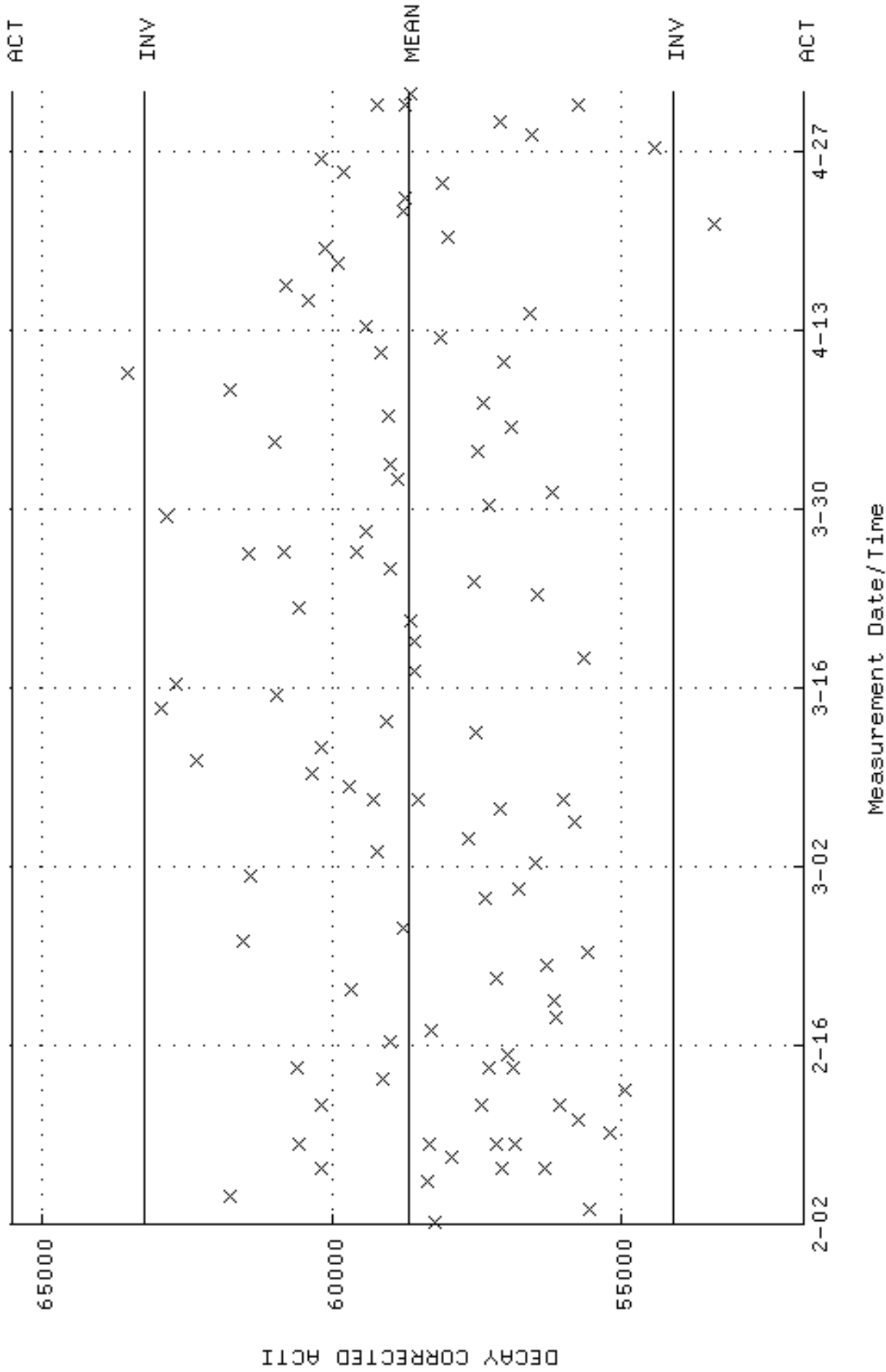
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM14_JAR.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-FEB-2022 04:24:55 through 1-MAY-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



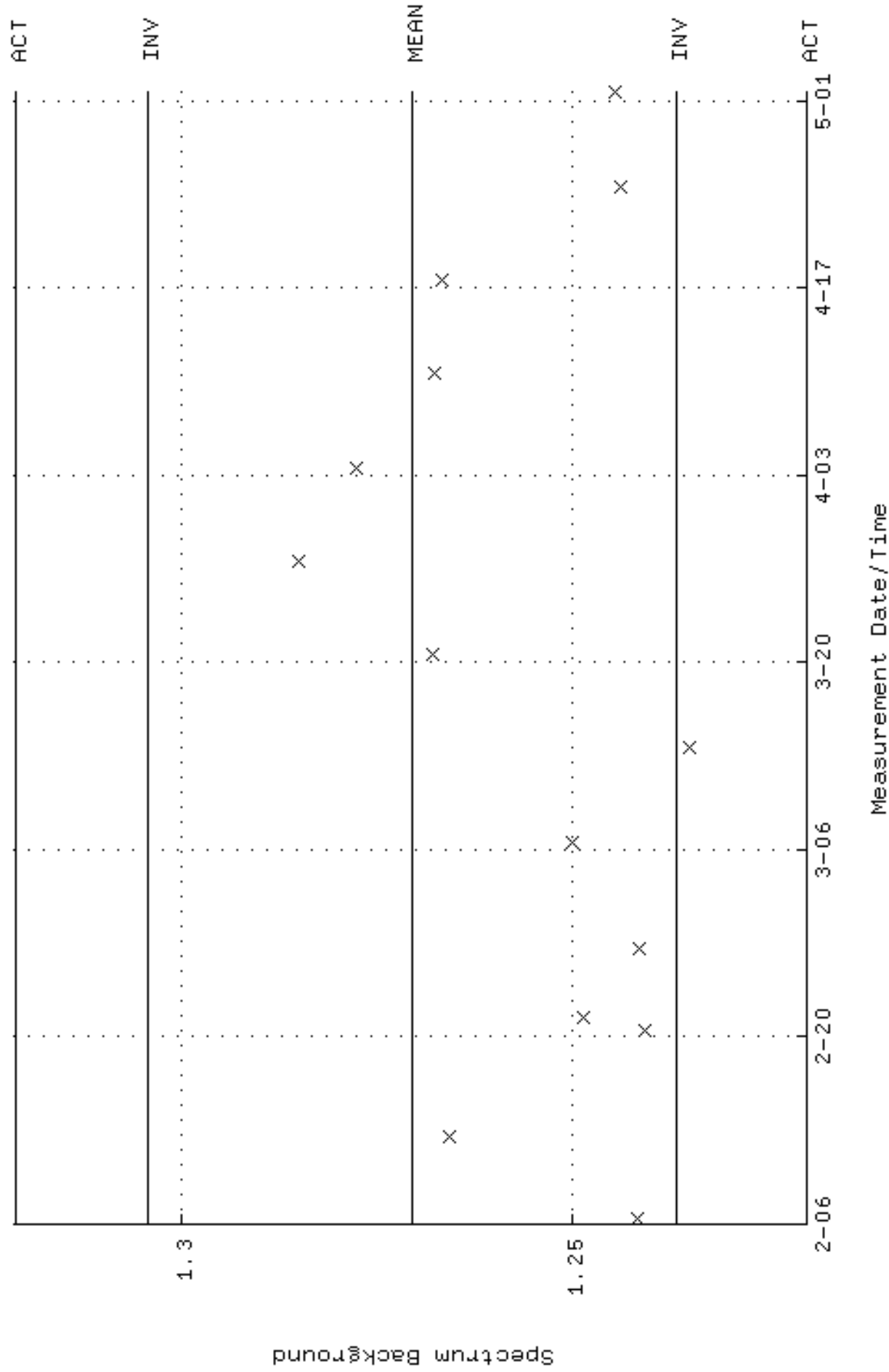
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM14_JAR.QAF;1
Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
Start/End Dates : 2-FEB-2022 04:24:55 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.01171 +- 5.781632E-02 (5.71 %)



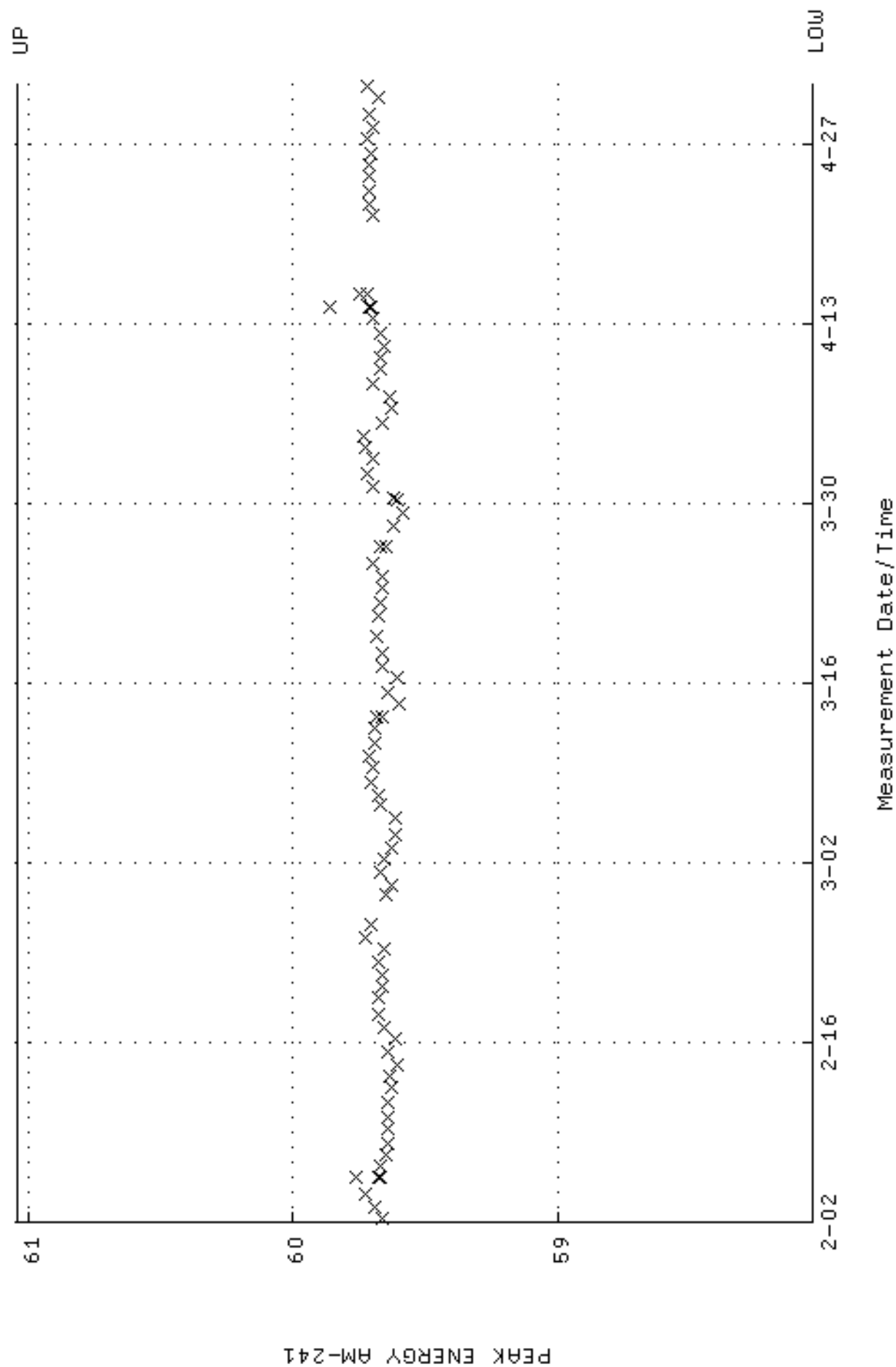
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM14_JAR.QAF;1
Parameter Name : NACTIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-FEB-2022 04:24:55 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 58686.3 +- 2273.88 (3.87 %)



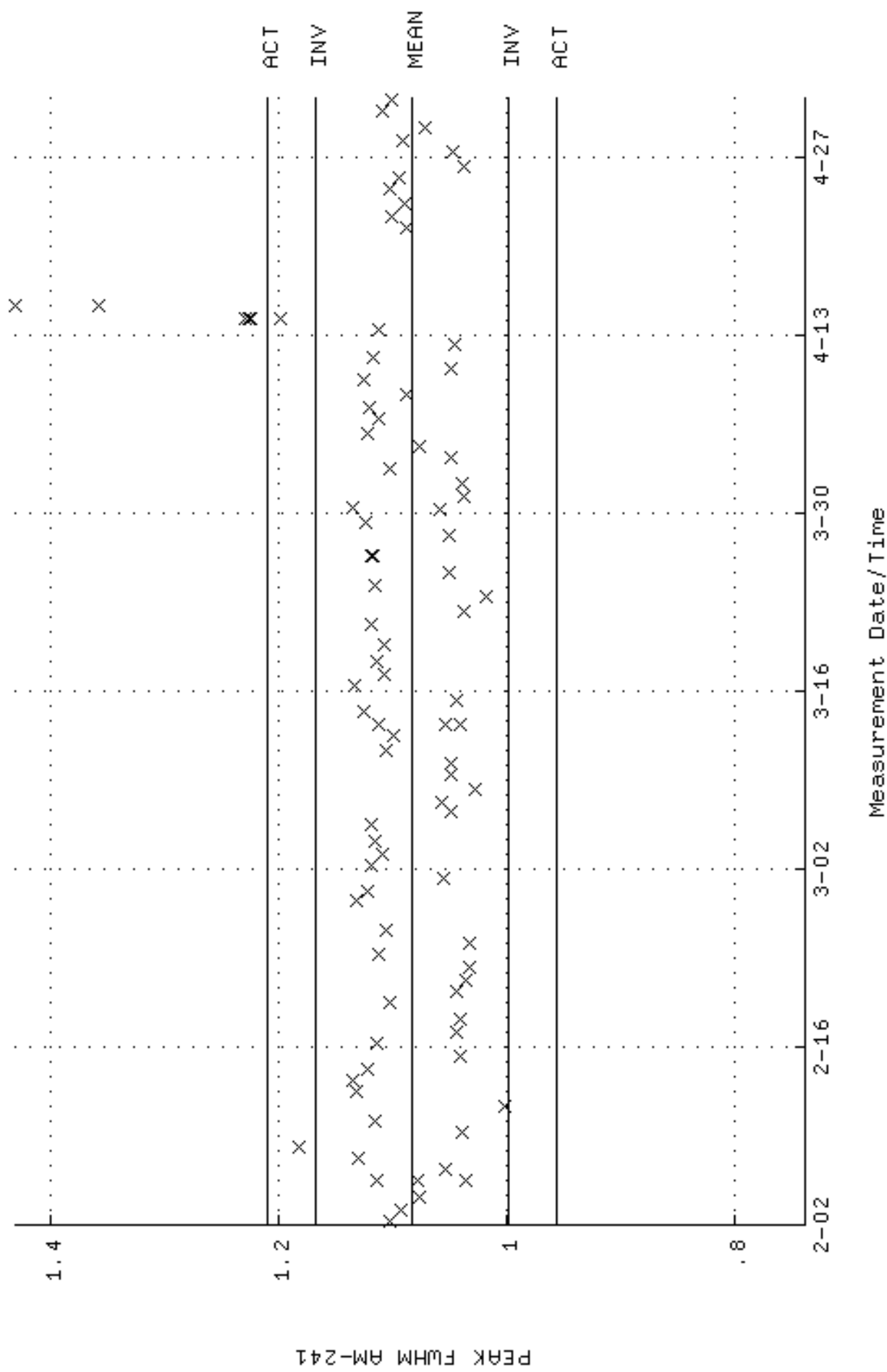
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM14.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-FEB-2022 11:13:16 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.27070 +- 1.686246E-02 (1.33 %)



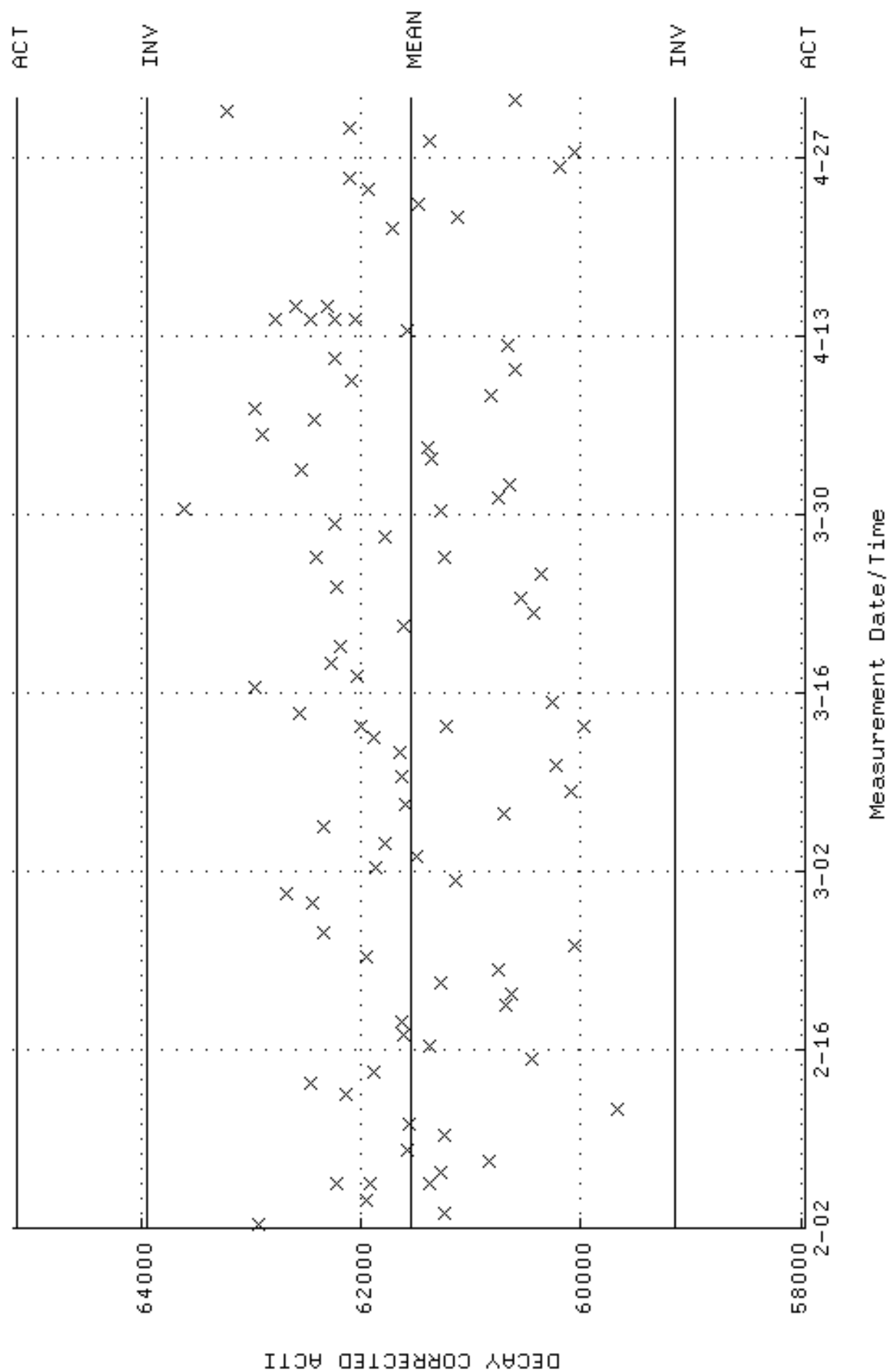
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM17_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-FEB-2022 07:02:20 through 1-MAY-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



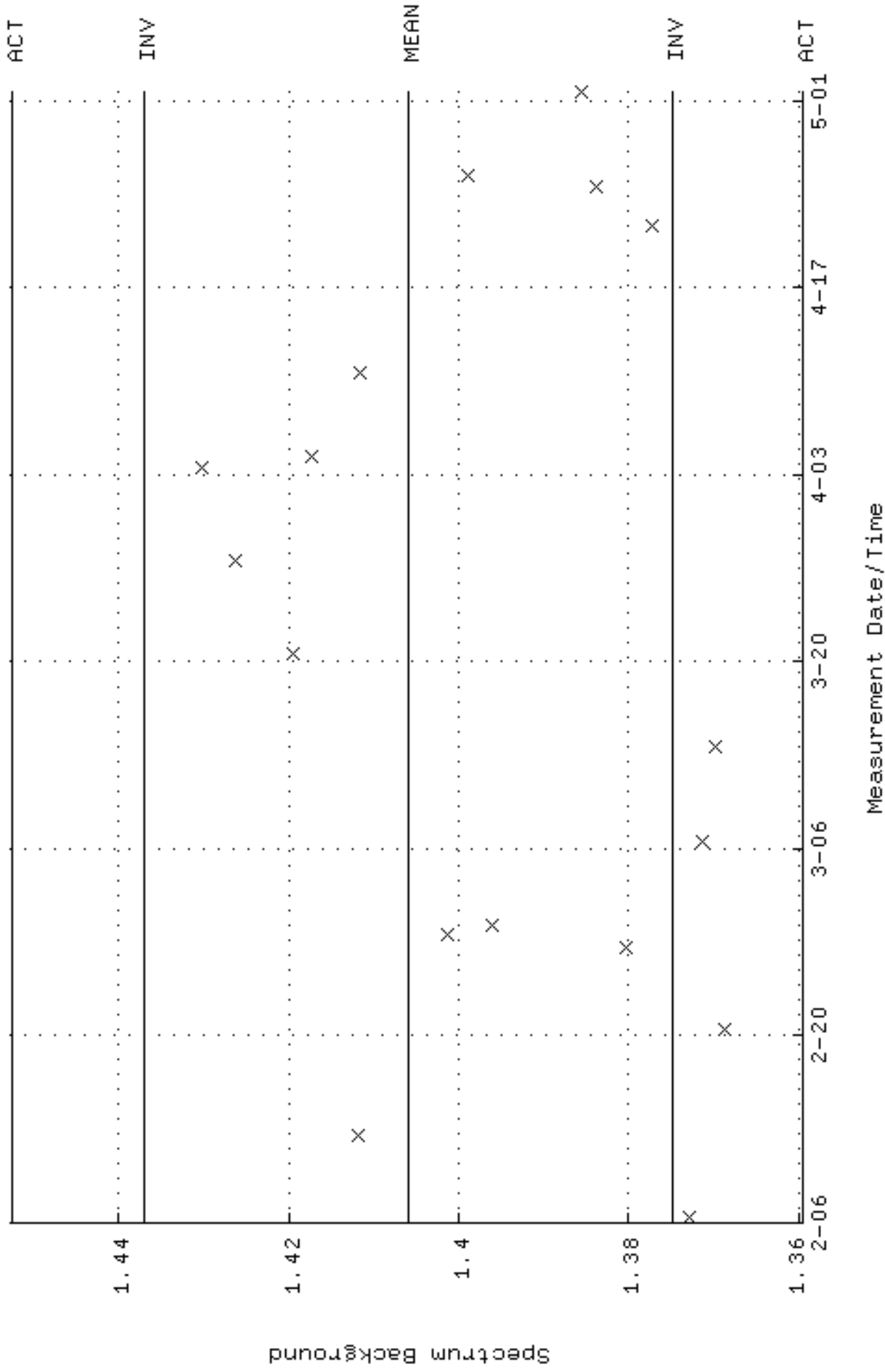
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM17_CAN.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-FEB-2022 07:02:20 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 1.08334 +- 4.250132E-02 (3.92 %)



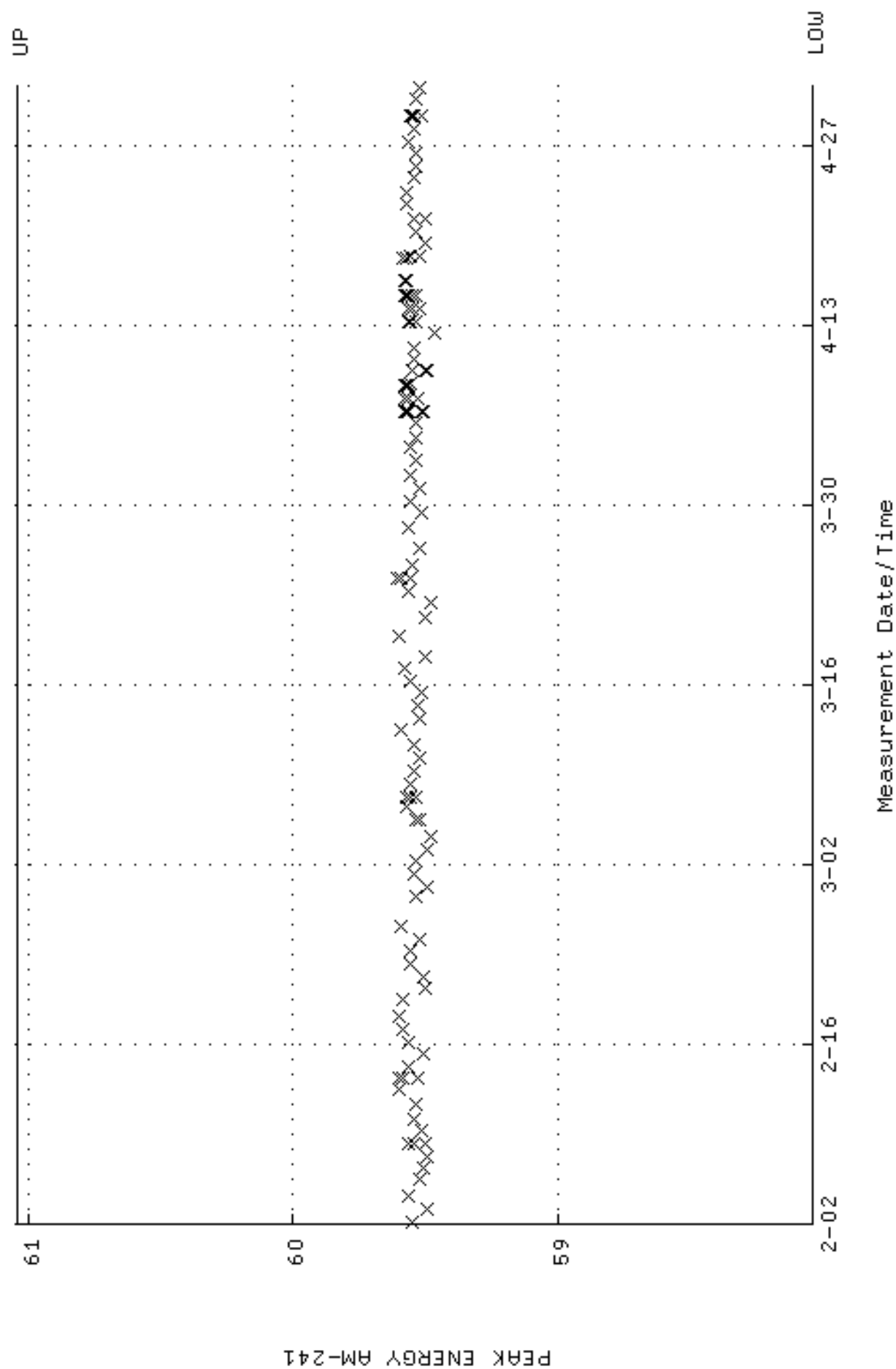
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM17-CAN.QAF;1
 Parameter Name : NLACTIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-FEB-2022 07:02:20 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 61554.1 +- 1197.24 (1.95 %)



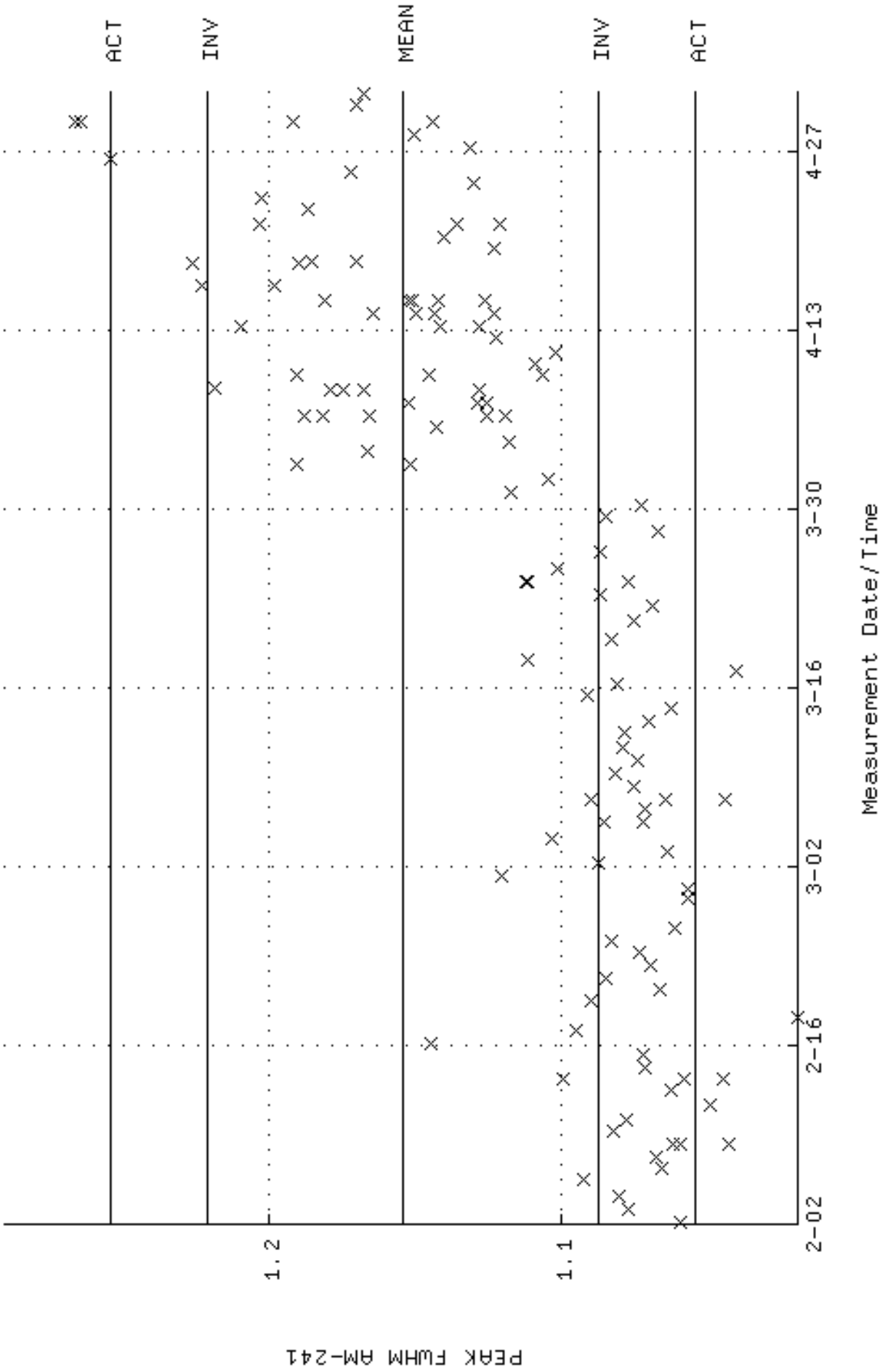
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM17.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-FEB-2022 11:13:28 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.40599 +- 1.550878E-02 (1.10 %)



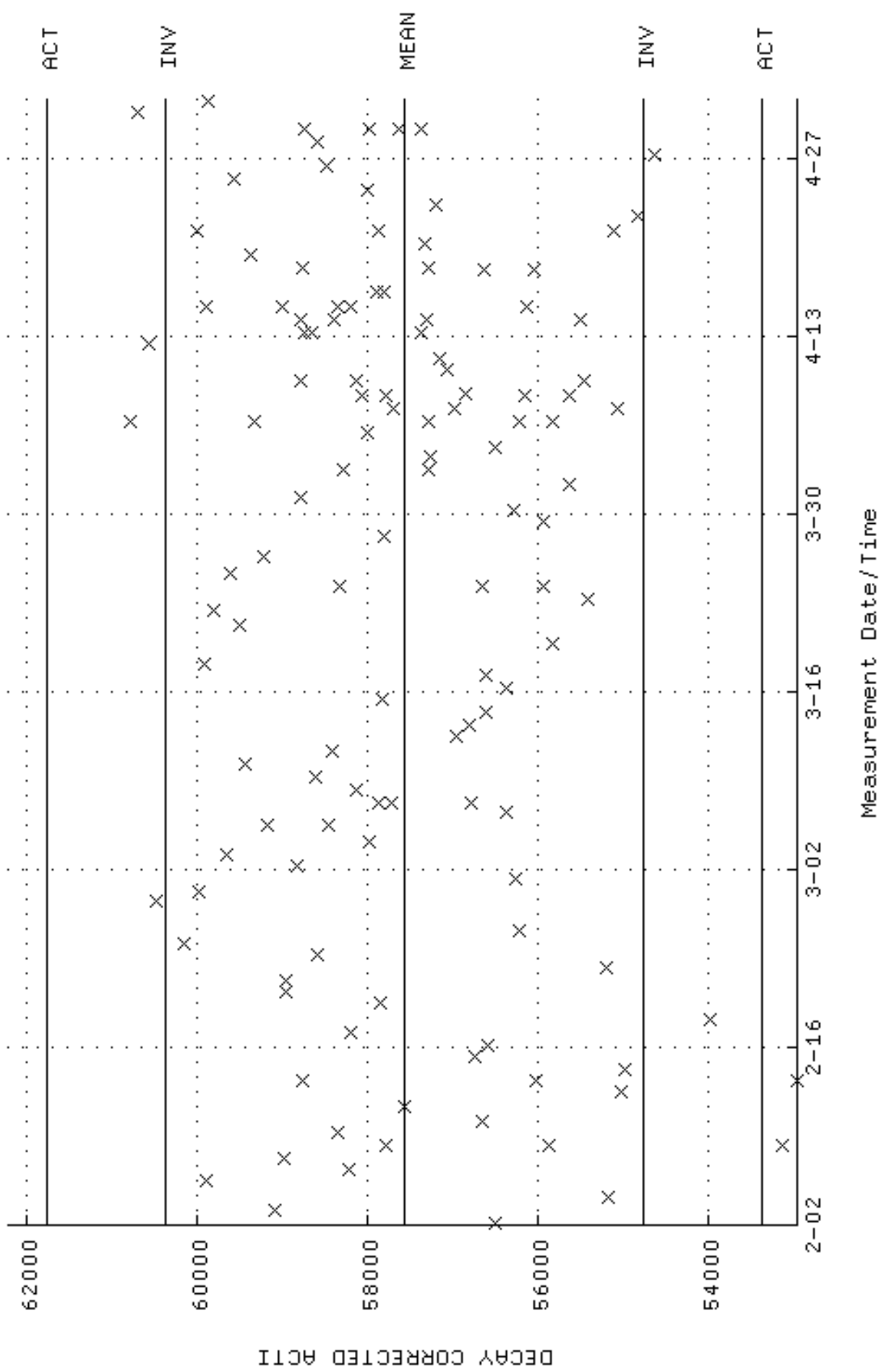
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM24_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-FEB-2022 03:52:48 through 1-MAY-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



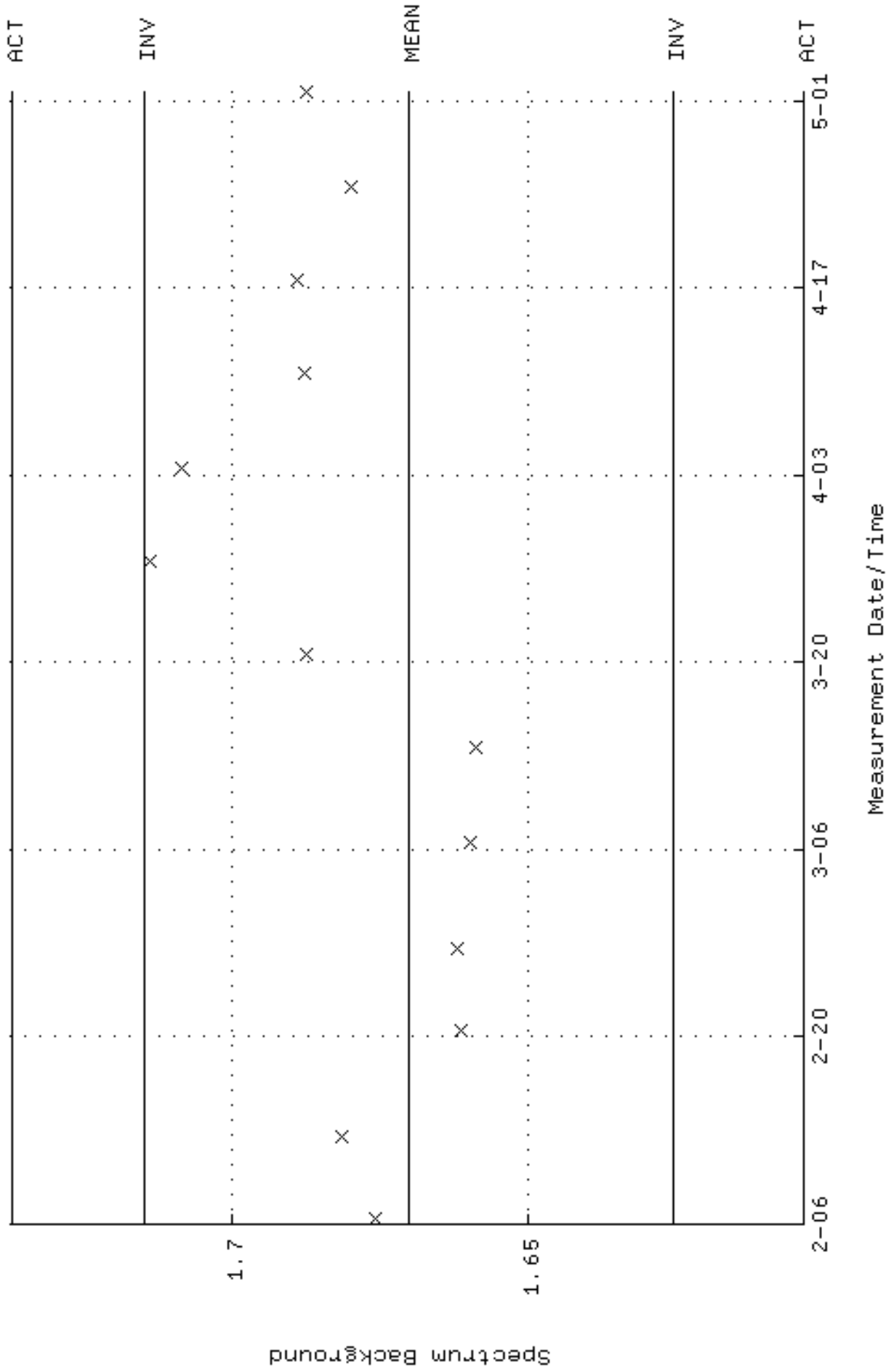
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM24_CAN.QAF;1
Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
Start/End Dates : 2-FEB-2022 03:52:48 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.15467 +- 3.331359E-02 (2.89 %)



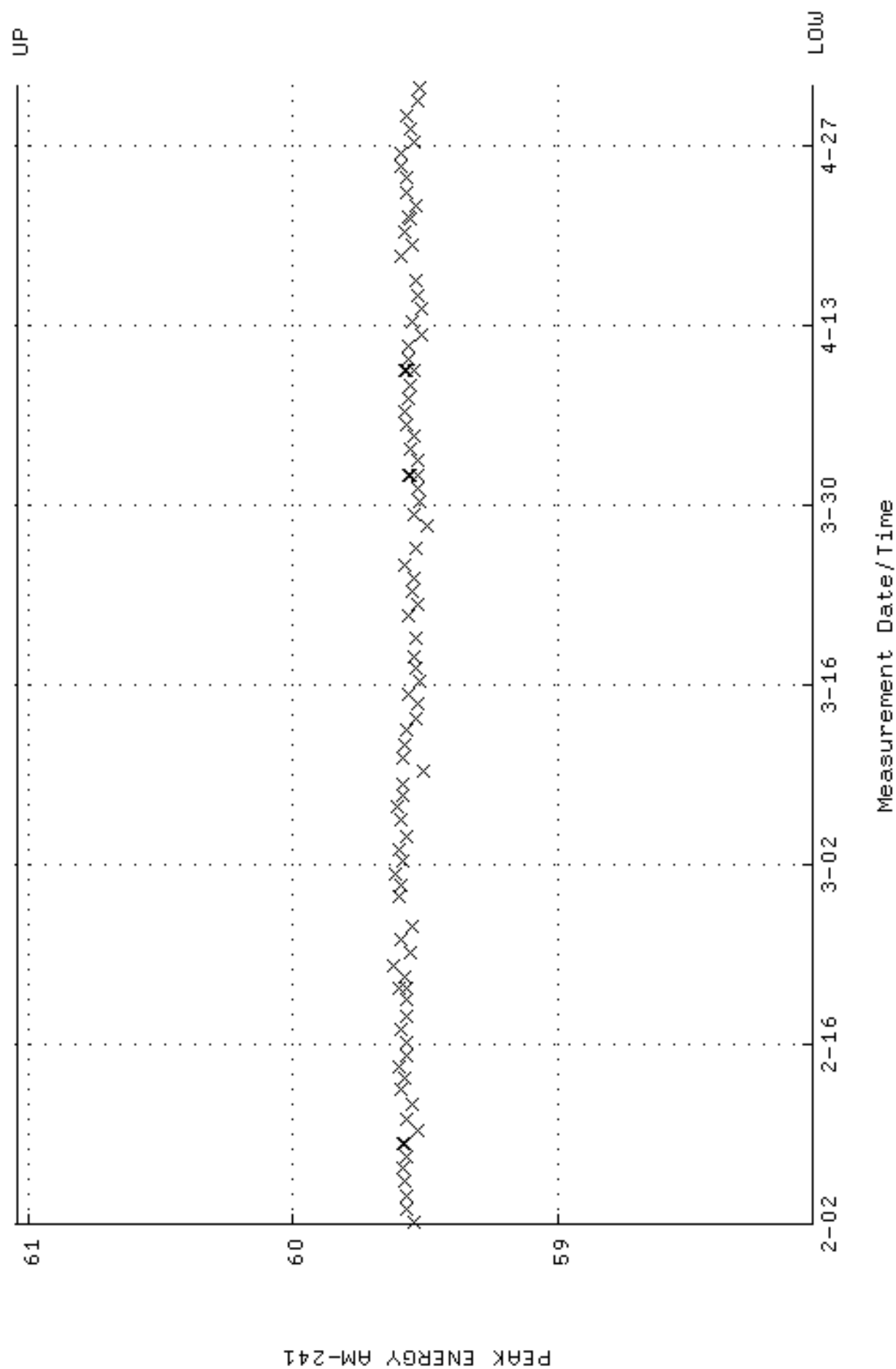
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM24-CAN.QAF;1
Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-FEB-2022 03:52:48 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 57575.7 +- 1403.54 (2.44 %)



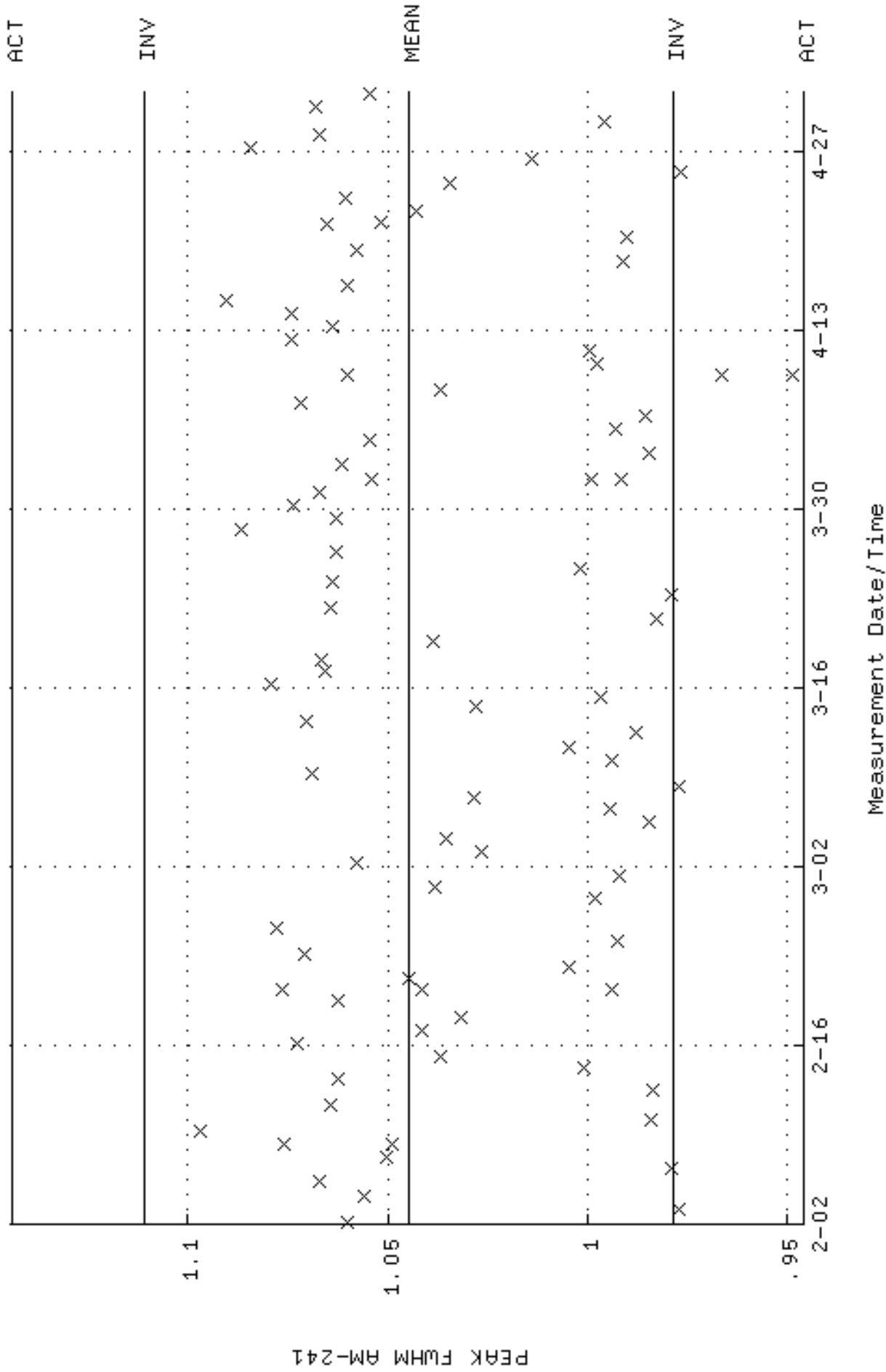
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM24.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-FEB-2022 11:14:04 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.67036 +- 2.221940E-02 (1.33 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM30_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-FEB-2022 03:52:53 through 1-MAY-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



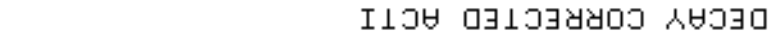
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM30_CAN.QAF;1
Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
Start/End Dates : 2-FEB-2022 03:52:53 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.04491 +- 3.300933E-02 (3.16 %)



QA filename

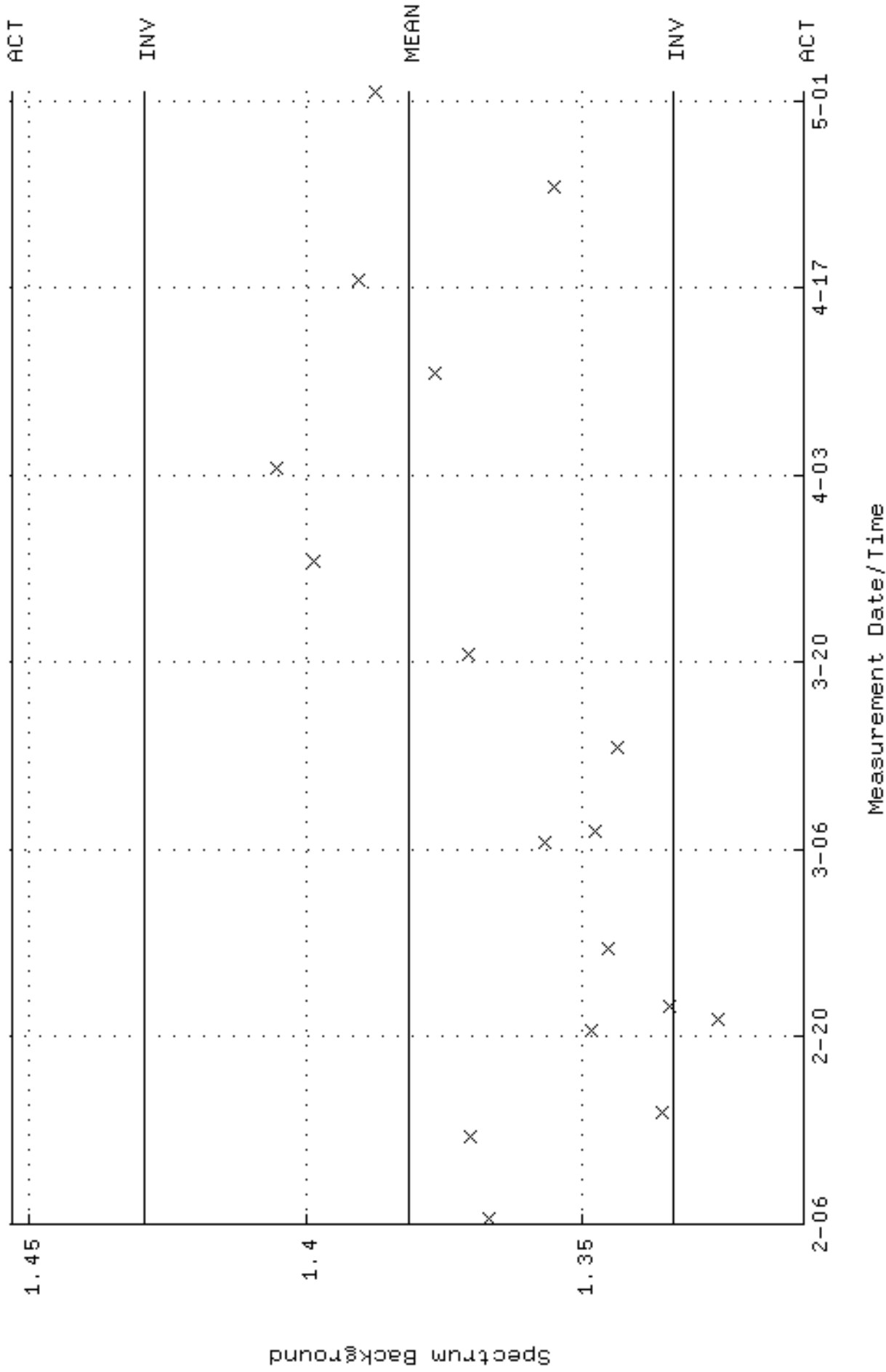
Parameter Name

Start/End Dates

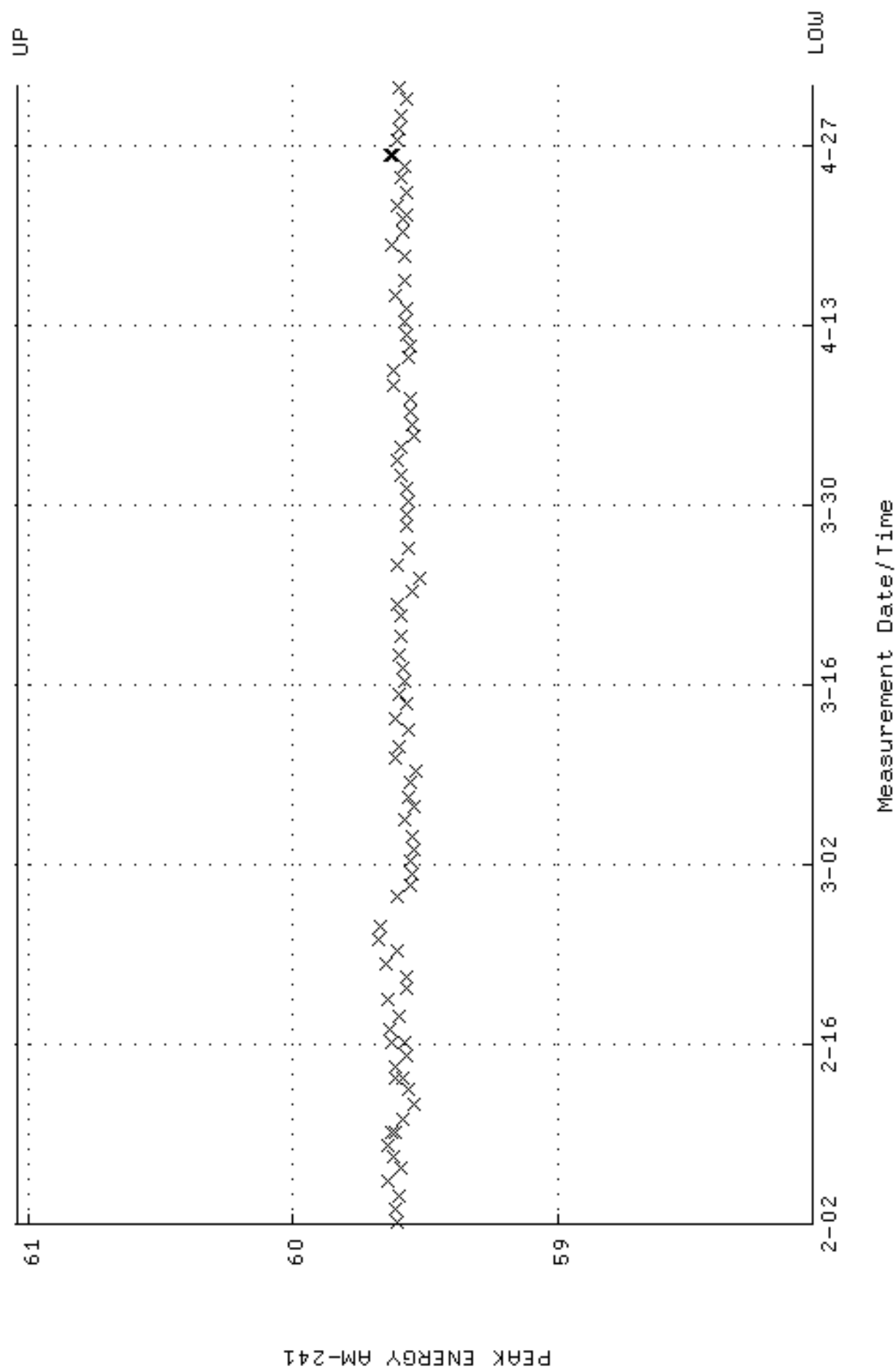
Mean $\pm$ Std Dev

Measurement Date/Time

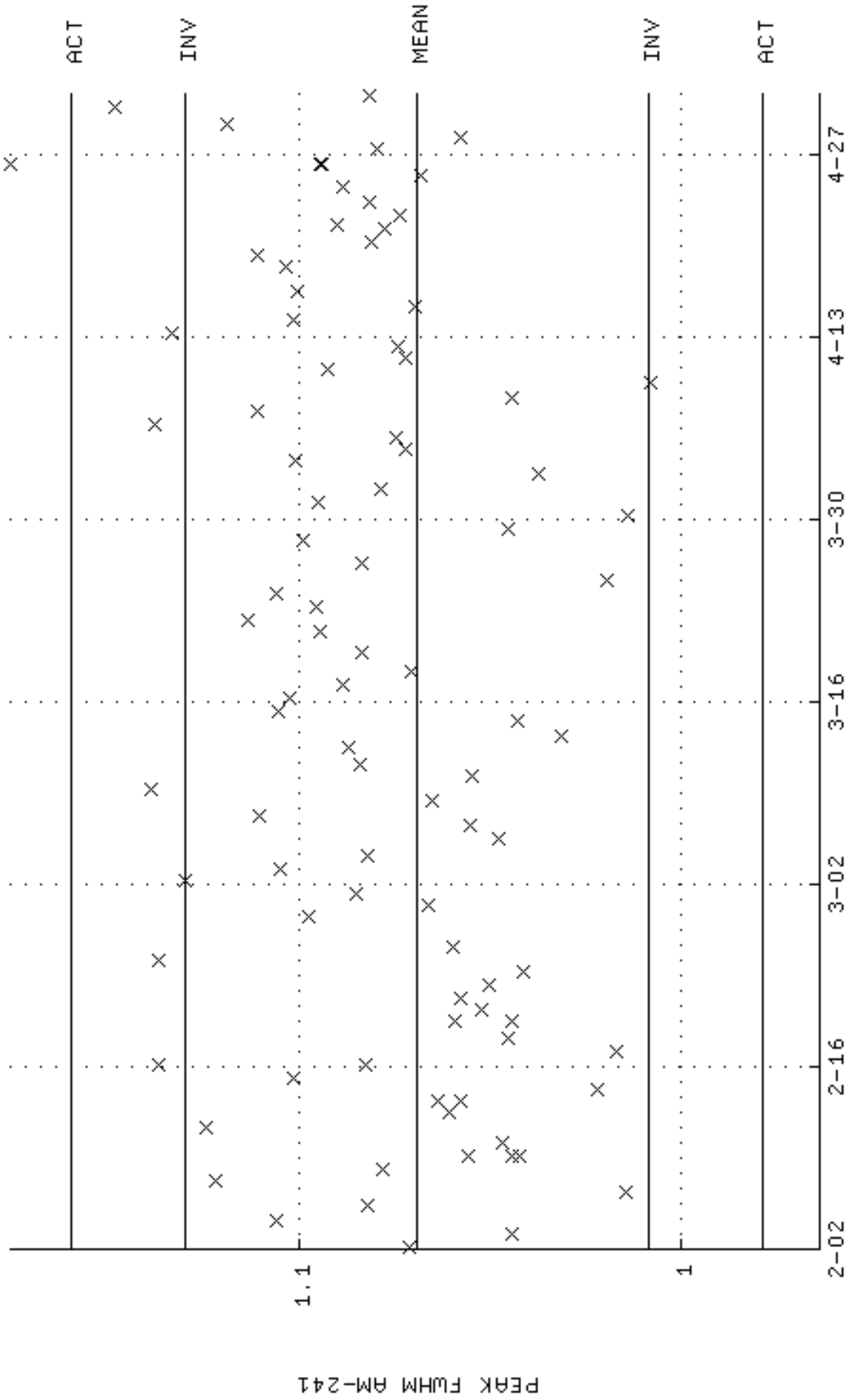
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM30.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-FEB-2022 11:14:15 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.38155 +- 2.378993E-02 (1.72 %)



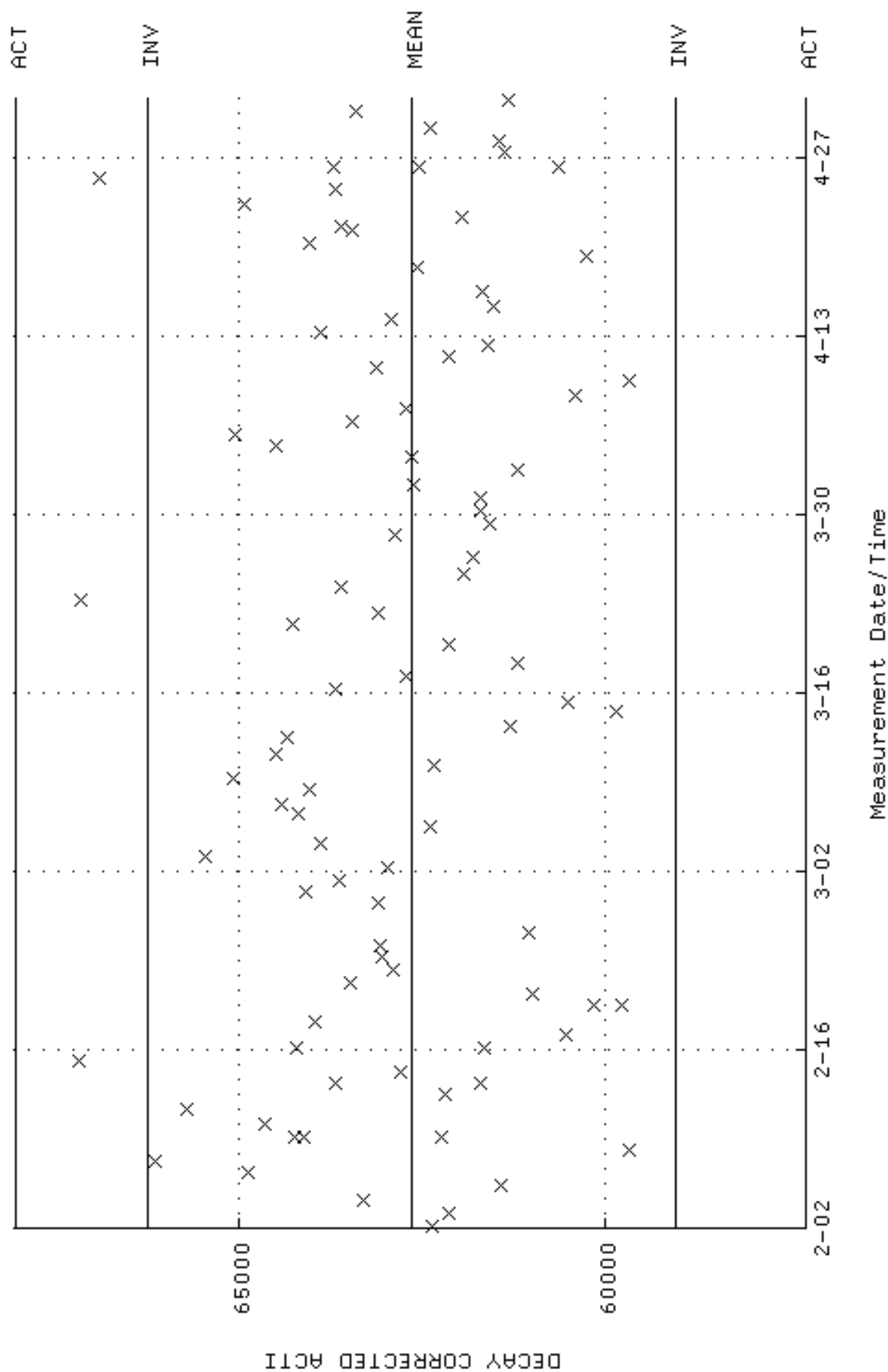
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM33_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-FEB-2022 03:52:58 through 1-MAY-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



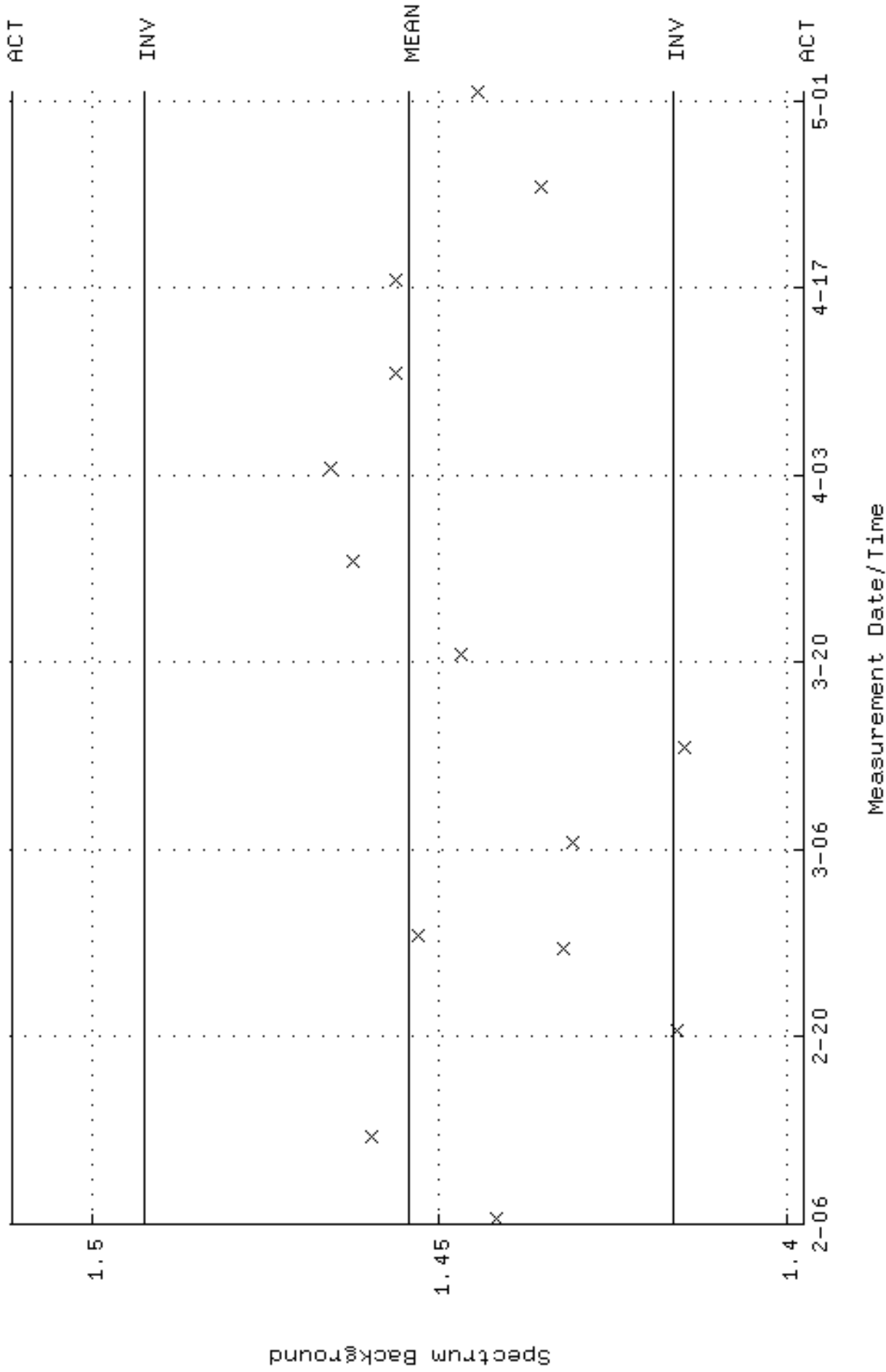
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM33_CAN.QAF;1
Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
Start/End Dates : 2-FEB-2022 03:52:58 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.06954 +- 3.028659E-02 (2.83 %)



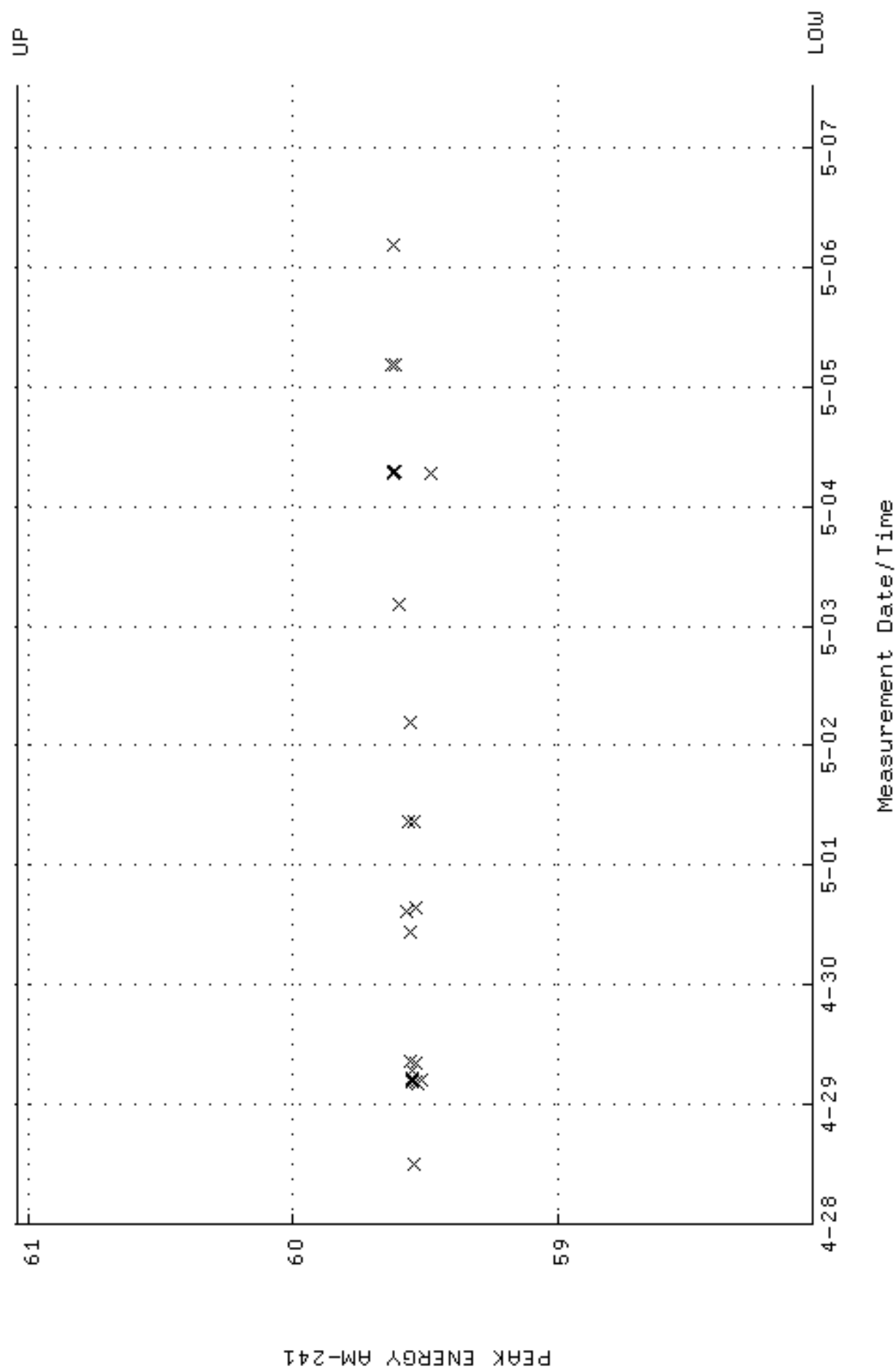
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM33_CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-FEB-2022 03:52:58 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 62660.7 +- 1800.47 (2.87 %)



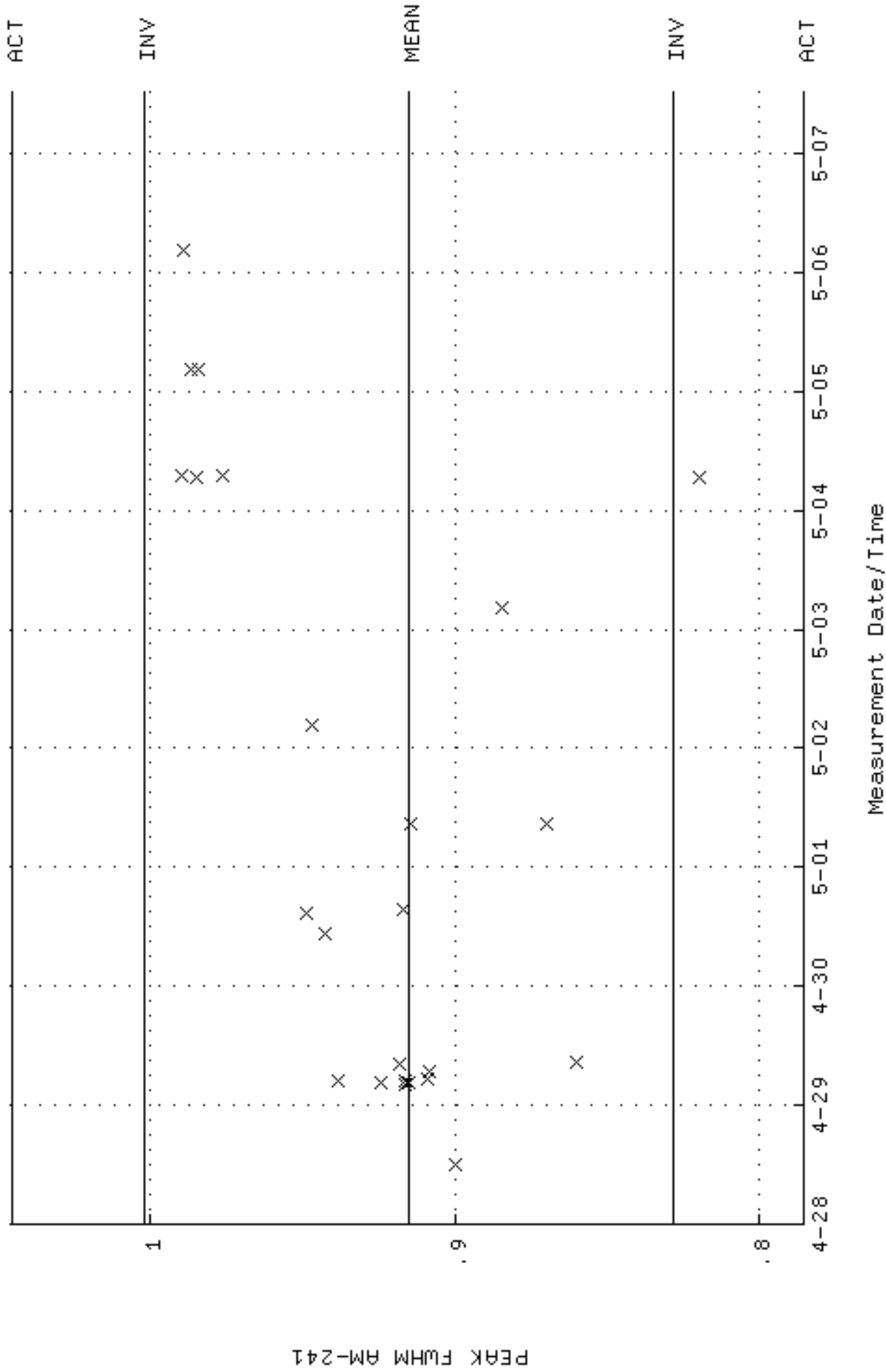
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM33.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-FEB-2022 11:14:32 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.45454 +- 1.896337E-02 (1.30 %)



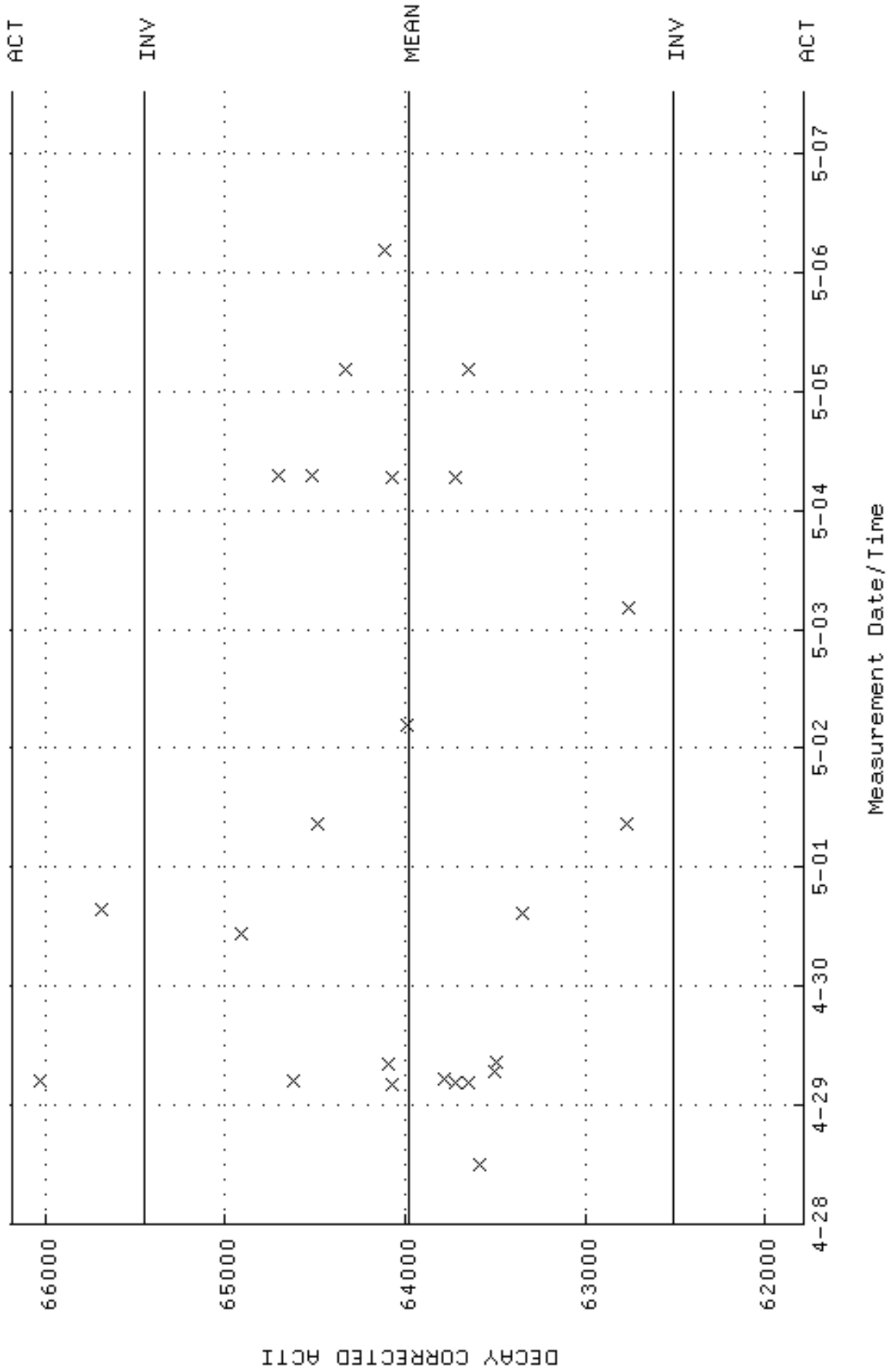
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM38_500MLMB.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 28-APR-2022 12:05:20 through 7-MAY-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



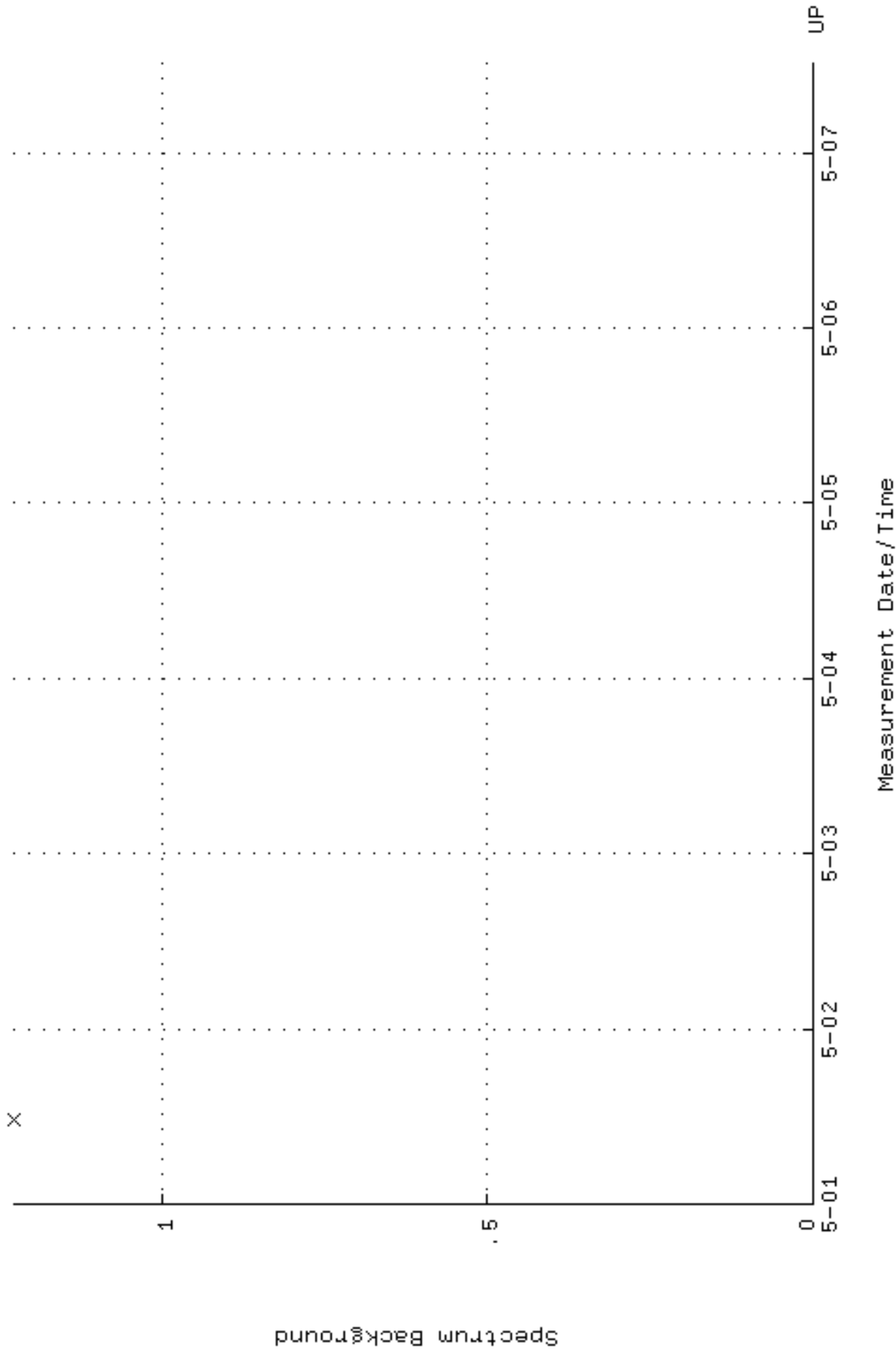
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM38_500MLMB.QAF;1
Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
Start/End Dates : 28-APR-2022 12:05:20 through 7-MAY-2022 12:00:00
Mean +- Std Dev : 0.915470 +- 4.337750E-02 (4.74 %)



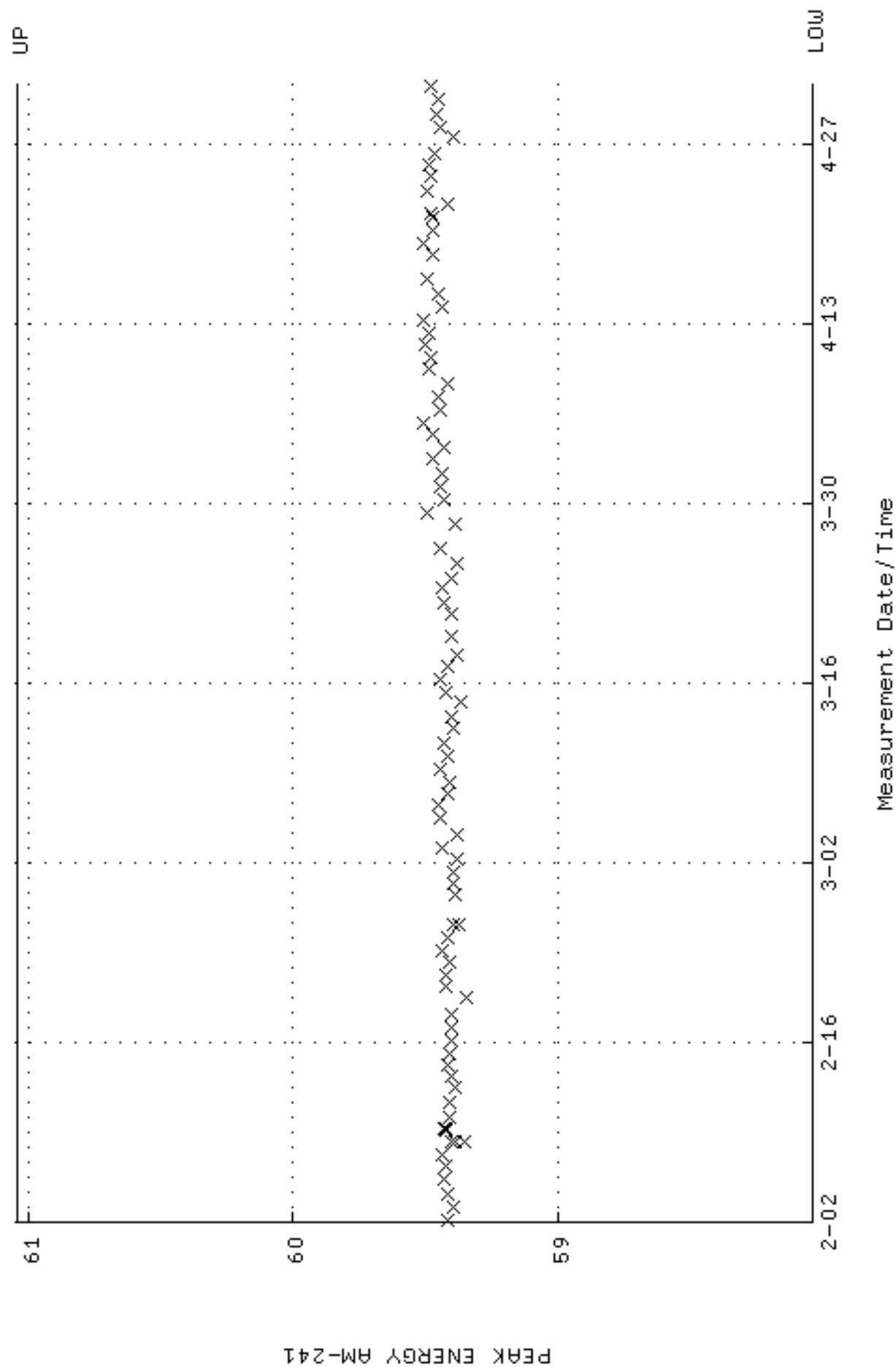
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM38_500MLMB.QAF;1
Parameter Name : NACTIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 28-APR-2022 12:05:20 through 7-MAY-2022 12:00:00
Mean +- Std Dev : 63984.1 +- 733.374 (1.15 %)



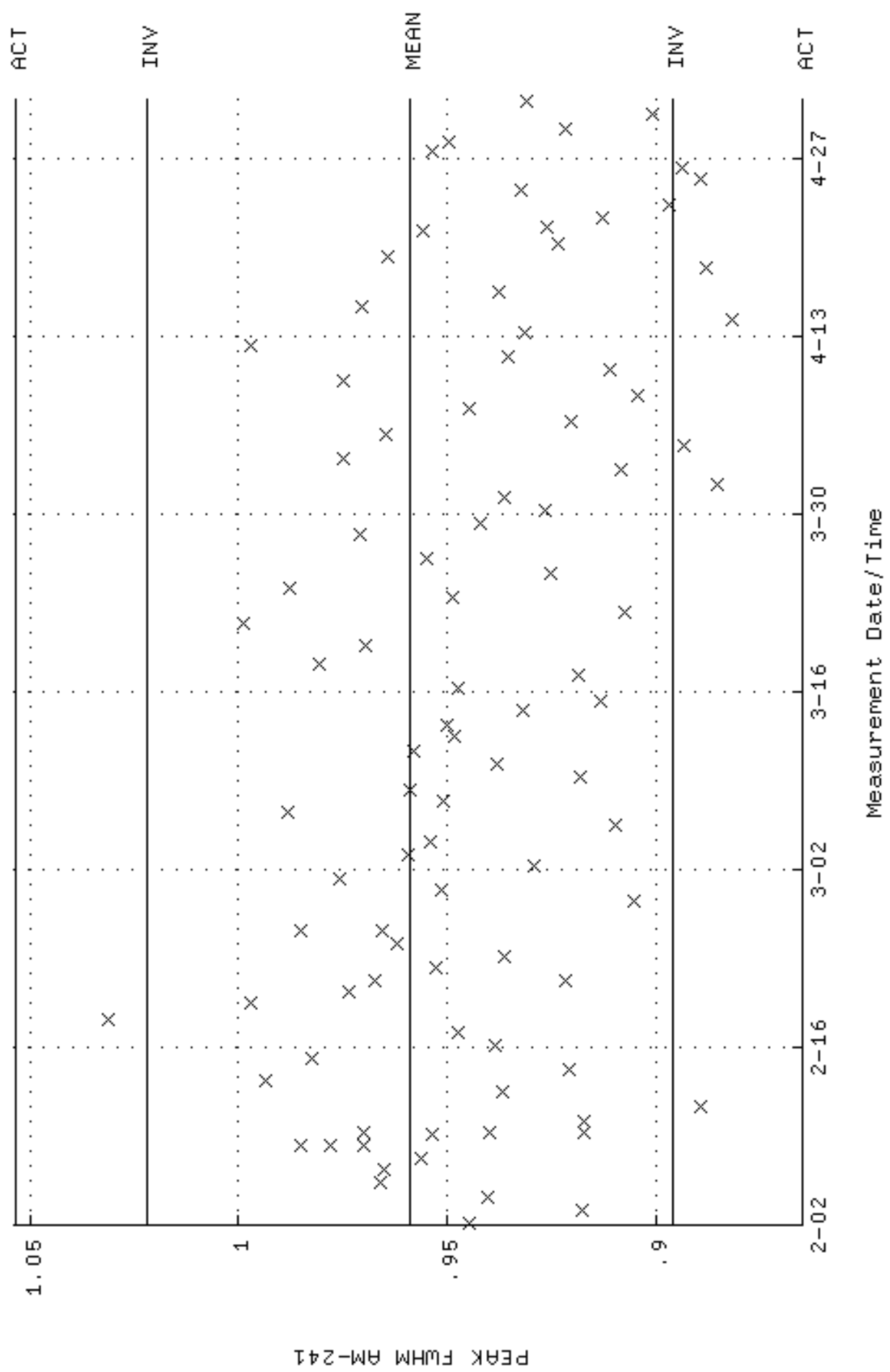
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM38.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 1-MAY-2022 11:27:51 through 7-MAY-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 0.000000E+00



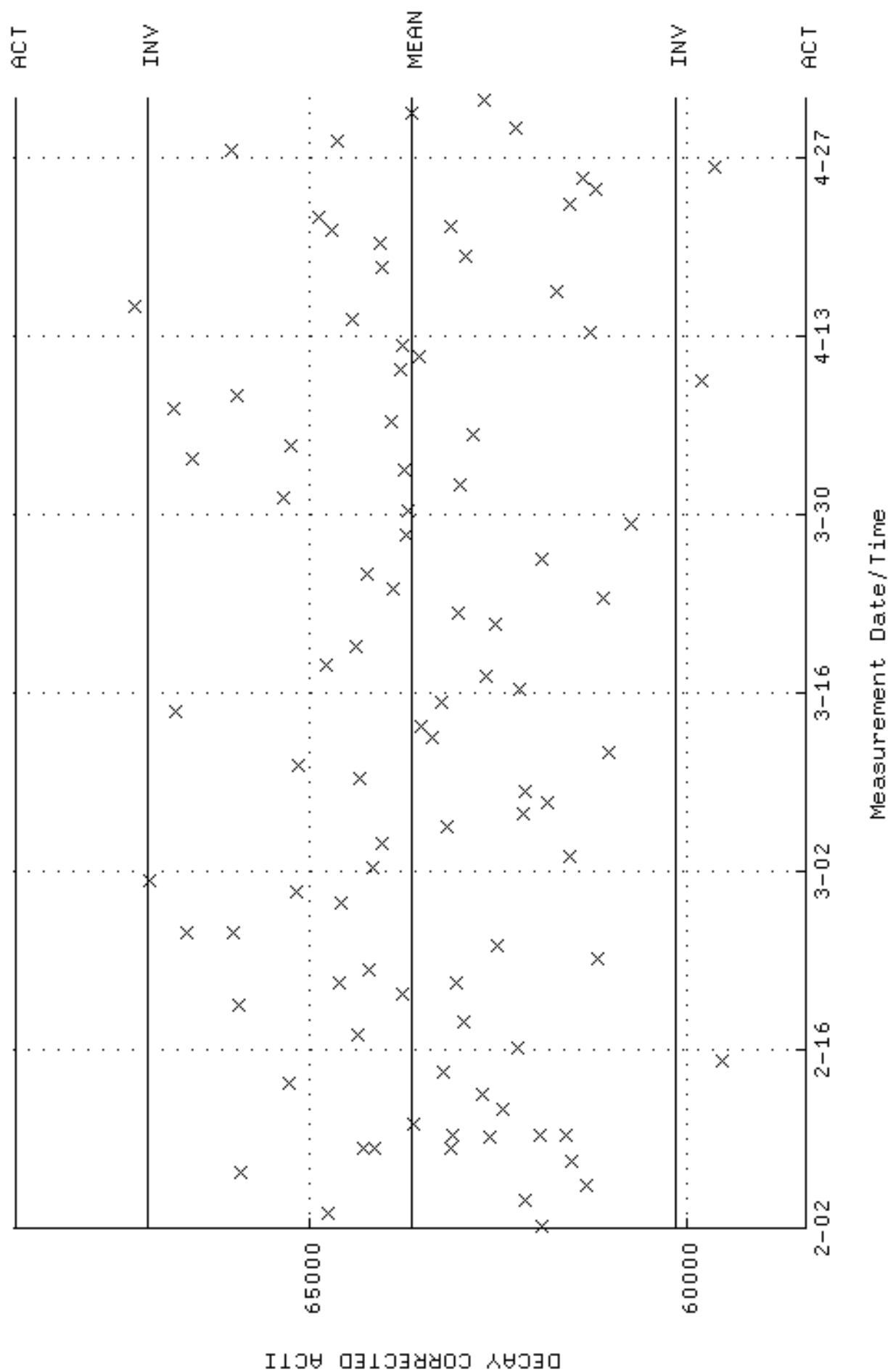
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM40_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-FEB-2022 03:53:09 through 1-MAY-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



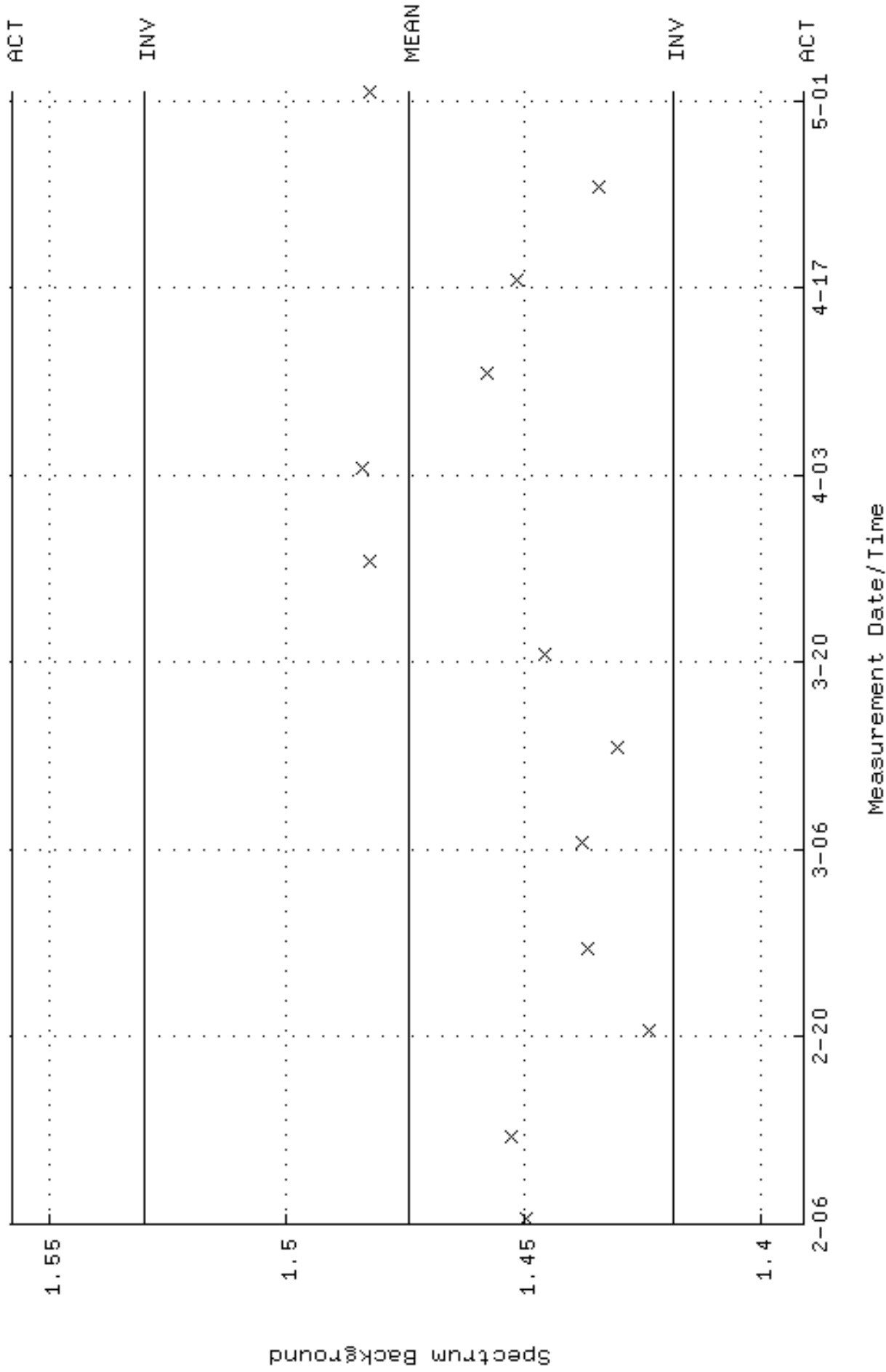
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC_GAM40_CAN.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-FEB-2022 03:53:09 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 0.959091 +- 3.142089E-02 (3.28 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM40-CAN.QAF;1
 Parameter Name : NLACTIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-FEB-2022 03:53:09 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 63652.7 +- 1747.14 (2.74 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM40.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-FEB-2022 11:14:42 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.47438 +- 2.782692E-02 (1.89 %)



RAD Standards Traceability

1298

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

78962-278

200 mL Solid in 250 mL PP MRP Jar

Customer: GEL Laboratories, LLC

P.O. No.: 88007 RD, Item 1

Calibration Date: 01-Jan-2009

12:00 EST

Grams of Master Source: 0.0068241

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* yps/gram	This Source yps	Uncertainty, %			Calibration Method
					Type	u _A	u _F	U
Pb-210	46.5	8145.1	—	1.305E+03	0.30	1.50	3.06	4π LS
Am-241	59.5	157860	—	7.746E+02	0.3	1.5	3.1	4π LS
Cd-109	88.0	462.60	1.694E+05	1.156E+03	0.6	1.7	3.6	HPGe
Co-57	122.1	271.79	8.597E+04	5.867E+02	0.7	1.3	3.0	HPGe
Ce-139	165.9	137.6	1.217E+05	8.305E+02	0.5	1.1	2.4	HPGe
Hg-203	279.2	46.61	2.692E+05	1.837E+03	0.5	1.1	2.4	HPGe
Sn-113	391.7	115.1	1.709E+05	1.166E+03	0.6	1.1	2.5	HPGe
Cs-137	661.7	10983	1.071E+05	7.309E+02	0.7	1.2	2.8	HPGe
Y-88	898.0	106.6	4.084E+05	2.787E+03	0.7	1.1	2.6	HPGe
Co-60	1173.2	1925.4	2.084E+05	1.422E+03	0.8	1.1	2.7	HPGe
Co-60	1332.5	1925.4	2.086E+05	1.424E+03	1.0	1.1	3.0	HPGe
Y-88	1836.1	106.6	4.320E+05	2.948E+03	0.8	1.1	2.7	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

This standard will expire one year after the calibration date.

Source Prepared by: W. Mao

W. Mao, Radiochemist

QA Approved: D. M. Montgomery

D. M. Montgomery, QA Manager

Date: 2-10-09

End of Certificate

RC-S-051-017

Standard Logbook

Serial ID: 1298 Open/Reference Date: 01-JAN-09 Aliquot : 1 mL
Name: Mixed Gamma LCS JAR Received: 12-FEB-09 Density : Hand Calculated
Type: Source Material Expires: 01-JAN-35 Lot Number : 78962-278
Employee: Maggie Stamps Verified: 07-NOV-11
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

JAR

1298

Verification for Mixed Gamma Standard

M. Stamps 11/7/2011	Isotope Am-241	Result pCi/L	Isotopic Abundance: Certificate Value (dps):
	Mixed Gamma N1	60560	0.359
	Mixed Gamma N2	56920	774.6
	Mixed Gamma N3	59450	

Mean Value (Counting) = 101.1344
Stdev = 1865.592
Pass
Rule 3 (Pass/Fail)

Certificate Value = 58315.1
Lower Limit = 55245.48276
Upper Limit = 62707.85057
Rule 1 Pass/Fail Pass
Two sigma = 3731.183905
10 % of Mean = 5897.666667
Rule 2 (Pass/Fail) Pass

Stamp
11/7/11
R. E. Smith
11/18/11

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard 1298 JAR

M. Stamps 11/7/2011	Isotope Cs-137	Result pCi/L	Isotopic Abundance: Certificate Value (dps):	0.851 730.9
	Mixed Gamma N1	24390		
	Mixed Gamma N2	24610		
	Mixed Gamma N3	24450		
Mean Value (Counting) =	24483.33	pCi/L	105.4736	
Stdev =	113.725	pCi/L		
Certificate Value =	23212.8	pCi/L		
Lower Limit =	24255.88371	pCi/L		
Upper Limit =	24710.78296	pCi/L		
Rule 1 Pass/Fail	Fail			
Two sigma =	227.4496281			
10 % of Mean =	2448.333333			
Rule 2 (Pass/Fail)	Pass			

*Exception taken due to the high uncertainty of the certified value

*exception taken due to full recovery of standard

Stamp
11/7/11

R. Futch
11/8/11

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard

1298

JAR

M. Stamps
11/7/2011

Isotope
Co-60 (1332.50)
Mixed Gamma N1
Mixed Gamma N2
Mixed Gamma N3

Result
pCi/L
41290
40800
41060

Isotopic Abundance:
Certificate Value (dps):
0.9998
1424

Mean Value (Counting) =
Stdev =

41050.00
245.153

pCi/L
pCi/L

Fail
Rule 3 (Pass/Fail)

*Exception taken due to the high uncertainty of the certified value

Certificate Value =
Lower Limit =
Upper Limit =
Rule 1 Pass/Fail
Two sigma =
10 % of Mean =
Rule 2 (Pass/Fail)

38494.2
40559.69397
41540.30603
Fail
490.3060269
4105
Pass

pCi/L
pCi/L
pCi/L

*exception taken due to full recovery of standard

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

J. Stamp
11/7/11

R. Fatch
11/8/11

Standard Logbook

Serial ID: 1298 **Open/Reference Date:** 01 JAN 2009 **Aliquot :** 1 mL
Name: Mixed Gamma LCS JAR **Received:** 12 FEB 2009 **Density :** Hand Calculated
Type: Source Material **Expires:** 01 JAN 2035 **Lot Number :** 78962-278
Employee: Maggie Stamps **Verified:** 07 NOV 2011
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

Runlogs

Instrument Run Log

Instrument Type: GAMMA SPECTROMETER

Batch ID: 2264689

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
579287001	SAMPLE	RXF2	GAM14	MAY-17-22 07:56:16	DONE JAR		09-MAY-22 00:00
579287002	SAMPLE	RXF2	GAM24	MAY-17-22 07:56:54	DONE JAR		06-JUL-21 00:00
579287003	SAMPLE	RXF2	GAM33	MAY-17-22 07:57:56	DONE JAR		27-JUL-21 00:00
579287004	SAMPLE	RXF2	GAM38	MAY-17-22 07:58:19	DONE JAR		22-APR-22 00:00
579287005	SAMPLE	RXF2	GAM40	MAY-17-22 07:59:24	DONE JAR		13-OCT-21 00:00
579289001	SAMPLE	RXF2	GAM43	MAY-17-22 07:59:56	DONE JAR		22-MAR-22 00:00
579289002	SAMPLE	RXF2	GAM45	MAY-17-22 08:00:33	DONE JAR		28-FEB-22 00:00
579289003	SAMPLE	RXF2	GAM03	MAY-17-22 09:21:15	DONE JAR		20-APR-22 00:00
1205089187	MB	RXF2	GAM17	MAY-17-22 09:21:48	DONE JAR		06-DEC-21 00:00
1205089189	LCS	RXF2	GAM30	MAY-17-22 09:22:49	DONE JAR		27-SEP-21 00:00
1205089188	DUP	RXF2	GAM24	MAY-17-22 10:06:23	DONE JAR		06-JUL-21 00:00

Gas Flow Raw Data

Batch 2269288 Check-list

This check-list was completed on 27-MAY-22 by Rhonda Birch

This batch was reviewed by Kenshalla Oston on 27-MAY-22 and Rhonda Birch on 27-MAY-22.

Batch ID:
2269288

Product:
GFC90SRF

Description: Gas Flow Strontium 90
GL-RAD-A-004

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
8	Are there any equilibrium assumptions?		No	
Quality Control (QC) Information				
9	Was the method blank (MB) within the acceptance criteria?	Yes		
10	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
11	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Strontium-90 in Filter

Batch ID: 2269288

Analyst: Kaitlyn Painter (KP1)

Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified

Lab SOP: GL-RAD-A-004 REV# 22

Instrument: No instrument-manual method

Due Dates for Lab: 04-JUN-2022

Package: 06-JUN-2022

SDG: 07-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205098590	Strontium-90 SPIKE	1943-C	.1	mL
LCSD	1205098591	Strontium-90 SPIKE	1943-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Initial Wt (g)	Final Wt (g)	Net Weight (mg)	Sr Separation (date)	Strontium Carrier Yield (percent)
1	579287001	25-MAY-2022	3	30	0.11118	0.0351	0.0392	4.1	05/26/22 11:13	97
2	579287002	25-MAY-2022	3	30	0.11549	0.0359	0.0399	4	05/26/22 11:13	94
3	579287003	25-MAY-2022	3	30	0.11403	0.0356	0.0387	3.1	05/26/22 11:13	73
4	579287004	25-MAY-2022	3	30	0.11518	0.0355	0.0384	2.9	05/26/22 11:13	68
5	579287005	25-MAY-2022	3	30	0.11218	0.0356	0.0393	3.7	05/26/22 11:13	87
6	579289001	25-MAY-2022	3	30	0.11084	0.0354	0.0395	4.1	05/26/22 11:13	97
7	579289002	25-MAY-2022	3	30	0.1135	0.0357	0.0396	3.9	05/26/22 11:13	92
8	579289003	25-MAY-2022	3	30	0.11151	0.0352	0.0394	4.2	05/26/22 11:13	99
9	1205098589 MB	25-MAY-2022	3		0.11549	0.0355	0.0387	3.2	05/26/22 11:13	75
10	1205098590 LCS	25-MAY-2022	3		0.11549	0.0357	0.0393	3.6	05/26/22 11:13	85
11	1205098591 LCSD	25-MAY-2022	3		0.11549	0.035	0.0388	3.8	05/26/22 11:13	90

Reagent/Solvent Lot ID	Description	Amount
CARR 3426335	Strontium Carrier 0.5mL=4.24 mg/mL	.5 mL
REGNT 3089697.1	Thymol Blue Indicator 0.04%	1 mL
REGNT 3385163	80% ethanol	3 mL
REGNT 3432260	RGF-0.05M Nitric Acid	15 mL
REGNT 3435861	0.75M Sodium Carbonate	13 mL
REGNT 3437363	3M HNO3 0.05M Oxalic	10 mL
REGNT 3438632	2265975	2 g
REGNT 3440334	RGF-6M Sodium Hydroxide	10 mL
REGNT 3441263	RGF-8M Nitric Acid	40 mL

Comments:

Spike Pipet ID: RAD-GFC-1795419
Carrier Pipet ID: RAD-GFC-2154115
Data Entry Date2: 25-MAY-2022 13:54 GFC-C045440487 Kaitlyn Painter
Data Entry Date3: 25-MAY-2022 00:00

Strontium-90 Filter

Filename : SR90.XLS
 File type : Excel
 Version # : 1.3.10

Carrier S/N : 3426335
 Carrier Exp Date : 4/15/2023
 Carrier Volume Added: 0.50
 Carrier Weight (mg/ml): 8.48
 Carrier Weight StDev.: 0.05

Batch : 2269288
 Analyst : KAI02410
 Prep Date : 5/25/2022
 Method Uncertainty : 0.1315

Procedure Code : GFC90SRF
 Parmname : Strontium-90
 Required MDA : 3 pCi/F
 Sr-90 Abundance : 1.00
 Halflife of Sr-90 : 28.90 years
 Halflife of Y-90 : 64.053 hours

Geometry: Tuffryn Filter

Sample Characteristics					Carrier Calculations				
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Carrier Weight (mg) (Standard)	Net Weight (mg) (Sample)	Net Weight StDev. (mg)	Carrier Aliquot (mL)	Carrier Aliquot StDev. (mL)
1	579287001.1	0.1112	1.2035E-05	3/29/2022 13:03	8.48	4.10	0.024952	0.5	0.001000
2	579287002.1	0.1155	1.2280E-05	3/29/2022 13:11	8.48	4.00	0.024522	0.5	0.001000
3	579287003.1	0.1140	1.2198E-05	3/29/2022 13:22	8.48	3.10	0.020654	0.5	0.001000
4	579287004.1	0.1152	1.2263E-05	3/29/2022 13:31	8.48	2.90	0.019794	0.5	0.001000
5	579287005.1	0.1122	1.2093E-05	3/29/2022 9:30	8.48	3.70	0.023233	0.5	0.001000
6	579289001.1	0.1108	1.2015E-05	3/29/2022 12:48	8.48	4.10	0.024952	0.5	0.001000
7	579289002.1	0.1135	1.2168E-05	3/29/2022 12:55	8.48	3.90	0.024092	0.5	0.001000
8	579289003.1	0.1115	1.2054E-05	3/29/2022 9:00	8.48	4.20	0.025382	0.5	0.001000
9	1205098589.1	0.1155	1.2280E-05	5/25/2022 0:00	8.48	3.20	0.021084	0.5	0.001000
10	1205098590.1	0.1155	1.2280E-05	5/25/2022 0:00	8.48	3.60	0.022803	0.5	0.001000
11	1205098591.1	0.1155	1.2280E-05	5/25/2022 0:00	8.48	3.80	0.023662	0.5	0.001000

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-004
 Instrument SOP: GL-RAD-I-016

Count Raw Data											Calculated	Sample
	Detector	Counting	Gross Counts		Gross Beta	Count	Strontium		Yttrium	Sr-90	Sample	Sample
Pos.	ID	Time (min.)	Alpha	Beta	CPM	Start Date/Time	Separation Date/Time		Ingrowth	Decay	Recovery %	Recovery Error %
1	11A	500	19	535	1.066	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	96.7%	1.06%
2	11B	500	27	953	1.902	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	94.3%	1.07%
3	11C	500	10	271	0.540	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	73.1%	1.13%
4	11D	500	40	411	0.817	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	68.4%	1.15%
5	12A	500	22	320	0.636	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	87.3%	1.08%
6	12C	500	21	307	0.612	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	96.7%	1.06%
7	12D	500	28	526	1.048	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	92.0%	1.07%
8	13B	500	14	569	1.136	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	99.1%	1.06%
9	13D	500	15	295	0.587	5/26/2022 19:10	5/26/2022 11:13		0.123	1.000	75.5%	1.12%
10	8A	60	7	1610	26.828	5/27/2022 10:47	5/26/2022 11:13		0.229	1.000	84.9%	1.09%
11	8D	60	10	1257	20.945	5/26/2022 16:27	5/26/2022 11:13		0.060	1.000	89.6%	1.08%

Calibration Data										
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)		Detector Efficiency Error (cpm/dpm)	Alpha X-Talk	Weekly Bkg CPM	Weekly Bkg Count Start Date/Time	Weekly Bkg Count Time (min.)
1	PIC	4/1/2021	3/31/2023	0.3496	0.4832	0.01317	0.11594	1.088	5/20/2022 19:05	500
2	PIC	4/1/2021	3/31/2023	0.3542	0.5237	0.00697	0.06801	1.672	5/20/2022 19:06	500
3	PIC	4/1/2021	3/31/2023	0.3534	0.5143	0.01278	0.08535	0.640	5/20/2022 19:06	500
4	PIC	4/1/2021	3/31/2023	0.3513	0.5255	0.01068	0.06004	0.816	5/20/2022 19:06	500
5	PIC	4/1/2021	3/31/2023	0.3515	0.5038	0.01964	0.09257	0.526	5/20/2022 19:06	500
6	PIC	4/1/2021	3/31/2023	0.3501	0.5175	0.01666	0.05110	0.594	5/20/2022 19:06	500
7	PIC	4/1/2021	3/31/2023	0.3509	0.5179	0.01845	0.06858	0.908	5/20/2022 19:06	500
8	PIC	4/1/2021	3/31/2023	0.3524	0.5164	0.00967	0.05916	0.970	5/20/2022 19:07	1000
9	PIC	4/1/2021	3/31/2023	0.3519	0.5115	0.01144	0.09377	0.688	5/20/2022 19:07	1000
10	PIC	4/1/2021	3/31/2023	0.3563	0.5214	0.01579	0.04450	0.470	5/20/2022 19:06	500
11	PIC	4/1/2021	3/31/2023	0.3666	0.5289	0.00609	0.02999	1.086	5/20/2022 19:06	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1943-C
LCS Exp Date : 1/4/2023
LCS Activity (dpm/ml): 521.97
LCS Volume Added: 0.10

Results																	Scanned Detector
Pos.	Decision Level pCi/F	Critical Level pCi/F	Required MDA pCi/F	MDA pCi/F	Sample Act. Conc. pCi/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/F	2 SIGMA Total Prop. Uncertainty pCi/F	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery	
1	1.5809	1.1161	3	2.2939	-0.2304	292.92%	-0.0224	0.0656	1.3230	1.3230		SAMPLE					
2	1.8895	1.3340	3	2.7274	2.2839	36.73%	0.2303	0.0845	1.6432	1.7467		SAMPLE					
3	1.5346	1.0834	3	2.2449	-1.2979	48.76%	-0.0997	0.0486	1.2396	1.2396		SAMPLE					
4	1.8370	1.2969	3	2.6767	0.0165	4775.38%	0.0012	0.0572	1.5459	1.5459		SAMPLE					
5	1.1939	0.8429	3	1.7528	1.2280	43.91%	0.1099	0.0482	1.0555	1.1042		SAMPLE					
6	1.1582	0.8177	3	1.6966	0.1821	275.07%	0.0179	0.0491	0.9816	0.9827		SAMPLE					
7	1.4670	1.0357	3	2.1341	1.4643	44.68%	0.1402	0.0625	1.2808	1.3377		SAMPLE					
8	1.2372	0.8735	3	1.8060	1.6373	34.26%	0.1663	0.0569	1.0986	1.1782		SAMPLE					
9	1.3190	0.9312	3	1.9373	-1.2562	42.84%	-0.1008	0.0432	1.0540	1.0540		MB					
10	2.1069	1.4875	3	3.4577	254.4655	3.18%	26.3581	0.6694	12.6662	67.9384		LCS			203.5886	125.0%	
11	3.6232	2.5580	3	5.6621	216.8937	3.23%	19.8590	0.5927	12.6869	57.6233		LCSD	15.9%		203.5886	106.5%	

Results (DPM)															
Decision Level DPM/F	Critical Level DPM/F	Required MDA DPM/F	MDA DPM/F	Sample Act. Conc. DPM/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	1 SIGMA Counting Uncertainty DPM/F	1 SIGMA Total Prop. Uncertainty DPM/F	Sample QC	Sample Type	RPD	RER	Nominal DPM/F	Recovery
3.5095	2.4777	6.66	5.0925	-0.5116	292.92%	-0.0224	0.0656	2.9370	2.9370		SAMPLE				
4.1946	2.9614	6.66	6.0549	5.0703	36.73%	0.2303	0.0845	3.6480	3.8777		SAMPLE				
3.4067	2.4052	6.66	4.9838	-2.8813	48.76%	-0.0997	0.0486	2.7519	2.7519		SAMPLE				
4.0781	2.8792	6.66	5.9422	0.0367	4775.38%	0.0012	0.0572	3.4318	3.4318		SAMPLE				
2.6504	1.8712	6.66	3.8913	2.7261	43.91%	0.1099	0.0482	2.3431	2.4514		SAMPLE				
2.5712	1.8153	6.66	3.7664	0.4042	275.07%	0.0179	0.0491	2.1791	2.1817		SAMPLE				
3.2567	2.2993	6.66	4.7377	3.2507	44.68%	0.1402	0.0625	2.8433	2.9696		SAMPLE				
2.7466	1.9391	6.66	4.0093	3.6349	34.26%	0.1663	0.0569	2.4389	2.6156		SAMPLE				
2.9283	2.0674	6.66	4.3007	-2.7888	42.84%	-0.1008	0.0432	2.3398	2.3399		MB				
4.6774	3.3023	6.66	7.6762	564.9134	3.18%	26.3581	0.6694	28.1189	150.8233		LCS			451.97	125.0%
8.0435	5.6788	6.66	12.5699	481.5041	3.23%	19.8590	0.5927	28.1650	127.9236		LCSD	15.9%		451.97	106.5%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
579287001	11A	500	19	535	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
579287002	11B	500	27	953	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
579287003	11C	500	10	271	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
579287004	11D	500	40	411	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
579287005	12A	500	22	320	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
579289001	12C	500	21	307	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
579289002	12D	500	28	526	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
579289003	13B	500	14	569	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
1205098589	13D	500	15	295	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
1205098590	8A	60	7	1610	5/27/2022 10:47	5/27/2022 11:47	PIC	2269288
1205098591	8D	60	10	1257	5/26/2022 16:27	5/26/2022 17:27	PIC	2269288

Batch 2269289 Check-list

This check-list was completed on 03-JUN-22 by Rhonda Birch

This batch was reviewed by Kenshalla Oston on 03-JUN-22 and Rhonda Birch on 03-JUN-22.

Batch ID:
2269289

Product:
GFCTORAF

Description: Gas Flow Total Radium
GL-RAD-A-010

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?		No	
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Total Radium in Filter

Batch ID: 2269289

Analyst: Jasmine Conley (JXC9)
 Prep: Kyle Hollandsworth (KH1)
Method: EPA 900.1 Mod/ EPA 903.0 Mod
Lab SOP: GL-RAD-A-010 REV# 21
Instrument: No instrument-manual method

Due Dates for Lab: 04-JUN-2022

Package: 06-JUN-2022

SDG: 07-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205098593		1926-C	.1	mL
LCSD	1205098594		1926-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Precipitation (date)	Initial Weight (g)	Final Weight (g)	Net Weight (mg)	Barium Carrier Yield (percent)
1	579287001	25-MAY-2022	1	1	0.00371	05/29/22 11:36	0.0885	0.1129	24.4	95
2	579287002	25-MAY-2022	1	1	0.00385	05/29/22 11:36	0.0886	0.1107	22.1	86
3	579287003	25-MAY-2022	1	1	0.0038	05/29/22 11:36	0.0876	0.1133	25.7	100
4	579287004	25-MAY-2022	1	1	0.00384	05/29/22 11:36	0.0874	0.1121	24.7	97
5	579287005	25-MAY-2022	1	1	0.00374	05/29/22 11:36	0.0875	0.1125	25	98
6	1205098592 MB	25-MAY-2022	1		0.00385	05/29/22 11:36	0.0881	0.113	24.9	97
7	1205098593 LCS	25-MAY-2022	1		0.00385	05/29/22 11:36	0.0889	0.1129	24	94
8	1205098594 LCSD	25-MAY-2022	1		0.00385	05/29/22 11:36	0.0879	0.1113	23.4	91

Reagent/Solvent Lot ID	Description	Amount
CARR 3437074	Barium Carrier TR 1ml=25.58mg	1 mL
REGNT 3439264	1:1 Sulfuric Acid	10 mL

Comments:

Pipet ID: RAD-GFC-1795419
 Pipet ID: RAD-GFC-1608405
 Data Entry Date2: 25-MAY-2022 12:39 GFC-C049640304 Jasmine Conley
 Data Entry Date3: 25-MAY-2022 12:39 RADMAN Jasmine Conley
 Data Entry Date4: 25-MAY-2022 00:00
 Data Entry Date5: 25-MAY-2022 12:39 RADMAN Jasmine Conley

Total Radium Filter

Filename : TOTRA.XLS
File type : Excel
Version # : 1.3.9

Carrier S/N : 3437074
Carrier Exp Date : 5/11/2023
Carrier Volume Added: 1.00
Carrier Weight (mg/ml): 25.58
Carrier Weight StDev.: 0.05

Batch : 2269289
Analyst : JXC9
Prep Date : 5/25/2022
Method Uncertainty: 0.0802

Procedure Code : GFCTORAF
Parmname : Total Radium
Required MDA : 1 pCi/F
Half-life of Rn-222 : 3.8235 days

Geometry: 47mm Filter

Sample Characteristics					Carrier Calculations				
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Carrier Weight (mg) (Standard)	Residue Weight (mg) (Sample)	Residue Weight StDev. (mg)	Carrier Aliquot (mL)	Carrier Aliquot StDev. (mL)
1	579287001.1	0.0037	3.6031E-06	3/29/2022 13:03	25.58	24.40	0.112201	1.0	0.002000
2	579287002.1	0.0038	3.6178E-06	3/29/2022 13:11	25.58	22.10	0.102316	1.0	0.002000
3	579287003.1	0.0038	3.6128E-06	3/29/2022 13:22	25.58	25.70	0.117789	1.0	0.002000
4	579287004.1	0.0038	3.6168E-06	3/29/2022 13:31	25.58	24.70	0.113491	1.0	0.002000
5	579287005.1	0.0037	3.6065E-06	3/29/2022 9:30	25.58	25.00	0.114780	1.0	0.002000
6	1205098592.1	0.0038	3.6178E-06	5/25/2022 0:00	25.58	24.90	0.114350	1.0	0.002000
7	1205098593.1	0.0038	3.6178E-06	5/25/2022 0:00	25.58	24.00	0.110482	1.0	0.002000
8	1205098594.1	0.0038	3.6178E-06	5/25/2022 0:00	25.58	23.40	0.107903	1.0	0.002000

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml
 Pipet, 5 ml Stdev : +/- 0.010000 ml

Analytical SOP: GL-RAD-A-010
 Instrument SOP: GL-RAD-I-016

Count Raw Data										
Pos.	Detector ID	Counting	Gross Counts		Gross Alpha	Count	Precipitation Date/Time	Ingrowth factor	Calculated	Sample
		Time (min.)	Alpha	Beta	CPM	Start Date/Time			Recovery %	Recovery Error %
1	3B	500	37	298	0.074	5/31/2022 18:51	5/29/2022 11:36	2.085	95.4%	0.71%
2	3C	500	33	559	0.066	5/31/2022 18:51	5/29/2022 11:36	2.085	86.4%	0.71%
3	3D	500	29	407	0.058	5/31/2022 18:51	5/29/2022 11:36	2.085	100%	0.71%
4	4A	500	48	317	0.096	5/31/2022 18:52	5/29/2022 11:36	2.085	96.6%	0.71%
5	4B	500	62	626	0.124	5/31/2022 18:52	5/29/2022 11:36	2.085	97.7%	0.71%
6	4C	500	76	384	0.152	5/31/2022 18:51	5/29/2022 11:36	2.085	97.3%	0.71%
7	7B	60	7962	7169	132.700	5/31/2022 17:29	5/29/2022 11:36	2.011	93.8%	0.71%
8	14D	60	5979	8078	99.650	5/31/2022 17:27	5/29/2022 11:36	2.010	91.5%	0.71%

Calibration Data									
Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Beta X-Talk	Weekly Bkg /Weekly Bkg CPM	Weekly Bkg Count Start Date/Time	Weekly Bkg Count Time (min.)	
PIC	6/1/2021	5/31/2022	0.3071	0.00853	0.00011	0.024	5/28/2022 12:39	500	
PIC	6/1/2021	5/31/2022	0.3017	0.00568	0.00010	0.050	5/28/2022 12:39	500	
PIC	6/1/2021	5/31/2022	0.3030	0.00657	0.00012	0.022	5/28/2022 12:39	500	
PIC	6/1/2021	5/31/2022	0.3062	0.01036	0.00305	0.084	5/28/2022 12:39	500	
PIC	6/1/2021	5/31/2022	0.2595	0.00704	0.00006	0.028	5/28/2022 12:39	500	
PIC	6/1/2021	5/31/2022	0.3131	0.01587	0.00492	0.214	5/28/2022 12:39	500	
PIC	6/1/2021	5/31/2022	0.2979	0.00479	0.00063	0.060	5/28/2022 12:40	500	
PIC	6/1/2021	5/31/2022	0.2730	0.01512	0.00010	0.072	5/28/2022 12:41	500	

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1926-C
LCS Exp Date : 9/15/2022
LCS Activity (dpm/ml): 2404.00
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/F	Critical Level pCi/F	Required MDA pCi/F	MDA pCi/F	Sample Act. Conc. pCi/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/F	2 SIGMA Total Prop. Uncertainty pCi/F	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery
1	4.5430	3.2074	1	7.6089	9.9365	28.02%	0.0500	0.0140	5.4606	5.6843		SAMPLE				
2	7.0951	5.0092	1	11.3104	3.4222	95.20%	0.0160	0.0152	6.4282	6.4513		SAMPLE				
3	4.0803	2.8807	1	6.8816	6.7028	35.15%	0.0360	0.0126	4.6282	4.7490		SAMPLE				
4	8.1279	5.7384	1	12.6186	1.9155	158.12%	0.0120	0.0190	7.0772	7.0865		SAMPLE				
5	5.6173	3.9659	1	9.2986	21.8509	18.19%	0.0960	0.0174	7.7849	8.5210		SAMPLE				
6	12.5546	8.8636	1	18.8323	-12.1138	43.67%	-0.0620	0.0271	9.7661	9.7663		MB				
7	16.2335	11.4610	1	33.3312	27597.9393	1.41%	132.6400	1.4872	606.8415	4407.5157		LCS			28129.8362	98.1%
8	19.9080	14.0552	1	39.7635	23204.8274	2.12%	99.5780	1.2888	588.7213	3772.8464		LCSD	17.3%		28129.8362	82.5%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
579287001	3B	500	37	298	5/31/2022 18:51	6/1/2022 3:11	PIC	2269289
579287002	3C	500	33	559	5/31/2022 18:51	6/1/2022 3:11	PIC	2269289
579287003	3D	500	29	407	5/31/2022 18:51	6/1/2022 3:11	PIC	2269289
579287004	4A	500	48	317	5/31/2022 18:52	6/1/2022 3:12	PIC	2269289
579287005	4B	500	62	626	5/31/2022 18:52	6/1/2022 3:12	PIC	2269289
1205098592	4C	500	76	384	5/31/2022 18:51	6/1/2022 3:11	PIC	2269289
1205098593	7B	60	7962	7169	5/31/2022 17:29	5/31/2022 18:29	PIC	2269289
1205098594	14D	60	5979	8078	5/31/2022 17:27	5/31/2022 18:27	PIC	2269289

Batch 2269287 Check-list

This check-list was completed on 02-JUN-22 by Kenshalla Oston

This batch was reviewed by Kenshalla Oston on 02-JUN-22 and Rhonda Birch on 02-JUN-22.

Batch ID:
2269287

Product:
GFC28RAF

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?		No	
11	Has the method required detection limit been met?		No	
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Filter

Batch ID: 2269287
Analyst: Jasmine Conley (JXC9)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: LSC-J93763

Due Dates for Lab: 04-JUN-2022			Package: 06-JUN-2022	SDG: 07-JUN-2022		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205098587	Radium-228		1965-C	.1	mL
LCSD	1205098588	Radium-228		1965-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	579287001	24-MAY-2022	1	30	0.11118	05/27/22 07:20	06/01/22 08:46
2	579287002	24-MAY-2022	1	30	0.11549	05/27/22 07:20	06/01/22 08:46
3	579287003	24-MAY-2022	1	30	0.11403	05/27/22 07:20	06/01/22 08:46
4	579287004	24-MAY-2022	1	30	0.11518	05/27/22 07:20	06/01/22 08:46
5	579287005	24-MAY-2022	1	30	0.11218	05/27/22 07:20	06/01/22 08:46
6	1205098586 MB	24-MAY-2022	1		0.11549	05/27/22 07:20	06/01/22 08:46
7	1205098587 LCS	24-MAY-2022	1		0.11549	05/27/22 07:20	06/01/22 08:46
8	1205098588 LCSD	24-MAY-2022	1		0.11549	05/27/22 07:20	06/01/22 08:46

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-C	Barium-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 24-MAY-2022 00:00
REGNT 3411398	Barium Carrier Ra228 REG	1 mL	
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3417468	RGF-1M Citric Acid	5 mL	
REGNT 3424040	7M Nitric Acid	25 mL	
REGNT 3424228	RGF-Neodymium Substrate	5 mL	
REGNT 3424651.3	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3426198	2M HCl	20 mL	
REGNT 3430182.12	HF (48-50%)	4 mL	
REGNT 3431618.7	Nitric Acid	5 mL	
REGNT 3432370	Test batches: 2259234	2 g	
REGNT 3435259	RGF-1.5M Ammonium Sulfate	10 mL	

Radium-228 Filter

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.2

Tracer S/N : 1951-C
 Tracer Exp Date : 9/16/2022
 Tracer Volume Added: 0.10

Batch : 2269287
 Analyst : JAS02031
 Prep Date : 5/24/2022
 Ra-228 Method Uncertainty : 0

Procedure Code : GFC28RAF
 Parmname : Radium-228
 Required MDA : 1 pCi/F
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations					
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	579287001.1	0.1112	1.2035E-05	3/29/2022 13:03	1383.2	1.55%	725.2	2.14%	0.1	0.000200
2	579287002.1	0.1155	1.2280E-05	3/29/2022 13:11	1383.2	1.55%	910.2	1.91%	0.1	0.000200
3	579287003.1	0.1140	1.2198E-05	3/29/2022 13:22	1383.2	1.55%	904.9	1.92%	0.1	0.000200
4	579287004.1	0.1152	1.2263E-05	3/29/2022 13:31	1383.2	1.55%	898.2	1.93%	0.1	0.000200
5	579287005.1	0.1122	1.2093E-05	3/29/2022 9:30	1383.2	1.55%	1126.2	1.72%	0.1	0.000200
6	1205098586.1	0.1155	1.2280E-05	5/24/2022 0:00	1383.2	1.55%	1198.8	1.67%	0.1	0.000200
7	1205098587.1	0.1155	1.2280E-05	5/24/2022 0:00	1383.2	1.55%	1209.8	1.66%	0.1	0.000200
8	1205098588.1	0.1155	1.2280E-05	5/24/2022 0:00	1383.2	1.55%	887.7	1.94%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
1	5D	90	36	109	1.211	6/1/2022 10:49	5/27/2022 7:20	6/1/2022 8:46	0.979	0.793	1.000	1.087	52.4%	1.35%
2	6A	90	29	147	1.633	6/1/2022 10:49	5/27/2022 7:20	6/1/2022 8:46	0.979	0.793	1.000	1.087	65.8%	1.26%
3	6B	90	36	130	1.444	6/1/2022 10:49	5/27/2022 7:20	6/1/2022 8:46	0.979	0.792	1.000	1.087	65.4%	1.27%
4	7A	90	24	135	1.500	6/1/2022 10:49	5/27/2022 7:20	6/1/2022 8:46	0.979	0.792	1.000	1.087	64.9%	1.27%
5	7B	90	23	58	0.644	6/1/2022 10:50	5/27/2022 7:20	6/1/2022 8:46	0.979	0.792	1.000	1.087	81.4%	1.19%
6	7C	90	34	121	1.344	6/1/2022 10:49	5/27/2022 7:20	6/1/2022 8:46	0.997	0.793	1.000	1.087	86.7%	1.17%
7	8A	60	28	931	15.517	6/1/2022 10:49	5/27/2022 7:20	6/1/2022 8:46	0.997	0.793	1.000	1.057	87.5%	1.17%
8	8B	60	8	597	9.950	6/1/2022 10:49	5/27/2022 7:20	6/1/2022 8:46	0.997	0.793	1.000	1.057	64.2%	1.27%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6236	0.00925	0.932	5/28/2022 12:40	500
2	PIC	6/1/2022	5/31/2023	0.6328	0.02228	1.072	5/28/2022 12:40	500
3	PIC	6/1/2022	5/31/2023	0.6280	0.00851	0.734	5/28/2022 12:40	500
4	PIC	6/1/2022	5/31/2023	0.6257	0.00594	1.142	5/28/2022 12:40	500
5	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.670	5/28/2022 12:40	500
6	PIC	6/1/2022	5/31/2023	0.6407	0.00790	1.086	5/28/2022 12:40	500
7	PIC	6/1/2022	5/31/2023	0.6398	0.01579	0.984	5/28/2022 12:41	500
8	PIC	6/1/2022	5/31/2023	0.6437	0.02148	1.294	5/28/2022 12:41	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1965-C
LCS Exp Date : 8/5/2022
LCS Activity (dpm/ml): 309.31
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/F	Critical Level pCi/F	Required MDA pCi/F	MDA pCi/F	Sample Act. Conc. pCi/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/F	2 SIGMA Total Prop. Uncertainty pCi/F	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery
1	4.4697	3.1557	1	6.8898	4.8437	44.38%	0.2791	0.1238	4.2101	4.2130		SAMPLE				
2	3.6242	2.5587	1	5.5547	7.3647	25.51%	0.5613	0.1425	3.6632	3.6818		SAMPLE				
3	3.0788	2.1737	1	4.7963	9.5695	18.69%	0.7104	0.1324	3.4942	3.5059		SAMPLE				
4	3.8450	2.7146	1	5.8788	4.8281	38.48%	0.3580	0.1377	3.6388	3.6412		SAMPLE				
5	2.3711	1.6740	1	3.7100	-0.2775	360.78%	-0.0256	0.0922	1.9621	1.9621		SAMPLE				
6	2.6826	1.8940	1	4.1096	2.4937	50.63%	0.2584	0.1308	2.4738	2.4747		MB				
7	2.9421	2.0772	1	4.6202	135.3995	4.03%	14.5327	0.5105	9.3218	10.6820		LCS			120.6422	112.2%
8	4.5704	3.2267	1	7.0845	109.2483	5.36%	8.6560	0.4104	10.1520	11.4744		LCSD	21.4%		120.6422	90.6%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
579287001	5D	90	36	109	6/1/2022 10:49	6/1/2022 12:19	PIC	2269287
579287002	6A	90	29	147	6/1/2022 10:49	6/1/2022 12:19	PIC	2269287
579287003	6B	90	36	130	6/1/2022 10:49	6/1/2022 12:19	PIC	2269287
579287004	7A	90	24	135	6/1/2022 10:49	6/1/2022 12:19	PIC	2269287
579287005	7B	90	23	58	6/1/2022 10:50	6/1/2022 12:20	PIC	2269287
1205098586	7C	90	34	121	6/1/2022 10:49	6/1/2022 12:19	PIC	2269287
1205098587	8A	60	28	931	6/1/2022 10:49	6/1/2022 11:49	PIC	2269287
1205098588	8B	60	8	597	6/1/2022 10:49	6/1/2022 11:49	PIC	2269287

ASSAY 1-Jun-22 10:19:21
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 6/1/2022
 Run id. 5070

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF	1	87	1	180	4150.28	1383.18	1.55		10:19:21
579287001	2	87	2	180	2176	725.18	2.14	52.43	10:22:35
579287002	3	87	3	180	2731	910.23	1.91	65.81	10:25:49
579287003	4	87	4	180	2715.28	904.91	1.92	65.42	10:29:03
579287004	5	87	5	180	2695.28	898.17	1.93	64.94	10:32:17
579287005	1	6	1	180	3379.28	1126.21	1.72	81.42	10:35:53
1205098586	2	6	2	180	3597	1198.77	1.67	86.67	10:39:07
1205098587	3	6	3	180	3630	1209.76	1.66	87.46	10:42:21
1205098588	4	6	4	180	2663.57	887.68	1.94	64.18	10:45:35

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 26-May-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	Above	Beta bkg	26-May 03:43	60	2.417	-2.15E-1	2.577	+2.66
LB4100E2	Above	Alpha bkg	26-May 03:43	60	0.367	-1.22E-1	0.368	+2.98
LB4100E2	Above	Beta bkg	26-May 03:43	60	2.333	1.386	3.015	+0.49
LB4100E2	need 2nd	Beta eff	26-May 05:25	5	14481	14390	15890	-2.64
LB4100E3	Below	Beta XTalk	26-May 06:43	5	1.36E-4	1.38E-4	5.47E-4	-3.03
LB4100F3	Above	Alpha bkg	26-May 03:43	60	0.367	0.119	0.404	+2.22
LB4100G1	Above	Alpha XTalk	26-May 05:10	5	1.131	0.088	0.447	+14.46
LB4100G1	Above	Beta bkg	26-May 03:44	60	9686	0.380	1.675	+44,881.17
LB4100G1	Above	Beta eff	26-May 05:18	5	23058	12880	18320	+8.23
LB4100G2	Above	Alpha eff	26-May 05:10	5	9660	7308	9581	+3.21
LB4100G2	need 2nd	Alpha XTalk	26-May 05:10	5	0.330	0.324	0.423	-2.64
LB4100G2	Above	Beta bkg	26-May 03:44	60	100	1.159	2.203	+565.24
LB4100G3	need 2nd	Alpha eff	26-May 05:10	5	6731	6620	7779	-2.42
LB4100G3	Above	Beta bkg	26-May 03:44	60	6.900	0.810	1.674	+39.29
PIC10B	Above	Beta bkg	26-May 11:41	60	2.083	-1.04E-1	2.645	+1.77
PIC12B	Above	Alpha bkg	26-May 08:30	60	0.633	-4.23E-2	0.379	+6.62

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by



Date

5/31/22

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 27-May-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	need 2nd	Alpha bkg	27-May 03:59	60	0.117	-1.22E-1	0.368	-0.08
LB4100E2	Above	Beta bkg	27-May 03:59	60	2.167	1.386	3.015	-0.12
LB4100F3	Above	Alpha bkg	27-May 03:59	60	0.333	0.119	0.404	+1.51
LB4100F3	Above	Beta bkg	27-May 03:59	60	72.567	0.854	1.842	+432.42
LB4100G1	need 2nd	Alpha XTalk	27-May 05:02	5	0.293	0.088	0.447	+0.42
LB4100G1	Above	Beta bkg	27-May 04:00	60	611	0.380	1.675	+2,827.57
LB4100G1	Above	Beta eff	27-May 05:15	5	24018	12880	18320	+9.28
LB4100G2	Above	Alpha eff	27-May 05:02	5	9648	7308	9581	+3.18
LB4100G2	Above	Beta bkg	27-May 04:00	60	4.550	1.159	2.203	+16.49
LB4100G3	Below	Alpha bkg	27-May 04:00	60	0.00E+0	0.002	0.276	-3.05
LB4100G3	Above	Beta bkg	27-May 04:00	60	6.767	0.810	1.674	+38.37
PIC2D	Above	Alpha bkg	27-May 07:12	60	0.350	-6.13E-2	0.350	+2.99
PIC2D	Above	Beta bkg	27-May 07:12	60	2.483	0.171	2.681	+2.53
PIC6C	Above	Beta bkg	27-May 07:01	60	2.200	0.415	2.299	+2.68
PIC7D	Above	Alpha bkg	27-May 07:01	60	0.350	-1.70E-2	0.435	+1.87
PIC10B	Above	Beta bkg	27-May 07:01	60	2.150	-1.04E-1	2.645	+1.92
PIC12B	Above	Alpha bkg	27-May 07:13	60	0.733	-4.23E-2	0.379	+8.05

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
 LB4100C2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
 LB4100C3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
 LB4100C4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
 LB4100I1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
 LB4100I2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
 LB4100I3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
 LB4100I4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by *James O'Rourke*

Date 5/27/22

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 31-May-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
G5400W1X	Above	Alpha bkg	31-May 04:06	60	0.200	-4.49E-2	0.194	+3.16
LB4100E2	Above	Beta bkg	31-May 03:36	60	2.583	1.386	3.015	+1.41
LB4100F3	Above	Alpha bkg	31-May 05:12	60	0.433	0.119	0.404	+3.62
LB4100G1	Above	Alpha XTalk	31-May 04:43	5	0.985	0.088	0.447	+12.01
LB4100G1	Above	Beta bkg	31-May 03:36	60	7780	0.380	1.675	+36,046.06
LB4100G1	Above	Beta eff	31-May 04:51	5	21158	12880	18320	+6.13
LB4100G2	Above	Alpha eff	31-May 04:43	5	10241	7308	9581	+4.74
LB4100G2	Below	Alpha XTalk	31-May 04:43	5	0.310	0.324	0.423	-3.82
LB4100G2	Above	Beta bkg	31-May 03:36	60	44.067	1.159	2.203	+243.60
LB4100G3	Above	Beta bkg	31-May 03:36	60	6.483	0.810	1.674	+36.40
LB4100H4	Above	Alpha eff	31-May 05:14	5	10327	6065	9898	+3.67
PIC2D	Above	Beta bkg	31-May 06:23	60	2.100	0.171	2.681	+1.61
PIC5C	Above	Beta bkg	31-May 06:36	60	2.017	-4.87E-1	2.075	+2.86
PIC6C	Above	Beta bkg	31-May 06:36	60	2.583	0.415	2.299	+3.91
PIC7D	Above	Alpha bkg	31-May 07:47	60	0.350	-1.70E-2	0.435	+1.87
PIC11D	Above	Alpha bkg	31-May 07:01	60	0.350	-4.15E-2	0.378	+2.60
PIC12B	Above	Alpha bkg	31-May 05:48	60	0.717	-4.23E-2	0.379	+7.81
PIC12B	Above	Beta bkg	31-May 05:48	60	2.167	0.269	2.358	+2.45
PIC14C	Above	Beta bkg	31-May 07:01	60	2.133	0.197	2.388	+2.30

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB410014

Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Yann Dushen

Date 5/31/22

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 01-Jun-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	01-Jun 03:35	60	2.617	1.386	3.015	+1.53
LB4100E3	Above	Beta bkg	01-Jun 06:04	60	2.050	0.506	2.576	+1.48
LB4100F3	Above	Beta bkg	01-Jun 05:02	60	7.417	0.854	1.842	+36.85
LB4100G1	Above	Alpha XTalk	01-Jun 04:38	5	1.325	0.088	0.447	+17.70
LB4100G1	Above	Beta bkg	01-Jun 03:36	60	13490	0.380	1.675	+62,508.44
LB4100G1	Above	Beta eff	01-Jun 04:51	5	24326	12880	18320	+9.62
LB4100G2	Above	Alpha eff	01-Jun 04:38	5	9729	7308	9581	+3.39
LB4100G2	need 2nd	Alpha XTalk	01-Jun 04:38	5	0.325	0.324	0.423	-2.95
LB4100G2	Above	Beta bkg	01-Jun 03:36	60	5.783	1.159	2.203	+23.58
LB4100G3	Above	Beta bkg	01-Jun 03:36	60	6.800	0.810	1.674	+38.60
PIC2D	Below	Alpha XTalk	01-Jun 04:46	5	0.249	0.250	0.298	-3.18
PIC2D	Above	Beta bkg	01-Jun 07:10	60	2.250	0.171	2.681	+1.97
PIC5C	Below	Alpha eff	01-Jun 04:58	5	8528	8546	10420	-3.06
PIC5C	Above	Beta bkg	01-Jun 06:19	60	2.083	-4.87E-1	2.075	+3.02
PIC6C	Above	Beta bkg	01-Jun 06:19	60	2.417	0.415	2.299	+3.37
PIC7D	Above	Alpha bkg	01-Jun 07:31	60	0.333	-1.70E-2	0.435	+1.65
PIC12B	Above	Alpha bkg	01-Jun 05:27	60	0.917	-4.23E-2	0.379	+10.66
PIC12B	need 2nd	Beta bkg	01-Jun 05:27	60	1.650	0.269	2.358	+0.97
PIC12B	Above	Beta eff	01-Jun 05:20	5	22368	20640	22160	+3.82
PIC14C	Above	Beta bkg	01-Jun 07:43	60	2.167	0.197	2.388	+2.39

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

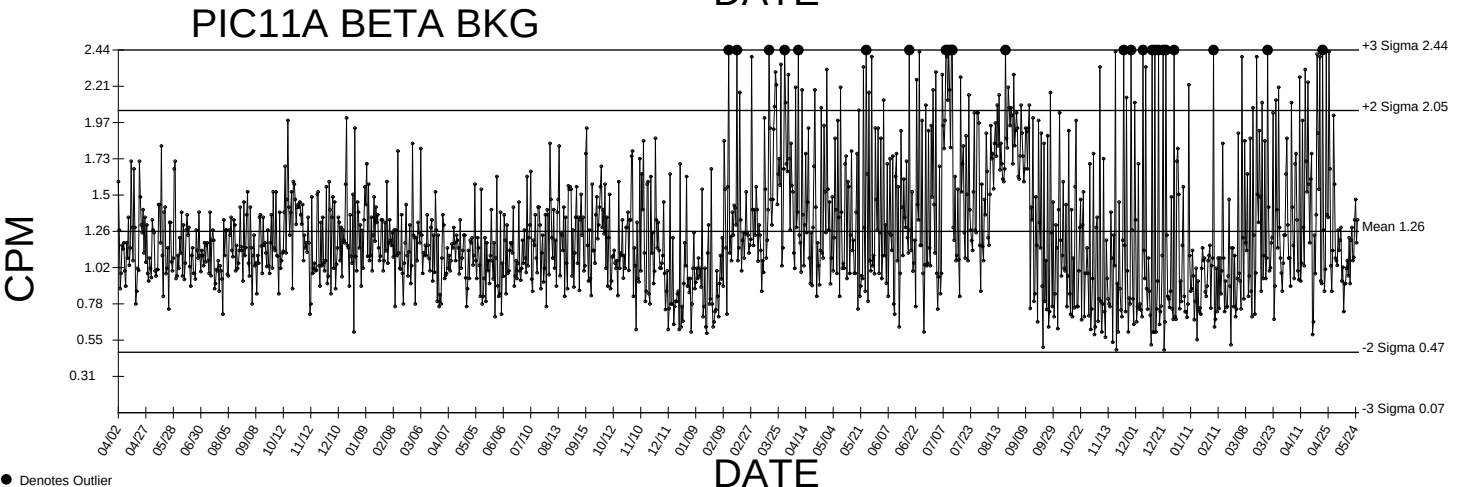
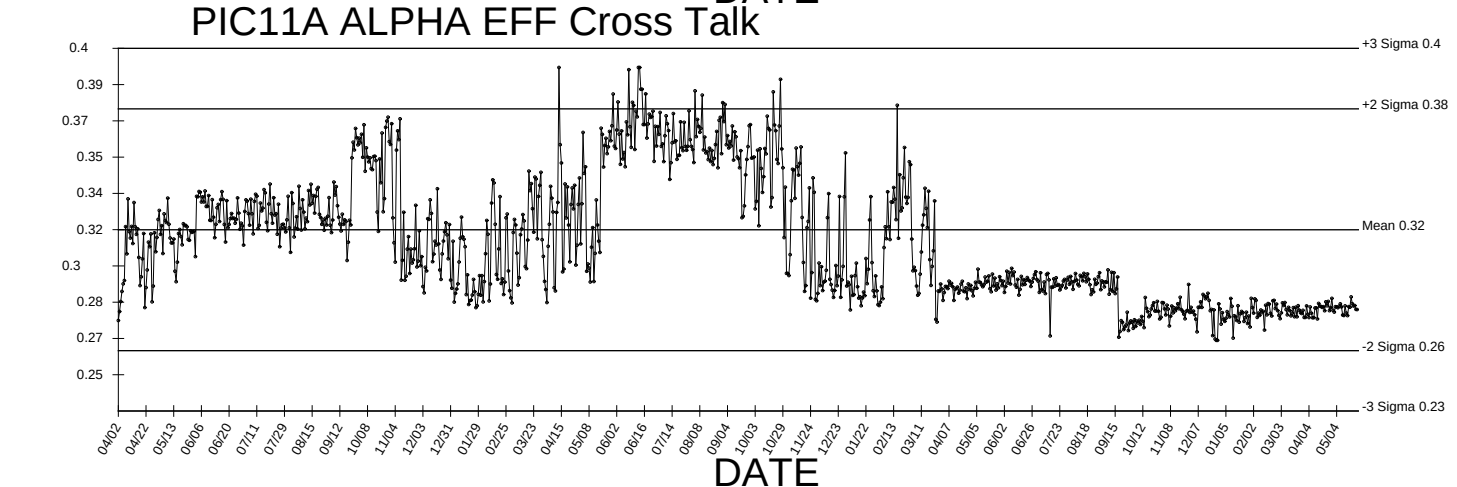
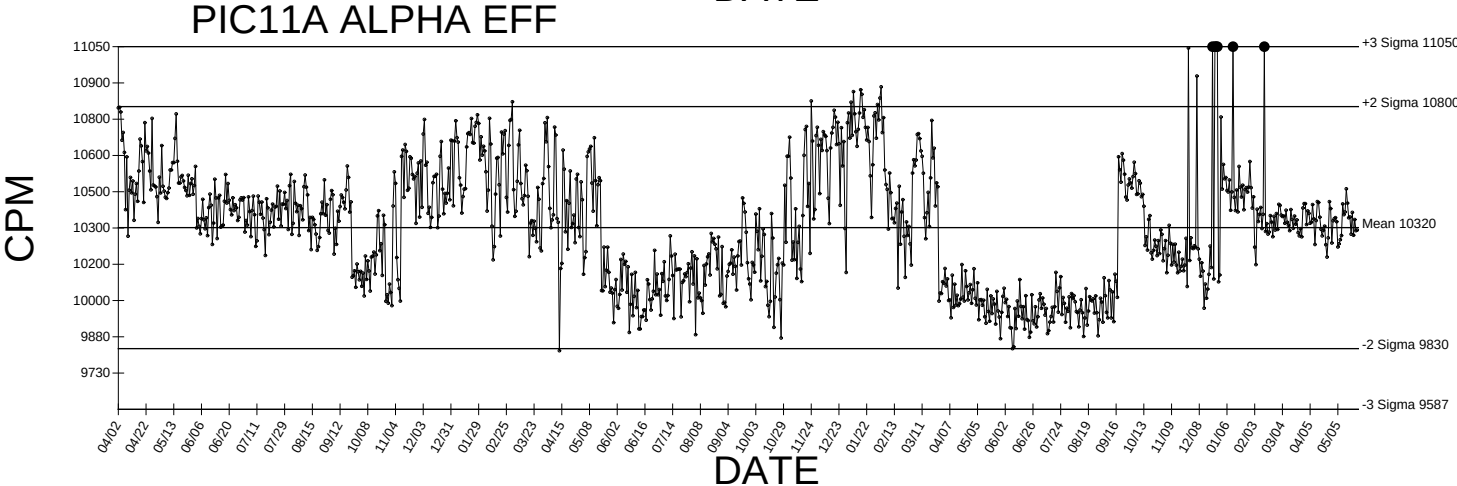
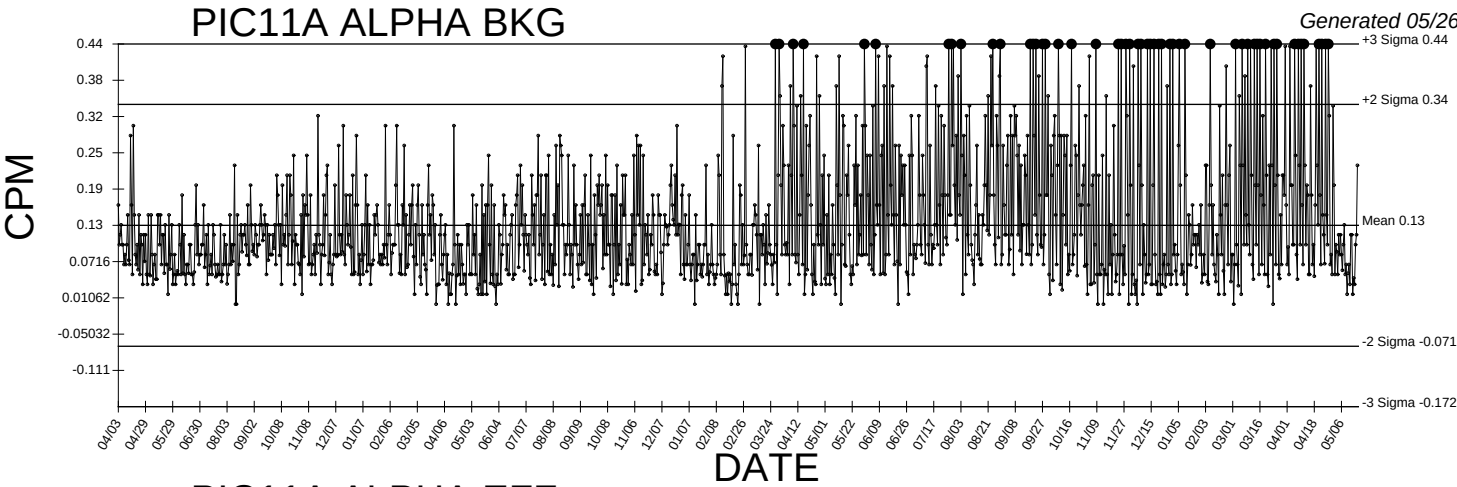
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LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Sam Pishen

Date 6/1/22

GEL Laboratories LLC

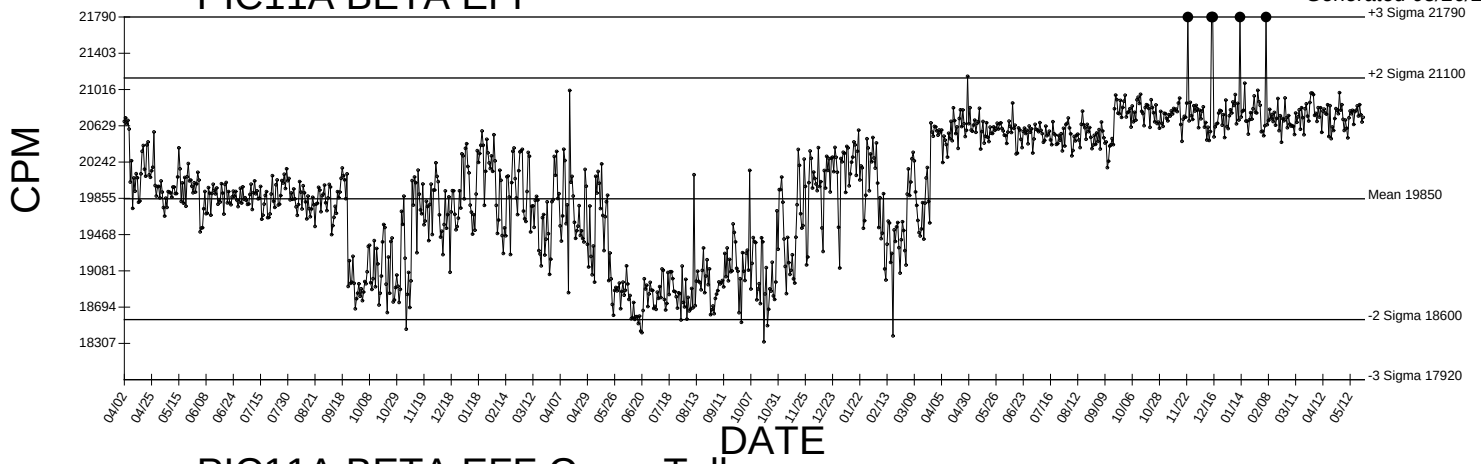
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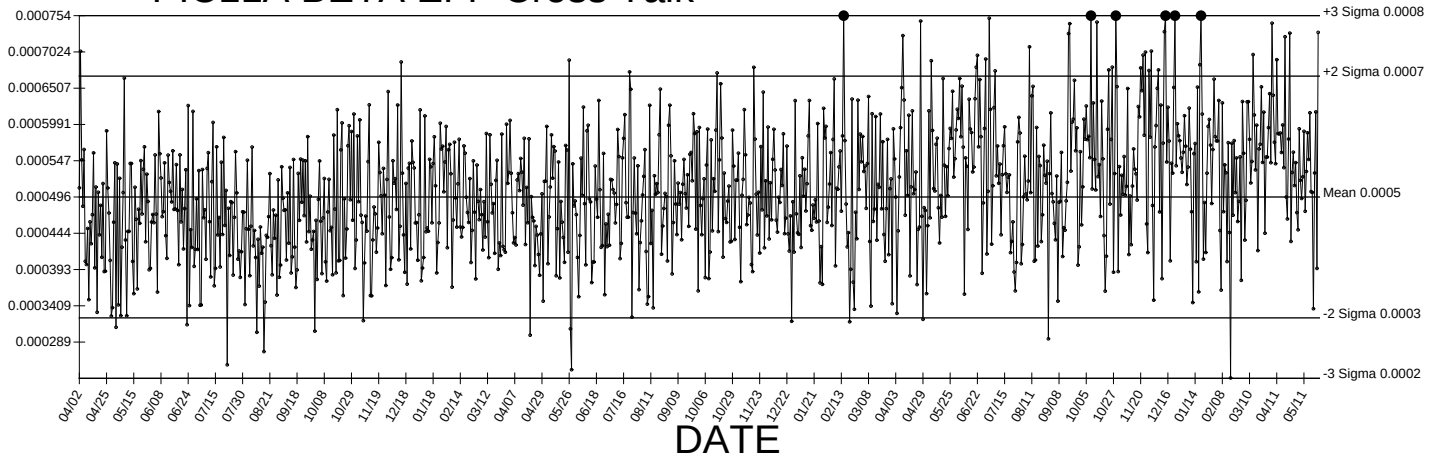
● Denotes Outlier

PIC11A BETA EFF

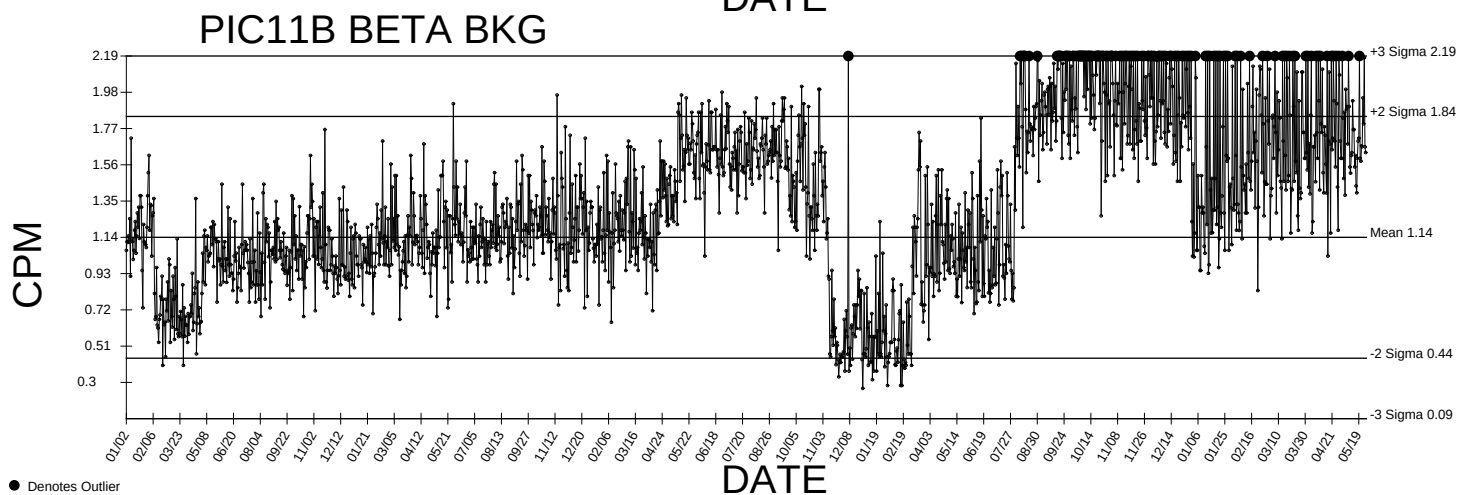
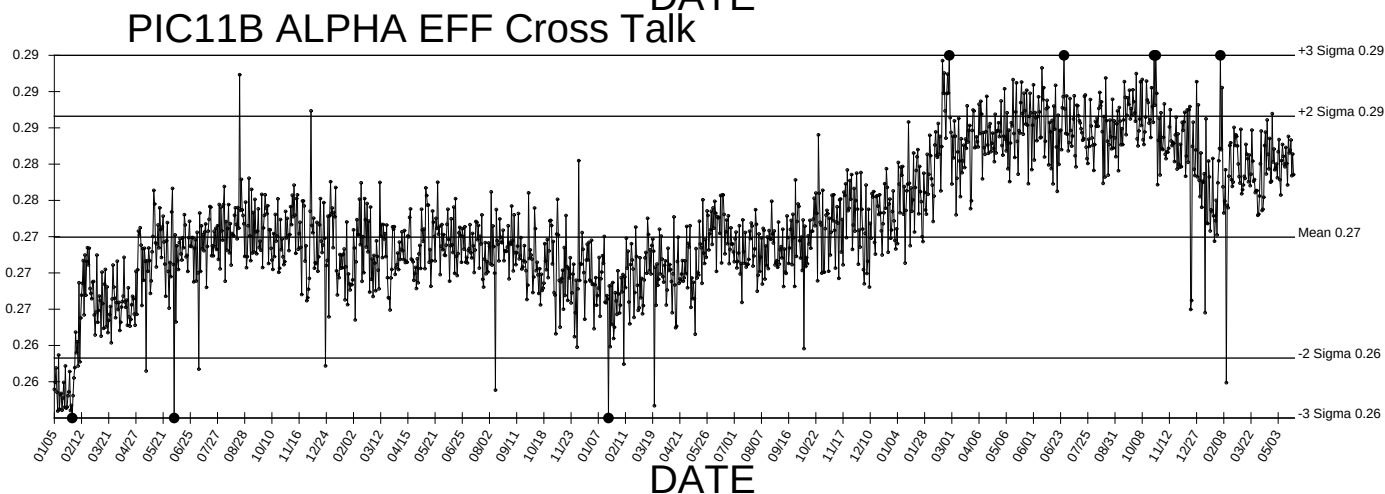
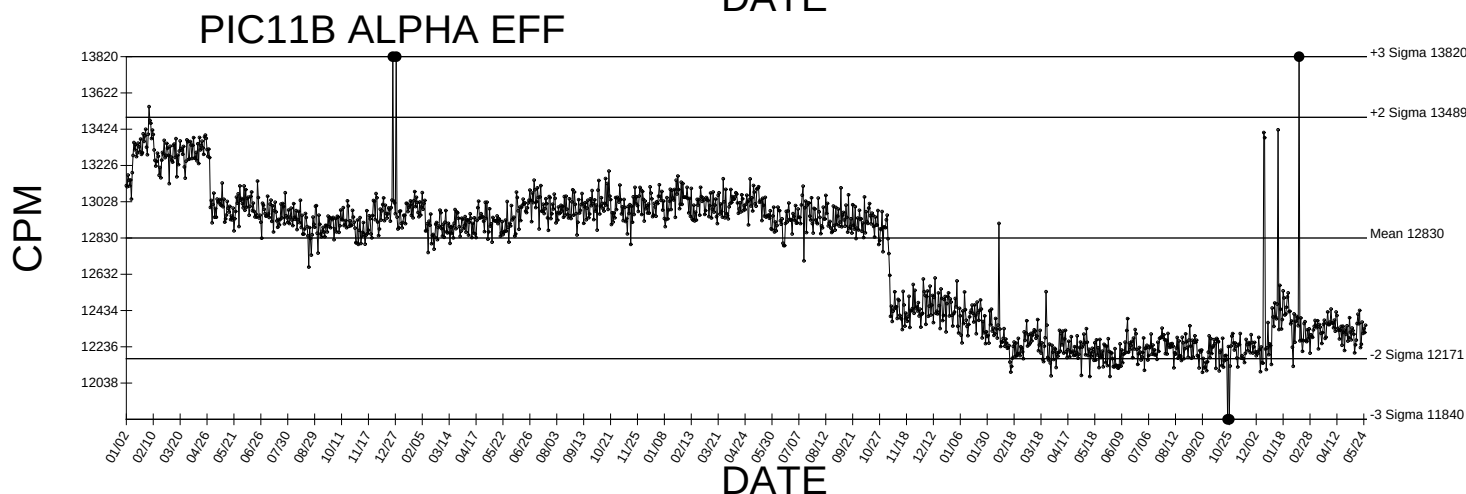
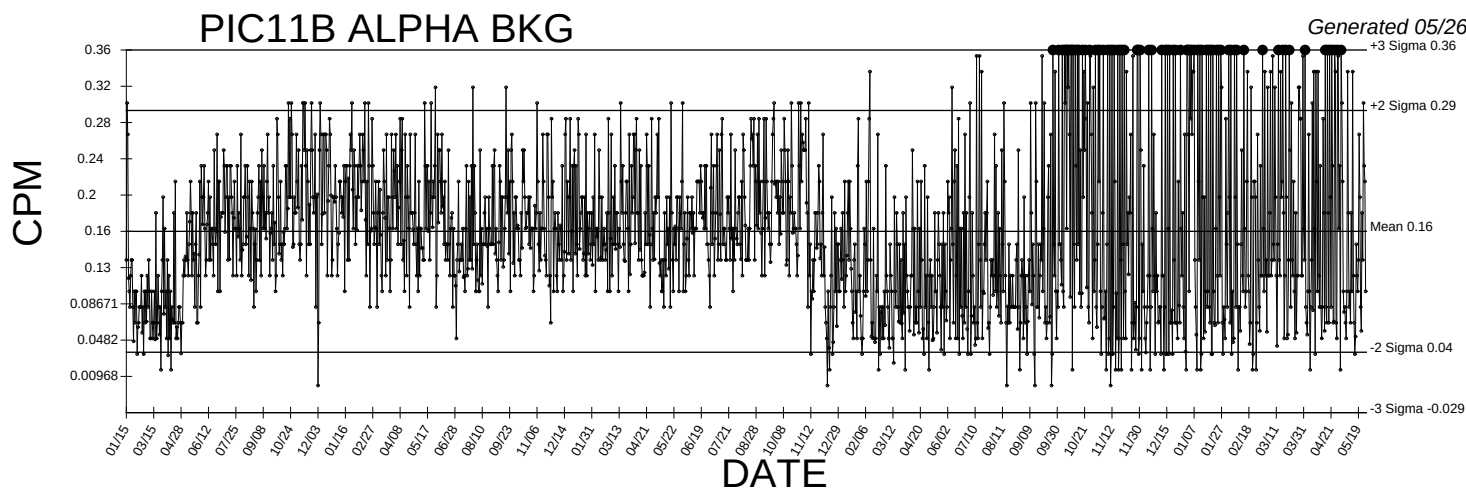
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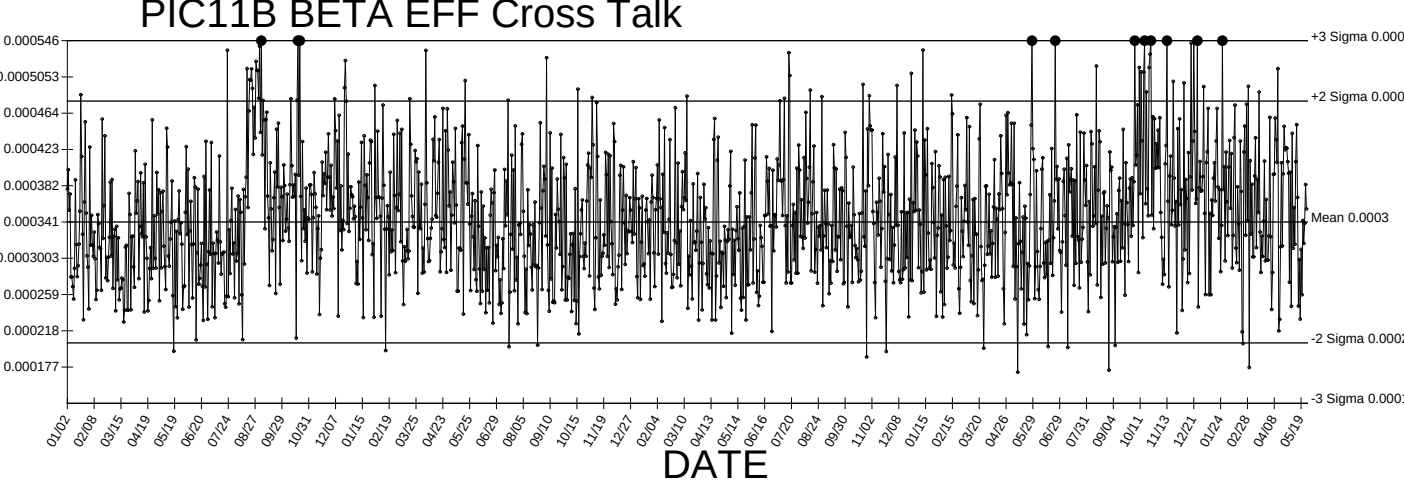
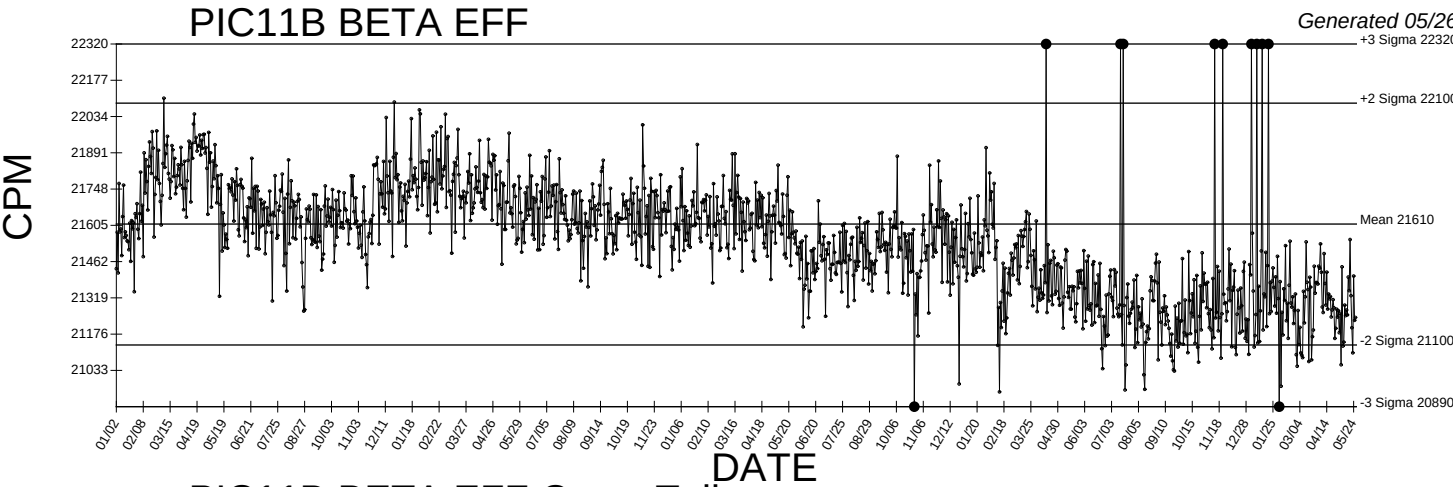
PIC11A BETA EFF Cross Talk



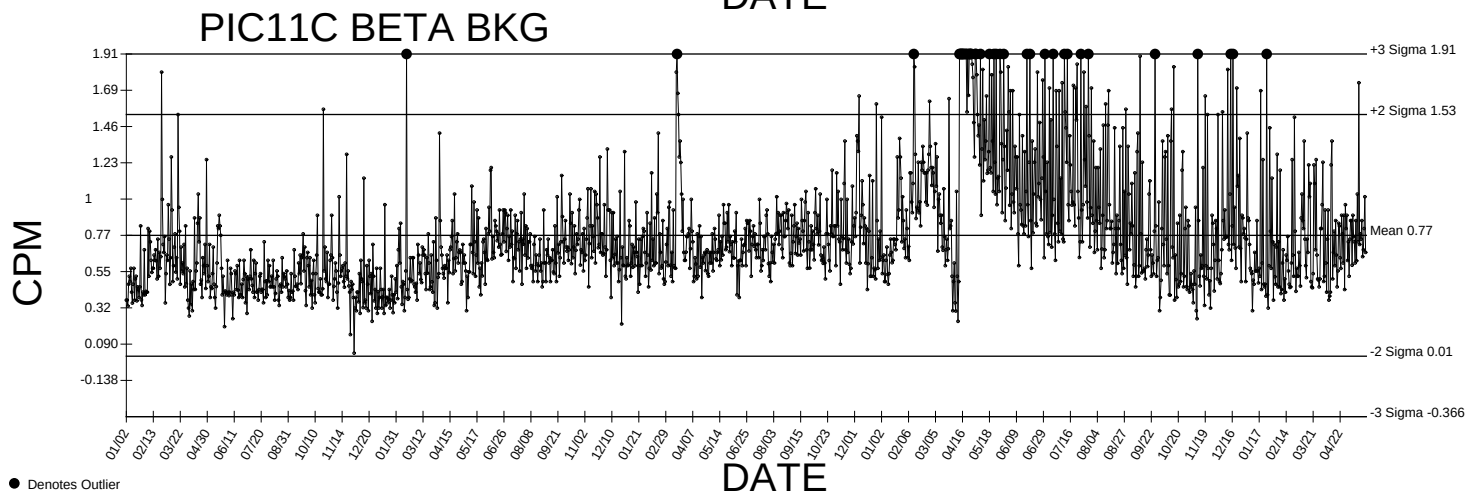
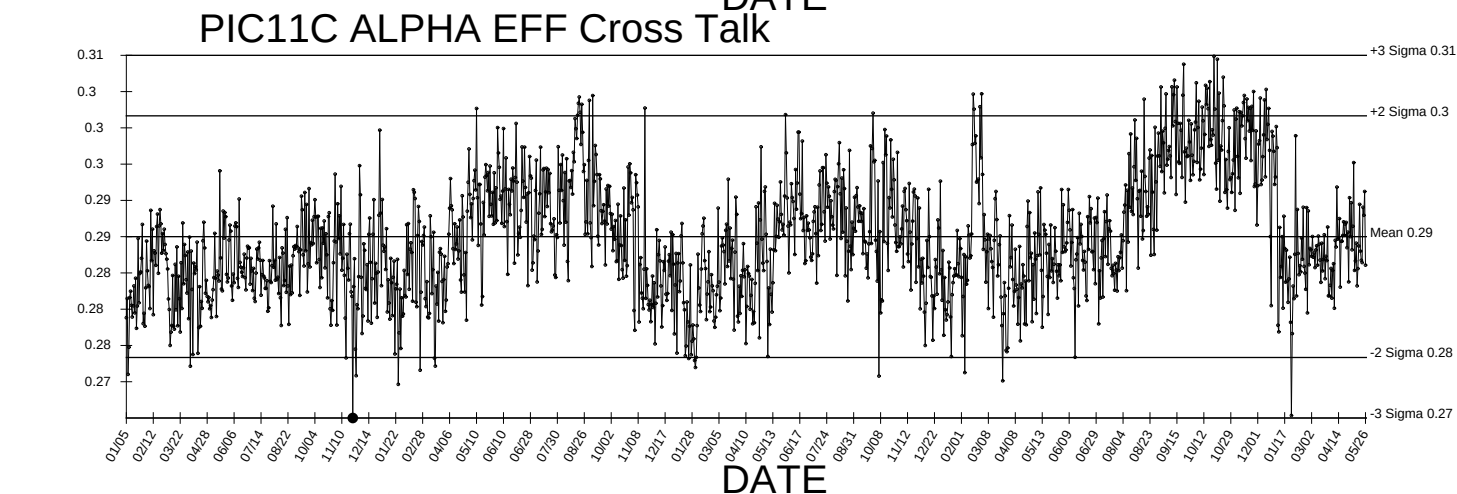
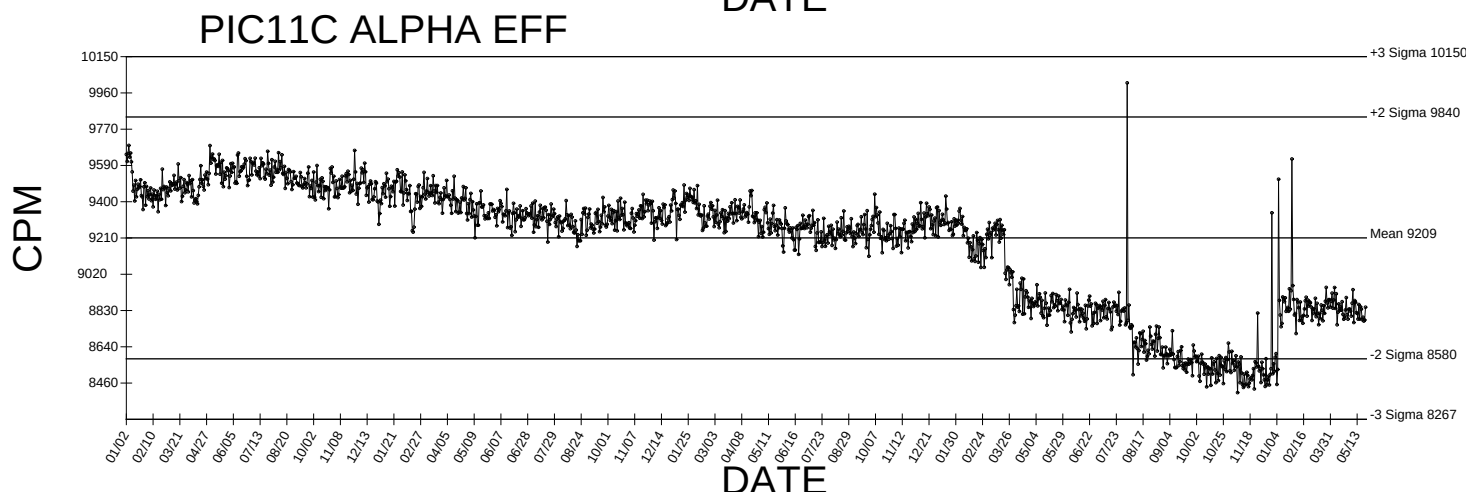
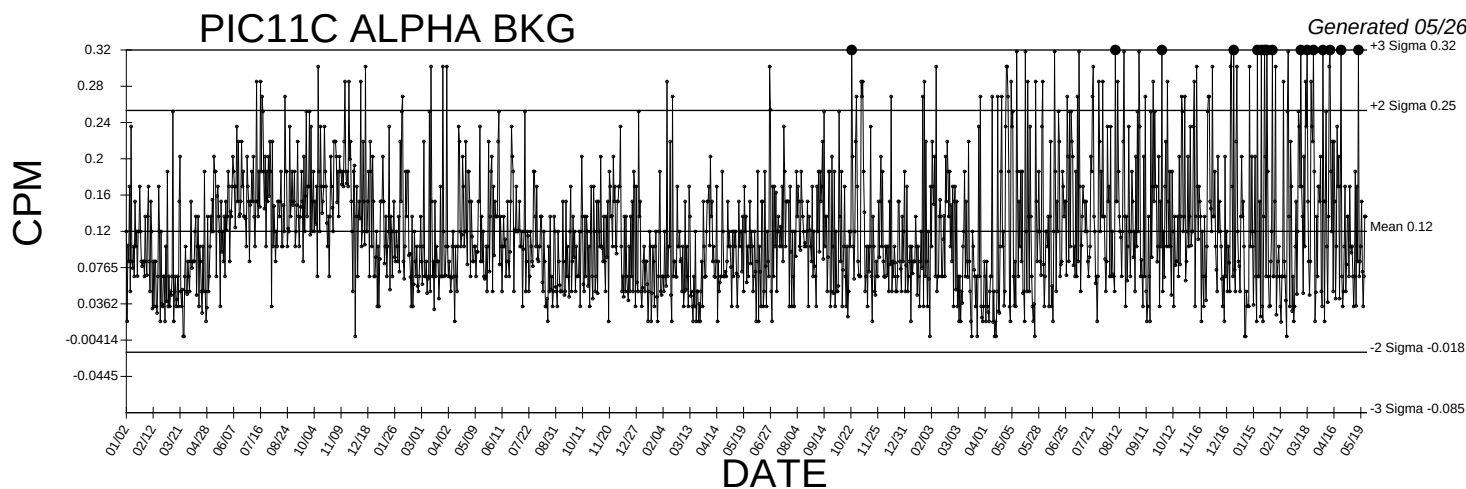
● Denotes Outlier



● Denotes Outlier



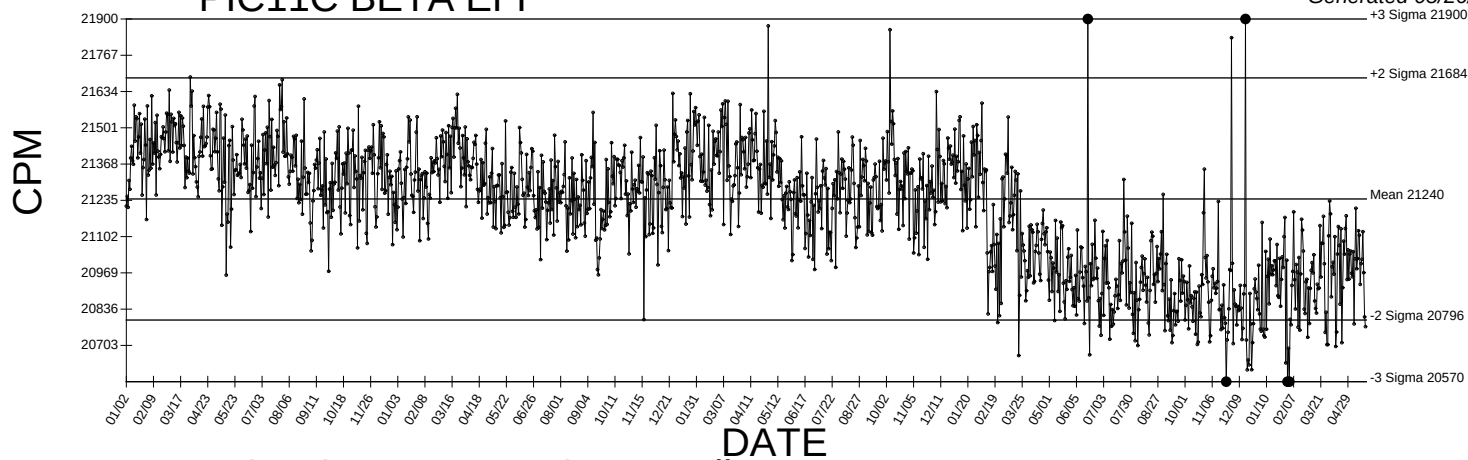
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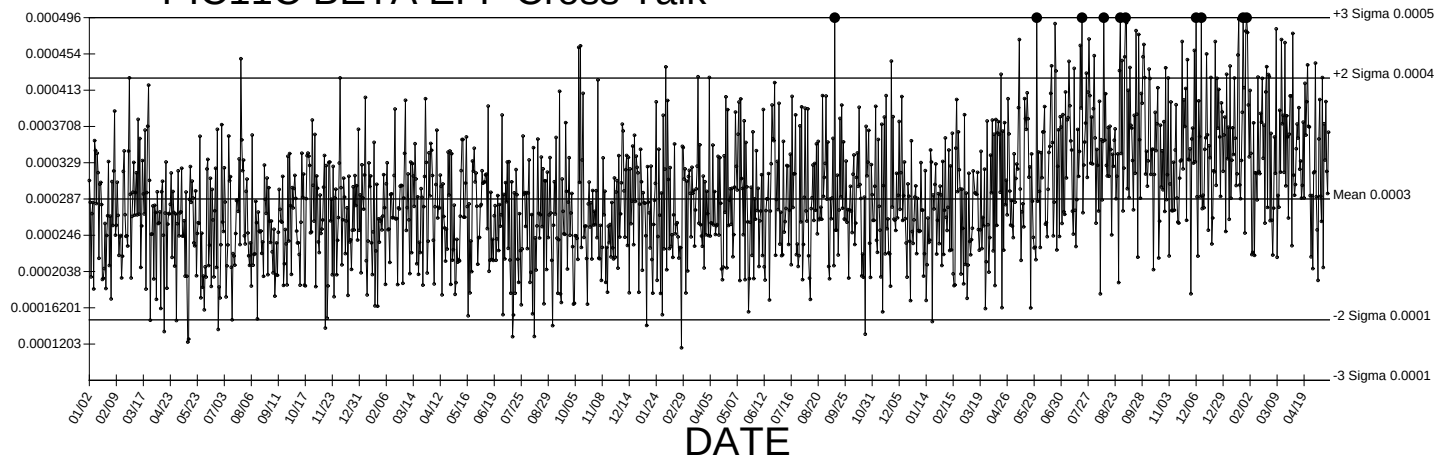
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PIC11C BETA EFF

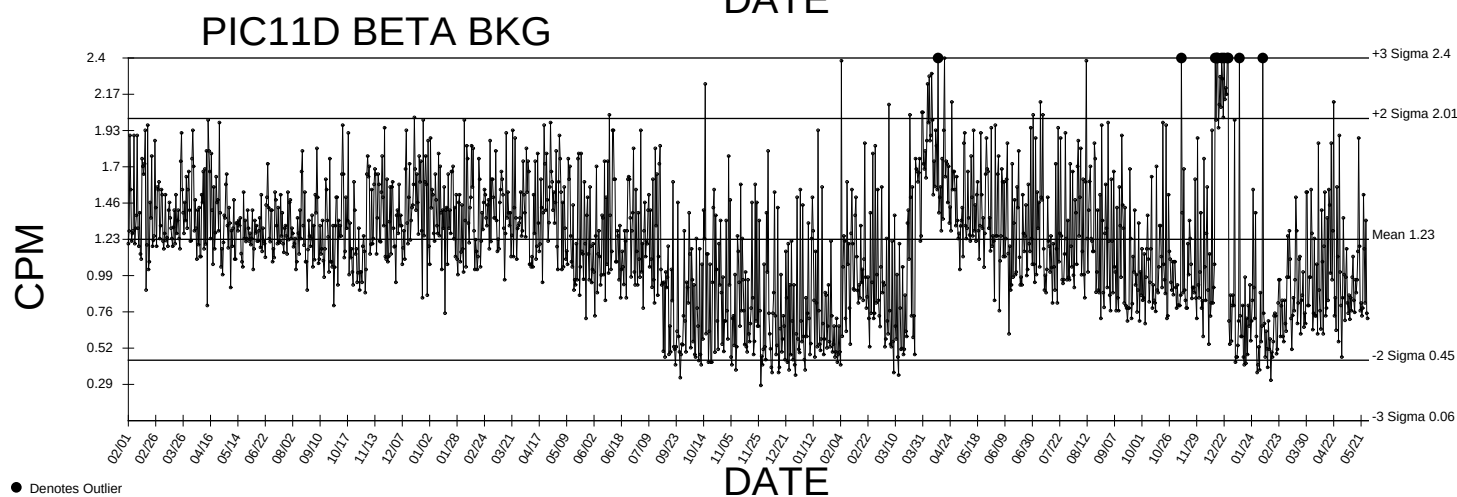
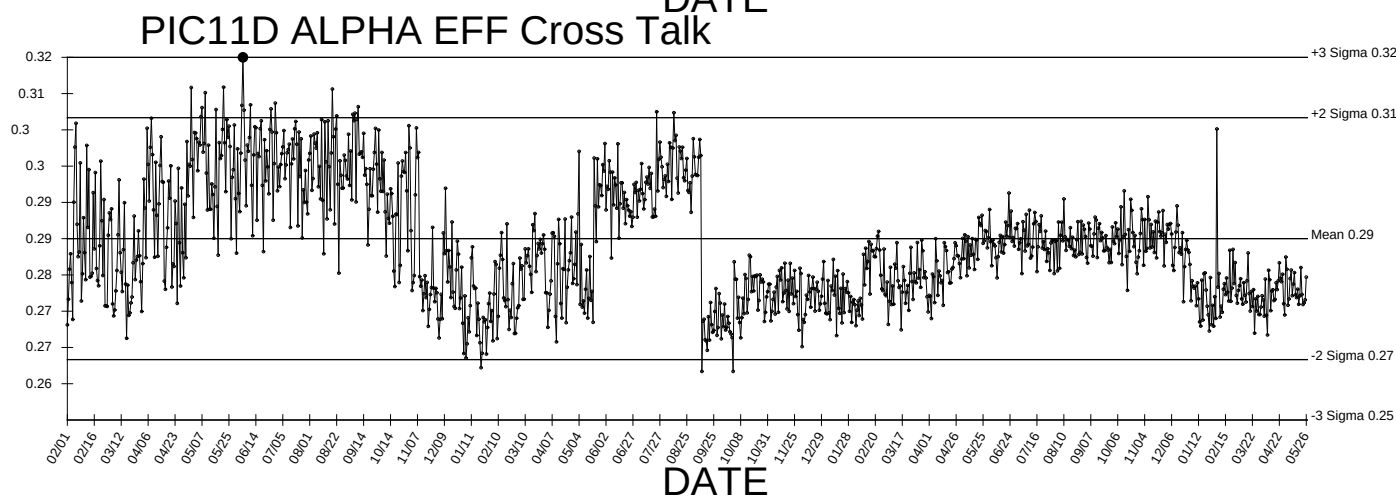
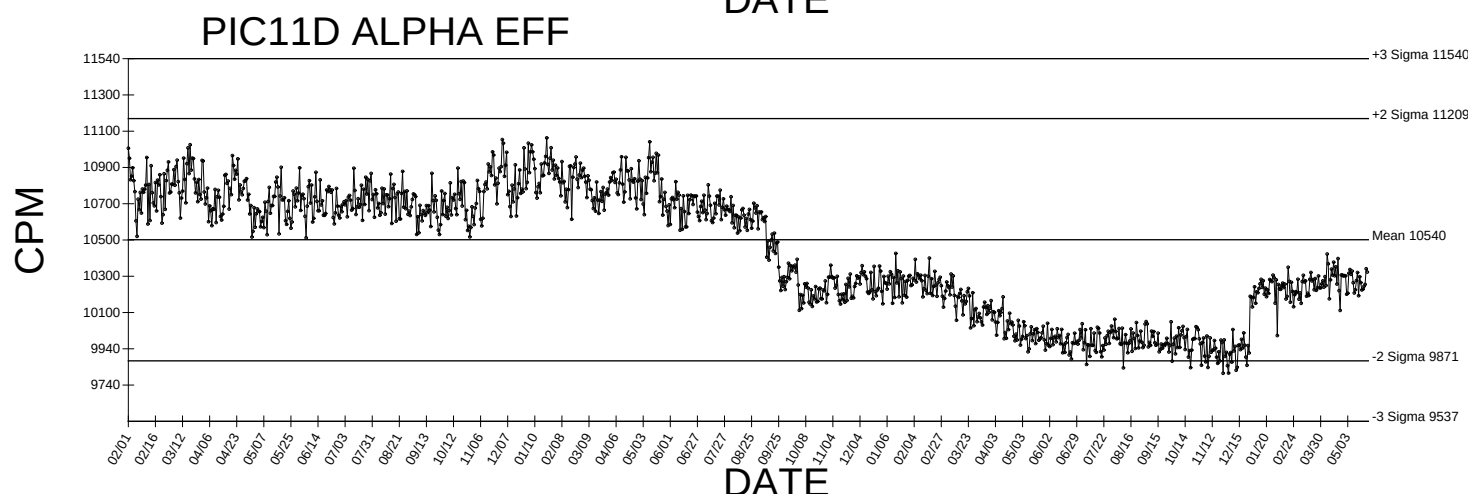
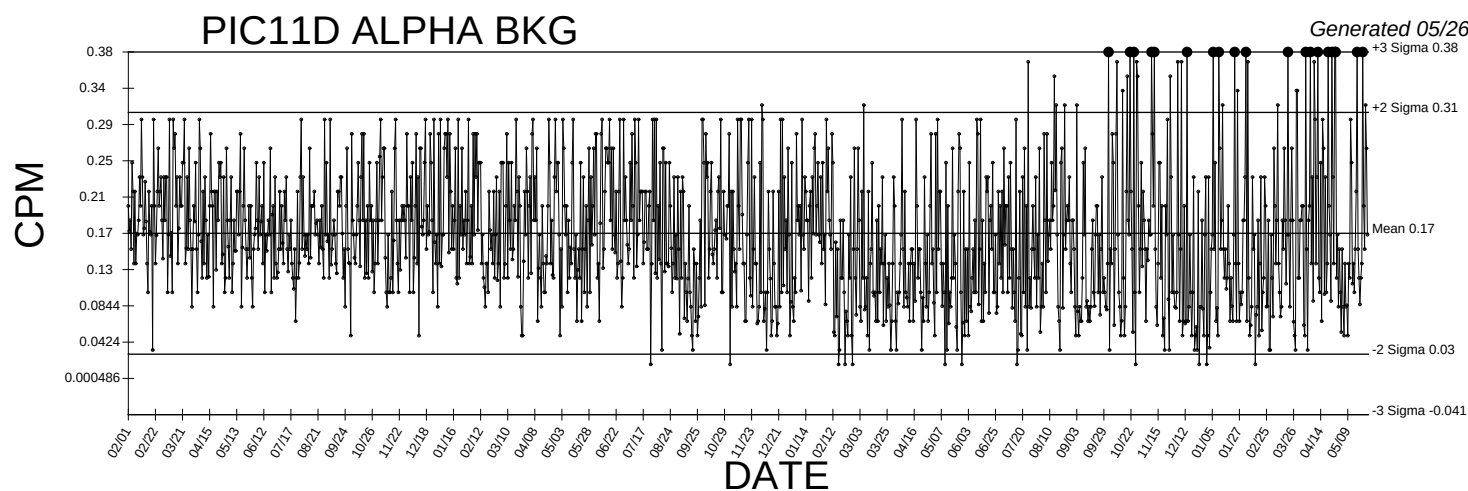
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PIC11C BETA EFF Cross Talk



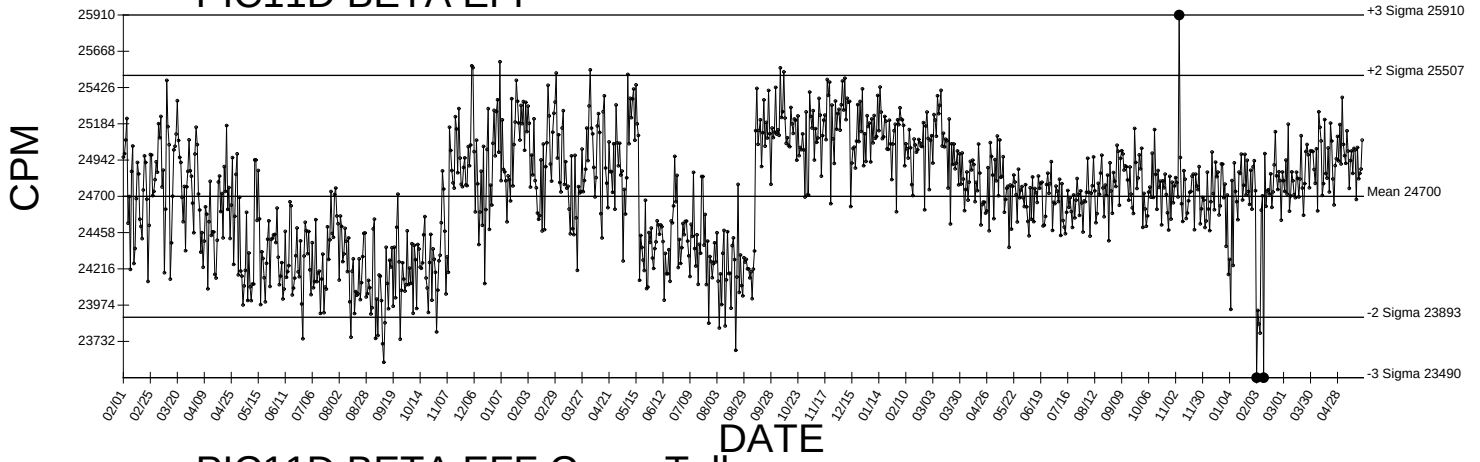
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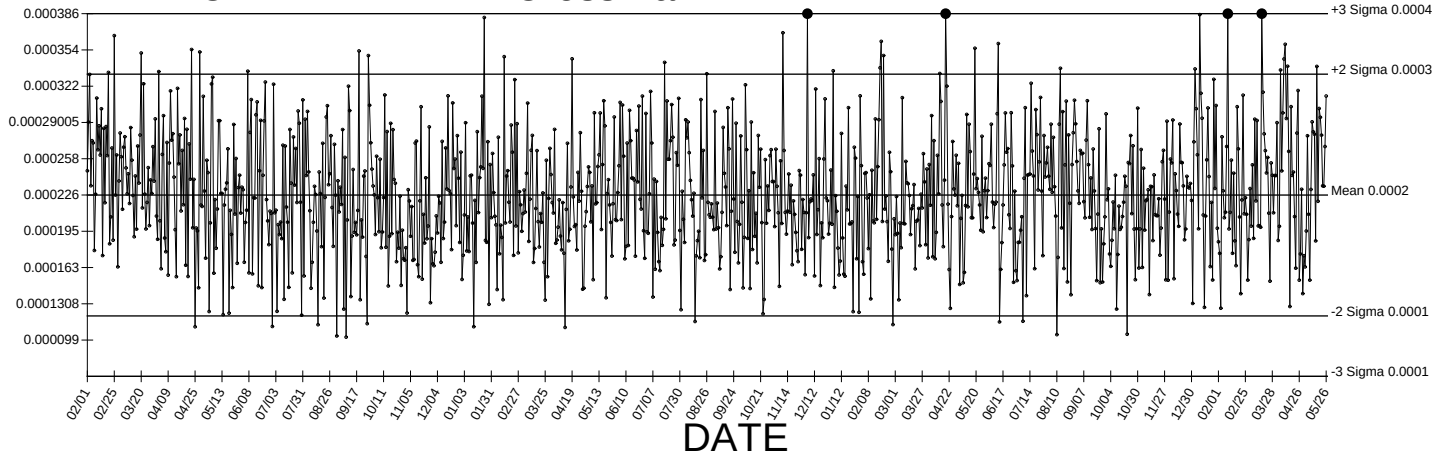
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PIC11D BETA EFF

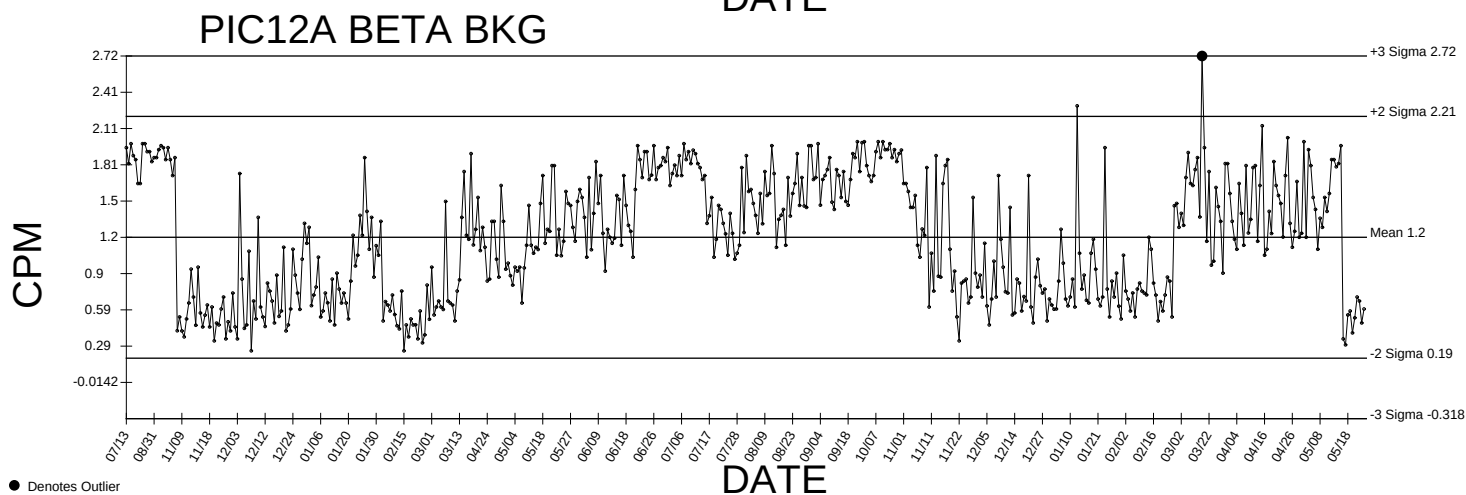
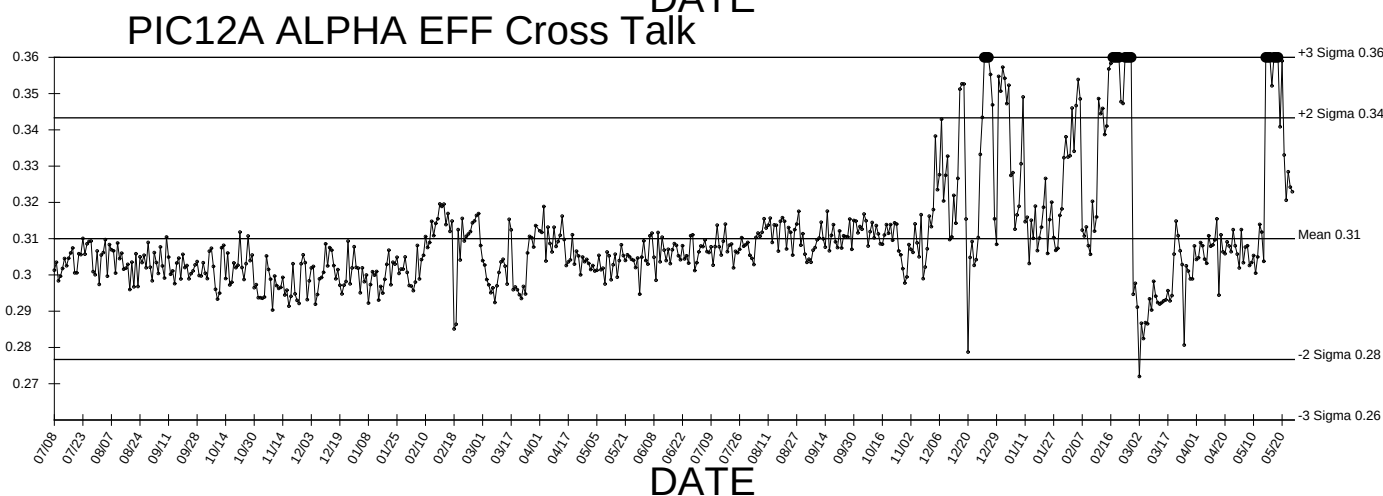
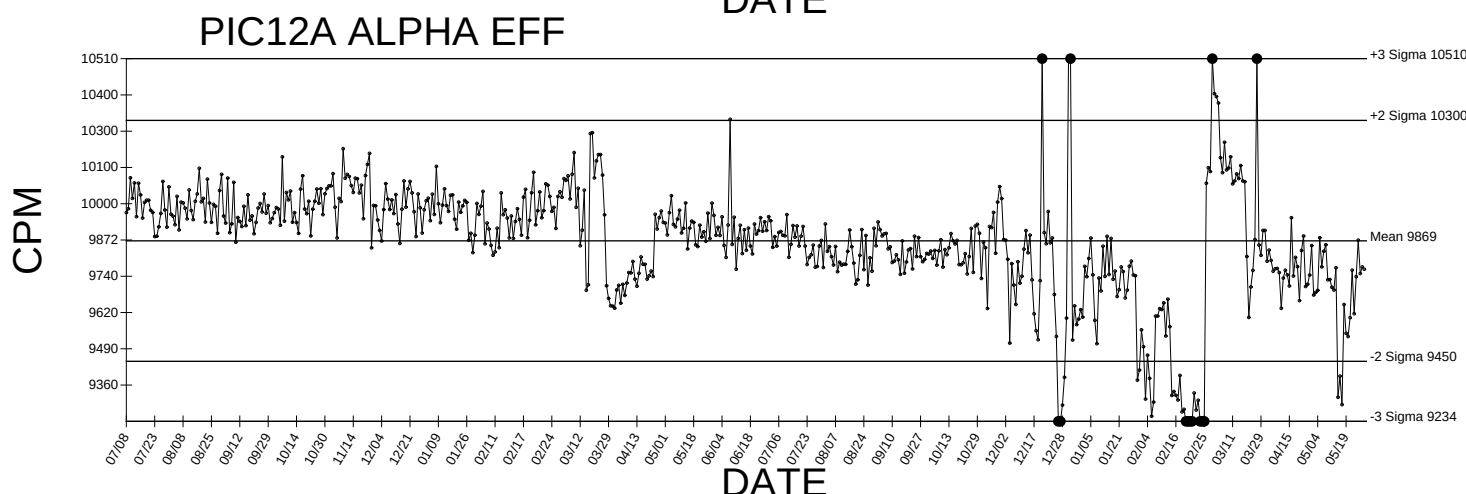
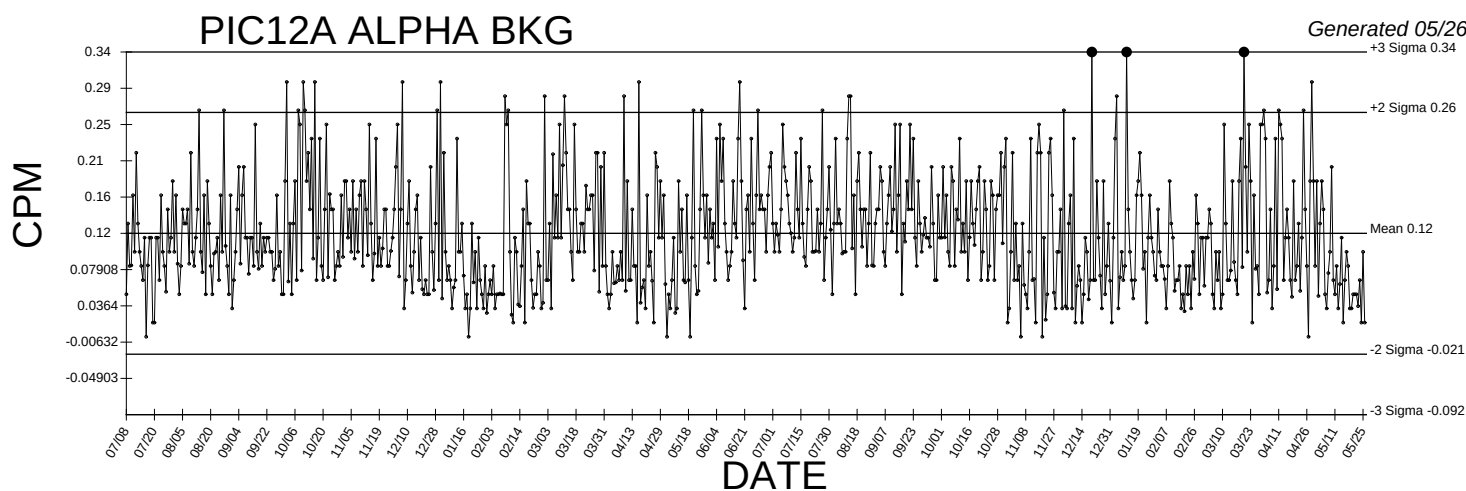
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PIC11D BETA EFF Cross Talk



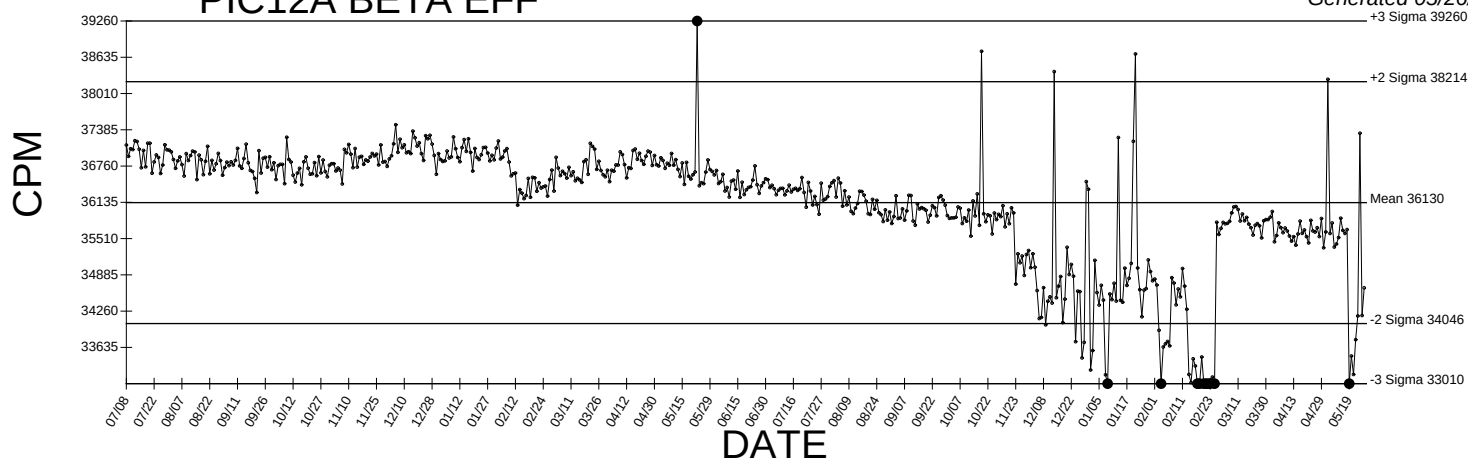
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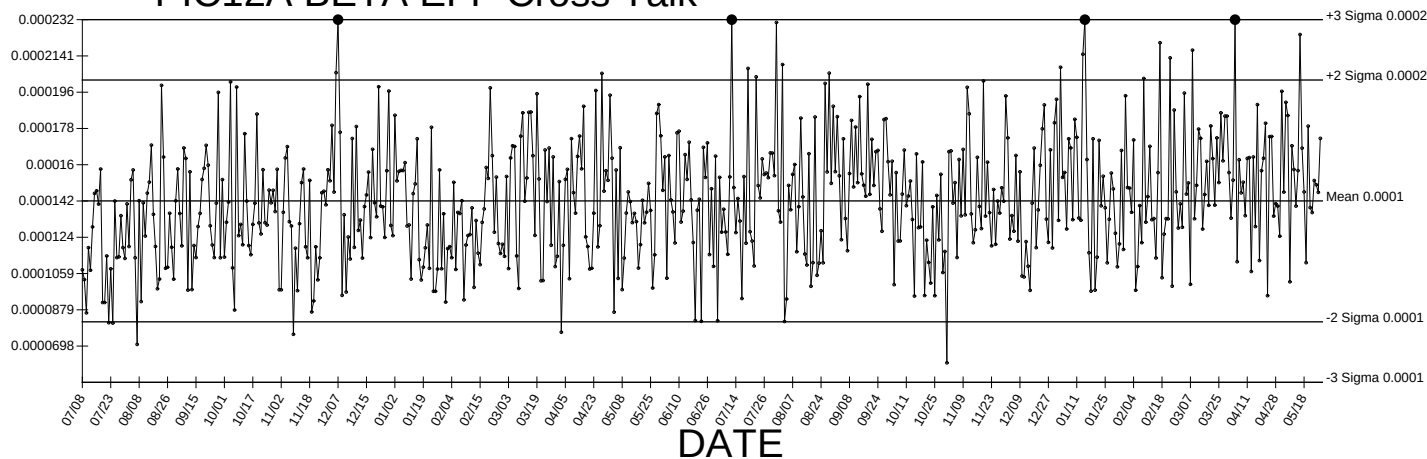
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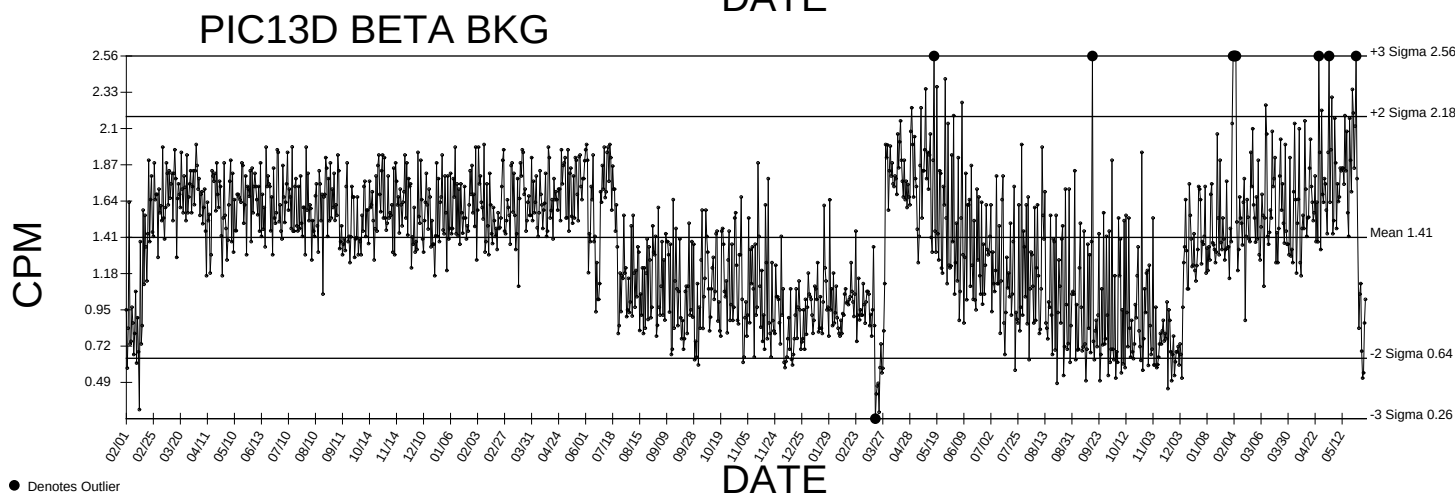
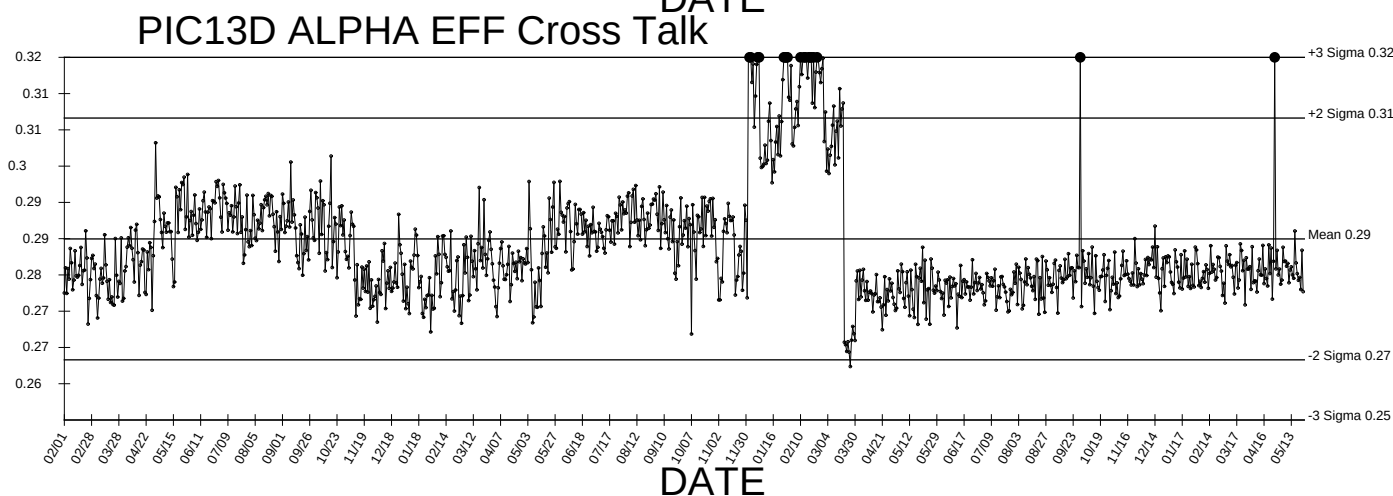
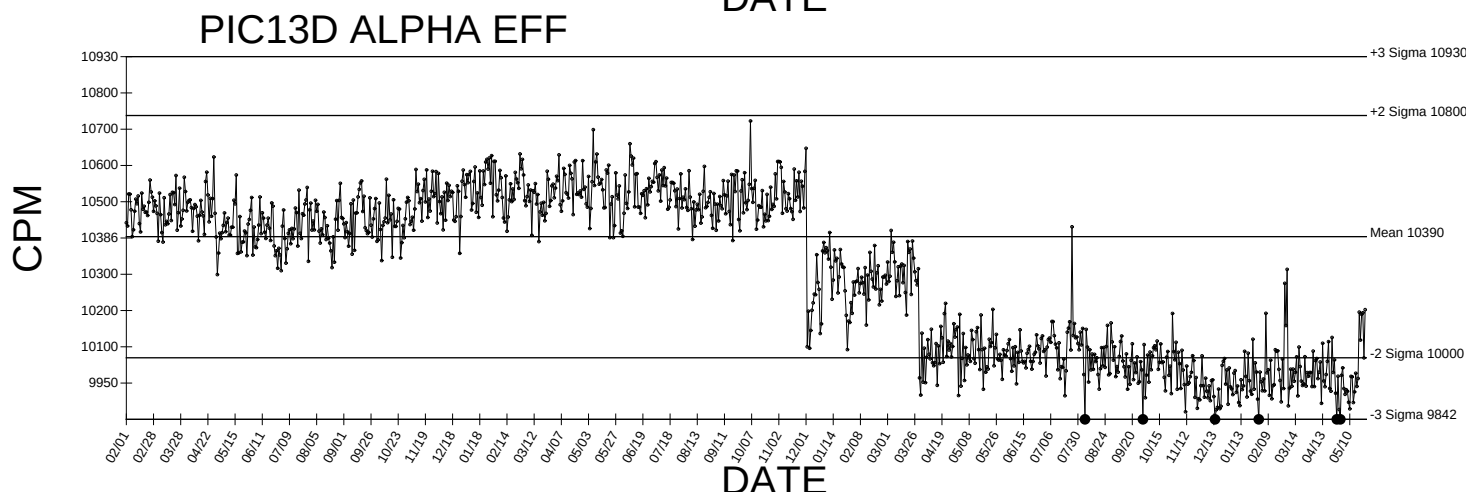
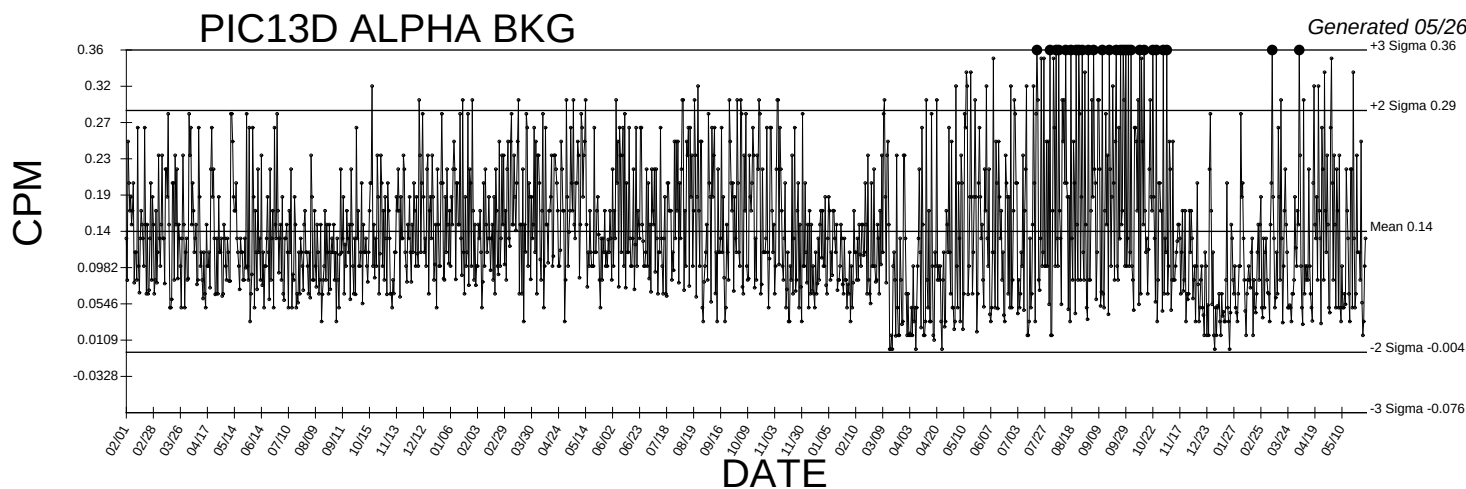
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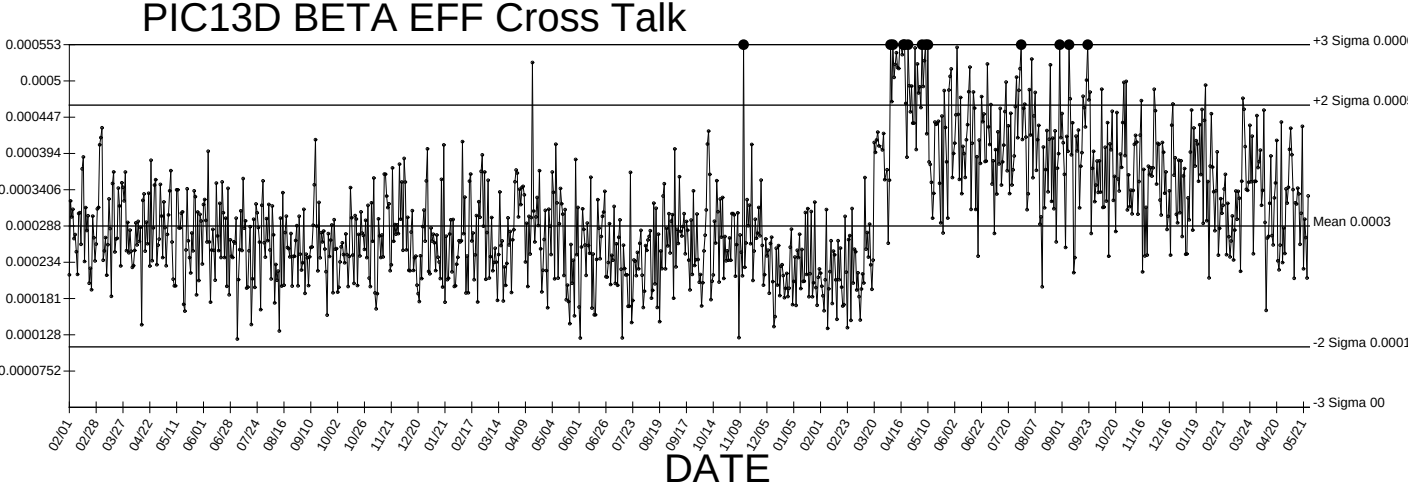
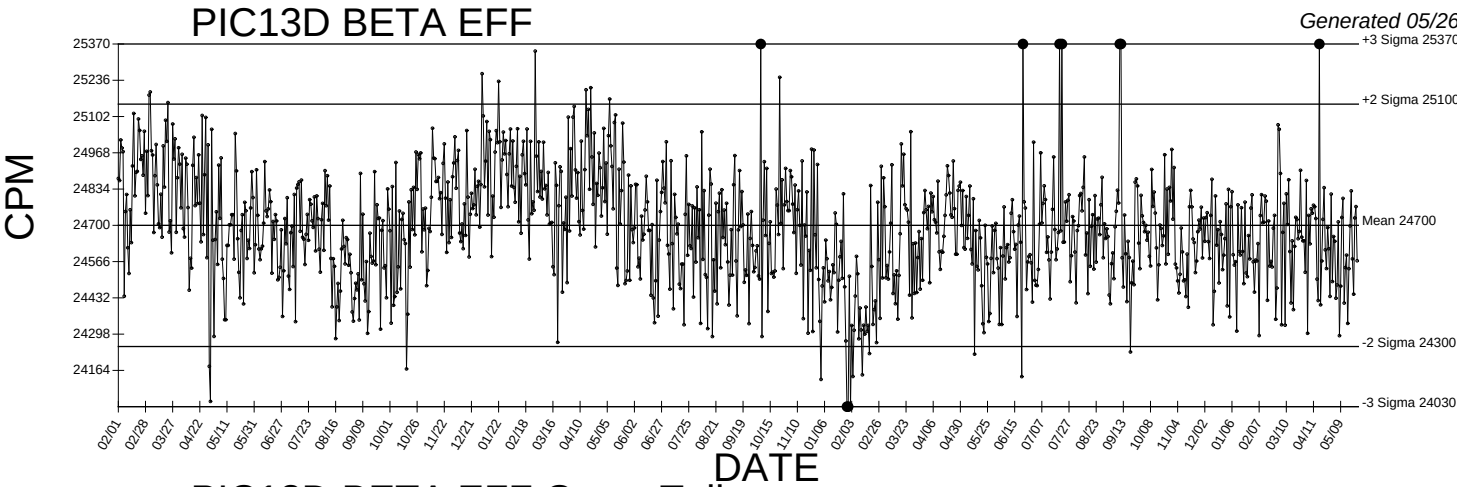
PIC12A BETA EFF Cross Talk



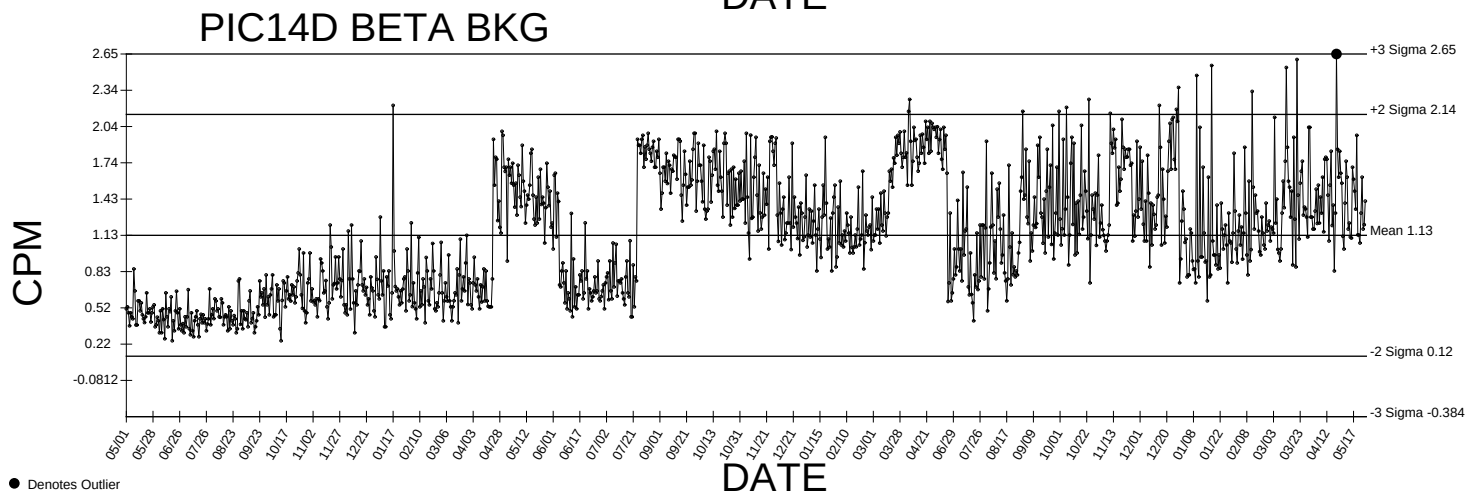
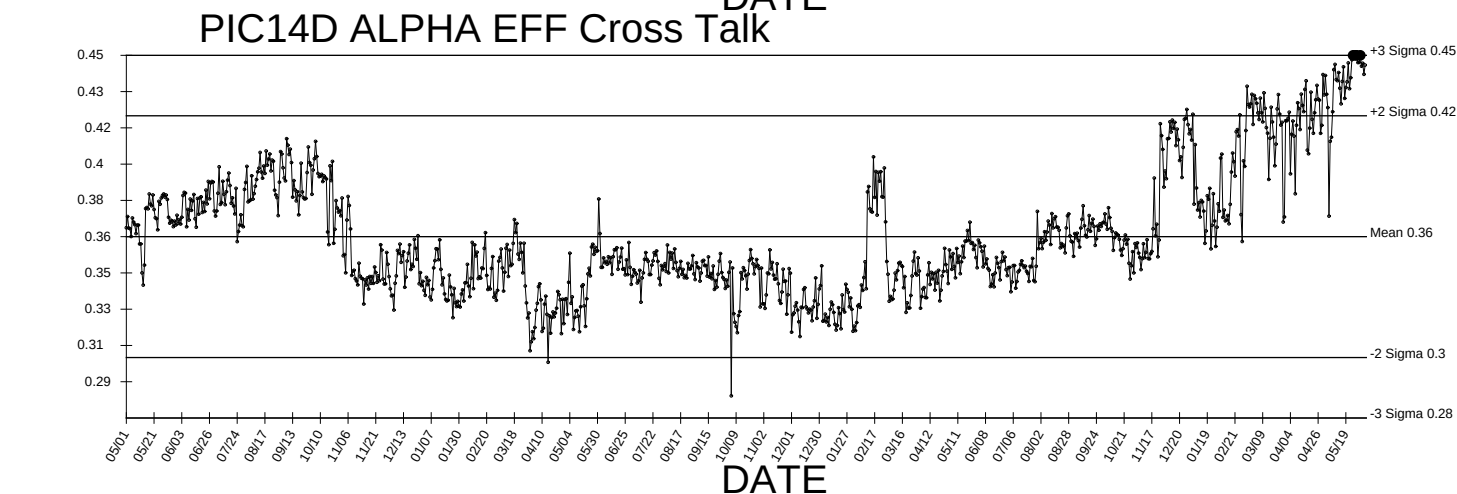
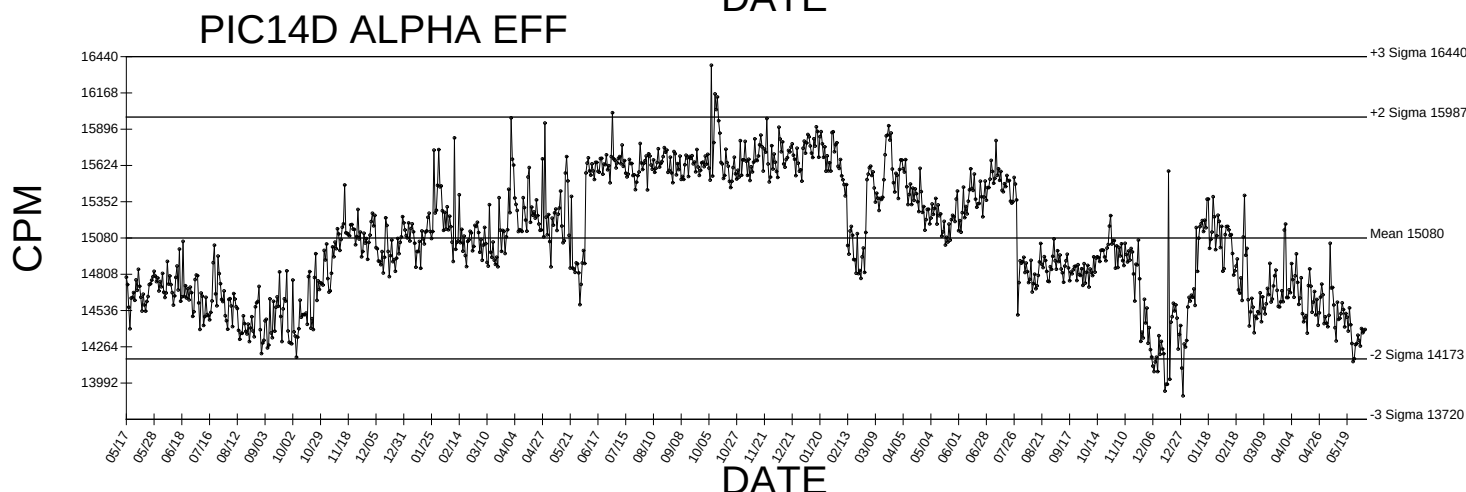
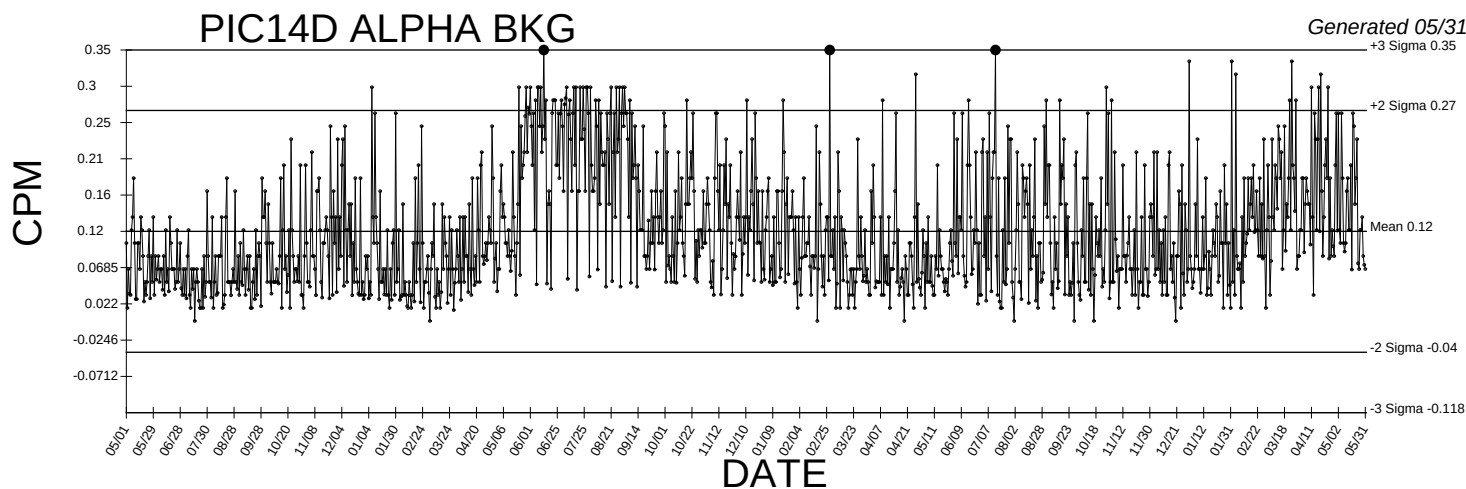
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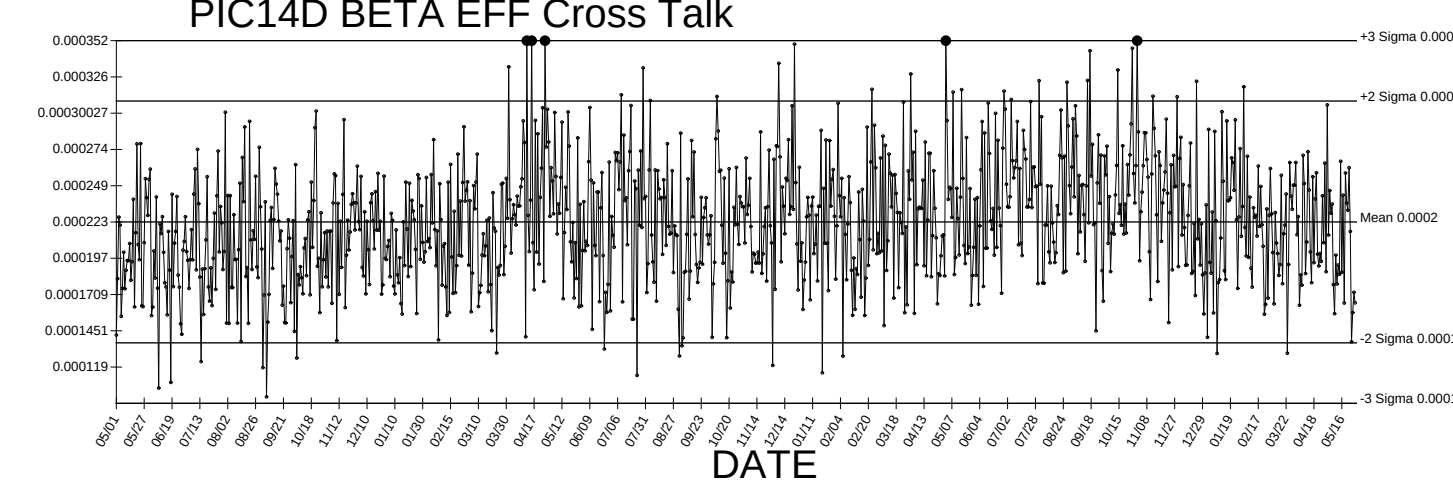
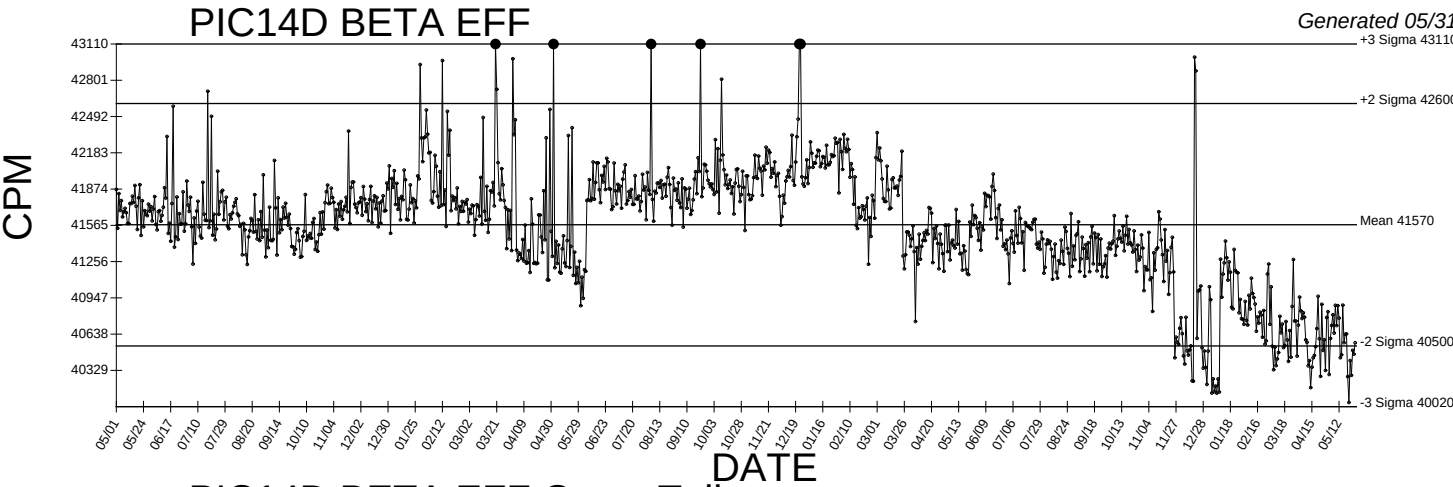


● Denotes Outlier

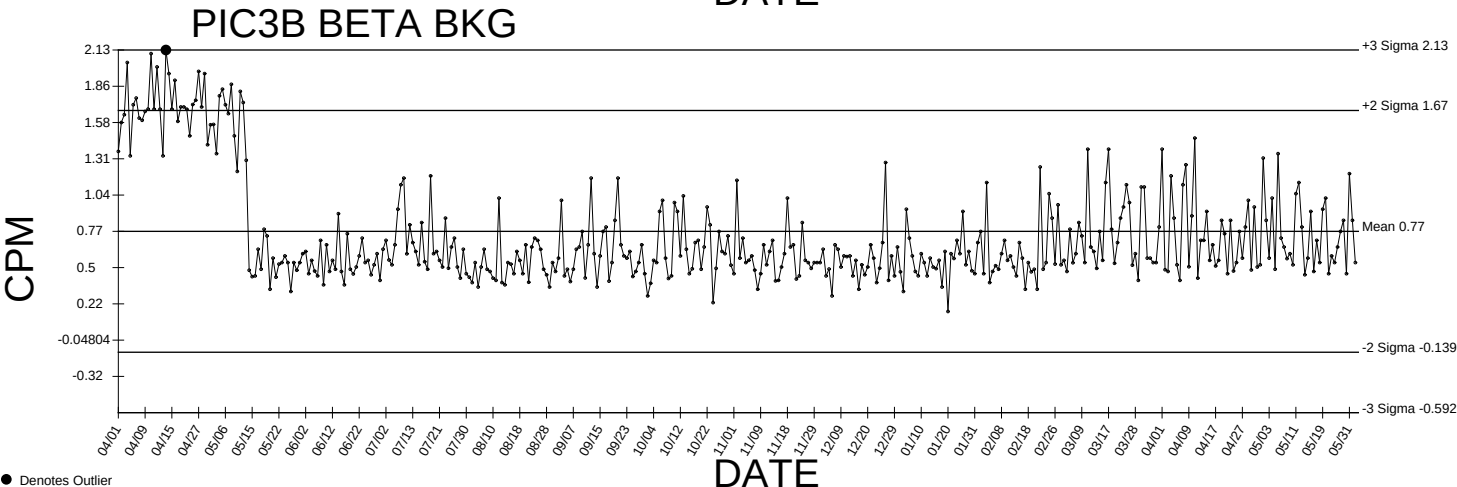
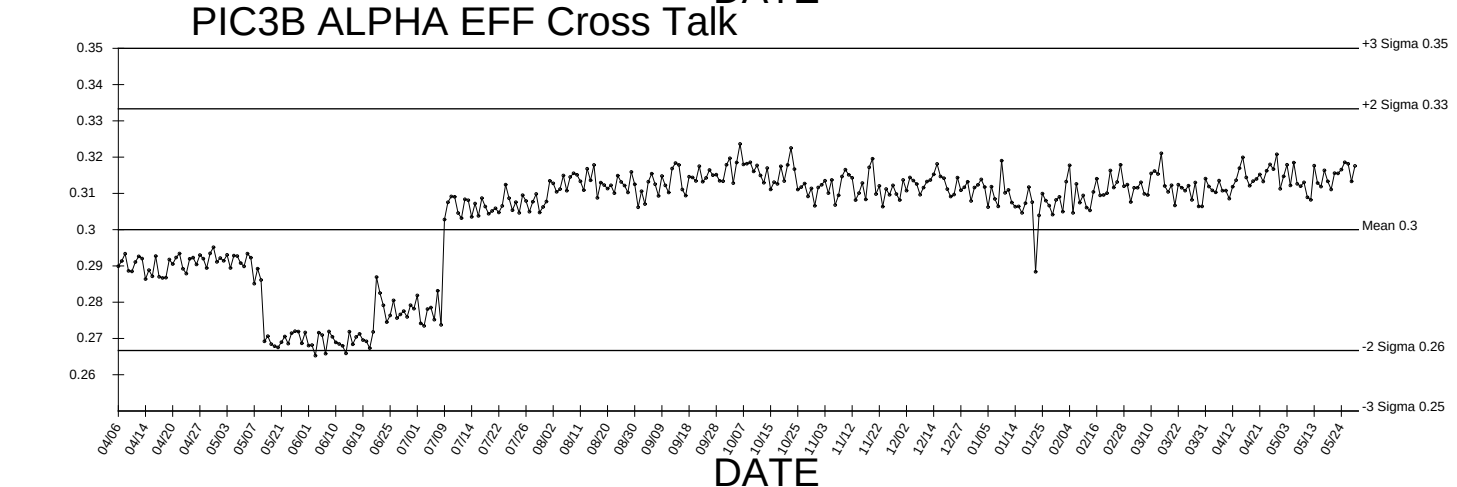
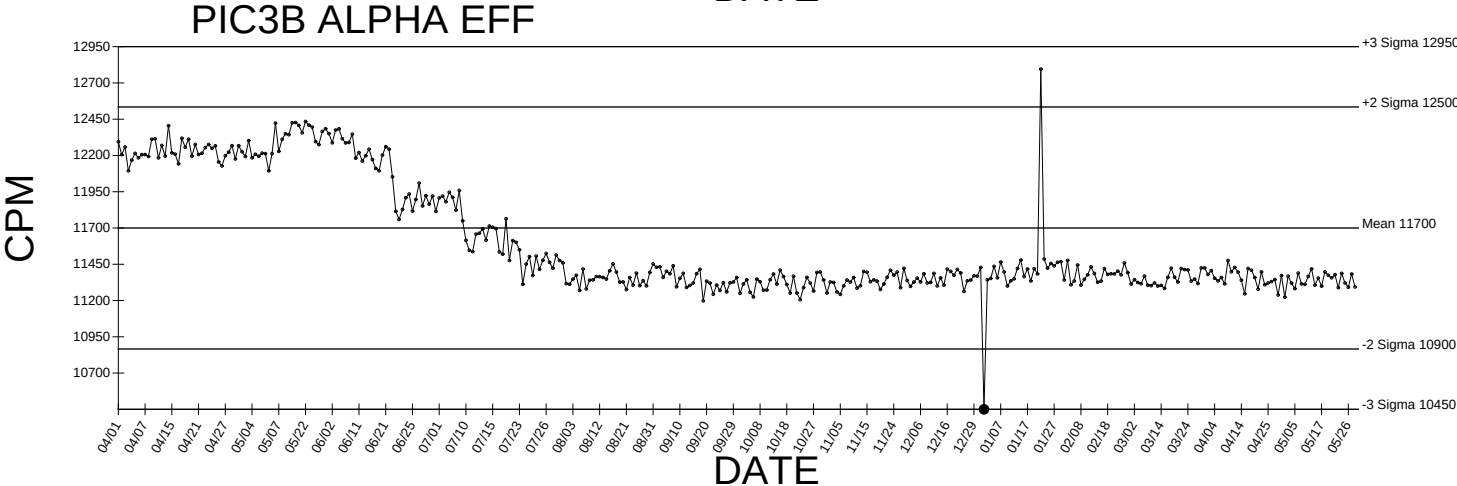
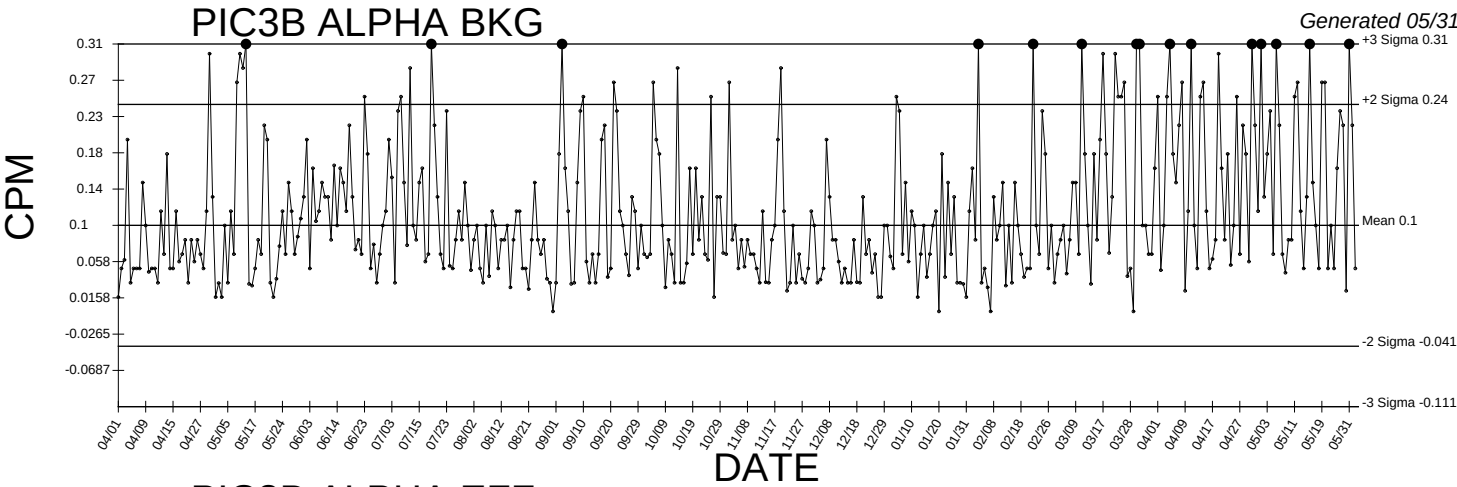


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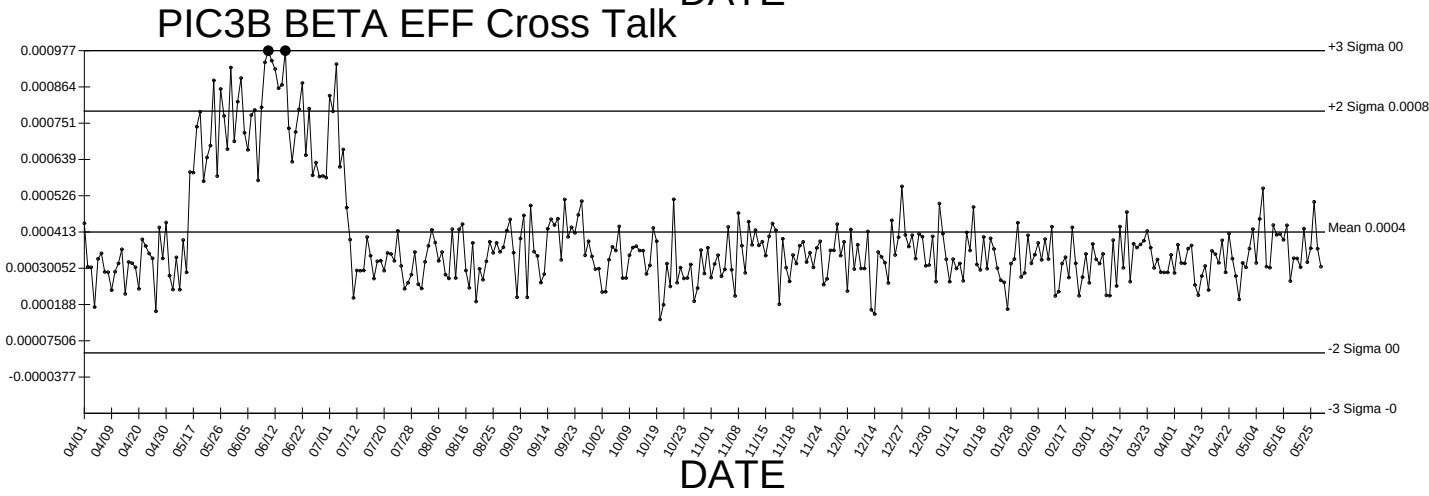
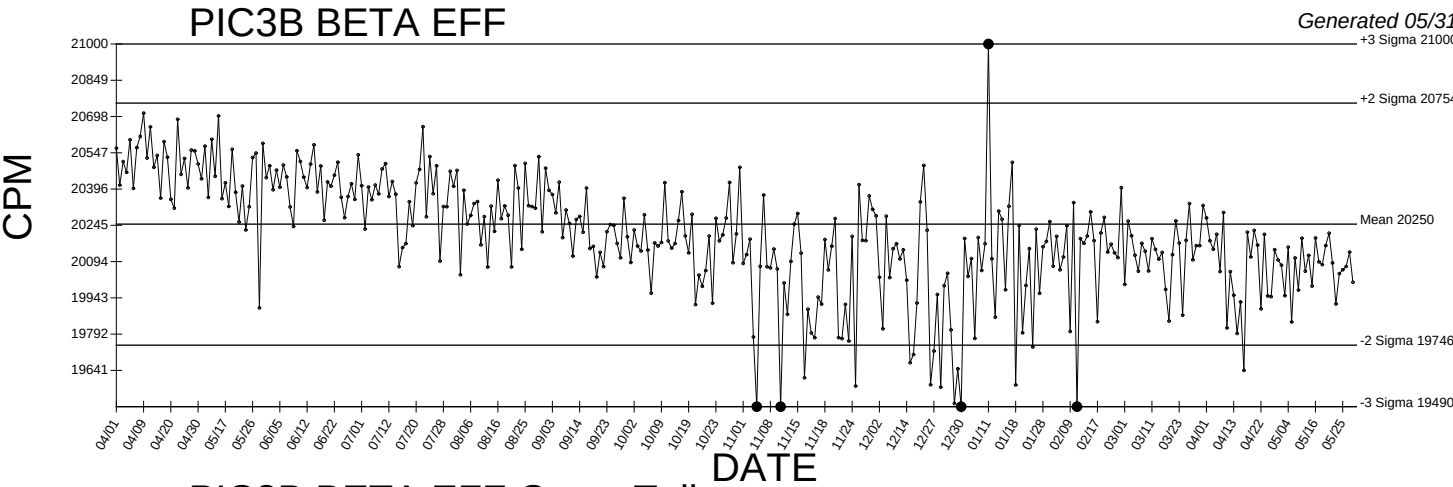




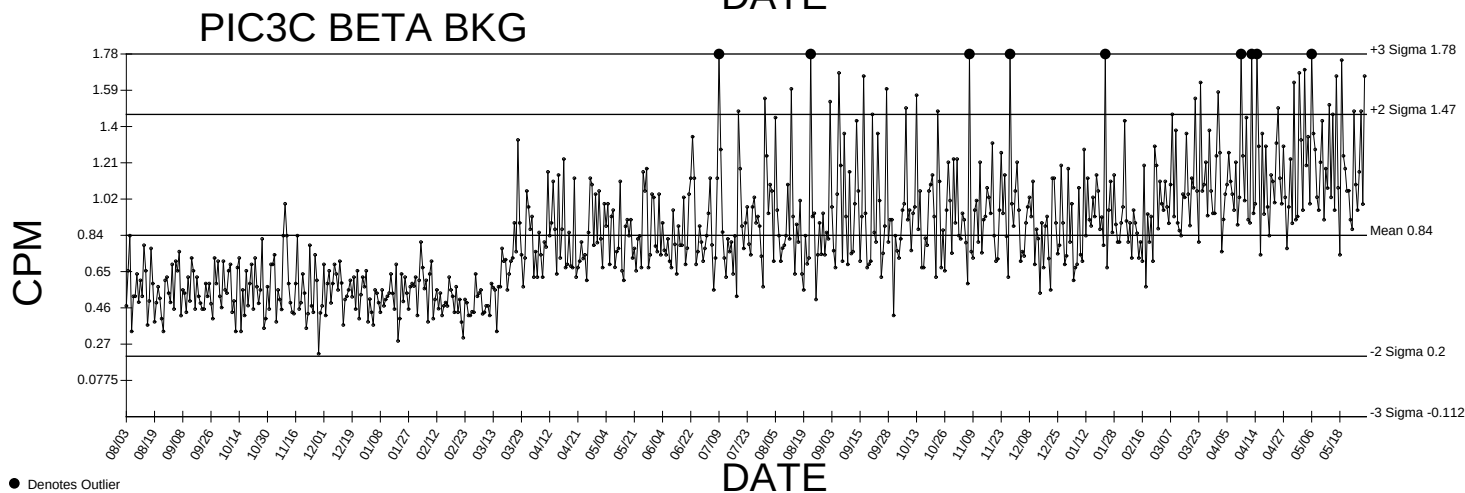
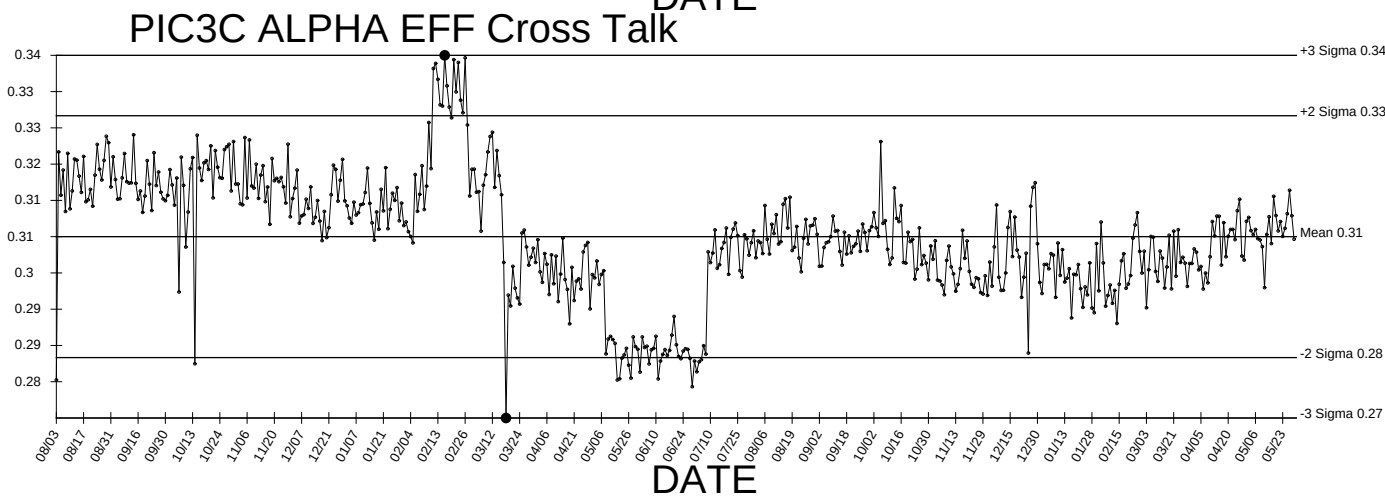
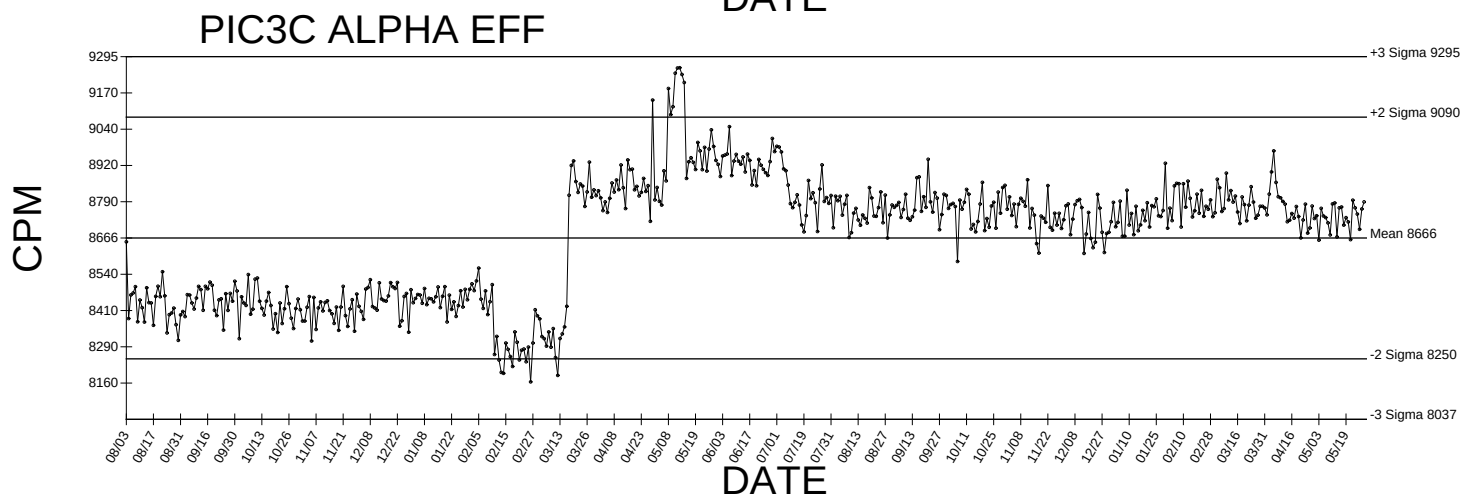
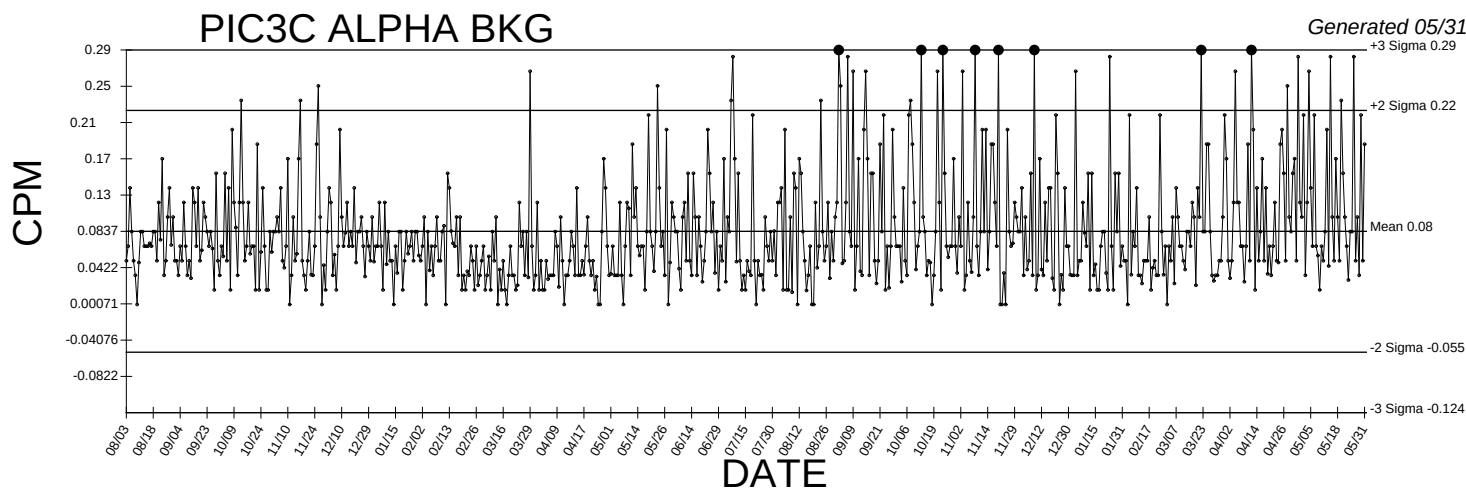
● Denotes Outlier



● Denotes Outlier



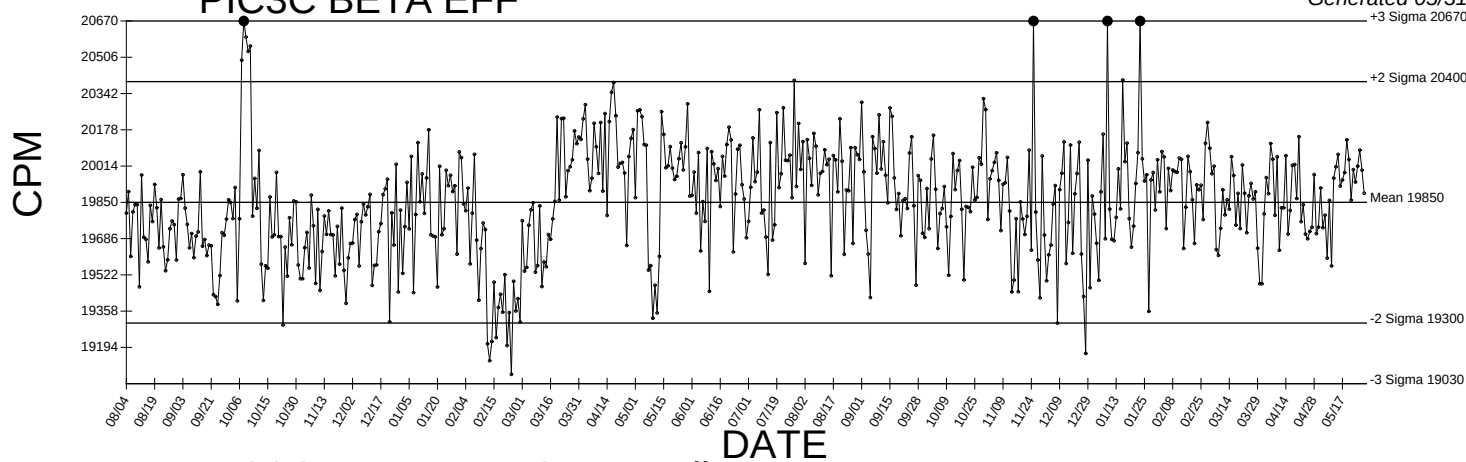
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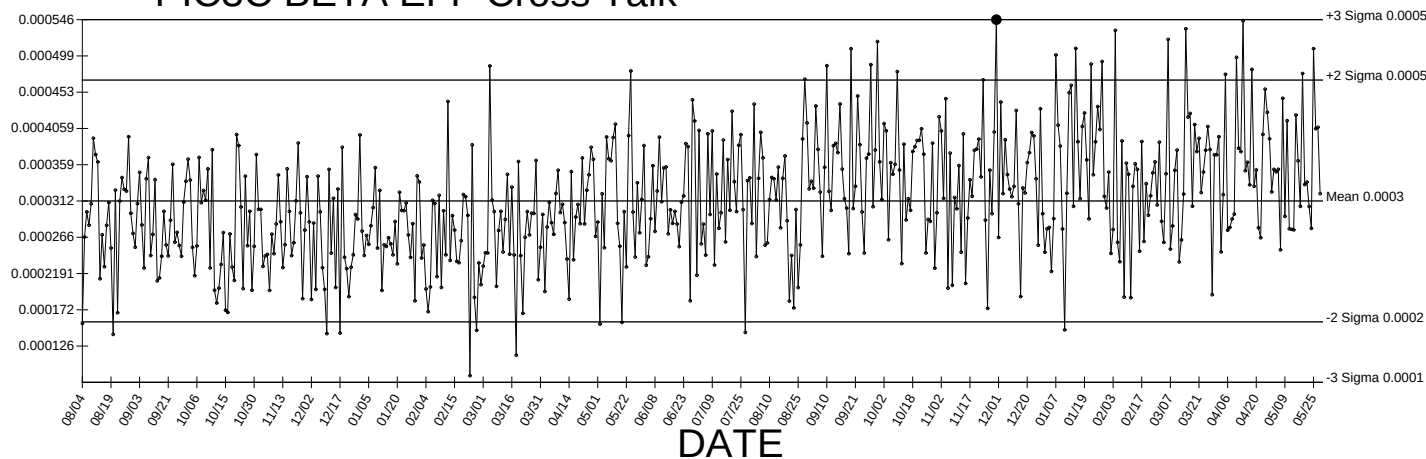
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PIC3C BETA EFF

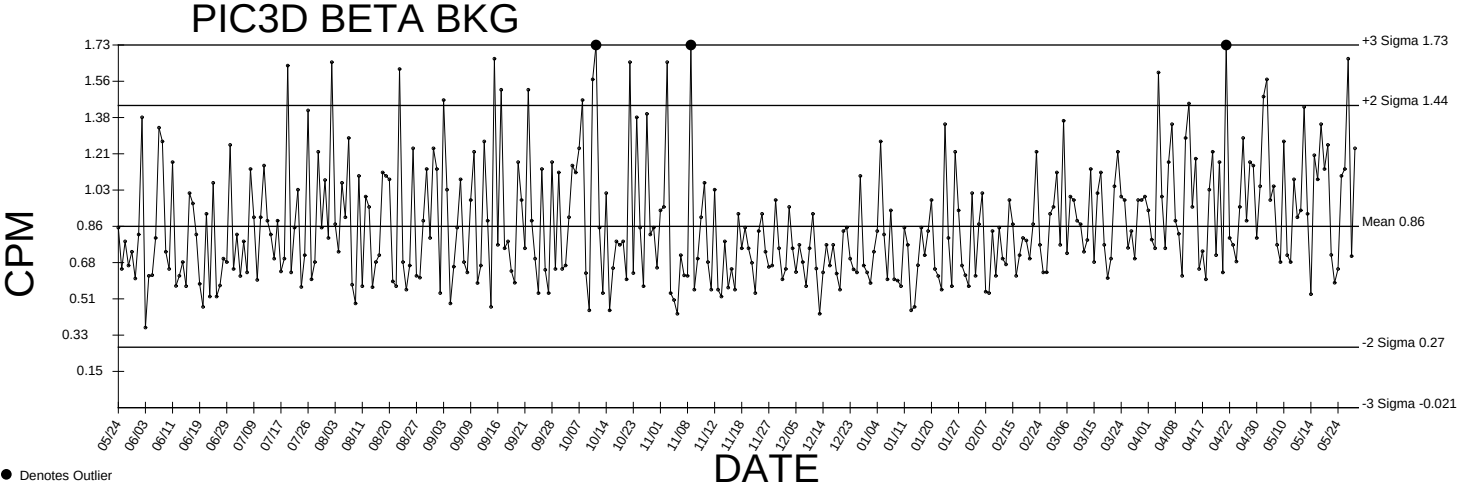
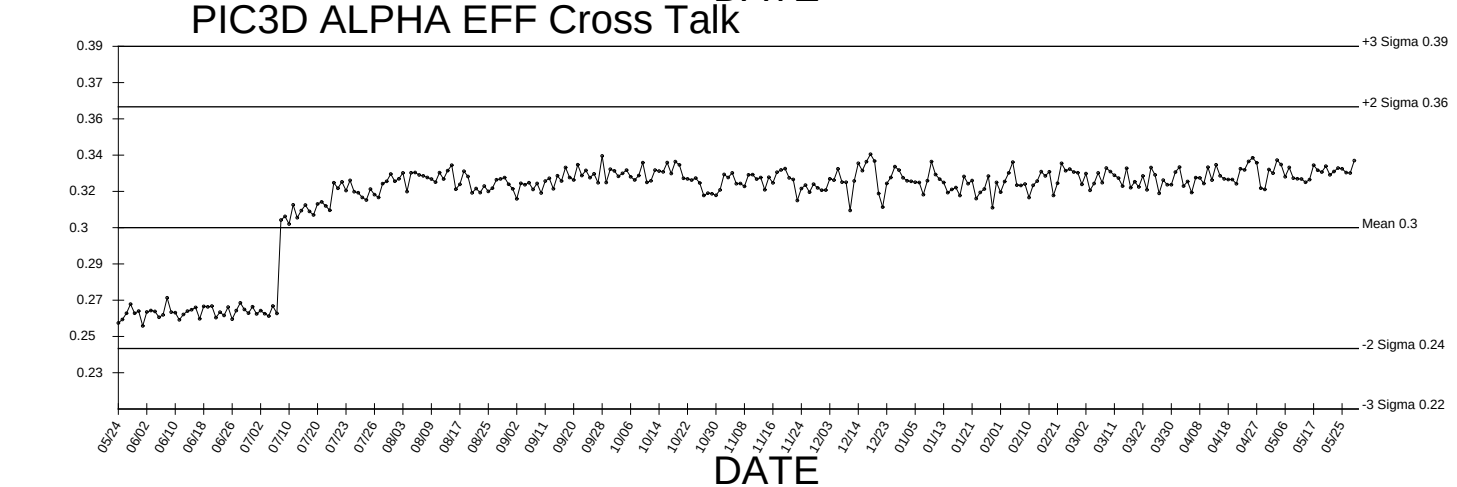
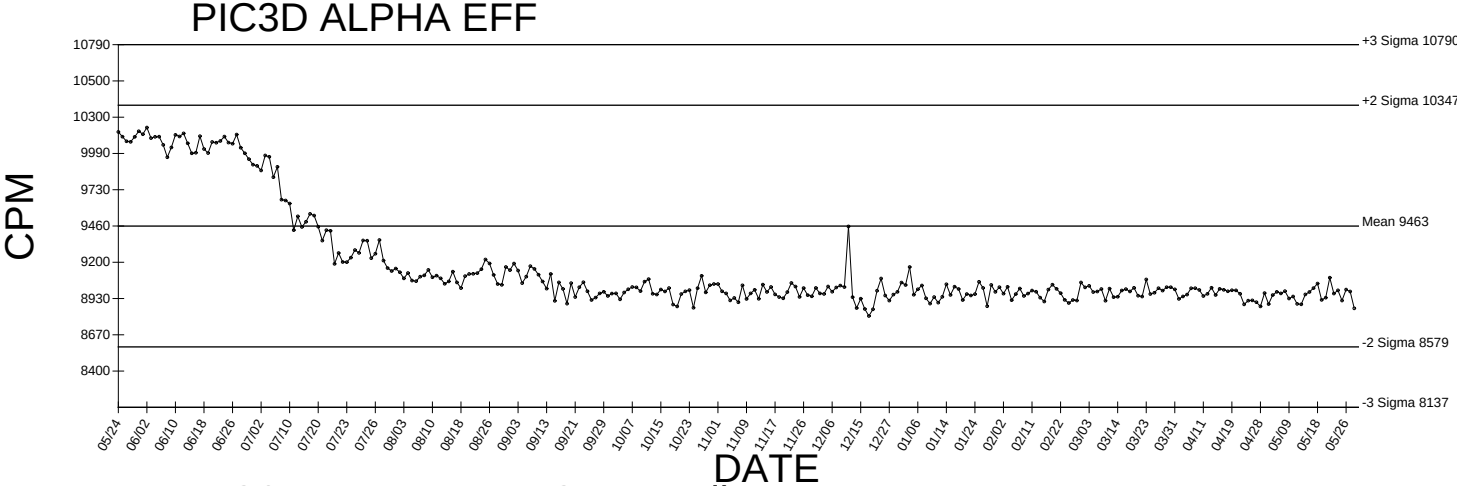
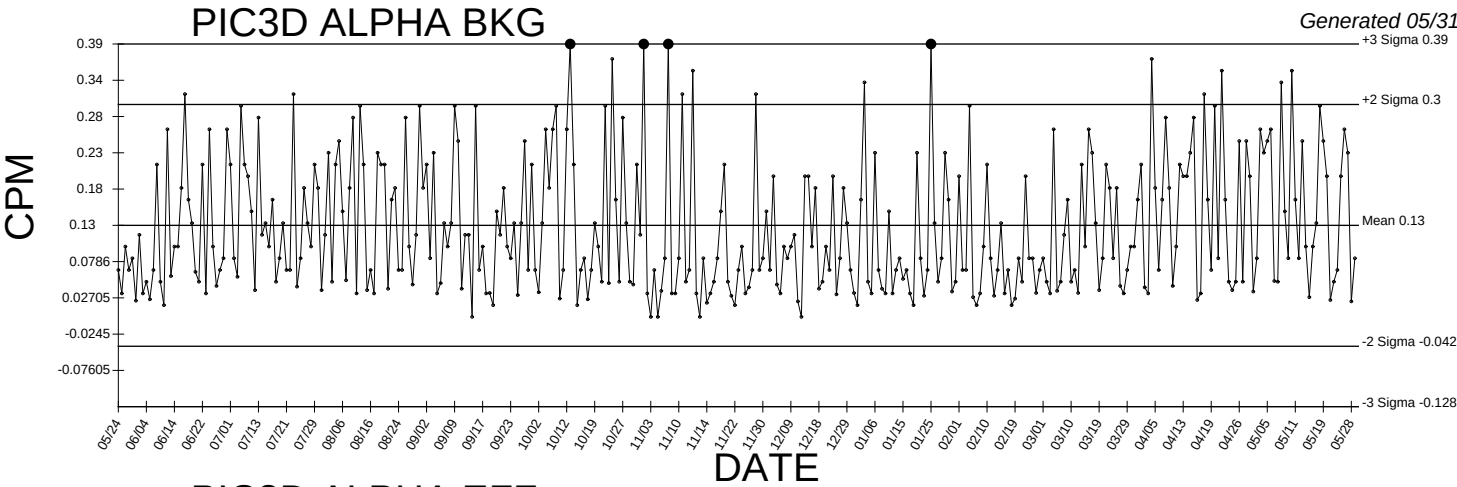
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PIC3C BETA EFF Cross Talk



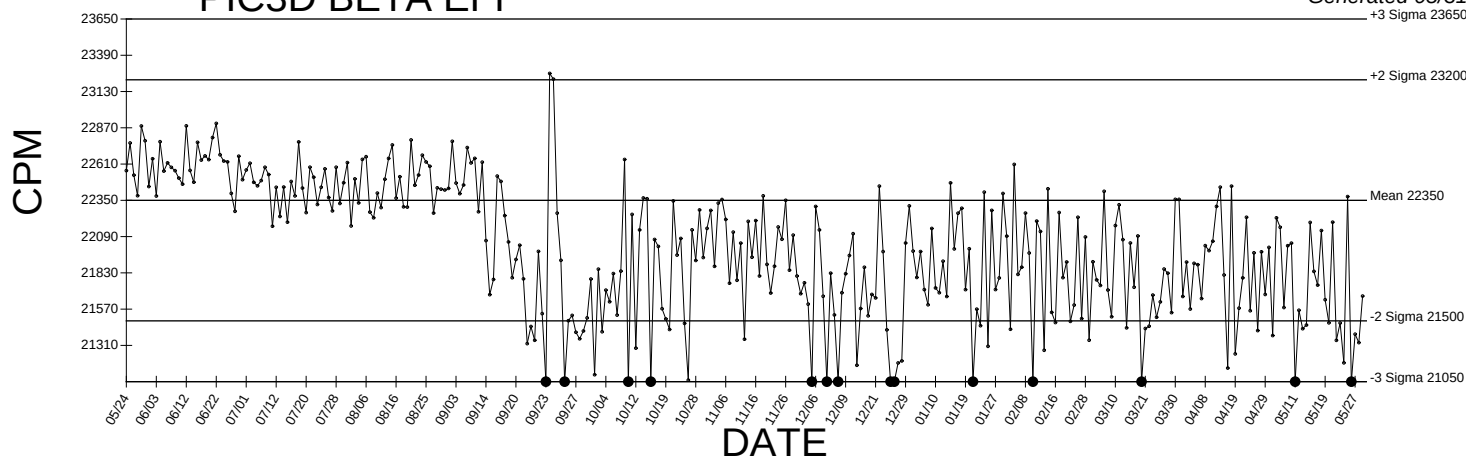
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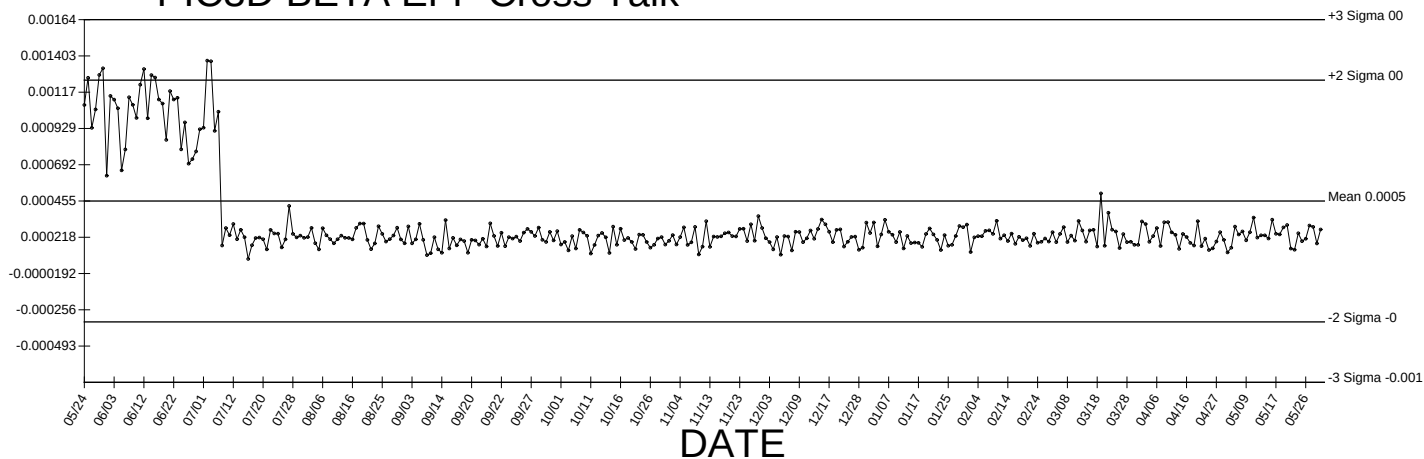
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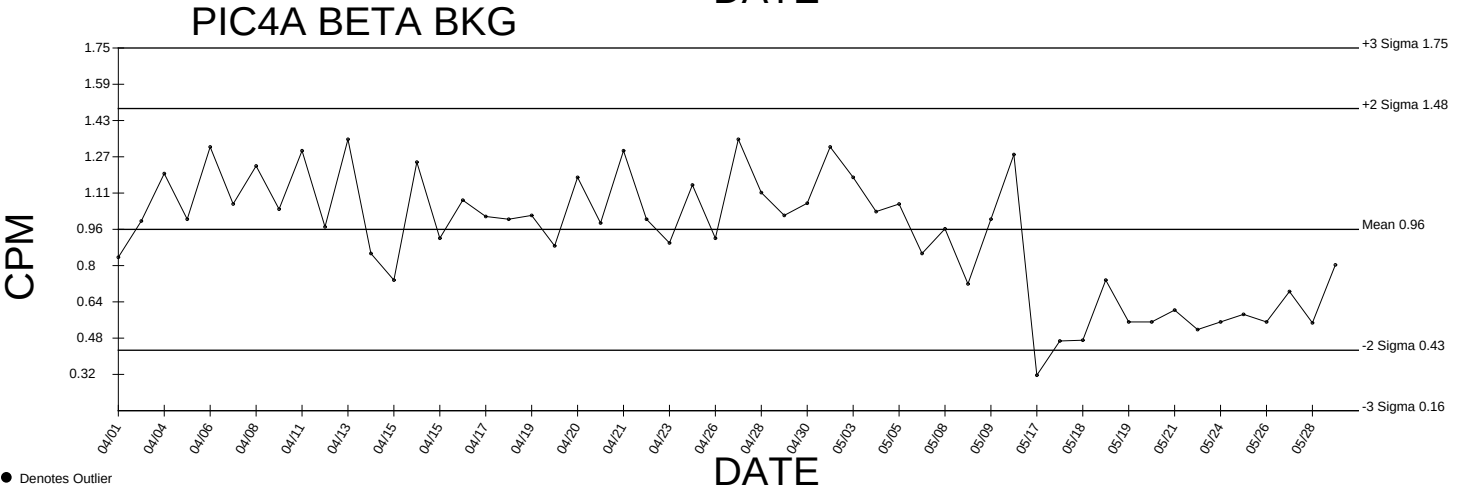
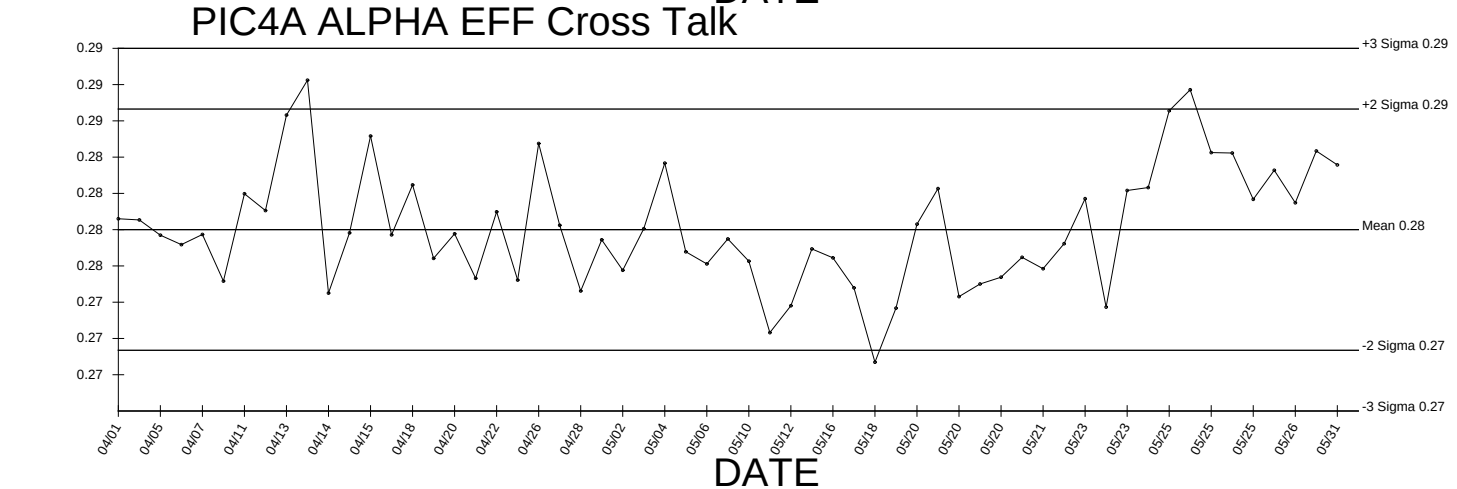
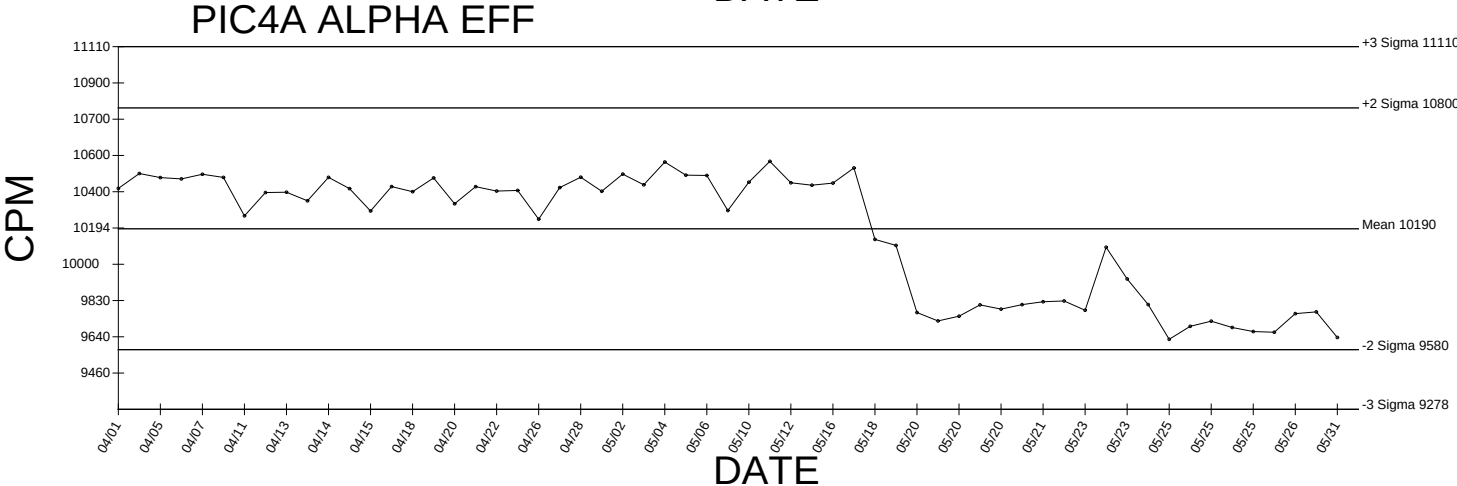
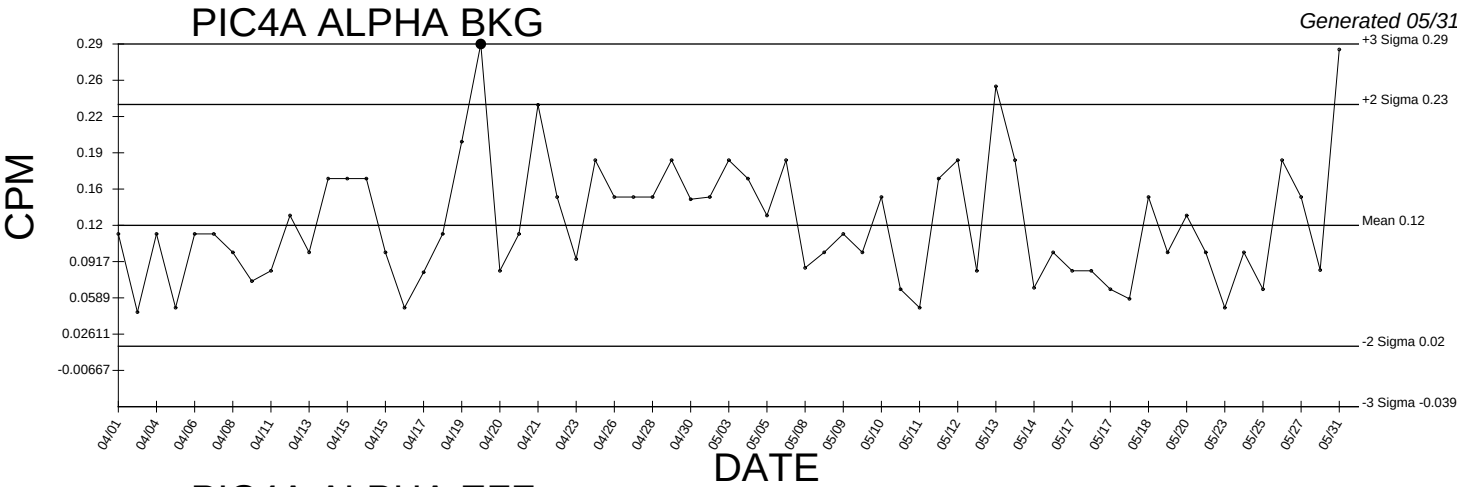
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PIC3D BETA EFF Cross Talk

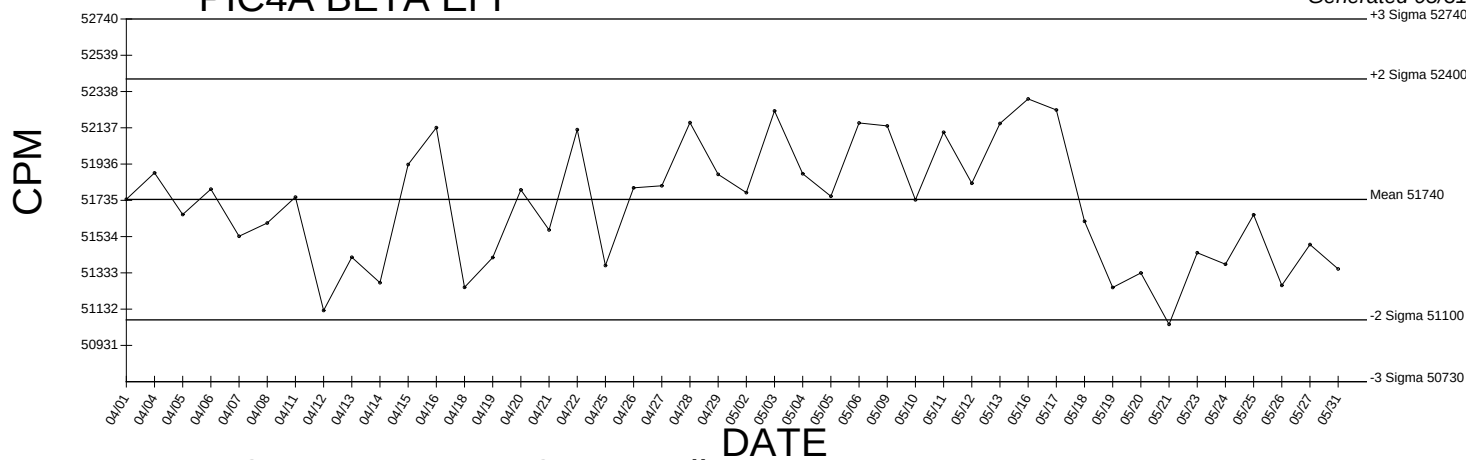


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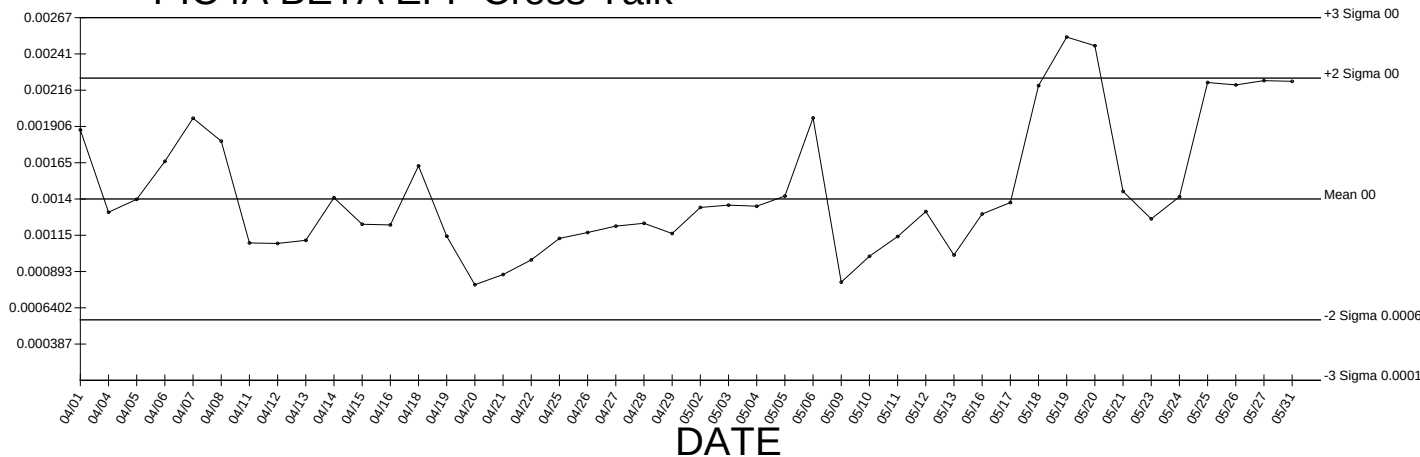


PIC4A BETA EFF

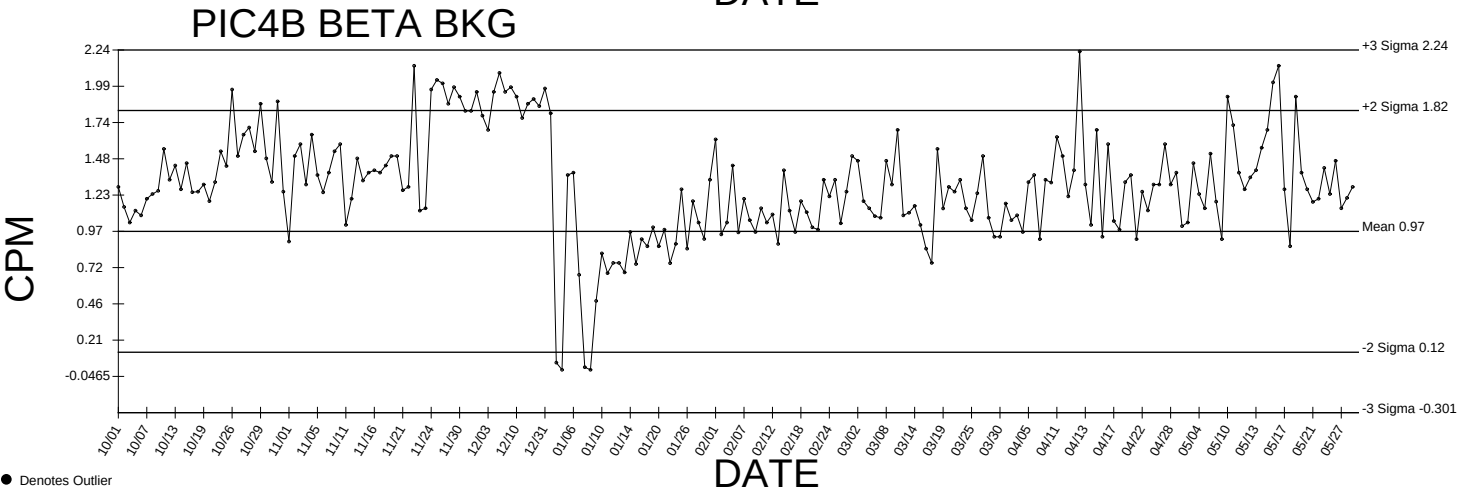
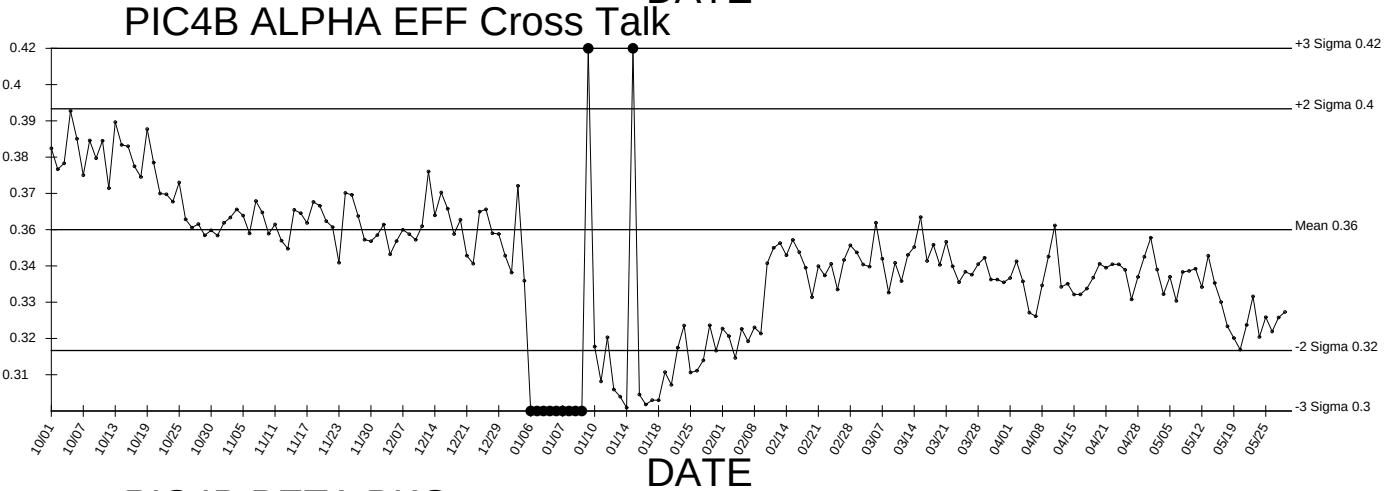
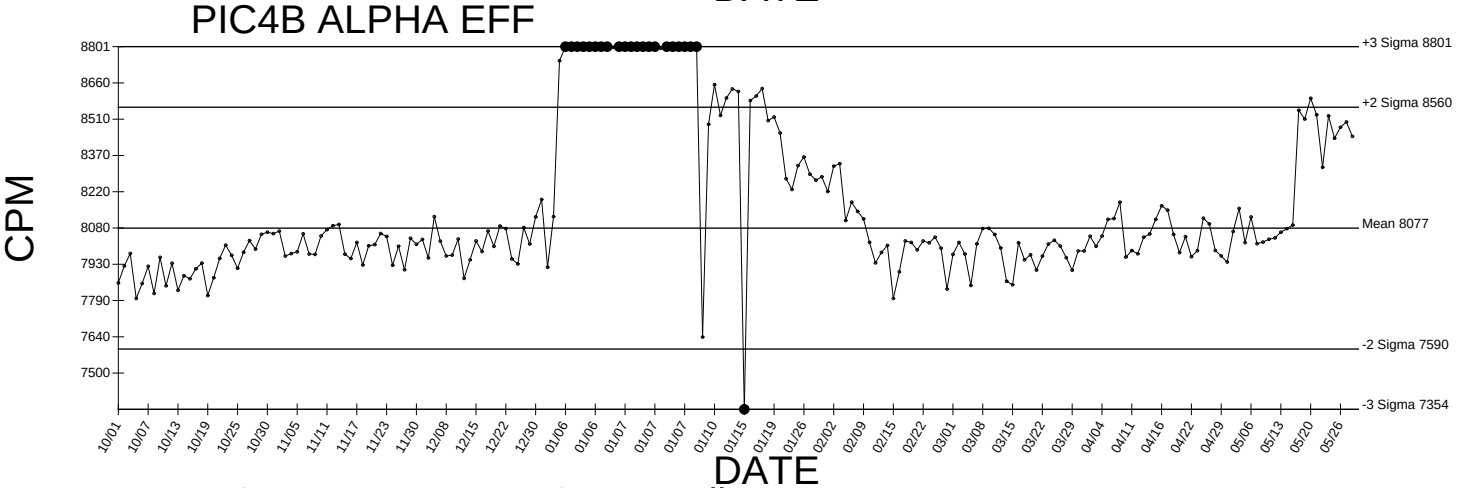
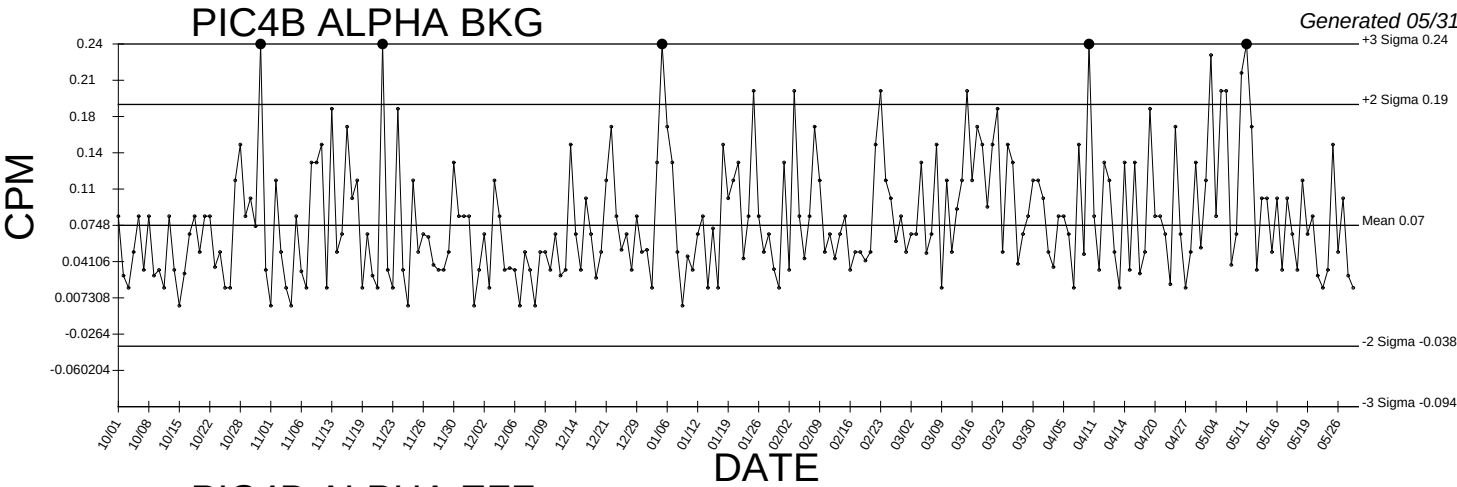
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PIC4A BETA EFF Cross Talk



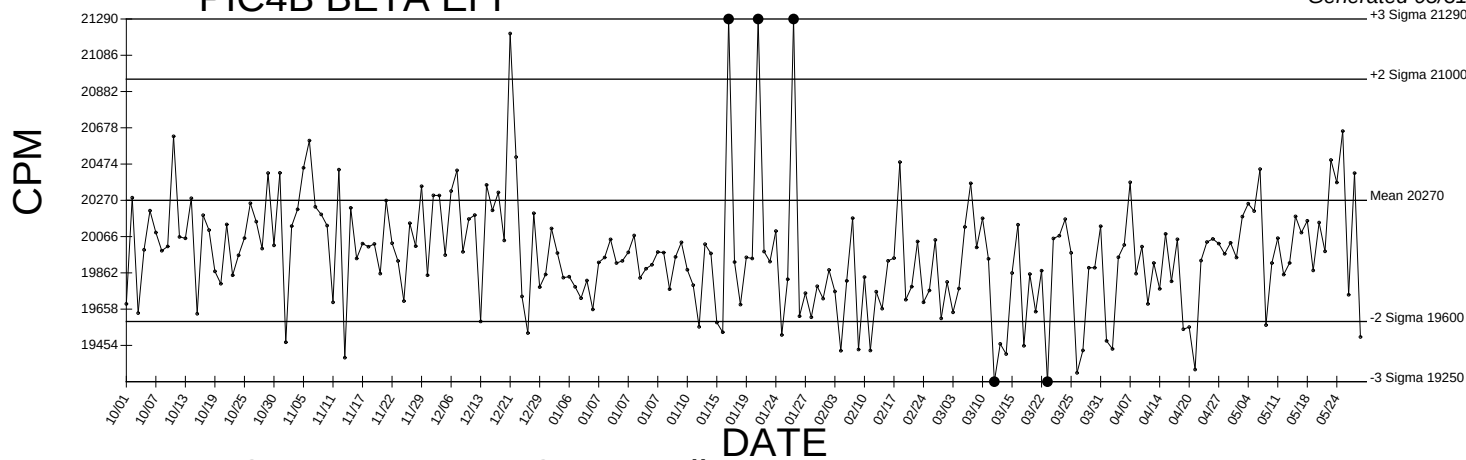
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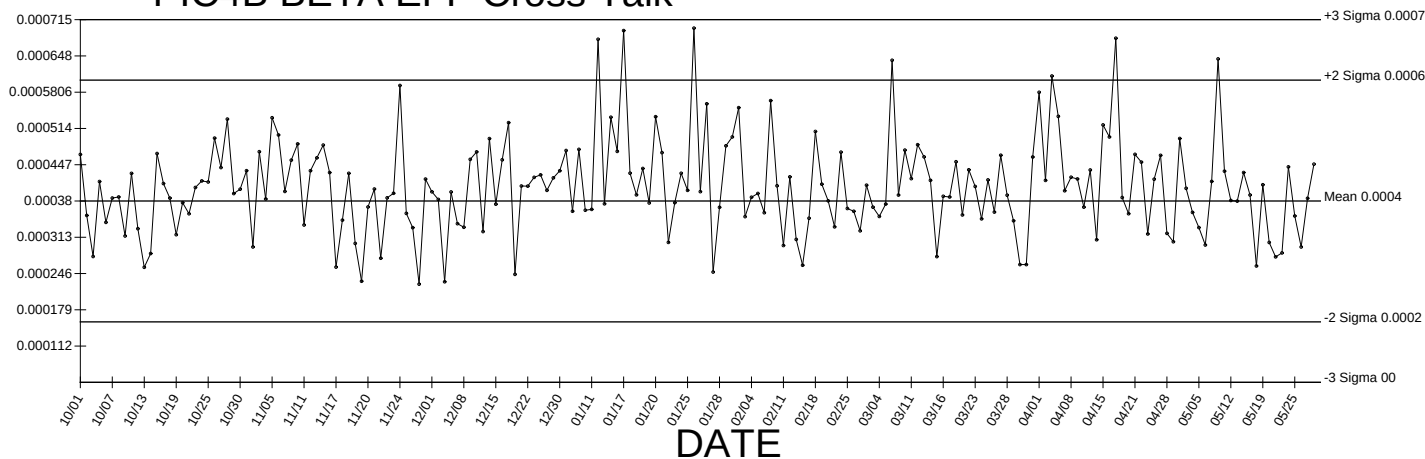
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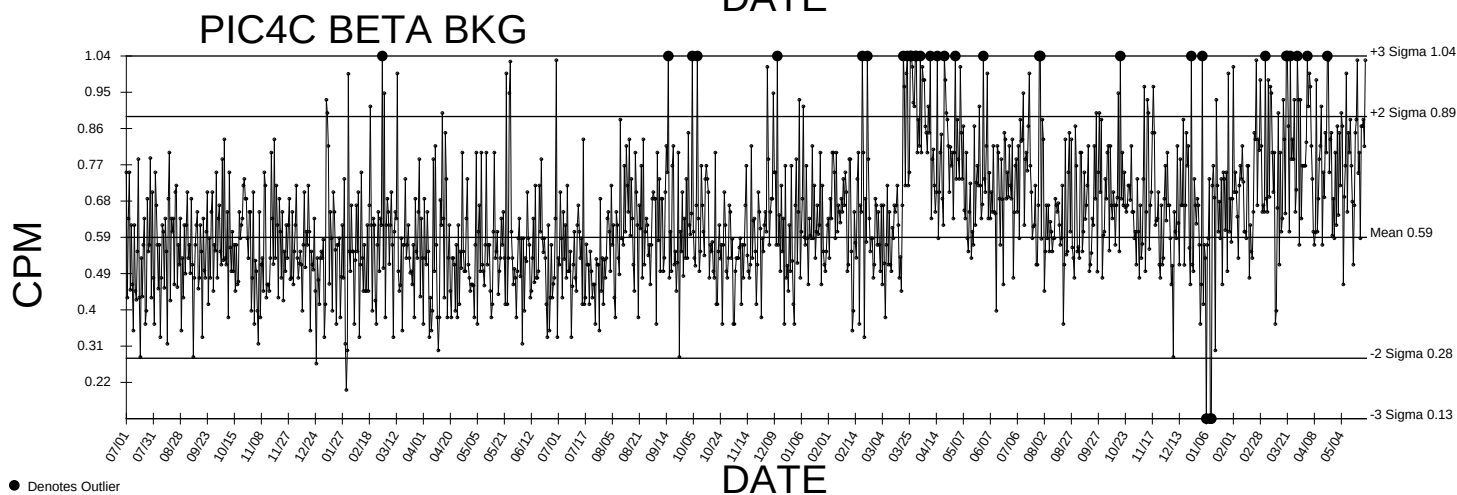
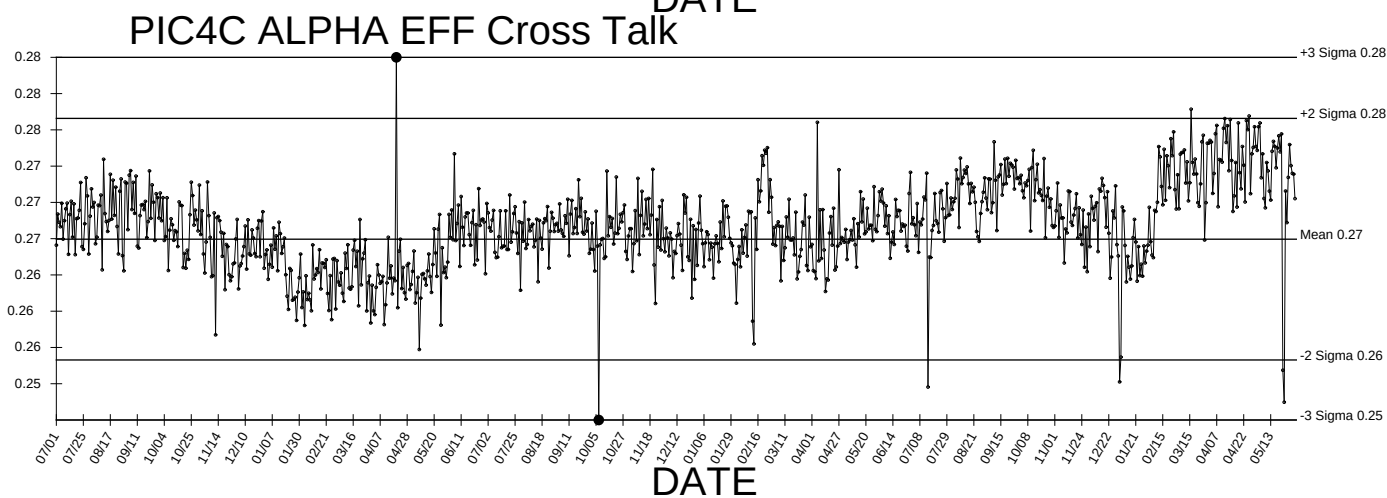
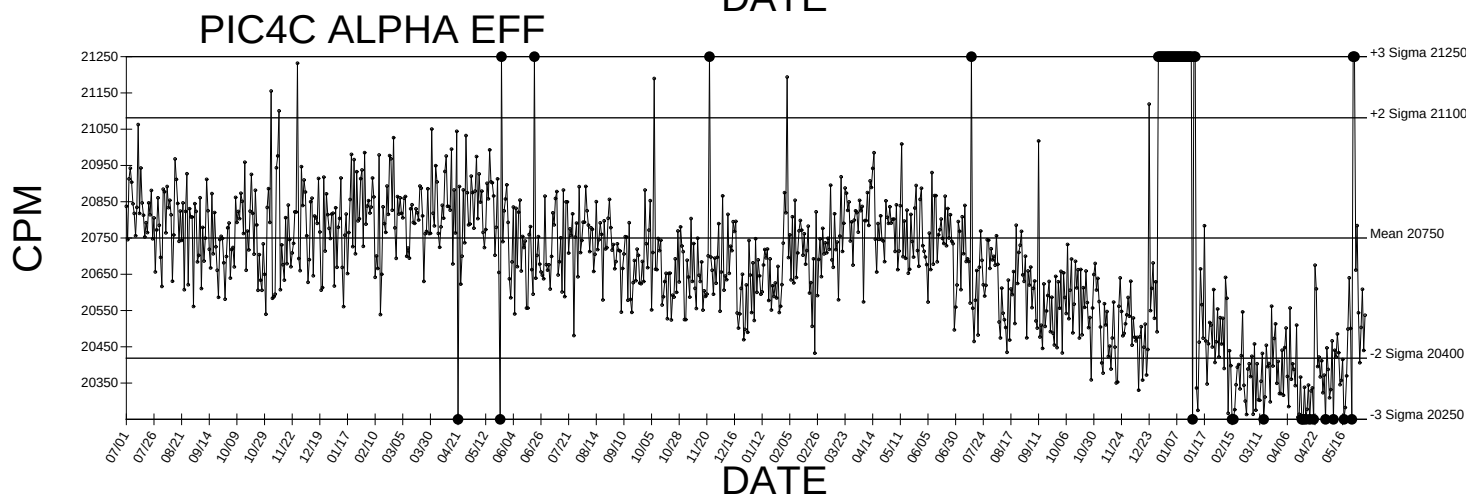
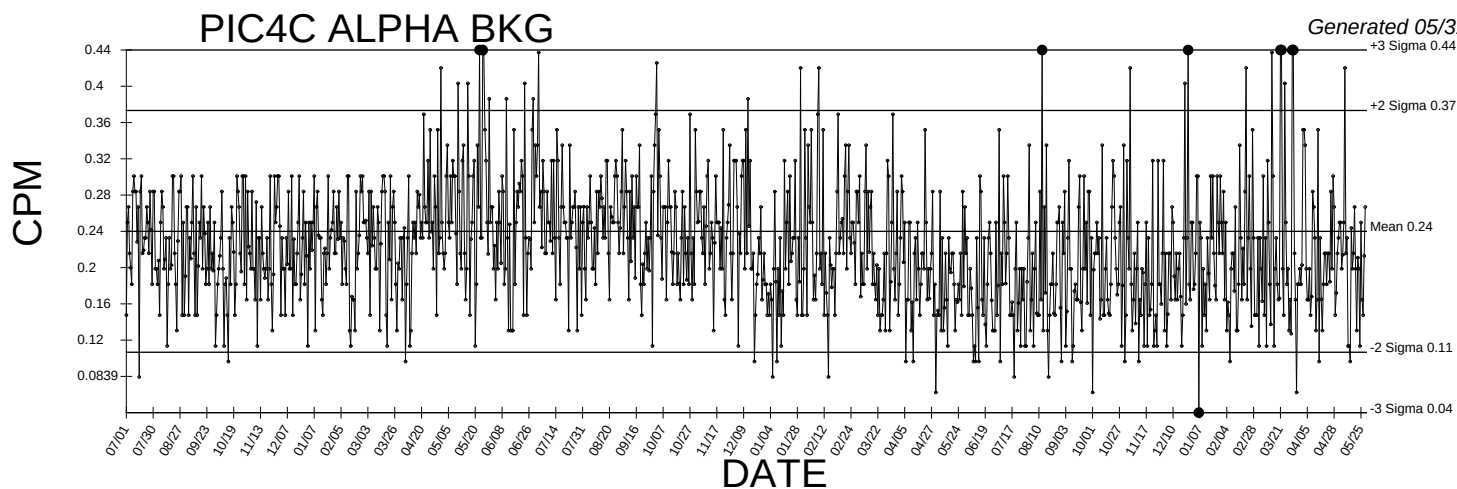
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PIC4B BETA EFF Cross Talk

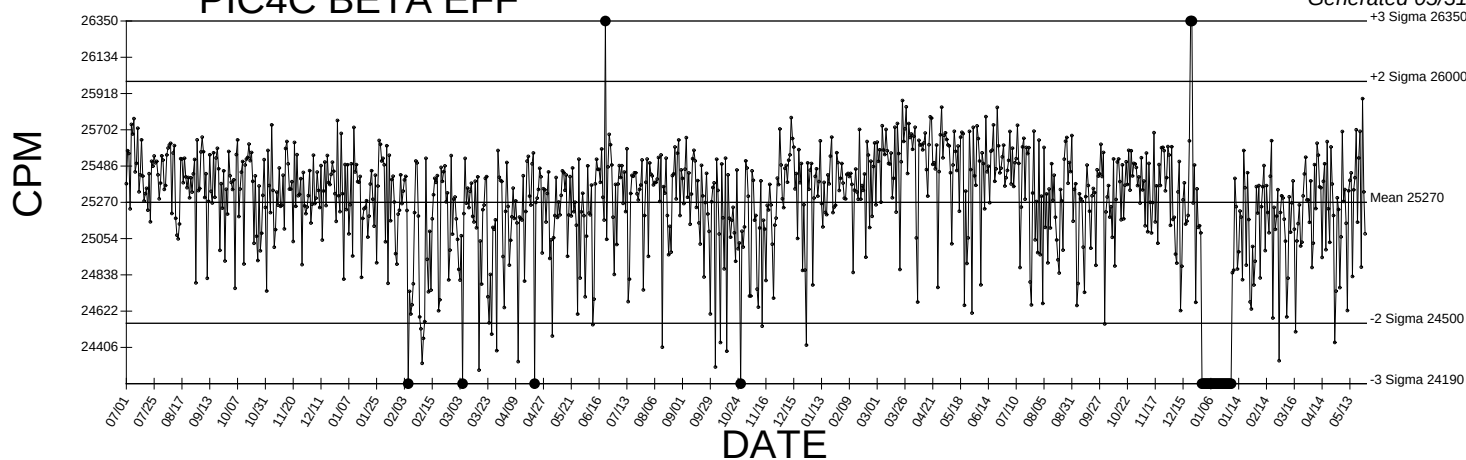


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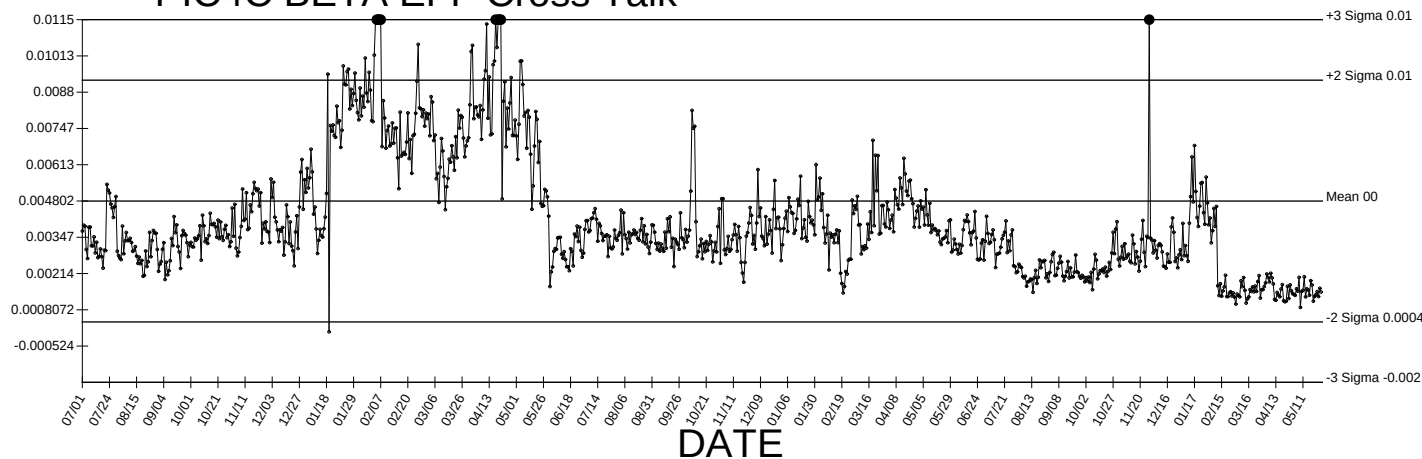


PIC4C BETA EFF

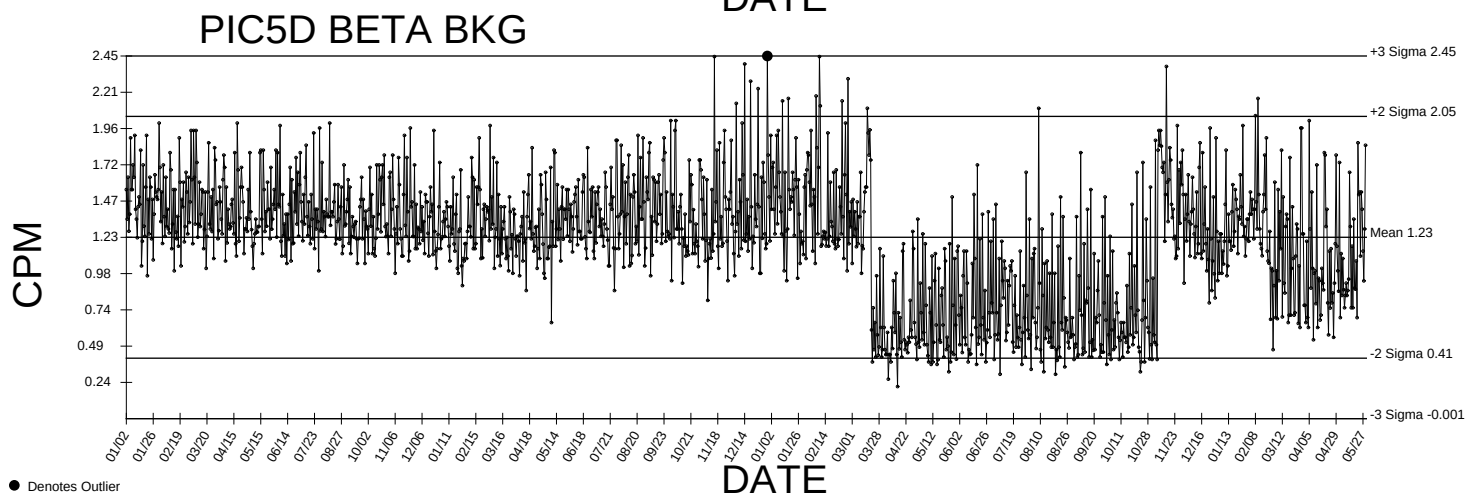
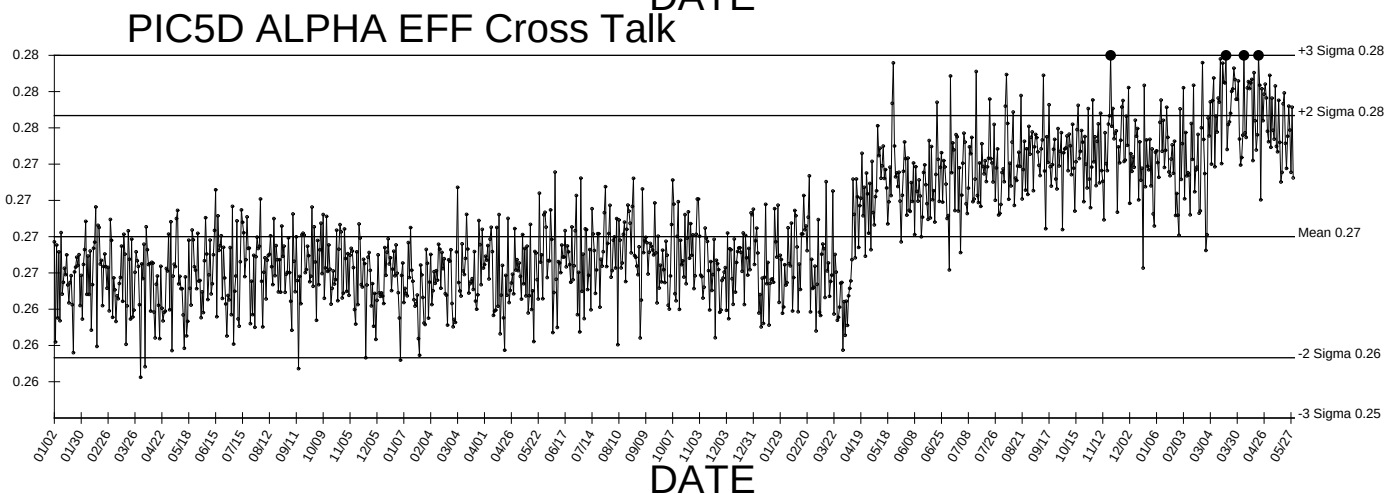
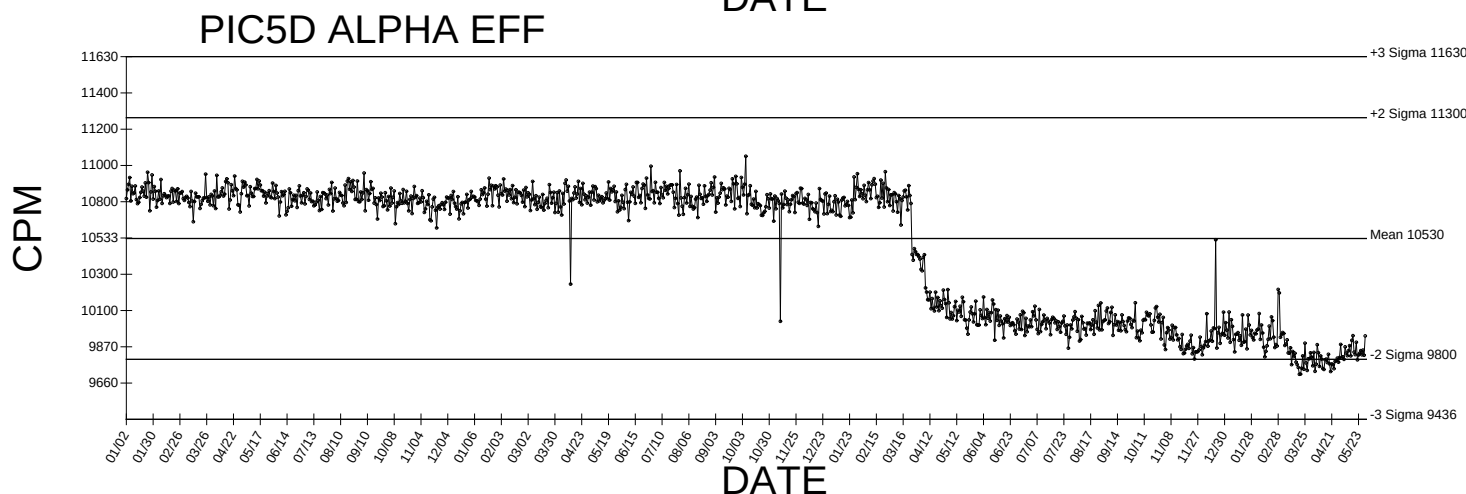
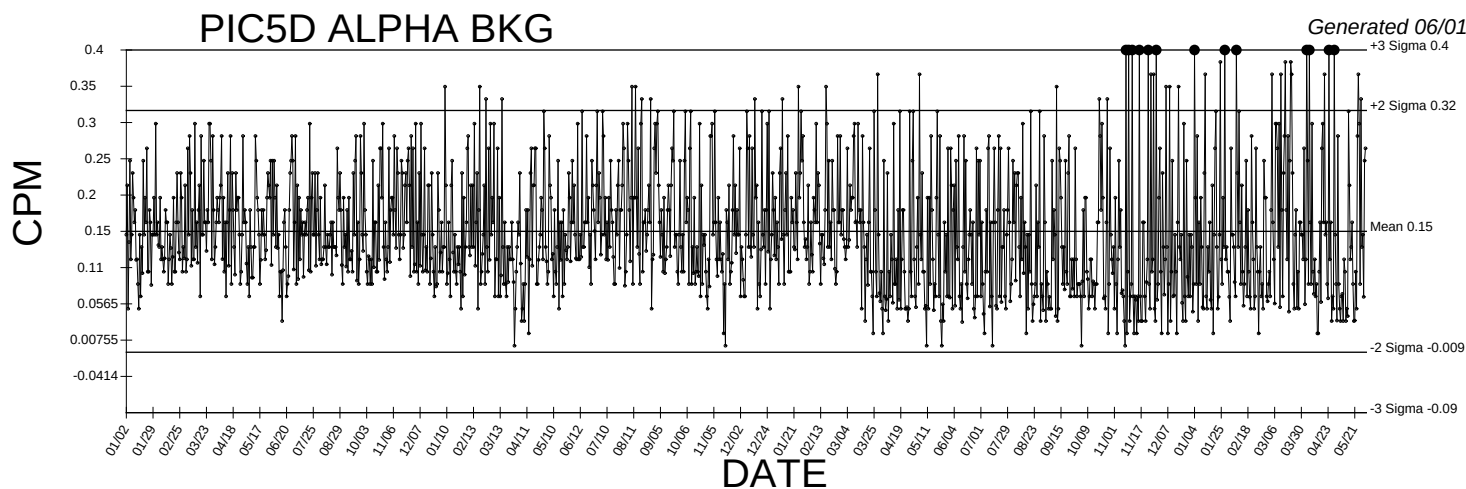
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PIC4C BETA EFF Cross Talk



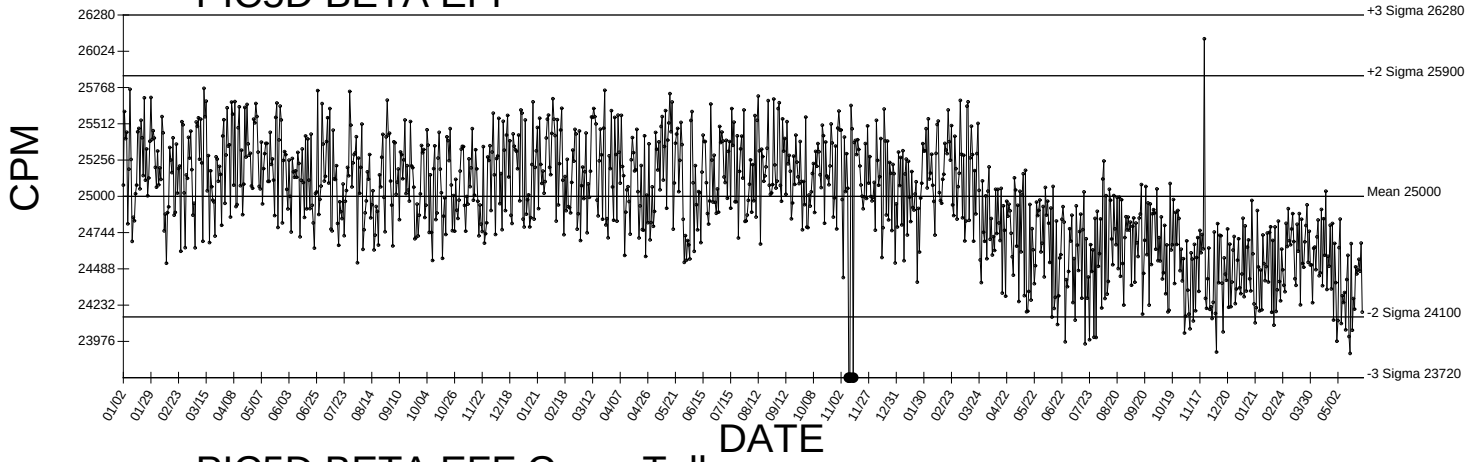
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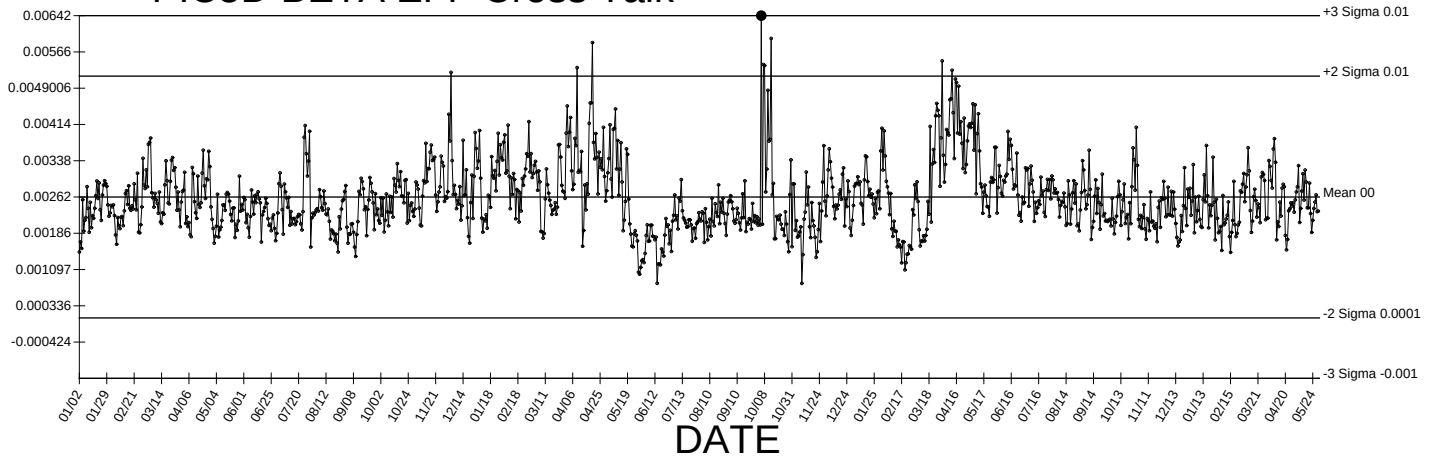
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PIC5D BETA EFF

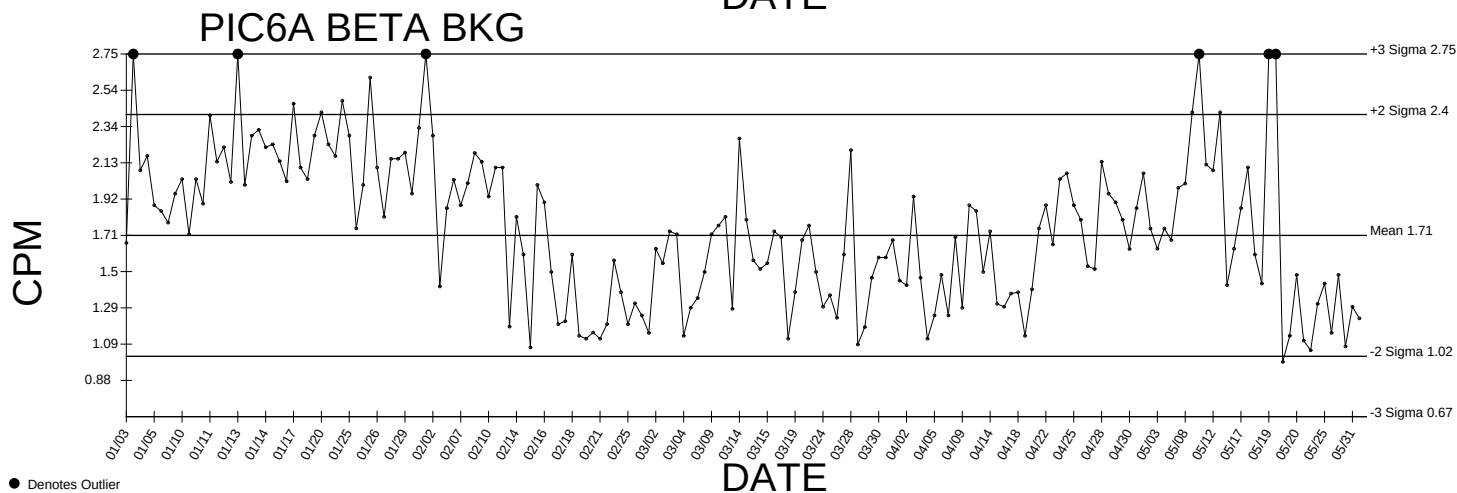
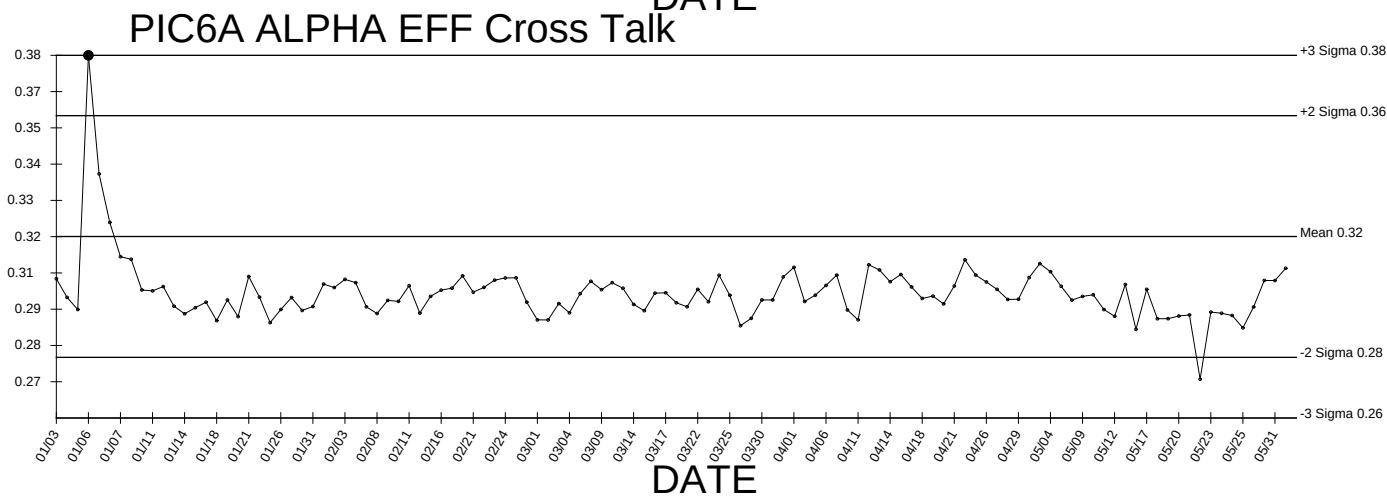
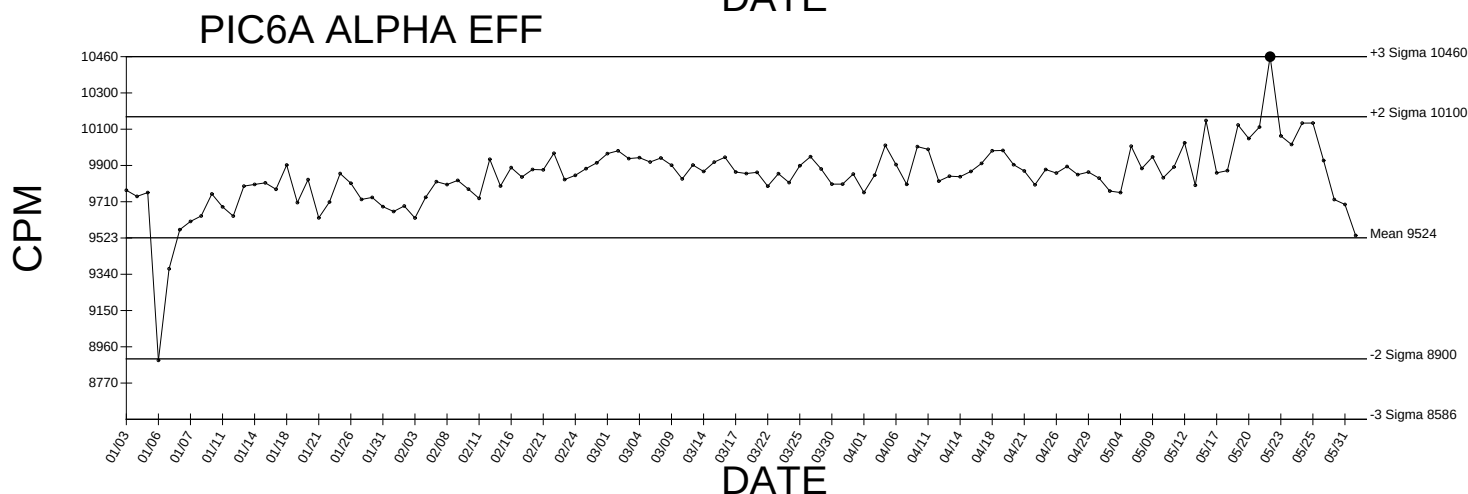
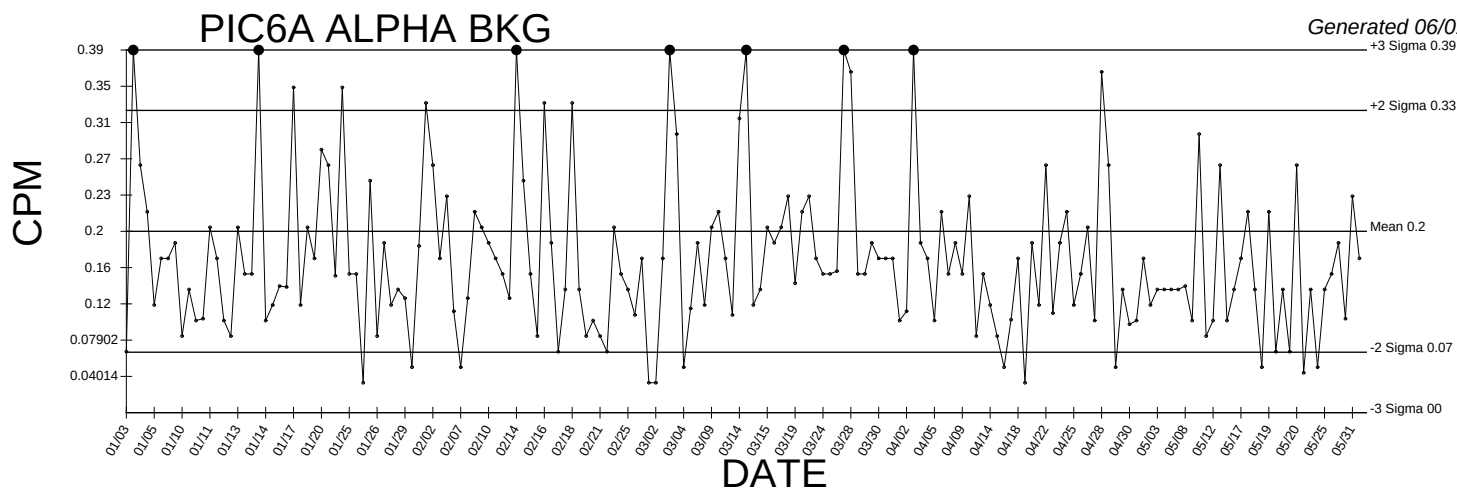
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+3 Sigma 26280



PIC5D BETA EFF Cross Talk



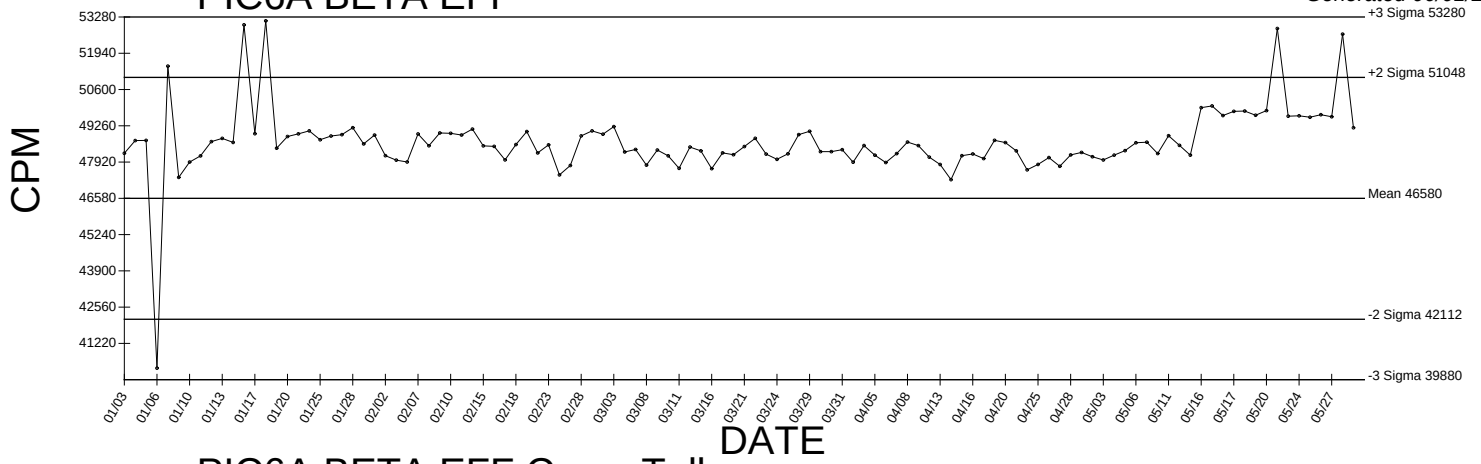
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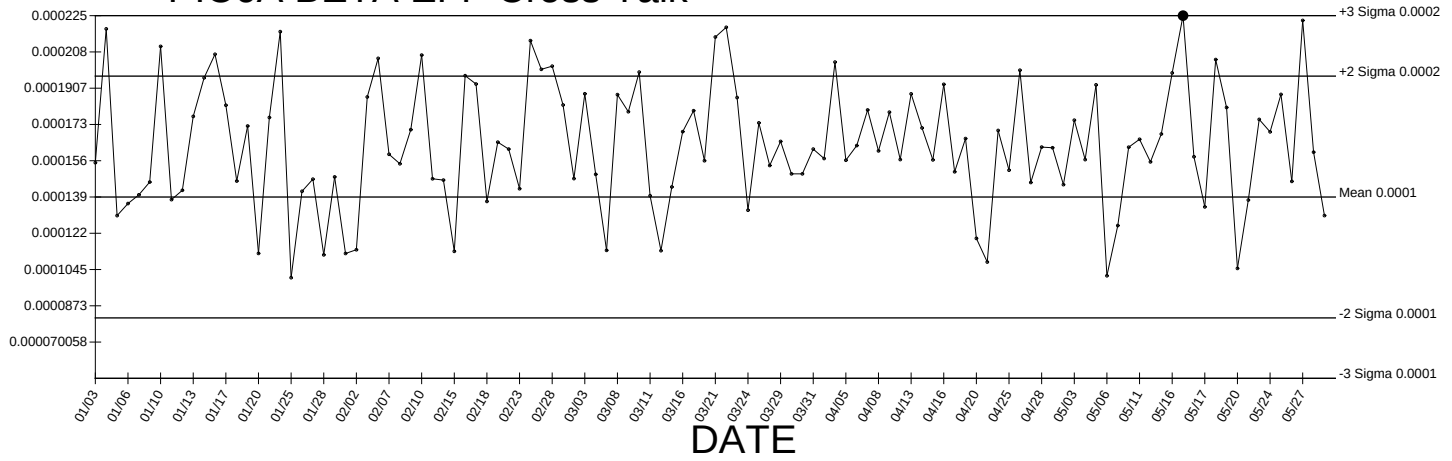
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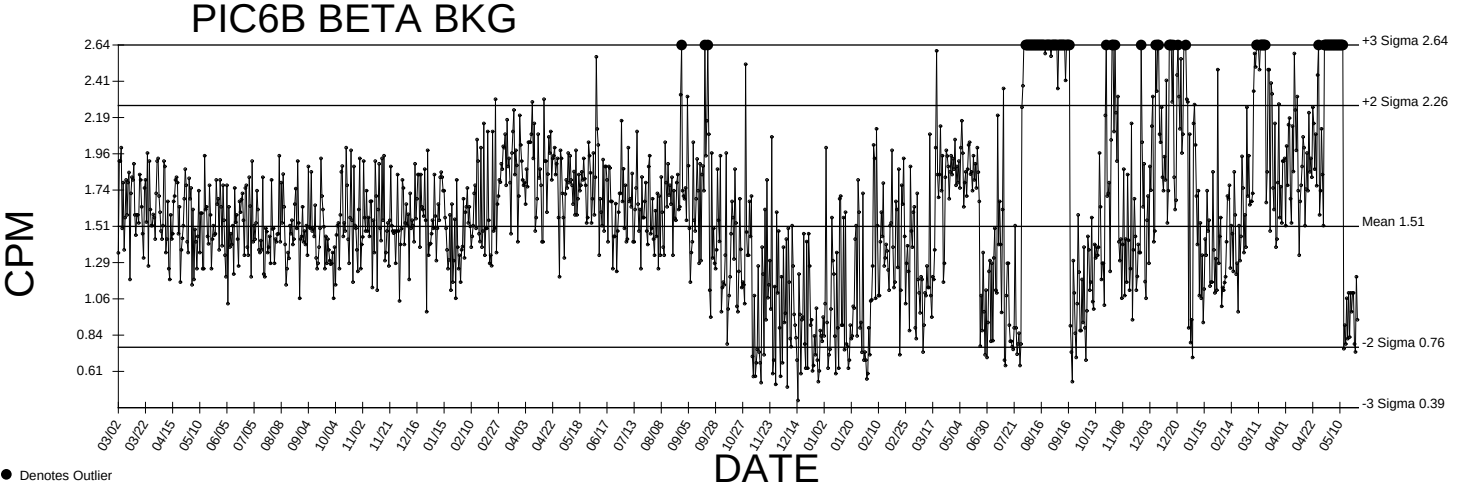
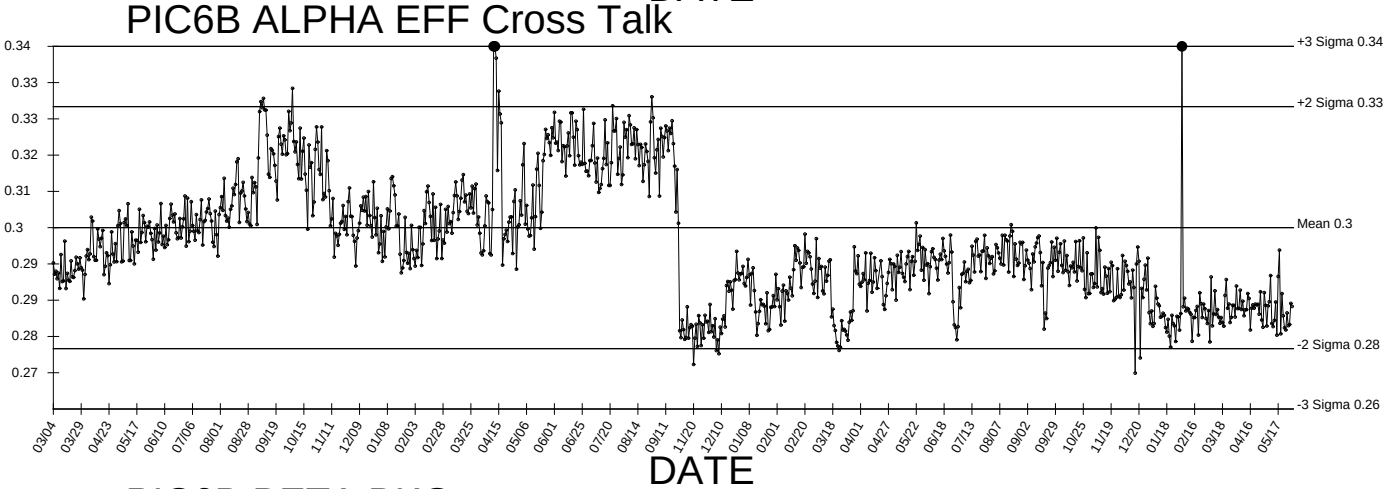
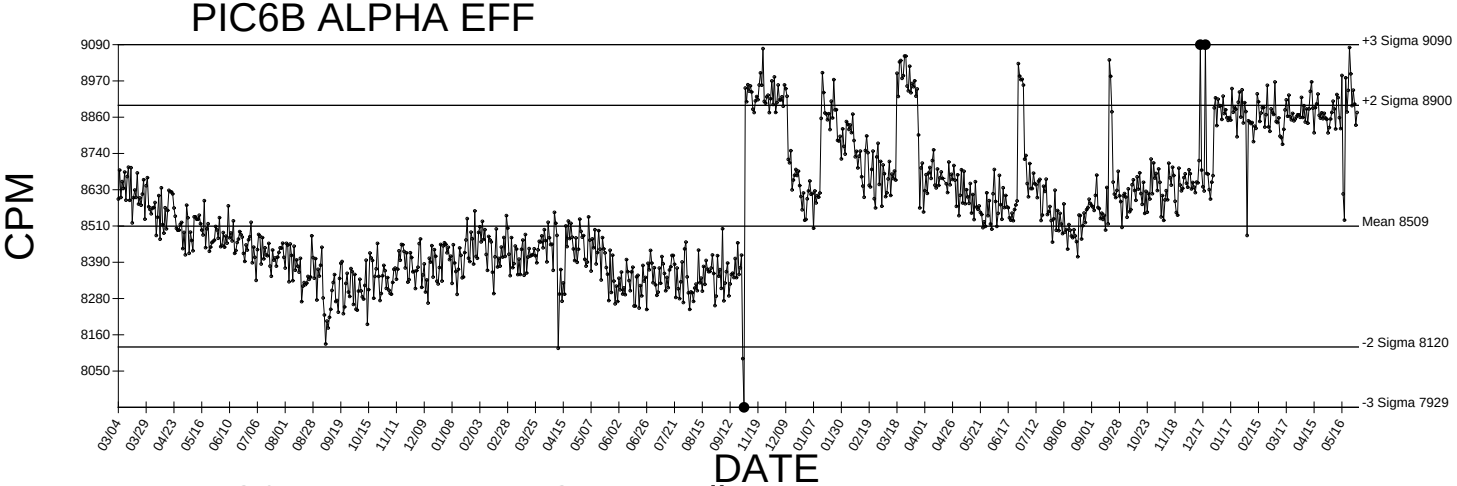
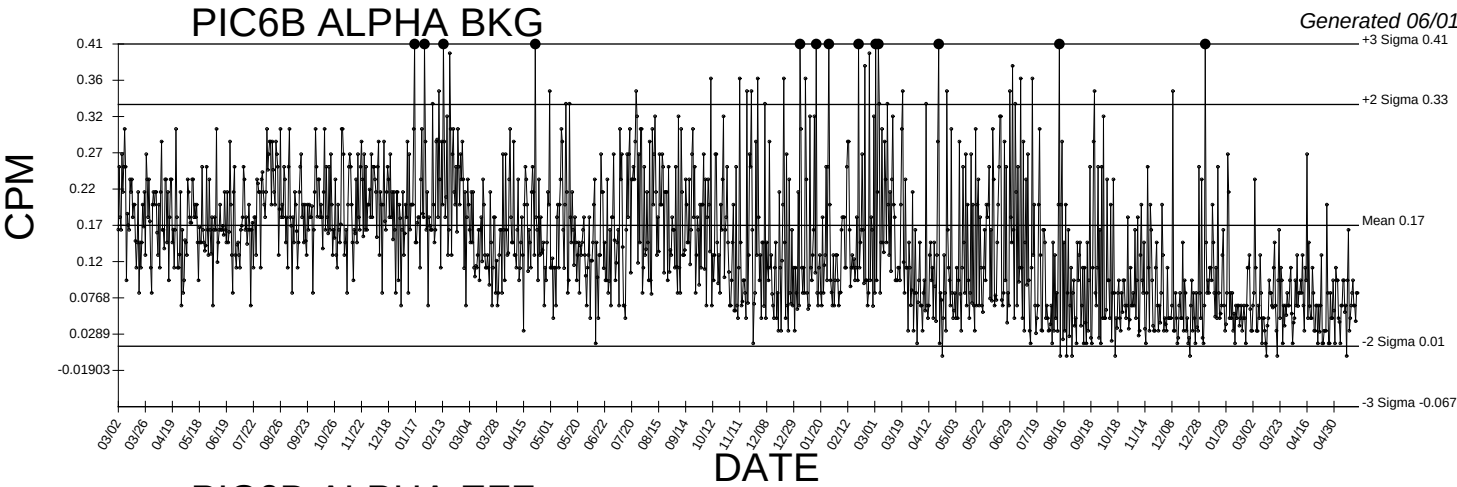
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PIC6A BETA EFF Cross Talk



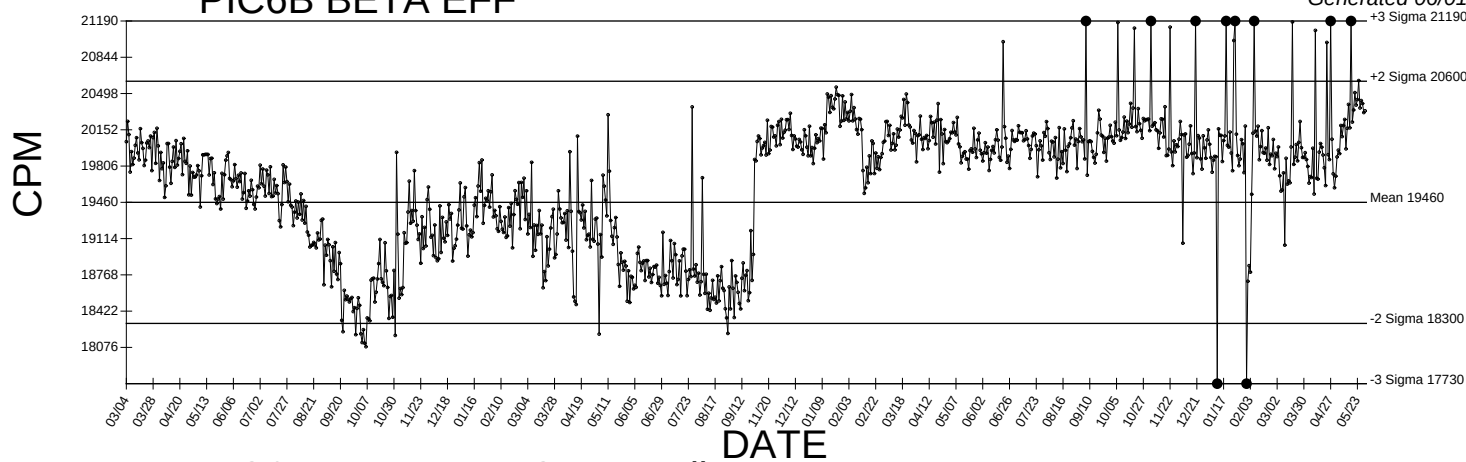
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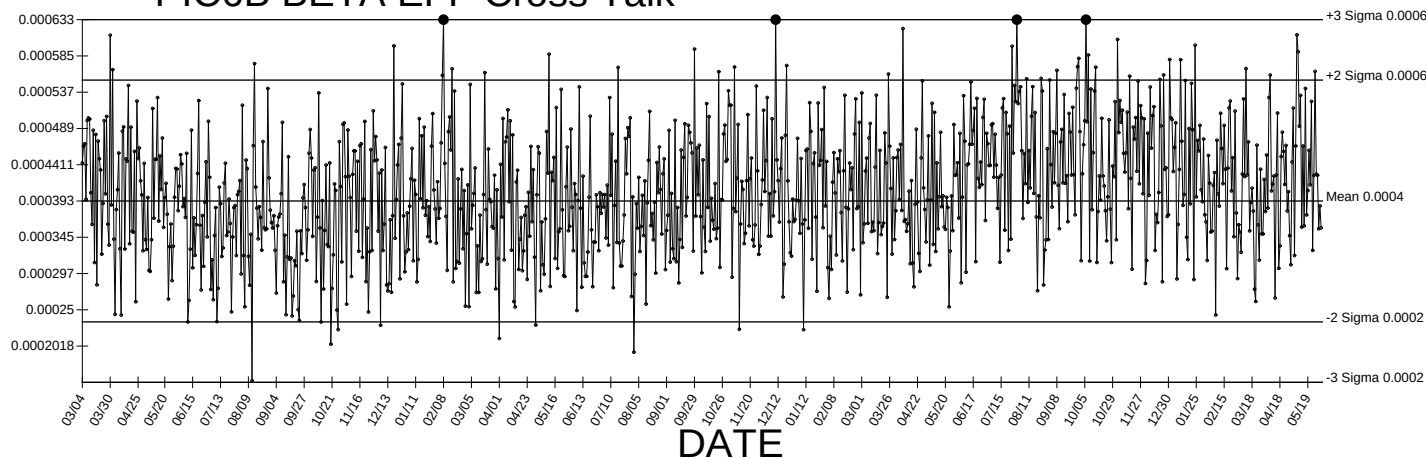
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PIC6B BETA EFF

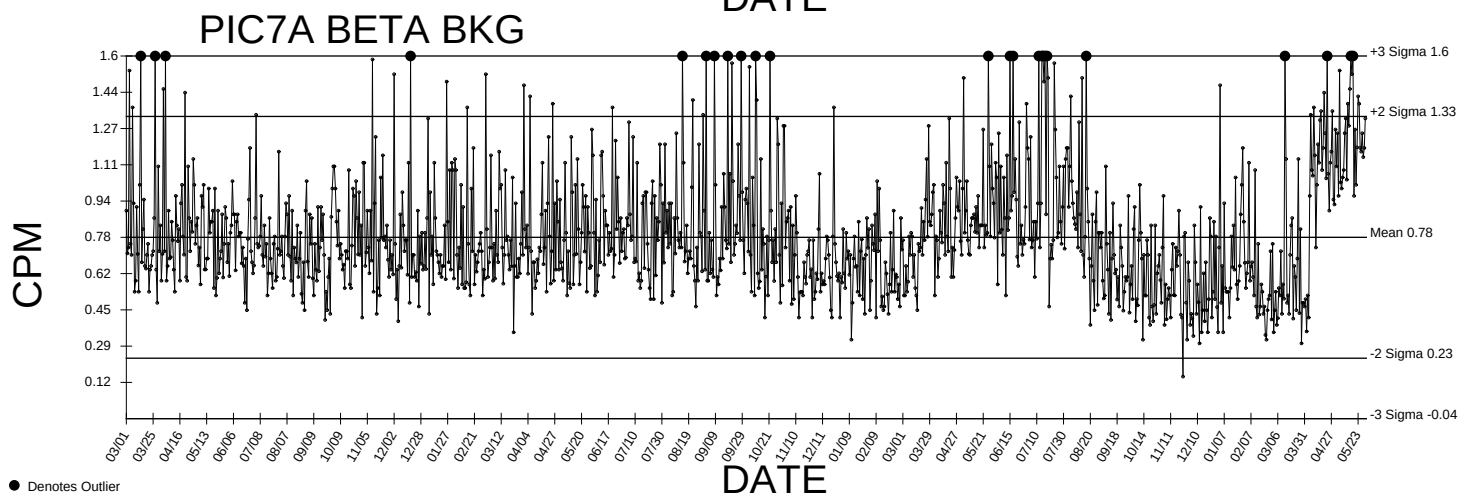
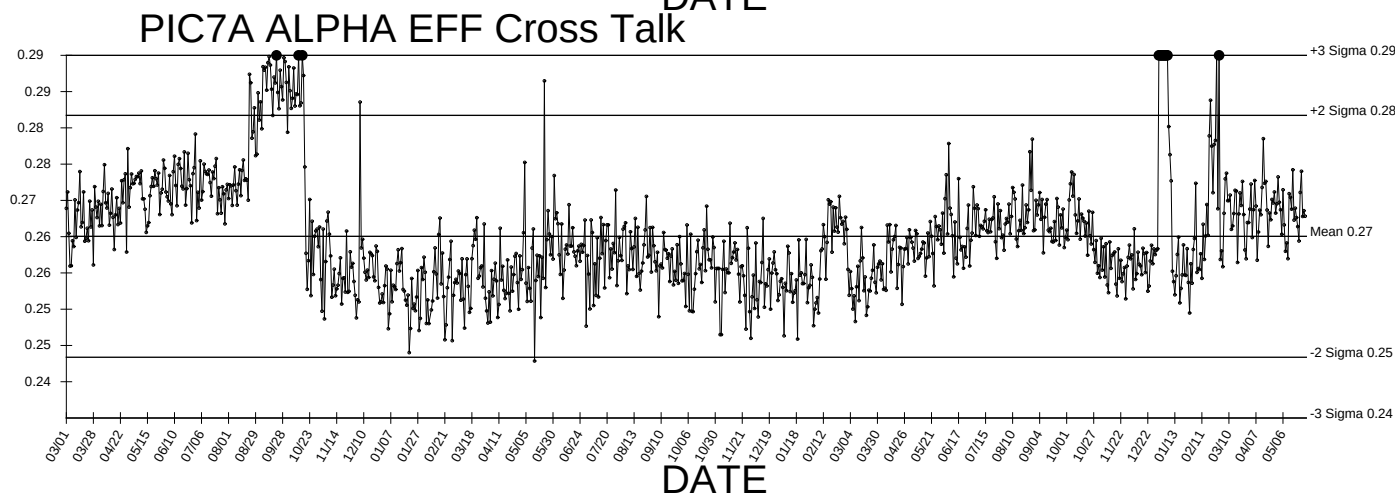
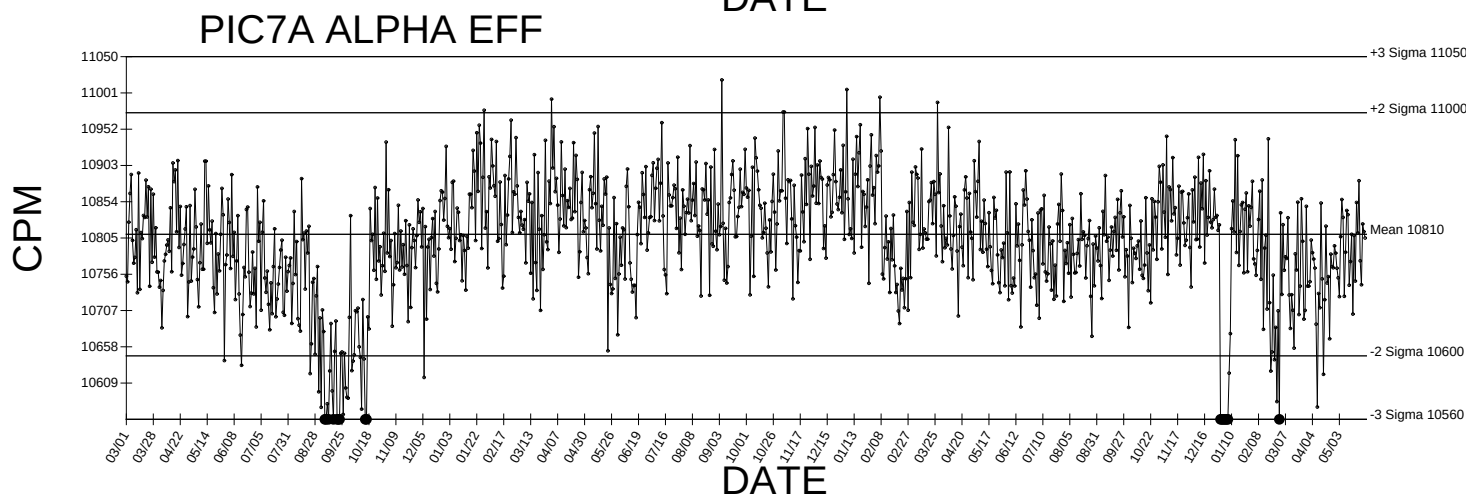
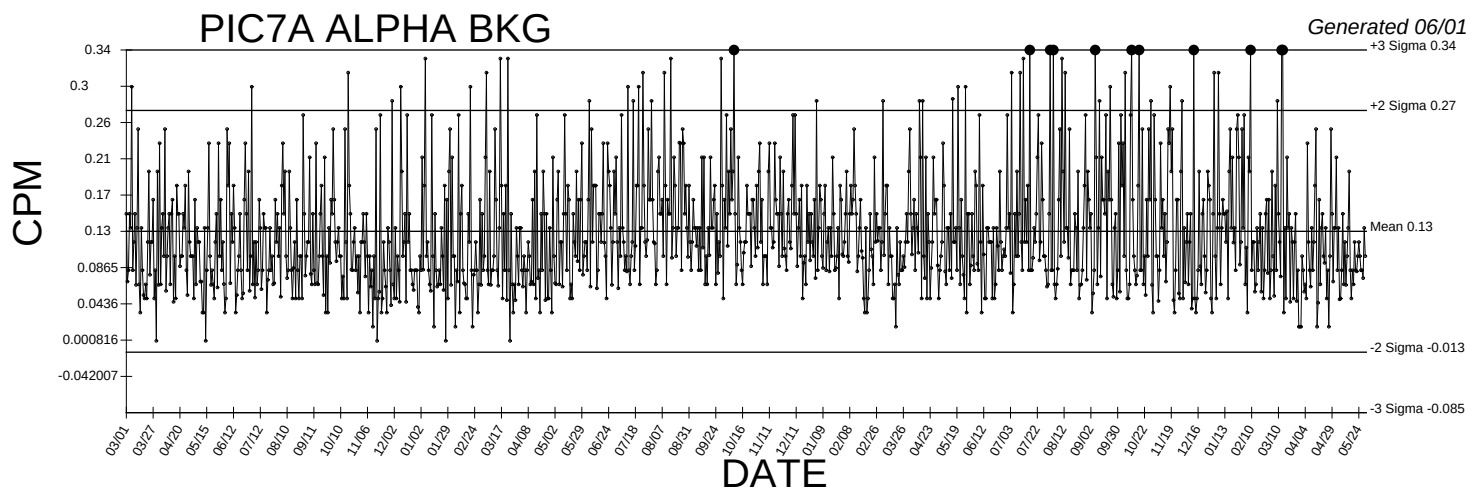
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PIC6B BETA EFF Cross Talk



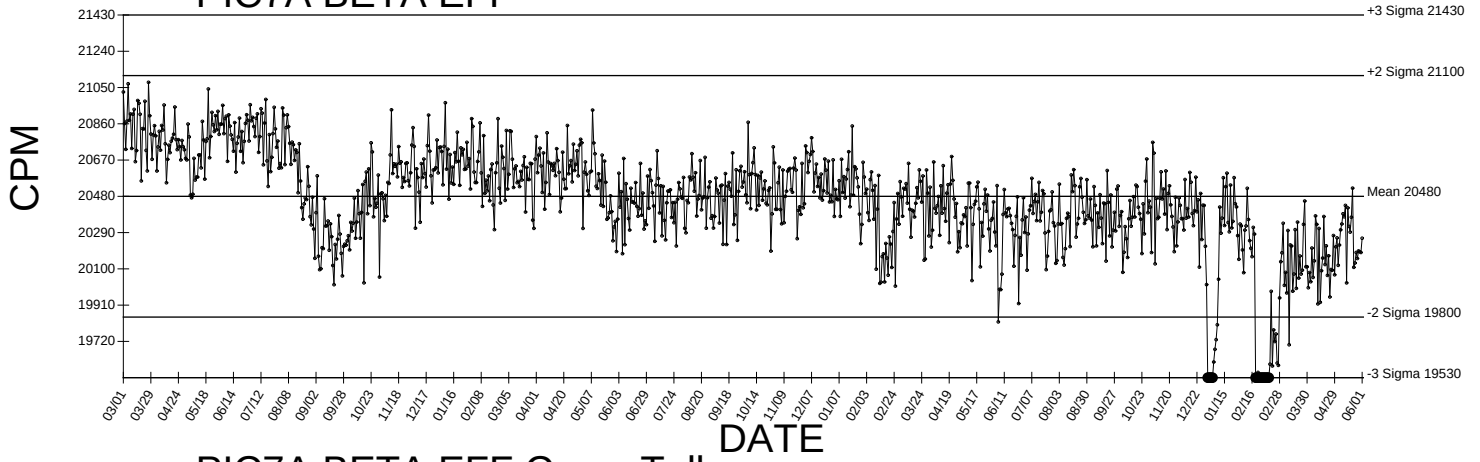
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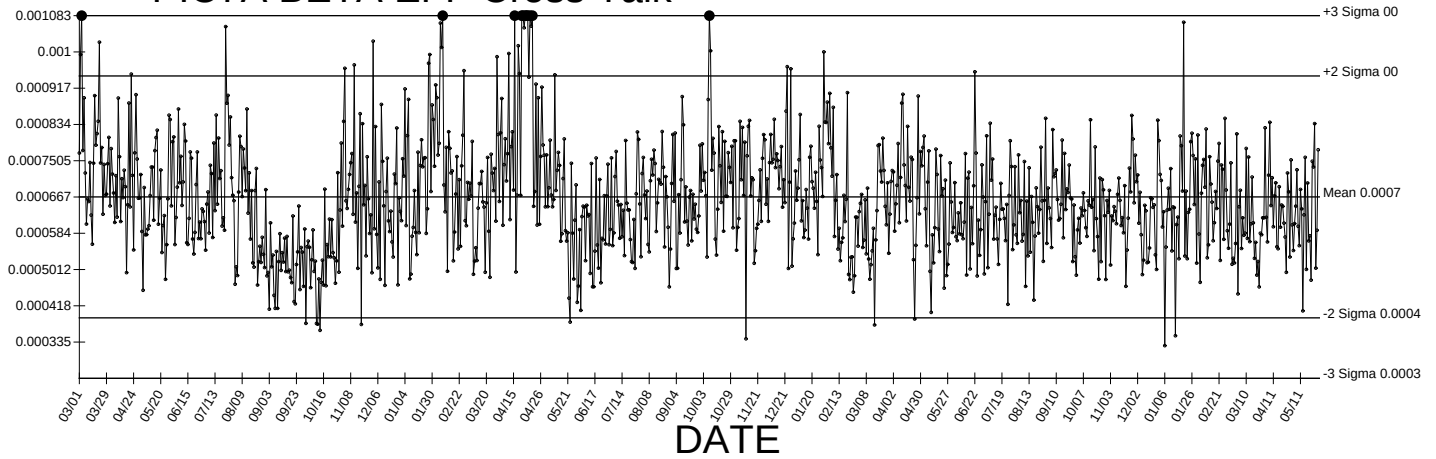
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PIC7A BETA EFF

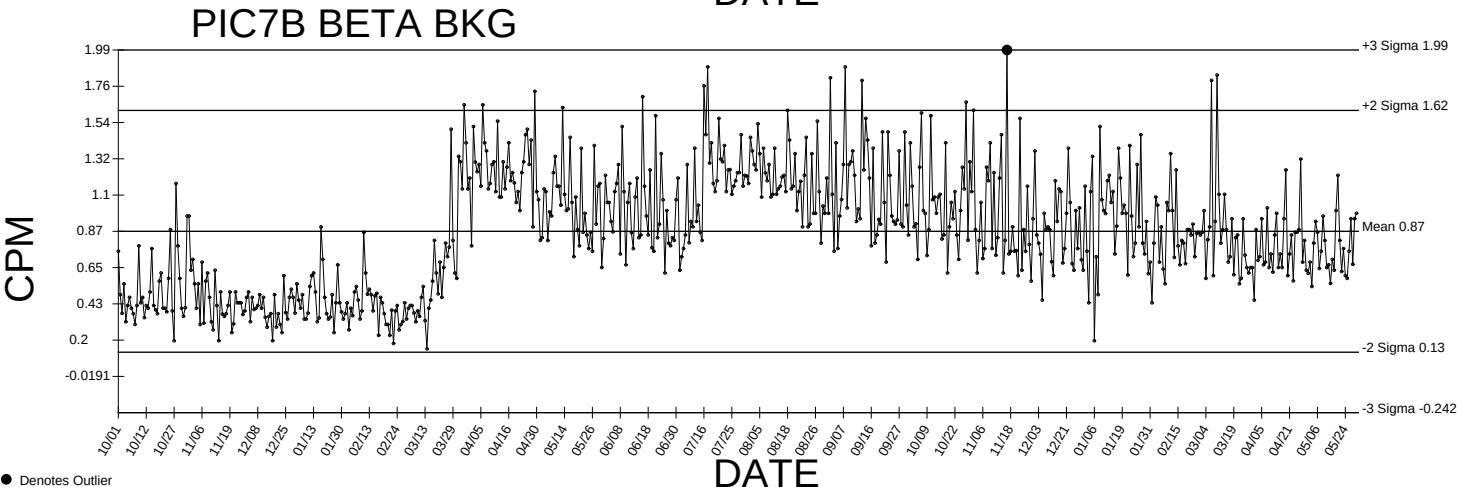
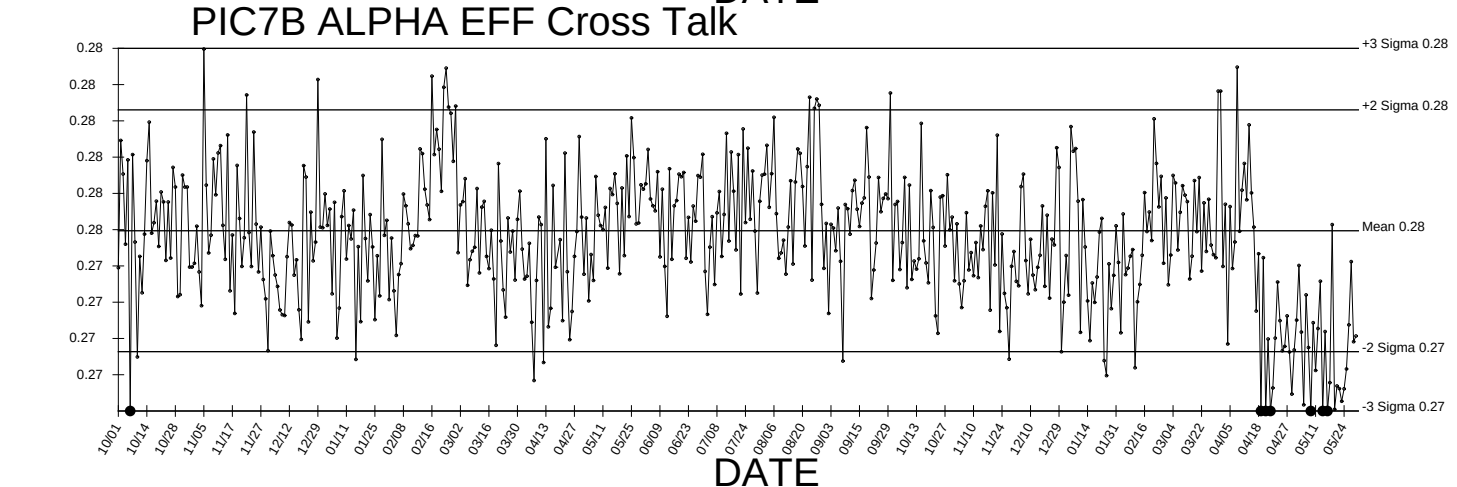
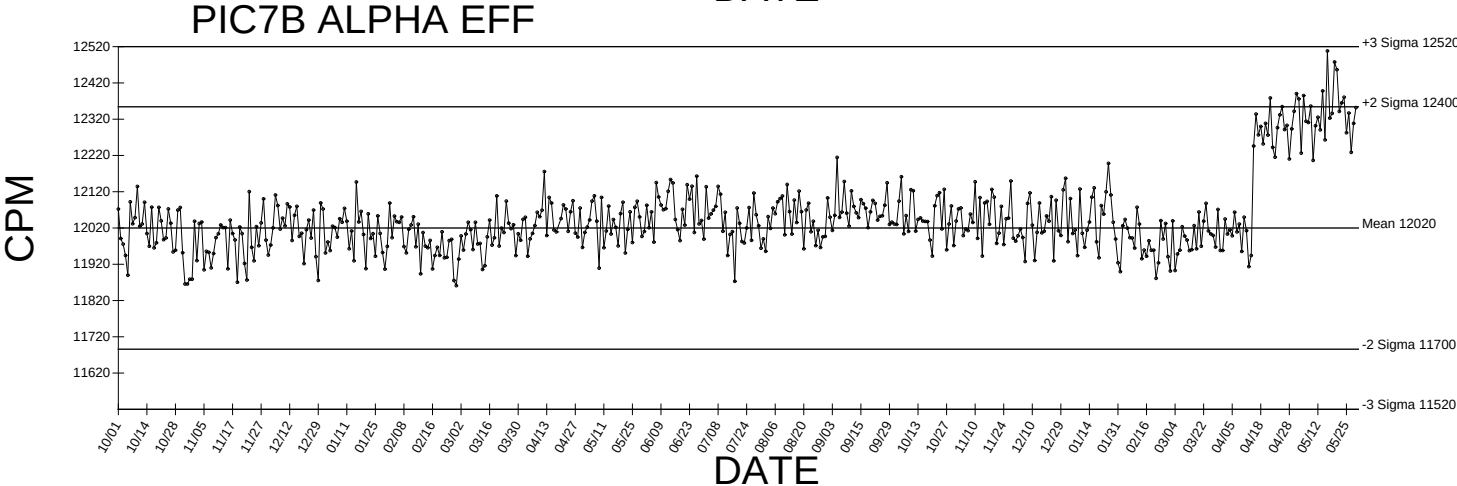
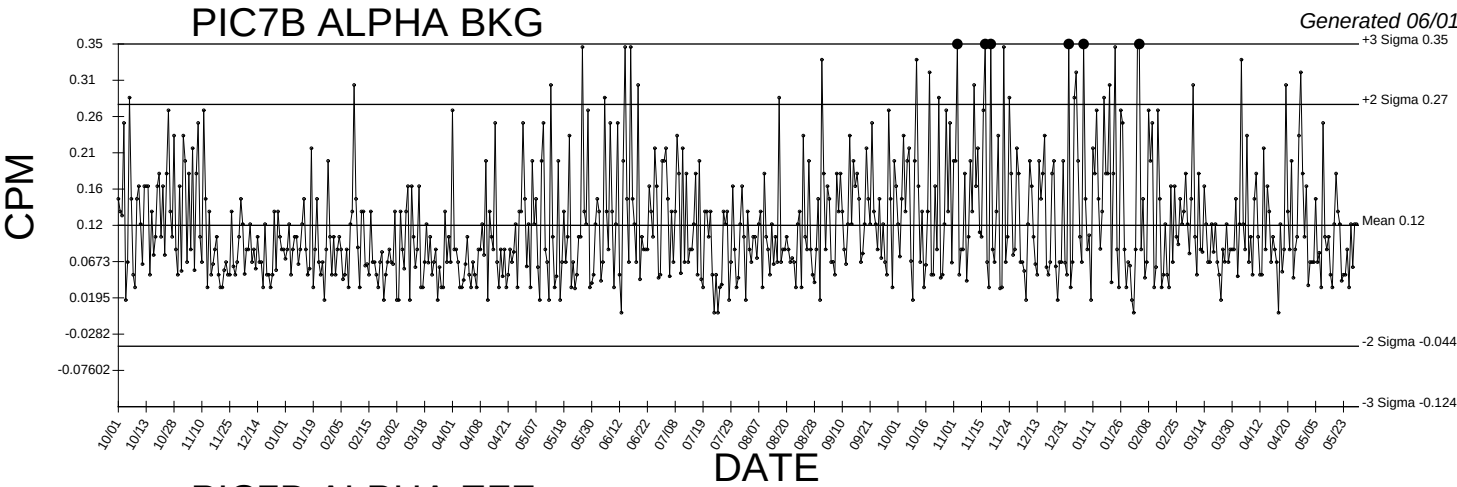
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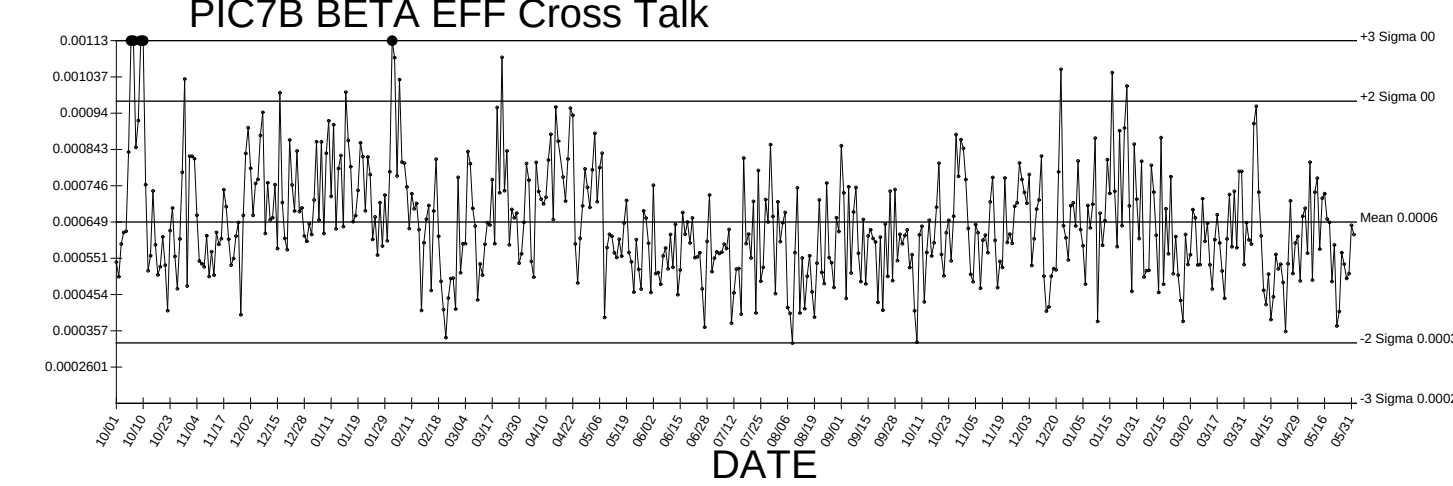
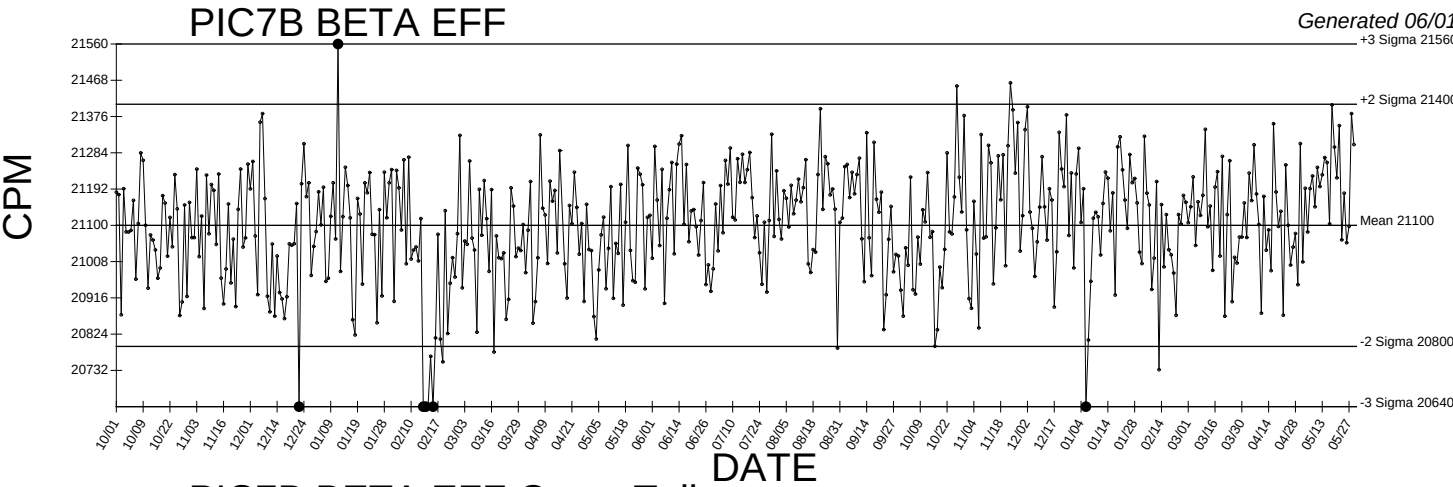
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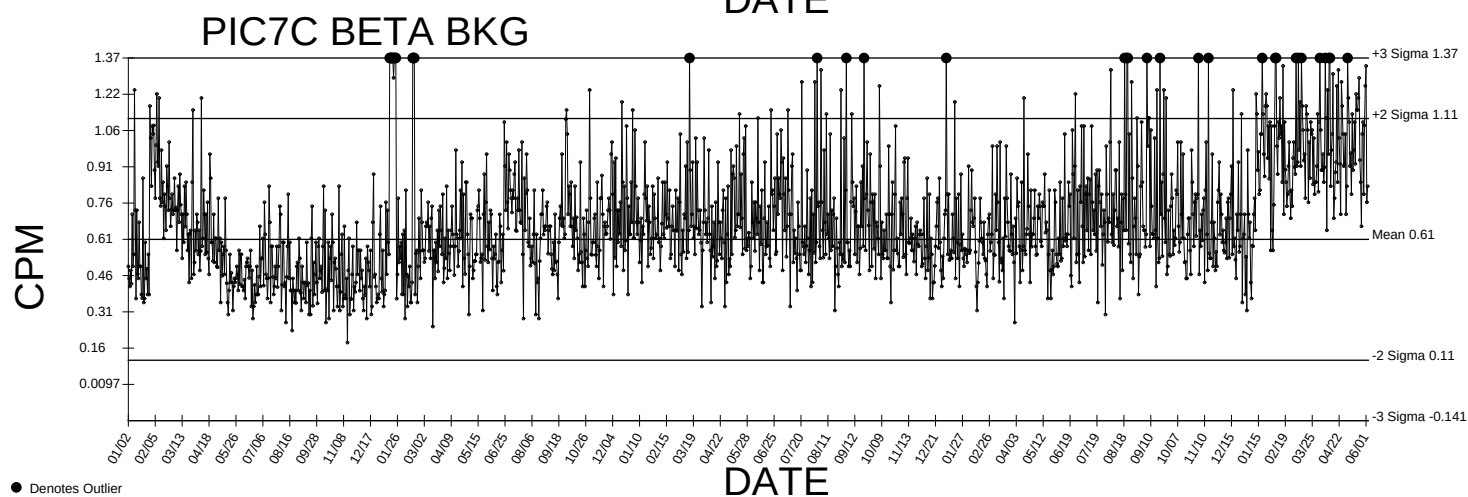
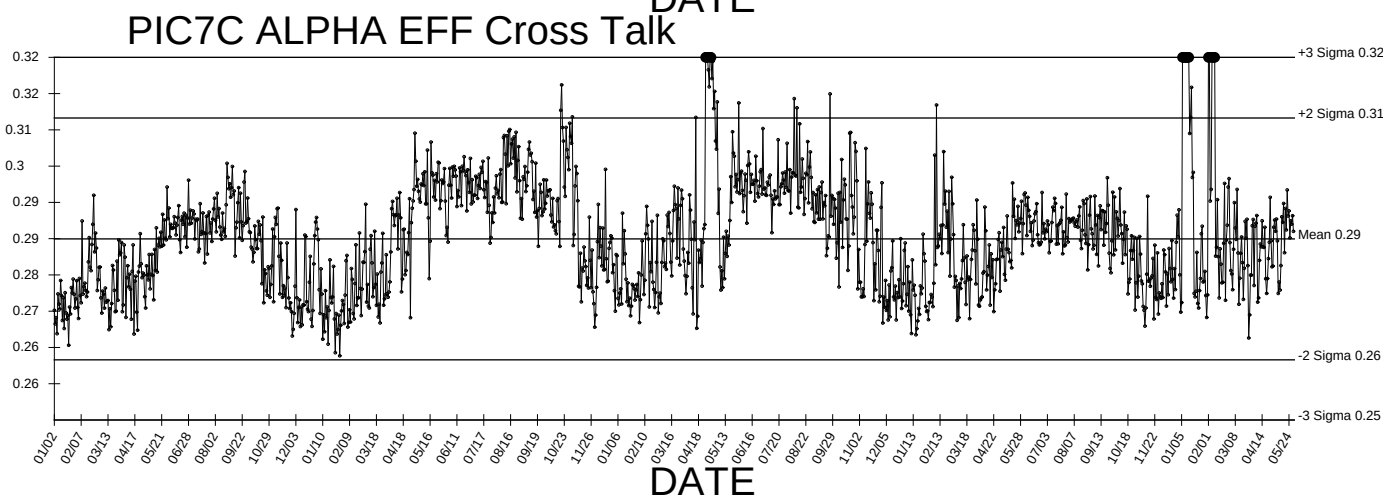
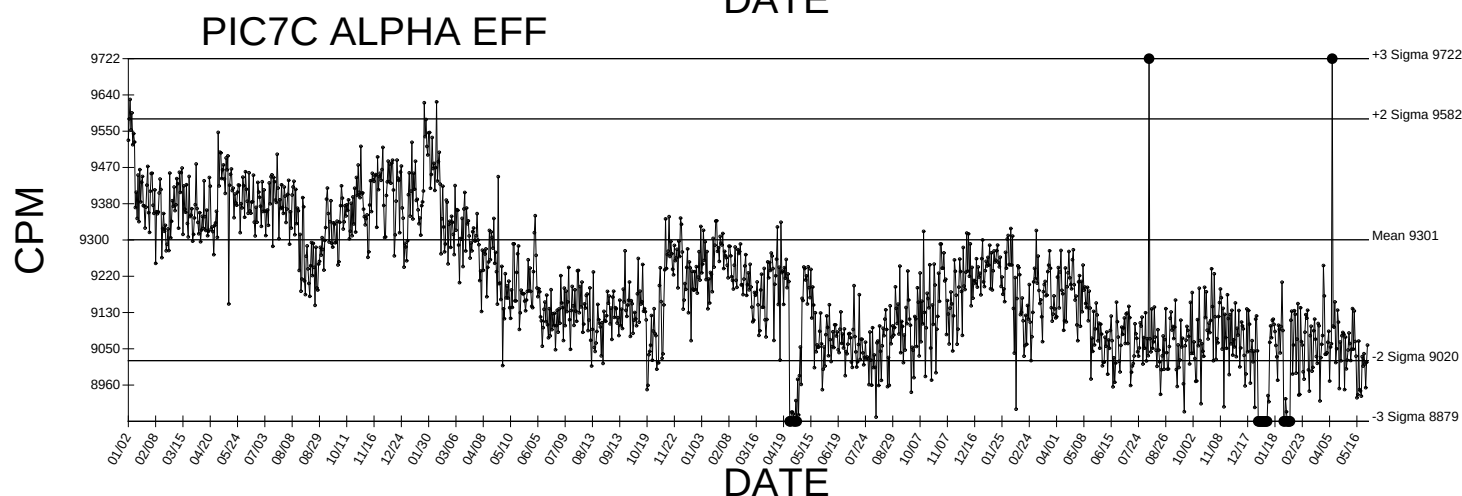
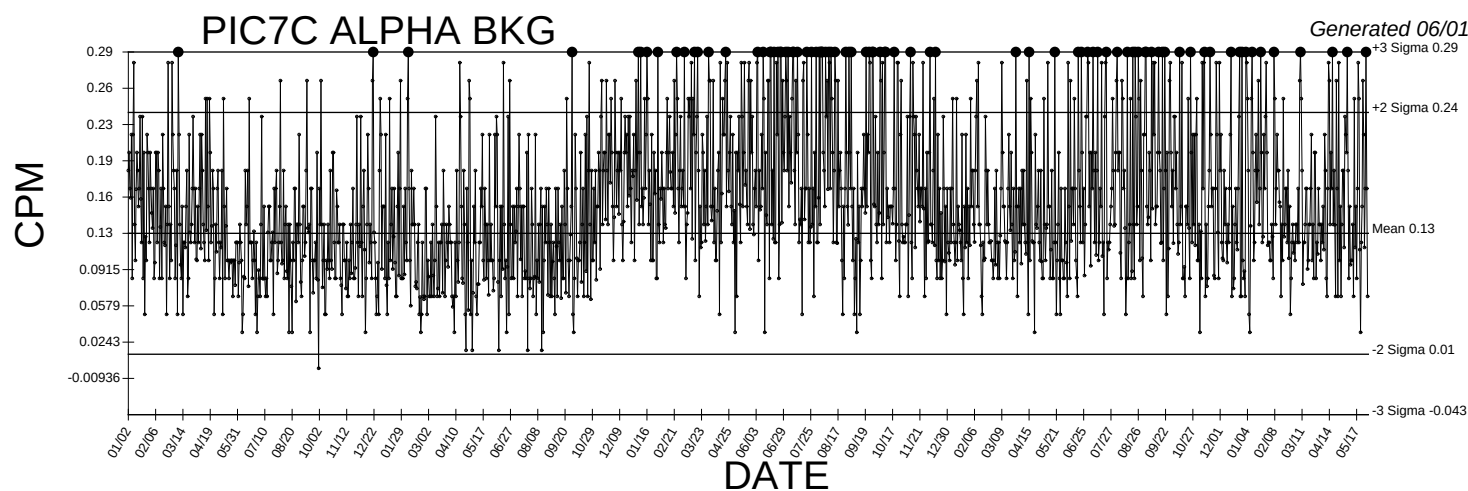
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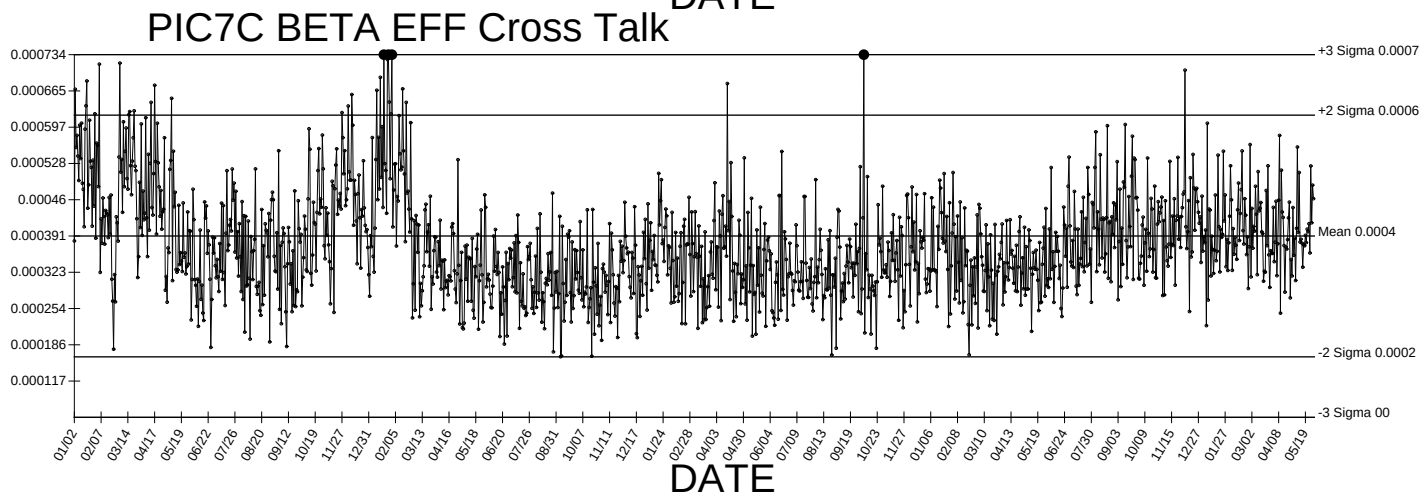
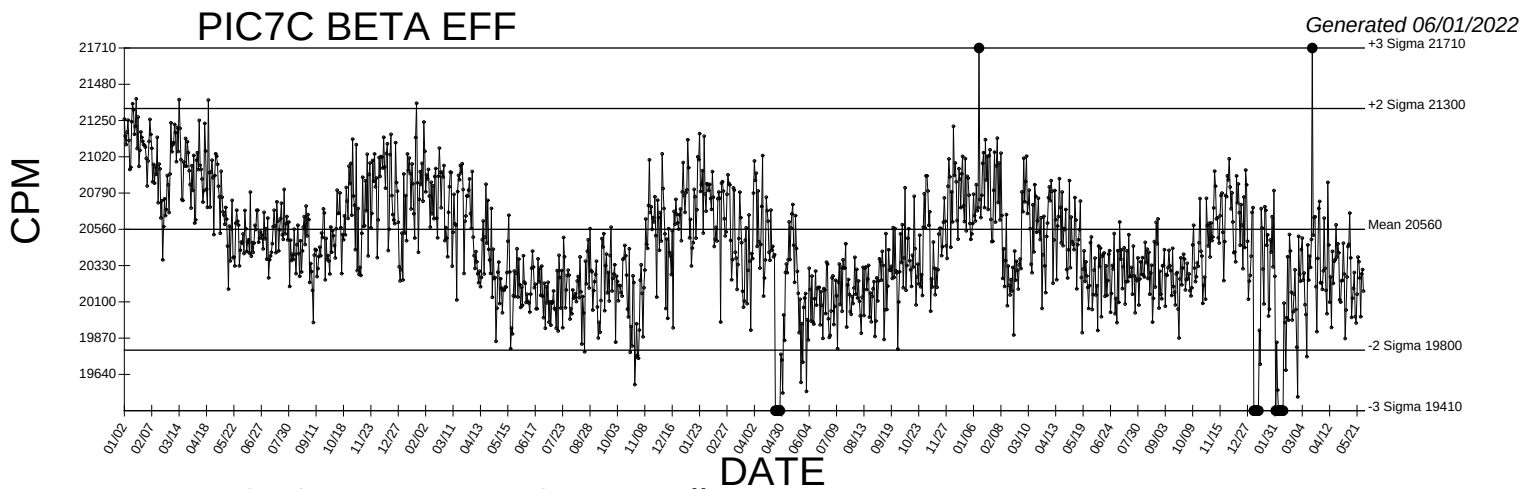


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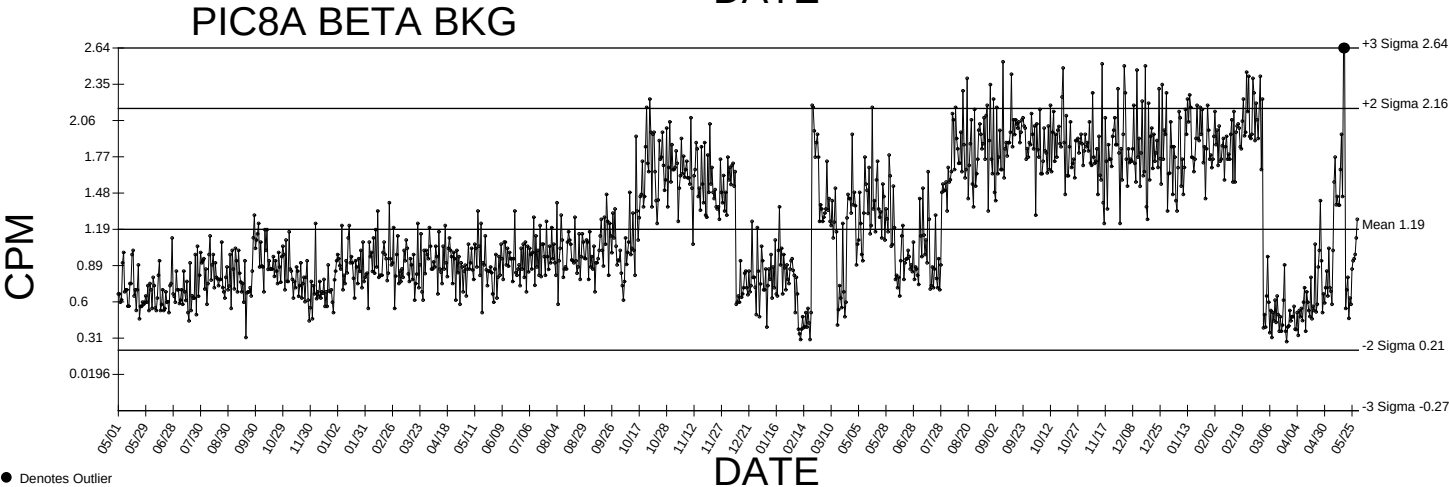
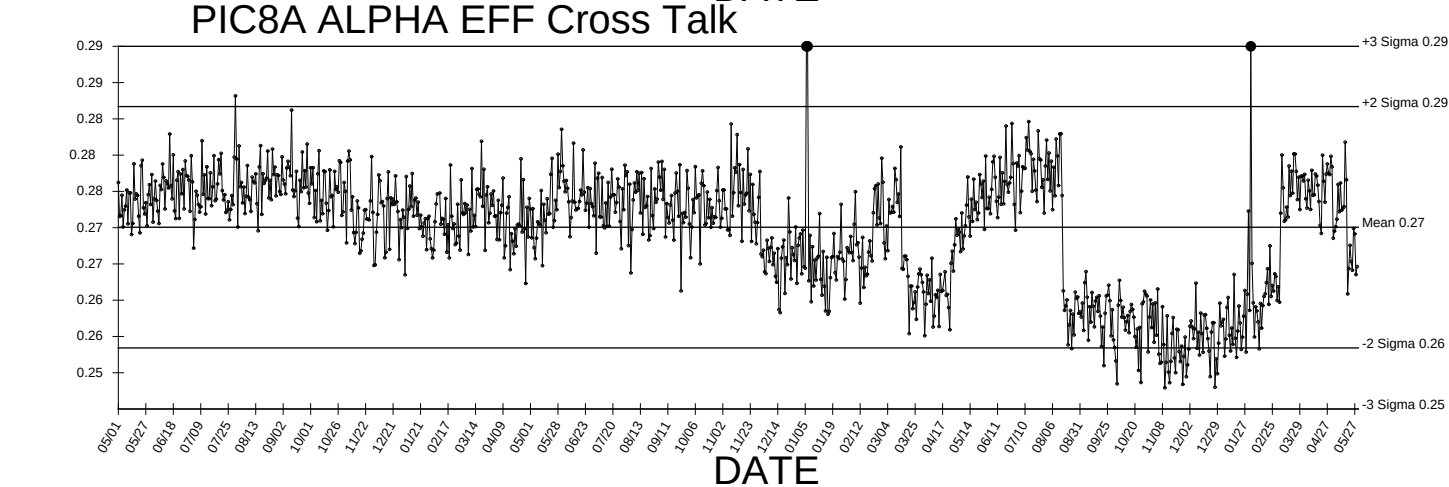
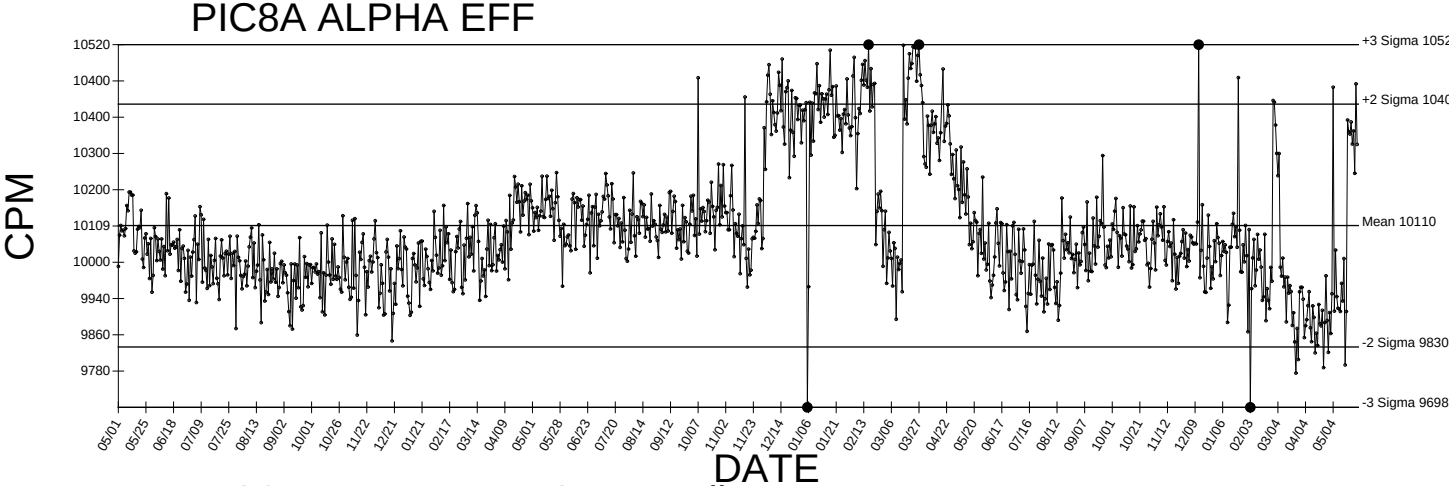
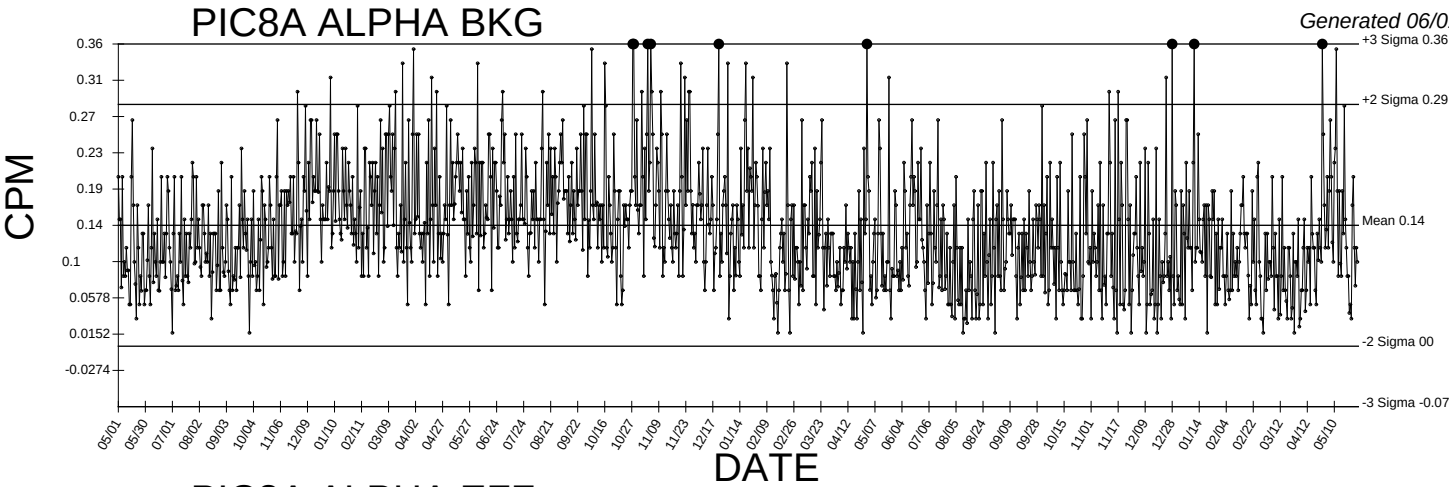


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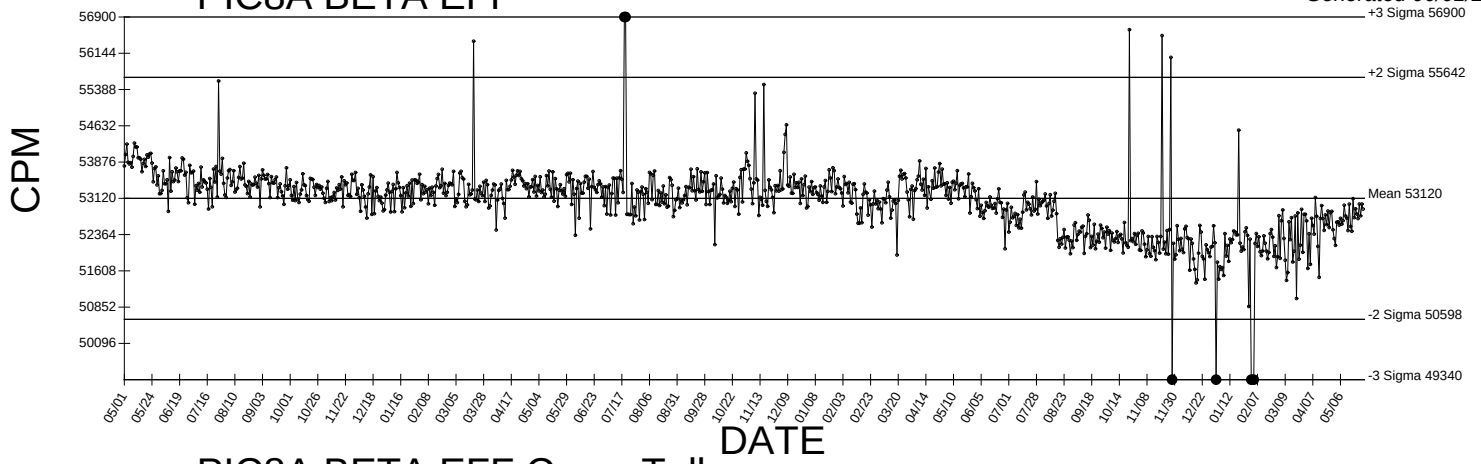
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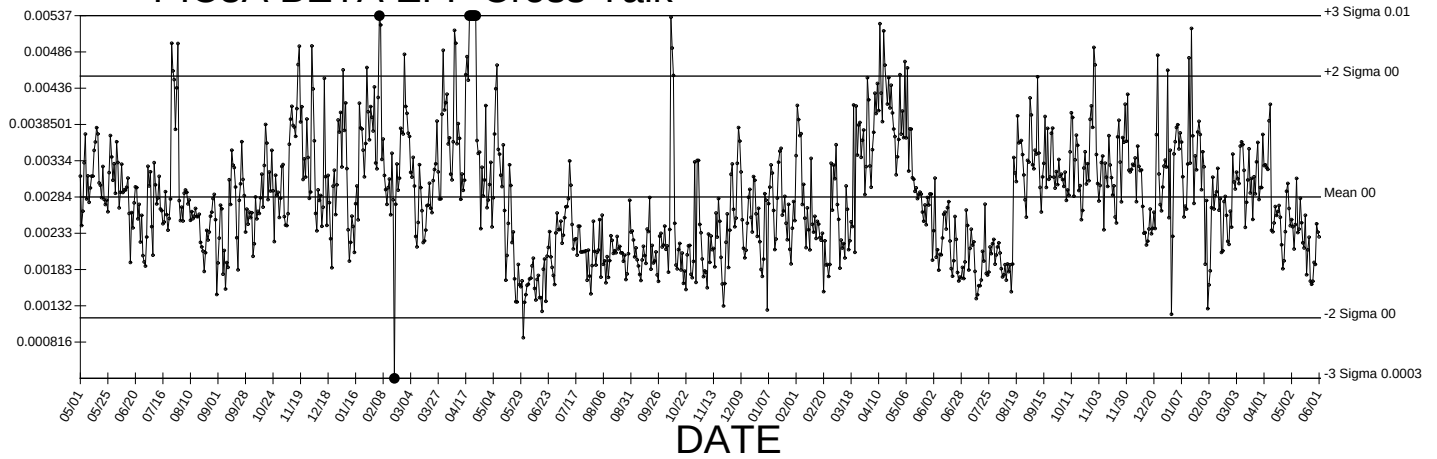
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PIC8A BETA EFF

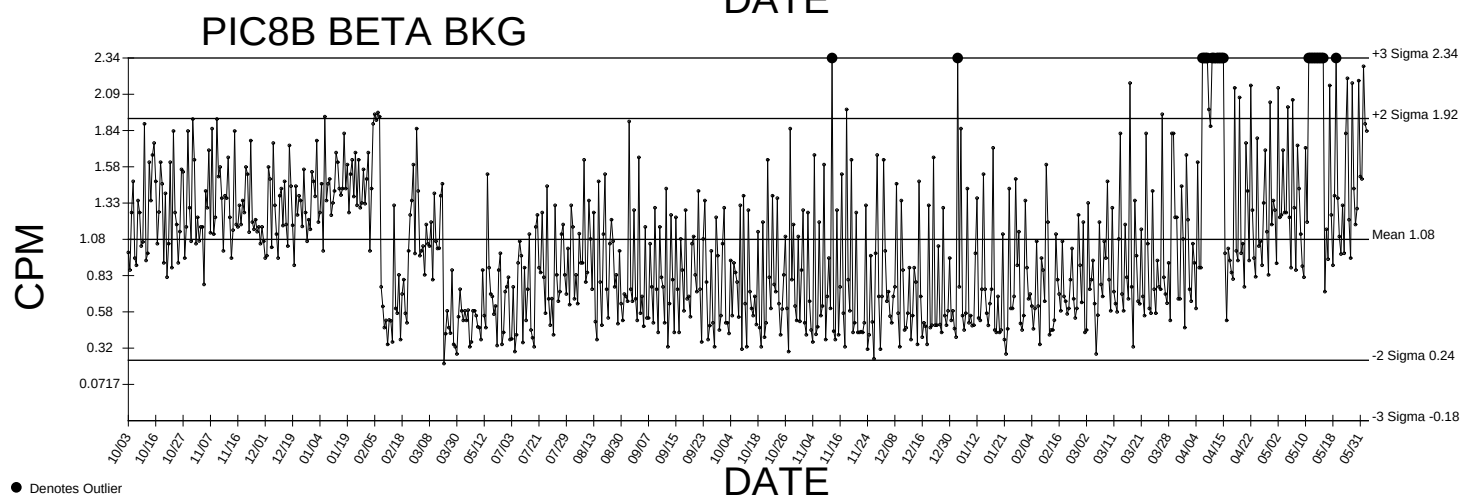
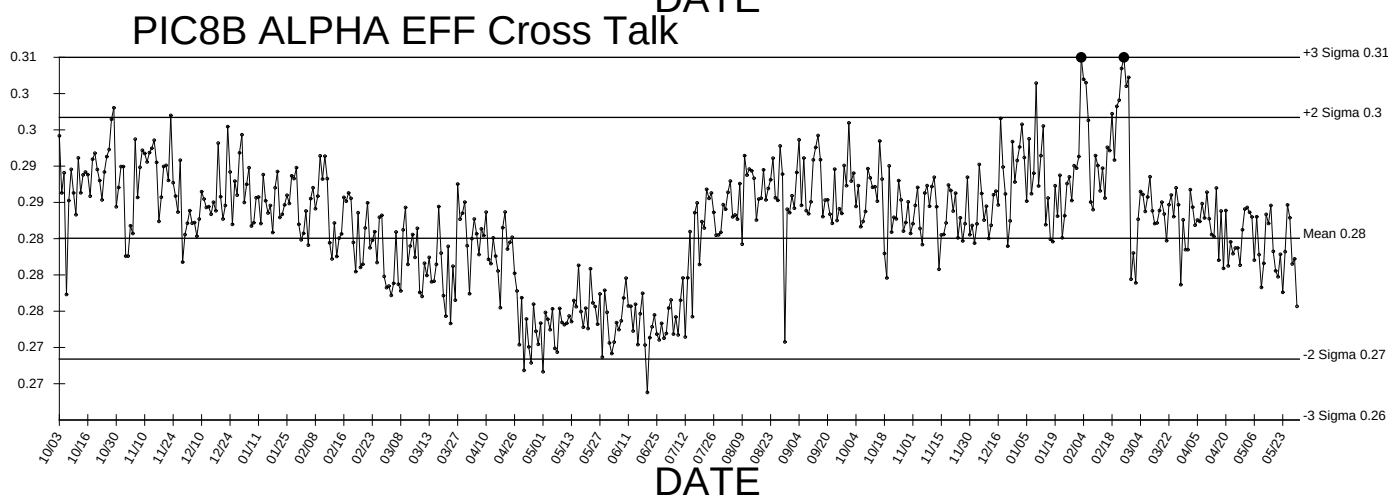
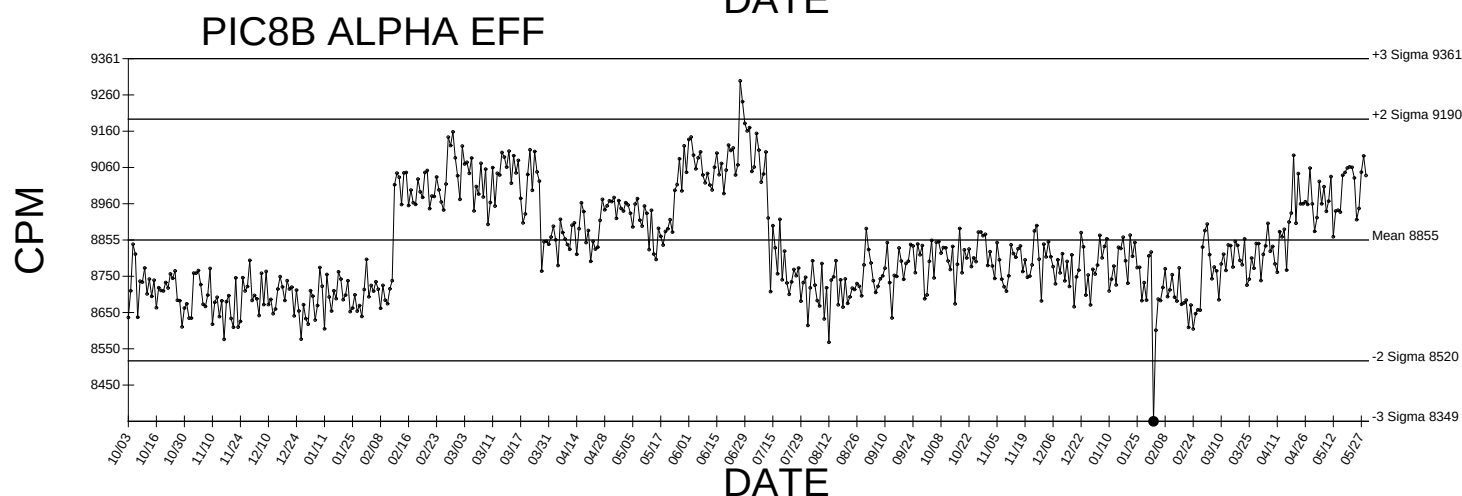
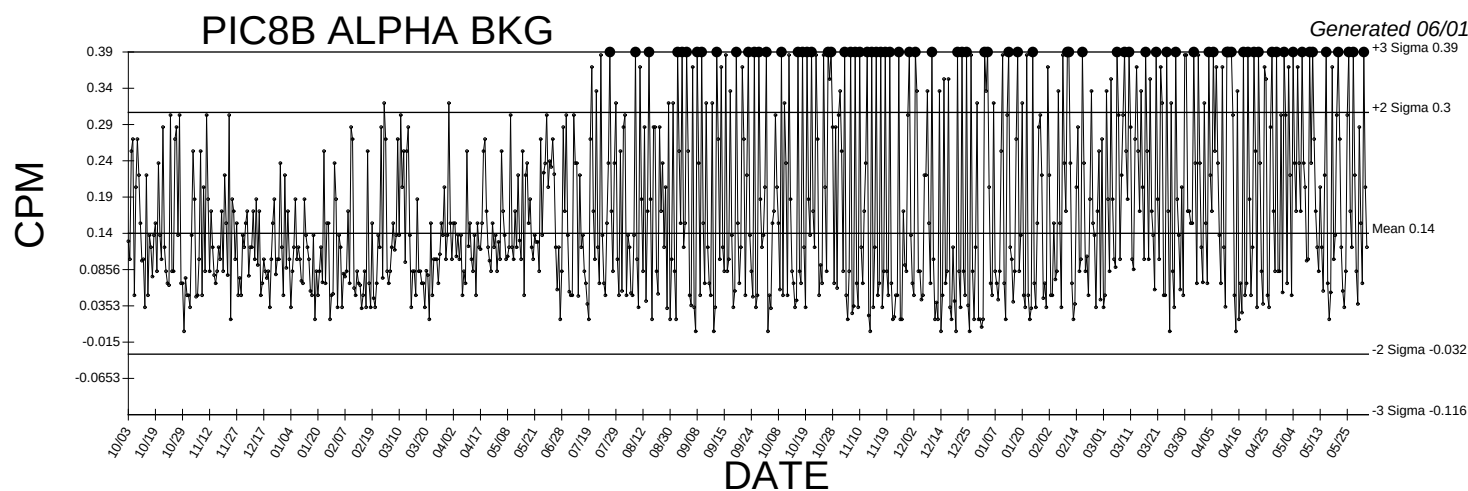
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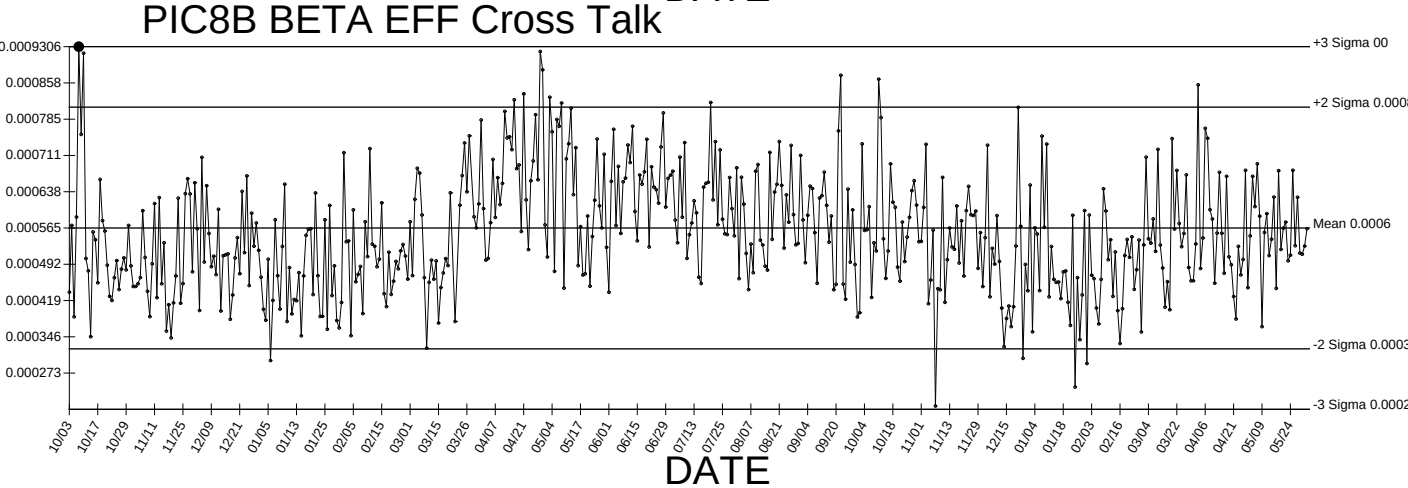
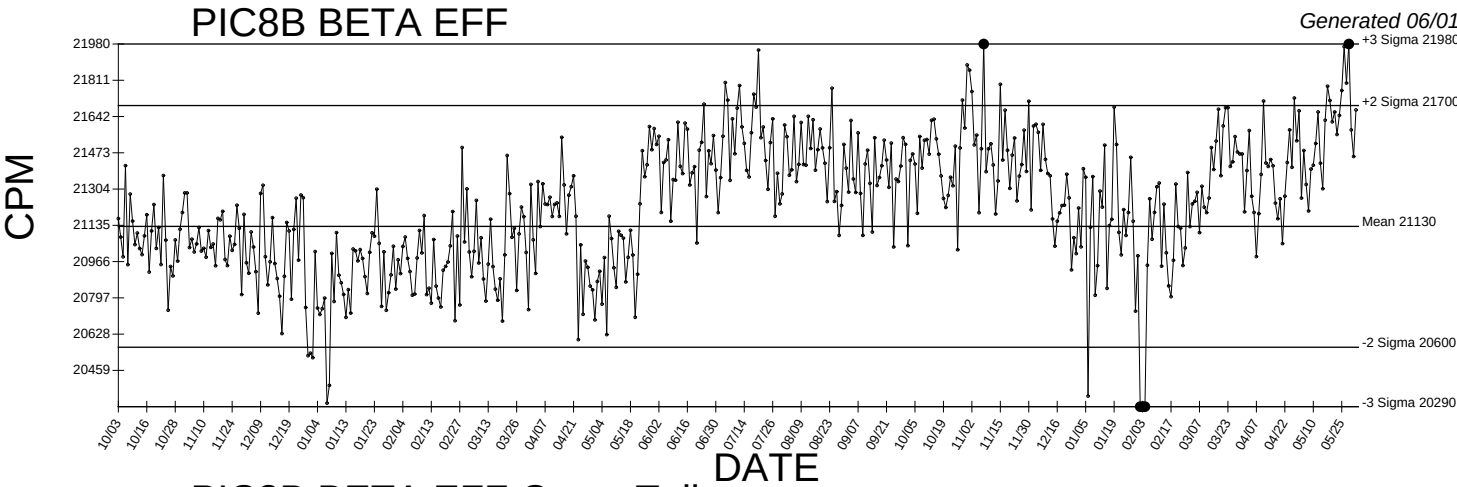
PIC8A BETA EFF Cross Talk



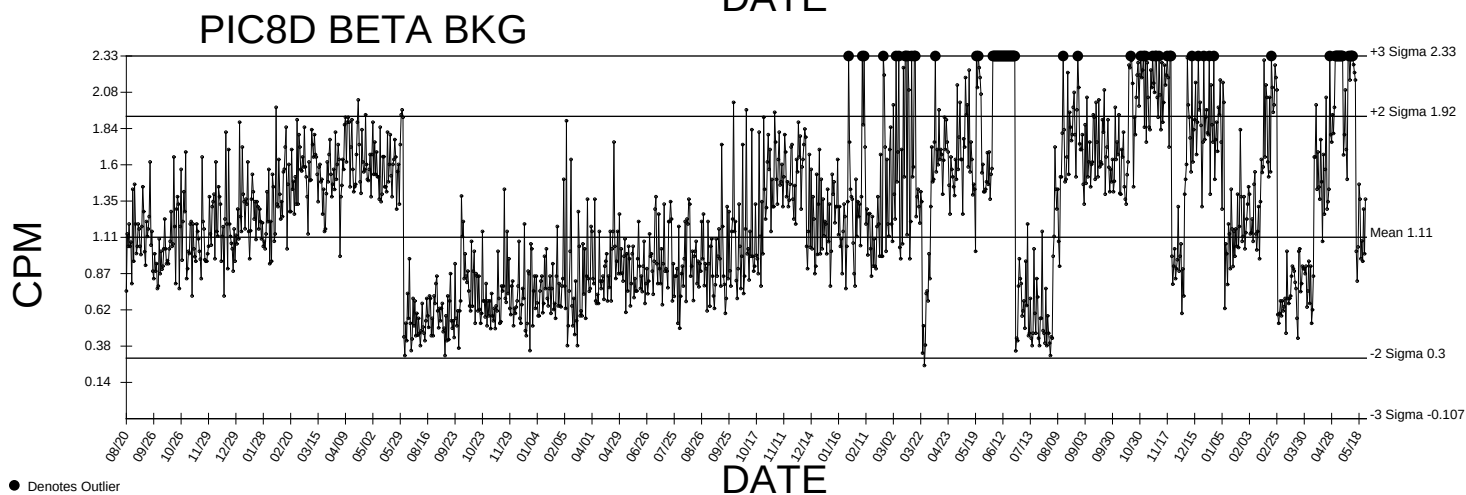
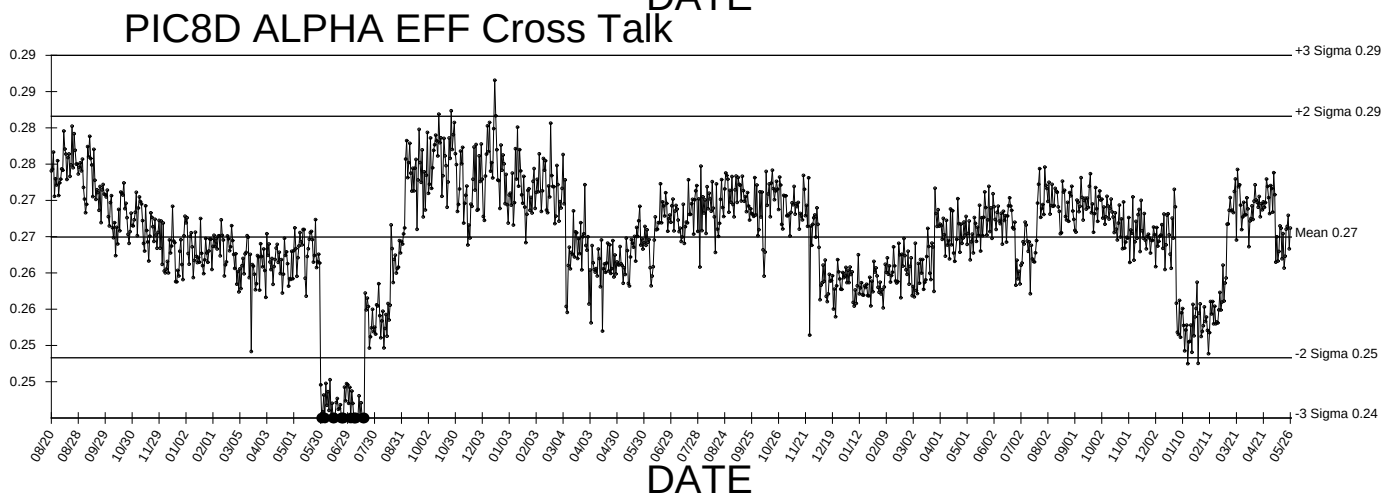
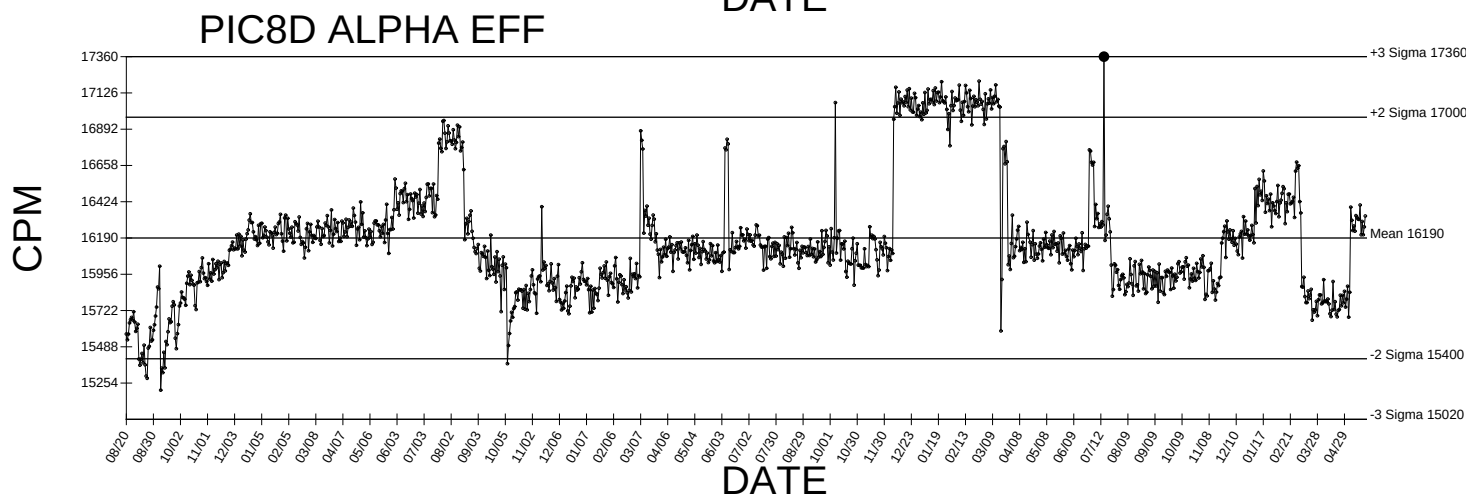
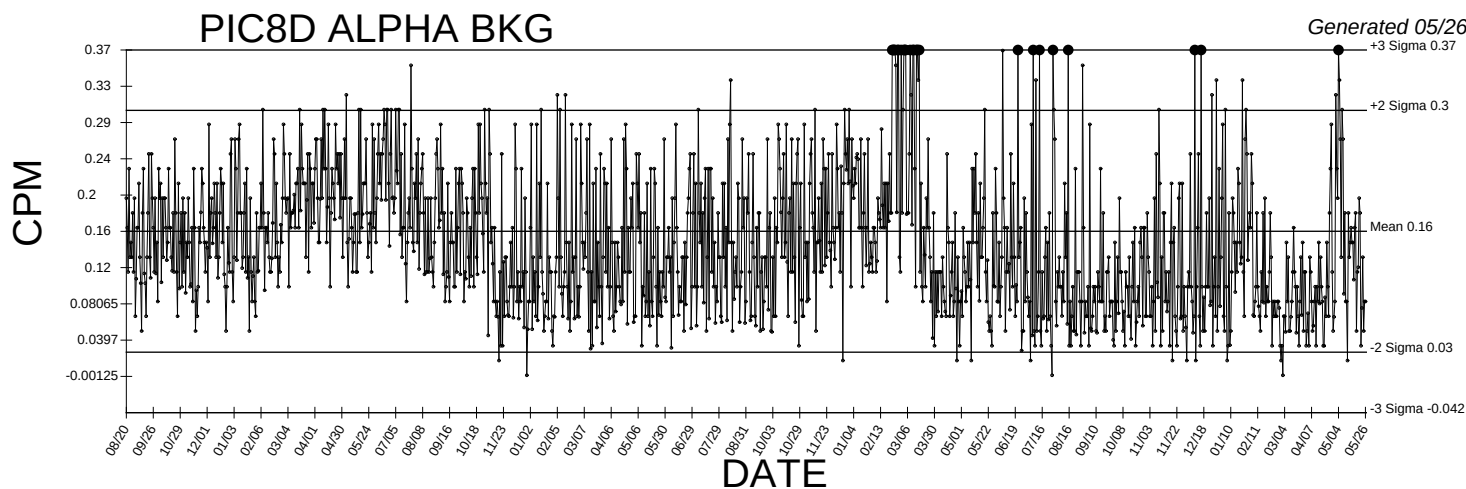
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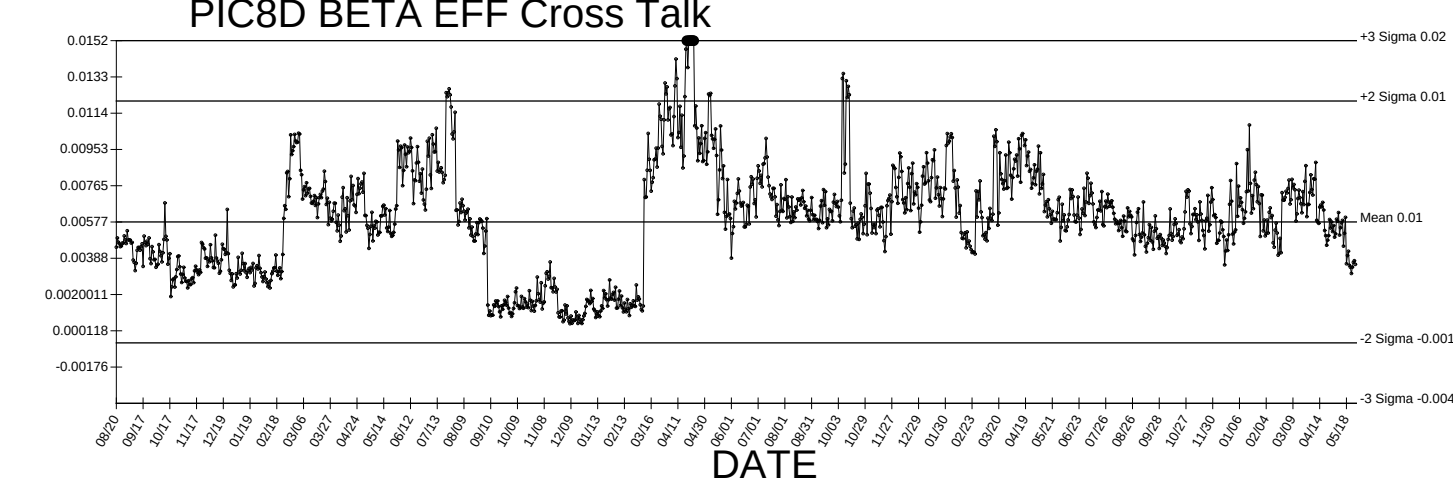
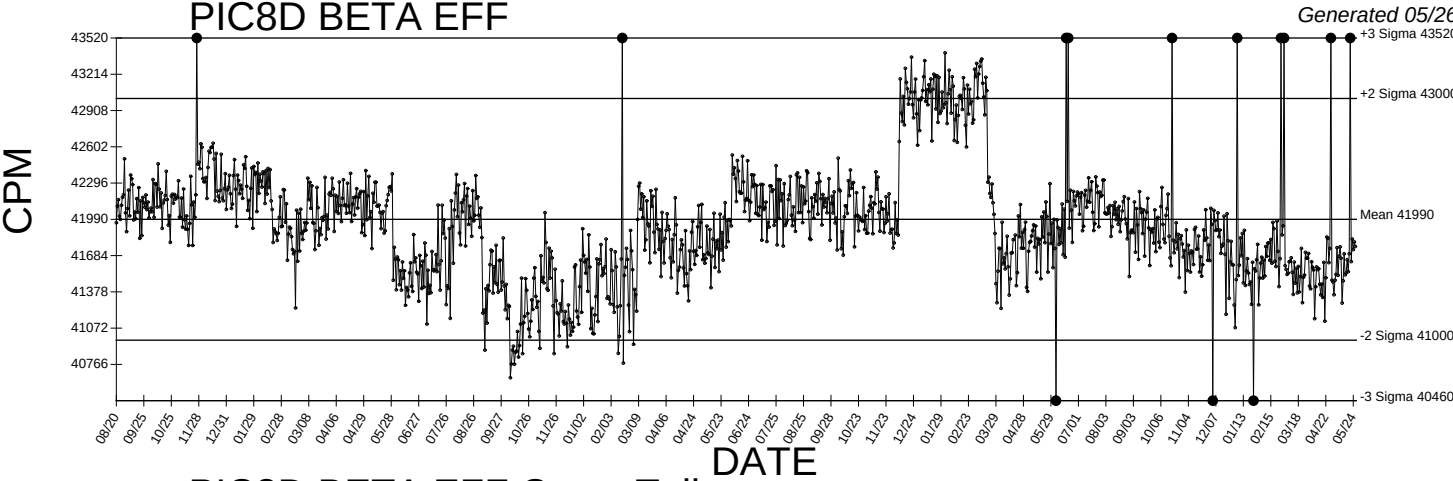
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● Denotes Outlier



● Denotes Outlier



● Denotes Outlier

RAD Standards Traceability



National Institute of Standards & Technology

Certificate

1951

Standard Reference Material® 4251d

Received
3-31-20

Barium-133 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive Barium-133 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4251d consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Barium-133** massic activity, at a **Reference Time of 1200 EST, 13 July 2018**, is:

$(382.6 \pm 4.6) \text{ kBq} \cdot \text{g}^{-1}$.

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4251d** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Use and Handling"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared by the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of B.E. Zimmerman, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Fitzgerald, R. Collé and L. Laureano-Pérez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida of the NIST Radiation Physics Division, Radioactivity Group.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

James M. Adams, Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 17 October 2019

Steven J. Choquette, Director
Office of Reference Materials

Table 1. Certified Massic Activity of SRM 4251d

Radionuclide	Barium-133
Reference time	1200 EST, 13 July 2018
Massic activity of the solution	382.6 kBq·g ⁻¹
Relative expanded uncertainty ($k = 2$)	1.2 % ^(a)

^(a) The uncertainties on certified values are expanded uncertainties, $U = ku_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO and NIST Guides [4, 5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

Table 2. Uncertified Information of SRM 4251d

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	88 µg·g ⁻¹ Ba ⁺² in 0.98 mol·L ⁻¹ HCl
Solution density	(1.015 ± 0.002) g·mL ⁻¹ at 22.6 °C ^(a)
Solution mass	(5.063 ± 0.003) g ^(a)
Photon-emitting impurities	None detected ^(b)
Half-lives used [6]	¹³³ Ba: (10.539 ± 0.006) a ^(c)
Calibration methods (and instruments)	The certified massic activity for ¹³³ Ba was obtained by 4π (e, X) - γ(NaI) live-timed anti-coincidence (LTAC) counting. Confirmatory measurements were performed by five other methods: (i) 4παβ liquid scintillation (LS) spectrometry (with ³ H standard efficiency tracing for β efficiencies) and two counters; (ii) 4παβ liquid scintillation (LS) spectrometry (with ⁵⁵ Fe standard efficiency tracing for β efficiencies) and two counters; (iii) an LS-based 4παβ triple-to-double coincidence ratio (TDCR) method; (iv) 4πγ ionization chamber measurements using NIST chamber "A"; and (v) HPGe γ-ray spectrometry. ^(d)

^(a) The stated uncertainty is two times the standard uncertainty [5].

^(b) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

336 s⁻¹·g⁻¹ for energies between 15 keV and 95 keV,

150 s⁻¹·g⁻¹ for energies between 100 keV and 280 keV,

276 s⁻¹·g⁻¹ for energies between 285 keV and 370 keV,

142 s⁻¹·g⁻¹ for energies between 380 keV and 400 keV,

16 s⁻¹·g⁻¹ for energies between 410 keV and 1430 keV,

24 s⁻¹·g⁻¹ for energies between 1440 keV and 1480 keV, and

13 s⁻¹·g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ¹³³Ba.

^(c) The stated uncertainty is the standard uncertainty. See reference 6.

^(d) The expanded ($k = 2$) uncertainties for the five confirmatory methods were: (i) 2.4 %; (ii) 2.4 %; (iii) 1.2 %; (iv) 1.6 %; and (v) 1.7 %, respectively. All of the confirmatory measurements agreed with the certified value within their respective measurement uncertainties. The results for methods (iii) and (iv) agreed with the certified anti-coincidence value to better than 0.2 %.

Table 2. Uncertainty evaluation for the massic activity of SRM 4251d

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ¹³³ Ba (%)
1	Measurement repeatability; standard deviation of the distribution for 6 samples, each measured once	A	0.35
2	Background; estimated by half the difference of using the middle background measurement rather than the background measurement closest in time to each sample measurement	A	0.06
3	Extrapolation fit; median uncertainty on least-squares intercept value for a single set of γ -ray gates	A	0.05
4	Analysis model, standard deviation between extrapolation intercept for two gate settings	A	0.46
5	Dead time; from previous systematic studies	B	0.1
6	Gravimetric (mass) measurements; includes uncertainty on average sample mass and dilution to SRM solution. From previous systematic studies.	B	0.05
7	¹³³ Ba decay corrections; from DDEP half-life of ¹³³ Ba of (10.539 $\pm$ 0.006) a	B	0.00004
8	Impurity limit, from limit (no impurities seen) from γ -ray spectrometry	A	0.04
Relative combined standard uncertainty			0.60
Relative expanded uncertainty ($k = 2$)			1.2

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4251d should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to the SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed Oct 2019). Note: This SRM is contained in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM); BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed Oct 2019).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed Oct 2019).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Oct 2019).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Oct 2019).
- [6] Chechev, V.P. and N.K. Kuzmenko ; *LNE-LNHB/CEA Table of Radionuclides*, ¹³³Ba; (October 2016); available at www.lnhb.fr/nuclides/Ba-133_tables.pdf (accessed Oct 2019).

Users of this SRM should ensure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

Standard Logbook

Serial ID: 1951 **Open/Reference Date:** 13 JUL 2018 **Aliquot :** 5.063 g
Name: Barium-133 **Received:** 31 MAR 2020 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 31 MAR 2035 **Logbook Num :** GL-CED-297-244
Employee: Tim Chandler **Lot Number :** 4251d
Supplier: NIST **Solvent :** 0.98M HCl
Uncertainty : .6 percent

Description: Barium-133
Comments: None

Analyte	Concentration	Analyte	Concentration
Barium-133	382.6 kBq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1951
Prepared By:	Tim Chandler
Carrier Conc:	0.98M HCl
Reference Date:	07/13/2018
Ampoule Mass (g):	5.063 g
Uncertainty:	+/- .6 %
LogBook No:	GL-CED-297-244
Supplier:	NIST

A Solution Material Info			
Isotope:	Barium-133		
Prepared By:	Bethany Fiem		
Prep Date:	09/23/2020		
Verification Date:	09/16/2021		
Expiration Date:	09/16/2022		
Primary Code:	1951-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.034 g		
Density(g/mL):	1.0167	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.034 \text{ g}) * (382.6 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 1155605.0400 \text{ dpm/mL}$
$(5.034 \text{ g}) * (382.6 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0167 \text{ g/mL}) / (100 \text{ mL}) = 1136603.3060 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
09/23/2020	Bethany Fiem	19.301	1000	1951-B	21937.5804 dpm/mL	09/16/2021	09/16/2022
09/16/2021	Bethany Fiem	19.02	1000	1951-C	21618.1948 dpm/mL	09/16/2021	09/16/2022
06/02/2022	Jennie Kill-Bowden	19.0813	1000	1951-D	21687.8687 dpm/mL	06/03/2022	06/02/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ba-133 Standard 1951-C

v1.0.2

Instrument	RED
Analyst	JXK3
Verification Prep Date	9/16/2021

Standard Information	
Isotope	Ba-133
Serial Number	1951-C
Isotope Halflife	3.8410E+03 D
Reference Date	7/13/2018
Ref. Act. (DPM/mL)	21618.1948
Amount of Std. (mL)	1.0
Standard Prep Date	9/16/2021

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	9/16/2021	95.20	13628.00	49.40
2	9/16/2021	95.30	13462.67	49.40
3	9/16/2021	95.60	13885.33	49.40

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	13578.60	0.798722	17000.40	17000.40
2	13413.27	0.798722	16793.41	16793.41
3	13835.93	0.798722	17322.58	17322.58

dpm/mL

Mean Value = 17038.80

Stdev = 266.6662518

Certificate Value* = 17531.9

Two sigma = 533.333

10 % of Mean = 1703.880

Rule A (Pass/Fail) Pass

% Recovery 97.19%

Rule B (Pass/Fail) Pass

Expiration Date 9/16/2022

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Ba-133 source 1951-C by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCRED for Ba-133 source standard verification. The Ba-133 efficiency calibration which was used for verification calculations was performed on 9/16/2021 using Ba-133 source 1601-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency (cpm/dpm), and
- D = volume used for standard verification.

RAD-M-001

Agla JG
9/22/21

JP 9/21/21

Standardization of Barium Carrier 3437074

v1.2.1

Analyst	JXK3
---------	------

Standard Information	
Isotope	Barium
Serial Number	3437074
Amount of Std. (mL)	1.0
Standard Prepared	5/11/2022

Parent Information	
Parent Serial #	3268059.1
Parent Exp. Date	1/18/2024

Std #	Weight of carrier added (g)	Weight of crucible or filter (g)	Weight of crucible or filter + ppt. (g)	Weight of ppt. (g)	mg Barium/mL	mg Barium/g
1	1.0367	0.0794	0.1049	0.0255	25.50	24.60
2	1.0295	0.0799	0.1055	0.0256	25.60	24.87
3	1.0284	0.0799	0.1055	0.0256	25.60	24.89
4	1.0277	0.0802	0.1058	0.0256	25.60	24.91

Mean Value (mg/mL) = 25.58
 Stdev (mg/mL) = ± 0.05
 1.0% of Mean Value = 0.255750
 Pass
 Expiration Date 5/11/2023
 Mean Value (mg/1.0mL) = 25.58

Standardization Rule

A satisfactory standardization is obtained when results give a standard deviation of less than 1.0% of the mean value.

5/25/22

Standardization of Strontium Carrier 3426335

v1.2.1

Analyst	JXK3
---------	------

Standard Information	
Isotope	Strontium
Serial Number	3426335
Amount of Std. (mL)	1.0
Standard Prepared	4/15/2022

Parent Information	
Parent Serial #	3268476.2
Parent Exp. Date	4/7/2024

Std #	Weight of carrier added (g)	Weight of crucible or filter (g)	Weight of crucible or filter + ppt. (g)	Weight of ppt. (g)	mg Strontium/mL	mg Strontium/g
1	1.0205	0.1232	0.1316	0.0084	8.40	8.23
2	1.0143	0.1245	0.1330	0.0085	8.50	8.38
3	1.0191	0.1189	0.1274	0.0085	8.50	8.34
4	1.0231	0.1234	0.1319	0.0085	8.50	8.31

Mean Value (mg/mL) = 8.48
 Stdev (mg/mL) = ± 0.05
 1.0% of Mean Value = 0.084750

Standardization Rule

A satisfactory standardization is obtained when results give a standard deviation of less than 1.0% of the mean value.

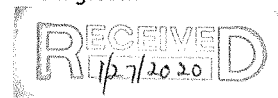
Expiration Date 4/15/2023

Pass

Mean Value (mg/1.0mL) = 8.48

Lais Brist 4/15/22

CERTIFICATE OF CALIBRATION
Standard Reference Source



1926

SRS Number: 115032

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8226

Customer: GEL Laboratories LLC

P.O. Number: GEL1924879, Item 8

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated using a germanium gamma-ray spectrometer system. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 23-January-2020

12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Ra-226	5.844E+05	3.733E+04	1.0	2.1	4.7	HPGe

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 115032

Comments:

5.00345 g of 0.1 M HCl solution with approximately 30 µg/g Ba carrier.

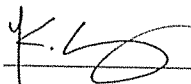
Impurities:

α-impurities (other than decay products) < 0.1%

γ-impurities (other than decay products) < 0.1%

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Eardley, Radiochemist

QC Approved by:


A. Chen, Spectroscopist

Date: 16 Jan 20

Standard Logbook

Serial ID: 1926 **Open/Reference Date:** 23 JAN 2020 **Aliquot :** 5.00345 g
Name: Radium-226 **Received:** 27 JAN 2020 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 26 JAN 2030 **Logbook Num :** GL-CED-297-219
Employee: Gregory Ramsay **Lot Number :** 115032
Supplier: Eckert and Ziegler **Solvent :** 0.1M HCl
Uncertainty : 4.7 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Radium-226	37330 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1926
Prepared By:	Gregory Ramsay
Carrier Conc:	0.1M HCl
Reference Date:	01/23/2020
Ampoule Mass (g):	5.00345 g
Uncertainty:	+/- 4.7 %
LogBook No:	GL-CED-297-219
Supplier:	Eckert and Ziegler

A Solution Material Info			
Isotope:	Radium-226		
Prepared By:	Bethany Fiem		
Prep Date:	03/10/2020		
Verification Date:	09/15/2021		
Expiration Date:	09/15/2022		
Primary Code:	1926-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9415 g		
Density(g/mL):	0.9974	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9415 \text{ g}) * (37330 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00345 \text{ g} * 100 \text{ mL}) = 22120.6801 \text{ dpm/mL}$
$(4.9415 \text{ g}) * (37330 \text{ Bq}) * (60 \text{ dpm/Bq}) / (0.9974 \text{ g/mL}) / (5.00345 \text{ g} * 100 \text{ mL}) = 22178.3439 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
03/10/2020	Bethany Fiem	11.4143	100	1926-B	2531.50269 dpm/mL	04/06/2021	04/06/2022
09/14/2021	Gregory Ramsay	27.1259	250	1926-C	2406.4301 dpm/mL	09/15/2021	09/15/2022

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-226 Standard 1926-C

v1.0.2

Instrument	GOLD
Analyst	GXR1
Verification Prep Date	9/15/2021

Standard Information	
Isotope	Ra-226
Serial Number	1926-C
Isotope Half-life	1,6000E+03 Y
Reference Date	1/23/2020
Ref. Act. (DPM/mL)	2406.4301
Amount of Std. (mL)	0.2
Standard Prep Date	9/14/2021

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	10/21/2021	71.70	3220.32	52.60
2	10/21/2021	70.60	3163.44	52.60
3	10/21/2021	71.60	3227.62	52.60

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	3167.72	6.809877	2325.83	465.17
2	3110.84	6.809877	2284.06	456.81
3	3175.02	6.809877	2331.19	466.24

Mean Value = 2313.69
Stddev = 25.79863504
Certificate Value* = 2404.6
Two sigma = 51.597
10 % of Mean = 231.369
Rule A (Pass/Fail) Pass
% Recovery 96.22%
Rule B (Pass/Fail) Pass
Expiration Date 9/15/2022

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Ra-226 source 1926-C by transferring 0.2 mL portions of the standard into glass liquid scintillation vials. 15 mL of Ecosint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 15 mL of Ecosint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCGOLD for Ra-226 source standard verification. The Ra-226 efficiency calibration which was used for verification calculations was performed on 9/15/2021 using Ra-226 source 1715-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency (cpm/dpm), and
- D = volume used for standard verification.

RAD-M-001

10/22/21

Eckert & Ziegler Analytics, Inc.
1380 Seaboard Industrial Blvd.
Atlanta, GA 30318, USA
Tel 1-404-352-8677
Fax 1-404-352-2837



Eckert & Ziegler
Analytics

1965
Received
9-22-20

akkreditiert durch die / *accredited by the*

Deutsche Akkreditierungsstelle GmbH



Deutsche
Akkreditierungsstelle
D-K-19023-01-00

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst



Kalibrierschein
Calibration certificate

Kalibrierzeichen
Calibration mark

001443
D-K- 19023-01-00
2020-09

Gegenstand
Object **5 mL Liquid in 5 mL Flame Sealed Ampoule**

Hersteller
Manufacturer **Eckert & Ziegler Analytics, Inc.**

Typ
Type **8328-5FSA-3700BQ-D**

Fabrikat/Serien-Nr.
Serial number **114437**

Auftraggeber
Customer **GEL Laboratories LLC**

Auftragsnummer
Order No. **CO-047265**

Anzahl der Seiten des Kalibrierscheines
Number of pages of the certificate **2**

Datum der Kalibrierung
Date of calibration **18-Sep-2020 1200 EST
(1700 UTC)**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).

Die DAKKS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine. Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).

The DAKKS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.

The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung sowohl der Deutschen Akkreditierungsstelle GmbH als auch des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine ohne Unterschrift haben keine Gültigkeit.

This calibration certificate may not be reproduced other than in full except with the permission of both the Deutsche Akkreditierungsstelle GmbH and the issuing laboratory. Calibration certificates without signature are not valid.

Datum
Date

Leiter des Kalibrierlaboratoriums
Head of the calibration laboratory

Bearbeiter
Person in charge

14-Sep-20

Levan Tkavadze

Karlee Eardley

001443
D-K- 19023-01-00
2020-09

- **Customer Purchase Order No.:**
GEL2026750, Item 1

- **Calibration Results:**

Nuclide	Half-Life *, d	Activity, Bq	Uncertainty, %	Calibration Method
Ra-228	2.100E+03	3.172E+03	4.9	HPGe

- **Calibration Method(s):**

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics using a germanium gamma-ray spectrometer system (HPGe).

- **Uncertainty:**

The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k = 2$. It has been determined in accordance with EA-4/02 M. The value of the measurand lies within the assigned range of values with a probability of approximately 95%. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

- **Traceability:**

Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

- **Impurities:**

γ -impurities (other than decay products) < 0.1 %

- **Expiration Date:**

No expiration date has been given for this source.

- **Wipe Test *:**

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

- **Additional Information:**

- 5.00785 g of 0.1 M HCl solution with approximately 30 $\mu\text{g/g}$ Ba carrier.
- Separation date: 01-March-2018
- *Values not calibrated by EZA (i.e. published nuclear data, uncertified values, etc.)
- Date of Calibration corresponds to Reference Date for this source.
- Expiration Date refers to useful life of this source.

End of Certificate

Standard Logbook

Serial ID: 1965 **Open/Reference Date:** 18 SEP 2020 **Aliquot :** 5.00785 g
Name: Radium-228 **Received:** 22 SEP 2020 **Density :** Hand Calculated
Type: Source Material **Expires:** 22 SEP 2035 **Logbook Num :** GL-CED-297-258
Employee: Tim Chandler **Lot Number :** 114437
Supplier: Eckert & Zeigler Analytics **Solvent :** 0.1M HCl
Uncertainty : 2.45 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Radium-228	3172 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1965
Prepared By:	Tim Chandler
Carrier Conc:	0.1M HCl
Reference Date:	09/18/2020
Ampoule Mass (g):	5.00785 g
Uncertainty:	+/- 2.45 %
LogBook No:	GL-CED-297-258
Supplier:	Eckert & Zeigler Analytics

A Solution Material Info			
Isotope:	Radium-228		
Prepared By:	Bethany Fiem		
Prep Date:	09/23/2020		
Verification Date:	08/05/2021		
Expiration Date:	08/05/2022		
Primary Code:	1965-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9411 g		
Density(g/mL):	0.9999	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9411 \text{ g}) * (3172 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00785 \text{ g} * 100 \text{ mL}) = 1877.8321 \text{ dpm/mL}$
$(4.9411 \text{ g}) * (3172 \text{ Bq}) * (60 \text{ dpm/Bq}) / (0.9999 \text{ g/mL}) / (5.00785 \text{ g} * 100 \text{ mL}) = 1877.9260 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
09/23/2020	Bethany Fiem	40.8755	200	1965-B	383.805821 dpm/mL	08/05/2021	08/05/2022
09/24/2020	Bethany Fiem	20.1605	100	1965-C	378.599271 dpm/mL	08/05/2021	08/05/2022

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-228 Standard 1965-C

v1.0.2

Instrument	BLUE
Analyst	BXF1
Verification Prep Date	8/5/2021

Standard Information	
Isotope	Ra-228
Serial Number	1965-C
Isotope Half-life	5.7500 Y
Reference Date	9/16/2020
Ref. Act. (DPM/mL)	378.599271
Amount of Std. (mL)	1.0
Standard Prep Date	9/24/2020

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	8/6/2021	105.30	2460.24	35.80
2	8/6/2021	105.00	2479.51	35.80
3	8/6/2021	104.20	2402.62	35.80

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	2424.44	7.130420	340.01	340.01
2	2443.71	7.130420	342.72	342.72
3	2366.82	7.130420	331.93	331.93

dpm/mL
338.22
5.610781665

Mean Value =
Stddev =

Certificate Value* = 340.4
Two sigma = 11.222
10 % of Mean = 33.822
Rule A (Pass/Fail) Pass
% Recovery 99.35%
Rule B (Pass/Fail) Pass
Expiration Date 8/5/2022

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Ra-228 source 1965-C by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecosint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecosint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCBLUE for Ra-228 source standard verification. The Ra-228 efficiency calibration which was used for verification calculations was performed on 8/5/2021 using Ra-228 source 1952-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

A = Ver. source cpm,

B = BKG cpm,

C = System efficiency (cpm/dpm), and

D = volume used for standard verification.

RAD-M-001

8/19/21
[Signature]

afg-afg 8/19/21



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

1943

SRS Number: 115036

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8090-5FSA-37kBq

Customer: GEL Laboratories LLC

P.O. Number: GEL1924879, Item 4

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 23-January-2020 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Sr-90	1.052E+04	3.705E+04	0.1	1.0	2.1	4 π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4 π LS - 4 π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

GL-CED-297-236a

EZA Certificate Program Rev. 1, 01-FEB-2019

Dec
4-8-20

Page 1 of 2

SRS Number: 115036

Comments:

5.00204 g of 0.1 M HCl solution with approximately 30 µg/g each Sr and Y carriers.

Impurities:

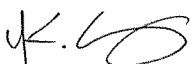
γ-impurities < 0.1%

Note:

This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total activity for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Eardley, Radiochemist

QC Approved by:


A. Chen, Spectroscopist

Date: 16 Jan 20

Standard Logbook

Serial ID: 1943 **Open/Reference Date:** 23 JAN 2020 **Aliquot :** 5.00204 g
Name: Strontium-90 **Received:** 23 JAN 2020 **Density :** Hand Calculated
Type: Source Material **Expires:** 23 JAN 2035 **Logbook Num :** GL-CED-297-236
Employee: Tim Chandler **Lot Number :** 115036
Supplier: Eckert & Zeigler **Solvent :** 0.1M HCl
Uncertainty : 1.05 percent
Description: Strontium-90
Comments: None

Analyte	Concentration	Analyte	Concentration
Strontium-90	37050 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1943
Prepared By:	Tim Chandler
Carrier Conc:	0.1M HCl
Reference Date:	01/23/2020
Ampoule Mass (g):	5.00204 g
Uncertainty:	+/- 1.05 %
LogBook No:	GL-CED-297-236
Supplier:	Eckert & Zeigler

A Solution Material Info			
Isotope:	Strontium-90		
Prepared By:	Jennie Kill-Bowden		
Prep Date:	08/13/2020		
Verification Date:	01/04/2022		
Expiration Date:	01/04/2023		
Primary Code:	1943-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9536 g		
Density(g/mL):	0.9995	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22014.7236 \text{ dpm/mL}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (0.9995 \text{ g/mL}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22025.6704 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/16/2021	Bethany Fiem	24.8842	1000	1943-B	548.091187 dpm/mL	02/16/2021	02/16/2022
01/04/2022	Jennie Kill-Bowden	25.0633	1000	1943-C	552.035985 dpm/ml	01/04/2022	01/04/2023
06/06/2022	Jennie Kill-Bowden	24.9802	1000	1943-D	550.2057 dpm/ml	06/04/2022	06/04/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Sr-90 Standard 1943-C

v1.0.2

Instrument	Red
Analyst	JXK3
Verification Prep Date	1/4/2022

Standard Information	
Isotope	Sr-90
Serial Number	1943-C
Isotope Halflife	28.9000 Y
Reference Date	1/23/2020
Ref. Act. (DPM/mL)	552.035984
Amount of Std. (mL)	1.0
Standard Prep Date	1/4/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	1/5/2022	88.50	1116.40	41.80
2	1/5/2022	87.90	1096.60	41.80
3	1/5/2022	89.00	1093.80	41.80

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	1074.60	2.021254	531.65	531.65
2	1054.80	2.021254	521.85	521.85
3	1052.00	2.021254	520.47	520.47

Mean Value =	dpm/mL 524.66
Stdev =	6.095043305
Certificate Value* =	526.8
Two sigma =	12.190
10 % of Mean =	52.466
Rule A (Pass/Fail)	Pass
% Recovery	99.60%
Rule B (Pass/Fail)	Pass
Expiration Date	1/4/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Sr-90 source 1943-C by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCRed for Sr-90 source standard verification. The Sr-90 efficiency calibration which was used for verification calculations was performed on 1/4/2022 using Sr-90 source 1689-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency (cpm/dpm), and
- D = volume used for standard verification.

RAD-M-001

Handwritten:
1/12/22
1/14/22

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2269287

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205098586	MB	JXC9	PIC7C	JUN-01-22 10:49:09	DONE	25mm Filter	01-JUN-22 00:00
1205098587	LCS	JXC9	PIC8A	JUN-01-22 10:49:16	DONE	25mm Filter	01-JUN-22 00:00
1205098588	LCSD	JXC9	PIC8B	JUN-01-22 10:49:20	DONE	25mm Filter	01-JUN-22 00:00
579287001	SAMPLE	JXC9	PIC5D	JUN-01-22 10:49:39	DONE	25mm Filter	01-JUN-22 00:00
579287002	SAMPLE	JXC9	PIC6A	JUN-01-22 10:49:47	DONE	25mm Filter	01-JUN-22 00:00
579287003	SAMPLE	JXC9	PIC6B	JUN-01-22 10:49:52	DONE	25mm Filter	01-JUN-22 00:00
579287004	SAMPLE	JXC9	PIC7A	JUN-01-22 10:49:59	DONE	25mm Filter	01-JUN-22 00:00
579287005	SAMPLE	JXC9	PIC7B	JUN-01-22 10:50:07	DONE	25mm Filter	01-JUN-22 00:00

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2269288

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205098591	LCSD	KP1	PIC8D	MAY-26-22 16:27:58	DONE	Tuffryn Filter	01-APR-21 00:00
1205098589	MB	KP1	PIC13D	MAY-26-22 19:10:09	DONE	Tuffryn Filter	01-APR-21 00:00
579287001	SAMPLE	KP1	PIC11A	MAY-26-22 19:10:12	DONE	Tuffryn Filter	01-APR-21 00:00
579287002	SAMPLE	KP1	PIC11B	MAY-26-22 19:10:16	DONE	Tuffryn Filter	01-APR-21 00:00
579287003	SAMPLE	KP1	PIC11C	MAY-26-22 19:10:19	DONE	Tuffryn Filter	01-APR-21 00:00
579287004	SAMPLE	KP1	PIC11D	MAY-26-22 19:10:21	DONE	Tuffryn Filter	01-APR-21 00:00
579287005	SAMPLE	KP1	PIC12A	MAY-26-22 19:10:28	DONE	Tuffryn Filter	01-APR-21 00:00
579289001	SAMPLE	KP1	PIC12C	MAY-26-22 19:10:31	DONE	Tuffryn Filter	01-APR-21 00:00
579289002	SAMPLE	KP1	PIC12D	MAY-26-22 19:10:35	DONE	Tuffryn Filter	01-APR-21 00:00
579289003	SAMPLE	KP1	PIC13B	MAY-26-22 19:10:41	DONE	Tuffryn Filter	01-APR-21 00:00
1205098590	LCS	KP1	PIC8A	MAY-27-22 10:47:39	DONE	Tuffryn Filter	01-APR-21 00:00

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2269289

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205098594	LCSD	JXC9	PIC14D	MAY-31-22 17:27:34	DONE	47mm Filter	01-JUN-21 00:00
1205098593	LCS	JXC9	PIC7B	MAY-31-22 17:29:13	DONE	47mm Filter	01-JUN-21 00:00
1205098592	MB	JXC9	PIC4C	MAY-31-22 18:51:46	DONE	47mm Filter	01-JUN-21 00:00
579287001	SAMPLE	JXC9	PIC3B	MAY-31-22 18:51:53	DONE	47mm Filter	01-JUN-21 00:00
579287002	SAMPLE	JXC9	PIC3C	MAY-31-22 18:51:53	DONE	47mm Filter	01-JUN-21 00:00
579287003	SAMPLE	JXC9	PIC3D	MAY-31-22 18:51:59	DONE	47mm Filter	01-JUN-21 00:00
579287004	SAMPLE	JXC9	PIC4A	MAY-31-22 18:52:03	DONE	47mm Filter	01-JUN-21 00:00
579287005	SAMPLE	JXC9	PIC4B	MAY-31-22 18:52:06	DONE	47mm Filter	01-JUN-21 00:00

Liquid Scintillation Raw Data

Batch 2265050 Check-list

This check-list was completed on 06-JUN-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 06-JUN-22 and Jessica Davis on 06-JUN-22.

Batch ID: 2265050

Product: LSC41PUF

Description: LSC Plutonium Filter

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have client special requirements have been reviewed and met?	Yes		
4	Have samples been blank corrected?		No	
5	Has a hit notification been completed?		No	
6	Has an Aliquot Correction been completed for this batch?	Yes		
7	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
8	Were all the samples prepared/analyzed within the required holding time period?	Yes		
9	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
10	Was the method blank (MB) within the acceptance criteria?	Yes		
11	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
12	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
13	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
14	Has the method required detection limit been met?		No	
Miscellaneous Information				
15	Were manual integrations performed on any sample or QC data files in this batch?		No	
16	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium-241 in Filter per Liter

Batch ID: 2265050
Analyst: Michael Potts (MP2)
Method: DOE EML HASL-300, Pu-11-RC
 Modified
Lab SOP: GL-RAD-A-035 REV# 23
Instrument: ASP-33005595

Due Dates for Lab: 05-JUN-2022

Package: 06-JUN-2022

SDG: 07-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205090031	Plutonium-241 AS SPIKE	1714-B	.1	mL
LCSD	1205090032	Plutonium-241 AS SPIKE	1714-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	579287001	25-MAY-2022	5	30	0.11118
2	579287002	25-MAY-2022	5	30	0.11549
3	579287003	25-MAY-2022	5	30	0.11403
4	579287004	25-MAY-2022	5	30	0.11518
5	579287005	25-MAY-2022	5	30	0.11218
6	579289001	25-MAY-2022	5	30.1	0.11121
7	579289002	25-MAY-2022	5	30	0.1135
8	579289003	25-MAY-2022	5	30	0.11151
9	1205090030 MB	25-MAY-2022	5		0.11549
10	1205090031 LCS	25-MAY-2022	5		0.11549
11	1205090032 LCSD	25-MAY-2022	5		0.11549

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2010-A	Plutonium-242 AS TRACER	.1 mL	Pipet ID: RAD-ASP-184002Z Data Entry Date2: 25-MAY-2022 00:00

Plutonium-241 Filter

Filename : PU241.XLS
File type : Excel
Version # : 1.3.4

Tracer S/N : 2010-A
Tracer Exp Date : 4/14/2023
Tracer Volume Added: 0.10
Tracer Error: 0.37%

Batch : 2265050
Analyst : MIC02277
Prep Date : 5/25/2022
Method Uncertainty : 0.0935

Procedure Code : LSC41PUF
Parmname : Plutonium-241
Required MDA : 5 pCi/F
Halflife of Pu-241 : 14.290 years
Pu-241 Abundance : 1.00
Tracer Abundance : 1.00
Halflife of Tracer : 373500.000 years

Geometry:

2mL DI/1 drop HNO3/13mL Ecoscint Ultra

Sample Characteristics					Tracer Calculations									
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Tracer Concentration DPM	Tracer Counts	Tracer Bkg Counts	Tracer Net CPM	Tracer Count Start Date/Time	Tracer Count Time (sec.)	Tracer Decay	Detector Serial #	Detector Efficiency (cpm/dpm)	Detector Efficiency StDev. (cpm/dpm)
1	579287001.1	0.1112	1.2035E-05	3/29/2022 13:03	4.2739	265	10.560	1.060	5/31/2022 9:23	14400	1.000	83291	0.316604	0.006118
2	579287002.1	0.1155	1.2280E-05	3/29/2022 13:11	4.2739	297	4.320	1.220	5/31/2022 9:23	14400	1.000	79988	0.312662	0.006043
3	579287003.1	0.1140	1.2198E-05	3/29/2022 13:22	4.2739	279	3.360	1.149	5/31/2022 9:23	14400	1.000	158119	0.356880	0.006877
4	579287004.1	0.1152	1.2263E-05	3/29/2022 13:31	4.2739	340	7.440	1.386	5/31/2022 9:23	14400	1.000	158160	0.331152	0.006392
5	579287005.1	0.1122	1.2093E-05	3/29/2022 9:30	4.2739	358	9.120	1.454	5/31/2022 9:23	14400	1.000	155764	0.337411	0.006510
6	579289001.1	0.1112	1.2037E-05	3/29/2022 12:48	4.2739	299	1.440	1.240	5/31/2022 9:23	14400	1.000	140237	0.323545	0.006248
7	579289002.1	0.1135	1.2168E-05	3/29/2022 12:55	4.2739	340	0.960	1.413	5/31/2022 9:23	14400	1.000	79778	0.350005	0.006747
8	579289003.1	0.1115	1.2054E-05	3/29/2022 9:00	4.2739	347	2.880	1.434	5/31/2022 9:23	14400	1.000	79463	0.355425	0.006850
9	1205090030.1	0.1155	1.2280E-05	5/25/2022 0:00	4.2739	288	1.920	1.192	5/31/2022 9:23	14400	1.000	83292	0.326024	0.006296
10	1205090031.1	0.1155	1.2280E-05	5/25/2022 0:00	4.2739	262	1.920	1.084	5/31/2022 9:34	14400	1.000	155839	0.276262	0.005356
11	1205090032.1	0.1155	1.2280E-05	5/25/2022 0:00	4.2739	267	3.120	1.100	5/31/2022 9:34	14400	1.000	155840	0.265265	0.005149

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-035
 Instrument SOP:

Count raw Data													Calibration Data						
Pos.	Rack Position #	Counting Time (min.)	Quench#	Gross cpm	Bkg cpm	Bkg Count Time (min.)	Bkg Quench#	Corrected Bkg cpm	Count Start Date/Time	Sample Decay	Calculated Sample Recovery %	Sample Recovery Error %	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Background Rack Position #	Background Count Start Date/Time
1	18-2	60	347.09	15.98	14.41	60	343.84	14.4212	6/5/2022 22:11	0.991	78.3%	6.74%	LSCNAVY	1/24/2022	1/31/2023	0.3023	0.00792	18-1	6/5/2022 21:10
2	18-3	60	348.72	15.73	14.41	60	343.84	14.4261	6/5/2022 23:12	0.991	91.3%	6.23%	LSCNAVY	1/24/2022	1/31/2023	0.3036	0.00792	18-1	6/5/2022 21:10
3	18-4	60	346.74	14.11	14.41	60	343.84	14.4201	6/6/2022 0:13	0.991	75.3%	6.39%	LSCNAVY	1/24/2022	1/31/2023	0.3021	0.00792	18-1	6/5/2022 21:10
4	18-5	60	348.58	15.79	14.41	60	343.84	14.4257	6/6/2022 1:14	0.991	97.9%	5.90%	LSCNAVY	1/24/2022	1/31/2023	0.3035	0.00792	18-1	6/5/2022 21:10
5	16-1	60	332.13	15.85	14.41	60	343.84	14.3533	6/6/2022 3:24	0.991	101%	5.79%	LSCNAVY	1/24/2022	1/31/2023	0.2907	0.00792	18-1	6/5/2022 21:10
6	16-2	60	335.99	15	14.41	60	343.84	14.3750	6/6/2022 4:25	0.991	89.7%	6.15%	LSCNAVY	1/24/2022	1/31/2023	0.2937	0.00792	18-1	6/5/2022 21:10
7	16-3	60	333.58	15	14.41	60	343.84	14.3618	6/6/2022 5:26	0.991	94.4%	5.79%	LSCNAVY	1/24/2022	1/31/2023	0.2918	0.00792	18-1	6/5/2022 21:10
8	16-4	60	347.05	15.96	14.41	60	343.84	14.4210	6/6/2022 6:27	0.991	94.4%	5.77%	LSCNAVY	1/24/2022	1/31/2023	0.3023	0.00792	18-1	6/5/2022 21:10
9	16-5	60	341.96	15.41	14.41	60	343.84	14.4027	6/6/2022 7:28	0.998	85.5%	6.26%	LSCNAVY	1/24/2022	1/31/2023	0.2984	0.00792	18-1	6/5/2022 21:10
10	18-1	15	329.76	55.99	14.41	60	343.84	14.3386	6/6/2022 8:29	0.998	91.8%	6.55%	LSCNAVY	1/24/2022	1/31/2023	0.2888	0.00792	18-1	6/5/2022 21:10
11	18-2	15	326.58	61.49	14.41	60	343.84	14.3169	6/6/2022 8:44	0.998	97.0%	6.52%	LSCNAVY	1/24/2022	1/31/2023	0.2863	0.00792	18-1	6/5/2022 21:10

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1714-B
LCS Exp Date : 1/19/2023
LCS Activity (dpm/ml): 1622.46
LCS Volume Added: 0.10

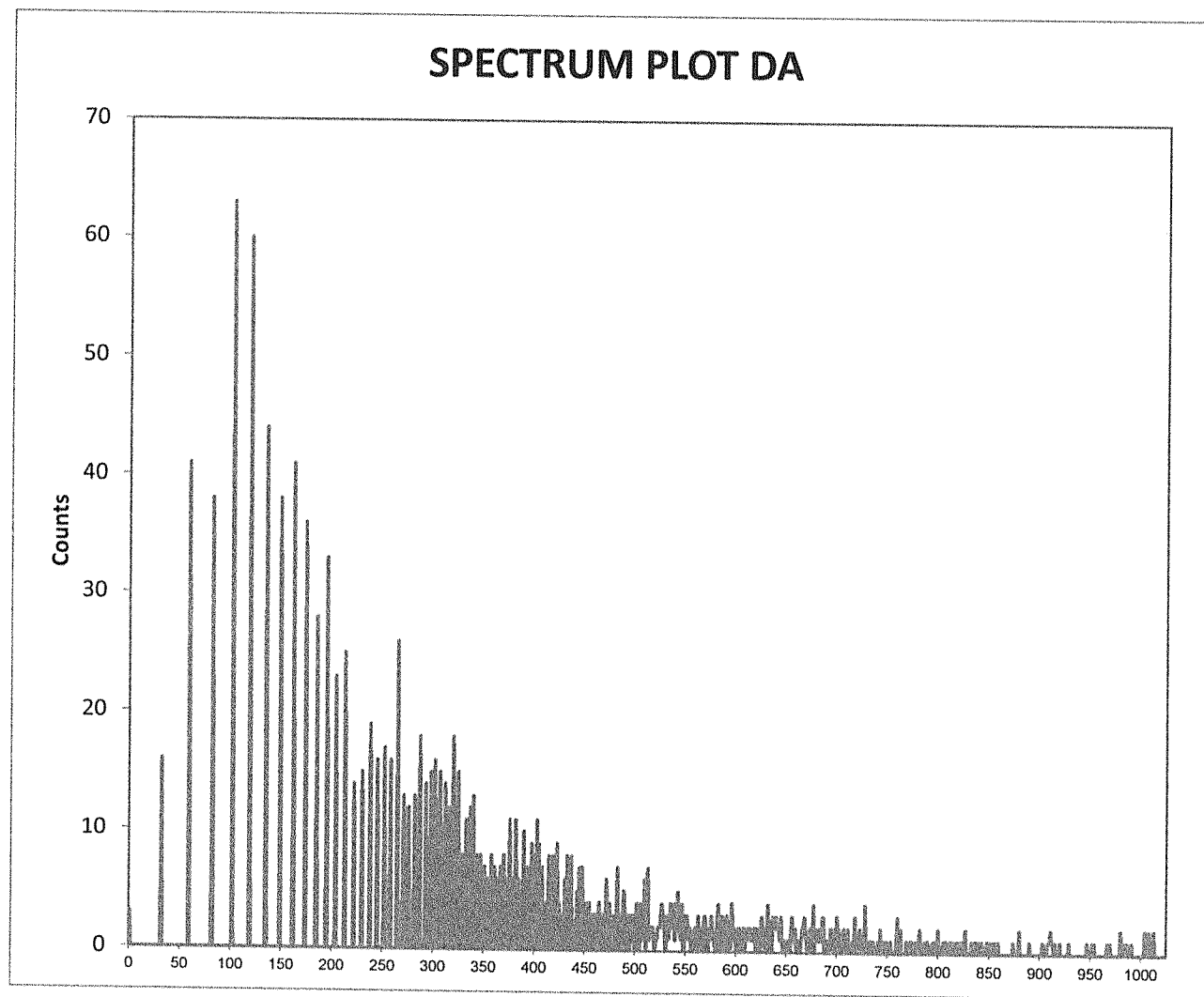
Results																
	Decision Level	Critical Level	Required MDA	MDA	Sample Act. Conc.	Sample Act. Error	Net Count Rate	Net Count Rate Error	2 SIGMA Counting Uncertainty	2 SIGMA Total Prop. Uncertainty	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery
Pos.	pCi/F	pCi/F	pCi/F	pCi/F	pCi/F	%	CPM	CPM	pCi/F	pCi/F						
1	27.8821	19.6850	5	40.2330	26.9047	46.16%	1.5588	0.7118	24.0799	24.8383		SAMPLE				
2	22.9529	16.2050	5	33.1202	18.5234	54.73%	1.3039	0.7089	19.7395	20.1586		SAMPLE				
3	28.3105	19.9875	5	40.8512	-5.4339	222.49%	-0.3101	0.6896	23.6865	23.6866		SAMPLE				
4	21.4592	15.1504	5	30.9649	18.1205	52.35%	1.3643	0.7096	18.4734	18.8884		SAMPLE				
5	22.2875	15.7351	5	32.1617	20.6972	47.76%	1.4967	0.7095	19.2308	19.7442		SAMPLE				
6	25.0342	17.6744	5	36.1249	9.7016	112.12%	0.6250	0.6997	21.2865	21.3932		SAMPLE				
7	23.4290	16.5411	5	33.8088	9.2747	109.77%	0.6382	0.6995	19.9263	20.0268		SAMPLE				
8	23.0781	16.2934	5	33.3010	21.9853	46.60%	1.5390	0.7116	19.9246	20.4822		SAMPLE				
9	24.7101	17.4456	5	35.6564	15.4182	70.26%	1.0073	0.7049	21.1465	21.4196		MB				
10	37.5395	26.5032	5	55.9542	613.9036	8.15%	41.6514	1.9929	57.5720	149.2227		LCS			632.8293	97.0%
11	35.8123	25.2838	5	53.3819	663.7996	7.91%	47.1731	2.0828	57.4435	159.3740		LCSD	7.8%		632.8293	104.9%

SampleID	Rack	Time (min.)	SQPE#	CPM Iso1	CPM Iso2	LumEx	Count Start Time	Count End Time	Machine
1	18-1	60	343.84	14.41			6/5/2022 21:10	6/5/2022 22:10	NAVY
2	18-2	60	347.09	15.98			6/5/2022 22:11	6/5/2022 23:11	NAVY
3	18-3	60	348.72	15.73			6/5/2022 23:12	6/6/2022 0:12	NAVY
4	18-4	60	346.74	14.11			6/6/2022 0:13	6/6/2022 1:13	NAVY
5	18-5	60	348.58	15.79			6/6/2022 1:14	6/6/2022 2:14	NAVY
1	16-1	60	332.13	15.85			6/6/2022 3:24	6/6/2022 4:24	NAVY
2	16-2	60	335.99	15			6/6/2022 4:25	6/6/2022 5:25	NAVY
3	16-3	60	333.58	15			6/6/2022 5:26	6/6/2022 6:26	NAVY
4	16-4	60	347.05	15.96			6/6/2022 6:27	6/6/2022 7:27	NAVY
5	16-5	60	341.96	15.41			6/6/2022 7:28	6/6/2022 8:28	NAVY
1	18-1	15	329.76	55.99			6/6/2022 8:29	6/6/2022 8:44	NAVY
2	18-2	15	326.58	61.49			6/6/2022 8:44	6/6/2022 8:59	NAVY

Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
05 Jun 2022 21:10:48
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M:\LSC\FILES\navy\2265050A\U2265050A.xls
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NAVY
1, 18, 60:

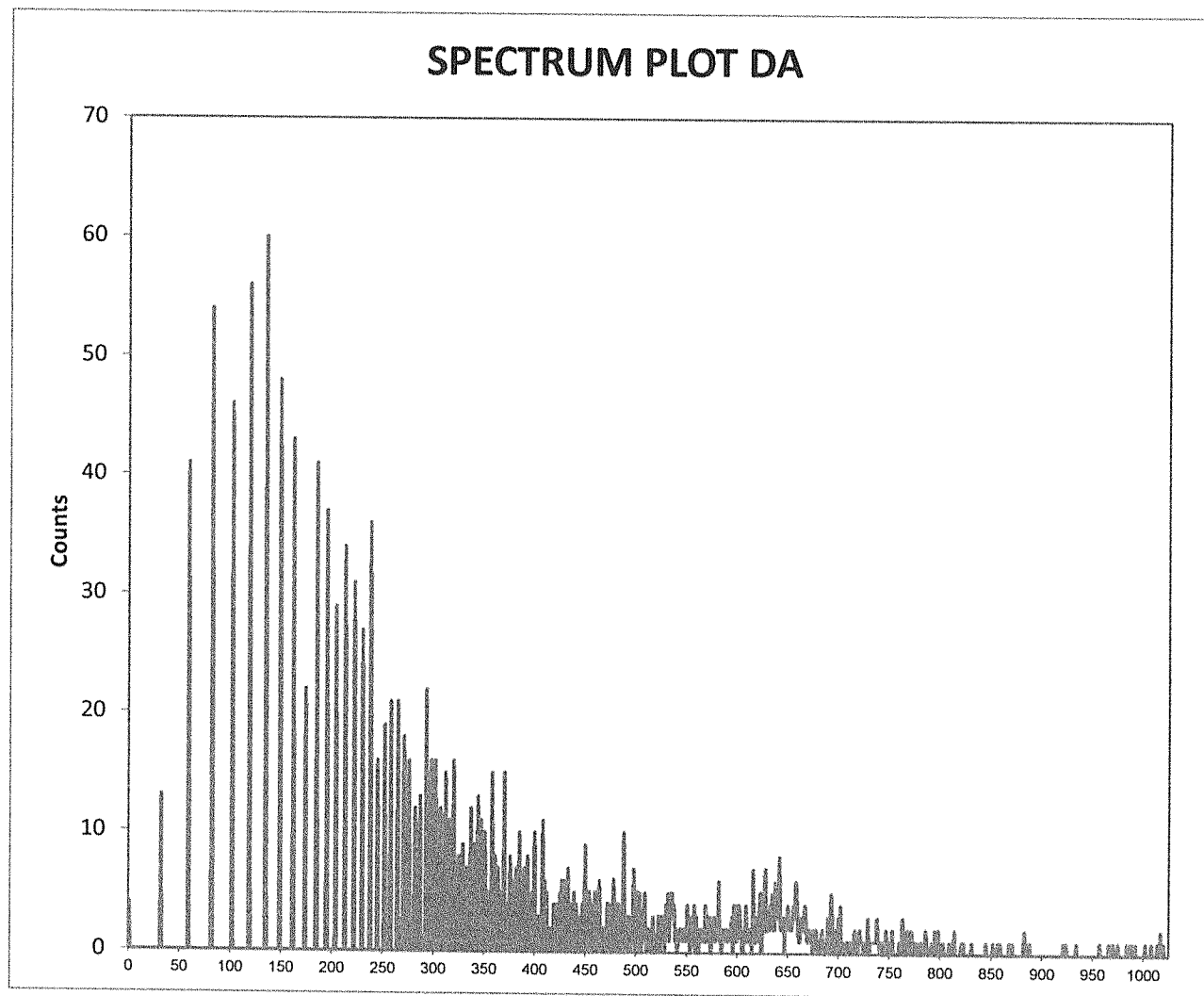
Quench: 343.84
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

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05 Jun 2022 22:11:49
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NAVY
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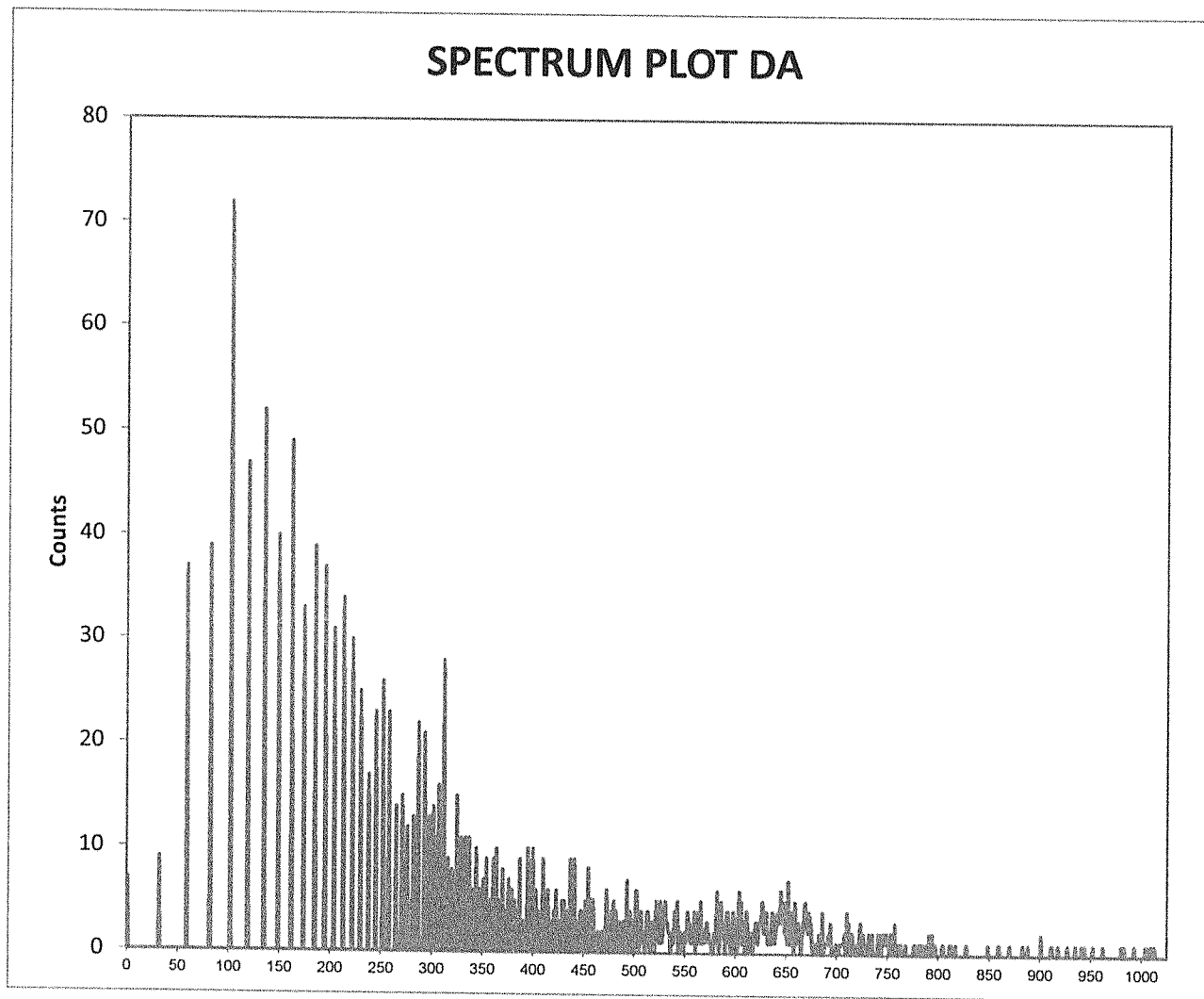
Quench: 347.09
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
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DA
NAVY
3, 18, 60:

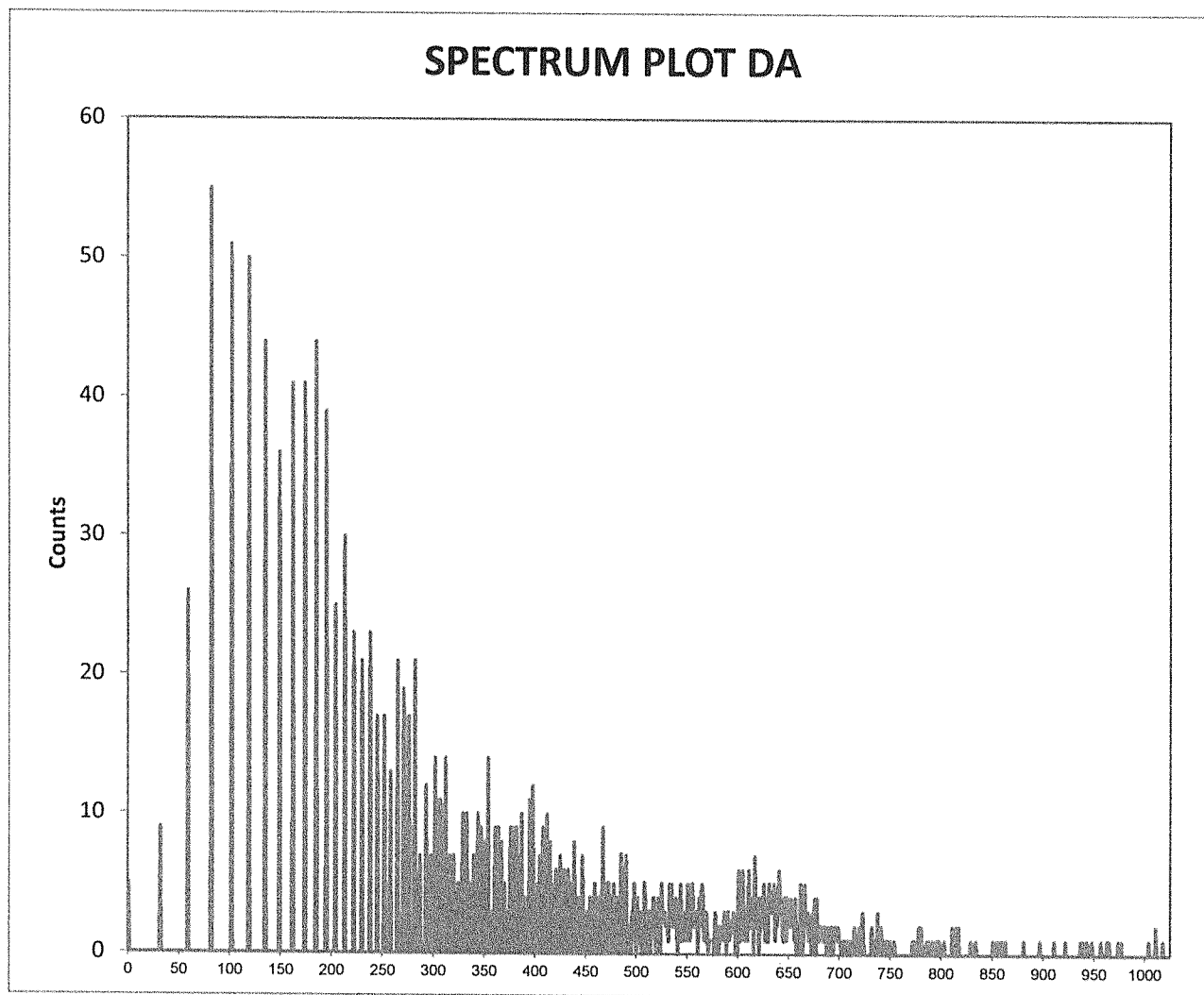
Quench: 348.72
Start, End, X-Axis



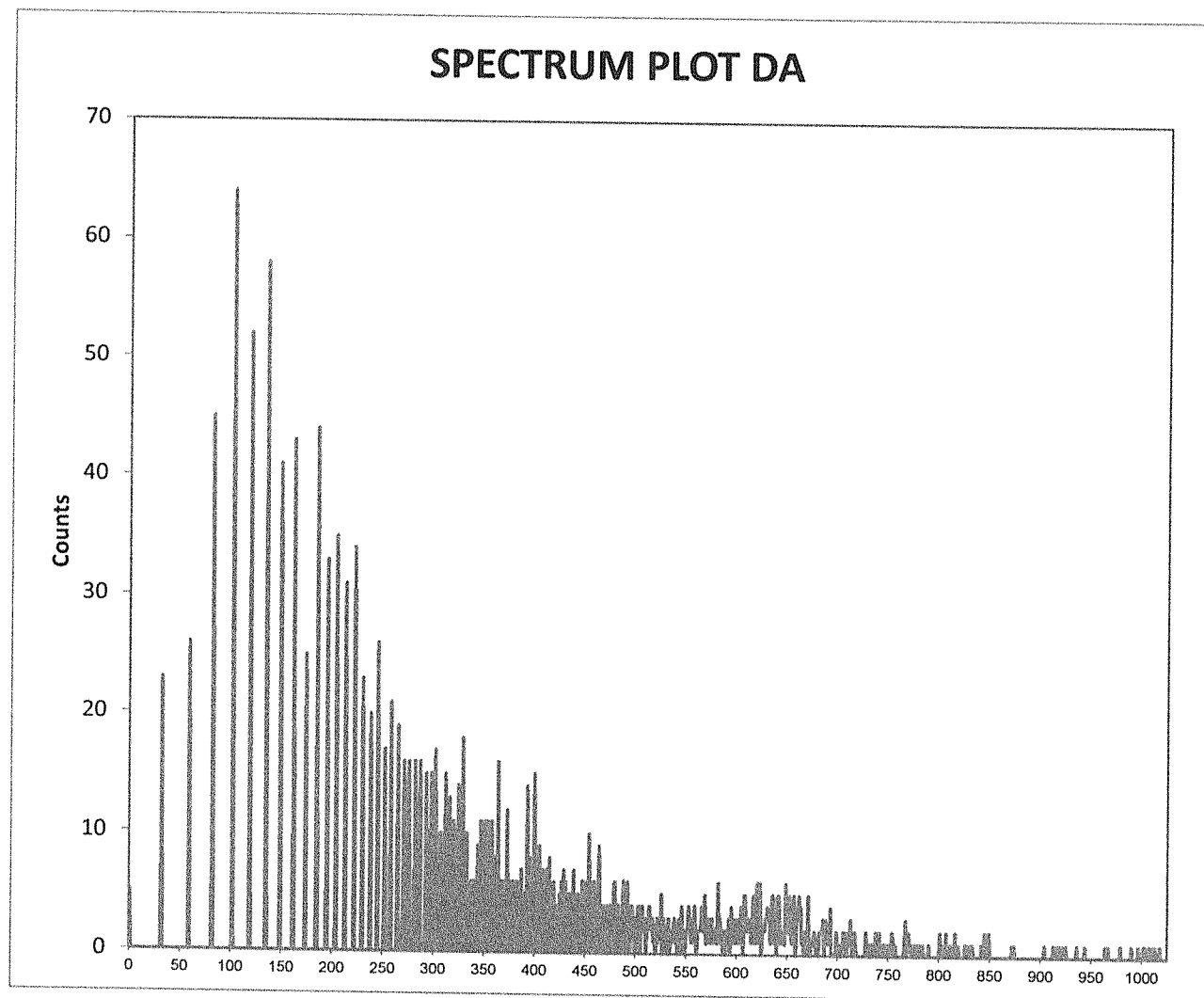
Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
06 Jun 2022 00:13:50
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DA
NAVY
4, 18, 60:

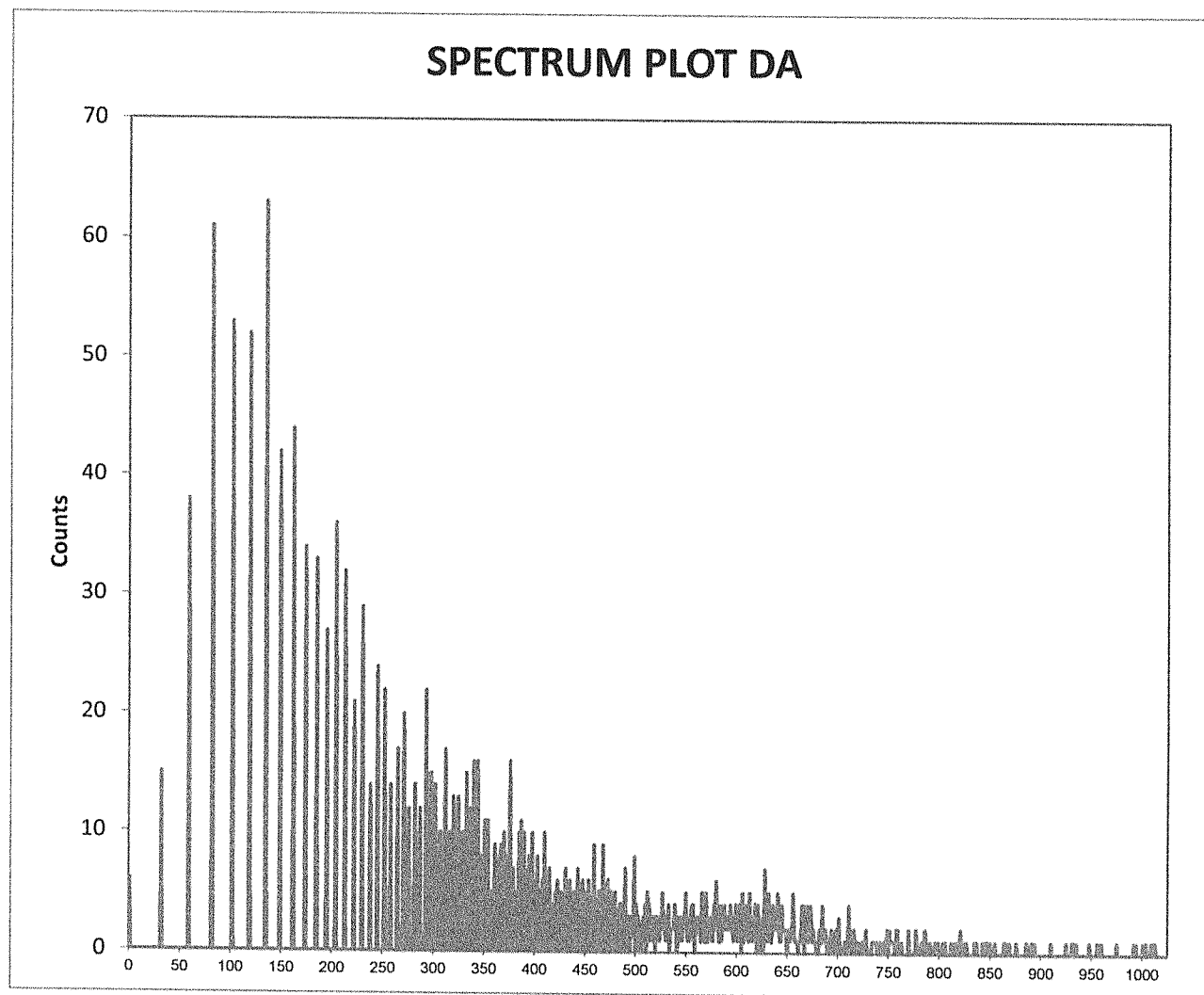
Quench: 346.74
Start, End, X-Axis



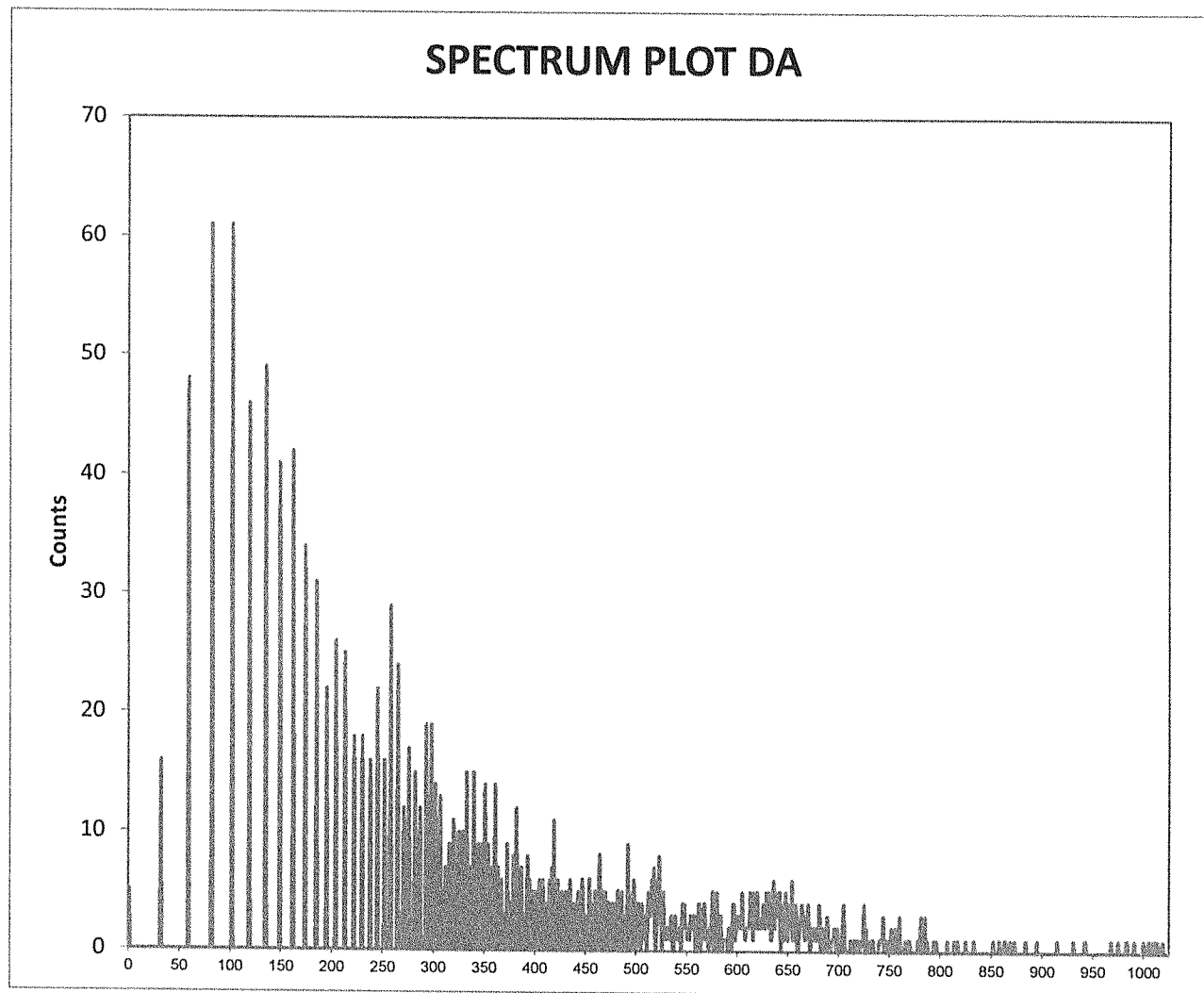
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File Info: M:\LSC\FILES\navy\2265050A\U2265050A.xls
ID: DA
Comments: NAVY
5, 18, 60:
Quench: 348.58
Start, End, X-Axis



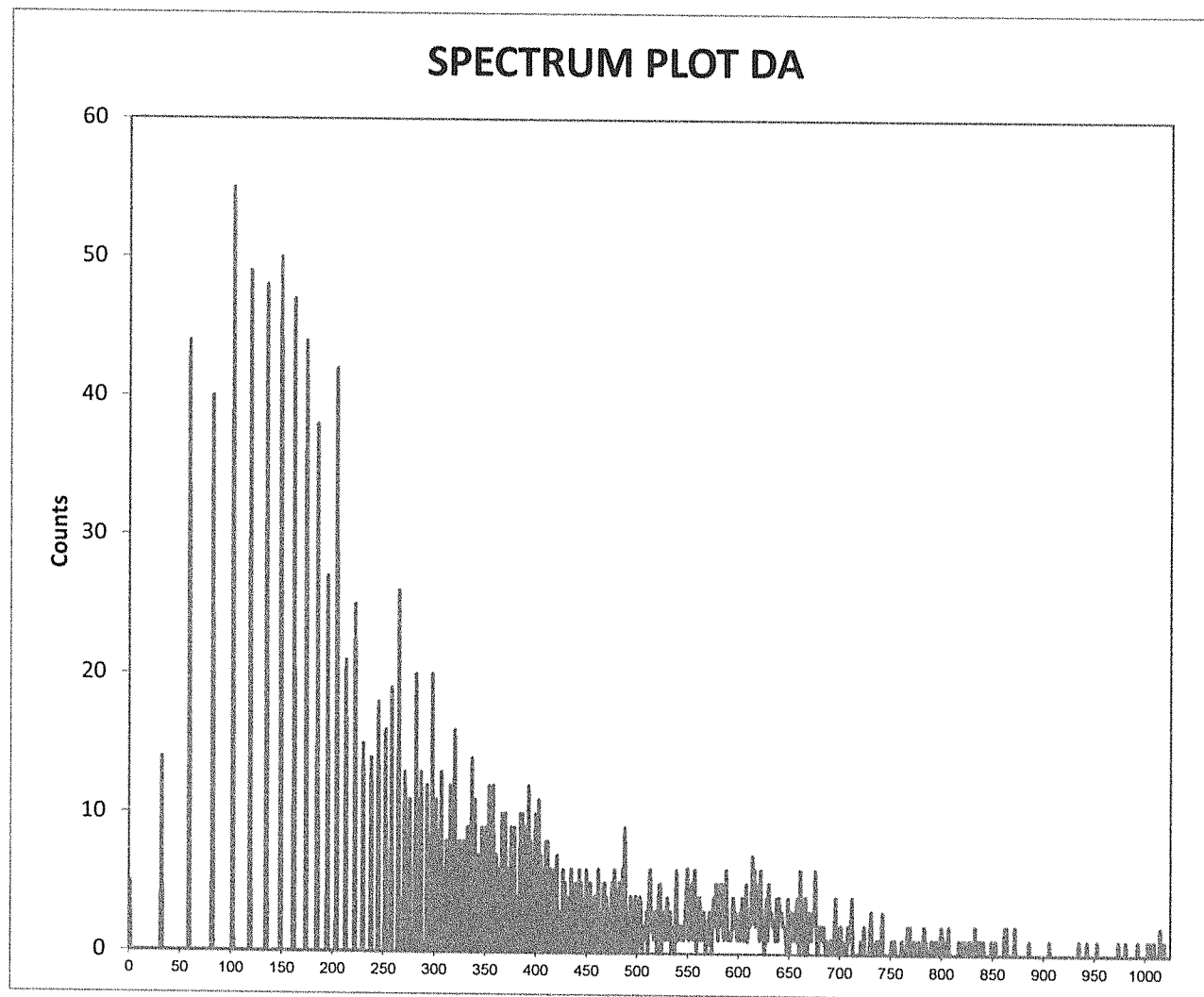
Instrument Type:	PE
Sample Count Start Time:	06 Jun 2022 03:24:19
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File Info:	M:\LSC\FILES\navy\2265050B\U2265050B.xls
ID:	DA
Comments:	NAVY
	1, 16, 60:
Quench:	332.13
Start, End, X-Axis	



Instrument Type:	PE
Sample Count Start Time:	06 Jun 2022 04:25:20
FileName:	M:\LSC\FILES\navy\2265050B\SPu241_3_S0002_R01_202206
File Info:	M:\LSC\FILES\navy\2265050B\U2265050B.xls
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Comments:	NAVY
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Quench:	335.99
Start, End, X-Axis	



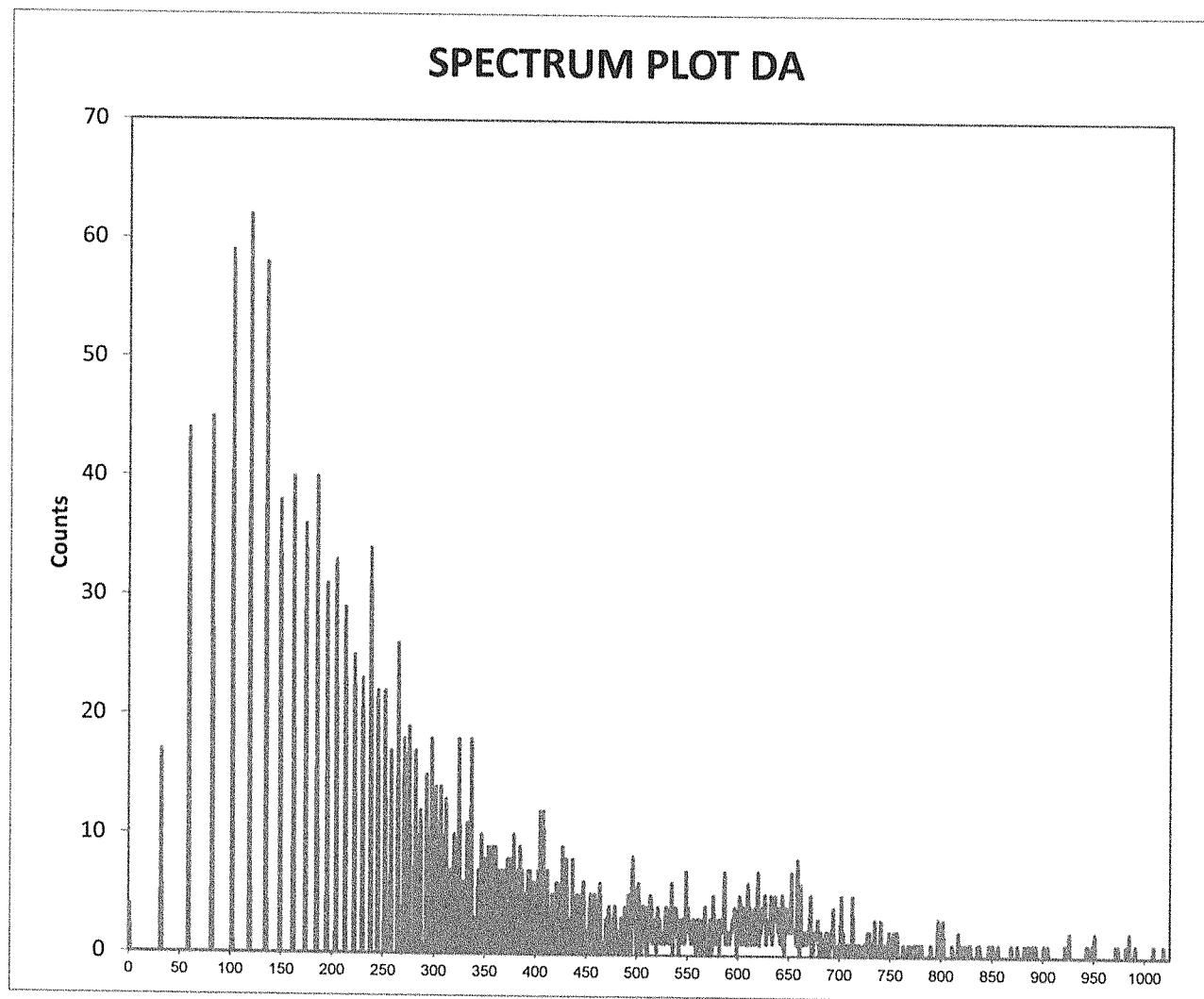
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File Info:	M:\LSC\FILES\navy\2265050B\U2265050B.xls
ID:	DA
Comments:	NAVY
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Quench:	333.58
Start, End, X-Axis	



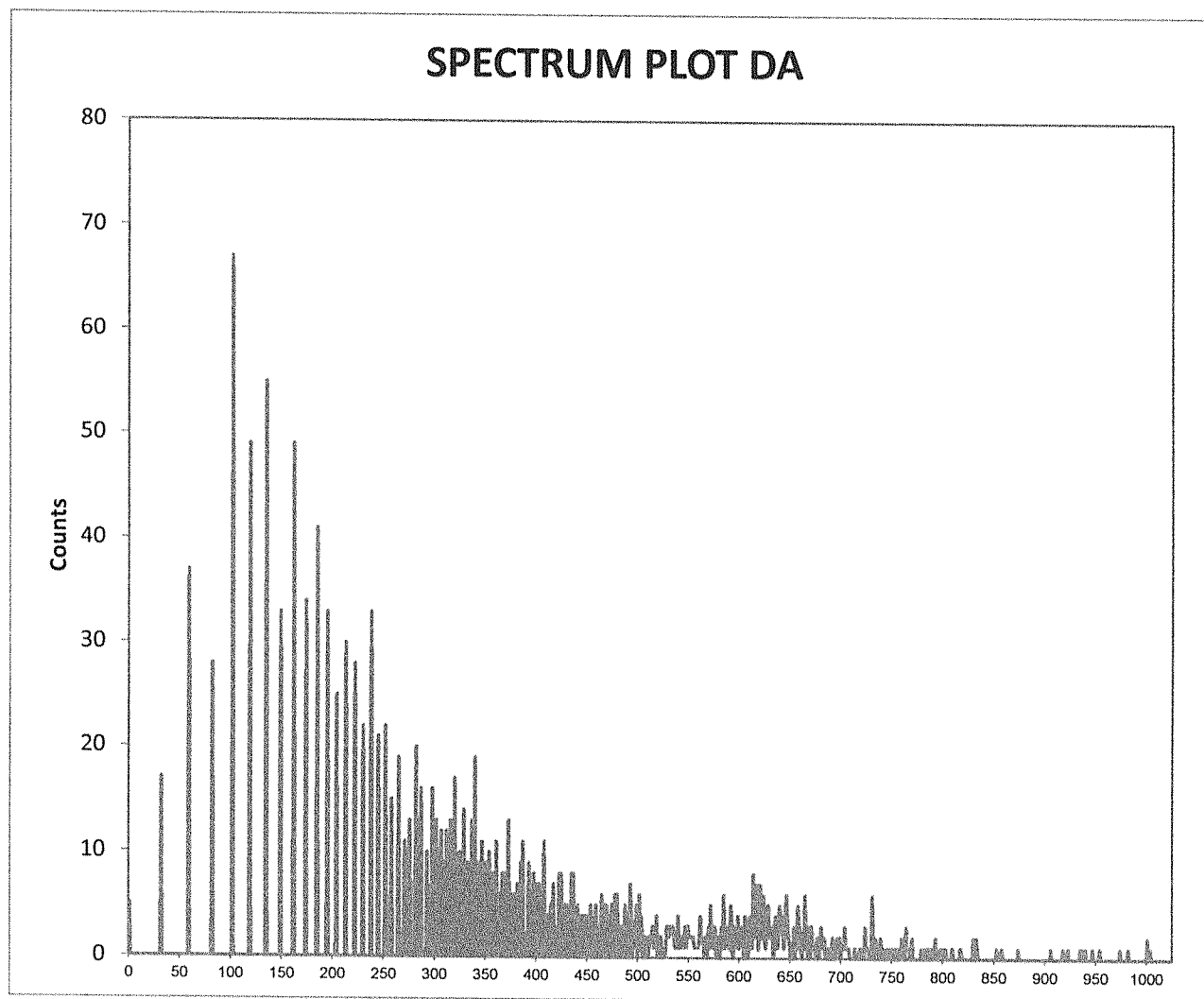
Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
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M:\LSC\FILES\navy\2265050B\U2265050B.xls
DA
NAVY
4, 16, 60:

Quench:
Start, End, X-Axis 347.05



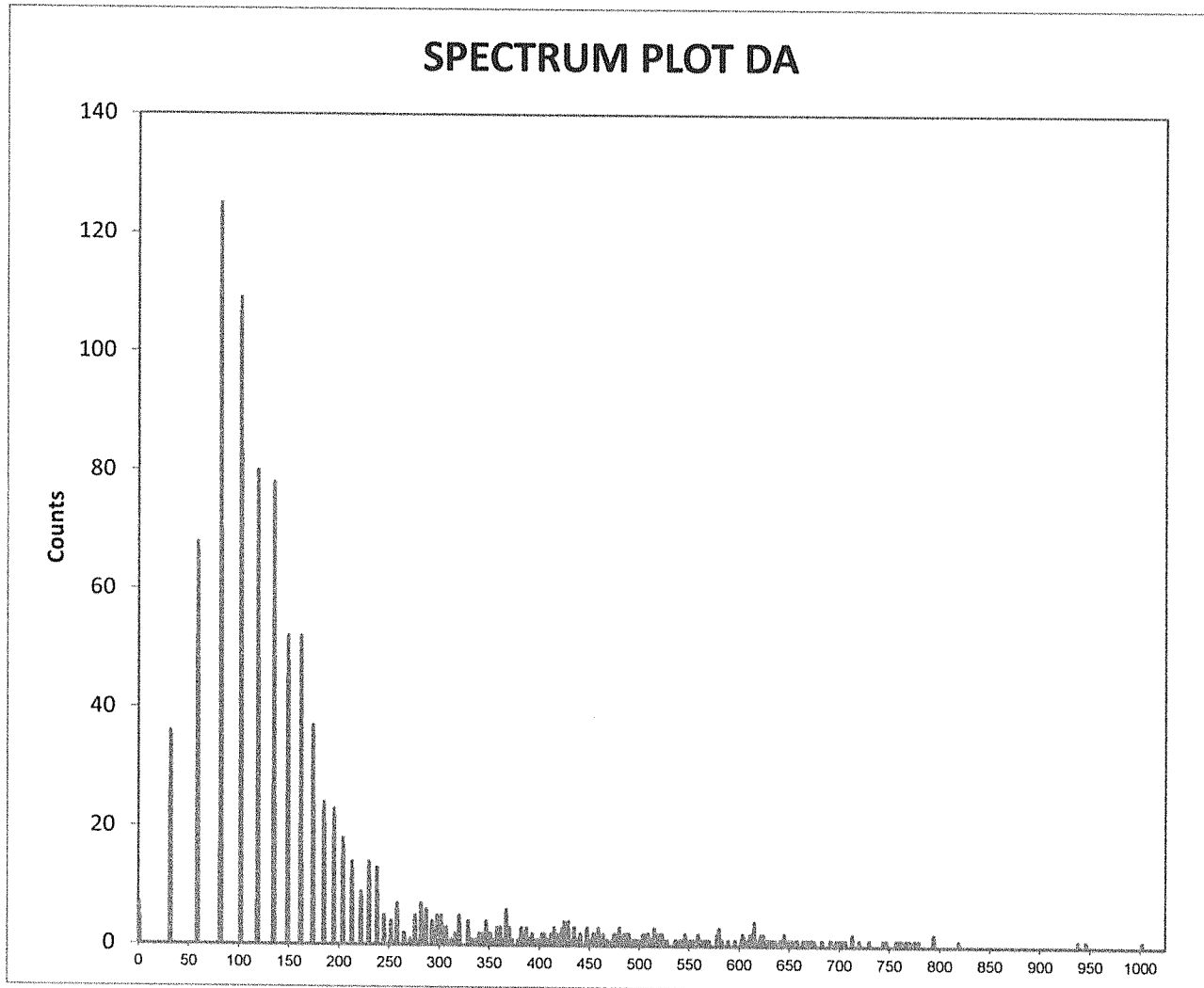
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Comments:	NAVY
	5, 16, 60:
Quench:	341.96
Start, End, X-Axis	



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
06 Jun 2022 08:29:20
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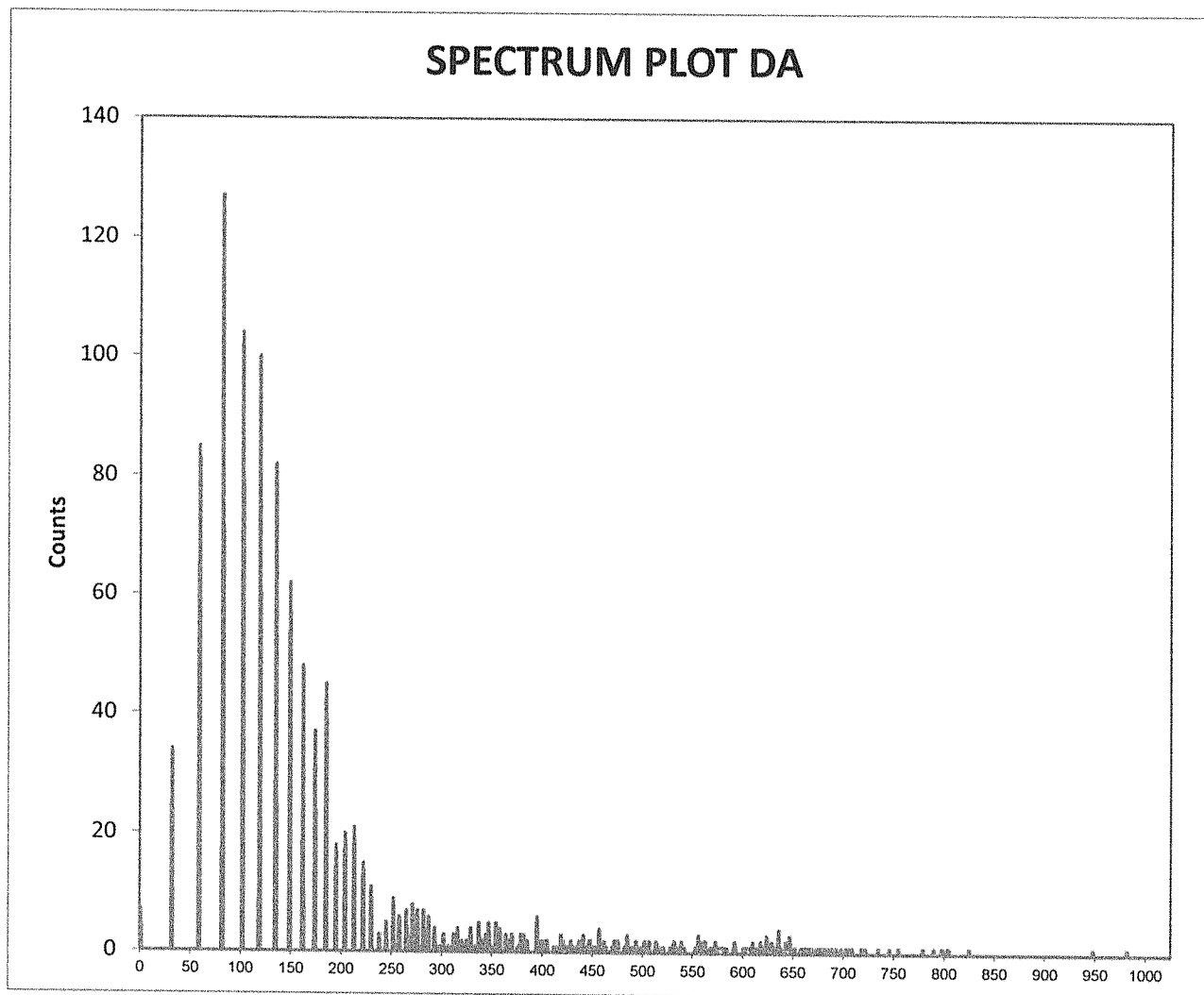
Quench: 329.76
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

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DA
NAVY
2, 18, 15:

Quench: 326.58
Start, End, X-Axis



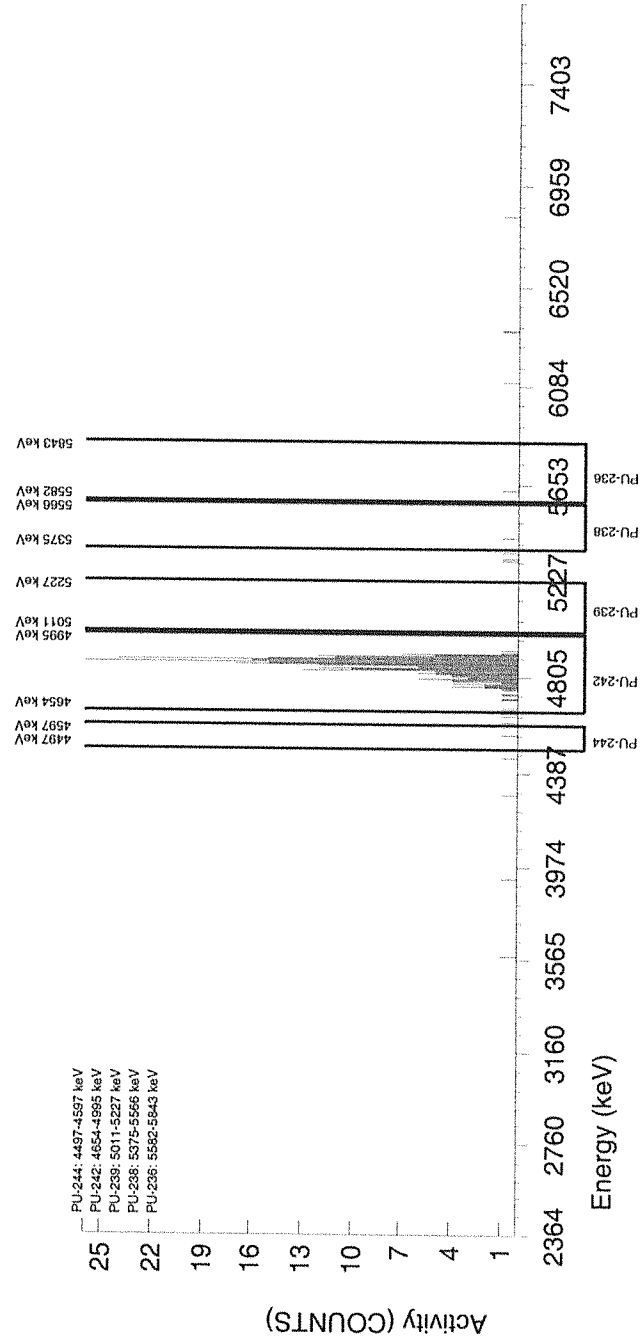
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2265050 SAMPLE ID : R0579287001_PU SAMPLE QTY : 0.111 F +/-1.345 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 78.3 +/-6.735 %		CHAMBER : 088 DETECTOR S/N : 83291 AVERAGE %EFFICIENCY : 31.6604 AVERAGE %EFF ERROR : 0.6118 COUNT DATE : 31-May-2022 09:23:01 ELAPSED LIVE TIME(SEC) : 14399.99		LIB FILE : PU BKG FILE : B088.CNF:2342 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W088.CNF:613 CAL DATE : 09-May-2022	
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TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 3.3486E+00 dpm	
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NUCLIDE ACTIVITY SUMMARY											
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5626.66	4.920	1.000	-1.160	2.160	1.4697	100.000	-8.23E-02	2.24E-01	2.23E-01
PU-238	5486.00	5418.32	4.920	1.000	-0.680	1.680	1.2961	99.900	-4.64E-02	2.10E-01	2.10E-01
PU-239	5155.00	5118.68	0.000	0.000	-0.720	0.720	0.8485	99.900	-4.90E-02	1.48E-01	1.48E-01
PU-242	4890.00	4853.65	30.998	265.000	254.440	10.560	3.2496	100.000	1.73E+01	3.26E+00	2.19E+00
PU-244	4589.00	4553.58	4.920	1.000	0.520	0.480	0.6928	99.900	3.54E-02	1.97E-01	1.97E-01

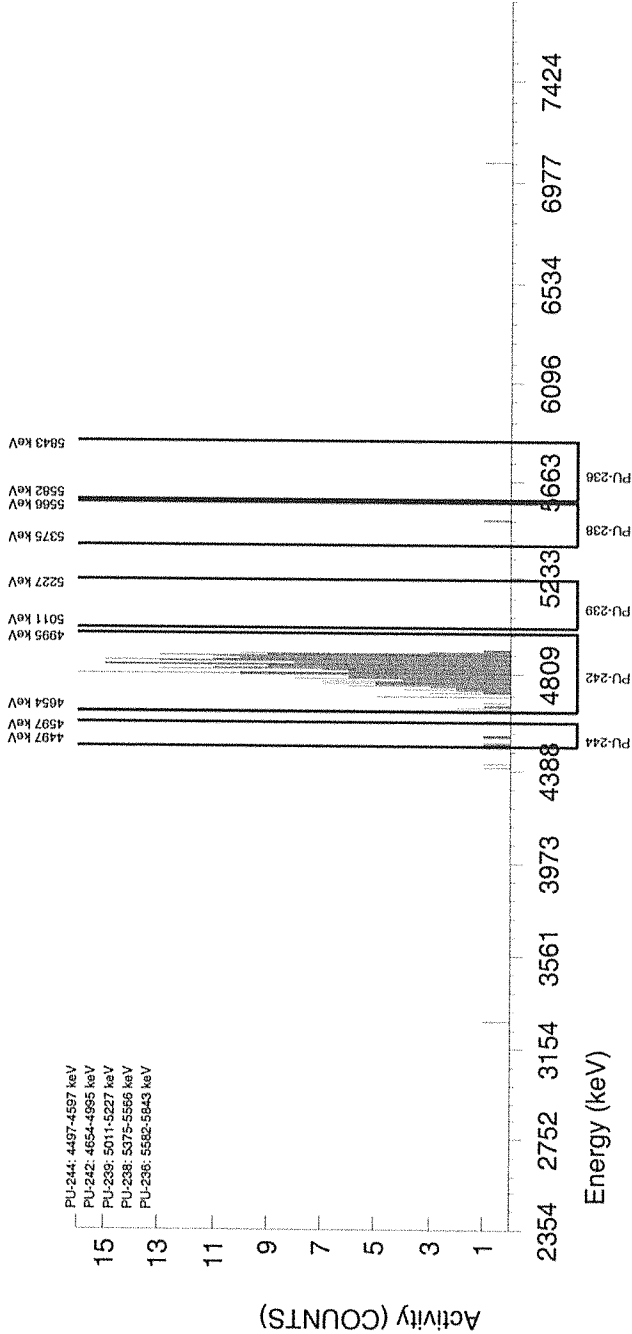


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2265050			CHAMBER : 089			LIB FILE : PU		
SAMPLE ID : R0579287002_PU			DETECTOR S/N : 79988			BKG FILE : B089.CNF:2048		
SAMPLE QTY : 0.115 F			AVERAGE %EFFICIENCY : 31.2662			BKG DATE : 29-May-2022		
SAMPLE DATE : 29-Mar-2022 00:00:00			AVERAGE %EFF ERROR : 0.6043			BKG LIVE TIME(SEC) : 59999.99		
ANALYST : MP2			COUNT DATE : 31-May-2022 09:23:02			EFF FILE : W089.CNF:536		
% YIELD : 91.3			ELAPSED LIVE TIME(SEC) : 14399.99			CAL DATE : 10-May-2022		
% YIELD : 91.3								
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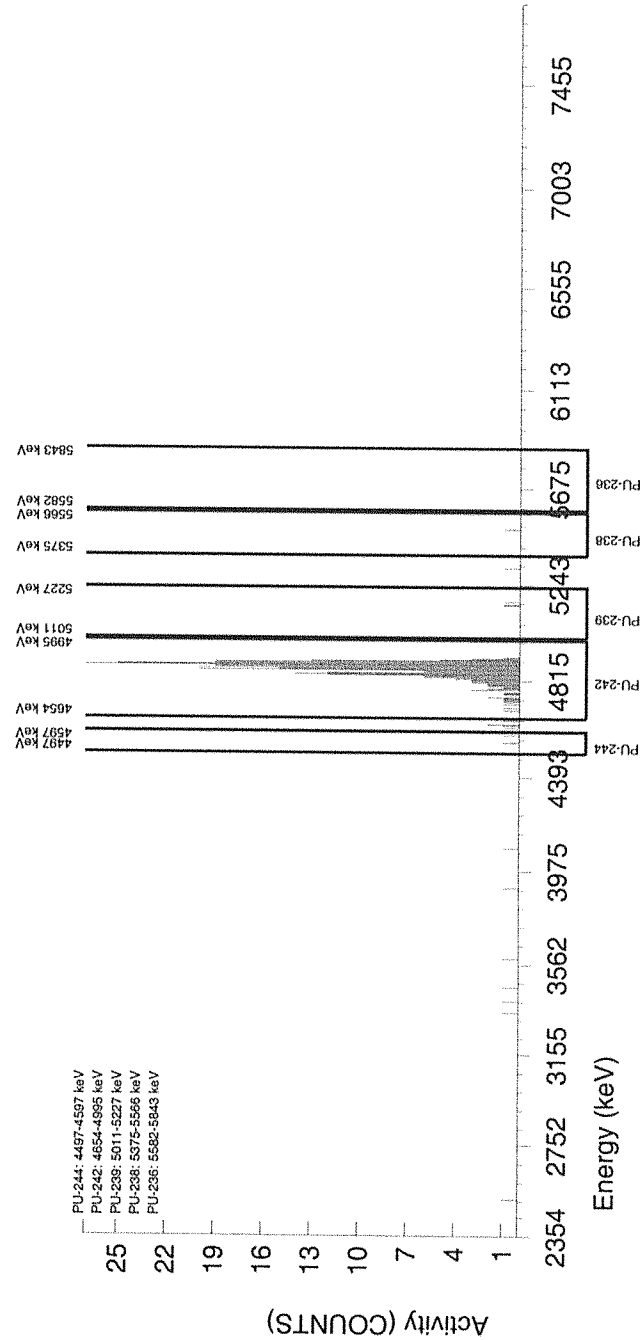
NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.25	0.000	0.000	-1.200	1.200	1.0954	100.000	-7.13E-02	1.35E-01	4.17E-01	1.19E-01	1.35E-01
PU-238	5486.00	5487.75	9.891	2.000	1.280	0.720	0.8485	99.900	7.31E-02	2.01E-01	3.49E-01	8.87E-02	2.01E-01
PU-239	5155.00	5118.68	0.000	0.000	-2.640	2.640	1.6248	99.900	-1.51E-01	1.46E-01	5.10E-01	1.70E-01	1.45E-01
PU-242	4890.00	4832.23	92.905	297.000	292.680	4.320	2.0785	100.000	1.67E+01	2.91E+00	6.05E-01	2.17E-01	1.93E+00
PU-244	4589.00	4524.52	44.509	6.000	5.280	0.720	0.8485	99.900	3.01E-01	3.03E-01	3.48E-01	8.86E-02	3.00E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORTInstrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-035BATCH NUMBER : 2265050
SAMPLE ID : R0579287003_PU
SAMPLE QTY : 0.114 F +/-1.330 %
SAMPLE DATE : 29-Mar-2022 00:00:00
ANALYST : MP2
% YIELD : 75.3 +/-6.389 %CHAMBER : 090
DETECTOR S/N : 158119
AVERAGE %EFFICIENCY : 35.6880
AVERAGE %EFF ERROR : 0.6877
COUNT DATE : 31-May-2022 09:23:02
ELAPSED LIVE TIME(SEC) : 14399.99LIB FILE : PU
BKG FILE : B090.CNF:2049
BKG DATE : 29-May-2022
BKG LIVE TIME(SEC) : 59999.99
EFF FILE : W090.CNF:528
CAL DATE : 10-May-2022TRACER
ID : 2010-A
NUCLIDE : PU-242
NOMINAL : 4.2739E+00 dpm
RESULTS : 3.2182E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.23	0.000	0.000	-0.960	0.960	0.9798	100.000	-6.13E-02	1.42E-01	4.21E-01	1.15E-01	1.42E-01
PU-238	5486.00	5490.93	4.941	1.000	1.000	0.000	1.0000	99.900	6.14E-02	1.73E-01	1.84E-01	1.12E-01	1.73E-01
PU-239	5155.00	5158.71	19.766	3.000	1.560	1.440	1.2000	99.900	9.56E-02	2.52E-01	4.53E-01	1.35E-01	2.52E-01
PU-242	4890.00	4863.73	55.180	279.000	275.640	3.360	1.8330	100.000	1.69E+01	3.02E+00	5.95E-01	2.06E-01	2.01E+00
PU-244	4589.00	4561.10	34.590	2.000	2.000	0.000	1.0000	99.900	1.23E-01	2.11E-01	1.84E-01	1.12E-01	2.10E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2265050
SAMPLE ID : R0579287004_PU
SAMPLE QTY : 0.115 F +/-1.324 %
SAMPLE DATE : 29-Mar-2022 00:00:00
ANALYST : MP2
% YIELD : 97.9 +/-5.905 %

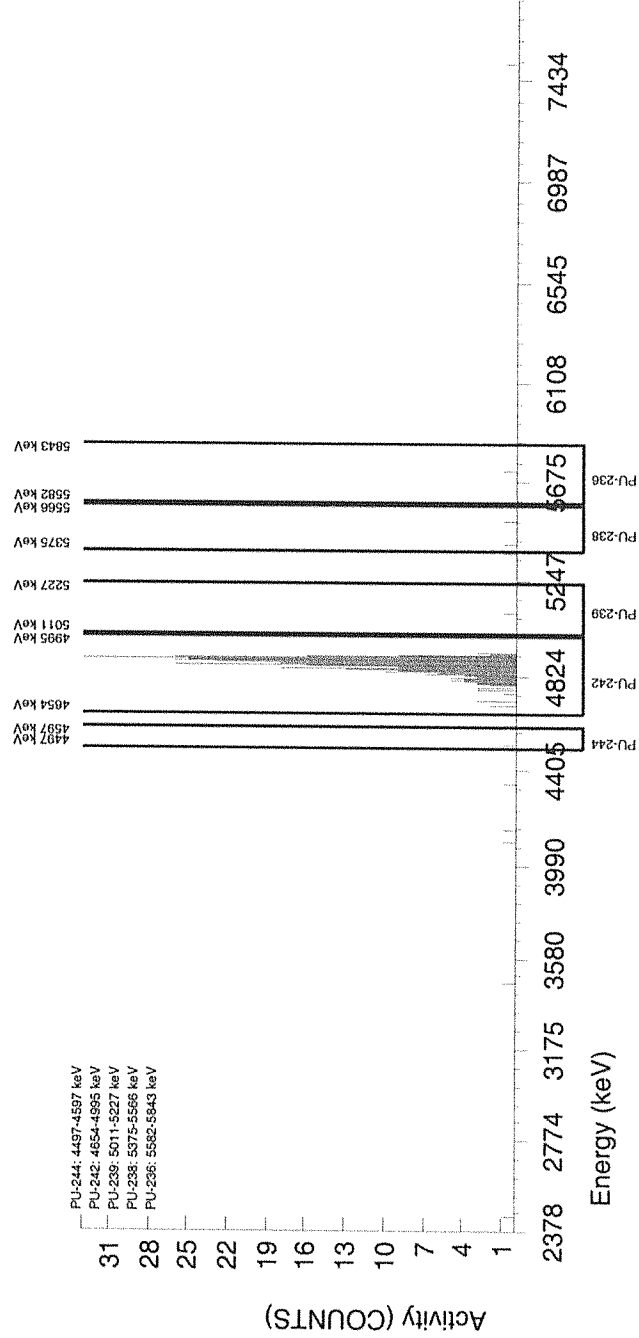
CHAMBER : 092
DETECTOR S/N : 158160
AVERAGE %EFFICIENCY : 33.1152
AVERAGE %EFF ERROR : 0.6392
COUNT DATE : 31-May-2022 09:23:02
ELAPSED LIVE TIME(SEC) : 14399.99

LIB FILE : PU
BKG FILE : B092.CNF;2057
BKG DATE : 29-May-2022
BKG LIVE TIME(SEC) : 59999.99
EFF FILE : W092.CNF;574
CAL DATE : 10-May-2022

TRACER
ID : 2010-A
NUCLIDE : PU-242
NOMINAL : 4.2739E+00 dpm
RESULTS : 4.1844E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5723.74	4.922	1.000	-1.400	2.400	1.5492	100.000	-7.34E-02	1.67E-01	4.55E-01	1.49E-01	1.67E-01
PU-238	5486.00	5452.60	98.442	2.000	1.040	0.960	0.9798	99.900	5.24E-02	1.79E-01	3.32E-01	9.04E-02	1.79E-01
PU-239	5155.00	5098.33	4.922	1.000	-0.200	1.200	1.0954	99.900	-1.01E-02	1.51E-01	3.53E-01	1.01E-01	1.51E-01
PU-242	4890.00	4866.80	50.452	340.000	332.560	7.440	2.7276	100.000	1.67E+01	2.77E+00	6.53E-01	2.51E-01	1.82E+00
PU-244	4589.00	4519.28	4.922	1.000	0.760	0.240	0.4899	99.900	3.82E-02	1.44E-01	2.41E-01	4.51E-02	1.43E-01



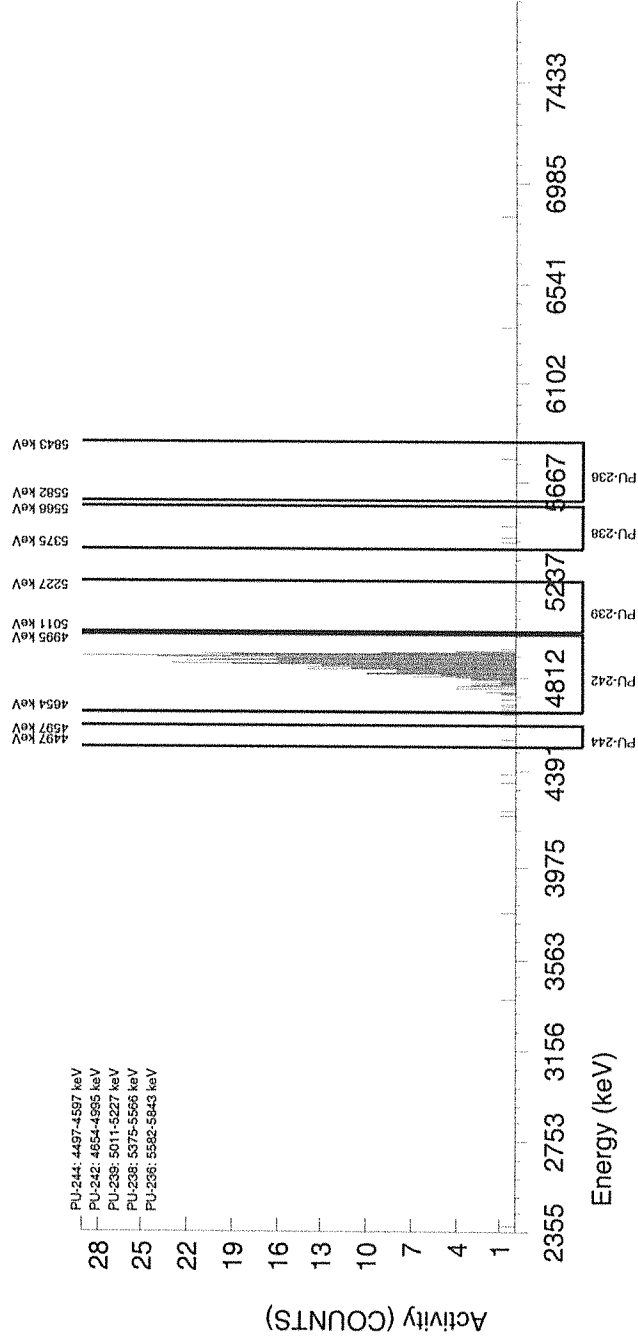
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2265050 SAMPLE ID : R0579287005_PU SAMPLE QTY : 0.112 F +/-1.340 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 101 +/-5.791 %		CHAMBER : 093 DETECTOR S/N : 155764 AVERAGE %EFFICIENCY : 33.7411 AVERAGE %EFF ERROR : 0.6510 COUNT DATE : 31-May-2022 09:23:02 ELAPSED LIVE TIME(SEC) : 14399.99		LIB FILE : PU BKG FILE : B093.CNF;2042 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W093.CNF;532 CAL DATE : 10-May-2022	
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TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 4.3083E+00 dpm	
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NUCLIDE ACTIVITY SUMMARY											
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5770.23	4.946	1.000	0.520	0.480	0.6928	100.000	2.67E-02	1.48E-01	1.48E-01
PU-238	5486.00	5433.91	69.243	3.000	2.280	0.720	0.8485	99.900	1.12E-01	1.99E-01	1.99E-01
PU-239	5155.00	5118.68	0.000	0.000	-3.120	3.120	1.7664	99.900	-1.54E-01	1.30E-01	1.30E-01
PU-242	4890.00	4864.99	50.902	358.000	348.880	9.120	3.0199	100.000	1.72E+01	2.79E+00	1.83E+00
PU-244	4589.00	4532.54	4.946	1.000	1.000	0.000	1.0000	99.900	4.92E-02	1.39E-01	1.38E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2265050
SAMPLE ID : R1205090030_PU
SAMPLE QTY : 0.115 F +/-1.323 %
SAMPLE DATE : 25-May-2022 00:00:00
ANALYST : MP2
% YIELD : 85.5 +/-6.265 %

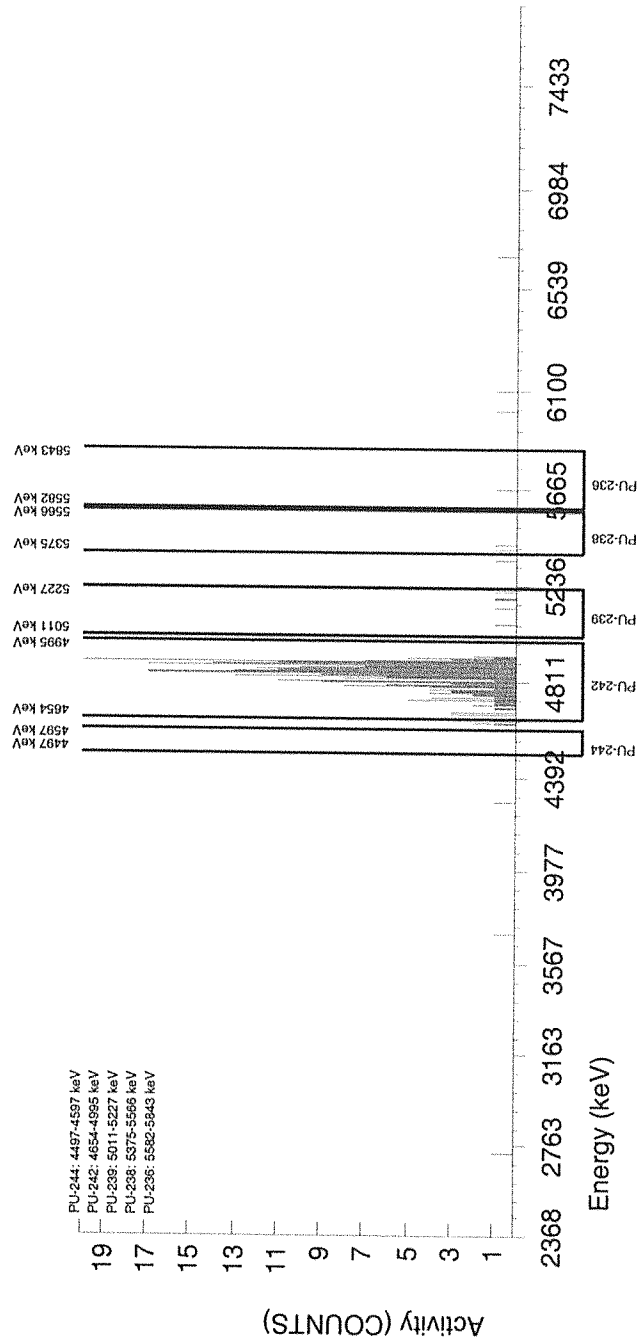
CHAMBER : 110
DETECTOR S/N : 83292
AVERAGE %EFFICIENCY : 32.6024
AVERAGE %EFF ERROR : 0.6296
COUNT DATE : 31-May-2022 09:23:03
ELAPSED LIVE TIME(SEC) : 14400.00

LIB FILE : PU
BKG FILE : B110.CNF;2047
BKG DATE : 29-May-2022
BKG LIVE TIME(SEC) : 60000.00
EFF FILE : W110.CNF;601
CAL DATE : 10-May-2022

TRACER
ID : 2010-A
NUCLIDE : PU-242
NOMINAL : 4.2739E+00 dpm
RESULTS : 3.6562E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG SDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5659.93	4.904	1.000	1.000	0.000	1.0000	100.000	5.85E-02	1.65E-01	1.76E-01	1.07E-01	1.65E-01
PU-238	5486.00	5407.04	24.519	2.000	1.520	0.480	0.6928	99.900	8.87E-02	2.04E-01	3.23E-01	7.40E-02	2.04E-01
PU-239	5155.00	5154.79	137.308	5.000	4.040	0.960	0.9798	99.900	2.36E-01	2.88E-01	3.84E-01	1.05E-01	2.87E-01
PU-242	4890.00	4841.87	84.686	288.000	286.080	1.920	1.3856	100.000	1.67E+01	2.92E+00	4.71E-01	1.48E-01	1.94E+00
PU-244	4589.00	4546.96	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00	1.18E-01	1.75E-01	1.07E-01	1.18E-01



TRACER	LCS
ID : 2010-A	ID
NUCLIDE : PU-242	NUCLIDE
NOMINAL : 4.2739E+00 dpm	NOMINAL (pCi/F)
RESULTS : 3.9226E+00 dpm	% RECOVERY

Isotope	Energy (keV)	Activity (COUNTS)
Pu-244	4497	4383
Pu-242	4654	4802
Pu-239	5011	5225
Pu-238	5375	5652
Pu-236	5582	5843
Pu-234	5843	5843

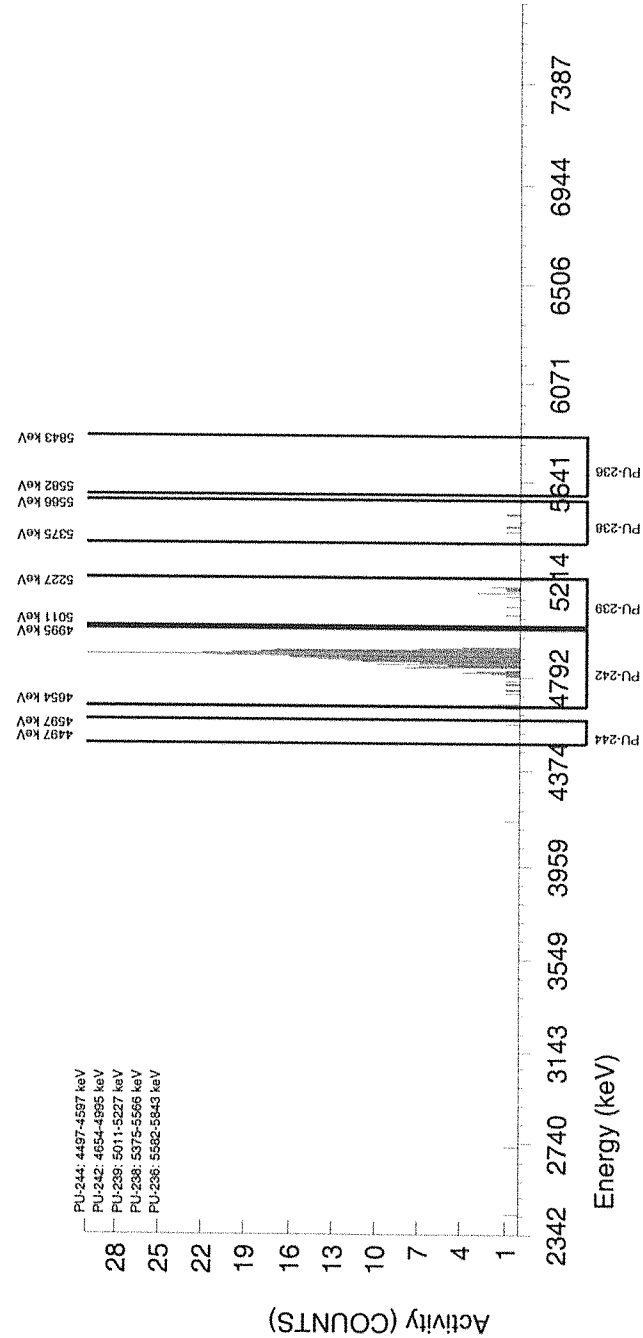
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2265050 SAMPLE ID : R1205090032_PU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 97.0 +/-6.520 %		CHAMBER : 216 DETECTOR S/N : 155840 AVERAGE %EFFICIENCY : 26.5265 AVERAGE %EFF ERROR : 0.5149 COUNT DATE : 31-May-2022 09:34:45 ELAPSED LIVE TIME(SEC) : 14400.00		LIB FILE : PU BKG FILE : B216.CNF:938 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W216.CNF:71 CAL DATE : 18-May-2022	
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TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 4.1449E+00 dpm	LCSD ID NUCLIDE NOMINAL (pCi/F) % RECOVERY
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NUCLIDE ACTIVITY SUMMARY										
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F
PU-236	5749.00	5712.27	0.000	0.000	-1.200	1.200	1.0954	100.000	-7.61E-02	1.45E-01
PU-238	5486.00	5462.23	79.242	5.000	3.560	1.440	1.2000	99.900	2.25E-01	3.15E-01
PU-239	5155.00	5149.76	28.478	11.000	10.280	0.720	0.8485	99.900	6.50E-01	4.42E-01
PU-242	4890.00	4869.22	38.135	267.000	263.880	3.120	1.7664	100.000	1.67E+01	3.04E+00
PU-244	4589.00	4582.26	4.953	1.000	1.000	0.000	1.0000	99.900	6.32E-02	1.78E-01
									MDA pCi/F	1.96-sigma cnt Unc pCi/F
									4.45E-01	1.44E-01
									4.68E-01	3.14E-01
									3.86E-01	4.33E-01
									5.98E-01	2.03E+00
									1.90E-01	1.78E-01



Continuing Calibration Data



Liquid Scintillation Counter Checks for 05-JUN-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LSCBROWN	Carbon-14	05:17	1.3		123710	-1.4		
	Carbon-14	05:18	1.3		124862	2.73		
	Tritium	05:21	1.1		156888	1.66		
	Tritium	05:22	1.1		156226	0.42		
	BKG	05:24	30		23	-0.76		
	BKG	05:54	30		25	0.59		
LSCGOLD	Carbon-14	04:04	1.3		124244	-0.52		
	Carbon-14	04:06	1.3		123764	-2.14		
	Tritium	04:08	1.1		158415	1.39		
	Tritium	04:09	1.1		158208	1.15		
	BKG	04:12	30		24	-1.96		
	BKG	04:43	30		26	-0.71		
LSCMOCHA	Carbon-14	02:46	1.3		123119	1.08		
	Carbon-14	02:48	1.35		122687	-0.38		
	Tritium	02:50	1.2		146284	1.25		
	Tritium	02:51	1.2		146072	0.95		
	BKG	02:53	30		20	-1.17		
	BKG	03:24	30		21	-0.32		
LSCNAVY	Carbon-14	05:15	1.3		124636	-2.06		
	Carbon-14	05:17	1.3		125289	-0.03		
	Tritium	05:19	1.06		173262	-0.8		
	Tritium	05:20	1.05		173017	-1.38		
	BKG	05:22	30		21	1.48		
	BKG	05:53	30		21	1.37		
LSCORANGE	Carbon-14	04:46	1.012433		123929	0.98		
	Tritium	04:49	1.012433		153039	-0.71		
	BKG	05:22	30.01243		9.17	1.37		
	Carbon-14	05:23	1.012433		123799	0.59		
	Tritium	05:24	1.012433		152862	-0.98		
	BKG	05:55	30.01243		9.27	1.57		

LSCPINK	Carbon-14	03:03	1.012433	123819	-0.21
	Tritium	03:06	1.012433	138837	0.86
	Carbon-14	03:10	1.012433	124228	0.85
	Tritium	03:12	1.012433	138379	0.13
	Carbon-14	08:15	1.012433	124251	0.91
	Tritium	08:18	1.012433	138758	0.74
	BKG	08:22	30.01243	9	1.17
	Carbon-14	08:53	1.012433	124012	0.29
	Tritium	08:55	1.012317	138708	0.66
	BKG	09:26	30.01243	8.3	0.47
LSCPURPLE	BKG	00:26	30	24	1.14
	Carbon-14	03:35	.45	122967	-1.7
	Carbon-14	03:36	.4	124593	1.26
	Tritium	03:37	.35	158575	0.55
	Tritium	03:37	.35	157561	-0.17
	BKG	03:39	30	23	-0.55
	BKG	04:09	30	23	-0.59

Reviewed by:



Lyndsey Pace

Date: 05-JUN-22

GEL Laboratories LLC



Liquid Scintillation Counter Checks for 06-JUN-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LSCBROWN	Carbon-14	02:53	1.3		124397	1.07		
	Carbon-14	02:54	1.3		123917	-0.66		
	Tritium	02:56	1.1		156892	1.67		
	Tritium	02:58	1.1		156427	0.8		
	BKG	03:00	30		24	0.08		
	BKG	03:30	30		24	0.13		
LSCGOLD	Carbon-14	05:38	1.3		124515	0.39		
	Carbon-14	05:39	1.3		124319	-0.27		
	Tritium	05:41	1.1		157487	0.33		
	Tritium	05:43	1.1		157491	0.33		
	BKG	05:45	30		26	-0.38		
	BKG	06:16	30		25	-1.05		
LSCMOCHA	Carbon-14	05:59	1.35		122984	0.63		
	Carbon-14	06:01	1.35		122781	-0.06		
	Tritium	06:03	1.2		145860	0.65		
	Tritium	06:04	1.2		146105	01		
	BKG	06:06	30		20	-1.3		
	BKG	06:37	30		21	-0.32		
LSCNAVY	Carbon-14	02:15	1.31		125396	0.3		
	Carbon-14	02:17	1.3		125053	-0.77		
	Tritium	02:19	1.05		173749	0.35		
	Tritium	02:20	1.06		173121	-1.14		
	BKG	02:22	30		20	0.31		
	BKG	02:52	30		20	-0.04		
LSCORANGE	Carbon-14	04:47	1.012433		123902	0.9		
	Tritium	04:50	1.012433		152651	-1.31		
	BKG	05:23	30.01243		9.68	2.39		
	Carbon-14	05:24	1.012433		123547	-0.16		
	Tritium	05:26	1.01235		153360	-0.22		
	BKG	05:56	30.01243		7.84	-1.3		

LSCPINK	Carbon-14	01:54	1.012433	123515	-01
	Tritium	01:58	1.01235	138034	-0.43
	BKG	02:31	30.01243	7.42	-0.4
	Carbon-14	02:32	1.012433	123535	-0.95
	Tritium	02:33	1.012433	139066	1.23
	BKG	03:04	30.01243	8.47	0.64
LSCPURPLE	Carbon-14	05:11	.4	123848	-0.09
	Carbon-14	05:12	.4	124103	0.37
	Tritium	05:13	.35	158540	0.53
	Tritium	05:14	.35	156707	-0.78
	BKG	05:15	30	23	-0.74
	BKG	05:46	30	24	0.37

Reviewed by:

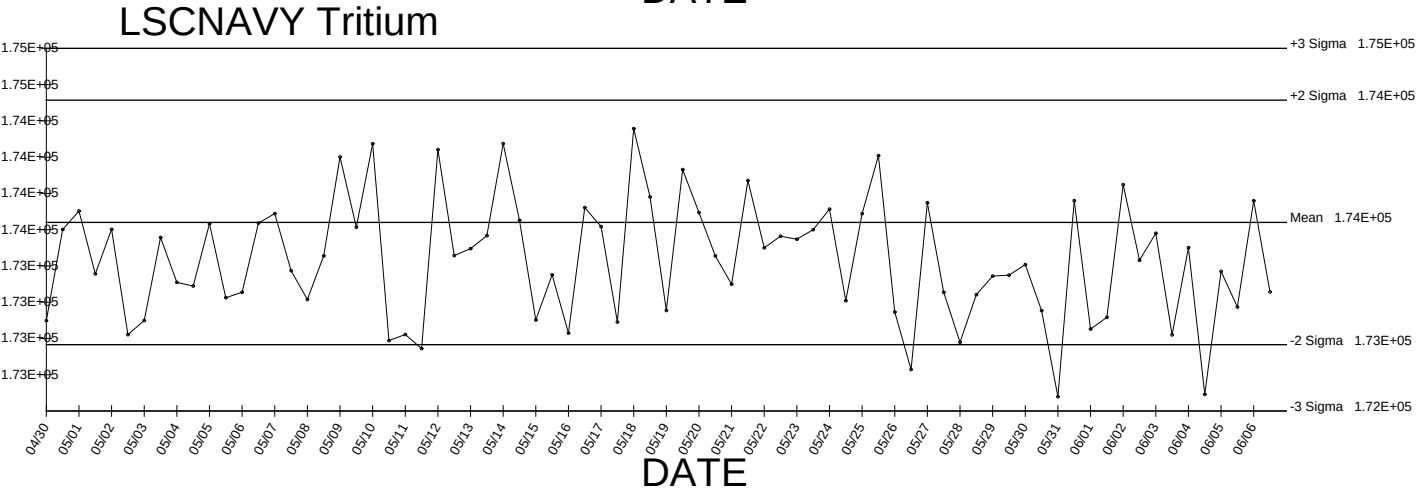
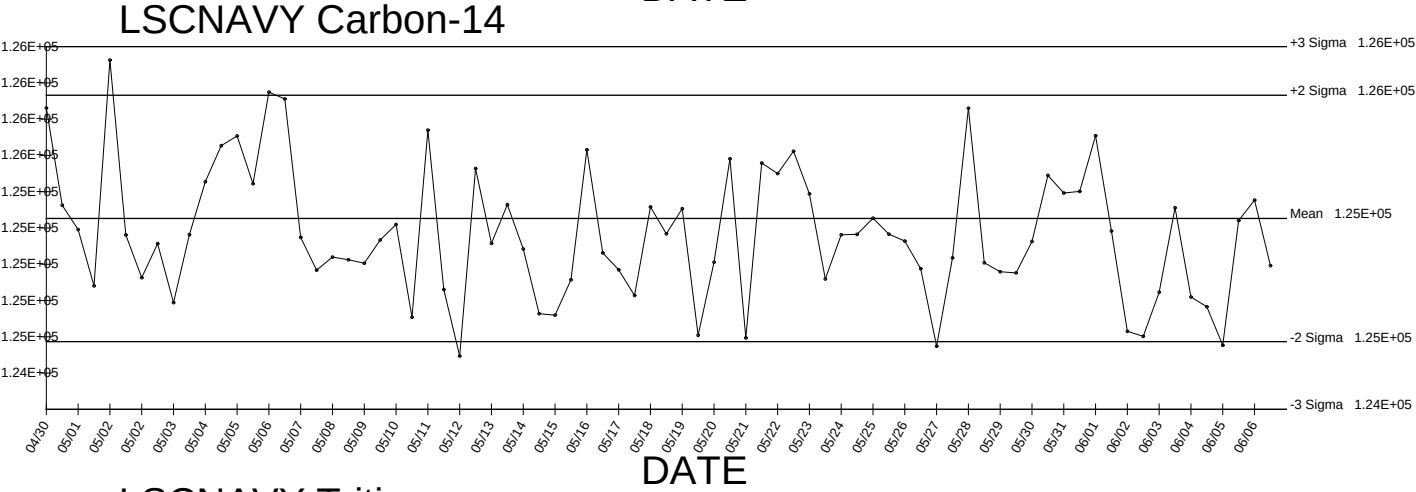
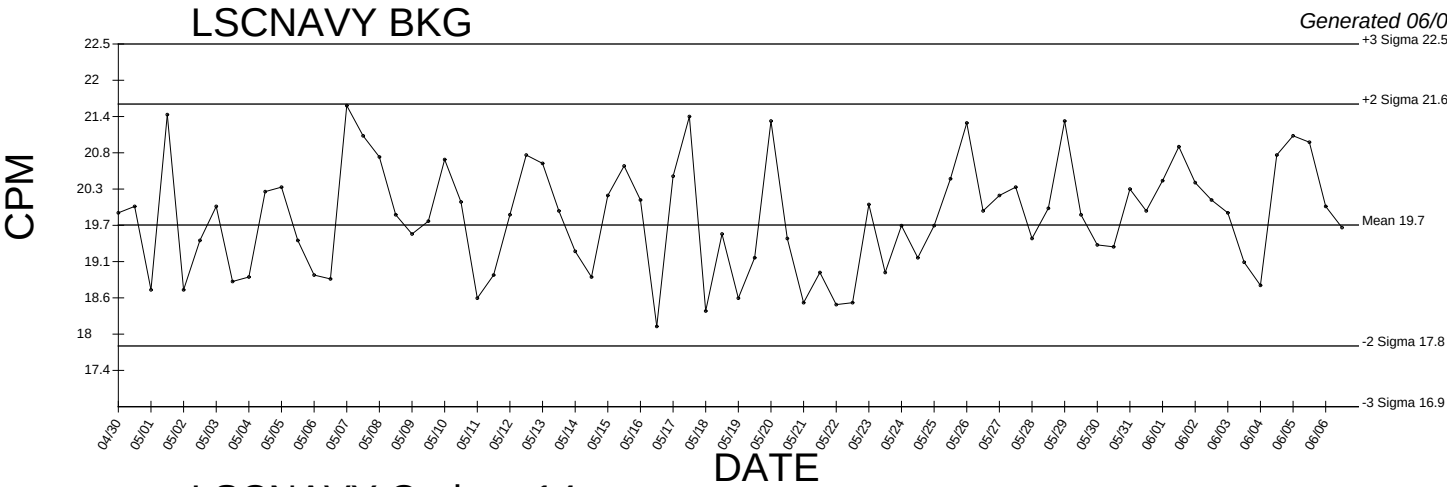


Lyndsey Pace

Date: 06-JUN-22

GEL Laboratories LLC

Background and Efficiency Data



● Denotes Outlier

RAD Standards Traceability



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

1714

98366

Pu-241 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL 1408580, Item 6 **Product Code:** 8341

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u_A	u_B	U	
Pu-241	5.232E+03	4.016E+04	0.2	1.7	3.5	09/09/2014

*Uncertainty: U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: α -impurities < 0.08%, γ -impurities (other than decay products) < 0.1%.
5.46647 g 3M HNO₃ solution. Carrier free.

Source Prepared by:

R. Ormsby, Radiochemist

QC Approved:

J. S. Lafr, Spectroscopist

Date: 9/5/14



Standard Logbook

Serial ID: 1714 **Open/Reference Date:** 09 SEP 2014 **Aliquot :** 5.46647 g
Name: Plutonium-241 **Received:** 10 SEP 2014 **Density :** Hand Calculated
Type: Source Material **Expires:** 11 SEP 2075 **Logbook Num :** GL-CED-297-007
Employee: Gregory Ramsay **Lot Number :** 98366
Supplier: Eckert & Ziegler **Solvent :** 3M HNO3
Uncertainty : 1.75 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-241	40160 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1714
Prepared By:	Gregory Ramsay
Carrier Conc:	3M HNO ₃
Reference Date:	09/09/2014
Ampoule Mass (g):	5.46647 g
Uncertainty:	+/- 1.75 %
LogBook No:	GL-CED-297-007
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Plutonium-241		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2019		
Verification Date:	01/25/2021		
Expiration Date:	01/25/2022		
Primary Code:	1714-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.4425 g		
Density(g/mL):	1.0331	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23990.3411 \text{ dpm/mL}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0331 \text{ g/mL}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23220.6511 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
07/22/2019	Tim Chandler	50.7721	500	1714-B	2357.9224 dpm/mL	01/19/2022	01/19/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-241 Standard 1714-B

1/19/2022	Isotope	Detector CPM	BKG CPM	NET CPM	Detector Eff	Mass. Used (mL)	Source DPM/mL
Matelon DeFreese	1714-B	418.9300	10.5300	408.4000	0.2541	1.0000	1607.241244
	1714-B	423.9300	10.5300	413.4000	0.2551	1.0000	1620.540964
	1714-B	413.8700	10.5300	403.3400	0.253	1.0000	1594.229249
Mean Value (Counting) =	1607.337152	dpm/mL	97.4108307	Pass		Average =	1607.337152
Stdev =	13.15611985	dpm/mL	0.00818504	Rule B (Pass/Fail)			
Certificate Value =	1650.06	dpm/mL					
Two sigma =	26.31223971						
10 % of Mean =	160.7337152						
Rule A (Pass/Fail)	Pass						

Verification Rules

- Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule B = The determined mean value shall be within 5% of the certificate value.

The analyst prepared three standard verification sources for Pu-241 source 1714-B by transferring 1 mL portions of the standard into plastic liquid scintillation vials. Thirteen mL of Ecoscint Ultra liquid scintillation cocktail and 2 mL of DI water were added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion. The standard verification vials and Background source were dark adapted for two hours and counted on LSC Brown for Pu-241 source standard verification. The Pu-241 efficiency calibration which was used for verification calculations was created during instrument calibrations. Each verification source calculation was performed as follows:

Source dpm/g = (A - B)/(C)(D)

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency, (cpm/dpm), and
- D = mass used for standard verification.

Reference RAD SOP M-001

8/24/22



National Institute of Standards & Technology

Certificate

Standard Reference Material® 4334j

Plutonium-242 Radioactivity Standard

2010

Revised
8-12-21

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterweger, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Steven J. Choquette, Director
Office of Reference Materials

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

GL CED-297-302a

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq•g^{-1(a)}
Relative expanded uncertainty ($k = 2$)	0.51 %^(b)

^(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

^(b) The uncertainties on certified values are expanded uncertainties, $U = k u_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

GL-CED-297-3026

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ^{-1(a,b,c,d)}
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ^{-1(a,d)}
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π α liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

^(a) The stated uncertainty is two times the standard uncertainty [5].

^(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

^(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,

0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and

0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

^(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclidic impurities follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ^{-6 (3)}	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ^{-5 (3)}	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

^(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,

5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and

3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

^(f) The stated uncertainty is the standard uncertainty. See reference 6.

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ^{242}Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	^{242}Pu decay corrections for half-life uncertainty of 0.22 %.	B	$< 10^{-10}$
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty ($k = 2$)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

GC-CED-297-302d

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

GL-CED-297-302e

Standard Logbook

Serial ID: 2010 **Open/Reference Date:** 09 AUG 2017 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 12 AUG 2021 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 12 AUG 2035 **Logbook Num :** GL-CED-297-302
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
Uncertainty : .255 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2010
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO ₃
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-302
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	04/14/2022		
Verification Date:	04/14/2022		
Expiration Date:	04/14/2023		
Primary Code:	2010-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.4626 g		
Density(g/mL):	1.0315	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.4626 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 42.7394 \text{ dpm/mL}$
$(5.4626 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0315 \text{ g/mL}) / (200 \text{ mL}) = 41.4342 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
-----------	----------	--------------	---------------	------	-------------	-------------------	-----------------

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2010-A

v1.2

Analyst	MXS2
Verification Prep Date	4/14/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.2
Expiration Date	8/17/2022

Standard Information	
Isotope	Pu-242
Serial Number	2010-A
Isotope Half-life	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	42.7394
Amount of Std. (mL)	0.2
Standard Prep Date	4/14/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	4/14/2022	3.920	43.51
2	4/14/2022	3.880	43.07
3	4/14/2022	3.960	43.96

Mean Value = 3.920 43.512
Stdev = 0.04 0.444

Certificate Value* = 3.8504 pCi
Two sigma = 0.0800
10 % of Mean = 0.3920
Rule A (Pass/Fail) Pass
% Recovery 101.81%
Rule B (Pass/Fail) Pass
Expiration Date 4/14/2023

dpm/mL
42.7390
0.8880
4.3512
Pass
101.81%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2010-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL of 2M HCl diluted to 40 mL with DI water. Added 0.1 mL of neodymium carrier, 3 to 4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

Signature

Runlogs

Instrument Run Log

Instrument Type: LSC

Batch ID: 2265050

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
579287001	SAMPLE	MP2	LSCNAVY	JUN-05-22 22:11:49	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
579287002	SAMPLE	MP2	LSCNAVY	JUN-05-22 23:12:50	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
579287003	SAMPLE	MP2	LSCNAVY	JUN-06-22 00:13:50	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
579287004	SAMPLE	MP2	LSCNAVY	JUN-06-22 01:14:51	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
579287005	SAMPLE	MP2	LSCNAVY	JUN-06-22 03:24:19	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
579289001	SAMPLE	MP2	LSCNAVY	JUN-06-22 04:25:20	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
579289002	SAMPLE	MP2	LSCNAVY	JUN-06-22 05:26:21	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
579289003	SAMPLE	MP2	LSCNAVY	JUN-06-22 06:27:22	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205090030	MB	MP2	LSCNAVY	JUN-06-22 07:28:22	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205090031	LCS	MP2	LSCNAVY	JUN-06-22 08:29:20	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205090032	LCSD	MP2	LSCNAVY	JUN-06-22 08:44:58	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00



June 07, 2022

Ms. Candace Christensen
Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607

Re: Project # 080153.007 Air Monitoring at SSFL
Work Order: 579289

Dear Ms. Christensen:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on May 09, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4422.

Sincerely,

Jake Crook
Project Manager

Purchase Order: 8-00000942
Chain of Custody: 05032022-1
Enclosures

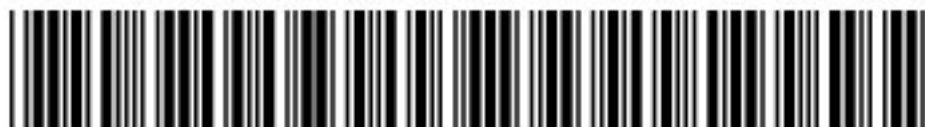


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Case Narrative

**Receipt Narrative
for
North Wind Solutions
SDG: 579289**

June 07, 2022

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on May 09, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
579289001	A-3-RMHF-2022-Qtr1
579289002	A-2-Area 20-2022-Qtr1
579289003	Blank-2022-Qtr1

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Jake Crook
Project Manager

Chain of Custody and Supporting Documentation



Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

JHC

Client: <u>NORW</u>		SDG/AR/COC/Work Order: <u>579289</u> <u>1579287</u>	
Received By: <u>DC</u>		Date Received: <u>5-1-77</u>	
Carrier and Tracking Number: <u>7767 5583 8792</u>		Circle Applicable: ☒ FedEx Express ☐ FedEx Ground ☐ UPS ☐ Field Services ☐ Courier ☐ Other	
Suspected Hazard Information		Yes	No
*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.			
A) Shipped as a DOT Hazardous?		☒	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		☒	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		☒	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		☒	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		☒	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____
Sample Receipt Criteria		Yes	NA
1 Shipping containers received intact and sealed?		☒	Circle Applicable: Seals broken Damaged container Leaking container Other (describe) _____
2 Chain of custody documents included with shipment?		☒	Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		☒	Preservation Method: Wet Ice Ice Packs Dry Ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius
4 Daily check performed and passed on IR temperature gun?		☒	Temperature Device Serial #: <u>IR2-22</u> Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?		☒	Circle Applicable: Seals broken Damaged container Leaking container Other (describe) _____
6 Samples requiring chemical preservation at proper pH?		☒	Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7 Do any samples require Volatile Analysis?		☒	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8 Samples received within holding time?		☒	ID's and tests affected: _____
9 Sample ID's on COC match ID's on bottles?		☒	ID's and containers affected: _____
10 Date & time on COC match date & time on bottles?		☒	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe) _____
11 Number of containers received match number indicated on COC?		☒	Circle Applicable: No container count on COC Other (describe) _____
12 Are sample containers identifiable as GEL provided by use of GEL labels?		☒	
13 COC form is properly signed in relinquished/received sections?		☒	Circle Applicable: Not relinquished Other (describe) _____
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials

AM

Date

5/1/77

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of

1

Laboratory Certifications

List of current GEL Certifications as of 07 June 2022

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122022-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
North Wind Solutions
SDG #: 579289**

Product: Alphaspec Pu, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2265049

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579289001	A-3-RMHF-2022-Qtr1
579289002	A-2-Area 20-2022-Qtr1
579289003	Blank-2022-Qtr1
1205090027	Method Blank (MB)
1205090028	Laboratory Control Sample (LCS)
1205090029	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec U, Filter

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2265052

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579289001	A-3-RMHF-2022-Qtr1
579289002	A-2-Area 20-2022-Qtr1
579289003	Blank-2022-Qtr1

1205090053	Method Blank (MB)
1205090054	Laboratory Control Sample (LCS)
1205090055	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec Th, Filter

Analytical Method: DOE EML HASL-300, Th-01-RC Modified

Analytical Procedure: GL-RAD-A-038 REV# 18

Analytical Batch: 2265053

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579289001	A-3-RMHF-2022-Qtr1
579289002	A-2-Area 20-2022-Qtr1
579289003	Blank-2022-Qtr1
1205090056	Method Blank (MB)
1205090057	Laboratory Control Sample (LCS)
1205090058	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Sample 579289001 (A-3-RMHF-2022-Qtr1) was recounted due to high MDC. The recount is reported.

Product: Alphaspec Po210, Filter

Analytical Method: DOE EML HASL-300, Po-01-RC Modified

Analytical Procedure: GL-RAD-A-016 REV# 19

Analytical Batch: 2265054

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579289001	A-3-RMHF-2022-Qtr1
579289002	A-2-Area 20-2022-Qtr1
579289003	Blank-2022-Qtr1
1205090059	Method Blank (MB)
1205090060	Laboratory Control Sample (LCS)
1205090061	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

Sample (See Below) did not meet the detection limit due to limited sample volume. Sample was counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
579289003 (Blank-2022-Qtr1)	Polonium-210	Result 0.392 < MDA 0.545 > RDL 0.5 pCi/Sample

Technical Information

Recounts

Samples 1205090059 (MB) and 579289003 (Blank-2022-Qtr1) were recounted due to high MDCs. The recounts are reported.

Product: Alphaspec Am241, Filter

Analytical Method: DOE EML HASL-300, Am-05-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2272481

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579289001	A-3-RMHF-2022-Qtr1
579289002	A-2-Area 20-2022-Qtr1
579289003	Blank-2022-Qtr1
1205104985	Method Blank (MB)
1205104986	Laboratory Control Sample (LCS)
1205104987	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Sample Re-prep/Re-analysis

Samples were reprepared due to low carrier/tracer yield. The re-analysis is being reported.

Recounts

Sample 579289001 (A-3-RMHF-2022-Qtr1) was recounted due to high MDC. The recount is reported.

Miscellaneous Information

Manual Integration

Manual integration of alpha spectroscopy spectra 1205104987 (LCSD) was performed to fully separate counts in Regions of Interest which would have been biased.

Product: Gammaspec, Gamma, Filter

Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R

Analytical Procedure: GL-RAD-A-013 REV# 27

Analytical Batch: 2264689

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579289001	A-3-RMHF-2022-Qtr1
579289002	A-2-Area 20-2022-Qtr1
579289003	Blank-2022-Qtr1
1205089187	Method Blank (MB)
1205089188	579287001(DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303) Sample Duplicate (DUP)
1205089189	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Qualifier Information

Qualifier	Reason	Analyte	Sample	Client Sample
UI	Results are considered a false positive due to high counting uncertainty.	Beryllium-7	1205089188	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303
UI	Results are considered a false positive due to high peak-width.	Potassium-40	579289003	Blank-2022-Qtr1
UI	Results are considered a false positive due to no valid peak.	Potassium-40	1205089188	DOE-1_Qtr 16_S (1/4/22 0833-3/29/22 1303

Product: GFPC, Sr90, Filter

Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified

Analytical Procedure: GL-RAD-A-004 REV# 22

Analytical Batch: 2269288

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579289001	A-3-RMHF-2022-Qtr1
579289002	A-2-Area 20-2022-Qtr1
579289003	Blank-2022-Qtr1
1205098589	Method Blank (MB)
1205098590	Laboratory Control Sample (LCS)
1205098591	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Sample 1205098590 (LCS) was recounted due to high recovery. The recount is reported.

Product: Liquid Scint Pu241, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-035 REV# 23

Analytical Batch: 2265050

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2264620

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
579289001	A-3-RMHF-2022-Qtr1
579289002	A-2-Area 20-2022-Qtr1
579289003	Blank-2022-Qtr1
1205090030	Method Blank (MB)
1205090031	Laboratory Control Sample (LCS)
1205090032	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205090030 (MB)	Plutonium-241	Result 15.4 < MDA 35.7 > RDL 5 pCi/Sample

Sample did not meet the detection limits due to limited sample volume.

Sample	Analyte	Value
579289001 (A-3-RMHF-2022-Qtr1)	Plutonium-241	Result 9.7 < MDA 36.1 > RDL 5 pCi/Sample
579289002 (A-2-Area 20-2022-Qtr1)	Plutonium-241	Result 9.27 < MDA 33.8 > RDL 5 pCi/Sample
579289003 (Blank-2022-Qtr1)	Plutonium-241	Result 22 < MDA 33.3 > RDL 5 pCi/Sample

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Prep Logbook

The Preparation of Special Matrices for the Determination of Radionuclides

Batch ID: 2264620

Analyst: Christine Carter (CXC1)

Method: Filter Prep

Lab SOP: GL-RAD-A-026 REV# 18

Instrument: NONE

SP-39020004

Due Dates for Lab: 04-JUN-2022

Package: 06-JUN-2022

SDG: 07-JUN-2022

Type Sample Id Description

Serial Number

Spike Amount

Spike Units

#	Sample ID	Prep Date	Min RDL ()	Number of Filters	Container Wt (g)	Weight of total filter with container (g)	Weight of filter Diluted with container (g)	Not Saved Final Volume of filter diluted to in Liters (mL)	Total Filter Weight (g)	Weight of Filter Diluted (g)
1	579287001	11-MAY-2022		1	100.589	104.051	103.155	200	3.462	2.566
2	579287002	11-MAY-2022		1	101.818	105.295	104.495	200	3.477	2.677
3	579287003	11-MAY-2022		1	104.244	107.722	106.888	200	3.478	2.644
4	579287004	11-MAY-2022		1	101.031	104.512	103.704	200	3.481	2.673
5	579287005	11-MAY-2022		1	102.654	106.097	105.229	200	3.443	2.575
6	579289001	11-MAY-2022		1	102.053	104.29	103.706	200	2.237	1.653
7	579289002	11-MAY-2022		1	103.177	105.462	104.906	200	2.285	1.729
8	579289003	11-MAY-2022		1	105.162	107.403	106.828	200	2.241	1.666
9	1205089021 MFB	11-MAY-2022		1	0	1	1	200	1	1

Reagent/Solvent Lot ID	Description	Amount	Comments:
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GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

NORW002 North Wind Solutions

Client SDG: 579289 GEL Work Order: 579289

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- UI Gamma Spectroscopy--Uncertain identification

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Theresa Austin

Date: 07 JUN 2022

Title: Group Leader

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-3-RMHF-2022-Qtr1
Sample ID: 579289001
Matrix: Filter
Collect Date: 29-MAR-22 12:48
Receive Date: 09-MAY-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.000	+/-0.321	0.627	1.00	pCi/Sample			MP2	06/06/22	1320	2272481	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		15.1	+/-2.26	0.861	0.500	pCi/Sample			MP2	06/01/22	0842	2265054	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.0606	+/-0.207	0.384	1.00	pCi/Sample			MP2	05/31/22	0923	2265049	3
Plutonium-239/240	U	0.0186	+/-0.212	0.451	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.359	+/-0.303	0.446	1.00	pCi/Sample			MP2	06/02/22	1427	2265053	4
Thorium-230		0.850	+/-0.388	0.469	1.00	pCi/Sample							
Thorium-232		0.404	+/-0.263	0.325	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.0785	+/-0.300	0.582	1.00	pCi/Sample			MP2	05/30/22	1217	2265052	5
Uranium-235/236	U	-0.0176	+/-0.151	0.351	1.00	pCi/Sample							
Uranium-238	U	0.315	+/-0.337	0.459	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	9.70	+/-21.3	36.1	5.00	pCi/Sample			MP2	06/06/22	0425	2265050	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	8.28	+/-16.6	34.7		pCi/Sample			RXF2	05/17/22	0759	2264689	7
Beryllium-7		200	+/-131	93.6		pCi/Sample							
Cesium-137	U	-2.61	+/-4.60	8.29	20.0	pCi/Sample							
Cobalt-60	U	-1.11	+/-4.00	7.71		pCi/Sample							
Potassium-40	U	12.6	+/-62.4	123		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	0.182	+/-0.982	1.70	3.00	pCi/Sample			KP1	05/26/22	1910	2269288	8

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	05/11/22	1427	2264620

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-3-RMHF-2022-Qtr1
Sample ID: 579289001
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			37	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			77	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			89.7	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			56	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			89.7	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			89.7	(15%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			96.7	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-2-Area 20-2022-Qtr1
Sample ID: 579289002
Matrix: Filter
Collect Date: 29-MAR-22 12:55
Receive Date: 09-MAY-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	-0.0655	+/-0.550	1.22	1.00	pCi/Sample			MP2	06/05/22	1438	2272481	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		16.4	+/-2.30	0.766	0.500	pCi/Sample			MP2	06/01/22	0842	2265054	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.0642	+/-0.177	0.306	1.00	pCi/Sample			MP2	05/31/22	0923	2265049	3
Plutonium-239/240	U	0.0260	+/-0.145	0.277	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.0128	+/-0.504	1.09	1.00	pCi/Sample			MP2	05/31/22	1036	2265053	4
Thorium-230	U	0.368	+/-0.641	1.09	1.00	pCi/Sample							
Thorium-232		0.877	+/-0.653	0.428	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.0636	+/-0.274	0.538	1.00	pCi/Sample			MP2	05/30/22	1217	2265052	5
Uranium-235/236	U	-0.0353	+/-0.156	0.407	1.00	pCi/Sample							
Uranium-238		0.464	+/-0.375	0.417	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	9.27	+/-19.9	33.8	5.00	pCi/Sample			MP2	06/06/22	0526	2265050	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	10.5	+/-15.4	32.9		pCi/Sample			RXF2	05/17/22	0800	2264689	7
Beryllium-7		293	+/-97.4	76.4		pCi/Sample							
Cesium-137	U	0.445	+/-3.07	6.22	20.0	pCi/Sample							
Cobalt-60	U	-0.830	+/-3.04	5.71		pCi/Sample							
Potassium-40	U	26.3	+/-73.7	77.0		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	1.46	+/-1.28	2.13	3.00	pCi/Sample			KP1	05/26/22	1910	2269288	8

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	05/11/22	1427	2264620

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-2-Area 20-2022-Qtr1
Sample ID: 579289002

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			32.4	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			79.7	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			94.4	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			55.8	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			88.4	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			94.4	(15%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			92	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: Blank-2022-Qtr1
Sample ID: 579289003
Matrix: Filter
Collect Date: 29-MAR-22 09:00
Receive Date: 09-MAY-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0124	+/-0.522	1.07	1.00	pCi/Sample			MP2	06/05/22	1438	2272481	1
Alphaspec Po210, Filter "As Received"													
Polonium-210	U	0.392	+/-0.363	0.545	0.500	pCi/Sample			MP2	06/02/22	1432	2265054	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.0644	+/-0.177	0.307	1.00	pCi/Sample			MP2	05/31/22	0923	2265049	3
Plutonium-239/240	U	0.0161	+/-0.183	0.389	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.345	+/-0.673	1.16	1.00	pCi/Sample			MP2	05/31/22	1036	2265053	4
Thorium-230	U	-0.0674	+/-0.598	1.34	1.00	pCi/Sample							
Thorium-232	U	0.587	+/-0.606	0.622	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.477	+/-0.389	0.483	1.00	pCi/Sample			MP2	05/30/22	1219	2265052	5
Uranium-235/236	U	0.0195	+/-0.204	0.425	1.00	pCi/Sample							
Uranium-238	U	0.230	+/-0.302	0.455	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	22.0	+/-19.9	33.3	5.00	pCi/Sample			MP2	06/06/22	0627	2265050	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-9.24	+/-22.6	35.4		pCi/Sample			RXF2	05/17/22	0921	2264689	7
Beryllium-7	U	-42.1	+/-66.9	110		pCi/Sample							
Cesium-137	U	-3.95	+/-4.12	6.82	20.0	pCi/Sample							
Cobalt-60	U	1.49	+/-3.57	8.39		pCi/Sample							
Potassium-40	UI	128	+/-86.7	74.6		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	1.64	+/-1.10	1.81	3.00	pCi/Sample			KP1	05/26/22	1910	2269288	8

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	05/11/22	1427	2264620

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 7, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: Blank-2022-Qtr1
Sample ID: 579289003

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			49.6	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			63.6	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			94.4	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			50.6	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			83	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			94.4	(15%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			99.1	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: June 7, 2022

Page 1 of 6

Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina
Ms. Candace Christensen

Contact:
Workorder: 579289

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2265049										
QC1205090028	LCS			0.296 pCi/Sample					MP2	05/31/22	09:23
Plutonium-238				+/-0.254							
				Uncertainty							
Plutonium-239/240	17.8			16.2 pCi/Sample			90.9	(75%-125%)			
				+/-1.69							
				Uncertainty							
QC1205090029	LCSD			0.238 pCi/Sample		45.7				05/31/22	09:23
Plutonium-238			U	+/-0.314							
				Uncertainty							
Plutonium-239/240	17.8			18.2 pCi/Sample		11.4	102	(0%-20%)			
				+/-2.03							
				Uncertainty							
QC1205090027	MB			0.0887 pCi/Sample						05/31/22	09:23
Plutonium-238			U	+/-0.204							
				Uncertainty							
Plutonium-239/240			U	0.236 pCi/Sample							
				+/-0.287							
				Uncertainty							
Batch	2265050										
QC1205090031	LCS			614 pCi/Sample			97	(75%-125%)	MP2	06/06/22	08:29
Plutonium-241	633			+/-57.6							
				Uncertainty							
QC1205090032	LCSD			664 pCi/Sample		7.81	105	(0%-20%)		06/06/22	08:44
Plutonium-241	633			+/-57.4							
				Uncertainty							
QC1205090030	MB			15.4 pCi/Sample						06/06/22	07:28
Plutonium-241			U	+/-21.1							
				Uncertainty							
Batch	2265052										
QC1205090054	LCS			22.6 pCi/Sample					MP2	05/30/22	12:17
Uranium-233/234				+/-2.24							
				Uncertainty							
Uranium-235/236				1.49 pCi/Sample							
				+/-0.653							
				Uncertainty							

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QC Summary

Workorder: 579289

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2265052										
Uranium-238	24.0			26.0 pCi/Sample			108	(75%-125%)	MP2	05/30/22	12:17
	Uncertainty			+/-2.40							
QC1205090055	LCSD										
Uranium-233/234				19.9 pCi/Sample		12.7				05/30/22	12:17
	Uncertainty			+/-2.03							
Uranium-235/236				1.39 pCi/Sample		7.26					
	Uncertainty			+/-0.608							
Uranium-238	24.0			23.2 pCi/Sample		11.6	96.4	(0%-20%)			
	Uncertainty			+/-2.19							
QC1205090053	MB										
Uranium-233/234			U	-0.0691 pCi/Sample						05/30/22	12:19
	Uncertainty			+/-0.235							
Uranium-235/236			U	0.0407 pCi/Sample							
	Uncertainty			+/-0.226							
Uranium-238			U	0.0836 pCi/Sample							
	Uncertainty			+/-0.262							
Batch	2265053										
QC1205090057	LCS										
Thorium-228				19.2 pCi/Sample					MP2	05/31/22	10:36
	Uncertainty			+/-1.84							
Thorium-230				2.76 pCi/Sample				(75%-125%)			
	Uncertainty			+/-0.732							
Thorium-232	17.2			17.4 pCi/Sample			101	(75%-125%)			
	Uncertainty			+/-1.74							
QC1205090058	LCSD										
Thorium-228				17.9 pCi/Sample		7.04				05/31/22	10:36
	Uncertainty			+/-1.89							
Thorium-230				3.05 pCi/Sample		9.8		(0%-20%)			
	Uncertainty			+/-0.797							
Thorium-232	17.2			17.7 pCi/Sample		1.22	103	(0%-20%)			
	Uncertainty			+/-1.86							

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QC Summary

Workorder: 579289

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2265053										
QC1205090056	MB										
Thorium-228			U	-0.0776 pCi/Sample					MP2	05/31/22	10:36
	Uncertainty			+/-0.123							
Thorium-230			U	0.298 pCi/Sample							
	Uncertainty			+/-0.333							
Thorium-232			U	-0.0329 pCi/Sample							
	Uncertainty			+/-0.112							
Batch	2265054										
QC1205090060	LCS										
Polonium-210	44.4			42.0 pCi/Sample			94.6	(75%-125%)	MP2	06/01/22	08:42
	Uncertainty			+/-3.44							
QC1205090061	LCSD										
Polonium-210	44.4			41.5 pCi/Sample		1.05	93.6	(0%-20%)		06/01/22	08:42
	Uncertainty			+/-3.48							
QC1205090059	MB										
Polonium-210			U	-0.0744 pCi/Sample						06/02/22	14:32
	Uncertainty			+/-0.161							
Batch	2272481										
QC1205104986	LCS										
Americium-241	50.1			40.0 pCi/Sample			79.7	(75%-125%)	MP2	06/05/22	14:38
	Uncertainty			+/-3.42							
QC1205104987	LCSD										
Americium-241	50.1			45.5 pCi/Sample		13.1	90.9	(0%-20%)		06/05/22	14:38
	Uncertainty			+/-3.86							
QC1205104985	MB										
Americium-241			U	-0.121 pCi/Sample						06/05/22	14:38
	Uncertainty			+/-0.498							
Rad Gamma Spec											
Batch	2264689										
QC1205089188	579287001	DUP									
Actinium-228	U	9.81	U	4.16 pCi/Sample		N/A			N/A	RXF2	05/17/22 10:06
	Uncertainty	+/-26.5		+/-17.7							
Beryllium-7		239	UI	134 pCi/Sample		56.3		(0% - 100%)			
	Uncertainty	+/-105		+/-138							

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QC Summary

Workorder: 579289

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	2264689										
Cesium-137	U	0.815	U	0.428 pCi/Sample		N/A		N/A	RXF2	05/17/22	10:06
	Uncertainty	+/-3.59		+/-3.75							
Cobalt-60	U	-0.757	U	3.72 pCi/Sample		N/A		N/A			
	Uncertainty	+/-3.54		+/-4.07							
Potassium-40	U	10.1	UI	66.9 pCi/Sample		N/A		N/A			
	Uncertainty	+/-53.5		+/-66.2							
QC1205089189	LCS										
Americium-241	74100			77900 pCi/Sample			105	(75%-125%)		05/17/22	09:22
	Uncertainty			+/-1610							
Actinium-228			U	146 pCi/Sample							
	Uncertainty			+/-296							
Beryllium-7			U	405 pCi/Sample							
	Uncertainty			+/-621							
Cesium-137	22200			22700 pCi/Sample			102	(75%-125%)			
	Uncertainty			+/-473							
Cobalt-60	8620			9120 pCi/Sample			106	(75%-125%)			
	Uncertainty			+/-360							
Potassium-40			U	279 pCi/Sample							
	Uncertainty			+/-228							
QC1205089187	MB										
Actinium-228			U	-41.0 pCi/Sample						05/17/22	09:21
	Uncertainty			+/-29.0							
Beryllium-7			U	4.39 pCi/Sample							
	Uncertainty			+/-35.7							
Cesium-137			U	3.08 pCi/Sample							
	Uncertainty			+/-8.34							
Cobalt-60			U	-1.73 pCi/Sample							
	Uncertainty			+/-5.33							
Potassium-40			U	52.6 pCi/Sample							
	Uncertainty			+/-110							

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QC Summary

Workorder: 579289

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2269288										
QC1205098590	LCS										
Strontium-90	204			254 pCi/Sample			125	(75%-125%)	KP1	05/27/22	10:47
	Uncertainty			+/-12.7							
QC1205098591	LCSD										
Strontium-90	204			217 pCi/Sample		15.9	107	(0%-20%)		05/26/22	16:27
	Uncertainty			+/-12.7							
QC1205098589	MB										
Strontium-90			U	-1.26 pCi/Sample						05/26/22	19:10
	Uncertainty			+/-1.05							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- ** Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded
- J See case narrative for an explanation
- J Value is estimated
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- M M if above MDC and less than LLD
- M REMP Result > MDC/CL and < RDL
- N/A RPD or %Recovery limits do not apply.
- N1 See case narrative
- ND Analyte concentration is not detected above the detection limit
- NJ Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Q One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
- R Sample results are rejected
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- UI Gamma Spectroscopy--Uncertain identification
- UJ Gamma Spectroscopy--Uncertain identification
- UL Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier

GEL LABORATORIES LLC

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QC Summary

Workorder: 579289

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.										
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.										
h	Preparation or preservation holding time was exceeded										

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Alpha Spectroscopy Raw Data

Batch 2265052 Check-list

This check-list was completed on 01-JUN-22 by Melanie Aycock

This batch was reviewed by Melanie Aycock on 01-JUN-22 and Jessica Davis on 02-JUN-22.

Batch ID:
2265052

Product:
ASP__UUF

Description: Alpha Spec Uranium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Uranium

Batch ID: 2265052
Analyst: Michael Potts (MP2)
Method: DOE EML HASL-300, U-02-RC
 Modified
Lab SOP: GL-RAD-A-011 REV# 28
Instrument: ASP-33005595

Due Dates for Lab: 05-JUN-2022			Package: 06-JUN-2022	SDG: 07-JUN-2022		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205090054	Uranium-238 AS SPIKE		1600-M	.1	mL
LCSD	1205090055	Uranium-238 AS SPIKE		1600-M	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	579287001	25-MAY-2022	1	30	0.11118
2	579287002	25-MAY-2022	1	30	0.11549
3	579287003	25-MAY-2022	1	30	0.11403
4	579287004	25-MAY-2022	1	30	0.11518
5	579287005	25-MAY-2022	1	30	0.11218
6	579289001	25-MAY-2022	1	30.1	0.11121
7	579289002	25-MAY-2022	1	30	0.1135
8	579289003	25-MAY-2022	1	30	0.11151
9	1205090053 MB	25-MAY-2022	1		0.11549
10	1205090054 LCS	25-MAY-2022	1		0.11549
11	1205090055 LCSD	25-MAY-2022	1		0.11549

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1564-DD	Uranium-232 AS TRACER	.1 ml	Pipet ID: RAD-ASP-184002Z Pu-236 Tracer Used: No Analyzed With: Am , Pu Data Entry Date2: 25-MAY-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

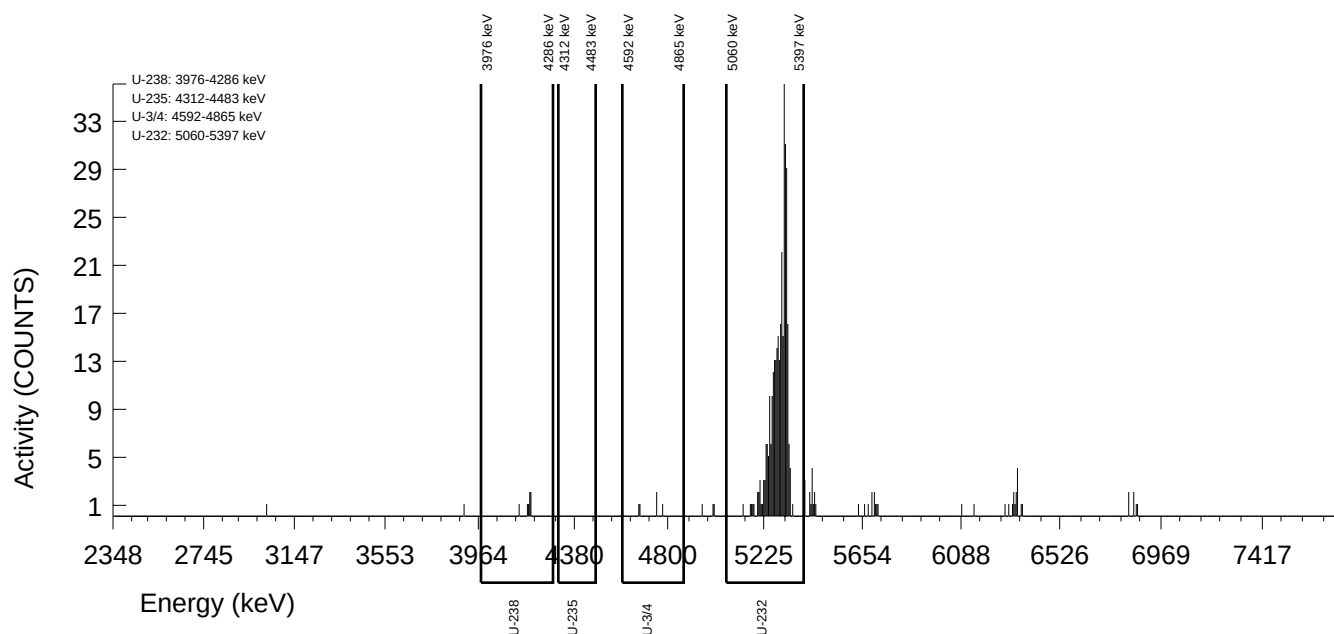
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265052 SAMPLE ID : S0579289001_UU SAMPLE QTY : 0.111 F +/-1.345 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 89.7 +/-6.591 %	CHAMBER : 011 DETECTOR S/N : 72531 AVERAGE %EFFICIENCY : 31.7936 AVERAGE %EFF ERROR : 0.6143 COUNT DATE : 30-May-2022 12:17:17 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B011.CNF;2470 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W011.CNF;676 CAL DATE : 02-May-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5328E+00 dpm RESULTS : 4.0649E+00 dpm		

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
U-232	5302.10	5287.05	27.211	319.000	309.640	9.360	3.0594	100.000	1.84E+01	3.27E+00	8.42E-01	3.32E-01	2.09E+00	2.09E+00
U-3/4	4763.02	4721.94	4.936	5.000	1.325	2.640	1.6248	100.000	7.85E-02	3.01E-01	5.82E-01	2.02E-01	3.00E-01	3.00E-01
U-235	4391.00	4397.18	0.000	0.000	-0.240	0.240	0.4899	80.900	-1.76E-02	1.52E-01	3.51E-01	6.57E-02	1.51E-01	1.51E-01
U-238	4184.73	4179.71	12.340	7.000	5.320	1.680	1.2961	100.000	3.15E-01	3.40E-01	4.59E-01	1.41E-01	3.37E-01	3.37E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (1.035 +/-0.031)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

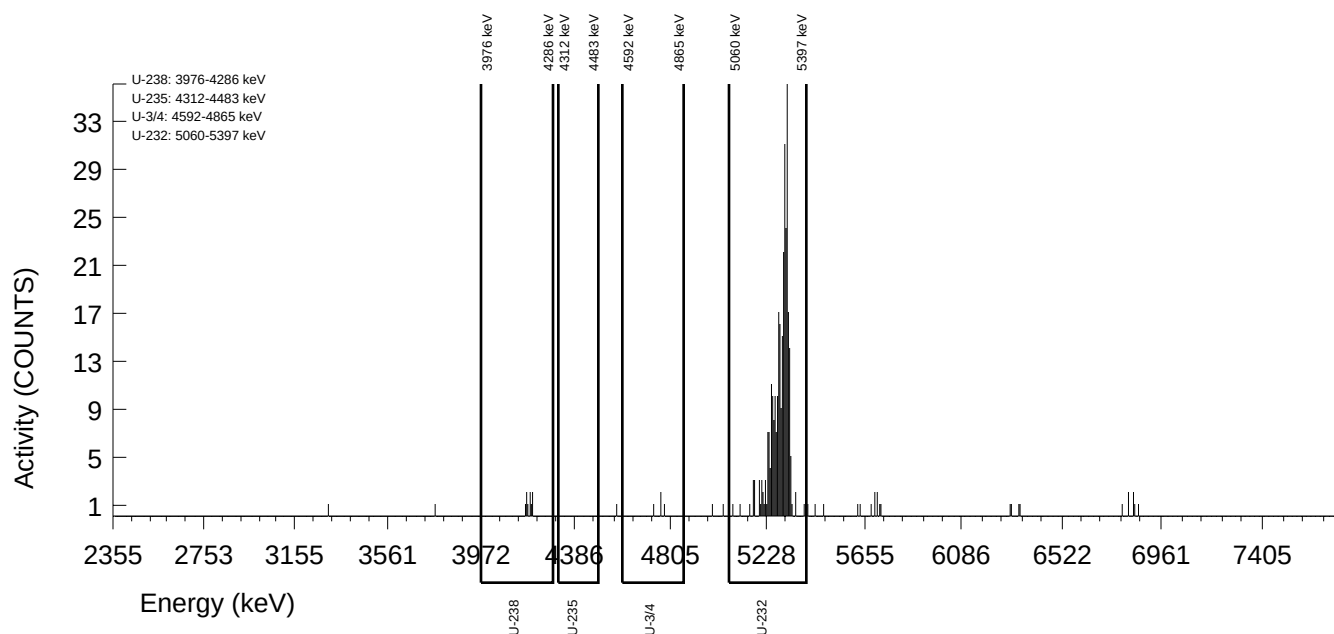
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265052 SAMPLE ID : S0579289002_UU SAMPLE QTY : 0.114 F +/-1.333 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 88.4 +/-6.609 %	CHAMBER : 012 DETECTOR S/N : 158176 AVERAGE %EFFICIENCY : 31.4764 AVERAGE %EFF ERROR : 0.6083 COUNT DATE : 30-May-2022 12:17:17 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B012.CNF;2469 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W012.CNF;648 CAL DATE : 02-May-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5328E+00 dpm RESULTS : 4.0072E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5286.86	22.353	307.000	302.200	4.800	2.1909	100.000	1.80E+01	3.21E+00	6.56E-01	2.39E-01	2.05E+00
U-3/4	4763.02	4758.88	4.947	4.000	1.070	1.920	1.3856	100.000	6.36E-02	2.74E-01	5.38E-01	1.80E-01	2.74E-01
U-235	4391.00	4397.18	0.000	0.000	-0.480	0.480	0.6928	80.900	-3.53E-02	1.56E-01	4.07E-01	9.32E-02	1.56E-01
U-238	4184.73	4184.62	32.154	9.000	7.800	1.200	1.0954	100.000	4.64E-01	3.80E-01	4.17E-01	1.19E-01	3.75E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (1.010 +/-0.030)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

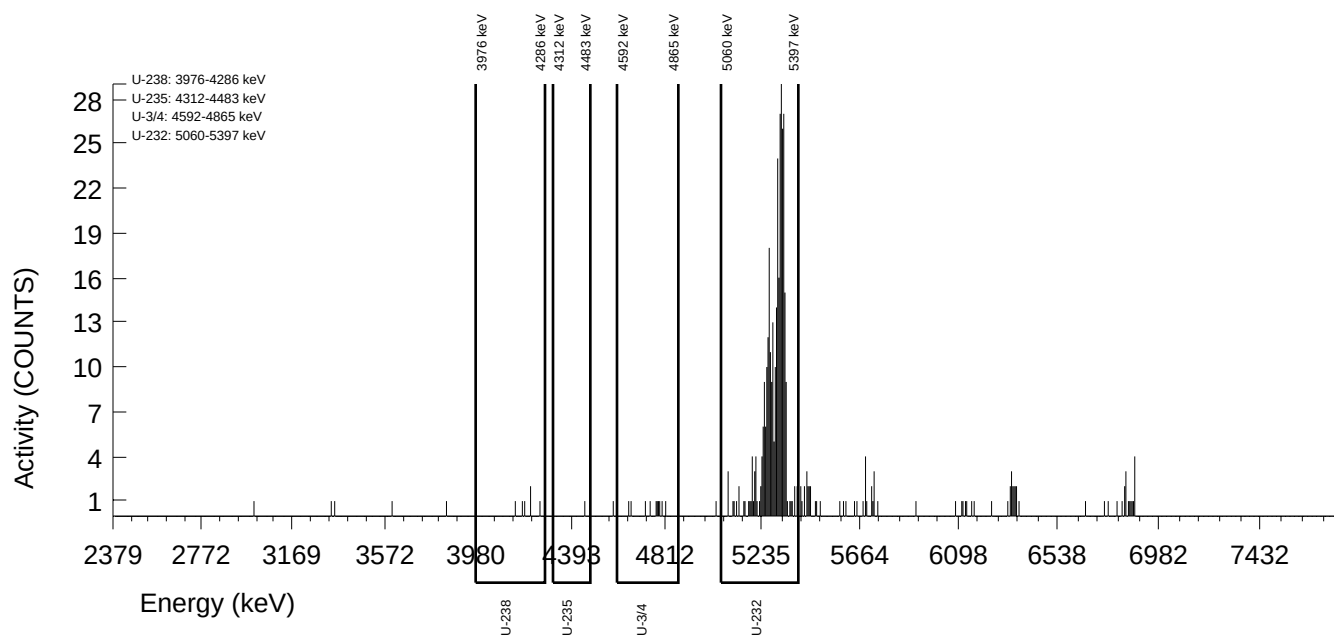
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265052 SAMPLE ID : S0579289003_UU SAMPLE QTY : 0.112 F +/-1.343 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 83.0 +/-6.491 %	CHAMBER : 013 DETECTOR S/N : 78790 AVERAGE %EFFICIENCY : 36.0307 AVERAGE %EFF ERROR : 0.6942 COUNT DATE : 30-May-2022 12:19:31 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B013.CNF;2426 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W013.CNF;657 CAL DATE : 02-May-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5328E+00 dpm RESULTS : 3.7621E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5291.02	66.570	337.000	324.760	12.240	3.4986	100.000	1.83E+01	3.21E+00	8.92E-01	3.61E-01	2.04E+00
U-3/4	4763.02	4759.61	0.000	11.000	8.475	1.440	1.2000	100.000	4.77E-01	3.95E-01	4.83E-01	1.57E-01	3.89E-01
U-235	4391.00	4455.69	4.871	1.000	0.280	0.720	0.8485	80.900	1.95E-02	2.04E-01	4.25E-01	1.08E-01	2.04E-01
U-238	4184.73	4202.34	4.871	6.000	4.080	1.920	1.3856	100.000	2.30E-01	3.04E-01	4.55E-01	1.43E-01	3.02E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (1.085 +/-0.033)



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ALPHA SPECTROSCOPY REPORT

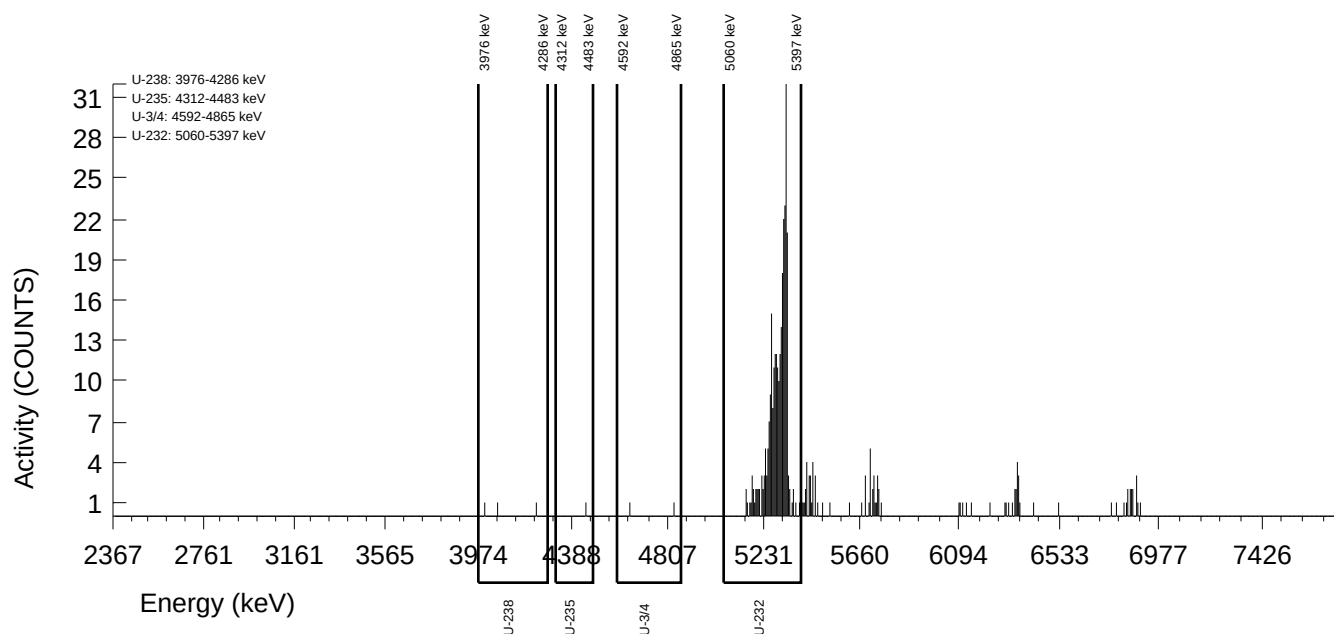
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265052 SAMPLE ID : S1205090053_UU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 73.8 +/-6.879 %	CHAMBER : 014 DETECTOR S/N : 83289 AVERAGE %EFFICIENCY : 34.7454 AVERAGE %EFF ERROR : 0.6699 COUNT DATE : 30-May-2022 12:19:31 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B014.CNF;2425 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W014.CNF;675 CAL DATE : 02-May-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5257E+00 dpm RESULTS : 3.3420E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5296.16	23.388	288.000	278.640	9.360	3.0594	100.000	1.77E+01	3.29E+00	9.00E-01	3.55E-01	2.12E+00
U-3/4	4763.02	4741.22	186.019	2.000	-1.091	2.160	1.4697	100.000	-6.91E-02	2.35E-01	5.86E-01	1.98E-01	2.35E-01
U-235	4391.00	4450.50	4.895	1.000	0.520	0.480	0.6928	80.900	4.07E-02	2.26E-01	4.34E-01	9.94E-02	2.26E-01
U-238	4184.73	4099.29	220.286	3.000	1.320	1.680	1.2961	100.000	8.36E-02	2.62E-01	4.91E-01	1.50E-01	2.62E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.931 +/-0.028)



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ALPHA SPECTROSCOPY REPORT

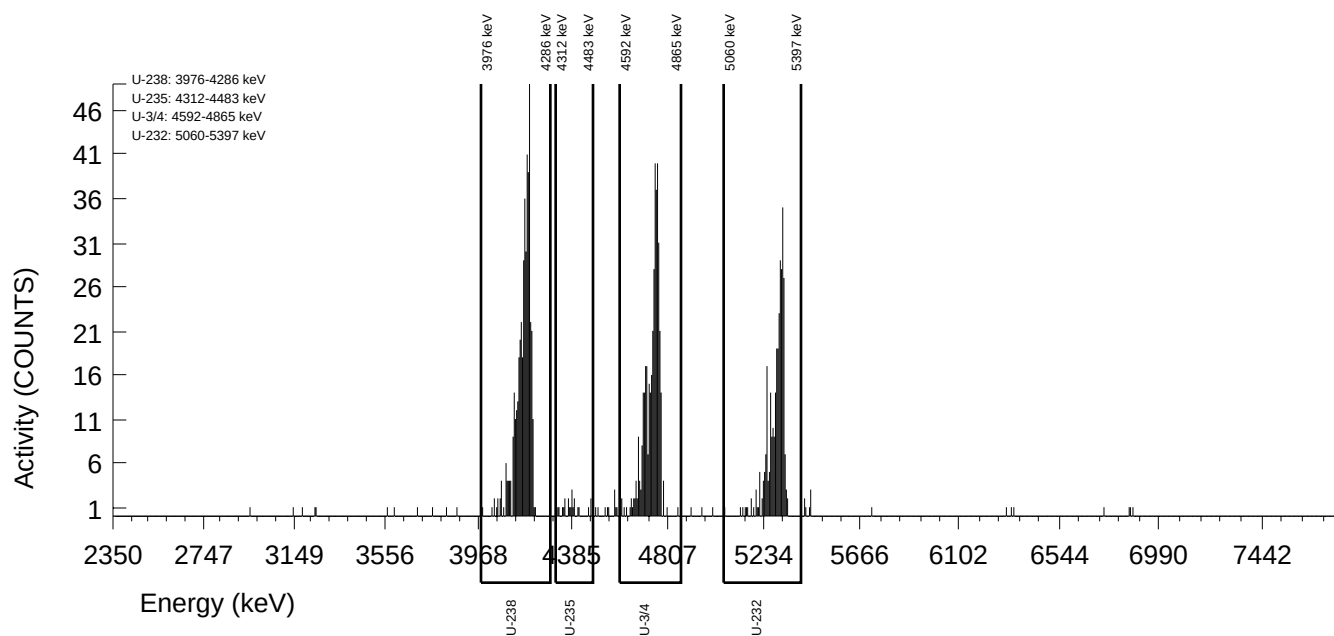
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265052 SAMPLE ID : S1205090054_UU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 81.1 +/-6.552 %	CHAMBER : 009 DETECTOR S/N : 149015 AVERAGE %EFFICIENCY : 34.8926 AVERAGE %EFF ERROR : 0.6728 COUNT DATE : 30-May-2022 12:17:17 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B009.CNF;2448 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W009.CNF;661 CAL DATE : 02-May-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5257E+00 dpm RESULTS : 3.6714E+00 dpm	LCS ID : 1600-M NUCLIDE : U-238 NOMINAL (pCi/F) : 2.4016E+01 % RECOVERY : 108.366	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			1.96-sigma
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5288.76	33.423	311.000	307.400	3.600	1.8974	100.000	1.77E+01	3.12E+00	5.71E-01	2.00E-01	1.99E+00
U-3/4	4763.02	4739.32	31.291	396.000	393.053	1.920	1.3856	100.000	2.26E+01	3.81E+00	5.21E-01	1.74E-01	2.24E+00
U-235	4391.00	4385.93	112.232	21.000	21.000	0.000	1.0000	80.900	1.49E+00	6.84E-01	2.13E-01	1.30E-01	6.53E-01
U-238	4184.73	4168.22	31.161	454.000	453.280	0.720	0.8485	100.000	2.60E+01	4.28E+00	3.51E-01	8.92E-02	2.40E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (1.027 +/-0.031)



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ALPHA SPECTROSCOPY REPORT

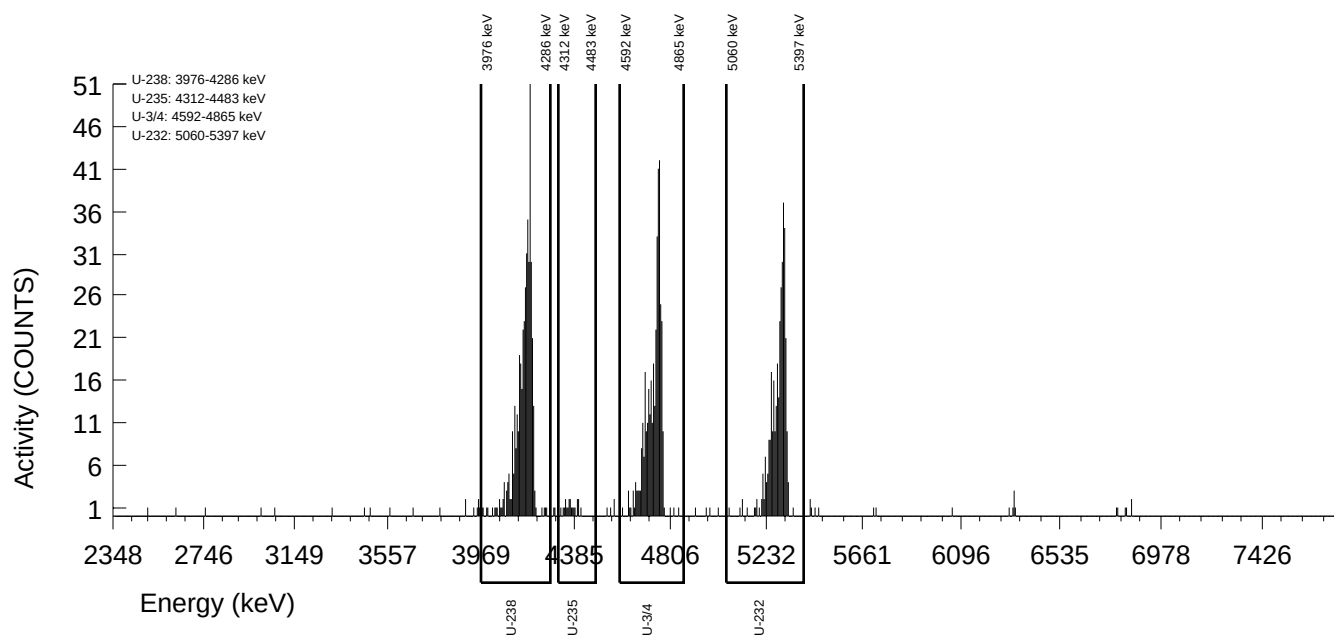
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265052 SAMPLE ID : S1205090055_UU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 90.8 +/-6.404 %	CHAMBER : 010 DETECTOR S/N : 149014 AVERAGE %EFFICIENCY : 33.5407 AVERAGE %EFF ERROR : 0.6472 COUNT DATE : 30-May-2022 12:17:17 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B010.CNF;2497 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W010.CNF;668 CAL DATE : 02-May-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5257E+00 dpm RESULTS : 4.1071E+00 dpm	LCSD ID 1600-M NUCLIDE U-238 NOMINAL (pCi/F) 2.4016E+01 % RECOVERY 96.443	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5286.76	28.365	338.000	330.560	7.440	2.7276	100.000	1.77E+01	3.05E+00	6.94E-01	2.67E-01	1.93E+00
U-3/4	4763.02	4736.53	26.076	376.000	372.255	2.640	1.6248	100.000	1.99E+01	3.35E+00	5.28E-01	1.84E-01	2.03E+00
U-235	4391.00	4369.65	61.909	21.000	21.000	0.000	1.0000	80.900	1.39E+00	6.35E-01	1.98E-01	1.21E-01	6.08E-01
U-238	4184.73	4164.30	29.097	435.000	433.800	1.200	1.0954	100.000	2.32E+01	3.79E+00	3.74E-01	1.07E-01	2.19E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (1.105 +/-0.033)



Batch 2265053 Check-list

This check-list was completed on 03-JUN-22 by Melanie Aycock

This batch was reviewed by Jessica Davis on 03-JUN-22 and Melanie Aycock on 03-JUN-22.

Batch ID:
2265053

Product:
ASP__THF

Description: Alpha Spec Thorium
GL-RAD-A-038

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Thorium

Batch ID: 2265053

Analyst: Michael Potts (MP2)

Method: DOE EML HASL-300, Th-01-RC
Modified

Lab SOP: GL-RAD-A-038 REV# 18

Instrument: ASP-33005595

Due Dates for Lab: 05-JUN-2022

Package: 06-JUN-2022

SDG: 07-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205090057	Thorium-232 AS SPIKE	1513-C	.1	mL
LCSD	1205090058	Thorium-232 AS SPIKE	1513-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	579287001	25-MAY-2022	1	30.1	0.11155
2	579287002	25-MAY-2022	1	30	0.11549
3	579287003	25-MAY-2022	1	30.1	0.11441
4	579287004	25-MAY-2022	1	30	0.11518
5	579287005	25-MAY-2022	1	30	0.11218
6	579289001	25-MAY-2022	1	30.1	0.11121
7	579289002	25-MAY-2022	1	30.1	0.11388
8	579289003	25-MAY-2022	1	30.1	0.11188
9	1205090056 MB	25-MAY-2022	1		0.11549
10	1205090057 LCS	25-MAY-2022	1		0.11549
11	1205090058 LCSD	25-MAY-2022	1		0.11549

Reagent/Solvent Lot ID	Description	Amount
WORK 1845-G	Thorium-229 AS TRACER, RASP	.1 mL

Comments:

Pipet ID: RAD-ASP-184002Z
Data Entry Date2: 25-MAY-2022 00:00

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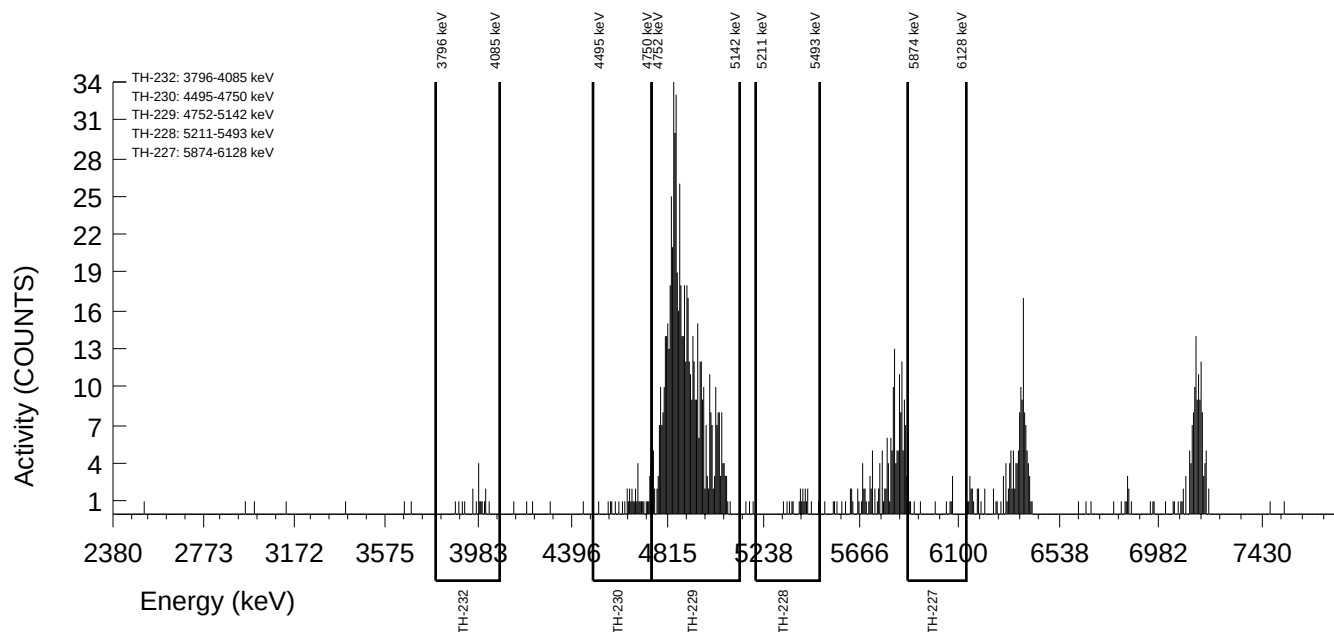
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2265053 SAMPLE ID : S0579289001_TH SAMPLE QTY : 0.111 F +/-1.345 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 56.0 +/-4.573 %	CHAMBER : 029 DETECTOR S/N : 125038 AVERAGE %EFFICIENCY : 35.1660 AVERAGE %EFF ERROR : 0.6778 COUNT DATE : 02-Jun-2022 14:27:39 ELAPSED LIVE TIME(SEC) : 43199.99	LIB FILE : TH(2) BKG FILE : B029.CNF;2461 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W029.CNF;724 CAL DATE : 03-May-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8638E+00 dpm RESULTS : 2.7230E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5955.19	0.000	17.000	5.480	11.520	3.3941	57.440	3.14E+00	5.82E+00	1.01E+01	4.19E+00	5.81E+00
TH-228	5363.00	5406.01	36.623	19.000	11.756	7.200	2.6833	99.940	3.59E-01	3.05E-01	4.46E-01	1.77E-01	3.03E-01
TH-229	4900.00	4896.91	74.222	689.000	686.120	2.880	1.6971	99.520	1.97E+01	2.48E+00	2.96E-01	1.05E-01	1.48E+00
TH-230	4671.39	4675.34	60.224	41.000	29.672	7.200	2.6833	99.700	8.50E-01	4.00E-01	4.69E-01	1.92E-01	3.88E-01
TH-232	3972.00	3976.07	5.697	18.000	14.124	3.600	1.8974	100.000	4.04E-01	2.67E-01	3.25E-01	1.20E-01	2.63E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.044 +/-0.001)
TH-230 (4.128 +/-0.064)
TH-232 (0.276 +/-0.004)



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Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-038

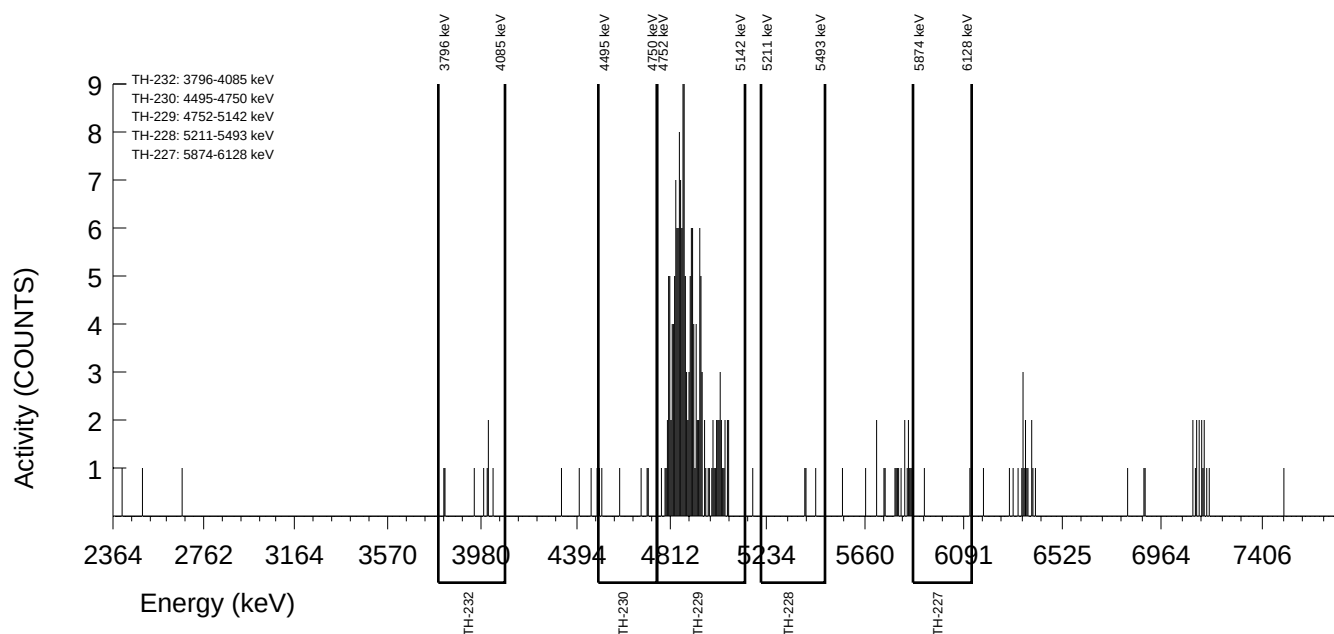
BATCH NUMBER : 2265053 SAMPLE ID : S0579289002_TH SAMPLE QTY : 0.114 F +/-1.331 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 55.8 +/-8.049 %	CHAMBER : 181 DETECTOR S/N : 92565 AVERAGE %EFFICIENCY : 26.6822 AVERAGE %EFF ERROR : 0.5179 COUNT DATE : 31-May-2022 10:36:04 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH(2) BKG FILE : B181.CNF;927 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W181.CNF;252 CAL DATE : 13-May-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8638E+00 dpm RESULTS : 2.7152E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	6023.17	187.936	2.000	0.320	1.680	1.2961	57.440	6.51E-01	7.43E+00	1.58E+01	4.83E+00	7.42E+00
TH-228	5363.00	5416.54	49.457	3.000	0.109	2.880	1.6971	99.940	1.28E-02	5.04E-01	1.09E+00	3.67E-01	5.04E-01
TH-229	4900.00	4891.99	135.595	174.000	173.040	0.960	0.9798	99.520	1.92E+01	4.28E+00	7.33E-01	2.00E-01	2.89E+00
TH-230	4671.39	4634.49	0.000	7.000	3.319	2.640	1.6248	99.700	3.68E-01	6.46E-01	1.09E+00	3.79E-01	6.41E-01
TH-232	3972.00	3954.05	7.419	8.000	7.930	0.000	1.0000	100.000	8.77E-01	6.69E-01	4.28E-01	2.08E-01	6.53E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.011 +/-0.000)
TH-230 (1.041 +/-0.016)
TH-232 (0.070 +/-0.001)



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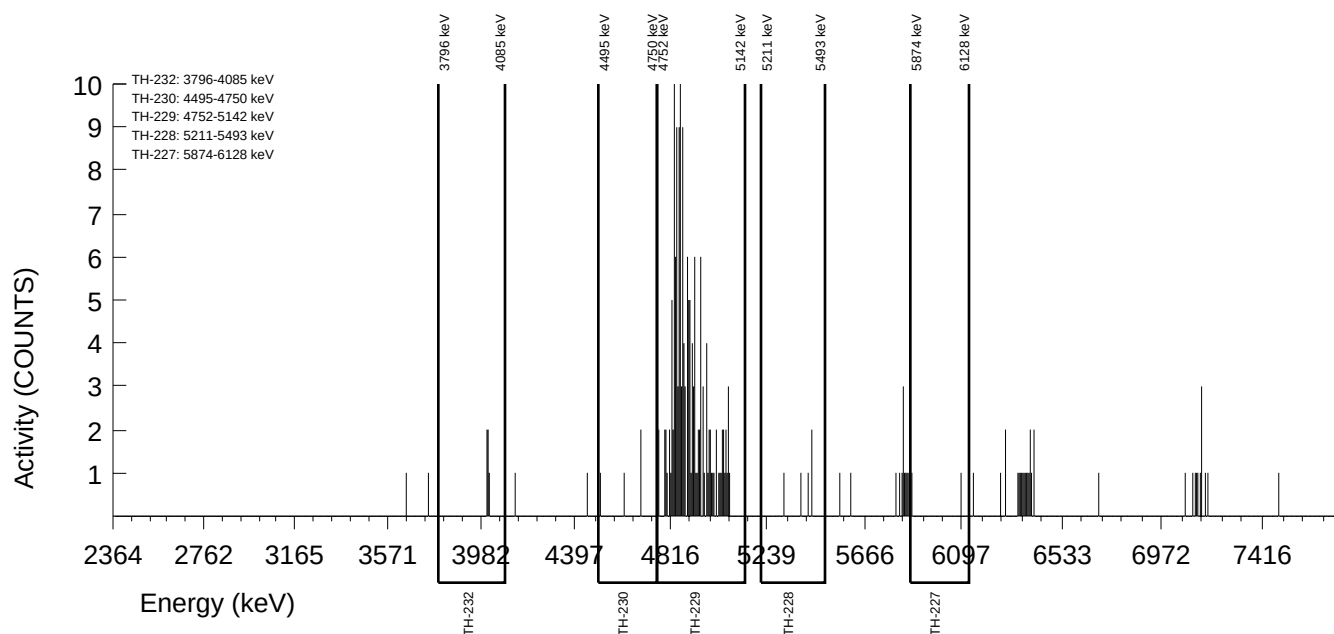
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2265053 SAMPLE ID : S0579289003_TH SAMPLE QTY : 0.112 F +/-1.341 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 50.6 +/-8.483 %	CHAMBER : 182 DETECTOR S/N : 92566 AVERAGE %EFFICIENCY : 26.5187 AVERAGE %EFF ERROR : 0.5148 COUNT DATE : 31-May-2022 10:36:05 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH(2) BKG FILE : B182.CNF;931 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W182.CNF;243 CAL DATE : 13-May-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8638E+00 dpm RESULTS : 2.4604E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma	MDA pCi/F	Lc	1.96-sigma
										TPU pCi/F		pCi/F	cnt Unc pCi/F
TH-227	5994.04	5983.80	0.000	2.000	0.560	1.440	1.2000	57.440	1.29E+00	8.32E+00	1.70E+01	5.05E+00	8.31E+00
TH-228	5363.00	5398.63	4.953	5.000	2.590	2.400	1.5492	99.940	3.45E-01	6.75E-01	1.16E+00	3.79E-01	6.73E-01
TH-229	4900.00	4897.86	112.880	158.000	155.840	2.160	1.4697	99.520	1.96E+01	4.59E+00	1.05E+00	3.38E-01	3.11E+00
TH-230	4671.39	4621.58	4.953	4.000	-0.538	3.600	1.8974	99.700	-6.74E-02	5.99E-01	1.34E+00	4.80E-01	5.98E-01
TH-232	3972.00	4012.02	12.382	5.000	4.697	0.240	0.4899	100.000	5.87E-01	6.15E-01	6.22E-01	1.23E-01	6.06E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.010 +/-0.000)
TH-230 (0.938 +/-0.015)
TH-232 (0.063 +/-0.001)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-038

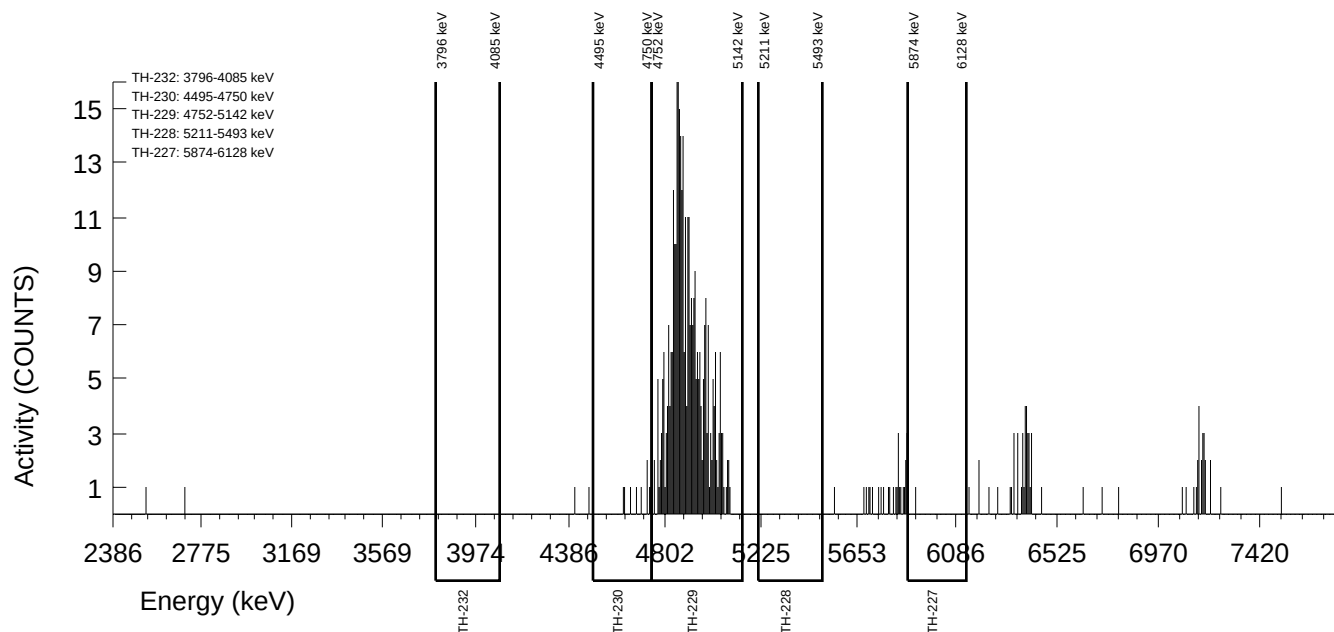
BATCH NUMBER : 2265053 SAMPLE ID : S1205090056_TH SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 75.5 +/-5.859 %	CHAMBER : 185 DETECTOR S/N : 140610 AVERAGE %EFFICIENCY : 40.8506 AVERAGE %EFF ERROR : 0.7850 COUNT DATE : 31-May-2022 10:36:07 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH(2) BKG FILE : B185.CNF;1480 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W185.CNF;393 CAL DATE : 17-May-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 3.6724E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5906.55	4.825	1.000	-3.080	4.080	2.0199	57.440	-3.60E-01	3.99E-01	1.22E+00	4.32E-01	3.99E-01
TH-228	5363.00	5351.70	0.000	0.000	-1.463	1.440	1.2000	99.940	-7.76E-02	1.23E-01	3.94E-01	1.17E-01	1.23E-01
TH-229	4900.00	4908.08	91.265	360.000	358.320	1.680	1.2961	99.520	1.90E+01	3.06E+00	4.10E-01	1.26E-01	1.97E+00
TH-230	4671.39	4693.00	4.825	9.000	5.644	1.200	1.0954	99.700	2.98E-01	3.37E-01	4.90E-01	1.66E-01	3.33E-01
TH-232	3972.00	3940.34	0.000	0.000	-0.624	0.480	0.6928	100.000	-3.29E-02	1.12E-01	3.07E-01	7.45E-02	1.12E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.023 +/-0.000)
TH-230 (2.156 +/-0.033)
TH-232 (0.144 +/-0.002)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

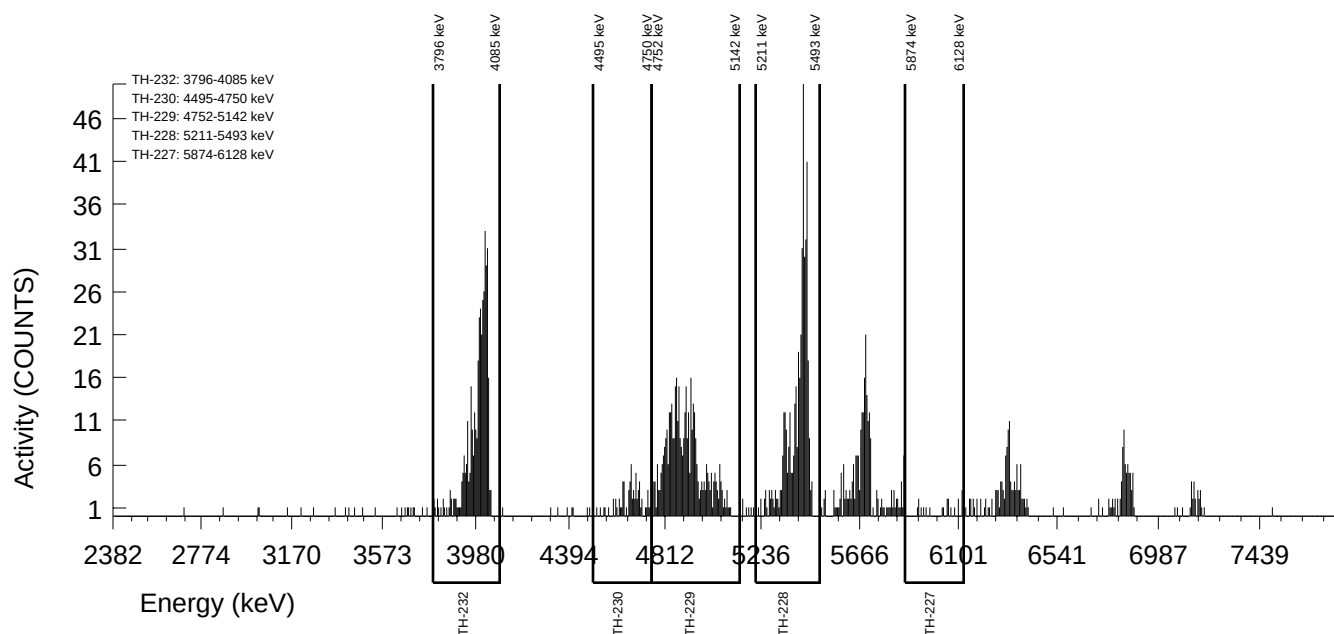
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2265053 SAMPLE ID : S1205090057_TH SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 89.7 +/-5.503 %	CHAMBER : 186 DETECTOR S/N : 140611 AVERAGE %EFFICIENCY : 40.3225 AVERAGE %EFF ERROR : 0.7752 COUNT DATE : 31-May-2022 10:36:10 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH(2) BKG FILE : B186.CNF;1444 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W186.CNF;81 CAL DATE : 17-May-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 4.3651E+00 dpm	LCS ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.7196E+01 % RECOVERY 101.421	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
TH-227	5994.04	6019.60	0.000	22.000	16.960	5.040	2.2450	57.440	1.69E+00	9.82E-01	1.12E+00	4.10E-01	9.62E-01
TH-228	5363.00	5398.62	25.719	427.000	424.813	2.160	1.4697	99.940	1.92E+01	2.90E+00	3.80E-01	1.22E-01	1.84E+00
TH-229	4900.00	4903.55	127.891	424.000	420.400	3.600	1.8974	99.520	1.90E+01	2.88E+00	4.49E-01	1.57E-01	1.83E+00
TH-230	4671.39	4659.09	71.231	67.000	61.351	3.120	1.7664	99.700	2.76E+00	8.06E-01	5.10E-01	1.87E-01	7.32E-01
TH-232	3972.00	3988.10	44.357	389.000	388.351	0.480	0.6928	100.000	1.74E+01	2.68E+00	2.64E-01	6.46E-02	1.74E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.027 +/-0.000)
 TH-230 (2.529 +/-0.039)
 TH-232 (0.169 +/-0.003)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

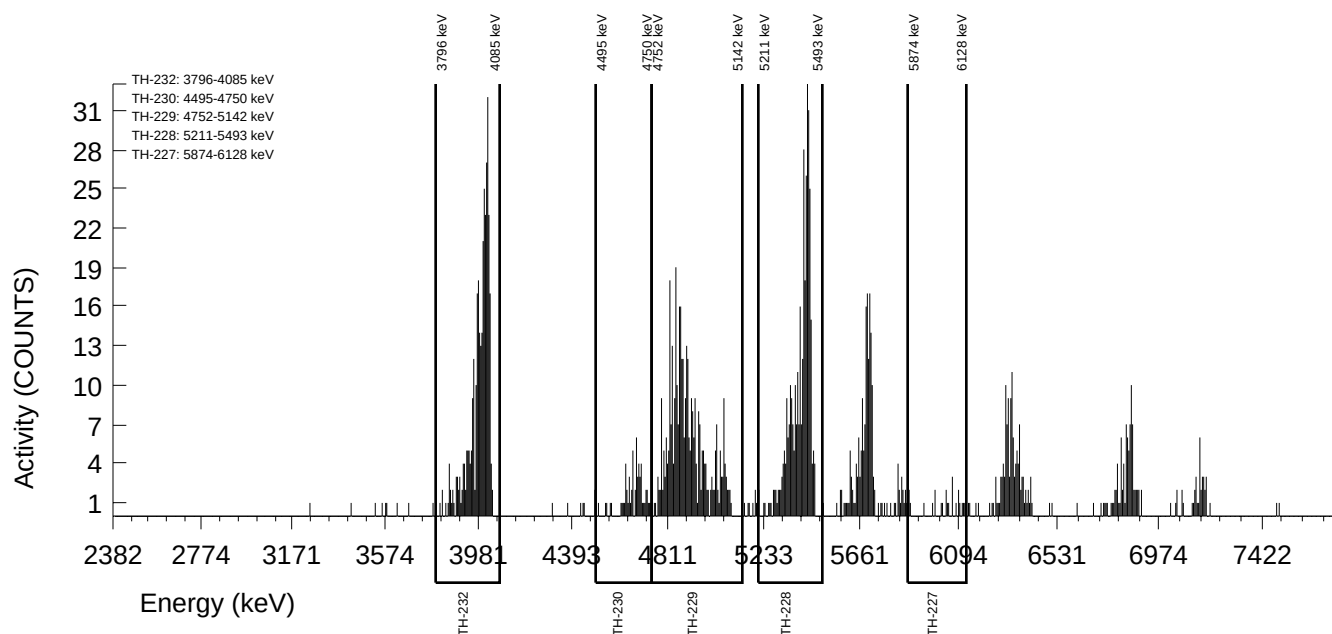
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2265053 SAMPLE ID : S1205090058_TH SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 83.0 +/-5.788 %	CHAMBER : 189 DETECTOR S/N : 84061 AVERAGE %EFFICIENCY : 38.3394 AVERAGE %EFF ERROR : 0.7377 COUNT DATE : 31-May-2022 10:36:12 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH(2) BKG FILE : B189.CNF;1465 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W189.CNF;397 CAL DATE : 17-May-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 4.0388E+00 dpm	LCSD ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.7196E+01 % RECOVERY 102.669	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			1.96-sigma
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
TH-227	5994.04	6028.78	0.000	23.000	20.600	2.400	1.5492	57.440	2.33E+00	1.14E+00	9.82E-01	3.21E-01	1.10E+00
TH-228	5363.00	5398.45	31.975	350.000	348.296	1.680	1.2961	99.940	1.79E+01	2.89E+00	4.00E-01	1.23E-01	1.89E+00
TH-229	4900.00	4905.74	78.227	372.000	369.840	2.160	1.4697	99.520	1.90E+01	3.03E+00	4.30E-01	1.38E-01	1.94E+00
TH-230	4671.39	4661.59	66.526	62.000	59.535	0.240	0.4899	99.700	3.05E+00	8.86E-01	4.21E-01	1.34E-01	7.97E-01
TH-232	3972.00	3989.70	54.615	346.000	345.851	0.000	1.0000	100.000	1.77E+01	2.85E+00	2.18E-01	9.90E-02	1.86E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.024 +/-0.000)
 TH-230 (2.225 +/-0.034)
 TH-232 (0.149 +/-0.002)



Batch 2272481 Check-list

This check-list was completed on 07-JUN-22 by Jessica Davis

This batch was reviewed by Jessica Davis on 07-JUN-22 and Melanie Aycock on 07-JUN-22.

Batch ID:
2272481

Product:
ASPAMCMF

Description: Alpha Spec Am241Curium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?		No	
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?	Yes		
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Americium/Curium

Batch ID: 2272481
Analyst: Michael Potts (MP2)
Method: DOE EML HASL-300, Am-05-RC
 Modified
Lab SOP: GL-RAD-A-011 REV# 28
Instrument: ASP-33005595

Due Dates for Lab: 05-JUN-2022

Package: 06-JUN-2022

SDG: 07-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205104986	Americium-241 SPIKE	0533-II	.1	mL
LCSD	1205104987	Americium-241 SPIKE	0533-II	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	579287001 - 2	03-JUN-2022	1	10.1	0.03743
2	579287002 - 2	03-JUN-2022	1	10.2	0.03927
3	579287003 - 2	03-JUN-2022	1	10.1	0.03839
4	579287004 - 2	03-JUN-2022	1	5	0.0192
5	579287005 - 2	03-JUN-2022	1	10	0.03739
6	579289001 - 2	03-JUN-2022	1	10	0.03695
7	579289002 - 2	03-JUN-2022	1	10	0.03783
8	579289003 - 2	03-JUN-2022	1	10	0.03717
9	1205104985 MB	03-JUN-2022	1		0.03927
10	1205104986 LCS	03-JUN-2022	1		0.03927
11	1205104987 LCSD	03-JUN-2022	1		0.03927

Reagent/Solvent Lot ID	Description	Amount
WORK 1752-I	Americium-243 AS TRACER	.1 ml

Comments:

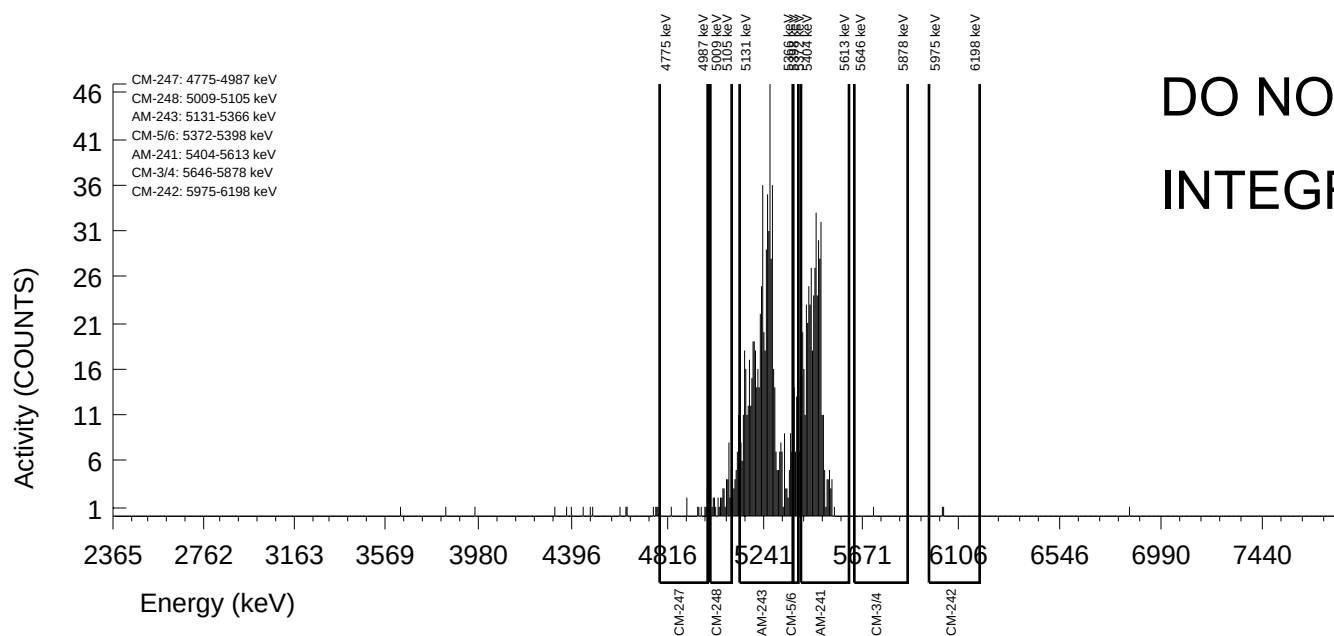
Pipet ID: RAD-ASP-184002Z
 Analyzed With: N/A
 Data Entry Date2: 03-JUN-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S1205104987_AM SAMPLE QTY : 0.039 F +/-2.736 % SAMPLE DATE : 03-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 59.4 +/-4.721 %	CHAMBER : 082 DETECTOR S/N : 149008 AVERAGE %EFFICIENCY : 34.3414 AVERAGE %EFF ERROR : 0.6623 COUNT DATE : 05-Jun-2022 14:38:46 ELAPSED LIVE TIME(SEC) : 43200.00	LIB FILE : AM BKG FILE : B082.CNF;2361 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W082.CNF;609 CAL DATE : 09-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 2.7366E+00 dpm	LCSD ID 0533-II NUCLIDE AM-241 NOMINAL (pCi/F) 5.0110E+01 % RECOVERY 72.506	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5460.26	80.957	461.000	458.120	2.880	1.6971	98.525	3.63E+01	5.31E+00	8.19E-01	2.90E-01	3.35E+00
AM-243	5269.50	5236.96	49.865	683.000	676.520	6.480	2.5456	99.980	5.29E+01	7.22E+00	1.09E+00	4.29E-01	4.02E+00
CM-242	6102.00	6032.52	9.850	2.000	1.280	0.720	0.8485	100.000	1.01E-01	3.12E-01	5.27E-01	1.45E-01	3.11E-01
CM-3/4	5795.02	5725.45	4.925	1.000	-1.880	2.880	1.6971	100.000	-1.47E-01	3.28E-01	8.07E-01	2.86E-01	3.28E-01
CM-5/6	5386.00	5383.25	0.000	63.000	62.280	0.720	0.8485	86.090	5.65E+00	1.57E+00	6.05E-01	1.66E-01	1.43E+00
CM-247	4946.00	4915.39	4.925	9.000	-3.240	12.240	3.4986	79.300	-3.19E-01	8.49E-01	1.78E+00	7.44E-01	8.49E-01
CM-248	5078.60	5070.14	19.700	47.000	44.840	2.160	1.4697	91.000	3.85E+00	1.27E+00	8.02E-01	2.72E-01	1.19E+00



DO NOT REPORT
INTEGRATED

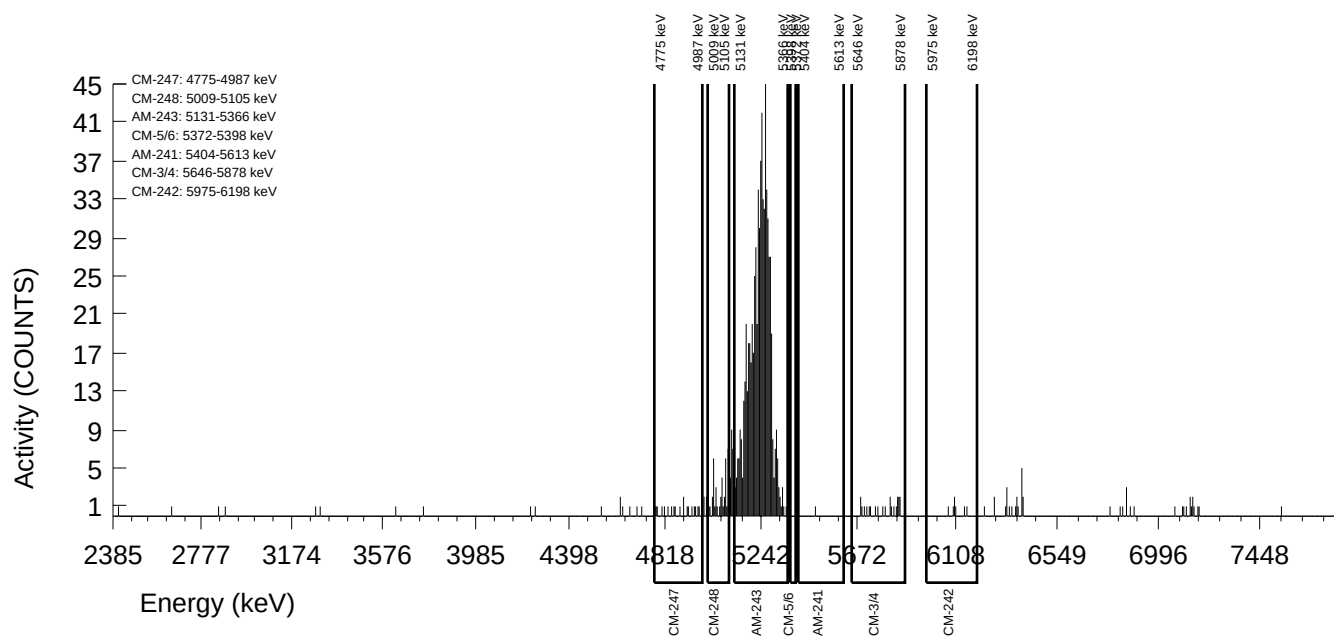
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S0579289001_AM SAMPLE QTY : 0.037 F +/-2.885 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 37.0 +/-4.653 %	CHAMBER : 200 DETECTOR S/N : 101464 AVERAGE %EFFICIENCY : 40.8674 AVERAGE %EFF ERROR : 0.7854 COUNT DATE : 06-Jun-2022 13:20:35 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : AM BKG FILE : B200.CNF;1421 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W200.CNF;397 CAL DATE : 17-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 1.7034E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY	PEAK	PEAK	GROSS	NET	BKG	BKG	%ABUN	ACTIVITY	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5483.57	4.861	1.000	0.000	1.000	1.0000	98.525	0.00E+00	3.21E-01	6.27E-01	1.91E-01	3.21E-01
AM-243	5269.50	5237.40	67.440	697.000	696.000	1.000	1.0000	99.980	5.62E+01	7.64E+00	6.18E-01	1.88E-01	4.19E+00
CM-242	6102.00	6107.39	9.721	7.000	5.000	2.000	1.4142	100.000	5.43E-01	7.09E-01	1.04E+00	3.58E-01	7.06E-01
CM-3/4	5795.02	5782.60	160.397	22.000	5.000	17.000	4.1231	100.000	4.07E-01	1.02E+00	1.80E+00	7.80E-01	1.02E+00
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	2.60E-01	2.81E-01	2.18E-01	2.60E-01
CM-247	4946.00	4878.12	4.861	19.000	16.000	3.000	1.7321	79.300	1.63E+00	9.95E-01	1.13E+00	4.10E-01	9.77E-01
CM-248	5078.60	5065.89	64.766	42.000	42.000	0.000	1.0000	91.000	3.73E+00	1.23E+00	2.66E-01	2.06E-01	1.15E+00

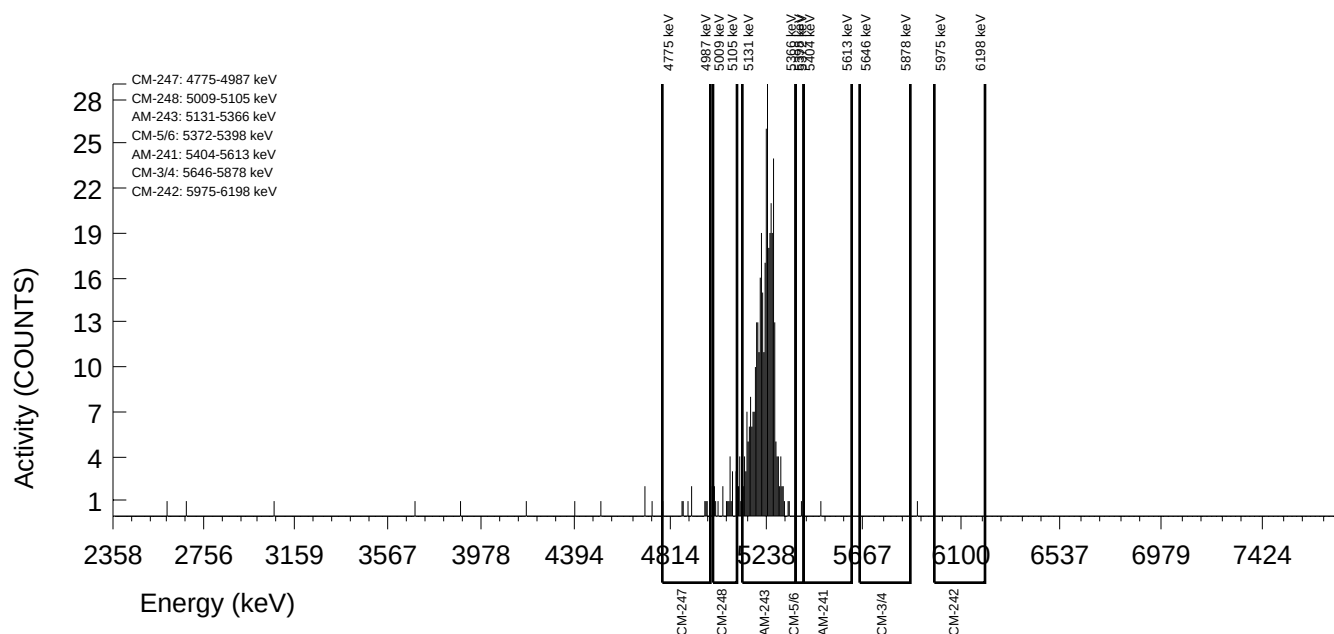


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S0579289002_AM SAMPLE QTY : 0.038 F +/-2.826 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 32.4 +/-5.867 %	CHAMBER : 078 DETECTOR S/N : 149002 AVERAGE %EFFICIENCY : 34.8468 AVERAGE %EFF ERROR : 0.6718 COUNT DATE : 05-Jun-2022 14:38:46 ELAPSED LIVE TIME(SEC) : 43200.00	LIB FILE : AM BKG FILE : B078.CNF;2356 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W078.CNF;618 CAL DATE : 09-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 1.4915E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5478.87	4.956	1.000	-0.440	1.440	1.2000	98.525	-6.55E-02	5.51E-01	1.22E+00	3.85E-01	5.50E-01
AM-243	5269.50	5230.40	60.281	377.000	374.120	2.880	1.6971	99.980	5.49E+01	9.21E+00	1.51E+00	5.37E-01	5.61E+00
CM-242	6102.00	6086.57	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	4.75E-01	5.90E-01	4.24E-01	4.75E-01
CM-3/4	5795.02	5761.60	0.000	0.000	-1.440	1.440	1.2000	100.000	-2.13E-01	4.63E-01	1.21E+00	3.82E-01	4.63E-01
CM-5/6	5386.00	5393.18	4.956	1.000	1.000	0.000	1.0000	86.090	1.70E-01	5.30E-01	5.11E-01	3.67E-01	5.30E-01
CM-247	4946.00	4905.52	4.956	9.000	6.120	2.880	1.6971	79.300	1.13E+00	1.29E+00	1.91E+00	6.77E-01	1.29E+00
CM-248	5078.60	5066.97	0.000	20.000	17.840	2.160	1.4697	91.000	2.87E+00	1.56E+00	1.51E+00	5.11E-01	1.52E+00

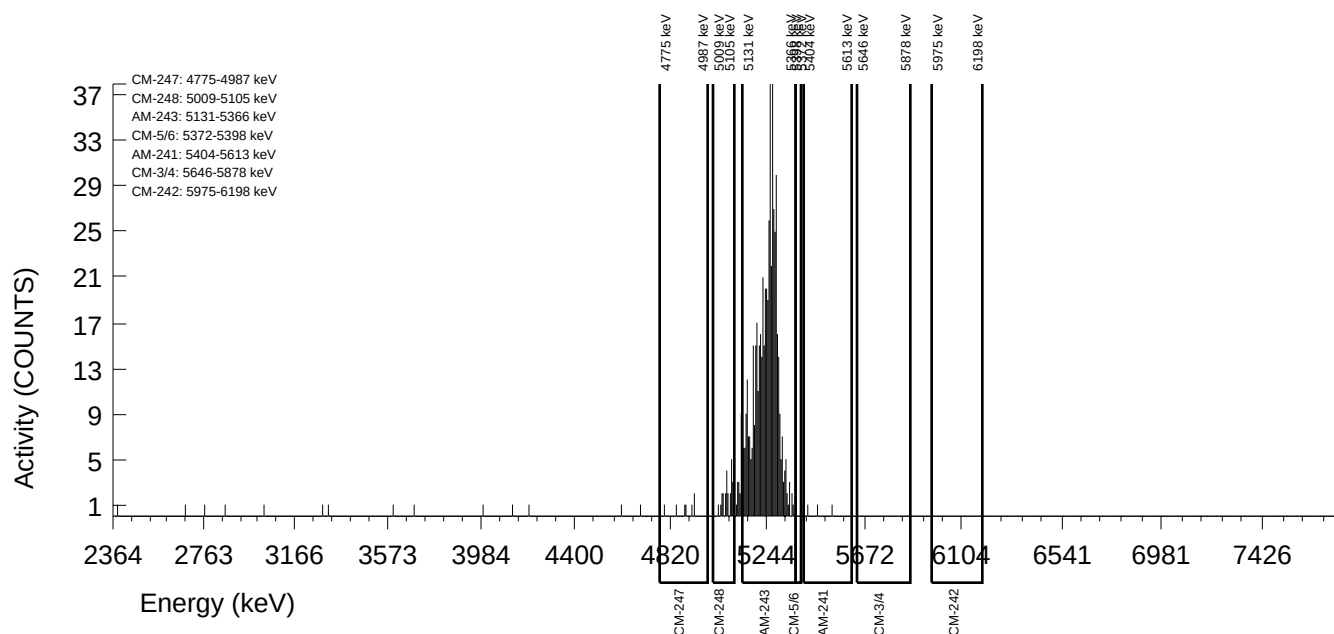


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S0579289003_AM SAMPLE QTY : 0.037 F +/-2.870 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 49.6 +/-5.098 %	CHAMBER : 079 DETECTOR S/N : 101450 AVERAGE %EFFICIENCY : 33.2327 AVERAGE %EFF ERROR : 0.6414 COUNT DATE : 05-Jun-2022 14:38:46 ELAPSED LIVE TIME(SEC) : 43200.00	LIB FILE : AM BKG FILE : B079.CNF;2373 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W079.CNF;645 CAL DATE : 09-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 2.2857E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5474.91	104.090	3.000	0.120	2.880	1.6971	98.525	1.24E-02	5.22E-01	1.07E+00	3.80E-01	5.22E-01
AM-243	5269.50	5241.98	59.834	554.000	546.800	7.200	2.6833	99.980	5.59E+01	8.24E+00	1.49E+00	5.91E-01	4.74E+00
CM-242	6102.00	6086.57	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	3.31E-01	4.11E-01	2.95E-01	3.31E-01
CM-3/4	5795.02	5761.60	0.000	0.000	-4.320	4.320	2.0785	100.000	-4.44E-01	4.34E-01	1.23E+00	4.61E-01	4.34E-01
CM-5/6	5386.00	5384.87	0.000	2.000	1.280	0.720	0.8485	86.090	1.52E-01	4.68E-01	7.90E-01	2.17E-01	4.67E-01
CM-247	4946.00	4882.13	4.957	7.000	4.120	2.880	1.6971	79.300	5.31E-01	8.24E-01	1.33E+00	4.71E-01	8.21E-01
CM-248	5078.60	5068.97	29.327	25.000	24.280	0.720	0.8485	91.000	2.72E+00	1.19E+00	7.48E-01	2.05E-01	1.14E+00



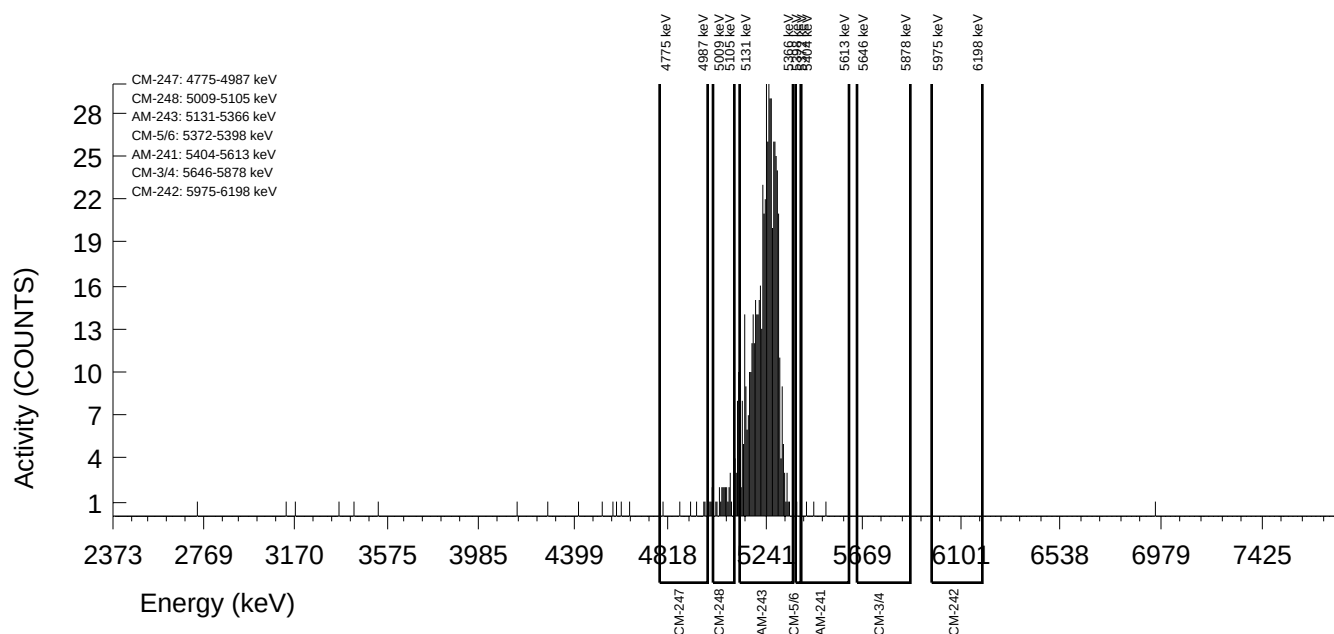
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S1205104985_AM SAMPLE QTY : 0.039 F +/-2.736 % SAMPLE DATE : 03-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 50.5 +/-4.994 %	CHAMBER : 080 DETECTOR S/N : 79197 AVERAGE %EFFICIENCY : 34.8127 AVERAGE %EFF ERROR : 0.6712 COUNT DATE : 05-Jun-2022 14:38:46 ELAPSED LIVE TIME(SEC) : 43200.00	LIB FILE : AM BKG FILE : B080.CNF;2346 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W080.CNF;596 CAL DATE : 09-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 2.3261E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5461.77	83.748	3.000	-1.320	4.320	2.0785	98.525	-1.21E-01	4.98E-01	1.10E+00	4.13E-01	4.98E-01
AM-243	5269.50	5242.18	81.777	593.000	582.920	10.080	3.1749	99.980	5.29E+01	7.60E+00	1.51E+00	6.21E-01	4.36E+00
CM-242	6102.00	6086.56	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	2.22E-01	2.75E-01	1.98E-01	2.22E-01
CM-3/4	5795.02	5761.59	0.000	0.000	-3.600	3.600	1.8974	100.000	-3.27E-01	3.61E-01	1.01E+00	3.71E-01	3.60E-01
CM-5/6	5386.00	5379.86	4.926	1.000	1.000	0.000	1.0000	86.090	1.05E-01	3.28E-01	3.16E-01	2.27E-01	3.28E-01
CM-247	4946.00	4909.40	177.348	6.000	-0.480	6.480	2.5456	79.300	-5.49E-02	7.82E-01	1.60E+00	6.28E-01	7.82E-01
CM-248	5078.60	5061.47	0.000	28.000	25.840	2.160	1.4697	91.000	2.58E+00	1.13E+00	9.31E-01	3.16E-01	1.09E+00

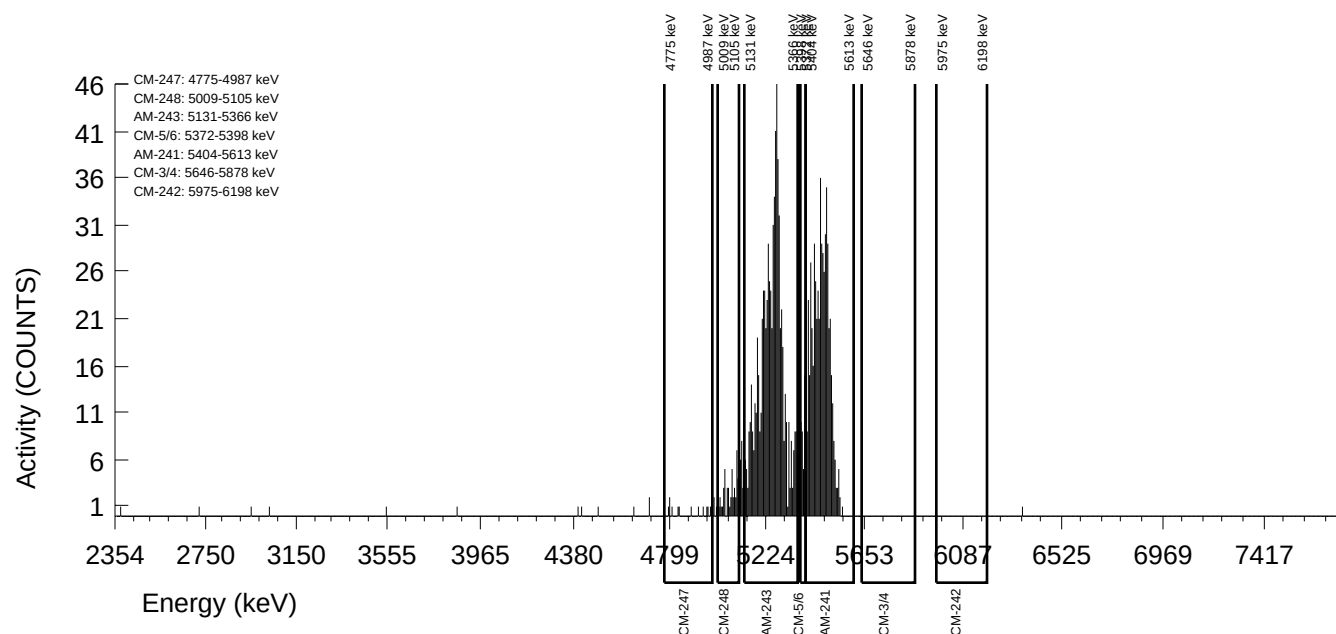


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S1205104986_AM SAMPLE QTY : 0.039 F +/-2.736 % SAMPLE DATE : 03-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 64.6 +/-4.634 %	CHAMBER : 081 DETECTOR S/N : 148987 AVERAGE %EFFICIENCY : 33.4831 AVERAGE %EFF ERROR : 0.6462 COUNT DATE : 05-Jun-2022 14:38:46 ELAPSED LIVE TIME(SEC) : 43200.00	LIB FILE : AM BKG FILE : B081.CNF;2363 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W081.CNF;610 CAL DATE : 09-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 2.9751E+00 dpm	LCS ID 0533-II NUCLIDE AM-241 NOMINAL (pCi/F) 5.0110E+01 % RECOVERY 79.729	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5467.23	92.649	539.000	533.960	5.040	2.2450	98.525	4.00E+01	5.63E+00	9.49E-01	3.62E-01	3.42E+00
AM-243	5269.50	5249.42	69.194	725.000	717.080	7.920	2.8142	99.980	5.29E+01	7.10E+00	1.12E+00	4.48E-01	3.91E+00
CM-242	6102.00	6086.56	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.80E-01	2.24E-01	1.61E-01	1.80E-01
CM-3/4	5795.02	5761.58	0.000	0.000	-2.880	2.880	1.6971	100.000	-2.12E-01	2.74E-01	7.61E-01	2.70E-01	2.74E-01
CM-5/6	5386.00	5389.29	0.000	55.000	55.000	0.000	1.0000	86.090	4.71E+00	1.37E+00	2.57E-01	1.85E-01	1.26E+00
CM-247	4946.00	4894.90	179.332	14.000	5.360	8.640	2.9394	79.300	4.98E-01	8.51E-01	1.46E+00	5.90E-01	8.50E-01
CM-248	5078.60	5069.98	0.000	56.000	55.280	0.720	0.8485	91.000	4.48E+00	1.31E+00	5.40E-01	1.48E-01	1.21E+00



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

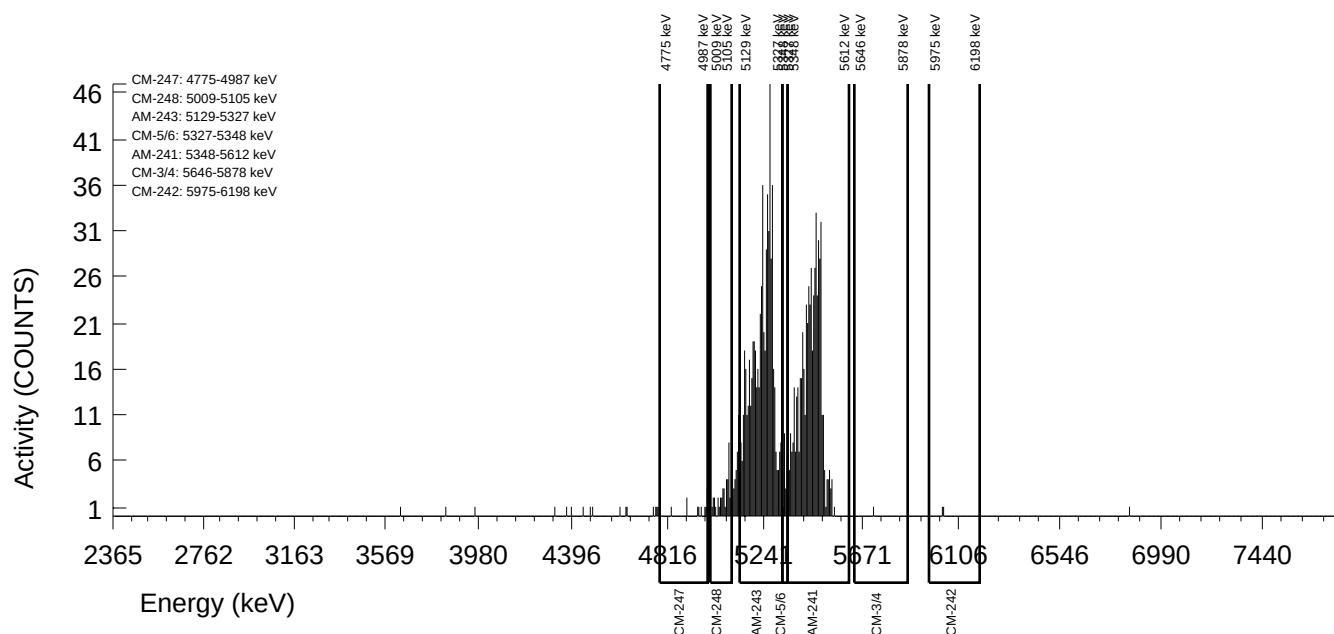
Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2272481 SAMPLE ID : S1205104987_AM SAMPLE QTY : 0.039 F +/-2.736 % SAMPLE DATE : 03-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 56.1 +/-4.812 %	CHAMBER : 082 DETECTOR S/N : 149008 AVERAGE %EFFICIENCY : 34.3414 AVERAGE %EFF ERROR : 0.6623 COUNT DATE : 05-Jun-2022 14:38:46 ELAPSED LIVE TIME(SEC) : 43200.00	LIB FILE : AM BKG FILE : B082.CNF;2361 BKG DATE : 03-Jun-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W082.CNF;609 CAL DATE : 09-May-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6089E+00 dpm RESULTS : 2.5858E+00 dpm	LCSD ID 0533-II NUCLIDE AM-241 NOMINAL (pCi/F) 5.0110E+01 % RECOVERY 90.898	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5447.11	80.957	547.000	542.680	4.320	2.0785	98.525	4.55E+01	6.50E+00	1.00E+00	3.76E-01	3.86E+00
AM-243	5269.50	5230.34	49.865	645.000	639.240	5.760	2.4000	99.980	5.29E+01	7.35E+00	1.10E+00	4.28E-01	4.14E+00
CM-242	6102.00	6032.52	9.850	2.000	1.280	0.720	0.8485	100.000	1.07E-01	3.30E-01	5.58E-01	1.53E-01	3.30E-01
CM-3/4	5795.02	5725.45	4.925	1.000	-1.880	2.880	1.6971	100.000	-1.56E-01	3.48E-01	8.54E-01	3.03E-01	3.47E-01
CM-5/6	5386.00	5336.44	6.464	18.000	18.000	0.000	1.0000	86.090	1.73E+00	8.55E-01	2.88E-01	2.07E-01	8.32E-01
CM-247	4946.00	4915.39	4.925	9.000	-3.240	12.240	3.4986	79.300	-3.38E-01	8.99E-01	1.89E+00	7.87E-01	8.99E-01
CM-248	5078.60	5070.14	19.700	47.000	44.840	2.160	1.4697	91.000	4.07E+00	1.34E+00	8.49E-01	2.88E-01	1.26E+00

NOTES:

* Regions have been manually adjusted



Batch 2265049 Check-list

This check-list was completed on 31-MAY-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 31-MAY-22 and Jessica Davis on 02-JUN-22.

Batch ID:
2265049

Product:
ASP_PUF

Description: Alpha Spec Plutonium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium

Batch ID: 2265049

Analyst: Michael Potts (MP2)

Method: DOE EML HASL-300, Pu-11-RC
Modified

Lab SOP: GL-RAD-A-011 REV# 28

Instrument: ASP-33005595

Due Dates for Lab: 05-JUN-2022

Package: 06-JUN-2022

SDG: 07-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205090028	Plutonium-239 AS SPIKE	1472-C	.1	mL
LCSD	1205090029	Plutonium-239 AS SPIKE	1472-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	579287001	25-MAY-2022	1	30	0.11118
2	579287002	25-MAY-2022	1	30	0.11549
3	579287003	25-MAY-2022	1	30	0.11403
4	579287004	25-MAY-2022	1	30	0.11518
5	579287005	25-MAY-2022	1	30	0.11218
6	579289001	25-MAY-2022	1	30.1	0.11121
7	579289002	25-MAY-2022	1	30	0.1135
8	579289003	25-MAY-2022	1	30	0.11151
9	1205090027 MB	25-MAY-2022	1		0.11549
10	1205090028 LCS	25-MAY-2022	1		0.11549
11	1205090029 LCSD	25-MAY-2022	1		0.11549

Reagent/Solvent Lot ID	Description	Amount
WORK 2010-A	Plutonium-242 AS TRACER	.1 ml

Comments:

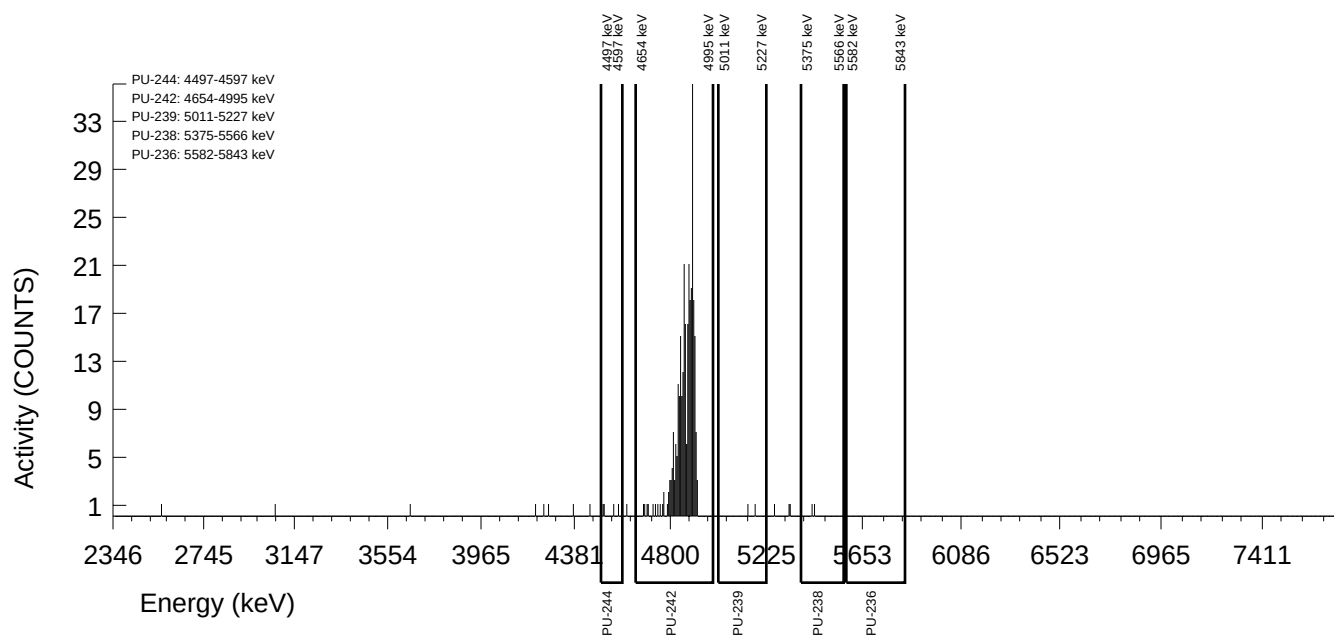
Pipet ID: RAD-ASP-184002Z
Analyzed With: Am , U
Data Entry Date2: 25-MAY-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265049 SAMPLE ID : S0579289001_PU SAMPLE QTY : 0.111 F +/-1.345 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 89.7 +/-6.148 %	CHAMBER : 107 DETECTOR S/N : 140237 AVERAGE %EFFICIENCY : 32.3545 AVERAGE %EFF ERROR : 0.6248 COUNT DATE : 31-May-2022 09:23:03 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B107.CNF;2060 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W107.CNF;599 CAL DATE : 10-May-2022
TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 3.8320E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.25	0.000	0.000	-1.200	1.200	1.0954	100.000	-7.28E-02	1.38E-01	4.26E-01	1.22E-01	1.38E-01
PU-238	5486.00	5433.03	14.848	2.000	1.040	0.960	0.9798	99.900	6.06E-02	2.07E-01	3.84E-01	1.05E-01	2.07E-01
PU-239	5155.00	5160.75	34.645	2.000	0.320	1.680	1.2961	99.900	1.86E-02	2.12E-01	4.51E-01	1.38E-01	2.12E-01
PU-242	4890.00	4868.15	41.245	299.000	297.560	1.440	1.2000	100.000	1.73E+01	2.98E+00	4.30E-01	1.28E-01	1.98E+00
PU-244	4589.00	4536.22	69.291	4.000	4.000	0.000	1.0000	99.900	2.33E-01	2.58E-01	1.75E-01	1.07E-01	2.57E-01

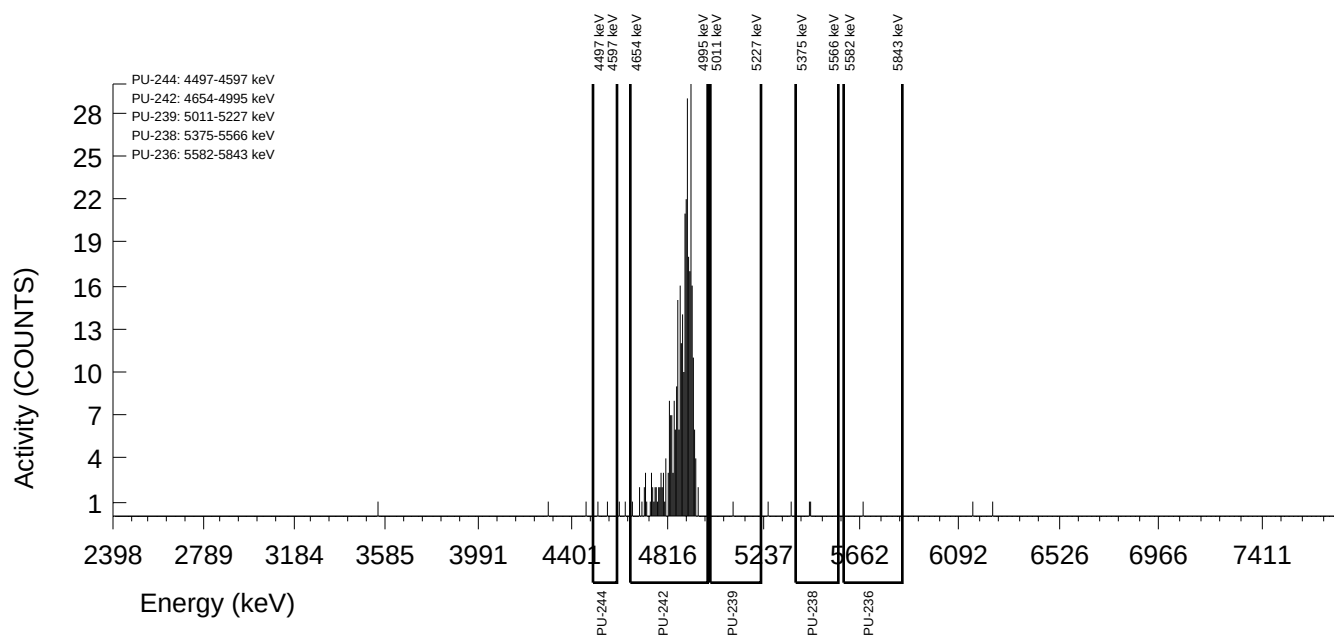


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265049 SAMPLE ID : S0579289002_PU SAMPLE QTY : 0.114 F +/-1.333 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 94.4 +/-5.792 %	CHAMBER : 108 DETECTOR S/N : 79778 AVERAGE %EFFICIENCY : 35.0005 AVERAGE %EFF ERROR : 0.6747 COUNT DATE : 31-May-2022 09:23:03 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B108.CNF;2049 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W108.CNF;594 CAL DATE : 10-May-2022
TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 4.0361E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5672.28	4.855	1.000	0.760	0.240	0.4899	100.000	3.97E-02	1.49E-01	2.50E-01	4.68E-02	1.49E-01
PU-238	5486.00	5440.47	9.710	2.000	1.280	0.720	0.8485	99.900	6.42E-02	1.77E-01	3.06E-01	7.79E-02	1.77E-01
PU-239	5155.00	5104.66	4.855	1.000	0.520	0.480	0.6928	99.900	2.60E-02	1.45E-01	2.77E-01	6.36E-02	1.45E-01
PU-242	4890.00	4876.54	50.008	340.000	339.040	0.960	0.9798	100.000	1.70E+01	2.76E+00	3.30E-01	8.98E-02	1.81E+00
PU-244	4589.00	4535.42	43.696	2.000	2.000	0.000	1.0000	99.900	1.00E-01	1.72E-01	1.50E-01	9.17E-02	1.72E-01

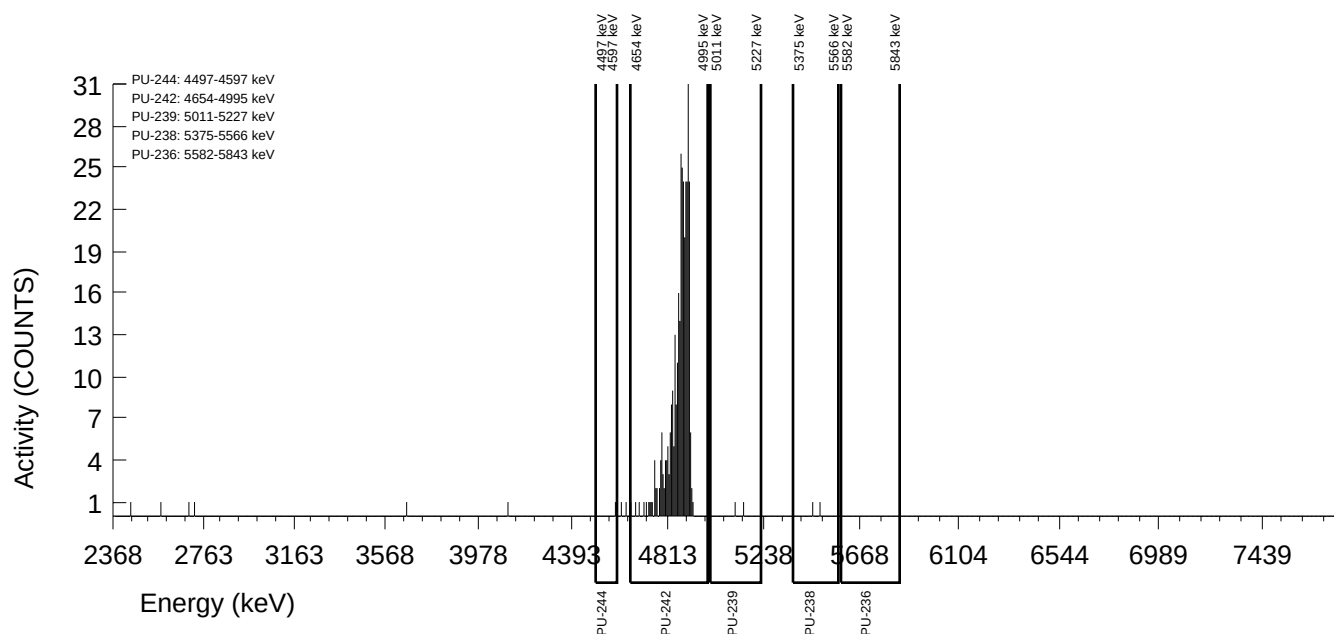


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265049 SAMPLE ID : S0579289003_PU SAMPLE QTY : 0.112 F +/-1.343 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 94.4 +/-5.771 %	CHAMBER : 109 DETECTOR S/N : 79463 AVERAGE %EFFICIENCY : 35.5425 AVERAGE %EFF ERROR : 0.6850 COUNT DATE : 31-May-2022 09:23:03 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B109.CNF;2047 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W109.CNF;588 CAL DATE : 10-May-2022
TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 4.0341E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.22	0.000	0.000	-0.480	0.480	0.6928	100.000	-2.51E-02	1.11E-01	2.90E-01	6.64E-02	1.11E-01
PU-238	5486.00	5474.26	34.338	2.000	1.280	0.720	0.8485	99.900	6.44E-02	1.77E-01	3.07E-01	7.82E-02	1.77E-01
PU-239	5155.00	5134.21	39.244	2.000	0.320	1.680	1.2961	99.900	1.61E-02	1.83E-01	3.89E-01	1.19E-01	1.83E-01
PU-242	4890.00	4868.80	46.956	347.000	344.120	2.880	1.6971	100.000	1.73E+01	2.80E+00	4.62E-01	1.56E-01	1.84E+00
PU-244	4589.00	4586.74	4.905	1.000	1.000	0.000	1.0000	99.900	5.02E-02	1.41E-01	1.51E-01	9.20E-02	1.41E-01

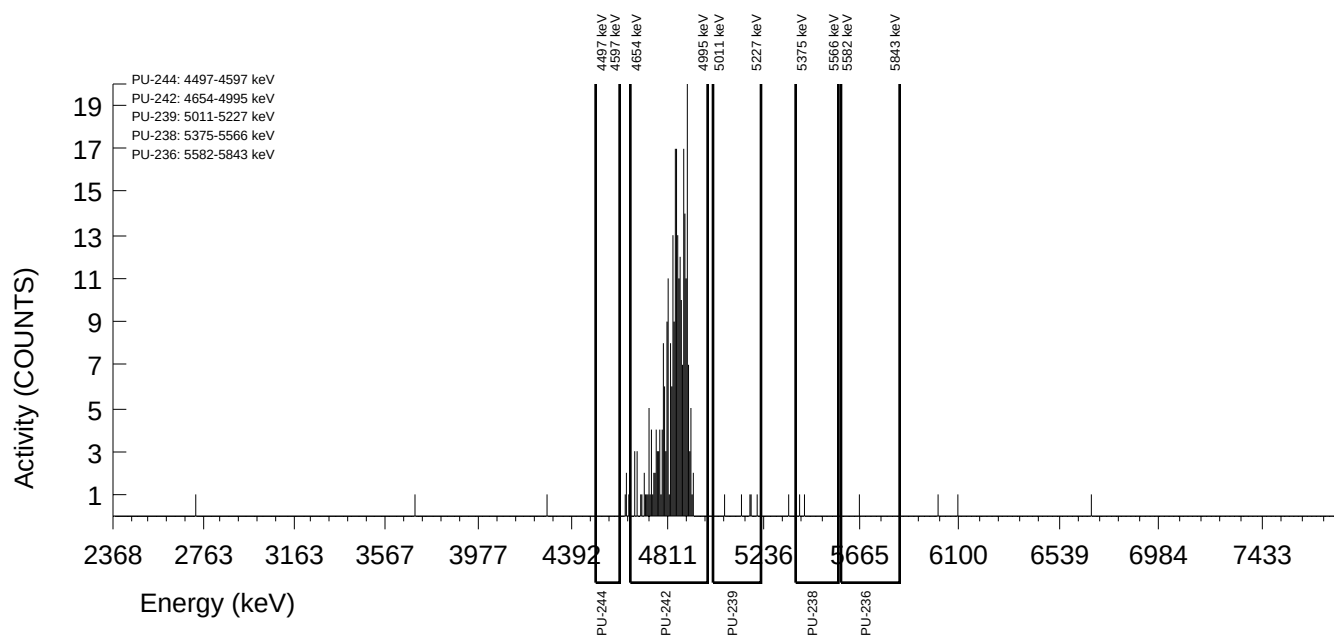


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265049 SAMPLE ID : S1205090027_PU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 85.5 +/-6.265 %	CHAMBER : 110 DETECTOR S/N : 83292 AVERAGE %EFFICIENCY : 32.6024 AVERAGE %EFF ERROR : 0.6296 COUNT DATE : 31-May-2022 09:23:03 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B110.CNF;2047 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W110.CNF;601 CAL DATE : 10-May-2022
TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 3.6562E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5659.93	4.904	1.000	1.000	0.000	1.0000	100.000	5.85E-02	1.65E-01	1.76E-01	1.07E-01	1.65E-01
PU-238	5486.00	5407.04	24.519	2.000	1.520	0.480	0.6928	99.900	8.87E-02	2.04E-01	3.23E-01	7.40E-02	2.04E-01
PU-239	5155.00	5154.79	137.308	5.000	4.040	0.960	0.9798	99.900	2.36E-01	2.88E-01	3.84E-01	1.05E-01	2.87E-01
PU-242	4890.00	4841.87	84.686	288.000	286.080	1.920	1.3856	100.000	1.67E+01	2.92E+00	4.71E-01	1.48E-01	1.94E+00
PU-244	4589.00	4546.96	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00	1.18E-01	1.75E-01	1.07E-01	1.18E-01

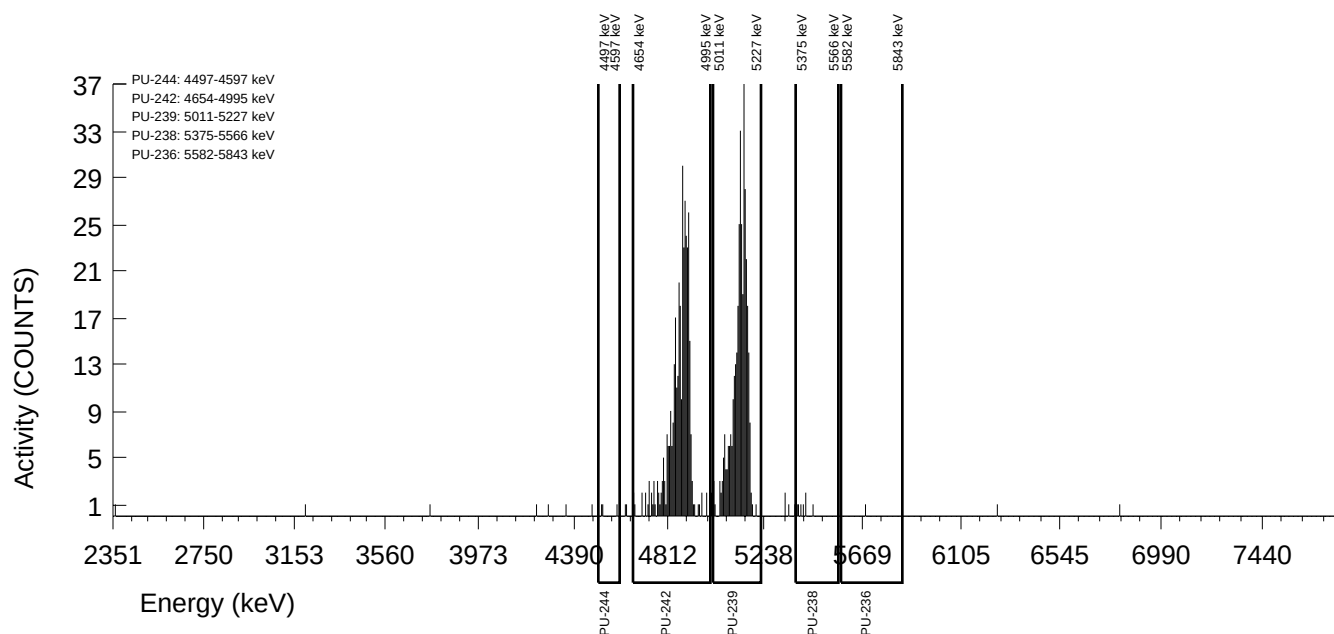


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265049 SAMPLE ID : S1205090028_PU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 101 +/-5.600 %	CHAMBER : 111 DETECTOR S/N : 140587 AVERAGE %EFFICIENCY : 35.3171 AVERAGE %EFF ERROR : 0.6807 COUNT DATE : 31-May-2022 09:23:03 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B111.CNF;2065 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W111.CNF;605 CAL DATE : 10-May-2022
TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 4.3369E+00 dpm	LCS ID 1472-C NUCLIDE PU-239 NOMINAL (pCi/F) 1.7825E+01 % RECOVERY 90.867	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5685.24	4.949	1.000	0.520	0.480	0.6928	100.000	2.37E-02	1.32E-01	2.52E-01	5.78E-02	1.32E-01
PU-238	5486.00	5410.54	4.949	7.000	6.520	0.480	0.6928	99.900	2.96E-01	2.57E-01	2.51E-01	5.76E-02	2.54E-01
PU-239	5155.00	5126.82	38.617	358.000	356.800	1.200	1.0954	99.900	1.62E+01	2.56E+00	3.18E-01	9.11E-02	1.69E+00
PU-242	4890.00	4860.78	61.858	370.000	367.600	2.400	1.5492	100.000	1.67E+01	2.62E+00	3.93E-01	1.29E-01	1.71E+00
PU-244	4589.00	4540.37	69.281	3.000	3.000	0.000	1.0000	99.900	1.36E-01	1.80E-01	1.36E-01	8.32E-02	1.79E-01

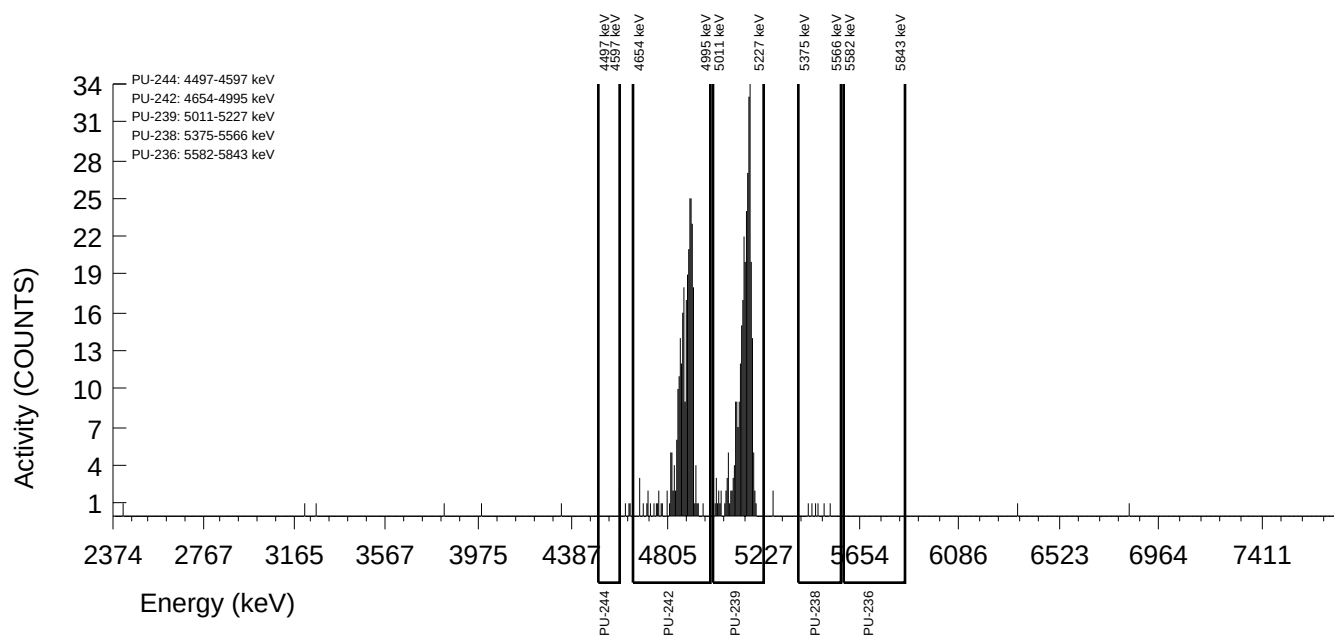


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2265049 SAMPLE ID : S1205090029_PU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 80.7 +/-6.280 %	CHAMBER : 112 DETECTOR S/N : 1558116 AVERAGE %EFFICIENCY : 34.5489 AVERAGE %EFF ERROR : 0.6662 COUNT DATE : 31-May-2022 09:23:03 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B112.CNF;2056 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W112.CNF;624 CAL DATE : 10-May-2022
TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 3.4478E+00 dpm	LCSD ID 1472-C NUCLIDE PU-239 NOMINAL (pCi/F) 1.7825E+01 % RECOVERY 101.869	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.23	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.41E-02	1.21E-01	2.81E-01	5.26E-02	1.21E-01
PU-238	5486.00	5466.29	92.686	6.000	4.080	1.920	1.3856	99.900	2.38E-01	3.15E-01	4.71E-01	1.48E-01	3.14E-01
PU-239	5155.00	5141.61	36.587	313.000	311.080	1.920	1.3856	99.900	1.82E+01	3.13E+00	4.71E-01	1.48E-01	2.03E+00
PU-242	4890.00	4877.60	57.678	289.000	285.880	3.120	1.7664	100.000	1.67E+01	2.93E+00	5.52E-01	1.89E-01	1.95E+00
PU-244	4589.00	4595.30	0.000	2.000	1.520	0.480	0.6928	99.900	8.87E-02	2.04E-01	3.23E-01	7.41E-02	2.04E-01



Batch 2265054 Check-list

This check-list was completed on 03-JUN-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 03-JUN-22 and Jessica Davis on 03-JUN-22.

Batch ID: 2265054

Product: ASP10POF

Description: Alpha Spec Polonium

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?		No	
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Polonium

Batch ID: 2265054

Analyst: Michael Potts (MP2)

Method: DOE EML HASL-300, Po-01-RC
Modified

Lab SOP: GL-RAD-A-016 REV# 19

Instrument: BAL-18550299

Due Dates for Lab: 05-JUN-2022

Package: 06-JUN-2022

SDG: 07-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205090060	Polonium-210 AS SPIKE	2012-A	.1	mL
LCSD	1205090061	Polonium-210 AS SPIKE	2012-A	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (g)	Aliquot (Filter)
1	579287001	25-MAY-2022	.5	0.356	0.10283
2	579287002	25-MAY-2022	.5	0.352	0.10124
3	579287003	25-MAY-2022	.5	0.358	0.10293
4	579287004	25-MAY-2022	.5	0.354	0.10169
5	579287005	25-MAY-2022	.5	0.359	0.10427
6	579289001	25-MAY-2022	.5	0.232	0.10371
7	579289002	25-MAY-2022	.5	0.236	0.10328
8	579289003	25-MAY-2022	.5	0.237	0.10576
9	1205090059 MB	25-MAY-2022	.5		0.10576
10	1205090060 LCS	25-MAY-2022	.5		0.10576
11	1205090061 LCSD	25-MAY-2022	.5		0.10576

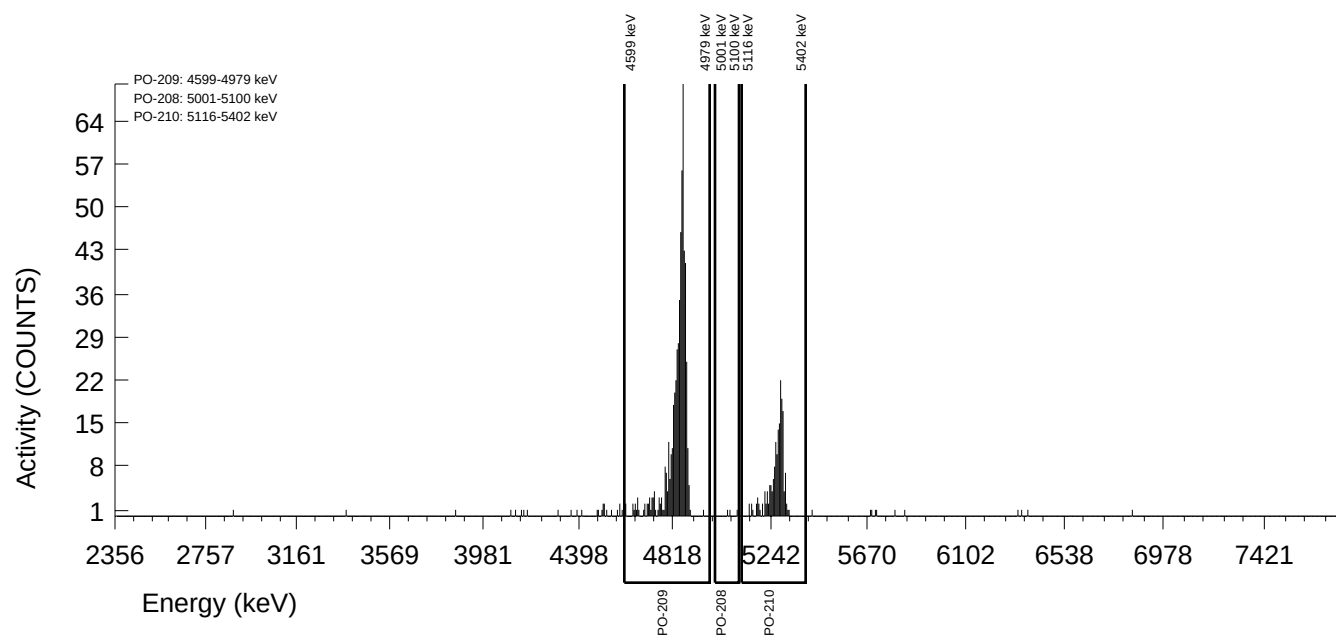
Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1720-D	Polonium-209 AS TRACER	.1 ml	Data Entry Date2: 25-MAY-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2265054 SAMPLE ID : S0579289001_PO SAMPLE QTY : 0.104 F +/-1.389 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 77.0 +/-4.858 %	CHAMBER : 131 DETECTOR S/N : 126132 AVERAGE %EFFICIENCY : 26.4787 AVERAGE %EFF ERROR : 0.5140 COUNT DATE : 01-Jun-2022 08:42:48 ELAPSED LIVE TIME(SEC) : 20660.51	LIB FILE : PO BKG FILE : B131.CNF;1769 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W131.CNF;473 CAL DATE : 11-May-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8901E+00 dpm RESULTS : 6.0751E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5073.35	0.000	3.000	3.000	0.000	1.0000	100.000	1.94E-01	2.58E-01	1.94E-01	1.23E-01	2.57E-01
PO-209	4882.00	4834.15	26.759	554.000	551.934	2.066	1.4374	99.740	3.43E+01	4.63E+00	5.27E-01	1.70E-01	2.87E+00
PO-210	5304.38	5269.84	33.413	180.000	176.557	3.443	1.8556	100.000	1.51E+01	2.77E+00	8.61E-01	3.02E-01	2.26E+00

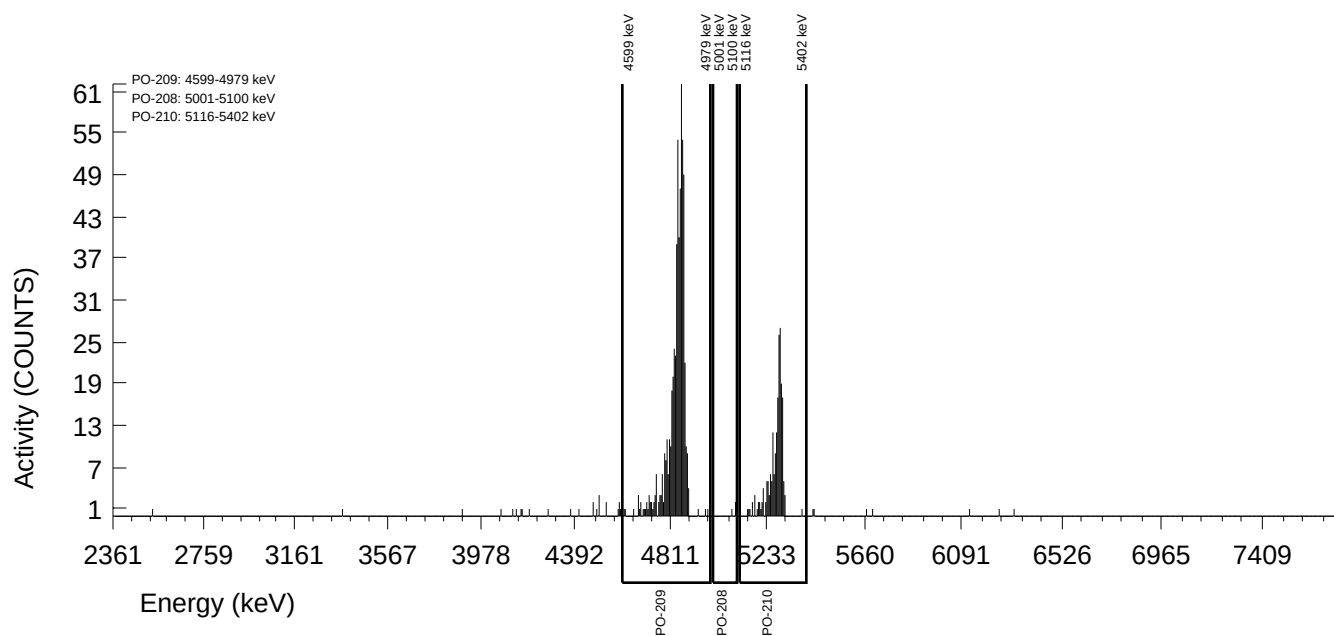


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2265054 SAMPLE ID : S0579289002_PO SAMPLE QTY : 0.103 F +/-1.392 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 79.7 +/-4.791 %	CHAMBER : 132 DETECTOR S/N : 92560 AVERAGE %EFFICIENCY : 26.7472 AVERAGE %EFF ERROR : 0.5191 COUNT DATE : 01-Jun-2022 08:42:50 ELAPSED LIVE TIME(SEC) : 20668.34	LIB FILE : PO BKG FILE : B132.CNF;1765 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W132.CNF;65 CAL DATE : 11-May-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8901E+00 dpm RESULTS : 6.2865E+00 dpm		

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5094.47	0.000	5.000	4.311	0.689	0.8300	100.000	2.67E-01	3.08E-01	3.82E-01	9.81E-02	3.06E-01
PO-209	4882.00	4835.72	35.455	583.000	577.144	5.856	2.4199	99.740	3.44E+01	4.59E+00	7.29E-01	2.75E-01	2.83E+00
PO-210	5304.38	5270.24	24.695	202.000	199.244	2.756	1.6601	100.000	1.64E+01	2.87E+00	7.66E-01	2.60E-01	2.30E+00

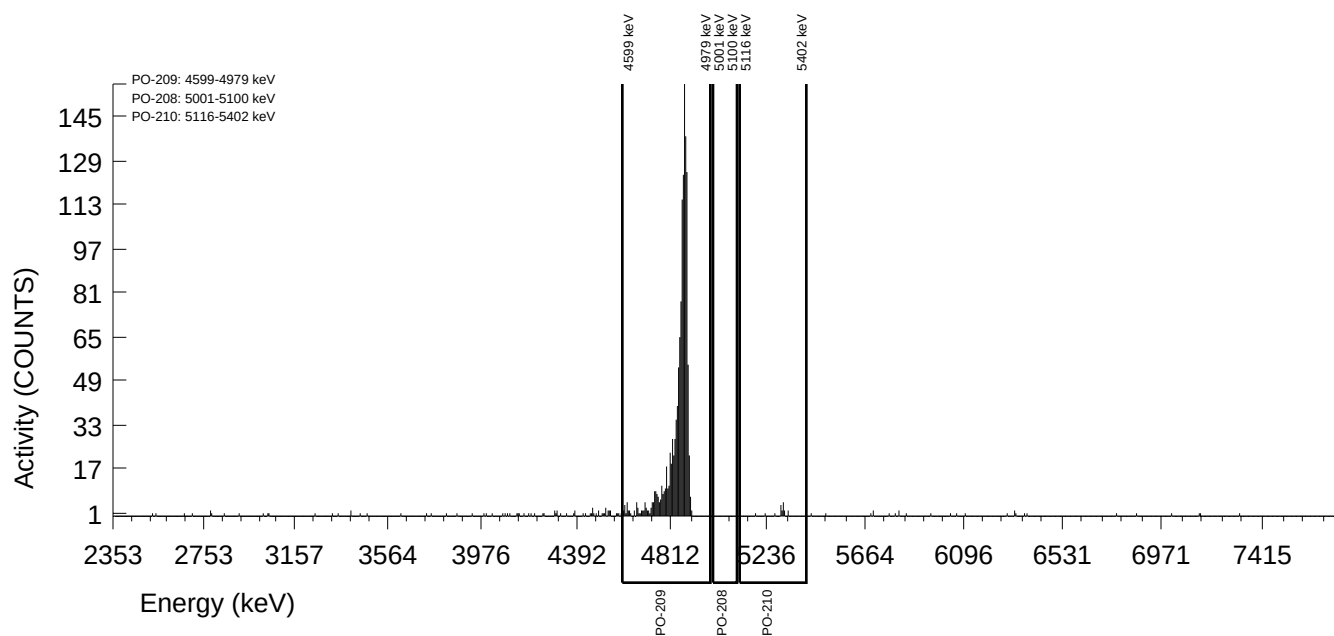


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2265054 SAMPLE ID : S0579289003_PO SAMPLE QTY : 0.106 F +/-1.376 % SAMPLE DATE : 29-Mar-2022 00:00:00 ANALYST : MP2 % YIELD : 63.6 +/-3.625 %	CHAMBER : 114 DETECTOR S/N : 155766 AVERAGE %EFFICIENCY : 26.1664 AVERAGE %EFF ERROR : 0.5081 COUNT DATE : 02-Jun-2022 14:32:51 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B114.CNF;1780 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W114.CNF;501 CAL DATE : 11-May-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8901E+00 dpm RESULTS : 5.0207E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5050.47	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	7.41E-02	8.01E-02	6.21E-02	7.40E-02
PO-209	4882.00	4843.58	28.108	1320.000	1309.000	11.000	3.3166	99.740	3.36E+01	3.40E+00	4.73E-01	1.98E-01	1.84E+00
PO-210	5304.38	5291.88	15.959	18.000	11.000	7.000	2.6458	100.000	3.92E-01	3.64E-01	5.45E-01	2.19E-01	3.63E-01

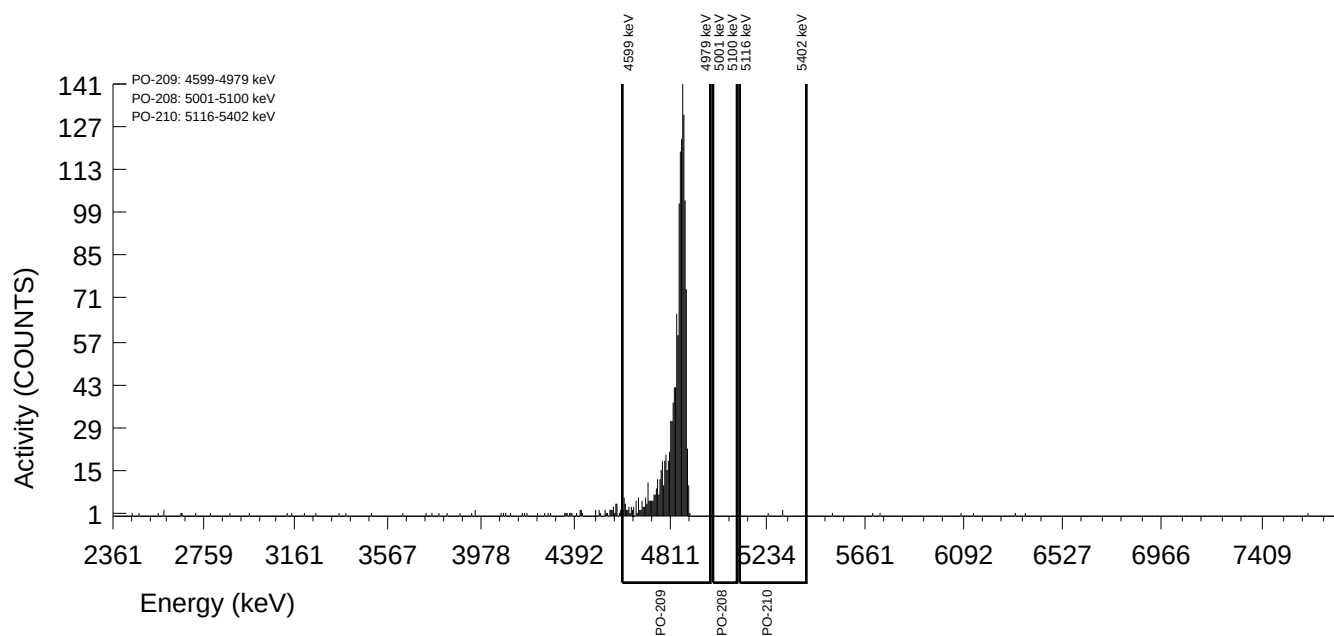


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2265054 SAMPLE ID : S1205090059_PO SAMPLE QTY : 0.106 F +/-1.376 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 68.1 +/-3.538 %	CHAMBER : 125 DETECTOR S/N : 84060 AVERAGE %EFFICIENCY : 26.3728 AVERAGE %EFF ERROR : 0.5120 COUNT DATE : 02-Jun-2022 14:32:48 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B125.CNF;1755 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W125.CNF;492 CAL DATE : 11-May-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8833E+00 dpm RESULTS : 5.3687E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5050.47	0.000	0.000	-1.000	1.000	1.0000	100.000	-2.39E-02	8.10E-02	1.83E-01	5.55E-02	8.10E-02
PO-209	4882.00	4832.27	33.649	1419.000	1412.000	7.000	2.6458	99.740	3.36E+01	3.31E+00	3.64E-01	1.46E-01	1.76E+00
PO-210	5304.38	5281.50	4.949	3.000	-3.000	6.000	2.4495	100.000	-7.44E-02	1.61E-01	3.57E-01	1.41E-01	1.61E-01

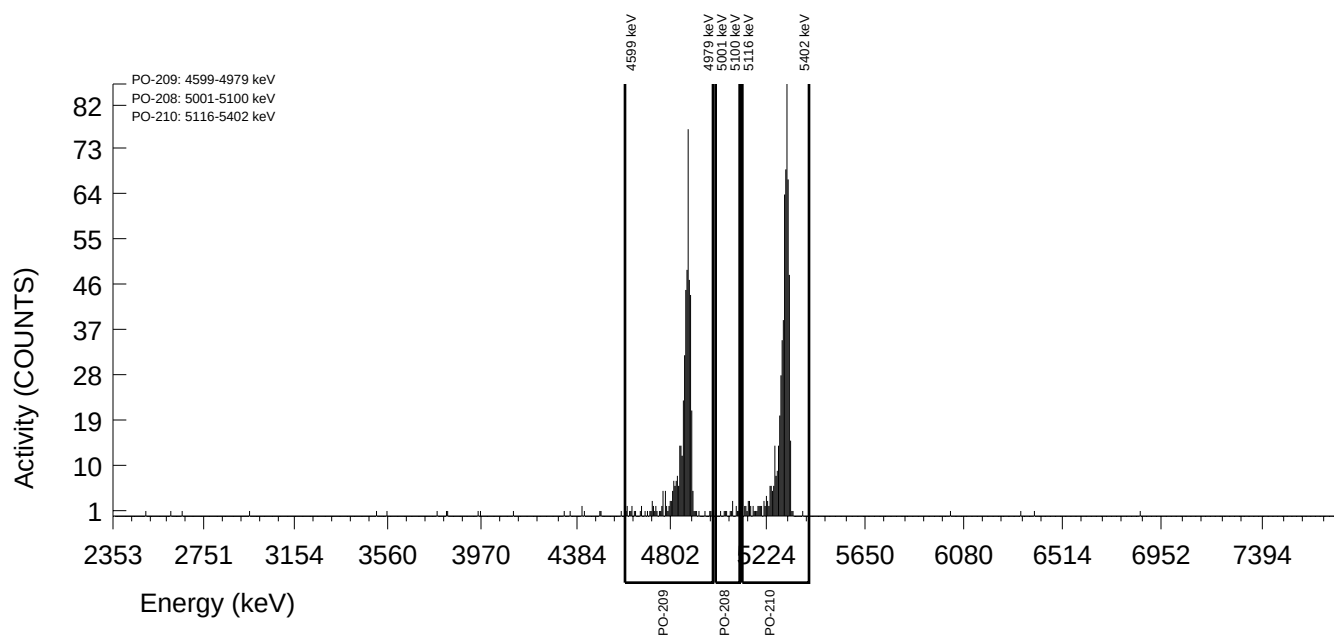


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2265054 SAMPLE ID : S1205090060_PO SAMPLE QTY : 0.106 F +/-1.376 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 67.6 +/-5.140 %	CHAMBER : 135 DETECTOR S/N : 80005 AVERAGE %EFFICIENCY : 26.1031 AVERAGE %EFF ERROR : 0.5069 COUNT DATE : 01-Jun-2022 08:42:57 ELAPSED LIVE TIME(SEC) : 20678.69	LIB FILE : PO BKG FILE : B135.CNF;1761 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W135.CNF;477 CAL DATE : 11-May-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8833E+00 dpm RESULTS : 5.3308E+00 dpm	LCS ID : 2012-A NUCLIDE : PO-210 NOMINAL (pCi/F) : 4.4363E+01 % RECOVERY : 94.628	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5064.29	21.052	13.000	12.311	0.689	0.8302	100.000	8.66E-01	5.31E-01	4.34E-01	1.11E-01	5.23E-01
PO-209	4882.00	4852.38	23.474	480.000	478.277	1.723	1.3127	99.740	3.36E+01	4.80E+00	5.62E-01	1.76E-01	3.02E+00
PO-210	5304.38	5289.72	24.725	582.000	577.520	4.480	2.1167	100.000	4.20E+01	5.80E+00	8.05E-01	2.93E-01	3.44E+00

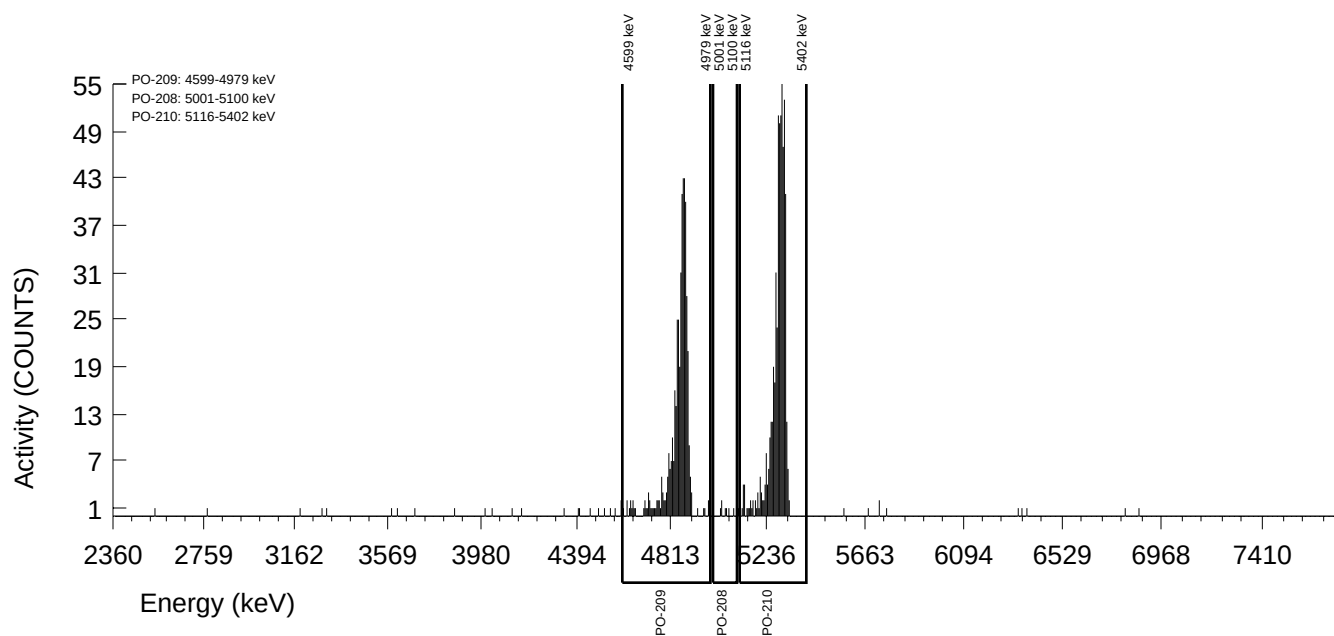


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2265054 SAMPLE ID : S1205090061_PO SAMPLE QTY : 0.106 F +/-1.376 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 63.9 +/-5.217 %	CHAMBER : 136 DETECTOR S/N : 140243 AVERAGE %EFFICIENCY : 26.5746 AVERAGE %EFF ERROR : 0.5158 COUNT DATE : 01-Jun-2022 08:42:59 ELAPSED LIVE TIME(SEC) : 20686.36	LIB FILE : PO BKG FILE : B136.CNF;377 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W136.CNF;70 CAL DATE : 11-May-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8833E+00 dpm RESULTS : 5.0339E+00 dpm	LCSD ID2012-A NUCLIDEPO-210 NOMINAL (pCi/F)4.4363E+01 % RECOVERY93.642	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			1.96-sigma
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
PO-208	5080.00	5051.32	7.438	7.000	6.655	0.345	0.5872	100.000	4.87E-01	4.15E-01	3.83E-01	8.19E-02	4.12E-01
PO-209	4882.00	4844.40	45.851	461.000	459.966	1.034	1.0170	99.740	3.36E+01	4.87E+00	5.02E-01	1.42E-01	3.08E+00
PO-210	5304.38	5282.04	43.217	551.000	549.621	1.379	1.1743	100.000	4.15E+01	5.82E+00	5.65E-01	1.69E-01	3.48E+00



Continuing Calibration Data

Review of Alpha Spectrometer QA results (Daily checks) 30-MAY-2022 11:03:10.39

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
30-MAY-2022	18	PSFWHM-5000	Above
30-MAY-2022	18	PSCTSS-5000	Below
30-MAY-2022	23	PSFWHM-5000	Above
30-MAY-2022	23	PSCTSS-5000	Below
30-MAY-2022	46	PSFWHM-5000	Below
30-MAY-2022	46	PSCTSS-5000	Below
30-MAY-2022	91	PSENERGY-5000	Above
30-MAY-2022	91	PSCENTRD-5000	Above
30-MAY-2022	94	PSFWHM-5000	Below
30-MAY-2022	94	PSCTSS-5000	Below
30-MAY-2022	101	PSFWHM-5000	Below
30-MAY-2022	101	PSCTSS-5000	Below
30-MAY-2022	143	PSENERGY-5000	Above
30-MAY-2022	143	PSCENTRD-5000	Above
30-MAY-2022	145	PSENERGY-5000	Below
30-MAY-2022	162	PSENERGY-5000	Above
30-MAY-2022	172	PSENERGY-5000	Above
30-MAY-2022	173	PSCTSS-5000	Below
30-MAY-2022	176	PSFWHM-5000	Above
30-MAY-2022	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transferred to the QA file

115 may not have run since 30-MAY-2022
116 may not have run since 30-MAY-2022
119 may not have run since 30-MAY-2022
120 may not have run since 30-MAY-2022
147 may not have run since 30-MAY-2022
148 may not have run since 30-MAY-2022
157 may not have run since 30-MAY-2022
158 may not have run since 30-MAY-2022
163 may not have run since 30-MAY-2022
164 may not have run since 30-MAY-2022
183 may not have run since 30-MAY-2022
184 may not have run since 30-MAY-2022
198 may not have run since 30-MAY-2022
221 may not have run since 30-MAY-2022
227 may not have run since 30-MAY-2022
228 may not have run since 30-MAY-2022
241 may not have run since 30-MAY-2022
242 may not have run since 30-MAY-2022
247 may not have run since 30-MAY-2022
248 may not have run since 30-MAY-2022

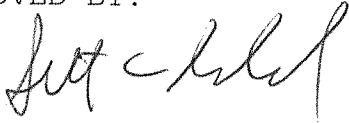
APPROVAL DATE:

5/30/22

APPROVAL TIME:

1110

APPROVED BY:



PROCEDURE # GL-RAD-I-009

Report completed at 30-MAY-2022 11:05:31.51

Review of Alpha Spectrometer QA results (Daily checks) 31-MAY-2022 10:13:21.48

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
31-MAY-2022	23	PSFWHM-5000	Above
31-MAY-2022	23	PSCTSS-5000	Below
31-MAY-2022	46	PSFWHM-5000	Below
31-MAY-2022	46	PSCTSS-5000	Below
31-MAY-2022	91	PSENERGY-5000	Above
31-MAY-2022	91	PSCENTRD-5000	Above
31-MAY-2022	94	PSFWHM-5000	Below
31-MAY-2022	94	PSCTSS-5000	Below
31-MAY-2022	101	PSFWHM-5000	Below
31-MAY-2022	101	PSCTSS-5000	Below
31-MAY-2022	143	PSENERGY-5000	Above
31-MAY-2022	143	PSCENTRD-5000	Above
31-MAY-2022	144	PSENERGY-5000	Below
31-MAY-2022	145	PSENERGY-5000	Below
31-MAY-2022	162	PSENERGY-5000	Above
31-MAY-2022	172	PSENERGY-5000	Above
31-MAY-2022	173	PSCTSS-5000	Below
31-MAY-2022	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transferred to the QA file

115 may not have run since 31-MAY-2022
116 may not have run since 31-MAY-2022
119 may not have run since 31-MAY-2022

120 may not have run since 31-MAY-2022
147 may not have run since 31-MAY-2022
148 may not have run since 31-MAY-2022
157 may not have run since 31-MAY-2022
158 may not have run since 31-MAY-2022
163 may not have run since 31-MAY-2022
164 may not have run since 31-MAY-2022
183 may not have run since 31-MAY-2022
184 may not have run since 31-MAY-2022
198 may not have run since 31-MAY-2022
211 may not have run since 31-MAY-2022
212 may not have run since 31-MAY-2022
221 may not have run since 31-MAY-2022
227 may not have run since 31-MAY-2022
228 may not have run since 31-MAY-2022
241 may not have run since 31-MAY-2022
242 may not have run since 31-MAY-2022
247 may not have run since 31-MAY-2022
248 may not have run since 31-MAY-2022

APPROVAL DATE: 5/31/22

APPROVAL TIME: 1017

APPROVED BY:



PROCEDURE # GL-RAD-I-009

Report completed at 31-MAY-2022 10:15:55.39

Review of Alpha Spectrometer QA results (Daily checks) 1-JUN-2022 09:18:37.67

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
1-JUN-2022	23	PSFWHM-5000	Above
1-JUN-2022	23	PSCTSS-5000	Below
1-JUN-2022	46	PSFWHM-5000	Below
1-JUN-2022	46	PSCTSS-5000	Below
1-JUN-2022	91	PSENERGY-5000	Above
1-JUN-2022	91	PSCENTRD-5000	Above
1-JUN-2022	94	PSFWHM-5000	Below
1-JUN-2022	94	PSCTSS-5000	Below
1-JUN-2022	101	PSFWHM-5000	Below
1-JUN-2022	101	PSCTSS-5000	Below
1-JUN-2022	143	PSENERGY-5000	Above
1-JUN-2022	143	PSCENTRD-5000	Above
1-JUN-2022	144	Second Check Required for D	
1-JUN-2022	145	PSENERGY-5000	Below
1-JUN-2022	162	PSENERGY-5000	Above
1-JUN-2022	172	PSENERGY-5000	Above
1-JUN-2022	173	PSCTSS-5000	Below
1-JUN-2022	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

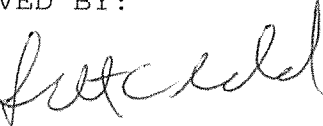
The following detectors that may not have properly transferred to the QA file

115 may not have run since 1-JUN-2022
116 may not have run since 1-JUN-2022
119 may not have run since 1-JUN-2022

120 may not have run since 1-JUN-2022
147 may not have run since 1-JUN-2022
148 may not have run since 1-JUN-2022
157 may not have run since 1-JUN-2022
158 may not have run since 1-JUN-2022
163 may not have run since 1-JUN-2022
164 may not have run since 1-JUN-2022
183 may not have run since 1-JUN-2022
184 may not have run since 1-JUN-2022
198 may not have run since 1-JUN-2022
221 may not have run since 1-JUN-2022
227 may not have run since 1-JUN-2022
228 may not have run since 1-JUN-2022
241 may not have run since 1-JUN-2022
242 may not have run since 1-JUN-2022
247 may not have run since 1-JUN-2022
248 may not have run since 1-JUN-2022

APPROVAL DATE:
6/1/22

APPROVAL TIME:
1000

APPROVED BY:


PROCEDURE # GL-RAD-I-009

Report completed at 1-JUN-2022 09:21:25.03

Review of Alpha Spectrometer QA results (Daily checks) 2-JUN-2022 23:00:00.85

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
2-JUN-2022	23	PSFWHM-5000	Above
2-JUN-2022	23	PSCTSS-5000	Below
2-JUN-2022	46	PSFWHM-5000	Below
2-JUN-2022	46	PSCTSS-5000	Below
2-JUN-2022	91	PSENERGY-5000	Above
2-JUN-2022	91	PSCENTRD-5000	Above
2-JUN-2022	94	PSFWHM-5000	Below
2-JUN-2022	94	PSCTSS-5000	Below
2-JUN-2022	101	PSFWHM-5000	Below
2-JUN-2022	101	PSCTSS-5000	Below
2-JUN-2022	143	PSENERGY-5000	Above
2-JUN-2022	143	PSCENTRD-5000	Above
2-JUN-2022	145	PSENERGY-5000	Below
2-JUN-2022	162	PSENERGY-5000	Above
2-JUN-2022	172	PSENERGY-5000	Above
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transferred to the QA file

115	may not have run since 2-JUN-2022
116	may not have run since 2-JUN-2022
119	may not have run since 2-JUN-2022
120	may not have run since 2-JUN-2022
147	may not have run since 2-JUN-2022
148	may not have run since 2-JUN-2022
157	may not have run since 2-JUN-2022
158	may not have run since 2-JUN-2022
163	may not have run since 2-JUN-2022

164 may not have run since 2-JUN-2022
183 may not have run since 2-JUN-2022
184 may not have run since 2-JUN-2022
198 may not have run since 2-JUN-2022
221 may not have run since 2-JUN-2022
227 may not have run since 2-JUN-2022
228 may not have run since 2-JUN-2022
241 may not have run since 2-JUN-2022
242 may not have run since 2-JUN-2022
243 may not have run since 2-JUN-2022
247 may not have run since 2-JUN-2022
248 may not have run since 2-JUN-2022

APPROVAL DATE:

6/2/2022

APPROVAL TIME:

23:10

APPROVED BY:



PROCEDURE # GL-RAD-I-009

Report completed at 2-JUN-2022 23:04:31.82

Review of Alpha Spectrometer QA results (Daily checks) 5-JUN-2022 08:20:48.90

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
5-JUN-2022	18	PSFWHM-5000	Above
5-JUN-2022	18	PSCTSS-5000	Below
5-JUN-2022	23	PSFWHM-5000	Above
5-JUN-2022	46	PSFWHM-5000	Below
5-JUN-2022	46	PSCTSS-5000	Below
5-JUN-2022	91	PSENERGY-5000	Above
5-JUN-2022	91	PSCENTRD-5000	Above
5-JUN-2022	94	PSFWHM-5000	Below
5-JUN-2022	94	PSCTSS-5000	Below
5-JUN-2022	101	PSFWHM-5000	Below
5-JUN-2022	101	PSCTSS-5000	Below
5-JUN-2022	143	PSENERGY-5000	Above
5-JUN-2022	143	PSCENTRD-5000	Above
5-JUN-2022	144	PSENERGY-5000	Below
5-JUN-2022	145	PSENERGY-5000	Below
5-JUN-2022	153	Second Check Required for D	
5-JUN-2022	162	PSENERGY-5000	Above
5-JUN-2022	172	PSFWHM-5000	Above
5-JUN-2022	172	PSENERGY-5000	Above
5-JUN-2022	173	PSCTSS-5000	Below
5-JUN-2022	176	PSFWHM-5000	Above
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
5-JUN-2022	199	PSCTSS-5000	Below
5-JUN-2022	212	PSFWHM-5000	Above
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below

20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transfered to the QA file

115	may not have run since 5-JUN-2022
116	may not have run since 5-JUN-2022
119	may not have run since 5-JUN-2022
120	may not have run since 5-JUN-2022
147	may not have run since 5-JUN-2022
148	may not have run since 5-JUN-2022
157	may not have run since 5-JUN-2022
158	may not have run since 5-JUN-2022
163	may not have run since 5-JUN-2022
164	may not have run since 5-JUN-2022
183	may not have run since 5-JUN-2022
184	may not have run since 5-JUN-2022
198	may not have run since 5-JUN-2022
221	may not have run since 5-JUN-2022
227	may not have run since 5-JUN-2022
228	may not have run since 5-JUN-2022
241	may not have run since 5-JUN-2022
242	may not have run since 5-JUN-2022
247	may not have run since 5-JUN-2022
248	may not have run since 5-JUN-2022

APPROVAL DATE:

6/5/2022

APPROVAL TIME:

8:30

APPROVED BY:



PROCEDURE # GL-RAD-I-009

Report completed at 5-JUN-2022 08:23:43.49

Review of Alpha Spectrometer QA results (Daily checks) 6-JUN-2022 23:00:00.91

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
6-JUN-2022	18	PSFWHM-5000	Above
6-JUN-2022	18	PSCTSS-5000	Below
6-JUN-2022	23	PSFWHM-5000	Above
6-JUN-2022	46	PSFWHM-5000	Below
6-JUN-2022	46	PSCTSS-5000	Below
6-JUN-2022	91	PSENERGY-5000	Above
6-JUN-2022	91	PSCENTRD-5000	Above
6-JUN-2022	94	PSFWHM-5000	Below
6-JUN-2022	94	PSCTSS-5000	Below
6-JUN-2022	101	PSFWHM-5000	Below
6-JUN-2022	101	PSCTSS-5000	Below
6-JUN-2022	143	PSENERGY-5000	Above
6-JUN-2022	143	PSCENTRD-5000	Above
6-JUN-2022	144	PSENERGY-5000	Below
6-JUN-2022	145	PSENERGY-5000	Below
6-JUN-2022	161	PSFWHM-5000	Above
6-JUN-2022	162	PSENERGY-5000	Above
6-JUN-2022	172	PSFWHM-5000	Above
6-JUN-2022	172	PSENERGY-5000	Above
6-JUN-2022	173	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
6-JUN-2022	212	PSFWHM-5000	Above
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transfered to the QA file

115	may not have run since 6-JUN-2022
116	may not have run since 6-JUN-2022
119	may not have run since 6-JUN-2022
120	may not have run since 6-JUN-2022
147	may not have run since 6-JUN-2022
148	may not have run since 6-JUN-2022
157	may not have run since 6-JUN-2022
158	may not have run since 6-JUN-2022
163	may not have run since 6-JUN-2022
164	may not have run since 6-JUN-2022
183	may not have run since 6-JUN-2022
184	may not have run since 6-JUN-2022
198	may not have run since 6-JUN-2022
221	may not have run since 6-JUN-2022
227	may not have run since 6-JUN-2022
228	may not have run since 6-JUN-2022
241	may not have run since 6-JUN-2022
242	may not have run since 6-JUN-2022
247	may not have run since 6-JUN-2022
248	may not have run since 6-JUN-2022

APPROVAL DATE: 6/6/2022

APPROVAL TIME: 23:10

APPROVED BY:

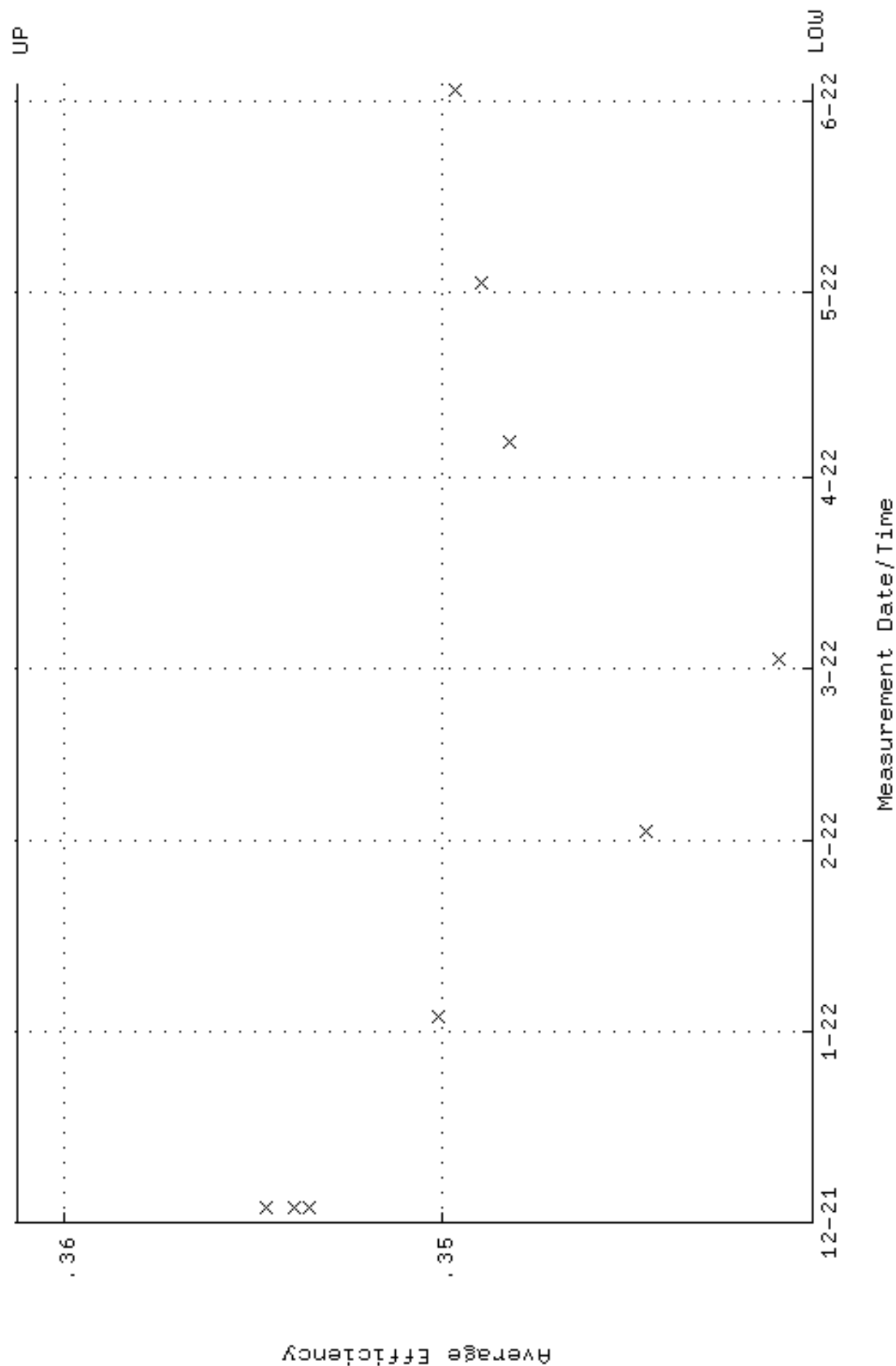


PROCEDURE # GL-RAD-I-009

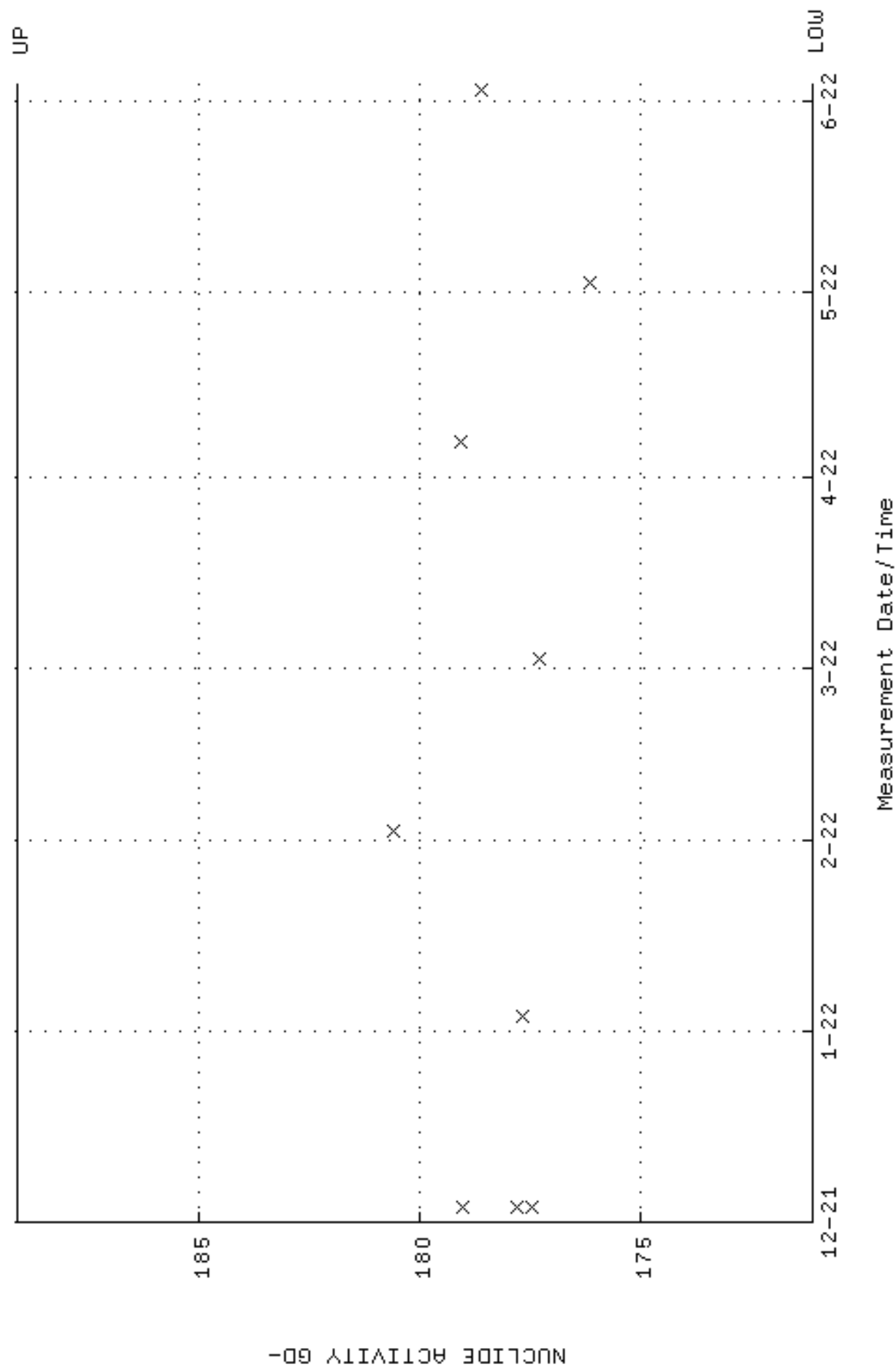
Report completed at 6-JUN-2022 23:02:17.86

Background and Efficiency Data

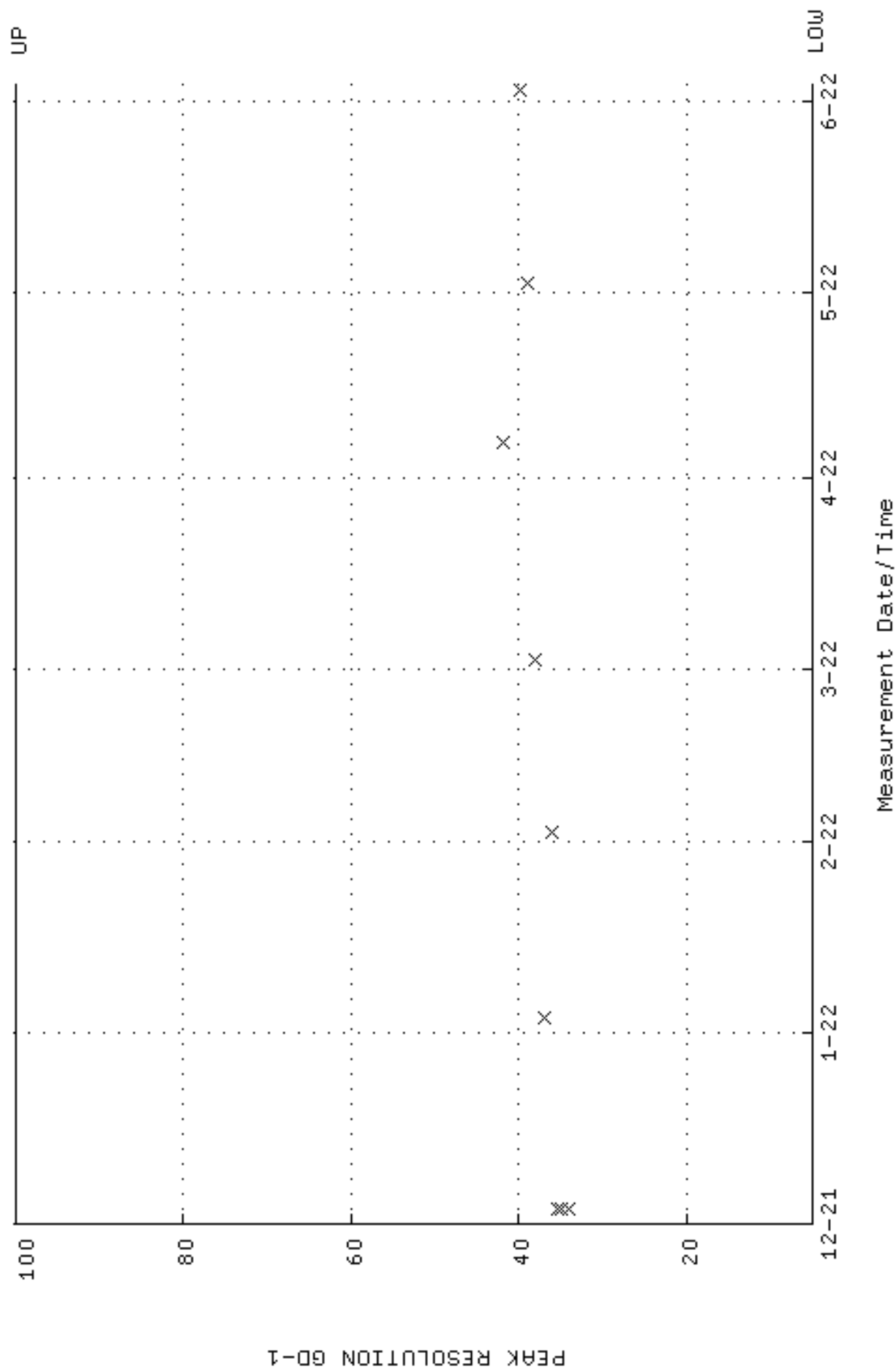
QA filename : DKA100:[ENV_ALPHA.QA.W]W009.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.340180 through 0.361220



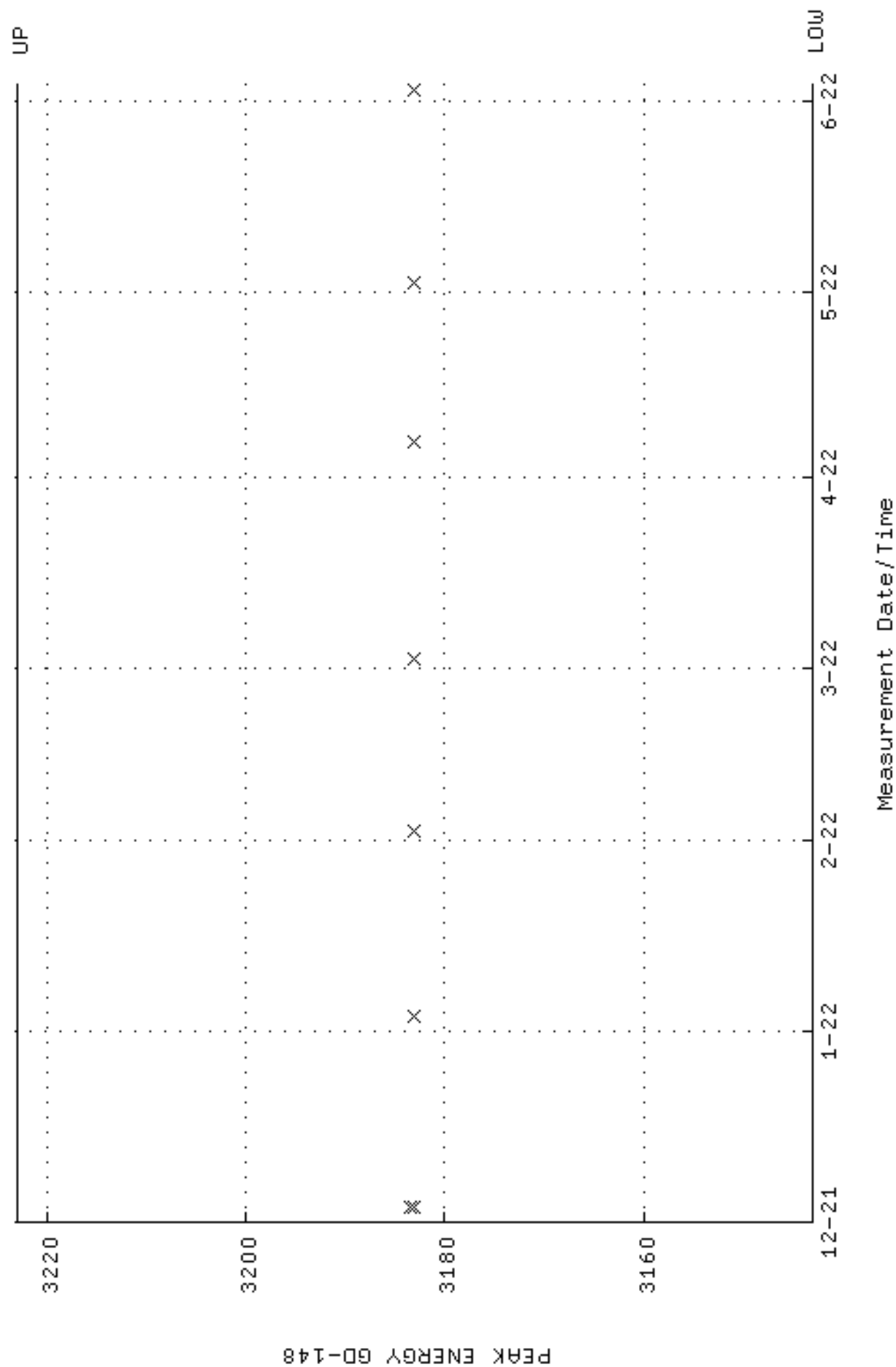
QA filename : DKA100:[ENV_ALPHA.QA.W]W009.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



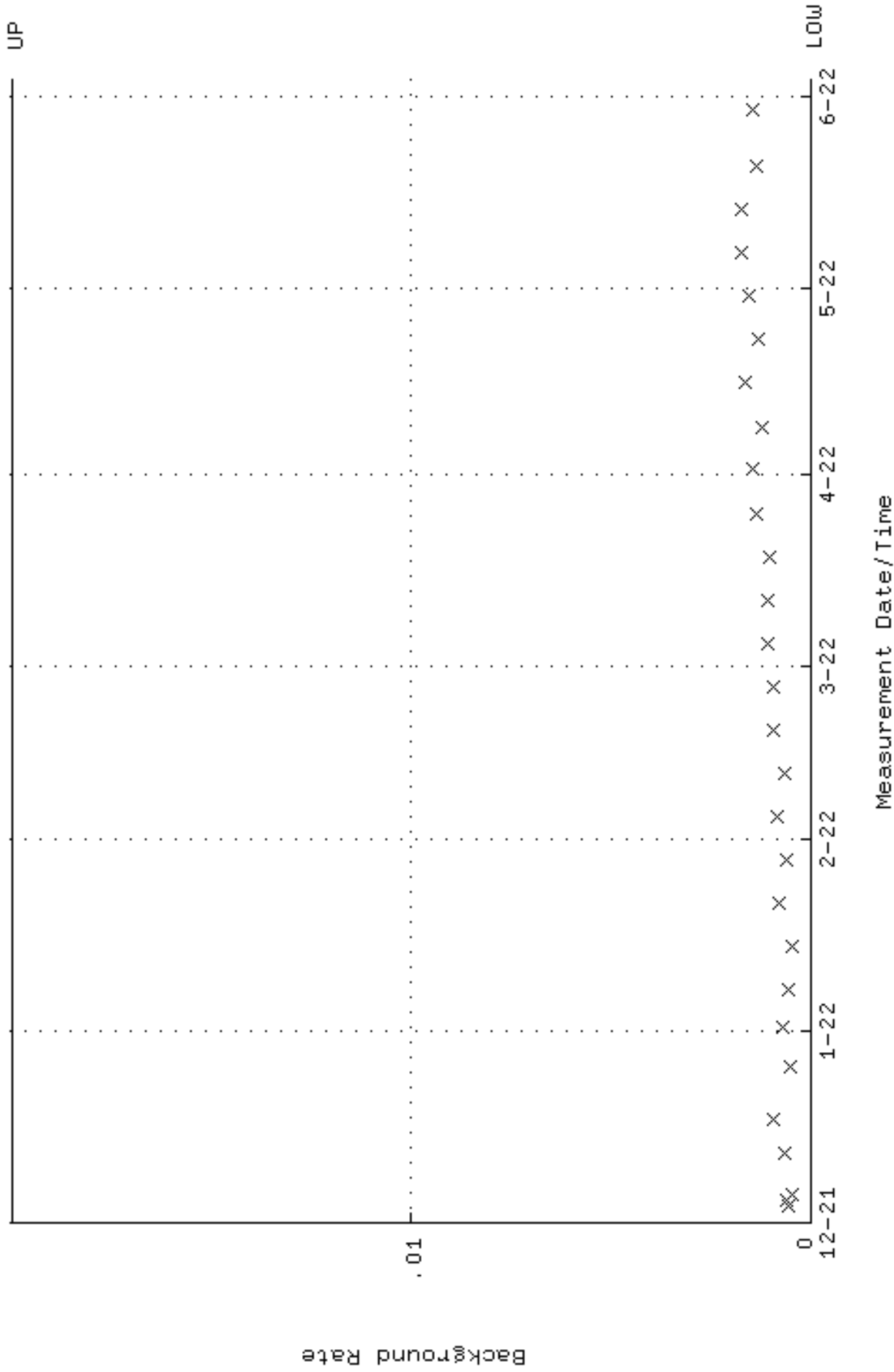
QA filename : DKA100:[ENV_ALPHA.QA.W]W009.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



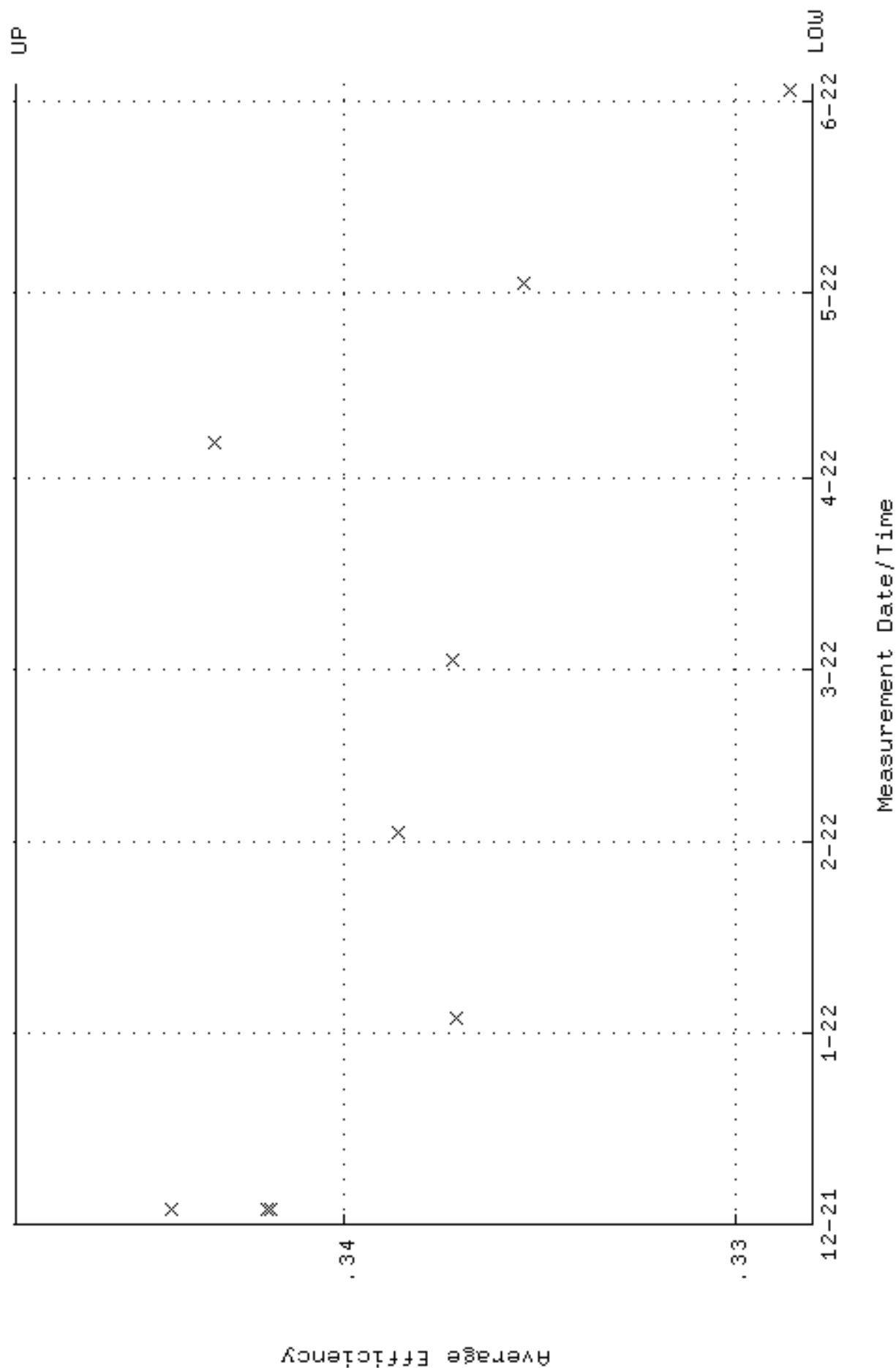
QA filename : DKA100:[ENV_ALPHA.QA.W]W009.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



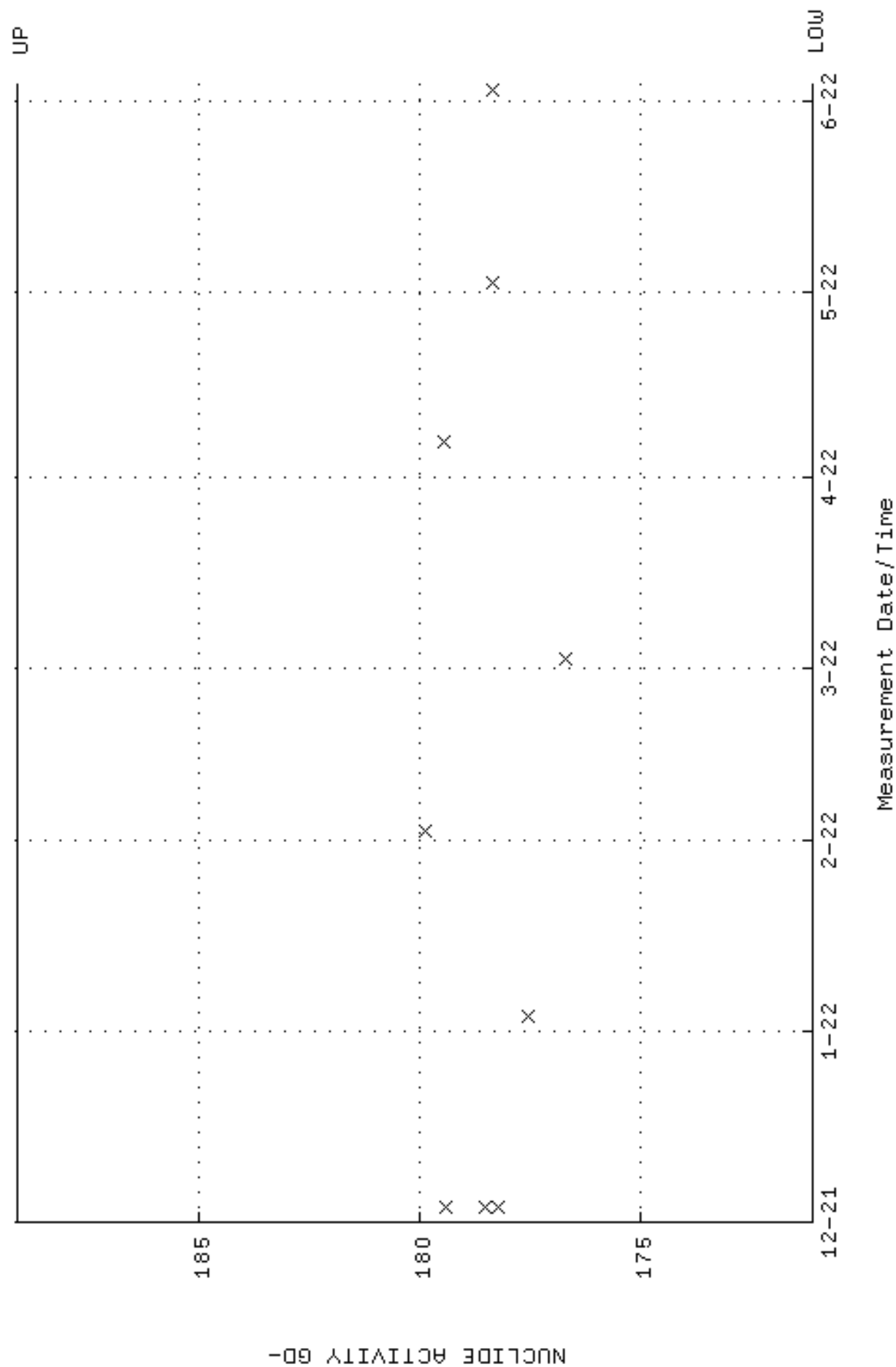
QA filename : DKA100:[ENV_ALPHA.QA.B]B009.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 3-DEC-2021 15:54:20 through 3-JUN-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



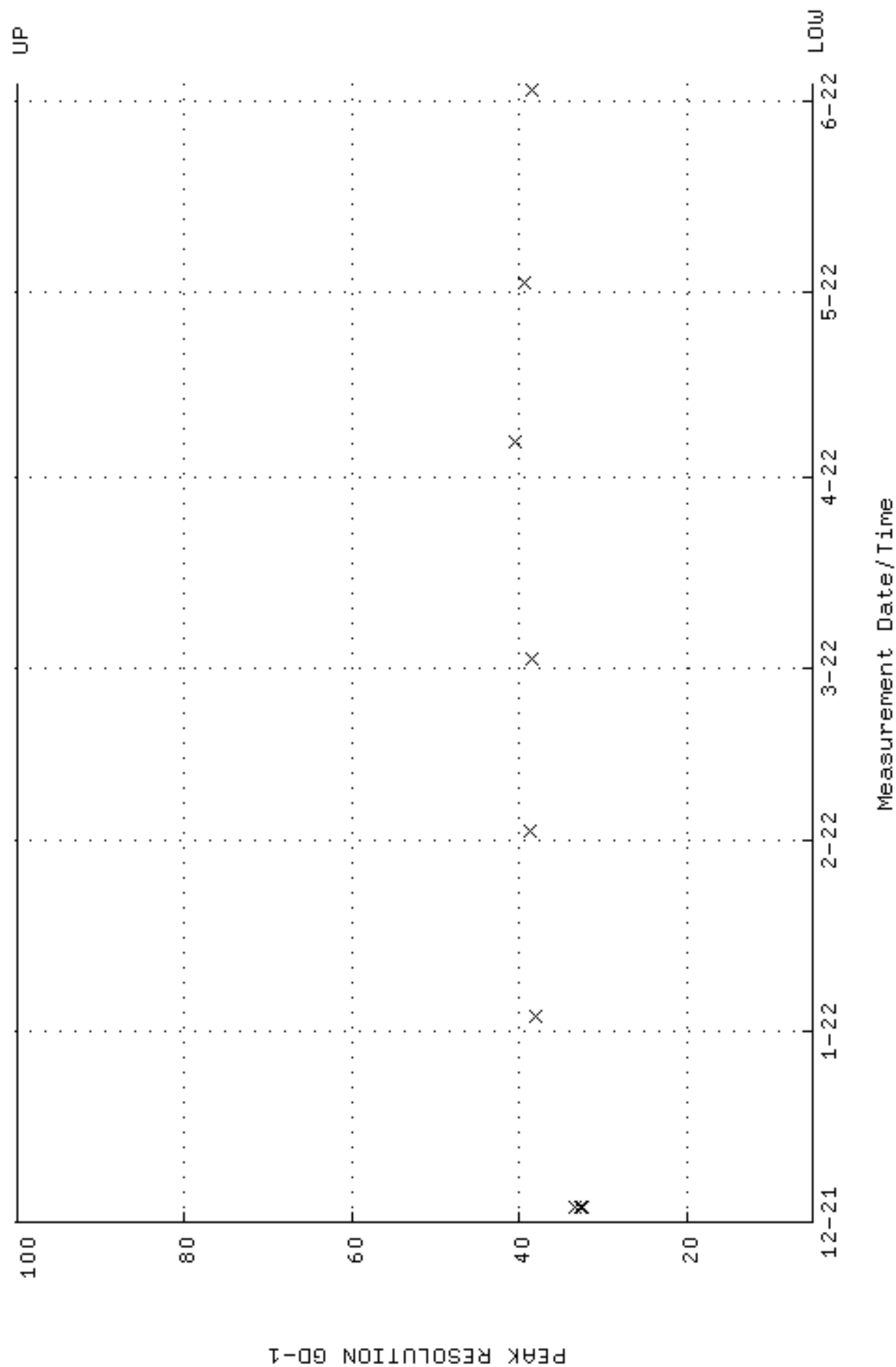
QA filename : DKA100:[ENV_ALPHA.QA.W]W010.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.328050 through 0.348350



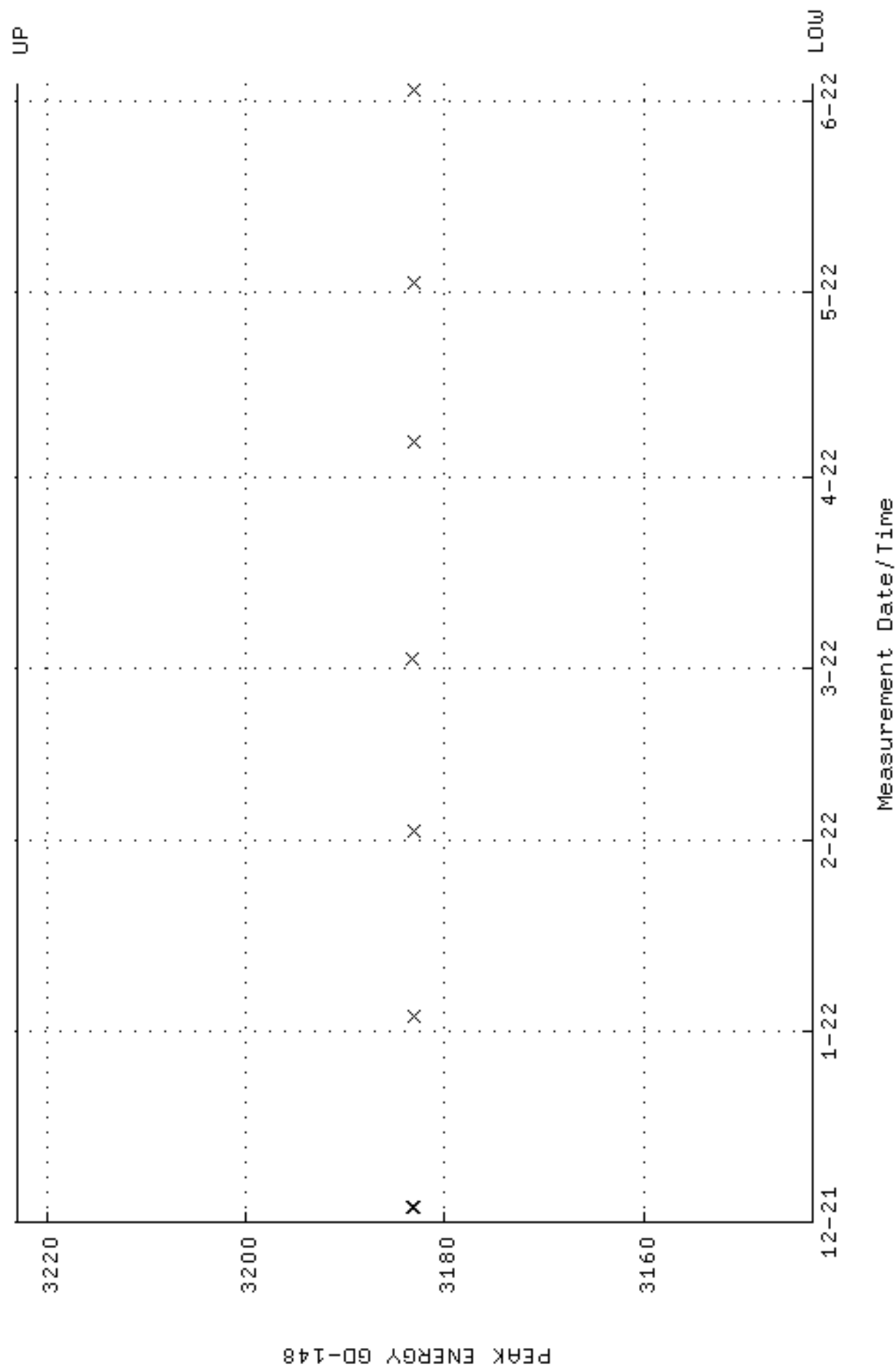
QA filename : DKA100:[ENV_ALPHA.QA.W]W010.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



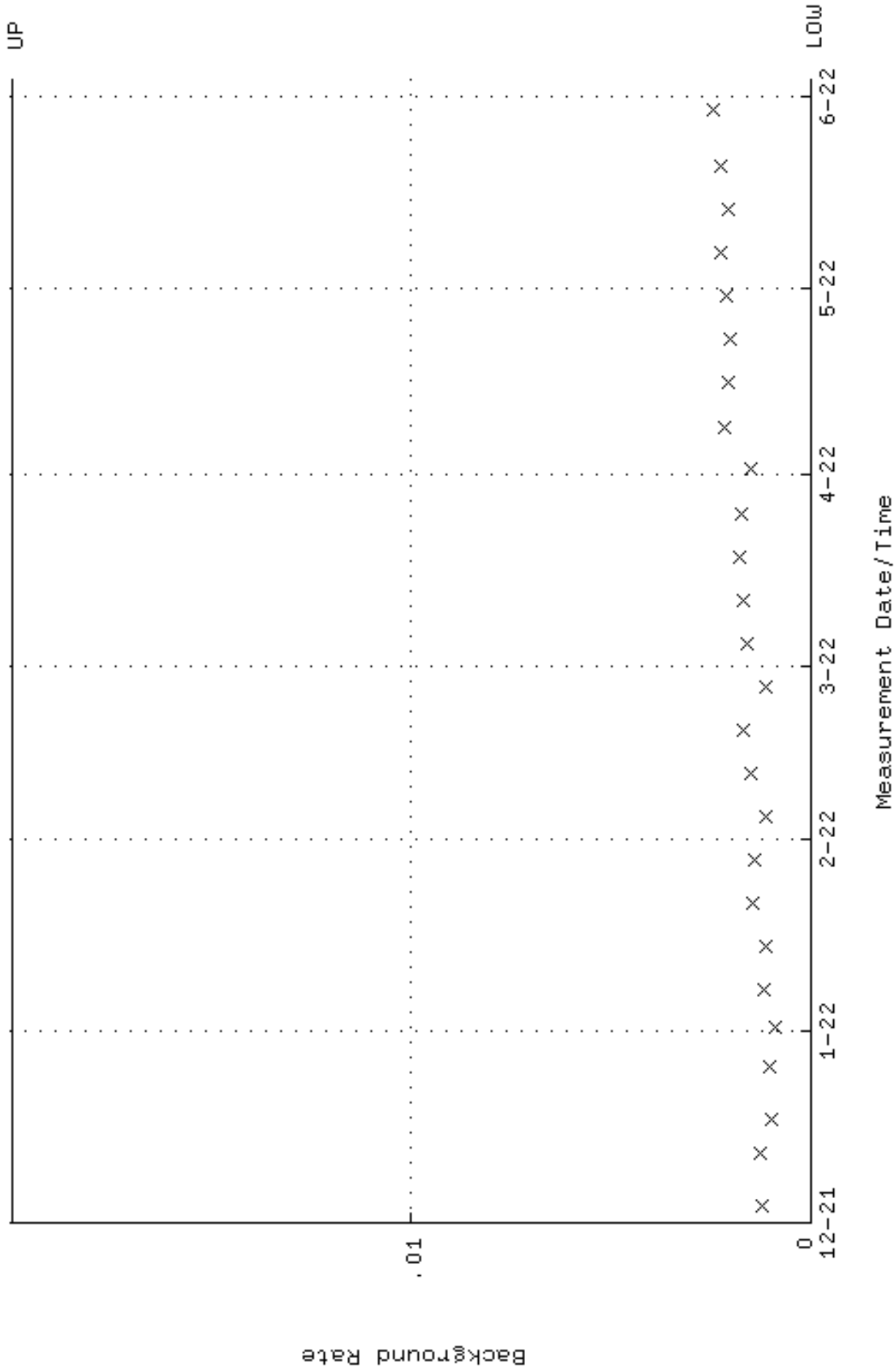
QA filename : DKA100:[ENV_ALPHA.QA.W]W010.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



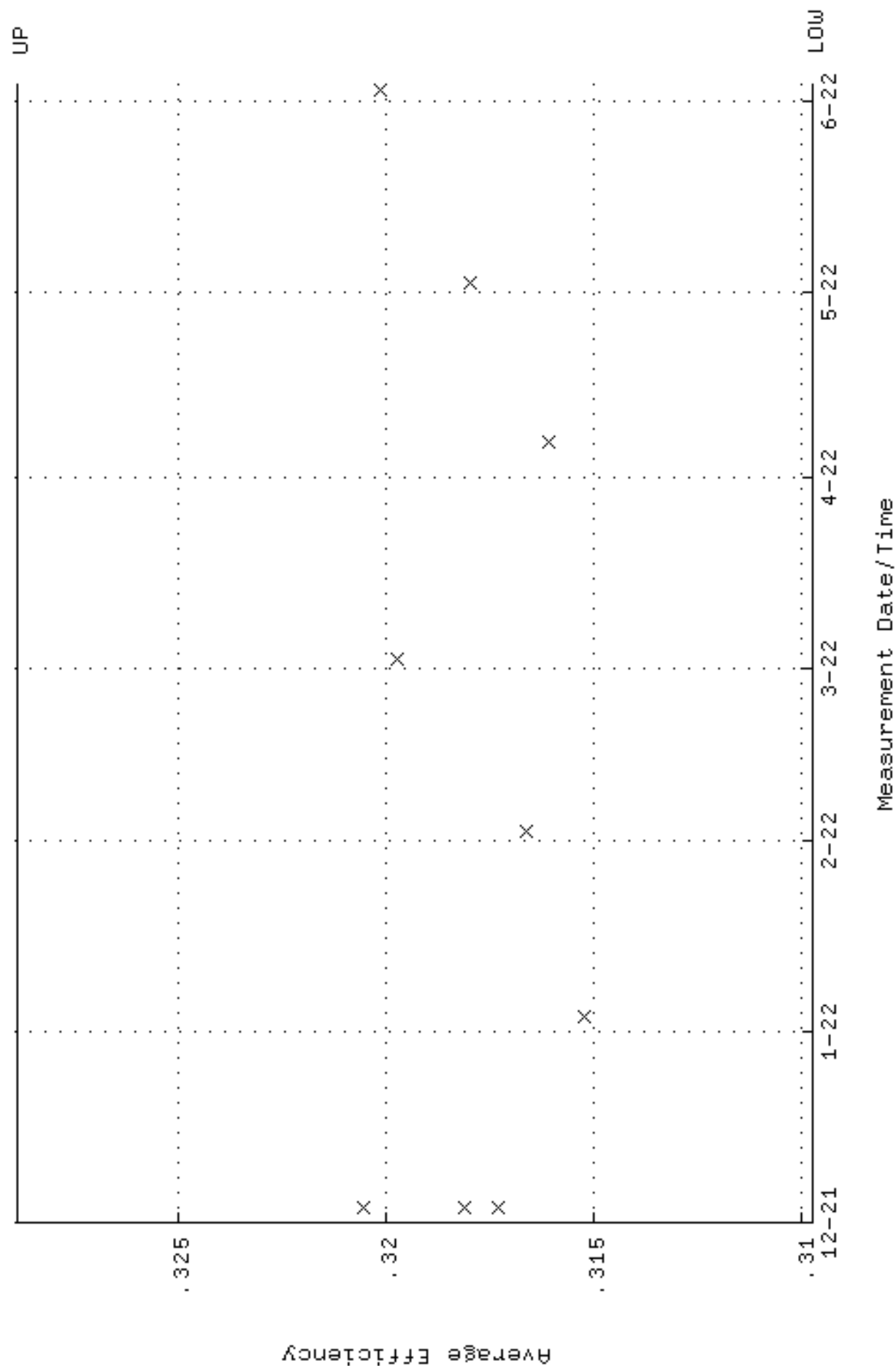
QA filename : DKA100:[ENV_ALPHA.QA.W]W010.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



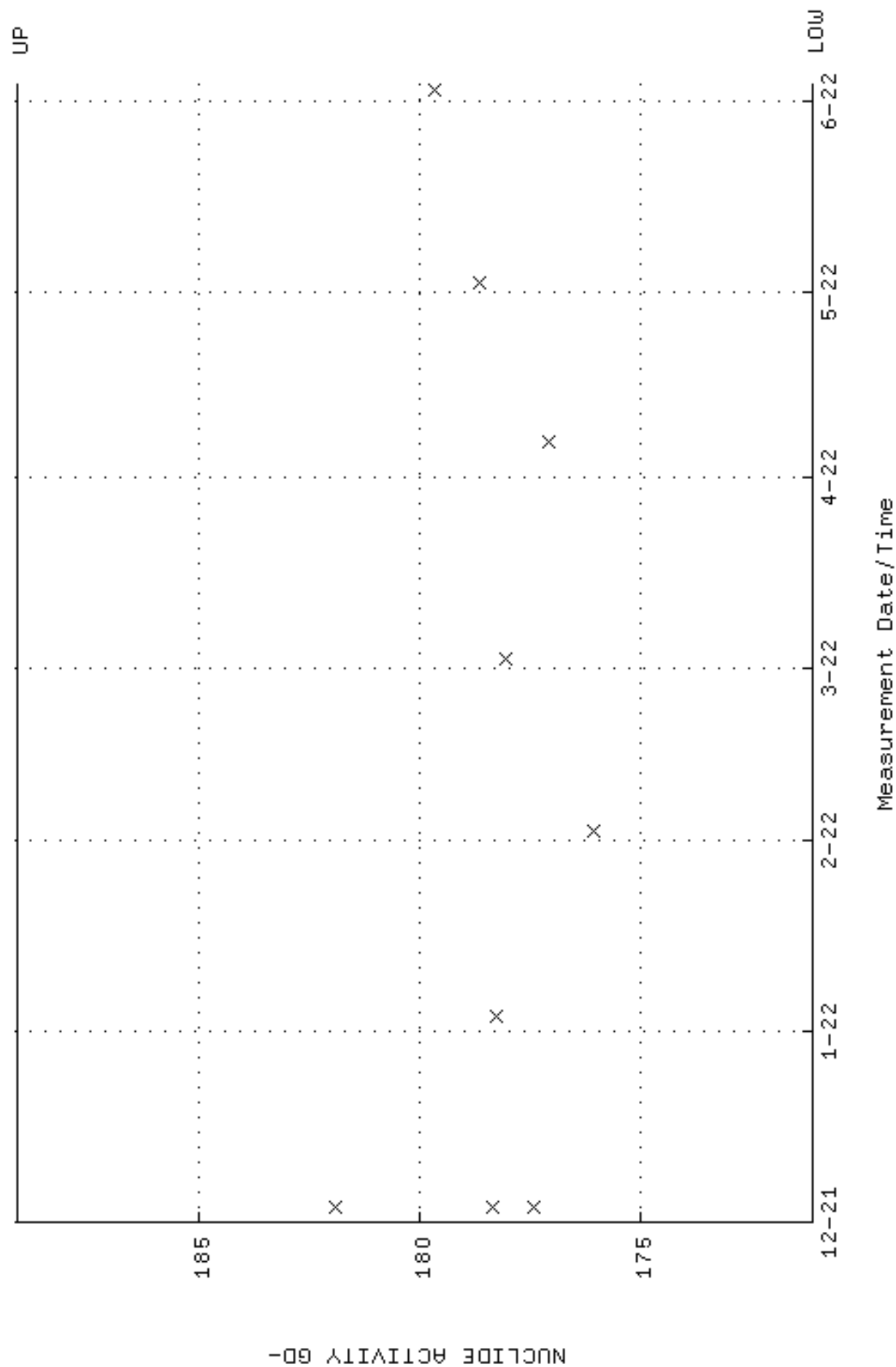
QA filename : DKA100:[ENV_ALPHA.QA.B]B010.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 3-DEC-2021 15:54:20 through 3-JUN-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



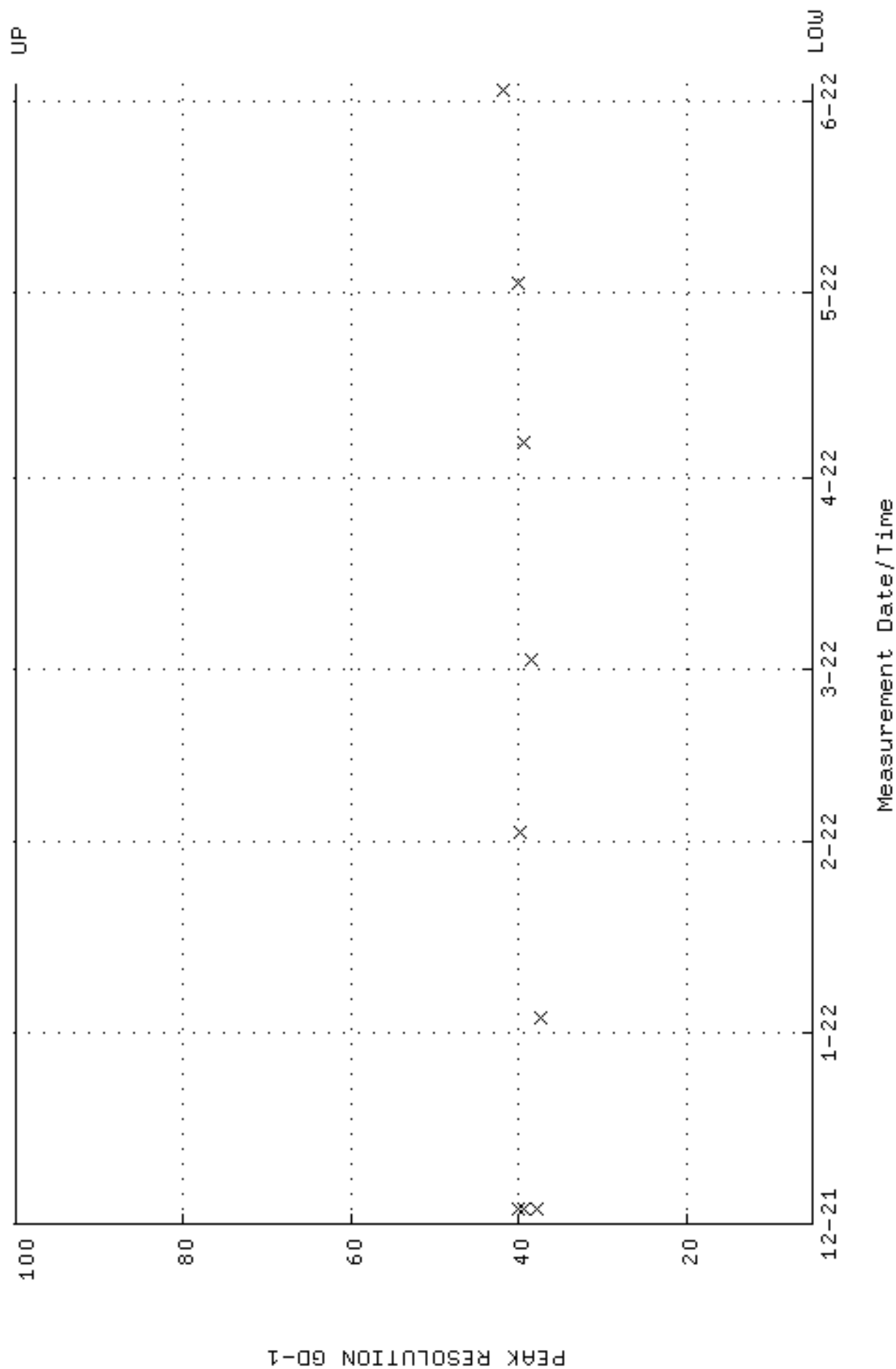
QA filename : DKA100:[ENV_ALPHA.QA.W]W011.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.309718 through 0.328876



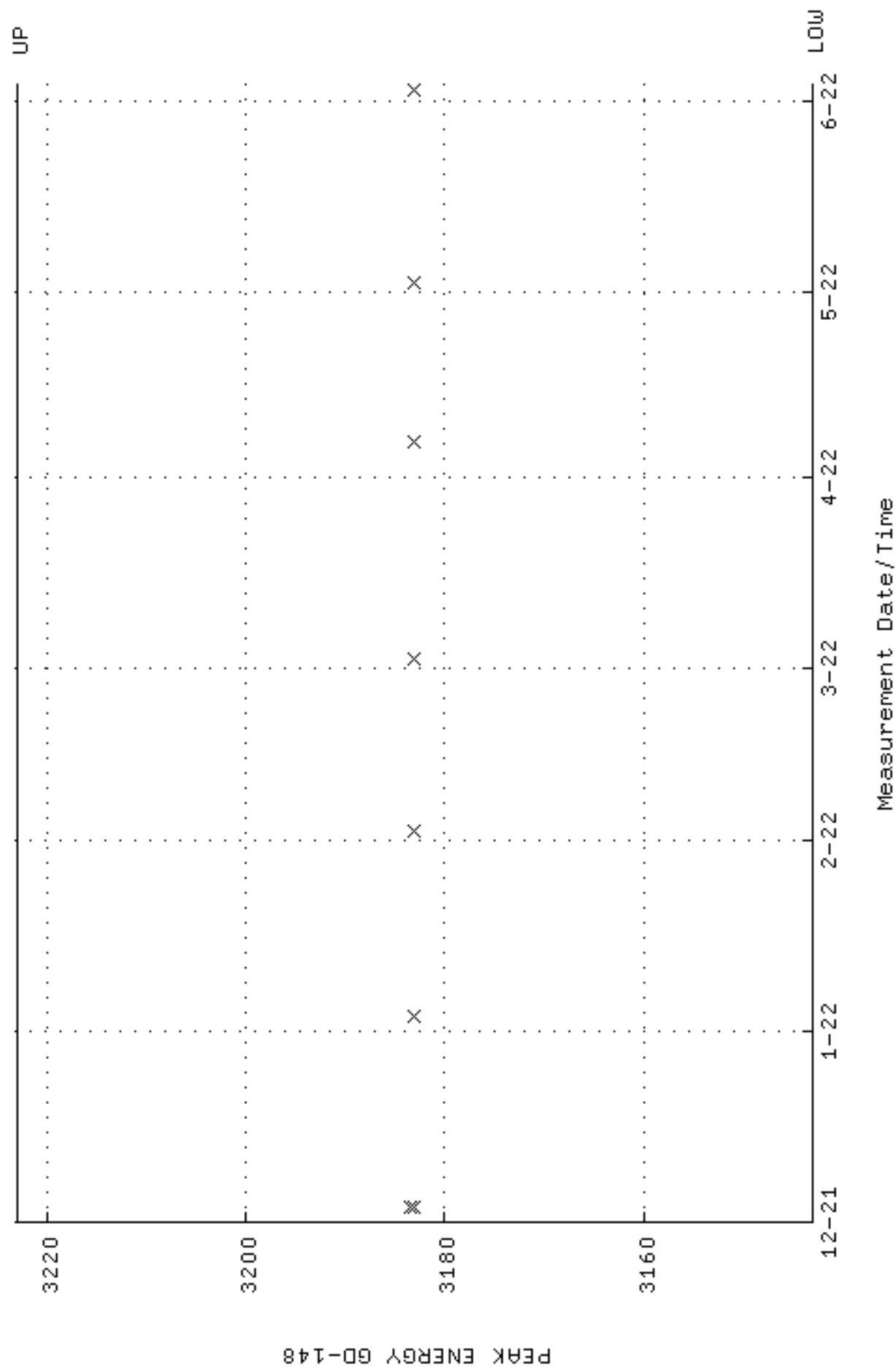
QA filename : DKA100:[ENV_ALPHA.QA.W]W011.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



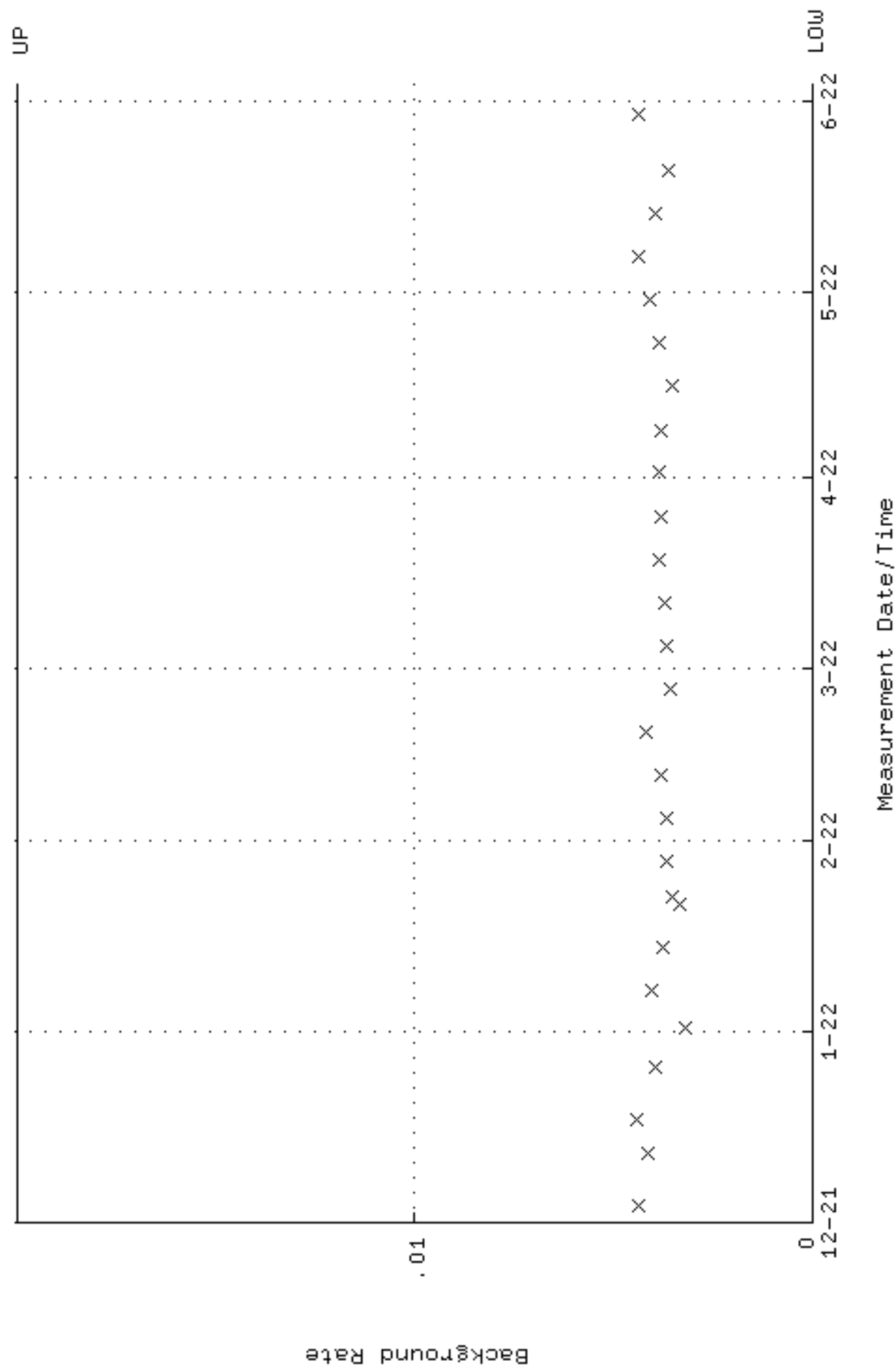
QA filename : DKA100:[ENV_ALPHA.QA.W]W011.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



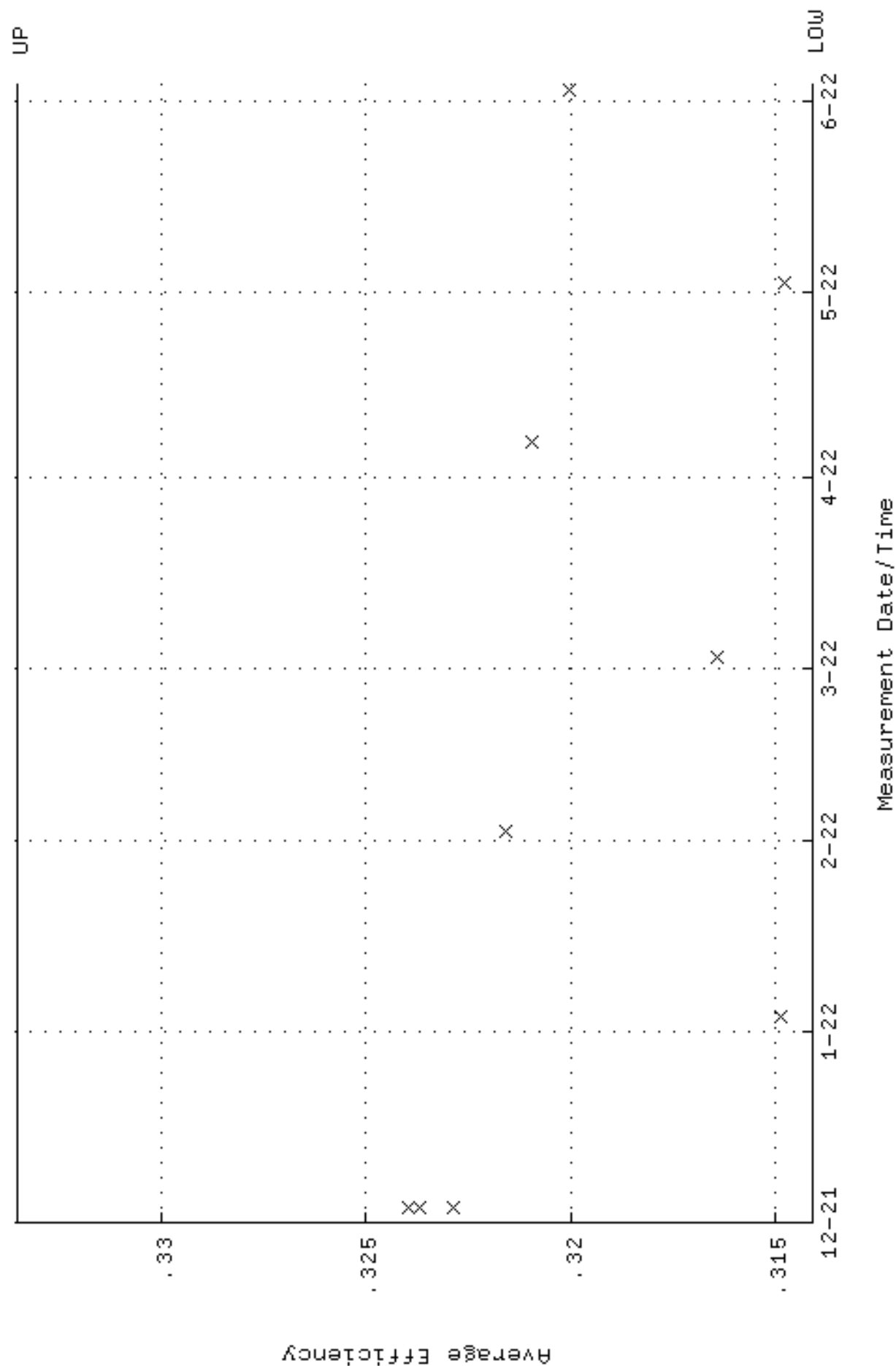
QA filename : DKA100:[ENV_ALPHA.QA.W]W011.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



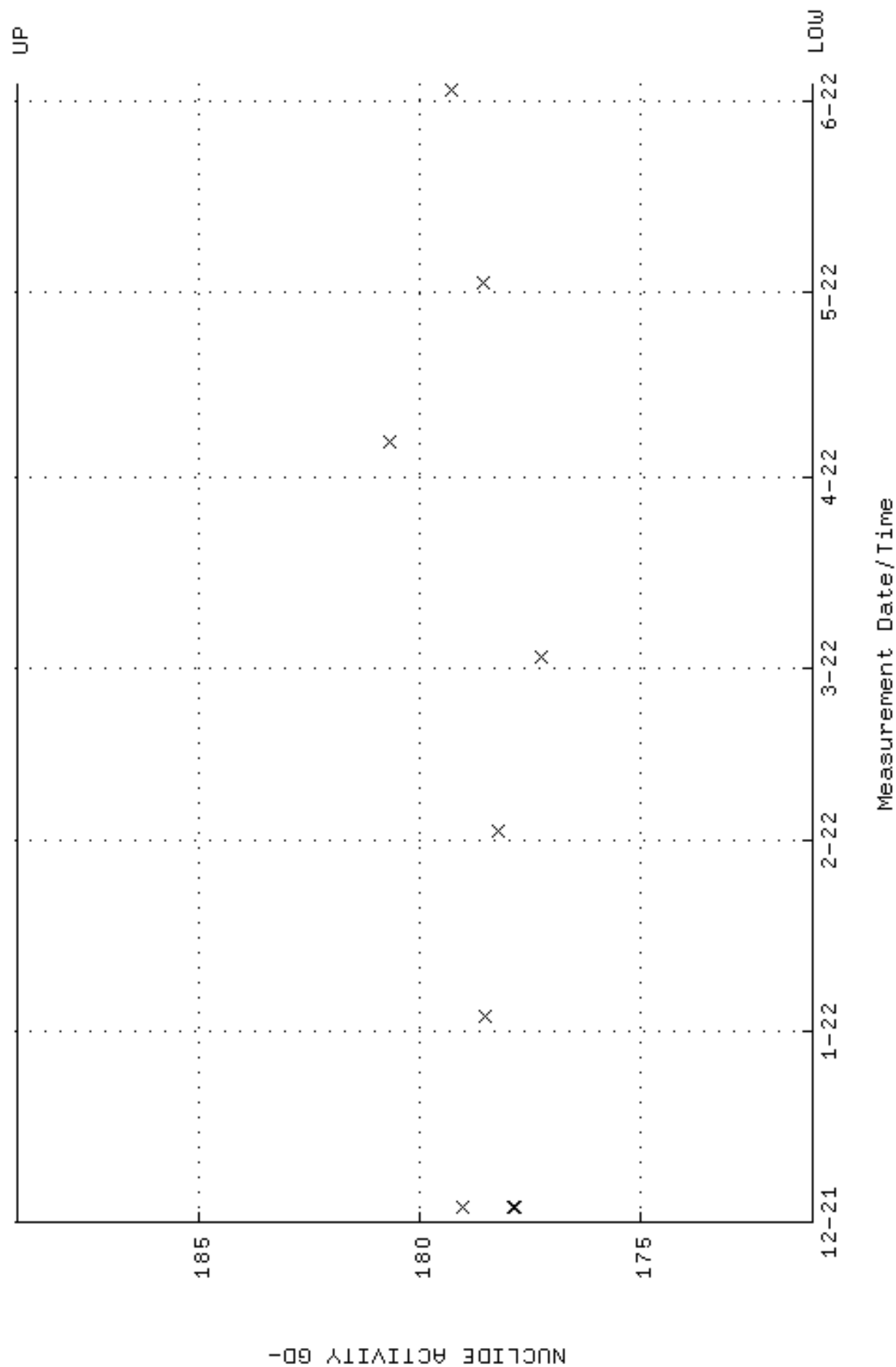
QA filename : DKA100:[ENV_ALPHA.QA.B]B011.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 3-DEC-2021 15:54:20 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



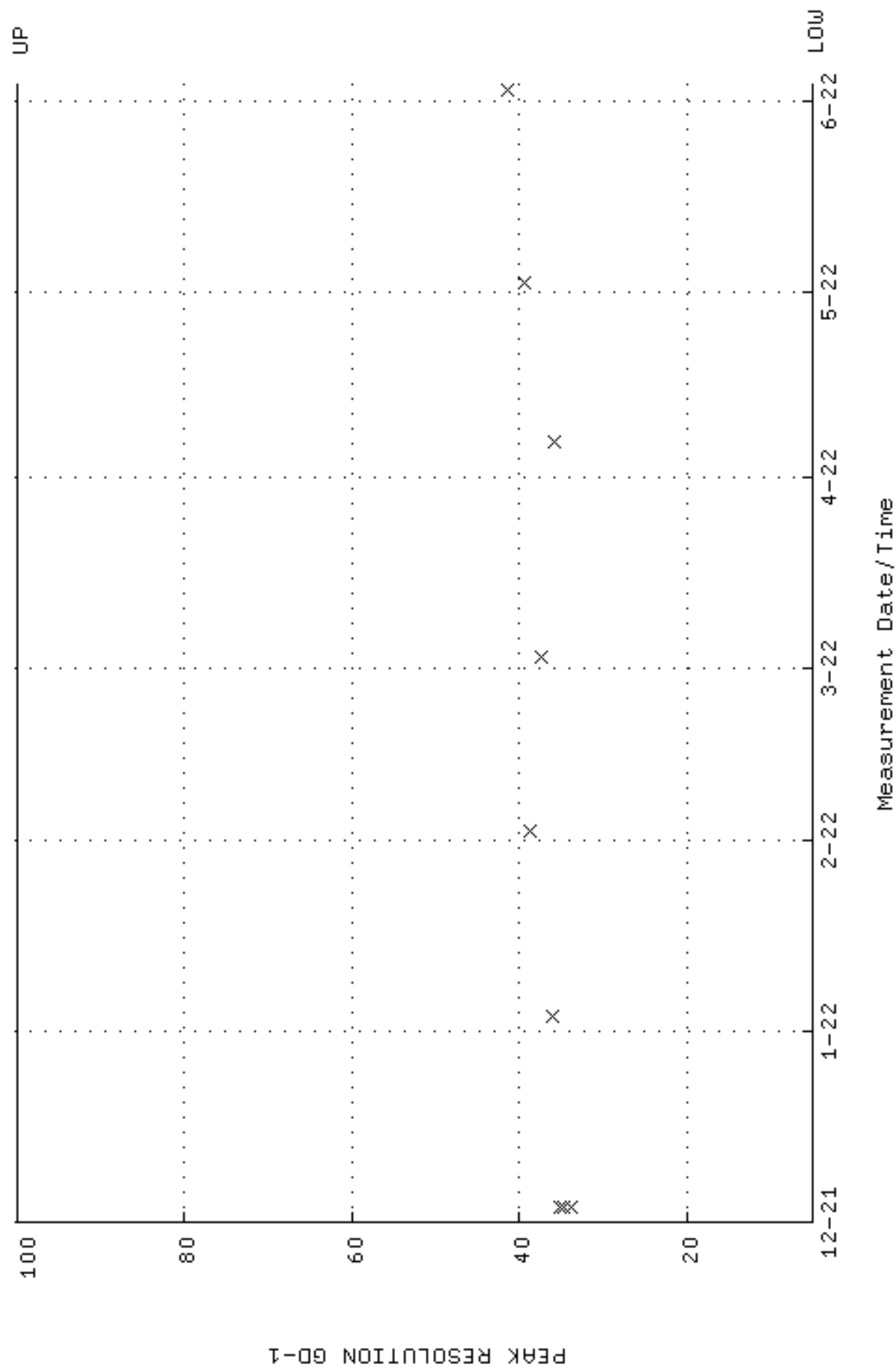
QA filename : DKA100:[ENV_ALPHA.QA.W]W012.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.314095 through 0.333523



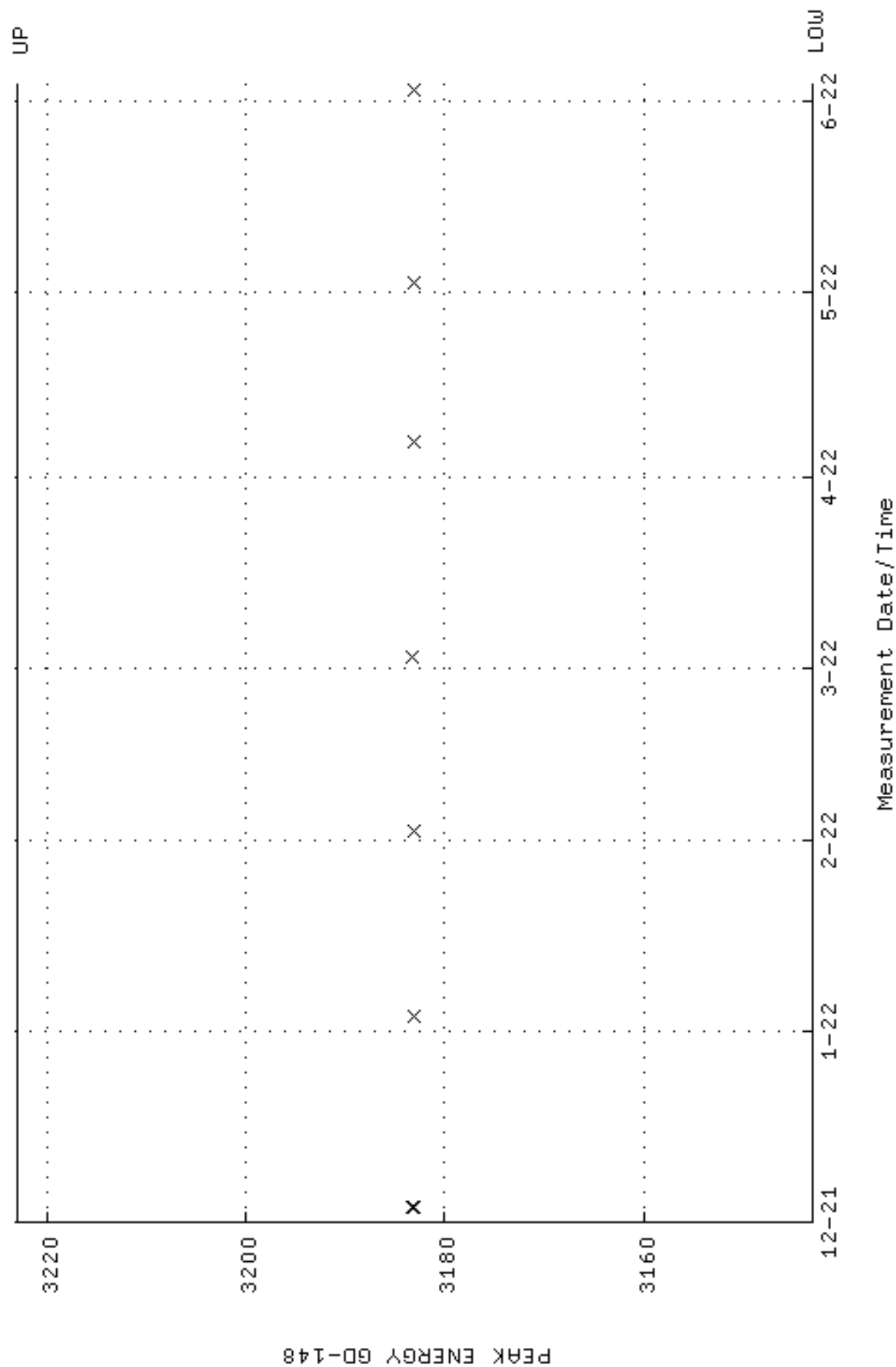
QA filename : DKA100:[ENV_ALPHA.QA.W]W012.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



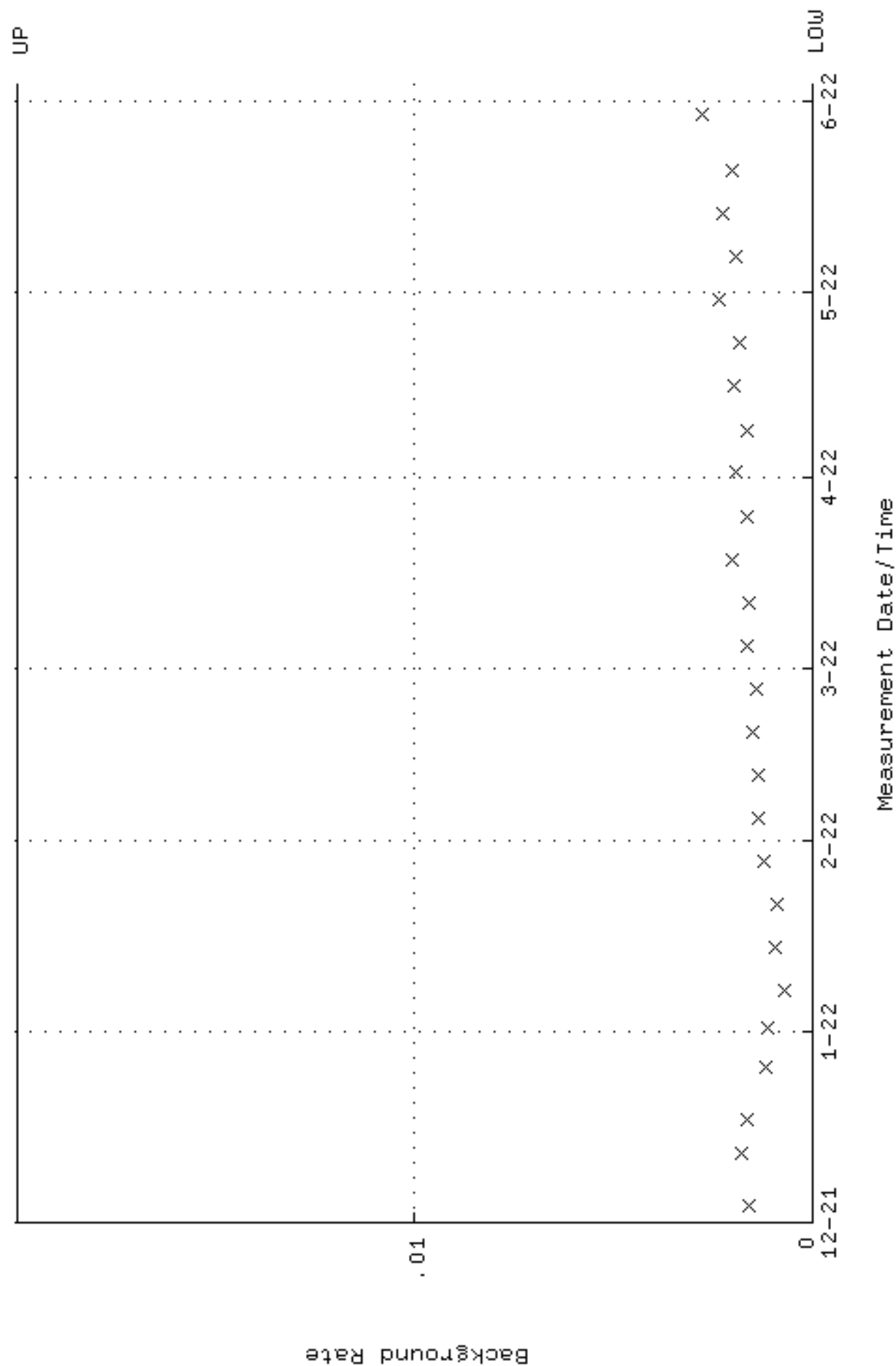
QA filename : DKA100:[ENV_ALPHA.QA.W]W012.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



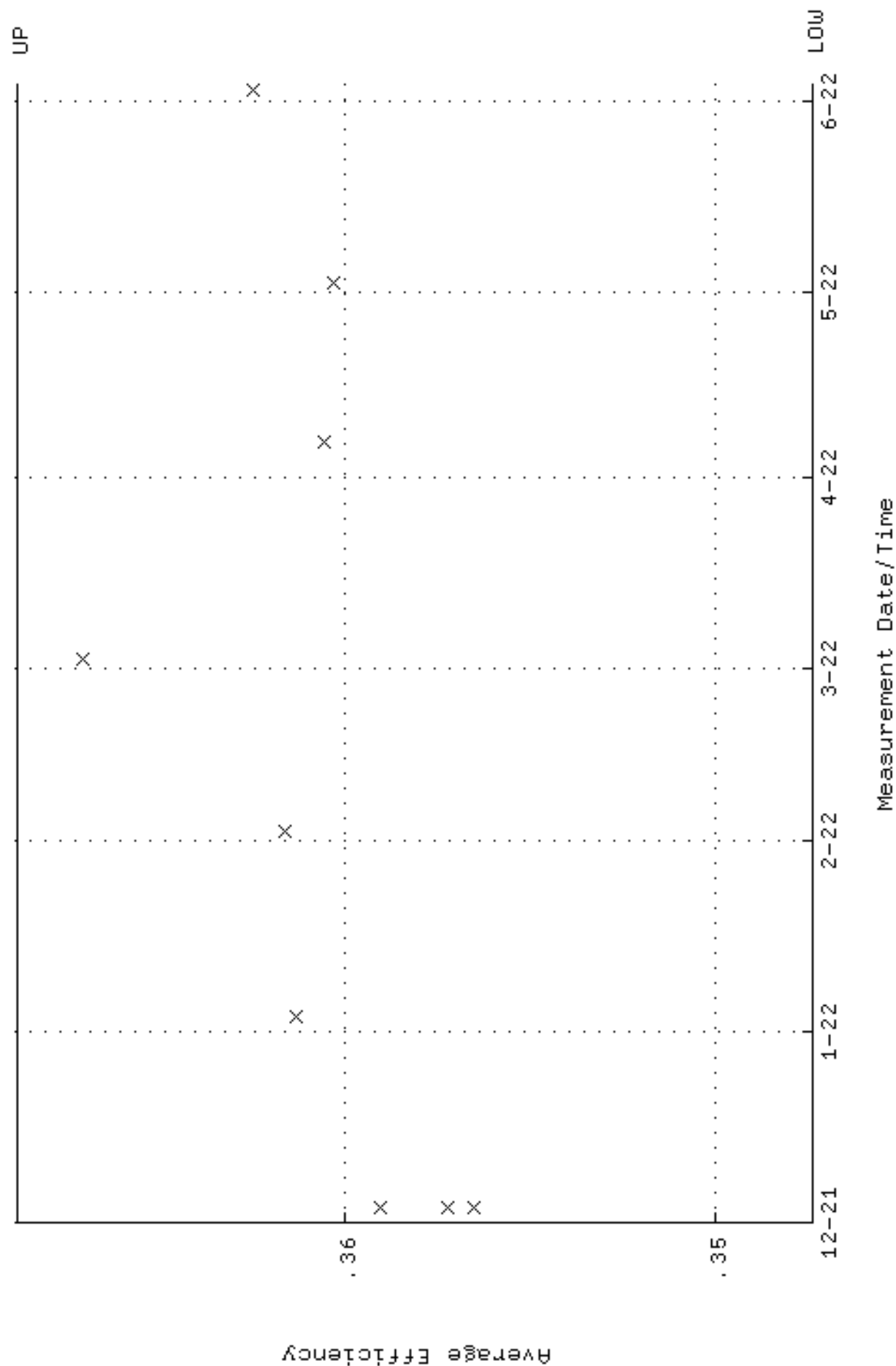
QA filename : DKA100:[ENV_ALPHA.QA.W]W012.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-DEC-2021 07:34:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



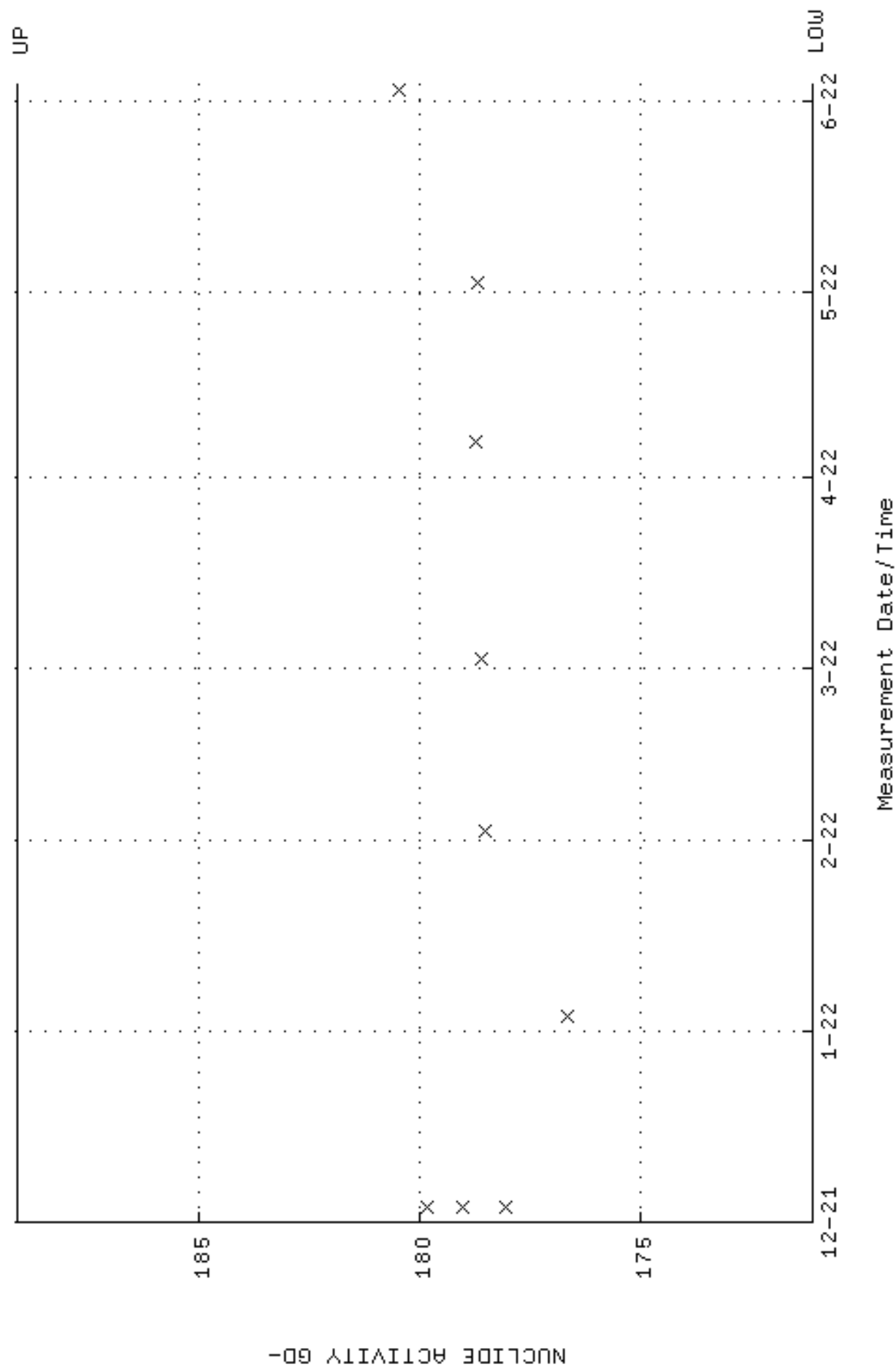
QA filename : DKA100:[ENV_ALPHA.QA.B]B012.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 3-DEC-2021 15:54:20 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



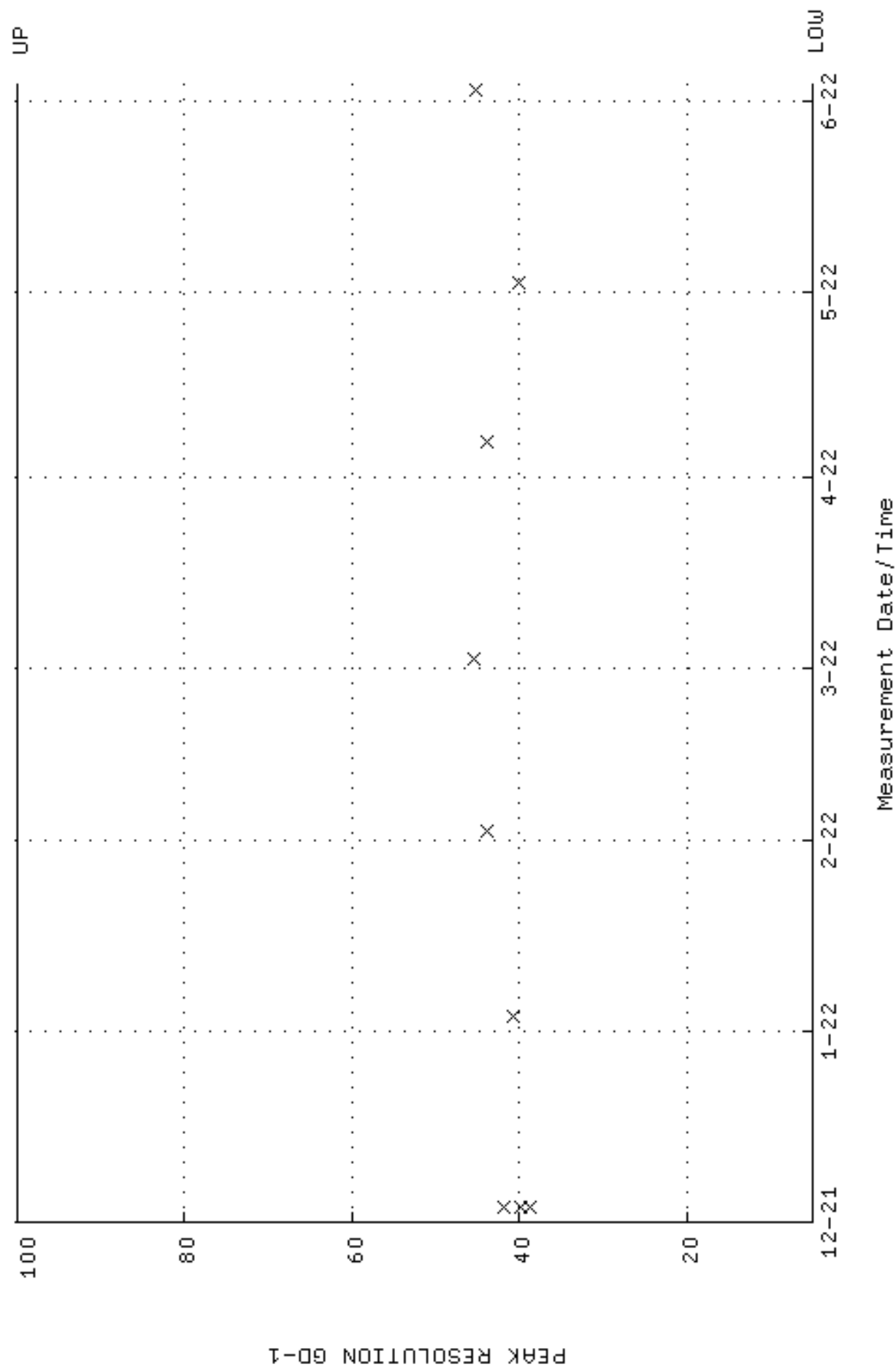
QA filename : DKA100:[ENV_ALPHA.QA.W]W013.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-DEC-2021 07:44:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.347377 through 0.368865



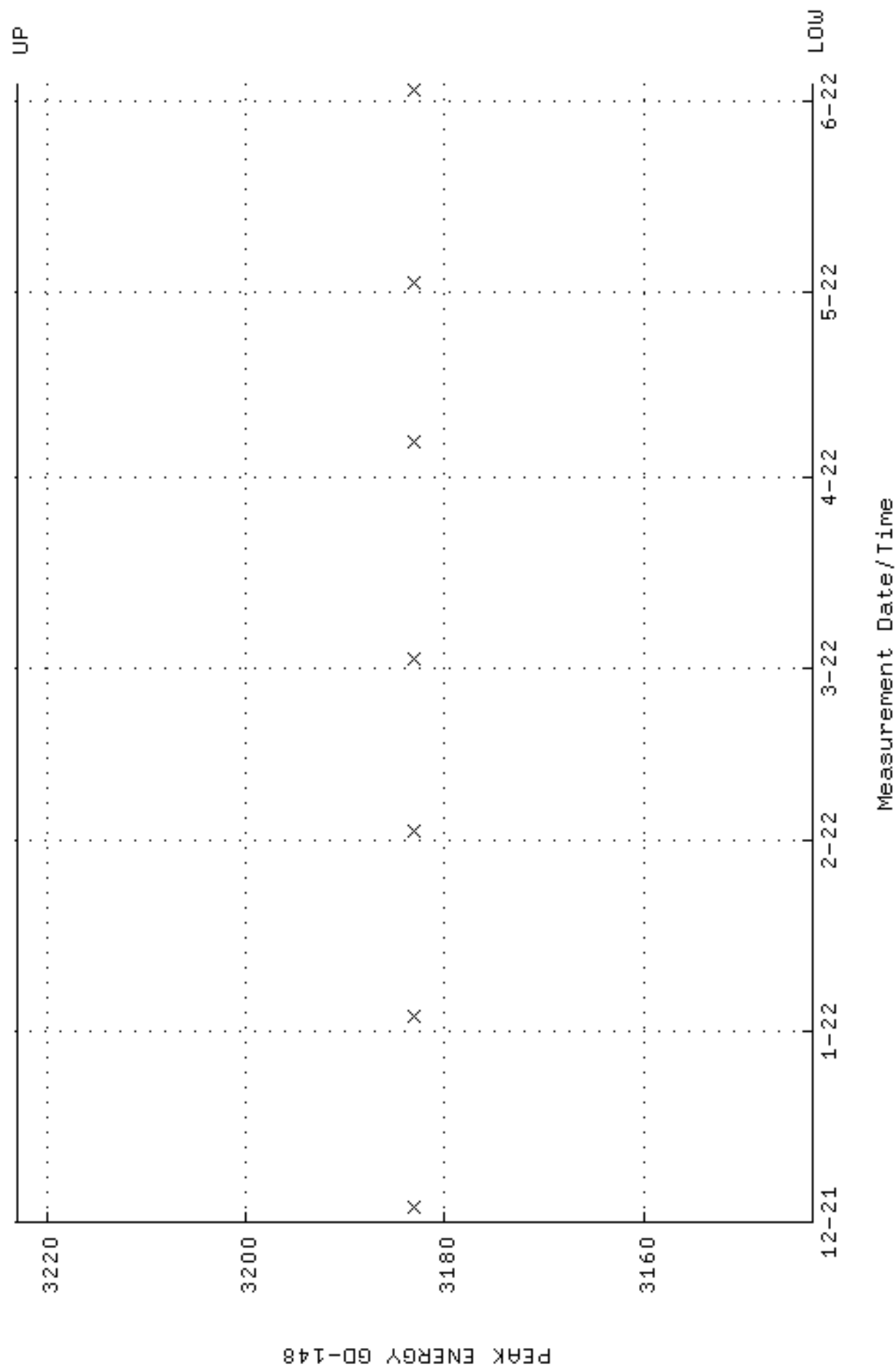
QA filename : DKA100:[ENV_ALPHA.QA.W]W013.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-DEC-2021 07:44:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



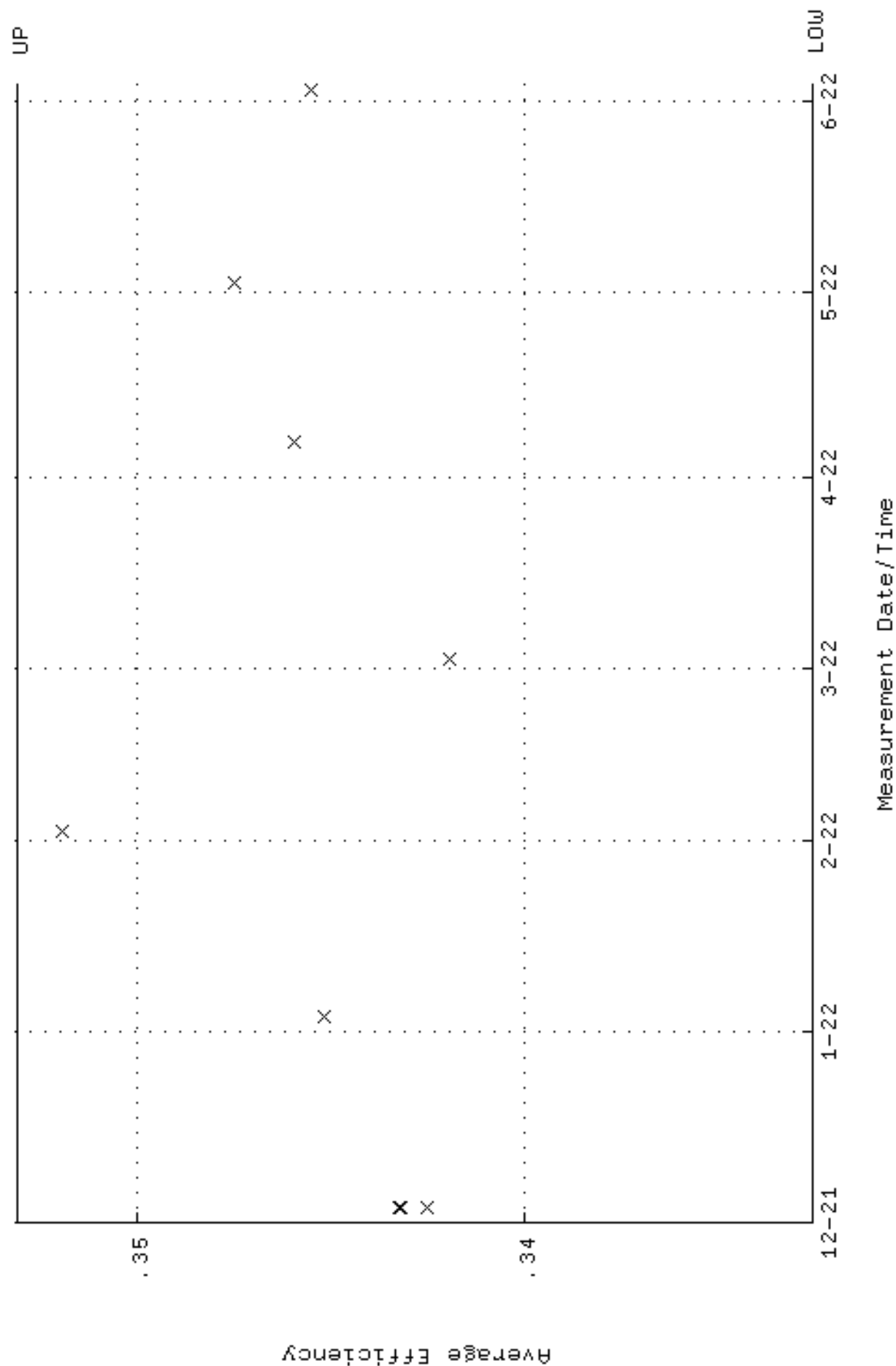
QA filename : DKA100:[ENV_ALPHA.QA.W]W013.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-DEC-2021 07:44:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



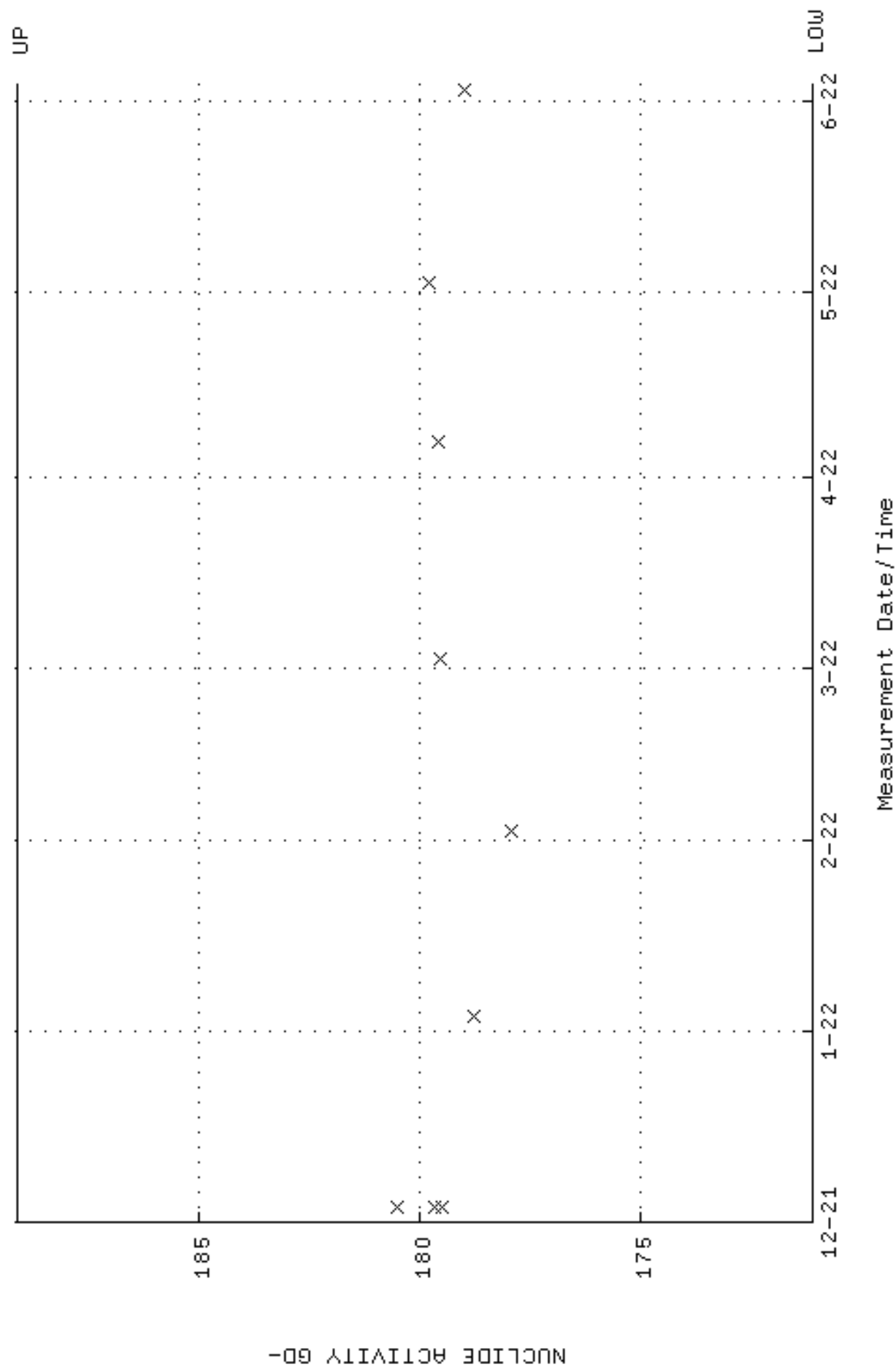
QA filename : DKA100:[ENV_ALPHA.QA.W]W013.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-DEC-2021 07:44:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



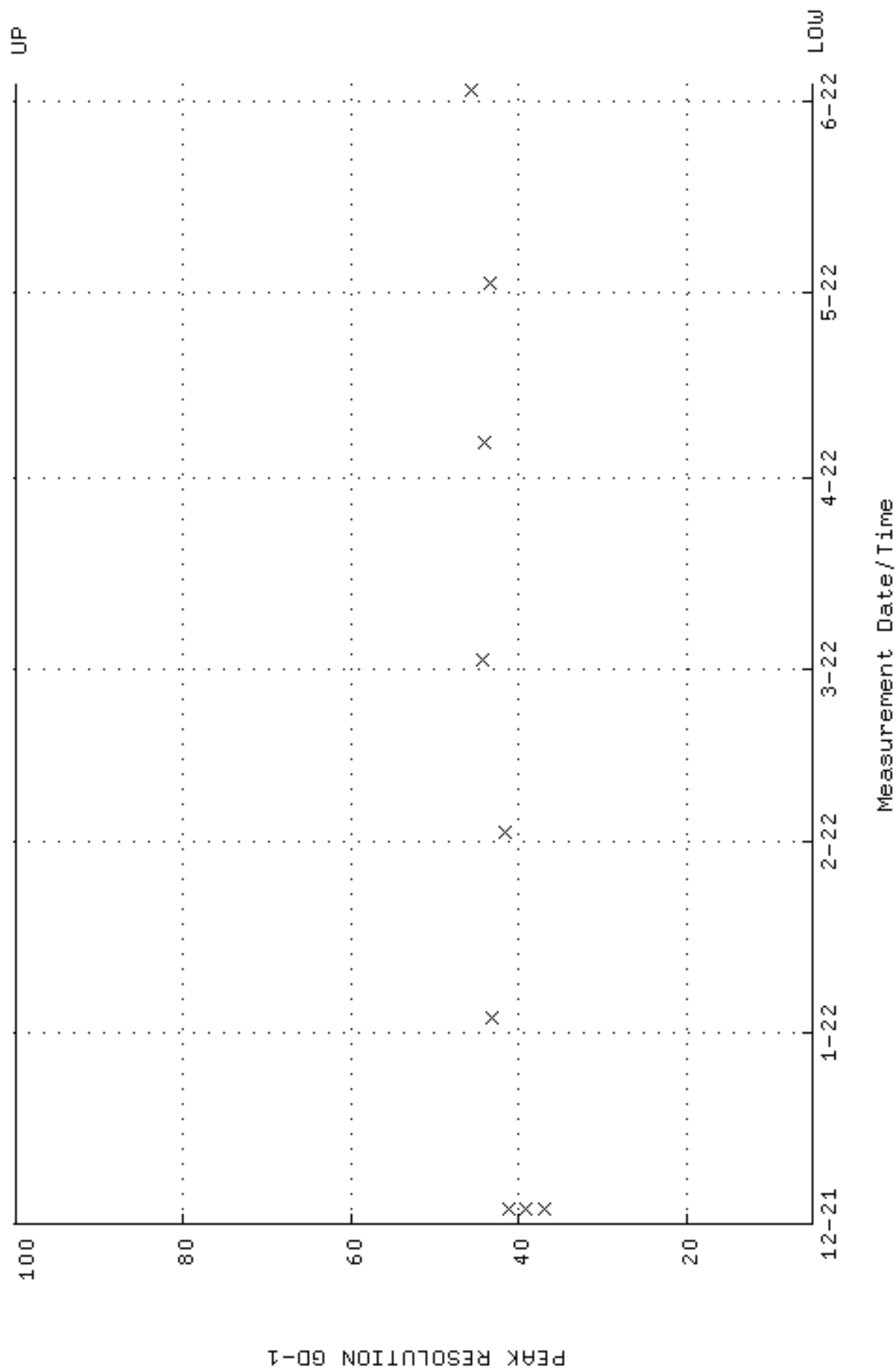
QA filename : DKA100:[ENV_ALPHA.QA.W]W014.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-DEC-2021 07:44:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.332527 through 0.353095



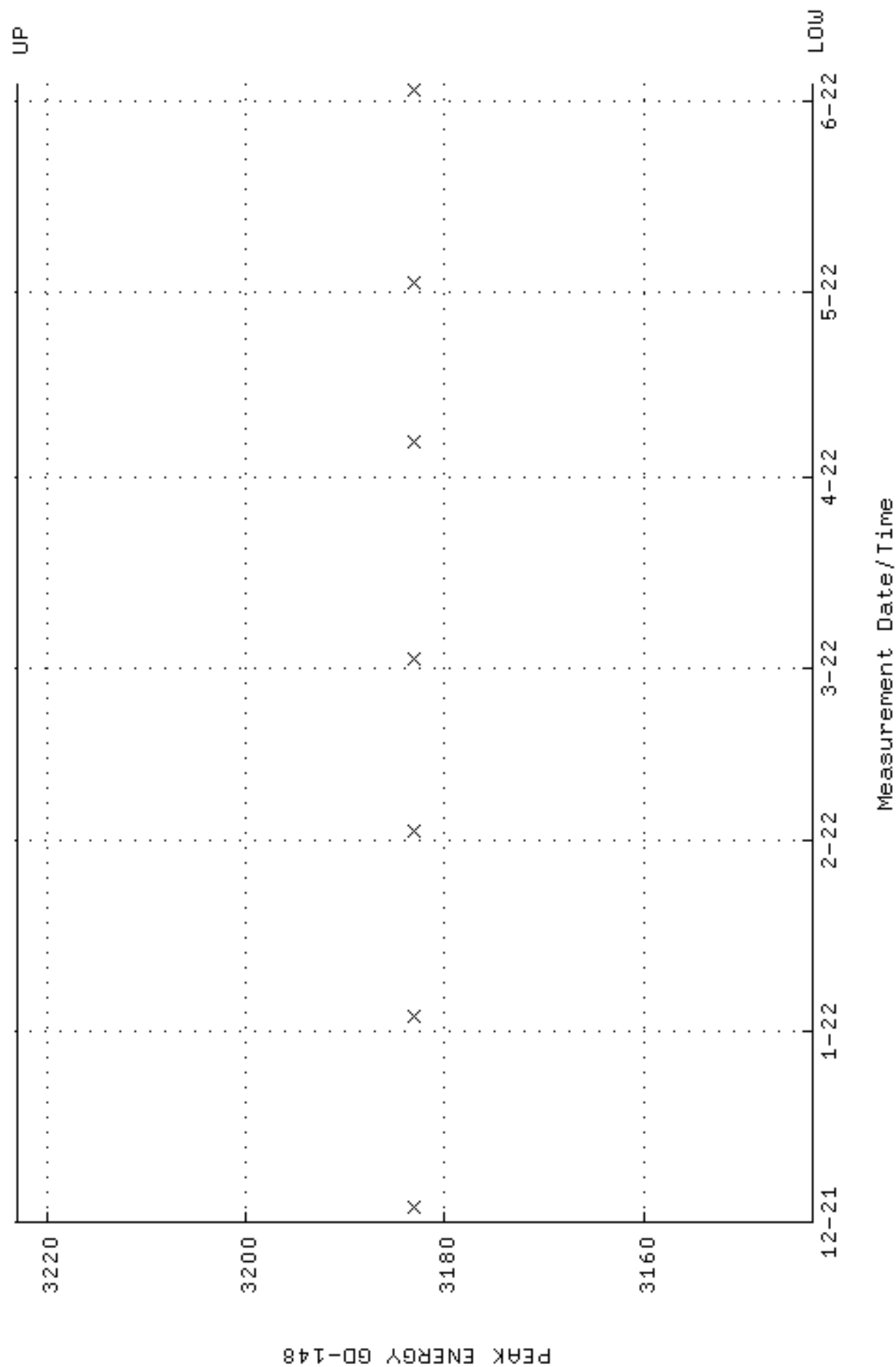
QA filename : DKA100:[ENV_ALPHA.QA.W]W014.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-DEC-2021 07:44:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



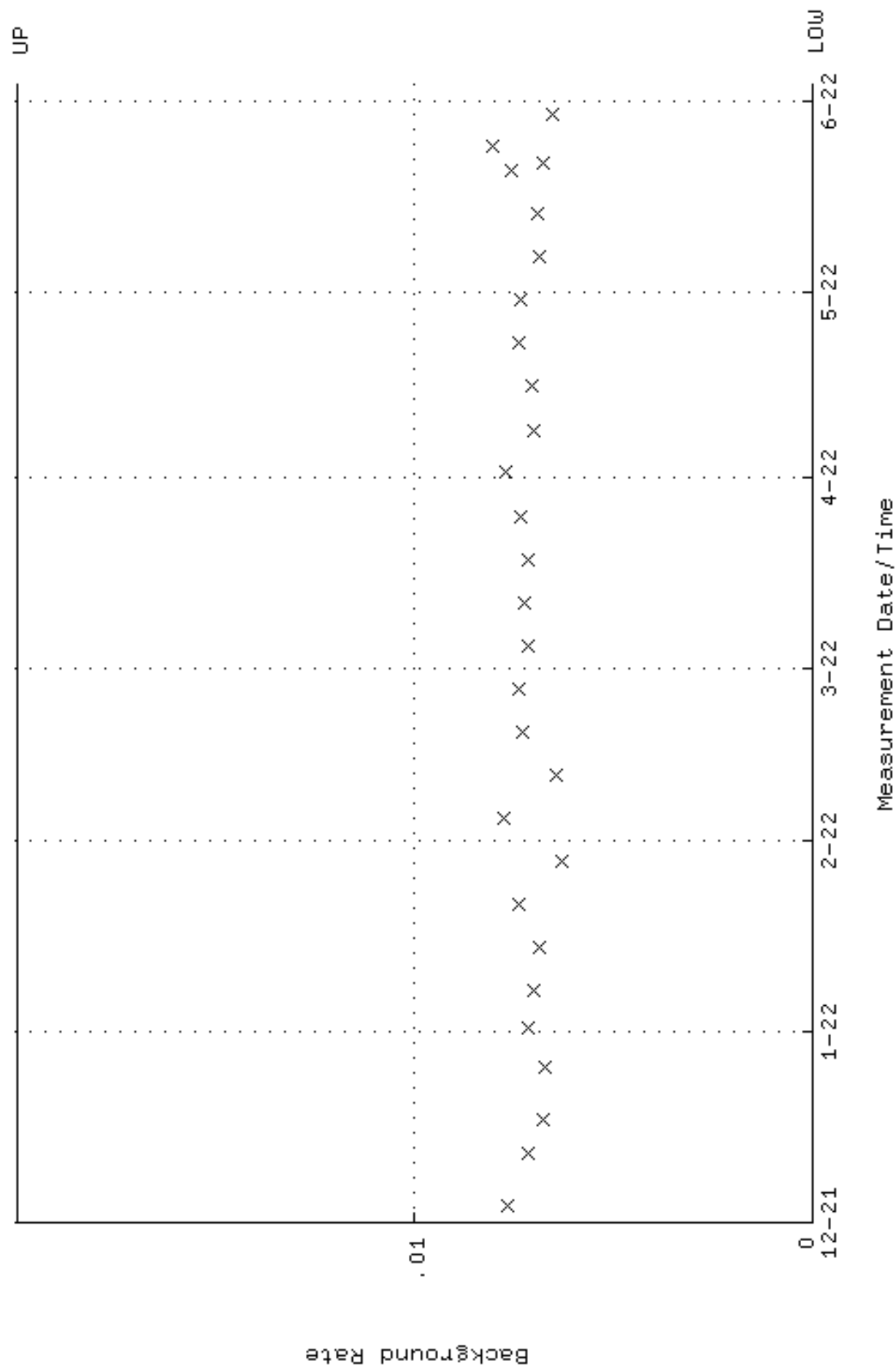
QA filename : DKA100:[ENV_ALPHA.QA.W]W014.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-DEC-2021 07:44:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



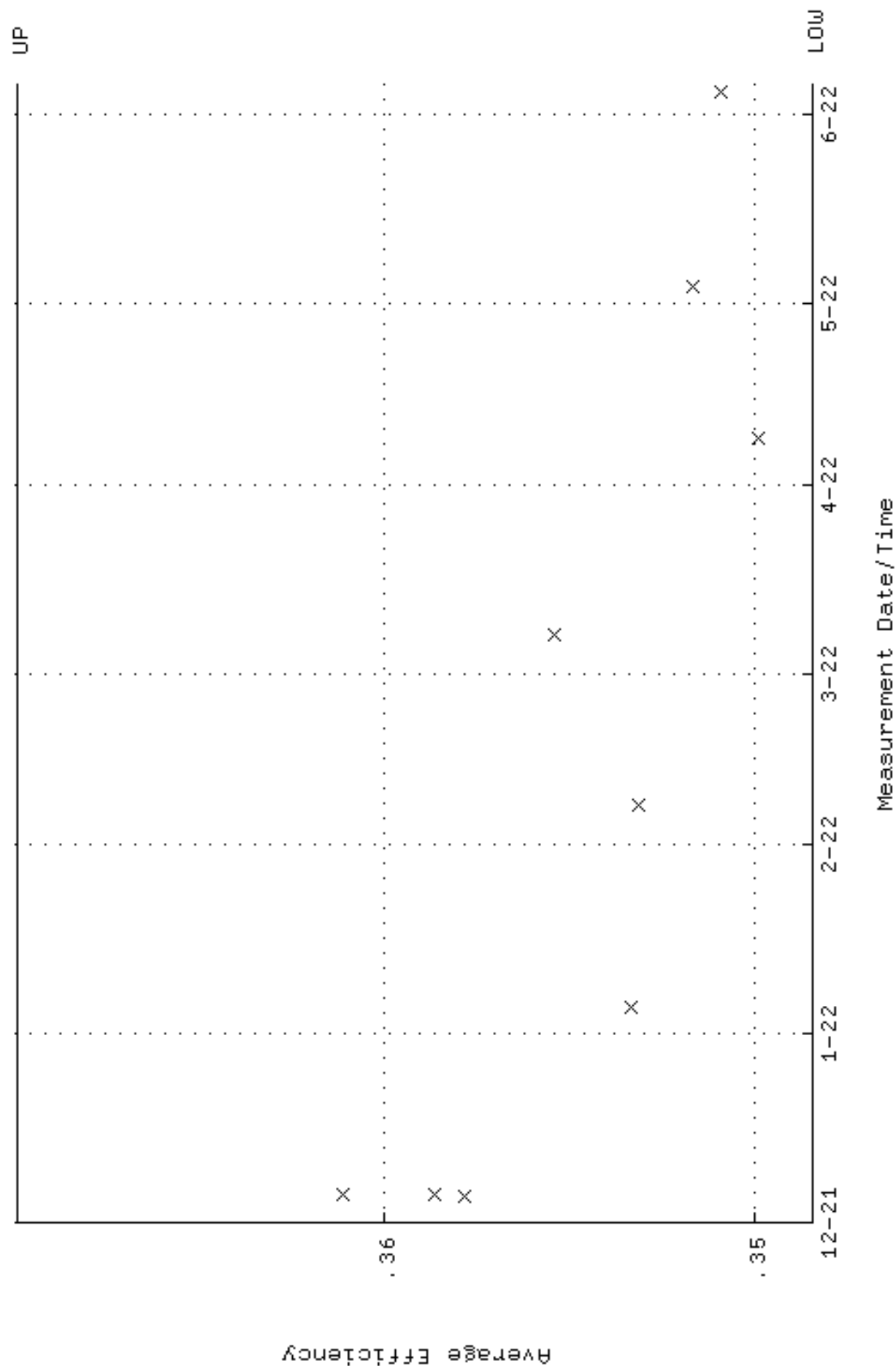
QA filename : DKA100:[ENV_ALPHA.QA.W]W014.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-DEC-2021 07:44:00 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



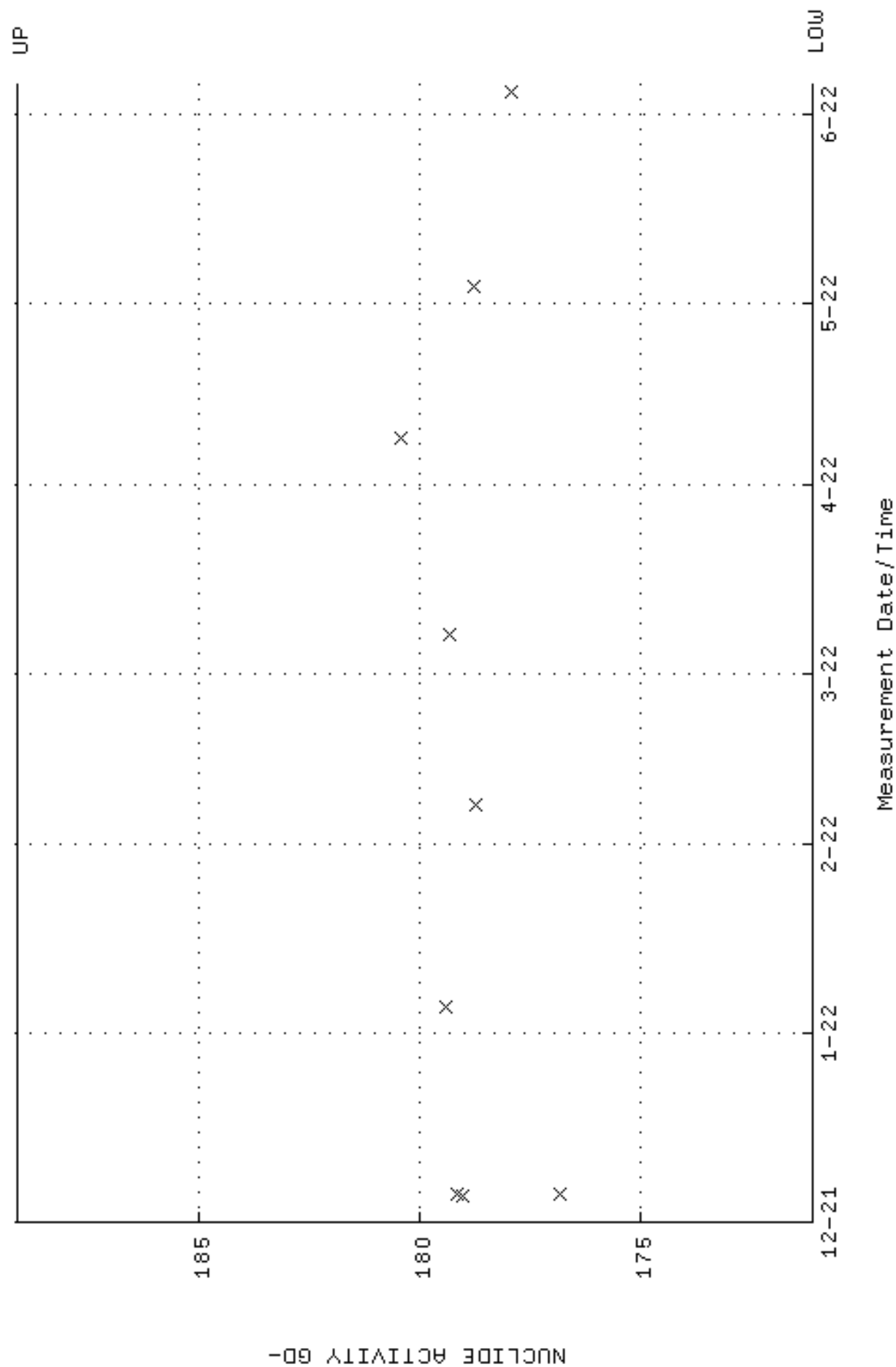
QA filename : DKA100:[ENV_ALPHA.QA.B]B014.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 3-DEC-2021 15:42:26 through 3-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



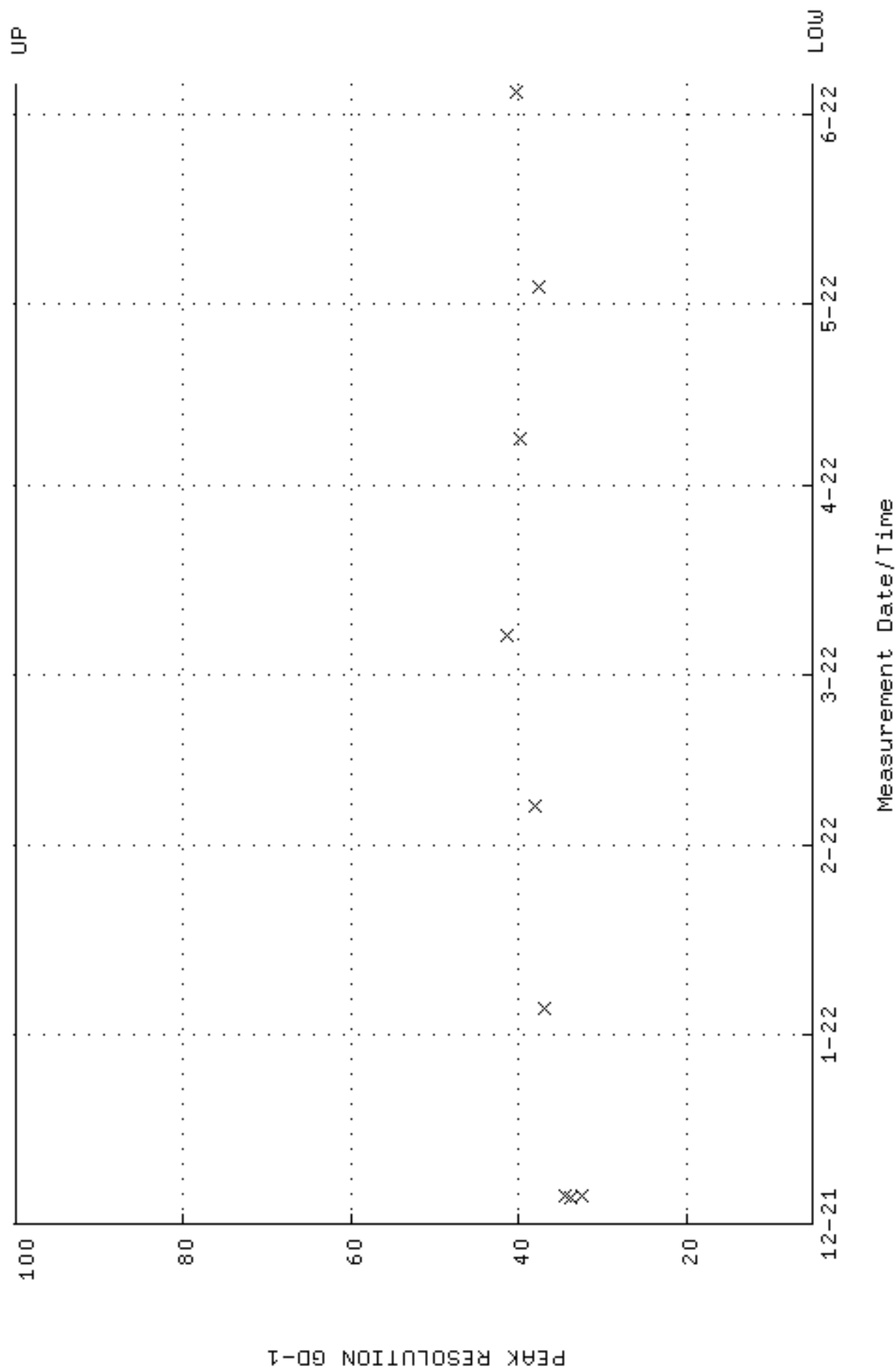
QA filename : DKA100:[ENV_ALPHA.QA.W]W029.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 0.348412 through 0.369964



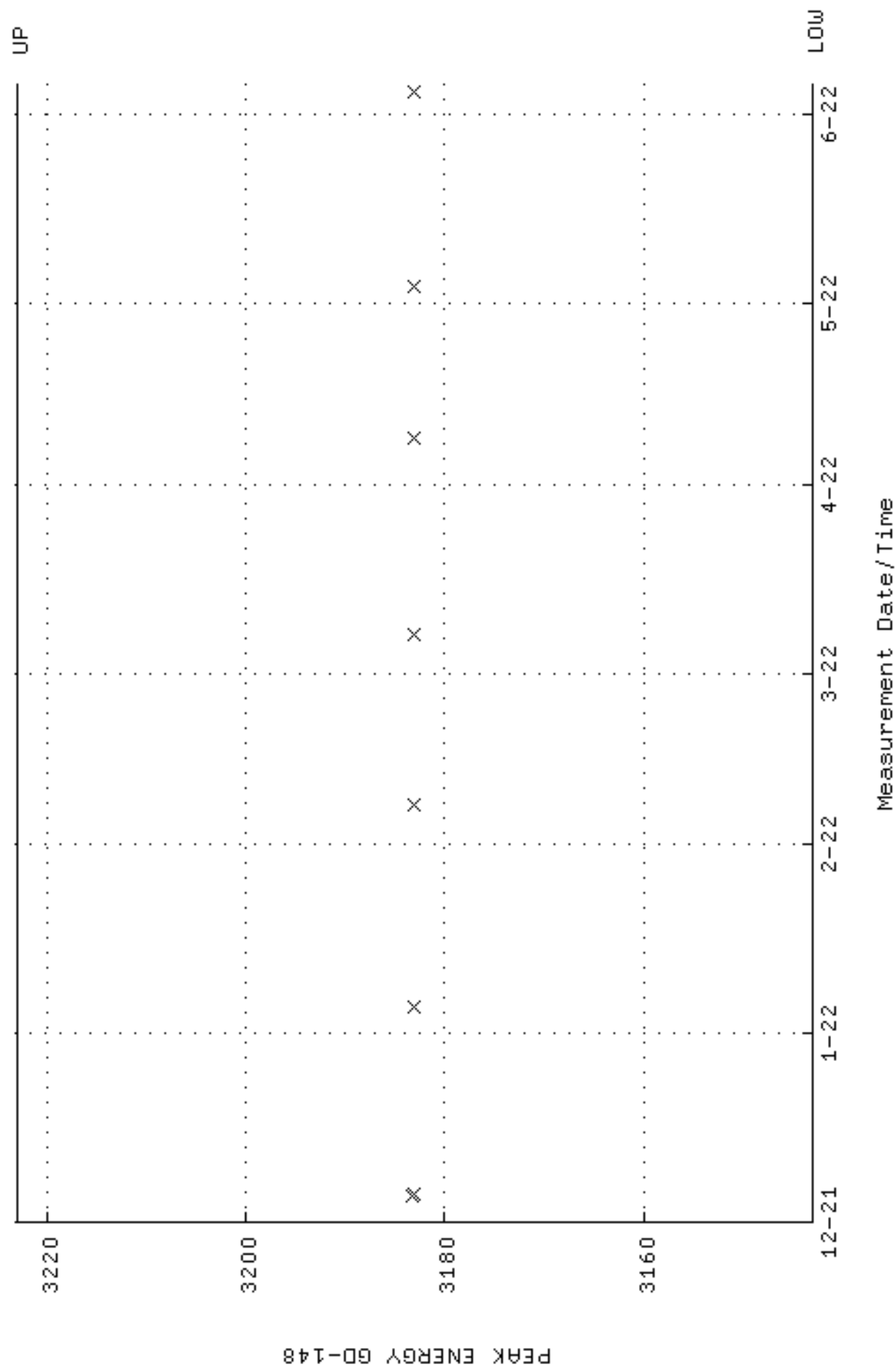
QA filename : DKA100:[ENV_ALPHA.QA.W]W029.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



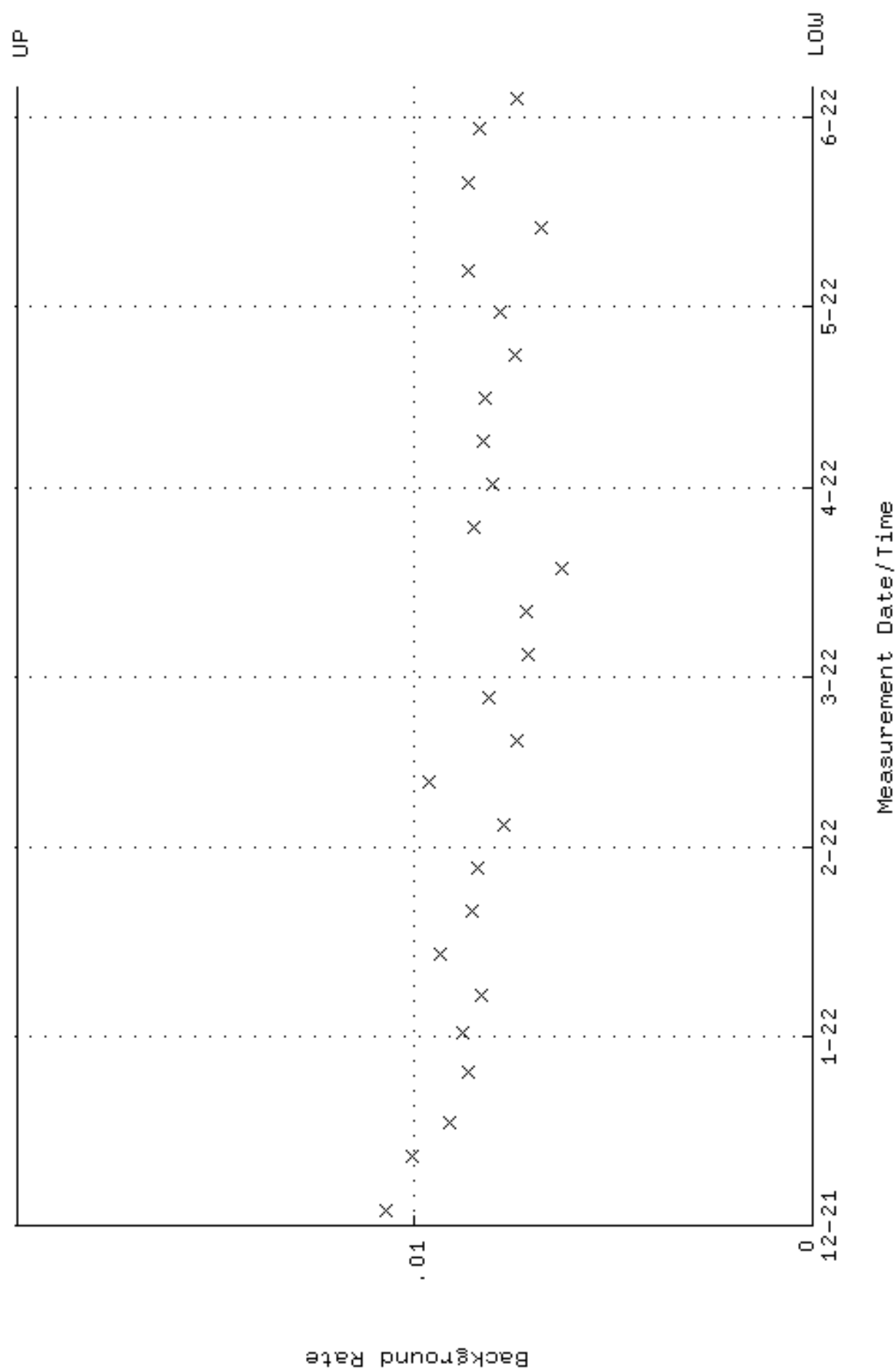
QA filename : DKA100:[ENV_ALPHA.QA.W]W029.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



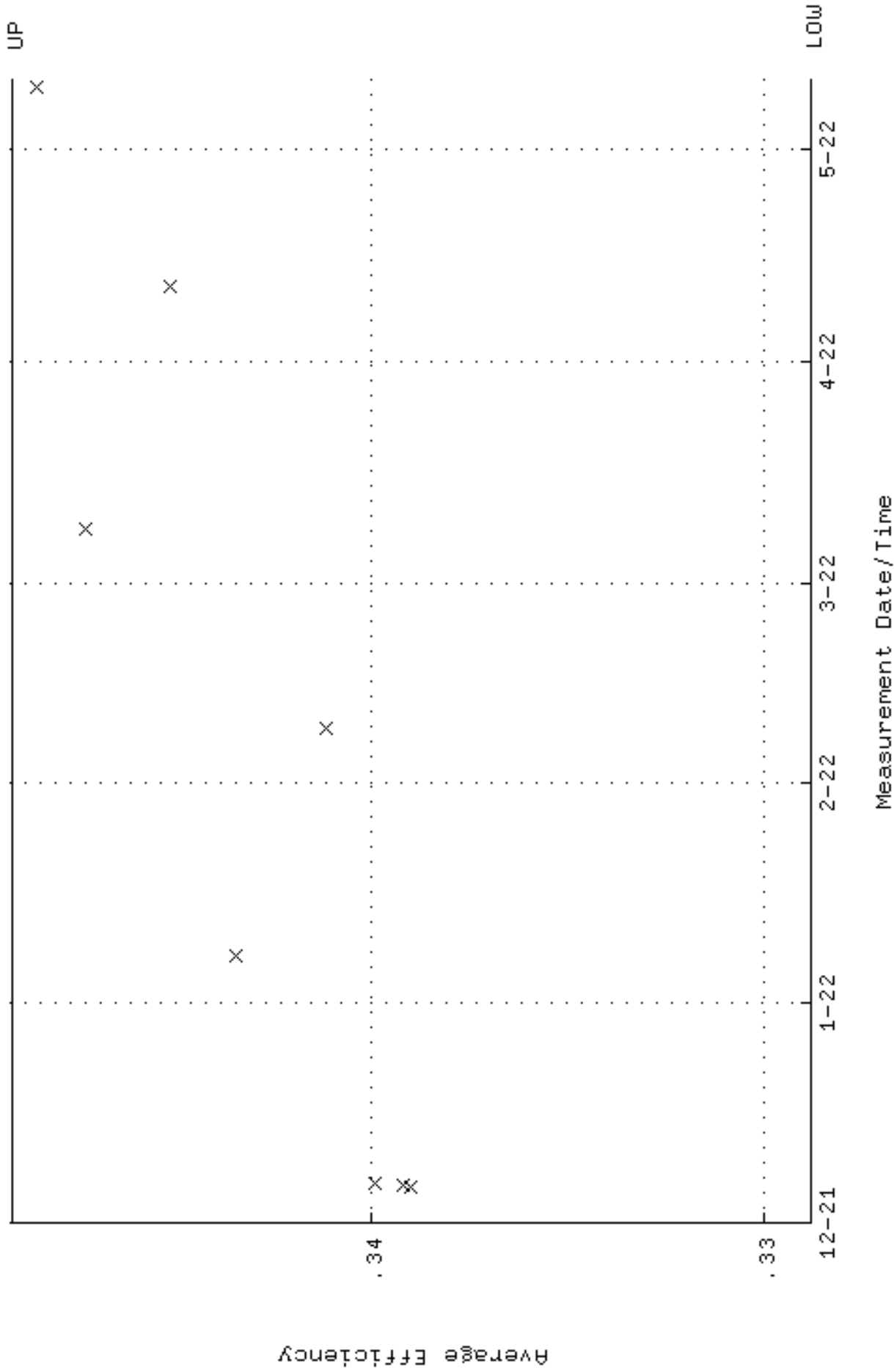
QA filename : DKA100:[ENV_ALPHA.QA.W]W029.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-DEC-2021 09:49:44 through 5-JUN-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



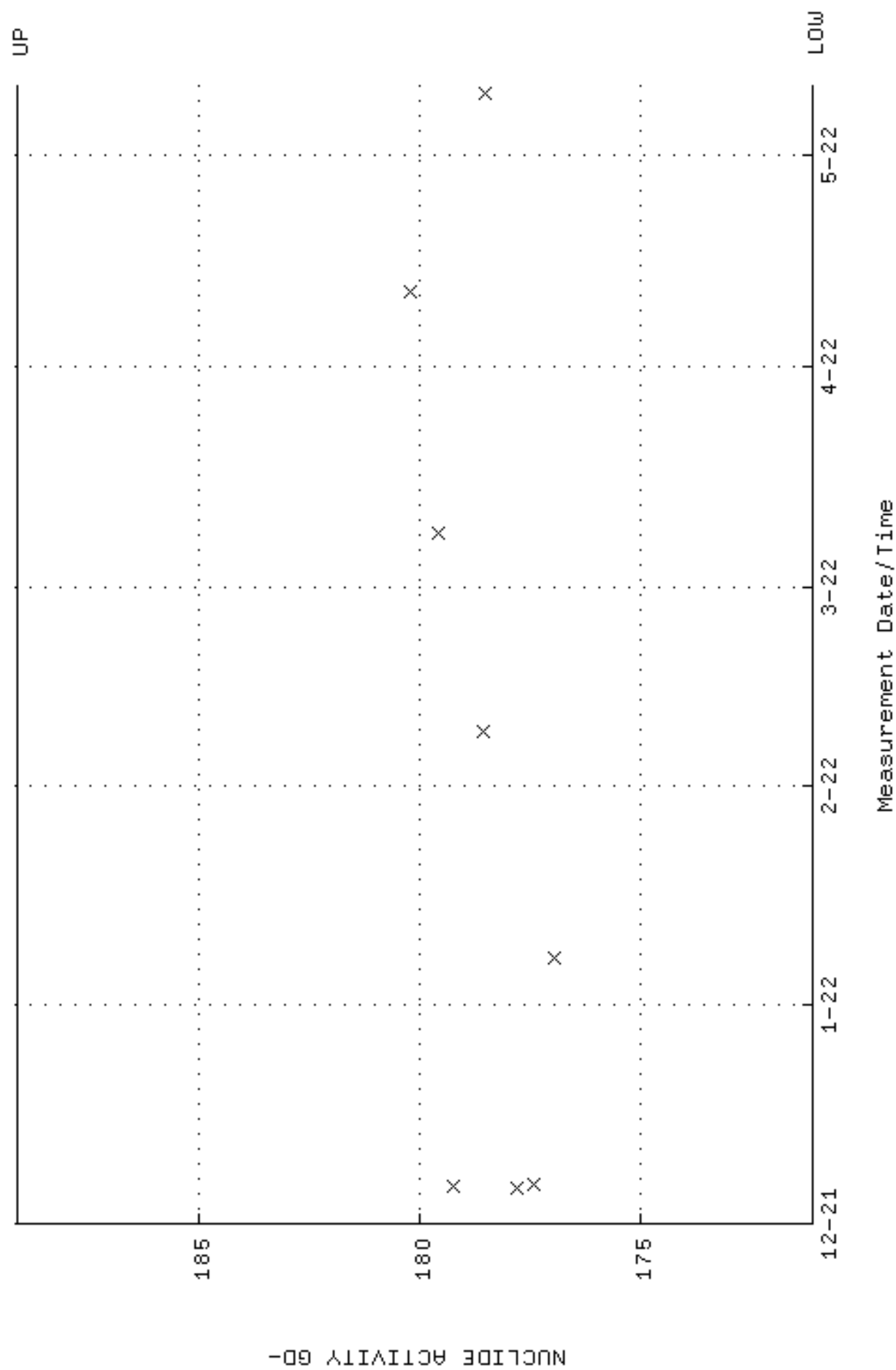
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



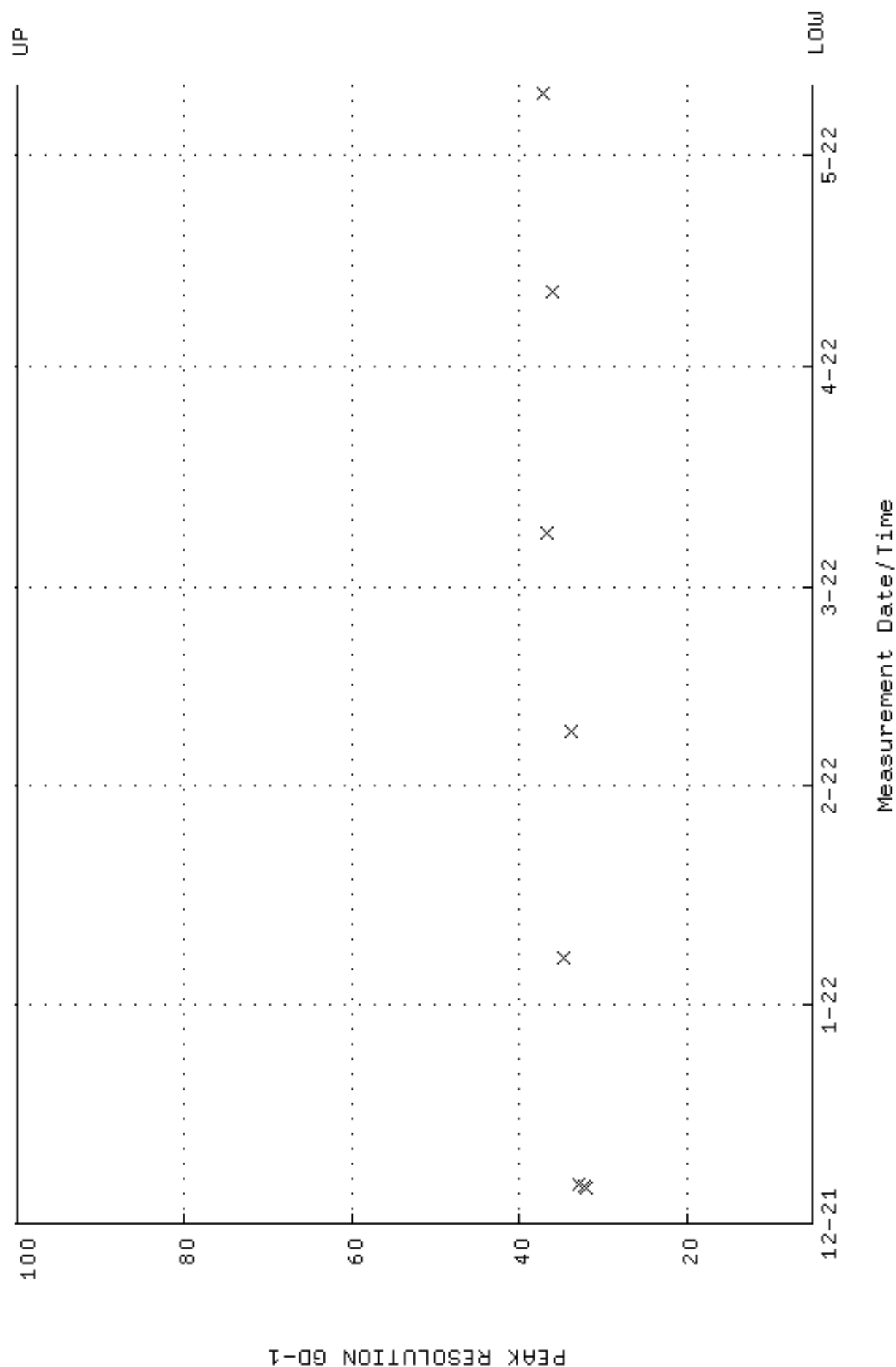
QA filename : DKA100:[ENV_ALPHA.QA.W]W078.QAF;11
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
Lower/Upper Lmts: 0.328800 through 0.349140



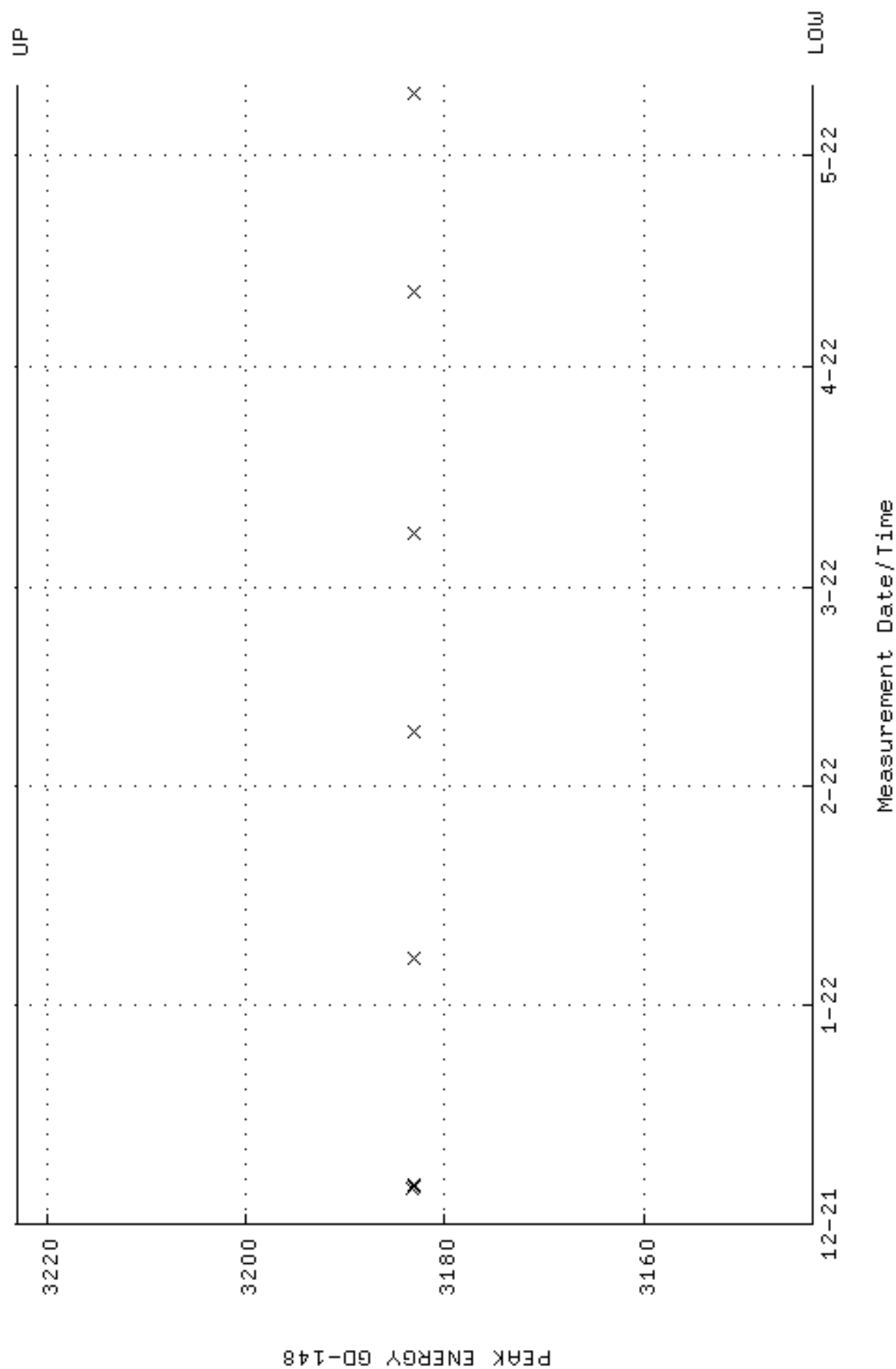
QA filename : DKA100:[ENV_ALPHA.QA.W]W078.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W078.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



QA filename : DKA100:[ENV_ALPHA.QA.W]W078.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



Background Rate

Measurement Date/Time

UP

LOW

0

.01

11-21

12-21

1-22

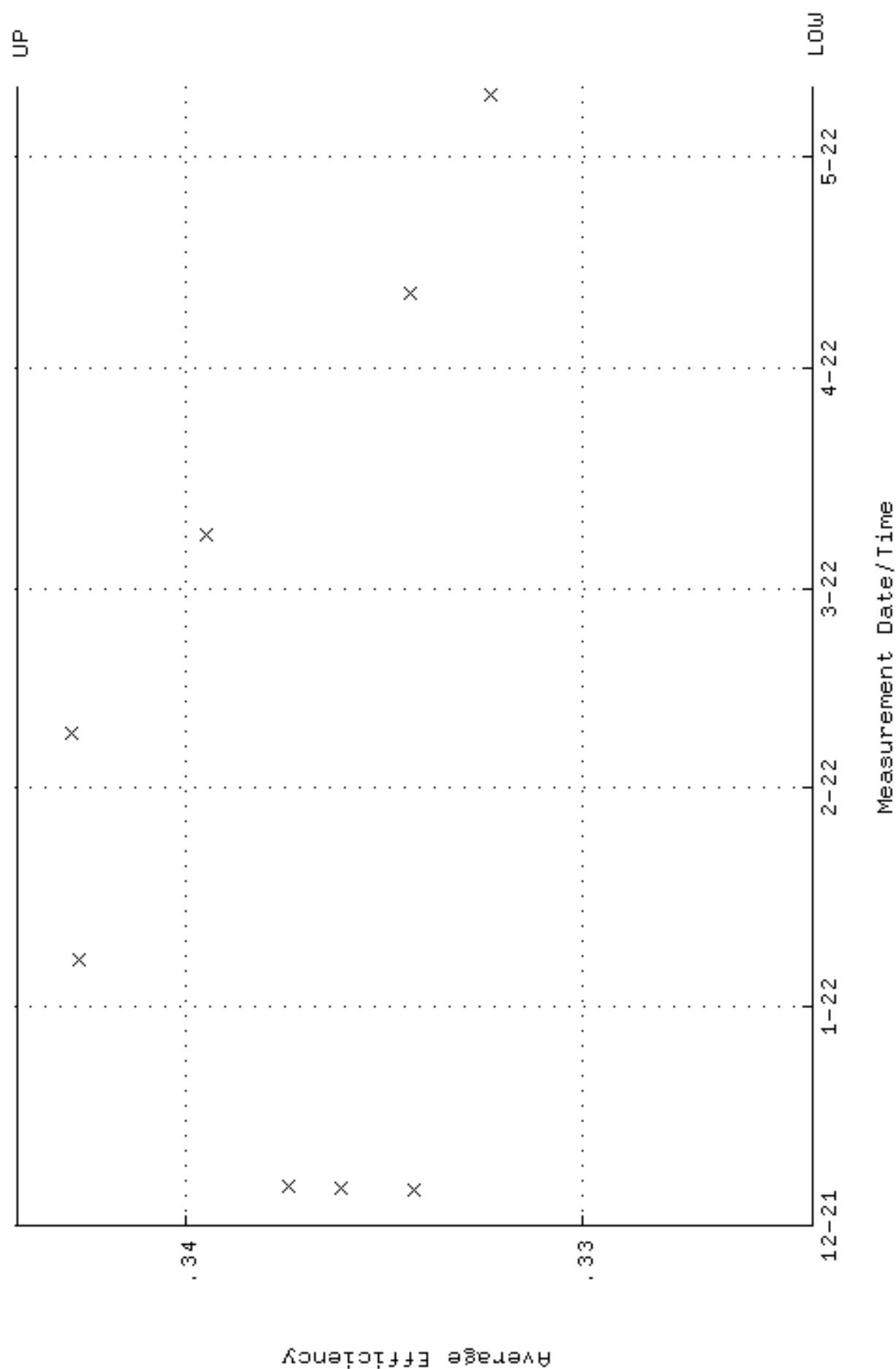
2-22

3-22

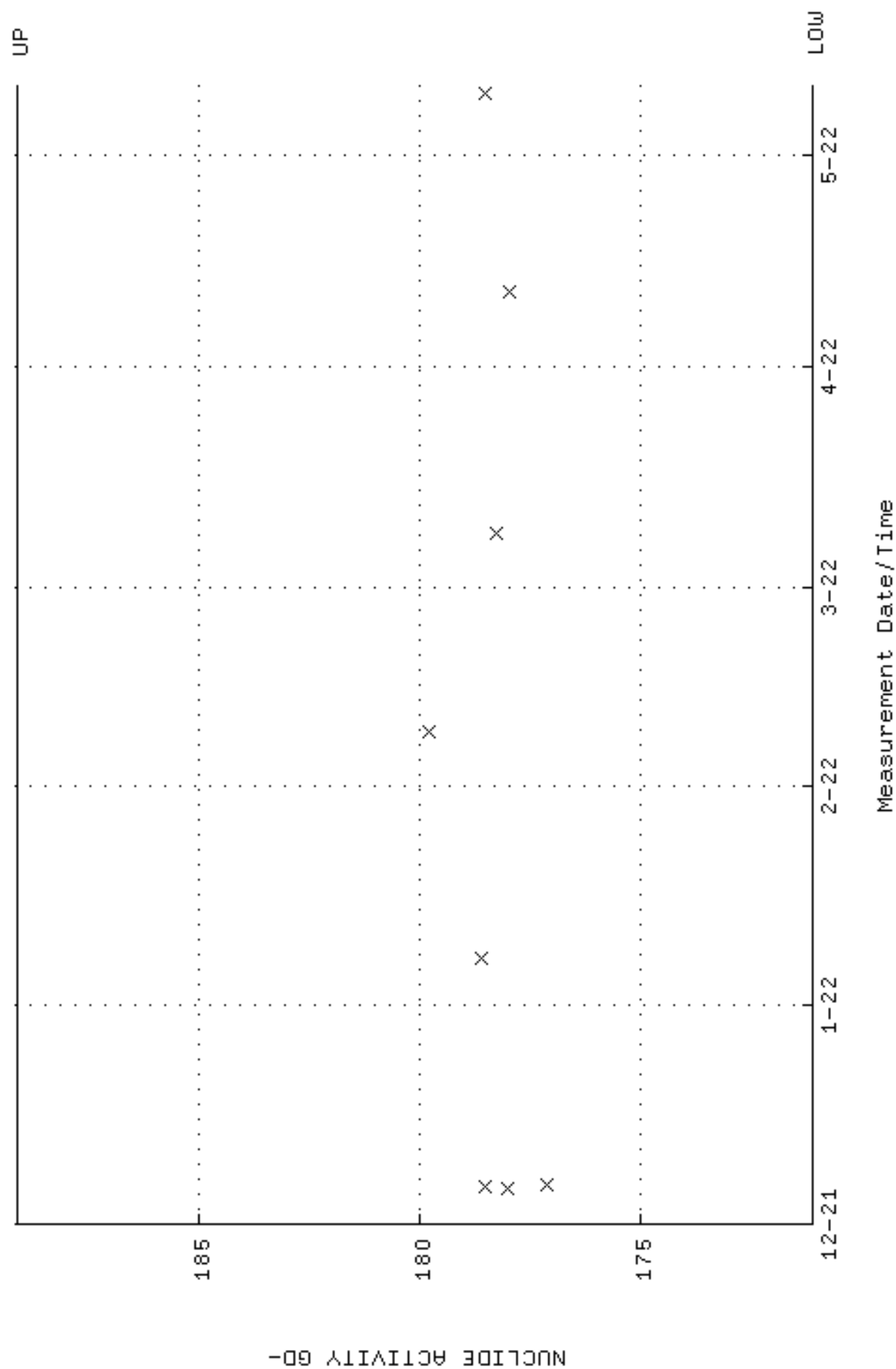
4-22

5-22

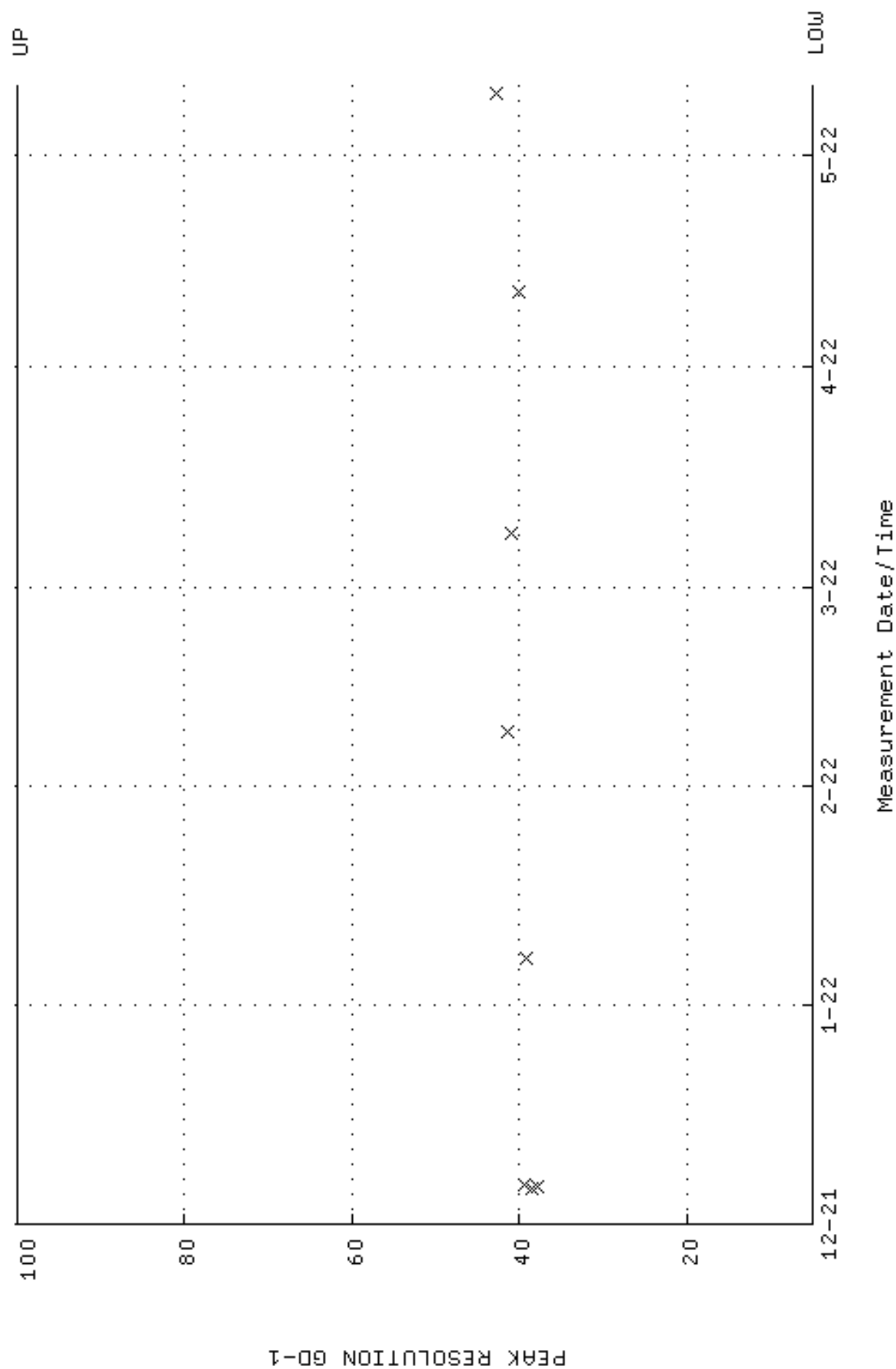
QA filename : DKA100:[ENV_ALPHA.QA.W]W079.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.324210 through 0.344260



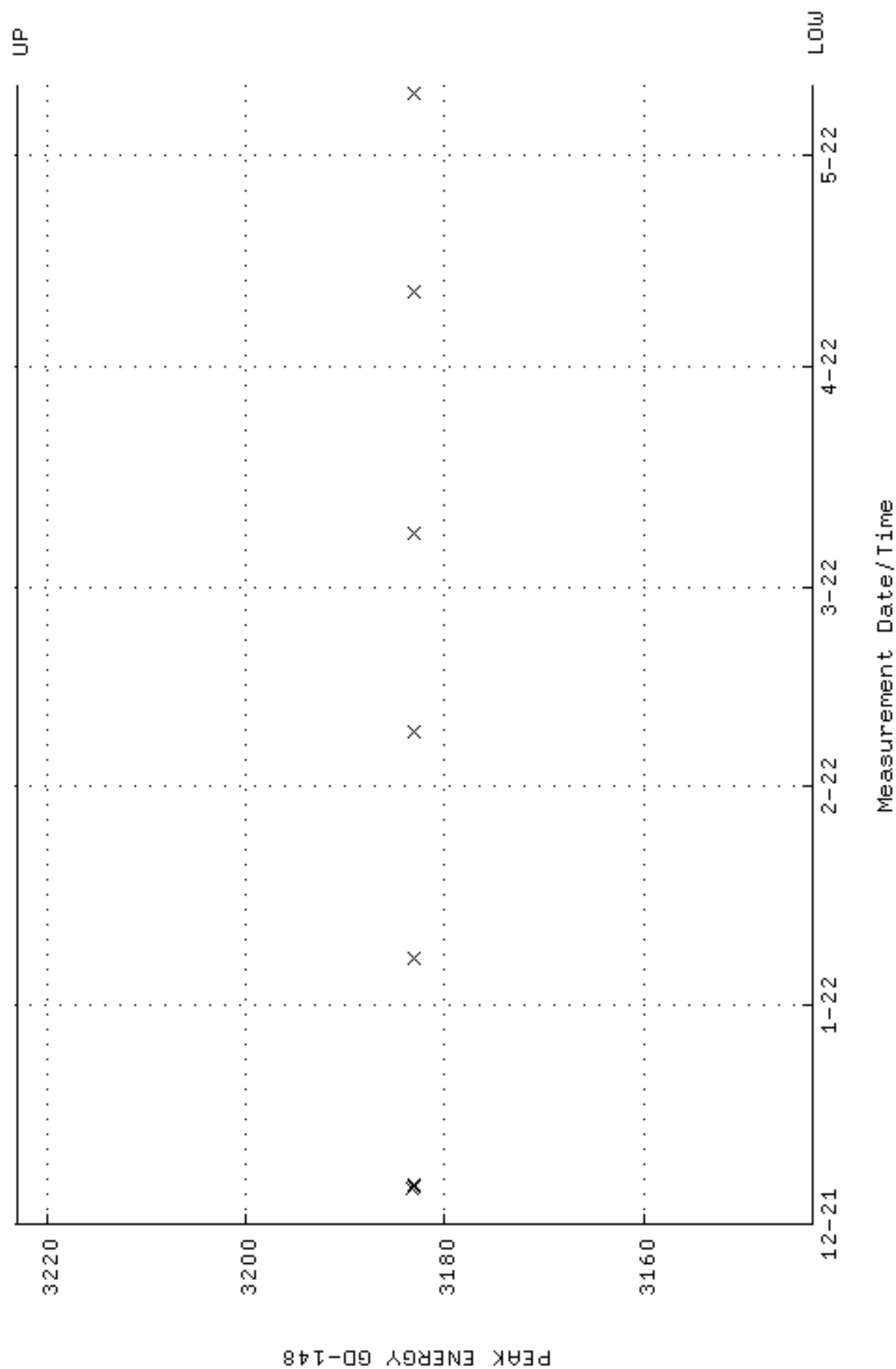
QA filename : DKA100:[ENV_ALPHA.QA.W]W079.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



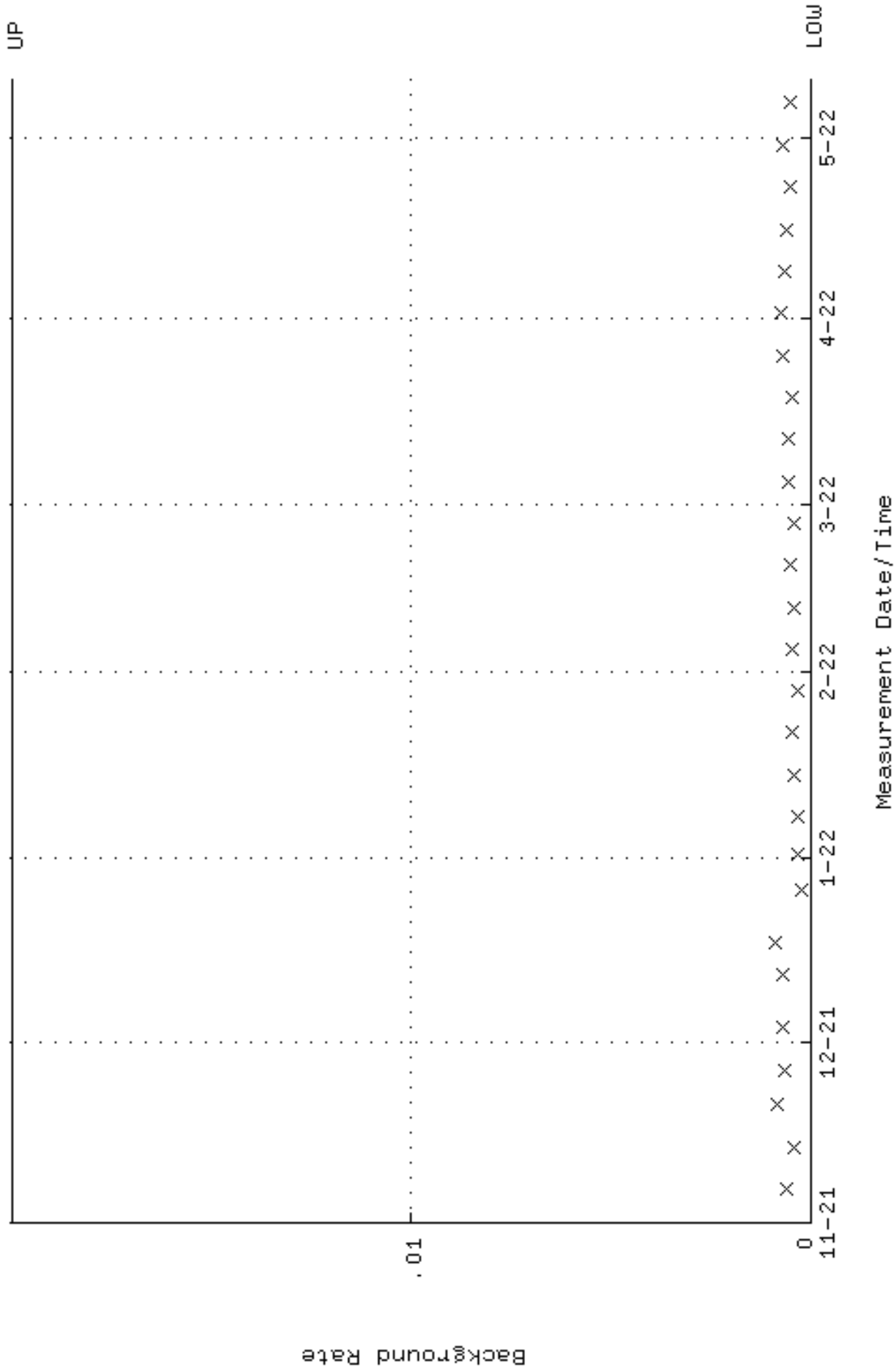
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



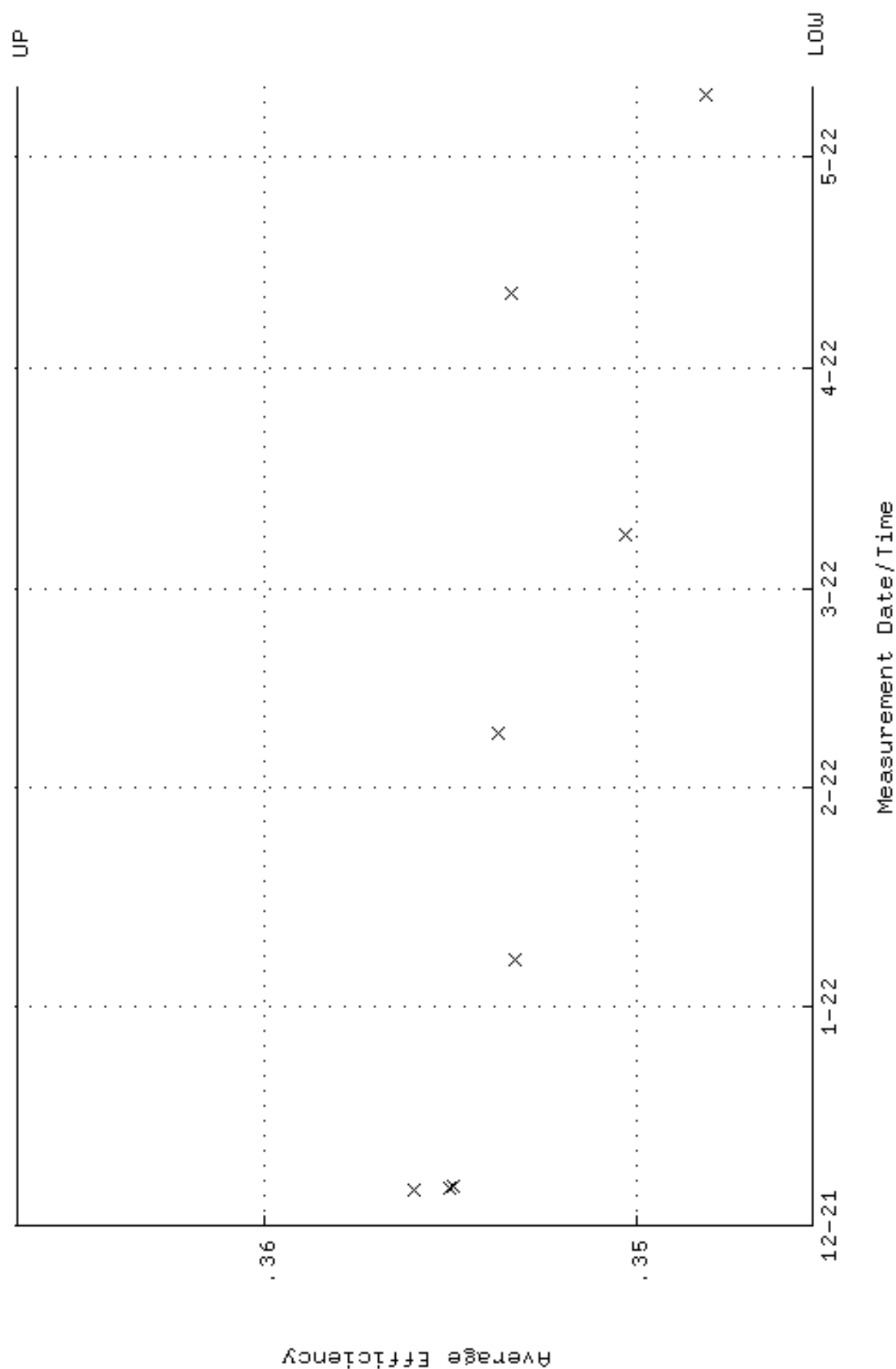
QA filename : DKA100:[ENV_ALPHA.QA.W]W079.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



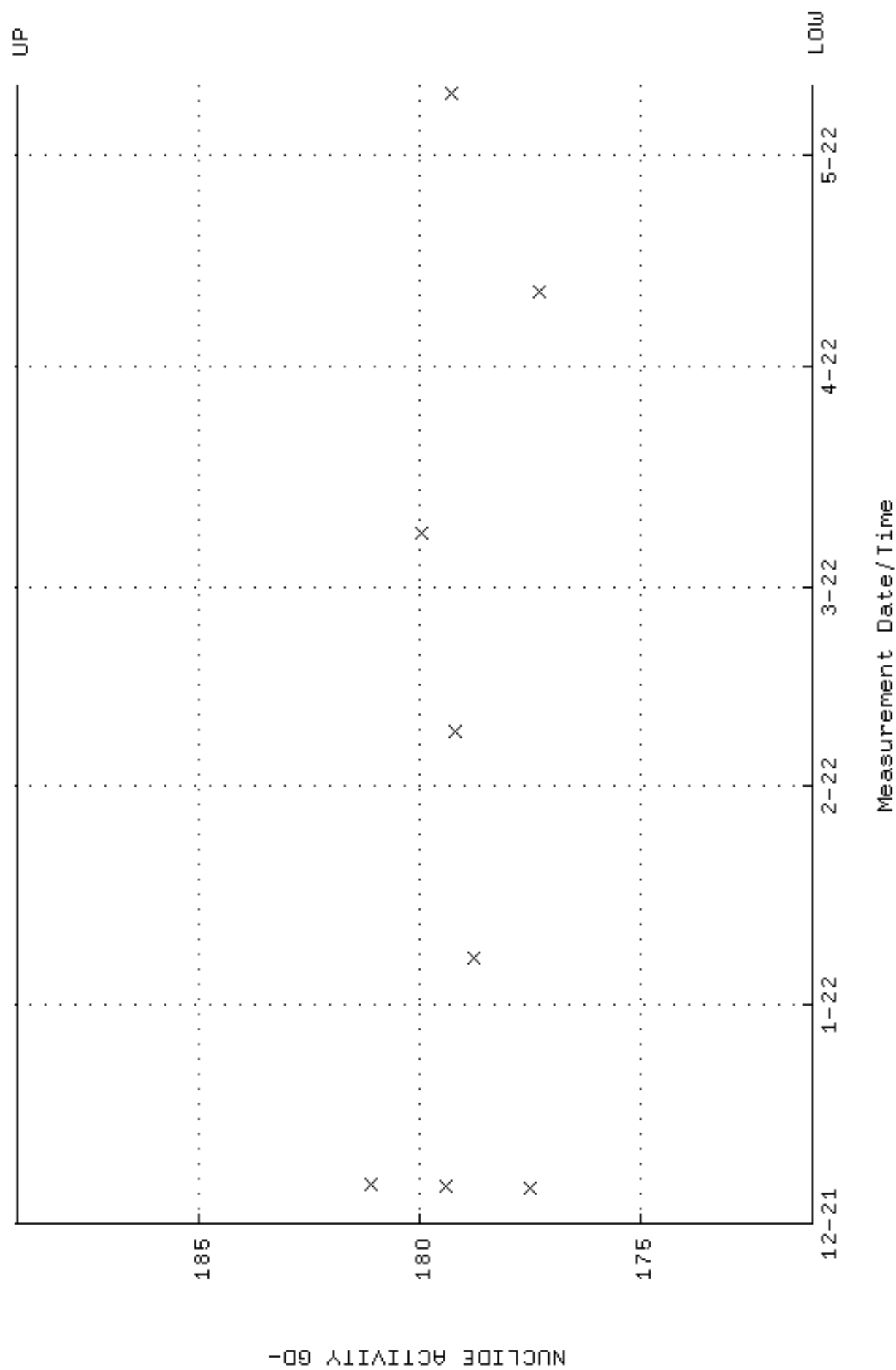
QA filename : DKA100:[ENV_ALPHA.QA.B]B079.QAF;6
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-NOV-2021 16:55:28 through 10-MAY-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



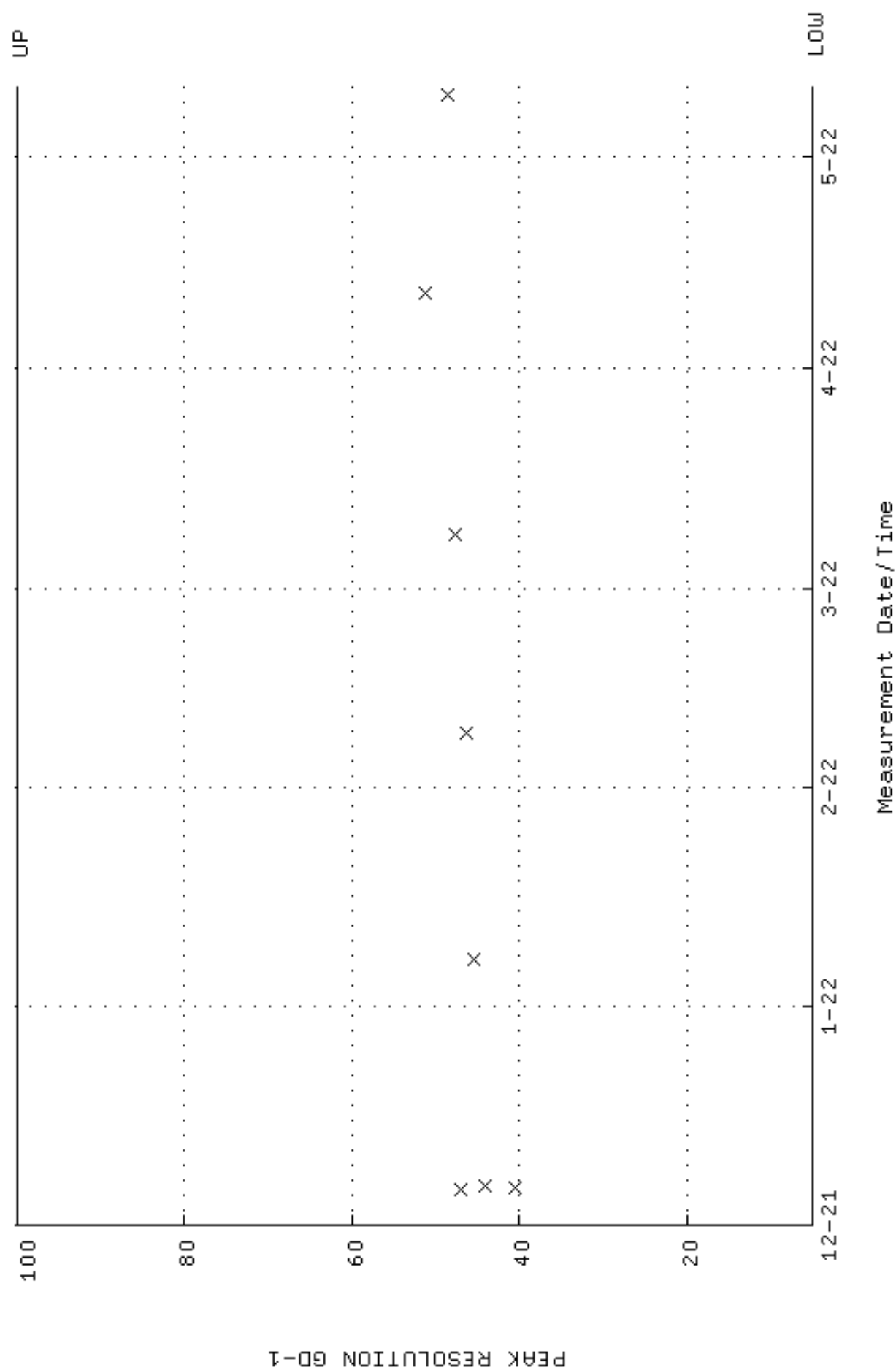
QA filename : DKA100:[ENV_ALPHA.QA.W]W080.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.345260 through 0.366620



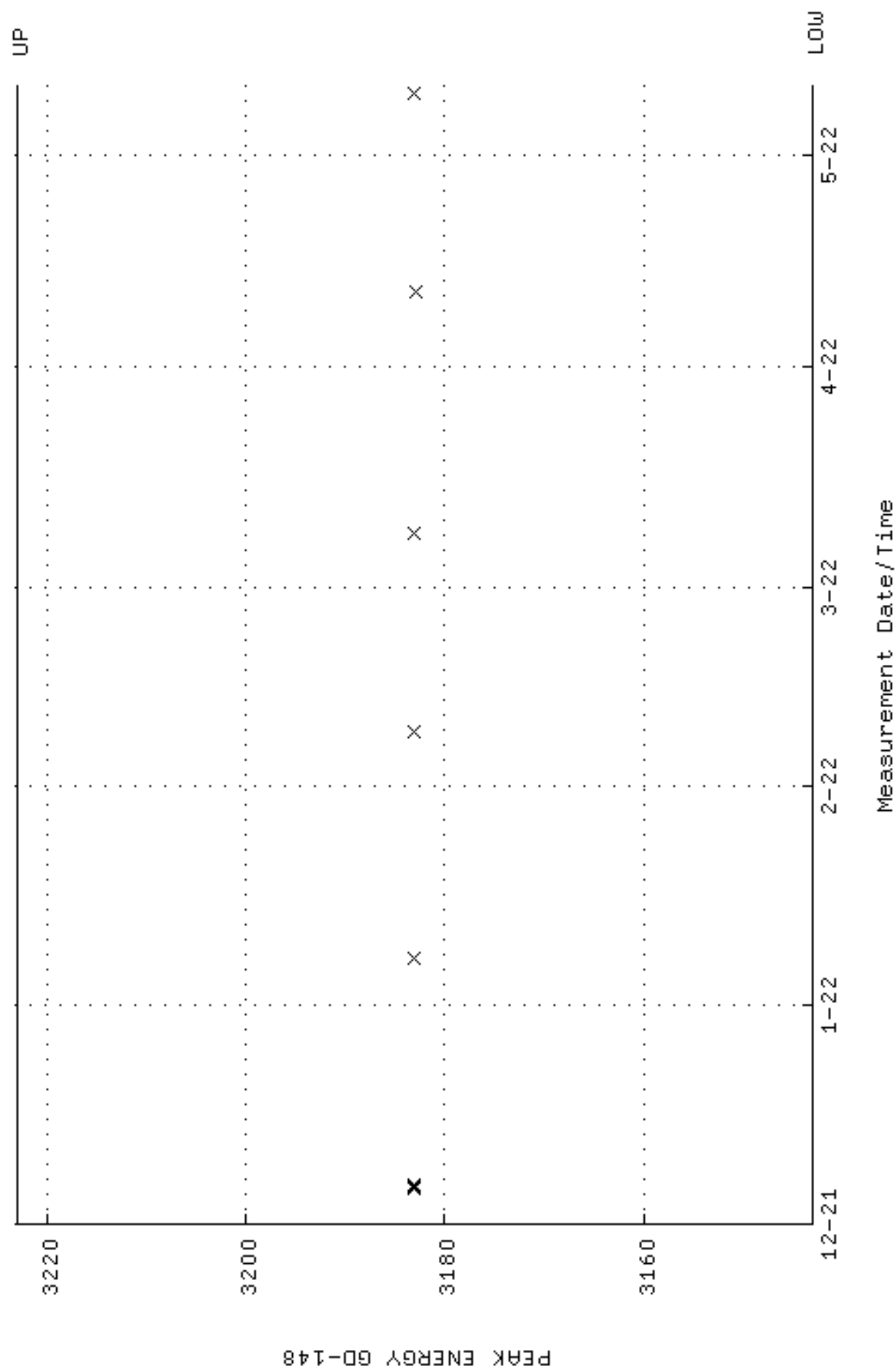
QA filename : DKA100:[ENV_ALPHA.QA.W]W080.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



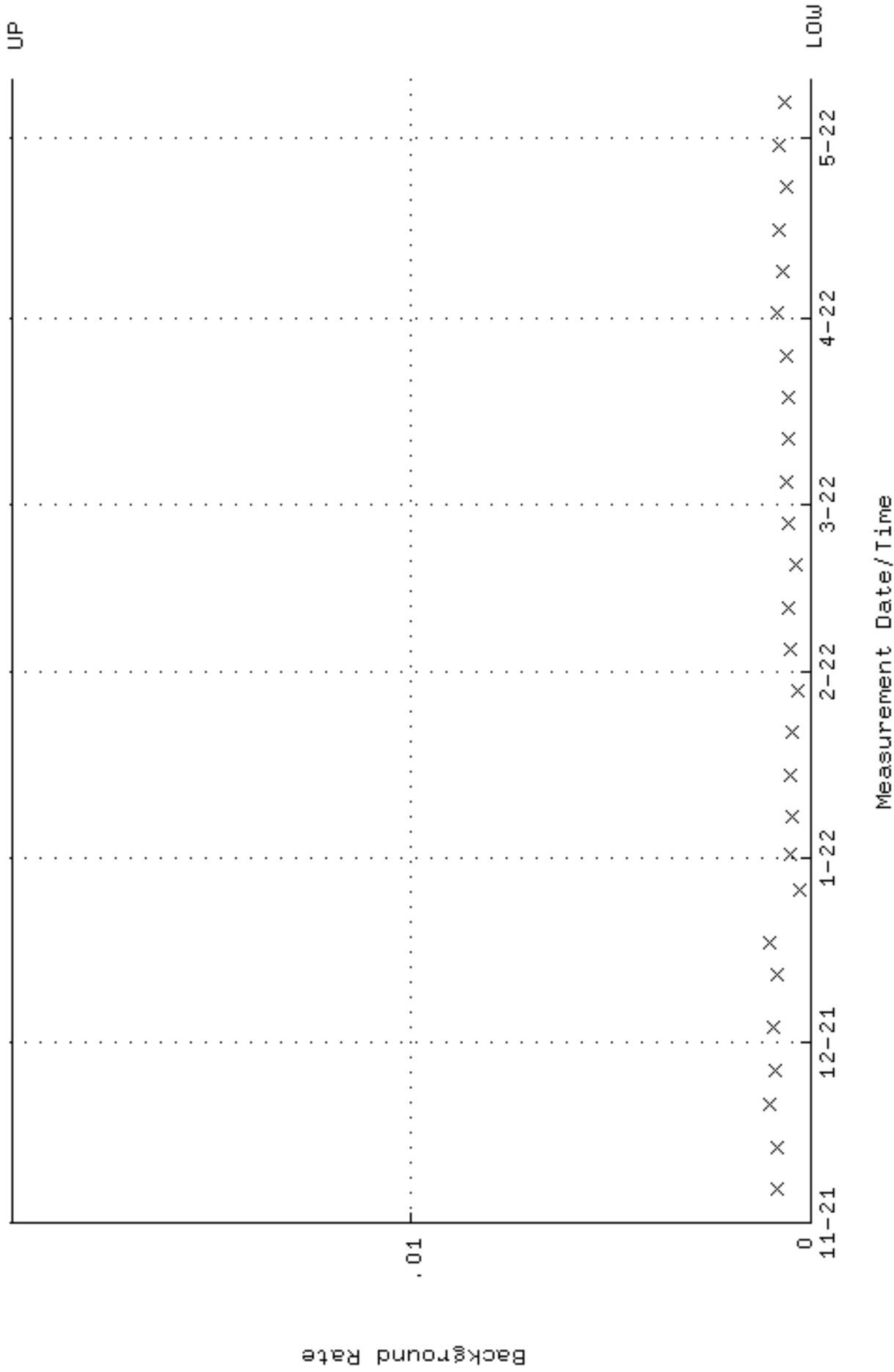
QA filename : DKA100:[ENV_ALPHA.QA.W]W080.QAF;10
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



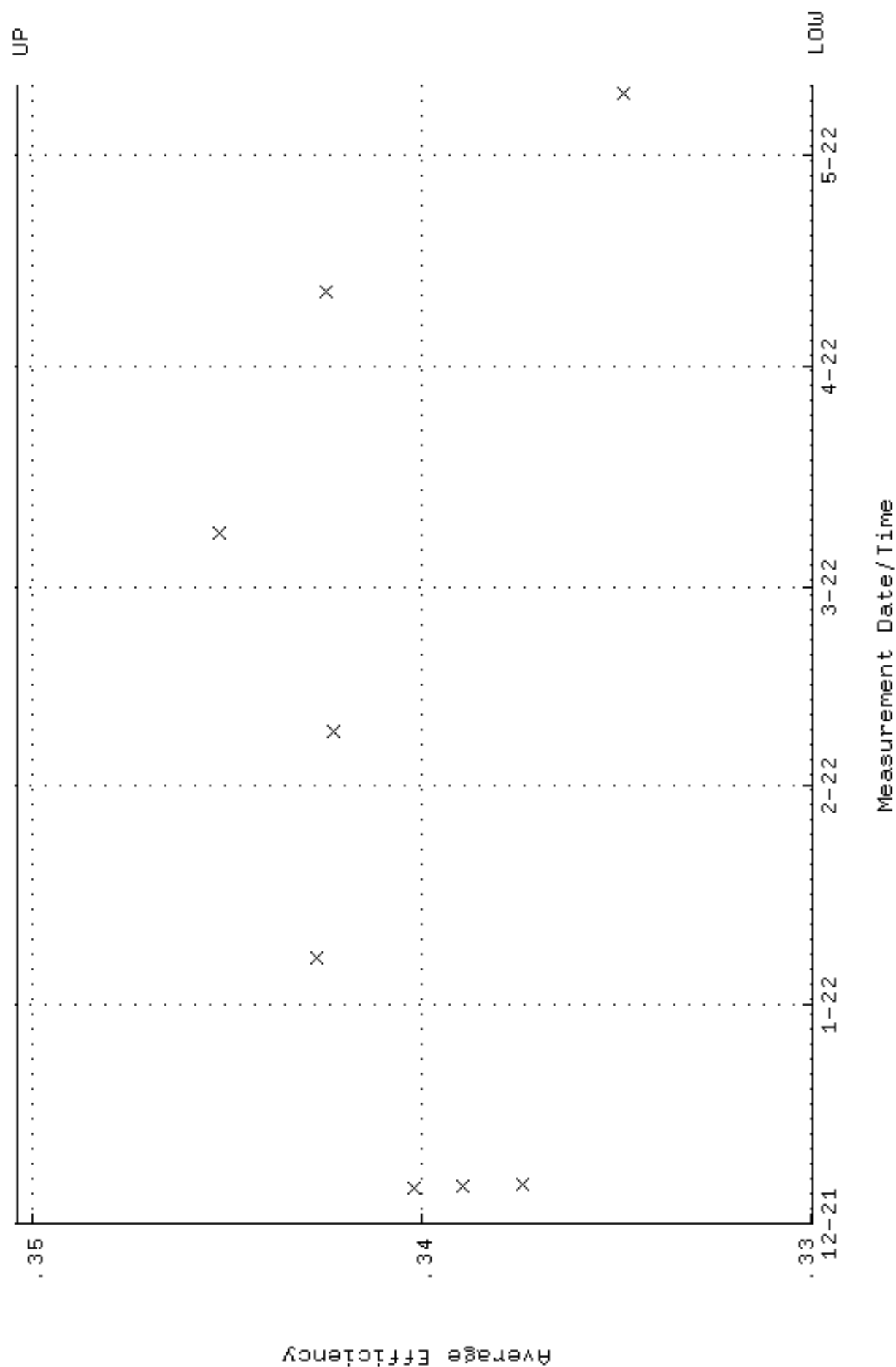
QA filename : DKA100:[ENV_ALPHA.QA.W]W080.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



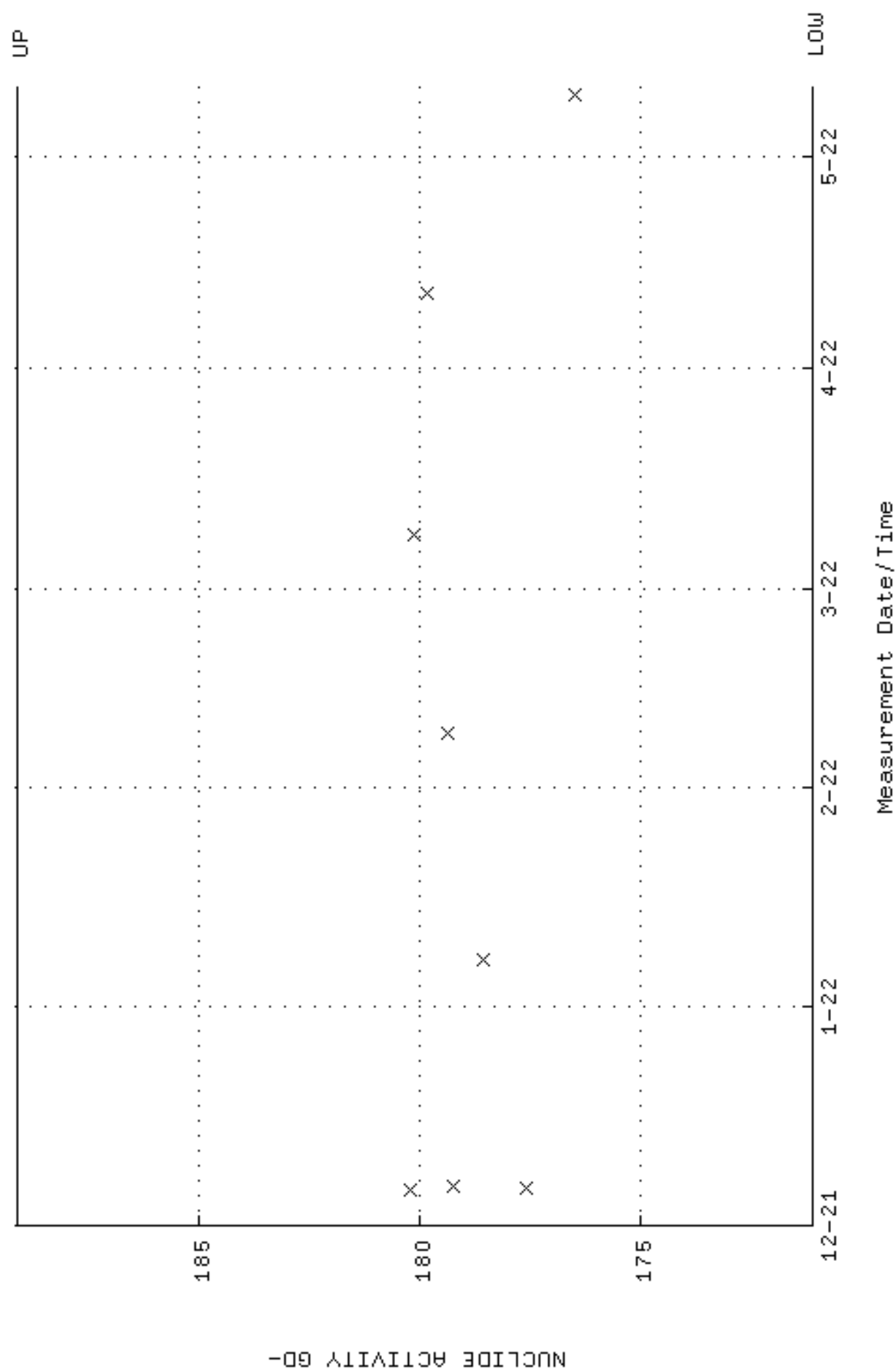
QA filename : DKA100:[ENV_ALPHA.QA.B]B080.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-NOV-2021 16:55:28 through 10-MAY-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



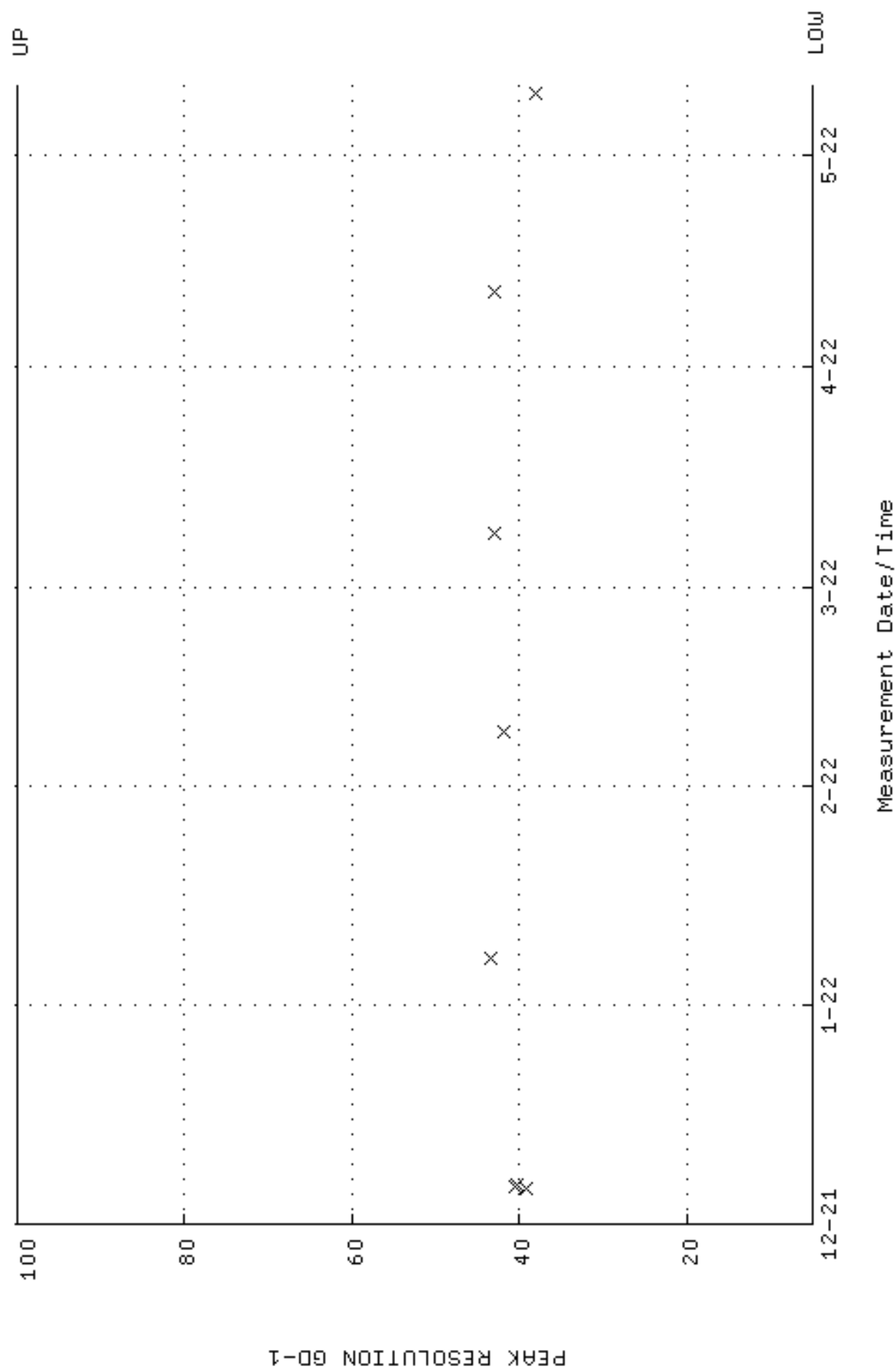
QA filename : DKA100:[ENV_ALPHA.QA.W]W081.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.329970 through 0.350380



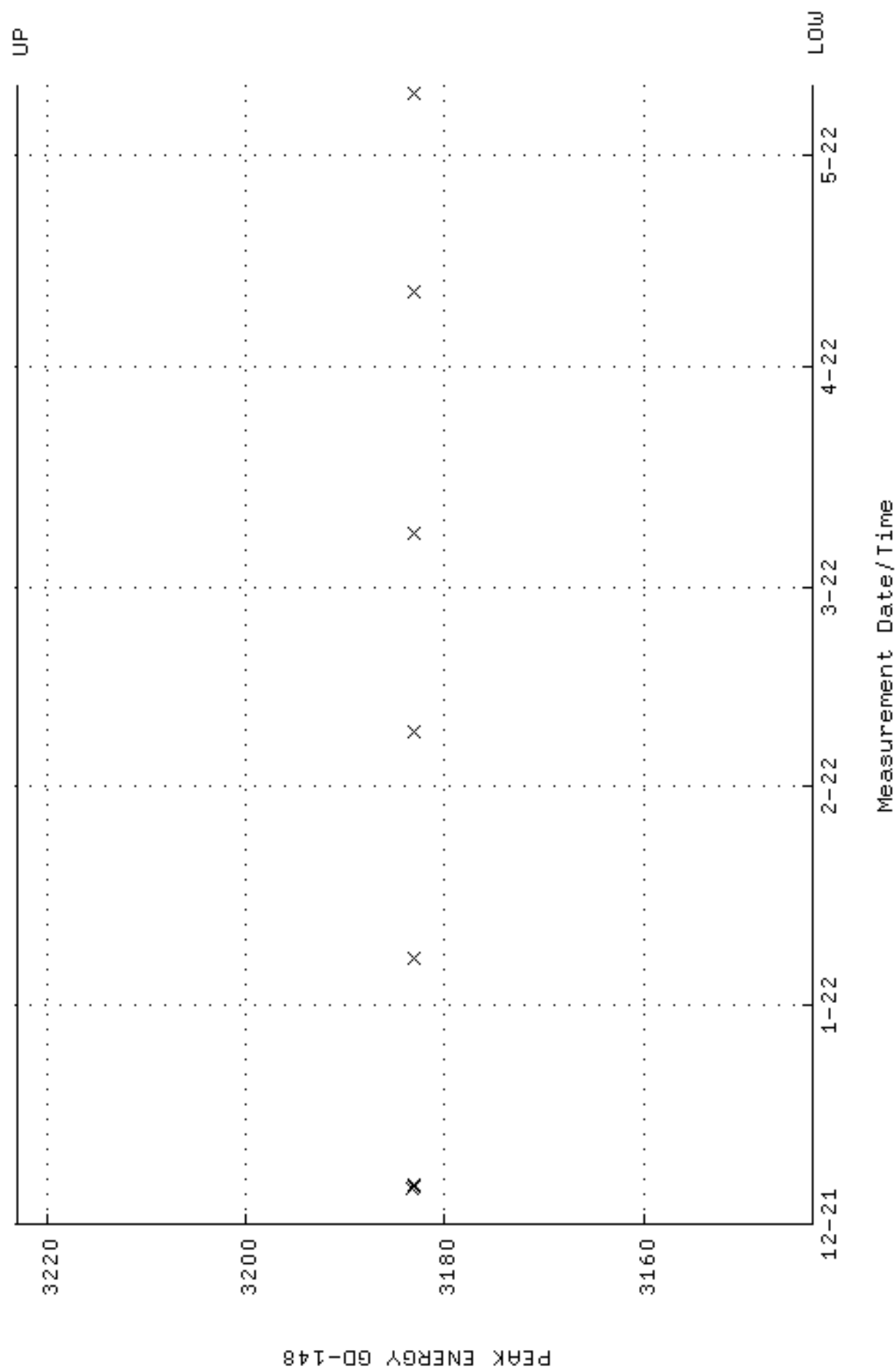
QA filename : DKA100:[ENV_ALPHA.QA.W]W081.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



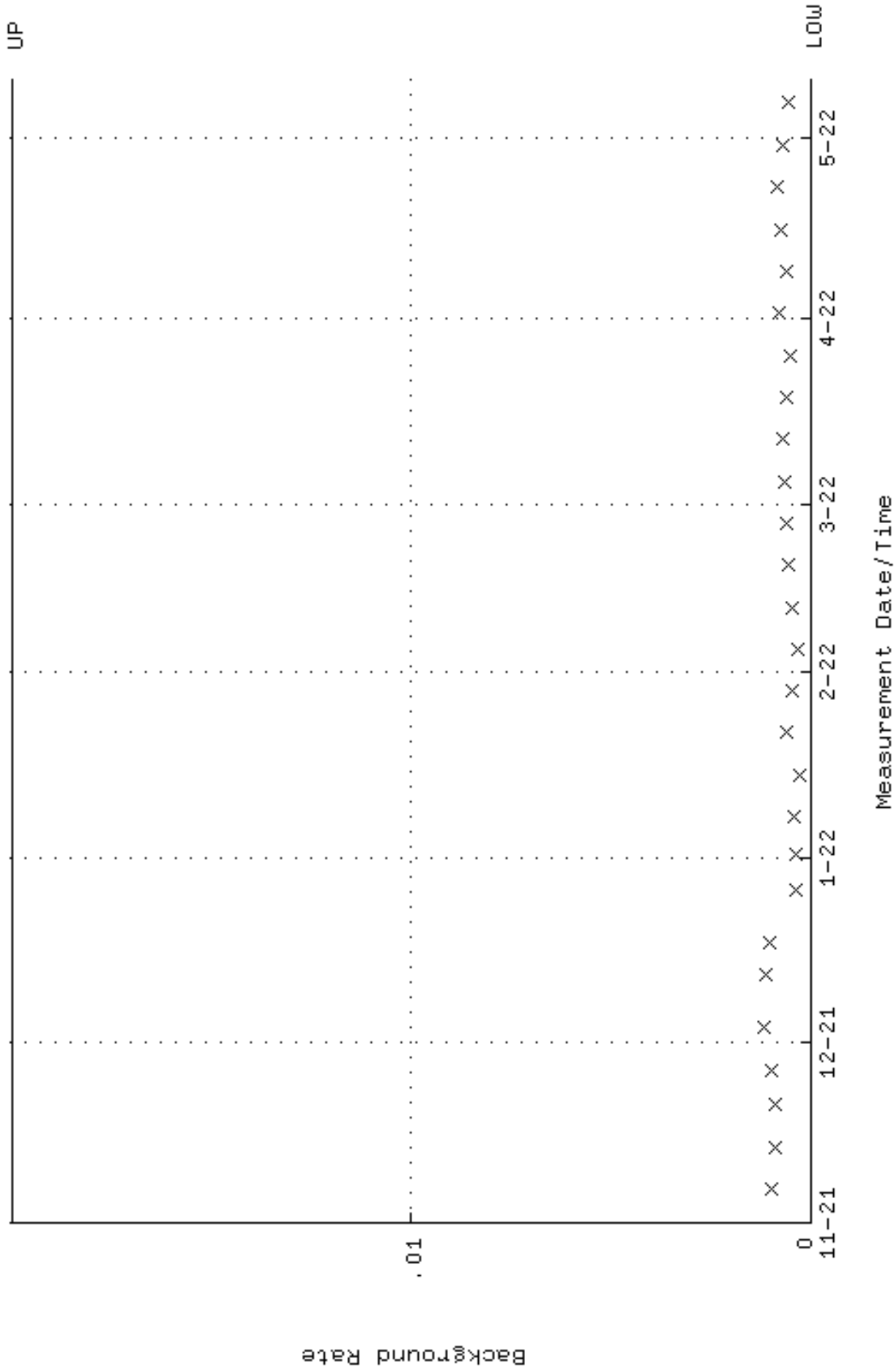
QA filename : DKA100:[ENV_ALPHA.QA.W]W081.QAF;9
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



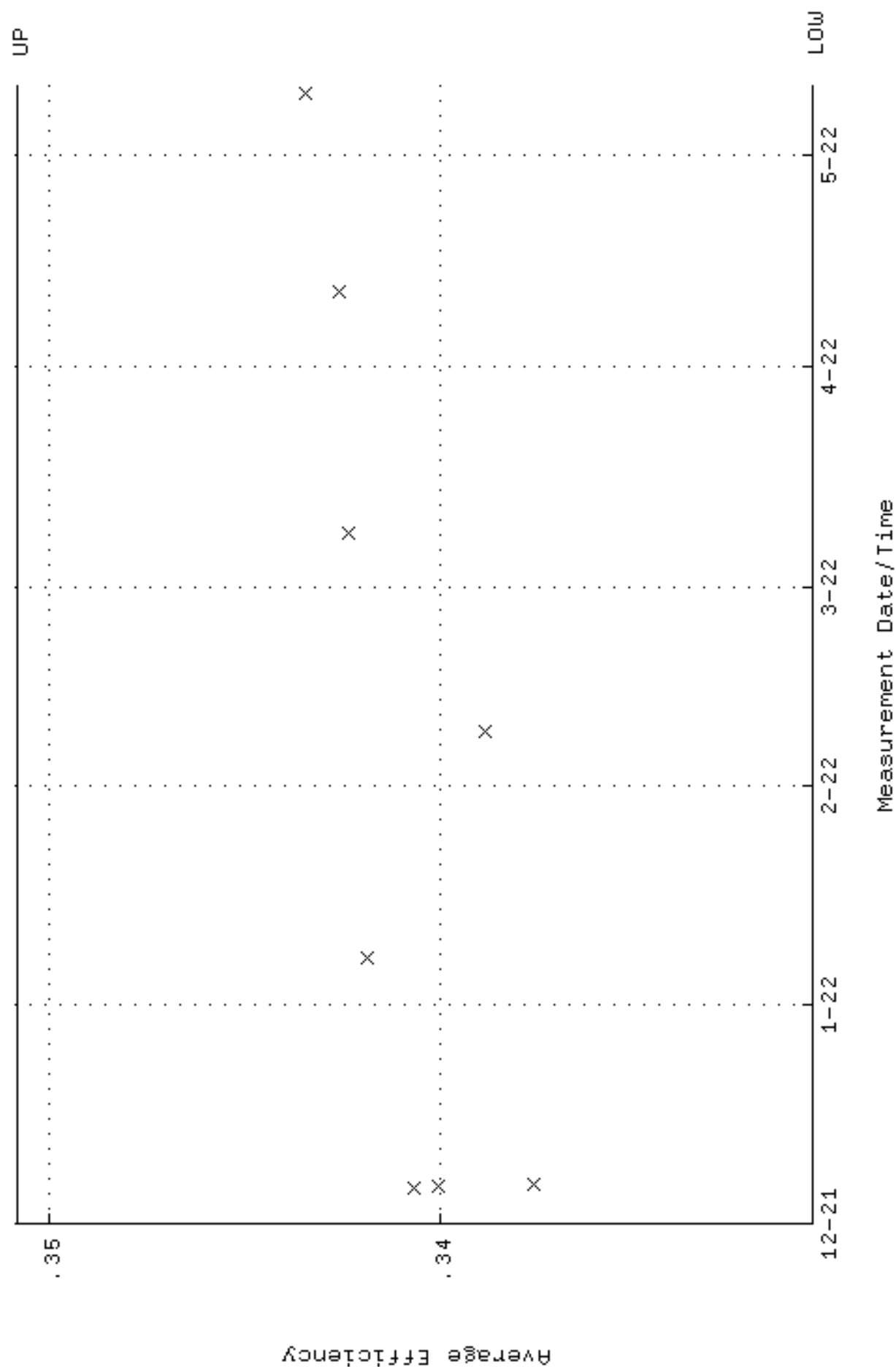
QA filename : DKA100:[ENV_ALPHA.QA.W]W081.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



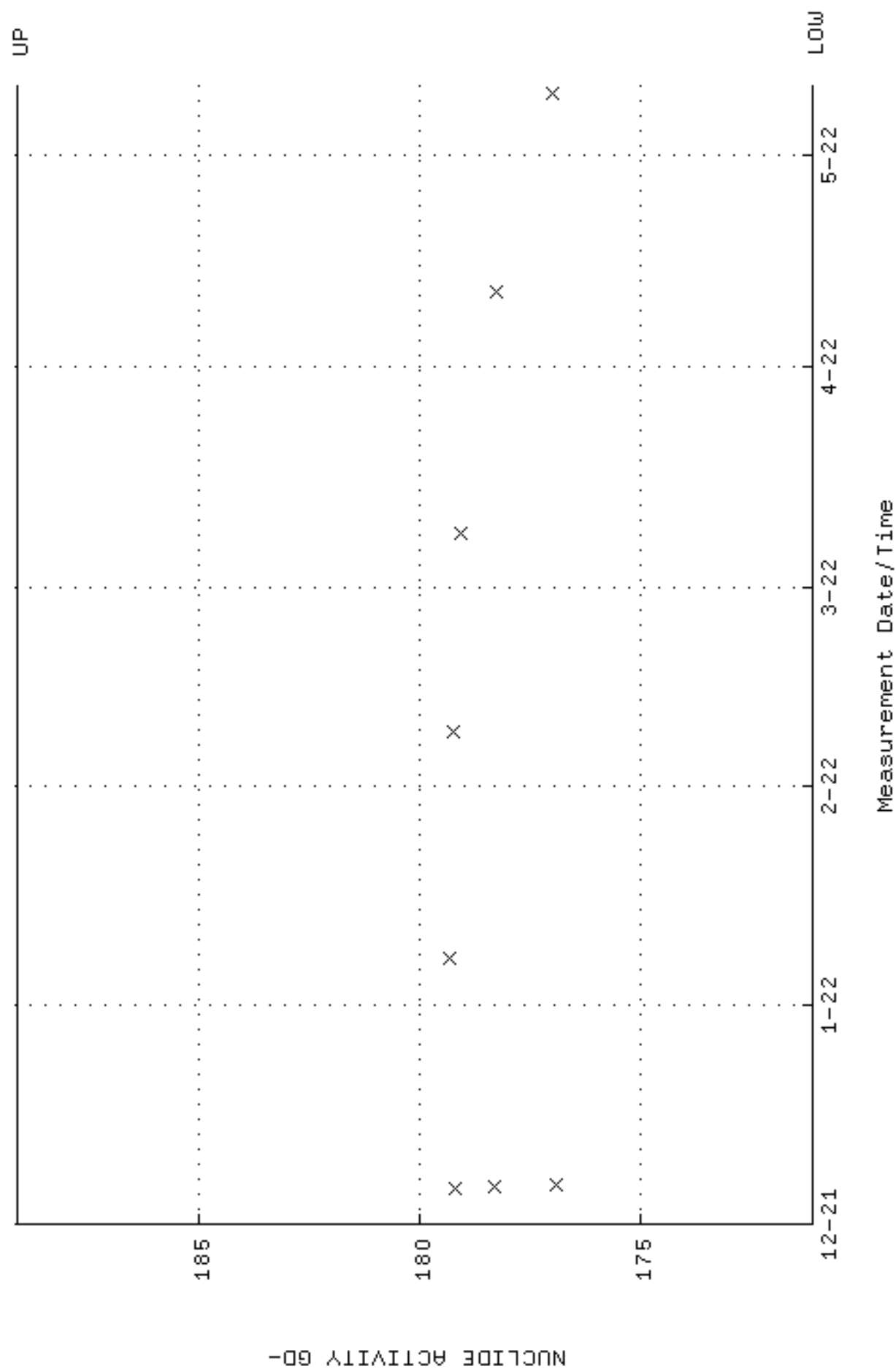
QA filename : DKA100:[ENV_ALPHA.QA.B]B081.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-NOV-2021 16:55:28 through 10-MAY-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



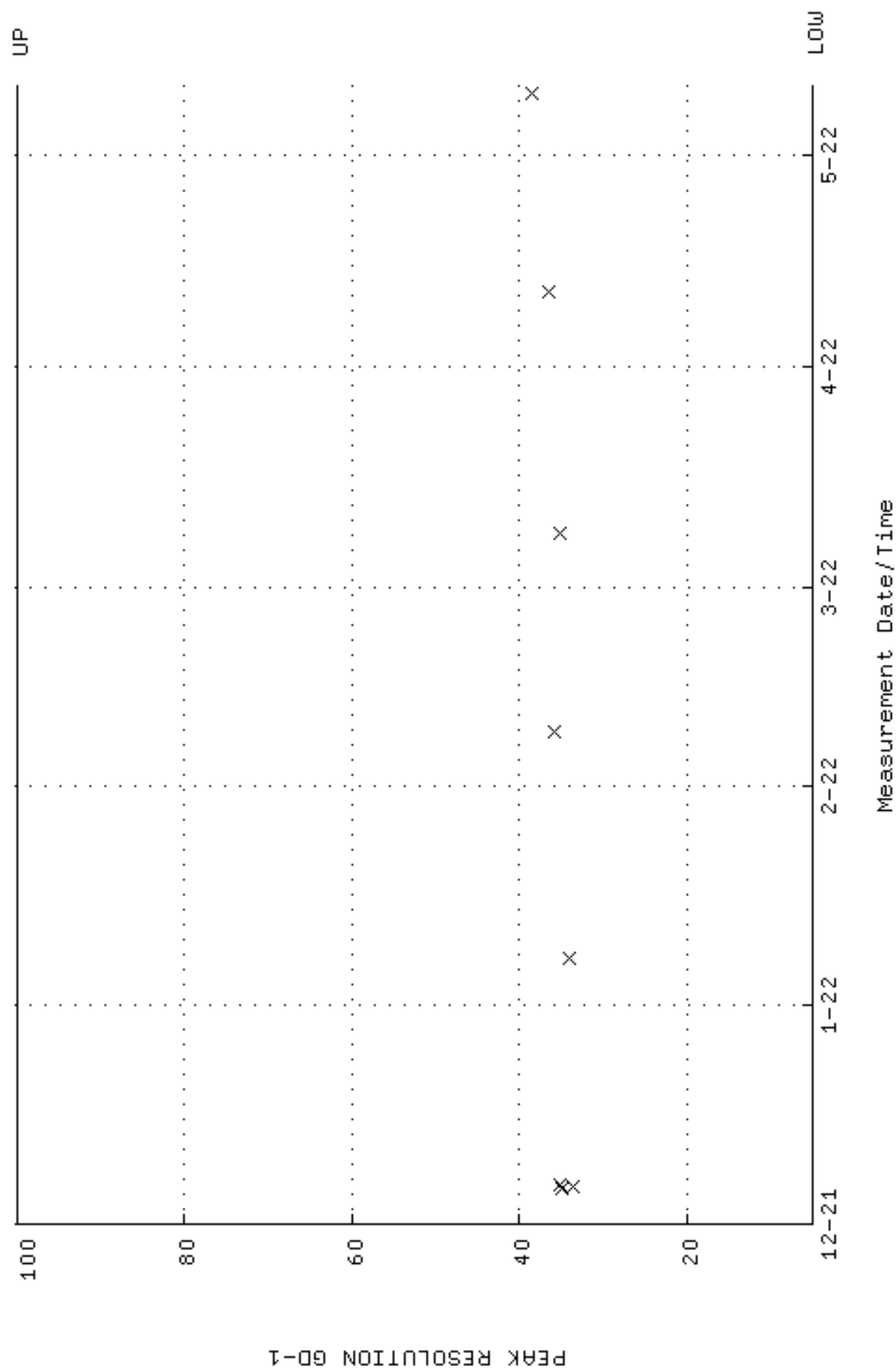
QA filename : DKA100:[ENV_ALPHA.QA.W]W082.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.330410 through 0.350840



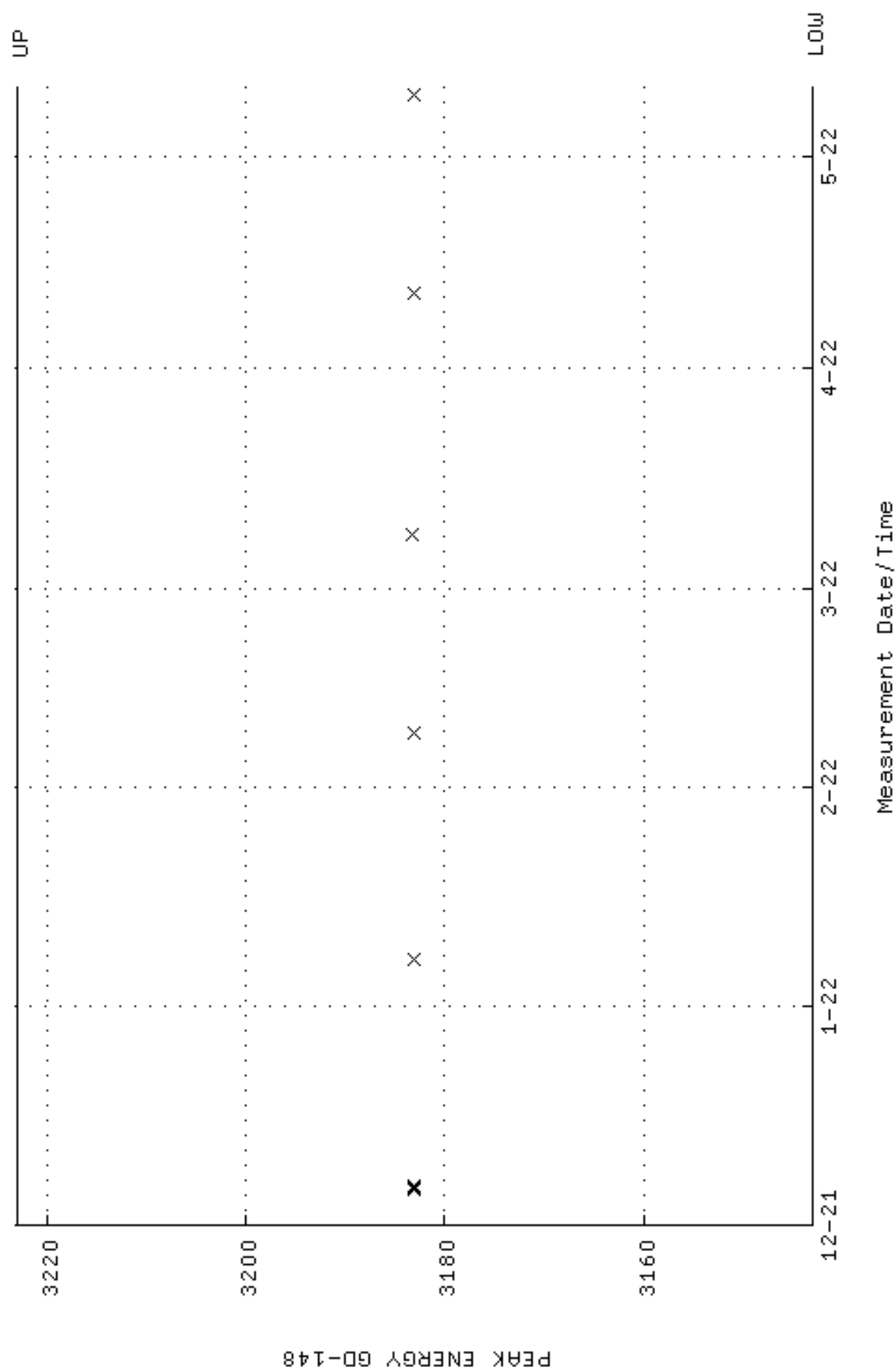
QA filename : DKA100:[ENV_ALPHA.QA.W]W082.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W082.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



QA filename : DKA100:[ENV_ALPHA.QA.W]W082.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-DEC-2021 21:23:01 through 10-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



Background Rate

Measurement Date/Time

UP

LOW

0

.01

11-21

12-21

1-22

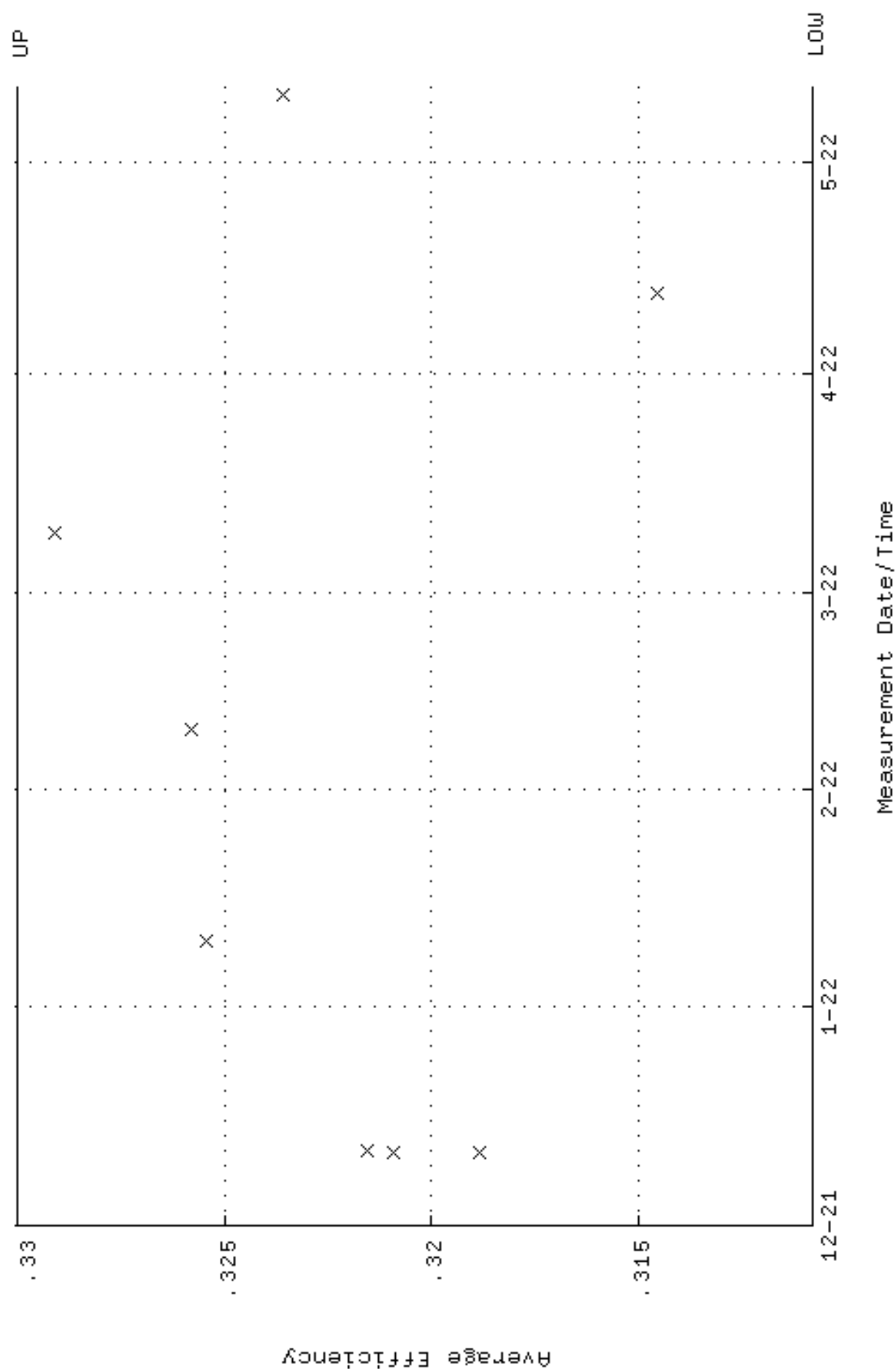
2-22

3-22

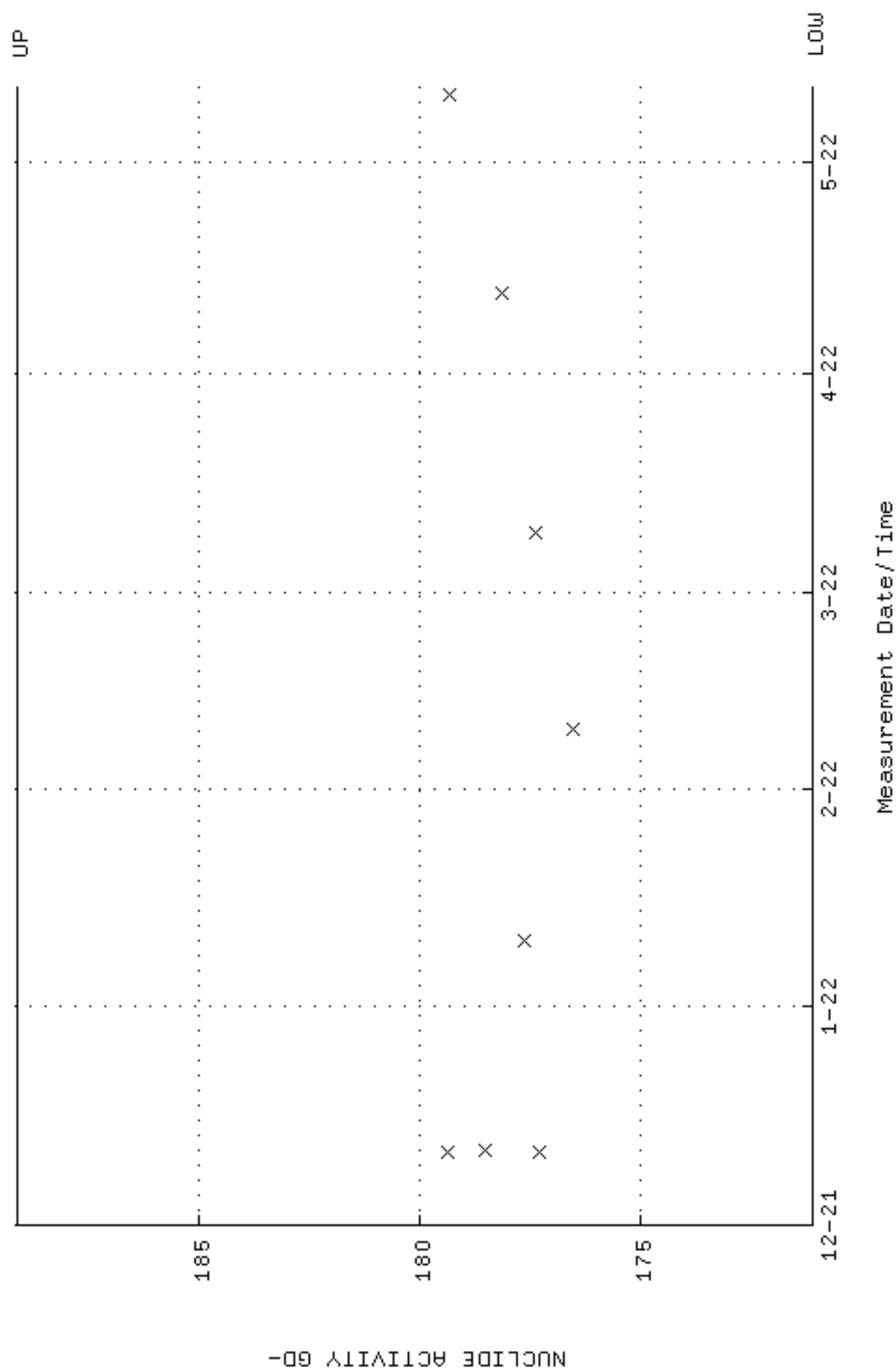
4-22

5-22

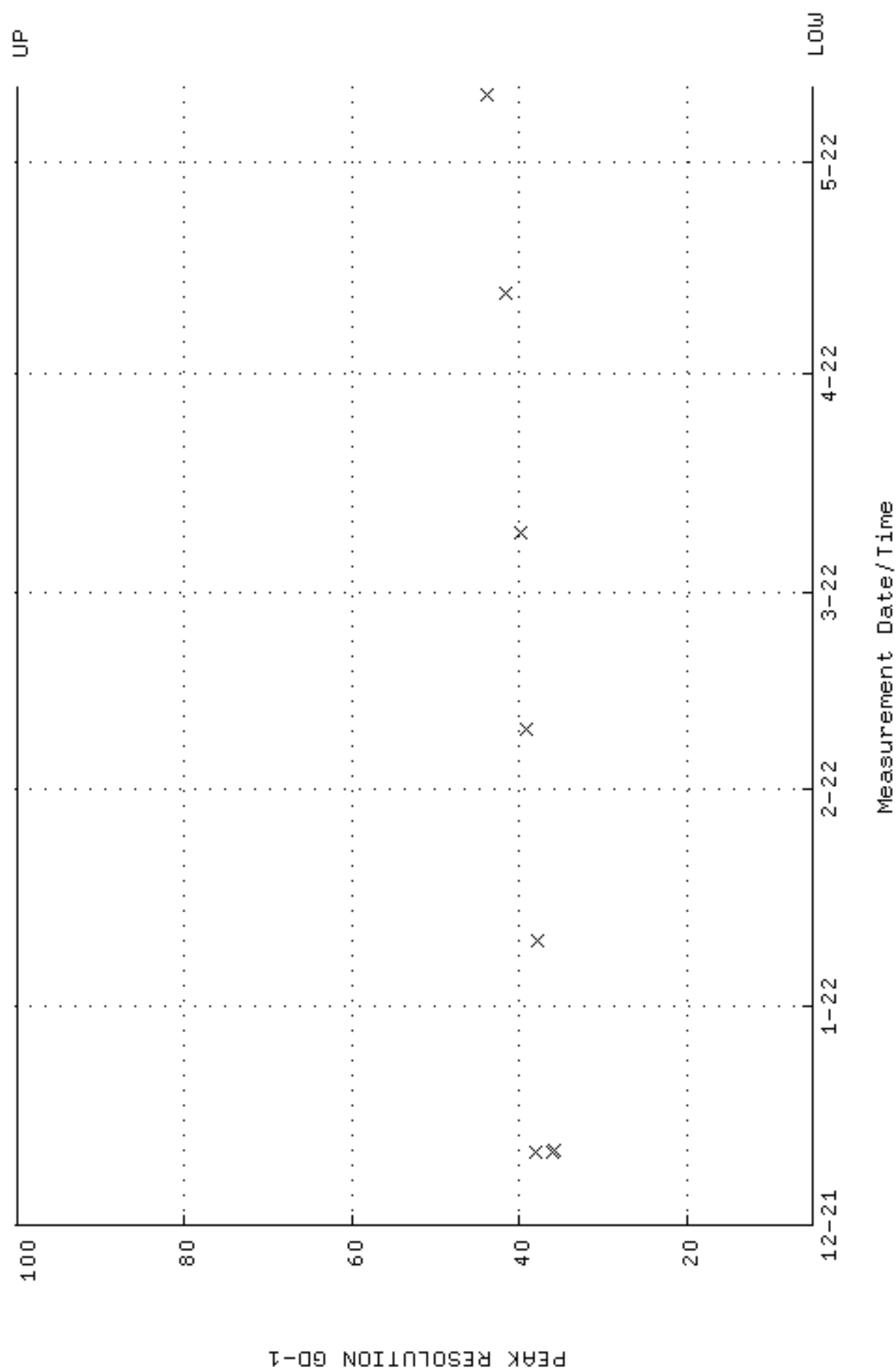
QA filename : DKA100:[ENV_ALPHA.QA.W]W107.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.310800 through 0.330000



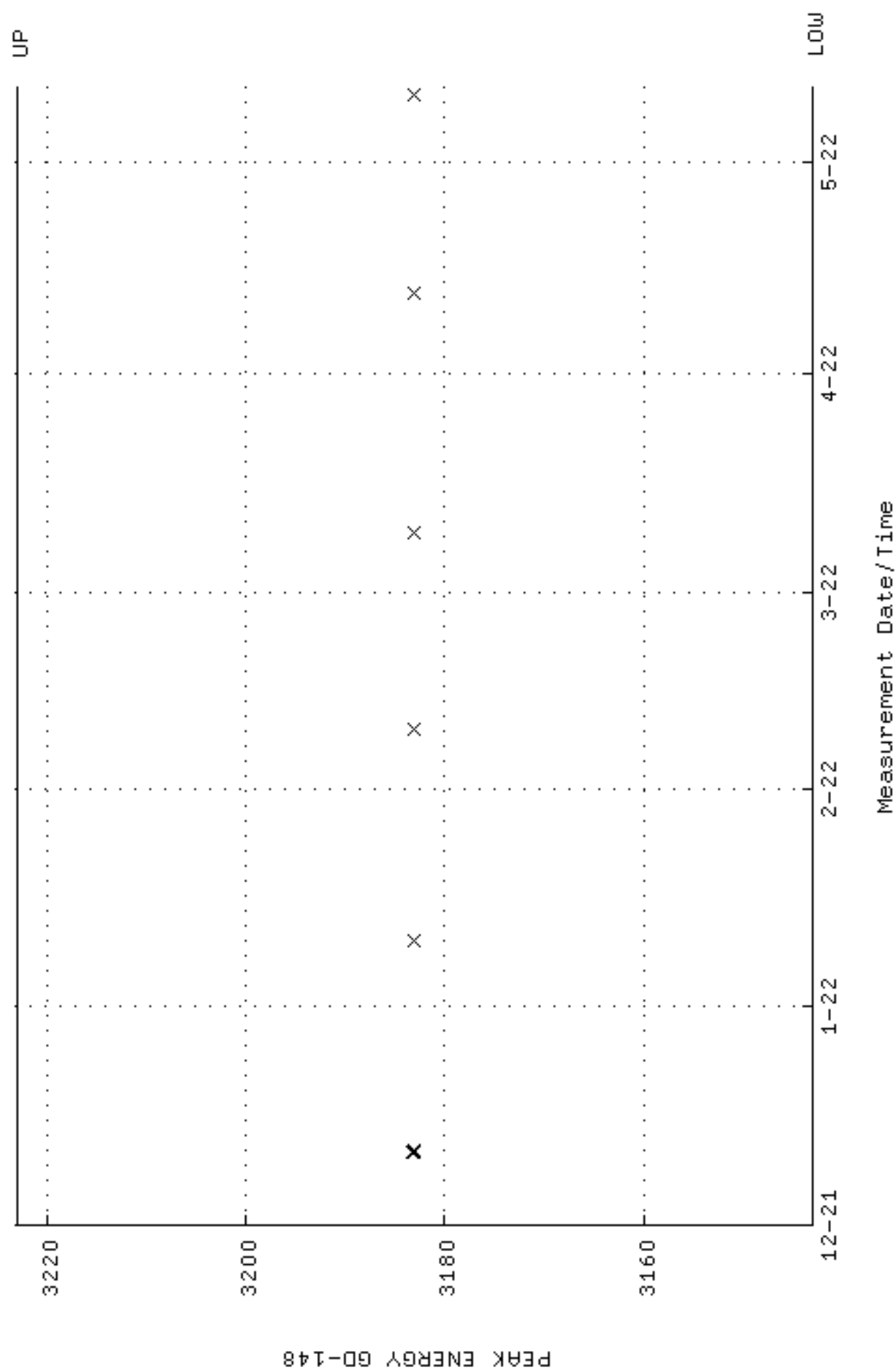
QA filename : DKA100:[ENV_ALPHA.QA.W]W107.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W107.QAF;11
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000

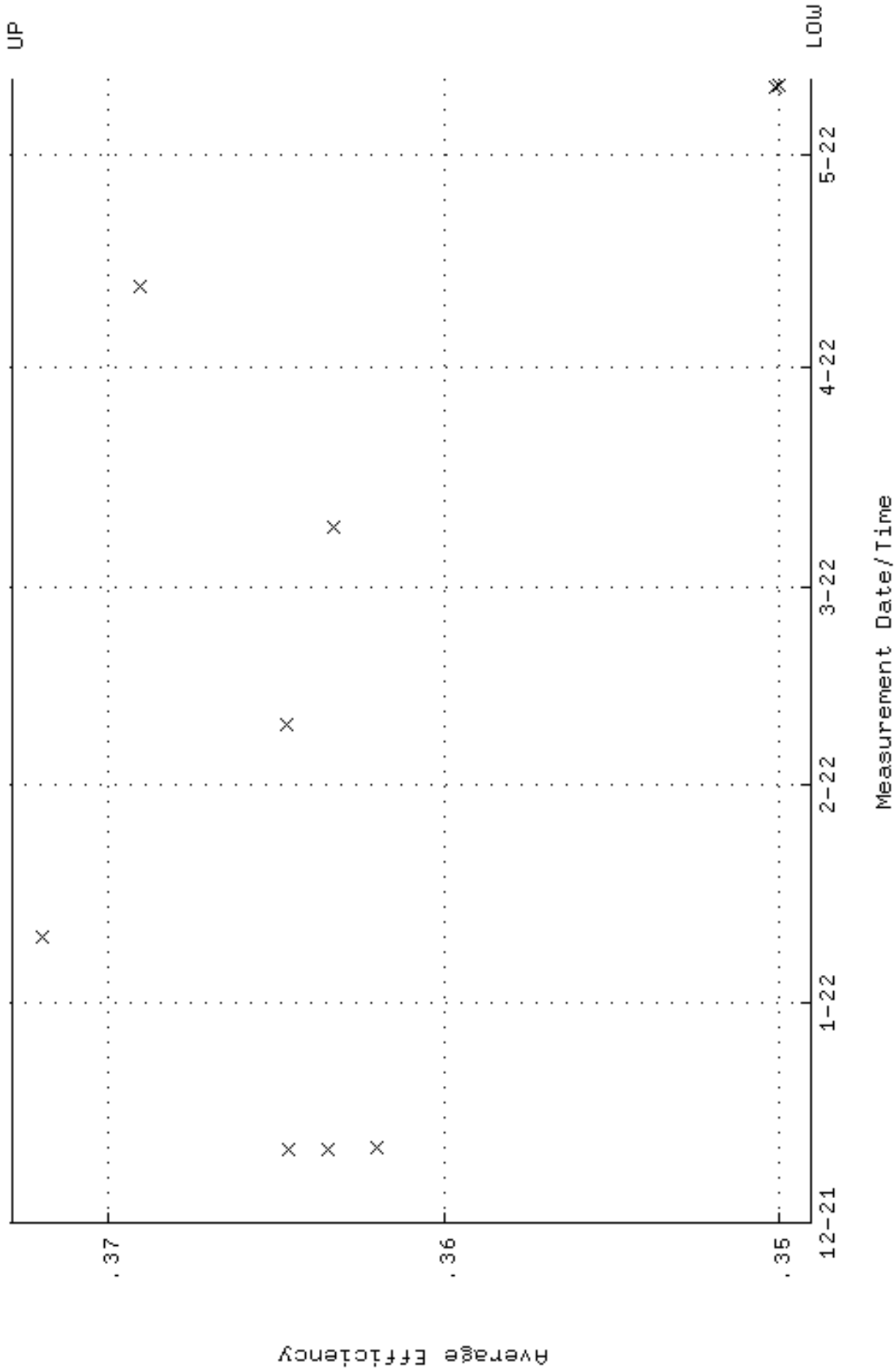


QA filename : DKA100:[ENV_ALPHA.QA.W]W107.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00

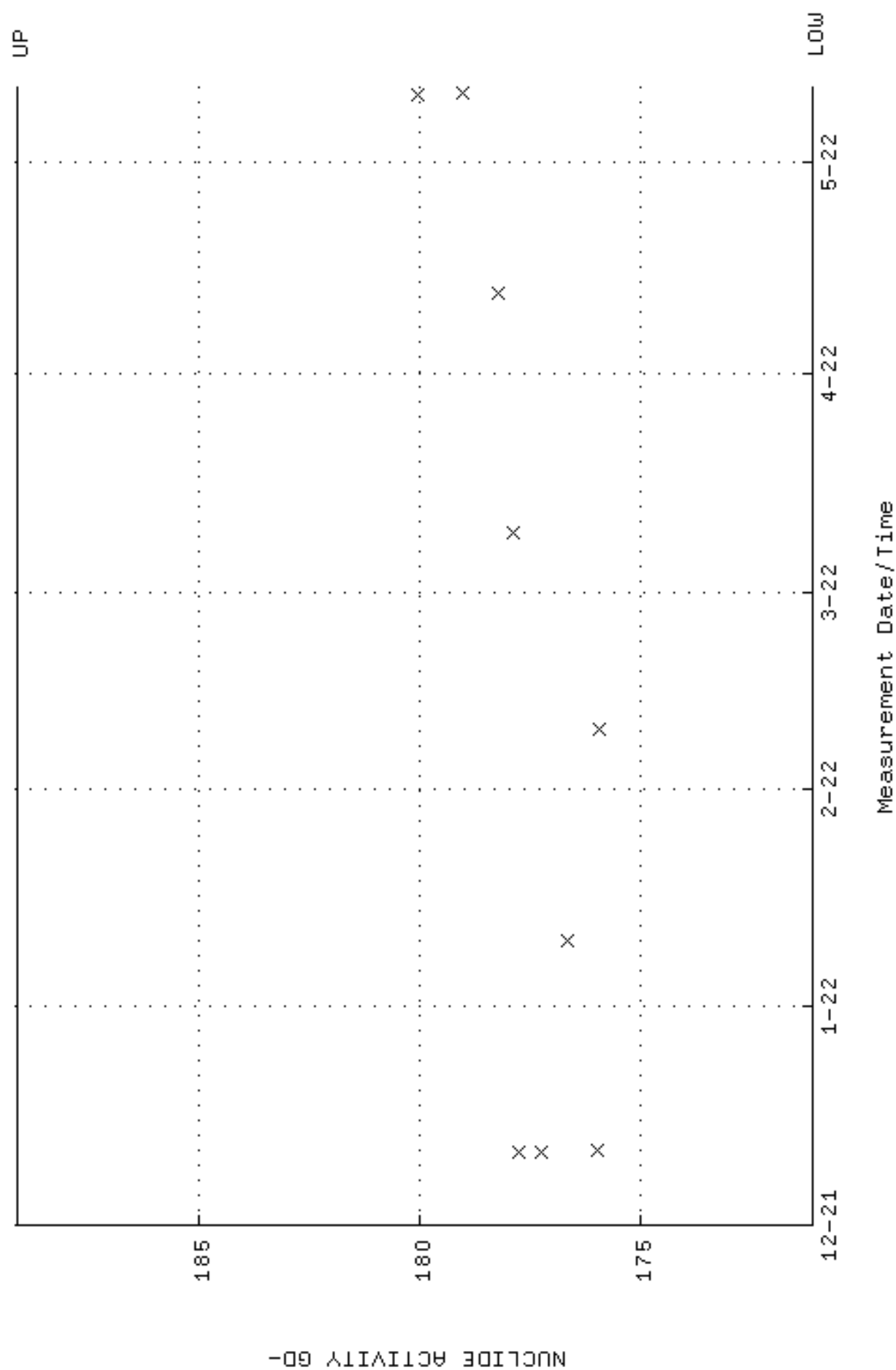


The graph shows the Background Rate (Y-axis) versus Measurement Date/Time (X-axis). The Y-axis ranges from 0 to 0.08 with increments of 0.02. The X-axis shows dates from 11-21 to 5-22. The data points are marked with 'X' and a solid line represents the background rate. The rate is consistently low, near zero, across the entire time period. The graph is labeled 'UP' at the top and 'LOW' at the bottom.

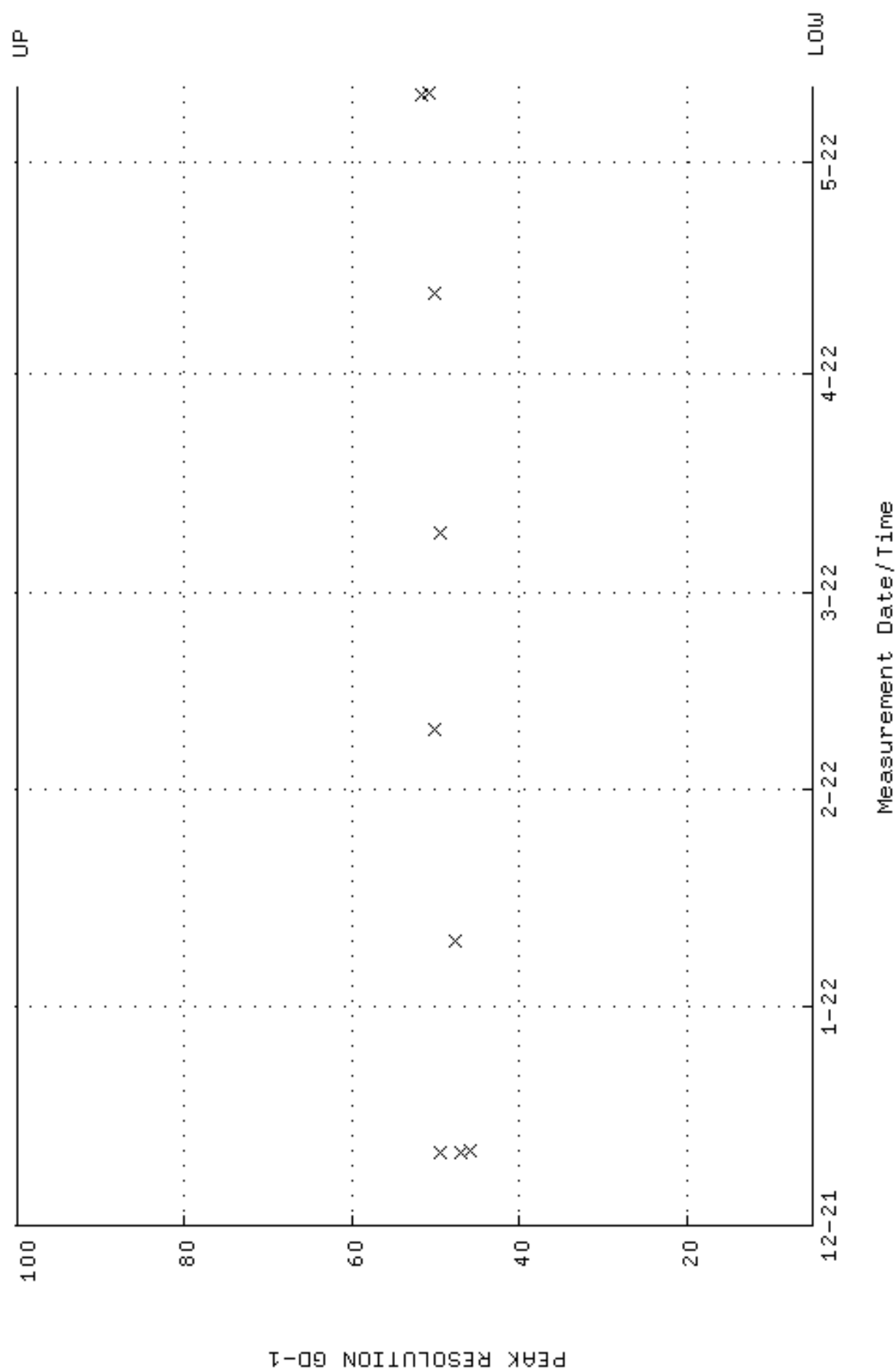
QA filename : DKA100:[ENV_ALPHA.QA.W]W108.QAF;11
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
Lower/Upper Lmts: 0.349052 through 0.372881



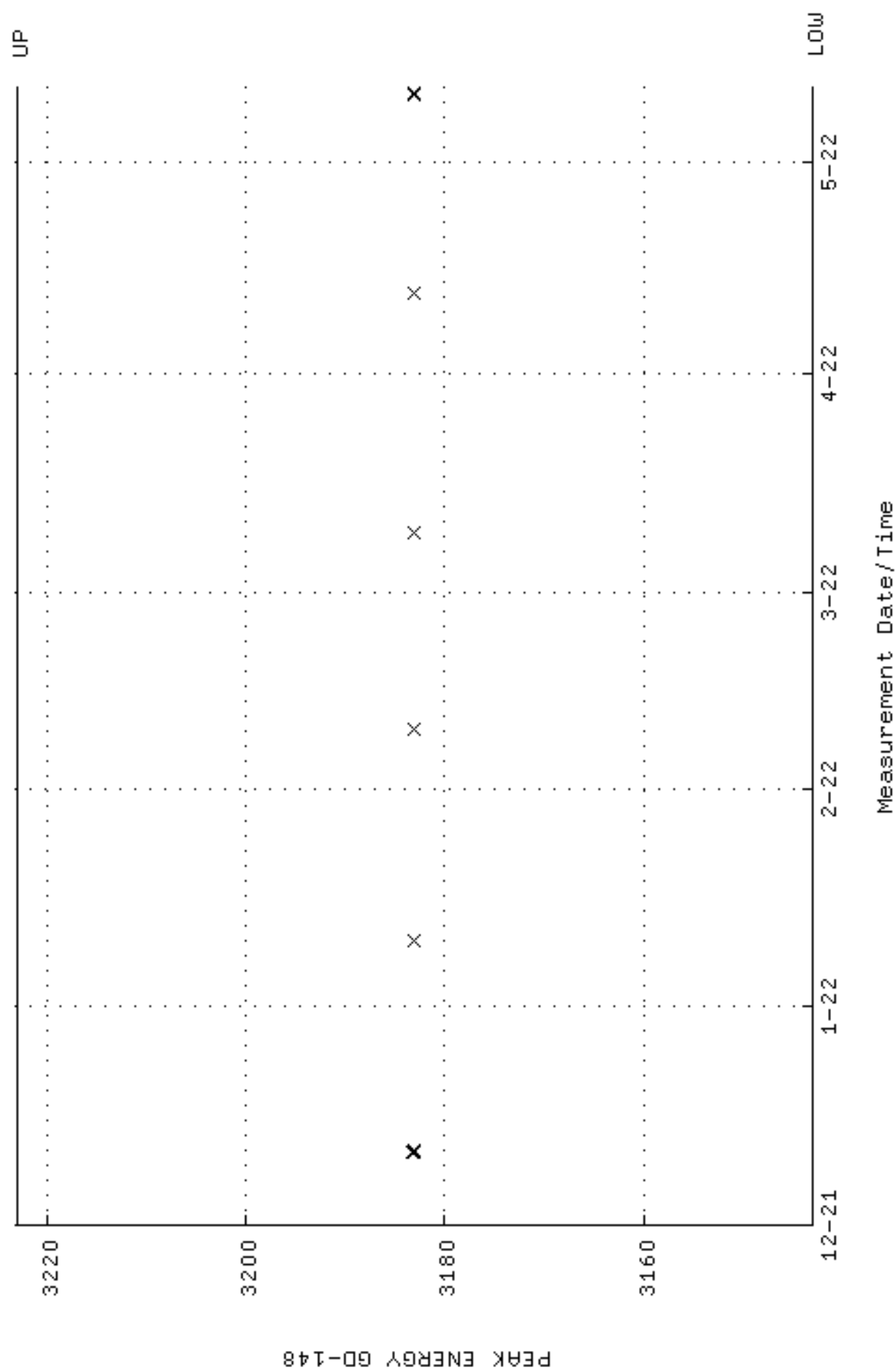
QA filename : DKA100:[ENV_ALPHA.QA.W]W108.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W108.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000

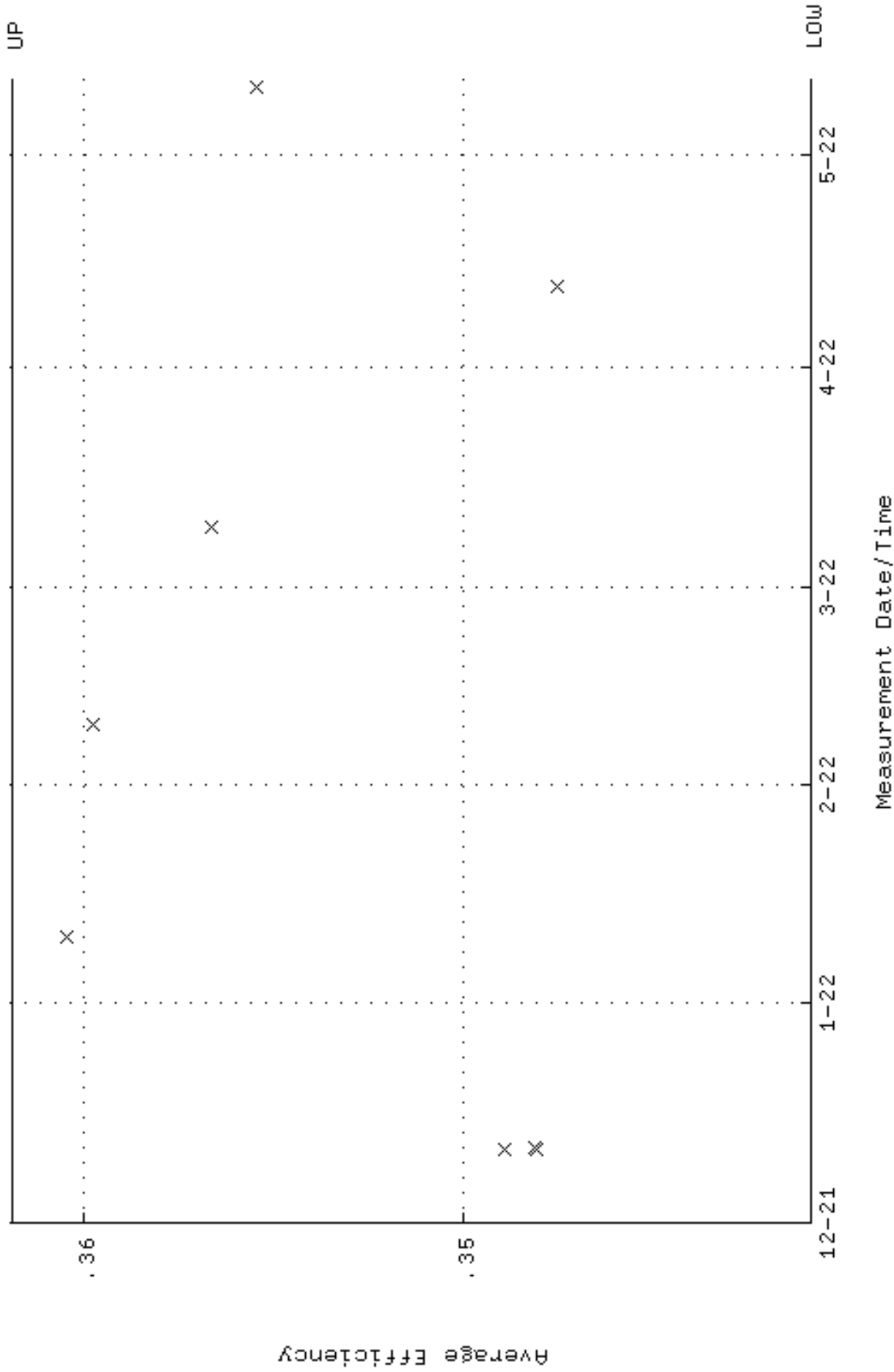


QA filename : DKA100:[ENV_ALPHA.QA.W]W108.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00

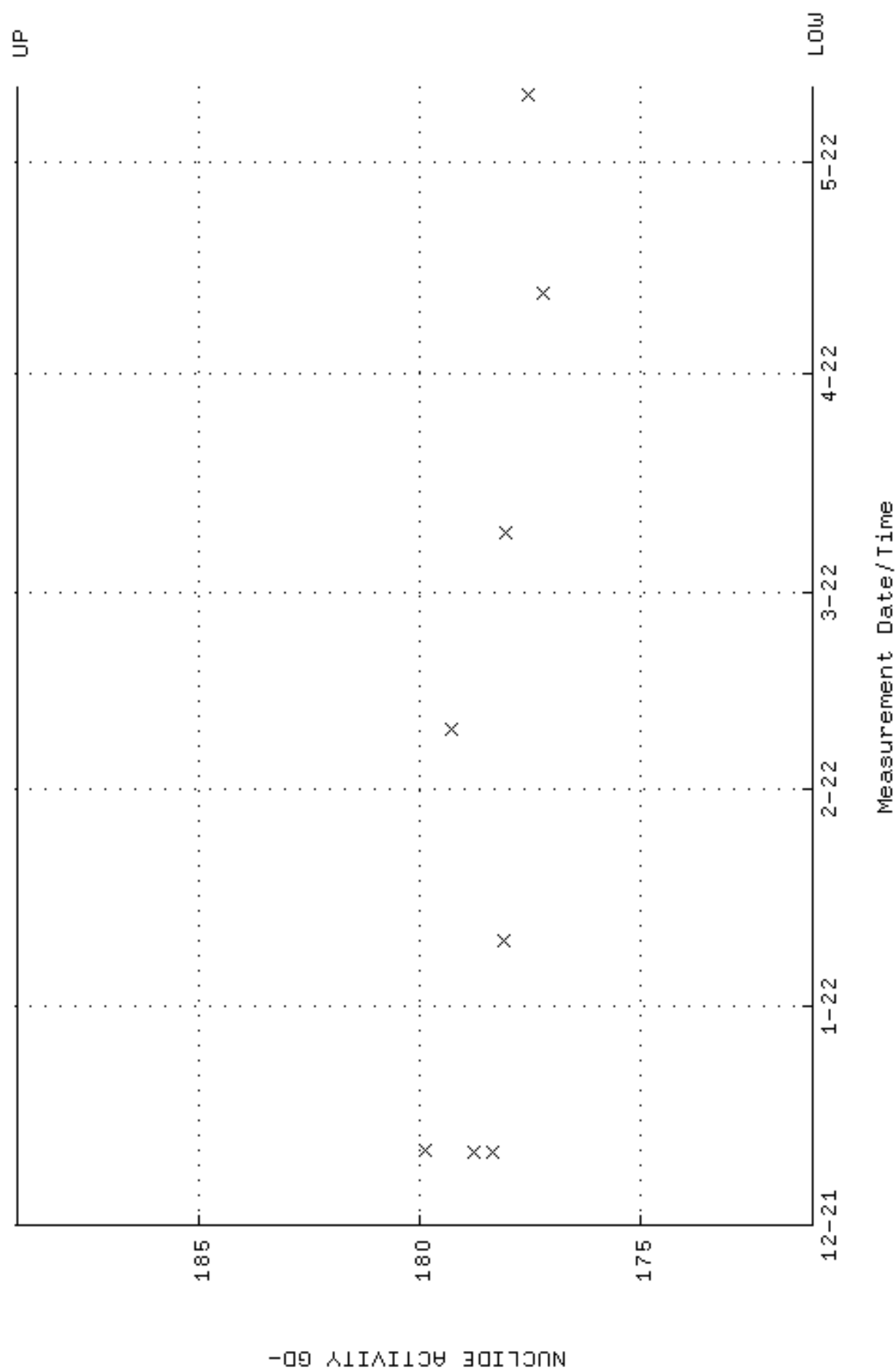


The graph displays the background rate over time. The Y-axis represents the Background Rate, ranging from 0 to 0.08. The X-axis represents the number of days since the last observation, with labels 11-21, 12-21, 1-22, 2-22, 3-22, 4-22, and 5-22. The rate is highest (around 0.08) between 11-21 and 12-21, and lowest (around 0.01) between 1-22 and 5-22. The graph is labeled 'UP' at the top and 'LOW' at the bottom.

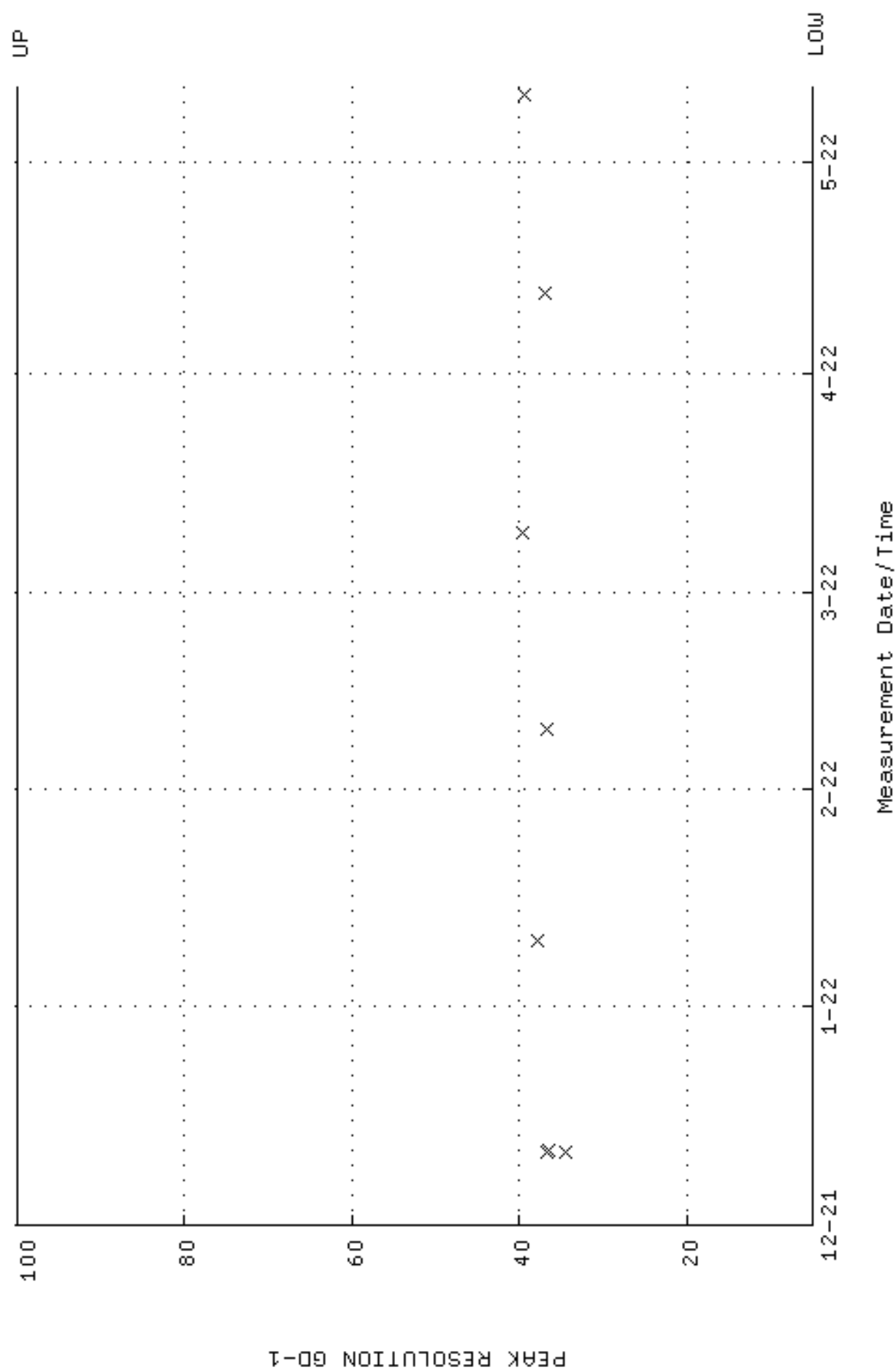
QA filename : DKA100:[ENV_ALPHA.QA.W]W109.QAF;11
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
Lower/Upper Lmts: 0.340810 through 0.361890



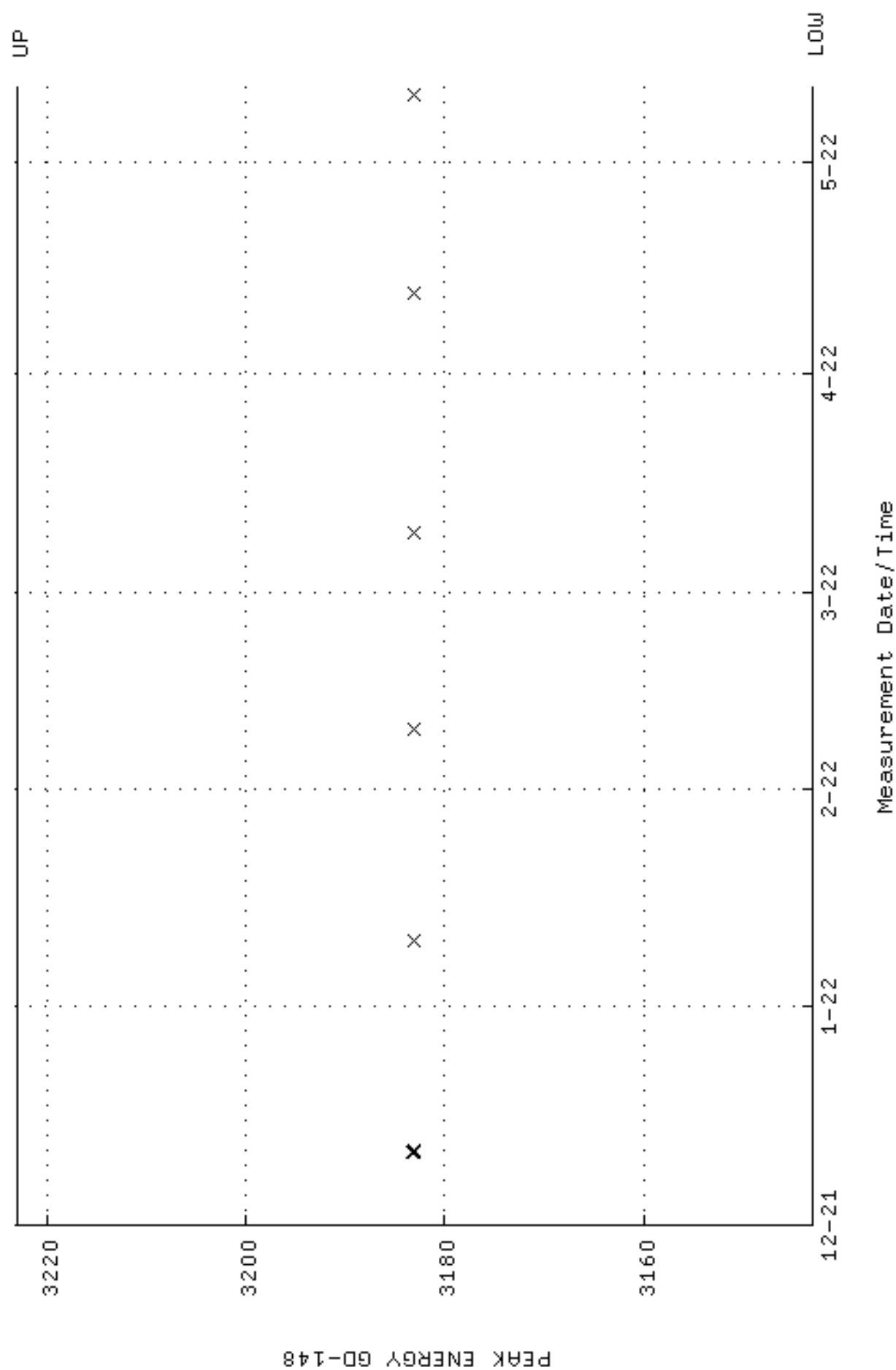
QA filename : DKA100:[ENV_ALPHA.QA.W]W109.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



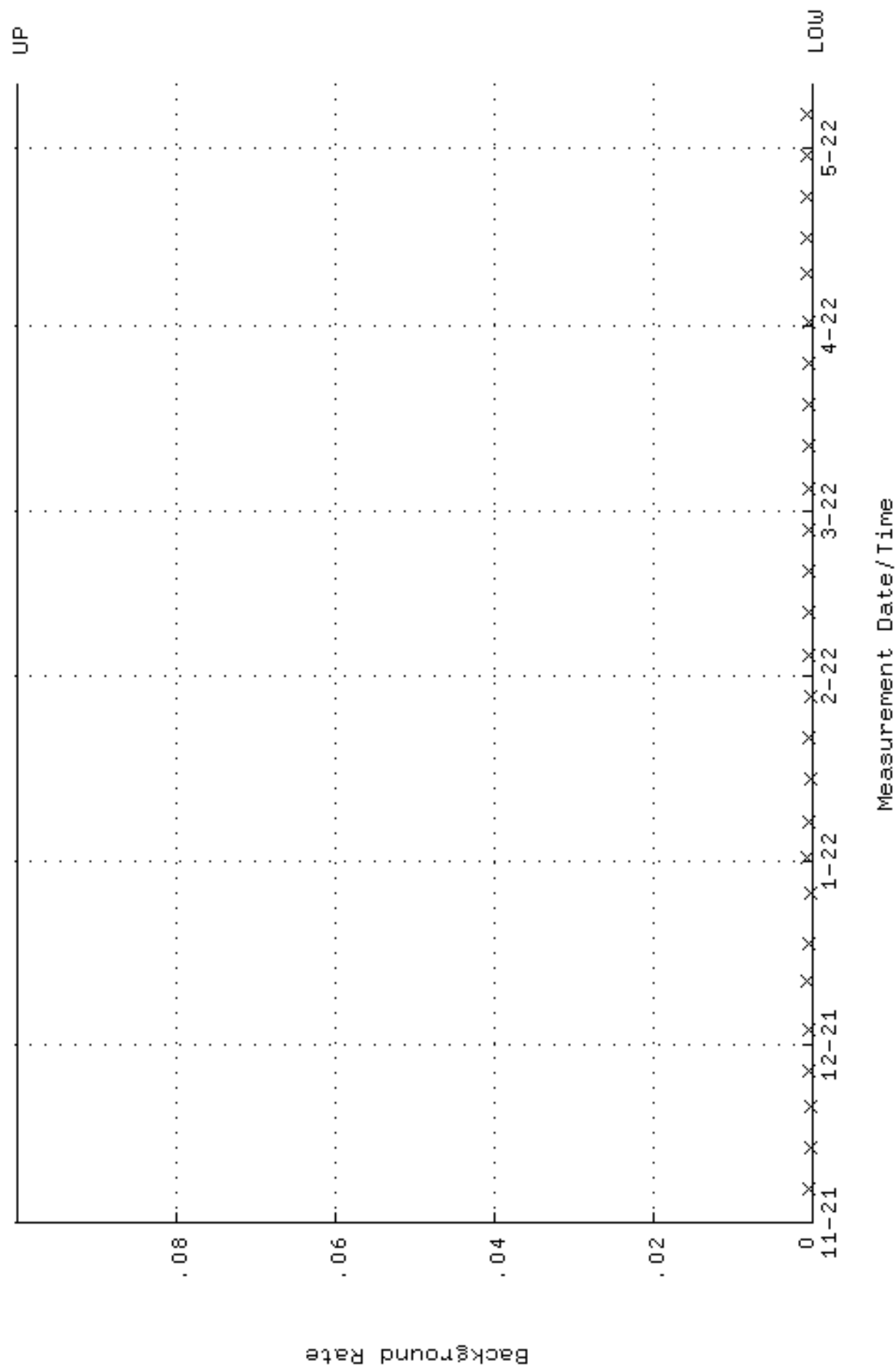
QA filename : DKA100:[ENV_ALPHA.QA.W]W109.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



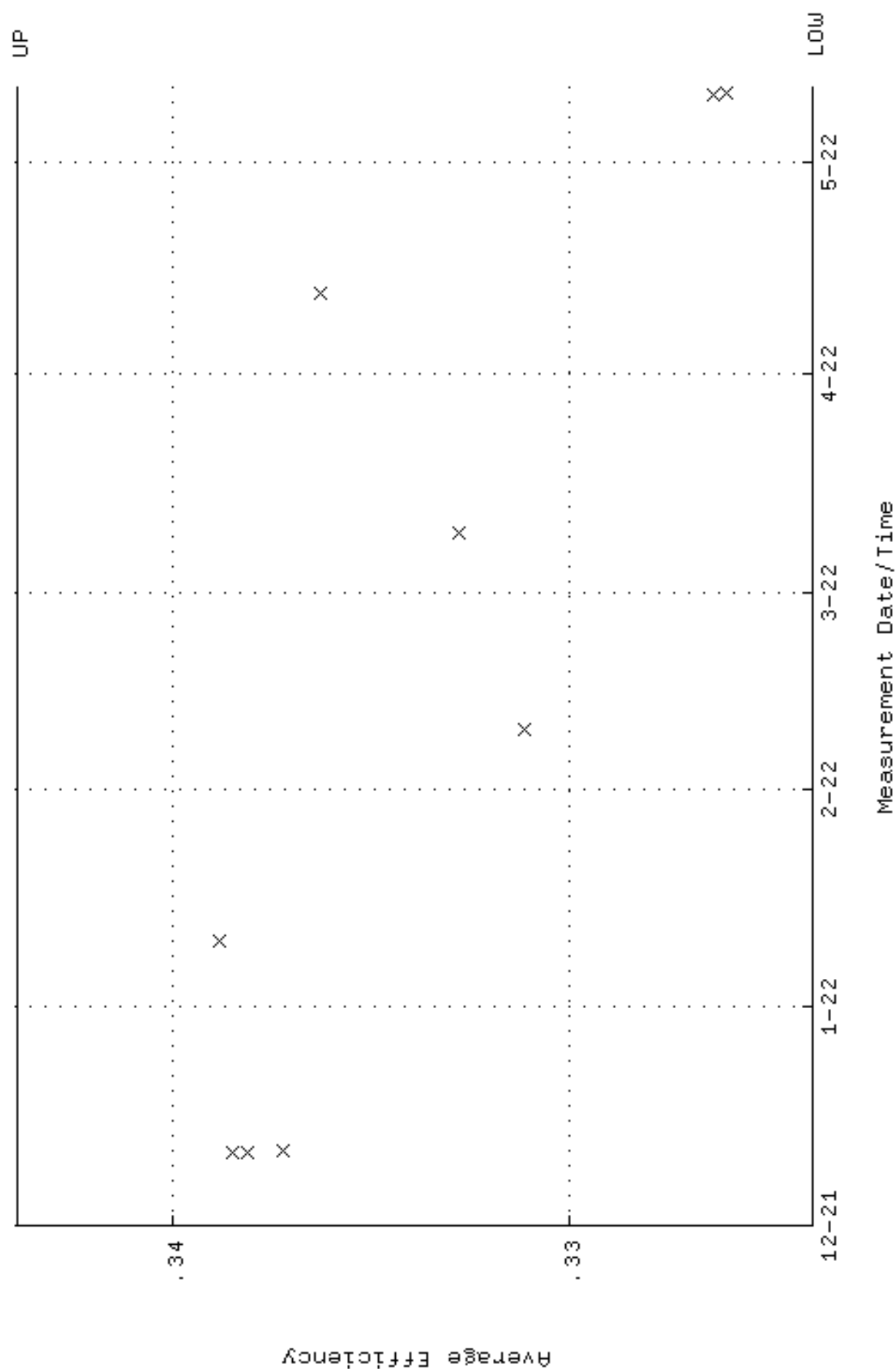
QA filename : DKA100:[ENV_ALPHA.QA.W]W109.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



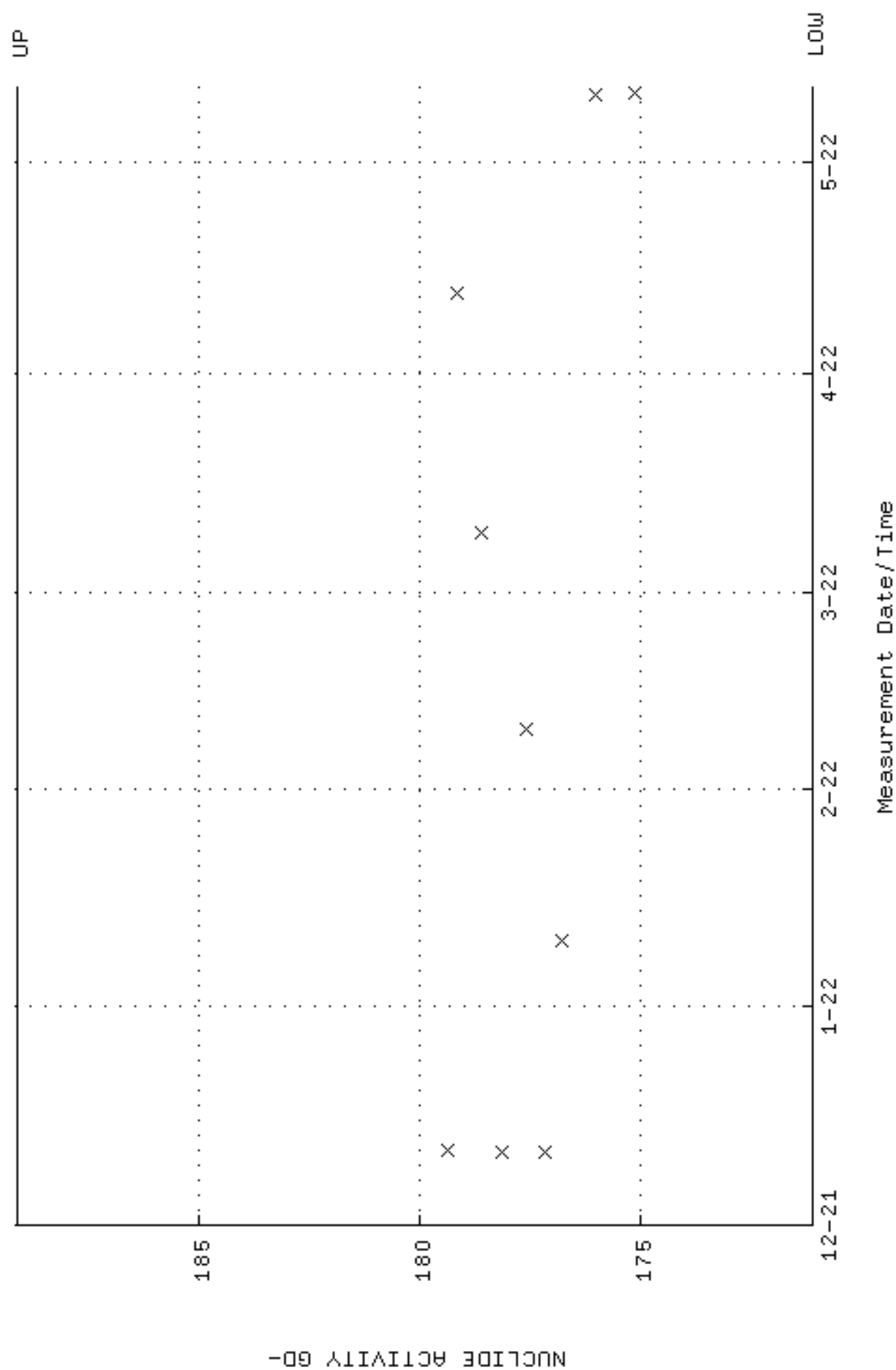
QA filename : DKA100:[ENV_ALPHA.QA.B]B109.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 16:55:34 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



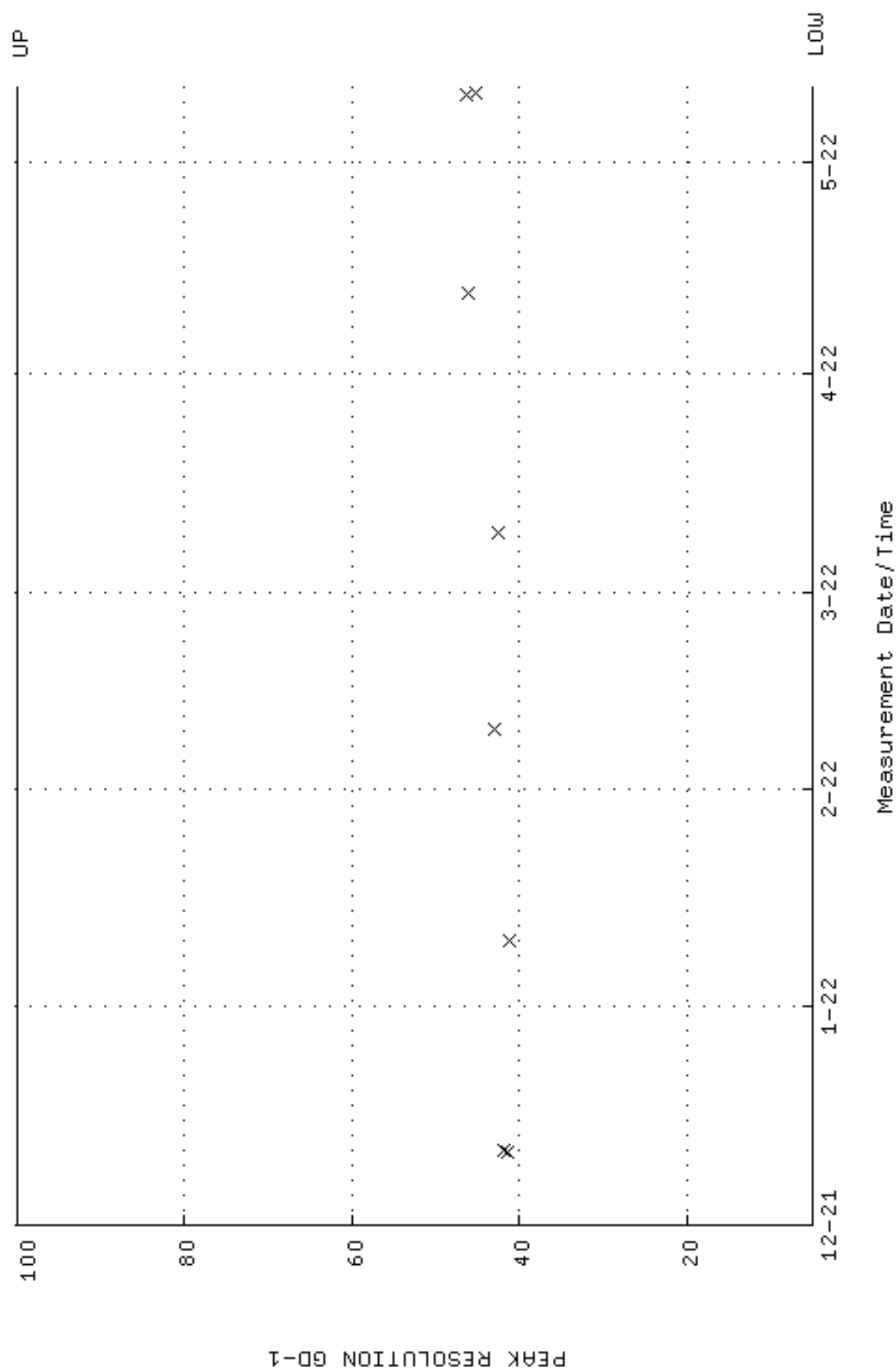
QA filename : DKA100:[ENV_ALPHA.QA.W]W110.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.323870 through 0.343904



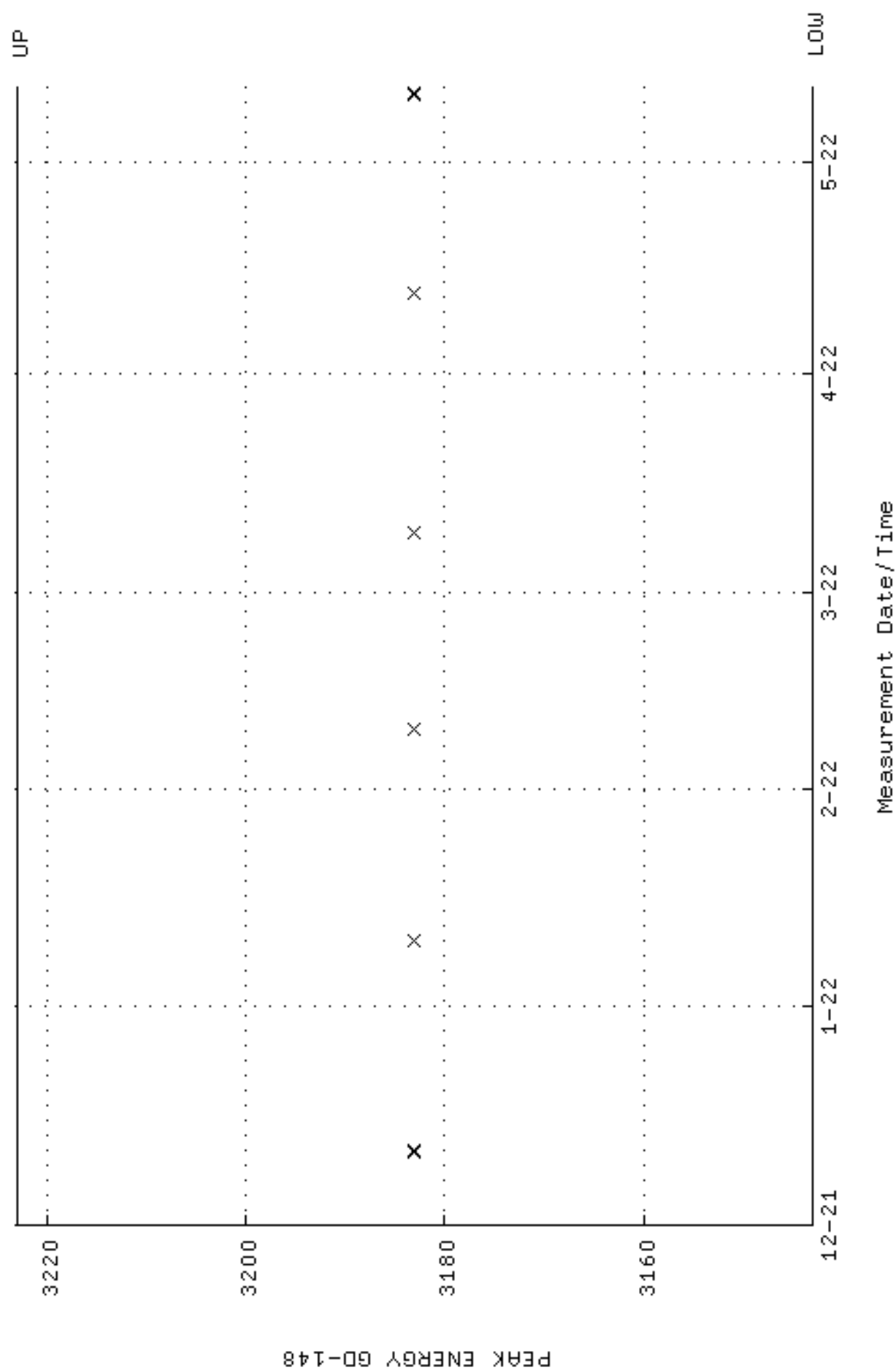
QA filename : DKA100:[ENV_ALPHA.QA.W]W110.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W110.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



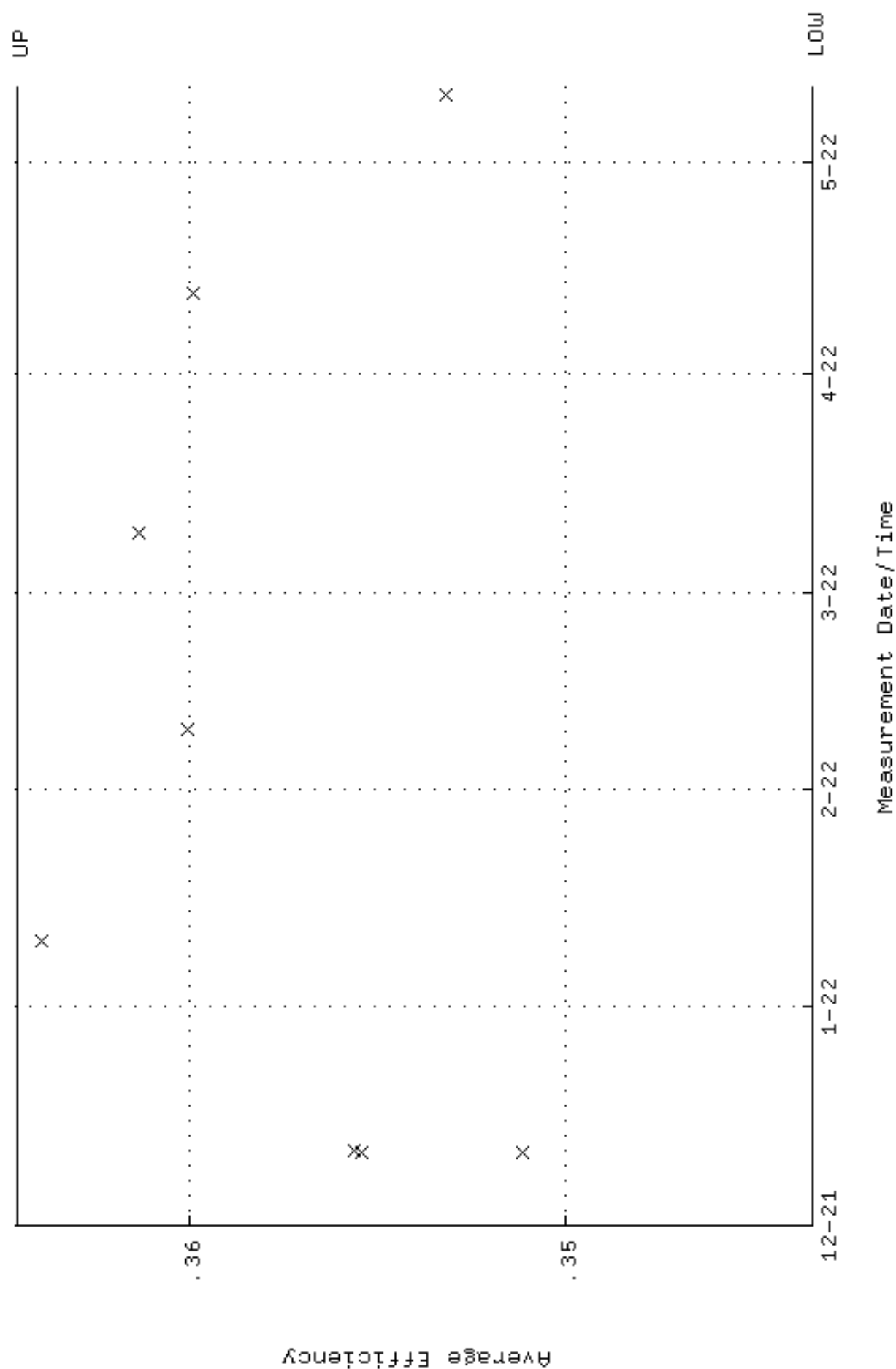
QA filename : DKA100:[ENV_ALPHA.QA.W]W110.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



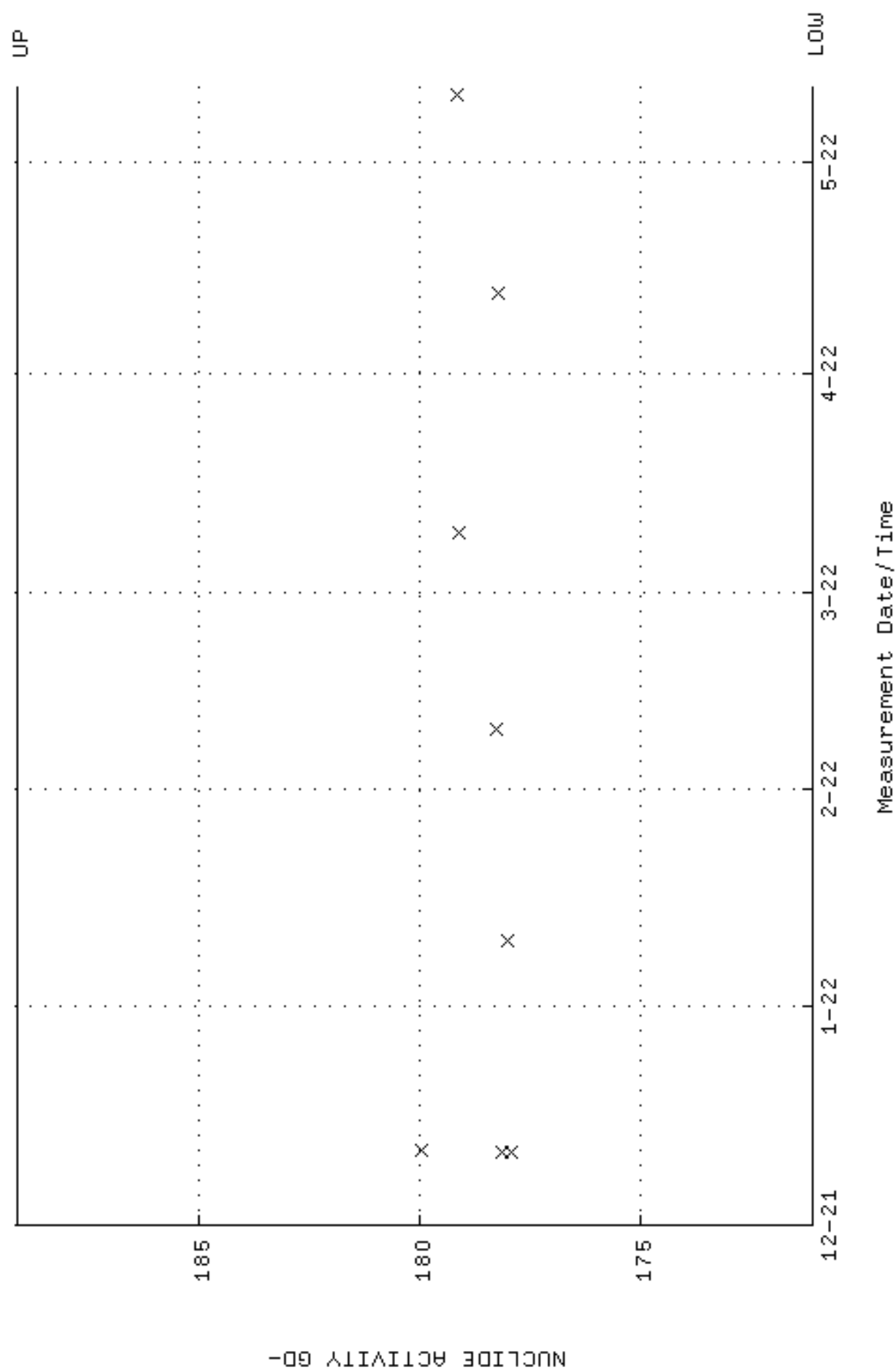
A scatter plot showing the relationship between the Background Rate (Y-axis) and the UP/Low status (X-axis). The Y-axis ranges from 0 to 0.08 with increments of 0.02. The X-axis has categories 11-21, 12-21, 1-22, 2-22, 3-22, 4-22, and 5-22. Data points are marked with 'x'. The background rate is consistently low (near 0) for all categories, with a slight increase for 4-22 and 5-22.

Category	Background Rate (approx.)
11-21	0.000
12-21	0.000
1-22	0.000
2-22	0.000
3-22	0.000
4-22	0.005
5-22	0.005

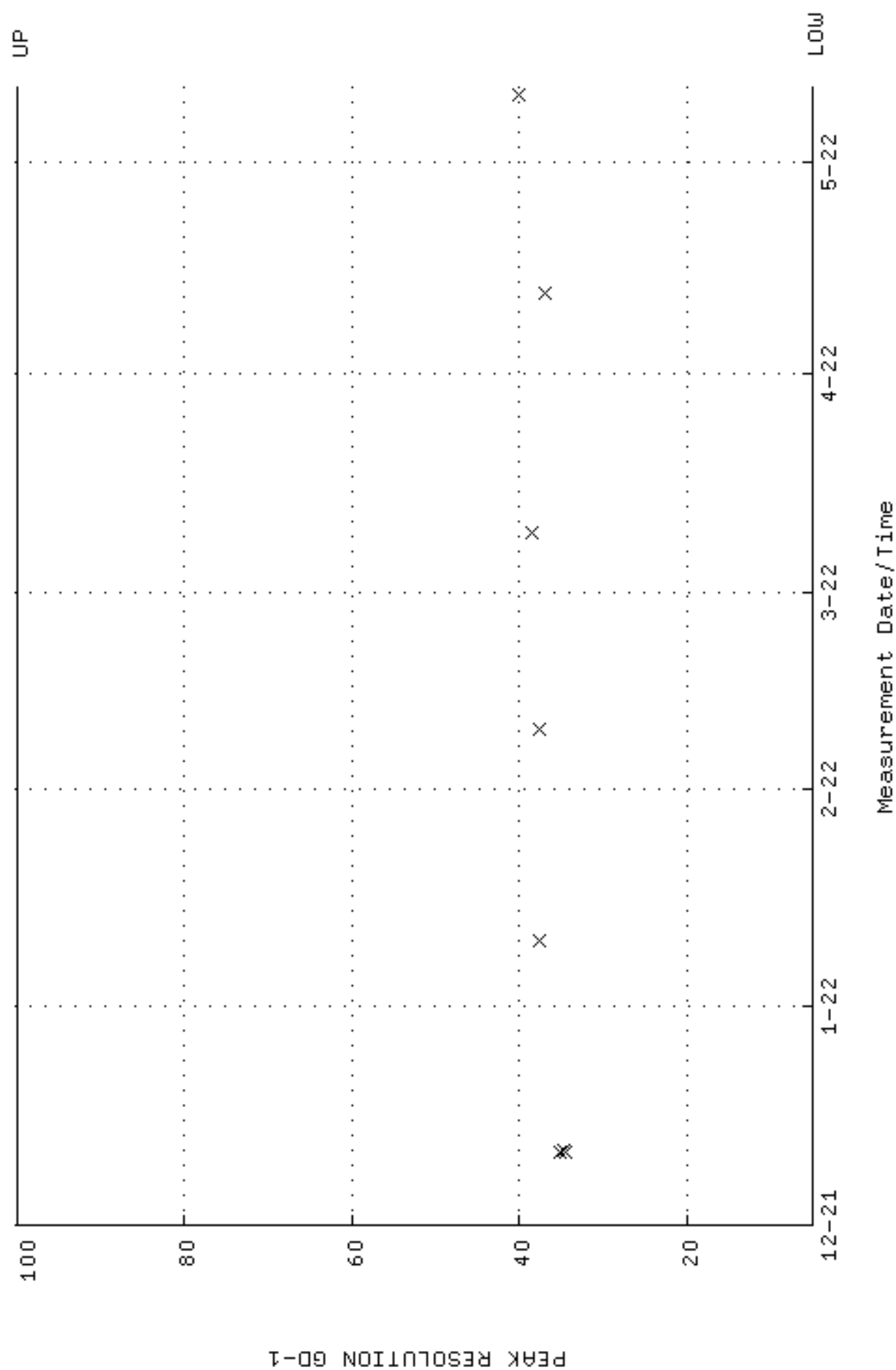
QA filename : DKA100:[ENV_ALPHA.QA.W]W111.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.343400 through 0.364600



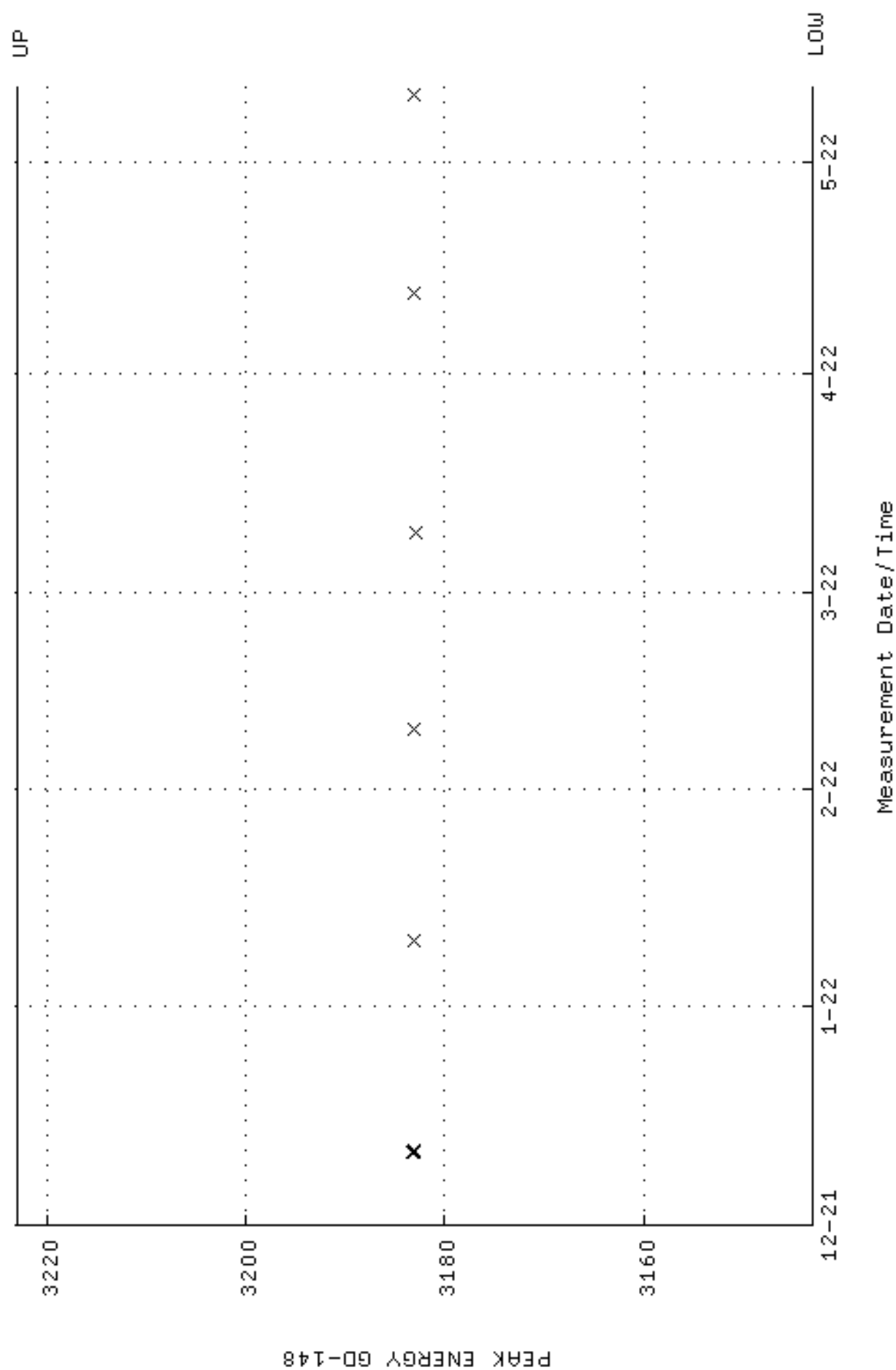
QA filename : DKA100:[ENV_ALPHA.QA.W]W111.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



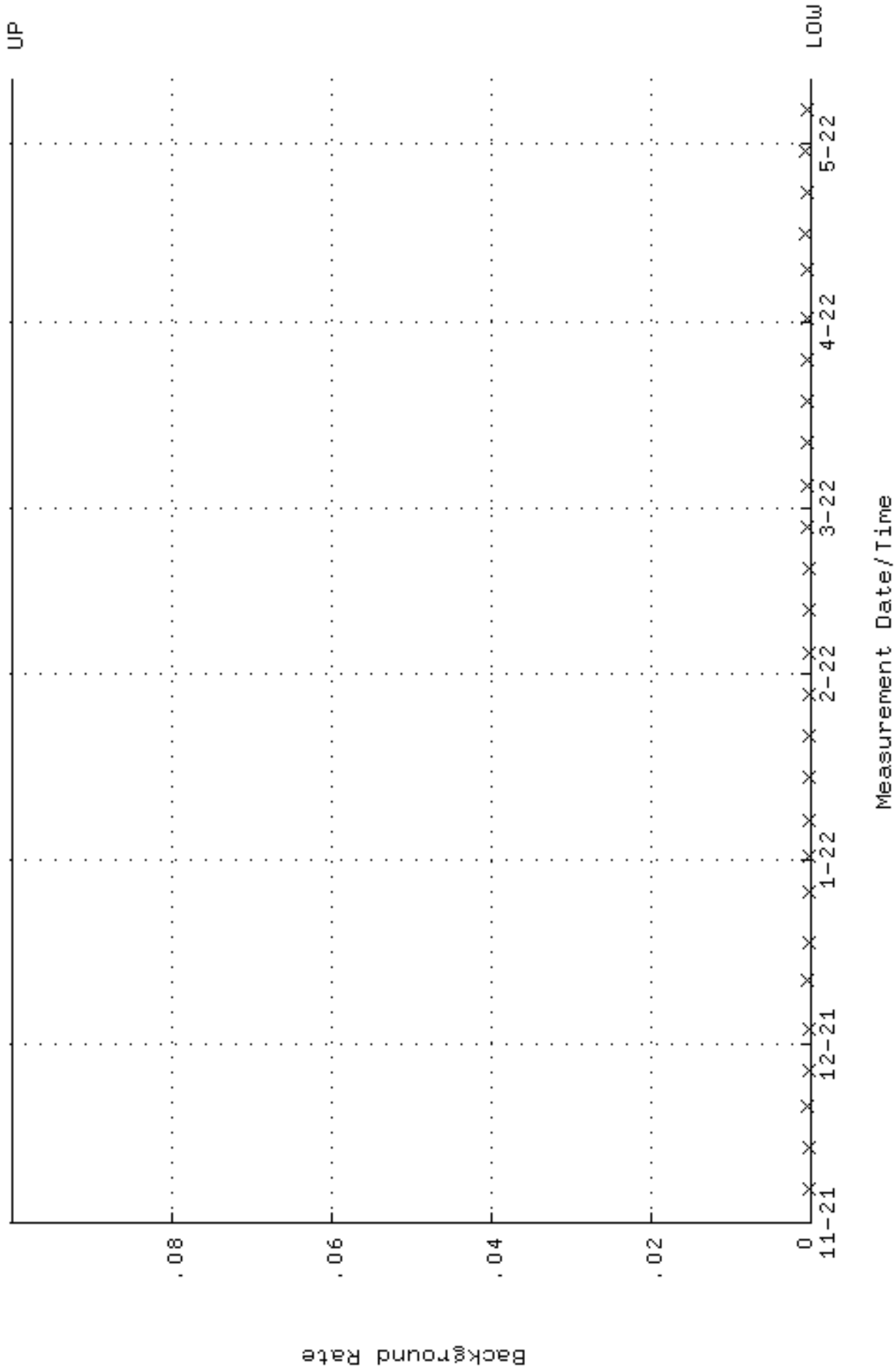
QA filename : DKA100:[ENV_ALPHA.QA.W]W111.QAF;11
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



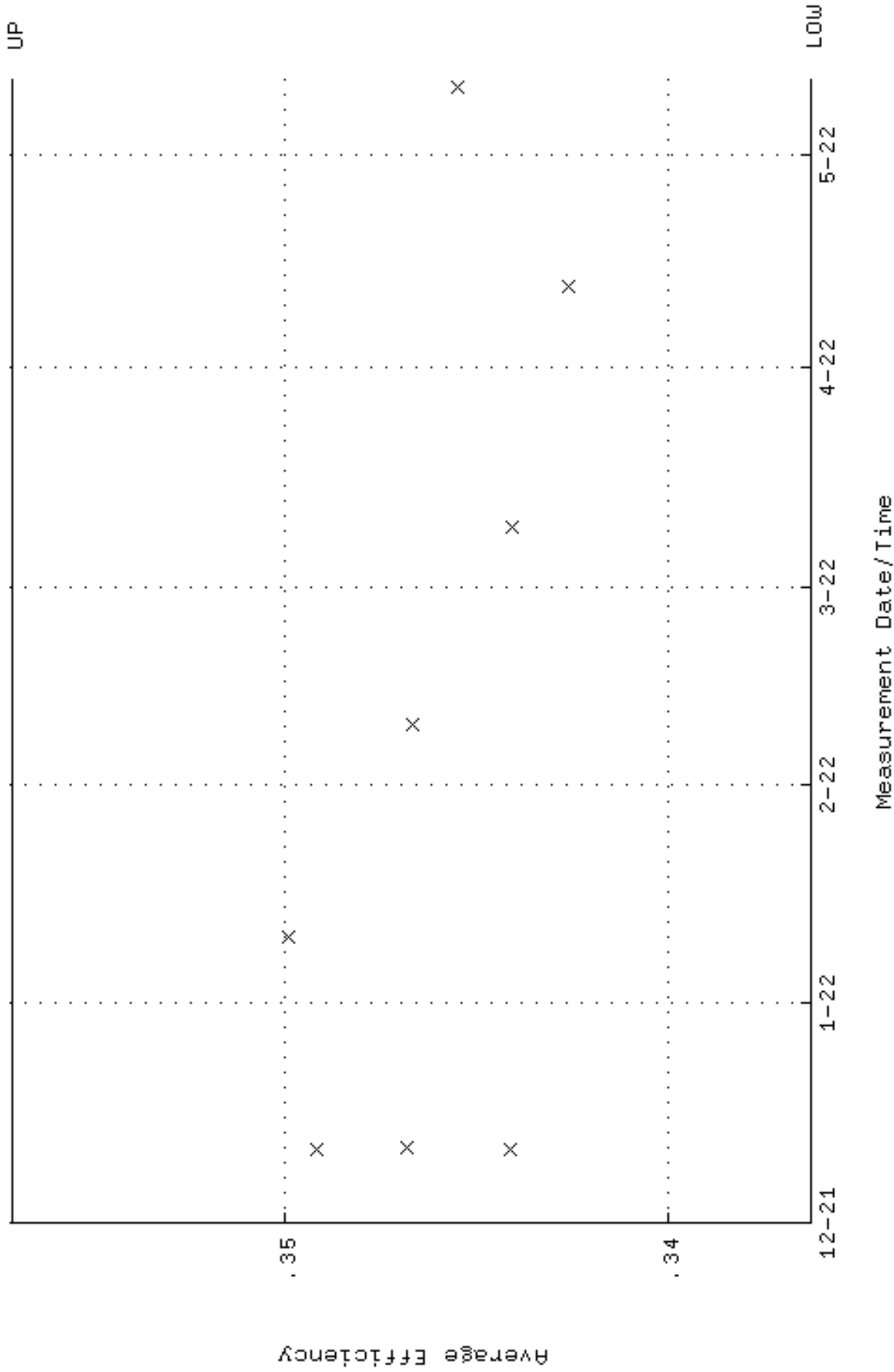
QA filename : DKA100:[ENV_ALPHA.QA.W]W111.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



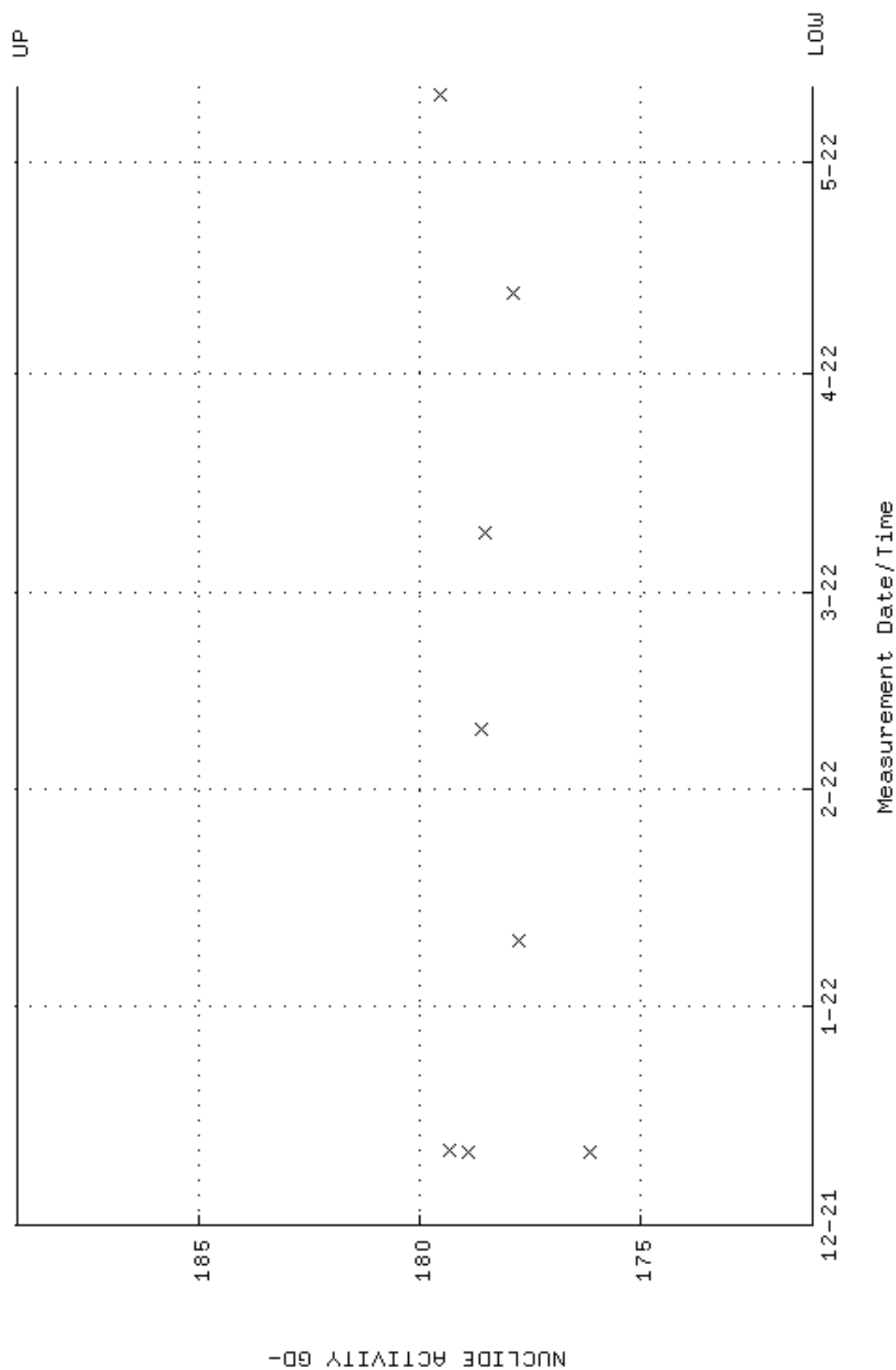
QA filename : DKA100:[ENV_ALPHA.QA.B]B111.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-NOV-2021 16:55:34 through 11-MAY-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 0.100000



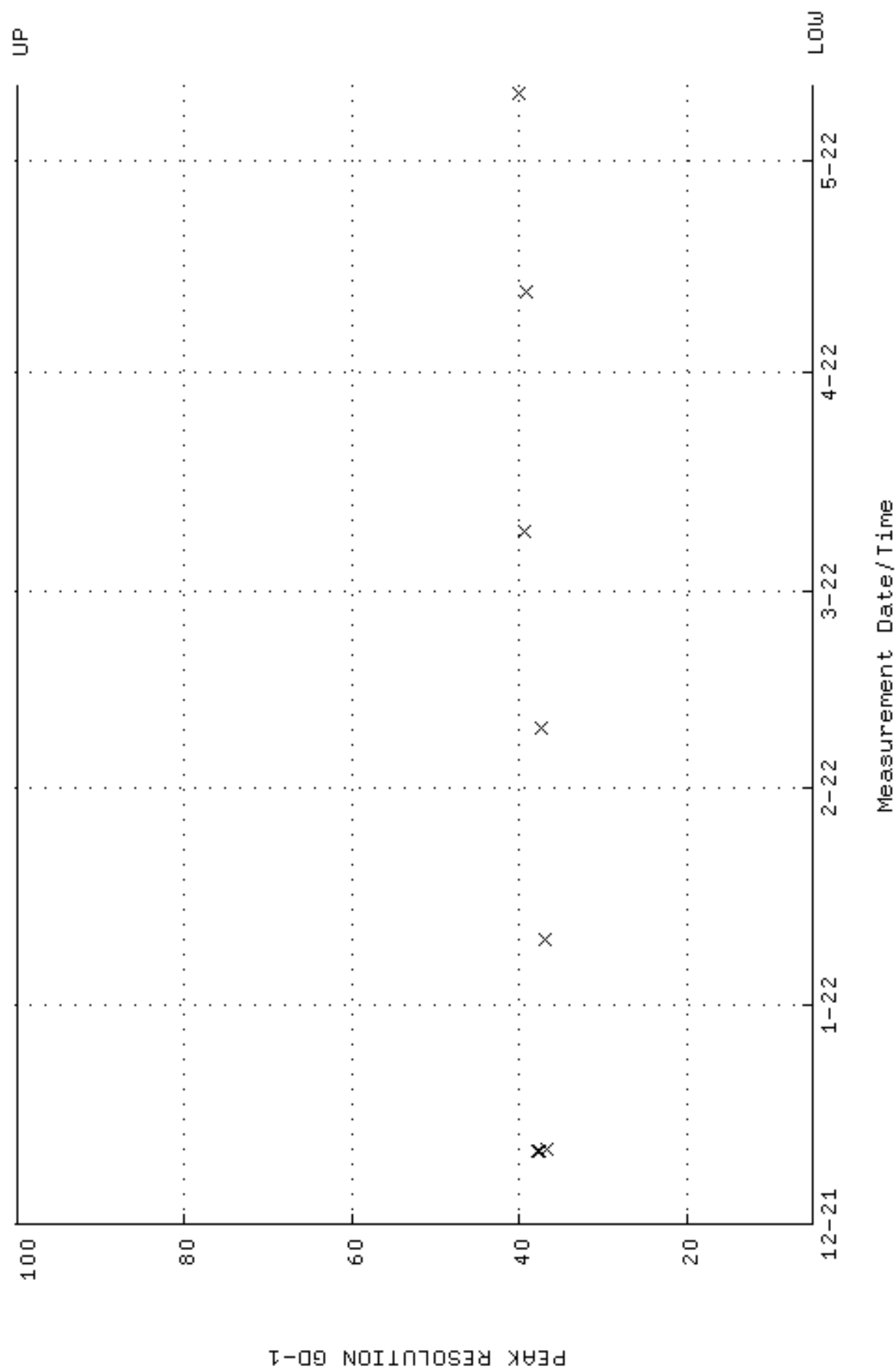
QA filename : DKA100:[ENV_ALPHA.QA.W]W112.QAF;11
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
Lower/Upper Lmts: 0.336300 through 0.357100



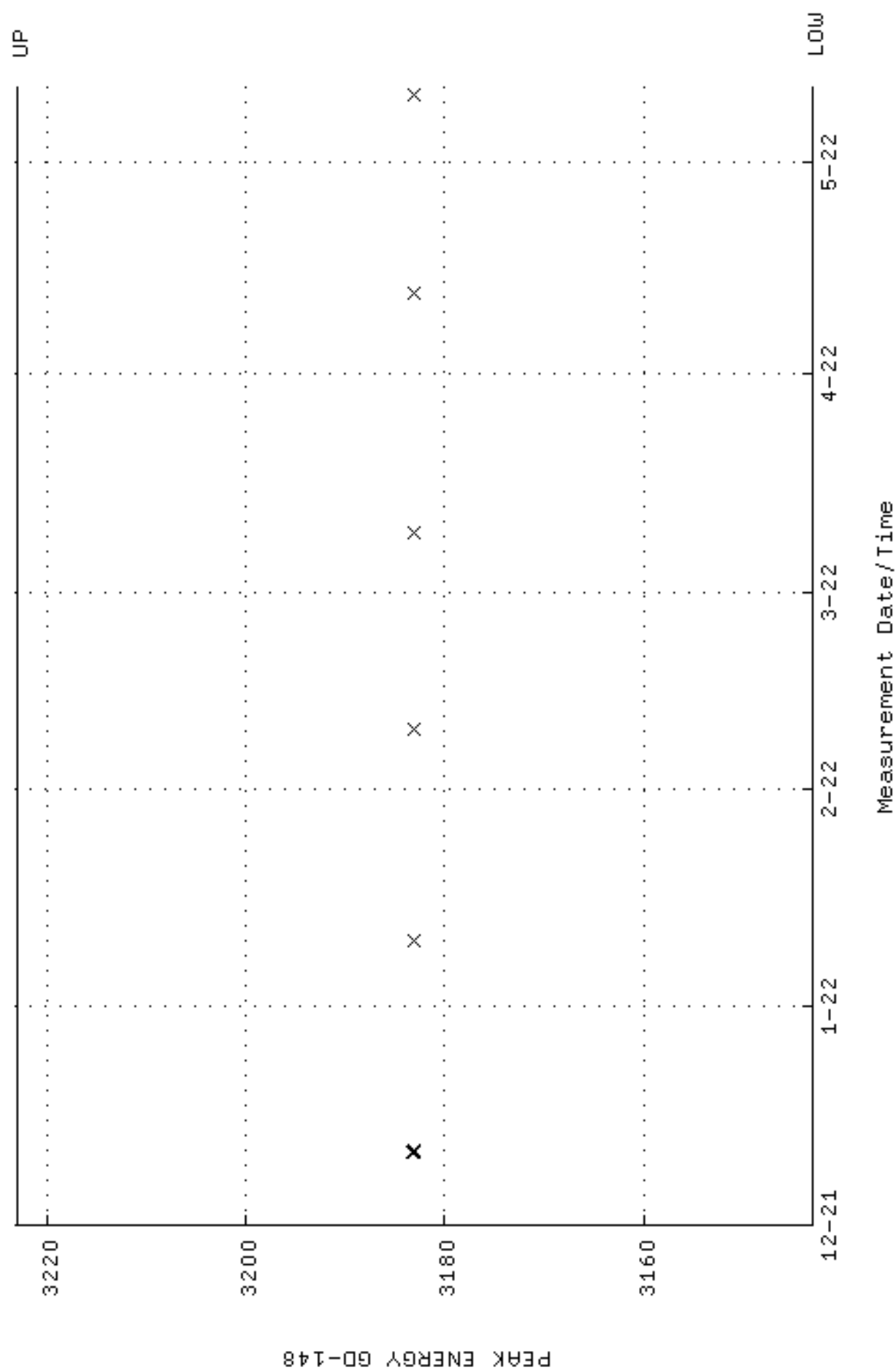
QA filename : DKA100:[ENV_ALPHA.QA.W]W112.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



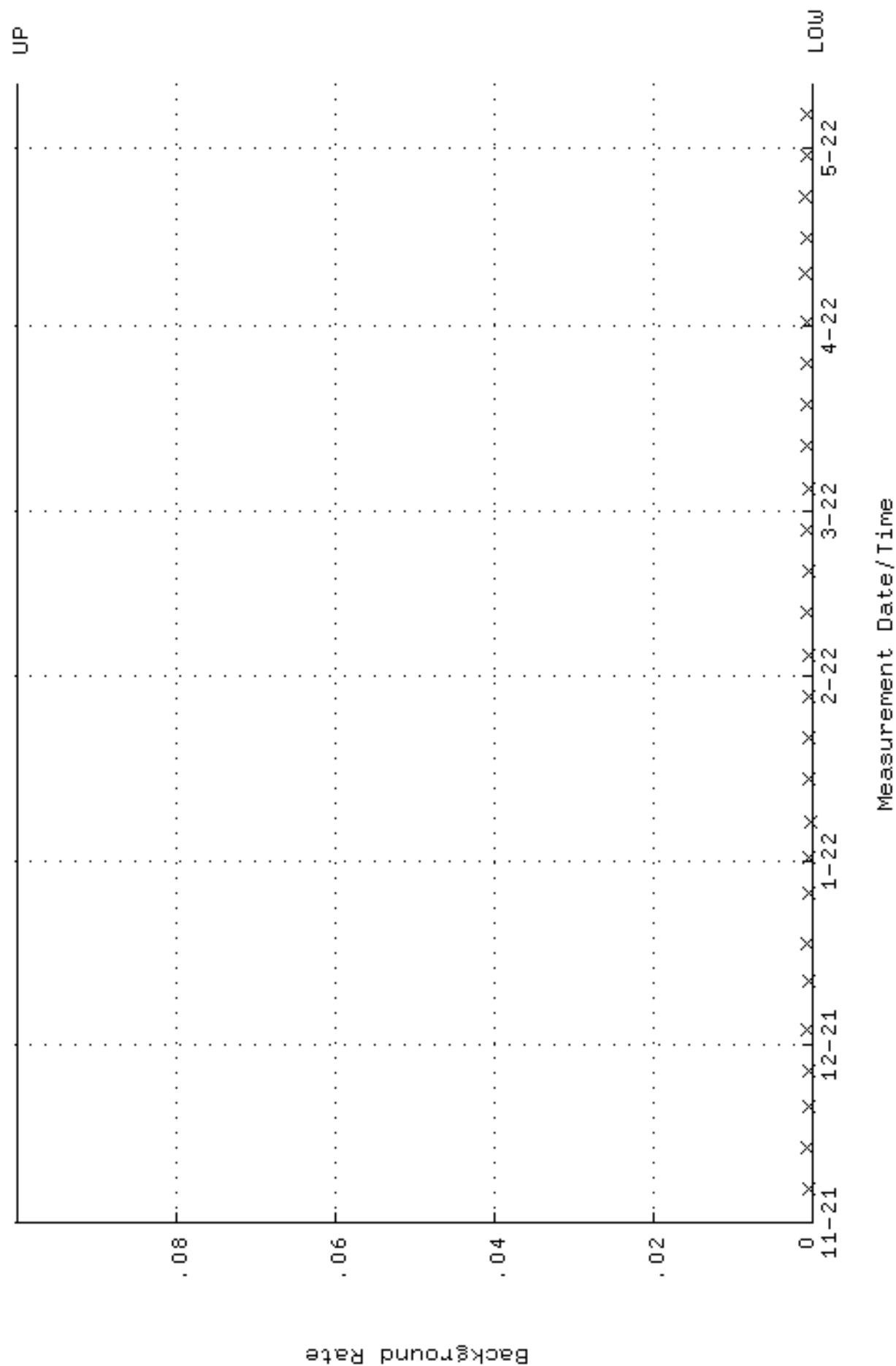
QA filename : DKA100:[ENV_ALPHA.QA.W]W112.QAF;11
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



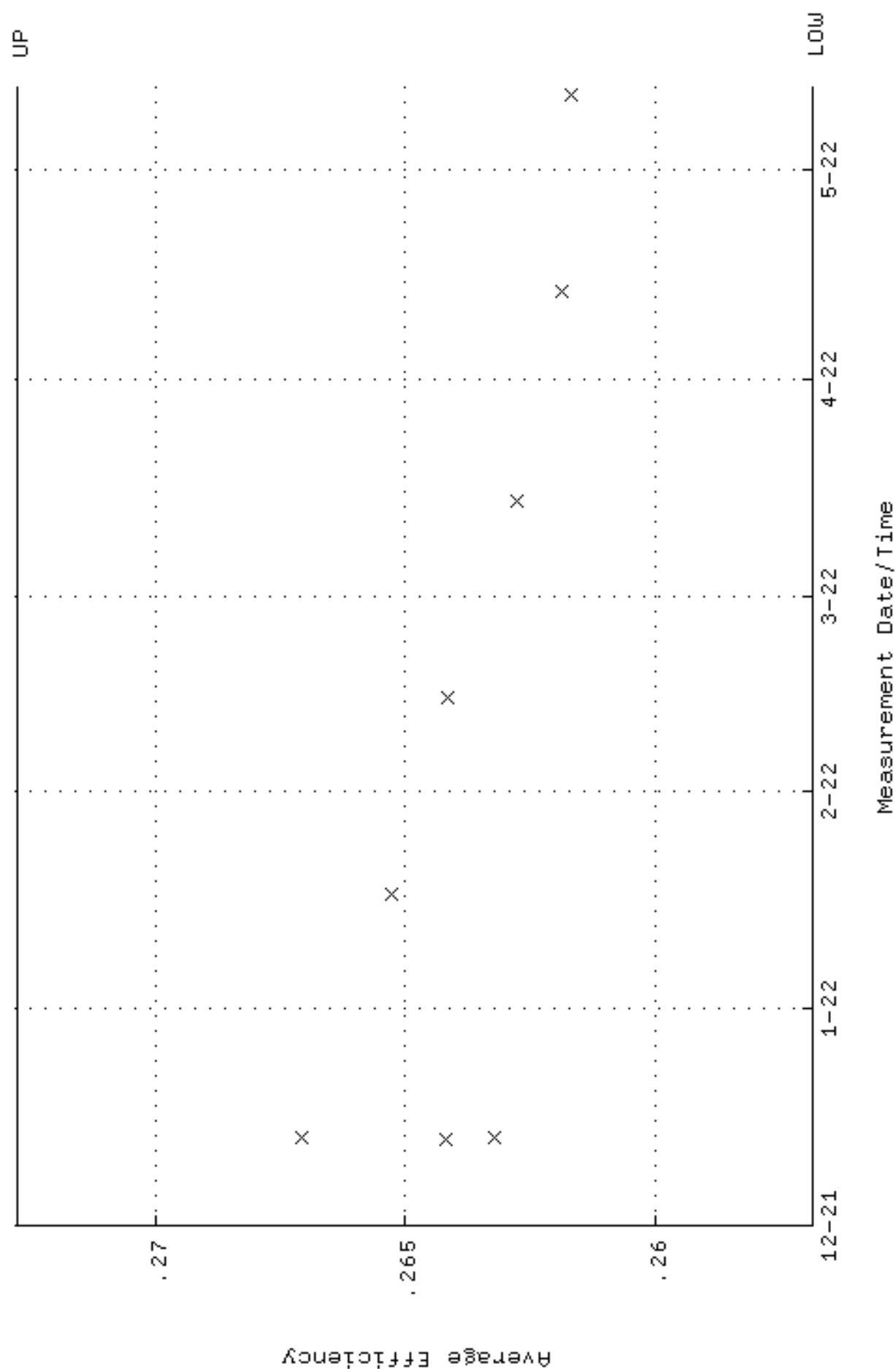
QA filename : DKA100:[ENV_ALPHA.QA.W]W112.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-DEC-2021 08:29:32 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



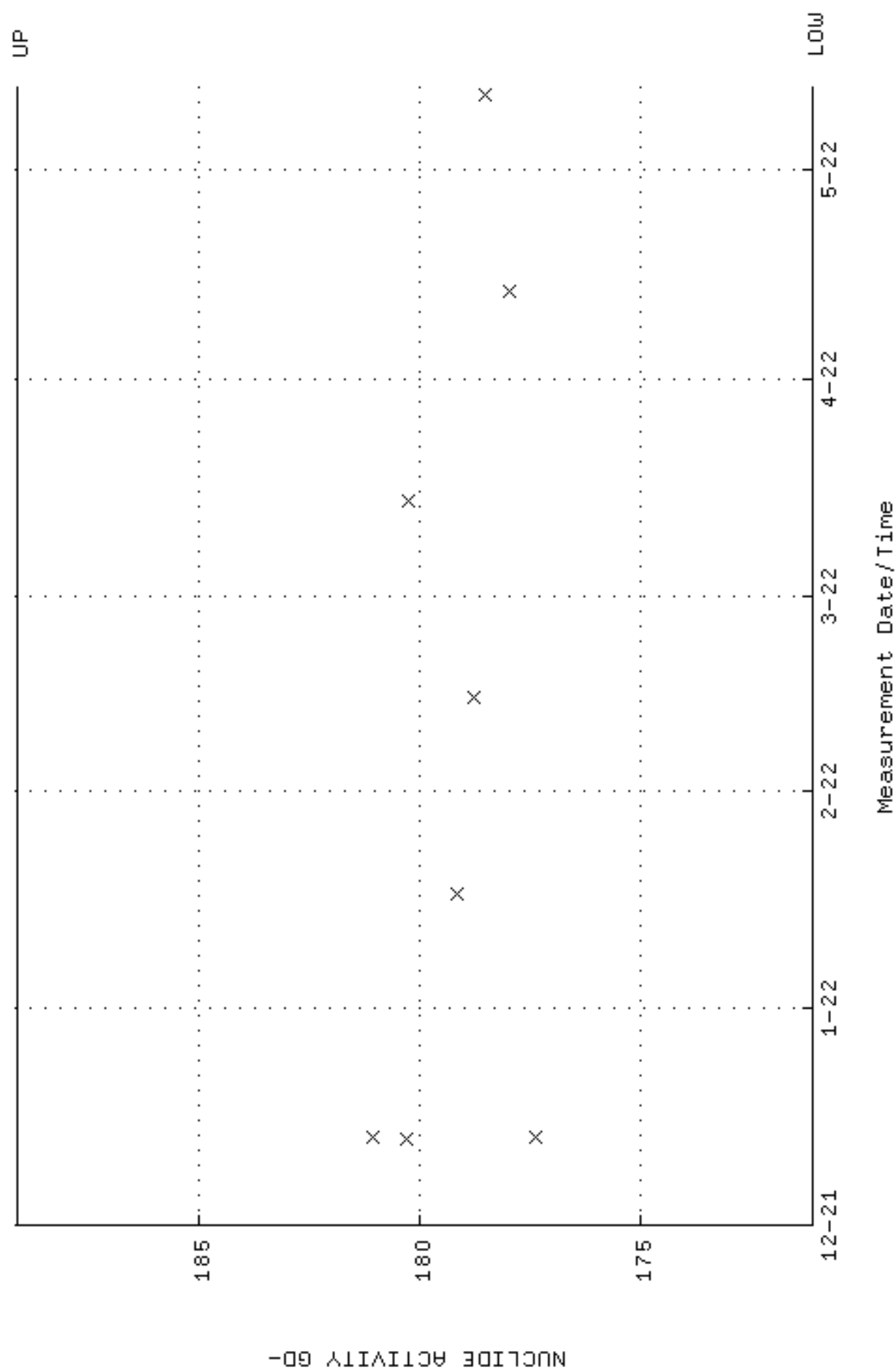
QA filename : DKA100:[ENV_ALPHA.QA.B]B112.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 16:55:34 through 11-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



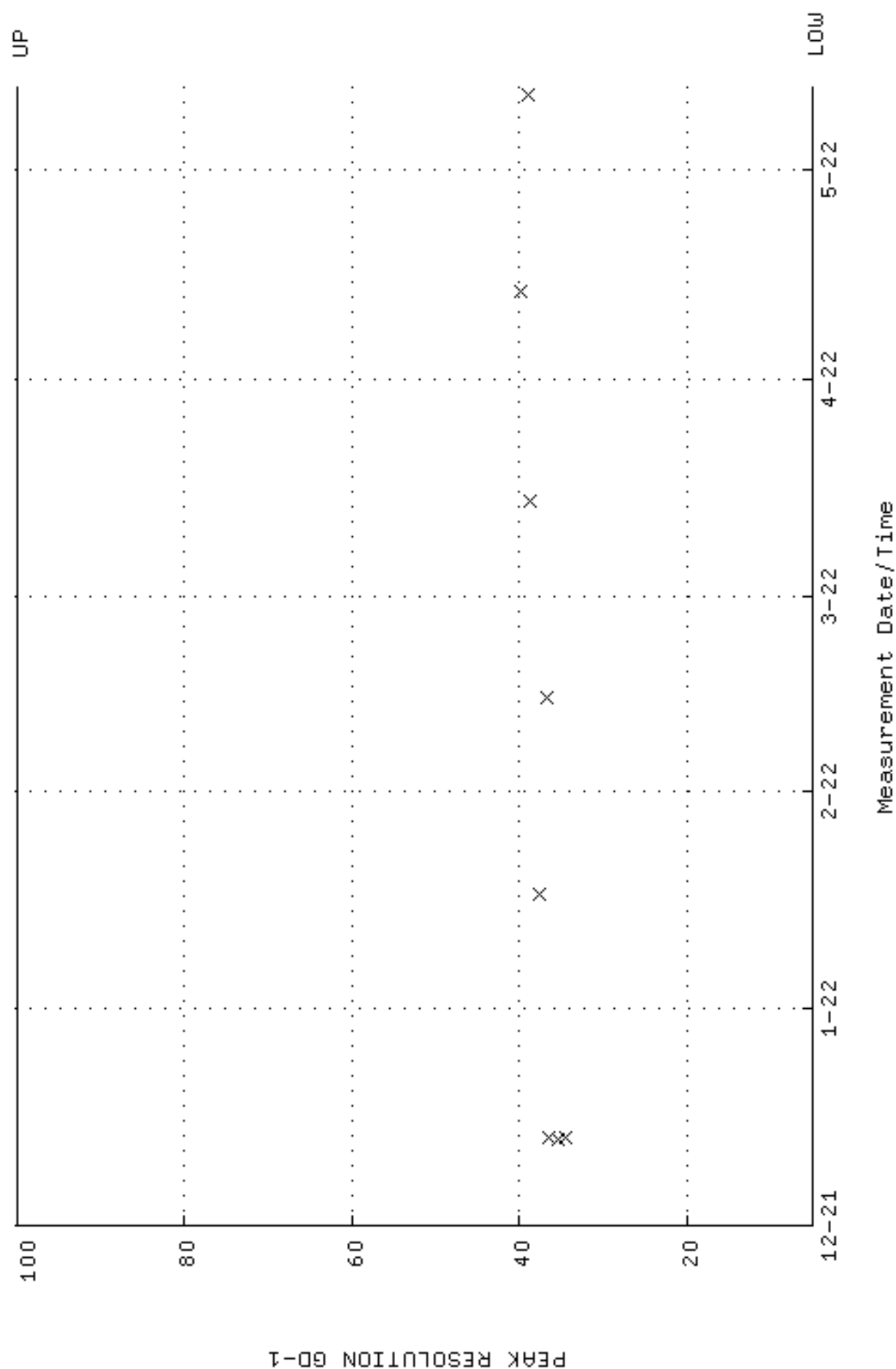
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-DEC-2021 08:02:25 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.256860 through 0.272750



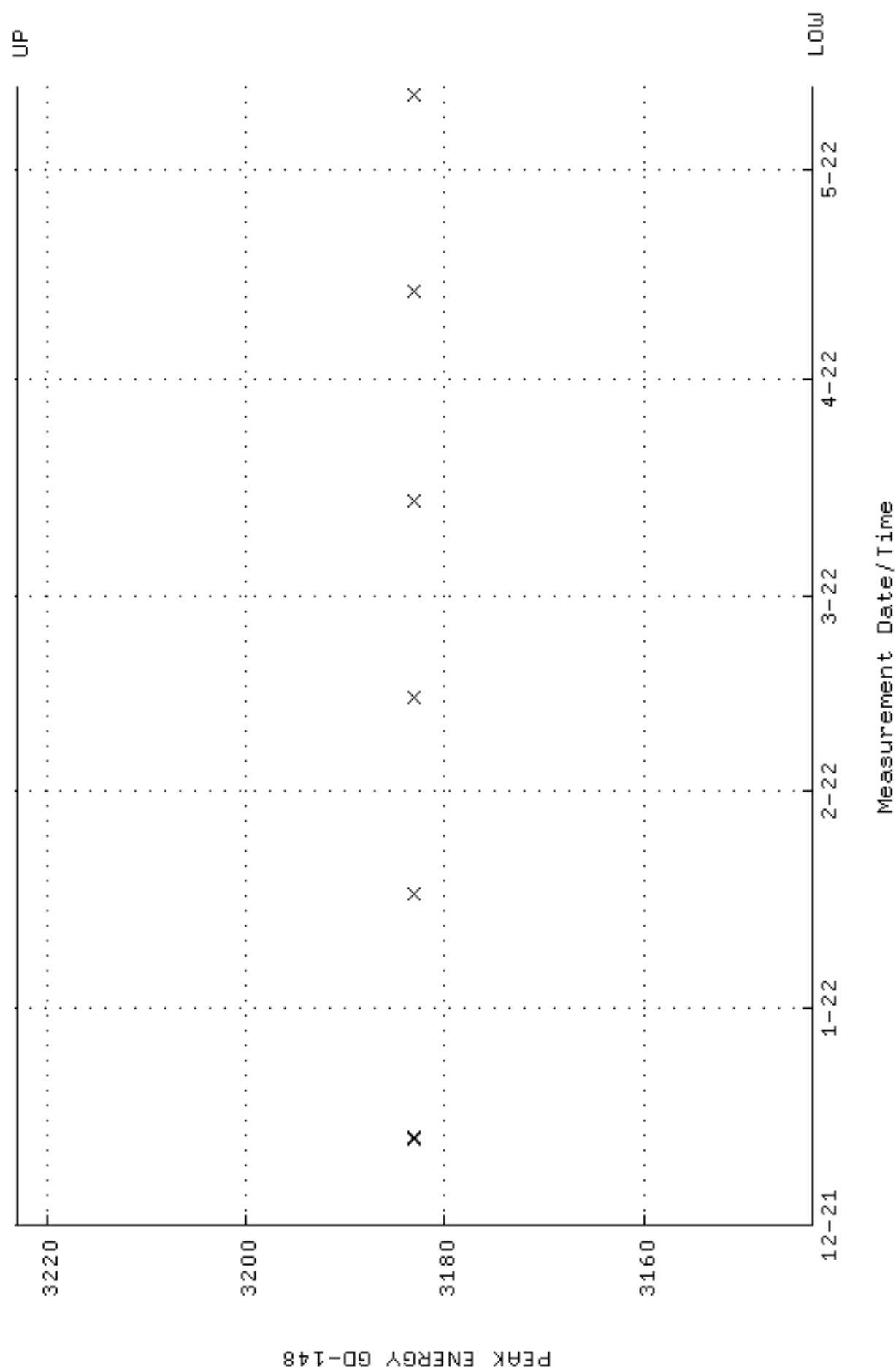
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-DEC-2021 08:02:25 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



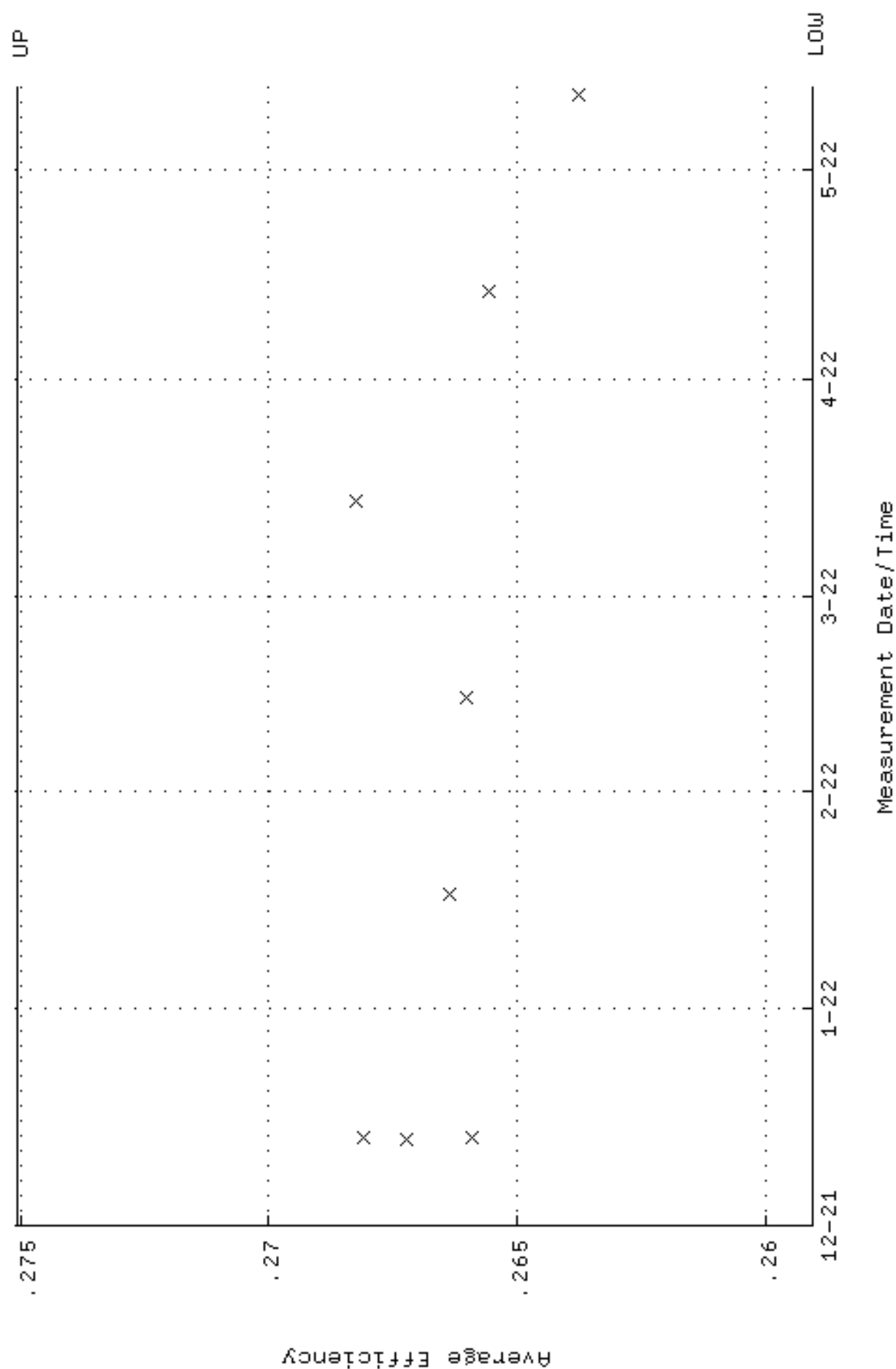
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-DEC-2021 08:02:25 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



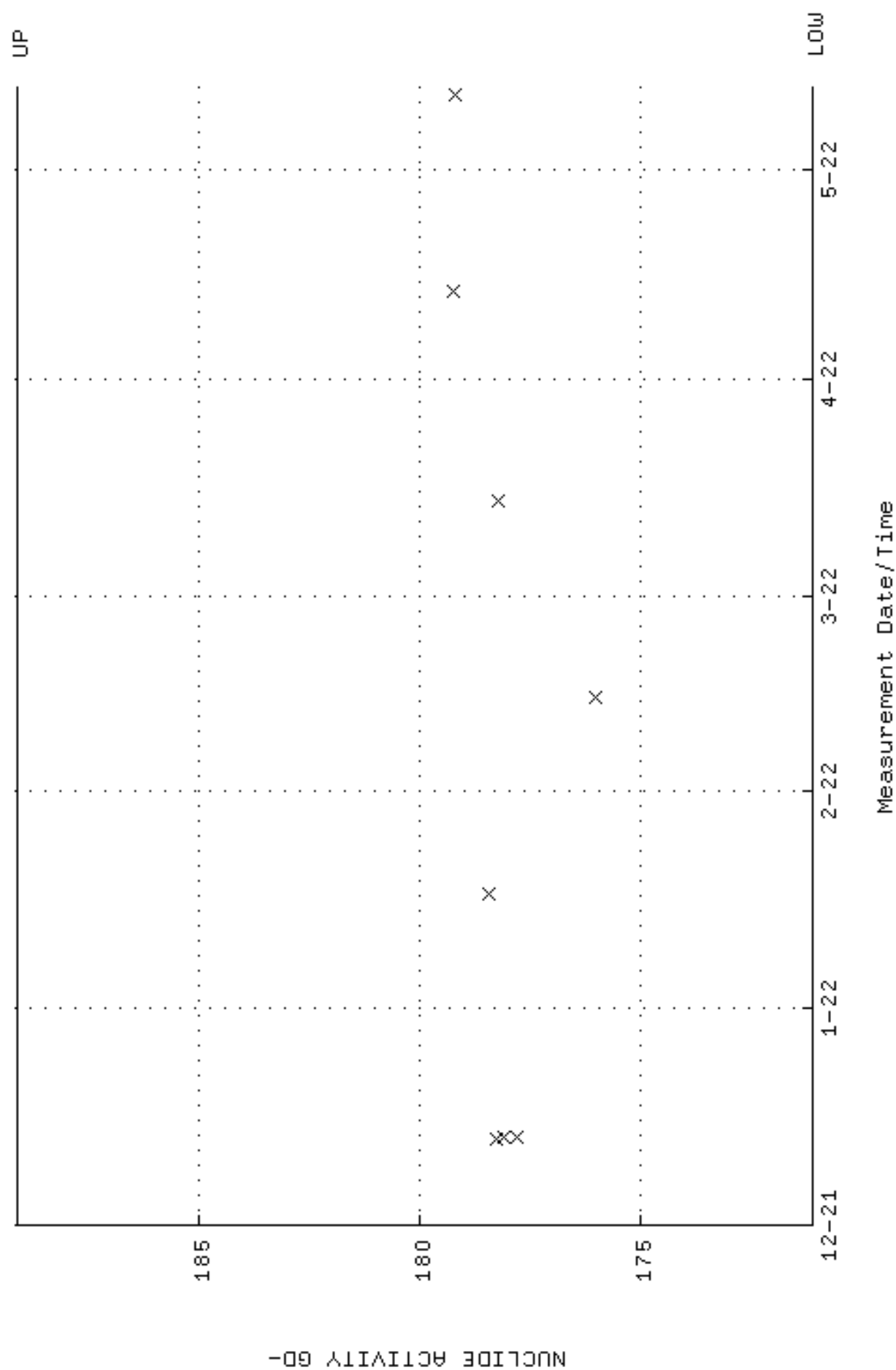
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-DEC-2021 08:02:25 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



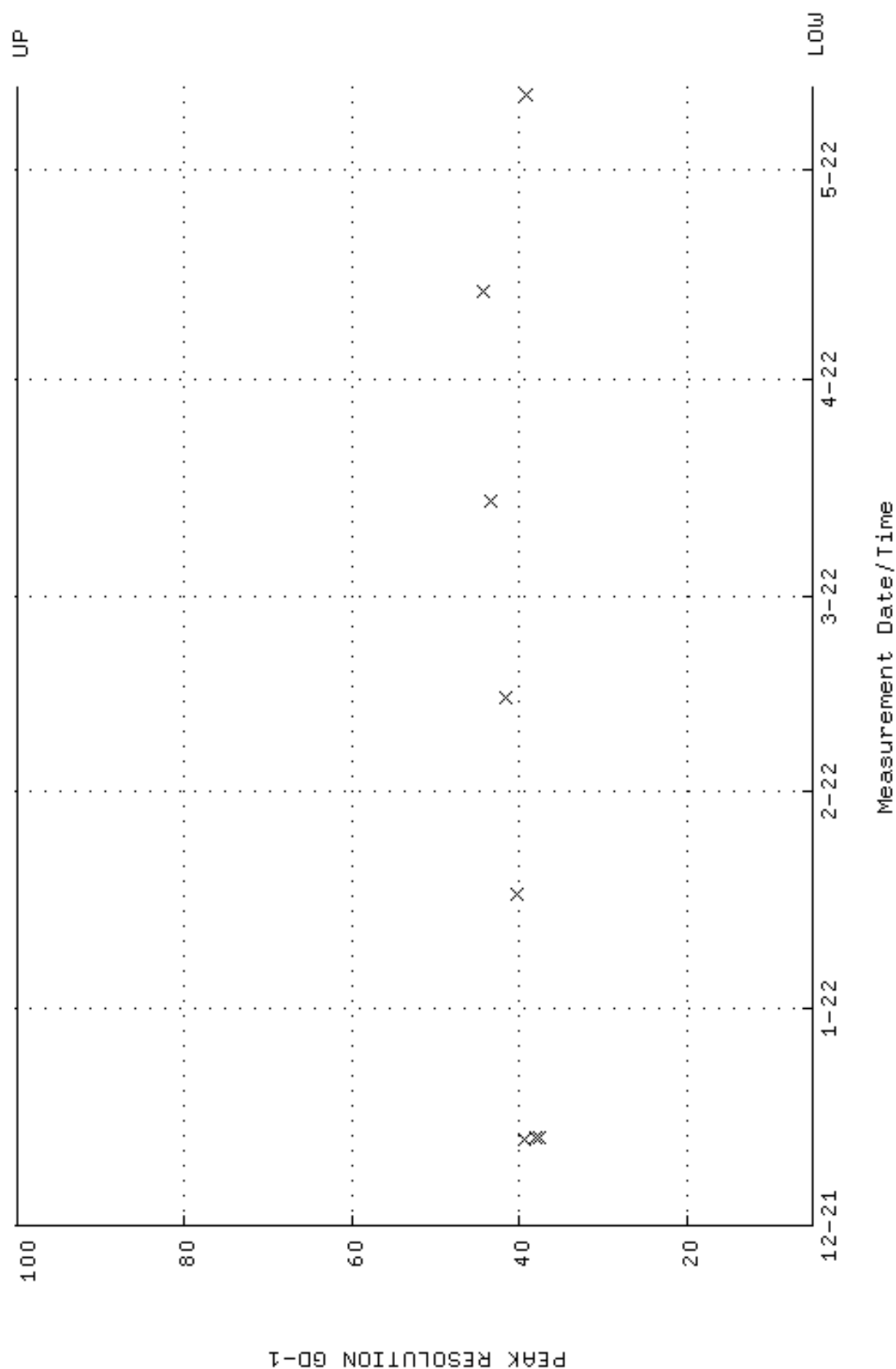
QA filename : DKA100:[ENV_ALPHA.QA.W]W125.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-DEC-2021 08:05:03 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.259040 through 0.275060



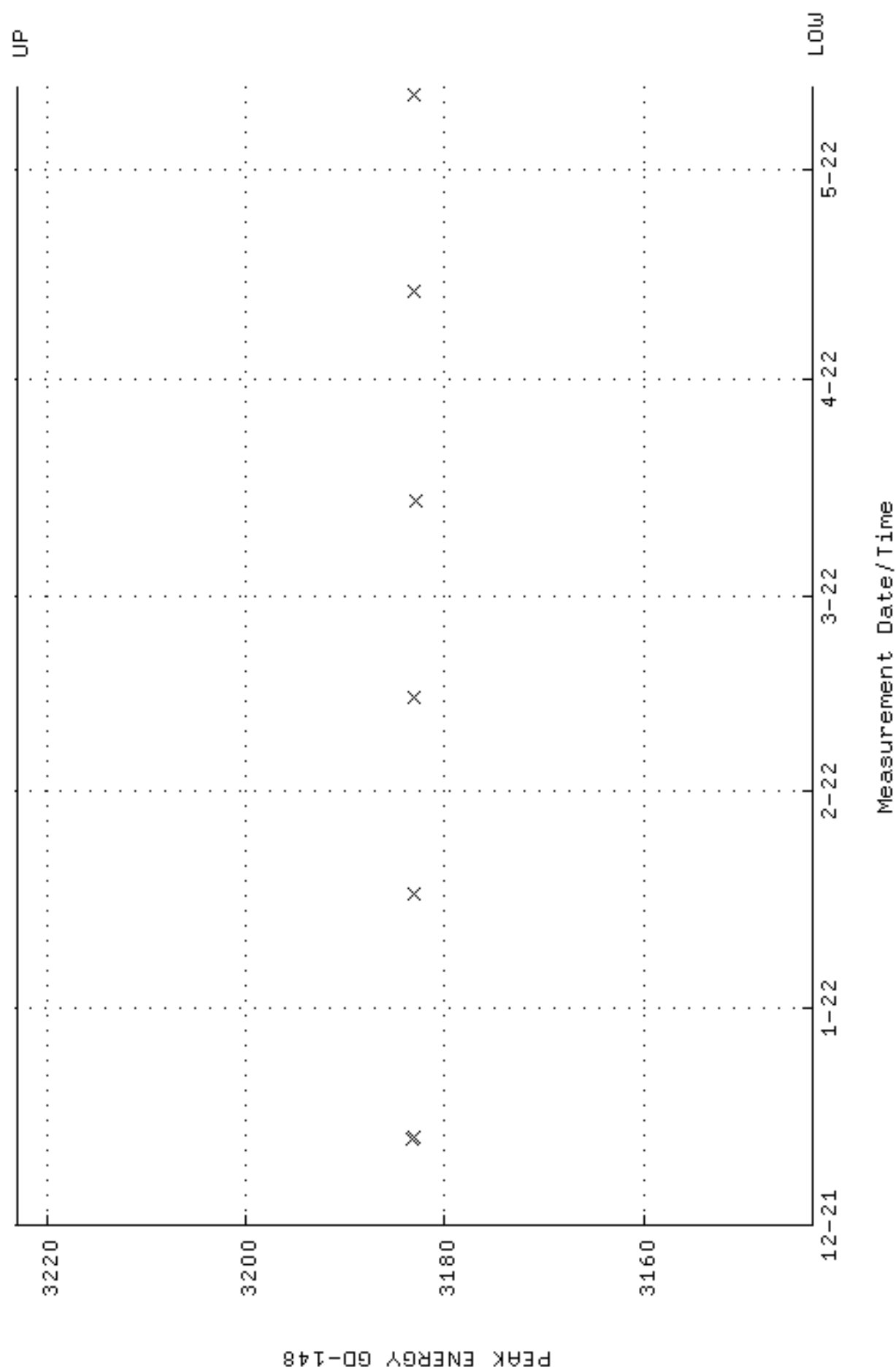
QA filename : DKA100:[ENV_ALPHA.QA.W]W125.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-DEC-2021 08:05:03 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



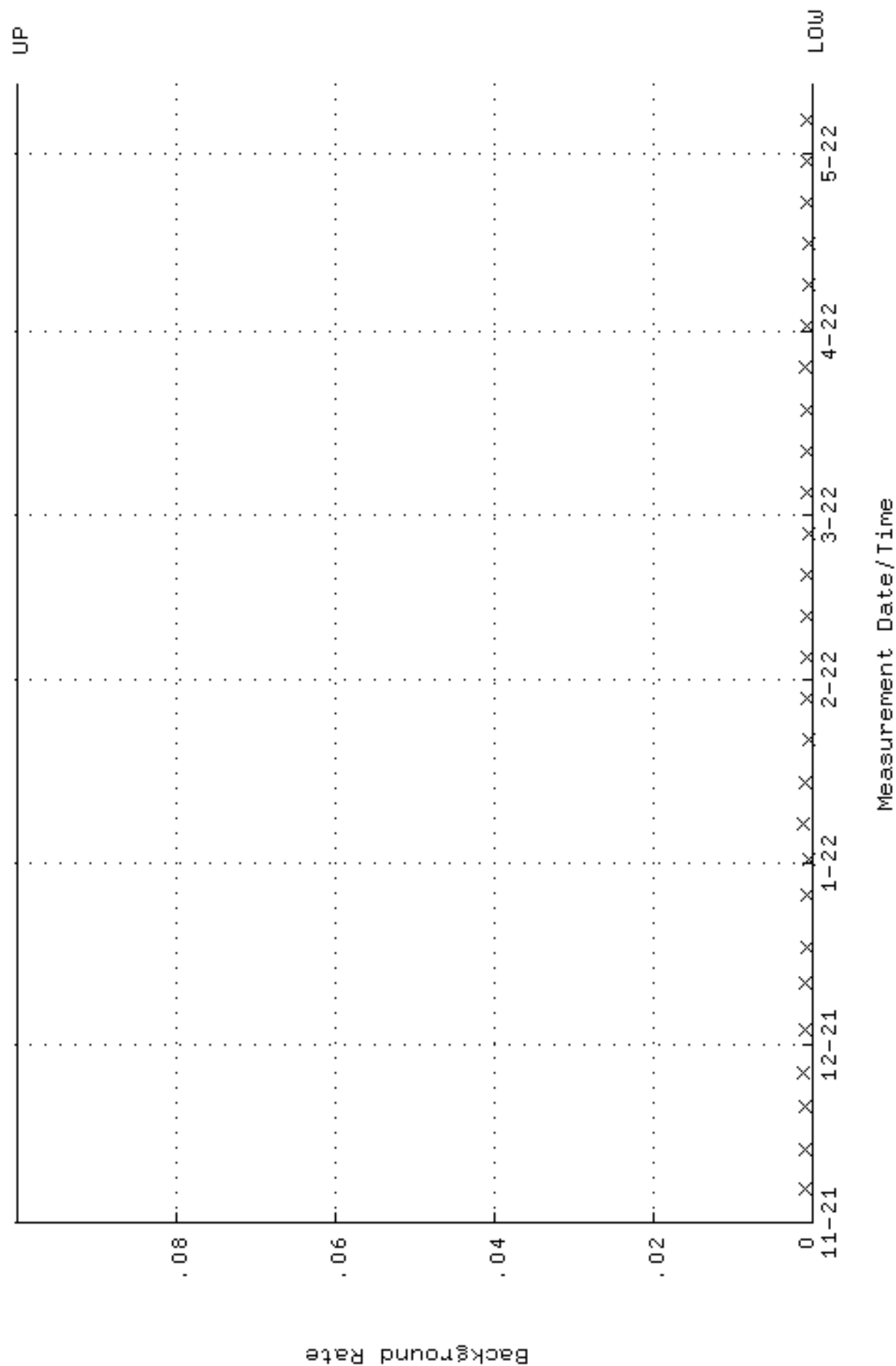
QA filename : DKA100:[ENV_ALPHA.QA.W]W125.QAF;6
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-DEC-2021 08:05:03 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



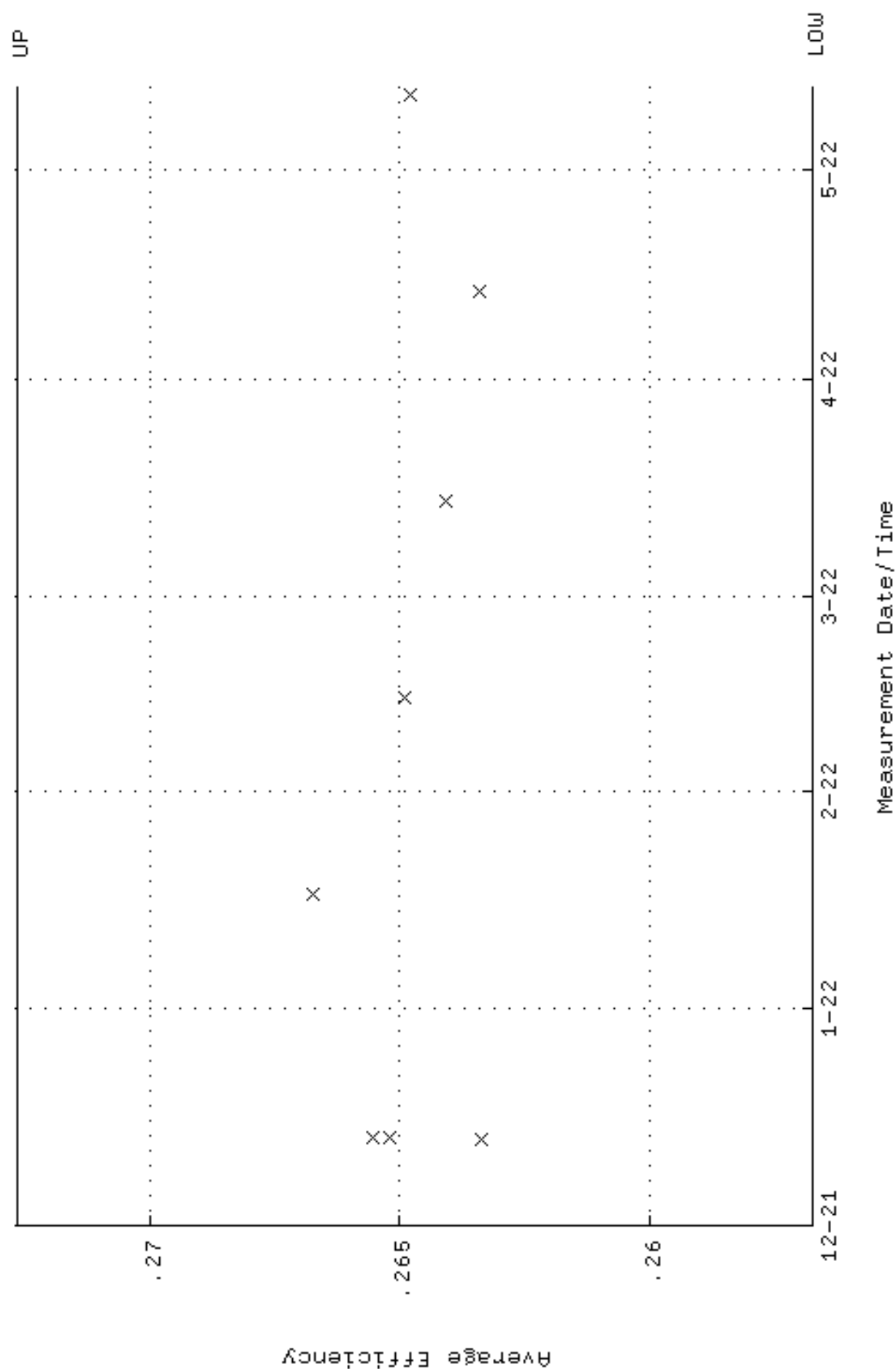
QA filename : DKA100:[ENV_ALPHA.QA.W]W125.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-DEC-2021 08:05:03 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



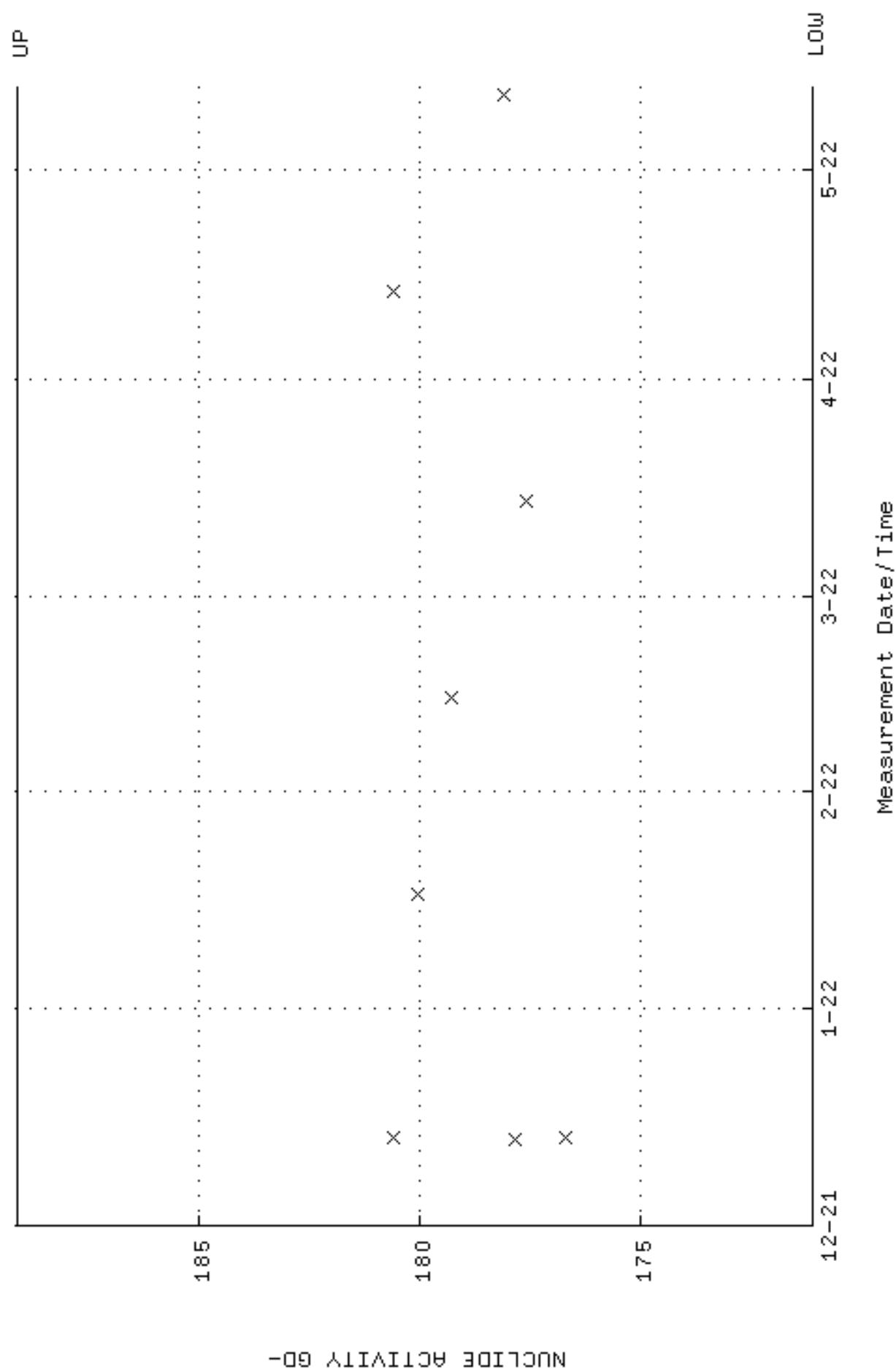
QA filename : DKA100:[ENV_ALPHA.QA.B]B125.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 17:00:17 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



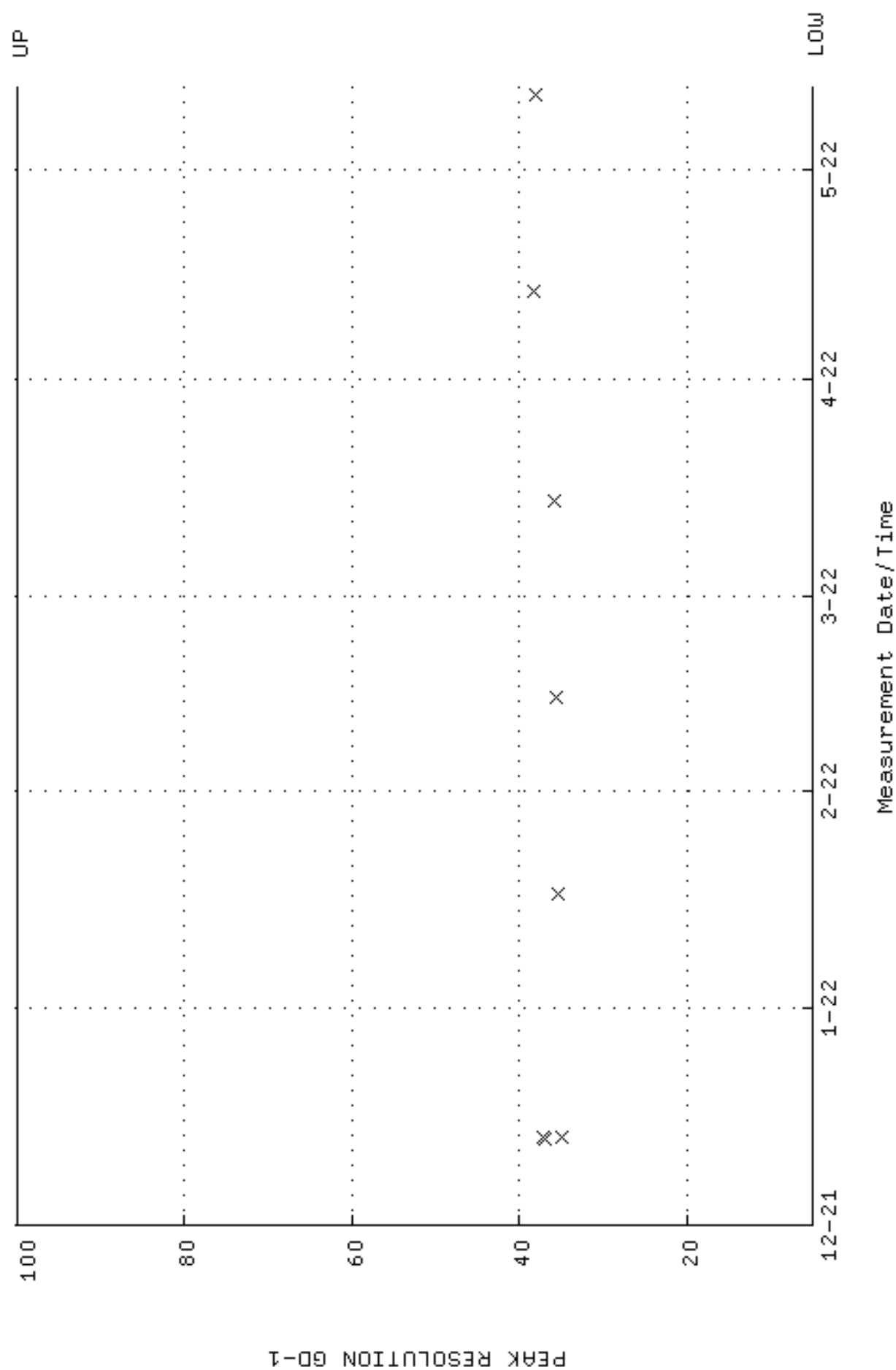
QA filename : DKA100:[ENV_ALPHA.QA.W]W131.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-DEC-2021 08:10:38 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.256760 through 0.272640



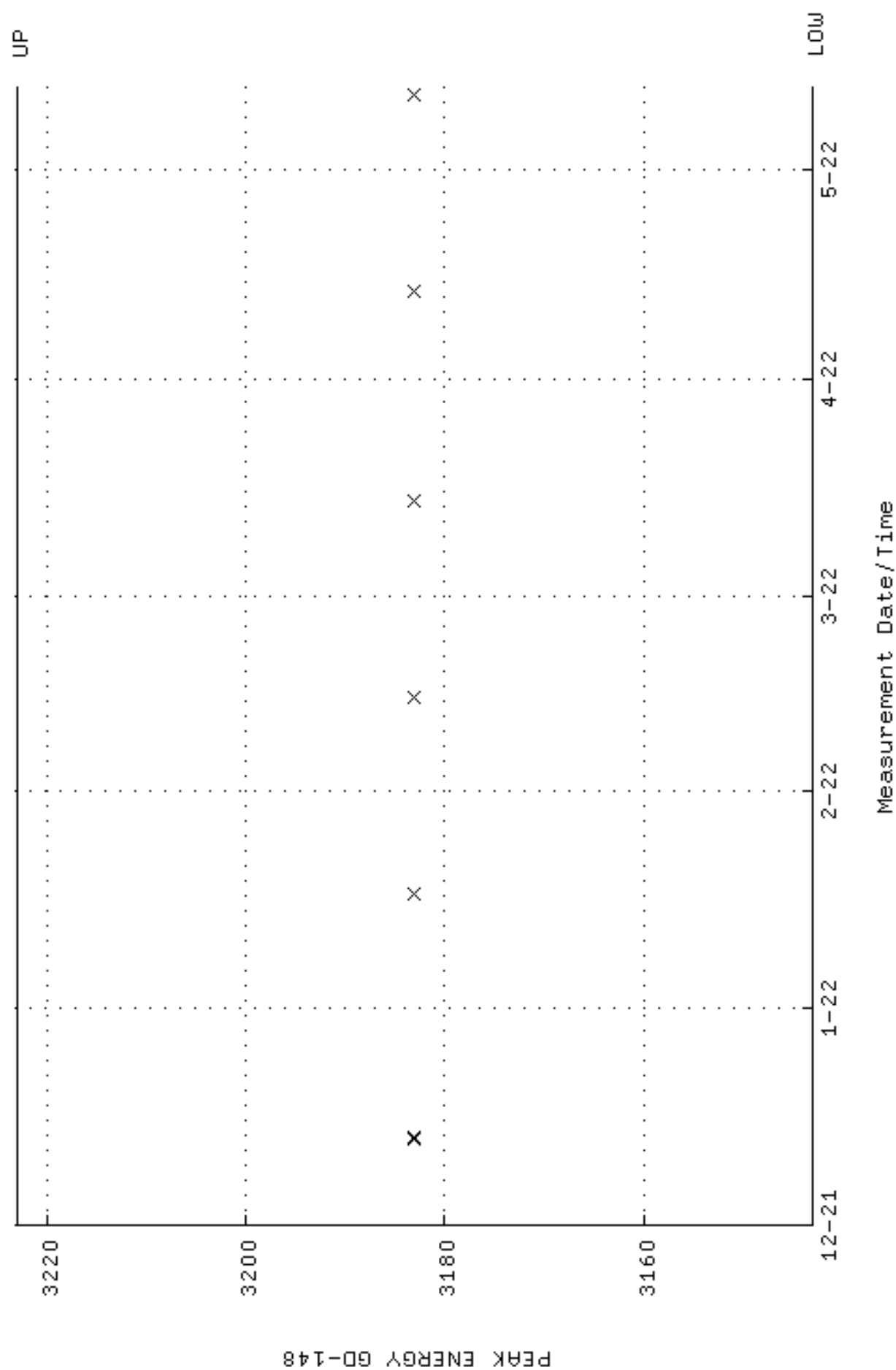
QA filename : DKA100:[ENV_ALPHA.QA.W]W131.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-DEC-2021 08:10:38 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



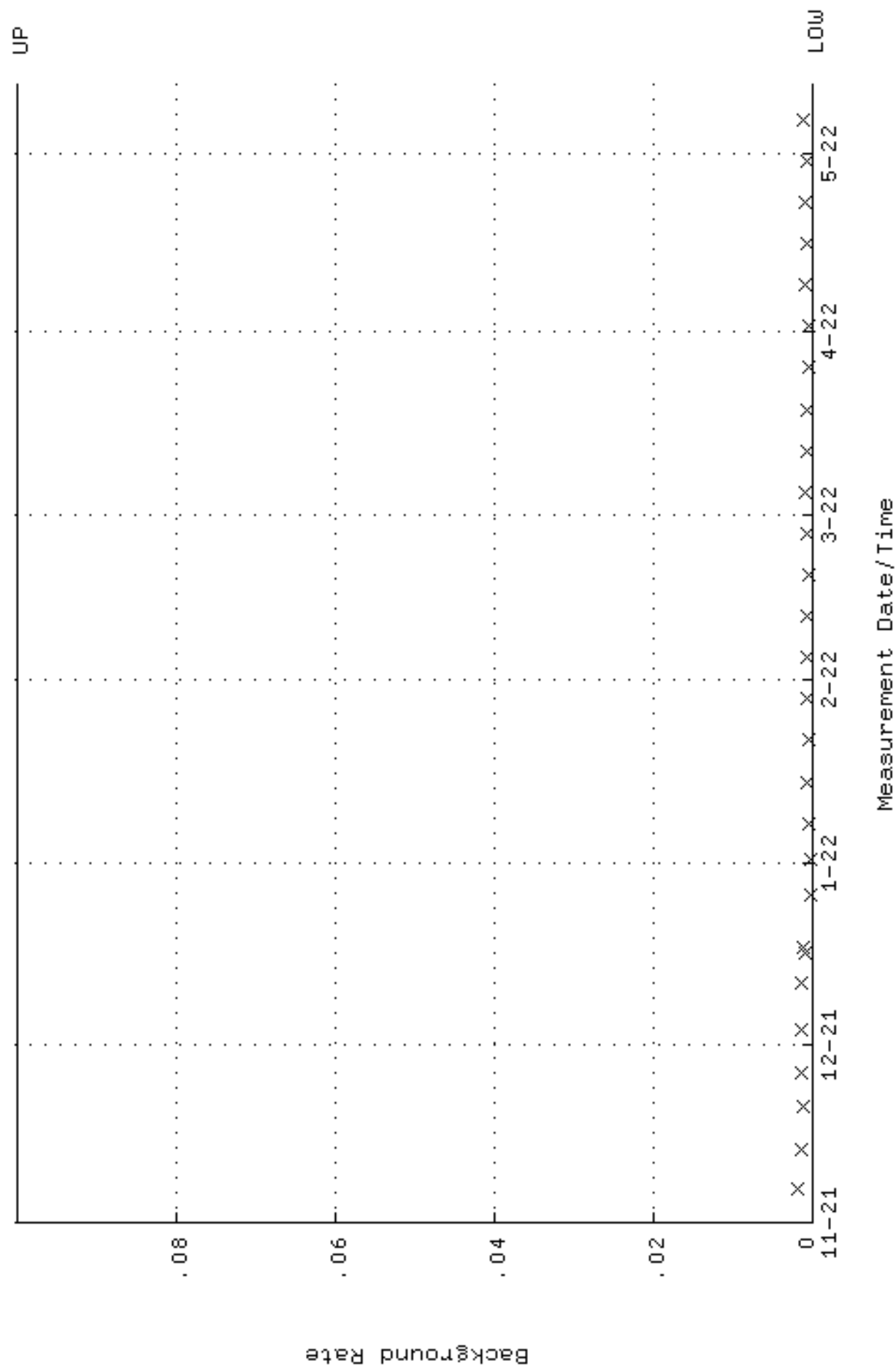
QA filename : DKA100:[ENV_ALPHA.QA.W]W131.QAF;7
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-DEC-2021 08:10:38 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



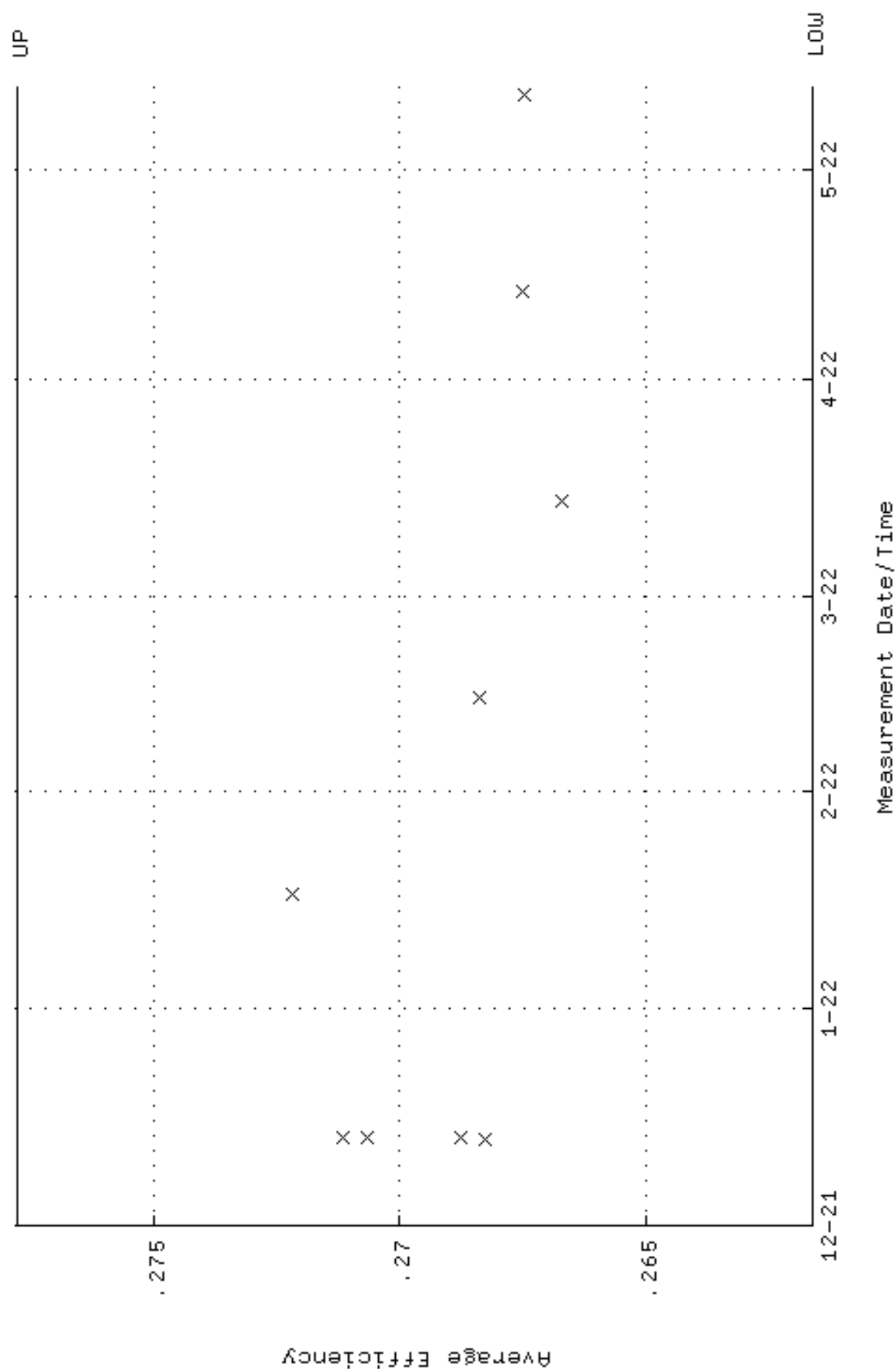
QA filename : DKA100:[ENV_ALPHA.QA.W]W131.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-DEC-2021 08:10:38 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



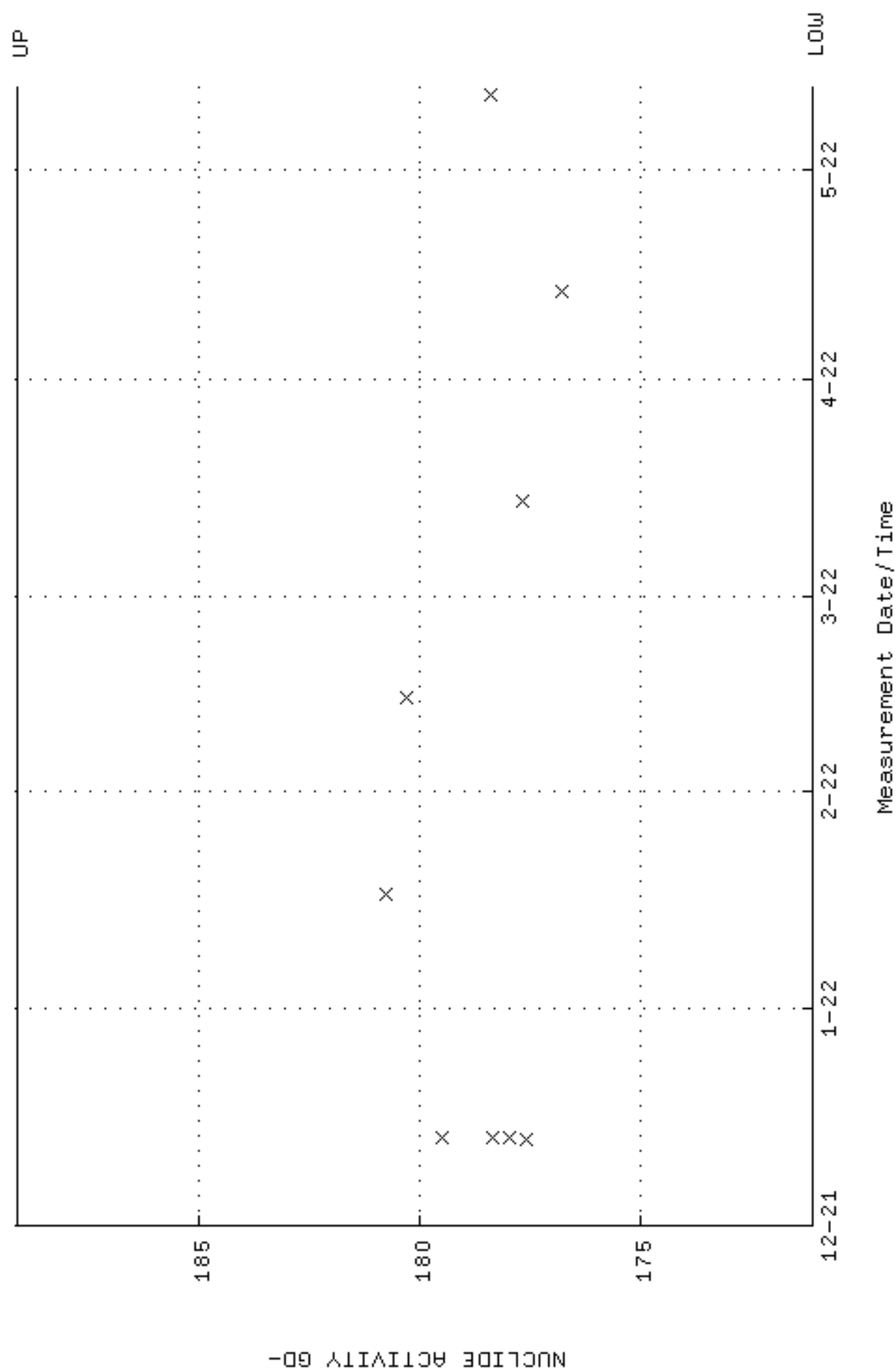
QA filename : DKA100:[ENV_ALPHA.QA.B]B131.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 17:00:40 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



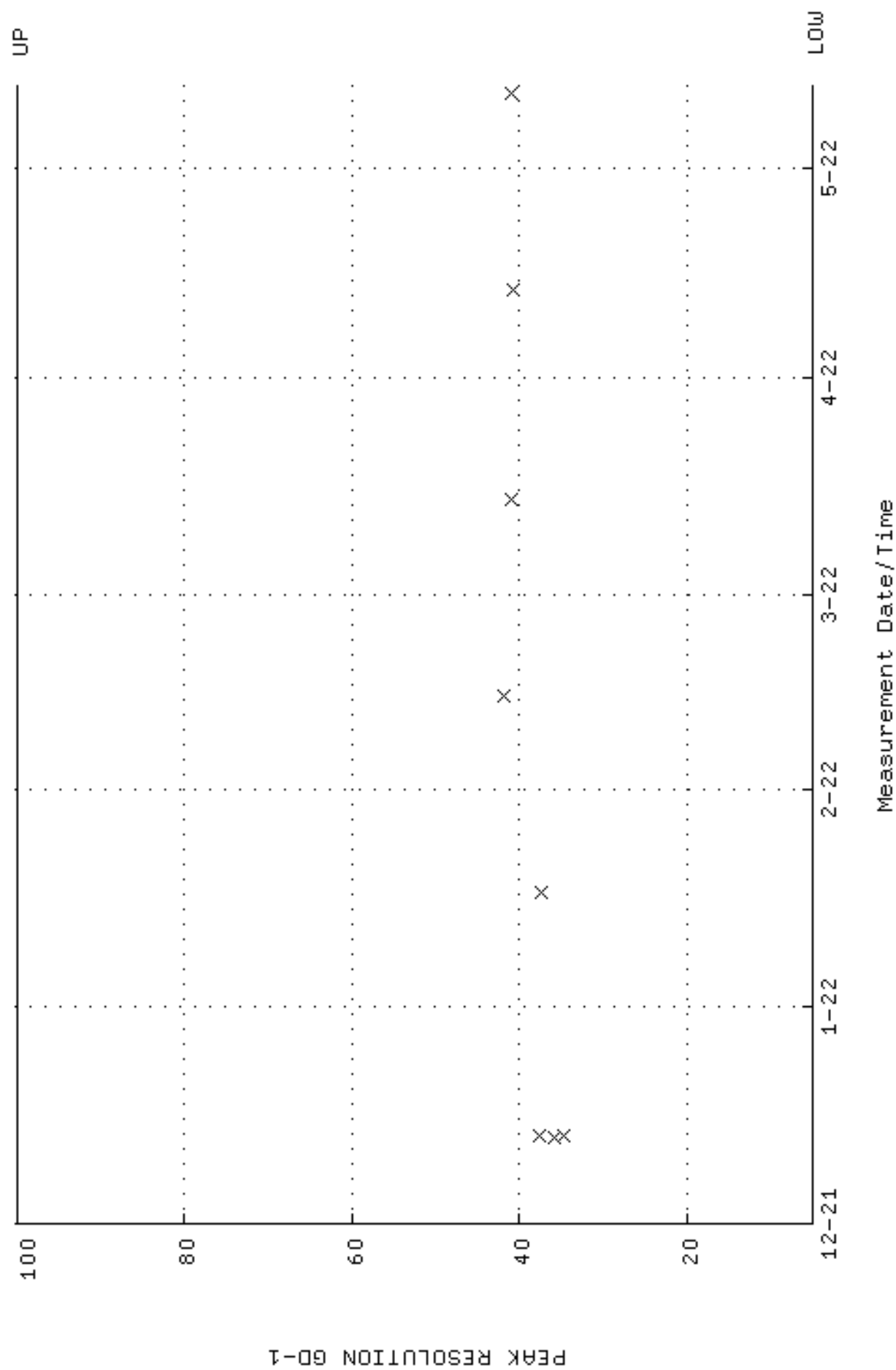
QA filename : DKA100:[ENV_ALPHA.QA.W]W132.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-DEC-2021 07:42:12 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.261600 through 0.277790



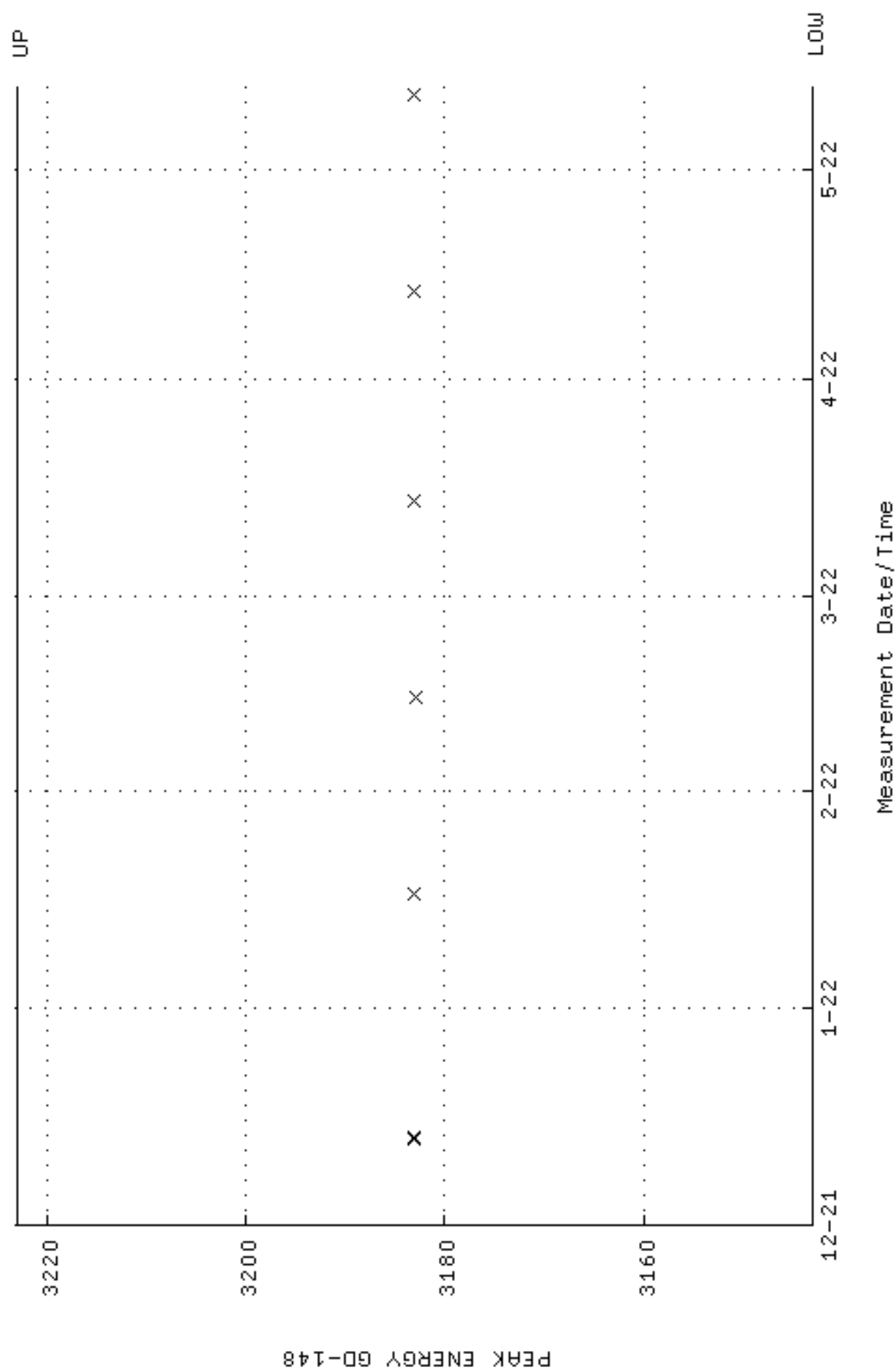
QA filename : DKA100:[ENV_ALPHA.QA.W]W132.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-DEC-2021 07:42:12 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



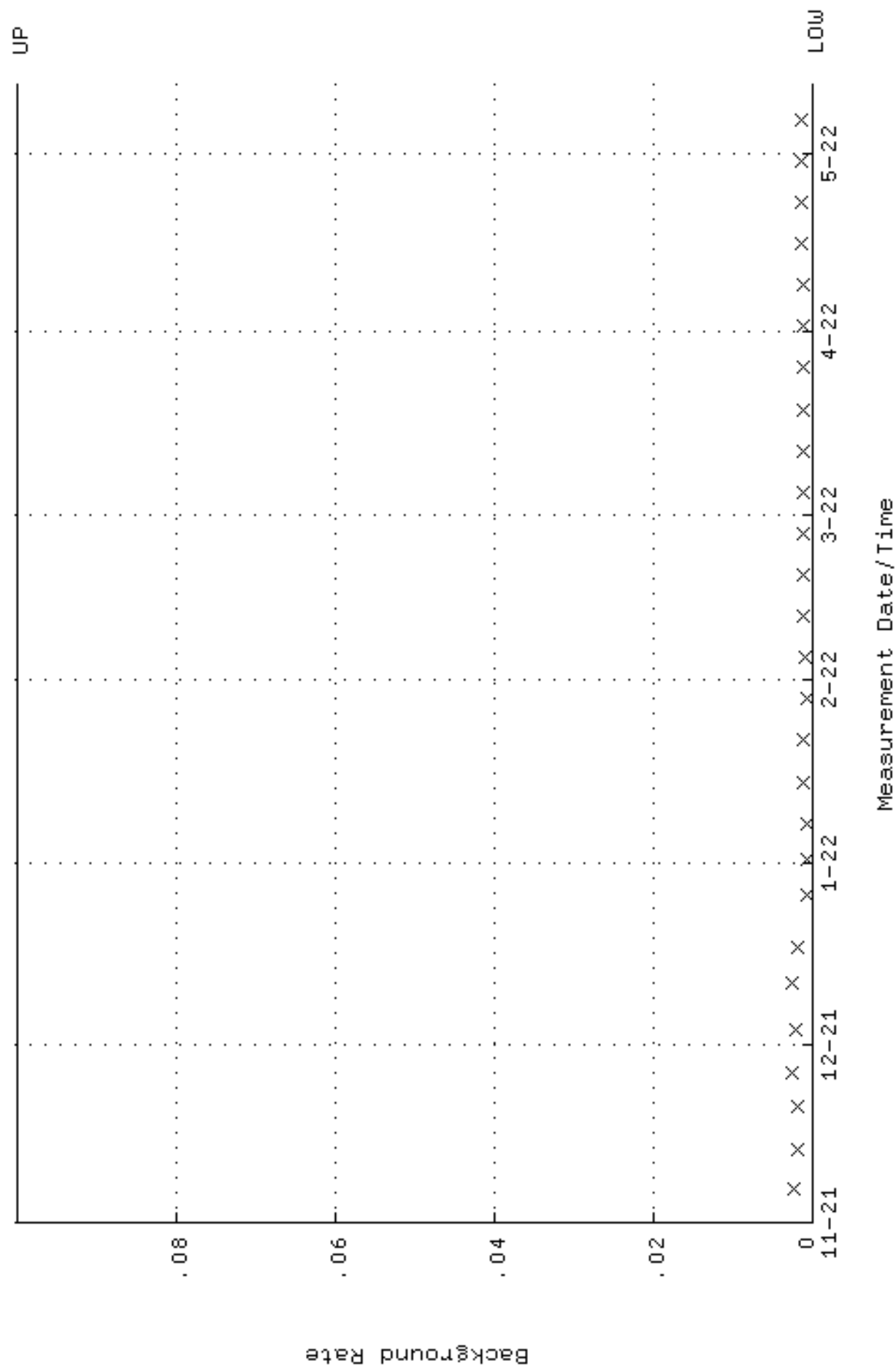
QA filename : DKA100:[ENV_ALPHA.QA.W]W132.QAF;6
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-DEC-2021 07:42:12 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



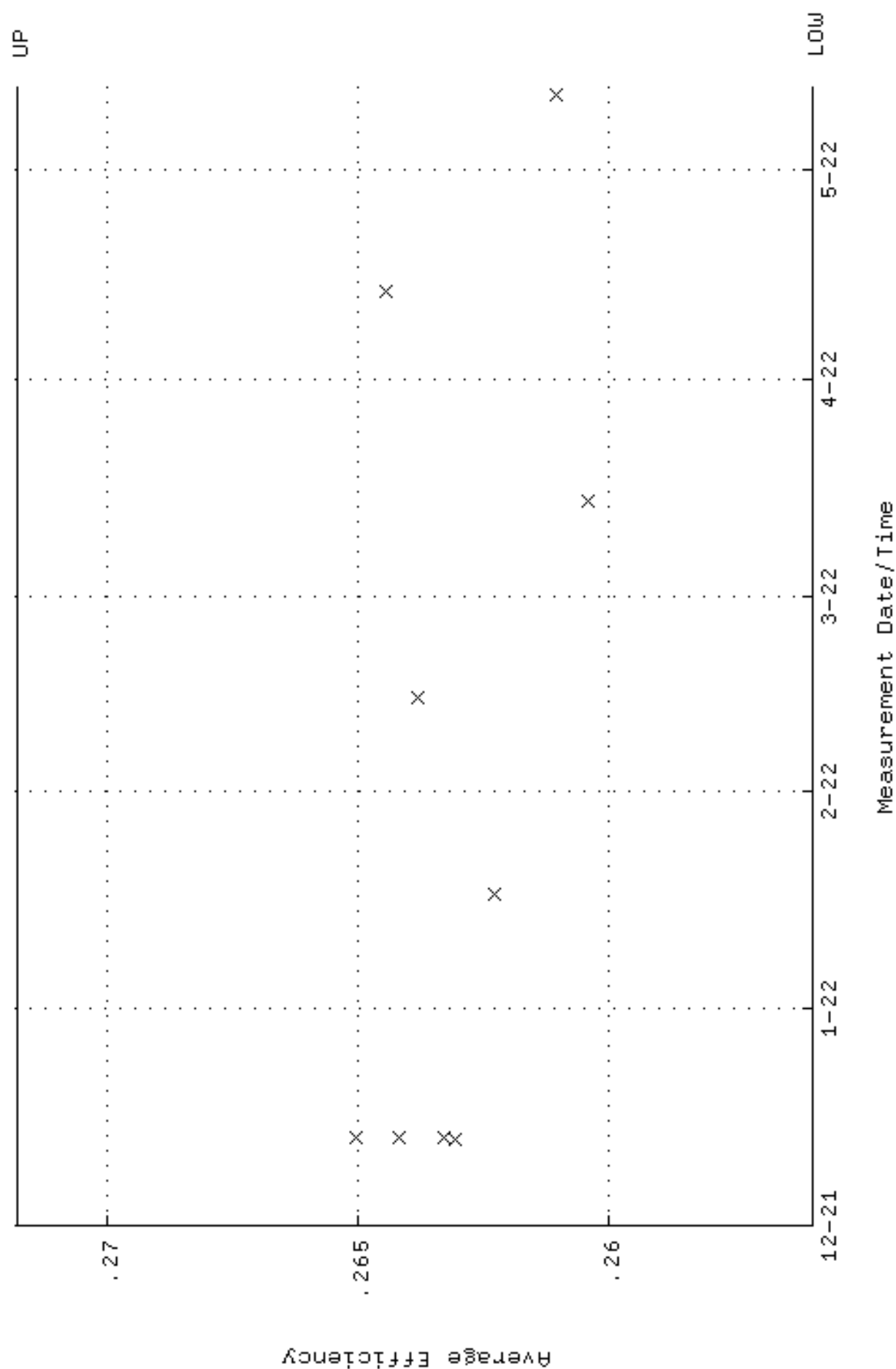
QA filename : DKA100:[ENV_ALPHA.QA.W]W132.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-DEC-2021 07:42:12 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



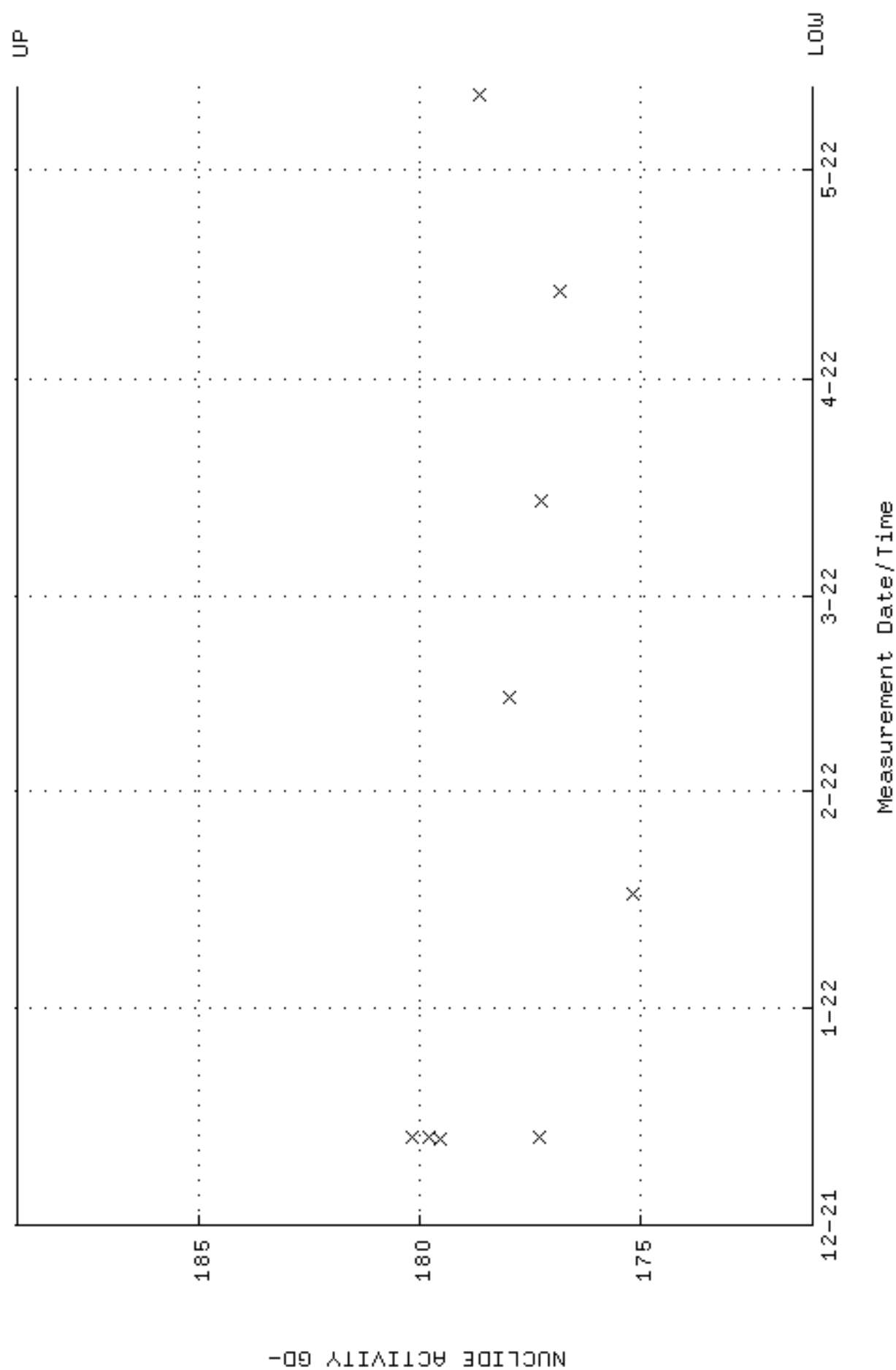
QA filename : DKA100:[ENV_ALPHA.QA.B]B132.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 17:00:44 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



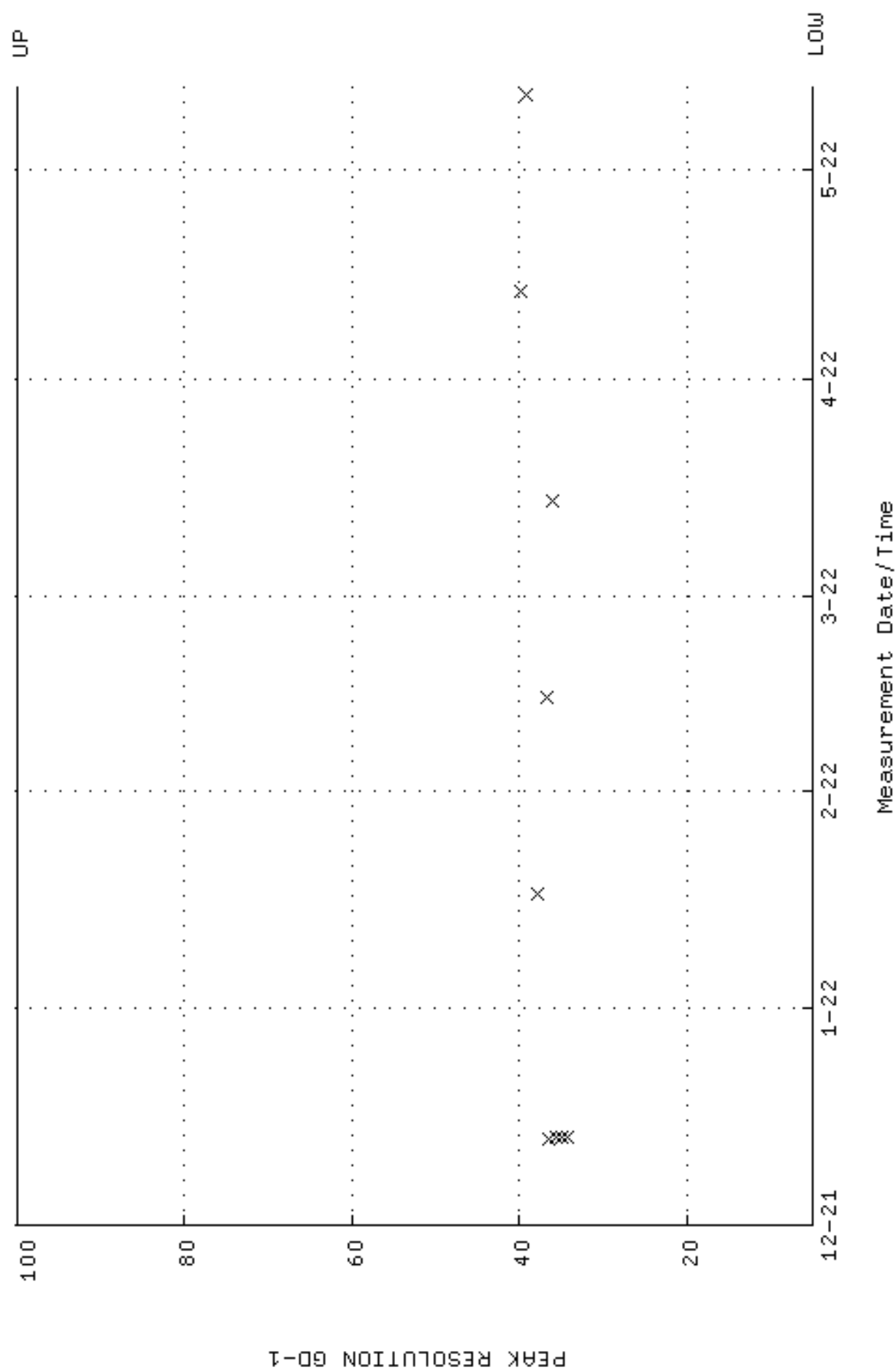
QA filename : DKA100:[ENV_ALPHA.QA.W]W135.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-DEC-2021 07:42:28 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.255950 through 0.271780



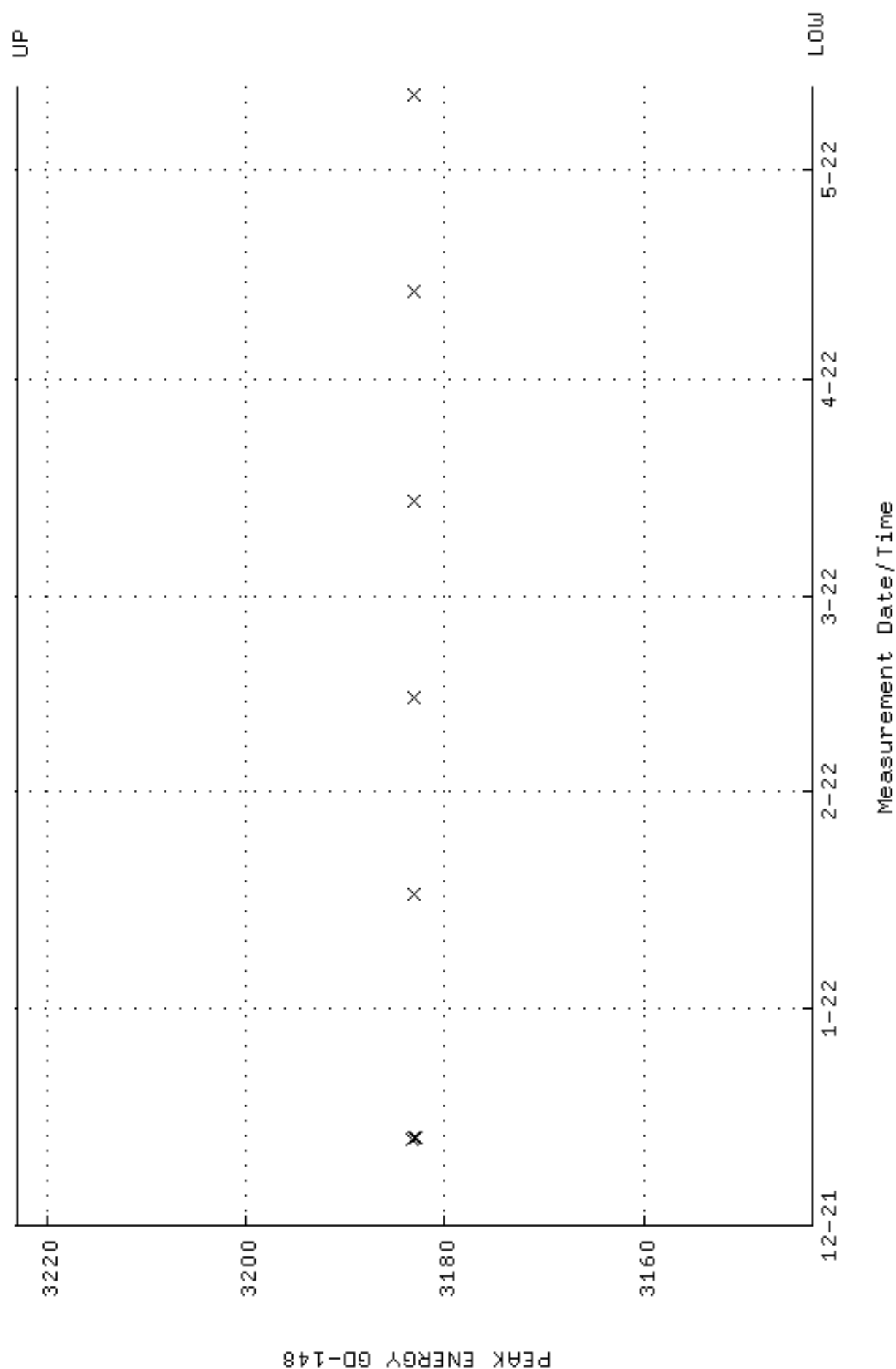
QA filename : DKA100:[ENV_ALPHA.QA.W]W135.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-DEC-2021 07:42:28 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



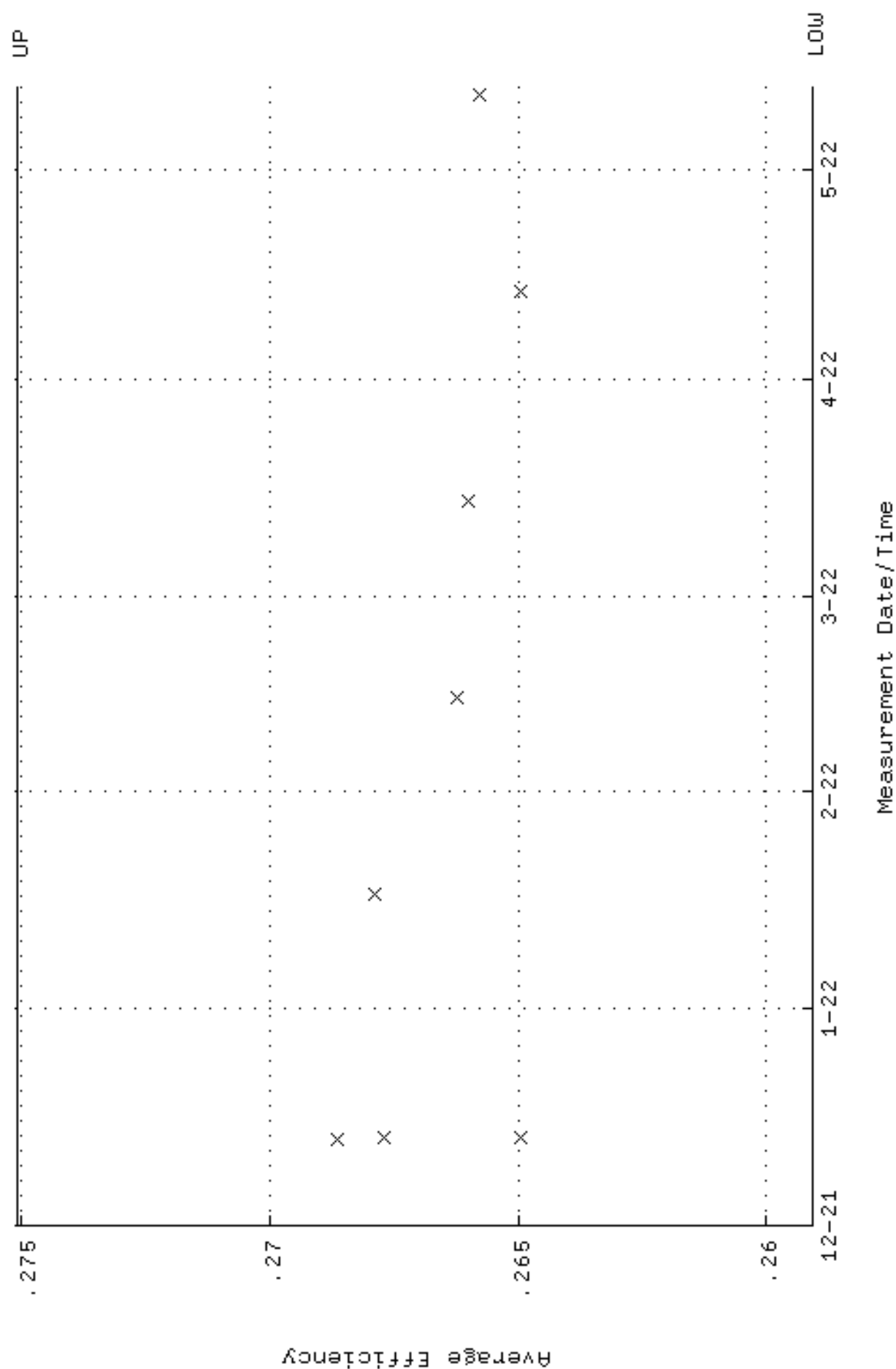
QA filename : DKA100:[ENV_ALPHA.QA.W]W135.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-DEC-2021 07:42:28 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



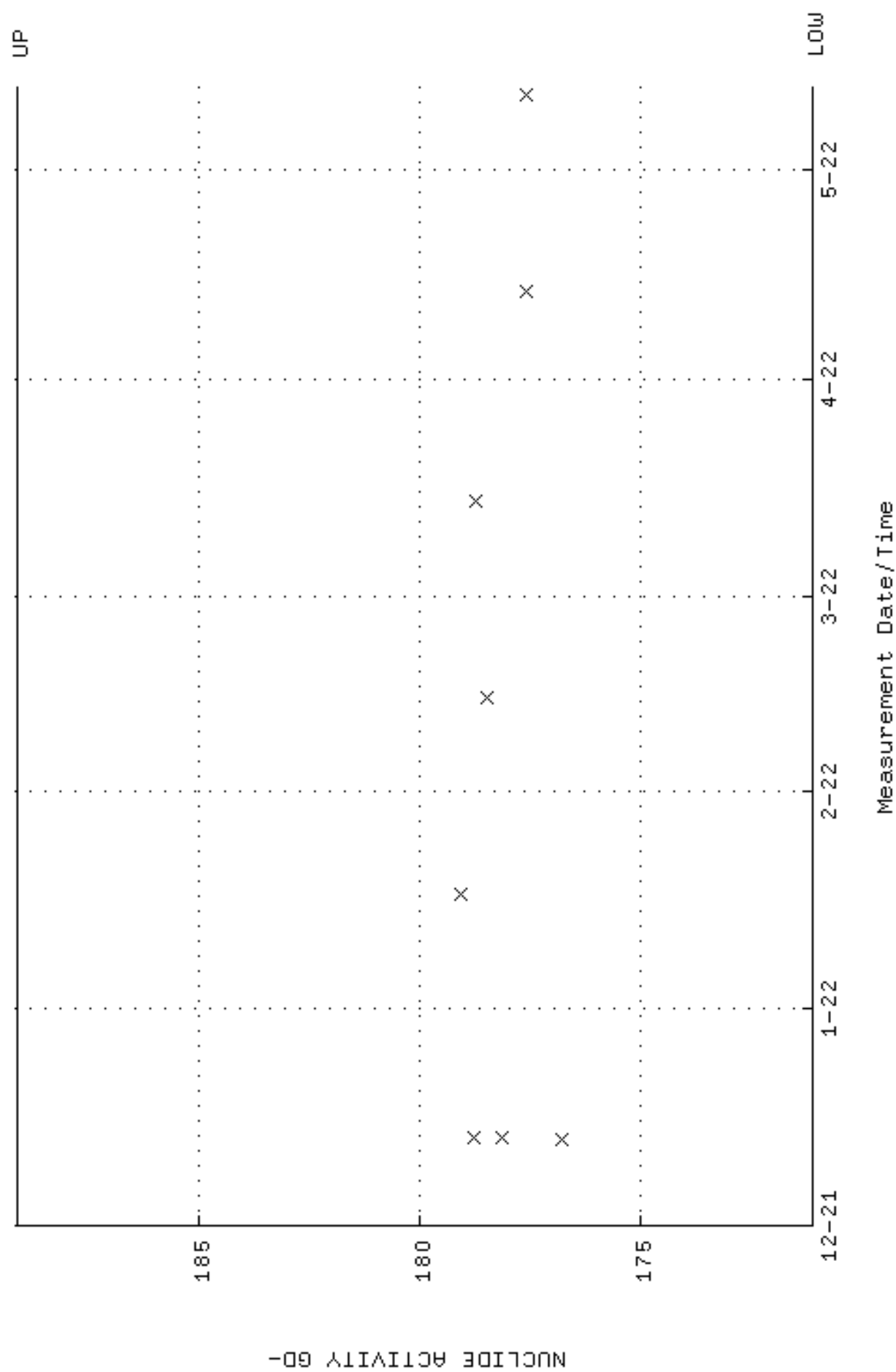
QA filename : DKA100:[ENV_ALPHA.QA.W]W135.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-DEC-2021 07:42:28 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



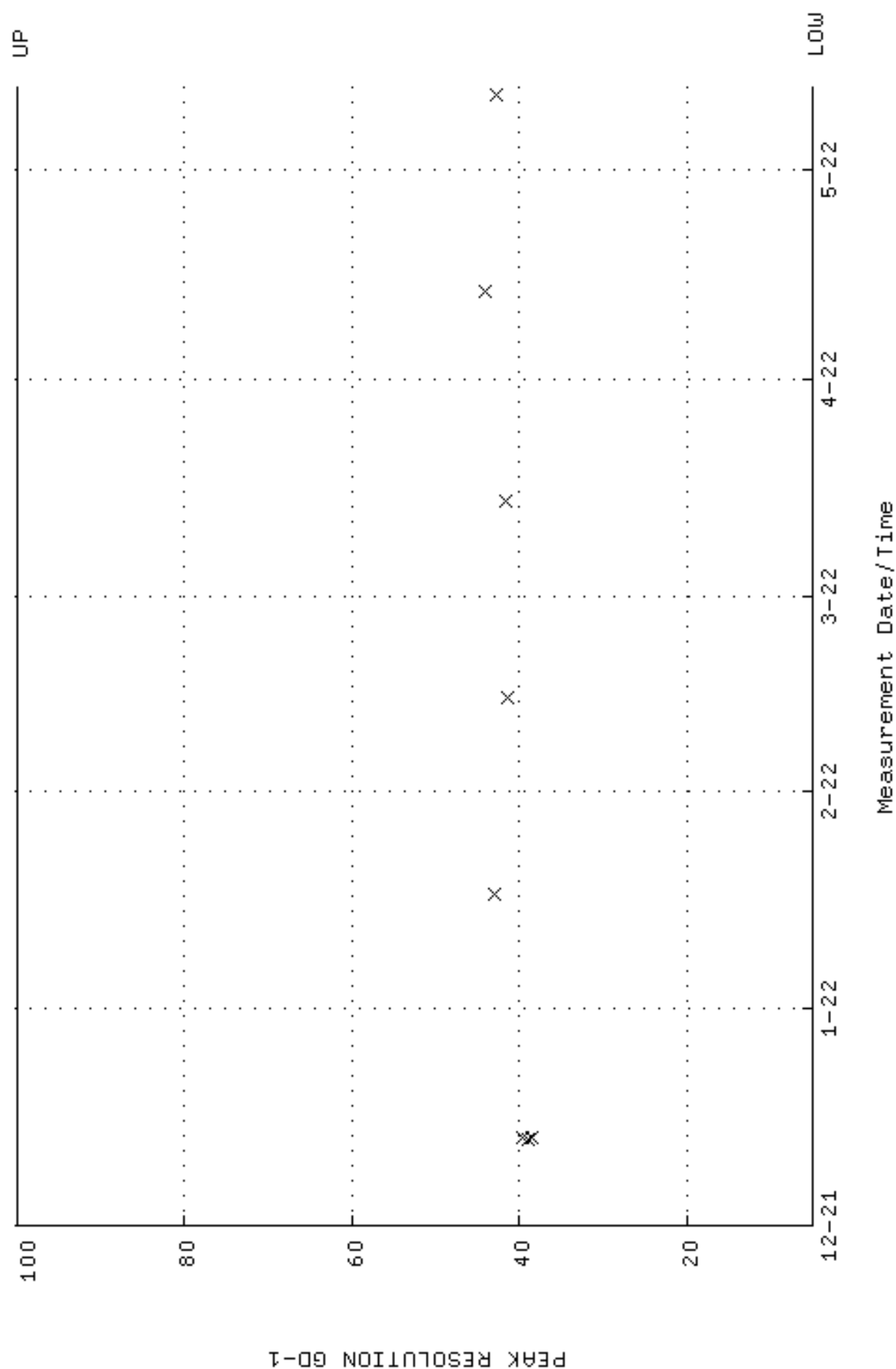
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-DEC-2021 07:42:34 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.259070 through 0.275090



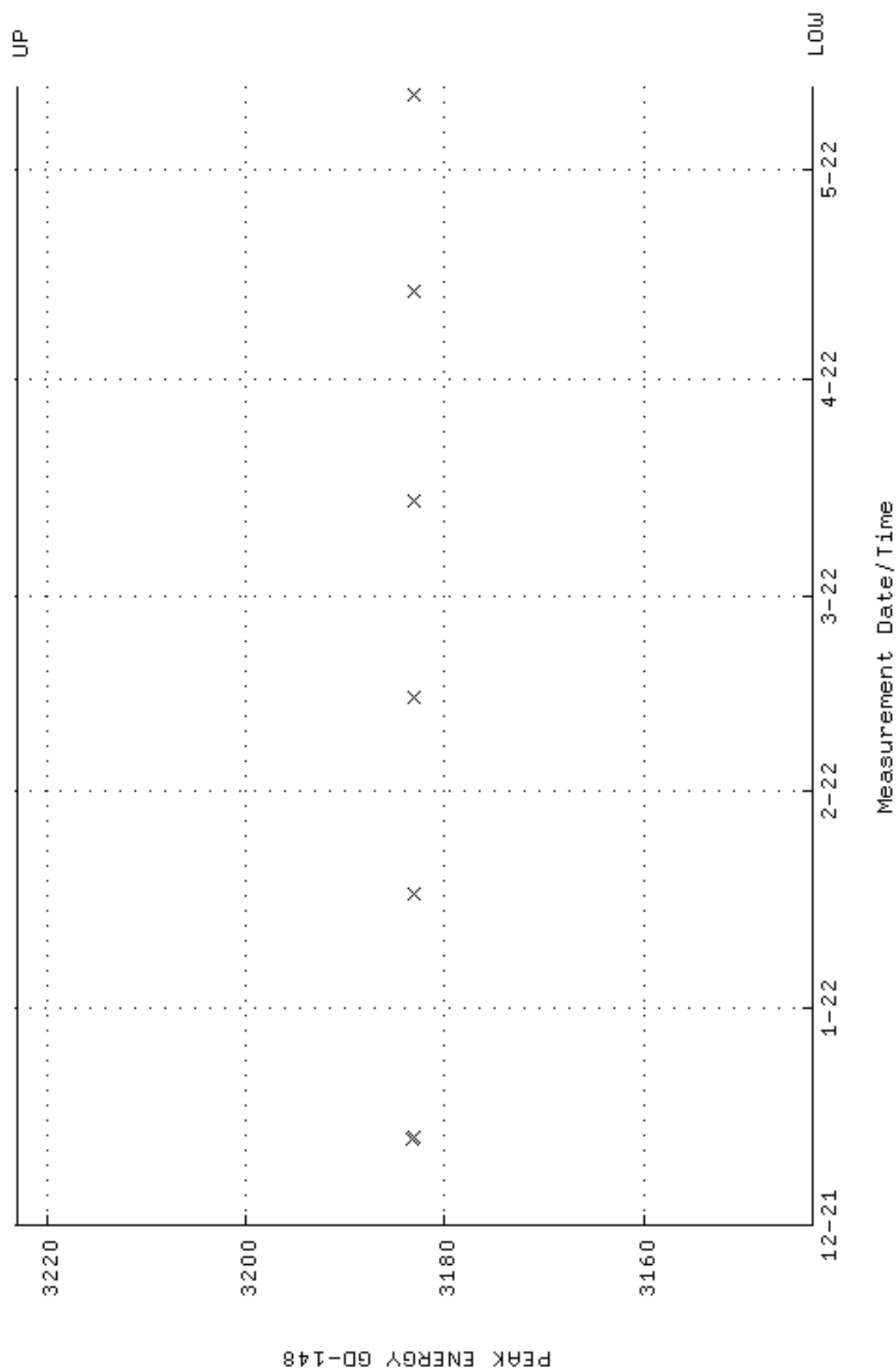
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-DEC-2021 07:42:34 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



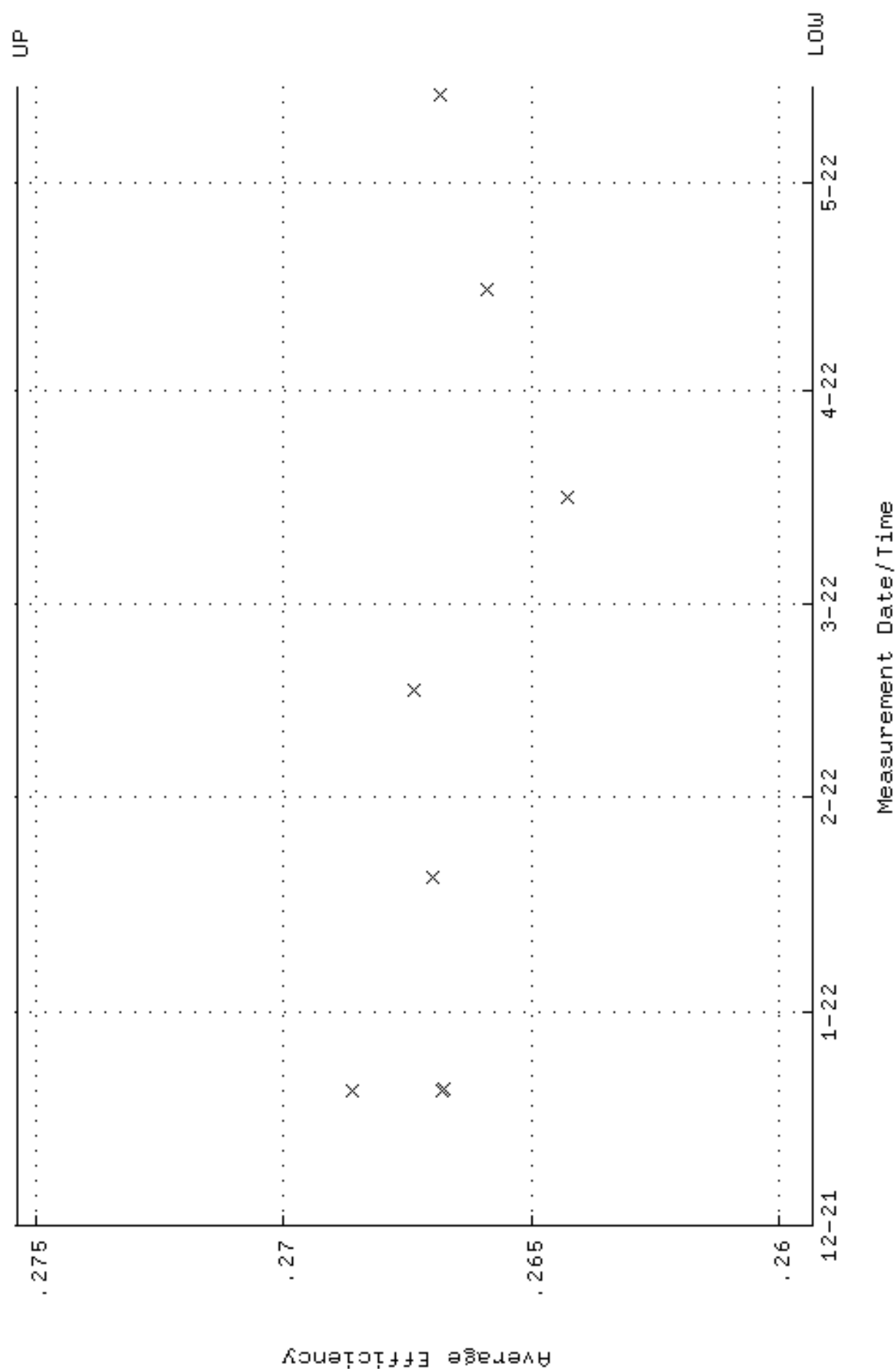
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-DEC-2021 07:42:34 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



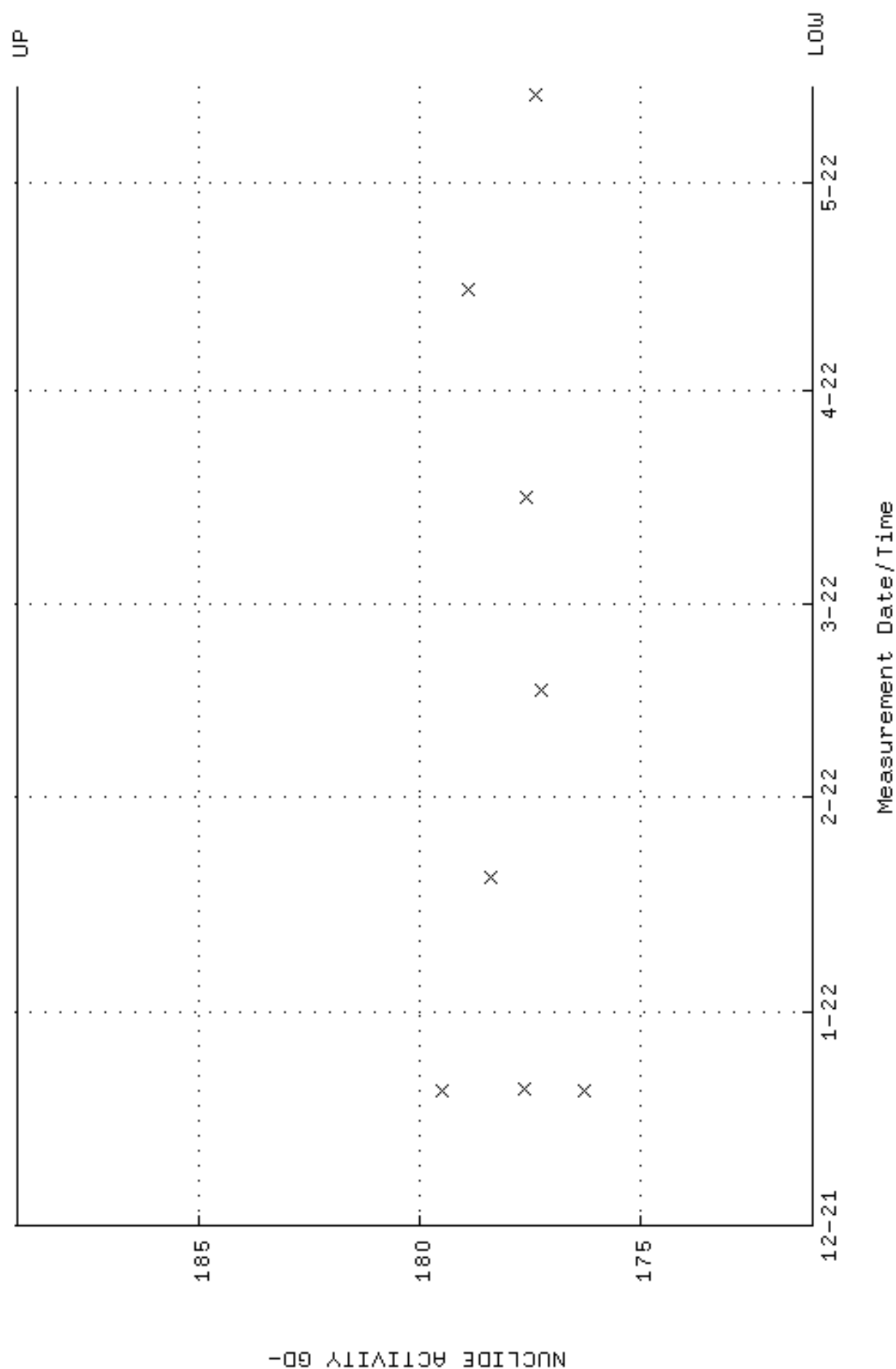
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-DEC-2021 07:42:34 through 12-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



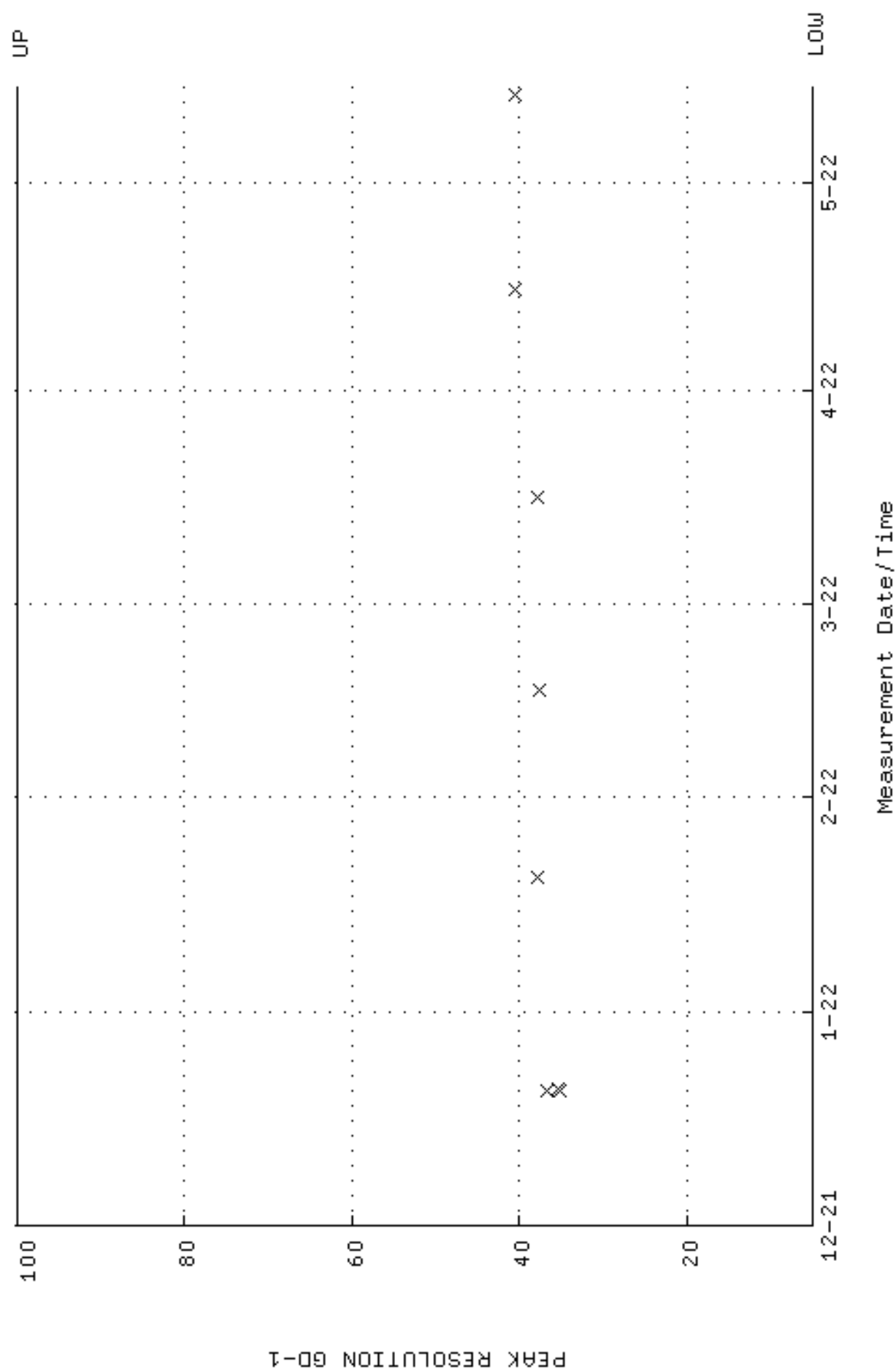
QA filename : DKA100:[ENV_ALPHA.QA.W]W181.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 20-DEC-2021 09:41:03 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.259330 through 0.275370



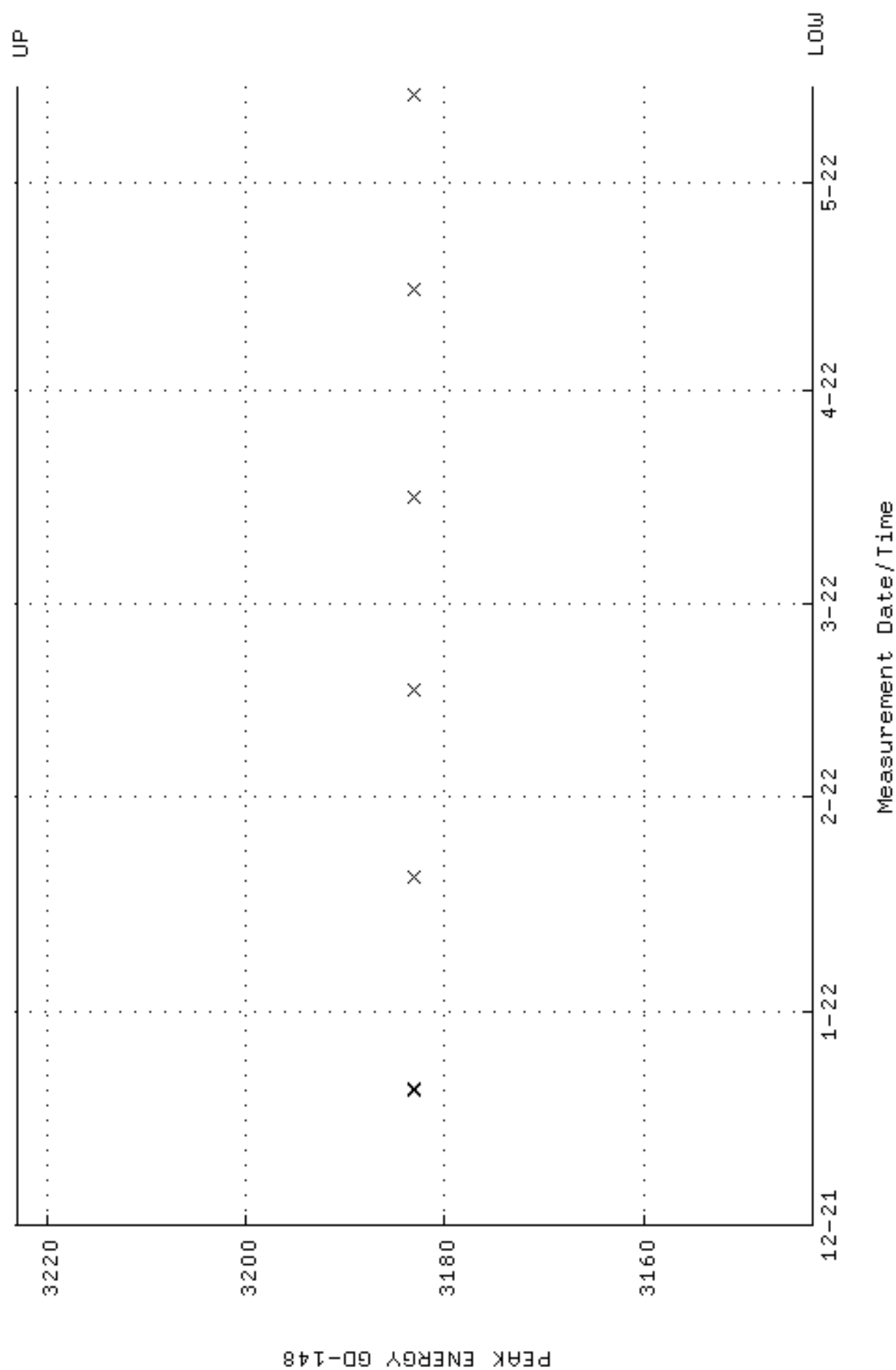
QA filename : DKA100:[ENV_ALPHA.QA.W]W181.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 20-DEC-2021 09:41:03 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



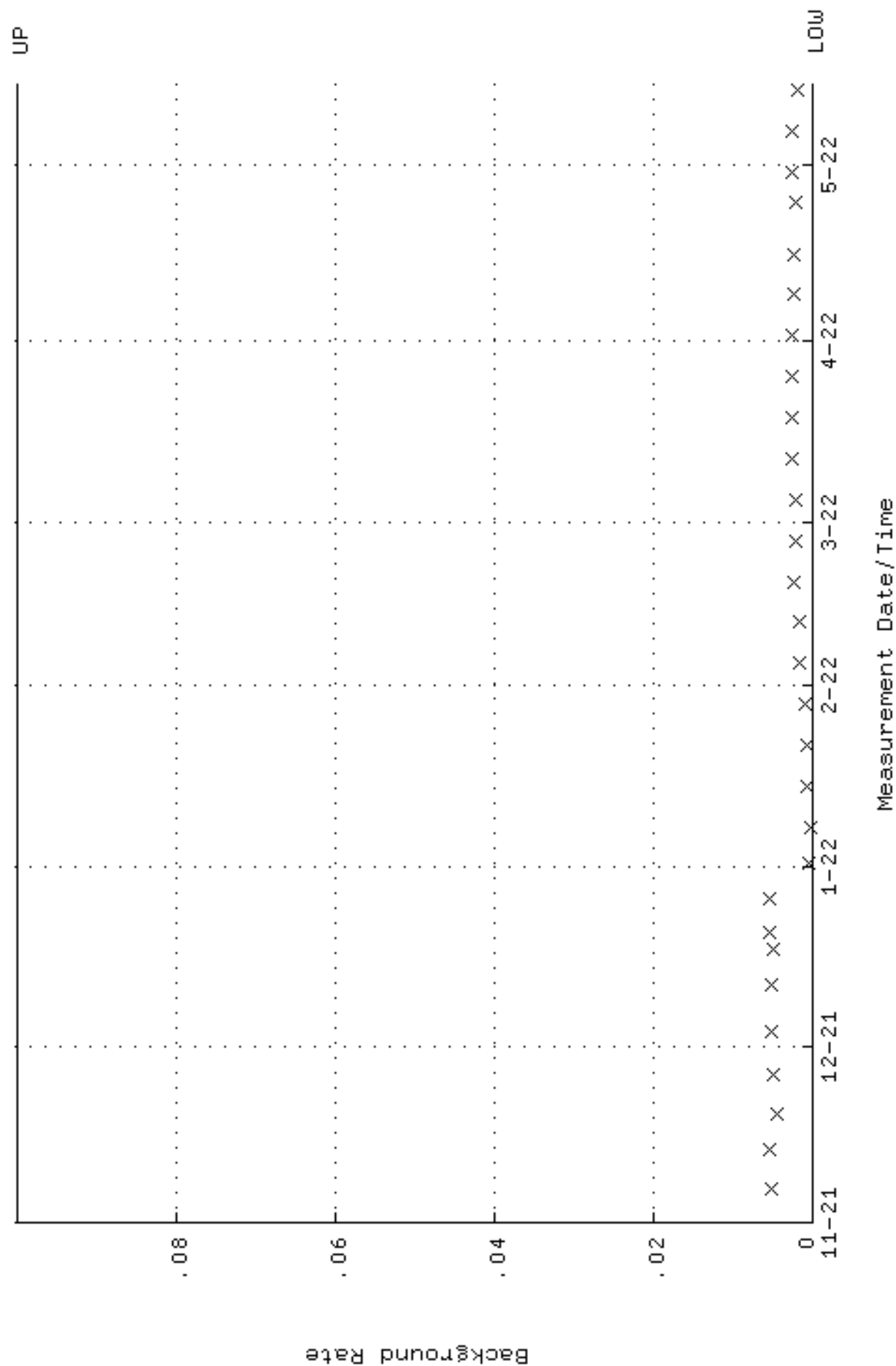
QA filename : DKA100:[ENV_ALPHA.QA.W]W181.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 20-DEC-2021 09:41:03 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



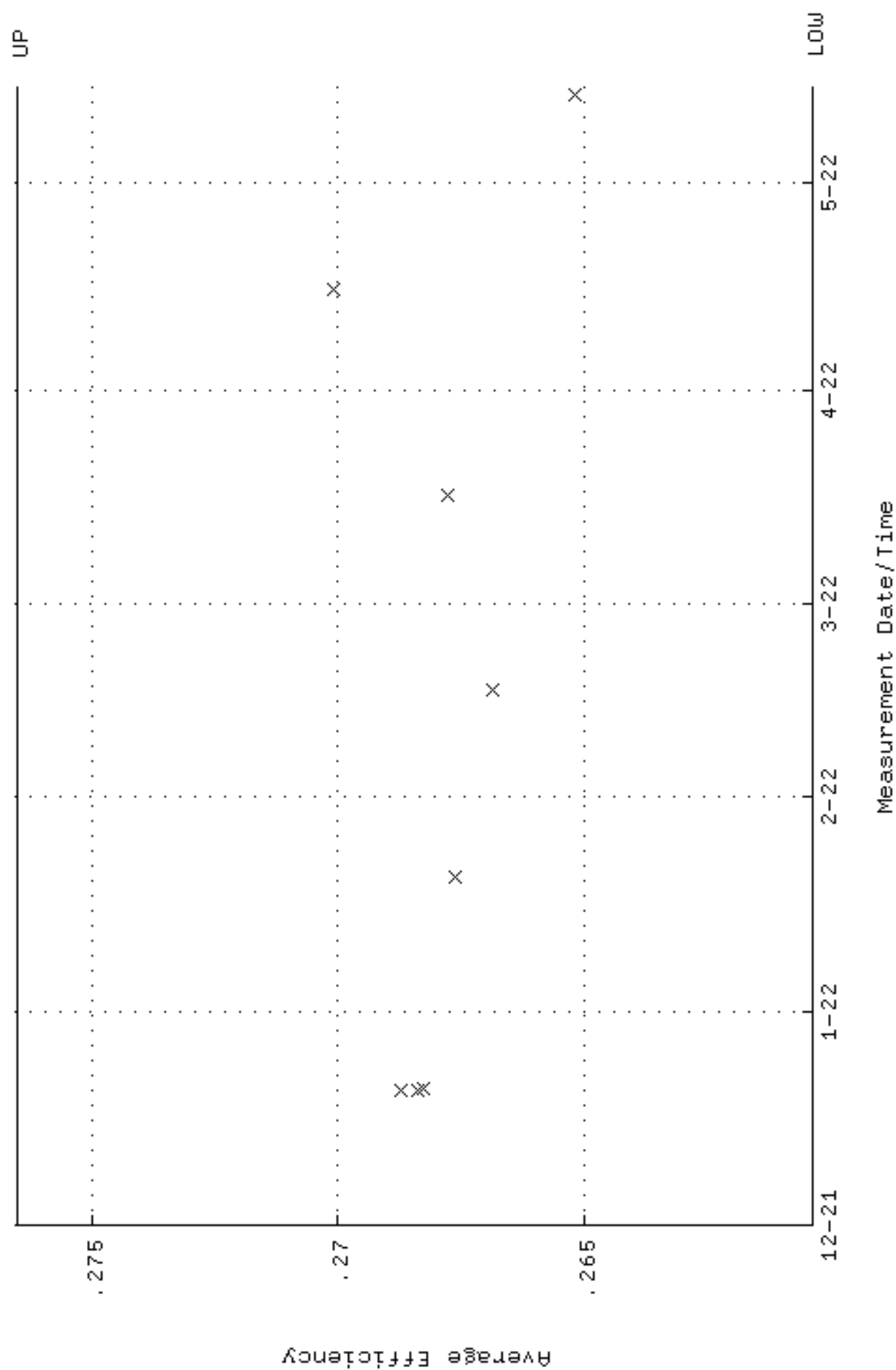
QA filename : DKA100:[ENV_ALPHA.QA.W]W181.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 20-DEC-2021 09:41:03 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



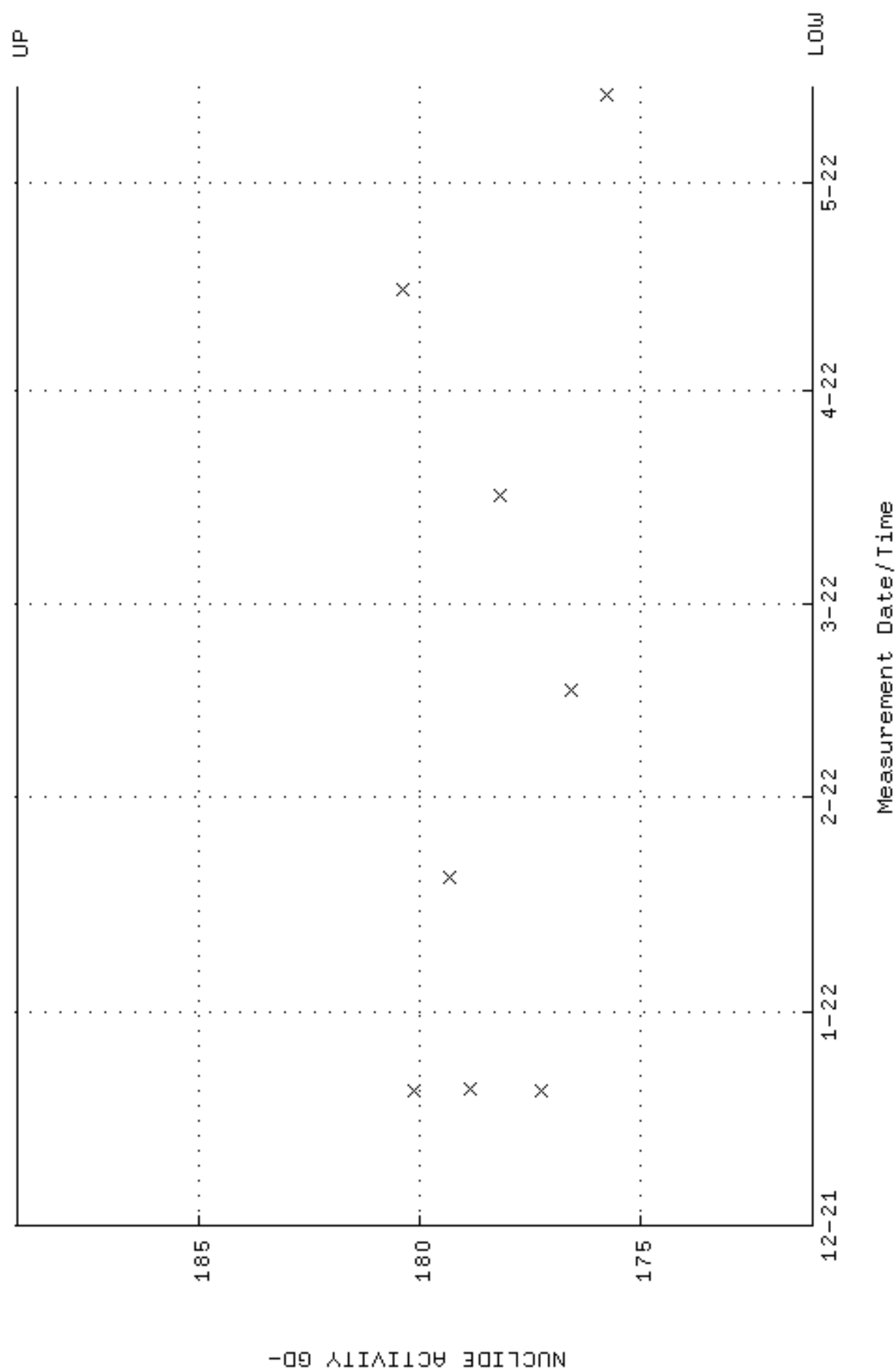
QA filename : DKA100:[ENV_ALPHA.QA.B]B181.QAF;3
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 17:08:41 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



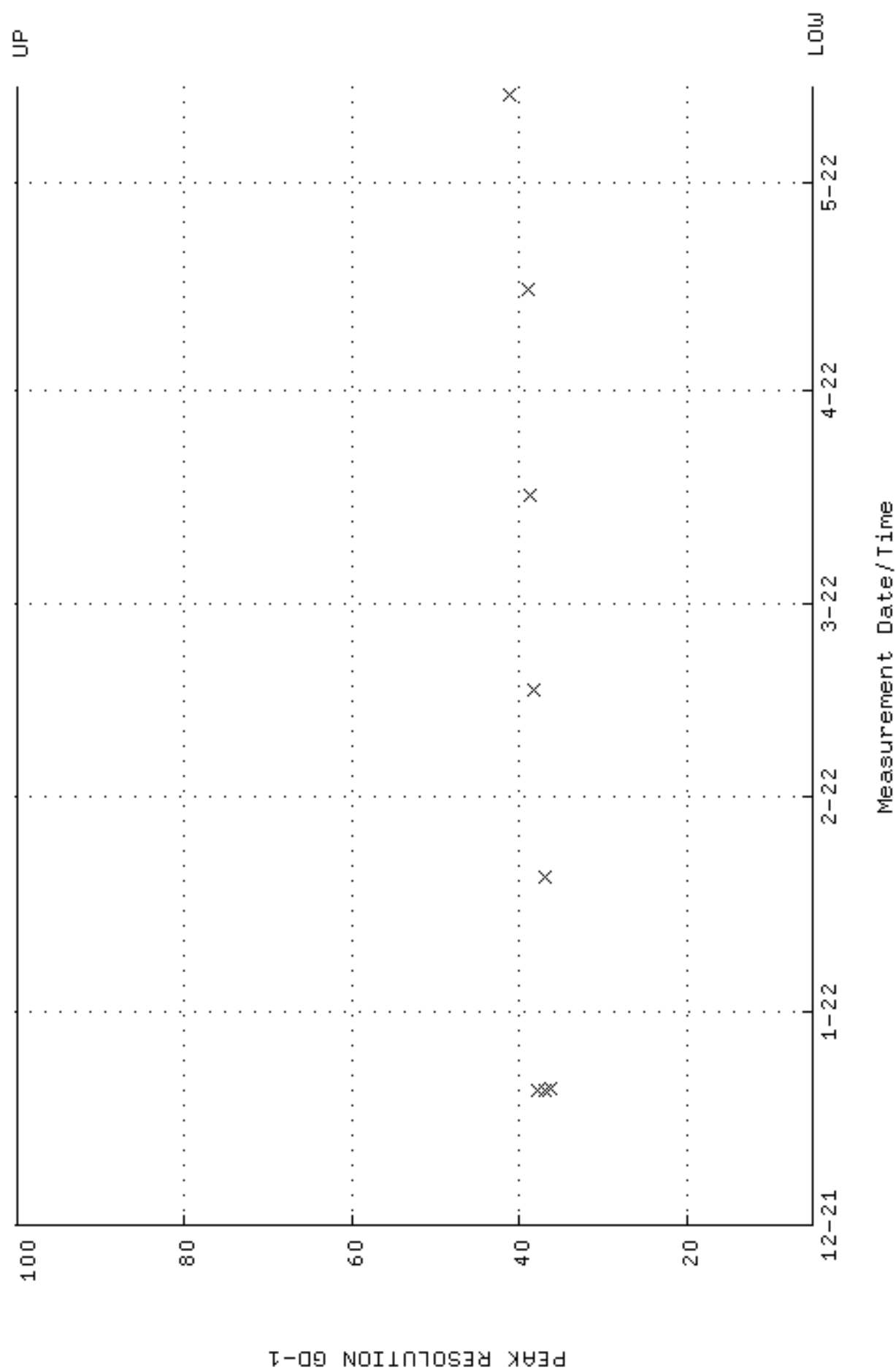
QA filename : DKA100:[ENV_ALPHA.QA.W]W182.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 20-DEC-2021 09:47:49 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.260390 through 0.276500



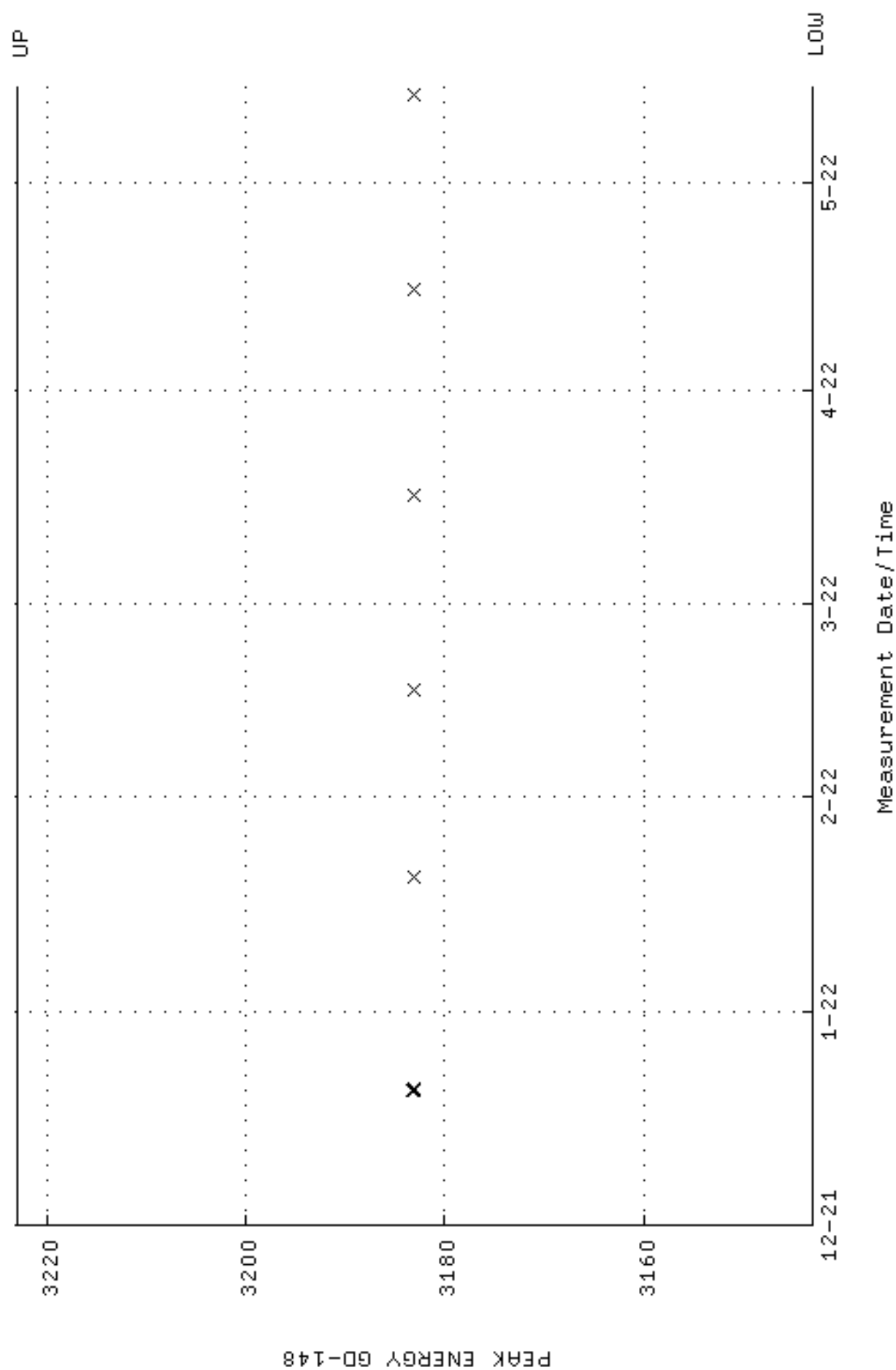
QA filename : DKA100:[ENV_ALPHA.QA.W]W182.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 20-DEC-2021 09:47:49 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



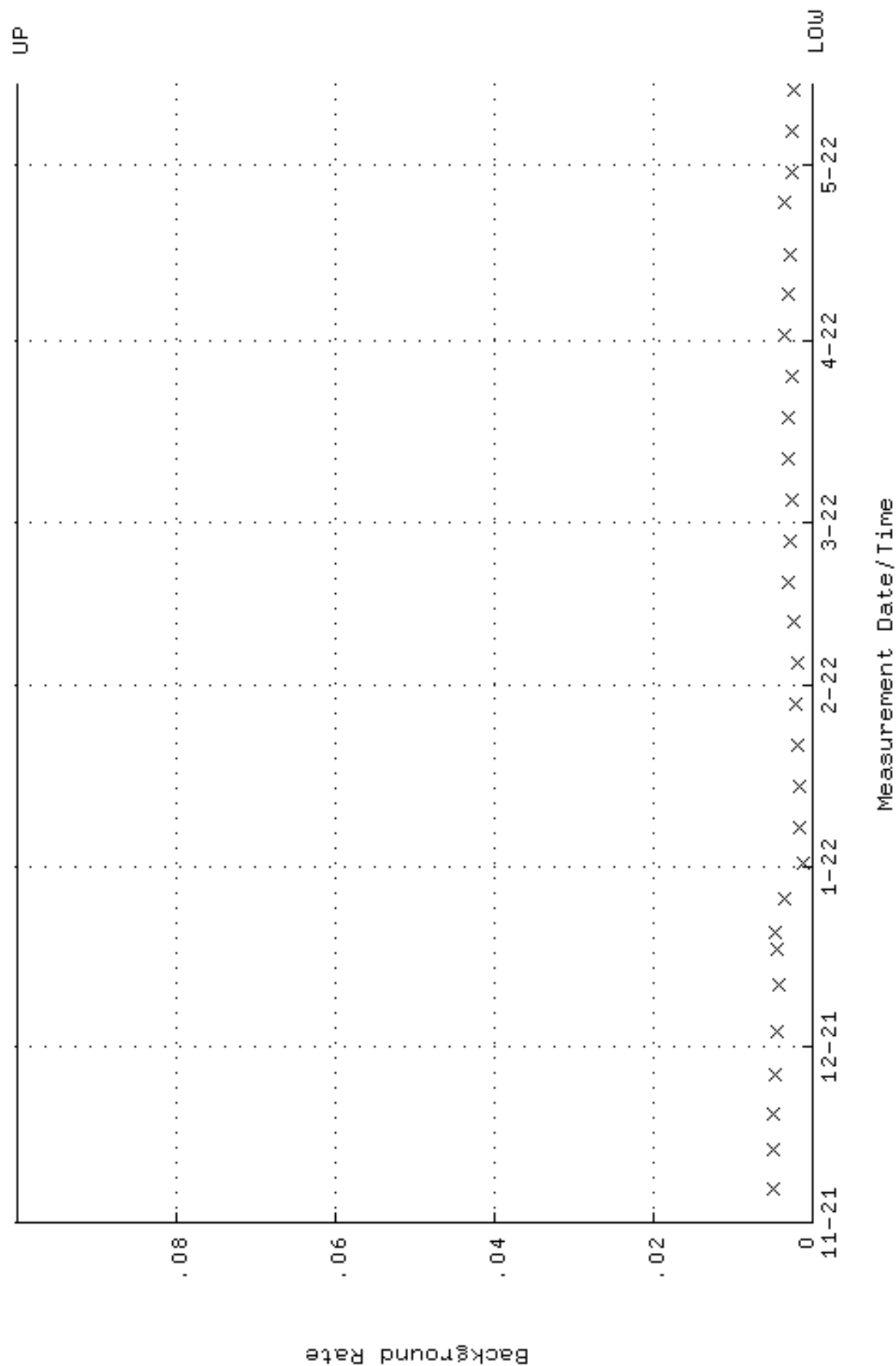
QA filename : DKA100:[ENV_ALPHA.QA.W]W182.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 20-DEC-2021 09:47:49 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



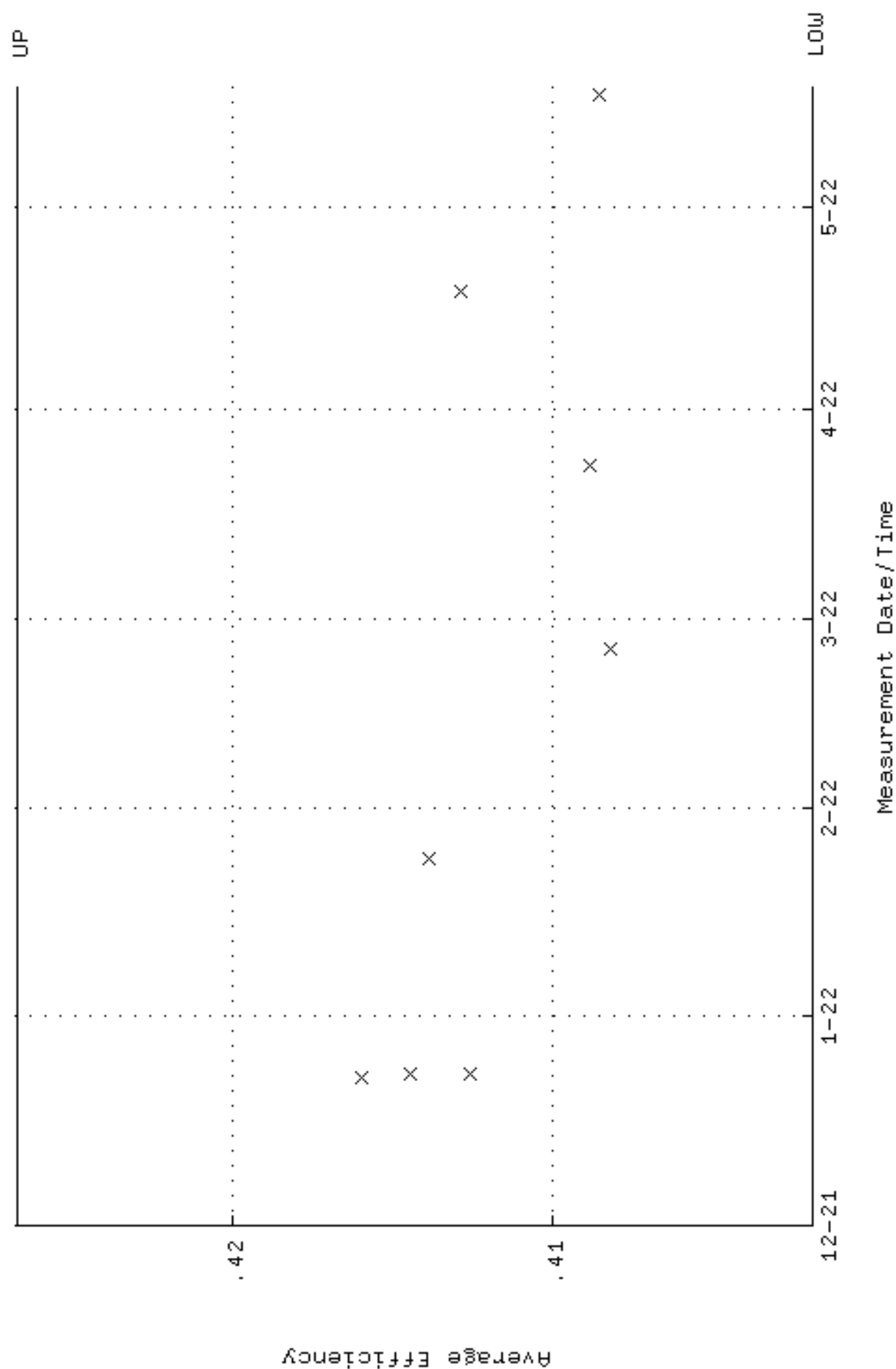
QA filename : DKA100:[ENV_ALPHA.QA.W]W182.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 20-DEC-2021 09:47:49 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



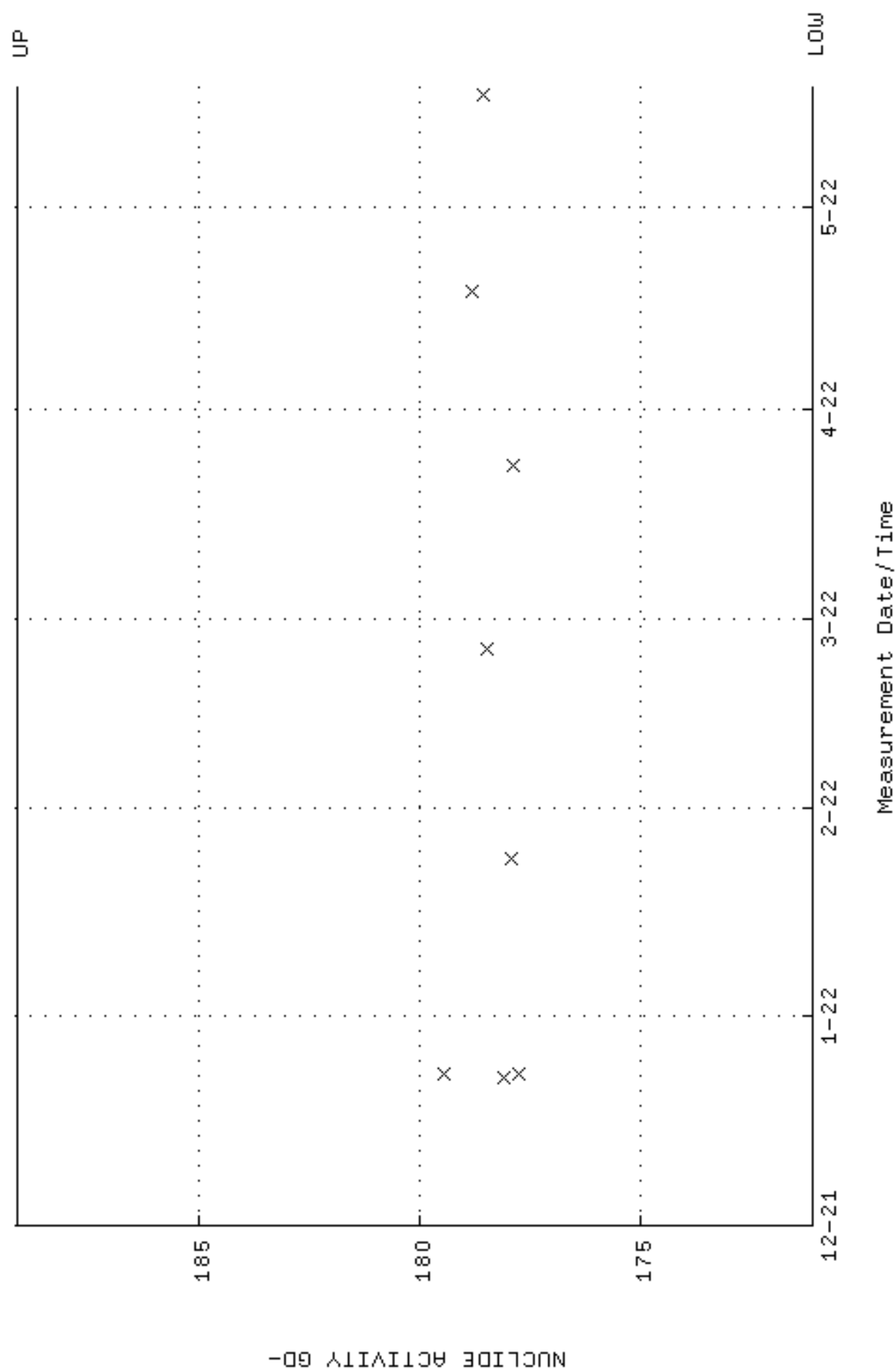
QA filename : DKA100:[ENV_ALPHA.QA.B]B182.QAF;3
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 17:08:45 through 14-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



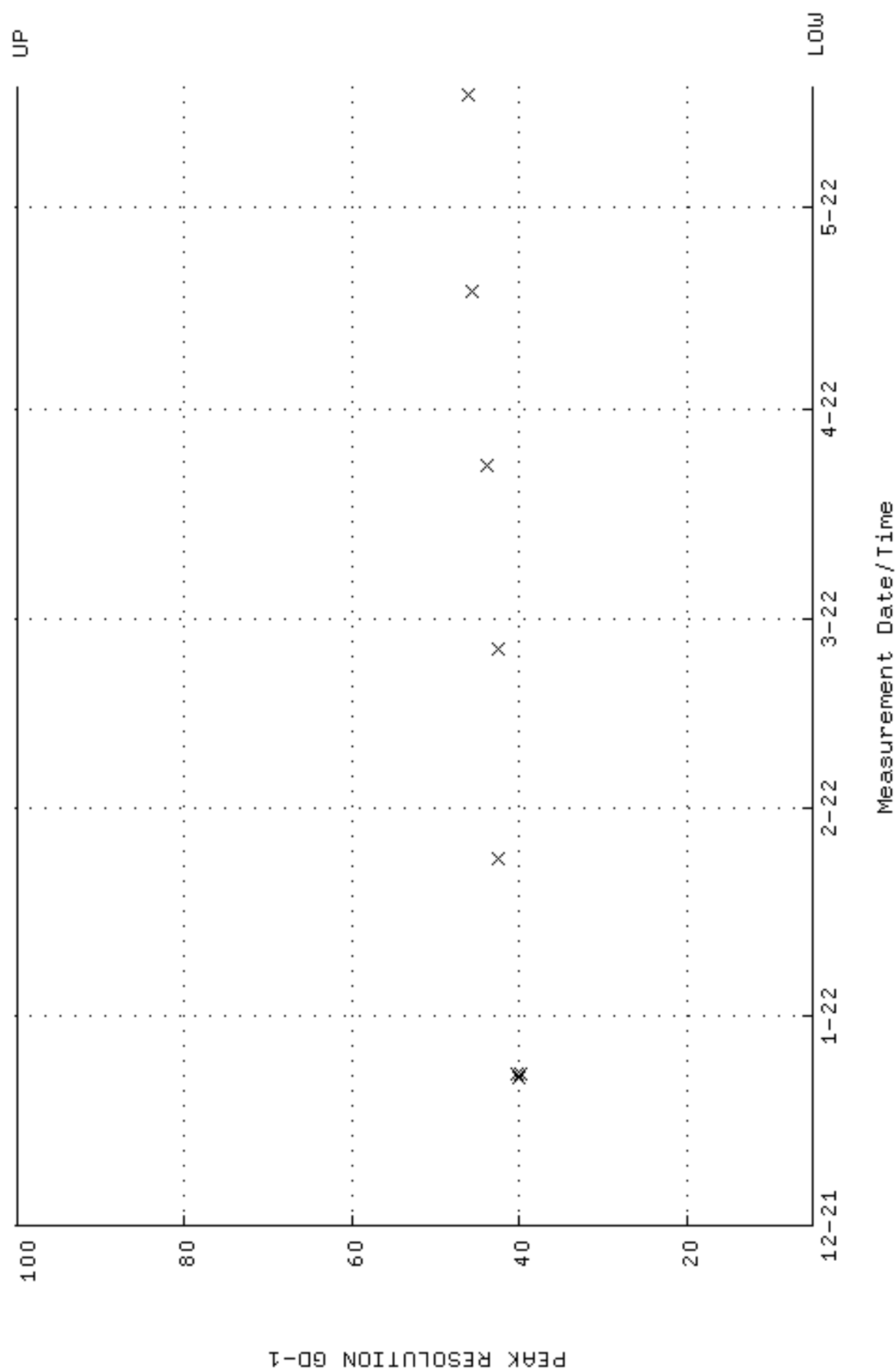
QA filename : DKA100:[ENV_ALPHA.QA.W]W185.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 22-DEC-2021 21:18:48 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.401860 through 0.426710



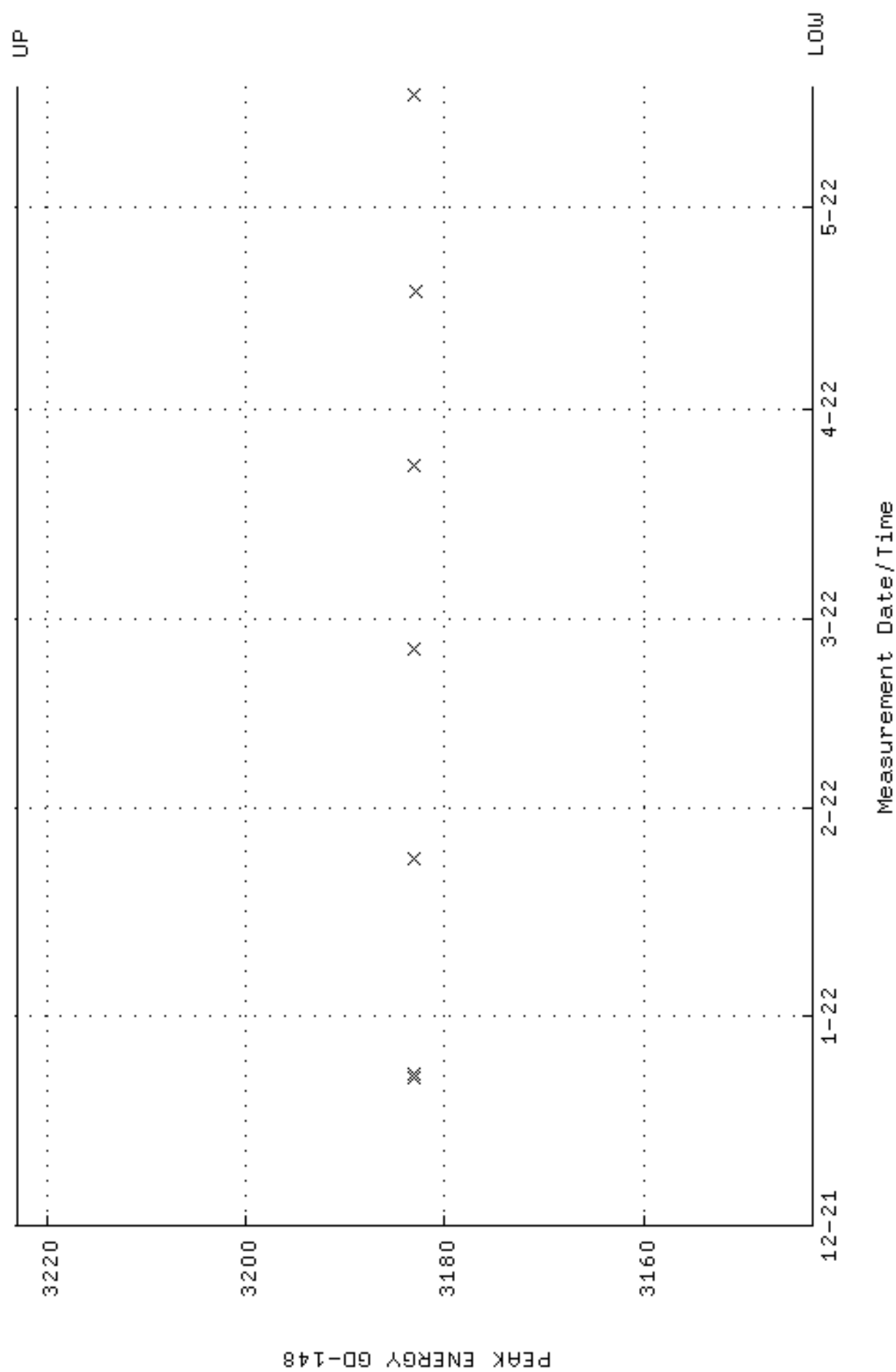
QA filename : DKA100:[ENV_ALPHA.QA.W]W185.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 22-DEC-2021 21:18:48 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



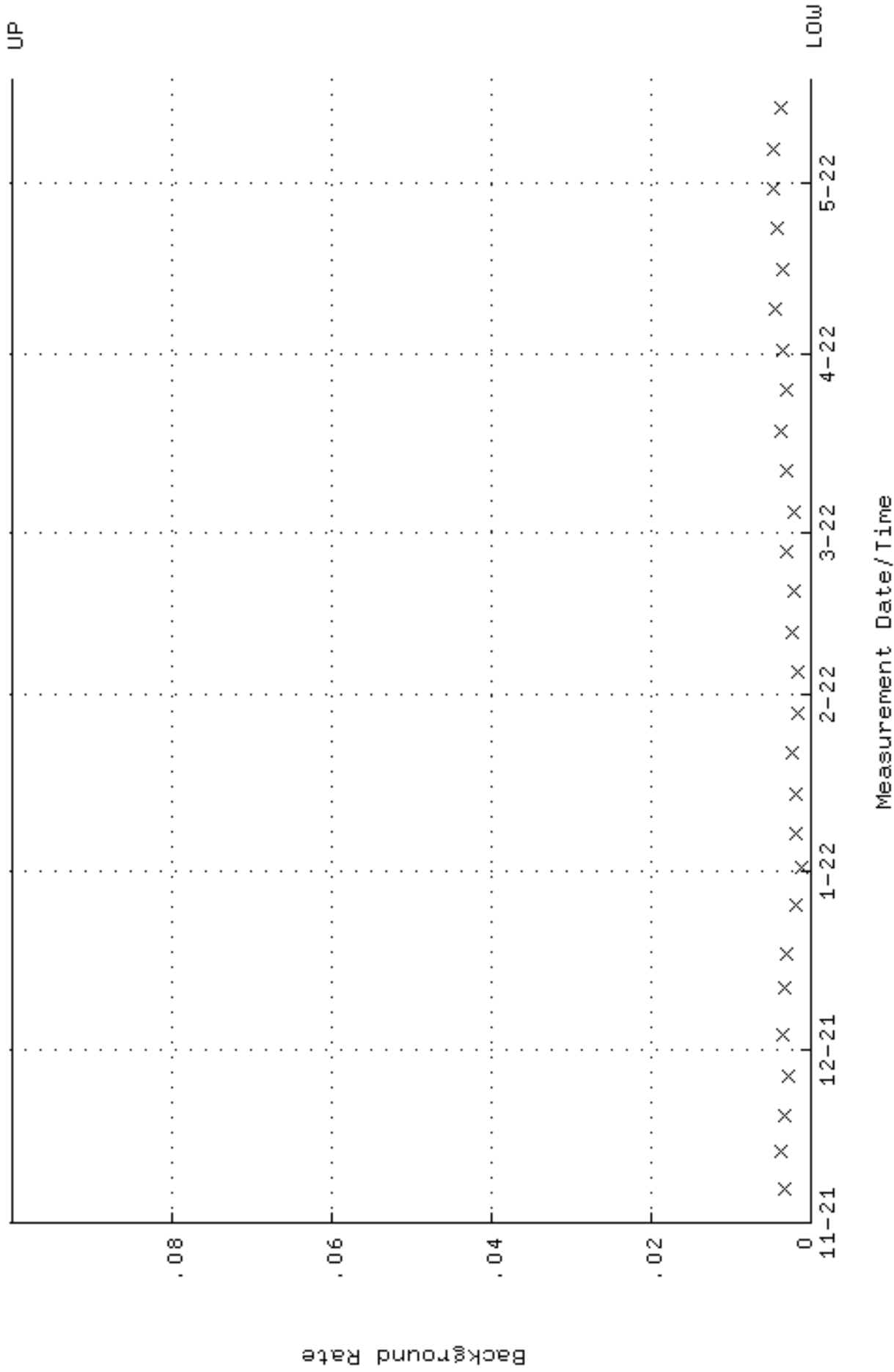
QA filename : DKA100:[ENV_ALPHA.QA.W]W185.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 22-DEC-2021 21:18:48 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



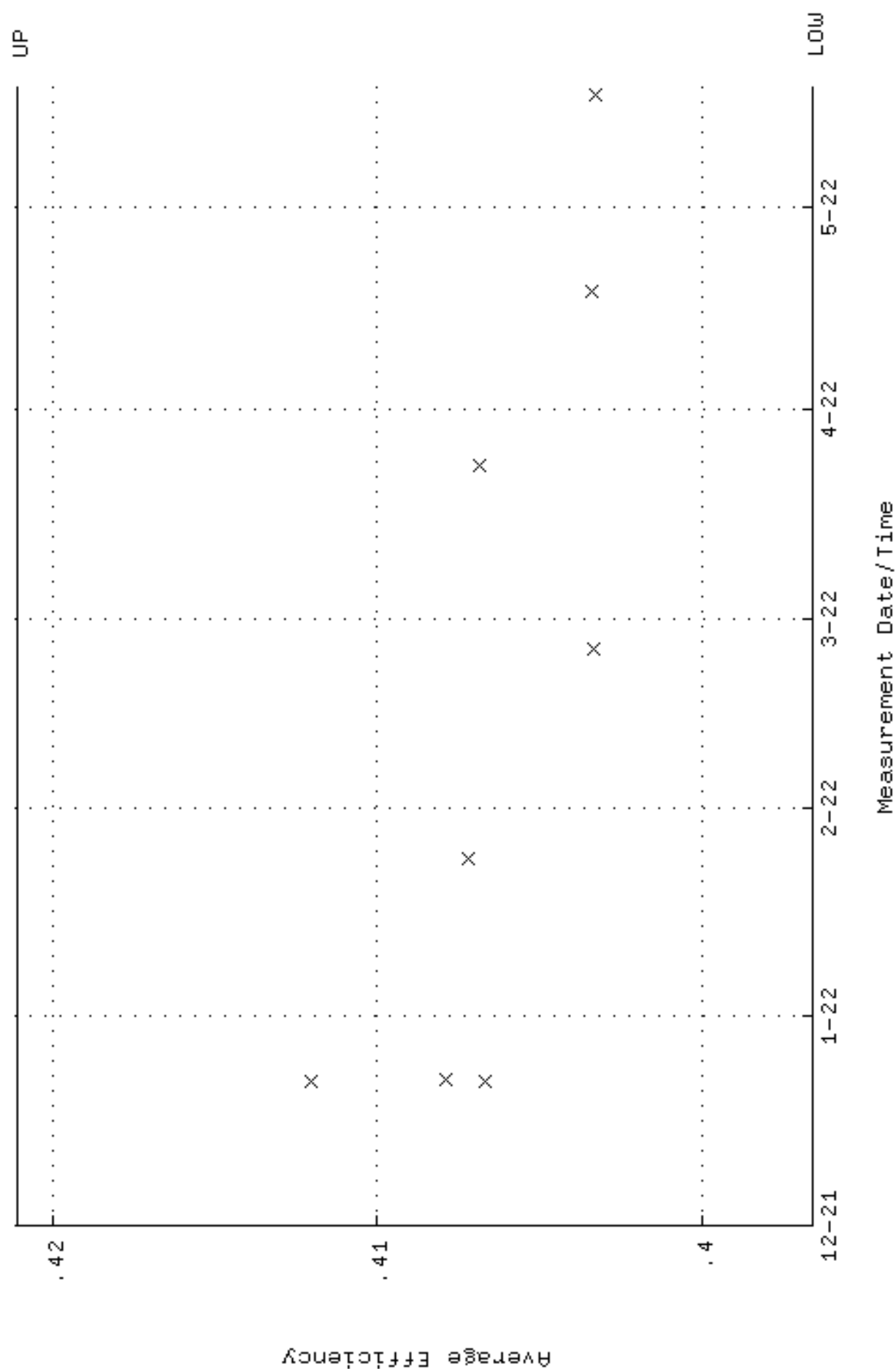
QA filename : DKA100:[ENV_ALPHA.QA.W]W185.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 22-DEC-2021 21:18:48 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



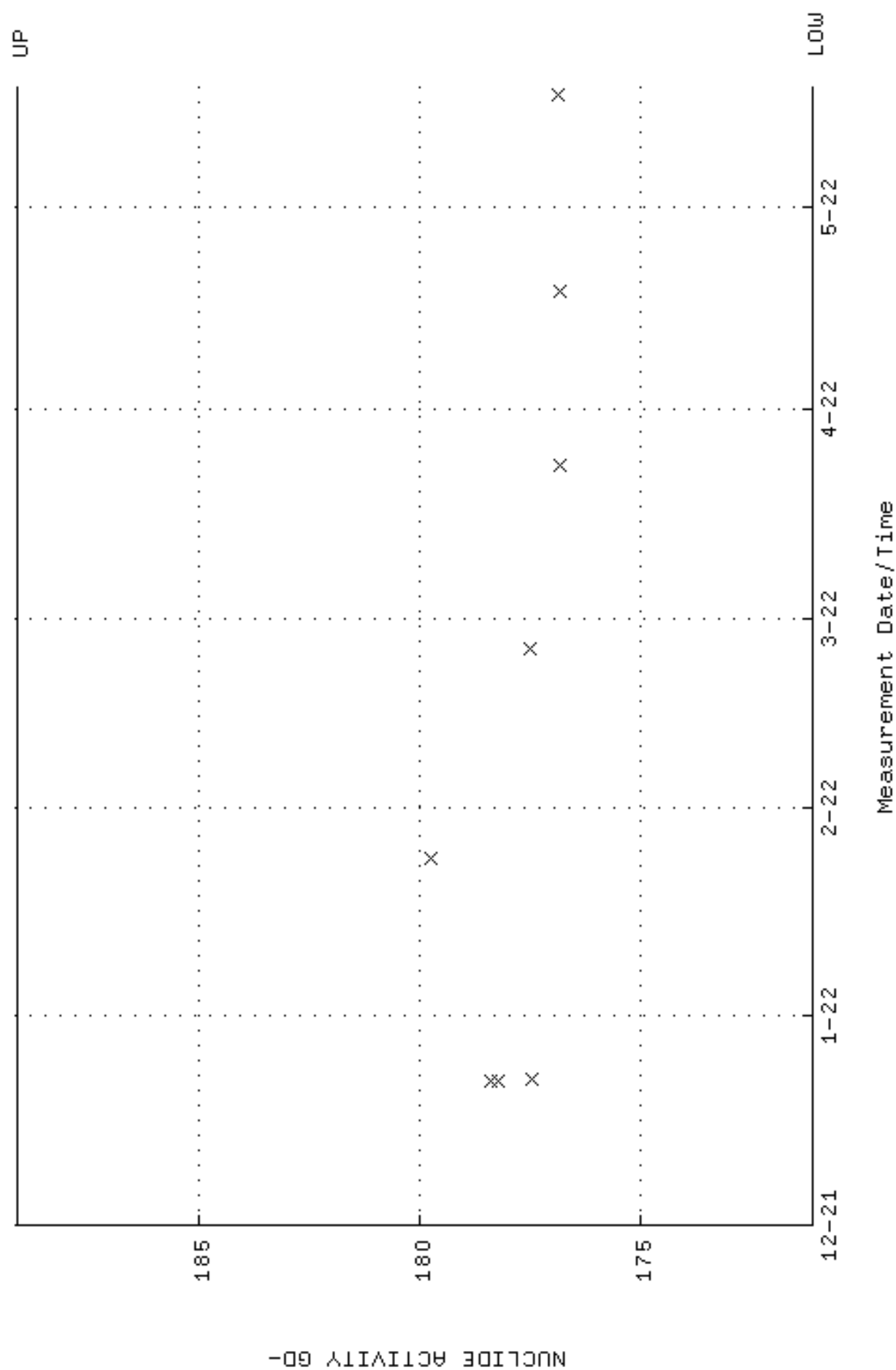
QA filename : DKA100:[ENV_ALPHA.QA.B]B185.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-NOV-2021 17:27:19 through 18-MAY-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 0.100000



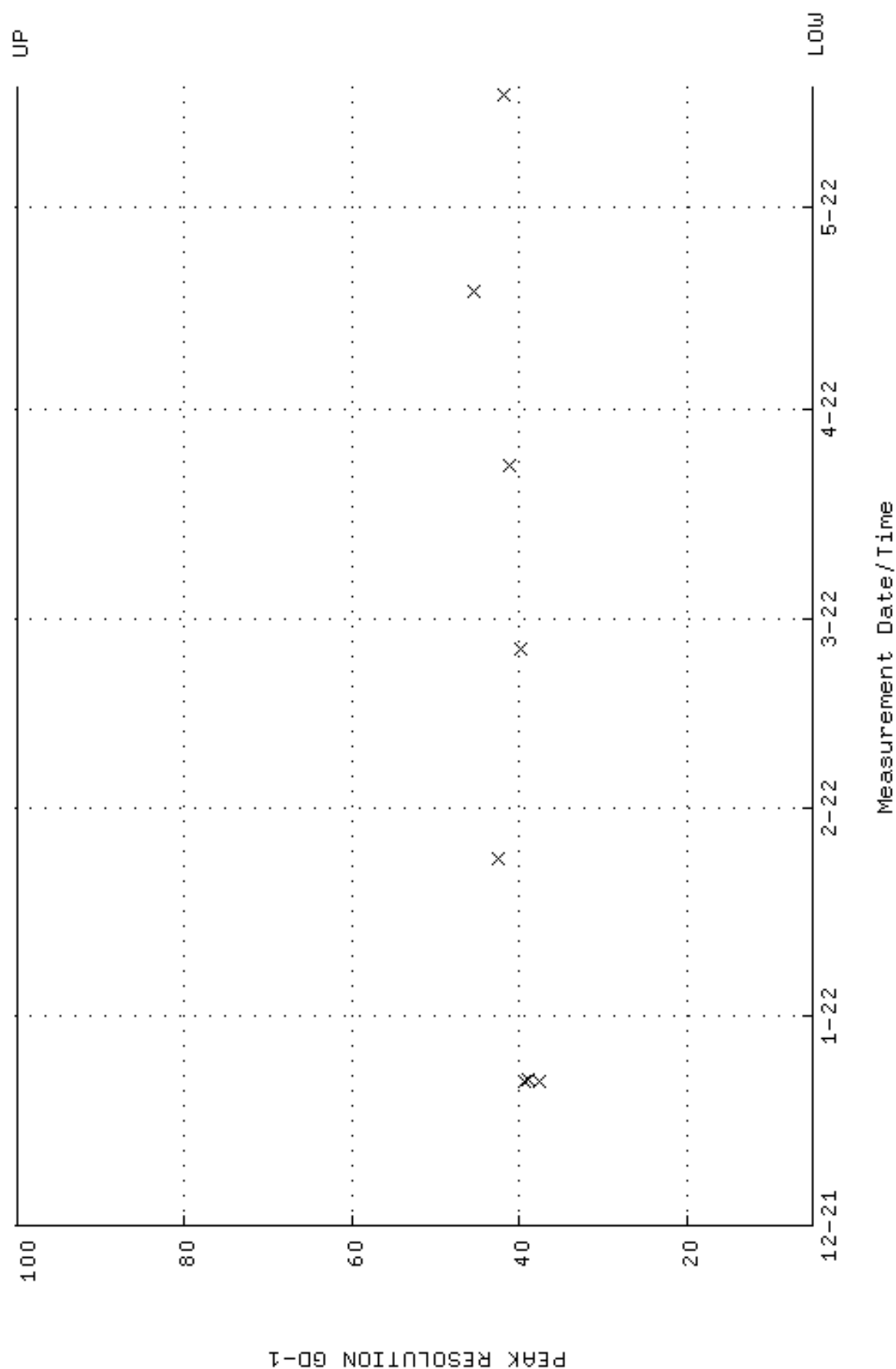
QA filename : DKA100:[ENV_ALPHA.QA.W]W186.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 22-DEC-2021 09:07:47 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.396570 through 0.421090



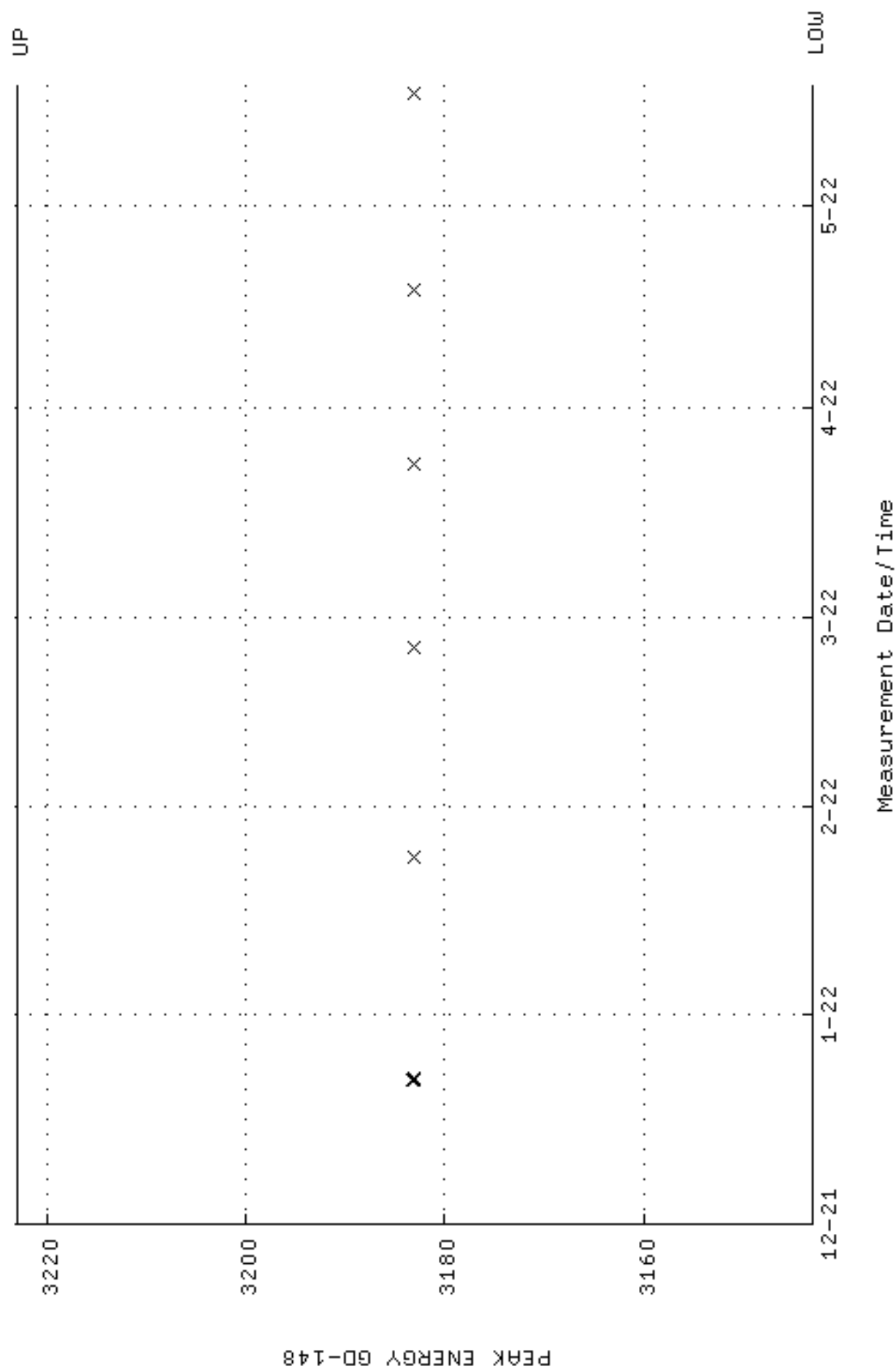
QA filename : DKA100:[ENV_ALPHA.QA.W]W186.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 22-DEC-2021 09:07:47 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



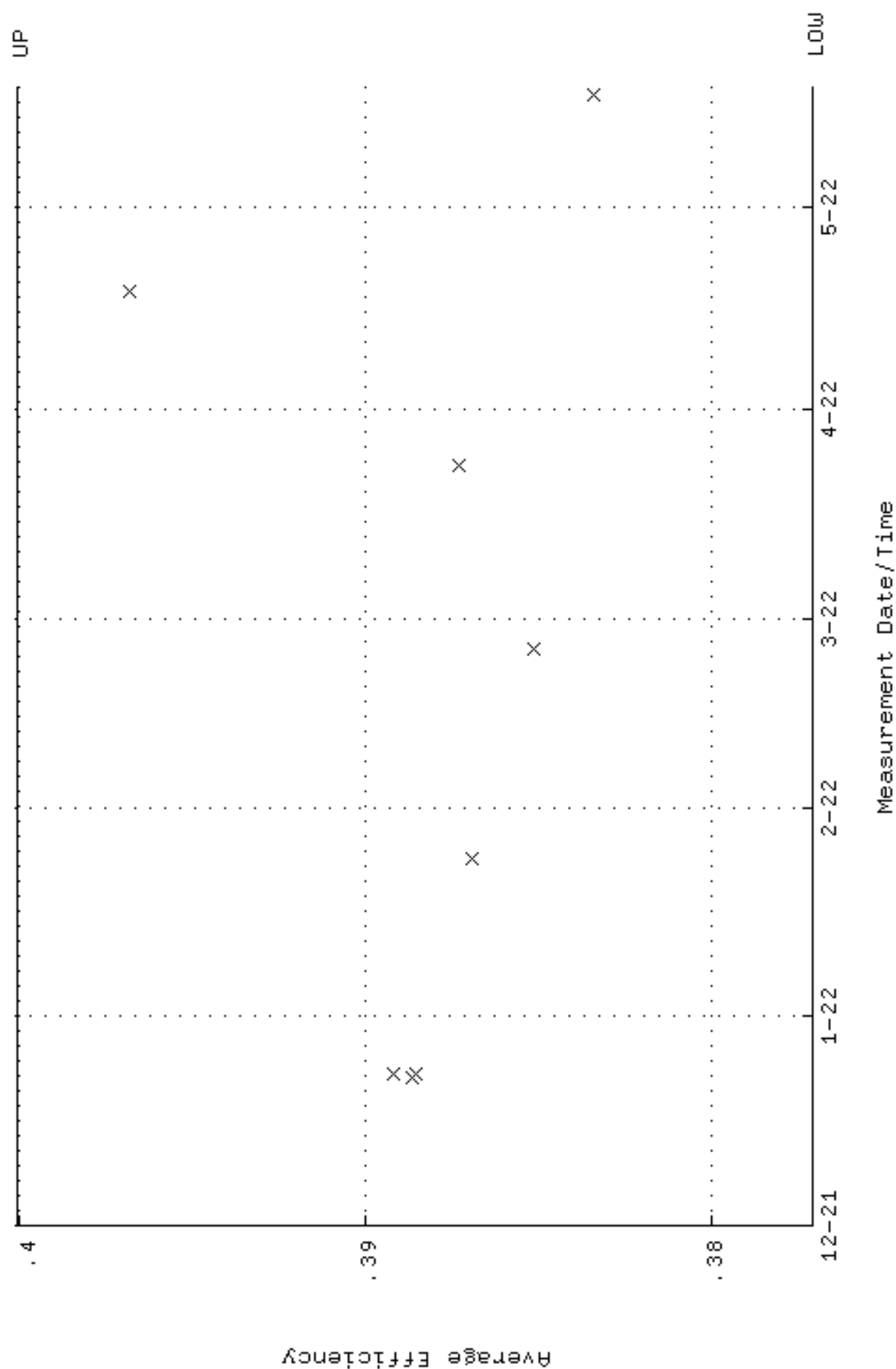
QA filename : DKA100:[ENV_ALPHA.QA.W]W186.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 22-DEC-2021 09:07:47 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



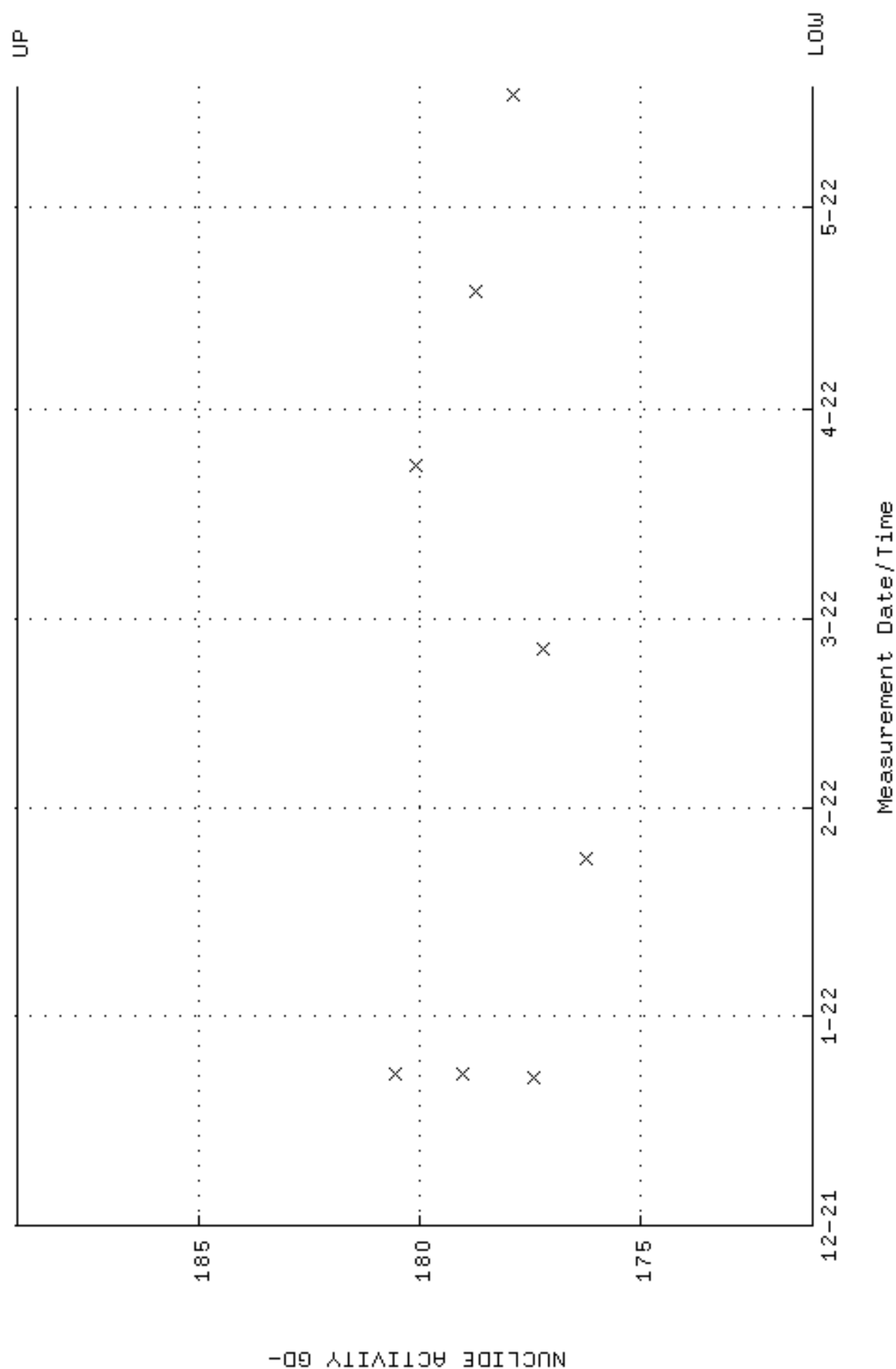
QA filename : DKA100:[ENV_ALPHA.QA.W]W186.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 22-DEC-2021 09:07:47 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



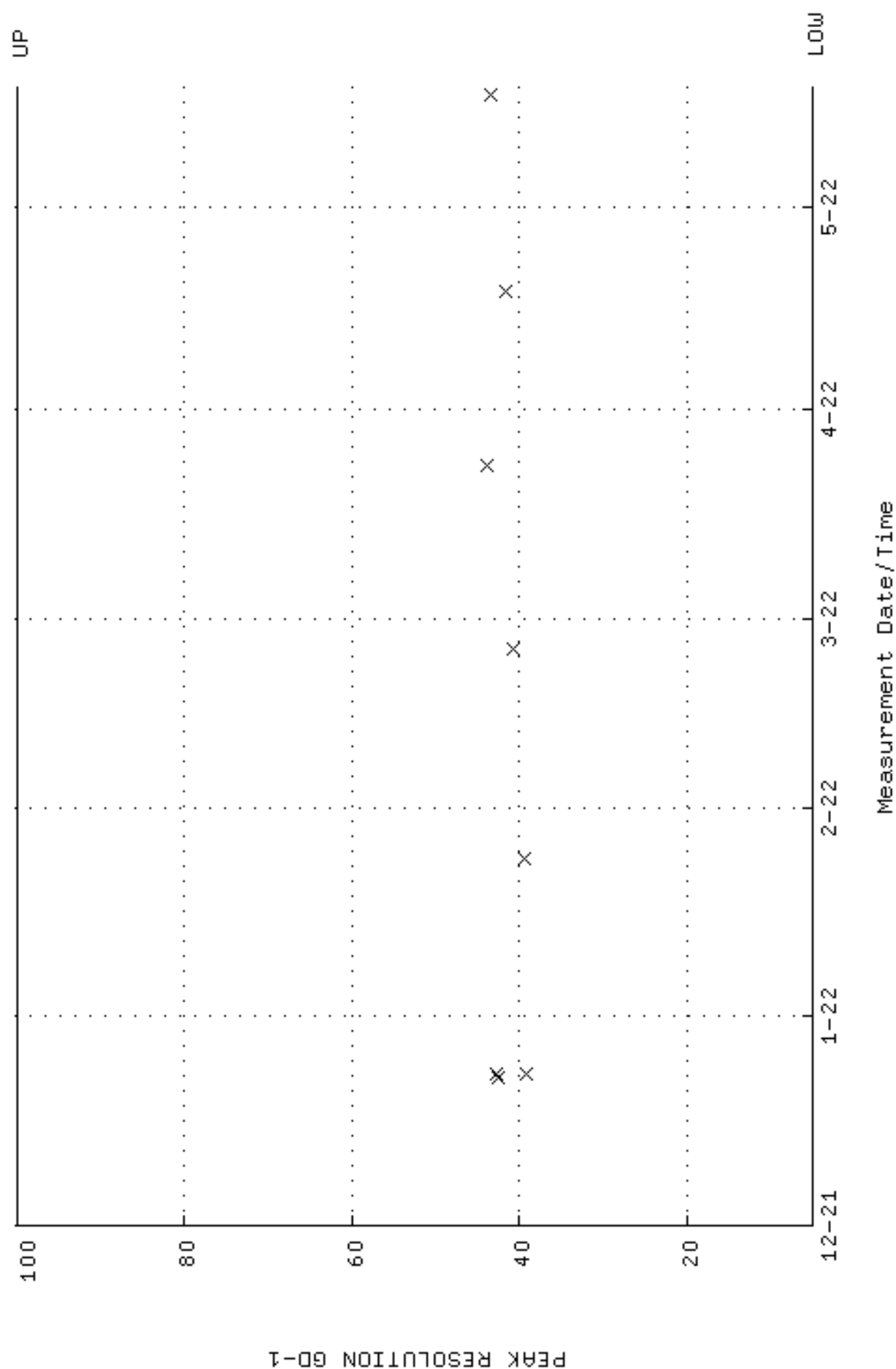
QA filename : DKA100:[ENV_ALPHA.QA.W]W189.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 22-DEC-2021 21:18:56 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.377090 through 0.400040



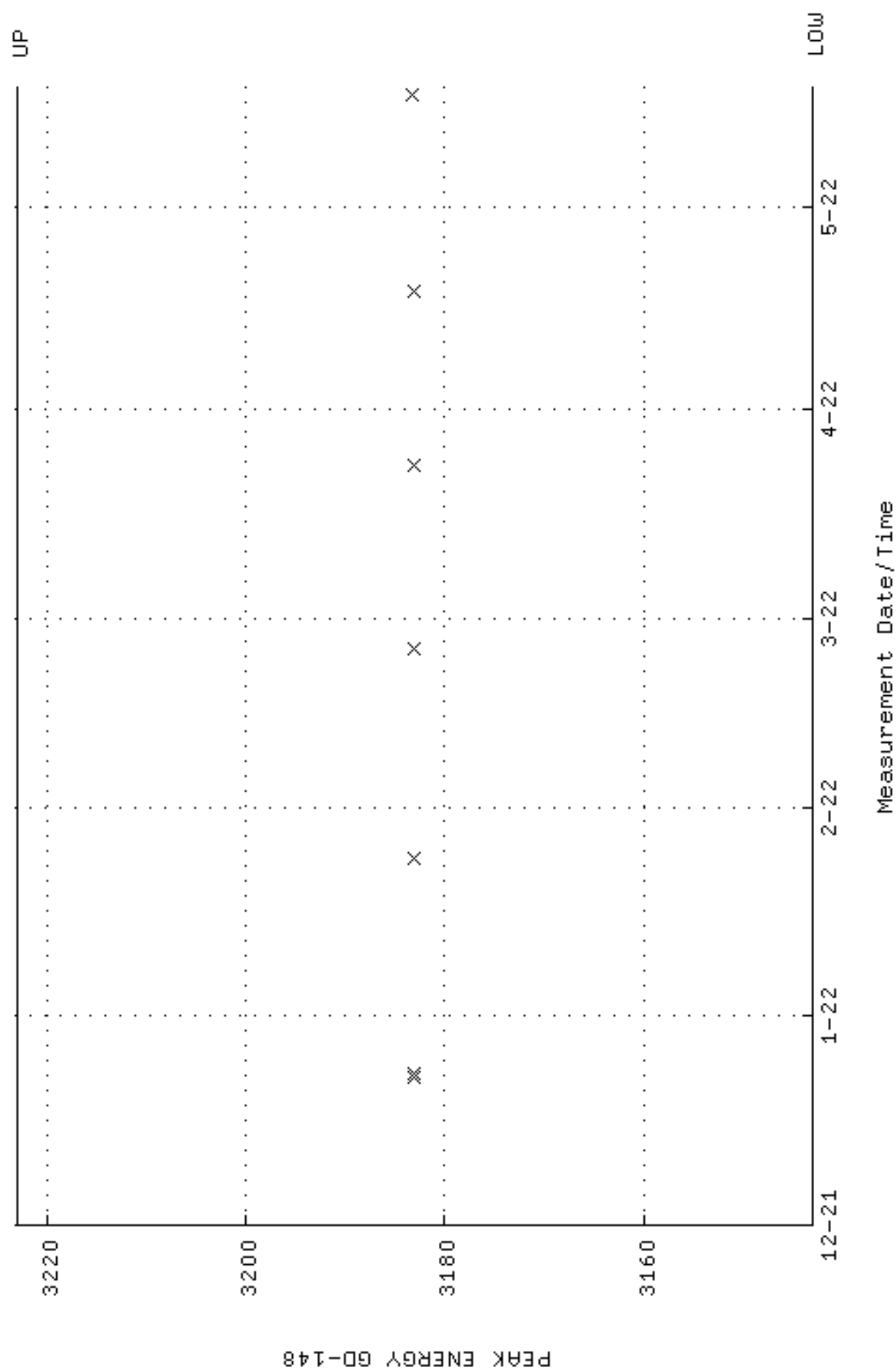
QA filename : DKA100:[ENV_ALPHA.QA.W]W189.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 22-DEC-2021 21:18:56 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



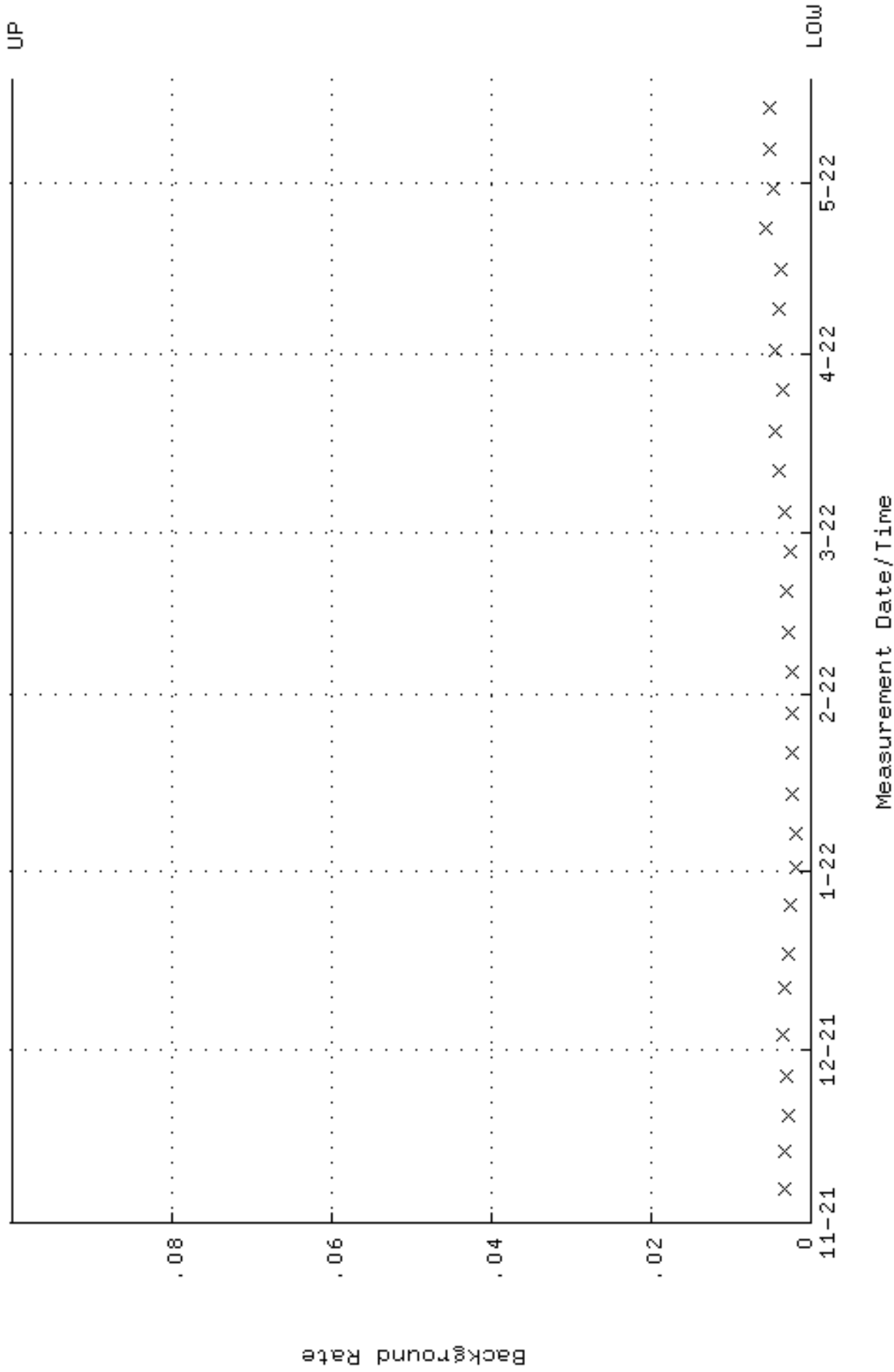
QA filename : DKA100:[ENV_ALPHA.QA.W]W189.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 22-DEC-2021 21:18:56 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



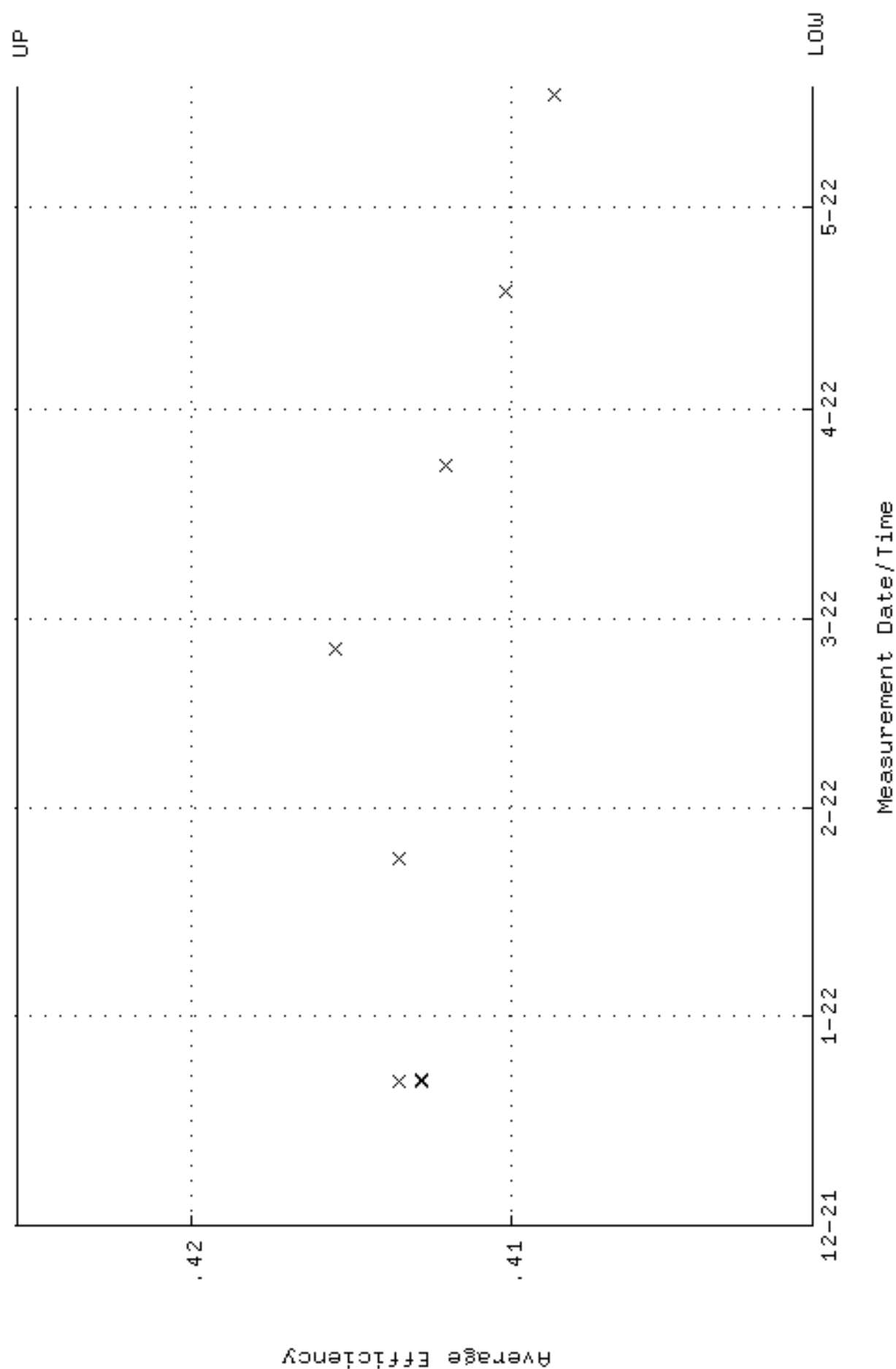
QA filename : DKA100:[ENV_ALPHA.QA.W]W189.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 22-DEC-2021 21:18:56 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



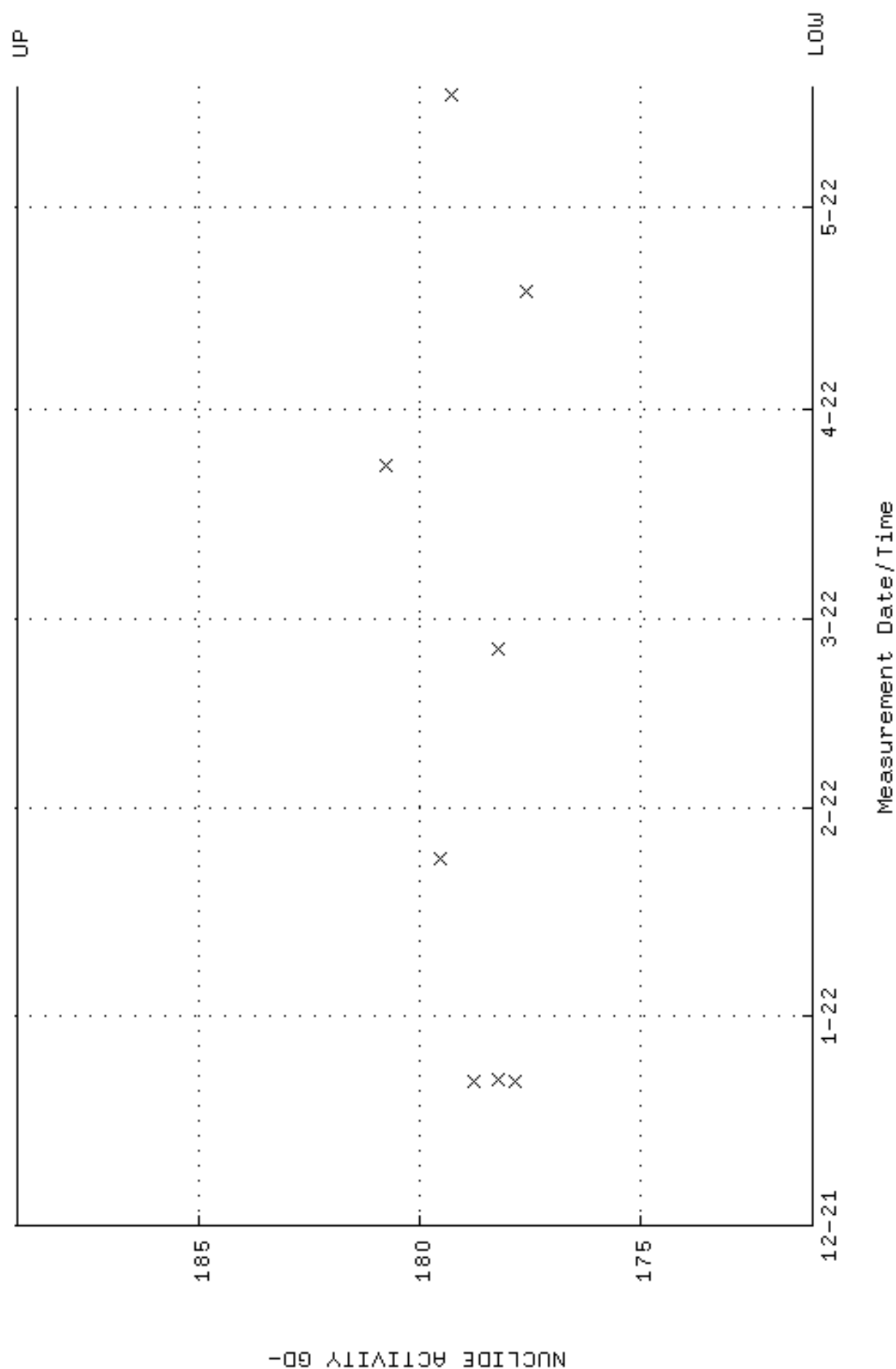
QA filename : DKA100:[ENV_ALPHA.QA.B]B189.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-NOV-2021 17:27:36 through 18-MAY-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 0.100000



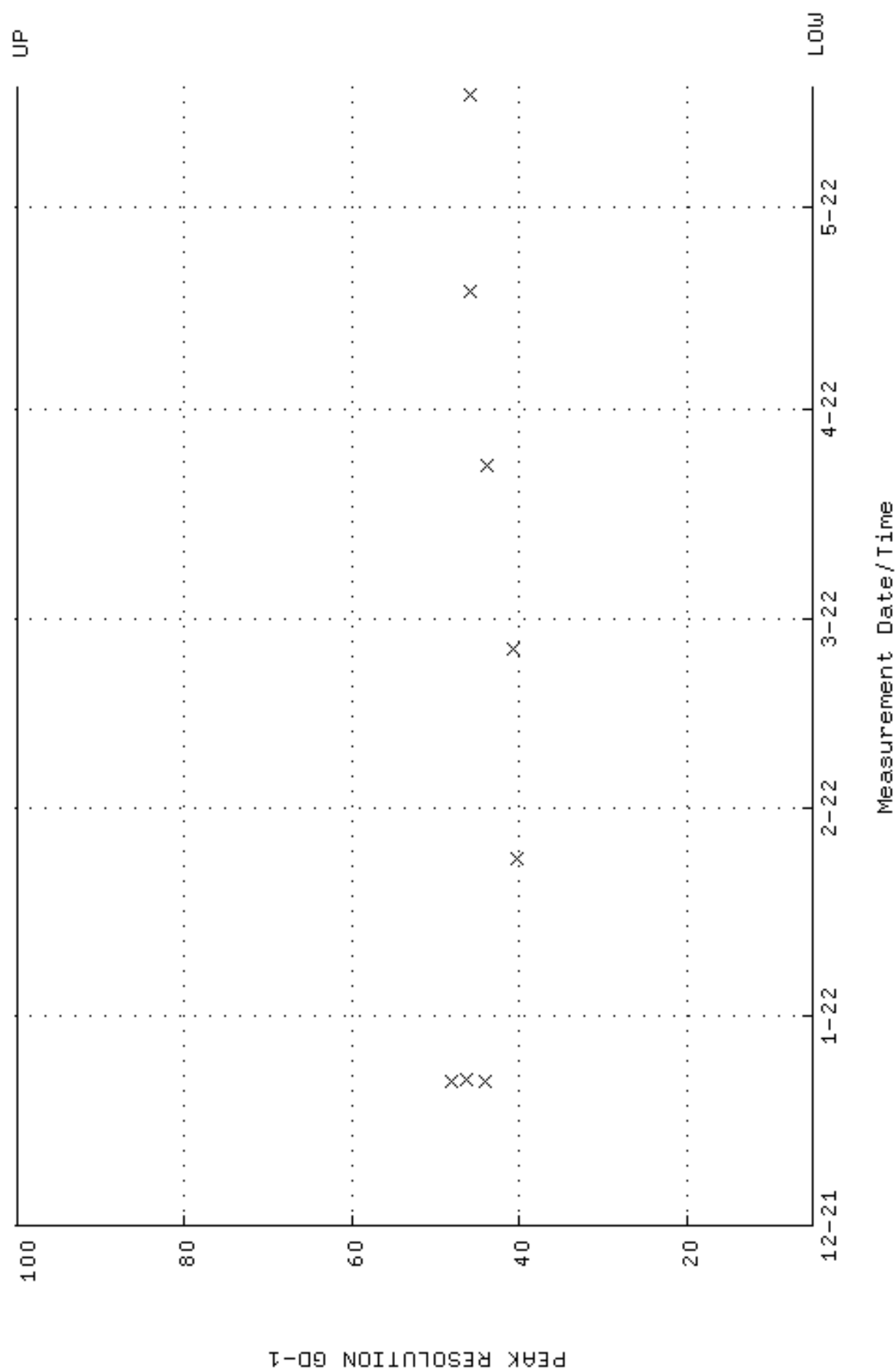
QA filename : DKA100:[ENV_ALPHA.QA.W]W200.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 22-DEC-2021 08:48:10 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.400630 through 0.425410



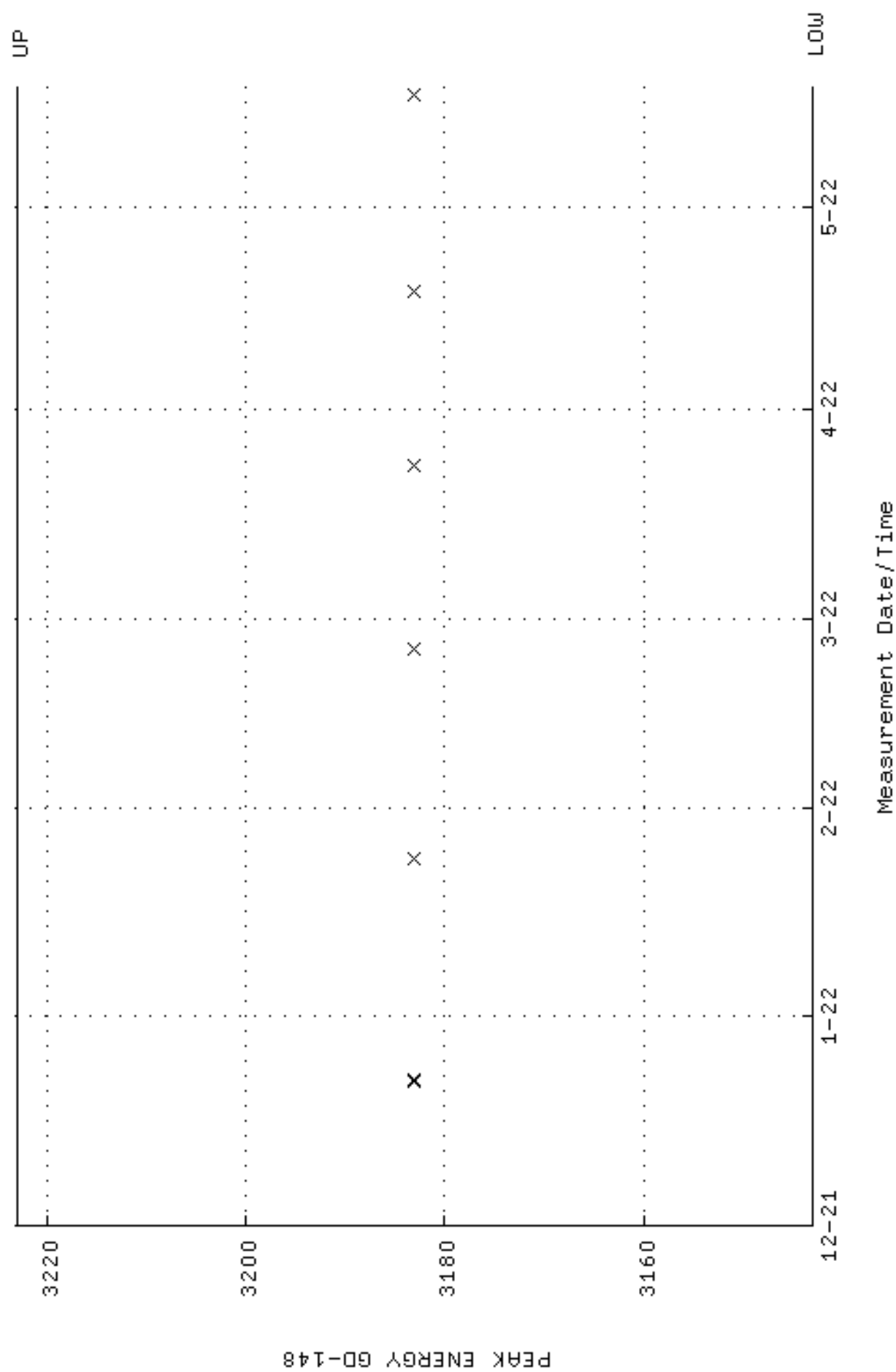
QA filename : DKA100:[ENV_ALPHA.QA.W]W200.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 22-DEC-2021 08:48:10 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



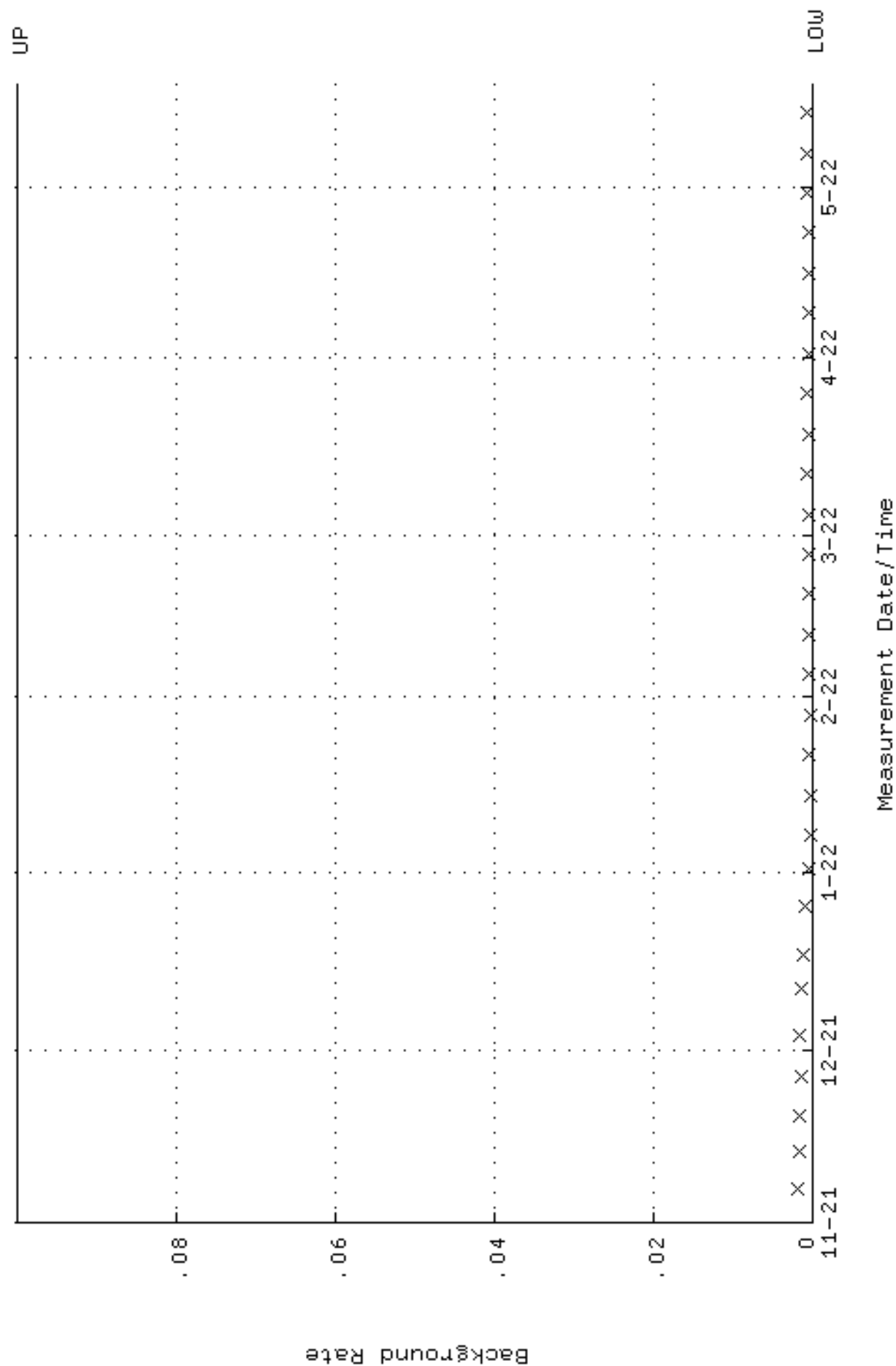
QA filename : DKA100:[ENV_ALPHA.QA.W]W200.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 22-DEC-2021 08:48:10 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



QA filename : DKA100:[ENV_ALPHA.QA.W]W200.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 22-DEC-2021 08:48:10 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



QA filename : DKA100:[ENV_ALPHA.QA.B]B200.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-NOV-2021 17:28:17 through 18-MAY-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



RAD Standards Traceability

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

65338-278

Am-241 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Am-241
ACTIVITY (dps):	3.920 E4
HALF-LIFE:	4.322 E2 years
CALIBRATION DATE:	January 15, 2003 12:00 EST
TOTAL UNCERTAINTY*:	3.2%
SYSTEMATIC:	2.2%
RANDOM:	1.0%

*99% confidence level.

5.10649 grams 1M HCl solution.

Impurities: γ -impurities <0.1%
 α -impurities <0.1%

P O NUMBER 3213 RD, Item 1

SOURCE PREPARED BY: M. Taskaeva
M. Taskaeva, Radiochemist

Q A APPROVED:

UM [Signature] 1-16-03

RC-S-035-046a

Standard Logbook

Serial ID: 0533 **Open/Reference Date:** 15 JAN 2003 **Aliquot :** 5.10649 g
Name: Americium-241 **Received:** 27 JAN 2003 **Density :** Hand Calculated
Type: Source Material **Expires:** 05 FEB 2020 **Logbook Num :** RC S 035 048
Employee: Angela Johnson **Lot Number :** 65338-278
Supplier: Analytics **Solvent :** 1 M HCL
Uncertainty : 1.25 percent
Description: 65338-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	39200 dps		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	0533
Prepared By:	Angela Johnson
Carrier Conc:	1 M HCL
Reference Date:	01/15/2003
Ampoule Mass (g):	5.10649 g
Uncertainty:	+/- 1.25 %
LogBook No:	RC S 035 048
Supplier:	Analytics

A Solution Material Info		
Isotope:	Americium-241	
Prepared By:	Angela Johnson	
Prep Date:	02/05/2003	
Verification Date:	06/03/2021	
Expiration Date:	06/03/2022	
Primary Code:	0533-A	
Dilution(mL):	100 mL	
Mass of Parent(g):	4.8225 g	
Density(g/mL):	1.0139	Balance ID:

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (5.10649 \text{ g} * 100 \text{ mL}) = 22211.9695 \text{ dpm/mL}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (1.0139 \text{ g/mL}) / (5.10649 \text{ g} * 100 \text{ mL}) = 21907.2185 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/20/2003	Angela Johnson	1.0151	100	0533-B	222.38 dpm/mL	03/01/2006	03/01/2007
01/16/2015	Christina Kimball	.005081	500	0533-BB	.22263 dpm/mL	01/14/2016	01/14/2017
02/20/2003	Angela Johnson	.6819	250	0533-C	59.754 dpm/mL	02/20/2004	02/20/2005
05/04/2015	Tim Chandler	1.02	500	0533-CC	44.6907 dpm/mL	04/17/2017	04/17/2018
05/07/2003	Tim Chandler	.1245	100	0533-D	27.2745 dpm/mL	05/03/2004	05/03/2005
01/22/2016	Christina Kimball	.103	500	0533-DD	4.51289 dpm/mL	01/05/2022	01/05/2023
09/10/2004	Amanda Fehr	.6933	250	0533-E	60.753 dpm/mL	09/10/2005	09/10/2006
10/31/2016	Christina Kimball	.00508	500	0533-EE	.22259 dpm/mL	10/30/2017	10/30/2018

12/17/2004	Brenda Burke	.0093	100	0533-F	2.0374 dpm/mL	12/20/2004	12/20/2005
10/13/2017	Tim Chandler	1.0219	500	0533-FF	44.774 dpm/mL	10/01/2019	10/01/2020
12/21/2004	Brenda Burke	.009273	100	0533-G	2.0315 dpm/mL	12/07/2005	12/07/2006
11/13/2017	Christina Kimball	.00507	500	0533-GG	.2222 dpm/mL	11/09/2018	11/09/2019
04/28/2005	Brenda Burke	.1347	100	0533-H	29.4598 dpm/mL	04/27/2006	04/27/2007
01/23/2018	Tim Chandler	1.2536	100	0533-HH	274.6289 dpm/mL	01/23/2018	01/23/2019
10/19/2005	Mary Aders	.6948	250	0533-I	60.7831 dpm/mL	10/18/2006	10/18/2007
01/30/2020	Tim Chandler	1.0284	500	0533-II	45.0588 dpm/mL	01/18/2022	01/18/2023
05/08/2006	Julie Strock	.0711	100	0533-J	15.576 dpm/mL	05/10/2008	05/10/2009
05/11/2006	Brenda Burke	.00092601	100	0533-K	.20286 dpm/mL	08/02/2007	07/28/2007
11/15/2006	Tara Sides	.132	1000	0533-L	2.88586 dpm/mL	09/15/2015	09/15/2016
06/12/2007	Julie Strock	.000979	100	0533-M	.21448 dpm/mL	05/20/2009	05/20/2010
08/03/2007	Daniel Roy	.7042	250	0533-N	61.7083 dpm/ml	08/02/2008	08/02/2009
09/25/2008	Daniel Roy	1.4561	500	0533-O	63.7982 dpm/ml	09/07/2010	09/07/2011
09/29/2008	Tara Sides	.1004	100	0533-P	21.9948 dpm/mL	09/07/2010	09/07/2011
06/03/2009	Julie Strock	.0009751	100	0533-Q	.2136 dpm/mL	06/01/2010	06/01/2011
11/08/2010	Ashley Drochter	1.4675	500	0533-R	64.2977 dpm/mL	11/08/2010	11/08/2011
11/09/2010	Ashley Drochter	.7295	500	0533-S	31.9626 dpm/mL	10/31/2011	10/31/2012
01/03/2011	Christina Kimball	.097	100	0533-T	21.25 dpm/mL	01/03/2011	01/03/2012
01/05/2011	Christina Kimball	.1009	100	0533-U	22.10438 dpm/mL	12/18/2013	12/18/2014
05/23/2011	Christina Kimball	.001008999	100	0533-V	.2210438 dpm/mL	05/11/2012	05/11/2013
05/11/2012	Christina Kimball	.001016	100	0533-W	.222676 dpm/mL	05/01/2014	05/01/2015

06/13/2012	Ashley Drochter	.728	500	0533-X	31.8969 dpm/mL	06/02/2014	06/02/2015
01/23/2013	Salina Pizarro	2	500	1641	.1498555 dpm/mL	12/19/2013	12/01/2038
07/16/2013	Julie Strock	1	500	1641-A	.07492775 dpm/mL	07/16/2038	07/16/2039
03/17/2014	Christina Kimball	.1013	100	0533-Y	22.19201 dpm/mL	02/26/2019	02/26/2020
05/05/2014	Christina Kimball	.00101595	100	0533-Z	.222567 dpm/mL	05/05/2014	05/05/2015

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Am-241 Standard 0533-II

v1.2

Analyst	MXS2
Verification Prep Date	1/18/2022

Tracer Information	
Isotope	Am-243
Serial Number	1752-H
Amount of Std. (mL)	0.2
Expiration Date	6/18/2022

Standard Information	
Isotope	Am-241
Serial Number	0533-II
Isotope Halflife	432.6000 Y
Reference Date	1/15/2003
Ref. Act. (dpm/mL)	45.0588
Amount of Std. (mL)	0.2
Standard Prep Date	1/30/2020

Std #	Count Date	Activity pCi	Standard dpm/mL
1	1/18/2022	3.910	43.40
2	1/18/2022	3.790	42.07
3	1/18/2022	3.890	43.18

Mean Value = 3.863 42.883
Stdev = 0.064291005 0.713630156

	pCi	dpm/mL
Certificate Value* =	3.9376	43.7071
Two sigma =	0.1286	1.4273
10 % of Mean =	0.3863	4.2883
Rule A (Pass/Fail)	Pass	Pass
% Recovery	98.11%	98.11%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	1/18/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

*** Certificate Value is decay corrected to Verification Prep Date.**

The analyst prepared three standard verification sources for Am-241 standard 0533-II using 0.2 mL for each source. Each standard was combined with 0.2 mL of Am-243 standard 1752-H and was diluted in a centrifuge tube containing 20 mL 3M/HCl and 20 mL DI water. 0.1g of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-241 were calculated by comparison to Am-243 certified values.

CERTIFICATE OF CALIBRATION
Standard Reference Source

1752

101294

Am-243 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL1511998, Item 1 **Product Code:** 8243



This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
Am-243	2.692E+06	3.809E+04	0.5	1.8	3.7	09/01/2015

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities (other than decay products) < 0.1%.
5.10528 g 1M HCl solution, carrier free.

Source Prepared by: _____

Z. Dimitrova, Radiochemist

QC Approved: _____

J. S. Lehr, Spectroscopist

Date: 28 AUG 15

Standard Logbook

Serial ID: 1752 **Open/Reference Date:** 01 SEP 2015 **Aliquot :** 5.10528 g
Name: Americium-243 **Received:** 01 SEP 2015 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18 SEP 2025 **Logbook Num :** GL-CED-297-045
Employee: Gregory Ramsay **Lot Number :** 101294
Supplier: Eckert & Ziegler **Solvent :** 1M HCl
Uncertainty : 1.85 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-243	38090 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1752
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HCl
Reference Date:	09/01/2015
Ampoule Mass (g):	5.10528 g
Uncertainty:	+/- 1.85 %
LogBook No:	GL-CED-297-045
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Americium-243		
Prepared By:	Tim Chandler		
Prep Date:	11/23/2015		
Verification Date:	01/06/2017		
Expiration Date:	01/20/2022		
Primary Code:	1752-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0826 g		
Density(g/mL):	1.0282	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22752.4720 \text{ dpm/mL}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0282 \text{ g/mL}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22128.4498 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/23/2015	Tim Chandler	1.0432	500	1752-B	46.1688 dpm/mL	11/24/2015	11/23/2016
05/26/2016	Tim Chandler	1.072	500	1752-C	47.4434 dpm/mL	05/26/2016	05/26/2017
01/06/2017	Tim Chandler	2.1043	1000	1752-D	46.5649 dpm/mL	12/20/2017	12/20/2018
05/30/2018	Tim Chandler	2.3853	1000	1752-E	52.783 dpm/mL	05/21/2019	05/21/2020
08/05/2019	Tim Chandler	2.2432	1000	1752-F	49.6385 dpm/mL	08/03/2020	08/03/2021
08/12/2020	Tim Chandler	2.2247	1000	1752-G	49.2292 dpm/mL	08/12/2020	08/12/2021
06/18/2021	Tim Chandler	2.2608	1000	1752-H	50.028 dpm/mL	06/18/2021	06/18/2022
01/20/2022	Matelon DeFreese	2.0841	1000	1752-I	46.1179022 dpm/mL	01/21/2022	01/21/2023

Verification for Am-243 Standard 1752-I

v1.2

Analyst	MXS2
Verification Prep Date	1/21/2022

Tracer Information	
Isotope	Cm-244
Serial Number	1216-N
Amount of Std. (mL)	0.2
Expiration Date	4/12/2022

Standard Information	
Isotope	Am-243
Serial Number	1752-I
Isotope Half-life	7.3700E+03 Y
Reference Date	9/1/2015
Ref. Act. (dpm/mL)	46.1179022
Amount of Std. (mL)	0.5
Standard Prep Date	1/20/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	1/23/2022	10.300	45.73
2	1/23/2022	10.700	47.51
3	1/23/2022	10.500	46.62

Mean Value = 10.500 46.620
Stddev = 0.2 0.888

Certificate Value* = 10.3807 pCi
Two sigma = 0.4000
10 % of Mean = 1.0500
Rule A (Pass/Fail) Pass
% Recovery 101.15%
Rule B (Pass/Fail) Pass
Expiration Date 1/21/2023

dpm/mL
46.0902
1.7760
4.6620
Pass
101.15%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Am-243 standard 1752-I using 0.5 mL for each source. Each standard was combined with 0.2 mL of Cm-244 standard 1216-N and was diluted in a centrifuge tube containing 20 mL of 3M HCl and 20 mL of DI water. 0.1 mL of neodymium carrier and five mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-243 were calculated by comparison to Cm-244 certified values.

1/24/22



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010

Fax 661•257•8303

1521

CERTIFICATE OF CALIBRATION GAMMA STANDARD SOLUTION

Radionuclide:	Pb-210	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	22.3 ± 0.2 years	P.O. No.:	936803 RD	
Catalog No.:	7210	Reference Date:	15-Feb-11	12:00 PST
Source No.:	1476-99	Contained Radioactivity:	4.973 μCi	184.0 kBq

Physical Description:

A. Mass of solution:	5.21292 g in 5 mL flame-sealed ampoule
B. Chemical form:	Pb(NO ₃) ₂ in 1M HNO ₃
C. Carrier content:	10 μg Pb/mL of solution
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.9540 μCi/g, 35.30 kBq/g

Method of Calibration:

This source was prepared from a weighed aliquot of solution whose activity in μCi/g was determined using gamma ray spectrometry.

Peak energy used for integration:	46.5 keV
Branching ratio used:	0.0418 gammas per decay

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5 %
B. Type B (systematic) uncertainty:	± 7.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 7.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.



Daniel James Van Dalsem
Quality Control

11-Jan-11
Date

EZIP Ref. No.: 1476-99

ISO 9001 CERTIFIED

Medical Imaging Laboratory

24937 Avenue Tibbitts Valencia, California 91355

Page 251 of 555 SDG: 579289

Industrial Gauging Laboratory

1800 North Keystone Street Burbank, California 91504

Standard Logbook

Serial ID: 1521 **Open/Reference Date:** 15 FEB 2011 **Aliquot :** 5.21292 g
Name: Lead-210 **Received:** 14 JAN 2011 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 02 MAR 2013 **Logbook Num :** RC-S-060-066
Employee: Gregory Ramsay **Lot Number :** 1426-99
Supplier: Eckert & Ziegler **Solvent :** 1M HNO₃
Uncertainty : 7 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Lead-210	35.3 kBq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1521
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	02/15/2011
Ampoule Mass (g):	5.21292 g
Uncertainty:	+/- 7 %
LogBook No:	RC-S-060-066
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Lead-210		
Prepared By:	Bethany Fiem		
Prep Date:	03/22/2011		
Verification Date:	12/03/2020		
Expiration Date:	12/23/2021		
Primary Code:	1521-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0705 g		
Density(g/mL):	1.0272	Balance ID:	1113021018

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 107393.1900 \text{ dpm/mL}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0272 \text{ g/mL}) / (100 \text{ mL}) = 104549.4451 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/07/2013	Ashley Drochter	.5177	100	1521-B	541.2525 dpm/mL	10/29/2013	10/29/2014
10/29/2013	Tim Chandler	5.1002	100	1521-C	5332.2308 dpm/mL	08/09/2018	08/09/2019
02/01/2019	Bethany Fiem	5.0359	100	1521-D	5265.0055 dpm/mL	11/30/2021	11/30/2022
06/05/2018	Tim Chandler	.6059	200	1867-A		06/06/2018	06/05/2019
06/14/2018	Tim Chandler	.6646	200	1867-B		06/15/2018	06/14/2019
06/14/2018	Tim Chandler	.6646	200	1868-A		06/14/2018	06/14/2019
06/13/2019	Tim Chandler	.6984	200	1907-A		06/15/2021	06/15/2022
06/13/2019	Tim Chandler	.6984	200	1907-A1		06/15/2021	06/15/2022
11/06/2019	Tim Chandler	15.0553	100	1920-A		11/07/2019	11/07/2020
12/14/2021	Matelon DeFreese	.6276	200	2012-A		12/15/2021	12/15/2022

Verification for Po-210 Standard 2012-A

v1.2

Analyst	MXS2
Verification Prep Date	12/15/2021

Tracer Information	
Isotope	Po-209
Serial Number	1720-C
Amount of Std. (mL)	0.2
Expiration Date	11/11/2022

Standard Information	
Isotope	Po-210
Serial Number	2012-A
Isotope Half-life	138.3800 D
Reference Date	12/14/2021
Ref. Act. (dpm/mL)	233.932217
Amount of Std. (mL)	0.2
Standard Prep Date	12/14/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	12/16/2021	20.500	227.55
2	12/16/2021	19.700	218.67
3	12/16/2021	20.000	222.00

Mean Value = 20.067 222.740
 Stdev = 0.404145188 4.486011592

pCi
 Certificate Value* = 20.9697 232.7634
 Two sigma = 0.8083 8.9720
 10 % of Mean = 2.0067 22.2740
 Rule A (Pass/Fail) Pass
 % Recovery 95.69%
 Rule B (Pass/Fail) Pass
 Expiration Date 12/15/2022

dpm/mL

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-210 standard 2012-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-209 standard 1720-C and was diluted in a centrifuge tube containing 15 mL of 0.05M HNO₃. Precipitated by adding 0.1mL of 30% H₂O₂, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-210 were calculated by comparison to Po-209 certified values.

12/15/2021

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

82308-278

Pu-239 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: 7340 RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u_A	u_B	U	
Pu-239	8.803E+06	3.758E+04	0.1	0.9	1.8	05/07/2010

*Uncertainty: U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities < 0.1 %, α -impurities < 0.1 %, Am-241 330.1 Bq. 5.56111 g 3M HNO₃ solution, carrier free.

Source Prepared by: W. Mao

W. Mao, Radiochemist

QA Approved: J. D. McCorvey

J. D. McCorvey, QA Manager Alternate

Date: 5/10/10



Standard Logbook

Serial ID: 1472 **Open/Reference Date:** 07 MAY 2010 **Aliquot :** 5.56111 g
Name: Plutonium-239 **Received:** 12 MAY 2010 **Density :** Hand Calculated
Type: Source Material **Expires:** 03 JUN 2030 **Logbook Num :** RC-S-060-019
Employee: Ashley Drochter **Lot Number :** 82308-278
Supplier: Eckert & Zeigler Analytics **Solvent :** 3M HNO3
Uncertainty : .9 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-239	37580 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1472
Prepared By:	Ashley Drochter
Carrier Conc:	3M HNO3
Reference Date:	05/07/2010
Ampoule Mass (g):	5.56111 g
Uncertainty:	+/- .9 %
LogBook No:	RC-S-060-019
Supplier:	Eckert & Zeigler Analytics

A Solution Material Info			
Isotope:	Plutonium-239		
Prepared By:	Julie Strock		
Prep Date:	10/20/2020		
Verification Date:	08/17/2021		
Expiration Date:	08/17/2022		
Primary Code:	1472-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.5071 g		
Density(g/mL):	1.1056	Balance ID:	BIOFA-B952846238

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.56111 \text{ g} * 100 \text{ mL}) = 22329.0118 \text{ dpm/mL}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.1056 \text{ g/mL}) / (5.56111 \text{ g} * 100 \text{ mL}) = 20195.4985 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
10/20/2020	Julie Strock	.0117	1000	1472-B	.2363 dpm/mL	10/14/2021	10/14/2022
08/17/2021	Tim Chandler	1.1318	500	1472-C	45.7145 dpm/mL	08/17/2021	08/17/2022
04/07/2022	Christina Kimball	.01	1000	1472-D	.20195 dpm/mL	04/07/2022	04/07/2023
04/15/2022	Christina Kimball	.011283	1000	1472-E	.2279 dpm/mL	04/15/2022	04/15/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-239 Standard 1472-C

v1.2

Analyst	TC1
Verification Prep Date	8/17/2021

Tracer Information	
Isotope	Pu-236
Serial Number	1980-B
Amount of Std. (mL)	0.2
Expiration Date	5/10/2022

Standard Information	
Isotope	Pu-239
Serial Number	1472-C
Isotope Halflife	2.4131E+04 Y
Reference Date	5/7/2010
Ref. Act. (dpm/mL)	45.7145
Amount of Std. (mL)	0.2
Standard Prep Date	8/17/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	8/17/2021	4.140	45.95
2	8/17/2021	4.330	48.06
3	8/17/2021	4.200	46.62

Mean Value = 4.223 46.879
Stdev = 0.097125349 1.078091369

	pCi	dpm/mL
Certificate Value* =	4.1171	45.6997
Two sigma =	0.1943	2.1562
10 % of Mean =	0.4223	4.6879
Rule A (Pass/Fail)	Pass	Pass
% Recovery	102.58%	102.58%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	8/17/2022	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-239 standard 1472-C using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-236 standard 1980-B and was diluted in a 50 mL plastic centrifuge tube containing 15 mL of 2M HCl. 100 micrograms of neodymium carrier, 6 drops of 25% hydrazine dichloride and five mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-239 were calculated by comparison to Pu-236 certified values.



National Institute of Standards & Technology

Certificate

Standard Reference Material® 4334j

Plutonium-242 Radioactivity Standard

2010

Revised
8-12-21

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterwieser, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Steven J. Choquette, Director
Office of Reference Materials

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

GL CED-297-302a

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq•g^{-1(a)}
Relative expanded uncertainty ($k = 2$)	0.51 %^(b)

^(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

^(b) The uncertainties on certified values are expanded uncertainties, $U = ku_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

GL-CED-297-3026

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ^{-1(a,b,c,d)}
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ^{-1(a,d)}
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π α liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

^(a) The stated uncertainty is two times the standard uncertainty [5].

^(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

^(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,

0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and

0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

^(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclidic impurities follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ^{-6 (3)}	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ^{-5 (3)}	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

^(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,

5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and

3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

^(f) The stated uncertainty is the standard uncertainty. See reference 6.

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ^{242}Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	^{242}Pu decay corrections for half-life uncertainty of 0.22 %.	B	$< 10^{-10}$
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty ($k = 2$)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

GC-CED-297-302d

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

GL-CED-297-302e

Standard Logbook

Serial ID: 2010 **Open/Reference Date:** 09 AUG 2017 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 12 AUG 2021 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 12 AUG 2035 **Logbook Num :** GL-CED-297-302
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
Uncertainty : .255 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2010
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO3
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-302
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	04/14/2022		
Verification Date:	04/14/2022		
Expiration Date:	04/14/2023		
Primary Code:	2010-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.4626 g		
Density(g/mL):	1.0315	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.4626 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 42.7394 \text{ dpm/mL}$
$(5.4626 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0315 \text{ g/mL}) / (200 \text{ mL}) = 41.4342 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
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GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2010-A

v1.2

Analyst	MXS2
Verification Prep Date	4/14/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.2
Expiration Date	8/17/2022

Standard Information	
Isotope	Pu-242
Serial Number	2010-A
Isotope Half-life	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	42.7394
Amount of Std. (mL)	0.2
Standard Prep Date	4/14/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	4/14/2022	3.920	43.51
2	4/14/2022	3.880	43.07
3	4/14/2022	3.960	43.96

Mean Value = 3.920 43.512
Stdev = 0.04 0.444

Certificate Value* = 3.8504 pCi
Two sigma = 0.0800
10 % of Mean = 0.3920
Rule A (Pass/Fail) Pass
% Recovery 101.81%
Rule B (Pass/Fail) Pass
Expiration Date 4/14/2023

dpm/mL
42.7390
0.8880
4.3512
Pass
101.81%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2010-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL of 2M HCl diluted to 40 mL with DI water. Added 0.1 mL of neodymium carrier, 3 to 4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

4/20/22



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661-309-1010
Fax 661-257-8303

1720

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Po-209	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	102 ± 5 years	P.O. No.:	GEL1408569	
Catalog No.:	7209	Reference Date:	1-Oct-14	12:00 PST
Source No.:	1760-53-1	Contained Radioactivity:	0.05281 µCi	1.954 kBq

Physical Description:

A. Mass of solution:	5.21650 g in 5 mL flame-sealed ampoule
B. Chemical form:	Po(NO ₃) ₄ in 1M HNO ₃
C. Carrier content:	None
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.01012 µCi/g, 0.3744 kBq/g

Method of Calibration:

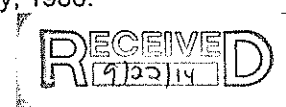
This source was prepared from a weighed aliquot of solution whose activity in µCi/g was determined using a liquid scintillation counter.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.4 %
D. Total uncertainty at the 99% confidence level:	± 3.1 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.



Daniel James Van Dorem
Quality Control

11-Sep-14
Date

EZIP Ref. No.: 1760-53

ISO 9001 CERTIFIED

GL-CED-297-013

Standard Logbook

Serial ID: 1720 **Open/Reference Date:** 01 OCT 2014 **Aliquot :** 5.2165 g
Name: Polonium-209 **Received:** 22 SEP 2014 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 22 SEP 2035 **Logbook Num :** GL-CED-297-013
Employee: Gregory Ramsay **Lot Number :** 1760-53-1
Supplier: Eckert & Ziegler **Solvent :** 1M HNO3
Uncertainty : 1.211 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Polonium-209	1.954 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1720
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	10/01/2014
Ampoule Mass (g):	5.2165 g
Uncertainty:	+/- 1.211 %
LogBook No:	GL-CED-297-013
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Polonium-209		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2016		
Verification Date:	07/12/2017		
Expiration Date:	12/06/2019		
Primary Code:	1720-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1896 g		
Density(g/mL):	1.0290	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1166.3543 \text{ dpm/mL}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0290 \text{ g/mL}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1133.4833 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
12/06/2018	Tim Chandler	14.42	200	1720-B	81.7241 dpm/mL	12/07/2018	12/07/2019
11/26/2019	Tim Chandler	14.5183	200	1720-C	82.2813 dpm/mL	11/11/2021	11/11/2022
11/26/2019	Tim Chandler	14.5183	200	1720-C1	82.2813 dpm/mL	11/11/2021	11/11/2022
02/21/2022	Matelon DeFreese	14.5109	200	1720-D	82.239314 dpm/mL	03/07/2022	03/07/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Po-209 Standard 1720-D

v1.2

Analyst	MXS2
Verification Prep Date	3/7/2022

Tracer Information	
Isotope	Po-210
Serial Number	2012-A
Amount of Std. (mL)	0.2
Expiration Date	12/15/2022

Standard Information	
Isotope	Po-209
Serial Number	1720-D
Isotope Half-life	125.3000 Y
Reference Date	10/1/2014
Ref. Act. (dpm/mL)	82.239314
Amount of Std. (mL)	0.2
Standard Prep Date	2/21/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	3/7/2022	7.180	79.70
2	3/7/2022	7.480	83.03
3	3/7/2022	7.700	85.47

Mean Value = 7.453 82.732
Stdev = 0.261023626 2.897362249

Certificate Value* = 7.1106 pCi
Two sigma = 0.5220
10 % of Mean = 0.7453
Rule A (Pass/Fail) Pass
% Recovery 104.82%
Rule B (Pass/Fail) Pass
Expiration Date 3/7/2023

dpm/mL
78.9274
5.7947
8.2732
Pass
104.82%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-209 standard 1720-D using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-210 standard 2012-A and was diluted in a centrifuge tube containing 15mL of 0.05M HNO3. Precipitated by adding 0.1mL of 30% H2O2, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-209 were calculated by comparison to Po-210 certified values.

3/15/22



Eckert & Ziegler

Analytics

1845

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION

Standard Reference Source

Received: 12-1-17 12:00

SRS Number: 108018

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8229

Customer: GEL Laboratories LLC

P.O. Number: GEL1718798, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 29-November-2017 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Th-229	2.897E+06	1.999E+04	0.5	1.5	3.1	4π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 108018

Comments:

5.21561 g of 0.5 M HNO₃ solution, carrier free.

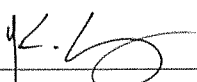
Impurities:

γ-impurities (other than decay products) < 0.1%

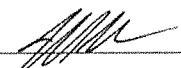
α-impurities: Th-228 6.6E+00 Bq, Th-230 1.2E+02 Bq, Th-232 8.0E+00 Bq

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Hardley, Radiochemist

QC Approved by:


J. Lahr, Spectroscopist

Date: 27-Nov-17

Standard Logbook

Serial ID: 1845 **Open/Reference Date:** 29 NOV 2017 **Aliquot :** 5.21561 g
Name: Thorium-229 **Received:** 01 DEC 2017 **Density :** Hand Calculated
Type: Source Material **Expires:** 01 DEC 2018 **Logbook Num :** GL-CED-297-138
Employee: Tim Chandler **Lot Number :** 108018
Supplier: Eckert & Ziegler **Solvent :** 0.5M HNO₃
Uncertainty : 1.55 percent
Description: 1 ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-229	19990 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1845
Prepared By:	Tim Chandler
Carrier Conc:	0.5M HNO3
Reference Date:	11/29/2017
Ampoule Mass (g):	5.21561 g
Uncertainty:	+/- 1.55 %
LogBook No:	GL-CED-297-138
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-229		
Prepared By:	Tim Chandler		
Prep Date:	06/08/2018		
Verification Date:	07/07/2020		
Expiration Date:	11/10/2022		
Primary Code:	1845-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1906 g		
Density(g/mL):	1.0291	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11936.4861 \text{ dpm/mL}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0291 \text{ g/mL}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11598.7987 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/08/2018	Tim Chandler	2.0385	1000	1845-B	23.6442 dpm/mL	06/01/2020	06/01/2021
07/10/2019	Tim Chandler	4.0198	1000	1845-C	46.62485 dpm/mL	07/07/2020	07/07/2021
10/26/2020	Tim Chandler	4.0184	1000	1845-D	46.6086 dpm/mL	10/27/2020	10/27/2021
04/23/2021	Tim Chandler	4.2911	1000	1845-E	49.7716 dpm/mL	04/26/2021	04/26/2022
11/10/2021	Matelon DeFreese	4.211	1000	1845-F	48.8425 dpm/mL	11/10/2021	11/10/2022
05/11/2022	Matelon DeFreese	4.1951	1000	1845-G	48.6581 dpm/mL	05/12/2022	05/11/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Th-229 Standard 1845-G

v1.2

Analyst	MXS2
Verification Prep Date	5/12/2022

Tracer Information	
Isotope	Th-232
Serial Number	1513-C
Amount of Std. (mL)	0.1
Expiration Date	12/22/2022

Standard Information	
Isotope	Th-229
Serial Number	1845-G
Isotope Half-life	7.3400E+03 Y
Reference Date	11/29/2017
Ref. Act. (dpm/mL)	48.6581
Amount of Std. (mL)	0.1
Standard Prep Date	5/11/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	5/12/2022	2.190	48.62
2	5/12/2022	2.070	45.95
3	5/12/2022	2.120	47.06

Mean Value = 2.127 47.212
Stdev = 0.060277138 1.338152458

Certificate Value* = 2.1909 pCi
Two sigma = 0.1206
10 % of Mean = 0.2127
Rule A (Pass/Fail) Pass
% Recovery 97.07%
Rule B (Pass/Fail) Pass
Expiration Date 5/12/2023
dpm/mL
48.6377
2.6763
4.7212
Pass
97.07%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-229 standard 1845-G using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-232 standard 1513-C and was diluted in a centrifuge tube containing 10 mL 8M HNO₃. The standard was isolated following the standard operating procedure for the separation of thorium (GL-RAD-A-038). After dissolving the sources in 5 mL of 2M HCl, the sources were diluted to 40 mL with deionized water. 100 micrograms of neodymium carrier and five mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-229 were calculated by comparison to Th-232 certified values.

5/16/22



Eckert & Ziegler

Isotope Products

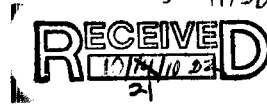
24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010

Fax 661•257•8303

1506 1513

3-11/30/10



CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide: Th-232
Half-life: (1.405 ± 0.006)E+10 years
Catalog No.: 7232
Source No.: 1451-62

Customer: GEL LABORATORIES, LLC
P.O. No.: 7347RD
Reference Date: 1-Nov-10 12:00 PST
Contained Radioactivity: 50.26 nCi 1860 Bq
(Th-232 only)

Physical Description:

A. Mass of solution: 5.73256 g in 5 mL flame-sealed ampoule
B. Chemical form: Th(NO₃)₄ in H₂O
C. Carrier content: None
D. Density: 1.15 g/mL @ 20°C

Radioimpurities:

Not determined

Radionuclide Concentration: 8.767 nCi/g, 324.4 Bq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.

Daniel James Van Dalsem
Quality Control

15-OCT-10
Date

EZIP Ref. No.: 1451-62

RC-S-060-058

ISO 9001 CERTIFIED

Medical Imaging Laboratory

Industrial Gauging Laboratory

Standard Logbook

Serial ID: 1513 **Open/Reference Date:** 01 NOV 2010 **Aliquot :** 5.73256 g
Name: Thorium-232 **Received:** 21 OCT 2010 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 30 NOV 2011 **Logbook Num :** RC-S-060-058
Employee: Gregory Ramsay **Verified:** 28 APR 2011 **Lot Number :** 1451-62
Supplier: Eckert & Ziegler **Solvent :** DI water
Uncertainty : 1.172 PERCENT

Description: in water
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-232	324.4 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1513
Prepared By:	Gregory Ramsay
Carrier Conc:	DI water
Reference Date:	11/01/2010
Ampoule Mass (g):	5.73256 g
Uncertainty:	+/- 1.172 %
LogBook No:	RC-S-060-058
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-232		
Prepared By:	Christina Kimball		
Prep Date:	04/19/2011		
Verification Date:	02/21/2020		
Expiration Date:	02/21/2021		
Primary Code:	1513-A		
Dilution(mL):	250 mL		
Mass of Parent(g):	5.672 g		
Density(g/mL):	1.0020	Balance ID:	60108592

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (250 \text{ mL}) = 441.5992 \text{ dpm/mL}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0020 \text{ g/mL}) / (250 \text{ mL}) = 440.7354 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
04/19/2011	Christina Kimball	5.0665	100	1513-B	22.3299 dpm/mL	04/11/2013	04/11/2014
02/26/2014	Matelon DeFreese	100.0316	1000	1513-C	44.08747 dpm/mL	12/22/2021	12/22/2022
04/18/2014	Christina Kimball	5.0477	100	1513-D	22.247 dpm/mL	06/22/2021	06/22/2022
01/04/2016	Christina Kimball	.2487	100	1513-E	1.096117 dpm/mL	02/11/2020	02/11/2021
08/01/2016	Christina Kimball	2.053	250	1513-F	3.61932 dpm/mL	07/26/2021	07/26/2022
02/21/2020	Christina Kimball	.248	100	1513-G	1.093 dpm/mL	02/23/2022	02/23/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Th-232 Standard 1513-C

v1.2

Analyst	MXS2
Verification Prep Date	12/22/2021

Tracer Information	
Isotope	Th-229
Serial Number	1845-F
Amount of Std. (mL)	0.1
Expiration Date	11/10/2022

Standard Information	
Isotope	Th-232
Serial Number	1513-C
Isotope Half-life	1.4050E+10 Y
Reference Date	11/1/2010
Ref. Act. (dpm/mL)	44.08747
Amount of Std. (mL)	0.1
Standard Prep Date	2/26/2014

Std #	Count Date	Activity pCi	Standard dpm/mL
1	12/22/2021	1.970	43.73
2	12/22/2021	2.070	45.95
3	12/22/2021	1.920	42.62

Mean Value = 1.987 44.104

Stdev = 0.076376262 1.695553007

Certificate Value* = 1.9859 pCi
 Two sigma = 0.1528
 10 % of Mean = 0.1987
 Rule A (Pass/Fail) Pass
 % Recovery 100.04%
 Rule B (Pass/Fail) Pass
 Expiration Date 12/22/2022

dpm/mL
 44.0875
 3.3911
 4.4104
 Pass
 100.04%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-232 standard 1513-C using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-229 standard 1845-F and was diluted in a centrifuge tube containing 10 mL of 8M HNO₃, then poured onto AG columns following SOP 038. 0.1 mL of neodymium carrier and 2 mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-232 were calculated by comparison to Th-229 certified values.

2/14/22



Eckert & Ziegler

Analytics

1564

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION Standard Radionuclide Source

85621-278

5 mL Liquid in Flame Sealed Vial

Customer: General Engineering Labs/Charleston, SC
P.O. No.: 936814RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
U-232	2.517E+04	3.393E+04	0.5	2.4	4.9	09/12/2011

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities (other than decay products) < 0.1 %, U-233 < 1.20E2 Bq, Am-241 < 5.8E1 Bq. 5.06048 grams 2M HNO3 solution.

Source Prepared by: M. I. Taskaeva
M. I. Taskaeva, Radiochemist

QA Approved: J. D. McCorvey
J. D. McCorvey, QA Manager Alternate

Date: 9/12/11

RECEIVED
9/14/11
AM



Standard Logbook

Serial ID: 1564 **Open/Reference Date:** 12 SEP 2011 **Aliquot :** 5.06048 g
Name: Uranium-232 **Received:** 14 SEP 2011 **Density :** Hand Calculated
Type: Source Material **Expires:** 26 SEP 2014 **Logbook Num :** RC-S-060-109
Employee: Ashley Drochter **Lot Number :** 85621-278
Supplier: Eckert & Ziegler **Solvent :** 2M HNO3
Uncertainty : 2.45 PERCENT

Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-232	33930 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1564
Prepared By:	Ashley Drochter
Carrier Conc:	2M HNO3
Reference Date:	09/12/2011
Ampoule Mass (g):	5.06048 g
Uncertainty:	+/- 2.45 %
LogBook No:	RC-S-060-109
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-232		
Prepared By:	Ashley Drochter		
Prep Date:	11/15/2012		
Verification Date:	07/26/2021		
Expiration Date:	07/26/2022		
Primary Code:	1564-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9067 g		
Density(g/mL):	1.0615	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.06048 \text{ g} * 100 \text{ mL}) = 19739.3525 \text{ dpm/mL}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0615 \text{ g/mL}) / (5.06048 \text{ g} * 100 \text{ mL}) = 18595.7160 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/16/2012	Ashley Drochter	2.6179	1000	1564-B	48.6817 dpm/mL	11/13/2013	11/13/2014
07/26/2021	Christina Kimball	.635	500	1564-BB	23.6166 dpm/mL	07/26/2021	07/26/2022
07/26/2021	Christina Kimball	.635	500	1564-BB Spike	23.6166 dpm/mL	07/26/2021	07/26/2022
01/15/2013	Christina Kimball	.265	250	1564-C	19.7115 dpm/mL	01/13/2014	01/13/2015
12/14/2021	Tim Chandler	2.6412	1000	1564-CC	49.115 dpm/mL	12/15/2021	12/15/2022
02/18/2013	Christina Kimball	.116	500	1564-D	4.31421 dpm/mL	02/16/2015	02/13/2016
04/13/2022	Matelon DeFreese	2.7103	1000	1564-DD	50.4 dpm/mL	04/13/2022	04/13/2023
01/02/2014	Gregory Ramsay	2.6936	1000	1564-E	50.08942 dpm/mL	12/10/2014	12/10/2015

03/17/2014	Christina Kimball	.266	250	1564-F	19.78584 dpm/mL	03/25/2015	03/25/2016
12/10/2014	Tim Chandler	2.6312	1000	1564-G	48.929 dpm/mL	12/10/2014	12/10/2015
07/20/2015	Christina Kimball	.266	250	1564-H	19.78584 dpm/mL	07/25/2016	07/25/2017
11/23/2015	Tim Chandler	2.6117	1000	1564-I	48.5664 dpm/mL	11/23/2015	11/23/2016
01/05/2016	Christina Kimball	.119	500	1564-J	4.4258 dpm/mL	12/27/2017	12/27/2018
01/05/2016	Christina Kimball	.119	500	1564-J Spike	4.4258 dpm/mL	12/27/2017	12/27/2018
09/20/2016	Tim Chandler	2.6389	1000	1564-K	49.0722 dpm/mL	09/18/2017	09/18/2018
12/20/2016	Christina Kimball	.276	250	1564-L	20.52974 dpm/mL	12/21/2017	12/21/2018
06/20/2017	Tim Chandler	2.6611	1000	1564-M	49.4851 dpm/mL	06/19/2018	06/19/2019
01/18/2018	Tim Chandler	2.6367	1000	1564-N	49.0313 dpm/mL	04/25/2018	04/25/2019
04/25/2018	Tim Chandler	2.6505	1000	1564-O	49.2879 dpm/mL	04/25/2018	04/25/2019
08/06/2018	Christina Kimball	.106	500	1564-P	3.9423 dpm/mL	12/19/2019	12/19/2020
08/06/2018	Christina Kimball	.106	500	1564-P Spike	3.9423 dpm/mL	12/19/2019	12/19/2020
12/13/2018	Tim Chandler	2.6502	1000	1564-Q	49.2824 dpm/mL	12/13/2018	12/13/2019
01/08/2019	Christina Kimball	.29	250	1564-R	21.571 dpm/mL	01/08/2019	01/08/2020
01/08/2019	Christina Kimball	.29	250	1564-R Spike	21.571 dpm/mL	01/08/2019	01/08/2020
10/01/2019	Tim Chandler	2.6957	1000	1564-S	50.1285 dpm/mL	10/01/2019	10/01/2020
12/18/2019	Christina Kimball	.307	250	1564-T	22.83554 dpm/mL	12/19/2019	12/19/2020
12/18/2019	Christina Kimball	.307	250	1564-T Spike	22.83554 dpm/mL	12/19/2019	12/19/2020
03/31/2020	Tim Chandler	2.6645	1000	1564-U	49.5483 dpm/mL	03/31/2020	03/31/2021
08/14/2020	Christina Kimball	.111	500	1564-V	4.1282 dpm/mL	08/14/2020	08/14/2021
08/14/2020	Christina Kimball	.111	500	1564-V Spike	4.1282 dpm/mL	08/14/2020	08/14/2021

10/13/2020	Tim Chandler	2.6983	1000	1564-W	50.1768 dpm/mL	10/13/2020	10/13/2021
11/04/2020	Christina Kimball	.315	250	1564-X	23.4306 dpm/mL	11/04/2020	11/04/2021
11/04/2020	Christina Kimball	.315	250	1564-X Spike	23.4306 dpm/mL	11/04/2020	11/04/2021
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Y	51.32232 dpm/mL	03/19/2021	03/19/2022
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Z	51.32232 dpm/mL	03/20/2021	03/20/2022

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-232 Standard 1564-DD

v1.2

Analyst	MXS2
Verification Prep Date	4/13/2022

Tracer Information	
Isotope	U-238
Serial Number	1600-M
Amount of Std. (mL)	0.2
Expiration Date	1/21/2023

Standard Information	
Isotope	U-232
Serial Number	1564-DD
Isotope Half-life	68.9000 Y
Reference Date	9/12/2011
Ref. Act. (dpm/mL)	50.4
Amount of Std. (mL)	0.2
Standard Prep Date	4/13/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	4/13/2022	3.880	43.07
2	4/13/2022	4.090	45.40
3	4/13/2022	3.840	42.62

Mean Value = 3.937 43.697
Stdev = 0.134288247 1.490599544

pCi
4.0819
0.2686
0.3937
Pass
96.44%
Pass

Certificate Value* =
Two sigma =
10 % of Mean =
Rule A (Pass/Fail)
% Recovery
Rule B (Pass/Fail)
Expiration Date

dpm/mL
45.3091
2.9812
4.3697
Pass
96.44%
Pass

4/13/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-232 standard 1564-DD using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-238 standard 1600-M and was diluted in a centrifuge tube containing 15 mL of 0.1M HCl diluted to 40 mL with DI water. 0.1 mL of neodymium carrier, 0.5 mL of titanium chloride and five mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-232 were calculated by comparison to U-238 certified values.

4/6/22

15 Apr 3/24/12
1600

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	U-238 (Nat)	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	(4.468 ± 0.005)E+09 years	P.O. No.:	936823 RD	
Catalog No.:	7338	Reference Date:	15-Apr-12 12:00 PST	
Source No.:	1577-71-2	Contained Radioactivity:	1.023 µCi 37.85 kBq	
		(Total Uranium)		

Physical Description:

A. Mass of solution:	7.05210 g in 10 mL flame-sealed ampoule
B. Chemical form:	UO ₂ (NO ₃) ₂ in dilute HNO ₃
C. Carrier content:	None
D. Density:	Approximately 1.41 g/mL @ 20°C

Radioimpurities:

See Technical Data Sheet

Radionuclide Concentration: 0.1451 µCi/g, 5.369 kBq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.


Quality Control

21-Mar-12
Date

EZIP Ref. No.: 1577-71

RC-S-065-030a

ISO 9001 CERTIFIED

Medical Imaging Laboratory

24937 Avenue Tibbitts Valencia, California 91355

Industrial Gauging Laboratory

1800 North Keystone Street Burbank, California 91504

U-238 Natural Technical Data

The U-238 Natural used to prepare your order was taken from Eckert & Ziegler Isotope Products Lot #4550102. It had the following composition as of 9 Feb 10:

<u>Nuclide</u>	<u>Atom %</u>	<u>Activity %</u>
U-234	0.0055	49.086
U-235	0.7200	2.241
U-238	99.274	48.673

Isotopic composition provided by New Brunswick Laboratory.

If you have any question, please contact Eckert & Ziegler Isotope Products Technical Service: (661) 309-1010

Standard Logbook

Serial ID: 1600 **Open/Reference Date:** 15 APR 2012 **Aliquot :** 7.0521 g
Name: Uranium-238 **Received:** 24 MAR 2012 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 26 MAR 2015 **Logbook Num :** RC-S-065-030
Employee: Ashley Drochter **Lot Number :** 4550102
Supplier: Eckert & Ziegler **Solvent :** UO₂(NO₃)₂ in dilute HNO₃
Uncertainty : 1.17 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-238	18.42 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1600
Prepared By:	Ashley Drochter
Carrier Conc:	UO ₂ (NO ₃) ₂ in dilute HNO ₃
Reference Date:	04/15/2012
Ampoule Mass (g):	7.0521 g
Uncertainty:	+/- 1.17 %
LogBook No:	RC-S-065-030
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-238		
Prepared By:	Ashley Drochter		
Prep Date:	09/04/2012		
Verification Date:	05/20/2022		
Expiration Date:	05/20/2023		
Primary Code:	1600-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	6.8204 g		
Density(g/mL):	1.0789	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (7.0521 \text{ g} * 100 \text{ mL}) = 10688.8814 \text{ dpm/mL}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0789 \text{ g/mL}) / (7.0521 \text{ g} * 100 \text{ mL}) = 9907.0626 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
09/04/2012	Ashley Drochter	1.4579	500	1600-B	28.8913 dpm/mL	09/04/2012	09/04/2013
09/11/2012	Ashley Drochter	3.0288	500	1600-C	60.0219 dpm/mL	09/04/2013	09/04/2014
03/27/2014	Tim Chandler	3.0445	500	1600-D	60.3241 dpm/mL	03/18/2015	03/18/2016
07/24/2015	Tim Chandler	3.0177	500	1600-E	59.7931 dpm/mL	07/10/2017	07/10/2018
02/16/2017	Tim Chandler	3.0261	500	1600-F	59.9595 dpm/mL	02/06/2018	02/06/2019
10/10/2017	Christina Kimball	.539	250	1600-G	21.3596 dpm/mL	07/26/2021	07/26/2022

04/02/2018	Tim Chandler	3.0544	500	1600-H	60.5203 dpm/mL	03/29/2019	03/29/2020
06/21/2019	Tim Chandler	3.0536	500	1600-I	60.5044 dpm/mL	06/21/2019	06/21/2020
01/30/2020	Tim Chandler	3.0563	500	1600-J	60.5579 dpm/mL	01/26/2021	01/26/2022
03/13/2020	Christina Kimball	.01222	500	1600-K	.24207 dpm/mL	03/15/2022	03/15/2023
04/23/2021	Tim Chandler	3.0507	500	1600-L	60.4469 dpm/mL	04/26/2021	04/26/2022
01/21/2022	Matelon DeFreese	3.1075	500	1600-M	61.5723941 dpm/mL	01/21/2022	01/21/2023
05/19/2022	Christina Kimball	.01275	500	1600-N	.2527 dpm/mL	05/20/2022	05/20/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-238 Standard 1600-M

v1.2

Analyst	MXS2
Verification Prep Date	1/21/2022

Tracer Information	
Isotope	U-232
Serial Number	1564-CC
Amount of Std. (mL)	0.2
Expiration Date	12/15/2022

Standard Information	
Isotope	U-238
Serial Number	1600-M
Isotope Half-life	4.4680E+09 Y
Reference Date	4/15/2012
Ref. Act. (dpm/mL)	61.5723941
Amount of Std. (mL)	0.2
Standard Prep Date	1/20/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	1/23/2022	5.500	61.05
2	1/23/2022	5.370	59.61
3	1/23/2022	5.410	60.05

Mean Value = 5.427 60.236
 Stdev = 0.066583281 0.739074421

Certificate Value* = 5.5471 pCi
 Two sigma = 0.1332
 10 % of Mean = 0.5427
 Rule A (Pass/Fail) Pass
 % Recovery 97.83%
 Rule B (Pass/Fail) Pass
 Expiration Date 1/21/2023

dpm/mL
 61.5724
 1.4781
 6.0236
 Pass
 97.83%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-238 standard 1600-M using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-232 standard 1564-CC and was diluted in a centrifuge tube containing 15 mL 0.1M HCl and 25 mL of DI water 0.1 mL of neodymium carrier, 0.5 mL titanium chloride, and five mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-238 were calculated by comparison to U-232 certified values.

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Runlogs

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2265049

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
579287001	SAMPLE	MP2	1088	MAY-31-22 09:23:01	DONE		09-MAY-22 12:01
579287002	SAMPLE	MP2	1089	MAY-31-22 09:23:02	DONE		10-MAY-22 13:31
579287003	SAMPLE	MP2	1090	MAY-31-22 09:23:02	DONE		10-MAY-22 16:35
579287004	SAMPLE	MP2	1092	MAY-31-22 09:23:02	DONE		10-MAY-22 13:32
579287005	SAMPLE	MP2	1093	MAY-31-22 09:23:02	DONE		10-MAY-22 13:32
579289001	SAMPLE	MP2	1107	MAY-31-22 09:23:03	DONE		10-MAY-22 14:00
579289002	SAMPLE	MP2	1108	MAY-31-22 09:23:03	DONE		10-MAY-22 16:36
579289003	SAMPLE	MP2	1109	MAY-31-22 09:23:03	DONE		10-MAY-22 14:01
1205090027	MB	MP2	1110	MAY-31-22 09:23:03	DONE		10-MAY-22 16:36
1205090028	LCS	MP2	1111	MAY-31-22 09:23:03	DONE		10-MAY-22 14:01
1205090029	LCSD	MP2	1112	MAY-31-22 09:23:03	DONE		10-MAY-22 14:01

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2265052

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
579287001	SAMPLE	MP2	1003	MAY-30-22 12:17:16	DONE		02-MAY-22 11:50
579287002	SAMPLE	MP2	1004	MAY-30-22 12:17:16	DONE		02-MAY-22 11:50
579287003	SAMPLE	MP2	1005	MAY-30-22 12:17:16	DONE		02-MAY-22 11:50
579287004	SAMPLE	MP2	1006	MAY-30-22 12:17:16	DONE		02-MAY-22 11:50
579287005	SAMPLE	MP2	1008	MAY-30-22 12:17:17	DONE		02-MAY-22 11:51
579289001	SAMPLE	MP2	1011	MAY-30-22 12:17:17	DONE		02-MAY-22 11:52
579289002	SAMPLE	MP2	1012	MAY-30-22 12:17:17	DONE		02-MAY-22 11:52
1205090054	LCS	MP2	1009	MAY-30-22 12:17:17	DONE		02-MAY-22 11:52
1205090055	LCSD	MP2	1010	MAY-30-22 12:17:17	DONE		02-MAY-22 11:52
579289003	SAMPLE	MP2	1013	MAY-30-22 12:19:31	DONE		02-MAY-22 11:52
1205090053	MB	MP2	1014	MAY-30-22 12:19:31	DONE		02-MAY-22 11:52

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2265053

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
579287001	SAMPLE	MP2	1170	MAY-31-22 10:35:51	DONE		13-MAY-22 11:55
579289002	SAMPLE	MP2	1181	MAY-31-22 10:36:04	DONE		13-MAY-22 11:50
579289003	SAMPLE	MP2	1182	MAY-31-22 10:36:05	DONE		13-MAY-22 11:50
1205090056	MB	MP2	1185	MAY-31-22 10:36:07	DONE		17-MAY-22 13:26
1205090057	LCS	MP2	1186	MAY-31-22 10:36:10	DONE		17-MAY-22 13:12
1205090058	LCSD	MP2	1189	MAY-31-22 10:36:12	DONE		17-MAY-22 13:12
579287002	SAMPLE	MP2	1025	JUN-02-22 14:27:39	DONE		03-MAY-22 12:04
579287003	SAMPLE	MP2	1026	JUN-02-22 14:27:39	DONE		03-MAY-22 12:04
579287004	SAMPLE	MP2	1027	JUN-02-22 14:27:39	DONE		03-MAY-22 18:01
579287005	SAMPLE	MP2	1028	JUN-02-22 14:27:39	DONE		03-MAY-22 12:05
579289001	SAMPLE	MP2	1029	JUN-02-22 14:27:39	DONE		03-MAY-22 12:05

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2265054

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
579287001	SAMPLE	MP2	1125	JUN-01-22 08:42:37	DONE		11-MAY-22 11:56
579287002	SAMPLE	MP2	1126	JUN-01-22 08:42:39	DONE		11-MAY-22 11:33
579287003	SAMPLE	MP2	1128	JUN-01-22 08:42:41	DONE		11-MAY-22 11:33
579287004	SAMPLE	MP2	1129	JUN-01-22 08:42:43	DONE		11-MAY-22 11:33
579289001	SAMPLE	MP2	1131	JUN-01-22 08:42:48	DONE		11-MAY-22 11:33
579289002	SAMPLE	MP2	1132	JUN-01-22 08:42:50	DONE		11-MAY-22 11:34
1205090060	LCS	MP2	1135	JUN-01-22 08:42:57	DONE		11-MAY-22 12:39
1205090061	LCSD	MP2	1136	JUN-01-22 08:42:59	DONE		11-MAY-22 11:34
579287005	SAMPLE	MP2	1113	JUN-02-22 14:32:46	DONE		11-MAY-22 12:37
1205090059	MB	MP2	1125	JUN-02-22 14:32:48	DONE		11-MAY-22 11:56
579289003	SAMPLE	MP2	1114	JUN-02-22 14:32:51	DONE		11-MAY-22 12:38

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2272481

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
579289002	SAMPLE	MP2	1078	JUN-05-22 14:38:46	DONE		09-MAY-22 12:27
579289003	SAMPLE	MP2	1079	JUN-05-22 14:38:46	DONE		09-MAY-22 12:28
1205104985	MB	MP2	1080	JUN-05-22 14:38:46	DONE		09-MAY-22 12:28
1205104986	LCS	MP2	1081	JUN-05-22 14:38:46	DONE		09-MAY-22 12:28
1205104987	LCSD	MP2	1082	JUN-05-22 14:38:46	DONE		09-MAY-22 12:28
579287001	SAMPLE	MP2	1245	JUN-06-22 13:20:24	DONE		19-MAY-22 12:18
579287002	SAMPLE	MP2	1246	JUN-06-22 13:20:25	DONE		19-MAY-22 12:18
579287003	SAMPLE	MP2	1252	JUN-06-22 13:20:28	DONE		19-MAY-22 12:18
579287004	SAMPLE	MP2	1254	JUN-06-22 13:20:30	DONE		19-MAY-22 12:19
579287005	SAMPLE	MP2	1256	JUN-06-22 13:20:33	DONE		19-MAY-22 12:19
579289001	SAMPLE	MP2	1200	JUN-06-22 13:20:35	DONE		17-MAY-22 13:15

Gamma Spectroscopy Raw Data

Batch 2264689 Check-list

This check-list was completed on 17-MAY-22 by Michael Hilton

This batch was reviewed by Michael Hilton on 17-MAY-22 and Spencer Collins on 18-MAY-22.

Batch ID: 2264689

Product: GSCGAMMF

Description: Gamma Spec Filter RAD A-013

#	Criteria	Yes	No	Comments
Preparation Information				
1	Did any sample(s) require dilution?		No	
2	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
3	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
4	Are instrument source checks within limits?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were any additional radionuclides added that were not requested by the client?		No	
7	Were all the samples prepared/analyzed within the required holding time period?	Yes		
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Gamma Spectroscopy

Batch ID: 2264689

Analyst: Rebekah Futch (RXF2)

Method: DOE HASL 300, 4.5.2.3/Ga-01-R

Lab SOP: GL-RAD-A-013 REV# 27

Instrument: No instrument-manual method

Due Dates for Lab: 05-JUN-2022

Package: 06-JUN-2022

SDG: 07-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205089189	78962-278	1298	1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	579287001	17-MAY-2022	20	200	0.74119
2	579287002	17-MAY-2022	20	200	0.76992
3	579287003	17-MAY-2022	20	200	0.76021
4	579287004	17-MAY-2022	20	200	0.76788
5	579287005	17-MAY-2022	20	200	0.74789
6	579289001	17-MAY-2022	20	200	0.73894
7	579289002	17-MAY-2022	20	200	0.75667
8	579289003	17-MAY-2022	20	200	0.74342
9	1205089187 MB	17-MAY-2022	20		0.76992
10	1205089188 DUP (579287001)	17-MAY-2022	20	200	0.74119
11	1205089189 LCS	17-MAY-2022	20		0.76992

Reagent/Solvent Lot ID	Description	Amount	Comments:
------------------------	-------------	--------	-----------

VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 09:56:37.25

```
*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287001.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM14.CNF;822
Background date    : 15-MAY-2022 09:12:25
Sample date       : 29-MAR-2022 13:03:00 Acquisition date : 17-MAY-2022 07:56:16
Sample ID        : G579287001 Sample quantity : 7.41190E-01 FILTER
Detector name    : GAM14 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:00.73 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : RXF2
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID        : 2264689 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
```

BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.34*	20	64	1.01	92.99	89	8	2.80E-03	78.8	
2	3	182.51	25	47	1.44	365.29	361	19	3.53E-03	61.0	8.13E-01
3	0	240.75	39	82	4.98	481.77	475	14	5.46E-03	51.9	
4	0	352.54	20	23	1.01	705.33	701	8	2.76E-03	48.1	
5	0	409.78	17	8	1.51	819.79	817	6	2.31E-03	37.3	
6	0	448.98	29	5	2.90	898.18	894	9	3.96E-03	23.0	
7	0	452.97	8	9	0.54	906.16	902	6	1.14E-03	67.1	
8	0	477.92	59	30	1.05	956.05	951	11	8.13E-03	22.4	
9	0	568.02*	2	25	2.86	1136.24	1126	12	2.95E-04	496.4	
10	0	570.37*	8	14	2.21	1140.95	1137	10	1.11E-03	101.8	
11	0	583.66*	20	17	0.60	1167.52	1164	12	2.73E-03	55.2	
12	0	713.62	8	16	3.45	1427.43	1421	12	1.06E-03	115.2	
13	0	724.22	7	8	1.45	1448.61	1444	7	9.72E-04	78.7	
14	0	773.91	4	7	0.61	1548.00	1544	7	5.56E-04	120.5	
15	0	836.70	11	14	0.64	1673.58	1667	11	1.57E-03	70.0	
16	0	911.90*	6	15	0.92	1823.97	1820	10	9.01E-04	137.6	
17	0	918.49	7	4	1.13	1837.15	1833	7	9.03E-04	61.8	
18	0	942.30*	6	4	0.57	1884.77	1880	8	8.06E-04	86.4	
19	0	1121.82	8	10	1.41	2243.81	2238	8	1.12E-03	76.5	
20	0	1255.37	11	0	1.06	2510.91	2507	8	1.53E-03	30.2	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 09:56:38

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287001.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 29-MAR-2022 13:03:00	Acquisition date	: 17-MAY-2022 07:56:16
Sample ID	: G579287001	Sample quantity	: 0.74119 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA14	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.73 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	59	10.44*	2.248E+00	1.264E+02	2.387E+02	44.82
TL-208	277.37	-----	6.60	3.299E+00	-----	Line Not Found	-----
	583.19	20	85.00*	1.929E+00	6.076E+00	6.378E+00	110.35
	860.56	-----	12.50	1.390E+00	-----	Line Not Found	-----
PB-210	46.54	20	4.25*	3.520E-01	6.825E+02	6.853E+02	157.62
BI-211	72.87	-----	1.23	2.699E+00	-----	Line Not Found	-----
	351.06	20	12.92*	2.797E+00	2.781E+01	2.792E+01	96.18
RA-224	240.99	39	4.10*	3.623E+00	1.339E+02	1.406E+02	103.72

Flag: "*" = Keyline

```

*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                          *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287001.CNF;1      *
* Acquisition date   : 17-MAY-2022 07:56:16 Sensitivity      : 3.000                *
* Detector ID        : GAM14 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:00.73 Half life ratio : *****      *
* Sample date        : 29-MAR-2022 13:03:00 Analyst initials: RXF2      *
* Sample ID          : G579287001 Sample Quantity : 7.4119E-01 FILTER *
* Batch Number       : 2264689 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000           *
* Nuclide Library    : LIQUID.NLB;26
*****
*                                     CALIBRATION INFORMATION                       *
*
* Eff. Cal. date     : 9-MAY-2022 05:17:58 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13
*****

```

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	2.387E+02	1.049E+02	8.062E+01
TL-208	6.378E+00	6.897E+00	5.518E+00
PB-210	6.853E+02	1.059E+03	1.034E+03
BI-211	2.792E+01	2.632E+01	3.172E+01
RA-224	1.406E+02	1.429E+02	1.180E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	2.443E+00		3.815E+00	8.984E+00	NOT IDENT.
NA-24	0.000E+00		8.705E+23	0.000E+00	SHORT HLIF
AL-26	-6.835E-01		2.935E+00	6.187E+00	NOT IDENT.
K-40	1.012E+01		5.351E+01	1.079E+02	NOT IDENT.
SC-46	-2.418E+00		4.657E+00	8.138E+00	FAIL ABUN
V-48	-3.002E+01		3.107E+01	4.690E+01	NOT IDENT.
CR-51	3.839E+01		9.970E+01	1.759E+02	NOT IDENT.
MN-52	-1.630E+01		1.695E+03	3.547E+03	NOT IDENT.
MN-54	6.867E-01		3.739E+00	7.503E+00	NOT IDENT.
CO-56	-9.987E-01		4.869E+00	9.174E+00	NOT IDENT.
CO-57	9.525E-01		2.300E+00	4.427E+00	NOT IDENT.
NI-57	0.000E+00		2.698E+10	0.000E+00	SHORT HLIF
CO-58	1.500E+00		4.314E+00	9.301E+00	NOT IDENT.
FE-59	-4.511E-01		1.283E+01	2.525E+01	NOT IDENT.
CO-60	-7.567E-01		3.539E+00	7.199E+00	NOT IDENT.
ZN-65	1.563E+00		8.677E+00	1.694E+01	NOT IDENT.
CU-67	0.000E+00		2.721E+06	0.000E+00	SHORT HLIF
GE-68	5.126E-01		1.189E+02	2.369E+02	NOT IDENT.
AS-73	5.022E+00		1.437E+02	2.737E+02	NOT IDENT.
AS-74	1.246E+01		3.170E+01	6.562E+01	NOT IDENT.
SE-75	6.075E-01		4.980E+00	9.079E+00	NOT IDENT.
BR-77	0.000E+00		2.046E+07	0.000E+00	SHORT HLIF
SR-82	-2.967E+01		8.673E+01	1.384E+02	NOT IDENT.
RB-83	-5.067E+00		7.240E+00	1.274E+01	NOT IDENT.
RB-84	-2.132E+00		1.114E+01	2.147E+01	NOT IDENT.

KR-85	-3.436E+03	1.169E+03	1.575E+03	NOT IDENT.
SR-85	-2.572E+01	8.748E+00	1.179E+01	NOT IDENT.
RB-86	2.265E+01	2.457E+02	4.972E+02	NOT IDENT.
Y-88	7.977E-01	5.456E+00	1.206E+01	NOT IDENT.
Y-91	7.274E+02	2.466E+03	5.467E+03	NOT IDENT.
NB-94	-1.510E+00	2.617E+00	4.609E+00	NOT IDENT.
NB-95	-2.358E+00	5.679E+00	1.019E+01	NOT IDENT.
NB-95M	6.829E+00	1.612E+01	2.834E+01	NOT IDENT.
TC-95M	-4.962E+00	6.843E+00	1.044E+01	NOT IDENT.
ZR-95	6.947E+00	8.722E+00	1.975E+01	FAIL ABUN
MO-99	0.000E+00	5.252E+06	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
RH-101	-7.193E-01	2.691E+00	4.803E+00	NOT IDENT.
RH-102M	-2.287E+00	3.157E+00	4.783E+00	NOT IDENT.
RU-103	-5.887E+00	6.497E+00	1.101E+01	NOT IDENT.
RH-106	-1.187E+01	2.959E+01	5.434E+01	NOT IDENT.
RU-106	-1.187E+01	2.959E+01	5.434E+01	NOT IDENT.
AG-108M	-1.733E+00	2.574E+00	4.605E+00	FAIL ABUN
CD-109	-2.267E+01	6.448E+01	1.158E+02	NOT IDENT.
AG-110	-1.021E+01	7.493E+01	1.247E+02	NOT IDENT.
AG-110M	1.480E+00	5.184E+00	1.069E+01	NOT IDENT.
IN-111	0.000E+00	4.414E+05	0.000E+00	SHORT HLIF
SN-113	1.118E+00	5.045E+00	1.013E+01	NOT IDENT.
IN-114M	5.069E+00	3.122E+01	5.254E+01	NOT IDENT.
CD-115	0.000E+00	3.206E+07	0.000E+00	SHORT HLIF
SN-117M	-1.570E+01	2.727E+01	4.632E+01	NOT IDENT.
SB-122	0.000E+00	1.020E+06	0.000E+00	SHORT HLIF
I-123	0.000E+00	1.138E+27	0.000E+00	SHORT HLIF
TE-123M	-2.157E+00	3.099E+00	5.185E+00	NOT IDENT.
SB-124	2.367E+00	4.640E+00	1.742E+01	FAIL ABUN
SB-125	3.817E+00	7.723E+00	1.634E+01	NOT IDENT.
TE-125M	-3.588E+02	1.295E+03	2.317E+03	NOT IDENT.
I-126	-1.361E+01	1.101E+02	1.981E+02	NOT IDENT.
SB-126	-5.120E+01	1.057E+02	1.624E+02	NOT IDENT.
SN-126	2.159E+00	5.676E+00	1.105E+01	NOT IDENT.
SB-127	0.000E+00	4.669E+04	0.000E+00	SHORT HLIF
TE-129	-8.861E+00	8.472E+01	1.649E+02	NOT IDENT.
I-131	-3.909E+01	1.888E+02	3.629E+02	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	9.866E+04	0.000E+00	SHORT HLIF
BA-133	1.334E+00	3.975E+00	7.455E+00	NOT IDENT.
I-133	0.000E+00	2.432E+17	0.000E+00	SHORT HLIF
CS-134	1.824E+00	3.568E+00	7.726E+00	FAIL ABUN
I-135	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
CS-136	3.312E+01	4.292E+01	1.064E+02	NOT IDENT.
BA-137M	7.710E-01	3.394E+00	6.674E+00	NOT IDENT.
CS-137	8.145E-01	3.585E+00	7.050E+00	NOT IDENT.
LA-138	-1.312E-01	5.607E+00	1.187E+01	NOT IDENT.
CE-139	5.628E-01	3.078E+00	5.692E+00	NOT IDENT.
BA-140	1.630E+02	1.567E+02	3.487E+02	NOT IDENT.
LA-140	-1.896E+01	5.533E+01	1.081E+02	NOT IDENT.
CE-141	-6.456E+00	1.333E+01	2.186E+01	NOT IDENT.
CE-143	0.000E+00	2.590E+11	0.000E+00	SHORT HLIF
CE-144	-2.475E+00	1.850E+01	3.338E+01	NOT IDENT.
PM-144	-1.110E+00	3.960E+00	7.247E+00	FAIL ABUN
PR-144	-8.351E+01	3.018E+02	5.526E+02	NOT IDENT.
PM-146	2.791E+00	3.668E+00	8.146E+00	FAIL ABUN
ND-147	-5.504E+01	3.864E+02	7.531E+02	NOT IDENT.
PM-147	-5.072E+03	6.223E+04	1.140E+05	NOT IDENT.
PM-149	0.000E+00	3.100E+08	0.000E+00	SHORT HLIF
EU-152	1.984E+00	8.267E+00	1.552E+01	NOT IDENT.
GD-153	-1.862E+00	7.372E+00	1.339E+01	NOT IDENT.
EU-154	6.979E+00	1.067E+01	2.516E+01	FAIL ABUN
EU-155	3.374E+00	7.970E+00	1.564E+01	NOT IDENT.
TB-160	2.103E+00	1.344E+01	2.853E+01	FAIL ABUN
HO-166M	1.175E+00	5.264E+00	1.077E+01	FAIL ABUN
TM-171	-2.963E+02	2.450E+03	4.594E+03	NOT IDENT.
LU-176	1.752E+00	2.369E+00	4.712E+00	NOT IDENT.
LU-177	-3.046E+03	3.312E+03	5.269E+03	NOT IDENT.
HF-181	3.137E-01	7.309E+00	1.311E+01	NOT IDENT.
W-181	7.917E+00	2.588E+01	5.092E+01	NOT IDENT.
TA-182	-7.344E+00	1.444E+01	2.765E+01	FAIL ABUN
RE-183	-9.625E+00	3.494E+01	5.835E+01	NOT IDENT.
RE-184	0.000E+00	1.864E+01	3.774E+01	NOT IDENT.
RE-188	-3.407E+00	1.882E+01	3.365E+01	FAIL ABUN
W-188	-8.970E+02	1.028E+03	1.601E+03	NOT IDENT.
OS-191	1.144E+01	6.208E+01	1.159E+02	NOT IDENT.
IR-192	-5.162E-01	4.673E+00	8.182E+00	NOT IDENT.

PB-201	0.000E+00	2.343E+38	0.000E+00	SHORT HLIF
TL-201	0.000E+00	1.232E+06	0.000E+00	SHORT HLIF
TL-202	-5.360E+00	3.989E+01	7.739E+01	NOT IDENT.
HG-203	1.257E+00	5.538E+00	1.027E+01	NOT IDENT.
PB-203	0.000E+00	1.682E+07	0.000E+00	SHORT HLIF
TL-204	-1.162E+02	4.376E+02	8.002E+02	NOT IDENT.
BI-207	-1.110E+00	5.777E+00	1.059E+01	FAIL ABUN
PB-211	1.085E+01	5.631E+01	1.152E+02	NOT IDENT.
BI-212	-3.181E+01	6.062E+01	9.555E+01	NOT IDENT.
PB-212	-2.277E+00	7.466E+00	1.269E+01	NOT IDENT.
BI-213	1.560E+00	9.262E+00	1.864E+01	NOT IDENT.
BI-214	8.092E-01	8.270E+00	1.480E+01	NOT IDENT.
PB-214	1.009E+01	9.512E+00	1.478E+01	FAIL ABUN
RN-219	-2.768E+01	3.114E+01	5.400E+01	NOT IDENT.
FR-221	8.927E+00	1.881E+01	3.564E+01	NOT IDENT.
RA-223	6.474E+01	6.141E+01	1.250E+02	NOT IDENT.
AC-225	2.634E+02	5.551E+02	1.052E+03	NOT IDENT.
RA-226	-5.400E+01	7.894E+01	1.409E+02	NOT IDENT.
AC-227	-9.795E+00	2.211E+01	3.733E+01	NOT IDENT.
TH-227	-9.795E+00	2.211E+01	3.733E+01	NOT IDENT.
AC-228	9.807E+00	2.645E+01	3.801E+01	FAIL ABUN
RA-228	9.807E+00	2.645E+01	3.801E+01	FAIL ABUN
TH-228	-2.277E+00	7.466E+00	1.269E+01	NOT IDENT.
TH-229	1.360E+01	4.439E+01	8.321E+01	NOT IDENT.
TH-230	-1.270E+03	1.190E+03	1.918E+03	NOT IDENT.
PA-231	-1.381E+01	4.028E+01	6.865E+01	NOT IDENT.
TH-231	-2.488E+01	3.964E+01	6.400E+01	NOT IDENT.
TH-232	-1.947E+03	2.214E+03	3.744E+03	NOT IDENT.
PA-233	7.482E-01	5.660E+00	1.041E+01	NOT IDENT.
PA-234	2.995E-01	2.340E+01	4.335E+01	FAIL ABUN
PA-234M	1.071E+02	4.436E+02	8.921E+02	NOT IDENT.
TH-234	-7.207E+01	1.578E+02	2.773E+02	NOT IDENT.
U-234	9.803E+02	8.164E+03	1.570E+04	NOT IDENT.
U-235	-1.660E+01	2.081E+01	3.301E+01	NOT IDENT.
NP-237	7.482E-01	5.660E+00	1.041E+01	NOT IDENT.
NP-238	0.000E+00	1.094E+08	0.000E+00	SHORT HLIF
U-238	-7.207E+01	1.578E+02	2.773E+02	NOT IDENT.
NP-239	-9.325E+00	2.198E+01	3.874E+01	NOT IDENT.
AM-241	-1.299E+01	1.848E+01	2.938E+01	NOT IDENT.
AM-242	-7.948E+00	5.221E+01	9.559E+01	NOT IDENT.
AM-243	1.625E-01	4.730E+00	8.839E+00	NOT IDENT.
CM-243	-1.158E+01	8.207E+00	1.267E+01	NOT IDENT.
BK-247	-7.468E-01	7.329E+00	1.297E+01	NOT IDENT.
CM-247	-1.787E+00	2.820E+00	5.121E+00	NOT IDENT.
CF-249	1.561E+00	3.644E+00	7.497E+00	NOT IDENT.
CF-251	-1.151E+01	1.208E+01	1.942E+01	NOT IDENT.
CF-252	-1.849E+03	1.536E+04	2.814E+04	NOT IDENT.
ANH-511	-1.409E+01	6.888E+00	1.332E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.34	31	64	1.01	92.99	89	8	4.31E-03	49.0	8.13E-01
2	0	92.81	63	137	1.06	185.92	181	11	8.79E-03	38.2	
3	3	182.51	25	47	1.44	365.29	361	19	3.53E-03	61.0	
4	3	185.80	38	75	1.44	371.87	361	19	5.23E-03	43.6	
5	0	240.75	39	82	4.98	481.77	475	14	5.46E-03	51.9	
6	0	352.54	20	23	1.01	705.33	701	8	2.76E-03	48.1	
7	0	409.78	17	8	1.51	819.79	817	6	2.31E-03	37.3	
8	0	448.98	29	5	2.90	898.18	894	9	3.96E-03	23.0	
9	0	452.97	8	9	0.54	906.16	902	6	1.14E-03	67.1	
10	0	477.92	59	30	1.05	956.05	951	11	8.13E-03	22.4	
11	0	511.09	145	66	2.22	1022.39	1014	19	2.02E-02	15.5	
12	0	568.02	7	25	2.86	1136.24	1126	12	1.00E-03	141.3	
13	0	570.37	13	14	2.21	1140.95	1137	10	1.81E-03	58.5	
14	0	583.66	26	17	0.60	1167.52	1164	12	3.55E-03	40.2	
15	0	713.62	8	16	3.45	1427.43	1421	12	1.06E-03	115.2	
16	0	724.22	7	8	1.45	1448.61	1444	7	9.72E-04	78.7	
17	0	773.91	4	7	0.61	1548.00	1544	7	5.56E-04	120.5	
18	0	836.70	11	14	0.64	1673.58	1667	11	1.57E-03	70.0	
19	0	911.90	17	15	0.92	1823.97	1820	10	2.36E-03	49.0	
20	0	918.49	7	4	1.13	1837.15	1833	7	9.03E-04	61.8	
21	0	942.30	9	4	0.57	1884.77	1880	8	1.30E-03	48.8	
22	0	1121.82	8	10	1.41	2243.81	2238	8	1.12E-03	76.5	
23	0	1255.37	11	0	1.06	2510.91	2507	8	1.53E-03	30.2	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	59	10.44*	2.248E+00	1.264E+02	2.387E+02	44.82
TL-208	277.37	-----	6.60	3.299E+00	-----	Line Not Found	-----
	583.19	20	85.00*	1.929E+00	6.076E+00	6.378E+00	110.35
	860.56	-----	12.50	1.390E+00	-----	Line Not Found	-----
PB-210	46.54	20	4.25*	3.520E-01	6.825E+02	6.853E+02	157.62
BI-211	72.87	-----	1.23	2.699E+00	-----	Line Not Found	-----
	351.06	20	12.92*	2.797E+00	2.781E+01	2.792E+01	96.18
RA-224	240.99	39	4.10*	3.623E+00	1.339E+02	1.406E+02	103.72

Flag: "*" = Keyline

Total number of lines in spectrum 20
Number of unidentified lines 6
Number of lines tentatively identified by NID 14 70.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.89	1.264E+02	2.387E+02	1.070E+02	44.82	
TL-208	1.91Y	1.05	6.076E+00	6.378E+00	7.038E+00	110.35	
PB-210	22.20Y	1.00	6.825E+02	6.853E+02	10.80E+02	157.62	
BI-211	21.77Y	1.00	2.781E+01	2.792E+01	2.686E+01	96.18	
RA-224	1.91Y	1.05	1.339E+02	1.406E+02	1.458E+02	103.72	

Total Activity : 9.766E+02 1.099E+03

Grand Total Activity : 9.766E+02 1.099E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
3	182.51	25	47	1.44	365.29	361	19	3.53E-03	****	4.27E+00	T
0	409.78	17	8	1.51	819.79	817	6	2.31E-03	74.6	2.51E+00	T
0	448.98	29	5	2.90	898.18	894	9	3.96E-03	46.1	2.35E+00	
0	452.97	8	9	0.54	906.16	902	6	1.14E-03	****	2.34E+00	T
0	568.02	2	25	2.86	1136.24	1126	12	2.95E-04	****	1.97E+00	
0	570.37	8	14	2.21	1140.95	1137	10	1.11E-03	****	1.96E+00	T
0	713.62	8	16	3.45	1427.43	1421	12	1.06E-03	****	1.64E+00	
0	724.22	7	8	1.45	1448.61	1444	7	9.72E-04	****	1.62E+00	T
0	773.91	4	7	0.61	1548.00	1544	7	5.56E-04	****	1.53E+00	T
0	836.70	11	14	0.64	1673.58	1667	11	1.57E-03	****	1.43E+00	T
0	911.90	6	15	0.92	1823.97	1820	10	9.01E-04	****	1.32E+00	T
0	918.49	7	4	1.13	1837.15	1833	7	9.03E-04	****	1.31E+00	
0	942.30	6	4	0.57	1884.77	1880	8	8.06E-04	****	1.28E+00	
0	1121.82	8	10	1.41	2243.81	2238	8	1.12E-03	****	1.09E+00	T
0	1255.37	11	0	1.06	2510.91	2507	8	1.53E-03	60.3	9.88E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287001.CNF;1  *
* Acquisition date   : 17-MAY-2022 07:56:16 Sensitivity      : 3.000          *
* Detector ID        : GAM14 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 02:00:00.73 Half life ratio  : *****          *
* Sample date        : 29-MAR-2022 13:03:00 Nuclide Library : LIQUID         *
* Sample ID          : G579287001 Analyst initials:  RXF2           *
* Batch Number       : 2264689 Sample Quantity  : 7.4119E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight       : 0.00000         *
*                                     Dry Weight    : 0.00000         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 9-MAY-2022 05:17:58 Eff. Geometry    : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13          *
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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.481E+01
TL-208	2.321E+00
PB-210	4.726E+02
BI-211	1.397E+01
RA-224	5.420E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	3.765E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.192E+00	NOT IDENT.
K-40	4.661E+01	NOT IDENT.
SC-46	3.310E+00	FAIL ABUN
V-48	1.882E+01	NOT IDENT.
CR-51	8.014E+01	NOT IDENT.
MN-52	1.444E+03	NOT IDENT.
MN-54	3.218E+00	NOT IDENT.
CO-56	3.835E+00	NOT IDENT.
CO-57	2.023E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.894E+00	NOT IDENT.
FE-59	1.030E+01	NOT IDENT.
CO-60	2.857E+00	NOT IDENT.
ZN-65	7.053E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	9.721E+01	NOT IDENT.
AS-73	1.249E+02	NOT IDENT.
AS-74	2.871E+01	NOT IDENT.
SE-75	4.088E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	5.788E+01	NOT IDENT.
RB-83	5.300E+00	NOT IDENT.
RB-84	8.685E+00	NOT IDENT.
KR-85	7.125E+02	NOT IDENT.

SR-85	5.333E+00	NOT IDENT.
RB-86	2.057E+02	NOT IDENT.
Y-88	4.779E+00	NOT IDENT.
Y-91	2.275E+03	NOT IDENT.
NB-94	1.891E+00	NOT IDENT.
NB-95	4.340E+00	NOT IDENT.
NB-95M	1.290E+01	NOT IDENT.
TC-95M	4.750E+00	NOT IDENT.
ZR-95	8.504E+00	FAIL ABUN
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.184E+00	NOT IDENT.
RH-102M	2.065E+00	NOT IDENT.
RU-103	4.690E+00	NOT IDENT.
RH-106	2.306E+01	NOT IDENT.
RU-106	2.306E+01	NOT IDENT.
AG-108M	1.989E+00	FAIL ABUN
CD-109	5.274E+01	NOT IDENT.
AG-110	5.241E+01	NOT IDENT.
AG-110M	4.553E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	4.523E+00	NOT IDENT.
IN-114M	2.419E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	2.107E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.355E+00	NOT IDENT.
SB-124	5.507E+00	FAIL ABUN
SB-125	7.197E+00	NOT IDENT.
TE-125M	1.059E+03	NOT IDENT.
I-126	8.261E+01	NOT IDENT.
SB-126	6.906E+01	NOT IDENT.
SN-126	5.039E+00	NOT IDENT.
SB-127	0.000E+00	SHORT HLIF
TE-129	7.193E+01	NOT IDENT.
I-131	1.607E+02	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	3.328E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.301E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	4.356E+01	NOT IDENT.
BA-137M	2.900E+00	NOT IDENT.
CS-137	3.063E+00	NOT IDENT.
LA-138	4.754E+00	NOT IDENT.
CE-139	2.602E+00	NOT IDENT.
BA-140	1.550E+02	NOT IDENT.
LA-140	4.156E+01	NOT IDENT.
CE-141	1.007E+01	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.523E+01	NOT IDENT.
PM-144	3.172E+00	FAIL ABUN
PR-144	2.419E+02	NOT IDENT.
PM-146	3.615E+00	FAIL ABUN
ND-147	3.217E+02	NOT IDENT.
PM-147	5.174E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	6.852E+00	NOT IDENT.
GD-153	6.060E+00	NOT IDENT.
EU-154	1.055E+01	FAIL ABUN
EU-155	7.087E+00	NOT IDENT.
TB-160	1.160E+01	FAIL ABUN
HO-166M	4.616E+00	FAIL ABUN
TM-171	2.096E+03	NOT IDENT.
LU-176	2.119E+00	NOT IDENT.
LU-177	2.365E+03	NOT IDENT.
HF-181	5.711E+00	NOT IDENT.
W-181	2.313E+01	NOT IDENT.
TA-182	1.046E+01	FAIL ABUN
RE-183	2.659E+01	NOT IDENT.
RE-184	1.536E+01	NOT IDENT.
RE-188	1.527E+01	FAIL ABUN
W-188	7.141E+02	NOT IDENT.
OS-191	5.305E+01	NOT IDENT.
IR-192	3.658E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF

TL-201	0.000E+00	SHORT HLIF
TL-202	3.381E+01	NOT IDENT.
HG-203	4.609E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	3.648E+02	NOT IDENT.
BI-207	4.491E+00	FAIL ABUN
PB-211	5.043E+01	NOT IDENT.
BI-212	4.109E+01	NOT IDENT.
PB-212	5.897E+00	NOT IDENT.
BI-213	8.216E+00	NOT IDENT.
BI-214	6.593E+00	NOT IDENT.
PB-214	6.704E+00	FAIL ABUN
RN-219	2.292E+01	NOT IDENT.
FR-221	1.627E+01	NOT IDENT.
RA-223	5.672E+01	NOT IDENT.
AC-225	4.800E+02	NOT IDENT.
RA-226	6.597E+01	NOT IDENT.
AC-227	1.659E+01	NOT IDENT.
TH-227	1.659E+01	NOT IDENT.
AC-228	1.697E+01	FAIL ABUN
RA-228	1.697E+01	FAIL ABUN
TH-228	5.897E+00	NOT IDENT.
TH-229	3.786E+01	NOT IDENT.
TH-230	8.778E+02	NOT IDENT.
PA-231	3.023E+01	NOT IDENT.
TH-231	2.913E+01	NOT IDENT.
TH-232	1.728E+03	NOT IDENT.
PA-233	4.621E+00	NOT IDENT.
PA-234	1.720E+01	FAIL ABUN
PA-234M	3.789E+02	NOT IDENT.
TH-234	1.283E+02	NOT IDENT.
U-234	7.161E+03	NOT IDENT.
U-235	1.518E+01	NOT IDENT.
NP-237	4.621E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.283E+02	NOT IDENT.
NP-239	1.754E+01	NOT IDENT.
AM-241	1.333E+01	NOT IDENT.
AM-242	4.343E+01	NOT IDENT.
AM-243	4.064E+00	NOT IDENT.
CM-243	5.598E+00	NOT IDENT.
BK-247	5.815E+00	NOT IDENT.
CM-247	2.188E+00	NOT IDENT.
CF-249	3.353E+00	NOT IDENT.
CF-251	8.800E+00	NOT IDENT.
CF-252	1.283E+04	NOT IDENT.
ANH-511	6.344E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579287001.CNF;1
* Acquisition date   : 17-MAY-2022 07:56:16 Sensitivity      : 3.000
* Detector ID        : GAM14 Energy tolerance: 1.500
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 02:00:00.73 Half life ratio  : *****
* Sample date        : 29-MAR-2022 13:03:00 Nuclide Library : LIQUID
* Sample ID          : G579287001 Analyst initials: RXF2
* Batch Number       : 2264689 Sample Quantity : 7.4119E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 9-MAY-2022 05:17:58 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	2.387E+02	1.068E+02	1.069E+02
TL-208	6.378E+00	6.918E+00	6.919E+00
PB-210	6.853E+02	1.061E+03	1.061E+03
BI-211	2.792E+01	2.643E+01	2.643E+01
RA-224	1.406E+02	1.434E+02	1.434E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	2.443E+00	3.822E+00	3.977E+00	NOT IDENT.
NA-24	-5.194E+23	8.728E+23	0.000E+00	SHORT HLIF
AL-26	-6.835E-01	2.936E+00	2.952E+00	NOT IDENT.
K-40	1.012E+01	5.352E+01	5.371E+01	NOT IDENT.
SC-46	-2.418E+00	4.663E+00	4.789E+00	FAIL ABUN
V-48	-3.002E+01	3.120E+01	3.401E+01	NOT IDENT.
CR-51	3.839E+01	9.975E+01	1.012E+02	NOT IDENT.
MN-52	-1.630E+01	1.695E+03	1.695E+03	NOT IDENT.
MN-54	6.867E-01	3.739E+00	3.752E+00	NOT IDENT.
CO-56	-9.987E-01	4.870E+00	4.891E+00	NOT IDENT.
CO-57	9.525E-01	2.301E+00	2.341E+00	NOT IDENT.
NI-57	-1.435E+10	2.705E+10	2.781E+10	SHORT HLIF
CO-58	1.500E+00	4.316E+00	4.369E+00	NOT IDENT.
FE-59	-4.511E-01	1.283E+01	1.283E+01	NOT IDENT.
CO-60	-7.567E-01	3.540E+00	3.556E+00	NOT IDENT.
ZN-65	1.563E+00	8.678E+00	8.707E+00	NOT IDENT.
CU-67	-4.588E+06	2.752E+06	3.444E+06	SHORT HLIF
GE-68	5.126E-01	1.189E+02	1.189E+02	NOT IDENT.
AS-73	5.022E+00	1.437E+02	1.437E+02	NOT IDENT.
AS-74	1.246E+01	3.173E+01	3.222E+01	NOT IDENT.
SE-75	6.075E-01	4.980E+00	4.988E+00	NOT IDENT.
BR-77	-7.475E+06	2.047E+07	2.075E+07	SHORT HLIF
SR-82	-2.967E+01	8.677E+01	8.780E+01	NOT IDENT.
RB-83	-5.067E+00	7.283E+00	7.634E+00	NOT IDENT.
RB-84	-2.132E+00	1.114E+01	1.118E+01	NOT IDENT.

KR-85	-3.436E+03	1.204E+03	1.963E+03	NOT IDENT.
SR-85	-2.572E+01	9.012E+00	1.469E+01	NOT IDENT.
RB-86	2.265E+01	2.457E+02	2.459E+02	NOT IDENT.
Y-88	7.977E-01	5.456E+00	5.468E+00	NOT IDENT.
Y-91	7.274E+02	2.467E+03	2.488E+03	NOT IDENT.
NB-94	-1.510E+00	2.620E+00	2.707E+00	NOT IDENT.
NB-95	-2.358E+00	5.683E+00	5.781E+00	NOT IDENT.
NB-95M	6.829E+00	1.613E+01	1.643E+01	NOT IDENT.
TC-95M	-4.962E+00	6.857E+00	7.213E+00	NOT IDENT.
ZR-95	6.947E+00	8.744E+00	9.289E+00	FAIL ABUN
MO-99	1.787E+05	5.252E+06	5.253E+06	SHORT HLIF
TC-99M	-1.000E+41	6.222E+41	0.000E+00	SHORT HLIF
RH-101	-7.193E-01	2.694E+00	2.714E+00	NOT IDENT.
RH-102M	-2.287E+00	3.168E+00	3.332E+00	NOT IDENT.
RU-103	-5.887E+00	6.517E+00	7.038E+00	NOT IDENT.
RH-106	-1.187E+01	2.962E+01	3.010E+01	NOT IDENT.
RU-106	-1.187E+01	2.962E+01	3.010E+01	NOT IDENT.
AG-108M	-1.733E+00	2.578E+00	2.694E+00	FAIL ABUN
CD-109	-2.267E+01	6.451E+01	6.532E+01	NOT IDENT.
AG-110	-1.021E+01	7.494E+01	7.508E+01	NOT IDENT.
AG-110M	1.480E+00	5.186E+00	5.229E+00	NOT IDENT.
IN-111	4.488E+05	4.430E+05	4.871E+05	SHORT HLIF
SN-113	1.118E+00	5.045E+00	5.070E+00	NOT IDENT.
IN-114M	5.069E+00	3.122E+01	3.130E+01	NOT IDENT.
CD-115	1.615E+06	3.206E+07	3.207E+07	SHORT HLIF
SN-117M	-1.570E+01	2.730E+01	2.820E+01	NOT IDENT.
SB-122	1.467E+05	1.020E+06	1.022E+06	SHORT HLIF
I-123	-7.883E+26	1.140E+27	0.000E+00	SHORT HLIF
TE-123M	-2.157E+00	3.103E+00	3.252E+00	NOT IDENT.
SB-124	2.367E+00	4.644E+00	4.766E+00	FAIL ABUN
SB-125	3.817E+00	7.729E+00	7.919E+00	NOT IDENT.
TE-125M	-3.588E+02	1.295E+03	1.305E+03	NOT IDENT.
I-126	-1.361E+01	1.101E+02	1.103E+02	NOT IDENT.
SB-126	-5.120E+01	1.059E+02	1.084E+02	NOT IDENT.
SN-126	2.159E+00	5.679E+00	5.762E+00	NOT IDENT.
SB-127	-1.014E+04	4.675E+04	4.697E+04	SHORT HLIF
TE-129	-8.861E+00	8.473E+01	8.483E+01	NOT IDENT.
I-131	-3.909E+01	1.888E+02	1.897E+02	NOT IDENT.
I-132	-1.000E+41	4.219E+41	0.000E+00	SHORT HLIF
TE-132	2.981E+04	9.872E+04	9.964E+04	SHORT HLIF
BA-133	1.334E+00	3.976E+00	4.022E+00	NOT IDENT.
I-133	-1.691E+17	2.488E+17	0.000E+00	SHORT HLIF
CS-134	1.824E+00	3.572E+00	3.666E+00	FAIL ABUN
I-135	1.000E+41	8.070E+41	0.000E+00	SHORT HLIF
CS-136	3.312E+01	4.310E+01	4.562E+01	NOT IDENT.
BA-137M	7.710E-01	3.395E+00	3.412E+00	NOT IDENT.
CS-137	8.145E-01	3.586E+00	3.605E+00	NOT IDENT.
LA-138	-1.312E-01	5.607E+00	5.607E+00	NOT IDENT.
CE-139	5.628E-01	3.081E+00	3.091E+00	NOT IDENT.
BA-140	1.630E+02	1.573E+02	1.736E+02	NOT IDENT.
LA-140	-1.896E+01	5.536E+01	5.601E+01	NOT IDENT.
CE-141	-6.456E+00	1.334E+01	1.365E+01	NOT IDENT.
CE-143	1.023E+11	2.592E+11	2.632E+11	SHORT HLIF
CE-144	-2.475E+00	1.850E+01	1.853E+01	NOT IDENT.
PM-144	-1.110E+00	3.961E+00	3.993E+00	FAIL ABUN
PR-144	-8.351E+01	3.019E+02	3.042E+02	NOT IDENT.
PM-146	2.791E+00	3.679E+00	3.889E+00	FAIL ABUN
ND-147	-5.504E+01	3.864E+02	3.872E+02	NOT IDENT.
PM-147	-5.072E+03	6.223E+04	6.227E+04	NOT IDENT.
PM-149	1.171E+07	3.100E+08	3.100E+08	SHORT HLIF
EU-152	1.984E+00	8.269E+00	8.317E+00	NOT IDENT.
GD-153	-1.862E+00	7.373E+00	7.421E+00	NOT IDENT.
EU-154	6.979E+00	1.069E+01	1.115E+01	FAIL ABUN
EU-155	3.374E+00	7.976E+00	8.120E+00	NOT IDENT.
TB-160	2.103E+00	1.344E+01	1.347E+01	FAIL ABUN
HO-166M	1.175E+00	5.265E+00	5.292E+00	FAIL ABUN
TM-171	-2.963E+02	2.450E+03	2.453E+03	NOT IDENT.
LU-176	1.752E+00	2.373E+00	2.502E+00	NOT IDENT.
LU-177	-3.046E+03	3.320E+03	3.593E+03	NOT IDENT.
HF-181	3.137E-01	7.309E+00	7.311E+00	NOT IDENT.
W-181	7.917E+00	2.596E+01	2.620E+01	NOT IDENT.
TA-182	-7.344E+00	1.446E+01	1.483E+01	FAIL ABUN
RE-183	-9.625E+00	3.496E+01	3.523E+01	NOT IDENT.
RE-184	0.000E+00	1.864E+01	0.000E+00	NOT IDENT.
RE-188	-3.407E+00	1.882E+01	1.889E+01	FAIL ABUN
W-188	-8.970E+02	1.035E+03	1.111E+03	NOT IDENT.
OS-191	1.144E+01	6.209E+01	6.230E+01	NOT IDENT.
IR-192	-5.162E-01	4.673E+00	4.679E+00	NOT IDENT.

PB-201	2.430E+37	2.347E+38	0.000E+00	SHORT HLIF
TL-201	-8.930E+05	1.233E+06	1.298E+06	SHORT HLIF
TL-202	-5.360E+00	3.989E+01	3.996E+01	NOT IDENT.
HG-203	1.257E+00	5.539E+00	5.568E+00	NOT IDENT.
PB-203	3.820E+06	1.683E+07	1.692E+07	SHORT HLIF
TL-204	-1.162E+02	4.377E+02	4.409E+02	NOT IDENT.
BI-207	-1.110E+00	5.778E+00	5.800E+00	FAIL ABUN
PB-211	1.085E+01	5.631E+01	5.653E+01	NOT IDENT.
BI-212	-3.181E+01	6.069E+01	6.236E+01	NOT IDENT.
PB-212	-2.277E+00	7.468E+00	7.538E+00	NOT IDENT.
BI-213	1.560E+00	9.262E+00	9.289E+00	NOT IDENT.
BI-214	8.092E-01	8.270E+00	8.278E+00	NOT IDENT.
PB-214	1.009E+01	9.549E+00	1.058E+01	FAIL ABUN
RN-219	-2.768E+01	3.140E+01	3.379E+01	NOT IDENT.
FR-221	8.927E+00	1.883E+01	1.926E+01	NOT IDENT.
RA-223	6.474E+01	6.172E+01	6.828E+01	NOT IDENT.
AC-225	2.634E+02	5.559E+02	5.685E+02	NOT IDENT.
RA-226	-5.400E+01	7.906E+01	8.272E+01	NOT IDENT.
AC-227	-9.795E+00	2.216E+01	2.260E+01	NOT IDENT.
TH-227	-9.795E+00	2.216E+01	2.260E+01	NOT IDENT.
AC-228	9.807E+00	2.646E+01	2.683E+01	FAIL ABUN
RA-228	9.807E+00	2.646E+01	2.683E+01	FAIL ABUN
TH-228	-2.277E+00	7.468E+00	7.538E+00	NOT IDENT.
TH-229	1.360E+01	4.440E+01	4.482E+01	NOT IDENT.
TH-230	-1.270E+03	1.211E+03	1.340E+03	NOT IDENT.
PA-231	-1.381E+01	4.040E+01	4.088E+01	NOT IDENT.
TH-231	-2.488E+01	3.980E+01	4.136E+01	NOT IDENT.
TH-232	-1.947E+03	2.228E+03	2.395E+03	NOT IDENT.
PA-233	7.482E-01	5.660E+00	5.670E+00	NOT IDENT.
PA-234	2.995E-01	2.340E+01	2.340E+01	FAIL ABUN
PA-234M	1.071E+02	4.437E+02	4.464E+02	NOT IDENT.
TH-234	-7.207E+01	1.587E+02	1.620E+02	NOT IDENT.
U-234	9.803E+02	8.165E+03	8.176E+03	NOT IDENT.
U-235	-1.660E+01	2.085E+01	2.216E+01	NOT IDENT.
NP-237	7.482E-01	5.660E+00	5.670E+00	NOT IDENT.
NP-238	-7.089E+07	1.096E+08	1.142E+08	SHORT HLIF
U-238	-7.207E+01	1.587E+02	1.620E+02	NOT IDENT.
NP-239	-9.325E+00	2.199E+01	2.239E+01	NOT IDENT.
AM-241	-1.299E+01	1.852E+01	1.943E+01	NOT IDENT.
AM-242	-7.948E+00	5.223E+01	5.235E+01	NOT IDENT.
AM-243	1.625E-01	4.730E+00	4.731E+00	NOT IDENT.
CM-243	-1.158E+01	8.301E+00	9.807E+00	NOT IDENT.
BK-247	-7.468E-01	7.331E+00	7.338E+00	NOT IDENT.
CM-247	-1.787E+00	2.839E+00	2.951E+00	NOT IDENT.
CF-249	1.561E+00	3.648E+00	3.715E+00	NOT IDENT.
CF-251	-1.151E+01	1.217E+01	1.323E+01	NOT IDENT.
CF-252	-1.849E+03	1.545E+04	1.547E+04	NOT IDENT.
ANH-511	-1.409E+01	6.989E+00	9.449E+00	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	27.3639	133.52	27.9369	116.30	0.0000
879.38	37.8461	364.49	33.5289	116.74	37.6649
46.54	37.9446	80.22	0.0000	117.23	27.7736
228.16	0.0000	711.68	28.8934	119.76	40.8226
52.39	34.9399	356.01	28.9173	120.54	39.8727
53.20	34.2278	323.87	28.9213	120.90	34.9073
53.44	36.0048	82.35	0.0000	264.66	33.9209
57.53	34.4904	82.47	27.1280	121.22	33.9261
293.27	0.0000	82.47	0.0000	344.28	30.9579
57.53	28.3855	83.79	38.4494	122.06	30.9707
482.18	28.3856	265.00	38.4644	1274.44	38.0200
57.98	34.6322	84.21	31.9100	123.68	37.0525
59.32	40.0876	84.86	0.0000	1377.63	0.0000
59.54	39.2170	193.51	36.6860	127.23	38.2483
155.04	51.9304	105.31	35.8195	129.43	36.3488
63.00	41.3284	86.79	34.8924	131.20	42.5121
129.43	38.6586	86.94	34.9020	133.02	39.5755
63.29	38.6586	87.09	33.0245	133.52	38.5874
290.67	37.7842	87.57	30.2205	135.34	0.0000
63.81	45.0046	88.03	40.6429	136.00	33.6239
87.57	52.2603	306.78	40.6658	136.28	32.6172
64.99	60.4652	88.47	40.6753	136.47	32.6260
65.08	53.2563	531.02	98.8465	739.50	0.0000
66.73	30.8019	184.58	0.0000	140.51	0.0000
66.98	30.8187	92.59	43.8353	140.88	39.9992
67.24	40.8125	93.31	0.0000	143.76	42.2099
67.67	49.9285	94.56	81.2802	144.24	38.1162
1221.41	48.1210	311.90	77.4676	145.44	38.1754
439.51	38.2275	946.00	77.4701	152.32	27.0632
70.82	38.2275	97.43	34.5951	152.43	27.0672
167.43	0.0000	98.43	32.7287	1048.07	39.6003
97.43	36.4679	98.44	32.7292	154.21	35.4744
70.82	0.0000	99.53	35.6826	155.04	35.5113
70.82	40.2120	103.37	35.6826	158.56	33.4629
279.20	0.0000	116.74	35.6826	158.97	0.0000
1063.66	38.5438	100.11	42.4746	159.00	45.1311
72.87	0.0000	100.20	37.6536	162.33	44.2597
351.06	38.5486	102.03	26.1474	537.26	42.1686
74.66	43.2962	103.18	40.7509	163.33	29.5419
238.63	40.5457	103.37	40.7634	165.86	34.9225
351.93	40.5457	105.31	25.3145	167.43	0.0000
238.63	40.5457	106.12	38.0214	245.35	0.0000
74.97	40.5580	106.47	39.9937	427.87	34.2778
77.11	38.8812	109.28	43.1124	176.60	47.1475
256.23	31.6353	111.00	39.2993	177.52	48.2691
79.82	0.0000	111.76	0.0000	181.07	0.0000
80.02	31.6558	208.37	40.4038	184.41	35.6708
80.03	31.6561	116.24	40.6077	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	35.7221	300.09	21.6359	477.60	13.4854
186.21	35.7413	300.13	21.6365	477.99	13.4882
190.27	42.0639	301.36	22.8605	482.18	14.8712
193.51	29.4744	302.85	15.6593	487.02	15.3620
197.03	31.7758	304.50	20.5034	492.35	0.0000
198.01	36.1955	304.85	22.9220	497.08	20.8962
201.83	29.7327	306.78	16.9151	511.00	40.2693
204.12	44.1522	308.46	24.1949	514.00	91.6667
205.31	27.6287	311.90	19.4067	520.40	14.7148
208.37	41.0181	316.51	25.5598	520.69	0.0000
210.85	24.4499	319.41	19.5161	667.71	0.0000
215.65	33.5005	320.08	23.1870	527.90	0.0000
218.12	29.1040	321.04	31.7518	529.59	13.8599
222.11	33.7120	323.87	17.1330	529.87	0.0000
227.09	27.0989	325.23	30.6252	531.02	12.9456
227.38	29.3651	1596.21	30.7037	537.26	10.2033
228.16	0.0000	331.15	0.0000	1260.41	0.0000
228.18	30.5175	333.37	24.6448	552.55	13.0851
235.69	27.3182	334.37	25.8956	795.86	5.6372
235.96	34.9151	338.28	32.1509	564.24	0.0000
238.63	42.2297	911.20	32.1517	569.33	0.0000
238.98	0.0000	340.48	24.7705	569.50	0.0000
240.99	42.3211	340.55	24.7717	569.70	18.3781
242.00	42.3595	344.28	16.1437	582.08	19.9080
244.70	32.1345	345.93	18.6488	583.19	9.4853
245.35	0.0000	351.06	18.2998	595.83	12.4038
459.60	34.6124	351.93	21.2241	600.60	20.0806
685.70	0.0000	356.01	18.7798	604.72	18.2029
388.16	38.1467	361.25	0.0000	609.32	14.4006
256.23	27.8267	364.49	22.6653	610.33	18.2493
527.90	0.0000	366.42	0.0000	614.28	14.4330
264.66	25.6933	383.85	16.1549	618.01	16.3850
265.00	26.8689	388.16	18.7577	621.93	14.4830
269.46	26.9707	666.33	21.3221	630.19	0.0000
401.81	32.8826	391.70	20.5093	631.29	11.6348
273.65	23.5352	400.66	16.3285	632.98	11.6436
276.40	24.7683	401.32	0.0000	633.25	8.7338
583.19	21.2465	401.81	19.7806	634.78	8.7396
277.60	16.5284	402.40	18.0670	635.95	14.5734
402.40	20.0765	404.85	14.6481	636.99	16.5241
278.43	24.8093	410.95	12.9736	657.50	8.8260
279.20	0.0000	720.70	20.8057	884.68	13.7311
279.54	24.8318	423.72	18.3045	661.66	5.8945
280.46	21.3003	427.09	17.4683	664.57	0.0000
301.36	22.5428	427.87	13.1073	666.33	7.8750
284.31	20.1802	433.94	21.0474	666.50	7.8757
285.41	21.3860	439.51	17.5968	667.71	0.0000
285.90	0.0000	440.45	16.7263	677.62	10.8800
287.50	21.4222	453.88	21.2920	685.70	0.0000
290.67	36.9875	459.60	16.9111	692.65	0.0000
293.27	0.0000	463.37	16.9470	695.00	13.9476
295.22	20.3566	468.07	18.7805	696.49	19.9373
316.51	25.1605	473.00	0.0000	696.51	19.9373
298.58	16.8083	475.06	22.8930	697.00	19.9414
299.98	21.6343	696.49	13.4793	697.49	17.9509

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	11.9922	903.28	6.4551	1291.59	0.9020
706.68	9.0088	907.67	0.0000	1298.22	0.0000
711.68	10.0301	911.20	6.4719	1312.11	9.0662
720.70	16.6094	984.45	0.0000	1332.49	6.3779
721.93	0.0000	926.36	3.2522	1365.19	2.7550
1690.97	10.5786	935.54	6.5239	1368.63	0.0000
722.91	10.5790	937.49	4.8961	1377.63	0.0000
723.31	11.0846	983.53	6.5420	1384.29	8.3029
756.73	12.0967	945.96	0.0000	1408.01	7.4214
727.33	13.6258	946.00	4.9094	1434.09	6.5326
733.00	11.1271	949.00	6.5522	1435.80	5.6016
735.93	11.1401	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	9.8701	1460.82	4.6945
1434.09	13.2084	964.08	5.4865	1489.16	5.6693
747.24	13.2238	966.17	8.7842	1596.21	5.8015
752.31	9.1729	968.97	7.6930	1620.50	4.8593
753.82	11.2180	983.53	14.3521	1678.03	0.0000
756.73	6.1257	984.45	0.0000	1690.97	0.0000
763.94	13.3089	996.26	2.2167	1757.55	0.0000
765.80	15.3674	1001.03	2.2200	1764.49	5.0006
1001.03	14.3464	1004.73	8.8900	1770.23	3.0037
766.84	11.2739	1025.87	0.0000	1771.35	3.0044
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	12.3438	1037.84	4.4896	1808.65	3.0258
777.92	0.0000	1038.76	0.0000	1836.06	4.0552
778.90	12.3550	1046.59	5.6266		
783.70	0.0000	1048.07	2.2516		
1435.80	10.3337	1050.41	9.0130		
903.28	11.3809	1063.66	12.4412		
795.86	7.2526	1077.00	4.5417		
801.95	8.3073	1077.34	4.5420		
802.10	8.3076	1083.85	2.2754		
810.29	4.1663	1085.87	6.8301		
810.45	4.1665	1099.25	6.8560		
810.76	6.2505	1111.64	8.0271		
815.77	7.3056	1112.07	9.1745		
818.51	6.2681	1112.84	11.4705		
832.01	6.2986	1115.54	6.8877		
834.85	10.5082	1120.29	10.3455		
835.15	10.5090	1120.55	9.1966		
836.80	0.0000	1121.30	8.6237		
846.77	10.5526	1808.65	8.0675		
856.80	7.4127	1131.51	0.0000		
860.56	8.4827	1332.49	4.6654		
871.09	9.5775	1177.95	1.7517		
873.19	11.7144	1189.05	7.0278		
875.33	0.0000	1204.77	6.1750		
879.38	5.3361	1221.41	6.2023		
880.51	8.5410	1231.02	5.3295		
881.60	7.4762	1235.36	8.0030		
883.24	7.4802	1238.28	4.4495		
884.68	8.5531	1260.41	0.0000		
889.28	10.7080	1271.87	11.6686		
894.76	11.8003	1274.44	4.4907		
1836.06	7.5178	1274.54	4.4910		

VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 10:00:24.11

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289001.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM43.CNF;499
Background date    : 15-MAY-2022 09:13:56
Sample date       : 29-MAR-2022 12:48:00 Acquisition date : 17-MAY-2022 07:59:56
Sample ID        : G579289001 Sample quantity : 7.38940E-01 FILTER
Detector name    : GAM43 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:00.80 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : RXF2
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID         : 2264689 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	60.97	16	17	1.23	121.78	120	10	2.24E-03	40.5	3.47E+00
2	4	62.68*	4	46	1.24	125.21	120	10	5.25E-04	359.6	
3	0	93.38*	7	89	1.08	186.59	181	10	1.01E-03	280.7	
4	0	148.61	20	28	1.32	297.02	295	5	2.79E-03	45.6	
5	0	185.49*	3	78	1.17	370.77	366	10	3.50E-04	734.8	
6	0	223.82	13	25	1.35	447.41	445	6	1.75E-03	68.4	
7	0	384.03	36	34	5.70	767.71	760	16	4.93E-03	41.2	
8	0	462.74	29	18	2.29	925.03	915	18	4.03E-03	39.0	
9	0	477.46	42	33	1.69	954.48	945	15	5.89E-03	33.5	
10	0	545.51	22	6	2.60	1090.50	1086	11	3.01E-03	30.3	
11	0	556.15	8	11	1.76	1111.76	1108	8	1.14E-03	76.1	
12	0	849.69	13	11	0.52	1698.42	1689	14	1.86E-03	58.1	
13	0	900.22	5	9	2.44	1799.39	1788	13	6.55E-04	143.4	
14	0	952.23	6	6	1.25	1903.32	1894	12	8.91E-04	85.4	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 10:00:24

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289001.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 29-MAR-2022 12:48:00	Acquisition date	: 17-MAY-2022 07:59:56
Sample ID	: G579289001	Sample quantity	: 0.73894 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA43	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.80 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	42	10.44*	1.953E+00	1.056E+02	1.995E+02	67.00
RA-226	186.21	3	3.59*	3.963E+00	8.987E+00	8.988E+00	1469.52
TH-232	63.81	4	0.26*	1.182E+00	6.252E+02	6.252E+02	719.19
	140.88	-----	0.02	4.217E+00	-----	Line Not Found	-----
TH-234	63.29	4	3.70*	1.182E+00	4.393E+01	4.393E+01	719.19
	92.59	7	4.23	3.223E+00	2.709E+01	2.709E+01	561.40
U-238	63.29	4	3.70*	1.182E+00	4.393E+01	4.393E+01	719.19
	92.59	7	4.23	3.223E+00	2.709E+01	2.709E+01	561.40
AM-241	59.54	16	35.90*	1.059E+00	2.154E+01	2.155E+01	80.97

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289001.CNF;1
Acquisition date : 17-MAY-2022 07:59:56 Sensitivity : 3.000
Detector ID : GAM43 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.80 Half life ratio : *****
Sample date : 29-MAR-2022 12:48:00 Analyst initials: RXF2
Sample ID : G579289001 Sample Quantity : 7.3894E-01 FILTER
Batch Number : 2264689 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 22-MAR-2022 09:17:22 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM43_JAR.CNF;16

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.995E+02	1.310E+02	9.360E+01
RA-226	8.988E+00	1.294E+02	1.175E+02
TH-232	6.252E+02	4.407E+03	4.510E+03
TH-234	4.393E+01	3.097E+02	3.264E+02
U-238	4.393E+01	3.097E+02	3.264E+02
AM-241	2.155E+01	1.710E+01	4.360E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-2.104E+00	4.285E+00	7.739E+00	NOT IDENT.
NA-24	0.000E+00	1.803E+24	0.000E+00	SHORT HLIF
AL-26	1.132E+00	4.651E+00	1.051E+01	NOT IDENT.
K-40	1.260E+01	6.241E+01	1.230E+02	NOT IDENT.
SC-46	-1.030E+00	7.073E+00	1.302E+01	NOT IDENT.
V-48	7.282E+00	3.397E+01	7.140E+01	NOT IDENT.
CR-51	2.284E+01	9.769E+01	1.869E+02	NOT IDENT.
MN-52	1.131E+03	2.100E+03	4.672E+03	NOT IDENT.
MN-54	1.757E+00	4.791E+00	9.706E+00	NOT IDENT.
CO-56	-1.684E+00	8.450E+00	1.329E+01	NOT IDENT.
CO-57	-8.739E-01	2.838E+00	4.989E+00	NOT IDENT.
NI-57	0.000E+00	5.313E+10	0.000E+00	SHORT HLIF
CO-58	3.657E-01	5.430E+00	1.091E+01	NOT IDENT.
FE-59	3.717E+00	1.179E+01	2.713E+01	NOT IDENT.
CO-60	-1.106E+00	3.997E+00	7.714E+00	NOT IDENT.
ZN-65	-1.340E+00	8.734E+00	1.742E+01	NOT IDENT.
CU-67	0.000E+00	4.860E+06	0.000E+00	SHORT HLIF
GE-68	-3.670E+01	1.344E+02	2.611E+02	NOT IDENT.
AS-73	6.742E+01	1.991E+02	3.982E+02	NOT IDENT.
AS-74	1.266E+01	4.957E+01	9.705E+01	NOT IDENT.
SE-75	-2.456E+00	5.881E+00	1.062E+01	NOT IDENT.
BR-77	0.000E+00	1.978E+07	0.000E+00	SHORT HLIF
SR-82	4.217E+01	8.863E+01	1.887E+02	NOT IDENT.
RB-83	7.210E+00	7.956E+00	1.851E+01	NOT IDENT.

RB-84	4.956E+00	1.825E+01	3.630E+01	NOT IDENT.
KR-85	-3.483E+03	1.300E+03	1.845E+03	NOT IDENT.
SR-85	-2.607E+01	9.734E+00	1.381E+01	NOT IDENT.
RB-86	-6.287E+01	2.570E+02	5.062E+02	NOT IDENT.
Y-88	1.937E+00	5.925E+00	1.397E+01	NOT IDENT.
Y-91	-1.540E+02	2.758E+03	5.598E+03	NOT IDENT.
NB-94	-6.702E-01	3.855E+00	7.246E+00	NOT IDENT.
NB-95	-1.770E+00	6.356E+00	1.174E+01	NOT IDENT.
NB-95M	-2.642E+01	1.723E+01	2.776E+01	NOT IDENT.
TC-95M	4.406E+00	6.438E+00	1.213E+01	NOT IDENT.
ZR-95	-8.005E-02	1.301E+01	2.490E+01	NOT IDENT.
MO-99	0.000E+00	6.213E+06	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	1.692E+41	0.000E+00	SHORT HLIF
RH-101	-8.839E-01	2.917E+00	5.140E+00	NOT IDENT.
RH-102M	2.812E+00	3.425E+00	7.081E+00	NOT IDENT.
RU-103	-1.808E+00	7.793E+00	1.390E+01	NOT IDENT.
RH-106	-2.708E+01	4.593E+01	7.875E+01	NOT IDENT.
RU-106	-2.708E+01	4.593E+01	7.875E+01	NOT IDENT.
AG-108M	4.076E-01	3.114E+00	5.943E+00	NOT IDENT.
CD-109	-6.092E+01	7.888E+01	1.356E+02	NOT IDENT.
AG-110	-5.453E+01	8.971E+01	1.576E+02	NOT IDENT.
AG-110M	-2.886E+00	7.136E+00	1.252E+01	NOT IDENT.
IN-111	0.000E+00	4.277E+05	0.000E+00	SHORT HLIF
SN-113	-9.886E-01	5.702E+00	1.041E+01	NOT IDENT.
IN-114M	-2.434E+01	3.014E+01	4.737E+01	NOT IDENT.
CD-115	0.000E+00	4.134E+07	0.000E+00	SHORT HLIF
SN-117M	-1.504E+01	2.866E+01	4.675E+01	NOT IDENT.
SB-122	0.000E+00	1.029E+06	0.000E+00	SHORT HLIF
I-123	0.000E+00	1.189E+27	0.000E+00	SHORT HLIF
TE-123M	-2.025E+00	3.216E+00	5.165E+00	NOT IDENT.
SB-124	2.097E+00	1.846E+01	3.954E+01	NOT IDENT.
SB-125	3.219E+00	1.107E+01	2.120E+01	FAIL ABUN
TE-125M	-7.216E+02	1.394E+03	2.423E+03	NOT IDENT.
I-126	8.199E+01	1.229E+02	2.747E+02	NOT IDENT.
SB-126	2.018E+01	9.729E+01	1.986E+02	NOT IDENT.
SN-126	-2.534E+00	7.251E+00	1.312E+01	NOT IDENT.
SB-127	0.000E+00	5.875E+04	0.000E+00	SHORT HLIF
TE-129	-6.547E+01	1.009E+02	1.669E+02	NOT IDENT.
I-131	-1.513E+02	2.316E+02	3.941E+02	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	9.450E+04	0.000E+00	SHORT HLIF
BA-133	2.038E+00	4.625E+00	9.087E+00	FAIL ABUN
I-133	0.000E+00	3.237E+17	0.000E+00	SHORT HLIF
CS-134	-2.107E+00	5.031E+00	8.952E+00	NOT IDENT.
I-135	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
CS-136	2.412E+01	6.334E+01	1.391E+02	NOT IDENT.
BA-137M	-2.475E+00	4.353E+00	7.846E+00	NOT IDENT.
CS-137	-2.614E+00	4.599E+00	8.288E+00	NOT IDENT.
LA-138	9.553E-01	7.840E+00	1.597E+01	NOT IDENT.
CE-139	1.653E+00	2.807E+00	5.470E+00	NOT IDENT.
BA-140	-9.813E+01	1.512E+02	2.717E+02	NOT IDENT.
LA-140	4.793E+01	6.491E+01	1.605E+02	NOT IDENT.
CE-141	-5.406E+00	1.262E+01	1.963E+01	NOT IDENT.
CE-143	0.000E+00	2.727E+11	0.000E+00	SHORT HLIF
CE-144	-1.327E+01	2.098E+01	3.517E+01	NOT IDENT.
PM-144	-2.183E+00	4.490E+00	7.976E+00	FAIL ABUN
PR-144	-1.687E+02	3.416E+02	6.061E+02	NOT IDENT.
PM-146	6.632E-01	4.343E+00	8.350E+00	NOT IDENT.
ND-147	2.890E+02	5.333E+02	1.122E+03	NOT IDENT.
PM-147	4.958E+04	7.771E+04	1.507E+05	NOT IDENT.
PM-149	0.000E+00	3.295E+08	0.000E+00	SHORT HLIF
EU-152	1.122E+01	1.047E+01	2.200E+01	NOT IDENT.
GD-153	5.972E+00	9.230E+00	1.837E+01	NOT IDENT.
EU-154	-5.186E+00	1.211E+01	2.226E+01	NOT IDENT.
EU-155	-6.960E-01	9.904E+00	1.830E+01	NOT IDENT.
TB-160	2.627E+01	2.351E+01	5.275E+01	NOT IDENT.
HO-166M	3.638E+00	7.370E+00	1.521E+01	FAIL ABUN
TM-171	5.061E+01	3.142E+03	6.147E+03	NOT IDENT.
LU-176	-2.330E-01	2.744E+00	5.121E+00	NOT IDENT.
LU-177	9.712E+02	4.159E+03	7.085E+03	NOT IDENT.
HF-181	-5.844E+00	1.070E+01	1.538E+01	NOT IDENT.
W-181	3.404E+01	3.865E+01	8.069E+01	NOT IDENT.
TA-182	9.540E+00	2.428E+01	5.172E+01	NOT IDENT.
RE-183	3.938E+01	4.135E+01	8.726E+01	NOT IDENT.
RE-184	-1.738E+00	2.883E+01	4.839E+01	NOT IDENT.
RE-188	-3.461E-01	2.160E+01	3.848E+01	FAIL ABUN
W-188	-3.091E+02	1.049E+03	1.912E+03	FAIL ABUN
OS-191	9.717E+00	7.010E+01	1.290E+02	FAIL ABUN

IR-192	2.661E-01	5.086E+00	9.610E+00	NOT IDENT.
PB-201	0.000E+00	2.395E+38	0.000E+00	SHORT HLIF
TL-201	0.000E+00	1.379E+06	0.000E+00	SHORT HLIF
TL-202	2.769E+01	4.259E+01	8.975E+01	NOT IDENT.
HG-203	-3.988E+00	6.227E+00	1.094E+01	NOT IDENT.
PB-203	0.000E+00	1.899E+07	0.000E+00	SHORT HLIF
TL-204	-4.991E+01	6.459E+02	1.210E+03	NOT IDENT.
BI-207	-9.460E-01	5.227E+00	1.017E+01	NOT IDENT.
TL-208	1.762E+00	4.852E+00	9.345E+00	NOT IDENT.
PB-210	-7.524E+01	7.308E+02	1.413E+03	NOT IDENT.
BI-211	-1.829E+01	2.635E+01	4.203E+01	NOT IDENT.
PB-211	-3.162E+01	7.737E+01	1.355E+02	NOT IDENT.
BI-212	5.580E+01	5.062E+01	1.192E+02	NOT IDENT.
PB-212	1.468E+00	7.211E+00	1.361E+01	NOT IDENT.
BI-213	-6.695E+00	1.003E+01	1.663E+01	NOT IDENT.
BI-214	7.649E+00	9.087E+00	1.910E+01	NOT IDENT.
PB-214	-7.168E+00	9.617E+00	1.524E+01	NOT IDENT.
RN-219	-1.751E+01	3.927E+01	6.879E+01	NOT IDENT.
FR-221	-1.281E+00	1.812E+01	3.472E+01	NOT IDENT.
RA-223	-2.163E+01	7.581E+01	1.364E+02	FAIL ABUN
RA-224	-4.367E+01	6.671E+01	1.184E+02	NOT IDENT.
AC-225	-3.784E+01	5.350E+02	1.025E+03	NOT IDENT.
AC-227	-1.019E+01	2.248E+01	4.092E+01	NOT IDENT.
TH-227	-1.019E+01	2.248E+01	4.092E+01	NOT IDENT.
AC-228	8.283E+00	1.659E+01	3.474E+01	NOT IDENT.
RA-228	8.283E+00	1.659E+01	3.474E+01	NOT IDENT.
TH-228	1.468E+00	7.211E+00	1.361E+01	NOT IDENT.
TH-229	2.787E+01	5.302E+01	9.623E+01	NOT IDENT.
TH-230	-1.615E+03	1.526E+03	2.434E+03	NOT IDENT.
PA-231	-9.044E+00	4.555E+01	8.425E+01	NOT IDENT.
TH-231	-1.748E+01	5.044E+01	8.570E+01	NOT IDENT.
PA-233	-2.737E+00	6.980E+00	1.250E+01	FAIL ABUN
PA-234	3.675E+01	3.985E+01	8.378E+01	FAIL ABUN
PA-234M	-5.049E+02	6.276E+02	1.093E+03	NOT IDENT.
U-234	5.319E+03	1.164E+04	2.349E+04	NOT IDENT.
U-235	-7.511E+00	2.006E+01	3.265E+01	FAIL ABUN
NP-237	-2.737E+00	6.980E+00	1.250E+01	FAIL ABUN
NP-238	0.000E+00	1.291E+08	0.000E+00	SHORT HLIF
NP-239	-6.791E+00	2.857E+01	5.070E+01	NOT IDENT.
AM-242	-6.089E+01	6.413E+01	1.064E+02	NOT IDENT.
AM-243	2.587E+00	7.076E+00	1.294E+01	NOT IDENT.
CM-243	-3.244E+00	9.978E+00	1.791E+01	NOT IDENT.
BK-247	-3.090E+00	8.781E+00	1.596E+01	NOT IDENT.
CM-247	-4.963E+00	3.929E+00	5.831E+00	NOT IDENT.
CF-249	-6.808E-01	4.964E+00	8.036E+00	NOT IDENT.
CF-251	3.548E+00	1.291E+01	2.344E+01	NOT IDENT.
CF-252	-1.160E+04	1.816E+04	3.135E+04	NOT IDENT.
ANH-511	-1.228E+01	8.068E+00	1.509E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	60.97	16	17	1.23	121.78	120	10	2.24E-03	40.5	3.47E+00
2	4	62.68	19	46	1.24	125.21	120	10	2.63E-03	67.4	
3	0	93.38	52	89	1.08	186.59	181	10	7.20E-03	37.5	
4	0	148.61	20	28	1.32	297.02	295	5	2.79E-03	45.6	
5	0	185.49	50	78	1.17	370.77	366	10	6.98E-03	35.7	
6	0	223.82	13	25	1.35	447.41	445	6	1.75E-03	68.4	
7	0	384.03	36	34	5.70	767.71	760	16	4.93E-03	41.2	
8	0	462.74	29	18	2.29	925.03	915	18	4.03E-03	39.0	
9	0	477.46	42	33	1.69	954.48	945	15	5.89E-03	33.5	
10	0	510.92	92	61	2.71	1021.35	1014	13	1.27E-02	20.5	
11	0	545.51	22	6	2.60	1090.50	1086	11	3.01E-03	30.3	
12	0	556.15	8	11	1.76	1111.76	1108	8	1.14E-03	76.1	
13	0	849.69	13	11	0.52	1698.42	1689	14	1.86E-03	58.1	
14	0	900.22	5	9	2.44	1799.39	1788	13	6.55E-04	143.4	
15	0	952.23	6	6	1.25	1903.32	1894	12	8.91E-04	85.4	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	42	10.44*	1.953E+00	1.056E+02	1.995E+02	67.00
RA-226	186.21	3	3.59*	3.963E+00	8.987E+00	8.988E+00	1469.52
TH-232	63.81	4	0.26*	1.182E+00	6.252E+02	6.252E+02	719.19
	140.88	-----	0.02	4.217E+00	-----	Line Not Found	-----
TH-234	63.29	4	3.70*	1.182E+00	4.393E+01	4.393E+01	719.19
	92.59	7	4.23	3.223E+00	2.709E+01	2.709E+01	561.40
U-238	63.29	4	3.70*	1.182E+00	4.393E+01	4.393E+01	719.19
	92.59	7	4.23	3.223E+00	2.709E+01	2.709E+01	561.40
AM-241	59.54	16	35.90*	1.059E+00	2.154E+01	2.155E+01	80.97

Flag: "*" = Keyline

Total number of lines in spectrum 14
Number of unidentified lines 6
Number of lines tentatively identified by NID 8 57.14%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.89	1.056E+02	1.995E+02	1.337E+02	67.00	
RA-226	1600.00Y	1.00	8.987E+00	8.988E+00	132.1E+00	1469.52	
TH-232	1.41E+10Y	1.00	6.252E+02	6.252E+02	44.97E+02	719.19	
TH-234	4.47E+09Y	1.00	4.393E+01	4.393E+01	31.60E+01	719.19	
U-238	4.47E+09Y	1.00	4.393E+01	4.393E+01	31.60E+01	719.19	
AM-241	432.60Y	1.00	2.154E+01	2.155E+01	1.745E+01	80.97	
Total Activity :			8.492E+02	9.431E+02			

Grand Total Activity : 8.492E+02 9.431E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	148.61	20	28	1.32	297.02	295	5	2.79E-03	91.2	4.21E+00	
0	223.82	13	25	1.35	447.41	445	6	1.75E-03	****	3.57E+00	
0	384.03	36	34	5.70	767.71	760	16	4.93E-03	82.4	2.35E+00	T
0	462.74	29	18	2.29	925.03	915	18	4.03E-03	78.0	2.00E+00	T
0	545.51	22	6	2.60	1090.50	1086	11	3.01E-03	60.6	1.75E+00	T
0	556.15	8	11	1.76	1111.76	1108	8	1.14E-03	****	1.72E+00	
0	849.69	13	11	0.52	1698.42	1689	14	1.86E-03	****	1.21E+00	
0	900.22	5	9	2.44	1799.39	1788	13	6.55E-04	****	1.16E+00	
0	952.23	6	6	1.25	1903.32	1894	12	8.91E-04	****	1.10E+00	

Flags: "T" = Tentatively associated


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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289001.CNF;1  *
* Acquisition date   : 17-MAY-2022 07:59:56 Sensitivity      : 3.000          *
* Detector ID        : GAM43 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000         *
* Elapsed real time  : 0 02:00:00.80 Half life ratio : *****          *
* Sample date        : 29-MAR-2022 12:48:00 Nuclide Library : LIQUID         *
* Sample ID          : G579289001 Analyst initials: RXF2           *
* Batch Number       : 2264689 Sample Quantity : 7.3894E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 22-MAR-2022 09:17:22 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM43_JAR.CNF;16          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	4.044E+01
RA-226	5.392E+01
TH-232	2.047E+03
TH-234	1.481E+02
U-238	1.481E+02
AM-241	1.981E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	3.051E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	4.204E+00	NOT IDENT.
K-40	5.325E+01	NOT IDENT.
SC-46	5.632E+00	NOT IDENT.
V-48	3.038E+01	NOT IDENT.
CR-51	8.486E+01	NOT IDENT.
MN-52	1.966E+03	NOT IDENT.
MN-54	4.231E+00	NOT IDENT.
CO-56	5.767E+00	NOT IDENT.
CO-57	2.273E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	4.569E+00	NOT IDENT.
FE-59	1.092E+01	NOT IDENT.
CO-60	3.024E+00	NOT IDENT.
ZN-65	7.103E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	1.063E+02	NOT IDENT.
AS-73	1.816E+02	NOT IDENT.
AS-74	4.372E+01	NOT IDENT.
SE-75	4.824E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	8.109E+01	NOT IDENT.
RB-83	8.014E+00	NOT IDENT.
RB-84	1.577E+01	NOT IDENT.

KR-85	8.351E+02	NOT IDENT.
SR-85	6.251E+00	NOT IDENT.
RB-86	2.041E+02	NOT IDENT.
Y-88	5.517E+00	NOT IDENT.
Y-91	2.282E+03	NOT IDENT.
NB-94	3.137E+00	NOT IDENT.
NB-95	4.984E+00	NOT IDENT.
NB-95M	1.252E+01	NOT IDENT.
TC-95M	5.565E+00	NOT IDENT.
ZR-95	1.084E+01	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.320E+00	NOT IDENT.
RH-102M	3.163E+00	NOT IDENT.
RU-103	6.004E+00	NOT IDENT.
RH-106	3.454E+01	NOT IDENT.
RU-106	3.454E+01	NOT IDENT.
AG-108M	2.614E+00	NOT IDENT.
CD-109	6.102E+01	NOT IDENT.
AG-110	6.712E+01	NOT IDENT.
AG-110M	5.338E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	4.592E+00	NOT IDENT.
IN-114M	2.146E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	2.109E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.323E+00	NOT IDENT.
SB-124	1.611E+01	NOT IDENT.
SB-125	9.492E+00	FAIL ABUN
TE-125M	1.092E+03	NOT IDENT.
I-126	1.180E+02	NOT IDENT.
SB-126	8.502E+01	NOT IDENT.
SN-126	5.928E+00	NOT IDENT.
SB-127	0.000E+00	SHORT HLIF
TE-129	7.135E+01	NOT IDENT.
I-131	1.738E+02	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	4.099E+00	FAIL ABUN
I-133	0.000E+00	SHORT HLIF
CS-134	3.819E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	5.856E+01	NOT IDENT.
BA-137M	3.408E+00	NOT IDENT.
CS-137	3.600E+00	NOT IDENT.
LA-138	6.659E+00	NOT IDENT.
CE-139	2.470E+00	NOT IDENT.
BA-140	1.132E+02	NOT IDENT.
LA-140	6.613E+01	NOT IDENT.
CE-141	8.864E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.593E+01	NOT IDENT.
PM-144	3.457E+00	FAIL ABUN
PR-144	2.626E+02	NOT IDENT.
PM-146	3.649E+00	NOT IDENT.
ND-147	4.971E+02	NOT IDENT.
PM-147	6.925E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	9.994E+00	NOT IDENT.
GD-153	8.390E+00	NOT IDENT.
EU-154	8.853E+00	NOT IDENT.
EU-155	8.255E+00	NOT IDENT.
TB-160	2.329E+01	NOT IDENT.
HO-166M	6.698E+00	FAIL ABUN
TM-171	2.780E+03	NOT IDENT.
LU-176	2.302E+00	NOT IDENT.
LU-177	3.255E+03	NOT IDENT.
HF-181	6.713E+00	NOT IDENT.
W-181	3.693E+01	NOT IDENT.
TA-182	2.207E+01	NOT IDENT.
RE-183	3.985E+01	NOT IDENT.
RE-184	2.013E+01	NOT IDENT.
RE-188	1.754E+01	FAIL ABUN
W-188	8.624E+02	FAIL ABUN
OS-191	5.893E+01	FAIL ABUN
IR-192	4.330E+00	NOT IDENT.

PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF
TL-202	3.928E+01	NOT IDENT.
HG-203	4.898E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	5.552E+02	NOT IDENT.
BI-207	4.168E+00	NOT IDENT.
TL-208	4.160E+00	NOT IDENT.
PB-210	6.437E+02	NOT IDENT.
BI-211	1.891E+01	NOT IDENT.
PB-211	5.961E+01	NOT IDENT.
BI-212	5.175E+01	NOT IDENT.
PB-212	6.324E+00	NOT IDENT.
BI-213	7.048E+00	NOT IDENT.
BI-214	8.606E+00	NOT IDENT.
PB-214	6.858E+00	NOT IDENT.
RN-219	2.977E+01	NOT IDENT.
FR-221	1.571E+01	NOT IDENT.
RA-223	6.181E+01	FAIL ABUN
RA-224	5.402E+01	NOT IDENT.
AC-225	4.638E+02	NOT IDENT.
AC-227	1.823E+01	NOT IDENT.
TH-227	1.823E+01	NOT IDENT.
AC-228	1.501E+01	NOT IDENT.
RA-228	1.501E+01	NOT IDENT.
TH-228	6.324E+00	NOT IDENT.
TH-229	4.412E+01	NOT IDENT.
TH-230	1.101E+03	NOT IDENT.
PA-231	3.766E+01	NOT IDENT.
TH-231	3.903E+01	NOT IDENT.
PA-233	5.613E+00	FAIL ABUN
PA-234	3.674E+01	FAIL ABUN
PA-234M	4.695E+02	NOT IDENT.
U-234	1.073E+04	NOT IDENT.
U-235	1.485E+01	FAIL ABUN
NP-237	5.613E+00	FAIL ABUN
NP-238	0.000E+00	SHORT HLIF
NP-239	2.320E+01	NOT IDENT.
AM-242	4.774E+01	NOT IDENT.
AM-243	5.978E+00	NOT IDENT.
CM-243	8.050E+00	NOT IDENT.
BK-247	7.260E+00	NOT IDENT.
CM-247	2.493E+00	NOT IDENT.
CF-249	3.572E+00	NOT IDENT.
CF-251	1.074E+01	NOT IDENT.
CF-252	1.413E+04	NOT IDENT.
ANH-511	7.175E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289001.CNF;1
Acquisition date : 17-MAY-2022 07:59:56 Sensitivity : 3.000
Detector ID : GAM43 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.80 Half life ratio : *****
Sample date : 29-MAR-2022 12:48:00 Nuclide Library : LIQUID
Sample ID : G579289001 Analyst initials: RXF2
Batch Number : 2264689 Sample Quantity : 7.3894E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 22-MAR-2022 09:17:22 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM43_JAR.CNF;16

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.995E+02	1.322E+02	1.323E+02
RA-226	8.988E+00	1.294E+02	1.294E+02
TH-232	6.252E+02	4.408E+03	4.408E+03
TH-234	4.393E+01	3.098E+02	3.098E+02
U-238	4.393E+01	3.098E+02	3.098E+02
AM-241	2.155E+01	1.733E+01	1.733E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-2.104E+00	4.288E+00	4.392E+00	NOT IDENT.
NA-24	9.568E+23	1.806E+24	0.000E+00	SHORT HLIF
AL-26	1.132E+00	4.652E+00	4.680E+00	NOT IDENT.
K-40	1.260E+01	6.242E+01	6.268E+01	NOT IDENT.
SC-46	-1.030E+00	7.074E+00	7.089E+00	NOT IDENT.
V-48	7.282E+00	3.398E+01	3.414E+01	NOT IDENT.
CR-51	2.284E+01	9.771E+01	9.825E+01	NOT IDENT.
MN-52	1.131E+03	2.102E+03	2.163E+03	NOT IDENT.
MN-54	1.757E+00	4.793E+00	4.858E+00	NOT IDENT.
CO-56	-1.684E+00	8.451E+00	8.486E+00	NOT IDENT.
CO-57	-8.739E-01	2.839E+00	2.866E+00	NOT IDENT.
NI-57	-1.434E+10	5.316E+10	5.355E+10	SHORT HLIF
CO-58	3.657E-01	5.430E+00	5.432E+00	NOT IDENT.
FE-59	3.717E+00	1.179E+01	1.191E+01	NOT IDENT.
CO-60	-1.106E+00	3.998E+00	4.029E+00	NOT IDENT.
ZN-65	-1.340E+00	8.734E+00	8.755E+00	NOT IDENT.
CU-67	3.375E+05	4.860E+06	4.862E+06	SHORT HLIF
GE-68	-3.670E+01	1.344E+02	1.354E+02	NOT IDENT.
AS-73	6.742E+01	1.997E+02	2.020E+02	NOT IDENT.
AS-74	1.266E+01	4.959E+01	4.992E+01	NOT IDENT.
SE-75	-2.456E+00	5.884E+00	5.988E+00	NOT IDENT.
BR-77	2.409E+06	1.978E+07	1.981E+07	SHORT HLIF
SR-82	4.217E+01	8.872E+01	9.073E+01	NOT IDENT.
RB-83	7.210E+00	8.039E+00	8.672E+00	NOT IDENT.

RB-84	4.956E+00	1.825E+01	1.839E+01	NOT IDENT.
KR-85	-3.483E+03	1.339E+03	2.065E+03	NOT IDENT.
SR-85	-2.607E+01	1.002E+01	1.546E+01	NOT IDENT.
RB-86	-6.287E+01	2.570E+02	2.586E+02	NOT IDENT.
Y-88	1.937E+00	5.926E+00	5.991E+00	NOT IDENT.
Y-91	-1.540E+02	2.758E+03	2.759E+03	NOT IDENT.
NB-94	-6.702E-01	3.855E+00	3.867E+00	NOT IDENT.
NB-95	-1.770E+00	6.358E+00	6.408E+00	NOT IDENT.
NB-95M	-2.642E+01	1.743E+01	2.111E+01	NOT IDENT.
TC-95M	4.406E+00	6.450E+00	6.749E+00	NOT IDENT.
ZR-95	-8.005E-02	1.301E+01	1.301E+01	NOT IDENT.
MO-99	2.974E+05	6.213E+06	6.214E+06	SHORT HLIF
TC-99M	1.000E+41	1.696E+41	0.000E+00	SHORT HLIF
RH-101	-8.839E-01	2.922E+00	2.949E+00	NOT IDENT.
RH-102M	2.812E+00	3.442E+00	3.668E+00	NOT IDENT.
RU-103	-1.808E+00	7.795E+00	7.838E+00	NOT IDENT.
RH-106	-2.708E+01	4.602E+01	4.762E+01	NOT IDENT.
RU-106	-2.708E+01	4.602E+01	4.762E+01	NOT IDENT.
AG-108M	4.076E-01	3.115E+00	3.120E+00	NOT IDENT.
CD-109	-6.092E+01	7.954E+01	8.416E+01	NOT IDENT.
AG-110	-5.453E+01	8.987E+01	9.318E+01	NOT IDENT.
AG-110M	-2.886E+00	7.140E+00	7.258E+00	NOT IDENT.
IN-111	-5.423E+04	4.277E+05	4.284E+05	SHORT HLIF
SN-113	-9.886E-01	5.703E+00	5.720E+00	NOT IDENT.
IN-114M	-2.434E+01	3.021E+01	3.214E+01	NOT IDENT.
CD-115	-1.390E+06	4.134E+07	4.134E+07	SHORT HLIF
SN-117M	-1.504E+01	2.868E+01	2.947E+01	NOT IDENT.
SB-122	-6.460E+04	1.029E+06	1.029E+06	SHORT HLIF
I-123	-6.789E+26	1.190E+27	0.000E+00	SHORT HLIF
TE-123M	-2.025E+00	3.220E+00	3.347E+00	NOT IDENT.
SB-124	2.097E+00	1.846E+01	1.848E+01	NOT IDENT.
SB-125	3.219E+00	1.107E+01	1.116E+01	FAIL ABUN
TE-125M	-7.216E+02	1.395E+03	1.433E+03	NOT IDENT.
I-126	8.199E+01	1.233E+02	1.287E+02	NOT IDENT.
SB-126	2.018E+01	9.732E+01	9.775E+01	NOT IDENT.
SN-126	-2.534E+00	7.262E+00	7.352E+00	NOT IDENT.
SB-127	-1.760E+04	5.891E+04	5.944E+04	SHORT HLIF
TE-129	-6.547E+01	1.015E+02	1.057E+02	NOT IDENT.
I-131	-1.513E+02	2.319E+02	2.417E+02	NOT IDENT.
I-132	1.000E+41	5.978E+41	0.000E+00	SHORT HLIF
TE-132	1.183E+03	9.450E+04	9.450E+04	SHORT HLIF
BA-133	2.038E+00	4.628E+00	4.718E+00	FAIL ABUN
I-133	1.501E+17	3.271E+17	0.000E+00	SHORT HLIF
CS-134	-2.107E+00	5.035E+00	5.124E+00	NOT IDENT.
I-135	1.000E+41	2.362E+41	0.000E+00	SHORT HLIF
CS-136	2.412E+01	6.339E+01	6.432E+01	NOT IDENT.
BA-137M	-2.475E+00	4.360E+00	4.500E+00	NOT IDENT.
CS-137	-2.614E+00	4.606E+00	4.754E+00	NOT IDENT.
LA-138	9.553E-01	7.840E+00	7.852E+00	NOT IDENT.
CE-139	1.653E+00	2.829E+00	2.926E+00	NOT IDENT.
BA-140	-9.813E+01	1.514E+02	1.578E+02	NOT IDENT.
LA-140	4.793E+01	6.501E+01	6.851E+01	NOT IDENT.
CE-141	-5.406E+00	1.263E+01	1.286E+01	NOT IDENT.
CE-143	-1.003E+11	2.728E+11	2.765E+11	SHORT HLIF
CE-144	-1.327E+01	2.101E+01	2.184E+01	NOT IDENT.
PM-144	-2.183E+00	4.495E+00	4.602E+00	FAIL ABUN
PR-144	-1.687E+02	3.420E+02	3.504E+02	NOT IDENT.
PM-146	6.632E-01	4.344E+00	4.354E+00	NOT IDENT.
ND-147	2.890E+02	5.340E+02	5.497E+02	NOT IDENT.
PM-147	4.958E+04	7.779E+04	8.094E+04	NOT IDENT.
PM-149	-1.574E+08	3.303E+08	3.379E+08	SHORT HLIF
EU-152	1.122E+01	1.051E+01	1.167E+01	NOT IDENT.
GD-153	5.972E+00	9.258E+00	9.642E+00	NOT IDENT.
EU-154	-5.186E+00	1.212E+01	1.235E+01	NOT IDENT.
EU-155	-6.960E-01	9.904E+00	9.909E+00	NOT IDENT.
TB-160	2.627E+01	2.363E+01	2.644E+01	NOT IDENT.
HO-166M	3.638E+00	7.379E+00	7.559E+00	FAIL ABUN
TM-171	5.061E+01	3.142E+03	3.142E+03	NOT IDENT.
LU-176	-2.330E-01	2.744E+00	2.746E+00	NOT IDENT.
LU-177	9.712E+02	4.159E+03	4.182E+03	NOT IDENT.
HF-181	-5.844E+00	1.071E+01	1.103E+01	NOT IDENT.
W-181	3.404E+01	3.977E+01	4.263E+01	NOT IDENT.
TA-182	9.540E+00	2.429E+01	2.467E+01	NOT IDENT.
RE-183	3.938E+01	4.176E+01	4.538E+01	NOT IDENT.
RE-184	-1.738E+00	2.883E+01	2.884E+01	NOT IDENT.
RE-188	-3.461E-01	2.160E+01	2.160E+01	FAIL ABUN
W-188	-3.091E+02	1.050E+03	1.059E+03	FAIL ABUN
OS-191	9.717E+00	7.010E+01	7.024E+01	FAIL ABUN

IR-192	2.661E-01	5.086E+00	5.087E+00	NOT IDENT.
PB-201	4.127E+37	2.407E+38	0.000E+00	SHORT HLIF
TL-201	-1.118E+06	1.382E+06	1.471E+06	SHORT HLIF
TL-202	2.769E+01	4.266E+01	4.445E+01	NOT IDENT.
HG-203	-3.988E+00	6.233E+00	6.487E+00	NOT IDENT.
PB-203	-1.216E+07	1.901E+07	1.979E+07	SHORT HLIF
TL-204	-4.991E+01	6.459E+02	6.463E+02	NOT IDENT.
BI-207	-9.460E-01	5.227E+00	5.245E+00	NOT IDENT.
TL-208	1.762E+00	4.854E+00	4.919E+00	NOT IDENT.
PB-210	-7.524E+01	7.309E+02	7.317E+02	NOT IDENT.
BI-211	-1.829E+01	2.639E+01	2.765E+01	NOT IDENT.
PB-211	-3.162E+01	7.742E+01	7.873E+01	NOT IDENT.
BI-212	5.580E+01	5.091E+01	5.680E+01	NOT IDENT.
PB-212	1.468E+00	7.212E+00	7.242E+00	NOT IDENT.
BI-213	-6.695E+00	1.005E+01	1.049E+01	NOT IDENT.
BI-214	7.649E+00	9.117E+00	9.749E+00	NOT IDENT.
PB-214	-7.168E+00	9.633E+00	1.016E+01	NOT IDENT.
RN-219	-1.751E+01	3.935E+01	4.013E+01	NOT IDENT.
FR-221	-1.281E+00	1.812E+01	1.813E+01	NOT IDENT.
RA-223	-2.163E+01	7.583E+01	7.646E+01	FAIL ABUN
RA-224	-4.367E+01	6.680E+01	6.964E+01	NOT IDENT.
AC-225	-3.784E+01	5.351E+02	5.353E+02	NOT IDENT.
AC-227	-1.019E+01	2.253E+01	2.299E+01	NOT IDENT.
TH-227	-1.019E+01	2.253E+01	2.299E+01	NOT IDENT.
AC-228	8.283E+00	1.661E+01	1.702E+01	NOT IDENT.
RA-228	8.283E+00	1.661E+01	1.702E+01	NOT IDENT.
TH-228	1.468E+00	7.212E+00	7.242E+00	NOT IDENT.
TH-229	2.787E+01	5.306E+01	5.453E+01	NOT IDENT.
TH-230	-1.615E+03	1.563E+03	1.725E+03	NOT IDENT.
PA-231	-9.044E+00	4.559E+01	4.577E+01	NOT IDENT.
TH-231	-1.748E+01	5.055E+01	5.116E+01	NOT IDENT.
PA-233	-2.737E+00	6.983E+00	7.091E+00	FAIL ABUN
PA-234	3.675E+01	5.798E+01	6.030E+01	FAIL ABUN
PA-234M	-5.049E+02	6.290E+02	6.689E+02	NOT IDENT.
U-234	5.319E+03	1.167E+04	1.191E+04	NOT IDENT.
U-235	-7.511E+00	2.006E+01	2.035E+01	FAIL ABUN
NP-237	-2.737E+00	6.983E+00	7.091E+00	FAIL ABUN
NP-238	-7.238E+07	1.292E+08	1.332E+08	SHORT HLIF
NP-239	-6.791E+00	2.858E+01	2.874E+01	NOT IDENT.
AM-242	-6.089E+01	6.528E+01	7.083E+01	NOT IDENT.
AM-243	2.587E+00	7.086E+00	7.182E+00	NOT IDENT.
CM-243	-3.244E+00	9.987E+00	1.009E+01	NOT IDENT.
BK-247	-3.090E+00	8.805E+00	8.915E+00	NOT IDENT.
CM-247	-4.963E+00	4.032E+00	4.612E+00	NOT IDENT.
CF-249	-6.808E-01	4.965E+00	4.974E+00	NOT IDENT.
CF-251	3.548E+00	1.292E+01	1.302E+01	NOT IDENT.
CF-252	-1.160E+04	2.102E+04	2.166E+04	NOT IDENT.
ANH-511	-1.228E+01	8.146E+00	9.852E+00	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	28.3588	133.52	34.6187	116.30	0.0000
879.38	34.1430	364.49	34.6280	116.74	43.0456
46.54	36.6709	80.22	0.0000	117.23	47.2090
228.16	0.0000	711.68	26.4642	119.76	40.3036
52.39	31.2529	356.01	26.5069	120.54	37.2818
53.20	30.7502	323.87	26.5138	120.90	32.1350
53.44	30.7886	82.35	0.0000	264.66	32.1542
57.53	40.2783	82.47	41.3560	121.22	32.1627
293.27	0.0000	82.47	0.0000	344.28	34.2893
57.53	25.6399	83.79	28.6276	122.06	40.5541
482.18	25.6402	265.00	30.4979	1274.44	35.4500
57.98	23.2096	84.21	30.5211	123.68	37.5960
59.32	33.3716	84.86	0.0000	1377.63	0.0000
59.54	33.4066	193.51	37.1579	127.23	33.7300
155.04	32.0289	105.31	25.1817	129.43	34.9814
63.00	32.2523	86.79	27.0698	131.20	38.3329
129.43	32.2948	86.94	32.6881	133.02	35.2989
63.29	32.2948	87.09	32.7054	133.52	41.7690
290.67	32.3373	87.57	34.6325	135.34	0.0000
63.81	32.3710	88.03	39.3760	136.00	36.6371
87.57	44.3910	306.78	41.2957	136.28	33.4271
64.99	36.5391	88.47	47.5742	136.47	33.4427
65.08	36.5537	531.02	45.4808	739.50	0.0000
66.73	32.7928	184.58	0.0000	140.51	0.0000
66.98	33.6924	92.59	39.9950	140.88	23.9866
67.24	37.1900	93.31	0.0000	143.76	31.8338
67.67	41.5917	94.56	35.7847	144.24	32.9681
1221.41	42.4727	311.90	35.7952	145.44	36.7335
439.51	38.3251	946.00	35.7978	152.32	38.0570
70.82	38.3251	97.43	27.0904	152.43	38.0663
167.43	0.0000	98.43	33.0011	1048.07	33.6488
97.43	34.9567	98.44	33.0021	154.21	40.4643
70.82	0.0000	99.53	40.9086	155.04	36.0342
70.82	43.0279	103.37	40.9086	158.56	38.3683
279.20	0.0000	116.74	40.9086	158.97	0.0000
1063.66	42.4962	100.11	38.0562	159.00	30.6659
72.87	0.0000	100.20	38.0669	162.33	32.0276
351.06	42.5065	102.03	29.4500	537.26	30.9052
74.66	36.5701	103.18	36.4507	163.33	33.2410
238.63	33.9156	103.37	31.5432	165.86	20.7414
351.93	33.9156	105.31	29.7469	167.43	0.0000
238.63	33.9156	106.12	28.8254	245.35	0.0000
74.97	32.1498	106.47	27.8607	427.87	45.8971
77.11	39.6259	109.28	36.1200	176.60	49.4559
256.23	36.3815	111.00	36.3013	177.52	35.3893
79.82	0.0000	111.76	0.0000	181.07	0.0000
80.02	34.6057	208.37	41.5752	184.41	41.8381
80.03	34.6062	116.24	35.8214	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	41.9417	300.09	28.5065	477.60	13.6294
186.21	41.9801	300.13	28.5083	477.99	13.6338
190.27	45.9240	301.36	26.6482	482.18	23.9416
193.51	27.9614	302.85	20.9764	487.02	22.8914
197.03	39.1504	304.50	28.6627	492.35	0.0000
198.01	36.7676	304.85	25.8074	497.08	16.1539
201.83	33.3149	306.78	27.7846	511.00	32.6635
204.12	29.7319	308.46	24.0011	514.00	84.1875
205.31	40.9655	311.90	31.8137	520.40	6.1690
208.37	29.9498	316.51	27.1427	520.69	0.0000
210.85	37.5952	319.41	27.2355	667.71	0.0000
215.65	33.6873	320.08	29.2041	527.90	0.0000
218.12	31.2876	321.04	28.2625	529.59	16.8610
222.11	17.8736	323.87	36.1787	529.87	0.0000
227.09	36.0331	325.23	27.4218	531.02	14.2144
227.38	39.9117	1596.21	30.4835	537.26	14.2808
228.16	0.0000	331.15	0.0000	1260.41	0.0000
228.18	30.0792	333.37	28.6672	552.55	12.9973
235.69	54.7789	334.37	26.7204	795.86	9.0955
235.96	54.8014	338.28	24.8505	564.24	0.0000
238.63	27.9492	911.20	24.8515	569.33	17.3562
238.98	0.0000	340.48	31.8867	569.50	19.1851
240.99	48.2095	340.55	31.8893	569.70	19.1883
242.00	31.6033	344.28	18.0121	582.08	10.1379
244.70	36.1378	345.93	31.0769	583.19	6.4563
245.35	0.0000	351.06	27.2192	595.83	24.1885
459.60	23.1168	351.93	28.2535	600.60	24.2663
685.70	0.0000	356.01	22.2972	604.72	20.5901
388.16	24.9740	361.25	0.0000	609.32	16.8981
256.23	28.6825	364.49	27.6114	610.33	18.7878
527.90	0.0000	366.42	0.0000	614.28	16.0117
264.66	39.9090	383.85	22.9493	618.01	16.9948
265.00	39.9278	388.16	23.5721	621.93	18.9319
269.46	35.6088	666.33	17.2943	630.19	0.0000
401.81	30.2030	391.70	21.0262	631.29	13.3326
273.65	27.5476	400.66	13.7868	632.98	15.2539
276.40	25.8062	401.32	0.0000	633.25	15.2563
583.19	22.1479	401.81	19.1107	634.78	16.2260
277.60	23.0779	402.40	27.6202	635.95	14.3275
402.40	22.1665	404.85	23.4256	636.99	9.5581
278.43	25.8757	410.95	25.7036	657.50	17.4271
279.20	0.0000	720.70	15.0468	884.68	22.2721
279.54	35.1689	423.72	21.6756	661.66	6.7947
280.46	25.0192	427.09	20.6556	664.57	0.0000
301.36	31.6391	427.87	20.6703	666.33	6.8141
284.31	27.0081	433.94	16.4084	666.50	6.8148
285.41	24.2491	439.51	9.8941	667.71	0.0000
285.90	0.0000	440.45	17.6045	677.62	10.7815
287.50	29.9258	453.88	14.4727	685.70	0.0000
290.67	32.8652	459.60	19.0188	692.65	0.0000
293.27	0.0000	463.37	19.0800	695.00	17.8259
295.22	30.2220	468.07	15.2119	696.49	19.8242
316.51	28.3600	473.00	0.0000	696.51	19.8242
298.58	27.5049	475.06	13.6008	697.00	17.8467
299.98	28.5028	696.49	13.6201	697.49	17.8522

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	15.9165	903.28	8.8298	1291.59	4.1104
706.68	18.9449	907.67	0.0000	1298.22	0.0000
711.68	13.0000	911.20	8.8621	1312.11	4.1383
720.70	10.0516	984.45	0.0000	1332.49	6.2487
721.93	0.0000	926.36	11.1545	1365.19	8.4191
1690.97	15.0952	935.54	10.0805	1368.63	0.0000
722.91	15.0966	937.49	14.5734	1377.63	0.0000
723.31	15.0998	983.53	12.5928	1384.29	7.4108
756.73	14.1004	945.96	0.0000	1408.01	3.1995
727.33	5.0447	946.00	7.5020	1434.09	5.3750
733.00	9.1096	949.00	18.0288	1435.80	7.5291
735.93	8.1106	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	9.9741	1460.82	6.5019
1434.09	14.2593	964.08	15.4262	1489.16	1.0927
747.24	10.2020	966.17	7.2660	1596.21	2.8156
752.31	12.2769	968.97	5.4563	1620.50	1.8894
753.82	15.3584	983.53	9.1509	1678.03	0.0000
756.73	15.3831	984.45	0.0000	1690.97	5.7747
763.94	14.4136	996.26	12.8810	1757.55	0.0000
765.80	13.3975	1001.03	12.9069	1764.49	5.8833
1001.03	13.4019	1004.73	11.0804	1770.23	7.8555
766.84	14.4362	1025.87	0.0000	1771.35	8.8400
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	8.2920	1037.84	13.1052	1808.65	3.9650
777.92	0.0000	1038.76	0.0000	1836.06	2.9934
778.90	8.3025	1046.59	5.6364		
783.70	0.0000	1048.07	6.5799		
1435.80	8.3457	1050.41	11.2904		
903.28	7.3153	1063.66	6.6209		
795.86	15.7063	1077.00	7.6070		
801.95	12.6050	1077.34	8.5592		
802.10	12.6057	1083.85	7.6273		
810.29	7.3845	1085.87	11.4504		
810.45	7.3849	1099.25	3.8367		
810.76	8.4414	1111.64	9.6372		
815.77	10.5786	1112.07	7.7113		
818.51	14.8310	1112.84	8.6779		
832.01	15.9984	1115.54	7.7215		
834.85	11.7489	1120.29	3.8678		
835.15	11.7506	1120.55	5.8022		
836.80	0.0000	1121.30	7.7383		
846.77	17.1899	1808.65	8.7333		
856.80	14.0355	1131.51	0.0000		
860.56	3.2449	1332.49	6.9029		
871.09	15.2198	1177.95	9.8784		
873.19	10.8823	1189.05	9.9180		
875.33	0.0000	1204.77	6.9815		
879.38	7.6400	1221.41	8.0258		
880.51	8.7361	1231.02	7.0461		
881.60	12.0185	1235.36	12.0979		
883.24	19.6820	1238.28	8.0730		
884.68	12.0359	1260.41	0.0000		
889.28	15.3518	1271.87	7.1456		
894.76	15.8309	1274.44	8.1734		
1836.06	13.2125	1274.54	8.1738		

VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 10:01:00.87

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289002.CNF;1
Background file  : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM45.CNF;46
Background date  : 15-MAY-2022 09:14:06
Sample date      : 29-MAR-2022 12:55:00 Acquisition date : 17-MAY-2022 08:00:33
Sample ID        : G579289002 Sample quantity : 7.56670E-01 FILTER
Detector name     : GAM45 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:00.52 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : RXF2
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2264689 Detector SN# :
Matrix Spike ID   : LCS ID :
*****

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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.45*	20	99	0.73	93.18	90	8	2.83E-03	95.4	
2	0	54.28*	36	81	1.21	108.85	104	10	4.99E-03	52.7	
3	0	78.78	47	137	4.26	157.85	152	14	6.57E-03	54.9	
4	5	92.58*	44	77	1.42	185.43	180	15	6.16E-03	44.4	1.64E+00
5	5	95.63	21	64	1.42	191.55	180	15	2.94E-03	68.3	
6	0	142.91*	25	93	1.33	286.09	282	9	3.48E-03	74.6	
7	0	185.71*	24	81	1.25	371.68	368	8	3.33E-03	78.1	
8	0	295.97*	24	77	1.43	592.17	585	14	3.28E-03	84.7	
9	0	425.08	17	14	1.81	850.36	847	7	2.33E-03	44.5	
10	0	431.97	20	37	5.12	864.15	857	13	2.84E-03	64.4	
11	0	477.31	82	29	1.38	954.81	950	12	1.14E-02	16.9	
12	0	608.88*	6	28	1.32	1217.94	1213	11	8.21E-04	208.8	
13	0	621.35	16	12	1.64	1242.88	1238	8	2.22E-03	45.1	
14	0	682.89	13	20	1.91	1365.94	1358	13	1.80E-03	76.0	
15	0	817.53	9	12	1.59	1635.22	1630	8	1.31E-03	71.1	
16	0	844.15	16	8	1.26	1688.46	1684	8	2.26E-03	38.9	
17	0	859.67*	3	20	0.63	1719.50	1714	9	3.76E-04	327.1	
18	0	921.75	12	0	2.38	1843.67	1840	8	1.67E-03	28.9	
19	0	951.93	11	3	1.73	1904.01	1901	6	1.58E-03	37.9	
20	0	962.84*	1	14	2.66	1925.83	1917	11	8.98E-05	*****	
21	0	1109.12	8	4	0.75	2218.40	2215	7	1.04E-03	55.2	
22	0	1120.14*	1	3	1.09	2240.44	2234	9	1.97E-04	363.0	
23	0	1166.29	8	0	1.35	2332.75	2329	7	1.11E-03	35.4	
24	0	1205.77	5	6	0.52	2411.71	2409	9	7.45E-04	85.7	
25	0	1278.85	12	3	0.95	2557.86	2551	12	1.67E-03	40.7	
26	0	1313.81	10	2	0.81	2627.79	2623	8	1.43E-03	38.9	
27	0	1407.23	8	4	0.93	2814.64	2810	8	1.17E-03	53.1	
28	0	1412.95	5	6	1.36	2826.09	2821	8	7.26E-04	91.7	
29	0	1422.84	8	5	1.21	2845.87	2840	9	1.04E-03	62.7	
30	0	1459.86*	6	8	1.16	2919.90	2914	11	7.74E-04	142.8	
31	0	1547.82	9	2	1.40	3095.86	3090	10	1.22E-03	47.1	
32	0	1763.32*	7	0	1.83	3526.89	3522	9	9.71E-04	67.3	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 10:01:01

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289002.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 29-MAR-2022 12:55:00	Acquisition date	: 17-MAY-2022 08:00:33
Sample ID	: G579289002	Sample quantity	: 0.75667 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA45	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.52 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	82	10.44*	2.504E+00	1.552E+02	2.932E+02	33.88
K-40	1460.82	6	10.66*	9.854E-01	2.630E+01	2.630E+01	285.69
AS-73	53.44	36	10.30*	6.654E+00	2.599E+01	3.962E+01	105.49
Y-91	1204.77	5	0.26*	1.153E+00	8.876E+02	1.583E+03	171.38
RH-106	621.93	16	9.93*	2.016E+00	3.964E+01	4.342E+01	90.14
	1050.41	-----	1.56	1.294E+00	-----	Line Not Found	-----
RU-106	621.93	16	9.93*	2.016E+00	3.964E+01	4.342E+01	90.14
	1050.41	-----	1.56	1.294E+00	-----	Line Not Found	-----
PB-210	46.54	20	4.25*	6.458E+00	3.688E+01	3.703E+01	190.89
BI-214	609.32	6	45.49*	2.051E+00	3.143E+00	3.144E+00	417.65
	1120.29	1	14.92	1.226E+00	3.846E+00	3.847E+00	726.00
	1764.49	7	15.30	8.482E-01	2.674E+01	2.674E+01	134.55
RA-226	186.21	24	3.59*	4.855E+00	6.833E+01	6.833E+01	156.11
U-234	53.20	36	0.12*	6.654E+00	2.231E+03	2.231E+03	105.49
	120.90	-----	0.04	5.945E+00	-----	Line Not Found	-----
U-235	143.76	25	10.96*	5.547E+00	2.047E+01	2.047E+01	149.16
	163.33	-----	5.08	5.201E+00	-----	Line Not Found	-----
	185.72	24	57.20	4.855E+00	4.288E+00	4.288E+00	156.11
	205.31	-----	5.01	4.580E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                          *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289002.CNF;1      *
* Acquisition date   : 17-MAY-2022 08:00:33 Sensitivity      : 3.000                *
* Detector ID        : GAM45 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:00.52 Half life ratio : *****      *
* Sample date        : 29-MAR-2022 12:55:00 Analyst initials: RXF2      *
* Sample ID          : G579289002 Sample Quantity : 7.5667E-01 FILTER *
* Batch Number       : 2264689 Wet Weight : 0.00000        *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000         *
* Nuclide Library    : LIQUID.NLB;26                                           *
*****
*                                     CALIBRATION INFORMATION                       *
*
* Eff. Cal. date     : 28-FEB-2022 05:30:22 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM45_JAR.CNF;1          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	2.932E+02	9.736E+01	7.644E+01
K-40	2.630E+01	7.365E+01	7.699E+01
AS-73	3.962E+01	4.096E+01	3.467E+01
Y-91	1.583E+03	2.659E+03	3.866E+03
RH-106	4.342E+01	3.836E+01	5.622E+01
RU-106	4.342E+01	3.836E+01	5.622E+01
PB-210	3.703E+01	6.928E+01	6.109E+01
BI-214	3.144E+00	1.287E+01	1.168E+01
RA-226	6.833E+01	1.045E+02	9.888E+01
U-234	2.231E+03	2.306E+03	1.953E+03
U-235	2.047E+01	2.992E+01	3.027E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-1.888E+00		4.434E+00	6.652E+00	NOT IDENT.
NA-24	0.000E+00		1.114E+24	0.000E+00	SHORT HLIF
AL-26	-6.096E-01		3.383E+00	7.013E+00	NOT IDENT.
SC-46	-6.128E-01		4.267E+00	8.257E+00	FAIL ABUN
V-48	-5.223E+00		2.616E+01	4.958E+01	NOT IDENT.
CR-51	3.111E+01		6.921E+01	1.335E+02	NOT IDENT.
MN-52	-7.150E+02		1.193E+03	2.222E+03	NOT IDENT.
MN-54	-1.501E+00		3.970E+00	7.191E+00	NOT IDENT.
CO-56	2.937E+00		5.487E+00	1.066E+01	NOT IDENT.
CO-57	-7.328E-01		2.075E+00	3.727E+00	NOT IDENT.
NI-57	0.000E+00		4.915E+10	0.000E+00	SHORT HLIF
CO-58	8.841E-01		3.836E+00	8.174E+00	NOT IDENT.
FE-59	-3.135E+00		1.091E+01	2.049E+01	NOT IDENT.
CO-60	-8.299E-01		3.036E+00	5.713E+00	NOT IDENT.
ZN-65	-4.333E+00		8.199E+00	1.202E+01	NOT IDENT.
CU-67	0.000E+00		3.920E+06	0.000E+00	SHORT HLIF
GE-68	9.134E+01		1.206E+02	2.689E+02	NOT IDENT.
AS-74	-1.819E+01		3.094E+01	5.570E+01	NOT IDENT.
SE-75	1.926E+00		5.012E+00	9.377E+00	NOT IDENT.

BR-77	0.000E+00	2.213E+07	0.000E+00	SHORT HLIF
SR-82	-3.309E+01	5.964E+01	1.071E+02	NOT IDENT.
RB-83	7.338E+00	8.949E+00	1.902E+01	NOT IDENT.
RB-84	2.201E+00	1.232E+01	2.505E+01	NOT IDENT.
KR-85	-2.466E+03	8.536E+02	1.128E+03	NOT IDENT.
SR-85	-1.846E+01	6.389E+00	8.445E+00	NOT IDENT.
RB-86	1.950E+02	2.461E+02	5.501E+02	NOT IDENT.
Y-88	-1.477E+00	5.060E+00	1.004E+01	NOT IDENT.
NB-94	2.774E+00	3.031E+00	6.623E+00	NOT IDENT.
NB-95	1.015E+00	6.026E+00	1.181E+01	NOT IDENT.
NB-95M	-2.258E+01	1.688E+01	2.620E+01	NOT IDENT.
TC-95M	1.102E+00	5.931E+00	1.087E+01	NOT IDENT.
ZR-95	-1.134E+00	8.206E+00	1.596E+01	NOT IDENT.
MO-99	0.000E+00	5.376E+06	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
RH-101	-8.941E-01	2.324E+00	4.162E+00	NOT IDENT.
RH-102M	-4.242E-01	2.473E+00	4.337E+00	NOT IDENT.
RU-103	-2.347E+00	6.318E+00	1.188E+01	FAIL ABUN
AG-108M	-3.897E-01	3.050E+00	4.881E+00	NOT IDENT.
CD-109	-3.980E+01	5.014E+01	7.593E+01	NOT IDENT.
AG-110	-3.824E+01	7.206E+01	1.301E+02	NOT IDENT.
AG-110M	1.549E+00	3.977E+00	8.704E+00	NOT IDENT.
IN-111	0.000E+00	3.702E+05	0.000E+00	SHORT HLIF
SN-113	1.420E+00	4.531E+00	8.592E+00	NOT IDENT.
IN-114M	-1.107E+01	2.496E+01	4.339E+01	NOT IDENT.
CD-115	0.000E+00	3.563E+07	0.000E+00	SHORT HLIF
SN-117M	-1.270E-01	2.540E+01	4.644E+01	NOT IDENT.
SB-122	0.000E+00	9.902E+05	0.000E+00	SHORT HLIF
I-123	0.000E+00	1.088E+27	0.000E+00	SHORT HLIF
TE-123M	-7.048E-01	2.930E+00	5.238E+00	NOT IDENT.
SB-124	-1.419E+00	8.912E+00	1.981E+01	NOT IDENT.
SB-125	3.304E+00	8.523E+00	1.397E+01	NOT IDENT.
TE-125M	3.987E+02	9.326E+02	1.816E+03	NOT IDENT.
I-126	-3.178E+01	1.077E+02	2.037E+02	NOT IDENT.
SB-126	-1.380E+01	7.423E+01	1.433E+02	NOT IDENT.
SN-126	-2.854E+00	4.451E+00	7.347E+00	NOT IDENT.
SB-127	0.000E+00	6.123E+04	0.000E+00	SHORT HLIF
TE-129	5.499E+00	8.204E+01	1.635E+02	NOT IDENT.
I-131	5.487E+01	1.989E+02	3.690E+02	FAIL ABUN
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	9.341E+04	0.000E+00	SHORT HLIF
BA-133	1.554E+00	3.952E+00	7.414E+00	NOT IDENT.
I-133	0.000E+00	2.511E+17	0.000E+00	SHORT HLIF
CS-134	-1.635E+00	3.453E+00	6.249E+00	NOT IDENT.
I-135	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
CS-136	-5.910E+01	5.358E+01	7.788E+01	FAIL ABUN
BA-137M	4.216E-01	2.910E+00	5.887E+00	NOT IDENT.
CS-137	4.454E-01	3.074E+00	6.219E+00	NOT IDENT.
LA-138	1.648E+00	3.979E+00	9.800E+00	NOT IDENT.
CE-139	-1.909E-02	2.879E+00	5.265E+00	NOT IDENT.
BA-140	-5.324E+01	1.438E+02	2.698E+02	FAIL ABUN
LA-140	-2.012E+01	4.480E+01	8.681E+01	NOT IDENT.
CE-141	3.803E+00	1.037E+01	1.847E+01	NOT IDENT.
CE-143	0.000E+00	2.559E+11	0.000E+00	SHORT HLIF
CE-144	1.241E+01	1.758E+01	3.418E+01	FAIL ABUN
PM-144	-1.626E+00	3.616E+00	6.546E+00	FAIL ABUN
PR-144	-1.284E+02	2.747E+02	4.961E+02	NOT IDENT.
PM-146	-2.973E+00	3.443E+00	5.175E+00	NOT IDENT.
ND-147	2.999E+02	3.717E+02	8.220E+02	FAIL ABUN
PM-147	3.621E+04	5.420E+04	1.069E+05	NOT IDENT.
PM-149	0.000E+00	3.049E+08	0.000E+00	SHORT HLIF
EU-152	-4.194E-01	9.328E+00	1.654E+01	FAIL ABUN
GD-153	-3.148E+00	5.769E+00	9.464E+00	NOT IDENT.
EU-154	-5.587E+00	1.228E+01	1.821E+01	NOT IDENT.
EU-155	8.510E+00	6.684E+00	1.392E+01	NOT IDENT.
TB-160	7.181E-01	1.732E+01	3.387E+01	FAIL ABUN
HO-166M	2.481E+00	4.618E+00	1.004E+01	FAIL ABUN
TM-171	-1.038E+02	3.297E+02	5.474E+02	NOT IDENT.
LU-176	6.931E-02	2.517E+00	4.518E+00	NOT IDENT.
LU-177	-8.779E+02	3.132E+03	5.518E+03	NOT IDENT.
HF-181	-5.051E+00	8.660E+00	1.345E+01	NOT IDENT.
W-181	2.585E+00	4.846E+00	9.328E+00	NOT IDENT.
TA-182	6.942E+00	1.510E+01	3.375E+01	FAIL ABUN
RE-183	-3.103E+00	6.304E+00	1.069E+01	NOT IDENT.
RE-184	-5.016E+00	2.134E+01	4.011E+01	NOT IDENT.
RE-188	-2.061E+00	1.848E+01	3.354E+01	FAIL ABUN
W-188	-1.461E+02	9.074E+02	1.476E+03	NOT IDENT.
OS-191	1.660E+01	5.102E+01	9.778E+01	NOT IDENT.

IR-192	1.236E+00	4.370E+00	8.115E+00	FAIL ABUN
PB-201	0.000E+00	2.133E+38	0.000E+00	SHORT HLIF
TL-201	0.000E+00	1.222E+06	0.000E+00	SHORT HLIF
TL-202	6.420E+00	4.471E+01	8.122E+01	FAIL ABUN
HG-203	-2.419E+00	6.234E+00	1.065E+01	NOT IDENT.
PB-203	0.000E+00	1.899E+07	0.000E+00	SHORT HLIF
TL-204	-3.488E+01	1.652E+02	3.090E+02	FAIL ABUN
BI-207	1.239E+00	4.310E+00	9.011E+00	NOT IDENT.
TL-208	-1.677E+00	4.043E+00	8.146E+00	FAIL ABUN
BI-211	2.608E+00	2.436E+01	4.244E+01	NOT IDENT.
PB-211	1.840E+01	6.861E+01	1.265E+02	NOT IDENT.
BI-212	1.523E+01	3.701E+01	8.026E+01	NOT IDENT.
PB-212	-1.004E+00	8.327E+00	1.523E+01	NOT IDENT.
BI-213	-7.093E+00	1.055E+01	1.675E+01	NOT IDENT.
PB-214	-2.806E+00	8.566E+00	1.424E+01	FAIL ABUN
RN-219	3.840E+01	3.617E+01	7.445E+01	NOT IDENT.
FR-221	-3.222E+00	1.792E+01	3.183E+01	NOT IDENT.
RA-223	-2.971E+01	5.861E+01	9.810E+01	FAIL ABUN
RA-224	-6.016E+00	6.368E+01	1.125E+02	NOT IDENT.
AC-225	-9.511E+01	5.289E+02	9.396E+02	NOT IDENT.
AC-227	1.275E+00	2.100E+01	3.839E+01	FAIL ABUN
TH-227	1.275E+00	2.100E+01	3.839E+01	FAIL ABUN
AC-228	1.054E+01	1.544E+01	3.288E+01	NOT IDENT.
RA-228	1.054E+01	1.544E+01	3.288E+01	NOT IDENT.
TH-228	-1.004E+00	8.327E+00	1.523E+01	NOT IDENT.
TH-229	-7.856E+00	4.526E+01	8.073E+01	NOT IDENT.
TH-230	-2.240E+02	3.809E+02	6.649E+02	NOT IDENT.
PA-231	1.628E+01	4.504E+01	8.365E+01	NOT IDENT.
TH-231	-1.569E+00	2.716E+01	4.520E+01	NOT IDENT.
TH-232	-4.288E+02	5.593E+02	1.019E+03	NOT IDENT.
PA-233	9.185E-01	5.655E+00	1.041E+01	FAIL ABUN
PA-234	-2.956E+01	3.003E+01	4.734E+01	FAIL ABUN
PA-234M	-1.086E+02	4.762E+02	8.530E+02	NOT IDENT.
TH-234	-1.131E+01	4.107E+01	7.745E+01	FAIL ABUN
NP-237	9.185E-01	5.655E+00	1.041E+01	FAIL ABUN
NP-238	0.000E+00	1.027E+08	0.000E+00	SHORT HLIF
U-238	-1.131E+01	4.107E+01	7.745E+01	FAIL ABUN
NP-239	3.031E-01	2.056E+01	3.809E+01	NOT IDENT.
AM-241	-1.319E-01	3.574E+00	6.823E+00	NOT IDENT.
AM-242	1.414E+01	3.832E+01	7.436E+01	NOT IDENT.
AM-243	-3.116E-01	2.405E+00	4.129E+00	NOT IDENT.
CM-243	1.467E+00	6.958E+00	1.325E+01	NOT IDENT.
BK-247	3.874E-01	7.683E+00	1.384E+01	NOT IDENT.
CM-247	9.751E-01	3.568E+00	6.587E+00	NOT IDENT.
CF-249	-2.316E+00	3.673E+00	5.946E+00	NOT IDENT.
CF-251	5.529E+00	1.113E+01	2.114E+01	NOT IDENT.
CF-252	1.048E+03	1.126E+04	2.128E+04	NOT IDENT.
ANH-511	-1.748E+01	6.289E+00	1.182E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.45	44	99	0.73	93.18	90	8	6.06E-03	42.4	1.64E+00
2	0	54.28	46	81	1.21	108.85	104	10	6.42E-03	39.9	
3	0	62.91	26	118	0.80	126.10	121	10	3.57E-03	81.9	
4	0	78.78	47	137	4.26	157.85	152	14	6.57E-03	54.9	
5	5	92.58	98	77	1.42	185.43	180	15	1.37E-02	18.9	
6	5	95.63	21	64	1.42	191.55	180	15	2.94E-03	68.3	
7	0	142.91	33	93	1.33	286.09	282	9	4.55E-03	55.7	
8	0	185.71	70	81	1.25	371.68	368	8	9.70E-03	25.4	
9	0	238.59	74	73	0.94	477.42	473	8	1.03E-02	23.4	
10	0	295.97	34	77	1.43	592.17	585	14	4.68E-03	57.9	
11	0	425.08	17	14	1.81	850.36	847	7	2.33E-03	44.5	
12	0	431.97	20	37	5.12	864.15	857	13	2.84E-03	64.4	
13	0	477.31	82	29	1.38	954.81	950	12	1.14E-02	16.9	
14	0	510.76	163	52	2.30	1021.72	1015	15	2.26E-02	12.7	
15	0	608.88	31	28	1.32	1217.94	1213	11	4.34E-03	37.1	
16	0	621.35	16	12	1.64	1242.88	1238	8	2.22E-03	45.1	
17	0	682.89	13	20	1.91	1365.94	1358	13	1.80E-03	76.0	
18	0	817.53	9	12	1.59	1635.22	1630	8	1.31E-03	71.1	
19	0	844.15	16	8	1.26	1688.46	1684	8	2.26E-03	38.9	
20	0	859.67	7	20	0.63	1719.50	1714	9	9.05E-04	130.7	
21	0	921.75	12	0	2.38	1843.67	1840	8	1.67E-03	28.9	
22	0	951.93	11	3	1.73	1904.01	1901	6	1.58E-03	37.9	
23	0	962.84	8	14	2.66	1925.83	1917	11	1.16E-03	92.7	
24	0	1109.12	8	4	0.75	2218.40	2215	7	1.04E-03	55.2	
25	0	1120.14	12	3	1.09	2240.44	2234	9	1.70E-03	36.6	
26	0	1166.29	8	0	1.35	2332.75	2329	7	1.11E-03	35.4	
27	0	1205.77	5	6	0.52	2411.71	2409	9	7.45E-04	85.7	
28	0	1278.85	12	3	0.95	2557.86	2551	12	1.67E-03	40.7	
29	0	1313.81	10	2	0.81	2627.79	2623	8	1.43E-03	38.9	
30	0	1407.23	8	4	0.93	2814.64	2810	8	1.17E-03	53.1	
31	0	1412.95	5	6	1.36	2826.09	2821	8	7.26E-04	91.7	
32	0	1422.84	8	5	1.21	2845.87	2840	9	1.04E-03	62.7	
33	0	1459.86	26	8	1.16	2919.90	2914	11	3.66E-03	28.6	
34	0	1547.82	9	2	1.40	3095.86	3090	10	1.22E-03	47.1	
35	0	1763.32	18	0	1.83	3526.89	3522	9	2.50E-03	23.6	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	82	10.44*	2.504E+00	1.552E+02	2.932E+02	33.88
K-40	1460.82	6	10.66*	9.854E-01	2.630E+01	2.630E+01	285.69
AS-73	53.44	36	10.30*	6.654E+00	2.599E+01	3.962E+01	105.49
Y-91	1204.77	5	0.26*	1.153E+00	8.876E+02	1.583E+03	171.38
RH-106	621.93	16	9.93*	2.016E+00	3.964E+01	4.342E+01	90.14
	1050.41	-----	1.56	1.294E+00	-----	Line Not Found	-----
RU-106	621.93	16	9.93*	2.016E+00	3.964E+01	4.342E+01	90.14
	1050.41	-----	1.56	1.294E+00	-----	Line Not Found	-----
PB-210	46.54	20	4.25*	6.458E+00	3.688E+01	3.703E+01	190.89
BI-214	609.32	6	45.49*	2.051E+00	3.143E+00	3.144E+00	417.65
	1120.29	1	14.92	1.226E+00	3.846E+00	3.847E+00	726.00
	1764.49	7	15.30	8.482E-01	2.674E+01	2.674E+01	134.55
RA-226	186.21	24	3.59*	4.855E+00	6.833E+01	6.833E+01	156.11
U-234	53.20	36	0.12*	6.654E+00	2.231E+03	2.231E+03	105.49
	120.90	-----	0.04	5.945E+00	-----	Line Not Found	-----
U-235	143.76	25	10.96*	5.547E+00	2.047E+01	2.047E+01	149.16
	163.33	-----	5.08	5.201E+00	-----	Line Not Found	-----
	185.72	24	57.20	4.855E+00	4.288E+00	4.288E+00	156.11
	205.31	-----	5.01	4.580E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

Total number of lines in spectrum 32
Number of unidentified lines 12
Number of lines tentatively identified by NID 20 62.50%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.89	1.552E+02	2.932E+02	0.993E+02	33.88	
K-40	1.25E+09Y	1.00	2.630E+01	2.630E+01	7.515E+01	285.69	
AS-73	80.30D	1.52	2.599E+01	3.962E+01	4.179E+01	105.49	
Y-91	58.51D	1.78	8.876E+02	1.583E+03	2.713E+03	171.38	
RH-106	371.80D	1.10	3.964E+01	4.342E+01	3.914E+01	90.14	
RU-106	371.80D	1.10	3.964E+01	4.342E+01	3.914E+01	90.14	
PB-210	22.20Y	1.00	3.688E+01	3.703E+01	7.070E+01	190.89	
BI-214	1600.00Y	1.00	3.143E+00	3.144E+00	13.13E+00	417.65	
RA-226	1600.00Y	1.00	6.833E+01	6.833E+01	10.67E+01	156.11	
U-234	2.45E+05Y	1.00	2.231E+03	2.231E+03	2.353E+03	105.49	
U-235	7.04E+08Y	1.00	2.047E+01	2.047E+01	3.053E+01	149.16	
Total Activity :			3.534E+03	4.389E+03			

Grand Total Activity : 3.534E+03 4.389E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	78.78	47	137	4.26	157.85	152	14	6.57E-03	****	6.64E+00	T
5	92.58	44	77	1.42	185.43	180	15	6.16E-03	88.8	6.45E+00	T
5	95.63	21	64	1.42	191.55	180	15	2.94E-03	****	6.40E+00	T
0	295.97	24	77	1.43	592.17	585	14	3.28E-03	****	3.60E+00	T
0	425.08	17	14	1.81	850.36	847	7	2.33E-03	88.9	2.75E+00	T
0	431.97	20	37	5.12	864.15	857	13	2.84E-03	****	2.71E+00	
0	682.89	13	20	1.91	1365.94	1358	13	1.80E-03	****	1.86E+00	
0	817.53	9	12	1.59	1635.22	1630	8	1.31E-03	****	1.60E+00	T
0	844.15	16	8	1.26	1688.46	1684	8	2.26E-03	77.8	1.56E+00	
0	859.67	3	20	0.63	1719.50	1714	9	3.76E-04	****	1.53E+00	T
0	921.75	12	0	2.38	1843.67	1840	8	1.67E-03	57.7	1.45E+00	
0	951.93	11	3	1.73	1904.01	1901	6	1.58E-03	75.7	1.41E+00	
0	962.84	1	14	2.66	1925.83	1917	11	8.98E-05	****	1.39E+00	T
0	1109.12	8	4	0.75	2218.40	2215	7	1.04E-03	****	1.24E+00	
0	1166.29	8	0	1.35	2332.75	2329	7	1.11E-03	70.7	1.19E+00	
0	1278.85	12	3	0.95	2557.86	2551	12	1.67E-03	81.4	1.10E+00	
0	1313.81	10	2	0.81	2627.79	2623	8	1.43E-03	77.7	1.07E+00	
0	1407.23	8	4	0.93	2814.64	2810	8	1.17E-03	****	1.02E+00	T
0	1412.95	5	6	1.36	2826.09	2821	8	7.26E-04	****	1.01E+00	
0	1422.84	8	5	1.21	2845.87	2840	9	1.04E-03	****	1.01E+00	
0	1547.82	9	2	1.40	3095.86	3090	10	1.22E-03	94.2	9.40E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                           *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*                                     *                                               *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289002.CNF;1        *
* Acquisition date   : 17-MAY-2022 08:00:33 Sensitivity      : 3.000                *
* Detector ID        : GAM45 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:00.52 Half life ratio  : *****          *
* Sample date        : 29-MAR-2022 12:55:00 Nuclide Library : LIQUID          *
* Sample ID          : G579289002 Analyst initials: RXF2          *
* Batch Number       : 2264689 Sample Quantity : 7.5667E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000        *
*                                     Dry Weight    : 0.00000        *
*****
*                                     CALIBRATION INFORMATION                       *
*                                     *                                               *
* Eff. Cal. date     : 28-FEB-2022 05:30:22 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM45_JAR.CNF;1          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.338E+01
K-40	3.211E+01
AS-73	1.584E+01
Y-91	1.534E+03
RH-106	2.444E+01
RU-106	2.444E+01
PB-210	2.810E+01
BI-214	5.124E+00
RA-226	4.560E+01
U-234	8.924E+02
U-235	1.404E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	2.695E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.698E+00	NOT IDENT.
SC-46	3.454E+00	FAIL ABUN
V-48	2.071E+01	NOT IDENT.
CR-51	6.001E+01	NOT IDENT.
MN-52	8.245E+02	NOT IDENT.
MN-54	3.121E+00	NOT IDENT.
CO-56	4.662E+00	NOT IDENT.
CO-57	1.715E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.413E+00	NOT IDENT.
FE-59	8.208E+00	NOT IDENT.
CO-60	2.213E+00	NOT IDENT.
ZN-65	4.772E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	1.158E+02	NOT IDENT.
AS-74	2.420E+01	NOT IDENT.
SE-75	4.302E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF

SR-82	4.344E+01	NOT IDENT.
RB-83	8.569E+00	NOT IDENT.
RB-84	1.071E+01	NOT IDENT.
KR-85	4.976E+02	NOT IDENT.
SR-85	3.724E+00	NOT IDENT.
RB-86	2.375E+02	NOT IDENT.
Y-88	3.888E+00	NOT IDENT.
NB-94	2.943E+00	NOT IDENT.
NB-95	5.234E+00	NOT IDENT.
NB-95M	1.201E+01	NOT IDENT.
TC-95M	5.036E+00	NOT IDENT.
ZR-95	6.757E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	1.907E+00	NOT IDENT.
RH-102M	1.881E+00	NOT IDENT.
RU-103	5.221E+00	FAIL ABUN
AG-108M	2.167E+00	NOT IDENT.
CD-109	3.499E+01	NOT IDENT.
AG-110	5.617E+01	NOT IDENT.
AG-110M	3.647E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	3.824E+00	NOT IDENT.
IN-114M	1.992E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	2.146E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.419E+00	NOT IDENT.
SB-124	7.078E+00	NOT IDENT.
SB-125	6.135E+00	NOT IDENT.
TE-125M	8.355E+02	NOT IDENT.
I-126	8.716E+01	NOT IDENT.
SB-126	6.079E+01	NOT IDENT.
SN-126	3.397E+00	NOT IDENT.
SB-127	0.000E+00	SHORT HLIF
TE-129	7.255E+01	NOT IDENT.
I-131	1.665E+02	FAIL ABUN
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	3.362E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	2.624E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	3.047E+01	FAIL ABUN
BA-137M	2.553E+00	NOT IDENT.
CS-137	2.697E+00	NOT IDENT.
LA-138	3.875E+00	NOT IDENT.
CE-139	2.426E+00	NOT IDENT.
BA-140	1.177E+02	FAIL ABUN
LA-140	3.250E+01	NOT IDENT.
CE-141	8.523E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.591E+01	FAIL ABUN
PM-144	2.870E+00	FAIL ABUN
PR-144	2.173E+02	NOT IDENT.
PM-146	2.185E+00	NOT IDENT.
ND-147	3.625E+02	FAIL ABUN
PM-147	4.937E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	7.486E+00	FAIL ABUN
GD-153	4.315E+00	NOT IDENT.
EU-154	7.348E+00	NOT IDENT.
EU-155	6.444E+00	NOT IDENT.
TB-160	1.457E+01	FAIL ABUN
HO-166M	4.334E+00	FAIL ABUN
TM-171	2.512E+02	NOT IDENT.
LU-176	2.056E+00	NOT IDENT.
LU-177	2.528E+03	NOT IDENT.
HF-181	5.983E+00	NOT IDENT.
W-181	4.252E+00	NOT IDENT.
TA-182	1.395E+01	FAIL ABUN
RE-183	4.872E+00	NOT IDENT.
RE-184	1.694E+01	NOT IDENT.
RE-188	1.547E+01	FAIL ABUN
W-188	6.641E+02	NOT IDENT.
OS-191	4.497E+01	NOT IDENT.
IR-192	3.685E+00	FAIL ABUN

PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF
TL-202	3.634E+01	FAIL ABUN
HG-203	4.873E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	1.416E+02	FAIL ABUN
BI-207	3.802E+00	NOT IDENT.
TL-208	3.685E+00	FAIL ABUN
BI-211	1.959E+01	NOT IDENT.
PB-211	5.704E+01	NOT IDENT.
BI-212	3.416E+01	NOT IDENT.
PB-212	7.229E+00	NOT IDENT.
BI-213	7.409E+00	NOT IDENT.
PB-214	6.530E+00	FAIL ABUN
RN-219	3.368E+01	NOT IDENT.
FR-221	1.459E+01	NOT IDENT.
RA-223	4.406E+01	FAIL ABUN
RA-224	5.211E+01	NOT IDENT.
AC-225	4.306E+02	NOT IDENT.
AC-227	1.742E+01	FAIL ABUN
TH-227	1.742E+01	FAIL ABUN
AC-228	1.463E+01	NOT IDENT.
RA-228	1.463E+01	NOT IDENT.
TH-228	7.229E+00	NOT IDENT.
TH-229	3.717E+01	NOT IDENT.
TH-230	3.063E+02	NOT IDENT.
PA-231	3.831E+01	NOT IDENT.
TH-231	2.106E+01	NOT IDENT.
TH-232	4.714E+02	NOT IDENT.
PA-233	4.703E+00	FAIL ABUN
PA-234	1.972E+01	FAIL ABUN
PA-234M	3.674E+02	NOT IDENT.
TH-234	3.605E+01	FAIL ABUN
NP-237	4.703E+00	FAIL ABUN
NP-238	0.000E+00	SHORT HLIF
U-238	3.605E+01	FAIL ABUN
NP-239	1.765E+01	NOT IDENT.
AM-241	3.134E+00	NOT IDENT.
AM-242	3.425E+01	NOT IDENT.
AM-243	1.916E+00	NOT IDENT.
CM-243	6.114E+00	NOT IDENT.
BK-247	6.346E+00	NOT IDENT.
CM-247	2.970E+00	NOT IDENT.
CF-249	2.629E+00	NOT IDENT.
CF-251	9.797E+00	NOT IDENT.
CF-252	9.799E+03	NOT IDENT.
ANH-511	5.628E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289002.CNF;1
Acquisition date : 17-MAY-2022 08:00:33 Sensitivity : 3.000
Detector ID : GAM45 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.52 Half life ratio : *****
Sample date : 29-MAR-2022 12:55:00 Nuclide Library : LIQUID
Sample ID : G579289002 Analyst initials: RXF2
Batch Number : 2264689 Sample Quantity : 7.5667E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 28-FEB-2022 05:30:22 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM45_JAR.CNF;1

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	2.932E+02	1.007E+02	1.009E+02
K-40	2.630E+01	7.368E+01	7.368E+01
AS-73	3.962E+01	4.182E+01	4.183E+01
Y-91	1.583E+03	2.662E+03	2.662E+03
RH-106	4.342E+01	3.862E+01	3.863E+01
RU-106	4.342E+01	3.862E+01	3.863E+01
PB-210	3.703E+01	6.938E+01	6.939E+01
BI-214	3.144E+00	1.287E+01	1.287E+01
RA-226	6.833E+01	1.050E+02	1.050E+02
U-234	2.231E+03	2.318E+03	2.318E+03
U-235	2.047E+01	3.002E+01	3.002E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-1.888E+00	4.437E+00	4.518E+00	NOT IDENT.
NA-24	-7.537E+23	1.117E+24	0.000E+00	SHORT HLIF
AL-26	-6.096E-01	3.383E+00	3.395E+00	NOT IDENT.
SC-46	-6.128E-01	4.267E+00	4.276E+00	FAIL ABUN
V-48	-5.223E+00	2.617E+01	2.627E+01	NOT IDENT.
CR-51	3.111E+01	6.926E+01	7.067E+01	NOT IDENT.
MN-52	-7.150E+02	1.194E+03	1.237E+03	NOT IDENT.
MN-54	-1.501E+00	3.973E+00	4.030E+00	NOT IDENT.
CO-56	2.937E+00	5.494E+00	5.651E+00	NOT IDENT.
CO-57	-7.328E-01	2.076E+00	2.102E+00	NOT IDENT.
NI-57	4.685E+10	4.950E+10	5.382E+10	SHORT HLIF
CO-58	8.841E-01	3.837E+00	3.857E+00	NOT IDENT.
FE-59	-3.135E+00	1.091E+01	1.101E+01	NOT IDENT.
CO-60	-8.299E-01	3.036E+00	3.059E+00	NOT IDENT.
ZN-65	-4.333E+00	8.207E+00	8.436E+00	NOT IDENT.
CU-67	2.563E+06	3.938E+06	4.104E+06	SHORT HLIF
GE-68	9.134E+01	1.209E+02	1.277E+02	NOT IDENT.
AS-74	-1.819E+01	3.101E+01	3.208E+01	NOT IDENT.
SE-75	1.926E+00	5.016E+00	5.091E+00	NOT IDENT.

BR-77	-1.548E+07	2.222E+07	2.329E+07	SHORT HLIF
SR-82	-3.309E+01	5.972E+01	6.156E+01	NOT IDENT.
RB-83	7.338E+00	9.024E+00	9.612E+00	NOT IDENT.
RB-84	2.201E+00	1.232E+01	1.236E+01	NOT IDENT.
KR-85	-2.466E+03	8.816E+02	1.420E+03	NOT IDENT.
SR-85	-1.846E+01	6.598E+00	1.063E+01	NOT IDENT.
RB-86	1.950E+02	2.467E+02	2.619E+02	NOT IDENT.
Y-88	-1.477E+00	5.061E+00	5.105E+00	NOT IDENT.
NB-94	2.774E+00	3.043E+00	3.290E+00	NOT IDENT.
NB-95	1.015E+00	6.027E+00	6.044E+00	NOT IDENT.
NB-95M	-2.258E+01	1.714E+01	1.994E+01	NOT IDENT.
TC-95M	1.102E+00	5.933E+00	5.954E+00	NOT IDENT.
ZR-95	-1.134E+00	8.207E+00	8.223E+00	NOT IDENT.
MO-99	3.486E+06	5.388E+06	5.613E+06	SHORT HLIF
TC-99M	1.000E+41	4.086E+41	0.000E+00	SHORT HLIF
RH-101	-8.941E-01	2.331E+00	2.366E+00	NOT IDENT.
RH-102M	-4.242E-01	2.474E+00	2.481E+00	NOT IDENT.
RU-103	-2.347E+00	6.321E+00	6.409E+00	FAIL ABUN
AG-108M	-3.897E-01	3.051E+00	3.056E+00	NOT IDENT.
CD-109	-3.980E+01	5.038E+01	5.348E+01	NOT IDENT.
AG-110	-3.824E+01	7.215E+01	7.418E+01	NOT IDENT.
AG-110M	1.549E+00	3.980E+00	4.041E+00	NOT IDENT.
IN-111	2.381E+05	3.711E+05	3.863E+05	SHORT HLIF
SN-113	1.420E+00	4.532E+00	4.578E+00	NOT IDENT.
IN-114M	-1.107E+01	2.501E+01	2.550E+01	NOT IDENT.
CD-115	-9.502E+06	3.564E+07	3.590E+07	SHORT HLIF
SN-117M	-1.270E-01	2.540E+01	2.540E+01	NOT IDENT.
SB-122	1.440E+05	9.903E+05	9.925E+05	SHORT HLIF
I-123	-2.583E+26	1.088E+27	0.000E+00	SHORT HLIF
TE-123M	-7.048E-01	2.932E+00	2.949E+00	NOT IDENT.
SB-124	-1.419E+00	8.912E+00	8.935E+00	NOT IDENT.
SB-125	3.304E+00	8.528E+00	8.657E+00	NOT IDENT.
TE-125M	3.987E+02	9.335E+02	9.507E+02	NOT IDENT.
I-126	-3.178E+01	1.078E+02	1.087E+02	NOT IDENT.
SB-126	-1.380E+01	7.425E+01	7.451E+01	NOT IDENT.
SN-126	-2.854E+00	4.463E+00	4.645E+00	NOT IDENT.
SB-127	-5.285E+04	6.255E+04	6.695E+04	SHORT HLIF
TE-129	5.499E+00	8.205E+01	8.209E+01	NOT IDENT.
I-131	5.487E+01	1.989E+02	2.005E+02	FAIL ABUN
I-132	1.000E+41	3.921E+41	0.000E+00	SHORT HLIF
TE-132	1.719E+04	9.345E+04	9.377E+04	SHORT HLIF
BA-133	1.554E+00	3.954E+00	4.016E+00	NOT IDENT.
I-133	-8.994E+16	2.527E+17	0.000E+00	SHORT HLIF
CS-134	-1.635E+00	3.457E+00	3.534E+00	NOT IDENT.
I-135	1.000E+41	1.000E+42	0.000E+00	SHORT HLIF
CS-136	-5.910E+01	5.400E+01	6.023E+01	FAIL ABUN
BA-137M	4.216E-01	2.910E+00	2.916E+00	NOT IDENT.
CS-137	4.454E-01	3.074E+00	3.080E+00	NOT IDENT.
LA-138	1.648E+00	3.981E+00	4.050E+00	NOT IDENT.
CE-139	-1.909E-02	2.879E+00	2.879E+00	NOT IDENT.
BA-140	-5.324E+01	1.438E+02	1.458E+02	FAIL ABUN
LA-140	-2.012E+01	4.483E+01	4.574E+01	NOT IDENT.
CE-141	3.803E+00	1.038E+01	1.052E+01	NOT IDENT.
CE-143	-2.763E+11	2.571E+11	2.857E+11	SHORT HLIF
CE-144	1.241E+01	1.763E+01	1.850E+01	FAIL ABUN
PM-144	-1.626E+00	3.619E+00	3.693E+00	FAIL ABUN
PR-144	-1.284E+02	2.750E+02	2.810E+02	NOT IDENT.
PM-146	-2.973E+00	3.457E+00	3.708E+00	NOT IDENT.
ND-147	2.999E+02	3.727E+02	3.965E+02	FAIL ABUN
PM-147	3.621E+04	5.431E+04	5.672E+04	NOT IDENT.
PM-149	1.792E+08	3.062E+08	3.167E+08	SHORT HLIF
EU-152	-4.194E-01	9.329E+00	9.330E+00	FAIL ABUN
GD-153	-3.148E+00	5.779E+00	5.951E+00	NOT IDENT.
EU-154	-5.587E+00	1.229E+01	1.255E+01	NOT IDENT.
EU-155	8.510E+00	6.754E+00	7.769E+00	NOT IDENT.
TB-160	7.181E-01	1.732E+01	1.732E+01	FAIL ABUN
HO-166M	2.481E+00	4.624E+00	4.758E+00	FAIL ABUN
TM-171	-1.038E+02	3.299E+02	3.332E+02	NOT IDENT.
LU-176	6.931E-02	2.517E+00	2.517E+00	NOT IDENT.
LU-177	-8.779E+02	3.134E+03	3.159E+03	NOT IDENT.
HF-181	-5.051E+00	8.672E+00	8.966E+00	NOT IDENT.
W-181	2.585E+00	4.893E+00	5.031E+00	NOT IDENT.
TA-182	6.942E+00	1.511E+01	1.543E+01	FAIL ABUN
RE-183	-3.103E+00	6.316E+00	6.470E+00	NOT IDENT.
RE-184	-5.016E+00	2.135E+01	2.147E+01	NOT IDENT.
RE-188	-2.061E+00	1.849E+01	1.851E+01	FAIL ABUN
W-188	-1.461E+02	9.076E+02	9.100E+02	NOT IDENT.
OS-191	1.660E+01	5.105E+01	5.160E+01	NOT IDENT.

IR-192	1.236E+00	4.372E+00	4.407E+00	FAIL ABUN
PB-201	-1.077E+37	2.134E+38	0.000E+00	SHORT HLIF
TL-201	3.127E+05	1.223E+06	1.231E+06	SHORT HLIF
TL-202	6.420E+00	4.471E+01	4.480E+01	FAIL ABUN
HG-203	-2.419E+00	6.237E+00	6.332E+00	NOT IDENT.
PB-203	-7.368E+06	1.900E+07	1.929E+07	SHORT HLIF
TL-204	-3.488E+01	1.652E+02	1.660E+02	FAIL ABUN
BI-207	1.239E+00	4.311E+00	4.347E+00	NOT IDENT.
TL-208	-1.677E+00	4.046E+00	4.116E+00	FAIL ABUN
BI-211	2.608E+00	2.436E+01	2.439E+01	NOT IDENT.
PB-211	1.840E+01	6.863E+01	6.913E+01	NOT IDENT.
BI-212	1.523E+01	3.704E+01	3.767E+01	NOT IDENT.
PB-212	-1.004E+00	8.327E+00	8.340E+00	NOT IDENT.
BI-213	-7.093E+00	1.057E+01	1.104E+01	NOT IDENT.
PB-214	-2.806E+00	8.570E+00	8.663E+00	FAIL ABUN
RN-219	3.840E+01	3.660E+01	4.049E+01	NOT IDENT.
FR-221	-3.222E+00	1.792E+01	1.798E+01	NOT IDENT.
RA-223	-2.971E+01	5.868E+01	6.019E+01	FAIL ABUN
RA-224	-6.016E+00	6.369E+01	6.374E+01	NOT IDENT.
AC-225	-9.511E+01	5.291E+02	5.308E+02	NOT IDENT.
AC-227	1.275E+00	2.100E+01	2.101E+01	FAIL ABUN
TH-227	1.275E+00	2.100E+01	2.101E+01	FAIL ABUN
AC-228	1.054E+01	1.548E+01	1.619E+01	NOT IDENT.
RA-228	1.054E+01	1.548E+01	1.619E+01	NOT IDENT.
TH-228	-1.004E+00	8.327E+00	8.340E+00	NOT IDENT.
TH-229	-7.856E+00	4.527E+01	4.541E+01	NOT IDENT.
TH-230	-2.240E+02	3.832E+02	3.963E+02	NOT IDENT.
PA-231	1.628E+01	4.519E+01	4.579E+01	NOT IDENT.
TH-231	-1.569E+00	2.716E+01	2.717E+01	NOT IDENT.
TH-232	-4.288E+02	5.625E+02	5.948E+02	NOT IDENT.
PA-233	9.185E-01	5.656E+00	5.671E+00	FAIL ABUN
PA-234	-2.956E+01	4.529E+01	4.722E+01	FAIL ABUN
PA-234M	-1.086E+02	4.763E+02	4.788E+02	NOT IDENT.
TH-234	-1.131E+01	4.116E+01	4.147E+01	FAIL ABUN
NP-237	9.185E-01	5.656E+00	5.671E+00	FAIL ABUN
NP-238	1.053E+07	1.027E+08	1.028E+08	SHORT HLIF
U-238	-1.131E+01	4.116E+01	4.147E+01	FAIL ABUN
NP-239	3.031E-01	2.056E+01	2.056E+01	NOT IDENT.
AM-241	-1.319E-01	3.575E+00	3.575E+00	NOT IDENT.
AM-242	1.414E+01	3.842E+01	3.895E+01	NOT IDENT.
AM-243	-3.116E-01	2.405E+00	2.409E+00	NOT IDENT.
CM-243	1.467E+00	6.960E+00	6.992E+00	NOT IDENT.
BK-247	3.874E-01	7.683E+00	7.685E+00	NOT IDENT.
CM-247	9.751E-01	3.573E+00	3.600E+00	NOT IDENT.
CF-249	-2.316E+00	3.681E+00	3.827E+00	NOT IDENT.
CF-251	5.529E+00	1.117E+01	1.144E+01	NOT IDENT.
CF-252	1.048E+03	1.130E+04	1.131E+04	NOT IDENT.
ANH-511	-1.748E+01	6.479E+00	1.021E+01	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	51.2687	133.52	54.0911	116.30	0.0000
879.38	44.2172	364.49	54.0988	116.74	53.1727
46.54	44.3390	80.22	0.0000	117.23	42.2045
228.16	0.0000	711.68	54.1411	119.76	57.1104
52.39	41.7331	356.01	54.1882	120.54	52.5682
53.20	37.9091	323.87	54.1959	120.90	43.3701
53.44	37.9333	82.35	0.0000	264.66	38.7694
57.53	34.6927	82.47	49.4602	121.22	36.9287
293.27	0.0000	82.47	0.0000	344.28	44.3529
57.53	27.1904	83.79	48.4373	122.06	50.8429
482.18	27.1905	265.00	51.9186	1274.44	48.1442
57.98	44.6429	84.21	51.9406	123.68	49.1157
59.32	40.1499	84.86	0.0000	1377.63	0.0000
59.54	43.4513	193.51	59.8749	127.23	47.5156
155.04	60.1351	105.31	52.1786	129.43	38.3243
63.00	39.6850	86.79	61.7734	131.20	50.6069
129.43	38.8853	86.94	61.7919	133.02	54.4998
63.29	38.8853	87.09	62.6803	133.52	46.0758
290.67	37.2562	87.57	54.8957	135.34	0.0000
63.81	38.9333	88.03	54.6536	136.00	57.5645
87.57	51.4160	306.78	59.3402	136.28	52.8674
64.99	52.3324	88.47	59.3553	136.47	52.8820
65.08	52.3435	531.02	42.1077	739.50	0.0000
66.73	36.6977	184.58	0.0000	140.51	0.0000
66.98	40.0569	92.59	42.2238	140.88	34.2070
67.24	40.0811	93.31	0.0000	143.76	54.3768
67.67	46.8069	94.56	42.3772	144.24	49.6395
1221.41	46.8155	311.90	42.3842	145.44	40.7969
439.51	51.9658	946.00	42.3860	152.32	44.3912
70.82	51.9658	97.43	46.1479	152.43	44.3976
167.43	0.0000	98.43	37.9326	1048.07	42.5129
97.43	38.6230	98.44	37.9333	154.21	50.3060
70.82	0.0000	99.53	39.1942	155.04	49.3915
70.82	43.7726	103.37	39.1942	158.56	47.5151
279.20	0.0000	116.74	39.1942	158.97	0.0000
1063.66	50.7280	100.11	43.6930	159.00	53.5385
72.87	0.0000	100.20	43.6997	162.33	50.8328
351.06	50.7349	102.03	43.8399	537.26	54.7653
74.66	38.4810	103.18	49.3058	163.33	41.1086
238.63	46.4195	103.37	43.9416	165.86	46.1480
351.93	46.4195	105.31	29.6915	167.43	0.0000
238.63	46.4195	106.12	46.8509	245.35	0.0000
74.97	45.3019	106.47	55.8938	427.87	52.7040
77.11	53.7556	109.28	37.1362	176.60	52.7218
256.23	54.0435	111.00	46.3250	177.52	43.8174
79.82	0.0000	111.76	0.0000	181.07	0.0000
80.02	54.0801	208.37	48.2949	184.41	58.8940
80.03	54.0805	116.24	59.5430	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	47.2532	300.09	35.8838	477.60	16.0057
186.21	47.2797	300.13	35.8857	477.99	16.0092
190.27	50.5302	301.36	33.6758	482.18	22.8038
193.51	48.6848	302.85	39.3355	487.02	19.4783
197.03	43.7834	304.50	43.8893	492.35	0.0000
198.01	47.9079	304.85	32.6445	497.08	22.1422
201.83	53.2251	306.78	33.8223	511.00	48.0544
204.12	49.2517	308.46	31.6094	514.00	68.7598
205.31	58.5612	311.90	27.1677	520.40	17.2493
208.37	45.3522	316.51	28.4012	520.69	0.0000
210.85	41.3367	319.41	25.0494	667.71	0.0000
215.65	41.5430	320.08	20.5054	527.90	0.0000
218.12	43.7303	321.04	27.3611	529.59	19.0665
222.11	32.4082	323.87	34.2755	529.87	0.0000
227.09	45.1777	325.23	30.8801	531.02	10.4077
227.38	49.3946	1596.21	35.5495	537.26	20.0127
228.16	0.0000	331.15	0.0000	1260.41	0.0000
228.18	44.1745	333.37	36.8232	552.55	22.8018
235.69	68.8681	334.37	31.0927	795.86	14.1074
235.96	68.8860	338.28	34.6481	564.24	0.0000
238.63	45.6882	911.20	34.6490	569.33	22.1100
238.98	0.0000	340.48	37.0186	569.50	19.4586
240.99	55.3746	340.55	32.3921	569.70	19.4604
242.00	33.0435	344.28	31.3209	582.08	18.6886
244.70	36.3336	345.93	24.3902	583.19	12.4659
245.35	0.0000	351.06	32.6407	595.83	21.5010
459.60	34.3853	351.93	33.8277	600.60	23.3456
685.70	0.0000	356.01	25.7376	604.72	20.2423
388.16	26.9176	361.25	0.0000	609.32	17.1306
256.23	31.3223	364.49	24.7145	610.33	29.7679
527.90	0.0000	366.42	0.0000	614.28	20.6050
264.66	34.8247	383.85	23.8519	618.01	8.1478
265.00	40.2779	388.16	28.7051	621.93	14.9645
269.46	34.9727	666.33	28.7139	630.19	0.0000
401.81	42.6884	391.70	17.9828	631.29	11.8410
273.65	40.5839	400.66	30.1483	632.98	20.0539
276.40	37.3826	401.32	0.0000	633.25	19.1449
583.19	39.6145	401.81	15.6886	634.78	13.6847
277.60	39.6222	402.40	24.1455	635.95	20.0816
402.40	40.7364	404.85	24.1840	636.99	22.8302
278.43	35.2441	410.95	18.2089	657.50	19.3551
279.20	0.0000	720.70	31.6375	884.68	18.4351
279.54	46.3015	423.72	26.1068	661.66	12.9268
280.46	40.8222	427.09	12.2632	664.57	0.0000
301.36	35.4023	427.87	12.2690	666.33	14.8040
284.31	46.4899	433.94	22.9881	666.50	14.8053
285.41	31.0215	439.51	22.2424	667.71	0.0000
285.90	0.0000	440.45	29.6733	677.62	11.1577
287.50	39.9551	453.88	19.9414	685.70	0.0000
290.67	29.6737	459.60	20.0088	692.65	0.0000
293.27	0.0000	463.37	16.7106	695.00	11.2412
295.22	29.0405	468.07	15.9184	696.49	22.4961
316.51	29.0580	473.00	0.0000	696.51	22.4961
298.58	40.3198	475.06	16.4031	697.00	23.4385
299.98	40.3660	696.49	15.9980	697.49	22.5059

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	11.2773	903.28	12.1680	1291.59	5.6856
706.68	9.4137	907.67	0.0000	1298.22	0.0000
711.68	8.4899	911.20	5.0838	1312.11	0.0000
720.70	12.3092	984.45	0.0000	1332.49	5.7446
721.93	0.0000	926.36	7.3582	1365.19	1.1583
1690.97	11.3721	935.54	9.2263	1368.63	0.0000
722.91	11.3726	937.49	14.3612	1377.63	0.0000
723.31	13.2703	983.53	8.2246	1384.29	4.6546
756.73	11.3784	945.96	0.0000	1408.01	3.5110
727.33	7.5954	946.00	18.5164	1434.09	6.1818
733.00	12.3711	949.00	7.7228	1435.80	2.6505
735.93	16.1969	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	9.3080	1460.82	8.5313
1434.09	13.3831	964.08	10.8657	1489.16	8.0502
747.24	13.3996	966.17	17.0861	1596.21	5.4950
752.31	13.4264	968.97	7.2552	1620.50	4.6030
753.82	13.4349	983.53	10.4134	1678.03	0.0000
756.73	11.5288	984.45	0.0000	1690.97	2.8026
763.94	20.2327	996.26	13.5924	1757.55	0.0000
765.80	18.3189	1001.03	8.3773	1764.49	3.0338
1001.03	17.3591	1004.73	9.4354	1770.23	5.6949
766.84	13.5038	1025.87	0.0000	1771.35	2.8480
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	10.6504	1037.84	4.2370	1808.65	4.7812
777.92	0.0000	1038.76	0.0000	1836.06	5.7678
778.90	10.6603	1046.59	6.3726		
783.70	0.0000	1048.07	13.8125		
1435.80	11.6733	1050.41	6.3799		
903.28	12.6620	1063.66	7.4728		
795.86	13.6559	1077.00	6.4309		
801.95	11.7319	1077.34	6.4316		
802.10	11.7329	1083.85	2.1479		
810.29	12.7498	1085.87	11.8209		
810.45	12.7503	1099.25	7.5520		
810.76	6.8664	1111.64	8.1207		
815.77	7.3706	1112.07	6.4976		
818.51	13.2808	1112.84	4.8743		
832.01	8.8982	1115.54	9.7559		
834.85	18.8044	1120.29	9.7690		
835.15	18.8067	1120.55	9.7698		
836.80	0.0000	1121.30	14.6580		
846.77	10.4372	1808.65	9.7954		
856.80	8.9784	1131.51	0.0000		
860.56	8.9905	1332.49	7.7126		
871.09	11.0295	1177.95	12.1360		
873.19	12.0410	1189.05	5.5334		
875.33	0.0000	1204.77	5.0013		
879.38	7.0393	1221.41	4.4655		
880.51	9.0542	1231.02	6.7158		
881.60	10.0639	1235.36	10.0854		
883.24	12.0840	1238.28	11.2142		
884.68	6.0449	1260.41	0.0000		
889.28	10.0911	1271.87	2.2627		
894.76	12.1323	1274.44	10.1887		
1836.06	8.0973	1274.54	10.1895		

VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 11:21:37.85

```
*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289003.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM03.CNF;621
Background date    : 15-MAY-2022 09:12:01
Sample date       : 29-MAR-2022 09:00:00 Acquisition date : 17-MAY-2022 09:21:15
Sample ID        : G579289003 Sample quantity : 7.43420E-01 FILTER
Detector name    : GAM03 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:00.47 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : RXF2
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID        : 2264689 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
```

BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	84.70*	21	74	1.82	169.08	166	7	2.94E-03	75.5	
2	0	92.63*	18	139	1.41	184.95	177	15	2.53E-03	166.5	
3	0	108.82	26	65	1.30	217.32	213	8	3.66E-03	56.1	
4	0	223.27	23	43	1.65	446.20	443	8	3.18E-03	54.2	
5	0	327.78	16	32	1.73	655.21	652	7	2.19E-03	64.3	
6	0	512.00*	55	33	3.20	1023.66	1013	28	7.59E-03	42.3	
7	0	609.68	36	28	2.02	1219.05	1214	10	5.05E-03	31.7	
8	5	634.76	9	5	1.50	1269.21	1267	14	1.32E-03	43.7	2.85E+00
9	5	637.83	22	12	2.98	1275.35	1267	14	3.10E-03	36.9	
10	0	648.88	15	15	0.66	1297.45	1290	12	2.12E-03	56.9	
11	0	683.91	14	14	4.30	1367.52	1362	13	2.01E-03	57.9	
12	0	709.78	13	5	0.57	1419.27	1416	7	1.81E-03	39.9	
13	0	758.33	7	8	0.68	1516.40	1511	7	9.95E-04	76.8	
14	0	870.39	8	11	2.11	1740.56	1732	10	1.05E-03	93.9	
15	0	907.54	9	8	1.39	1814.88	1807	12	1.28E-03	71.8	
16	0	1001.07*	14	0	1.34	2002.00	1996	12	2.01E-03	39.9	
17	0	1040.94	5	10	2.07	2081.77	2076	9	6.39E-04	129.1	
18	0	1080.71	7	8	0.76	2161.33	2155	10	1.01E-03	87.0	
19	0	1105.41	10	8	0.65	2210.75	2200	16	1.39E-03	70.7	
20	0	1120.07	24	4	4.45	2240.08	2233	16	3.29E-03	28.0	
21	0	1198.15	6	3	1.16	2396.32	2392	8	8.18E-04	70.0	
22	0	1214.49	7	2	2.26	2429.00	2425	8	1.01E-03	49.5	
23	0	1461.56*	22	4	4.63	2923.39	2915	17	3.05E-03	34.7	
24	0	1559.48	7	3	1.41	3119.36	3113	10	1.03E-03	54.1	
25	0	1596.89	8	3	1.37	3194.23	3190	8	1.06E-03	57.1	
26	0	2027.35	4	5	0.52	4055.79	4051	9	5.25E-04	115.8	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 11:21:38

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289003.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 29-MAR-2022 09:00:00	Acquisition date	: 17-MAY-2022 09:21:15
Sample ID	: G579289003	Sample quantity	: 0.74342 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA3	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.47 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	22	10.66*	8.157E-01	1.275E+02	1.275E+02	69.34
TE-125M	109.28	26	0.27*	3.980E+00	1.240E+03	2.242E+03	112.18
BI-214	609.32	36	45.49*	1.695E+00	2.382E+01	2.382E+01	63.35
	1120.29	24	14.92	1.017E+00	7.870E+01	7.870E+01	56.07
	1764.49	-----	15.30	7.198E-01	-----	Line Not Found	-----
TH-231	84.21	21	6.60*	3.020E+00	5.359E+01	5.359E+01	150.98
ANH-511	511.00	55	100.00*	1.935E+00	1.426E+01	1.426E+01	84.57

Flag: "*" = Keyline

```

*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                          *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*                                     *                                               *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289003.CNF;1      *
* Acquisition date   : 17-MAY-2022 09:21:15 Sensitivity      : 3.000                *
* Detector ID       : GAM03 Energy tolerance: 1.500          *
* Elapsed live time : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time : 0 02:00:00.47 Half life ratio : ***** *
* Sample date       : 29-MAR-2022 09:00:00 Analyst initials: RXF2          *
* Sample ID        : G579289003 Sample Quantity : 7.4342E-01 FILTER *
* Batch Number     : 2264689 Wet Weight : 0.00000          *
* Wet wt corr      : 1.00000 Dry Weight : 0.00000           *
* Nuclide Library   : LIQUID.NLB;26                                           *
*****
*                                     CALIBRATION INFORMATION                       *
*                                     *                                               *
* Eff. Cal. date    : 20-APR-2022 11:51:08 Eff. Geometry   : JAR              *
* Eff. File         : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16             *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
K-40	1.275E+02	8.667E+01	7.463E+01
TE-125M	2.242E+03	2.465E+03	3.403E+03
BI-214	2.382E+01	1.479E+01	1.855E+01
TH-231	5.359E+01	7.928E+01	1.035E+02
ANH-511	1.426E+01	1.182E+01	6.033E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	-4.211E+01		6.687E+01	1.097E+02	NOT IDENT.
NA-22	3.540E-01		4.036E+00	8.632E+00	NOT IDENT.
NA-24	0.000E+00		1.697E+24	0.000E+00	SHORT HLIF
AL-26	-1.485E+00		3.468E+00	6.615E+00	NOT IDENT.
SC-46	-1.992E+00		5.542E+00	1.015E+01	FAIL ABUN
V-48	-5.602E+00		3.275E+01	6.215E+01	NOT IDENT.
CR-51	2.090E+01		9.662E+01	1.823E+02	NOT IDENT.
MN-52	1.298E+02		1.469E+03	3.295E+03	NOT IDENT.
MN-54	3.882E+00		4.216E+00	9.406E+00	NOT IDENT.
CO-56	-1.155E+00		6.546E+00	1.225E+01	NOT IDENT.
CO-57	7.886E-01		3.413E+00	6.474E+00	NOT IDENT.
NI-57	0.000E+00		4.169E+10	0.000E+00	SHORT HLIF
CO-58	1.104E+00		6.051E+00	1.217E+01	NOT IDENT.
FE-59	-7.176E+00		1.627E+01	2.402E+01	NOT IDENT.
CO-60	1.491E+00		3.569E+00	8.393E+00	NOT IDENT.
ZN-65	-4.042E+00		1.208E+01	1.841E+01	NOT IDENT.
CU-67	0.000E+00		4.264E+06	0.000E+00	SHORT HLIF
GE-68	-2.593E+02		2.517E+02	3.022E+02	NOT IDENT.
AS-73	1.037E+02		2.510E+02	4.569E+02	NOT IDENT.
AS-74	2.958E+01		4.183E+01	8.767E+01	FAIL ABUN
SE-75	-3.087E+00		6.311E+00	1.098E+01	NOT IDENT.
BR-77	0.000E+00		2.650E+07	0.000E+00	SHORT HLIF
SR-82	2.540E+01		8.488E+01	1.763E+02	NOT IDENT.
RB-83	4.967E+00		1.076E+01	2.039E+01	NOT IDENT.
RB-84	1.648E+00		1.350E+01	2.766E+01	NOT IDENT.

KR-85	2.178E+03	1.020E+03	2.281E+03	NOT IDENT.
SR-85	1.634E+01	7.653E+00	1.711E+01	NOT IDENT.
RB-86	-5.281E+02	5.126E+02	6.155E+02	NOT IDENT.
Y-88	1.584E+00	6.739E+00	1.466E+01	NOT IDENT.
Y-91	-1.222E+03	3.400E+03	6.045E+03	NOT IDENT.
NB-94	6.360E-01	4.201E+00	8.187E+00	FAIL ABUN
NB-95	2.074E+00	6.809E+00	1.371E+01	NOT IDENT.
NB-95M	-3.160E+01	2.014E+01	3.115E+01	NOT IDENT.
TC-95M	-4.839E+00	8.219E+00	1.253E+01	NOT IDENT.
ZR-95	7.173E+00	1.143E+01	2.437E+01	NOT IDENT.
MO-99	0.000E+00	7.756E+06	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
RH-101	1.575E+00	3.710E+00	7.153E+00	NOT IDENT.
RH-102M	1.477E+00	3.508E+00	6.786E+00	NOT IDENT.
RU-103	-6.993E+00	8.757E+00	1.386E+01	FAIL ABUN
RH-106	-1.032E+01	4.211E+01	7.853E+01	NOT IDENT.
RU-106	-1.032E+01	4.211E+01	7.853E+01	NOT IDENT.
AG-108M	1.819E+00	3.283E+00	6.514E+00	NOT IDENT.
CD-109	6.385E+01	1.238E+02	1.891E+02	NOT IDENT.
AG-110	1.748E+01	9.799E+01	1.931E+02	NOT IDENT.
AG-110M	-8.446E-01	5.184E+00	1.003E+01	NOT IDENT.
IN-111	0.000E+00	5.616E+05	0.000E+00	SHORT HLIF
SN-113	-1.518E+00	7.055E+00	1.243E+01	NOT IDENT.
IN-114M	-3.135E-03	3.411E+01	6.279E+01	NOT IDENT.
CD-115	0.000E+00	4.247E+07	0.000E+00	SHORT HLIF
SN-117M	1.086E+01	3.293E+01	6.305E+01	NOT IDENT.
SB-122	0.000E+00	1.390E+06	0.000E+00	SHORT HLIF
I-123	0.000E+00	1.809E+27	0.000E+00	SHORT HLIF
TE-123M	1.546E+00	3.700E+00	7.134E+00	NOT IDENT.
SB-124	7.613E+00	1.645E+01	3.801E+01	NOT IDENT.
SB-125	1.142E+01	1.152E+01	2.352E+01	FAIL ABUN
I-126	5.841E+01	1.531E+02	3.125E+02	NOT IDENT.
SB-126	-1.288E+01	1.145E+02	2.172E+02	NOT IDENT.
SN-126	-3.472E+00	1.290E+01	1.741E+01	NOT IDENT.
SB-127	0.000E+00	7.513E+04	0.000E+00	SHORT HLIF
TE-129	-1.826E+01	1.322E+02	2.335E+02	NOT IDENT.
I-131	8.655E+01	2.599E+02	4.940E+02	FAIL ABUN
I-132	0.000E+00	1.062E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	1.287E+05	0.000E+00	SHORT HLIF
BA-133	-5.041E+00	5.486E+00	8.845E+00	NOT IDENT.
I-133	0.000E+00	3.702E+17	0.000E+00	SHORT HLIF
CS-134	4.999E+00	4.589E+00	1.038E+01	NOT IDENT.
I-135	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
CS-136	3.617E+01	6.452E+01	1.412E+02	NOT IDENT.
BA-137M	-3.734E+00	3.896E+00	6.451E+00	NOT IDENT.
CS-137	-3.945E+00	4.116E+00	6.815E+00	NOT IDENT.
LA-138	2.777E-01	5.062E+00	1.129E+01	NOT IDENT.
CE-139	-7.477E-01	3.720E+00	6.807E+00	NOT IDENT.
BA-140	-7.720E+01	1.775E+02	3.283E+02	NOT IDENT.
LA-140	7.603E+01	8.507E+01	1.939E+02	FAIL ABUN
CE-141	-7.704E+00	1.598E+01	2.717E+01	NOT IDENT.
CE-143	0.000E+00	3.864E+11	0.000E+00	SHORT HLIF
CE-144	1.052E+01	2.220E+01	4.342E+01	NOT IDENT.
PM-144	2.448E-01	4.073E+00	7.972E+00	NOT IDENT.
PR-144	1.642E+01	3.099E+02	6.060E+02	NOT IDENT.
PM-146	1.545E+00	4.804E+00	9.226E+00	NOT IDENT.
ND-147	1.410E+02	4.989E+02	1.021E+03	NOT IDENT.
PM-147	-2.028E+04	9.384E+04	1.724E+05	NOT IDENT.
PM-149	0.000E+00	4.376E+08	0.000E+00	SHORT HLIF
EU-152	4.242E+00	1.174E+01	2.229E+01	NOT IDENT.
GD-153	4.771E+00	1.220E+01	2.020E+01	NOT IDENT.
EU-154	2.600E+00	1.091E+01	2.417E+01	NOT IDENT.
EU-155	-9.216E+00	1.276E+01	2.001E+01	NOT IDENT.
TB-160	-6.282E+00	1.760E+01	3.256E+01	NOT IDENT.
HO-166M	-4.081E+00	8.451E+00	1.288E+01	NOT IDENT.
TM-171	-1.244E+03	4.231E+03	7.196E+03	NOT IDENT.
LU-176	2.454E-02	3.167E+00	5.796E+00	NOT IDENT.
LU-177	-1.106E+03	4.028E+03	7.254E+03	NOT IDENT.
HF-181	-1.885E+00	9.773E+00	1.719E+01	NOT IDENT.
W-181	-4.330E+01	4.529E+01	7.104E+01	NOT IDENT.
TA-182	9.983E+00	1.956E+01	4.472E+01	FAIL ABUN
RE-183	-4.146E+01	5.064E+01	8.085E+01	NOT IDENT.
RE-184	2.226E+01	2.780E+01	5.755E+01	NOT IDENT.
RE-188	-3.682E+00	2.620E+01	4.803E+01	NOT IDENT.
W-188	-6.766E+01	1.065E+03	1.953E+03	NOT IDENT.
OS-191	5.430E+01	8.019E+01	1.582E+02	NOT IDENT.
IR-192	-2.769E+00	6.118E+00	1.057E+01	NOT IDENT.
PB-201	0.000E+00	4.402E+38	0.000E+00	SHORT HLIF

TL-201	0.000E+00	1.702E+06	0.000E+00	SHORT HLIF
TL-202	4.661E+00	5.128E+01	9.564E+01	NOT IDENT.
HG-203	-3.495E+00	7.941E+00	1.381E+01	NOT IDENT.
PB-203	0.000E+00	2.586E+07	0.000E+00	SHORT HLIF
TL-204	-4.870E+02	7.112E+02	1.144E+03	NOT IDENT.
BI-207	-5.800E+00	5.899E+00	8.991E+00	NOT IDENT.
TL-208	-7.426E+00	5.641E+00	9.384E+00	NOT IDENT.
PB-210	-1.776E+02	9.690E+02	1.675E+03	NOT IDENT.
BI-211	1.073E+01	3.001E+01	5.323E+01	NOT IDENT.
PB-211	3.400E+01	8.652E+01	1.651E+02	NOT IDENT.
BI-212	-4.420E+01	6.465E+01	1.118E+02	NOT IDENT.
PB-212	-3.598E-01	9.016E+00	1.659E+01	NOT IDENT.
BI-213	-1.100E+01	1.159E+01	1.798E+01	NOT IDENT.
PB-214	9.670E+00	1.083E+01	2.020E+01	NOT IDENT.
RN-219	-3.246E+00	5.029E+01	9.056E+01	NOT IDENT.
FR-221	-3.473E+00	2.359E+01	4.280E+01	NOT IDENT.
RA-223	3.007E+01	7.598E+01	1.333E+02	FAIL ABUN
RA-224	-9.786E+01	8.585E+01	1.403E+02	NOT IDENT.
AC-225	-1.041E+02	7.070E+02	1.283E+03	NOT IDENT.
RA-226	-1.940E+01	1.119E+02	2.093E+02	NOT IDENT.
AC-227	2.101E+01	3.044E+01	5.935E+01	NOT IDENT.
TH-227	2.101E+01	3.044E+01	5.935E+01	NOT IDENT.
AC-228	-9.242E+00	2.261E+01	3.541E+01	NOT IDENT.
RA-228	-9.242E+00	2.261E+01	3.541E+01	NOT IDENT.
TH-228	-3.598E-01	9.016E+00	1.659E+01	NOT IDENT.
TH-229	1.014E+00	5.860E+01	1.083E+02	FAIL ABUN
TH-230	-5.028E+02	1.671E+03	2.805E+03	NOT IDENT.
PA-231	1.171E+01	5.977E+01	1.107E+02	NOT IDENT.
TH-232	-3.749E+03	3.903E+03	6.227E+03	NOT IDENT.
PA-233	-8.150E+00	7.554E+00	1.200E+01	NOT IDENT.
PA-234	-8.161E+00	3.212E+01	5.991E+01	NOT IDENT.
PA-234M	7.739E+02	6.052E+02	1.322E+03	FAIL ABUN
TH-234	-1.093E+02	2.802E+02	4.686E+02	FAIL ABUN
U-234	1.192E+04	1.389E+04	2.644E+04	NOT IDENT.
U-235	-8.779E-01	2.497E+01	4.406E+01	NOT IDENT.
NP-237	-8.150E+00	7.554E+00	1.200E+01	NOT IDENT.
NP-238	0.000E+00	1.504E+08	0.000E+00	SHORT HLIF
U-238	-1.093E+02	2.802E+02	4.686E+02	FAIL ABUN
NP-239	-1.570E+01	2.774E+01	4.993E+01	NOT IDENT.
AM-241	1.258E+01	2.556E+01	4.712E+01	NOT IDENT.
AM-242	2.746E+01	7.631E+01	1.476E+02	NOT IDENT.
AM-243	1.689E+00	8.080E+00	1.310E+01	NOT IDENT.
CM-243	1.283E+00	1.192E+01	2.275E+01	NOT IDENT.
BK-247	-1.286E+01	9.873E+00	1.555E+01	FAIL ABUN
CM-247	8.694E-01	4.565E+00	8.492E+00	NOT IDENT.
CF-249	-1.129E-01	4.590E+00	8.376E+00	NOT IDENT.
CF-251	5.150E-01	1.457E+01	2.703E+01	NOT IDENT.
CF-252	8.525E+03	2.135E+04	4.149E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.34	48	96	1.10	126.37	121	10	6.74E-03	40.3	
2	0	84.70	30	74	1.82	169.08	166	7	4.15E-03	51.3	
3	0	92.63	170	139	1.41	184.95	177	15	2.36E-02	17.1	
4	0	108.82	26	65	1.30	217.32	213	8	3.66E-03	56.1	
5	0	186.31	70	131	1.21	372.29	366	13	9.72E-03	36.0	
6	0	223.27	23	43	1.65	446.20	443	8	3.18E-03	54.2	
7	0	239.59	38	106	1.19	478.83	472	14	5.30E-03	59.3	
8	0	327.78	16	32	1.73	655.21	652	7	2.19E-03	64.3	
9	0	512.00	198	33	3.20	1023.66	1013	28	2.74E-02	11.0	
10	0	584.62	11	35	5.39	1168.92	1158	14	1.50E-03	119.9	
11	0	609.68	36	28	2.02	1219.05	1214	10	5.05E-03	31.7	
12	5	634.76	9	5	1.50	1269.21	1267	14	1.32E-03	43.7	2.85E+00
13	5	637.83	22	12	2.98	1275.35	1267	14	3.10E-03	36.9	
14	0	648.88	15	15	0.66	1297.45	1290	12	2.12E-03	56.9	
15	0	683.91	14	14	4.30	1367.52	1362	13	2.01E-03	57.9	
16	0	709.78	13	5	0.57	1419.27	1416	7	1.81E-03	39.9	
17	0	758.33	7	8	0.68	1516.40	1511	7	9.95E-04	76.8	
18	0	870.39	8	11	2.11	1740.56	1732	10	1.05E-03	93.9	
19	0	907.54	9	8	1.39	1814.88	1807	12	1.28E-03	71.8	
20	0	1001.07	25	0	1.34	2002.00	1996	12	3.47E-03	20.0	
21	0	1040.94	5	10	2.07	2081.77	2076	9	6.39E-04	129.1	
22	0	1080.71	7	8	0.76	2161.33	2155	10	1.01E-03	87.0	
23	0	1105.41	10	8	0.65	2210.75	2200	16	1.39E-03	70.7	
24	0	1120.07	24	4	4.45	2240.08	2233	16	3.29E-03	28.0	
25	0	1198.15	6	3	1.16	2396.32	2392	8	8.18E-04	70.0	
26	0	1214.49	7	2	2.26	2429.00	2425	8	1.01E-03	49.5	
27	0	1461.56	32	4	4.63	2923.39	2915	17	4.40E-03	23.2	
28	0	1559.48	7	3	1.41	3119.36	3113	10	1.03E-03	54.1	
29	0	1596.89	8	3	1.37	3194.23	3190	8	1.06E-03	57.1	
30	0	2027.35	4	5	0.52	4055.79	4051	9	5.25E-04	115.8	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	22	10.66*	8.157E-01	1.275E+02	1.275E+02	69.34
TE-125M	109.28	26	0.27*	3.980E+00	1.240E+03	2.242E+03	112.18
BI-214	609.32	36	45.49*	1.695E+00	2.382E+01	2.382E+01	63.35
	1120.29	24	14.92	1.017E+00	7.870E+01	7.870E+01	56.07
	1764.49	-----	15.30	7.198E-01	-----	Line Not Found	-----
TH-231	84.21	21	6.60*	3.020E+00	5.359E+01	5.359E+01	150.98
ANH-511	511.00	55	100.00*	1.935E+00	1.426E+01	1.426E+01	84.57

Flag: "*" = Keyline

Total number of lines in spectrum 26
Number of unidentified lines 11
Number of lines tentatively identified by NID 15 57.69%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
K-40	1.25E+09Y	1.00	1.275E+02	1.275E+02	0.884E+02	69.34	
TE-125M	57.40D	1.81	1.240E+03	2.242E+03	2.515E+03	112.18	
BI-214	1600.00Y	1.00	2.382E+01	2.382E+01	1.509E+01	63.35	
TH-231	7.04E+08Y	1.00	5.359E+01	5.359E+01	8.090E+01	150.98	
ANH-511	1.00E+09Y	1.00	1.426E+01	1.426E+01	1.206E+01	84.57	

Total Activity : 1.459E+03 2.461E+03

Grand Total Activity : 1.459E+03 2.461E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	92.63	18	139	1.41	184.95	177	15	2.53E-03	****	3.45E+00	T
0	223.27	23	43	1.65	446.20	443	8	3.18E-03	****	3.44E+00	T
0	327.78	16	32	1.73	655.21	652	7	2.19E-03	****	2.66E+00	T
5	634.76	9	5	1.50	1269.21	1267	14	1.32E-03	87.5	1.64E+00	T
5	637.83	22	12	2.98	1275.35	1267	14	3.10E-03	73.8	1.64E+00	T
0	648.88	15	15	0.66	1297.45	1290	12	2.12E-03	****	1.61E+00	
0	683.91	14	14	4.30	1367.52	1362	13	2.01E-03	****	1.55E+00	
0	709.78	13	5	0.57	1419.27	1416	7	1.81E-03	79.9	1.50E+00	
0	758.33	7	8	0.68	1516.40	1511	7	9.95E-04	****	1.42E+00	
0	870.39	8	11	2.11	1740.56	1732	10	1.05E-03	****	1.27E+00	T
0	907.54	9	8	1.39	1814.88	1807	12	1.28E-03	****	1.22E+00	T
0	1001.07	14	0	1.34	2002.00	1996	12	2.01E-03	79.8	1.12E+00	T
0	1040.94	5	10	2.07	2081.77	2076	9	6.39E-04	****	1.08E+00	
0	1080.71	7	8	0.76	2161.33	2155	10	1.01E-03	****	1.05E+00	
0	1105.41	10	8	0.65	2210.75	2200	16	1.39E-03	****	1.03E+00	
0	1198.15	6	3	1.16	2396.32	2392	8	8.18E-04	****	9.60E-01	
0	1214.49	7	2	2.26	2429.00	2425	8	1.01E-03	99.1	9.49E-01	
0	1559.48	7	3	1.41	3119.36	3113	10	1.03E-03	****	7.78E-01	
0	1596.89	8	3	1.37	3194.23	3190	8	1.06E-03	****	7.65E-01	T
0	2027.35	4	5	0.52	4055.79	4051	9	5.25E-04	****	6.79E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                     *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289003.CNF;1  *
* Acquisition date   : 17-MAY-2022 09:21:15 Sensitivity      : 3.000          *
* Detector ID        : GAM03 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000      *
* Elapsed real time  : 0 02:00:00.47 Half life ratio : *****      *
* Sample date        : 29-MAR-2022 09:00:00 Nuclide Library : LIQUID      *
* Sample ID          : G579289003 Analyst initials: RXF2          *
* Batch Number       : 2264689 Sample Quantity : 7.4342E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                     *
* Eff. Cal. date     : 20-APR-2022 11:51:08 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16          *
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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
K-40	2.947E+01
TE-125M	1.587E+03
BI-214	8.391E+00
TH-231	4.830E+01
ANH-511	2.665E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	4.879E+01	NOT IDENT.
NA-22	3.539E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.344E+00	NOT IDENT.
SC-46	4.252E+00	FAIL ABUN
V-48	2.604E+01	NOT IDENT.
CR-51	8.247E+01	NOT IDENT.
MN-52	1.286E+03	NOT IDENT.
MN-54	4.124E+00	NOT IDENT.
CO-56	5.307E+00	NOT IDENT.
CO-57	3.021E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	5.260E+00	NOT IDENT.
FE-59	9.501E+00	NOT IDENT.
CO-60	3.405E+00	NOT IDENT.
ZN-65	7.689E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	1.283E+02	NOT IDENT.
AS-73	2.122E+02	NOT IDENT.
AS-74	3.930E+01	FAIL ABUN
SE-75	4.994E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	7.578E+01	NOT IDENT.
RB-83	9.021E+00	NOT IDENT.
RB-84	1.160E+01	NOT IDENT.
KR-85	1.058E+03	NOT IDENT.

SR-85	7.935E+00	NOT IDENT.
RB-86	2.613E+02	NOT IDENT.
Y-88	5.990E+00	NOT IDENT.
Y-91	2.532E+03	NOT IDENT.
NB-94	3.643E+00	FAIL ABUN
NB-95	6.032E+00	NOT IDENT.
NB-95M	1.417E+01	NOT IDENT.
TC-95M	5.747E+00	NOT IDENT.
ZR-95	1.069E+01	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	3.332E+00	NOT IDENT.
RH-102M	3.034E+00	NOT IDENT.
RU-103	6.031E+00	FAIL ABUN
RH-106	3.476E+01	NOT IDENT.
RU-106	3.476E+01	NOT IDENT.
AG-108M	2.912E+00	NOT IDENT.
CD-109	8.842E+01	NOT IDENT.
AG-110	8.571E+01	NOT IDENT.
AG-110M	4.155E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	5.616E+00	NOT IDENT.
IN-114M	2.909E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	2.917E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	3.303E+00	NOT IDENT.
SB-124	1.558E+01	NOT IDENT.
SB-125	1.069E+01	FAIL ABUN
I-126	1.381E+02	NOT IDENT.
SB-126	9.522E+01	NOT IDENT.
SN-126	8.130E+00	NOT IDENT.
SB-127	0.000E+00	SHORT HLIF
TE-129	1.051E+02	NOT IDENT.
I-131	2.237E+02	FAIL ABUN
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	3.982E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	4.582E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	6.012E+01	NOT IDENT.
BA-137M	2.747E+00	NOT IDENT.
CS-137	2.902E+00	NOT IDENT.
LA-138	4.384E+00	NOT IDENT.
CE-139	3.132E+00	NOT IDENT.
BA-140	1.426E+02	NOT IDENT.
LA-140	8.349E+01	FAIL ABUN
CE-141	1.262E+01	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	2.007E+01	NOT IDENT.
PM-144	3.493E+00	NOT IDENT.
PR-144	2.654E+02	NOT IDENT.
PM-146	4.109E+00	NOT IDENT.
ND-147	4.495E+02	NOT IDENT.
PM-147	8.024E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	1.014E+01	NOT IDENT.
GD-153	9.360E+00	NOT IDENT.
EU-154	9.923E+00	NOT IDENT.
EU-155	9.163E+00	NOT IDENT.
TB-160	1.339E+01	NOT IDENT.
HO-166M	5.599E+00	NOT IDENT.
TM-171	3.323E+03	NOT IDENT.
LU-176	2.637E+00	NOT IDENT.
LU-177	3.323E+03	NOT IDENT.
HF-181	7.662E+00	NOT IDENT.
W-181	3.242E+01	NOT IDENT.
TA-182	1.876E+01	FAIL ABUN
RE-183	3.700E+01	NOT IDENT.
RE-184	2.496E+01	NOT IDENT.
RE-188	2.229E+01	NOT IDENT.
W-188	8.814E+02	NOT IDENT.
OS-191	7.353E+01	NOT IDENT.
IR-192	4.806E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF

TL-202	4.237E+01	NOT IDENT.
HG-203	6.324E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	5.279E+02	NOT IDENT.
BI-207	3.634E+00	NOT IDENT.
TL-208	4.213E+00	NOT IDENT.
PB-210	7.735E+02	NOT IDENT.
BI-211	2.453E+01	NOT IDENT.
PB-211	7.467E+01	NOT IDENT.
BI-212	4.860E+01	NOT IDENT.
PB-212	7.799E+00	NOT IDENT.
BI-213	7.773E+00	NOT IDENT.
PB-214	9.348E+00	NOT IDENT.
RN-219	4.079E+01	NOT IDENT.
FR-221	1.969E+01	NOT IDENT.
RA-223	6.027E+01	FAIL ABUN
RA-224	6.482E+01	NOT IDENT.
AC-225	5.902E+02	NOT IDENT.
RA-226	9.972E+01	NOT IDENT.
AC-227	2.739E+01	NOT IDENT.
TH-227	2.739E+01	NOT IDENT.
AC-228	1.550E+01	NOT IDENT.
RA-228	1.550E+01	NOT IDENT.
TH-228	7.799E+00	NOT IDENT.
TH-229	5.003E+01	FAIL ABUN
TH-230	1.300E+03	NOT IDENT.
PA-231	5.085E+01	NOT IDENT.
TH-232	2.930E+03	NOT IDENT.
PA-233	5.359E+00	NOT IDENT.
PA-234	2.513E+01	NOT IDENT.
PA-234M	5.885E+02	FAIL ABUN
TH-234	2.209E+02	FAIL ABUN
U-234	1.228E+04	NOT IDENT.
U-235	2.055E+01	NOT IDENT.
NP-237	5.359E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	2.209E+02	FAIL ABUN
NP-239	2.288E+01	NOT IDENT.
AM-241	2.178E+01	NOT IDENT.
AM-242	6.875E+01	NOT IDENT.
AM-243	6.115E+00	NOT IDENT.
CM-243	1.053E+01	NOT IDENT.
BK-247	7.038E+00	FAIL ABUN
CM-247	3.836E+00	NOT IDENT.
CF-249	3.752E+00	NOT IDENT.
CF-251	1.250E+01	NOT IDENT.
CF-252	1.930E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G579289003.CNF;1
* Acquisition date   : 17-MAY-2022 09:21:15 Sensitivity      : 3.000
* Detector ID        : GAM03 Energy tolerance: 1.500
* Elapsed live time   : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time   : 0 02:00:00.47 Half life ratio  : *****
* Sample date        : 29-MAR-2022 09:00:00 Nuclide Library : LIQUID
* Sample ID          : G579289003 Analyst initials: RXF2
* Batch Number       : 2264689 Sample Quantity : 7.4342E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 20-APR-2022 11:51:08 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
K-40	1.275E+02	8.758E+01	8.762E+01
TE-125M	2.242E+03	2.470E+03	2.471E+03
BI-214	2.382E+01	1.492E+01	1.493E+01
TH-231	5.359E+01	7.966E+01	7.967E+01
ANH-511	1.426E+01	1.188E+01	1.188E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	-4.211E+01	6.696E+01	6.961E+01	NOT IDENT.
NA-22	3.540E-01	4.036E+00	4.039E+00	NOT IDENT.
NA-24	-2.394E+24	1.721E+24	0.000E+00	SHORT HLIF
AL-26	-1.485E+00	3.470E+00	3.534E+00	NOT IDENT.
SC-46	-1.992E+00	5.546E+00	5.618E+00	FAIL ABUN
V-48	-5.602E+00	3.276E+01	3.286E+01	NOT IDENT.
CR-51	2.090E+01	9.664E+01	9.710E+01	NOT IDENT.
MN-52	1.298E+02	1.469E+03	1.470E+03	NOT IDENT.
MN-54	3.882E+00	4.231E+00	4.579E+00	NOT IDENT.
CO-56	-1.155E+00	6.546E+00	6.567E+00	NOT IDENT.
CO-57	7.886E-01	3.413E+00	3.432E+00	NOT IDENT.
NI-57	-2.519E+10	4.183E+10	4.335E+10	SHORT HLIF
CO-58	1.104E+00	6.052E+00	6.073E+00	NOT IDENT.
FE-59	-7.176E+00	1.629E+01	1.661E+01	NOT IDENT.
CO-60	1.491E+00	3.572E+00	3.635E+00	NOT IDENT.
ZN-65	-4.042E+00	1.209E+01	1.222E+01	NOT IDENT.
CU-67	-8.575E+06	4.336E+06	5.811E+06	SHORT HLIF
GE-68	-2.593E+02	2.527E+02	2.785E+02	NOT IDENT.
AS-73	1.037E+02	2.520E+02	2.563E+02	NOT IDENT.
AS-74	2.958E+01	4.195E+01	4.402E+01	FAIL ABUN
SE-75	-3.087E+00	6.316E+00	6.468E+00	NOT IDENT.
BR-77	-1.367E+06	2.650E+07	2.651E+07	SHORT HLIF
SR-82	2.540E+01	8.491E+01	8.568E+01	NOT IDENT.
RB-83	4.967E+00	1.079E+01	1.102E+01	NOT IDENT.
RB-84	1.648E+00	1.350E+01	1.353E+01	NOT IDENT.

KR-85	2.178E+03	1.037E+03	1.428E+03	NOT IDENT.
SR-85	1.634E+01	7.776E+00	1.072E+01	NOT IDENT.
RB-86	-5.281E+02	5.147E+02	5.672E+02	NOT IDENT.
Y-88	1.584E+00	6.740E+00	6.777E+00	NOT IDENT.
Y-91	-1.222E+03	3.401E+03	3.445E+03	NOT IDENT.
NB-94	6.360E-01	4.202E+00	4.211E+00	FAIL ABUN
NB-95	2.074E+00	6.812E+00	6.876E+00	NOT IDENT.
NB-95M	-3.160E+01	2.039E+01	2.489E+01	NOT IDENT.
TC-95M	-4.839E+00	8.230E+00	8.515E+00	NOT IDENT.
ZR-95	7.173E+00	1.144E+01	1.189E+01	NOT IDENT.
MO-99	-1.602E+06	7.758E+06	7.791E+06	SHORT HLIF
TC-99M	1.000E+41	4.857E+41	0.000E+00	SHORT HLIF
RH-101	1.575E+00	3.722E+00	3.789E+00	NOT IDENT.
RH-102M	1.477E+00	3.512E+00	3.575E+00	NOT IDENT.
RU-103	-6.993E+00	8.779E+00	9.329E+00	FAIL ABUN
RH-106	-1.032E+01	4.212E+01	4.238E+01	NOT IDENT.
RU-106	-1.032E+01	4.212E+01	4.238E+01	NOT IDENT.
AG-108M	1.819E+00	3.286E+00	3.387E+00	NOT IDENT.
CD-109	6.385E+01	1.239E+02	1.272E+02	NOT IDENT.
AG-110	1.748E+01	9.800E+01	9.832E+01	NOT IDENT.
AG-110M	-8.446E-01	5.185E+00	5.198E+00	NOT IDENT.
IN-111	-4.644E+04	5.616E+05	5.620E+05	SHORT HLIF
SN-113	-1.518E+00	7.056E+00	7.089E+00	NOT IDENT.
IN-114M	-3.135E-03	3.411E+01	3.411E+01	NOT IDENT.
CD-115	-4.018E+06	4.247E+07	4.251E+07	SHORT HLIF
SN-117M	1.086E+01	3.294E+01	3.330E+01	NOT IDENT.
SB-122	3.692E+05	1.391E+06	1.401E+06	SHORT HLIF
I-123	7.725E+26	1.810E+27	0.000E+00	SHORT HLIF
TE-123M	1.546E+00	3.702E+00	3.767E+00	NOT IDENT.
SB-124	7.613E+00	1.646E+01	1.682E+01	NOT IDENT.
SB-125	1.142E+01	1.156E+01	1.266E+01	FAIL ABUN
I-126	5.841E+01	1.532E+02	1.554E+02	NOT IDENT.
SB-126	-1.288E+01	1.145E+02	1.146E+02	NOT IDENT.
SN-126	-3.472E+00	1.290E+01	1.300E+01	NOT IDENT.
SB-127	8.526E+03	7.516E+04	7.526E+04	SHORT HLIF
TE-129	-1.826E+01	1.323E+02	1.325E+02	NOT IDENT.
I-131	8.655E+01	2.601E+02	2.630E+02	FAIL ABUN
I-132	-1.000E+41	3.206E+41	0.000E+00	SHORT HLIF
TE-132	-1.442E+04	1.287E+05	1.288E+05	SHORT HLIF
BA-133	-5.041E+00	5.502E+00	5.953E+00	NOT IDENT.
I-133	4.474E+16	3.705E+17	0.000E+00	SHORT HLIF
CS-134	4.999E+00	4.611E+00	5.134E+00	NOT IDENT.
I-135	-1.000E+41	2.539E+41	0.000E+00	SHORT HLIF
CS-136	3.617E+01	6.466E+01	6.669E+01	NOT IDENT.
BA-137M	-3.734E+00	3.908E+00	4.255E+00	NOT IDENT.
CS-137	-3.945E+00	4.128E+00	4.495E+00	NOT IDENT.
LA-138	2.777E-01	5.062E+00	5.064E+00	NOT IDENT.
CE-139	-7.477E-01	3.723E+00	3.739E+00	NOT IDENT.
BA-140	-7.720E+01	1.776E+02	1.810E+02	NOT IDENT.
LA-140	7.603E+01	8.533E+01	9.197E+01	FAIL ABUN
CE-141	-7.704E+00	1.599E+01	1.636E+01	NOT IDENT.
CE-143	-3.138E+11	3.874E+11	4.124E+11	SHORT HLIF
CE-144	1.052E+01	2.222E+01	2.272E+01	NOT IDENT.
PM-144	2.448E-01	4.073E+00	4.075E+00	NOT IDENT.
PR-144	1.642E+01	3.099E+02	3.100E+02	NOT IDENT.
PM-146	1.545E+00	4.806E+00	4.857E+00	NOT IDENT.
ND-147	1.410E+02	4.990E+02	5.031E+02	NOT IDENT.
PM-147	-2.028E+04	9.385E+04	9.430E+04	NOT IDENT.
PM-149	-7.924E+07	4.377E+08	4.392E+08	SHORT HLIF
EU-152	4.242E+00	1.174E+01	1.190E+01	NOT IDENT.
GD-153	4.771E+00	1.221E+01	1.239E+01	NOT IDENT.
EU-154	2.600E+00	1.091E+01	1.098E+01	NOT IDENT.
EU-155	-9.216E+00	1.279E+01	1.345E+01	NOT IDENT.
TB-160	-6.282E+00	1.761E+01	1.784E+01	NOT IDENT.
HO-166M	-4.081E+00	8.459E+00	8.657E+00	NOT IDENT.
TM-171	-1.244E+03	4.233E+03	4.270E+03	NOT IDENT.
LU-176	2.454E-02	3.167E+00	3.167E+00	NOT IDENT.
LU-177	-1.106E+03	4.029E+03	4.059E+03	NOT IDENT.
HF-181	-1.885E+00	9.775E+00	9.812E+00	NOT IDENT.
W-181	-4.330E+01	4.668E+01	5.060E+01	NOT IDENT.
TA-182	9.983E+00	1.957E+01	2.009E+01	FAIL ABUN
RE-183	-4.146E+01	5.088E+01	5.421E+01	NOT IDENT.
RE-184	2.226E+01	2.793E+01	2.968E+01	NOT IDENT.
RE-188	-3.682E+00	2.620E+01	2.626E+01	NOT IDENT.
W-188	-6.766E+01	1.065E+03	1.065E+03	NOT IDENT.
OS-191	5.430E+01	8.030E+01	8.395E+01	NOT IDENT.
IR-192	-2.769E+00	6.122E+00	6.248E+00	NOT IDENT.
PB-201	5.268E+38	5.353E+38	0.000E+00	SHORT HLIF

TL-201	-1.119E+06	1.704E+06	1.777E+06	SHORT HLIF
TL-202	4.661E+00	5.128E+01	5.132E+01	NOT IDENT.
HG-203	-3.495E+00	7.946E+00	8.101E+00	NOT IDENT.
PB-203	-1.138E+07	2.588E+07	2.638E+07	SHORT HLIF
TL-204	-4.870E+02	7.129E+02	7.460E+02	NOT IDENT.
BI-207	-5.800E+00	5.922E+00	6.475E+00	NOT IDENT.
TL-208	-7.426E+00	5.675E+00	6.591E+00	NOT IDENT.
PB-210	-1.776E+02	9.692E+02	9.725E+02	NOT IDENT.
BI-211	1.073E+01	3.003E+01	3.041E+01	NOT IDENT.
PB-211	3.400E+01	8.657E+01	8.792E+01	NOT IDENT.
BI-212	-4.420E+01	6.477E+01	6.777E+01	NOT IDENT.
PB-212	-3.598E-01	9.016E+00	9.017E+00	NOT IDENT.
BI-213	-1.100E+01	1.162E+01	1.264E+01	NOT IDENT.
PB-214	9.670E+00	1.086E+01	1.170E+01	NOT IDENT.
RN-219	-3.246E+00	5.030E+01	5.032E+01	NOT IDENT.
FR-221	-3.473E+00	2.359E+01	2.364E+01	NOT IDENT.
RA-223	3.007E+01	7.603E+01	7.723E+01	FAIL ABUN
RA-224	-9.786E+01	8.623E+01	9.688E+01	NOT IDENT.
AC-225	-1.041E+02	7.071E+02	7.086E+02	NOT IDENT.
RA-226	-1.940E+01	1.119E+02	1.122E+02	NOT IDENT.
AC-227	2.101E+01	3.059E+01	3.203E+01	NOT IDENT.
TH-227	2.101E+01	3.059E+01	3.203E+01	NOT IDENT.
AC-228	-9.242E+00	2.263E+01	2.301E+01	NOT IDENT.
RA-228	-9.242E+00	2.263E+01	2.301E+01	NOT IDENT.
TH-228	-3.598E-01	9.016E+00	9.017E+00	NOT IDENT.
TH-229	1.014E+00	5.860E+01	5.860E+01	FAIL ABUN
TH-230	-5.028E+02	1.673E+03	1.688E+03	NOT IDENT.
PA-231	1.171E+01	5.983E+01	6.007E+01	NOT IDENT.
TH-232	-3.749E+03	3.933E+03	4.282E+03	NOT IDENT.
PA-233	-8.150E+00	7.585E+00	8.430E+00	NOT IDENT.
PA-234	-8.161E+00	3.346E+01	3.366E+01	NOT IDENT.
PA-234M	7.739E+02	6.096E+02	7.026E+02	FAIL ABUN
TH-234	-1.093E+02	2.813E+02	2.856E+02	FAIL ABUN
U-234	1.192E+04	1.395E+04	1.495E+04	NOT IDENT.
U-235	-8.779E-01	2.497E+01	2.497E+01	NOT IDENT.
NP-237	-8.150E+00	7.585E+00	8.430E+00	NOT IDENT.
NP-238	-6.034E+07	1.505E+08	1.529E+08	SHORT HLIF
U-238	-1.093E+02	2.813E+02	2.856E+02	FAIL ABUN
NP-239	-1.570E+01	2.777E+01	2.866E+01	NOT IDENT.
AM-241	1.258E+01	2.559E+01	2.621E+01	NOT IDENT.
AM-242	2.746E+01	7.647E+01	7.746E+01	NOT IDENT.
AM-243	1.689E+00	8.081E+00	8.117E+00	NOT IDENT.
CM-243	1.283E+00	1.192E+01	1.194E+01	NOT IDENT.
BK-247	-1.286E+01	1.024E+01	1.177E+01	FAIL ABUN
CM-247	8.694E-01	4.568E+00	4.585E+00	NOT IDENT.
CF-249	-1.129E-01	4.590E+00	4.590E+00	NOT IDENT.
CF-251	5.150E-01	1.457E+01	1.457E+01	NOT IDENT.
CF-252	8.525E+03	2.271E+04	2.303E+04	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	43.5383	81.00	58.1964	120.90	58.5803
45.60	49.3929	81.07	58.2037	121.12	62.9074
46.54	52.8908	82.35	0.0000	121.22	65.5019
49.72	0.0000	82.47	45.3852	121.78	60.3781
51.35	53.5369	167.43	0.0000	122.06	60.4016
52.39	54.8146	82.47	45.3855	123.07	55.3021
53.20	40.0470	83.79	68.2397	265.00	57.0786
53.44	48.0841	84.00	68.2658	127.16	0.0000
56.28	50.7110	84.21	65.8525	127.23	53.0118
57.36	0.0000	84.86	0.0000	129.43	45.3254
57.53	55.4802	85.43	71.6987	131.20	62.0333
57.53	55.4804	86.55	61.2274	133.02	40.2879
57.98	55.5370	86.79	68.6033	133.52	41.1905
59.32	40.6182	86.94	68.6217	135.34	0.0000
59.54	40.6382	87.09	68.6396	136.00	44.8413
61.49	86.2916	87.57	61.3369	57.53	45.7375
63.00	42.1174	88.03	41.7423	136.47	45.7486
63.29	52.6796	88.34	61.4189	140.51	0.0000
63.58	55.0552	88.47	61.4326	140.88	48.6627
63.81	62.1141	91.11	66.6480	143.76	47.9515
64.28	61.0031	91.27	0.0000	144.24	47.9800
64.99	72.8440	92.59	66.8149	145.44	51.6114
65.08	88.1344	93.31	0.0000	152.32	50.2527
66.73	49.5260	94.56	67.0349	152.43	50.2595
66.98	49.5517	94.65	67.0448	153.25	53.9026
67.24	53.1196	94.67	56.2862	323.87	51.2660
67.67	60.2555	97.43	44.9006	155.04	58.5188
67.75	54.3569	98.43	62.4630	156.02	48.6722
68.89	55.6684	98.44	62.4641	158.56	45.2021
68.89	0.0000	99.53	54.2305	158.97	0.0000
69.67	47.4524	100.11	51.7755	159.00	44.3210
70.82	0.0000	100.20	51.7830	162.33	46.3085
70.82	63.0196	102.03	54.4460	162.66	48.1429
70.83	0.0000	103.18	49.5097	163.33	41.8162
72.81	63.2687	103.37	49.5244	165.86	48.3192
72.87	0.0000	105.31	54.3044	167.43	0.0000
74.66	55.1104	106.12	42.9918	171.28	0.0000
74.82	56.3260	106.47	49.3406	176.31	45.1943
74.97	56.3421	109.28	64.7982	176.60	52.5892
77.11	61.3874	111.00	70.0609	177.52	50.7949
79.69	66.5227	111.76	0.0000	181.07	0.0000
79.82	0.0000	112.95	52.1225	184.41	89.3154
80.02	76.2453	116.24	54.7695	184.58	0.0000
80.03	76.2458	116.30	0.0000	185.72	54.9674
80.12	66.5755	116.74	50.5270	186.21	47.5386
80.19	66.5844	117.23	53.9907	190.27	53.3563
80.22	0.0000	119.76	54.1858	193.51	48.8383
80.57	66.6309	99.53	57.6899	197.03	51.8406

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
198.01	47.1741	256.23	33.0736	492.35	0.0000
201.83	48.3012	304.85	33.0820	497.08	25.5794
204.12	38.9184	306.78	34.1642	511.00	19.3212
205.31	42.7652	308.46	25.9140	514.00	19.3500
208.37	44.7988	311.90	40.5274	520.40	14.1177
210.85	50.6391	316.51	41.7049	520.69	0.0000
215.65	44.1526	319.41	25.0752	522.65	0.0000
218.12	47.1413	320.08	27.1775	527.90	0.0000
222.11	43.4546	321.04	31.3800	529.59	14.1821
227.09	33.4678	323.87	23.5826	529.87	0.0000
227.38	39.2986	325.23	22.0314	531.02	15.0789
228.16	0.0000	328.76	52.0600	537.26	19.5736
228.18	41.9493	331.15	0.0000	546.56	0.0000
116.74	41.9493	333.37	44.3140	552.55	25.0947
235.69	64.5229	334.37	43.2889	563.25	18.0157
235.96	71.3834	338.28	33.8770	564.24	0.0000
238.63	42.1470	338.32	33.8783	569.33	26.1963
238.98	0.0000	311.90	30.7476	946.00	26.1989
240.99	74.6471	340.55	36.0503	569.70	28.0077
242.00	58.9838	344.28	28.7007	582.08	25.4417
244.70	47.2979	345.93	31.9250	583.19	27.2726
245.35	0.0000	351.06	33.1027	595.83	16.4575
250.62	36.6443	351.93	27.7800	427.87	32.9854
252.40	0.0000	356.01	42.8540	604.72	17.6244
252.80	47.6265	361.25	0.0000	609.32	30.3534
256.23	35.8228	364.49	25.8555	610.33	25.0293
260.90	0.0000	366.42	0.0000	614.28	19.1737
264.66	42.0854	356.01	32.7191	618.01	23.0827
265.00	54.1252	388.16	25.1520	621.93	23.1216
269.46	34.2027	388.63	31.7229	630.19	0.0000
271.23	41.3028	391.70	32.8790	631.29	14.8579
273.65	47.4389	264.66	25.3453	155.04	23.7898
276.40	32.3698	401.32	0.0000	633.25	23.7922
277.37	29.3575	401.81	28.6708	634.78	19.3438
277.60	33.4129	402.40	26.4746	635.95	12.0963
278.00	44.5649	404.85	24.3042	636.99	12.1014
278.43	38.5010	410.95	39.9155	657.50	18.7787
279.20	0.0000	414.70	18.8908	657.76	15.0244
279.54	41.5764	423.72	24.5763	661.66	21.6327
280.46	42.6212	427.09	32.4592	664.57	0.0000
283.69	38.6595	427.87	19.0361	666.33	15.0781
284.31	44.7860	433.94	16.8552	666.50	15.0791
285.41	41.7674	439.51	19.1630	667.71	0.0000
285.90	0.0000	440.45	25.9400	677.62	15.1475
287.50	24.4888	453.88	18.1807	685.70	0.0000
290.67	29.6626	459.60	29.6362	692.65	0.0000
293.27	0.0000	463.37	22.8438	695.00	14.3005
351.93	39.0027	468.07	19.4667	696.49	16.2166
295.96	35.9442	473.00	0.0000	696.51	16.2166
879.38	49.3916	475.06	18.3903	697.00	18.1279
299.98	40.1727	476.78	25.3099	697.49	17.1771
300.09	40.1759	477.60	31.0754	702.65	20.0810
300.13	40.1775	477.99	29.9308	706.68	22.9863
301.36	39.1829	482.18	25.3820	711.68	21.4963
302.85	41.2915	487.02	35.8564	720.70	18.2972

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
721.93	0.0000	935.54	16.6050	1368.63	0.0000
722.78	15.4204	937.49	7.2692	1377.63	0.0000
722.91	16.3852	944.13	10.4059	1384.29	5.6168
723.31	17.3518	945.96	0.0000	1408.01	5.6473
724.19	16.3935	946.00	11.4532	1434.09	3.7869
727.33	23.1716	949.00	8.3374	1435.80	3.7883
733.00	14.5134	667.71	0.0000	1457.56	0.0000
735.93	10.6552	962.31	16.7437	1460.82	4.7617
739.50	0.0000	964.08	14.6588	1489.16	1.9165
744.23	15.5474	966.17	20.9546	1596.21	3.9201
747.24	18.4834	968.97	17.8270	1620.50	2.9547
752.31	11.6960	983.53	10.5328	1678.03	0.0000
753.82	20.2846	984.45	0.0000	1690.97	3.9949
756.73	10.7388	996.26	6.7670	1757.55	0.0000
763.94	14.6832	1001.03	7.4119	1764.49	4.0516
765.80	14.6933	1274.44	6.7840	1063.66	9.1257
766.42	15.6763	1025.87	0.0000	1771.35	7.0995
766.84	15.6787	1028.54	0.0000	1791.20	0.0000
772.60	0.0000	1037.84	8.5630	1808.65	4.0850
776.52	9.8340	1038.76	0.0000	1836.06	5.1318
739.50	0.0000	475.06	11.8036		
778.90	11.8110	1048.07	6.4413		
783.70	0.0000	1050.41	11.8171		
788.74	9.8776	1063.66	15.0963		
792.07	18.7901	1077.00	19.0502		
795.86	7.9224	1077.34	19.0523		
802.10	14.8878	459.60	3.4703		
810.29	12.9401	1085.87	2.8936		
344.28	11.9454	1099.25	8.7134		
810.76	11.9469	1111.64	6.2451		
815.77	11.9678	1112.07	5.4651		
1048.07	10.9809	1112.84	5.8307		
832.01	12.0355	1115.54	12.2534		
834.85	8.0317	1120.29	6.5728		
835.15	8.0325	1120.55	6.5731		
836.80	0.0000	1221.41	6.5746		
846.77	16.1289	1129.67	14.2775		
856.80	17.1956	1131.51	0.0000		
860.56	10.1279	1173.23	3.3333		
871.09	8.1309	1177.95	6.6749		
873.19	6.5092	1189.05	12.2729		
875.33	0.0000	1204.77	12.3226		
879.38	10.1917	1221.41	5.4000		
880.51	8.1563	1231.02	15.3374		
881.60	8.1592	1235.36	9.9349		
883.24	4.0819	1238.28	11.7501		
884.68	9.1884	1260.41	0.0000		
889.28	12.2699	1271.87	7.2914		
894.76	16.3892	1274.44	5.4721		
898.04	11.2796	1274.54	6.3844		
903.28	6.5738	1291.59	2.7476		
907.67	0.0000	1298.22	0.0000		
911.20	13.1813	1312.11	5.5225		
923.98	0.0000	1332.49	3.6994		
926.36	11.3827	1365.19	2.7959		

VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 11:22:25.01

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089187.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM17.CNF;682
Background date    : 16-MAY-2022 04:38:38
Sample date       : 17-MAY-2022 00:00:00 Acquisition date : 17-MAY-2022 09:21:48
Sample ID        : G1205089187 Sample quantity : 7.69920E-01 FILTER
Detector name     : GAM17 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:00.88 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : RXF2
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2264689 Detector SN# :
Matrix Spike ID   : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	5	46.92*	1	57	1.82	94.01	90	15	1.36E-04	*****	1.27E+00
2	5	49.77	26	57	1.83	99.72	90	15	3.59E-03	69.6	
3	0	63.64*	12	121	1.03	127.52	123	11	1.67E-03	199.2	
4	0	69.71	26	72	1.25	139.66	135	8	3.58E-03	60.4	
5	0	81.26	20	64	1.03	162.80	158	8	2.78E-03	72.8	
6	0	84.16*	20	61	1.08	168.62	165	8	2.80E-03	76.5	
7	0	93.06*	63	87	1.54	186.43	180	14	8.73E-03	38.2	
8	0	186.27*	30	51	1.17	373.11	369	11	4.21E-03	57.8	
9	0	239.93*	5	125	1.71	480.56	472	18	7.42E-04	514.3	
10	0	296.66	23	29	1.40	594.17	590	7	3.17E-03	45.4	
11	0	353.75	33	38	3.56	708.49	702	14	4.59E-03	43.4	
12	0	449.82	23	23	1.62	900.82	896	10	3.22E-03	43.6	
13	0	521.60	20	26	1.87	1044.51	1037	14	2.71E-03	58.6	
14	0	583.43*	1	17	0.71	1168.29	1162	10	1.75E-04	794.1	
15	0	632.95	20	13	4.01	1267.41	1260	13	2.84E-03	42.4	
16	0	679.69	11	16	0.57	1360.95	1357	9	1.51E-03	72.8	
17	0	823.53	12	3	3.76	1648.81	1643	11	1.73E-03	38.2	
18	0	882.52	8	18	1.80	1766.84	1758	10	1.18E-03	98.5	
19	0	918.43	10	8	1.83	1838.70	1832	10	1.45E-03	58.0	
20	0	1015.46	9	6	2.20	2032.83	2029	8	1.21E-03	59.7	
21	0	1092.64	8	5	1.64	2187.23	2180	11	1.09E-03	67.6	
22	0	1122.36	8	20	4.98	2246.68	2233	16	1.13E-03	128.2	
23	0	1151.84	13	7	3.29	2305.65	2296	14	1.78E-03	52.1	
24	0	1240.29	18	3	1.86	2482.54	2475	13	2.44E-03	32.0	
25	0	1255.84	11	2	1.10	2513.64	2509	10	1.52E-03	40.2	
26	0	1323.80	9	0	1.46	2649.56	2646	8	1.25E-03	33.3	
27	0	1461.07*	7	7	2.05	2924.05	2916	13	9.30E-04	107.0	
28	0	1636.48	8	0	0.99	3274.75	3269	11	1.11E-03	35.4	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 11:22:25

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089187.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 17-MAY-2022 00:00:00	Acquisition date	: 17-MAY-2022 09:21:48
Sample ID	: G1205089187	Sample quantity	: 0.76992 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA17	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.88 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	7	10.66*	5.823E-01	5.259E+01	5.259E+01	214.07
BR-77	238.98	5	23.10*	2.793E+00	4.038E+00	4.580E+00	1028.59
	520.69	20	22.40	1.437E+00	2.953E+01	3.349E+01	117.28
RB-84	881.60	8	68.90*	8.911E-01	6.735E+00	6.796E+00	196.95
TL-201	68.89	26	22.00	4.639E+00	1.230E+01	1.358E+01	120.80
	70.82	26	37.00	4.639E+00	7.315E+00	8.072E+00	120.80
	79.82	20	4.40	4.633E+00	4.783E+01	5.278E+01	145.60
	80.22	20	8.50	4.633E+00	2.476E+01	2.732E+01	145.60
	82.47	20	3.10	4.633E+00	6.789E+01	7.492E+01	145.60
	135.34	-----	2.57	4.000E+00	-----	Line Not Found	-----
	167.43	-----	10.00*	3.569E+00	-----	Line Not Found	-----
TL-204	68.89	26	0.47	4.639E+00	5.771E+02	5.772E+02	120.80
	70.82	26	0.79*	4.639E+00	3.430E+02	3.431E+02	120.80
	80.03	20	0.28	4.633E+00	7.598E+02	7.600E+02	145.60
	82.47	20	0.07	4.633E+00	3.194E+03	3.195E+03	145.60
TL-208	277.37	-----	6.60	2.493E+00	-----	Line Not Found	-----
	583.19	1	85.00*	1.297E+00	5.556E-01	5.558E-01	1588.19
	860.56	-----	12.50	9.113E-01	-----	Line Not Found	-----
PB-210	46.54	1	4.25*	4.159E+00	2.694E+00	2.694E+00	3526.73
RA-224	240.99	5	4.10*	2.793E+00	2.275E+01	2.276E+01	1028.59
RA-226	186.21	30	3.59*	3.339E+00	1.232E+02	1.232E+02	115.64
TH-231	84.21	20	6.60*	4.617E+00	3.224E+01	3.224E+01	152.94
TH-232	63.81	12	0.26*	4.593E+00	4.918E+02	4.918E+02	398.49
	140.88	-----	0.02	3.923E+00	-----	Line Not Found	-----
TH-234	63.29	12	3.70*	4.593E+00	3.456E+01	3.456E+01	398.49
	92.59	63	4.23	4.546E+00	1.593E+02	1.593E+02	76.41
U-238	63.29	12	3.70*	4.593E+00	3.456E+01	3.456E+01	398.49
	92.59	63	4.23	4.546E+00	1.593E+02	1.593E+02	76.41

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                          *
*****
*                                     DETECTOR AND SAMPLE DATA                      *
*                                     *                                              *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089187.CNF;1      *
* Acquisition date   : 17-MAY-2022 09:21:48 Sensitivity      : 3.000                *
* Detector ID        : GAM17 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:00.88 Half life ratio : *****      *
* Sample date        : 17-MAY-2022 00:00:00 Analyst initials: RXF2      *
* Sample ID          : G1205089187 Sample Quantity : 7.6992E-01 FILTER *
* Batch Number       : 2264689 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000           *
* Nuclide Library    : LIQUID.NLB;26                                             *
*****
*                                     CALIBRATION INFORMATION                      *
*                                     *                                              *
* Eff. Cal. date     : 6-DEC-2021 05:10:21 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM17_JAR.CNF;16          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
K-40	5.259E+01	1.103E+02	1.048E+02
BR-77	4.580E+00	4.616E+01	2.365E+01
RB-84	6.796E+00	1.312E+01	1.642E+01
TL-201	-1.571E+01	2.360E+01	4.190E+01
TL-204	3.431E+02	4.062E+02	5.080E+02
TL-208	5.558E-01	8.651E+00	1.038E+01
PB-210	2.694E+00	9.311E+01	8.371E+01
RA-224	2.276E+01	2.294E+02	1.184E+02
RA-226	1.232E+02	1.397E+02	1.295E+02
TH-231	3.224E+01	4.833E+01	5.328E+01
TH-232	4.918E+02	1.921E+03	1.470E+03
TH-234	3.456E+01	1.350E+02	1.034E+02
U-238	3.456E+01	1.350E+02	1.034E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	4.390E+00	3.567E+01	6.836E+01	NOT IDENT.
NA-22	-1.932E+00	5.011E+00	9.428E+00	NOT IDENT.
NA-24	6.785E+00	9.281E+00	2.177E+01	NOT IDENT.
AL-26	-6.141E-01	5.726E+00	1.164E+01	NOT IDENT.
SC-46	-9.443E-01	5.189E+00	1.008E+01	NOT IDENT.
V-48	1.196E-01	5.656E+00	1.133E+01	NOT IDENT.
CR-51	-1.218E+01	3.786E+01	6.760E+01	NOT IDENT.
MN-52	8.565E-02	7.055E+00	1.411E+01	NOT IDENT.
MN-54	-1.016E+00	4.989E+00	9.669E+00	NOT IDENT.
CO-56	-4.150E-01	5.552E+00	1.086E+01	NOT IDENT.
CO-57	1.005E+00	2.388E+00	4.705E+00	NOT IDENT.
NI-57	-3.802E+00	7.176E+00	1.288E+01	NOT IDENT.
CO-58	-1.011E+00	4.505E+00	8.799E+00	NOT IDENT.
FE-59	7.580E+00	1.124E+01	2.457E+01	NOT IDENT.
CO-60	-1.730E+00	5.328E+00	1.013E+01	NOT IDENT.
ZN-65	1.070E+01	1.274E+01	2.693E+01	NOT IDENT.
CU-67	-1.266E+01	8.154E+00	1.293E+01	FAIL ABUN

GE-68	6.064E+01	1.600E+02	3.488E+02	NOT IDENT.
AS-73	7.290E+00	2.230E+01	3.773E+01	NOT IDENT.
AS-74	-6.167E+00	8.189E+00	1.329E+01	NOT IDENT.
SE-75	-1.988E+00	5.436E+00	9.743E+00	NOT IDENT.
SR-82	-1.763E+00	3.071E+01	6.135E+01	NOT IDENT.
RB-83	1.475E+01	1.695E+01	2.068E+01	FAIL ABUN
KR-85	-2.593E+03	1.583E+03	2.339E+03	NOT IDENT.
SR-85	-1.167E+01	7.123E+00	1.052E+01	NOT IDENT.
RB-86	6.004E+00	6.664E+01	1.357E+02	NOT IDENT.
Y-88	-1.595E+00	6.305E+00	1.207E+01	NOT IDENT.
Y-91	-5.434E+02	1.528E+03	2.980E+03	NOT IDENT.
NB-94	-8.115E-01	5.395E+00	9.684E+00	NOT IDENT.
NB-95	-1.925E+00	5.151E+00	9.666E+00	NOT IDENT.
NB-95M	3.166E+00	1.180E+01	2.074E+01	NOT IDENT.
TC-95M	2.335E+00	4.562E+00	8.878E+00	FAIL ABUN
ZR-95	1.568E+00	9.187E+00	1.871E+01	NOT IDENT.
MO-99	-5.591E+00	4.208E+01	8.281E+01	NOT IDENT.
TC-99M	-3.563E+00	8.764E+00	1.490E+01	NOT IDENT.
RH-101	-9.241E-03	3.190E+00	6.044E+00	NOT IDENT.
RH-102M	-2.153E+00	4.553E+00	7.875E+00	NOT IDENT.
RU-103	-1.415E+00	5.051E+00	8.956E+00	NOT IDENT.
RH-106	-4.634E+00	4.632E+01	8.487E+01	NOT IDENT.
RU-106	-4.634E+00	4.632E+01	8.487E+01	NOT IDENT.
AG-108M	9.373E-01	4.379E+00	8.356E+00	NOT IDENT.
CD-109	7.499E+00	6.924E+01	9.849E+01	NOT IDENT.
AG-110	-6.246E+01	1.218E+02	2.052E+02	NOT IDENT.
AG-110M	2.464E+00	8.398E+00	1.564E+01	NOT IDENT.
IN-111	-8.591E-01	3.833E+00	6.241E+00	NOT IDENT.
SN-113	8.607E-01	5.571E+00	1.060E+01	NOT IDENT.
IN-114M	-4.303E+00	1.841E+01	3.021E+01	NOT IDENT.
CD-115	-1.470E+01	1.650E+01	2.622E+01	NOT IDENT.
SN-117M	1.068E+00	2.748E+00	5.365E+00	NOT IDENT.
SB-122	-2.217E+00	6.928E+00	1.225E+01	NOT IDENT.
I-123	-4.083E-01	4.754E+00	8.917E+00	NOT IDENT.
TE-123M	-3.214E-01	2.737E+00	5.121E+00	NOT IDENT.
SB-124	7.553E+00	1.122E+01	2.789E+01	NOT IDENT.
SB-125	2.147E+00	1.214E+01	2.331E+01	NOT IDENT.
TE-125M	1.831E+02	7.772E+02	1.381E+03	NOT IDENT.
I-126	-1.739E+01	2.005E+01	3.090E+01	NOT IDENT.
SB-126	1.763E+00	9.656E+00	1.849E+01	NOT IDENT.
SN-126	5.474E+00	6.109E+00	1.002E+01	FAIL ABUN
SB-127	9.529E+00	1.366E+01	2.856E+01	NOT IDENT.
TE-129	2.843E+01	5.390E+01	1.068E+02	NOT IDENT.
I-131	-3.923E+00	4.248E+00	6.961E+00	FAIL ABUN
I-132	-1.645E+02	1.506E+02	2.234E+02	FAIL ABUN
TE-132	9.036E-01	3.567E+00	6.831E+00	FAIL ABUN
BA-133	-2.926E+00	6.589E+00	1.017E+01	FAIL ABUN
I-133	1.343E+00	5.717E+00	1.135E+01	NOT IDENT.
CS-134	-2.121E+00	5.537E+00	1.044E+01	NOT IDENT.
I-135	-2.643E+01	5.514E+01	8.292E+01	NOT IDENT.
CS-136	1.059E+00	5.645E+00	1.224E+01	NOT IDENT.
BA-137M	2.912E+00	7.892E+00	1.484E+01	NOT IDENT.
CS-137	3.076E+00	8.337E+00	1.567E+01	NOT IDENT.
LA-138	-5.589E+00	1.162E+01	2.039E+01	NOT IDENT.
CE-139	-2.704E-01	2.674E+00	5.041E+00	NOT IDENT.
BA-140	-5.577E-01	1.607E+01	3.017E+01	NOT IDENT.
LA-140	9.206E-01	3.364E+00	8.982E+00	NOT IDENT.
CE-141	2.969E-01	4.752E+00	9.028E+00	NOT IDENT.
CE-143	2.835E+00	1.035E+01	1.798E+01	NOT IDENT.
CE-144	-2.140E+00	1.988E+01	3.731E+01	FAIL ABUN
PM-144	7.098E-02	5.329E+00	9.842E+00	NOT IDENT.
PR-144	-1.612E-02	3.949E+02	7.280E+02	NOT IDENT.
PM-146	1.908E+00	7.034E+00	1.219E+01	FAIL ABUN
ND-147	1.296E+01	2.775E+01	5.706E+01	NOT IDENT.
PM-147	1.161E+04	7.146E+04	1.379E+05	NOT IDENT.
PM-149	-8.490E+01	1.208E+02	2.079E+02	NOT IDENT.
EU-152	7.856E+00	1.319E+01	2.617E+01	NOT IDENT.
GD-153	1.684E+00	7.750E+00	1.272E+01	FAIL ABUN
EU-154	-5.086E+00	1.443E+01	2.738E+01	NOT IDENT.
EU-155	3.332E+00	9.704E+00	1.748E+01	NOT IDENT.
TB-160	1.670E+01	1.980E+01	4.079E+01	FAIL ABUN
HO-166M	-3.955E+00	1.004E+01	1.724E+01	FAIL ABUN
TM-171	-6.835E+00	4.652E+02	7.577E+02	NOT IDENT.
LU-176	1.606E+00	3.465E+00	6.793E+00	NOT IDENT.
LU-177	-1.731E+01	2.620E+01	4.603E+01	NOT IDENT.
HF-181	8.085E-03	4.998E+00	9.329E+00	NOT IDENT.
W-181	-5.115E+00	7.032E+00	1.137E+01	FAIL ABUN
TA-182	1.448E+01	2.194E+01	4.944E+01	FAIL ABUN

RE-183	-3.517E+00	6.460E+00	1.066E+01	NOT IDENT.
RE-184	4.894E+00	1.271E+01	2.742E+01	NOT IDENT.
RE-188	-3.879E+00	1.472E+01	2.718E+01	FAIL ABUN
W-188	-5.359E+02	7.536E+02	1.295E+03	FAIL ABUN
OS-191	-4.445E+00	8.258E+00	1.494E+01	FAIL ABUN
IR-192	1.934E-01	4.166E+00	7.784E+00	FAIL ABUN
PB-201	3.067E+00	9.917E+00	1.903E+01	NOT IDENT.
TL-202	1.232E+00	4.030E+00	7.894E+00	FAIL ABUN
HG-203	1.232E+00	3.829E+00	7.392E+00	FAIL ABUN
PB-203	1.417E+00	4.404E+00	8.503E+00	FAIL ABUN
BI-207	2.238E+00	7.113E+00	1.522E+01	NOT IDENT.
BI-211	1.744E+01	3.324E+01	5.620E+01	NOT IDENT.
PB-211	5.424E+01	1.021E+02	2.016E+02	NOT IDENT.
BI-212	9.272E+01	8.674E+01	1.830E+02	NOT IDENT.
PB-212	2.140E+00	2.157E+01	1.750E+01	FAIL ABUN
BI-213	-3.509E+00	1.418E+01	2.564E+01	NOT IDENT.
BI-214	-2.329E+00	1.365E+01	2.260E+01	NOT IDENT.
PB-214	-1.962E+00	1.241E+01	2.059E+01	FAIL ABUN
RN-219	-6.706E+00	5.975E+01	1.091E+02	NOT IDENT.
FR-221	2.354E+00	2.252E+01	4.291E+01	NOT IDENT.
RA-223	3.427E+01	9.157E+01	1.759E+02	FAIL ABUN
AC-225	2.425E+00	2.320E+01	4.422E+01	NOT IDENT.
AC-227	4.450E+00	3.406E+01	6.402E+01	NOT IDENT.
TH-227	4.450E+00	3.406E+01	6.402E+01	NOT IDENT.
AC-228	-4.100E+01	2.897E+01	4.283E+01	NOT IDENT.
RA-228	-4.100E+01	2.897E+01	4.283E+01	NOT IDENT.
TH-228	2.140E+00	2.157E+01	1.750E+01	FAIL ABUN
TH-229	3.000E+01	5.968E+01	1.169E+02	FAIL ABUN
TH-230	1.919E+01	6.466E+02	9.404E+02	NOT IDENT.
PA-231	5.356E+01	6.098E+01	1.240E+02	NOT IDENT.
PA-233	-3.280E+00	8.992E+00	1.604E+01	NOT IDENT.
PA-234	-4.798E+00	4.315E+01	8.513E+01	FAIL ABUN
PA-234M	-6.240E+01	5.652E+02	1.133E+03	NOT IDENT.
U-234	-2.939E+01	1.948E+03	3.153E+03	NOT IDENT.
U-235	1.314E+01	1.990E+01	3.983E+01	FAIL ABUN
NP-237	-3.280E+00	8.992E+00	1.604E+01	NOT IDENT.
NP-238	-5.973E+00	2.613E+01	4.997E+01	NOT IDENT.
NP-239	2.079E+01	2.580E+01	5.225E+01	NOT IDENT.
AM-241	7.795E+00	6.329E+00	1.173E+01	NOT IDENT.
AM-242	4.383E+01	6.064E+01	1.125E+02	NOT IDENT.
AM-243	-9.613E-01	3.969E+00	6.528E+00	NOT IDENT.
CM-243	-4.328E+00	9.056E+00	1.483E+01	NOT IDENT.
BK-247	-7.161E+00	1.068E+01	1.851E+01	FAIL ABUN
CM-247	8.214E-01	5.369E+00	1.015E+01	NOT IDENT.
CF-249	5.210E-01	5.811E+00	1.089E+01	NOT IDENT.
CF-251	-2.229E+00	1.366E+01	2.542E+01	NOT IDENT.
CF-252	-7.033E+03	1.762E+04	2.899E+04	NOT IDENT.
ANH-511	-1.571E+01	9.156E+00	1.736E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	7	36.80	43	8	1.72	73.75	70	20	6.00E-03	25.4	2.22E+00
2	7	40.24	39	40	1.80	80.64	70	20	5.45E-03	39.9	
3	7	43.08	18	45	1.54	86.34	70	20	2.46E-03	62.5	
4	5	46.92	81	57	1.82	94.01	90	15	1.13E-02	20.0	1.27E+00
5	5	49.77	26	57	1.83	99.72	90	15	3.59E-03	69.6	
6	0	63.64	85	121	1.03	127.52	123	11	1.18E-02	27.3	
7	0	69.71	26	72	1.25	139.66	135	8	3.58E-03	60.4	
8	0	81.26	20	64	1.03	162.80	158	8	2.78E-03	72.8	
9	0	84.16	30	61	1.08	168.62	165	8	4.13E-03	48.9	
10	0	93.06	153	87	1.54	186.43	180	14	2.12E-02	15.3	
11	0	186.27	84	51	1.17	373.11	369	11	1.16E-02	19.7	
12	0	239.93	47	125	1.71	480.56	472	18	6.60E-03	56.5	
13	0	296.66	23	29	1.40	594.17	590	7	3.17E-03	45.4	
14	0	353.75	33	38	3.56	708.49	702	14	4.59E-03	43.4	
15	0	449.82	23	23	1.62	900.82	896	10	3.22E-03	43.6	
16	0	511.73	121	49	2.74	1024.77	1017	20	1.68E-02	17.9	
17	0	521.60	20	26	1.87	1044.51	1037	14	2.71E-03	58.6	
18	0	583.43	21	17	0.71	1168.29	1162	10	2.87E-03	43.8	
19	0	609.27	12	16	1.46	1220.00	1216	8	1.67E-03	64.5	
20	0	632.95	20	13	4.01	1267.41	1260	13	2.84E-03	42.4	
21	0	679.69	11	16	0.57	1360.95	1357	9	1.51E-03	72.8	
22	0	823.53	12	3	3.76	1648.81	1643	11	1.73E-03	38.2	
23	0	882.52	8	18	1.80	1766.84	1758	10	1.18E-03	98.5	
24	0	918.43	10	8	1.83	1838.70	1832	10	1.45E-03	58.0	
25	0	1015.46	9	6	2.20	2032.83	2029	8	1.21E-03	59.7	
26	0	1092.64	8	5	1.64	2187.23	2180	11	1.09E-03	67.6	
27	0	1122.36	8	20	4.98	2246.68	2233	16	1.13E-03	128.2	
28	0	1151.84	13	7	3.29	2305.65	2296	14	1.78E-03	52.1	
29	0	1240.29	18	3	1.86	2482.54	2475	13	2.44E-03	32.0	
30	0	1255.84	11	2	1.10	2513.64	2509	10	1.52E-03	40.2	
31	0	1323.80	9	0	1.46	2649.56	2646	8	1.25E-03	33.3	
32	0	1461.07	18	7	2.05	2924.05	2916	13	2.56E-03	36.9	
33	0	1636.48	8	0	0.99	3274.75	3269	11	1.11E-03	35.4	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	7	10.66*	5.823E-01	5.259E+01	5.259E+01	214.07
BR-77	238.98	5	23.10*	2.793E+00	4.038E+00	4.580E+00	1028.59
	520.69	20	22.40	1.437E+00	2.953E+01	3.349E+01	117.28
RB-84	881.60	8	68.90*	8.911E-01	6.735E+00	6.796E+00	196.95
TL-201	68.89	26	22.00	4.639E+00	1.230E+01	1.358E+01	120.80
	70.82	26	37.00	4.639E+00	7.315E+00	8.072E+00	120.80
	79.82	20	4.40	4.633E+00	4.783E+01	5.278E+01	145.60
	80.22	20	8.50	4.633E+00	2.476E+01	2.732E+01	145.60
	82.47	20	3.10	4.633E+00	6.789E+01	7.492E+01	145.60
	135.34	-----	2.57	4.000E+00	-----	Line Not Found	-----
	167.43	-----	10.00*	3.569E+00	-----	Line Not Found	-----
TL-204	68.89	26	0.47	4.639E+00	5.771E+02	5.772E+02	120.80
	70.82	26	0.79*	4.639E+00	3.430E+02	3.431E+02	120.80
	80.03	20	0.28	4.633E+00	7.598E+02	7.600E+02	145.60
	82.47	20	0.07	4.633E+00	3.194E+03	3.195E+03	145.60
TL-208	277.37	-----	6.60	2.493E+00	-----	Line Not Found	-----
	583.19	1	85.00*	1.297E+00	5.556E-01	5.558E-01	1588.19
	860.56	-----	12.50	9.113E-01	-----	Line Not Found	-----
PB-210	46.54	1	4.25*	4.159E+00	2.694E+00	2.694E+00	3526.73
RA-224	240.99	5	4.10*	2.793E+00	2.275E+01	2.276E+01	1028.59
RA-226	186.21	30	3.59*	3.339E+00	1.232E+02	1.232E+02	115.64
TH-231	84.21	20	6.60*	4.617E+00	3.224E+01	3.224E+01	152.94
TH-232	63.81	12	0.26*	4.593E+00	4.918E+02	4.918E+02	398.49
	140.88	-----	0.02	3.923E+00	-----	Line Not Found	-----
TH-234	63.29	12	3.70*	4.593E+00	3.456E+01	3.456E+01	398.49
	92.59	63	4.23	4.546E+00	1.593E+02	1.593E+02	76.41
U-238	63.29	12	3.70*	4.593E+00	3.456E+01	3.456E+01	398.49
	92.59	63	4.23	4.546E+00	1.593E+02	1.593E+02	76.41

Flag: "*" = Keyline

Total number of lines in spectrum 28
Number of unidentified lines 12
Number of lines tentatively identified by NID 16 57.14%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
K-40	1.25E+09Y	1.00	5.259E+01	5.259E+01	11.26E+01	214.07	
BR-77	57.04H	1.13	4.038E+00	4.580E+00	47.11E+00	1028.59	
RB-84	32.82D	1.01	6.735E+00	6.796E+00	13.39E+00	196.95	
TL-201	3.04D	1.10	7.315E+00	8.072E+00	9.751E+00	120.80	K
TL-204	3.78Y	1.00	3.430E+02	3.431E+02	4.145E+02	120.80	
TL-208	1.91Y	1.00	5.556E-01	5.558E-01	88.27E-01	1588.19	
PB-210	22.20Y	1.00	2.694E+00	2.694E+00	95.01E+00	3526.73	
RA-224	1.91Y	1.00	2.275E+01	2.276E+01	23.41E+01	1028.59	
RA-226	1600.00Y	1.00	1.232E+02	1.232E+02	1.425E+02	115.64	
TH-231	7.04E+08Y	1.00	3.224E+01	3.224E+01	4.931E+01	152.94	
TH-232	1.41E+10Y	1.00	4.918E+02	4.918E+02	19.60E+02	398.49	
TH-234	4.47E+09Y	1.00	3.456E+01	3.456E+01	13.77E+01	398.49	
U-238	4.47E+09Y	1.00	3.456E+01	3.456E+01	13.77E+01	398.49	
Total Activity :			1.156E+03	1.158E+03			

Grand Total Activity : 1.156E+03 1.158E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
5	49.77	26	57	1.83	99.72	90	15	3.59E-03	****	4.28E+00	T
0	296.66	23	29	1.40	594.17	590	7	3.17E-03	90.8	2.36E+00	T
0	353.75	33	38	3.56	708.49	702	14	4.59E-03	86.7	2.03E+00	
0	449.82	23	23	1.62	900.82	896	10	3.22E-03	87.3	1.64E+00	
0	632.95	20	13	4.01	1267.41	1260	13	2.84E-03	84.9	1.20E+00	T
0	679.69	11	16	0.57	1360.95	1357	9	1.51E-03	****	1.13E+00	
0	823.53	12	3	3.76	1648.81	1643	11	1.73E-03	76.4	9.48E-01	
0	918.43	10	8	1.83	1838.70	1832	10	1.45E-03	****	8.60E-01	
0	1015.46	9	6	2.20	2032.83	2029	8	1.21E-03	****	7.88E-01	
0	1092.64	8	5	1.64	2187.23	2180	11	1.09E-03	****	7.39E-01	
0	1122.36	8	20	4.98	2246.68	2233	16	1.13E-03	****	7.23E-01	T
0	1151.84	13	7	3.29	2305.65	2296	14	1.78E-03	****	7.07E-01	
0	1240.29	18	3	1.86	2482.54	2475	13	2.44E-03	63.9	6.65E-01	
0	1255.84	11	2	1.10	2513.64	2509	10	1.52E-03	80.3	6.58E-01	
0	1323.80	9	0	1.46	2649.56	2646	8	1.25E-03	66.7	6.30E-01	
0	1636.48	8	0	0.99	3274.75	3269	11	1.11E-03	70.7	5.34E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089187.CNF;1
* Acquisition date   : 17-MAY-2022 09:21:48 Sensitivity      : 3.000
* Detector ID       : GAM17 Energy tolerance: 1.500
* Elapsed live time : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time : 0 02:00:00.88 Half life ratio : *****
* Sample date       : 17-MAY-2022 00:00:00 Nuclide Library : LIQUID
* Sample ID         : G1205089187 Analyst initials: RXF2
* Batch Number      : 2264689 Sample Quantity : 7.6992E-01 FILTER
* Wet wt corr       : 1.00000 Wet Weight : 0.00000
*                                     Dry Weight : 0.00000
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date    : 6-DEC-2021 05:10:21 Eff. Geometry    : JAR
* Eff. File         : DKA100:[CANBERRA.GAMMA]EFF_GAM17_JAR.CNF;16
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
K-40	4.179E+01
BR-77	1.067E+01
RB-84	7.129E+00
TL-201	1.892E+01
TL-204	2.361E+02
TL-208	4.592E+00
PB-210	3.813E+01
RA-224	5.342E+01
RA-226	5.929E+01
TH-231	2.448E+01
TH-232	6.799E+02
TH-234	4.782E+01
U-238	4.782E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	3.011E+01	NOT IDENT.
NA-22	3.698E+00	NOT IDENT.
NA-24	9.150E+00	NOT IDENT.
AL-26	4.487E+00	NOT IDENT.
SC-46	4.293E+00	NOT IDENT.
V-48	4.838E+00	NOT IDENT.
CR-51	3.077E+01	NOT IDENT.
MN-52	5.879E+00	NOT IDENT.
MN-54	4.131E+00	NOT IDENT.
CO-56	4.713E+00	NOT IDENT.
CO-57	2.169E+00	NOT IDENT.
NI-57	4.822E+00	NOT IDENT.
CO-58	3.708E+00	NOT IDENT.
FE-59	1.069E+01	NOT IDENT.
CO-60	4.015E+00	NOT IDENT.
ZN-65	1.167E+01	NOT IDENT.
CU-67	6.015E+00	FAIL ABUN
GE-68	1.470E+02	NOT IDENT.

AS-73	1.741E+01	NOT IDENT.
AS-74	5.754E+00	NOT IDENT.
SE-75	4.440E+00	NOT IDENT.
SR-82	2.625E+01	NOT IDENT.
RB-83	9.324E+00	FAIL ABUN
KR-85	1.064E+03	NOT IDENT.
SR-85	4.790E+00	NOT IDENT.
RB-86	5.752E+01	NOT IDENT.
Y-88	4.677E+00	NOT IDENT.
Y-91	1.115E+03	NOT IDENT.
NB-94	4.240E+00	NOT IDENT.
NB-95	4.178E+00	NOT IDENT.
NB-95M	9.432E+00	NOT IDENT.
TC-95M	4.107E+00	FAIL ABUN
ZR-95	8.166E+00	NOT IDENT.
MO-99	3.561E+01	NOT IDENT.
TC-99M	6.834E+00	NOT IDENT.
RH-101	2.787E+00	NOT IDENT.
RH-102M	3.495E+00	NOT IDENT.
RU-103	3.993E+00	NOT IDENT.
RH-106	3.702E+01	NOT IDENT.
RU-106	3.702E+01	NOT IDENT.
AG-108M	3.750E+00	NOT IDENT.
CD-109	4.538E+01	NOT IDENT.
AG-110	9.000E+01	NOT IDENT.
AG-110M	6.802E+00	NOT IDENT.
IN-111	2.837E+00	NOT IDENT.
SN-113	4.755E+00	NOT IDENT.
IN-114M	1.382E+01	NOT IDENT.
CD-115	1.119E+01	NOT IDENT.
SN-117M	2.472E+00	NOT IDENT.
SB-122	5.347E+00	NOT IDENT.
I-123	4.090E+00	NOT IDENT.
TE-123M	2.347E+00	NOT IDENT.
SB-124	1.127E+01	NOT IDENT.
SB-125	1.037E+01	NOT IDENT.
TE-125M	6.345E+02	NOT IDENT.
I-126	1.367E+01	NOT IDENT.
SB-126	8.074E+00	NOT IDENT.
SN-126	4.626E+00	FAIL ABUN
SB-127	1.256E+01	NOT IDENT.
TE-129	4.804E+01	NOT IDENT.
I-131	3.058E+00	FAIL ABUN
I-132	9.869E+01	FAIL ABUN
TE-132	3.133E+00	FAIL ABUN
BA-133	4.559E+00	FAIL ABUN
I-133	4.919E+00	NOT IDENT.
CS-134	4.433E+00	NOT IDENT.
I-135	3.104E+01	NOT IDENT.
CS-136	5.023E+00	NOT IDENT.
BA-137M	6.786E+00	NOT IDENT.
CS-137	7.169E+00	NOT IDENT.
LA-138	8.493E+00	NOT IDENT.
CE-139	2.291E+00	NOT IDENT.
BA-140	1.311E+01	NOT IDENT.
LA-140	3.189E+00	NOT IDENT.
CE-141	4.159E+00	NOT IDENT.
CE-143	8.192E+00	NOT IDENT.
CE-144	1.718E+01	FAIL ABUN
PM-144	4.321E+00	NOT IDENT.
PR-144	3.194E+02	NOT IDENT.
PM-146	5.476E+00	FAIL ABUN
ND-147	2.488E+01	NOT IDENT.
PM-147	6.348E+04	NOT IDENT.
PM-149	9.396E+01	NOT IDENT.
EU-152	1.190E+01	NOT IDENT.
GD-153	5.855E+00	FAIL ABUN
EU-154	1.079E+01	NOT IDENT.
EU-155	8.036E+00	NOT IDENT.
TB-160	1.794E+01	FAIL ABUN
HO-166M	7.496E+00	FAIL ABUN
TM-171	3.469E+02	NOT IDENT.
LU-176	3.091E+00	NOT IDENT.
LU-177	2.087E+01	NOT IDENT.
HF-181	4.132E+00	NOT IDENT.
W-181	5.227E+00	FAIL ABUN
TA-182	2.109E+01	FAIL ABUN
RE-183	4.906E+00	NOT IDENT.

RE-184	1.171E+01	NOT IDENT.
RE-188	1.246E+01	FAIL ABUN
W-188	5.793E+02	FAIL ABUN
OS-191	6.853E+00	FAIL ABUN
IR-192	3.536E+00	FAIL ABUN
PB-201	8.660E+00	NOT IDENT.
TL-202	3.508E+00	FAIL ABUN
HG-203	3.369E+00	FAIL ABUN
PB-203	3.876E+00	FAIL ABUN
BI-207	6.441E+00	NOT IDENT.
BI-211	2.562E+01	NOT IDENT.
PB-211	9.119E+01	NOT IDENT.
BI-212	8.220E+01	NOT IDENT.
PB-212	8.212E+00	FAIL ABUN
BI-213	1.131E+01	NOT IDENT.
BI-214	1.014E+01	NOT IDENT.
PB-214	9.393E+00	FAIL ABUN
RN-219	4.910E+01	NOT IDENT.
FR-221	1.954E+01	NOT IDENT.
RA-223	8.046E+01	FAIL ABUN
AC-225	2.013E+01	NOT IDENT.
AC-227	2.941E+01	NOT IDENT.
TH-227	2.941E+01	NOT IDENT.
AC-228	1.847E+01	NOT IDENT.
RA-228	1.847E+01	NOT IDENT.
TH-228	8.212E+00	FAIL ABUN
TH-229	5.389E+01	FAIL ABUN
TH-230	4.329E+02	NOT IDENT.
PA-231	5.673E+01	NOT IDENT.
PA-233	7.265E+00	NOT IDENT.
PA-234	3.601E+01	FAIL ABUN
PA-234M	4.684E+02	NOT IDENT.
U-234	1.452E+03	NOT IDENT.
U-235	1.838E+01	FAIL ABUN
NP-237	7.265E+00	NOT IDENT.
NP-238	2.126E+01	NOT IDENT.
NP-239	2.418E+01	NOT IDENT.
AM-241	5.464E+00	NOT IDENT.
AM-242	5.217E+01	NOT IDENT.
AM-243	3.054E+00	NOT IDENT.
CM-243	6.705E+00	NOT IDENT.
BK-247	8.411E+00	FAIL ABUN
CM-247	4.572E+00	NOT IDENT.
CF-249	4.915E+00	NOT IDENT.
CF-251	1.161E+01	NOT IDENT.
CF-252	1.337E+04	NOT IDENT.
ANH-511	8.234E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089187.CNF;1
* Acquisition date   : 17-MAY-2022 09:21:48 Sensitivity      : 3.000
* Detector ID        : GAM17 Energy tolerance: 1.500
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 02:00:00.88 Half life ratio  : *****
* Sample date        : 17-MAY-2022 00:00:00 Nuclide Library : LIQUID
* Sample ID          : G1205089187 Analyst initials: RXF2
* Batch Number       : 2264689 Sample Quantity : 7.6992E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 6-DEC-2021 05:10:21 Eff. Geometry    : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM17_JAR.CNF;16

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
K-40	5.259E+01	1.104E+02	1.104E+02
BR-77	4.580E+00	4.616E+01	4.617E+01
RB-84	6.796E+00	1.313E+01	1.313E+01
TL-201	-1.571E+01	2.363E+01	2.363E+01
TL-204	3.431E+02	4.076E+02	4.077E+02
TL-208	5.558E-01	8.651E+00	8.651E+00
PB-210	2.694E+00	9.312E+01	9.312E+01
RA-224	2.276E+01	2.294E+02	2.294E+02
RA-226	1.232E+02	1.400E+02	1.400E+02
TH-231	3.224E+01	4.855E+01	4.856E+01
TH-232	4.918E+02	1.922E+03	1.922E+03
TH-234	3.456E+01	1.352E+02	1.352E+02
U-238	3.456E+01	1.352E+02	1.352E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	4.390E+00	3.567E+01	3.572E+01	NOT IDENT.
NA-22	-1.932E+00	5.013E+00	5.089E+00	NOT IDENT.
NA-24	6.785E+00	9.297E+00	9.788E+00	NOT IDENT.
AL-26	-6.141E-01	5.726E+00	5.732E+00	NOT IDENT.
SC-46	-9.443E-01	5.190E+00	5.207E+00	NOT IDENT.
V-48	1.196E-01	5.656E+00	5.656E+00	NOT IDENT.
CR-51	-1.218E+01	3.788E+01	3.828E+01	NOT IDENT.
MN-52	8.565E-02	7.055E+00	7.055E+00	NOT IDENT.
MN-54	-1.016E+00	4.990E+00	5.011E+00	NOT IDENT.
CO-56	-4.150E-01	5.552E+00	5.555E+00	NOT IDENT.
CO-57	1.005E+00	2.389E+00	2.432E+00	NOT IDENT.
NI-57	-3.802E+00	7.186E+00	7.388E+00	NOT IDENT.
CO-58	-1.011E+00	4.506E+00	4.529E+00	NOT IDENT.
FE-59	7.580E+00	1.127E+01	1.177E+01	NOT IDENT.
CO-60	-1.730E+00	5.330E+00	5.387E+00	NOT IDENT.
ZN-65	1.070E+01	1.277E+01	1.365E+01	NOT IDENT.
CU-67	-1.266E+01	8.213E+00	1.000E+01	FAIL ABUN

GE-68	6.064E+01	1.600E+02	1.624E+02	NOT IDENT.
AS-73	7.290E+00	2.236E+01	2.260E+01	NOT IDENT.
AS-74	-6.167E+00	8.218E+00	8.676E+00	NOT IDENT.
SE-75	-1.988E+00	5.439E+00	5.512E+00	NOT IDENT.
SR-82	-1.763E+00	3.071E+01	3.072E+01	NOT IDENT.
RB-83	1.475E+01	1.712E+01	1.836E+01	FAIL ABUN
KR-85	-2.593E+03	1.601E+03	1.983E+03	NOT IDENT.
SR-85	-1.167E+01	7.205E+00	8.923E+00	NOT IDENT.
RB-86	6.004E+00	6.665E+01	6.670E+01	NOT IDENT.
Y-88	-1.595E+00	6.306E+00	6.347E+00	NOT IDENT.
Y-91	-5.434E+02	1.528E+03	1.548E+03	NOT IDENT.
NB-94	-8.115E-01	5.396E+00	5.408E+00	NOT IDENT.
NB-95	-1.925E+00	5.153E+00	5.226E+00	NOT IDENT.
NB-95M	3.166E+00	1.180E+01	1.189E+01	NOT IDENT.
TC-95M	2.335E+00	4.566E+00	4.686E+00	FAIL ABUN
ZR-95	1.568E+00	9.188E+00	9.215E+00	NOT IDENT.
MO-99	-5.591E+00	4.208E+01	4.216E+01	NOT IDENT.
TC-99M	-3.563E+00	8.774E+00	8.921E+00	NOT IDENT.
RH-101	-9.241E-03	3.190E+00	3.190E+00	NOT IDENT.
RH-102M	-2.153E+00	4.561E+00	4.663E+00	NOT IDENT.
RU-103	-1.415E+00	5.053E+00	5.093E+00	NOT IDENT.
RH-106	-4.634E+00	4.633E+01	4.637E+01	NOT IDENT.
RU-106	-4.634E+00	4.633E+01	4.637E+01	NOT IDENT.
AG-108M	9.373E-01	4.380E+00	4.400E+00	NOT IDENT.
CD-109	7.499E+00	6.924E+01	6.932E+01	NOT IDENT.
AG-110	-6.246E+01	1.219E+02	1.251E+02	NOT IDENT.
AG-110M	2.464E+00	8.400E+00	8.473E+00	NOT IDENT.
IN-111	-8.591E-01	3.834E+00	3.853E+00	NOT IDENT.
SN-113	8.607E-01	5.572E+00	5.585E+00	NOT IDENT.
IN-114M	-4.303E+00	1.841E+01	1.851E+01	NOT IDENT.
CD-115	-1.470E+01	1.657E+01	1.785E+01	NOT IDENT.
SN-117M	1.068E+00	2.749E+00	2.791E+00	NOT IDENT.
SB-122	-2.217E+00	6.930E+00	7.002E+00	NOT IDENT.
I-123	-4.083E-01	4.754E+00	4.757E+00	NOT IDENT.
TE-123M	-3.214E-01	2.737E+00	2.741E+00	NOT IDENT.
SB-124	7.553E+00	1.124E+01	1.174E+01	NOT IDENT.
SB-125	2.147E+00	1.214E+01	1.218E+01	NOT IDENT.
TE-125M	1.831E+02	7.773E+02	7.817E+02	NOT IDENT.
I-126	-1.739E+01	2.012E+01	2.159E+01	NOT IDENT.
SB-126	1.763E+00	9.658E+00	9.691E+00	NOT IDENT.
SN-126	5.474E+00	6.126E+00	6.606E+00	FAIL ABUN
SB-127	9.529E+00	1.368E+01	1.434E+01	NOT IDENT.
TE-129	2.843E+01	5.414E+01	5.564E+01	NOT IDENT.
I-131	-3.923E+00	4.264E+00	4.616E+00	FAIL ABUN
I-132	-1.645E+02	1.513E+02	1.685E+02	FAIL ABUN
TE-132	9.036E-01	3.568E+00	3.592E+00	FAIL ABUN
BA-133	-2.926E+00	6.595E+00	6.726E+00	FAIL ABUN
I-133	1.343E+00	5.718E+00	5.750E+00	NOT IDENT.
CS-134	-2.121E+00	5.539E+00	5.621E+00	NOT IDENT.
I-135	-2.643E+01	5.520E+01	5.648E+01	NOT IDENT.
CS-136	1.059E+00	5.646E+00	5.667E+00	NOT IDENT.
BA-137M	2.912E+00	7.896E+00	8.004E+00	NOT IDENT.
CS-137	3.076E+00	8.341E+00	8.456E+00	NOT IDENT.
LA-138	-5.589E+00	1.163E+01	1.190E+01	NOT IDENT.
CE-139	-2.704E-01	2.674E+00	2.677E+00	NOT IDENT.
BA-140	-5.577E-01	1.607E+01	1.607E+01	NOT IDENT.
LA-140	9.206E-01	3.364E+00	3.390E+00	NOT IDENT.
CE-141	2.969E-01	4.752E+00	4.753E+00	NOT IDENT.
CE-143	2.835E+00	1.035E+01	1.043E+01	NOT IDENT.
CE-144	-2.140E+00	1.988E+01	1.991E+01	FAIL ABUN
PM-144	7.098E-02	5.329E+00	5.329E+00	NOT IDENT.
PR-144	-1.612E-02	3.949E+02	3.949E+02	NOT IDENT.
PM-146	1.908E+00	7.037E+00	7.089E+00	FAIL ABUN
ND-147	1.296E+01	2.778E+01	2.839E+01	NOT IDENT.
PM-147	1.161E+04	7.147E+04	7.166E+04	NOT IDENT.
PM-149	-8.490E+01	1.215E+02	1.274E+02	NOT IDENT.
EU-152	7.856E+00	1.321E+01	1.368E+01	NOT IDENT.
GD-153	1.684E+00	7.752E+00	7.789E+00	FAIL ABUN
EU-154	-5.086E+00	1.443E+01	1.461E+01	NOT IDENT.
EU-155	3.332E+00	9.709E+00	9.825E+00	NOT IDENT.
TB-160	1.670E+01	1.985E+01	2.123E+01	FAIL ABUN
HO-166M	-3.955E+00	1.004E+01	1.020E+01	FAIL ABUN
TM-171	-6.835E+00	4.652E+02	4.652E+02	NOT IDENT.
LU-176	1.606E+00	3.469E+00	3.544E+00	NOT IDENT.
LU-177	-1.731E+01	2.624E+01	2.737E+01	NOT IDENT.
HF-181	8.085E-03	4.998E+00	4.998E+00	NOT IDENT.
W-181	-5.115E+00	7.155E+00	7.518E+00	FAIL ABUN
TA-182	1.448E+01	2.197E+01	2.292E+01	FAIL ABUN

RE-183	-3.517E+00	6.472E+00	6.663E+00	NOT IDENT.
RE-184	4.894E+00	1.272E+01	1.291E+01	NOT IDENT.
RE-188	-3.879E+00	1.472E+01	1.482E+01	FAIL ABUN
W-188	-5.359E+02	7.572E+02	7.949E+02	FAIL ABUN
OS-191	-4.445E+00	8.266E+00	8.505E+00	FAIL ABUN
IR-192	1.934E-01	4.166E+00	4.167E+00	FAIL ABUN
PB-201	3.067E+00	9.932E+00	1.003E+01	NOT IDENT.
TL-202	1.232E+00	4.032E+00	4.070E+00	FAIL ABUN
HG-203	1.232E+00	3.830E+00	3.870E+00	FAIL ABUN
PB-203	1.417E+00	4.406E+00	4.452E+00	FAIL ABUN
BI-207	2.238E+00	7.115E+00	7.187E+00	NOT IDENT.
BI-211	1.744E+01	3.328E+01	3.420E+01	NOT IDENT.
PB-211	5.424E+01	1.023E+02	1.051E+02	NOT IDENT.
BI-212	9.272E+01	8.710E+01	9.663E+01	NOT IDENT.
PB-212	2.140E+00	2.157E+01	2.160E+01	FAIL ABUN
BI-213	-3.509E+00	1.418E+01	1.427E+01	NOT IDENT.
BI-214	-2.329E+00	1.365E+01	1.369E+01	NOT IDENT.
PB-214	-1.962E+00	1.241E+01	1.244E+01	FAIL ABUN
RN-219	-6.706E+00	5.976E+01	5.983E+01	NOT IDENT.
FR-221	2.354E+00	2.252E+01	2.254E+01	NOT IDENT.
RA-223	3.427E+01	9.164E+01	9.294E+01	FAIL ABUN
AC-225	2.425E+00	2.320E+01	2.323E+01	NOT IDENT.
AC-227	4.450E+00	3.407E+01	3.413E+01	NOT IDENT.
TH-227	4.450E+00	3.407E+01	3.413E+01	NOT IDENT.
AC-228	-4.100E+01	2.915E+01	3.453E+01	NOT IDENT.
RA-228	-4.100E+01	2.915E+01	3.453E+01	NOT IDENT.
TH-228	2.140E+00	2.157E+01	2.160E+01	FAIL ABUN
TH-229	3.000E+01	5.973E+01	6.124E+01	FAIL ABUN
TH-230	1.919E+01	6.466E+02	6.466E+02	NOT IDENT.
PA-231	5.356E+01	6.219E+01	6.672E+01	NOT IDENT.
PA-233	-3.280E+00	8.997E+00	9.118E+00	NOT IDENT.
PA-234	-4.798E+00	4.350E+01	4.355E+01	FAIL ABUN
PA-234M	-6.240E+01	5.652E+02	5.659E+02	NOT IDENT.
U-234	-2.939E+01	1.948E+03	1.948E+03	NOT IDENT.
U-235	1.314E+01	1.993E+01	2.079E+01	FAIL ABUN
NP-237	-3.280E+00	8.997E+00	9.118E+00	NOT IDENT.
NP-238	-5.973E+00	2.613E+01	2.627E+01	NOT IDENT.
NP-239	2.079E+01	2.586E+01	2.751E+01	NOT IDENT.
AM-241	7.795E+00	6.362E+00	7.269E+00	NOT IDENT.
AM-242	4.383E+01	6.117E+01	6.429E+01	NOT IDENT.
AM-243	-9.613E-01	3.970E+00	3.994E+00	NOT IDENT.
CM-243	-4.328E+00	9.069E+00	9.277E+00	NOT IDENT.
BK-247	-7.161E+00	1.079E+01	1.127E+01	FAIL ABUN
CM-247	8.214E-01	5.371E+00	5.384E+00	NOT IDENT.
CF-249	5.210E-01	5.812E+00	5.817E+00	NOT IDENT.
CF-251	-2.229E+00	1.366E+01	1.370E+01	NOT IDENT.
CF-252	-7.033E+03	1.874E+04	1.901E+04	NOT IDENT.
ANH-511	-1.571E+01	9.272E+00	1.167E+01	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	49.4021	81.00	59.0260	120.90	41.9228
45.60	45.1013	81.07	59.0316	121.12	41.9329
46.54	35.0194	82.35	23.9752	121.22	41.9378
49.72	35.2373	82.47	23.9793	121.78	39.4459
51.35	47.1285	167.43	23.9793	122.06	39.4581
52.39	39.6040	82.47	23.9793	123.07	36.9804
53.20	45.7652	83.79	48.0475	265.00	39.5284
53.44	41.2068	84.00	43.2554	127.16	47.2755
56.28	44.8701	84.21	43.2680	127.23	47.2789
57.36	55.3303	84.86	43.3070	129.43	50.7751
57.53	58.8059	85.43	59.3933	131.20	40.6963
57.53	58.8061	86.55	40.1924	133.02	38.2256
57.98	55.3903	86.79	40.2054	133.52	47.5946
59.32	38.5550	86.94	40.2138	135.34	43.4266
59.54	35.4840	87.09	40.2219	136.00	46.0124
61.49	61.9163	87.57	28.9788	57.53	44.3215
63.00	51.2102	88.03	43.4951	136.47	41.7724
63.29	51.2348	88.34	41.9019	140.51	37.6643
63.58	51.2594	88.47	40.2974	140.88	38.5345
63.81	51.2788	91.11	32.7563	143.76	36.0694
64.28	51.3185	91.27	32.7631	144.24	42.1009
64.99	51.3781	92.59	32.8201	145.44	44.7314
65.08	51.3856	93.31	32.8510	152.32	42.4334
66.73	28.1034	94.56	32.9046	152.43	42.4379
66.98	28.1146	94.65	32.9083	153.25	49.4053
67.24	28.1263	94.67	32.9091	323.87	52.0532
67.67	28.1455	97.43	40.7725	155.04	45.1482
67.75	28.1492	98.43	48.9893	156.02	40.8448
68.89	39.1665	98.44	48.9899	158.56	39.2001
68.89	39.1668	99.53	40.4720	158.97	42.7005
69.67	39.2146	100.11	55.2293	159.00	42.7020
70.82	58.1411	100.20	55.2355	162.33	42.8336
70.82	58.1411	102.03	39.3679	162.66	42.8466
70.83	58.1422	103.18	45.5835	163.33	35.8729
72.81	77.2329	103.37	38.2003	165.86	35.0789
72.87	77.2404	105.31	37.0555	167.43	39.5197
74.66	67.5705	106.12	42.0375	171.28	33.4870
74.82	64.0294	106.47	48.2397	176.31	29.2097
74.97	68.7878	109.28	38.4730	176.60	29.2171
77.11	58.6947	111.00	48.4995	177.52	39.8730
79.69	73.2460	111.76	34.8511	181.07	31.9962
79.82	58.9266	112.95	33.6530	184.41	44.1197
80.02	58.9432	116.24	43.3722	184.58	44.1262
80.03	58.9435	116.30	43.3751	185.72	39.2609
80.12	58.9518	116.74	37.5549	186.21	39.2770
80.19	58.9575	117.23	35.9057	190.27	42.9932
80.22	58.9605	119.76	53.5931	193.51	37.7194
80.57	58.9894	99.53	50.2872	197.03	38.7282

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
198.01	31.5479	256.23	36.8774	492.35	19.2129
201.83	43.3984	304.85	35.9145	497.08	26.7390
204.12	41.6655	306.78	27.2099	511.00	33.3528
205.31	39.8916	308.46	29.1833	514.00	67.8655
208.37	42.7138	311.90	37.0413	520.40	17.2819
210.85	34.6010	316.51	32.2548	520.69	17.2839
215.65	35.6425	319.41	40.1425	522.65	17.2982
218.12	32.9626	320.08	40.1583	527.90	21.6691
222.11	27.5513	321.04	31.3607	529.59	14.0950
227.09	30.4185	323.87	32.3937	529.87	11.9279
227.38	33.1908	325.23	38.3137	531.02	10.8488
228.16	36.8998	328.76	32.4850	537.26	15.2265
228.18	36.9006	331.15	29.5721	546.56	16.3757
116.74	36.9006	333.37	39.4800	552.55	16.4148
235.69	29.2179	334.37	33.5767	563.25	15.3854
235.96	32.0068	338.28	35.6301	564.24	19.7886
238.63	28.8146	338.32	30.6821	569.33	27.5391
238.98	28.8219	311.90	33.6922	946.00	22.0329
240.99	28.8632	340.55	33.6936	569.70	22.0345
242.00	28.8837	344.28	24.8266	582.08	19.9263
244.70	40.6073	345.93	23.8550	583.19	19.9343
245.35	37.8241	351.06	17.9418	595.83	23.3687
250.62	32.8072	351.93	30.9149	427.87	17.8366
252.40	35.6629	356.01	32.9825	604.72	20.0969
252.80	43.1826	361.25	27.0621	609.32	15.6577
256.23	40.4610	364.49	30.1208	610.33	17.9010
260.90	45.3086	366.42	22.1115	614.28	14.5658
264.66	41.6367	356.01	29.4136	618.01	15.7078
265.00	44.4861	388.16	27.4455	621.93	16.8542
269.46	37.0227	388.63	24.4023	630.19	8.4525
271.23	36.1152	391.70	23.4221	631.29	11.2744
273.65	29.5090	264.66	26.5967	155.04	11.2813
276.40	37.1901	401.32	26.6051	633.25	11.2821
277.37	41.0299	401.81	28.6591	634.78	11.8531
277.60	40.0817	402.40	25.5956	635.95	10.1638
278.00	31.5008	404.85	22.5519	636.99	15.2518
278.43	31.5095	410.95	23.6481	657.50	23.8976
279.20	30.5697	414.70	20.6010	657.76	22.7620
279.54	34.3989	423.72	22.7605	661.66	18.2344
280.46	38.2430	427.09	25.9059	664.57	28.5197
283.69	32.5736	427.87	19.6958	666.33	21.6881
284.31	42.1702	433.94	22.8715	666.50	21.6897
285.41	40.2816	439.51	17.7197	667.71	25.1251
285.90	41.2538	440.45	21.8985	677.62	12.0325
287.50	20.1673	453.88	22.0352	685.70	10.3422
290.67	34.6414	459.60	19.9884	692.65	23.0363
293.27	30.3599	463.37	23.1839	695.00	19.5968
351.93	43.4244	468.07	22.1771	696.49	17.2998
295.96	28.9624	473.00	21.1674	696.51	17.2998
879.38	34.8113	475.06	27.5430	697.00	19.6099
299.98	30.4855	476.78	21.2028	697.49	25.3811
300.09	30.4874	477.60	16.9684	702.65	18.4909
300.13	30.4887	477.99	20.1535	706.68	18.5163
301.36	25.1838	482.18	20.1906	711.68	19.7061
302.85	36.8403	487.02	13.8440	720.70	13.9512

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
721.93	10.4678	935.54	6.5055	1368.63	4.1106
722.78	12.7975	937.49	13.0178	1377.63	6.1769
722.91	12.7980	944.13	5.5889	1384.29	6.1853
723.31	23.2723	945.96	11.1833	1408.01	11.3934
724.19	26.7706	946.00	11.1833	1434.09	8.3281
727.33	12.8163	949.00	4.6635	1435.80	9.3724
733.00	17.5092	667.71	11.2090	1457.56	8.3662
735.93	12.2679	962.31	7.4880	1460.82	5.2322
739.50	14.0366	964.08	7.4915	1489.16	4.2083
744.23	19.3299	966.17	9.3695	1596.21	1.0730
747.24	19.3487	968.97	4.6883	1620.50	7.5435
752.31	22.0222	983.53	11.2947	1678.03	4.3540
753.82	22.0329	984.45	13.1801	1690.97	2.1819
756.73	14.1143	996.26	7.5547	1757.55	3.3096
763.94	14.1460	1001.03	8.5095	1764.49	4.4180
765.80	17.6929	1274.44	8.5174	1063.66	4.4221
766.42	15.0421	1025.87	9.5148	1771.35	4.4229
766.84	11.5043	1028.54	8.5688	1791.20	3.3281
772.60	12.4115	1037.84	5.7261	1808.65	4.4500
776.52	12.4265	1038.76	4.7726	1836.06	5.5872
739.50	9.7680	475.06	11.4771		
778.90	7.9945	1048.07	5.7404		
783.70	14.2334	1050.41	3.8293		
788.74	15.1463	1063.66	7.6836		
792.07	10.7025	1077.00	9.6356		
795.86	14.2866	1077.34	6.7454		
802.10	13.4189	459.60	1.9303		
810.29	13.4523	1085.87	12.3602		
344.28	13.4528	1099.25	8.7188		
810.76	11.6602	1111.64	9.9938		
815.77	11.6777	1112.07	10.3646		
1048.07	11.5074	1112.84	6.2199		
832.01	7.2209	1115.54	6.2238		
834.85	13.5507	1120.29	15.5771		
835.15	11.7448	1120.55	15.5781		
836.80	11.7507	1221.41	15.5811		
846.77	15.4109	1129.67	6.8300		
856.80	15.4555	1131.51	11.7136		
860.56	15.4727	1173.23	7.8848		
871.09	5.4774	1177.95	3.9465		
873.19	5.4805	1189.05	10.8798		
875.33	14.6240	1204.77	4.9628		
879.38	8.7844	1221.41	5.9773		
880.51	15.5609	1231.02	5.9901		
881.60	14.6499	1235.36	6.3953		
883.24	11.7254	1238.28	5.9996		
884.68	11.7301	1260.41	6.4305		
889.28	12.8464	1271.87	9.0648		
894.76	19.2991	1274.44	7.0543		
898.04	11.0380	1274.54	7.0543		
903.28	8.2906	1291.59	10.1141		
907.67	10.1453	1298.22	9.1154		
911.20	21.1014	1312.11	9.1423		
923.98	3.7057	1332.49	7.1406		
926.36	9.2703	1365.19	13.3499		

VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 12:07:06.08

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089188.CNF;1
Background file : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM24.CNF;629
Background date  : 15-MAY-2022 09:13:07
Sample date     : 29-MAR-2022 13:03:00 Acquisition date : 17-MAY-2022 10:06:23
Sample ID      : G1205089188 Sample quantity : 7.41190E-01 FILTER
Detector name   : GAM24 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:09.43 0.1%
Energy tolerance: 1.50000 keV Analyst Initials : RXF2
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2264689 Detector SN# :
Matrix Spike ID : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.52*	26	103	1.30	93.19	90	9	3.58E-03	80.5	
2	0	72.43	36	60	1.00	145.05	143	5	5.01E-03	36.4	
3	0	75.10*	10	125	2.86	150.39	148	9	1.42E-03	218.7	
4	0	85.84*	31	148	3.84	171.89	164	14	4.30E-03	89.9	
5	0	92.85*	26	124	1.42	185.92	182	11	3.56E-03	99.2	
6	0	160.32*	16	84	0.78	320.94	316	9	2.17E-03	114.7	
7	0	191.05	57	62	1.48	382.44	377	11	7.93E-03	30.0	
8	6	235.77	18	16	1.17	471.94	470	13	2.48E-03	37.1	2.57E+00
9	6	238.84*	19	75	1.95	478.09	470	13	2.60E-03	96.8	
10	0	352.40*	16	22	1.76	705.37	702	7	2.19E-03	67.5	
11	0	477.96	38	73	1.45	956.69	949	16	5.29E-03	52.4	
12	0	489.51	15	12	1.47	979.81	974	10	2.04E-03	51.9	
13	0	497.17	20	7	1.26	995.13	992	6	2.72E-03	31.6	
14	0	510.99*	3	39	3.51	1022.80	1013	17	3.59E-04	855.8	
15	0	580.86	10	27	0.93	1162.65	1156	10	1.38E-03	103.3	
16	0	583.88*	11	15	2.29	1168.70	1165	9	1.59E-03	82.8	
17	0	628.97	23	14	3.24	1258.96	1253	12	3.25E-03	38.7	
18	0	712.92	16	10	1.10	1426.99	1424	7	2.25E-03	41.1	
19	0	717.25	12	9	1.41	1435.66	1432	7	1.66E-03	50.3	
20	0	742.95	21	10	0.82	1487.10	1480	13	2.96E-03	37.2	
21	0	838.55*	4	20	3.56	1678.48	1671	13	5.83E-04	248.2	
22	0	897.18	6	12	0.69	1795.84	1791	9	8.68E-04	105.3	
23	0	922.69	12	33	5.16	1846.91	1828	22	1.70E-03	122.7	
24	0	962.31	14	12	0.76	1926.21	1919	15	1.88E-03	60.7	
25	0	1197.41	22	0	2.64	2396.86	2391	14	3.06E-03	21.3	
26	0	1263.93	22	0	0.83	2530.05	2521	18	3.06E-03	21.3	
27	0	1461.05*	15	4	3.43	2924.71	2916	14	2.07E-03	50.5	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 12:07:06

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089188.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 29-MAR-2022 13:03:00	Acquisition date	: 17-MAY-2022 10:06:23
Sample ID	: G1205089188	Sample quantity	: 0.74119 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA24	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:09.43 0.1%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	38	10.44*	2.609E+00	7.083E+01	1.339E+02	104.86
K-40	1460.82	15	10.66*	1.058E+00	6.687E+01	6.687E+01	100.98
NB-95M	235.69	18	24.80*	4.120E+00	8.843E+00	1.502E+01	74.14
RU-103	497.08	20	91.00*	2.538E+00	4.289E+00	1.017E+01	63.25
	610.33	-----	5.76	2.181E+00	-----	Line Not Found	-----
IN-114M	190.27	57	15.56*	4.651E+00	3.995E+01	7.924E+01	59.97
TE-123M	159.00	16	84.00*	5.081E+00	1.853E+00	2.463E+00	229.31
TL-208	277.37	-----	6.60	3.731E+00	-----	Line Not Found	-----
	583.19	11	85.00*	2.256E+00	3.022E+00	3.172E+00	165.56
	860.56	-----	12.50	1.649E+00	-----	Line Not Found	-----
PB-210	46.54	26	4.25*	1.468E+00	2.094E+02	2.103E+02	160.94
BI-211	72.87	36	1.23	4.470E+00	3.326E+02	3.340E+02	72.77
	351.06	16	12.92*	3.204E+00	1.927E+01	1.935E+01	135.01
AM-243	43.53	-----	5.90	1.097E+00	-----	Line Not Found	-----
	74.66	10	67.20*	4.666E+00	1.656E+00	1.656E+00	437.37
ANH-511	511.00	3	100.00*	2.488E+00	5.264E-01	5.264E-01	1711.64

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                       *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089188.CNF;1 *
* Acquisition date   : 17-MAY-2022 10:06:23 Sensitivity      : 3.000          *
* Detector ID        : GAM24 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 02:00:09.43 Half life ratio : *****          *
* Sample date        : 29-MAR-2022 13:03:00 Analyst initials: RXF2          *
* Sample ID          : G1205089188 Sample Quantity : 7.4119E-01 FILTER *
* Batch Number       : 2264689 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                       *
* Eff. Cal. date     : 6-JUL-2021 06:54:13 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM24_JAR.CNF;16          *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.339E+02	1.376E+02	1.007E+02
K-40	6.687E+01	6.618E+01	6.244E+01
NB-95M	1.502E+01	1.091E+01	2.963E+01
RU-103	1.017E+01	6.305E+00	1.417E+01
IN-114M	7.924E+01	4.657E+01	5.055E+01
TE-123M	2.463E+00	5.535E+00	5.352E+00
TL-208	3.172E+00	5.147E+00	7.508E-01
PB-210	2.103E+02	3.317E+02	3.145E+02
BI-211	1.935E+01	2.561E+01	3.695E+01
AM-243	1.656E+00	7.096E+00	6.084E+00
ANH-511	5.264E-01	8.831E+00	5.642E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-4.462E-01		3.590E+00	7.174E+00	NOT IDENT.
NA-24	0.000E+00		1.639E+24	0.000E+00	SHORT HLIF
AL-26	1.589E+00		3.255E+00	7.719E+00	NOT IDENT.
SC-46	5.620E+00		5.518E+00	1.192E+01	NOT IDENT.
V-48	2.404E+01		3.125E+01	6.634E+01	NOT IDENT.
CR-51	-2.179E+01		8.641E+01	1.514E+02	NOT IDENT.
MN-52	4.208E+02		1.651E+03	3.506E+03	FAIL ABUN
MN-54	1.902E+00		4.158E+00	7.639E+00	NOT IDENT.
CO-56	5.681E-01		5.588E+00	1.073E+01	NOT IDENT.
CO-57	-2.727E+00		2.540E+00	4.286E+00	NOT IDENT.
NI-57	0.000E+00		3.679E+10	0.000E+00	SHORT HLIF
CO-58	-7.861E-01		5.831E+00	1.081E+01	NOT IDENT.
FE-59	-1.004E+01		1.296E+01	2.074E+01	NOT IDENT.
CO-60	3.721E+00		4.073E+00	9.345E+00	NOT IDENT.
ZN-65	-1.612E+00		9.544E+00	1.742E+01	NOT IDENT.
CU-67	0.000E+00		3.226E+06	0.000E+00	SHORT HLIF
GE-68	-6.307E+01		1.353E+02	2.347E+02	NOT IDENT.
AS-73	-3.046E+01		8.408E+01	1.286E+02	NOT IDENT.
AS-74	-9.163E+00		3.163E+01	5.857E+01	NOT IDENT.

SE-75	-5.970E-02	5.365E+00	9.702E+00	NOT IDENT.
BR-77	0.000E+00	2.995E+07	0.000E+00	SHORT HLIF
SR-82	-4.137E+00	7.065E+01	1.363E+02	NOT IDENT.
RB-83	-2.073E-02	8.582E+00	1.657E+01	NOT IDENT.
RB-84	6.180E+00	1.381E+01	2.822E+01	NOT IDENT.
KR-85	0.000E+00	8.737E+02	1.845E+03	NOT IDENT.
SR-85	0.000E+00	6.545E+00	1.382E+01	NOT IDENT.
RB-86	-1.664E+02	2.786E+02	4.690E+02	NOT IDENT.
Y-88	-3.159E+00	5.761E+00	1.014E+01	FAIL ABUN
Y-91	6.809E+02	2.495E+03	4.956E+03	NOT IDENT.
NB-94	5.099E-01	3.549E+00	6.806E+00	NOT IDENT.
NB-95	-2.546E+00	6.215E+00	1.106E+01	NOT IDENT.
TC-95M	-2.982E+00	6.596E+00	1.148E+01	FAIL ABUN
ZR-95	-1.403E+00	1.098E+01	2.039E+01	NOT IDENT.
MO-99	0.000E+00	6.165E+06	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
RH-101	7.494E-01	3.011E+00	5.645E+00	NOT IDENT.
RH-102M	7.519E-01	3.719E+00	6.408E+00	NOT IDENT.
RH-106	-4.360E+00	3.449E+01	6.258E+01	NOT IDENT.
RU-106	-4.360E+00	3.449E+01	6.258E+01	NOT IDENT.
AG-108M	-1.546E+00	3.168E+00	5.293E+00	NOT IDENT.
CD-109	-3.931E+01	7.558E+01	1.090E+02	NOT IDENT.
AG-110	-3.805E+01	7.879E+01	1.405E+02	NOT IDENT.
AG-110M	-5.818E+00	5.009E+00	7.450E+00	NOT IDENT.
IN-111	0.000E+00	4.717E+05	0.000E+00	SHORT HLIF
SN-113	-3.079E+00	6.068E+00	1.016E+01	NOT IDENT.
CD-115	0.000E+00	4.201E+07	0.000E+00	SHORT HLIF
SN-117M	3.172E+01	3.509E+01	5.753E+01	NOT IDENT.
SB-122	0.000E+00	1.136E+06	0.000E+00	SHORT HLIF
I-123	0.000E+00	2.276E+27	0.000E+00	SHORT HLIF
SB-124	5.798E+00	1.013E+01	2.552E+01	NOT IDENT.
SB-125	-1.130E+00	1.008E+01	1.773E+01	NOT IDENT.
TE-125M	3.670E+02	1.224E+03	2.329E+03	NOT IDENT.
I-126	3.574E+01	1.429E+02	2.779E+02	NOT IDENT.
SB-126	1.559E+02	9.092E+01	2.048E+02	NOT IDENT.
SN-126	-1.716E+00	6.405E+00	1.046E+01	FAIL ABUN
SB-127	0.000E+00	5.741E+04	0.000E+00	SHORT HLIF
TE-129	3.977E+01	8.917E+01	1.810E+02	NOT IDENT.
I-131	7.031E+01	2.415E+02	4.441E+02	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	1.078E+05	0.000E+00	SHORT HLIF
BA-133	-2.873E+00	4.948E+00	7.158E+00	NOT IDENT.
I-133	0.000E+00	3.168E+17	0.000E+00	SHORT HLIF
CS-134	-1.258E+00	4.089E+00	7.429E+00	NOT IDENT.
I-135	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
CS-136	-2.634E+01	5.639E+01	9.848E+01	NOT IDENT.
BA-137M	4.054E-01	3.553E+00	6.860E+00	NOT IDENT.
CS-137	4.282E-01	3.754E+00	7.247E+00	NOT IDENT.
LA-138	-2.640E+00	5.842E+00	1.078E+01	NOT IDENT.
CE-139	3.345E+00	3.549E+00	6.920E+00	NOT IDENT.
BA-140	3.126E+01	1.520E+02	3.017E+02	NOT IDENT.
LA-140	-3.164E+01	5.107E+01	8.971E+01	NOT IDENT.
CE-141	4.452E+00	1.268E+01	2.376E+01	NOT IDENT.
CE-143	0.000E+00	3.193E+11	0.000E+00	SHORT HLIF
CE-144	-5.131E-01	2.024E+01	3.714E+01	NOT IDENT.
PM-144	9.585E-01	4.226E+00	8.101E+00	FAIL ABUN
PR-144	7.041E+01	3.216E+02	6.160E+02	NOT IDENT.
PM-146	7.403E-01	3.728E+00	7.413E+00	NOT IDENT.
ND-147	-2.437E+02	4.717E+02	8.478E+02	NOT IDENT.
PM-147	-2.820E+04	6.814E+04	1.219E+05	NOT IDENT.
PM-149	0.000E+00	3.768E+08	0.000E+00	SHORT HLIF
EU-152	4.880E+00	1.105E+01	2.056E+01	NOT IDENT.
GD-153	2.344E+00	8.353E+00	1.441E+01	NOT IDENT.
EU-154	-1.296E+00	9.986E+00	1.994E+01	NOT IDENT.
EU-155	-2.041E+00	8.591E+00	1.572E+01	FAIL ABUN
TB-160	5.209E+00	1.867E+01	3.701E+01	FAIL ABUN
HO-166M	7.858E+00	6.336E+00	1.337E+01	FAIL ABUN
TM-171	-2.248E+02	1.335E+03	2.081E+03	NOT IDENT.
LU-176	8.155E-01	2.836E+00	5.239E+00	NOT IDENT.
LU-177	-1.940E+03	3.916E+03	6.774E+03	NOT IDENT.
HF-181	5.617E+00	8.354E+00	1.562E+01	NOT IDENT.
W-181	-1.675E+01	1.627E+01	2.489E+01	NOT IDENT.
TA-182	-5.181E+00	1.903E+01	3.649E+01	NOT IDENT.
RE-183	-2.089E+00	1.706E+01	2.894E+01	NOT IDENT.
RE-184	-5.235E+00	2.428E+01	4.456E+01	NOT IDENT.
RE-188	-5.902E+00	2.148E+01	3.667E+01	FAIL ABUN
W-188	-4.605E+02	1.091E+03	1.873E+03	NOT IDENT.
OS-191	-1.441E+01	6.897E+01	1.248E+02	NOT IDENT.

IR-192	2.926E+00	5.223E+00	9.879E+00	NOT IDENT.
PB-201	0.000E+00	2.814E+38	0.000E+00	SHORT HLIF
TL-201	0.000E+00	1.536E+06	0.000E+00	SHORT HLIF
TL-202	-9.602E-01	4.973E+01	8.853E+01	NOT IDENT.
HG-203	4.931E-01	7.305E+00	1.311E+01	FAIL ABUN
PB-203	0.000E+00	2.281E+07	0.000E+00	SHORT HLIF
TL-204	3.804E+02	3.673E+02	6.781E+02	NOT IDENT.
BI-207	-8.717E-02	5.096E+00	9.661E+00	FAIL ABUN
PB-211	-2.739E+01	8.526E+01	1.453E+02	NOT IDENT.
BI-212	-3.715E+00	4.511E+01	7.795E+01	NOT IDENT.
PB-212	5.587E+00	1.060E+01	1.379E+01	FAIL ABUN
BI-213	-5.039E+00	1.167E+01	1.960E+01	NOT IDENT.
BI-214	-9.428E-01	8.783E+00	1.581E+01	NOT IDENT.
PB-214	6.994E+00	9.254E+00	1.626E+01	FAIL ABUN
RN-219	-2.239E+01	4.713E+01	7.899E+01	NOT IDENT.
FR-221	-9.025E+00	1.953E+01	3.396E+01	NOT IDENT.
RA-223	-4.807E+01	6.325E+01	1.038E+02	NOT IDENT.
RA-224	4.738E+01	7.676E+01	1.314E+02	NOT IDENT.
AC-225	-2.680E+02	5.799E+02	1.008E+03	NOT IDENT.
RA-226	-1.414E+01	8.987E+01	1.521E+02	NOT IDENT.
AC-227	-3.934E-01	2.515E+01	4.546E+01	FAIL ABUN
TH-227	-3.934E-01	2.515E+01	4.546E+01	FAIL ABUN
AC-228	4.159E+00	1.768E+01	3.117E+01	NOT IDENT.
RA-228	4.159E+00	1.768E+01	3.117E+01	NOT IDENT.
TH-228	5.587E+00	1.060E+01	1.379E+01	FAIL ABUN
TH-229	7.038E+00	5.070E+01	8.472E+01	FAIL ABUN
TH-230	-6.967E+02	6.754E+02	1.173E+03	NOT IDENT.
PA-231	-3.735E-01	4.406E+01	7.982E+01	NOT IDENT.
TH-231	6.584E+00	4.051E+01	7.008E+01	NOT IDENT.
TH-232	1.748E+02	1.769E+03	2.773E+03	NOT IDENT.
PA-233	2.325E+00	7.362E+00	1.355E+01	NOT IDENT.
PA-234	1.767E+01	3.004E+01	6.238E+01	NOT IDENT.
PA-234M	5.387E+01	3.979E+02	7.865E+02	NOT IDENT.
TH-234	-4.087E-01	1.285E+02	2.002E+02	FAIL ABUN
U-234	-1.051E+03	4.774E+03	7.405E+03	NOT IDENT.
U-235	-1.835E+00	2.305E+01	3.937E+01	NOT IDENT.
NP-237	2.325E+00	7.362E+00	1.355E+01	NOT IDENT.
NP-238	0.000E+00	1.314E+08	0.000E+00	SHORT HLIF
U-238	-4.087E-01	1.285E+02	2.002E+02	FAIL ABUN
NP-239	1.574E+01	2.481E+01	4.789E+01	NOT IDENT.
AM-241	8.269E+00	9.541E+00	1.774E+01	NOT IDENT.
AM-242	-4.863E+01	5.121E+01	8.817E+01	NOT IDENT.
CM-243	-4.945E+00	8.386E+00	1.490E+01	NOT IDENT.
BK-247	2.949E-01	7.785E+00	1.417E+01	NOT IDENT.
CM-247	-2.638E+00	4.243E+00	6.980E+00	NOT IDENT.
CF-249	-8.998E-01	4.693E+00	8.144E+00	NOT IDENT.
CF-251	6.793E+00	1.189E+01	2.282E+01	NOT IDENT.
CF-252	4.471E+03	1.425E+04	2.727E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.52	50	103	1.30	93.19	90	9	6.96E-03	38.9	
2	0	63.15	48	104	1.11	126.46	123	8	6.72E-03	39.0	
3	0	72.43	36	60	1.00	145.05	143	5	5.01E-03	36.4	
4	0	75.10	37	125	2.86	150.39	148	9	5.17E-03	56.0	
5	0	85.84	53	148	3.84	171.89	164	14	7.32E-03	51.2	
6	0	92.85	112	124	1.42	185.92	182	11	1.55E-02	21.5	
7	0	160.32	17	84	0.78	320.94	316	9	2.31E-03	102.0	
8	0	186.46	51	100	1.88	373.26	366	11	7.06E-03	40.8	
9	0	191.05	57	62	1.48	382.44	377	11	7.93E-03	30.0	
10	6	235.77	18	16	1.17	471.94	470	13	2.48E-03	37.1	2.57E+00
11	6	238.84	40	75	1.95	478.09	470	13	5.53E-03	42.7	
12	0	352.40	29	22	1.76	705.37	702	7	3.98E-03	34.3	
13	0	477.96	38	73	1.45	956.69	949	16	5.29E-03	52.4	
14	0	489.51	15	12	1.47	979.81	974	10	2.04E-03	51.9	
15	0	497.17	20	7	1.26	995.13	992	6	2.72E-03	31.6	
16	0	510.99	189	39	3.51	1022.80	1013	17	2.62E-02	10.5	
17	0	580.86	10	27	0.93	1162.65	1156	10	1.38E-03	103.3	
18	0	583.88	20	15	2.29	1168.70	1165	9	2.83E-03	39.6	
19	0	628.97	23	14	3.24	1258.96	1253	12	3.25E-03	38.7	
20	0	712.92	16	10	1.10	1426.99	1424	7	2.25E-03	41.1	
21	0	717.25	12	9	1.41	1435.66	1432	7	1.66E-03	50.3	
22	0	742.95	21	10	0.82	1487.10	1480	13	2.96E-03	37.2	
23	0	838.55	11	20	3.56	1678.48	1671	13	1.46E-03	92.0	
24	0	897.18	6	12	0.69	1795.84	1791	9	8.68E-04	105.3	
25	0	922.69	12	33	5.16	1846.91	1828	22	1.70E-03	122.7	
26	0	962.31	14	12	0.76	1926.21	1919	15	1.88E-03	60.7	
27	0	1197.41	22	0	2.64	2396.86	2391	14	3.06E-03	21.3	
28	0	1263.93	22	0	0.83	2530.05	2521	18	3.06E-03	21.3	
29	0	1461.05	28	4	3.43	2924.71	2916	14	3.88E-03	23.8	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	38	10.44*	2.609E+00	7.083E+01	1.339E+02	104.86
K-40	1460.82	15	10.66*	1.058E+00	6.687E+01	6.687E+01	100.98
NB-95M	235.69	18	24.80*	4.120E+00	8.843E+00	1.502E+01	74.14
RU-103	497.08	20	91.00*	2.538E+00	4.289E+00	1.017E+01	63.25
	610.33	-----	5.76	2.181E+00	-----	Line Not Found	-----
IN-114M	190.27	57	15.56*	4.651E+00	3.995E+01	7.924E+01	59.97
TE-123M	159.00	16	84.00*	5.081E+00	1.853E+00	2.463E+00	229.31
TL-208	277.37	-----	6.60	3.731E+00	-----	Line Not Found	-----
	583.19	11	85.00*	2.256E+00	3.022E+00	3.172E+00	165.56
	860.56	-----	12.50	1.649E+00	-----	Line Not Found	-----
PB-210	46.54	26	4.25*	1.468E+00	2.094E+02	2.103E+02	160.94
BI-211	72.87	36	1.23	4.470E+00	3.326E+02	3.340E+02	72.77
	351.06	16	12.92*	3.204E+00	1.927E+01	1.935E+01	135.01
AM-243	43.53	-----	5.90	1.097E+00	-----	Line Not Found	-----
	74.66	10	67.20*	4.666E+00	1.656E+00	1.656E+00	437.37
ANH-511	511.00	3	100.00*	2.488E+00	5.264E-01	5.264E-01	1711.64

Flag: "*" = Keyline

Total number of lines in spectrum 27
Number of unidentified lines 5
Number of lines tentatively identified by NID 22 81.48%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.89	7.083E+01	1.339E+02	1.404E+02	104.86	
K-40	1.25E+09Y	1.00	6.687E+01	6.687E+01	6.753E+01	100.98	
NB-95M	64.03D	1.70	8.843E+00	1.502E+01	1.113E+01	74.14	
RU-103	39.26D	2.37	4.289E+00	1.017E+01	0.643E+01	63.25	
IN-114M	49.51D	1.98	3.995E+01	7.924E+01	4.752E+01	59.97	
TE-123M	119.20D	1.33	1.853E+00	2.463E+00	5.648E+00	229.31	
TL-208	1.91Y	1.05	3.022E+00	3.172E+00	5.252E+00	165.56	
PB-210	22.20Y	1.00	2.094E+02	2.103E+02	3.384E+02	160.94	
BI-211	21.77Y	1.00	1.927E+01	1.935E+01	2.613E+01	135.01	
AM-243	7370.00Y	1.00	1.656E+00	1.656E+00	7.241E+00	437.37	
ANH-511	1.00E+09Y	1.00	5.264E-01	5.264E-01	90.11E-01	1711.64	
Total Activity :			4.265E+02	5.427E+02			

Grand Total Activity : 4.265E+02 5.427E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	85.84	31	148	3.84	171.89	164	14	4.30E-03	****	5.23E+00	T
0	92.85	26	124	1.42	185.92	182	11	3.56E-03	****	5.44E+00	T
6	238.84	19	75	1.95	478.09	470	13	2.60E-03	****	4.09E+00	T
0	489.51	15	12	1.47	979.81	974	10	2.04E-03	****	2.57E+00	
0	580.86	10	27	0.93	1162.65	1156	10	1.38E-03	****	2.26E+00	T
0	628.97	23	14	3.24	1258.96	1253	12	3.25E-03	77.5	2.13E+00	T
0	712.92	16	10	1.10	1426.99	1424	7	2.25E-03	82.3	1.93E+00	T
0	717.25	12	9	1.41	1435.66	1432	7	1.66E-03	****	1.92E+00	
0	742.95	21	10	0.82	1487.10	1480	13	2.96E-03	74.3	1.87E+00	T
0	838.55	4	20	3.56	1678.48	1671	13	5.83E-04	****	1.69E+00	
0	897.18	6	12	0.69	1795.84	1791	9	8.68E-04	****	1.59E+00	T
0	922.69	12	33	5.16	1846.91	1828	22	1.70E-03	****	1.55E+00	T
0	962.31	14	12	0.76	1926.21	1919	15	1.88E-03	****	1.50E+00	T
0	1197.41	22	0	2.64	2396.86	2391	14	3.06E-03	42.6	1.24E+00	
0	1263.93	22	0	0.83	2530.05	2521	18	3.06E-03	42.6	1.19E+00	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089188.CNF;1 *
* Acquisition date   : 17-MAY-2022 10:06:23 Sensitivity      : 3.000          *
* Detector ID        : GAM24 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 02:00:09.43 Half life ratio  : *****          *
* Sample date        : 29-MAR-2022 13:03:00 Nuclide Library : LIQUID          *
* Sample ID          : G1205089188 Analyst initials: RXF2          *
* Batch Number       : 2264689 Sample Quantity : 7.4119E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 6-JUL-2021 06:54:13 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM24_JAR.CNF;16          *
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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	4.561E+01
K-40	2.515E+01
NB-95M	1.368E+01
RU-103	6.385E+00
IN-114M	2.341E+01
TE-123M	2.464E+00
TL-208	0.000E+00
PB-210	1.463E+02
BI-211	1.682E+01
AM-243	2.824E+00
ANH-511	2.547E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	2.984E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	3.120E+00	NOT IDENT.
SC-46	5.324E+00	NOT IDENT.
V-48	2.928E+01	NOT IDENT.
CR-51	6.881E+01	NOT IDENT.
MN-52	1.478E+03	FAIL ABUN
MN-54	3.369E+00	NOT IDENT.
CO-56	4.733E+00	NOT IDENT.
CO-57	1.981E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	4.767E+00	NOT IDENT.
FE-59	8.427E+00	NOT IDENT.
CO-60	4.059E+00	NOT IDENT.
ZN-65	7.530E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	9.960E+01	NOT IDENT.
AS-73	6.010E+01	NOT IDENT.
AS-74	2.577E+01	NOT IDENT.
SE-75	4.451E+00	NOT IDENT.

BR-77	0.000E+00	SHORT HLIF
SR-82	5.852E+01	NOT IDENT.
RB-83	7.371E+00	NOT IDENT.
RB-84	1.239E+01	NOT IDENT.
KR-85	8.579E+02	NOT IDENT.
SR-85	6.427E+00	NOT IDENT.
RB-86	1.986E+02	NOT IDENT.
Y-88	4.039E+00	FAIL ABUN
Y-91	2.097E+03	NOT IDENT.
NB-94	3.053E+00	NOT IDENT.
NB-95	4.889E+00	NOT IDENT.
TC-95M	5.319E+00	FAIL ABUN
ZR-95	9.035E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.636E+00	NOT IDENT.
RH-102M	2.923E+00	NOT IDENT.
RH-106	2.778E+01	NOT IDENT.
RU-106	2.778E+01	NOT IDENT.
AG-108M	2.376E+00	NOT IDENT.
CD-109	5.077E+01	NOT IDENT.
AG-110	6.182E+01	NOT IDENT.
AG-110M	3.055E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	4.607E+00	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	2.690E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
SB-124	1.013E+01	NOT IDENT.
SB-125	8.023E+00	NOT IDENT.
TE-125M	1.083E+03	NOT IDENT.
I-126	1.249E+02	NOT IDENT.
SB-126	9.207E+01	NOT IDENT.
SN-126	4.882E+00	FAIL ABUN
SB-127	0.000E+00	SHORT HLIF
TE-129	8.143E+01	NOT IDENT.
I-131	2.038E+02	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	3.230E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.240E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	4.115E+01	NOT IDENT.
BA-137M	3.058E+00	NOT IDENT.
CS-137	3.230E+00	NOT IDENT.
LA-138	4.413E+00	NOT IDENT.
CE-139	3.243E+00	NOT IDENT.
BA-140	1.342E+02	NOT IDENT.
LA-140	3.454E+01	NOT IDENT.
CE-141	1.112E+01	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.730E+01	NOT IDENT.
PM-144	3.667E+00	FAIL ABUN
PR-144	2.788E+02	NOT IDENT.
PM-146	3.312E+00	NOT IDENT.
ND-147	3.766E+02	NOT IDENT.
PM-147	5.651E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	9.489E+00	NOT IDENT.
GD-153	6.716E+00	NOT IDENT.
EU-154	8.290E+00	NOT IDENT.
EU-155	7.270E+00	FAIL ABUN
TB-160	1.627E+01	FAIL ABUN
HO-166M	6.032E+00	FAIL ABUN
TM-171	9.732E+02	NOT IDENT.
LU-176	2.412E+00	NOT IDENT.
LU-177	3.144E+03	NOT IDENT.
HF-181	7.083E+00	NOT IDENT.
W-181	1.148E+01	NOT IDENT.
TA-182	1.545E+01	NOT IDENT.
RE-183	1.339E+01	NOT IDENT.
RE-184	1.933E+01	NOT IDENT.
RE-188	1.696E+01	FAIL ABUN
W-188	8.605E+02	NOT IDENT.
OS-191	5.816E+01	NOT IDENT.
IR-192	4.560E+00	NOT IDENT.

PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF
TL-202	4.003E+01	NOT IDENT.
HG-203	6.090E+00	FAIL ABUN
PB-203	0.000E+00	SHORT HLIF
TL-204	3.187E+02	NOT IDENT.
BI-207	4.161E+00	FAIL ABUN
PB-211	6.647E+01	NOT IDENT.
BI-212	3.330E+01	NOT IDENT.
PB-212	6.493E+00	FAIL ABUN
BI-213	8.848E+00	NOT IDENT.
BI-214	7.216E+00	NOT IDENT.
PB-214	7.535E+00	FAIL ABUN
RN-219	3.596E+01	NOT IDENT.
FR-221	1.559E+01	NOT IDENT.
RA-223	4.681E+01	NOT IDENT.
RA-224	6.141E+01	NOT IDENT.
AC-225	4.629E+02	NOT IDENT.
RA-226	7.205E+01	NOT IDENT.
AC-227	2.089E+01	FAIL ABUN
TH-227	2.089E+01	FAIL ABUN
AC-228	1.387E+01	NOT IDENT.
RA-228	1.387E+01	NOT IDENT.
TH-228	6.493E+00	FAIL ABUN
TH-229	3.902E+01	FAIL ABUN
TH-230	5.425E+02	NOT IDENT.
PA-231	3.631E+01	NOT IDENT.
TH-231	3.305E+01	NOT IDENT.
TH-232	1.315E+03	NOT IDENT.
PA-233	6.264E+00	NOT IDENT.
PA-234	2.744E+01	NOT IDENT.
PA-234M	3.370E+02	NOT IDENT.
TH-234	9.500E+01	FAIL ABUN
U-234	3.462E+03	NOT IDENT.
U-235	1.852E+01	NOT IDENT.
NP-237	6.264E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	9.500E+01	FAIL ABUN
NP-239	2.241E+01	NOT IDENT.
AM-241	8.274E+00	NOT IDENT.
AM-242	4.067E+01	NOT IDENT.
CM-243	6.866E+00	NOT IDENT.
BK-247	6.494E+00	NOT IDENT.
CM-247	3.167E+00	NOT IDENT.
CF-249	3.728E+00	NOT IDENT.
CF-251	1.060E+01	NOT IDENT.
CF-252	1.266E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089188.CNF;1
Acquisition date : 17-MAY-2022 10:06:23 Sensitivity : 3.000
Detector ID : GAM24 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:09.43 Half life ratio : *****
Sample date : 29-MAR-2022 13:03:00 Nuclide Library : LIQUID
Sample ID : G1205089188 Analyst initials: RXF2
Batch Number : 2264689 Sample Quantity : 7.4119E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 6-JUL-2021 06:54:13 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM24_JAR.CNF;16

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.339E+02	1.381E+02	1.381E+02
K-40	6.687E+01	6.648E+01	6.649E+01
NB-95M	1.502E+01	1.103E+01	1.104E+01
RU-103	1.017E+01	6.371E+00	6.374E+00
IN-114M	7.924E+01	4.701E+01	4.703E+01
TE-123M	2.463E+00	5.538E+00	5.538E+00
TL-208	3.172E+00	5.154E+00	5.155E+00
PB-210	2.103E+02	3.324E+02	3.324E+02
BI-211	1.935E+01	2.567E+01	2.567E+01
AM-243	1.656E+00	7.098E+00	7.098E+00
ANH-511	5.264E-01	8.831E+00	8.831E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-4.462E-01	3.590E+00	3.596E+00	NOT IDENT.
NA-24	1.760E+24	1.651E+24	0.000E+00	SHORT HLIF
AL-26	1.589E+00	3.257E+00	3.335E+00	NOT IDENT.
SC-46	5.620E+00	5.542E+00	6.095E+00	NOT IDENT.
V-48	2.404E+01	3.133E+01	3.315E+01	NOT IDENT.
CR-51	-2.179E+01	8.643E+01	8.699E+01	NOT IDENT.
MN-52	4.208E+02	1.651E+03	1.662E+03	FAIL ABUN
MN-54	1.902E+00	4.161E+00	4.249E+00	NOT IDENT.
CO-56	5.681E-01	5.588E+00	5.594E+00	NOT IDENT.
CO-57	-2.727E+00	2.548E+00	2.829E+00	NOT IDENT.
NI-57	1.285E+10	3.683E+10	3.729E+10	SHORT HLIF
CO-58	-7.861E-01	5.832E+00	5.842E+00	NOT IDENT.
FE-59	-1.004E+01	1.300E+01	1.377E+01	NOT IDENT.
CO-60	3.721E+00	4.086E+00	4.418E+00	NOT IDENT.
ZN-65	-1.612E+00	9.545E+00	9.573E+00	NOT IDENT.
CU-67	-4.015E+06	3.248E+06	3.719E+06	SHORT HLIF
GE-68	-6.307E+01	1.354E+02	1.384E+02	NOT IDENT.
AS-73	-3.046E+01	8.434E+01	8.545E+01	NOT IDENT.
AS-74	-9.163E+00	3.164E+01	3.191E+01	NOT IDENT.

SE-75	-5.970E-02	5.365E+00	5.365E+00	NOT IDENT.
BR-77	1.578E+07	2.999E+07	3.083E+07	SHORT HLIF
SR-82	-4.137E+00	7.065E+01	7.067E+01	NOT IDENT.
RB-83	-2.073E-02	8.582E+00	8.582E+00	NOT IDENT.
RB-84	6.180E+00	1.382E+01	1.410E+01	NOT IDENT.
KR-85	1.933E+03	8.894E+02	1.246E+03	NOT IDENT.
SR-85	1.448E+01	6.663E+00	9.333E+00	NOT IDENT.
RB-86	-1.664E+02	2.790E+02	2.889E+02	NOT IDENT.
Y-88	-3.159E+00	5.766E+00	5.940E+00	FAIL ABUN
Y-91	6.809E+02	2.496E+03	2.515E+03	NOT IDENT.
NB-94	5.099E-01	3.549E+00	3.557E+00	NOT IDENT.
NB-95	-2.546E+00	6.219E+00	6.324E+00	NOT IDENT.
TC-95M	-2.982E+00	6.601E+00	6.737E+00	FAIL ABUN
ZR-95	-1.403E+00	1.098E+01	1.100E+01	NOT IDENT.
MO-99	4.698E+05	6.165E+06	6.169E+06	SHORT HLIF
TC-99M	-1.000E+41	3.998E+41	0.000E+00	SHORT HLIF
RH-101	7.494E-01	3.014E+00	3.033E+00	NOT IDENT.
RH-102M	7.519E-01	3.720E+00	3.735E+00	NOT IDENT.
RH-106	-4.360E+00	3.450E+01	3.455E+01	NOT IDENT.
RU-106	-4.360E+00	3.450E+01	3.455E+01	NOT IDENT.
AG-108M	-1.546E+00	3.171E+00	3.247E+00	NOT IDENT.
CD-109	-3.931E+01	7.572E+01	7.777E+01	NOT IDENT.
AG-110	-3.805E+01	7.885E+01	8.070E+01	NOT IDENT.
AG-110M	-5.818E+00	5.040E+00	5.683E+00	NOT IDENT.
IN-111	-4.464E+05	4.735E+05	5.146E+05	SHORT HLIF
SN-113	-3.079E+00	6.073E+00	6.230E+00	NOT IDENT.
CD-115	8.287E+06	4.201E+07	4.218E+07	SHORT HLIF
SN-117M	3.172E+01	3.517E+01	3.797E+01	NOT IDENT.
SB-122	7.418E+05	1.138E+06	1.186E+06	SHORT HLIF
I-123	1.013E+27	2.278E+27	0.000E+00	SHORT HLIF
SB-124	5.798E+00	1.014E+01	1.047E+01	NOT IDENT.
SB-125	-1.130E+00	1.008E+01	1.010E+01	NOT IDENT.
TE-125M	3.670E+02	1.225E+03	1.236E+03	NOT IDENT.
I-126	3.574E+01	1.429E+02	1.438E+02	NOT IDENT.
SB-126	1.559E+02	9.296E+01	1.166E+02	NOT IDENT.
SN-126	-1.716E+00	6.407E+00	6.454E+00	FAIL ABUN
SB-127	6.142E+04	5.926E+04	6.542E+04	SHORT HLIF
TE-129	3.977E+01	8.944E+01	9.122E+01	NOT IDENT.
I-131	7.031E+01	2.415E+02	2.436E+02	NOT IDENT.
I-132	1.000E+41	4.644E+41	0.000E+00	SHORT HLIF
TE-132	-3.789E+04	1.079E+05	1.093E+05	SHORT HLIF
BA-133	-2.873E+00	4.954E+00	5.121E+00	NOT IDENT.
I-133	-1.649E+17	3.209E+17	0.000E+00	SHORT HLIF
CS-134	-1.258E+00	4.091E+00	4.130E+00	NOT IDENT.
I-135	-1.000E+41	1.863E+42	0.000E+00	SHORT HLIF
CS-136	-2.634E+01	5.647E+01	5.771E+01	NOT IDENT.
BA-137M	4.054E-01	3.553E+00	3.558E+00	NOT IDENT.
CS-137	4.282E-01	3.754E+00	3.759E+00	NOT IDENT.
LA-138	-2.640E+00	5.847E+00	5.967E+00	NOT IDENT.
CE-139	3.345E+00	3.618E+00	3.920E+00	NOT IDENT.
BA-140	3.126E+01	1.520E+02	1.527E+02	NOT IDENT.
LA-140	-3.164E+01	5.114E+01	5.309E+01	NOT IDENT.
CE-141	4.452E+00	1.268E+01	1.284E+01	NOT IDENT.
CE-143	1.883E+11	3.198E+11	3.309E+11	SHORT HLIF
CE-144	-5.131E-01	2.024E+01	2.024E+01	NOT IDENT.
PM-144	9.585E-01	4.226E+00	4.249E+00	FAIL ABUN
PR-144	7.041E+01	3.216E+02	3.232E+02	NOT IDENT.
PM-146	7.403E-01	3.728E+00	3.743E+00	NOT IDENT.
ND-147	-2.437E+02	4.722E+02	4.848E+02	NOT IDENT.
PM-147	-2.820E+04	6.817E+04	6.935E+04	NOT IDENT.
PM-149	-4.064E+07	3.768E+08	3.773E+08	SHORT HLIF
EU-152	4.880E+00	1.106E+01	1.128E+01	NOT IDENT.
GD-153	2.344E+00	8.356E+00	8.423E+00	NOT IDENT.
EU-154	-1.296E+00	9.986E+00	1.000E+01	NOT IDENT.
EU-155	-2.041E+00	8.593E+00	8.642E+00	FAIL ABUN
TB-160	5.209E+00	1.868E+01	1.883E+01	FAIL ABUN
HO-166M	7.858E+00	6.375E+00	7.295E+00	FAIL ABUN
TM-171	-2.248E+02	1.335E+03	1.339E+03	NOT IDENT.
LU-176	8.155E-01	2.837E+00	2.861E+00	NOT IDENT.
LU-177	-1.940E+03	3.919E+03	4.015E+03	NOT IDENT.
HF-181	5.617E+00	8.368E+00	8.744E+00	NOT IDENT.
W-181	-1.675E+01	1.687E+01	1.849E+01	NOT IDENT.
TA-182	-5.181E+00	1.904E+01	1.918E+01	NOT IDENT.
RE-183	-2.089E+00	1.707E+01	1.709E+01	NOT IDENT.
RE-184	-5.235E+00	2.428E+01	2.440E+01	NOT IDENT.
RE-188	-5.902E+00	2.148E+01	2.165E+01	FAIL ABUN
W-188	-4.605E+02	1.093E+03	1.112E+03	NOT IDENT.
OS-191	-1.441E+01	6.898E+01	6.929E+01	NOT IDENT.

IR-192	2.926E+00	5.231E+00	5.395E+00	NOT IDENT.
PB-201	1.816E+38	3.004E+38	0.000E+00	SHORT HLIF
TL-201	-5.195E+05	1.536E+06	1.554E+06	SHORT HLIF
TL-202	-9.602E-01	4.973E+01	4.974E+01	NOT IDENT.
HG-203	4.931E-01	7.305E+00	7.309E+00	FAIL ABUN
PB-203	1.540E+06	2.281E+07	2.282E+07	SHORT HLIF
TL-204	3.804E+02	3.699E+02	4.077E+02	NOT IDENT.
BI-207	-8.717E-02	5.096E+00	5.096E+00	FAIL ABUN
PB-211	-2.739E+01	8.529E+01	8.618E+01	NOT IDENT.
BI-212	-3.715E+00	4.511E+01	4.514E+01	NOT IDENT.
PB-212	5.587E+00	1.062E+01	1.091E+01	FAIL ABUN
BI-213	-5.039E+00	1.168E+01	1.190E+01	NOT IDENT.
BI-214	-9.428E-01	8.783E+00	8.793E+00	NOT IDENT.
PB-214	6.994E+00	9.276E+00	9.798E+00	FAIL ABUN
RN-219	-2.239E+01	4.724E+01	4.831E+01	NOT IDENT.
FR-221	-9.025E+00	1.955E+01	1.997E+01	NOT IDENT.
RA-223	-4.807E+01	6.345E+01	6.706E+01	NOT IDENT.
RA-224	4.738E+01	7.689E+01	7.980E+01	NOT IDENT.
AC-225	-2.680E+02	5.807E+02	5.932E+02	NOT IDENT.
RA-226	-1.414E+01	8.988E+01	9.011E+01	NOT IDENT.
AC-227	-3.934E-01	2.515E+01	2.515E+01	FAIL ABUN
TH-227	-3.934E-01	2.515E+01	2.515E+01	FAIL ABUN
AC-228	4.159E+00	1.768E+01	1.778E+01	NOT IDENT.
RA-228	4.159E+00	1.768E+01	1.778E+01	NOT IDENT.
TH-228	5.587E+00	1.062E+01	1.091E+01	FAIL ABUN
TH-229	7.038E+00	5.071E+01	5.081E+01	FAIL ABUN
TH-230	-6.967E+02	6.874E+02	7.559E+02	NOT IDENT.
PA-231	-3.735E-01	4.406E+01	4.406E+01	NOT IDENT.
TH-231	6.584E+00	4.053E+01	4.064E+01	NOT IDENT.
TH-232	1.748E+02	1.769E+03	1.770E+03	NOT IDENT.
PA-233	2.325E+00	7.366E+00	7.440E+00	NOT IDENT.
PA-234	1.767E+01	3.624E+01	3.710E+01	NOT IDENT.
PA-234M	5.387E+01	3.979E+02	3.987E+02	NOT IDENT.
TH-234	-4.087E-01	1.285E+02	1.285E+02	FAIL ABUN
U-234	-1.051E+03	4.775E+03	4.799E+03	NOT IDENT.
U-235	-1.835E+00	2.305E+01	2.307E+01	NOT IDENT.
NP-237	2.325E+00	7.366E+00	7.440E+00	NOT IDENT.
NP-238	-6.229E+06	1.314E+08	1.314E+08	SHORT HLIF
U-238	-4.087E-01	1.285E+02	1.285E+02	FAIL ABUN
NP-239	1.574E+01	2.484E+01	2.583E+01	NOT IDENT.
AM-241	8.269E+00	9.585E+00	1.029E+01	NOT IDENT.
AM-242	-4.863E+01	5.200E+01	5.644E+01	NOT IDENT.
CM-243	-4.945E+00	8.405E+00	8.696E+00	NOT IDENT.
BK-247	2.949E-01	7.785E+00	7.786E+00	NOT IDENT.
CM-247	-2.638E+00	4.271E+00	4.434E+00	NOT IDENT.
CF-249	-8.998E-01	4.694E+00	4.711E+00	NOT IDENT.
CF-251	6.793E+00	1.192E+01	1.231E+01	NOT IDENT.
CF-252	4.471E+03	1.481E+04	1.495E+04	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	44.3134	133.52	79.2563	116.30	0.0000
879.38	55.6727	364.49	79.2658	116.74	57.6126
46.54	59.7837	80.22	0.0000	117.23	65.7571
228.16	0.0000	711.68	81.8755	119.76	65.0731
52.39	62.8694	356.01	75.5339	120.54	54.2828
53.20	64.3416	323.87	75.5429	120.90	63.3595
53.44	66.8047	82.35	0.0000	264.66	62.4723
57.53	64.7700	82.47	64.1695	121.22	62.4804
293.27	0.0000	82.47	0.0000	344.28	69.7750
57.53	71.0669	83.79	65.1675	122.06	72.5199
482.18	71.0672	265.00	65.1900	1274.44	59.9068
57.98	53.9634	84.21	65.2124	123.68	54.5035
59.32	43.0443	84.86	0.0000	1377.63	0.0000
59.54	45.5245	193.51	65.3430	127.23	61.1367
155.04	108.7025	105.31	65.4617	129.43	67.7106
63.00	63.1877	86.79	65.4868	131.20	64.1909
129.43	63.2238	86.94	65.5027	133.02	64.3340
63.29	63.2238	87.09	65.5185	133.52	62.5346
290.67	57.0579	87.57	72.4712	135.34	0.0000
63.81	57.0836	88.03	75.9781	136.00	59.9549
87.57	69.5569	306.78	76.0157	136.28	67.3570
64.99	104.4795	88.47	67.3915	136.47	67.3726
65.08	104.4976	531.02	65.9376	739.50	0.0000
66.73	62.3981	184.58	0.0000	140.51	0.0000
66.98	61.1793	92.59	71.3071	140.88	71.4371
67.24	61.2096	93.31	0.0000	143.76	65.1614
67.67	71.6776	94.56	71.5231	144.24	67.0605
1221.41	71.6881	311.90	71.5331	145.44	64.3555
439.51	72.1762	946.00	71.5352	152.32	61.0988
70.82	72.1762	97.43	56.5034	152.43	61.1068
167.43	0.0000	98.43	68.4321	1048.07	59.2804
97.43	51.4502	98.44	68.4329	154.21	50.8656
70.82	0.0000	99.53	66.7861	155.04	56.5692
70.82	56.5892	103.37	66.7861	158.56	59.4618
279.20	0.0000	116.74	66.7861	158.97	0.0000
1063.66	76.9881	100.11	50.1324	159.00	45.4517
72.87	0.0000	100.20	50.1388	162.33	75.5502
351.06	76.9965	102.03	54.6830	537.26	75.5769
74.66	55.7164	103.18	60.0748	163.33	75.6303
238.63	55.7321	103.37	57.4403	165.86	53.4172
351.93	55.7321	105.31	55.8277	167.43	0.0000
238.63	55.7321	106.12	58.5536	245.35	0.0000
74.97	70.9506	106.47	50.5940	427.87	50.1396
77.11	77.5759	109.28	53.4668	176.60	41.4738
256.23	66.4247	111.00	58.9535	177.52	45.3735
79.82	0.0000	111.76	0.0000	181.07	0.0000
80.02	79.2431	208.37	70.7540	184.41	68.0418
80.03	79.2436	116.24	58.4738	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	42.3375	300.09	49.1698	477.60	31.1377
186.21	55.5029	300.13	48.1027	477.99	31.1436
190.27	52.7888	301.36	34.2357	482.18	21.4003
193.51	42.6557	302.85	43.9095	487.02	18.5910
197.03	57.0637	304.50	39.6716	492.35	0.0000
198.01	52.1924	304.85	41.8255	497.08	27.8445
201.83	66.2128	306.78	39.7340	511.00	28.9353
204.12	63.3815	308.46	40.8551	514.00	18.8348
205.31	44.6136	311.90	44.1839	520.40	21.7976
208.37	66.6088	316.51	37.8355	520.69	0.0000
210.85	56.7936	319.41	34.6602	667.71	0.0000
215.65	44.0278	320.08	37.9259	527.90	0.0000
218.12	51.1432	321.04	46.6253	529.59	25.5399
222.11	63.3961	323.87	41.2811	529.87	0.0000
227.09	55.5824	325.23	34.7943	531.02	28.2953
227.38	55.5959	1596.21	45.7734	537.26	19.2229
228.16	0.0000	331.15	0.0000	1260.41	0.0000
228.18	53.6108	333.37	38.2592	552.55	22.1213
235.69	48.8594	334.37	47.0347	795.86	21.3007
235.96	48.8701	338.28	32.8979	564.24	0.0000
238.63	60.2022	911.20	32.8986	569.33	27.8577
238.98	0.0000	340.48	48.3184	569.50	29.7168
240.99	53.6733	340.55	48.3202	569.70	30.6485
242.00	50.6476	344.28	39.6284	582.08	0.0000
244.70	61.5259	345.93	36.3643	583.19	0.0000
245.35	0.0000	351.06	34.8235	595.83	21.6025
459.60	39.1512	351.93	34.2891	600.60	24.4694
685.70	0.0000	356.01	39.9207	604.72	32.0545
388.16	48.5075	361.25	0.0000	609.32	24.5591
256.23	43.4637	364.49	36.7846	610.33	18.8995
527.90	0.0000	366.42	0.0000	614.28	31.2356
264.66	41.6650	383.85	34.9570	618.01	26.5439
265.00	39.5918	388.16	42.9580	621.93	22.7886
269.46	49.1343	666.33	33.9240	630.19	0.0000
401.81	46.0598	391.70	40.7813	631.29	21.3507
273.65	65.0198	400.66	34.1589	632.98	18.3129
276.40	53.5940	401.32	0.0000	633.25	18.3152
583.19	50.4775	401.81	43.2958	634.78	12.7266
277.60	57.8478	402.40	43.3105	635.95	18.1442
402.40	57.8657	404.85	44.5121	636.99	20.0624
278.43	64.1982	410.95	35.5025	657.50	24.0791
279.20	0.0000	720.70	32.1335	884.68	25.0447
279.54	58.9839	423.72	24.2197	661.66	21.2245
280.46	44.2678	427.09	26.5750	664.57	0.0000
301.36	51.7684	427.87	32.3659	666.33	23.1958
284.31	49.6774	433.94	33.6316	666.50	23.1973
285.41	41.2550	439.51	30.2424	667.71	0.0000
285.90	0.0000	440.45	36.0758	677.62	18.4439
287.50	48.7327	453.88	21.0952	685.70	0.0000
290.67	50.9678	459.60	21.1578	692.65	0.0000
293.27	0.0000	463.37	31.7977	695.00	20.5206
295.22	58.5897	468.07	29.2179	696.49	27.3762
316.51	44.7643	473.00	0.0000	696.51	27.3762
298.58	36.3048	475.06	32.6975	697.00	31.2930
299.98	49.1661	696.49	31.1249	697.49	29.3427

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	23.5195	903.28	16.7813	1291.59	7.4437
706.68	22.5732	907.67	0.0000	1298.22	0.0000
711.68	20.4521	911.20	11.7756	1312.11	7.4789
720.70	6.3139	984.45	0.0000	1332.49	6.5745
721.93	0.0000	926.36	16.8999	1365.19	13.2460
1690.97	18.7588	935.54	12.7101	1368.63	0.0000
722.91	18.7594	937.49	10.5978	1377.63	0.0000
723.31	15.7998	983.53	13.8046	1384.29	9.5015
756.73	19.7559	945.96	0.0000	1408.01	5.7305
727.33	8.9003	946.00	11.6872	1434.09	7.6836
733.00	12.8826	949.00	15.9512	1435.80	10.5687
735.93	14.5498	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	10.6760	1460.82	5.7952
1434.09	15.9199	964.08	20.5084	1489.16	9.7163
747.24	15.9370	966.17	22.2308	1596.21	7.9422
752.31	21.9530	968.97	10.2688	1620.50	2.9924
753.82	19.9677	983.53	10.7419	1678.03	0.0000
756.73	21.9872	984.45	0.0000	1690.97	2.0219
763.94	22.0430	996.26	12.9375	1757.55	0.0000
765.80	25.0648	1001.03	10.7959	1764.49	1.0247
1001.03	23.0646	1004.73	14.0493	1770.23	9.2316
766.84	22.0651	1025.87	0.0000	1771.35	5.1296
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	13.0825	1037.84	15.2706	1808.65	3.0983
777.92	0.0000	1038.76	0.0000	1836.06	9.3397
778.90	15.1076	1046.59	12.0272		
783.70	0.0000	1048.07	13.1265		
1435.80	17.1800	1050.41	14.2291		
903.28	20.2350	1063.66	13.1821		
795.86	19.2476	1077.00	16.5372		
801.95	23.3481	1077.34	15.4364		
802.10	19.2888	1083.85	17.6719		
810.29	18.3235	1085.87	11.0510		
810.45	18.3246	1099.25	13.3081		
810.76	20.3632	1111.64	8.9009		
815.77	18.3576	1112.07	8.9019		
818.51	16.3325	1112.84	10.0168		
832.01	18.0458	1115.54	15.5928		
834.85	13.1367	1120.29	16.7276		
835.15	14.7801	1120.55	16.7285		
836.80	0.0000	1121.30	13.3850		
846.77	17.5149	1808.65	7.8250		
856.80	13.4372	1131.51	0.0000		
860.56	17.5930	1332.49	9.0425		
871.09	15.5750	1177.95	8.1479		
873.19	19.7416	1189.05	9.9859		
875.33	0.0000	1204.77	7.8118		
879.38	14.5751	1221.41	12.8112		
880.51	10.4144	1231.02	14.6750		
881.60	12.5013	1235.36	10.0998		
883.24	13.5503	1238.28	10.1068		
884.68	18.7701	1260.41	0.0000		
889.28	11.4871	1271.87	6.6155		
894.76	11.7161	1274.44	9.2671		
1836.06	16.7544	1274.54	9.2676		

VAX/VMS Nuclide Identification Report Generated 17-MAY-2022 09:38:23.99

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                    *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089189.CNF;1
Background file : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM30.CNF;611
Background date  : 15-MAY-2022 09:13:17
Sample date     : 17-MAY-2022 00:00:00 Acquisition date : 17-MAY-2022 09:22:49
Sample ID      : G1205089189 Sample quantity : 7.69920E-01 FILTER
Detector name   : GAM30 Detector geometry: JAR
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.59 0.4%
Energy tolerance: 1.50000 keV Analyst Initials : RXF2
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2264689 Detector SN# :
Matrix Spike ID : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.45*	6645	3698	1.06	93.41	87	11	7.38E+00	2.2	
2	0	49.59	72	2383	1.33	99.69	99	7	7.99E-02	112.9	
3	0	59.54	15878	2850	1.05	119.61	114	12	1.76E+01	1.1	
4	0	83.64*	70	606	0.71	167.85	165	8	7.83E-02	61.5	
5	0	152.00	47	427	1.30	304.70	301	8	5.21E-02	77.7	
6	0	329.17	24	236	1.85	659.34	658	7	2.65E-02	105.9	
7	0	333.81	30	349	3.43	668.64	664	10	3.34E-02	117.5	
8	0	441.24	46	443	2.19	883.69	879	11	5.11E-02	89.8	
9	0	584.11*	6	121	0.97	1169.69	1165	8	7.03E-03	303.7	
10	0	661.78	9490	166	1.54	1325.17	1318	14	1.05E+01	1.1	
11	0	712.49	31	91	1.71	1426.69	1419	11	3.42E-02	63.3	
12	0	726.63	11	66	0.87	1454.99	1450	8	1.26E-02	127.8	
13	0	904.46	71	87	1.14	1811.00	1805	12	7.91E-02	28.8	
14	3	908.52	61	42	2.24	1819.11	1816	37	6.76E-02	17.5	4.08E+00
15	3	912.76	48	98	1.96	1827.60	1816	37	5.33E-02	44.7	
16	3	915.45	43	80	1.69	1833.00	1816	37	4.75E-02	43.4	
17	0	978.68	16	71	0.54	1959.58	1954	7	1.75E-02	94.2	
18	0	1026.26	25	96	0.58	2054.83	2045	12	2.80E-02	80.4	
19	0	1032.67	52	88	2.29	2067.65	2061	13	5.79E-02	39.6	
20	0	1060.52	16	92	1.70	2123.41	2122	9	1.73E-02	113.3	
21	0	1166.44	9	36	0.68	2335.46	2331	7	1.03E-02	112.8	
22	0	1173.42	2687	45	1.86	2349.43	2342	15	2.99E+00	2.0	
23	0	1189.02	33	40	5.34	2380.67	2369	23	3.70E-02	52.4	
24	0	1206.37	12	15	1.24	2415.40	2409	10	1.28E-02	69.3	
25	0	1274.87	14	2	1.34	2552.53	2549	7	1.59E-02	30.4	
26	0	1332.70	2526	12	2.06	2668.32	2662	17	2.81E+00	2.0	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 17-MAY-2022 09:38:26

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089189.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 17-MAY-2022 00:00:00	Acquisition date	: 17-MAY-2022 09:22:49
Sample ID	: G1205089189	Sample quantity	: 0.76992 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA30	Detector geometry	: JAR
Elapsed live time	: 0 00:15:00.00	Elapsed real time	: 0 00:15:03.59 0.4%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
NA-22	1274.54	14	99.94*	1.119E+00	5.001E+01	5.002E+01	60.88
CO-60	1173.23	2687	99.85	1.198E+00	8.765E+03	8.766E+03	4.01
	1332.49	2526	99.98*	1.081E+00	9.119E+03	9.120E+03	4.03
BA-137M	661.66	9490	89.90*	1.920E+00	2.145E+04	2.145E+04	2.13
CS-137	661.66	9490	85.10*	1.920E+00	2.266E+04	2.266E+04	2.13
TL-208	277.37	-----	6.60	3.585E+00	-----	Line Not Found	-----
	583.19	6	85.00*	2.114E+00	1.374E+01	1.374E+01	607.32
	860.56	-----	12.50	1.552E+00	-----	Line Not Found	-----
PB-210	46.54	6645	4.25*	8.167E-01	7.468E+05	7.468E+05	4.30
BI-212	727.33	11	6.67*	1.782E+00	3.711E+02	3.713E+02	255.61
	1620.50	-----	1.47	9.387E-01	-----	Line Not Found	-----
BI-213	440.45	46	25.94*	2.600E+00	2.660E+02	2.660E+02	179.65
TH-231	84.21	70	6.60*	4.340E+00	9.593E+02	9.593E+02	123.00
AM-241	59.54	15878	35.90*	2.215E+00	7.789E+04	7.789E+04	2.11

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089189.CNF;1
Acquisition date : 17-MAY-2022 09:22:49 Sensitivity : 3.000
Detector ID : GAM30 Energy tolerance: 1.500
Elapsed live time: 0 00:15:00.00 Abundance limit : 75.000
Elapsed real time: 0 00:15:03.59 Half life ratio : *****
Sample date : 17-MAY-2022 00:00:00 Analyst initials: RXF2
Sample ID : G1205089189 Sample Quantity : 7.6992E-01 FILTER
Batch Number : 2264689 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 27-SEP-2021 06:08:34 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM30_JAR.CNF;11

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
NA-22	5.002E+01	2.984E+01	4.776E+01
CO-60	9.120E+03	3.602E+02	6.133E+01
BA-137M	2.145E+04	4.481E+02	1.089E+02
CS-137	2.266E+04	4.734E+02	1.150E+02
TL-208	1.374E+01	8.180E+01	1.024E+02
PB-210	7.468E+05	3.150E+04	1.861E+04
BI-212	3.713E+02	9.301E+02	1.273E+03
BI-213	2.660E+02	4.682E+02	4.130E+02
TH-231	9.593E+02	1.156E+03	1.122E+03
AM-241	7.789E+04	1.612E+03	7.165E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	4.046E+02	6.213E+02	1.128E+03	NOT IDENT.
NA-24	2.747E+01	3.918E+01	9.349E+01	NOT IDENT.
AL-26	-4.965E+00	1.992E+01	4.122E+01	NOT IDENT.
K-40	2.791E+02	2.277E+02	6.087E+02	NOT IDENT.
SC-46	-2.247E+01	6.728E+01	1.137E+02	NOT IDENT.
V-48	-2.870E+01	7.308E+01	1.220E+02	NOT IDENT.
CR-51	1.513E+02	4.605E+02	8.453E+02	NOT IDENT.
MN-52	-7.039E+00	2.667E+01	5.254E+01	NOT IDENT.
MN-54	2.559E+00	6.117E+01	1.072E+02	NOT IDENT.
CO-56	-1.221E+01	5.495E+01	9.478E+01	NOT IDENT.
CO-57	1.213E+01	3.942E+01	6.821E+01	NOT IDENT.
NI-57	2.373E+00	3.641E+01	7.768E+01	NOT IDENT.
CO-58	-3.098E+01	5.445E+01	9.112E+01	NOT IDENT.
FE-59	8.910E+01	1.292E+02	2.488E+02	NOT IDENT.
ZN-65	3.139E+01	1.444E+02	2.696E+02	NOT IDENT.
CU-67	2.631E+01	9.456E+01	1.608E+02	NOT IDENT.
GE-68	-3.149E+03	1.967E+03	3.179E+03	NOT IDENT.
AS-73	-1.818E+03	2.840E+03	4.475E+03	NOT IDENT.
AS-74	5.411E+01	8.686E+01	1.608E+02	NOT IDENT.
SE-75	-3.215E+01	7.773E+01	1.252E+02	NOT IDENT.

BR-77	-1.310E+02	2.231E+02	3.591E+02	NOT IDENT.
SR-82	1.891E+02	3.492E+02	6.451E+02	NOT IDENT.
RB-83	1.242E+01	1.276E+02	2.272E+02	NOT IDENT.
RB-84	2.398E+01	9.002E+01	1.606E+02	NOT IDENT.
KR-85	1.612E+04	1.291E+04	2.439E+04	NOT IDENT.
SR-85	7.252E+01	5.806E+01	1.097E+02	NOT IDENT.
RB-86	-1.104E+03	7.563E+02	1.241E+03	NOT IDENT.
Y-88	-1.629E+01	2.349E+01	3.882E+01	NOT IDENT.
Y-91	1.125E+04	1.415E+04	3.065E+04	NOT IDENT.
NB-94	4.324E+00	4.451E+01	8.031E+01	NOT IDENT.
NB-95	1.952E+01	5.269E+01	9.596E+01	NOT IDENT.
NB-95M	-3.991E+01	1.836E+02	3.004E+02	NOT IDENT.
TC-95M	-1.513E+01	7.079E+01	1.166E+02	NOT IDENT.
ZR-95	2.183E+01	9.283E+01	1.678E+02	NOT IDENT.
MO-99	-2.655E+02	4.497E+02	7.569E+02	NOT IDENT.
TC-99M	5.378E+00	1.211E+02	2.060E+02	NOT IDENT.
RH-101	-2.527E+01	5.206E+01	8.675E+01	NOT IDENT.
RH-102M	-2.582E+01	7.400E+01	1.286E+02	NOT IDENT.
RU-103	-8.157E-01	6.483E+01	1.148E+02	NOT IDENT.
RH-106	-2.740E+02	4.913E+02	8.385E+02	NOT IDENT.
RU-106	-2.740E+02	4.913E+02	8.385E+02	NOT IDENT.
AG-108M	2.227E-01	6.784E+01	1.205E+02	NOT IDENT.
CD-109	8.292E+02	1.159E+03	2.050E+03	NOT IDENT.
AG-110	1.223E+03	1.339E+03	2.288E+03	NOT IDENT.
AG-110M	-6.164E+01	8.821E+01	1.446E+02	NOT IDENT.
IN-111	-8.120E+00	5.328E+01	8.732E+01	NOT IDENT.
SN-113	1.950E+01	8.412E+01	1.519E+02	NOT IDENT.
IN-114M	6.845E+00	2.834E+02	4.729E+02	NOT IDENT.
CD-115	-1.925E+02	2.153E+02	3.626E+02	NOT IDENT.
SN-117M	-1.617E+01	3.988E+01	6.614E+01	NOT IDENT.
SB-122	1.378E+01	7.776E+01	1.401E+02	NOT IDENT.
I-123	4.098E+00	6.653E+01	1.129E+02	NOT IDENT.
TE-123M	2.930E+00	4.020E+01	6.828E+01	NOT IDENT.
SB-124	2.795E+01	4.740E+01	1.194E+02	NOT IDENT.
SB-125	5.554E+01	1.991E+02	3.583E+02	NOT IDENT.
TE-125M	3.855E+03	1.268E+04	2.204E+04	NOT IDENT.
I-126	1.814E+02	1.505E+02	2.726E+02	NOT IDENT.
SB-126	-5.660E+01	8.636E+01	1.449E+02	NOT IDENT.
SN-126	2.941E+01	1.269E+02	2.043E+02	NOT IDENT.
SB-127	5.288E+01	1.218E+02	2.276E+02	NOT IDENT.
TE-129	3.178E+02	8.491E+02	1.525E+03	NOT IDENT.
I-131	2.230E+00	6.426E+01	1.157E+02	NOT IDENT.
I-132	2.880E+02	8.621E+02	1.511E+03	NOT IDENT.
TE-132	-1.709E+01	5.568E+01	9.085E+01	FAIL ABUN
BA-133	3.562E+00	7.823E+01	1.412E+02	NOT IDENT.
I-133	-2.840E+01	8.315E+01	1.449E+02	NOT IDENT.
CS-134	3.737E+01	6.737E+01	1.234E+02	NOT IDENT.
I-135	1.417E+01	2.877E+02	5.852E+02	NOT IDENT.
CS-136	1.223E+01	8.510E+01	1.592E+02	FAIL ABUN
LA-138	-1.790E+01	3.297E+01	6.056E+01	NOT IDENT.
CE-139	2.726E+01	4.733E+01	8.166E+01	NOT IDENT.
BA-140	-2.241E+02	2.168E+02	3.618E+02	NOT IDENT.
LA-140	2.179E-02	2.114E+01	4.744E+01	FAIL ABUN
CE-141	-2.448E+01	7.329E+01	1.223E+02	NOT IDENT.
CE-143	1.204E+01	1.258E+02	2.293E+02	NOT IDENT.
CE-144	2.501E+02	3.141E+02	5.521E+02	NOT IDENT.
PM-144	8.590E+00	4.711E+01	8.525E+01	NOT IDENT.
PR-144	6.759E+02	3.502E+03	6.342E+03	NOT IDENT.
PM-146	9.653E+01	1.019E+02	1.869E+02	NOT IDENT.
ND-147	3.502E+02	4.070E+02	7.596E+02	NOT IDENT.
PM-147	-6.531E+05	1.198E+06	1.997E+06	NOT IDENT.
PM-149	-3.260E+02	1.544E+03	2.785E+03	NOT IDENT.
EU-152	-4.394E+01	1.818E+02	3.243E+02	NOT IDENT.
GD-153	-1.176E+02	1.277E+02	2.114E+02	NOT IDENT.
EU-154	1.428E+02	8.519E+01	2.121E+02	FAIL ABUN
EU-155	9.510E+01	1.698E+02	2.979E+02	NOT IDENT.
TB-160	-1.287E+02	2.198E+02	3.642E+02	FAIL ABUN
HO-166M	1.225E+02	1.520E+02	1.798E+02	FAIL ABUN
TM-171	-4.424E+04	6.495E+04	1.023E+05	NOT IDENT.
LU-176	1.019E+01	4.753E+01	8.695E+01	NOT IDENT.
LU-177	6.079E+01	4.312E+02	7.219E+02	NOT IDENT.
HF-181	7.800E-01	7.072E+01	1.257E+02	NOT IDENT.
W-181	0.000E+00	6.554E+02	1.310E+03	FAIL ABUN
TA-182	-1.990E+01	1.457E+02	2.783E+02	FAIL ABUN
RE-183	0.000E+00	6.795E+02	1.422E+03	FAIL ABUN
RE-184	0.000E+00	2.780E+02	3.340E+02	FAIL ABUN
RE-188	1.689E+01	2.392E+02	3.747E+02	NOT IDENT.
W-188	-3.512E+03	1.064E+04	1.908E+04	NOT IDENT.

OS-191	1.439E+02	1.342E+02	2.386E+02	NOT IDENT.
IR-192	-3.692E+01	5.352E+01	9.412E+01	NOT IDENT.
PB-201	0.000E+00	1.372E+02	2.205E+02	FAIL ABUN
TL-201	-1.054E+02	4.122E+02	6.854E+02	FAIL ABUN
TL-202	3.277E+00	7.711E+01	1.231E+02	FAIL ABUN
HG-203	5.015E+01	5.272E+01	9.948E+01	NOT IDENT.
PB-203	5.706E+01	5.999E+01	1.132E+02	FAIL ABUN
TL-204	1.476E+03	7.241E+03	1.267E+04	FAIL ABUN
BI-207	-1.882E+01	1.094E+02	1.752E+02	NOT IDENT.
BI-211	1.513E+02	3.828E+02	7.013E+02	NOT IDENT.
PB-211	-5.042E+02	1.440E+03	2.534E+03	NOT IDENT.
PB-212	-3.637E+01	1.063E+02	1.731E+02	NOT IDENT.
BI-214	-6.982E+01	1.110E+02	1.889E+02	NOT IDENT.
PB-214	9.688E+01	1.366E+02	2.536E+02	NOT IDENT.
RN-219	8.278E+00	8.357E+02	1.494E+03	NOT IDENT.
FR-221	4.286E+01	3.815E+02	6.367E+02	NOT IDENT.
RA-223	2.717E+02	1.143E+03	2.090E+03	FAIL ABUN
RA-224	-7.873E+00	1.125E+03	1.857E+03	NOT IDENT.
AC-225	4.405E+01	3.921E+02	6.545E+02	NOT IDENT.
RA-226	7.308E+02	1.178E+03	2.030E+03	NOT IDENT.
AC-227	-7.282E+01	4.956E+02	8.103E+02	FAIL ABUN
TH-227	-7.282E+01	4.956E+02	8.103E+02	FAIL ABUN
AC-228	1.462E+02	2.956E+02	4.787E+02	NOT IDENT.
RA-228	1.462E+02	2.956E+02	4.787E+02	NOT IDENT.
TH-228	-3.637E+01	1.063E+02	1.731E+02	NOT IDENT.
TH-229	-2.179E+02	9.912E+02	1.636E+03	NOT IDENT.
TH-230	-1.426E+03	1.571E+04	2.727E+04	NOT IDENT.
PA-231	-5.161E+01	8.197E+02	1.484E+03	NOT IDENT.
TH-232	-4.678E+03	2.871E+04	4.626E+04	NOT IDENT.
PA-233	-5.196E+01	1.157E+02	2.058E+02	NOT IDENT.
PA-234	1.361E+02	6.899E+02	1.197E+03	NOT IDENT.
PA-234M	-3.953E+03	8.243E+03	1.369E+04	NOT IDENT.
TH-234	4.507E+01	2.041E+03	3.320E+03	NOT IDENT.
U-234	-1.840E+05	2.467E+05	3.878E+05	NOT IDENT.
U-235	2.487E+02	3.219E+02	5.646E+02	NOT IDENT.
NP-237	-5.196E+01	1.157E+02	2.058E+02	NOT IDENT.
NP-238	2.207E+01	3.098E+02	5.391E+02	FAIL ABUN
U-238	4.507E+01	2.041E+03	3.320E+03	NOT IDENT.
NP-239	2.391E+02	4.499E+02	7.849E+02	NOT IDENT.
AM-242	4.656E+02	1.027E+03	1.799E+03	NOT IDENT.
AM-243	-2.538E+01	7.681E+01	1.315E+02	NOT IDENT.
CM-243	4.478E+01	1.736E+02	3.010E+02	NOT IDENT.
BK-247	-5.826E+01	1.526E+02	2.463E+02	FAIL ABUN
CM-247	-1.624E+01	7.686E+01	1.361E+02	NOT IDENT.
CF-249	-1.688E+01	7.859E+01	1.395E+02	FAIL ABUN
CF-251	1.626E+02	2.144E+02	3.731E+02	NOT IDENT.
CF-252	-6.690E+04	2.876E+05	4.892E+05	NOT IDENT.
ANH-511	-6.124E+01	5.514E+01	9.538E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.45	6646	3698	1.06	93.41	87	11	7.38E+00	2.2	
2	0	49.59	72	2383	1.33	99.69	99	7	7.99E-02	112.9	
3	0	59.54	15878	2850	1.05	119.61	114	12	1.76E+01	1.1	
4	0	83.64	71	606	0.71	167.85	165	8	7.93E-02	60.7	
5	0	152.00	47	427	1.30	304.70	301	8	5.21E-02	77.7	
6	0	329.17	24	236	1.85	659.34	658	7	2.65E-02	105.9	
7	0	333.81	30	349	3.43	668.64	664	10	3.34E-02	117.5	
8	0	441.24	46	443	2.19	883.69	879	11	5.11E-02	89.8	
9	0	584.11	8	121	0.97	1169.69	1165	8	9.26E-03	230.5	
10	0	661.78	9490	166	1.54	1325.17	1318	14	1.05E+01	1.1	
11	0	712.49	31	91	1.71	1426.69	1419	11	3.42E-02	63.3	
12	0	726.63	11	66	0.87	1454.99	1450	8	1.26E-02	127.8	
13	0	904.46	71	87	1.14	1811.00	1805	12	7.91E-02	28.8	
14	3	908.52	61	42	2.24	1819.11	1816	37	6.76E-02	17.5	4.08E+00
15	3	912.76	48	98	1.96	1827.60	1816	37	5.33E-02	44.7	
16	3	915.45	43	80	1.69	1833.00	1816	37	4.75E-02	43.4	
17	0	978.68	16	71	0.54	1959.58	1954	7	1.75E-02	94.2	
18	0	1026.26	25	96	0.58	2054.83	2045	12	2.80E-02	80.4	
19	0	1032.67	52	88	2.29	2067.65	2061	13	5.79E-02	39.6	
20	0	1060.52	16	92	1.70	2123.41	2122	9	1.73E-02	113.3	
21	0	1166.44	9	36	0.68	2335.46	2331	7	1.03E-02	112.8	
22	0	1173.42	2687	45	1.86	2349.43	2342	15	2.99E+00	2.0	
23	0	1189.02	33	40	5.34	2380.67	2369	23	3.70E-02	52.4	
24	0	1206.37	12	15	1.24	2415.40	2409	10	1.28E-02	69.3	
25	0	1274.87	14	2	1.34	2552.53	2549	7	1.59E-02	30.4	
26	0	1332.70	2526	12	2.06	2668.32	2662	17	2.81E+00	2.0	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
NA-22	1274.54	14	99.94*	1.119E+00	5.001E+01	5.002E+01	60.88
CO-60	1173.23	2687	99.85	1.198E+00	8.765E+03	8.766E+03	4.01
	1332.49	2526	99.98*	1.081E+00	9.119E+03	9.120E+03	4.03
BA-137M	661.66	9490	89.90*	1.920E+00	2.145E+04	2.145E+04	2.13
CS-137	661.66	9490	85.10*	1.920E+00	2.266E+04	2.266E+04	2.13
TL-208	277.37	-----	6.60	3.585E+00	-----	Line Not Found	-----
	583.19	6	85.00*	2.114E+00	1.374E+01	1.374E+01	607.32
	860.56	-----	12.50	1.552E+00	-----	Line Not Found	-----
PB-210	46.54	6645	4.25*	8.167E-01	7.468E+05	7.468E+05	4.30
BI-212	727.33	11	6.67*	1.782E+00	3.711E+02	3.713E+02	255.61
	1620.50	-----	1.47	9.387E-01	-----	Line Not Found	-----
BI-213	440.45	46	25.94*	2.600E+00	2.660E+02	2.660E+02	179.65
TH-231	84.21	70	6.60*	4.340E+00	9.593E+02	9.593E+02	123.00
AM-241	59.54	15878	35.90*	2.215E+00	7.789E+04	7.789E+04	2.11

Flag: "*" = Keyline

Total number of lines in spectrum 26
Number of unidentified lines 7
Number of lines tentatively identified by NID 19 73.08%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
NA-22	2.60Y	1.00	5.001E+01	5.002E+01	3.045E+01	60.88	
CO-60	1925.28D	1.00	9.119E+03	9.120E+03	0.368E+03	4.03	
BA-137M	30.08Y	1.00	2.145E+04	2.145E+04	0.046E+04	2.13	
CS-137	30.08Y	1.00	2.266E+04	2.266E+04	0.048E+04	2.13	
TL-208	1.91Y	1.00	1.374E+01	1.374E+01	8.347E+01	607.32	
PB-210	22.20Y	1.00	7.468E+05	7.468E+05	0.321E+05	4.30	
BI-212	1.91Y	1.00	3.711E+02	3.713E+02	9.491E+02	255.61	
BI-213	7340.00Y	1.00	2.660E+02	2.660E+02	4.778E+02	179.65	
TH-231	7.04E+08Y	1.00	9.593E+02	9.593E+02	11.80E+02	123.00	
AM-241	432.60Y	1.00	7.789E+04	7.789E+04	0.164E+04	2.11	
Total Activity :			8.795E+05	8.796E+05			

Grand Total Activity : 8.795E+05 8.796E+05

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	49.59	72	2383	1.33	99.69	99	7	7.99E-02	****	1.12E+00	T
0	152.00	47	427	1.30	304.70	301	8	5.21E-02	****	5.00E+00	T
0	329.17	24	236	1.85	659.34	658	7	2.65E-02	****	3.19E+00	T
0	333.81	30	349	3.43	668.64	664	10	3.34E-02	****	3.16E+00	T
0	712.49	31	91	1.71	1426.69	1419	11	3.42E-02	****	1.81E+00	T
0	904.46	71	87	1.14	1811.00	1805	12	7.91E-02	57.5	1.49E+00	T
3	908.52	61	42	2.24	1819.11	1816	37	6.76E-02	34.9	1.48E+00	T
3	912.76	48	98	1.96	1827.60	1816	37	5.33E-02	89.4	1.48E+00	
3	915.45	43	80	1.69	1833.00	1816	37	4.75E-02	86.8	1.47E+00	
0	978.68	16	71	0.54	1959.58	1954	7	1.75E-02	****	1.39E+00	
0	1026.26	25	96	0.58	2054.83	2045	12	2.80E-02	****	1.34E+00	T
0	1032.67	52	88	2.29	2067.65	2061	13	5.79E-02	79.1	1.33E+00	
0	1060.52	16	92	1.70	2123.41	2122	9	1.73E-02	****	1.30E+00	
0	1166.44	9	36	0.68	2335.46	2331	7	1.03E-02	****	1.20E+00	
0	1189.02	33	40	5.34	2380.67	2369	23	3.70E-02	****	1.18E+00	T
0	1206.37	12	15	1.24	2415.40	2409	10	1.28E-02	****	1.17E+00	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089189.CNF;1 *
* Acquisition date   : 17-MAY-2022 09:22:49 Sensitivity      : 3.000          *
* Detector ID        : GAM30 Energy tolerance: 1.500          *
* Elapsed live time  : 0 00:15:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 00:15:03.59 Half life ratio  : *****          *
* Sample date        : 17-MAY-2022 00:00:00 Nuclide Library : LIQUID          *
* Sample ID          : G1205089189 Analyst initials:  RXF2          *
* Batch Number       : 2264689 Sample Quantity  : 7.6992E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight       : 0.00000          *
*                                     Dry Weight      : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 27-SEP-2021 06:08:34 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM30_JAR.CNF;11          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
NA-22	1.917E+01
CO-60	2.579E+01
BA-137M	5.142E+01
CS-137	5.432E+01
TL-208	4.827E+01
PB-210	9.159E+03
BI-212	5.926E+02
BI-213	1.988E+02
TH-231	5.429E+02
AM-241	3.518E+02

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	5.438E+02	NOT IDENT.
NA-24	3.902E+01	NOT IDENT.
AL-26	1.460E+01	NOT IDENT.
K-40	2.553E+02	NOT IDENT.
SC-46	5.336E+01	NOT IDENT.
V-48	5.714E+01	NOT IDENT.
CR-51	4.063E+02	NOT IDENT.
MN-52	2.085E+01	NOT IDENT.
MN-54	5.033E+01	NOT IDENT.
CO-56	4.404E+01	NOT IDENT.
CO-57	3.294E+01	NOT IDENT.
NI-57	3.147E+01	NOT IDENT.
CO-58	4.231E+01	NOT IDENT.
FE-59	1.170E+02	NOT IDENT.
ZN-65	1.265E+02	NOT IDENT.
CU-67	7.783E+01	NOT IDENT.
GE-68	1.463E+03	NOT IDENT.
AS-73	2.205E+03	NOT IDENT.
AS-74	7.606E+01	NOT IDENT.
SE-75	6.022E+01	NOT IDENT.
BR-77	1.731E+02	NOT IDENT.

SR-82	3.018E+02	NOT IDENT.
RB-83	1.086E+02	NOT IDENT.
RB-84	7.524E+01	NOT IDENT.
KR-85	1.167E+04	NOT IDENT.
SR-85	5.250E+01	NOT IDENT.
RB-86	5.725E+02	NOT IDENT.
Y-88	1.331E+01	NOT IDENT.
Y-91	1.359E+04	NOT IDENT.
NB-94	3.728E+01	NOT IDENT.
NB-95	4.489E+01	NOT IDENT.
NB-95M	1.449E+02	NOT IDENT.
TC-95M	5.638E+01	NOT IDENT.
ZR-95	7.830E+01	NOT IDENT.
MO-99	3.512E+02	NOT IDENT.
TC-99M	9.960E+01	NOT IDENT.
RH-101	4.190E+01	NOT IDENT.
RH-102M	6.208E+01	NOT IDENT.
RU-103	5.499E+01	NOT IDENT.
RH-106	3.930E+02	NOT IDENT.
RU-106	3.930E+02	NOT IDENT.
AG-108M	5.805E+01	NOT IDENT.
CD-109	9.945E+02	NOT IDENT.
AG-110	1.084E+03	NOT IDENT.
AG-110M	6.755E+01	NOT IDENT.
IN-111	4.209E+01	NOT IDENT.
SN-113	7.313E+01	NOT IDENT.
IN-114M	2.290E+02	NOT IDENT.
CD-115	1.719E+02	NOT IDENT.
SN-117M	3.182E+01	NOT IDENT.
SB-122	6.628E+01	NOT IDENT.
I-123	5.438E+01	NOT IDENT.
TE-123M	3.288E+01	NOT IDENT.
SB-124	4.750E+01	NOT IDENT.
SB-125	1.726E+02	NOT IDENT.
TE-125M	1.064E+04	NOT IDENT.
I-126	1.278E+02	NOT IDENT.
SB-126	6.687E+01	NOT IDENT.
SN-126	9.908E+01	NOT IDENT.
SB-127	1.056E+02	NOT IDENT.
TE-129	7.356E+02	NOT IDENT.
I-131	5.560E+01	NOT IDENT.
I-132	7.067E+02	NOT IDENT.
TE-132	4.384E+01	FAIL ABUN
BA-133	6.781E+01	NOT IDENT.
I-133	6.882E+01	NOT IDENT.
CS-134	5.799E+01	NOT IDENT.
I-135	2.484E+02	NOT IDENT.
CS-136	7.451E+01	FAIL ABUN
LA-138	2.239E+01	NOT IDENT.
CE-139	3.948E+01	NOT IDENT.
BA-140	1.712E+02	NOT IDENT.
LA-140	1.776E+01	FAIL ABUN
CE-141	5.899E+01	NOT IDENT.
CE-143	1.103E+02	NOT IDENT.
CE-144	2.670E+02	NOT IDENT.
PM-144	3.976E+01	NOT IDENT.
PR-144	2.958E+03	NOT IDENT.
PM-146	9.033E+01	NOT IDENT.
ND-147	3.618E+02	NOT IDENT.
PM-147	9.633E+05	NOT IDENT.
PM-149	1.338E+03	NOT IDENT.
EU-152	1.558E+02	NOT IDENT.
GD-153	1.021E+02	NOT IDENT.
EU-154	9.262E+01	FAIL ABUN
EU-155	1.441E+02	NOT IDENT.
TB-160	1.706E+02	FAIL ABUN
HO-166M	8.458E+01	FAIL ABUN
TM-171	5.039E+04	NOT IDENT.
LU-176	4.181E+01	NOT IDENT.
LU-177	3.488E+02	NOT IDENT.
HF-181	6.017E+01	NOT IDENT.
W-181	6.472E+02	FAIL ABUN
TA-182	1.223E+02	FAIL ABUN
RE-183	7.039E+02	FAIL ABUN
RE-184	1.577E+02	FAIL ABUN
RE-188	1.806E+02	NOT IDENT.
W-188	9.168E+03	NOT IDENT.
OS-191	1.155E+02	NOT IDENT.

IR-192	4.513E+01	NOT IDENT.
PB-201	1.059E+02	FAIL ABUN
TL-201	3.309E+02	FAIL ABUN
TL-202	5.934E+01	FAIL ABUN
HG-203	4.794E+01	NOT IDENT.
PB-203	5.455E+01	FAIL ABUN
TL-204	6.140E+03	FAIL ABUN
BI-207	8.218E+01	NOT IDENT.
BI-211	3.375E+02	NOT IDENT.
PB-211	1.217E+03	NOT IDENT.
PB-212	8.355E+01	NOT IDENT.
BI-214	8.883E+01	NOT IDENT.
PB-214	1.220E+02	NOT IDENT.
RN-219	7.185E+02	NOT IDENT.
FR-221	3.075E+02	NOT IDENT.
RA-223	1.004E+03	FAIL ABUN
RA-224	8.962E+02	NOT IDENT.
AC-225	3.160E+02	NOT IDENT.
RA-226	9.831E+02	NOT IDENT.
AC-227	3.907E+02	FAIL ABUN
TH-227	3.907E+02	FAIL ABUN
AC-228	2.257E+02	NOT IDENT.
RA-228	2.257E+02	NOT IDENT.
TH-228	8.355E+01	NOT IDENT.
TH-229	7.916E+02	NOT IDENT.
TH-230	1.319E+04	NOT IDENT.
PA-231	7.133E+02	NOT IDENT.
TH-232	2.238E+04	NOT IDENT.
PA-233	9.882E+01	NOT IDENT.
PA-234	5.682E+02	NOT IDENT.
PA-234M	6.387E+03	NOT IDENT.
TH-234	1.607E+03	NOT IDENT.
U-234	1.911E+05	NOT IDENT.
U-235	2.730E+02	NOT IDENT.
NP-237	9.882E+01	NOT IDENT.
NP-238	2.525E+02	FAIL ABUN
U-238	1.607E+03	NOT IDENT.
NP-239	3.799E+02	NOT IDENT.
AM-242	8.704E+02	NOT IDENT.
AM-243	6.367E+01	NOT IDENT.
CM-243	1.456E+02	NOT IDENT.
BK-247	1.185E+02	FAIL ABUN
CM-247	6.542E+01	NOT IDENT.
CF-249	6.700E+01	FAIL ABUN
CF-251	1.801E+02	NOT IDENT.
CF-252	2.366E+05	NOT IDENT.
ANH-511	4.545E+01	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205089189.CNF;1
* Acquisition date   : 17-MAY-2022 09:22:49 Sensitivity      : 3.000
* Detector ID        : GAM30 Energy tolerance: 1.500
* Elapsed live time  : 0 00:15:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 00:15:03.59 Half life ratio  : *****
* Sample date        : 17-MAY-2022 00:00:00 Nuclide Library : LIQUID
* Sample ID          : G1205089189 Analyst initials: RXF2
* Batch Number       : 2264689 Sample Quantity : 7.6992E-01 FILTER
*                    : Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight : 0.00000
*                    : Dry Weight : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date    : 27-SEP-2021 06:08:34 Eff. Geometry   : JAR
* Eff. File         : DKA100:[CANBERRA.GAMMA]EFF_GAM30_JAR.CNF;11

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
NA-22	5.002E+01	3.012E+01	3.014E+01
CO-60	9.120E+03	8.364E+02	8.553E+02
BA-137M	2.145E+04	1.913E+03	1.958E+03
CS-137	2.266E+04	2.020E+03	2.068E+03
TL-208	1.374E+01	8.181E+01	8.181E+01
PB-210	7.468E+05	7.664E+04	7.803E+04
BI-212	3.713E+02	9.307E+02	9.307E+02
BI-213	2.660E+02	4.688E+02	4.688E+02
TH-231	9.593E+02	1.165E+03	1.165E+03
AM-241	7.789E+04	6.882E+03	7.049E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	4.046E+02	6.223E+02	6.485E+02	NOT IDENT.
NA-24	2.747E+01	3.925E+01	4.116E+01	NOT IDENT.
AL-26	-4.965E+00	1.992E+01	2.005E+01	NOT IDENT.
K-40	2.791E+02	2.290E+02	2.614E+02	NOT IDENT.
SC-46	-2.247E+01	6.731E+01	6.806E+01	NOT IDENT.
V-48	-2.870E+01	7.312E+01	7.426E+01	NOT IDENT.
CR-51	1.513E+02	4.607E+02	4.657E+02	NOT IDENT.
MN-52	-7.039E+00	2.667E+01	2.686E+01	NOT IDENT.
MN-54	2.559E+00	6.117E+01	6.118E+01	NOT IDENT.
CO-56	-1.221E+01	5.497E+01	5.524E+01	NOT IDENT.
CO-57	1.213E+01	3.943E+01	3.980E+01	NOT IDENT.
NI-57	2.373E+00	3.641E+01	3.643E+01	NOT IDENT.
CO-58	-3.098E+01	5.452E+01	5.628E+01	NOT IDENT.
FE-59	8.910E+01	1.296E+02	1.357E+02	NOT IDENT.
ZN-65	3.139E+01	1.444E+02	1.451E+02	NOT IDENT.
CU-67	2.631E+01	9.458E+01	9.533E+01	NOT IDENT.
GE-68	-3.149E+03	1.985E+03	2.441E+03	NOT IDENT.
AS-73	-1.818E+03	2.866E+03	2.981E+03	NOT IDENT.
AS-74	5.411E+01	8.706E+01	9.042E+01	NOT IDENT.
SE-75	-3.215E+01	7.777E+01	7.912E+01	NOT IDENT.

BR-77	-1.310E+02	2.234E+02	2.311E+02	NOT IDENT.
SR-82	1.891E+02	3.497E+02	3.599E+02	NOT IDENT.
RB-83	1.242E+01	1.276E+02	1.277E+02	NOT IDENT.
RB-84	2.398E+01	9.005E+01	9.070E+01	NOT IDENT.
KR-85	1.612E+04	1.298E+04	1.488E+04	NOT IDENT.
SR-85	7.252E+01	5.840E+01	6.694E+01	NOT IDENT.
RB-86	-1.104E+03	7.620E+02	9.103E+02	NOT IDENT.
Y-88	-1.629E+01	2.352E+01	2.465E+01	NOT IDENT.
Y-91	1.125E+04	1.418E+04	1.506E+04	NOT IDENT.
NB-94	4.324E+00	4.451E+01	4.455E+01	NOT IDENT.
NB-95	1.952E+01	5.272E+01	5.345E+01	NOT IDENT.
NB-95M	-3.991E+01	1.836E+02	1.845E+02	NOT IDENT.
TC-95M	-1.513E+01	7.080E+01	7.113E+01	NOT IDENT.
ZR-95	2.183E+01	9.285E+01	9.337E+01	NOT IDENT.
MO-99	-2.655E+02	4.504E+02	4.661E+02	NOT IDENT.
TC-99M	5.378E+00	1.211E+02	1.212E+02	NOT IDENT.
RH-101	-2.527E+01	5.227E+01	5.350E+01	NOT IDENT.
RH-102M	-2.582E+01	7.406E+01	7.498E+01	NOT IDENT.
RU-103	-8.157E-01	6.483E+01	6.483E+01	NOT IDENT.
RH-106	-2.740E+02	4.920E+02	5.073E+02	NOT IDENT.
RU-106	-2.740E+02	4.920E+02	5.073E+02	NOT IDENT.
AG-108M	2.227E-01	6.784E+01	6.784E+01	NOT IDENT.
CD-109	8.292E+02	1.162E+03	1.221E+03	NOT IDENT.
AG-110	1.223E+03	1.343E+03	1.452E+03	NOT IDENT.
AG-110M	-6.164E+01	8.840E+01	9.267E+01	NOT IDENT.
IN-111	-8.120E+00	5.328E+01	5.341E+01	NOT IDENT.
SN-113	1.950E+01	8.414E+01	8.459E+01	NOT IDENT.
IN-114M	6.845E+00	2.834E+02	2.834E+02	NOT IDENT.
CD-115	-1.925E+02	2.161E+02	2.329E+02	NOT IDENT.
SN-117M	-1.617E+01	3.990E+01	4.056E+01	NOT IDENT.
SB-122	1.378E+01	7.777E+01	7.802E+01	NOT IDENT.
I-123	4.098E+00	6.653E+01	6.656E+01	NOT IDENT.
TE-123M	2.930E+00	4.020E+01	4.022E+01	NOT IDENT.
SB-124	2.795E+01	4.745E+01	4.910E+01	NOT IDENT.
SB-125	5.554E+01	1.992E+02	2.007E+02	NOT IDENT.
TE-125M	3.855E+03	1.268E+04	1.280E+04	NOT IDENT.
I-126	1.814E+02	1.515E+02	1.722E+02	NOT IDENT.
SB-126	-5.660E+01	8.665E+01	9.034E+01	NOT IDENT.
SN-126	2.941E+01	1.269E+02	1.276E+02	NOT IDENT.
SB-127	5.288E+01	1.219E+02	1.242E+02	NOT IDENT.
TE-129	3.178E+02	8.509E+02	8.629E+02	NOT IDENT.
I-131	2.230E+00	6.426E+01	6.427E+01	NOT IDENT.
I-132	2.880E+02	8.625E+02	8.722E+02	NOT IDENT.
TE-132	-1.709E+01	5.571E+01	5.624E+01	FAIL ABUN
BA-133	3.562E+00	7.823E+01	7.824E+01	NOT IDENT.
I-133	-2.840E+01	8.319E+01	8.418E+01	NOT IDENT.
CS-134	3.737E+01	6.746E+01	6.953E+01	NOT IDENT.
I-135	1.417E+01	2.877E+02	2.877E+02	NOT IDENT.
CS-136	1.223E+01	8.511E+01	8.529E+01	FAIL ABUN
LA-138	-1.790E+01	3.300E+01	3.397E+01	NOT IDENT.
CE-139	2.726E+01	4.768E+01	4.924E+01	NOT IDENT.
BA-140	-2.241E+02	2.177E+02	2.400E+02	NOT IDENT.
LA-140	2.179E-02	2.114E+01	2.114E+01	FAIL ABUN
CE-141	-2.448E+01	7.331E+01	7.414E+01	NOT IDENT.
CE-143	1.204E+01	1.258E+02	1.259E+02	NOT IDENT.
CE-144	2.501E+02	3.147E+02	3.343E+02	NOT IDENT.
PM-144	8.590E+00	4.711E+01	4.727E+01	NOT IDENT.
PR-144	6.759E+02	3.502E+03	3.516E+03	NOT IDENT.
PM-146	9.653E+01	1.024E+02	1.113E+02	NOT IDENT.
ND-147	3.502E+02	4.081E+02	4.376E+02	NOT IDENT.
PM-147	-6.531E+05	1.199E+06	1.235E+06	NOT IDENT.
PM-149	-3.260E+02	1.545E+03	1.552E+03	NOT IDENT.
EU-152	-4.394E+01	1.818E+02	1.829E+02	NOT IDENT.
GD-153	-1.176E+02	1.280E+02	1.386E+02	NOT IDENT.
EU-154	1.428E+02	8.602E+01	1.075E+02	FAIL ABUN
EU-155	9.510E+01	1.700E+02	1.753E+02	NOT IDENT.
TB-160	-1.287E+02	2.202E+02	2.277E+02	FAIL ABUN
HO-166M	1.225E+02	1.524E+02	1.621E+02	FAIL ABUN
TM-171	-4.424E+04	6.509E+04	6.808E+04	NOT IDENT.
LU-176	1.019E+01	4.754E+01	4.776E+01	NOT IDENT.
LU-177	6.079E+01	4.312E+02	4.320E+02	NOT IDENT.
HF-181	7.800E-01	7.072E+01	7.072E+01	NOT IDENT.
W-181	6.788E+03	1.876E+03	3.592E+03	FAIL ABUN
TA-182	-1.990E+01	1.457E+02	1.460E+02	FAIL ABUN
RE-183	1.105E+04	1.412E+03	5.184E+03	FAIL ABUN
RE-184	4.932E+02	2.830E+02	3.601E+02	FAIL ABUN
RE-188	1.689E+01	2.392E+02	2.393E+02	NOT IDENT.
W-188	-3.512E+03	1.065E+04	1.077E+04	NOT IDENT.

OS-191	1.439E+02	1.346E+02	1.494E+02	NOT IDENT.
IR-192	-3.692E+01	5.360E+01	5.613E+01	NOT IDENT.
PB-201	3.063E+02	1.471E+02	2.018E+02	FAIL ABUN
TL-201	-1.054E+02	4.123E+02	4.151E+02	FAIL ABUN
TL-202	3.277E+00	7.711E+01	7.712E+01	FAIL ABUN
HG-203	5.015E+01	5.287E+01	5.751E+01	NOT IDENT.
PB-203	5.706E+01	6.015E+01	6.543E+01	FAIL ABUN
TL-204	1.476E+03	7.242E+03	7.273E+03	FAIL ABUN
BI-207	-1.882E+01	1.094E+02	1.097E+02	NOT IDENT.
BI-211	1.513E+02	3.830E+02	3.890E+02	NOT IDENT.
PB-211	-5.042E+02	1.441E+03	1.459E+03	NOT IDENT.
PB-212	-3.637E+01	1.063E+02	1.076E+02	NOT IDENT.
BI-214	-6.982E+01	1.112E+02	1.155E+02	NOT IDENT.
PB-214	9.688E+01	1.368E+02	1.436E+02	NOT IDENT.
RN-219	8.278E+00	8.357E+02	8.357E+02	NOT IDENT.
FR-221	4.286E+01	3.815E+02	3.820E+02	NOT IDENT.
RA-223	2.717E+02	1.144E+03	1.150E+03	FAIL ABUN
RA-224	-7.873E+00	1.125E+03	1.125E+03	NOT IDENT.
AC-225	4.405E+01	3.921E+02	3.926E+02	NOT IDENT.
RA-226	7.308E+02	1.180E+03	1.225E+03	NOT IDENT.
AC-227	-7.282E+01	4.957E+02	4.968E+02	FAIL ABUN
TH-227	-7.282E+01	4.957E+02	4.968E+02	FAIL ABUN
AC-228	1.462E+02	2.959E+02	3.032E+02	NOT IDENT.
RA-228	1.462E+02	2.959E+02	3.032E+02	NOT IDENT.
TH-228	-3.637E+01	1.063E+02	1.076E+02	NOT IDENT.
TH-229	-2.179E+02	9.914E+02	9.962E+02	NOT IDENT.
TH-230	-1.426E+03	1.572E+04	1.573E+04	NOT IDENT.
PA-231	-5.161E+01	8.198E+02	8.201E+02	NOT IDENT.
TH-232	-4.678E+03	2.872E+04	2.879E+04	NOT IDENT.
PA-233	-5.196E+01	1.158E+02	1.182E+02	NOT IDENT.
PA-234	1.361E+02	7.073E+02	7.100E+02	NOT IDENT.
PA-234M	-3.953E+03	8.250E+03	8.441E+03	NOT IDENT.
TH-234	4.507E+01	2.041E+03	2.041E+03	NOT IDENT.
U-234	-1.840E+05	2.473E+05	2.608E+05	NOT IDENT.
U-235	2.487E+02	3.225E+02	3.415E+02	NOT IDENT.
NP-237	-5.196E+01	1.158E+02	1.182E+02	NOT IDENT.
NP-238	2.207E+01	3.098E+02	3.100E+02	FAIL ABUN
U-238	4.507E+01	2.041E+03	2.041E+03	NOT IDENT.
NP-239	2.391E+02	4.503E+02	4.630E+02	NOT IDENT.
AM-242	4.656E+02	1.030E+03	1.051E+03	NOT IDENT.
AM-243	-2.538E+01	7.683E+01	7.768E+01	NOT IDENT.
CM-243	4.478E+01	1.736E+02	1.748E+02	NOT IDENT.
BK-247	-5.826E+01	1.531E+02	1.554E+02	FAIL ABUN
CM-247	-1.624E+01	7.692E+01	7.726E+01	NOT IDENT.
CF-249	-1.688E+01	7.861E+01	7.898E+01	FAIL ABUN
CF-251	1.626E+02	2.155E+02	2.276E+02	NOT IDENT.
CF-252	-6.690E+04	2.940E+05	2.955E+05	NOT IDENT.
ANH-511	-6.124E+01	5.539E+01	6.190E+01	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	1293.8320	80.22	315.6689	117.23	283.8629
45.60	1249.4762	80.57	364.2472	119.76	263.4320
46.54	1252.4211	81.00	348.3817	120.54	270.1436
49.72	1134.6967	81.07	348.4265	53.20	278.8545
51.35	1292.3954	82.35	300.6680	121.12	273.5736
52.39	1439.0531	82.47	300.7315	121.22	273.6106
53.20	1529.5469	82.47	300.7315	121.78	258.7838
53.44	1530.3845	323.87	298.0375	122.06	248.1410
56.28	1540.1908	84.00	298.1451	123.07	256.0054
57.36	1619.6393	84.21	298.2528	123.68	275.5918
57.53	946.3190	84.86	298.5848	127.16	289.8412
57.53	946.3228	85.43	303.6182	127.23	289.8637
57.98	947.2443	86.55	335.4290	129.43	246.2238
59.54	950.4359	879.38	335.5621	131.20	281.5740
61.49	954.3618	87.57	335.6501	482.18	268.0640
155.04	289.8740	87.09	335.7330	133.52	247.5158
63.29	290.0470	87.57	325.1216	135.34	272.1272
63.58	299.3294	88.03	307.3313	264.66	277.8241
63.81	299.4704	88.34	307.4898	136.28	272.4501
64.28	302.3642	193.51	298.3603	122.06	287.8369
129.43	283.8757	91.11	348.9182	140.51	276.0786
65.08	277.0732	91.27	349.0089	63.81	283.9079
66.73	295.6722	63.29	330.2108	143.76	244.0422
66.98	304.6643	184.58	324.4136	144.24	253.0231
67.24	293.0232	94.56	315.7750	145.44	264.4514
67.67	294.2551	94.65	315.8193	152.32	245.4086
67.75	294.3008	94.67	315.8310	152.43	245.4388
68.89	279.1762	97.43	298.5469	153.25	250.1406
68.89	279.1784	311.90	279.2841	154.21	213.1501
69.67	338.8810	946.00	279.2882	155.04	232.7495
167.43	315.8653	99.53	272.4792	156.02	230.7724
70.82	315.8653	1221.41	297.7043	158.56	230.3153
439.51	315.8653	100.20	297.7458	158.97	219.1786
70.83	315.8726	265.00	277.6956	159.00	219.1875
72.81	323.0238	103.18	276.0870	162.33	232.4164
279.20	323.0610	99.53	276.1655	162.66	221.2148
72.87	323.0610	103.37	276.1655	143.76	262.0408
74.66	323.1447	116.74	276.1655	165.86	254.8416
74.82	323.2411	105.31	265.4249	167.43	268.8925
1063.66	307.3632	106.12	254.1894	171.28	239.2493
238.63	351.6481	106.47	262.7278	176.31	288.6372
351.93	351.6481	109.28	249.0341	1048.07	281.8475
79.69	310.0021	111.00	279.2714	177.52	224.7797
79.82	310.0749	228.16	254.1577	739.50	223.3060
80.02	315.5542	112.95	269.4390	711.68	295.6797
80.03	315.5565	116.24	256.8311	184.58	277.2473
80.12	315.6091	116.30	256.8531	185.72	284.5088
80.19	315.6498	116.74	274.0723	186.21	278.8659

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
190.27	310.2099	301.36	205.8024	482.18	166.8978
193.51	307.7113	302.85	205.1726	1596.21	159.7046
197.03	273.6832	304.50	213.0890	527.90	188.7308
127.23	287.9922	537.26	219.1078	497.08	171.0245
306.78	297.2796	306.78	200.6288	511.00	152.0049
204.12	299.1058	316.51	216.2534	514.00	124.2864
205.31	298.2641	311.90	209.9238	520.40	149.8031
208.37	262.4699	316.51	206.3037	238.98	131.4567
210.85	276.1115	531.02	192.9375	522.65	150.9282
215.65	245.1971	320.08	192.1669	527.90	137.7301
218.12	255.2940	427.87	189.7070	520.40	128.1328
222.11	276.5648	323.87	194.3939	529.87	130.0960
290.67	260.9523	325.23	195.4418	531.02	107.8248
177.52	246.5874	328.76	201.5454	537.26	132.4971
228.16	266.0154	331.15	104.1919	546.56	115.4648
228.18	266.0188	388.16	208.6914	552.55	104.0116
235.69	256.8546	334.37	208.8330	563.25	87.7579
256.23	256.9128	338.28	236.8610	564.24	97.6626
238.63	264.7860	338.32	236.8665	795.86	105.7983
238.98	264.8659	340.48	212.3036	569.50	105.8071
240.99	253.1477	340.55	202.7026	569.70	102.8490
242.00	226.5655	344.28	209.3292	204.12	99.9398
344.28	227.0792	345.93	217.4491	583.19	91.5321
245.35	243.0809	351.06	198.8213	595.83	86.0385
250.62	250.2779	351.93	184.8480	600.60	95.2397
252.40	213.7856	356.01	195.0386	604.72	97.4184
252.80	221.2289	331.15	179.7520	609.32	98.6181
256.23	245.2641	364.49	204.9636	497.08	88.5908
260.90	230.1046	366.42	194.5523	433.94	97.8170
264.66	225.8282	383.85	208.3195	696.49	81.8108
265.00	225.8893	388.16	200.7599	621.93	89.0277
269.46	232.9111	388.63	204.4210	667.71	83.2479
271.23	225.7473	391.70	209.3060	475.06	75.1593
273.65	219.9248	400.66	214.9500	632.98	91.4758
356.01	223.7259	401.32	217.7539	453.88	94.5364
277.37	201.3384	401.81	210.5568	595.83	108.8330
277.60	204.7150	402.40	216.0797	635.95	81.4128
278.00	204.7798	404.85	210.0205	636.99	85.5176
459.60	193.9753	410.95	209.8507	657.50	80.0789
279.20	196.5983	414.70	227.6776	657.76	80.0884
279.54	204.1822	423.72	210.4618	661.66	95.6414
280.46	226.9360	404.85	234.8032	664.57	66.4080
283.69	188.8733	427.87	215.5569	666.33	46.3641
364.49	204.0771	433.94	231.9983	720.70	52.5502
285.41	214.3340	439.51	230.8589	667.71	61.8530
285.90	209.3693	440.45	218.9165	884.68	43.4680
402.40	204.5665	453.88	230.7886	685.70	46.7212
290.67	210.1140	459.60	228.6805	564.24	41.6423
293.27	213.0505	463.37	253.5535	695.00	57.3096
295.22	214.2048	468.07	251.3555	696.49	60.4710
295.96	227.8718	685.70	235.9568	696.51	60.4710
298.58	213.0324	475.06	272.1094	697.00	58.3971
299.98	208.9989	476.78	224.1210	697.49	50.0645
300.09	224.3076	477.60	207.1883	702.65	54.3444
300.13	224.3130	477.99	201.5509	706.68	58.0925

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
711.68	53.4840	911.20	75.8276	1312.11	9.3884
720.70	62.0849	923.98	93.0475	1332.49	9.4336
721.93	58.4290	926.36	96.5006	1365.19	7.6035
722.78	56.8674	1434.09	92.8139	1368.63	3.8047
722.91	56.8696	937.49	92.8706	1377.63	5.7188
1274.44	53.7185	944.13	105.5408	1384.29	3.8181
724.19	45.8347	945.96	106.7368	1408.01	4.7980
727.33	60.1288	946.00	110.1433	1434.09	6.7560
733.00	50.7422	949.00	120.4749	1435.80	5.7931
735.93	61.3796	954.55	109.2930	1457.56	8.7303
739.50	68.8800	962.31	101.5591	1460.82	0.9708
744.23	56.2607	964.08	87.9127	696.51	2.9299
747.24	53.1352	966.17	93.6814	1596.21	2.9951
752.31	56.4268	968.97	93.7581	727.33	4.0129
753.82	67.1118	983.53	83.8300	1678.03	6.0872
756.73	59.7165	984.45	71.2183	1690.97	2.0341
763.94	70.5654	996.26	74.9235	1757.55	4.1194
765.80	62.0522	1001.03	76.1809	1764.49	3.0934
766.42	64.2065	1004.73	46.2207	1770.23	1.0322
766.84	69.5677	1025.87	48.8291	1771.35	2.0649
772.60	65.4231	1028.54	52.3572	1791.20	3.1086
776.52	57.9946	846.77	80.4888	1808.65	3.1185
777.92	53.7252	1038.76	87.5122	1836.06	5.2231
778.90	54.8204	1046.59	72.7972		
783.70	50.6069	1048.07	68.4404		
788.74	59.3260	621.93	65.8493		
792.07	73.4342	1063.66	81.7834		
795.86	68.1244	1077.00	78.7224		
801.95	71.5188	1077.34	77.8433		
802.10	71.5215	1083.85	70.8936		
810.29	78.2461	1085.87	80.6859		
810.45	69.5547	1099.25	67.6318		
810.76	69.5625	1111.64	73.2164		
815.77	82.7477	1112.07	79.4720		
818.51	73.0168	1112.84	70.5571		
832.01	81.0158	1115.54	72.3977		
834.85	76.7106	609.32	51.0126		
835.15	75.6204	889.28	51.0161		
1260.41	82.2418	1121.30	65.3498		
846.77	62.7125	1129.67	60.1094		
856.80	67.3368	1131.51	53.8550		
860.56	55.2633	1173.23	30.8519		
702.65	98.7054	1177.95	30.5259		
873.19	102.1037	1189.05	20.0436		
529.87	82.1841	1204.77	11.8915		
879.38	88.9616	1221.41	19.2889		
880.51	81.2072	1231.02	14.7314		
881.60	67.8829	1235.36	10.1386		
883.24	70.1444	1238.28	9.2236		
884.68	84.6589	1260.41	10.2010		
889.28	87.0168	1271.87	4.4637		
903.28	91.6394	1274.44	4.6524		
898.04	66.0029	1274.54	5.5833		
903.28	58.8297	1099.25	9.3433		
907.67	40.3960	1298.22	9.3579		

Continuing Calibration Data

Review of Gamma Spectrometer QA results (Daily calibration & background checks)
17-MAY-2022 10:20:13

Run Date	Detector	Parameter	Flag	Status	Comments
17-MAY-22	GAM01	All Parameters Passed			
17-MAY-22	GAM03	Cal Check PSFWHM-662	Investigate		
17-MAY-22	GAM04	Cal Check NLACTVTY-1332	Investigate		
17-MAY-22	GAM06	Cal Check NLACTVTY-662	Action	Lockout	Detector locked out.
17-MAY-22	GAM06	Cal Check NLACTVTY-1332	Investigate		
17-MAY-22	GAM06	Cal Check NLACTVTY-59	Action	Lockout	Detector locked out.
17-MAY-22	GAM06	Bkg Check BACKRATE	Investigate		
17-MAY-22	GAM07	All Parameters Passed			
17-MAY-22	GAM08	Cal Check PSFWHM-59	Action	Lockout	Detector locked out.
08-MAY-22	GAM08	Bkg Check may not have run since 17-MAY-2022			Detector locked out.
17-MAY-22	GAM09	All Parameters Passed			
17-MAY-22	GAM10	Cal Check NLACTVTY-59	Investigate		
14-MAY-22	GAM11	Cal Check may not have run since 17-MAY-2022			Detector locked out.
15-MAY-22	GAM11	Bkg Check may not have run since 17-MAY-2022			Detector locked out.
14-MAY-22	GAM12	Cal Check may not have run since 17-MAY-2022			Detector locked out.
15-MAY-22	GAM12	Bkg Check may not have run since 17-MAY-2022			Detector locked out.
17-MAY-22	GAM14	All Parameters Passed			
17-MAY-22	GAM16	Cal Check NLACTVTY-662	Action	Lockout	Detector locked out.
17-MAY-22	GAM16	Cal Check NLACTVTY-1332	Action	Lockout	Detector locked out.
17-MAY-22	GAM16	Cal Check NLACTVTY-59	Action	Lockout	Detector locked out.
17-MAY-22	GAM17	All Parameters Passed			
17-MAY-22	GAM18	Bkg Check BACKRATE	Investigate		
17-MAY-22	GAM19	All Parameters Passed			
17-MAY-22	GAM20	All Parameters Passed			
17-MAY-22	GAM21	All Parameters Passed			
17-MAY-22	GAM23	All Parameters Passed			
17-MAY-22	GAM24	All Parameters Passed			
17-MAY-22	GAM26	Cal Check NLACTVTY-1332	Investigate		
17-MAY-22	GAM28	All Parameters Passed			
17-MAY-22	GAM30	Cal Check PSFWHM-662	Investigate		
17-MAY-22	GAM31	Cal Check PSFWHM-662	Investigate		
17-MAY-22	GAM32	All Parameters Passed			
17-MAY-22	GAM33	All Parameters Passed			
17-MAY-22	GAM34	All Parameters Passed			
17-MAY-22	GAM36	All Parameters Passed			
17-MAY-22	GAM38	Bkg Check BACKRATE	Above		approved
17-MAY-22	GAM40	Cal Check NLACTVTY-662	Investigate		
17-MAY-22	GAM41	All Parameters Passed			
17-MAY-22	GAM43	All Parameters Passed			
16-MAY-22	GAM44	Cal Check may not have run since 17-MAY-2022			Detector locked out.
15-MAY-22	GAM44	Bkg Check may not have run since 17-MAY-2022			Detector locked out.
17-MAY-22	GAM45	Cal Check PSFWHM-662	Investigate		
22-FEB-22	GAM46	Cal Check may not have run since 17-MAY-2022			Detector locked out.
21-FEB-22	GAM46	Bkg Check may not have run since 17-MAY-2022			Detector locked out.
14-MAY-22	GAM47	Cal Check may not have run since 17-MAY-2022			Detector locked out.
15-MAY-22	GAM47	Bkg Check may not have run since 17-MAY-2022			Detector locked out.

17-MAY-22	XRAY1	All Parameters Passed			
17-MAY-22	XRAY2	All Parameters Passed			
17-MAY-22	XRAY3	All Parameters Passed			
17-MAY-22	XRAY4	All Parameters Passed			
17-MAY-22	XRAY6	All Parameters Passed			
17-MAY-22	XRAY7	All Parameters Passed			

APPROVAL DATE: 17-MAY-2022

APPROVAL TIME: 10:30:04

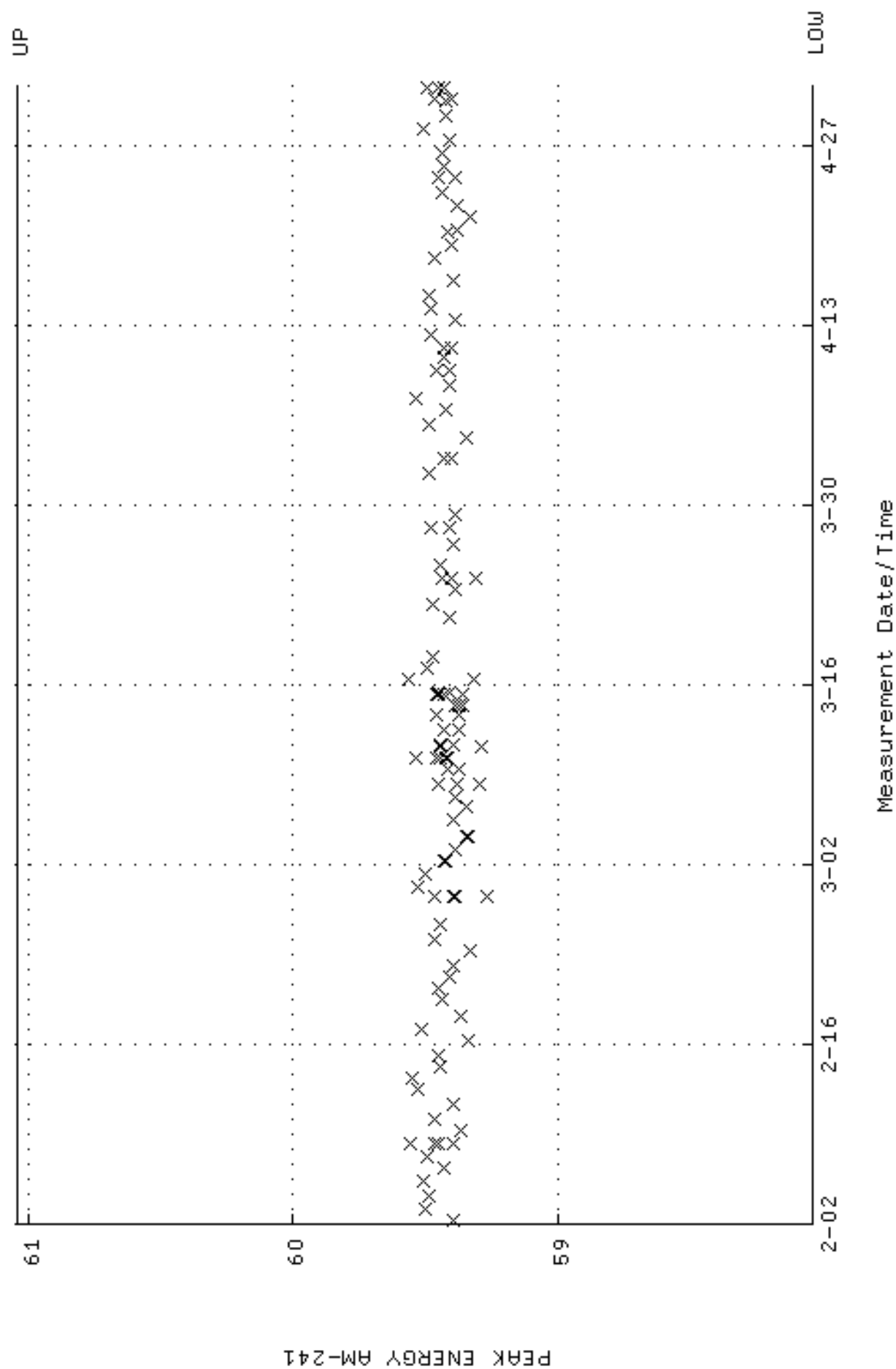
APPROVED BY: Rebekah Futch

PROCEDURE # GL-RAD-I-001

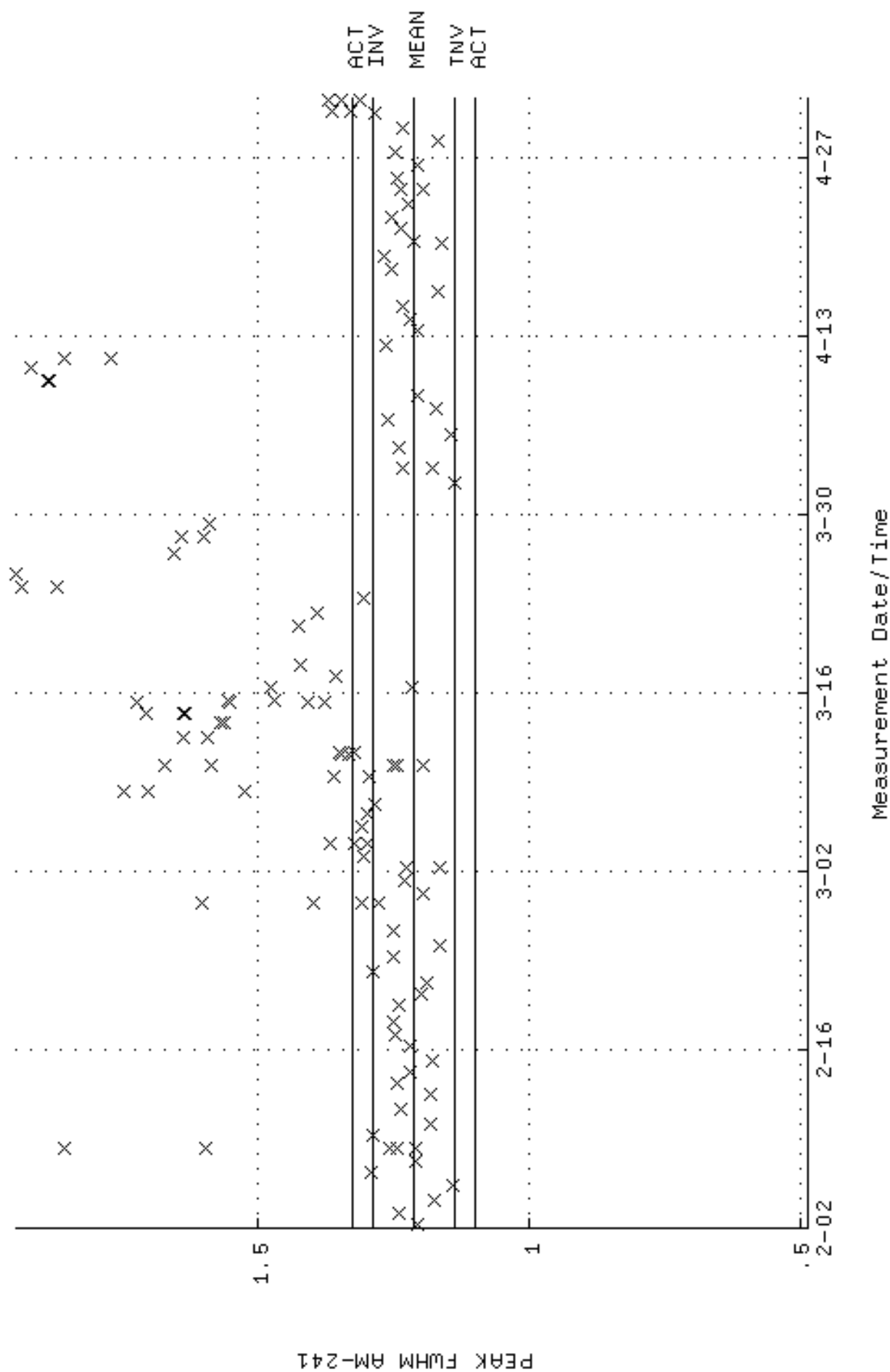
The Investigate flag does not indicate a lockout and is approved for use. Action flags that have not been approved are locked out of service.

Background and Efficiency Data

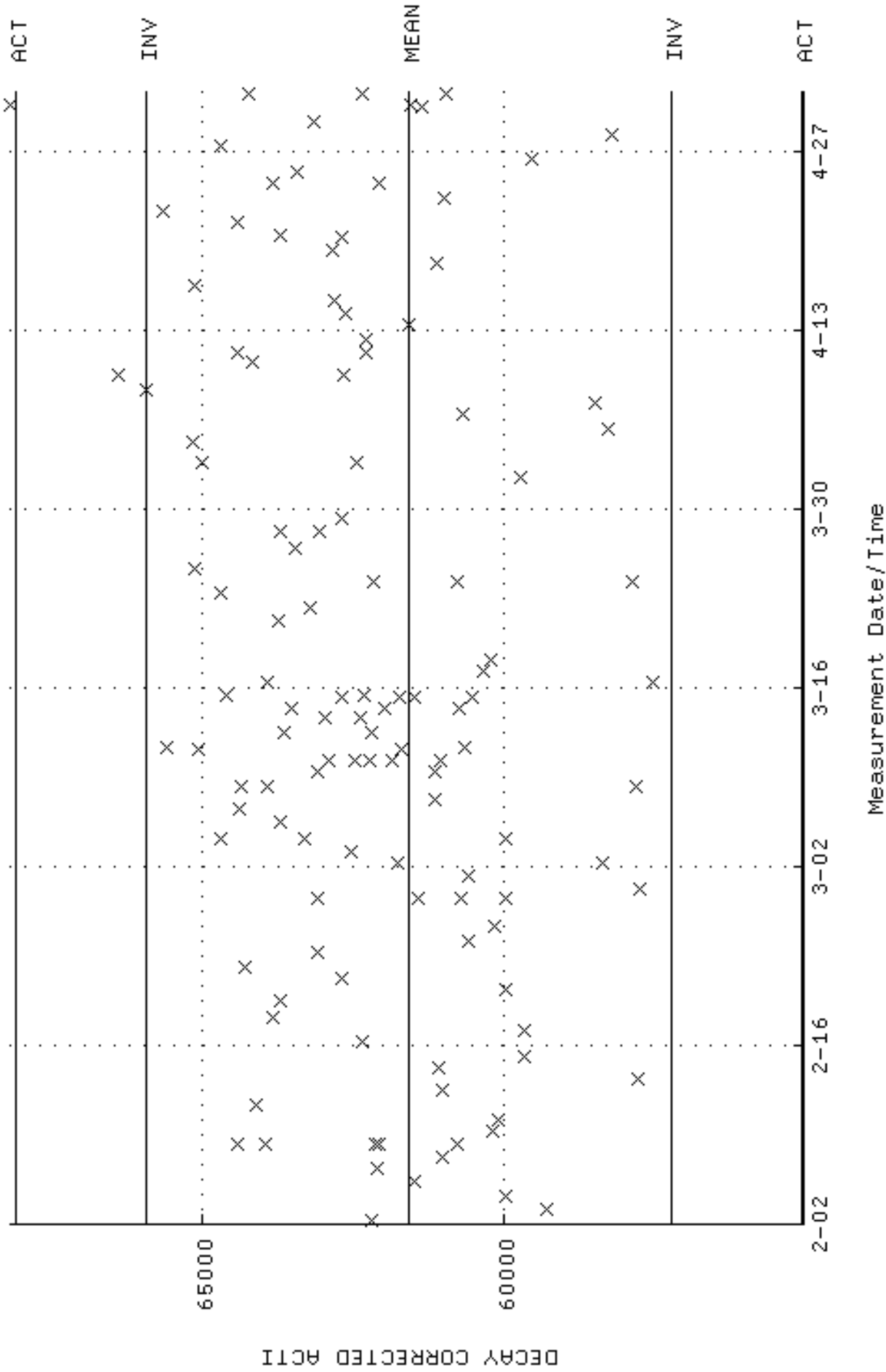
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM03_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-FEB-2022 07:02:10 through 1-MAY-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



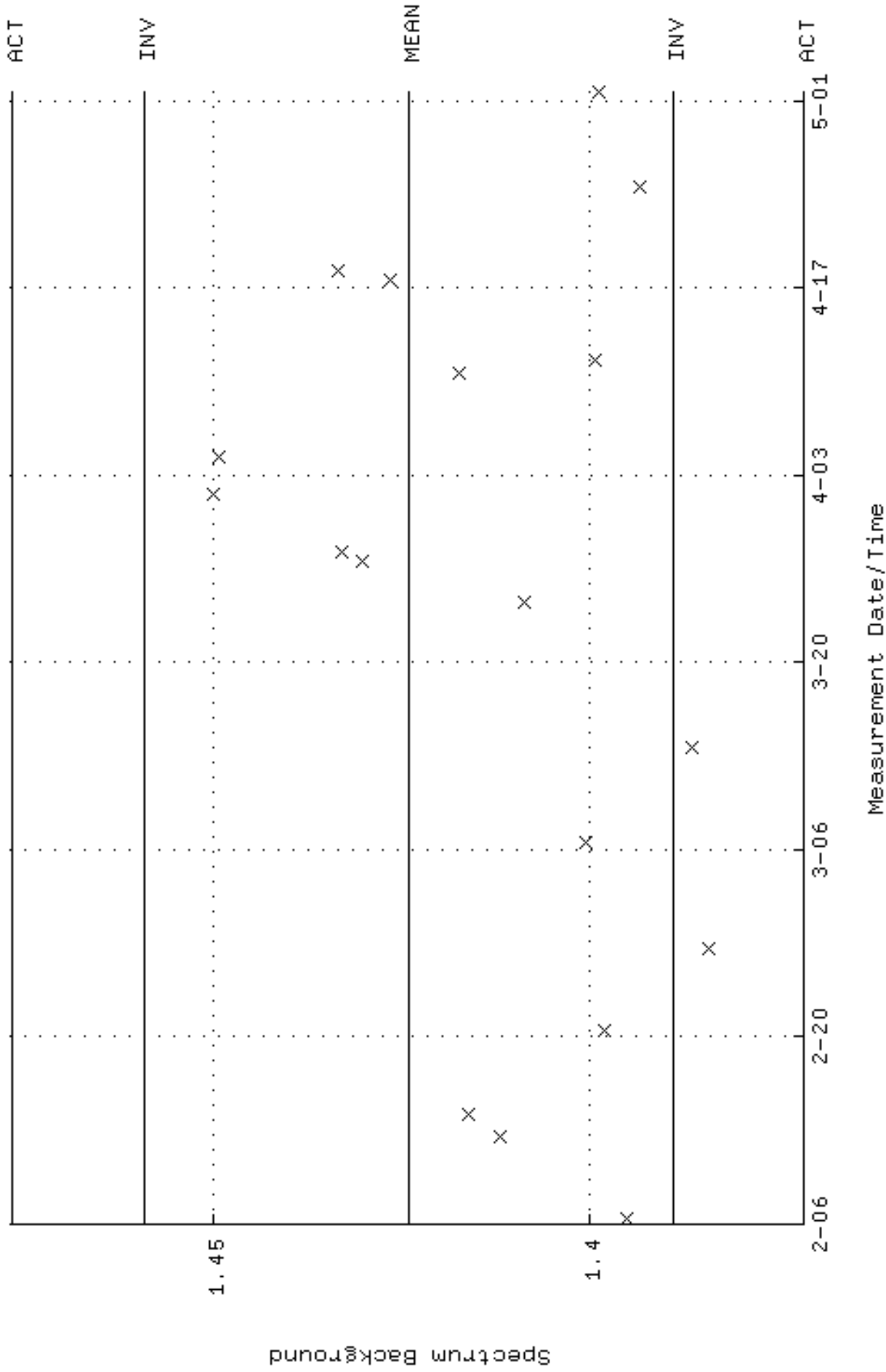
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC_GAM03_CAN.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-FEB-2022 07:02:10 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 1.21548 +- 3.783057E-02 (3.11 %)



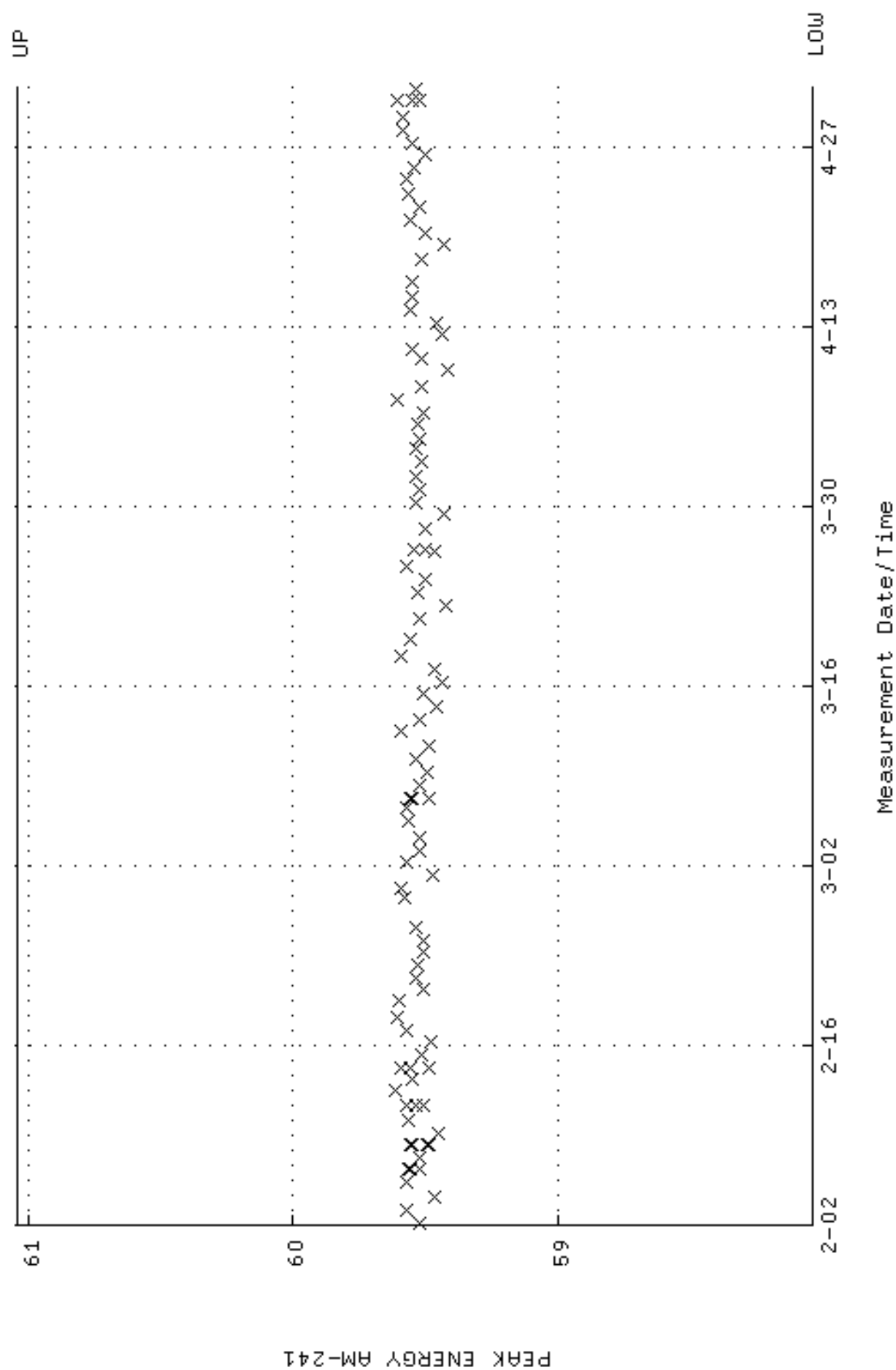
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM03_CAN.QAF;1
Parameter Name : NLACTIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-FEB-2022 07:02:10 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 61594.1 +- 2165.91 (3.52 %)



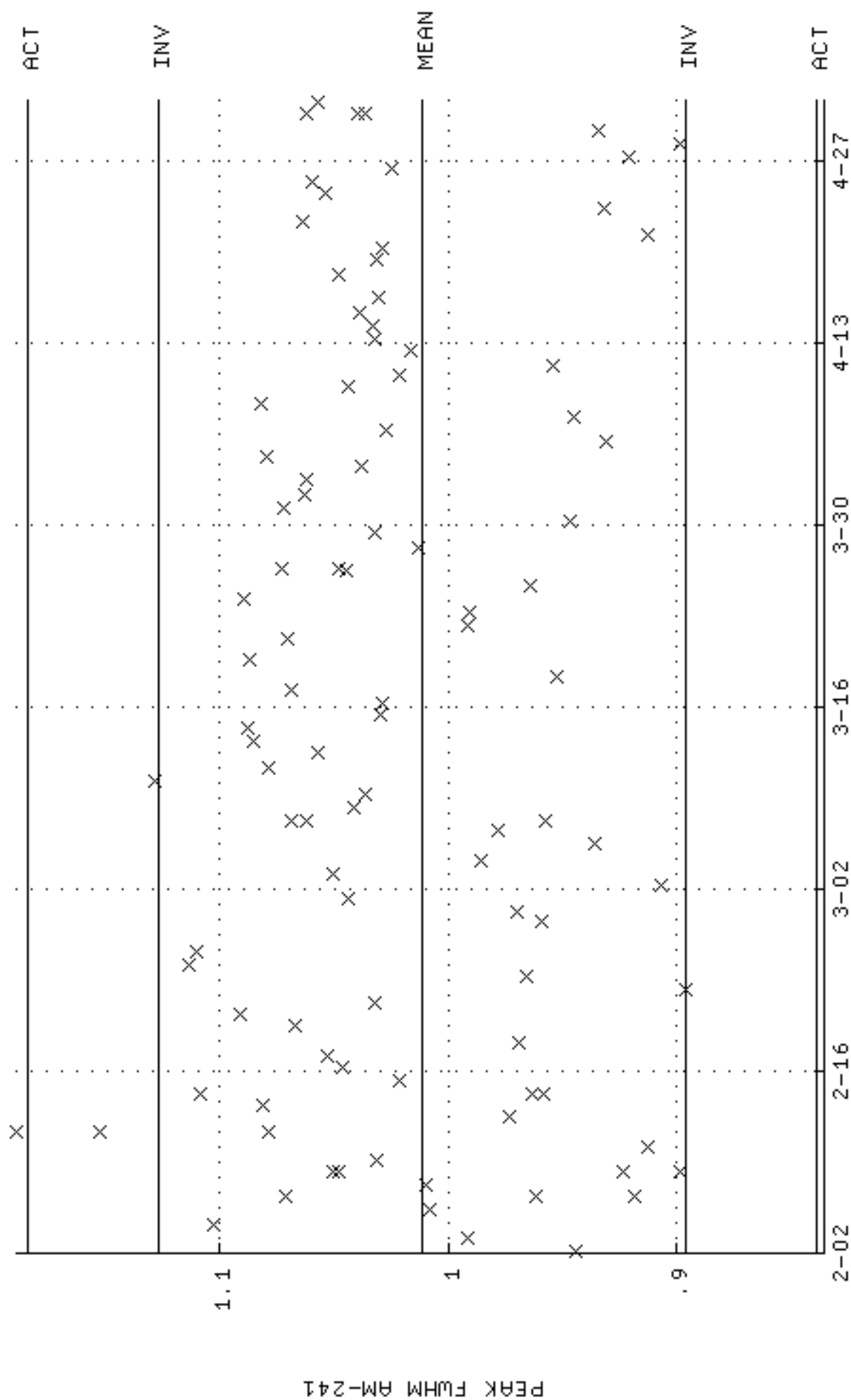
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM03.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-FEB-2022 11:12:40 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.42408 +- 1.750913E-02 (1.23 %)



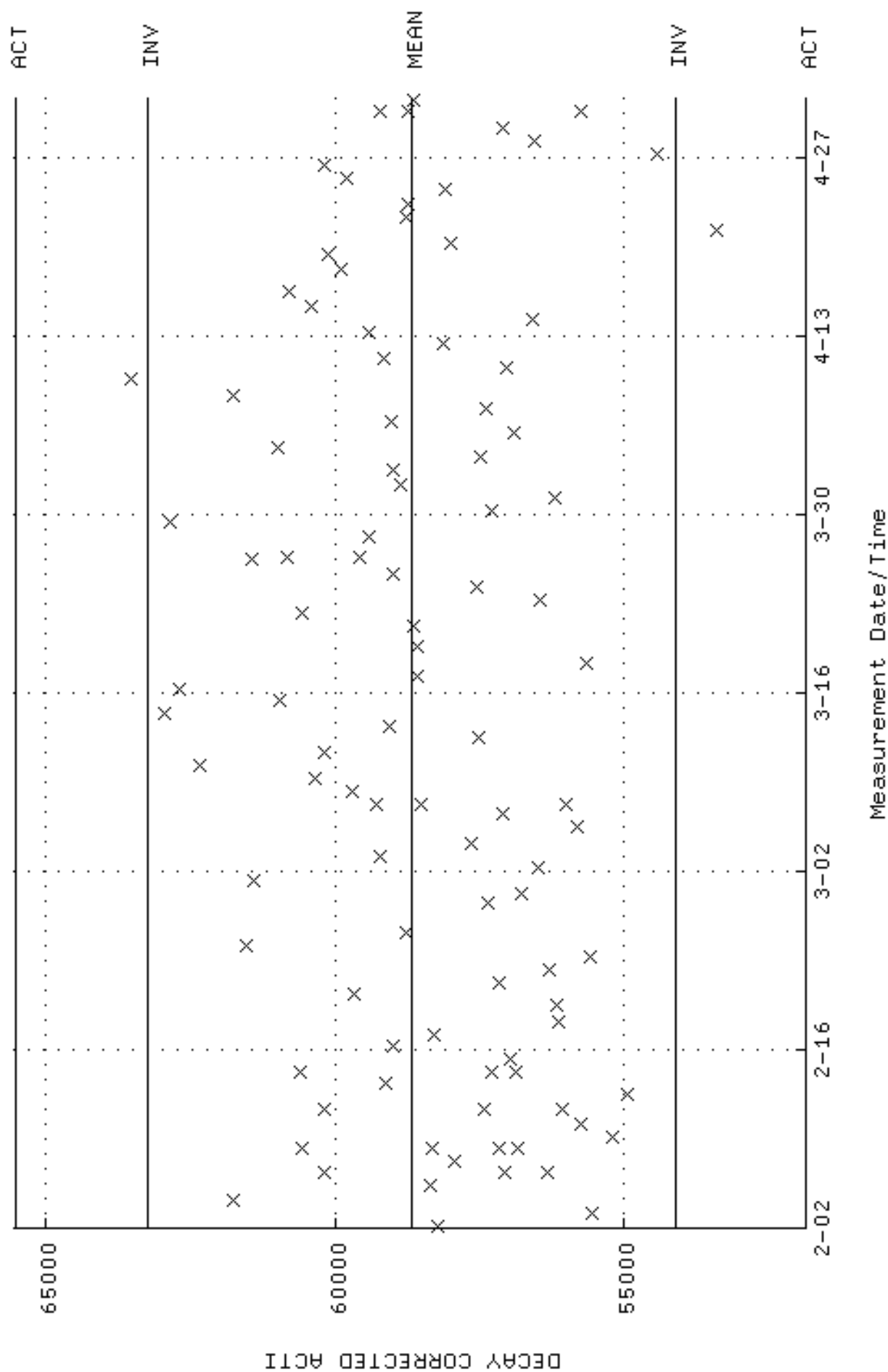
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM14_JAR.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-FEB-2022 04:24:55 through 1-MAY-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



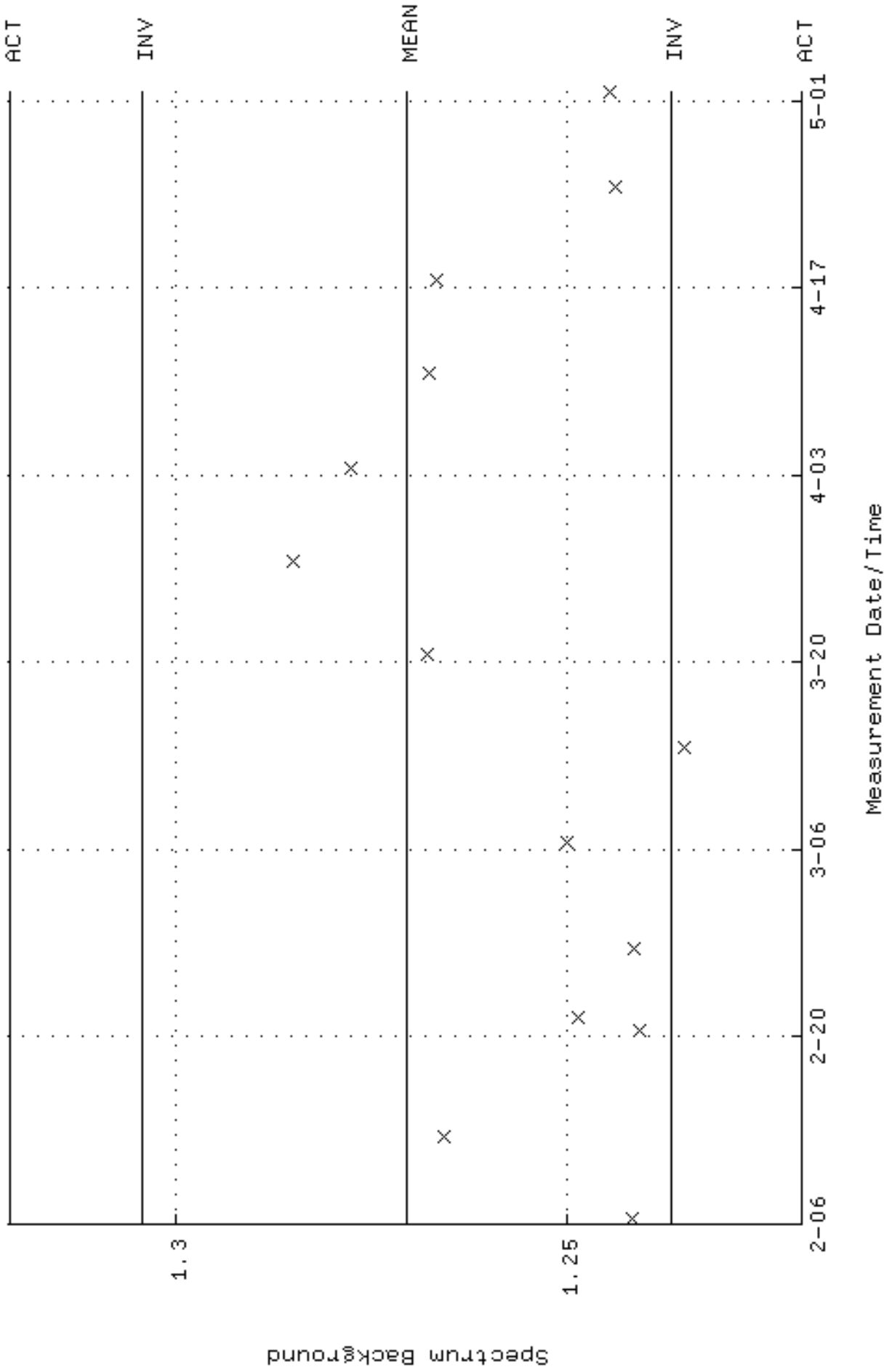
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM14_JAR.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-FEB-2022 04:24:55 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 1.01171 +- 5.781632E-02 (5.71 %)



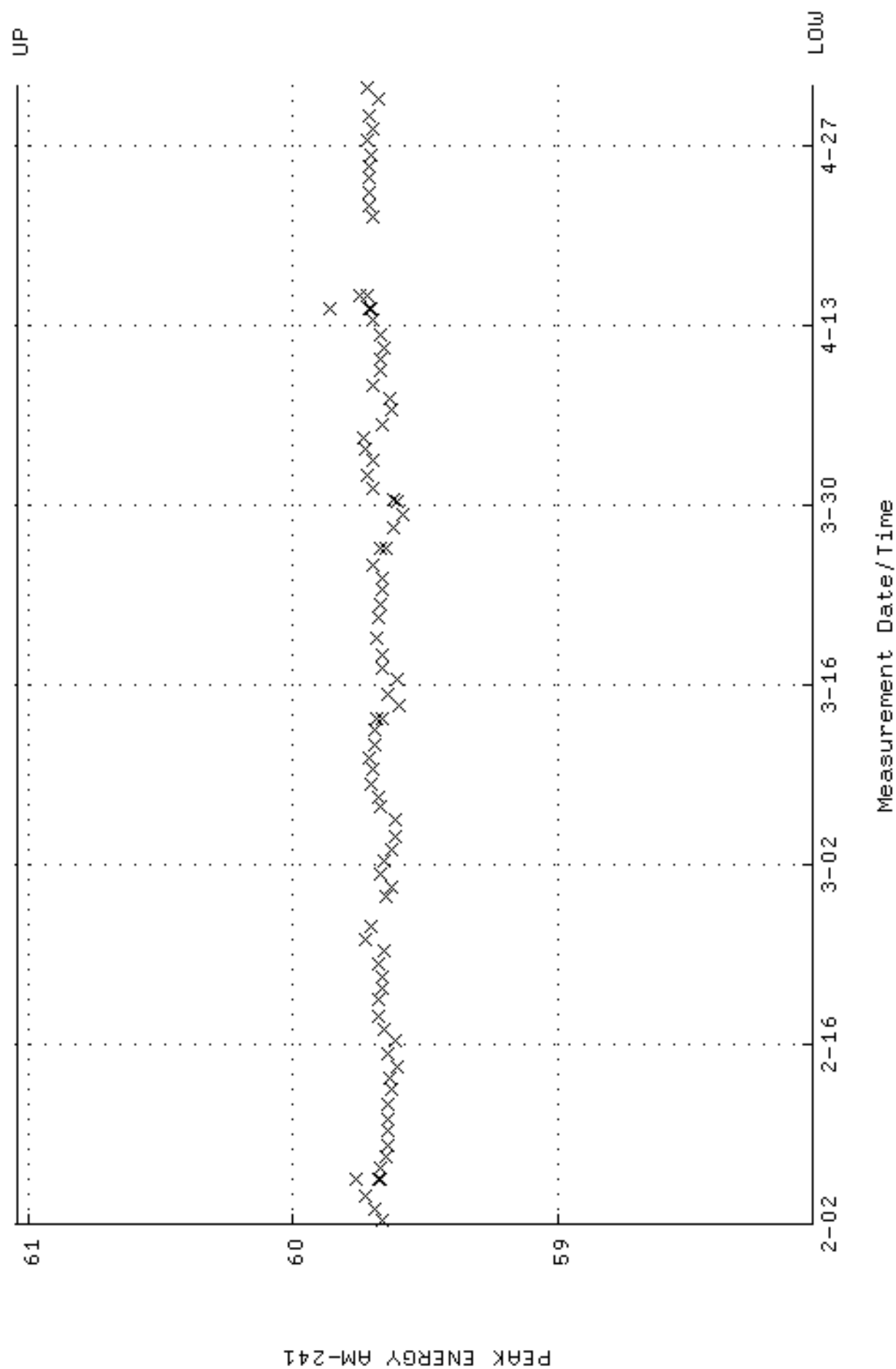
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM14_JAR.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-FEB-2022 04:24:55 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 58686.3 +- 2273.88 (3.87 %)



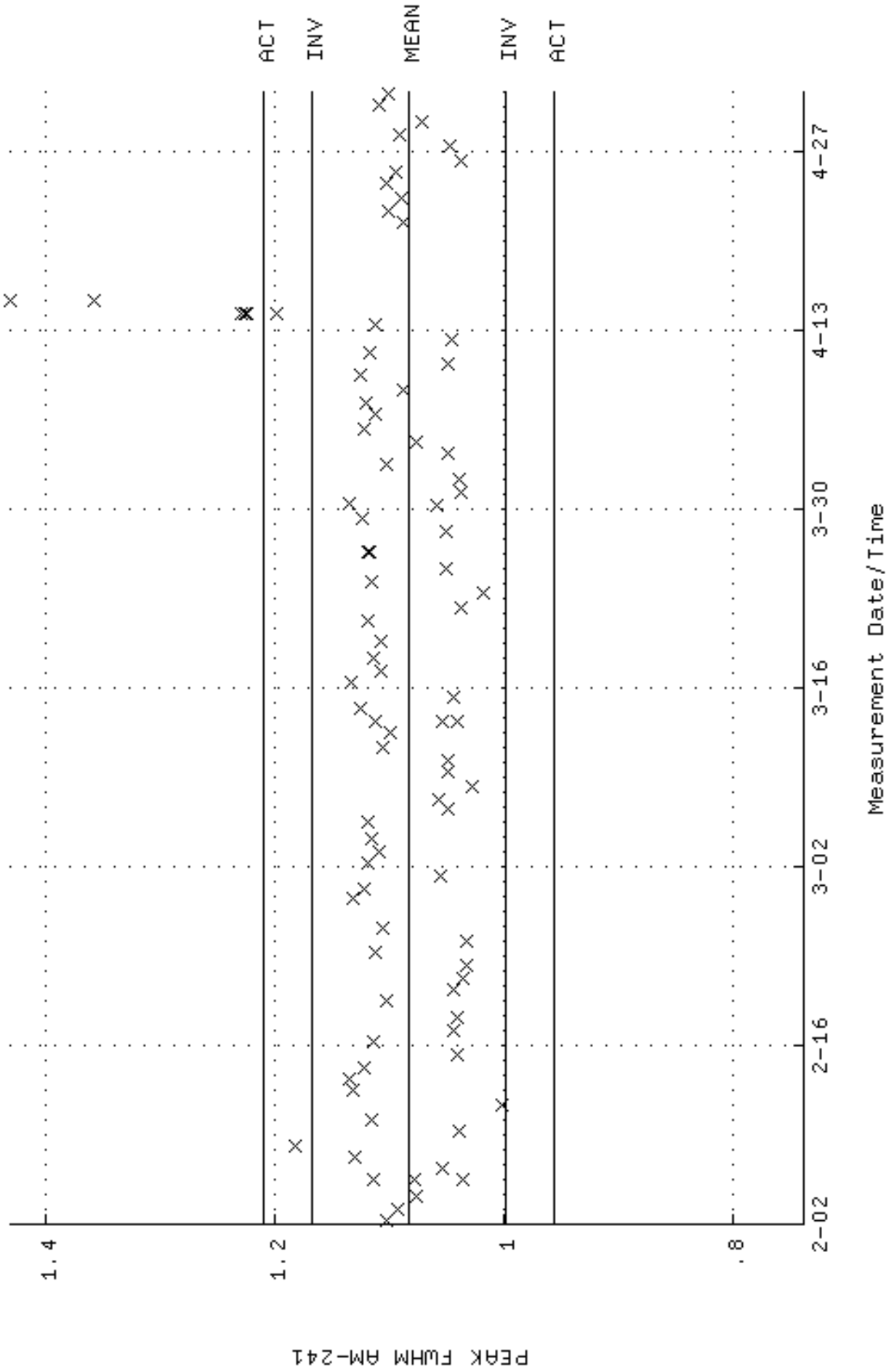
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM14.QAF;1
 Parameter Name : BACKRATE (Spectrum Background Rate)
 Start/End Dates : 6-FEB-2022 11:13:16 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 1.27070 +- 1.686246E-02 (1.33 %)



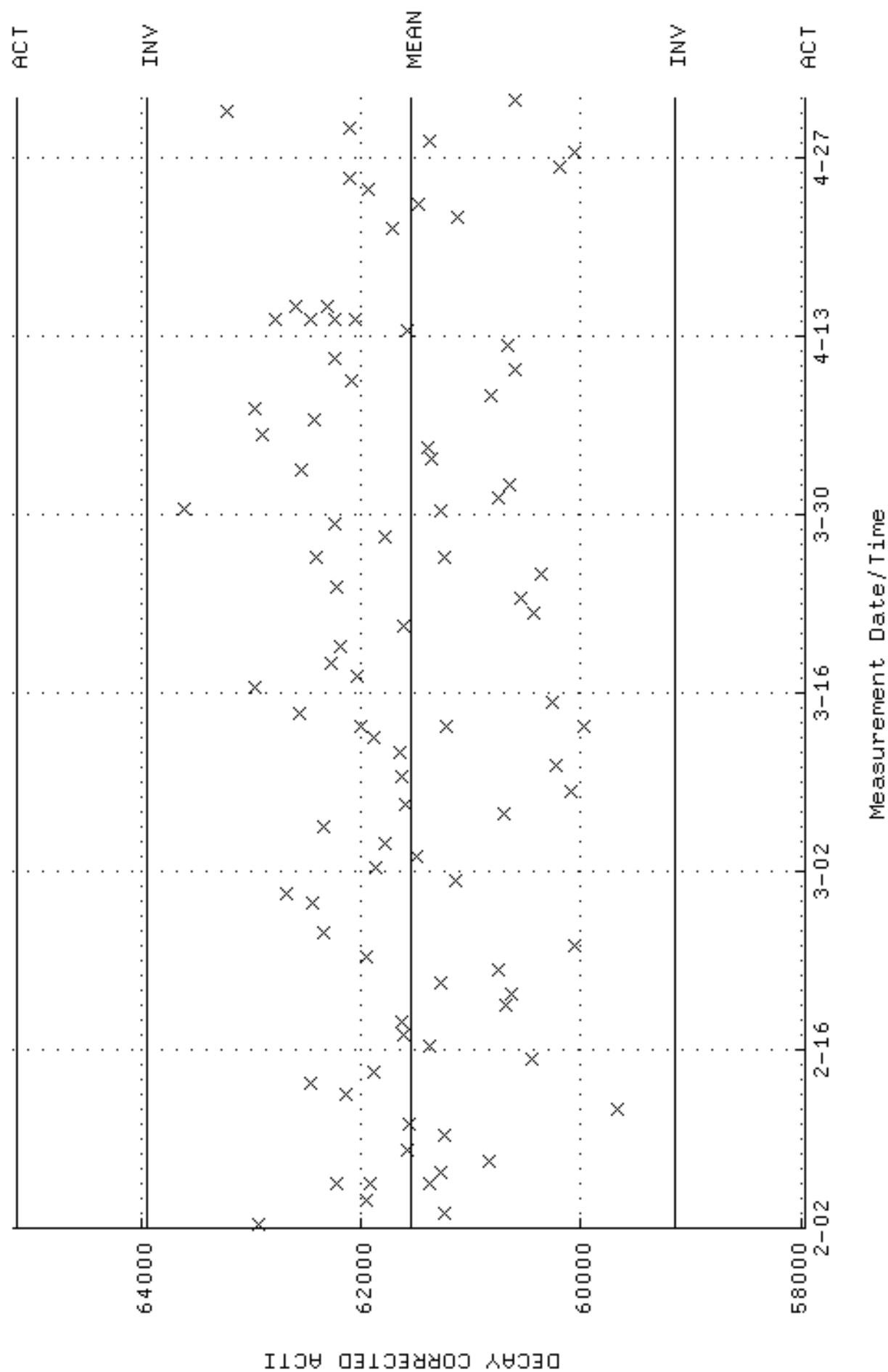
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM17_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-FEB-2022 07:02:20 through 1-MAY-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



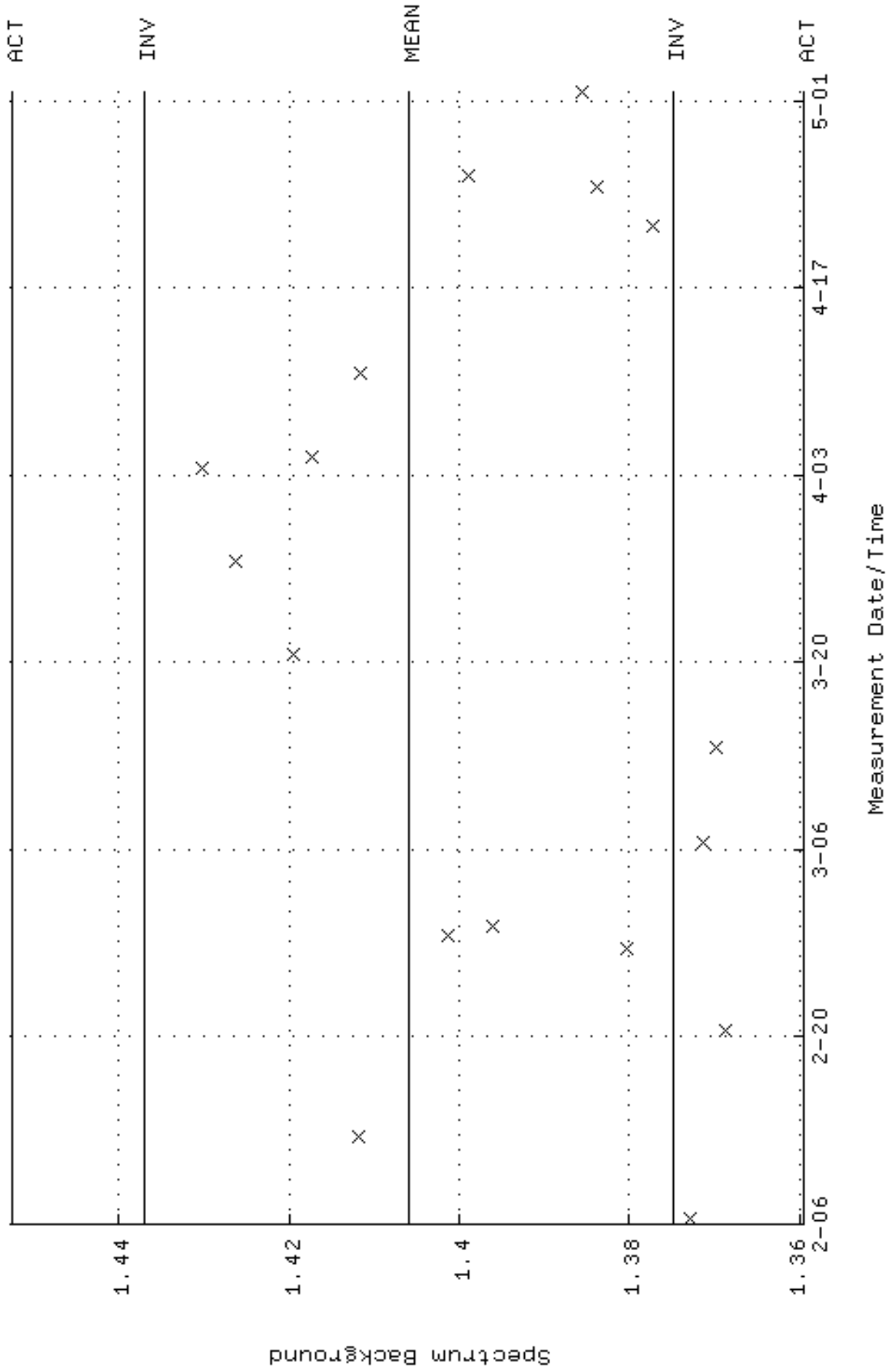
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM17_CAN.QAF;1
Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
Start/End Dates : 2-FEB-2022 07:02:20 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.08334 +- 4.250132E-02 (3.92 %)



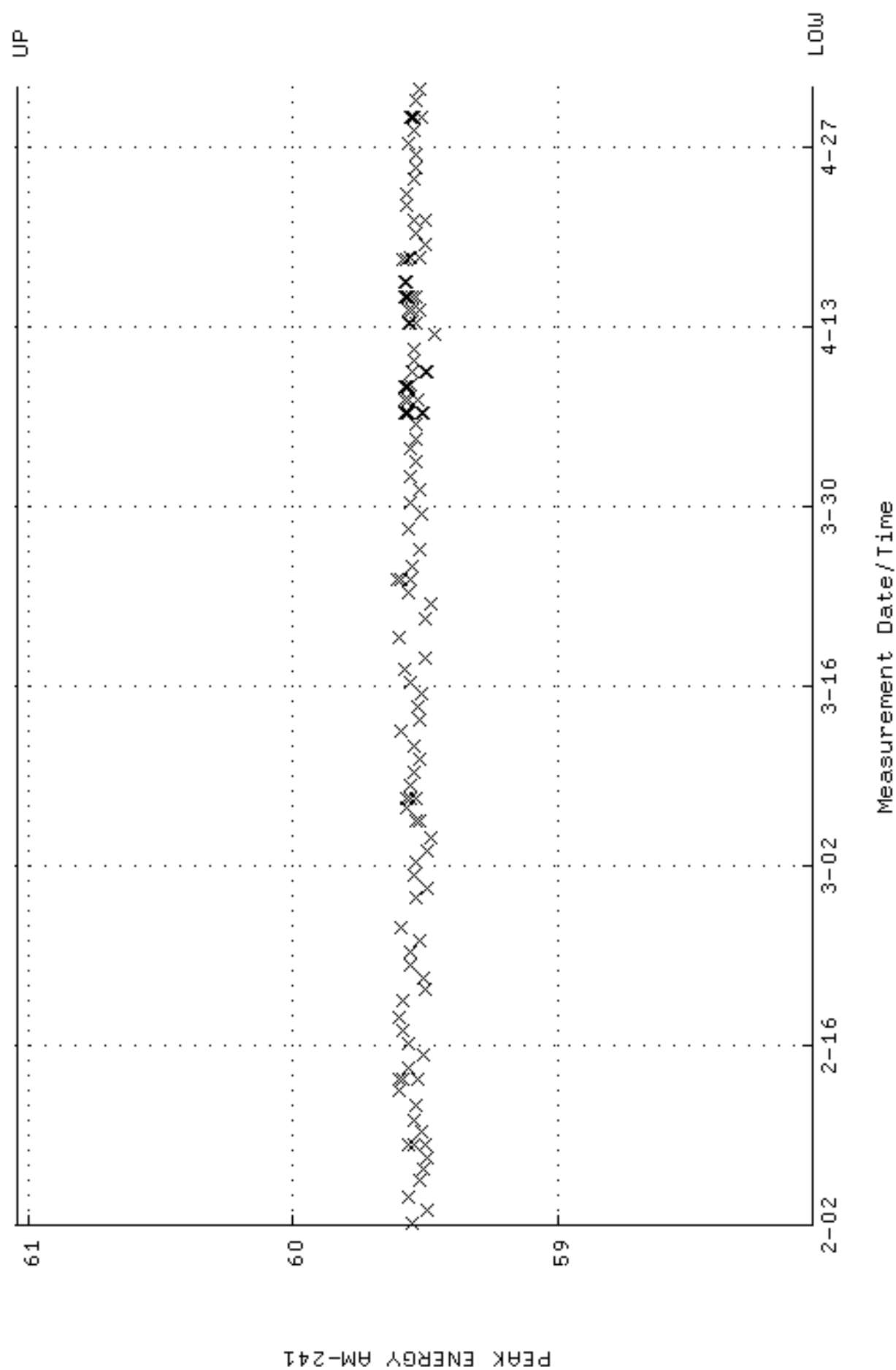
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM17_CAN.QAF;1
 Parameter Name : NLACTIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-FEB-2022 07:02:20 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 61554.1 +- 1197.24 (1.95 %)



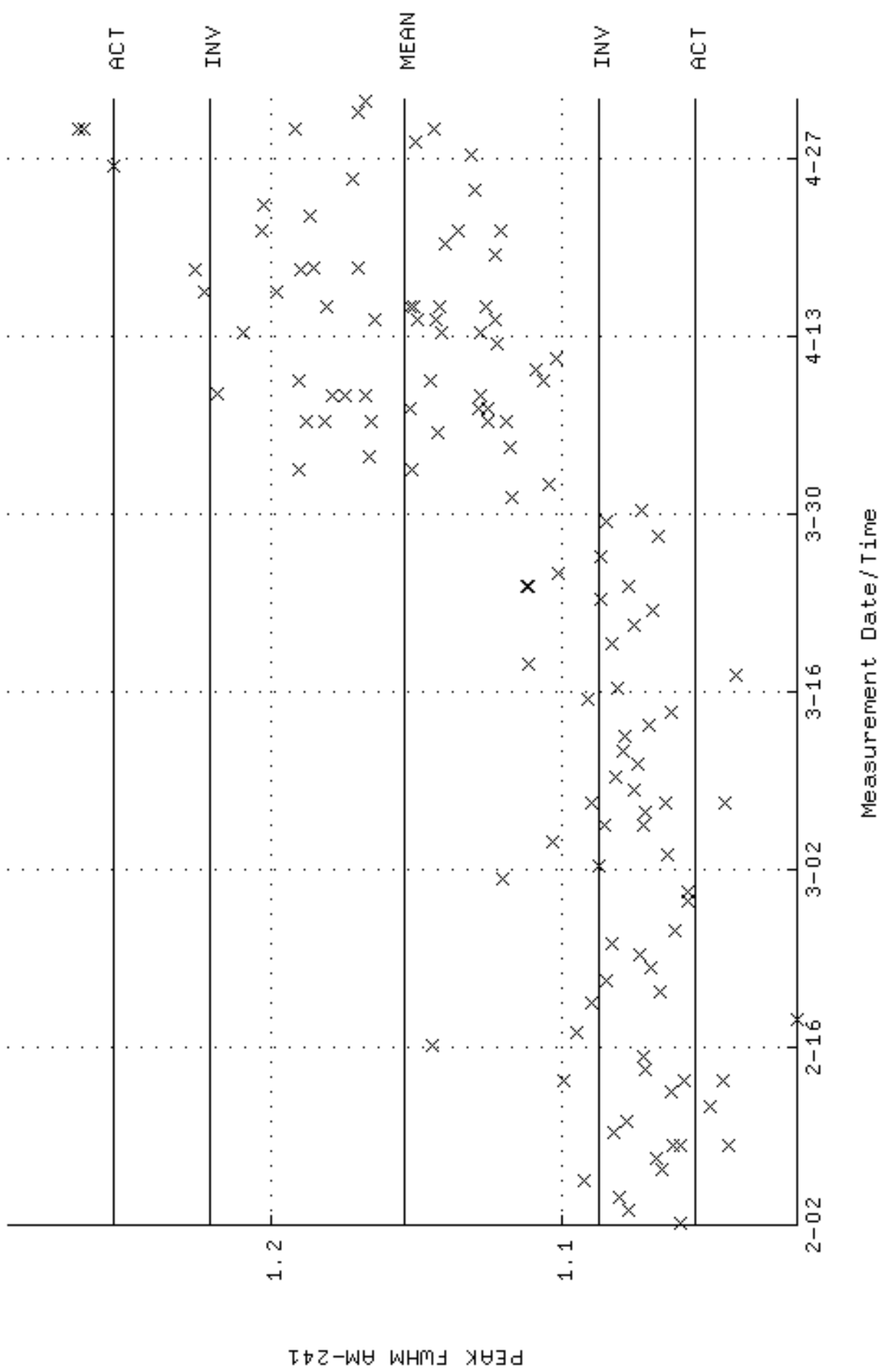
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM17.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-FEB-2022 11:13:28 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.40599 +- 1.550878E-02 (1.10 %)



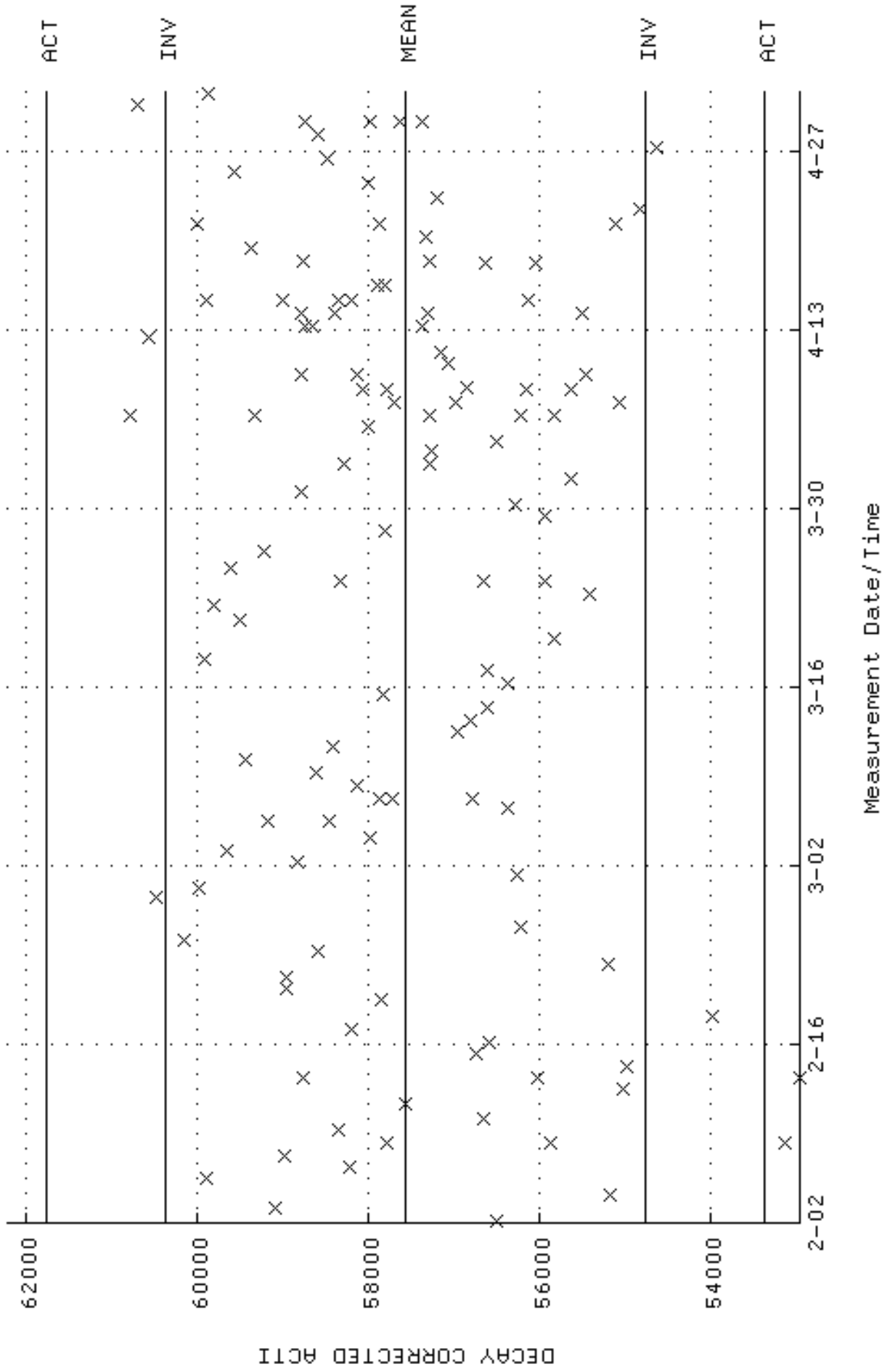
QA filename : DKA100:[CANSBERRA.GAMMA.SCUSR.QA]QCC_GAM24_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-FEB-2022 03:52:48 through 1-MAY-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



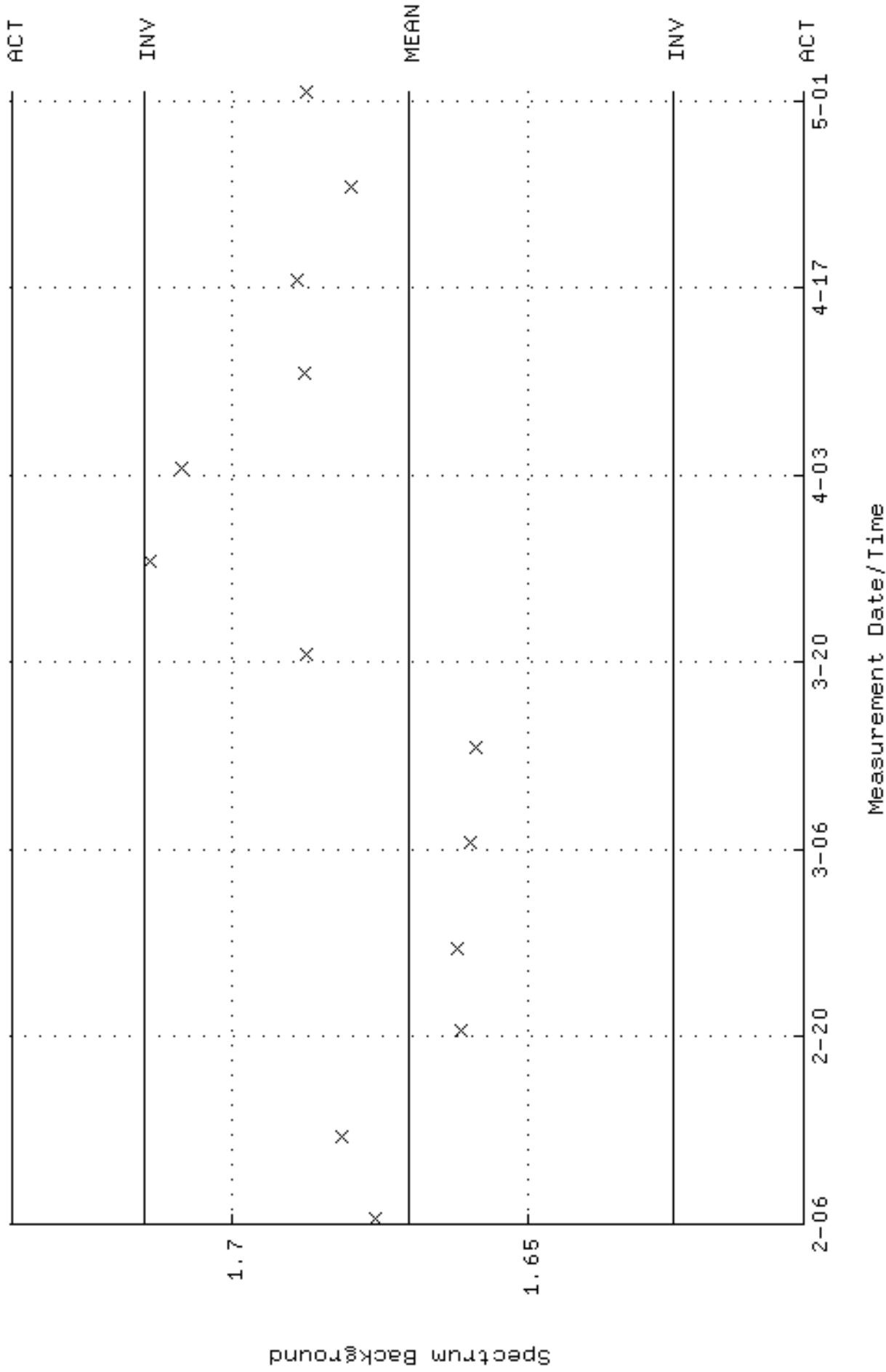
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM24_CAN.QAF;1
Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
Start/End Dates : 2-FEB-2022 03:52:48 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.15467 +- 3.331359E-02 (2.89 %)



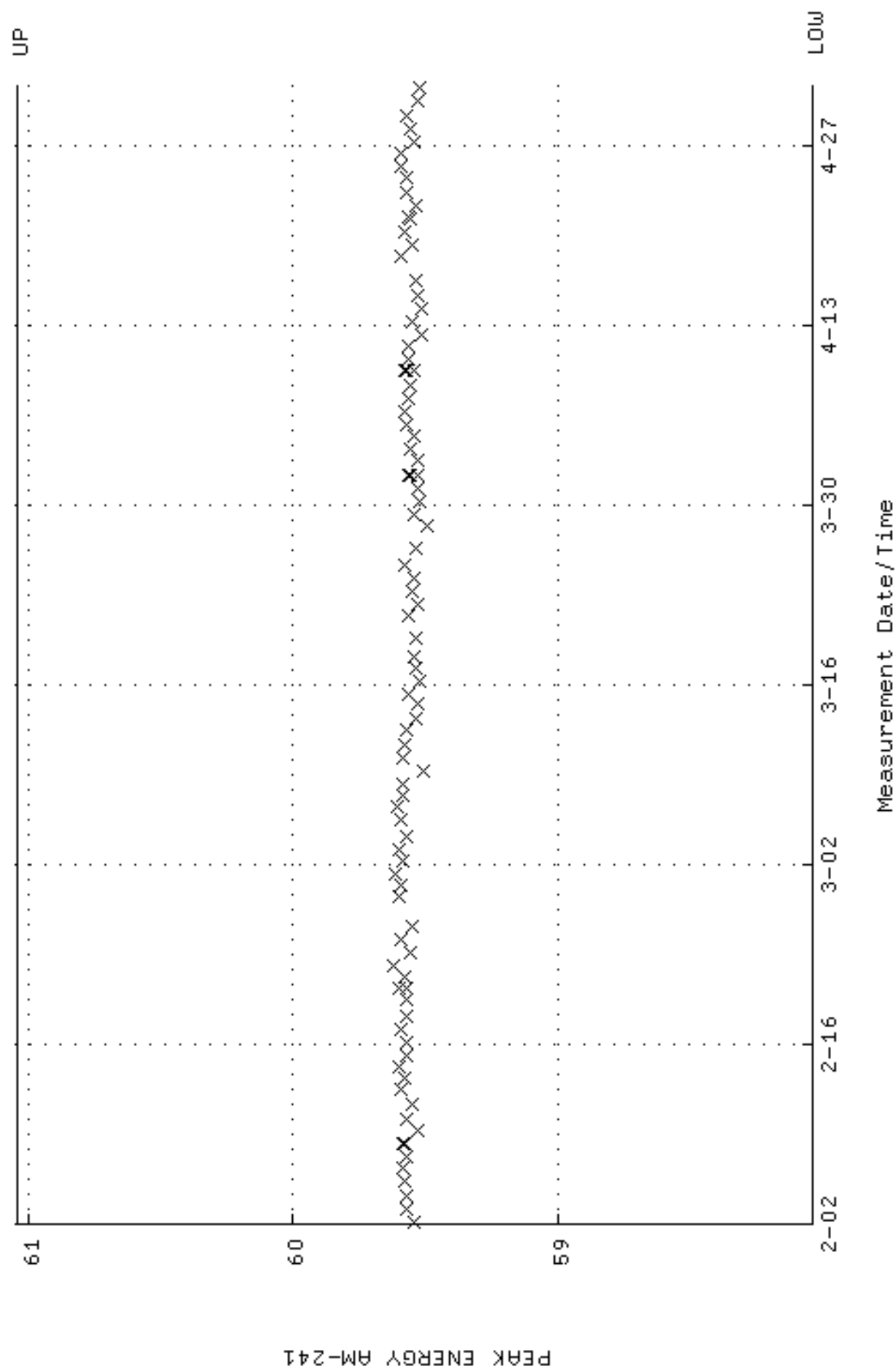
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM24-CAN.QAF;1
Parameter Name : NACTIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-FEB-2022 03:52:48 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 57575.7 +- 1403.54 (2.44 %)



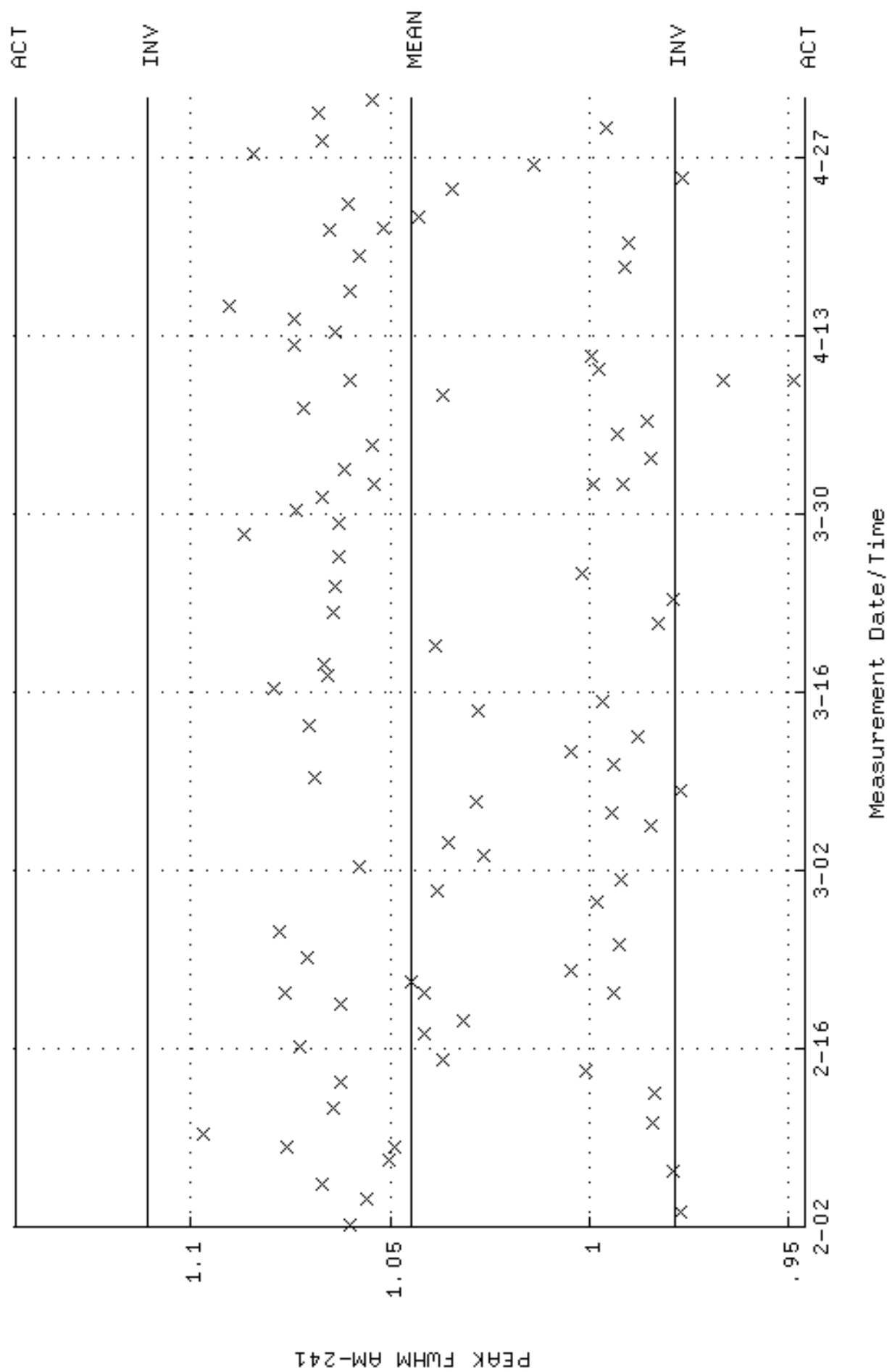
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM24.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-FEB-2022 11:14:04 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.67036 +- 2.221940E-02 (1.33 %)



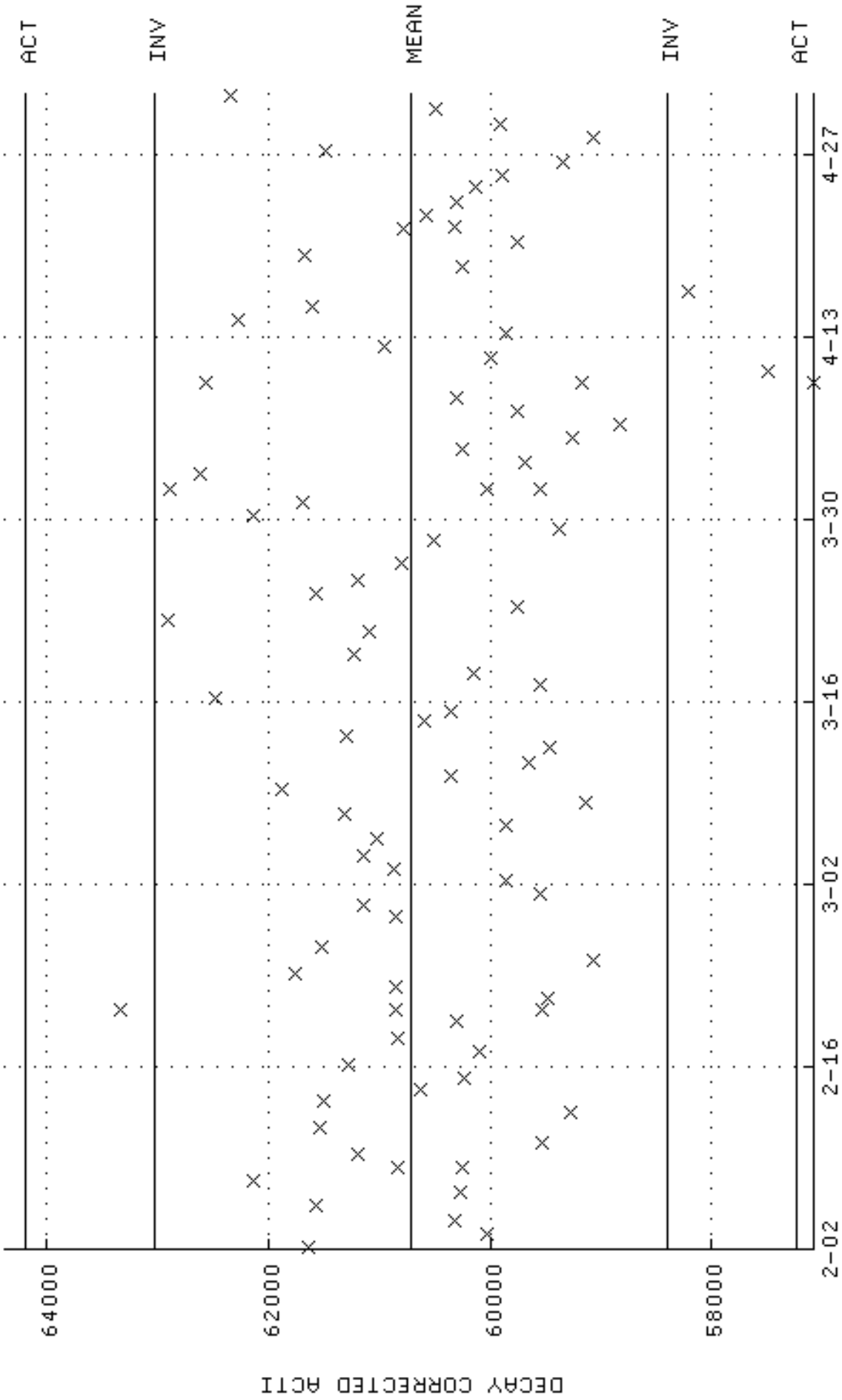
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM30_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-FEB-2022 03:52:53 through 1-MAY-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



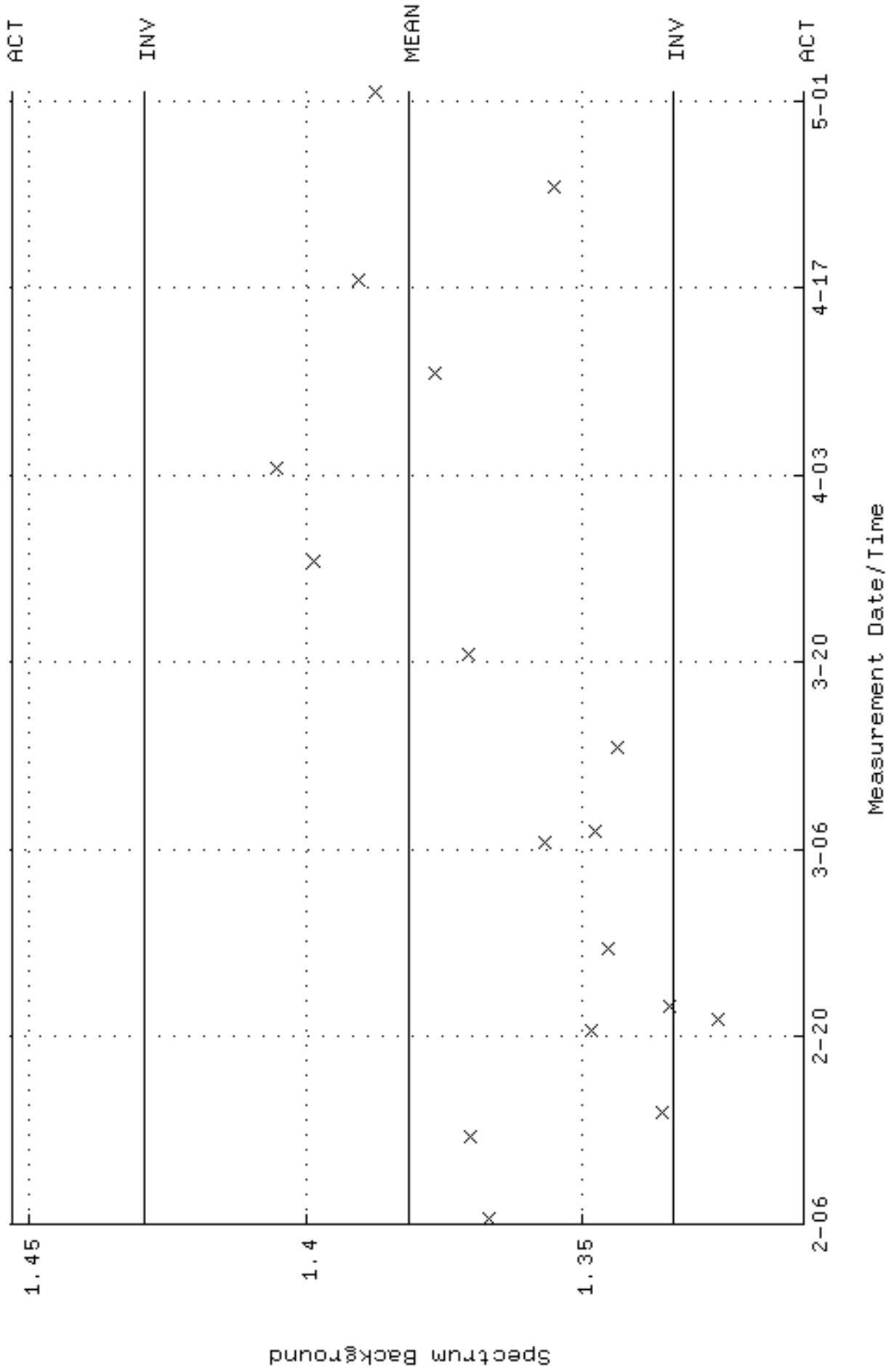
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM30_CAN.QAF;1
 Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
 Start/End Dates : 2-FEB-2022 03:52:53 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 1.04491 +- 3.300933E-02 (3.16 %)



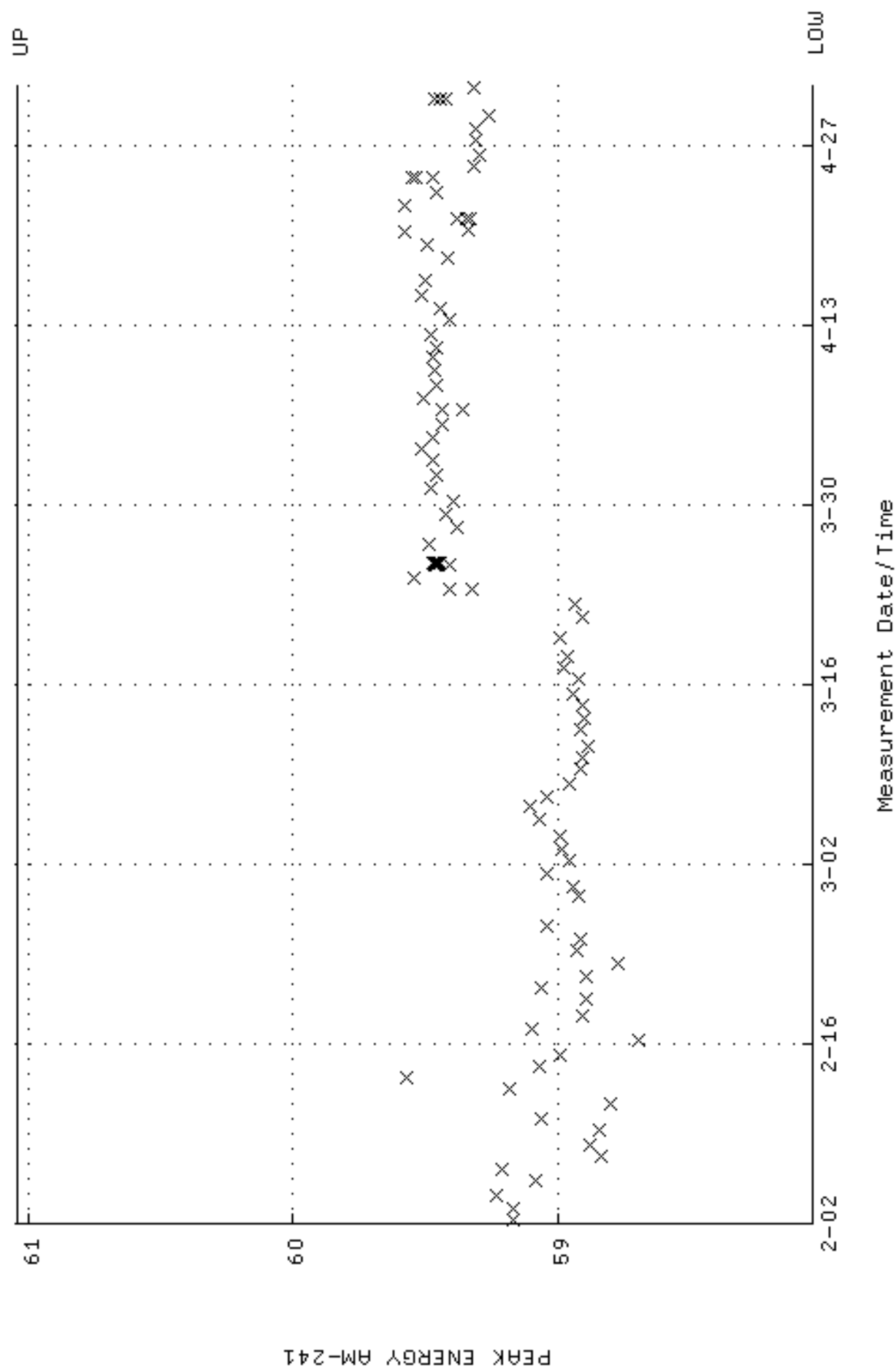
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM30-CAN.QAF;1
Parameter Name : NLACTIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-FEB-2022 03:52:53 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 60719.9 +- 1157.24 (1.91 %)



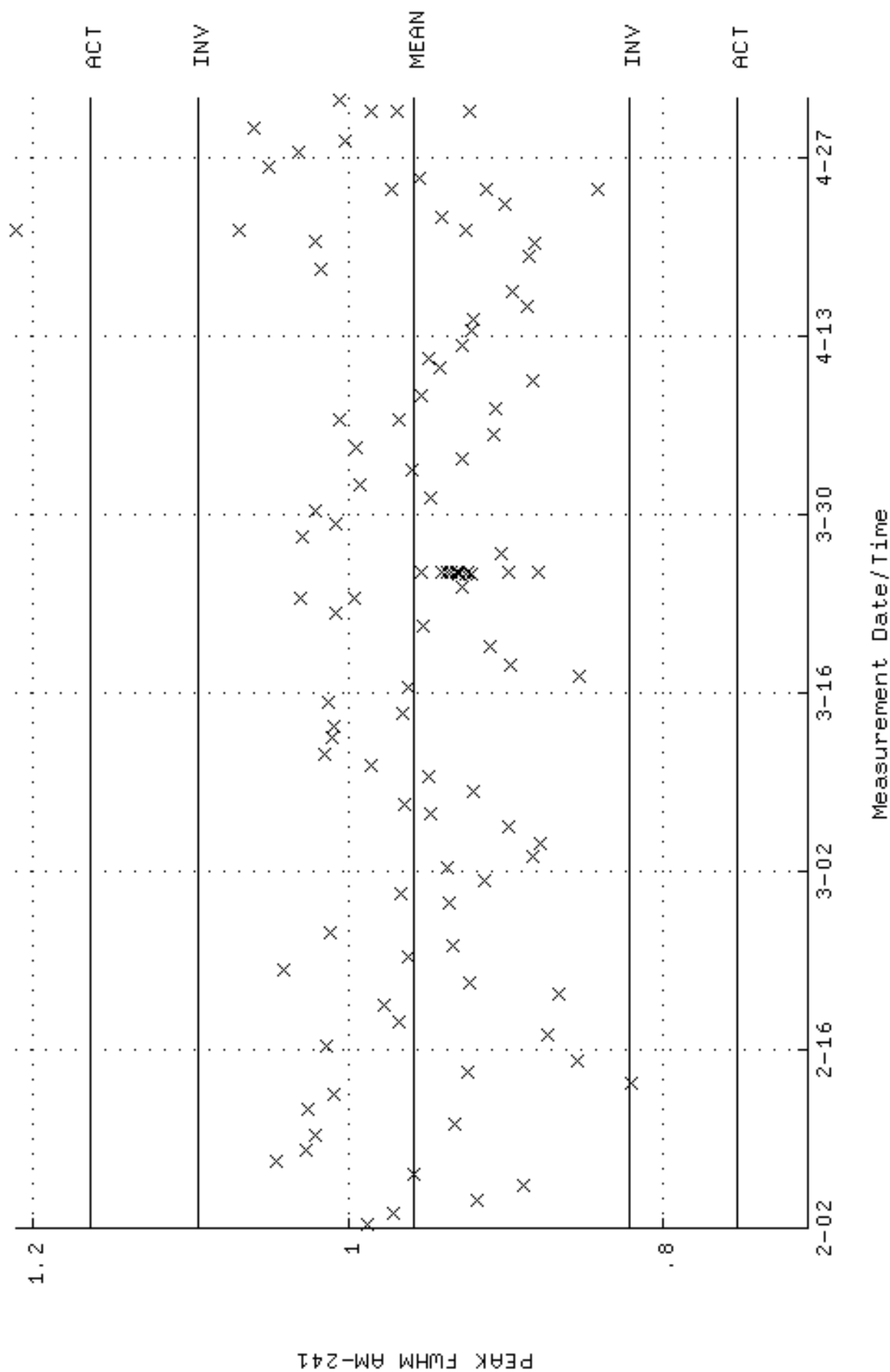
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM30.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-FEB-2022 11:14:15 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.38155 +- 2.378993E-02 (1.72 %)



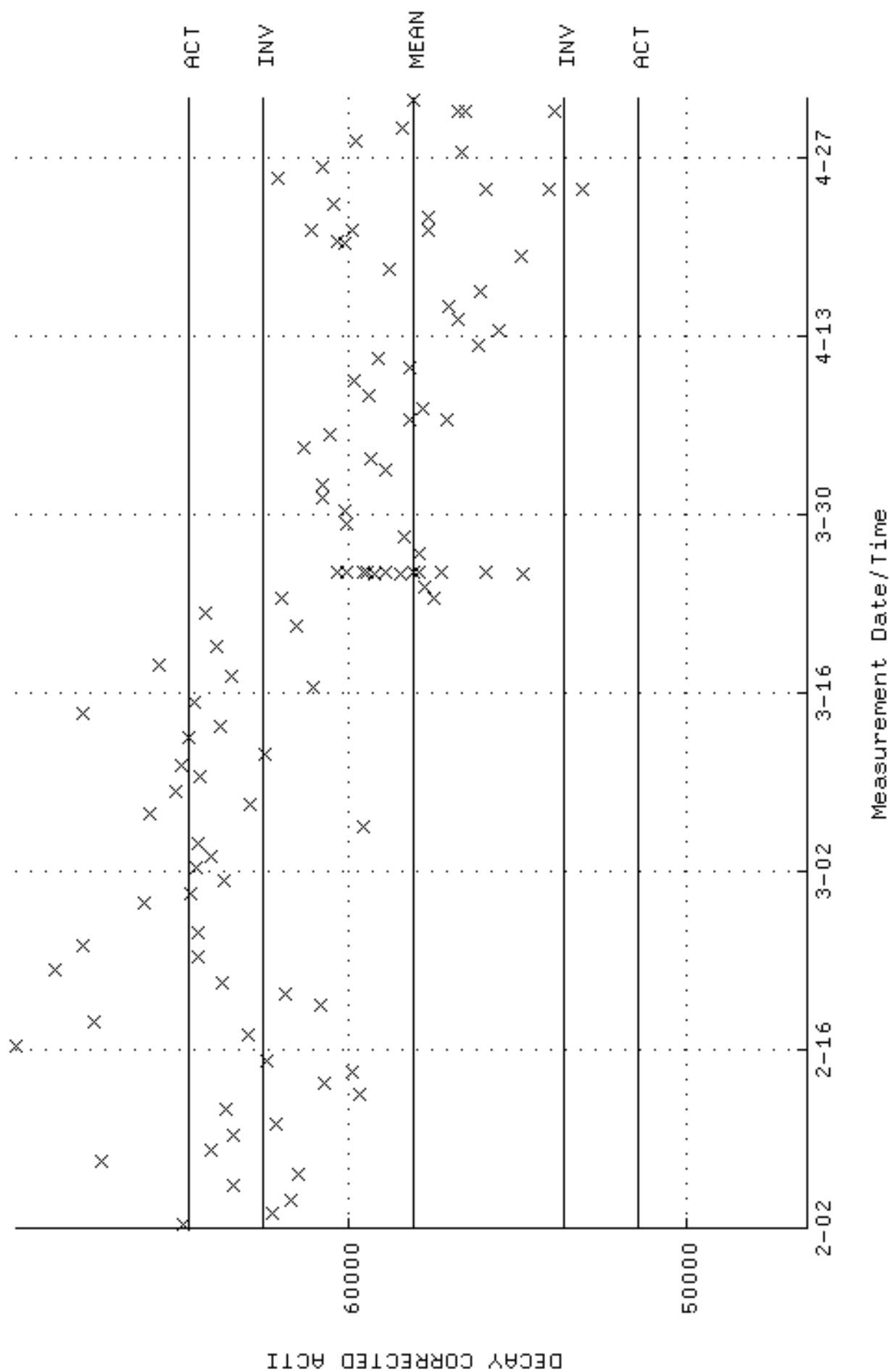
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM43_JAR.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-FEB-2022 07:02:35 through 1-MAY-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



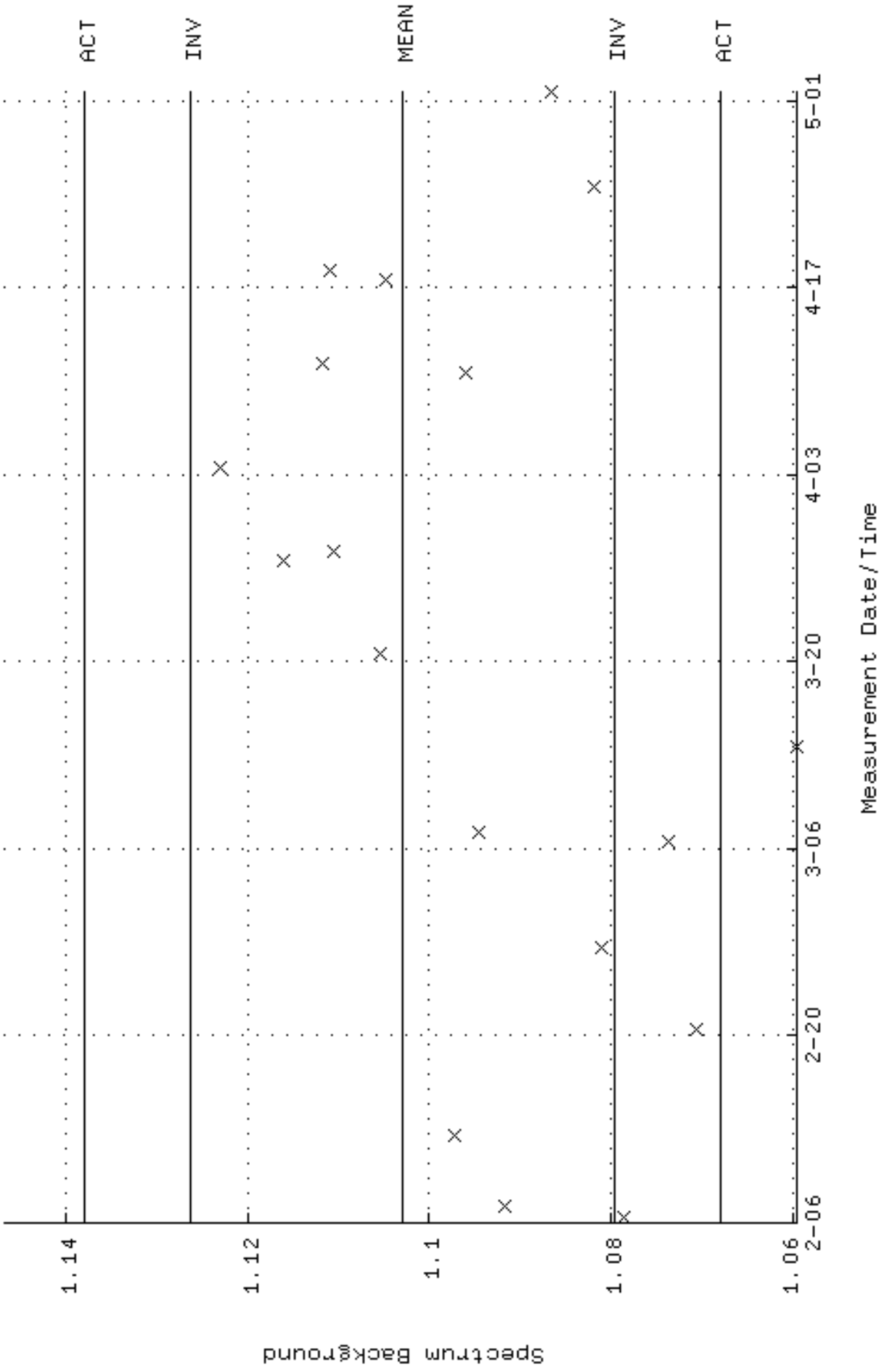
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM43_JAR.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-FEB-2022 07:02:35 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 0.958943 +- 6.834434E-02 (7.13 %)



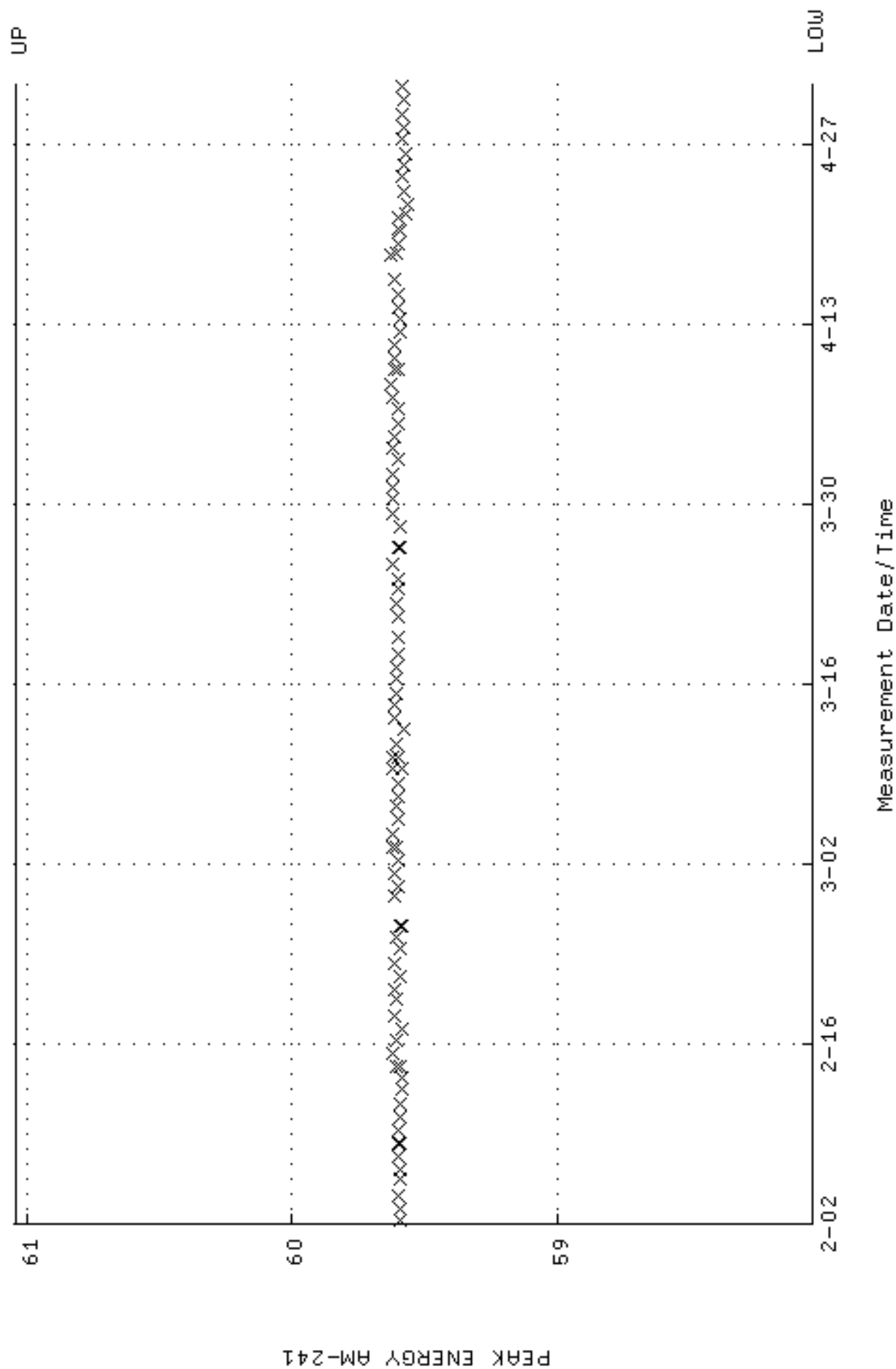
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM43-JAR.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-FEB-2022 07:02:35 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 58085.1 +- 2213.88 (3.81 %)



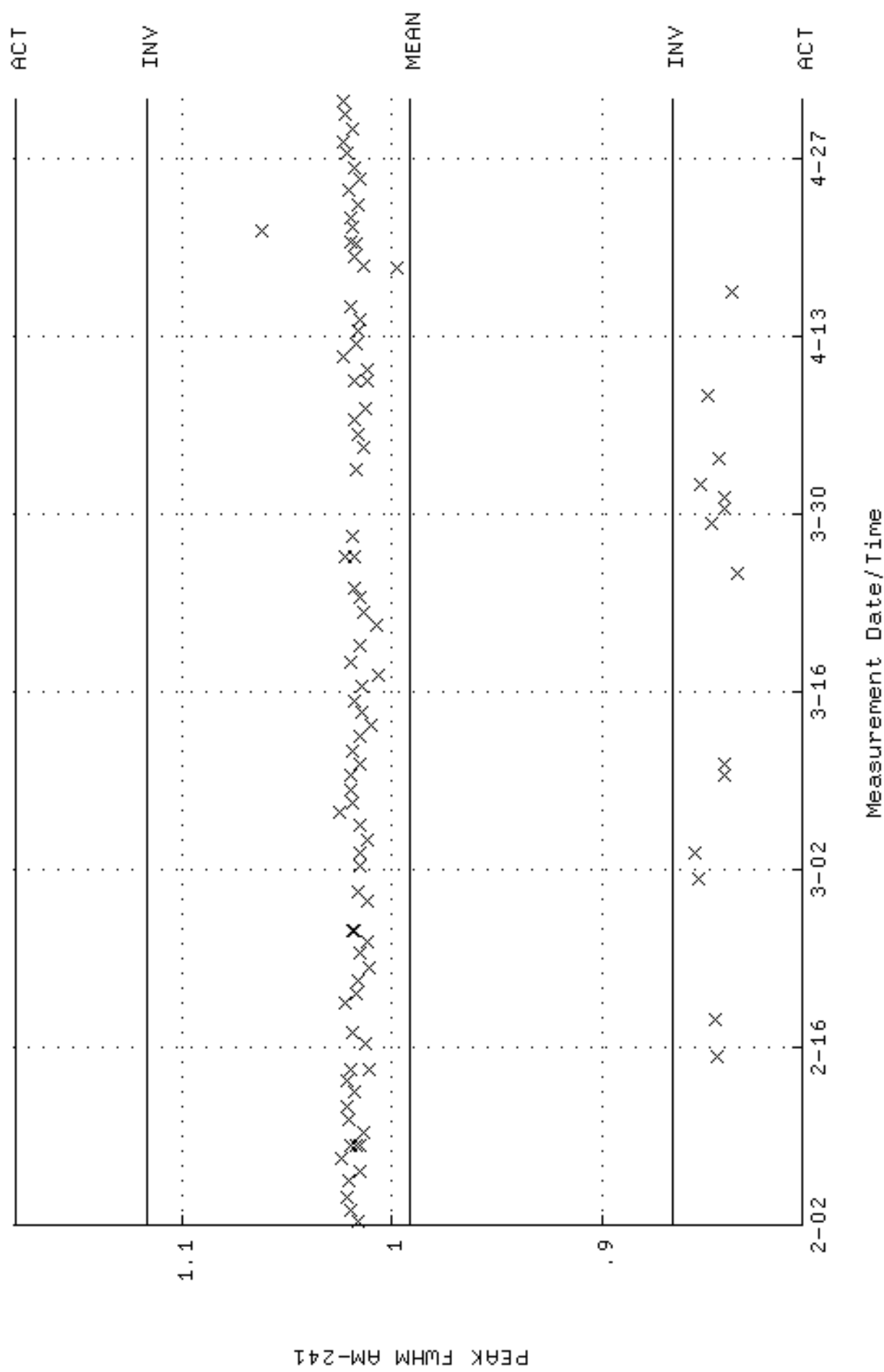
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM43.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-FEB-2022 11:14:53 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.10306 +- 1.164919E-02 (1.06 %)



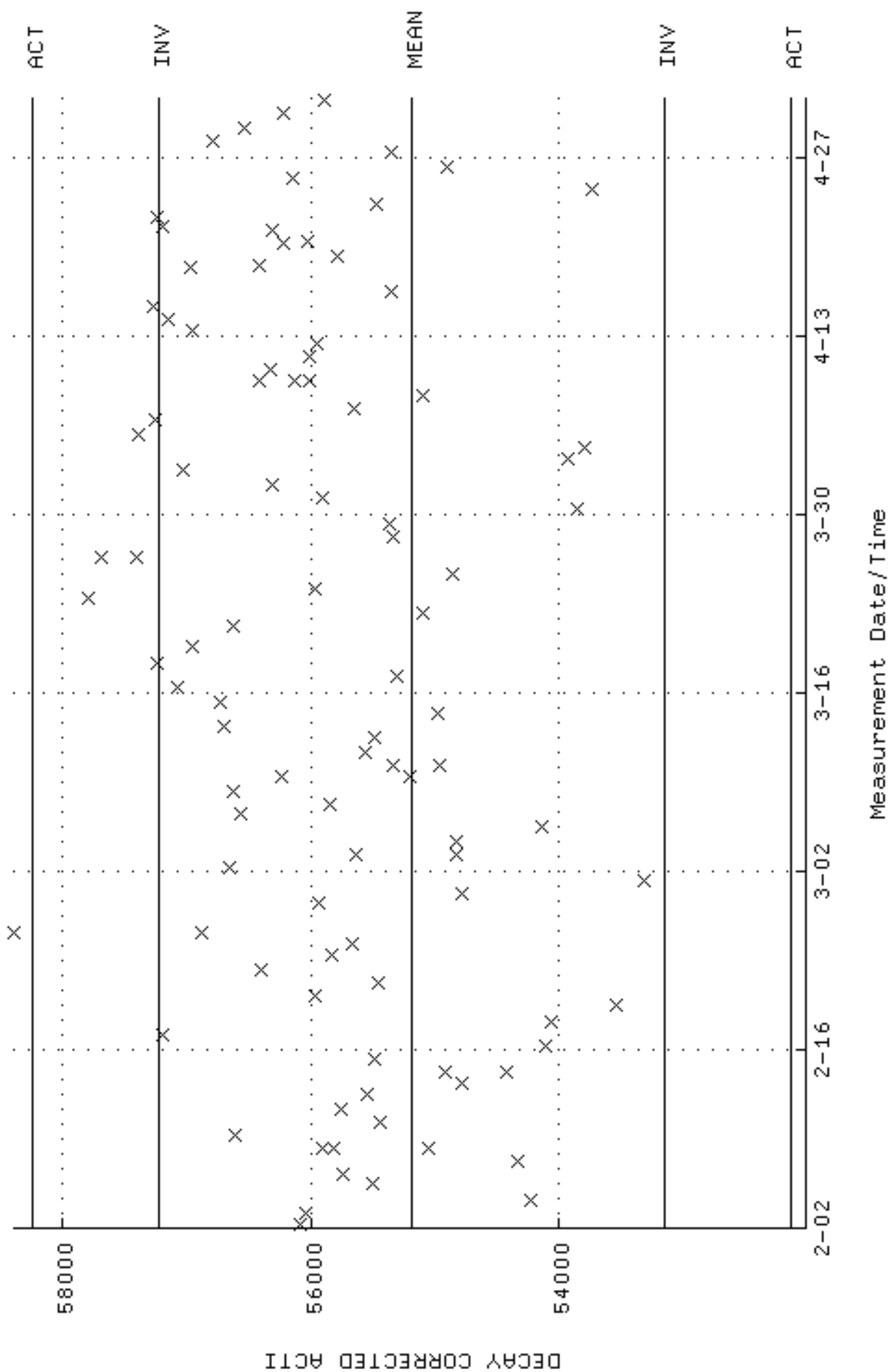
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM45_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-FEB-2022 07:29:09 through 1-MAY-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



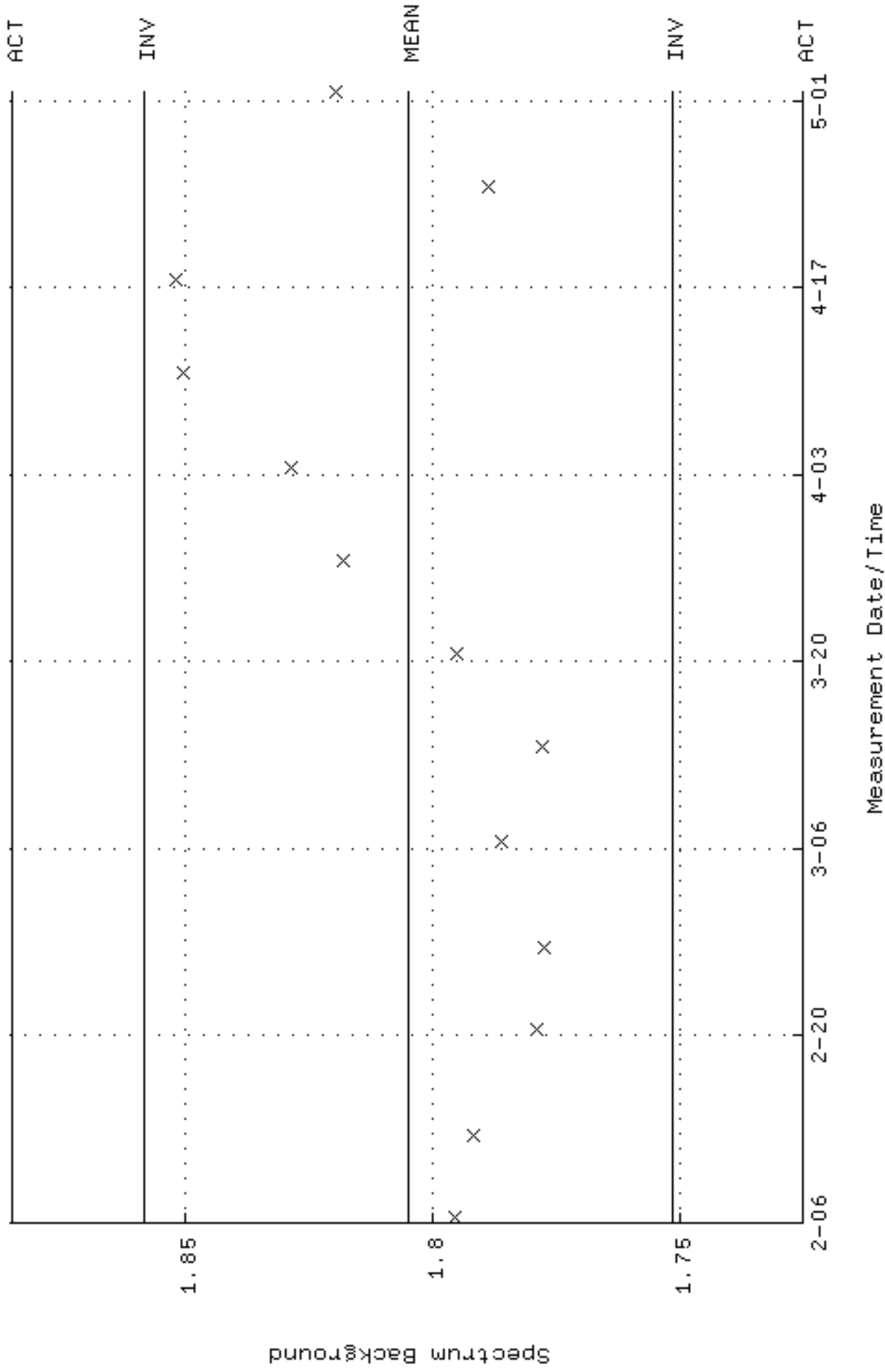
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM45_CAN.QAF;1
 Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
 Start/End Dates : 2-FEB-2022 07:29:09 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 0.991965 +- 6.235033E-02 (6.29 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM45_CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-FEB-2022 07:29:09 through 1-MAY-2022 12:00:00
 Mean +- Std Dev : 55195.2 +- 1018.13 (1.84 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM45.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-FEB-2022 11:17:02 through 1-MAY-2022 12:00:00
Mean +- Std Dev : 1.80494 +- 2.664484E-02 (1.48 %)



RAD Standards Traceability

1298

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

78962-278
200 mL Solid in 250 mL PP MRP Jar

Customer: GEL Laboratories, LLC

P.O. No.: 88007 RD, Item 1

Calibration Date: 01-Jan-2009

12:00 EST

Grams of Master Source: 0.0068241

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* yps/gram	This Source yps	Uncertainty, %			Calibration Method
					Type	u _A	u _F	U
Pb-210	46.5	8145.1	—	1.305E+03	0.30	1.50	3.06	4π LS
Am-241	59.5	157860	—	7.746E+02	0.3	1.5	3.1	4π LS
Cd-109	88.0	462.60	1.694E+05	1.156E+03	0.6	1.7	3.6	HPGe
Co-57	122.1	271.79	8.597E+04	5.867E+02	0.7	1.3	3.0	HPGe
Ce-139	165.9	137.6	1.217E+05	8.305E+02	0.5	1.1	2.4	HPGe
Hg-203	279.2	46.61	2.692E+05	1.837E+03	0.5	1.1	2.4	HPGe
Sn-113	391.7	115.1	1.709E+05	1.166E+03	0.6	1.1	2.5	HPGe
Cs-137	661.7	10983	1.071E+05	7.309E+02	0.7	1.2	2.8	HPGe
Y-88	898.0	106.6	4.084E+05	2.787E+03	0.7	1.1	2.6	HPGe
Co-60	1173.2	1925.4	2.084E+05	1.422E+03	0.8	1.1	2.7	HPGe
Co-60	1332.5	1925.4	2.086E+05	1.424E+03	1.0	1.1	3.0	HPGe
Y-88	1836.1	106.6	4.320E+05	2.948E+03	0.8	1.1	2.7	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

This standard will expire one year after the calibration date.

Source Prepared by:

W. Mao, Radiochemist

QA Approved:

D. M. Montgomery, QA Manager

Date:

2-10-07

End of Certificate

RC-S-051-017

Standard Logbook

Serial ID: 1298 Open/Reference Date: 01-JAN-09 Aliquot : 1 mL
Name: Mixed Gamma LCS JAR Received: 12-FEB-09 Density : Hand Calculated
Type: Source Material Expires: 01-JAN-35 Lot Number : 78962-278
Employee: Maggie Stamps Verified: 07-NOV-11
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

Verification for Mixed Gamma Standard

1298

JAR

M. Stamps 11/7/2011	Isotope Am-241	Result pCi/L	Isotopic Abundance: Certificate Value (dps):
	Mixed Gamma N1	60560	0.359
	Mixed Gamma N2	56920	774.6
	Mixed Gamma N3	59450	

Mean Value (Counting) =	58976.67	pCi/L	101.1344	Pass
Stdev =	1865.592	pCi/L		Rule 3 (Pass/Fail)
Certificate Value =	58315.1	pCi/L		
Lower Limit =	55245.48276	pCi/L		
Upper Limit =	62707.85057	pCi/L		
Rule 1 Pass/Fail	Pass			
Two sigma =	3731.183905			
10 % of Mean =	5897.666667			
Rule 2 (Pass/Fail)	Pass			

Stamp
11/7/11
R. F. Smith
11/18/11

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard 1298 JAR

M. Stamps 11/7/2011	Isotope Cs-137	Result pCi/L	Isotopic Abundance: Certificate Value (dps):	0.851 730.9
	Mixed Gamma N1	24390		
	Mixed Gamma N2	24610		
	Mixed Gamma N3	24450		
Mean Value (Counting) =	24483.33	pCi/L	105.4736	
Stdev =	113.725	pCi/L		
			Fail	
			Rule 3 (Pass/Fail)	

*Exception taken due to the high uncertainty of the certified value

Certificate Value =
 Lower Limit =
 Upper Limit =
 Rule 1 Pass/Fail
 Two sigma =
 10 % of Mean =
 Rule 2 (Pass/Fail)

*exception taken due to full recovery of standard

Handwritten signature: J. Stamps
 11/7/11

Handwritten signature: R. Futch
 11/8/11

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard

1298

JAR

M. Stamps
11/7/2011

Isotope
Co-60 (1332.50)
Mixed Gamma N1
Mixed Gamma N2
Mixed Gamma N3

Result
pCi/L
41290
40800
41060

Isotopic Abundance:
Certificate Value (dps):
0.9998
1424

Mean Value (Counting) =
Stdev =

41050.00
245.153

pCi/L
pCi/L

Fail
Rule 3 (Pass/Fail)

*Exception taken due to the high uncertainty of the certified value

Certificate Value =
Lower Limit =
Upper Limit =
Rule 1 Pass/Fail
Two sigma =
10 % of Mean =
Rule 2 (Pass/Fail)

38494.2
40559.69397
41540.30603
Fail
490.3060269
4105
Pass

pCi/L
pCi/L
pCi/L

*exception taken due to full recovery of standard

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

J. Stamps
11/7/11

R. Fatch
11/8/11

Standard Logbook

Serial ID: 1298 **Open/Reference Date:** 01 JAN 2009 **Aliquot :** 1 mL
Name: Mixed Gamma LCS JAR **Received:** 12 FEB 2009 **Density :** Hand Calculated
Type: Source Material **Expires:** 01 JAN 2035 **Lot Number :** 78962-278
Employee: Maggie Stamps **Verified:** 07 NOV 2011
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

Runlogs

Instrument Run Log

Instrument Type: GAMMA SPECTROMETER

Batch ID: 2264689

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
579287001	SAMPLE	RXF2	GAM14	MAY-17-22 07:56:16	DONE JAR		09-MAY-22 00:00
579287002	SAMPLE	RXF2	GAM24	MAY-17-22 07:56:54	DONE JAR		06-JUL-21 00:00
579287003	SAMPLE	RXF2	GAM33	MAY-17-22 07:57:56	DONE JAR		27-JUL-21 00:00
579287004	SAMPLE	RXF2	GAM38	MAY-17-22 07:58:19	DONE JAR		22-APR-22 00:00
579287005	SAMPLE	RXF2	GAM40	MAY-17-22 07:59:24	DONE JAR		13-OCT-21 00:00
579289001	SAMPLE	RXF2	GAM43	MAY-17-22 07:59:56	DONE JAR		22-MAR-22 00:00
579289002	SAMPLE	RXF2	GAM45	MAY-17-22 08:00:33	DONE JAR		28-FEB-22 00:00
579289003	SAMPLE	RXF2	GAM03	MAY-17-22 09:21:15	DONE JAR		20-APR-22 00:00
1205089187	MB	RXF2	GAM17	MAY-17-22 09:21:48	DONE JAR		06-DEC-21 00:00
1205089189	LCS	RXF2	GAM30	MAY-17-22 09:22:49	DONE JAR		27-SEP-21 00:00
1205089188	DUP	RXF2	GAM24	MAY-17-22 10:06:23	DONE JAR		06-JUL-21 00:00

Gas Flow Raw Data

Batch 2269288 Check-list

This check-list was completed on 27-MAY-22 by Rhonda Birch

This batch was reviewed by Kenshalla Oston on 27-MAY-22 and Rhonda Birch on 27-MAY-22.

Batch ID:
2269288

Product:
GFC90SRF

Description: Gas Flow Strontium 90
GL-RAD-A-004

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
8	Are there any equilibrium assumptions?		No	
Quality Control (QC) Information				
9	Was the method blank (MB) within the acceptance criteria?	Yes		
10	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
11	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Strontium-90 in Filter

Batch ID: 2269288

Analyst: Kaitlyn Painter (KP1)

Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified

Lab SOP: GL-RAD-A-004 REV# 22

Instrument: No instrument-manual method

Due Dates for Lab: 04-JUN-2022

Package: 06-JUN-2022

SDG: 07-JUN-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205098590	Strontium-90 SPIKE	1943-C	.1	mL
LCSD	1205098591	Strontium-90 SPIKE	1943-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Initial Wt (g)	Final Wt (g)	Net Weight (mg)	Sr Separation (date)	Strontium Carrier Yield (percent)
1	579287001	25-MAY-2022	3	30	0.11118	0.0351	0.0392	4.1	05/26/22 11:13	97
2	579287002	25-MAY-2022	3	30	0.11549	0.0359	0.0399	4	05/26/22 11:13	94
3	579287003	25-MAY-2022	3	30	0.11403	0.0356	0.0387	3.1	05/26/22 11:13	73
4	579287004	25-MAY-2022	3	30	0.11518	0.0355	0.0384	2.9	05/26/22 11:13	68
5	579287005	25-MAY-2022	3	30	0.11218	0.0356	0.0393	3.7	05/26/22 11:13	87
6	579289001	25-MAY-2022	3	30	0.11084	0.0354	0.0395	4.1	05/26/22 11:13	97
7	579289002	25-MAY-2022	3	30	0.1135	0.0357	0.0396	3.9	05/26/22 11:13	92
8	579289003	25-MAY-2022	3	30	0.11151	0.0352	0.0394	4.2	05/26/22 11:13	99
9	1205098589 MB	25-MAY-2022	3		0.11549	0.0355	0.0387	3.2	05/26/22 11:13	75
10	1205098590 LCS	25-MAY-2022	3		0.11549	0.0357	0.0393	3.6	05/26/22 11:13	85
11	1205098591 LCSD	25-MAY-2022	3		0.11549	0.035	0.0388	3.8	05/26/22 11:13	90

Reagent/Solvent Lot ID	Description	Amount
CARR 3426335	Strontium Carrier 0.5mL=4.24 mg/mL	.5 mL
REGNT 3089697.1	Thymol Blue Indicator 0.04%	1 mL
REGNT 3385163	80% ethanol	3 mL
REGNT 3432260	RGF-0.05M Nitric Acid	15 mL
REGNT 3435861	0.75M Sodium Carbonate	13 mL
REGNT 3437363	3M HNO3 0.05M Oxalic	10 mL
REGNT 3438632	2265975	2 g
REGNT 3440334	RGF-6M Sodium Hydroxide	10 mL
REGNT 3441263	RGF-8M Nitric Acid	40 mL

Comments:

Spike Pipet ID: RAD-GFC-1795419
Carrier Pipet ID: RAD-GFC-2154115
Data Entry Date2: 25-MAY-2022 13:54 GFC-C045440487 Kaitlyn Painter
Data Entry Date3: 25-MAY-2022 00:00

Strontium-90 Filter

Filename : SR90.XLS
 File type : Excel
 Version # : 1.3.10

Carrier S/N : 3426335
 Carrier Exp Date : 4/15/2023
 Carrier Volume Added: 0.50
 Carrier Weight (mg/ml): 8.48
 Carrier Weight StDev.: 0.05

Batch : 2269288
 Analyst : KAI02410
 Prep Date : 5/25/2022
 Method Uncertainty : 0.1315

Procedure Code : GFC90SRF
 Parmname : Strontium-90
 Required MDA : 3 pCi/F
 Sr-90 Abundance : 1.00
 Halflife of Sr-90 : 28.90 years
 Halflife of Y-90 : 64.053 hours

Geometry: Tuffryn Filter

Sample Characteristics					Carrier Calculations				
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Carrier Weight (mg) (Standard)	Net Weight (mg) (Sample)	Net Weight StDev. (mg)	Carrier Aliquot (mL)	Carrier Aliquot StDev. (mL)
1	579287001.1	0.1112	1.2035E-05	3/29/2022 13:03	8.48	4.10	0.024952	0.5	0.001000
2	579287002.1	0.1155	1.2280E-05	3/29/2022 13:11	8.48	4.00	0.024522	0.5	0.001000
3	579287003.1	0.1140	1.2198E-05	3/29/2022 13:22	8.48	3.10	0.020654	0.5	0.001000
4	579287004.1	0.1152	1.2263E-05	3/29/2022 13:31	8.48	2.90	0.019794	0.5	0.001000
5	579287005.1	0.1122	1.2093E-05	3/29/2022 9:30	8.48	3.70	0.023233	0.5	0.001000
6	579289001.1	0.1108	1.2015E-05	3/29/2022 12:48	8.48	4.10	0.024952	0.5	0.001000
7	579289002.1	0.1135	1.2168E-05	3/29/2022 12:55	8.48	3.90	0.024092	0.5	0.001000
8	579289003.1	0.1115	1.2054E-05	3/29/2022 9:00	8.48	4.20	0.025382	0.5	0.001000
9	1205098589.1	0.1155	1.2280E-05	5/25/2022 0:00	8.48	3.20	0.021084	0.5	0.001000
10	1205098590.1	0.1155	1.2280E-05	5/25/2022 0:00	8.48	3.60	0.022803	0.5	0.001000
11	1205098591.1	0.1155	1.2280E-05	5/25/2022 0:00	8.48	3.80	0.023662	0.5	0.001000

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-004
 Instrument SOP: GL-RAD-I-016

Count Raw Data											Calculated	Sample
	Detector	Counting		Gross Counts	Gross Beta	Count	Strontium		Yttrium	Sr-90	Sample	Sample
Pos.	ID	Time (min.)	Alpha	Beta	CPM	Start Date/Time	Separation Date/Time		Ingrowth	Decay	Recovery %	Recovery Error %
1	11A	500	19	535	1.066	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	96.7%	1.06%
2	11B	500	27	953	1.902	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	94.3%	1.07%
3	11C	500	10	271	0.540	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	73.1%	1.13%
4	11D	500	40	411	0.817	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	68.4%	1.15%
5	12A	500	22	320	0.636	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	87.3%	1.08%
6	12C	500	21	307	0.612	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	96.7%	1.06%
7	12D	500	28	526	1.048	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	92.0%	1.07%
8	13B	500	14	569	1.136	5/26/2022 19:10	5/26/2022 11:13		0.123	0.996	99.1%	1.06%
9	13D	500	15	295	0.587	5/26/2022 19:10	5/26/2022 11:13		0.123	1.000	75.5%	1.12%
10	8A	60	7	1610	26.828	5/27/2022 10:47	5/26/2022 11:13		0.229	1.000	84.9%	1.09%
11	8D	60	10	1257	20.945	5/26/2022 16:27	5/26/2022 11:13		0.060	1.000	89.6%	1.08%

Calibration Data										
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)		Detector Efficiency Error (cpm/dpm)	Alpha X-Talk	Weekly Bkg CPM	Weekly Bkg Count Start Date/Time	Weekly Bkg Count Time (min.)
1	PIC	4/1/2021	3/31/2023	0.3496	0.4832	0.01317	0.11594	1.088	5/20/2022 19:05	500
2	PIC	4/1/2021	3/31/2023	0.3542	0.5237	0.00697	0.06801	1.672	5/20/2022 19:06	500
3	PIC	4/1/2021	3/31/2023	0.3534	0.5143	0.01278	0.08535	0.640	5/20/2022 19:06	500
4	PIC	4/1/2021	3/31/2023	0.3513	0.5255	0.01068	0.06004	0.816	5/20/2022 19:06	500
5	PIC	4/1/2021	3/31/2023	0.3515	0.5038	0.01964	0.09257	0.526	5/20/2022 19:06	500
6	PIC	4/1/2021	3/31/2023	0.3501	0.5175	0.01666	0.05110	0.594	5/20/2022 19:06	500
7	PIC	4/1/2021	3/31/2023	0.3509	0.5179	0.01845	0.06858	0.908	5/20/2022 19:06	500
8	PIC	4/1/2021	3/31/2023	0.3524	0.5164	0.00967	0.05916	0.970	5/20/2022 19:07	1000
9	PIC	4/1/2021	3/31/2023	0.3519	0.5115	0.01144	0.09377	0.688	5/20/2022 19:07	1000
10	PIC	4/1/2021	3/31/2023	0.3563	0.5214	0.01579	0.04450	0.470	5/20/2022 19:06	500
11	PIC	4/1/2021	3/31/2023	0.3666	0.5289	0.00609	0.02999	1.086	5/20/2022 19:06	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1943-C
LCS Exp Date : 1/4/2023
LCS Activity (dpm/ml): 521.97
LCS Volume Added: 0.10

Results																	Scanned Detector
Pos.	Decision Level pCi/F	Critical Level pCi/F	Required MDA pCi/F	MDA pCi/F	Sample Act. Conc. pCi/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/F	2 SIGMA Total Prop. Uncertainty pCi/F	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery	
1	1.5809	1.1161	3	2.2939	-0.2304	292.92%	-0.0224	0.0656	1.3230	1.3230		SAMPLE					
2	1.8895	1.3340	3	2.7274	2.2839	36.73%	0.2303	0.0845	1.6432	1.7467		SAMPLE					
3	1.5346	1.0834	3	2.2449	-1.2979	48.76%	-0.0997	0.0486	1.2396	1.2396		SAMPLE					
4	1.8370	1.2969	3	2.6767	0.0165	4775.38%	0.0012	0.0572	1.5459	1.5459		SAMPLE					
5	1.1939	0.8429	3	1.7528	1.2280	43.91%	0.1099	0.0482	1.0555	1.1042		SAMPLE					
6	1.1582	0.8177	3	1.6966	0.1821	275.07%	0.0179	0.0491	0.9816	0.9827		SAMPLE					
7	1.4670	1.0357	3	2.1341	1.4643	44.68%	0.1402	0.0625	1.2808	1.3377		SAMPLE					
8	1.2372	0.8735	3	1.8060	1.6373	34.26%	0.1663	0.0569	1.0986	1.1782		SAMPLE					
9	1.3190	0.9312	3	1.9373	-1.2562	42.84%	-0.1008	0.0432	1.0540	1.0540		MB					
10	2.1069	1.4875	3	3.4577	254.4655	3.18%	26.3581	0.6694	12.6662	67.9384		LCS			203.5886	125.0%	
11	3.6232	2.5580	3	5.6621	216.8937	3.23%	19.8590	0.5927	12.6869	57.6233		LCSD	15.9%		203.5886	106.5%	

Results (DPM)															
Decision Level DPM/F	Critical Level DPM/F	Required MDA DPM/F	MDA DPM/F	Sample Act. Conc. DPM/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	1 SIGMA Counting Uncertainty DPM/F	1 SIGMA Total Prop. Uncertainty DPM/F	Sample QC	Sample Type	RPD	RER	Nominal DPM/F	Recovery
3.5095	2.4777	6.66	5.0925	-0.5116	292.92%	-0.0224	0.0656	2.9370	2.9370		SAMPLE				
4.1946	2.9614	6.66	6.0549	5.0703	36.73%	0.2303	0.0845	3.6480	3.8777		SAMPLE				
3.4067	2.4052	6.66	4.9838	-2.8813	48.76%	-0.0997	0.0486	2.7519	2.7519		SAMPLE				
4.0781	2.8792	6.66	5.9422	0.0367	4775.38%	0.0012	0.0572	3.4318	3.4318		SAMPLE				
2.6504	1.8712	6.66	3.8913	2.7261	43.91%	0.1099	0.0482	2.3431	2.4514		SAMPLE				
2.5712	1.8153	6.66	3.7664	0.4042	275.07%	0.0179	0.0491	2.1791	2.1817		SAMPLE				
3.2567	2.2993	6.66	4.7377	3.2507	44.68%	0.1402	0.0625	2.8433	2.9696		SAMPLE				
2.7466	1.9391	6.66	4.0093	3.6349	34.26%	0.1663	0.0569	2.4389	2.6156		SAMPLE				
2.9283	2.0674	6.66	4.3007	-2.7888	42.84%	-0.1008	0.0432	2.3398	2.3399		MB				
4.6774	3.3023	6.66	7.6762	564.9134	3.18%	26.3581	0.6694	28.1189	150.8233		LCS			451.97	125.0%
8.0435	5.6788	6.66	12.5699	481.5041	3.23%	19.8590	0.5927	28.1650	127.9236		LCSD	15.9%		451.97	106.5%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
579287001	11A	500	19	535	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
579287002	11B	500	27	953	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
579287003	11C	500	10	271	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
579287004	11D	500	40	411	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
579287005	12A	500	22	320	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
579289001	12C	500	21	307	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
579289002	12D	500	28	526	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
579289003	13B	500	14	569	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
1205098589	13D	500	15	295	5/26/2022 19:10	5/27/2022 3:30	PIC	2269288
1205098590	8A	60	7	1610	5/27/2022 10:47	5/27/2022 11:47	PIC	2269288
1205098591	8D	60	10	1257	5/26/2022 16:27	5/26/2022 17:27	PIC	2269288

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 26-May-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	Above	Beta bkg	26-May 03:43	60	2.417	-2.15E-1	2.577	+2.66
LB4100E2	Above	Alpha bkg	26-May 03:43	60	0.367	-1.22E-1	0.368	+2.98
LB4100E2	Above	Beta bkg	26-May 03:43	60	2.333	1.386	3.015	+0.49
LB4100E2	need 2nd	Beta eff	26-May 05:25	5	14481	14390	15890	-2.64
LB4100E3	Below	Beta XTalk	26-May 06:43	5	1.36E-4	1.38E-4	5.47E-4	-3.03
LB4100F3	Above	Alpha bkg	26-May 03:43	60	0.367	0.119	0.404	+2.22
LB4100G1	Above	Alpha XTalk	26-May 05:10	5	1.131	0.088	0.447	+14.46
LB4100G1	Above	Beta bkg	26-May 03:44	60	9686	0.380	1.675	+44,881.17
LB4100G1	Above	Beta eff	26-May 05:18	5	23058	12880	18320	+8.23
LB4100G2	Above	Alpha eff	26-May 05:10	5	9660	7308	9581	+3.21
LB4100G2	need 2nd	Alpha XTalk	26-May 05:10	5	0.330	0.324	0.423	-2.64
LB4100G2	Above	Beta bkg	26-May 03:44	60	100	1.159	2.203	+565.24
LB4100G3	need 2nd	Alpha eff	26-May 05:10	5	6731	6620	7779	-2.42
LB4100G3	Above	Beta bkg	26-May 03:44	60	6.900	0.810	1.674	+39.29
PIC10B	Above	Beta bkg	26-May 11:41	60	2.083	-1.04E-1	2.645	+1.77
PIC12B	Above	Alpha bkg	26-May 08:30	60	0.633	-4.23E-2	0.379	+6.62

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by



Date

5/31/22

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 27-May-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	need 2nd	Alpha bkg	27-May 03:59	60	0.117	-1.22E-1	0.368	-0.08
LB4100E2	Above	Beta bkg	27-May 03:59	60	2.167	1.386	3.015	-0.12
LB4100F3	Above	Alpha bkg	27-May 03:59	60	0.333	0.119	0.404	+1.51
LB4100F3	Above	Beta bkg	27-May 03:59	60	72.567	0.854	1.842	+432.42
LB4100G1	need 2nd	Alpha XTalk	27-May 05:02	5	0.293	0.088	0.447	+0.42
LB4100G1	Above	Beta bkg	27-May 04:00	60	611	0.380	1.675	+2,827.57
LB4100G1	Above	Beta eff	27-May 05:15	5	24018	12880	18320	+9.28
LB4100G2	Above	Alpha eff	27-May 05:02	5	9648	7308	9581	+3.18
LB4100G2	Above	Beta bkg	27-May 04:00	60	4.550	1.159	2.203	+16.49
LB4100G3	Below	Alpha bkg	27-May 04:00	60	0.00E+0	0.002	0.276	-3.05
LB4100G3	Above	Beta bkg	27-May 04:00	60	6.767	0.810	1.674	+38.37
PIC2D	Above	Alpha bkg	27-May 07:12	60	0.350	-6.13E-2	0.350	+2.99
PIC2D	Above	Beta bkg	27-May 07:12	60	2.483	0.171	2.681	+2.53
PIC6C	Above	Beta bkg	27-May 07:01	60	2.200	0.415	2.299	+2.68
PIC7D	Above	Alpha bkg	27-May 07:01	60	0.350	-1.70E-2	0.435	+1.87
PIC10B	Above	Beta bkg	27-May 07:01	60	2.150	-1.04E-1	2.645	+1.92
PIC12B	Above	Alpha bkg	27-May 07:13	60	0.733	-4.23E-2	0.379	+8.05

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

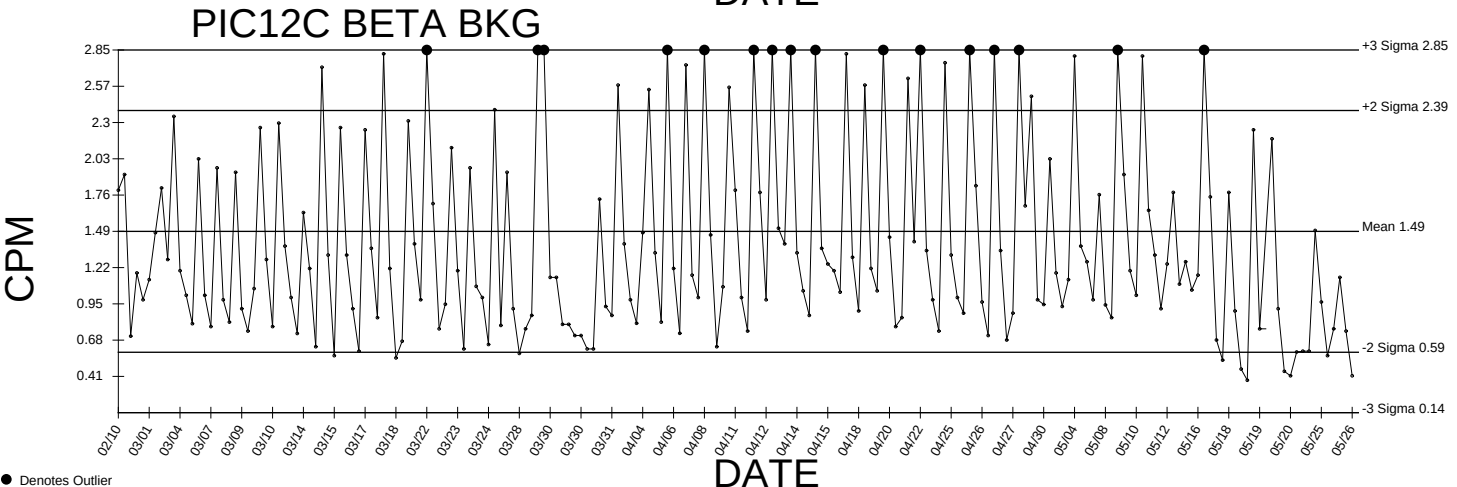
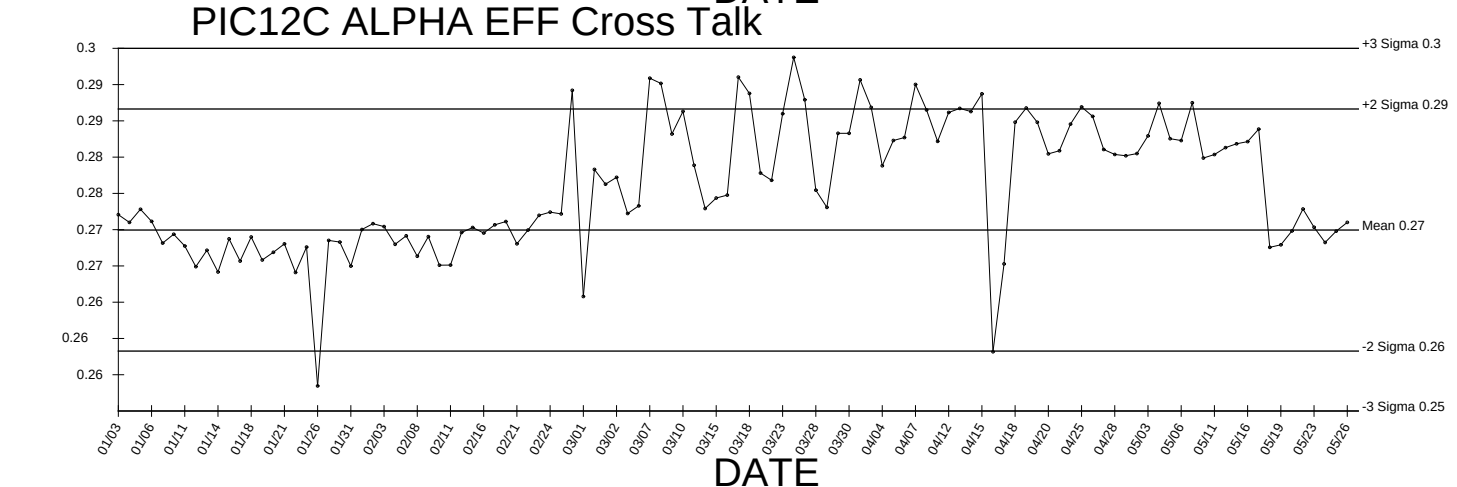
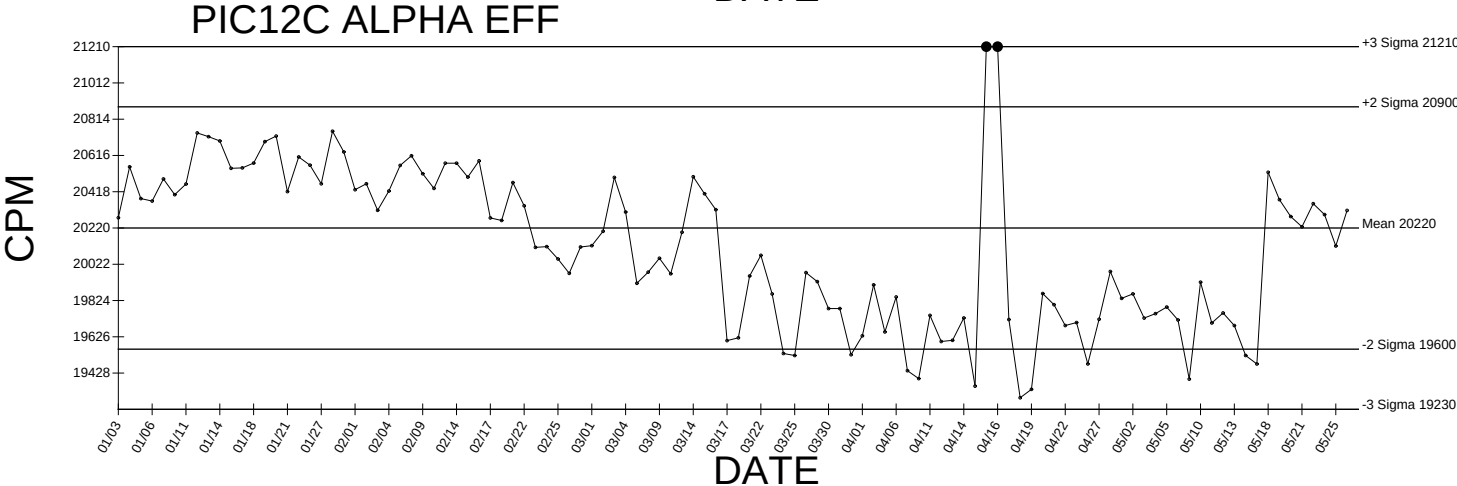
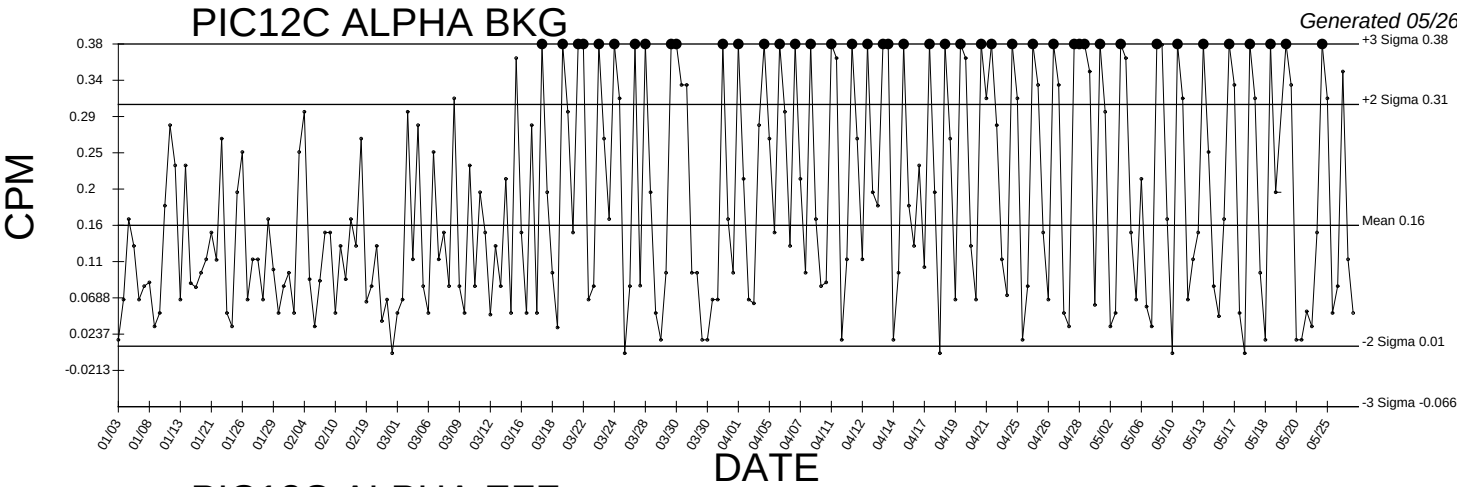
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 LB4100C4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
 LB4100I1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
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 LB4100I3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
 LB4100I4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by James O'Rourke

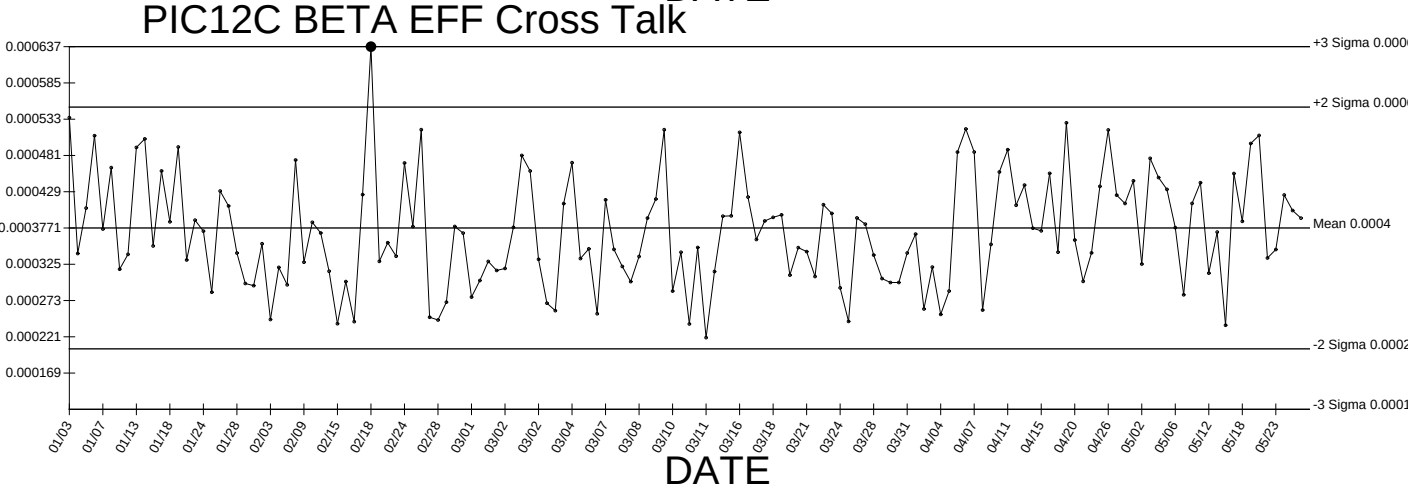
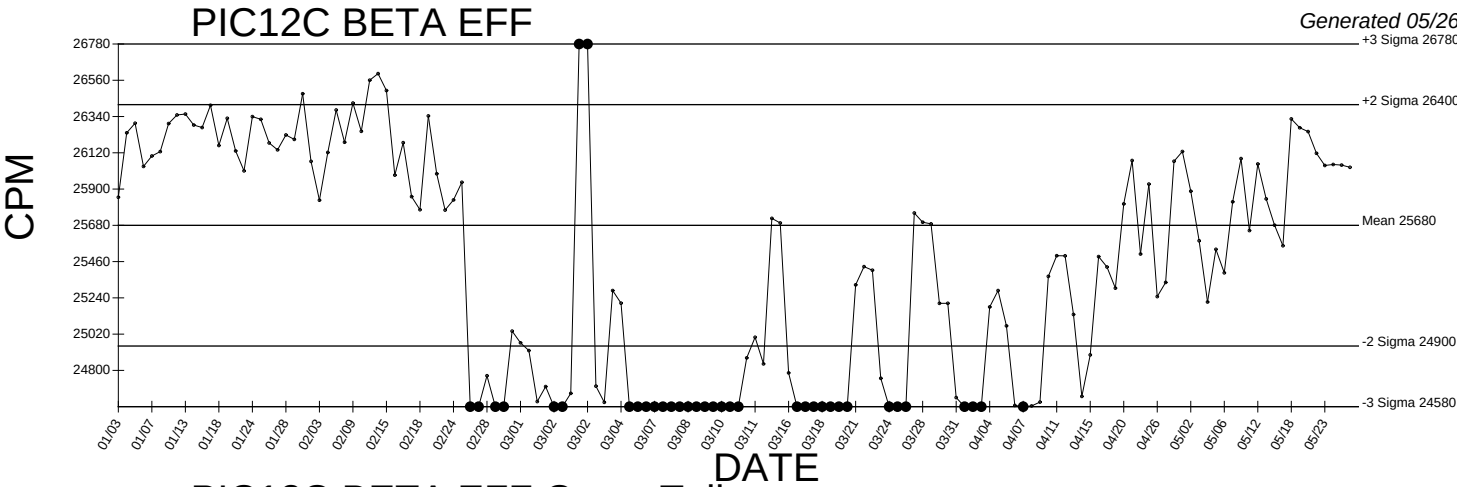
Date 5/27/22

GEL Laboratories LLC

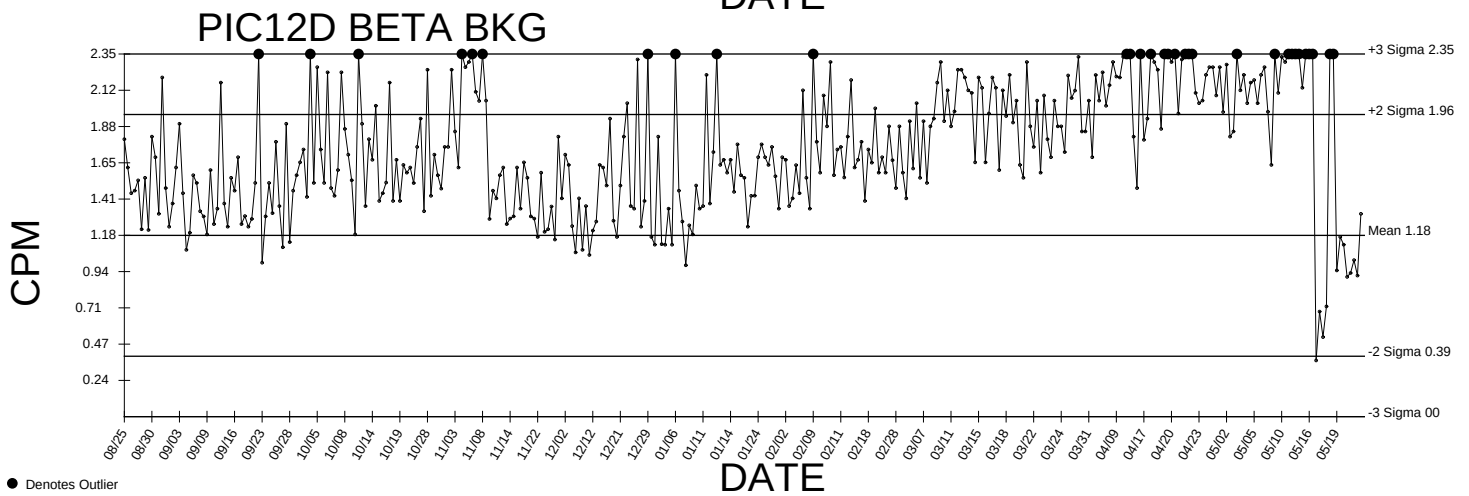
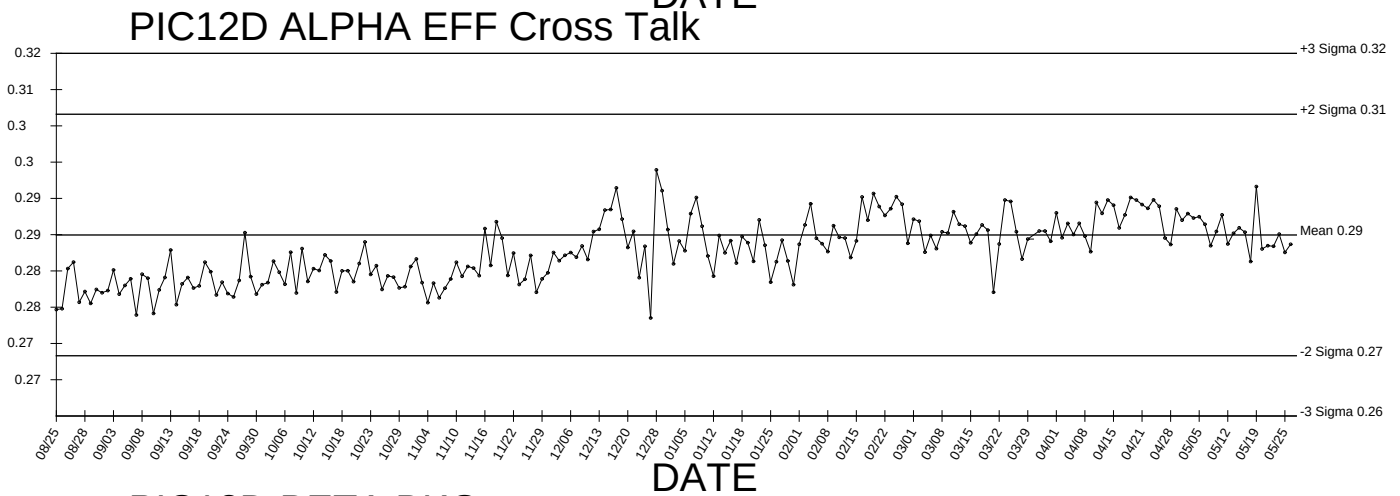
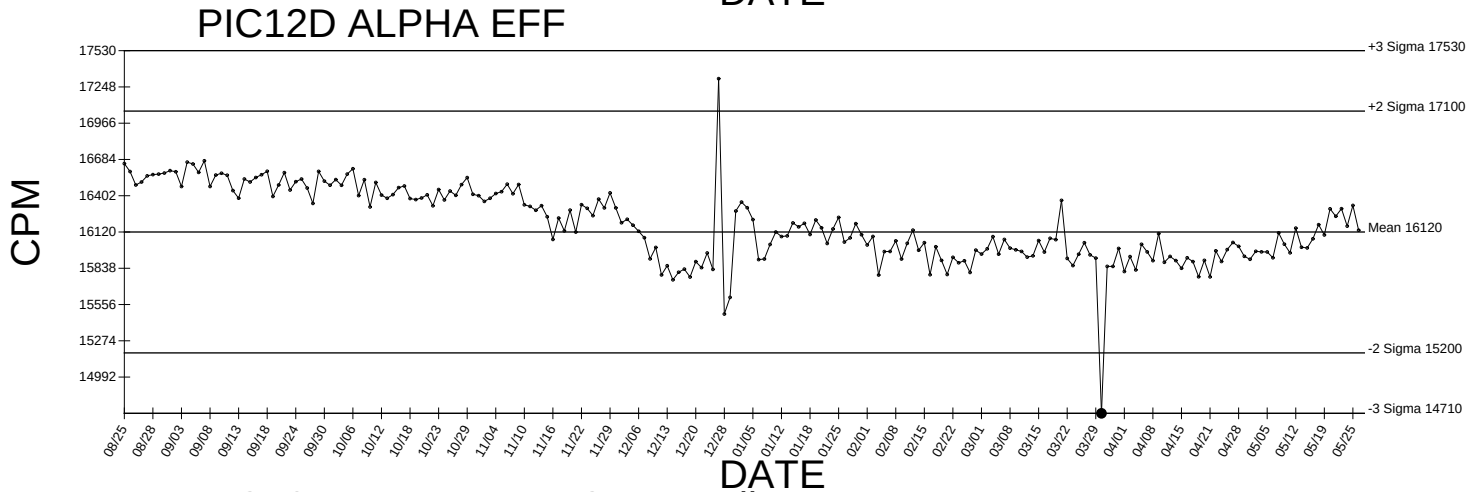
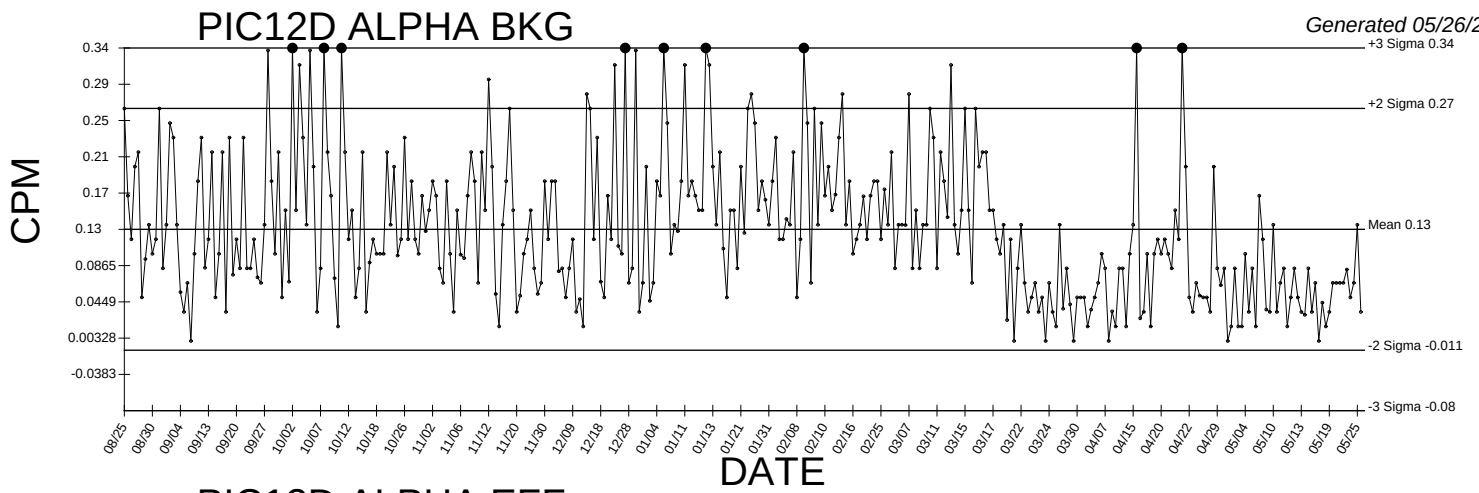
Background and Efficiency Data

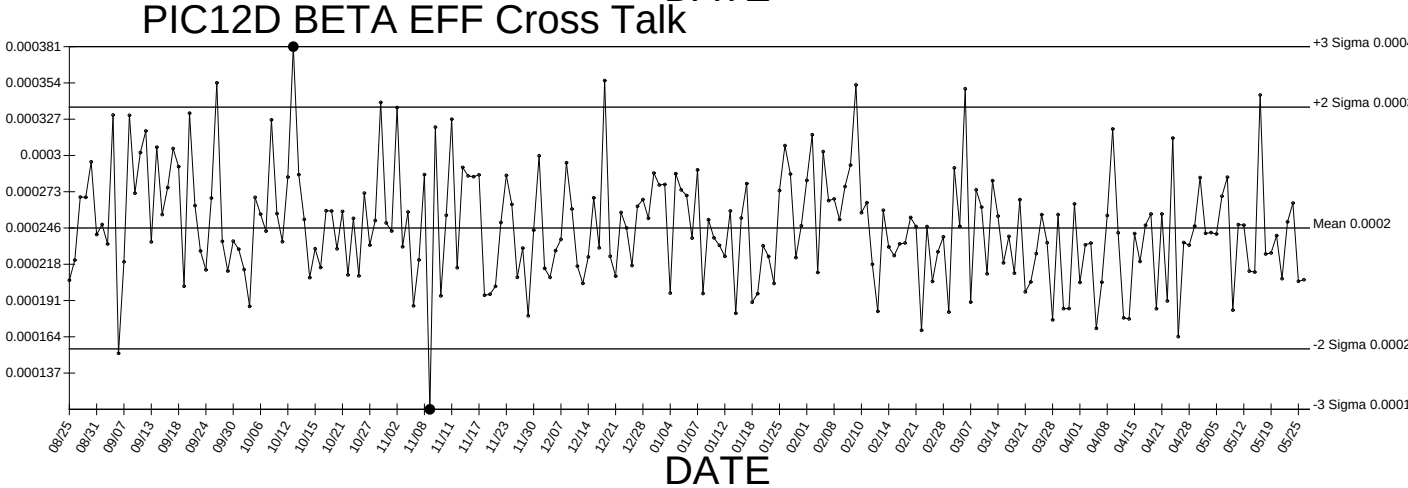
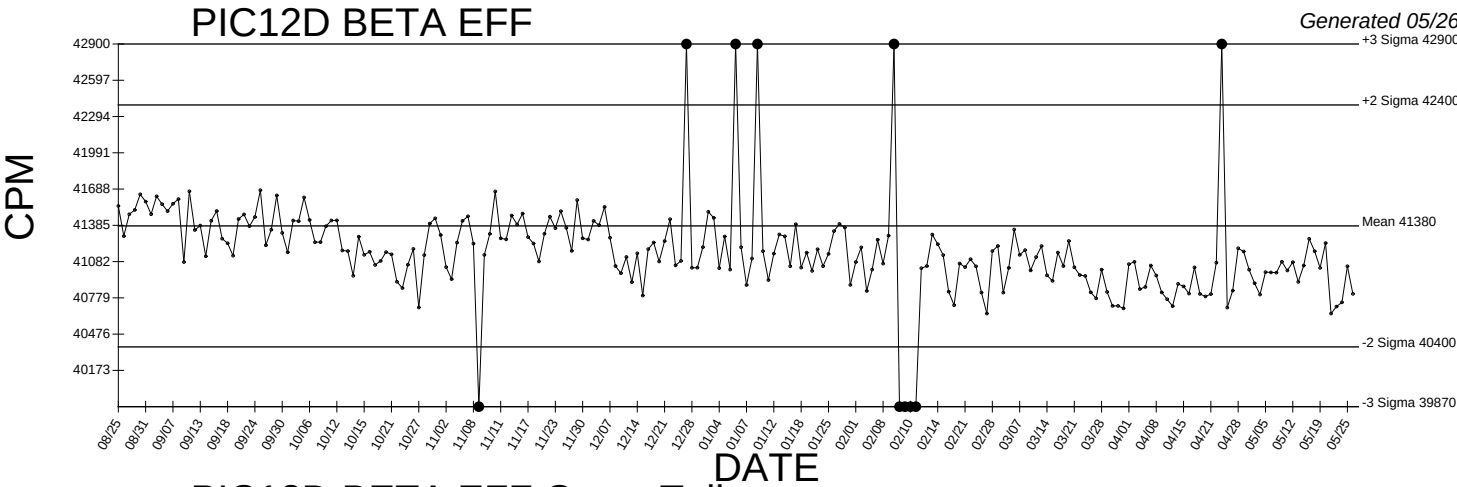


● Denotes Outlier

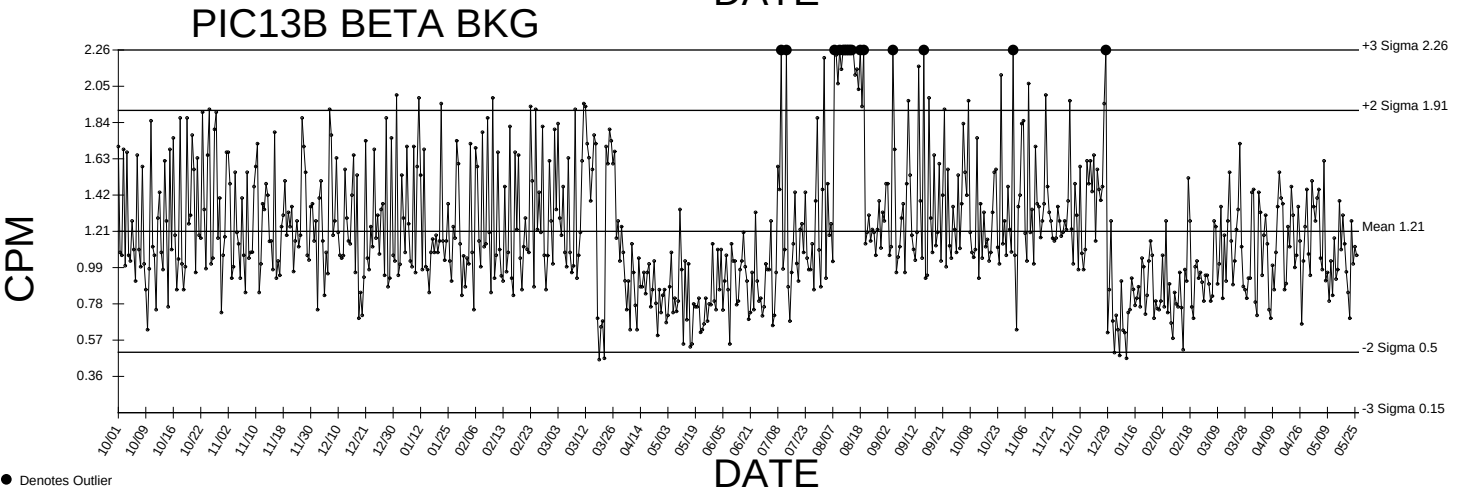
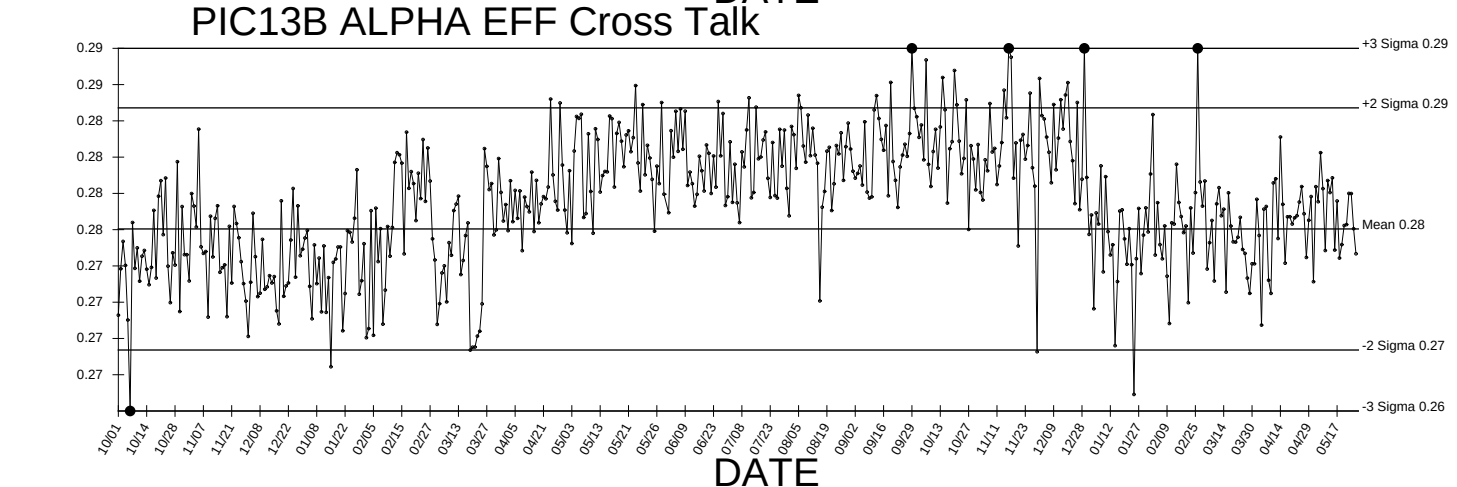
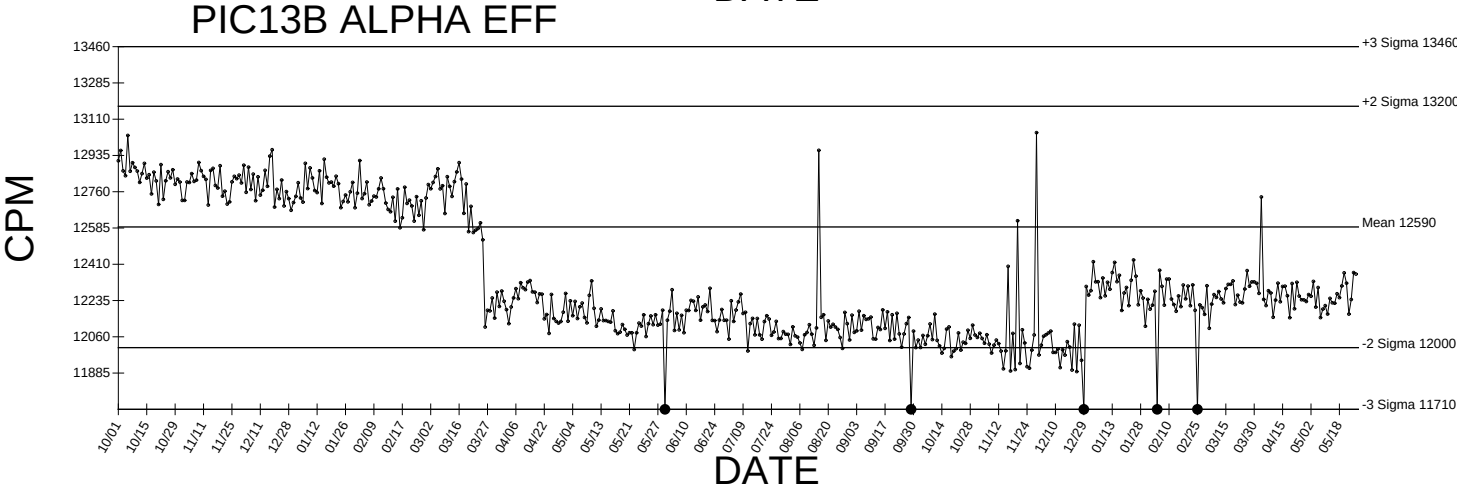
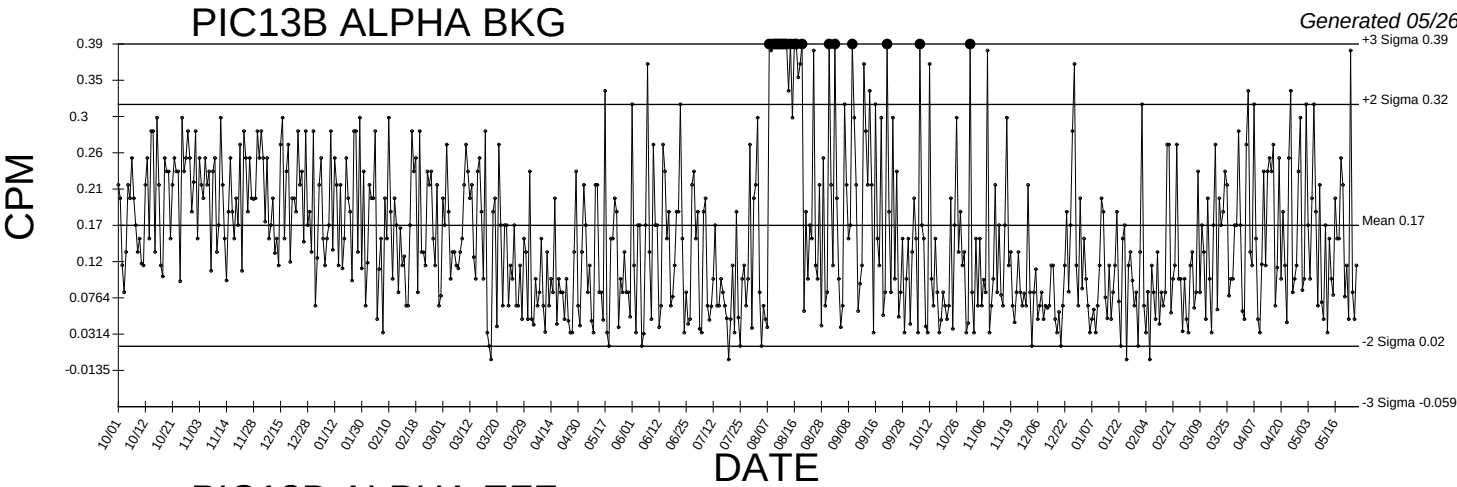


● Denotes Outlier

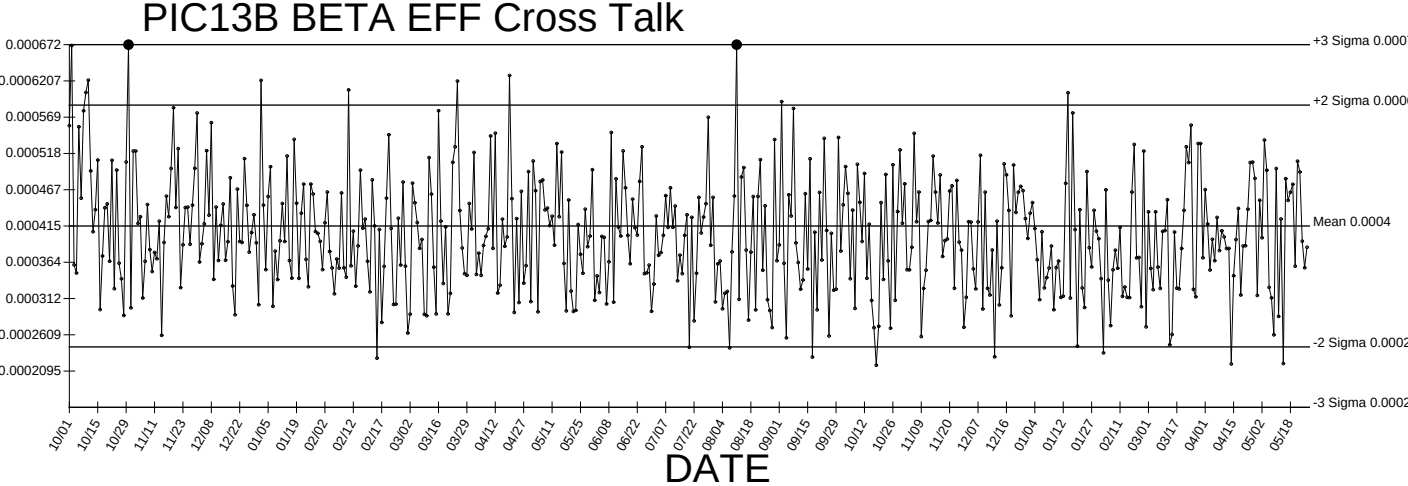
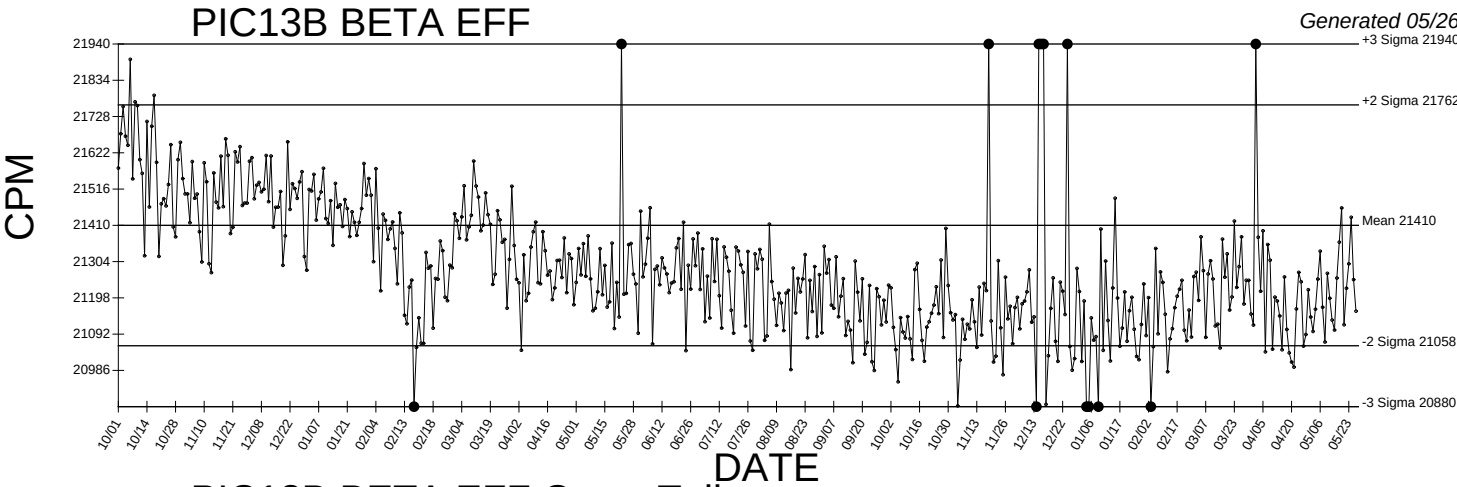




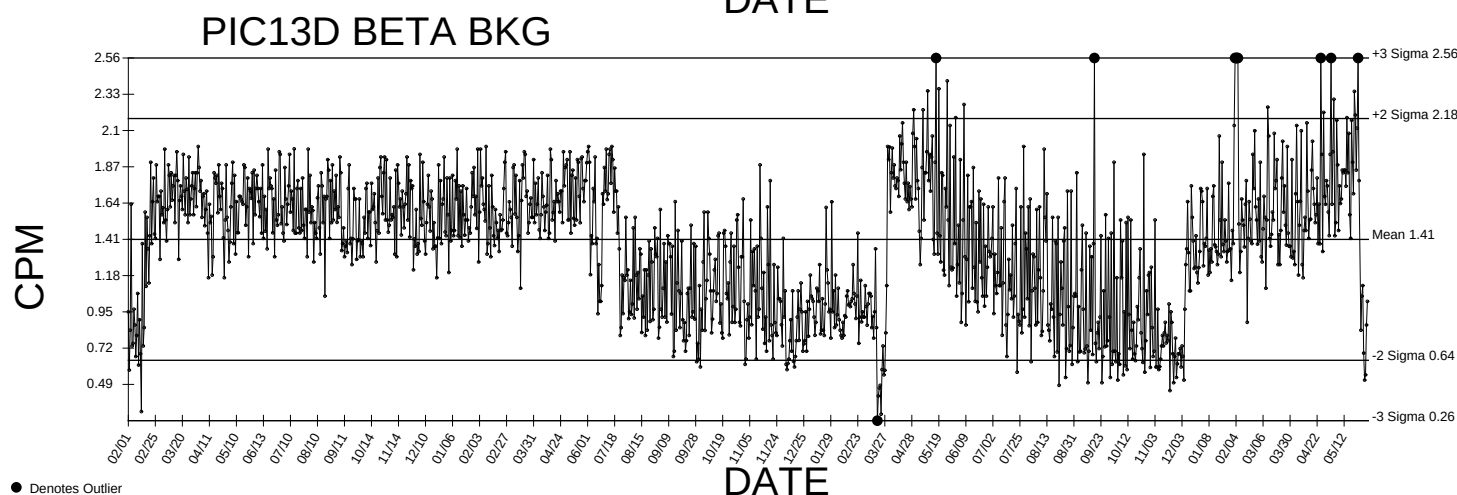
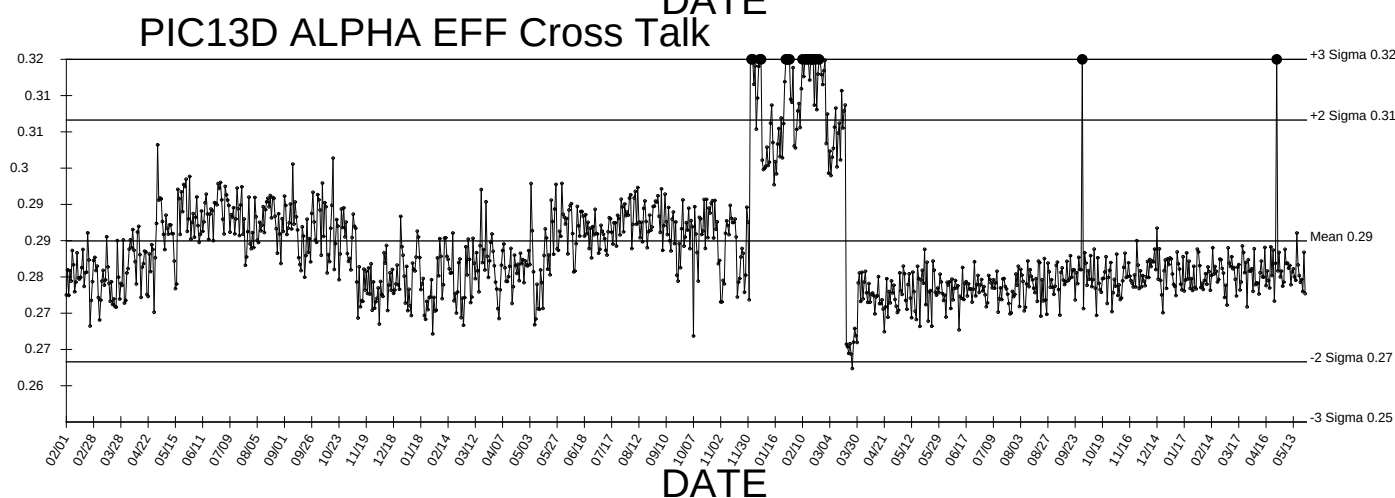
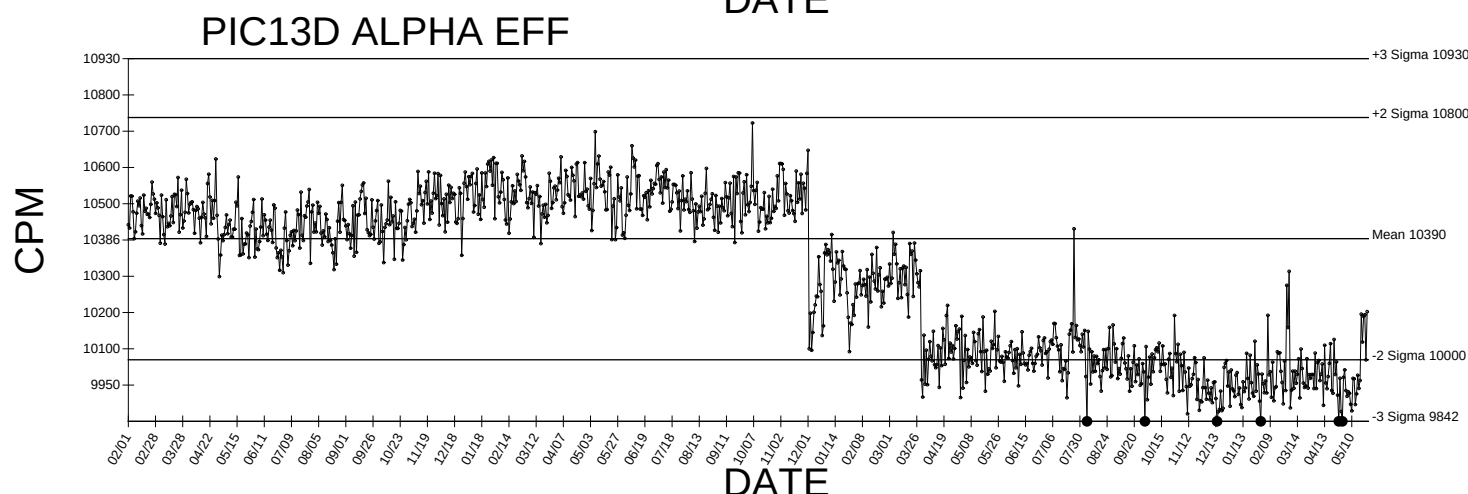
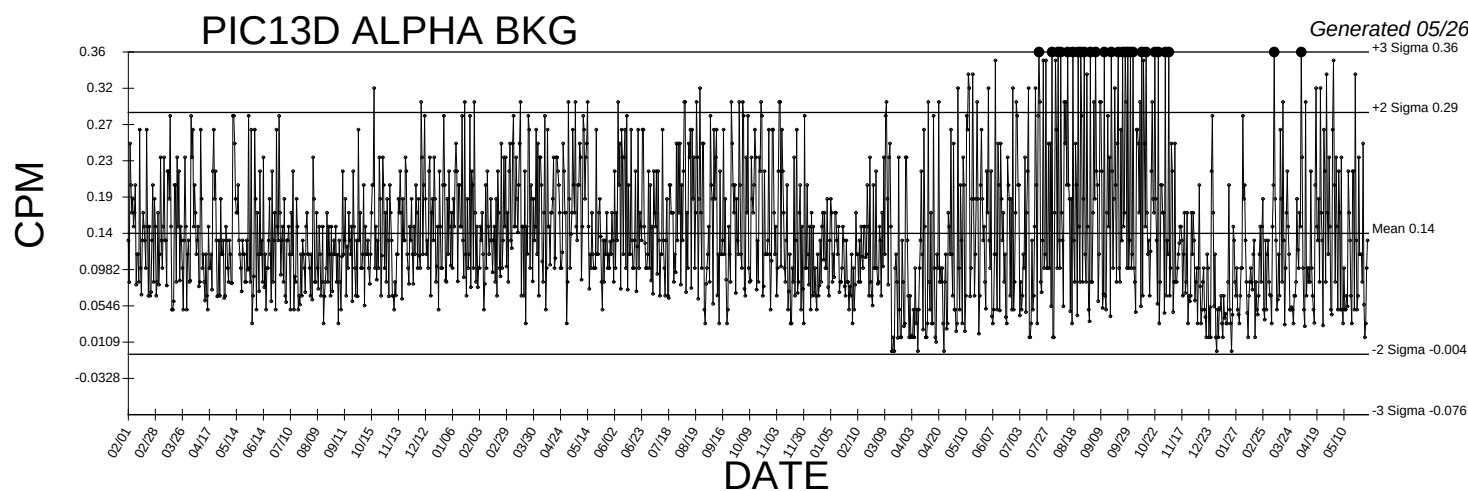
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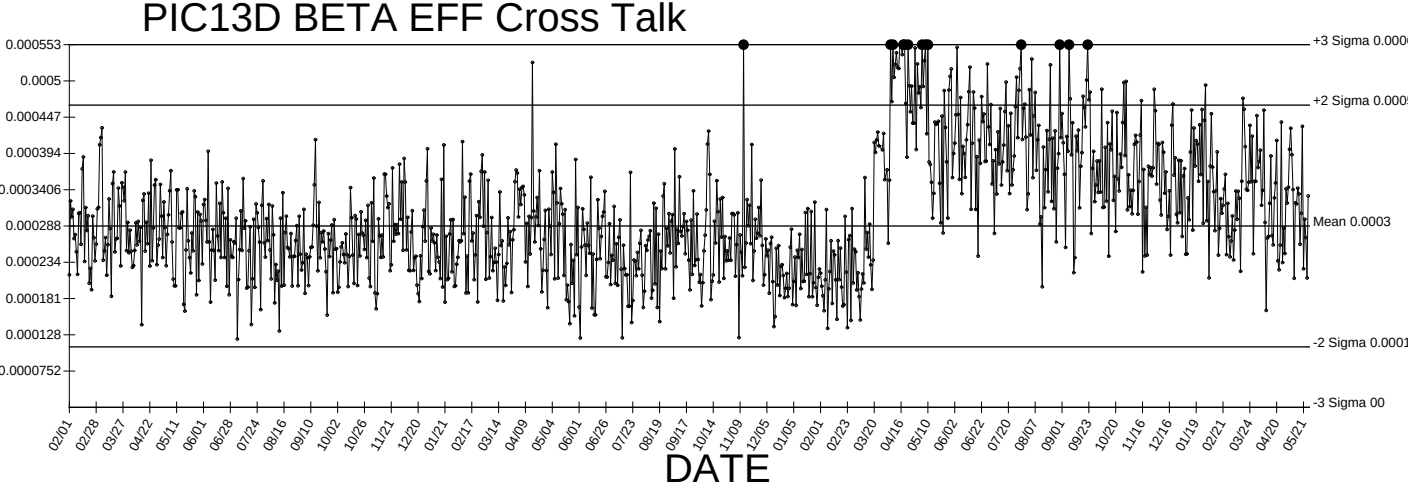
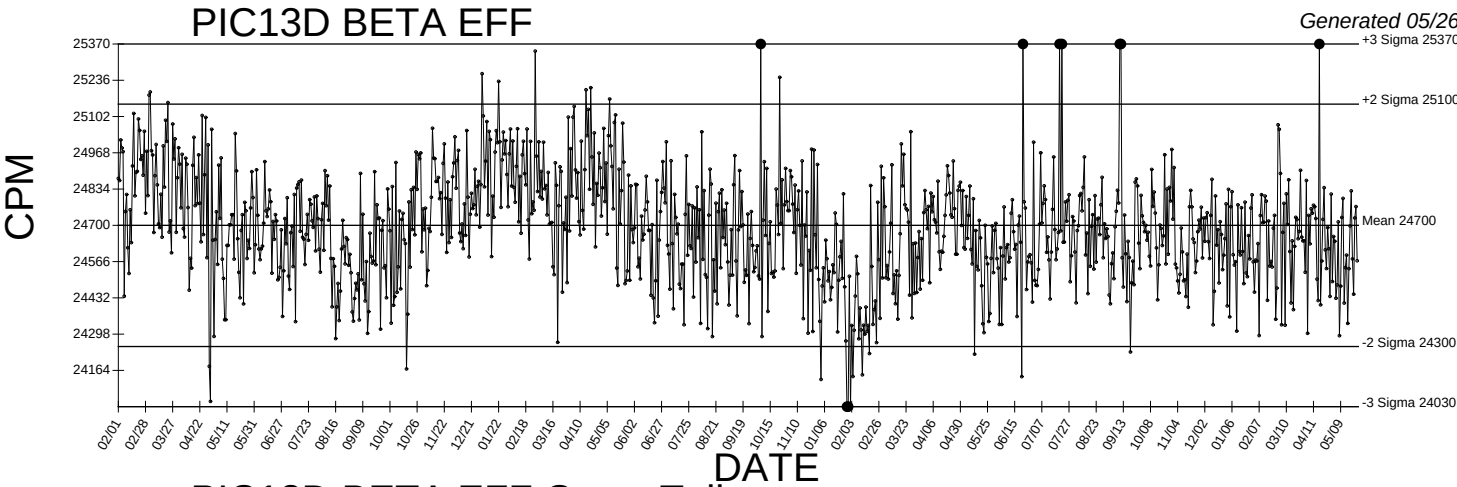
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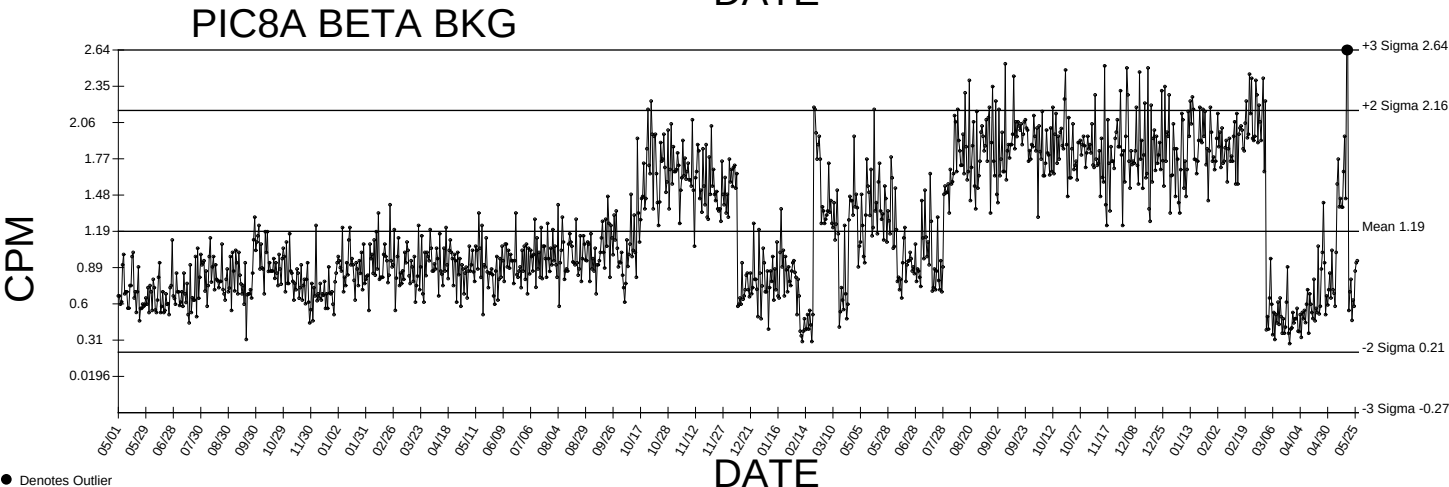
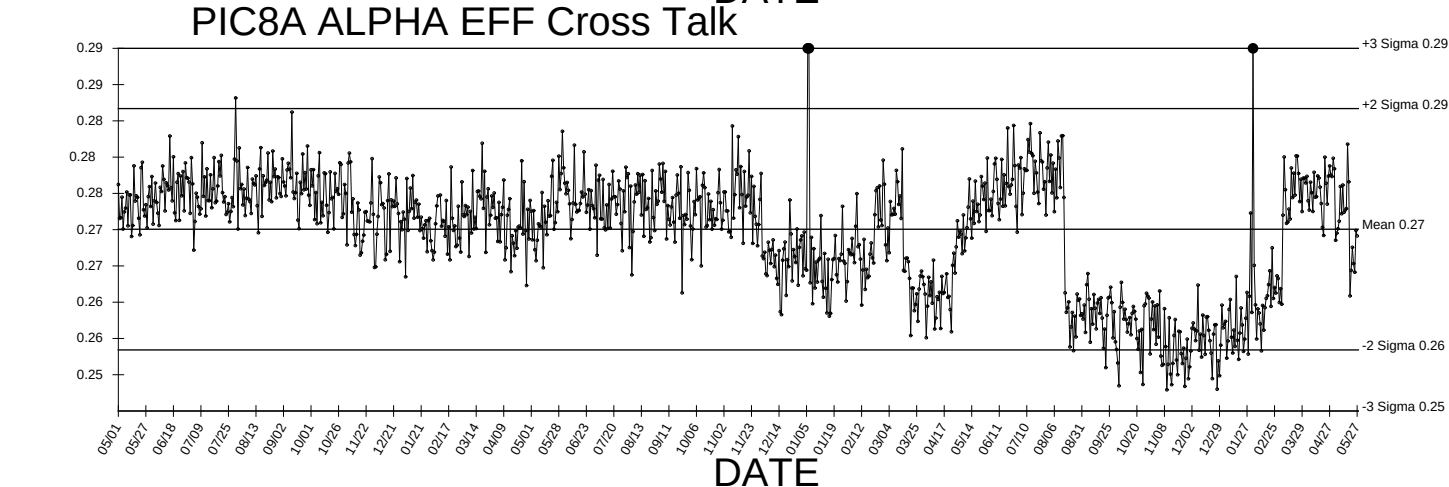
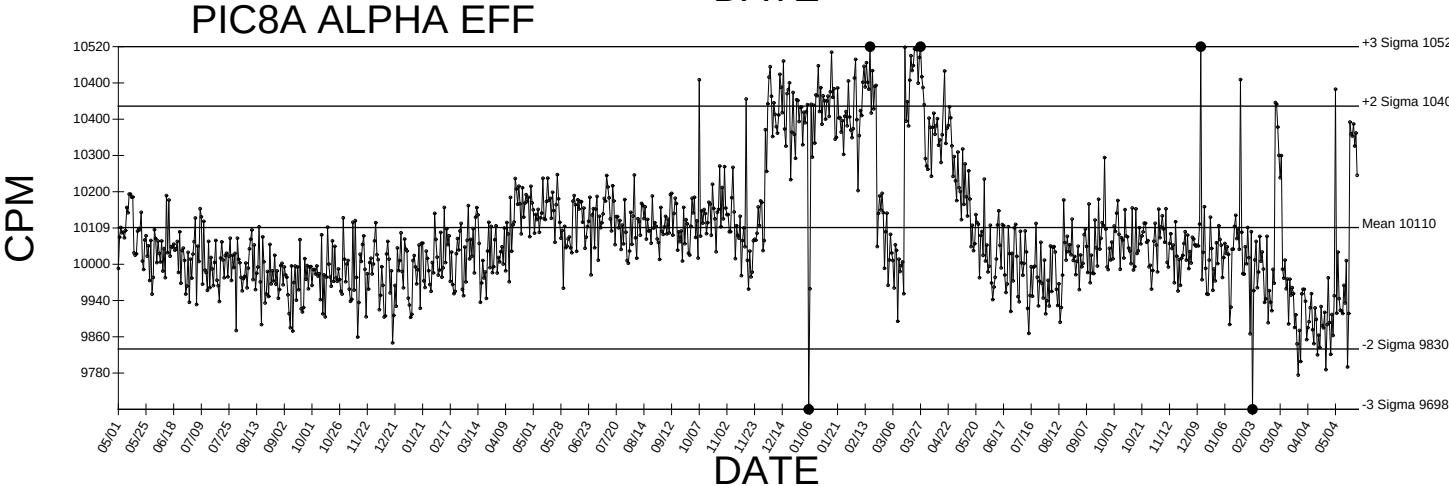
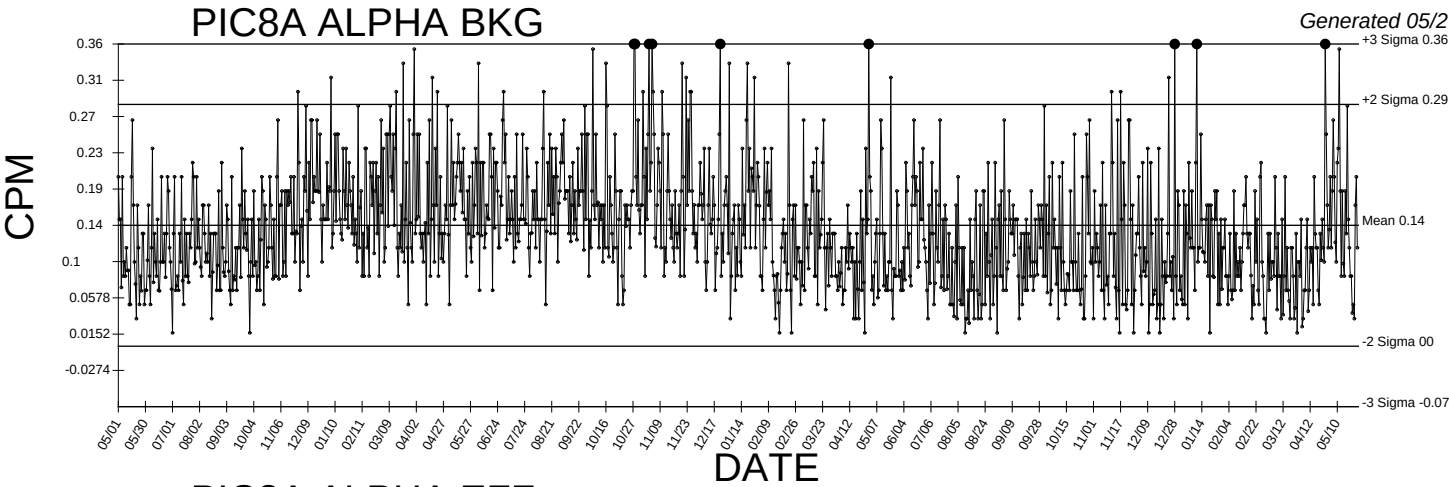
● Denotes Outlier



● Denotes Outlier



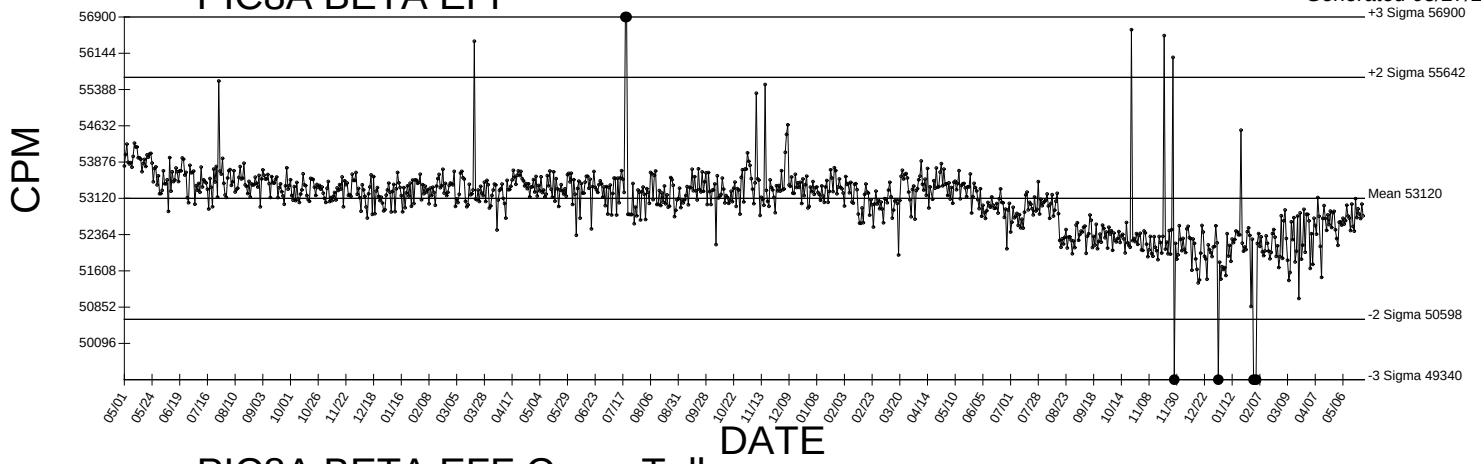
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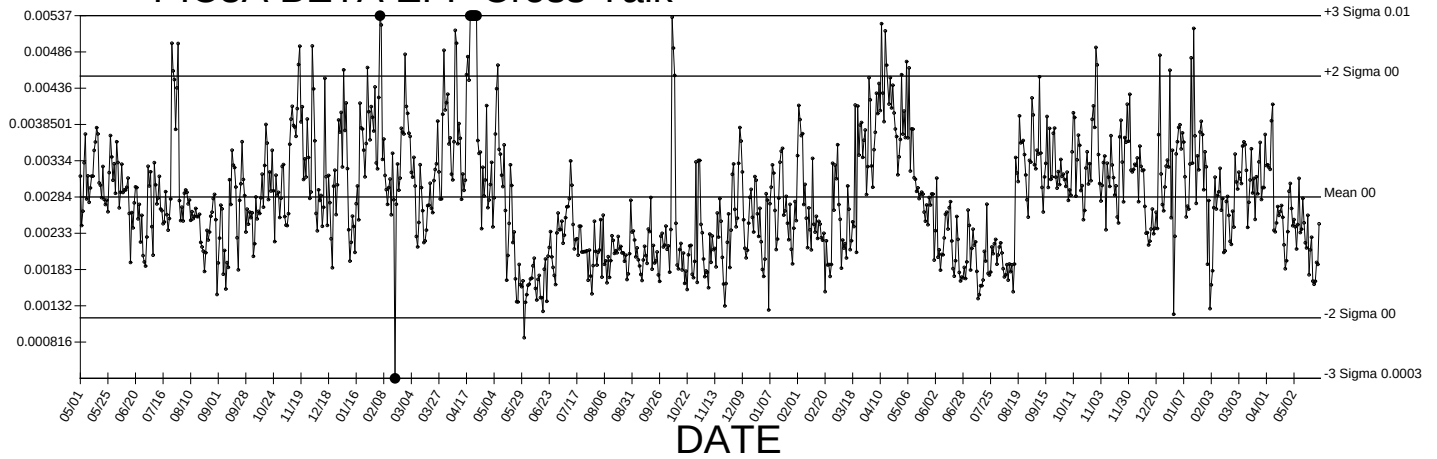
● Denotes Outlier

PIC8A BETA EFF

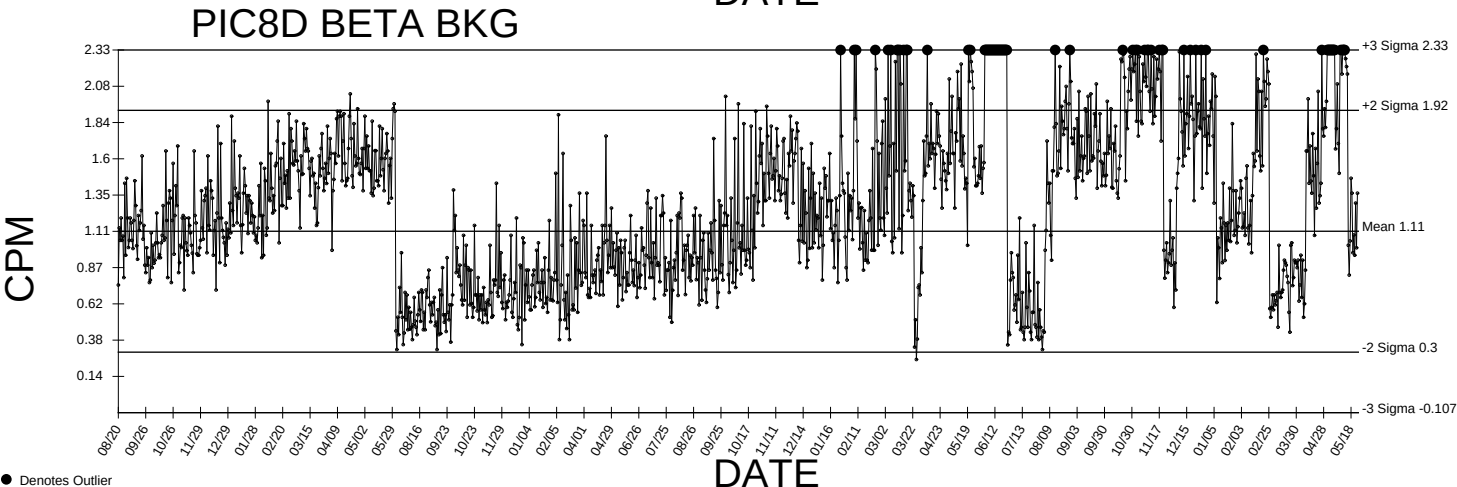
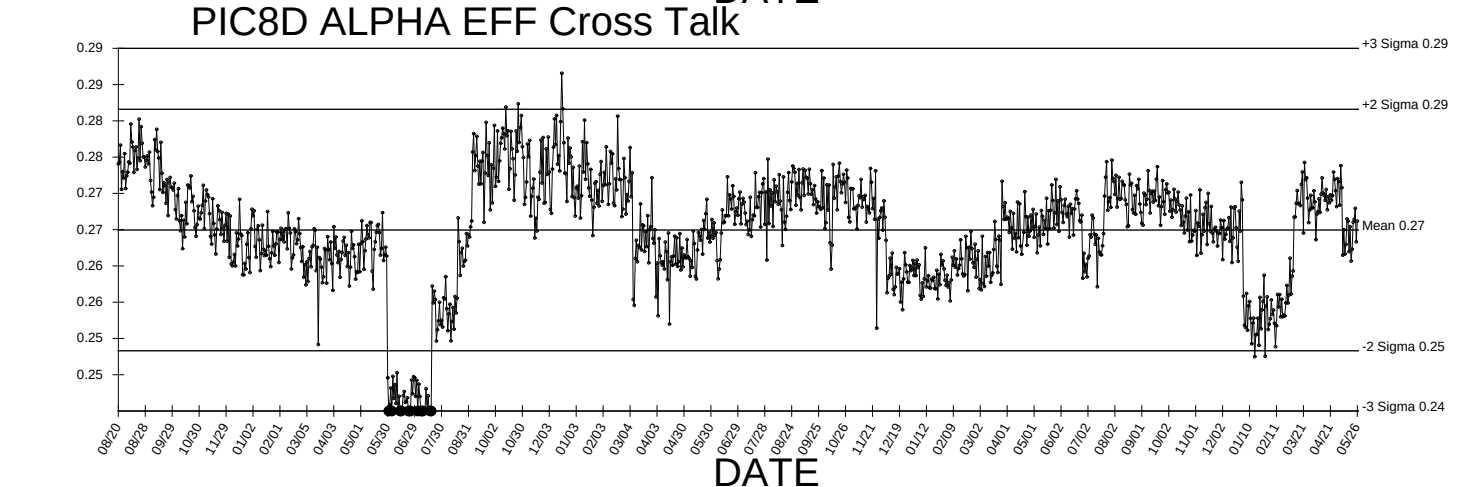
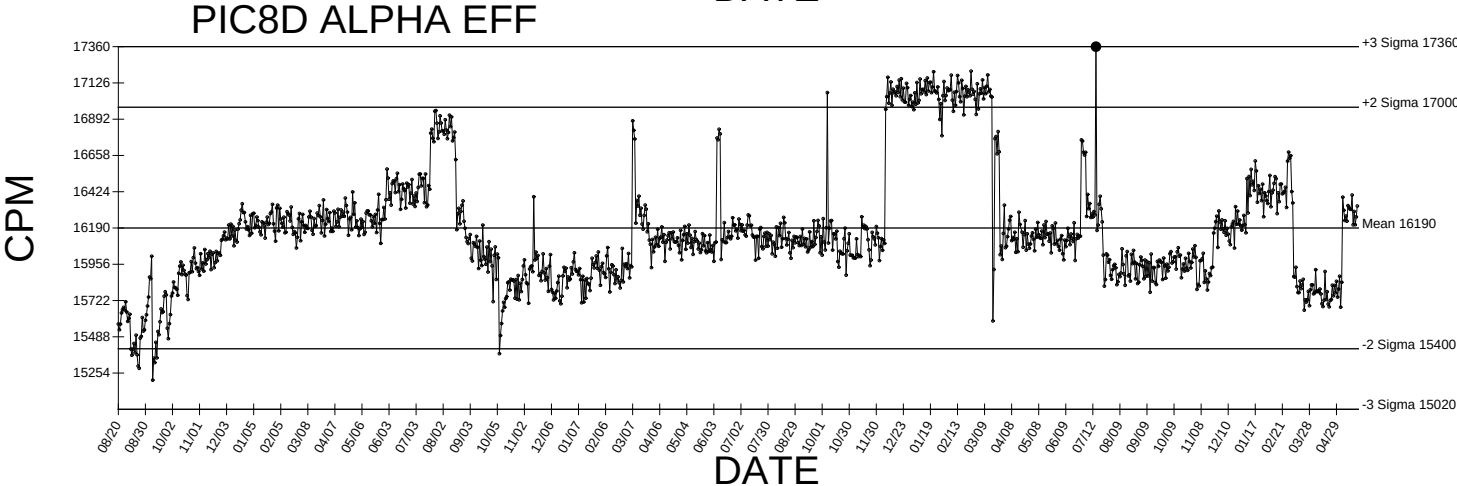
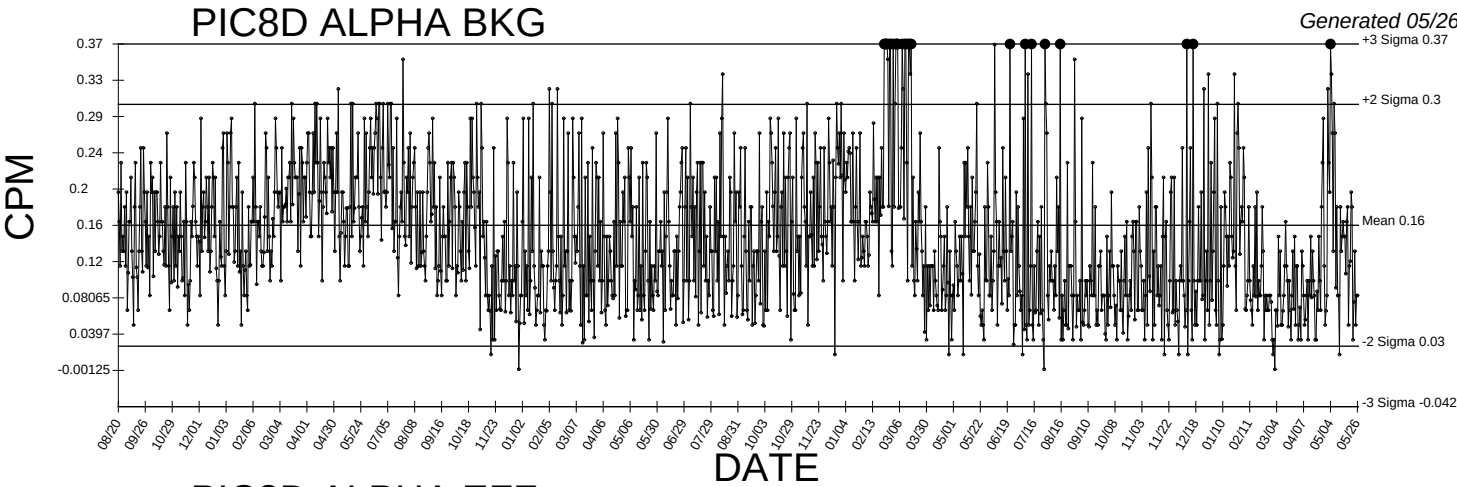
Generated 05/27/2022



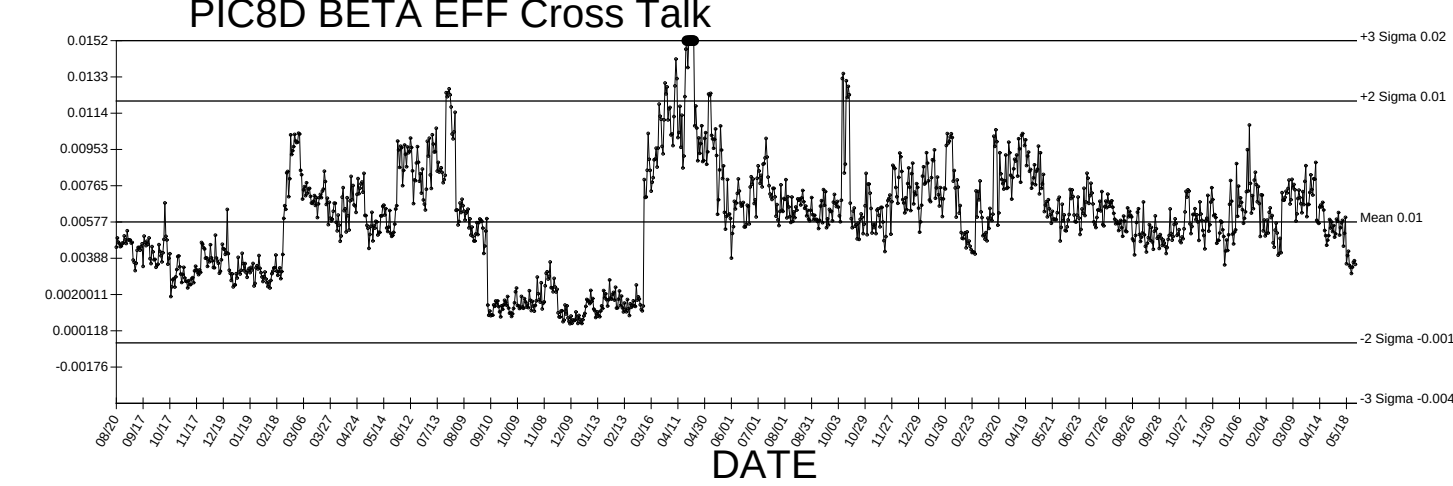
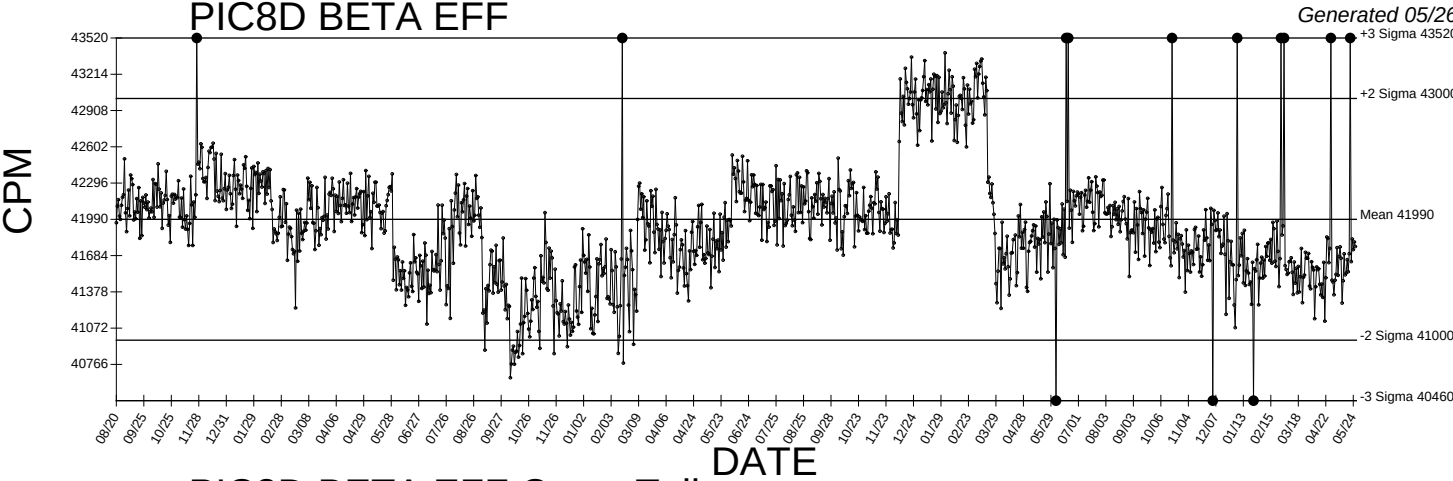
PIC8A BETA EFF Cross Talk



● Denotes Outlier



● Denotes Outlier



● Denotes Outlier

RAD Standards Traceability

Standardization of Strontium Carrier 3426335

v1.2.1

Analyst	JXK3
---------	------

Standard Information	
Isotope	Strontium
Serial Number	3426335
Amount of Std. (mL)	1.0
Standard Prepared	4/15/2022

Parent Information	
Parent Serial #	3268476.2
Parent Exp. Date	4/7/2024

Std #	Weight of carrier added (g)	Weight of crucible or filter (g)	Weight of crucible or filter + ppt. (g)	Weight of ppt. (g)	mg Strontium/mL	mg Strontium/g
1	1.0205	0.1232	0.1316	0.0084	8.40	8.23
2	1.0143	0.1245	0.1330	0.0085	8.50	8.38
3	1.0191	0.1189	0.1274	0.0085	8.50	8.34
4	1.0231	0.1234	0.1319	0.0085	8.50	8.31

Mean Value (mg/mL) = 8.48
 Stdev (mg/mL) = ± 0.05
 1.0% of Mean Value = 0.084750

Standardization Rule

A satisfactory standardization is obtained when results give a standard deviation of less than 1.0% of the mean value.

Expiration Date 4/15/2023

Pass

Mean Value (mg/1.0mL) = 8.48

Lais Brist 4/15/22



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

1943

SRS Number: 115036

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8090-5FSA-37kBq

Customer: GEL Laboratories LLC

P.O. Number: GEL1924879, Item 4

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 23-January-2020 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Sr-90	1.052E+04	3.705E+04	0.1	1.0	2.1	4 π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4 π LS - 4 π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

GL-CED-297-236a

Dec
4-8-20

SRS Number: 115036

Comments:

5.00204 g of 0.1 M HCl solution with approximately 30 µg/g each Sr and Y carriers.

Impurities:

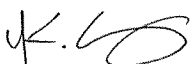
γ-impurities < 0.1%

Note:

This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total activity for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by: _____


K. Eardley, Radiochemist

QC Approved by: _____


A. Chen, Spectroscopist

Date: 16 Jan 20

Standard Logbook

Serial ID: 1943 **Open/Reference Date:** 23 JAN 2020 **Aliquot :** 5.00204 g
Name: Strontium-90 **Received:** 23 JAN 2020 **Density :** Hand Calculated
Type: Source Material **Expires:** 23 JAN 2035 **Logbook Num :** GL-CED-297-236
Employee: Tim Chandler **Lot Number :** 115036
Supplier: Eckert & Zeigler **Solvent :** 0.1M HCl
Uncertainty : 1.05 percent
Description: Strontium-90
Comments: None

Analyte	Concentration	Analyte	Concentration
Strontium-90	37050 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1943
Prepared By:	Tim Chandler
Carrier Conc:	0.1M HCl
Reference Date:	01/23/2020
Ampoule Mass (g):	5.00204 g
Uncertainty:	+/- 1.05 %
LogBook No:	GL-CED-297-236
Supplier:	Eckert & Zeigler

A Solution Material Info			
Isotope:	Strontium-90		
Prepared By:	Jennie Kill-Bowden		
Prep Date:	08/13/2020		
Verification Date:	01/04/2022		
Expiration Date:	01/04/2023		
Primary Code:	1943-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9536 g		
Density(g/mL):	0.9995	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22014.7236 \text{ dpm/mL}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (0.9995 \text{ g/mL}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22025.6704 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/16/2021	Bethany Fiem	24.8842	1000	1943-B	548.091187 dpm/mL	02/16/2021	02/16/2022
01/04/2022	Jennie Kill-Bowden	25.0633	1000	1943-C	552.035985 dpm/ml	01/04/2022	01/04/2023
06/06/2022	Jennie Kill-Bowden	24.9802	1000	1943-D	550.2057 dpm/ml	06/04/2022	06/04/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Sr-90 Standard 1943-C

v1.0.2

Instrument	Red
Analyst	JXK3
Verification Prep Date	1/4/2022

Standard Information	
Isotope	Sr-90
Serial Number	1943-C
Isotope Halflife	28.9000 Y
Reference Date	1/23/2020
Ref. Act. (DPM/mL)	552.035984
Amount of Std. (mL)	1.0
Standard Prep Date	1/4/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	1/5/2022	88.50	1116.40	41.80
2	1/5/2022	87.90	1096.60	41.80
3	1/5/2022	89.00	1093.80	41.80

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	1074.60	2.021254	531.65	531.65
2	1054.80	2.021254	521.85	521.85
3	1052.00	2.021254	520.47	520.47

Mean Value = 524.66 dpm/mL
 Stdev = 6.095043305
 Certificate Value* = 526.8
 Two sigma = 12.190
 10 % of Mean = 52.466
 Rule A (Pass/Fail) Pass
 % Recovery 99.60%
 Rule B (Pass/Fail) Pass
 Expiration Date 1/4/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Sr-90 source 1943-C by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCRed for Sr-90 source standard verification. The Sr-90 efficiency calibration which was used for verification calculations was performed on 1/4/2022 using Sr-90 source 1689-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency (cpm/dpm), and
- D = volume used for standard verification.

RAD-M-001

Handwritten:
 1/12/22
 1/14/22

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2269288

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205098591	LCSD	KP1	PIC8D	MAY-26-22 16:27:58	DONE	Tuffryn Filter	01-APR-21 00:00
1205098589	MB	KP1	PIC13D	MAY-26-22 19:10:09	DONE	Tuffryn Filter	01-APR-21 00:00
579287001	SAMPLE	KP1	PIC11A	MAY-26-22 19:10:12	DONE	Tuffryn Filter	01-APR-21 00:00
579287002	SAMPLE	KP1	PIC11B	MAY-26-22 19:10:16	DONE	Tuffryn Filter	01-APR-21 00:00
579287003	SAMPLE	KP1	PIC11C	MAY-26-22 19:10:19	DONE	Tuffryn Filter	01-APR-21 00:00
579287004	SAMPLE	KP1	PIC11D	MAY-26-22 19:10:21	DONE	Tuffryn Filter	01-APR-21 00:00
579287005	SAMPLE	KP1	PIC12A	MAY-26-22 19:10:28	DONE	Tuffryn Filter	01-APR-21 00:00
579289001	SAMPLE	KP1	PIC12C	MAY-26-22 19:10:31	DONE	Tuffryn Filter	01-APR-21 00:00
579289002	SAMPLE	KP1	PIC12D	MAY-26-22 19:10:35	DONE	Tuffryn Filter	01-APR-21 00:00
579289003	SAMPLE	KP1	PIC13B	MAY-26-22 19:10:41	DONE	Tuffryn Filter	01-APR-21 00:00
1205098590	LCS	KP1	PIC8A	MAY-27-22 10:47:39	DONE	Tuffryn Filter	01-APR-21 00:00

Liquid Scintillation Raw Data

Batch 2265050 Check-list

This check-list was completed on 06-JUN-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 06-JUN-22 and Jessica Davis on 06-JUN-22.

Batch ID: 2265050

Product: LSC41PUF

Description: LSC Plutonium Filter

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have client special requirements have been reviewed and met?	Yes		
4	Have samples been blank corrected?		No	
5	Has a hit notification been completed?		No	
6	Has an Aliquot Correction been completed for this batch?	Yes		
7	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
8	Were all the samples prepared/analyzed within the required holding time period?	Yes		
9	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
10	Was the method blank (MB) within the acceptance criteria?	Yes		
11	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
12	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
13	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
14	Has the method required detection limit been met?		No	
Miscellaneous Information				
15	Were manual integrations performed on any sample or QC data files in this batch?		No	
16	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium-241 in Filter per Liter

Batch ID: 2265050
Analyst: Michael Potts (MP2)
Method: DOE EML HASL-300, Pu-11-RC
 Modified
Lab SOP: GL-RAD-A-035 REV# 23
Instrument: ASP-33005595

Due Dates for Lab: 05-JUN-2022			Package: 06-JUN-2022	SDG: 07-JUN-2022		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205090031	Plutonium-241 AS SPIKE		1714-B	.1	mL
LCSD	1205090032	Plutonium-241 AS SPIKE		1714-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	579287001	25-MAY-2022	5	30	0.11118
2	579287002	25-MAY-2022	5	30	0.11549
3	579287003	25-MAY-2022	5	30	0.11403
4	579287004	25-MAY-2022	5	30	0.11518
5	579287005	25-MAY-2022	5	30	0.11218
6	579289001	25-MAY-2022	5	30.1	0.11121
7	579289002	25-MAY-2022	5	30	0.1135
8	579289003	25-MAY-2022	5	30	0.11151
9	1205090030 MB	25-MAY-2022	5		0.11549
10	1205090031 LCS	25-MAY-2022	5		0.11549
11	1205090032 LCSD	25-MAY-2022	5		0.11549

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2010-A	Plutonium-242 AS TRACER	.1 mL	Pipet ID: RAD-ASP-184002Z Data Entry Date2: 25-MAY-2022 00:00

Plutonium-241 Filter

Filename : PU241.XLS
 File type : Excel
 Version # : 1.3.4

Tracer S/N : 2010-A
 Tracer Exp Date : 4/14/2023
 Tracer Volume Added: 0.10
 Tracer Error: 0.37%

Batch : 2265050
 Analyst : MIC02277
 Prep Date : 5/25/2022
 Method Uncertainty : 0.0935

Procedure Code : LSC41PUF
 Parmname : Plutonium-241
 Required MDA : 5 pCi/F
 Halflife of Pu-241 : 14.290 years
 Pu-241 Abundance : 1.00
 Tracer Abundance : 1.00
 Halflife of Tracer : 373500.000 years

Geometry:

2mL DI/1 drop HNO3/13mL Ecoscint Ultra

Sample Characteristics					Tracer Calculations									
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Tracer Concentration DPM	Tracer Counts	Tracer Bkg Counts	Tracer Net CPM	Tracer Count Start Date/Time	Tracer Count Time (sec.)	Tracer Decay	Detector Serial #	Detector Efficiency (cpm/dpm)	Detector Efficiency StDev. (cpm/dpm)
1	579287001.1	0.1112	1.2035E-05	3/29/2022 13:03	4.2739	265	10.560	1.060	5/31/2022 9:23	14400	1.000	83291	0.316604	0.006118
2	579287002.1	0.1155	1.2280E-05	3/29/2022 13:11	4.2739	297	4.320	1.220	5/31/2022 9:23	14400	1.000	79988	0.312662	0.006043
3	579287003.1	0.1140	1.2198E-05	3/29/2022 13:22	4.2739	279	3.360	1.149	5/31/2022 9:23	14400	1.000	158119	0.356880	0.006877
4	579287004.1	0.1152	1.2263E-05	3/29/2022 13:31	4.2739	340	7.440	1.386	5/31/2022 9:23	14400	1.000	158160	0.331152	0.006392
5	579287005.1	0.1122	1.2093E-05	3/29/2022 9:30	4.2739	358	9.120	1.454	5/31/2022 9:23	14400	1.000	155764	0.337411	0.006510
6	579289001.1	0.1112	1.2037E-05	3/29/2022 12:48	4.2739	299	1.440	1.240	5/31/2022 9:23	14400	1.000	140237	0.323545	0.006248
7	579289002.1	0.1135	1.2168E-05	3/29/2022 12:55	4.2739	340	0.960	1.413	5/31/2022 9:23	14400	1.000	79778	0.350005	0.006747
8	579289003.1	0.1115	1.2054E-05	3/29/2022 9:00	4.2739	347	2.880	1.434	5/31/2022 9:23	14400	1.000	79463	0.355425	0.006850
9	1205090030.1	0.1155	1.2280E-05	5/25/2022 0:00	4.2739	288	1.920	1.192	5/31/2022 9:23	14400	1.000	83292	0.326024	0.006296
10	1205090031.1	0.1155	1.2280E-05	5/25/2022 0:00	4.2739	262	1.920	1.084	5/31/2022 9:34	14400	1.000	155839	0.276262	0.005356
11	1205090032.1	0.1155	1.2280E-05	5/25/2022 0:00	4.2739	267	3.120	1.100	5/31/2022 9:34	14400	1.000	155840	0.265265	0.005149

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-035
 Instrument SOP:

Count raw Data													Calibration Data						
Pos.	Rack Position #	Counting Time (min.)	Quench#	Gross cpm	Bkg cpm	Bkg Count Time (min.)	Bkg Quench#	Corrected Bkg cpm	Count Start Date/Time	Sample Decay	Calculated Sample Recovery %	Sample Recovery Error %	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Background Rack Position #	Background Count Start Date/Time
1	18-2	60	347.09	15.98	14.41	60	343.84	14.4212	6/5/2022 22:11	0.991	78.3%	6.74%	LSCNAVY	1/24/2022	1/31/2023	0.3023	0.00792	18-1	6/5/2022 21:10
2	18-3	60	348.72	15.73	14.41	60	343.84	14.4261	6/5/2022 23:12	0.991	91.3%	6.23%	LSCNAVY	1/24/2022	1/31/2023	0.3036	0.00792	18-1	6/5/2022 21:10
3	18-4	60	346.74	14.11	14.41	60	343.84	14.4201	6/6/2022 0:13	0.991	75.3%	6.39%	LSCNAVY	1/24/2022	1/31/2023	0.3021	0.00792	18-1	6/5/2022 21:10
4	18-5	60	348.58	15.79	14.41	60	343.84	14.4257	6/6/2022 1:14	0.991	97.9%	5.90%	LSCNAVY	1/24/2022	1/31/2023	0.3035	0.00792	18-1	6/5/2022 21:10
5	16-1	60	332.13	15.85	14.41	60	343.84	14.3533	6/6/2022 3:24	0.991	101%	5.79%	LSCNAVY	1/24/2022	1/31/2023	0.2907	0.00792	18-1	6/5/2022 21:10
6	16-2	60	335.99	15	14.41	60	343.84	14.3750	6/6/2022 4:25	0.991	89.7%	6.15%	LSCNAVY	1/24/2022	1/31/2023	0.2937	0.00792	18-1	6/5/2022 21:10
7	16-3	60	333.58	15	14.41	60	343.84	14.3618	6/6/2022 5:26	0.991	94.4%	5.79%	LSCNAVY	1/24/2022	1/31/2023	0.2918	0.00792	18-1	6/5/2022 21:10
8	16-4	60	347.05	15.96	14.41	60	343.84	14.4210	6/6/2022 6:27	0.991	94.4%	5.77%	LSCNAVY	1/24/2022	1/31/2023	0.3023	0.00792	18-1	6/5/2022 21:10
9	16-5	60	341.96	15.41	14.41	60	343.84	14.4027	6/6/2022 7:28	0.998	85.5%	6.26%	LSCNAVY	1/24/2022	1/31/2023	0.2984	0.00792	18-1	6/5/2022 21:10
10	18-1	15	329.76	55.99	14.41	60	343.84	14.3386	6/6/2022 8:29	0.998	91.8%	6.55%	LSCNAVY	1/24/2022	1/31/2023	0.2888	0.00792	18-1	6/5/2022 21:10
11	18-2	15	326.58	61.49	14.41	60	343.84	14.3169	6/6/2022 8:44	0.998	97.0%	6.52%	LSCNAVY	1/24/2022	1/31/2023	0.2863	0.00792	18-1	6/5/2022 21:10

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1714-B
LCS Exp Date : 1/19/2023
LCS Activity (dpm/ml): 1622.46
LCS Volume Added: 0.10

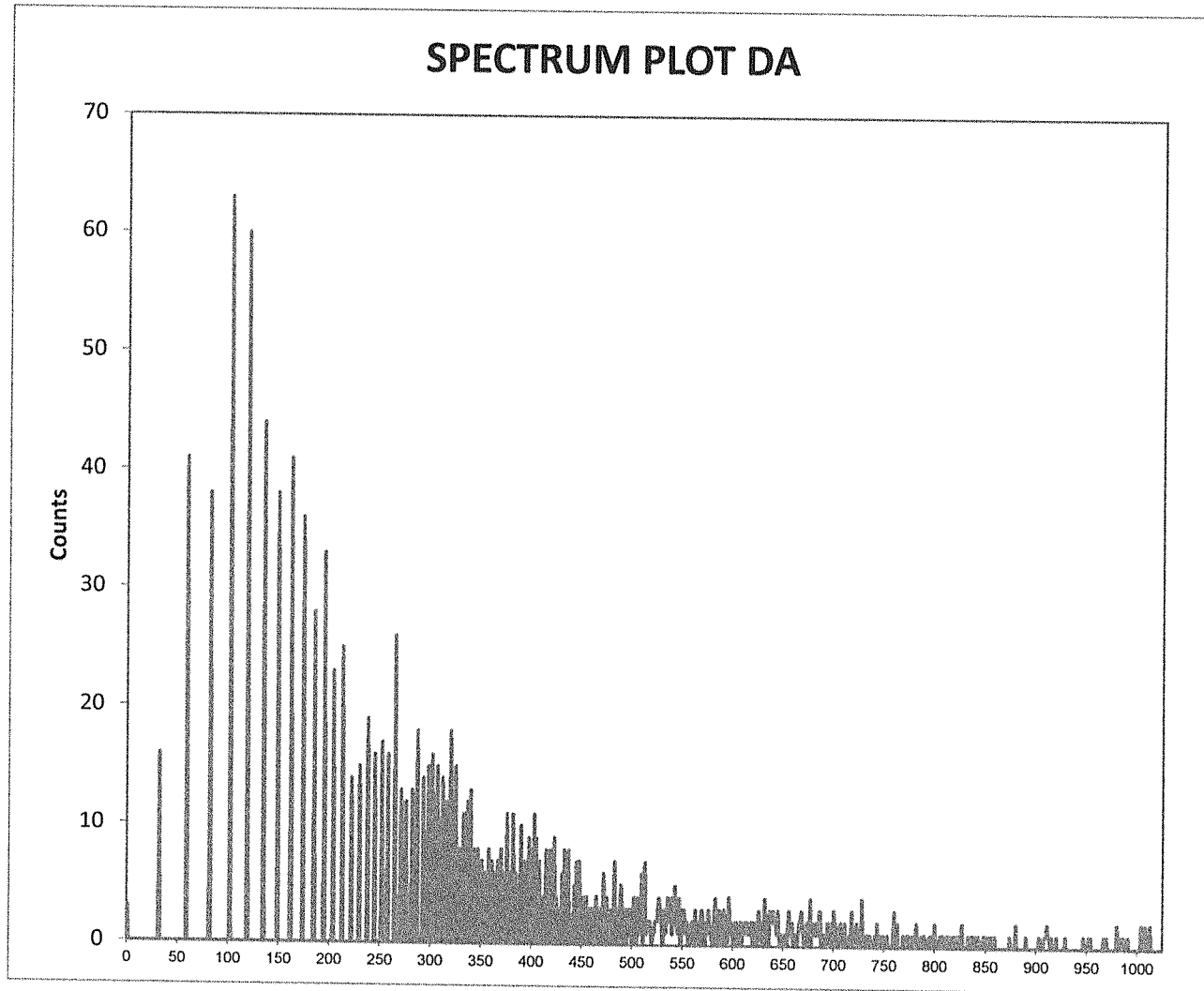
Results																
	Decision Level	Critical Level	Required MDA	MDA	Sample Act. Conc.	Sample Act. Error	Net Count Rate	Net Count Rate Error	2 SIGMA Counting Uncertainty	2 SIGMA Total Prop. Uncertainty	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery
Pos.	pCi/F	pCi/F	pCi/F	pCi/F	pCi/F	%	CPM	CPM	pCi/F	pCi/F						
1	27.8821	19.6850	5	40.2330	26.9047	46.16%	1.5588	0.7118	24.0799	24.8383		SAMPLE				
2	22.9529	16.2050	5	33.1202	18.5234	54.73%	1.3039	0.7089	19.7395	20.1586		SAMPLE				
3	28.3105	19.9875	5	40.8512	-5.4339	222.49%	-0.3101	0.6896	23.6865	23.6866		SAMPLE				
4	21.4592	15.1504	5	30.9649	18.1205	52.35%	1.3643	0.7096	18.4734	18.8884		SAMPLE				
5	22.2875	15.7351	5	32.1617	20.6972	47.76%	1.4967	0.7095	19.2308	19.7442		SAMPLE				
6	25.0342	17.6744	5	36.1249	9.7016	112.12%	0.6250	0.6997	21.2865	21.3932		SAMPLE				
7	23.4290	16.5411	5	33.8088	9.2747	109.77%	0.6382	0.6995	19.9263	20.0268		SAMPLE				
8	23.0781	16.2934	5	33.3010	21.9853	46.60%	1.5390	0.7116	19.9246	20.4822		SAMPLE				
9	24.7101	17.4456	5	35.6564	15.4182	70.26%	1.0073	0.7049	21.1465	21.4196		MB				
10	37.5395	26.5032	5	55.9542	613.9036	8.15%	41.6514	1.9929	57.5720	149.2227		LCS			632.8293	97.0%
11	35.8123	25.2838	5	53.3819	663.7996	7.91%	47.1731	2.0828	57.4435	159.3740		LCSD	7.8%		632.8293	104.9%

SampleID	Rack	Time (min.)	SQPE#	CPM Iso1	CPM Iso2	LumEx	Count Start Time	Count End Time	Machine
1	18-1	60	343.84	14.41			6/5/2022 21:10	6/5/2022 22:10	NAVY
2	18-2	60	347.09	15.98			6/5/2022 22:11	6/5/2022 23:11	NAVY
3	18-3	60	348.72	15.73			6/5/2022 23:12	6/6/2022 0:12	NAVY
4	18-4	60	346.74	14.11			6/6/2022 0:13	6/6/2022 1:13	NAVY
5	18-5	60	348.58	15.79			6/6/2022 1:14	6/6/2022 2:14	NAVY
1	16-1	60	332.13	15.85			6/6/2022 3:24	6/6/2022 4:24	NAVY
2	16-2	60	335.99	15			6/6/2022 4:25	6/6/2022 5:25	NAVY
3	16-3	60	333.58	15			6/6/2022 5:26	6/6/2022 6:26	NAVY
4	16-4	60	347.05	15.96			6/6/2022 6:27	6/6/2022 7:27	NAVY
5	16-5	60	341.96	15.41			6/6/2022 7:28	6/6/2022 8:28	NAVY
1	18-1	15	329.76	55.99			6/6/2022 8:29	6/6/2022 8:44	NAVY
2	18-2	15	326.58	61.49			6/6/2022 8:44	6/6/2022 8:59	NAVY

Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
05 Jun 2022 21:10:48
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M:\LSC\FILES\navy\2265050A\U2265050A.xls
DA
NAVY
1, 18, 60:

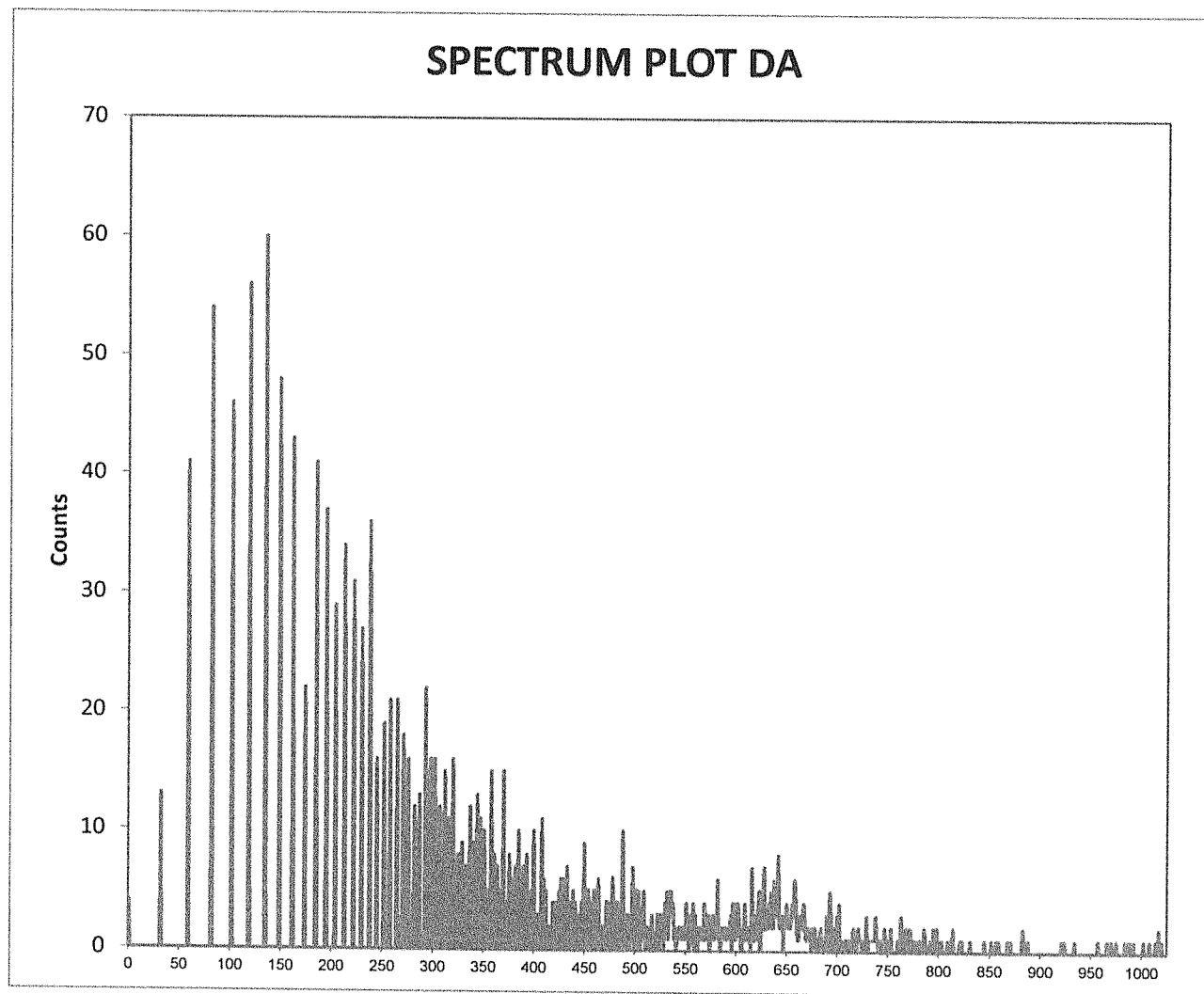
Quench: 343.84
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
05 Jun 2022 22:11:49
M:\LSC\FILES\navy\2265050A\SPu241_2_S0002_R01_202206
M:\LSC\FILES\navy\2265050A\U2265050A.xls
DA
NAVY
2, 18, 60:

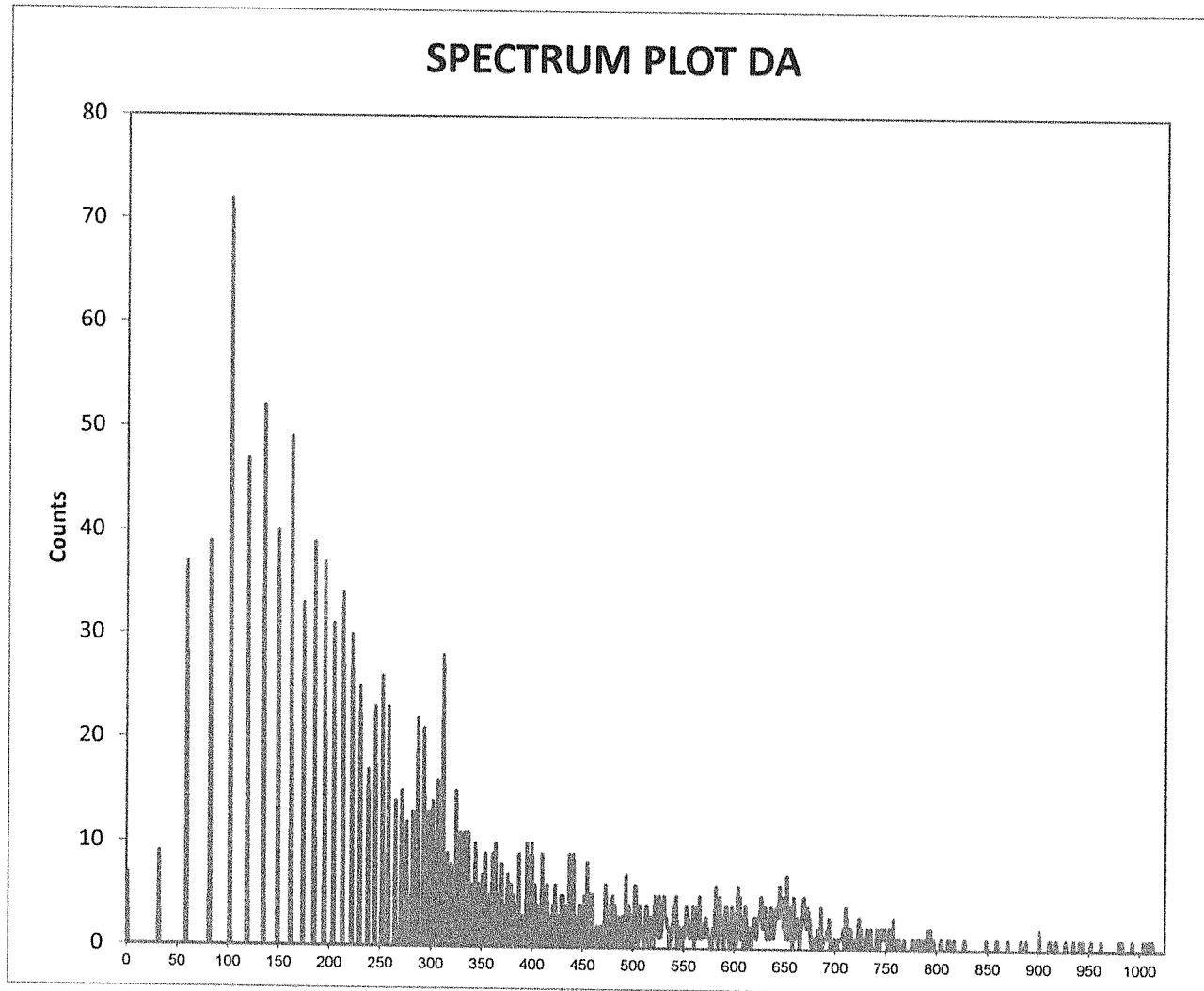
Quench: 347.09
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
05 Jun 2022 23:12:50
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DA
NAVY
3, 18, 60:

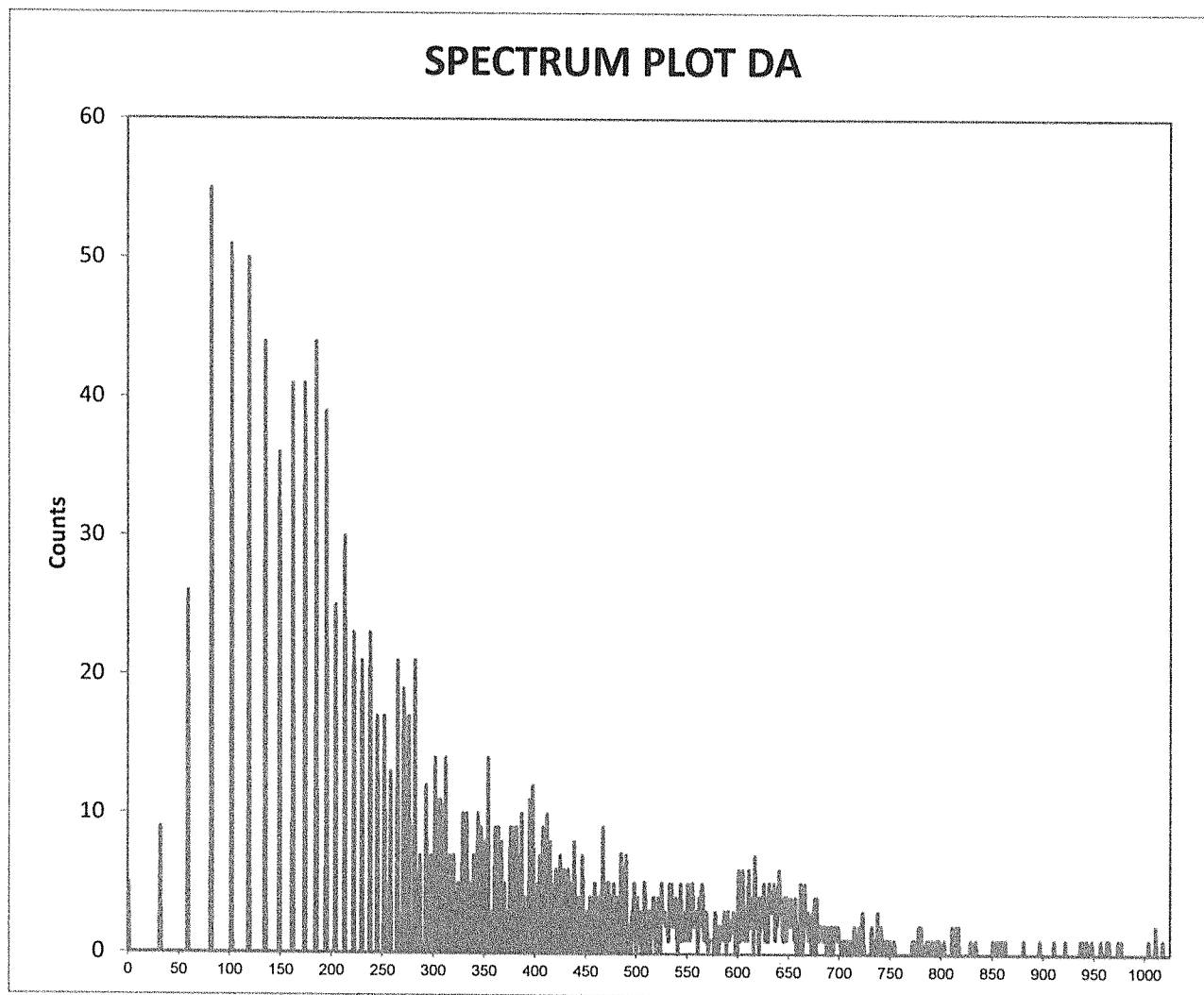
Quench: 348.72
Start, End, X-Axis



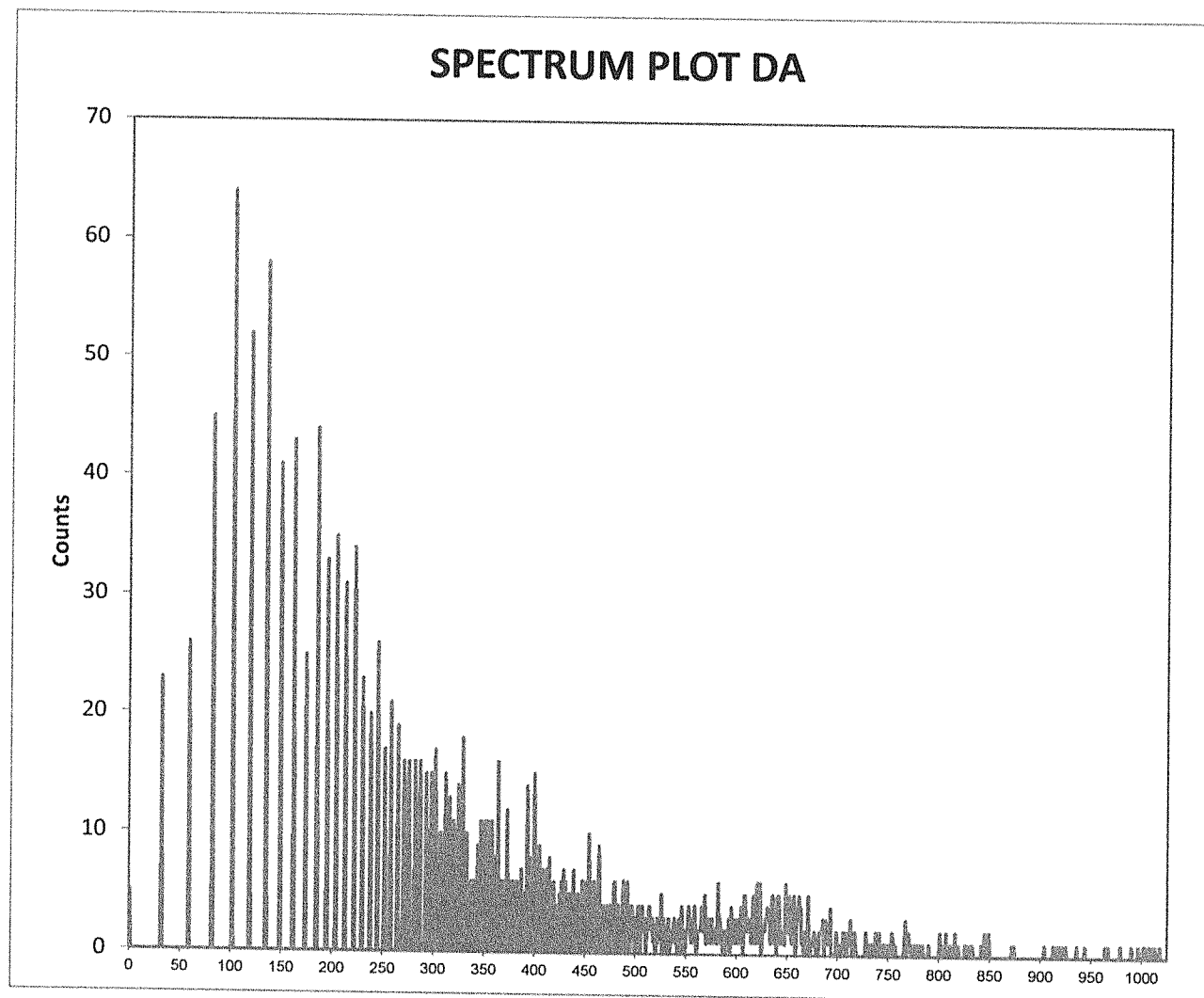
Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
06 Jun 2022 00:13:50
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DA
NAVY
4, 18, 60:

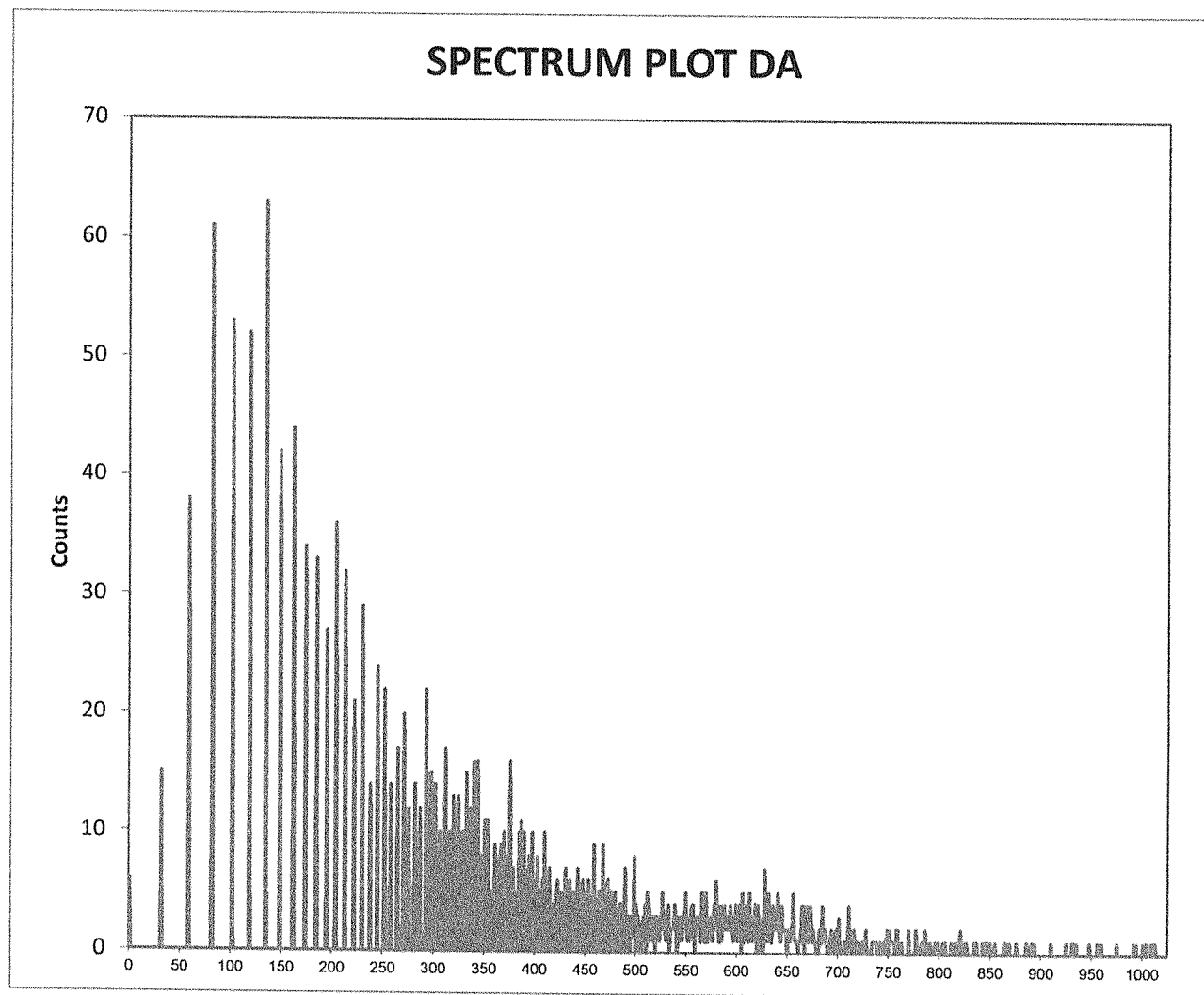
Quench: 346.74
Start, End, X-Axis



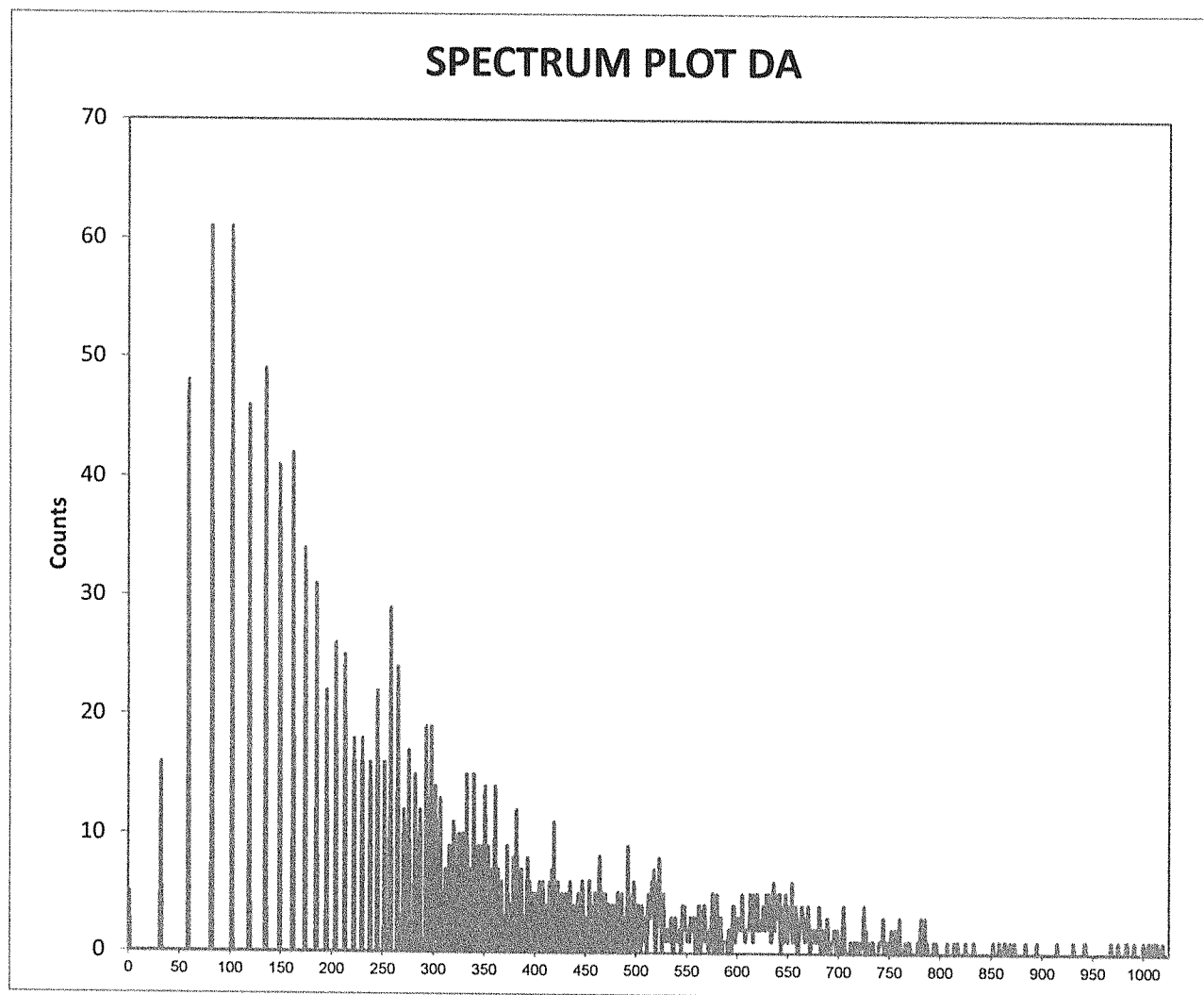
Instrument Type: PE
Sample Count Start Time: 06 Jun 2022 01:14:51
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File Info: M:\LSC\FILES\navy\2265050A\U2265050A.xls
ID: DA
Comments: NAVY
5, 18, 60:
Quench: 348.58
Start, End, X-Axis



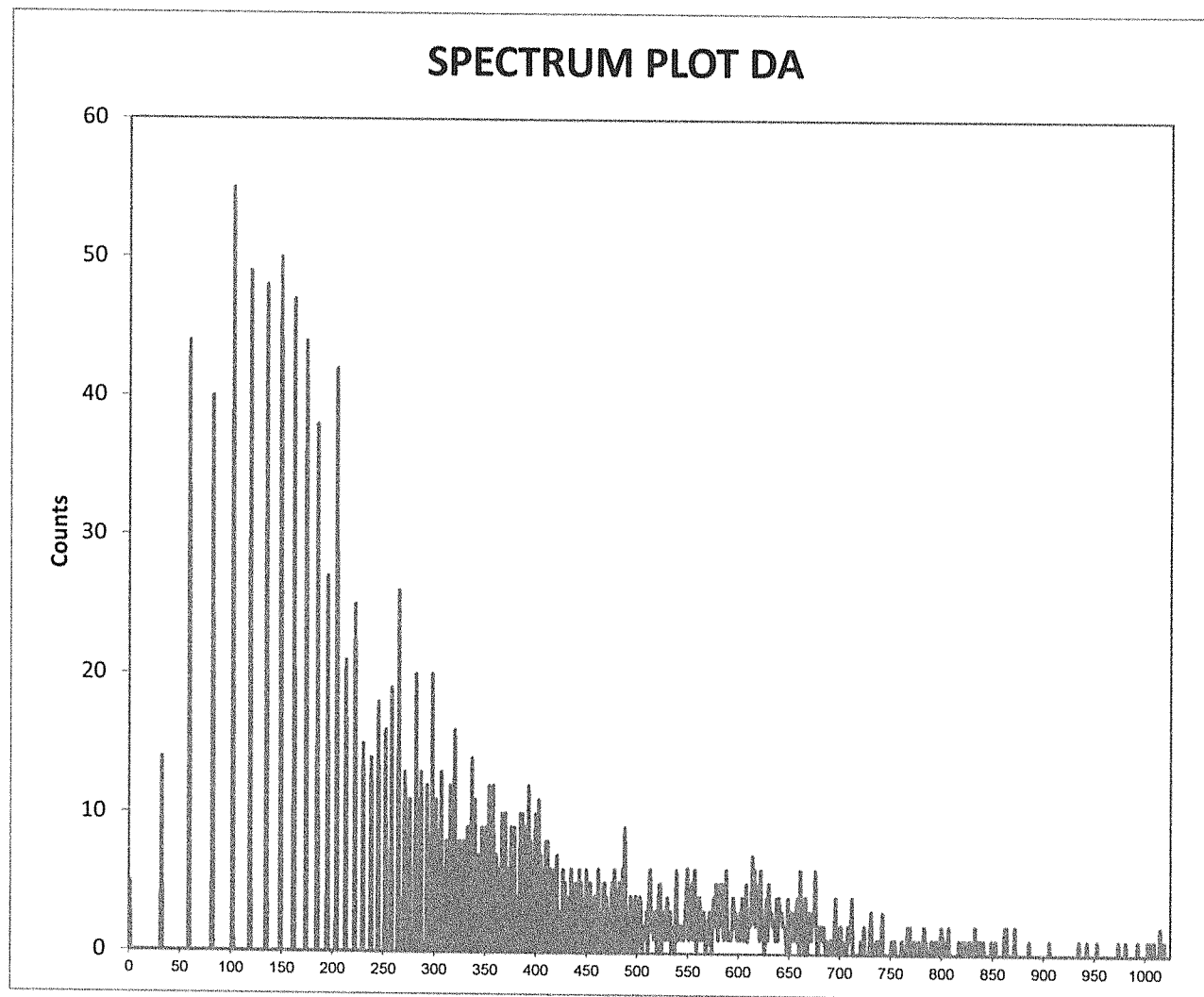
Instrument Type:	PE
Sample Count Start Time:	06 Jun 2022 03:24:19
FileName:	M:\LSC\FILES\navy\2265050B\SPu241_3_S0001_R01_202206
File Info:	M:\LSC\FILES\navy\2265050B\U2265050B.xls
ID:	DA
Comments:	NAVY
	1, 16, 60:
Quench:	332.13
Start, End, X-Axis	



Instrument Type:	PE
Sample Count Start Time:	06 Jun 2022 04:25:20
FileName:	M:\LSC\FILES\navy\2265050B\SPu241_3_S0002_R01_202206
File Info:	M:\LSC\FILES\navy\2265050B\U2265050B.xls
ID:	DA
Comments:	NAVY
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Quench:	335.99
Start, End, X-Axis	



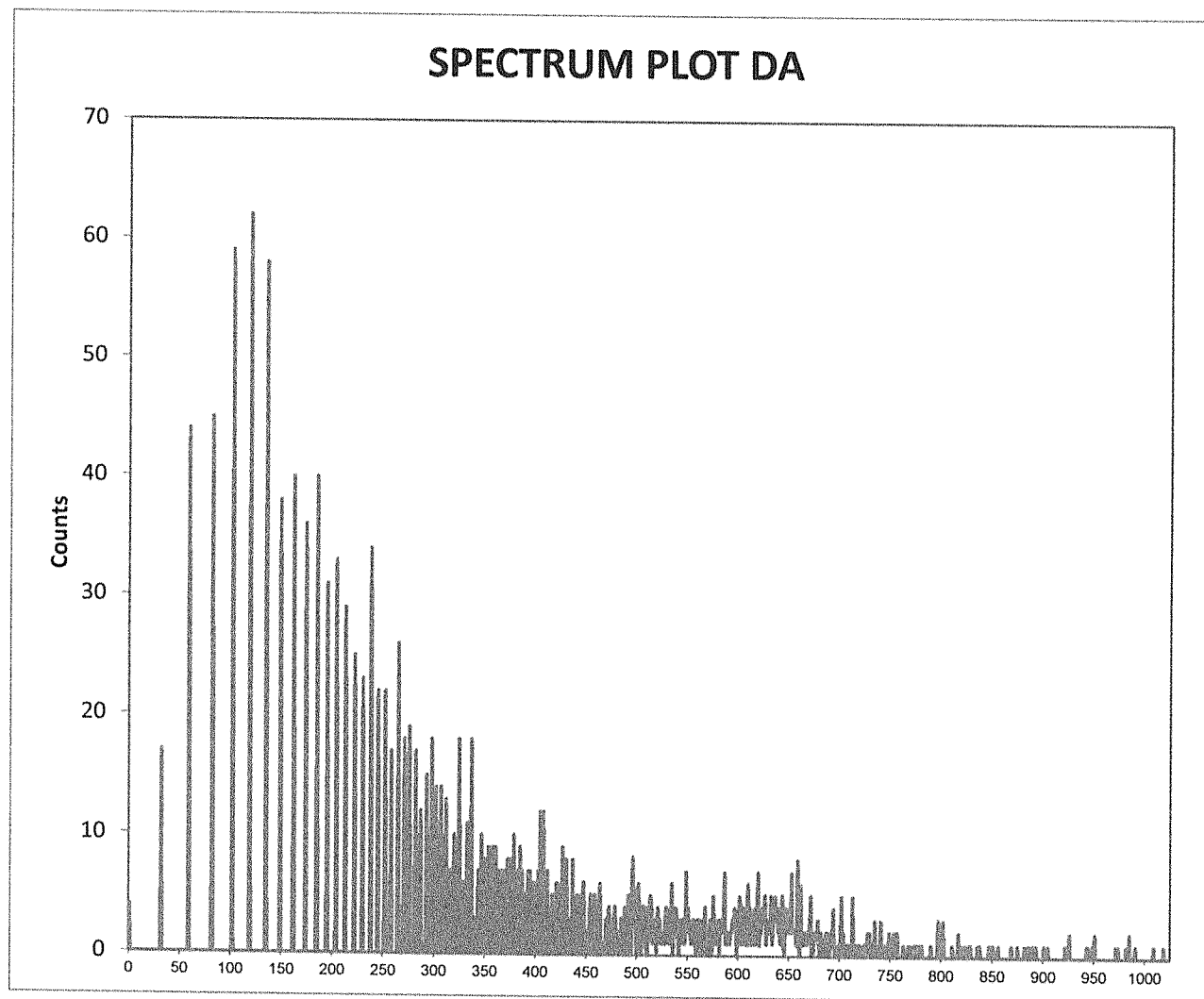
Instrument Type:	PE
Sample Count Start Time:	06 Jun 2022 05:26:21
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File Info:	M:\LSC\FILES\navy\2265050B\U2265050B.xls
ID:	DA
Comments:	NAVY
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Quench:	333.58
Start, End, X-Axis	



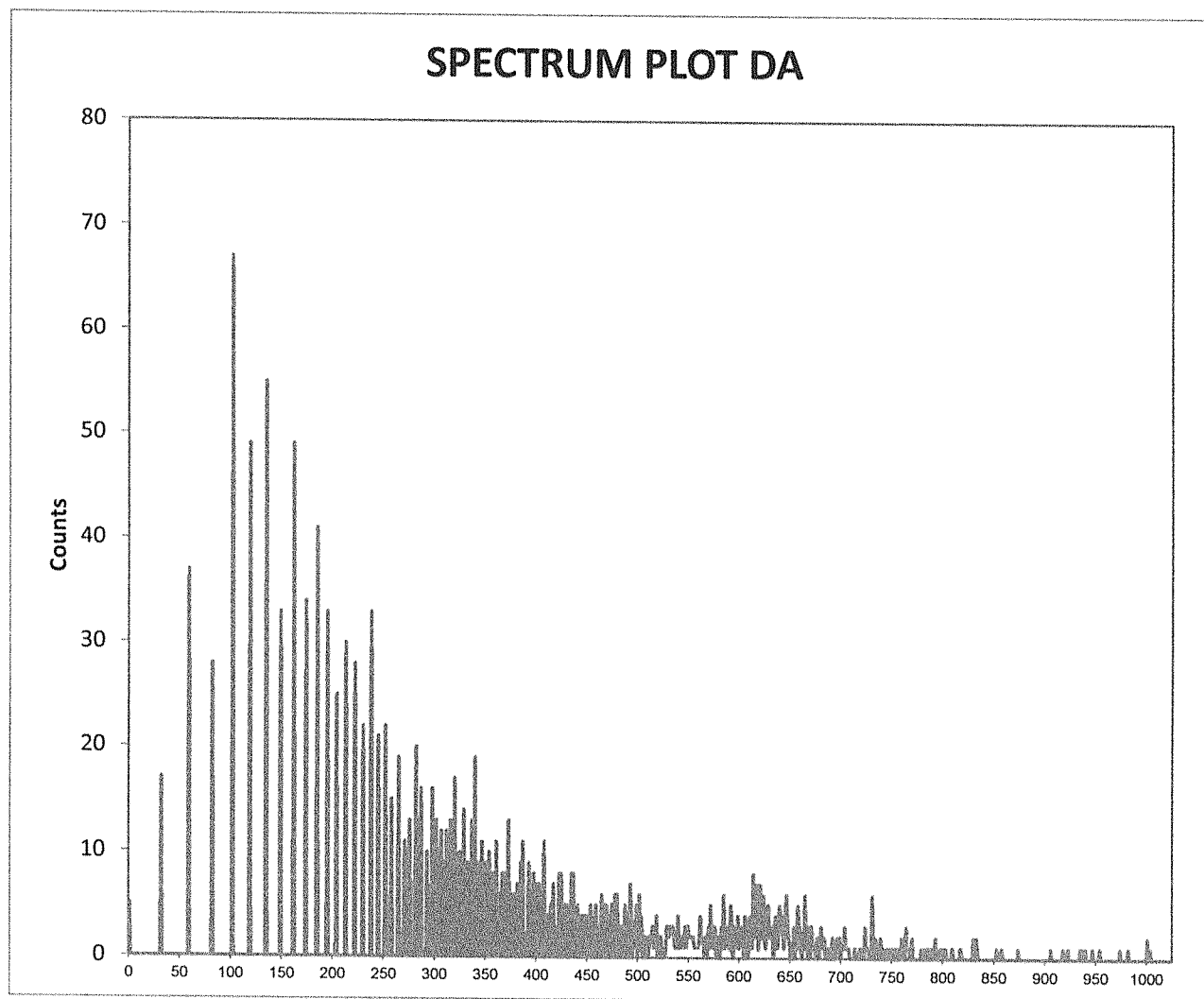
Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
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M:\LSC\FILES\navy\2265050B\U2265050B.xls
DA
NAVY
4, 16, 60:

Quench: 347.05
Start, End, X-Axis



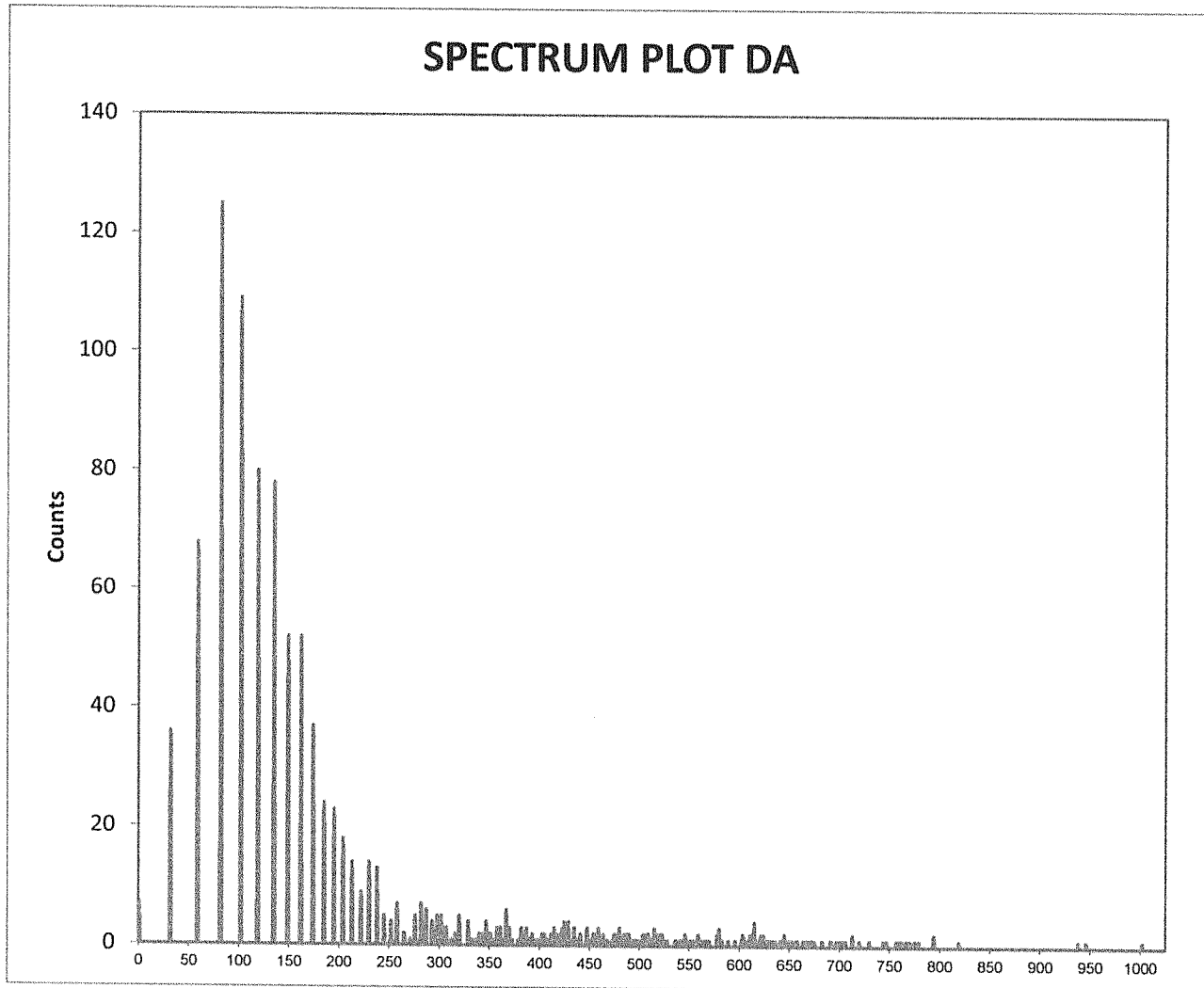
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File Info:	M:\LSC\FILES\navy\2265050B\U2265050B.xls
ID:	DA
Comments:	NAVY
	5, 16, 60:
Quench:	
Start, End, X-Axis	341.96



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
06 Jun 2022 08:29:20
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DA
NAVY
1, 18, 15:

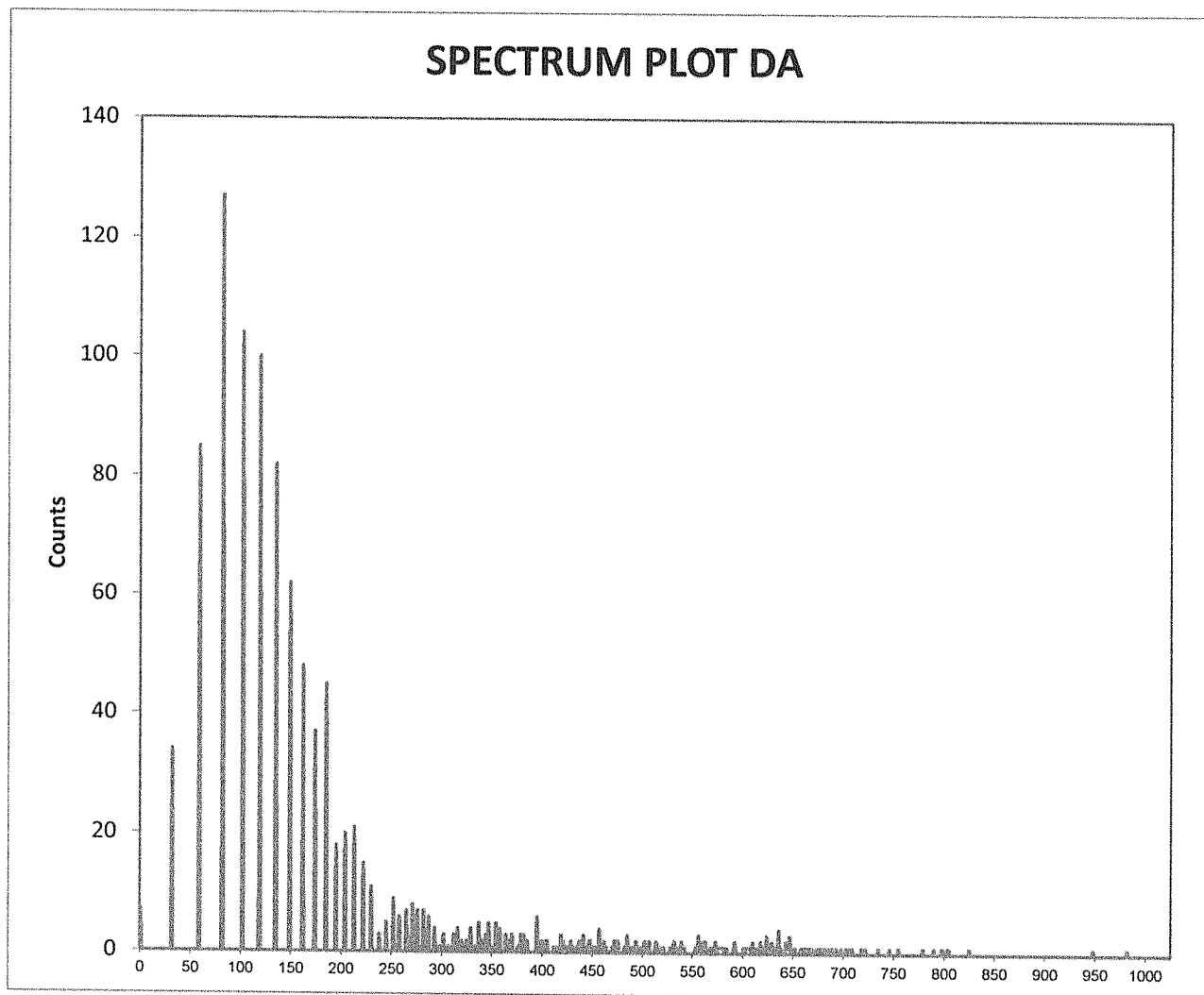
Quench: 329.76
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
06 Jun 2022 08:44:58
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M:\LSC\FILES\navy\2265050C\U2265050C.xls
DA
NAVY
2, 18, 15:

Quench:
Start, End, X-Axis 326.58



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2265050
SAMPLE ID : R0579289001_PU
SAMPLE QTY : 0.111 F +/-1.345 %
SAMPLE DATE : 29-Mar-2022 00:00:00
ANALYST : MP2
% YIELD : 89.7 +/-6.148 %

CHAMBER : 107
DETECTOR S/N : 140237
AVERAGE %EFFICIENCY : 32.3545
AVERAGE %EFF ERROR : 0.6248
COUNT DATE : 31-May-2022 09:23:03
ELAPSED LIVE TIME(SEC) : 14400.00

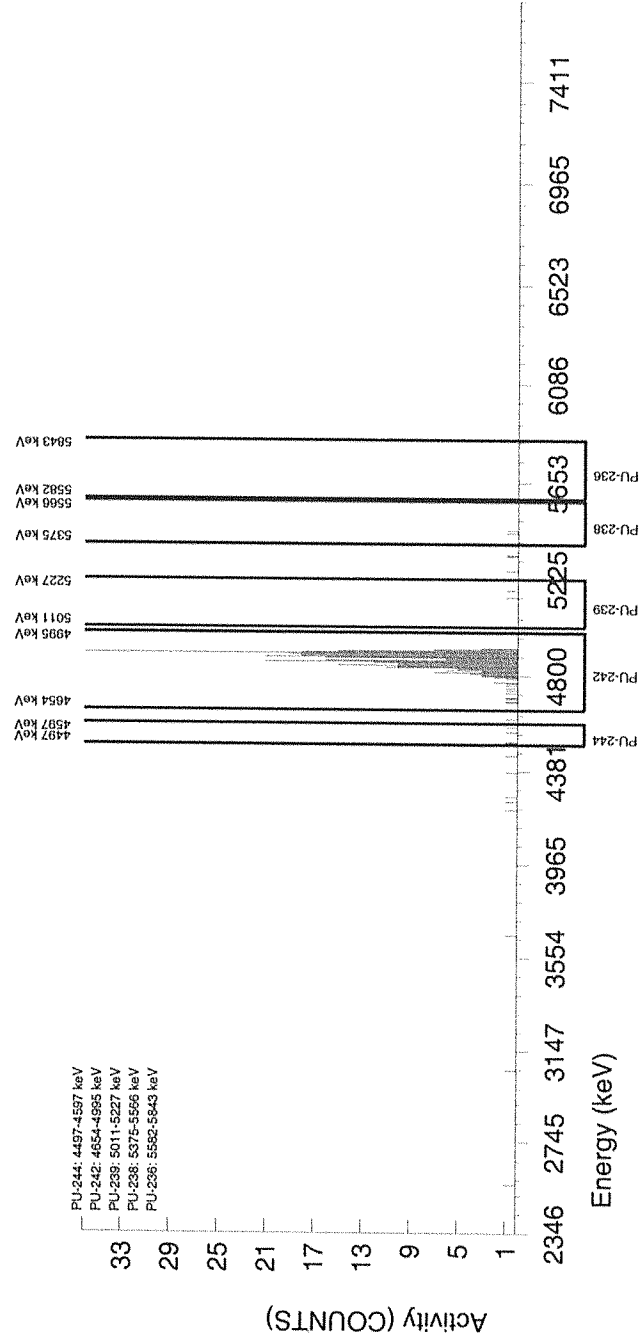
LIB FILE : PU
BKG FILE : B107.CNF;2060
BKG DATE : 29-May-2022
BKG LIVE TIME(SEC) : 60000.00
EFF FILE : W107.CNF;599
CAL DATE : 10-May-2022

TRACER

ID : 2010-A
NUCLIDE : PU-242
NOMINAL : 4.2739E+00 dpm
RESULTS : 3.8320E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.25	0.000	0.000	-1.200	1.200	1.0954	100.000	-7.28E-02	1.38E-01	4.26E-01	1.22E-01	1.38E-01
PU-238	5486.00	5433.03	14.848	2.000	1.040	0.960	0.9798	99.900	6.06E-02	2.07E-01	3.84E-01	1.05E-01	2.07E-01
PU-239	5155.00	5160.75	34.645	2.000	0.320	1.680	1.2961	99.900	1.86E-02	2.12E-01	4.51E-01	1.38E-01	2.12E-01
PU-242	4890.00	4868.15	41.245	299.000	297.560	1.440	1.2000	100.000	1.73E+01	2.98E+00	4.30E-01	1.28E-01	1.98E+00
PU-244	4589.00	4536.22	69.291	4.000	4.000	0.000	1.0000	99.900	2.33E-01	2.58E-01	1.75E-01	1.07E-01	2.57E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2265050
SAMPLE ID : R0579289002_PU
SAMPLE QTY : 0.114 F +/-1.333 %
SAMPLE DATE : 29-Mar-2022 00:00:00
ANALYST : MP2
% YIELD : 94.4 +/-5.792 %

CHAMBER : 108
DETECTOR SN : 79778
AVERAGE %EFFICIENCY : 35.0005
AVERAGE %EFF ERROR : 0.6747
COUNT DATE : 31-May-2022 09:23:03
ELAPSED LIVE TIME(SEC) : 14400.00

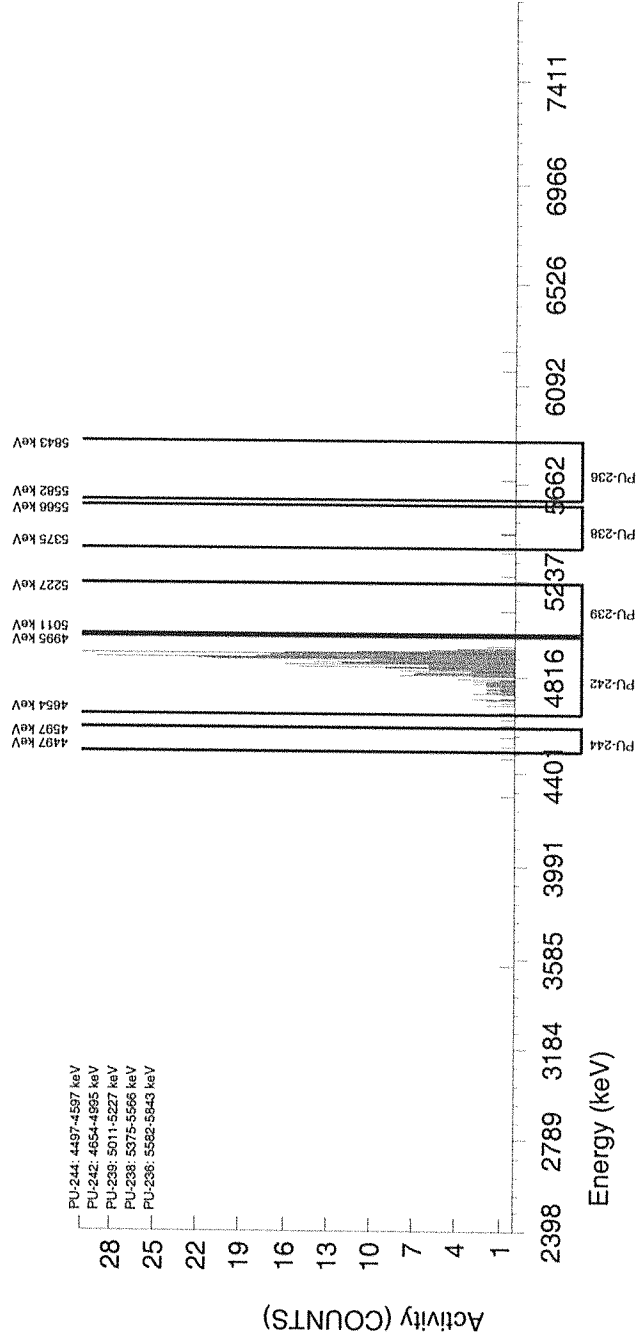
LIB FILE : PU
BKG FILE : B108.CNF:2049
BKG DATE : 29-May-2022
BKG LIVE TIME(SEC) : 60000.00
EFF FILE : W108.CNF:594
CAL DATE : 10-May-2022

TRACER

ID : 2010-A
NUCLIDE : PU-242
NOMINAL : 4.2739E+00 dpm
RESULTS : 4.0361E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5672.28	4.855	1.000	0.760	0.240	0.4899	100.000	3.97E-02	1.49E-01	2.50E-01	4.68E-02	1.49E-01
PU-238	5486.00	5440.47	9.710	2.000	1.280	0.720	0.8485	99.900	6.42E-02	1.77E-01	3.06E-01	7.79E-02	1.77E-01
PU-239	5155.00	5104.66	4.855	1.000	0.520	0.480	0.6928	99.900	2.60E-02	1.45E-01	2.77E-01	6.36E-02	1.45E-01
PU-242	4890.00	4876.54	50.008	340.000	339.040	0.960	0.9798	100.000	1.70E+01	2.76E+00	3.30E-01	8.98E-02	1.81E+00
PU-244	4589.00	4535.42	43.696	2.000	2.000	0.000	1.0000	99.900	1.00E-01	1.72E-01	1.50E-01	9.17E-02	1.72E-01



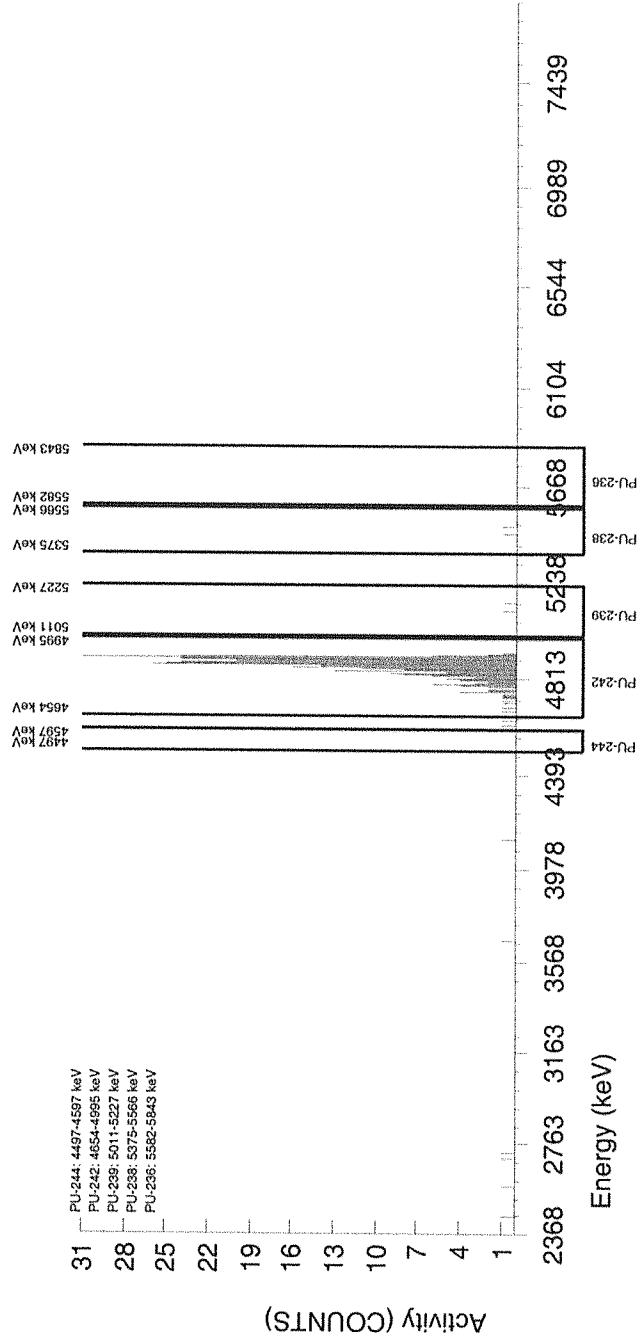
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2265050		CHAMBER : 109		LIB FILE : PU	
SAMPLE ID : R0579289003_PU		DETECTOR S/N : 79463		BKG FILE : B109.CNF:2047	
SAMPLE QTY : 0.112 F +/-1.343 %		AVERAGE %EFFICIENCY : 35.5425		BKG DATE : 29-May-2022	
SAMPLE DATE : 29-Mar-2022 00:00:00		AVERAGE %EFF ERROR : 0.6850		BKG LIVE TIME(SEC) : 60000.00	
ANALYST : MP2		COUNT DATE : 31-May-2022 09:23:03		EFF FILE : W109.CNF:588	
% YIELD : 94.4 +/-5.771 %		ELAPSED LIVE TIME(SEC) : 14400.00		CAL DATE : 10-May-2022	

TRACER	
ID : 2010-A	
NUCLIDE : PU-242	
NOMINAL : 4.2739E+00 dpm	
RESULTS : 4.0341E+00 dpm	

NUCLIDE ACTIVITY SUMMARY										
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG SDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F
PU-236	5749.00	5712.22	0.000	0.000	-0.480	0.480	0.6928	100.000	-2.51E-02	1.11E-01
PU-238	5486.00	5474.26	34.338	2.000	1.280	0.720	0.8485	99.900	6.44E-02	1.77E-01
PU-239	5155.00	5134.21	39.244	2.000	0.320	1.680	1.2961	99.900	1.61E-02	1.83E-01
PU-242	4890.00	4868.80	46.956	347.000	344.120	2.880	1.6971	100.000	1.73E+01	2.80E+00
PU-244	4589.00	4586.74	4.905	1.000	1.000	0.000	1.0000	99.900	5.02E-02	1.41E-01
									MDA pCi/F	1.96-sigma cnt Unc pCi/F
									2.90E-01	6.64E-02
									3.07E-01	7.82E-02
									3.89E-01	1.19E-01
									4.62E-01	1.56E-01
									1.51E-01	9.20E-02



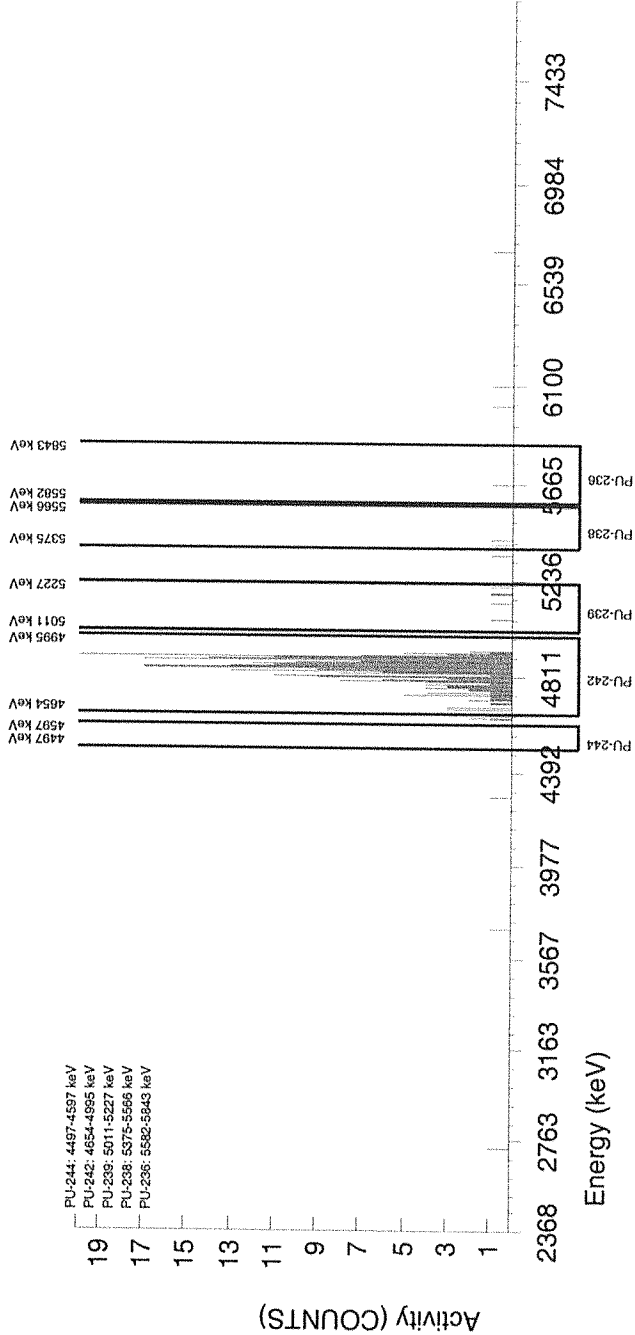
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2265050 SAMPLE ID : R1205090030_PU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 85.5 +/-6.265 %		CHAMBER : 110 DETECTOR S/N : 83292 AVERAGE %EFFICIENCY : 32.6024 AVERAGE %EFF ERROR : 0.6296 COUNT DATE : 31-May-2022 09:23:03 ELAPSED LIVE TIME(SEC) : 14400.00		LIB FILE : PU BKG FILE : B110.CNF;2047 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W110.CNF;601 CAL DATE : 10-May-2022	
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TRACER ID : 2010-A	
NUCLIDE : PU-242	
NOMINAL : 4.2739E+00 dpm	
RESULTS : 3.6562E+00 dpm	

NUCLIDE ACTIVITY SUMMARY									
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG SDev	%ABUN	ACTIVITY pCi/F
PU-236	5749.00	5659.93	4.904	1.000	1.000	0.000	1.0000	100.000	5.85E-02
PU-238	5486.00	5407.04	24.519	2.000	1.520	0.480	0.6928	99.900	8.87E-02
PU-239	5155.00	5154.79	137.308	5.000	4.040	0.960	0.9798	99.900	2.36E-01
PU-242	4890.00	4841.87	84.686	288.000	286.080	1.920	1.3856	100.000	1.67E+01
PU-244	4589.00	4546.96	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00
1.96-sigma TPU pCi/F									1.65E-01
MDA pCi/F									1.76E-01
Lc pCi/F									1.07E-01
1.96-sigma cnt Unc pCi/F									1.65E-01
									2.04E-01
									2.87E-01
									1.94E+00
									1.18E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORTInstrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-035BATCH NUMBER : 2265050
SAMPLE ID : R1205090031_PU
SAMPLE QTY : 0.115 F +/-1.323 %
SAMPLE DATE : 25-May-2022 00:00:00
ANALYST : MP2
% YIELD : 91.8 +/-6.547 %CHAMBER : 215
DETECTOR S/N : 155839
AVERAGE %EFFICIENCY : 27.6262
AVERAGE %EFF ERROR : 0.5356
COUNT DATE : 31-May-2022 09:34:42
ELAPSED LIVE TIME(SEC) : 14400.00LIB FILE : PU
BKG FILE : B215.CNF:939
BKG DATE : 29-May-2022
BKG LIVE TIME(SEC) : 60000.00
EFF FILE : W215.CNF:69
CAL DATE : 18-May-2022

TRACER

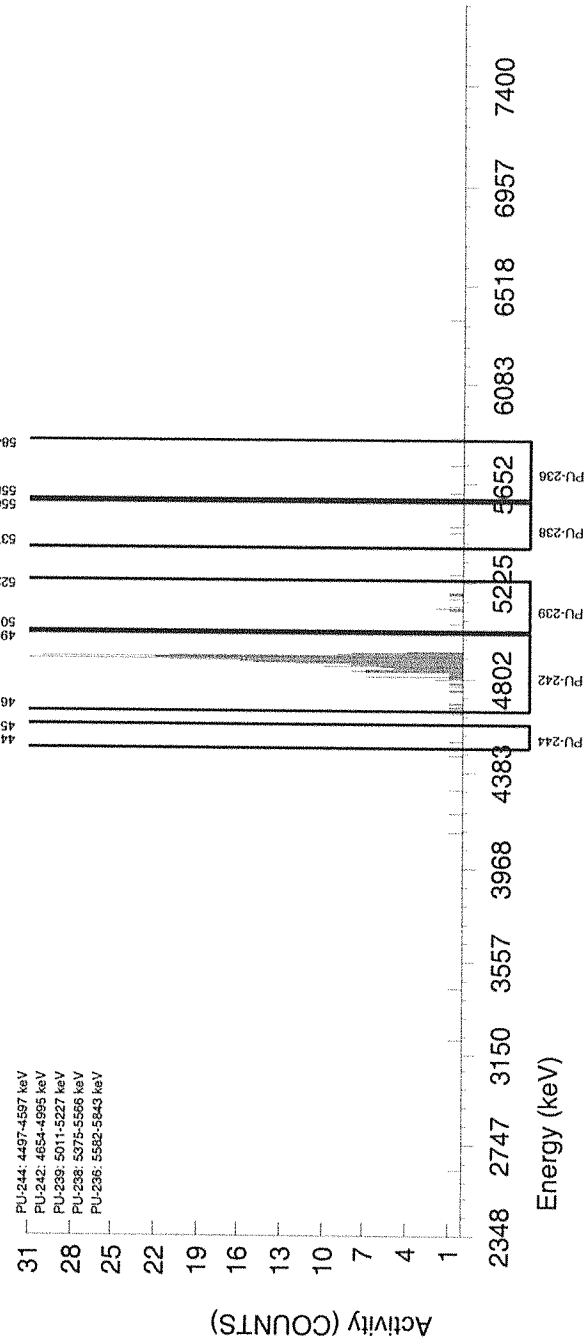
ID : 2010-A
NUCLIDE : PU-242
NOMINAL : 4.2739E+00 dpm
RESULTS : 3.9226E+00 dpm

LCS

ID
NUCLIDE
NOMINAL (pCi/F)
% RECOVERY

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5670.71	119.088	2.000	0.320	1.680	1.2961	100.000	2.06E-02	2.35E-01	4.99E-01	1.53E-01	2.35E-01
PU-238	5486.00	5451.28	29.772	2.000	0.800	1.200	1.0954	99.900	5.13E-02	2.30E-01	4.50E-01	1.29E-01	2.30E-01
PU-239	5155.00	5124.11	7.443	10.000	9.040	0.960	0.9798	99.900	5.80E-01	4.30E-01	4.23E-01	1.15E-01	4.22E-01
PU-242	4890.00	4870.71	29.565	262.000	260.080	1.920	1.3856	100.000	1.67E+01	3.05E+00	5.18E-01	1.63E-01	2.04E+00
PU-244	4589.00	4523.89	4.962	1.000	0.520	0.480	0.6928	99.900	3.34E-02	1.86E-01	3.55E-01	8.14E-02	1.85E-01



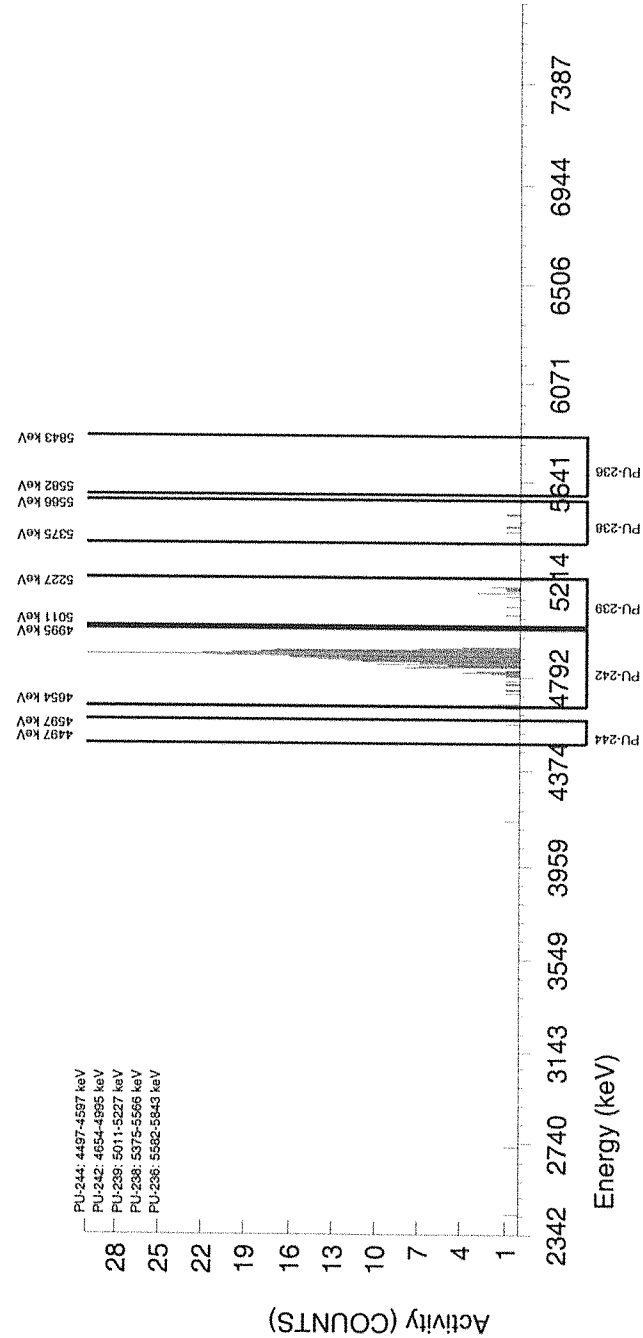
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP: GL-RAD-I-009
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2265050 SAMPLE ID : R1205090032_PU SAMPLE QTY : 0.115 F +/-1.323 % SAMPLE DATE : 25-May-2022 00:00:00 ANALYST : MP2 % YIELD : 97.0 +/-6.520 %		CHAMBER : 216 DETECTOR S/N : 155840 AVERAGE %EFFICIENCY : 26.5265 AVERAGE %EFF ERROR : 0.5149 COUNT DATE : 31-May-2022 09:34:45 ELAPSED LIVE TIME(SEC) : 14400.00		LIB FILE : PU BKG FILE : B216.CNF:938 BKG DATE : 29-May-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W216.CNF:71 CAL DATE : 18-May-2022	
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TRACER ID : 2010-A NUCLIDE : PU-242 NOMINAL : 4.2739E+00 dpm RESULTS : 4.1449E+00 dpm	LCSD ID NUCLIDE NOMINAL (pCi/F) % RECOVERY
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NUCLIDE ACTIVITY SUMMARY											
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	1.96-sigma Lc pCi/F
PU-236	5749.00	5712.27	0.000	0.000	-1.200	1.200	1.0954	100.000	-7.61E-02	1.45E-01	1.27E-01
PU-238	5486.00	5462.23	79.242	5.000	3.560	1.440	1.2000	99.900	2.25E-01	3.15E-01	1.39E-01
PU-239	5155.00	5149.76	28.478	11.000	10.280	0.720	0.8485	99.900	6.50E-01	4.42E-01	9.83E-02
PU-242	4890.00	4869.22	38.135	267.000	263.880	3.120	1.7664	100.000	1.67E+01	3.04E+00	2.04E-01
PU-244	4589.00	4582.26	4.953	1.000	1.000	0.000	1.0000	99.900	6.32E-02	1.78E-01	1.16E-01



Continuing Calibration Data



Liquid Scintillation Counter Checks for 06-JUN-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LSCBROWN	Carbon-14	02:53	1.3		124397	1.07		
	Carbon-14	02:54	1.3		123917	-0.66		
	Tritium	02:56	1.1		156892	1.67		
	Tritium	02:58	1.1		156427	0.8		
	BKG	03:00	30		24	0.08		
	BKG	03:30	30		24	0.13		
LSCGOLD	Carbon-14	05:38	1.3		124515	0.39		
	Carbon-14	05:39	1.3		124319	-0.27		
	Tritium	05:41	1.1		157487	0.33		
	Tritium	05:43	1.1		157491	0.33		
	BKG	05:45	30		26	-0.38		
	BKG	06:16	30		25	-1.05		
LSCMOCHA	Carbon-14	05:59	1.35		122984	0.63		
	Carbon-14	06:01	1.35		122781	-0.06		
	Tritium	06:03	1.2		145860	0.65		
	Tritium	06:04	1.2		146105	01		
	BKG	06:06	30		20	-1.3		
	BKG	06:37	30		21	-0.32		
LSCNAVY	Carbon-14	02:15	1.31		125396	0.3		
	Carbon-14	02:17	1.3		125053	-0.77		
	Tritium	02:19	1.05		173749	0.35		
	Tritium	02:20	1.06		173121	-1.14		
	BKG	02:22	30		20	0.31		
	BKG	02:52	30		20	-0.04		
LSCORANGE	Carbon-14	04:47	1.012433		123902	0.9		
	Tritium	04:50	1.012433		152651	-1.31		
	BKG	05:23	30.01243		9.68	2.39		
	Carbon-14	05:24	1.012433		123547	-0.16		
	Tritium	05:26	1.01235		153360	-0.22		
	BKG	05:56	30.01243		7.84	-1.3		

LSCPINK	Carbon-14	01:54	1.012433	123515	-01
	Tritium	01:58	1.01235	138034	-0.43
	BKG	02:31	30.01243	7.42	-0.4
	Carbon-14	02:32	1.012433	123535	-0.95
	Tritium	02:33	1.012433	139066	1.23
	BKG	03:04	30.01243	8.47	0.64
LSCPURPLE	Carbon-14	05:11	.4	123848	-0.09
	Carbon-14	05:12	.4	124103	0.37
	Tritium	05:13	.35	158540	0.53
	Tritium	05:14	.35	156707	-0.78
	BKG	05:15	30	23	-0.74
	BKG	05:46	30	24	0.37

Reviewed by:



Lyndsey Pace

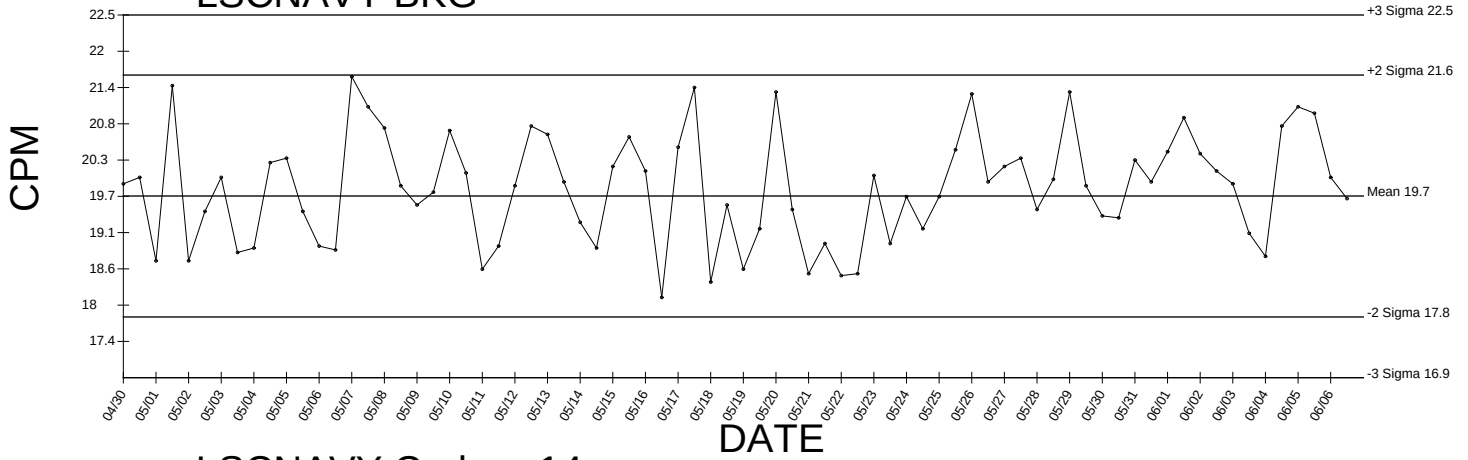
Date: 06-JUN-22

GEL Laboratories LLC

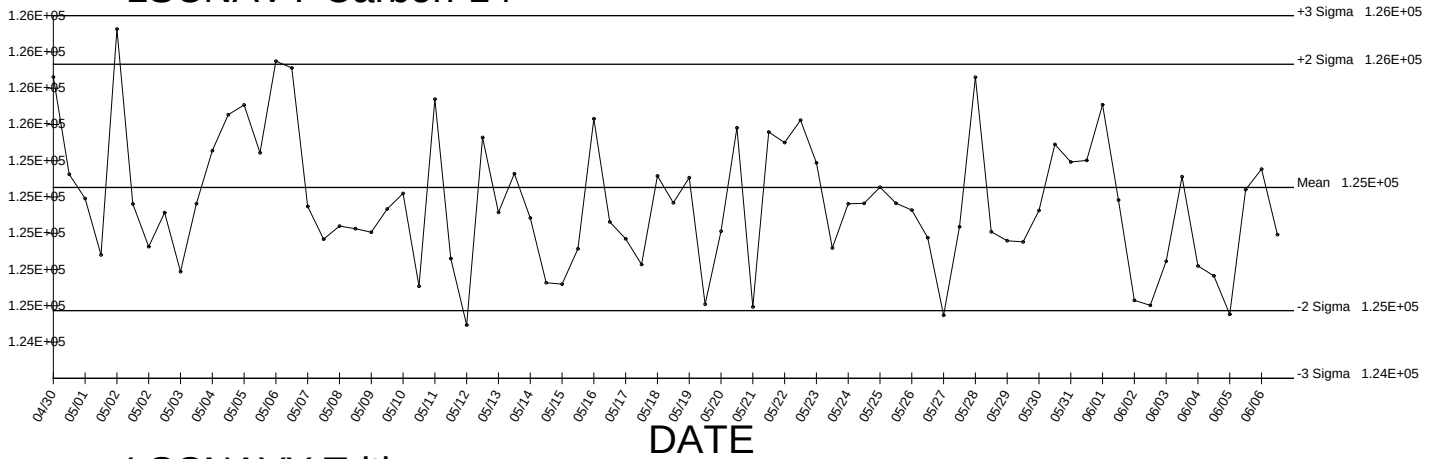
Background and Efficiency Data

LSCNAVY BKG

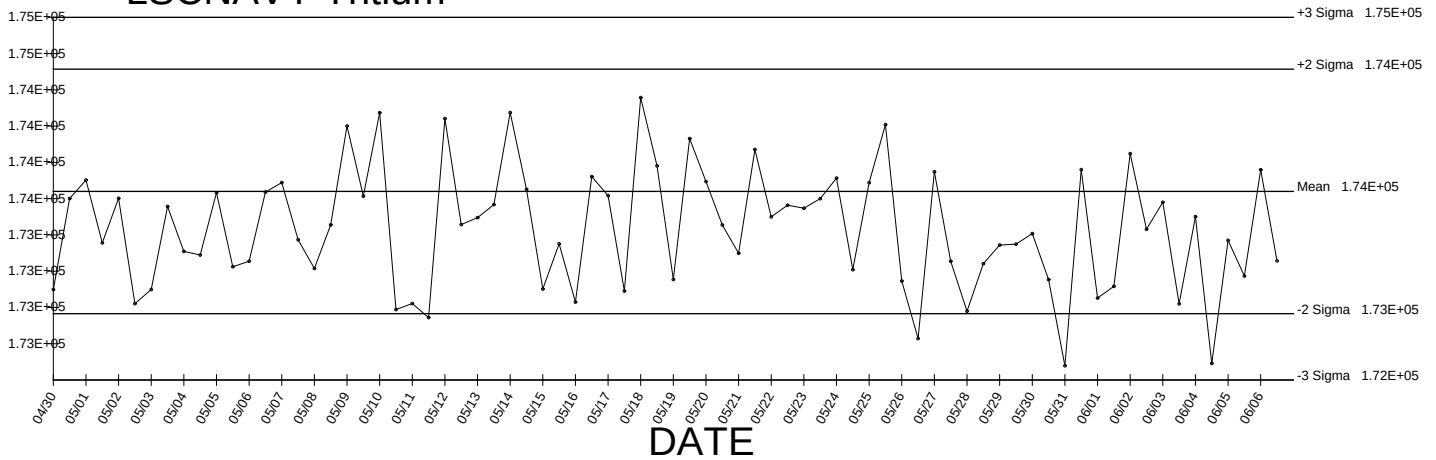
Generated 06/06/2022



LSCNAVY Carbon-14



LSCNAVY Tritium



● Denotes Outlier

RAD Standards Traceability



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

1714

98366

Pu-241 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL 1408580, Item 6 **Product Code:** 8341

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
Pu-241	5.232E+03	4.016E+04	0.2	1.7	3.5	09/09/2014

*Uncertainty: U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: α -impurities < 0.08%, γ -impurities (other than decay products) < 0.1%.
5.46647 g 3M HNO₃ solution. Carrier free.

Source Prepared by:

R. Ormsby, Radiochemist

QC Approved:

J. S. Lahr, Spectroscopist

Date: 9/5/14



Standard Logbook

Serial ID: 1714 **Open/Reference Date:** 09 SEP 2014 **Aliquot :** 5.46647 g
Name: Plutonium-241 **Received:** 10 SEP 2014 **Density :** Hand Calculated
Type: Source Material **Expires:** 11 SEP 2075 **Logbook Num :** GL-CED-297-007
Employee: Gregory Ramsay **Lot Number :** 98366
Supplier: Eckert & Ziegler **Solvent :** 3M HNO3
Uncertainty : 1.75 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-241	40160 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1714
Prepared By:	Gregory Ramsay
Carrier Conc:	3M HNO ₃
Reference Date:	09/09/2014
Ampoule Mass (g):	5.46647 g
Uncertainty:	+/- 1.75 %
LogBook No:	GL-CED-297-007
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Plutonium-241		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2019		
Verification Date:	01/25/2021		
Expiration Date:	01/25/2022		
Primary Code:	1714-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.4425 g		
Density(g/mL):	1.0331	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23990.3411 \text{ dpm/mL}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0331 \text{ g/mL}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23220.6511 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
07/22/2019	Tim Chandler	50.7721	500	1714-B	2357.9224 dpm/mL	01/19/2022	01/19/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-241 Standard 1714-B

1/19/2022	Isotope	Detector CPM	BKG CPM	NET CPM	Detector Eff Mass. Used (mL)	Source DPM/mL
Matelon DeFreese	1714-B	418.9300	10.5300	408.4000	0.2541	1607.241244
	1714-B	423.9300	10.5300	413.4000	0.2551	1620.540964
	1714-B	413.8700	10.5300	403.3400	0.253	1594.229249
Mean Value (Counting) =	1607.337152	dpm/mL	97.4108307	Pass	Average =	1607.337152
Stdev =	13.15611985	dpm/mL	0.00818504	Rule B (Pass/Fail)		
Certificate Value =	1650.06	dpm/mL				
Two sigma =	26.31223971					
10 % of Mean =	160.7337152					
Rule A (Pass/Fail)	Pass					

Verification Rules

- Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule B = The determined mean value shall be within 5% of the certificate value.

The analyst prepared three standard verification sources for Pu-241 source 1714-B by transferring 1 mL portions of the standard into plastic liquid scintillation vials. Thirteen mL of Ecoscint Ultra liquid scintillation cocktail and 2 mL of DI water were added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion. The standard verification vials and Background source were dark adapted for two hours and counted on LSC Brown for Pu-241 source standard verification. The Pu-241 efficiency calibration which was used for verification calculations was created during instrument calibrations. Each verification source calculation was performed as follows:

Source dpm/g = (A - B)/(C)(D)

where:

A = Ver. source cpm,
B = BKG cpm,
C = System efficiency, (cpm/dpm), and
D = mass used for standard verification.

Reference RAD SOP M-001

8/24/22



National Institute of Standards & Technology

Certificate

Standard Reference Material® 4334j

Plutonium-242 Radioactivity Standard

2010

Revised
8-12-21

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterweger, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Steven J. Choquette, Director
Office of Reference Materials

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

GL CED-297-302a

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq•g^{-1(a)}
Relative expanded uncertainty ($k = 2$)	0.51 %^(b)

^(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

^(b) The uncertainties on certified values are expanded uncertainties, $U = ku_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

GL-CED-297-3026

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ^{-1(a,b,c,d)}
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ^{-1(a,d)}
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π α liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

^(a) The stated uncertainty is two times the standard uncertainty [5].

^(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

^(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,

0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and

0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

^(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclidic impurities follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ⁻⁶ ⁽³⁾	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ⁻⁵ ⁽³⁾	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

^(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,

5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and

3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

^(f) The stated uncertainty is the standard uncertainty. See reference 6.

GLCEN-297-302c

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ^{242}Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	^{242}Pu decay corrections for half-life uncertainty of 0.22 %.	B	$< 10^{-10}$
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty ($k = 2$)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

GC-CED-297-302d

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

GL-CED-297-302e

Standard Logbook

Serial ID: 2010 **Open/Reference Date:** 09 AUG 2017 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 12 AUG 2021 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 12 AUG 2035 **Logbook Num :** GL-CED-297-302
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
Uncertainty : .255 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2010
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO3
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-302
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	04/14/2022		
Verification Date:	04/14/2022		
Expiration Date:	04/14/2023		
Primary Code:	2010-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.4626 g		
Density(g/mL):	1.0315	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.4626 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 42.7394 \text{ dpm/mL}$
$(5.4626 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0315 \text{ g/mL}) / (200 \text{ mL}) = 41.4342 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
-----------	----------	--------------	---------------	------	-------------	-------------------	-----------------

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2010-A

v1.2

Analyst	MXS2
Verification Prep Date	4/14/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.2
Expiration Date	8/17/2022

Standard Information	
Isotope	Pu-242
Serial Number	2010-A
Isotope Half-life	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	42.7394
Amount of Std. (mL)	0.2
Standard Prep Date	4/14/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	4/14/2022	3.920	43.51
2	4/14/2022	3.880	43.07
3	4/14/2022	3.960	43.96

Mean Value = 3.920 43.512
Stdev = 0.04 0.444

Certificate Value* = 3.8504 pCi
Two sigma = 0.0800
10 % of Mean = 0.3920
Rule A (Pass/Fail) Pass
% Recovery 101.81%
Rule B (Pass/Fail) Pass
Expiration Date 4/14/2023

dpm/mL
42.7390
0.8880
4.3512
Pass
101.81%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2010-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL of 2M HCl diluted to 40 mL with DI water. Added 0.1 mL of neodymium carrier, 3 to 4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

Signature

Runlogs

Instrument Run Log

Instrument Type: LSC

Batch ID: 2265050

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
579287001	SAMPLE	MP2	LSCNAVY	JUN-05-22 22:11:49	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
579287002	SAMPLE	MP2	LSCNAVY	JUN-05-22 23:12:50	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
579287003	SAMPLE	MP2	LSCNAVY	JUN-06-22 00:13:50	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
579287004	SAMPLE	MP2	LSCNAVY	JUN-06-22 01:14:51	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
579287005	SAMPLE	MP2	LSCNAVY	JUN-06-22 03:24:19	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
579289001	SAMPLE	MP2	LSCNAVY	JUN-06-22 04:25:20	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
579289002	SAMPLE	MP2	LSCNAVY	JUN-06-22 05:26:21	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
579289003	SAMPLE	MP2	LSCNAVY	JUN-06-22 06:27:22	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205090030	MB	MP2	LSCNAVY	JUN-06-22 07:28:22	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205090031	LCS	MP2	LSCNAVY	JUN-06-22 08:29:20	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205090032	LCSD	MP2	LSCNAVY	JUN-06-22 08:44:58	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00



August 02, 2022

Ms. Candace Christensen
Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607

Re: Project # 080153.007 Air Monitoring at SSFL
Work Order: 585885

Dear Ms. Christensen:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on July 13, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4422.

Sincerely,

Jake Crook
Project Manager

Purchase Order: 8-00000942
Chain of Custody: 07112022-1
Enclosures

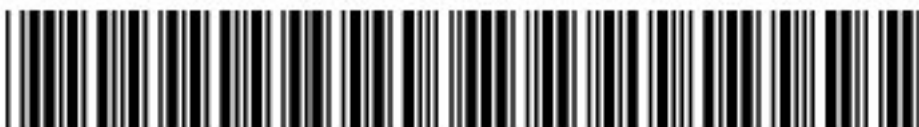


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Case Narrative

**Receipt Narrative
for
North Wind Solutions
SDG: 585885**

August 02, 2022

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on July 13, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
585885001	A-3-RMHF-2022-Qtr2
585885002	A-2-Area 20-2022-Qtr2
585885003	Blank-2022-Qtr2

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Jake Crook
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: <u>NURV</u>		SDG/AR/COC/Work Order: <u>585885 / 585905</u>	
Received By: <u>PG</u>		Date Received: <u>7/13/22</u>	
Carrier and Tracking Number		Circle Applicable: ☒ FedEx Express ☐ FedEx Ground ☐ UPS ☐ Field Services ☐ Courier ☐ Other	
		7773 5412 4410	
Suspected Hazard Information	Yes ☐ No ☐	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.	
A) Shipped as a DOT Hazardous?	Yes ☒ No ☐	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___	
B) Did the client designate the samples are to be received as radioactive?	Yes ☒ No ☐	COC notation or radioactive stickers on containers equal client designation.	
C) Did the RSO classify the samples as radioactive?	Yes ☒ No ☐	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM/mR/Hr Classified as: Rad 1 Rad 2 Rad 3	
D) Did the client designate samples are hazardous?	Yes ☒ No ☐	COC notation or hazard labels on containers equal client designation.	
E) Did the RSO identify possible hazards?	Yes ☒ No ☐	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____	
Sample Receipt Criteria		Yes ☐ NA ☐ No ☐	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	Yes ☒ NA ☐ No ☐	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	Yes ☒ NA ☐ No ☐	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	Yes ☒ NA ☐ No ☐	Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius TEMP: <u>22</u>
4	Daily check performed and passed on IR temperature gun?	Yes ☒ NA ☐ No ☐	Temperature Device Serial #: <u>182-22</u> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	Yes ☒ NA ☐ No ☐	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	Yes ☒ NA ☐ No ☐	Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?	Yes ☒ NA ☐ No ☐	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8	Samples received within holding time?	Yes ☒ NA ☐ No ☐	ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles?	Yes ☒ NA ☐ No ☐	ID's and containers affected: _____
10	Date & time on COC match date & time on bottles?	Yes ☒ NA ☐ No ☐	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	Yes ☒ NA ☐ No ☐	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	Yes ☒ NA ☐ No ☐	Circle Applicable: Not relinquished Other (describe)
13	COC form is properly signed in relinquished/received sections?	Yes ☒ NA ☐ No ☐	
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials EM Date 7/19/22 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 02 August 2022

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122022-5
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
North Wind Solutions
SDG #: 585885**

Product: Alphaspec U, Filter

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2290611

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290583

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585885001	A-3-RMHF-2022-Qtr2
585885002	A-2-Area 20-2022-Qtr2
585885003	Blank-2022-Qtr2
1205140833	Method Blank (MB)
1205140834	Laboratory Control Sample (LCS)
1205140835	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec Th, Filter

Analytical Method: DOE EML HASL-300, Th-01-RC Modified

Analytical Procedure: GL-RAD-A-038 REV# 18

Analytical Batch: 2290612

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290583

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585885001	A-3-RMHF-2022-Qtr2
585885003	Blank-2022-Qtr2
1205140836	Method Blank (MB)

1205140838 Laboratory Control Sample (LCS)
1205140839 Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Method Blank Criteria

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205140836 (MB)	Thorium-230	Result: 0.509 pCi/Sample > MDA: 0.346 pCi/Sample <= RDL: 1.00 pCi/Sample

Duplication Criteria between LCS and LCSD

The Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD), 1205140838 and 1205140839, Thorium-230 relative percent difference (RPD) is not applicable as both the LCS and LCSD were spiked with Thorium-232. The Thorium-232 RPD meets acceptance criteria.

Product: Alphaspec Po210, Filter

Analytical Method: DOE EML HASL-300, Po-01-RC Modified

Analytical Procedure: GL-RAD-A-016 REV# 19

Analytical Batch: 2290613

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290583

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585885001	A-3-RMHF-2022-Qtr2
585885002	A-2-Area 20-2022-Qtr2
585885003	Blank-2022-Qtr2
1205140840	Method Blank (MB)
1205140841	Laboratory Control Sample (LCS)
1205140842	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and

procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

Sample 1205140840 (MB) did not meet the resolution requirement of having a full width half maximum of 100 keV or less for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest. The tracer peak centroid for samples 1205140840 (MB), 1205140841 (LCS), 585885001 (A-3-RMHF-2022-Qtr2), 585885002 (A-2-Area 20-2022-Qtr2) and 585885003 (Blank-2022-Qtr2) are greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peaks are within the tracer region of interest.

Product: Alphaspec Am241, Filter

Analytical Method: DOE EML HASL-300, Am-05-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2293754

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290583

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585885001	A-3-RMHF-2022-Qtr2
585885002	A-2-Area 20-2022-Qtr2
585885003	Blank-2022-Qtr2
1205146816	Method Blank (MB)
1205146817	Laboratory Control Sample (LCS)
1205146818	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Sample Re-prep/Re-analysis

Samples were re-prepped due to low carrier/tracer yield. The re-analysis is being reported.

Product: Alphaspec Th, Filter

Analytical Method: DOE EML HASL-300, Th-01-RC Modified

Analytical Procedure: GL-RAD-A-038 REV# 18

Analytical Batch: 2293848

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290583

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585885002	A-2-Area 20-2022-Qtr2
1205146994	Method Blank (MB)
1205146995	Laboratory Control Sample (LCS)
1205146996	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Method Blank Criteria

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205146994 (MB)	Thorium-230	Result: 0.903 pCi/Sample > MDA: 0.657 pCi/Sample <= RDL: 1.00 pCi/Sample

Technical Information

Sample Re-prep/Re-analysis

Sample 585885002 (A-2-Area 20-2022-Qtr2) was reprepared due to low carrier/tracer yield. The re-analysis is being reported.

Product: Alphaspec Pu, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2294036

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290583

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585885001	A-3-RMHF-2022-Qtr2
585885002	A-2-Area 20-2022-Qtr2
585885003	Blank-2022-Qtr2
1205147417	Method Blank (MB)
1205147418	Laboratory Control Sample (LCS)
1205147419	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Sample Re-prep/Re-analysis

Batch was reprepared due to analyst error. The re-analysis is being reported.

Miscellaneous Information

Additional Comments

Samples 1205147418 (LCS) and 1205147419 (LCSD) did not meet the resolution requirement of having a full width half maximum of 100 keV or less for the tracer; however, the tracer yield requirement was met and the tracer peaks are within the tracer region of interest. The tracer peak centroid for samples 1205147417 (MB), 1205147418 (LCS), 1205147419 (LCSD), 585885002 (A-2-Area 20-2022-Qtr2) and 585885003 (Blank-2022-Qtr2) are greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peaks are within the tracer region of interest.

Product: Gammaspec, Gamma, Filter

Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R

Analytical Procedure: GL-RAD-A-013 REV# 27

Analytical Batch: 2290721

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290583

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585885001	A-3-RMHF-2022-Qtr2
585885002	A-2-Area 20-2022-Qtr2
585885003	Blank-2022-Qtr2
1205141122	Method Blank (MB)
1205141123	585885001(A-3-RMHF-2022-Qtr2) Sample Duplicate (DUP)
1205141124	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC, Sr90, Filter

Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified

Analytical Procedure: GL-RAD-A-004 REV# 22

Analytical Batch: 2290790

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290583

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585885001	A-3-RMHF-2022-Qtr2
585885002	A-2-Area 20-2022-Qtr2
585885003	Blank-2022-Qtr2
1205141315	Method Blank (MB)
1205141316	Laboratory Control Sample (LCS)
1205141317	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205141315 (MB)	Strontium-90	Result -0.285 < MDA 5.38 > RDL 3 pCi/Sample

Samples (See Below) did not meet the detection limits due to limited sample volume. Samples were counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
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585885001 (A-3-RMHF-2022-Qtr2)	Strontium-90	Result 0.689 < MDA 5.32 > RDL 3 pCi/Sample
585885002 (A-2-Area 20-2022-Qtr2)	Strontium-90	Result 2.19 < MDA 6.03 > RDL 3 pCi/Sample
585885003 (Blank-2022-Qtr2)	Strontium-90	Result -9.22 < MDA 14.3 > RDL 3 pCi/Sample

Technical Information

Recounts

Sample 1205141315 (MB) was recounted due to a suspected blank false positive. The recount is reported.
Samples 585885001 (A-3-RMHF-2022-Qtr2) and 585885002 (A-2-Area 20-2022-Qtr2) were recounted due to a suspected false positive. The recounts are reported.

Product: Liquid Scint Pu241, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2294040

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290583

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585885001	A-3-RMHF-2022-Qtr2
585885002	A-2-Area 20-2022-Qtr2
585885003	Blank-2022-Qtr2
1205147420	Method Blank (MB)
1205147421	Laboratory Control Sample (LCS)
1205147422	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205147420 (MB)	Plutonium-241	Result -7.23 < MDA 29.1 > RDL 5 pCi/Sample

Samples (See Below) did not meet the detection limits due to limited sample volume. Samples were counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
585885001 (A-3-RMHF-2022-Qtr2)	Plutonium-241	Result 18.5 < MDA 31.2 > RDL 5 pCi/Sample
585885002 (A-2-Area 20-2022-Qtr2)	Plutonium-241	Result 3.36 < MDA 33.5 > RDL 5 pCi/Sample
585885003 (Blank-2022-Qtr2)	Plutonium-241	Result 0.713 < MDA 28.1 > RDL 5 pCi/Sample

Technical Information

Sample Re-prep/Re-analysis

Batch was reprepared due to analyst error. The re-analysis is being reported.

Miscellaneous Information

Additional Comments

Sample 1205147421 (LCS) did not meet the resolution requirement of having a full width half maximum of 100 keV or less for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest. The tracer peak centroid for samples 1205147420 (MB), 1205147421 (LCS), 1205147422 (LCSD), 585885002 (A-2-Area 20-2022-Qtr2) and 585885003 (Blank-2022-Qtr2) are greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peaks are within the tracer region of interest.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

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Qualifier Definition Report for

NORW002 North Wind Solutions

Client SDG: 585885 GEL Work Order: 585885

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 10 AUG 2022

Title: Group Leader

Prep Logbook

The Preparation of Special Matrices for the Determination of Radionuclides

Batch ID: 2290583

Analyst: Celeste Drayton (CXB7)

Method: Filter Prep

Lab SOP: GL-RAD-A-026 REV# 18

Instrument: NONE

SP-15750050

Due Dates for Lab: 07-AUG-2022

Package: 09-AUG-2022

SDG: 10-AUG-2022

Type Sample Id Description

Serial Number

Spike Amount

Spike Units

#	Sample ID	Prep Date	Min RDL ()	Number of Filters	Container Wt (g)	Weight of total filter with container (g)	Weight of filter Diluted with container (g)	Not Saved Final Volume of filter diluted to in Liters (mL)	Total Filter Weight (g)	Weight of Filter Diluted (g)
1	585885001	18-JUL-2022		1	65.282	67.536	66.441	200	2.254	1.159
2	585885002	18-JUL-2022		1	65.59	67.857	66.735	200	2.267	1.145
3	585885003	18-JUL-2022		1	66.264	68.473	67.527	200	2.209	1.263
4	1205140795 MFB	18-JUL-2022		1	0	1	1	200	1	1

Reagent/Solvent Lot ID	Description	Amount	Comments:
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Sample Data Summary

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: August 10, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-3-RMHF-2022-Qtr2
Sample ID: 585885001
Matrix: Filter
Collect Date: 27-JUN-22 09:24
Receive Date: 13-JUL-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	-0.00120	+/-0.189	0.401	1.00	pCi/Sample			BV1	07/25/22	1829	2293754	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		7.39	+/-0.707	0.166	0.500	pCi/Sample			BV1	07/23/22	1217	2290613	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.118	+/-0.151	0.209	1.00	pCi/Sample			BV1	07/25/22	1829	2294036	3
Plutonium-239/240	U	-0.0897	+/-0.0968	0.297	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.557	+/-0.427	0.567	1.00	pCi/Sample			MP2	07/24/22	1400	2290612	4
Thorium-230		1.13	+/-0.527	0.525	1.00	pCi/Sample							
Thorium-232		0.735	+/-0.409	0.359	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	-0.176	+/-0.260	0.585	1.00	pCi/Sample			MP2	07/24/22	1339	2290611	5
Uranium-235/236	U	0.0601	+/-0.148	0.236	1.00	pCi/Sample							
Uranium-238		0.292	+/-0.219	0.229	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	18.5	+/-18.6	31.2	5.00	pCi/Sample			BV1	07/26/22	1452	2294040	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	2.86	+/-25.6	23.8		pCi/Sample			MJH1	07/21/22	1633	2290721	7
Beryllium-7		187	+/-79.1	56.1		pCi/Sample							
Cesium-137	U	1.68	+/-3.27	6.56	20.0	pCi/Sample							
Cobalt-60	U	-3.40	+/-3.21	5.14		pCi/Sample							
Potassium-40		83.2	+/-79.9	74.5		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	0.689	+/-3.11	5.32	3.00	pCi/Sample			JXK3	08/09/22	1004	2290790	8

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXB7	07/18/22	1500	2290583

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: August 10, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-3-RMHF-2022-Qtr2
Sample ID: 585885001

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			68.6	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			53.6	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			87.7	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			41.1	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			56.9	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			87.7	(15%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			46.2	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: August 10, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-2-Area 20-2022-Qtr2
Sample ID: 585885002
Matrix: Filter
Collect Date: 27-JUN-22 09:38
Receive Date: 13-JUL-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0164	+/-0.133	0.269	1.00	pCi/Sample			BV1	07/25/22	1829	2293754	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		8.24	+/-0.704	0.189	0.500	pCi/Sample			BV1	07/23/22	1217	2290613	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	-0.0332	+/-0.0856	0.232	1.00	pCi/Sample			BV1	07/25/22	1829	2294036	3
Plutonium-239/240	U	-0.116	+/-0.137	0.381	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228		0.748	+/-0.557	0.684	1.00	pCi/Sample			BV1	07/26/22	0826	2293848	4
Thorium-230		1.37	+/-0.664	0.560	1.00	pCi/Sample							
Thorium-232		1.11	+/-0.584	0.416	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.316	+/-0.260	0.394	1.00	pCi/Sample			MP2	07/24/22	1339	2290611	5
Uranium-235/236	U	0.113	+/-0.144	0.200	1.00	pCi/Sample							
Uranium-238		0.332	+/-0.199	0.216	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	3.36	+/-19.8	33.5	5.00	pCi/Sample			BV1	07/26/22	1654	2294040	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-11.6	+/-18.1	27.9		pCi/Sample			MJH1	07/21/22	2246	2290721	7
Beryllium-7		119	+/-74.5	77.8		pCi/Sample							
Cesium-137	U	-6.58	+/-6.58	11.4	20.0	pCi/Sample							
Cobalt-60	U	1.58	+/-3.72	7.65		pCi/Sample							
Potassium-40		112	+/-84.7	54.1		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	2.19	+/-3.56	6.03	3.00	pCi/Sample			JXK3	08/09/22	1004	2290790	8

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXB7	07/18/22	1500	2290583

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Certificate of Analysis

Report Date: August 10, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-2-Area 20-2022-Qtr2
Sample ID: 585885002

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			80.3	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			64	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			81.7	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			72.6	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			84.4	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			81.7	(15%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			37	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 10, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: Blank-2022-Qtr2
Sample ID: 585885003
Matrix: Filter
Collect Date: 27-JUN-22 10:00
Receive Date: 13-JUL-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0142	+/-0.137	0.281	1.00	pCi/Sample			BV1	07/25/22	1829	2293754	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		0.200	+/-0.131	0.164	0.500	pCi/Sample			BV1	07/23/22	1217	2290613	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.129	+/-0.143	0.168	1.00	pCi/Sample			BV1	07/25/22	1829	2294036	3
Plutonium-239/240	U	0.0857	+/-0.135	0.202	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228		0.778	+/-0.430	0.461	1.00	pCi/Sample			MP2	07/24/22	1400	2290612	4
Thorium-230		1.11	+/-0.479	0.421	1.00	pCi/Sample							
Thorium-232		1.09	+/-0.463	0.363	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.158	+/-0.238	0.406	1.00	pCi/Sample			MP2	07/24/22	1339	2290611	5
Uranium-235/236	U	0.0921	+/-0.121	0.155	1.00	pCi/Sample							
Uranium-238		0.586	+/-0.238	0.201	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	0.713	+/-16.5	28.1	5.00	pCi/Sample			BV1	07/26/22	1855	2294040	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	12.1	+/-15.1	31.1		pCi/Sample			MJH1	07/21/22	2247	2290721	7
Beryllium-7	U	18.8	+/-39.6	74.3		pCi/Sample							
Cesium-137	U	-1.93	+/-5.68	8.84	20.0	pCi/Sample							
Cobalt-60	U	0.0153	+/-3.62	7.08		pCi/Sample							
Potassium-40	U	13.1	+/-78.8	76.1		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	-9.22	+/-8.04	14.3	3.00	pCi/Sample			JXK3	07/26/22	1910	2290790	8

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXB7	07/18/22	1500	2290583

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Certificate of Analysis

Report Date: August 10, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: Blank-2022-Qtr2
Sample ID: 585885003
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
-----------	-----------	--------	-------------	-----	----	-------	----	----	---------	------	------------	--------

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			72.6	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			66.5	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			85.3	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			40.6	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			77.8	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			85.3	(15%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			34.7	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: August 10, 2022

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Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina
Ms. Candace Christensen

Contact:
Workorder: 585885

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2290611										
QC1205140834	LCS										
Uranium-233/234				17.9 pCi/Sample					MP2	07/25/22	08:43
	Uncertainty			+/-2.57							
Uranium-235/236				0.663 pCi/Sample							
	Uncertainty			+/-0.611							
Uranium-238	21.3			19.3 pCi/Sample			90.5	(75%-125%)			
	Uncertainty			+/-2.66							
QC1205140835	LCSD										
Uranium-233/234				20.2 pCi/Sample		12.2				07/25/22	08:43
	Uncertainty			+/-2.84							
Uranium-235/236				1.07 pCi/Sample		47.2					
	Uncertainty			+/-0.789							
Uranium-238	21.3			23.4 pCi/Sample		19.5	110	(0%-20%)			
	Uncertainty			+/-3.05							
QC1205140833	MB										
Uranium-233/234			U	-0.0155 pCi/Sample						07/24/22	13:39
	Uncertainty			+/-0.139							
Uranium-235/236			U	0.0464 pCi/Sample							
	Uncertainty			+/-0.114							
Uranium-238			U	0.0626 pCi/Sample							
	Uncertainty			+/-0.104							
Batch	2290612										
QC1205140838	LCS										
Thorium-228				15.8 pCi/Sample					MP2	07/24/22	14:00
	Uncertainty			+/-1.16							
Thorium-230				1.96 pCi/Sample				(75%-125%)			
	Uncertainty			+/-0.431							
Thorium-232	15.3			15.7 pCi/Sample			102	(75%-125%)			
	Uncertainty			+/-1.15							

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2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 585885

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2290612										
QC1205140839	LCSD			15.8 pCi/Sample		0.273			MP2	07/24/22	14:00
Thorium-228				Uncertainty		+/-1.69					
Thorium-230				2.69 pCi/Sample		31.2*		(0%-20%)			
				Uncertainty		+/-0.745					
Thorium-232				15.3		16.6 pCi/Sample	5.36	108	(0%-20%)		
				Uncertainty		+/-1.69					
QC1205140836	MB			0.0232 pCi/Sample						07/24/22	14:00
Thorium-228			U	Uncertainty		+/-0.128					
Thorium-230				0.509 pCi/Sample							
				Uncertainty		+/-0.279					
Thorium-232			U	0.0428 pCi/Sample							
				Uncertainty		+/-0.106					
Batch	2290613										
QC1205140841	LCS			15.3 pCi/Sample			92.6	(75%-125%)	BV1	07/23/22	12:19
Polonium-210				Uncertainty		+/-0.871					
QC1205140842	LCSD			15.3 pCi/Sample		0.0727	92.7	(0%-20%)		07/23/22	12:19
Polonium-210				Uncertainty		+/-0.892					
QC1205140840	MB			-0.0811 pCi/Sample						07/23/22	12:19
Polonium-210			U	Uncertainty		+/-0.119					
Batch	2293754										
QC1205146817	LCS			14.5 pCi/Sample			84.3	(75%-125%)	BV1	07/25/22	18:29
Americium-241				Uncertainty		+/-1.18					
QC1205146818	LCSD			13.9 pCi/Sample		3.97	81	(0%-20%)		07/25/22	18:29
Americium-241				Uncertainty		+/-1.13					
QC1205146816	MB			-0.0653 pCi/Sample						07/25/22	18:29
Americium-241			U	Uncertainty		+/-0.0806					

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QC Summary

Workorder: 585885

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2293848										
QC1205146995	LCS										
Thorium-228				20.3 pCi/Sample					BV1	07/26/22	08:26
	Uncertainty			+/-2.17							
Thorium-230				3.23 pCi/Sample				(75%-125%)			
	Uncertainty			+/-0.910							
Thorium-232	19.7			21.9 pCi/Sample			111	(75%-125%)			
	Uncertainty			+/-2.25							
QC1205146996	LCSD										
Thorium-228				24.2 pCi/Sample		17.7				07/26/22	08:26
	Uncertainty			+/-2.54							
Thorium-230				3.48 pCi/Sample		7.51		(0%-20%)			
	Uncertainty			+/-1.00							
Thorium-232	19.7			21.1 pCi/Sample		3.92	107	(0%-20%)			
	Uncertainty			+/-2.36							
QC1205146994	MB										
Thorium-228			U	-0.0297 pCi/Sample						07/26/22	08:26
	Uncertainty			+/-0.265							
Thorium-230				0.903 pCi/Sample							
	Uncertainty			+/-0.580							
Thorium-232			U	0.0988 pCi/Sample							
	Uncertainty			+/-0.247							
Batch	2294036										
QC1205147418	LCS										
Plutonium-238				0.0837 pCi/Sample					BV1	07/25/22	18:29
	Uncertainty			+/-0.113							
Plutonium-239/240	18.0			15.0 pCi/Sample			83.3	(75%-125%)			
	Uncertainty			+/-1.27							
QC1205147419	LCSD										
Plutonium-238			U	0.117 pCi/Sample		98.2				07/25/22	18:29
	Uncertainty			+/-0.158							
Plutonium-239/240	18.0			14.1 pCi/Sample		6.31	78.2	(0%-20%)			
	Uncertainty			+/-1.20							

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QC Summary

Workorder: 585885

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2294036										
QC1205147417	MB										
Plutonium-238			U	0.125 pCi/Sample					BV1	07/25/22	18:29
	Uncertainty			+/-0.222							
Plutonium-239/240			U	0.0301 pCi/Sample							
	Uncertainty			+/-0.194							
Batch	2294040										
QC1205147421	LCS										
Plutonium-241	634			700 pCi/Sample			110	(75%-125%)	BV1	07/27/22	11:09
	Uncertainty			+/-76.1							
QC1205147422	LCSD										
Plutonium-241	634			680 pCi/Sample		2.82	107	(0%-20%)		07/27/22	11:25
	Uncertainty			+/-69.1							
QC1205147420	MB										
Plutonium-241			U	-7.23 pCi/Sample						07/27/22	09:08
	Uncertainty			+/-17.0							
Rad Gamma Spec											
Batch	2290721										
QC1205141123	585885001	DUP									
Actinium-228	U	2.86		52.0 pCi/Sample		74.4		(0% - 100%)	MJH1	07/21/22	23:03
	Uncertainty	+/-25.6		+/-26.3							
Beryllium-7		187		228 pCi/Sample		20.1		(0% - 100%)			
	Uncertainty	+/-79.1		+/-68.7							
Cesium-137	U	1.68	U	5.81 pCi/Sample		N/A			N/A		
	Uncertainty	+/-3.27		+/-4.33							
Cobalt-60	U	-3.40	U	-0.457 pCi/Sample		N/A			N/A		
	Uncertainty	+/-3.21		+/-4.07							
Potassium-40		83.2	U	89.7 pCi/Sample		44		(0% - 100%)			
	Uncertainty	+/-79.9		+/-59.4							
QC1205141124	LCS										
Americium-241	99800			1.06E+05 pCi/Sample			106	(75%-125%)		07/21/22	22:56
	Uncertainty			+/-3000							
Actinium-228			U	386 pCi/Sample							
	Uncertainty			+/-439							

GEL LABORATORIES LLC

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QC Summary

Workorder: 585885

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	2290721										
Beryllium-7			U	-123 pCi/Sample					MJH1	07/21/22	22:56
	Uncertainty			+/-985							
Cesium-137	29700			29600 pCi/Sample			99.6	(75%-125%)			
	Uncertainty			+/-712							
Cobalt-60	11300			11600 pCi/Sample			102	(75%-125%)			
	Uncertainty			+/-553							
Potassium-40			U	-1.61 pCi/Sample							
	Uncertainty			+/-306							
QC1205141122	MB										
Actinium-228			U	-7.70 pCi/Sample						07/21/22	22:54
	Uncertainty			+/-25.7							
Beryllium-7			U	-2.83 pCi/Sample							
	Uncertainty			+/-31.0							
Cesium-137			U	3.69 pCi/Sample							
	Uncertainty			+/-8.15							
Cobalt-60			U	0.699 pCi/Sample							
	Uncertainty			+/-5.57							
Potassium-40			U	15.5 pCi/Sample							
	Uncertainty			+/-113							
Rad Gas Flow											
Batch	2290790										
QC1205141316	LCS										
Strontium-90	410			454 pCi/Sample			111	(75%-125%)	JXK3	07/26/22	17:47
	Uncertainty			+/-32.5							
QC1205141317	LCSD										
Strontium-90	410			417 pCi/Sample		8.38	102	(0%-20%)		07/26/22	17:47
	Uncertainty			+/-30.9							
QC1205141315	MB										
Strontium-90			U	-0.285 pCi/Sample						07/27/22	10:14
	Uncertainty			+/-3.10							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).
The Qualifiers in this report are defined as follows:

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 585885

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
**	Analyte is a Tracer compound										
<	Result is less than value reported										
>	Result is greater than value reported										
BD	Results are either below the MDC or tracer recovery is low										
FA	Failed analysis.										
H	Analytical holding time was exceeded										
J	See case narrative for an explanation										
J	Value is estimated										
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.										
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.										
M	M if above MDC and less than LLD										
M	REMP Result > MDC/CL and < RDL										
N/A	RPD or %Recovery limits do not apply.										
N1	See case narrative										
ND	Analyte concentration is not detected above the detection limit										
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.										
R	Sample results are rejected										
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.										
UI	Gamma Spectroscopy--Uncertain identification										
UJ	Gamma Spectroscopy--Uncertain identification										
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.										
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.										
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.										
h	Preparation or preservation holding time was exceeded										

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Alpha Spectroscopy Raw Data

Batch 2290612 Check-list

This check-list was completed on 28-JUL-22 by Theresa Austin

This batch was reviewed by Jessica Davis on 25-JUL-22 and Melanie Aycock on 25-JUL-22.

Batch ID:
2290612

Product:
ASP__THF

Description: Alpha Spec Thorium
GL-RAD-A-038

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?		No	
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?	Yes		
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Thorium

Batch ID: 2290612
Analyst: Michael Potts (MP2)
Method: DOE EML HASL-300, Th-01-RC
 Modified
Lab SOP: GL-RAD-A-038 REV# 18
Instrument: SP-C018367602

Due Dates for Lab: 26-JUL-2022

Package: 27-JUL-2022

SDG: 27-JUL-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205140838	Thorium-232 AS SPIKE	1513-C	.1	mL
LCSD	1205140839	Thorium-232 AS SPIKE	1513-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	585885001	22-JUL-2022	1	45.6	0.11724
3	585885003	22-JUL-2022	1	45.3	0.1295
4	585905001	22-JUL-2022	1	45.6	0.11889
5	585905002	22-JUL-2022	1	45.9	0.11304
6	585905003	22-JUL-2022	1	45.6	0.10404
7	585905004	22-JUL-2022	1	45.5	0.10704
8	585905005	22-JUL-2022	1	45	0.11477
9	1205140836 MB	22-JUL-2022	1		0.1295
10	1205140838 LCS	22-JUL-2022	1		0.1295
11	1205140839 LCSD	22-JUL-2022	1		0.1295

Reagent/Solvent Lot ID	Description	Amount
WORK 1845-G	Thorium-229 AS TRACER, RASP	.1 mL

Comments:

Pipet ID: RAD-ASP-184002Z
 Data Entry Date2: 22-JUL-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

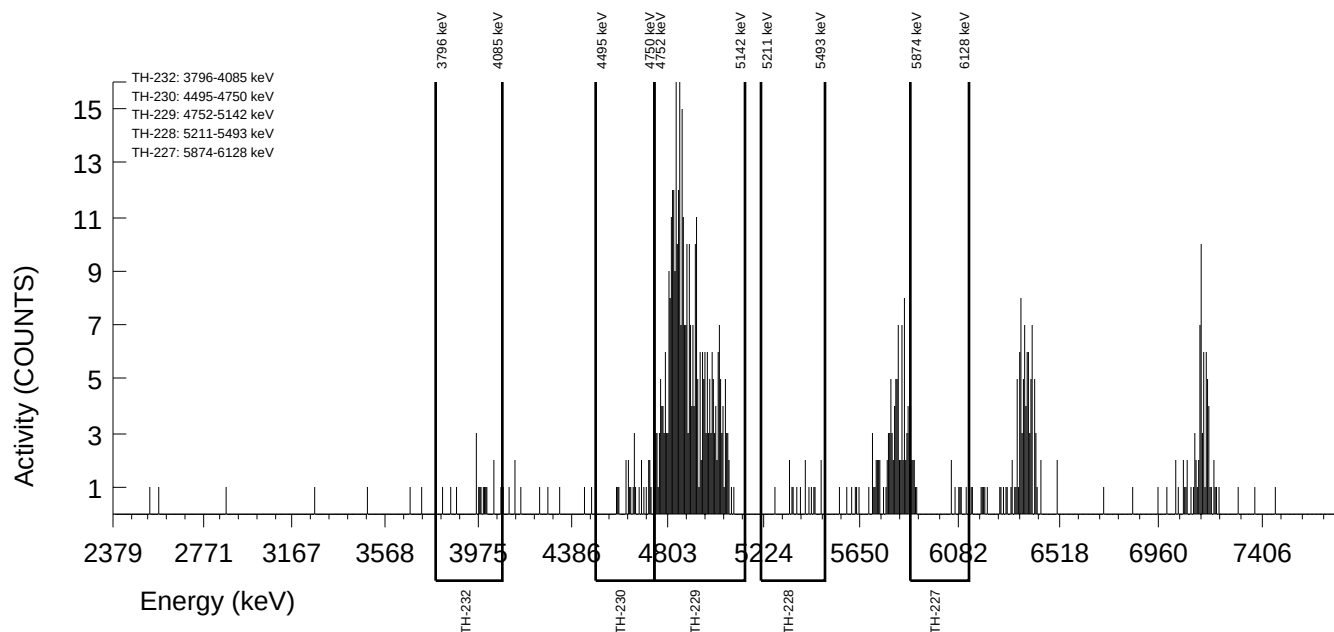
BATCH NUMBER : 2290612 SAMPLE ID : S0585885001_TH SAMPLE QTY : 0.117 F +/-0.853 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 41.1 +/-5.779 %	CHAMBER : 037 DETECTOR S/N : 140606 AVERAGE %EFFICIENCY : 37.3372 AVERAGE %EFF ERROR : 0.7188 COUNT DATE : 24-Jul-2022 14:00:45 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : TH(2) BKG FILE : B037.CNF;2463 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W037.CNF;685 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 2.0009E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5983.92	0.000	16.000	9.435	6.565	2.5622	57.440	2.28E+00	2.16E+00	3.22E+00	1.25E+00	2.15E+00
TH-228	5363.00	5397.84	131.225	15.000	10.937	4.040	2.0100	99.940	5.57E-01	4.32E-01	5.67E-01	2.07E-01	4.27E-01
TH-229	4900.00	4899.37	115.024	380.000	375.455	4.545	2.1319	99.520	1.87E+01	2.95E+00	5.78E-01	2.14E-01	1.91E+00
TH-230	4671.39	4676.00	0.000	27.000	22.721	2.020	1.4213	99.700	1.13E+00	5.48E-01	5.25E-01	1.88E-01	5.27E-01
TH-232	3972.00	3976.76	76.548	16.000	14.839	1.010	1.0050	100.000	7.35E-01	4.19E-01	3.59E-01	1.05E-01	4.09E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.023 +/-0.000)
TH-230 (2.259 +/-0.035)
TH-232 (0.151 +/-0.002)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

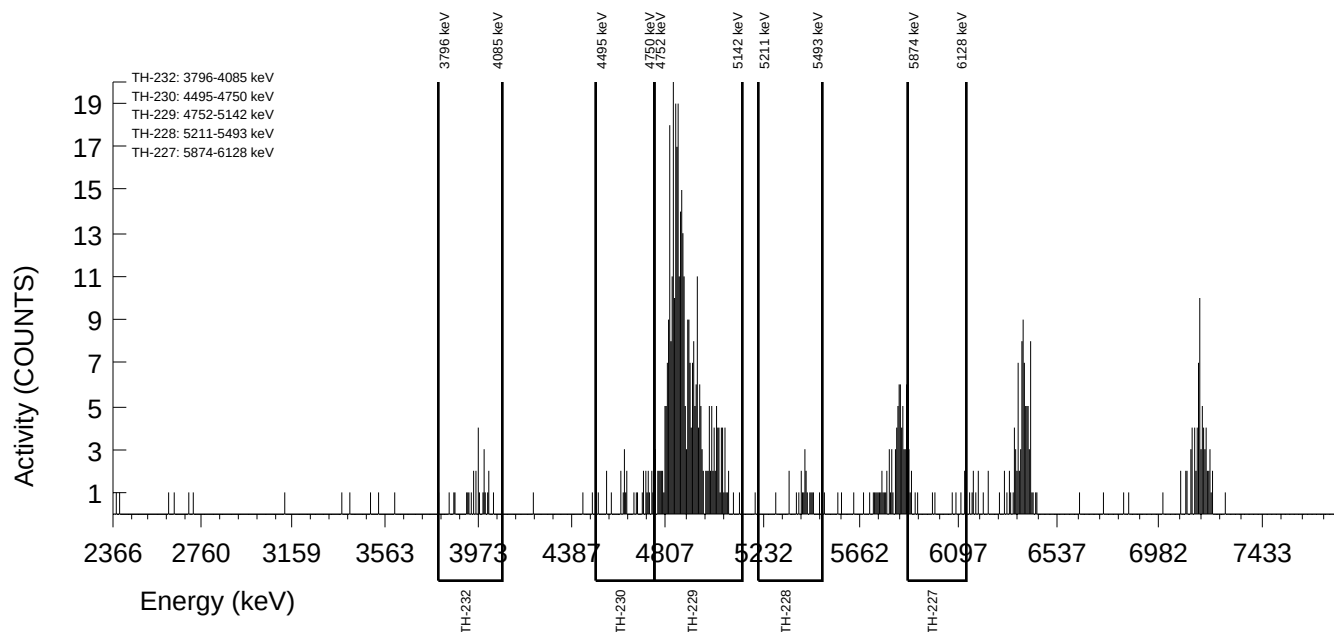
BATCH NUMBER : 2290612 SAMPLE ID : S0585885003_TH SAMPLE QTY : 0.130 F +/-0.772 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 40.6 +/-5.756 %	CHAMBER : 039 DETECTOR S/N : 158115 AVERAGE %EFFICIENCY : 37.9680 AVERAGE %EFF ERROR : 0.7307 COUNT DATE : 24-Jul-2022 14:00:45 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : TH(2) BKG FILE : B039.CNF;2482 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W039.CNF;716 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 1.9756E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5961.99	0.000	17.000	0.335	16.665	4.0823	57.440	7.30E-02	2.20E+00	4.24E+00	1.79E+00	2.20E+00
TH-228	5363.00	5410.51	72.173	20.000	16.947	3.030	1.7407	99.940	7.78E-01	4.40E-01	4.61E-01	1.62E-01	4.30E-01
TH-229	4900.00	4894.04	117.589	380.000	376.970	3.030	1.7407	99.520	1.69E+01	2.66E+00	4.50E-01	1.58E-01	1.72E+00
TH-230	4671.39	4659.81	189.607	28.000	24.722	1.010	1.0050	99.700	1.11E+00	5.00E-01	4.21E-01	1.43E-01	4.79E-01
TH-232	3972.00	3962.16	29.359	26.000	24.333	1.515	1.2309	100.000	1.09E+00	4.82E-01	3.63E-01	1.15E-01	4.63E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.023 +/-0.000)
 TH-230 (2.268 +/-0.035)
 TH-232 (0.152 +/-0.002)



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Instrument SOP:
Analytical SOP: GL-RAD-A-038

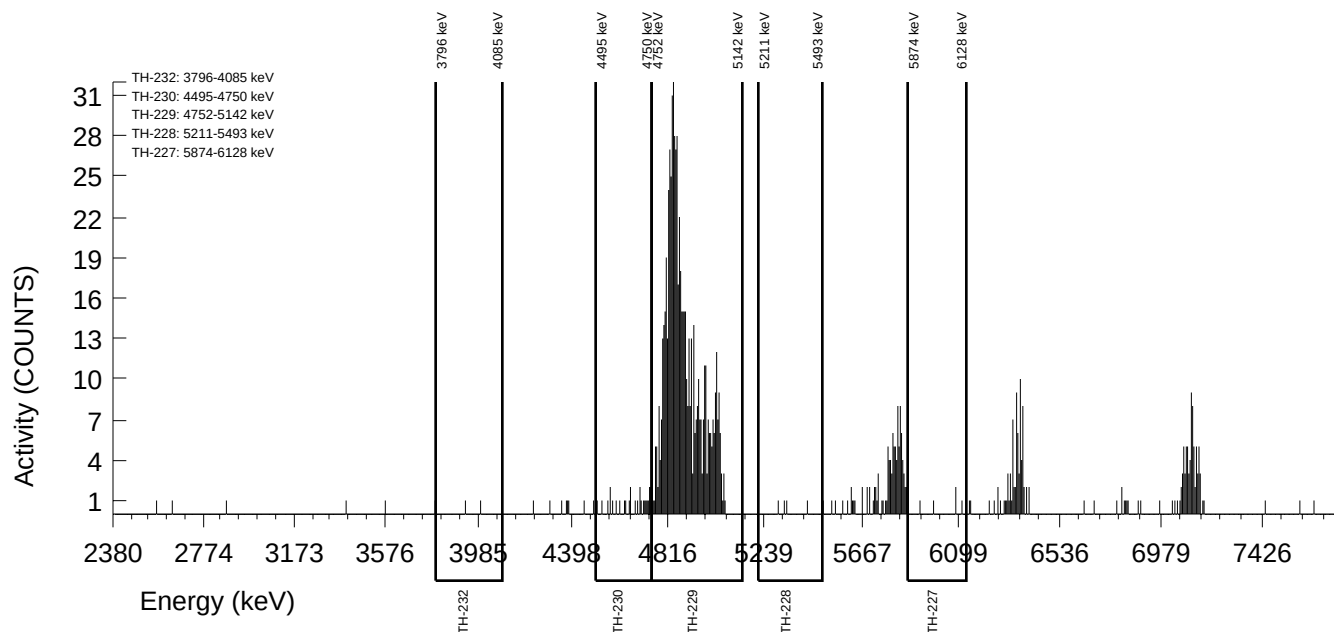
BATCH NUMBER : 2290612 SAMPLE ID : S1205140836_TH SAMPLE QTY : 0.130 F +/-0.772 % SAMPLE DATE : 22-Jul-2022 00:00:00 ANALYST : MP2 % YIELD : 80.1 +/-4.608 %	CHAMBER : 045 DETECTOR S/N : 78783 AVERAGE %EFFICIENCY : 34.5344 AVERAGE %EFF ERROR : 0.6659 COUNT DATE : 24-Jul-2022 14:00:46 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : TH(2) BKG FILE : B045.CNF;2459 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W045.CNF;650 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 3.8974E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	6038.70	0.000	8.000	-2.605	10.605	3.2565	57.440	-1.25E-01	3.60E-01	7.75E-01	3.15E-01	3.60E-01
TH-228	5363.00	5350.73	122.338	4.000	0.928	3.030	1.7407	99.940	2.32E-02	1.28E-01	2.51E-01	8.81E-02	1.28E-01
TH-229	4900.00	4885.97	65.655	683.000	676.435	6.565	2.5622	99.520	1.69E+01	2.11E+00	3.34E-01	1.29E-01	1.29E+00
TH-230	4671.39	4662.69	0.000	29.000	20.385	4.545	2.1319	99.700	5.09E-01	2.86E-01	3.46E-01	1.36E-01	2.79E-01
TH-232	3972.00	3906.12	0.000	3.000	1.718	1.010	1.0050	100.000	4.28E-02	1.07E-01	1.84E-01	5.48E-02	1.06E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.042 +/-0.001)
 TH-230 (4.070 +/-0.063)
 TH-232 (0.272 +/-0.004)



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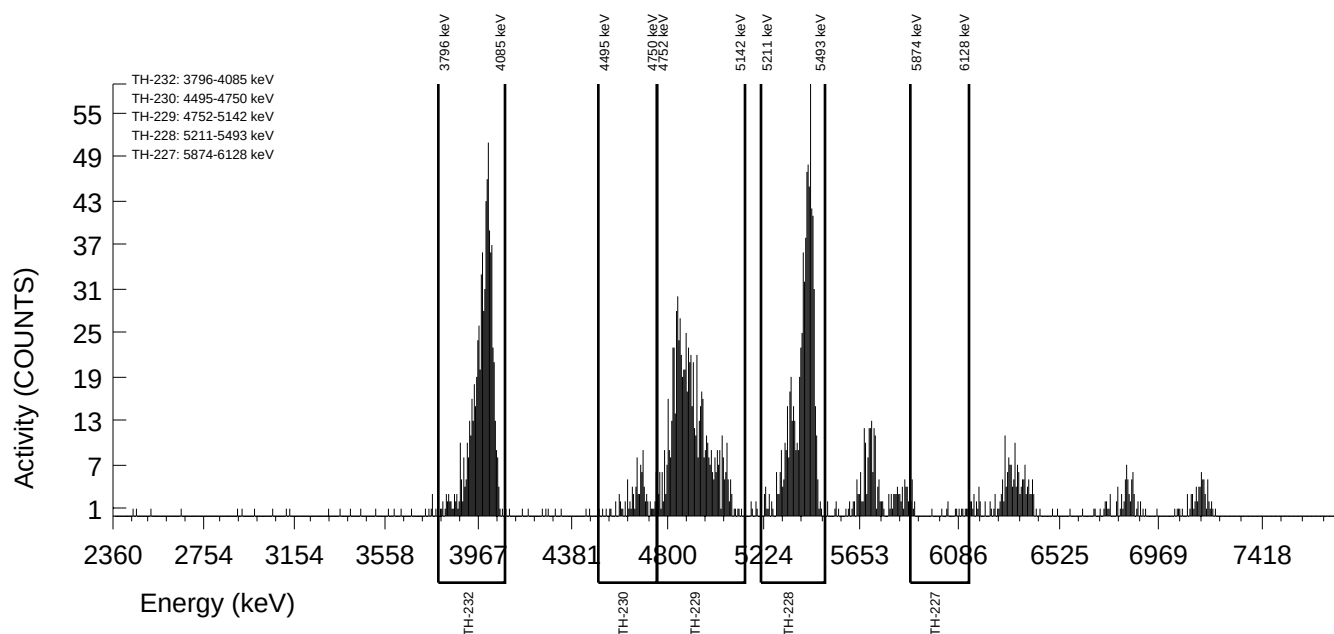
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2290612 SAMPLE ID : S1205140838_TH SAMPLE QTY : 0.130 F +/-0.772 % SAMPLE DATE : 22-Jul-2022 00:00:00 ANALYST : MP2 % YIELD : 88.5 +/-4.404 %	CHAMBER : 047 DETECTOR S/N : 80064 AVERAGE %EFFICIENCY : 35.4924 AVERAGE %EFF ERROR : 0.6840 COUNT DATE : 24-Jul-2022 14:00:46 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : TH(2) BKG FILE : B047.CNF;2465 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W047.CNF;654 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 4.3052E+00 dpm	LCS ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.5335E+01 % RECOVERY 102.390	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma	MDA pCi/F	Lc	1.96-sigma
										TPU pCi/F		pCi/F	cnt Unc pCi/F
TH-227	5994.04	5986.16	7.140	23.000	3.810	19.190	4.3806	57.440	1.61E-01	4.83E-01	8.74E-01	3.74E-01	4.83E-01
TH-228	5363.00	5396.81	47.414	721.000	716.408	4.545	2.1319	99.940	1.58E+01	1.90E+00	2.56E-01	9.50E-02	1.16E+00
TH-229	4900.00	4904.36	143.135	774.000	767.940	6.060	2.4617	99.520	1.69E+01	2.01E+00	2.85E-01	1.09E-01	1.20E+00
TH-230	4671.39	4667.43	0.000	97.000	89.350	3.030	1.7407	99.700	1.96E+00	4.74E-01	2.85E-01	1.10E-01	4.31E-01
TH-232	3972.00	3984.61	59.100	717.000	716.186	0.505	0.7106	100.000	1.57E+01	1.89E+00	1.40E-01	3.73E-02	1.15E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.047 +/-0.001)
 TH-230 (4.620 +/-0.072)
 TH-232 (0.309 +/-0.005)



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ALPHA SPECTROSCOPY REPORT

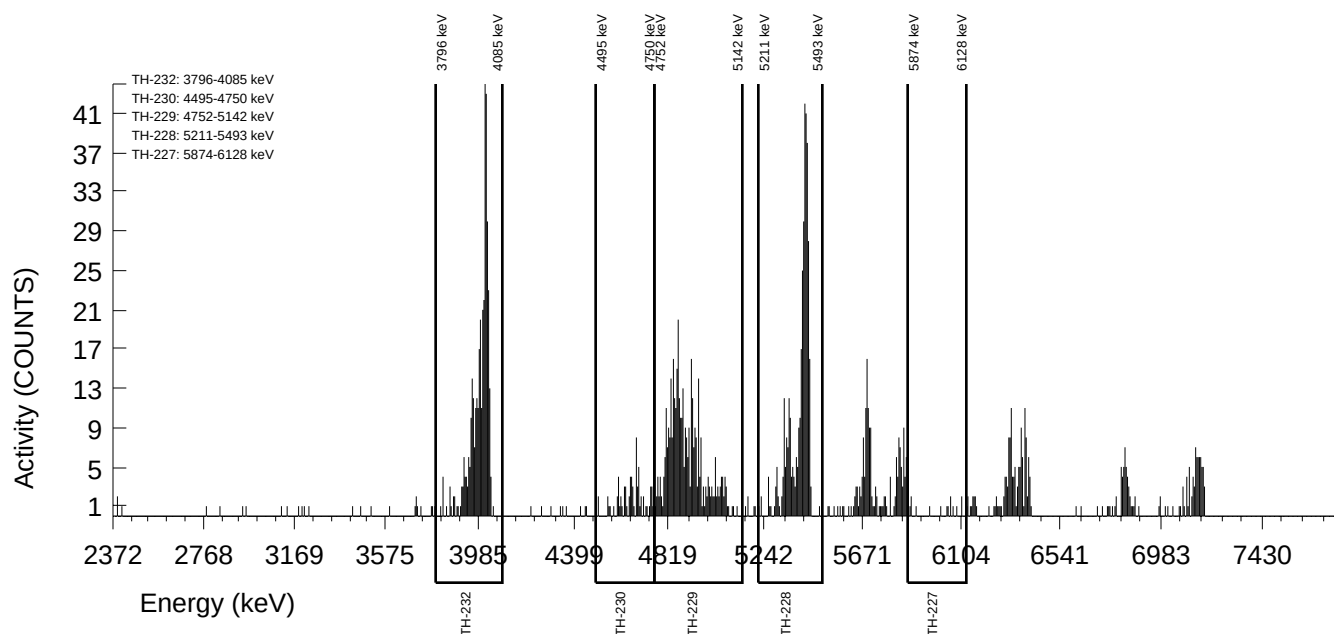
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2290612 SAMPLE ID : S1205140839_TH SAMPLE QTY : 0.130 F +/-0.772 % SAMPLE DATE : 22-Jul-2022 00:00:00 ANALYST : MP2 % YIELD : 48.2 +/-5.796 %	CHAMBER : 048 DETECTOR S/N : 140242 AVERAGE %EFFICIENCY : 32.2813 AVERAGE %EFF ERROR : 0.6235 COUNT DATE : 24-Jul-2022 14:00:46 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : TH(2) BKG FILE : B048.CNF;2475 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W048.CNF;735 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 2.3447E+00 dpm	LCSD ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.5335E+01 % RECOVERY 108.034	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma	MDA pCi/F	Lc pCi/F	1.96-sigma
										TPU pCi/F			cnt Unc pCi/F
TH-227	5994.04	6009.78	209.316	14.000	5.415	8.585	2.9300	57.440	4.62E-01	7.43E-01	1.27E+00	5.05E-01	7.41E-01
TH-228	5363.00	5394.74	29.961	369.000	355.847	13.130	3.6235	99.940	1.58E+01	2.55E+00	7.83E-01	3.25E-01	1.69E+00
TH-229	4900.00	4896.28	135.932	390.000	380.405	9.595	3.0976	99.520	1.69E+01	2.68E+00	6.89E-01	2.78E-01	1.73E+00
TH-230	4671.39	4654.43	13.544	69.000	60.651	6.060	2.4617	99.700	2.69E+00	8.18E-01	6.26E-01	2.47E-01	7.45E-01
TH-232	3972.00	3986.32	20.193	377.000	374.322	2.525	1.5890	100.000	1.66E+01	2.62E+00	4.22E-01	1.45E-01	1.69E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.023 +/-0.000)
TH-230 (2.289 +/-0.035)
TH-232 (0.153 +/-0.002)



Batch 2293848 Check-list

This check-list was completed on 26-JUL-22 by Melanie Aycock

This batch was reviewed by Melanie Aycock on 26-JUL-22 and Jessica Davis on 02-AUG-22.

Batch ID:
2293848

Product:
ASP__THF

Description: Alpha Spec Thorium
GL-RAD-A-038

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Thorium

Batch ID: 2293848

Analyst: Brendon Viquez (BV1)

Method: DOE EML HASL-300, Th-01-RC
Modified

Lab SOP: GL-RAD-A-038 REV# 18

Instrument: ASP-33005595

Due Dates for Lab: 08-AUG-2022

Package: 09-AUG-2022

SDG: 10-AUG-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205146995	Thorium-232 AS SPIKE	1513-C	.1	mL
LCSD	1205146996	Thorium-232 AS SPIKE	1513-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	585885002 - 2	25-JUL-2022	1	40	0.10101
2	1205146994 MB	25-JUL-2022	1		0.10102
3	1205146995 LCS	25-JUL-2022	1		0.10102
4	1205146996 LCSD	25-JUL-2022	1		0.10102

Reagent/Solvent Lot ID	Description	Amount
WORK 1845-G	Thorium-229 AS TRACER, RASP	.1 mL

Comments:

Pipet ID: RAD-ASP-184002Z
Data Entry Date2: 25-JUL-2022 00:00

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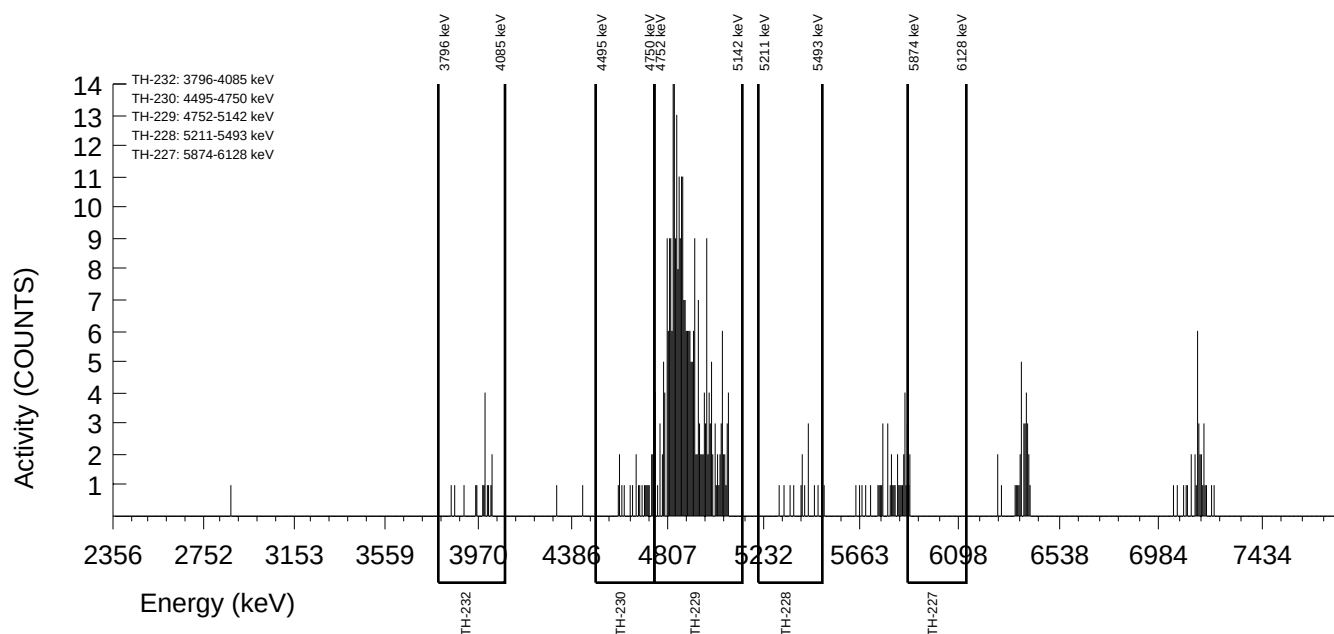
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2293848 SAMPLE ID : S0585885002_TH SAMPLE QTY : 0.101 F +/-0.990 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 72.6 +/-6.322 %	CHAMBER : 043 DETECTOR S/N : 155792 AVERAGE %EFFICIENCY : 35.6168 AVERAGE %EFF ERROR : 0.6864 COUNT DATE : 26-Jul-2022 08:26:26 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH(2) BKG FILE : B043.CNF;2475 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W043.CNF;692 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 3.5308E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
TH-227	5994.04	5877.93	7.379	3.000	-2.040	5.040	2.2450	57.440	-7.61E-01	1.68E+00	4.19E+00	1.53E+00	1.68E+00
TH-228	5363.00	5398.78	29.515	13.000	10.102	2.880	1.6971	99.940	7.48E-01	5.66E-01	6.84E-01	2.31E-01	5.57E-01
TH-229	4900.00	4894.47	164.829	303.000	300.360	2.640	1.6248	99.520	2.17E+01	3.76E+00	6.46E-01	2.15E-01	2.47E+00
TH-230	4671.39	4678.32	145.113	21.000	18.953	0.240	0.4899	99.700	1.37E+00	6.93E-01	5.60E-01	1.72E-01	6.64E-01
TH-232	3972.00	3978.85	5.739	16.000	15.399	0.480	0.6928	100.000	1.11E+00	6.02E-01	4.16E-01	1.00E-01	5.84E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.018 +/-0.000)
TH-230 (1.807 +/-0.028)
TH-232 (0.121 +/-0.002)



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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

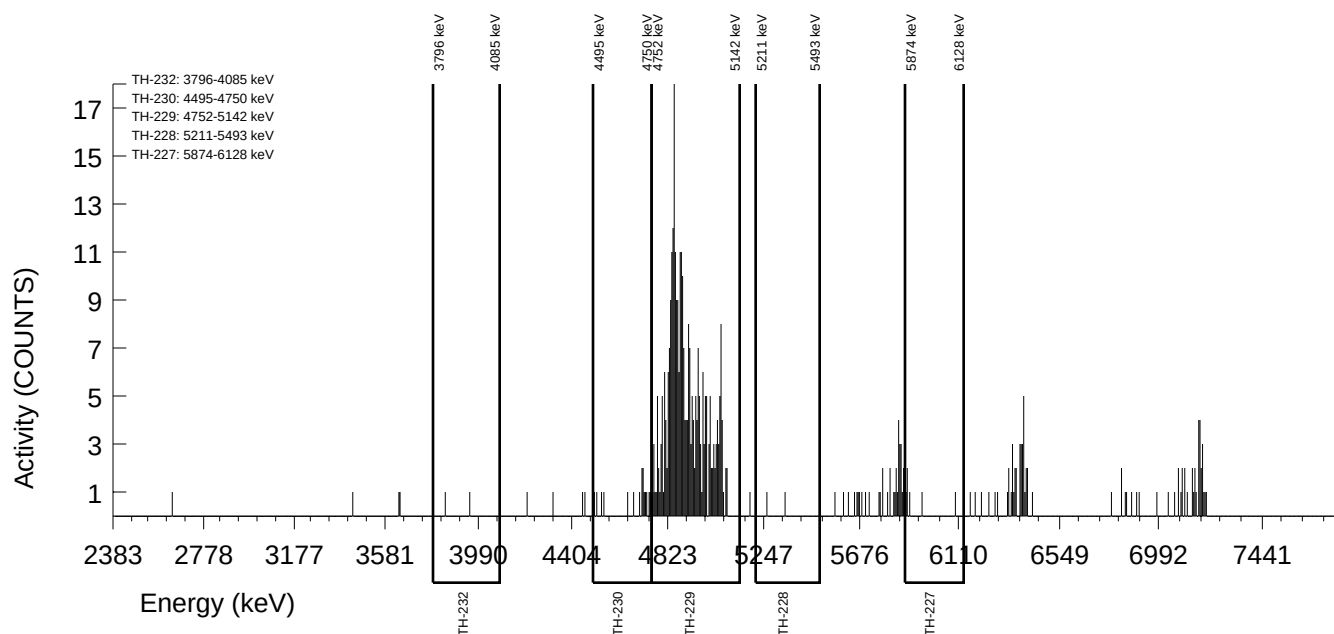
BATCH NUMBER : 2293848 SAMPLE ID : S1205146994_TH SAMPLE QTY : 0.101 F +/-0.990 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 71.3 +/-6.282 %	CHAMBER : 044 DETECTOR S/N : 80060 AVERAGE %EFFICIENCY : 36.8199 AVERAGE %EFF ERROR : 0.7091 COUNT DATE : 26-Jul-2022 08:26:26 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH(2) BKG FILE : B044.CNF;2474 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W044.CNF;674 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 3.4695E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5928.64	7.347	6.000	-0.720	6.720	2.5923	57.440	-9.35E-02	7.50E-01	1.62E+00	6.17E-01	7.50E-01
TH-228	5363.00	5303.37	78.368	2.000	-0.419	2.400	1.5492	99.940	-2.97E-02	2.65E-01	6.16E-01	2.02E-01	2.65E-01
TH-229	4900.00	4907.39	50.613	308.000	305.120	2.880	1.6971	99.520	2.17E+01	3.74E+00	6.55E-01	2.21E-01	2.45E+00
TH-230	4671.39	4666.73	12.245	16.000	12.724	1.440	1.2000	99.700	9.03E-01	5.96E-01	6.57E-01	2.22E-01	5.80E-01
TH-232	3972.00	3900.47	107.756	2.000	1.397	0.480	0.6928	100.000	9.88E-02	2.47E-01	4.09E-01	9.86E-02	2.47E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.019 +/-0.000)
TH-230 (1.836 +/-0.028)
TH-232 (0.123 +/-0.002)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

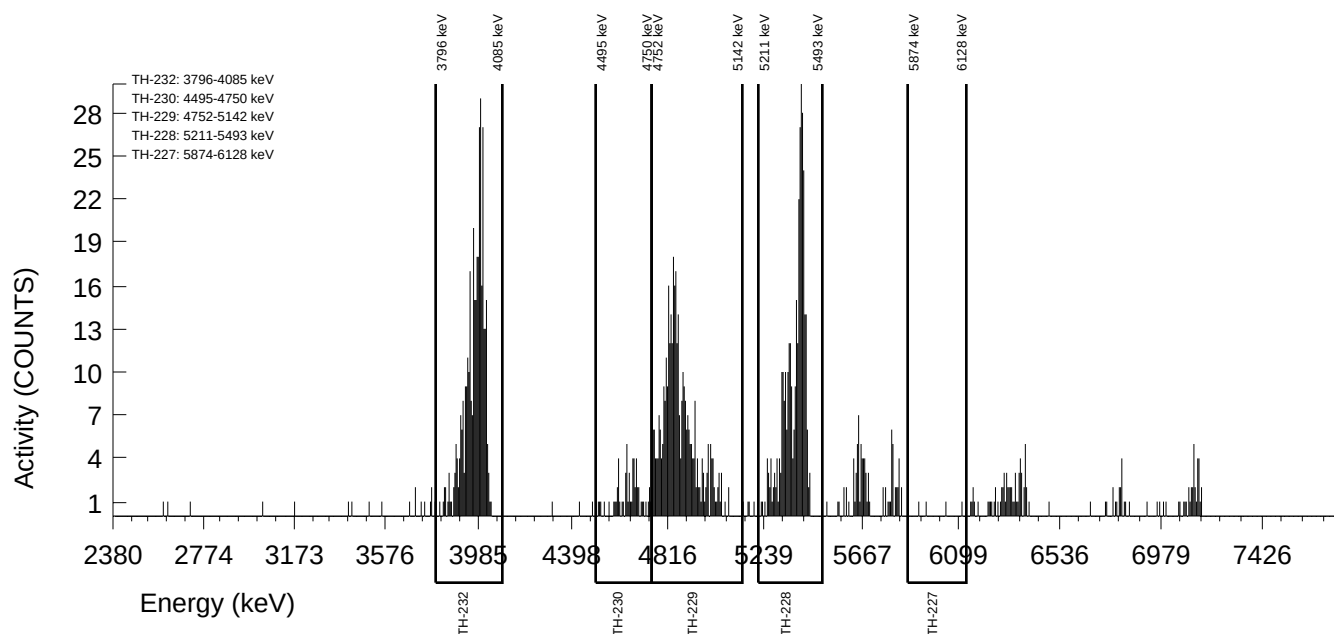
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2293848 SAMPLE ID : S1205146995_TH SAMPLE QTY : 0.101 F +/-0.990 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 89.7 +/-5.863 %	CHAMBER : 045 DETECTOR S/N : 78783 AVERAGE %EFFICIENCY : 34.5344 AVERAGE %EFF ERROR : 0.6659 COUNT DATE : 26-Jul-2022 08:26:26 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH(2) BKG FILE : B045.CNF;2459 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W045.CNF;650 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 4.3630E+00 dpm	LCS ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.9660E+01 % RECOVERY 111.466	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
TH-227	5994.04	6005.47	176.167	4.000	-1.040	5.040	2.2450	57.440	-1.15E-01	5.41E-01	1.24E+00	4.53E-01	5.40E-01
TH-228	5363.00	5373.97	27.404	339.000	337.538	1.440	1.2000	99.940	2.03E+01	3.30E+00	4.46E-01	1.33E-01	2.17E+00
TH-229	4900.00	4870.03	76.665	363.000	359.880	3.120	1.7664	99.520	2.17E+01	3.49E+00	5.71E-01	1.95E-01	2.26E+00
TH-230	4671.39	4646.91	80.743	58.000	53.675	2.160	1.4697	99.700	3.23E+00	9.99E-01	6.16E-01	2.18E-01	9.10E-01
TH-232	3972.00	3966.59	70.502	366.000	365.375	0.480	0.6928	100.000	2.19E+01	3.51E+00	3.50E-01	8.49E-02	2.25E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.022 +/-0.000)
 TH-230 (2.165 +/-0.034)
 TH-232 (0.145 +/-0.002)



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ALPHA SPECTROSCOPY REPORT

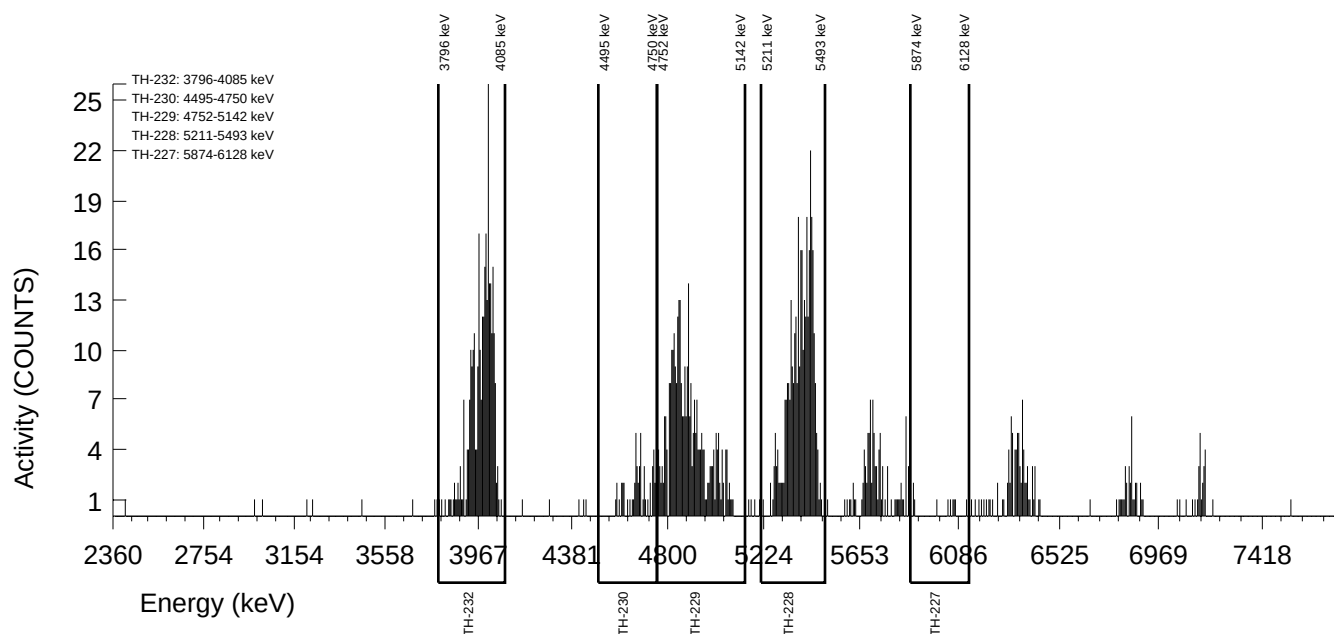
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2293848 SAMPLE ID : S1205146996_TH SAMPLE QTY : 0.101 F +/-0.990 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 76.4 +/-6.197 %	CHAMBER : 047 DETECTOR S/N : 80064 AVERAGE %EFFICIENCY : 35.4924 AVERAGE %EFF ERROR : 0.6840 COUNT DATE : 26-Jul-2022 08:26:26 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH(2) BKG FILE : B047.CNF;2465 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W047.CNF;654 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 3.7172E+00 dpm	LCSD ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.9660E+01 % RECOVERY 107.181	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma	MDA pCi/F	Lc pCi/F	1.96-sigma
										TPU pCi/F			cnt Unc pCi/F
TH-227	5994.04	6004.62	7.344	10.000	0.880	9.120	3.0199	57.440	1.11E-01	8.97E-01	1.77E+00	6.96E-01	8.97E-01
TH-228	5363.00	5388.22	94.652	355.000	352.821	2.160	1.4697	99.940	2.42E+01	4.02E+00	5.77E-01	1.85E-01	2.54E+00
TH-229	4900.00	4892.54	89.716	318.000	315.120	2.880	1.6971	99.520	2.17E+01	3.69E+00	6.34E-01	2.14E-01	2.41E+00
TH-230	4671.39	4672.03	81.189	54.000	50.664	1.440	1.2000	99.700	3.48E+00	1.10E+00	6.40E-01	2.17E-01	1.00E+00
TH-232	3972.00	3982.48	63.646	308.000	307.633	0.240	0.4899	100.000	2.11E+01	3.60E+00	3.52E-01	7.34E-02	2.36E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.019 +/-0.000)
 TH-230 (1.896 +/-0.029)
 TH-232 (0.127 +/-0.002)



Batch 2294036 Check-list

This check-list was completed on 26-JUL-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 26-JUL-22 and Jessica Davis on 26-JUL-22.

Batch ID:
2294036

Product:
ASP_PUF

Description: Alpha Spec Plutonium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium

Batch ID: 2294036
Analyst: Brendon Viquez (BV1)
Method: DOE EML HASL-300, Pu-11-RC
 Modified
Lab SOP: GL-RAD-A-011 REV# 28
Instrument: ASP-33005595

Due Dates for Lab: 26-JUL-2022			Package: 27-JUL-2022		SDG: 27-JUL-2022	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205147418	Plutonium-239 AS SPIKE	1472-C	.1	mL	
LCSD	1205147419	Plutonium-239 AS SPIKE	1472-C	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	585885001 - 2	25-JUL-2022	1	40	0.10284
2	585885002 - 2	25-JUL-2022	1	40	0.10101
3	585885003 - 2	25-JUL-2022	1	40	0.11435
4	585905001 - 3	25-JUL-2022	1	40	0.10429
5	585905002 - 2	25-JUL-2022	1	40	0.09851
6	585905003 - 2	25-JUL-2022	1	40	0.09126
7	585905004 - 2	25-JUL-2022	1	40	0.0941
8	585905005 - 2	25-JUL-2022	1	40	0.10203
9	1205147417 MB	25-JUL-2022	1		0.11435
10	1205147418 LCS	25-JUL-2022	1		0.11435
11	1205147419 LCSD	25-JUL-2022	1		0.11435

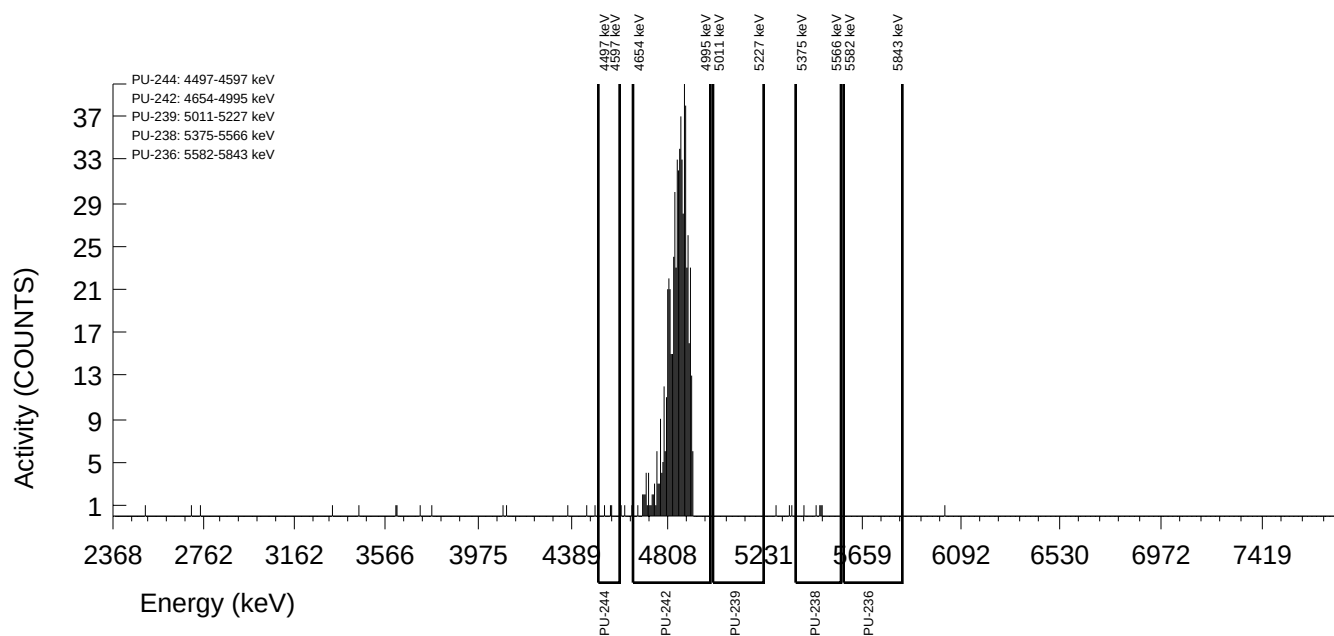
Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2020-A	Plutonium-242 AS TRACER	.1 ml	Pipet ID: RAD-ASP-184002Z Analyzed With: Am Data Entry Date2: 25-JUL-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2294036 SAMPLE ID : S0585885001_PU SAMPLE QTY : 0.103 F +/-0.972 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 87.7 +/-4.468 %	CHAMBER : 071 DETECTOR S/N : 80020 AVERAGE %EFFICIENCY : 33.4445 AVERAGE %EFF ERROR : 0.6454 COUNT DATE : 25-Jul-2022 18:29:37 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : PU BKG FILE : B071.CNF;2434 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W071.CNF;617 CAL DATE : 11-Jul-2022
TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 3.7504E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.23	0.000	0.000	-1.515	1.515	1.2309	100.000	-4.57E-02	8.40E-02	2.40E-01	7.49E-02	8.40E-02
PU-238	5486.00	5462.70	78.465	5.000	3.990	1.010	1.0050	99.900	1.18E-01	1.51E-01	2.09E-01	6.01E-02	1.51E-01
PU-239	5155.00	5118.67	0.000	0.000	-3.030	3.030	1.7407	99.900	-8.97E-02	9.69E-02	2.97E-01	1.04E-01	9.68E-02
PU-242	4890.00	4848.63	95.138	641.000	633.425	7.575	2.7523	100.000	1.87E+01	2.34E+00	4.17E-01	1.64E-01	1.47E+00
PU-244	4589.00	4549.04	34.328	3.000	2.495	0.505	0.7106	99.900	7.38E-02	1.23E-01	1.74E-01	4.24E-02	1.23E-01

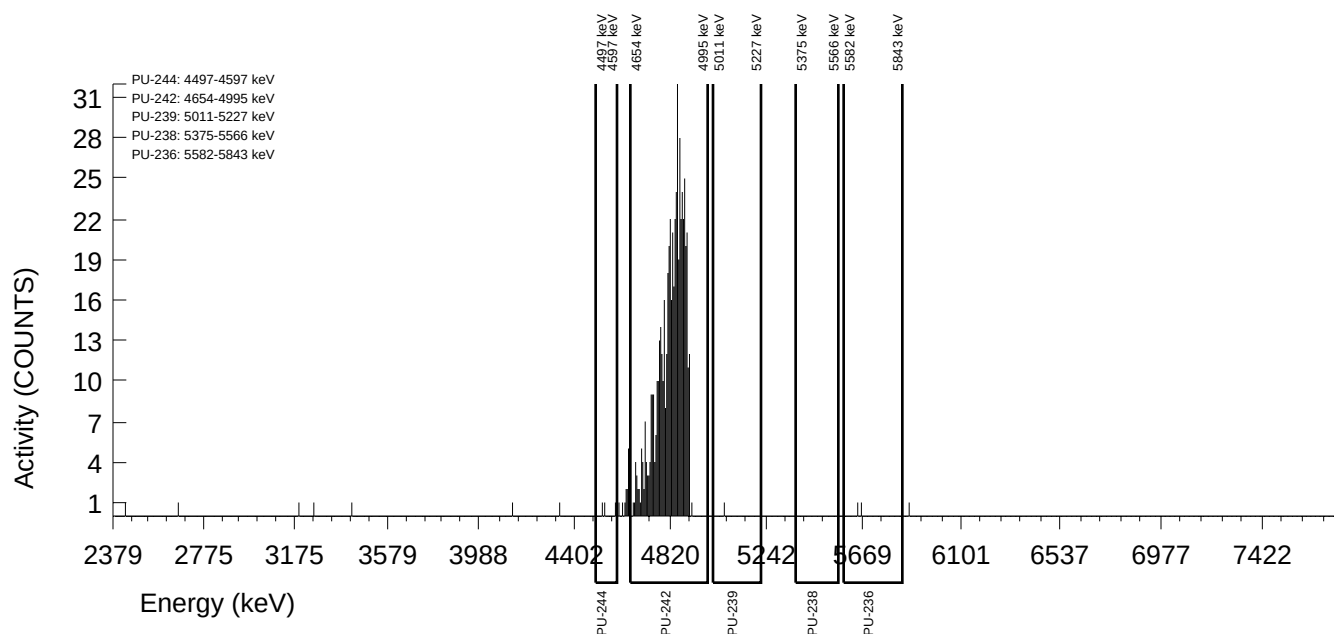


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2294036 SAMPLE ID : S0585885002_PU SAMPLE QTY : 0.101 F +/-0.990 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 81.7 +/-4.615 %	CHAMBER : 072 DETECTOR S/N : 155835 AVERAGE %EFFICIENCY : 32.9361 AVERAGE %EFF ERROR : 0.6358 COUNT DATE : 25-Jul-2022 18:29:37 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : PU BKG FILE : B072.CNF;2448 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W072.CNF;652 CAL DATE : 11-Jul-2022
TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 3.4929E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5655.94	19.663	2.000	2.000	0.000	1.0000	100.000	6.69E-02	1.18E-01	1.00E-01	6.75E-02	1.18E-01
PU-238	5486.00	5470.34	0.000	0.000	-1.010	1.010	1.0050	99.900	-3.32E-02	8.57E-02	2.32E-01	6.67E-02	8.56E-02
PU-239	5155.00	5062.32	4.916	1.000	-3.545	4.545	2.1319	99.900	-1.16E-01	1.37E-01	3.81E-01	1.41E-01	1.37E-01
PU-242	4890.00	4828.84	82.747	585.000	580.960	4.040	2.0100	100.000	1.91E+01	2.46E+00	3.65E-01	1.33E-01	1.56E+00
PU-244	4589.00	4559.50	63.904	4.000	2.990	1.010	1.0050	99.900	9.82E-02	1.55E-01	2.32E-01	6.66E-02	1.55E-01

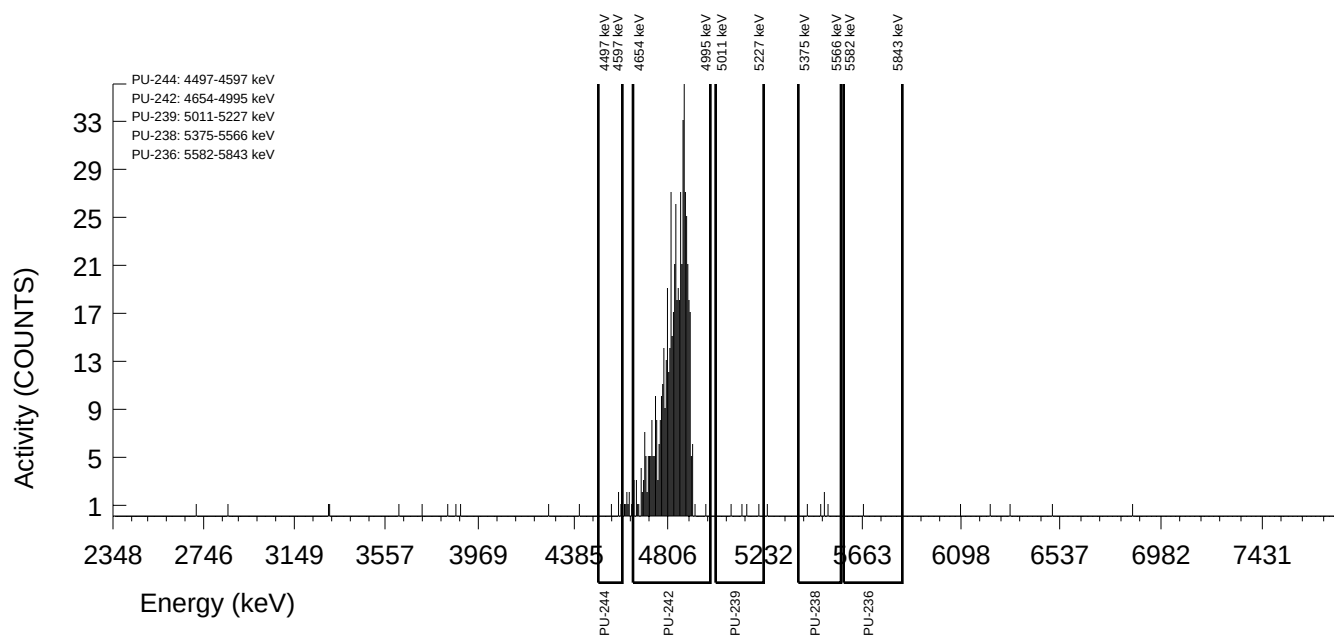


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2294036 SAMPLE ID : S0585885003_PU SAMPLE QTY : 0.114 F +/-0.875 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 85.3 +/-4.627 %	CHAMBER : 074 DETECTOR S/N : 149001 AVERAGE %EFFICIENCY : 31.9401 AVERAGE %EFF ERROR : 0.6170 COUNT DATE : 25-Jul-2022 18:29:37 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : PU BKG FILE : B074.CNF;2468 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W074.CNF;685 CAL DATE : 11-Jul-2022
TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 3.6478E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5668.11	4.948	1.000	-0.515	1.515	1.2309	100.000	-1.50E-02	9.94E-02	2.33E-01	7.25E-02	9.94E-02
PU-238	5486.00	5480.28	4.948	5.000	4.495	0.505	0.7106	99.900	1.29E-01	1.44E-01	1.68E-01	4.11E-02	1.43E-01
PU-239	5155.00	5142.72	118.750	4.000	2.990	1.010	1.0050	99.900	8.57E-02	1.35E-01	2.02E-01	5.81E-02	1.35E-01
PU-242	4890.00	4828.37	89.887	600.000	588.385	11.615	3.4081	100.000	1.68E+01	2.18E+00	4.80E-01	1.97E-01	1.38E+00
PU-244	4589.00	4562.61	4.948	5.000	3.990	1.010	1.0050	99.900	1.14E-01	1.47E-01	2.02E-01	5.81E-02	1.46E-01

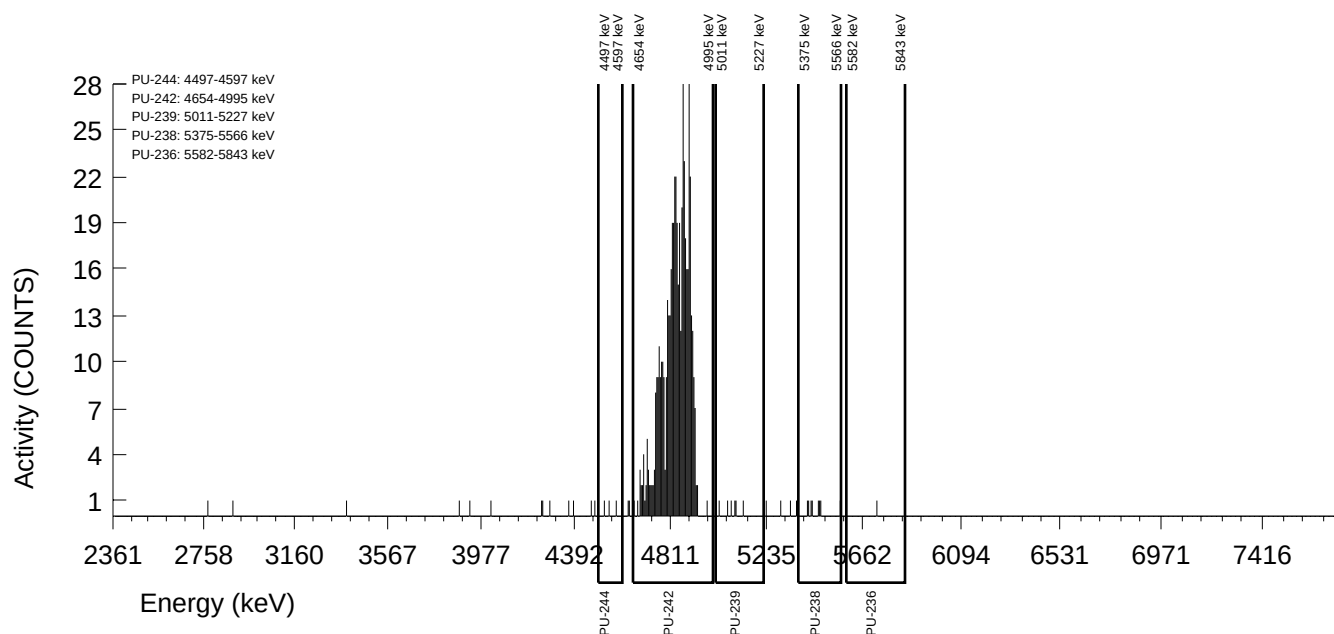


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2294036 SAMPLE ID : S1205147417_PU SAMPLE QTY : 0.114 F +/-0.875 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 82.5 +/-4.814 %	CHAMBER : 086 DETECTOR S/N : 78779 AVERAGE %EFFICIENCY : 29.9106 AVERAGE %EFF ERROR : 0.5788 COUNT DATE : 25-Jul-2022 18:29:38 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : PU BKG FILE : B086.CNF;2362 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W086.CNF;628 CAL DATE : 11-Jul-2022
TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 3.5281E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5721.50	4.944	1.000	-0.515	1.515	1.2309	100.000	-1.63E-02	1.08E-01	2.52E-01	7.86E-02	1.08E-01
PU-238	5486.00	5449.74	0.000	9.000	3.950	5.050	2.2472	99.900	1.25E-01	2.22E-01	3.82E-01	1.43E-01	2.22E-01
PU-239	5155.00	5084.17	103.820	6.000	0.950	5.050	2.2472	99.900	3.01E-02	1.94E-01	3.82E-01	1.43E-01	1.94E-01
PU-242	4890.00	4836.50	86.791	542.000	532.910	9.090	3.0150	100.000	1.68E+01	2.26E+00	4.79E-01	1.92E-01	1.45E+00
PU-244	4589.00	4546.98	54.382	3.000	0.980	2.020	1.4213	99.900	3.10E-02	1.42E-01	2.76E-01	9.07E-02	1.42E-01

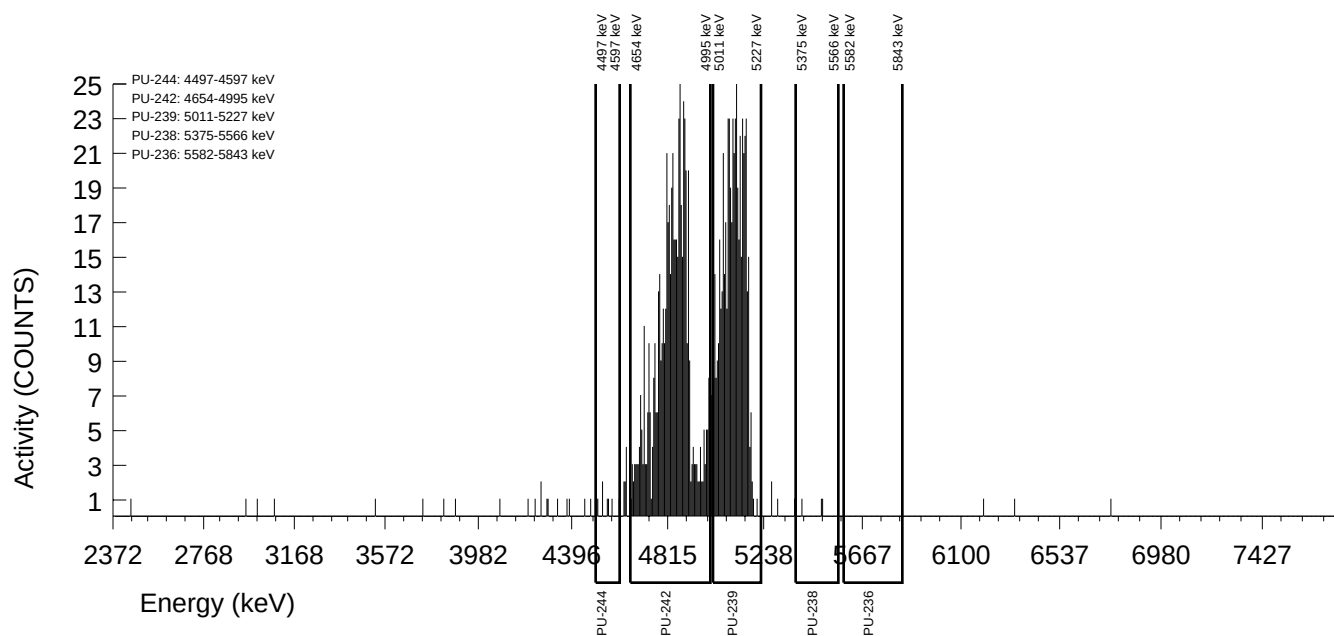


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2294036 SAMPLE ID : S1205147418_PU SAMPLE QTY : 0.114 F +/-0.875 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 85.5 +/-4.533 %			CHAMBER : 088 DETECTOR S/N : 83291 AVERAGE %EFFICIENCY : 32.7339 AVERAGE %EFF ERROR : 0.6320 COUNT DATE : 25-Jul-2022 18:29:38 ELAPSED LIVE TIME(SEC) : 30300.00			LIB FILE : PU BKG FILE : B088.CNF;2359 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W088.CNF;617 CAL DATE : 11-Jul-2022		
TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 3.6567E+00 dpm			LCS ID : 1472-C NUCLIDE : PU-239 NOMINAL (pCi/F) : 1.8002E+01 % RECOVERY : 83.282					

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.24	0.000	0.000	-1.010	1.010	1.0050	100.000	-2.82E-02	7.27E-02	1.97E-01	5.65E-02	7.26E-02
PU-238	5486.00	5462.72	88.412	3.000	3.000	0.000	1.0000	99.900	8.37E-02	1.13E-01	8.37E-02	5.63E-02	1.13E-01
PU-239	5155.00	5101.10	139.874	538.000	537.495	0.505	0.7106	99.900	1.50E+01	1.94E+00	1.64E-01	4.00E-02	1.27E+00
PU-242	4890.00	4833.56	126.494	607.000	604.475	2.525	1.5890	100.000	1.68E+01	2.13E+00	2.62E-01	8.94E-02	1.35E+00
PU-244	4589.00	4535.68	4.912	9.000	9.000	0.000	1.0000	99.900	2.51E-01	1.77E-01	8.37E-02	5.63E-02	1.75E-01

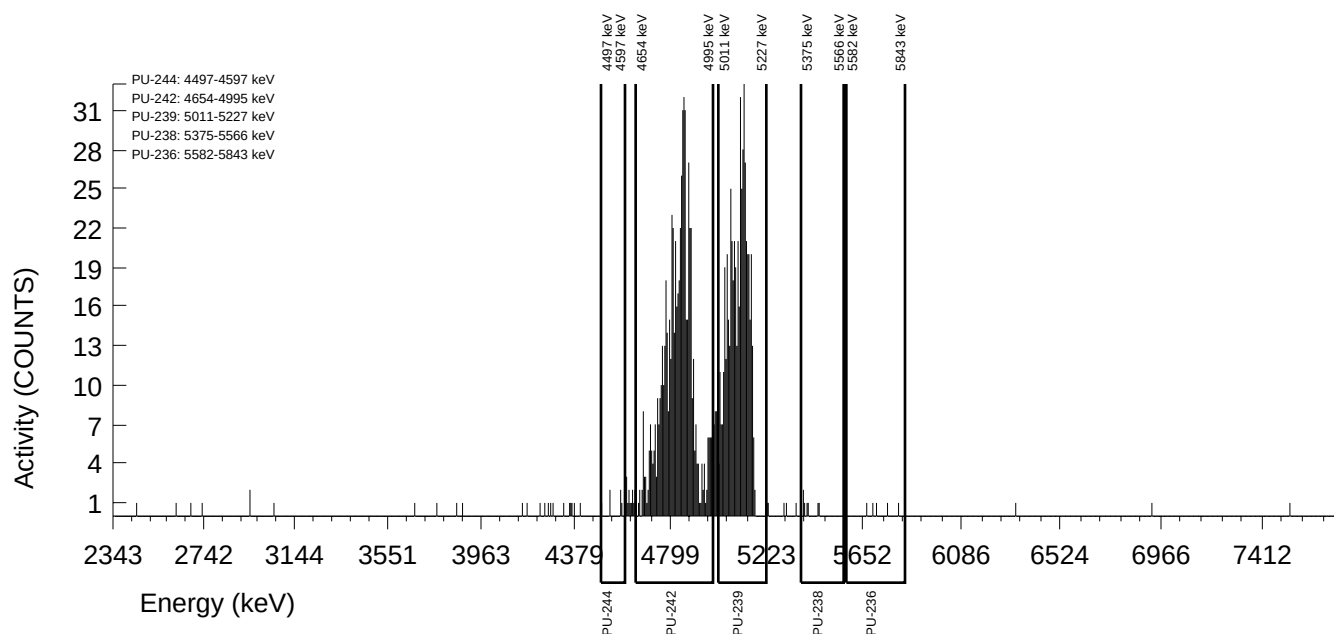


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2294036 SAMPLE ID : S1205147419_PU SAMPLE QTY : 0.114 F +/-0.875 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 95.6 +/-4.454 %	CHAMBER : 107 DETECTOR S/N : 140237 AVERAGE %EFFICIENCY : 31.3643 AVERAGE %EFF ERROR : 0.6062 COUNT DATE : 25-Jul-2022 18:29:41 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : PU BKG FILE : B107.CNF;2076 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W107.CNF;603 CAL DATE : 12-Jul-2022
TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 4.0872E+00 dpm	LCSD ID 1472-C NUCLIDE PU-239 NOMINAL (pCi/F) 1.8002E+01 % RECOVERY 78.191	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5729.02	133.674	5.000	0.960	4.040	2.0100	100.000	2.50E-02	1.47E-01	2.89E-01	1.06E-01	1.47E-01
PU-238	5486.00	5414.40	7.426	7.000	4.475	2.525	1.5890	99.900	1.17E-01	1.58E-01	2.45E-01	8.35E-02	1.58E-01
PU-239	5155.00	5099.51	112.942	546.000	540.445	5.555	2.3569	99.900	1.41E+01	1.81E+00	3.26E-01	1.24E-01	1.20E+00
PU-242	4890.00	4837.22	108.234	661.000	647.365	13.635	3.6926	100.000	1.68E+01	2.10E+00	4.66E-01	1.94E-01	1.32E+00
PU-244	4589.00	4554.04	51.984	6.000	4.485	1.515	1.2309	99.900	1.17E-01	1.45E-01	2.08E-01	6.47E-02	1.45E-01



Batch 2293754 Check-list

This check-list was completed on 26-JUL-22 by Melanie Aycock

This batch was reviewed by Jessica Downey on 26-JUL-22 and Melanie Aycock on 26-JUL-22.

Batch ID:
2293754

Product:
ASPAMCMF

Description: Alpha Spec Am241Curium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Americium/Curium

Batch ID: 2293754
Analyst: Brendon Viquez (BV1)
Method: DOE EML HASL-300, Am-05-RC
 Modified
Lab SOP: GL-RAD-A-011 REV# 28
Instrument: ASP-33005595

Due Dates for Lab: 26-JUL-2022			Package: 27-JUL-2022	SDG: 27-JUL-2022		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205146817	Americium-241 SPIKE		0533-II	.1	mL
LCSD	1205146818	Americium-241 SPIKE		0533-II	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	585885001 - 2	25-JUL-2022	1	40	0.10284
2	585885002 - 2	25-JUL-2022	1	40	0.10101
3	585885003 - 2	25-JUL-2022	1	40	0.11435
4	585905001 - 2	25-JUL-2022	1	40	0.10429
5	585905002 - 2	25-JUL-2022	1	40	0.09851
6	585905003 - 2	25-JUL-2022	1	40	0.09126
7	585905004 - 2	25-JUL-2022	1	40	0.0941
8	585905005 - 2	25-JUL-2022	1	40	0.10203
9	1205146816 MB	25-JUL-2022	1		0.11435
10	1205146817 LCS	25-JUL-2022	1		0.11435
11	1205146818 LCSD	25-JUL-2022	1		0.11435

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1752-I	Americium-243 AS TRACER	.1 ml	Pipet ID: RAD-ASP-184002Z Analyzed With: Pu Data Entry Date2: 25-JUL-2022 00:00

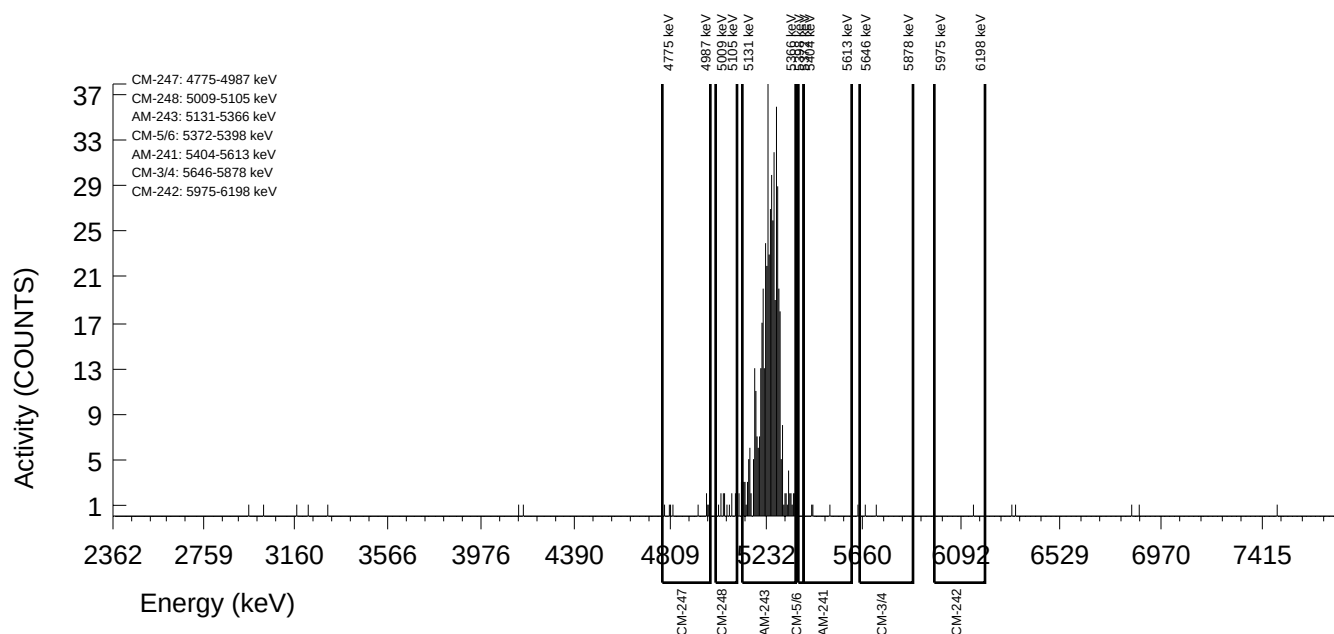
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2293754 SAMPLE ID : S0585885001_AM SAMPLE QTY : 0.103 F +/-0.972 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 68.6 +/-5.201 %	CHAMBER : 095 DETECTOR S/N : 140239 AVERAGE %EFFICIENCY : 32.0661 AVERAGE %EFF ERROR : 0.6195 COUNT DATE : 25-Jul-2022 18:29:39 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : AM BKG FILE : B095.CNF;2024 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W095.CNF;578 CAL DATE : 12-Jul-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6088E+00 dpm RESULTS : 3.1622E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY	PEAK	PEAK	GROSS	NET	BKG	BKG	%ABUN	ACTIVITY	1.96-sigma	MDA	Lc	1.96-sigma
	ENERGY	ENERGY	FWHM	AREA	AREA	AREA	StDev		pCi/F	TPU	pCi/F	pCi/F	cnt Unc
AM-241	5480.15	5463.44	78.881	3.000	-0.030	3.030	1.7407	98.525	-1.20E-03	1.89E-01	4.01E-01	1.41E-01	1.89E-01
AM-243	5269.50	5249.64	68.199	516.000	511.960	4.040	2.0100	99.980	2.02E+01	2.84E+00	4.38E-01	1.60E-01	1.76E+00
CM-242	6102.00	6146.54	4.930	1.000	1.000	0.000	1.0000	100.000	4.46E-02	1.31E-01	1.34E-01	9.00E-02	1.31E-01
CM-3/4	5795.02	5694.99	49.300	2.000	-0.020	2.020	1.4213	100.000	-7.91E-04	1.60E-01	3.45E-01	1.13E-01	1.60E-01
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	1.01E-01	1.37E-01	9.24E-02	1.01E-01
CM-247	4946.00	4897.41	7.395	9.000	6.980	2.020	1.4213	79.300	3.47E-01	3.29E-01	4.34E-01	1.43E-01	3.27E-01
CM-248	5078.60	5061.23	64.090	13.000	13.000	0.000	1.0000	91.000	5.63E-01	3.27E-01	1.30E-01	8.74E-02	3.21E-01



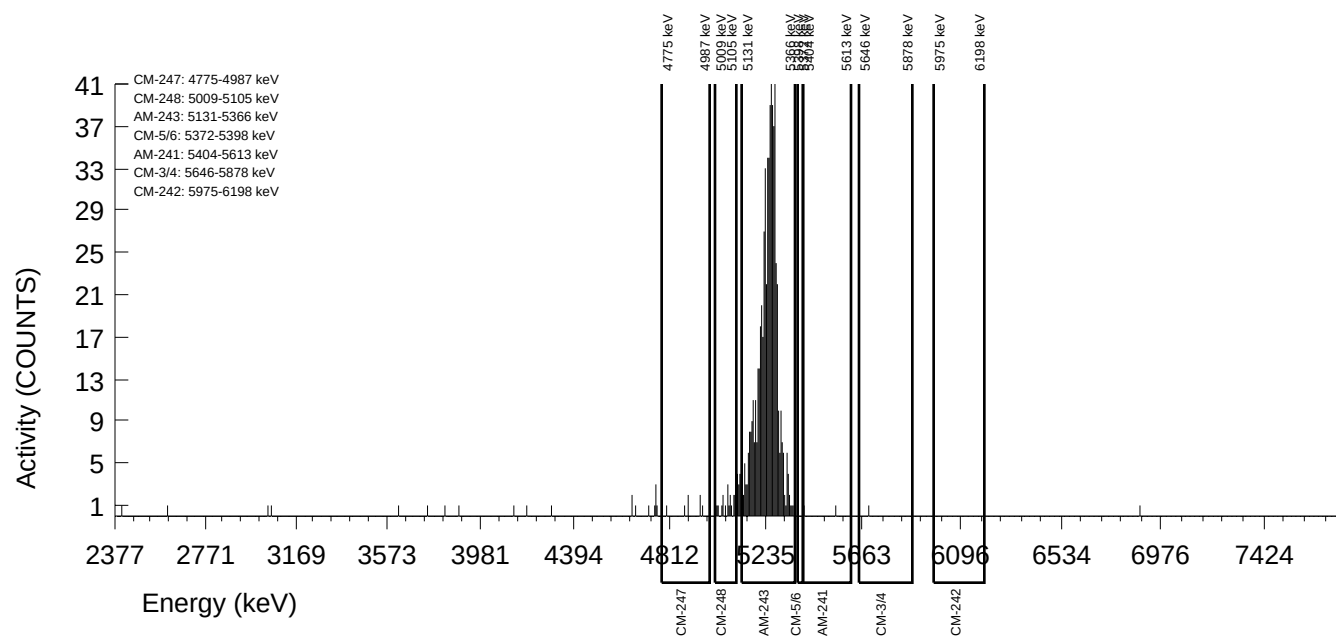
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2293754 SAMPLE ID : S0585885002_AM SAMPLE QTY : 0.101 F +/-0.990 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 80.3 +/-4.862 %	CHAMBER : 096 DETECTOR S/N : 80016 AVERAGE %EFFICIENCY : 33.0360 AVERAGE %EFF ERROR : 0.6378 COUNT DATE : 25-Jul-2022 18:29:39 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : AM BKG FILE : B096.CNF;2016 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W096.CNF;508 CAL DATE : 12-Jul-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6088E+00 dpm RESULTS : 3.6989E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5475.14	0.000	2.000	0.485	1.515	1.2309	98.525	1.64E-02	1.33E-01	2.69E-01	8.40E-02	1.33E-01
AM-243	5269.50	5246.03	57.538	621.000	616.960	4.040	2.0100	99.980	2.06E+01	2.69E+00	3.70E-01	1.35E-01	1.63E+00
CM-242	6102.00	6086.55	0.000	0.000	-0.505	0.505	0.7106	100.000	-1.90E-02	9.08E-02	2.21E-01	5.40E-02	9.07E-02
CM-3/4	5795.02	5689.88	4.886	1.000	-1.020	2.020	1.4213	100.000	-3.41E-02	1.19E-01	2.92E-01	9.58E-02	1.18E-01
CM-5/6	5386.00	5385.09	0.000	0.000	-1.010	1.010	1.0050	86.090	-3.91E-02	1.01E-01	2.73E-01	7.85E-02	1.01E-01
CM-247	4946.00	4904.52	53.751	7.000	1.950	5.050	2.2472	79.300	8.19E-02	2.71E-01	5.07E-01	1.90E-01	2.71E-01
CM-248	5078.60	5067.01	0.000	18.000	15.980	2.020	1.4213	91.000	5.85E-01	3.29E-01	3.20E-01	1.05E-01	3.23E-01

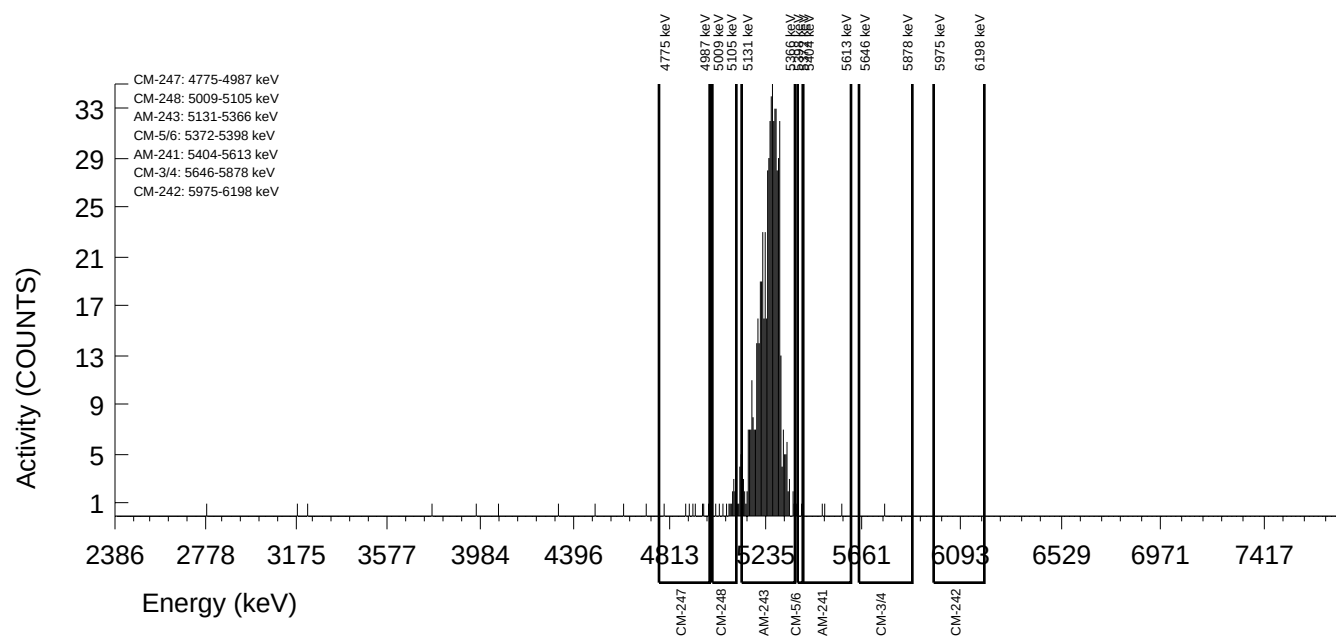


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2293754 SAMPLE ID : S0585885003_AM SAMPLE QTY : 0.114 F +/-0.875 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 72.6 +/-4.866 %	CHAMBER : 097 DETECTOR S/N : 83288 AVERAGE %EFFICIENCY : 36.5736 AVERAGE %EFF ERROR : 0.7044 COUNT DATE : 25-Jul-2022 18:29:39 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : AM BKG FILE : B097.CNF;2013 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W097.CNF;532 CAL DATE : 12-Jul-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6088E+00 dpm RESULTS : 3.3464E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5516.80	82.820	3.000	0.475	2.525	1.5890	98.525	1.42E-02	1.37E-01	2.81E-01	9.56E-02	1.37E-01
AM-243	5269.50	5250.35	83.128	624.000	617.940	6.060	2.4617	99.980	1.82E+01	2.38E+00	3.80E-01	1.46E-01	1.44E+00
CM-242	6102.00	6086.55	0.000	0.000	-0.505	0.505	0.7106	100.000	-1.68E-02	8.01E-02	1.95E-01	4.76E-02	8.00E-02
CM-3/4	5795.02	5758.03	4.872	1.000	-1.020	2.020	1.4213	100.000	-3.01E-02	1.05E-01	2.57E-01	8.45E-02	1.05E-01
CM-5/6	5386.00	5383.45	0.000	2.000	2.000	0.000	1.0000	86.090	6.82E-02	1.21E-01	1.02E-01	6.89E-02	1.21E-01
CM-247	4946.00	4917.24	0.000	8.000	3.455	4.545	2.1319	79.300	1.28E-01	2.47E-01	4.30E-01	1.59E-01	2.47E-01
CM-248	5078.60	5077.83	0.000	14.000	13.495	0.505	0.7106	91.000	4.36E-01	2.53E-01	1.89E-01	4.63E-02	2.49E-01

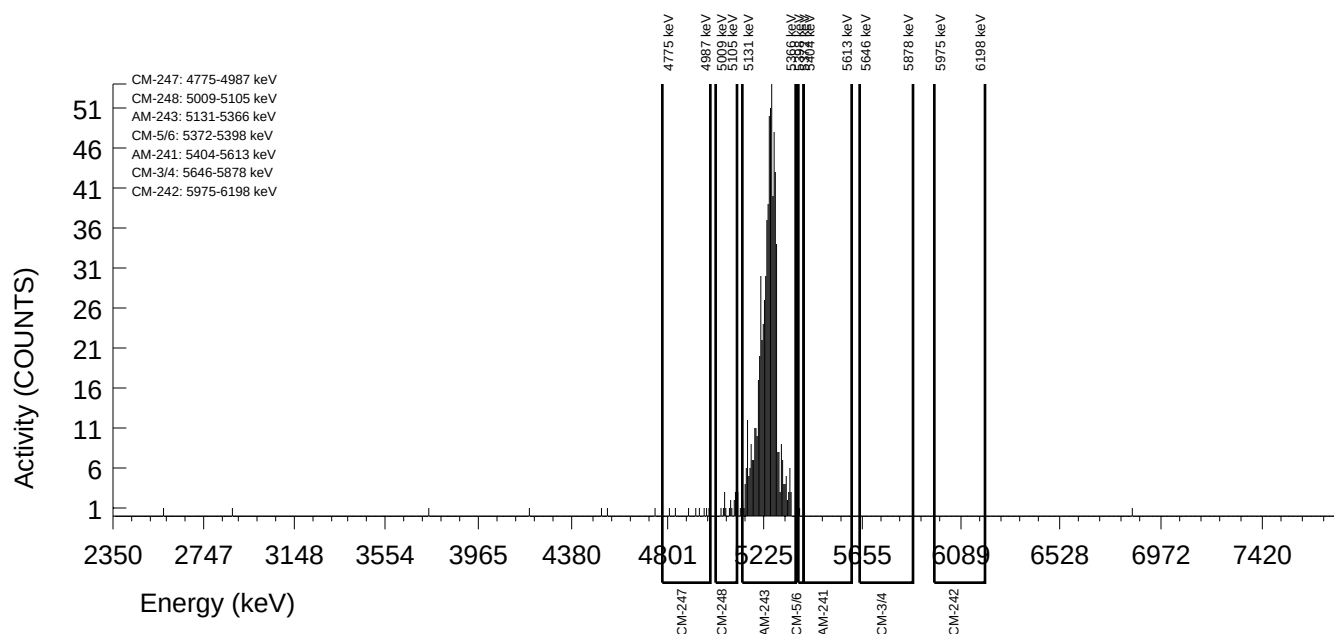


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2293754 SAMPLE ID : S1205146816_AM SAMPLE QTY : 0.114 F +/-0.875 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 93.4 +/-4.636 %	CHAMBER : 104 DETECTOR S/N : 80011 AVERAGE %EFFICIENCY : 32.7705 AVERAGE %EFF ERROR : 0.6327 COUNT DATE : 25-Jul-2022 18:29:40 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : AM BKG FILE : B104.CNF;2027 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W104.CNF;551 CAL DATE : 12-Jul-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6088E+00 dpm RESULTS : 4.3058E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5508.47	0.000	0.000	-2.525	2.525	1.5890	98.525	-6.53E-02	8.07E-02	2.43E-01	8.29E-02	8.06E-02
AM-243	5269.50	5240.71	66.861	719.000	712.435	6.565	2.5622	99.980	1.82E+01	2.26E+00	3.40E-01	1.32E-01	1.34E+00
CM-242	6102.00	6086.56	0.000	0.000	-0.505	0.505	0.7106	100.000	-1.29E-02	6.17E-02	1.50E-01	3.67E-02	6.16E-02
CM-3/4	5795.02	5761.59	0.000	0.000	-2.020	2.020	1.4213	100.000	-5.15E-02	7.54E-02	2.23E-01	7.31E-02	7.53E-02
CM-5/6	5386.00	5377.84	9.855	2.000	1.495	0.505	0.7106	86.090	4.42E-02	1.09E-01	1.74E-01	4.24E-02	1.09E-01
CM-247	4946.00	4912.30	167.532	8.000	0.425	7.575	2.7523	79.300	1.37E-02	2.28E-01	4.53E-01	1.78E-01	2.28E-01
CM-248	5078.60	5069.78	0.000	20.000	18.485	1.515	1.2309	91.000	5.18E-01	2.63E-01	2.23E-01	6.95E-02	2.58E-01

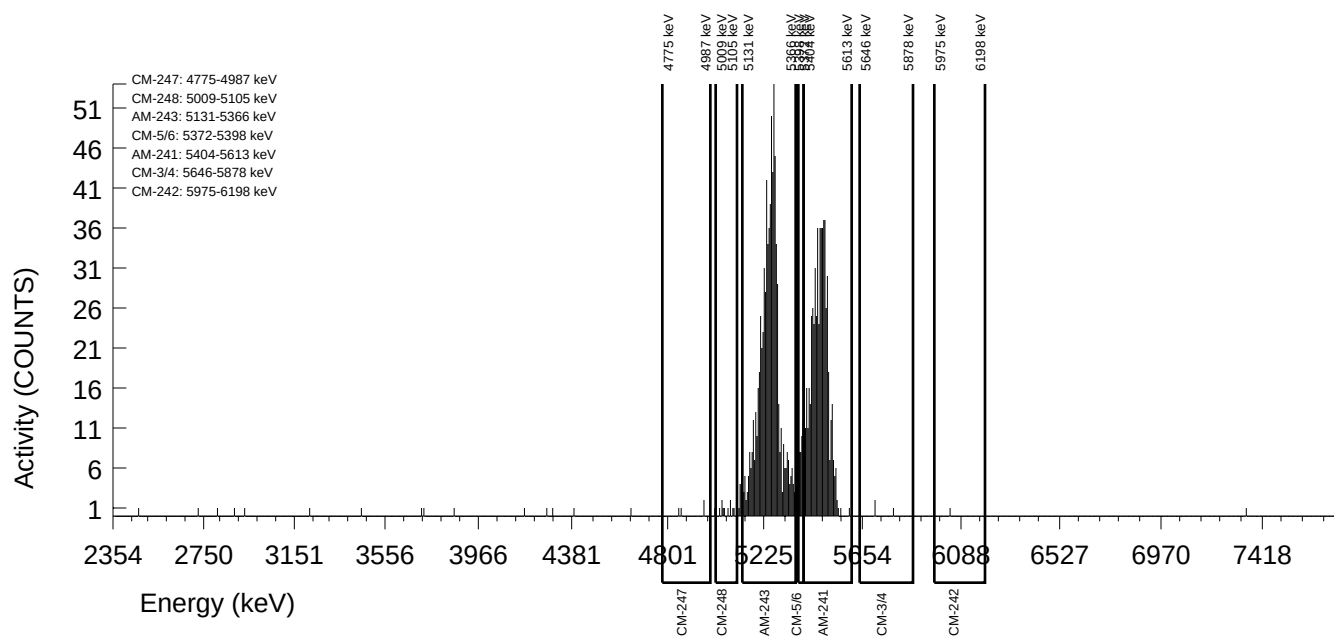


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2293754 SAMPLE ID : S1205146817_AM SAMPLE QTY : 0.114 F +/-0.875 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 90.0 +/-4.574 %	CHAMBER : 105 DETECTOR S/N : 158117 AVERAGE %EFFICIENCY : 35.4639 AVERAGE %EFF ERROR : 0.6835 COUNT DATE : 25-Jul-2022 18:29:40 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : AM BKG FILE : B105.CNF;2026 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W105.CNF;527 CAL DATE : 12-Jul-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6088E+00 dpm RESULTS : 4.1463E+00 dpm	LCS ID 0533-II NUCLIDE AM-241 NOMINAL (pCi/F) 1.7203E+01 % RECOVERY 84.308	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5469.32	71.592	588.000	584.465	3.535	1.8802	98.525	1.45E+01	1.86E+00	2.63E-01	9.42E-02	1.18E+00
AM-243	5269.50	5248.22	57.244	750.000	742.425	7.575	2.7523	99.980	1.82E+01	2.23E+00	3.45E-01	1.36E-01	1.32E+00
CM-242	6102.00	6044.65	4.921	1.000	1.000	0.000	1.0000	100.000	2.45E-02	7.23E-02	7.36E-02	4.95E-02	7.23E-02
CM-3/4	5795.02	5740.81	4.921	3.000	1.485	1.515	1.2309	100.000	3.63E-02	1.07E-01	1.95E-01	6.07E-02	1.07E-01
CM-5/6	5386.00	5385.04	0.000	51.000	51.000	0.000	1.0000	86.090	1.45E+00	4.27E-01	8.52E-02	5.73E-02	4.02E-01
CM-247	4946.00	4906.56	4.921	4.000	-2.565	6.565	2.5622	79.300	-7.91E-02	1.77E-01	4.11E-01	1.59E-01	1.77E-01
CM-248	5078.60	5055.69	0.000	15.000	14.495	0.505	0.7106	91.000	3.89E-01	2.17E-01	1.58E-01	3.85E-02	2.14E-01

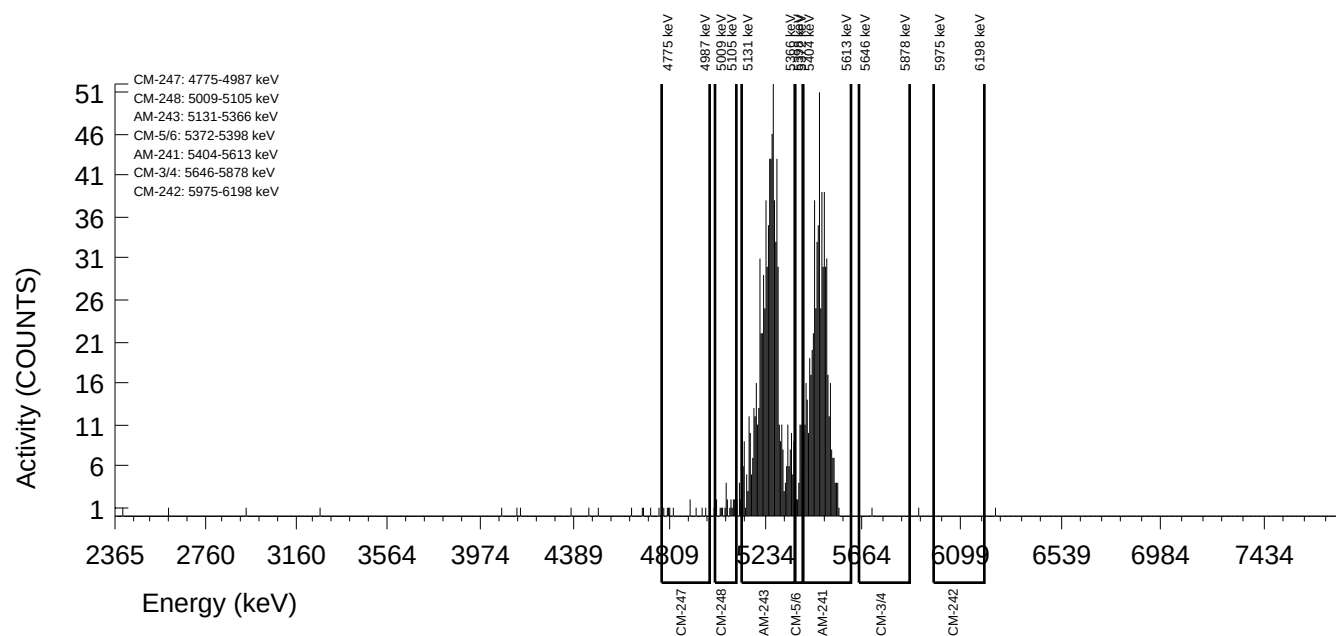


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2293754 SAMPLE ID : S1205146818_AM SAMPLE QTY : 0.114 F +/-0.875 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 96.4 +/-4.496 %	CHAMBER : 106 DETECTOR S/N : 80012 AVERAGE %EFFICIENCY : 34.8790 AVERAGE %EFF ERROR : 0.6725 COUNT DATE : 25-Jul-2022 18:29:40 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : AM BKG FILE : B106.CNF;2026 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W106.CNF;519 CAL DATE : 12-Jul-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6088E+00 dpm RESULTS : 4.4430E+00 dpm	LCSD ID 0533-II NUCLIDE AM-241 NOMINAL (pCi/F) 1.7203E+01 % RECOVERY 81.025	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5474.64	54.765	595.000	591.970	3.030	1.7407	98.525	1.39E+01	1.77E+00	2.36E-01	8.27E-02	1.13E+00
AM-243	5269.50	5253.51	75.909	790.000	782.425	7.575	2.7523	99.980	1.82E+01	2.18E+00	3.27E-01	1.29E-01	1.28E+00
CM-242	6102.00	6086.55	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	5.12E-02	6.99E-02	4.70E-02	5.11E-02
CM-3/4	5795.02	5706.89	4.901	1.000	-1.525	2.525	1.5890	100.000	-3.54E-02	8.55E-02	2.18E-01	7.44E-02	8.54E-02
CM-5/6	5386.00	5390.28	0.000	36.000	35.495	0.505	0.7106	86.090	9.56E-01	3.37E-01	1.58E-01	3.86E-02	3.23E-01
CM-247	4946.00	4871.11	4.901	10.000	-2.120	12.120	3.4814	79.300	-6.20E-02	2.39E-01	4.99E-01	2.06E-01	2.39E-01
CM-248	5078.60	5062.13	8.168	22.000	17.960	4.040	2.0100	91.000	4.58E-01	2.55E-01	2.83E-01	1.03E-01	2.51E-01



Batch 2290611 Check-list

This check-list was completed on 25-JUL-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 25-JUL-22 and Jessica Davis on 25-JUL-22.

Batch ID:
2290611

Product:
ASP__UUF

Description: Alpha Spec Uranium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Uranium

Batch ID: 2290611
Analyst: Michael Potts (MP2)
Method: DOE EML HASL-300, U-02-RC
 Modified
Lab SOP: GL-RAD-A-011 REV# 28
Instrument: SP-C018367602

Due Dates for Lab: 26-JUL-2022			Package: 27-JUL-2022		SDG: 27-JUL-2022	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205140834	Uranium-238 AS SPIKE	1600-M	.1	mL	
LCSD	1205140835	Uranium-238 AS SPIKE	1600-M	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	585885001	22-JUL-2022	1	45.9	0.11801
2	585885002	22-JUL-2022	1	45	0.11364
3	585885003	22-JUL-2022	1	45.6	0.13036
4	585905001	22-JUL-2022	1	45.1	0.11759
5	585905002	22-JUL-2022	1	45.5	0.11206
6	585905003	22-JUL-2022	1	45.4	0.10358
7	585905004	22-JUL-2022	1	45.3	0.10657
8	585905005	22-JUL-2022	1	45.6	0.11631
9	1205140833 MB	22-JUL-2022	1		0.13036
10	1205140834 LCS	22-JUL-2022	1		0.13036
11	1205140835 LCSD	22-JUL-2022	1		0.13036

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1564-DD	Uranium-232 AS TRACER	.1 ml	Pipet ID: R2-428724 Pu-236 Tracer Used: no Analyzed With: Am , Pu Data Entry Date2: 22-JUL-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

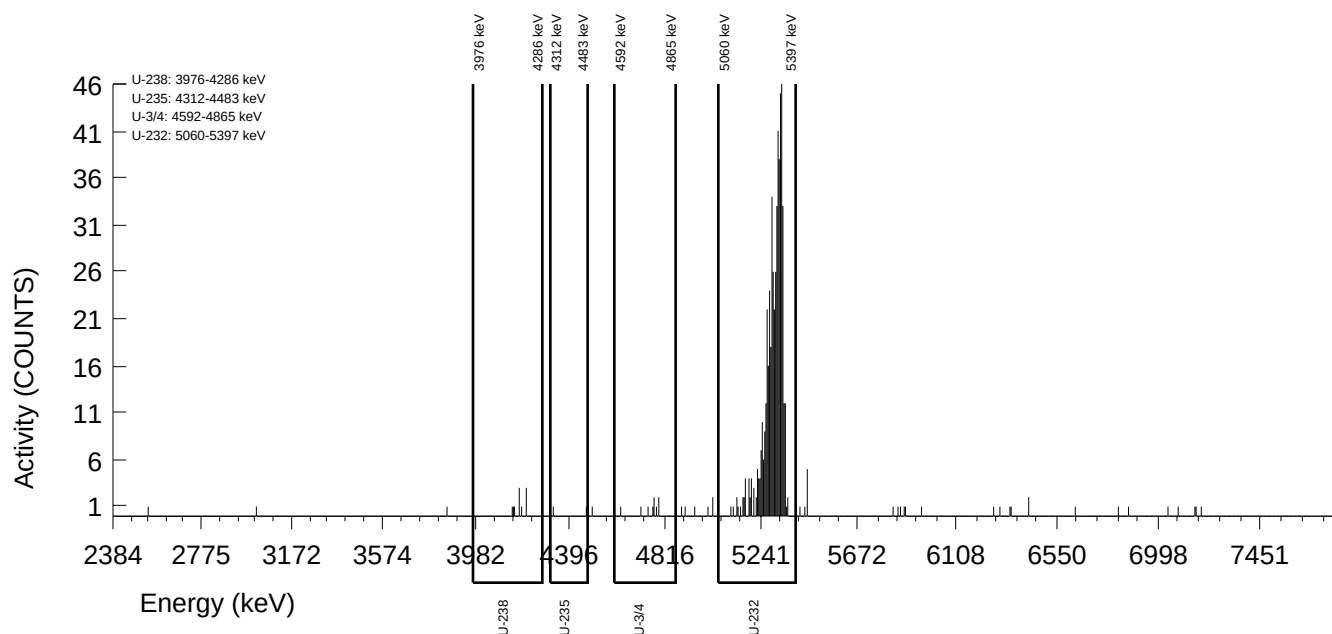
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2290611 SAMPLE ID : S0585885001_UU SAMPLE QTY : 0.118 F +/-0.847 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 56.9 +/-5.388 %	CHAMBER : 139 DETECTOR S/N : 76231 AVERAGE %EFFICIENCY : 40.8486 AVERAGE %EFF ERROR : 0.7851 COUNT DATE : 24-Jul-2022 13:39:28 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : UU BKG FILE : B139.CNF;1739 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W139.CNF;492 CAL DATE : 14-Jul-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5216E+00 dpm RESULTS : 2.5733E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5301.54	56.308	537.000	530.435	6.565	2.5622	100.000	1.73E+01	2.46E+00	4.34E-01	1.68E-01	1.48E+00
U-3/4	4763.02	4752.89	26.695	9.000	-5.400	12.625	3.5532	100.000	-1.76E-01	2.60E-01	5.85E-01	2.44E-01	2.60E-01
U-235	4391.00	4401.30	140.756	2.000	1.495	0.505	0.7106	80.900	6.01E-02	1.48E-01	2.36E-01	5.76E-02	1.48E-01
U-238	4184.73	4180.71	33.976	10.000	8.990	1.010	1.0050	100.000	2.92E-01	2.21E-01	2.29E-01	6.59E-02	2.19E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (1.775 +/-0.053)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

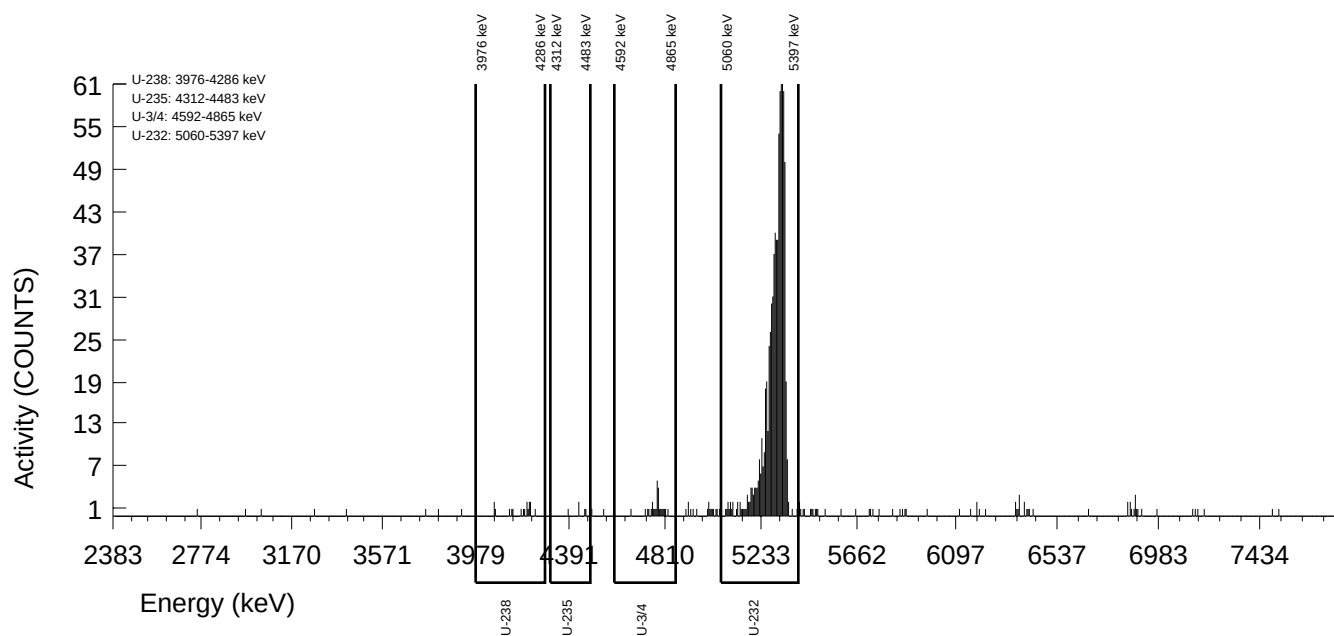
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2290611 SAMPLE ID : S0585885002_UU SAMPLE QTY : 0.114 F +/-0.880 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 84.4 +/-4.771 %	CHAMBER : 140 DETECTOR S/N : 155855 AVERAGE %EFFICIENCY : 40.5974 AVERAGE %EFF ERROR : 0.7803 COUNT DATE : 24-Jul-2022 13:39:30 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : UU BKG FILE : B140.CNF;1721 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W140.CNF;446 CAL DATE : 14-Jul-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5216E+00 dpm RESULTS : 3.8145E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5296.03	53.964	788.000	781.435	6.565	2.5622	100.000	1.79E+01	2.23E+00	3.06E-01	1.19E-01	1.27E+00
U-3/4	4763.02	4776.05	10.304	27.000	13.780	10.605	3.2565	100.000	3.16E-01	2.63E-01	3.94E-01	1.62E-01	2.60E-01
U-235	4391.00	4435.01	4.849	5.000	3.990	1.010	1.0050	80.900	1.13E-01	1.45E-01	2.00E-01	5.75E-02	1.44E-01
U-238	4184.73	4170.06	155.167	17.000	14.475	2.525	1.5890	100.000	3.32E-01	2.01E-01	2.16E-01	7.35E-02	1.99E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (2.615 +/-0.078)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

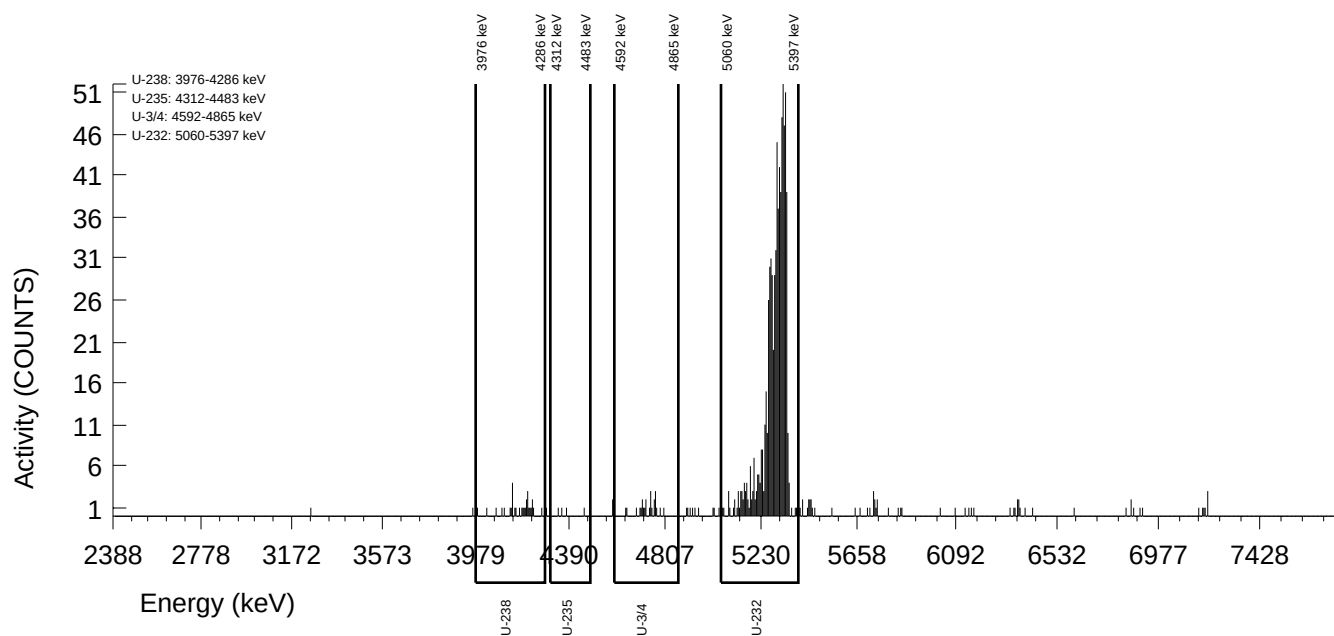
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2290611 SAMPLE ID : S0585885003_UU SAMPLE QTY : 0.130 F +/-0.767 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 77.8 +/-4.871 %	CHAMBER : 141 DETECTOR S/N : 155856 AVERAGE %EFFICIENCY : 41.2547 AVERAGE %EFF ERROR : 0.7927 COUNT DATE : 24-Jul-2022 13:39:32 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : UU BKG FILE : B141.CNF;1757 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W141.CNF;71 CAL DATE : 14-Jul-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5216E+00 dpm RESULTS : 3.5182E+00 dpm		

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
U-232	5302.10	5295.13	74.583	742.000	732.405	9.595	3.0976	100.000	1.56E+01	1.98E+00	3.31E-01	1.33E-01	1.14E+00	1.14E+00
U-3/4	4763.02	4736.16	59.142	24.000	7.409	14.140	3.7603	100.000	1.58E-01	2.39E-01	4.06E-01	1.71E-01	2.38E-01	2.38E-01
U-235	4391.00	4384.85	111.043	4.000	3.495	0.505	0.7106	80.900	9.21E-02	1.22E-01	1.55E-01	3.78E-02	1.21E-01	1.21E-01
U-238	4184.73	4167.97	68.396	30.000	27.475	2.525	1.5890	100.000	5.86E-01	2.46E-01	2.01E-01	6.84E-02	2.38E-01	2.38E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (2.451 +/-0.074)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

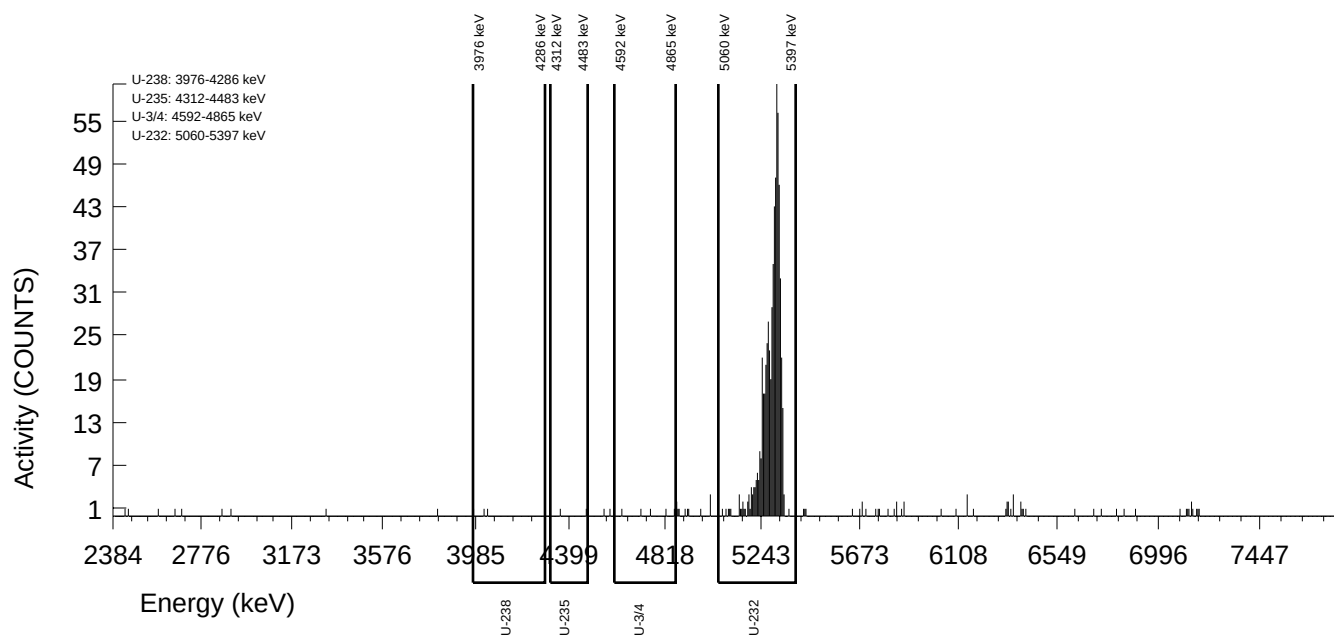
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2290611 SAMPLE ID : S1205140833_UU SAMPLE QTY : 0.130 F +/-0.767 % SAMPLE DATE : 22-Jul-2022 00:00:00 ANALYST : MP2 % YIELD : 70.0 +/-5.109 %	CHAMBER : 160 DETECTOR S/N : 155815 AVERAGE %EFFICIENCY : 38.9919 AVERAGE %EFF ERROR : 0.7501 COUNT DATE : 24-Jul-2022 13:39:45 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : UU BKG FILE : B160.CNF;1710 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W160.CNF;67 CAL DATE : 14-Jul-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5185E+00 dpm RESULTS : 3.1613E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5289.10	34.595	628.000	622.445	5.555	2.3569	100.000	1.56E+01	2.09E+00	3.14E-01	1.19E-01	1.24E+00
U-3/4	4763.02	4755.91	219.079	5.000	-0.618	3.535	1.8802	100.000	-1.55E-02	1.39E-01	3.00E-01	1.12E-01	1.39E-01
U-235	4391.00	4414.45	111.974	2.000	1.495	0.505	0.7106	80.900	4.64E-02	1.14E-01	1.82E-01	4.45E-02	1.14E-01
U-238	4184.73	4010.67	0.000	3.000	2.495	0.505	0.7106	100.000	6.26E-02	1.05E-01	1.47E-01	3.60E-02	1.04E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (2.083 +/-0.062)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

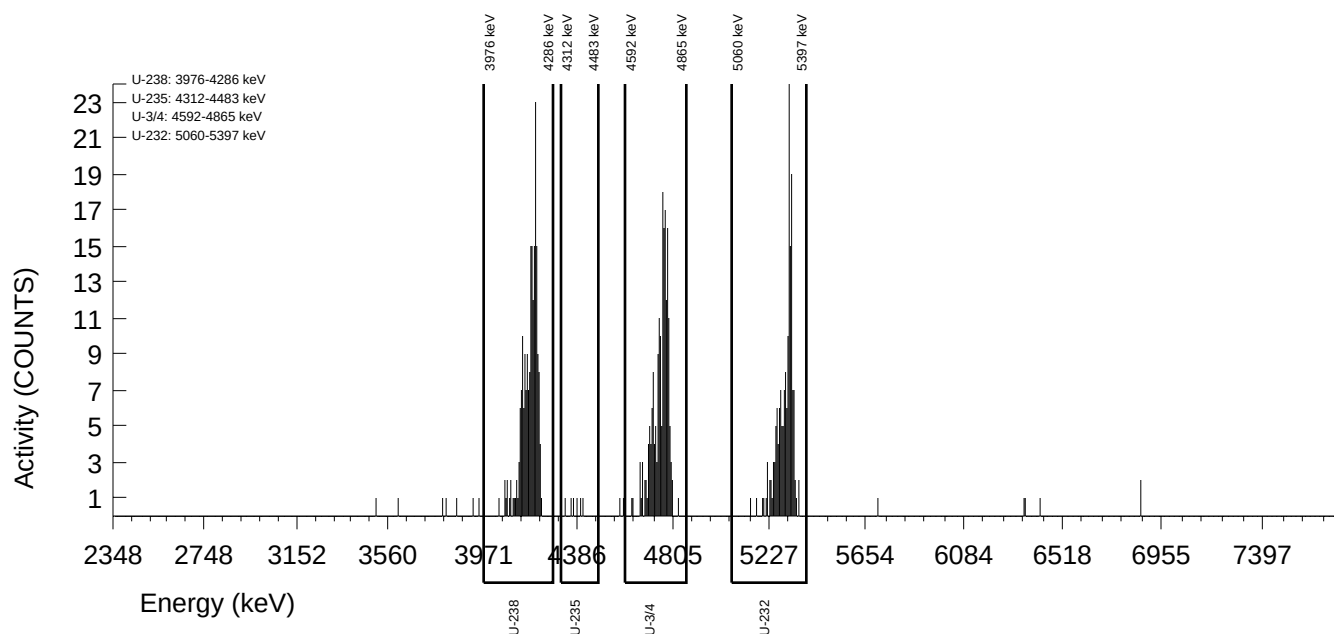
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2290611 SAMPLE ID : S1205140834_UU SAMPLE QTY : 0.130 F +/-0.767 % SAMPLE DATE : 22-Jul-2022 00:00:00 ANALYST : MP2 % YIELD : 83.1 +/-8.451 %	CHAMBER : 113 DETECTOR S/N : 67598 AVERAGE %EFFICIENCY : 25.9324 AVERAGE %EFF ERROR : 0.5038 COUNT DATE : 25-Jul-2022 08:43:36 ELAPSED LIVE TIME(SEC) : 10159.12	LIB FILE : UU BKG FILE : B113.CNF;1785 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W113.CNF;476 CAL DATE : 13-Jul-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5185E+00 dpm RESULTS : 3.7540E+00 dpm	LCS ID 1600-M NUCLIDE U-238 NOMINAL (pCi/F) 2.1276E+01 % RECOVERY 90.522	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5298.01	17.125	166.000	164.815	1.185	1.0887	100.000	1.56E+01	3.59E+00	6.51E-01	1.83E-01	2.40E+00
U-3/4	4763.02	4751.08	46.457	190.000	188.602	0.847	0.9201	100.000	1.79E+01	3.99E+00	6.71E-01	1.93E-01	2.57E+00
U-235	4391.00	4377.33	79.641	6.000	5.661	0.339	0.5819	80.900	6.63E-01	6.21E-01	5.94E-01	1.21E-01	6.11E-01
U-238	4184.73	4177.41	30.280	204.000	203.323	0.677	0.8230	100.000	1.93E+01	4.23E+00	5.62E-01	1.39E-01	2.66E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.552 +/-0.017)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

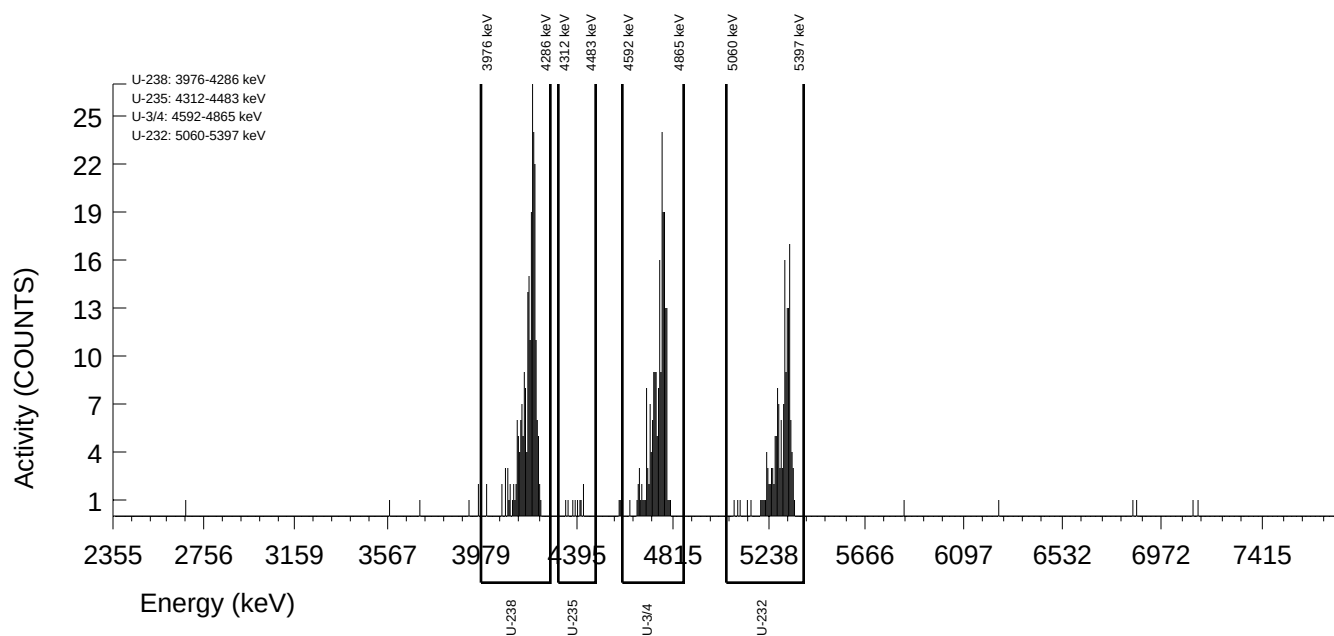
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2290611 SAMPLE ID : S1205140835_UU SAMPLE QTY : 0.130 F +/-0.767 % SAMPLE DATE : 22-Jul-2022 00:00:00 ANALYST : MP2 % YIELD : 74.2 +/-8.778 %	CHAMBER : 114 DETECTOR S/N : 155766 AVERAGE %EFFICIENCY : 26.3352 AVERAGE %EFF ERROR : 0.5113 COUNT DATE : 25-Jul-2022 08:43:38 ELAPSED LIVE TIME(SEC) : 10372.94	LIB FILE : UU BKG FILE : B114.CNF;1796 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W114.CNF;505 CAL DATE : 13-Jul-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5185E+00 dpm RESULTS : 3.3516E+00 dpm	LCSD ID 1600-M NUCLIDE U-238 NOMINAL (pCi/F) 2.1276E+01 % RECOVERY 110.111	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			1.96-sigma
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5296.30	27.892	155.000	152.580	2.420	1.5557	100.000	1.56E+01	3.73E+00	8.74E-01	2.84E-01	2.51E+00
U-3/4	4763.02	4755.51	32.755	199.000	197.279	1.210	1.1001	100.000	2.02E+01	4.57E+00	7.75E-01	2.34E-01	2.84E+00
U-235	4391.00	4394.90	4.975	9.000	8.481	0.519	0.7202	80.900	1.07E+00	8.11E-01	7.04E-01	1.62E-01	7.89E-01
U-238	4184.73	4182.68	33.946	230.000	228.963	1.037	1.0185	100.000	2.34E+01	5.14E+00	6.78E-01	1.86E-01	3.05E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.511 +/-0.015)



Batch 2290613 Check-list

This check-list was completed on 24-JUL-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 24-JUL-22 and Jessica Davis on 25-JUL-22.

Batch ID: 2290613

Product: ASP10POF

Description: Alpha Spec Polonium

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Polonium

Batch ID: 2290613
Analyst: Brendon Viquez (BV1)
Method: DOE EML HASL-300, Po-01-RC
 Modified
Lab SOP: GL-RAD-A-016 REV# 19
Instrument: BAL-18550299

Due Dates for Lab: 26-JUL-2022

Package: 27-JUL-2022

SDG: 27-JUL-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205140841	Polonium-210 AS SPIKE	2012-A	.1	mL
LCSD	1205140842	Polonium-210 AS SPIKE	2012-A	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (g)	Aliquot (Filter)
1	585885001	18-JUL-2022	.5	0.476	0.21118
2	585885002	18-JUL-2022	.5	0.462	0.20379
3	585885003	18-JUL-2022	.5	0.479	0.21684
4	585905001	18-JUL-2022	.5	0.766	0.21067
5	585905002	18-JUL-2022	.5	0.756	0.20849
6	585905003	18-JUL-2022	.5	0.76	0.20879
7	585905004	18-JUL-2022	.5	0.764	0.21047
8	585905005	18-JUL-2022	.5	0.753	0.21187
9	1205140840 MB	18-JUL-2022	.5		0.21684
10	1205140841 LCS	18-JUL-2022	.5		0.21684
11	1205140842 LCSD	18-JUL-2022	.5		0.21684

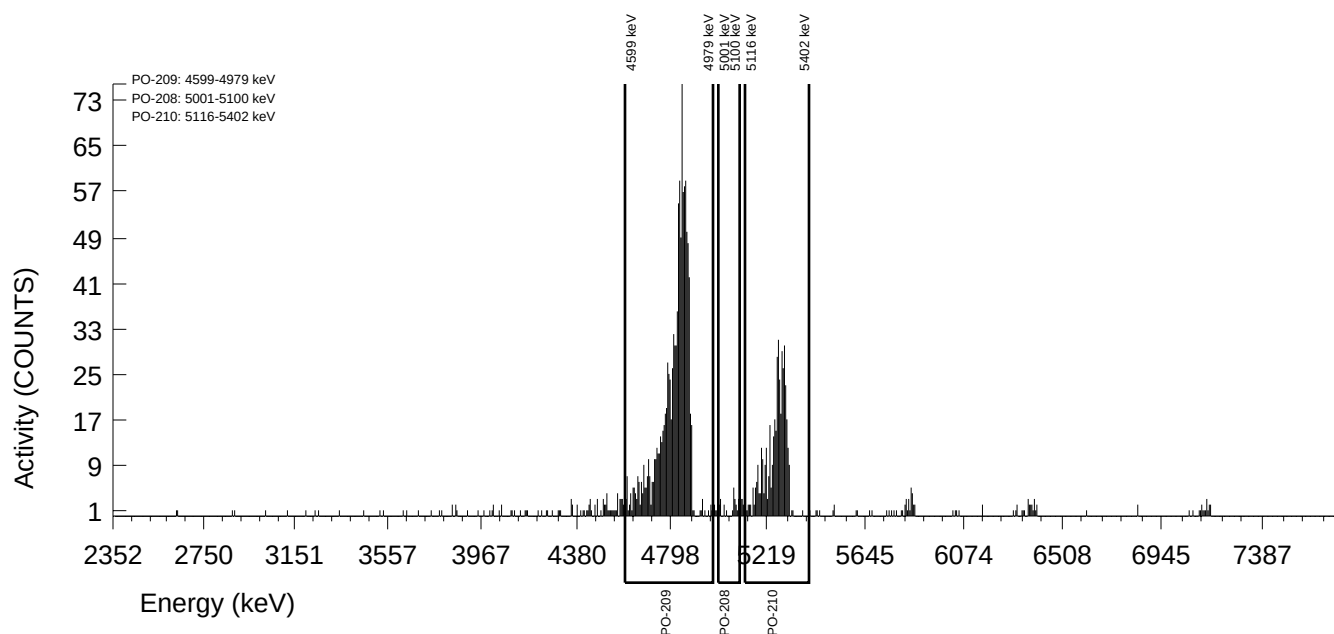
Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1720-D	Polonium-209 AS TRACER	.1 ml	Data Entry Date2: 18-JUL-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2290613 SAMPLE ID : S0585885001_PO SAMPLE QTY : 0.211 F +/-0.474 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 53.6 +/-3.824 %	CHAMBER : 165 DETECTOR S/N : 155807 AVERAGE %EFFICIENCY : 26.2164 AVERAGE %EFF ERROR : 0.5091 COUNT DATE : 23-Jul-2022 12:17:15 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B165.CNF;1509 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W165.CNF;69 CAL DATE : 15-Jul-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8794E+00 dpm RESULTS : 4.2200E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5062.20	0.000	28.000	27.000	1.000	1.0000	100.000	4.17E-01	1.72E-01	1.18E-01	3.60E-02	1.69E-01
PO-209	4882.00	4810.89	49.753	1114.000	1103.000	11.000	3.3166	99.740	1.68E+01	1.74E+00	2.81E-01	1.18E-01	1.00E+00
PO-210	5304.38	5254.84	70.988	427.000	425.000	2.000	1.4142	100.000	7.39E+00	9.44E-01	1.66E-01	5.72E-02	7.07E-01

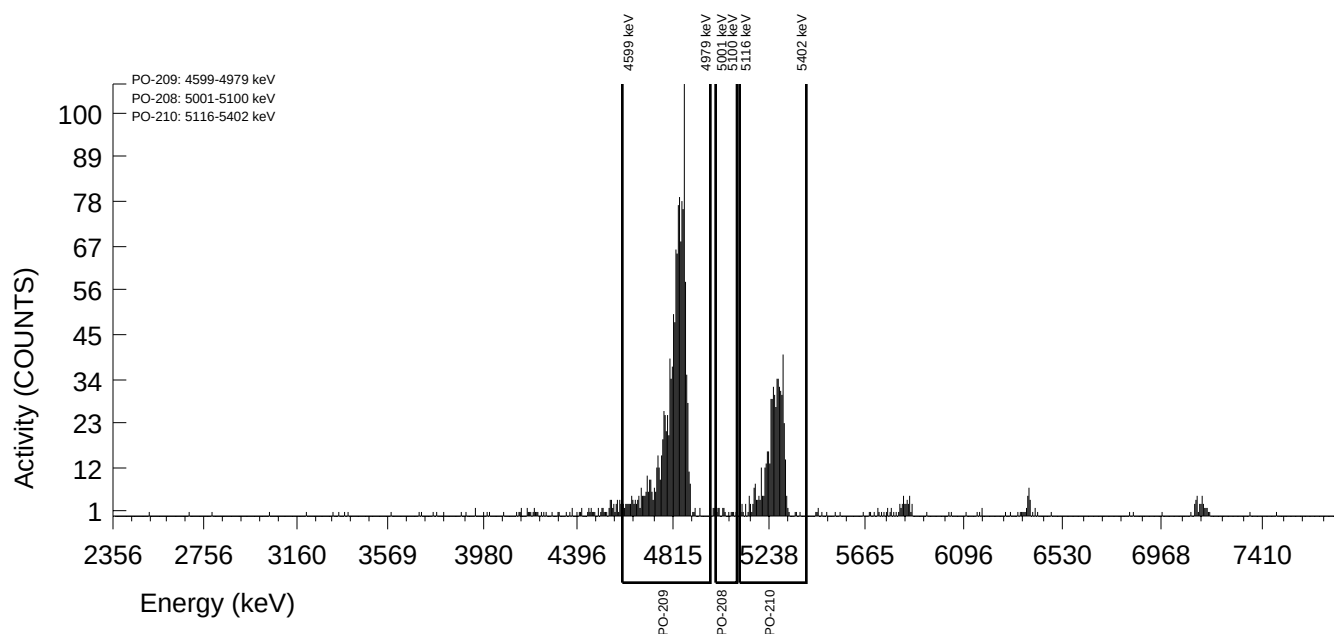


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2290613 SAMPLE ID : S0585885002_PO SAMPLE QTY : 0.204 F +/-0.491 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 64.0 +/-3.636 %	CHAMBER : 170 DETECTOR S/N : 155787 AVERAGE %EFFICIENCY : 25.7465 AVERAGE %EFF ERROR : 0.5002 COUNT DATE : 23-Jul-2022 12:17:17 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B170.CNF;1503 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W170.CNF;62 CAL DATE : 15-Jul-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8794E+00 dpm RESULTS : 5.0411E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5043.71	0.000	18.000	17.000	1.000	1.0000	100.000	2.32E-01	1.24E-01	1.05E-01	3.18E-02	1.23E-01
PO-209	4882.00	4820.16	44.295	1304.000	1294.000	10.000	3.1623	99.740	1.74E+01	1.71E+00	2.38E-01	9.90E-02	9.57E-01
PO-210	5304.38	5261.31	59.272	541.000	537.000	4.000	2.0000	100.000	8.24E+00	9.72E-01	1.89E-01	7.14E-02	7.04E-01

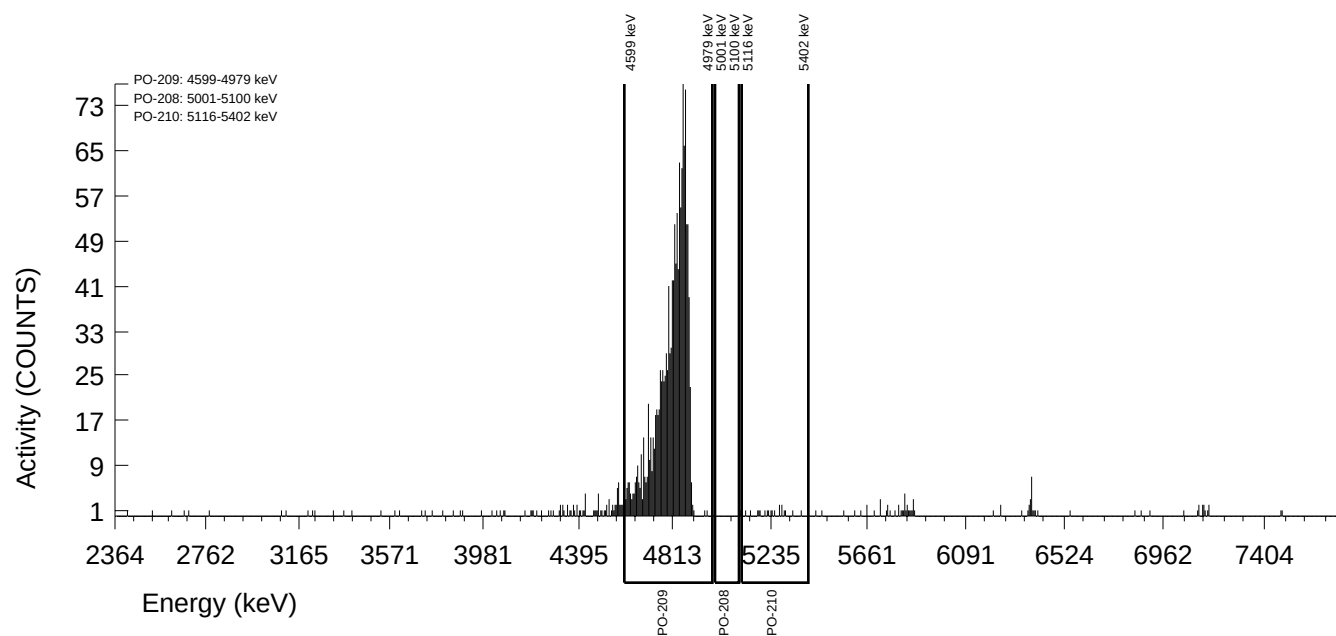


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2290613 SAMPLE ID : S0585885003_PO SAMPLE QTY : 0.217 F +/-0.461 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 66.5 +/-3.547 %	CHAMBER : 177 DETECTOR S/N : 92559 AVERAGE %EFFICIENCY : 26.7825 AVERAGE %EFF ERROR : 0.5198 COUNT DATE : 23-Jul-2022 12:17:19 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B177.CNF;1501 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W177.CNF;390 CAL DATE : 15-Jul-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8794E+00 dpm RESULTS : 5.2393E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5050.47	0.000	0.000	-4.000	4.000	2.0000	100.000	-4.75E-02	5.70E-02	1.46E-01	5.52E-02	5.70E-02
PO-209	4882.00	4805.19	85.186	1406.000	1399.000	7.000	2.6458	99.740	1.64E+01	1.56E+00	1.79E-01	7.20E-02	8.63E-01
PO-210	5304.38	5246.89	14.860	19.000	15.000	4.000	2.0000	100.000	2.00E-01	1.32E-01	1.64E-01	6.21E-02	1.31E-01

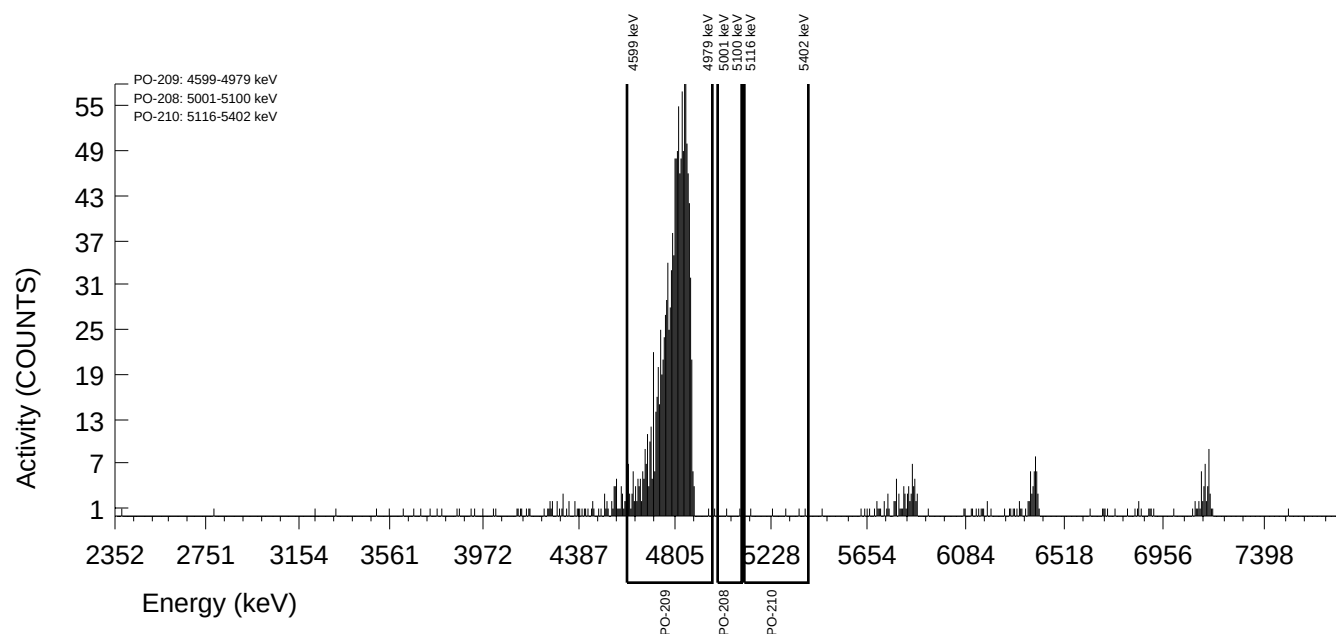


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2290613 SAMPLE ID : S1205140840_PO SAMPLE QTY : 0.217 F +/-0.461 % SAMPLE DATE : 18-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 61.4 +/-3.699 %	CHAMBER : 194 DETECTOR S/N : 140618 AVERAGE %EFFICIENCY : 25.7555 AVERAGE %EFF ERROR : 0.5004 COUNT DATE : 23-Jul-2022 12:19:51 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B194.CNF;1495 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W194.CNF;438 CAL DATE : 18-Jul-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8769E+00 dpm RESULTS : 4.8392E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5066.30	59.585	2.000	-1.000	3.000	1.7321	100.000	-1.32E-02	6.84E-02	1.46E-01	5.31E-02	6.83E-02
PO-209	4882.00	4803.44	100.662	1263.000	1243.000	20.000	4.4721	99.740	1.64E+01	1.63E+00	3.13E-01	1.37E-01	9.25E-01
PO-210	5304.38	5301.25	238.338	6.000	-6.000	12.000	3.4641	100.000	-8.11E-02	1.19E-01	2.58E-01	1.09E-01	1.19E-01

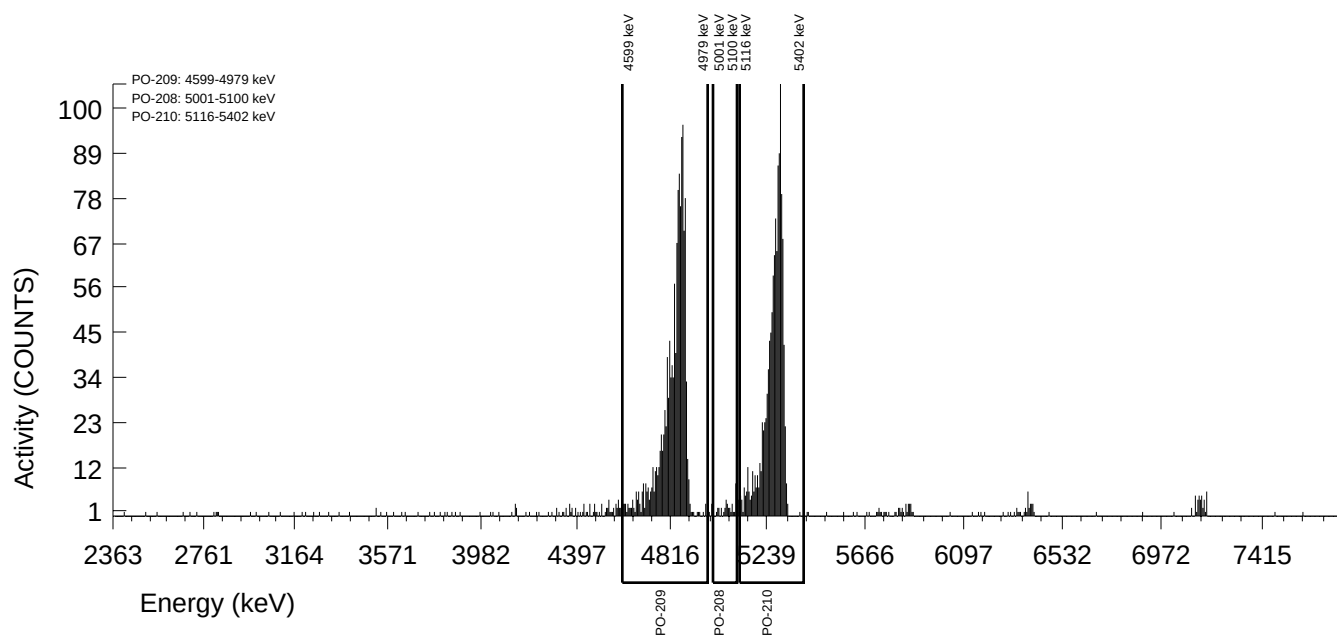


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2290613 SAMPLE ID : S1205140841_PO SAMPLE QTY : 0.217 F +/-0.461 % SAMPLE DATE : 18-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 61.7 +/-3.614 %	CHAMBER : 195 DETECTOR S/N : 140619 AVERAGE %EFFICIENCY : 26.9871 AVERAGE %EFF ERROR : 0.5237 COUNT DATE : 23-Jul-2022 12:19:53 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B195.CNF;1510 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W195.CNF;421 CAL DATE : 18-Jul-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8769E+00 dpm RESULTS : 4.8598E+00 dpm	LCS ID 2012-A NUCLIDE PO-210 NOMINAL (pCi/F) 1.6509E+01 % RECOVERY 92.612	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
PO-208	5080.00	5066.02	0.000	36.000	34.000	2.000	1.4142	100.000	4.26E-01	1.59E-01	1.20E-01	4.12E-02	1.55E-01
PO-209	4882.00	4826.21	49.849	1312.000	1308.000	4.000	2.0000	99.740	1.64E+01	1.60E+00	1.54E-01	5.82E-02	8.90E-01
PO-210	5304.38	5266.20	45.813	1192.000	1190.000	2.000	1.4142	100.000	1.53E+01	1.51E+00	1.23E-01	4.23E-02	8.71E-01

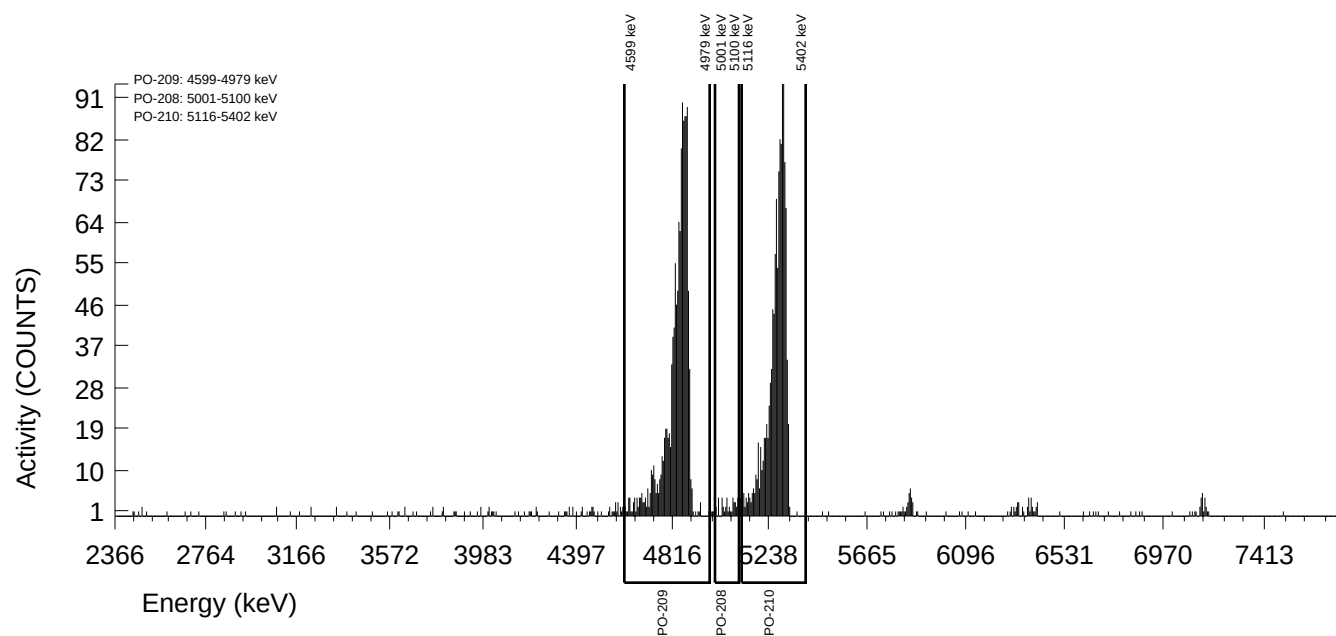


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2290613 SAMPLE ID : S1205140842_PO SAMPLE QTY : 0.217 F +/-0.461 % SAMPLE DATE : 18-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 60.2 +/-3.653 %	CHAMBER : 196 DETECTOR S/N : 140620 AVERAGE %EFFICIENCY : 26.9069 AVERAGE %EFF ERROR : 0.5221 COUNT DATE : 23-Jul-2022 12:19:55 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B196.CNF;1490 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W196.CNF;427 CAL DATE : 18-Jul-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8769E+00 dpm RESULTS : 4.7439E+00 dpm	LCSD ID2012-A NUCLIDEPO-210 NOMINAL (pCi/F)1.6509E+01 % RECOVERY92.680	

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
PO-208	5080.00	5059.79	0.000	40.000	36.000	4.000	2.0000	100.000	4.63E-01	1.75E-01	1.58E-01	5.99E-02	1.71E-01	
PO-209	4882.00	4832.45	59.157	1283.000	1273.000	10.000	3.1623	99.740	1.64E+01	1.61E+00	2.28E-01	9.46E-02	9.07E-01	
PO-210	5304.38	5270.59	51.364	1173.000	1159.000	14.000	3.7417	100.000	1.53E+01	1.53E+00	2.69E-01	1.15E-01	8.92E-01	



Continuing Calibration Data

Review of Alpha Spectrometer QA results (Daily checks) 23-JUL-2022 15:45:59.87

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
23-JUL-2022	18	PSFWHM-5000	Below
23-JUL-2022	18	PSENERGY-5000	Above
23-JUL-2022	18	PSCENTRD-5000	Above
23-JUL-2022	18	PSCTSS-5000	Below
23-JUL-2022	19	Second Check Required for D	
23-JUL-2022	23	PSFWHM-5000	Above
23-JUL-2022	23	PSCTSS-5000	Below
23-JUL-2022	46	PSFWHM-5000	Below
23-JUL-2022	46	PSCTSS-5000	Below
23-JUL-2022	91	PSENERGY-5000	Above
23-JUL-2022	94	PSFWHM-5000	Below
23-JUL-2022	94	PSCTSS-5000	Below
23-JUL-2022	101	PSFWHM-5000	Below
23-JUL-2022	101	PSCTSS-5000	Below
23-JUL-2022	137	Second Check Required for D	
23-JUL-2022	142	PSENERGY-5000	Above
23-JUL-2022	142	PSCENTRD-5000	Above
23-JUL-2022	145	PSFWHM-5000	Above
23-JUL-2022	145	PSENERGY-5000	Below
23-JUL-2022	151	PSENERGY-5000	Below
23-JUL-2022	161	PSENERGY-5000	Above
23-JUL-2022	161	PSCENTRD-5000	Above
23-JUL-2022	162	PSENERGY-5000	Above
23-JUL-2022	172	PSENERGY-5000	Above
23-JUL-2022	173	PSCTSS-5000	Below
23-JUL-2022	176	Second Check Required for D	
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below

15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

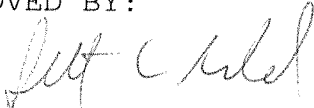
23-JUL-2022	249	Second Check Required for D	
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The following detectors that may not have properly transfered to the QA file

115	may not have run since 23-JUL-2022
116	may not have run since 23-JUL-2022
119	may not have run since 23-JUL-2022
120	may not have run since 23-JUL-2022
147	may not have run since 23-JUL-2022
148	may not have run since 23-JUL-2022
163	may not have run since 23-JUL-2022
164	may not have run since 23-JUL-2022
183	may not have run since 23-JUL-2022
184	may not have run since 23-JUL-2022
187	may not have run since 23-JUL-2022
188	may not have run since 23-JUL-2022
198	may not have run since 23-JUL-2022
221	may not have run since 23-JUL-2022
227	may not have run since 23-JUL-2022
228	may not have run since 23-JUL-2022
241	may not have run since 23-JUL-2022
242	may not have run since 23-JUL-2022
247	may not have run since 23-JUL-2022
248	may not have run since 23-JUL-2022

APPROVAL DATE:
7/23/22

APPROVAL TIME:
1600

APPROVED BY:


PROCEDURE # GL-RAD-I-009

Report completed at 23-JUL-2022 15:48:59.14

Review of Alpha Spectrometer QA results (Daily checks) 24-JUL-2022 23:00:00.76

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
24-JUL-2022	18	PSFWHM-5000	Below
24-JUL-2022	18	PSENERGY-5000	Above
24-JUL-2022	18	PSCENTRD-5000	Above
24-JUL-2022	18	PSCTSS-5000	Below
24-JUL-2022	23	PSFWHM-5000	Above
24-JUL-2022	23	PSCTSS-5000	Below
24-JUL-2022	46	PSFWHM-5000	Below
24-JUL-2022	46	PSCTSS-5000	Below
24-JUL-2022	73	PSENERGY-5000	Above
24-JUL-2022	91	PSENERGY-5000	Above
24-JUL-2022	94	PSFWHM-5000	Below
24-JUL-2022	94	PSCTSS-5000	Below
24-JUL-2022	101	PSFWHM-5000	Below
24-JUL-2022	101	PSCTSS-5000	Below
24-JUL-2022	137	PSCTSS-5000	Below
24-JUL-2022	142	PSENERGY-5000	Above
24-JUL-2022	142	PSCENTRD-5000	Above
24-JUL-2022	145	PSFWHM-5000	Above
24-JUL-2022	145	PSENERGY-5000	Below
24-JUL-2022	151	PSENERGY-5000	Below
24-JUL-2022	161	PSENERGY-5000	Above
24-JUL-2022	161	PSCENTRD-5000	Above
24-JUL-2022	162	PSENERGY-5000	Above
24-JUL-2022	172	PSENERGY-5000	Above
24-JUL-2022	173	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below

15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transferred to the QA file

115	may not have run since 24-JUL-2022
116	may not have run since 24-JUL-2022
119	may not have run since 24-JUL-2022
120	may not have run since 24-JUL-2022
147	may not have run since 24-JUL-2022
148	may not have run since 24-JUL-2022
163	may not have run since 24-JUL-2022
164	may not have run since 24-JUL-2022
183	may not have run since 24-JUL-2022
184	may not have run since 24-JUL-2022
187	may not have run since 24-JUL-2022
188	may not have run since 24-JUL-2022
198	may not have run since 24-JUL-2022
221	may not have run since 24-JUL-2022
227	may not have run since 24-JUL-2022
228	may not have run since 24-JUL-2022
241	may not have run since 24-JUL-2022
242	may not have run since 24-JUL-2022
247	may not have run since 24-JUL-2022
248	may not have run since 24-JUL-2022

APPROVAL DATE: 7/24/2022 APPROVAL TIME: 23:10

APPROVED BY:  PROCEDURE # GL-RAD-I-009

Report completed at 24-JUL-2022 23:02:30.95

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
25-JUL-2022	18	PSFWHM-5000	Below
25-JUL-2022	18	PSENERGY-5000	Above
25-JUL-2022	18	PSCTSS-5000	Below
25-JUL-2022	23	PSFWHM-5000	Above
25-JUL-2022	23	PSCTSS-5000	Below
25-JUL-2022	46	PSFWHM-5000	Below
25-JUL-2022	46	PSCTSS-5000	Below
25-JUL-2022	73	Second Check Required for D	
25-JUL-2022	91	PSENERGY-5000	Above
25-JUL-2022	94	PSFWHM-5000	Below
25-JUL-2022	94	PSCTSS-5000	Below
25-JUL-2022	101	PSFWHM-5000	Below
25-JUL-2022	101	PSCTSS-5000	Below
25-JUL-2022	137	Second Check Required for D	
25-JUL-2022	142	PSENERGY-5000	Above
25-JUL-2022	142	PSCENTRD-5000	Above
25-JUL-2022	145	PSFWHM-5000	Above
25-JUL-2022	145	PSENERGY-5000	Below
25-JUL-2022	151	PSENERGY-5000	Below
25-JUL-2022	161	PSENERGY-5000	Above
25-JUL-2022	161	PSCENTRD-5000	Above
25-JUL-2022	162	PSENERGY-5000	Above
25-JUL-2022	172	PSENERGY-5000	Above
25-JUL-2022	173	PSCTSS-5000	Below
25-JUL-2022	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below

15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transfered to the QA file

115	may not have run since 25-JUL-2022
116	may not have run since 25-JUL-2022
119	may not have run since 25-JUL-2022
120	may not have run since 25-JUL-2022
147	may not have run since 25-JUL-2022
148	may not have run since 25-JUL-2022
157	may not have run since 25-JUL-2022
158	may not have run since 25-JUL-2022
163	may not have run since 25-JUL-2022
164	may not have run since 25-JUL-2022
183	may not have run since 25-JUL-2022
184	may not have run since 25-JUL-2022
198	may not have run since 25-JUL-2022
221	may not have run since 25-JUL-2022
227	may not have run since 25-JUL-2022
228	may not have run since 25-JUL-2022
241	may not have run since 25-JUL-2022
242	may not have run since 25-JUL-2022
247	may not have run since 25-JUL-2022
248	may not have run since 25-JUL-2022

APPROVAL DATE:

7/25/22

APPROVAL TIME:

1015

APPROVED BY:

[Signature]

PROCEDURE # GL-RAD-I-009

Report completed at 25-JUL-2022 10:05:40.31

Review of Alpha Spectrometer QA results (Daily checks) 26-JUL-2022 13:40:27.32

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
26-JUL-2022	18	PSFWHM-5000	Below
26-JUL-2022	18	PSCTSS-5000	Below
26-JUL-2022	23	PSFWHM-5000	Above
26-JUL-2022	23	PSCTSS-5000	Below
26-JUL-2022	46	PSFWHM-5000	Below
26-JUL-2022	46	PSCTSS-5000	Below
26-JUL-2022	91	PSENERGY-5000	Above
26-JUL-2022	94	PSFWHM-5000	Below
26-JUL-2022	94	PSCTSS-5000	Below
26-JUL-2022	101	PSFWHM-5000	Below
26-JUL-2022	101	PSCTSS-5000	Below
26-JUL-2022	142	PSENERGY-5000	Above
26-JUL-2022	142	PSCENTRD-5000	Above
26-JUL-2022	145	PSFWHM-5000	Above
26-JUL-2022	145	PSENERGY-5000	Below
26-JUL-2022	151	PSENERGY-5000	Below
26-JUL-2022	161	PSENERGY-5000	Above
26-JUL-2022	161	PSCENTRD-5000	Above
26-JUL-2022	162	PSENERGY-5000	Above
26-JUL-2022	172	PSENERGY-5000	Above
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transferred to the QA file

115 may not have run since 26-JUL-2022

116 may not have run since 26-JUL-2022
119 may not have run since 26-JUL-2022
120 may not have run since 26-JUL-2022
147 may not have run since 26-JUL-2022
148 may not have run since 26-JUL-2022
157 may not have run since 26-JUL-2022
158 may not have run since 26-JUL-2022
163 may not have run since 26-JUL-2022
164 may not have run since 26-JUL-2022
183 may not have run since 26-JUL-2022
184 may not have run since 26-JUL-2022
198 may not have run since 26-JUL-2022
221 may not have run since 26-JUL-2022
227 may not have run since 26-JUL-2022
228 may not have run since 26-JUL-2022
241 may not have run since 26-JUL-2022
242 may not have run since 26-JUL-2022
247 may not have run since 26-JUL-2022
248 may not have run since 26-JUL-2022
254 may not have run since 26-JUL-2022

APPROVAL DATE: 7/26/22

APPROVAL TIME: 1904

APPROVED BY:

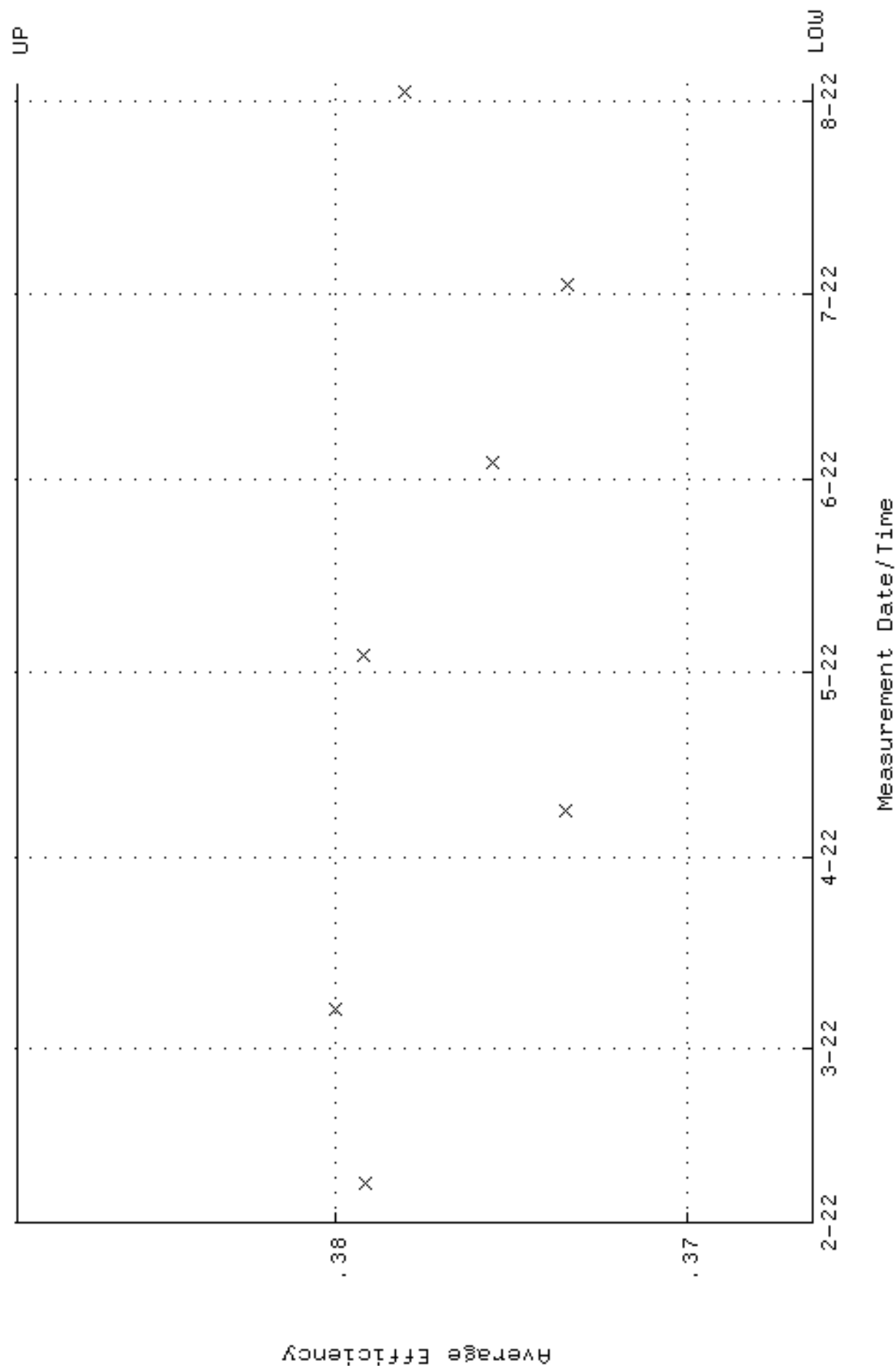


PROCEDURE # GL-RAD-I-009

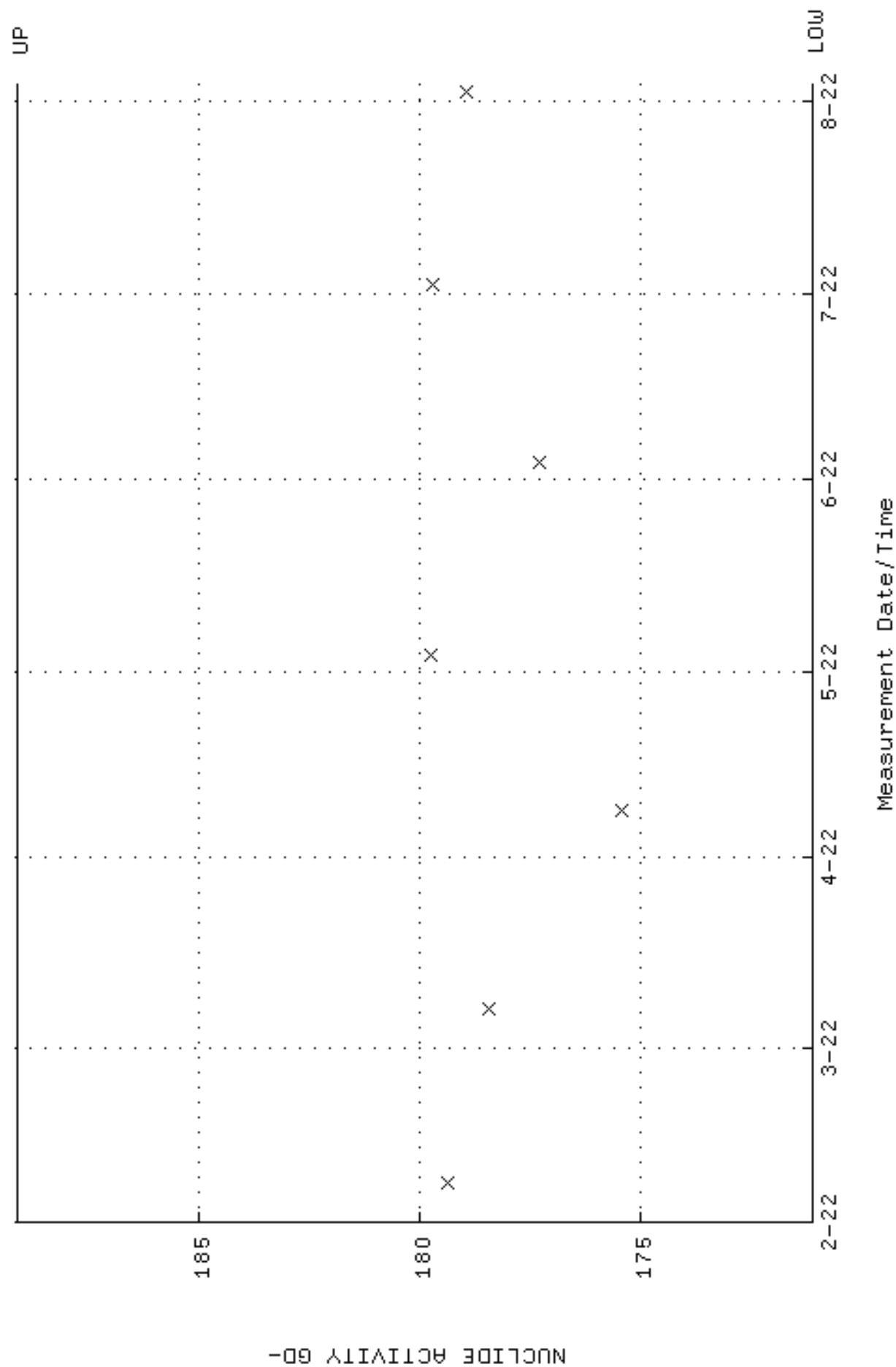
Report completed at 26-JUL-2022 13:43:05.37

Background and Efficiency Data

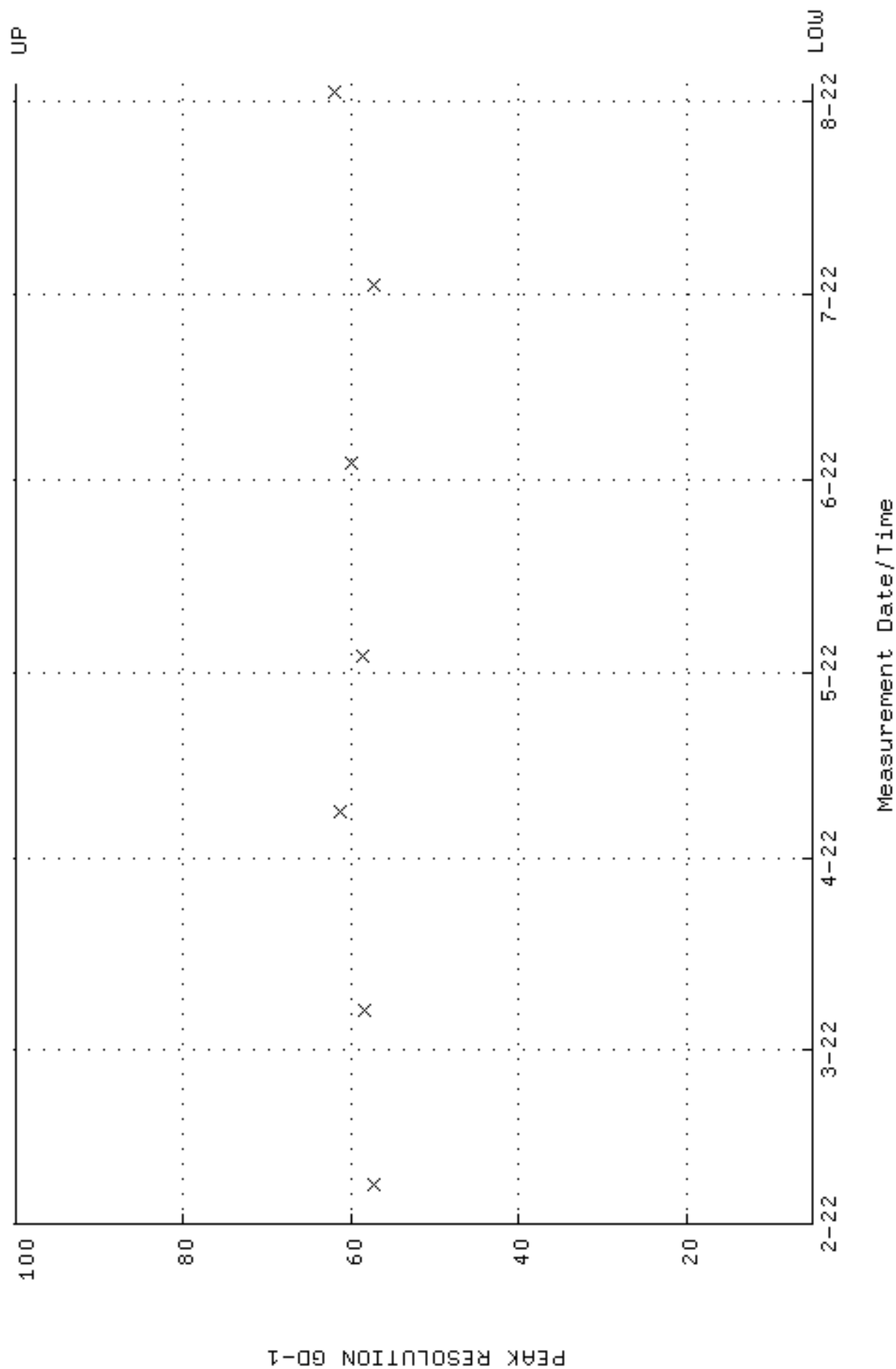
QA filename : DKA100:[ENV_ALPHA.QA.W]W037.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-FEB-2022 09:39:20 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 0.366408 through 0.389072



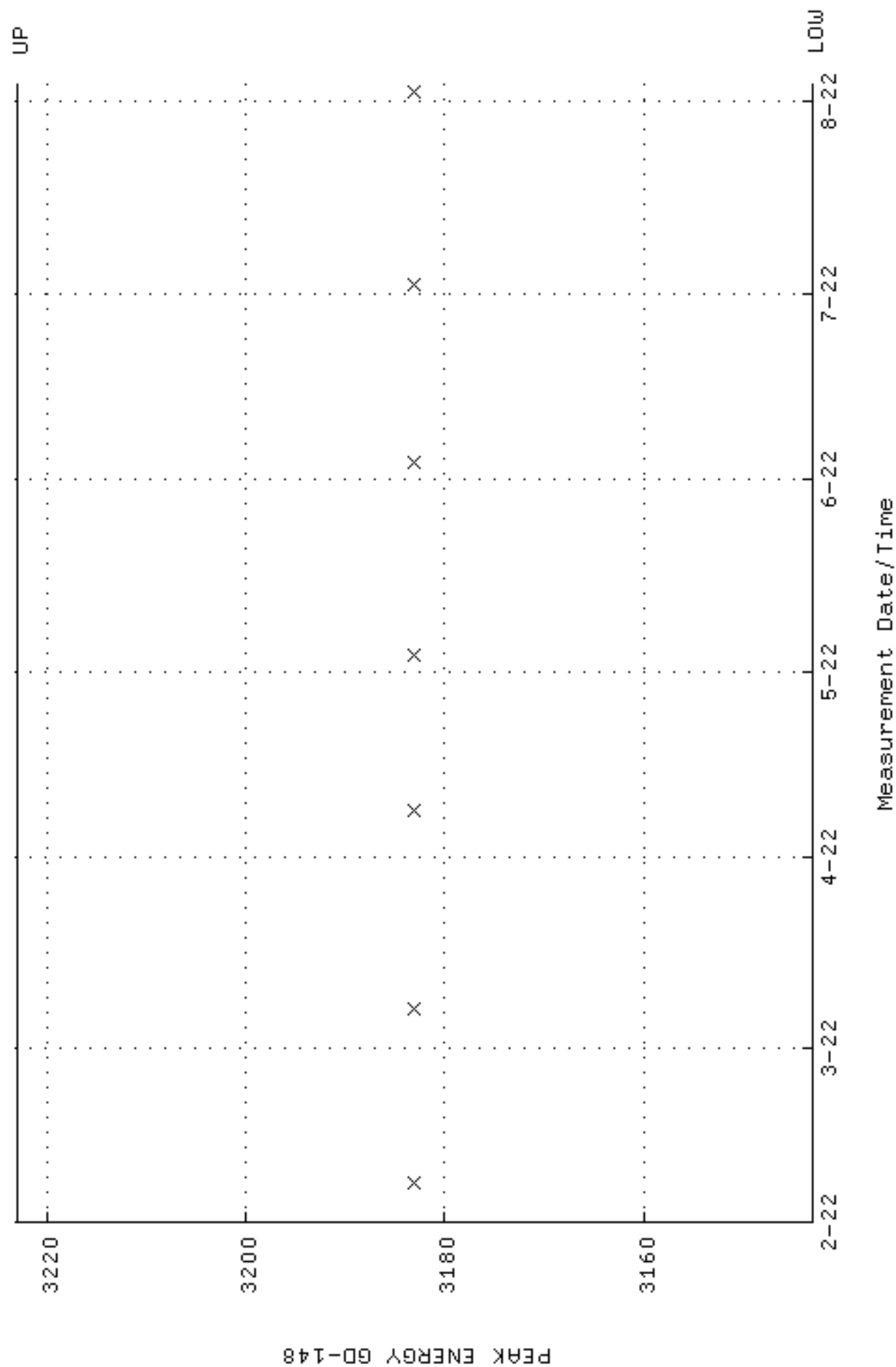
QA filename : DKA100:[ENV_ALPHA.QA.W]W037.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-FEB-2022 09:39:20 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



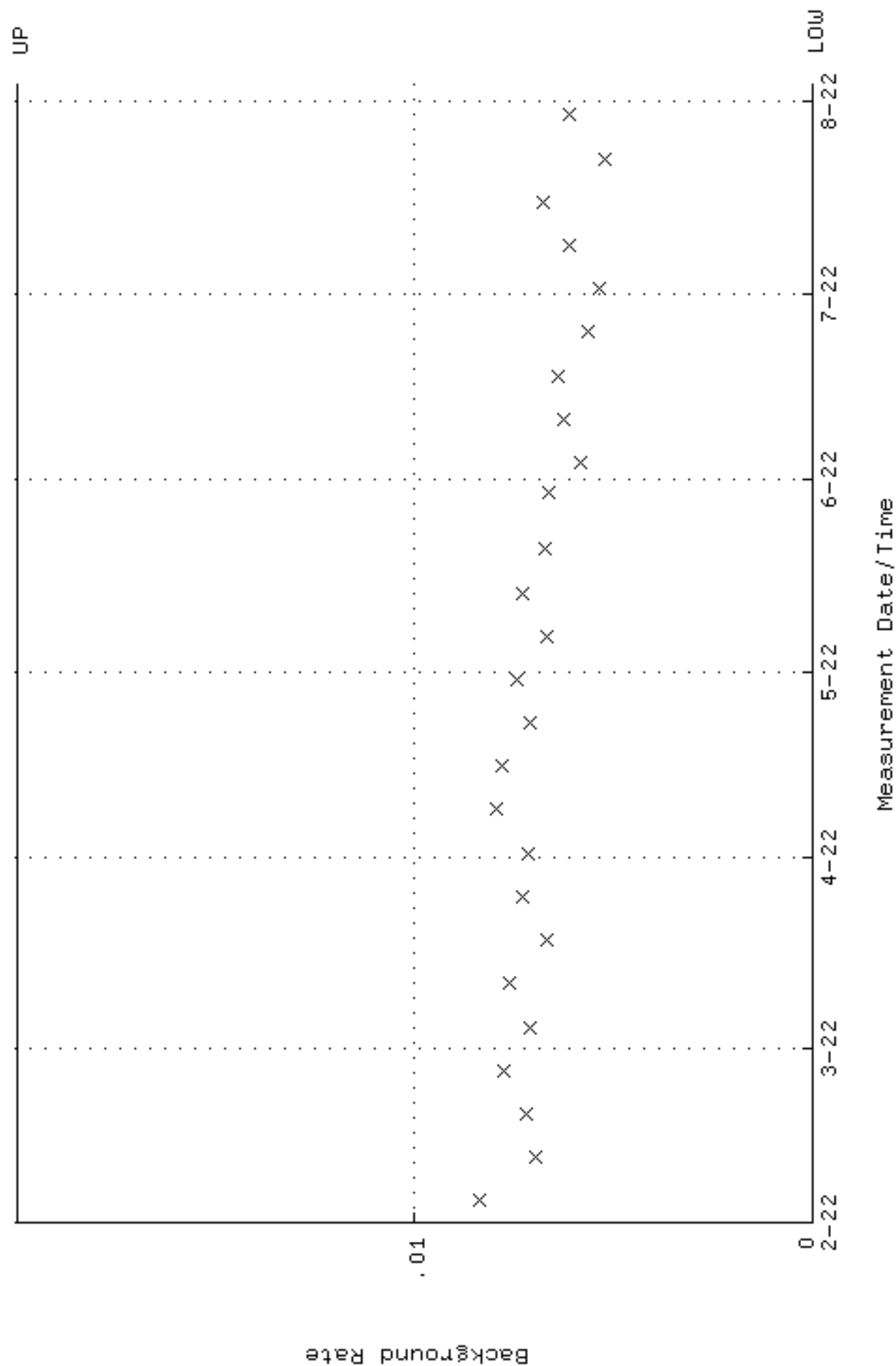
QA filename : DKA100:[ENV_ALPHA.QA.W]W037.QAF;10
Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 7-FEB-2022 09:39:20 through 3-AUG-2022 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



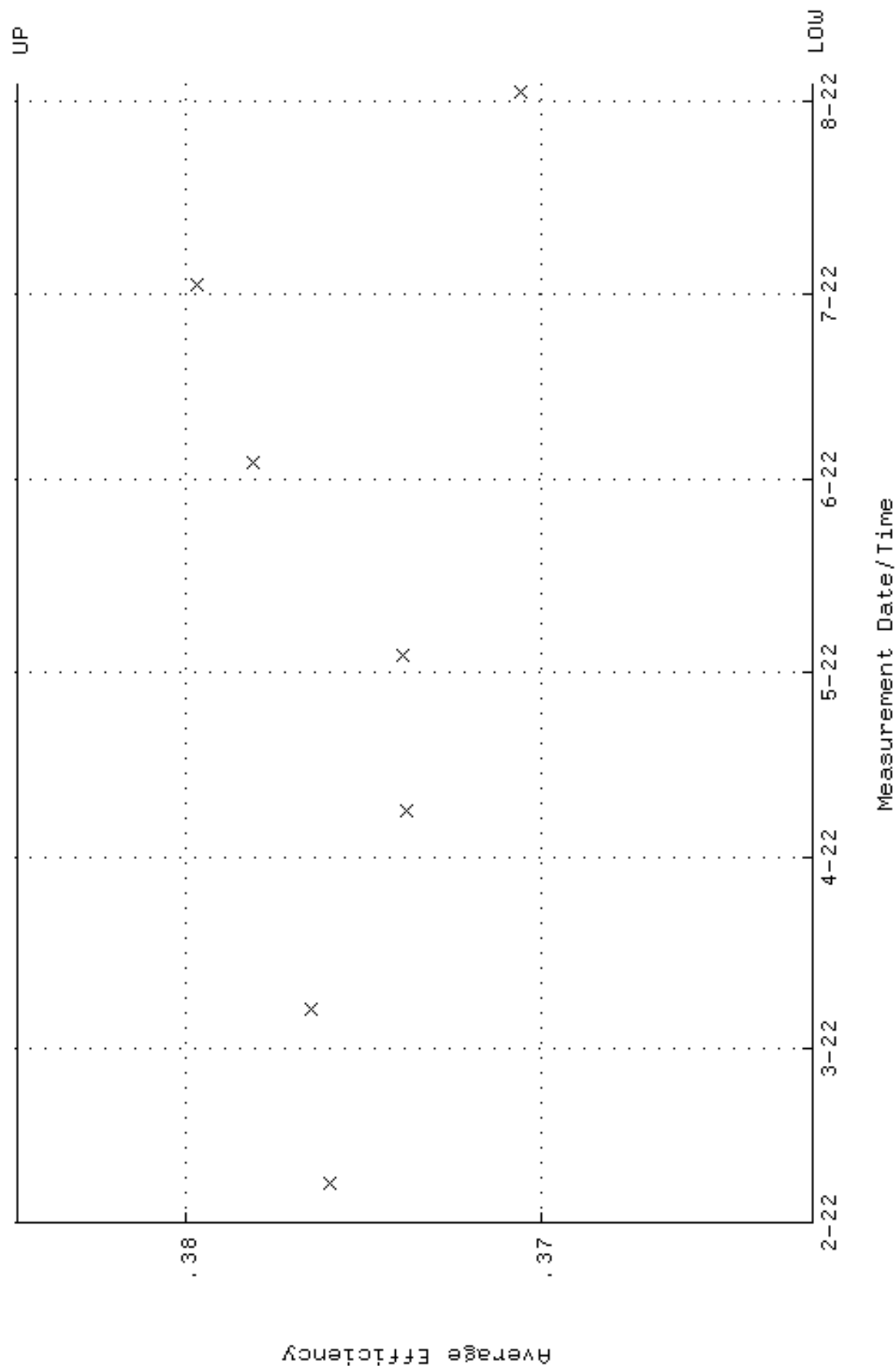
QA filename : DKA100:[ENV_ALPHA.QA.W]W037.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-FEB-2022 09:39:20 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



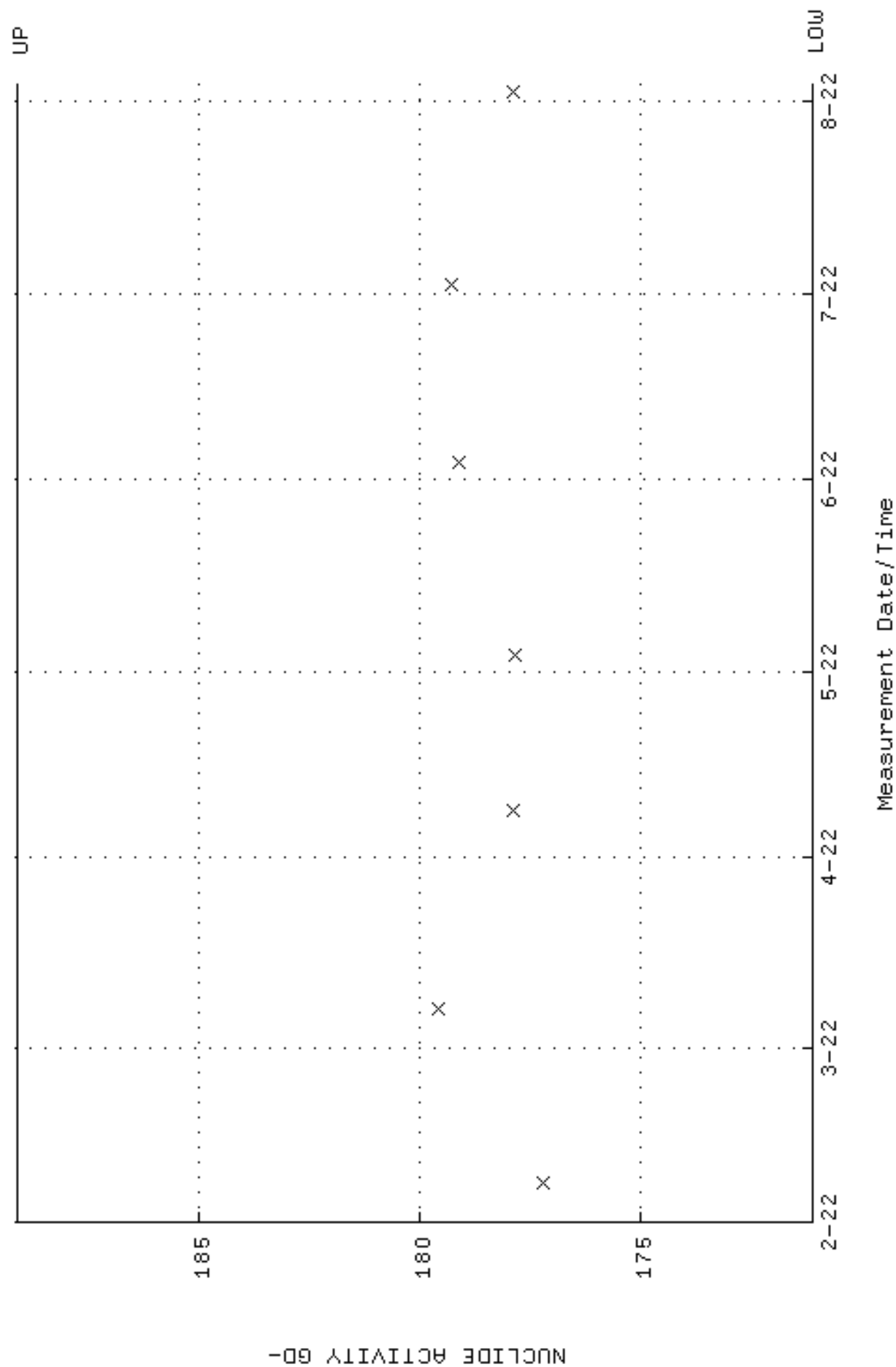
QA filename : DKA100:[ENV_ALPHA.QA.B]B037.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 4-FEB-2022 12:42:15 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



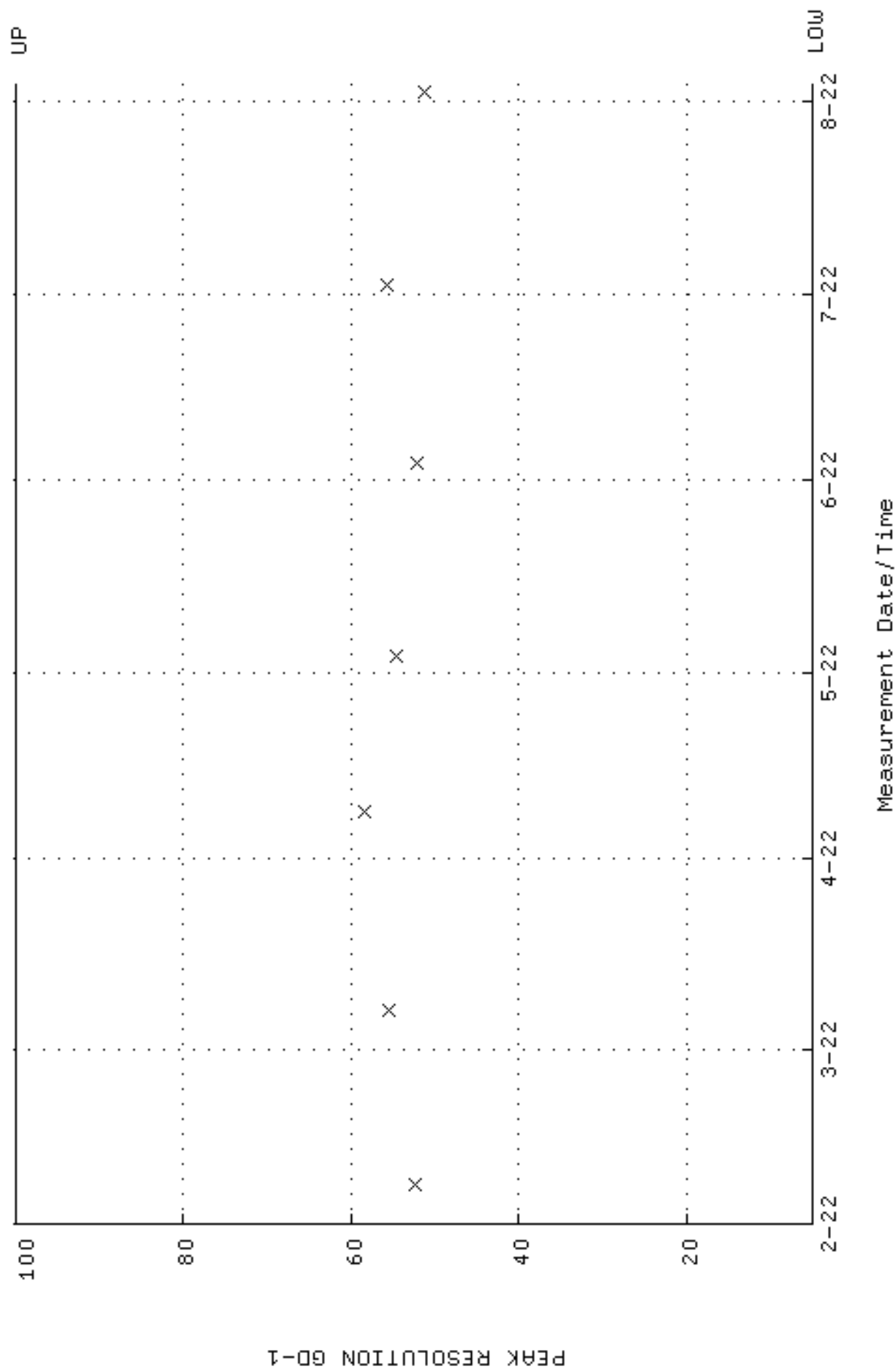
QA filename : DKA100:[ENV_ALPHA.QA.W]W039.QAF;8
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 7-FEB-2022 09:39:20 through 3-AUG-2022 12:00:00
Lower/Upper Lmts: 0.362349 through 0.384763



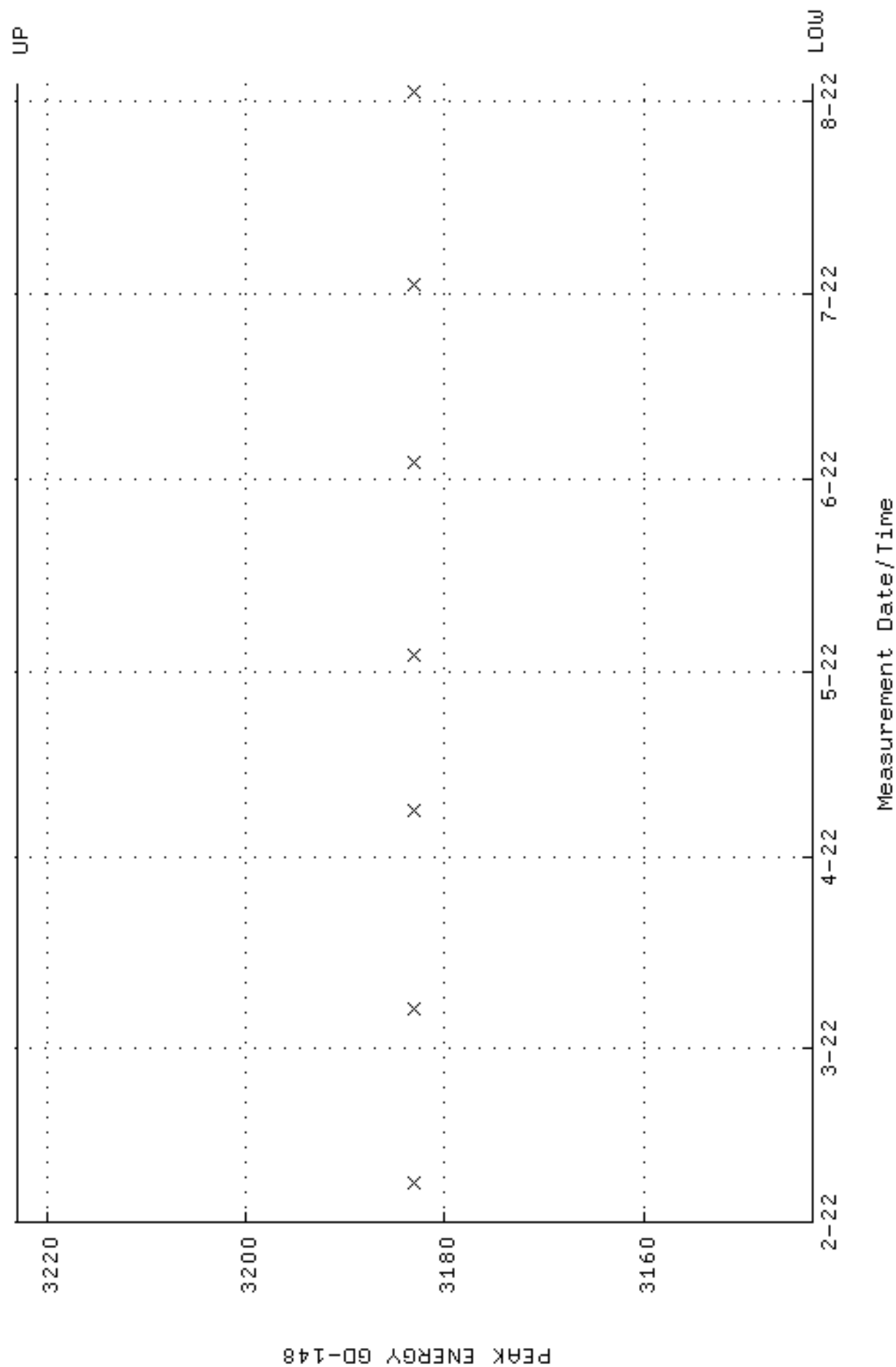
QA filename : DKA100:[ENV_ALPHA.QA.W]W039.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-FEB-2022 09:39:20 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



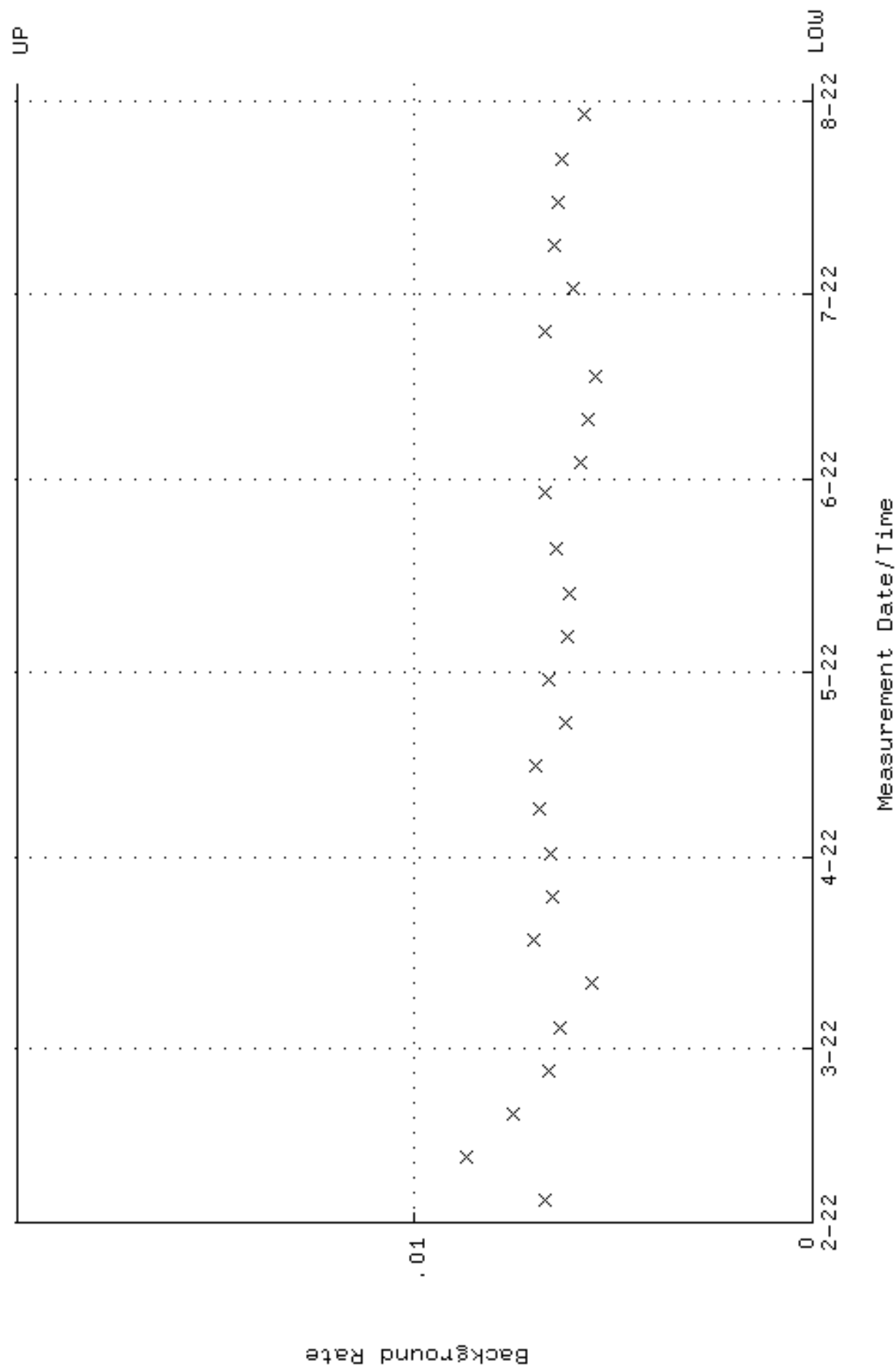
QA filename : DKA100:[ENV_ALPHA.QA.W]W039.QAF;8
Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 7-FEB-2022 09:39:20 through 3-AUG-2022 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



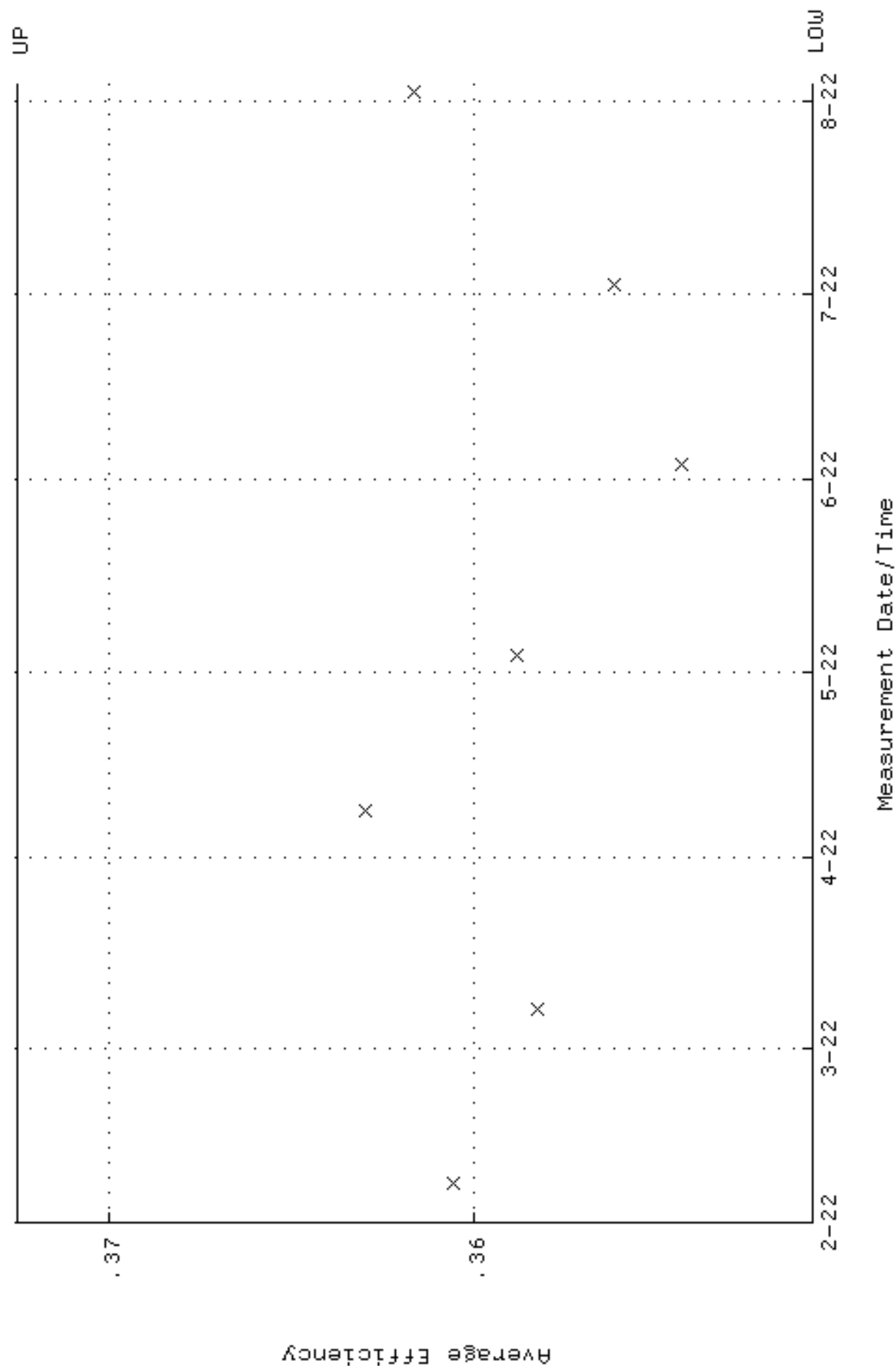
QA filename : DKA100:[ENV_ALPHA.QA.W]W039.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-FEB-2022 09:39:20 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



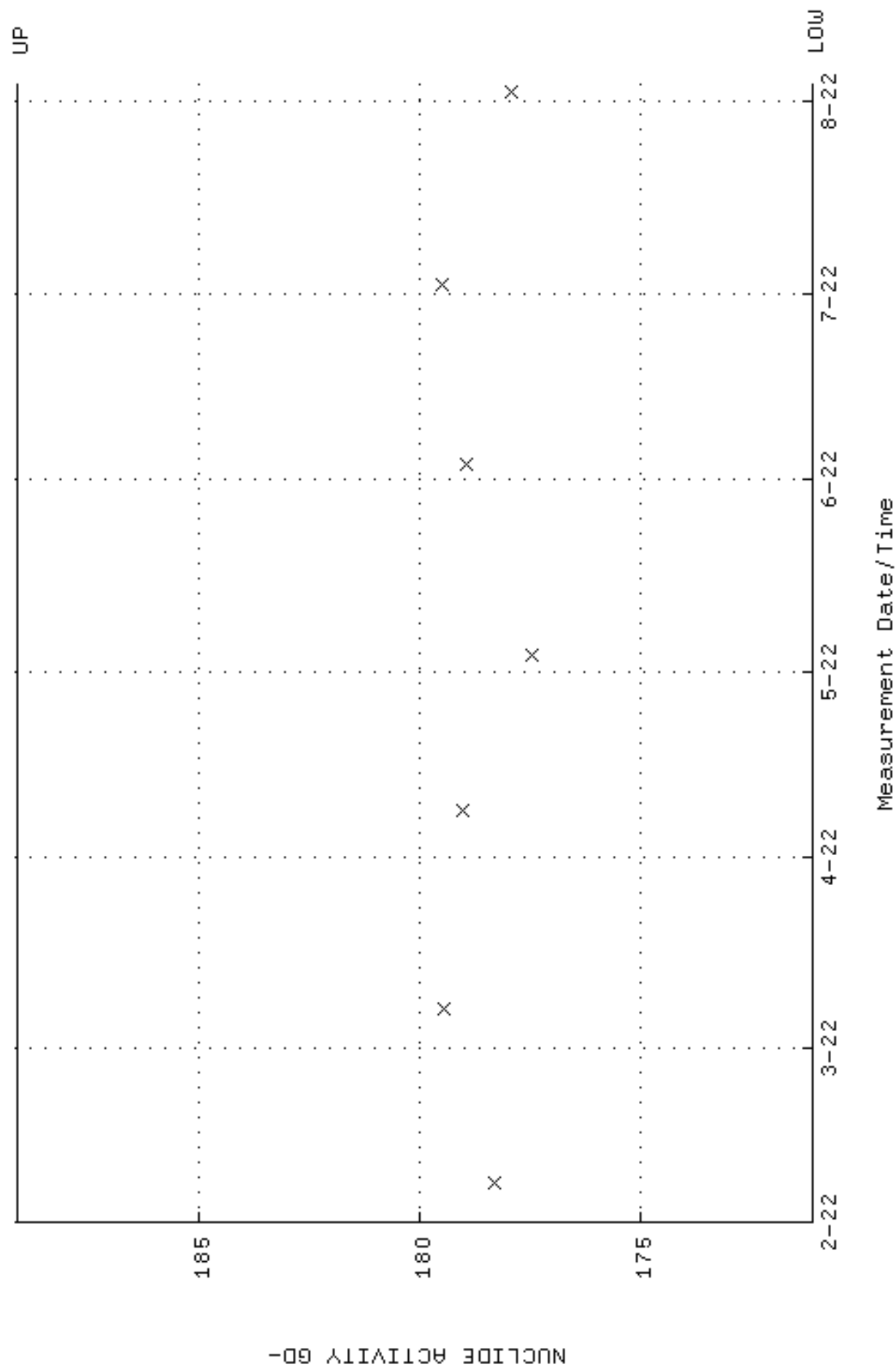
QA filename : DKA100:[ENV_ALPHA.QA.B]B039.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 4-FEB-2022 12:42:15 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



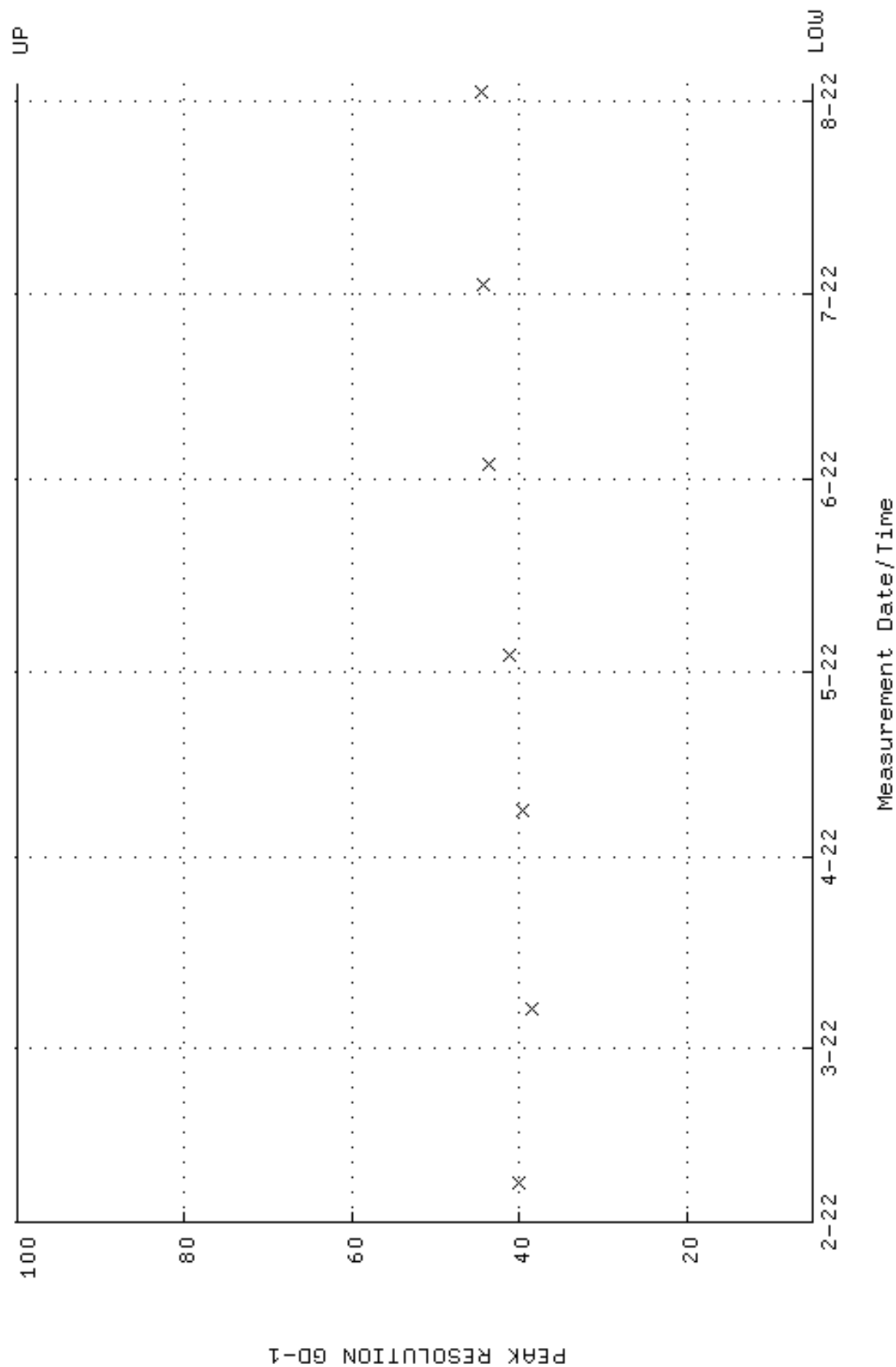
QA filename : DKA100:[ENV_ALPHA.QA.W]W043.QAF;109
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 0.350783 through 0.372480



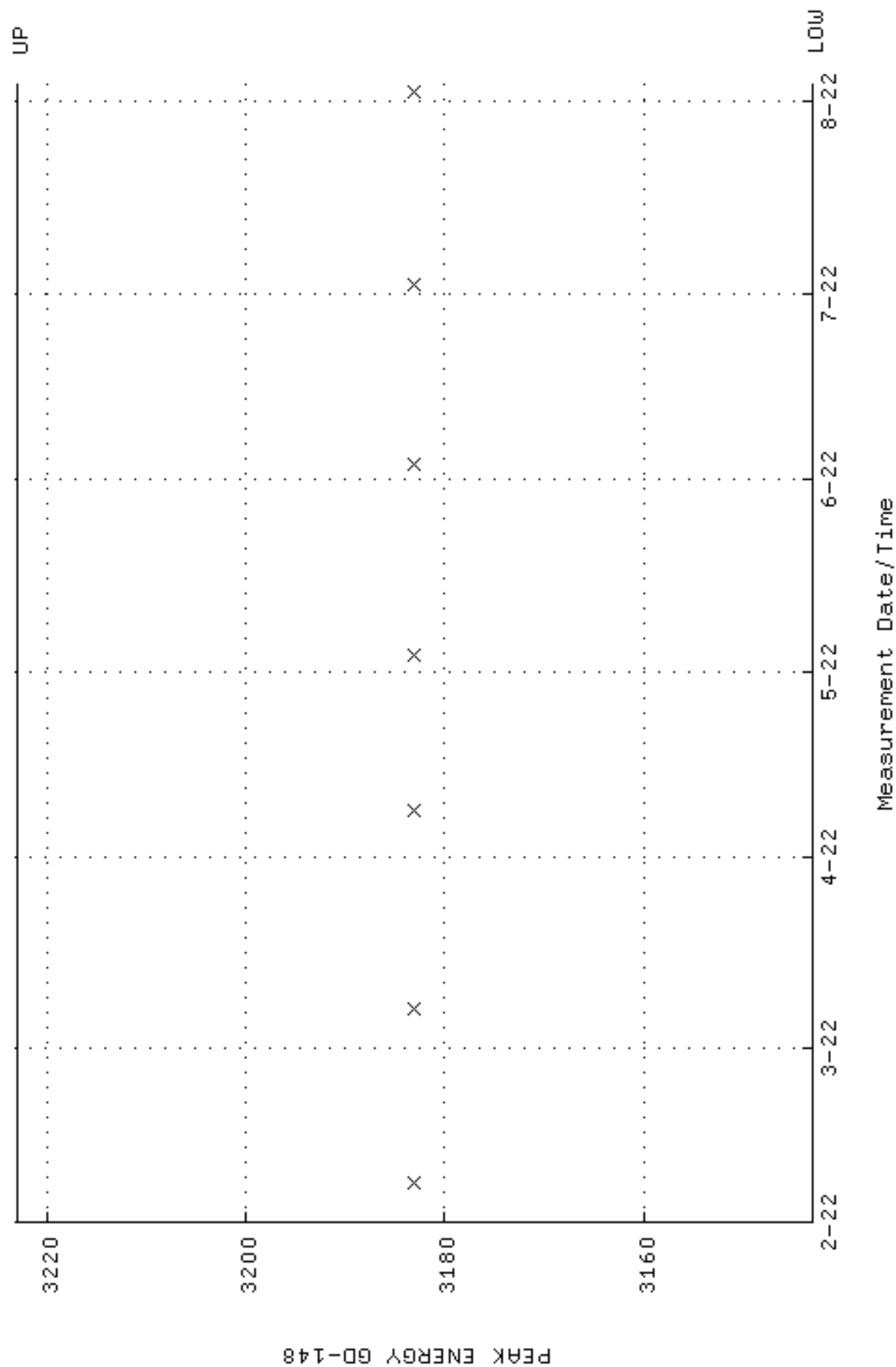
QA filename : DKA100:[ENV_ALPHA.QA.W]W043.QAF;109
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



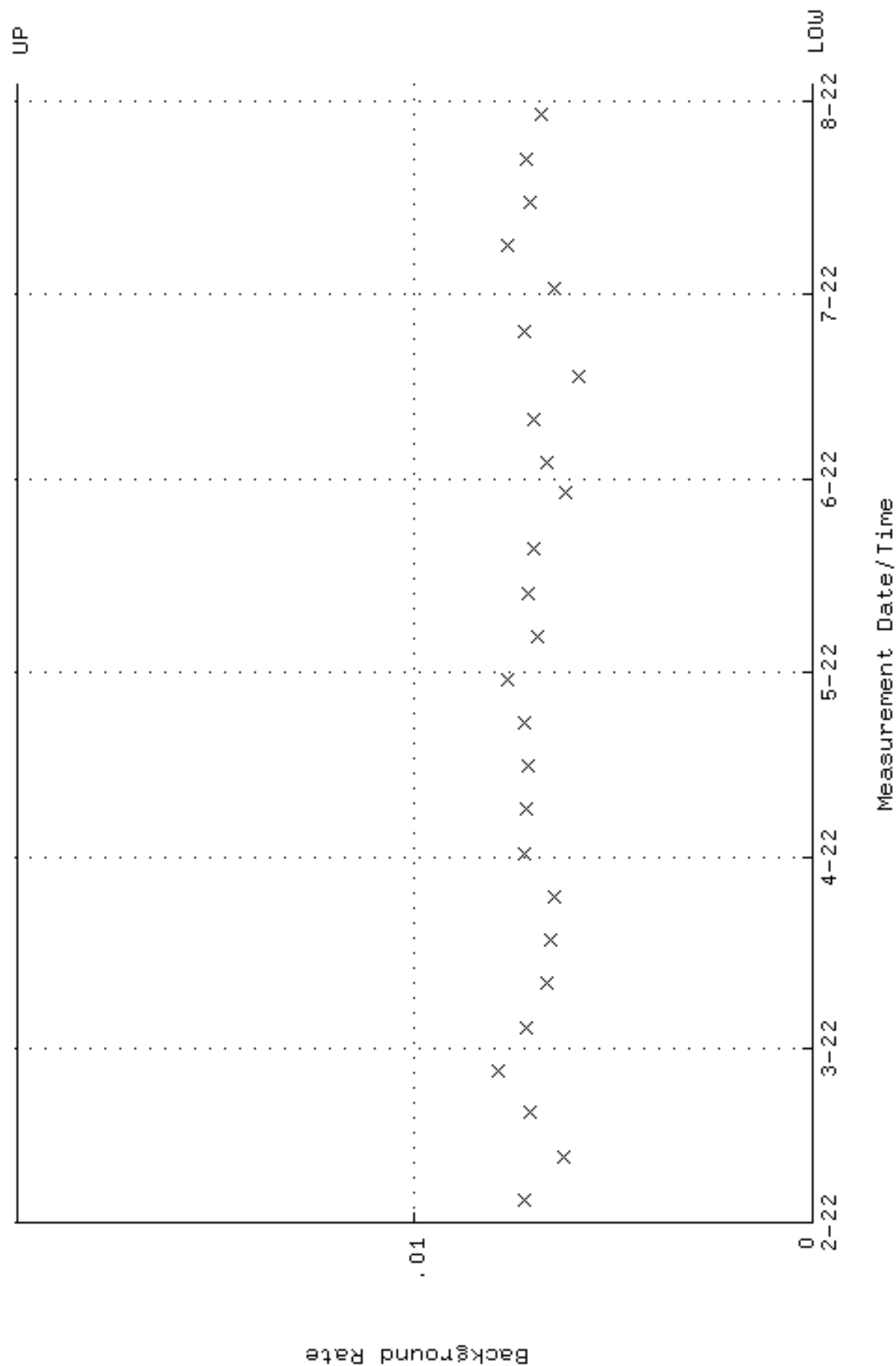
QA filename : DKA100:[ENV_ALPHA.QA.W]W043.QAF;109
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



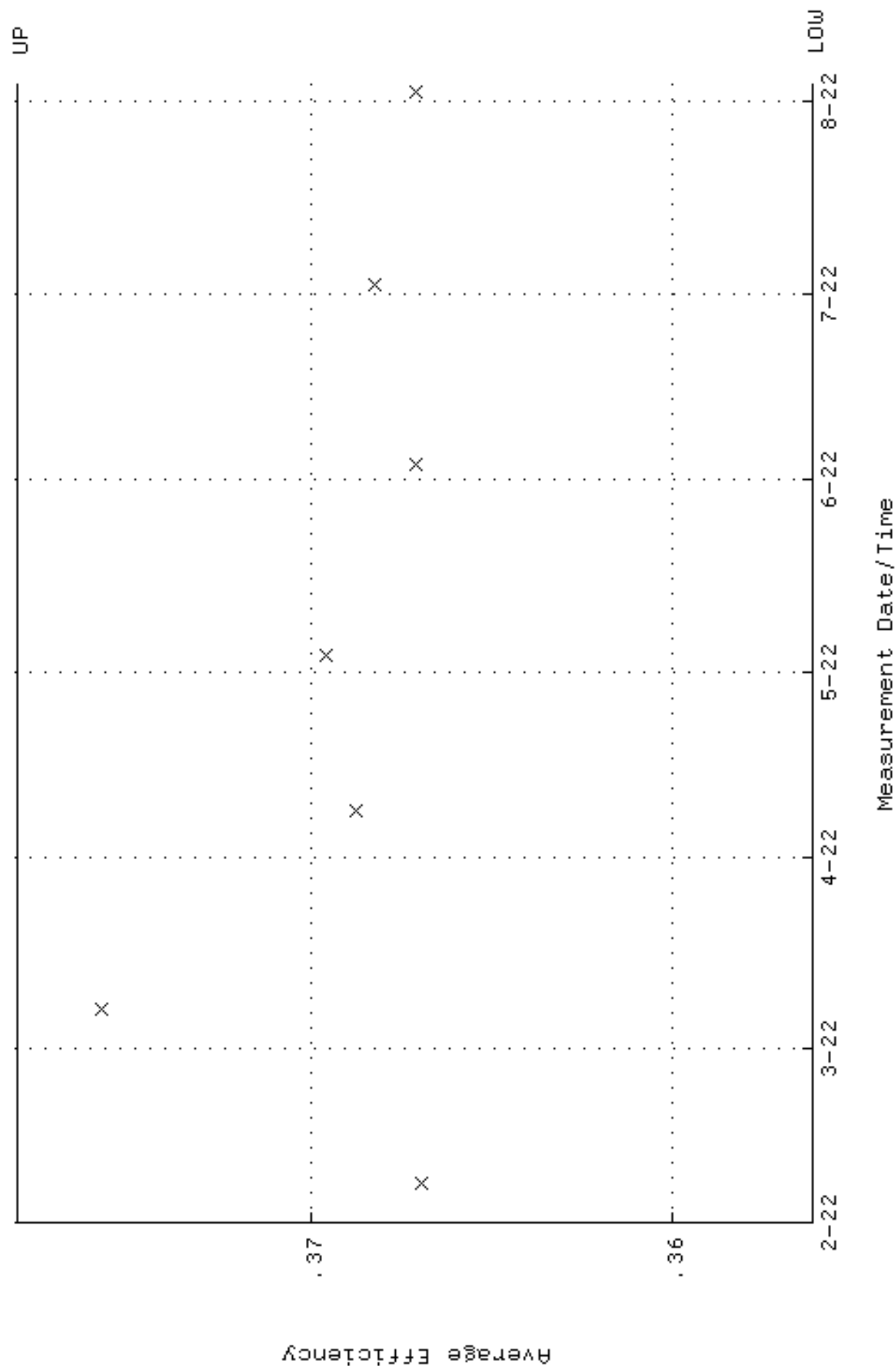
QA filename : DKA100:[ENV_ALPHA.QA.W]W043.QAF;109
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



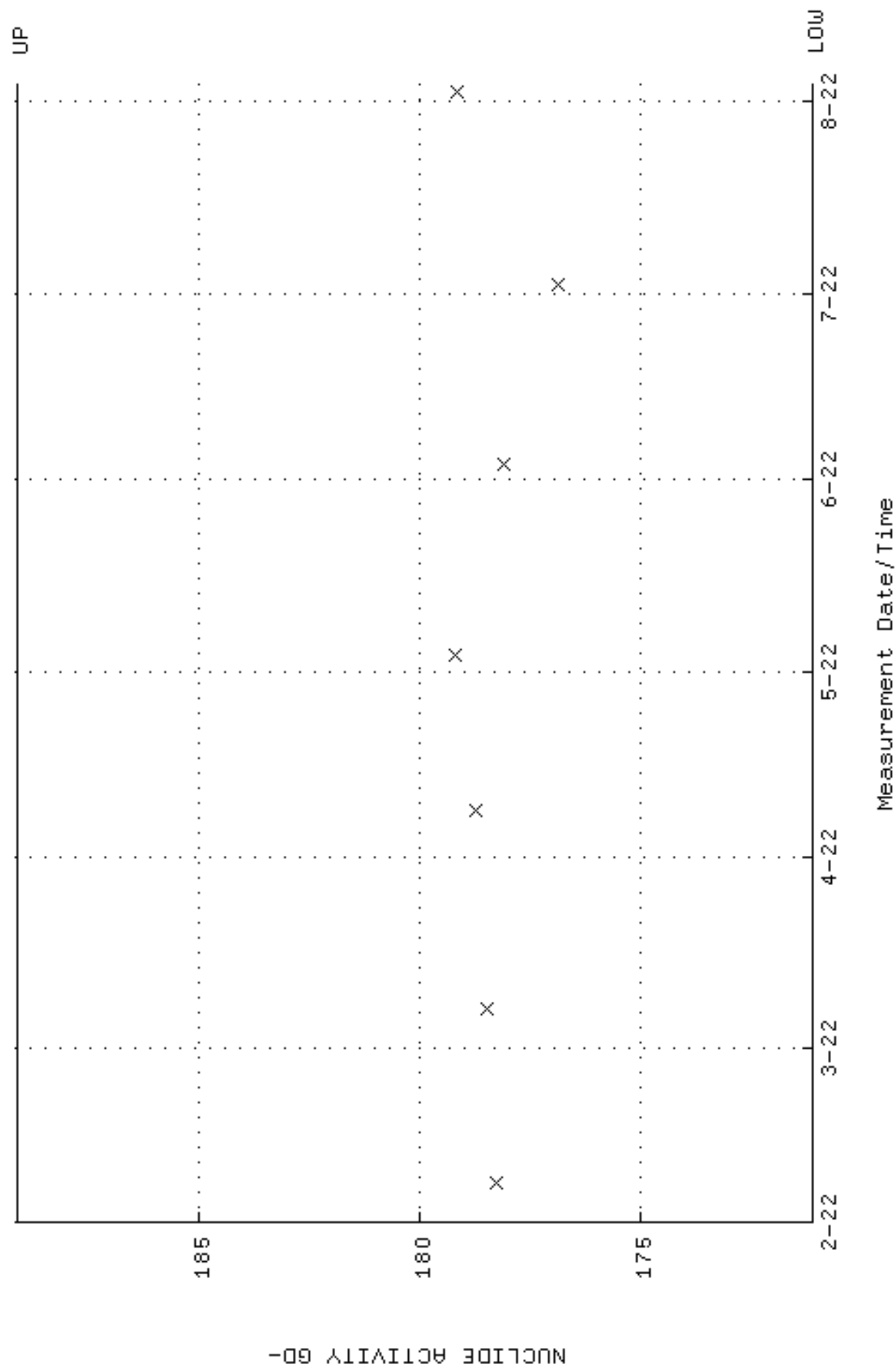
QA filename : DKA100:[ENV_ALPHA.QA.B]B043.QAF;6
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 4-FEB-2022 12:42:16 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



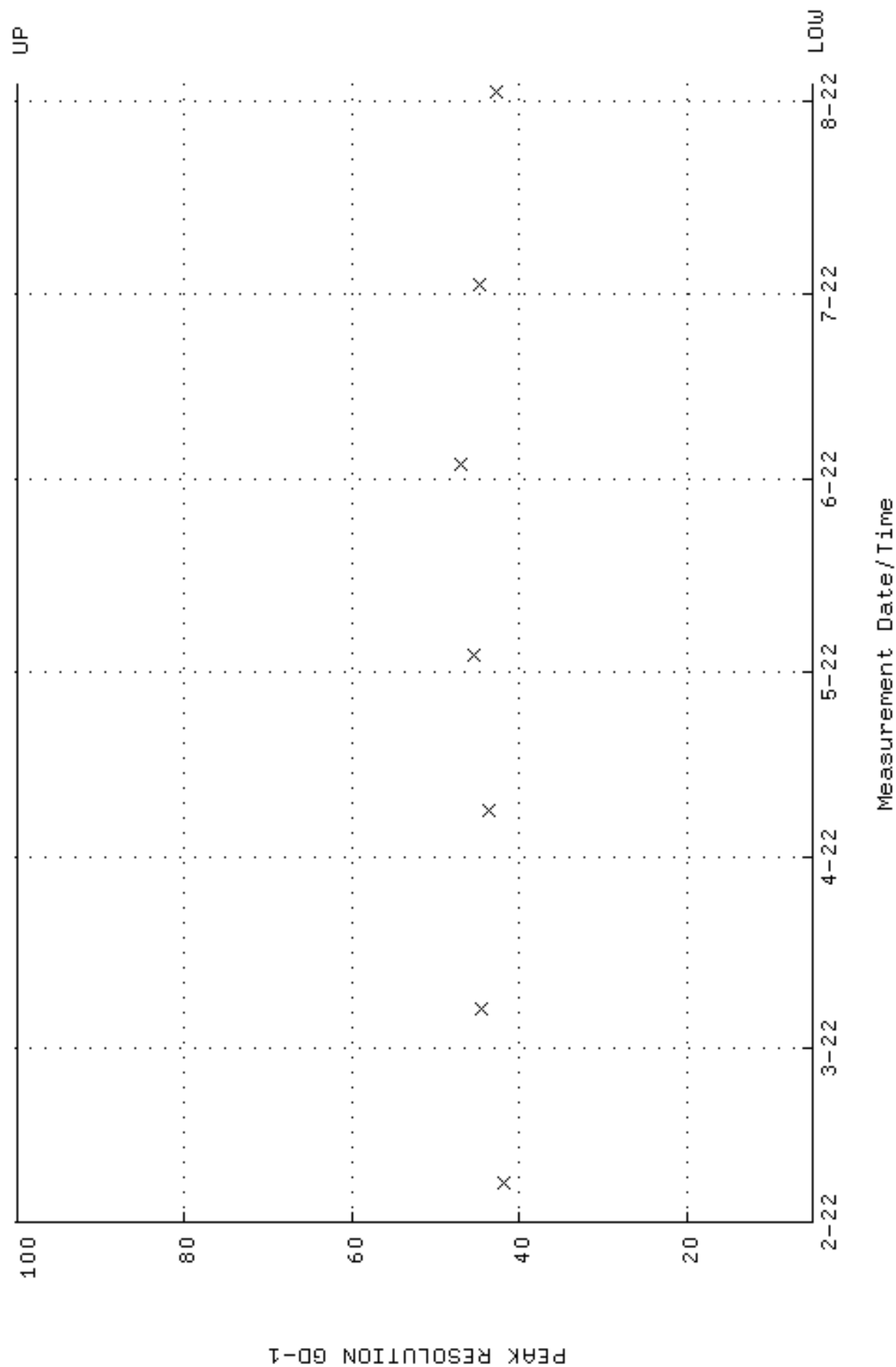
QA filename : DKA100:[ENV_ALPHA.QA.W]W044.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 0.356120 through 0.378148



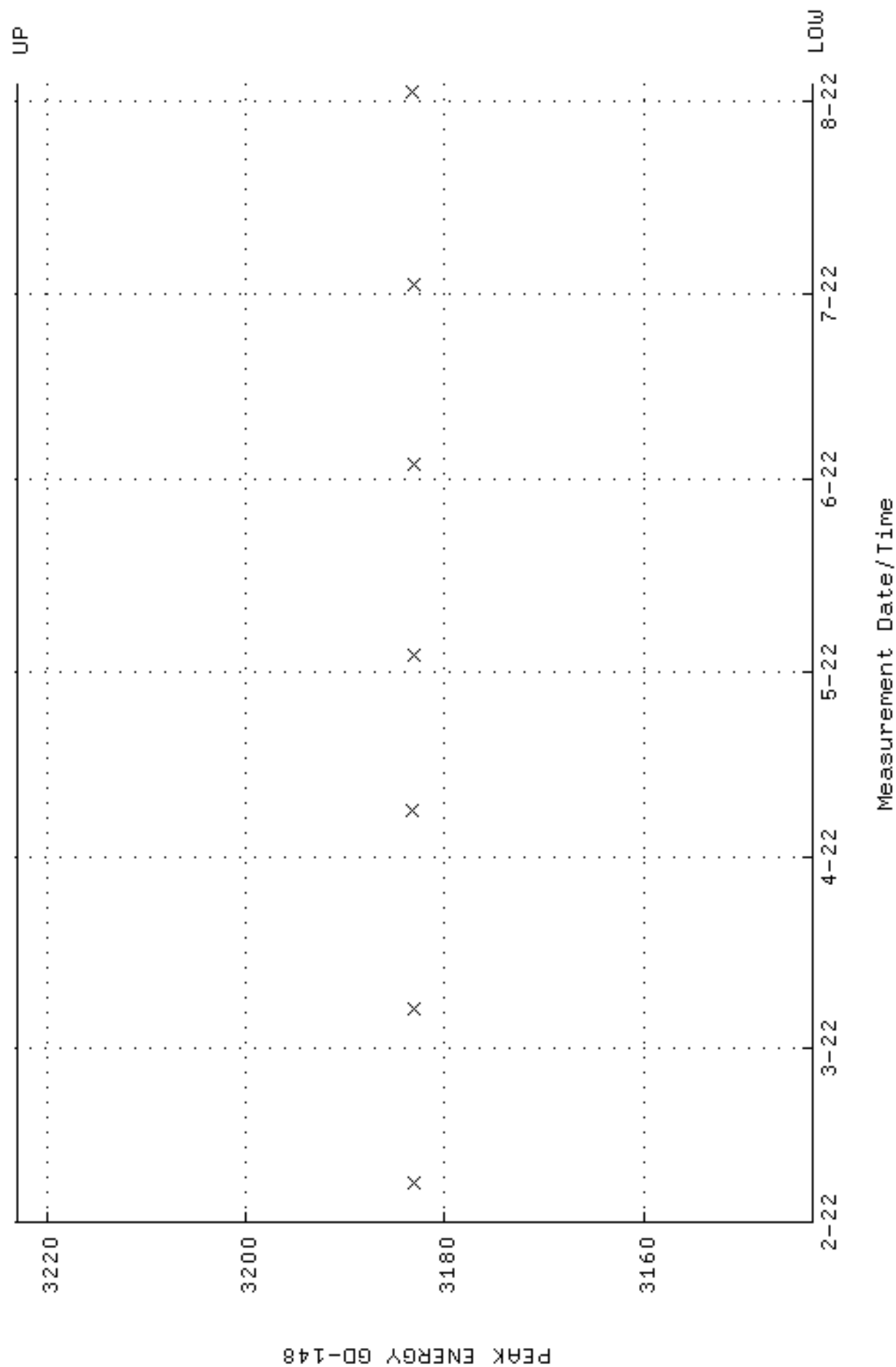
QA filename : DKA100:[ENV_ALPHA.QA.W]W044.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



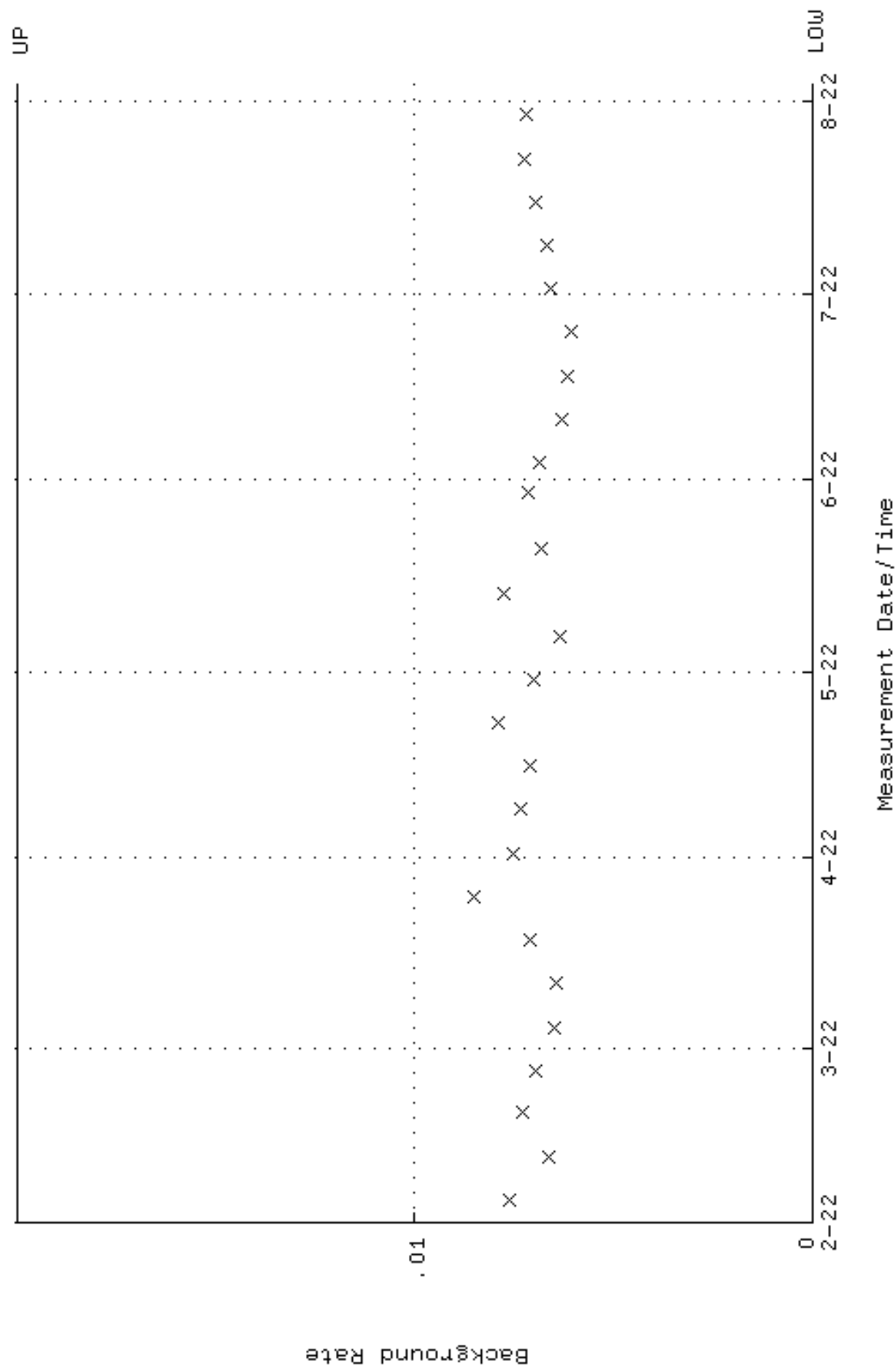
QA filename : DKA100:[ENV_ALPHA.QA.W]W044.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



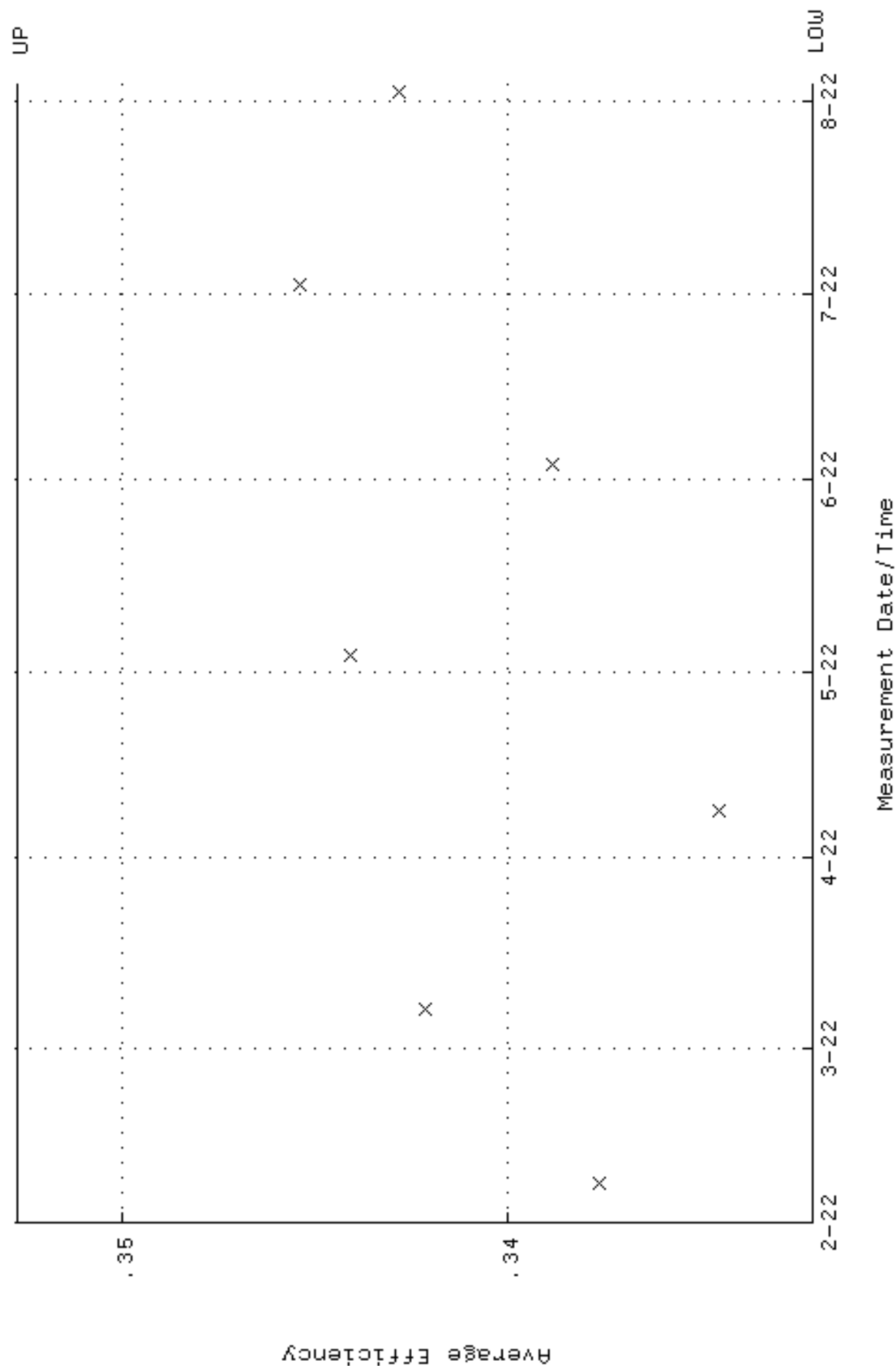
QA filename : DKA100:[ENV_ALPHA.QA.W]W044.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



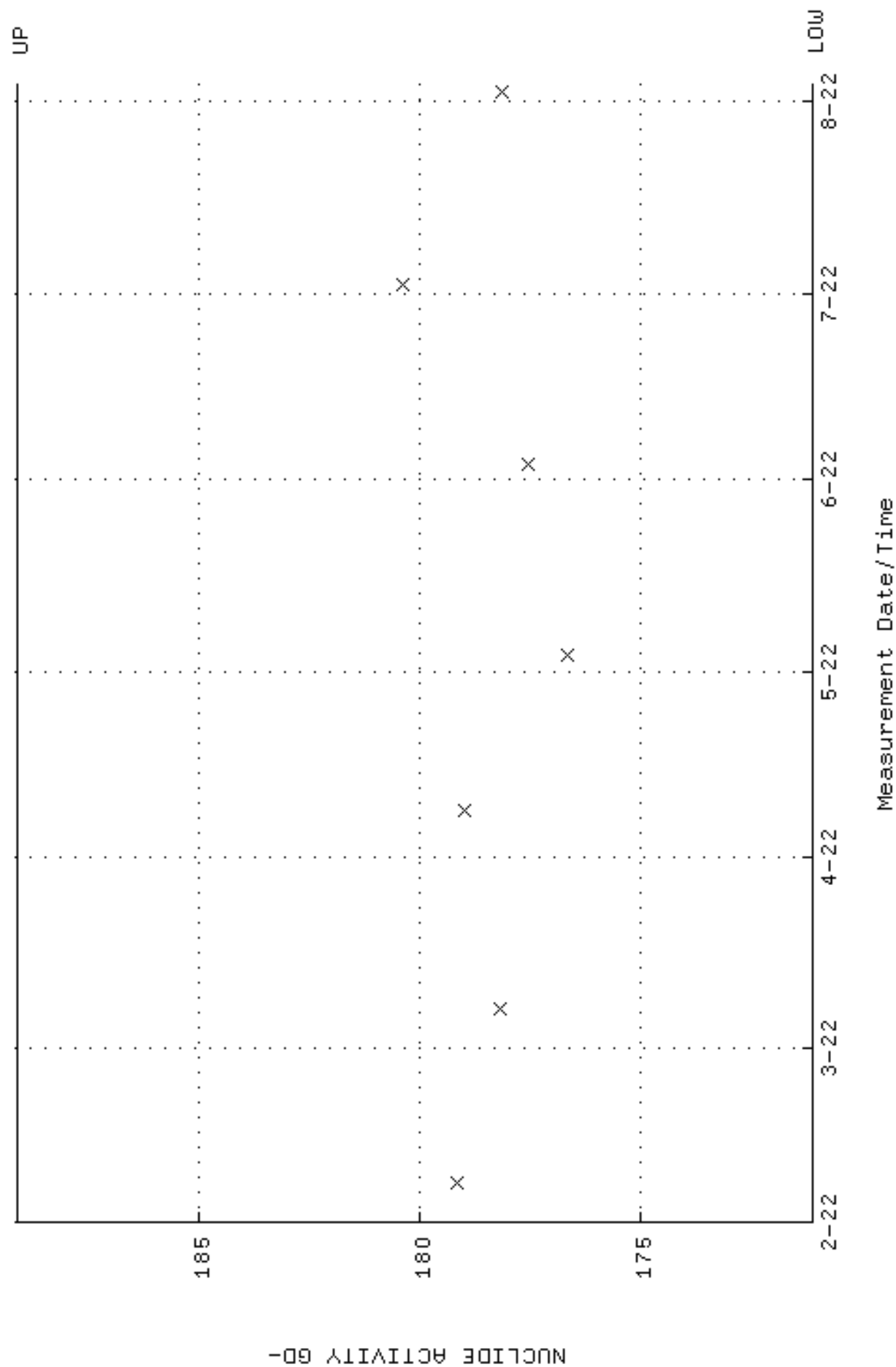
QA filename : DKA100:[ENV_ALPHA.QA.B]B044.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 4-FEB-2022 12:42:16 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



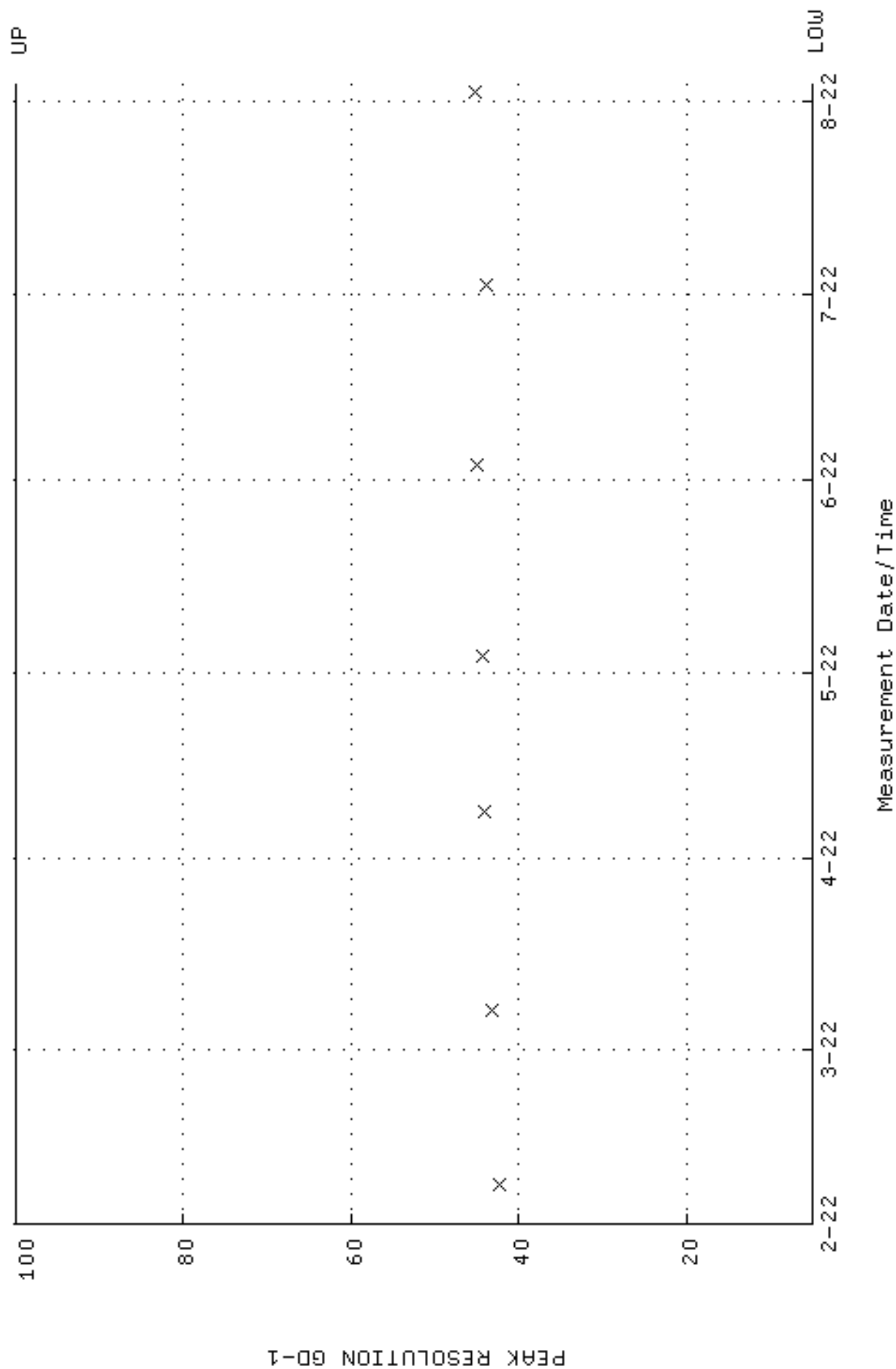
QA filename : DKA100:[ENV_ALPHA.QA.W]W045.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 0.332140 through 0.352690



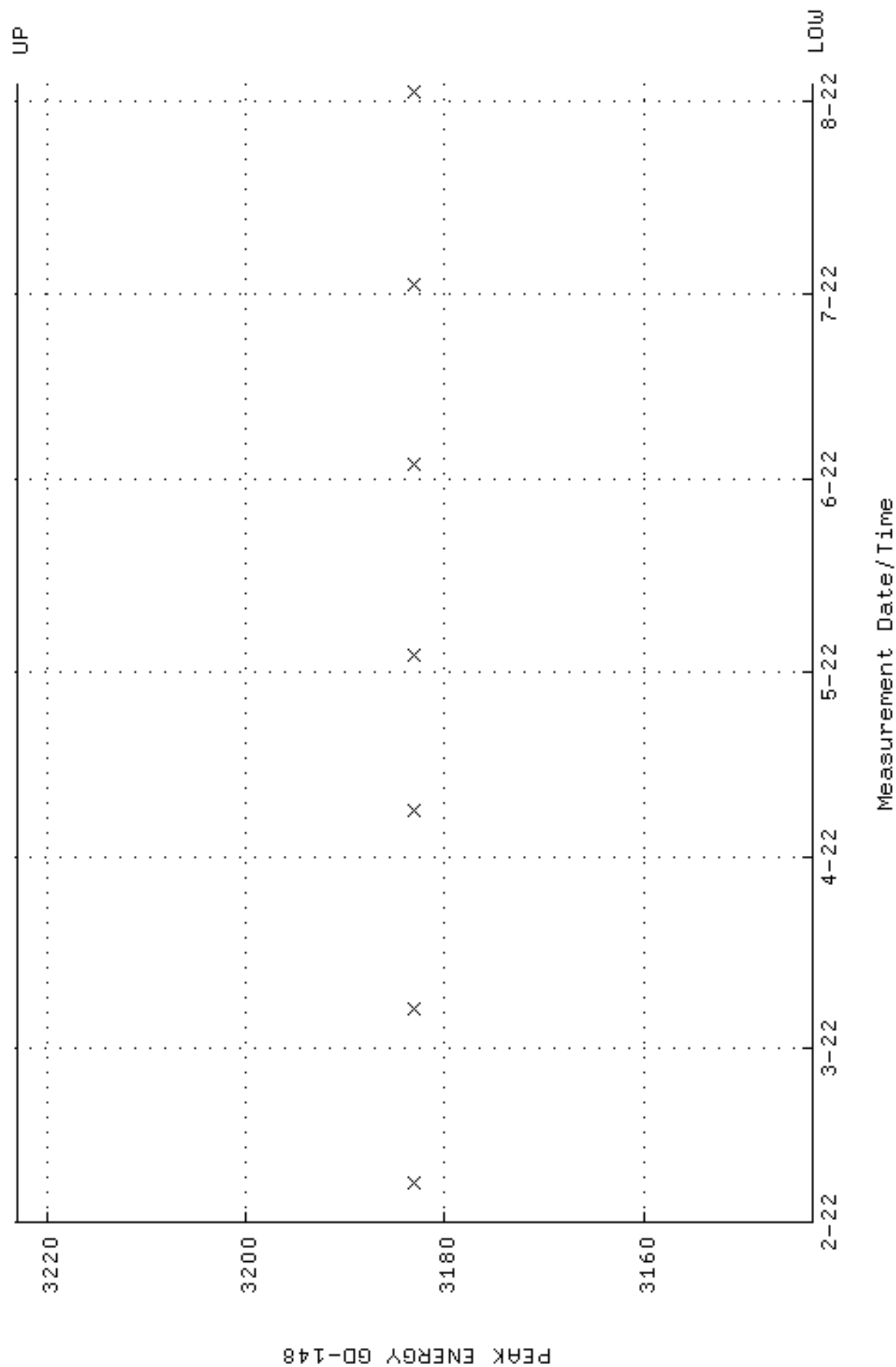
QA filename : DKA100:[ENV_ALPHA.QA.W]W045.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



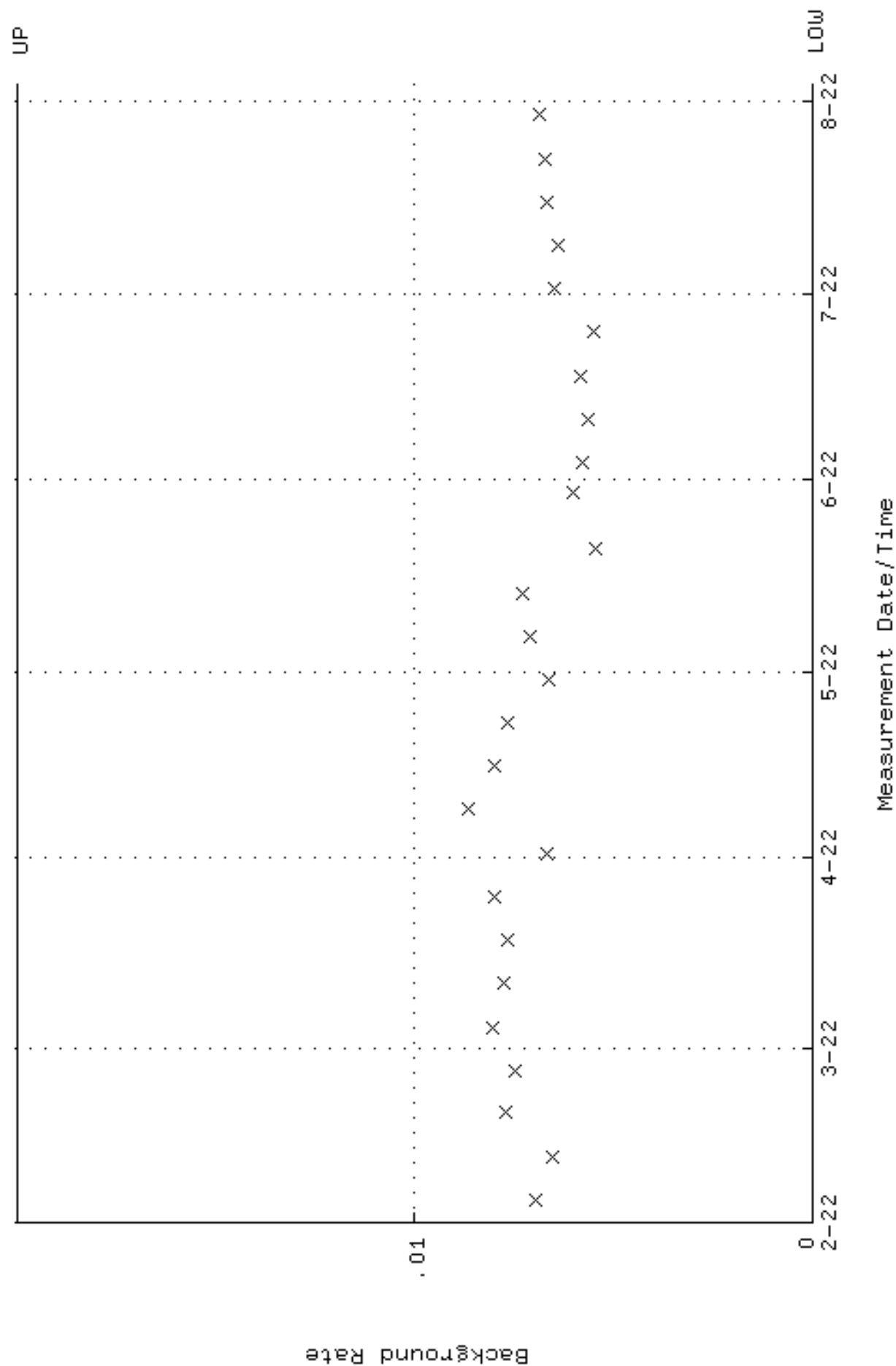
QA filename : DKA100:[ENV_ALPHA.QA.W]W045.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



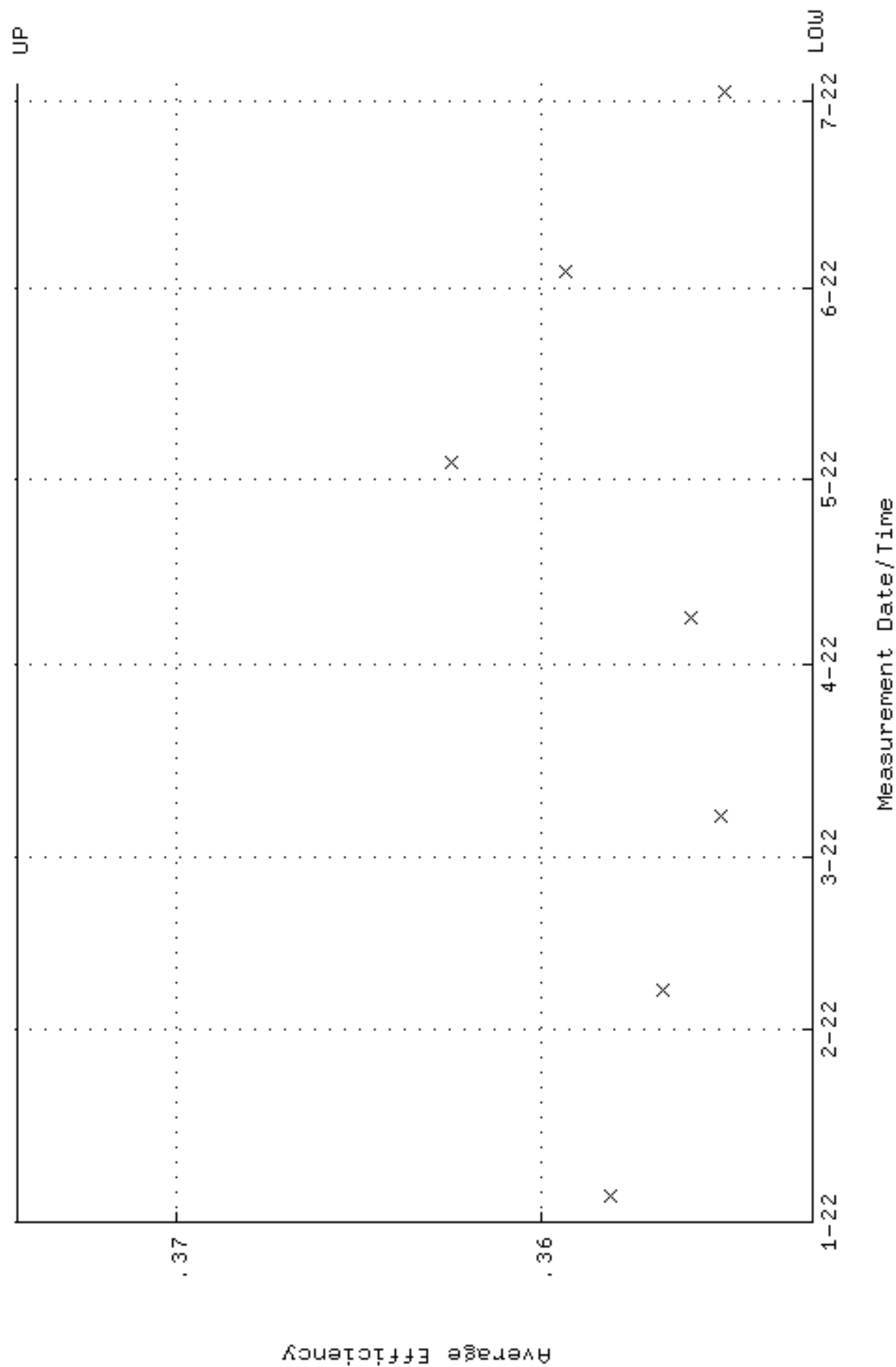
QA filename : DKA100:[ENV_ALPHA.QA.W]W045.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



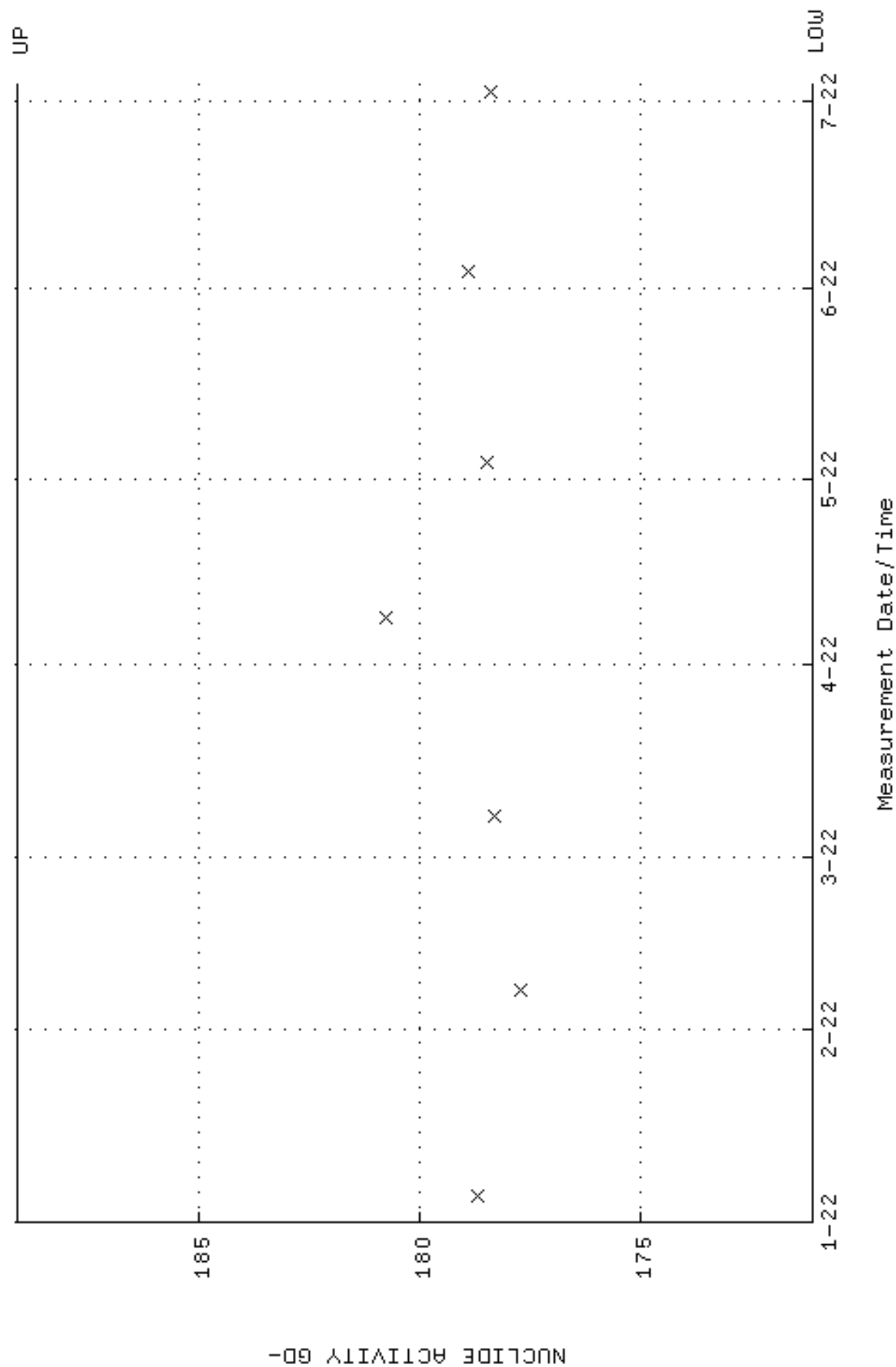
QA filename : DKA100:[ENV_ALPHA.QA.B]B045.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 4-FEB-2022 12:42:16 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



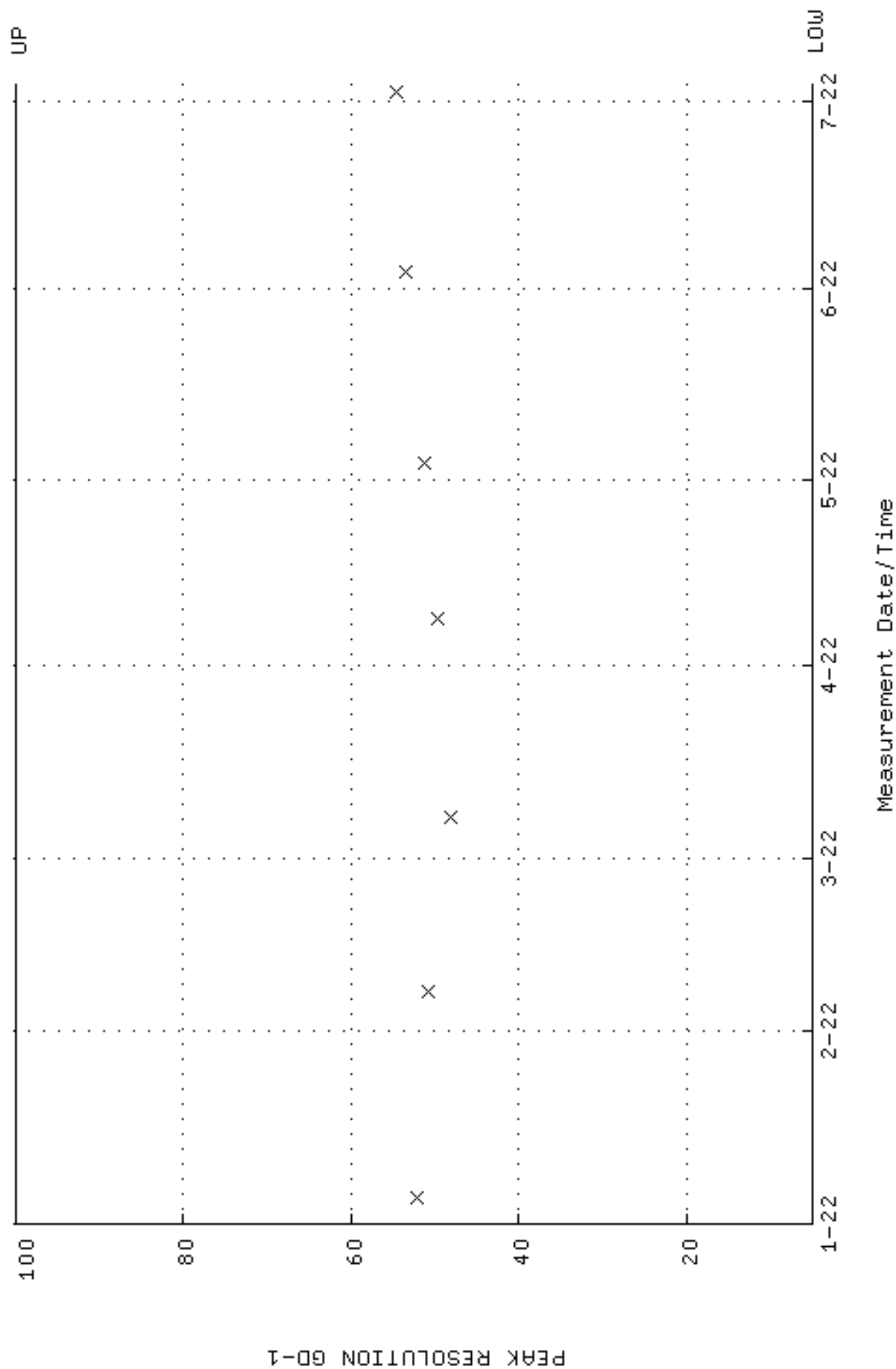
QA filename : DKA100:[ENV_ALPHA.QA.W]W047.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.352538 through 0.374344



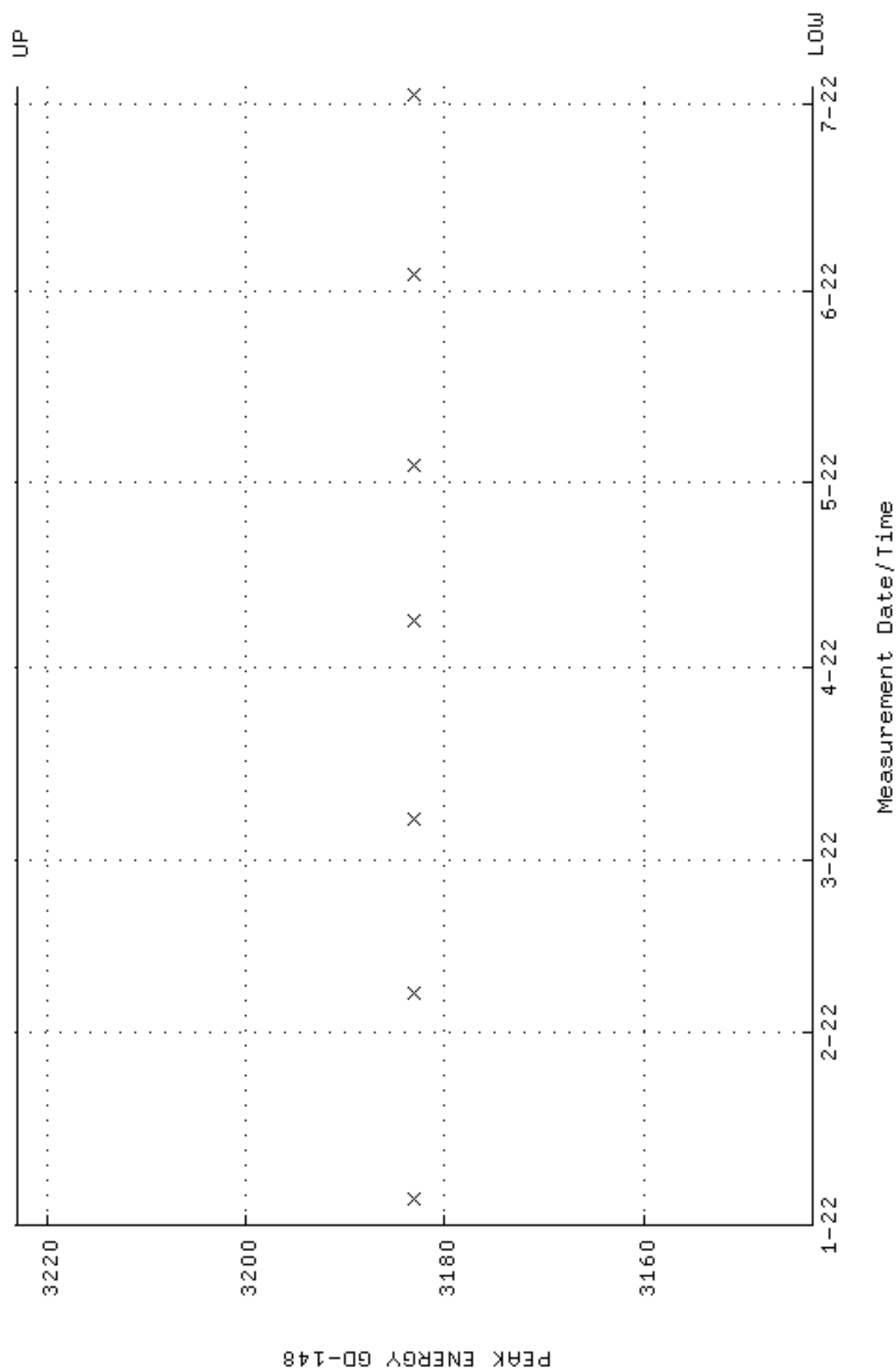
QA filename : DKA100:[ENV_ALPHA.QA.W]W047.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



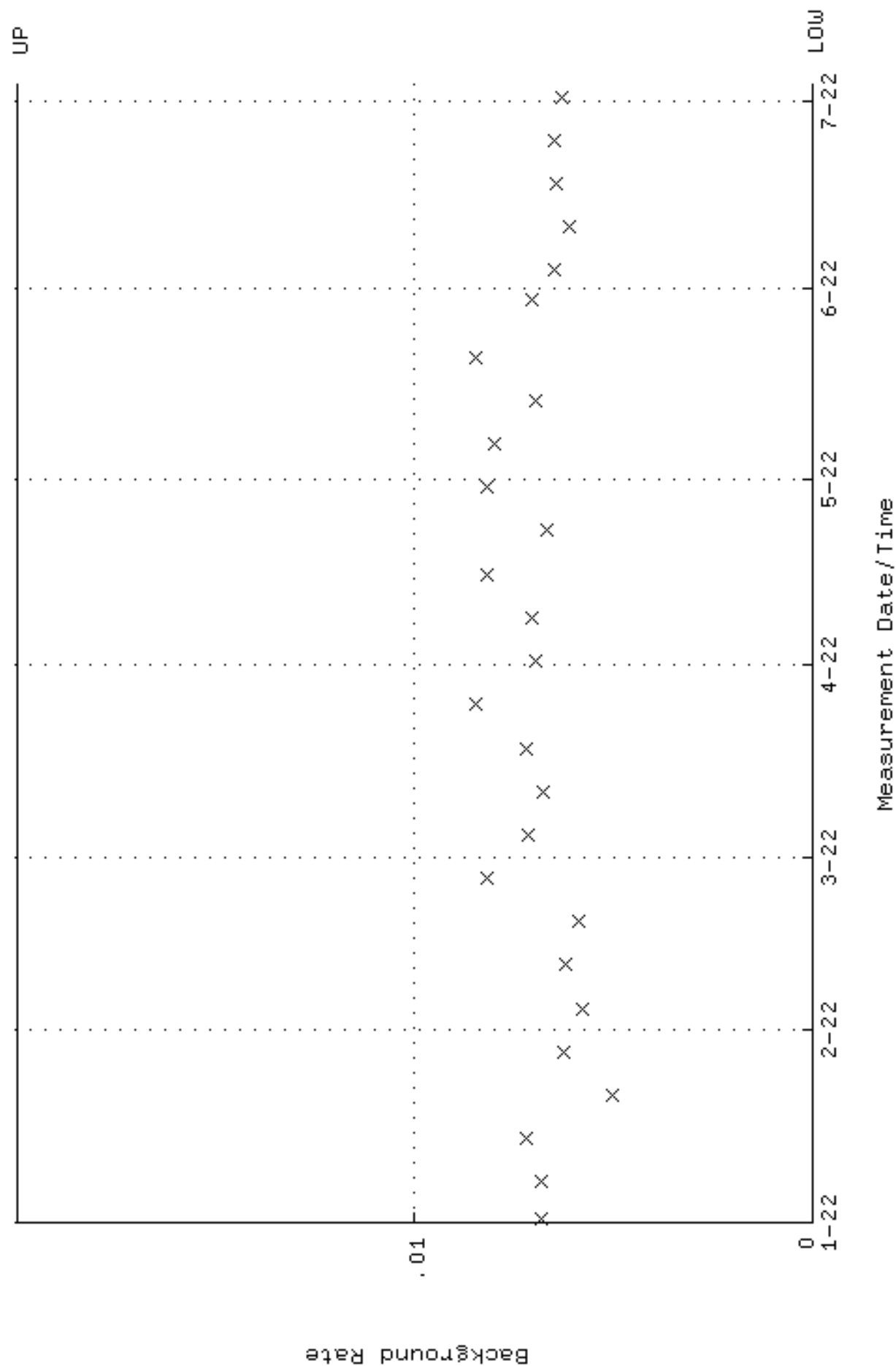
QA filename : DKA100:[ENV_ALPHA.QA.W]W047.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



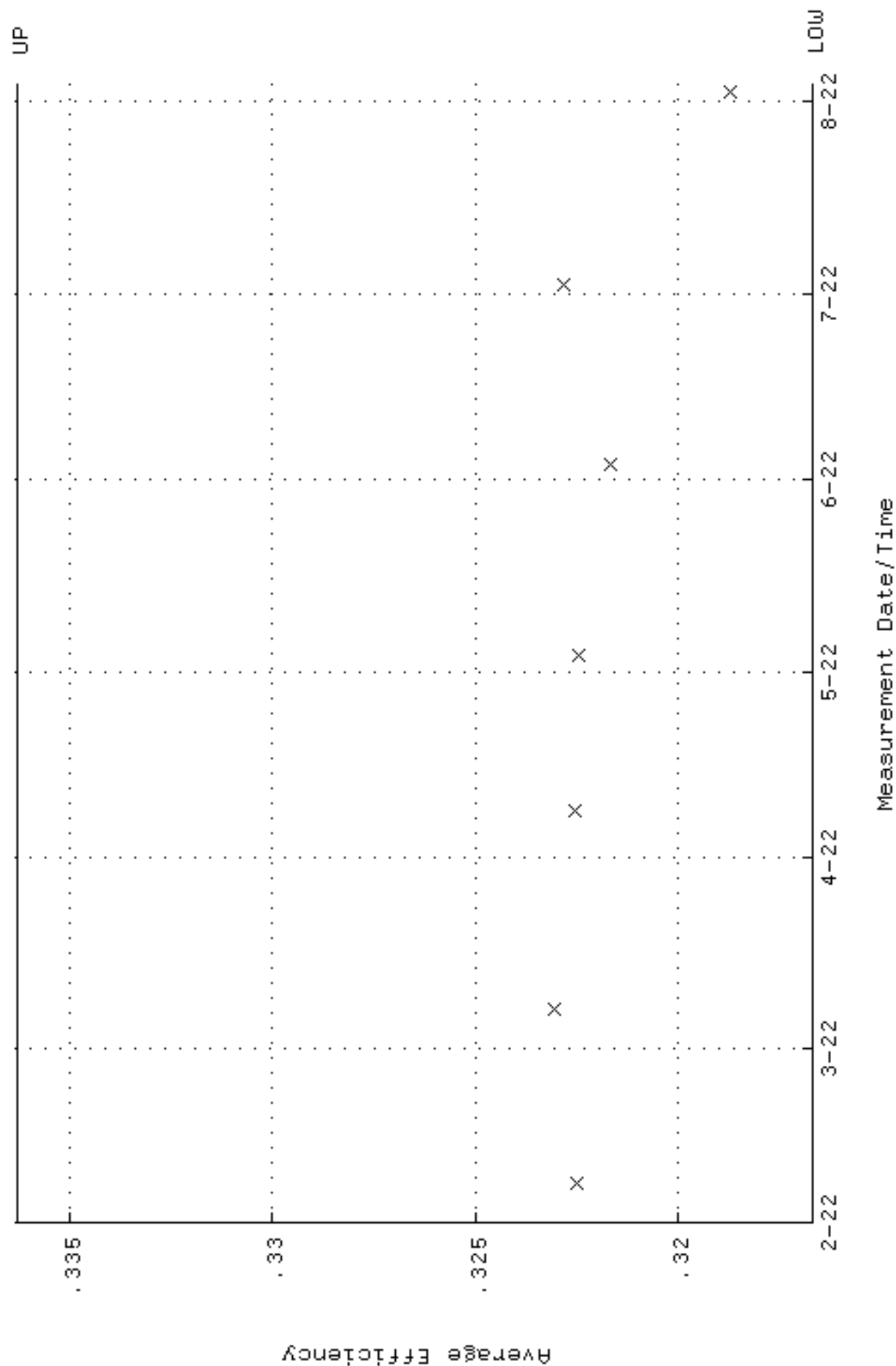
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



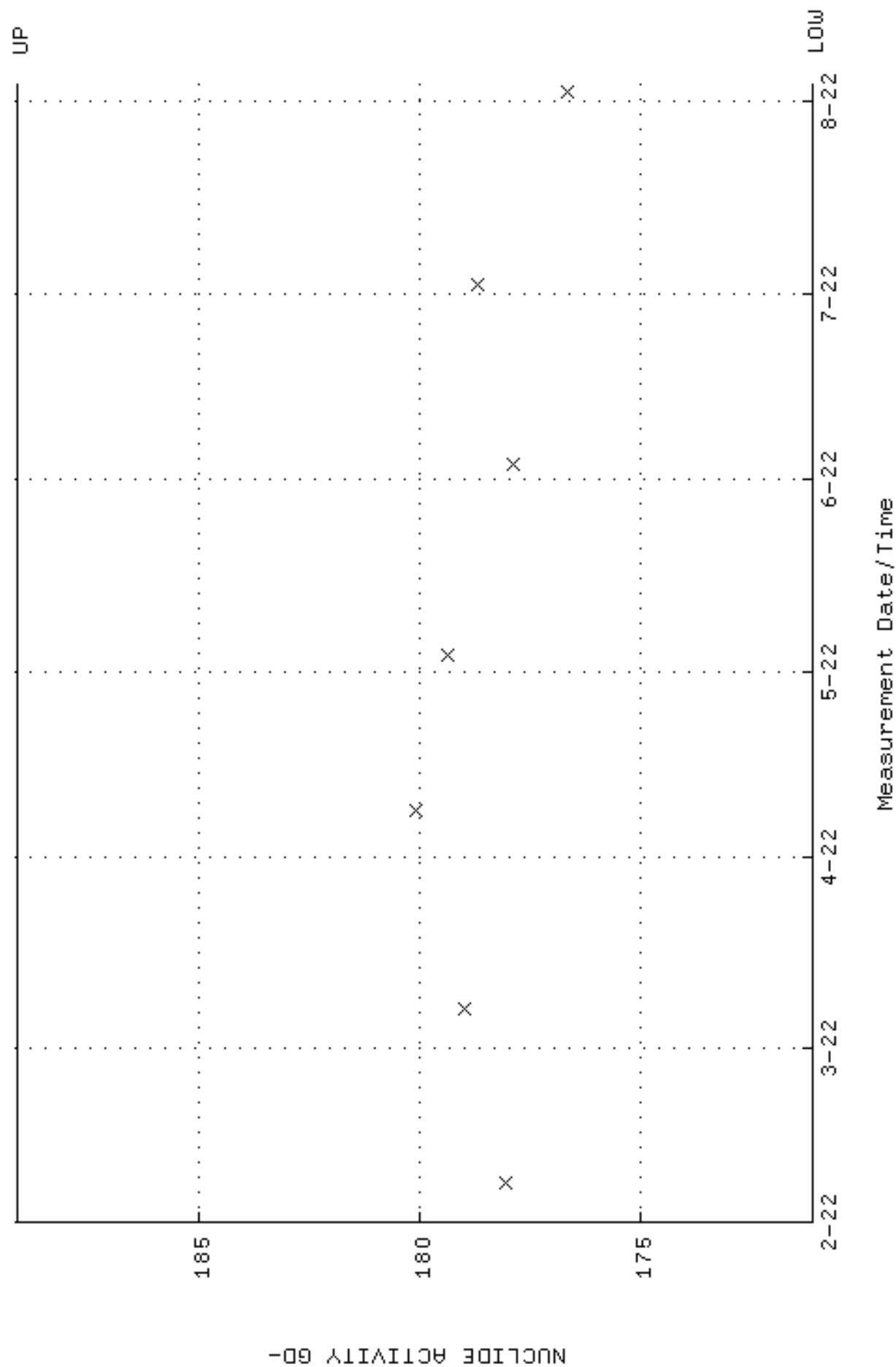
QA filename : DKA100:[ENV_ALPHA.QA.B]B047.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:43:07 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



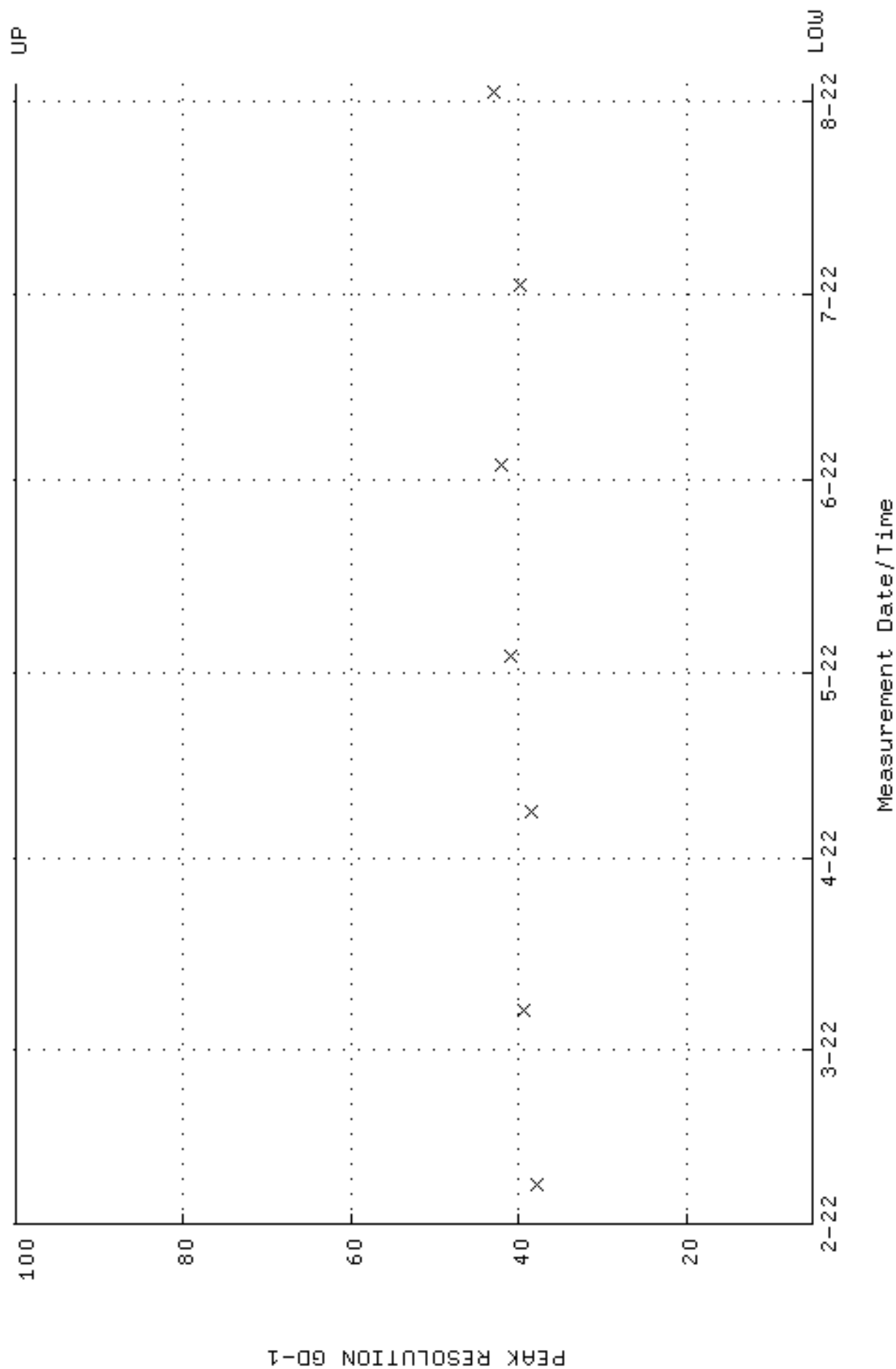
QA filename : DKA100:[ENV_ALPHA.QA.W]W048.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 0.316695 through 0.336285



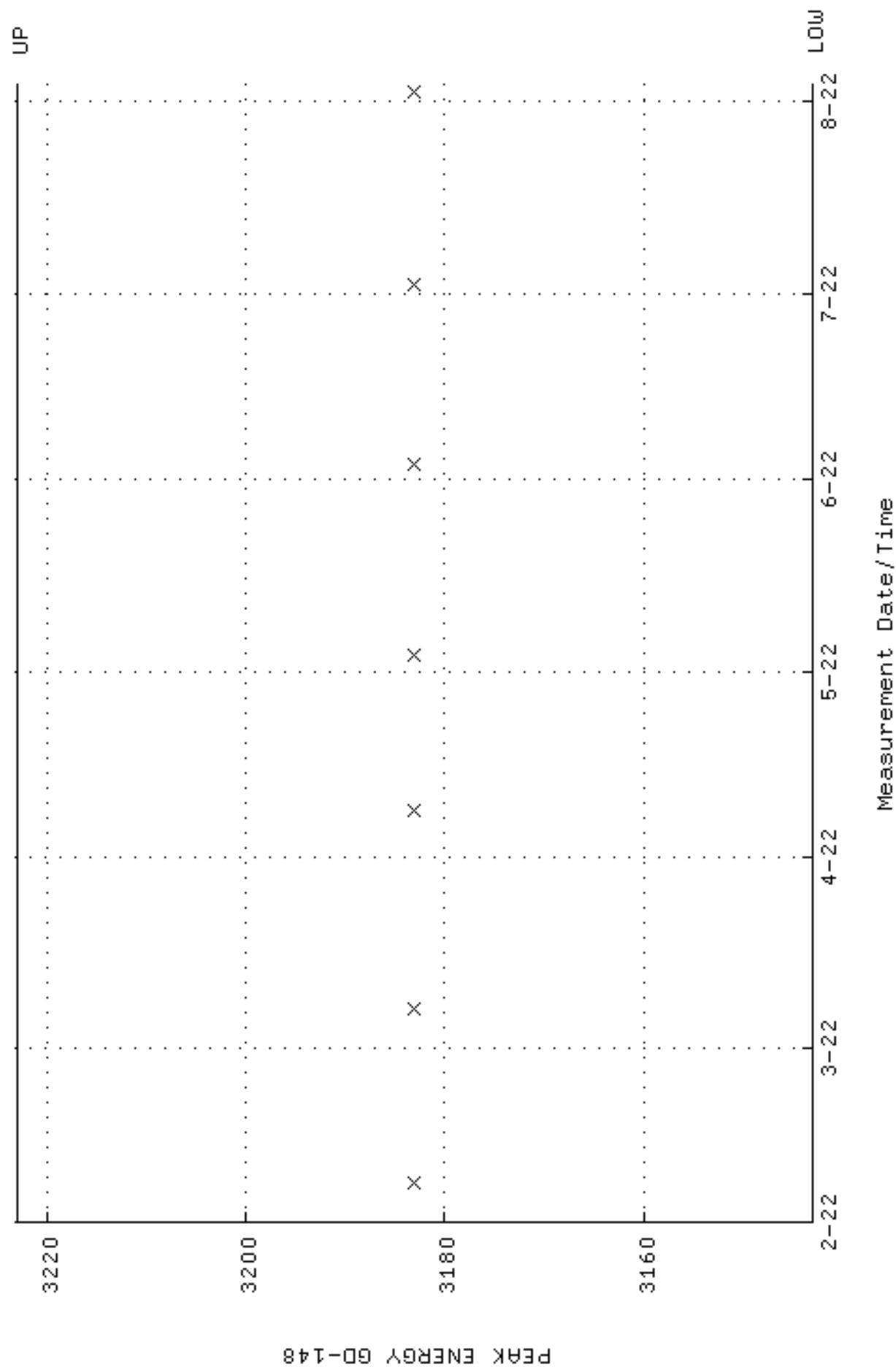
QA filename : DKA100:[ENV_ALPHA.QA.W]W048.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



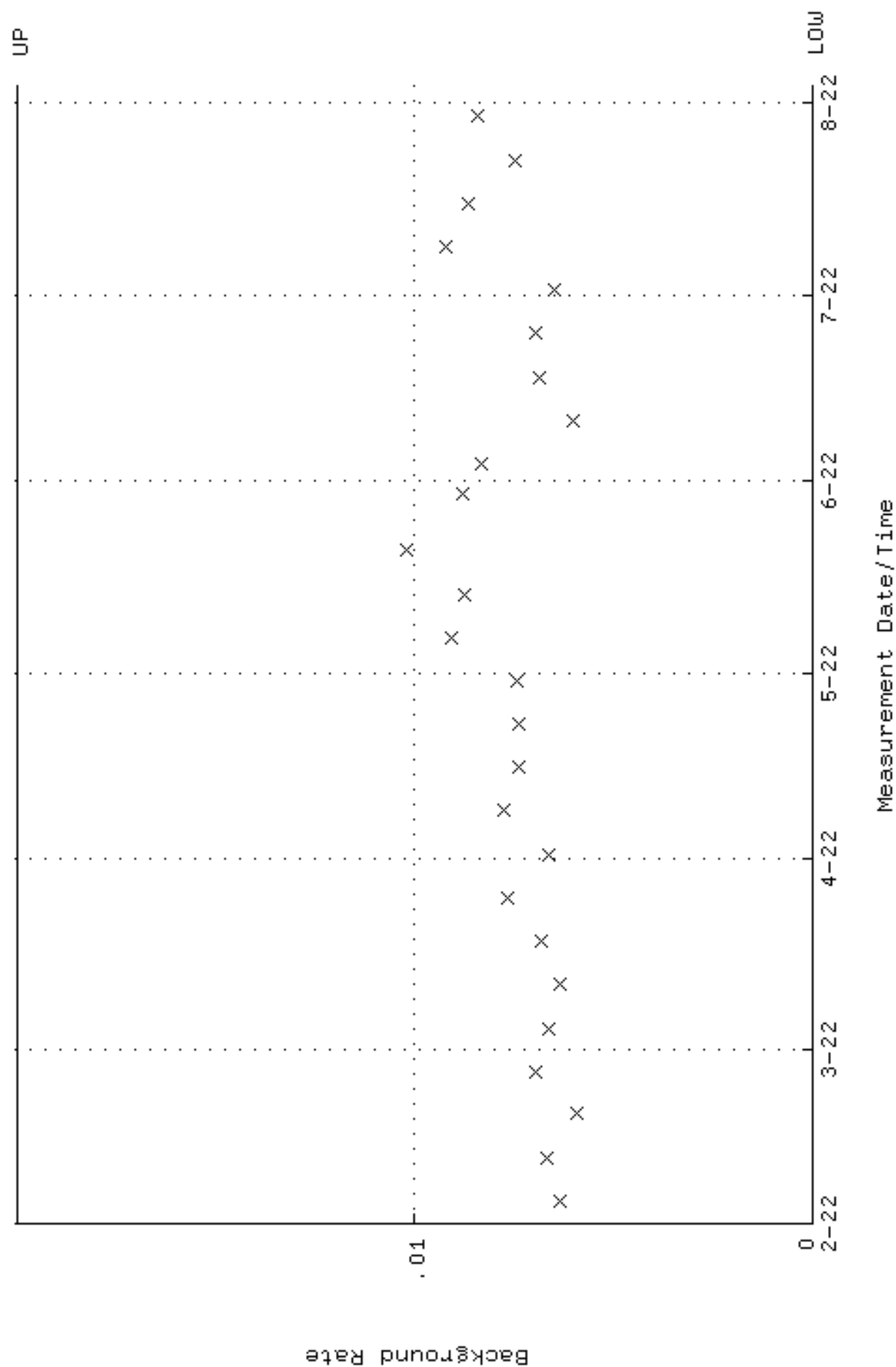
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



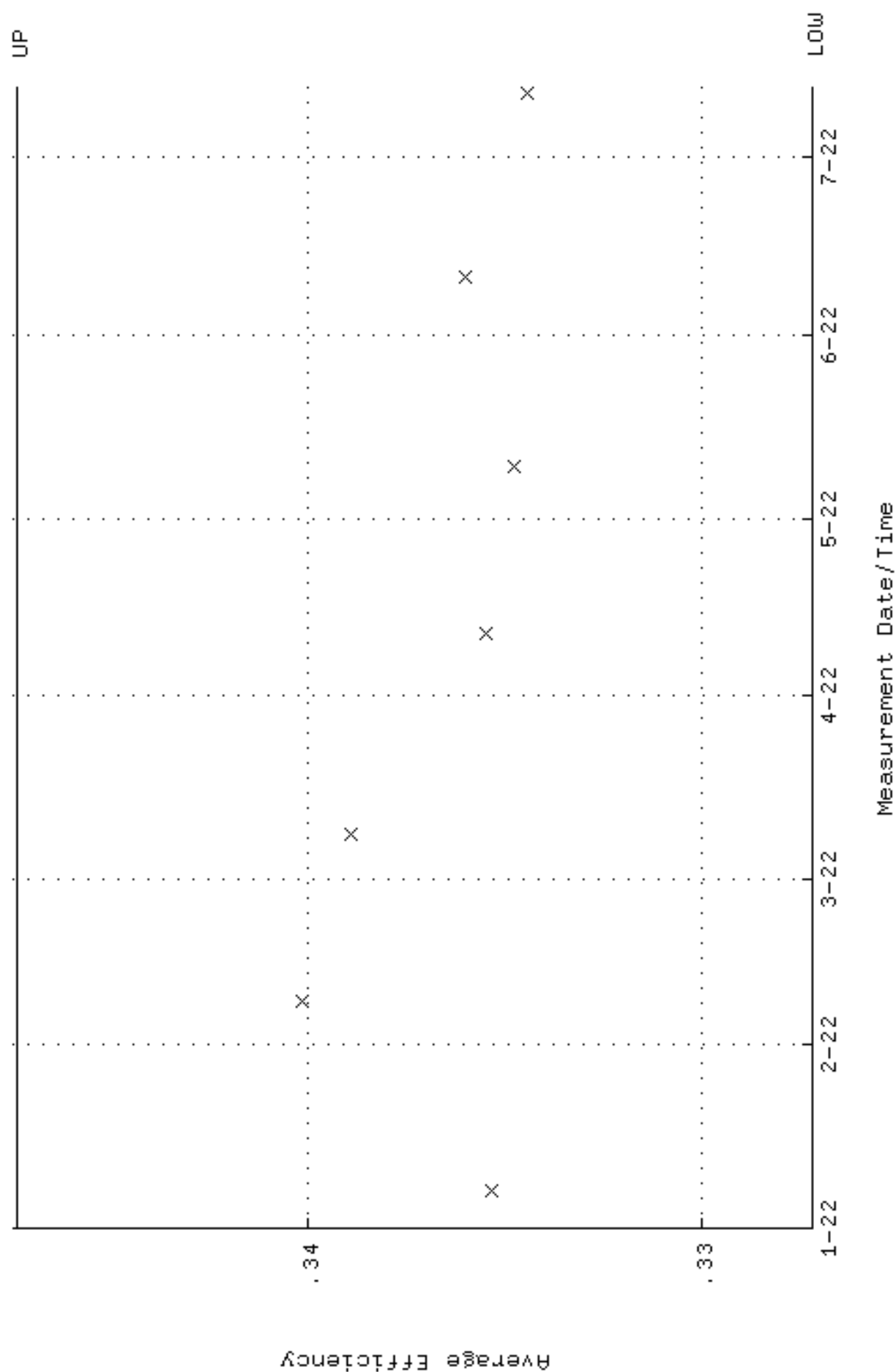
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-FEB-2022 09:16:49 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



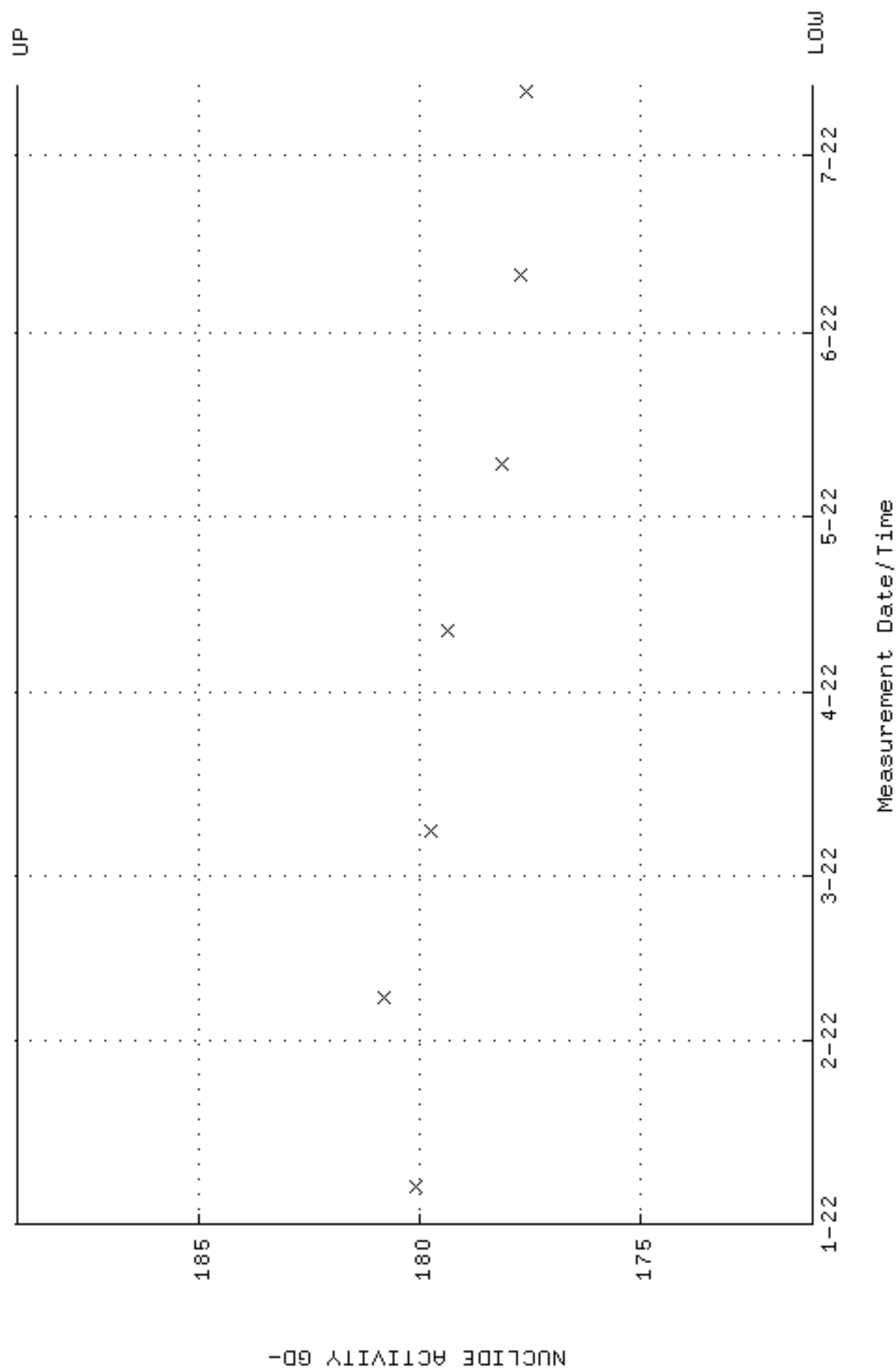
QA filename : DKA100:[ENV_ALPHA.QA.B]B048.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 4-FEB-2022 12:42:16 through 3-AUG-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



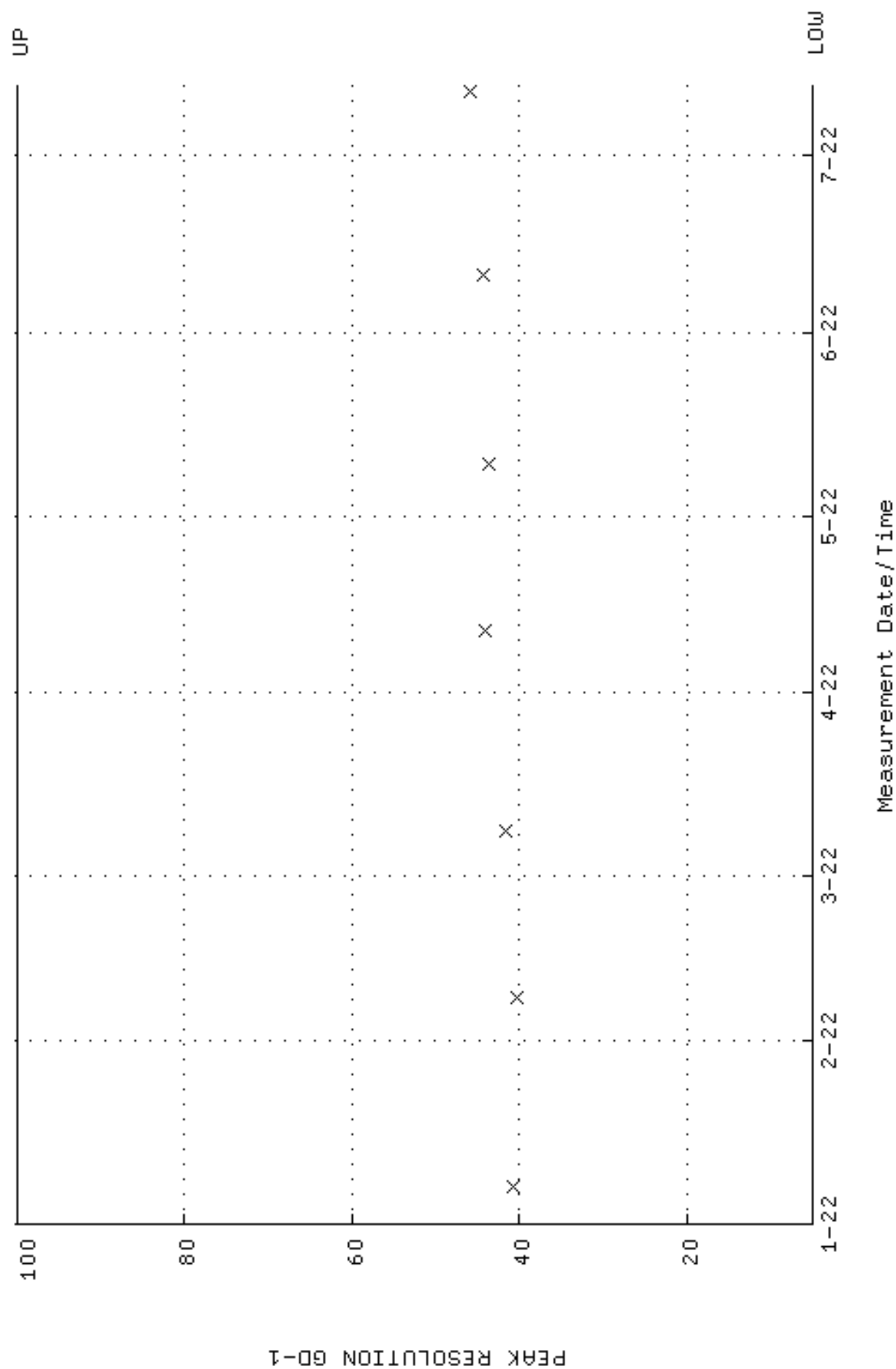
QA filename : DKA100:[ENV_ALPHA.QA.W]W071.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.327210 through 0.347450



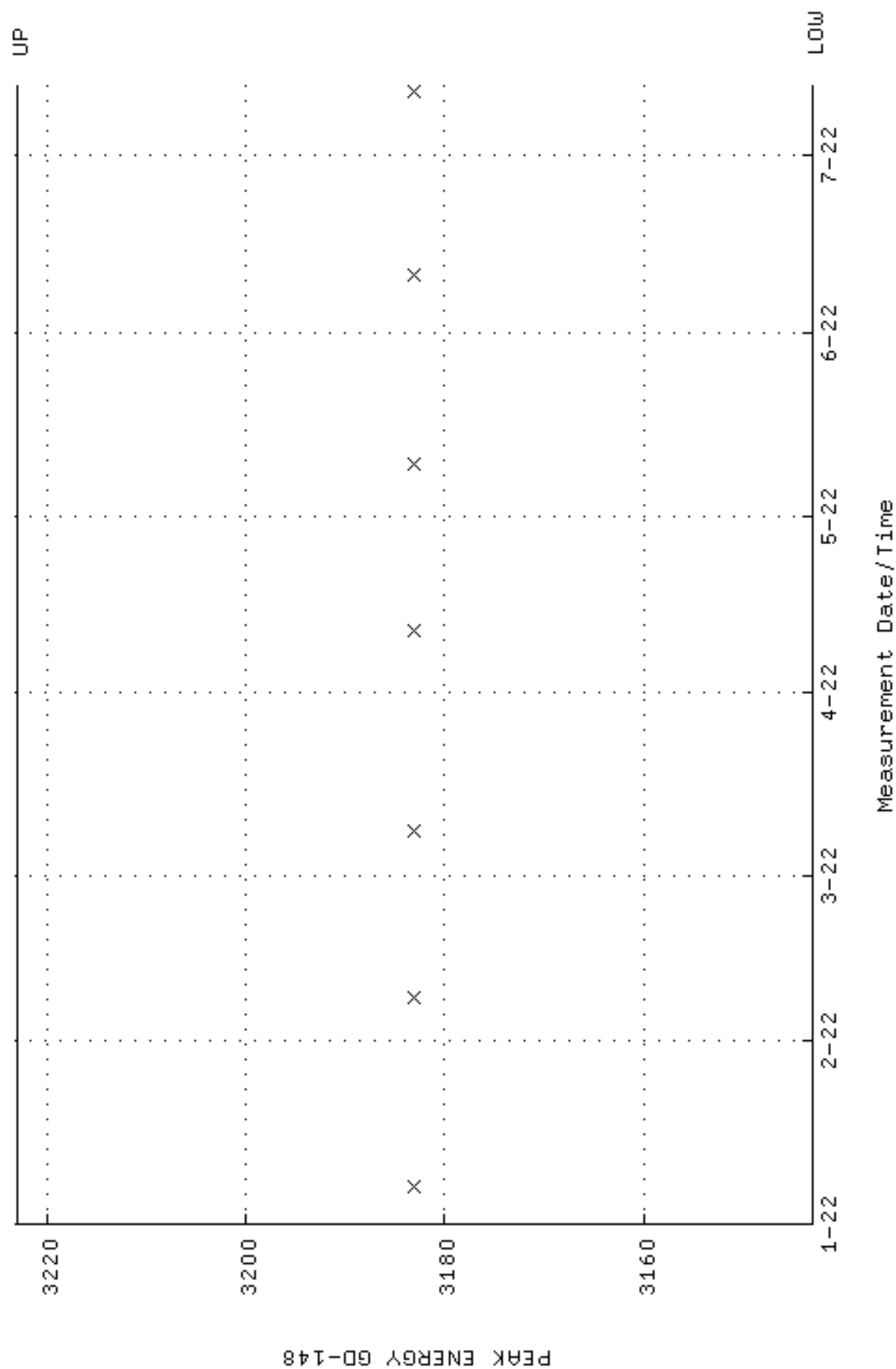
QA filename : DKA100:[ENV_ALPHA.QA.W]W071.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



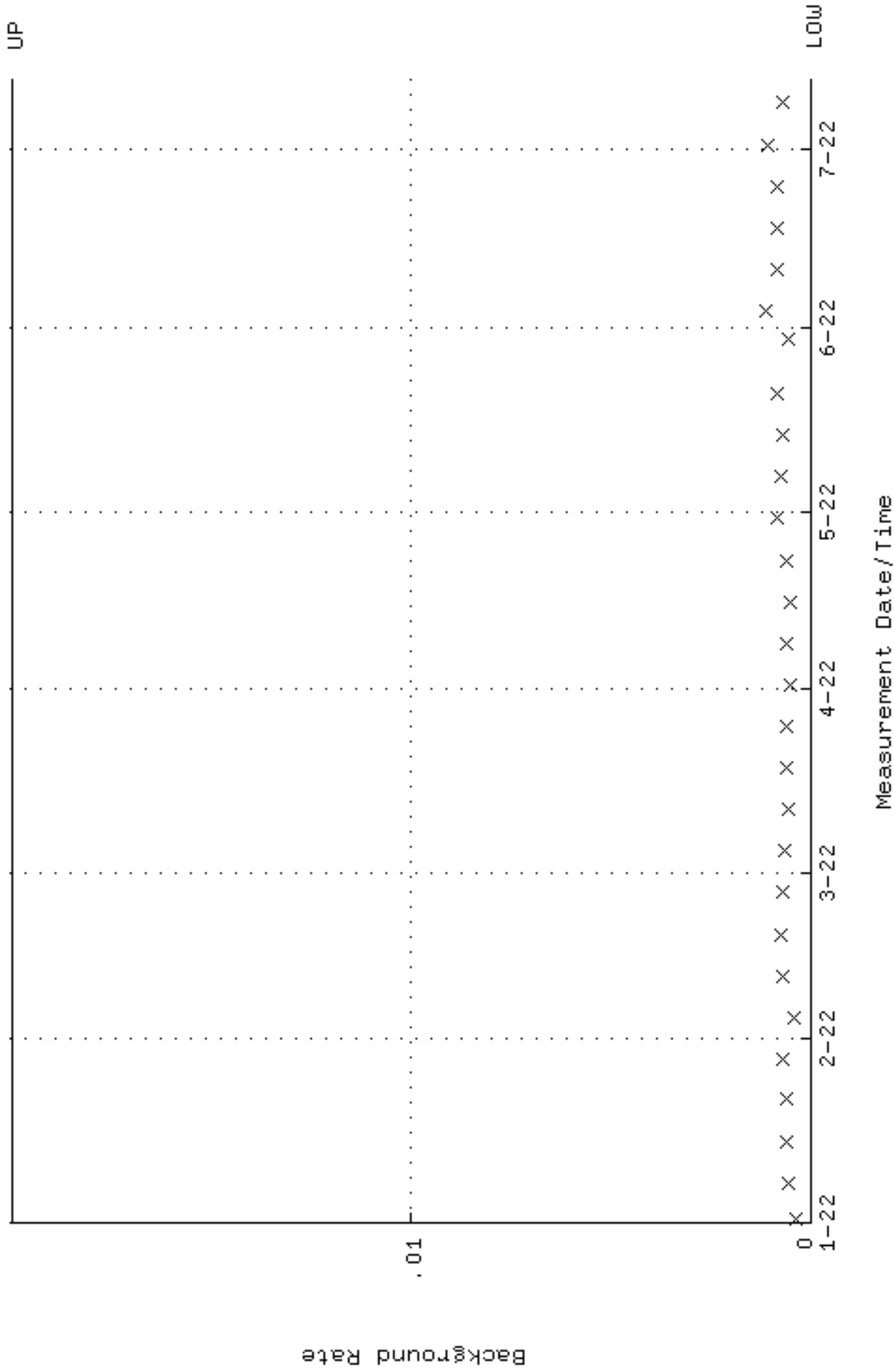
QA filename : DKA100:[ENV_ALPHA.QA.W]W071.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



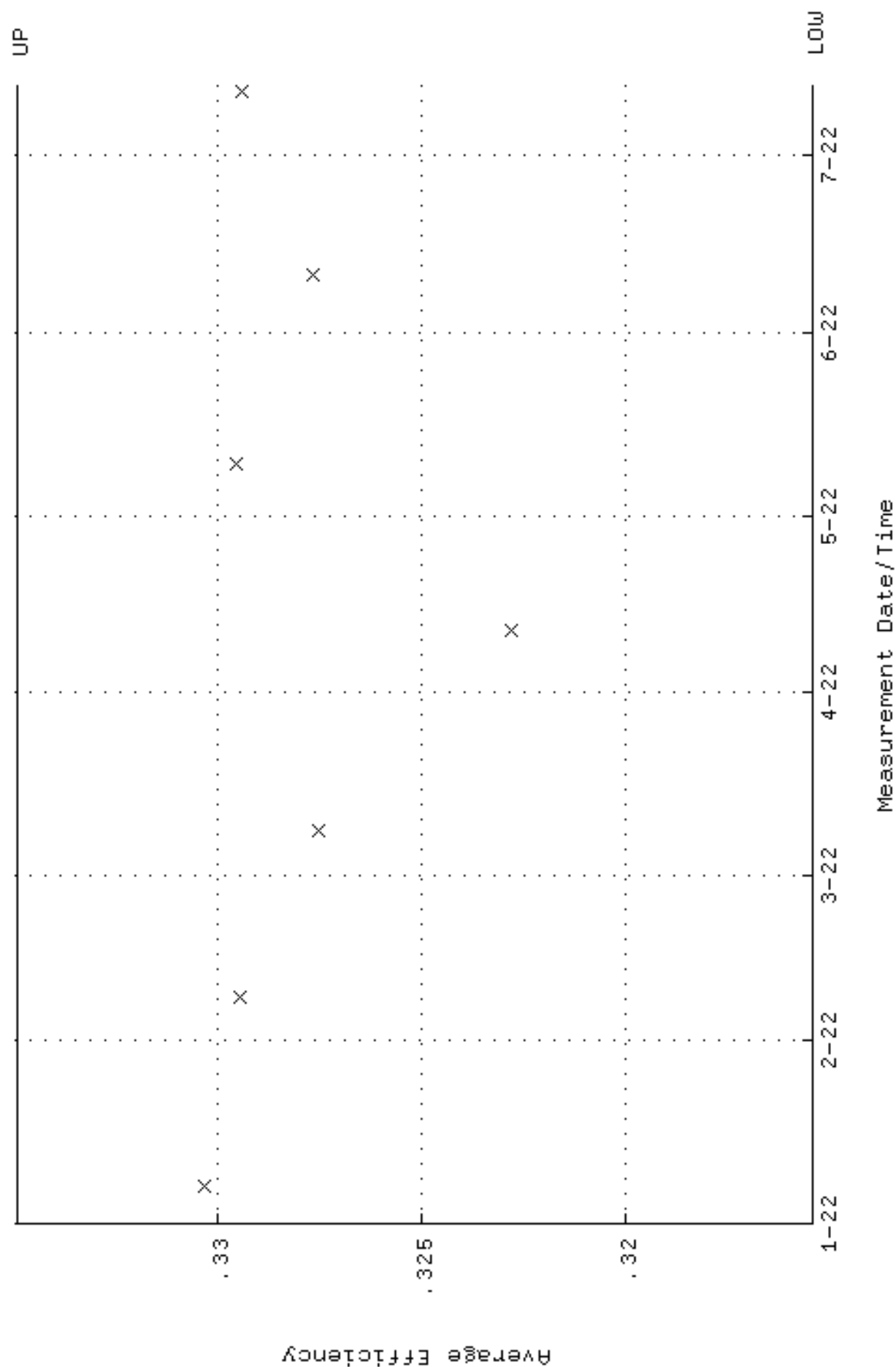
QA filename : DKA100:[ENV_ALPHA.QA.W]W071.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



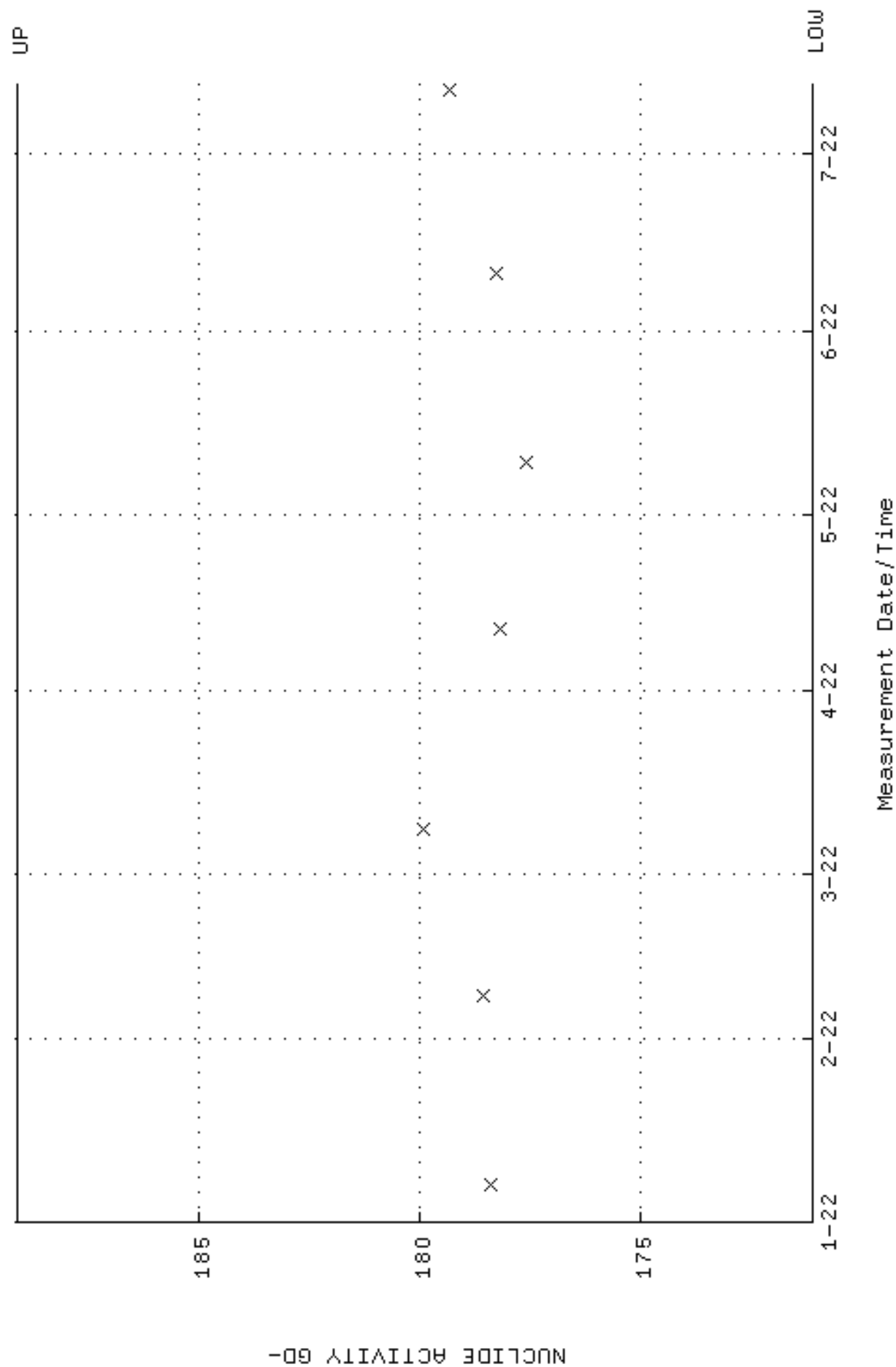
QA filename : DKA100:[ENV_ALPHA.QA.B]B071.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JAN-2022 12:51:14 through 12-JUL-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



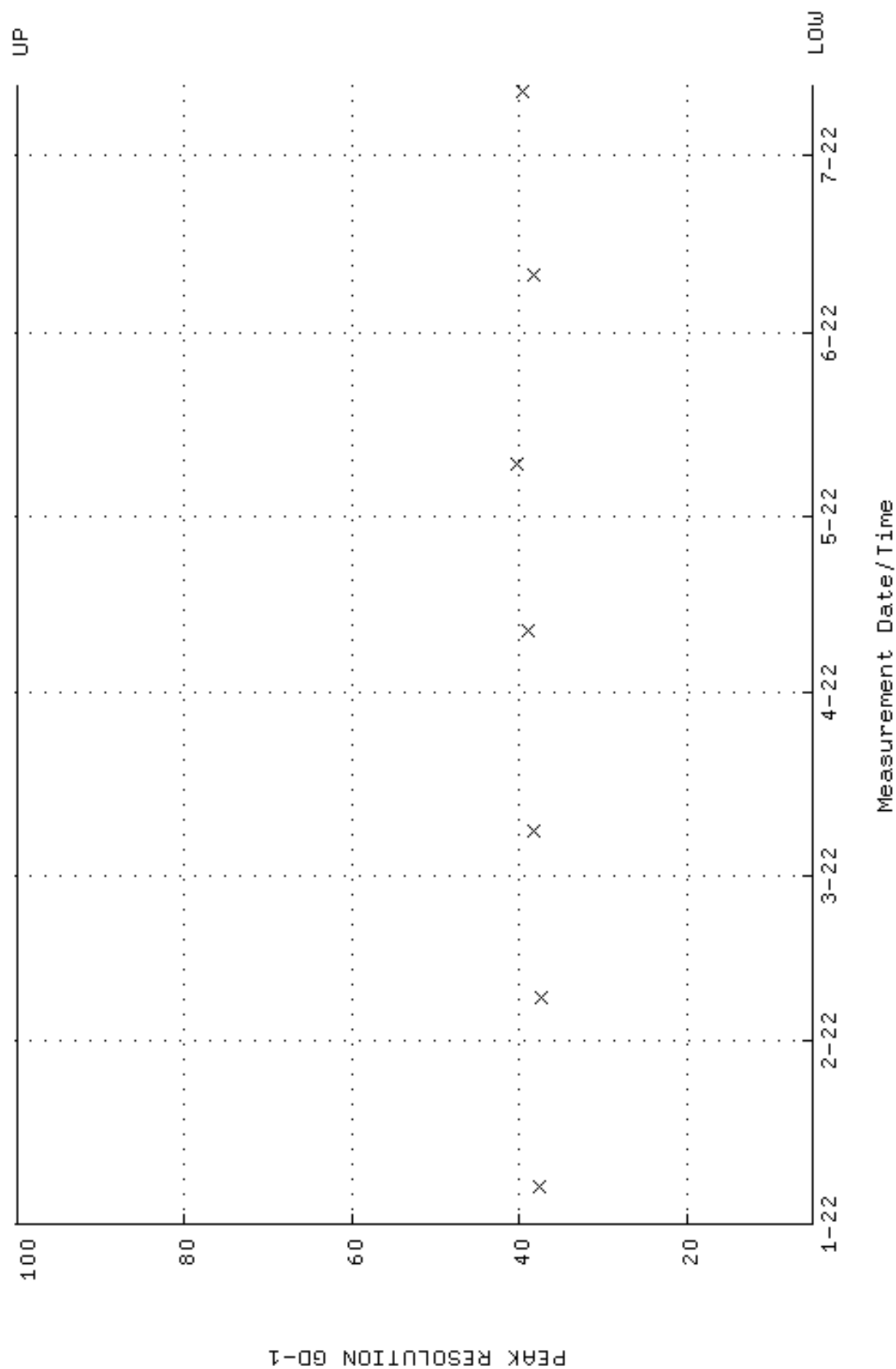
QA filename : DKA100:[ENV_ALPHA.QA.W]W072.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.315390 through 0.334900



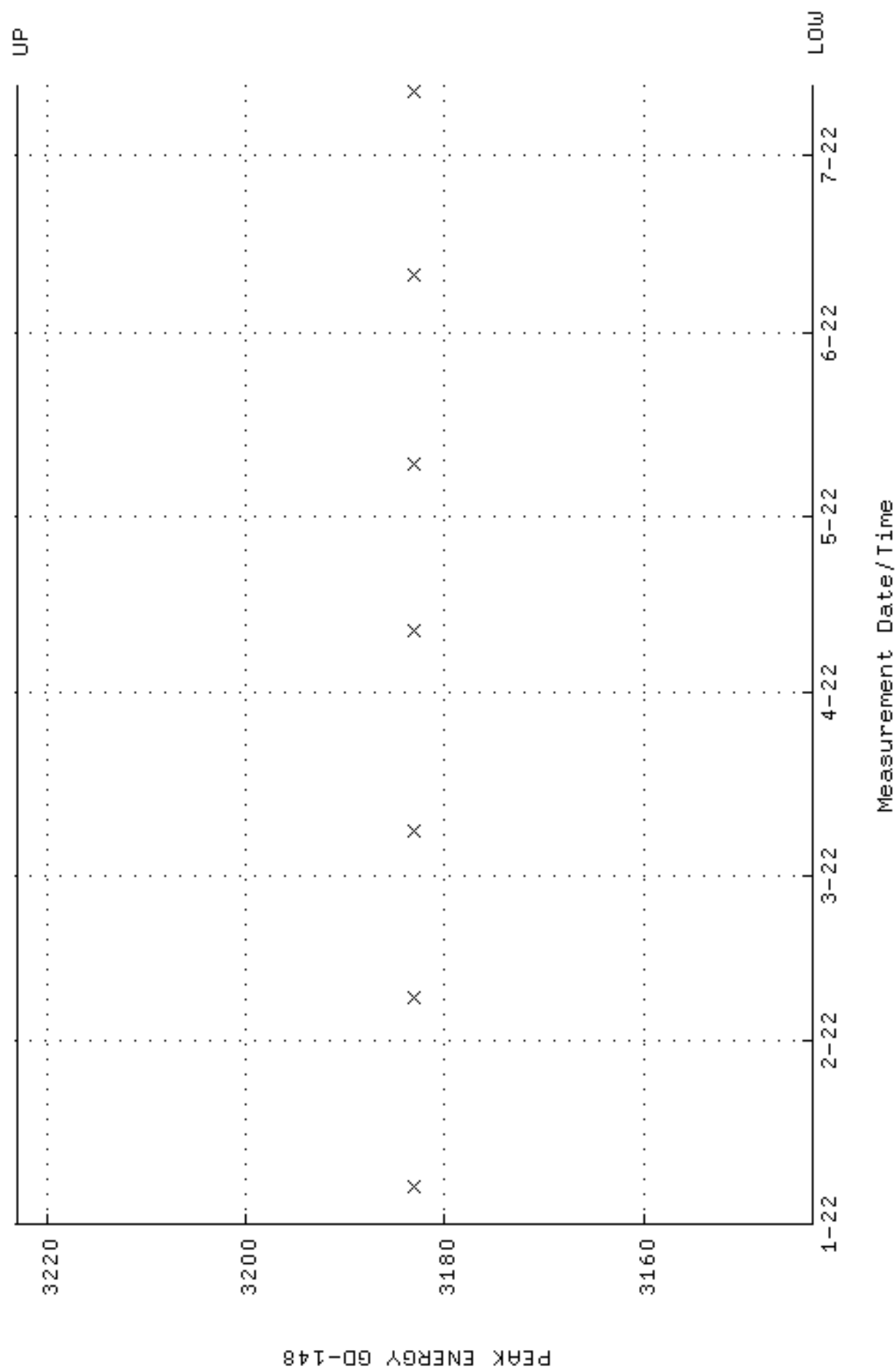
QA filename : DKA100:[ENV_ALPHA.QA.W]W072.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



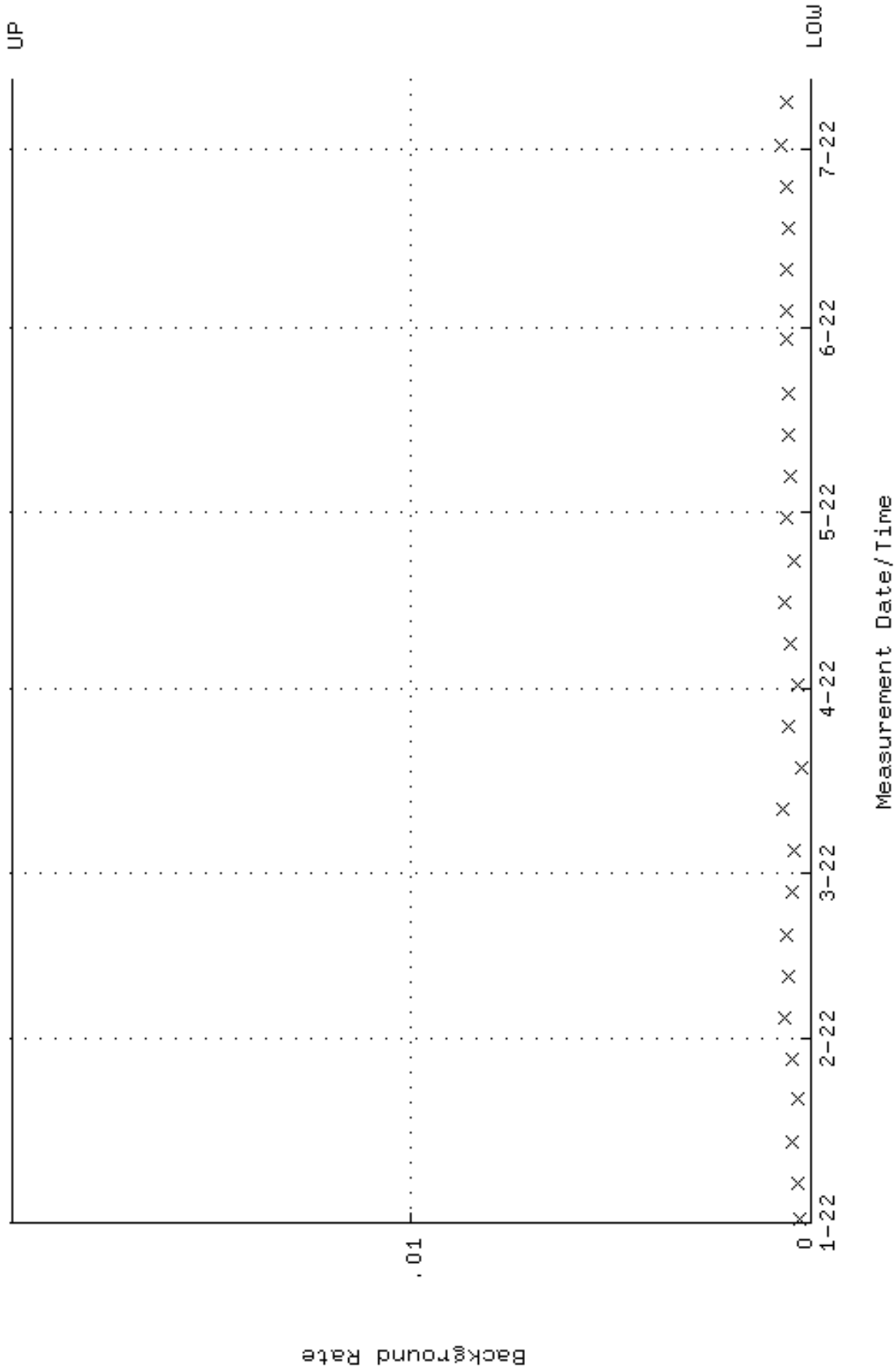
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



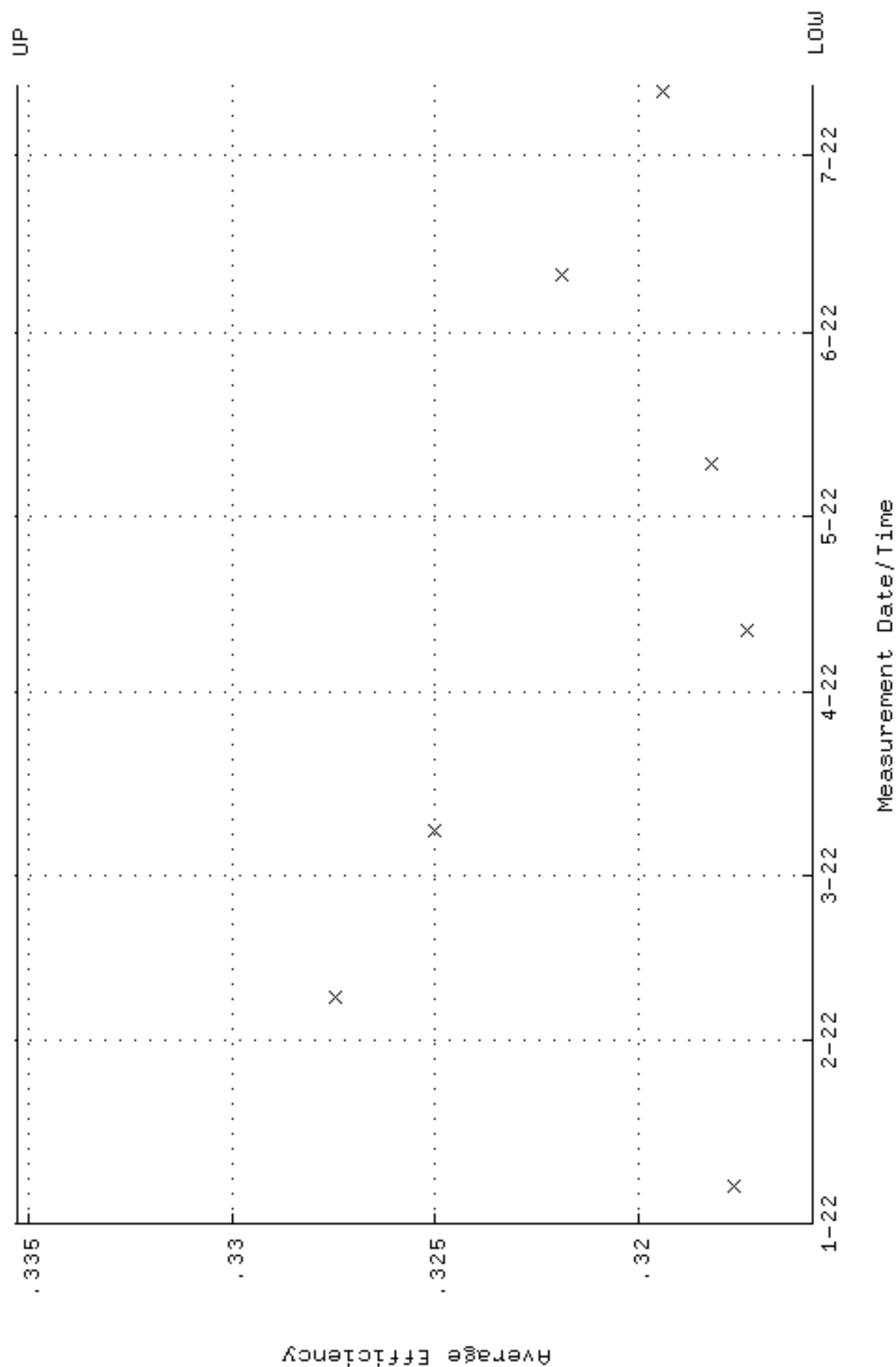
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



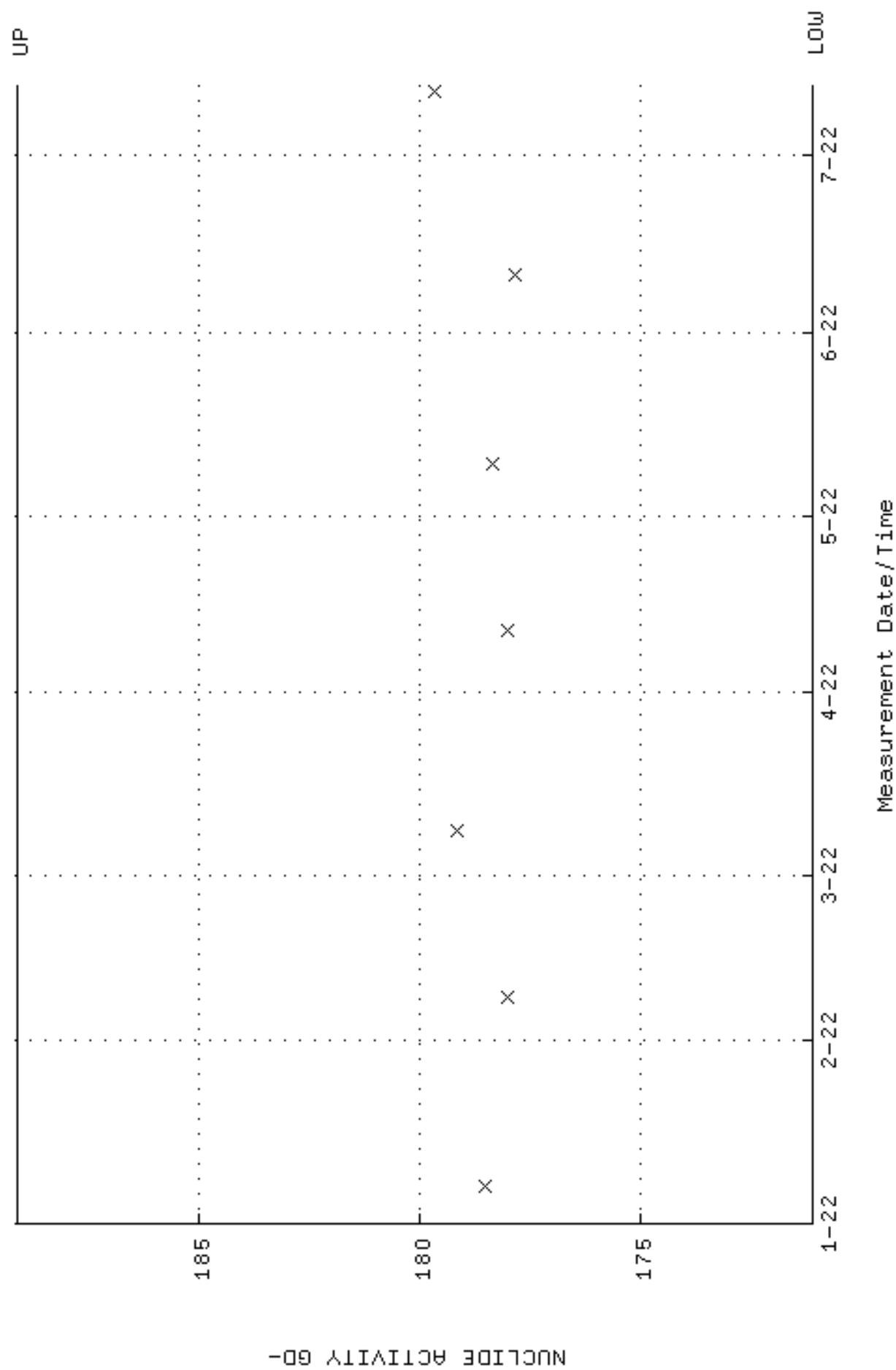
QA filename : DKA100:[ENV_ALPHA.QA.B]B072.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JAN-2022 12:51:14 through 12-JUL-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



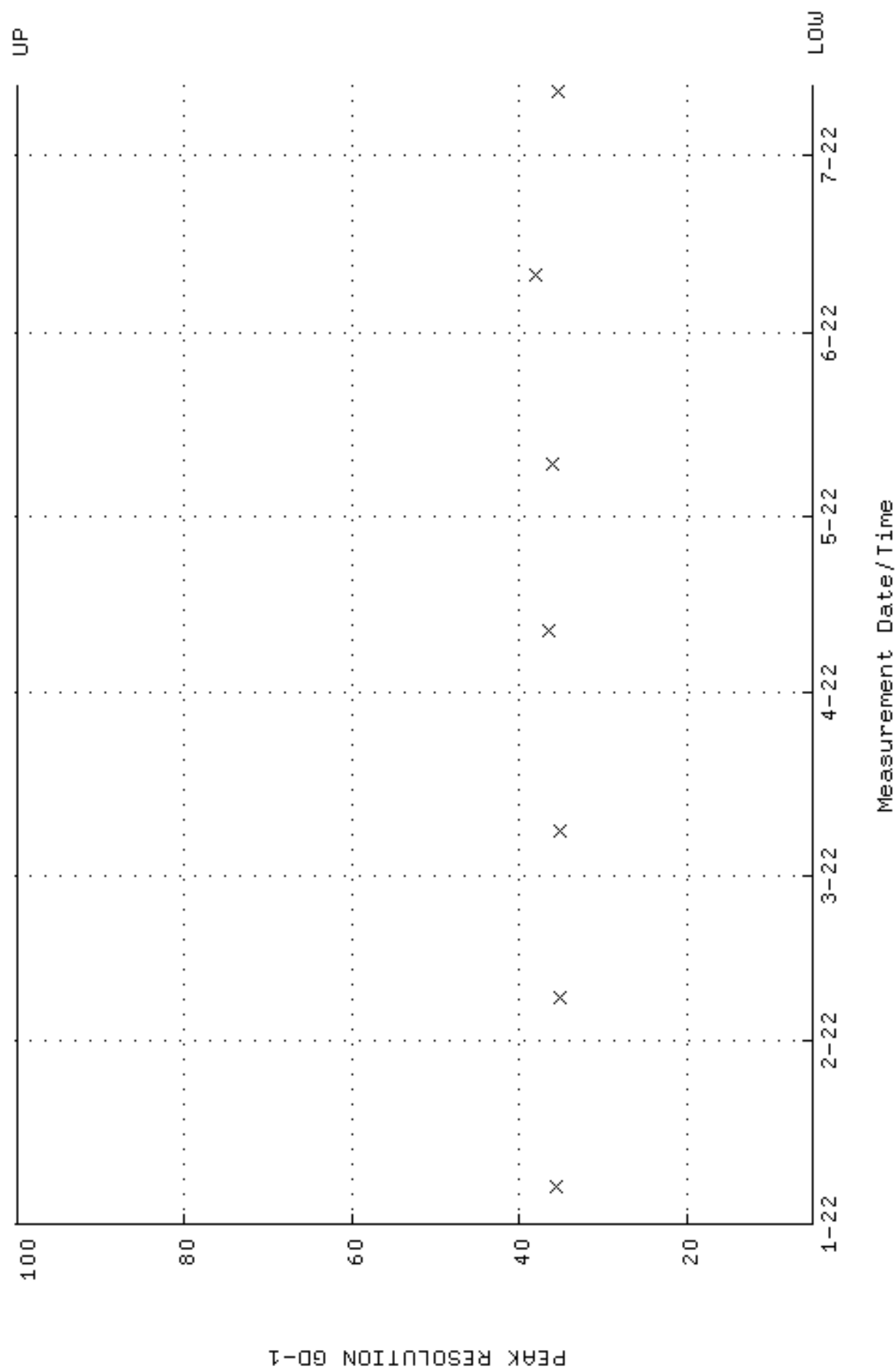
QA filename : DKA100:[ENV_ALPHA.QA.W]W074.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.315740 through 0.335270



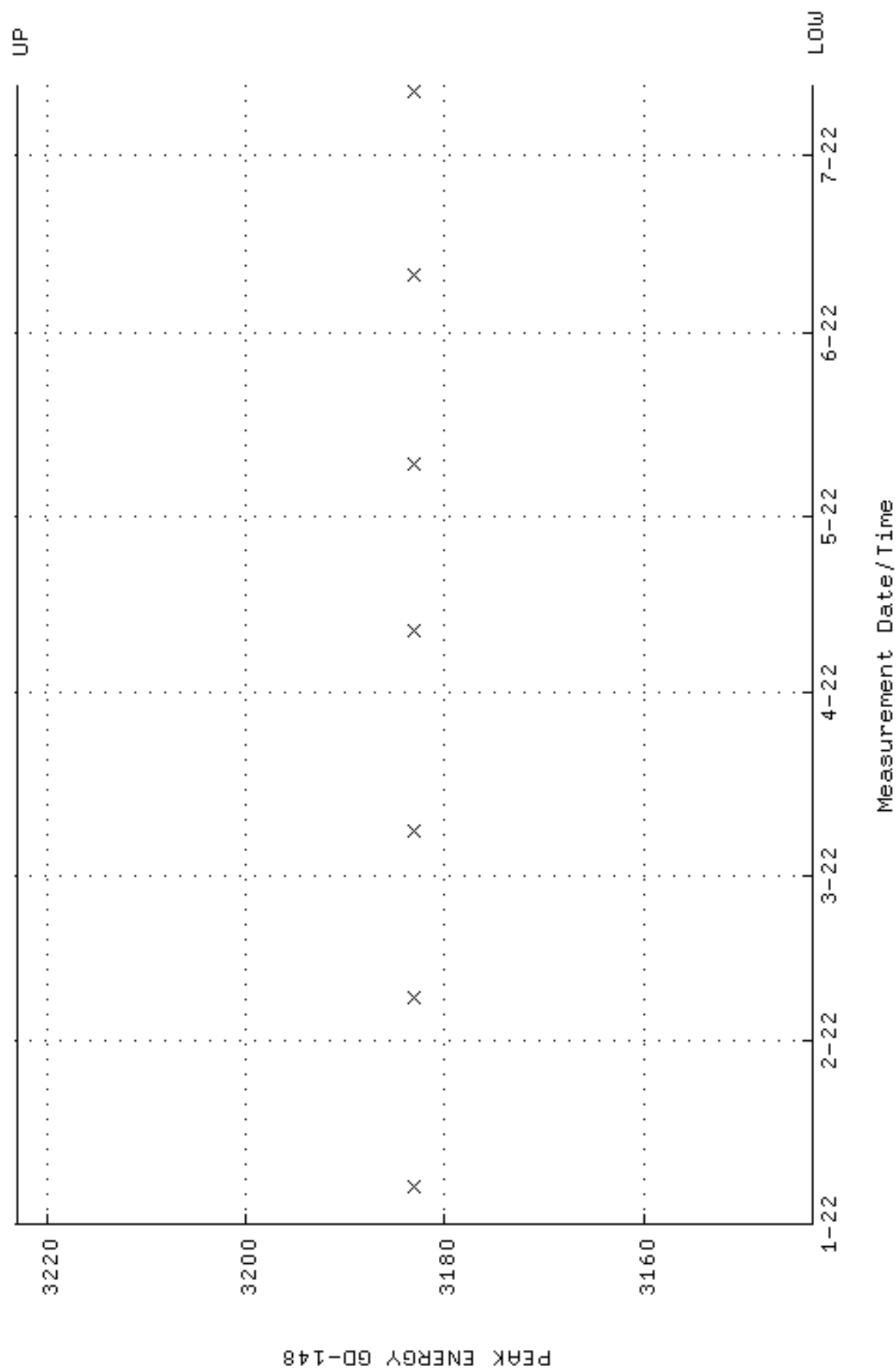
QA filename : DKA100:[ENV_ALPHA.QA.W]W074.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



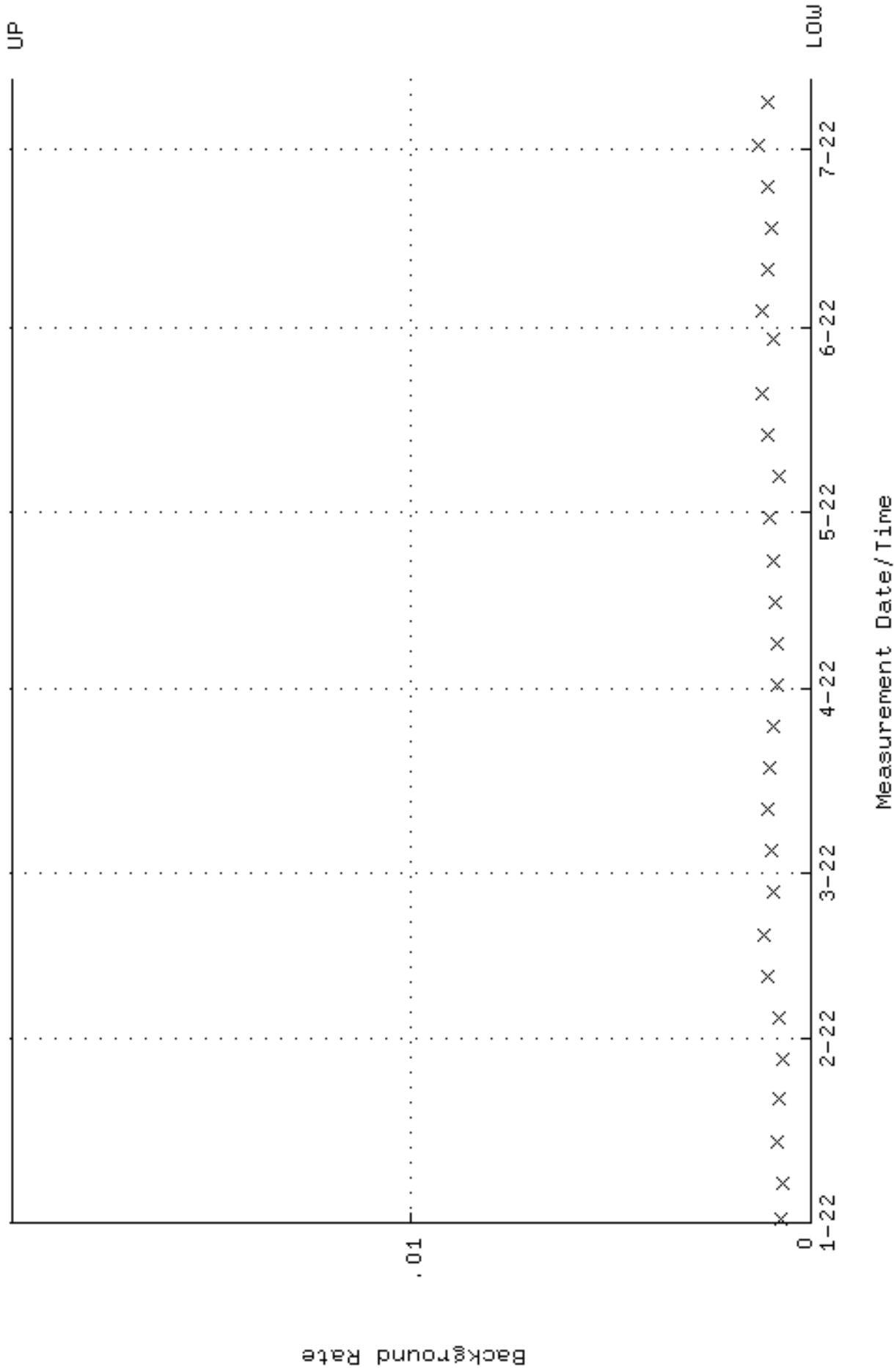
QA filename : DKA100:[ENV_ALPHA.QA.W]W074.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



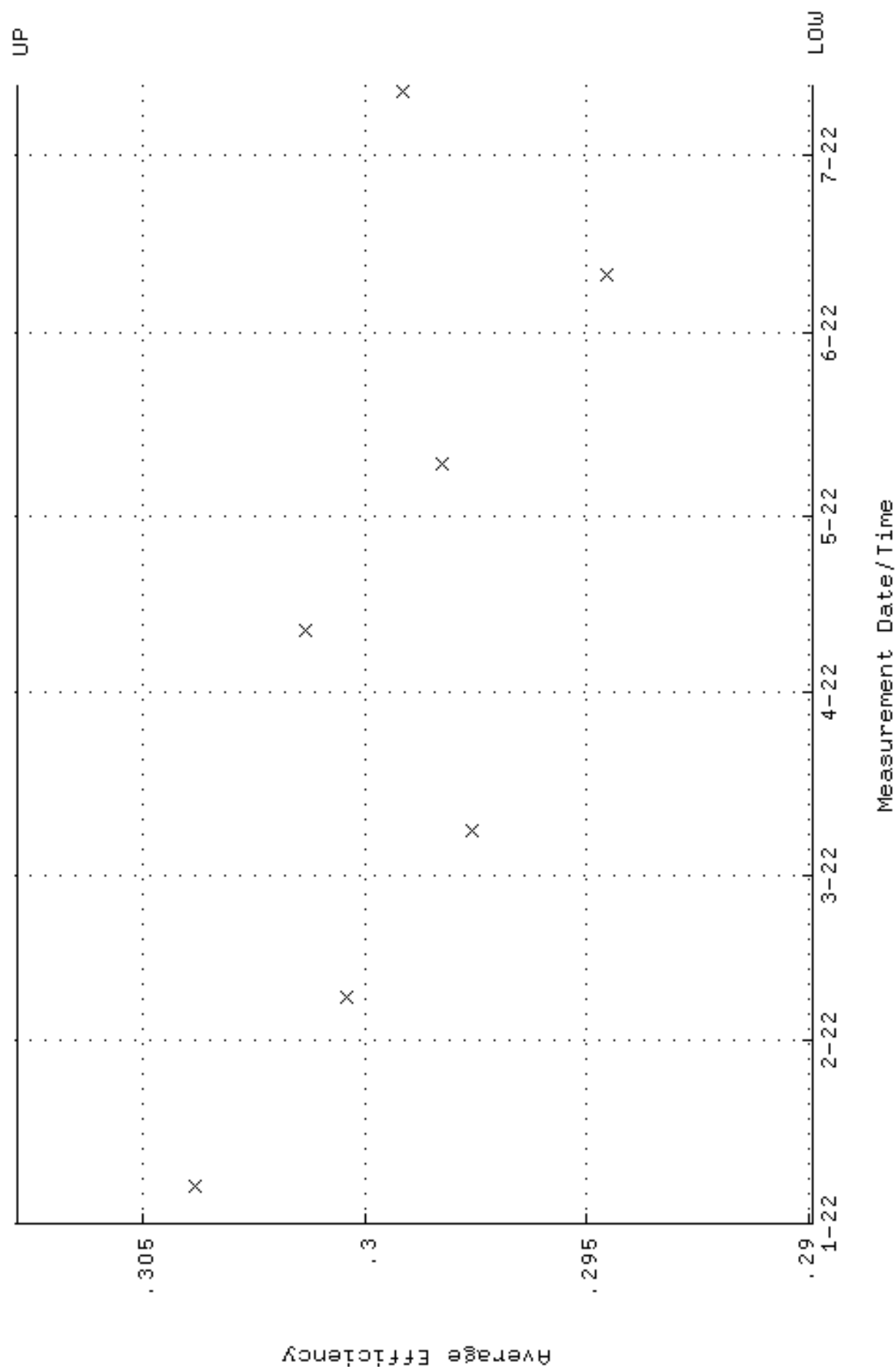
QA filename : DKA100:[ENV_ALPHA.QA.W]W074.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



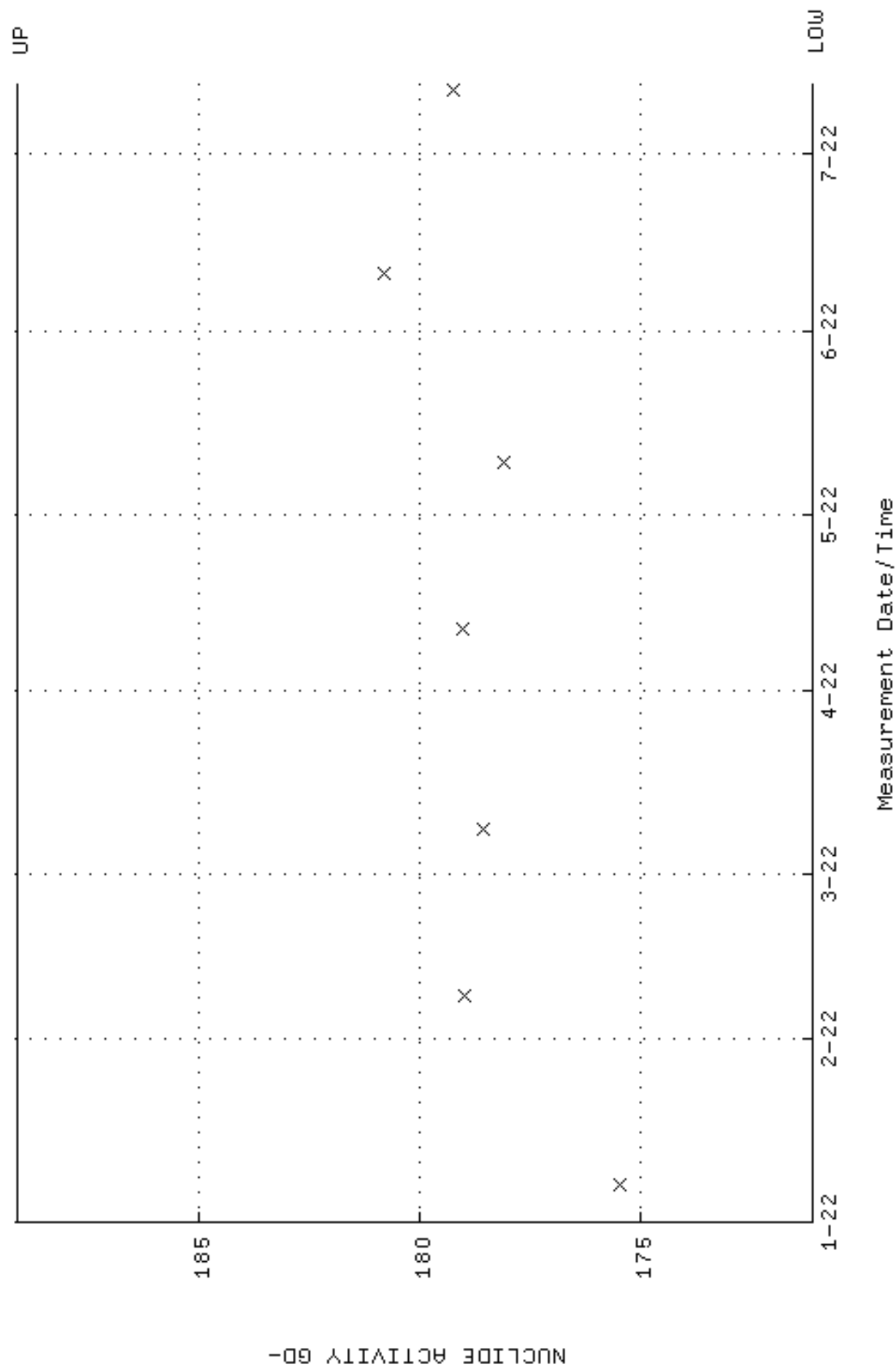
QA filename : DKA100:[ENV_ALPHA.QA.B]B074.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JAN-2022 12:51:14 through 12-JUL-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



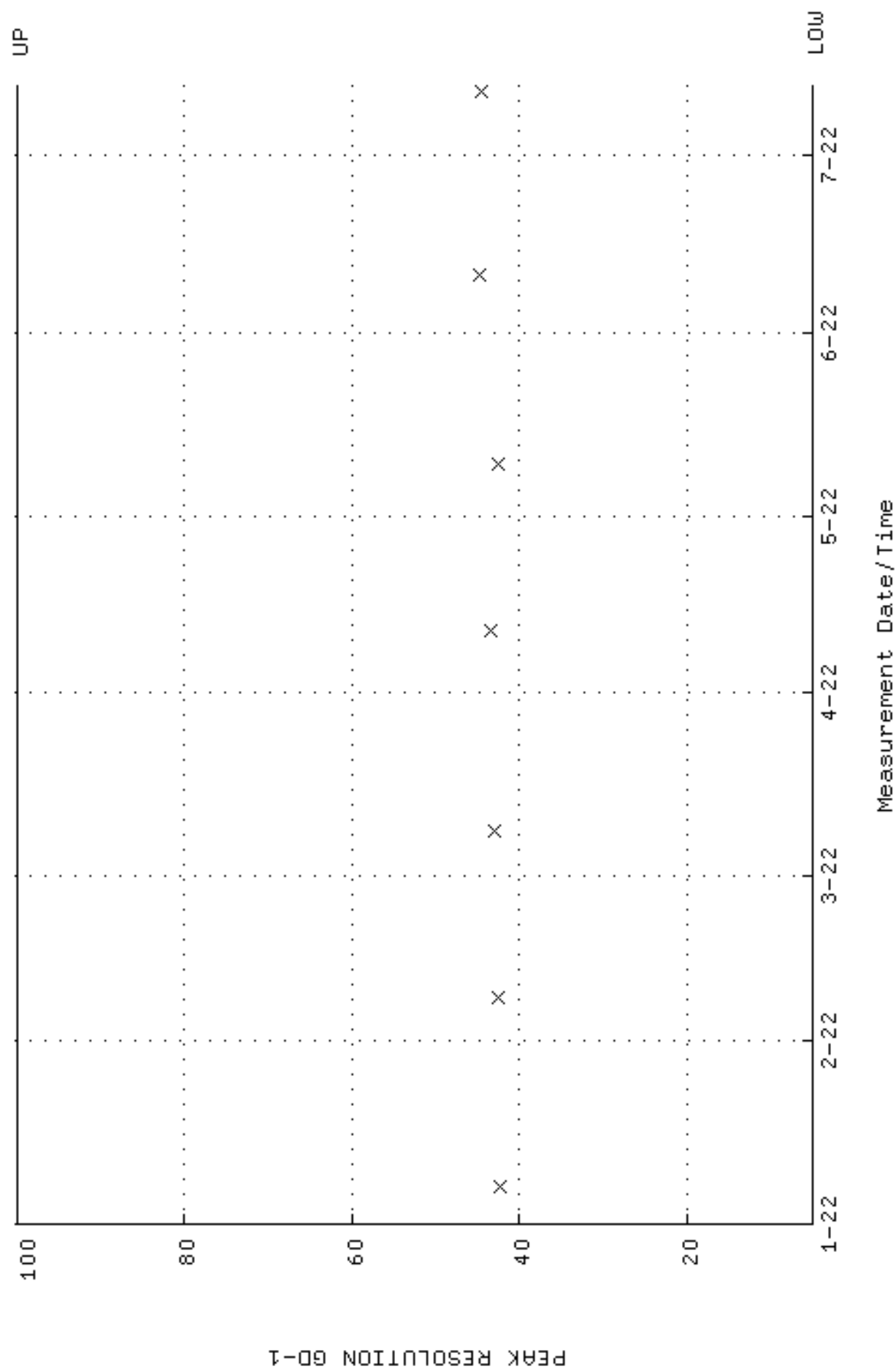
QA filename : DKA100:[ENV_ALPHA.QA.W]W086.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.289900 through 0.307830



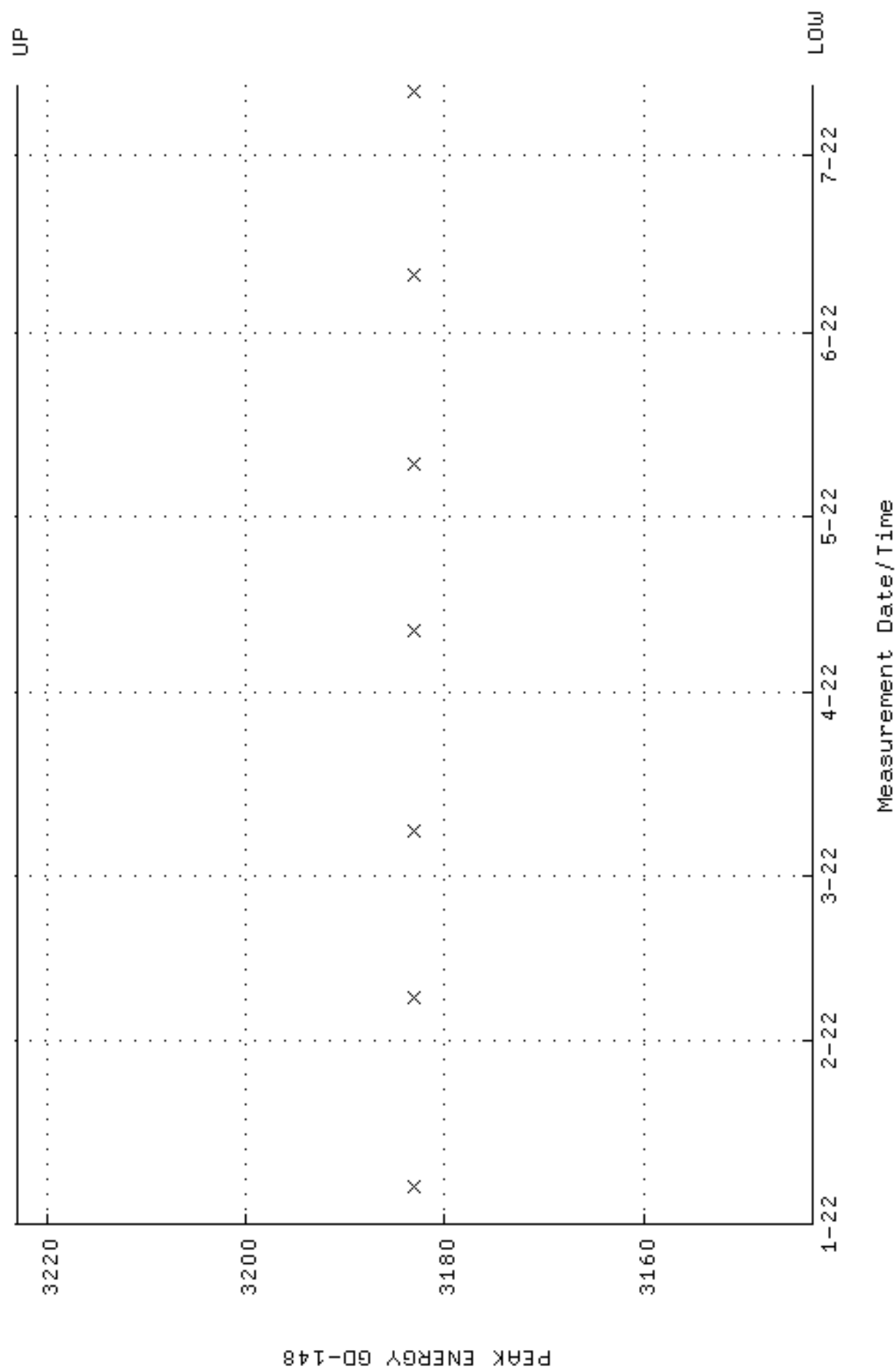
QA filename : DKA100:[ENV_ALPHA.QA.W]W086.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



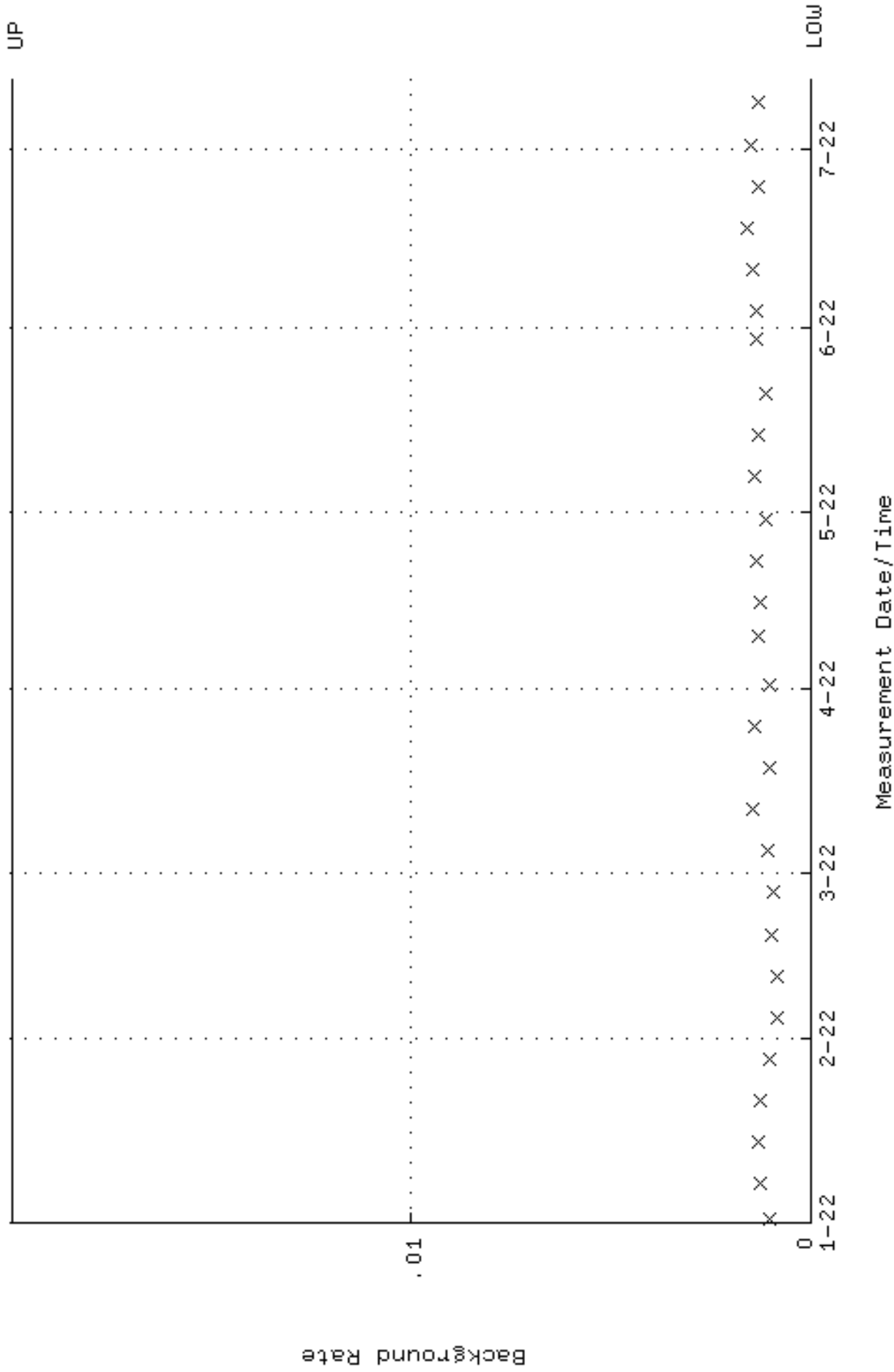
QA filename : DKA100:[ENV_ALPHA.QA.W]W086.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



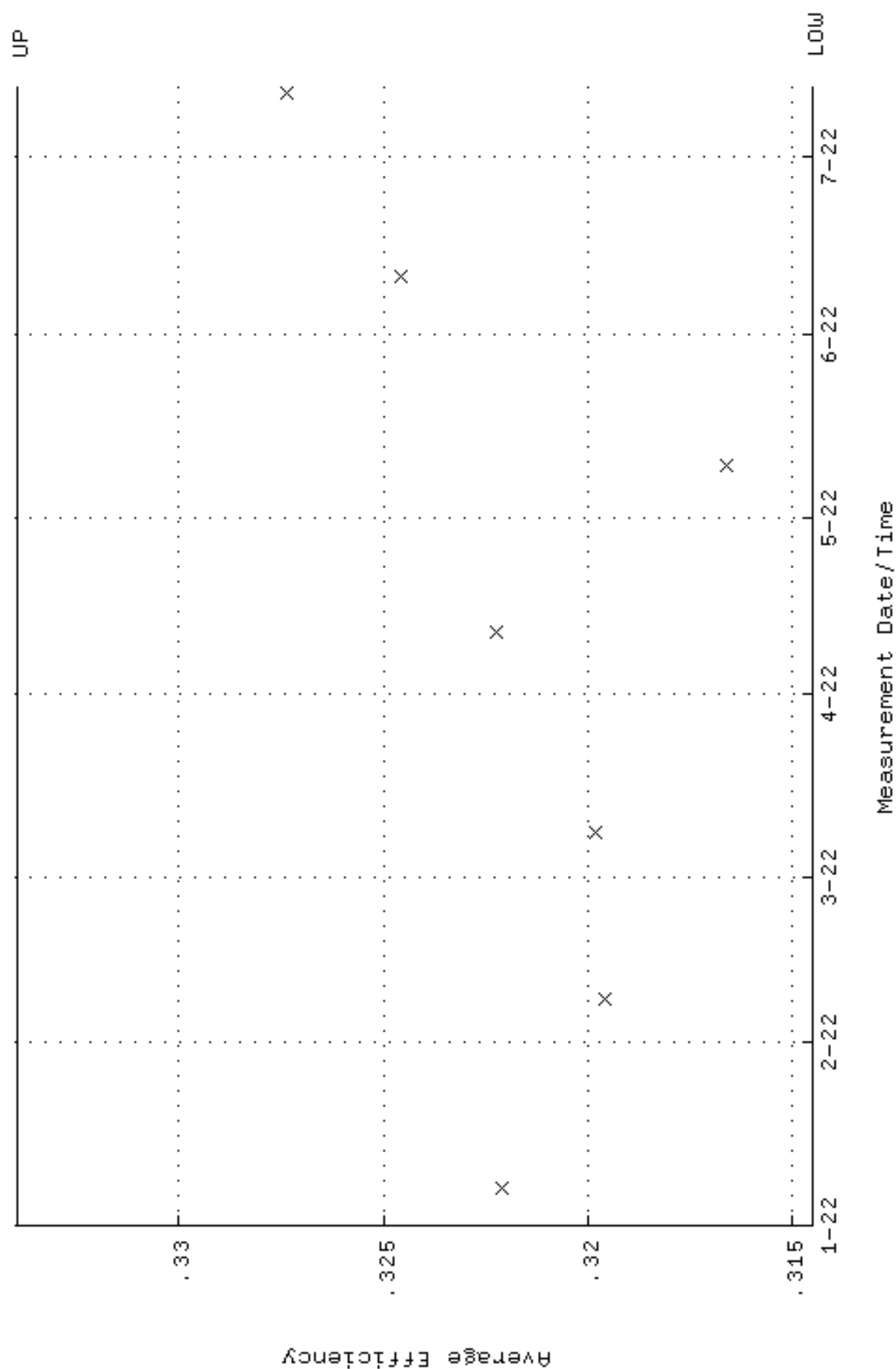
QA filename : DKA100:[ENV_ALPHA.QA.W]W086.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



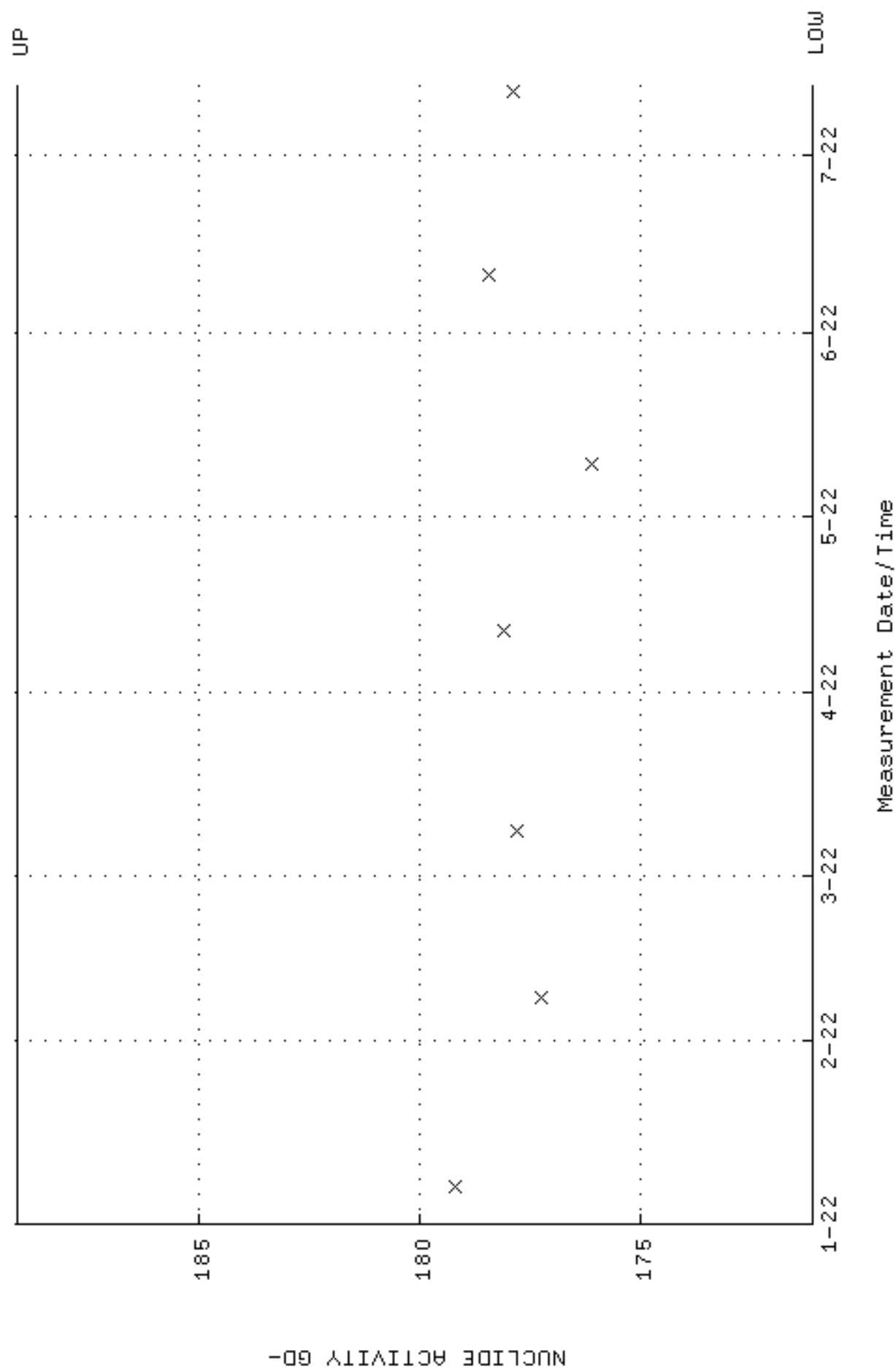
QA filename : DKA100:[ENV_ALPHA.QA.B]B086.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JAN-2022 12:51:15 through 12-JUL-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



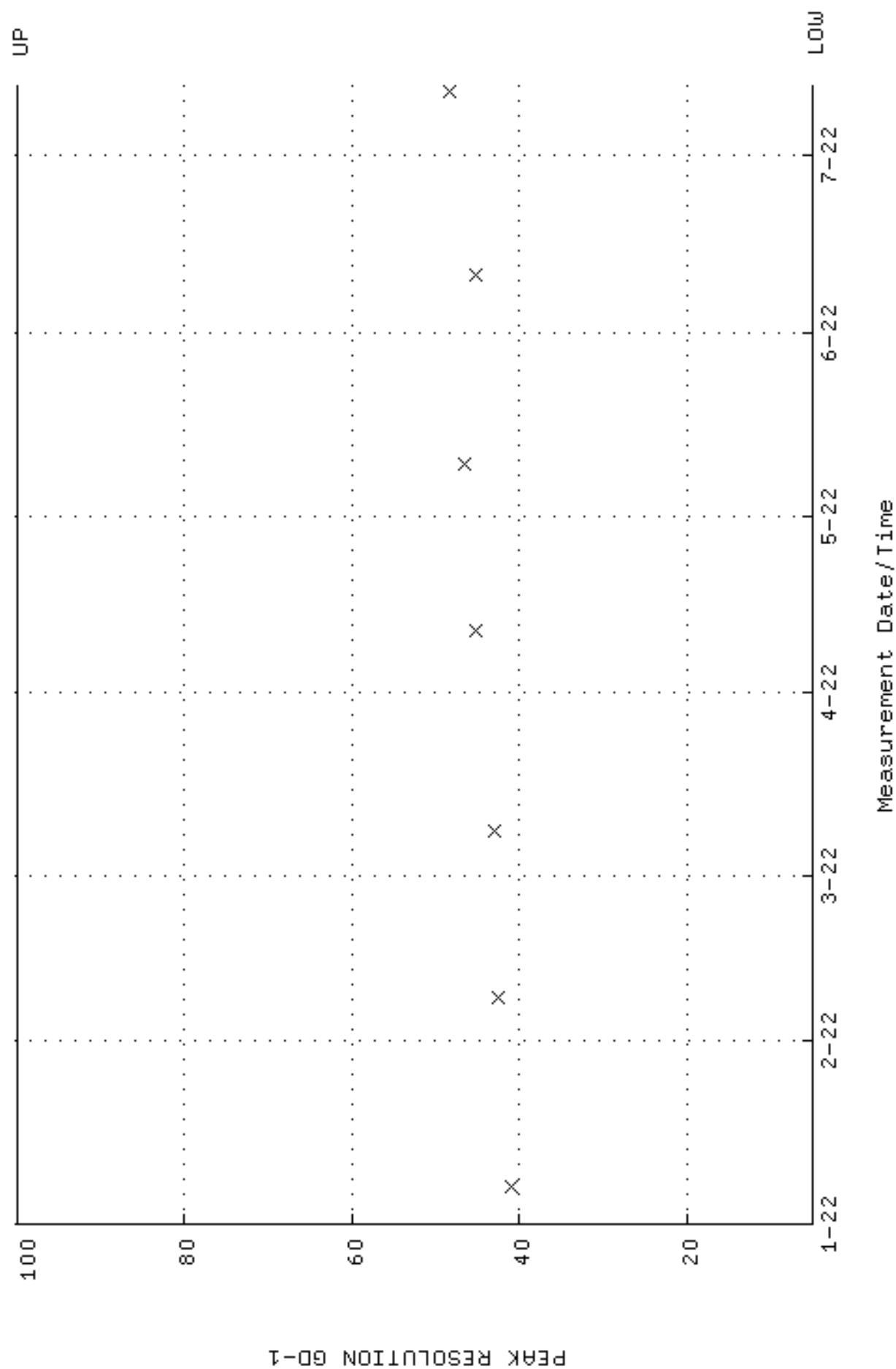
QA filename : DKA100:[ENV_ALPHA.QA.W]W088.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.314500 through 0.333950



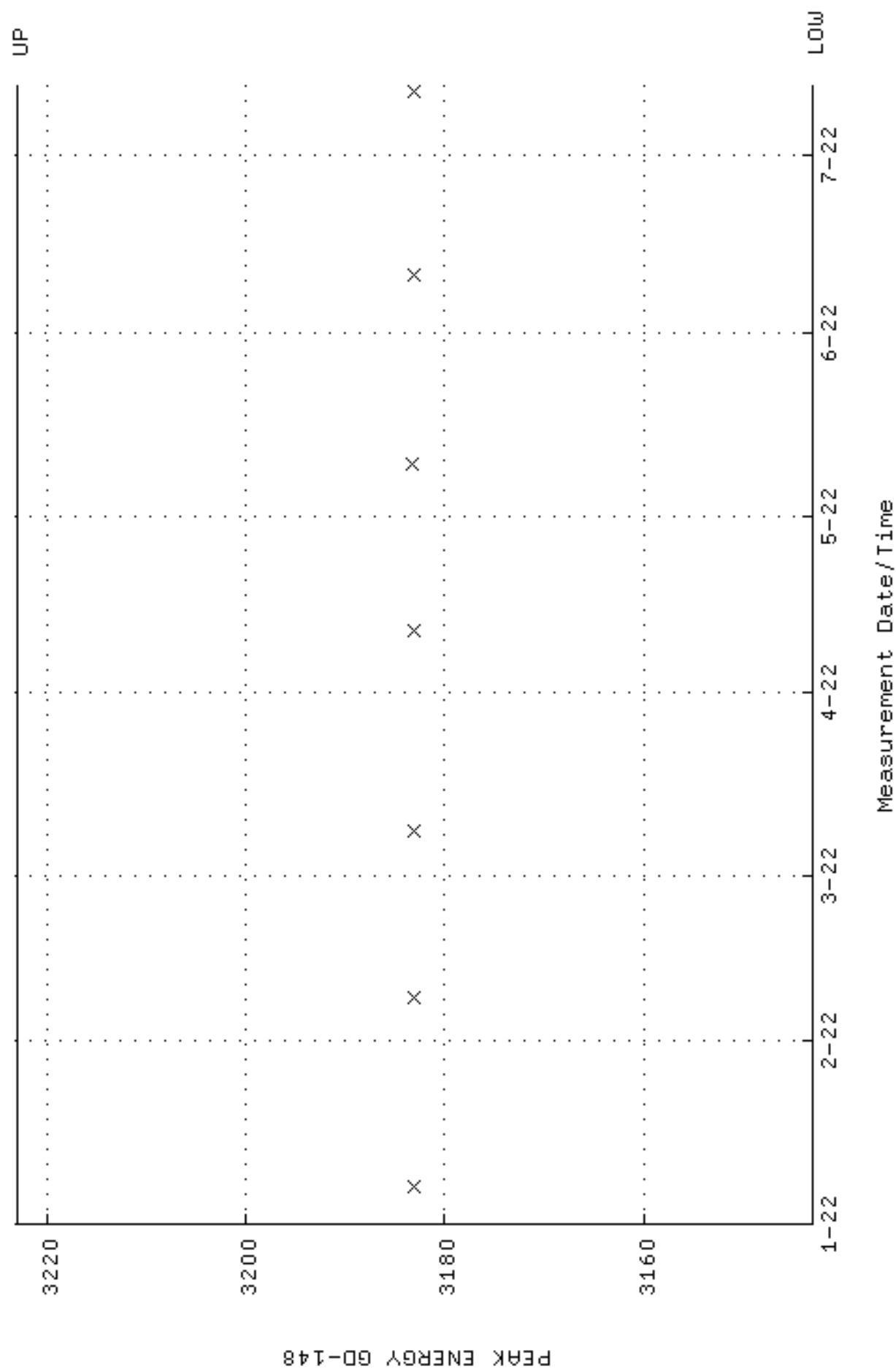
QA filename : DKA100:[ENV_ALPHA.QA.W]W088.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



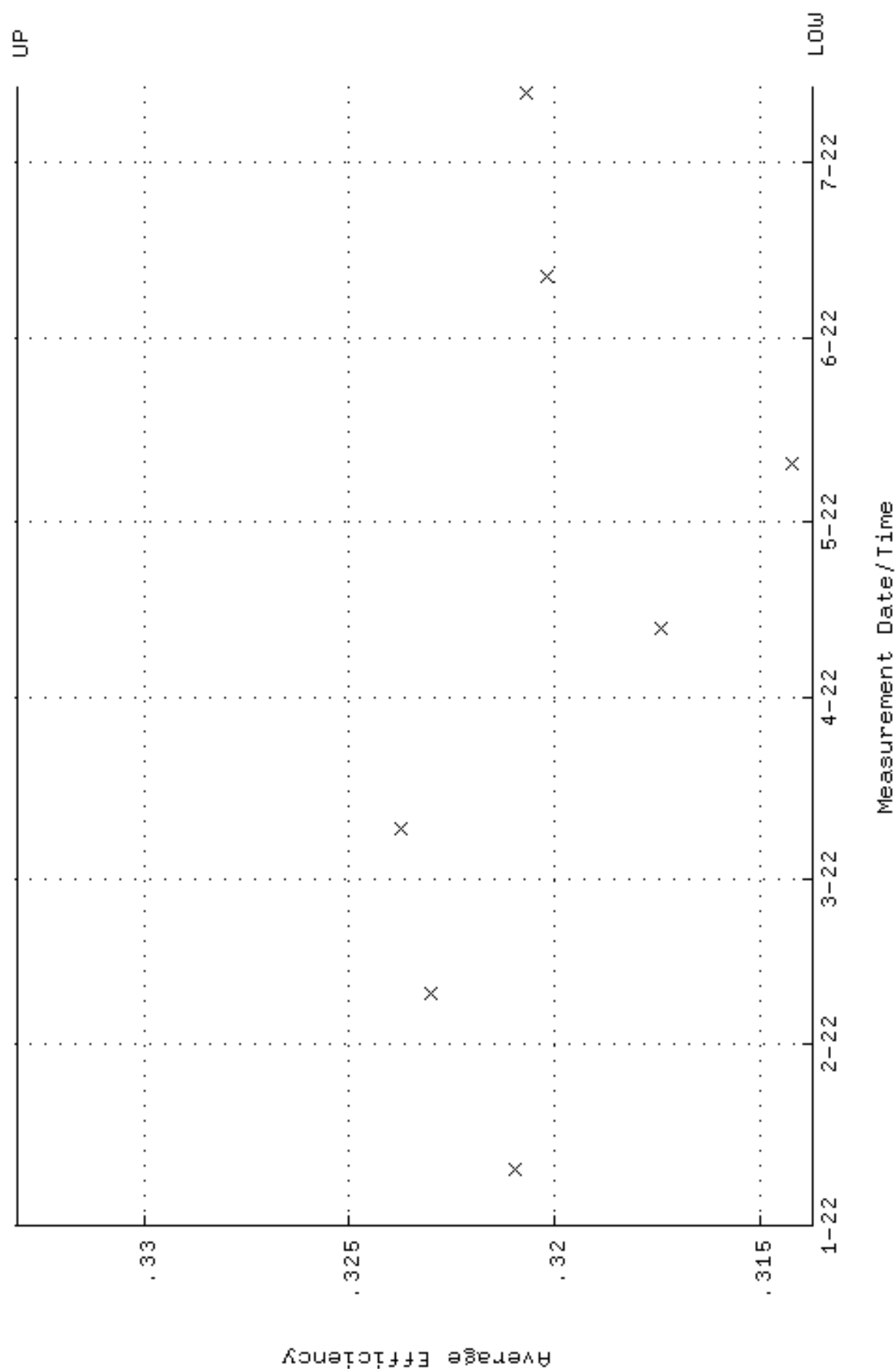
QA filename : DKA100:[ENV_ALPHA.QA.W]W088.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



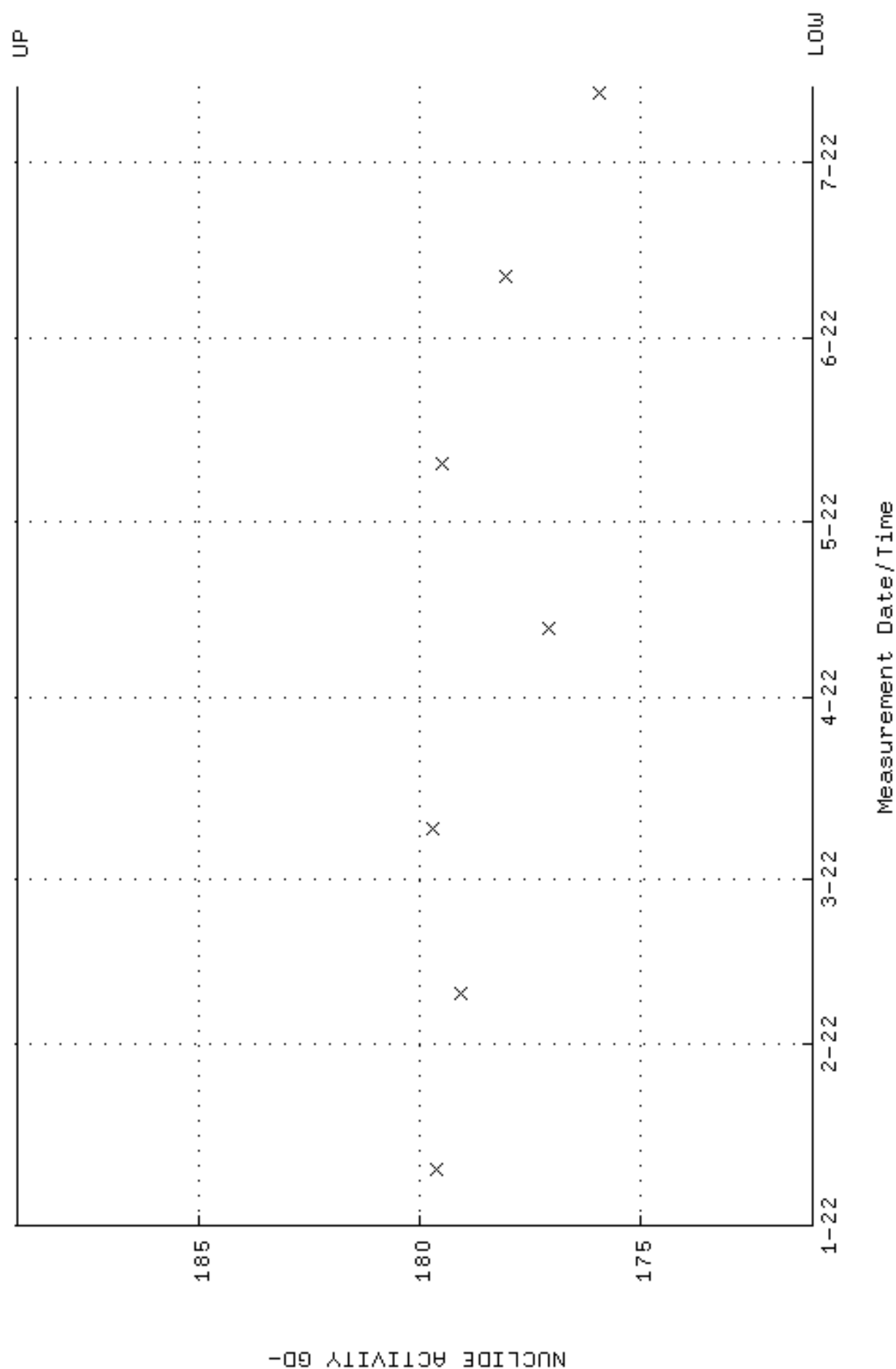
QA filename : DKA100:[ENV_ALPHA.QA.W]W088.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



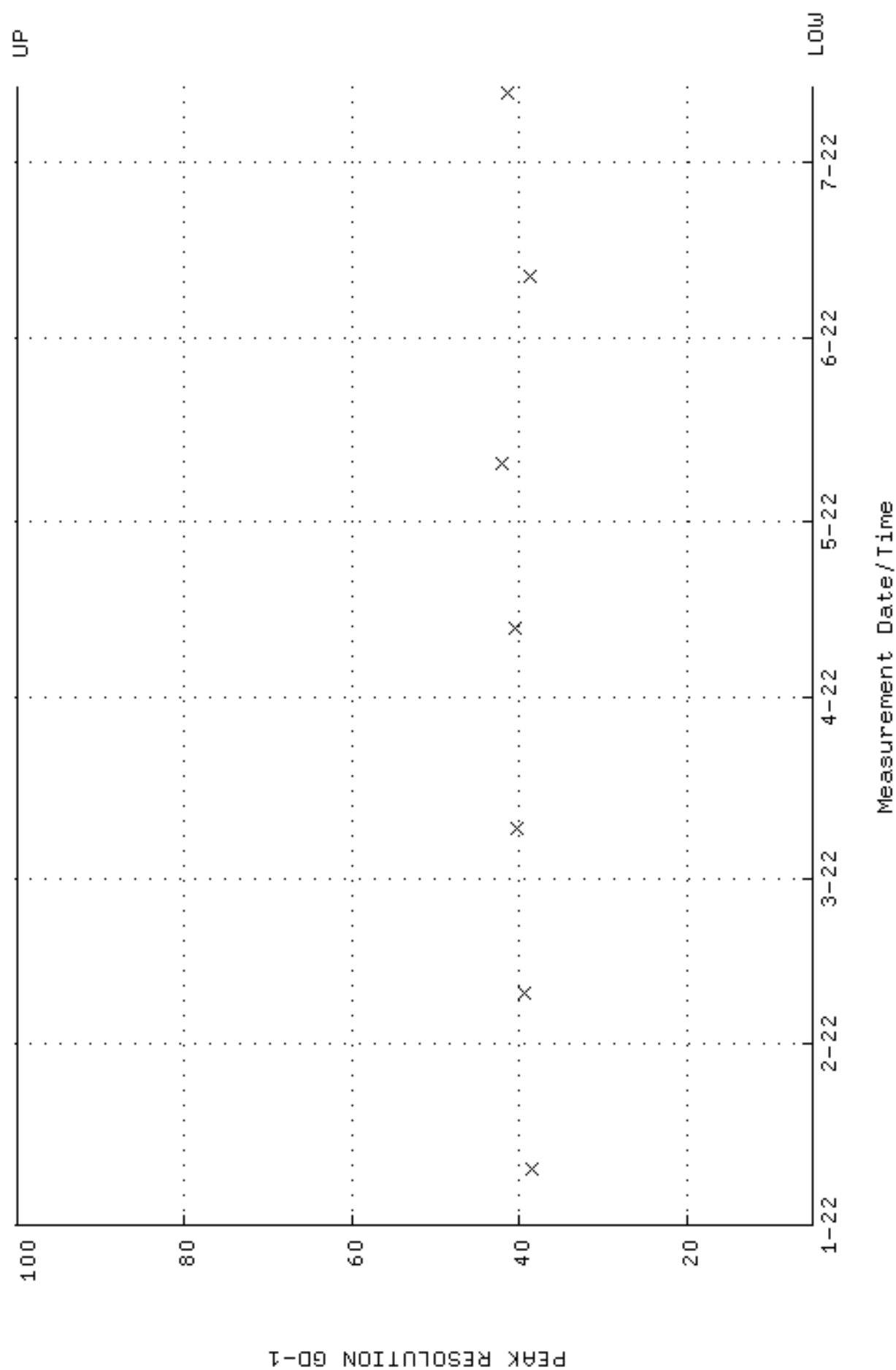
QA filename : DKA100:[ENV_ALPHA.QA.W]W095.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.313700 through 0.333100



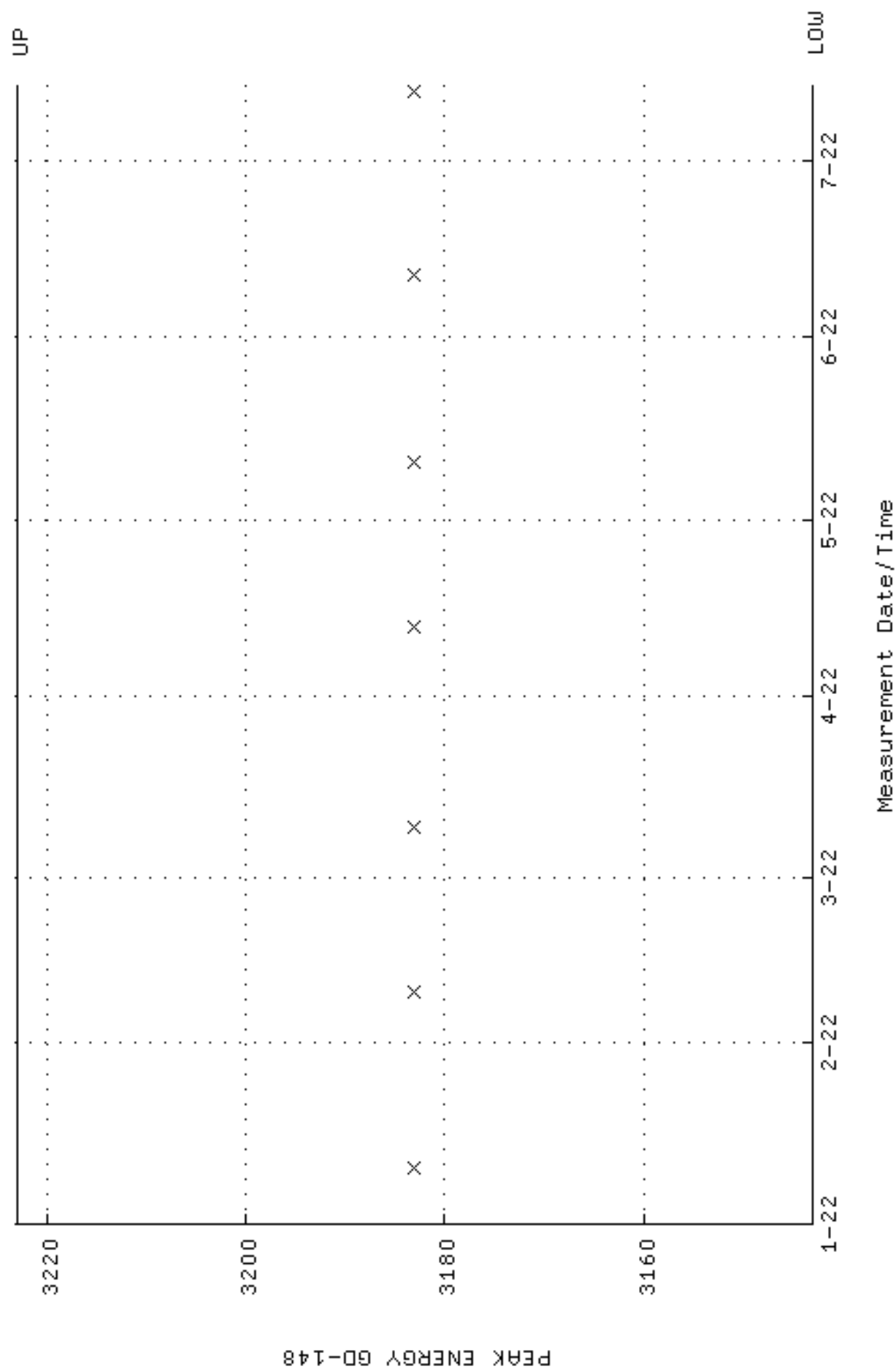
QA filename : DKA100:[ENV_ALPHA.QA.W]W095.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



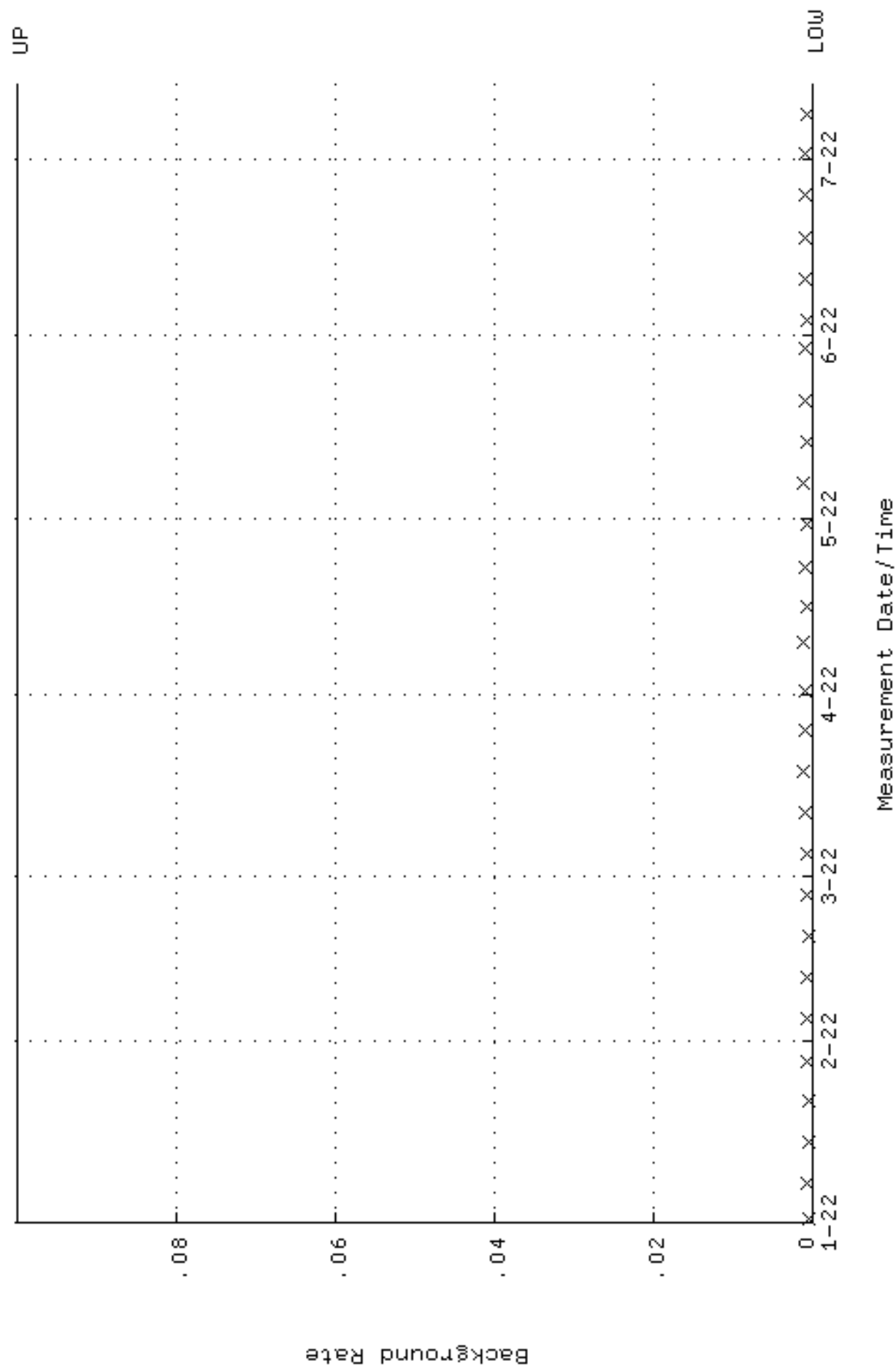
QA filename : DKA100:[ENV_ALPHA.QA.W]W095.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



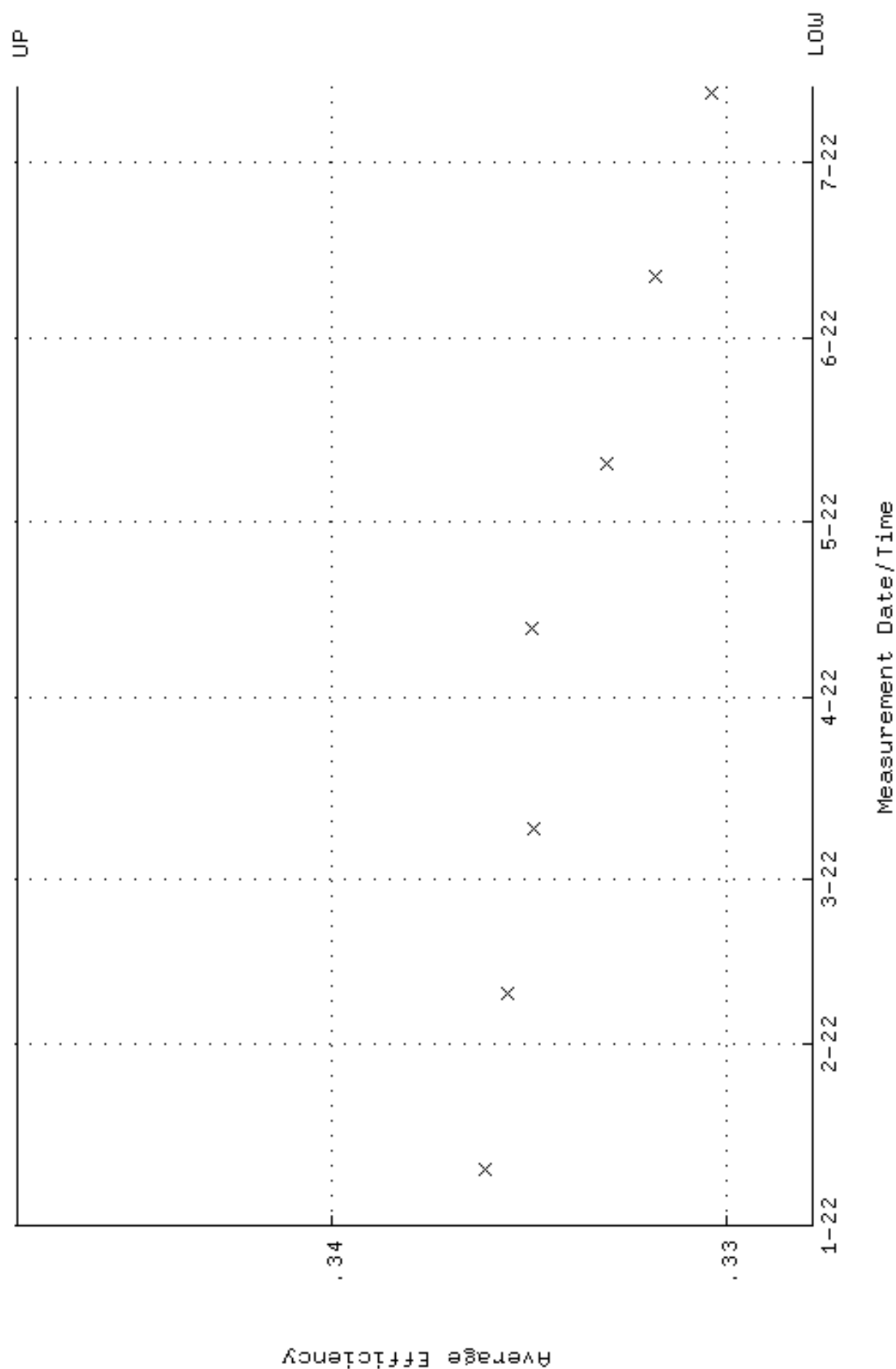
QA filename : DKA100:[ENV_ALPHA.QA.W]W095.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



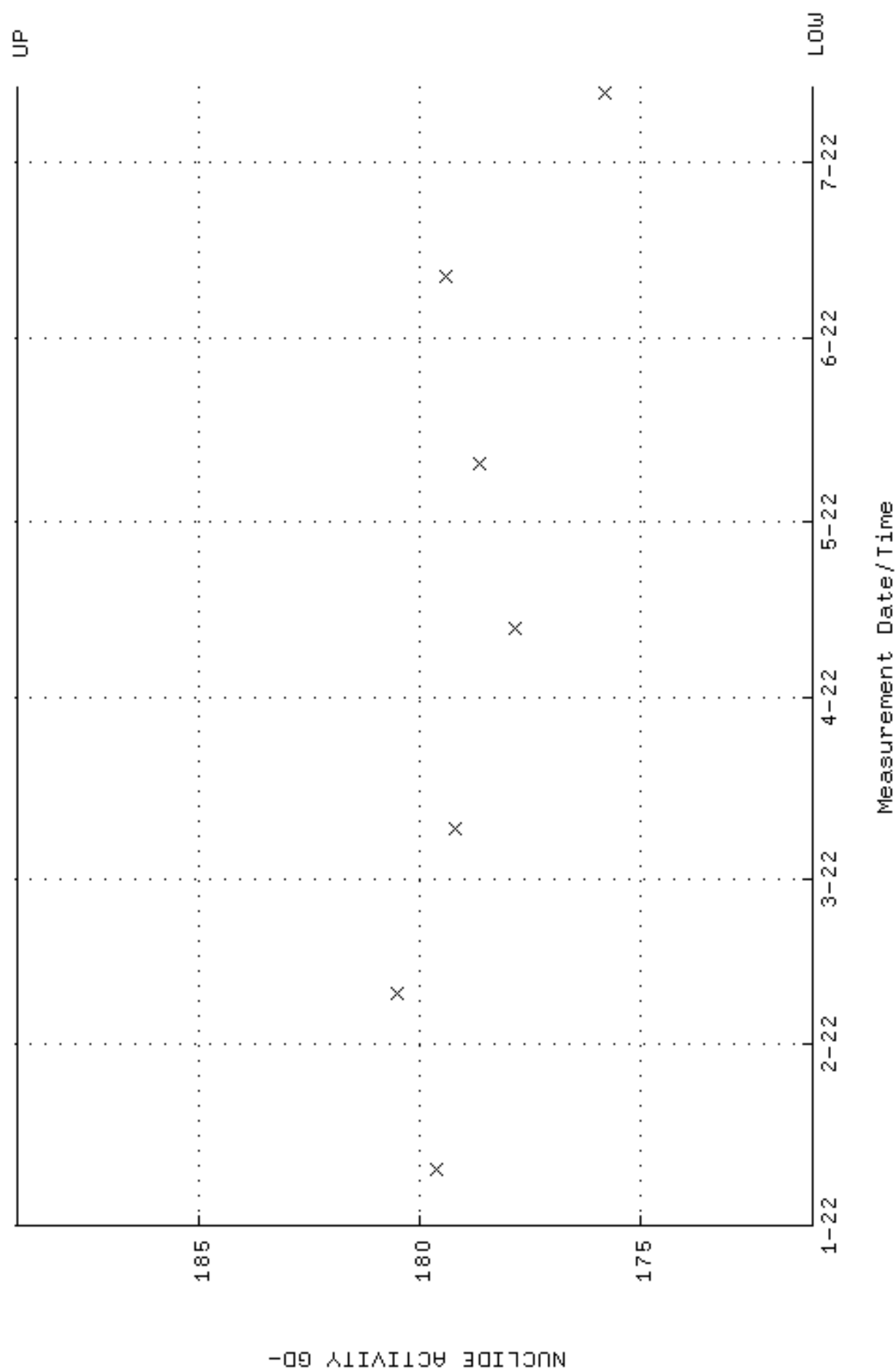
QA filename : DKA100:[ENV_ALPHA.QA.B]B095.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:54:59 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



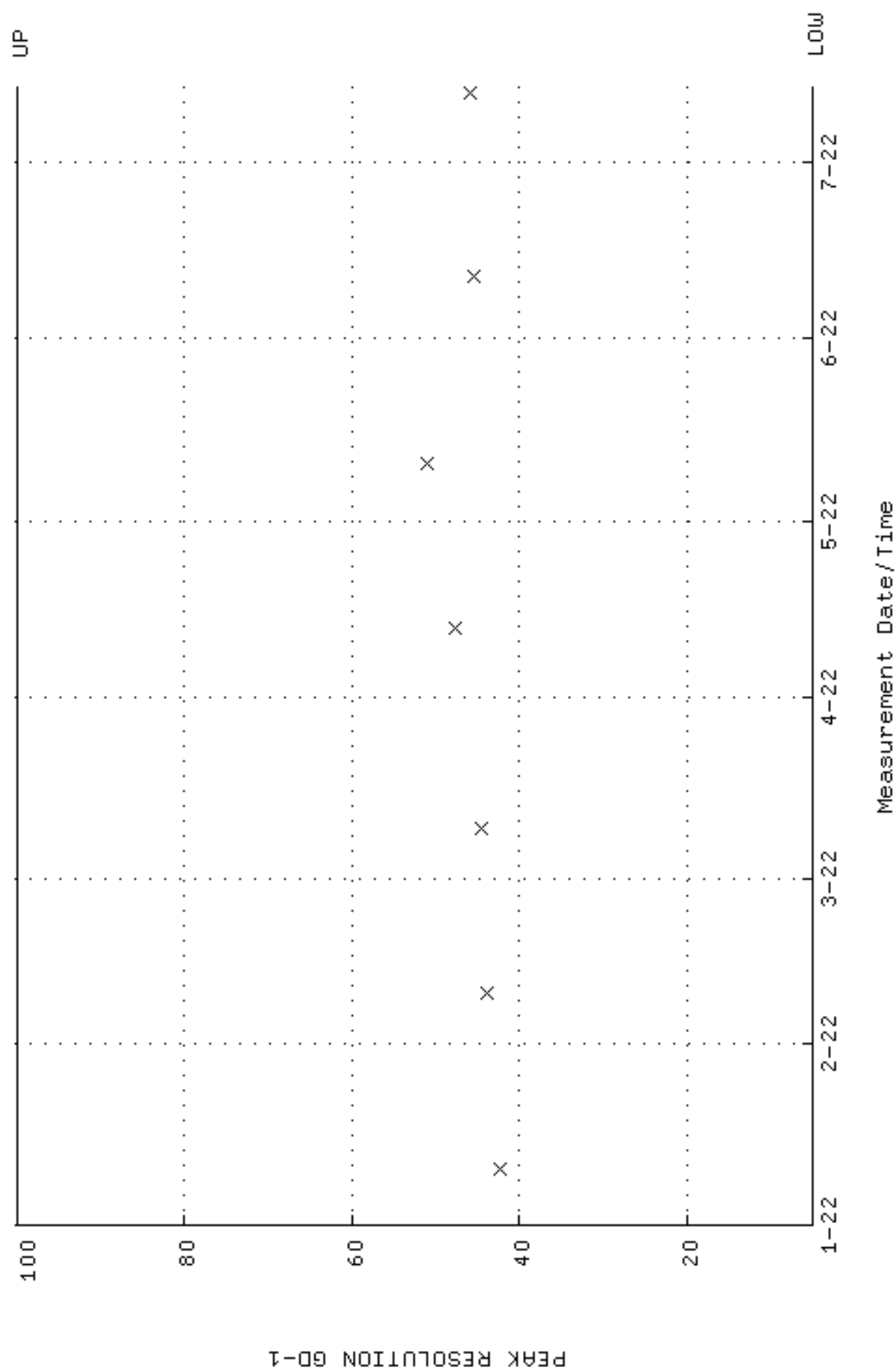
QA filename : DKA100:[ENV_ALPHA.QA.W]W096.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.327800 through 0.348000



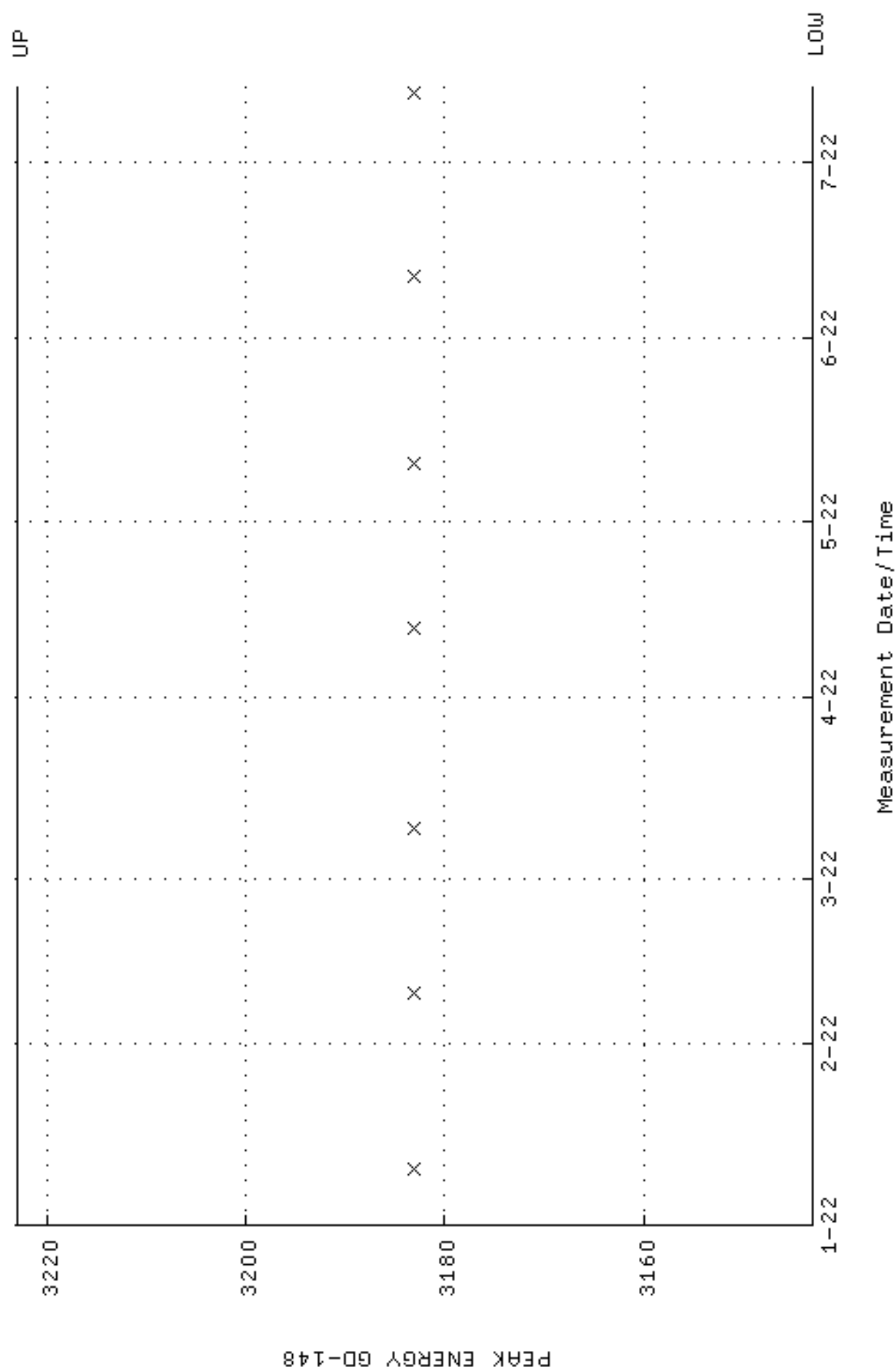
QA filename : DKA100:[ENV_ALPHA.QA.W]W096.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



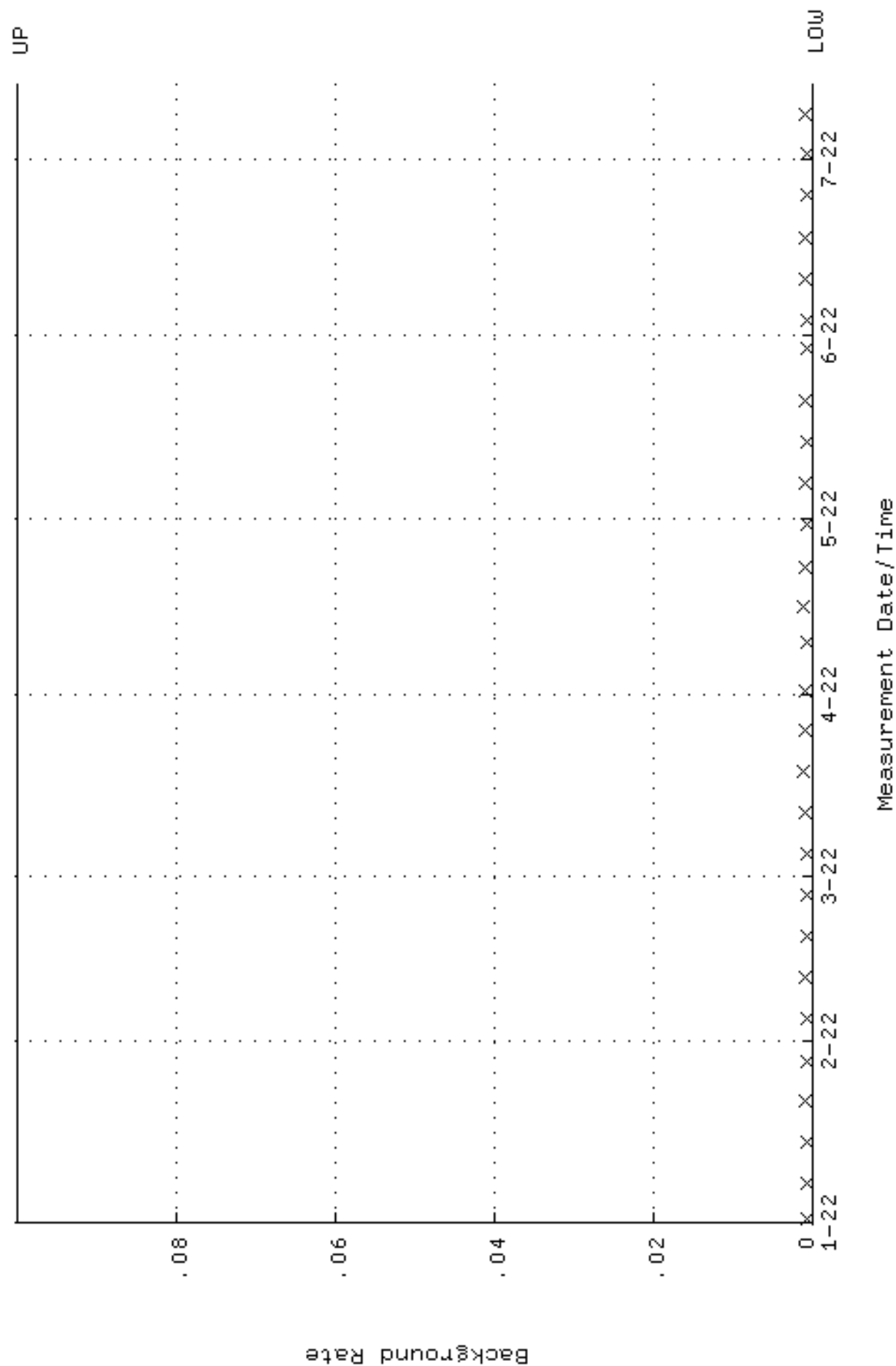
QA filename : DKA100:[ENV_ALPHA.QA.W]W096.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



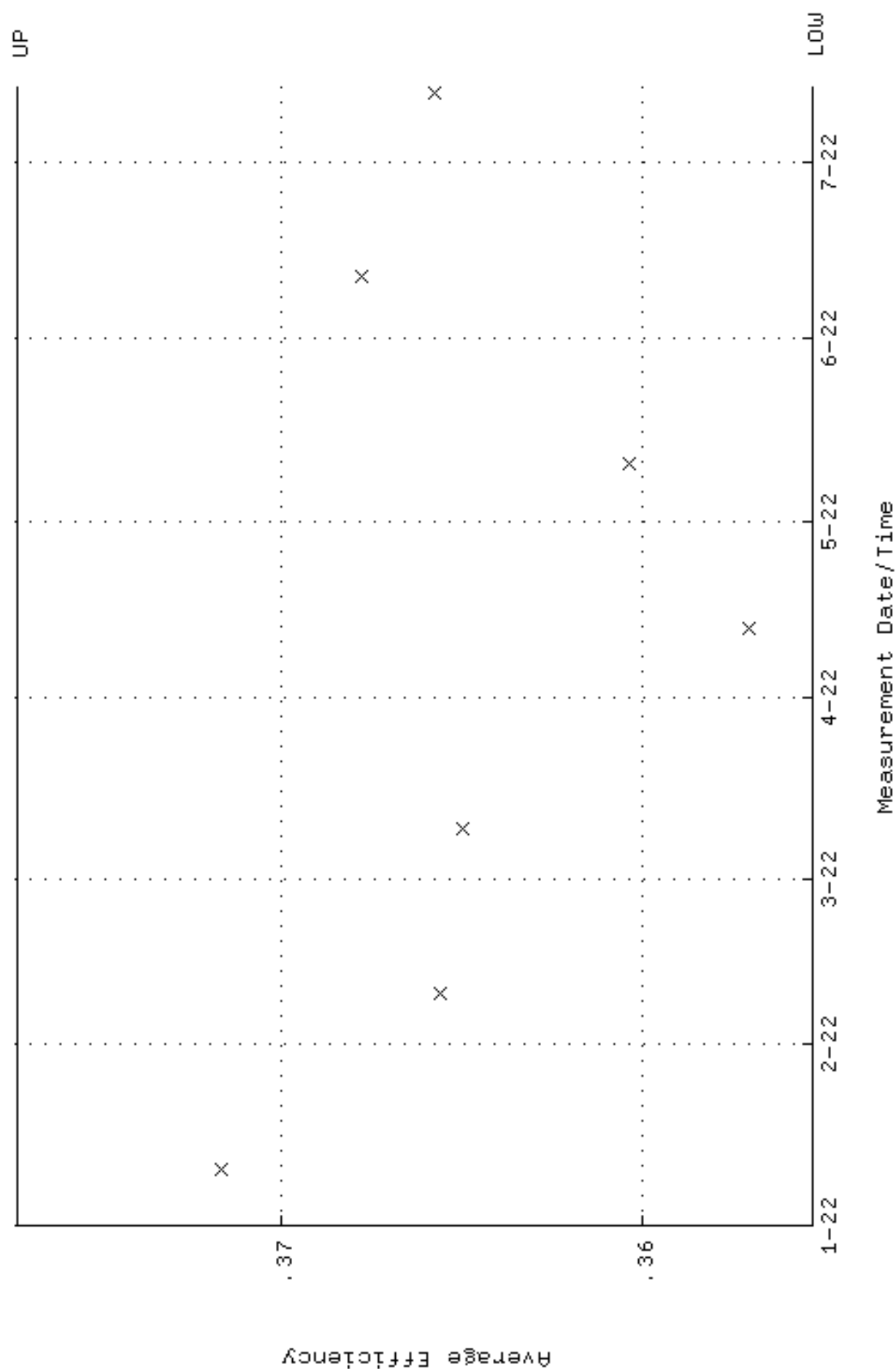
QA filename : DKA100:[ENV_ALPHA.QA.W]W096.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



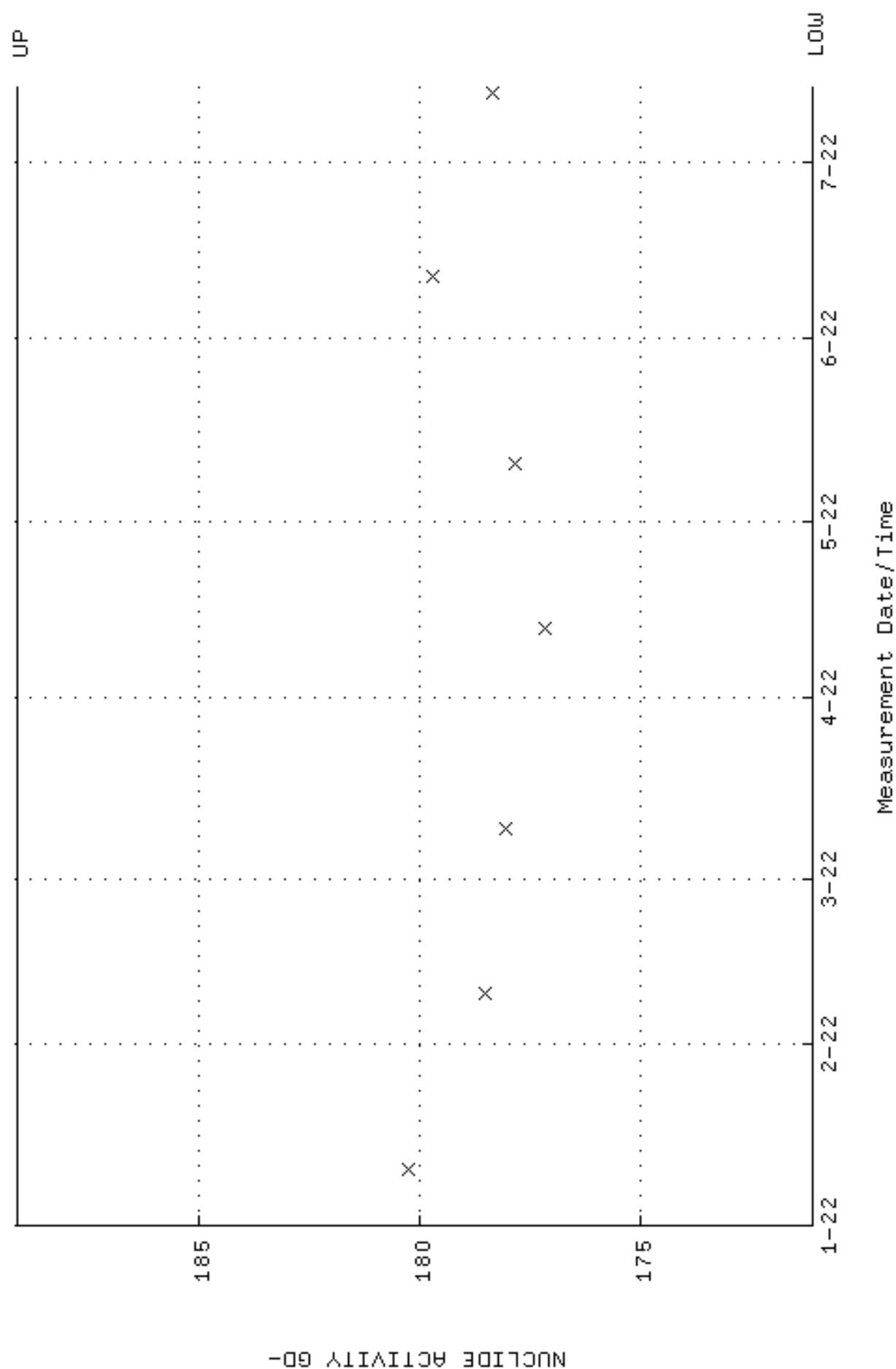
QA filename : DKA100:[ENV_ALPHA.QA.B]B096.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:54:59 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



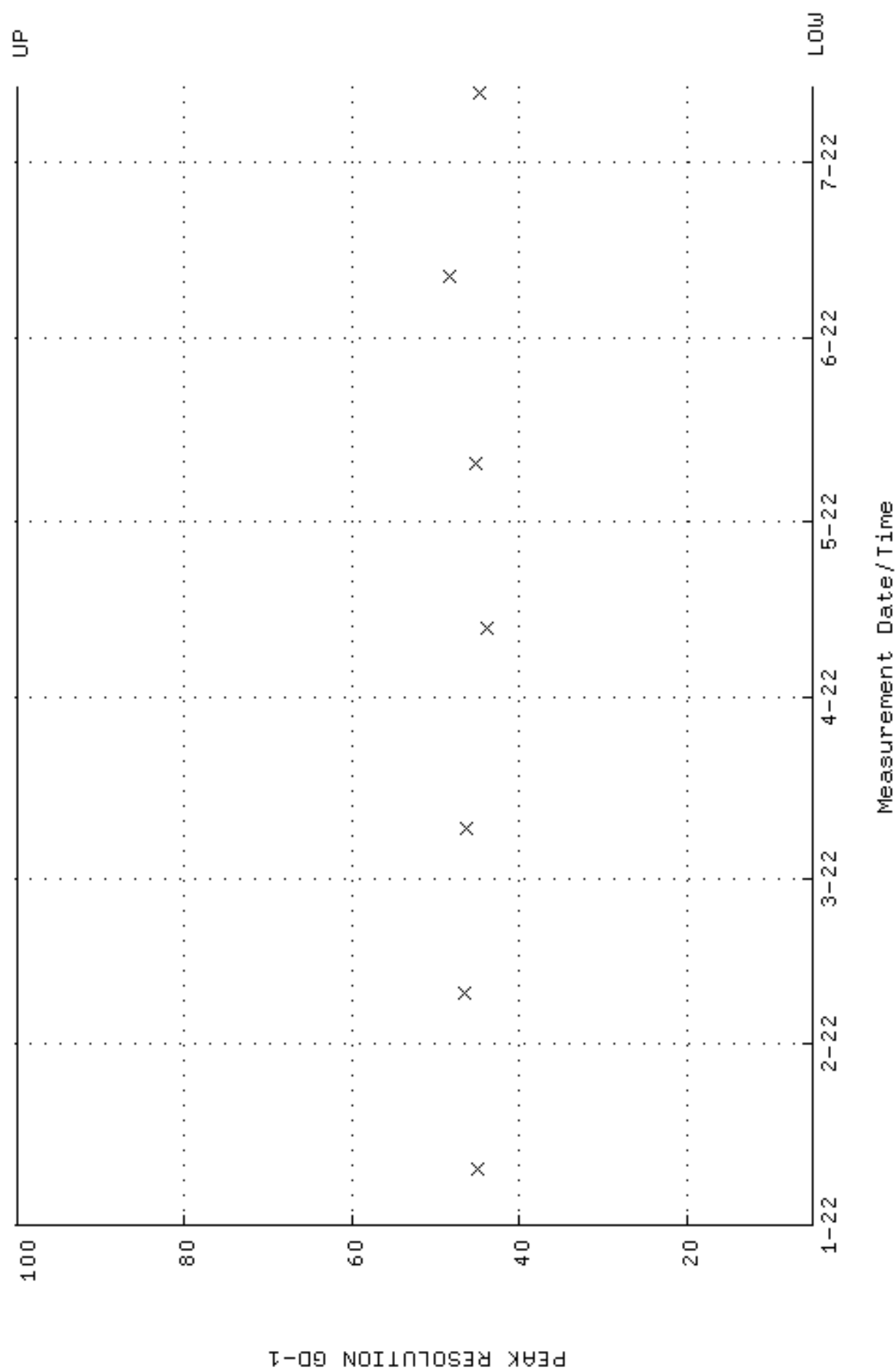
QA filename : DKA100:[ENV_ALPHA.QA.W]W097.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.355300 through 0.377300



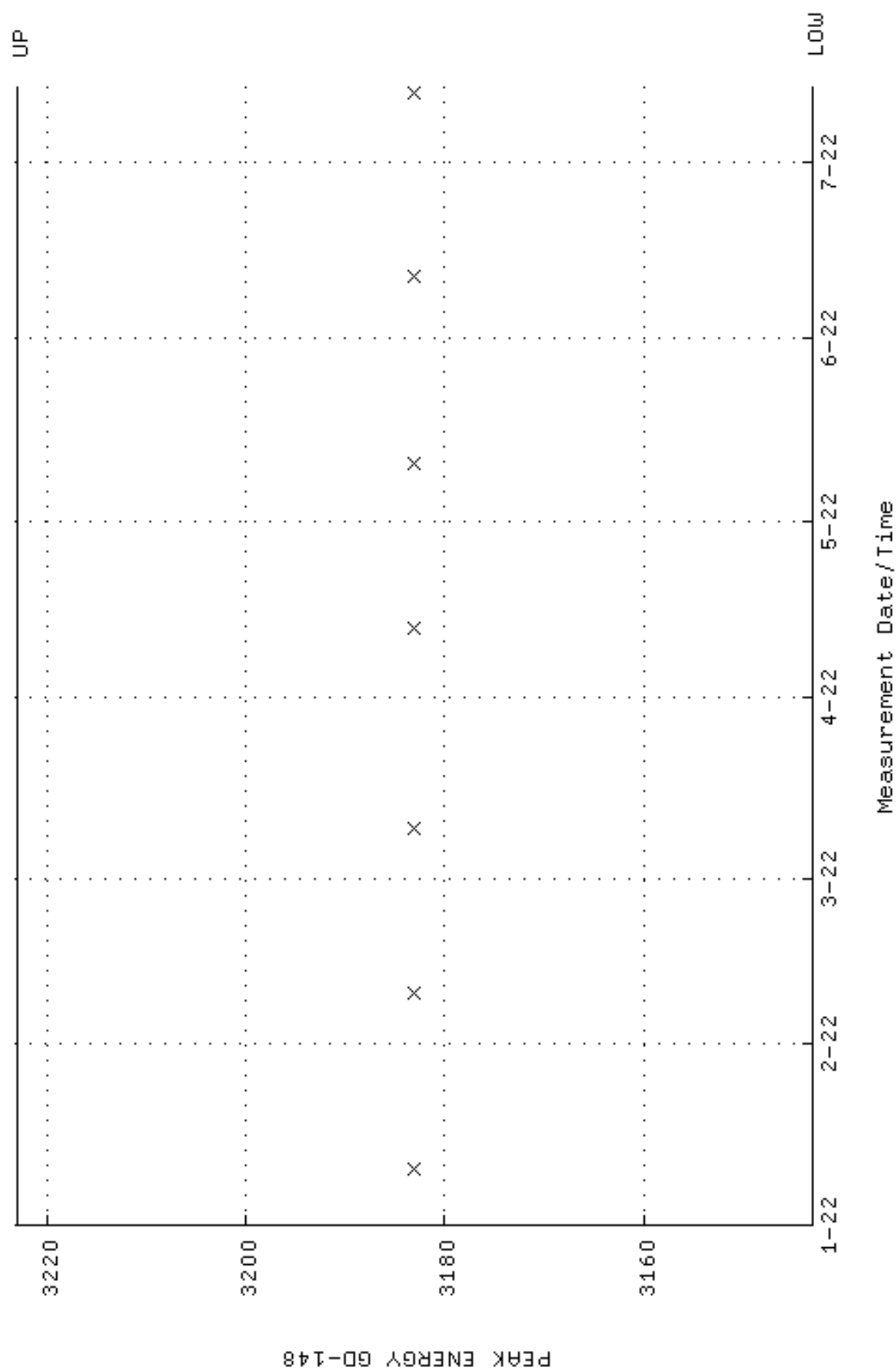
QA filename : DKA100:[ENV_ALPHA.QA.W]W097.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



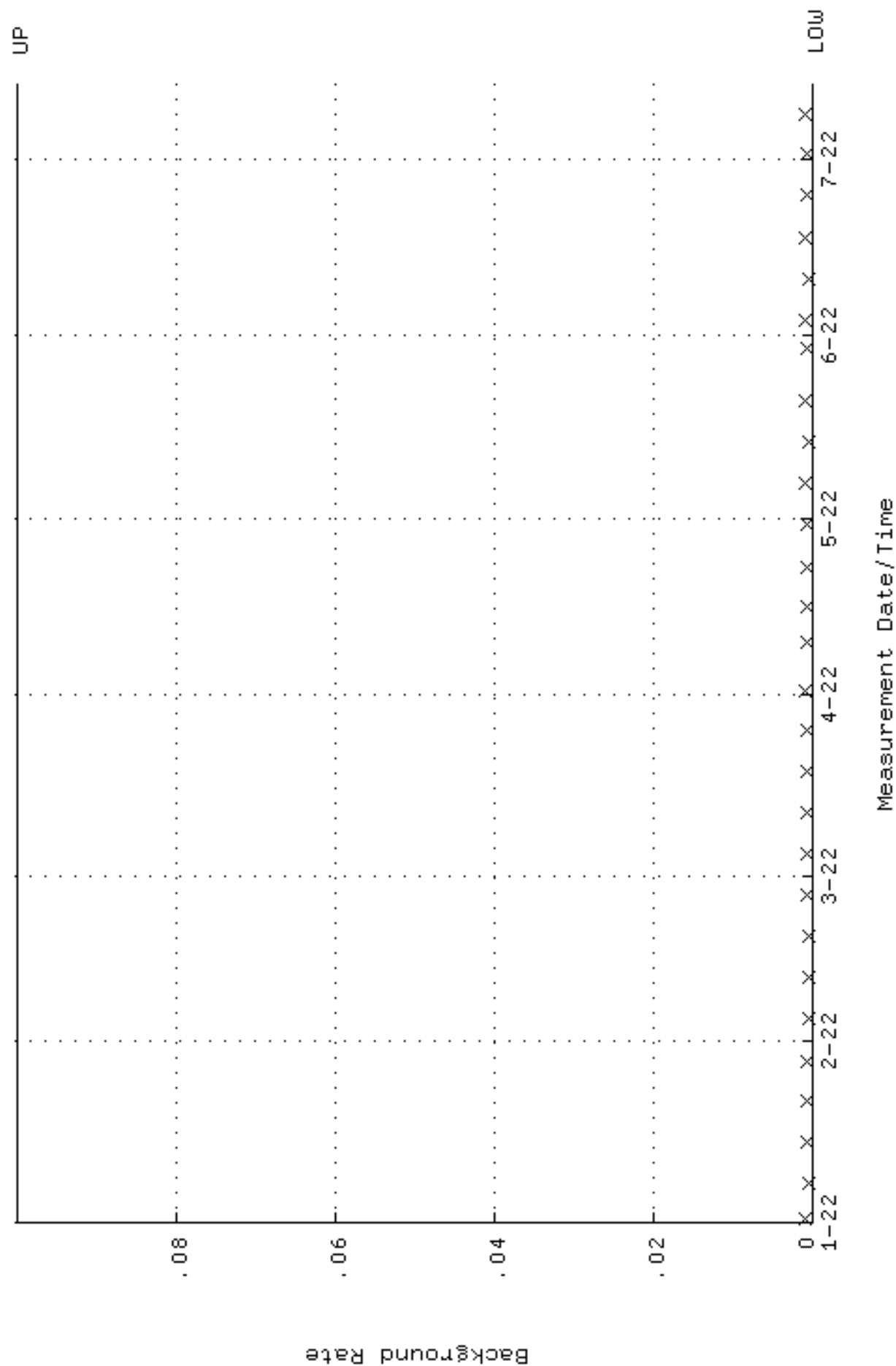
QA filename : DKA100:[ENV_ALPHA.QA.W]W097.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



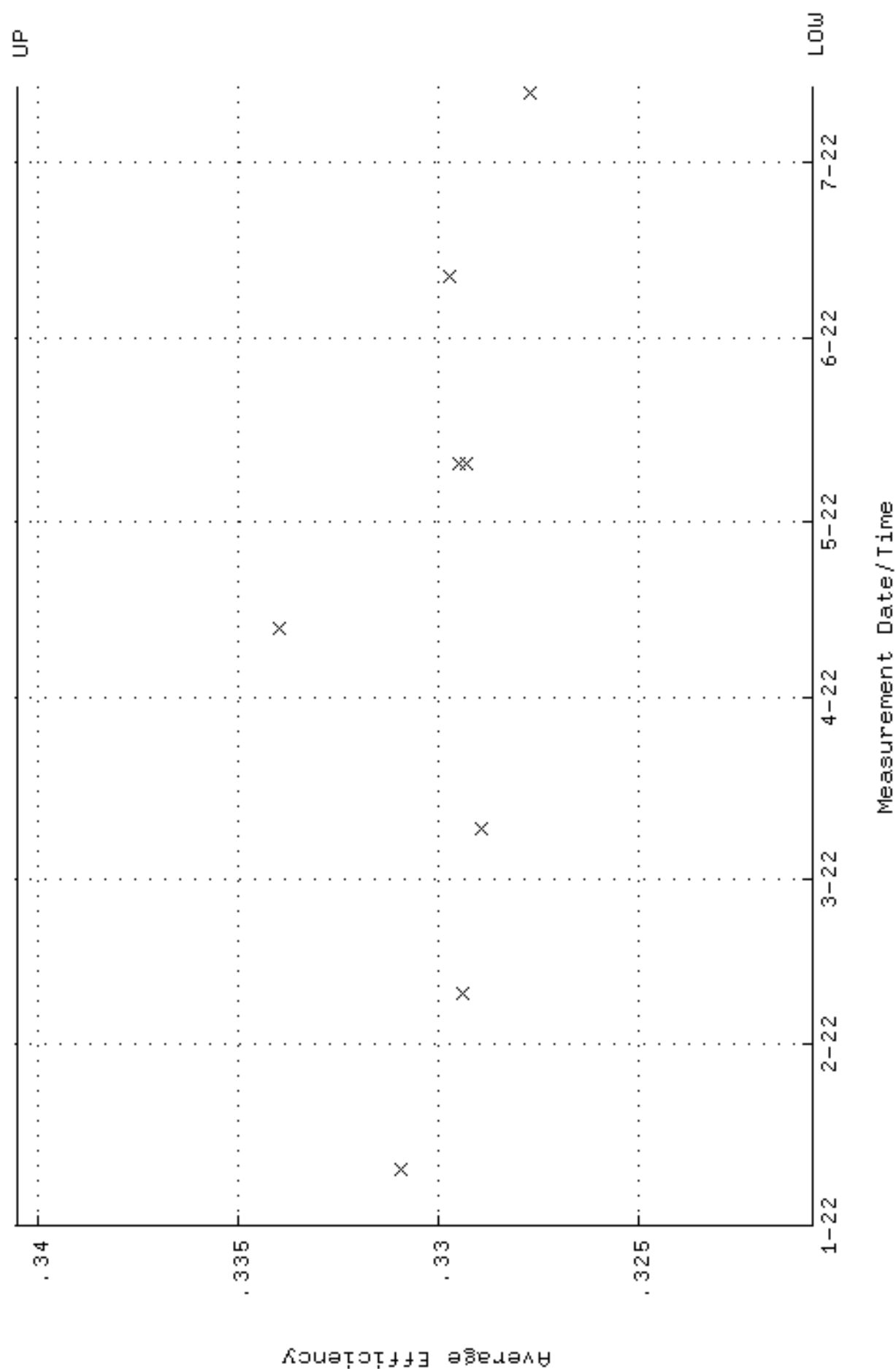
QA filename : DKA100:[ENV_ALPHA.QA.W]W097.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



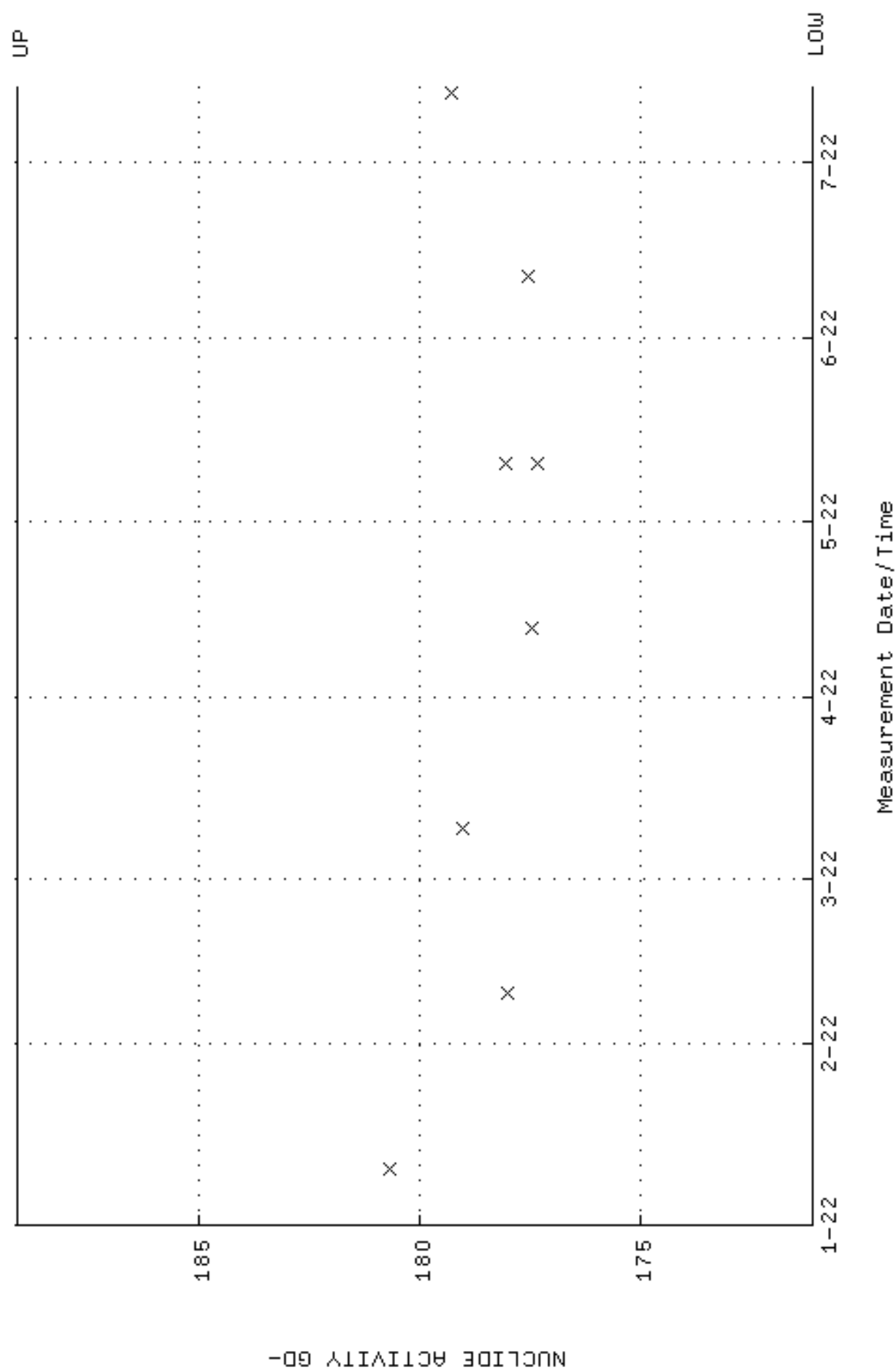
QA filename : DKA100:[ENV_ALPHA.QA.B]B097.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:54:59 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



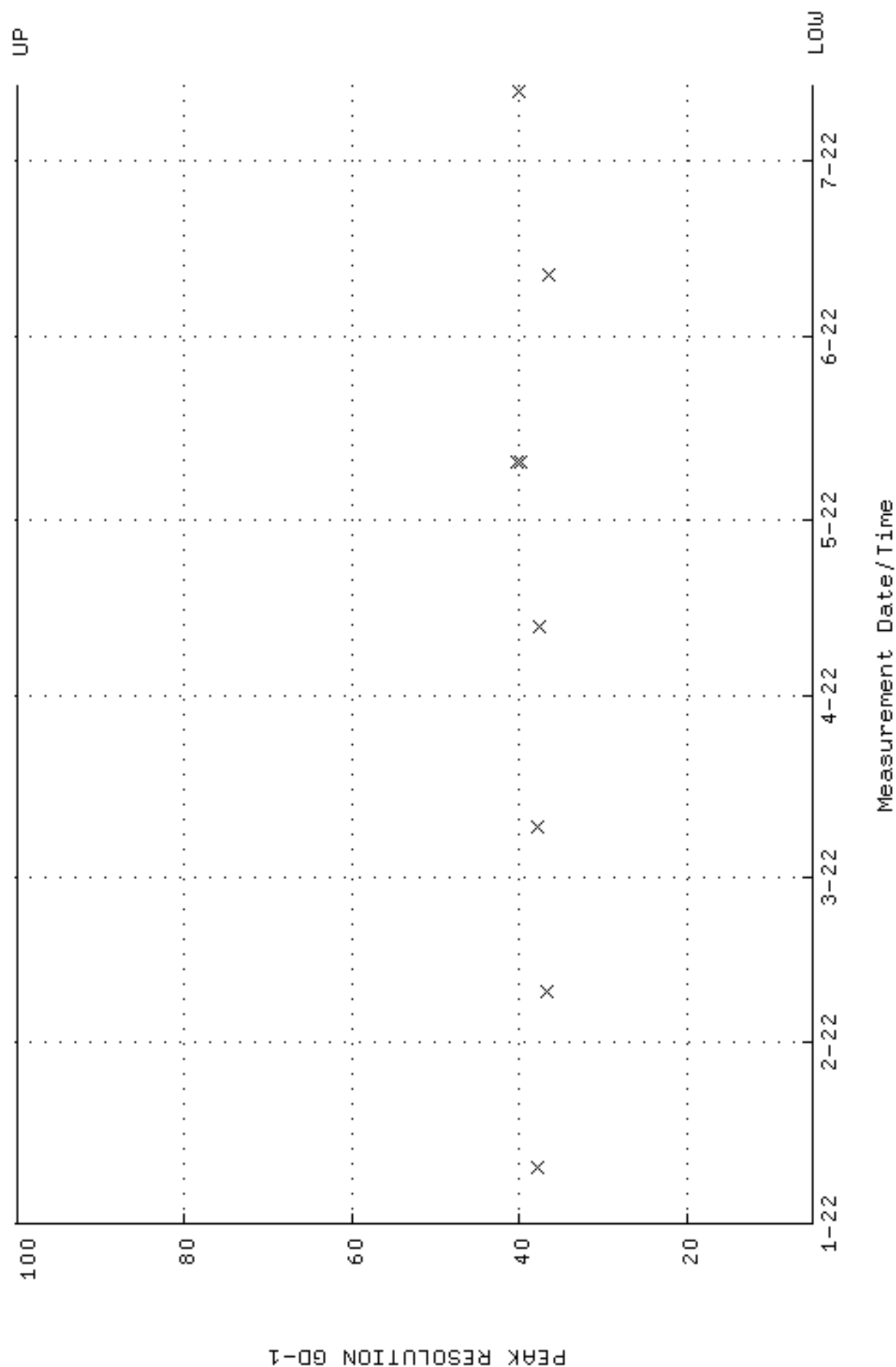
QA filename : DKA100:[ENV_ALPHA.QA.W]W104.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.320670 through 0.340510



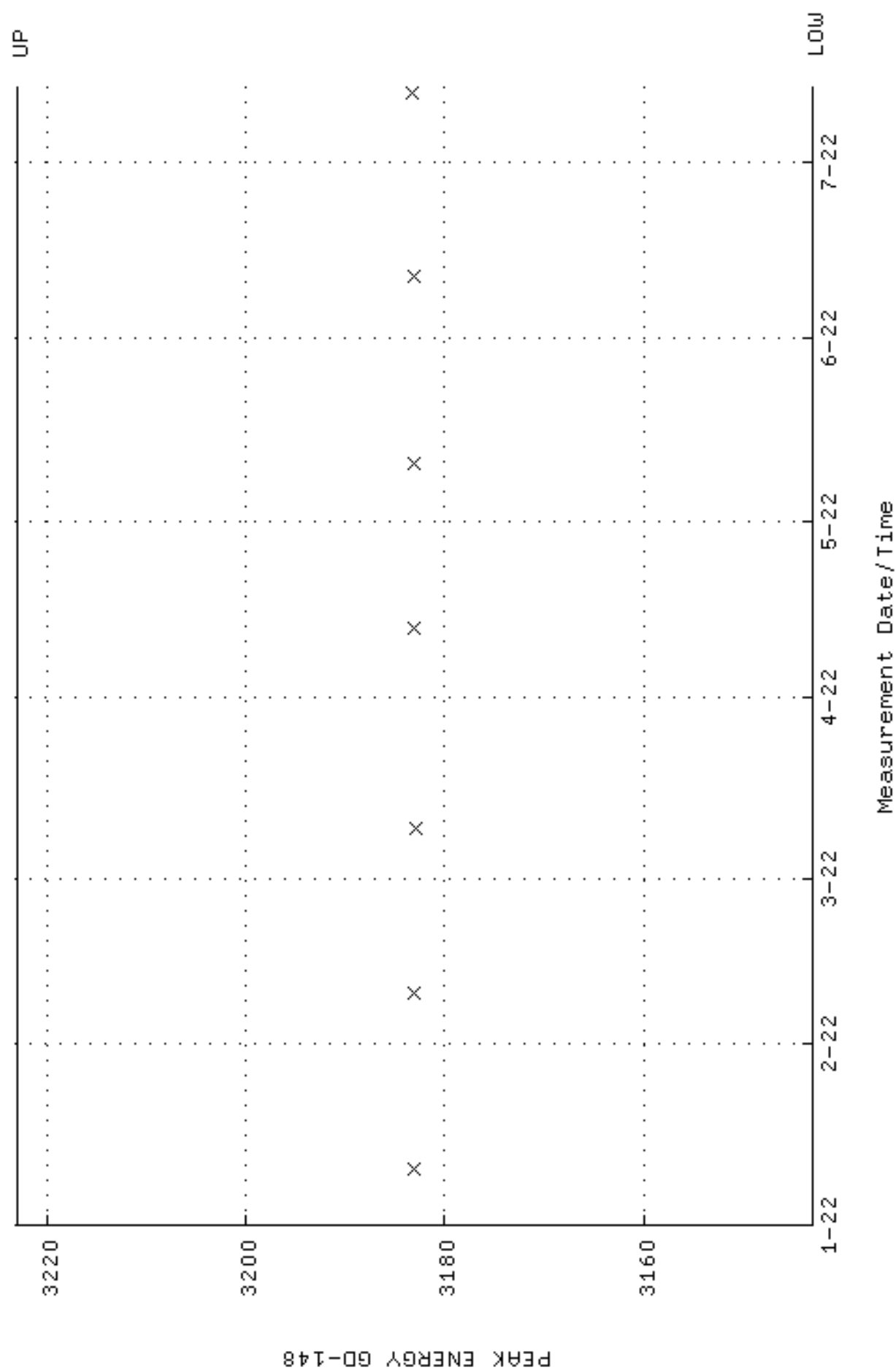
QA filename : DKA100:[ENV_ALPHA.QA.W]W104.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



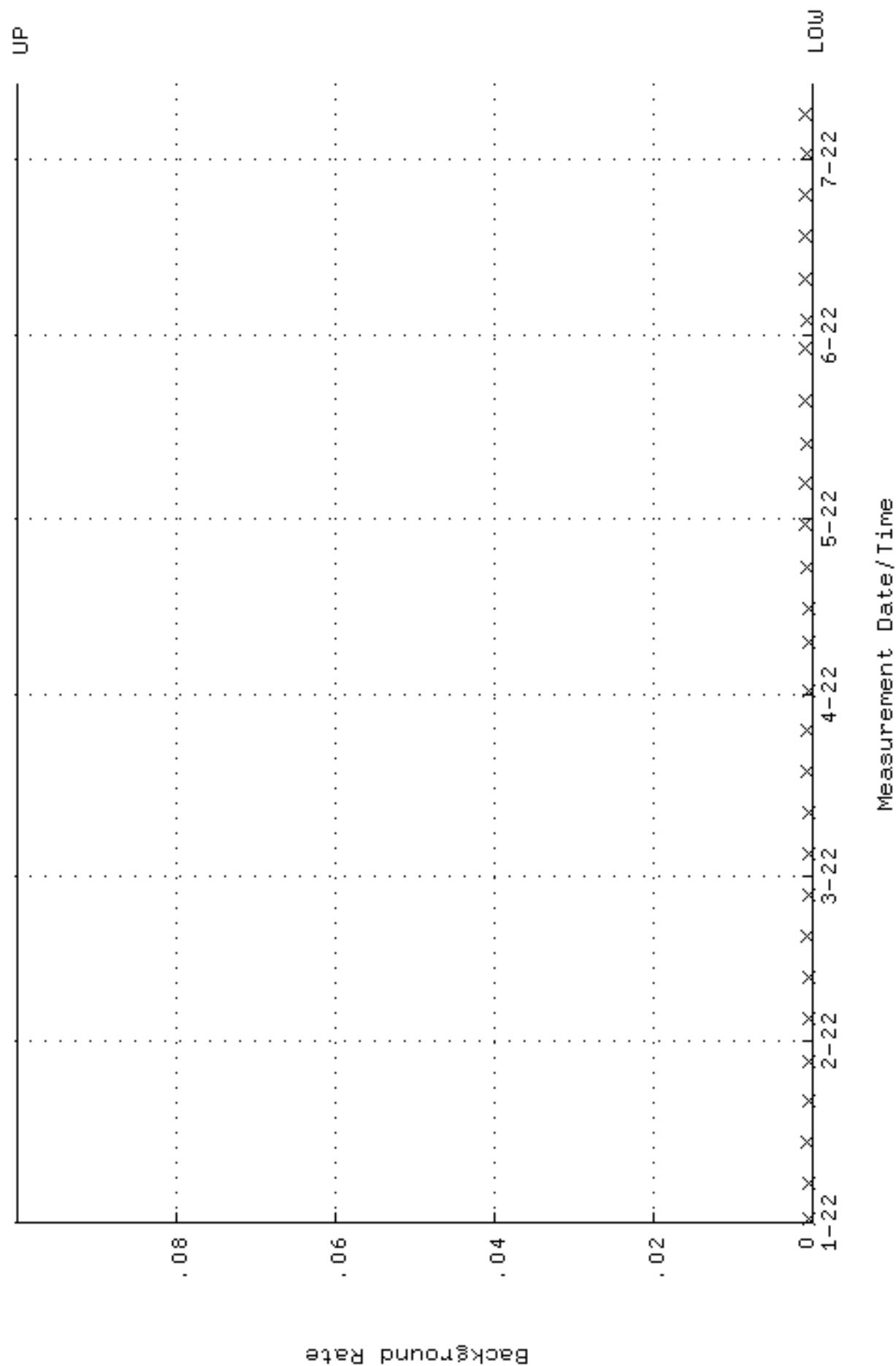
QA filename : DKA100:[ENV_ALPHA.QA.W]W104.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



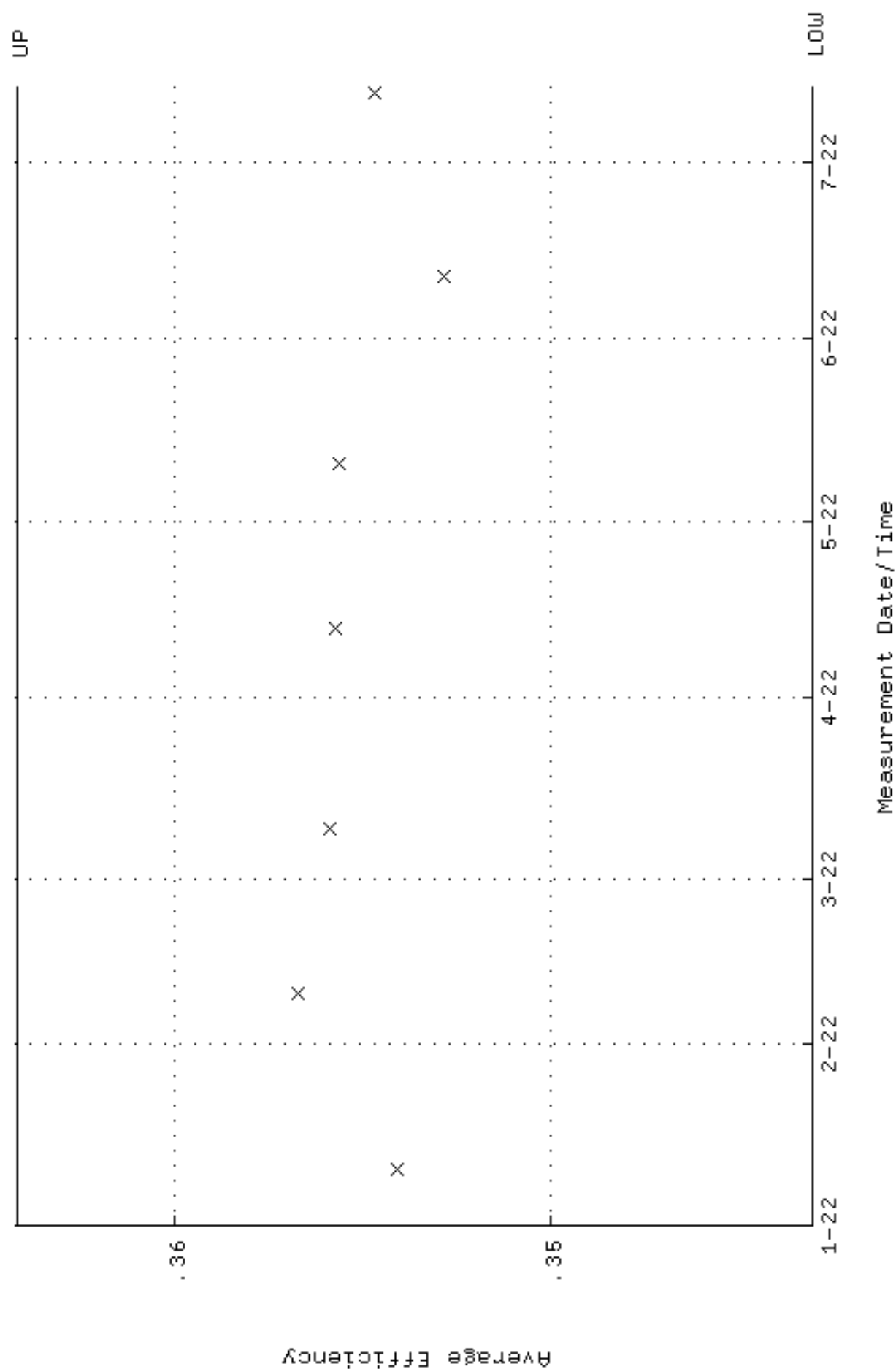
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



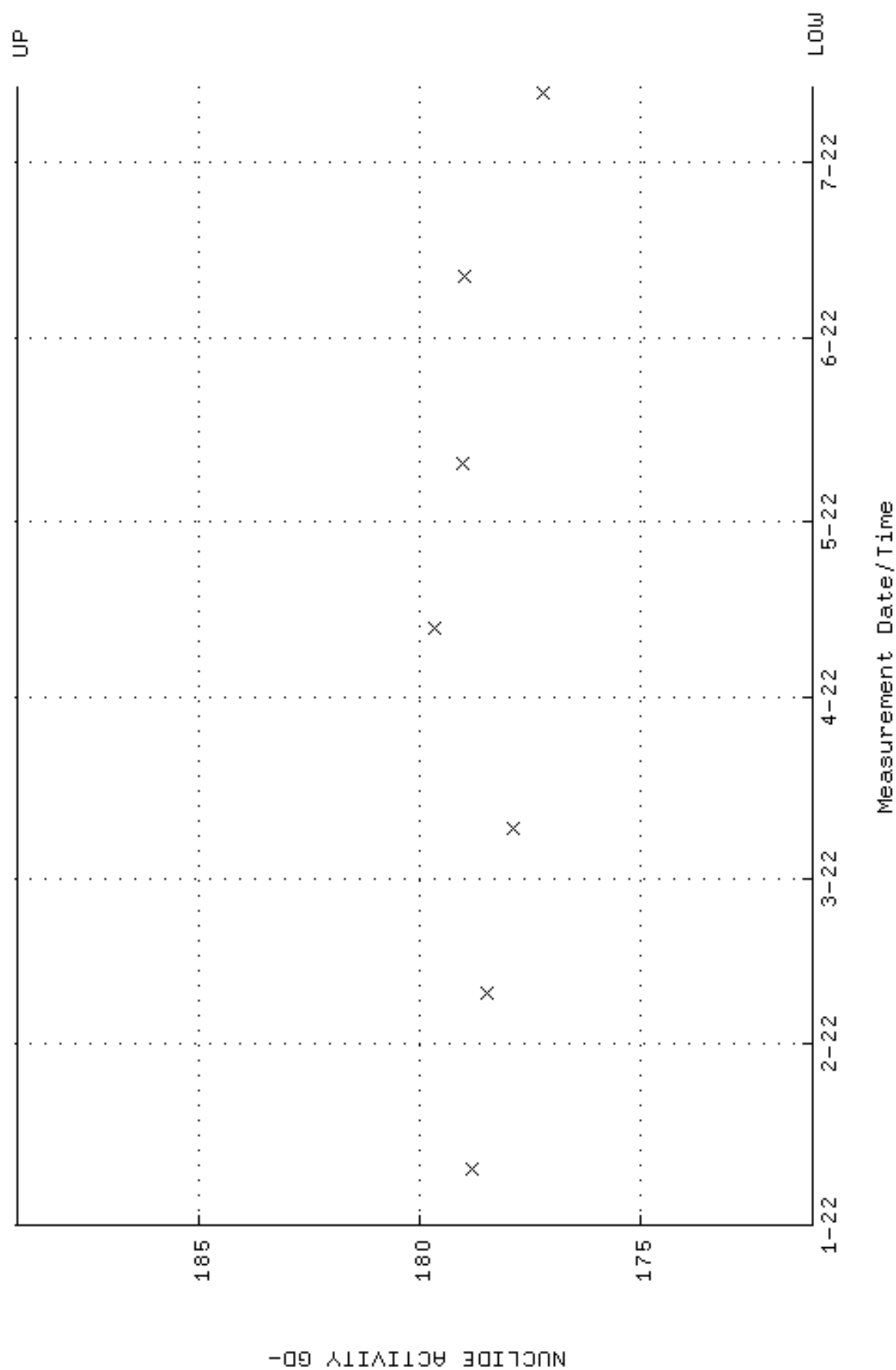
QA filename : DKA100:[ENV_ALPHA.QA.B]B104.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:55:00 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



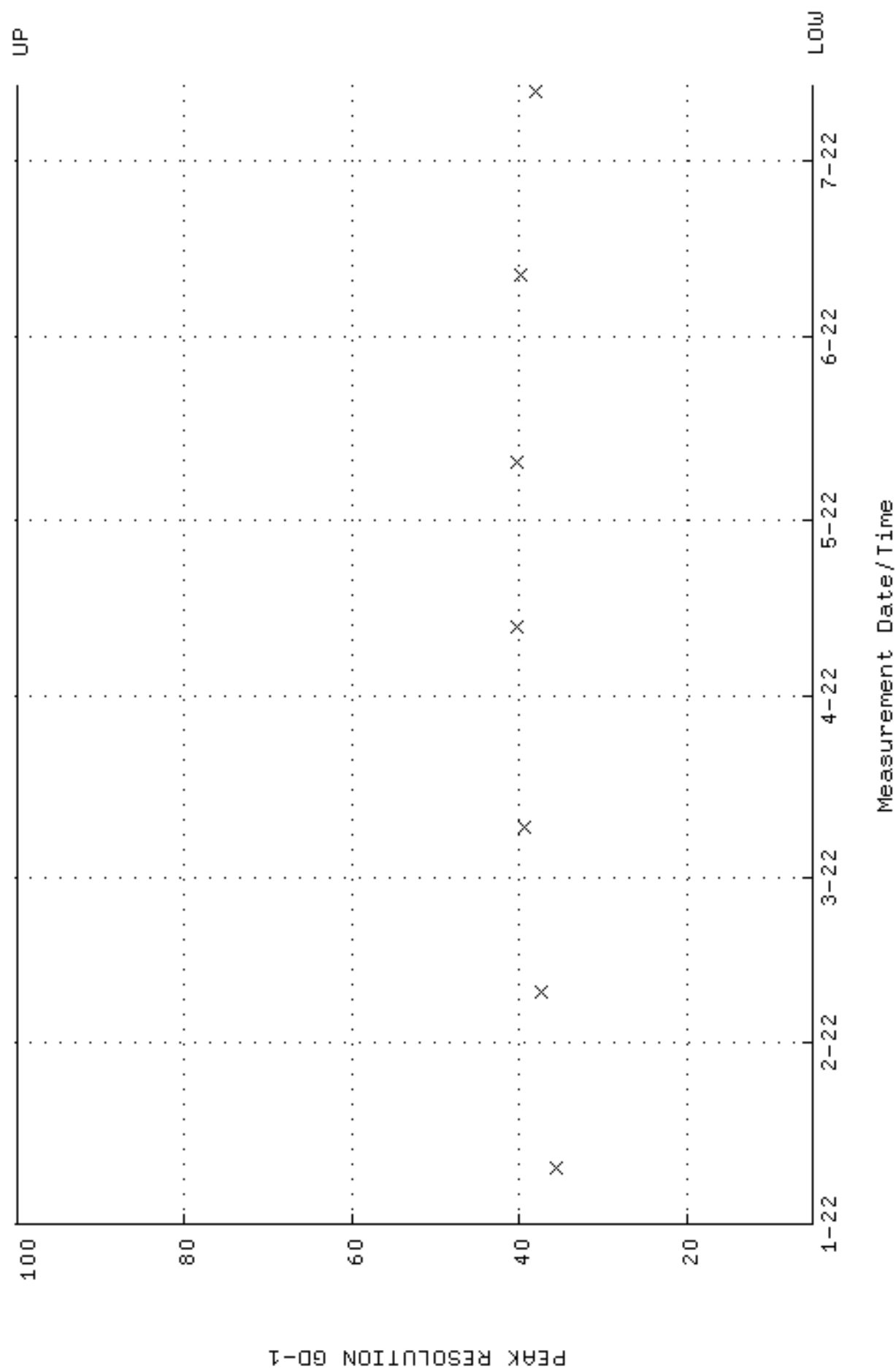
QA filename : DKA100:[ENV_ALPHA.QA.W]W105.QAF;12
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.343000 through 0.364200



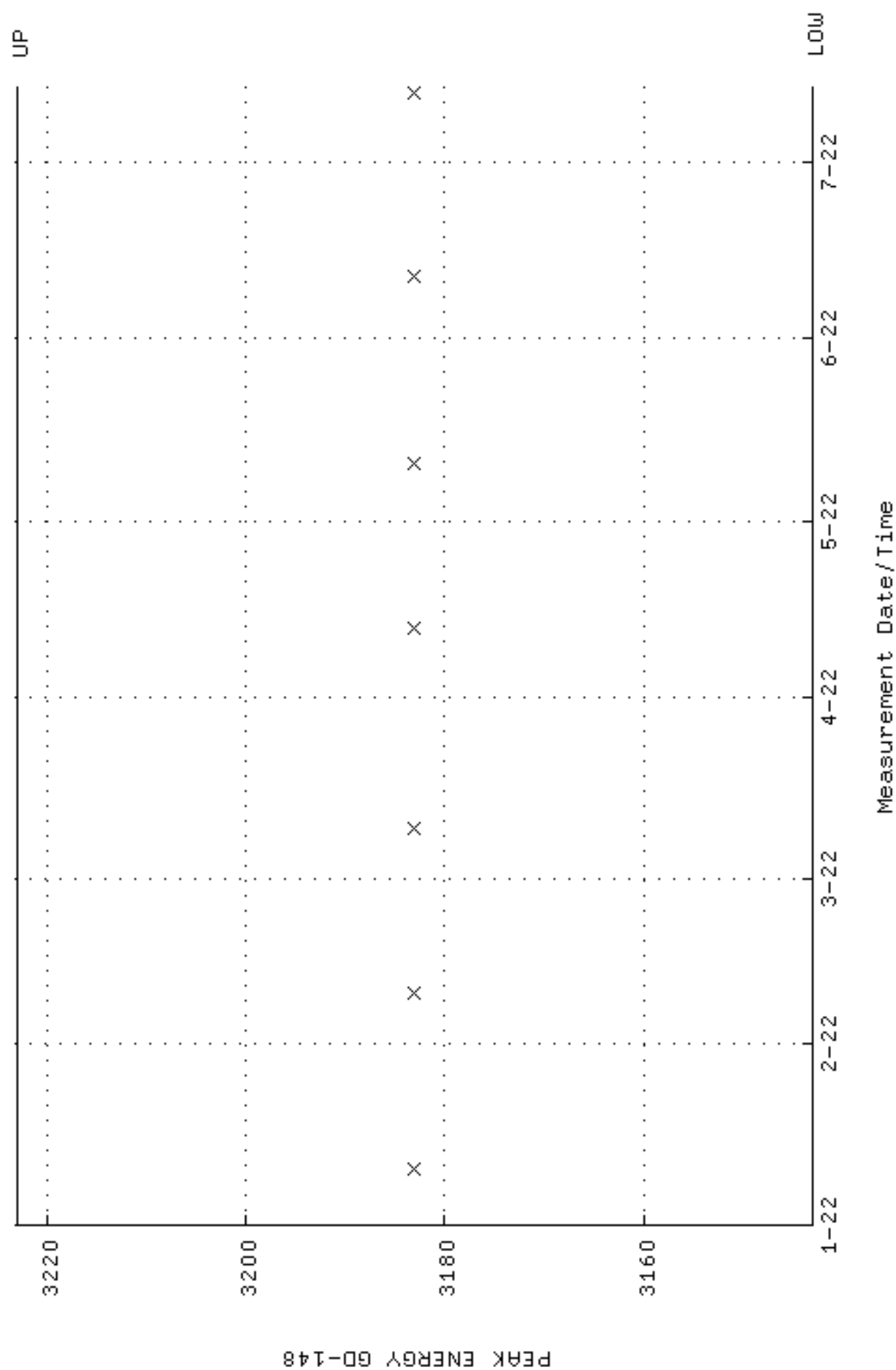
QA filename : DKA100:[ENV_ALPHA.QA.W]W105.QAF;12
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



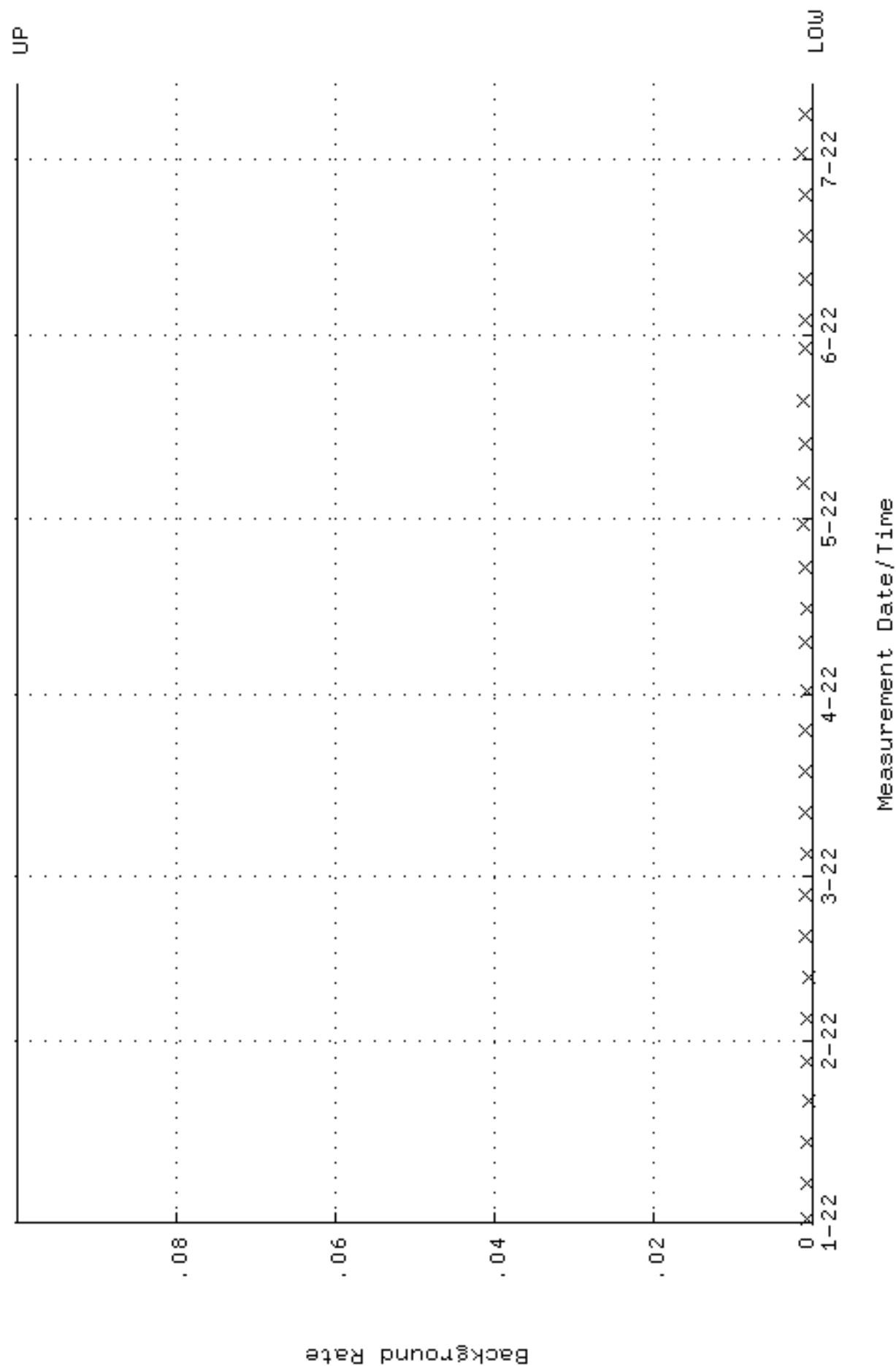
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



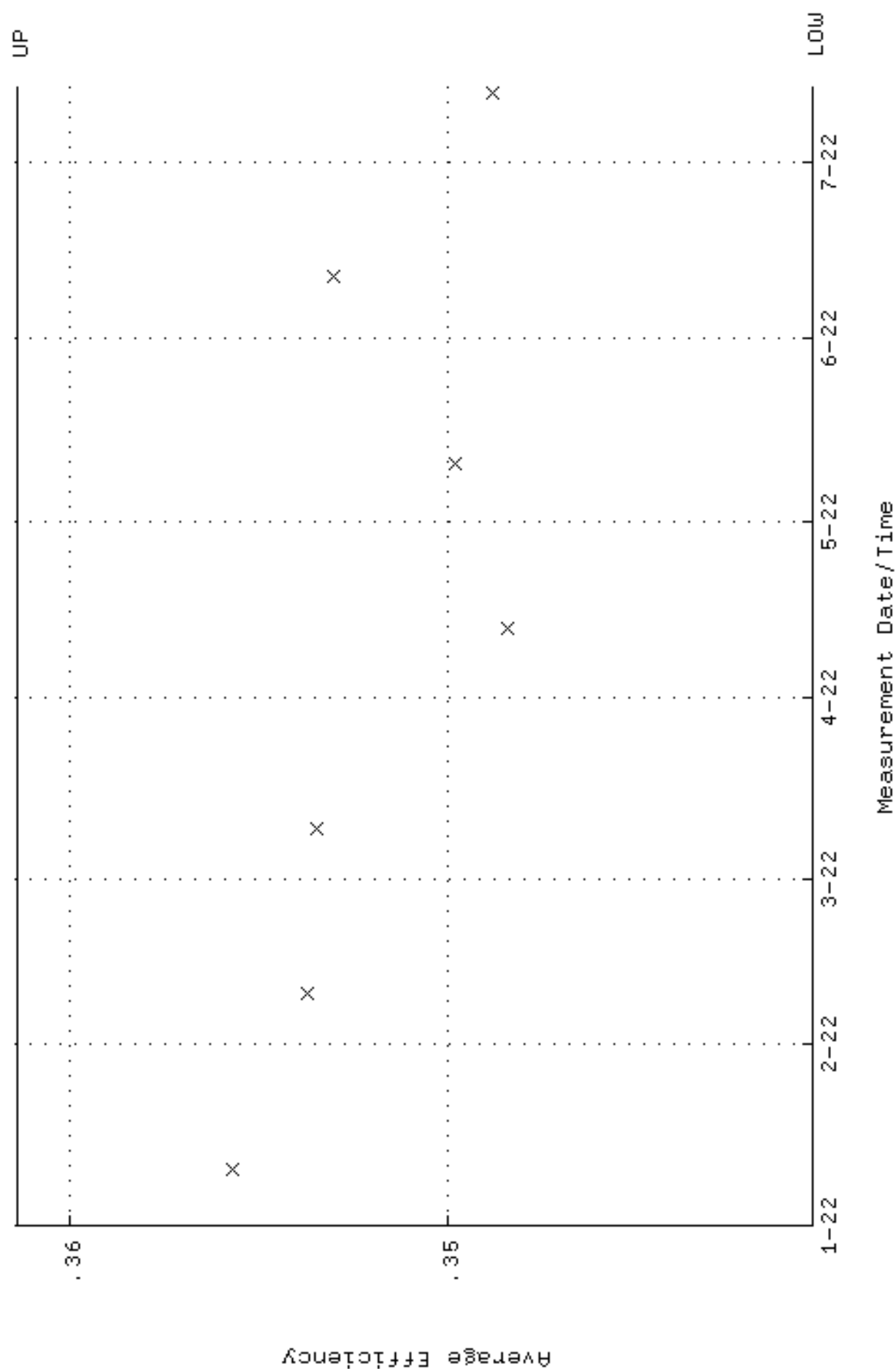
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



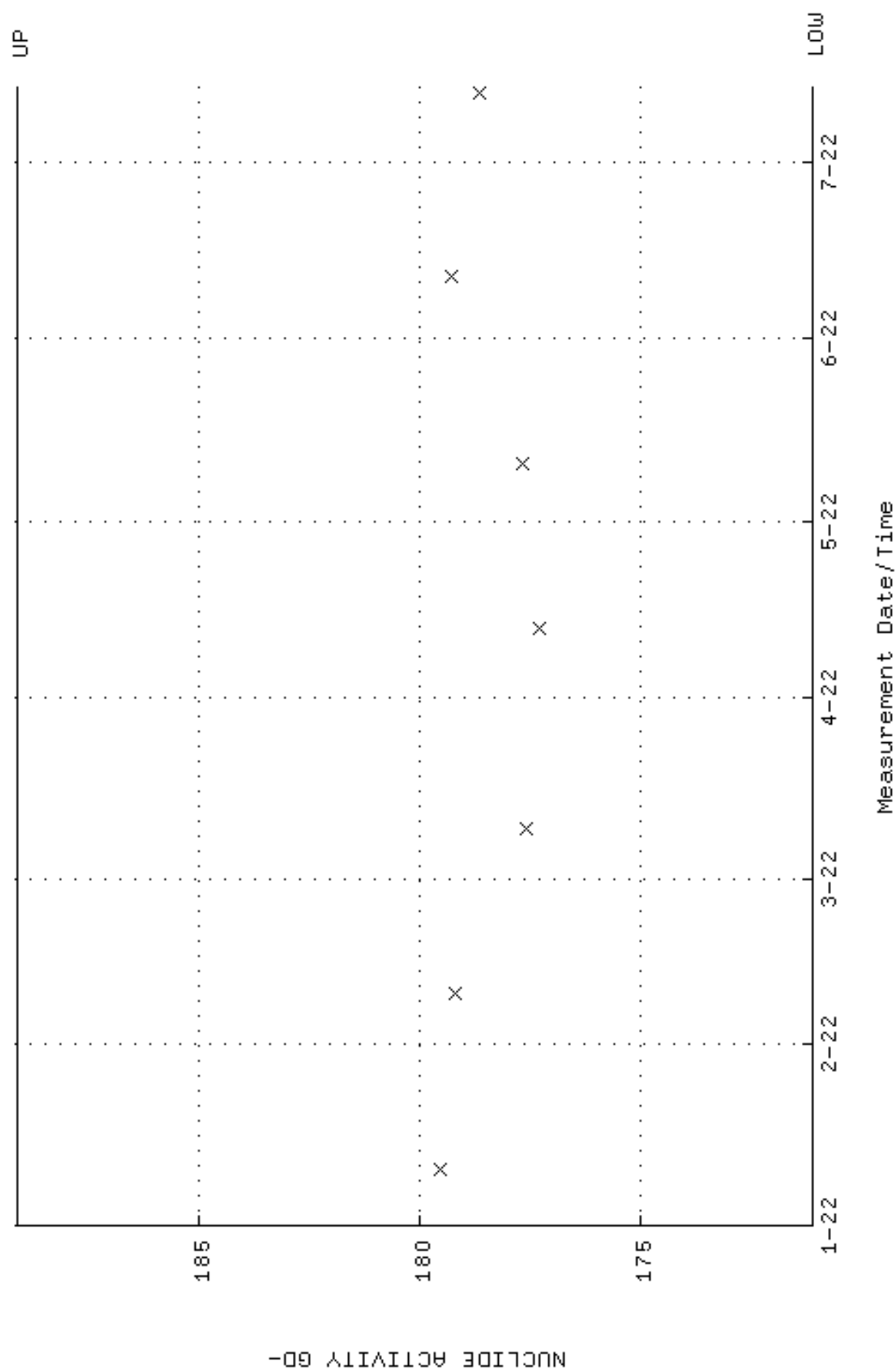
QA filename : DKA100:[ENV_ALPHA.QA.B]B105.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:55:00 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



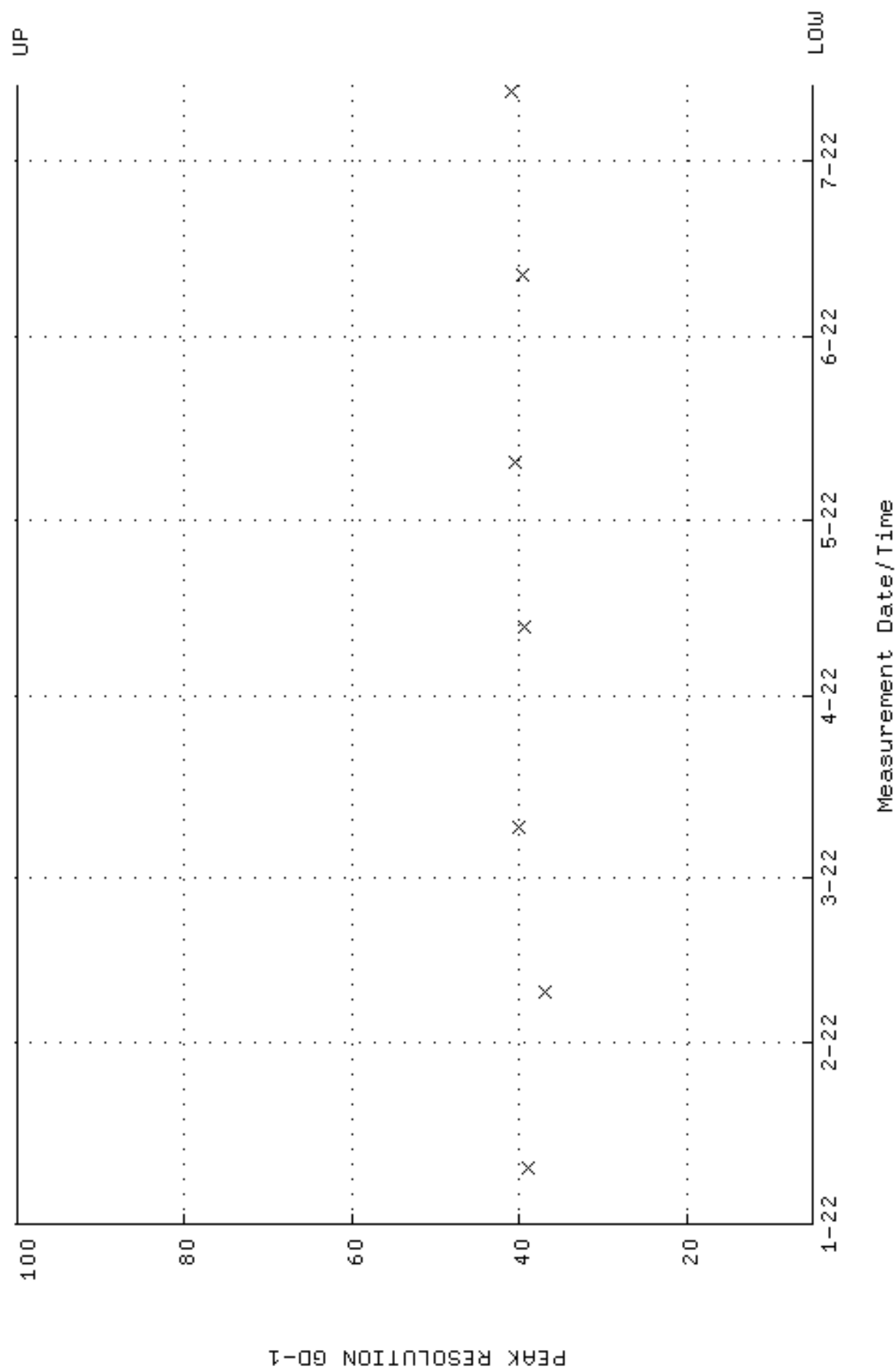
QA filename : DKA100:[ENV_ALPHA.QA.W]W106.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.340300 through 0.361400



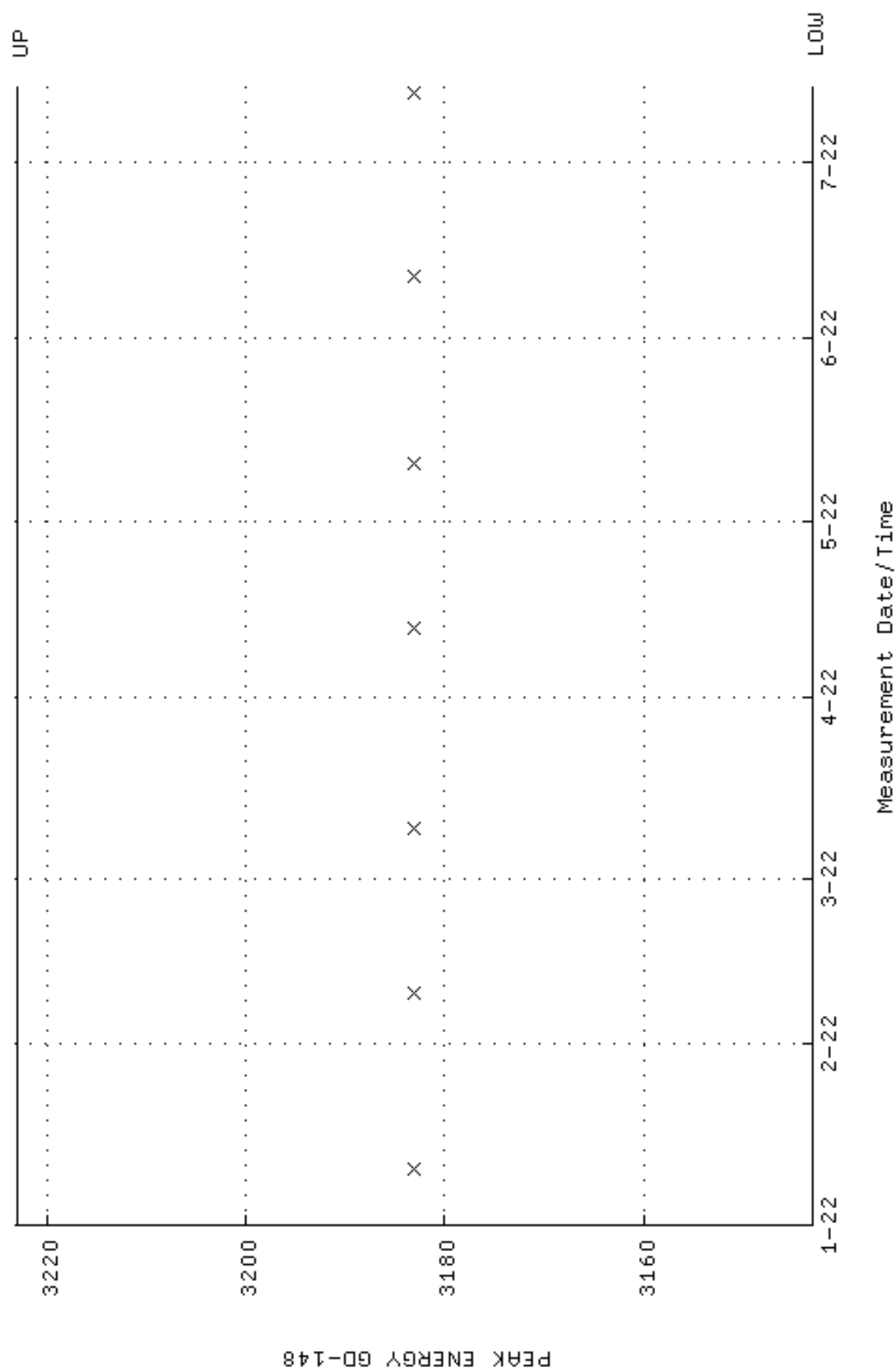
QA filename : DKA100:[ENV_ALPHA.QA.W]W106.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



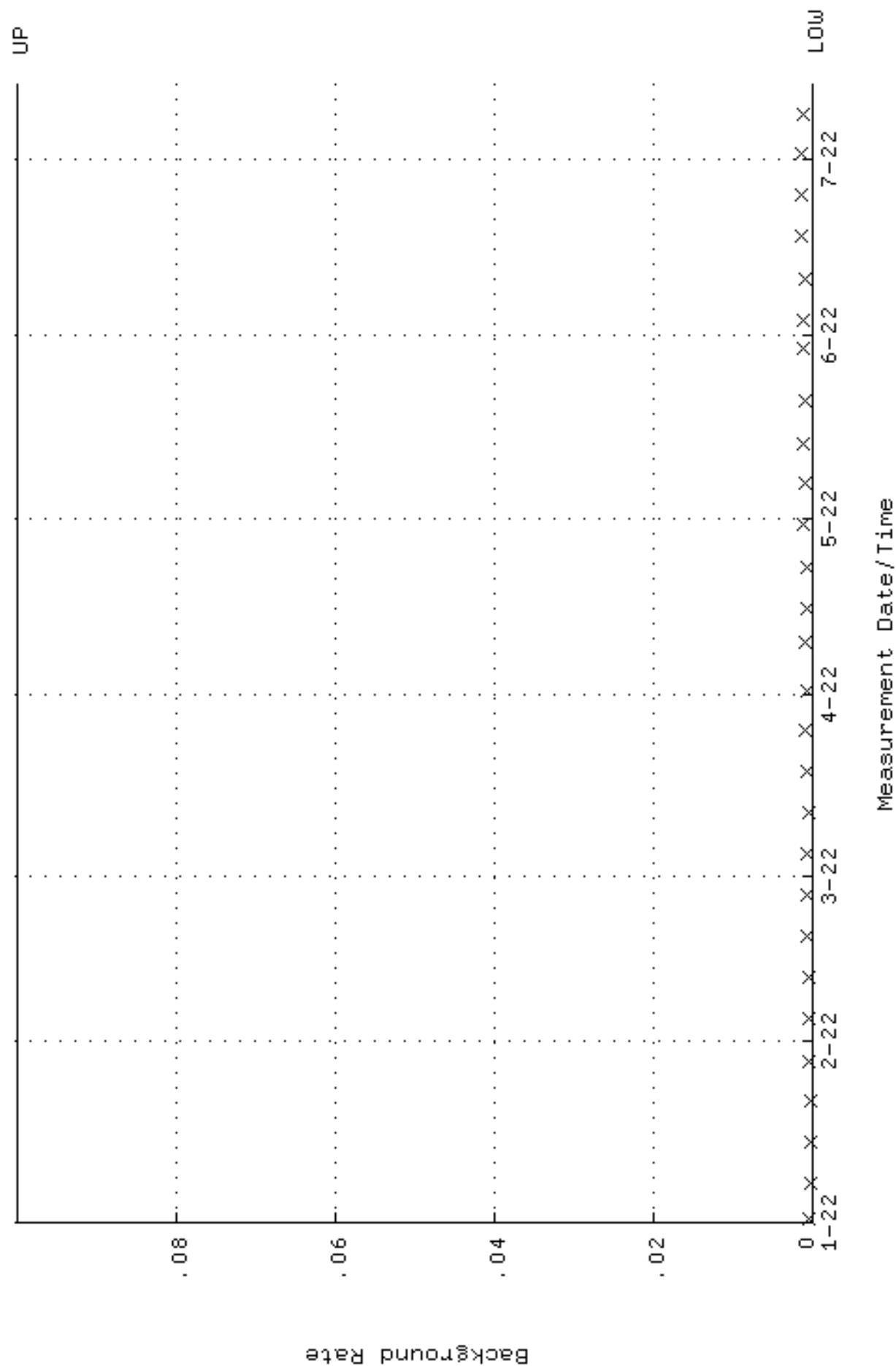
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



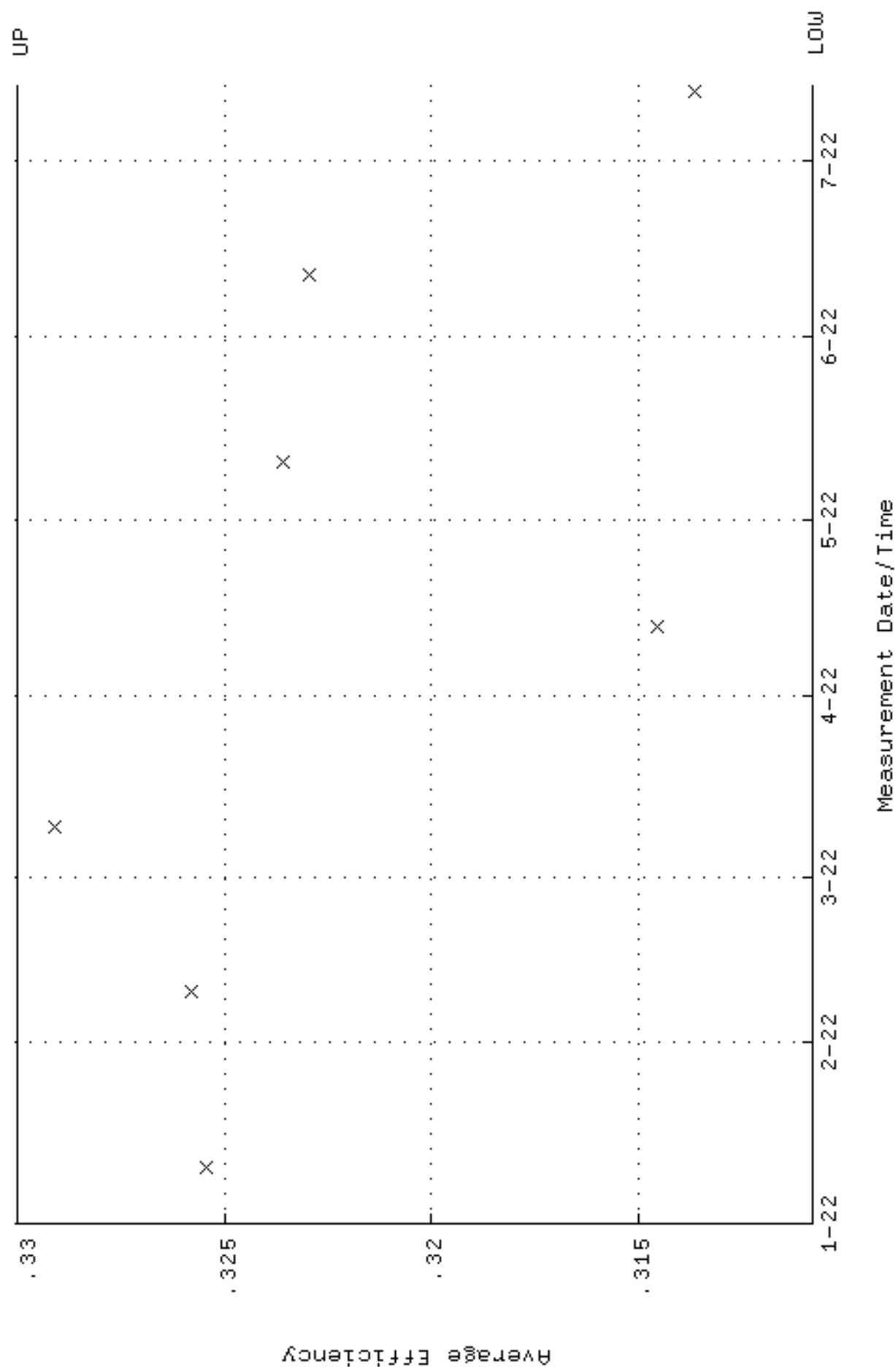
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



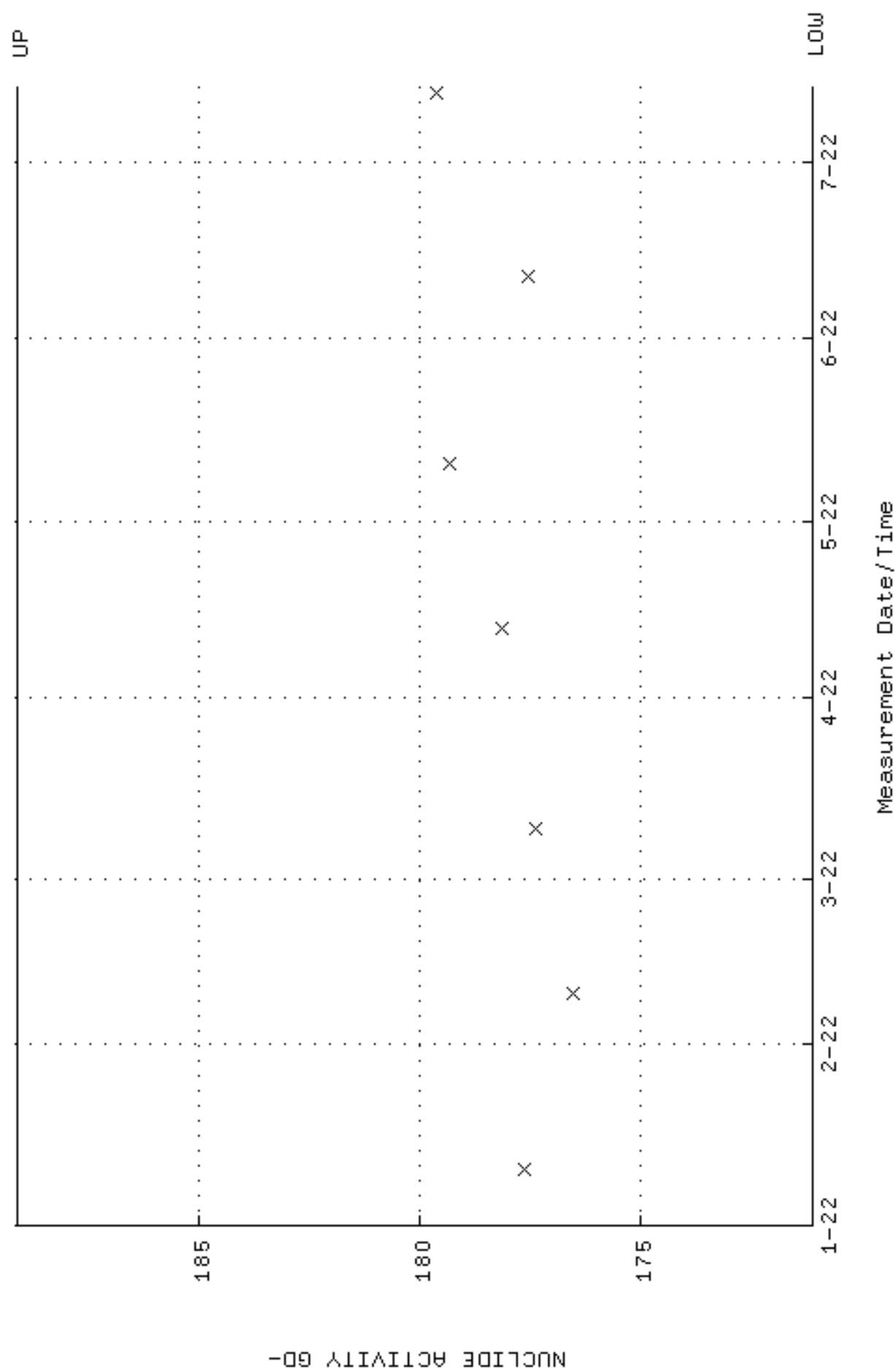
QA filename : DKA100:[ENV_ALPHA.QA.B]B106.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:55:00 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



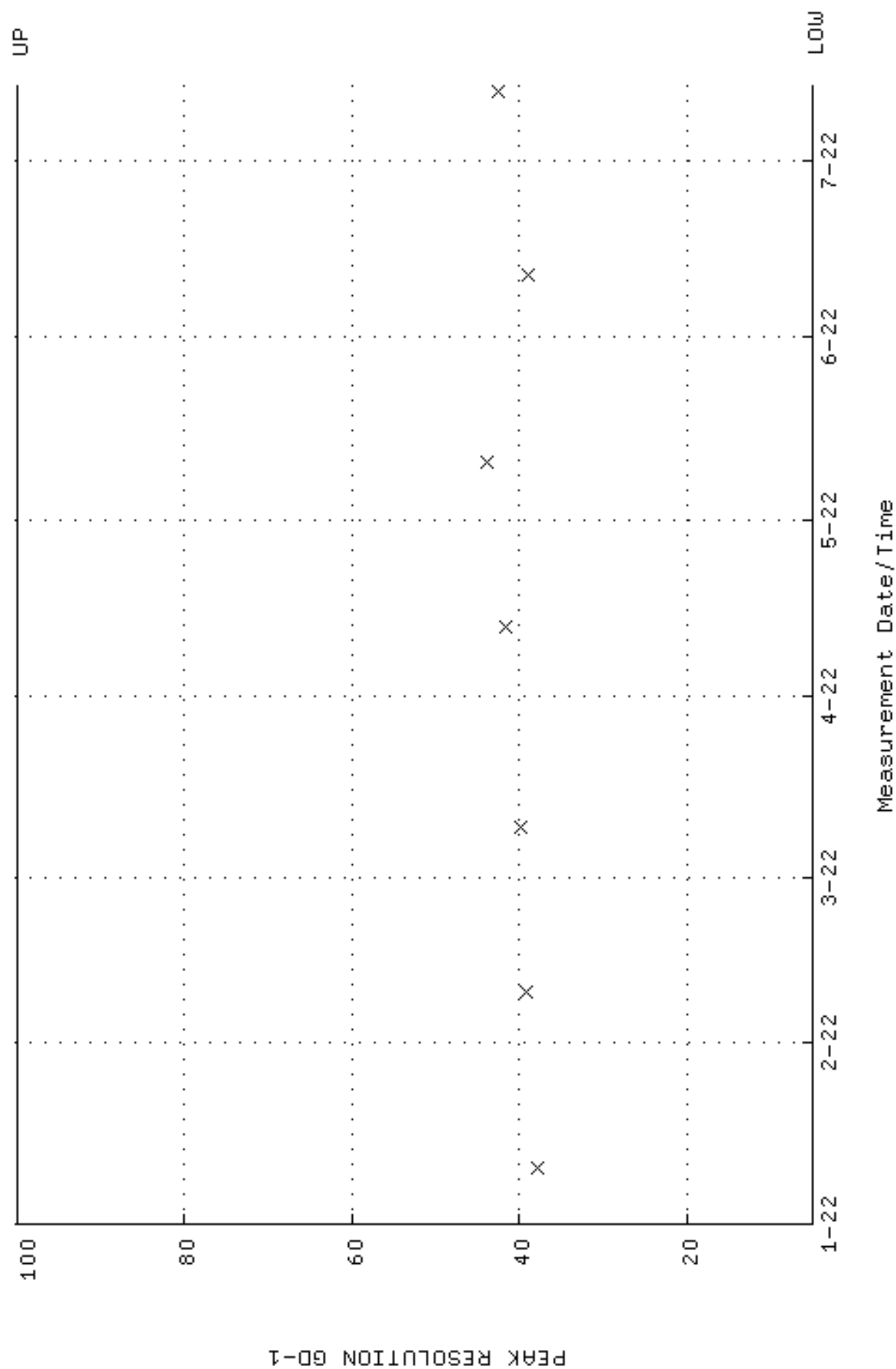
QA filename : DKA100:[ENV_ALPHA.QA.W]W107.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:18:01 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.310800 through 0.330000



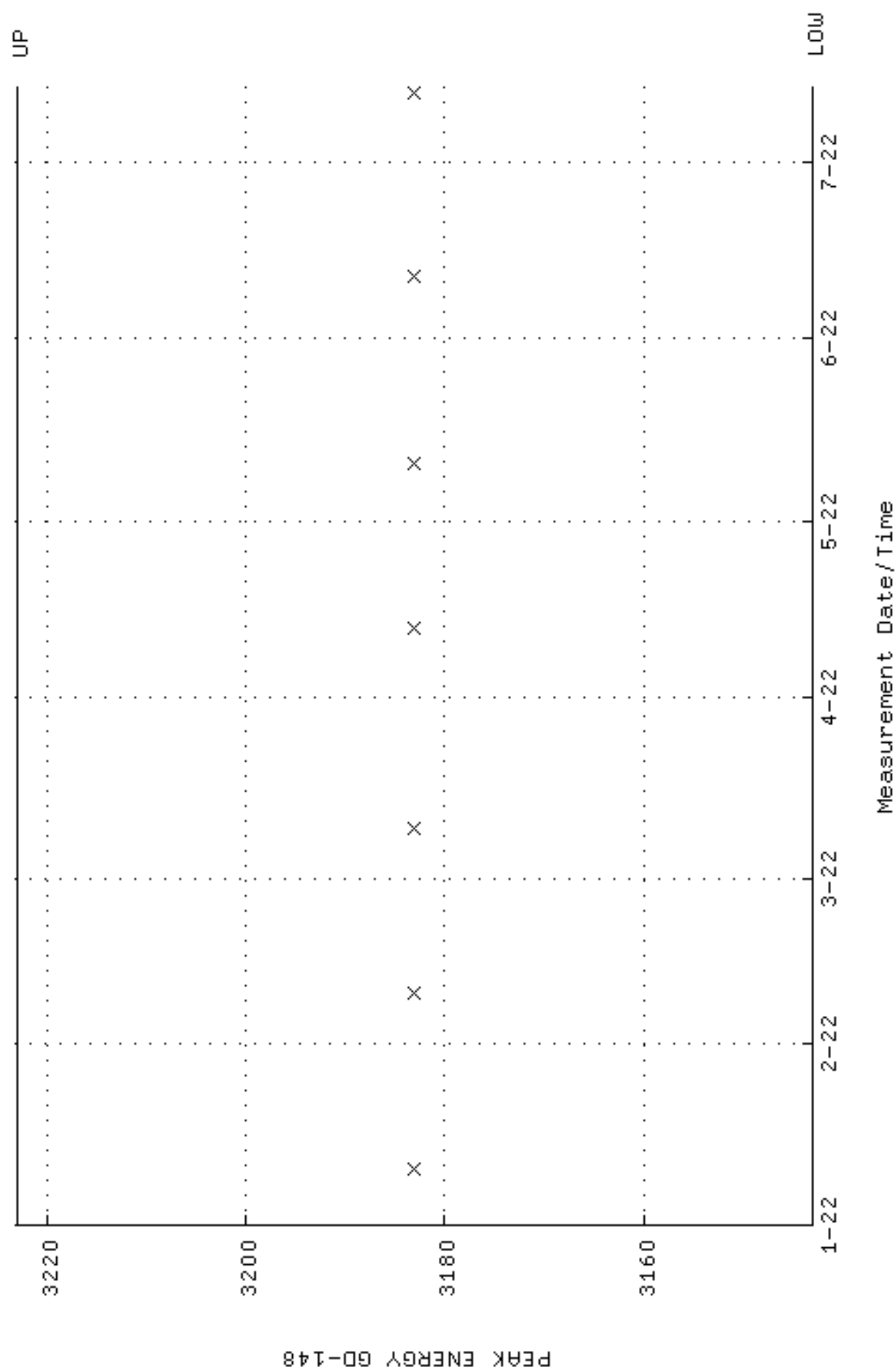
QA filename : DKA100:[ENV_ALPHA.QA.W]W107.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:18:01 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



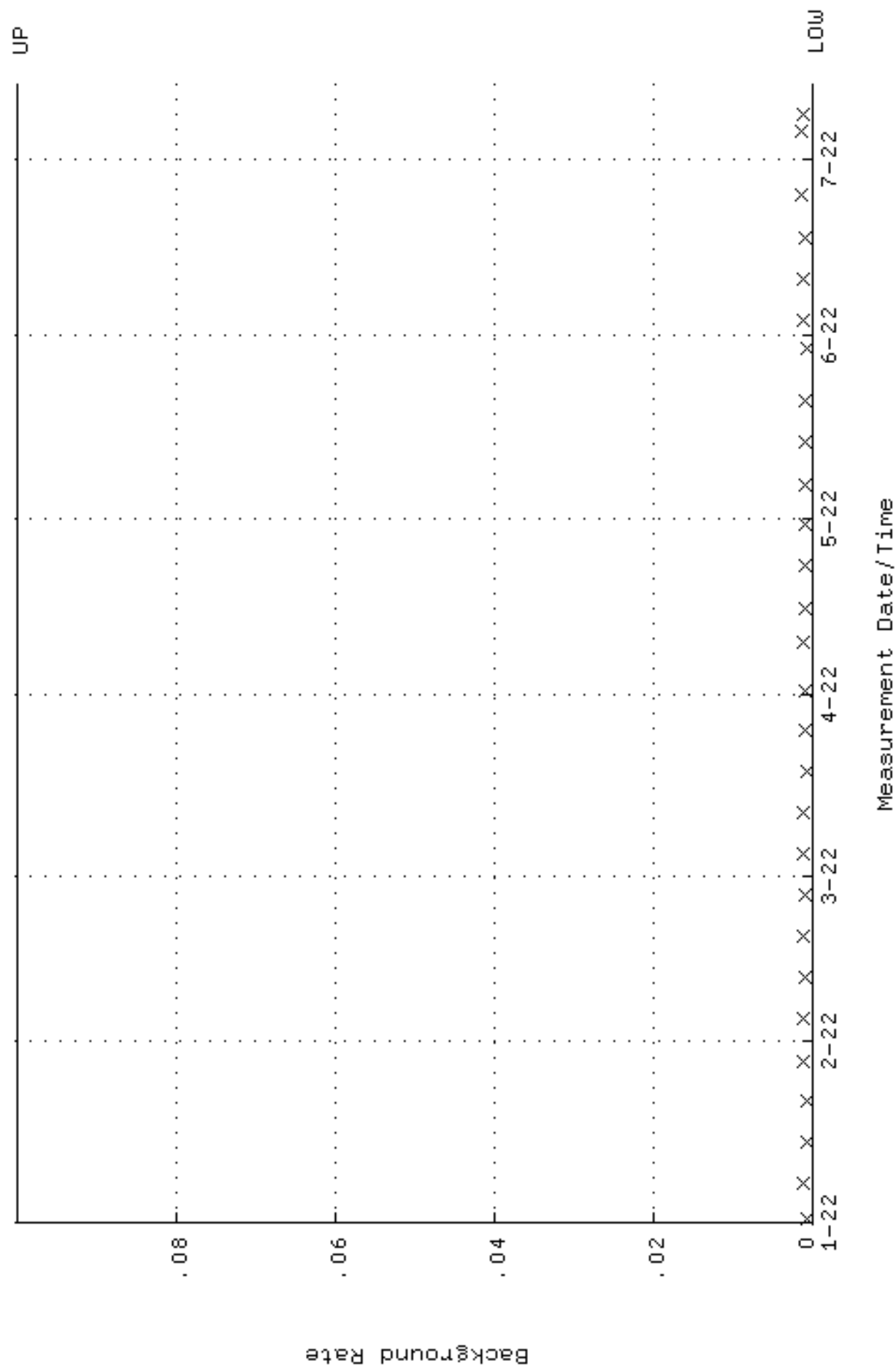
QA filename : DKA100:[ENV_ALPHA.QA.W]W107.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:18:01 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



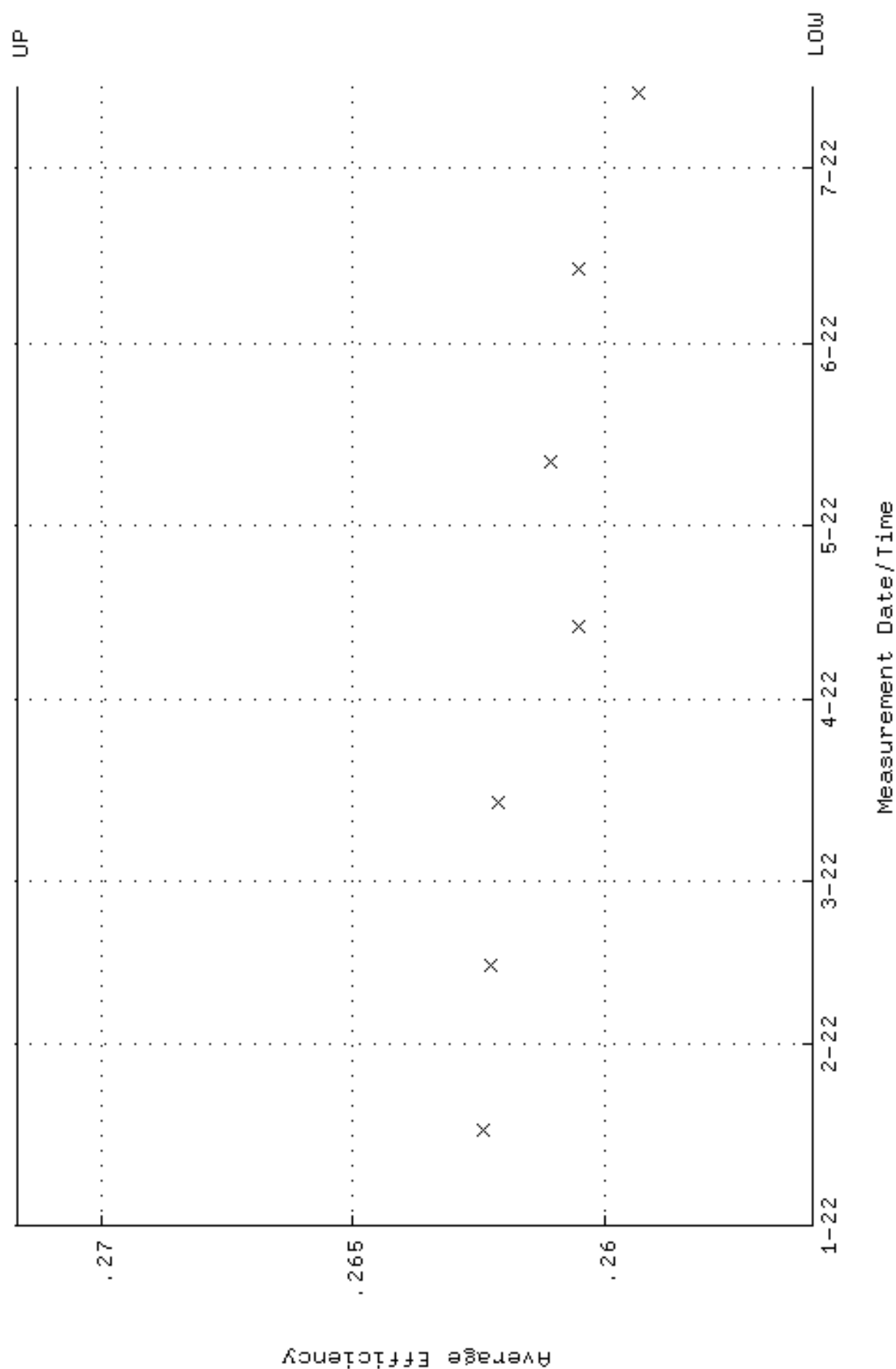
QA filename : DKA100:[ENV_ALPHA.QA.W]W107.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:18:01 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



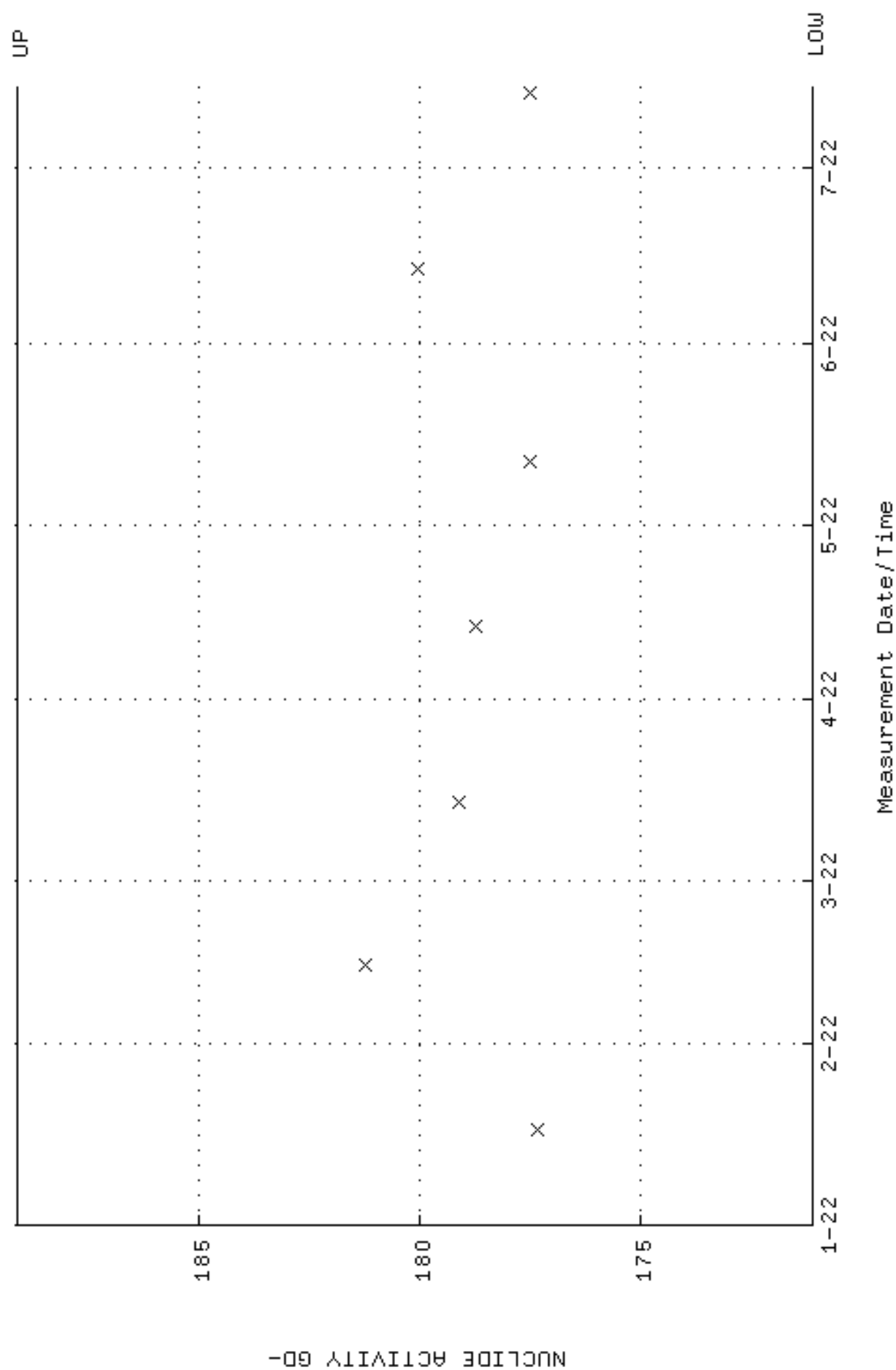
QA filename : DKA100:[ENV_ALPHA.QA.B]B107.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:55:01 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



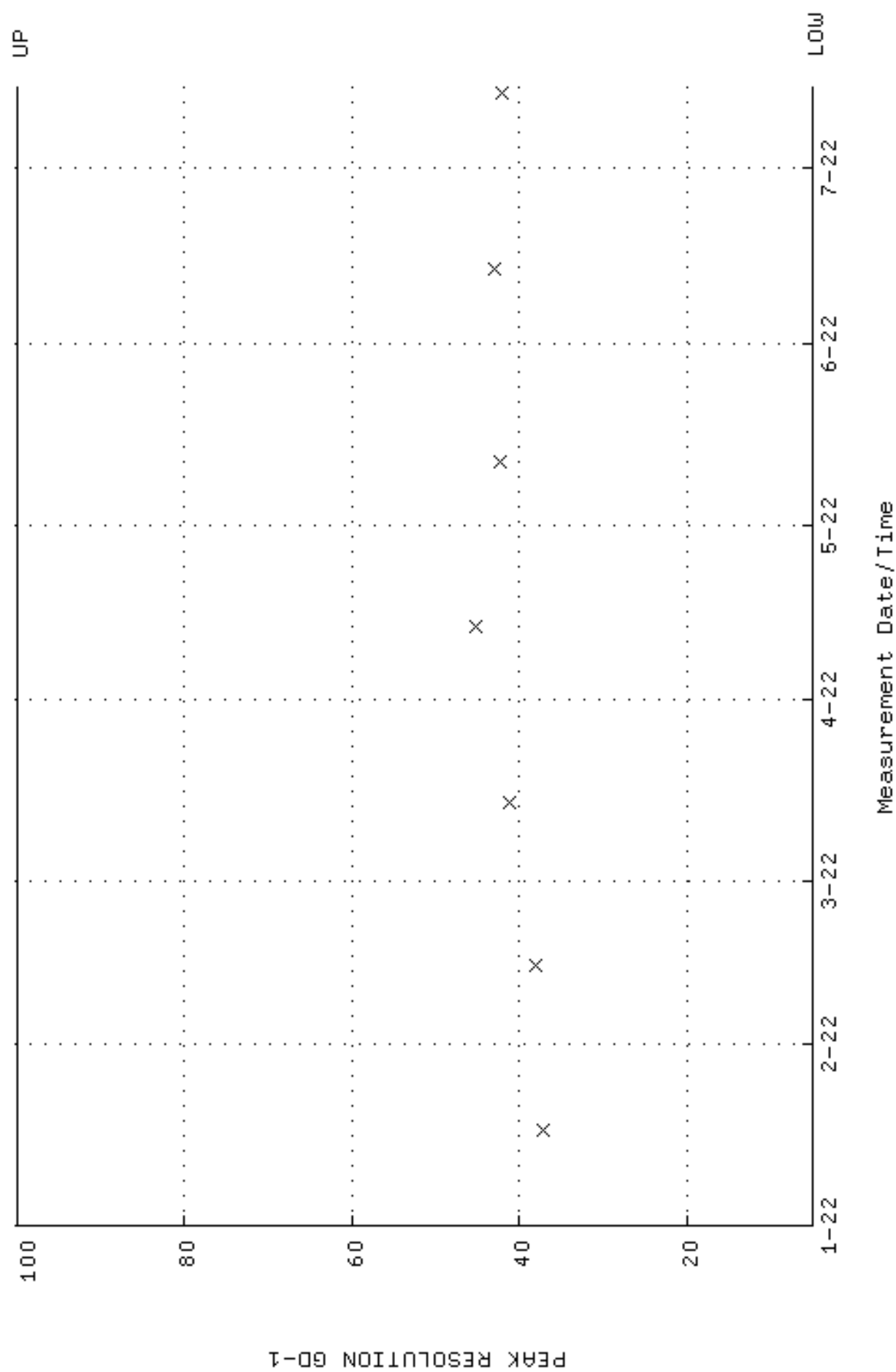
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 17-JAN-2022 08:51:51 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.255850 through 0.271680



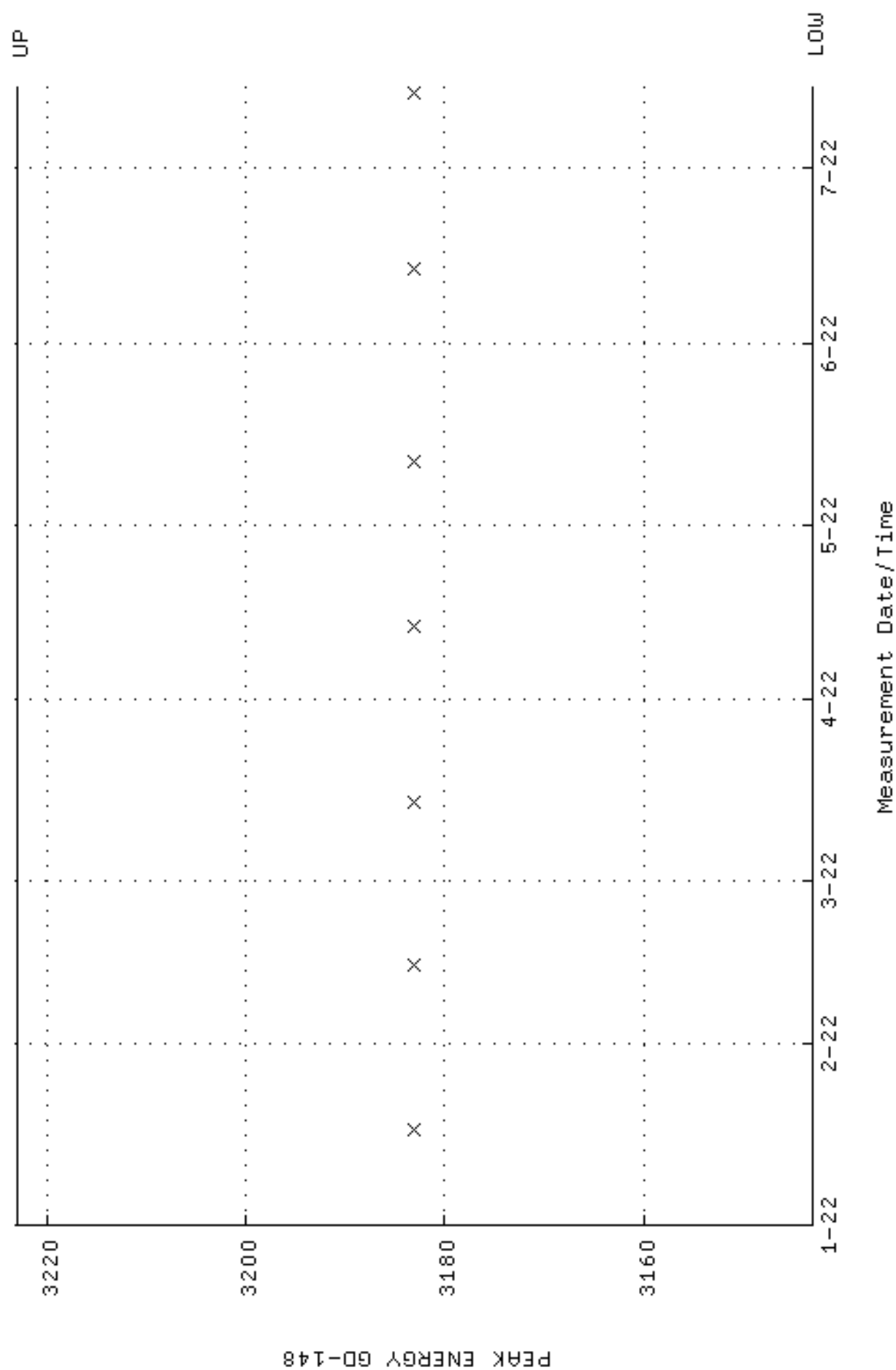
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 17-JAN-2022 08:51:51 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



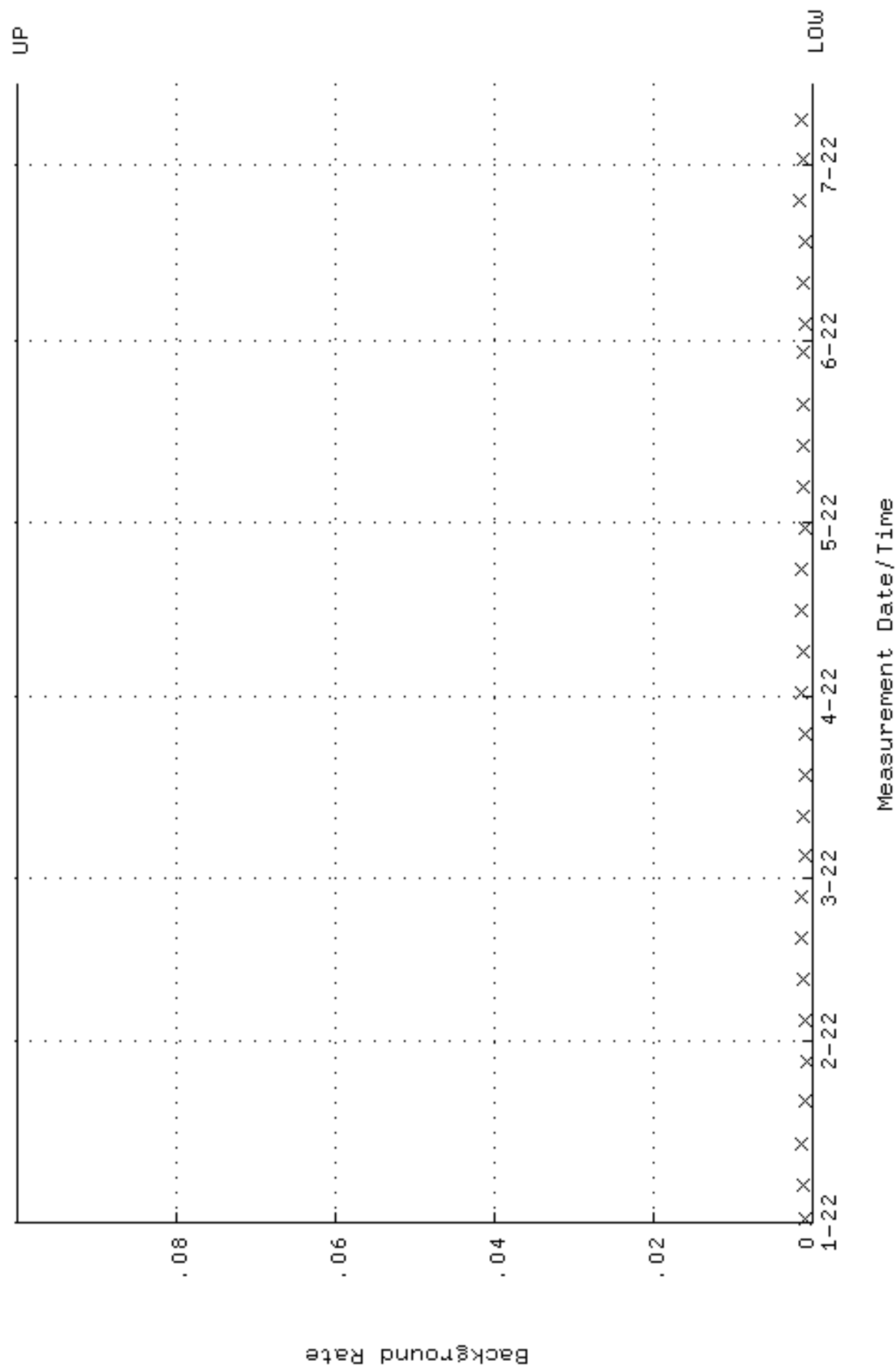
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 17-JAN-2022 08:51:51 through 14-JUL-2022 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



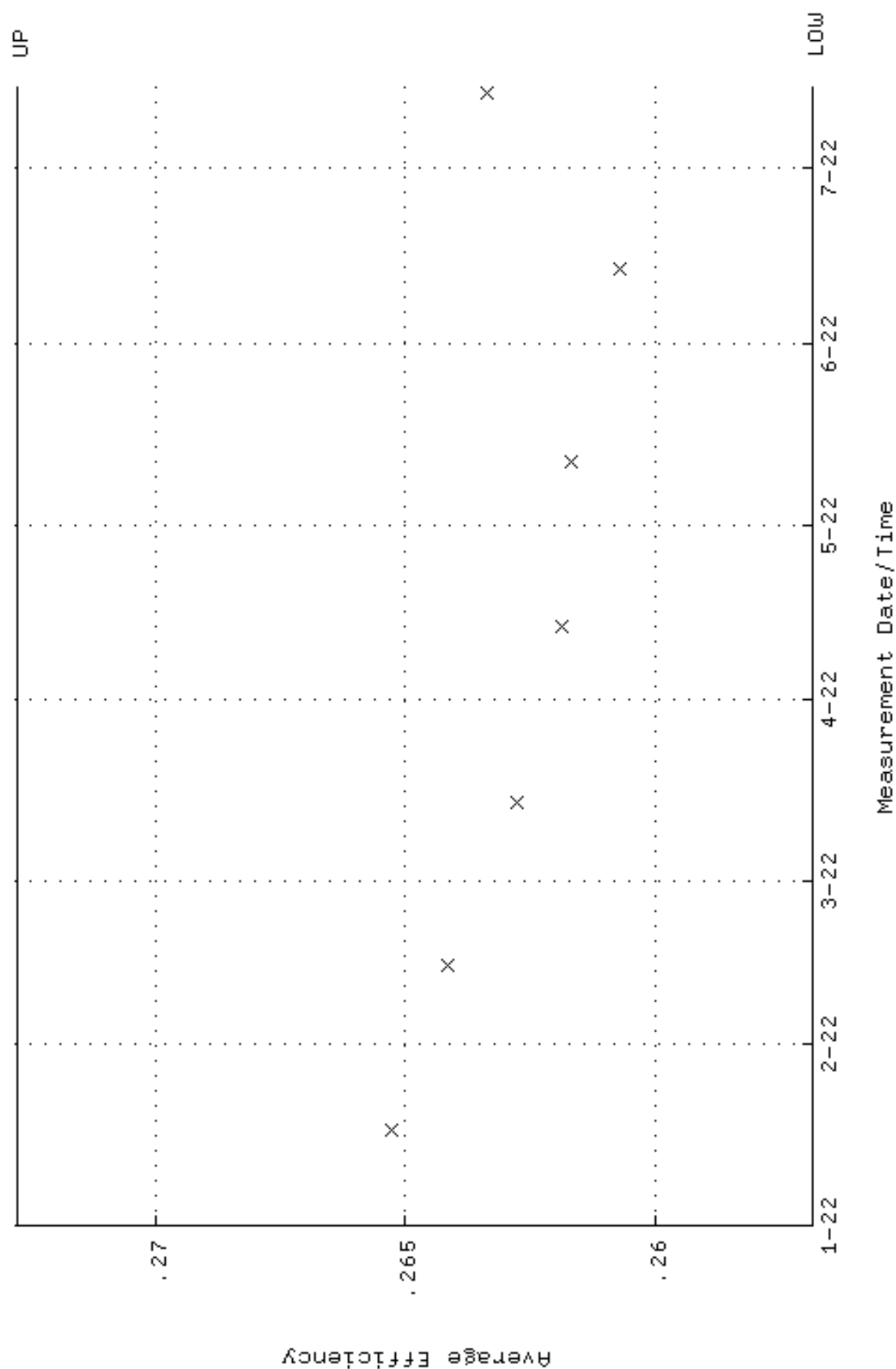
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 17-JAN-2022 08:51:51 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



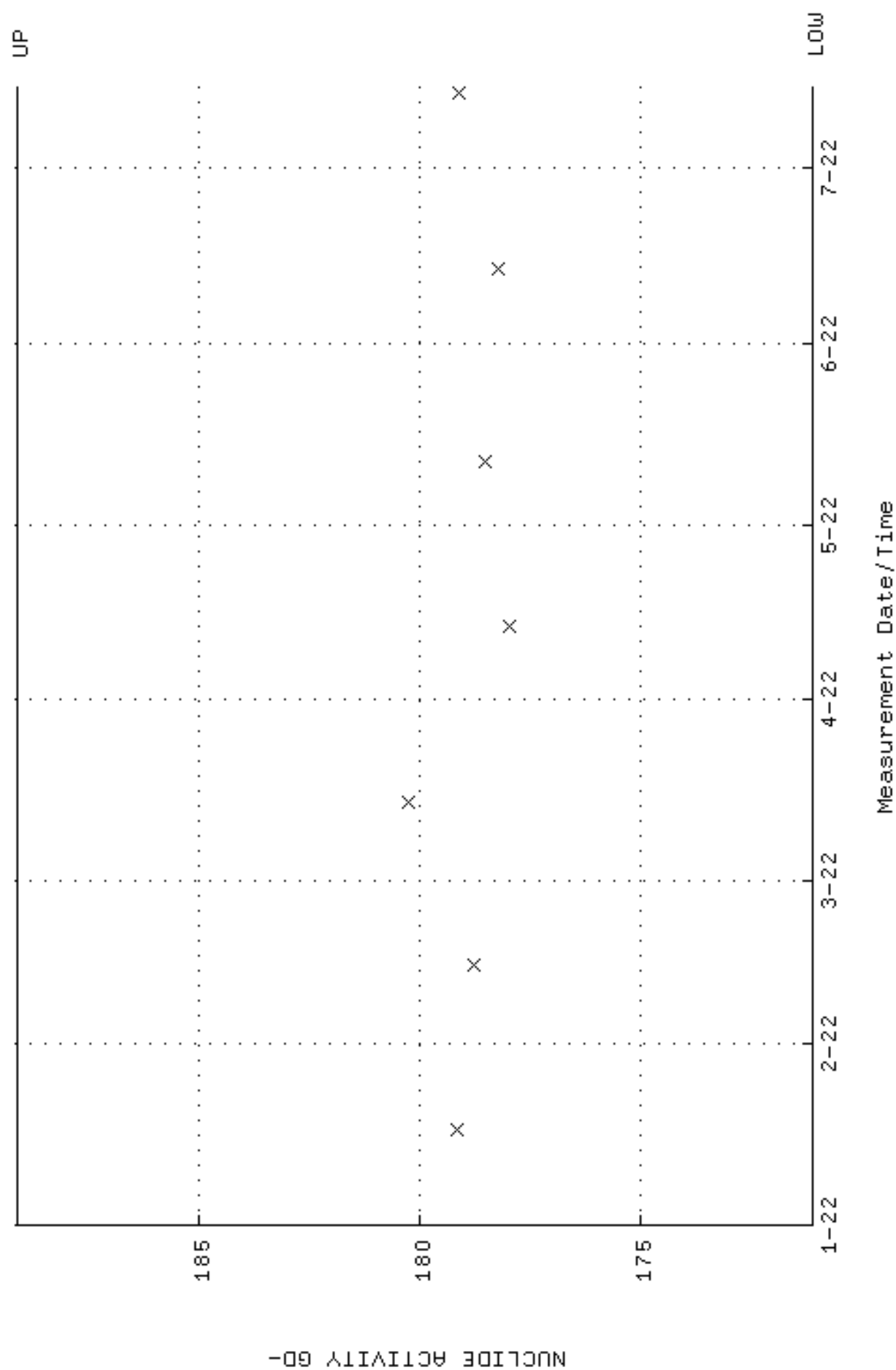
QA filename : DKA100:[ENV_ALPHA.QA.B]B113.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:04:29 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



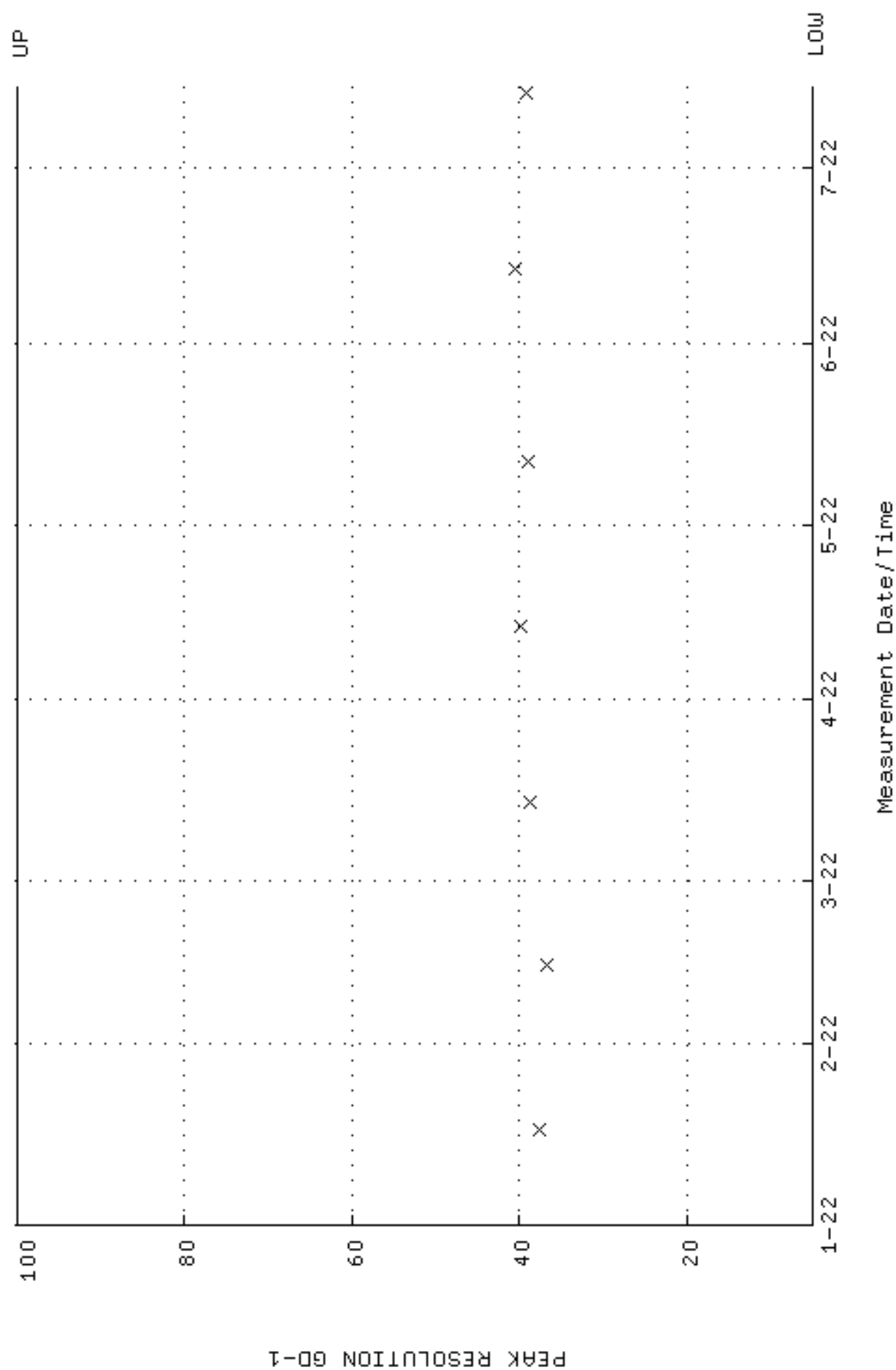
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 17-JAN-2022 09:45:58 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.256860 through 0.272750



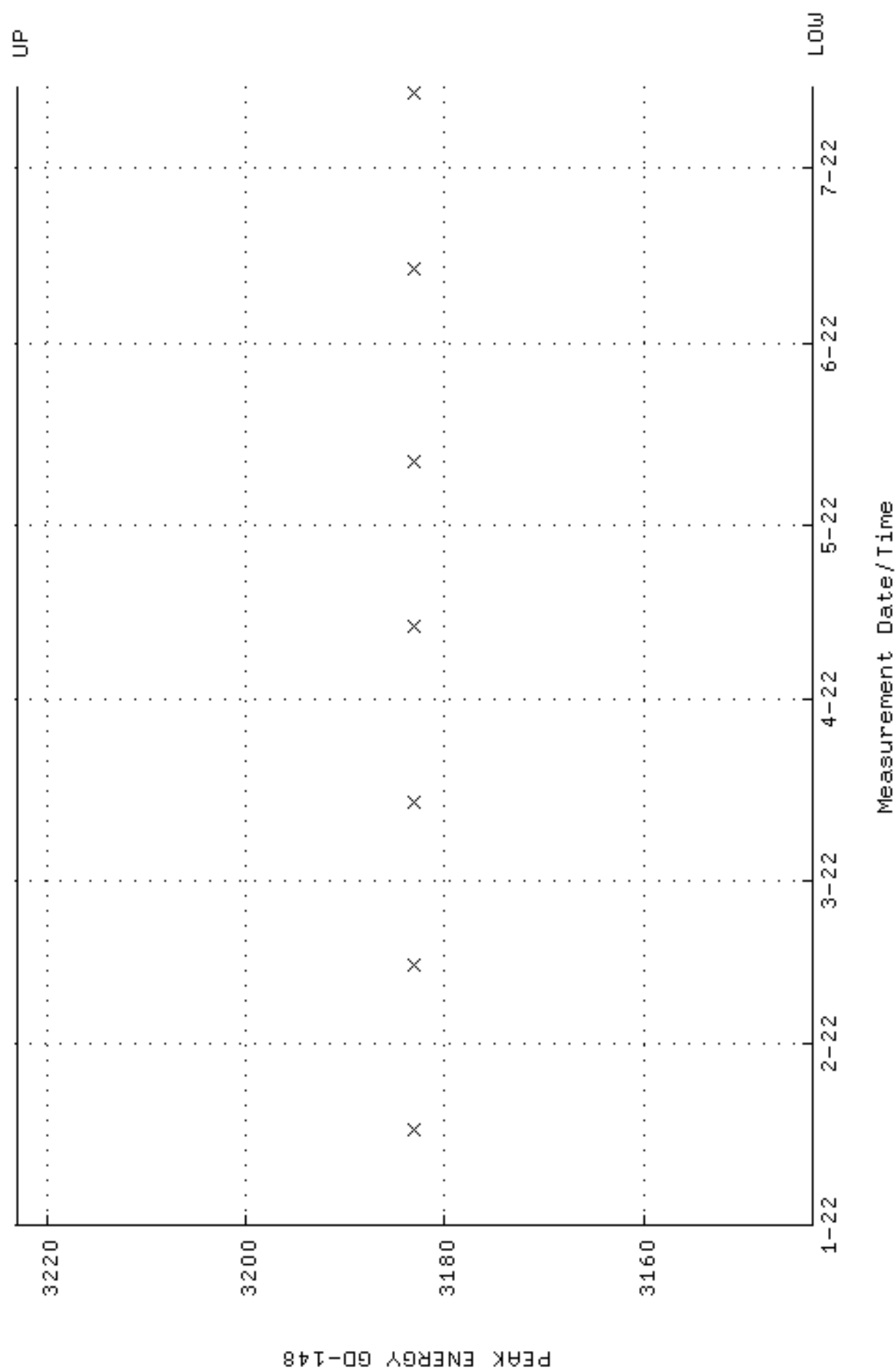
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 17-JAN-2022 09:45:58 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



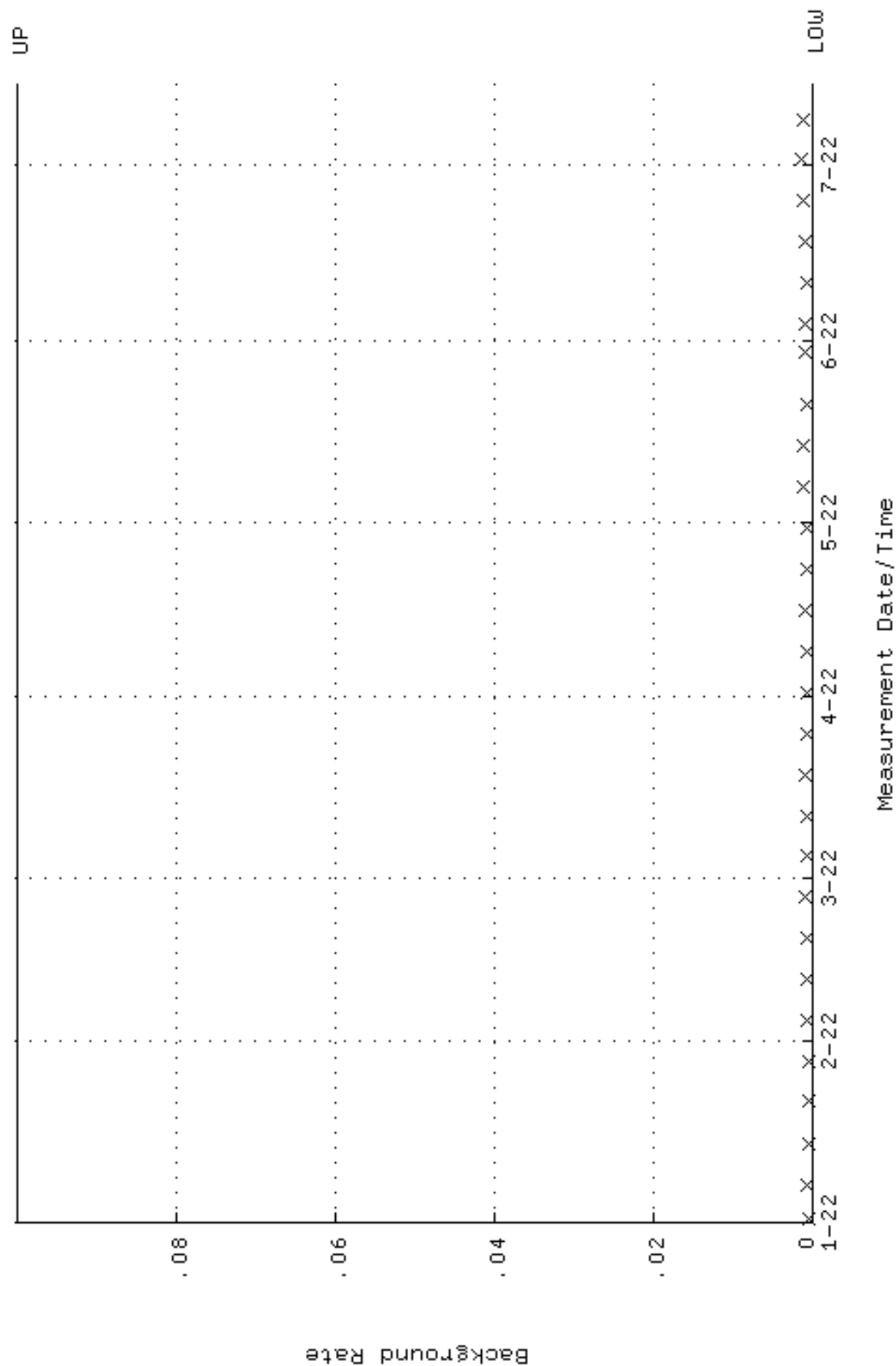
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 17-JAN-2022 09:45:58 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



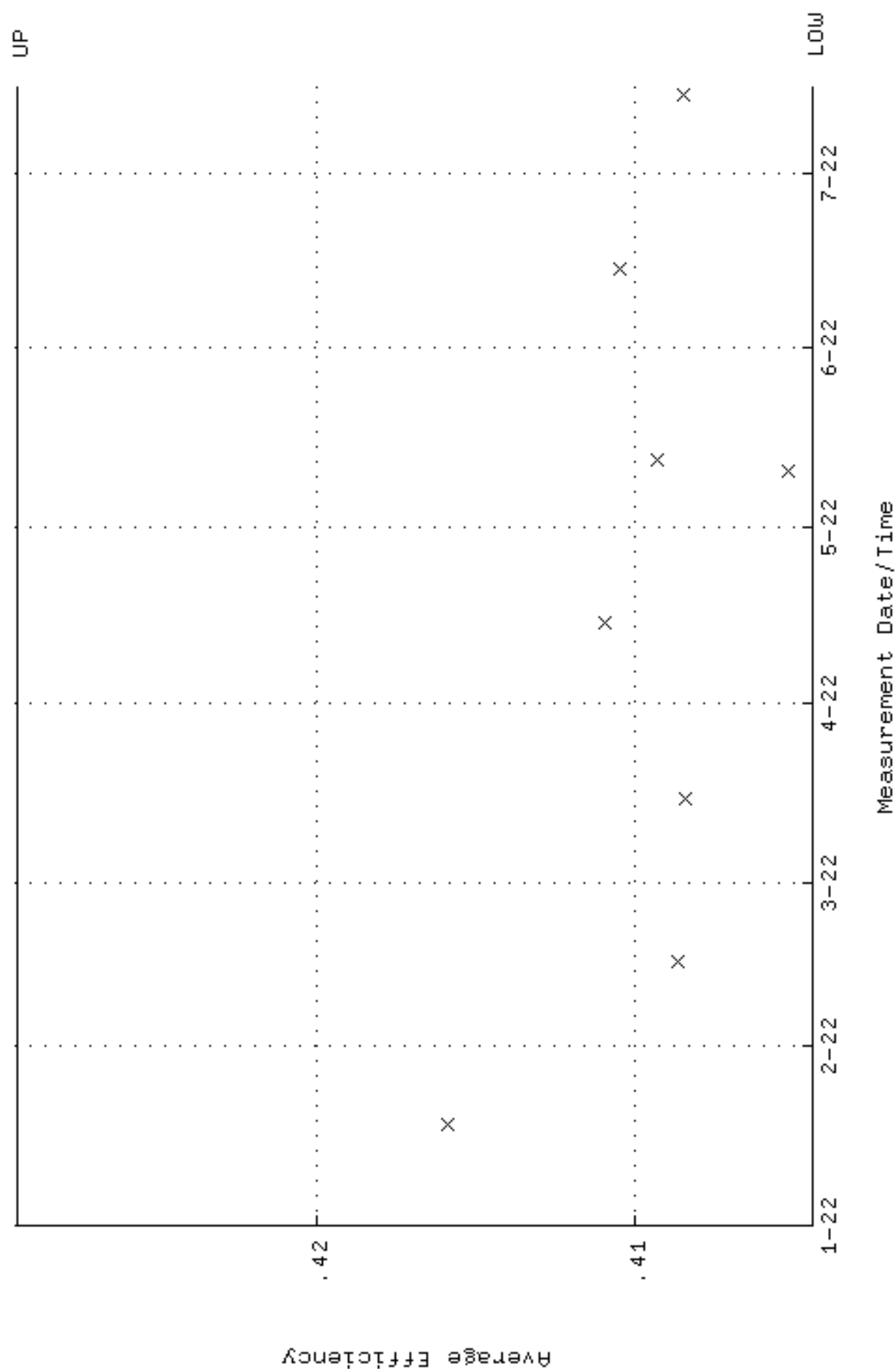
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 17-JAN-2022 09:45:58 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



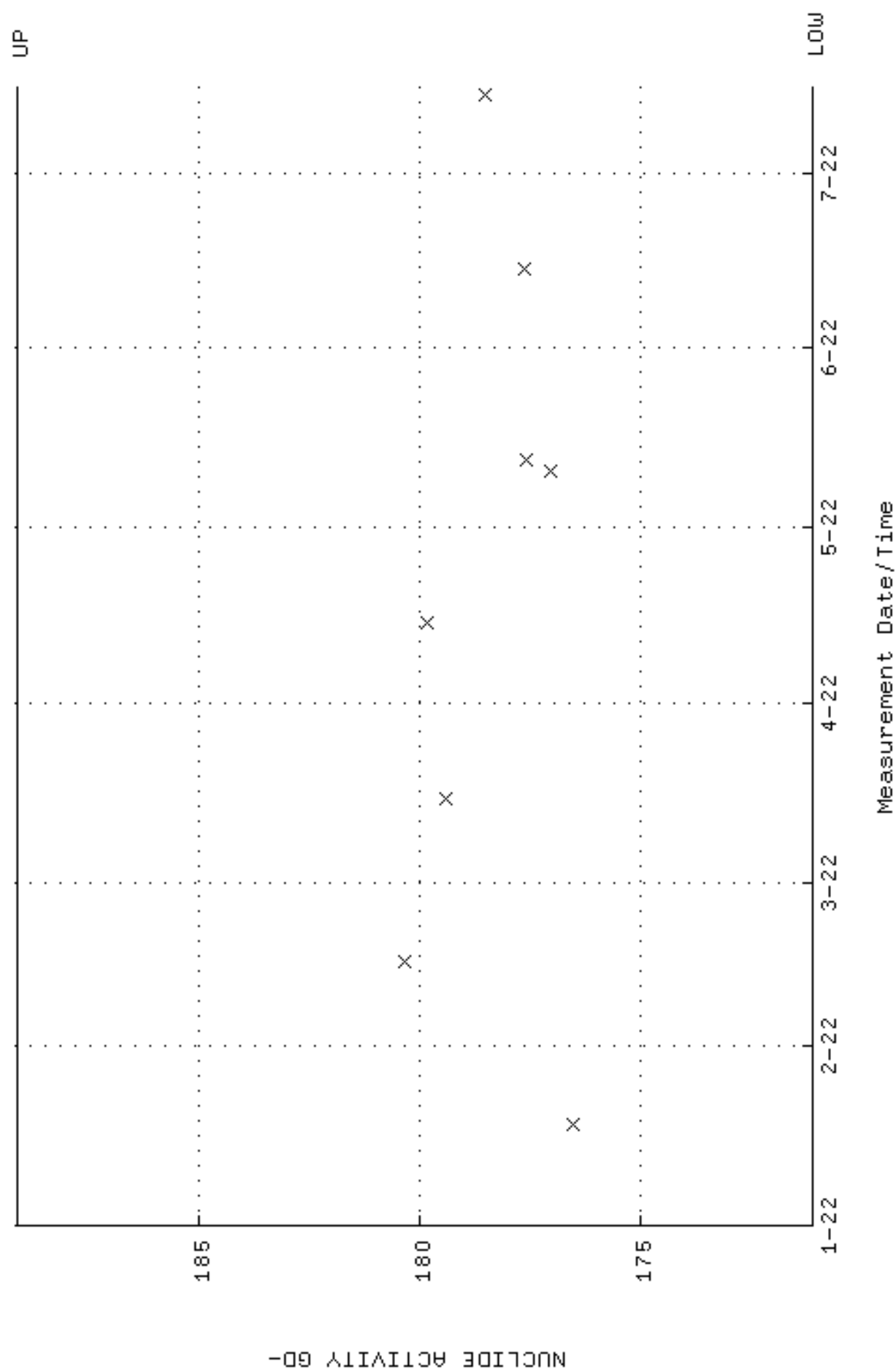
QA filename : DKA100:[ENV_ALPHA.QA.B]B114.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:04:33 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



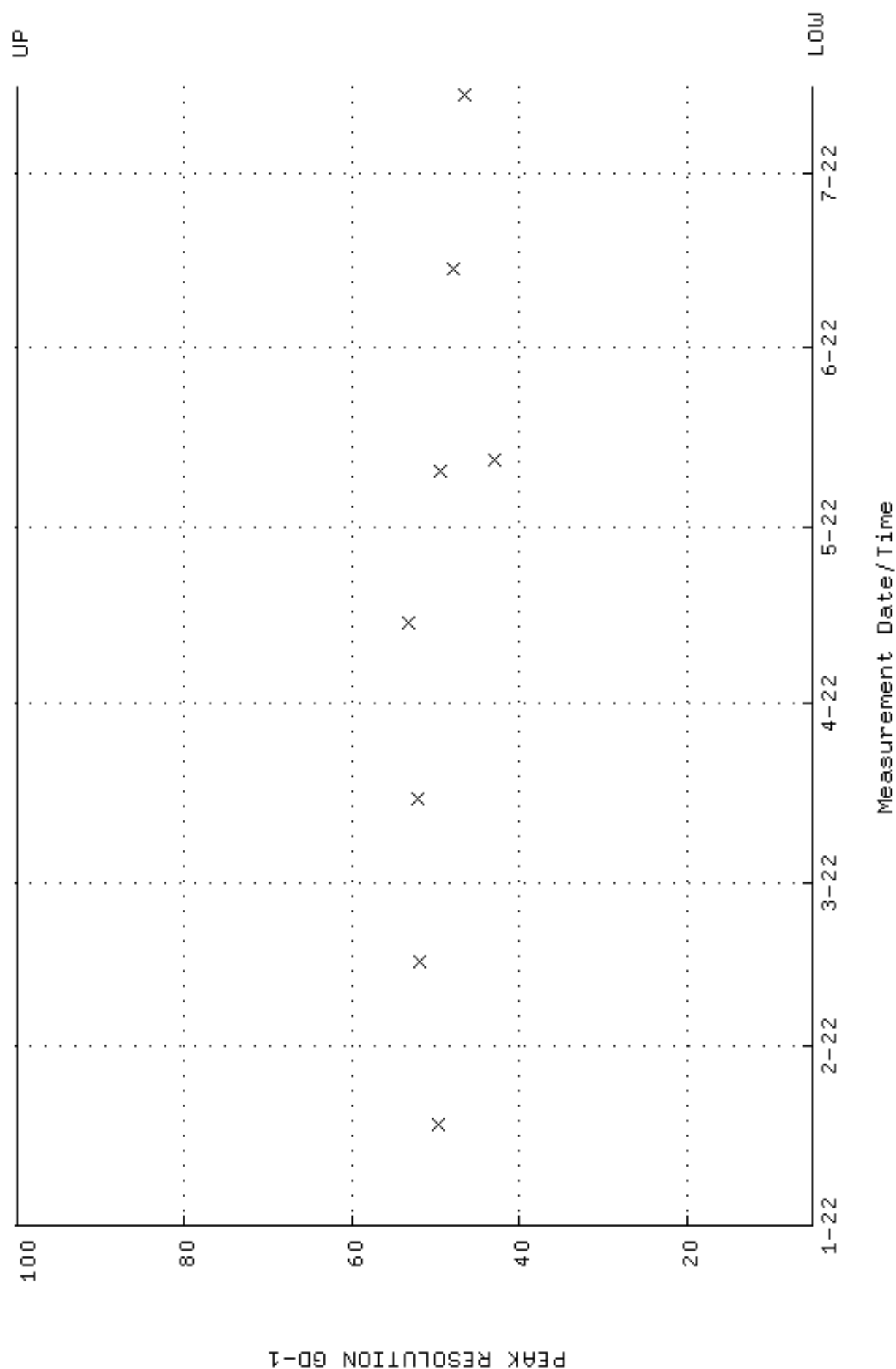
QA filename : DKA100:[ENV_ALPHA.QA.W]W139.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JAN-2022 11:25:39 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.404411 through 0.429430



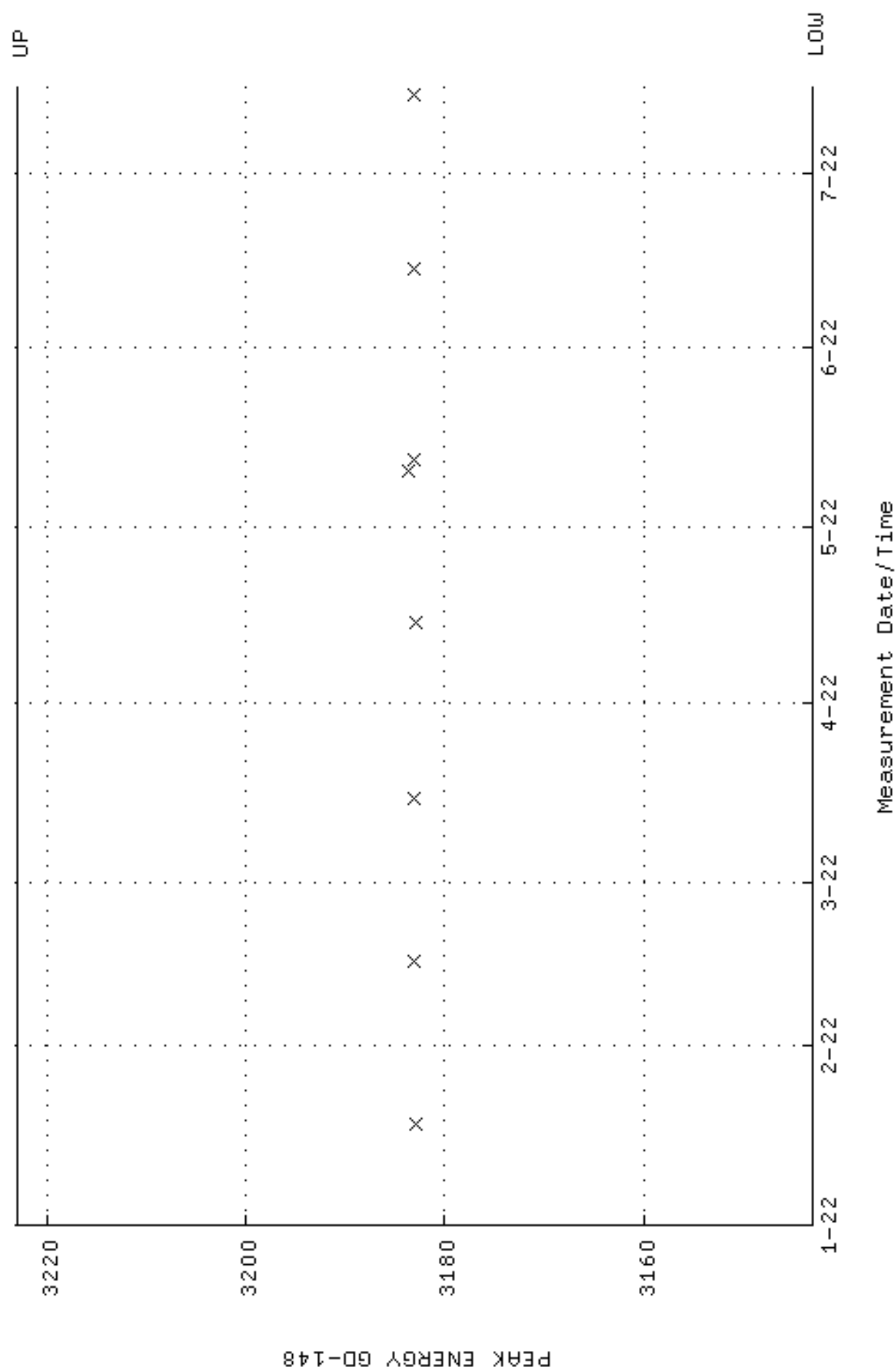
QA filename : DKA100:[ENV_ALPHA.QA.W]W139.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JAN-2022 11:25:39 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



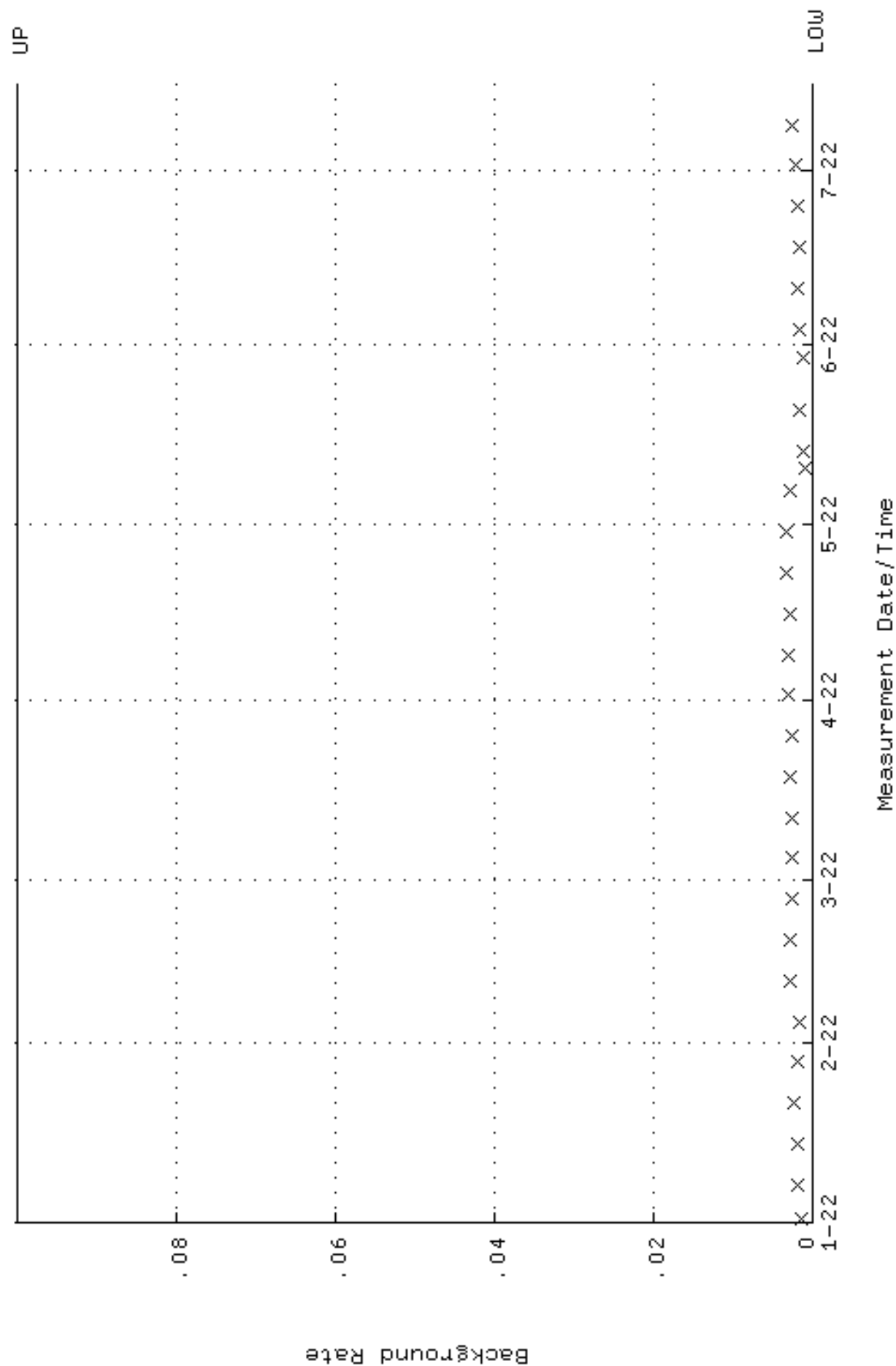
QA filename : DKA100:[ENV_ALPHA.QA.W]W139.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JAN-2022 11:25:39 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



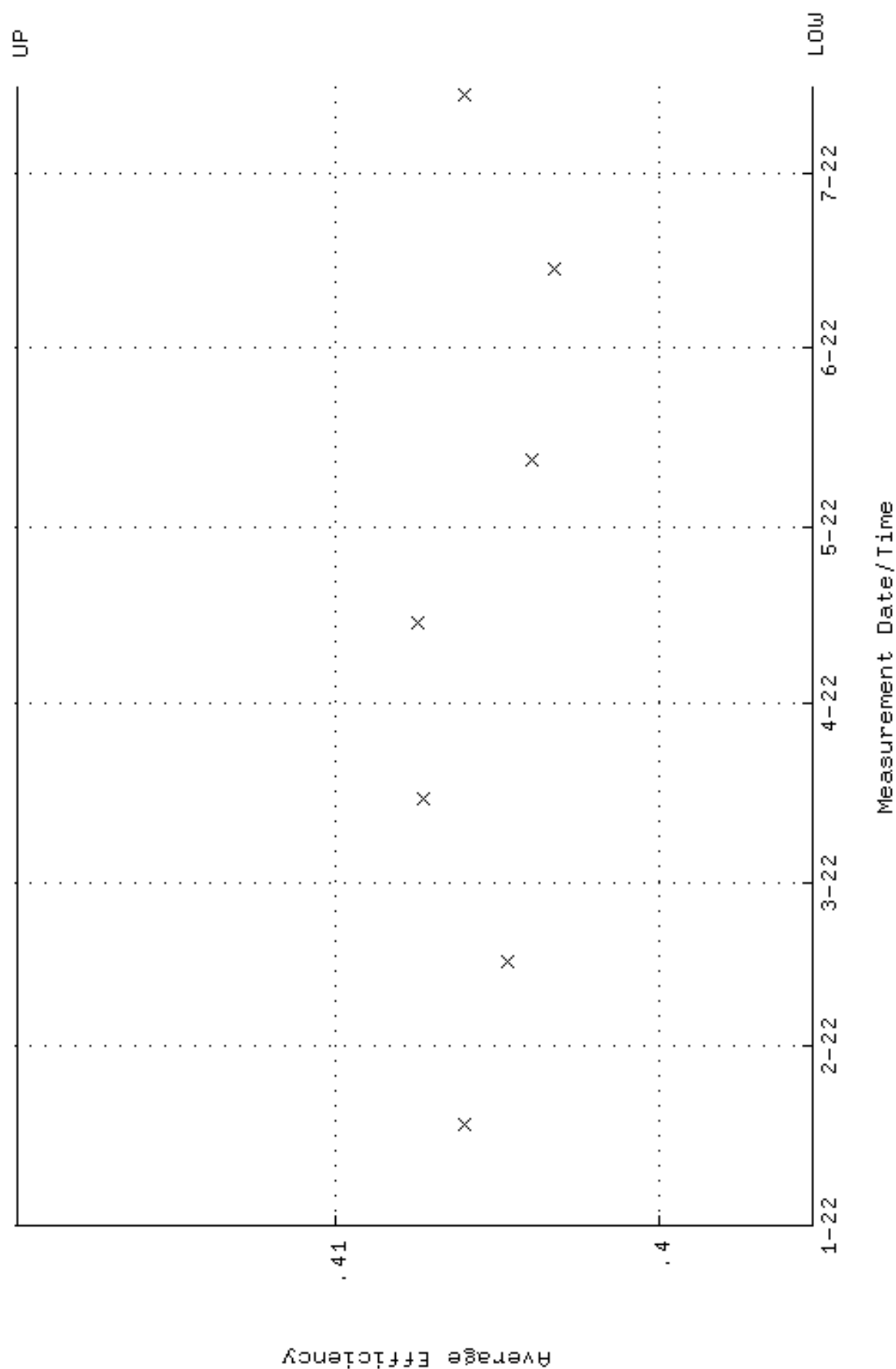
QA filename : DKA100:[ENV_ALPHA.QA.W]W139.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JAN-2022 11:25:39 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



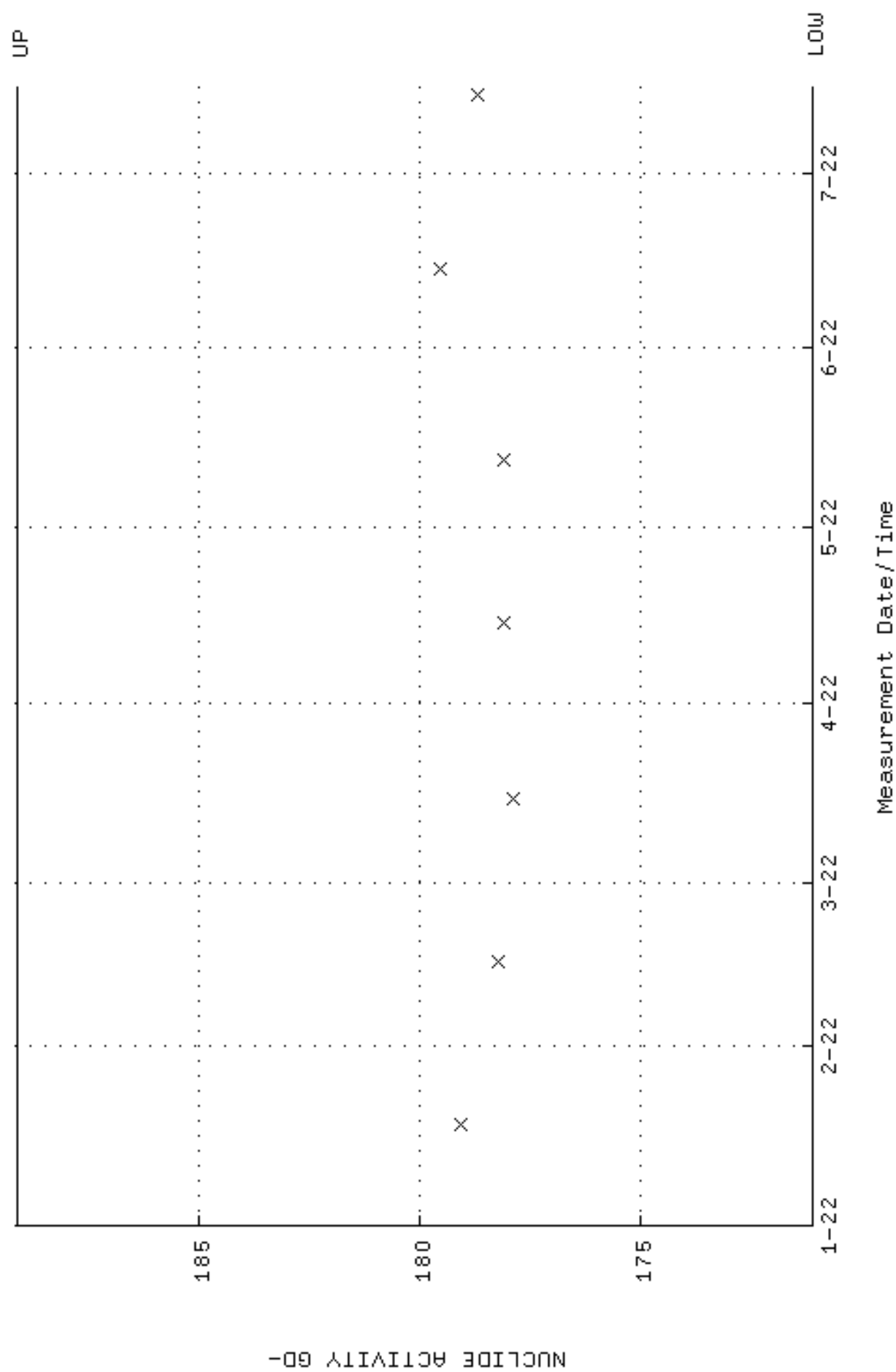
QA filename : DKA100:[ENV_ALPHA.QA.B]B139.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:06:28 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



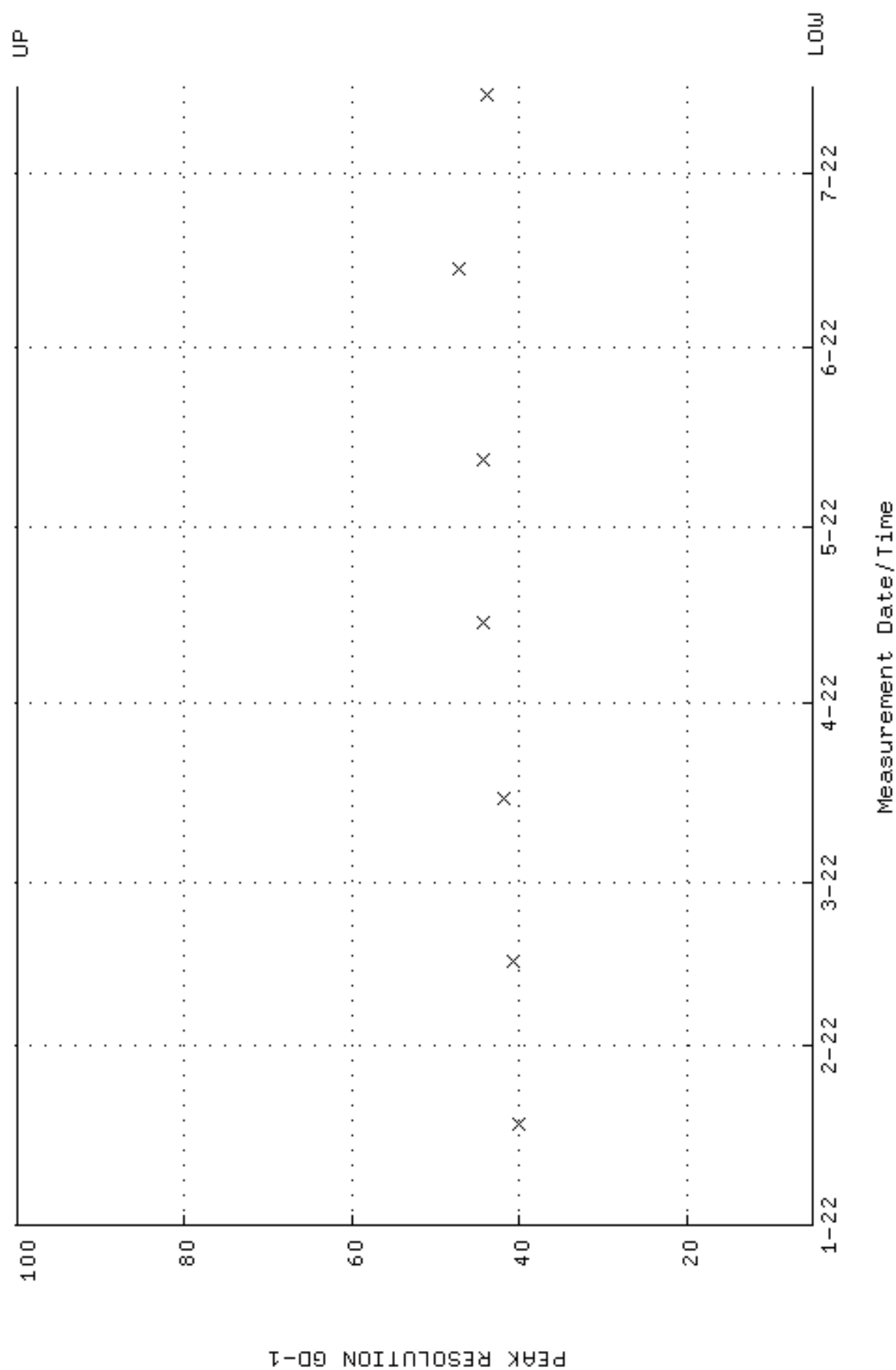
QA filename : DKA100:[ENV_ALPHA.QA.W]W140.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JAN-2022 09:18:45 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.395310 through 0.419760



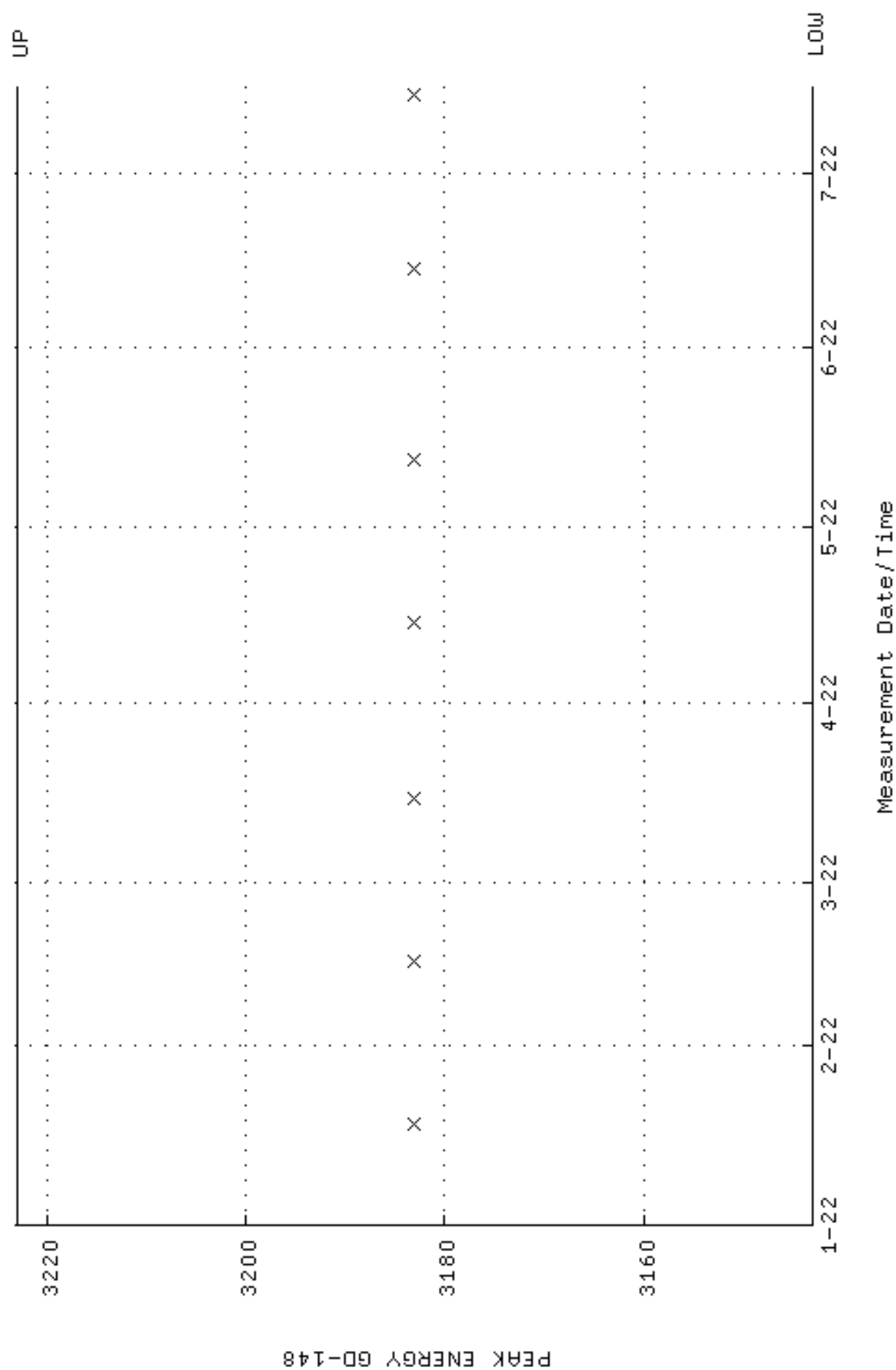
QA filename : DKA100:[ENV_ALPHA.QA.W]W140.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JAN-2022 09:18:45 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



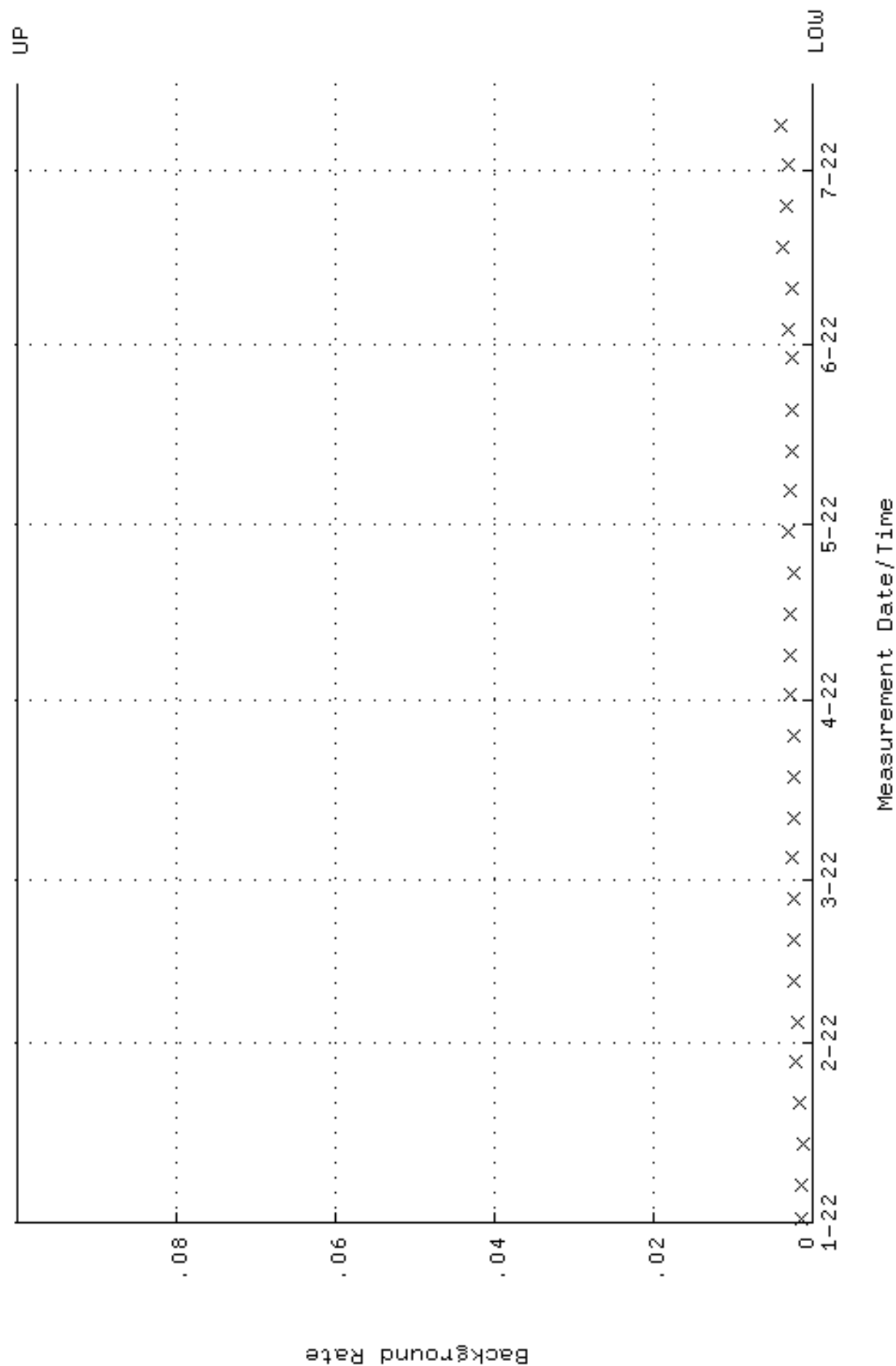
QA filename : DKA100:[ENV_ALPHA.QA.W]W140.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JAN-2022 09:18:45 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



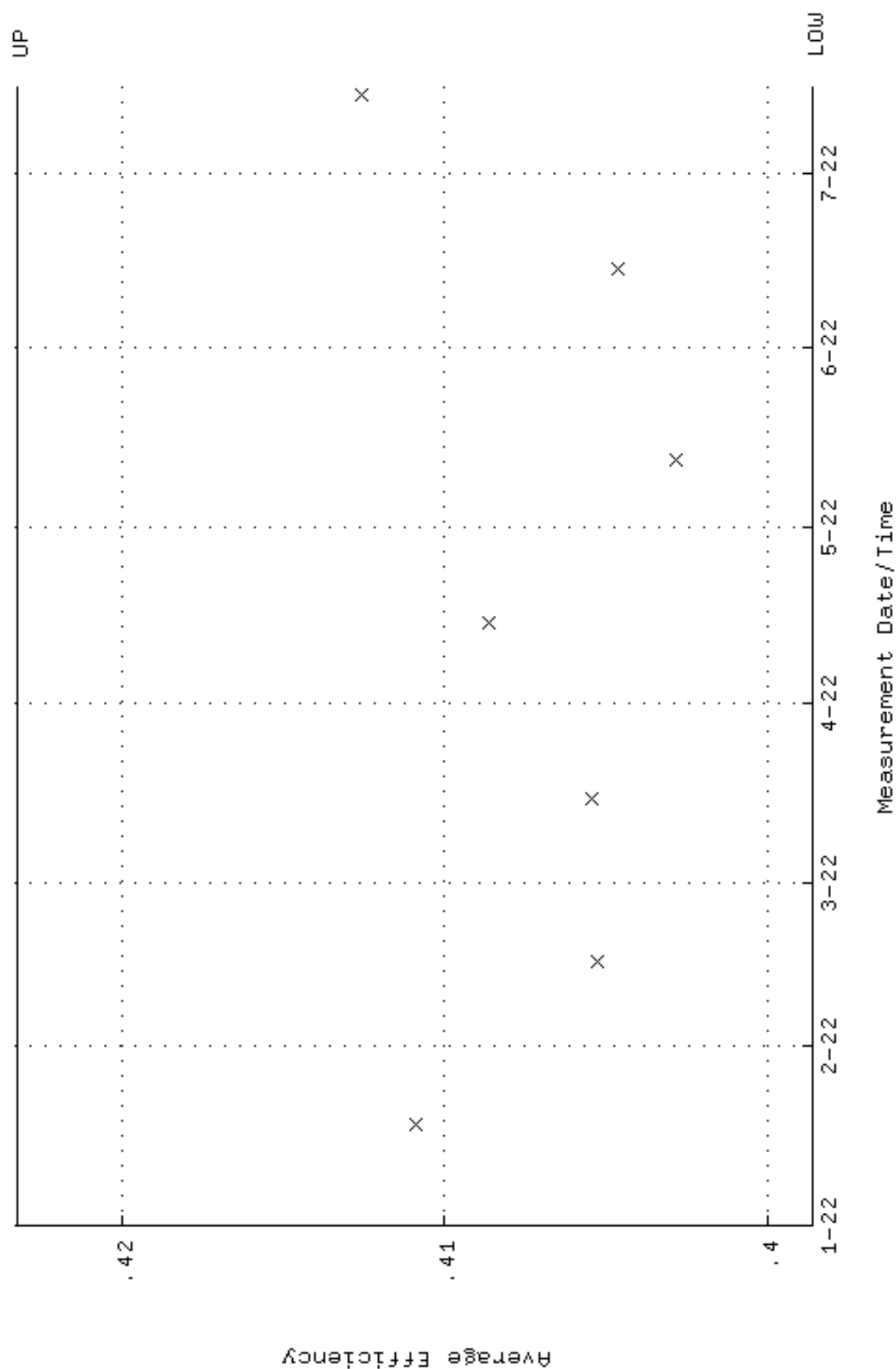
QA filename : DKA100:[ENV_ALPHA.QA.W]W140.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JAN-2022 09:18:45 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



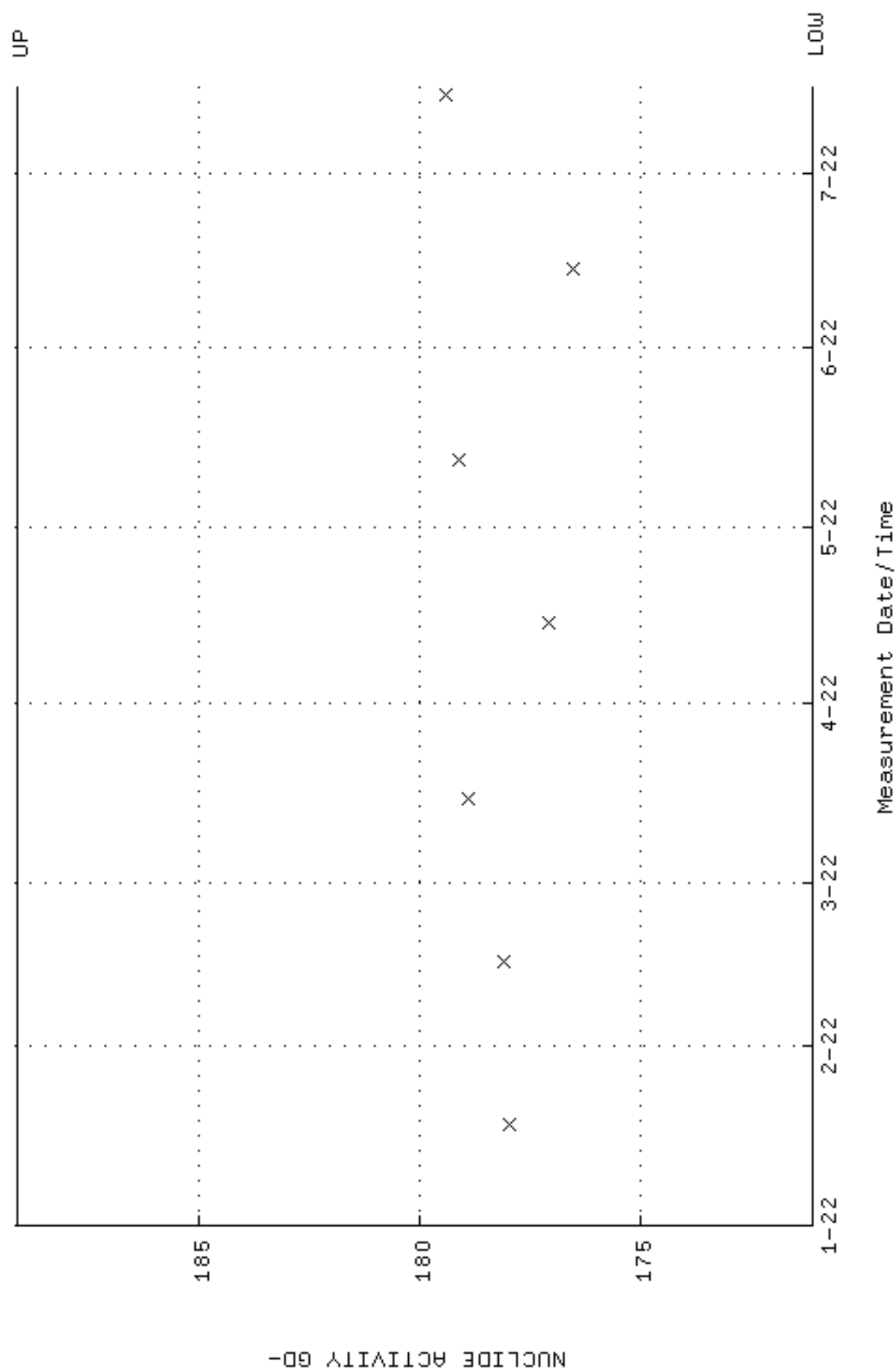
QA filename : DKA100:[ENV_ALPHA.QA.B]B140.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:06:33 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



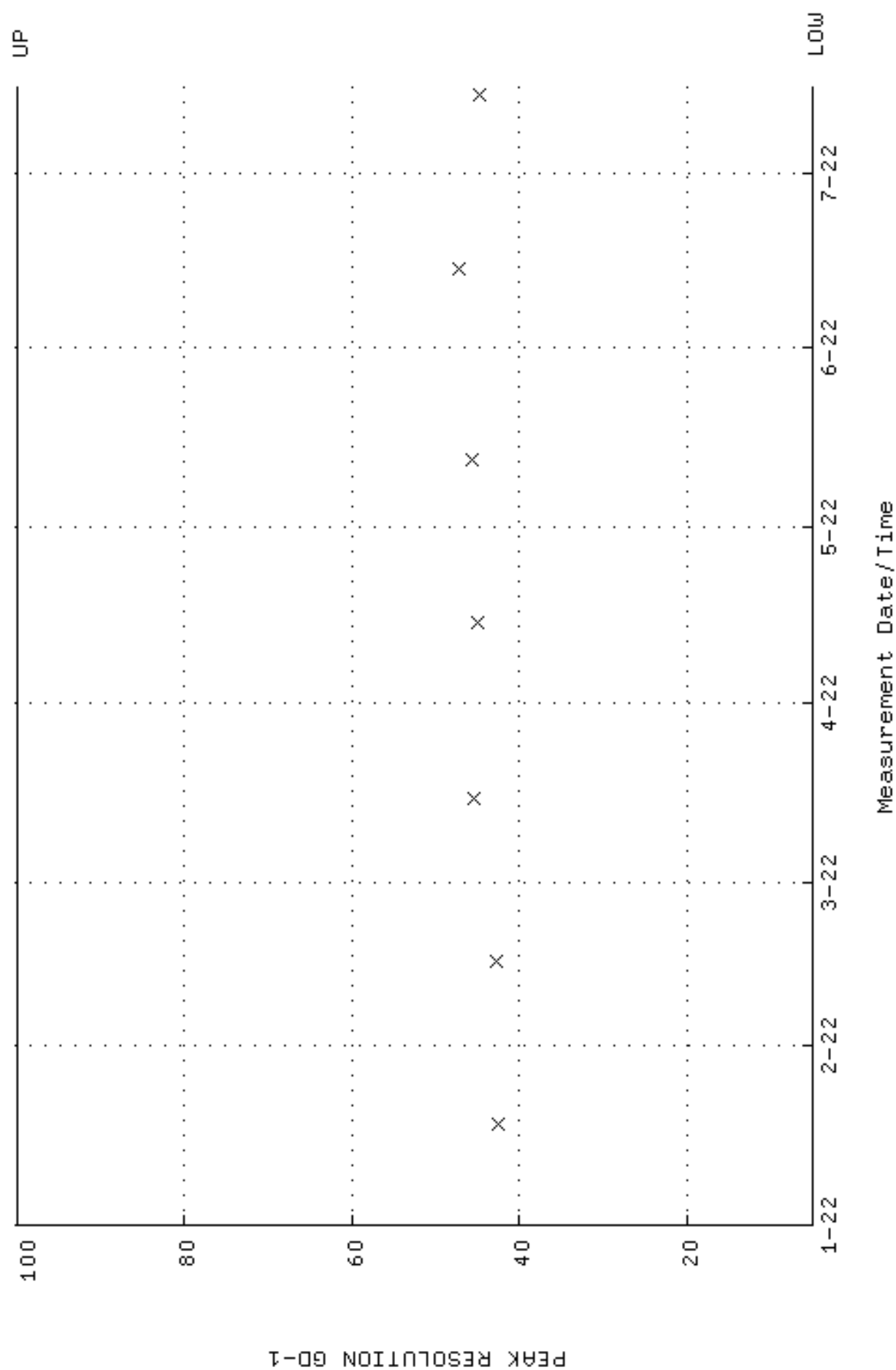
QA filename : DKA100:[ENV_ALPHA.QA.W]W141.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JAN-2022 08:55:53 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.398600 through 0.423250



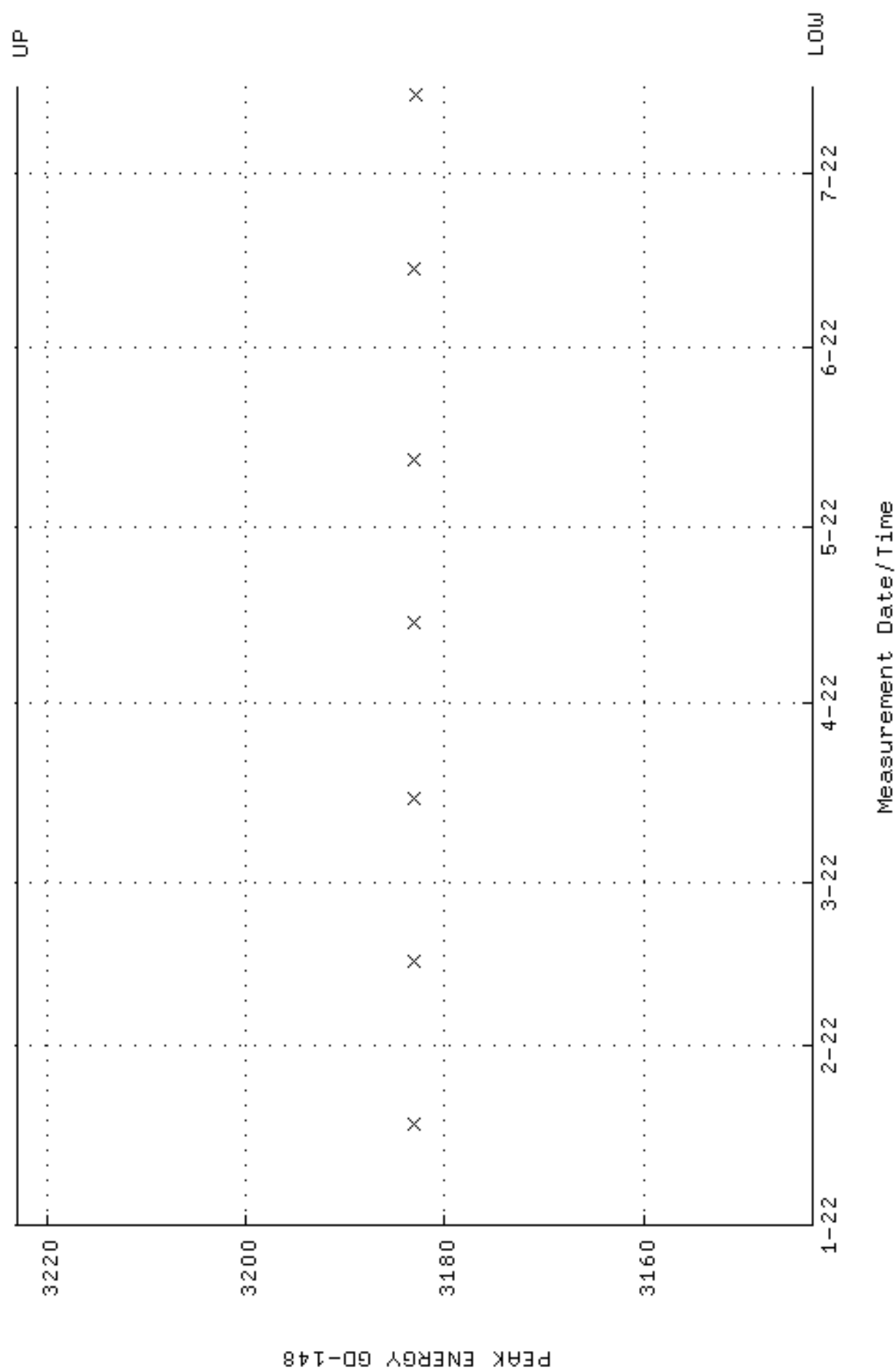
QA filename : DKA100:[ENV_ALPHA.QA.W]W141.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JAN-2022 08:55:53 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



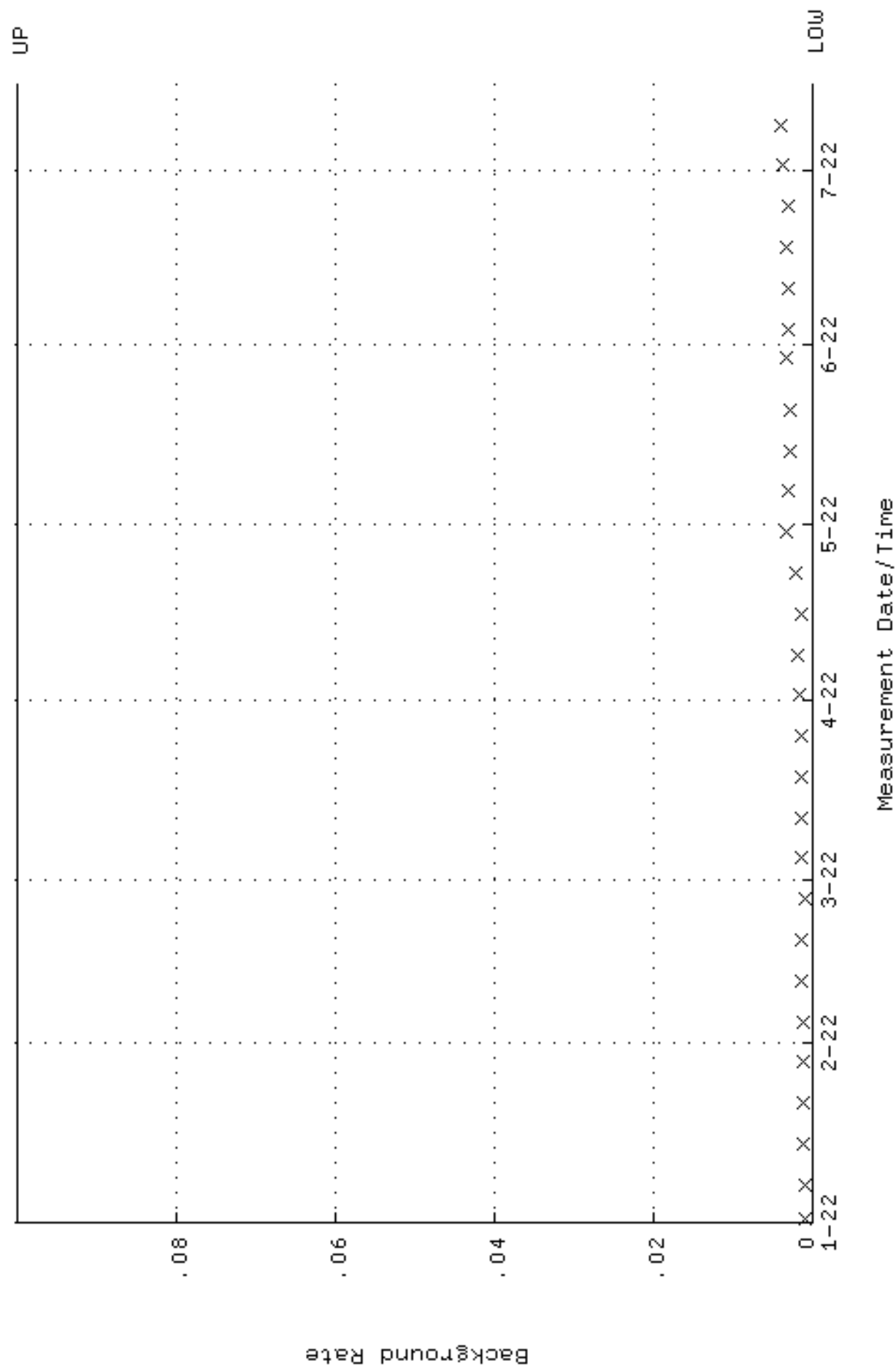
QA filename : DKA100:[ENV_ALPHA.QA.W]W141.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JAN-2022 08:55:53 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



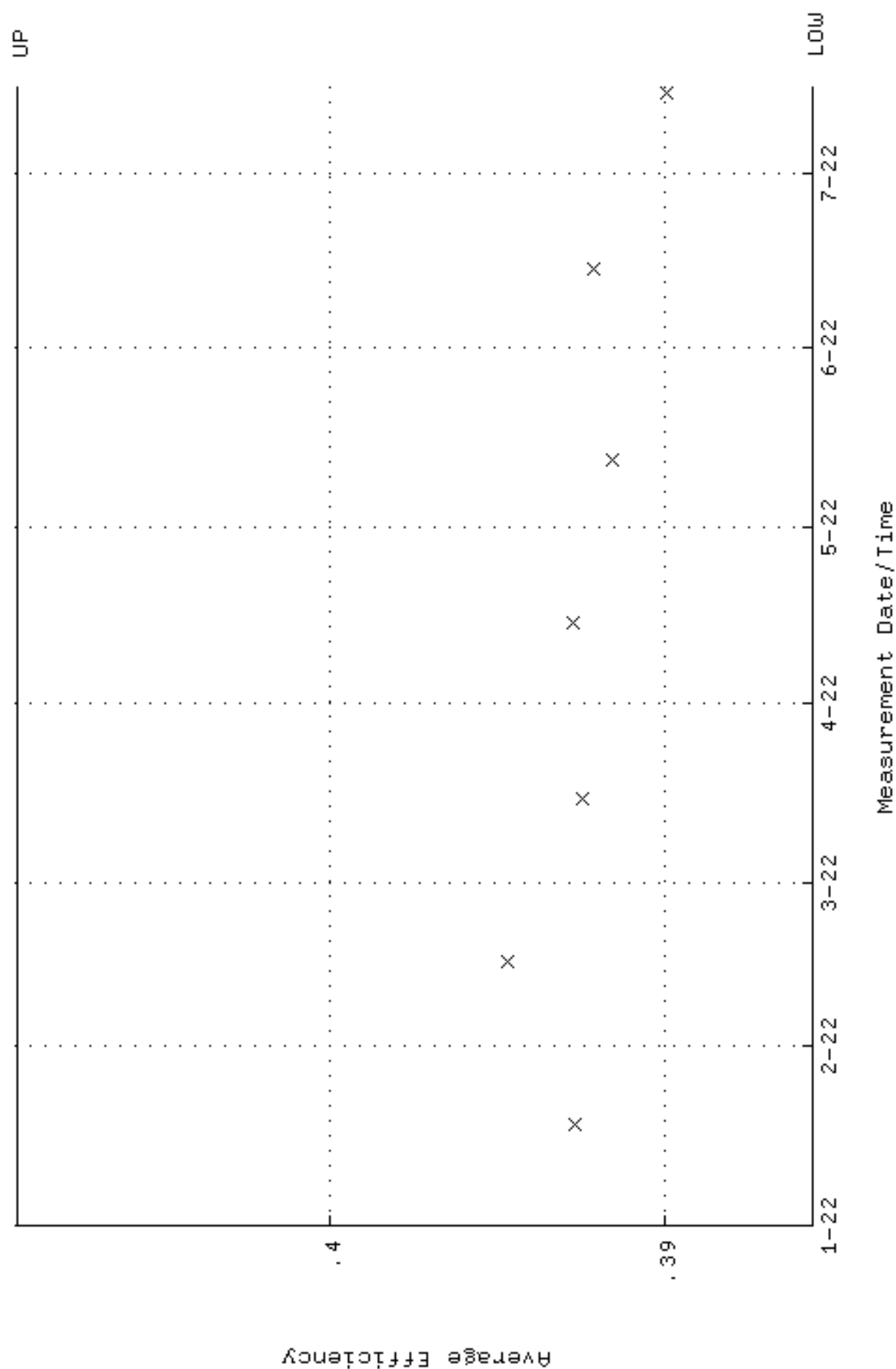
QA filename : DKA100:[ENV_ALPHA.QA.W]W141.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JAN-2022 08:55:53 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



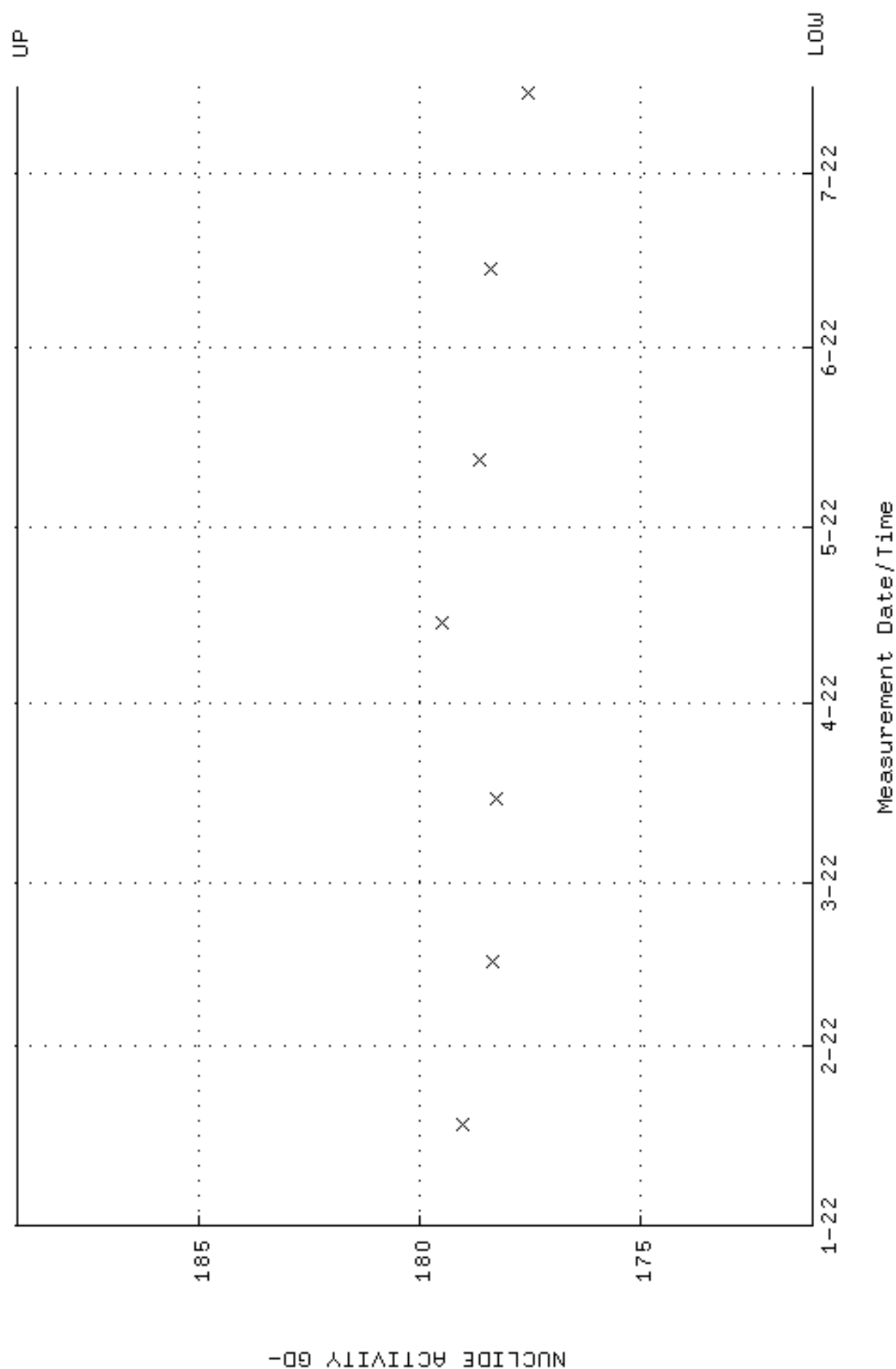
QA filename : DKA100:[ENV_ALPHA.QA.B]B141.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:06:37 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



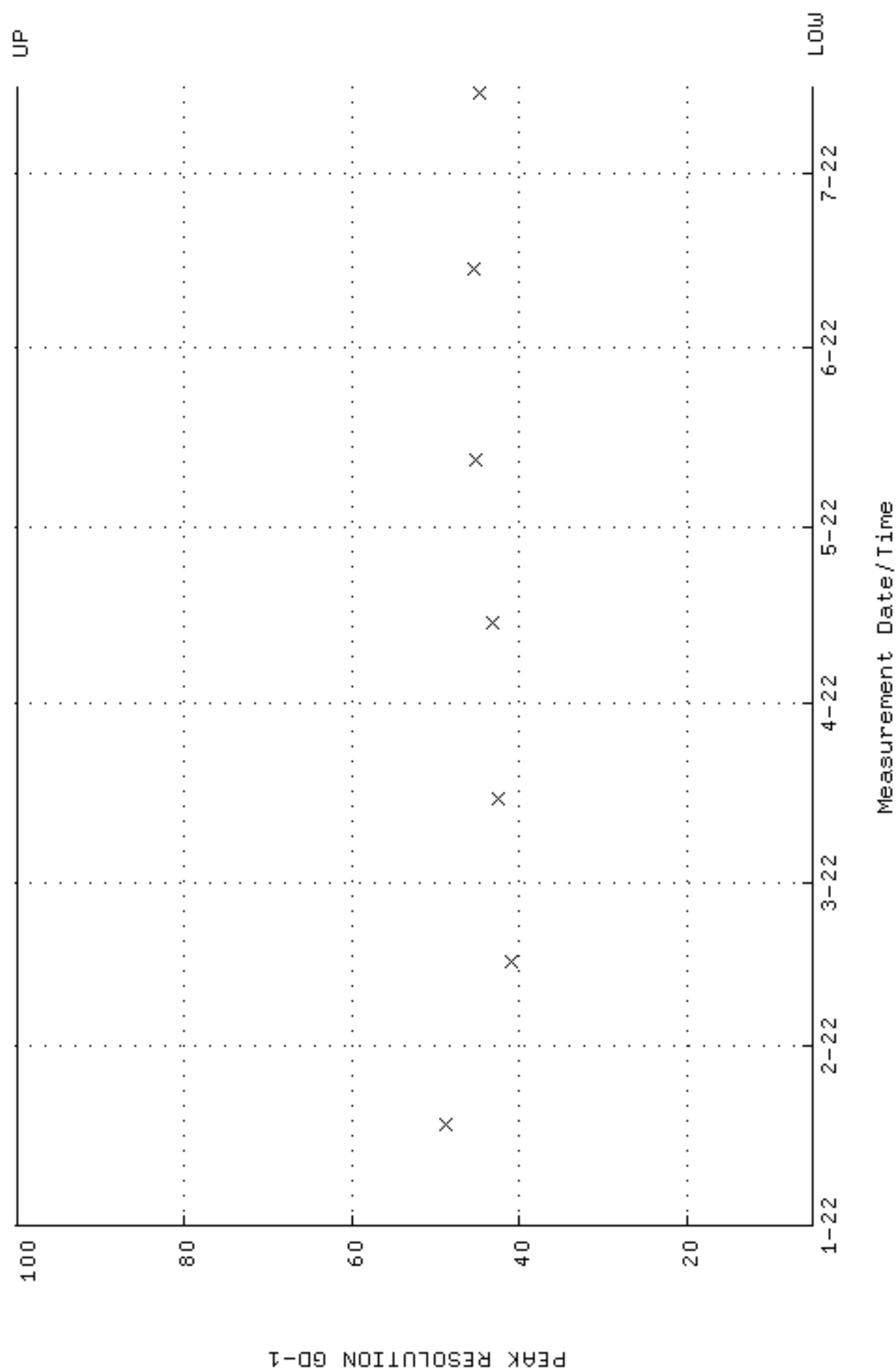
QA filename : DKA100:[ENV_ALPHA.QA.W]W160.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JAN-2022 08:57:15 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.385540 through 0.409390



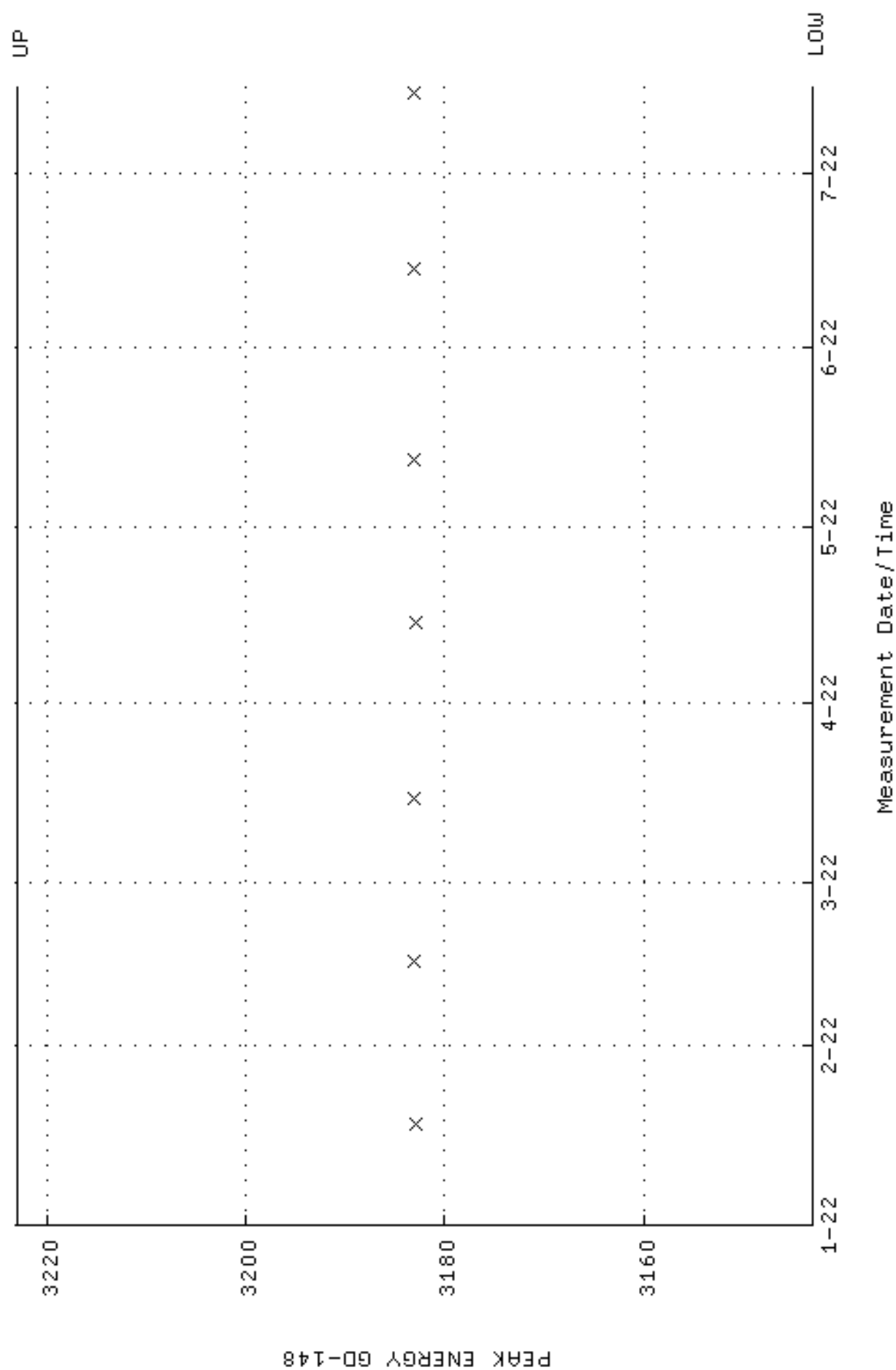
QA filename : DKA100:[ENV_ALPHA.QA.W]W160.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JAN-2022 08:57:15 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



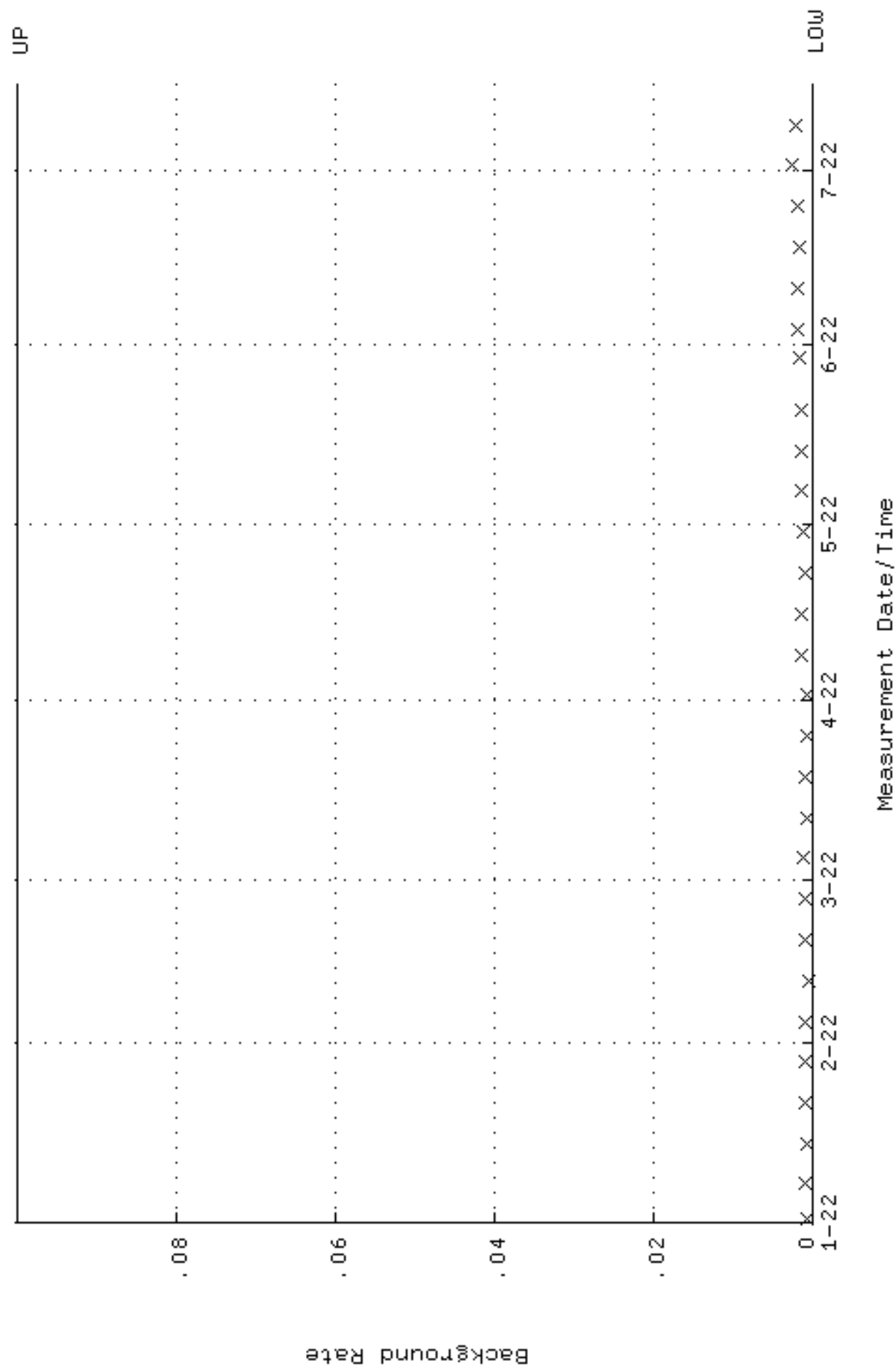
QA filename : DKA100:[ENV_ALPHA.QA.W]W160.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JAN-2022 08:57:15 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



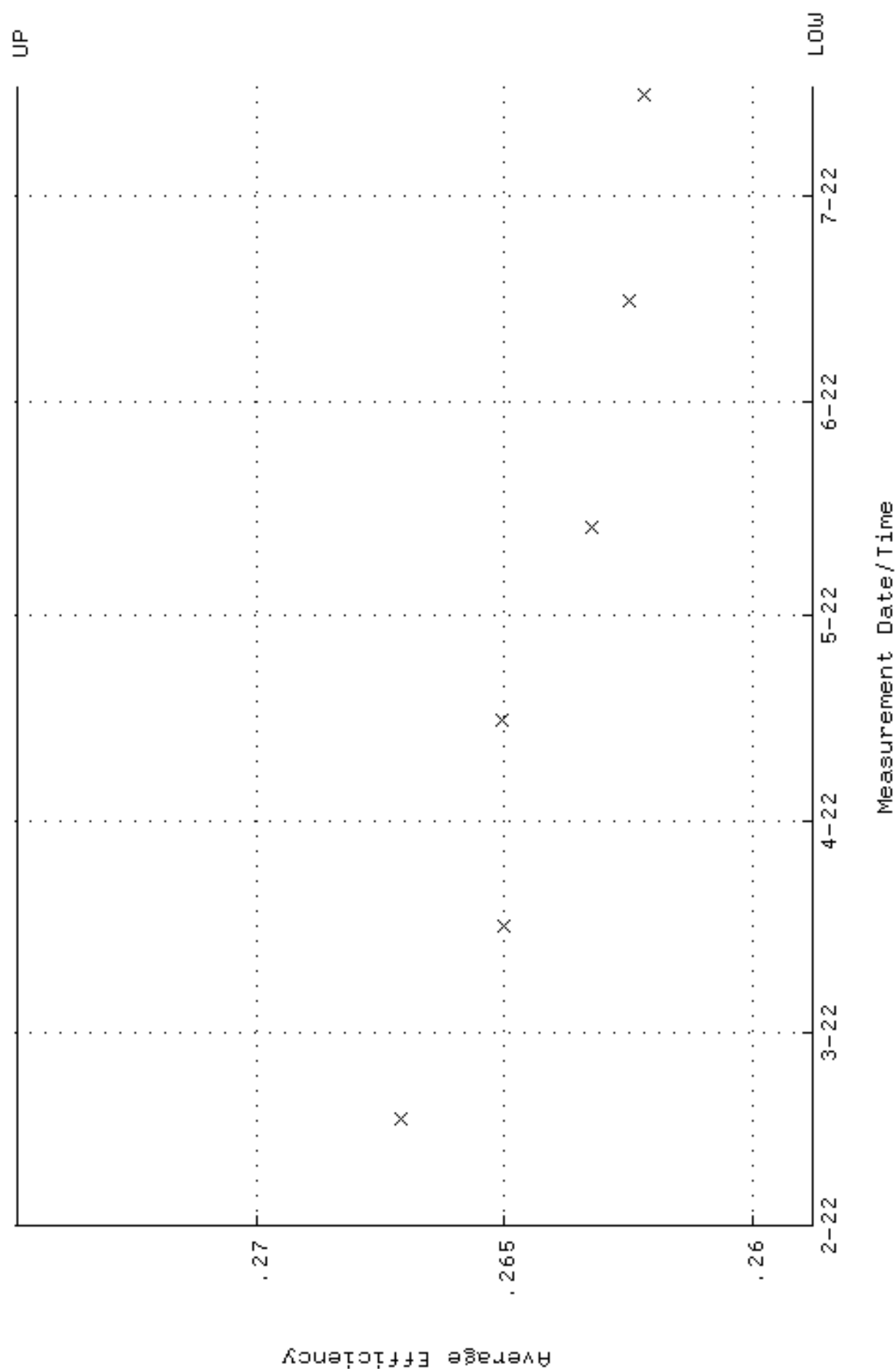
QA filename : DKA100:[ENV_ALPHA.QA.W]W160.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JAN-2022 08:57:15 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



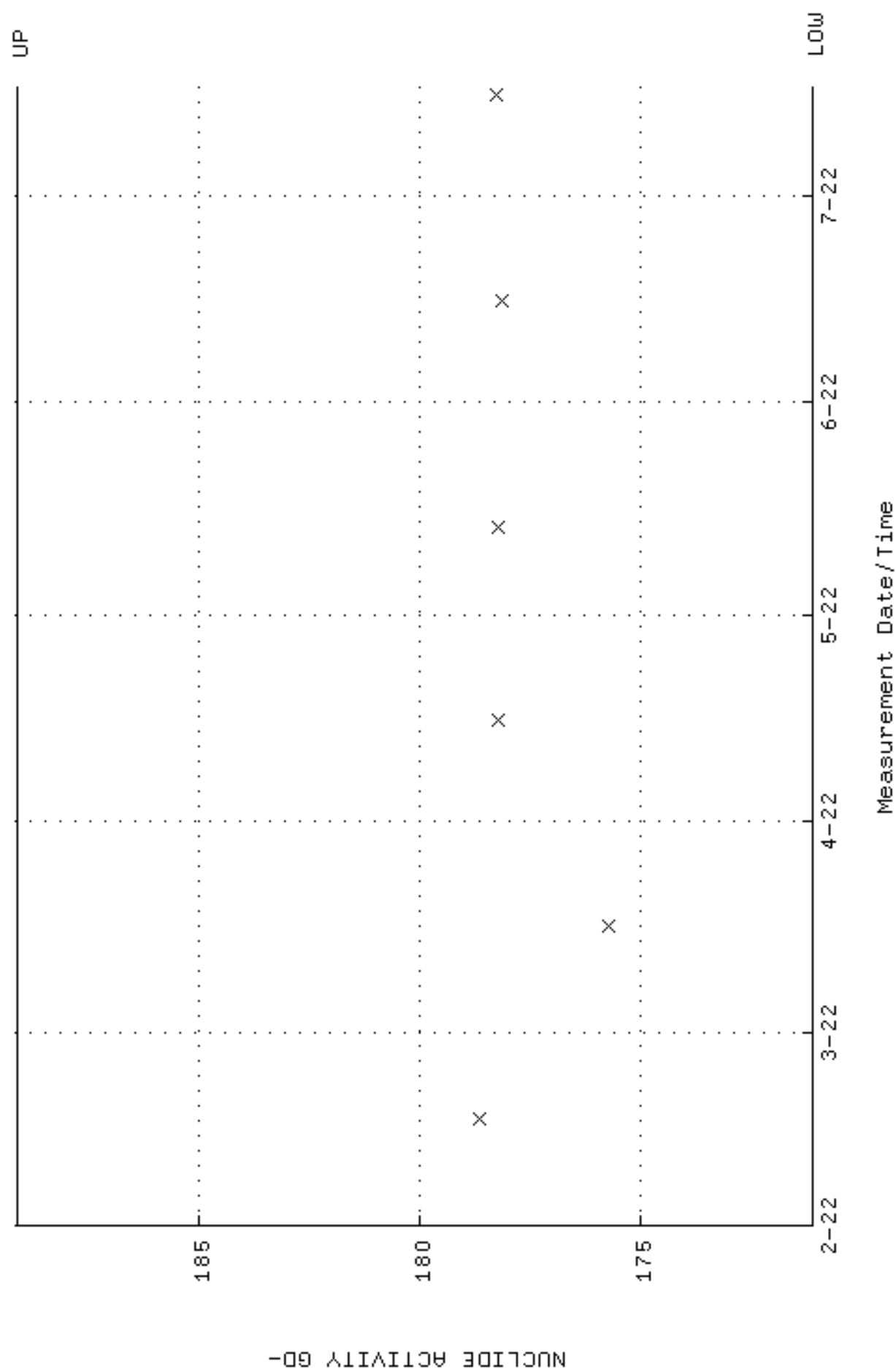
QA filename : DKA100:[ENV_ALPHA.QA.B]B160.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:07:42 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



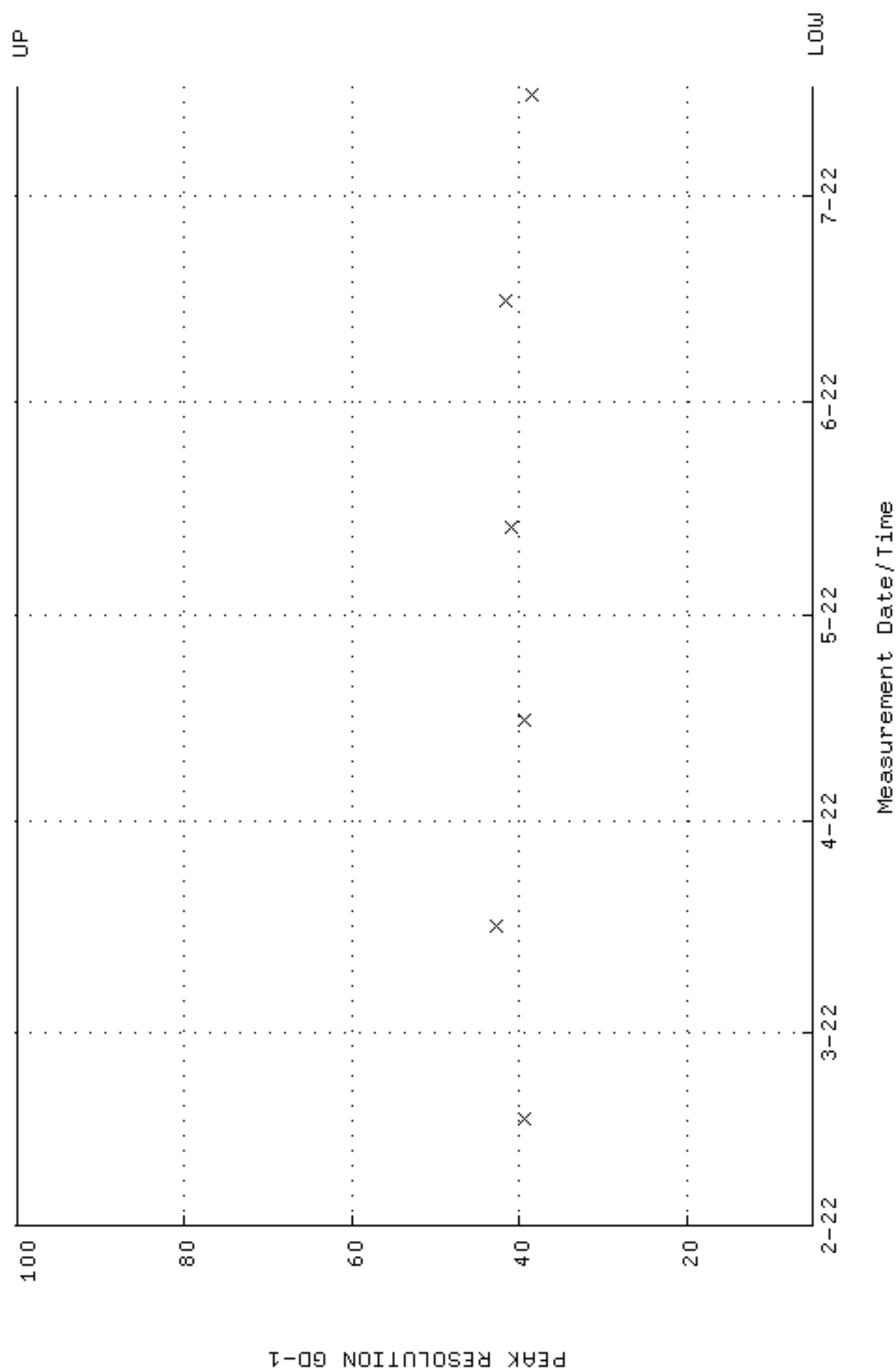
QA filename : DKA100:[ENV_ALPHA.QA.W]W165.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 16-FEB-2022 09:15:00 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.258800 through 0.274810



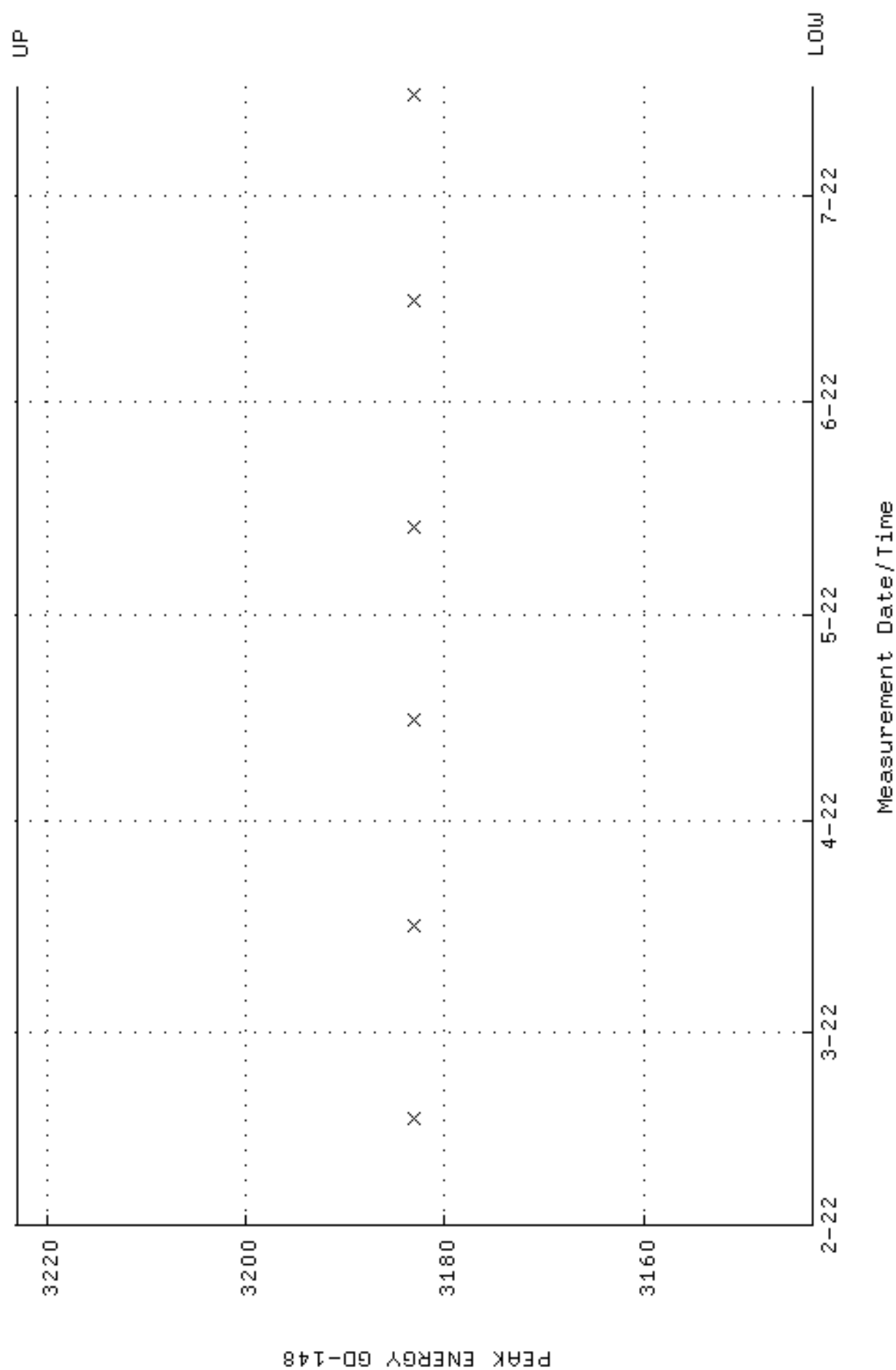
QA filename : DKA100:[ENV_ALPHA.QA.W]W165.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 16-FEB-2022 09:15:00 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



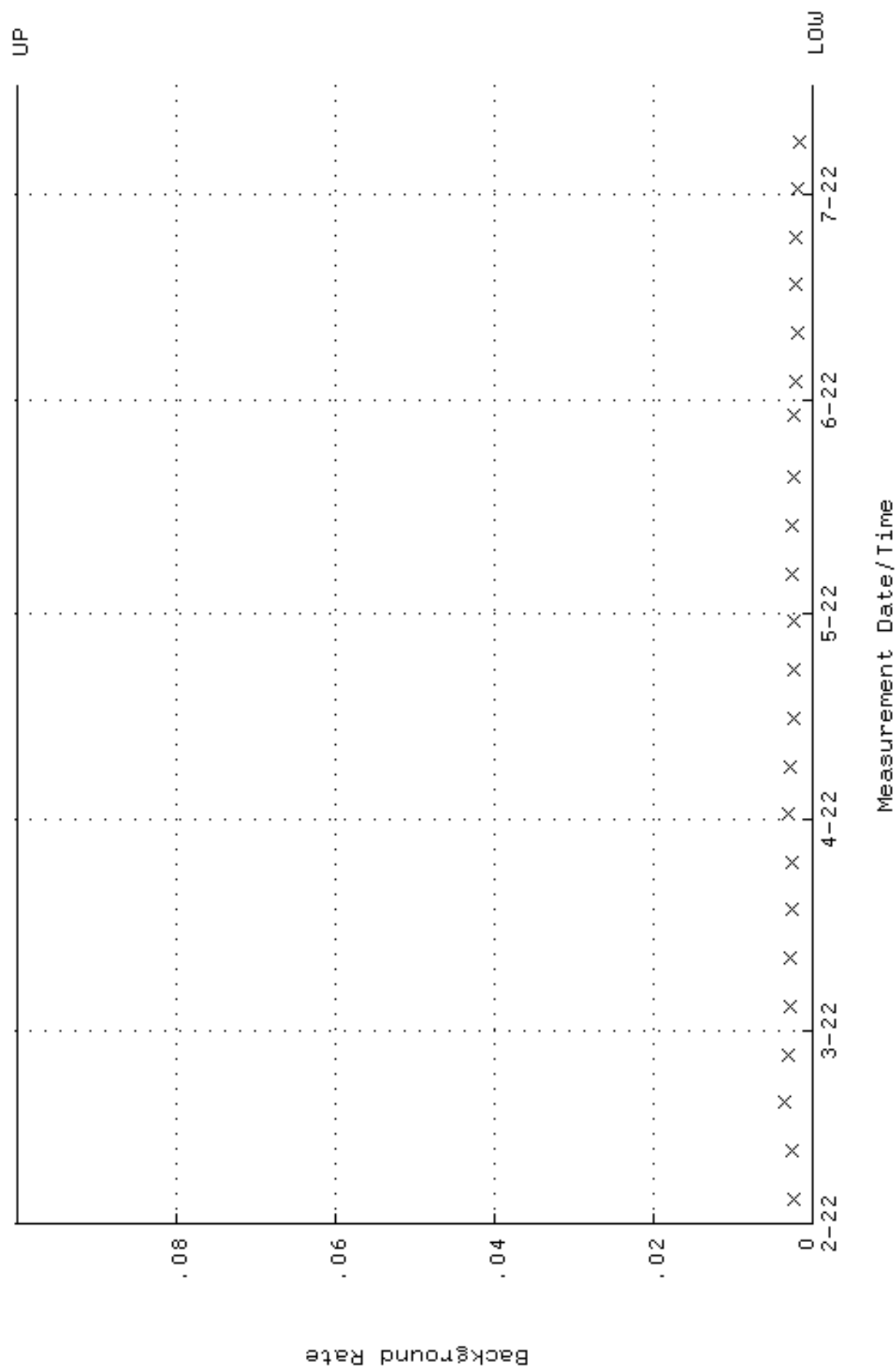
QA filename : DKA100:[ENV_ALPHA.QA.W]W165.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 16-FEB-2022 09:15:00 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



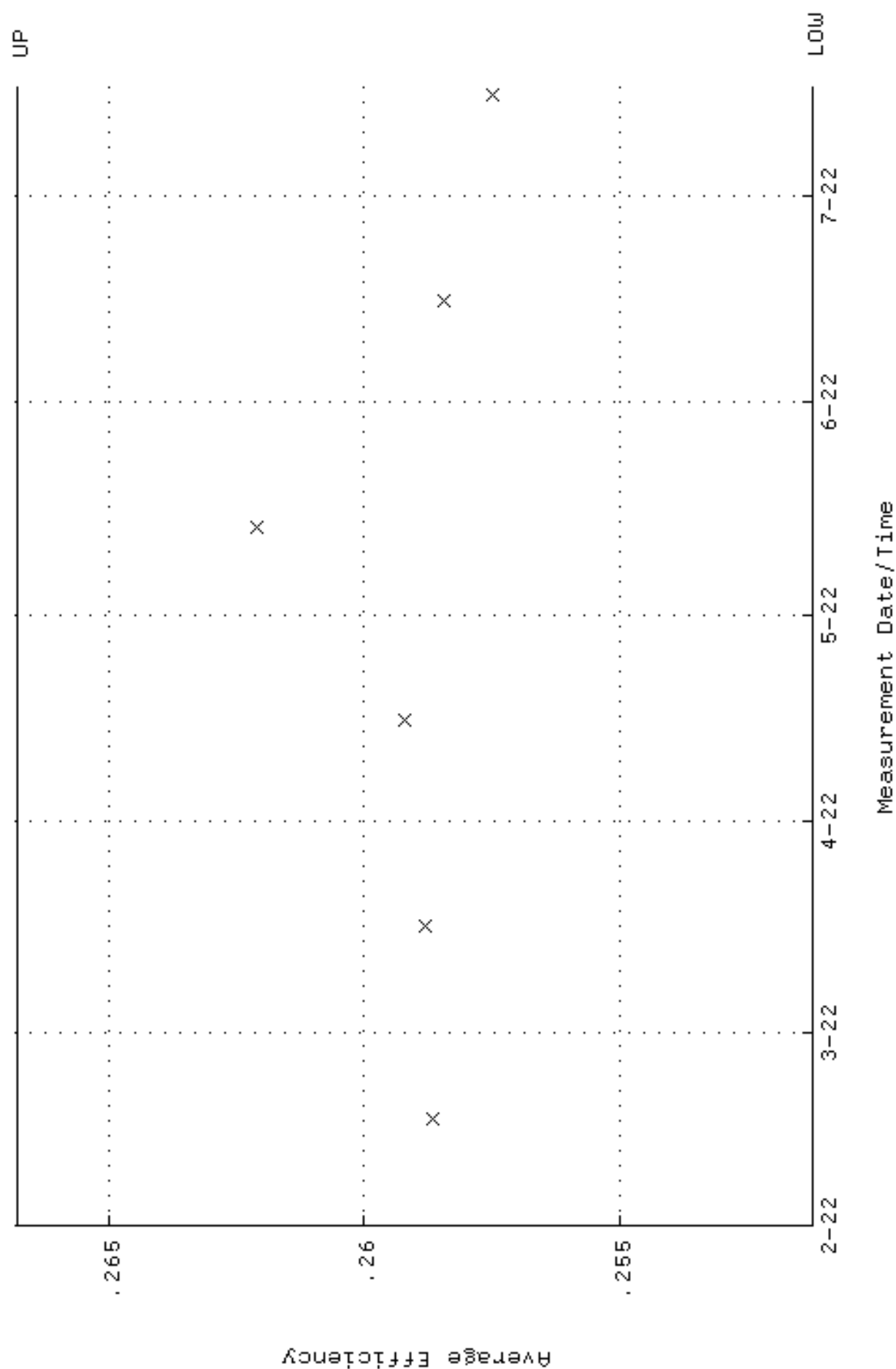
QA filename : DKA100:[ENV_ALPHA.QA.W]W165.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 16-FEB-2022 09:15:00 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



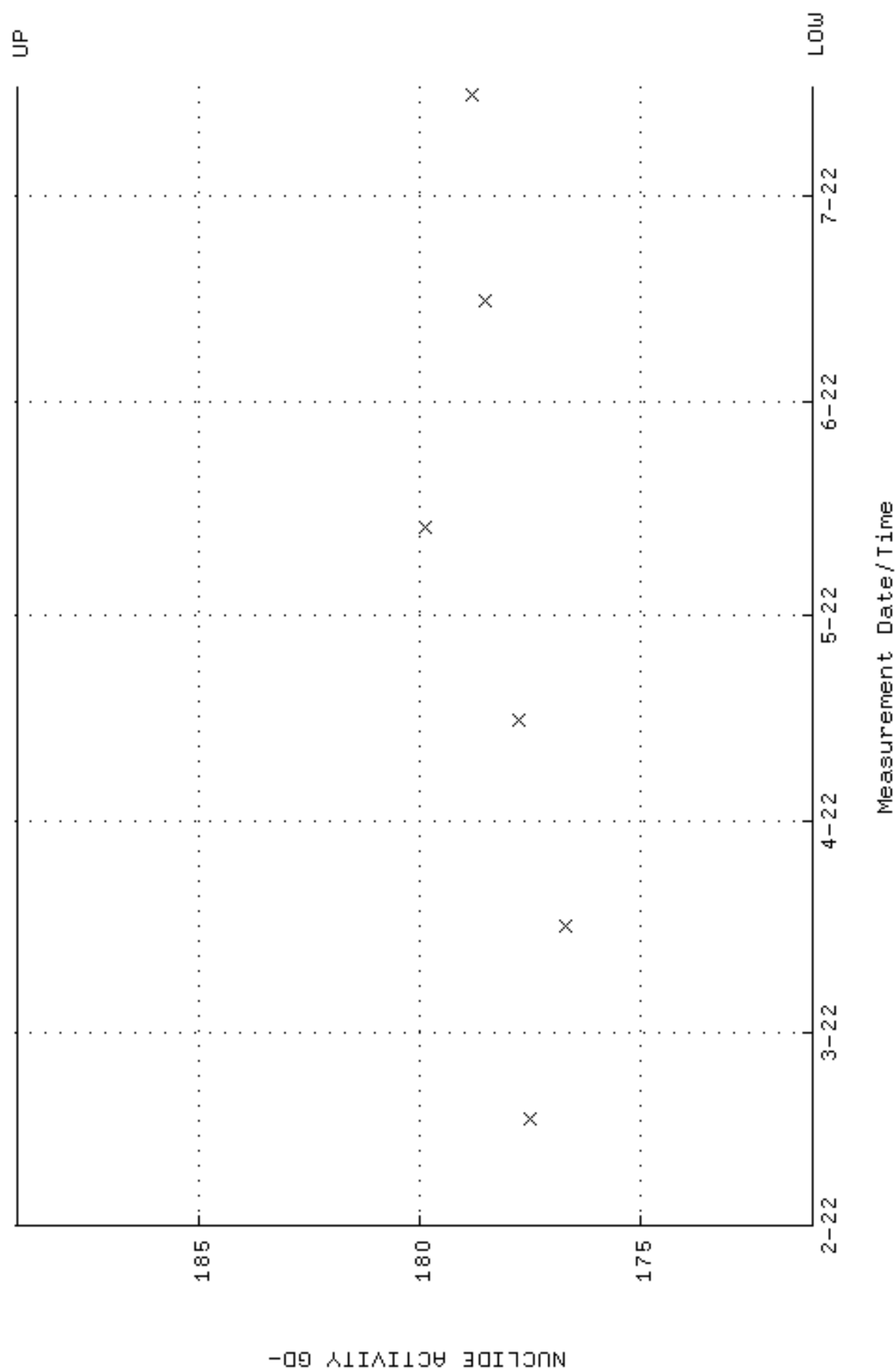
QQA filename : DKA100:[ENV_ALPHA.QA.B]B165.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 4-FEB-2022 13:09:49 through 16-JUN-2022 13:09:49
Lower/Upper Lmts: 0.000000E+00 through 0.100000



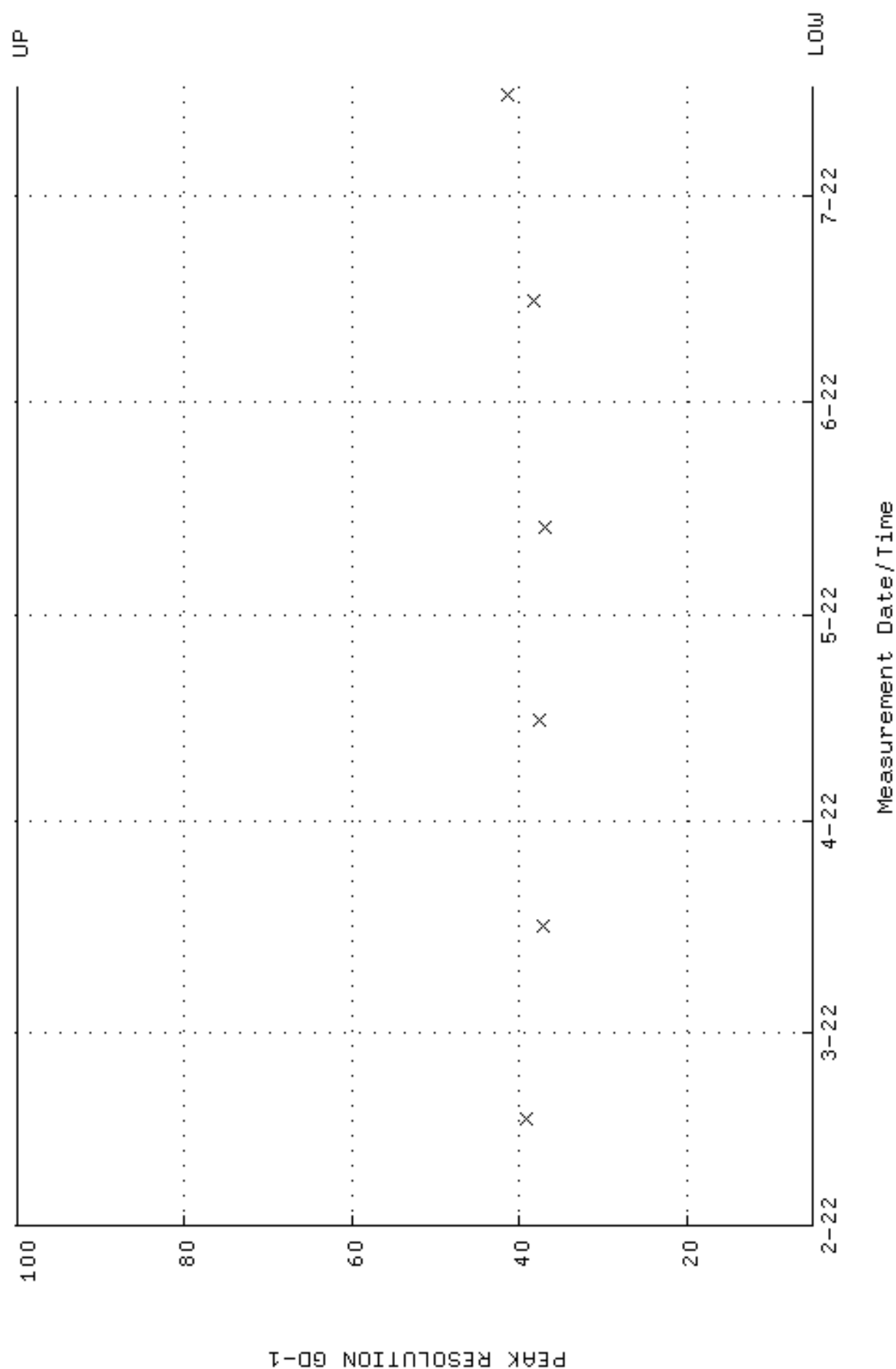
QA filename : DKA100:[ENV_ALPHA.QA.W]W170.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 16-FEB-2022 09:15:20 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.251240 through 0.266780



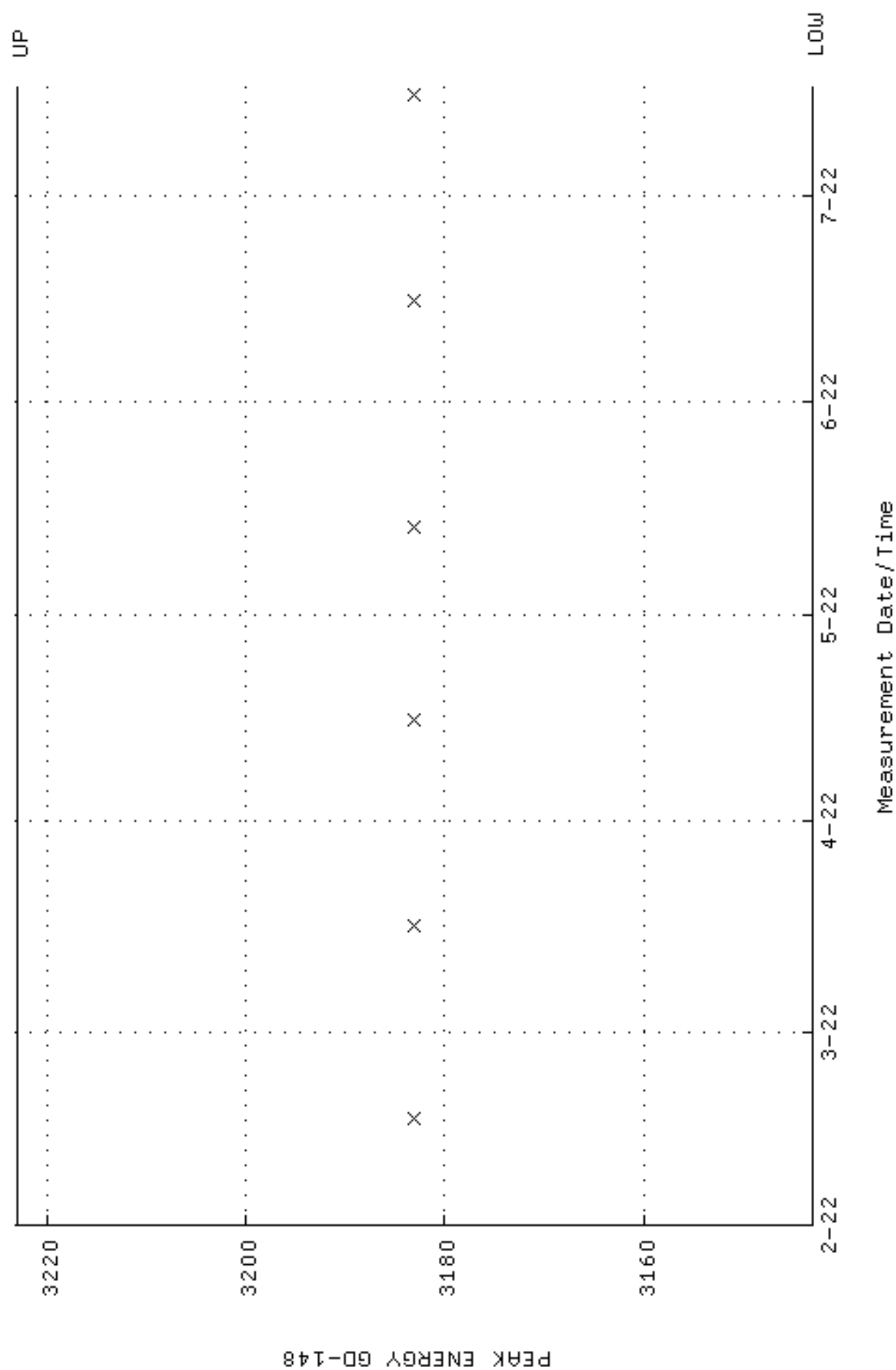
QA filename : DKA100:[ENV_ALPHA.QA.W]W170.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 16-FEB-2022 09:15:20 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



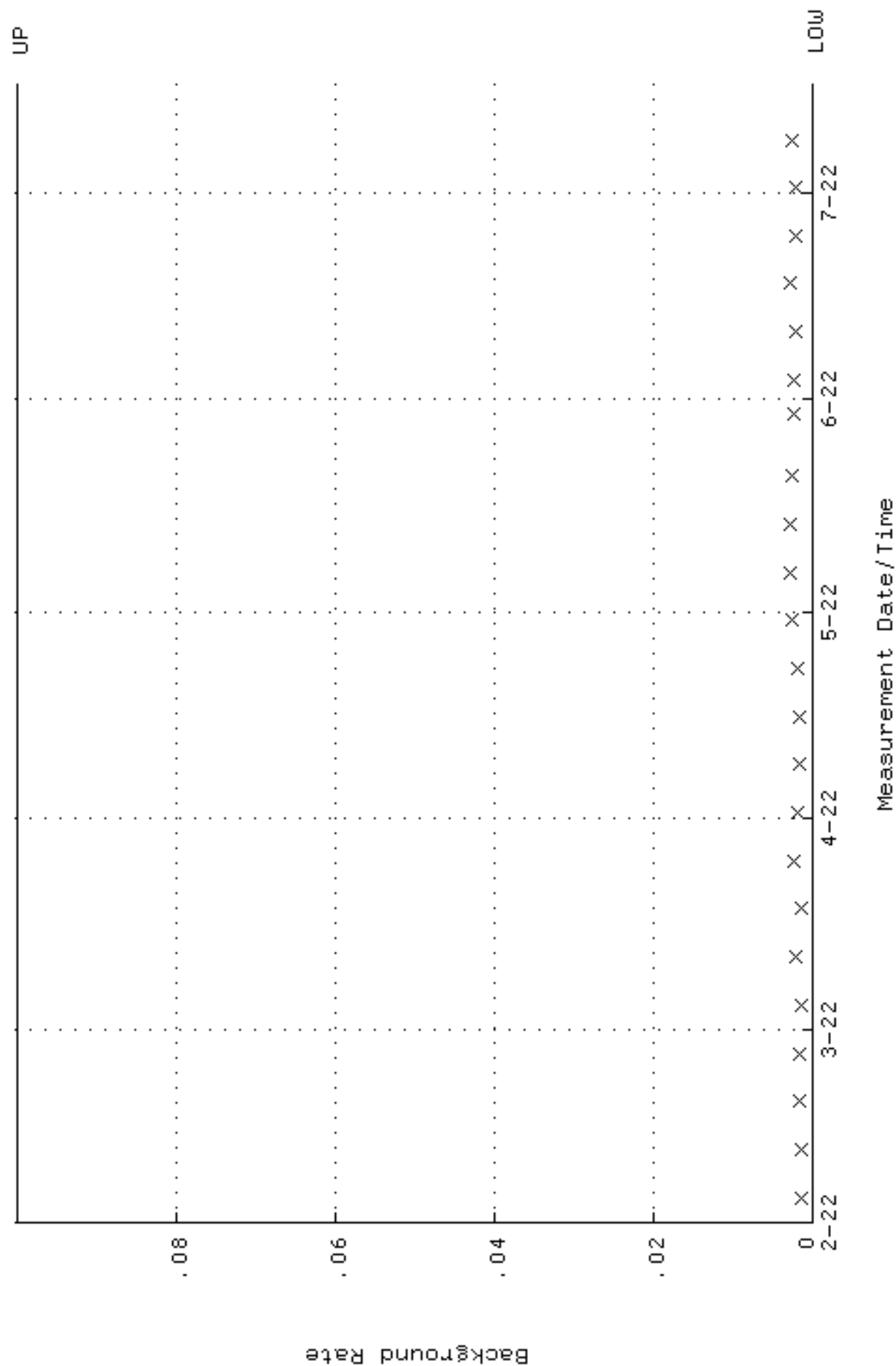
QA filename : DKA100:[ENV_ALPHA.QA.W]W170.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 16-FEB-2022 09:15:20 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



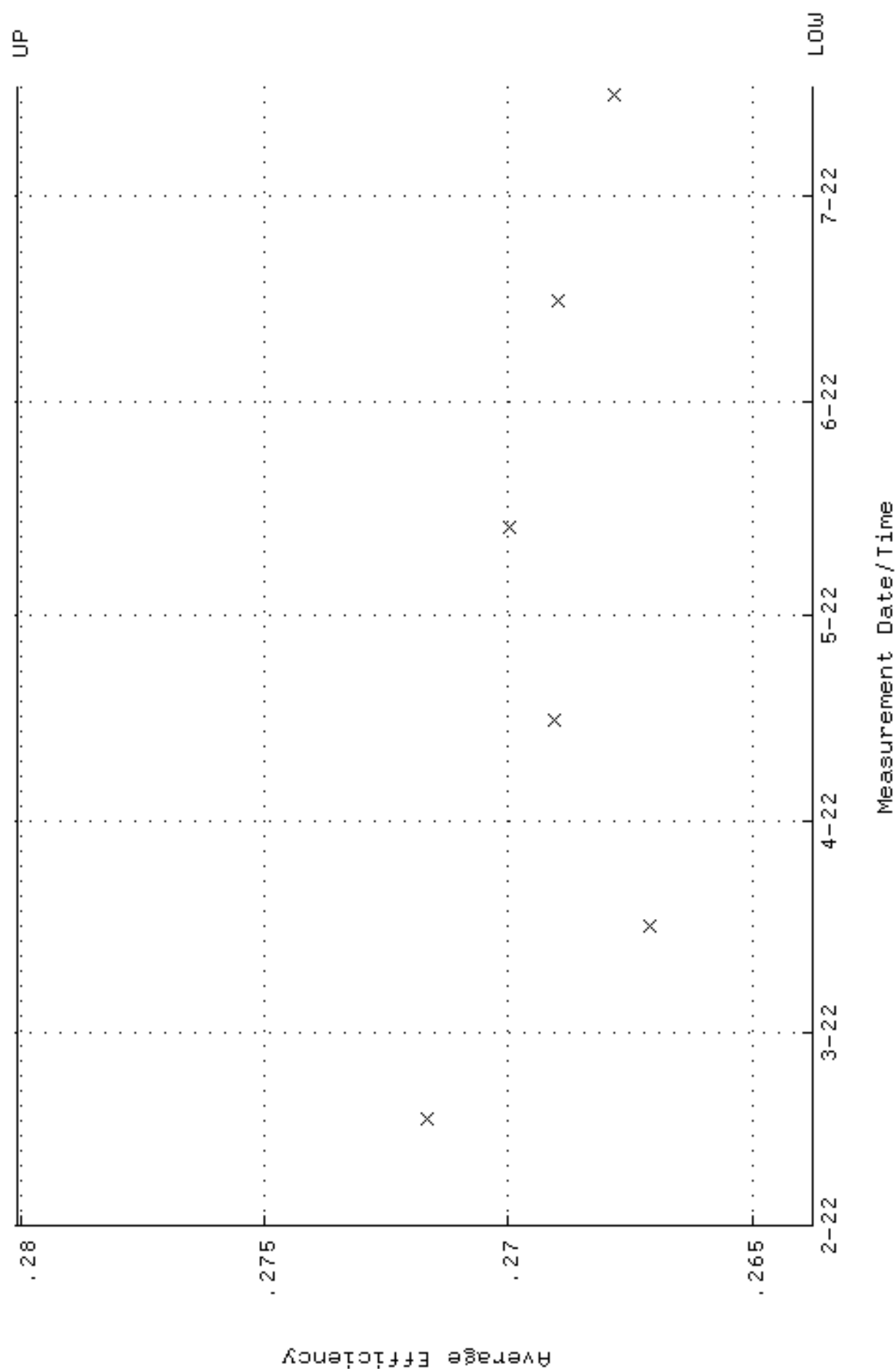
QA filename : DKA100:[ENV_ALPHA.QA.W]W170.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 16-FEB-2022 09:15:20 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



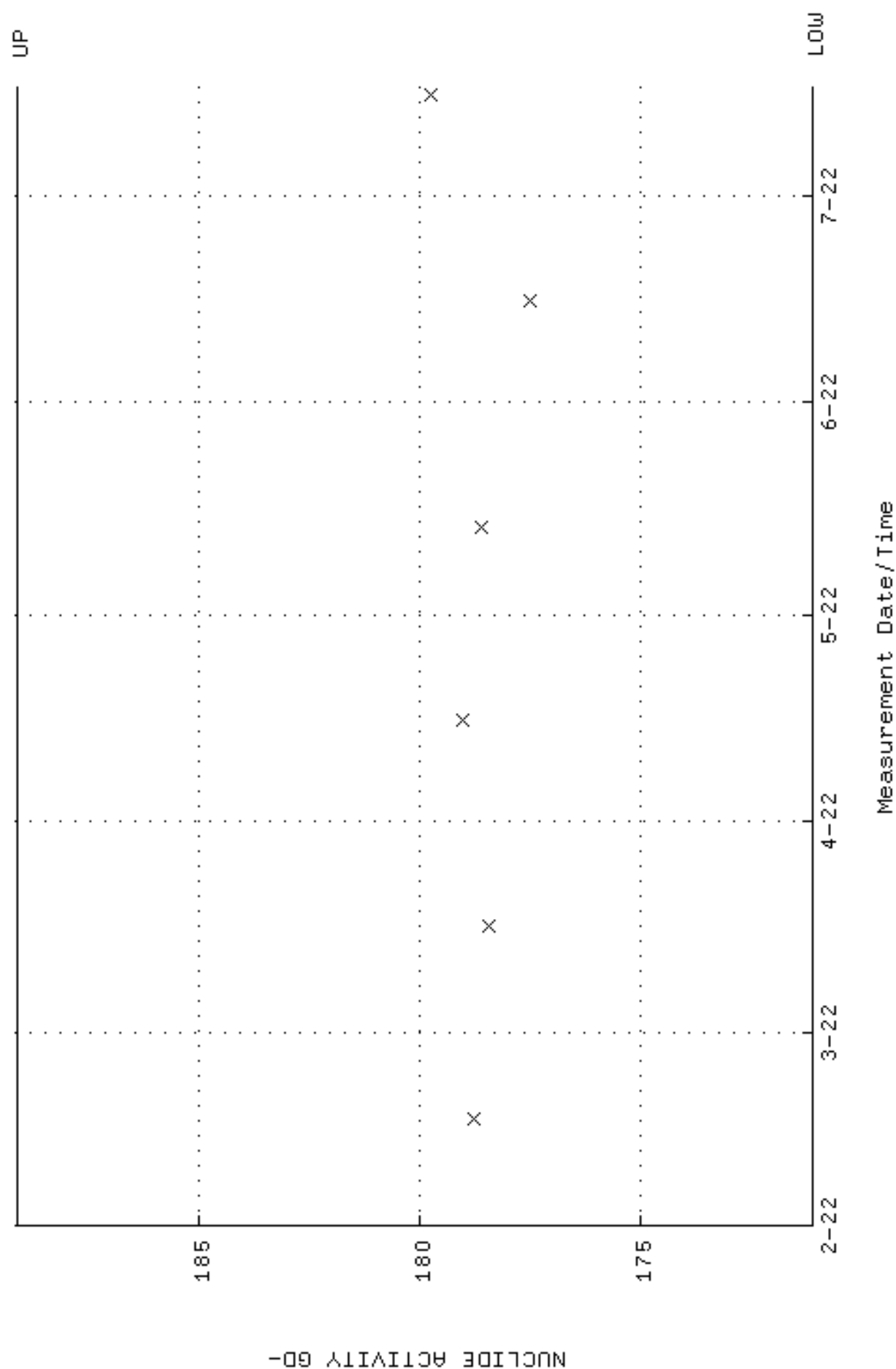
QA filename : DKA100:[ENV_ALPHA.QA.B]B170.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 4-FEB-2022 13:10:10 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



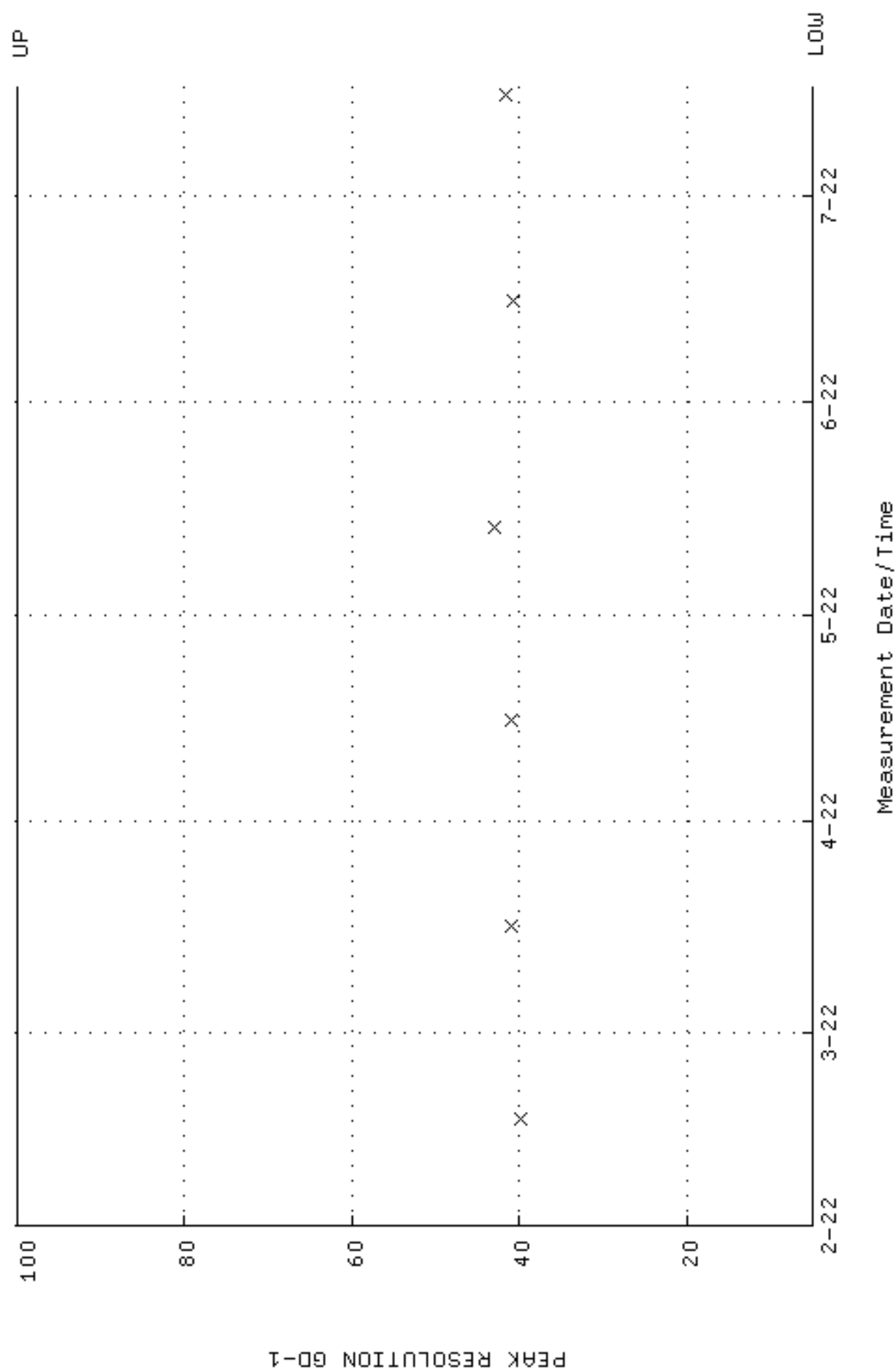
QA filename : DKA100:[ENV_ALPHA.QA.W]W177.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 16-FEB-2022 09:18:39 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.263760 through 0.280080



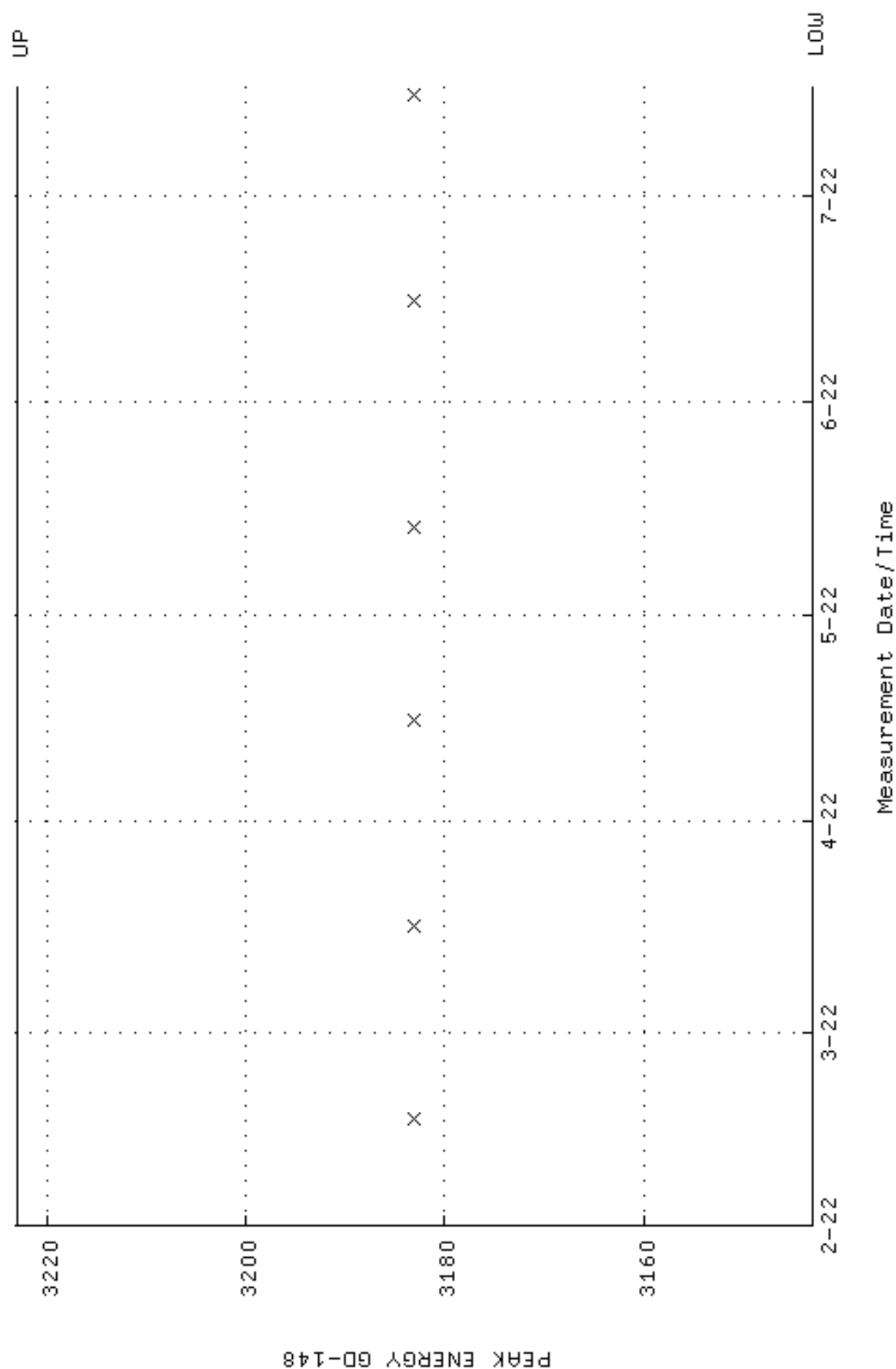
QA filename : DKA100:[ENV_ALPHA.QA.W]W177.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 16-FEB-2022 09:18:39 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



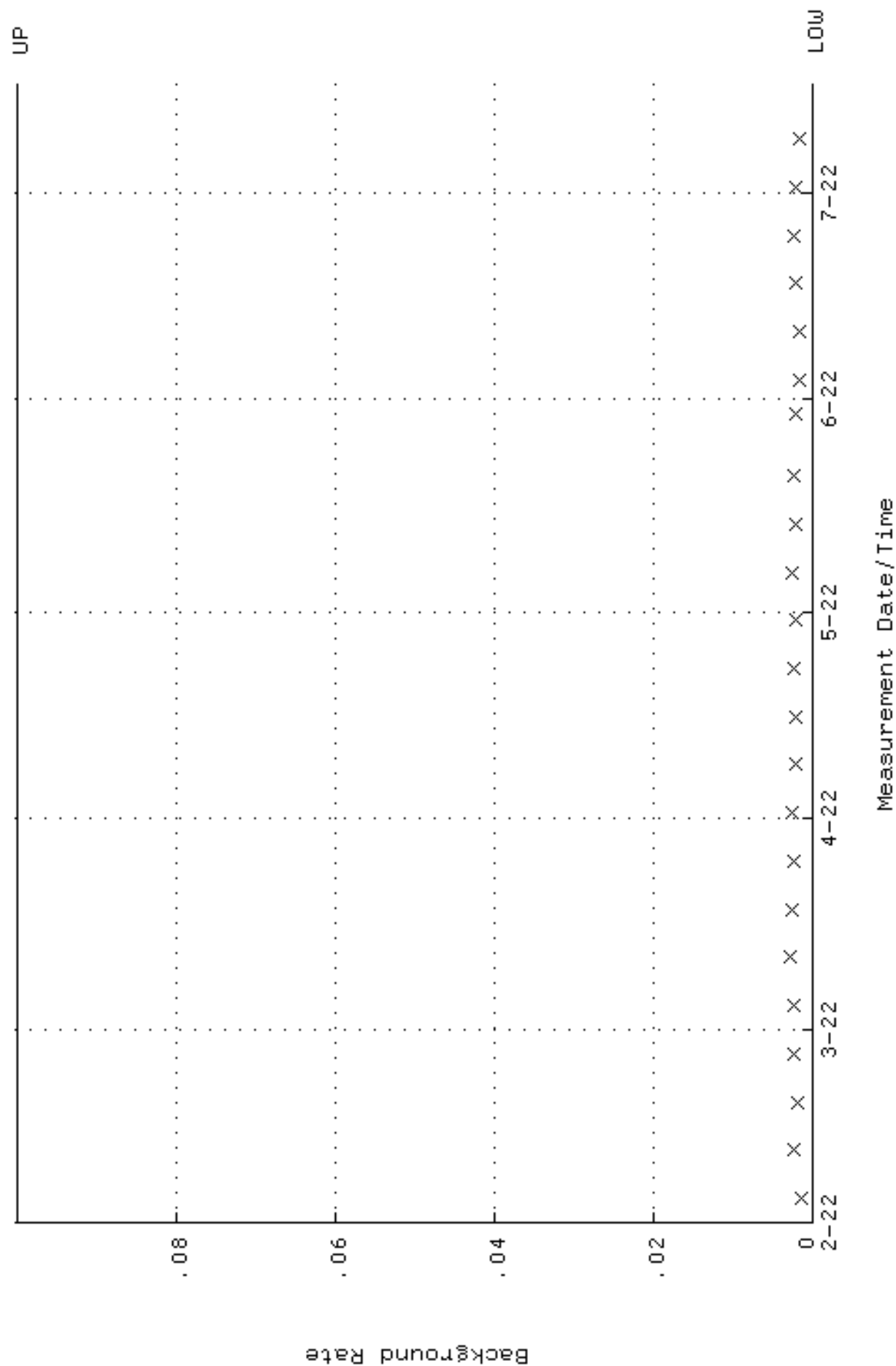
QA filename : DKA100:[ENV_ALPHA.QA.W]W177.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 16-FEB-2022 09:18:39 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



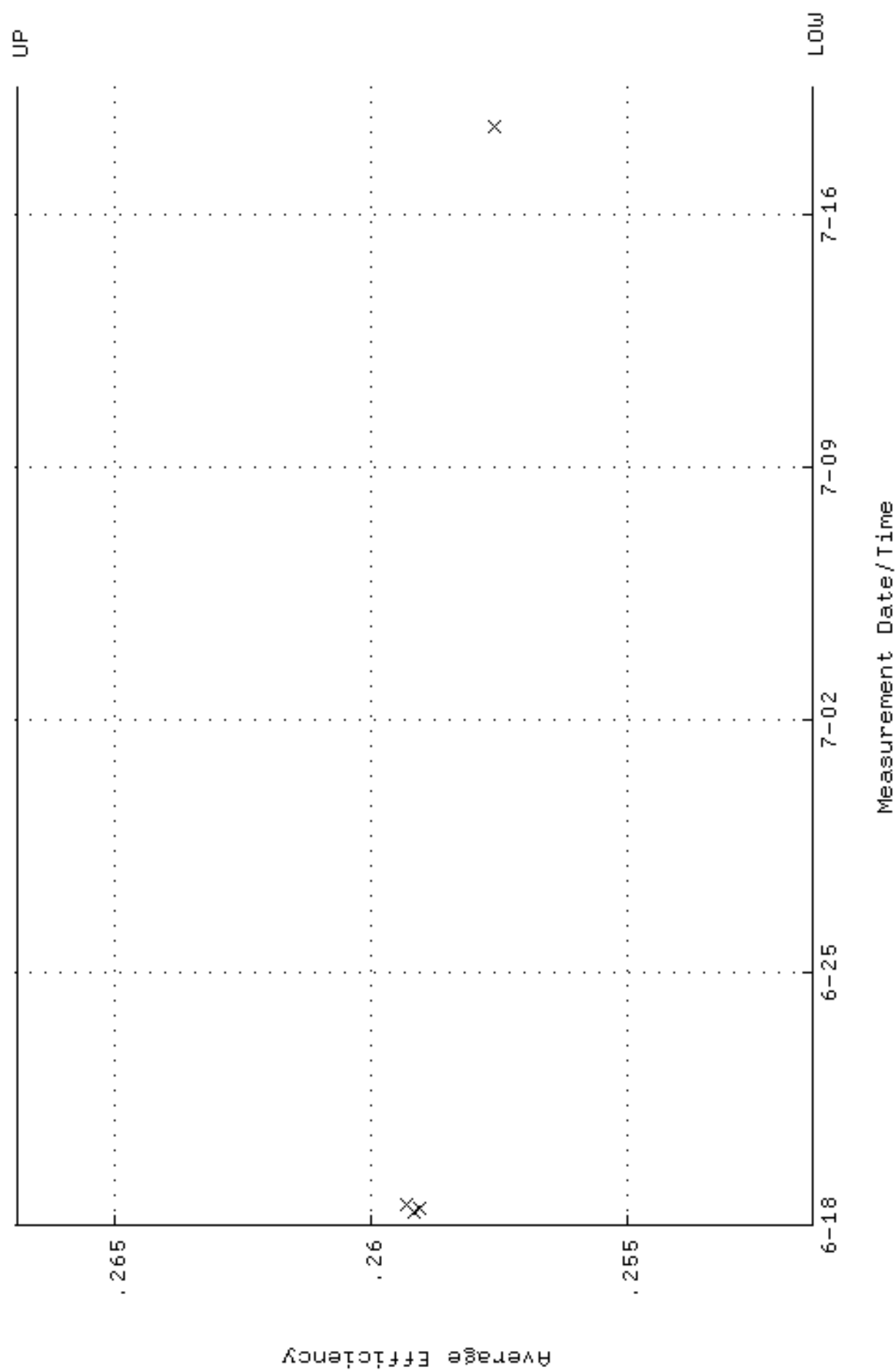
QA filename : DKA100:[ENV_ALPHA.QA.W]W177.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 16-FEB-2022 09:18:39 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



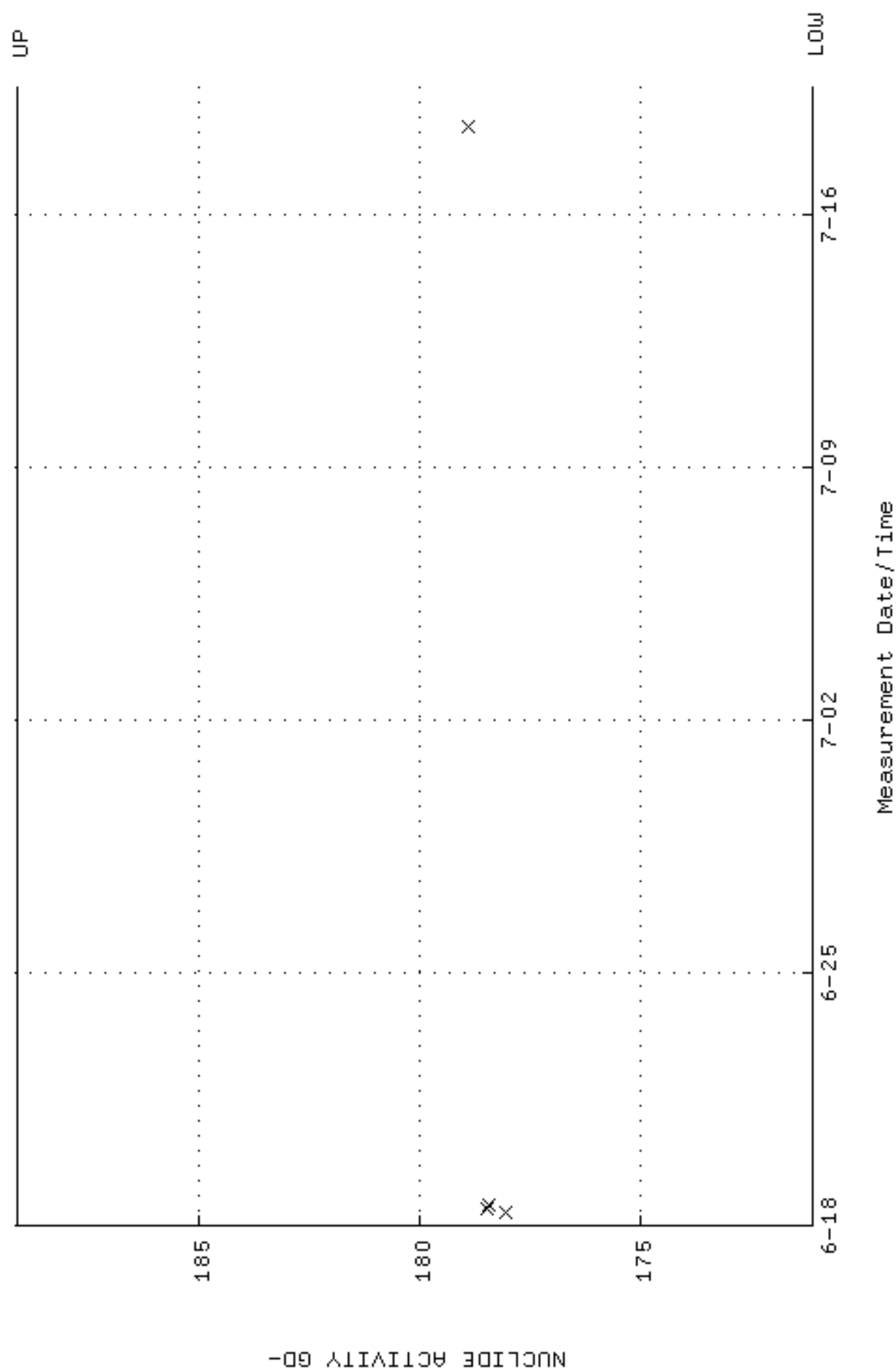
QA filename : DKA100:[ENV_ALPHA.QA.B]B177.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 4-FEB-2022 13:10:40 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



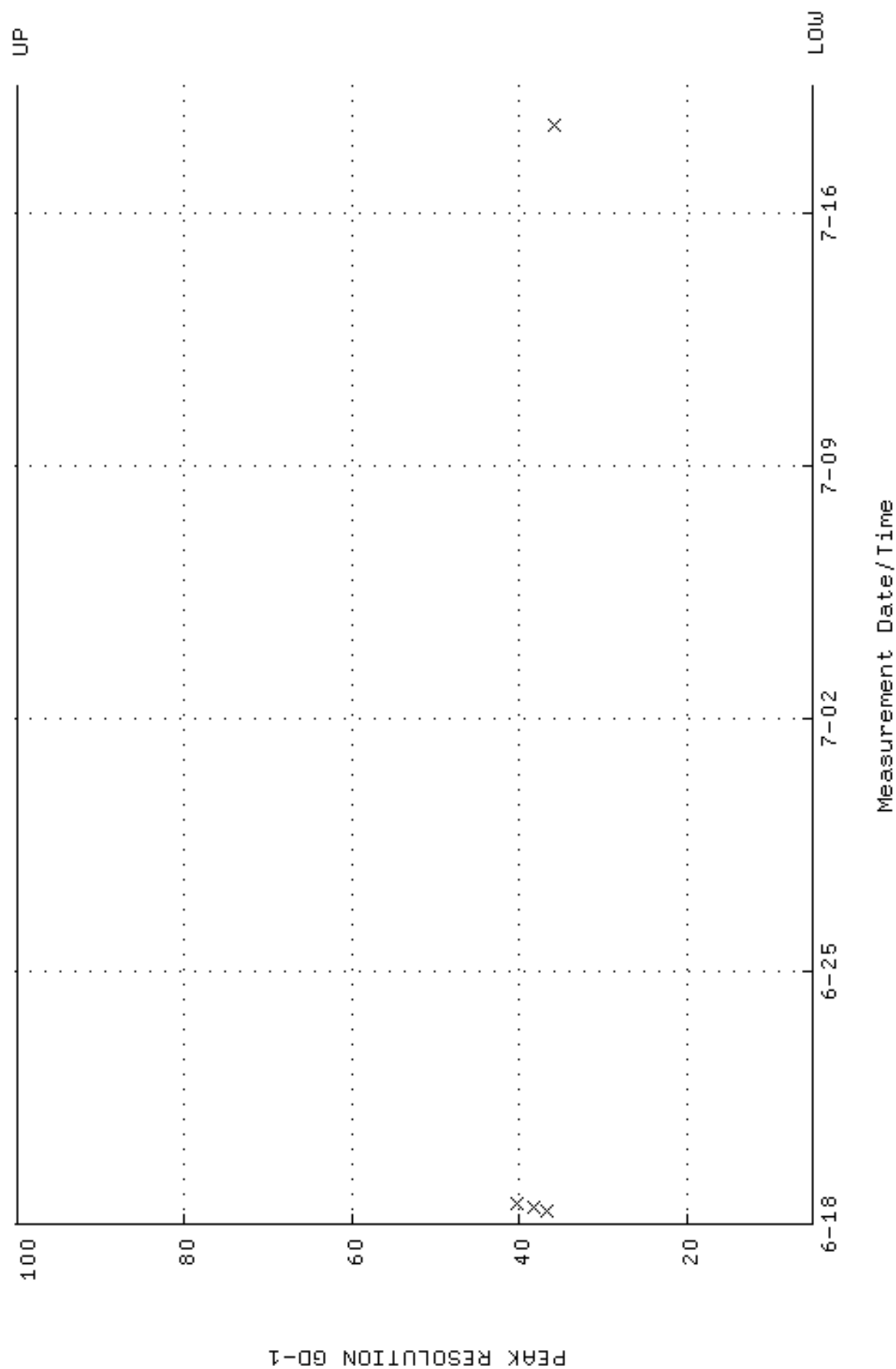
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUN-2022 09:02:52 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.251370 through 0.266910



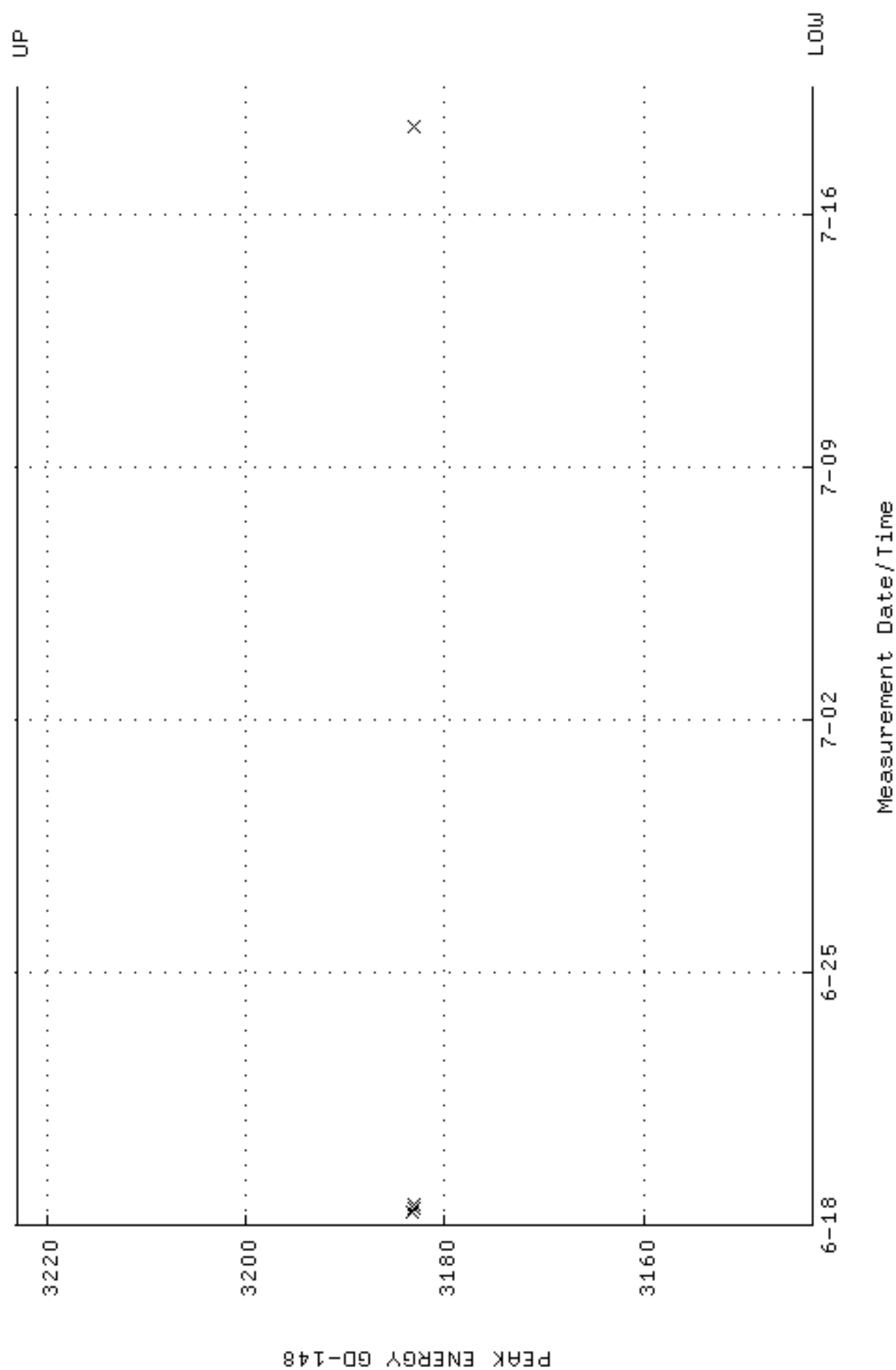
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:52 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



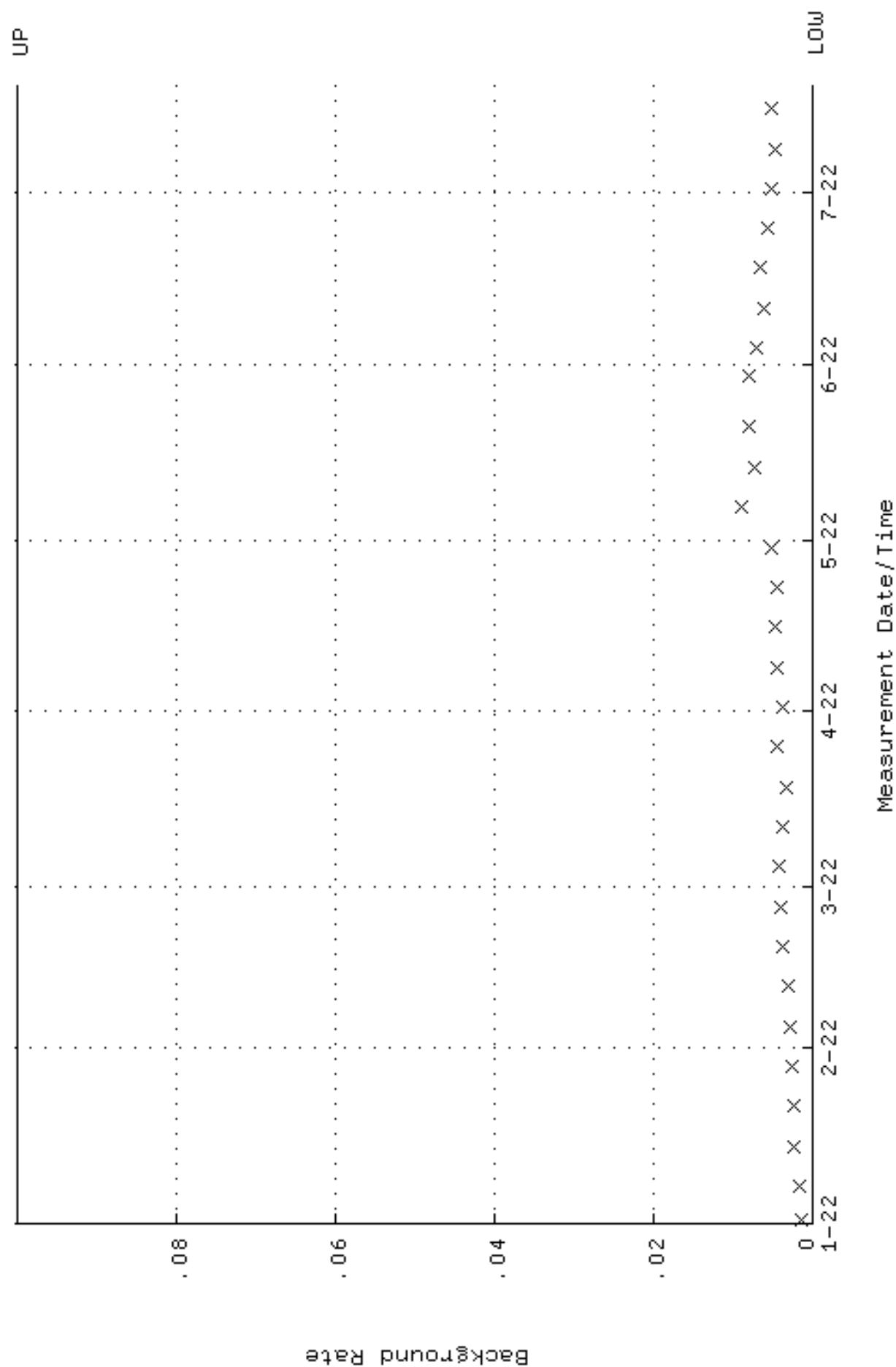
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUN-2022 09:02:52 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



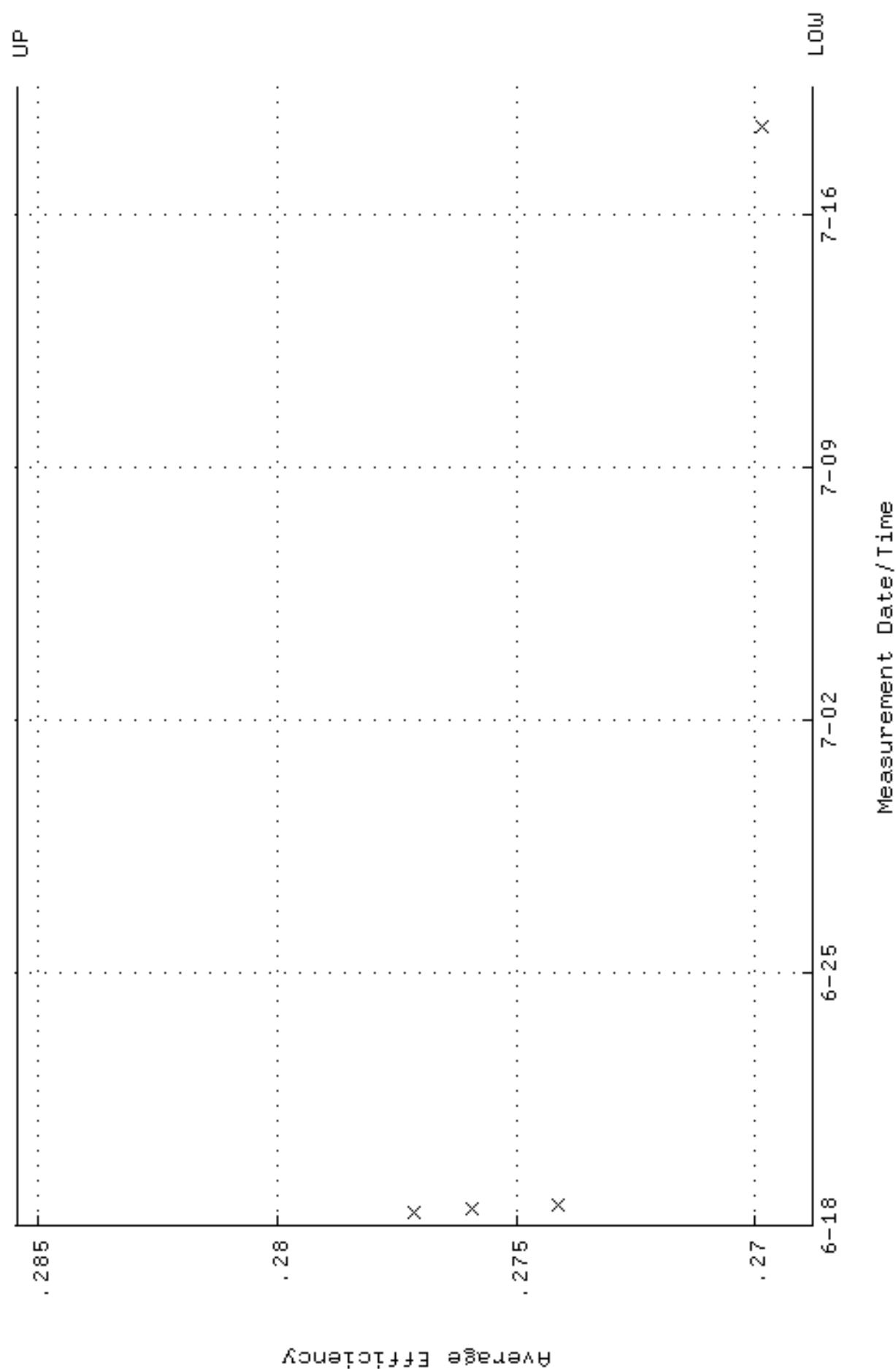
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:52 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



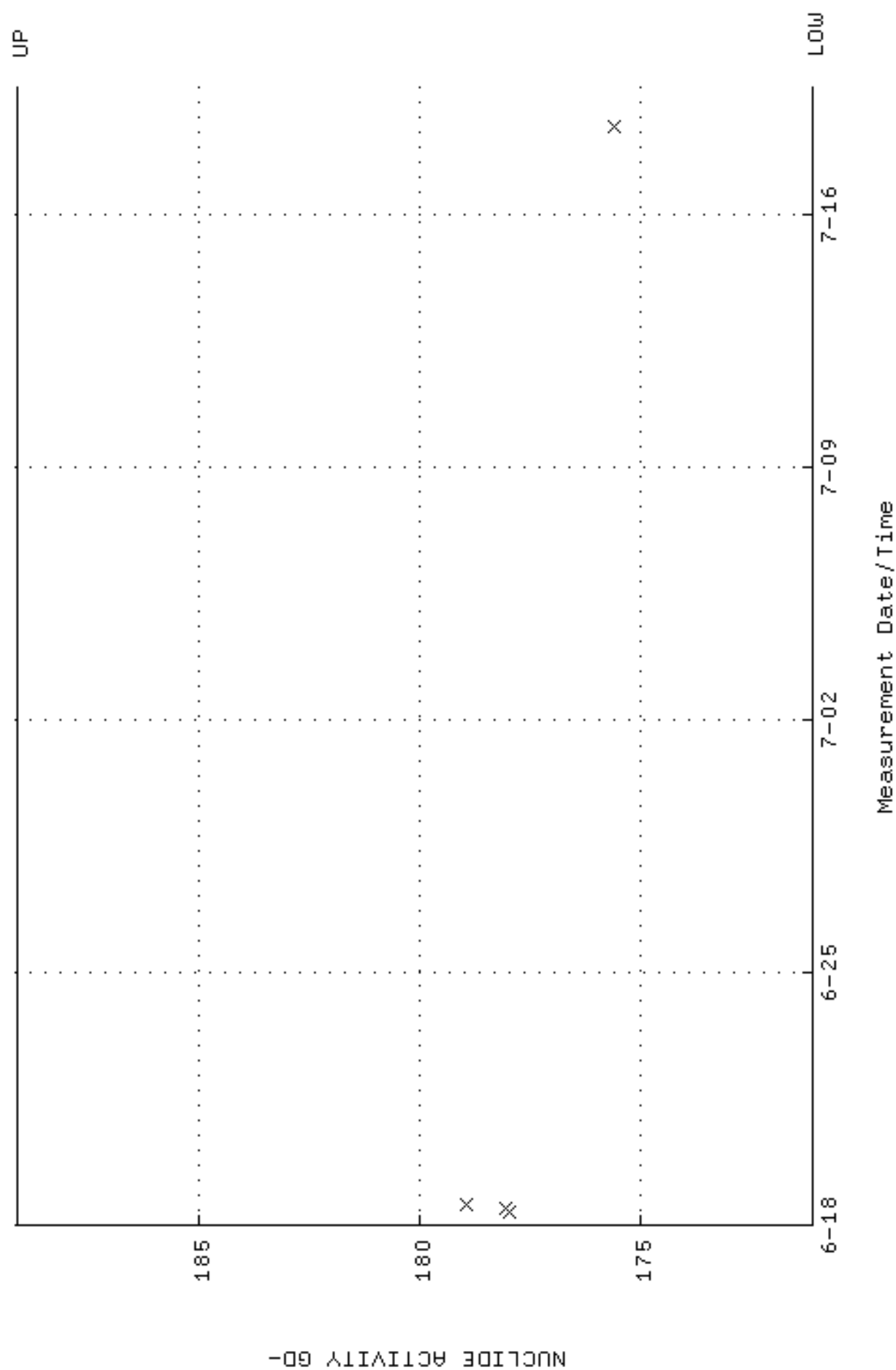
QA filename : DKA100:[ENV_ALPHA.QA.B]B194.QAF;3
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:20:50 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



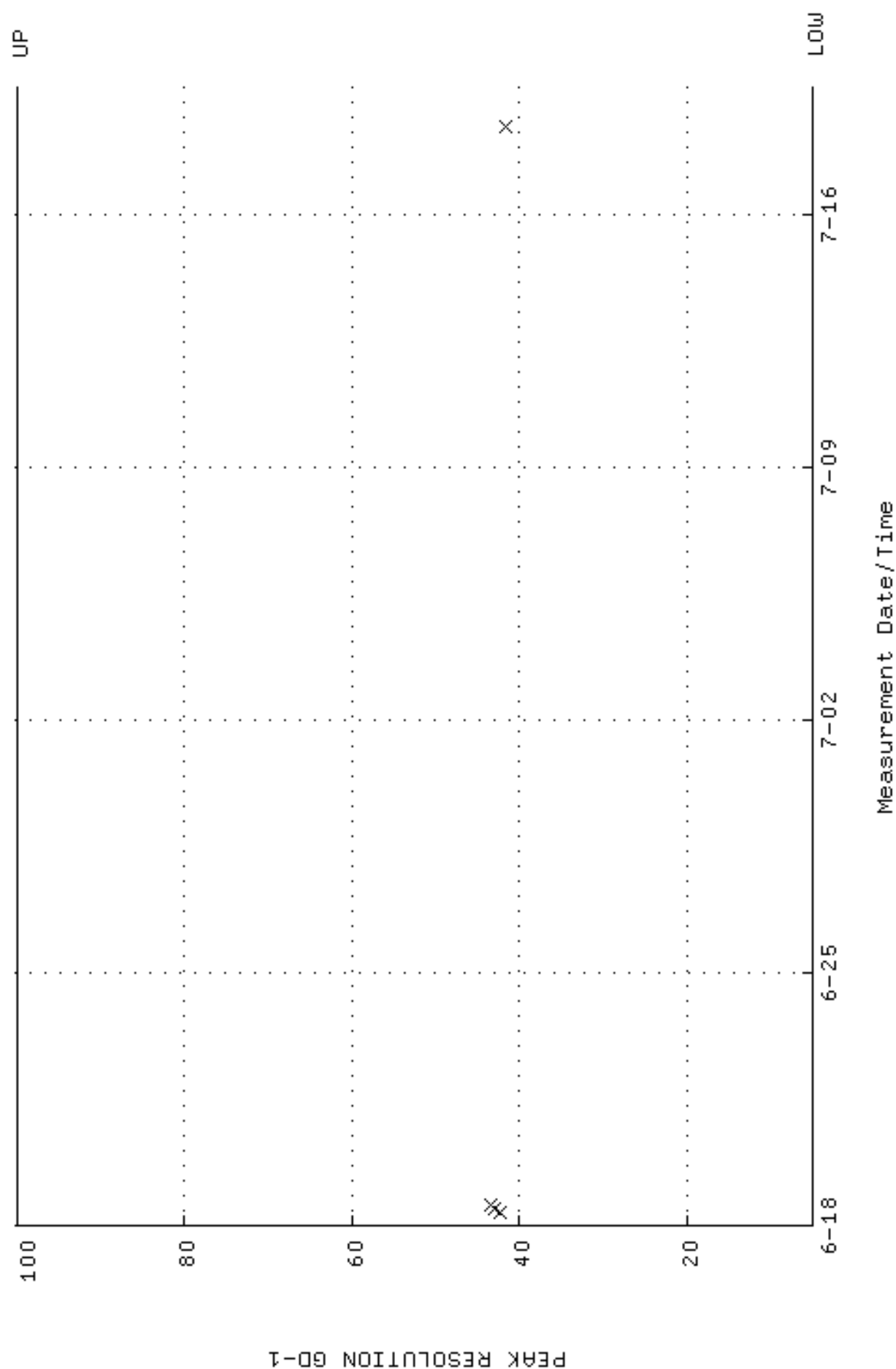
QA filename : DKA100:[ENV_ALPHA.QA.W]W195.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUN-2022 09:02:56 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.268800 through 0.285430



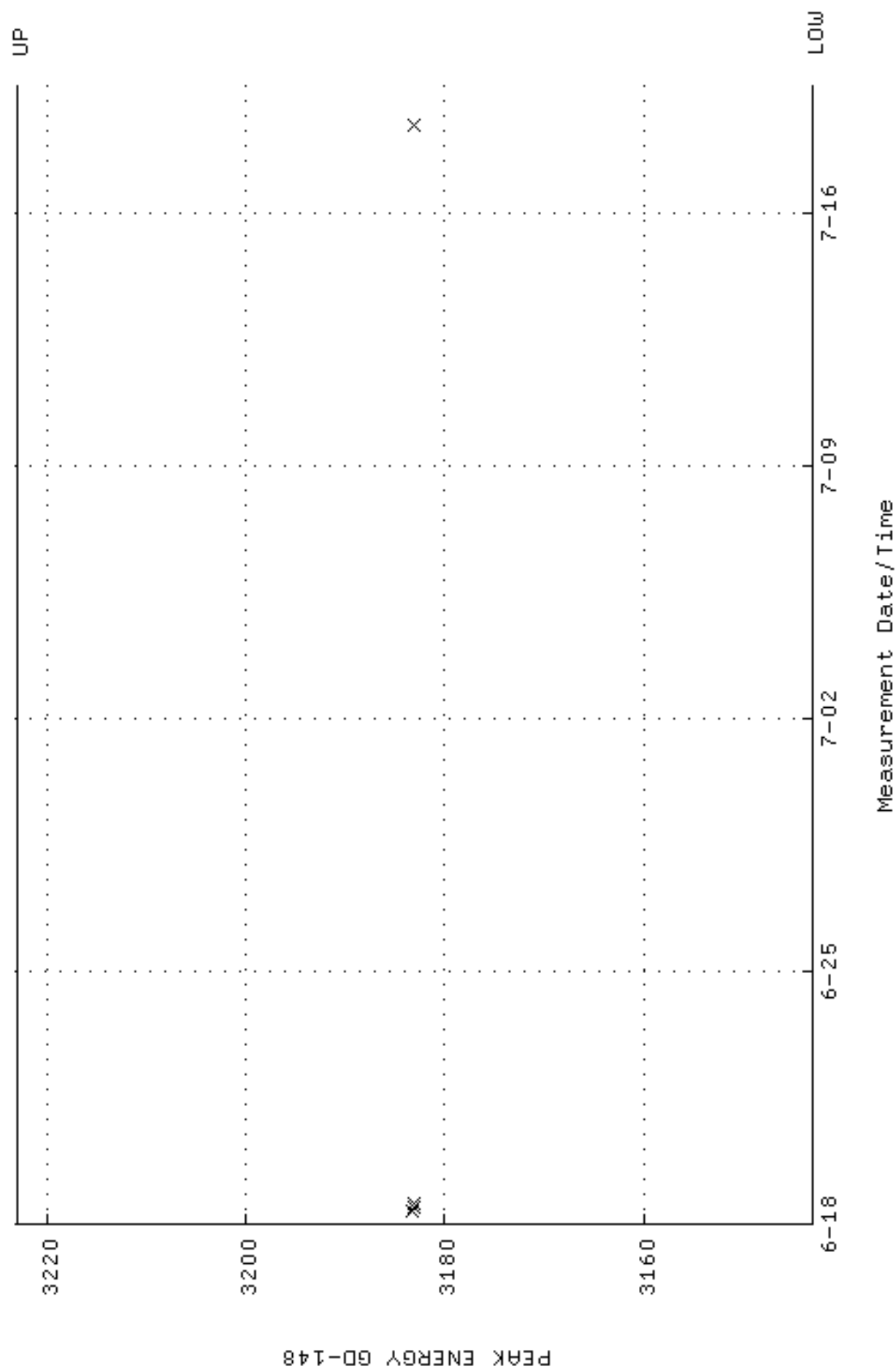
QA filename : DKA100:[ENV_ALPHA.QA.W]W195.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:56 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



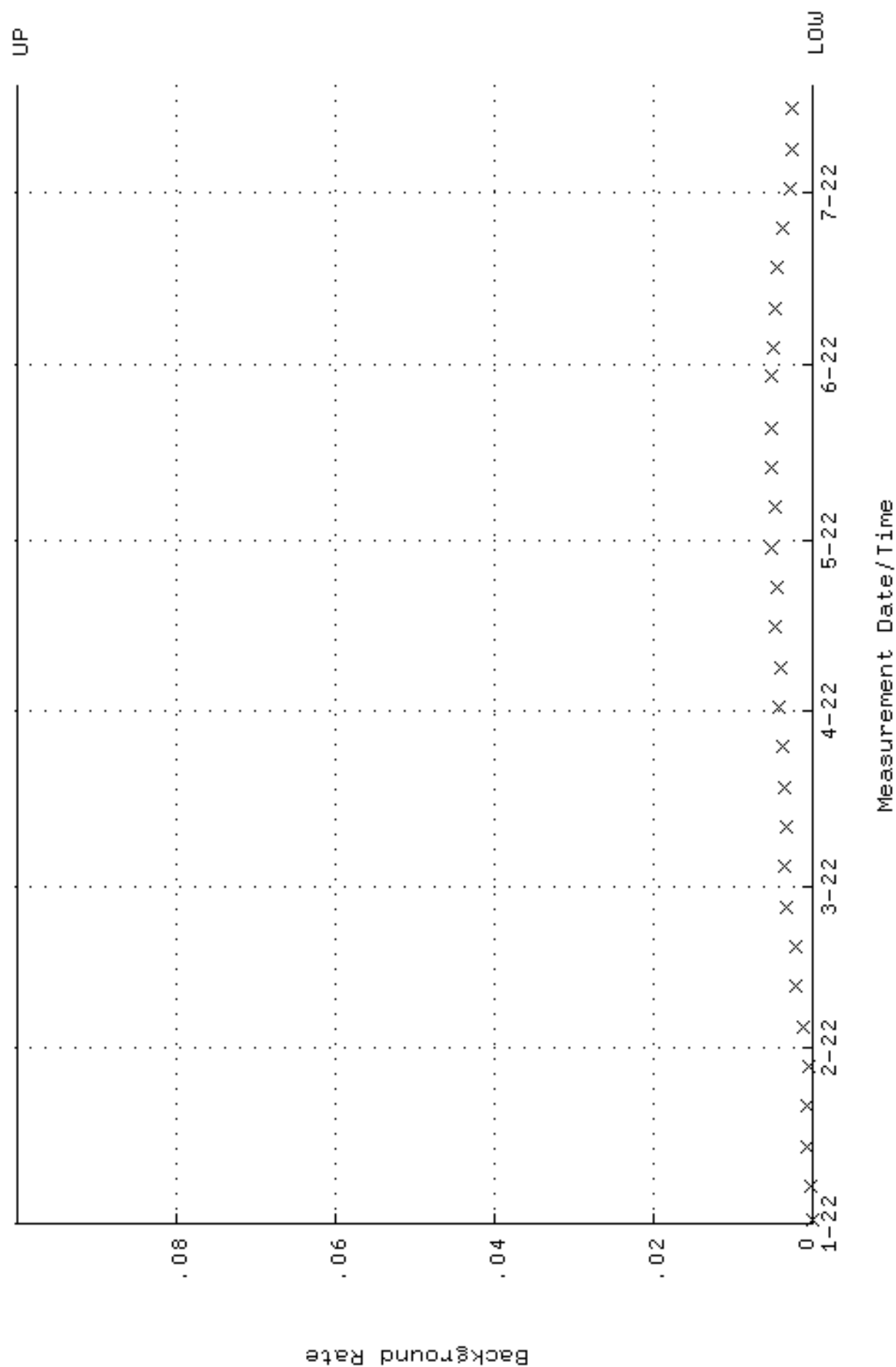
QA filename : DKA100:[ENV_ALPHA.QA.W]W195.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUN-2022 09:02:56 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



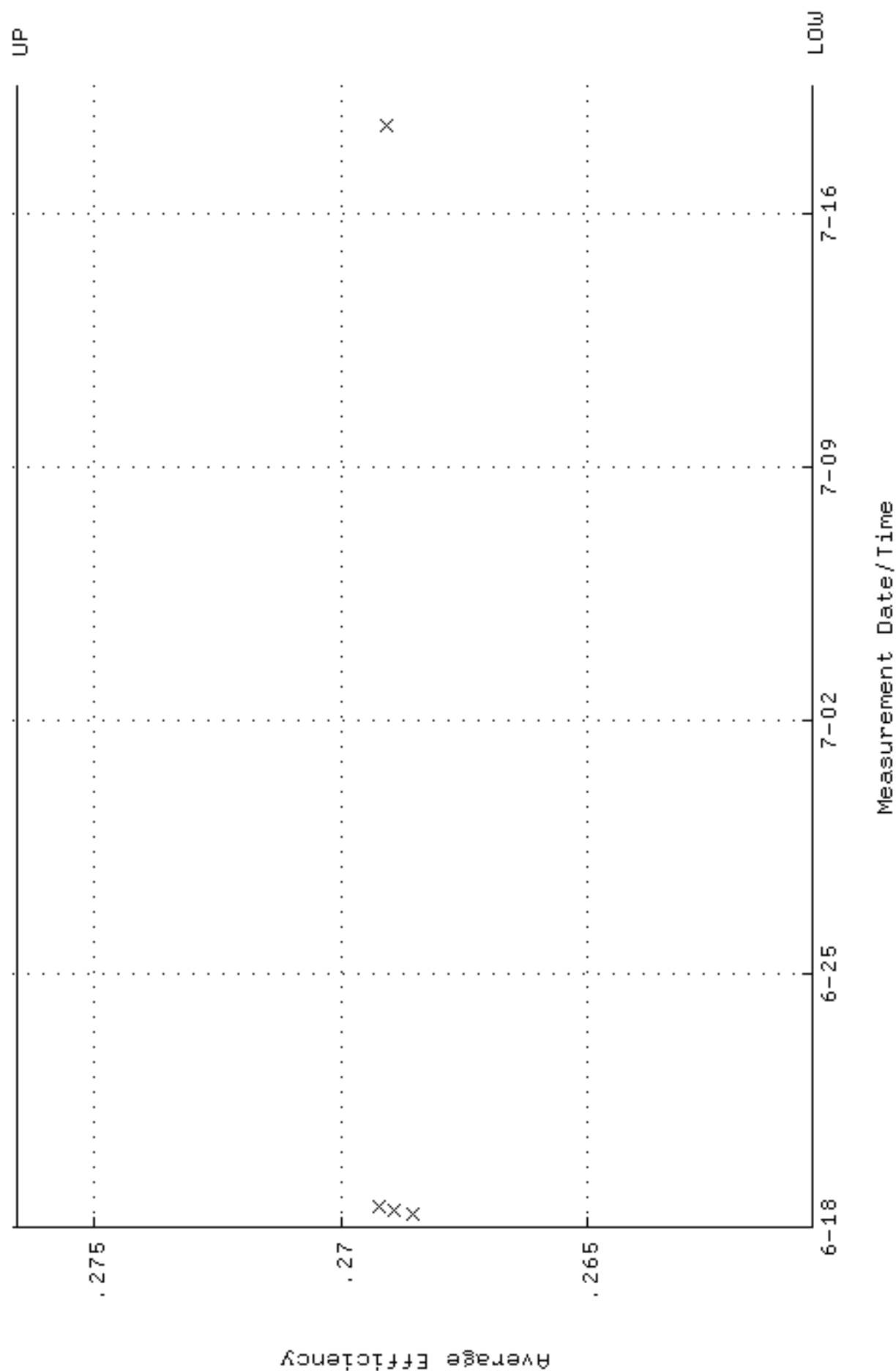
QA filename : DKA100:[ENV_ALPHA.QA.W]W195.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:56 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



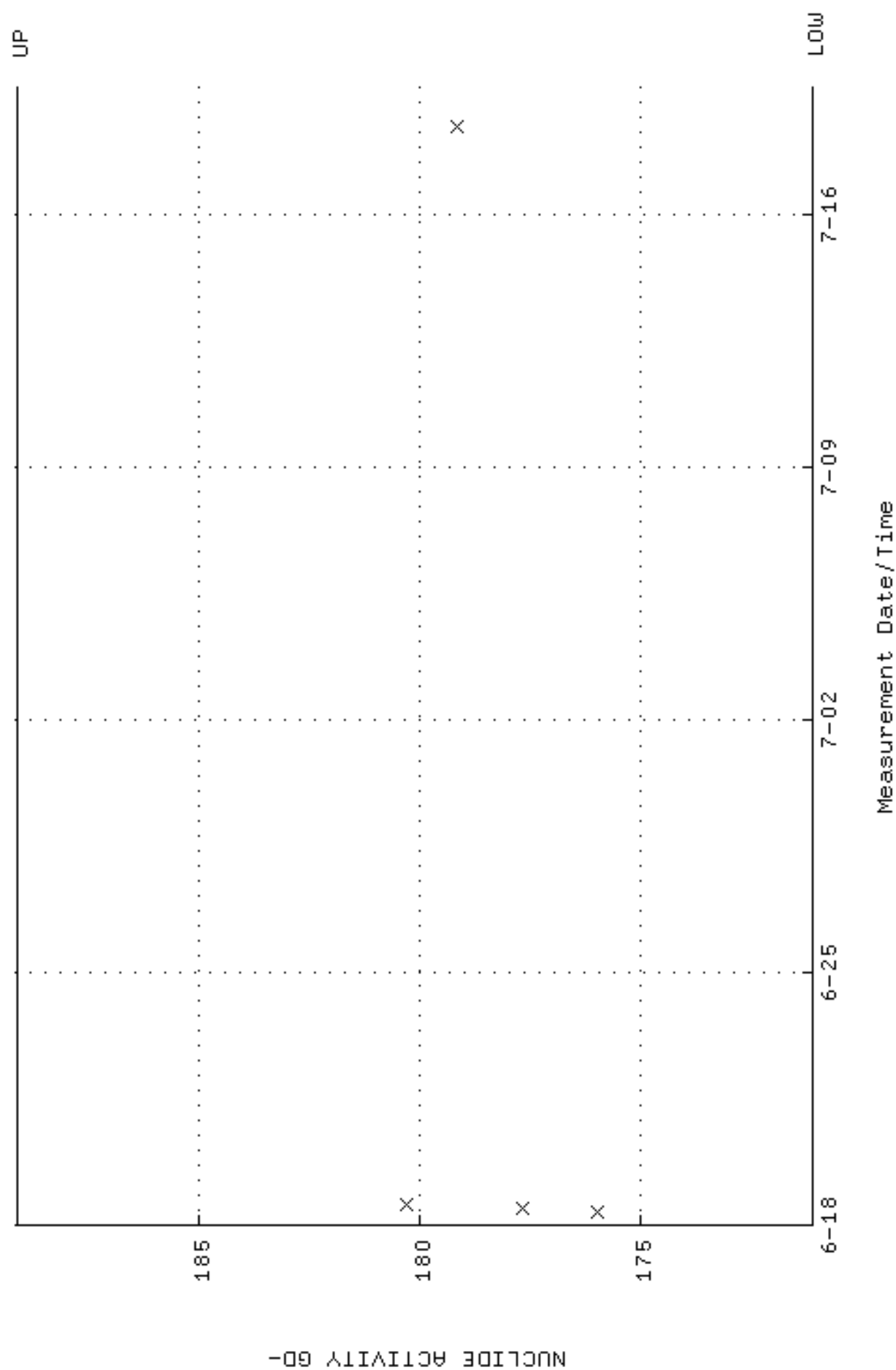
QA filename : DKA100:[ENV_ALPHA.QA.B]B195.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:20:55 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



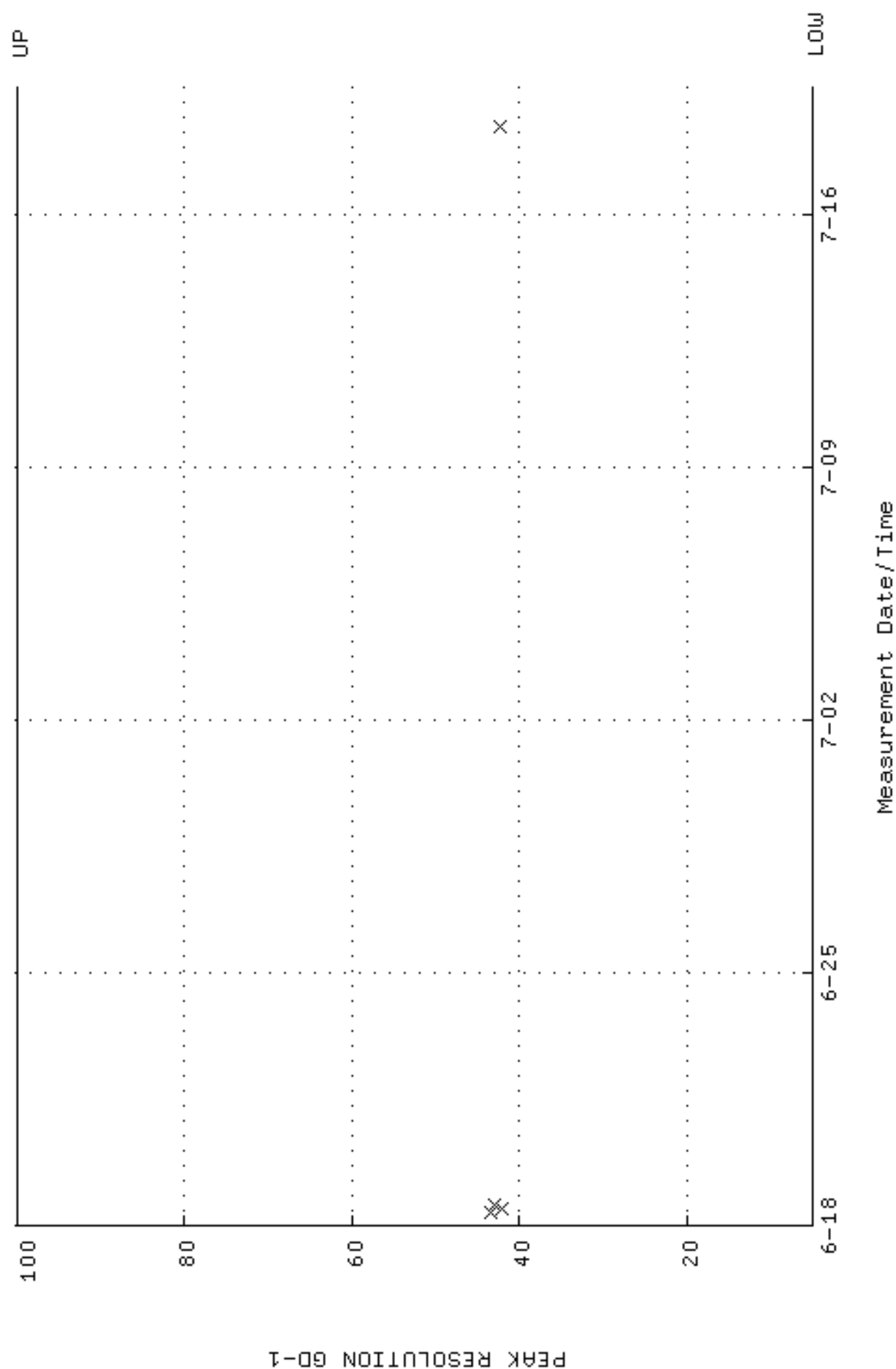
QA filename : DKA100:[ENV_ALPHA.QA.W]W196.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUN-2022 09:02:59 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.260470 through 0.276580



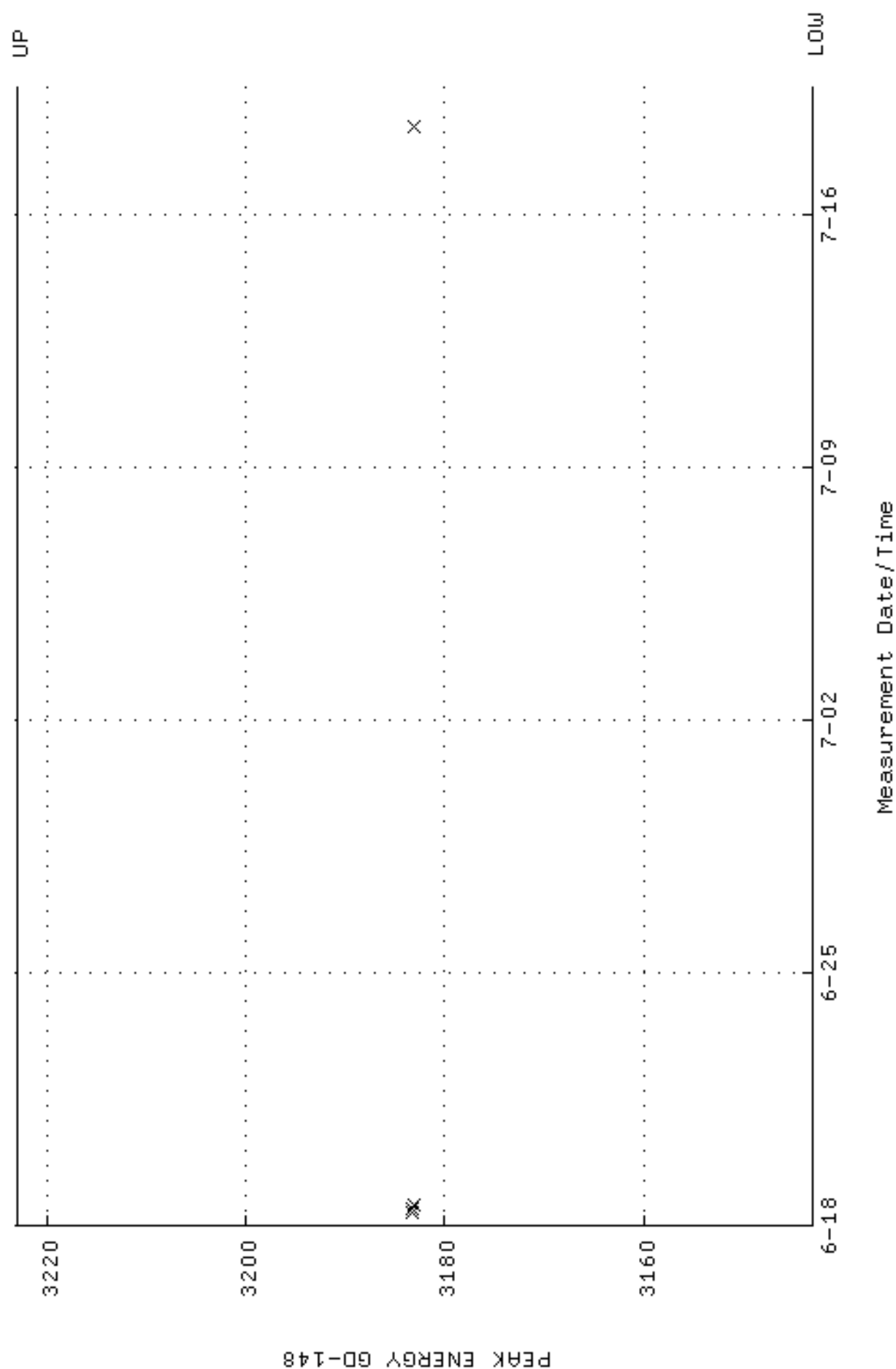
QA filename : DKA100:[ENV_ALPHA.QA.W]W196.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:59 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



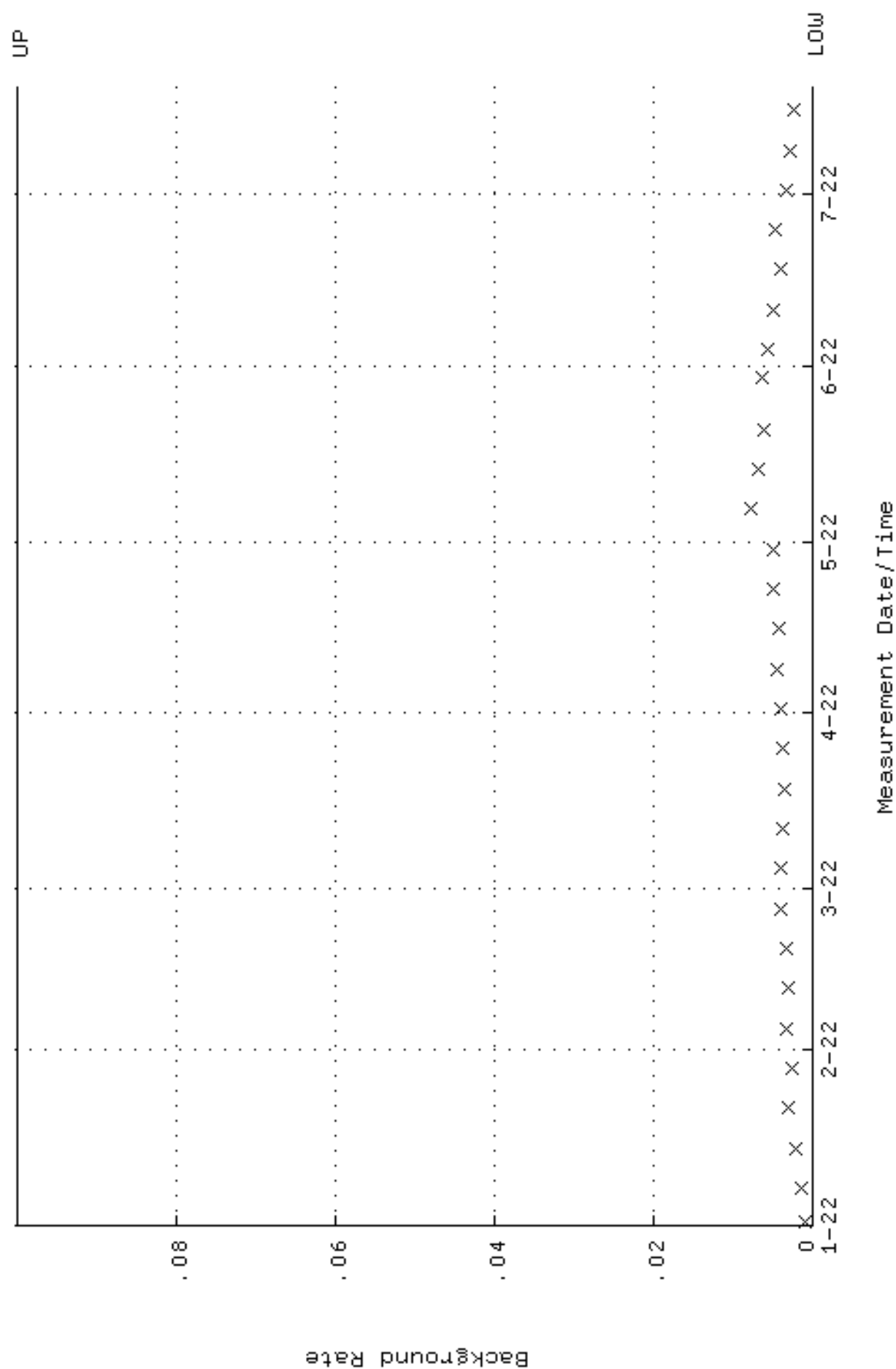
QA filename : DKA100:[ENV_ALPHA.QA.W]W196.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUN-2022 09:02:59 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



QA filename : DKA100:[ENV_ALPHA.QA.W]W196.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:59 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



QA filename : DKA100:[ENV_ALPHA.QA.B]B196.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:20:59 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



RAD Standards Traceability

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

65338-278

Am-241 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Am-241
ACTIVITY (dps):	3.920 E4
HALF-LIFE:	4.322 E2 years
CALIBRATION DATE:	January 15, 2003 12:00 EST
TOTAL UNCERTAINTY*:	3.2%
SYSTEMATIC:	2.2%
RANDOM:	1.0%

*99% confidence level.

5.10649 grams 1M HCl solution.

Impurities: γ -impurities <0.1%
 α -impurities <0.1%

P O NUMBER 3213 RD, Item 1

SOURCE PREPARED BY: M. Taskaeva
M. Taskaeva, Radiochemist

Q A APPROVED:

UM [Signature] 1-16-03

RC-S-035-046a

Standard Logbook

Serial ID: 0533 **Open/Reference Date:** 15 JAN 2003 **Aliquot :** 5.10649 g
Name: Americium-241 **Received:** 27 JAN 2003 **Density :** Hand Calculated
Type: Source Material **Expires:** 05 FEB 2020 **Logbook Num :** RC S 035 048
Employee: Angela Johnson **Lot Number :** 65338-278
Supplier: Analytics **Solvent :** 1 M HCL
Uncertainty : 1.25 percent
Description: 65338-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	39200 dps		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	0533
Prepared By:	Angela Johnson
Carrier Conc:	1 M HCL
Reference Date:	01/15/2003
Ampoule Mass (g):	5.10649 g
Uncertainty:	+/- 1.25 %
LogBook No:	RC S 035 048
Supplier:	Analytics

A Solution Material Info		
Isotope:	Americium-241	
Prepared By:	Angela Johnson	
Prep Date:	02/05/2003	
Verification Date:	07/08/2022	
Expiration Date:	07/08/2023	
Primary Code:	0533-A	
Dilution(mL):	100 mL	
Mass of Parent(g):	4.8225 g	
Density(g/mL):	1.0139	Balance ID:

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (5.10649 \text{ g} * 100 \text{ mL}) = 22211.9695 \text{ dpm/mL}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (1.0139 \text{ g/mL}) / (5.10649 \text{ g} * 100 \text{ mL}) = 21907.2185 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/20/2003	Angela Johnson	1.0151	100	0533-B	222.38 dpm/mL	03/01/2006	03/01/2007
01/16/2015	Christina Kimball	.005081	500	0533-BB	.22263 dpm/mL	01/14/2016	01/14/2017
02/20/2003	Angela Johnson	.6819	250	0533-C	59.754 dpm/mL	02/20/2004	02/20/2005
05/04/2015	Tim Chandler	1.02	500	0533-CC	44.6907 dpm/mL	04/17/2017	04/17/2018
05/07/2003	Tim Chandler	.1245	100	0533-D	27.2745 dpm/mL	05/03/2004	05/03/2005
01/22/2016	Christina Kimball	.103	500	0533-DD	4.51289 dpm/mL	01/05/2022	01/05/2023
09/10/2004	Amanda Fehr	.6933	250	0533-E	60.753 dpm/mL	09/10/2005	09/10/2006
10/31/2016	Christina Kimball	.00508	500	0533-EE	.22259 dpm/mL	10/30/2017	10/30/2018

12/17/2004	Brenda Burke	.0093	100	0533-F	2.0374 dpm/mL	12/20/2004	12/20/2005
10/13/2017	Tim Chandler	1.0219	500	0533-FF	44.774 dpm/mL	10/01/2019	10/01/2020
12/21/2004	Brenda Burke	.009273	100	0533-G	2.0315 dpm/mL	12/07/2005	12/07/2006
11/13/2017	Christina Kimball	.00507	500	0533-GG	.2222 dpm/mL	11/09/2018	11/09/2019
04/28/2005	Brenda Burke	.1347	100	0533-H	29.4598 dpm/mL	04/27/2006	04/27/2007
01/23/2018	Tim Chandler	1.2536	100	0533-HH	274.6289 dpm/mL	01/23/2018	01/23/2019
10/19/2005	Mary Aders	.6948	250	0533-I	60.7831 dpm/mL	10/18/2006	10/18/2007
01/30/2020	Tim Chandler	1.0284	500	0533-II	45.0588 dpm/mL	01/18/2022	01/18/2023
05/08/2006	Julie Strock	.0711	100	0533-J	15.576 dpm/mL	05/10/2008	05/10/2009
07/08/2022	Matelon DeFreese	1.0349	500	0533-JJ	45.3435609 dpm/mL	07/18/2022	07/18/2023
05/11/2006	Brenda Burke	.00092601	100	0533-K	.20286 dpm/mL	08/02/2007	07/28/2007
11/15/2006	Tara Sides	.132	1000	0533-L	2.88586 dpm/mL	09/15/2015	09/15/2016
06/12/2007	Julie Strock	.000979	100	0533-M	.21448 dpm/mL	05/20/2009	05/20/2010
08/03/2007	Daniel Roy	.7042	250	0533-N	61.7083 dpm/ml	08/02/2008	08/02/2009
09/25/2008	Daniel Roy	1.4561	500	0533-O	63.7982 dpm/ml	09/07/2010	09/07/2011
09/29/2008	Tara Sides	.1004	100	0533-P	21.9948 dpm/mL	09/07/2010	09/07/2011
06/03/2009	Julie Strock	.0009751	100	0533-Q	.2136 dpm/mL	06/01/2010	06/01/2011
11/08/2010	Ashley Drochter	1.4675	500	0533-R	64.2977 dpm/mL	11/08/2010	11/08/2011
11/09/2010	Ashley Drochter	.7295	500	0533-S	31.9626 dpm/mL	10/31/2011	10/31/2012
01/03/2011	Christina Kimball	.097	100	0533-T	21.25 dpm/mL	01/03/2011	01/03/2012
01/05/2011	Christina Kimball	.1009	100	0533-U	22.10438 dpm/mL	12/18/2013	12/18/2014
05/23/2011	Christina Kimball	.001008999	100	0533-V	.2210438 dpm/mL	05/11/2012	05/11/2013
05/11/2012	Christina Kimball	.001016	100	0533-W	.222676 dpm/mL	05/01/2014	05/01/2015

06/13/2012	Ashley Drochter	.728	500	0533-X	31.8969 dpm/mL	06/02/2014	06/02/2015
01/23/2013	Salina Pizarro	2	500	1641	.1498555 dpm/mL	12/19/2013	12/01/2038
07/16/2013	Julie Strock	1	500	1641-A	.07492775 dpm/mL	07/16/2038	07/16/2039
03/17/2014	Christina Kimball	.1013	100	0533-Y	22.19201 dpm/mL	02/26/2019	02/26/2020
05/05/2014	Christina Kimball	.00101595	100	0533-Z	.222567 dpm/mL	05/05/2014	05/05/2015

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Am-241 Standard 0533-II

v1.2

Analyst	MXS2
Verification Prep Date	1/18/2022

Tracer Information	
Isotope	Am-243
Serial Number	1752-H
Amount of Std. (mL)	0.2
Expiration Date	6/18/2022

Standard Information	
Isotope	Am-241
Serial Number	0533-II
Isotope Halflife	432.6000 Y
Reference Date	1/15/2003
Ref. Act. (dpm/mL)	45.0588
Amount of Std. (mL)	0.2
Standard Prep Date	1/30/2020

Std #	Count Date	Activity pCi	Standard dpm/mL
1	1/18/2022	3.910	43.40
2	1/18/2022	3.790	42.07
3	1/18/2022	3.890	43.18

Mean Value = 3.863 42.883
Stdev = 0.064291005 0.713630156

	pCi	dpm/mL
Certificate Value* =	3.9376	43.7071
Two sigma =	0.1286	1.4273
10 % of Mean =	0.3863	4.2883
Rule A (Pass/Fail)	Pass	Pass
% Recovery	98.11%	98.11%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	1/18/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

*** Certificate Value is decay corrected to Verification Prep Date.**

The analyst prepared three standard verification sources for Am-241 standard 0533-II using 0.2 mL for each source. Each standard was combined with 0.2 mL of Am-243 standard 1752-H and was diluted in a centrifuge tube containing 20 mL 3M/HCl and 20 mL DI water. 0.1g of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-241 were calculated by comparison to Am-243 certified values.

CERTIFICATE OF CALIBRATION
Standard Reference Source

1752

101294

Am-243 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL1511998, Item 1 **Product Code:** 8243



This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
Am-243	2.692E+06	3.809E+04	0.5	1.8	3.7	09/01/2015

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities (other than decay products) < 0.1%.
5.10528 g 1M HCl solution, carrier free.

Source Prepared by: _____

Z. Dimitrova, Radiochemist

QC Approved: _____

J. S. Lehr, Spectroscopist

Date: 28 AUG 15

Standard Logbook

Serial ID: 1752 **Open/Reference Date:** 01 SEP 2015 **Aliquot :** 5.10528 g
Name: Americium-243 **Received:** 01 SEP 2015 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18 SEP 2025 **Logbook Num :** GL-CED-297-045
Employee: Gregory Ramsay **Lot Number :** 101294
Supplier: Eckert & Ziegler **Solvent :** 1M HCl
Uncertainty : 1.85 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-243	38090 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1752
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HCl
Reference Date:	09/01/2015
Ampoule Mass (g):	5.10528 g
Uncertainty:	+/- 1.85 %
LogBook No:	GL-CED-297-045
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Americium-243		
Prepared By:	Tim Chandler		
Prep Date:	11/23/2015		
Verification Date:	01/06/2017		
Expiration Date:	01/20/2022		
Primary Code:	1752-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0826 g		
Density(g/mL):	1.0282	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22752.4720 \text{ dpm/mL}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0282 \text{ g/mL}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22128.4498 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/23/2015	Tim Chandler	1.0432	500	1752-B	46.1688 dpm/mL	11/24/2015	11/23/2016
05/26/2016	Tim Chandler	1.072	500	1752-C	47.4434 dpm/mL	05/26/2016	05/26/2017
01/06/2017	Tim Chandler	2.1043	1000	1752-D	46.5649 dpm/mL	12/20/2017	12/20/2018
05/30/2018	Tim Chandler	2.3853	1000	1752-E	52.783 dpm/mL	05/21/2019	05/21/2020
08/05/2019	Tim Chandler	2.2432	1000	1752-F	49.6385 dpm/mL	08/03/2020	08/03/2021
08/12/2020	Tim Chandler	2.2247	1000	1752-G	49.2292 dpm/mL	08/12/2020	08/12/2021
06/18/2021	Tim Chandler	2.2608	1000	1752-H	50.028 dpm/mL	06/18/2021	06/18/2022
01/20/2022	Matelon DeFreese	2.0841	1000	1752-I	46.1179022 dpm/mL	01/21/2022	01/21/2023

Verification for Am-243 Standard 1752-I

v1.2

Analyst	MXS2
Verification Prep Date	1/21/2022

Tracer Information	
Isotope	Cm-244
Serial Number	1216-N
Amount of Std. (mL)	0.2
Expiration Date	4/12/2022

Standard Information	
Isotope	Am-243
Serial Number	1752-I
Isotope Half-life	7.3700E+03 Y
Reference Date	9/1/2015
Ref. Act. (dpm/mL)	46.1179022
Amount of Std. (mL)	0.5
Standard Prep Date	1/20/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	1/23/2022	10.300	45.73
2	1/23/2022	10.700	47.51
3	1/23/2022	10.500	46.62

Mean Value = 10.500 46.620
Stddev = 0.2 0.888

Certificate Value* = 10.3807 pCi
Two sigma = 0.4000
10 % of Mean = 1.0500
Rule A (Pass/Fail) Pass
% Recovery 101.15%
Rule B (Pass/Fail) Pass
Expiration Date 1/21/2023

dpm/mL
46.0902
1.7760
4.6620
Pass
101.15%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Am-243 standard 1752-I using 0.5 mL for each source. Each standard was combined with 0.2 mL of Cm-244 standard 1216-N and was diluted in a centrifuge tube containing 20 mL of 3M HCl and 20 mL of DI water. 0.1 mL of neodymium carrier and five mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-243 were calculated by comparison to Cm-244 certified values.

1/24/22



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010

Fax 661•257•8303

1521

CERTIFICATE OF CALIBRATION GAMMA STANDARD SOLUTION

Radionuclide:	Pb-210	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	22.3 ± 0.2 years	P.O. No.:	936803 RD	
Catalog No.:	7210	Reference Date:	15-Feb-11	12:00 PST
Source No.:	1476-99	Contained Radioactivity:	4.973 μ Ci	184.0 kBq

Physical Description:

A. Mass of solution:	5.21292 g in 5 mL flame-sealed ampoule
B. Chemical form:	Pb(NO ₃) ₂ in 1M HNO ₃
C. Carrier content:	10 μ g Pb/mL of solution
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.9540 μ Ci/g, 35.30 kBq/g

Method of Calibration:

This source was prepared from a weighed aliquot of solution whose activity in μ Ci/g was determined using gamma ray spectrometry.

Peak energy used for integration:	46.5 keV
Branching ratio used:	0.0418 gammas per decay

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5 %
B. Type B (systematic) uncertainty:	± 7.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 7.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.



Quality Control

11-Jan-11
Date

EZIP Ref. No.: 1476-99

ISO 9001 CERTIFIED

Medical Imaging Laboratory

Industrial Gauging Laboratory

Standard Logbook

Serial ID: 1521 **Open/Reference Date:** 15 FEB 2011 **Aliquot :** 5.21292 g
Name: Lead-210 **Received:** 14 JAN 2011 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 02 MAR 2013 **Logbook Num :** RC-S-060-066
Employee: Gregory Ramsay **Lot Number :** 1426-99
Supplier: Eckert & Ziegler **Solvent :** 1M HNO₃
Description: ampule **Uncertainty :** 7 percent
Comments: None

Analyte	Concentration	Analyte	Concentration
Lead-210	35.3 kBq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1521
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	02/15/2011
Ampoule Mass (g):	5.21292 g
Uncertainty:	+/- 7 %
LogBook No:	RC-S-060-066
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Lead-210		
Prepared By:	Bethany Fiem		
Prep Date:	03/22/2011		
Verification Date:	12/03/2020		
Expiration Date:	12/23/2021		
Primary Code:	1521-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0705 g		
Density(g/mL):	1.0272	Balance ID:	1113021018

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 107393.1900 \text{ dpm/mL}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0272 \text{ g/mL}) / (100 \text{ mL}) = 104549.4451 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/07/2013	Ashley Drochter	.5177	100	1521-B	541.2525 dpm/mL	10/29/2013	10/29/2014
10/29/2013	Tim Chandler	5.1002	100	1521-C	5332.2308 dpm/mL	08/09/2018	08/09/2019
02/01/2019	Bethany Fiem	5.0359	100	1521-D	5265.0055 dpm/mL	11/30/2021	11/30/2022
06/05/2018	Tim Chandler	.6059	200	1867-A		06/06/2018	06/05/2019
06/14/2018	Tim Chandler	.6646	200	1867-B		06/15/2018	06/14/2019
06/14/2018	Tim Chandler	.6646	200	1868-A		06/14/2018	06/14/2019
06/13/2019	Tim Chandler	.6984	200	1907-A		06/15/2021	06/15/2022
06/13/2019	Tim Chandler	.6984	200	1907-A1		06/15/2021	06/15/2022
11/06/2019	Tim Chandler	15.0553	100	1920-A		11/07/2019	11/07/2020
12/14/2021	Matelon DeFreese	.6276	200	2012-A		12/15/2021	12/15/2022

Verification for Po-210 Standard 2012-A

v1.2

Analyst	MXS2
Verification Prep Date	12/15/2021

Tracer Information	
Isotope	Po-209
Serial Number	1720-C
Amount of Std. (mL)	0.2
Expiration Date	11/11/2022

Standard Information	
Isotope	Po-210
Serial Number	2012-A
Isotope Half-life	138.3800 D
Reference Date	12/14/2021
Ref. Act. (dpm/mL)	233.932217
Amount of Std. (mL)	0.2
Standard Prep Date	12/14/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	12/16/2021	20.500	227.55
2	12/16/2021	19.700	218.67
3	12/16/2021	20.000	222.00

Mean Value = 20.067 222.740
 Stdev = 0.404145188 4.486011592

pCi
 Certificate Value* = 20.9697
 Two sigma = 0.8083
 10 % of Mean = 2.0067
 Rule A (Pass/Fail) Pass
 % Recovery 95.69%
 Rule B (Pass/Fail) Pass
 Expiration Date 12/15/2022

dpm/mL
 232.7634
 8.9720
 22.2740
 Pass
 95.69%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-210 standard 2012-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-209 standard 1720-C and was diluted in a centrifuge tube containing 15 mL of 0.05M HNO₃. Precipitated by adding 0.1mL of 30% H₂O₂, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-210 were calculated by comparison to Po-209 certified values.

12/16/2021

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

82308-278

Pu-239 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: 7340 RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u_A	u_B	U	
Pu-239	8.803E+06	3.758E+04	0.1	0.9	1.8	05/07/2010

*Uncertainty: U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities < 0.1 %, α -impurities < 0.1 %, Am-241 330.1 Bq. 5.56111 g 3M HNO₃ solution, carrier free.

Source Prepared by: W. Mao

W. Mao, Radiochemist

QA Approved: J. D. McCorvey

J. D. McCorvey, QA Manager Alternate

Date: 5/10/10



Standard Logbook

Serial ID: 1472 **Open/Reference Date:** 07 MAY 2010 **Aliquot :** 5.56111 g
Name: Plutonium-239 **Received:** 12 MAY 2010 **Density :** Hand Calculated
Type: Source Material **Expires:** 03 JUN 2030 **Logbook Num :** RC-S-060-019
Employee: Ashley Drochter **Lot Number :** 82308-278
Supplier: Eckert & Zeigler Analytics **Solvent :** 3M HNO₃
Uncertainty : .9 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-239	37580 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1472
Prepared By:	Ashley Drochter
Carrier Conc:	3M HNO3
Reference Date:	05/07/2010
Ampoule Mass (g):	5.56111 g
Uncertainty:	+/- .9 %
LogBook No:	RC-S-060-019
Supplier:	Eckert & Zeigler Analytics

A Solution Material Info			
Isotope:	Plutonium-239		
Prepared By:	Julie Strock		
Prep Date:	10/20/2020		
Verification Date:	08/17/2021		
Expiration Date:	08/17/2022		
Primary Code:	1472-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.5071 g		
Density(g/mL):	1.1056	Balance ID:	BIOFA-B952846238

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.56111 \text{ g} * 100 \text{ mL}) = 22329.0118 \text{ dpm/mL}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.1056 \text{ g/mL}) / (5.56111 \text{ g} * 100 \text{ mL}) = 20195.4985 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
10/20/2020	Julie Strock	.0117	1000	1472-B	.2363 dpm/mL	10/14/2021	10/14/2022
08/17/2021	Tim Chandler	1.1318	500	1472-C	45.7145 dpm/mL	08/17/2021	08/17/2022
04/07/2022	Christina Kimball	.01	1000	1472-D	.20195 dpm/mL	04/07/2022	04/07/2023
04/15/2022	Christina Kimball	.011283	1000	1472-E	.2279 dpm/mL	04/15/2022	04/15/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-239 Standard 1472-C

v1.2

Analyst	TC1
Verification Prep Date	8/17/2021

Tracer Information	
Isotope	Pu-236
Serial Number	1980-B
Amount of Std. (mL)	0.2
Expiration Date	5/10/2022

Standard Information	
Isotope	Pu-239
Serial Number	1472-C
Isotope Halflife	2.4131E+04 Y
Reference Date	5/7/2010
Ref. Act. (dpm/mL)	45.7145
Amount of Std. (mL)	0.2
Standard Prep Date	8/17/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	8/17/2021	4.140	45.95
2	8/17/2021	4.330	48.06
3	8/17/2021	4.200	46.62

Mean Value = 4.223 46.879
Stdev = 0.097125349 1.078091369

	pCi	dpm/mL
Certificate Value* =	4.1171	45.6997
Two sigma =	0.1943	2.1562
10 % of Mean =	0.4223	4.6879
Rule A (Pass/Fail)	Pass	Pass
% Recovery	102.58%	102.58%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	8/17/2022	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-239 standard 1472-C using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-236 standard 1980-B and was diluted in a 50 mL plastic centrifuge tube containing 15 mL of 2M HCl. 100 micrograms of neodymium carrier, 6 drops of 25% hydrazine dichloride and five mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-239 were calculated by comparison to Pu-236 certified values.



National Institute of Standards & Technology

Certificate

2020

Standard Reference Material® 4334j

Plutonium-242 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}.$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterwieser, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

Steven J. Choquette, Director
Office of Reference Materials

62-CEJ-797-312a

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq·g^{-1(a)}
Relative expanded uncertainty ($k = 2$)	0.51 % ^(b)

^(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

^(b) The uncertainties on certified values are expanded uncertainties, $U = k u_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

GL-CED-297-3126

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ^{-1(a,b,c,d)}
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ^{-1(a,d)}
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

^(a) The stated uncertainty is two times the standard uncertainty [5].

^(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

^(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,

0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and

0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

^(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclides follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ^{-6 (3)}	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ^{-5 (3)}	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

^(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,

5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and

3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

^(f) The stated uncertainty is the standard uncertainty. See reference 6.

GL-CED-297-312c

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ²⁴² Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	²⁴² Pu decay corrections for half-life uncertainty of 0.22 %.	B	< 10 ⁻¹⁰
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty (k = 2)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

GL-CED-297-312d

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

GL-CEN-297-312e

Standard Logbook

Serial ID: 2020 **Open/Reference Date:** 09 AUG 2017 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 18 JAN 2022 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18 JAN 2050 **Logbook Num :** GL-CED-297-312
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
Uncertainty : .255 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2020
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO3
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-312
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	06/03/2022		
Verification Date:	06/03/2022		
Expiration Date:	06/03/2023		
Primary Code:	2020-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.4651 g		
Density(g/mL):	1.0325	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.4651 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 42.7589 \text{ dpm/mL}$
$(5.4651 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0325 \text{ g/mL}) / (200 \text{ mL}) = 41.4130 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
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GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2020-A

v1.2

Analyst	MXS2
Verification Prep Date	6/3/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.1
Expiration Date	8/17/2022

Standard Information	
Isotope	Pu-242
Serial Number	2020-A
Isotope Half-life	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	42.7589
Amount of Std. (mL)	0.1
Standard Prep Date	6/3/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	6/6/2022	1.960	43.51
2	6/6/2022	1.900	42.18
3	6/6/2022	1.810	40.18

Mean Value = 1.890 41.958
Stdev = 0.075498344 1.676063245

pCi 1.9261 42.7585
Certificate Value* = 3.3521
Two sigma = 4.1958
10 % of Mean = Pass
Rule A (Pass/Fail) 98.13%
% Recovery Pass
Rule B (Pass/Fail) 98.13%
Expiration Date 6/3/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2020-A using 0.1 mL for each source. Each standard was combined with 0.1 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. Added 0.1mL of neodymium carrier and 3-4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

6/8/22



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661-309-1010

Fax 661-257-8303

1720

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Po-209	Customer:	GENERAL ENGINEERING LABS.
Half-life:	102 ± 5 years	P.O. No.:	GEL1408569
Catalog No.:	7209	Reference Date:	1-Oct-14 12:00 PST
Source No.:	1760-53-1	Contained Radioactivity:	0.05281 µCi 1.954 kBq

Physical Description:

A. Mass of solution:	5.21650 g in 5 mL flame-sealed ampoule
B. Chemical form:	Po(NO ₃) ₄ in 1M HNO ₃
C. Carrier content:	None
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.01012 µCi/g, 0.3744 kBq/g

Method of Calibration:

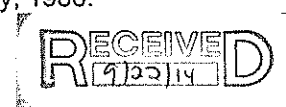
This source was prepared from a weighed aliquot of solution whose activity in µCi/g was determined using a liquid scintillation counter.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.4 %
D. Total uncertainty at the 99% confidence level:	± 3.1 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.



Daniel James Van Dorem
Quality Control

11-Sep-14
Date

EZIP Ref. No.: 1760-53

ISO 9001 CERTIFIED

GEL-CEP-297-013

Standard Logbook

Serial ID: 1720 **Open/Reference Date:** 01 OCT 2014 **Aliquot :** 5.2165 g
Name: Polonium-209 **Received:** 22 SEP 2014 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 22 SEP 2035 **Logbook Num :** GL-CED-297-013
Employee: Gregory Ramsay **Lot Number :** 1760-53-1
Supplier: Eckert & Ziegler **Solvent :** 1M HNO3
Uncertainty : 1.211 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Polonium-209	1.954 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1720
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	10/01/2014
Ampoule Mass (g):	5.2165 g
Uncertainty:	+/- 1.211 %
LogBook No:	GL-CED-297-013
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Polonium-209		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2016		
Verification Date:	07/12/2017		
Expiration Date:	12/06/2019		
Primary Code:	1720-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1896 g		
Density(g/mL):	1.0290	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1166.3543 \text{ dpm/mL}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0290 \text{ g/mL}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1133.4833 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
12/06/2018	Tim Chandler	14.42	200	1720-B	81.7241 dpm/mL	12/07/2018	12/07/2019
11/26/2019	Tim Chandler	14.5183	200	1720-C	82.2813 dpm/mL	11/11/2021	11/11/2022
11/26/2019	Tim Chandler	14.5183	200	1720-C1	82.2813 dpm/mL	11/11/2021	11/11/2022
02/21/2022	Matelon DeFreese	14.5109	200	1720-D	82.239314 dpm/mL	03/07/2022	03/07/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Po-209 Standard 1720-D

v1.2

Analyst	MXS2
Verification Prep Date	3/7/2022

Tracer Information	
Isotope	Po-210
Serial Number	2012-A
Amount of Std. (mL)	0.2
Expiration Date	12/15/2022

Standard Information	
Isotope	Po-209
Serial Number	1720-D
Isotope Half-life	125.3000 Y
Reference Date	10/1/2014
Ref. Act. (dpm/mL)	82.239314
Amount of Std. (mL)	0.2
Standard Prep Date	2/21/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	3/7/2022	7.180	79.70
2	3/7/2022	7.480	83.03
3	3/7/2022	7.700	85.47

Mean Value = 7.453 82.732
Stdev = 0.261023626 2.897362249

Certificate Value* = 7.1106 pCi
Two sigma = 0.5220
10 % of Mean = 0.7453
Rule A (Pass/Fail) Pass
% Recovery 104.82%
Rule B (Pass/Fail) Pass
Expiration Date 3/7/2023

dpm/mL
78.9274
5.7947
8.2732
Pass
104.82%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-209 standard 1720-D using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-210 standard 2012-A and was diluted in a centrifuge tube containing 15mL of 0.05M HNO3. Precipitated by adding 0.1mL of 30% H2O2, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-209 were calculated by comparison to Po-210 certified values.

3/15/22



Eckert & Ziegler

Analytics

1845

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION

Standard Reference Source

Received: 12-1-17 12:00

SRS Number: 108018

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8229

Customer: GEL Laboratories LLC

P.O. Number: GEL1718798, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 29-November-2017 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Th-229	2.897E+06	1.999E+04	0.5	1.5	3.1	4π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 108018

Comments:

5.21561 g of 0.5 M HNO₃ solution, carrier free.

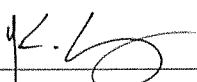
Impurities:

γ-impurities (other than decay products) < 0.1%

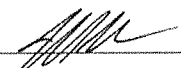
α-impurities: Th-228 6.6E+00 Bq, Th-230 1.2E+02 Bq, Th-232 8.0E+00 Bq

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Hardley, Radiochemist

QC Approved by:


J. Lahr, Spectroscopist

Date: 27-Nov-17

Standard Logbook

Serial ID: 1845 **Open/Reference Date:** 29 NOV 2017 **Aliquot :** 5.21561 g
Name: Thorium-229 **Received:** 01 DEC 2017 **Density :** Hand Calculated
Type: Source Material **Expires:** 01 DEC 2018 **Logbook Num :** GL-CED-297-138
Employee: Tim Chandler **Lot Number :** 108018
Supplier: Eckert & Ziegler **Solvent :** 0.5M HNO₃
Uncertainty : 1.55 percent
Description: 1 ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-229	19990 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1845
Prepared By:	Tim Chandler
Carrier Conc:	0.5M HNO3
Reference Date:	11/29/2017
Ampoule Mass (g):	5.21561 g
Uncertainty:	+/- 1.55 %
LogBook No:	GL-CED-297-138
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-229		
Prepared By:	Tim Chandler		
Prep Date:	06/08/2018		
Verification Date:	07/07/2020		
Expiration Date:	11/10/2022		
Primary Code:	1845-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1906 g		
Density(g/mL):	1.0291	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11936.4861 \text{ dpm/mL}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0291 \text{ g/mL}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11598.7987 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/08/2018	Tim Chandler	2.0385	1000	1845-B	23.6442 dpm/mL	06/01/2020	06/01/2021
07/10/2019	Tim Chandler	4.0198	1000	1845-C	46.62485 dpm/mL	07/07/2020	07/07/2021
10/26/2020	Tim Chandler	4.0184	1000	1845-D	46.6086 dpm/mL	10/27/2020	10/27/2021
04/23/2021	Tim Chandler	4.2911	1000	1845-E	49.7716 dpm/mL	04/26/2021	04/26/2022
11/10/2021	Matelon DeFreese	4.211	1000	1845-F	48.8425 dpm/mL	11/10/2021	11/10/2022
05/11/2022	Matelon DeFreese	4.1951	1000	1845-G	48.6581 dpm/mL	05/12/2022	05/11/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Th-229 Standard 1845-G

v1.2

Analyst	MXS2
Verification Prep Date	5/12/2022

Tracer Information	
Isotope	Th-232
Serial Number	1513-C
Amount of Std. (mL)	0.1
Expiration Date	12/22/2022

Standard Information	
Isotope	Th-229
Serial Number	1845-G
Isotope Half-life	7.3400E+03 Y
Reference Date	11/29/2017
Ref. Act. (dpm/mL)	48.6581
Amount of Std. (mL)	0.1
Standard Prep Date	5/11/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	5/12/2022	2.190	48.62
2	5/12/2022	2.070	45.95
3	5/12/2022	2.120	47.06

Mean Value = 2.127 47.212
Stdev = 0.060277138 1.338152458

Certificate Value* = 2.1909 pCi
Two sigma = 0.1206
10 % of Mean = 0.2127
Rule A (Pass/Fail) Pass
% Recovery 97.07%
Rule B (Pass/Fail) Pass
Expiration Date 5/12/2023
dpm/mL
48.6377
2.6763
4.7212
Pass
97.07%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-229 standard 1845-G using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-232 standard 1513-C and was diluted in a centrifuge tube containing 10 mL 8M HNO₃. The standard was isolated following the standard operating procedure for the separation of thorium (GL-RAD-A-038). After dissolving the sources in 5 mL of 2M HCl, the sources were diluted to 40 mL with deionized water. 100 micrograms of neodymium carrier and five mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-229 were calculated by comparison to Th-232 certified values.

5/16/22

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Th-232	Customer:	GEL LABORATORIES, LLC
Half-life:	(1.405 ± 0.006)E+10 years	P.O. No.:	7347RD
Catalog No.:	7232	Reference Date:	1-Nov-10 12:00 PST
Source No.:	1451-62	Contained Radioactivity:	50.26 nCi 1860 Bq
		(Th-232 only)	

Physical Description:

A. Mass of solution:	5.73256 g in 5 mL flame-sealed ampoule
B. Chemical form:	Th(NO ₃) ₄ in H ₂ O
C. Carrier content:	None
D. Density:	1.15 g/mL @ 20°C

Radioimpurities:

Not determined

Radionuclide Concentration: 8.767 nCi/g, 324.4 Bq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.


Quality Control

15-OCT-10
Date

EZIP Ref. No.: 1451-62

RC-S-060-058

ISO 9001 CERTIFIED

Standard Logbook

Serial ID: 1513 **Open/Reference Date:** 01 NOV 2010 **Aliquot :** 5.73256 g
Name: Thorium-232 **Received:** 21 OCT 2010 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 30 NOV 2011 **Logbook Num :** RC-S-060-058
Employee: Gregory Ramsay **Verified:** 28 APR 2011 **Lot Number :** 1451-62
Supplier: Eckert & Ziegler **Solvent :** DI water
Uncertainty : 1.172 PERCENT

Description: in water
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-232	324.4 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1513
Prepared By:	Gregory Ramsay
Carrier Conc:	DI water
Reference Date:	11/01/2010
Ampoule Mass (g):	5.73256 g
Uncertainty:	+/- 1.172 %
LogBook No:	RC-S-060-058
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-232		
Prepared By:	Christina Kimball		
Prep Date:	04/19/2011		
Verification Date:	02/21/2020		
Expiration Date:	02/21/2021		
Primary Code:	1513-A		
Dilution(mL):	250 mL		
Mass of Parent(g):	5.672 g		
Density(g/mL):	1.0020	Balance ID:	60108592

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (250 \text{ mL}) = 441.5992 \text{ dpm/mL}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0020 \text{ g/mL}) / (250 \text{ mL}) = 440.7354 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
04/19/2011	Christina Kimball	5.0665	100	1513-B	22.3299 dpm/mL	04/11/2013	04/11/2014
02/26/2014	Matelon DeFreese	100.0316	1000	1513-C	44.08747 dpm/mL	12/22/2021	12/22/2022
04/18/2014	Christina Kimball	5.0477	100	1513-D	22.247 dpm/mL	06/28/2022	06/28/2023
01/04/2016	Christina Kimball	.2487	100	1513-E	1.096117 dpm/mL	02/11/2020	02/11/2021
08/01/2016	Christina Kimball	2.053	250	1513-F	3.61932 dpm/mL	07/21/2022	07/21/2023
02/21/2020	Christina Kimball	.248	100	1513-G	1.093 dpm/mL	02/23/2022	02/23/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Th-232 Standard 1513-C

v1.2

Analyst	MXS2
Verification Prep Date	12/22/2021

Tracer Information	
Isotope	Th-229
Serial Number	1845-F
Amount of Std. (mL)	0.1
Expiration Date	11/10/2022

Standard Information	
Isotope	Th-232
Serial Number	1513-C
Isotope Half-life	1.4050E+10 Y
Reference Date	11/1/2010
Ref. Act. (dpm/mL)	44.08747
Amount of Std. (mL)	0.1
Standard Prep Date	2/26/2014

Std #	Count Date	Activity pCi	Standard dpm/mL
1	12/22/2021	1.970	43.73
2	12/22/2021	2.070	45.95
3	12/22/2021	1.920	42.62

Mean Value = 1.987 44.104

Stdev = 0.076376262 1.695553007

Certificate Value* = 1.9859 pCi
 Two sigma = 0.1528
 10 % of Mean = 0.1987
 Rule A (Pass/Fail) Pass
 % Recovery 100.04%
 Rule B (Pass/Fail) Pass
 Expiration Date 12/22/2022

dpm/mL
 44.0875
 3.3911
 4.4104
 Pass
 100.04%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-232 standard 1513-C using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-229 standard 1845-F and was diluted in a centrifuge tube containing 10 mL of 8M HNO₃, then poured onto AG columns following SOP 038. 0.1 mL of neodymium carrier and 2 mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-232 were calculated by comparison to Th-229 certified values.

2/14/22



Eckert & Ziegler

Analytics

1564

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION Standard Radionuclide Source

85621-278

5 mL Liquid in Flame Sealed Vial

Customer: General Engineering Labs/Charleston, SC
P.O. No.: 936814RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
U-232	2.517E+04	3.393E+04	0.5	2.4	4.9	09/12/2011

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities (other than decay products) < 0.1 %, U-233 < 1.20E2 Bq, Am-241 < 5.8E1 Bq. 5.06048 grams 2M HNO3 solution.

Source Prepared by: M. I. Taskaeva
M. I. Taskaeva, Radiochemist

QA Approved: J. D. McCorvey
J. D. McCorvey, QA Manager Alternate

Date: 9/12/11

RECEIVED
9/14/11
AM



Standard Logbook

Serial ID: 1564 **Open/Reference Date:** 12 SEP 2011 **Aliquot :** 5.06048 g
Name: Uranium-232 **Received:** 14 SEP 2011 **Density :** Hand Calculated
Type: Source Material **Expires:** 26 SEP 2014 **Logbook Num :** RC-S-060-109
Employee: Ashley Drochter **Lot Number :** 85621-278
Supplier: Eckert & Ziegler **Solvent :** 2M HNO3
Uncertainty : 2.45 PERCENT

Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-232	33930 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1564
Prepared By:	Ashley Drochter
Carrier Conc:	2M HNO3
Reference Date:	09/12/2011
Ampoule Mass (g):	5.06048 g
Uncertainty:	+/- 2.45 %
LogBook No:	RC-S-060-109
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-232		
Prepared By:	Ashley Drochter		
Prep Date:	11/15/2012		
Verification Date:	07/26/2021		
Expiration Date:	07/26/2022		
Primary Code:	1564-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9067 g		
Density(g/mL):	1.0615	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.06048 \text{ g} * 100 \text{ mL}) = 19739.3525 \text{ dpm/mL}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0615 \text{ g/mL}) / (5.06048 \text{ g} * 100 \text{ mL}) = 18595.7160 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/16/2012	Ashley Drochter	2.6179	1000	1564-B	48.6817 dpm/mL	11/13/2013	11/13/2014
07/26/2021	Christina Kimball	.635	500	1564-BB	23.6166 dpm/mL	07/21/2022	07/21/2023
07/26/2021	Christina Kimball	.635	500	1564-BB Spike	23.6166 dpm/mL	07/26/2022	07/26/2023
01/15/2013	Christina Kimball	.265	250	1564-C	19.7115 dpm/mL	01/13/2014	01/13/2015
12/14/2021	Tim Chandler	2.6412	1000	1564-CC	49.115 dpm/mL	12/15/2021	12/15/2022
02/18/2013	Christina Kimball	.116	500	1564-D	4.31421 dpm/mL	02/16/2015	02/13/2016
04/13/2022	Matelon DeFreese	2.7103	1000	1564-DD	50.4 dpm/mL	04/13/2022	04/13/2023
01/02/2014	Gregory Ramsay	2.6936	1000	1564-E	50.08942 dpm/mL	12/10/2014	12/10/2015

03/17/2014	Christina Kimball	.266	250	1564-F	19.78584 dpm/mL	03/25/2015	03/25/2016
12/10/2014	Tim Chandler	2.6312	1000	1564-G	48.929 dpm/mL	12/10/2014	12/10/2015
07/20/2015	Christina Kimball	.266	250	1564-H	19.78584 dpm/mL	07/25/2016	07/25/2017
11/23/2015	Tim Chandler	2.6117	1000	1564-I	48.5664 dpm/mL	11/23/2015	11/23/2016
01/05/2016	Christina Kimball	.119	500	1564-J	4.4258 dpm/mL	12/27/2017	12/27/2018
01/05/2016	Christina Kimball	.119	500	1564-J Spike	4.4258 dpm/mL	12/27/2017	12/27/2018
09/20/2016	Tim Chandler	2.6389	1000	1564-K	49.0722 dpm/mL	09/18/2017	09/18/2018
12/20/2016	Christina Kimball	.276	250	1564-L	20.52974 dpm/mL	12/21/2017	12/21/2018
06/20/2017	Tim Chandler	2.6611	1000	1564-M	49.4851 dpm/mL	06/19/2018	06/19/2019
01/18/2018	Tim Chandler	2.6367	1000	1564-N	49.0313 dpm/mL	04/25/2018	04/25/2019
04/25/2018	Tim Chandler	2.6505	1000	1564-O	49.2879 dpm/mL	04/25/2018	04/25/2019
08/06/2018	Christina Kimball	.106	500	1564-P	3.9423 dpm/mL	12/19/2019	12/19/2020
08/06/2018	Christina Kimball	.106	500	1564-P Spike	3.9423 dpm/mL	12/19/2019	12/19/2020
12/13/2018	Tim Chandler	2.6502	1000	1564-Q	49.2824 dpm/mL	12/13/2018	12/13/2019
01/08/2019	Christina Kimball	.29	250	1564-R	21.571 dpm/mL	01/08/2019	01/08/2020
01/08/2019	Christina Kimball	.29	250	1564-R Spike	21.571 dpm/mL	01/08/2019	01/08/2020
10/01/2019	Tim Chandler	2.6957	1000	1564-S	50.1285 dpm/mL	10/01/2019	10/01/2020
12/18/2019	Christina Kimball	.307	250	1564-T	22.83554 dpm/mL	12/19/2019	12/19/2020
12/18/2019	Christina Kimball	.307	250	1564-T Spike	22.83554 dpm/mL	12/19/2019	12/19/2020
03/31/2020	Tim Chandler	2.6645	1000	1564-U	49.5483 dpm/mL	03/31/2020	03/31/2021
08/14/2020	Christina Kimball	.111	500	1564-V	4.1282 dpm/mL	08/14/2020	08/14/2021
08/14/2020	Christina Kimball	.111	500	1564-V Spike	4.1282 dpm/mL	08/14/2020	08/14/2021

10/13/2020	Tim Chandler	2.6983	1000	1564-W	50.1768 dpm/mL	10/13/2020	10/13/2021
11/04/2020	Christina Kimball	.315	250	1564-X	23.4306 dpm/mL	11/04/2020	11/04/2021
11/04/2020	Christina Kimball	.315	250	1564-X Spike	23.4306 dpm/mL	11/04/2020	11/04/2021
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Y	51.32232 dpm/mL	03/19/2021	03/19/2022
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Z	51.32232 dpm/mL	03/20/2021	03/20/2022

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-232 Standard 1564-DD

v1.2

Analyst	MXS2
Verification Prep Date	4/13/2022

Tracer Information	
Isotope	U-238
Serial Number	1600-M
Amount of Std. (mL)	0.2
Expiration Date	1/21/2023

Standard Information	
Isotope	U-232
Serial Number	1564-DD
Isotope Half-life	68.9000 Y
Reference Date	9/12/2011
Ref. Act. (dpm/mL)	50.4
Amount of Std. (mL)	0.2
Standard Prep Date	4/13/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	4/13/2022	3.880	43.07
2	4/13/2022	4.090	45.40
3	4/13/2022	3.840	42.62

Mean Value = 3.937 43.697
Stdev = 0.134288247 1.490599544

pCi
4.0819
0.2686
0.3937
Pass
96.44%
Pass

Certificate Value* =
Two sigma =
10 % of Mean =
Rule A (Pass/Fail)
% Recovery
Rule B (Pass/Fail)
Expiration Date

dpm/mL
45.3091
2.9812
4.3697
Pass
96.44%
Pass

4/13/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-232 standard 1564-DD using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-238 standard 1600-M and was diluted in a centrifuge tube containing 15 mL of 0.1M HCl diluted to 40 mL with DI water. 0.1 mL of neodymium carrier, 0.5 mL of titanium chloride and five mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-232 were calculated by comparison to U-238 certified values.

4/6/22

15 Apr 3/24/12
1600

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	U-238 (Nat)	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	(4.468 ± 0.005)E+09 years	P.O. No.:	936823 RD	
Catalog No.:	7338	Reference Date:	15-Apr-12 12:00 PST	
Source No.:	1577-71-2	Contained Radioactivity:	1.023 µCi 37.85 kBq	
		(Total Uranium)		

Physical Description:

A. Mass of solution:	7.05210 g in 10 mL flame-sealed ampoule
B. Chemical form:	UO ₂ (NO ₃) ₂ in dilute HNO ₃
C. Carrier content:	None
D. Density:	Approximately 1.41 g/mL @ 20°C

Radioimpurities:

See Technical Data Sheet

Radionuclide Concentration: 0.1451 µCi/g, 5.369 kBq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.


Quality Control

21-Mar-12
Date

EZIP Ref. No.: 1577-71

RC-S-065-030a

ISO 9001 CERTIFIED

Medical Imaging Laboratory

24937 Avenue Tibbitts Valencia, California 91355

Industrial Gauging Laboratory

1800 North Keystone Street Burbank, California 91504

U-238 Natural Technical Data

The U-238 Natural used to prepare your order was taken from Eckert & Ziegler Isotope Products Lot #4550102. It had the following composition as of 9 Feb 10:

<u>Nuclide</u>	<u>Atom %</u>	<u>Activity %</u>
U-234	0.0055	49.086
U-235	0.7200	2.241
U-238	99.274	48.673

Isotopic composition provided by New Brunswick Laboratory.

If you have any question, please contact Eckert & Ziegler Isotope Products Technical Service: (661) 309-1010

Standard Logbook

Serial ID: 1600 **Open/Reference Date:** 15 APR 2012 **Aliquot :** 7.0521 g
Name: Uranium-238 **Received:** 24 MAR 2012 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 26 MAR 2015 **Logbook Num :** RC-S-065-030
Employee: Ashley Drochter **Lot Number :** 4550102
Supplier: Eckert & Ziegler **Solvent :** UO₂(NO₃)₂ in dilute HNO₃
Uncertainty : 1.17 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-238	18.42 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1600
Prepared By:	Ashley Drochter
Carrier Conc:	UO ₂ (NO ₃) ₂ in dilute HNO ₃
Reference Date:	04/15/2012
Ampoule Mass (g):	7.0521 g
Uncertainty:	+/- 1.17 %
LogBook No:	RC-S-065-030
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-238		
Prepared By:	Ashley Drochter		
Prep Date:	09/04/2012		
Verification Date:	05/20/2022		
Expiration Date:	05/20/2023		
Primary Code:	1600-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	6.8204 g		
Density(g/mL):	1.0789	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (7.0521 \text{ g} * 100 \text{ mL}) = 10688.8814 \text{ dpm/mL}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0789 \text{ g/mL}) / (7.0521 \text{ g} * 100 \text{ mL}) = 9907.0626 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
09/04/2012	Ashley Drochter	1.4579	500	1600-B	28.8913 dpm/mL	09/04/2012	09/04/2013
09/11/2012	Ashley Drochter	3.0288	500	1600-C	60.0219 dpm/mL	09/04/2013	09/04/2014
03/27/2014	Tim Chandler	3.0445	500	1600-D	60.3241 dpm/mL	03/18/2015	03/18/2016
07/24/2015	Tim Chandler	3.0177	500	1600-E	59.7931 dpm/mL	07/10/2017	07/10/2018
02/16/2017	Tim Chandler	3.0261	500	1600-F	59.9595 dpm/mL	02/06/2018	02/06/2019
10/10/2017	Christina Kimball	.539	250	1600-G	21.3596 dpm/mL	07/21/2022	07/21/2023

04/02/2018	Tim Chandler	3.0544	500	1600-H	60.5203 dpm/mL	03/29/2019	03/29/2020
06/21/2019	Tim Chandler	3.0536	500	1600-I	60.5044 dpm/mL	06/21/2019	06/21/2020
01/30/2020	Tim Chandler	3.0563	500	1600-J	60.5579 dpm/mL	01/26/2021	01/26/2022
03/13/2020	Christina Kimball	.01222	500	1600-K	.24207 dpm/mL	03/15/2022	03/15/2023
04/23/2021	Tim Chandler	3.0507	500	1600-L	60.4469 dpm/mL	04/26/2021	04/26/2022
01/21/2022	Matelon DeFreese	3.1075	500	1600-M	61.5723941 dpm/mL	01/21/2022	01/21/2023
05/19/2022	Christina Kimball	.01275	500	1600-N	.2527 dpm/mL	05/20/2022	05/20/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-238 Standard 1600-M

v1.2

Analyst	MXS2
Verification Prep Date	1/21/2022

Tracer Information	
Isotope	U-232
Serial Number	1564-CC
Amount of Std. (mL)	0.2
Expiration Date	12/15/2022

Standard Information	
Isotope	U-238
Serial Number	1600-M
Isotope Half-life	4.4680E+09 Y
Reference Date	4/15/2012
Ref. Act. (dpm/mL)	61.5723941
Amount of Std. (mL)	0.2
Standard Prep Date	1/20/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	1/23/2022	5.500	61.05
2	1/23/2022	5.370	59.61
3	1/23/2022	5.410	60.05

Mean Value = 5.427 60.236
 Stdev = 0.066583281 0.739074421

Certificate Value* = 5.5471 pCi
 Two sigma = 0.1332
 10 % of Mean = 0.5427
 Rule A (Pass/Fail) Pass
 % Recovery 97.83%
 Rule B (Pass/Fail) Pass
 Expiration Date 1/21/2023

dpm/mL
 61.5724
 1.4781
 6.0236
 Pass
 97.83%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-238 standard 1600-M using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-232 standard 1564-CC and was diluted in a centrifuge tube containing 15 mL 0.1M HCl and 25 mL of DI water 0.1 mL of neodymium carrier, 0.5 mL titanium chloride, and five mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-238 were calculated by comparison to U-232 certified values.

1/21/2022

Runlogs

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2290611

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885001	SAMPLE	MP2	1139	JUL-24-22 13:39:28	DONE		14-JUL-22 12:05
585885002	SAMPLE	MP2	1140	JUL-24-22 13:39:30	DONE		14-JUL-22 12:06
585885003	SAMPLE	MP2	1141	JUL-24-22 13:39:32	DONE		14-JUL-22 12:06
585905002	SAMPLE	MP2	1152	JUL-24-22 13:39:36	DONE		14-JUL-22 12:06
585905003	SAMPLE	MP2	1155	JUL-24-22 13:39:39	DONE		14-JUL-22 12:06
585905004	SAMPLE	MP2	1156	JUL-24-22 13:39:41	DONE		14-JUL-22 12:06
585905005	SAMPLE	MP2	1159	JUL-24-22 13:39:43	DONE		14-JUL-22 13:06
1205140833	MB	MP2	1160	JUL-24-22 13:39:45	DONE		14-JUL-22 13:06
585905001	SAMPLE	MP2	1149	JUL-24-22 14:37:18	DONE		14-JUL-22 13:25
1205140834	LCS	MP2	1113	JUL-25-22 08:43:36	DONE		13-JUL-22 12:48
1205140835	LCSD	MP2	1114	JUL-25-22 08:43:38	DONE		13-JUL-22 12:48

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2290612

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885001	SAMPLE	MP2	1037	JUL-24-22 14:00:45	DONE		02-JUL-22 10:46
585885002	SAMPLE	MP2	1038	JUL-24-22 14:00:45	DUSE		02-JUL-22 10:46
585885003	SAMPLE	MP2	1039	JUL-24-22 14:00:45	DONE		02-JUL-22 10:46
585905001	SAMPLE	MP2	1040	JUL-24-22 14:00:45	DONE		02-JUL-22 10:46
585905002	SAMPLE	MP2	1041	JUL-24-22 14:00:45	DONE		02-JUL-22 10:46
585905003	SAMPLE	MP2	1042	JUL-24-22 14:00:45	DONE		02-JUL-22 10:46
585905004	SAMPLE	MP2	1043	JUL-24-22 14:00:46	DONE		02-JUL-22 10:46
585905005	SAMPLE	MP2	1044	JUL-24-22 14:00:46	DONE		02-JUL-22 10:46
1205140836	MB	MP2	1045	JUL-24-22 14:00:46	DONE		02-JUL-22 10:47
1205140838	LCS	MP2	1047	JUL-24-22 14:00:46	DONE		02-JUL-22 10:47
1205140839	LCSD	MP2	1048	JUL-24-22 14:00:46	DONE		02-JUL-22 10:47

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2290613

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885001	SAMPLE	BV1	1165	JUL-23-22 12:17:15	DONE		15-JUL-22 11:32
585885002	SAMPLE	BV1	1170	JUL-23-22 12:17:17	DONE		15-JUL-22 11:32
585885003	SAMPLE	BV1	1177	JUL-23-22 12:17:19	DONE		15-JUL-22 13:06
585905001	SAMPLE	BV1	1178	JUL-23-22 12:17:21	DONE		15-JUL-22 11:39
585905002	SAMPLE	BV1	1179	JUL-23-22 12:17:23	DONE		15-JUL-22 11:53
585905003	SAMPLE	BV1	1180	JUL-23-22 12:17:26	DONE		15-JUL-22 13:06
585905004	SAMPLE	BV1	1191	JUL-23-22 12:19:46	DONE		18-JUL-22 12:40
585905005	SAMPLE	BV1	1192	JUL-23-22 12:19:48	DONE		18-JUL-22 12:40
1205140840	MB	BV1	1194	JUL-23-22 12:19:51	DONE		18-JUL-22 12:41
1205140841	LCS	BV1	1195	JUL-23-22 12:19:53	DONE		18-JUL-22 12:41
1205140842	LCSD	BV1	1196	JUL-23-22 12:19:55	DONE		18-JUL-22 12:42

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2293754

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885001	SAMPLE	BV1	1095	JUL-25-22 18:29:39	DONE		12-JUL-22 12:20
585885002	SAMPLE	BV1	1096	JUL-25-22 18:29:39	DONE		12-JUL-22 12:21
585885003	SAMPLE	BV1	1097	JUL-25-22 18:29:39	DONE		12-JUL-22 12:21
585905001	SAMPLE	BV1	1098	JUL-25-22 18:29:39	DONE		12-JUL-22 16:57
585905002	SAMPLE	BV1	1099	JUL-25-22 18:29:39	DONE		12-JUL-22 12:22
585905003	SAMPLE	BV1	1100	JUL-25-22 18:29:39	DONE		12-JUL-22 12:22
585905004	SAMPLE	BV1	1102	JUL-25-22 18:29:40	DONE		12-JUL-22 12:08
585905005	SAMPLE	BV1	1103	JUL-25-22 18:29:40	DONE		12-JUL-22 12:10
1205146816	MB	BV1	1104	JUL-25-22 18:29:40	DONE		12-JUL-22 12:10
1205146817	LCS	BV1	1105	JUL-25-22 18:29:40	DONE		12-JUL-22 12:10
1205146818	LCSD	BV1	1106	JUL-25-22 18:29:40	DONE		12-JUL-22 12:10

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2293848

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885002	SAMPLE	BV1	1043	JUL-26-22 08:26:26	DONE		02-JUL-22 10:46
1205146994	MB	BV1	1044	JUL-26-22 08:26:26	DONE		02-JUL-22 10:46
1205146995	LCS	BV1	1045	JUL-26-22 08:26:26	DONE		02-JUL-22 10:47
1205146996	LCSD	BV1	1047	JUL-26-22 08:26:26	DONE		02-JUL-22 10:47

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2294036

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885001	SAMPLE	BV1	1071	JUL-25-22 18:29:37	DONE		11-JUL-22 12:31
585885002	SAMPLE	BV1	1072	JUL-25-22 18:29:37	DONE		11-JUL-22 12:31
585885003	SAMPLE	BV1	1074	JUL-25-22 18:29:37	DONE		11-JUL-22 12:31
585905001	SAMPLE	BV1	1075	JUL-25-22 18:29:37	DONE		11-JUL-22 12:32
585905002	SAMPLE	BV1	1076	JUL-25-22 18:29:37	DONE		11-JUL-22 12:32
585905003	SAMPLE	BV1	1083	JUL-25-22 18:29:38	DONE		11-JUL-22 11:44
585905004	SAMPLE	BV1	1084	JUL-25-22 18:29:38	DONE		11-JUL-22 11:44
585905005	SAMPLE	BV1	1085	JUL-25-22 18:29:38	DONE		11-JUL-22 11:45
1205147417	MB	BV1	1086	JUL-25-22 18:29:38	DONE		11-JUL-22 11:45
1205147418	LCS	BV1	1088	JUL-25-22 18:29:38	DONE		11-JUL-22 11:45
1205147419	LCSD	BV1	1107	JUL-25-22 18:29:41	DONE		12-JUL-22 12:13

Gamma Spectroscopy Raw Data

Batch 2290721 Check-list

This check-list was completed on 22-JUL-22 by Michael Hilton

This batch was reviewed by Michael Hilton on 22-JUL-22 and Spencer Collins on 22-JUL-22.

Batch ID: 2290721

Product: GSCGAMMF

Description: Gamma Spec Filter RAD A-013

#	Criteria	Yes	No	Comments
Preparation Information				
1	Did any sample(s) require dilution?		No	
2	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
3	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
4	Are instrument source checks within limits?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were any additional radionuclides added that were not requested by the client?		No	
7	Were all the samples prepared/analyzed within the required holding time period?	Yes		
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Gamma Spectroscopy

Batch ID: 2290721
Analyst: Michael Hilton (MJH1)
Method: DOE HASL 300, 4.5.2.3/Ga-01-R
Lab SOP: GL-RAD-A-013 REV# 27
Instrument: No instrument-manual method

Due Dates for Lab: 26-JUL-2022 **Package:** 27-JUL-2022 **SDG:** 27-JUL-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205141124	78962-278	1298	1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	585885001	21-JUL-2022	20	200	0.5142
2	585885002	21-JUL-2022	20	200	0.50507
3	585885003	21-JUL-2022	20	200	0.57175
4	585905001	21-JUL-2022	20	200	0.52145
5	585905002	21-JUL-2022	20	200	0.49255
6	585905003	21-JUL-2022	20	200	0.45632
7	585905004	21-JUL-2022	20	200	0.47052
8	585905005	21-JUL-2022	20	200	0.51013
9	1205141122 MB	21-JUL-2022	20		0.57175
10	1205141123 DUP (585885001)	21-JUL-2022	20	200	0.5142
11	1205141124 LCS	21-JUL-2022	20		0.57175

Reagent/Solvent Lot ID	Description	Amount	Comments:
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VAX/VMS Nuclide Identification Report Generated 21-JUL-2022 20:33:54.35

```
*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885001.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM14.CNF;831
Background date    : 16-JUL-2022 13:55:22
Sample date       : 27-JUN-2022 09:24:00 Acquisition date : 21-JUL-2022 16:33:26
Sample ID        : G585885001 Sample quantity : 5.14200E-01 FILTER
Detector name    : GAM14 Detector geometry: JAR
Elapsed live time: 0 04:00:00.00 Elapsed real time: 0 04:00:01.47 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : MJH1
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID        : 2290721 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
```

BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	54.40	23	107	1.27	109.10	106	7	1.57E-03	78.7	
2	0	63.72*	52	135	0.80	127.74	124	9	3.61E-03	50.4	
3	0	149.40	27	121	1.03	299.09	296	8	1.85E-03	74.0	
4	1	240.76*	7	71	1.26	481.77	473	12	5.18E-04	221.6	2.15E+00
5	0	304.53	22	47	1.18	609.31	607	6	1.54E-03	53.1	
6	0	347.56	12	50	1.15	695.35	690	7	8.60E-04	98.1	
7	0	352.37*	21	43	1.80	704.98	701	8	1.47E-03	71.4	
8	0	395.16	31	69	3.53	790.55	785	12	2.13E-03	57.0	
9	0	474.27	10	36	1.39	948.76	942	8	6.73E-04	104.2	
10	0	477.66	87	62	0.79	955.54	950	14	6.06E-03	21.6	
11	0	511.65*	19	92	2.42	1023.50	1016	20	1.29E-03	178.5	
12	0	584.50*	7	45	2.26	1169.21	1162	11	4.87E-04	218.8	
13	0	687.11	5	20	1.30	1374.40	1369	8	3.47E-04	161.2	
14	0	747.55	42	32	7.34	1495.28	1486	19	2.94E-03	36.0	
15	0	755.06	33	20	0.72	1510.30	1505	13	2.26E-03	33.1	
16	0	882.53	15	18	0.63	1765.23	1759	12	1.04E-03	62.2	
17	0	911.68*	3	20	1.39	1823.53	1816	14	1.84E-04	457.3	
18	0	935.76	22	7	0.67	1871.70	1865	13	1.49E-03	32.6	
19	6	969.36	15	21	1.81	1938.88	1933	15	1.05E-03	64.1	1.04E+00
20	6	972.10*	2	4	2.02	1944.38	1933	15	1.66E-04	400.9	
21	0	1080.14	12	17	2.11	2160.44	2150	13	7.99E-04	78.2	
22	0	1282.87	9	9	4.85	2565.92	2558	12	6.31E-04	73.9	
23	0	1385.51	9	5	1.61	2771.20	2765	10	6.50E-04	55.0	
24	0	1461.24*	21	9	2.25	2922.66	2914	17	1.47E-03	49.0	
25	0	1491.01	7	10	1.38	2982.20	2977	9	5.07E-04	89.2	
26	0	1527.30	10	0	1.55	3054.80	3051	7	6.94E-04	31.6	
27	0	1586.70	5	9	3.34	3173.60	3167	9	3.47E-04	117.0	
28	0	1849.76	6	6	0.97	3699.76	3690	12	4.17E-04	91.3	
29	0	1859.59	8	5	3.83	3719.43	3712	11	5.34E-04	68.9	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 21-JUL-2022 20:33:55

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885001.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 27-JUN-2022 09:24:00	Acquisition date	: 21-JUL-2022 16:33:26
Sample ID	: G585885001	Sample quantity	: 0.51420 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA14	Detector geometry	: JAR
Elapsed live time	: 0 04:00:00.00	Elapsed real time	: 0 04:00:01.47 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	87	10.44*	2.248E+00	1.358E+02	1.865E+02	43.29
K-40	1460.82	21	10.66*	8.715E-01	8.316E+01	8.315E+01	98.10
AS-73	53.44	23	10.30*	9.253E-01	8.657E+01	1.069E+02	157.49
RB-84	881.60	15	68.90*	1.359E+00	5.847E+00	9.785E+00	124.37
TL-208	277.37	-----	6.60	3.299E+00	-----	Line Not Found	-----
	583.19	7	85.00*	1.927E+00	1.562E+00	1.600E+00	437.68
	860.56	-----	12.50	1.390E+00	-----	Line Not Found	-----
BI-211	72.87	-----	1.23	2.699E+00	-----	Line Not Found	-----
	351.06	21	12.92*	2.798E+00	2.135E+01	2.139E+01	142.75
RA-224	240.99	7	4.10*	3.623E+00	1.832E+01	1.877E+01	443.25
AC-228	338.32	-----	11.27	2.878E+00	-----	Line Not Found	-----
	911.20	3	25.80*	1.320E+00	2.835E+00	2.858E+00	914.50
	968.97	15	15.80	1.248E+00	2.811E+01	2.834E+01	128.30
RA-228	338.32	-----	11.27	2.878E+00	-----	Line Not Found	-----
	911.20	3	25.80*	1.320E+00	2.835E+00	2.858E+00	914.50
	968.97	15	15.80	1.248E+00	2.811E+01	2.834E+01	128.30
TH-232	63.81	52	0.26*	1.814E+00	4.022E+03	4.022E+03	100.89
	140.88	-----	0.02	4.699E+00	-----	Line Not Found	-----
U-234	53.20	23	0.12*	9.253E-01	7.431E+03	7.431E+03	157.49
	120.90	-----	0.04	4.726E+00	-----	Line Not Found	-----
ANH-511	511.00	19	100.00*	2.136E+00	3.173E+00	3.173E+00	357.09

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                    *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885001.CNF;1  *
* Acquisition date   : 21-JUL-2022 16:33:26 Sensitivity      : 3.000          *
* Detector ID        : GAM14 Energy tolerance: 1.500          *
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 04:00:01.47 Half life ratio : *****          *
* Sample date        : 27-JUN-2022 09:24:00 Analyst initials: MJH1          *
* Sample ID          : G585885001 Sample Quantity : 5.1420E-01 FILTER      *
* Batch Number       : 2290721 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 9-MAY-2022 05:17:58 Eff. Geometry   : JAR            *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13          *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.865E+02	7.914E+01	5.606E+01
K-40	8.315E+01	7.994E+01	7.446E+01
AS-73	1.069E+02	1.649E+02	1.909E+02
RB-84	9.785E+00	1.193E+01	1.262E+01
TL-208	1.600E+00	6.864E+00	5.778E+00
BI-211	2.139E+01	2.993E+01	3.419E+01
RA-224	1.877E+01	8.153E+01	1.017E+02
AC-228	2.858E+00	2.562E+01	2.379E+01
RA-228	2.858E+00	2.562E+01	2.379E+01
TH-232	4.022E+03	3.977E+03	3.050E+03
U-234	7.431E+03	1.147E+04	1.359E+04
ANH-511	3.173E+00	1.111E+01	4.956E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-2.383E+00	2.817E+00	4.807E+00	NOT IDENT.
NA-24	0.000E+00	1.788E+12	0.000E+00	SHORT HLIF
AL-26	-2.479E-02	3.274E+00	6.771E+00	NOT IDENT.
SC-46	1.972E+00	3.573E+00	7.378E+00	NOT IDENT.
V-48	5.999E+00	8.077E+00	1.757E+01	NOT IDENT.
CR-51	-2.081E+01	4.884E+01	8.022E+01	NOT IDENT.
MN-52	-1.189E+01	6.785E+01	1.341E+02	FAIL ABUN
MN-54	1.835E+00	3.486E+00	6.963E+00	NOT IDENT.
CO-56	9.738E-01	4.402E+00	8.394E+00	NOT IDENT.
CO-57	5.409E-01	2.003E+00	3.703E+00	NOT IDENT.
NI-57	0.000E+00	2.981E+05	0.000E+00	SHORT HLIF
CO-58	2.507E+00	4.330E+00	8.637E+00	NOT IDENT.
FE-59	7.357E+00	8.041E+00	1.785E+01	NOT IDENT.
CO-60	-3.400E+00	3.213E+00	5.143E+00	NOT IDENT.
ZN-65	3.422E+00	7.805E+00	1.560E+01	NOT IDENT.
CU-67	-1.653E+04	4.943E+03	5.601E+03	NOT IDENT.
GE-68	5.165E+01	1.078E+02	2.210E+02	NOT IDENT.
AS-74	8.345E+00	1.416E+01	2.781E+01	NOT IDENT.

SE-75	-2.075E+00	4.438E+00	7.356E+00	NOT IDENT.
BR-77	0.000E+00	1.659E+04	0.000E+00	SHORT HLIF
SR-82	-1.711E+01	3.757E+01	6.614E+01	NOT IDENT.
RB-83	-8.600E-01	7.018E+00	1.255E+01	NOT IDENT.
KR-85	1.372E+03	7.682E+02	1.626E+03	NOT IDENT.
SR-85	7.941E+00	4.446E+00	9.409E+00	NOT IDENT.
RB-86	2.594E+01	8.976E+01	1.799E+02	NOT IDENT.
Y-88	-2.349E+00	4.214E+00	7.466E+00	NOT IDENT.
Y-91	7.112E+02	1.750E+03	3.732E+03	NOT IDENT.
NB-94	-6.664E-01	3.144E+00	5.721E+00	NOT IDENT.
NB-95	-1.135E+00	4.205E+00	7.569E+00	NOT IDENT.
NB-95M	-4.591E+00	1.243E+01	1.915E+01	NOT IDENT.
TC-95M	-2.574E+00	4.325E+00	7.185E+00	NOT IDENT.
ZR-95	7.869E+00	7.059E+00	1.451E+01	NOT IDENT.
MO-99	8.285E+03	1.102E+04	2.289E+04	NOT IDENT.
TC-99M	0.000E+00	4.690E+29	0.000E+00	SHORT HLIF
RH-101	2.667E-01	2.600E+00	4.703E+00	NOT IDENT.
RH-102M	1.669E+00	3.407E+00	5.136E+00	FAIL ABUN
RU-103	-1.420E+00	4.322E+00	7.904E+00	NOT IDENT.
RH-106	-5.642E+00	2.865E+01	5.285E+01	NOT IDENT.
RU-106	-5.642E+00	2.865E+01	5.285E+01	NOT IDENT.
AG-108M	-1.273E+00	2.894E+00	5.245E+00	NOT IDENT.
CD-109	1.606E+01	6.440E+01	1.188E+02	NOT IDENT.
AG-110	3.837E+01	6.343E+01	1.295E+02	NOT IDENT.
AG-110M	-3.088E-01	4.710E+00	7.881E+00	FAIL ABUN
IN-111	6.585E+02	1.052E+03	1.924E+03	NOT IDENT.
SN-113	4.245E-01	4.165E+00	7.318E+00	NOT IDENT.
IN-114M	-2.144E+00	1.865E+01	3.245E+01	NOT IDENT.
CD-115	0.000E+00	1.753E+04	0.000E+00	SHORT HLIF
SN-117M	-1.010E+00	7.023E+00	1.236E+01	NOT IDENT.
SB-122	-9.464E+02	1.949E+03	3.473E+03	NOT IDENT.
I-123	0.000E+00	4.512E+13	0.000E+00	SHORT HLIF
TE-123M	1.595E-01	2.450E+00	4.383E+00	NOT IDENT.
SB-124	4.344E+00	9.813E+00	2.174E+01	NOT IDENT.
SB-125	5.401E+00	8.450E+00	1.695E+01	NOT IDENT.
TE-125M	-4.660E+02	8.886E+02	1.538E+03	NOT IDENT.
I-126	2.291E+00	3.073E+01	5.872E+01	FAIL ABUN
SB-126	1.234E-01	2.334E+01	4.358E+01	NOT IDENT.
SN-126	3.304E+00	6.198E+00	1.167E+01	FAIL ABUN
SB-127	2.366E+02	7.477E+02	1.117E+03	FAIL ABUN
TE-129	1.113E+01	5.165E+01	1.004E+02	NOT IDENT.
I-131	4.821E+00	2.277E+01	4.427E+01	NOT IDENT.
I-132	0.000E+00	8.910E+40	0.000E+00	SHORT HLIF
TE-132	2.378E+01	4.604E+02	8.112E+02	NOT IDENT.
BA-133	6.436E-01	4.376E+00	7.613E+00	NOT IDENT.
I-133	0.000E+00	8.264E+08	0.000E+00	SHORT HLIF
CS-134	2.006E+00	3.466E+00	7.093E+00	NOT IDENT.
I-135	0.000E+00	6.935E+27	0.000E+00	SHORT HLIF
CS-136	1.683E+00	1.798E+01	3.357E+01	NOT IDENT.
BA-137M	1.587E+00	3.092E+00	6.210E+00	NOT IDENT.
CS-137	1.676E+00	3.267E+00	6.560E+00	NOT IDENT.
LA-138	-2.599E+00	5.438E+00	1.001E+01	NOT IDENT.
CE-139	-3.876E-01	2.746E+00	4.799E+00	NOT IDENT.
BA-140	1.795E+00	4.018E+01	7.646E+01	FAIL ABUN
LA-140	-1.747E-01	1.059E+01	2.259E+01	NOT IDENT.
CE-141	-9.015E+00	8.138E+00	1.164E+01	NOT IDENT.
CE-143	0.000E+00	1.136E+06	0.000E+00	SHORT HLIF
CE-144	-1.679E+00	1.704E+01	3.024E+01	NOT IDENT.
PM-144	2.147E+00	3.225E+00	6.509E+00	FAIL ABUN
PR-144	1.608E+02	2.424E+02	4.892E+02	NOT IDENT.
PM-146	-1.804E+00	3.616E+00	6.535E+00	FAIL ABUN
ND-147	-1.940E+01	8.539E+01	1.586E+02	NOT IDENT.
PM-147	1.363E+04	5.934E+04	1.091E+05	NOT IDENT.
PM-149	0.000E+00	1.626E+05	0.000E+00	SHORT HLIF
EU-152	-7.324E+00	9.864E+00	1.390E+01	NOT IDENT.
GD-153	-3.920E+00	8.751E+00	1.307E+01	NOT IDENT.
EU-154	-8.821E+00	8.341E+00	1.337E+01	NOT IDENT.
EU-155	5.746E+00	8.593E+00	1.636E+01	NOT IDENT.
TB-160	-7.829E+00	1.512E+01	2.249E+01	NOT IDENT.
HO-166M	6.190E+00	5.881E+00	1.228E+01	NOT IDENT.
TM-171	-3.228E+01	2.215E+03	3.848E+03	NOT IDENT.
LU-176	1.408E+00	2.724E+00	4.630E+00	NOT IDENT.
LU-177	-4.488E+01	2.690E+02	4.635E+02	NOT IDENT.
HF-181	4.774E+00	4.355E+00	8.779E+00	NOT IDENT.
W-181	-7.953E-01	2.505E+01	4.303E+01	FAIL ABUN
TA-182	-3.529E-01	1.461E+01	2.932E+01	NOT IDENT.
RE-183	-1.102E+01	2.556E+01	4.222E+01	NOT IDENT.
RE-184	-5.705E+00	1.351E+01	2.365E+01	NOT IDENT.

RE-188	5.566E+00	1.502E+01	2.748E+01	FAIL ABUN
W-188	1.914E+02	7.170E+02	1.282E+03	FAIL ABUN
OS-191	2.027E-02	2.047E+01	3.662E+01	FAIL ABUN
IR-192	-1.983E-01	4.132E+00	7.049E+00	NOT IDENT.
PB-201	0.000E+00	2.330E+19	0.000E+00	SHORT HLIF
TL-201	2.280E+03	5.162E+03	9.422E+03	NOT IDENT.
TL-202	-3.088E+00	1.039E+01	1.918E+01	NOT IDENT.
HG-203	1.299E+00	4.070E+00	7.291E+00	NOT IDENT.
PB-203	0.000E+00	7.051E+03	0.000E+00	SHORT HLIF
TL-204	9.129E+01	4.376E+02	8.126E+02	NOT IDENT.
BI-207	3.037E-01	4.917E+00	9.241E+00	NOT IDENT.
PB-210	-1.878E+02	7.975E+02	1.176E+03	NOT IDENT.
PB-211	5.940E+01	6.262E+01	1.292E+02	NOT IDENT.
BI-212	1.689E+01	4.799E+01	9.363E+01	NOT IDENT.
PB-212	-1.965E+00	7.276E+00	1.224E+01	NOT IDENT.
BI-213	-5.551E+00	9.083E+00	1.622E+01	NOT IDENT.
BI-214	-1.244E+00	9.433E+00	1.453E+01	NOT IDENT.
PB-214	7.747E+00	1.084E+01	1.450E+01	FAIL ABUN
RN-219	-2.103E+01	3.406E+01	6.115E+01	NOT IDENT.
FR-221	8.833E+00	1.781E+01	3.268E+01	NOT IDENT.
RA-223	-3.904E+01	7.685E+01	1.156E+02	NOT IDENT.
AC-225	4.787E+01	9.651E+01	1.771E+02	NOT IDENT.
RA-226	-8.820E+01	9.794E+01	1.402E+02	NOT IDENT.
AC-227	-1.888E+01	2.383E+01	3.818E+01	FAIL ABUN
TH-227	-1.888E+01	2.383E+01	3.818E+01	FAIL ABUN
TH-228	-1.965E+00	7.276E+00	1.224E+01	NOT IDENT.
TH-229	3.822E+01	4.827E+01	8.988E+01	NOT IDENT.
TH-230	-8.827E+02	1.230E+03	1.781E+03	NOT IDENT.
PA-231	3.611E+01	4.635E+01	8.140E+01	NOT IDENT.
TH-231	-8.165E+00	4.556E+01	6.727E+01	NOT IDENT.
PA-233	6.636E+00	6.158E+00	1.184E+01	NOT IDENT.
PA-234	-1.995E+01	2.763E+01	4.542E+01	FAIL ABUN
PA-234M	3.207E+02	5.543E+02	9.503E+02	NOT IDENT.
TH-234	2.827E+02	2.795E+02	2.907E+02	FAIL ABUN
U-235	-7.380E-01	2.221E+01	3.516E+01	NOT IDENT.
NP-237	6.636E+00	6.158E+00	1.184E+01	NOT IDENT.
NP-238	0.000E+00	3.213E+04	0.000E+00	SHORT HLIF
U-238	2.827E+02	2.795E+02	2.907E+02	FAIL ABUN
NP-239	-1.206E+01	2.203E+01	3.793E+01	NOT IDENT.
AM-241	4.426E+00	1.563E+01	2.954E+01	NOT IDENT.
AM-242	-6.553E+01	6.644E+01	9.519E+01	NOT IDENT.
AM-243	6.955E+00	4.559E+00	9.152E+00	NOT IDENT.
CM-243	-1.137E+01	8.356E+00	1.339E+01	NOT IDENT.
BK-247	-5.126E+00	7.678E+00	1.244E+01	NOT IDENT.
CM-247	-3.237E+00	3.076E+00	5.249E+00	NOT IDENT.
CF-249	1.461E+00	3.394E+00	6.744E+00	NOT IDENT.
CF-251	4.266E+00	1.166E+01	2.113E+01	NOT IDENT.
CF-252	5.675E+03	1.515E+04	2.816E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.88	36	107	0.97	94.08	91	6	2.51E-03	48.5	
2	0	54.40	23	107	1.27	109.10	106	7	1.57E-03	78.7	
3	0	63.72	91	135	0.80	127.74	124	9	6.31E-03	25.2	
4	0	92.73	116	213	1.03	185.75	181	11	8.06E-03	26.2	
5	0	144.21	27	102	0.68	288.69	285	6	1.85E-03	63.2	
6	0	149.40	27	121	1.03	299.09	296	8	1.85E-03	74.0	
7	0	185.99	77	133	0.82	372.24	368	9	5.36E-03	29.3	
8	1	238.98	57	99	1.26	478.23	473	12	3.96E-03	32.9	2.15E+00
9	1	240.76	22	71	1.26	481.77	473	12	1.55E-03	65.3	
10	0	304.53	22	47	1.18	609.31	607	6	1.54E-03	53.1	
11	0	347.56	12	50	1.15	695.35	690	7	8.60E-04	98.1	
12	0	352.37	36	43	1.80	704.98	701	8	2.51E-03	35.8	
13	0	395.16	31	69	3.53	790.55	785	12	2.13E-03	57.0	
14	0	474.27	10	36	1.39	948.76	942	8	6.73E-04	104.2	
15	0	477.66	87	62	0.79	955.54	950	14	6.06E-03	21.6	
16	0	511.65	311	92	2.42	1023.50	1016	20	2.16E-02	9.5	
17	0	584.50	21	45	2.26	1169.21	1162	11	1.46E-03	66.3	
18	0	687.11	5	20	1.30	1374.40	1369	8	3.47E-04	161.2	
19	0	747.55	42	32	7.34	1495.28	1486	19	2.94E-03	36.0	
20	0	755.06	33	20	0.72	1510.30	1505	13	2.26E-03	33.1	
21	0	882.53	15	18	0.63	1765.23	1759	12	1.04E-03	62.2	
22	0	911.68	24	20	1.39	1823.53	1816	14	1.65E-03	45.6	
23	0	935.76	22	7	0.67	1871.70	1865	13	1.49E-03	32.6	
24	6	969.36	15	21	1.81	1938.88	1933	15	1.05E-03	64.1	1.04E+00
25	6	972.10	12	4	2.02	1944.38	1933	15	8.03E-04	61.8	
26	0	1080.14	12	17	2.11	2160.44	2150	13	7.99E-04	78.2	
27	0	1282.87	9	9	4.85	2565.92	2558	12	6.31E-04	73.9	
28	0	1385.51	9	5	1.61	2771.20	2765	10	6.50E-04	55.0	
29	0	1461.24	43	9	2.25	2922.66	2914	17	2.95E-03	22.0	
30	0	1491.01	7	10	1.38	2982.20	2977	9	5.07E-04	89.2	
31	0	1527.30	10	0	1.55	3054.80	3051	7	6.94E-04	31.6	
32	0	1586.70	5	9	3.34	3173.60	3167	9	3.47E-04	117.0	
33	0	1849.76	6	6	0.97	3699.76	3690	12	4.17E-04	91.3	
34	0	1859.59	8	5	3.83	3719.43	3712	11	5.34E-04	68.9	
35	0	1912.04	9	0	0.83	3824.33	3821	8	6.25E-04	33.3	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	87	10.44*	2.248E+00	1.358E+02	1.865E+02	43.29
K-40	1460.82	21	10.66*	8.715E-01	8.316E+01	8.315E+01	98.10
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TL-208	277.37	-----	6.60	3.299E+00	-----	Line Not Found	-----
	583.19	7	85.00*	1.927E+00	1.562E+00	1.600E+00	437.68
	860.56	-----	12.50	1.390E+00	-----	Line Not Found	-----
BI-211	72.87	-----	1.23	2.699E+00	-----	Line Not Found	-----
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AC-228	338.32	-----	11.27	2.878E+00	-----	Line Not Found	-----
	911.20	3	25.80*	1.320E+00	2.835E+00	2.858E+00	914.50
	968.97	15	15.80	1.248E+00	2.811E+01	2.834E+01	128.30
RA-228	338.32	-----	11.27	2.878E+00	-----	Line Not Found	-----
	911.20	3	25.80*	1.320E+00	2.835E+00	2.858E+00	914.50
	968.97	15	15.80	1.248E+00	2.811E+01	2.834E+01	128.30
TH-232	63.81	52	0.26*	1.814E+00	4.022E+03	4.022E+03	100.89
	140.88	-----	0.02	4.699E+00	-----	Line Not Found	-----
U-234	53.20	23	0.12*	9.253E-01	7.431E+03	7.431E+03	157.49
	120.90	-----	0.04	4.726E+00	-----	Line Not Found	-----
ANH-511	511.00	19	100.00*	2.136E+00	3.173E+00	3.173E+00	357.09

Flag: "*" = Keyline

Total number of lines in spectrum 29
Number of unidentified lines 11
Number of lines tentatively identified by NID 18 62.07%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.37	1.358E+02	1.865E+02	0.808E+02	43.29	
K-40	1.25E+09Y	1.00	8.316E+01	8.315E+01	8.157E+01	98.10	
AS-73	80.30D	1.23	8.657E+01	1.069E+02	1.683E+02	157.49	
RB-84	32.82D	1.67	5.847E+00	9.785E+00	12.17E+00	124.37	
TL-208	1.91Y	1.02	1.562E+00	1.600E+00	7.005E+00	437.68	
BI-211	21.77Y	1.00	2.135E+01	2.139E+01	3.054E+01	142.75	
RA-224	1.91Y	1.02	1.832E+01	1.877E+01	8.320E+01	443.25	
AC-228	5.75Y	1.01	2.835E+00	2.858E+00	26.14E+00	914.50	
RA-228	5.75Y	1.01	2.835E+00	2.858E+00	26.14E+00	914.50	
TH-232	1.41E+10Y	1.00	4.022E+03	4.022E+03	4.058E+03	100.89	
U-234	2.45E+05Y	1.00	7.431E+03	7.431E+03	11.70E+03	157.49	
ANH-511	1.00E+09Y	1.00	3.173E+00	3.173E+00	11.33E+00	357.09	

Total Activity : 1.181E+04 1.189E+04

Grand Total Activity : 1.181E+04 1.189E+04

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	149.40	27	121	1.03	299.09	296	8	1.85E-03	****	4.63E+00	
0	304.53	22	47	1.18	609.31	607	6	1.54E-03	****	3.10E+00	T
0	347.56	12	50	1.15	695.35	690	7	8.60E-04	****	2.82E+00	
0	395.16	31	69	3.53	790.55	785	12	2.13E-03	****	2.58E+00	
0	474.27	10	36	1.39	948.76	942	8	6.73E-04	****	2.26E+00	T
0	687.11	5	20	1.30	1374.40	1369	8	3.47E-04	****	1.69E+00	T
0	747.55	42	32	7.34	1495.28	1486	19	2.94E-03	71.9	1.57E+00	T
0	755.06	33	20	0.72	1510.30	1505	13	2.26E-03	66.2	1.56E+00	T
0	935.76	22	7	0.67	1871.70	1865	13	1.49E-03	65.2	1.29E+00	T
6	972.10	2	4	2.02	1944.38	1933	15	1.66E-04	****	1.24E+00	
0	1080.14	12	17	2.11	2160.44	2150	13	7.99E-04	****	1.13E+00	
0	1282.87	9	9	4.85	2565.92	2558	12	6.31E-04	****	9.70E-01	
0	1385.51	9	5	1.61	2771.20	2765	10	6.50E-04	****	9.09E-01	T
0	1491.01	7	10	1.38	2982.20	2977	9	5.07E-04	****	8.58E-01	
0	1527.30	10	0	1.55	3054.80	3051	7	6.94E-04	63.2	8.43E-01	
0	1586.70	5	9	3.34	3173.60	3167	9	3.47E-04	****	8.21E-01	
0	1849.76	6	6	0.97	3699.76	3690	12	4.17E-04	****	7.55E-01	
0	1859.59	8	5	3.83	3719.43	3712	11	5.34E-04	****	7.53E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                    *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885001.CNF;1  *
* Acquisition date   : 21-JUL-2022 16:33:26 Sensitivity      : 3.000          *
* Detector ID       : GAM14 Energy tolerance: 1.500          *
* Elapsed live time : 0 04:00:00.00 Abundance limit : 75.000          *
* Elapsed real time : 0 04:00:01.47 Half life ratio : *****          *
* Sample date       : 27-JUN-2022 09:24:00 Nuclide Library : LIQUID          *
* Sample ID        : G585885001 Analyst initials: MJH1          *
* Batch Number     : 2290721 Sample Quantity : 5.1420E-01 FILTER          *
* Wet wt corr      : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date    : 9-MAY-2022 05:17:58 Eff. Geometry    : JAR          *
* Eff. File        : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	2.515E+01
K-40	3.193E+01
AS-73	8.846E+01
RB-84	5.428E+00
TL-208	2.582E+00
BI-211	1.574E+01
RA-224	4.746E+01
AC-228	1.044E+01
RA-228	1.044E+01
TH-232	1.422E+03
U-234	6.298E+03
ANH-511	2.248E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	1.888E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.736E+00	NOT IDENT.
SC-46	3.242E+00	NOT IDENT.
V-48	7.631E+00	NOT IDENT.
CR-51	3.706E+01	NOT IDENT.
MN-52	5.560E+01	FAIL ABUN
MN-54	3.118E+00	NOT IDENT.
CO-56	3.763E+00	NOT IDENT.
CO-57	1.722E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.890E+00	NOT IDENT.
FE-59	7.780E+00	NOT IDENT.
CO-60	2.041E+00	NOT IDENT.
ZN-65	6.851E+00	NOT IDENT.
CU-67	2.633E+03	NOT IDENT.
GE-68	9.615E+01	NOT IDENT.
AS-74	1.277E+01	NOT IDENT.
SE-75	3.396E+00	NOT IDENT.

BR-77	0.000E+00	SHORT HLIF
SR-82	2.889E+01	NOT IDENT.
RB-83	5.643E+00	NOT IDENT.
KR-85	7.590E+02	NOT IDENT.
SR-85	4.393E+00	NOT IDENT.
RB-86	7.749E+01	NOT IDENT.
Y-88	2.963E+00	NOT IDENT.
Y-91	1.619E+03	NOT IDENT.
NB-94	2.563E+00	NOT IDENT.
NB-95	3.368E+00	NOT IDENT.
NB-95M	8.871E+00	NOT IDENT.
TC-95M	3.337E+00	NOT IDENT.
ZR-95	6.496E+00	NOT IDENT.
MO-99	1.024E+04	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.197E+00	NOT IDENT.
RH-102M	2.336E+00	FAIL ABUN
RU-103	3.571E+00	NOT IDENT.
RH-106	2.360E+01	NOT IDENT.
RU-106	2.360E+01	NOT IDENT.
AG-108M	2.398E+00	NOT IDENT.
CD-109	5.583E+01	NOT IDENT.
AG-110	5.806E+01	NOT IDENT.
AG-110M	3.406E+00	FAIL ABUN
IN-111	9.012E+02	NOT IDENT.
SN-113	3.322E+00	NOT IDENT.
IN-114M	1.516E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	5.745E+00	NOT IDENT.
SB-122	1.561E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.043E+00	NOT IDENT.
SB-124	9.129E+00	NOT IDENT.
SB-125	7.788E+00	NOT IDENT.
TE-125M	7.159E+02	NOT IDENT.
I-126	2.617E+01	FAIL ABUN
SB-126	1.957E+01	NOT IDENT.
SN-126	5.485E+00	FAIL ABUN
SB-127	4.946E+02	FAIL ABUN
TE-129	4.566E+01	NOT IDENT.
I-131	2.032E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	3.764E+02	NOT IDENT.
BA-133	3.520E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.151E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.487E+01	NOT IDENT.
BA-137M	2.791E+00	NOT IDENT.
CS-137	2.948E+00	NOT IDENT.
LA-138	4.155E+00	NOT IDENT.
CE-139	2.244E+00	NOT IDENT.
BA-140	3.454E+01	FAIL ABUN
LA-140	8.914E+00	NOT IDENT.
CE-141	5.455E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.413E+01	NOT IDENT.
PM-144	2.945E+00	FAIL ABUN
PR-144	2.213E+02	NOT IDENT.
PM-146	2.941E+00	FAIL ABUN
ND-147	7.086E+01	NOT IDENT.
PM-147	5.084E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	6.296E+00	NOT IDENT.
GD-153	6.109E+00	NOT IDENT.
EU-154	5.229E+00	NOT IDENT.
EU-155	7.658E+00	NOT IDENT.
TB-160	9.726E+00	NOT IDENT.
HO-166M	5.588E+00	NOT IDENT.
TM-171	1.783E+03	NOT IDENT.
LU-176	2.145E+00	NOT IDENT.
LU-177	2.166E+02	NOT IDENT.
HF-181	3.982E+00	NOT IDENT.
W-181	2.006E+01	FAIL ABUN
TA-182	1.257E+01	NOT IDENT.
RE-183	1.966E+01	NOT IDENT.
RE-184	1.026E+01	NOT IDENT.
RE-188	1.287E+01	FAIL ABUN

W-188	5.921E+02	FAIL ABUN
OS-191	1.714E+01	FAIL ABUN
IR-192	3.277E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	4.425E+03	NOT IDENT.
TL-202	8.704E+00	NOT IDENT.
HG-203	3.382E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	3.812E+02	NOT IDENT.
BI-207	4.044E+00	NOT IDENT.
PB-210	5.560E+02	NOT IDENT.
PB-211	5.946E+01	NOT IDENT.
BI-212	4.212E+01	NOT IDENT.
PB-212	5.803E+00	NOT IDENT.
BI-213	7.315E+00	NOT IDENT.
BI-214	6.684E+00	NOT IDENT.
PB-214	6.759E+00	FAIL ABUN
RN-219	2.765E+01	NOT IDENT.
FR-221	1.522E+01	NOT IDENT.
RA-223	5.366E+01	NOT IDENT.
AC-225	8.251E+01	NOT IDENT.
RA-226	6.690E+01	NOT IDENT.
AC-227	1.760E+01	FAIL ABUN
TH-227	1.760E+01	FAIL ABUN
TH-228	5.803E+00	NOT IDENT.
TH-229	4.226E+01	NOT IDENT.
TH-230	8.320E+02	NOT IDENT.
PA-231	3.776E+01	NOT IDENT.
TH-231	3.157E+01	NOT IDENT.
PA-233	5.502E+00	NOT IDENT.
PA-234	1.949E+01	FAIL ABUN
PA-234M	4.268E+02	NOT IDENT.
TH-234	1.379E+02	FAIL ABUN
U-235	1.663E+01	NOT IDENT.
NP-237	5.502E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.379E+02	FAIL ABUN
NP-239	1.765E+01	NOT IDENT.
AM-241	1.379E+01	NOT IDENT.
AM-242	4.446E+01	NOT IDENT.
AM-243	4.321E+00	NOT IDENT.
CM-243	6.168E+00	NOT IDENT.
BK-247	5.741E+00	NOT IDENT.
CM-247	2.356E+00	NOT IDENT.
CF-249	3.087E+00	NOT IDENT.
CF-251	9.910E+00	NOT IDENT.
CF-252	1.320E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885001.CNF;1
Acquisition date : 21-JUL-2022 16:33:26 Sensitivity : 3.000
Detector ID : GAM14 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:01.47 Half life ratio : *****
Sample date : 27-JUN-2022 09:24:00 Nuclide Library : LIQUID
Sample ID : G585885001 Analyst initials: MJH1
Batch Number : 2290721 Sample Quantity : 5.1420E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 9-MAY-2022 05:17:58 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.865E+02	8.068E+01	8.076E+01
K-40	8.315E+01	8.038E+01	8.039E+01
AS-73	1.069E+02	1.665E+02	1.665E+02
RB-84	9.785E+00	1.196E+01	1.197E+01
TL-208	1.600E+00	6.866E+00	6.866E+00
BI-211	2.139E+01	2.998E+01	2.998E+01
RA-224	1.877E+01	8.155E+01	8.155E+01
AC-228	2.858E+00	2.562E+01	2.562E+01
RA-228	2.858E+00	2.562E+01	2.562E+01
TH-232	4.022E+03	4.011E+03	4.012E+03
U-234	7.431E+03	1.149E+04	1.149E+04
ANH-511	3.173E+00	1.111E+01	1.111E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-2.383E+00	2.826E+00	3.023E+00	NOT IDENT.
NA-24	6.800E+11	1.789E+12	1.815E+12	SHORT HLIF
AL-26	-2.479E-02	3.274E+00	3.274E+00	NOT IDENT.
SC-46	1.972E+00	3.578E+00	3.687E+00	NOT IDENT.
V-48	5.999E+00	8.097E+00	8.538E+00	NOT IDENT.
CR-51	-2.081E+01	4.888E+01	4.977E+01	NOT IDENT.
MN-52	-1.189E+01	6.786E+01	6.807E+01	FAIL ABUN
MN-54	1.835E+00	3.490E+00	3.587E+00	NOT IDENT.
CO-56	9.738E-01	4.403E+00	4.425E+00	NOT IDENT.
CO-57	5.409E-01	2.003E+00	2.018E+00	NOT IDENT.
NI-57	-8.137E+04	2.982E+05	3.005E+05	SHORT HLIF
CO-58	2.507E+00	4.336E+00	4.481E+00	NOT IDENT.
FE-59	7.357E+00	8.080E+00	8.735E+00	NOT IDENT.
CO-60	-3.400E+00	3.229E+00	3.575E+00	NOT IDENT.
ZN-65	3.422E+00	7.811E+00	7.962E+00	NOT IDENT.
CU-67	-1.653E+04	5.118E+03	9.047E+03	NOT IDENT.
GE-68	5.165E+01	1.079E+02	1.104E+02	NOT IDENT.
AS-74	8.345E+00	1.418E+01	1.468E+01	NOT IDENT.

SE-75	-2.075E+00	4.442E+00	4.539E+00	NOT IDENT.
BR-77	-1.998E+03	1.659E+04	1.661E+04	SHORT HLIF
SR-82	-1.711E+01	3.760E+01	3.838E+01	NOT IDENT.
RB-83	-8.600E-01	7.019E+00	7.030E+00	NOT IDENT.
KR-85	1.372E+03	7.769E+02	9.934E+02	NOT IDENT.
SR-85	7.941E+00	4.497E+00	5.750E+00	NOT IDENT.
RB-86	2.594E+01	8.979E+01	9.055E+01	NOT IDENT.
Y-88	-2.349E+00	4.218E+00	4.349E+00	NOT IDENT.
Y-91	7.112E+02	1.751E+03	1.780E+03	NOT IDENT.
NB-94	-6.664E-01	3.145E+00	3.159E+00	NOT IDENT.
NB-95	-1.135E+00	4.206E+00	4.237E+00	NOT IDENT.
NB-95M	-4.591E+00	1.244E+01	1.261E+01	NOT IDENT.
TC-95M	-2.574E+00	4.330E+00	4.483E+00	NOT IDENT.
ZR-95	7.869E+00	7.093E+00	7.932E+00	NOT IDENT.
MO-99	8.285E+03	1.104E+04	1.166E+04	NOT IDENT.
TC-99M	8.698E+28	4.691E+29	0.000E+00	SHORT HLIF
RH-101	2.667E-01	2.600E+00	2.603E+00	NOT IDENT.
RH-102M	1.669E+00	3.412E+00	3.494E+00	FAIL ABUN
RU-103	-1.420E+00	4.324E+00	4.371E+00	NOT IDENT.
RH-106	-5.642E+00	2.865E+01	2.876E+01	NOT IDENT.
RU-106	-5.642E+00	2.865E+01	2.876E+01	NOT IDENT.
AG-108M	-1.273E+00	2.896E+00	2.952E+00	NOT IDENT.
CD-109	1.606E+01	6.442E+01	6.483E+01	NOT IDENT.
AG-110	3.837E+01	6.351E+01	6.583E+01	NOT IDENT.
AG-110M	-3.088E-01	4.711E+00	4.713E+00	FAIL ABUN
IN-111	6.585E+02	1.054E+03	1.095E+03	NOT IDENT.
SN-113	4.245E-01	4.165E+00	4.169E+00	NOT IDENT.
IN-114M	-2.144E+00	1.865E+01	1.868E+01	NOT IDENT.
CD-115	1.246E+04	1.757E+04	1.844E+04	SHORT HLIF
SN-117M	-1.010E+00	7.023E+00	7.038E+00	NOT IDENT.
SB-122	-9.464E+02	1.951E+03	1.997E+03	NOT IDENT.
I-123	2.330E+12	4.512E+13	4.513E+13	SHORT HLIF
TE-123M	1.595E-01	2.450E+00	2.451E+00	NOT IDENT.
SB-124	4.344E+00	9.820E+00	1.001E+01	NOT IDENT.
SB-125	5.401E+00	8.461E+00	8.805E+00	NOT IDENT.
TE-125M	-4.660E+02	8.894E+02	9.139E+02	NOT IDENT.
I-126	2.291E+00	3.073E+01	3.075E+01	FAIL ABUN
SB-126	1.234E-01	2.334E+01	2.334E+01	NOT IDENT.
SN-126	3.304E+00	6.204E+00	6.380E+00	FAIL ABUN
SB-127	2.366E+02	7.484E+02	7.560E+02	FAIL ABUN
TE-129	1.113E+01	5.169E+01	5.193E+01	NOT IDENT.
I-131	4.821E+00	2.277E+01	2.288E+01	NOT IDENT.
I-132	-1.000E+41	1.748E+41	0.000E+00	SHORT HLIF
TE-132	2.378E+01	4.604E+02	4.605E+02	NOT IDENT.
BA-133	6.436E-01	4.376E+00	4.386E+00	NOT IDENT.
I-133	-6.957E+08	8.355E+08	8.926E+08	SHORT HLIF
CS-134	2.006E+00	3.470E+00	3.586E+00	NOT IDENT.
I-135	6.304E+27	7.786E+27	0.000E+00	SHORT HLIF
CS-136	1.683E+00	1.799E+01	1.800E+01	NOT IDENT.
BA-137M	1.587E+00	3.095E+00	3.177E+00	NOT IDENT.
CS-137	1.676E+00	3.269E+00	3.356E+00	NOT IDENT.
LA-138	-2.599E+00	5.444E+00	5.569E+00	NOT IDENT.
CE-139	-3.876E-01	2.747E+00	2.753E+00	NOT IDENT.
BA-140	1.795E+00	4.018E+01	4.019E+01	FAIL ABUN
LA-140	-1.747E-01	1.059E+01	1.059E+01	NOT IDENT.
CE-141	-9.015E+00	8.166E+00	9.123E+00	NOT IDENT.
CE-143	-3.601E+05	1.137E+06	1.148E+06	SHORT HLIF
CE-144	-1.679E+00	1.704E+01	1.706E+01	NOT IDENT.
PM-144	2.147E+00	3.230E+00	3.372E+00	FAIL ABUN
PR-144	1.608E+02	2.428E+02	2.534E+02	NOT IDENT.
PM-146	-1.804E+00	3.621E+00	3.711E+00	FAIL ABUN
ND-147	-1.940E+01	8.540E+01	8.585E+01	NOT IDENT.
PM-147	1.363E+04	5.935E+04	5.967E+04	NOT IDENT.
PM-149	-6.026E+04	1.628E+05	1.651E+05	SHORT HLIF
EU-152	-7.324E+00	9.887E+00	1.042E+01	NOT IDENT.
GD-153	-3.920E+00	8.756E+00	8.933E+00	NOT IDENT.
EU-154	-8.821E+00	8.381E+00	9.279E+00	NOT IDENT.
EU-155	5.746E+00	8.609E+00	8.991E+00	NOT IDENT.
TB-160	-7.829E+00	1.515E+01	1.555E+01	NOT IDENT.
HO-166M	6.190E+00	5.908E+00	6.535E+00	NOT IDENT.
TM-171	-3.228E+01	2.215E+03	2.215E+03	NOT IDENT.
LU-176	1.408E+00	2.727E+00	2.800E+00	NOT IDENT.
LU-177	-4.488E+01	2.690E+02	2.698E+02	NOT IDENT.
HF-181	4.774E+00	4.374E+00	4.876E+00	NOT IDENT.
W-181	-7.953E-01	2.505E+01	2.505E+01	FAIL ABUN
TA-182	-3.529E-01	1.461E+01	1.461E+01	NOT IDENT.
RE-183	-1.102E+01	2.559E+01	2.607E+01	NOT IDENT.
RE-184	-5.705E+00	1.353E+01	1.377E+01	NOT IDENT.

RE-188	5.566E+00	1.503E+01	1.524E+01	FAIL ABUN
W-188	1.914E+02	7.174E+02	7.226E+02	FAIL ABUN
OS-191	2.027E-02	2.047E+01	2.047E+01	FAIL ABUN
IR-192	-1.983E-01	4.132E+00	4.133E+00	NOT IDENT.
PB-201	4.225E+18	2.334E+19	0.000E+00	SHORT HLIF
TL-201	2.280E+03	5.165E+03	5.267E+03	NOT IDENT.
TL-202	-3.088E+00	1.039E+01	1.049E+01	NOT IDENT.
HG-203	1.299E+00	4.071E+00	4.113E+00	NOT IDENT.
PB-203	2.250E+03	7.053E+03	7.126E+03	SHORT HLIF
TL-204	9.129E+01	4.376E+02	4.396E+02	NOT IDENT.
BI-207	3.037E-01	4.917E+00	4.918E+00	NOT IDENT.
PB-210	-1.878E+02	7.977E+02	8.022E+02	NOT IDENT.
PB-211	5.940E+01	6.284E+01	6.831E+01	NOT IDENT.
BI-212	1.689E+01	4.801E+01	4.861E+01	NOT IDENT.
PB-212	-1.965E+00	7.278E+00	7.332E+00	NOT IDENT.
BI-213	-5.551E+00	9.095E+00	9.433E+00	NOT IDENT.
BI-214	-1.244E+00	9.433E+00	9.450E+00	NOT IDENT.
PB-214	7.747E+00	1.086E+01	1.141E+01	FAIL ABUN
RN-219	-2.103E+01	3.419E+01	3.549E+01	NOT IDENT.
FR-221	8.833E+00	1.783E+01	1.827E+01	NOT IDENT.
RA-223	-3.904E+01	7.694E+01	7.894E+01	NOT IDENT.
AC-225	4.787E+01	9.663E+01	9.902E+01	NOT IDENT.
RA-226	-8.820E+01	9.818E+01	1.059E+02	NOT IDENT.
AC-227	-1.888E+01	2.400E+01	2.546E+01	FAIL ABUN
TH-227	-1.888E+01	2.400E+01	2.546E+01	FAIL ABUN
TH-228	-1.965E+00	7.278E+00	7.332E+00	NOT IDENT.
TH-229	3.822E+01	4.836E+01	5.134E+01	NOT IDENT.
TH-230	-8.827E+02	1.239E+03	1.302E+03	NOT IDENT.
PA-231	3.611E+01	4.706E+01	4.980E+01	NOT IDENT.
TH-231	-8.165E+00	4.558E+01	4.573E+01	NOT IDENT.
PA-233	6.636E+00	6.185E+00	6.872E+00	NOT IDENT.
PA-234	-1.995E+01	3.588E+01	3.699E+01	FAIL ABUN
PA-234M	3.207E+02	5.552E+02	5.737E+02	NOT IDENT.
TH-234	2.827E+02	2.868E+02	3.139E+02	FAIL ABUN
U-235	-7.380E-01	2.221E+01	2.221E+01	NOT IDENT.
NP-237	6.636E+00	6.185E+00	6.872E+00	NOT IDENT.
NP-238	7.429E+03	3.214E+04	3.231E+04	SHORT HLIF
U-238	2.827E+02	2.868E+02	3.139E+02	FAIL ABUN
NP-239	-1.206E+01	2.205E+01	2.271E+01	NOT IDENT.
AM-241	4.426E+00	1.564E+01	1.576E+01	NOT IDENT.
AM-242	-6.553E+01	6.749E+01	7.368E+01	NOT IDENT.
AM-243	6.955E+00	4.592E+00	5.562E+00	NOT IDENT.
CM-243	-1.137E+01	8.444E+00	9.880E+00	NOT IDENT.
BK-247	-5.126E+00	7.755E+00	8.093E+00	NOT IDENT.
CM-247	-3.237E+00	3.132E+00	3.456E+00	NOT IDENT.
CF-249	1.461E+00	3.398E+00	3.461E+00	NOT IDENT.
CF-251	4.266E+00	1.167E+01	1.183E+01	NOT IDENT.
CF-252	5.675E+03	1.600E+04	1.620E+04	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	67.5546	133.52	68.9109	116.30	78.2514
879.38	79.1327	364.49	67.9892	116.74	72.3562
46.54	62.9535	80.22	67.9936	117.23	65.4662
228.16	46.9686	711.68	64.3111	119.76	79.6539
52.39	58.2331	356.01	58.7674	120.54	57.8155
53.20	53.8283	323.87	67.1721	120.90	59.8412
53.44	53.8609	82.35	0.0000	264.66	57.8650
57.53	63.6746	82.47	76.7067	121.22	57.8739
293.27	0.0000	82.47	76.7067	344.28	53.9267
57.53	63.8674	83.79	85.3389	122.06	53.9489
482.18	63.8676	265.00	85.3722	1274.44	66.0347
57.98	71.0403	84.21	69.4512	123.68	50.0710
59.32	58.7951	84.86	0.0000	1377.63	0.0000
59.54	60.6082	193.51	79.9566	127.23	65.4248
155.04	59.6901	105.31	90.4915	129.43	71.6879
63.00	62.8910	86.79	85.8165	131.20	56.6827
129.43	62.9325	86.94	85.8401	133.02	86.2542
63.29	62.9325	87.09	83.9766	133.52	70.0665
290.67	62.9737	87.57	69.8848	135.34	64.1334
63.81	63.0064	88.03	74.6694	136.00	83.5503
87.57	63.0727	306.78	82.2774	136.28	79.5044
64.99	63.1726	88.47	82.2966	136.47	79.5258
65.08	63.1854	531.02	172.9814	739.50	65.6074
66.73	57.9800	184.58	157.8198	140.51	0.0000
66.98	58.0117	92.59	64.8000	140.88	65.6396
67.24	85.8574	93.31	66.7908	143.76	74.1248
67.67	72.6233	94.56	154.9105	144.24	71.0815
1221.41	67.7931	311.90	153.9789	145.44	79.4462
439.51	81.0059	946.00	153.9838	152.32	72.1686
70.82	81.0059	97.43	63.4244	152.43	72.1792
167.43	81.0066	98.43	70.2704	1048.07	61.1374
97.43	68.3773	98.44	70.2715	154.21	75.1223
70.82	72.1989	99.53	77.1515	155.04	63.7114
70.82	72.1989	103.37	77.1515	158.56	66.9258
279.20	0.0000	116.74	77.1515	158.97	0.0000
1063.66	89.0178	100.11	70.4692	159.00	61.9241
72.87	0.0000	100.20	66.6179	162.33	63.2281
351.06	89.0289	102.03	62.9474	537.26	68.5239
74.66	58.9565	103.18	74.7101	163.33	74.9099
238.63	66.3475	103.37	74.7330	165.86	73.0198
351.93	66.3475	105.31	57.4443	167.43	68.9147
238.63	66.3475	106.12	55.5697	245.35	67.0952
74.97	66.3676	106.47	58.5274	427.87	66.4133
77.11	69.4307	109.28	72.5073	176.60	69.6497
256.23	76.2969	111.00	72.7037	177.52	67.5768
79.82	76.3170	111.76	58.0349	181.07	72.1546
80.02	76.3464	208.37	79.8221	184.41	147.0068
80.03	76.3470	116.24	78.2442	184.58	101.6263

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	54.1245	300.09	70.9178	477.60	25.6223
186.21	66.0672	300.13	70.9196	477.99	25.6275
190.27	70.7109	301.36	38.5020	482.18	16.2231
193.51	63.3154	302.85	46.5763	487.02	20.7839
197.03	59.1688	304.50	44.6252	492.35	0.0000
198.01	81.1656	304.85	44.6376	497.08	34.5241
201.83	57.2630	306.78	41.8850	511.00	32.0324
204.12	70.6436	308.46	37.5022	514.00	32.0833
205.31	56.3626	311.90	36.3876	520.40	28.6939
208.37	72.0588	316.51	59.6395	520.69	0.0000
210.85	57.7906	319.41	58.5483	667.71	0.0000
215.65	61.4176	320.08	58.5776	527.90	0.0000
218.12	51.4917	321.04	47.6277	529.59	34.1877
222.11	55.0629	323.87	58.7417	529.87	0.0000
227.09	62.1016	325.23	50.2253	531.02	26.8158
227.38	49.6947	1596.21	49.1260	537.26	28.7547
228.16	54.2527	331.15	0.0000	1260.41	0.0000
228.18	54.2534	333.37	36.9672	552.55	25.2356
235.69	62.2249	334.37	41.9262	795.86	34.7628
235.96	56.1677	338.28	39.5703	564.24	33.8394
238.63	60.4911	911.20	39.5713	569.33	30.1536
238.98	0.0000	340.48	50.7795	569.50	30.1563
240.99	65.5787	340.55	50.7820	569.70	25.4465
242.00	44.2676	344.28	46.3613	582.08	23.7000
244.70	53.9400	345.93	36.0544	583.19	23.7132
245.35	58.5649	351.06	44.9176	595.83	32.4408
459.60	57.6874	351.93	43.6966	600.60	46.8547
685.70	75.1106	356.01	47.5754	604.72	40.2380
388.16	75.1374	361.25	0.0000	609.32	28.8013
256.23	63.7696	364.49	38.6150	610.33	25.9332
527.90	0.0000	366.42	47.0711	614.28	24.0550
264.66	58.3939	383.85	34.8607	618.01	33.7339
265.00	61.9153	388.16	32.3996	621.93	26.0695
269.46	71.5309	666.33	29.8510	630.19	0.0000
401.81	58.7189	391.70	30.7639	631.29	23.2695
273.65	64.7217	400.66	30.9382	632.98	23.2871
276.40	45.9983	401.32	0.0000	633.25	22.3196
583.19	50.7554	401.81	39.5612	634.78	20.3925
277.60	59.0302	402.40	42.1562	635.95	15.5449
402.40	59.0485	404.85	29.2962	636.99	17.4961
278.43	62.6140	410.95	35.4613	657.50	17.6521
279.20	0.0000	720.70	35.5430	884.68	16.6735
279.54	48.4810	423.72	27.8926	661.66	19.6484
280.46	55.6174	427.09	27.9492	664.57	0.0000
301.36	53.3908	427.87	32.3313	666.33	21.6563
284.31	43.9217	433.94	45.6026	666.50	21.6580
285.41	55.8412	439.51	36.9534	667.71	0.0000
285.90	0.0000	440.45	37.8542	677.62	22.7492
287.50	54.7457	453.88	34.5995	685.70	19.8486
290.67	44.1464	459.60	30.2619	692.65	22.8914
293.27	0.0000	463.37	24.9745	695.00	19.9251
295.22	45.5031	468.07	25.7561	696.49	20.9342
316.51	68.2928	473.00	34.9732	696.51	20.9342
298.58	54.0266	475.06	16.1598	697.00	23.9297
299.98	70.9124	696.49	25.6107	697.49	27.9237

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	27.9818	903.28	19.3652	1291.59	11.7265
706.68	24.0234	907.67	0.0000	1298.22	0.0000
711.68	19.0572	911.20	17.2585	1312.11	7.2529
720.70	26.1724	984.45	0.0000	1332.49	13.6670
721.93	0.0000	926.36	17.3451	1365.19	10.1017
1690.97	29.2171	935.54	13.0479	1368.63	0.0000
722.91	29.2183	937.49	13.0562	1377.63	0.0000
723.31	30.2307	983.53	11.9937	1384.29	9.2255
756.73	27.2175	945.96	0.0000	1408.01	16.6981
727.33	22.2050	946.00	20.7287	1434.09	9.3323
733.00	29.3351	949.00	19.6567	1435.80	12.1367
735.93	23.2929	954.55	0.0000	1457.56	0.0000
739.50	15.2124	962.31	17.5469	1460.82	12.2057
1434.09	15.2405	964.08	14.8134	1489.16	10.5827
747.24	15.2582	966.17	14.8233	1596.21	4.8346
752.31	6.1152	968.97	17.5840	1620.50	7.7749
753.82	10.7081	983.53	7.7280	1678.03	0.0000
756.73	10.7200	984.45	0.0000	1690.97	5.9150
763.94	26.6178	996.26	13.3003	1757.55	0.0000
765.80	25.6124	1001.03	13.3198	1764.49	8.0010
1001.03	28.6927	1004.73	17.7799	1770.23	7.0085
766.84	21.5229	1025.87	0.0000	1771.35	7.0103
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	21.6016	1037.84	11.2240	1808.65	6.0516
777.92	17.4960	1038.76	0.0000	1836.06	9.1241
778.90	17.5029	1046.59	13.5039		
783.70	18.5654	1048.07	19.1388		
1435.80	16.5339	1050.41	11.2663		
903.28	25.8657	1063.66	15.8343		
795.86	14.5053	1077.00	10.2188		
801.95	20.7682	1077.34	10.2195		
802.10	20.7690	1083.85	10.2393		
810.29	22.9149	1085.87	12.5218		
810.45	22.9158	1099.25	6.8560		
810.76	19.7932	1111.64	19.4944		
815.77	13.5676	1112.07	14.9085		
818.51	17.7595	1112.84	17.2058		
832.01	20.9953	1115.54	12.6274		
834.85	17.8640	1120.29	8.0465		
835.15	21.0181	1120.55	10.3462		
836.80	0.0000	1121.30	12.6480		
846.77	22.1604	1808.65	10.3726		
856.80	28.5919	1131.51	0.0000		
860.56	13.7845	1332.49	16.3288		
871.09	18.0909	1177.95	12.2620		
873.19	18.1040	1189.05	11.4202		
875.33	0.0000	1204.77	10.5857		
879.38	20.8108	1221.41	12.4047		
880.51	14.4130	1231.02	7.9942		
881.60	12.8164	1235.36	12.4491		
883.24	12.8232	1238.28	11.5686		
884.68	14.4333	1260.41	0.0000		
889.28	11.7788	1271.87	6.2831		
894.76	20.3823	1274.44	12.5739		
1836.06	13.9617	1274.54	10.7783		

VAX/VMS Nuclide Identification Report Generated 22-JUL-2022 02:46:55.19

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885002.CNF;1
Background file  : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM11.CNF;844
Background date  : 16-JUL-2022 13:55:11
Sample date      : 27-JUN-2022 09:38:00 Acquisition date : 21-JUL-2022 22:46:28
Sample ID        : G585885002 Sample quantity : 5.05070E-01 FILTER
Detector name    : GAM11 Detector geometry: JAR
Elapsed live time: 0 04:00:00.00 Elapsed real time: 0 04:00:01.01 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : MJH1
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID         : 2290721 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.22*	14	119	0.84	126.08	123	7	9.98E-04	169.4	
2	0	92.66*	5	242	1.25	185.04	180	10	3.67E-04	656.8	
3	1	110.21	33	58	1.17	220.21	219	13	2.28E-03	31.7	5.18E+00
4	1	113.21*	13	123	1.17	226.21	219	13	9.31E-04	167.6	
5	0	138.83*	23	138	1.67	277.53	274	7	1.61E-03	98.0	
6	0	144.25*	13	124	1.22	288.38	285	7	9.19E-04	167.3	
7	0	185.43*	15	158	0.99	370.88	366	11	1.05E-03	202.0	
8	0	255.68	21	85	1.23	511.57	508	7	1.49E-03	74.5	
9	0	477.58	56	81	1.00	955.98	952	9	3.89E-03	31.9	
10	0	491.22	13	33	1.25	983.30	979	7	8.72E-04	81.3	
11	0	510.86*	29	139	2.59	1022.63	1015	19	1.99E-03	129.3	
12	0	601.13	13	46	0.69	1203.41	1199	6	9.27E-04	86.4	
13	0	829.75	16	25	0.65	1661.18	1654	11	1.13E-03	64.3	
14	0	1127.04	7	17	1.38	2256.38	2250	13	4.51E-04	134.0	
15	1	1188.30	15	6	2.04	2379.00	2371	19	1.05E-03	45.7	6.14E-01
16	1	1191.09	17	5	2.25	2384.59	2371	19	1.15E-03	39.2	
17	0	1310.39	15	0	3.31	2623.40	2618	11	1.04E-03	25.8	
18	0	1352.37	12	16	0.59	2707.43	2698	14	8.07E-04	81.3	
19	0	1369.42	15	14	4.01	2741.55	2734	13	1.07E-03	58.8	
20	0	1460.16*	30	12	1.86	2923.18	2914	16	2.10E-03	38.6	
21	0	1478.16	9	8	2.47	2959.21	2952	11	6.15E-04	71.2	
22	0	1507.66	10	3	1.25	3018.25	3014	8	6.62E-04	48.0	
23	0	1512.58	22	0	1.14	3028.09	3022	14	1.53E-03	21.3	
24	0	1529.72	13	7	1.59	3062.40	3057	13	8.96E-04	49.7	
25	0	1610.97	13	0	1.43	3225.00	3220	10	9.03E-04	27.7	
26	0	1764.14	9	6	2.93	3531.53	3526	9	6.11E-04	62.4	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 22-JUL-2022 02:46:56

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885002.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 27-JUN-2022 09:38:00	Acquisition date	: 21-JUL-2022 22:46:28
Sample ID	: G585885002	Sample quantity	: 0.50507 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA11	Detector geometry	: JAR
Elapsed live time	: 0 04:00:00.00	Elapsed real time	: 0 04:00:01.01 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	56	10.44*	2.305E+00	8.647E+01	1.192E+02	63.81
K-40	1460.82	30	10.66*	9.441E-01	1.118E+02	1.118E+02	77.28
CU-67	91.27	5	7.00	4.521E+00	6.200E+00	4.682E+03	1313.63
	93.31	5	16.10	4.521E+00	2.696E+00	2.036E+03	1313.63
	184.58	15	48.70*	4.327E+00	2.663E+00	2.011E+03	404.02
TE-125M	109.28	33	0.27*	4.872E+00	9.292E+02	1.251E+03	63.33
CE-141	145.44	13	48.29*	4.795E+00	2.124E+00	3.591E+00	334.66
RA-226	186.21	15	3.59*	4.327E+00	3.613E+01	3.613E+01	404.02
TH-232	63.81	14	0.26*	2.583E+00	7.953E+02	7.953E+02	338.77
	140.88	-----	0.02	4.825E+00	-----	Line Not Found	-----
TH-234	63.29	14	3.70*	2.583E+00	5.589E+01	5.589E+01	338.77
	92.59	5	4.23	4.521E+00	1.026E+01	1.026E+01	1313.63
U-235	143.76	13	10.96*	4.795E+00	9.358E+00	9.358E+00	334.66
	163.33	-----	5.08	4.592E+00	-----	Line Not Found	-----
	185.72	15	57.20	4.327E+00	2.267E+00	2.267E+00	404.02
U-238	205.31	-----	5.01	4.093E+00	-----	Line Not Found	-----
	63.29	14	3.70*	2.583E+00	5.589E+01	5.589E+01	338.77
	92.59	5	4.23	4.521E+00	1.026E+01	1.026E+01	1313.63
ANH-511	511.00	29	100.00*	2.193E+00	4.867E+00	4.867E+00	258.67

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885002.CNF;1
Acquisition date : 21-JUL-2022 22:46:28 Sensitivity : 3.000
Detector ID : GAM11 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:01.01 Half life ratio : *****
Sample date : 27-JUN-2022 09:38:00 Analyst initials: MJH1
Sample ID : G585885002 Sample Quantity : 5.0507E-01 FILTER
Batch Number : 2290721 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 7-MAR-2022 08:30:49 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM11_JAR.CNF;18

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.192E+02	7.453E+01	7.782E+01
K-40	1.118E+02	8.465E+01	5.414E+01
CU-67	2.011E+03	7.963E+03	6.039E+03
TE-125M	1.251E+03	7.765E+02	1.803E+03
CE-141	3.591E+00	1.178E+01	1.295E+01
RA-226	3.613E+01	1.430E+02	1.091E+02
TH-232	7.953E+02	2.640E+03	2.380E+03
TH-234	5.589E+01	1.855E+02	1.705E+02
U-235	9.358E+00	3.069E+01	3.168E+01
U-238	5.589E+01	1.855E+02	1.705E+02
ANH-511	4.867E+00	1.234E+01	5.852E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-2.120E-01		4.481E+00	8.349E+00	NOT IDENT.
NA-24	0.000E+00		4.844E+12	0.000E+00	SHORT HLIF
AL-26	2.231E-01		4.082E+00	8.246E+00	NOT IDENT.
SC-46	2.572E+00		3.911E+00	8.172E+00	NOT IDENT.
V-48	-3.480E+00		1.043E+01	1.905E+01	NOT IDENT.
CR-51	1.326E+01		5.114E+01	9.563E+01	NOT IDENT.
MN-52	3.140E+00		8.512E+01	1.629E+02	NOT IDENT.
MN-54	9.773E-01		3.737E+00	7.147E+00	NOT IDENT.
CO-56	2.607E+00		4.521E+00	9.136E+00	NOT IDENT.
CO-57	-1.254E+00		2.559E+00	4.296E+00	NOT IDENT.
NI-57	0.000E+00		6.514E+05	0.000E+00	SHORT HLIF
CO-58	-7.530E-01		3.532E+00	6.722E+00	NOT IDENT.
FE-59	-1.981E+00		9.749E+00	1.804E+01	NOT IDENT.
CO-60	1.578E+00		3.716E+00	7.648E+00	NOT IDENT.
ZN-65	-3.378E+00		8.022E+00	1.433E+01	NOT IDENT.
GE-68	3.475E+01		1.147E+02	2.301E+02	NOT IDENT.
AS-73	3.123E+01		7.110E+01	1.328E+02	NOT IDENT.
AS-74	5.874E+00		1.731E+01	3.042E+01	NOT IDENT.
SE-75	9.513E-01		4.839E+00	9.085E+00	NOT IDENT.

BR-77	0.000E+00	2.228E+04	0.000E+00	SHORT HLIF
SR-82	-1.028E+00	4.160E+01	7.989E+01	NOT IDENT.
RB-83	-1.700E-01	6.782E+00	1.247E+01	NOT IDENT.
RB-84	6.057E+00	8.866E+00	1.815E+01	NOT IDENT.
KR-85	4.372E+02	8.052E+02	1.515E+03	NOT IDENT.
SR-85	2.537E+00	4.673E+00	8.790E+00	NOT IDENT.
RB-86	-9.390E+00	1.053E+02	1.987E+02	NOT IDENT.
Y-88	1.747E+00	3.769E+00	8.605E+00	NOT IDENT.
Y-91	-1.726E+03	1.986E+03	3.237E+03	NOT IDENT.
NB-94	6.589E-01	3.355E+00	6.171E+00	NOT IDENT.
NB-95	3.713E+00	4.696E+00	9.617E+00	NOT IDENT.
NB-95M	-2.212E+01	1.409E+01	2.362E+01	NOT IDENT.
TC-95M	-8.325E-01	5.087E+00	8.498E+00	NOT IDENT.
ZR-95	7.516E+00	7.400E+00	1.585E+01	NOT IDENT.
MO-99	5.693E+03	1.460E+04	2.734E+04	NOT IDENT.
TC-99M	0.000E+00	1.230E+30	0.000E+00	SHORT HLIF
RH-101	-2.751E-01	3.216E+00	5.544E+00	NOT IDENT.
RH-102M	-1.293E+00	3.901E+00	6.031E+00	NOT IDENT.
RU-103	-1.852E+00	5.237E+00	9.145E+00	NOT IDENT.
RH-106	2.478E+01	3.829E+01	7.276E+01	NOT IDENT.
RU-106	2.478E+01	3.829E+01	7.276E+01	NOT IDENT.
AG-108M	-2.400E+00	3.320E+00	5.633E+00	NOT IDENT.
CD-109	-6.842E+01	8.329E+01	1.151E+02	NOT IDENT.
AG-110	-2.228E+02	9.701E+01	1.250E+02	NOT IDENT.
AG-110M	-3.300E-02	4.724E+00	9.111E+00	NOT IDENT.
IN-111	-7.170E+02	1.150E+03	2.048E+03	NOT IDENT.
SN-113	-1.161E+00	4.821E+00	8.648E+00	NOT IDENT.
IN-114M	1.558E+00	2.453E+01	3.847E+01	NOT IDENT.
CD-115	0.000E+00	2.161E+04	0.000E+00	SHORT HLIF
SN-117M	6.934E+00	9.097E+00	1.646E+01	NOT IDENT.
SB-122	1.244E+03	2.378E+03	4.530E+03	NOT IDENT.
I-123	0.000E+00	7.576E+13	0.000E+00	SHORT HLIF
TE-123M	3.156E+00	3.006E+00	5.557E+00	NOT IDENT.
SB-124	6.000E+00	9.445E+00	2.165E+01	NOT IDENT.
SB-125	2.091E+00	1.016E+01	1.880E+01	FAIL ABUN
I-126	9.426E+00	3.638E+01	6.771E+01	NOT IDENT.
SB-126	1.715E+01	2.388E+01	4.704E+01	NOT IDENT.
SN-126	-6.779E+00	7.617E+00	1.118E+01	FAIL ABUN
SB-127	3.636E+02	6.670E+02	1.305E+03	NOT IDENT.
TE-129	3.997E+00	6.439E+01	1.176E+02	NOT IDENT.
I-131	-1.884E+01	2.839E+01	4.913E+01	NOT IDENT.
I-132	0.000E+00	1.087E+41	0.000E+00	SHORT HLIF
TE-132	-3.457E+01	5.191E+02	9.667E+02	FAIL ABUN
BA-133	2.973E+00	4.312E+00	8.354E+00	NOT IDENT.
I-133	0.000E+00	1.143E+09	0.000E+00	SHORT HLIF
CS-134	3.809E+00	3.931E+00	8.332E+00	NOT IDENT.
I-135	0.000E+00	1.396E+28	0.000E+00	SHORT HLIF
CS-136	8.845E+00	1.653E+01	3.385E+01	NOT IDENT.
BA-137M	-6.231E+00	6.228E+00	1.079E+01	NOT IDENT.
CS-137	-6.582E+00	6.579E+00	1.139E+01	NOT IDENT.
LA-138	-1.042E+00	6.153E+00	1.135E+01	NOT IDENT.
CE-139	3.688E-01	3.187E+00	5.503E+00	NOT IDENT.
BA-140	1.791E+01	4.567E+01	8.657E+01	NOT IDENT.
LA-140	2.742E+00	1.142E+01	2.533E+01	NOT IDENT.
CE-143	0.000E+00	1.387E+06	0.000E+00	SHORT HLIF
CE-144	-4.767E+00	2.027E+01	3.450E+01	NOT IDENT.
PM-144	-7.756E+00	9.590E+00	8.344E+00	FAIL ABUN
PR-144	-5.847E+02	7.212E+02	6.271E+02	NOT IDENT.
PM-146	-7.372E-01	4.047E+00	7.291E+00	NOT IDENT.
ND-147	-1.597E+01	1.056E+02	1.888E+02	NOT IDENT.
PM-147	9.098E+04	7.243E+04	1.374E+05	NOT IDENT.
PM-149	0.000E+00	1.887E+05	0.000E+00	SHORT HLIF
EU-152	1.175E+00	9.551E+00	1.779E+01	NOT IDENT.
GD-153	-9.158E+00	1.019E+01	1.430E+01	NOT IDENT.
EU-154	-8.005E-01	1.260E+01	2.343E+01	NOT IDENT.
EU-155	-2.625E+00	1.003E+01	1.728E+01	NOT IDENT.
TB-160	-1.023E+00	1.527E+01	2.886E+01	NOT IDENT.
HO-166M	3.544E+00	6.670E+00	1.263E+01	FAIL ABUN
TM-171	-6.235E+02	1.366E+03	2.405E+03	NOT IDENT.
LU-176	-1.289E+00	2.557E+00	4.548E+00	NOT IDENT.
LU-177	2.913E+01	3.620E+02	5.641E+02	FAIL ABUN
HF-181	9.552E-01	6.470E+00	1.066E+01	NOT IDENT.
W-181	1.405E+01	1.642E+01	3.146E+01	NOT IDENT.
TA-182	2.496E+01	1.726E+01	3.902E+01	FAIL ABUN
RE-183	7.387E+00	1.665E+01	3.106E+01	NOT IDENT.
RE-184	-3.719E+00	1.402E+01	2.605E+01	NOT IDENT.
RE-188	-3.993E+00	1.742E+01	2.945E+01	FAIL ABUN
W-188	3.174E+02	7.493E+02	1.435E+03	FAIL ABUN

OS-191	8.679E+00	2.372E+01	4.227E+01	FAIL ABUN
IR-192	1.212E+00	3.889E+00	7.344E+00	NOT IDENT.
PB-201	0.000E+00	4.317E+19	0.000E+00	SHORT HLIF
TL-201	4.544E+03	6.095E+03	1.103E+04	NOT IDENT.
TL-202	-2.415E+00	1.323E+01	2.364E+01	NOT IDENT.
HG-203	8.073E-01	4.380E+00	8.213E+00	NOT IDENT.
PB-203	0.000E+00	8.188E+03	0.000E+00	SHORT HLIF
TL-204	1.167E+02	4.126E+02	7.483E+02	NOT IDENT.
BI-207	-3.800E+00	5.944E+00	9.353E+00	NOT IDENT.
TL-208	-3.060E-01	5.626E+00	8.625E+00	NOT IDENT.
PB-210	-1.207E+02	3.423E+02	4.781E+02	NOT IDENT.
BI-211	6.013E+00	2.839E+01	4.277E+01	NOT IDENT.
PB-211	-4.693E+01	8.001E+01	1.382E+02	NOT IDENT.
BI-212	-1.256E+01	7.102E+01	9.994E+01	NOT IDENT.
PB-212	-3.415E+00	9.200E+00	1.393E+01	NOT IDENT.
BI-213	-4.511E-01	1.105E+01	2.006E+01	NOT IDENT.
BI-214	-1.140E+00	1.187E+01	1.752E+01	FAIL ABUN
PB-214	4.621E+00	1.025E+01	1.572E+01	NOT IDENT.
RN-219	-1.717E+01	4.128E+01	7.274E+01	NOT IDENT.
FR-221	3.321E+00	2.325E+01	3.954E+01	NOT IDENT.
RA-223	-4.162E+01	6.613E+01	1.157E+02	FAIL ABUN
RA-224	-1.282E+02	7.103E+01	1.172E+02	NOT IDENT.
AC-225	1.831E+01	1.282E+02	2.180E+02	NOT IDENT.
AC-227	2.356E+01	3.441E+01	4.944E+01	FAIL ABUN
TH-227	2.356E+01	3.441E+01	4.944E+01	FAIL ABUN
AC-228	-1.164E+01	1.806E+01	2.790E+01	NOT IDENT.
RA-228	-1.164E+01	1.806E+01	2.790E+01	NOT IDENT.
TH-228	-3.415E+00	9.200E+00	1.393E+01	NOT IDENT.
TH-229	1.554E+01	5.317E+01	9.250E+01	NOT IDENT.
TH-230	-9.405E+02	1.084E+03	1.545E+03	NOT IDENT.
PA-231	2.140E+01	5.079E+01	9.604E+01	NOT IDENT.
TH-231	-1.009E+01	4.671E+01	7.077E+01	NOT IDENT.
PA-233	6.636E+00	6.812E+00	1.341E+01	NOT IDENT.
PA-234	-1.839E+01	2.854E+01	4.994E+01	FAIL ABUN
PA-234M	-3.883E+02	5.361E+02	8.364E+02	NOT IDENT.
U-234	1.894E+03	5.016E+03	9.332E+03	NOT IDENT.
NP-237	6.636E+00	6.812E+00	1.341E+01	NOT IDENT.
NP-238	0.000E+00	4.322E+04	0.000E+00	SHORT HLIF
NP-239	7.792E+00	2.550E+01	4.256E+01	NOT IDENT.
AM-241	-2.388E+00	1.146E+01	1.895E+01	NOT IDENT.
AM-242	-3.287E+01	7.624E+01	1.114E+02	NOT IDENT.
AM-243	2.542E-01	4.199E+00	7.514E+00	NOT IDENT.
CM-243	-1.581E+00	9.754E+00	1.697E+01	NOT IDENT.
BK-247	8.666E-03	8.258E+00	1.530E+01	NOT IDENT.
CM-247	-2.549E-02	3.670E+00	6.733E+00	NOT IDENT.
CF-249	-2.731E-01	4.242E+00	7.713E+00	NOT IDENT.
CF-251	1.259E+00	1.348E+01	2.315E+01	NOT IDENT.
CF-252	-2.536E+04	2.184E+04	3.026E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	47.09	16	140	0.50	93.76	89	7	1.13E-03	123.8	5.18E+00
2	0	63.22	92	119	0.84	126.08	123	7	6.42E-03	22.1	
3	0	92.66	211	242	1.25	185.04	180	10	1.47E-02	15.5	
4	1	110.21	33	58	1.17	220.21	219	13	2.28E-03	31.7	
5	1	113.21	33	123	1.17	226.21	219	13	2.28E-03	60.4	
6	0	138.83	38	138	1.67	277.53	274	7	2.61E-03	54.4	
7	0	144.25	43	124	1.22	288.38	285	7	2.99E-03	45.8	
8	0	185.43	166	158	0.99	370.88	366	11	1.15E-02	16.6	
9	0	238.42	77	160	0.79	477.01	472	10	5.33E-03	32.9	
10	0	255.68	21	85	1.23	511.57	508	7	1.49E-03	74.5	
11	0	477.58	56	81	1.00	955.98	952	9	3.89E-03	31.9	6.14E-01
12	0	491.22	13	33	1.25	983.30	979	7	8.72E-04	81.3	
13	0	510.86	315	139	2.59	1022.63	1015	19	2.19E-02	10.6	
14	0	584.51	18	62	1.87	1170.13	1161	11	1.26E-03	87.6	
15	0	601.13	13	46	0.69	1203.41	1199	6	9.27E-04	86.4	
16	0	661.01	76	33	1.10	1323.31	1318	11	5.26E-03	18.7	
17	0	697.62	17	57	0.92	1396.62	1389	11	1.19E-03	91.9	
18	0	829.75	16	25	0.65	1661.18	1654	11	1.13E-03	64.3	
19	0	1127.04	7	17	1.38	2256.38	2250	13	4.51E-04	134.0	
20	1	1188.30	15	6	2.04	2379.00	2371	19	1.05E-03	45.7	
21	1	1191.09	17	5	2.25	2384.59	2371	19	1.15E-03	39.2	6.14E-01
22	0	1310.39	15	0	3.31	2623.40	2618	11	1.04E-03	25.8	
23	0	1352.37	12	16	0.59	2707.43	2698	14	8.07E-04	81.3	
24	0	1369.42	15	14	4.01	2741.55	2734	13	1.07E-03	58.8	
25	0	1460.16	51	12	1.86	2923.18	2914	16	3.53E-03	20.8	
26	0	1478.16	9	8	2.47	2959.21	2952	11	6.15E-04	71.2	
27	0	1507.66	10	3	1.25	3018.25	3014	8	6.62E-04	48.0	
28	0	1512.58	22	0	1.14	3028.09	3022	14	1.53E-03	21.3	
29	0	1529.72	13	7	1.59	3062.40	3057	13	8.96E-04	49.7	
30	0	1610.97	13	0	1.43	3225.00	3220	10	9.03E-04	27.7	
31	0	1764.14	9	6	2.93	3531.53	3526	9	6.11E-04	62.4	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	56	10.44*	2.305E+00	8.647E+01	1.192E+02	63.81
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	93.31	5	16.10	4.521E+00	2.696E+00	2.036E+03	1313.63
	184.58	15	48.70*	4.327E+00	2.663E+00	2.011E+03	404.02
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TH-232	63.81	14	0.26*	2.583E+00	7.953E+02	7.953E+02	338.77
	140.88	-----	0.02	4.825E+00	-----	Line Not Found	-----
TH-234	63.29	14	3.70*	2.583E+00	5.589E+01	5.589E+01	338.77
	92.59	5	4.23	4.521E+00	1.026E+01	1.026E+01	1313.63
U-235	143.76	13	10.96*	4.795E+00	9.358E+00	9.358E+00	334.66
	163.33	-----	5.08	4.592E+00	-----	Line Not Found	-----
	185.72	15	57.20	4.327E+00	2.267E+00	2.267E+00	404.02
	205.31	-----	5.01	4.093E+00	-----	Line Not Found	-----
U-238	63.29	14	3.70*	2.583E+00	5.589E+01	5.589E+01	338.77
	92.59	5	4.23	4.521E+00	1.026E+01	1.026E+01	1313.63
ANH-511	511.00	29	100.00*	2.193E+00	4.867E+00	4.867E+00	258.67

Flag: "*" = Keyline

Total number of lines in spectrum 26
Number of unidentified lines 11
Number of lines tentatively identified by NID 15 57.69%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.38	8.647E+01	1.192E+02	0.761E+02	63.81	
K-40	1.25E+09Y	1.00	1.118E+02	1.118E+02	0.864E+02	77.28	
CU-67	61.83H	755.	2.663E+00	2.011E+03	8.125E+03	404.02	
TE-125M	57.40D	1.35	9.292E+02	1.251E+03	0.792E+03	63.33	
CE-141	32.51D	1.69	2.124E+00	3.591E+00	12.02E+00	334.66	
RA-226	1600.00Y	1.00	3.613E+01	3.613E+01	14.60E+01	404.02	
TH-232	1.41E+10Y	1.00	7.953E+02	7.953E+02	26.94E+02	338.77	
TH-234	4.47E+09Y	1.00	5.589E+01	5.589E+01	18.93E+01	338.77	
U-235	7.04E+08Y	1.00	9.358E+00	9.358E+00	31.32E+00	334.66	
U-238	4.47E+09Y	1.00	5.589E+01	5.589E+01	18.93E+01	338.77	
ANH-511	1.00E+09Y	1.00	4.867E+00	4.867E+00	12.59E+00	258.67	
Total Activity :			2.090E+03	4.454E+03			

Grand Total Activity : 2.090E+03 4.454E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
1	113.21	13	123	1.17	226.21	219	13	9.31E-04	****	4.89E+00	T
0	138.83	23	138	1.67	277.53	274	7	1.61E-03	****	4.84E+00	
0	255.68	21	85	1.23	511.57	508	7	1.49E-03	****	3.57E+00	T
0	491.22	13	33	1.25	983.30	979	7	8.72E-04	****	2.26E+00	T
0	601.13	13	46	0.69	1203.41	1199	6	9.27E-04	****	1.94E+00	T
0	829.75	16	25	0.65	1661.18	1654	11	1.13E-03	****	1.50E+00	
0	1127.04	7	17	1.38	2256.38	2250	13	4.51E-04	****	1.16E+00	
1	1188.30	15	6	2.04	2379.00	2371	19	1.05E-03	91.5	1.11E+00	T
1	1191.09	17	5	2.25	2384.59	2371	19	1.15E-03	78.4	1.11E+00	
0	1310.39	15	0	3.31	2623.40	2618	11	1.04E-03	51.6	1.03E+00	
0	1352.37	12	16	0.59	2707.43	2698	14	8.07E-04	****	1.00E+00	
0	1369.42	15	14	4.01	2741.55	2734	13	1.07E-03	****	9.92E-01	T
0	1478.16	9	8	2.47	2959.21	2952	11	6.15E-04	****	9.35E-01	
0	1507.66	10	3	1.25	3018.25	3014	8	6.62E-04	96.1	9.22E-01	
0	1512.58	22	0	1.14	3028.09	3022	14	1.53E-03	42.6	9.20E-01	
0	1529.72	13	7	1.59	3062.40	3057	13	8.96E-04	99.4	9.12E-01	
0	1610.97	13	0	1.43	3225.00	3220	10	9.03E-04	55.5	8.80E-01	
0	1764.14	9	6	2.93	3531.53	3526	9	6.11E-04	****	8.29E-01	T

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885002.CNF;1  *
* Acquisition date   : 21-JUL-2022 22:46:28 Sensitivity      : 3.000          *
* Detector ID        : GAM11 Energy tolerance: 1.500        *
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 04:00:01.01 Half life ratio : *****      *
* Sample date        : 27-JUN-2022 09:38:00 Nuclide Library : LIQUID      *
* Sample ID          : G585885002 Analyst initials: MJH1        *
* Batch Number       : 2290721 Sample Quantity : 5.0507E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 7-MAR-2022 08:30:49 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM11_JAR.CNF;18          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.605E+01
K-40	2.208E+01
CU-67	2.841E+03
TE-125M	8.505E+02
CE-141	6.109E+00
RA-226	5.132E+01
TH-232	1.117E+03
TH-234	8.002E+01
U-235	1.489E+01
U-238	8.002E+01
ANH-511	2.698E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	3.688E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	3.507E+00	NOT IDENT.
SC-46	3.652E+00	NOT IDENT.
V-48	8.402E+00	NOT IDENT.
CR-51	4.478E+01	NOT IDENT.
MN-52	7.036E+01	NOT IDENT.
MN-54	3.218E+00	NOT IDENT.
CO-56	4.144E+00	NOT IDENT.
CO-57	2.022E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	2.941E+00	NOT IDENT.
FE-59	7.920E+00	NOT IDENT.
CO-60	3.325E+00	NOT IDENT.
ZN-65	6.257E+00	NOT IDENT.
GE-68	1.013E+02	NOT IDENT.
AS-73	6.258E+01	NOT IDENT.
AS-74	1.407E+01	NOT IDENT.
SE-75	4.263E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF

SR-82	3.583E+01	NOT IDENT.
RB-83	5.609E+00	NOT IDENT.
RB-84	8.219E+00	NOT IDENT.
KR-85	7.039E+02	NOT IDENT.
SR-85	4.085E+00	NOT IDENT.
RB-86	8.732E+01	NOT IDENT.
Y-88	3.569E+00	NOT IDENT.
Y-91	1.384E+03	NOT IDENT.
NB-94	2.793E+00	NOT IDENT.
NB-95	4.399E+00	NOT IDENT.
NB-95M	1.111E+01	NOT IDENT.
TC-95M	3.995E+00	NOT IDENT.
ZR-95	7.179E+00	NOT IDENT.
MO-99	1.242E+04	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.620E+00	NOT IDENT.
RH-102M	2.785E+00	NOT IDENT.
RU-103	4.193E+00	NOT IDENT.
RH-106	3.359E+01	NOT IDENT.
RU-106	3.359E+01	NOT IDENT.
AG-108M	2.593E+00	NOT IDENT.
CD-109	5.434E+01	NOT IDENT.
AG-110	5.589E+01	NOT IDENT.
AG-110M	4.036E+00	NOT IDENT.
IN-111	9.596E+02	NOT IDENT.
SN-113	3.989E+00	NOT IDENT.
IN-114M	1.818E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	7.795E+00	NOT IDENT.
SB-122	2.080E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.631E+00	NOT IDENT.
SB-124	9.178E+00	NOT IDENT.
SB-125	8.717E+00	FAIL ABUN
I-126	3.067E+01	NOT IDENT.
SB-126	2.131E+01	NOT IDENT.
SN-126	5.276E+00	FAIL ABUN
SB-127	5.867E+02	NOT IDENT.
TE-129	5.427E+01	NOT IDENT.
I-131	2.273E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	4.527E+02	FAIL ABUN
BA-133	3.893E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.779E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.507E+01	NOT IDENT.
BA-137M	5.084E+00	NOT IDENT.
CS-137	5.371E+00	NOT IDENT.
LA-138	4.872E+00	NOT IDENT.
CE-139	2.597E+00	NOT IDENT.
BA-140	3.958E+01	NOT IDENT.
LA-140	1.040E+01	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.627E+01	NOT IDENT.
PM-144	3.867E+00	FAIL ABUN
PR-144	2.906E+02	NOT IDENT.
PM-146	3.321E+00	NOT IDENT.
ND-147	8.590E+01	NOT IDENT.
PM-147	6.509E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.251E+00	NOT IDENT.
GD-153	6.755E+00	NOT IDENT.
EU-154	1.034E+01	NOT IDENT.
EU-155	8.147E+00	NOT IDENT.
TB-160	1.295E+01	NOT IDENT.
HO-166M	5.770E+00	FAIL ABUN
TM-171	1.128E+03	NOT IDENT.
LU-176	2.105E+00	NOT IDENT.
LU-177	2.666E+02	FAIL ABUN
HF-181	4.922E+00	NOT IDENT.
W-181	1.483E+01	NOT IDENT.
TA-182	1.753E+01	FAIL ABUN
RE-183	1.463E+01	NOT IDENT.
RE-184	1.150E+01	NOT IDENT.
RE-188	1.385E+01	FAIL ABUN
W-188	6.693E+02	FAIL ABUN
OS-191	1.997E+01	FAIL ABUN

IR-192	3.426E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	5.211E+03	NOT IDENT.
TL-202	1.093E+01	NOT IDENT.
HG-203	3.845E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	3.547E+02	NOT IDENT.
BI-207	4.124E+00	NOT IDENT.
TL-208	4.009E+00	NOT IDENT.
PB-210	2.258E+02	NOT IDENT.
BI-211	2.004E+01	NOT IDENT.
PB-211	6.402E+01	NOT IDENT.
BI-212	4.536E+01	NOT IDENT.
PB-212	6.654E+00	NOT IDENT.
BI-213	9.244E+00	NOT IDENT.
BI-214	8.189E+00	FAIL ABUN
PB-214	7.371E+00	NOT IDENT.
RN-219	3.347E+01	NOT IDENT.
FR-221	1.866E+01	NOT IDENT.
RA-223	5.375E+01	FAIL ABUN
RA-224	5.526E+01	NOT IDENT.
AC-225	1.029E+02	NOT IDENT.
AC-227	2.325E+01	FAIL ABUN
TH-227	2.325E+01	FAIL ABUN
AC-228	1.254E+01	NOT IDENT.
RA-228	1.254E+01	NOT IDENT.
TH-228	6.654E+00	NOT IDENT.
TH-229	4.358E+01	NOT IDENT.
TH-230	7.287E+02	NOT IDENT.
PA-231	4.511E+01	NOT IDENT.
TH-231	3.358E+01	NOT IDENT.
PA-233	6.292E+00	NOT IDENT.
PA-234	2.186E+01	FAIL ABUN
PA-234M	3.717E+02	NOT IDENT.
U-234	4.397E+03	NOT IDENT.
NP-237	6.292E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
NP-239	2.000E+01	NOT IDENT.
AM-241	8.843E+00	NOT IDENT.
AM-242	5.274E+01	NOT IDENT.
AM-243	3.550E+00	NOT IDENT.
CM-243	7.984E+00	NOT IDENT.
BK-247	7.173E+00	NOT IDENT.
CM-247	3.101E+00	NOT IDENT.
CF-249	3.574E+00	NOT IDENT.
CF-251	1.092E+01	NOT IDENT.
CF-252	1.430E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885002.CNF;1
Acquisition date : 21-JUL-2022 22:46:28 Sensitivity : 3.000
Detector ID : GAM11 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:01.01 Half life ratio : *****
Sample date : 27-JUN-2022 09:38:00 Nuclide Library : LIQUID
Sample ID : G585885002 Analyst initials: MJH1
Batch Number : 2290721 Sample Quantity : 5.0507E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 7-MAR-2022 08:30:49 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM11_JAR.CNF;18

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.192E+02	7.527E+01	7.530E+01
K-40	1.118E+02	8.534E+01	8.537E+01
CU-67	2.011E+03	7.965E+03	7.965E+03
TE-125M	1.251E+03	7.823E+02	7.827E+02
CE-141	3.591E+00	1.178E+01	1.178E+01
RA-226	3.613E+01	1.431E+02	1.431E+02
TH-232	7.953E+02	2.642E+03	2.642E+03
TH-234	5.589E+01	1.860E+02	1.860E+02
U-235	9.358E+00	3.070E+01	3.070E+01
U-238	5.589E+01	1.860E+02	1.860E+02
ANH-511	4.867E+00	1.235E+01	1.235E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-2.120E-01	4.481E+00	4.483E+00	NOT IDENT.
NA-24	4.202E+12	4.862E+12	5.219E+12	SHORT HLIF
AL-26	2.231E-01	4.082E+00	4.083E+00	NOT IDENT.
SC-46	2.572E+00	3.919E+00	4.087E+00	NOT IDENT.
V-48	-3.480E+00	1.044E+01	1.056E+01	NOT IDENT.
CR-51	1.326E+01	5.115E+01	5.150E+01	NOT IDENT.
MN-52	3.140E+00	8.512E+01	8.513E+01	NOT IDENT.
MN-54	9.773E-01	3.738E+00	3.764E+00	NOT IDENT.
CO-56	2.607E+00	4.528E+00	4.678E+00	NOT IDENT.
CO-57	-1.254E+00	2.560E+00	2.622E+00	NOT IDENT.
NI-57	-8.978E+04	6.515E+05	6.527E+05	SHORT HLIF
CO-58	-7.530E-01	3.533E+00	3.549E+00	NOT IDENT.
FE-59	-1.981E+00	9.752E+00	9.792E+00	NOT IDENT.
CO-60	1.578E+00	3.719E+00	3.787E+00	NOT IDENT.
ZN-65	-3.378E+00	8.027E+00	8.170E+00	NOT IDENT.
GE-68	3.475E+01	1.147E+02	1.158E+02	NOT IDENT.
AS-73	3.123E+01	7.140E+01	7.278E+01	NOT IDENT.
AS-74	5.874E+00	1.732E+01	1.752E+01	NOT IDENT.
SE-75	9.513E-01	4.840E+00	4.859E+00	NOT IDENT.

BR-77	-2.558E+03	2.228E+04	2.231E+04	SHORT HLIF
SR-82	-1.028E+00	4.160E+01	4.160E+01	NOT IDENT.
RB-83	-1.700E-01	6.782E+00	6.783E+00	NOT IDENT.
RB-84	6.057E+00	8.885E+00	9.296E+00	NOT IDENT.
KR-85	4.372E+02	8.062E+02	8.300E+02	NOT IDENT.
SR-85	2.537E+00	4.678E+00	4.816E+00	NOT IDENT.
RB-86	-9.390E+00	1.053E+02	1.054E+02	NOT IDENT.
Y-88	1.747E+00	3.772E+00	3.853E+00	NOT IDENT.
Y-91	-1.726E+03	1.991E+03	2.138E+03	NOT IDENT.
NB-94	6.589E-01	3.355E+00	3.368E+00	NOT IDENT.
NB-95	3.713E+00	4.709E+00	4.998E+00	NOT IDENT.
NB-95M	-2.212E+01	1.427E+01	1.742E+01	NOT IDENT.
TC-95M	-8.325E-01	5.087E+00	5.101E+00	NOT IDENT.
ZR-95	7.516E+00	7.433E+00	8.171E+00	NOT IDENT.
MO-99	5.693E+03	1.461E+04	1.484E+04	NOT IDENT.
TC-99M	-1.470E+29	1.230E+30	0.000E+00	SHORT HLIF
RH-101	-2.751E-01	3.217E+00	3.219E+00	NOT IDENT.
RH-102M	-1.293E+00	3.904E+00	3.947E+00	NOT IDENT.
RU-103	-1.852E+00	5.239E+00	5.306E+00	NOT IDENT.
RH-106	2.478E+01	3.838E+01	3.997E+01	NOT IDENT.
RU-106	2.478E+01	3.838E+01	3.997E+01	NOT IDENT.
AG-108M	-2.400E+00	3.326E+00	3.498E+00	NOT IDENT.
CD-109	-6.842E+01	8.356E+01	8.908E+01	NOT IDENT.
AG-110	-2.228E+02	9.905E+01	1.411E+02	NOT IDENT.
AG-110M	-3.300E-02	4.724E+00	4.724E+00	NOT IDENT.
IN-111	-7.170E+02	1.151E+03	1.196E+03	NOT IDENT.
SN-113	-1.161E+00	4.822E+00	4.850E+00	NOT IDENT.
IN-114M	1.558E+00	2.453E+01	2.454E+01	NOT IDENT.
CD-115	-1.403E+04	2.166E+04	2.256E+04	SHORT HLIF
SN-117M	6.934E+00	9.112E+00	9.634E+00	NOT IDENT.
SB-122	1.244E+03	2.381E+03	2.446E+03	NOT IDENT.
I-123	7.985E+13	7.599E+13	8.410E+13	SHORT HLIF
TE-123M	3.156E+00	3.015E+00	3.334E+00	NOT IDENT.
SB-124	6.000E+00	9.458E+00	9.838E+00	NOT IDENT.
SB-125	2.091E+00	1.016E+01	1.020E+01	FAIL ABUN
I-126	9.426E+00	3.639E+01	3.664E+01	NOT IDENT.
SB-126	1.715E+01	2.398E+01	2.520E+01	NOT IDENT.
SN-126	-6.779E+00	7.638E+00	8.228E+00	FAIL ABUN
SB-127	3.636E+02	6.691E+02	6.889E+02	NOT IDENT.
TE-129	3.997E+00	6.439E+01	6.442E+01	NOT IDENT.
I-131	-1.884E+01	2.844E+01	2.968E+01	NOT IDENT.
I-132	-1.000E+41	1.868E+41	0.000E+00	SHORT HLIF
TE-132	-3.457E+01	5.192E+02	5.194E+02	FAIL ABUN
BA-133	2.973E+00	4.319E+00	4.522E+00	NOT IDENT.
I-133	7.041E+08	1.150E+09	1.193E+09	SHORT HLIF
CS-134	3.809E+00	3.948E+00	4.306E+00	NOT IDENT.
I-135	1.196E+28	1.552E+28	0.000E+00	SHORT HLIF
CS-136	8.845E+00	1.656E+01	1.704E+01	NOT IDENT.
BA-137M	-6.231E+00	6.253E+00	6.856E+00	NOT IDENT.
CS-137	-6.582E+00	6.606E+00	7.243E+00	NOT IDENT.
LA-138	-1.042E+00	6.154E+00	6.172E+00	NOT IDENT.
CE-139	3.688E-01	3.188E+00	3.192E+00	NOT IDENT.
BA-140	1.791E+01	4.570E+01	4.641E+01	NOT IDENT.
LA-140	2.742E+00	1.142E+01	1.149E+01	NOT IDENT.
CE-143	-9.775E+05	1.390E+06	1.458E+06	SHORT HLIF
CE-144	-4.767E+00	2.027E+01	2.039E+01	NOT IDENT.
PM-144	-7.756E+00	9.616E+00	1.023E+01	FAIL ABUN
PR-144	-5.847E+02	7.232E+02	7.698E+02	NOT IDENT.
PM-146	-7.372E-01	4.048E+00	4.061E+00	NOT IDENT.
ND-147	-1.597E+01	1.056E+02	1.059E+02	NOT IDENT.
PM-147	9.098E+04	7.272E+04	8.351E+04	NOT IDENT.
PM-149	5.427E+04	1.889E+05	1.904E+05	SHORT HLIF
EU-152	1.175E+00	9.551E+00	9.566E+00	NOT IDENT.
GD-153	-9.158E+00	1.022E+01	1.102E+01	NOT IDENT.
EU-154	-8.005E-01	1.260E+01	1.261E+01	NOT IDENT.
EU-155	-2.625E+00	1.004E+01	1.011E+01	NOT IDENT.
TB-160	-1.023E+00	1.527E+01	1.528E+01	NOT IDENT.
HO-166M	3.544E+00	6.679E+00	6.868E+00	FAIL ABUN
TM-171	-6.235E+02	1.367E+03	1.396E+03	NOT IDENT.
LU-176	-1.289E+00	2.559E+00	2.624E+00	NOT IDENT.
LU-177	2.913E+01	3.620E+02	3.622E+02	FAIL ABUN
HF-181	9.552E-01	6.471E+00	6.485E+00	NOT IDENT.
W-181	1.405E+01	1.681E+01	1.797E+01	NOT IDENT.
TA-182	2.496E+01	1.738E+01	2.071E+01	FAIL ABUN
RE-183	7.387E+00	1.667E+01	1.700E+01	NOT IDENT.
RE-184	-3.719E+00	1.402E+01	1.412E+01	NOT IDENT.
RE-188	-3.993E+00	1.742E+01	1.751E+01	FAIL ABUN
W-188	3.174E+02	7.504E+02	7.640E+02	FAIL ABUN

OS-191	8.679E+00	2.373E+01	2.405E+01	FAIL ABUN
IR-192	1.212E+00	3.891E+00	3.929E+00	NOT IDENT.
PB-201	2.118E+19	4.372E+19	0.000E+00	SHORT HLIF
TL-201	4.544E+03	6.104E+03	6.439E+03	NOT IDENT.
TL-202	-2.415E+00	1.324E+01	1.328E+01	NOT IDENT.
HG-203	8.073E-01	4.380E+00	4.395E+00	NOT IDENT.
PB-203	1.509E+03	8.189E+03	8.218E+03	SHORT HLIF
TL-204	1.167E+02	4.128E+02	4.161E+02	NOT IDENT.
BI-207	-3.800E+00	5.954E+00	6.196E+00	NOT IDENT.
TL-208	-3.060E-01	5.627E+00	5.628E+00	NOT IDENT.
PB-210	-1.207E+02	3.425E+02	3.468E+02	NOT IDENT.
BI-211	6.013E+00	2.840E+01	2.853E+01	NOT IDENT.
PB-211	-4.693E+01	8.012E+01	8.287E+01	NOT IDENT.
BI-212	-1.256E+01	7.103E+01	7.126E+01	NOT IDENT.
PB-212	-3.415E+00	9.204E+00	9.332E+00	NOT IDENT.
BI-213	-4.511E-01	1.105E+01	1.105E+01	NOT IDENT.
BI-214	-1.140E+00	1.187E+01	1.189E+01	FAIL ABUN
PB-214	4.621E+00	1.025E+01	1.046E+01	NOT IDENT.
RN-219	-1.717E+01	4.136E+01	4.208E+01	NOT IDENT.
FR-221	3.321E+00	2.325E+01	2.330E+01	NOT IDENT.
RA-223	-4.162E+01	6.624E+01	6.885E+01	FAIL ABUN
RA-224	-1.282E+02	7.182E+01	9.223E+01	NOT IDENT.
AC-225	1.831E+01	1.282E+02	1.285E+02	NOT IDENT.
AC-227	2.356E+01	3.458E+01	3.618E+01	FAIL ABUN
TH-227	2.356E+01	3.458E+01	3.618E+01	FAIL ABUN
AC-228	-1.164E+01	1.810E+01	1.884E+01	NOT IDENT.
RA-228	-1.164E+01	1.810E+01	1.884E+01	NOT IDENT.
TH-228	-3.415E+00	9.204E+00	9.332E+00	NOT IDENT.
TH-229	1.554E+01	5.319E+01	5.365E+01	NOT IDENT.
TH-230	-9.405E+02	1.096E+03	1.176E+03	NOT IDENT.
PA-231	2.140E+01	5.101E+01	5.192E+01	NOT IDENT.
TH-231	-1.009E+01	4.673E+01	4.695E+01	NOT IDENT.
PA-233	6.636E+00	6.835E+00	7.462E+00	NOT IDENT.
PA-234	-1.839E+01	3.550E+01	3.645E+01	FAIL ABUN
PA-234M	-3.883E+02	5.373E+02	5.652E+02	NOT IDENT.
U-234	1.894E+03	5.019E+03	5.091E+03	NOT IDENT.
NP-237	6.636E+00	6.835E+00	7.462E+00	NOT IDENT.
NP-238	-1.124E+04	4.324E+04	4.353E+04	SHORT HLIF
NP-239	7.792E+00	2.551E+01	2.575E+01	NOT IDENT.
AM-241	-2.388E+00	1.146E+01	1.151E+01	NOT IDENT.
AM-242	-3.287E+01	7.647E+01	7.789E+01	NOT IDENT.
AM-243	2.542E-01	4.199E+00	4.200E+00	NOT IDENT.
CM-243	-1.581E+00	9.756E+00	9.782E+00	NOT IDENT.
BK-247	8.666E-03	8.258E+00	8.258E+00	NOT IDENT.
CM-247	-2.549E-02	3.670E+00	3.670E+00	NOT IDENT.
CF-249	-2.731E-01	4.242E+00	4.243E+00	NOT IDENT.
CF-251	1.259E+00	1.348E+01	1.349E+01	NOT IDENT.
CF-252	-2.536E+04	3.173E+04	3.373E+04	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	78.6469	133.52	89.0380	116.30	73.1382
879.38	69.1861	364.49	89.0523	116.74	73.1947
46.54	63.9227	80.22	89.0598	117.23	80.4402
228.16	69.1930	711.68	95.1384	119.76	94.1414
52.39	76.0364	356.01	100.2441	120.54	82.3492
53.20	79.2640	323.87	100.2594	120.90	71.5581
53.44	78.3879	82.35	0.0000	264.66	73.7545
57.53	79.0480	82.47	102.5883	121.22	73.7670
293.27	0.0000	82.47	102.5891	344.28	85.7824
57.53	69.8888	83.79	100.8736	122.06	98.8599
482.18	69.8893	265.00	92.8472	1274.44	91.4123
57.98	75.6525	84.21	92.8900	123.68	103.4895
59.32	84.4825	84.86	0.0000	1377.63	0.0000
59.54	70.9203	193.51	111.3629	127.23	101.9142
155.04	61.1177	105.31	98.4416	129.43	87.9871
63.00	78.6286	86.79	98.4927	131.20	104.7861
129.43	78.6899	86.94	100.5567	133.02	77.4384
63.29	78.6899	87.09	100.5892	133.52	98.5361
290.67	78.7512	87.57	105.7789	135.34	94.7513
63.81	78.7995	88.03	104.5262	136.00	90.4042
87.57	87.2371	306.78	104.5951	136.28	90.4439
64.99	107.9659	88.47	101.9073	136.47	74.1567
65.08	107.9916	531.02	102.4780	739.50	91.7896
66.73	81.3436	184.58	102.5124	140.51	0.0000
66.98	92.0552	92.59	102.7946	140.88	96.3222
67.24	92.1168	93.31	102.9472	143.76	82.1228
67.67	97.0726	94.56	97.7073	144.24	82.1829
1221.41	97.0924	311.90	97.7247	145.44	93.2346
439.51	118.7972	946.00	97.7290	152.32	94.5693
70.82	118.7972	97.43	99.6592	152.43	94.5845
167.43	118.7990	98.43	94.6574	1048.07	96.9791
97.43	92.6894	98.44	94.6588	154.21	85.6888
70.82	101.7617	99.53	93.8212	155.04	90.3673
70.82	101.7625	103.37	93.8212	158.56	92.7849
279.20	0.0000	116.74	93.8212	158.97	0.0000
1063.66	93.4127	100.11	112.7140	159.00	77.0741
72.87	0.0000	100.20	112.7337	162.33	79.7465
351.06	93.4265	102.03	85.8997	537.26	75.1582
74.66	95.8078	103.18	94.4893	163.33	90.2732
238.63	95.8448	103.37	89.2730	165.86	90.5886
351.93	95.8448	105.31	96.9828	167.43	79.1438
238.63	95.8448	106.12	80.2386	245.35	79.5568
74.97	100.8210	106.47	97.1948	427.87	96.5767
77.11	90.4057	109.28	92.0410	176.60	88.3656
256.23	94.9471	111.00	86.2949	177.52	90.8312
79.82	94.9761	111.76	86.4147	181.07	82.1641
80.02	89.0177	208.37	86.6008	184.41	84.4988
80.03	89.0190	116.24	80.3000	184.58	84.5173

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	84.6386	300.09	74.3423	477.60	53.0125
186.21	84.6906	300.13	74.3440	477.99	53.0252
190.27	95.9119	301.36	69.9417	482.18	46.0052
193.51	80.6472	302.85	67.3401	487.02	36.9119
197.03	100.3343	304.50	62.0413	492.35	0.0000
198.01	88.3505	304.85	62.9604	497.08	47.4506
201.83	80.2441	306.78	62.1649	511.00	46.7999
204.12	86.5573	308.46	55.0368	514.00	46.8823
205.31	80.5735	311.90	55.1993	520.40	27.1870
208.37	80.8615	316.51	58.1419	520.69	0.0000
210.85	89.6939	319.41	65.5693	667.71	0.0000
215.65	72.8893	320.08	66.5172	527.90	0.0000
218.12	90.4369	321.04	60.1871	529.59	26.2787
222.11	75.9065	323.87	70.3844	529.87	0.0000
227.09	70.0658	325.23	68.6340	531.02	36.8201
227.38	70.0880	1596.21	66.9984	537.26	31.6699
228.16	74.3224	331.15	0.0000	1260.41	0.0000
228.18	74.3242	333.37	63.5659	552.55	19.1631
235.69	127.1175	334.37	63.6178	795.86	37.4780
235.96	144.8380	338.28	51.7948	564.24	33.2125
238.63	86.9785	911.20	51.7959	569.33	33.3033
238.98	0.0000	340.48	59.2982	569.50	33.3058
240.99	141.3700	340.55	59.3008	569.70	32.2351
242.00	75.4206	344.28	52.0431	582.08	33.5278
244.70	91.7765	345.93	56.7631	583.19	30.3014
245.35	89.2870	351.06	62.5985	595.83	44.4440
459.60	72.6682	351.93	57.9661	600.60	52.4141
685.70	70.6576	356.01	48.7712	604.72	40.7057
388.16	87.3937	361.25	0.0000	609.32	36.1945
256.23	68.3490	364.49	65.1367	610.33	42.7975
527.90	0.0000	366.42	61.4493	614.28	29.6873
264.66	72.8164	383.85	53.6302	618.01	41.8609
265.00	75.4418	388.16	54.7584	621.93	36.4241
269.46	77.5092	666.33	47.0889	630.19	0.0000
401.81	75.0225	391.70	52.0082	631.29	25.5035
273.65	80.4401	400.66	48.4639	632.98	37.7326
276.40	69.2536	401.32	0.0000	633.25	37.7367
583.19	52.6453	401.81	52.3828	634.78	29.9905
277.60	57.9219	402.40	45.6116	635.95	27.7842
402.40	63.2109	404.85	65.1325	636.99	28.9104
278.43	66.7505	410.95	57.5992	657.50	69.6239
279.20	0.0000	720.70	52.8541	884.68	69.6314
279.54	68.5769	423.72	36.4369	661.66	33.7549
280.46	76.5551	427.09	55.2731	664.57	0.0000
301.36	70.6055	427.87	50.3640	666.33	27.0635
284.31	64.4646	433.94	59.4922	666.50	33.8318
285.41	62.7620	439.51	53.7396	667.71	0.0000
285.90	0.0000	440.45	46.8021	677.62	28.3396
287.50	67.3102	453.88	38.1693	685.70	19.3429
290.67	55.0686	459.60	46.3734	692.65	38.8089
293.27	0.0000	463.37	43.4523	695.00	33.1371
295.22	65.9951	468.07	47.6340	696.49	36.5898
316.51	62.4691	473.00	60.9961	696.51	36.5898
298.58	79.6097	475.06	56.4925	697.00	37.7413
299.98	74.3356	696.49	51.9670	697.49	33.1749

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	27.5186	903.28	22.3835	1291.59	25.2773
706.68	37.9065	907.67	0.0000	1298.22	0.0000
711.68	28.7811	911.20	19.6420	1312.11	10.1666
720.70	20.8052	984.45	0.0000	1332.49	10.6476
721.93	0.0000	926.36	15.0474	1365.19	12.0278
1690.97	32.3932	935.54	16.0402	1368.63	0.0000
722.91	31.2385	937.49	17.9395	1377.63	0.0000
723.31	25.4581	983.53	15.1426	1384.29	16.1874
756.73	32.4137	945.96	0.0000	1408.01	8.6855
727.33	31.2990	946.00	24.6234	1434.09	13.1133
733.00	29.0527	949.00	20.8566	1435.80	14.2124
735.93	26.7622	954.55	0.0000	1457.56	0.0000
739.50	26.8034	962.31	20.9540	1460.82	6.5999
1434.09	28.9012	964.08	24.7789	1489.16	9.9679
747.24	27.1846	966.17	32.4270	1596.21	5.4501
752.31	27.2433	968.97	22.9116	1620.50	9.1333
753.82	28.1406	983.53	23.0259	1678.03	0.0000
756.73	17.6093	984.45	0.0000	1690.97	5.5652
763.94	30.0270	996.26	16.3806	1757.55	0.0000
765.80	26.5155	1001.03	14.4768	1764.49	15.7007
1001.03	29.1741	1004.73	23.1914	1770.23	9.4316
766.84	30.0634	1025.87	0.0000	1771.35	6.6035
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	25.7458	1037.84	23.4463	1808.65	10.4564
777.92	21.3193	1038.76	0.0000	1836.06	4.7793
778.90	23.1055	1046.59	20.5732		
783.70	16.0280	1048.07	15.6826		
1435.80	21.4146	1050.41	20.5988		
903.28	35.7397	1063.66	13.7915		
795.86	18.7922	1077.00	18.7959		
801.95	18.8383	1077.34	14.8407		
802.10	18.8396	1083.85	17.8451		
810.29	21.6021	1085.87	13.8881		
810.45	21.6035	1099.25	19.9231		
810.76	18.9050	1111.64	21.0000		
815.77	23.4530	1112.07	21.0026		
818.51	27.9944	1112.84	23.0084		
832.01	30.5033	1115.54	21.0244		
834.85	23.8896	1120.29	16.0420		
835.15	24.9316	1120.55	16.0439		
836.80	0.0000	1121.30	17.6516		
846.77	23.7394	1808.65	8.0439		
856.80	26.5813	1131.51	0.0000		
860.56	26.6193	1332.49	16.2988		
871.09	20.2745	1177.95	12.2410		
873.19	21.2130	1189.05	11.2571		
875.33	0.0000	1204.77	21.5883		
879.38	26.8087	1221.41	9.2961		
880.51	23.1209	1231.02	12.4292		
881.60	21.2796	1235.36	18.6658		
883.24	24.9961	1238.28	16.6055		
884.68	20.3779	1260.41	0.0000		
889.28	15.7736	1271.87	16.7607		
894.76	24.1727	1274.44	19.9173		
1836.06	21.4095	1274.54	19.9185		

VAX/VMS Nuclide Identification Report Generated 22-JUL-2022 02:47:32.33

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885003.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM12.CNF;908
Background date    : 16-JUL-2022 13:55:16
Sample date       : 27-JUN-2022 10:00:00 Acquisition date : 21-JUL-2022 22:47:05
Sample ID        : G585885003 Sample quantity : 5.71750E-01 FILTER
Detector name    : GAM12 Detector geometry: JAR
Elapsed live time: 0 04:00:00.00 Elapsed real time: 0 04:00:01.07 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : MJH1
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID        : 2290721 Detector SN# :
Matrix Spike ID : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	63.12*	23	137	1.67	126.17	120	18	1.57E-03	118.6	9.89E-01
2	3	66.69	58	132	1.67	133.31	120	18	4.02E-03	40.2	
3	0	133.35*	3	134	1.33	266.64	264	8	2.23E-04	691.1	
4	0	162.95	25	82	1.27	325.85	323	6	1.74E-03	60.4	
5	0	185.77*	49	151	1.31	371.50	365	13	3.44E-03	65.6	
6	0	239.52*	23	200	1.79	479.00	471	16	1.56E-03	155.0	
7	0	295.69	33	152	5.13	591.38	580	17	2.32E-03	87.5	
8	0	352.55	71	118	2.01	705.12	699	17	4.94E-03	36.6	
9	0	425.28	10	46	0.65	850.63	844	8	7.04E-04	115.0	
10	0	570.70*	41	50	2.00	1141.60	1136	14	2.86E-03	43.8	
11	0	583.46*	33	22	2.55	1167.13	1163	9	2.28E-03	38.7	
12	0	683.45	29	19	3.39	1367.22	1362	11	2.02E-03	34.6	
13	0	704.10*	12	56	2.83	1408.55	1399	13	8.28E-04	149.1	
14	0	743.57	11	16	0.53	1487.54	1482	8	7.33E-04	72.8	
15	0	851.38	21	14	1.75	1703.30	1700	7	1.43E-03	37.5	
16	0	859.55	19	28	1.37	1719.66	1713	11	1.30E-03	61.0	
17	0	929.12	12	19	1.48	1858.91	1853	10	8.00E-04	78.2	
18	0	941.33	29	26	6.16	1883.36	1868	22	1.99E-03	50.0	
19	0	946.70	11	1	1.49	1894.09	1891	7	7.35E-04	36.7	
20	0	971.22	8	35	0.63	1943.18	1935	13	5.47E-04	160.3	
21	0	1009.52	20	15	1.93	2019.85	2016	11	1.38E-03	43.1	
22	0	1165.62	15	15	4.75	2332.34	2322	15	1.05E-03	61.5	
23	0	1222.62*	11	15	4.40	2446.48	2440	12	7.80E-04	92.1	
24	0	1275.98*	7	15	0.79	2553.30	2546	9	4.67E-04	121.3	
25	0	1319.49	6	5	1.44	2640.44	2634	10	4.48E-04	75.1	
26	0	1373.44	11	2	1.69	2748.45	2745	8	7.37E-04	38.8	
27	0	1413.32	7	6	0.62	2828.32	2824	9	4.75E-04	77.5	
28	0	1462.19*	4	24	2.19	2926.18	2919	12	2.44E-04	306.2	
29	0	1654.66*	2	2	0.80	3311.66	3307	9	1.68E-04	207.6	
30	0	1756.44*	5	2	1.48	3515.54	3512	8	3.52E-04	99.1	
31	0	1764.72	24	17	3.32	3532.13	3523	22	1.66E-03	48.1	
32	0	1826.68	4	7	0.51	3656.24	3651	8	2.84E-04	127.0	
33	0	1861.61	10	3	3.91	3726.22	3720	12	7.18E-04	45.3	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 22-JUL-2022 02:47:33

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885003.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 27-JUN-2022 10:00:00	Acquisition date	: 21-JUL-2022 22:47:05
Sample ID	: G585885003	Sample quantity	: 0.57175 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA12	Detector geometry	: JAR
Elapsed live time	: 0 04:00:00.00	Elapsed real time	: 0 04:00:01.07 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
NA-22	1274.54	7	99.94*	9.165E-01	2.408E+00	2.452E+00	242.56
K-40	1460.82	4	10.66*	8.244E-01	1.313E+01	1.313E+01	612.39
CE-144	80.12	-----	1.36	2.485E+00	-----	Line Not Found	-----
	133.52	3	11.09*	4.041E+00	2.347E+00	2.492E+00	1382.13
TL-208	277.37	-----	6.60	2.992E+00	-----	Line Not Found	-----
	583.19	33	85.00*	1.724E+00	7.358E+00	7.541E+00	77.45
	860.56	19	12.50	1.266E+00	3.877E+01	3.973E+01	122.09
BI-211	72.87	-----	1.23	1.982E+00	-----	Line Not Found	-----
	351.06	71	12.92*	2.522E+00	7.170E+01	7.185E+01	73.11
RA-224	240.99	23	4.10*	3.296E+00	5.468E+01	5.603E+01	309.95
RA-226	186.21	49	3.59*	3.784E+00	1.196E+02	1.196E+02	131.23
TH-230	67.67	58	0.38*	1.519E+00	3.295E+03	3.295E+03	80.41
TH-232	63.81	23	0.26*	1.250E+00	2.283E+03	2.283E+03	237.10
	140.88	-----	0.02	4.052E+00	-----	Line Not Found	-----
U-235	143.76	-----	10.96*	4.049E+00	-----	Line Not Found	-----
	163.33	25	5.08	3.965E+00	4.077E+01	4.077E+01	120.84
	185.72	49	57.20	3.784E+00	7.506E+00	7.506E+00	131.23
	205.31	-----	5.01	3.605E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885003.CNF;1
Acquisition date : 21-JUL-2022 22:47:05 Sensitivity : 3.000
Detector ID : GAM12 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:01.07 Half life ratio : *****
Sample date : 27-JUN-2022 10:00:00 Analyst initials: MJH1
Sample ID : G585885003 Sample Quantity : 5.7175E-01 FILTER
Batch Number : 2290721 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 21-APR-2022 12:00:34 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM12_JAR.CNF;17

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
NA-22	2.452E+00	5.829E+00	6.609E+00
K-40	1.313E+01	7.880E+01	7.614E+01
CE-144	2.492E+00	3.376E+01	3.570E+01
TL-208	7.541E+00	5.723E+00	6.926E+00
BI-211	7.185E+01	5.148E+01	3.492E+01
RA-224	5.603E+01	1.702E+02	1.160E+02
RA-226	1.196E+02	1.538E+02	1.075E+02
TH-230	3.295E+03	2.596E+03	2.514E+03
TH-232	2.283E+03	5.305E+03	4.259E+03
U-235	-6.602E+00	1.998E+01	3.560E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	1.877E+01	3.959E+01	7.431E+01	NOT IDENT.
NA-24	0.000E+00	3.090E+12	0.000E+00	SHORT HLIF
AL-26	3.640E+00	2.884E+00	7.680E+00	NOT IDENT.
SC-46	-2.724E-01	3.952E+00	7.583E+00	NOT IDENT.
V-48	-6.815E+00	9.882E+00	1.721E+01	NOT IDENT.
CR-51	-2.108E+01	4.934E+01	8.543E+01	NOT IDENT.
MN-52	-2.611E+01	7.973E+01	1.460E+02	FAIL ABUN
MN-54	4.857E-01	3.845E+00	7.429E+00	NOT IDENT.
CO-56	8.612E+00	4.518E+00	9.925E+00	NOT IDENT.
CO-57	-9.538E-01	2.765E+00	4.945E+00	NOT IDENT.
NI-57	0.000E+00	4.732E+05	0.000E+00	SHORT HLIF
CO-58	2.160E+00	3.977E+00	8.192E+00	NOT IDENT.
FE-59	7.518E+00	9.389E+00	2.007E+01	NOT IDENT.
CO-60	1.525E-02	3.623E+00	7.081E+00	NOT IDENT.
ZN-65	6.186E+00	8.191E+00	1.723E+01	NOT IDENT.
CU-67	6.631E+03	8.528E+03	8.809E+03	FAIL ABUN
GE-68	3.211E+01	1.026E+02	2.117E+02	NOT IDENT.
AS-73	-9.134E+01	1.805E+02	2.915E+02	NOT IDENT.
AS-74	-3.948E+00	1.544E+01	2.663E+01	NOT IDENT.
SE-75	-2.976E-01	4.639E+00	8.334E+00	NOT IDENT.

BR-77	0.000E+00	3.867E+04	0.000E+00	SHORT HLIF
SR-82	6.395E+00	4.053E+01	7.972E+01	NOT IDENT.
RB-83	-4.579E+00	7.559E+00	1.262E+01	NOT IDENT.
RB-84	7.153E-02	9.813E+00	1.857E+01	NOT IDENT.
KR-85	-3.729E+03	1.276E+03	1.741E+03	NOT IDENT.
SR-85	-2.164E+01	7.404E+00	1.010E+01	NOT IDENT.
RB-86	-4.083E+00	9.323E+01	1.812E+02	NOT IDENT.
Y-88	-2.279E+00	4.061E+00	6.978E+00	NOT IDENT.
Y-91	-2.224E+03	1.905E+03	2.942E+03	NOT IDENT.
NB-94	2.636E+00	7.703E+00	7.402E+00	FAIL ABUN
NB-95	4.649E-01	4.709E+00	9.049E+00	NOT IDENT.
NB-95M	-3.410E+00	1.425E+01	2.247E+01	NOT IDENT.
TC-95M	1.871E+00	4.994E+00	9.221E+00	FAIL ABUN
ZR-95	-5.611E+00	8.718E+00	1.333E+01	NOT IDENT.
MO-99	-1.012E+04	1.360E+04	2.016E+04	NOT IDENT.
TC-99M	0.000E+00	1.498E+30	0.000E+00	SHORT HLIF
RH-101	-1.372E+00	3.167E+00	5.630E+00	NOT IDENT.
RH-102M	-7.324E-01	3.025E+00	5.297E+00	NOT IDENT.
RU-103	-4.991E+00	5.174E+00	8.252E+00	NOT IDENT.
RH-106	6.084E+00	2.973E+01	5.544E+01	NOT IDENT.
RU-106	6.084E+00	2.973E+01	5.544E+01	NOT IDENT.
AG-108M	-2.666E+00	3.041E+00	4.949E+00	NOT IDENT.
CD-109	-2.363E+01	8.683E+01	1.570E+02	NOT IDENT.
AG-110	-4.705E+01	7.552E+01	1.240E+02	NOT IDENT.
AG-110M	3.702E+00	5.227E+00	1.081E+01	NOT IDENT.
IN-111	-3.287E+02	1.187E+03	1.868E+03	NOT IDENT.
SN-113	-3.233E+00	5.489E+00	9.275E+00	NOT IDENT.
IN-114M	4.303E+00	2.002E+01	3.346E+01	NOT IDENT.
CD-115	0.000E+00	2.110E+04	0.000E+00	SHORT HLIF
SN-117M	8.608E+00	9.342E+00	1.722E+01	NOT IDENT.
SB-122	-3.980E+02	2.404E+03	4.215E+03	NOT IDENT.
I-123	0.000E+00	7.967E+13	0.000E+00	SHORT HLIF
TE-123M	3.130E+00	3.218E+00	5.687E+00	NOT IDENT.
SB-124	-2.868E+00	1.077E+01	1.994E+01	NOT IDENT.
SB-125	-3.386E+00	1.071E+01	1.641E+01	NOT IDENT.
TE-125M	4.388E+02	1.100E+03	2.072E+03	NOT IDENT.
I-126	-1.589E+01	4.419E+01	7.476E+01	NOT IDENT.
SB-126	-1.327E+01	2.953E+01	4.590E+01	NOT IDENT.
SN-126	-7.555E+00	8.767E+00	1.530E+01	FAIL ABUN
SB-127	5.094E+02	7.380E+02	1.343E+03	NOT IDENT.
TE-129	-4.715E+01	5.750E+01	9.384E+01	NOT IDENT.
I-131	1.428E+01	2.641E+01	5.003E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	-2.431E+02	5.723E+02	1.000E+03	NOT IDENT.
BA-133	9.963E-01	4.180E+00	7.699E+00	NOT IDENT.
I-133	0.000E+00	1.074E+09	0.000E+00	SHORT HLIF
CS-134	-3.907E+00	4.797E+00	6.601E+00	FAIL ABUN
I-135	0.000E+00	1.442E+28	0.000E+00	SHORT HLIF
CS-136	-1.883E+01	1.774E+01	2.883E+01	NOT IDENT.
BA-137M	-1.822E+00	5.374E+00	8.369E+00	NOT IDENT.
CS-137	-1.925E+00	5.677E+00	8.842E+00	NOT IDENT.
LA-138	2.738E-01	5.429E+00	1.077E+01	NOT IDENT.
CE-139	1.824E-01	3.260E+00	5.355E+00	NOT IDENT.
BA-140	2.394E+00	5.512E+01	9.416E+01	FAIL ABUN
LA-140	-5.630E+00	1.247E+01	2.247E+01	NOT IDENT.
CE-141	3.610E+00	7.449E+00	1.397E+01	NOT IDENT.
CE-143	0.000E+00	1.436E+06	0.000E+00	SHORT HLIF
PM-144	2.953E+00	4.611E+00	7.899E+00	NOT IDENT.
PR-144	2.200E+02	3.466E+02	5.933E+02	NOT IDENT.
PM-146	-3.138E+00	4.524E+00	7.514E+00	NOT IDENT.
ND-147	-8.949E+00	1.019E+02	1.820E+02	NOT IDENT.
PM-147	-5.225E+04	7.738E+04	1.355E+05	NOT IDENT.
PM-149	0.000E+00	1.815E+05	0.000E+00	SHORT HLIF
EU-152	1.111E+01	1.039E+01	2.024E+01	NOT IDENT.
GD-153	-1.155E+00	1.149E+01	1.690E+01	NOT IDENT.
EU-154	1.038E+01	1.141E+01	2.474E+01	NOT IDENT.
EU-155	-8.247E+00	1.078E+01	1.886E+01	NOT IDENT.
TB-160	1.459E+01	1.595E+01	3.325E+01	NOT IDENT.
HO-166M	2.205E-01	5.513E+00	1.071E+01	FAIL ABUN
TM-171	2.917E+02	3.447E+03	5.881E+03	FAIL ABUN
LU-176	8.183E-01	2.997E+00	5.471E+00	NOT IDENT.
LU-177	-6.093E+01	3.064E+02	5.445E+02	NOT IDENT.
HF-181	-1.583E+00	5.157E+00	8.972E+00	FAIL ABUN
W-181	1.290E+01	3.918E+01	6.755E+01	FAIL ABUN
TA-182	1.671E+01	3.017E+01	3.418E+01	FAIL ABUN
RE-183	-5.424E+00	4.310E+01	6.568E+01	FAIL ABUN
RE-184	-1.095E+00	1.571E+01	2.974E+01	NOT IDENT.
RE-188	-8.317E+00	1.728E+01	3.045E+01	FAIL ABUN

W-188	-1.849E+02	9.802E+02	1.540E+03	FAIL ABUN
OS-191	-5.409E+00	2.492E+01	4.288E+01	FAIL ABUN
IR-192	2.503E+00	3.860E+00	7.331E+00	FAIL ABUN
PB-201	0.000E+00	3.911E+19	0.000E+00	SHORT HLIF
TL-201	-8.119E+02	5.851E+03	1.053E+04	NOT IDENT.
TL-202	2.806E+00	1.202E+01	2.217E+01	NOT IDENT.
HG-203	2.361E+00	4.465E+00	8.356E+00	NOT IDENT.
PB-203	0.000E+00	8.309E+03	0.000E+00	SHORT HLIF
TL-204	8.584E+01	7.212E+02	1.210E+03	NOT IDENT.
BI-207	3.309E+00	4.623E+00	9.839E+00	FAIL ABUN
PB-210	3.509E+02	9.286E+02	1.602E+03	NOT IDENT.
PB-211	-5.403E+00	7.170E+01	1.281E+02	NOT IDENT.
BI-212	1.268E+01	4.987E+01	9.823E+01	NOT IDENT.
PB-212	5.269E+00	1.600E+01	1.348E+01	FAIL ABUN
BI-213	1.021E+00	1.061E+01	1.929E+01	NOT IDENT.
BI-214	3.031E+00	8.239E+00	1.510E+01	FAIL ABUN
PB-214	0.000E+00	1.864E+01	1.804E+01	FAIL ABUN
RN-219	-1.663E+01	4.133E+01	7.136E+01	NOT IDENT.
FR-221	-1.540E+00	1.969E+01	3.543E+01	NOT IDENT.
RA-223	1.844E+01	6.501E+01	1.198E+02	NOT IDENT.
AC-225	-8.481E+00	1.085E+02	1.952E+02	NOT IDENT.
AC-227	1.682E+01	2.643E+01	4.971E+01	NOT IDENT.
TH-227	1.682E+01	2.643E+01	4.971E+01	NOT IDENT.
AC-228	1.209E+01	1.507E+01	3.112E+01	NOT IDENT.
RA-228	1.209E+01	1.507E+01	3.112E+01	NOT IDENT.
TH-228	5.269E+00	1.600E+01	1.348E+01	FAIL ABUN
TH-229	6.974E+00	4.688E+01	8.616E+01	NOT IDENT.
PA-231	-1.832E+01	4.471E+01	7.789E+01	NOT IDENT.
TH-231	1.627E+01	6.571E+01	1.038E+02	NOT IDENT.
PA-233	1.886E+00	6.688E+00	1.231E+01	NOT IDENT.
PA-234	2.475E+01	1.779E+01	4.386E+01	FAIL ABUN
PA-234M	1.352E+02	4.269E+02	8.545E+02	NOT IDENT.
TH-234	1.604E+02	3.728E+02	3.959E+02	FAIL ABUN
U-234	-6.257E+03	1.284E+04	2.078E+04	NOT IDENT.
NP-237	1.886E+00	6.688E+00	1.231E+01	NOT IDENT.
NP-238	0.000E+00	4.402E+04	0.000E+00	SHORT HLIF
U-238	1.604E+02	3.728E+02	3.959E+02	FAIL ABUN
NP-239	-5.564E+00	2.660E+01	4.818E+01	NOT IDENT.
AM-241	-2.734E+01	2.806E+01	3.891E+01	NOT IDENT.
AM-242	1.586E+01	8.584E+01	1.299E+02	NOT IDENT.
AM-243	-1.070E+00	7.038E+00	1.281E+01	NOT IDENT.
CM-243	-1.356E+00	1.088E+01	1.989E+01	NOT IDENT.
BK-247	-1.870E+00	7.967E+00	1.411E+01	NOT IDENT.
CM-247	-8.756E-01	3.584E+00	6.311E+00	NOT IDENT.
CF-249	-1.502E+00	4.322E+00	7.493E+00	NOT IDENT.
CF-251	2.699E+00	1.294E+01	2.373E+01	NOT IDENT.
CF-252	-3.303E+03	1.937E+04	3.521E+04	NOT IDENT.
ANH-511	-2.480E+01	8.244E+00	1.354E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	63.12	68	137	1.67	126.17	120	18	4.74E-03	34.9	9.89E-01
2	3	66.69	58	132	1.67	133.31	120	18	4.02E-03	40.2	
3	0	92.83	192	179	1.28	185.60	181	11	1.33E-02	15.4	
4	0	133.35	13	134	1.33	266.64	264	8	9.25E-04	152.3	
5	0	162.95	25	82	1.27	325.85	323	6	1.74E-03	60.4	
6	0	185.77	200	151	1.31	371.50	365	13	1.39E-02	14.6	
7	0	239.52	74	200	1.79	479.00	471	16	5.14E-03	44.3	
8	0	295.69	33	152	5.13	591.38	580	17	2.32E-03	87.5	
9	0	352.55	71	118	2.01	705.12	699	17	4.94E-03	36.6	
10	0	425.28	10	46	0.65	850.63	844	8	7.04E-04	115.0	
11	0	511.34	316	78	2.79	1022.82	1014	19	2.19E-02	9.0	
12	0	570.70	49	50	2.00	1141.60	1136	14	3.38E-03	33.8	
13	0	583.46	45	22	2.55	1167.13	1163	9	3.11E-03	23.7	
14	0	683.45	29	19	3.39	1367.22	1362	11	2.02E-03	34.6	
15	0	704.10	14	56	2.83	1408.55	1399	13	9.45E-04	118.5	
16	0	743.57	11	16	0.53	1487.54	1482	8	7.33E-04	72.8	
17	0	851.38	21	14	1.75	1703.30	1700	7	1.43E-03	37.5	
18	0	859.55	19	28	1.37	1719.66	1713	11	1.30E-03	61.0	
19	0	929.12	12	19	1.48	1858.91	1853	10	8.00E-04	78.2	
20	0	941.33	29	26	6.16	1883.36	1868	22	1.99E-03	50.0	
21	0	946.70	11	1	1.49	1894.09	1891	7	7.35E-04	36.7	
22	0	971.22	8	35	0.63	1943.18	1935	13	5.47E-04	160.3	
23	0	1009.52	20	15	1.93	2019.85	2016	11	1.38E-03	43.1	
24	0	1165.62	15	15	4.75	2332.34	2322	15	1.05E-03	61.5	
25	0	1222.62	13	15	4.40	2446.48	2440	12	8.79E-04	67.5	
26	0	1275.98	9	15	0.79	2553.30	2546	9	6.52E-04	82.1	
27	0	1319.49	6	5	1.44	2640.44	2634	10	4.48E-04	75.1	
28	0	1373.44	11	2	1.69	2748.45	2745	8	7.37E-04	38.8	
29	0	1413.32	7	6	0.62	2828.32	2824	9	4.75E-04	77.5	
30	0	1462.19	10	24	2.19	2926.18	2919	12	6.82E-04	104.8	
31	0	1654.66	7	2	0.80	3311.66	3307	9	4.90E-04	53.1	
32	0	1756.44	10	2	1.48	3515.54	3512	8	7.20E-04	38.6	
33	0	1764.72	24	17	3.32	3532.13	3523	22	1.66E-03	48.1	
34	0	1826.68	4	7	0.51	3656.24	3651	8	2.84E-04	127.0	
35	0	1861.61	10	3	3.91	3726.22	3720	12	7.18E-04	45.3	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
NA-22	1274.54	7	99.94*	9.165E-01	2.408E+00	2.452E+00	242.56
K-40	1460.82	4	10.66*	8.244E-01	1.313E+01	1.313E+01	612.39
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TL-208	277.37	-----	6.60	2.992E+00	-----	Line Not Found	-----
	583.19	33	85.00*	1.724E+00	7.358E+00	7.541E+00	77.45
	860.56	19	12.50	1.266E+00	3.877E+01	3.973E+01	122.09
BI-211	72.87	-----	1.23	1.982E+00	-----	Line Not Found	-----
	351.06	71	12.92*	2.522E+00	7.170E+01	7.185E+01	73.11
RA-224	240.99	23	4.10*	3.296E+00	5.468E+01	5.603E+01	309.95
RA-226	186.21	49	3.59*	3.784E+00	1.196E+02	1.196E+02	131.23
TH-230	67.67	58	0.38*	1.519E+00	3.295E+03	3.295E+03	80.41
TH-232	63.81	23	0.26*	1.250E+00	2.283E+03	2.283E+03	237.10
	140.88	-----	0.02	4.052E+00	-----	Line Not Found	-----
U-235	143.76	-----	10.96*	4.049E+00	-----	Line Not Found	-----
	163.33	25	5.08	3.965E+00	4.077E+01	4.077E+01	120.84
	185.72	49	57.20	3.784E+00	7.506E+00	7.506E+00	131.23
	205.31	-----	5.01	3.605E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

Total number of lines in spectrum 33
Number of unidentified lines 14
Number of lines tentatively identified by NID 19 57.58%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
NA-22	2.60Y	1.02	2.408E+00	2.452E+00	5.948E+00	242.56	
K-40	1.25E+09Y	1.00	1.313E+01	1.313E+01	8.041E+01	612.39	
CE-144	284.91D	1.06	2.347E+00	2.492E+00	34.45E+00	1382.13	
TL-208	1.91Y	1.02	7.358E+00	7.541E+00	5.840E+00	77.45	
BI-211	21.77Y	1.00	7.170E+01	7.185E+01	5.253E+01	73.11	
RA-224	1.91Y	1.02	5.468E+01	5.603E+01	17.37E+01	309.95	
RA-226	1600.00Y	1.00	1.196E+02	1.196E+02	1.570E+02	131.23	
TH-230	7.54E+04Y	1.00	3.295E+03	3.295E+03	2.649E+03	80.41	
TH-232	1.41E+10Y	1.00	2.283E+03	2.283E+03	5.413E+03	237.10	
U-235	7.04E+08Y	1.00	7.506E+00	7.506E+00	9.851E+00	131.23	K
Total Activity :			5.857E+03	5.859E+03			

Grand Total Activity : 5.857E+03 5.859E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	295.69	33	152	5.13	591.38	580	17	2.32E-03	****	2.86E+00	T
0	425.28	10	46	0.65	850.63	844	8	7.04E-04	****	2.19E+00	
0	570.70	41	50	2.00	1141.60	1136	14	2.86E-03	87.5	1.75E+00	T
0	683.45	29	19	3.39	1367.22	1362	11	2.02E-03	69.2	1.52E+00	
0	704.10	12	56	2.83	1408.55	1399	13	8.28E-04	****	1.49E+00	T
0	743.57	11	16	0.53	1487.54	1482	8	7.33E-04	****	1.42E+00	T
0	851.38	21	14	1.75	1703.30	1700	7	1.43E-03	75.0	1.28E+00	
0	929.12	12	19	1.48	1858.91	1853	10	8.00E-04	****	1.19E+00	
0	941.33	29	26	6.16	1883.36	1868	22	1.99E-03	****	1.18E+00	
0	946.70	11	1	1.49	1894.09	1891	7	7.35E-04	73.3	1.17E+00	T
0	971.22	8	35	0.63	1943.18	1935	13	5.47E-04	****	1.15E+00	
0	1009.52	20	15	1.93	2019.85	2016	11	1.38E-03	86.1	1.11E+00	
0	1165.62	15	15	4.75	2332.34	2322	15	1.05E-03	****	9.86E-01	
0	1222.62	11	15	4.40	2446.48	2440	12	7.80E-04	****	9.49E-01	T
0	1319.49	6	5	1.44	2640.44	2634	10	4.48E-04	****	8.92E-01	
0	1373.44	11	2	1.69	2748.45	2745	8	7.37E-04	77.7	8.65E-01	
0	1413.32	7	6	0.62	2828.32	2824	9	4.75E-04	****	8.46E-01	
0	1654.66	2	2	0.80	3311.66	3307	9	1.68E-04	****	7.55E-01	
0	1756.44	5	2	1.48	3515.54	3512	8	3.52E-04	****	7.26E-01	T
0	1764.72	24	17	3.32	3532.13	3523	22	1.66E-03	96.1	7.24E-01	T
0	1826.68	4	7	0.51	3656.24	3651	8	2.84E-04	****	7.09E-01	
0	1861.61	10	3	3.91	3726.22	3720	12	7.18E-04	90.7	7.01E-01	

Flags: "T" = Tentatively associated


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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885003.CNF;1  *
* Acquisition date   : 21-JUL-2022 22:47:05 Sensitivity      : 3.000          *
* Detector ID        : GAM12 Energy tolerance: 1.500        *
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 04:00:01.07 Half life ratio  : *****        *
* Sample date        : 27-JUN-2022 10:00:00 Nuclide Library : LIQUID      *
* Sample ID          : G585885003 Analyst initials: MJH1        *
* Batch Number       : 2290721 Sample Quantity : 5.7175E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000        *
*                                     Dry Weight    : 0.00000        *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 21-APR-2022 12:00:34 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM12_JAR.CNF;17          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
NA-22	2.812E+00
K-40	3.303E+01
CE-144	1.681E+01
TL-208	3.154E+00
BI-211	1.611E+01
RA-224	5.464E+01
RA-226	5.051E+01
TH-230	1.184E+03
TH-232	1.999E+03
U-235	1.681E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	3.425E+01	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	3.217E+00	NOT IDENT.
SC-46	3.351E+00	NOT IDENT.
V-48	7.469E+00	NOT IDENT.
CR-51	3.966E+01	NOT IDENT.
MN-52	6.180E+01	FAIL ABUN
MN-54	3.354E+00	NOT IDENT.
CO-56	4.532E+00	NOT IDENT.
CO-57	2.334E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.670E+00	NOT IDENT.
FE-59	8.925E+00	NOT IDENT.
CO-60	3.035E+00	NOT IDENT.
ZN-65	7.696E+00	NOT IDENT.
CU-67	4.226E+03	FAIL ABUN
GE-68	9.189E+01	NOT IDENT.
AS-73	1.368E+02	NOT IDENT.
AS-74	1.216E+01	NOT IDENT.
SE-75	3.887E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF

SR-82	3.568E+01	NOT IDENT.
RB-83	5.672E+00	NOT IDENT.
RB-84	8.416E+00	NOT IDENT.
KR-85	8.165E+02	NOT IDENT.
SR-85	4.738E+00	NOT IDENT.
RB-86	7.841E+01	NOT IDENT.
Y-88	2.746E+00	NOT IDENT.
Y-91	1.233E+03	NOT IDENT.
NB-94	3.404E+00	FAIL ABUN
NB-95	4.108E+00	NOT IDENT.
NB-95M	1.054E+01	NOT IDENT.
TC-95M	4.355E+00	FAIL ABUN
ZR-95	5.907E+00	NOT IDENT.
MO-99	8.810E+03	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.651E+00	NOT IDENT.
RH-102M	2.415E+00	NOT IDENT.
RU-103	3.741E+00	NOT IDENT.
RH-106	2.488E+01	NOT IDENT.
RU-106	2.488E+01	NOT IDENT.
AG-108M	2.248E+00	NOT IDENT.
CD-109	7.433E+01	NOT IDENT.
AG-110	5.527E+01	NOT IDENT.
AG-110M	4.879E+00	NOT IDENT.
IN-111	8.702E+02	NOT IDENT.
SN-113	4.300E+00	NOT IDENT.
IN-114M	1.566E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	8.164E+00	NOT IDENT.
SB-122	1.920E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.692E+00	NOT IDENT.
SB-124	8.304E+00	NOT IDENT.
SB-125	7.515E+00	NOT IDENT.
TE-125M	9.775E+02	NOT IDENT.
I-126	3.414E+01	NOT IDENT.
SB-126	2.071E+01	NOT IDENT.
SN-126	7.246E+00	FAIL ABUN
SB-127	6.052E+02	NOT IDENT.
TE-129	4.231E+01	NOT IDENT.
I-131	2.317E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	4.695E+02	NOT IDENT.
BA-133	3.564E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	2.907E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	1.253E+01	NOT IDENT.
BA-137M	3.870E+00	NOT IDENT.
CS-137	4.088E+00	NOT IDENT.
LA-138	4.573E+00	NOT IDENT.
CE-139	2.519E+00	NOT IDENT.
BA-140	4.332E+01	FAIL ABUN
LA-140	8.941E+00	NOT IDENT.
CE-141	6.603E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
PM-144	3.639E+00	NOT IDENT.
PR-144	2.733E+02	NOT IDENT.
PM-146	3.429E+00	NOT IDENT.
ND-147	8.237E+01	NOT IDENT.
PM-147	6.380E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	9.473E+00	NOT IDENT.
GD-153	7.966E+00	NOT IDENT.
EU-154	1.098E+01	NOT IDENT.
EU-155	8.852E+00	NOT IDENT.
TB-160	1.513E+01	NOT IDENT.
HO-166M	4.799E+00	FAIL ABUN
TM-171	2.759E+03	FAIL ABUN
LU-176	2.567E+00	NOT IDENT.
LU-177	2.568E+02	NOT IDENT.
HF-181	4.074E+00	FAIL ABUN
W-181	3.191E+01	FAIL ABUN
TA-182	1.508E+01	FAIL ABUN
RE-183	3.098E+01	FAIL ABUN
RE-184	1.332E+01	NOT IDENT.
RE-188	1.433E+01	FAIL ABUN
W-188	7.215E+02	FAIL ABUN

OS-191	2.019E+01	FAIL ABUN
IR-192	3.419E+00	FAIL ABUN
PB-201	0.000E+00	SHORT HLIF
TL-201	4.958E+03	NOT IDENT.
TL-202	1.018E+01	NOT IDENT.
HG-203	3.916E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	5.741E+02	NOT IDENT.
BI-207	4.360E+00	FAIL ABUN
PB-210	7.606E+02	NOT IDENT.
PB-211	5.891E+01	NOT IDENT.
BI-212	4.443E+01	NOT IDENT.
PB-212	6.429E+00	FAIL ABUN
BI-213	8.850E+00	NOT IDENT.
BI-214	6.969E+00	FAIL ABUN
PB-214	8.532E+00	FAIL ABUN
RN-219	3.275E+01	NOT IDENT.
FR-221	1.661E+01	NOT IDENT.
RA-223	5.577E+01	NOT IDENT.
AC-225	9.147E+01	NOT IDENT.
AC-227	2.338E+01	NOT IDENT.
TH-227	2.338E+01	NOT IDENT.
AC-228	1.413E+01	NOT IDENT.
RA-228	1.413E+01	NOT IDENT.
TH-228	6.429E+00	FAIL ABUN
TH-229	4.039E+01	NOT IDENT.
PA-231	3.602E+01	NOT IDENT.
TH-231	4.947E+01	NOT IDENT.
PA-233	5.741E+00	NOT IDENT.
PA-234	1.878E+01	FAIL ABUN
PA-234M	3.801E+02	NOT IDENT.
TH-234	1.886E+02	FAIL ABUN
U-234	9.754E+03	NOT IDENT.
NP-237	5.741E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.886E+02	FAIL ABUN
NP-239	2.267E+01	NOT IDENT.
AM-241	1.821E+01	NOT IDENT.
AM-242	6.140E+01	NOT IDENT.
AM-243	6.097E+00	NOT IDENT.
CM-243	9.357E+00	NOT IDENT.
BK-247	6.580E+00	NOT IDENT.
CM-247	2.887E+00	NOT IDENT.
CF-249	3.462E+00	NOT IDENT.
CF-251	1.121E+01	NOT IDENT.
CF-252	1.662E+04	NOT IDENT.
ANH-511	6.541E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885003.CNF;1
Acquisition date : 21-JUL-2022 22:47:05 Sensitivity : 3.000
Detector ID : GAM12 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:01.07 Half life ratio : *****
Sample date : 27-JUN-2022 10:00:00 Nuclide Library : LIQUID
Sample ID : G585885003 Analyst initials: MJH1
Batch Number : 2290721 Sample Quantity : 5.7175E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 21-APR-2022 12:00:34 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM12_JAR.CNF;17

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
NA-22	2.452E+00	5.832E+00	5.833E+00
K-40	1.313E+01	7.881E+01	7.881E+01
CE-144	2.492E+00	3.376E+01	3.376E+01
TL-208	7.541E+00	5.765E+00	5.766E+00
BI-211	7.185E+01	5.180E+01	5.182E+01
RA-224	5.603E+01	1.702E+02	1.703E+02
RA-226	1.196E+02	1.541E+02	1.541E+02
TH-230	3.295E+03	2.660E+03	2.661E+03
TH-232	2.283E+03	5.313E+03	5.313E+03
U-235	-6.602E+00	1.999E+01	1.999E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	1.877E+01	3.962E+01	4.052E+01	NOT IDENT.
NA-24	-1.295E+12	3.092E+12	3.147E+12	SHORT HLIF
AL-26	3.640E+00	2.897E+00	3.330E+00	NOT IDENT.
SC-46	-2.724E-01	3.952E+00	3.954E+00	NOT IDENT.
V-48	-6.815E+00	9.902E+00	1.037E+01	NOT IDENT.
CR-51	-2.108E+01	4.936E+01	5.027E+01	NOT IDENT.
MN-52	-2.611E+01	7.976E+01	8.063E+01	FAIL ABUN
MN-54	4.857E-01	3.845E+00	3.851E+00	NOT IDENT.
CO-56	8.612E+00	4.591E+00	6.015E+00	NOT IDENT.
CO-57	-9.538E-01	2.766E+00	2.799E+00	NOT IDENT.
NI-57	2.765E+05	4.741E+05	4.902E+05	SHORT HLIF
CO-58	2.160E+00	3.982E+00	4.100E+00	NOT IDENT.
FE-59	7.518E+00	9.422E+00	1.001E+01	NOT IDENT.
CO-60	1.525E-02	3.623E+00	3.623E+00	NOT IDENT.
ZN-65	6.186E+00	8.208E+00	8.669E+00	NOT IDENT.
CU-67	6.631E+03	8.545E+03	9.053E+03	FAIL ABUN
GE-68	3.211E+01	1.027E+02	1.037E+02	NOT IDENT.
AS-73	-9.134E+01	1.815E+02	1.861E+02	NOT IDENT.
AS-74	-3.948E+00	1.544E+01	1.555E+01	NOT IDENT.
SE-75	-2.976E-01	4.639E+00	4.641E+00	NOT IDENT.

BR-77	1.273E+04	3.868E+04	3.910E+04	SHORT HLIF
SR-82	6.395E+00	4.054E+01	4.064E+01	NOT IDENT.
RB-83	-4.579E+00	7.594E+00	7.870E+00	NOT IDENT.
RB-84	7.153E-02	9.813E+00	9.813E+00	NOT IDENT.
KR-85	-3.729E+03	1.319E+03	2.138E+03	NOT IDENT.
SR-85	-2.164E+01	7.650E+00	1.240E+01	NOT IDENT.
RB-86	-4.083E+00	9.323E+01	9.325E+01	NOT IDENT.
Y-88	-2.279E+00	4.065E+00	4.193E+00	NOT IDENT.
Y-91	-2.224E+03	1.913E+03	2.161E+03	NOT IDENT.
NB-94	2.636E+00	7.707E+00	7.798E+00	FAIL ABUN
NB-95	4.649E-01	4.709E+00	4.713E+00	NOT IDENT.
NB-95M	-3.410E+00	1.425E+01	1.434E+01	NOT IDENT.
TC-95M	1.871E+00	4.996E+00	5.067E+00	FAIL ABUN
ZR-95	-5.611E+00	8.735E+00	9.094E+00	NOT IDENT.
MO-99	-1.012E+04	1.364E+04	1.438E+04	NOT IDENT.
TC-99M	-8.747E+29	1.502E+30	0.000E+00	SHORT HLIF
RH-101	-1.372E+00	3.177E+00	3.237E+00	NOT IDENT.
RH-102M	-7.324E-01	3.027E+00	3.045E+00	NOT IDENT.
RU-103	-4.991E+00	5.194E+00	5.661E+00	NOT IDENT.
RH-106	6.084E+00	2.973E+01	2.986E+01	NOT IDENT.
RU-106	6.084E+00	2.973E+01	2.986E+01	NOT IDENT.
AG-108M	-2.666E+00	3.049E+00	3.278E+00	NOT IDENT.
CD-109	-2.363E+01	8.687E+01	8.752E+01	NOT IDENT.
AG-110	-4.705E+01	7.564E+01	7.857E+01	NOT IDENT.
AG-110M	3.702E+00	5.240E+00	5.499E+00	NOT IDENT.
IN-111	-3.287E+02	1.188E+03	1.197E+03	NOT IDENT.
SN-113	-3.233E+00	5.496E+00	5.686E+00	NOT IDENT.
IN-114M	4.303E+00	2.003E+01	2.012E+01	NOT IDENT.
CD-115	-9.618E+03	2.112E+04	2.156E+04	SHORT HLIF
SN-117M	8.608E+00	9.363E+00	1.014E+01	NOT IDENT.
SB-122	-3.980E+02	2.405E+03	2.411E+03	NOT IDENT.
I-123	7.860E+13	7.988E+13	8.740E+13	SHORT HLIF
TE-123M	3.130E+00	3.226E+00	3.522E+00	NOT IDENT.
SB-124	-2.868E+00	1.077E+01	1.085E+01	NOT IDENT.
SB-125	-3.386E+00	1.071E+01	1.082E+01	NOT IDENT.
TE-125M	4.388E+02	1.101E+03	1.118E+03	NOT IDENT.
I-126	-1.589E+01	4.422E+01	4.480E+01	NOT IDENT.
SB-126	-1.327E+01	2.958E+01	3.018E+01	NOT IDENT.
SN-126	-7.555E+00	8.795E+00	9.433E+00	FAIL ABUN
SB-127	5.094E+02	7.417E+02	7.765E+02	NOT IDENT.
TE-129	-4.715E+01	5.809E+01	6.186E+01	NOT IDENT.
I-131	1.428E+01	2.644E+01	2.721E+01	NOT IDENT.
I-132	-1.000E+41	1.213E+42	0.000E+00	SHORT HLIF
TE-132	-2.431E+02	5.729E+02	5.833E+02	NOT IDENT.
BA-133	9.963E-01	4.181E+00	4.205E+00	NOT IDENT.
I-133	1.391E+08	1.074E+09	1.076E+09	SHORT HLIF
CS-134	-3.907E+00	4.811E+00	5.124E+00	FAIL ABUN
I-135	4.910E+27	1.469E+28	0.000E+00	SHORT HLIF
CS-136	-1.883E+01	1.788E+01	1.979E+01	NOT IDENT.
BA-137M	-1.822E+00	5.377E+00	5.439E+00	NOT IDENT.
CS-137	-1.925E+00	5.680E+00	5.746E+00	NOT IDENT.
LA-138	2.738E-01	5.429E+00	5.431E+00	NOT IDENT.
CE-139	1.824E-01	3.260E+00	3.261E+00	NOT IDENT.
BA-140	2.394E+00	5.512E+01	5.513E+01	FAIL ABUN
LA-140	-5.630E+00	1.248E+01	1.273E+01	NOT IDENT.
CE-141	3.610E+00	7.453E+00	7.629E+00	NOT IDENT.
CE-143	-1.269E+05	1.436E+06	1.437E+06	SHORT HLIF
PM-144	2.953E+00	4.619E+00	4.808E+00	NOT IDENT.
PR-144	2.200E+02	3.472E+02	3.611E+02	NOT IDENT.
PM-146	-3.138E+00	4.536E+00	4.752E+00	NOT IDENT.
ND-147	-8.949E+00	1.019E+02	1.020E+02	NOT IDENT.
PM-147	-5.225E+04	7.747E+04	8.097E+04	NOT IDENT.
PM-149	-1.906E+04	1.815E+05	1.817E+05	SHORT HLIF
EU-152	1.111E+01	1.043E+01	1.157E+01	NOT IDENT.
GD-153	-1.155E+00	1.149E+01	1.150E+01	NOT IDENT.
EU-154	1.038E+01	1.145E+01	1.237E+01	NOT IDENT.
EU-155	-8.247E+00	1.081E+01	1.143E+01	NOT IDENT.
TB-160	1.459E+01	1.602E+01	1.732E+01	NOT IDENT.
HO-166M	2.205E-01	5.513E+00	5.514E+00	FAIL ABUN
TM-171	2.917E+02	3.447E+03	3.449E+03	FAIL ABUN
LU-176	8.183E-01	2.998E+00	3.021E+00	NOT IDENT.
LU-177	-6.093E+01	3.065E+02	3.077E+02	NOT IDENT.
HF-181	-1.583E+00	5.159E+00	5.208E+00	FAIL ABUN
W-181	1.290E+01	3.932E+01	3.975E+01	FAIL ABUN
TA-182	1.671E+01	3.020E+01	3.112E+01	FAIL ABUN
RE-183	-5.424E+00	4.310E+01	4.317E+01	FAIL ABUN
RE-184	-1.095E+00	1.571E+01	1.572E+01	NOT IDENT.
RE-188	-8.317E+00	1.729E+01	1.769E+01	FAIL ABUN

W-188	-1.849E+02	9.805E+02	9.841E+02	FAIL ABUN
OS-191	-5.409E+00	2.493E+01	2.505E+01	FAIL ABUN
IR-192	2.503E+00	3.865E+00	4.027E+00	FAIL ABUN
PB-201	-1.023E+19	3.925E+19	0.000E+00	SHORT HLIF
TL-201	-8.119E+02	5.851E+03	5.863E+03	NOT IDENT.
TL-202	2.806E+00	1.202E+01	1.209E+01	NOT IDENT.
HG-203	2.361E+00	4.468E+00	4.593E+00	NOT IDENT.
PB-203	4.395E+03	8.315E+03	8.548E+03	SHORT HLIF
TL-204	8.584E+01	7.213E+02	7.223E+02	NOT IDENT.
BI-207	3.309E+00	4.633E+00	4.867E+00	FAIL ABUN
PB-210	3.509E+02	9.293E+02	9.427E+02	NOT IDENT.
PB-211	-5.403E+00	7.170E+01	7.175E+01	NOT IDENT.
BI-212	1.268E+01	4.989E+01	5.021E+01	NOT IDENT.
PB-212	5.269E+00	1.601E+01	1.619E+01	FAIL ABUN
BI-213	1.021E+00	1.061E+01	1.062E+01	NOT IDENT.
BI-214	3.031E+00	8.244E+00	8.357E+00	FAIL ABUN
PB-214	2.602E+01	1.876E+01	2.213E+01	FAIL ABUN
RN-219	-1.663E+01	4.140E+01	4.207E+01	NOT IDENT.
FR-221	-1.540E+00	1.969E+01	1.970E+01	NOT IDENT.
RA-223	1.844E+01	6.503E+01	6.556E+01	NOT IDENT.
AC-225	-8.481E+00	1.085E+02	1.085E+02	NOT IDENT.
AC-227	1.682E+01	2.654E+01	2.760E+01	NOT IDENT.
TH-227	1.682E+01	2.654E+01	2.760E+01	NOT IDENT.
AC-228	1.209E+01	1.512E+01	1.607E+01	NOT IDENT.
RA-228	1.209E+01	1.512E+01	1.607E+01	NOT IDENT.
TH-228	5.269E+00	1.601E+01	1.619E+01	FAIL ABUN
TH-229	6.974E+00	4.688E+01	4.699E+01	NOT IDENT.
PA-231	-1.832E+01	4.489E+01	4.565E+01	NOT IDENT.
TH-231	1.627E+01	6.576E+01	6.616E+01	NOT IDENT.
PA-233	1.886E+00	6.690E+00	6.744E+00	NOT IDENT.
PA-234	2.475E+01	3.350E+01	3.531E+01	FAIL ABUN
PA-234M	1.352E+02	4.271E+02	4.315E+02	NOT IDENT.
TH-234	1.604E+02	3.746E+02	3.815E+02	FAIL ABUN
U-234	-6.257E+03	1.286E+04	1.316E+04	NOT IDENT.
NP-237	1.886E+00	6.690E+00	6.744E+00	NOT IDENT.
NP-238	-4.399E+04	4.421E+04	4.846E+04	SHORT HLIF
U-238	1.604E+02	3.746E+02	3.815E+02	FAIL ABUN
NP-239	-5.564E+00	2.661E+01	2.672E+01	NOT IDENT.
AM-241	-2.734E+01	2.816E+01	3.074E+01	NOT IDENT.
AM-242	1.586E+01	8.589E+01	8.618E+01	NOT IDENT.
AM-243	-1.070E+00	7.039E+00	7.055E+00	NOT IDENT.
CM-243	-1.356E+00	1.089E+01	1.090E+01	NOT IDENT.
BK-247	-1.870E+00	7.977E+00	8.021E+00	NOT IDENT.
CM-247	-8.756E-01	3.588E+00	3.609E+00	NOT IDENT.
CF-249	-1.502E+00	4.325E+00	4.378E+00	NOT IDENT.
CF-251	2.699E+00	1.294E+01	1.300E+01	NOT IDENT.
CF-252	-3.303E+03	1.960E+04	1.965E+04	NOT IDENT.
ANH-511	-2.480E+01	8.533E+00	1.407E+01	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	89.9292	80.22	122.7671	117.23	94.8180
45.60	101.2132	80.57	115.9937	119.76	80.8293
46.54	105.0320	81.00	116.0525	120.54	90.6653
49.72	93.2883	81.07	112.6479	53.20	93.3629
51.35	88.6009	82.35	0.0000	121.12	103.1644
52.39	75.1833	82.47	112.8319	121.22	103.1739
53.20	91.3172	82.47	112.8319	121.78	99.6674
53.44	91.3500	323.87	116.4274	122.06	104.1436
56.28	76.8567	84.00	111.3181	123.07	92.6573
57.36	0.0000	84.21	112.2010	123.68	89.1429
57.53	88.1720	84.86	0.0000	127.16	0.0000
57.53	88.1722	85.43	119.2184	127.23	98.3696
57.98	96.0988	86.55	114.2170	129.43	92.4689
59.54	101.2922	879.38	120.2605	131.20	82.1130
61.49	81.1704	87.57	120.2808	482.18	90.3328
155.04	78.4182	87.09	134.0498	133.52	86.3252
63.29	78.4489	87.57	130.6830	135.34	102.6724
63.58	78.4798	88.03	112.6854	264.66	91.9166
63.81	78.5040	88.34	106.7012	136.28	91.9384
64.28	78.5536	193.51	106.7164	122.06	87.8962
129.43	78.6282	91.11	180.3918	140.51	94.0776
65.08	78.6375	91.27	180.4236	63.81	86.8672
66.73	78.8091	63.29	88.1797	143.76	104.3088
66.98	78.8349	184.58	89.9786	144.24	98.9065
67.24	78.8616	94.56	160.2716	145.44	87.1963
67.67	88.1398	94.65	205.3414	152.32	91.3350
67.75	88.1489	94.67	205.3450	152.43	95.9103
68.89	118.5456	97.43	87.7657	153.25	97.8014
68.89	118.5463	311.90	77.4187	154.21	87.8135
69.67	113.6151	946.00	77.4196	155.04	97.0243
167.43	111.2528	99.53	87.9574	156.02	90.6876
70.82	111.2528	1221.41	98.4669	158.56	84.8090
439.51	111.2528	100.20	98.4761	158.97	0.0000
70.83	0.0000	265.00	82.0717	159.00	77.1256
72.81	123.3605	103.18	87.4120	162.33	96.6548
279.20	0.0000	99.53	87.4290	162.66	85.6303
72.87	123.3694	103.37	87.4290	143.76	84.2920
74.66	132.9583	116.74	87.4290	165.86	83.0695
74.82	132.9846	105.31	97.2357	167.43	90.5611
1063.66	133.0094	106.12	83.2869	171.28	81.5538
238.63	113.8190	106.47	82.4389	176.31	96.7383
351.93	113.8190	109.28	82.6674	1048.07	95.8280
79.69	124.3942	111.00	95.1383	177.52	90.3060
79.82	124.4135	228.16	96.0896	739.50	96.6038
80.02	121.8855	112.95	83.8440	711.68	80.4605
80.03	121.8862	116.24	85.8765	184.58	80.4710
80.12	122.7524	116.30	85.8815	185.72	80.5358
80.19	122.7620	116.74	89.4600	186.21	80.5629

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
190.27	66.2307	301.36	59.2065	482.18	38.0135
193.51	71.5569	302.85	65.2764	1596.21	32.6422
197.03	83.0541	304.50	59.3013	527.90	0.0000
127.23	72.7209	537.26	64.3385	497.08	49.1464
306.78	88.0579	306.78	70.4401	511.00	81.2318
204.12	87.2430	316.51	65.4642	514.00	168.1344
205.31	97.7517	311.90	57.5068	520.40	36.3475
208.37	96.9977	316.51	50.5615	238.98	0.0000
210.85	89.5345	531.02	60.7617	522.65	0.0000
215.65	82.1682	320.08	65.8464	527.90	0.0000
218.12	76.5560	427.87	66.8916	520.40	25.4155
222.11	75.7903	323.87	54.8064	529.87	0.0000
290.67	76.9881	325.23	55.8583	531.02	32.0621
177.52	76.0394	328.76	50.8677	537.26	35.4570
228.16	89.5583	331.15	0.0000	546.56	0.0000
228.18	89.5592	388.16	55.0602	552.55	31.1890
235.69	82.7151	334.37	71.4085	563.25	43.6005
256.23	92.8887	338.28	58.2559	564.24	38.0245
238.63	88.1924	338.32	58.2571	795.86	30.2476
238.98	0.0000	340.48	76.7334	569.50	39.2112
240.99	88.3164	340.55	76.7365	569.70	39.2141
242.00	67.0059	344.28	48.1733	204.12	30.3761
344.28	64.1953	345.93	59.4939	583.19	34.8889
245.35	68.5981	351.06	47.2981	595.83	41.8147
250.62	69.2984	351.93	47.3177	600.60	50.9344
252.40	77.1862	356.01	47.4076	604.72	40.8018
252.80	72.3176	331.15	0.0000	609.32	40.8618
256.23	68.5434	364.49	42.4189	497.08	37.4688
260.90	0.0000	366.42	54.8816	433.94	34.1064
264.66	65.9204	383.85	33.3952	696.49	21.6263
265.00	68.8849	388.16	56.4609	621.93	22.7930
269.46	56.2323	388.63	41.8311	667.71	0.0000
271.23	64.1867	391.70	67.0195	475.06	38.8615
273.65	55.3734	400.66	47.3044	632.98	29.7335
356.01	81.2042	401.32	0.0000	453.88	29.7356
277.37	74.3118	401.81	49.4317	595.83	30.8947
277.60	74.3210	402.40	43.1321	635.95	32.0503
278.00	63.4349	404.85	45.2833	636.99	33.2056
459.60	64.4406	410.95	48.5671	657.50	32.2633
279.20	0.0000	414.70	43.3556	657.76	32.2656
279.54	54.5591	423.72	43.5183	661.66	35.7655
280.46	63.5195	404.85	44.6412	664.57	0.0000
283.69	57.6649	427.87	46.2506	666.33	43.9035
364.49	58.6783	433.94	49.0294	720.70	41.5942
285.41	66.6742	439.51	38.4565	667.71	0.0000
285.90	0.0000	440.45	39.5398	884.68	29.2134
402.40	64.2572	453.88	49.4206	685.70	17.4304
290.67	79.3334	459.60	41.9937	564.24	38.4261
293.27	0.0000	463.37	38.8198	695.00	32.6256
295.22	66.0201	468.07	41.0507	696.49	33.2233
295.96	66.0457	685.70	46.5405	696.51	33.2233
298.58	52.6079	475.06	40.0773	697.00	31.4791
299.98	40.6129	476.78	31.4326	697.49	40.2289
300.09	40.6145	477.60	37.9480	702.65	33.2825
300.13	40.6154	477.99	40.1225	706.68	26.6575

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
711.68	24.5880	911.20	21.2845	1312.11	12.6566
720.70	32.5760	923.98	0.0000	1332.49	12.1260
721.93	0.0000	926.36	13.3748	1365.19	8.1323
722.78	23.7857	1434.09	16.3824	1368.63	0.0000
722.91	29.0724	937.49	16.3899	1377.63	0.0000
1274.44	32.5997	944.13	0.0000	1384.29	13.2603
724.19	33.4889	945.96	0.0000	1408.01	16.3887
727.33	26.4624	946.00	0.0000	1434.09	13.3761
733.00	24.7375	949.00	14.9404	1435.80	10.2924
735.93	18.5685	954.55	0.0000	1457.56	0.0000
739.50	26.9071	962.31	19.6702	1460.82	14.4717
744.23	15.5985	964.08	17.9912	696.51	20.7727
747.24	34.0617	966.17	28.5000	1596.21	8.4561
752.31	27.5365	968.97	21.5765	727.33	14.8553
753.82	25.7706	983.53	22.5901	1678.03	0.0000
756.73	23.1229	984.45	0.0000	1690.97	10.7275
763.94	30.2979	996.26	13.2156	1757.55	0.0000
765.80	31.2050	1001.03	17.9551	1764.49	7.4376
766.42	24.0765	1004.73	25.7250	1770.23	10.4215
766.84	25.8626	1025.87	0.0000	1771.35	13.8977
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	22.3541	846.77	18.1024	1808.65	1.0917
777.92	26.8350	1038.76	0.0000	1836.06	8.7681
778.90	25.0529	1046.59	16.2280		
783.70	22.3976	1048.07	18.1430		
788.74	23.3245	621.93	19.1077		
792.07	23.3459	1063.66	12.4557		
795.86	24.2677	1077.00	14.4131		
801.95	18.9056	1077.34	11.5313		
802.10	18.9063	1083.85	12.5096		
810.29	23.4586	1085.87	20.2169		
810.45	20.7525	1099.25	12.5501		
810.76	18.0469	1111.64	18.3912		
815.77	21.6848	1112.07	20.3284		
818.51	18.0835	1112.84	22.2686		
832.01	19.9617	1115.54	14.5303		
834.85	27.2406	609.32	17.4540		
835.15	27.2424	889.28	18.4248		
1260.41	0.0000	1121.30	13.5779		
846.77	10.2006	1129.67	15.5449		
856.80	29.2188	1131.51	0.0000		
860.56	17.5482	1173.23	17.6440		
702.65	22.9095	1177.95	17.6605		
873.19	19.2536	1189.05	15.7324		
529.87	0.0000	1204.77	21.7006		
879.38	21.1196	1221.41	13.8539		
880.51	32.1481	1231.02	13.8804		
881.60	31.2379	1235.36	19.8450		
883.24	24.8165	1238.28	8.9352		
884.68	19.3087	1260.41	0.0000		
889.28	20.2510	1271.87	14.3886		
903.28	21.1996	1274.44	10.9966		
898.04	16.6047	1274.54	10.9966		
903.28	25.8621	1099.25	18.0527		
907.67	0.0000	1298.22	0.0000		

VAX/VMS Nuclide Identification Report Generated 22-JUL-2022 02:54:54.15

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                    *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141122.CNF;1
Background file  : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM36.CNF;317
Background date  : 16-JUL-2022 14:09:01
Sample date      : 21-JUL-2022 00:00:00 Acquisition date : 21-JUL-2022 22:54:38
Sample ID        : G1205141122 Sample quantity : 5.71750E-01 FILTER
Detector name     : GAM36 Detector geometry: JAR
Elapsed live time : 0 04:00:00.00 Elapsed real time: 0 04:00:00.70 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : MJH1
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2290721 Detector SN# :
Matrix Spike ID   : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	62.90*	14	162	1.26	125.42	121	10	9.96E-04	193.9	
2	0	93.29*	15	247	1.06	186.16	181	11	1.02E-03	245.7	
3	0	112.54	34	101	0.68	224.61	222	6	2.35E-03	49.7	
4	0	144.77*	49	220	3.30	289.03	284	11	3.38E-03	63.1	
5	0	186.22*	27	155	1.16	371.86	368	9	1.88E-03	103.4	
6	0	213.63	32	83	1.13	426.63	424	7	2.22E-03	50.4	
7	0	239.23*	33	127	1.09	477.80	474	9	2.32E-03	73.1	
8	0	295.37*	5	96	1.04	590.00	586	8	3.40E-04	389.9	
9	0	377.86	15	37	0.93	754.87	753	6	1.07E-03	67.1	
10	0	464.10	21	30	1.58	927.24	921	10	1.45E-03	53.6	
11	0	511.30*	4	59	2.05	1021.58	1013	17	3.04E-04	597.7	
12	0	609.74*	24	35	1.38	1218.37	1212	13	1.64E-03	65.9	
13	0	623.17	12	11	1.41	1245.22	1242	7	7.99E-04	55.3	
14	0	647.90	12	9	1.16	1294.66	1291	6	8.45E-04	49.8	
15	0	662.22*	10	21	1.93	1323.29	1319	10	6.94E-04	112.7	
16	0	777.79	10	12	0.71	1554.33	1549	13	7.28E-04	69.9	
17	0	936.42	23	19	0.82	1871.51	1865	15	1.58E-03	46.6	
18	0	971.05*	13	15	5.04	1940.77	1935	14	8.97E-04	85.3	
19	0	1092.60	11	11	0.58	2183.85	2177	11	7.95E-04	63.1	
20	0	1117.19	6	5	1.21	2233.03	2229	6	3.82E-04	74.4	
21	0	1172.75*	12	13	3.23	2344.15	2337	17	8.34E-04	81.9	
22	0	1230.35	3	10	0.58	2459.33	2453	10	2.08E-04	205.5	
23	0	1280.07	16	7	4.97	2558.79	2552	13	1.08E-03	42.4	
24	0	1452.73	6	0	1.37	2904.17	2901	6	4.17E-04	40.8	
25	0	1461.88*	2	10	0.86	2922.47	2914	12	1.73E-04	369.5	
26	0	1521.58	6	4	1.19	3041.91	3037	7	3.82E-04	70.7	
27	0	1592.96	14	3	1.32	3184.71	3178	11	9.76E-04	35.3	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 22-JUL-2022 02:54:54

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141122.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 21-JUL-2022 00:00:00	Acquisition date	: 21-JUL-2022 22:54:38
Sample ID	: G1205141122	Sample quantity	: 0.57175 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA36	Detector geometry	: JAR
Elapsed live time	: 0 04:00:00.00	Elapsed real time	: 0 04:00:00.70 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	2	10.66*	4.952E-01	1.553E+01	1.553E+01	739.06
SR-82	776.52	10	15.08*	8.978E-01	2.540E+01	2.613E+01	139.87
RH-106	621.93	12	9.93*	1.105E+00	3.441E+01	3.447E+01	110.51
	1050.41	-----	1.56	6.713E-01	-----	Line Not Found	-----
RU-106	621.93	12	9.93*	1.105E+00	3.441E+01	3.447E+01	110.51
	1050.41	-----	1.56	6.713E-01	-----	Line Not Found	-----
BA-137M	661.66	10	89.90*	1.045E+00	3.492E+00	3.492E+00	225.46
CS-137	661.66	10	85.10*	1.045E+00	3.689E+00	3.689E+00	225.46
CE-141	145.44	49	48.29*	3.439E+00	9.621E+00	9.836E+00	126.22
RA-226	186.21	27	3.59*	3.022E+00	8.202E+01	8.202E+01	206.84
TH-232	63.81	14	0.26*	1.421E+00	1.275E+03	1.275E+03	387.88
	140.88	-----	0.02	3.469E+00	-----	Line Not Found	-----
TH-234	63.29	14	3.70*	1.421E+00	8.957E+01	8.957E+01	387.88
	92.59	15	4.23	3.155E+00	3.630E+01	3.630E+01	491.36
U-235	143.76	49	10.96*	3.439E+00	4.239E+01	4.239E+01	126.22
	163.33	-----	5.08	3.264E+00	-----	Line Not Found	-----
	185.72	27	57.20	3.022E+00	5.148E+00	5.148E+00	206.84
	205.31	-----	5.01	2.826E+00	-----	Line Not Found	-----
U-238	63.29	14	3.70*	1.421E+00	8.957E+01	8.957E+01	387.88
	92.59	15	4.23	3.155E+00	3.630E+01	3.630E+01	491.36
ANH-511	511.00	4	100.00*	1.321E+00	1.087E+00	1.087E+00	1195.45

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141122.CNF;1
Acquisition date : 21-JUL-2022 22:54:38 Sensitivity : 3.000
Detector ID : GAM36 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:00.70 Half life ratio : *****
Sample date : 21-JUL-2022 00:00:00 Analyst initials: MJH1
Sample ID : G1205141122 Sample Quantity : 5.7175E-01 FILTER
Batch Number : 2290721 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 20-SEP-2021 05:19:44 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM36_JAR.CNF;13

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
K-40	1.553E+01	1.125E+02	8.095E+01
SR-82	2.613E+01	3.582E+01	5.427E+01
RH-106	3.447E+01	3.734E+01	8.351E+01
RU-106	3.447E+01	3.734E+01	8.351E+01
BA-137M	3.492E+00	7.716E+00	7.832E+00
CS-137	3.689E+00	8.151E+00	8.274E+00
CE-141	9.836E+00	1.217E+01	9.156E+00
RA-226	8.202E+01	1.663E+02	1.391E+02
TH-232	1.275E+03	4.845E+03	3.212E+03
TH-234	8.957E+01	3.405E+02	2.317E+02
U-235	4.239E+01	5.243E+01	3.926E+01
U-238	8.957E+01	3.405E+02	2.317E+02
ANH-511	1.087E+00	1.273E+01	6.101E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	-2.829E+00	3.100E+01	5.887E+01	NOT IDENT.
NA-22	6.484E+00	4.431E+00	1.128E+01	NOT IDENT.
NA-24	7.022E+00	1.586E+01	3.485E+01	NOT IDENT.
AL-26	2.301E+00	3.450E+00	9.330E+00	NOT IDENT.
SC-46	-1.423E+00	3.863E+00	6.899E+00	NOT IDENT.
V-48	5.877E-01	4.529E+00	8.864E+00	NOT IDENT.
CR-51	-1.384E+01	3.792E+01	6.291E+01	NOT IDENT.
MN-52	1.811E+00	4.637E+00	1.070E+01	FAIL ABUN
MN-54	-6.933E-01	4.488E+00	8.240E+00	NOT IDENT.
CO-56	-1.982E+00	5.474E+00	9.201E+00	NOT IDENT.
CO-57	1.836E+00	2.845E+00	5.345E+00	NOT IDENT.
NI-57	4.983E-01	1.130E+01	2.270E+01	NOT IDENT.
CO-58	2.524E+00	4.769E+00	9.579E+00	NOT IDENT.
FE-59	-4.923E+00	7.309E+00	1.313E+01	NOT IDENT.
CO-60	6.986E-01	5.572E+00	1.136E+01	FAIL ABUN
ZN-65	1.411E+00	1.020E+01	1.890E+01	NOT IDENT.
CU-67	-1.743E+01	1.124E+01	1.424E+01	FAIL ABUN

GE-68	-5.324E+01	1.472E+02	2.797E+02	NOT IDENT.
AS-73	7.608E+01	9.294E+01	1.857E+02	NOT IDENT.
AS-74	2.636E+00	6.339E+00	1.273E+01	NOT IDENT.
SE-75	1.889E+00	5.452E+00	9.786E+00	NOT IDENT.
BR-77	2.551E+01	3.657E+01	4.353E+01	FAIL ABUN
RB-83	2.474E+00	8.301E+00	1.623E+01	NOT IDENT.
RB-84	9.335E-01	7.204E+00	1.373E+01	NOT IDENT.
KR-85	1.269E+03	9.830E+02	1.948E+03	NOT IDENT.
SR-85	5.746E+00	4.451E+00	8.822E+00	NOT IDENT.
RB-86	-1.706E+01	5.551E+01	1.067E+02	NOT IDENT.
Y-88	-1.071E+00	4.834E+00	9.493E+00	NOT IDENT.
Y-91	3.225E+02	2.175E+03	4.411E+03	NOT IDENT.
NB-94	-7.142E+00	6.286E+00	7.132E+00	NOT IDENT.
NB-95	-3.881E+00	4.690E+00	7.682E+00	NOT IDENT.
NB-95M	2.338E+00	1.295E+01	2.135E+01	NOT IDENT.
TC-95M	1.284E+00	4.612E+00	8.284E+00	NOT IDENT.
ZR-95	1.078E+00	7.032E+00	1.380E+01	NOT IDENT.
MO-99	3.864E+00	4.043E+01	7.852E+01	FAIL ABUN
TC-99M	3.045E+01	5.388E+01	9.329E+01	NOT IDENT.
RH-101	-2.396E+00	3.555E+00	6.109E+00	NOT IDENT.
RH-102M	2.344E+00	3.477E+00	7.122E+00	NOT IDENT.
RU-103	1.391E+00	4.092E+00	8.027E+00	FAIL ABUN
AG-108M	-4.931E-01	3.717E+00	6.991E+00	NOT IDENT.
CD-109	-1.017E+02	9.222E+01	1.224E+02	NOT IDENT.
AG-110	9.776E+01	7.797E+01	1.689E+02	NOT IDENT.
AG-110M	-7.484E-01	6.678E+00	1.226E+01	FAIL ABUN
IN-111	-2.371E+00	4.329E+00	7.190E+00	NOT IDENT.
SN-113	4.874E-01	5.404E+00	1.033E+01	NOT IDENT.
IN-114M	8.000E+00	1.901E+01	3.229E+01	NOT IDENT.
CD-115	-4.230E+00	1.691E+01	3.136E+01	NOT IDENT.
SN-117M	1.246E+00	3.102E+00	5.681E+00	NOT IDENT.
SB-122	-6.760E-01	6.705E+00	1.259E+01	NOT IDENT.
I-123	5.597E+00	1.134E+01	2.089E+01	NOT IDENT.
TE-123M	1.537E+00	3.073E+00	5.661E+00	NOT IDENT.
SB-124	-5.028E+00	8.394E+00	1.463E+01	NOT IDENT.
SB-125	1.130E+01	1.195E+01	2.453E+01	FAIL ABUN
TE-125M	1.315E+03	8.011E+02	1.571E+03	NOT IDENT.
I-126	-3.047E+00	1.504E+01	2.440E+01	NOT IDENT.
SB-126	-4.744E+00	7.947E+00	1.367E+01	NOT IDENT.
SN-126	-2.675E+00	9.075E+00	1.284E+01	FAIL ABUN
SB-127	-1.086E+01	1.327E+01	2.205E+01	NOT IDENT.
TE-129	-6.003E+00	4.574E+01	7.754E+01	NOT IDENT.
I-131	-3.597E+00	4.674E+00	7.303E+00	NOT IDENT.
I-132	9.990E+02	7.168E+03	1.323E+04	NOT IDENT.
TE-132	-4.844E+00	5.132E+00	7.309E+00	FAIL ABUN
BA-133	-1.294E+00	5.763E+00	9.676E+00	NOT IDENT.
I-133	2.796E+00	8.571E+00	1.712E+01	NOT IDENT.
CS-134	-3.462E+00	5.135E+00	8.612E+00	NOT IDENT.
I-135	-7.951E+01	2.118E+02	4.032E+02	NOT IDENT.
CS-136	-2.695E-02	6.647E+00	1.245E+01	NOT IDENT.
LA-138	2.812E+00	6.905E+00	1.557E+01	NOT IDENT.
CE-139	1.649E-01	3.146E+00	5.625E+00	NOT IDENT.
BA-140	6.857E+00	1.663E+01	3.281E+01	NOT IDENT.
LA-140	5.304E+00	5.124E+00	1.273E+01	NOT IDENT.
CE-143	2.538E-01	1.350E+01	2.169E+01	NOT IDENT.
CE-144	-6.021E+00	2.304E+01	4.059E+01	NOT IDENT.
PM-144	1.284E-01	4.849E+00	9.032E+00	NOT IDENT.
PR-144	1.053E+01	3.604E+02	6.714E+02	NOT IDENT.
PM-146	-1.230E+00	5.447E+00	1.011E+01	NOT IDENT.
ND-147	-9.920E+00	2.774E+01	5.068E+01	NOT IDENT.
PM-147	-7.083E+04	8.735E+04	1.491E+05	NOT IDENT.
PM-149	1.543E+01	1.373E+02	2.424E+02	NOT IDENT.
EU-152	7.025E+00	1.407E+01	2.537E+01	FAIL ABUN
GD-153	6.351E+00	9.051E+00	1.628E+01	NOT IDENT.
EU-154	1.884E+01	1.273E+01	3.240E+01	NOT IDENT.
EU-155	1.324E+00	1.098E+01	2.021E+01	NOT IDENT.
TB-160	4.018E-01	1.596E+01	3.001E+01	NOT IDENT.
HO-166M	6.900E+00	8.095E+00	1.682E+01	NOT IDENT.
TM-171	-1.515E+03	2.329E+03	4.210E+03	NOT IDENT.
LU-176	-2.049E+00	3.872E+00	6.331E+00	NOT IDENT.
LU-177	-4.229E+00	3.291E+01	5.710E+01	FAIL ABUN
HF-181	7.674E-01	4.234E+00	8.247E+00	NOT IDENT.
W-181	-9.256E+00	2.012E+01	3.687E+01	NOT IDENT.
TA-182	-1.698E+00	1.406E+01	2.897E+01	FAIL ABUN
RE-183	-8.126E+00	1.843E+01	3.381E+01	NOT IDENT.
RE-184	7.146E+00	1.254E+01	2.569E+01	NOT IDENT.
RE-188	-7.477E+00	2.083E+01	2.965E+01	FAIL ABUN
W-188	-1.717E+02	7.804E+02	1.330E+03	FAIL ABUN

OS-191	2.819E+00	9.314E+00	1.713E+01	FAIL ABUN
IR-192	-1.018E+00	3.832E+00	6.473E+00	FAIL ABUN
PB-201	-1.278E+01	2.913E+01	4.789E+01	NOT IDENT.
TL-201	2.483E+01	3.229E+01	6.059E+01	NOT IDENT.
TL-202	-6.871E-01	3.776E+00	7.082E+00	NOT IDENT.
HG-203	-1.394E+00	4.073E+00	6.845E+00	NOT IDENT.
PB-203	-1.930E+00	5.638E+00	9.475E+00	NOT IDENT.
TL-204	-3.275E+02	4.977E+02	8.855E+02	NOT IDENT.
BI-207	2.301E+00	6.047E+00	1.298E+01	NOT IDENT.
TL-208	-1.045E+01	6.712E+00	9.399E+00	NOT IDENT.
PB-210	1.944E+02	5.185E+02	1.007E+03	NOT IDENT.
BI-211	-3.282E+01	3.573E+01	5.481E+01	NOT IDENT.
PB-211	-6.717E+00	8.820E+01	1.669E+02	NOT IDENT.
BI-212	1.488E+01	6.746E+01	1.300E+02	NOT IDENT.
PB-212	9.997E+00	1.433E+01	1.673E+01	FAIL ABUN
BI-213	-3.970E+00	1.255E+01	2.321E+01	NOT IDENT.
BI-214	1.514E+01	1.955E+01	2.730E+01	FAIL ABUN
PB-214	-3.734E+00	1.299E+01	2.120E+01	FAIL ABUN
RN-219	-2.004E+01	6.337E+01	9.791E+01	NOT IDENT.
FR-221	1.265E+01	2.884E+01	5.184E+01	NOT IDENT.
RA-223	2.659E+00	8.618E+01	1.495E+02	FAIL ABUN
RA-224	5.244E+00	8.817E+01	1.422E+02	NOT IDENT.
AC-225	1.359E+01	3.099E+01	5.570E+01	NOT IDENT.
AC-227	3.408E+01	3.442E+01	6.472E+01	NOT IDENT.
TH-227	3.408E+01	3.442E+01	6.472E+01	NOT IDENT.
AC-228	-7.695E+00	2.574E+01	4.339E+01	NOT IDENT.
RA-228	-7.695E+00	2.574E+01	4.339E+01	NOT IDENT.
TH-228	9.997E+00	1.433E+01	1.673E+01	FAIL ABUN
TH-229	-6.994E+00	6.126E+01	1.073E+02	NOT IDENT.
TH-230	-7.812E+02	1.344E+03	2.016E+03	NOT IDENT.
PA-231	5.380E+00	6.131E+01	1.074E+02	NOT IDENT.
TH-231	-1.110E+01	5.435E+01	7.888E+01	NOT IDENT.
PA-233	-6.222E+00	9.389E+00	1.511E+01	FAIL ABUN
PA-234	2.006E+01	3.209E+01	6.975E+01	FAIL ABUN
PA-234M	-5.735E+02	7.037E+02	1.054E+03	NOT IDENT.
U-234	4.056E+03	8.102E+03	1.587E+04	NOT IDENT.
NP-237	-6.222E+00	9.389E+00	1.511E+01	FAIL ABUN
NP-238	-6.374E+00	2.348E+01	4.246E+01	NOT IDENT.
NP-239	-6.467E-01	2.878E+01	5.215E+01	NOT IDENT.
AM-241	5.497E+00	1.563E+01	2.869E+01	NOT IDENT.
AM-242	-3.041E+01	6.615E+01	1.173E+02	NOT IDENT.
AM-243	-2.758E+00	6.451E+00	9.817E+00	NOT IDENT.
CM-243	-3.570E+00	1.146E+01	2.048E+01	NOT IDENT.
BK-247	9.948E+00	1.030E+01	1.952E+01	NOT IDENT.
CM-247	-5.047E+00	5.809E+00	8.404E+00	NOT IDENT.
CF-249	5.845E+00	5.315E+00	1.096E+01	NOT IDENT.
CF-251	-1.677E+00	1.464E+01	2.578E+01	NOT IDENT.
CF-252	-7.002E+03	1.838E+04	3.276E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	62.90	74	162	1.26	125.42	121	10	5.16E-03	34.0	
2	0	93.29	132	247	1.06	186.16	181	11	9.17E-03	24.7	
3	0	112.54	34	101	0.68	224.61	222	6	2.35E-03	49.7	
4	0	144.77	59	220	3.30	289.03	284	11	4.10E-03	50.4	
5	0	186.22	103	155	1.16	371.86	368	9	7.17E-03	24.0	
6	0	213.63	32	83	1.13	426.63	424	7	2.22E-03	50.4	
7	0	239.23	85	127	1.09	477.80	474	9	5.87E-03	26.3	
8	0	295.37	20	96	1.04	590.00	586	8	1.39E-03	87.7	
9	0	352.35	16	76	1.00	703.88	702	8	1.13E-03	98.0	
10	0	377.86	15	37	0.93	754.87	753	6	1.07E-03	67.1	
11	0	464.10	21	30	1.58	927.24	921	10	1.45E-03	53.6	
12	0	511.30	204	59	2.05	1021.58	1013	17	1.41E-02	11.2	
13	0	609.74	66	35	1.38	1218.37	1212	13	4.59E-03	22.3	
14	0	623.17	12	11	1.41	1245.22	1242	7	7.99E-04	55.3	
15	0	647.90	12	9	1.16	1294.66	1291	6	8.45E-04	49.8	
16	0	662.22	27	21	1.93	1323.29	1319	10	1.89E-03	36.4	
17	0	777.79	10	12	0.71	1554.33	1549	13	7.28E-04	69.9	
18	0	936.42	23	19	0.82	1871.51	1865	15	1.58E-03	46.6	
19	0	971.05	23	15	5.04	1940.77	1935	14	1.60E-03	43.1	
20	0	1092.60	11	11	0.58	2183.85	2177	11	7.95E-04	63.1	
21	0	1117.19	6	5	1.21	2233.03	2229	6	3.82E-04	74.4	
22	0	1172.75	16	13	3.23	2344.15	2337	17	1.09E-03	58.0	
23	0	1230.35	3	10	0.58	2459.33	2453	10	2.08E-04	205.5	
24	0	1280.07	16	7	4.97	2558.79	2552	13	1.08E-03	42.4	
25	0	1452.73	6	0	1.37	2904.17	2901	6	4.17E-04	40.8	
26	0	1461.88	22	10	0.86	2922.47	2914	12	1.56E-03	34.2	
27	0	1521.58	6	4	1.19	3041.91	3037	7	3.82E-04	70.7	
28	0	1592.96	14	3	1.32	3184.71	3178	11	9.76E-04	35.3	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	2	10.66*	4.952E-01	1.553E+01	1.553E+01	739.06
SR-82	776.52	10	15.08*	8.978E-01	2.540E+01	2.613E+01	139.87
RH-106	621.93	12	9.93*	1.105E+00	3.441E+01	3.447E+01	110.51
	1050.41	-----	1.56	6.713E-01	-----	Line Not Found	-----
RU-106	621.93	12	9.93*	1.105E+00	3.441E+01	3.447E+01	110.51
	1050.41	-----	1.56	6.713E-01	-----	Line Not Found	-----
BA-137M	661.66	10	89.90*	1.045E+00	3.492E+00	3.492E+00	225.46
CS-137	661.66	10	85.10*	1.045E+00	3.689E+00	3.689E+00	225.46
CE-141	145.44	49	48.29*	3.439E+00	9.621E+00	9.836E+00	126.22
RA-226	186.21	27	3.59*	3.022E+00	8.202E+01	8.202E+01	206.84
TH-232	63.81	14	0.26*	1.421E+00	1.275E+03	1.275E+03	387.88
	140.88	-----	0.02	3.469E+00	-----	Line Not Found	-----
TH-234	63.29	14	3.70*	1.421E+00	8.957E+01	8.957E+01	387.88
	92.59	15	4.23	3.155E+00	3.630E+01	3.630E+01	491.36
U-235	143.76	49	10.96*	3.439E+00	4.239E+01	4.239E+01	126.22
	163.33	-----	5.08	3.264E+00	-----	Line Not Found	-----
	185.72	27	57.20	3.022E+00	5.148E+00	5.148E+00	206.84
	205.31	-----	5.01	2.826E+00	-----	Line Not Found	-----
U-238	63.29	14	3.70*	1.421E+00	8.957E+01	8.957E+01	387.88
	92.59	15	4.23	3.155E+00	3.630E+01	3.630E+01	491.36
ANH-511	511.00	4	100.00*	1.321E+00	1.087E+00	1.087E+00	1195.45

Flag: "*" = Keyline

Total number of lines in spectrum 27
Number of unidentified lines 10
Number of lines tentatively identified by NID 17 62.96%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
K-40	1.25E+09Y	1.00	1.553E+01	1.553E+01	11.48E+01	739.06	
SR-82	25.35D	1.03	2.540E+01	2.613E+01	3.655E+01	139.87	
RH-106	371.80D	1.00	3.441E+01	3.447E+01	3.810E+01	110.51	
RU-106	371.80D	1.00	3.441E+01	3.447E+01	3.810E+01	110.51	
BA-137M	30.08Y	1.00	3.492E+00	3.492E+00	7.873E+00	225.46	
CS-137	30.08Y	1.00	3.689E+00	3.689E+00	8.317E+00	225.46	
CE-141	32.51D	1.02	9.621E+00	9.836E+00	12.41E+00	126.22	
RA-226	1600.00Y	1.00	8.202E+01	8.202E+01	16.97E+01	206.84	
TH-232	1.41E+10Y	1.00	1.275E+03	1.275E+03	4.944E+03	387.88	
TH-234	4.47E+09Y	1.00	8.957E+01	8.957E+01	34.74E+01	387.88	
U-235	7.04E+08Y	1.00	4.239E+01	4.239E+01	5.350E+01	126.22	
U-238	4.47E+09Y	1.00	8.957E+01	8.957E+01	34.74E+01	387.88	
ANH-511	1.00E+09Y	1.00	1.087E+00	1.087E+00	12.99E+00	1195.45	
Total Activity :			1.706E+03	1.707E+03			

Grand Total Activity : 1.706E+03 1.707E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	112.54	34	101	0.68	224.61	222	6	2.35E-03	99.4	3.51E+00	T
0	213.63	32	83	1.13	426.63	424	7	2.22E-03	****	2.75E+00	
0	239.23	33	127	1.09	477.80	474	9	2.32E-03	****	2.52E+00	T
0	295.37	5	96	1.04	590.00	586	8	3.40E-04	****	2.12E+00	T
0	377.86	15	37	0.93	754.87	753	6	1.07E-03	****	1.72E+00	
0	464.10	21	30	1.58	927.24	921	10	1.45E-03	****	1.44E+00	T
0	609.74	24	35	1.38	1218.37	1212	13	1.64E-03	****	1.13E+00	T
0	647.90	12	9	1.16	1294.66	1291	6	8.45E-04	99.7	1.07E+00	
0	936.42	23	19	0.82	1871.51	1865	15	1.58E-03	93.2	7.51E-01	T
0	971.05	13	15	5.04	1940.77	1935	14	8.97E-04	****	7.25E-01	
0	1092.60	11	11	0.58	2183.85	2177	11	7.95E-04	****	6.46E-01	
0	1117.19	6	5	1.21	2233.03	2229	6	3.82E-04	****	6.33E-01	
0	1172.75	12	13	3.23	2344.15	2337	17	8.34E-04	****	6.04E-01	T
0	1230.35	3	10	0.58	2459.33	2453	10	2.08E-04	****	5.77E-01	T
0	1280.07	16	7	4.97	2558.79	2552	13	1.08E-03	84.7	5.56E-01	
0	1452.73	6	0	1.37	2904.17	2901	6	4.17E-04	81.6	4.98E-01	
0	1521.58	6	4	1.19	3041.91	3037	7	3.82E-04	****	4.79E-01	
0	1592.96	14	3	1.32	3184.71	3178	11	9.76E-04	70.5	4.63E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141122.CNF;1
* Acquisition date   : 21-JUL-2022 22:54:38 Sensitivity      : 3.000
* Detector ID        : GAM36 Energy tolerance: 1.500
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 04:00:00.70 Half life ratio : *****
* Sample date        : 21-JUL-2022 00:00:00 Nuclide Library : LIQUID
* Sample ID          : G1205141122 Analyst initials: MJH1
* Batch Number       : 2290721 Sample Quantity : 5.7175E-01 FILTER
* Wet wt corr        : 1.00000 Wet Weight : 0.00000
*                                     Dry Weight : 0.00000
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 20-SEP-2021 05:19:44 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM36_JAR.CNF;13
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
K-40	3.207E+01
SR-82	2.377E+01
RH-106	3.772E+01
RU-106	3.772E+01
BA-137M	3.445E+00
CS-137	3.639E+00
CE-141	4.306E+00
RA-226	6.551E+01
TH-232	1.492E+03
TH-234	1.076E+02
U-235	1.846E+01
U-238	1.076E+02
ANH-511	2.716E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	2.637E+01	NOT IDENT.
NA-22	4.843E+00	NOT IDENT.
NA-24	1.475E+01	NOT IDENT.
AL-26	3.618E+00	NOT IDENT.
SC-46	2.883E+00	NOT IDENT.
V-48	3.784E+00	NOT IDENT.
CR-51	2.915E+01	NOT IDENT.
MN-52	4.349E+00	FAIL ABUN
MN-54	3.591E+00	NOT IDENT.
CO-56	4.060E+00	NOT IDENT.
CO-57	2.527E+00	NOT IDENT.
NI-57	9.660E+00	NOT IDENT.
CO-58	4.268E+00	NOT IDENT.
FE-59	5.322E+00	NOT IDENT.
CO-60	4.852E+00	FAIL ABUN
ZN-65	8.061E+00	NOT IDENT.
CU-67	6.724E+00	FAIL ABUN
GE-68	1.188E+02	NOT IDENT.

AS-73	8.692E+01	NOT IDENT.
AS-74	5.686E+00	NOT IDENT.
SE-75	4.568E+00	NOT IDENT.
BR-77	2.074E+01	FAIL ABUN
RB-83	7.352E+00	NOT IDENT.
RB-84	6.039E+00	NOT IDENT.
KR-85	8.960E+02	NOT IDENT.
SR-85	4.057E+00	NOT IDENT.
RB-86	4.522E+01	NOT IDENT.
Y-88	3.678E+00	NOT IDENT.
Y-91	1.912E+03	NOT IDENT.
NB-94	3.117E+00	NOT IDENT.
NB-95	3.349E+00	NOT IDENT.
NB-95M	9.970E+00	NOT IDENT.
TC-95M	3.894E+00	NOT IDENT.
ZR-95	6.006E+00	NOT IDENT.
MO-99	3.422E+01	FAIL ABUN
TC-99M	4.416E+01	NOT IDENT.
RH-101	2.871E+00	NOT IDENT.
RH-102M	3.231E+00	NOT IDENT.
RU-103	3.648E+00	FAIL ABUN
AG-108M	3.175E+00	NOT IDENT.
CD-109	5.720E+01	NOT IDENT.
AG-110	7.509E+01	NOT IDENT.
AG-110M	5.359E+00	FAIL ABUN
IN-111	3.349E+00	NOT IDENT.
SN-113	4.756E+00	NOT IDENT.
IN-114M	1.518E+01	NOT IDENT.
CD-115	1.395E+01	NOT IDENT.
SN-117M	2.678E+00	NOT IDENT.
SB-122	5.622E+00	NOT IDENT.
I-123	9.854E+00	NOT IDENT.
TE-123M	2.671E+00	NOT IDENT.
SB-124	5.183E+00	NOT IDENT.
SB-125	1.131E+01	FAIL ABUN
TE-125M	7.378E+02	NOT IDENT.
I-126	1.083E+01	NOT IDENT.
SB-126	5.932E+00	NOT IDENT.
SN-126	6.016E+00	FAIL ABUN
SB-127	9.592E+00	NOT IDENT.
TE-129	3.473E+01	NOT IDENT.
I-131	3.317E+00	NOT IDENT.
I-132	5.874E+03	NOT IDENT.
TE-132	3.414E+00	FAIL ABUN
BA-133	4.444E+00	NOT IDENT.
I-133	7.651E+00	NOT IDENT.
CS-134	3.715E+00	NOT IDENT.
I-135	1.641E+02	NOT IDENT.
CS-136	5.357E+00	NOT IDENT.
LA-138	6.440E+00	NOT IDENT.
CE-139	2.642E+00	NOT IDENT.
BA-140	1.489E+01	NOT IDENT.
LA-140	5.301E+00	NOT IDENT.
CE-143	1.003E+01	NOT IDENT.
CE-144	1.916E+01	NOT IDENT.
PM-144	4.069E+00	NOT IDENT.
PR-144	3.025E+02	NOT IDENT.
PM-146	4.590E+00	NOT IDENT.
ND-147	2.252E+01	NOT IDENT.
PM-147	7.016E+04	NOT IDENT.
PM-149	1.121E+02	NOT IDENT.
EU-152	1.179E+01	FAIL ABUN
GD-153	7.677E+00	NOT IDENT.
EU-154	1.393E+01	NOT IDENT.
EU-155	9.496E+00	NOT IDENT.
TB-160	1.314E+01	NOT IDENT.
HO-166M	7.575E+00	NOT IDENT.
TM-171	1.962E+03	NOT IDENT.
LU-176	2.936E+00	NOT IDENT.
LU-177	2.686E+01	FAIL ABUN
HF-181	3.722E+00	NOT IDENT.
W-181	1.707E+01	NOT IDENT.
TA-182	1.164E+01	FAIL ABUN
RE-183	1.566E+01	NOT IDENT.
RE-184	1.132E+01	NOT IDENT.
RE-188	1.397E+01	FAIL ABUN
W-188	6.131E+02	FAIL ABUN
OS-191	8.072E+00	FAIL ABUN

IR-192	2.967E+00	FAIL ABUN
PB-201	2.205E+01	NOT IDENT.
TL-201	2.856E+01	NOT IDENT.
TL-202	3.201E+00	NOT IDENT.
HG-203	3.175E+00	NOT IDENT.
PB-203	4.395E+00	NOT IDENT.
TL-204	4.149E+02	NOT IDENT.
BI-207	5.594E+00	NOT IDENT.
TL-208	4.256E+00	NOT IDENT.
PB-210	4.720E+02	NOT IDENT.
BI-211	2.554E+01	NOT IDENT.
PB-211	7.621E+01	NOT IDENT.
BI-212	5.805E+01	NOT IDENT.
PB-212	7.964E+00	FAIL ABUN
BI-213	1.047E+01	NOT IDENT.
BI-214	1.279E+01	FAIL ABUN
PB-214	9.924E+00	FAIL ABUN
RN-219	4.485E+01	NOT IDENT.
FR-221	2.449E+01	NOT IDENT.
RA-223	6.909E+01	FAIL ABUN
RA-224	6.679E+01	NOT IDENT.
AC-225	2.632E+01	NOT IDENT.
AC-227	3.041E+01	NOT IDENT.
TH-227	3.041E+01	NOT IDENT.
AC-228	1.947E+01	NOT IDENT.
RA-228	1.947E+01	NOT IDENT.
TH-228	7.964E+00	FAIL ABUN
TH-229	5.026E+01	NOT IDENT.
TH-230	9.429E+02	NOT IDENT.
PA-231	4.972E+01	NOT IDENT.
TH-231	3.706E+01	NOT IDENT.
PA-233	6.991E+00	FAIL ABUN
PA-234	2.991E+01	FAIL ABUN
PA-234M	4.518E+02	NOT IDENT.
U-234	7.418E+03	NOT IDENT.
NP-237	6.991E+00	FAIL ABUN
NP-238	1.777E+01	NOT IDENT.
NP-239	2.450E+01	NOT IDENT.
AM-241	1.329E+01	NOT IDENT.
AM-242	5.496E+01	NOT IDENT.
AM-243	4.619E+00	NOT IDENT.
CM-243	9.617E+00	NOT IDENT.
BK-247	9.125E+00	NOT IDENT.
CM-247	3.825E+00	NOT IDENT.
CF-249	5.083E+00	NOT IDENT.
CF-251	1.207E+01	NOT IDENT.
CF-252	1.536E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141122.CNF;1
* Acquisition date   : 21-JUL-2022 22:54:38 Sensitivity      : 3.000
* Detector ID        : GAM36 Energy tolerance: 1.500
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 04:00:00.70 Half life ratio  : *****
* Sample date        : 21-JUL-2022 00:00:00 Nuclide Library : LIQUID
* Sample ID          : G1205141122 Analyst initials: MJH1
* Batch Number       : 2290721 Sample Quantity : 5.7175E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 20-SEP-2021 05:19:44 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM36_JAR.CNF;13

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
K-40	1.553E+01	1.125E+02	1.125E+02
SR-82	2.613E+01	3.589E+01	3.589E+01
RH-106	3.447E+01	3.749E+01	3.749E+01
RU-106	3.447E+01	3.749E+01	3.749E+01
BA-137M	3.492E+00	7.721E+00	7.722E+00
CS-137	3.689E+00	8.157E+00	8.157E+00
CE-141	9.836E+00	1.219E+01	1.219E+01
RA-226	8.202E+01	1.664E+02	1.664E+02
TH-232	1.275E+03	4.849E+03	4.849E+03
TH-234	8.957E+01	3.411E+02	3.411E+02
U-235	4.239E+01	5.255E+01	5.256E+01
U-238	8.957E+01	3.411E+02	3.411E+02
ANH-511	1.087E+00	1.273E+01	1.273E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	-2.829E+00	3.100E+01	3.102E+01	NOT IDENT.
NA-22	6.484E+00	4.465E+00	5.338E+00	NOT IDENT.
NA-24	7.022E+00	1.588E+01	1.619E+01	NOT IDENT.
AL-26	2.301E+00	3.455E+00	3.607E+00	NOT IDENT.
SC-46	-1.423E+00	3.865E+00	3.918E+00	NOT IDENT.
V-48	5.877E-01	4.529E+00	4.537E+00	NOT IDENT.
CR-51	-1.384E+01	3.795E+01	3.846E+01	NOT IDENT.
MN-52	1.811E+00	4.640E+00	4.712E+00	FAIL ABUN
MN-54	-6.933E-01	4.489E+00	4.499E+00	NOT IDENT.
CO-56	-1.982E+00	5.476E+00	5.549E+00	NOT IDENT.
CO-57	1.836E+00	2.849E+00	2.967E+00	NOT IDENT.
NI-57	4.983E-01	1.130E+01	1.130E+01	NOT IDENT.
CO-58	2.524E+00	4.773E+00	4.907E+00	NOT IDENT.
FE-59	-4.923E+00	7.326E+00	7.656E+00	NOT IDENT.
CO-60	6.986E-01	5.573E+00	5.582E+00	FAIL ABUN
ZN-65	1.411E+00	1.020E+01	1.022E+01	NOT IDENT.
CU-67	-1.743E+01	1.134E+01	1.380E+01	FAIL ABUN

GE-68	-5.324E+01	1.473E+02	1.492E+02	NOT IDENT.
AS-73	7.608E+01	9.456E+01	1.006E+02	NOT IDENT.
AS-74	2.636E+00	6.346E+00	6.456E+00	NOT IDENT.
SE-75	1.889E+00	5.456E+00	5.522E+00	NOT IDENT.
BR-77	2.551E+01	3.664E+01	3.841E+01	FAIL ABUN
RB-83	2.474E+00	8.310E+00	8.385E+00	NOT IDENT.
RB-84	9.335E-01	7.204E+00	7.217E+00	NOT IDENT.
KR-85	1.269E+03	9.894E+02	1.143E+03	NOT IDENT.
SR-85	5.746E+00	4.480E+00	5.176E+00	NOT IDENT.
RB-86	-1.706E+01	5.552E+01	5.605E+01	NOT IDENT.
Y-88	-1.071E+00	4.834E+00	4.858E+00	NOT IDENT.
Y-91	3.225E+02	2.176E+03	2.180E+03	NOT IDENT.
NB-94	-7.142E+00	6.314E+00	7.089E+00	NOT IDENT.
NB-95	-3.881E+00	4.701E+00	5.017E+00	NOT IDENT.
NB-95M	2.338E+00	1.296E+01	1.300E+01	NOT IDENT.
TC-95M	1.284E+00	4.614E+00	4.650E+00	NOT IDENT.
ZR-95	1.078E+00	7.033E+00	7.050E+00	NOT IDENT.
MO-99	3.864E+00	4.043E+01	4.047E+01	FAIL ABUN
TC-99M	3.045E+01	5.400E+01	5.572E+01	NOT IDENT.
RH-101	-2.396E+00	3.584E+00	3.744E+00	NOT IDENT.
RH-102M	2.344E+00	3.488E+00	3.645E+00	NOT IDENT.
RU-103	1.391E+00	4.094E+00	4.142E+00	FAIL ABUN
AG-108M	-4.931E-01	3.717E+00	3.724E+00	NOT IDENT.
CD-109	-1.017E+02	9.296E+01	1.037E+02	NOT IDENT.
AG-110	9.776E+01	7.840E+01	8.996E+01	NOT IDENT.
AG-110M	-7.484E-01	6.678E+00	6.686E+00	FAIL ABUN
IN-111	-2.371E+00	4.335E+00	4.465E+00	NOT IDENT.
SN-113	4.874E-01	5.405E+00	5.409E+00	NOT IDENT.
IN-114M	8.000E+00	1.902E+01	1.936E+01	NOT IDENT.
CD-115	-4.230E+00	1.691E+01	1.702E+01	NOT IDENT.
SN-117M	1.246E+00	3.103E+00	3.154E+00	NOT IDENT.
SB-122	-6.760E-01	6.705E+00	6.712E+00	NOT IDENT.
I-123	5.597E+00	1.135E+01	1.163E+01	NOT IDENT.
TE-123M	1.537E+00	3.076E+00	3.153E+00	NOT IDENT.
SB-124	-5.028E+00	8.404E+00	8.705E+00	NOT IDENT.
SB-125	1.130E+01	1.199E+01	1.303E+01	FAIL ABUN
TE-125M	1.315E+03	8.093E+02	1.004E+03	NOT IDENT.
I-126	-3.047E+00	1.504E+01	1.510E+01	NOT IDENT.
SB-126	-4.744E+00	7.968E+00	8.251E+00	NOT IDENT.
SN-126	-2.675E+00	9.079E+00	9.159E+00	FAIL ABUN
SB-127	-1.086E+01	1.330E+01	1.418E+01	NOT IDENT.
TE-129	-6.003E+00	4.575E+01	4.583E+01	NOT IDENT.
I-131	-3.597E+00	4.685E+00	4.959E+00	NOT IDENT.
I-132	9.990E+02	7.169E+03	7.183E+03	NOT IDENT.
TE-132	-4.844E+00	5.161E+00	5.605E+00	FAIL ABUN
BA-133	-1.294E+00	5.764E+00	5.793E+00	NOT IDENT.
I-133	2.796E+00	8.576E+00	8.668E+00	NOT IDENT.
CS-134	-3.462E+00	5.143E+00	5.375E+00	NOT IDENT.
I-135	-7.951E+01	2.119E+02	2.149E+02	NOT IDENT.
CS-136	-2.695E-02	6.647E+00	6.647E+00	NOT IDENT.
LA-138	2.812E+00	6.910E+00	7.025E+00	NOT IDENT.
CE-139	1.649E-01	3.146E+00	3.147E+00	NOT IDENT.
BA-140	6.857E+00	1.664E+01	1.693E+01	NOT IDENT.
LA-140	5.304E+00	5.143E+00	5.673E+00	NOT IDENT.
CE-143	2.538E-01	1.350E+01	1.350E+01	NOT IDENT.
CE-144	-6.021E+00	2.305E+01	2.321E+01	NOT IDENT.
PM-144	1.284E-01	4.849E+00	4.850E+00	NOT IDENT.
PR-144	1.053E+01	3.604E+02	3.604E+02	NOT IDENT.
PM-146	-1.230E+00	5.449E+00	5.477E+00	NOT IDENT.
ND-147	-9.920E+00	2.775E+01	2.811E+01	NOT IDENT.
PM-147	-7.083E+04	8.754E+04	9.319E+04	NOT IDENT.
PM-149	1.543E+01	1.374E+02	1.375E+02	NOT IDENT.
EU-152	7.025E+00	1.409E+01	1.444E+01	FAIL ABUN
GD-153	6.351E+00	9.070E+00	9.512E+00	NOT IDENT.
EU-154	1.884E+01	1.283E+01	1.539E+01	NOT IDENT.
EU-155	1.324E+00	1.098E+01	1.100E+01	NOT IDENT.
TB-160	4.018E-01	1.596E+01	1.596E+01	NOT IDENT.
HO-166M	6.900E+00	8.119E+00	8.695E+00	NOT IDENT.
TM-171	-1.515E+03	2.337E+03	2.435E+03	NOT IDENT.
LU-176	-2.049E+00	3.877E+00	3.986E+00	NOT IDENT.
LU-177	-4.229E+00	3.292E+01	3.297E+01	FAIL ABUN
HF-181	7.674E-01	4.234E+00	4.248E+00	NOT IDENT.
W-181	-9.256E+00	2.028E+01	2.071E+01	NOT IDENT.
TA-182	-1.698E+00	1.406E+01	1.408E+01	FAIL ABUN
RE-183	-8.126E+00	1.847E+01	1.883E+01	NOT IDENT.
RE-184	7.146E+00	1.256E+01	1.296E+01	NOT IDENT.
RE-188	-7.477E+00	2.084E+01	2.111E+01	FAIL ABUN
W-188	-1.717E+02	7.808E+02	7.846E+02	FAIL ABUN

OS-191	2.819E+00	9.316E+00	9.403E+00	FAIL ABUN
IR-192	-1.018E+00	3.833E+00	3.860E+00	FAIL ABUN
PB-201	-1.278E+01	2.922E+01	2.978E+01	NOT IDENT.
TL-201	2.483E+01	3.235E+01	3.424E+01	NOT IDENT.
TL-202	-6.871E-01	3.776E+00	3.789E+00	NOT IDENT.
HG-203	-1.394E+00	4.075E+00	4.123E+00	NOT IDENT.
PB-203	-1.930E+00	5.641E+00	5.708E+00	NOT IDENT.
TL-204	-3.275E+02	4.992E+02	5.206E+02	NOT IDENT.
BI-207	2.301E+00	6.050E+00	6.138E+00	NOT IDENT.
TL-208	-1.045E+01	6.775E+00	8.255E+00	NOT IDENT.
PB-210	1.944E+02	5.189E+02	5.263E+02	NOT IDENT.
BI-211	-3.282E+01	3.586E+01	3.880E+01	NOT IDENT.
PB-211	-6.717E+00	8.820E+01	8.825E+01	NOT IDENT.
BI-212	1.488E+01	6.748E+01	6.781E+01	NOT IDENT.
PB-212	9.997E+00	1.436E+01	1.505E+01	FAIL ABUN
BI-213	-3.970E+00	1.256E+01	1.269E+01	NOT IDENT.
BI-214	1.514E+01	1.960E+01	2.075E+01	FAIL ABUN
PB-214	-3.734E+00	1.299E+01	1.310E+01	FAIL ABUN
RN-219	-2.004E+01	6.344E+01	6.408E+01	NOT IDENT.
FR-221	1.265E+01	2.887E+01	2.943E+01	NOT IDENT.
RA-223	2.659E+00	8.618E+01	8.619E+01	FAIL ABUN
RA-224	5.244E+00	8.817E+01	8.821E+01	NOT IDENT.
AC-225	1.359E+01	3.102E+01	3.162E+01	NOT IDENT.
AC-227	3.408E+01	3.484E+01	3.808E+01	NOT IDENT.
TH-227	3.408E+01	3.484E+01	3.808E+01	NOT IDENT.
AC-228	-7.695E+00	2.575E+01	2.598E+01	NOT IDENT.
RA-228	-7.695E+00	2.575E+01	2.598E+01	NOT IDENT.
TH-228	9.997E+00	1.436E+01	1.505E+01	FAIL ABUN
TH-229	-6.994E+00	6.126E+01	6.134E+01	NOT IDENT.
TH-230	-7.812E+02	1.352E+03	1.397E+03	NOT IDENT.
PA-231	5.380E+00	6.132E+01	6.137E+01	NOT IDENT.
TH-231	-1.110E+01	5.437E+01	5.460E+01	NOT IDENT.
PA-233	-6.222E+00	9.409E+00	9.819E+00	FAIL ABUN
PA-234	2.006E+01	3.948E+01	4.050E+01	FAIL ABUN
PA-234M	-5.735E+02	7.053E+02	7.513E+02	NOT IDENT.
U-234	4.056E+03	8.119E+03	8.323E+03	NOT IDENT.
NP-237	-6.222E+00	9.409E+00	9.819E+00	FAIL ABUN
NP-238	-6.374E+00	2.348E+01	2.366E+01	NOT IDENT.
NP-239	-6.467E-01	2.878E+01	2.878E+01	NOT IDENT.
AM-241	5.497E+00	1.564E+01	1.584E+01	NOT IDENT.
AM-242	-3.041E+01	6.639E+01	6.780E+01	NOT IDENT.
AM-243	-2.758E+00	6.457E+00	6.576E+00	NOT IDENT.
CM-243	-3.570E+00	1.147E+01	1.158E+01	NOT IDENT.
BK-247	9.948E+00	1.052E+01	1.144E+01	NOT IDENT.
CM-247	-5.047E+00	5.883E+00	6.308E+00	NOT IDENT.
CF-249	5.845E+00	5.355E+00	5.969E+00	NOT IDENT.
CF-251	-1.677E+00	1.464E+01	1.466E+01	NOT IDENT.
CF-252	-7.002E+03	1.945E+04	1.971E+04	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	70.0471	81.00	84.2600	120.90	100.9770
45.60	67.4355	81.07	84.2741	121.12	107.6265
46.54	66.8728	82.35	81.9180	121.22	107.6456
49.72	72.3778	82.47	81.9416	121.78	86.9596
51.35	66.3727	167.43	81.9416	122.06	83.2211
52.39	77.0292	82.47	81.9416	123.07	102.3203
53.20	57.9229	83.79	70.8293	265.00	91.9987
53.44	53.9419	84.00	78.7383	127.16	99.2464
56.28	41.4280	84.21	71.7744	127.23	99.2567
57.36	61.1258	84.86	72.7605	129.43	81.4346
57.53	61.1572	85.43	82.5125	131.20	81.6823
57.53	61.1578	86.55	78.3259	133.02	100.2501
57.98	62.0573	86.79	73.0854	133.52	102.2654
59.32	45.9108	86.94	66.0639	135.34	99.6744
59.54	45.9408	87.09	77.5411	136.00	106.5659
61.49	56.9308	87.57	70.5695	57.53	94.0146
63.00	57.1793	88.03	89.1872	136.47	85.3198
63.29	57.2267	88.34	79.5293	140.51	88.4905
63.58	57.2738	88.47	79.5534	140.88	83.3346
63.81	57.3113	91.11	91.2871	143.76	83.3956
64.28	57.3875	91.27	91.3200	144.24	83.4592
64.99	60.0022	92.59	80.2860	145.44	83.6187
65.08	60.0172	93.31	80.4124	152.32	85.5145
66.73	75.9238	94.56	80.6307	152.43	85.5289
66.98	67.0380	94.65	80.6465	153.25	78.6661
67.24	64.8494	94.67	80.6499	323.87	83.7667
67.67	73.0412	97.43	72.1124	155.04	77.8810
67.75	73.0568	98.43	79.4908	156.02	91.9958
68.89	67.3865	98.44	79.4929	158.56	80.3015
68.89	67.3871	99.53	85.1065	158.97	80.3503
69.67	74.2802	100.11	85.2090	159.00	80.3540
70.82	89.7464	100.20	85.2248	162.33	74.6933
70.82	89.7472	102.03	87.3669	162.66	78.7677
70.83	89.7497	103.18	87.5713	163.33	77.8342
72.81	80.8535	103.37	87.6057	165.86	78.1197
72.87	80.8658	105.31	77.8711	167.43	71.1781
74.66	76.9627	106.12	87.1730	171.28	70.5456
74.82	66.7283	106.47	86.3156	176.31	87.5136
74.97	66.7533	109.28	43.0888	176.60	74.1588
77.11	87.7636	111.00	64.2314	177.52	75.2835
79.69	91.7860	111.76	66.7996	181.07	62.1762
79.82	90.0836	112.95	66.9518	184.41	80.4969
80.02	90.1272	116.24	75.7886	184.58	80.5158
80.03	90.1280	116.30	75.7972	185.72	86.5461
80.12	88.4150	116.74	81.4782	186.21	86.6019
80.19	88.4298	117.23	87.1769	190.27	71.3297
80.22	88.4376	119.76	82.8746	193.51	75.8419
80.57	82.4372	99.53	85.8214	197.03	97.3457

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
198.01	92.1693	256.23	49.8327	492.35	20.0158
201.83	78.7729	304.85	58.1561	497.08	28.2867
204.12	74.7264	306.78	66.5803	511.00	22.0864
205.31	74.8354	308.46	50.0109	514.00	22.1260
208.37	86.9203	311.90	65.6918	520.40	26.8382
210.85	77.4943	316.51	45.5738	520.69	25.9173
215.65	76.4959	319.41	51.7016	522.65	29.6536
218.12	85.7662	320.08	61.3563	527.90	25.0983
222.11	85.0745	321.04	56.5913	529.59	16.7483
227.09	62.5264	323.87	49.4883	529.87	19.5431
227.38	64.7410	325.23	45.9217	531.02	26.0757
228.16	72.4866	328.76	32.7274	537.26	26.1702
228.18	76.8819	331.15	54.6570	546.56	22.5518
116.74	76.8819	333.37	47.4586	552.55	21.6860
235.69	62.0242	334.37	51.1529	563.25	24.6617
235.96	62.0430	338.28	47.6550	564.24	24.6755
238.63	74.4488	338.32	47.6574	569.33	31.4075
238.98	74.4774	311.90	58.7607	946.00	28.5547
240.99	78.7258	340.55	58.7637	569.70	28.5583
242.00	62.4548	344.28	47.8931	582.08	23.9604
244.70	86.1257	345.93	50.4179	583.19	26.8516
245.35	74.9926	351.06	49.3945	595.83	18.3444
250.62	73.1637	351.93	42.0154	427.87	23.2305
252.40	50.7465	356.01	47.1138	604.72	33.4668
252.80	53.0242	361.25	44.8209	609.32	28.2000
256.23	57.7431	364.49	47.4327	610.33	28.2141
260.90	61.4339	366.42	30.8363	614.28	19.0104
264.66	58.2435	356.01	38.8565	618.01	13.6753
265.00	47.9819	388.16	34.7456	621.93	29.3628
269.46	47.0497	388.63	40.6924	630.19	20.6411
271.23	57.4799	391.70	43.3342	631.29	18.6853
273.65	66.8359	264.66	38.4906	155.04	20.6702
276.40	48.5292	401.32	33.3744	633.25	20.6727
277.37	77.4892	401.81	35.0984	634.78	21.6742
277.60	69.4098	402.40	41.1084	635.95	17.7437
278.00	57.8629	404.85	38.6087	636.99	18.7395
278.43	52.0985	410.95	38.7790	657.50	7.4728
279.20	62.5660	414.70	39.7465	657.76	7.4741
279.54	59.1088	423.72	36.5227	661.66	17.9714
280.46	51.0415	427.09	40.0956	664.57	14.9976
283.69	58.1833	427.87	30.5239	666.33	24.0166
284.31	43.0805	433.94	35.0309	666.50	25.5197
285.41	46.6235	439.51	32.5271	667.71	19.2266
285.90	48.9765	440.45	33.4278	677.62	16.0983
287.50	46.7163	453.88	36.3930	685.70	25.2513
290.67	51.5424	459.60	26.7297	692.65	25.3337
293.27	50.1016	463.37	19.6501	695.00	27.3911
351.93	50.5848	468.07	29.5659	696.49	27.4098
295.96	58.0760	473.00	31.4574	696.51	27.4098
879.38	62.9378	475.06	22.4991	697.00	28.4318
299.98	50.8079	476.78	33.3355	697.49	28.4386
300.09	50.8132	477.60	26.1414	702.65	28.5070
300.13	50.8158	477.99	28.8529	706.68	16.3203
301.36	50.8722	482.18	26.2175	711.68	16.3581
302.85	58.0499	487.02	28.1108	720.70	21.5588

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
721.93	24.6523	935.54	13.4448	1368.63	6.7257
722.78	19.5234	937.49	13.4541	1377.63	10.5938
722.91	19.5249	944.13	6.7434	1384.29	6.7535
723.31	19.5280	945.96	6.7478	1408.01	8.7369
724.19	18.5083	946.00	6.7480	1434.09	3.9089
727.33	20.5933	949.00	9.0072	1435.80	4.8883
733.00	19.6139	667.71	15.7939	1457.56	1.9661
735.93	20.6730	962.31	16.9690	1460.82	4.9194
739.50	14.4945	964.08	11.3200	1489.16	10.8986
744.23	12.4497	966.17	23.7899	1596.21	1.6263
747.24	14.5440	968.97	13.6079	1620.50	4.0886
752.31	14.5765	983.53	10.2583	1678.03	6.2128
753.82	14.5862	984.45	11.4018	1690.97	5.1920
756.73	13.5618	996.26	10.3041	1757.55	6.3208
763.94	16.7441	1001.03	9.1742	1764.49	8.4404
765.80	26.1831	1274.44	10.3341	1063.66	10.5634
766.42	23.0474	1025.87	5.7829	1771.35	10.5658
766.84	27.2431	1028.54	8.1034	1791.20	6.3658
772.60	15.7562	1037.84	12.7734	1808.65	1.0649
776.52	16.8346	1038.76	9.2930	1836.06	5.3546
739.50	16.8451	475.06	16.3048		
778.90	16.8522	1048.07	12.8172		
783.70	17.4138	1050.41	8.1627		
788.74	11.6342	1063.66	9.6626		
792.07	15.8868	1077.00	13.2339		
795.86	21.2166	1077.34	14.1172		
802.10	19.1448	459.60	16.8001		
810.29	11.7394	1085.87	8.2578		
344.28	11.7399	1099.25	11.5519		
810.76	16.0114	1111.64	11.2148		
815.77	8.5570	1112.07	10.7065		
1048.07	13.9204	1112.84	11.4234		
832.01	12.9204	1115.54	10.0037		
834.85	17.2474	1120.29	10.0188		
835.15	16.1713	1120.55	10.0194		
836.80	15.1029	1221.41	9.2040		
846.77	15.1632	1129.67	7.1772		
856.80	15.2236	1131.51	12.5679		
860.56	16.3354	1173.23	9.0924		
871.09	9.8416	1177.95	10.1979		
873.19	19.6992	1189.05	10.0493		
875.33	15.3341	1204.77	12.8499		
879.38	16.4551	1221.41	6.4561		
880.51	20.8524	1231.02	4.4396		
881.60	16.4691	1235.36	15.8758		
883.24	12.0850	1238.28	6.4882		
884.68	17.5879	1260.41	9.3274		
889.28	12.1132	1271.87	11.2295		
894.76	14.3452	1274.44	1.4983		
898.04	14.3632	1274.54	1.4983		
903.28	12.1776	1291.59	7.5273		
907.67	21.0688	1298.22	9.4269		
911.20	12.2139	1312.11	8.5166		
923.98	11.1564	1332.49	10.4669		
926.36	12.2828	1365.19	12.4795		

VAX/VMS Nuclide Identification Report Generated 22-JUL-2022 03:03:38.53

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141123.CNF;1
Background file  : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM43.CNF;510
Background date  : 16-JUL-2022 14:00:37
Sample date      : 27-JUN-2022 09:24:00 Acquisition date : 21-JUL-2022 23:03:14
Sample ID        : G1205141123 Sample quantity : 5.14200E-01 FILTER
Detector name     : GAM43 Detector geometry: JAR
Elapsed live time : 0 04:00:00.00 Elapsed real time: 0 04:00:01.57 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : MJH1
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2290721 Detector SN# :
Matrix Spike ID   : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	62.91*	15	119	1.15	125.66	121	8	1.02E-03	152.6	
2	0	139.91*	18	80	1.42	279.64	278	6	1.24E-03	98.4	
3	0	143.76*	7	72	1.07	287.34	285	5	5.01E-04	234.1	
4	0	146.36	32	77	0.67	292.53	290	7	2.21E-03	49.7	
5	0	271.17	22	82	1.78	542.06	535	11	1.53E-03	82.8	
6	0	454.71	18	38	0.87	908.98	903	9	1.26E-03	66.9	
7	1	477.84	92	36	1.87	955.23	947	32	6.41E-03	15.4	1.74E+00
8	1	486.90	24	15	1.89	973.34	947	32	1.66E-03	49.0	
9	0	525.78	41	68	10.65	1051.05	1033	27	2.87E-03	57.4	
10	1	550.59*	23	22	1.98	1100.64	1096	16	1.59E-03	45.8	4.10E+00
11	1	554.59	20	5	1.99	1108.64	1096	16	1.42E-03	31.9	
12	0	584.37*	13	32	2.08	1168.17	1162	11	9.17E-04	106.7	
13	0	595.98	19	22	1.55	1191.37	1188	8	1.30E-03	49.2	
14	0	699.92	12	15	1.00	1399.12	1396	7	8.08E-04	63.5	
15	0	793.52*	17	7	2.49	1586.18	1579	15	1.15E-03	65.3	
16	0	831.87	13	23	0.59	1662.80	1652	15	8.68E-04	87.4	
17	0	874.80	12	19	1.27	1748.59	1741	14	8.00E-04	88.8	
18	0	911.66	42	13	1.54	1822.25	1813	18	2.89E-03	25.8	
19	1	958.96	19	3	2.49	1916.77	1913	16	1.33E-03	30.2	1.77E+00
20	1	962.08*	6	17	2.27	1923.00	1913	16	3.93E-04	204.3	
21	0	968.94*	14	12	1.34	1936.72	1929	14	9.53E-04	72.0	
22	0	985.45	12	11	4.15	1969.70	1963	12	8.15E-04	65.4	
23	0	1002.21	24	14	2.12	2003.19	1995	15	1.64E-03	41.0	
24	0	1027.61	21	10	4.43	2053.93	2047	13	1.49E-03	36.9	
25	0	1062.01	12	7	1.06	2122.67	2114	14	8.33E-04	55.0	
26	0	1086.65*	3	0	0.56	2171.89	2169	8	1.91E-04	222.9	
27	0	1132.28	17	7	1.40	2263.06	2256	13	1.15E-03	40.3	
28	0	1154.32	11	12	3.22	2307.08	2299	12	7.82E-04	68.2	
29	0	1422.59	11	9	2.52	2843.00	2829	18	7.64E-04	70.7	
30	0	1656.32	19	5	4.01	3309.80	3298	21	1.31E-03	38.1	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 22-JUL-2022 03:03:39

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141123.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 27-JUN-2022 09:24:00	Acquisition date	: 21-JUL-2022 23:03:14
Sample ID	: G1205141123	Sample quantity	: 0.51420 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA43	Detector geometry	: JAR
Elapsed live time	: 0 04:00:00.00	Elapsed real time	: 0 04:00:01.57 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	92	10.44*	1.951E+00	1.655E+02	2.281E+02	30.72
AS-74	595.83	19	59.00*	1.621E+00	7.157E+00	1.872E+01	98.31
	634.78	-----	15.40	1.539E+00	-----	Line Not Found	-----
CE-141	145.44	32	48.29*	4.217E+00	5.704E+00	9.648E+00	99.35
TL-208	277.37	-----	6.60	3.062E+00	-----	Line Not Found	-----
	583.19	13	85.00*	1.648E+00	3.441E+00	3.527E+00	213.47
	860.56	-----	12.50	1.198E+00	-----	Line Not Found	-----
AC-228	338.32	-----	11.27	2.610E+00	-----	Line Not Found	-----
	911.20	42	25.80*	1.143E+00	5.158E+01	5.200E+01	51.62
	968.97	14	15.80	1.088E+00	2.914E+01	2.938E+01	144.04
RA-228	338.32	-----	11.27	2.610E+00	-----	Line Not Found	-----
	911.20	42	25.80*	1.143E+00	5.158E+01	5.200E+01	51.62
	968.97	14	15.80	1.088E+00	2.914E+01	2.938E+01	144.04
TH-232	63.81	15	0.26*	1.198E+00	1.729E+03	1.729E+03	305.21
	140.88	18	0.02	4.216E+00	7.718E+03	7.718E+03	196.76

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141123.CNF;1
Acquisition date : 21-JUL-2022 23:03:14 Sensitivity : 3.000
Detector ID : GAM43 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:01.57 Half life ratio : *****
Sample date : 27-JUN-2022 09:24:00 Analyst initials: MJH1
Sample ID : G1205141123 Sample Quantity : 5.1420E-01 FILTER
Batch Number : 2290721 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 22-MAR-2022 09:17:22 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM43_JAR.CNF;16

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	2.281E+02	6.867E+01	7.259E+01
AS-74	1.872E+01	1.804E+01	2.993E+01
CE-141	9.648E+00	9.394E+00	1.169E+01
TL-208	3.527E+00	7.378E+00	7.457E+00
AC-228	5.200E+01	2.631E+01	2.854E+01
RA-228	5.200E+01	2.631E+01	2.854E+01
TH-232	1.729E+03	5.172E+03	4.309E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	1.114E+00	4.383E+00	8.819E+00	NOT IDENT.
NA-24	0.000E+00	3.033E+12	0.000E+00	SHORT HLIF
AL-26	-1.086E+00	3.437E+00	6.696E+00	NOT IDENT.
K-40	8.967E+01	5.937E+01	1.300E+02	NOT IDENT.
SC-46	-5.324E+00	7.514E+00	9.012E+00	NOT IDENT.
V-48	3.303E+00	1.312E+01	2.333E+01	NOT IDENT.
CR-51	1.298E+01	5.112E+01	9.508E+01	NOT IDENT.
MN-52	5.804E+01	1.022E+02	2.129E+02	NOT IDENT.
MN-54	1.710E+00	4.620E+00	8.038E+00	NOT IDENT.
CO-56	-1.209E+00	5.329E+00	9.501E+00	NOT IDENT.
CO-57	4.266E-01	2.475E+00	4.475E+00	NOT IDENT.
NI-57	0.000E+00	5.331E+05	0.000E+00	SHORT HLIF
CO-58	-3.923E+00	5.154E+00	8.527E+00	NOT IDENT.
FE-59	3.885E+00	1.043E+01	2.138E+01	NOT IDENT.
CO-60	-4.570E-01	4.065E+00	7.774E+00	NOT IDENT.
ZN-65	4.035E+00	9.049E+00	1.855E+01	NOT IDENT.
CU-67	-1.083E+04	5.507E+03	8.063E+03	NOT IDENT.
GE-68	-4.454E+01	1.332E+02	2.462E+02	NOT IDENT.
AS-73	4.828E+01	1.521E+02	2.953E+02	NOT IDENT.
SE-75	4.218E+00	4.426E+00	8.579E+00	NOT IDENT.
BR-77	0.000E+00	1.780E+04	0.000E+00	SHORT HLIF
SR-82	-1.268E+00	5.171E+01	9.555E+01	NOT IDENT.
RB-83	5.133E-01	7.963E+00	1.535E+01	NOT IDENT.

RB-84	9.435E+00	1.010E+01	2.053E+01	NOT IDENT.
KR-85	-7.432E+03	1.859E+03	2.058E+03	NOT IDENT.
SR-85	-4.314E+01	1.079E+01	1.195E+01	NOT IDENT.
RB-86	-3.091E+01	1.180E+02	2.202E+02	NOT IDENT.
Y-88	3.323E+00	5.681E+00	1.252E+01	NOT IDENT.
Y-91	1.112E+03	1.868E+03	4.067E+03	NOT IDENT.
NB-94	2.279E+00	4.501E+00	7.900E+00	NOT IDENT.
NB-95	3.579E+00	4.896E+00	9.964E+00	NOT IDENT.
NB-95M	-9.411E+00	1.273E+01	2.237E+01	NOT IDENT.
TC-95M	-1.853E+00	5.589E+00	8.162E+00	NOT IDENT.
ZR-95	-3.396E+00	8.628E+00	1.529E+01	NOT IDENT.
MO-99	1.109E+04	1.527E+04	3.104E+04	FAIL ABUN
TC-99M	0.000E+00	1.276E+30	0.000E+00	SHORT HLIF
RH-101	-3.317E+00	2.966E+00	4.746E+00	NOT IDENT.
RH-102M	-5.834E-01	3.851E+00	5.954E+00	NOT IDENT.
RU-103	9.741E-01	5.846E+00	1.054E+01	NOT IDENT.
RH-106	-1.126E+01	2.964E+01	5.409E+01	NOT IDENT.
RU-106	-1.126E+01	2.964E+01	5.409E+01	NOT IDENT.
AG-108M	-1.315E+00	3.095E+00	5.304E+00	NOT IDENT.
CD-109	-8.291E+01	7.743E+01	1.294E+02	NOT IDENT.
AG-110	-5.981E+01	8.840E+01	1.523E+02	NOT IDENT.
AG-110M	-4.934E+00	5.982E+00	9.646E+00	NOT IDENT.
IN-111	1.768E+01	1.125E+03	2.087E+03	NOT IDENT.
SN-113	-1.356E+00	4.792E+00	8.432E+00	NOT IDENT.
IN-114M	-1.024E+01	2.017E+01	3.286E+01	NOT IDENT.
CD-115	0.000E+00	2.410E+04	0.000E+00	SHORT HLIF
SN-117M	-4.286E+00	7.746E+00	1.282E+01	NOT IDENT.
SB-122	-2.080E+03	2.547E+03	4.395E+03	NOT IDENT.
I-123	0.000E+00	6.768E+13	0.000E+00	SHORT HLIF
TE-123M	-2.161E-01	2.549E+00	4.427E+00	NOT IDENT.
SB-124	4.527E+00	1.165E+01	2.543E+01	NOT IDENT.
SB-125	-5.983E+00	9.483E+00	1.583E+01	NOT IDENT.
TE-125M	-4.941E+02	1.049E+03	1.813E+03	NOT IDENT.
I-126	1.056E+00	3.761E+01	7.139E+01	NOT IDENT.
SB-126	-5.471E+00	2.641E+01	4.821E+01	NOT IDENT.
SN-126	-2.526E-01	7.122E+00	1.302E+01	FAIL ABUN
SB-127	-3.640E+02	6.909E+02	1.219E+03	NOT IDENT.
TE-129	-7.698E+01	6.535E+01	9.953E+01	NOT IDENT.
I-131	7.522E+00	2.814E+01	5.242E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	3.314E+02	5.415E+02	1.051E+03	NOT IDENT.
BA-133	1.033E+00	4.730E+00	8.715E+00	NOT IDENT.
I-133	0.000E+00	1.496E+09	0.000E+00	SHORT HLIF
CS-134	-8.001E+00	6.860E+00	7.280E+00	NOT IDENT.
I-135	0.000E+00	1.725E+28	0.000E+00	SHORT HLIF
CS-136	-1.105E+01	1.953E+01	3.472E+01	NOT IDENT.
BA-137M	5.503E+00	4.096E+00	8.738E+00	NOT IDENT.
CS-137	5.813E+00	4.327E+00	9.231E+00	NOT IDENT.
LA-138	2.135E+00	7.827E+00	1.544E+01	NOT IDENT.
CE-139	2.596E-01	2.780E+00	4.876E+00	NOT IDENT.
BA-140	7.928E+00	4.393E+01	8.623E+01	NOT IDENT.
LA-140	-5.427E+00	2.099E+01	3.959E+01	FAIL ABUN
CE-143	0.000E+00	1.473E+06	0.000E+00	SHORT HLIF
CE-144	-9.111E+00	1.772E+01	2.998E+01	NOT IDENT.
PM-144	-2.595E+00	4.868E+00	7.235E+00	FAIL ABUN
PR-144	-1.952E+02	3.661E+02	5.441E+02	NOT IDENT.
PM-146	5.050E+00	6.617E+00	9.363E+00	FAIL ABUN
ND-147	5.609E+01	1.209E+02	2.182E+02	NOT IDENT.
PM-147	-6.991E+03	7.123E+04	1.260E+05	NOT IDENT.
PM-149	0.000E+00	1.821E+05	0.000E+00	SHORT HLIF
EU-152	3.356E+00	1.008E+01	1.893E+01	FAIL ABUN
GD-153	7.421E+00	8.630E+00	1.670E+01	NOT IDENT.
EU-154	2.901E+00	1.231E+01	2.472E+01	NOT IDENT.
EU-155	-2.544E+00	9.564E+00	1.695E+01	NOT IDENT.
TB-160	4.394E+00	1.915E+01	3.236E+01	FAIL ABUN
HO-166M	2.892E+00	7.317E+00	1.418E+01	NOT IDENT.
TM-171	-4.189E+02	3.028E+03	5.702E+03	NOT IDENT.
LU-176	3.839E-01	2.758E+00	5.109E+00	NOT IDENT.
LU-177	5.092E+01	2.760E+02	4.786E+02	NOT IDENT.
HF-181	-9.349E-01	5.667E+00	9.933E+00	NOT IDENT.
W-181	-3.604E+00	2.954E+01	5.561E+01	NOT IDENT.
TA-182	-1.053E+00	2.093E+01	3.952E+01	NOT IDENT.
RE-183	7.311E+00	3.066E+01	5.913E+01	NOT IDENT.
RE-184	-6.738E+00	1.642E+01	2.595E+01	FAIL ABUN
RE-188	-5.543E+00	1.739E+01	2.941E+01	FAIL ABUN
W-188	-1.757E+02	7.814E+02	1.410E+03	FAIL ABUN
OS-191	1.546E+01	2.414E+01	4.472E+01	FAIL ABUN
IR-192	1.430E+00	3.735E+00	7.099E+00	NOT IDENT.

PB-201	0.000E+00	3.912E+19	0.000E+00	SHORT HLIF
TL-201	-2.292E+03	5.629E+03	9.393E+03	NOT IDENT.
TL-202	6.705E+00	1.322E+01	2.501E+01	NOT IDENT.
HG-203	-3.481E+00	4.631E+00	7.994E+00	NOT IDENT.
PB-203	0.000E+00	8.715E+03	0.000E+00	SHORT HLIF
TL-204	-1.501E+02	5.626E+02	1.024E+03	NOT IDENT.
BI-207	4.184E+00	4.748E+00	1.004E+01	NOT IDENT.
PB-210	4.614E+01	6.288E+02	1.215E+03	NOT IDENT.
BI-211	-2.319E+01	2.936E+01	4.305E+01	NOT IDENT.
PB-211	-4.371E+01	8.060E+01	1.366E+02	FAIL ABUN
BI-212	2.866E+01	5.629E+01	1.118E+02	NOT IDENT.
PB-212	-7.966E+00	7.315E+00	1.173E+01	NOT IDENT.
BI-213	-2.880E+00	1.189E+01	2.072E+01	NOT IDENT.
BI-214	-4.997E+00	1.039E+01	1.683E+01	NOT IDENT.
PB-214	-7.121E+00	1.081E+01	1.614E+01	NOT IDENT.
RN-219	1.818E+01	4.232E+01	8.004E+01	FAIL ABUN
FR-221	1.004E+01	1.947E+01	3.766E+01	NOT IDENT.
RA-223	-2.576E+01	6.916E+01	1.218E+02	FAIL ABUN
RA-224	-5.499E+01	6.316E+01	1.096E+02	NOT IDENT.
AC-225	5.541E+01	1.075E+02	2.080E+02	NOT IDENT.
RA-226	2.341E+00	9.544E+01	1.594E+02	NOT IDENT.
AC-227	-1.461E+01	2.156E+01	3.788E+01	NOT IDENT.
TH-227	-1.461E+01	2.156E+01	3.788E+01	NOT IDENT.
TH-228	-7.966E+00	7.315E+00	1.173E+01	NOT IDENT.
TH-229	4.777E+01	5.006E+01	9.280E+01	NOT IDENT.
TH-230	-1.741E+03	1.594E+03	2.392E+03	NOT IDENT.
PA-231	-8.849E+00	5.083E+01	9.147E+01	NOT IDENT.
TH-231	-7.149E+00	5.459E+01	8.428E+01	NOT IDENT.
PA-233	3.128E+00	6.472E+00	1.238E+01	NOT IDENT.
PA-234	-2.679E+01	2.748E+01	4.596E+01	NOT IDENT.
PA-234M	9.723E+02	7.812E+02	1.119E+03	FAIL ABUN
TH-234	1.215E+02	3.634E+02	3.806E+02	FAIL ABUN
U-234	2.649E+03	1.072E+04	2.073E+04	NOT IDENT.
U-235	5.699E+00	2.615E+01	3.691E+01	FAIL ABUN
NP-237	3.128E+00	6.472E+00	1.238E+01	NOT IDENT.
NP-238	0.000E+00	6.435E+04	0.000E+00	SHORT HLIF
U-238	1.215E+02	3.634E+02	3.806E+02	FAIL ABUN
NP-239	4.944E+00	2.640E+01	4.783E+01	NOT IDENT.
AM-241	5.617E-01	2.279E+01	4.014E+01	NOT IDENT.
AM-242	6.388E+00	6.362E+01	1.162E+02	NOT IDENT.
AM-243	-3.865E-01	6.962E+00	1.070E+01	NOT IDENT.
CM-243	1.327E+00	9.166E+00	1.695E+01	NOT IDENT.
BK-247	4.191E+00	7.677E+00	1.434E+01	NOT IDENT.
CM-247	-8.919E-01	4.132E+00	7.270E+00	NOT IDENT.
CF-249	1.708E+00	4.001E+00	7.608E+00	NOT IDENT.
CF-251	1.793E+00	1.287E+01	2.236E+01	NOT IDENT.
CF-252	-4.399E+03	1.796E+04	3.187E+04	NOT IDENT.
ANH-511	-1.973E+01	9.169E+00	1.501E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	62.91	53	119	1.15	125.66	121	8	3.69E-03	38.2	
2	0	77.34	10	131	0.53	154.53	151	8	7.06E-04	198.0	
3	0	92.91	86	148	1.07	185.65	181	8	5.95E-03	27.0	
4	0	139.91	30	80	1.42	279.64	278	6	2.08E-03	50.0	
5	0	143.76	25	72	1.07	287.34	285	5	1.77E-03	53.9	
6	0	146.36	32	77	0.67	292.53	290	7	2.21E-03	49.7	
7	0	185.87	84	159	0.89	371.53	367	10	5.86E-03	30.2	
8	0	239.19	38	80	1.20	478.13	474	8	2.64E-03	43.9	
9	0	271.17	22	82	1.78	542.06	535	11	1.53E-03	82.8	
10	0	454.71	18	38	0.87	908.98	903	9	1.26E-03	66.9	
11	1	477.84	92	36	1.87	955.23	947	32	6.41E-03	15.4	1.74E+00
12	1	486.90	24	15	1.89	973.34	947	32	1.66E-03	49.0	
13	0	511.39	250	82	2.45	1022.29	1015	17	1.74E-02	10.7	
14	0	525.78	41	68	10.65	1051.05	1033	27	2.87E-03	57.4	
15	1	550.59	26	22	1.98	1100.64	1096	16	1.84E-03	34.8	4.10E+00
16	1	554.59	20	5	1.99	1108.64	1096	16	1.42E-03	31.9	
17	0	584.37	22	32	2.08	1168.17	1162	11	1.53E-03	54.7	
18	0	595.98	19	22	1.55	1191.37	1188	8	1.30E-03	49.2	
19	0	699.92	12	15	1.00	1399.12	1396	7	8.08E-04	63.5	
20	0	793.52	32	7	2.49	1586.18	1579	15	2.25E-03	25.3	
21	0	831.87	13	23	0.59	1662.80	1652	15	8.68E-04	87.4	
22	0	874.80	12	19	1.27	1748.59	1741	14	8.00E-04	88.8	
23	0	911.66	42	13	1.54	1822.25	1813	18	2.89E-03	25.8	
24	1	958.96	19	3	2.49	1916.77	1913	16	1.33E-03	30.2	1.77E+00
25	1	962.08	21	17	2.27	1923.00	1913	16	1.47E-03	40.6	
26	0	968.94	20	12	1.34	1936.72	1929	14	1.40E-03	44.7	
27	0	985.45	12	11	4.15	1969.70	1963	12	8.15E-04	65.4	
28	0	1002.21	24	14	2.12	2003.19	1995	15	1.64E-03	41.0	
29	0	1027.61	21	10	4.43	2053.93	2047	13	1.49E-03	36.9	
30	0	1062.01	12	7	1.06	2122.67	2114	14	8.33E-04	55.0	
31	0	1086.65	9	0	0.56	2171.89	2169	8	6.25E-04	33.3	
32	0	1132.28	17	7	1.40	2263.06	2256	13	1.15E-03	40.3	
33	0	1154.32	11	12	3.22	2307.08	2299	12	7.82E-04	68.2	
34	0	1422.59	11	9	2.52	2843.00	2829	18	7.64E-04	70.7	
35	0	1656.32	19	5	4.01	3309.80	3298	21	1.31E-03	38.1	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	92	10.44*	1.951E+00	1.655E+02	2.281E+02	30.72
AS-74	595.83	19	59.00*	1.621E+00	7.157E+00	1.872E+01	98.31
	634.78	-----	15.40	1.539E+00	-----	Line Not Found	-----
CE-141	145.44	32	48.29*	4.217E+00	5.704E+00	9.648E+00	99.35
TL-208	277.37	-----	6.60	3.062E+00	-----	Line Not Found	-----
	583.19	13	85.00*	1.648E+00	3.441E+00	3.527E+00	213.47
	860.56	-----	12.50	1.198E+00	-----	Line Not Found	-----
AC-228	338.32	-----	11.27	2.610E+00	-----	Line Not Found	-----
	911.20	42	25.80*	1.143E+00	5.158E+01	5.200E+01	51.62
	968.97	14	15.80	1.088E+00	2.914E+01	2.938E+01	144.04
RA-228	338.32	-----	11.27	2.610E+00	-----	Line Not Found	-----
	911.20	42	25.80*	1.143E+00	5.158E+01	5.200E+01	51.62
	968.97	14	15.80	1.088E+00	2.914E+01	2.938E+01	144.04
TH-232	63.81	15	0.26*	1.198E+00	1.729E+03	1.729E+03	305.21
	140.88	18	0.02	4.216E+00	7.718E+03	7.718E+03	196.76

Flag: "*" = Keyline

Total number of lines in spectrum 30
Number of unidentified lines 9
Number of lines tentatively identified by NID 21 70.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.38	1.655E+02	2.281E+02	0.701E+02	30.72	
AS-74	17.77D	2.62	7.157E+00	1.872E+01	1.841E+01	98.31	
CE-141	32.51D	1.69	5.704E+00	9.648E+00	9.585E+00	99.35	
TL-208	1.91Y	1.02	3.441E+00	3.527E+00	7.528E+00	213.47	
AC-228	5.75Y	1.01	5.158E+01	5.200E+01	2.684E+01	51.62	
RA-228	5.75Y	1.01	5.158E+01	5.200E+01	2.684E+01	51.62	
TH-232	1.41E+10Y	1.00	1.729E+03	1.729E+03	5.278E+03	305.21	
Total Activity :			2.014E+03	2.093E+03			

Grand Total Activity : 2.014E+03 2.093E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	143.76	7	72	1.07	287.34	285	5	5.01E-04	****	4.22E+00	T
0	271.17	22	82	1.78	542.06	535	11	1.53E-03	****	3.12E+00	T
0	454.71	18	38	0.87	908.98	903	9	1.26E-03	****	2.03E+00	T
1	486.90	24	15	1.89	973.34	947	32	1.66E-03	97.9	1.92E+00	T
0	525.78	41	68	10.65	1051.05	1033	27	2.87E-03	****	1.80E+00	
1	550.59	23	22	1.98	1100.64	1096	16	1.59E-03	91.7	1.73E+00	
1	554.59	20	5	1.99	1108.64	1096	16	1.42E-03	63.8	1.72E+00	
0	699.92	12	15	1.00	1399.12	1396	7	8.08E-04	****	1.42E+00	
0	793.52	17	7	2.49	1586.18	1579	15	1.15E-03	****	1.28E+00	T
0	831.87	13	23	0.59	1662.80	1652	15	8.68E-04	****	1.23E+00	T
0	874.80	12	19	1.27	1748.59	1741	14	8.00E-04	****	1.18E+00	T
1	958.96	19	3	2.49	1916.77	1913	16	1.33E-03	60.4	1.10E+00	
1	962.08	6	17	2.27	1923.00	1913	16	3.93E-04	****	1.09E+00	T
0	985.45	12	11	4.15	1969.70	1963	12	8.15E-04	****	1.07E+00	T
0	1002.21	24	14	2.12	2003.19	1995	15	1.64E-03	82.0	1.06E+00	T
0	1027.61	21	10	4.43	2053.93	2047	13	1.49E-03	73.7	1.04E+00	T
0	1062.01	12	7	1.06	2122.67	2114	14	8.33E-04	****	1.01E+00	
0	1086.65	3	0	0.56	2171.89	2169	8	1.91E-04	****	9.91E-01	T
0	1132.28	17	7	1.40	2263.06	2256	13	1.15E-03	80.5	9.58E-01	T
0	1154.32	11	12	3.22	2307.08	2299	12	7.82E-04	****	9.43E-01	
0	1422.59	11	9	2.52	2843.00	2829	18	7.64E-04	****	7.96E-01	
0	1656.32	19	5	4.01	3309.80	3298	21	1.31E-03	76.2	7.04E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141123.CNF;1
* Acquisition date   : 21-JUL-2022 23:03:14 Sensitivity      : 3.000
* Detector ID        : GAM43 Energy tolerance: 1.500
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 04:00:01.57 Half life ratio : *****
* Sample date        : 27-JUN-2022 09:24:00 Nuclide Library : LIQUID
* Sample ID          : G1205141123 Analyst initials: MJH1
* Batch Number       : 2290721 Sample Quantity : 5.1420E-01 FILTER
* Wet wt corr        : 1.00000 Wet Weight : 0.00000
*                                     Dry Weight : 0.00000
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 22-MAR-2022 09:17:22 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM43_JAR.CNF;16
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.297E+01
AS-74	1.362E+01
CE-141	5.440E+00
TL-208	3.369E+00
AC-228	1.259E+01
RA-228	1.259E+01
TH-232	2.005E+03

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	3.833E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.594E+00	NOT IDENT.
K-40	5.910E+01	NOT IDENT.
SC-46	3.988E+00	NOT IDENT.
V-48	1.033E+01	NOT IDENT.
CR-51	4.418E+01	NOT IDENT.
MN-52	9.319E+01	NOT IDENT.
MN-54	3.596E+00	NOT IDENT.
CO-56	4.244E+00	NOT IDENT.
CO-57	2.088E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.763E+00	NOT IDENT.
FE-59	9.388E+00	NOT IDENT.
CO-60	3.294E+00	NOT IDENT.
ZN-65	8.201E+00	NOT IDENT.
CU-67	3.840E+03	NOT IDENT.
GE-68	1.068E+02	NOT IDENT.
AS-73	1.375E+02	NOT IDENT.
SE-75	3.987E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	4.286E+01	NOT IDENT.
RB-83	6.942E+00	NOT IDENT.
RB-84	9.244E+00	NOT IDENT.

KR-85	9.666E+02	NOT IDENT.
SR-85	5.610E+00	NOT IDENT.
RB-86	9.583E+01	NOT IDENT.
Y-88	5.361E+00	NOT IDENT.
Y-91	1.755E+03	NOT IDENT.
NB-94	3.602E+00	NOT IDENT.
NB-95	4.494E+00	NOT IDENT.
NB-95M	1.043E+01	NOT IDENT.
TC-95M	3.809E+00	NOT IDENT.
ZR-95	6.756E+00	NOT IDENT.
MO-99	1.402E+04	FAIL ABUN
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.196E+00	NOT IDENT.
RH-102M	2.710E+00	NOT IDENT.
RU-103	4.825E+00	NOT IDENT.
RH-106	2.372E+01	NOT IDENT.
RU-106	2.372E+01	NOT IDENT.
AG-108M	2.395E+00	NOT IDENT.
CD-109	6.003E+01	NOT IDENT.
AG-110	6.832E+01	NOT IDENT.
AG-110M	4.204E+00	NOT IDENT.
IN-111	9.741E+02	NOT IDENT.
SN-113	3.835E+00	NOT IDENT.
IN-114M	1.529E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	5.934E+00	NOT IDENT.
SB-122	1.978E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.052E+00	NOT IDENT.
SB-124	1.073E+01	NOT IDENT.
SB-125	7.132E+00	NOT IDENT.
TE-125M	8.423E+02	NOT IDENT.
I-126	3.190E+01	NOT IDENT.
SB-126	2.147E+01	NOT IDENT.
SN-126	6.057E+00	FAIL ABUN
SB-127	5.310E+02	NOT IDENT.
TE-129	4.450E+01	NOT IDENT.
I-131	2.415E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	4.925E+02	NOT IDENT.
BA-133	4.040E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.178E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.515E+01	NOT IDENT.
BA-137M	4.001E+00	NOT IDENT.
CS-137	4.227E+00	NOT IDENT.
LA-138	6.768E+00	NOT IDENT.
CE-139	2.270E+00	NOT IDENT.
BA-140	3.876E+01	NOT IDENT.
LA-140	1.707E+01	FAIL ABUN
CE-143	0.000E+00	SHORT HLIF
CE-144	1.387E+01	NOT IDENT.
PM-144	3.254E+00	FAIL ABUN
PR-144	2.447E+02	NOT IDENT.
PM-146	4.308E+00	FAIL ABUN
ND-147	9.913E+01	NOT IDENT.
PM-147	5.871E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.744E+00	FAIL ABUN
GD-153	7.820E+00	NOT IDENT.
EU-154	1.073E+01	NOT IDENT.
EU-155	7.841E+00	NOT IDENT.
TB-160	1.442E+01	FAIL ABUN
HO-166M	6.441E+00	NOT IDENT.
TM-171	2.645E+03	NOT IDENT.
LU-176	2.369E+00	NOT IDENT.
LU-177	2.227E+02	NOT IDENT.
HF-181	4.494E+00	NOT IDENT.
W-181	2.567E+01	NOT IDENT.
TA-182	1.741E+01	NOT IDENT.
RE-183	2.743E+01	NOT IDENT.
RE-184	1.115E+01	FAIL ABUN
RE-188	1.375E+01	FAIL ABUN
W-188	6.523E+02	FAIL ABUN
OS-191	2.102E+01	FAIL ABUN
IR-192	3.278E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF

TL-201	4.367E+03	NOT IDENT.
TL-202	1.148E+01	NOT IDENT.
HG-203	3.712E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	4.769E+02	NOT IDENT.
BI-207	4.366E+00	NOT IDENT.
PB-210	5.626E+02	NOT IDENT.
BI-211	2.002E+01	NOT IDENT.
PB-211	6.250E+01	FAIL ABUN
BI-212	5.039E+01	NOT IDENT.
PB-212	5.530E+00	NOT IDENT.
BI-213	9.452E+00	NOT IDENT.
BI-214	7.738E+00	NOT IDENT.
PB-214	7.523E+00	NOT IDENT.
RN-219	3.672E+01	FAIL ABUN
FR-221	1.765E+01	NOT IDENT.
RA-223	5.634E+01	FAIL ABUN
RA-224	5.120E+01	NOT IDENT.
AC-225	9.744E+01	NOT IDENT.
RA-226	7.624E+01	NOT IDENT.
AC-227	1.735E+01	NOT IDENT.
TH-227	1.735E+01	NOT IDENT.
TH-228	5.530E+00	NOT IDENT.
TH-229	4.354E+01	NOT IDENT.
TH-230	1.113E+03	NOT IDENT.
PA-231	4.254E+01	NOT IDENT.
TH-231	3.940E+01	NOT IDENT.
PA-233	5.733E+00	NOT IDENT.
PA-234	1.928E+01	NOT IDENT.
PA-234M	5.043E+02	FAIL ABUN
TH-234	1.795E+02	FAIL ABUN
U-234	9.641E+03	NOT IDENT.
U-235	1.740E+01	FAIL ABUN
NP-237	5.733E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.795E+02	FAIL ABUN
NP-239	2.237E+01	NOT IDENT.
AM-241	1.865E+01	NOT IDENT.
AM-242	5.420E+01	NOT IDENT.
AM-243	4.995E+00	NOT IDENT.
CM-243	7.831E+00	NOT IDENT.
BK-247	6.655E+00	NOT IDENT.
CM-247	3.332E+00	NOT IDENT.
CF-249	3.484E+00	NOT IDENT.
CF-251	1.048E+01	NOT IDENT.
CF-252	1.485E+04	NOT IDENT.
ANH-511	7.239E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141123.CNF;1
* Acquisition date   : 21-JUL-2022 23:03:14 Sensitivity      : 3.000
* Detector ID        : GAM43 Energy tolerance: 1.500
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 04:00:01.57 Half life ratio  : *****
* Sample date        : 27-JUN-2022 09:24:00 Nuclide Library : LIQUID
* Sample ID          : G1205141123 Analyst initials: MJH1
* Batch Number       : 2290721 Sample Quantity  : 5.1420E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 22-MAR-2022 09:17:22 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM43_JAR.CNF;16

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	2.281E+02	7.164E+01	7.178E+01
AS-74	1.872E+01	1.817E+01	1.817E+01
CE-141	9.648E+00	9.421E+00	9.423E+00
TL-208	3.527E+00	7.386E+00	7.386E+00
AC-228	5.200E+01	2.667E+01	2.669E+01
RA-228	5.200E+01	2.667E+01	2.669E+01
TH-232	1.729E+03	5.180E+03	5.180E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	1.114E+00	4.384E+00	4.413E+00	NOT IDENT.
NA-24	-6.814E+11	3.033E+12	3.049E+12	SHORT HLIF
AL-26	-1.086E+00	3.438E+00	3.473E+00	NOT IDENT.
K-40	8.967E+01	5.985E+01	7.224E+01	NOT IDENT.
SC-46	-5.324E+00	7.526E+00	7.900E+00	NOT IDENT.
V-48	3.303E+00	1.312E+01	1.321E+01	NOT IDENT.
CR-51	1.298E+01	5.113E+01	5.146E+01	NOT IDENT.
MN-52	5.804E+01	1.023E+02	1.056E+02	NOT IDENT.
MN-54	1.710E+00	4.622E+00	4.686E+00	NOT IDENT.
CO-56	-1.209E+00	5.330E+00	5.358E+00	NOT IDENT.
CO-57	4.266E-01	2.475E+00	2.482E+00	NOT IDENT.
NI-57	-2.107E+05	5.336E+05	5.420E+05	SHORT HLIF
CO-58	-3.923E+00	5.165E+00	5.460E+00	NOT IDENT.
FE-59	3.885E+00	1.044E+01	1.058E+01	NOT IDENT.
CO-60	-4.570E-01	4.066E+00	4.071E+00	NOT IDENT.
ZN-65	4.035E+00	9.055E+00	9.236E+00	NOT IDENT.
CU-67	-1.083E+04	5.583E+03	7.418E+03	NOT IDENT.
GE-68	-4.454E+01	1.333E+02	1.348E+02	NOT IDENT.
AS-73	4.828E+01	1.525E+02	1.541E+02	NOT IDENT.
SE-75	4.218E+00	4.437E+00	4.828E+00	NOT IDENT.
BR-77	-1.268E+04	1.783E+04	1.872E+04	SHORT HLIF
SR-82	-1.268E+00	5.171E+01	5.172E+01	NOT IDENT.
RB-83	5.133E-01	7.964E+00	7.967E+00	NOT IDENT.

RB-84	9.435E+00	1.013E+01	1.099E+01	NOT IDENT.
KR-85	-7.432E+03	1.980E+03	3.895E+03	NOT IDENT.
SR-85	-4.314E+01	1.149E+01	2.261E+01	NOT IDENT.
RB-86	-3.091E+01	1.180E+02	1.188E+02	NOT IDENT.
Y-88	3.323E+00	5.686E+00	5.881E+00	NOT IDENT.
Y-91	1.112E+03	1.870E+03	1.936E+03	NOT IDENT.
NB-94	2.279E+00	4.507E+00	4.623E+00	NOT IDENT.
NB-95	3.579E+00	4.907E+00	5.166E+00	NOT IDENT.
NB-95M	-9.411E+00	1.276E+01	1.345E+01	NOT IDENT.
TC-95M	-1.853E+00	5.591E+00	5.653E+00	NOT IDENT.
ZR-95	-3.396E+00	8.634E+00	8.769E+00	NOT IDENT.
MO-99	1.109E+04	1.531E+04	1.610E+04	FAIL ABUN
TC-99M	6.618E+29	1.278E+30	0.000E+00	SHORT HLIF
RH-101	-3.317E+00	3.030E+00	3.379E+00	NOT IDENT.
RH-102M	-5.834E-01	3.851E+00	3.860E+00	NOT IDENT.
RU-103	9.741E-01	5.847E+00	5.864E+00	NOT IDENT.
RH-106	-1.126E+01	2.966E+01	3.010E+01	NOT IDENT.
RU-106	-1.126E+01	2.966E+01	3.010E+01	NOT IDENT.
AG-108M	-1.315E+00	3.097E+00	3.154E+00	NOT IDENT.
CD-109	-8.291E+01	7.866E+01	8.710E+01	NOT IDENT.
AG-110	-5.981E+01	8.859E+01	9.261E+01	NOT IDENT.
AG-110M	-4.934E+00	5.997E+00	6.397E+00	NOT IDENT.
IN-111	1.768E+01	1.125E+03	1.125E+03	NOT IDENT.
SN-113	-1.356E+00	4.794E+00	4.832E+00	NOT IDENT.
IN-114M	-1.024E+01	2.019E+01	2.071E+01	NOT IDENT.
CD-115	7.697E+03	2.411E+04	2.436E+04	SHORT HLIF
SN-117M	-4.286E+00	7.753E+00	7.991E+00	NOT IDENT.
SB-122	-2.080E+03	2.555E+03	2.722E+03	NOT IDENT.
I-123	-2.413E+13	6.771E+13	6.858E+13	SHORT HLIF
TE-123M	-2.161E-01	2.549E+00	2.551E+00	NOT IDENT.
SB-124	4.527E+00	1.165E+01	1.183E+01	NOT IDENT.
SB-125	-5.983E+00	9.496E+00	9.873E+00	NOT IDENT.
TE-125M	-4.941E+02	1.050E+03	1.073E+03	NOT IDENT.
I-126	1.056E+00	3.761E+01	3.761E+01	NOT IDENT.
SB-126	-5.471E+00	2.642E+01	2.654E+01	NOT IDENT.
SN-126	-2.526E-01	7.122E+00	7.123E+00	FAIL ABUN
SB-127	-3.640E+02	6.931E+02	7.123E+02	NOT IDENT.
TE-129	-7.698E+01	6.674E+01	7.524E+01	NOT IDENT.
I-131	7.522E+00	2.815E+01	2.835E+01	NOT IDENT.
I-132	-1.000E+41	1.761E+42	0.000E+00	SHORT HLIF
TE-132	3.314E+02	5.427E+02	5.629E+02	NOT IDENT.
BA-133	1.033E+00	4.731E+00	4.754E+00	NOT IDENT.
I-133	3.275E+08	1.497E+09	1.505E+09	SHORT HLIF
CS-134	-8.001E+00	6.898E+00	7.785E+00	NOT IDENT.
I-135	1.165E+28	1.846E+28	0.000E+00	SHORT HLIF
CS-136	-1.105E+01	1.957E+01	2.019E+01	NOT IDENT.
BA-137M	5.503E+00	4.131E+00	4.820E+00	NOT IDENT.
CS-137	5.813E+00	4.364E+00	5.092E+00	NOT IDENT.
LA-138	2.135E+00	7.829E+00	7.888E+00	NOT IDENT.
CE-139	2.596E-01	2.781E+00	2.783E+00	NOT IDENT.
BA-140	7.928E+00	4.394E+01	4.409E+01	NOT IDENT.
LA-140	-5.427E+00	2.099E+01	2.114E+01	FAIL ABUN
CE-143	-6.062E+05	1.473E+06	1.499E+06	SHORT HLIF
CE-144	-9.111E+00	1.774E+01	1.821E+01	NOT IDENT.
PM-144	-2.595E+00	4.874E+00	5.013E+00	FAIL ABUN
PR-144	-1.952E+02	3.666E+02	3.771E+02	NOT IDENT.
PM-146	5.050E+00	6.638E+00	7.019E+00	FAIL ABUN
ND-147	5.609E+01	1.210E+02	1.237E+02	NOT IDENT.
PM-147	-6.991E+03	7.123E+04	7.130E+04	NOT IDENT.
PM-149	-3.072E+04	1.822E+05	1.827E+05	SHORT HLIF
EU-152	3.356E+00	1.009E+01	1.020E+01	FAIL ABUN
GD-153	7.421E+00	8.677E+00	9.301E+00	NOT IDENT.
EU-154	2.901E+00	1.232E+01	1.238E+01	NOT IDENT.
EU-155	-2.544E+00	9.568E+00	9.637E+00	NOT IDENT.
TB-160	4.394E+00	1.916E+01	1.926E+01	FAIL ABUN
HO-166M	2.892E+00	7.323E+00	7.438E+00	NOT IDENT.
TM-171	-4.189E+02	3.028E+03	3.034E+03	NOT IDENT.
LU-176	3.839E-01	2.758E+00	2.764E+00	NOT IDENT.
LU-177	5.092E+01	2.760E+02	2.769E+02	NOT IDENT.
HF-181	-9.349E-01	5.668E+00	5.683E+00	NOT IDENT.
W-181	-3.604E+00	2.956E+01	2.960E+01	NOT IDENT.
TA-182	-1.053E+00	2.093E+01	2.094E+01	NOT IDENT.
RE-183	7.311E+00	3.068E+01	3.085E+01	NOT IDENT.
RE-184	-6.738E+00	1.644E+01	1.671E+01	FAIL ABUN
RE-188	-5.543E+00	1.739E+01	1.757E+01	FAIL ABUN
W-188	-1.757E+02	7.817E+02	7.857E+02	FAIL ABUN
OS-191	1.546E+01	2.416E+01	2.515E+01	FAIL ABUN
IR-192	1.430E+00	3.736E+00	3.792E+00	NOT IDENT.

PB-201	2.394E+19	3.989E+19	0.000E+00	SHORT HLIF
TL-201	-2.292E+03	5.632E+03	5.726E+03	NOT IDENT.
TL-202	6.705E+00	1.323E+01	1.357E+01	NOT IDENT.
HG-203	-3.481E+00	4.638E+00	4.896E+00	NOT IDENT.
PB-203	-6.551E+03	8.727E+03	9.214E+03	SHORT HLIF
TL-204	-1.501E+02	5.630E+02	5.671E+02	NOT IDENT.
BI-207	4.184E+00	4.760E+00	5.120E+00	NOT IDENT.
PB-210	4.614E+01	6.288E+02	6.291E+02	NOT IDENT.
BI-211	-2.319E+01	2.942E+01	3.122E+01	NOT IDENT.
PB-211	-4.371E+01	8.069E+01	8.307E+01	FAIL ABUN
BI-212	2.866E+01	5.636E+01	5.782E+01	NOT IDENT.
PB-212	-7.966E+00	7.341E+00	8.174E+00	NOT IDENT.
BI-213	-2.880E+00	1.189E+01	1.196E+01	NOT IDENT.
BI-214	-4.997E+00	1.041E+01	1.065E+01	NOT IDENT.
PB-214	-7.121E+00	1.083E+01	1.129E+01	NOT IDENT.
RN-219	1.818E+01	4.240E+01	4.319E+01	FAIL ABUN
FR-221	1.004E+01	1.950E+01	2.001E+01	NOT IDENT.
RA-223	-2.576E+01	6.920E+01	7.017E+01	FAIL ABUN
RA-224	-5.499E+01	6.330E+01	6.799E+01	NOT IDENT.
AC-225	5.541E+01	1.077E+02	1.105E+02	NOT IDENT.
RA-226	2.341E+00	9.544E+01	9.545E+01	NOT IDENT.
AC-227	-1.461E+01	2.166E+01	2.264E+01	NOT IDENT.
TH-227	-1.461E+01	2.166E+01	2.264E+01	NOT IDENT.
TH-228	-7.966E+00	7.341E+00	8.174E+00	NOT IDENT.
TH-229	4.777E+01	5.020E+01	5.463E+01	NOT IDENT.
TH-230	-1.741E+03	1.635E+03	1.814E+03	NOT IDENT.
PA-231	-8.849E+00	5.087E+01	5.102E+01	NOT IDENT.
TH-231	-7.149E+00	5.461E+01	5.471E+01	NOT IDENT.
PA-233	3.128E+00	6.476E+00	6.628E+00	NOT IDENT.
PA-234	-2.679E+01	4.120E+01	4.294E+01	NOT IDENT.
PA-234M	9.723E+02	7.852E+02	8.994E+02	FAIL ABUN
TH-234	1.215E+02	3.647E+02	3.688E+02	FAIL ABUN
U-234	2.649E+03	1.073E+04	1.079E+04	NOT IDENT.
U-235	5.699E+00	2.615E+01	2.628E+01	FAIL ABUN
NP-237	3.128E+00	6.476E+00	6.628E+00	NOT IDENT.
NP-238	5.018E+04	6.448E+04	6.834E+04	SHORT HLIF
U-238	1.215E+02	3.647E+02	3.688E+02	FAIL ABUN
NP-239	4.944E+00	2.640E+01	2.649E+01	NOT IDENT.
AM-241	5.617E-01	2.279E+01	2.279E+01	NOT IDENT.
AM-242	6.388E+00	6.363E+01	6.370E+01	NOT IDENT.
AM-243	-3.865E-01	6.963E+00	6.965E+00	NOT IDENT.
CM-243	1.327E+00	9.168E+00	9.188E+00	NOT IDENT.
BK-247	4.191E+00	7.726E+00	7.955E+00	NOT IDENT.
CM-247	-8.919E-01	4.135E+00	4.155E+00	NOT IDENT.
CF-249	1.708E+00	4.005E+00	4.078E+00	NOT IDENT.
CF-251	1.793E+00	1.287E+01	1.289E+01	NOT IDENT.
CF-252	-4.399E+03	1.840E+04	1.851E+04	NOT IDENT.
ANH-511	-1.973E+01	9.345E+00	1.291E+01	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	53.6517	133.52	54.6611	116.30	75.7496
879.38	61.3023	364.49	54.6758	116.74	65.5933
46.54	50.7150	80.22	54.6826	117.23	62.6033
228.16	52.4248	711.68	52.0159	119.76	67.1726
52.39	56.8964	356.01	60.3261	120.54	62.1364
53.20	54.2174	323.87	60.3417	120.90	64.2700
53.44	54.2852	82.35	0.0000	264.66	64.3083
57.53	54.2524	82.47	58.8174	121.22	64.3254
293.27	0.0000	82.47	58.8184	344.28	62.3442
57.53	50.4528	83.79	58.1786	122.06	61.3511
482.18	50.4533	265.00	60.0716	1274.44	55.2604
57.98	50.5638	84.21	60.1173	123.68	57.4384
59.32	52.2821	84.86	0.0000	1377.63	0.0000
59.54	56.7912	193.51	69.6711	127.23	76.9465
155.04	59.8434	105.31	55.0267	129.43	65.7227
63.00	60.2608	86.79	53.2061	131.20	66.0179
129.43	60.3403	86.94	60.7064	133.02	70.5978
63.29	60.3403	87.09	60.7386	133.52	62.1180
290.67	60.1361	87.57	59.9048	135.34	54.8669
63.81	60.1986	88.03	78.7519	136.00	64.6536
87.57	64.8792	306.78	83.5298	136.28	58.2278
64.99	66.2271	88.47	84.5068	136.47	62.5702
65.08	66.2536	531.02	130.7574	739.50	66.8129
66.73	58.6819	184.58	130.8290	140.51	0.0000
66.98	58.7457	92.59	55.2312	140.88	67.5987
67.24	62.2716	93.31	91.6377	143.76	81.2311
67.67	66.7200	94.56	130.3586	144.24	59.3427
1221.41	75.4108	311.90	130.3970	145.44	59.5083
439.51	60.9718	946.00	130.4063	152.32	68.2787
70.82	60.9718	97.43	53.2133	152.43	68.2955
167.43	60.9728	98.43	66.9727	1048.07	72.9058
97.43	62.9220	98.44	66.9748	154.21	67.4405
70.82	66.7366	99.53	62.3369	155.04	76.5726
70.82	66.7372	103.37	62.3369	158.56	57.5524
279.20	0.0000	116.74	62.3369	158.97	0.0000
1063.66	62.8590	100.11	67.3302	159.00	55.6529
72.87	0.0000	100.20	67.3491	162.33	60.6238
351.06	62.8742	102.03	53.0100	537.26	58.3765
74.66	58.8689	103.18	50.2428	163.33	63.0432
238.63	59.7986	103.37	46.3291	165.86	58.7672
351.93	59.7986	105.31	56.5190	167.43	68.2061
238.63	59.7986	106.12	45.7231	245.35	75.7335
74.97	77.6954	106.47	55.7214	427.87	72.9647
77.11	52.2342	109.28	68.2267	176.60	69.4737
256.23	60.0295	111.00	62.5189	177.52	70.7785
79.82	53.6902	111.76	58.6138	181.07	77.2063
80.02	54.6405	208.37	73.0102	184.41	101.6068
80.03	54.6414	116.24	75.7366	184.58	108.8137

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	67.1067	300.09	69.3657	477.60	32.9377
186.21	62.3705	300.13	69.3702	477.99	32.9483
190.27	72.5116	301.36	62.8136	482.18	33.0622
193.51	54.7071	302.85	55.3013	487.02	33.1926
197.03	74.6304	304.50	50.6375	492.35	0.0000
198.01	61.2793	304.85	57.3499	497.08	36.9232
201.83	76.5010	306.78	51.7368	511.00	66.4936
204.12	64.4192	308.46	54.7224	514.00	239.9344
205.31	72.0000	311.90	43.3823	520.40	29.0825
208.37	56.1559	316.51	41.6834	520.69	0.0000
210.85	59.3169	319.41	54.4710	667.71	0.0000
215.65	69.0590	320.08	52.5674	527.90	0.0000
218.12	62.5753	321.04	42.8810	529.59	32.6571
222.11	59.5788	323.87	58.6682	529.87	0.0000
227.09	55.7655	325.23	56.8023	531.02	25.5858
227.38	54.9323	1596.21	46.2169	537.26	24.0988
228.16	61.0163	331.15	0.0000	1260.41	0.0000
228.18	61.0178	333.37	46.4607	552.55	25.2725
235.69	81.7336	334.37	38.5961	795.86	33.6532
235.96	81.7671	338.28	39.7607	564.24	40.0482
238.63	68.1262	911.20	39.7624	569.33	27.4045
238.98	0.0000	340.48	59.7876	569.50	28.3208
240.99	87.6536	340.55	59.7925	569.70	28.3255
242.00	75.4967	344.28	43.0289	582.08	25.0684
244.70	66.9871	345.93	48.1191	583.19	29.5146
245.35	65.2875	351.06	52.4221	595.83	34.4221
459.60	56.9030	351.93	53.4798	600.60	43.3060
685.70	57.9415	356.01	49.6619	604.72	41.1802
388.16	51.7318	361.25	0.0000	609.32	38.4901
256.23	51.9869	364.49	40.9058	610.33	30.9999
527.90	0.0000	366.42	43.0382	614.28	39.5583
264.66	39.1834	383.85	33.3809	618.01	21.7155
265.00	44.6466	388.16	32.4771	621.93	21.7717
269.46	45.6523	666.33	32.4922	630.19	0.0000
401.81	45.7621	391.70	38.8985	631.29	27.6176
273.65	57.8500	400.66	31.8158	632.98	28.6011
276.40	61.7506	401.32	0.0000	633.25	30.5127
583.19	60.9069	401.81	33.9746	634.78	36.2698
277.60	57.2332	402.40	44.6173	635.95	38.2068
402.40	60.0343	404.85	48.9808	636.99	22.9395
278.43	65.6135	410.95	36.4135	657.50	35.8223
279.20	0.0000	720.70	30.0935	884.68	37.7658
279.54	56.4553	423.72	36.8485	661.66	19.4135
280.46	58.3781	427.09	40.2241	664.57	0.0000
301.36	66.0699	427.87	38.0769	666.33	23.3628
284.31	58.6729	433.94	36.0984	666.50	23.3650
285.41	53.1615	439.51	32.9803	667.71	0.0000
285.90	0.0000	440.45	40.7104	677.62	28.4239
287.50	54.2405	453.88	46.7578	685.70	21.6677
290.67	55.4013	459.60	43.6314	692.65	28.6796
293.27	0.0000	463.37	30.3036	695.00	34.3313
295.22	56.6663	468.07	38.3116	696.49	36.4766
316.51	72.7906	473.00	52.6133	696.51	36.4766
298.58	65.4427	475.06	37.4023	697.00	26.9684
299.98	69.3568	696.49	32.9153	697.49	25.3898

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	27.0581	903.28	17.6597	1291.59	12.3311
706.68	39.8840	907.67	0.0000	1298.22	0.0000
711.68	27.0000	911.20	18.8319	1312.11	23.7951
720.70	25.1289	984.45	0.0000	1332.49	11.4560
721.93	0.0000	926.36	16.7317	1365.19	10.5239
1690.97	22.1396	935.54	12.3206	1368.63	0.0000
722.91	22.1417	937.49	13.4524	1377.63	0.0000
723.31	18.1198	983.53	13.4923	1384.29	11.6456
756.73	27.1936	945.96	0.0000	1408.01	12.7980
727.33	21.1878	946.00	18.9051	1434.09	10.7500
733.00	23.2801	949.00	9.0144	1435.80	13.9826
735.93	28.3871	954.55	0.0000	1457.56	0.0000
739.50	19.3012	962.31	9.0674	1460.82	13.0037
1434.09	29.5372	964.08	18.1484	1489.16	7.6491
747.24	22.4445	966.17	18.1650	1596.21	15.9548
752.31	25.5768	968.97	21.2188	1620.50	11.3364
753.82	19.4540	983.53	16.7766	1678.03	0.0000
756.73	24.6130	984.45	0.0000	1690.97	6.7371
763.94	24.7090	996.26	12.2676	1757.55	0.0000
765.80	18.5504	1001.03	17.5166	1764.49	8.8250
1001.03	21.6492	1004.73	24.6230	1770.23	11.7832
766.84	24.7478	1025.87	0.0000	1771.35	5.8933
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	25.9125	1037.84	17.7856	1808.65	5.9475
777.92	21.7828	1038.76	0.0000	1836.06	6.9846
778.90	24.9075	1046.59	18.7881		
783.70	23.9307	1048.07	22.5598		
1435.80	21.6988	1050.41	16.9356		
903.28	24.0360	1063.66	6.3057		
795.86	23.4548	1077.00	18.0667		
801.95	21.0083	1077.34	18.0695		
802.10	23.1105	1083.85	11.1232		
810.29	23.2085	1085.87	12.7227		
810.45	28.4848	1099.25	13.4285		
810.76	29.5449	1111.64	14.4558		
815.77	21.1572	1112.07	20.2422		
818.51	24.3652	1112.84	21.2126		
832.01	23.8909	1115.54	14.4778		
834.85	18.7983	1120.29	16.4380		
835.15	15.3826	1120.55	18.3738		
836.80	0.0000	1121.30	18.3784		
846.77	26.8593	1808.65	9.7036		
856.80	25.9116	1131.51	0.0000		
860.56	20.5511	1332.49	13.8059		
871.09	19.1334	1177.95	7.9027		
873.19	17.4116	1189.05	14.8770		
875.33	0.0000	1204.77	7.9789		
879.38	19.2092	1221.41	19.0612		
880.51	17.4722	1231.02	19.1252		
881.60	14.9841	1235.36	12.0979		
883.24	17.4951	1238.28	12.1096		
884.68	26.2603	1260.41	0.0000		
889.28	18.6415	1271.87	10.2080		
894.76	21.9873	1274.44	12.2602		
1836.06	15.4146	1274.54	12.2607		

VAX/VMS Nuclide Identification Report Generated 21-JUL-2022 23:11:57.91

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                    *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141124.CNF;1
Background file  : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM40.CNF;411
Background date  : 16-JUL-2022 14:12:17
Sample date     : 21-JUL-2022 00:00:00 Acquisition date : 21-JUL-2022 22:56:30
Sample ID      : G1205141124 Sample quantity : 5.71750E-01 FILTER
Detector name   : GAM40 Detector geometry: JAR
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.63 0.2%
Energy tolerance: 1.50000 keV Analyst Initials : MJH1
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2290721 Detector SN# :
Matrix Spike ID : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.37*	1398	1140	0.86	93.74	89	9	1.55E+00	5.1	2.84E+00
2	2	57.67	109	432	0.97	116.38	115	12	1.21E-01	22.9	
3	2	59.48	6332	771	0.97	120.00	115	12	7.04E+00	1.4	
4	0	75.96*	45	417	1.46	152.98	150	7	4.96E-02	77.1	
5	0	141.24	48	330	1.33	283.67	281	7	5.30E-02	64.6	
6	0	146.30	48	355	2.10	293.80	291	8	5.35E-02	69.2	
7	0	230.52	60	229	1.43	462.38	460	6	6.68E-02	42.1	
8	0	572.44	25	77	1.47	1146.58	1145	7	2.75E-02	61.4	
9	0	661.92	7325	158	1.47	1325.58	1318	15	8.14E+00	1.2	
10	0	873.03	26	58	1.15	1747.82	1745	8	2.93E-02	54.2	
11	0	1156.75	25	62	4.00	2315.07	2307	15	2.82E-02	71.2	
12	0	1173.56	2053	51	1.82	2348.67	2339	18	2.28E+00	2.3	
13	0	1184.41	62	47	9.22	2370.35	2357	31	6.83E-02	35.2	
14	0	1332.96	1822	29	1.73	2667.27	2657	18	2.02E+00	2.4	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 21-JUL-2022 23:11:58

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141124.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 21-JUL-2022 00:00:00	Acquisition date	: 21-JUL-2022 22:56:30
Sample ID	: G1205141124	Sample quantity	: 0.57175 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA40	Detector geometry	: JAR
Elapsed live time	: 0 00:15:00.00	Elapsed real time	: 0 00:15:01.63 0.2%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
CO-60	1173.23	2053	99.85	9.229E-01	1.170E+04	1.170E+04	4.70
	1332.49	1822	99.98*	8.268E-01	1.157E+04	1.158E+04	4.88
TC-99M	140.51	48	89.06*	4.013E+00	7.011E+01	9.983E+02	129.26
BA-137M	661.66	7325	89.90*	1.527E+00	2.802E+04	2.802E+04	2.45
CS-137	661.66	7325	85.10*	1.527E+00	2.960E+04	2.961E+04	2.45
CE-141	145.44	48	48.29*	3.992E+00	1.312E+02	1.339E+02	138.43
W-181	56.28	109	18.70	7.482E-01	4.076E+03	4.099E+03	45.75
	57.53	109	32.00*	7.482E-01	2.382E+03	2.395E+03	45.75
	65.08	-----	10.60	1.311E+00	-----	Line Not Found	-----
	66.98	-----	2.40	1.465E+00	-----	Line Not Found	-----
	136.28	-----	0.03	4.024E+00	-----	Line Not Found	-----
	152.32	-----	0.08	3.956E+00	-----	Line Not Found	-----
PB-210	46.54	1398	4.25*	1.712E-01	1.009E+06	1.009E+06	10.22
AM-241	59.54	6332	35.90*	8.768E-01	1.057E+05	1.057E+05	2.89
AM-243	43.53	-----	5.90	9.770E-02	-----	Line Not Found	-----
	74.66	45	67.20*	2.184E+00	1.598E+02	1.598E+02	154.22

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141124.CNF;1
Acquisition date : 21-JUL-2022 22:56:30 Sensitivity : 3.000
Detector ID : GAM40 Energy tolerance: 1.500
Elapsed live time: 0 00:15:00.00 Abundance limit : 75.000
Elapsed real time: 0 00:15:01.63 Half life ratio : *****
Sample date : 21-JUL-2022 00:00:00 Analyst initials: MJH1
Sample ID : G1205141124 Sample Quantity : 5.7175E-01 FILTER
Batch Number : 2290721 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 13-OCT-2021 04:34:22 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM40_JAR.CNF;17

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
CO-60	1.158E+04	5.533E+02	1.131E+02
TC-99M	9.983E+02	1.265E+03	1.464E+03
BA-137M	2.802E+04	6.738E+02	1.629E+02
CS-137	2.961E+04	7.118E+02	1.721E+02
CE-141	1.339E+02	1.817E+02	2.003E+02
W-181	2.395E+03	1.074E+03	3.082E+03
PB-210	1.009E+06	1.011E+05	7.433E+04
AM-241	1.057E+05	2.995E+03	1.811E+03
AM-243	1.598E+02	2.415E+02	2.722E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	-1.229E+02	9.854E+02	1.734E+03	NOT IDENT.
NA-22	2.415E+01	4.918E+01	1.091E+02	NOT IDENT.
NA-24	3.967E+01	1.032E+02	2.471E+02	NOT IDENT.
AL-26	1.661E+01	2.228E+01	7.395E+01	NOT IDENT.
K-40	-1.610E+00	3.061E+02	7.609E+02	NOT IDENT.
SC-46	-2.523E+01	1.011E+02	1.726E+02	NOT IDENT.
V-48	-2.392E+01	1.218E+02	2.066E+02	NOT IDENT.
CR-51	8.154E+01	7.428E+02	1.355E+03	NOT IDENT.
MN-52	-6.303E+00	4.429E+01	9.173E+01	NOT IDENT.
MN-54	-8.167E+00	8.985E+01	1.569E+02	NOT IDENT.
CO-56	-5.906E+01	1.045E+02	1.735E+02	NOT IDENT.
CO-57	-1.510E+01	6.758E+01	1.146E+02	NOT IDENT.
NI-57	1.641E+00	6.826E+01	1.503E+02	NOT IDENT.
CO-58	-1.836E+01	8.629E+01	1.495E+02	NOT IDENT.
FE-59	1.912E+02	2.136E+02	4.185E+02	NOT IDENT.
ZN-65	-7.784E+00	2.297E+02	4.229E+02	NOT IDENT.
CU-67	-5.969E+01	1.757E+02	2.911E+02	NOT IDENT.
GE-68	1.877E+03	3.238E+03	6.299E+03	NOT IDENT.
AS-73	-1.144E+04	7.477E+03	1.251E+04	NOT IDENT.
AS-74	5.840E+00	1.338E+02	2.400E+02	NOT IDENT.
SE-75	6.840E+01	1.275E+02	2.165E+02	NOT IDENT.

BR-77	-1.174E+02	4.100E+02	6.752E+02	NOT IDENT.
SR-82	-2.312E+02	5.299E+02	9.024E+02	NOT IDENT.
RB-83	-4.713E+01	1.826E+02	3.206E+02	NOT IDENT.
RB-84	1.841E+01	1.592E+02	2.794E+02	NOT IDENT.
KR-85	-1.832E+04	2.023E+04	3.406E+04	NOT IDENT.
SR-85	-8.290E+01	9.152E+01	1.541E+02	NOT IDENT.
RB-86	1.039E+03	1.236E+03	2.453E+03	NOT IDENT.
Y-88	2.277E+01	4.183E+01	1.038E+02	NOT IDENT.
Y-91	-1.653E+03	2.758E+04	5.287E+04	NOT IDENT.
NB-94	1.313E+01	7.573E+01	1.373E+02	NOT IDENT.
NB-95	4.536E+01	7.929E+01	1.486E+02	NOT IDENT.
NB-95M	-1.526E+02	3.041E+02	4.910E+02	NOT IDENT.
TC-95M	-2.404E+01	1.123E+02	1.854E+02	NOT IDENT.
ZR-95	-9.560E+00	1.586E+02	2.790E+02	NOT IDENT.
MO-99	6.886E+00	8.491E+02	1.509E+03	FAIL ABUN
RH-101	-2.206E+01	8.532E+01	1.441E+02	NOT IDENT.
RH-102M	2.550E+01	1.115E+02	1.990E+02	NOT IDENT.
RU-103	-3.271E+01	9.671E+01	1.689E+02	NOT IDENT.
RH-106	-2.107E+02	7.810E+02	1.364E+03	NOT IDENT.
RU-106	-2.107E+02	7.810E+02	1.364E+03	NOT IDENT.
AG-108M	3.734E+01	1.052E+02	1.902E+02	NOT IDENT.
CD-109	9.255E+02	2.177E+03	3.837E+03	NOT IDENT.
AG-110	-5.464E+02	2.287E+03	3.521E+03	NOT IDENT.
AG-110M	-5.900E+01	1.427E+02	2.397E+02	NOT IDENT.
IN-111	-8.010E+01	1.001E+02	1.587E+02	NOT IDENT.
SN-113	-1.177E+02	1.337E+02	2.300E+02	NOT IDENT.
IN-114M	3.151E+02	4.336E+02	7.504E+02	NOT IDENT.
CD-115	6.923E+01	4.256E+02	7.640E+02	NOT IDENT.
SN-117M	2.017E+01	7.078E+01	1.215E+02	NOT IDENT.
SB-122	5.868E+01	1.428E+02	2.620E+02	NOT IDENT.
I-123	2.161E+02	2.304E+02	4.077E+02	NOT IDENT.
TE-123M	6.468E+01	6.857E+01	1.214E+02	NOT IDENT.
SB-124	3.141E+01	6.318E+01	1.720E+02	NOT IDENT.
SB-125	1.118E+02	3.171E+02	5.737E+02	NOT IDENT.
TE-125M	-1.297E+04	2.267E+04	3.802E+04	NOT IDENT.
I-126	4.362E+01	2.370E+02	3.906E+02	NOT IDENT.
SB-126	-1.327E+00	1.406E+02	2.517E+02	NOT IDENT.
SN-126	1.516E+02	2.179E+02	3.884E+02	NOT IDENT.
SB-127	-7.466E+01	2.099E+02	3.653E+02	NOT IDENT.
TE-129	-1.557E+02	1.387E+03	2.443E+03	NOT IDENT.
I-131	1.070E+02	1.005E+02	1.905E+02	NOT IDENT.
I-132	-1.746E+04	8.216E+04	1.283E+05	NOT IDENT.
TE-132	2.099E+01	1.099E+02	1.697E+02	NOT IDENT.
BA-133	3.889E+01	1.292E+02	2.359E+02	NOT IDENT.
I-133	-1.379E+02	2.110E+02	3.604E+02	NOT IDENT.
CS-134	2.675E+01	9.897E+01	1.794E+02	NOT IDENT.
I-135	1.074E+03	2.052E+03	4.512E+03	NOT IDENT.
CS-136	-9.119E+01	1.371E+02	2.415E+02	NOT IDENT.
LA-138	2.791E+01	5.894E+01	1.417E+02	NOT IDENT.
CE-139	-7.054E+00	7.388E+01	1.243E+02	NOT IDENT.
BA-140	4.219E+02	3.681E+02	6.992E+02	NOT IDENT.
LA-140	1.494E+01	5.467E+01	1.200E+02	NOT IDENT.
CE-143	-3.203E+01	2.694E+02	4.877E+02	FAIL ABUN
CE-144	2.845E+02	5.117E+02	8.955E+02	NOT IDENT.
PM-144	1.537E+01	7.419E+01	1.352E+02	NOT IDENT.
PR-144	1.141E+03	5.511E+03	1.004E+04	NOT IDENT.
PM-146	4.590E+01	1.599E+02	2.867E+02	NOT IDENT.
ND-147	-1.415E+02	6.703E+02	1.179E+03	NOT IDENT.
PM-147	-8.328E+04	1.981E+06	3.391E+06	NOT IDENT.
PM-149	-2.263E+03	2.960E+03	5.219E+03	NOT IDENT.
EU-152	-1.173E+02	2.810E+02	4.985E+02	NOT IDENT.
GD-153	7.518E+01	2.313E+02	4.055E+02	NOT IDENT.
EU-154	6.893E+01	1.404E+02	3.114E+02	FAIL ABUN
EU-155	5.336E+01	3.001E+02	5.209E+02	NOT IDENT.
TB-160	4.278E+01	3.622E+02	6.356E+02	FAIL ABUN
HO-166M	-4.707E+01	1.291E+02	2.234E+02	NOT IDENT.
TM-171	-4.428E+04	1.759E+05	3.050E+05	NOT IDENT.
LU-176	-3.123E+00	7.681E+01	1.393E+02	NOT IDENT.
LU-177	-4.256E+02	7.228E+02	1.171E+03	NOT IDENT.
HF-181	-2.284E+01	1.176E+02	2.069E+02	FAIL ABUN
TA-182	-3.303E+01	2.717E+02	5.152E+02	NOT IDENT.
RE-183	2.244E+03	1.006E+03	3.805E+03	FAIL ABUN
RE-184	7.943E+01	2.967E+02	5.257E+02	NOT IDENT.
RE-188	1.308E+02	3.621E+02	6.254E+02	NOT IDENT.
W-188	-1.010E+04	1.810E+04	3.216E+04	NOT IDENT.
OS-191	-1.573E+01	2.229E+02	3.799E+02	NOT IDENT.
IR-192	3.409E+01	8.980E+01	1.655E+02	NOT IDENT.
PB-201	-3.060E+02	5.173E+02	9.123E+02	NOT IDENT.

TL-201	3.394E+02	7.269E+02	1.256E+03	NOT IDENT.
TL-202	-2.292E+01	1.145E+02	2.016E+02	NOT IDENT.
HG-203	-4.106E+00	8.622E+01	1.569E+02	NOT IDENT.
PB-203	-5.552E+00	1.166E+02	2.121E+02	NOT IDENT.
TL-204	4.374E+03	1.584E+04	2.806E+04	NOT IDENT.
BI-207	1.077E+02	1.402E+02	2.760E+02	FAIL ABUN
TL-208	1.067E+01	1.005E+02	1.807E+02	NOT IDENT.
BI-211	-2.030E+02	6.360E+02	1.132E+03	NOT IDENT.
PB-211	1.367E+03	2.310E+03	4.245E+03	NOT IDENT.
BI-212	-2.161E+02	1.144E+03	2.012E+03	NOT IDENT.
PB-212	3.704E+01	1.619E+02	2.740E+02	FAIL ABUN
BI-213	-1.909E+02	3.887E+02	6.753E+02	NOT IDENT.
BI-214	1.121E+00	1.748E+02	3.129E+02	NOT IDENT.
PB-214	2.394E+02	2.283E+02	4.302E+02	FAIL ABUN
RN-219	7.474E+02	1.300E+03	2.389E+03	NOT IDENT.
FR-221	-3.142E+02	6.324E+02	1.026E+03	NOT IDENT.
RA-223	1.106E+03	1.889E+03	3.506E+03	NOT IDENT.
RA-224	-8.049E+02	1.821E+03	2.949E+03	NOT IDENT.
AC-225	-3.359E+02	6.760E+02	1.097E+03	NOT IDENT.
RA-226	5.193E+02	1.836E+03	3.132E+03	NOT IDENT.
AC-227	-1.834E+02	7.544E+02	1.231E+03	NOT IDENT.
TH-227	-1.834E+02	7.544E+02	1.231E+03	NOT IDENT.
AC-228	3.859E+02	4.387E+02	8.125E+02	NOT IDENT.
RA-228	3.859E+02	4.387E+02	8.125E+02	NOT IDENT.
TH-228	3.704E+01	1.619E+02	2.740E+02	FAIL ABUN
TH-229	-4.252E+02	1.486E+03	2.455E+03	NOT IDENT.
TH-230	-2.253E+04	3.749E+04	6.416E+04	NOT IDENT.
PA-231	3.039E+02	1.354E+03	2.483E+03	NOT IDENT.
TH-231	7.972E+01	1.225E+03	2.142E+03	NOT IDENT.
TH-232	-2.548E+04	7.324E+04	1.175E+05	FAIL ABUN
PA-233	4.042E+01	1.867E+02	3.423E+02	NOT IDENT.
PA-234	-6.201E+01	1.083E+03	1.851E+03	NOT IDENT.
PA-234M	3.442E+03	1.238E+04	2.351E+04	NOT IDENT.
TH-234	-4.776E+03	5.382E+03	8.377E+03	NOT IDENT.
U-234	-6.657E+05	6.397E+05	1.085E+06	NOT IDENT.
U-235	7.516E+01	6.077E+02	8.477E+02	NOT IDENT.
NP-237	4.042E+01	1.867E+02	3.423E+02	NOT IDENT.
NP-238	-1.999E+02	6.401E+02	1.074E+03	NOT IDENT.
U-238	-4.776E+03	5.382E+03	8.377E+03	NOT IDENT.
NP-239	4.786E+02	7.039E+02	1.248E+03	NOT IDENT.
AM-242	-1.804E+02	1.783E+03	3.069E+03	NOT IDENT.
CM-243	-1.073E+01	3.083E+02	5.306E+02	NOT IDENT.
BK-247	1.049E+02	2.502E+02	4.220E+02	NOT IDENT.
CM-247	-1.310E+01	1.189E+02	2.119E+02	NOT IDENT.
CF-249	7.302E+01	1.296E+02	2.381E+02	NOT IDENT.
CF-251	-1.211E+02	3.360E+02	5.564E+02	NOT IDENT.
CF-252	-4.159E+05	4.930E+05	8.195E+05	NOT IDENT.
ANH-511	2.894E+01	9.195E+01	1.699E+02	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.37	1399	1140	0.86	93.74	89	9	1.55E+00	5.1	2.84E+00
2	2	57.67	109	432	0.97	116.38	115	12	1.21E-01	22.9	
3	2	59.48	6332	771	0.97	120.00	115	12	7.04E+00	1.4	
4	0	75.96	46	417	1.46	152.98	150	7	5.10E-02	75.0	
5	0	141.24	48	330	1.33	283.67	281	7	5.30E-02	64.6	
6	0	146.30	48	355	2.10	293.80	291	8	5.35E-02	69.2	
7	0	230.52	60	229	1.43	462.38	460	6	6.68E-02	42.1	
8	0	572.44	25	77	1.47	1146.58	1145	7	2.75E-02	61.4	
9	0	661.92	7325	158	1.47	1325.58	1318	15	8.14E+00	1.2	
10	0	873.03	26	58	1.15	1747.82	1745	8	2.93E-02	54.2	
11	0	1156.75	25	62	4.00	2315.07	2307	15	2.82E-02	71.2	
12	0	1173.56	2053	51	1.82	2348.67	2339	18	2.28E+00	2.3	
13	0	1184.41	62	47	9.22	2370.35	2357	31	6.83E-02	35.2	
14	0	1332.96	1822	29	1.73	2667.27	2657	18	2.02E+00	2.4	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
CO-60	1173.23	2053	99.85	9.229E-01	1.170E+04	1.170E+04	4.70
	1332.49	1822	99.98*	8.268E-01	1.157E+04	1.158E+04	4.88
TC-99M	140.51	48	89.06*	4.013E+00	7.011E+01	9.983E+02	129.26
BA-137M	661.66	7325	89.90*	1.527E+00	2.802E+04	2.802E+04	2.45
CS-137	661.66	7325	85.10*	1.527E+00	2.960E+04	2.961E+04	2.45
CE-141	145.44	48	48.29*	3.992E+00	1.312E+02	1.339E+02	138.43
W-181	56.28	109	18.70	7.482E-01	4.076E+03	4.099E+03	45.75
	57.53	109	32.00*	7.482E-01	2.382E+03	2.395E+03	45.75
	65.08	-----	10.60	1.311E+00	-----	Line Not Found	-----
	66.98	-----	2.40	1.465E+00	-----	Line Not Found	-----
	136.28	-----	0.03	4.024E+00	-----	Line Not Found	-----
	152.32	-----	0.08	3.956E+00	-----	Line Not Found	-----
PB-210	46.54	1398	4.25*	1.712E-01	1.009E+06	1.009E+06	10.22
AM-241	59.54	6332	35.90*	8.768E-01	1.057E+05	1.057E+05	2.89
AM-243	43.53	-----	5.90	9.770E-02	-----	Line Not Found	-----
	74.66	45	67.20*	2.184E+00	1.598E+02	1.598E+02	154.22

Flag: "*" = Keyline

Total number of lines in spectrum 14
Number of unidentified lines 4
Number of lines tentatively identified by NID 10 71.43%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
CO-60	1925.28D	1.00	1.157E+04	1.158E+04	0.056E+04	4.88	
TC-99M	6.02H	14.2	7.011E+01	9.983E+02	12.90E+02	129.26	
BA-137M	30.08Y	1.00	2.802E+04	2.802E+04	0.069E+04	2.45	
CS-137	30.08Y	1.00	2.960E+04	2.961E+04	0.073E+04	2.45	
CE-141	32.51D	1.02	1.312E+02	1.339E+02	1.854E+02	138.43	
W-181	121.20D	1.01	2.382E+03	2.395E+03	1.096E+03	45.75	
PB-210	22.20Y	1.00	1.009E+06	1.009E+06	0.103E+06	10.22	
AM-241	432.60Y	1.00	1.057E+05	1.057E+05	0.031E+05	2.89	
AM-243	7370.00Y	1.00	1.598E+02	1.598E+02	2.465E+02	154.22	
Total Activity :			1.187E+06	1.188E+06			

Grand Total Activity : 1.187E+06 1.188E+06

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	230.52	60	229	1.43	462.38	460	6	6.68E-02	84.3	3.24E+00	
0	572.44	25	77	1.47	1146.58	1145	7	2.75E-02	****	1.71E+00	
0	873.03	26	58	1.15	1747.82	1745	8	2.93E-02	****	1.21E+00	T
0	1156.75	25	62	4.00	2315.07	2307	15	2.82E-02	****	9.35E-01	
0	1184.41	62	47	9.22	2370.35	2357	31	6.83E-02	70.4	9.15E-01	

Flags: "T" = Tentatively associated

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141124.CNF;1
Acquisition date : 21-JUL-2022 22:56:30 Sensitivity : 3.000
Detector ID : GAM40 Energy tolerance : 1.500
Elapsed live time : 0 00:15:00.00 Abundance limit : 75.000
Elapsed real time : 0 00:15:01.63 Half life ratio : *****
Sample date : 21-JUL-2022 00:00:00 Nuclide Library : LIQUID
Sample ID : G1205141124 Analyst initials : MJH1
Batch Number : 2290721 Sample Quantity : 5.7175E-01 FILTER
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 13-OCT-2021 04:34:22 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM40_JAR.CNF;17

Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
CO-60	4.796E+01
TC-99M	7.043E+02
BA-137M	7.631E+01
CS-137	8.062E+01
CE-141	9.643E+01
W-181	1.512E+03
PB-210	3.624E+04
AM-241	8.838E+02
AM-243	1.311E+02

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	8.326E+02	NOT IDENT.
NA-22	4.628E+01	NOT IDENT.
NA-24	9.806E+01	NOT IDENT.
AL-26	2.645E+01	NOT IDENT.
K-40	2.938E+02	NOT IDENT.
SC-46	8.028E+01	NOT IDENT.
V-48	9.652E+01	NOT IDENT.
CR-51	6.494E+02	NOT IDENT.
MN-52	3.561E+01	NOT IDENT.
MN-54	7.281E+01	NOT IDENT.
CO-56	8.101E+01	NOT IDENT.
CO-57	5.524E+01	NOT IDENT.
NI-57	5.824E+01	NOT IDENT.
CO-58	6.918E+01	NOT IDENT.
FE-59	1.963E+02	NOT IDENT.
ZN-65	1.970E+02	NOT IDENT.
CU-67	1.405E+02	NOT IDENT.
GE-68	2.929E+03	NOT IDENT.
AS-73	6.115E+03	NOT IDENT.
AS-74	1.125E+02	NOT IDENT.
SE-75	1.042E+02	NOT IDENT.
BR-77	3.249E+02	NOT IDENT.

SR-82	4.152E+02	NOT IDENT.
RB-83	1.518E+02	NOT IDENT.
RB-84	1.310E+02	NOT IDENT.
KR-85	1.615E+04	NOT IDENT.
SR-85	7.306E+01	NOT IDENT.
RB-86	1.142E+03	NOT IDENT.
Y-88	4.120E+01	NOT IDENT.
Y-91	2.338E+04	NOT IDENT.
NB-94	6.377E+01	NOT IDENT.
NB-95	6.900E+01	NOT IDENT.
NB-95M	2.365E+02	NOT IDENT.
TC-95M	8.948E+01	NOT IDENT.
ZR-95	1.299E+02	NOT IDENT.
MO-99	7.012E+02	FAIL ABUN
RH-101	6.950E+01	NOT IDENT.
RH-102M	9.577E+01	NOT IDENT.
RU-103	8.035E+01	NOT IDENT.
RH-106	6.377E+02	NOT IDENT.
RU-106	6.377E+02	NOT IDENT.
AG-108M	9.141E+01	NOT IDENT.
CD-109	1.855E+03	NOT IDENT.
AG-110	1.658E+03	NOT IDENT.
AG-110M	1.117E+02	NOT IDENT.
IN-111	7.629E+01	NOT IDENT.
SN-113	1.102E+02	NOT IDENT.
IN-114M	3.626E+02	NOT IDENT.
CD-115	3.631E+02	NOT IDENT.
SN-117M	5.856E+01	NOT IDENT.
SB-122	1.237E+02	NOT IDENT.
I-123	1.966E+02	NOT IDENT.
TE-123M	5.854E+01	NOT IDENT.
SB-124	6.438E+01	NOT IDENT.
SB-125	2.758E+02	NOT IDENT.
TE-125M	1.832E+04	NOT IDENT.
I-126	1.804E+02	NOT IDENT.
SB-126	1.161E+02	NOT IDENT.
SN-126	1.878E+02	NOT IDENT.
SB-127	1.672E+02	NOT IDENT.
TE-129	1.175E+03	NOT IDENT.
I-131	9.130E+01	NOT IDENT.
I-132	5.922E+04	NOT IDENT.
TE-132	8.184E+01	NOT IDENT.
BA-133	1.132E+02	NOT IDENT.
I-133	1.706E+02	NOT IDENT.
CS-134	8.339E+01	NOT IDENT.
I-135	1.932E+03	NOT IDENT.
CS-136	1.116E+02	NOT IDENT.
LA-138	5.693E+01	NOT IDENT.
CE-139	5.986E+01	NOT IDENT.
BA-140	3.327E+02	NOT IDENT.
LA-140	4.916E+01	NOT IDENT.
CE-143	2.342E+02	FAIL ABUN
CE-144	4.320E+02	NOT IDENT.
PM-144	6.273E+01	NOT IDENT.
PR-144	4.660E+03	NOT IDENT.
PM-146	1.381E+02	NOT IDENT.
ND-147	5.580E+02	NOT IDENT.
PM-147	1.634E+06	NOT IDENT.
PM-149	2.500E+03	NOT IDENT.
EU-152	2.386E+02	NOT IDENT.
GD-153	1.957E+02	NOT IDENT.
EU-154	1.321E+02	FAIL ABUN
EU-155	2.515E+02	NOT IDENT.
TB-160	2.981E+02	FAIL ABUN
HO-166M	1.026E+02	NOT IDENT.
TM-171	1.490E+05	NOT IDENT.
LU-176	6.684E+01	NOT IDENT.
LU-177	5.637E+02	NOT IDENT.
HF-181	9.888E+01	FAIL ABUN
TA-182	2.280E+02	NOT IDENT.
RE-183	1.876E+03	FAIL ABUN
RE-184	2.467E+02	NOT IDENT.
RE-188	3.012E+02	NOT IDENT.
W-188	1.544E+04	NOT IDENT.
OS-191	1.831E+02	NOT IDENT.
IR-192	7.949E+01	NOT IDENT.
PB-201	4.362E+02	NOT IDENT.
TL-201	6.054E+02	NOT IDENT.

TL-202	9.690E+01	NOT IDENT.
HG-203	7.538E+01	NOT IDENT.
PB-203	1.019E+02	NOT IDENT.
TL-204	1.353E+04	NOT IDENT.
BI-207	1.286E+02	FAIL ABUN
TL-208	8.542E+01	NOT IDENT.
BI-211	5.436E+02	NOT IDENT.
PB-211	2.038E+03	NOT IDENT.
BI-212	9.309E+02	NOT IDENT.
PB-212	1.319E+02	FAIL ABUN
BI-213	3.247E+02	NOT IDENT.
BI-214	1.469E+02	NOT IDENT.
PB-214	2.070E+02	FAIL ABUN
RN-219	1.147E+03	NOT IDENT.
FR-221	4.947E+02	NOT IDENT.
RA-223	1.685E+03	NOT IDENT.
RA-224	1.420E+03	NOT IDENT.
AC-225	5.288E+02	NOT IDENT.
RA-226	1.513E+03	NOT IDENT.
AC-227	5.912E+02	NOT IDENT.
TH-227	5.912E+02	NOT IDENT.
AC-228	3.827E+02	NOT IDENT.
RA-228	3.827E+02	NOT IDENT.
TH-228	1.319E+02	FAIL ABUN
TH-229	1.183E+03	NOT IDENT.
TH-230	3.087E+04	NOT IDENT.
PA-231	1.193E+03	NOT IDENT.
TH-231	1.032E+03	NOT IDENT.
TH-232	5.654E+04	FAIL ABUN
PA-233	1.643E+02	NOT IDENT.
PA-234	8.733E+02	NOT IDENT.
PA-234M	1.097E+04	NOT IDENT.
TH-234	4.026E+03	NOT IDENT.
U-234	5.300E+05	NOT IDENT.
U-235	4.079E+02	NOT IDENT.
NP-237	1.643E+02	NOT IDENT.
NP-238	5.017E+02	NOT IDENT.
U-238	4.026E+03	NOT IDENT.
NP-239	6.016E+02	NOT IDENT.
AM-242	1.479E+03	NOT IDENT.
CM-243	2.561E+02	NOT IDENT.
BK-247	2.031E+02	NOT IDENT.
CM-247	1.015E+02	NOT IDENT.
CF-249	1.144E+02	NOT IDENT.
CF-251	2.674E+02	NOT IDENT.
CF-252	3.945E+05	NOT IDENT.
ANH-511	8.118E+01	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141124.CNF;1
Acquisition date : 21-JUL-2022 22:56:30 Sensitivity : 3.000
Detector ID : GAM40 Energy tolerance: 1.500
Elapsed live time: 0 00:15:00.00 Abundance limit : 75.000
Elapsed real time: 0 00:15:01.63 Half life ratio : *****
Sample date : 21-JUL-2022 00:00:00 Nuclide Library : LIQUID
Sample ID : G1205141124 Analyst initials: MJH1
Batch Number : 2290721 Sample Quantity : 5.7175E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 13-OCT-2021 04:34:22 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM40_JAR.CNF;17

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
CO-60	1.158E+04	1.216E+03	1.237E+03
TC-99M	9.983E+02	1.270E+03	1.270E+03
BA-137M	2.802E+04	2.370E+03	2.433E+03
CS-137	2.961E+04	2.502E+03	2.568E+03
CE-141	1.339E+02	1.820E+02	1.820E+02
W-181	2.395E+03	1.267E+03	1.267E+03
PB-210	1.009E+06	1.540E+05	1.553E+05
AM-241	1.057E+05	1.443E+04	1.457E+04
AM-243	1.598E+02	2.422E+02	2.422E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	-1.229E+02	9.855E+02	9.871E+02	NOT IDENT.
NA-22	2.415E+01	4.923E+01	5.042E+01	NOT IDENT.
NA-24	3.967E+01	1.032E+02	1.048E+02	NOT IDENT.
AL-26	1.661E+01	2.232E+01	2.354E+01	NOT IDENT.
K-40	-1.610E+00	3.061E+02	3.061E+02	NOT IDENT.
SC-46	-2.523E+01	1.011E+02	1.018E+02	NOT IDENT.
V-48	-2.392E+01	1.218E+02	1.223E+02	NOT IDENT.
CR-51	8.154E+01	7.428E+02	7.437E+02	NOT IDENT.
MN-52	-6.303E+00	4.429E+01	4.438E+01	NOT IDENT.
MN-54	-8.167E+00	8.985E+01	8.993E+01	NOT IDENT.
CO-56	-5.906E+01	1.046E+02	1.079E+02	NOT IDENT.
CO-57	-1.510E+01	6.759E+01	6.793E+01	NOT IDENT.
NI-57	1.641E+00	6.826E+01	6.826E+01	NOT IDENT.
CO-58	-1.836E+01	8.630E+01	8.670E+01	NOT IDENT.
FE-59	1.912E+02	2.145E+02	2.312E+02	NOT IDENT.
ZN-65	-7.784E+00	2.297E+02	2.297E+02	NOT IDENT.
CU-67	-5.969E+01	1.757E+02	1.778E+02	NOT IDENT.
GE-68	1.877E+03	3.242E+03	3.351E+03	NOT IDENT.
AS-73	-1.144E+04	7.967E+03	9.493E+03	NOT IDENT.
AS-74	5.840E+00	1.338E+02	1.339E+02	NOT IDENT.
SE-75	6.840E+01	1.277E+02	1.314E+02	NOT IDENT.

BR-77	-1.174E+02	4.101E+02	4.135E+02	NOT IDENT.
SR-82	-2.312E+02	5.302E+02	5.404E+02	NOT IDENT.
RB-83	-4.713E+01	1.828E+02	1.840E+02	NOT IDENT.
RB-84	1.841E+01	1.592E+02	1.594E+02	NOT IDENT.
KR-85	-1.832E+04	2.029E+04	2.191E+04	NOT IDENT.
SR-85	-8.290E+01	9.179E+01	9.912E+01	NOT IDENT.
RB-86	1.039E+03	1.239E+03	1.325E+03	NOT IDENT.
Y-88	2.277E+01	4.186E+01	4.311E+01	NOT IDENT.
Y-91	-1.653E+03	2.758E+04	2.759E+04	NOT IDENT.
NB-94	1.313E+01	7.574E+01	7.597E+01	NOT IDENT.
NB-95	4.536E+01	7.939E+01	8.198E+01	NOT IDENT.
NB-95M	-1.526E+02	3.045E+02	3.122E+02	NOT IDENT.
TC-95M	-2.404E+01	1.123E+02	1.128E+02	NOT IDENT.
ZR-95	-9.560E+00	1.586E+02	1.586E+02	NOT IDENT.
MO-99	6.886E+00	8.491E+02	8.491E+02	FAIL ABUN
RH-101	-2.206E+01	8.543E+01	8.600E+01	NOT IDENT.
RH-102M	2.550E+01	1.115E+02	1.121E+02	NOT IDENT.
RU-103	-3.271E+01	9.675E+01	9.787E+01	NOT IDENT.
RH-106	-2.107E+02	7.812E+02	7.870E+02	NOT IDENT.
RU-106	-2.107E+02	7.812E+02	7.870E+02	NOT IDENT.
AG-108M	3.734E+01	1.052E+02	1.066E+02	NOT IDENT.
CD-109	9.255E+02	2.179E+03	2.219E+03	NOT IDENT.
AG-110	-5.464E+02	2.287E+03	2.300E+03	NOT IDENT.
AG-110M	-5.900E+01	1.428E+02	1.453E+02	NOT IDENT.
IN-111	-8.010E+01	1.004E+02	1.067E+02	NOT IDENT.
SN-113	-1.177E+02	1.341E+02	1.442E+02	NOT IDENT.
IN-114M	3.151E+02	4.344E+02	4.571E+02	NOT IDENT.
CD-115	6.923E+01	4.257E+02	4.268E+02	NOT IDENT.
SN-117M	2.017E+01	7.080E+01	7.138E+01	NOT IDENT.
SB-122	5.868E+01	1.429E+02	1.453E+02	NOT IDENT.
I-123	2.161E+02	2.311E+02	2.508E+02	NOT IDENT.
TE-123M	6.468E+01	6.878E+01	7.471E+01	NOT IDENT.
SB-124	3.141E+01	6.323E+01	6.480E+01	NOT IDENT.
SB-125	1.118E+02	3.173E+02	3.212E+02	NOT IDENT.
TE-125M	-1.297E+04	2.270E+04	2.344E+04	NOT IDENT.
I-126	4.362E+01	2.371E+02	2.379E+02	NOT IDENT.
SB-126	-1.327E+00	1.406E+02	1.406E+02	NOT IDENT.
SN-126	1.516E+02	2.185E+02	2.290E+02	NOT IDENT.
SB-127	-7.466E+01	2.100E+02	2.127E+02	NOT IDENT.
TE-129	-1.557E+02	1.387E+03	1.389E+03	NOT IDENT.
I-131	1.070E+02	1.009E+02	1.119E+02	NOT IDENT.
I-132	-1.746E+04	8.218E+04	8.256E+04	NOT IDENT.
TE-132	2.099E+01	1.099E+02	1.103E+02	NOT IDENT.
BA-133	3.889E+01	1.292E+02	1.304E+02	NOT IDENT.
I-133	-1.379E+02	2.115E+02	2.204E+02	NOT IDENT.
CS-134	2.675E+01	9.900E+01	9.973E+01	NOT IDENT.
I-135	1.074E+03	2.056E+03	2.112E+03	NOT IDENT.
CS-136	-9.119E+01	1.375E+02	1.435E+02	NOT IDENT.
LA-138	2.791E+01	5.899E+01	6.032E+01	NOT IDENT.
CE-139	-7.054E+00	7.390E+01	7.397E+01	NOT IDENT.
BA-140	4.219E+02	3.698E+02	4.160E+02	NOT IDENT.
LA-140	1.494E+01	5.468E+01	5.510E+01	NOT IDENT.
CE-143	-3.203E+01	2.694E+02	2.698E+02	FAIL ABUN
CE-144	2.845E+02	5.123E+02	5.282E+02	NOT IDENT.
PM-144	1.537E+01	7.420E+01	7.452E+01	NOT IDENT.
PR-144	1.141E+03	5.512E+03	5.536E+03	NOT IDENT.
PM-146	4.590E+01	1.600E+02	1.613E+02	NOT IDENT.
ND-147	-1.415E+02	6.704E+02	6.734E+02	NOT IDENT.
PM-147	-8.328E+04	1.981E+06	1.981E+06	NOT IDENT.
PM-149	-2.263E+03	2.981E+03	3.151E+03	NOT IDENT.
EU-152	-1.173E+02	2.813E+02	2.862E+02	NOT IDENT.
GD-153	7.518E+01	2.314E+02	2.339E+02	NOT IDENT.
EU-154	6.893E+01	1.405E+02	1.439E+02	FAIL ABUN
EU-155	5.336E+01	3.001E+02	3.011E+02	NOT IDENT.
TB-160	4.278E+01	3.623E+02	3.628E+02	FAIL ABUN
HO-166M	-4.707E+01	1.292E+02	1.309E+02	NOT IDENT.
TM-171	-4.428E+04	1.761E+05	1.772E+05	NOT IDENT.
LU-176	-3.123E+00	7.681E+01	7.683E+01	NOT IDENT.
LU-177	-4.256E+02	7.238E+02	7.488E+02	NOT IDENT.
HF-181	-2.284E+01	1.176E+02	1.181E+02	FAIL ABUN
TA-182	-3.303E+01	2.717E+02	2.721E+02	NOT IDENT.
RE-183	2.244E+03	1.064E+03	1.469E+03	FAIL ABUN
RE-184	7.943E+01	2.968E+02	2.989E+02	NOT IDENT.
RE-188	1.308E+02	3.623E+02	3.671E+02	NOT IDENT.
W-188	-1.010E+04	1.815E+04	1.872E+04	NOT IDENT.
OS-191	-1.573E+01	2.229E+02	2.231E+02	NOT IDENT.
IR-192	3.409E+01	8.986E+01	9.117E+01	NOT IDENT.
PB-201	-3.060E+02	5.202E+02	5.382E+02	NOT IDENT.

TL-201	3.394E+02	7.275E+02	7.434E+02	NOT IDENT.
TL-202	-2.292E+01	1.145E+02	1.149E+02	NOT IDENT.
HG-203	-4.106E+00	8.622E+01	8.624E+01	NOT IDENT.
PB-203	-5.552E+00	1.166E+02	1.166E+02	NOT IDENT.
TL-204	4.374E+03	1.585E+04	1.597E+04	NOT IDENT.
BI-207	1.077E+02	1.405E+02	1.486E+02	FAIL ABUN
TL-208	1.067E+01	1.005E+02	1.006E+02	NOT IDENT.
BI-211	-2.030E+02	6.362E+02	6.428E+02	NOT IDENT.
PB-211	1.367E+03	2.313E+03	2.394E+03	NOT IDENT.
BI-212	-2.161E+02	1.144E+03	1.148E+03	NOT IDENT.
PB-212	3.704E+01	1.619E+02	1.628E+02	FAIL ABUN
BI-213	-1.909E+02	3.890E+02	3.985E+02	NOT IDENT.
BI-214	1.121E+00	1.748E+02	1.748E+02	NOT IDENT.
PB-214	2.394E+02	2.293E+02	2.535E+02	FAIL ABUN
RN-219	7.474E+02	1.304E+03	1.347E+03	NOT IDENT.
FR-221	-3.142E+02	6.332E+02	6.489E+02	NOT IDENT.
RA-223	1.106E+03	1.892E+03	1.957E+03	NOT IDENT.
RA-224	-8.049E+02	1.823E+03	1.859E+03	NOT IDENT.
AC-225	-3.359E+02	6.768E+02	6.936E+02	NOT IDENT.
RA-226	5.193E+02	1.837E+03	1.852E+03	NOT IDENT.
AC-227	-1.834E+02	7.549E+02	7.594E+02	NOT IDENT.
TH-227	-1.834E+02	7.549E+02	7.594E+02	NOT IDENT.
AC-228	3.859E+02	4.401E+02	4.733E+02	NOT IDENT.
RA-228	3.859E+02	4.401E+02	4.733E+02	NOT IDENT.
TH-228	3.704E+01	1.619E+02	1.628E+02	FAIL ABUN
TH-229	-4.252E+02	1.487E+03	1.499E+03	NOT IDENT.
TH-230	-2.253E+04	3.774E+04	3.908E+04	NOT IDENT.
PA-231	3.039E+02	1.356E+03	1.363E+03	NOT IDENT.
TH-231	7.972E+01	1.226E+03	1.226E+03	NOT IDENT.
TH-232	-2.548E+04	7.334E+04	7.424E+04	FAIL ABUN
PA-233	4.042E+01	1.868E+02	1.877E+02	NOT IDENT.
PA-234	-6.201E+01	1.086E+03	1.086E+03	NOT IDENT.
PA-234M	3.442E+03	1.239E+04	1.248E+04	NOT IDENT.
TH-234	-4.776E+03	5.508E+03	5.914E+03	NOT IDENT.
U-234	-6.657E+05	6.475E+05	7.138E+05	NOT IDENT.
U-235	7.516E+01	6.077E+02	6.087E+02	NOT IDENT.
NP-237	4.042E+01	1.868E+02	1.877E+02	NOT IDENT.
NP-238	-1.999E+02	6.403E+02	6.467E+02	NOT IDENT.
U-238	-4.776E+03	5.508E+03	5.914E+03	NOT IDENT.
NP-239	4.786E+02	7.051E+02	7.375E+02	NOT IDENT.
AM-242	-1.804E+02	1.784E+03	1.785E+03	NOT IDENT.
CM-243	-1.073E+01	3.083E+02	3.083E+02	NOT IDENT.
BK-247	1.049E+02	2.512E+02	2.556E+02	NOT IDENT.
CM-247	-1.310E+01	1.189E+02	1.190E+02	NOT IDENT.
CF-249	7.302E+01	1.298E+02	1.339E+02	NOT IDENT.
CF-251	-1.211E+02	3.364E+02	3.408E+02	NOT IDENT.
CF-252	-4.159E+05	6.213E+05	6.491E+05	NOT IDENT.
ANH-511	2.894E+01	9.199E+01	9.291E+01	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	409.1144	81.00	240.0604	121.12	230.6767
45.60	493.7099	81.07	240.0917	121.22	230.7099
46.54	494.9490	82.35	226.6805	121.78	245.7900
49.72	536.2910	82.47	226.7298	122.06	245.8887
51.35	550.6484	82.47	226.7316	123.07	234.5137
52.39	605.4944	83.79	240.2948	123.68	235.7837
53.20	663.9857	84.00	240.3864	127.16	251.9403
53.44	712.2963	84.21	232.4620	127.23	251.9609
56.28	753.1003	84.86	223.7078	129.43	236.5933
57.36	844.7953	85.43	231.9711	131.20	244.7067
57.53	845.1284	86.55	292.8094	133.02	232.3415
57.53	845.1317	86.79	265.7543	133.52	223.8447
57.98	521.4730	86.94	265.8268	135.34	225.4719
59.32	523.0751	87.09	265.8973	136.00	243.0278
59.54	523.3369	87.57	253.0184	136.28	235.5193
61.49	525.6342	88.03	262.3050	136.47	235.5789
63.00	221.5859	88.34	264.4666	140.51	209.5371
63.29	239.6694	88.47	264.5266	140.88	227.1064
63.58	239.8206	91.11	246.4734	143.76	208.2184
63.81	224.5432	91.27	257.7013	144.24	208.3459
64.28	224.7724	92.59	240.9979	145.44	222.5728
64.99	206.4635	93.31	249.4394	152.32	222.6347
65.08	206.5027	94.56	258.1286	152.43	222.6623
66.73	240.1535	94.65	258.1672	153.25	211.7974
66.98	246.0935	94.67	258.1750	154.21	236.4659
67.24	243.3190	97.43	239.8861	155.04	210.0352
67.67	236.7473	98.43	222.8243	156.02	230.3071
67.75	228.0525	98.44	222.8293	158.56	225.4284
68.89	225.6757	99.53	239.6840	158.97	204.3252
68.89	225.6775	100.11	249.1766	159.00	204.3308
69.67	237.7302	100.20	257.4520	162.33	208.4951
70.82	229.4976	102.03	247.8827	162.66	225.3981
70.82	229.4994	103.18	244.1978	163.33	253.6293
70.83	229.5029	103.37	256.6923	165.86	229.6121
72.81	253.6244	105.31	250.2118	167.43	213.1124
72.87	253.6560	106.12	242.2118	171.28	211.7789
74.66	225.6888	106.47	235.0626	176.31	208.4160
74.82	249.3847	109.28	255.9311	176.60	206.2046
74.97	249.4581	111.00	216.8010	177.52	215.5349
77.11	255.7696	111.76	233.8274	181.07	227.8194
79.69	243.7779	112.95	232.1434	184.41	263.1075
79.82	238.5388	116.24	207.9448	184.58	263.1564
80.02	238.6267	116.30	207.9628	185.72	243.9184
80.03	238.6285	116.74	207.0403	186.21	246.3469
80.12	238.6707	117.23	229.3870	190.27	238.1529
80.19	238.7018	119.76	209.0089	193.51	247.0775
80.22	229.7663	120.54	215.6163	197.03	217.7054
80.57	229.9144	120.90	248.6714	198.01	230.7412

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
201.83	255.0297	306.78	189.4805	511.00	127.6132
204.12	263.8229	308.46	181.1739	514.00	139.4297
205.31	251.2221	311.90	179.9219	520.40	111.7104
208.37	247.2729	316.51	181.3882	520.69	115.6105
210.85	198.2977	319.41	183.4932	522.65	114.7542
215.65	232.4240	320.08	174.9611	527.90	117.0020
218.12	261.4984	321.04	193.1927	529.59	123.9304
222.11	256.5198	323.87	179.7614	529.87	123.9511
227.09	244.5286	325.23	181.6650	531.02	110.3470
227.38	230.2061	328.76	158.7065	537.26	95.0147
228.16	233.5697	331.15	178.9550	546.56	113.1563
228.18	233.5757	333.37	161.8304	552.55	101.6421
235.69	252.4928	334.37	168.0386	563.25	87.2839
235.96	228.3856	338.28	171.1172	564.24	83.3540
238.63	204.7077	338.32	166.7558	569.33	74.6033
238.98	220.5211	340.48	173.9995	569.50	76.1016
240.99	242.7643	340.55	174.0076	569.70	76.1078
242.00	195.5997	344.28	179.7128	582.08	78.0476
244.70	230.1649	345.93	180.7948	583.19	95.1082
245.35	242.4796	351.06	206.9637	595.83	74.5119
250.62	187.2835	351.93	174.4827	600.60	84.7622
252.40	210.8638	356.01	182.0270	604.72	75.8209
252.80	214.6137	361.25	168.4727	609.32	78.0026
256.23	202.9430	364.49	141.2859	610.33	88.1753
260.90	208.6816	366.42	179.7254	614.28	69.0376
264.66	195.7111	383.85	179.0482	618.01	70.1680
265.00	199.4812	388.16	176.8275	621.93	75.3821
269.46	174.1028	388.63	171.4646	630.19	66.4547
271.23	178.0867	391.70	206.1519	631.29	66.4864
273.65	192.1663	400.66	168.1982	632.98	75.7464
276.40	194.2567	401.32	160.9896	633.25	75.7554
277.37	198.5803	401.81	168.3149	634.78	70.6818
277.60	198.6190	402.40	180.2069	635.95	76.8677
278.00	188.6644	404.85	172.2733	636.99	64.5970
278.43	189.5638	410.95	154.6107	657.50	94.6423
279.20	202.2132	414.70	176.9638	657.76	94.6535
279.54	211.4613	423.72	203.7209	661.66	73.5654
280.46	194.0508	427.09	187.4958	664.57	43.5706
283.69	197.9006	427.87	190.3547	666.33	45.1603
284.31	193.8065	433.94	189.1707	666.50	45.1620
285.41	191.4519	439.51	213.0336	667.71	52.9756
285.90	201.6064	440.45	225.2453	677.62	58.4085
287.50	169.8991	453.88	211.9486	685.70	46.0428
290.67	216.6921	459.60	219.2102	692.65	51.4205
293.27	199.3843	463.37	210.2376	695.00	55.6698
295.22	204.7586	468.07	224.0101	696.49	51.5002
295.96	193.0244	473.00	211.3401	696.51	51.5002
298.58	212.0717	475.06	205.8833	697.00	53.6127
299.98	188.5184	476.78	191.8285	697.49	57.8288
300.09	188.5320	477.60	194.7608	702.65	53.7330
300.13	188.5410	477.99	202.4046	706.68	56.9861
301.36	192.1129	482.18	162.8591	711.68	49.6965
302.85	187.2229	487.02	136.5413	720.70	47.7502
304.50	184.0474	492.35	136.9253	721.93	44.5891
304.85	186.6526	497.08	136.3029	722.78	55.2225

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
722.91	55.2267	937.49	91.6048	1377.63	3.8689
723.31	53.1108	944.13	92.9443	1384.29	3.8750
724.19	47.8162	945.96	94.1485	1408.01	2.9220
727.33	54.2581	946.00	94.1485	1434.09	4.8990
733.00	52.2439	949.00	102.2834	1435.80	2.9405
735.93	45.8992	954.55	96.7046	1457.56	2.9548
739.50	57.7178	962.31	101.5531	1460.82	1.9713
744.23	51.3984	964.08	75.0531	1489.16	2.9755
747.24	41.8088	966.17	85.4993	1596.21	5.0728
752.31	41.8898	968.97	68.2283	1620.50	5.0980
753.82	62.3330	983.53	72.0180	1678.03	3.0943
756.73	62.4015	984.45	74.3620	1690.97	1.0341
763.94	50.7025	996.26	48.9761	1757.55	1.0474
765.80	45.3411	1001.03	58.6802	1764.49	0.0000
766.42	53.9897	1004.73	65.7600	1770.23	5.2499
766.84	52.9179	1025.87	53.8218	1771.35	2.1003
772.60	53.0315	1028.54	52.9834	1791.20	2.1082
776.52	53.1073	1037.84	60.2097	1808.65	0.0000
777.92	57.4727	1038.76	67.3118	1836.06	2.1257
778.90	52.0684	1046.59	59.4756		
783.70	78.2402	1048.07	63.9404		
788.74	64.2336	1050.41	49.7656		
792.07	67.5804	1063.66	47.2808		
795.86	52.3926	1077.00	43.8799		
801.95	62.3530	1077.34	47.4651		
802.10	59.0735	1083.85	64.5996		
810.29	60.3442	1085.87	61.9459		
810.45	60.3465	1099.25	56.7708		
810.76	55.9639	1111.64	47.9245		
815.77	53.8649	1112.07	52.4528		
818.51	81.4283	1112.84	69.6497		
832.01	56.3851	1115.54	62.4597		
834.85	57.5479	1120.29	60.7269		
835.15	67.5155	1120.55	60.7310		
836.80	59.8008	1121.30	54.3970		
846.77	80.0098	1129.67	46.3464		
856.80	75.8249	1131.51	41.8223		
860.56	65.8732	1173.23	26.4797		
871.09	58.8254	1177.95	11.0471		
873.19	66.1565	1189.05	14.7725		
875.33	70.6930	1204.77	20.3954		
879.38	73.0351	1221.41	21.4137		
880.51	85.4258	1231.02	12.1335		
881.60	71.9635	1235.36	11.2126		
883.24	73.1276	1238.28	5.6104		
884.68	72.0391	1260.41	7.5225		
889.28	65.3845	1271.87	9.4299		
894.76	68.8906	1274.44	6.6052		
898.04	55.3982	1274.54	6.6052		
903.28	71.3492	1291.59	9.4757		
907.67	82.7933	1298.22	9.4910		
911.20	65.8565	1312.11	8.5710		
923.98	69.5483	1332.49	10.5267		
926.36	67.3185	1365.19	7.7153		
935.54	91.5495	1368.63	2.8956		

Continuing Calibration Data

Review of Gamma Spectrometer QA results (Daily calibration & background checks)
21-JUL-2022 09:34:18

Run Date	Detector	Parameter	Flag	Status	Comments
21-JUL-22	GAM01	Cal Check PSFWHM-59	Investigate		
21-JUL-22	GAM03	Cal Check PSFWHM-662	Investigate		
21-JUL-22	GAM03	Cal Check NLACTVTY-59	Investigate		
21-JUL-22	GAM03	Cal Check PSFWHM-59	Action	Lockout	Detector locked out.
21-JUL-22	GAM04	Cal Check NLACTVTY-662	Investigate		
21-JUL-22	GAM06	All Parameters Passed			
21-JUL-22	GAM07	All Parameters Passed			
21-JUL-22	GAM08	Cal Check NLACTVTY-59	Investigate		
21-JUL-22	GAM09	Cal Check PSFWHM-662	Investigate		
21-JUL-22	GAM09	Cal Check NLACTVTY-1332	Investigate		
21-JUL-22	GAM10	Cal Check PSFWHM-662	Investigate		
21-JUL-22	GAM11	All Parameters Passed			
21-JUL-22	GAM12	All Parameters Passed			
21-JUL-22	GAM14	All Parameters Passed			
21-JUL-22	GAM16	Cal Check NLACTVTY-59	Investigate		
20-JUL-22	GAM17	Cal Check may not have run since 21-JUL-2022			Detector locked out.
21-JUL-22	GAM18	All Parameters Passed			
21-JUL-22	GAM19	All Parameters Passed			
21-JUL-22	GAM20	All Parameters Passed			
21-JUL-22	GAM21	All Parameters Passed			
	GAM22	Cal Check may not have run since 21-JUL-2022			Detector locked out.
10-JUL-22	GAM22	Bkg Check may not have run since 21-JUL-2022			Detector locked out.
21-JUL-22	GAM23	All Parameters Passed			
21-JUL-22	GAM24	Bkg Check BACKRATE	Action	Approved	
21-JUL-22	GAM26	All Parameters Passed			
21-JUL-22	GAM27	Cal Check PSFWHM-59	Action	Lockout	Detector locked out.
21-JUL-22	GAM27	Cal Check PSFWHM-662	Action	Lockout	Detector locked out.
21-JUL-22	GAM27	Cal Check PSFWHM-1332	Action	Lockout	Detector locked out.
21-JUL-22	GAM27	Bkg Check BACKRATE	Action	Approved	
21-JUL-22	GAM28	All Parameters Passed			
21-JUL-22	GAM29	Cal Check PSFWHM-662	Investigate		
21-JUL-22	GAM29	Bkg Check BACKRATE	Investigate		
21-JUL-22	GAM30	Cal Check PSFWHM-1332	Investigate		
21-JUL-22	GAM30	Bkg Check BACKRATE	Investigate		
21-JUL-22	GAM31	Cal Check NLACTVTY-1332	Investigate		
21-JUL-22	GAM32	All Parameters Passed			
21-JUL-22	GAM33	All Parameters Passed			
21-JUL-22	GAM34	All Parameters Passed			
21-JUL-22	GAM36	All Parameters Passed			
21-JUL-22	GAM38	All Parameters Passed			
21-JUL-22	GAM40	Cal Check PSFWHM-59	Action	Approved	Low FWHM, approved for use.
21-JUL-22	GAM41	Cal Check NLACTVTY-1332	Investigate		
21-JUL-22	GAM43	All Parameters Passed			
21-JUL-22	GAM44	All Parameters Passed			
20-JUL-22	GAM45	Cal Check may not have run since 21-JUL-2022			Detector locked out.
16-JUL-22	GAM45	Bkg Check may not have run since 21-JUL-2022			Detector locked out.

21-JUL-22	GAM47	Cal Check NLACTVTY-59	Investigate		
21-JUL-22	XRAY1	All Parameters Passed			
21-JUL-22	XRAY2	All Parameters Passed			
21-JUL-22	XRAY3	Cal Check PSFWHM-29	Action	Approved	Low FWHM, approved for use.
21-JUL-22	XRAY3	Cal Check PSFWHM-33	Action	Approved	Low FWHM, approved for use.
21-JUL-22	XRAY3	Cal Check PSFWHM-39	Action	Approved	Low FWHM, approved for use.
21-JUL-22	XRAY4	All Parameters Passed			
21-JUL-22	XRAY6	All Parameters Passed			
21-JUL-22	XRAY7	All Parameters Passed			

APPROVAL DATE: 21-JUL-2022

APPROVAL TIME: 09:48:23

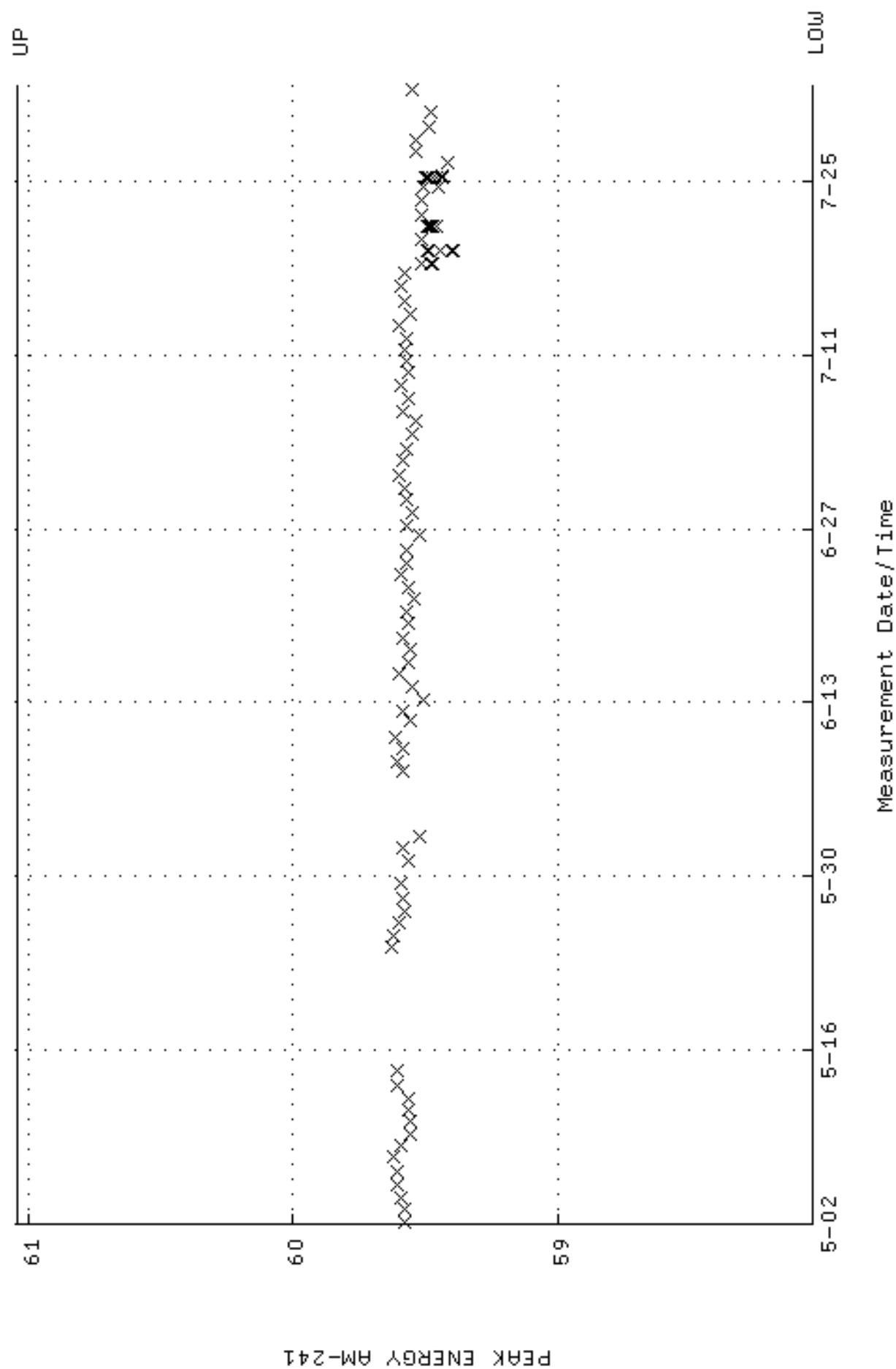
APPROVED BY: Rebekah Futch

PROCEDURE # GL-RAD-I-001

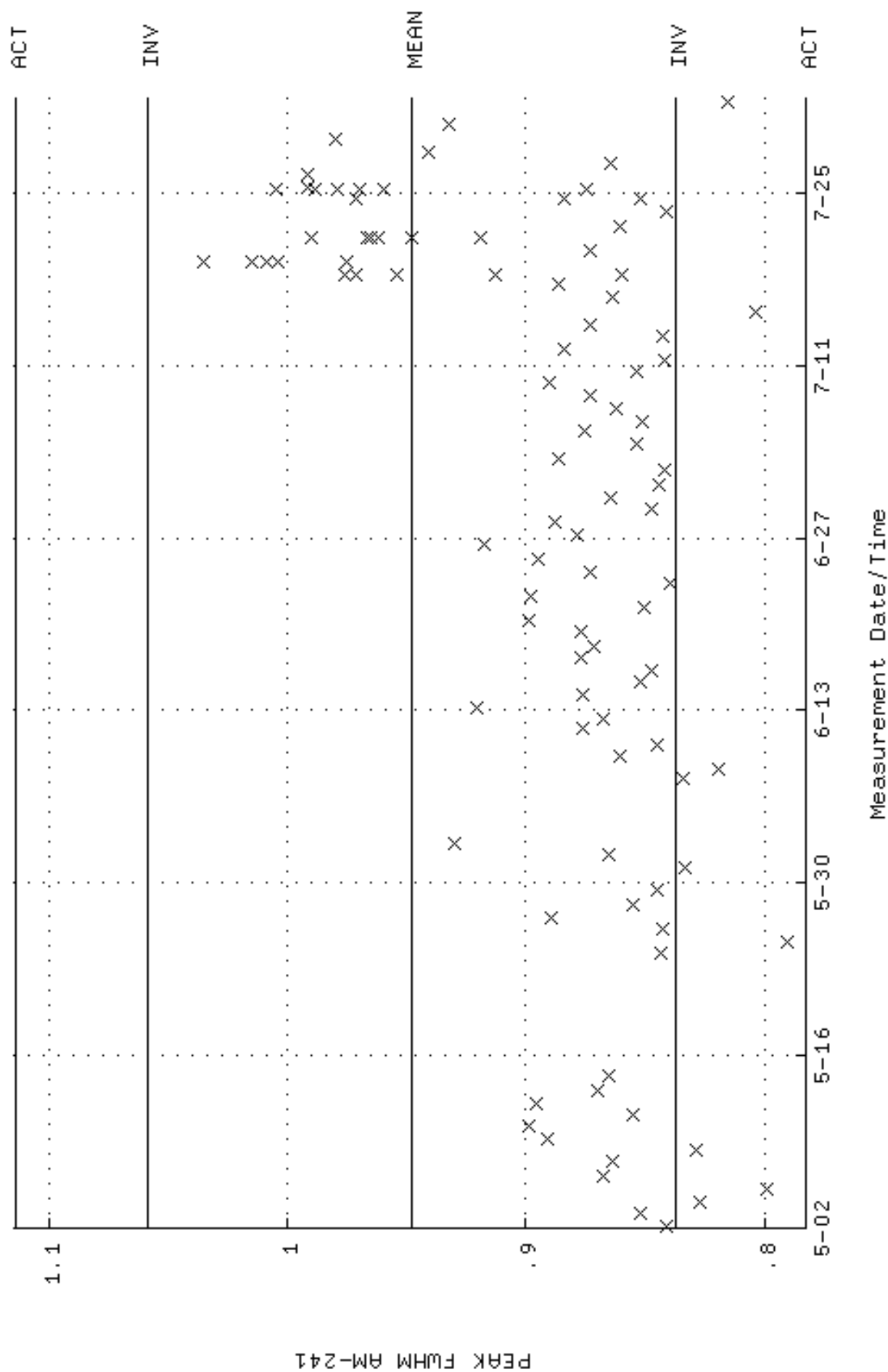
The Investigate flag does not indicate a lockout and is approved for use. Action flags that have not been approved are locked out of service.

Background and Efficiency Data

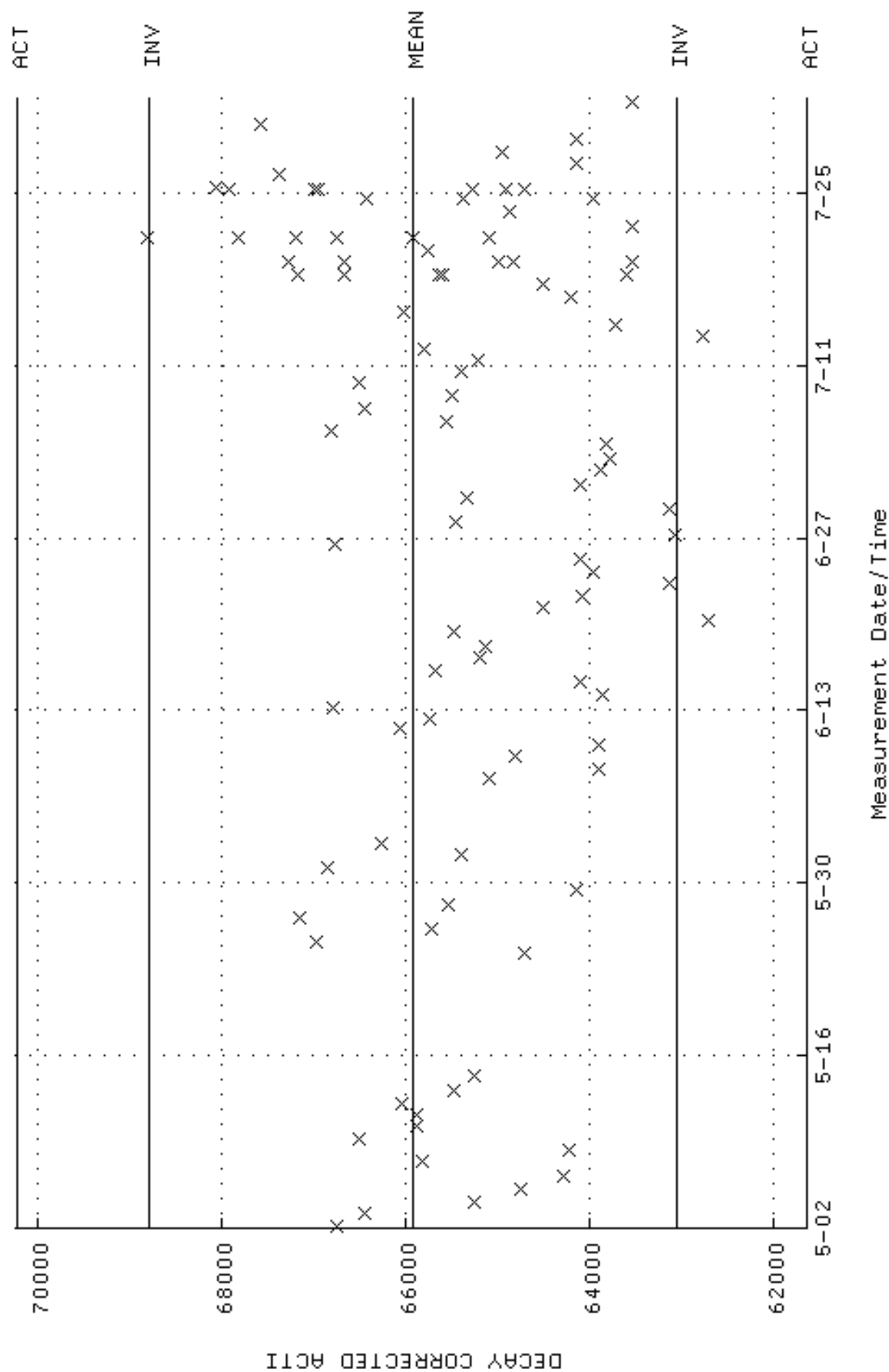
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM11_500MLMB.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-MAY-2022 04:33:54 through 1-AUG-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



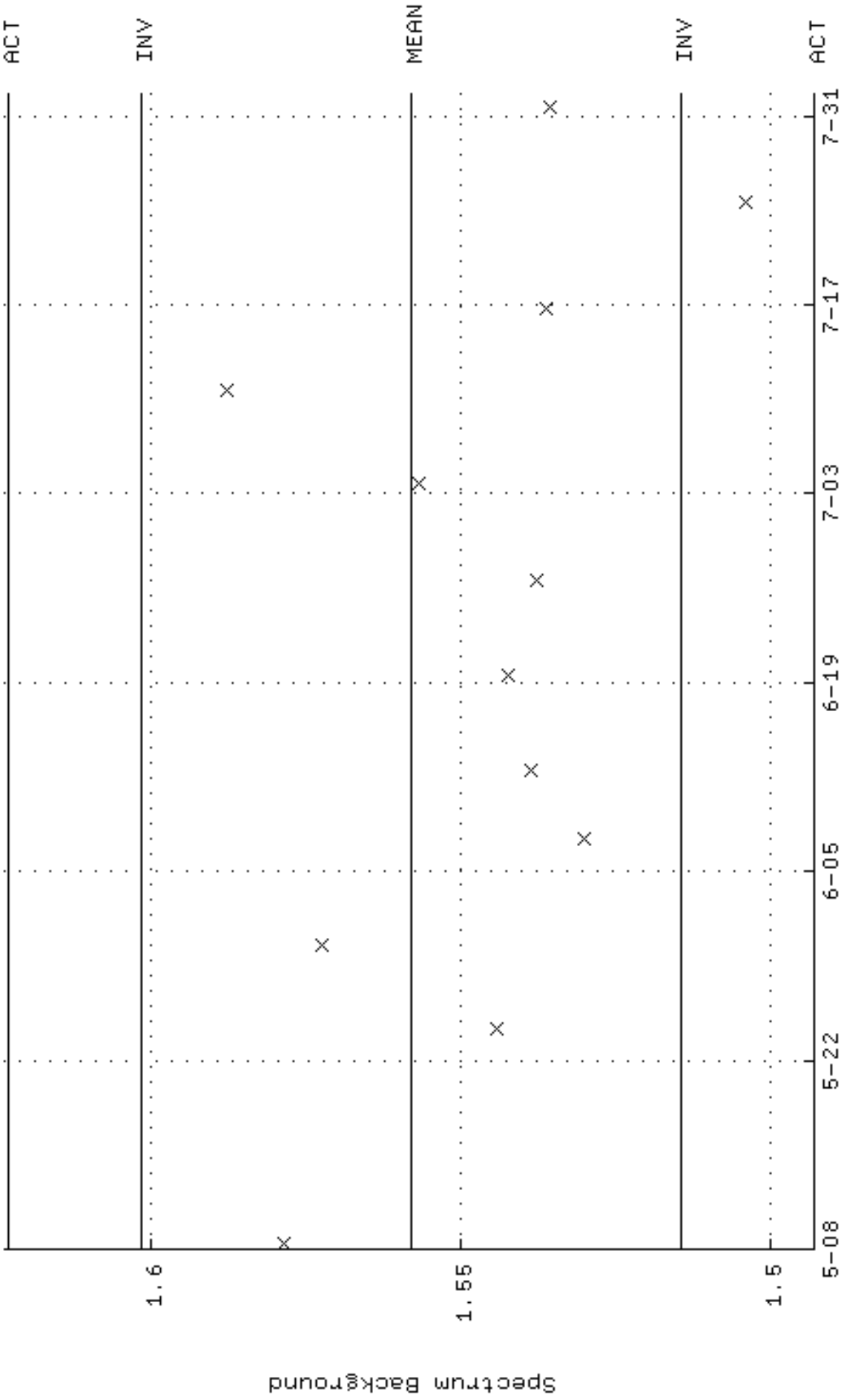
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM11_500MLMB.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-MAY-2022 04:33:54 through 1-AUG-2022 12:00:00
 Mean +- Std Dev : 0.948213 +- 5.517069E-02 (5.82 %)



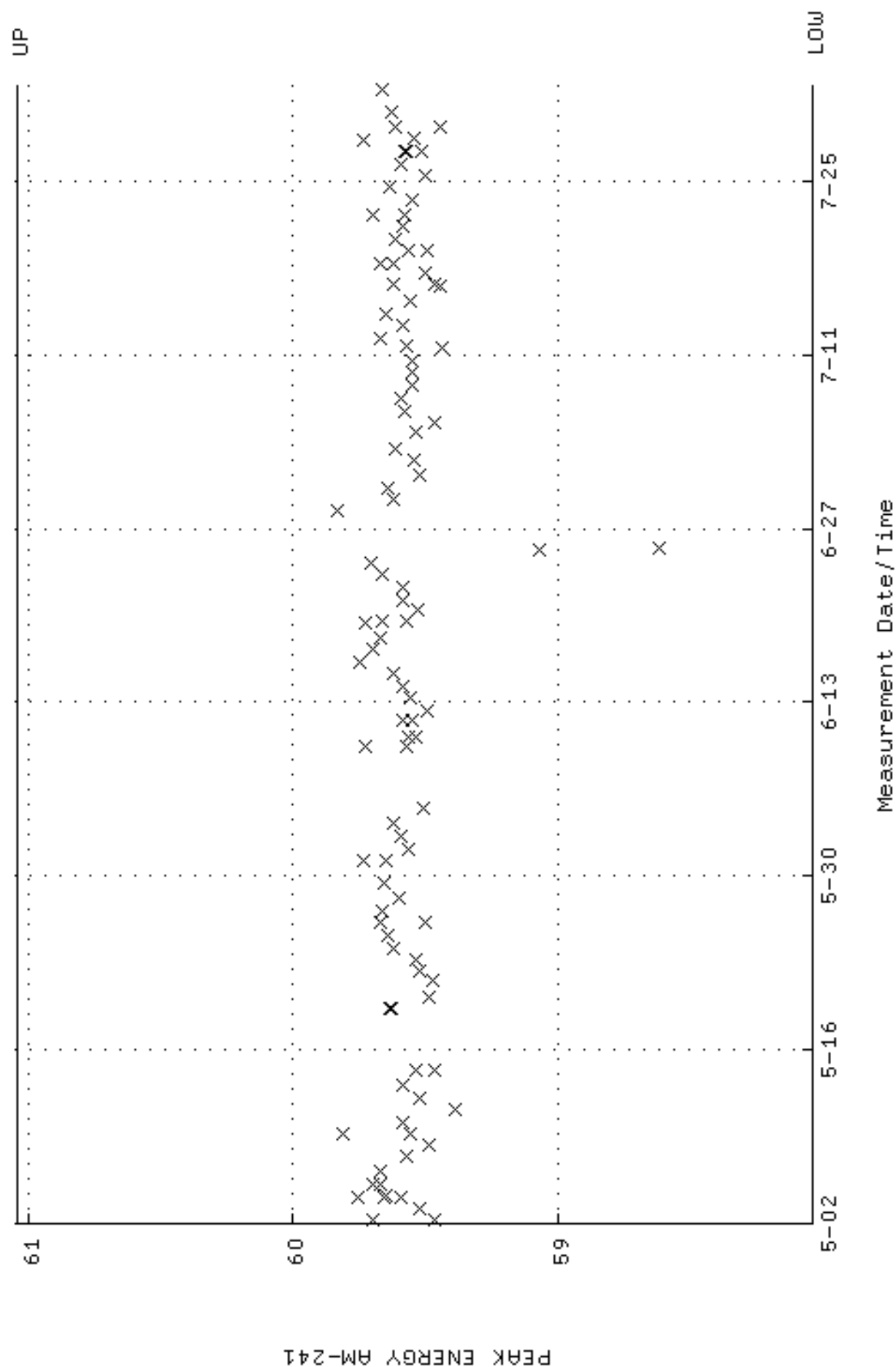
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM11-500MLMB.QAF;1
 Parameter Name : NLACTVY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-MAY-2022 04:33:54 through 1-AUG-2022 12:00:00
 Mean +- Std Dev : 65928.5 +- 1434.05 (2.18 %)



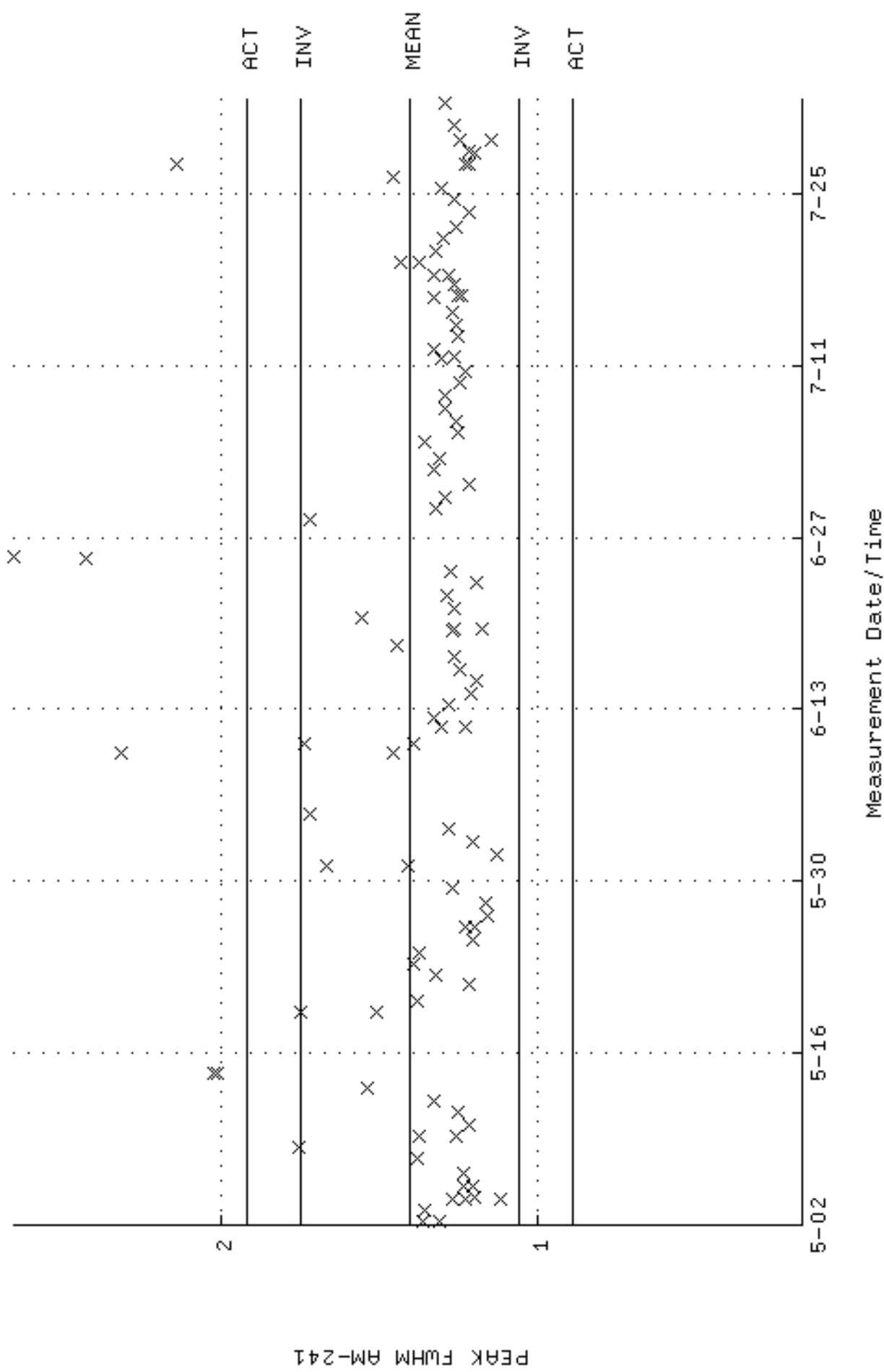
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM11.QAF;1
 Parameter Name : BACKRATE (Spectrum Background Rate)
 Start/End Dates : 8-MAY-2022 10:31:34 through 1-AUG-2022 12:00:00
 Mean +- Std Dev : 1.55819 +- 2.171917E-02 (1.39 %)



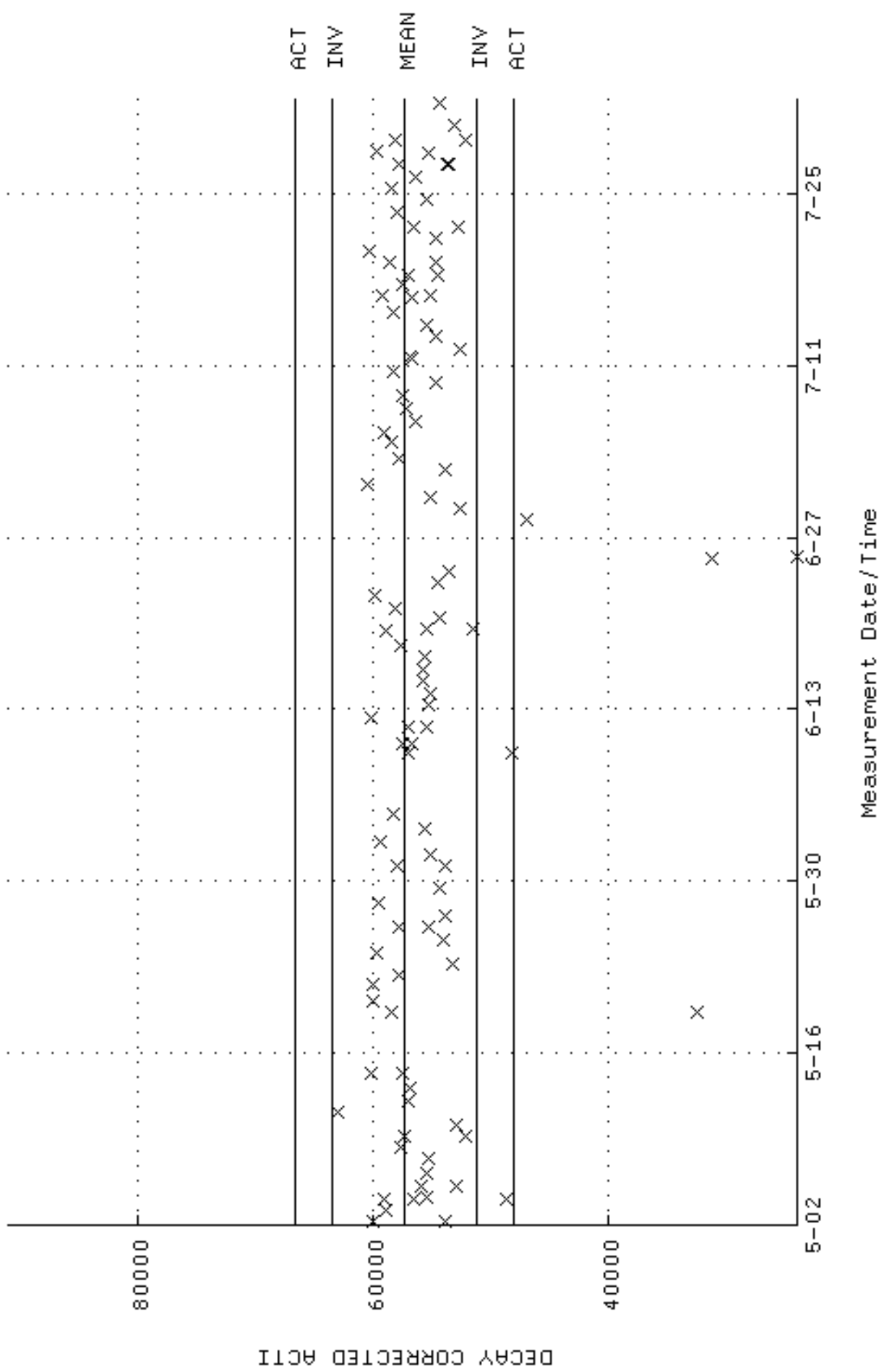
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM12_JAR.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-MAY-2022 06:44:04 through 1-AUG-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



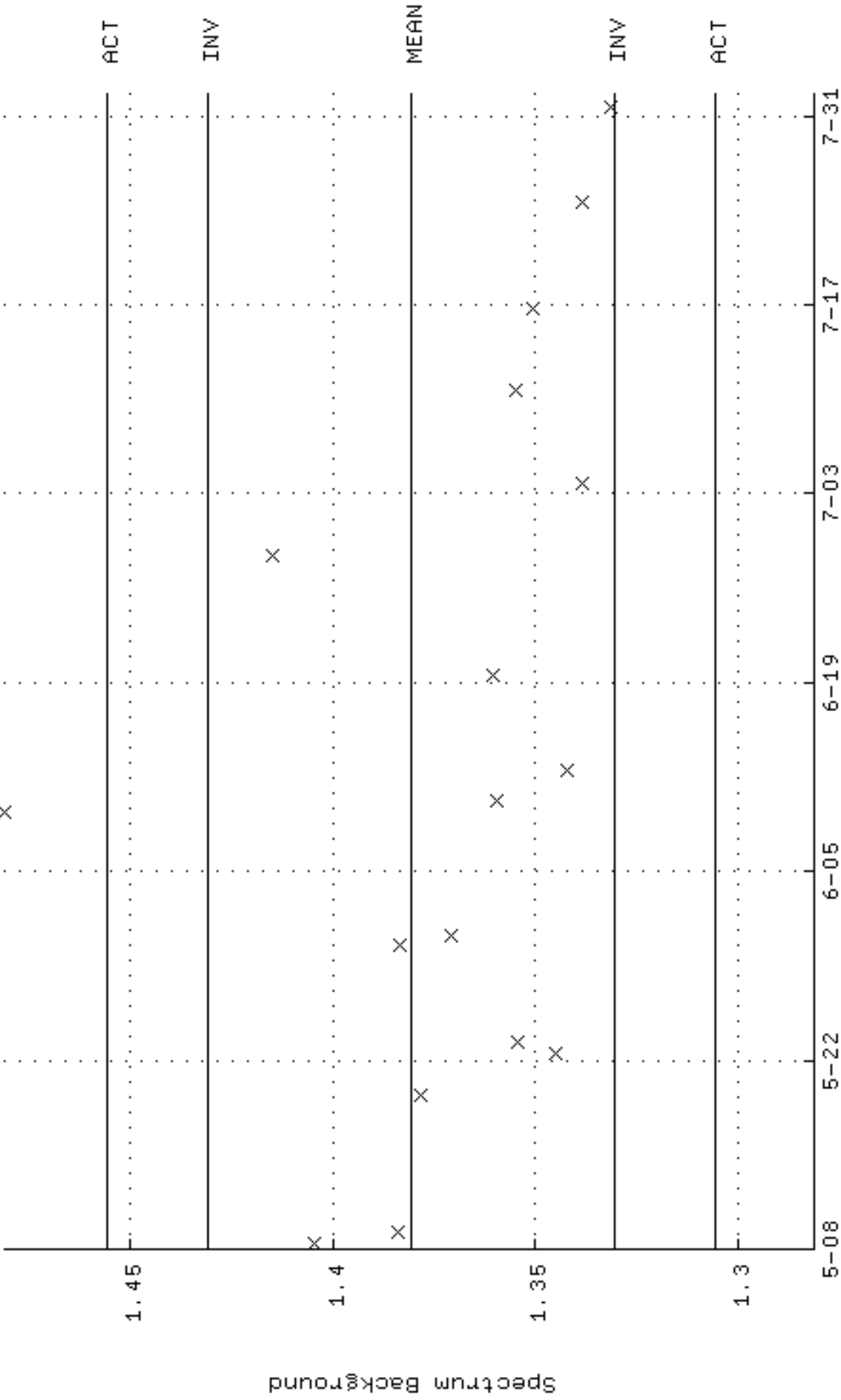
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM12_JAR.QAF;1
Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
Start/End Dates : 2-MAY-2022 06:44:04 through 1-AUG-2022 12:00:00
Mean +- Std Dev : 1.40563 +- 0.172268 (12.26 %)



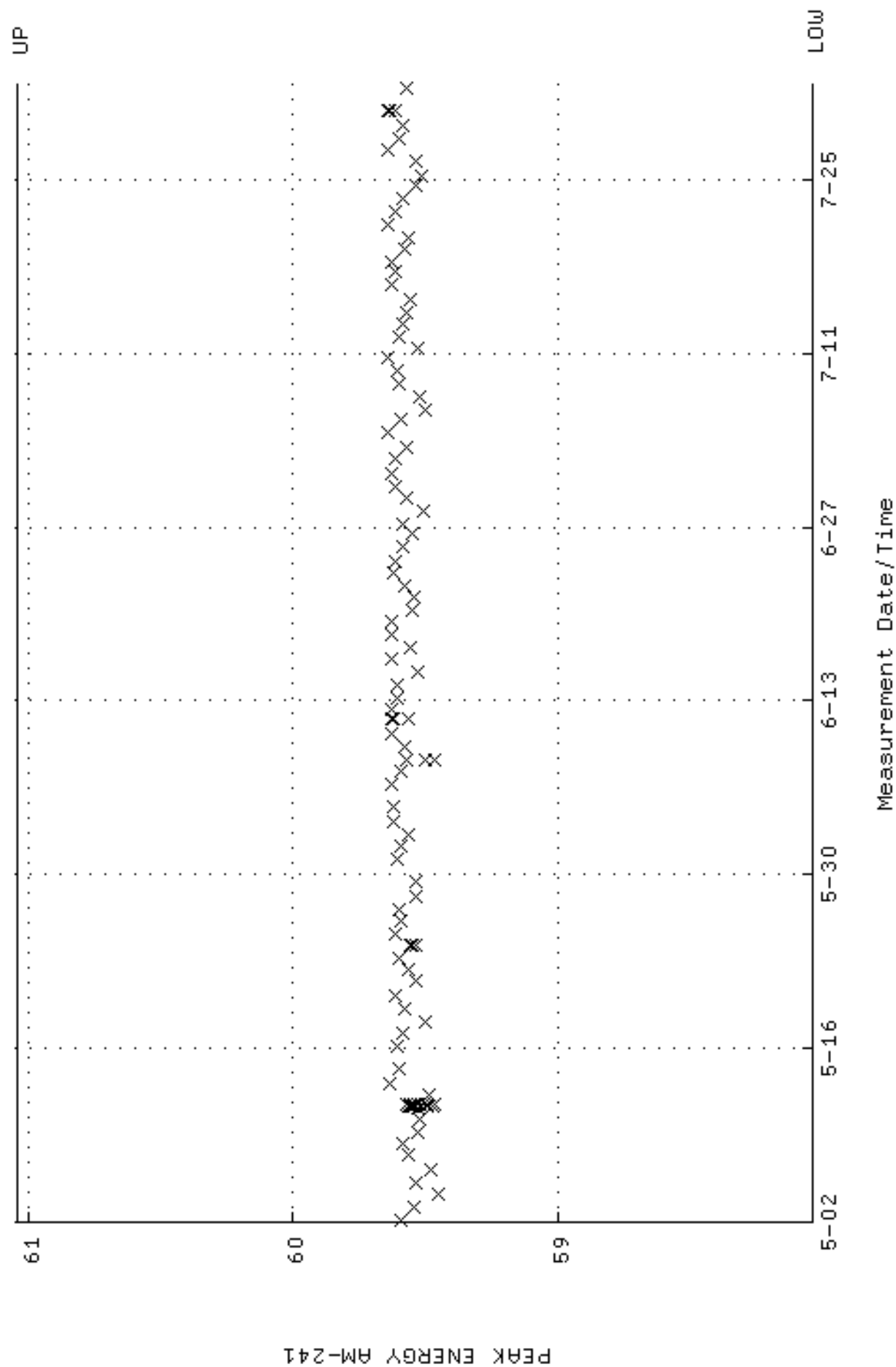
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM12_JAR.QAF;1
Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-MAY-2022 06:44:04 through 1-AUG-2022 12:00:00
Mean +- Std Dev : 57428.6 +- 3068.30 (5.34 %)



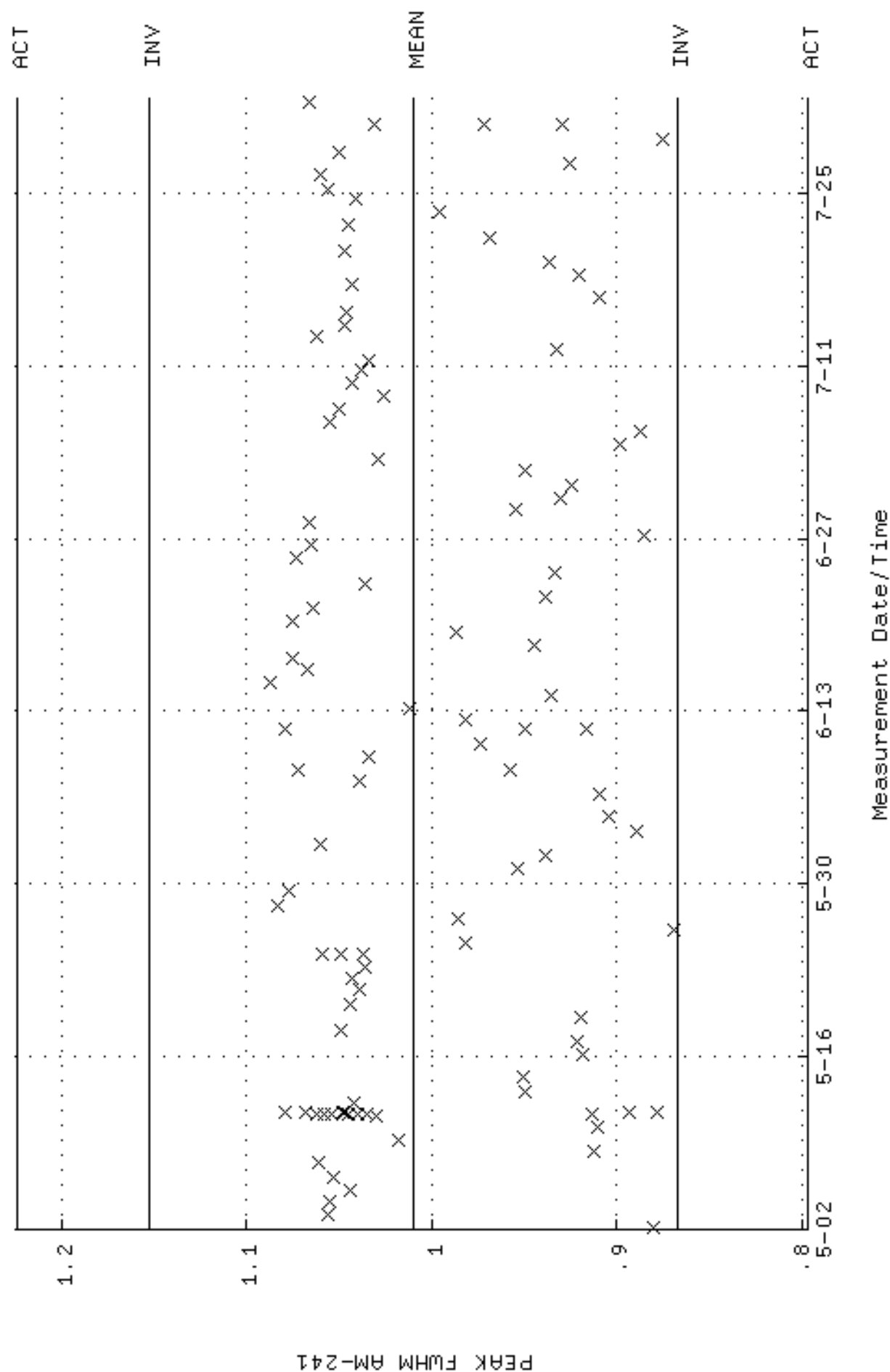
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM12.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 8-MAY-2022 10:31:40 through 1-AUG-2022 12:00:00
Mean +- Std Dev : 1.38089 +- 2.500928E-02 (1.81 %)



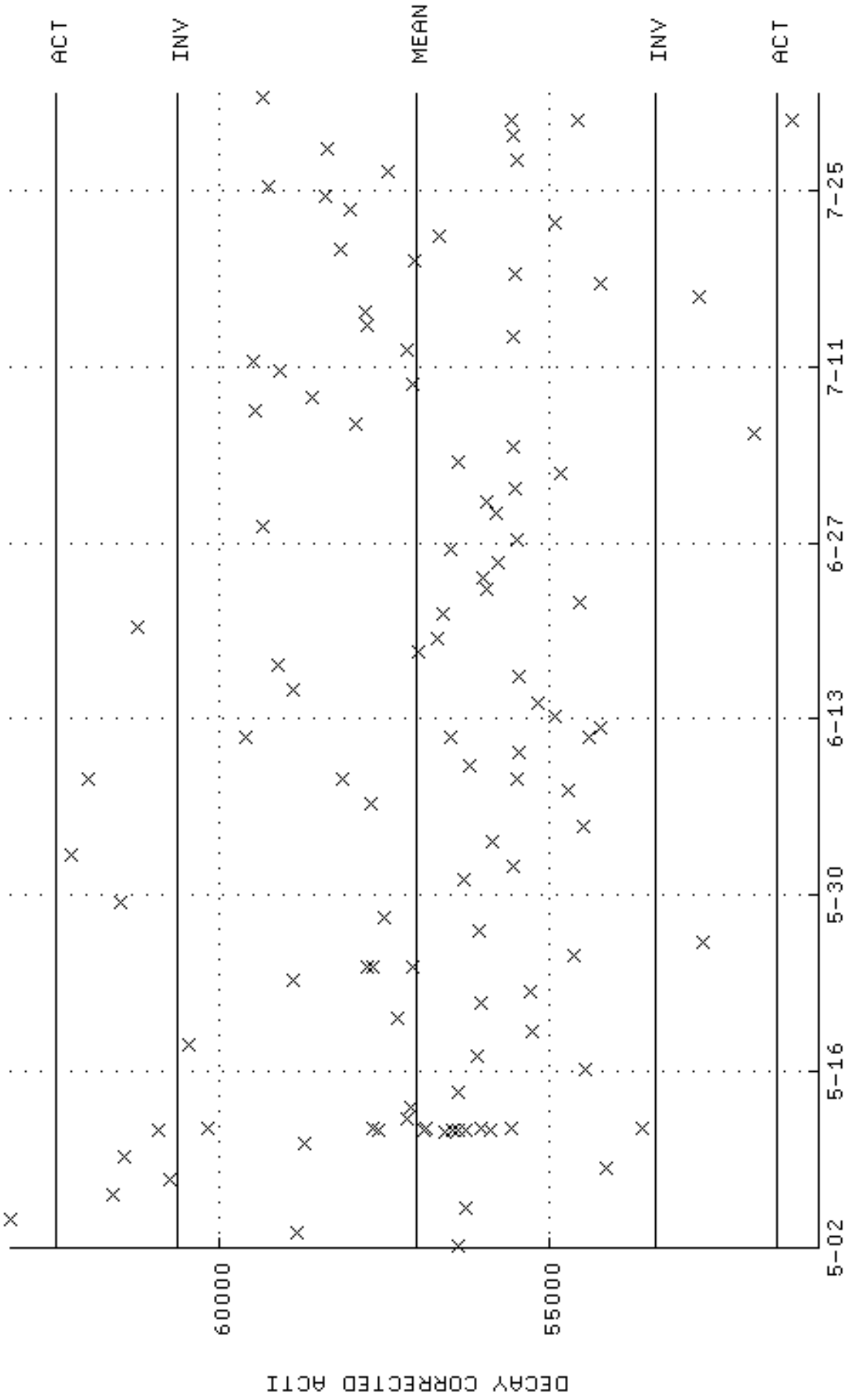
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM14_JAR.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-MAY-2022 04:33:59 through 1-AUG-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM14_JAR.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-MAY-2022 04:33:59 through 1-AUG-2022 12:00:00
 Mean +- Std Dev : 1.01037 +- 7.108480E-02 (7.04 %)

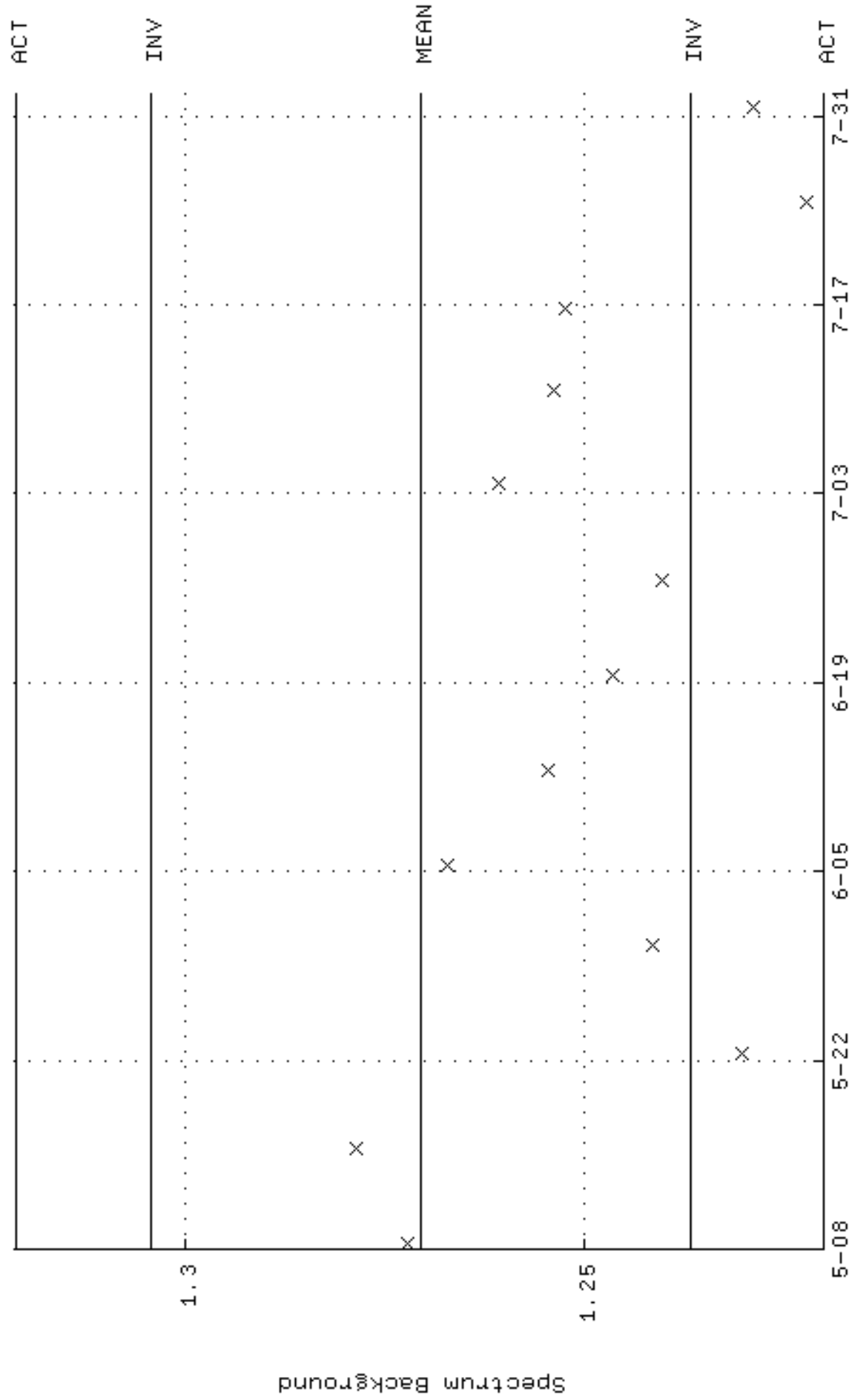


QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM14-JAR.QAF;1
Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-MAY-2022 04:33:59 through 1-AUG-2022 12:00:00
Mean +- Std Dev : 57019.6 +- 1818.51 (3.19 %)

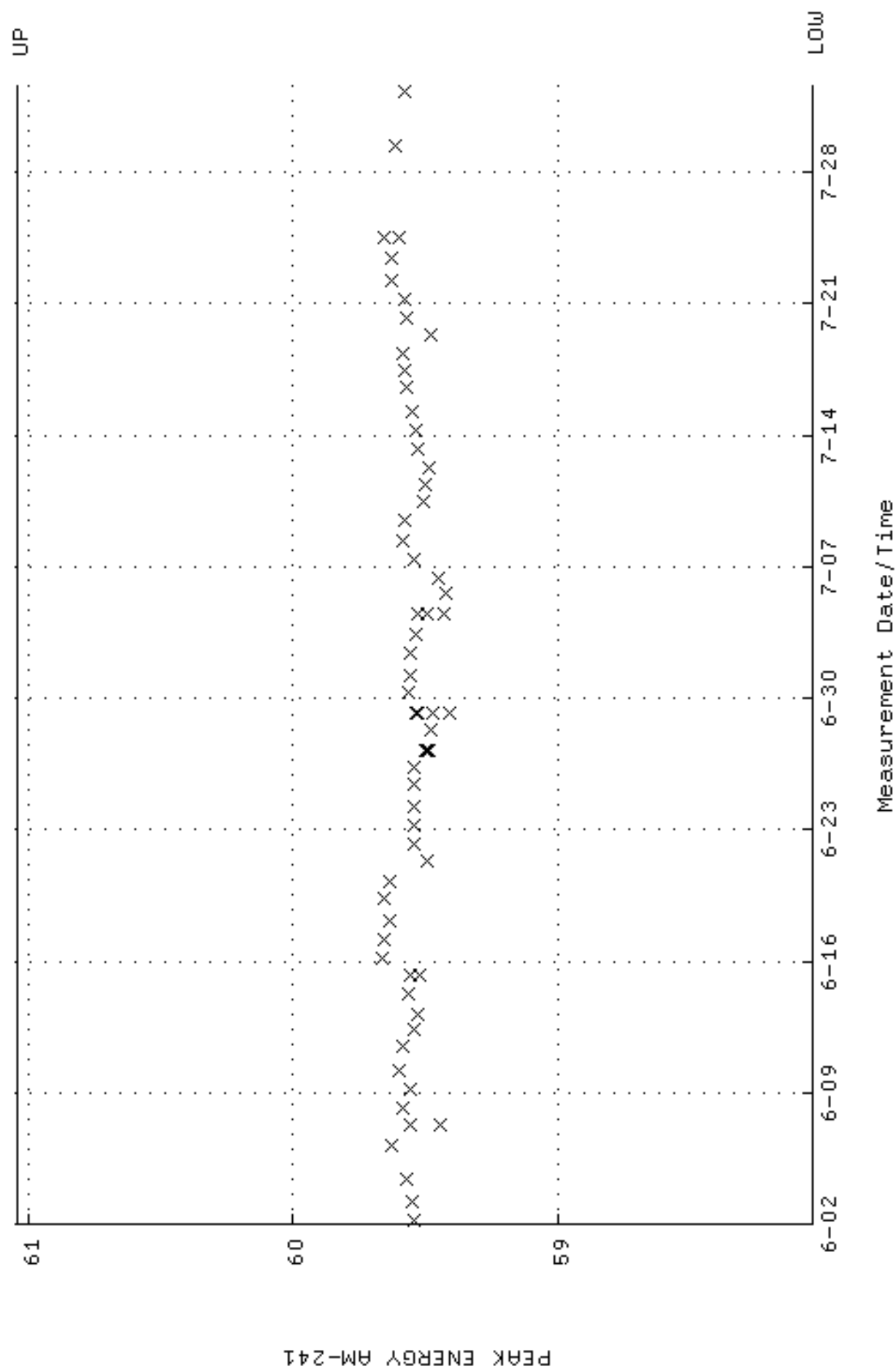


Measurement Date/Time

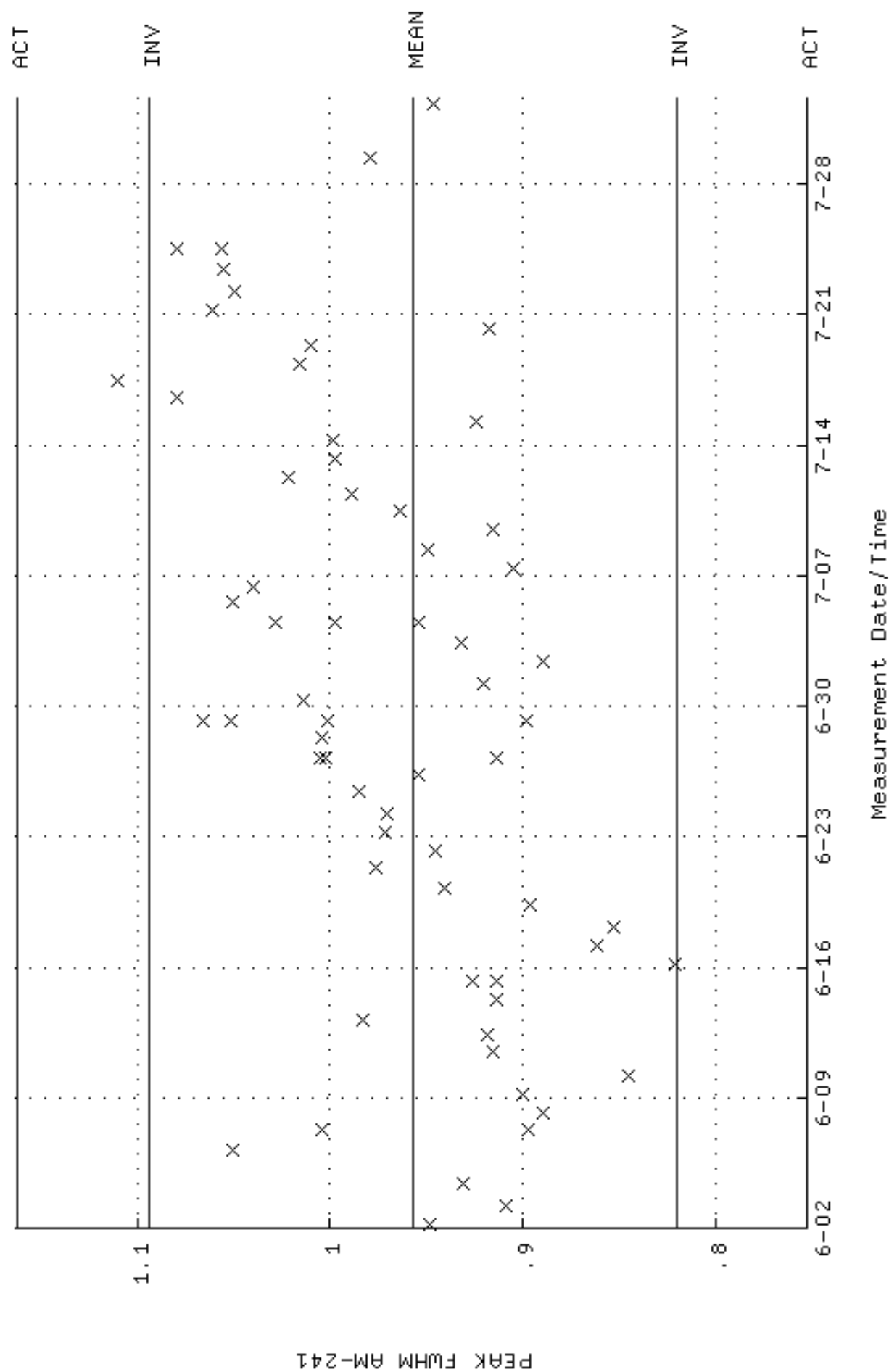
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM14.QAF;1
 Parameter Name : BACKRATE (Spectrum Background Rate)
 Start/End Dates : 8-MAY-2022 10:31:44 through 1-AUG-2022 12:00:00
 Mean +- Std Dev : 1.27070 +- 1.686246E-02 (1.33 %)



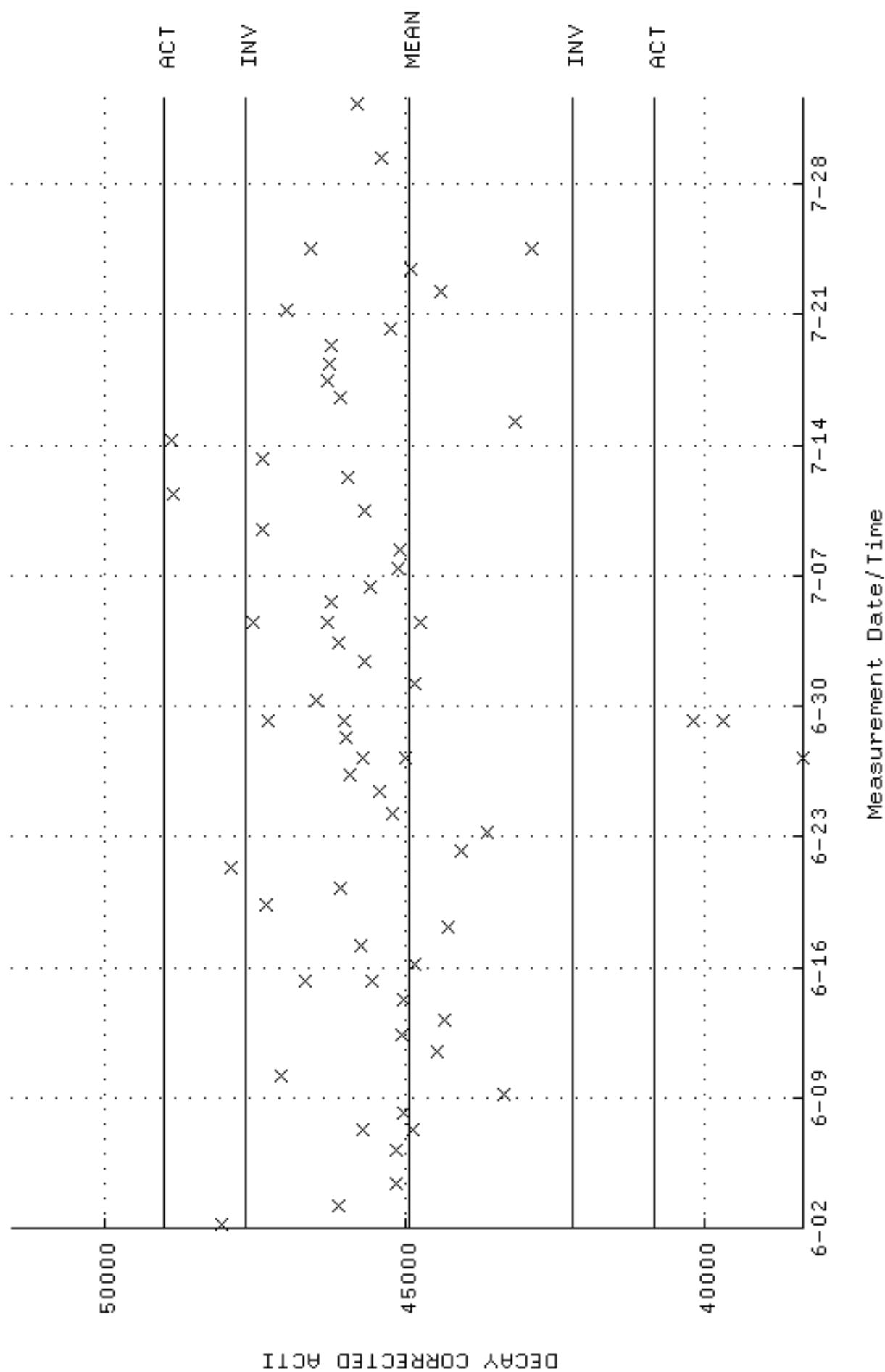
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM36_SCAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-JUN-2022 04:19:53 through 1-AUG-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



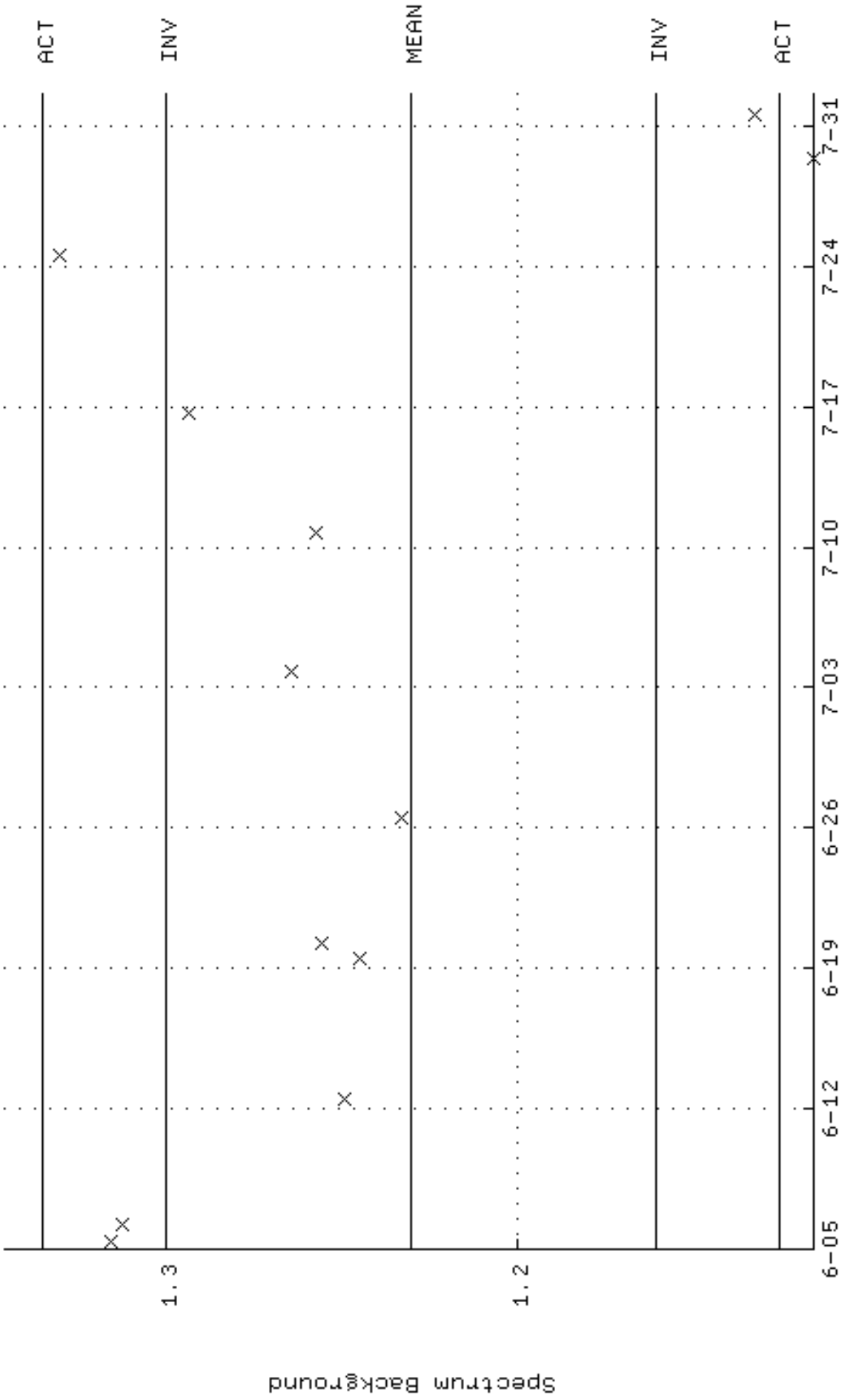
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC_GAM36_SCAN.QAF;1
 Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
 Start/End Dates : 2-JUN-2022 04:19:53 through 1-AUG-2022 12:00:00
 Mean +- Std Dev : 0.957433 +- 6.836953E-02 (7.14 %)



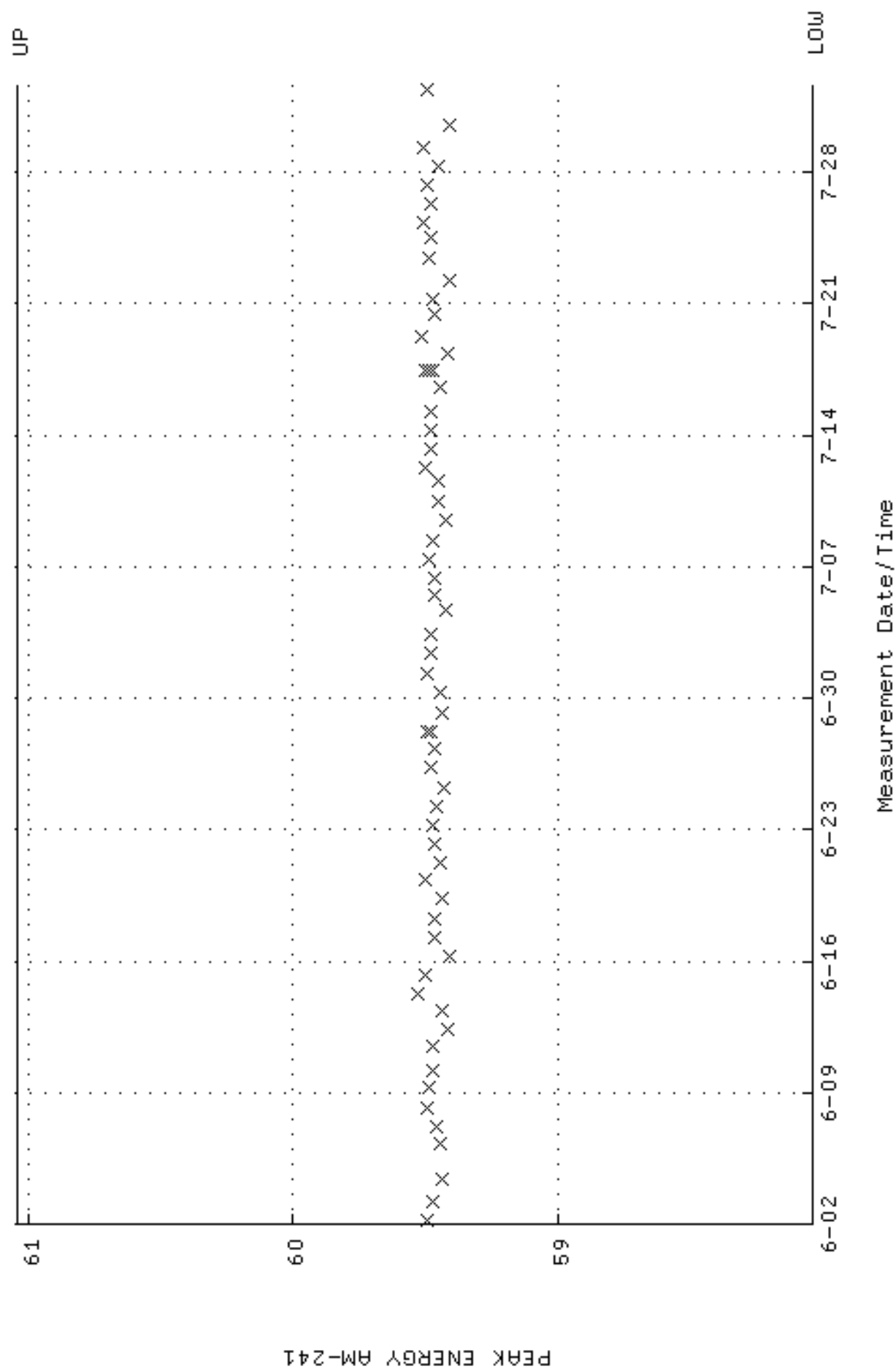
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM36-SCAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-JUN-2022 04:19:53 through 1-AUG-2022 12:00:00
 Mean +- Std Dev : 44948.0 +- 1362.20 (3.03 %)



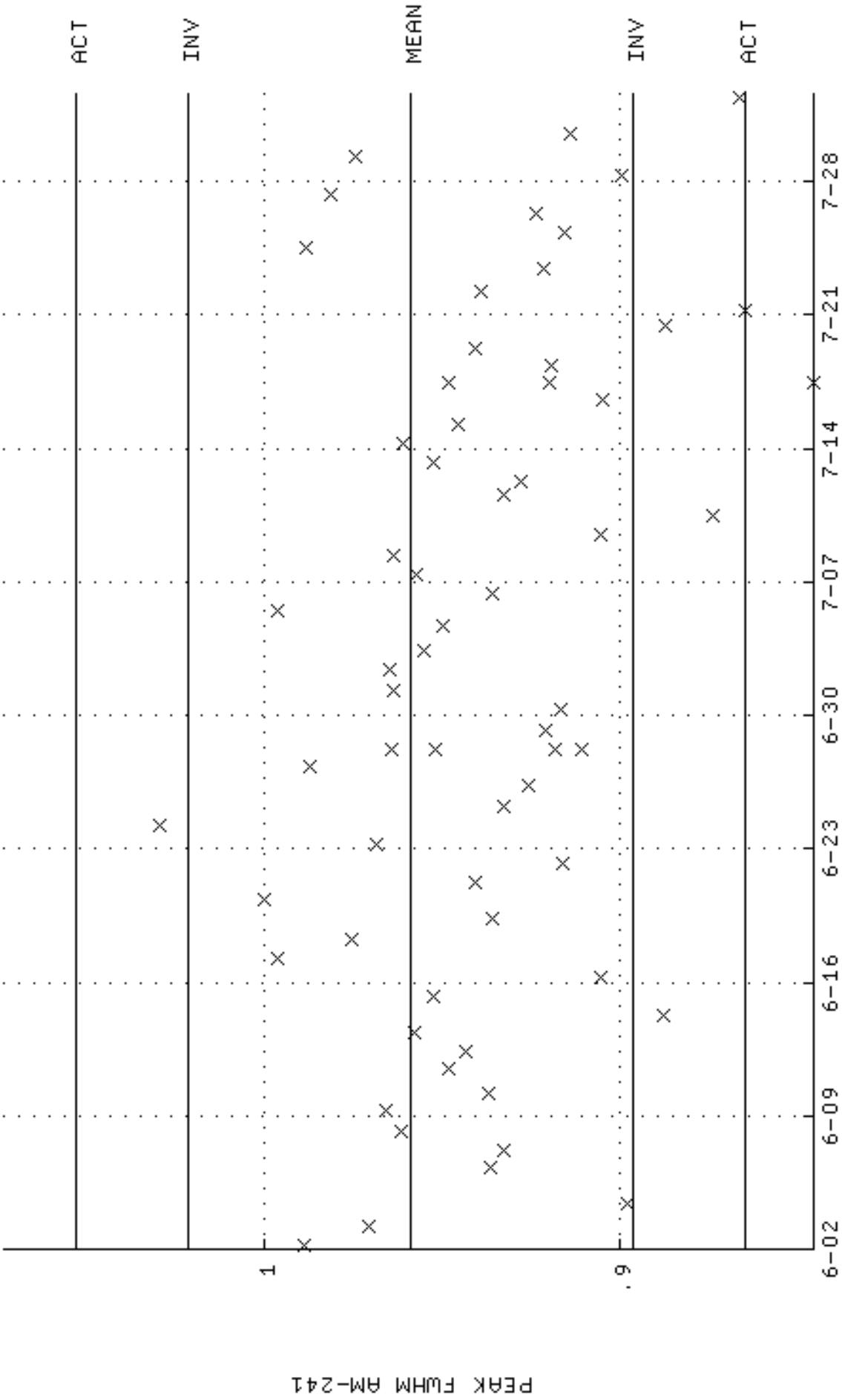
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM36.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 5-JUN-2022 10:03:25 through 1-AUG-2022 12:00:00
Mean +- Std Dev : 1.23043 +- 3.503159E-02 (2.85 %)



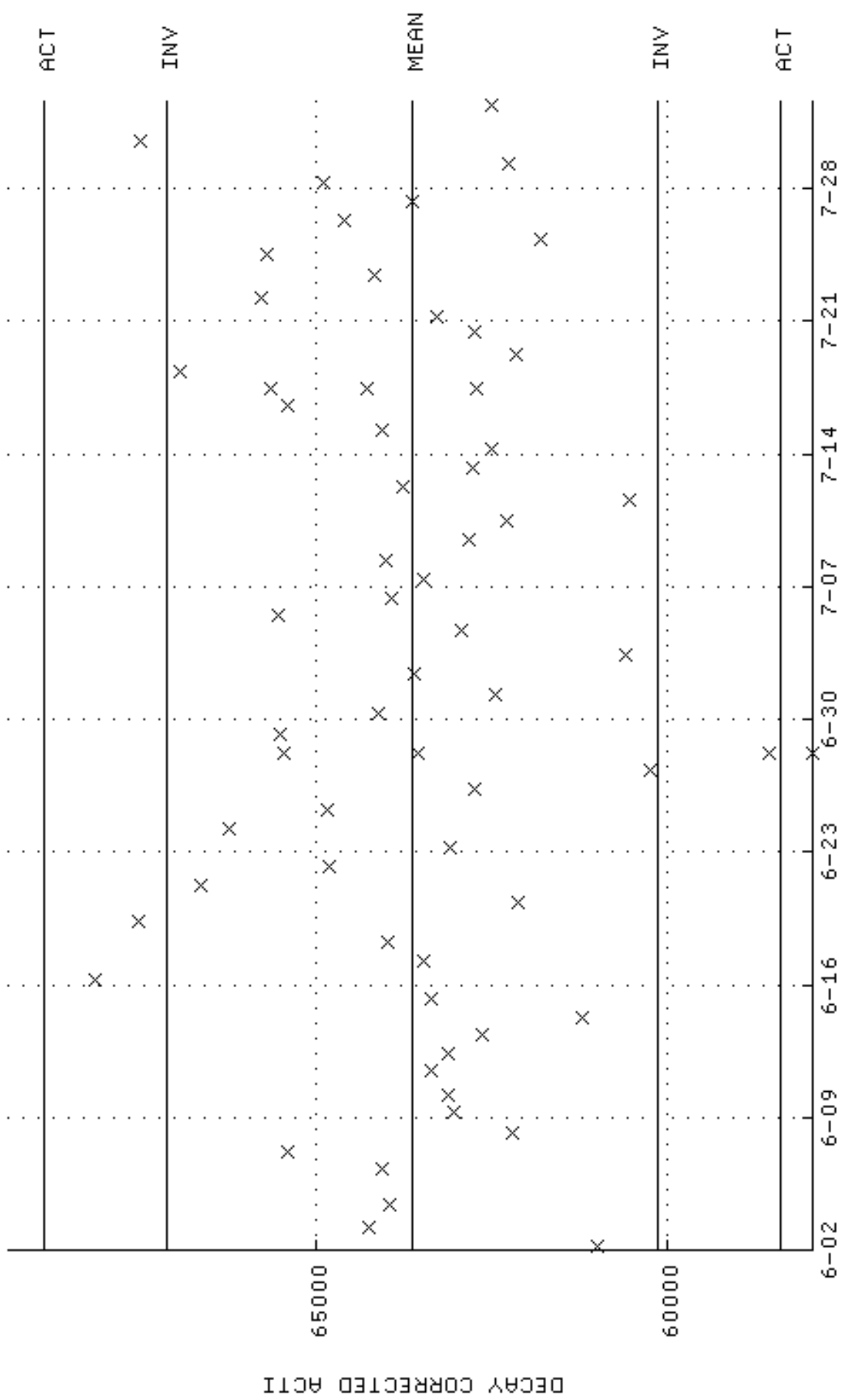
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM40_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-JUN-2022 05:25:23 through 1-AUG-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM40-CAN.QAF;1
Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
Start/End Dates : 2-JUN-2022 05:25:23 through 1-AUG-2022 12:00:00
Mean +- Std Dev : 0.959091 +- 3.142089E-02 (3.28 %)

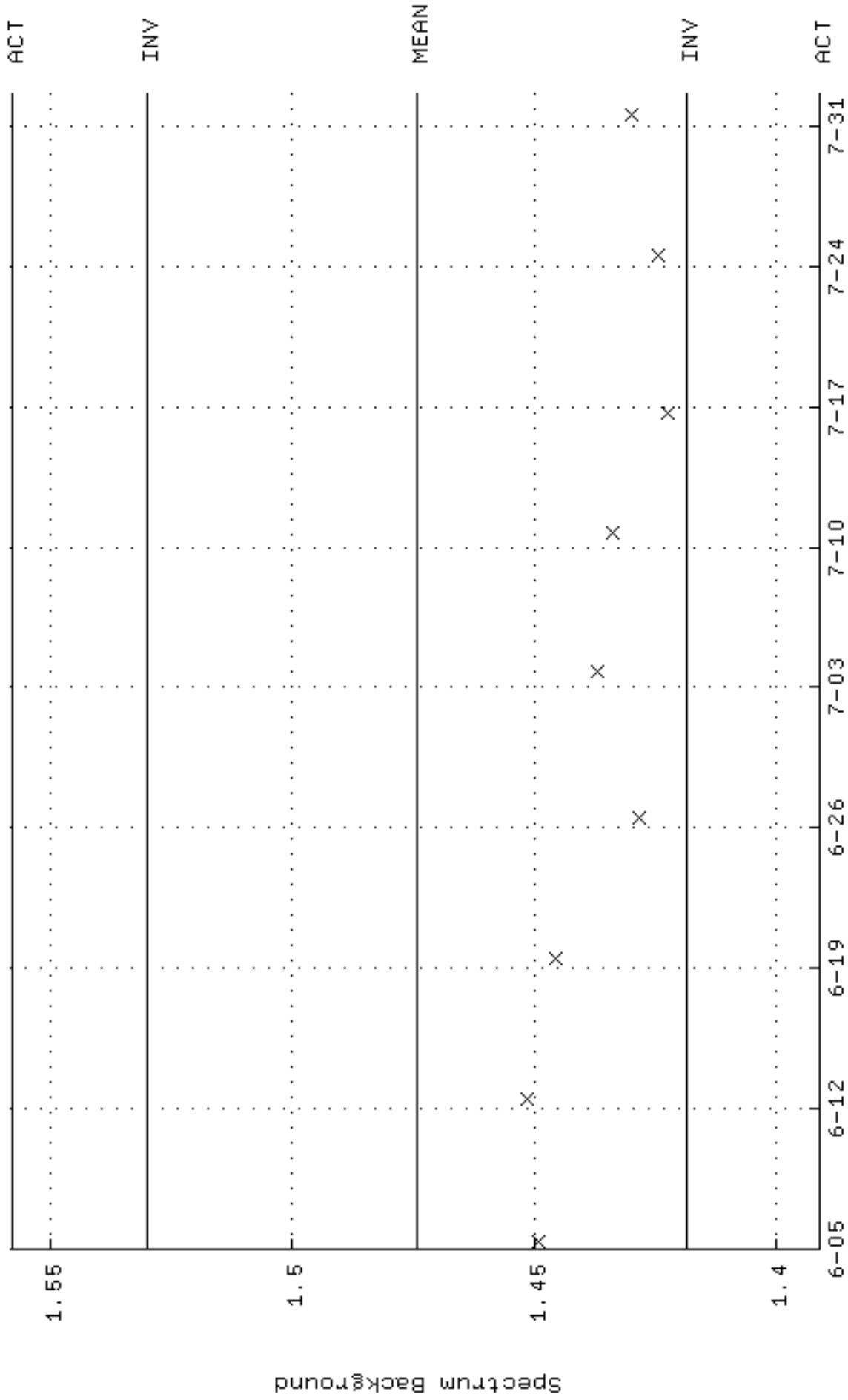


QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM40_CAN.QAF;1
Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-JUN-2022 05:25:23 through 1-AUG-2022 12:00:00
Mean +- Std Dev : 63652.7 +- 1747.14 (2.74 %)

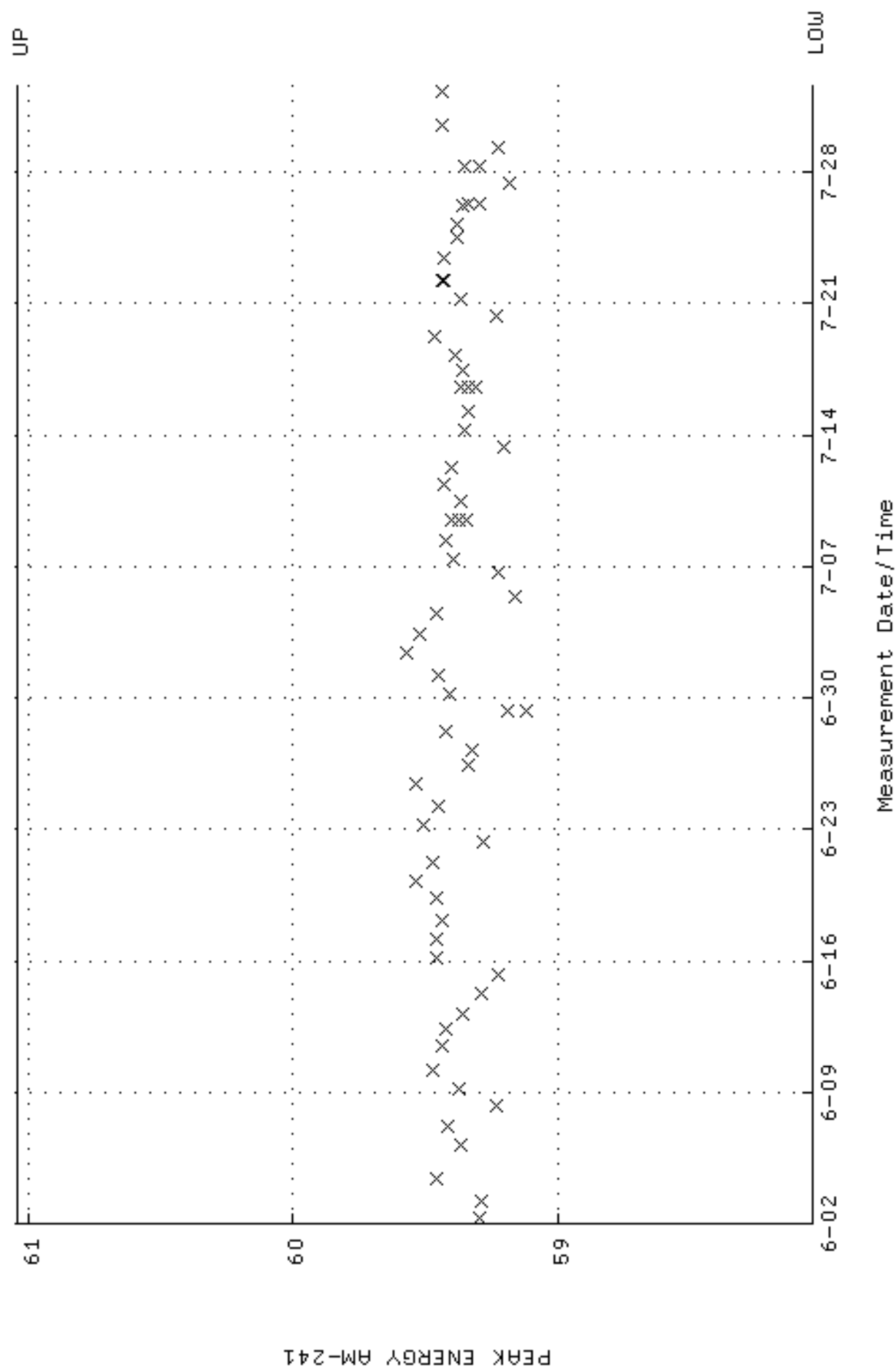


Measurement Date/Time

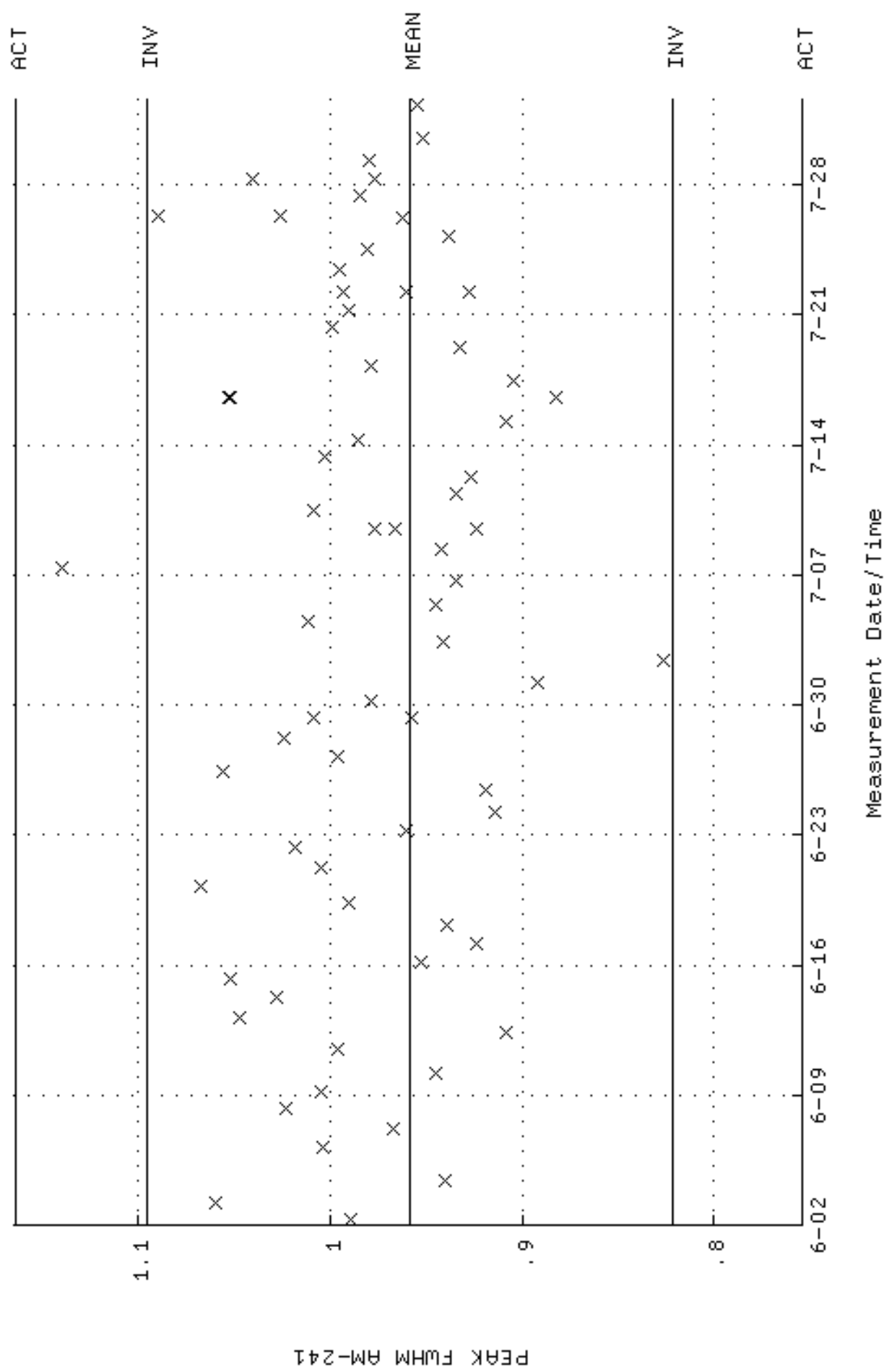
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM40.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 5-JUN-2022 10:03:35 through 1-AUG-2022 12:00:00
Mean +- Std Dev : 1.47438 +- 2.782692E-02 (1.89 %)



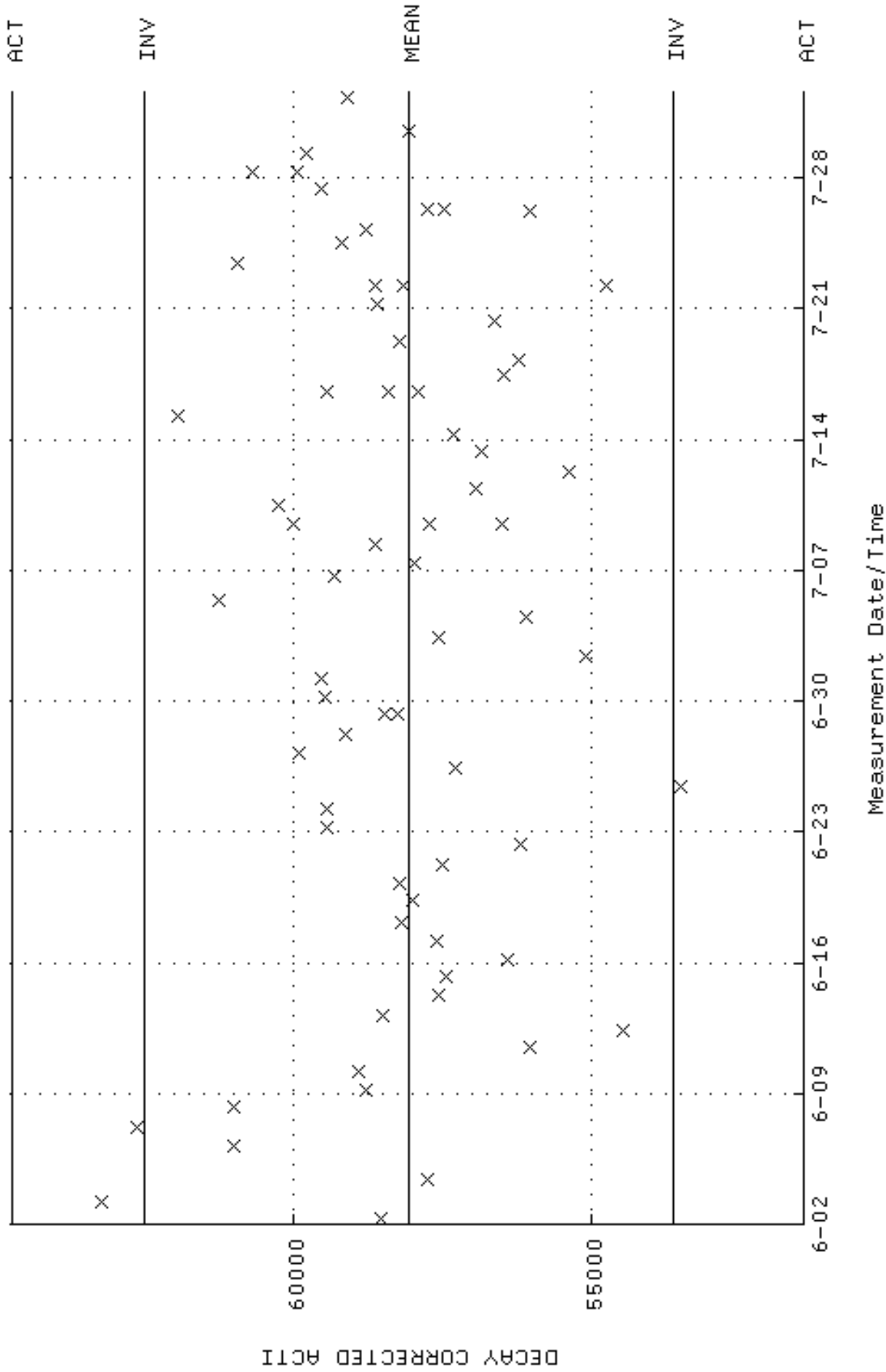
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM43_JAR.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-JUN-2022 07:40:39 through 1-AUG-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



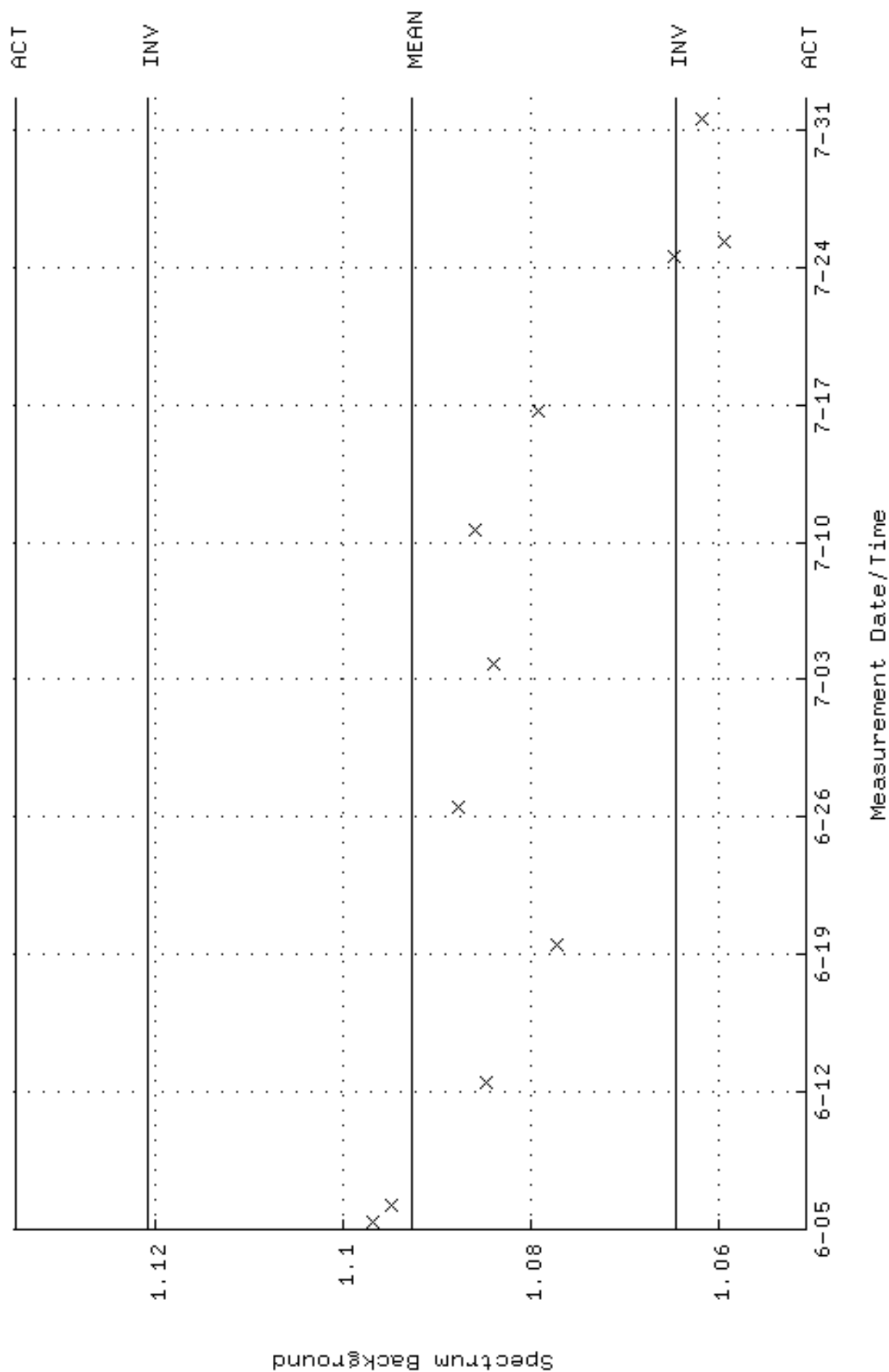
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC_GAM43_JAR.QAF;1
Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
Start/End Dates : 2-JUN-2022 07:40:39 through 1-AUG-2022 12:00:00
Mean +- Std Dev : 0.958943 +- 6.834434E-02 (7.13 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM43-JAR.QAF;1
Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-JUN-2022 07:40:39 through 1-AUG-2022 12:00:00
Mean +- Std Dev : 58085.1 +- 2213.88 (3.81 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM43.QAF;1
 Parameter Name : BACKRATE (Spectrum Background Rate)
 Start/End Dates : 5-JUN-2022 10:03:45 through 1-AUG-2022 12:00:00
 Mean +- Std Dev : 1.09279 +- 1.406415E-02 (1.29 %)



RAD Standards Traceability

1298

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

78962-278

200 mL Solid in 250 mL PP MRP Jar

Customer: GEL Laboratories, LLC

P.O. No.: 88007 RD, Item 1

Calibration Date: 01-Jan-2009

12:00 EST

Grams of Master Source: 0.0068241

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* yps/gram	This Source yps	Uncertainty, %			Calibration Method
					Type	u_A	u_F	U
Pb-210	46.5	8145.1	—	1.305E+03	0.30	1.50	3.06	4 π LS
Am-241	59.5	157860	—	7.746E+02	0.3	1.5	3.1	4 π LS
Cd-109	88.0	462.60	1.694E+05	1.156E+03	0.6	1.7	3.6	HPGe
Co-57	122.1	271.79	8.597E+04	5.867E+02	0.7	1.3	3.0	HPGe
Ce-139	165.9	137.6	1.217E+05	8.305E+02	0.5	1.1	2.4	HPGe
Hg-203	279.2	46.61	2.692E+05	1.837E+03	0.5	1.1	2.4	HPGe
Sn-113	391.7	115.1	1.709E+05	1.166E+03	0.6	1.1	2.5	HPGe
Cs-137	661.7	10983	1.071E+05	7.309E+02	0.7	1.2	2.8	HPGe
Y-88	898.0	106.6	4.084E+05	2.787E+03	0.7	1.1	2.6	HPGe
Co-60	1173.2	1925.4	2.084E+05	1.422E+03	0.8	1.1	2.7	HPGe
Co-60	1332.5	1925.4	2.086E+05	1.424E+03	1.0	1.1	3.0	HPGe
Y-88	1836.1	106.6	4.320E+05	2.948E+03	0.8	1.1	2.7	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4 π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

This standard will expire one year after the calibration date.

Source Prepared by: W. Mao

W. Mao, Radiochemist

QA Approved: D. M. Montgomery

D. M. Montgomery, QA Manager

Date: 2-10-09

End of Certificate

RC-S-051-017

Standard Logbook

Serial ID: 1298 **Open/Reference Date:** 01-JAN-09 **Aliquot :** 1 mL
Name: Mixed Gamma LCS JAR **Received:** 12-FEB-09 **Density :** Hand Calculated
Type: Source Material **Expires:** 01-JAN-35 **Lot Number :** 78962-278
Employee: Maggie Stamps **Verified:** 07-NOV-11
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

Verification for Mixed Gamma Standard

1298

JAR

M. Stamps 11/7/2011	Isotope Am-241	Result pCi/L	Isotopic Abundance: Certificate Value (dps):
	Mixed Gamma N1	60560	0.359
	Mixed Gamma N2	56920	774.6
	Mixed Gamma N3	59450	

Mean Value (Counting) =	58976.67	pCi/L	101.1344	Pass
Stdev =	1865.592	pCi/L		Rule 3 (Pass/Fail)
Certificate Value =	58315.1	pCi/L		
Lower Limit =	55245.48276	pCi/L		
Upper Limit =	62707.85057	pCi/L		
Rule 1 Pass/Fail	Pass			
Two sigma =	3731.183905			
10 % of Mean =	5897.666667			
Rule 2 (Pass/Fail)	Pass			

Stamp
11/7/11
R. F. Smith
11/18/11

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard 1298 JAR

M. Stamps 11/7/2011	Isotope Cs-137	Result pCi/L	Isotopic Abundance: Certificate Value (dps):	0.851 730.9
	Mixed Gamma N1	24390		
	Mixed Gamma N2	24610		
	Mixed Gamma N3	24450		
Mean Value (Counting) =	24483.33	pCi/L	105.4736	
Stdev =	113.725	pCi/L		
			Fail	
			Rule 3 (Pass/Fail)	

*Exception taken due to the high uncertainty of the certified value

Certificate Value =
 Lower Limit =
 Upper Limit =
 Rule 1 Pass/Fail
 Two sigma =
 10 % of Mean =
 Rule 2 (Pass/Fail)

*exception taken due to full recovery of standard

Handwritten signature
11/7/11

Handwritten signature
R. Futch
11/8/11

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard

1298

JAR

M. Stamps
11/7/2011

Isotope
Co-60 (1332.50)
Mixed Gamma N1
Mixed Gamma N2
Mixed Gamma N3

Result
pCi/L
41290
40800
41060

Isotopic Abundance:
Certificate Value (dps):
0.9998
1424

Mean Value (Counting) =
Stdev =

41050.00
245.153

pCi/L
pCi/L

Fail
Rule 3 (Pass/Fail)

*Exception taken due to the high uncertainty of the certified value

Certificate Value =
Lower Limit =
Upper Limit =
Rule 1 Pass/Fail
Two sigma =
10 % of Mean =
Rule 2 (Pass/Fail)

38494.2
40559.69397
41540.30603
Fail
490.3060269
4105
Pass

pCi/L
pCi/L
pCi/L

*exception taken due to full recovery of standard

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

J. Stamps
11/7/11

R. Fatch
11/8/11

Standard Logbook

Serial ID: 1298 **Open/Reference Date:** 01 JAN 2009 **Aliquot :** 1 mL
Name: Mixed Gamma LCS JAR **Received:** 12 FEB 2009 **Density :** Hand Calculated
Type: Source Material **Expires:** 01 JAN 2035 **Lot Number :** 78962-278
Employee: Maggie Stamps **Verified:** 07 NOV 2011
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

Runlogs

Instrument Run Log

Instrument Type: GAMMA SPECTROMETER

Batch ID: 2290721

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885001	SAMPLE	MJH1	GAM14	JUL-21-22 16:33:26	DONE JAR		09-MAY-22 00:00
585885002	SAMPLE	MJH1	GAM11	JUL-21-22 22:46:28	DONE JAR		07-MAR-22 00:00
585885003	SAMPLE	MJH1	GAM12	JUL-21-22 22:47:05	DONE JAR		21-APR-22 00:00
585905001	SAMPLE	MJH1	GAM14	JUL-21-22 22:47:37	DONE JAR		09-MAY-22 00:00
585905002	SAMPLE	MJH1	GAM16	JUL-21-22 22:48:20	DONE JAR		07-MAR-22 00:00
585905003	SAMPLE	MJH1	GAM18	JUL-21-22 22:49:13	DONE JAR		08-JUN-22 00:00
585905004	SAMPLE	MJH1	GAM30	JUL-21-22 22:50:24	DONE JAR		27-SEP-21 00:00
585905005	SAMPLE	MJH1	GAM33	JUL-21-22 22:52:48	DONE JAR		27-JUL-21 00:00
1205141122	MB	MJH1	GAM36	JUL-21-22 22:54:38	DONE JAR		20-SEP-21 00:00
1205141124	LCS	MJH1	GAM40	JUL-21-22 22:56:30	DONE JAR		13-OCT-21 00:00
1205141123	DUP	MJH1	GAM43	JUL-21-22 23:03:14	DONE JAR		22-MAR-22 00:00

Gas Flow Raw Data

Batch 2290790 Check-list

This check-list was completed on 10-AUG-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 28-JUL-22, Nat Long on 28-JUL-22, Kenshalla Oston on 10-AUG-22 and Nat Long on 10-AUG-22.

Batch ID:
2290790

Product:
GFC90SRF

Description: Gas Flow Strontium 90
GL-RAD-A-004

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
8	Are there any equilibrium assumptions?		No	
Quality Control (QC) Information				
9	Was the method blank (MB) within the acceptance criteria?	Yes		
10	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
11	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
13	Has the method required detection limit been met?		No	
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Strontium-90 in Filter

Batch ID: 2290790
Analyst: Jennie Kill-Bowden (JXK3)
Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified
Lab SOP: GL-RAD-A-004 REV# 22
Instrument: GAB-C133357449

Due Dates for Lab: 25-JUL-2022			Package: 27-JUL-2022		SDG: 27-JUL-2022	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205141316	Strontium-90 SPIKE	1943-C	.1	mL	
LCSD	1205141317	Strontium-90 SPIKE	1943-C	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Initial Wt (g)	Final Wt (g)	Net Weight (mg)	Sr Separation (date)	Strontium Carrier Yield (percent)
1	585885001	25-JUL-2022	3	20	0.05142	0.0357	0.0377	2	07/26/22 14:00	46
2	585885002	25-JUL-2022	3	20	0.05051	0.0355	0.0371	1.6	07/26/22 14:00	37
3	585885003	25-JUL-2022	3	20	0.05718	0.0356	0.0371	1.5	07/26/22 14:00	35
4	585905001	25-JUL-2022	3	20	0.05215	0.0358	0.0378	2	07/26/22 14:00	46
5	585905002	25-JUL-2022	3	20	0.04926	0.0357	0.0384	2.7	07/26/22 14:00	62
6	585905003	25-JUL-2022	3	20	0.04563	0.0365	0.0388	2.3	07/26/22 14:00	53
7	585905004	25-JUL-2022	3	20	0.04705	0.0359	0.038	2.1	07/26/22 14:00	49
8	585905005	25-JUL-2022	3	20	0.05101	0.0359	0.0381	2.2	07/26/22 14:00	51
9	1205141315 MB	25-JUL-2022	3		0.05718	0.0356	0.0383	2.7	07/26/22 14:00	62
10	1205141316 LCS	25-JUL-2022	3		0.05718	0.0357	0.0386	2.9	07/26/22 14:00	67
11	1205141317 LCSD	25-JUL-2022	3		0.05718	0.0359	0.0387	2.8	07/26/22 14:00	65

Reagent/Solvent Lot ID	Description	Amount	Comments:
CARR 3452293	Strontium Carrier 0.5mL=4.325 mg/mL	.5 mL	Spike Pipet ID: RAD-GFC-1795419
REGNT 3089709.7	Thymol Blue Indicator 0.04%	1 mL	Carrier Pipet ID: RAD-GFC-2154115
REGNT 3432260	RGF-0.05M Nitric Acid	15 mL	Data Entry Date2: 25-JUL-2022 13:52 GFC-C045440487 Jennie Kill-Bowden
REGNT 3444489	80% ethanol	3 mL	Data Entry Date3: 25-JUL-2022 00:00
REGNT 3454205	3M HNO3 0.05M Oxalic	10 mL	
REGNT 3461483	RGF-8M Nitric Acid	40 mL	
REGNT 3464132	RGF-6M Sodium Hydroxide	10 mL	
REGNT 3465454	0.75M Sodium Carbonate	13 mL	
REGNT SR0062	SR Resin	2 g	

Strontium-90 Filter

Filename : SR90.XLS
 File type : Excel
 Version # : 1.3.10

Carrier S/N : 3452293
 Carrier Exp Date : 6/20/2023
 Carrier Volume Added: 0.50
 Carrier Weight (mg/ml): 8.65
 Carrier Weight StDev.: 0.06

Batch : 2290790
 Analyst : JEN02186
 Prep Date : 7/25/2022
 Method Uncertainty : 0.1315

Procedure Code : GFC90SRF
 Parmname : Strontium-90
 Required MDA : 3 pCi/F
 Sr-90 Abundance : 1.00
 Halflife of Sr-90 : 28.90 years
 Halflife of Y-90 : 64.053 hours

Geometry: Tuffryn Filter

Sample Characteristics					Carrier Calculations				
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Carrier Weight (mg) (Standard)	Net Weight (mg) (Sample)	Net Weight StDev. (mg)	Carrier Aliquot (mL)	Carrier Aliquot StDev. (mL)
1	585885001.1	0.0514	7.9479E-06	6/27/2022 9:24	8.65	2.00	0.015926	0.5	0.001000
2	585885002.1	0.0505	7.8746E-06	6/27/2022 9:38	8.65	1.60	0.014207	0.5	0.001000
3	585885003.1	0.0572	8.4023E-06	6/27/2022 10:00	8.65	1.50	0.013777	0.5	0.001000
4	585905001.1	0.0521	8.0060E-06	6/27/2022 9:43	8.65	2.00	0.015926	0.5	0.001000
5	585905002.1	0.0493	7.7734E-06	6/27/2022 9:52	8.65	2.70	0.018935	0.5	0.001000
6	585905003.1	0.0456	7.4767E-06	6/27/2022 10:01	8.65	2.30	0.017215	0.5	0.001000
7	585905004.1	0.0471	7.5937E-06	6/27/2022 10:08	8.65	2.10	0.016356	0.5	0.001000
8	585905005.1	0.0510	7.9153E-06	6/27/2022 12:00	8.65	2.20	0.016786	0.5	0.001000
9	1205141315.1	0.0572	8.4023E-06	7/25/2022 0:00	8.65	2.70	0.018935	0.5	0.001000
10	1205141316.1	0.0572	8.4023E-06	7/25/2022 0:00	8.65	2.90	0.019794	0.5	0.001000
11	1205141317.1	0.0572	8.4023E-06	7/25/2022 0:00	8.65	2.80	0.019364	0.5	0.001000

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-004
 Instrument SOP: GL-RAD-I-016

Count Raw Data										
Pos.	Detector ID	Counting	Gross Counts		Gross Beta	Count	Strontium	Yttrium	Sr-90	Calculated
		Time (min.)	Alpha	Beta	CPM	Start Date/Time	Separation Date/Time	Ingrowth	Decay	Sample Recovery %
1	4B	500	38	840	1.669	8/9/2022 10:04	7/26/2022 14:00	0.974	0.997	46.2%
2	4D	500	47	677	1.351	8/9/2022 10:04	7/26/2022 14:00	0.974	0.997	37.0%
3	7A	500	41	588	1.171	7/26/2022 19:10	7/26/2022 14:00	0.096	0.998	34.7%
4	7B	500	21	342	0.682	7/26/2022 19:10	7/26/2022 14:00	0.096	0.998	46.2%
5	7C	500	59	462	0.915	7/26/2022 19:10	7/26/2022 14:00	0.096	0.998	62.4%
6	7D	500	94	318	0.623	7/26/2022 19:10	7/26/2022 14:00	0.096	0.998	53.2%
7	8C	500	28	254	0.506	7/26/2022 19:10	7/26/2022 14:00	0.096	0.998	48.6%
8	8C	500	27	223	0.444	7/27/2022 10:14	7/26/2022 14:00	0.232	0.998	50.9%
9	8D	500	17	464	0.927	7/27/2022 10:14	7/26/2022 14:00	0.232	1.000	62.4%
10	13A	60	5	916	15.262	7/26/2022 17:47	7/26/2022 14:00	0.045	1.000	67.1%
11	13B	60	3	838	13.964	7/26/2022 17:47	7/26/2022 14:00	0.045	1.000	64.7%

Calibration Data										
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)		Detector Efficiency Error (cpm/dpm)	Alpha X-Talk	Weekly Bkg CPM	Weekly Bkg Count Start Date/Time	Weekly Bkg Count Time (min.)
1	PIC	4/1/2021	3/31/2023	0.3539	0.5037	0.01519	0.14973	1.638	8/6/2022 11:15	1000
2	PIC	4/1/2021	3/31/2023	0.3458	0.5081	0.00773	0.03047	1.275	8/6/2022 11:15	1000
3	PIC	4/1/2021	3/31/2023	0.3442	0.5013	0.00594	0.06005	1.330	7/23/2022 12:20	500
4	PIC	4/1/2021	3/31/2023	0.3471	0.5082	0.00627	0.05180	0.644	7/23/2022 12:20	500
5	PIC	4/1/2021	3/31/2023	0.3486	0.4907	0.00790	0.07364	0.840	7/23/2022 12:20	500
6	PIC	4/1/2021	3/31/2023	0.3482	0.4994	0.01113	0.06820	0.538	7/23/2022 12:20	500
7	PIC	4/1/2021	3/31/2023	0.3562	0.5218	0.01955	0.03167	0.408	7/23/2022 12:20	500
8	PIC	4/1/2021	3/31/2023	0.3563	0.5218	0.01955	0.03167	0.408	7/23/2022 12:20	500
9	PIC	4/1/2021	3/31/2023	0.3640	0.5289	0.00609	0.02922	0.938	7/23/2022 12:20	500
10	PIC	4/1/2021	3/31/2023	0.3369	0.4928	0.00714	0.05461	1.384	7/23/2022 12:20	500
11	PIC	4/1/2021	3/31/2023	0.3510	0.5164	0.00967	0.05782	1.120	7/23/2022 12:20	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1943-C
LCS Exp Date : 1/4/2023
LCS Activity (dpm/ml): 519.88
LCS Volume Added: 0.10

Results																	Scanned Detector
Pos.	Decision Level	Critical Level	Required MDA	MDA	Sample Act. Conc.	Sample Act. Error	Net Count Rate	Net Count Rate Error	2 SIGMA Counting Uncertainty	2 SIGMA Total Prop. Uncertainty	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery	
	pCi/F	pCi/F	pCi/F	pCi/F	pCi/F	%	CPM	CPM	pCi/F	pCi/F							
1	3.6746	2.5943	3	5.3235	0.6889	230.36%	0.0306	0.0705	3.1102	3.1155		SAMPLE					6A
2	4.1448	2.9262	3	6.0251	2.1899	82.85%	0.0761	0.0631	3.5553	3.6007		SAMPLE					6C
3	9.8584	6.9601	3	14.2682	-9.2190	44.53%	-0.1589	0.0707	8.0413	8.0414		SAMPLE					7A
4	5.5899	3.9465	3	8.1767	1.7879	136.15%	0.0378	0.0515	4.7708	4.7934		SAMPLE					7B
5	5.0080	3.5357	3	7.2939	2.7925	78.69%	0.0753	0.0593	4.3061	4.3668		SAMPLE					7C
6	5.0734	3.5818	3	7.4453	3.9980	56.60%	0.0852	0.0482	4.4334	4.5544		SAMPLE					7D
7	4.5753	3.2302	3	6.7520	4.7745	43.60%	0.0982	0.0428	4.0738	4.2652		SAMPLE					8C
8	3.4294	2.4212	3	5.0610	1.3222	113.79%	0.0363	0.0413	2.9483	2.9690		SAMPLE					8C
9	3.7005	2.6126	3	5.3808	-0.2850	555.55%	-0.0110	0.0611	3.1037	3.1038		MB					8D
10	12.2511	8.6494	3	18.9344	453.9923	3.91%	13.8781	0.5071	32.5129	122.2486		LCS			409.5823	110.8%	13A
11	10.9509	7.7315	3	17.0882	417.4897	4.08%	12.8438	0.4847	30.8827	112.9446		LCSD	8.4%		409.5823	101.9%	13B

Results (DPM)								1 SIGMA	1 SIGMA						
Decision Level DPM/F	Critical Level DPM/F	Required MDA DPM/F	MDA DPM/F	Sample Act. Conc. DPM/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty DPM/F	Total Prop. Uncertainty DPM/F	Sample QC	Sample Type	RPD	RER	Nominal DPM/F	Recovery
8.1575	5.7593	6.66	11.8182	1.5293	230.36%	0.0306	0.0705	6.9047	6.9164		SAMPLE				
9.2014	6.4963	6.66	13.3756	4.8615	82.85%	0.0761	0.0631	7.8928	7.9935		SAMPLE				
21.8856	15.4514	6.66	31.6755	-20.4662	44.53%	-0.1589	0.0707	17.8517	17.8519		SAMPLE				
12.4097	8.7613	6.66	18.1523	3.9692	136.15%	0.0378	0.0515	10.5912	10.6412		SAMPLE				
11.1178	7.8492	6.66	16.1924	6.1993	78.69%	0.0753	0.0593	9.5596	9.6943		SAMPLE				
11.2629	7.9517	6.66	16.5286	8.8756	56.60%	0.0852	0.0482	9.8422	10.1107		SAMPLE				
10.1571	7.1710	6.66	14.9894	10.5994	43.60%	0.0982	0.0428	9.0438	9.4688		SAMPLE				
7.6134	5.3751	6.66	11.2355	2.9353	113.79%	0.0363	0.0413	6.5452	6.5912		SAMPLE				
8.2151	5.8000	6.66	11.9453	-0.6328	555.55%	-0.0110	0.0611	6.8903	6.8904		MB				
27.1975	19.2016	6.66	42.0344	1007.8628	3.91%	13.8781	0.5071	72.1787	271.3918		LCS			909.27	110.8%
24.3111	17.1638	6.66	37.9357	926.8270	4.08%	12.8438	0.4847	68.5595	250.7371		LCSD	8.4%		909.27	101.9%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
585885001	4B	500	38	840	8/9/2022 10:04	8/9/2022 18:24	PIC	2290790
585885002	4D	500	47	677	8/9/2022 10:04	8/9/2022 18:24	PIC	2290790
585885003	7A	500	41	588	7/26/2022 19:10	7/27/2022 3:30	PIC	2290790
585905001	7B	500	21	342	7/26/2022 19:10	7/27/2022 3:30	PIC	2290790
585905002	7C	500	59	462	7/26/2022 19:10	7/27/2022 3:30	PIC	2290790
585905003	7D	500	94	318	7/26/2022 19:10	7/27/2022 3:30	PIC	2290790
585905004	8C	500	28	254	7/26/2022 19:10	7/27/2022 3:30	PIC	2290790
585905005	8C	500	27	223	7/27/2022 10:14	7/27/2022 18:34	PIC	2290790
1205141315	8D	500	17	464	7/27/2022 10:14	7/27/2022 18:34	PIC	2290790
1205141316	13A	60	5	916	7/26/2022 17:47	7/26/2022 18:47	PIC	2290790
1205141317	13B	60	3	838	7/26/2022 17:47	7/26/2022 18:47	PIC	2290790

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 26-Jul-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	Above	Beta bkg	26-Jul 05:27	60	2.183	-2.15E-1	2.577	+2.15
LB4100A2	Above	Beta eff	26-Jul 06:46	5	24152	19870	23260	+4.58
LB4100E2	Above	Beta bkg	26-Jul 04:57	60	2.467	1.385	3.072	+0.85
LB4100E3	Above	Beta bkg	26-Jul 04:57	60	2.433	0.506	2.576	+2.59
LB4100F3	Above	Alpha bkg	26-Jul 04:57	60	0.317	0.119	0.404	+1.16
LB4100G1	need 2nd	Alpha XTalk	26-Jul 06:04	5	0.307	0.088	0.447	+0.66
LB4100G1	Above	Beta bkg	26-Jul 04:57	60	1496	0.380	1.675	+6,928.12
LB4100G2	Above	Alpha eff	26-Jul 06:04	5	9721	7308	9581	+3.37
LB4100G2	Above	Beta bkg	26-Jul 04:57	60	4.217	1.159	2.203	+14.57
LB4100G3	Below	Alpha bkg	26-Jul 04:57	60	0.00E+0	0.002	0.276	-3.05
LB4100G3	need 2nd	Alpha eff	26-Jul 06:04	5	6634	6620	7779	-2.93
LB4100G3	Above	Beta bkg	26-Jul 04:57	60	7.167	0.810	1.674	+41.14
PIC1A	need 2nd	Alpha bkg	26-Jul 06:29	60	0.233	-1.13E-1	0.365	+1.35
PIC1A	Above	Beta bkg	26-Jul 06:29	60	2.250	-7.65E-1	2.862	+1.99
PIC2D	Below	Beta eff	26-Jul 06:38	5	38291	38700	42550	-3.64
PIC6B	Above	Beta bkg	26-Jul 06:49	60	5.133	0.389	2.636	+9.67
PIC8A	Above	Beta bkg	26-Jul 05:39	60	2.650	-2.72E-1	2.644	+3.01
PIC8B	Above	Alpha bkg	26-Jul 05:39	60	0.983	-1.16E-1	0.388	+10.11
PIC8B	Above	Beta bkg	26-Jul 05:39	60	2.467	-1.80E-1	2.341	+3.30
PIC8B	need 2nd	Beta eff	26-Jul 05:32	5	21906	20290	21980	+2.74
PIC14B	Above	Beta bkg	26-Jul 09:18	60	2.167	-2.13E-1	2.672	+1.95

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100I3
LB4100I4

Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Laura Pliska

Date 7/26/22

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 27-Jul-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

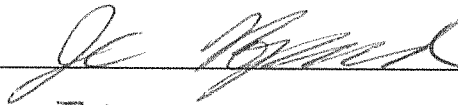
Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	Above	Beta bkg	27-Jul 05:15	60	2.400	-2.15E-1	2.577	+2.62
LB4100A2	Above	Beta eff	27-Jul 06:34	5	24170	19870	23260	+4.61
LB4100A3	Above	Beta eff	27-Jul 06:34	5	23996	18490	23930	+3.07
LB4100E1	Below	Beta eff	27-Jul 05:51	5	13899	13920	15150	-3.10
LB4100E2	Above	Beta bkg	27-Jul 04:45	60	2.283	1.385	3.072	+0.20
LB4100E3	Above	Beta bkg	27-Jul 04:45	60	2.633	0.506	2.576	+3.17
LB4100F3	Above	Alpha bkg	27-Jul 04:45	60	0.317	0.119	0.404	+1.16
LB4100G1	Above	Alpha XTalk	27-Jul 05:51	5	1.440	0.088	0.447	+19.63
LB4100G1	Above	Beta bkg	27-Jul 04:45	60	123	0.380	1.675	+562.89
LB4100G1	Above	Beta eff	27-Jul 05:58	5	18708	12880	18320	+3.43
LB4100G2	Above	Alpha eff	27-Jul 05:51	5	9965	7308	9581	+4.01
LB4100G2	Below	Alpha XTalk	27-Jul 05:51	5	0.315	0.324	0.423	-3.56
LB4100G2	Above	Beta bkg	27-Jul 04:45	60	5.167	1.159	2.203	+20.03
LB4100G3	need 2nd	Alpha bkg	27-Jul 04:45	60	0.050	0.002	0.276	-1.95
LB4100G3	Below	Alpha eff	27-Jul 05:51	5	6512	6620	7779	-3.56
LB4100G3	Above	Beta bkg	27-Jul 04:45	60	9.617	0.810	1.674	+58.16
PIC1A	need 2nd	Alpha bkg	27-Jul 06:17	60	0.233	-1.13E-1	0.365	+1.35
PIC1A	Above	Beta bkg	27-Jul 06:17	60	2.017	-7.65E-1	2.862	+1.60
PIC8A	Above	Alpha bkg	27-Jul 05:30	60	0.333	-7.00E-2	0.356	+2.68
PIC8A	Above	Beta bkg	27-Jul 05:30	60	2.250	-2.72E-1	2.644	+2.19
PIC8B	Above	Alpha bkg	27-Jul 05:30	60	1.050	-1.16E-1	0.388	+10.90
PIC8B	Above	Beta bkg	27-Jul 05:30	60	2.483	-1.80E-1	2.341	+3.34
PIC8B	Above	Beta eff	27-Jul 05:23	5	22149	20290	21980	+3.60

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100I2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 7/27/22

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 09-Aug-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	Above	Beta bkg	09-Aug 07:45	60	2.267	-2.15E-1	2.577	+2.33
LB4100A2	Above	Beta eff	09-Aug 05:14	5	24415	19870	23260	+5.05
LB4100A3	Above	Beta eff	09-Aug 05:14	5	24184	18490	23930	+3.28
LB4100E2	Above	Beta bkg	09-Aug 04:47	60	2.667	1.385	3.072	+1.56
LB4100E3	Above	Beta bkg	09-Aug 04:47	60	2.317	0.506	2.576	+2.25
LB4100F3	need 2nd	Alpha bkg	09-Aug 04:47	60	0.233	0.119	0.404	-0.60
LB4100G1	need 2nd	Alpha XTalk	09-Aug 05:52	5	0.310	0.088	0.447	+0.72
LB4100G1	need 2nd	Beta bkg	09-Aug 04:48	60	1.217	0.380	1.675	+0.88
LB4100G2	Below	Beta eff	09-Aug 06:00	5	13969	14190	15940	-3.76
LB4100G3	Below	Alpha eff	09-Aug 05:52	5	6314	6620	7779	-4.59
LB4100G3	Above	Alpha XTalk	09-Aug 05:52	5	0.375	0.309	0.375	+3.05
LB4100G3	Above	Beta bkg	09-Aug 04:48	60	2.400	0.810	1.674	+8.04
LB4100G3	Below	Beta eff	09-Aug 06:00	5	21249	21640	22870	-4.91
PIC2D	Above	Beta bkg	09-Aug 07:10	60	2.250	0.171	2.681	+1.97
PIC6C	Above	Beta bkg	09-Aug 08:22	60	2.333	0.415	2.299	+3.11
PIC8B	Above	Alpha bkg	09-Aug 08:24	60	0.350	-1.16E-1	0.388	+2.55
PIC8B	Above	Beta bkg	09-Aug 08:24	60	2.183	-1.80E-1	2.341	+2.62
PIC12C	need 2nd	Alpha bkg	09-Aug 08:12	60	0.217	-6.64E-2	0.384	+0.77
PIC12C	need 2nd	Beta bkg	09-Aug 08:12	60	0.967	0.142	2.845	-1.17
PIC14A	need 2nd	Alpha bkg	09-Aug 08:12	60	0.217	-8.33E-2	0.475	+0.22
PIC14B	need 2nd	Alpha bkg	09-Aug 08:12	60	0.267	-1.04E-1	0.352	+1.87
PIC14B	need 2nd	Beta bkg	09-Aug 08:12	60	1.733	-2.13E-1	2.672	+1.05
PIC14C	need 2nd	Beta bkg	09-Aug 08:12	60	1.917	0.197	2.388	+1.71

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

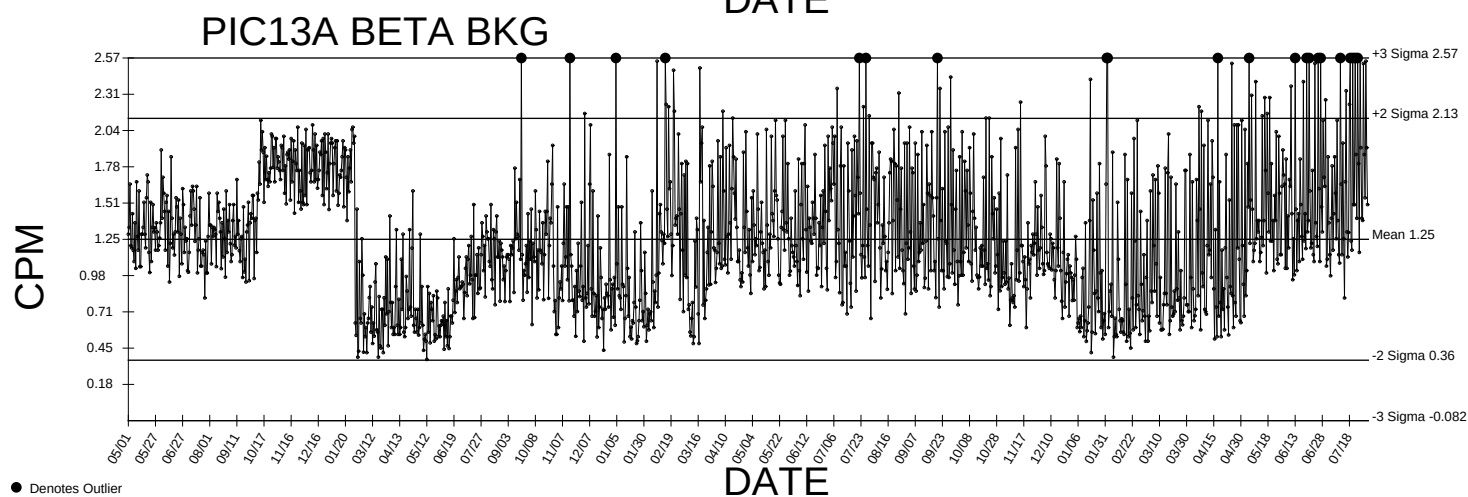
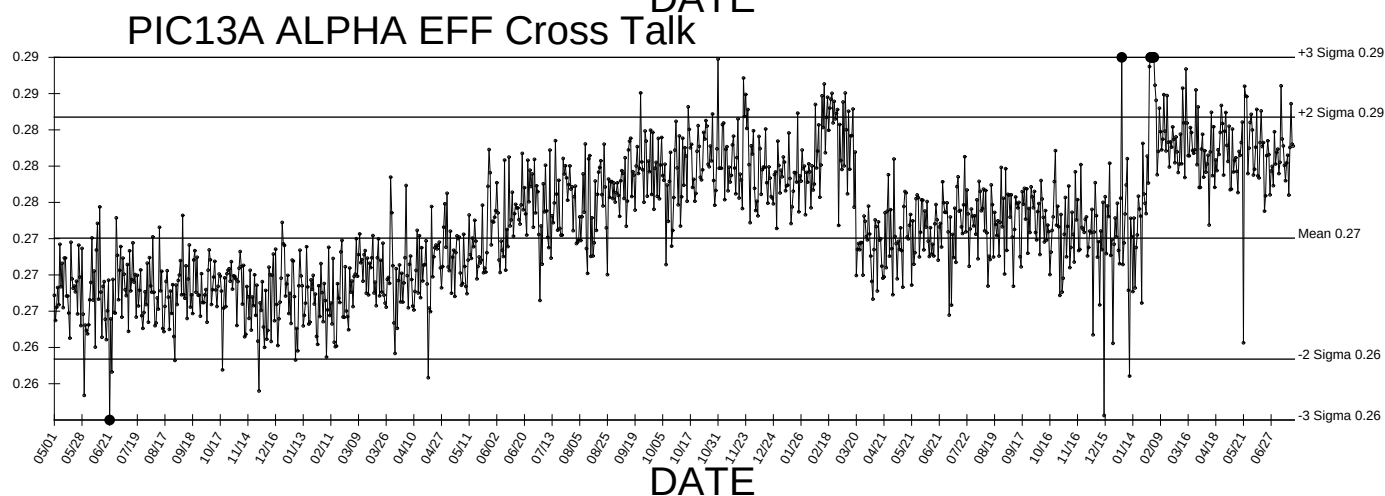
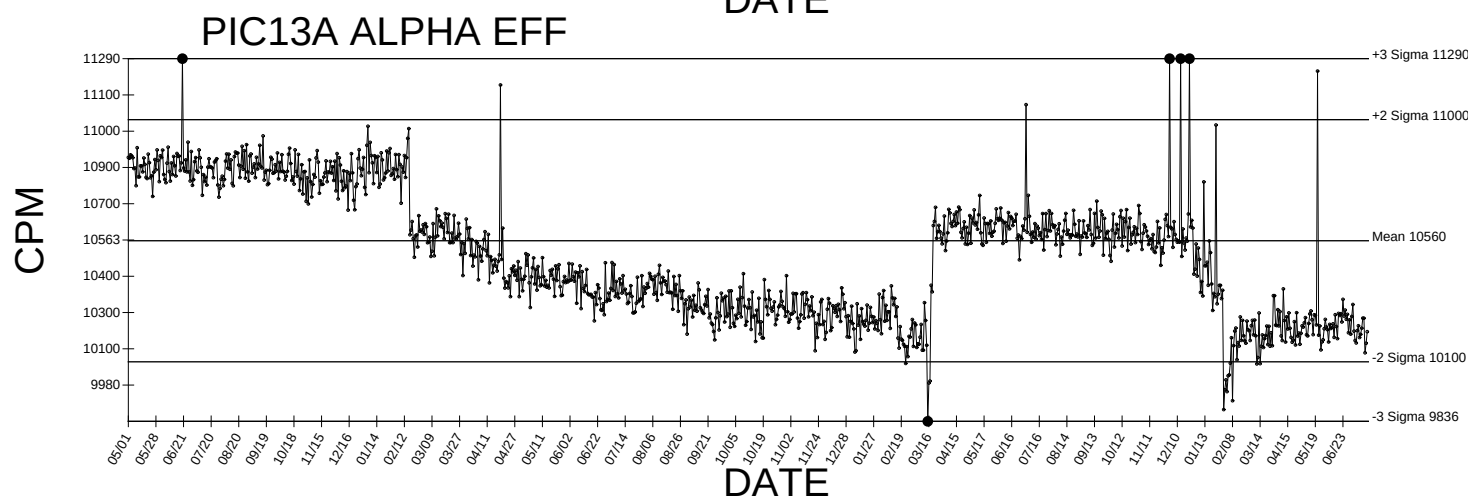
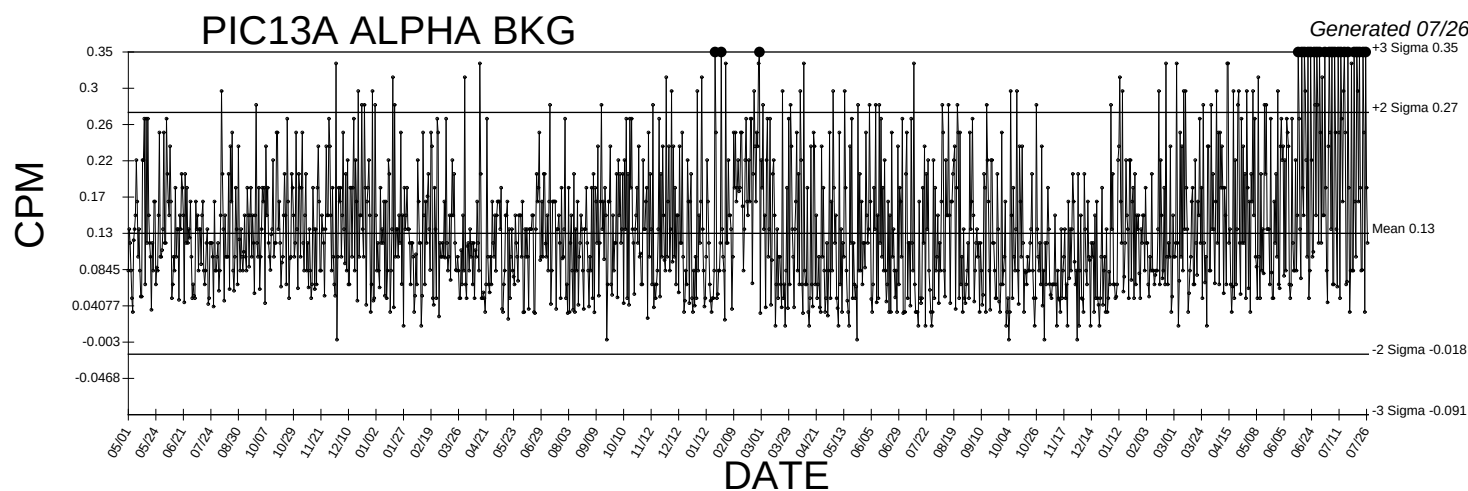
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by _____

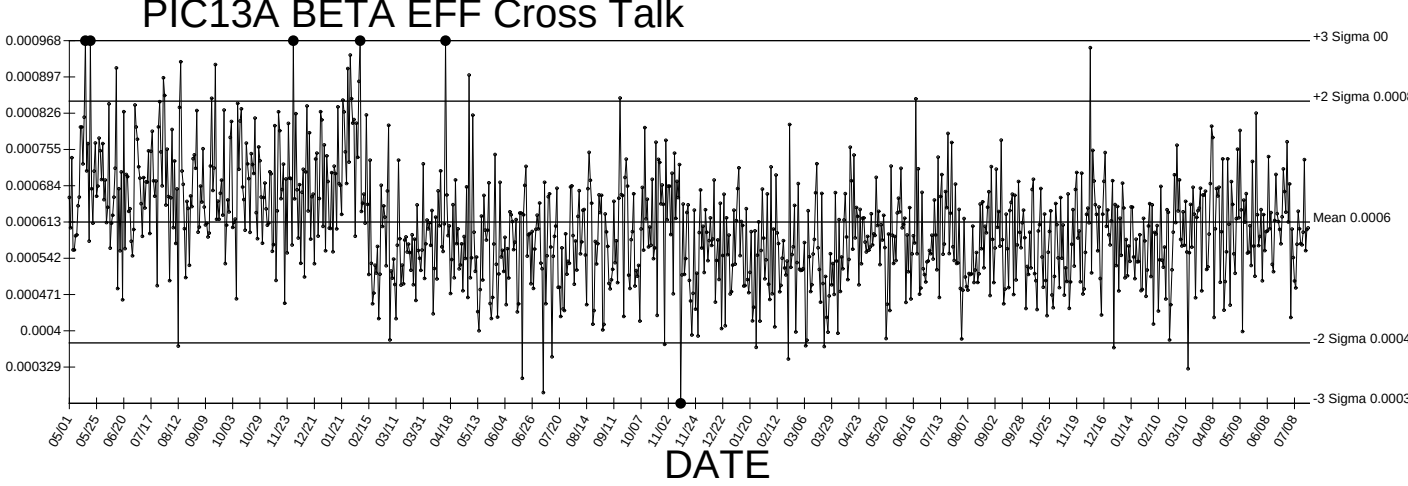
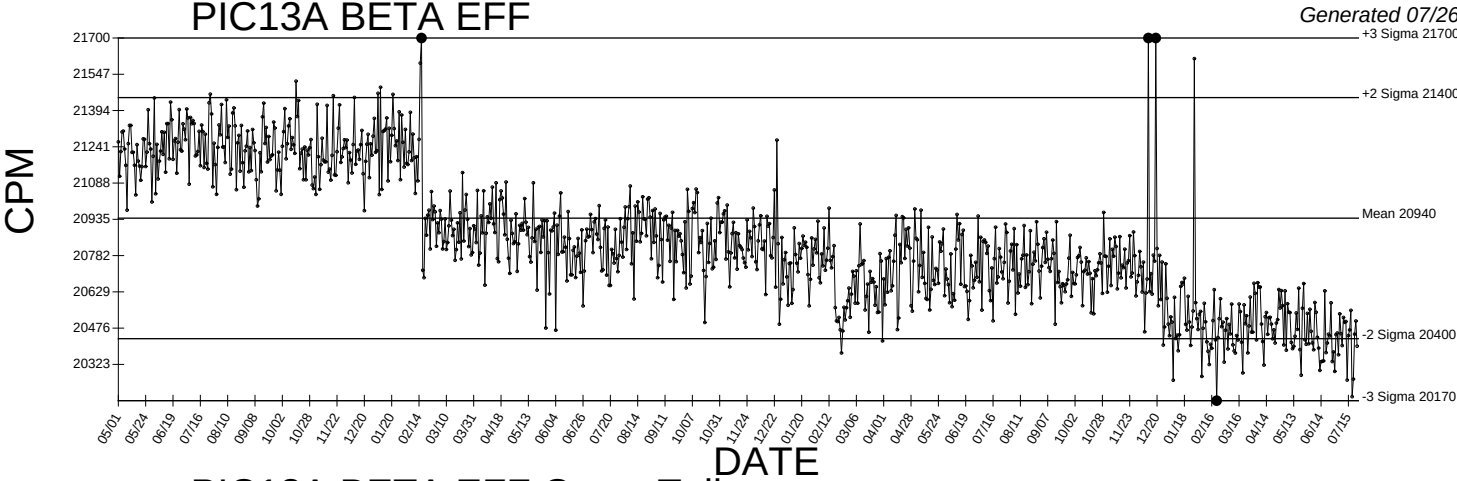
Date 08/09/2022

GEL Laboratories LLC

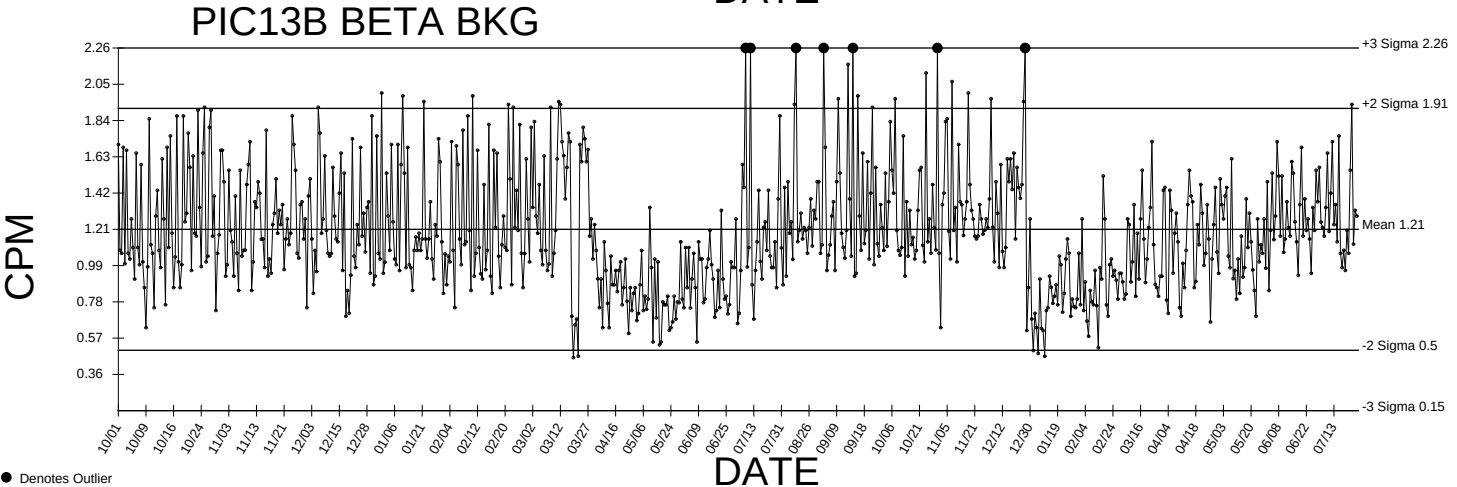
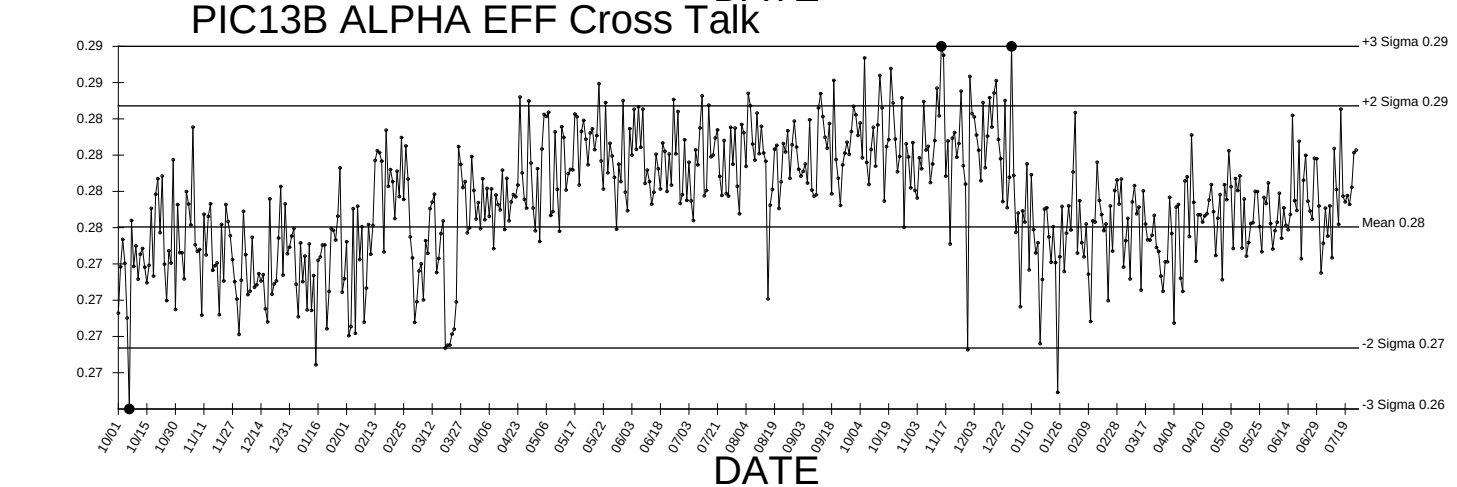
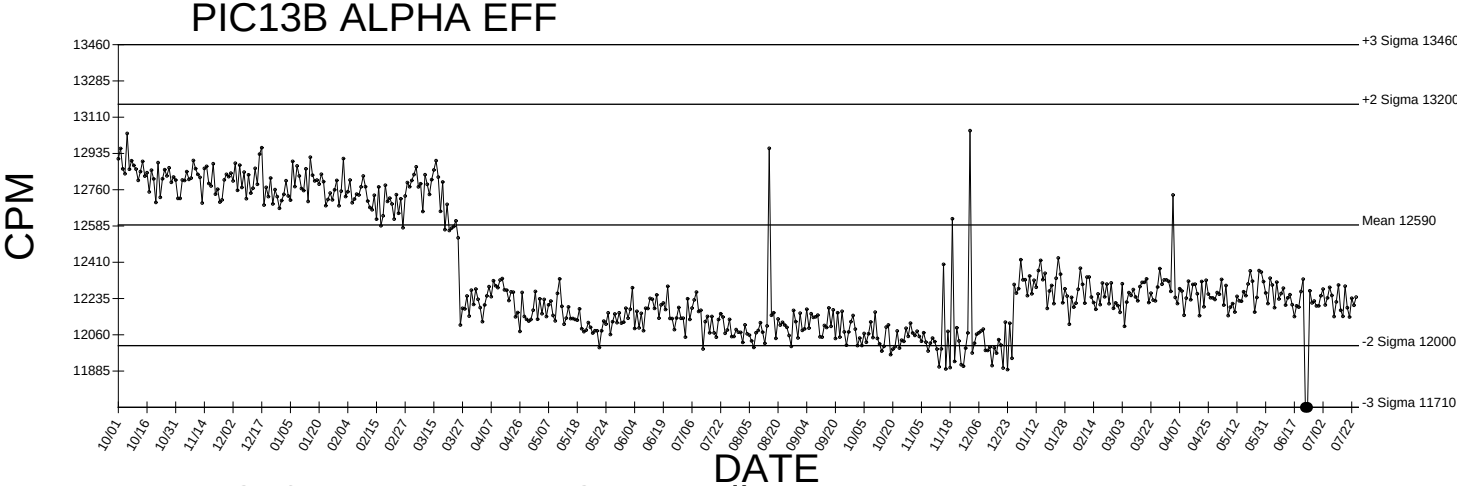
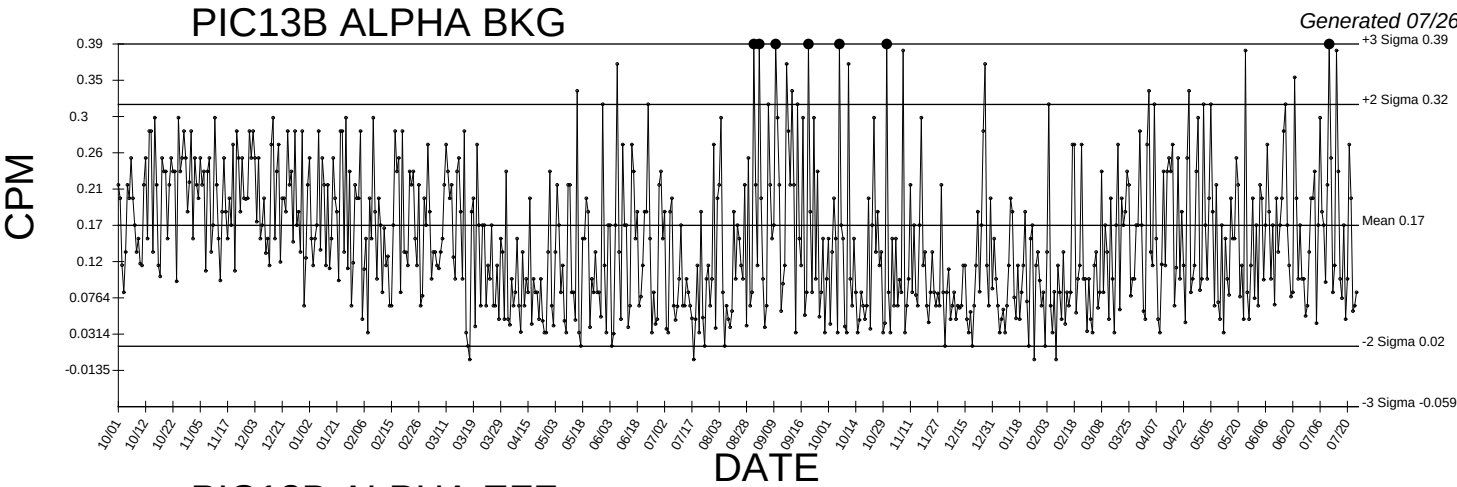
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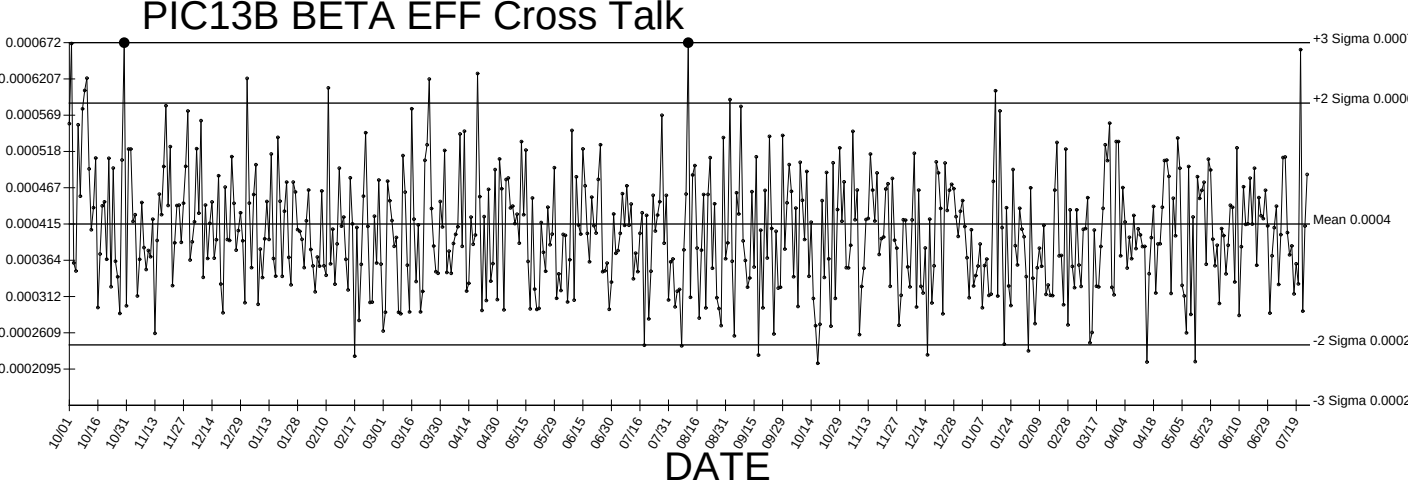
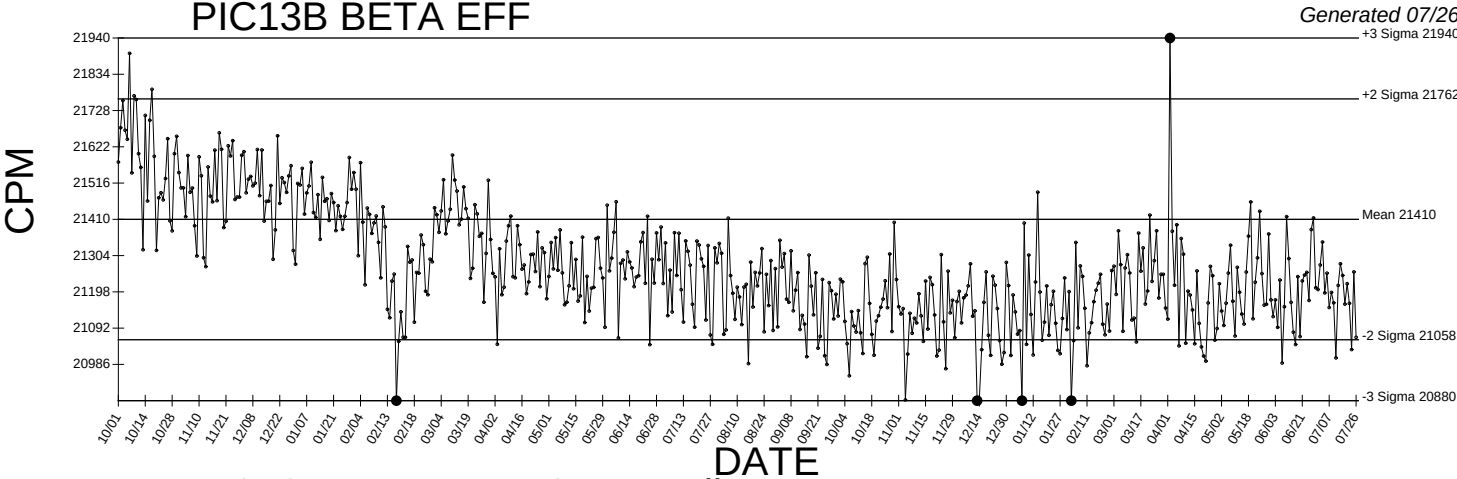
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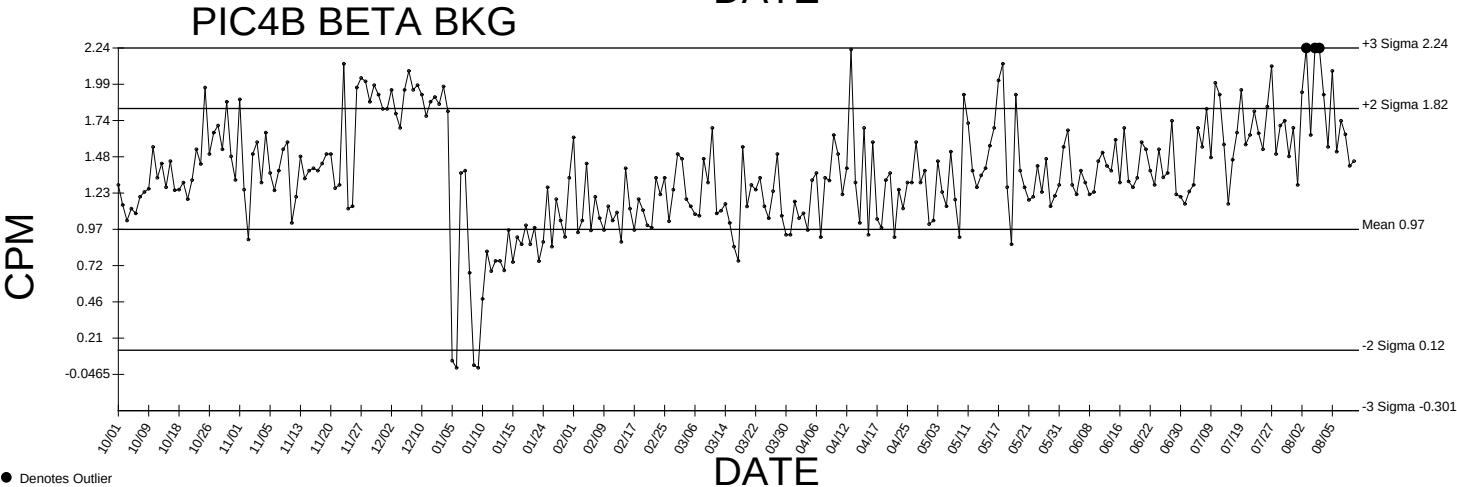
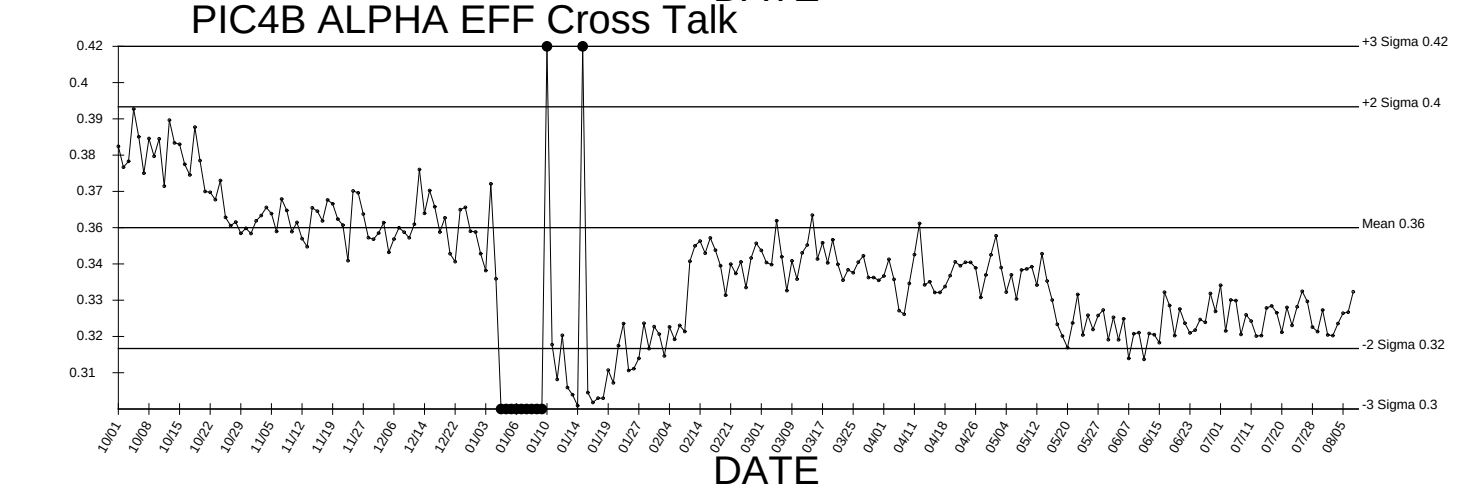
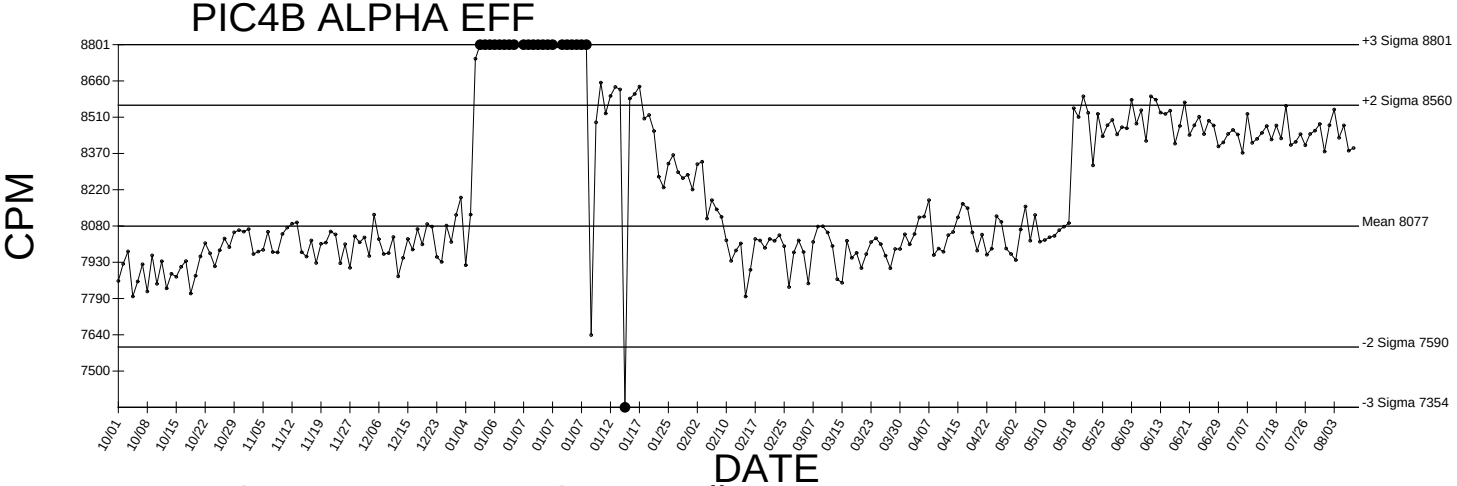
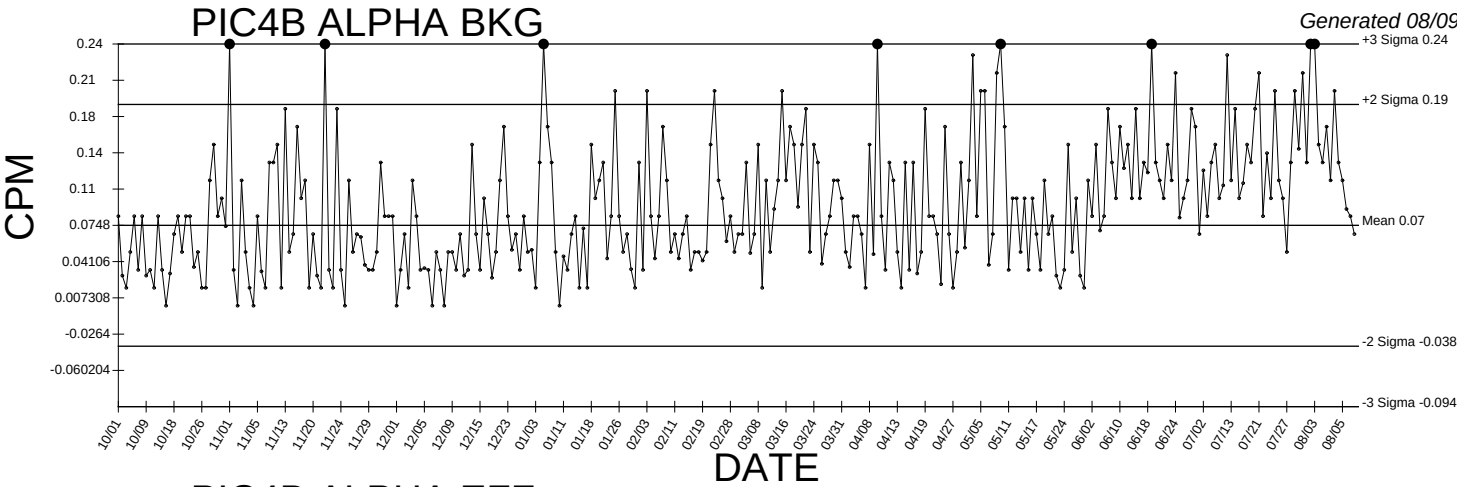
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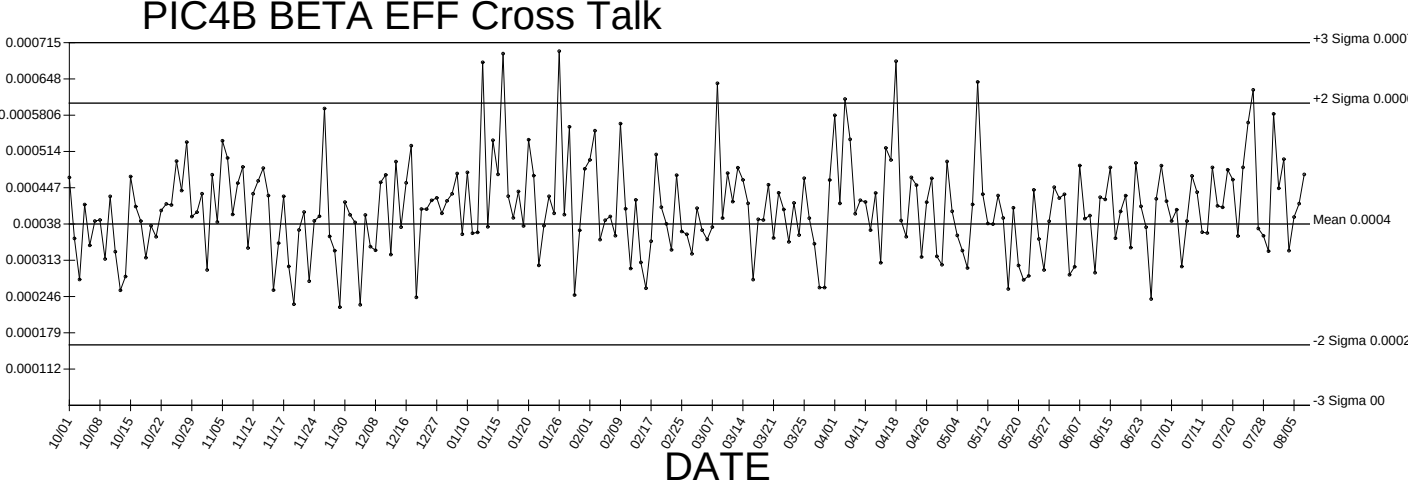
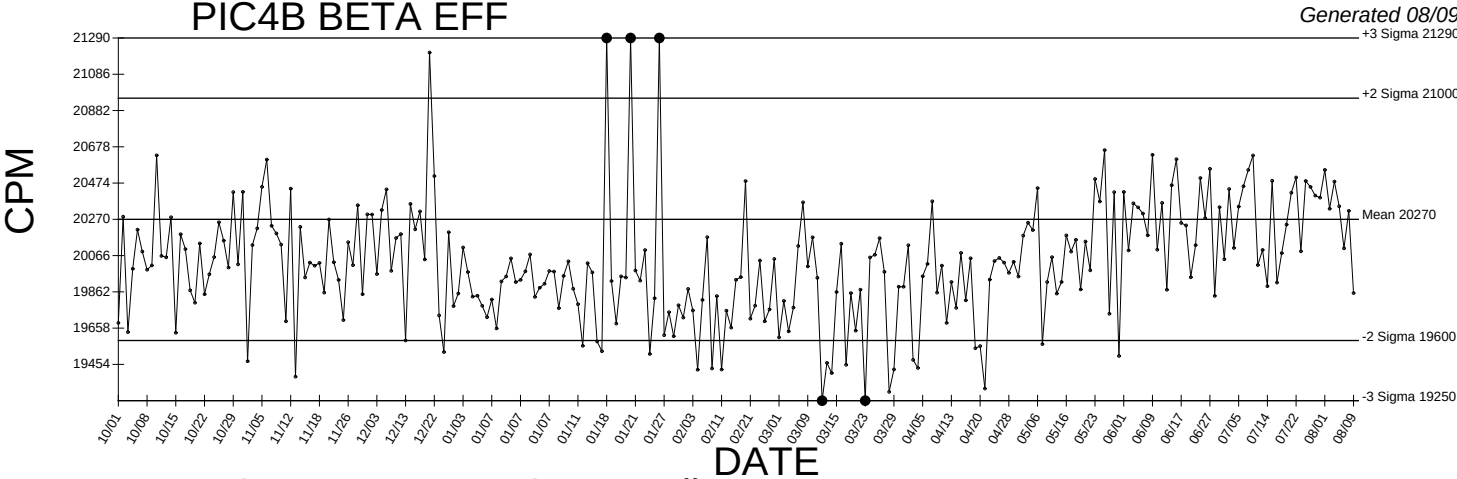
● Denotes Outlier



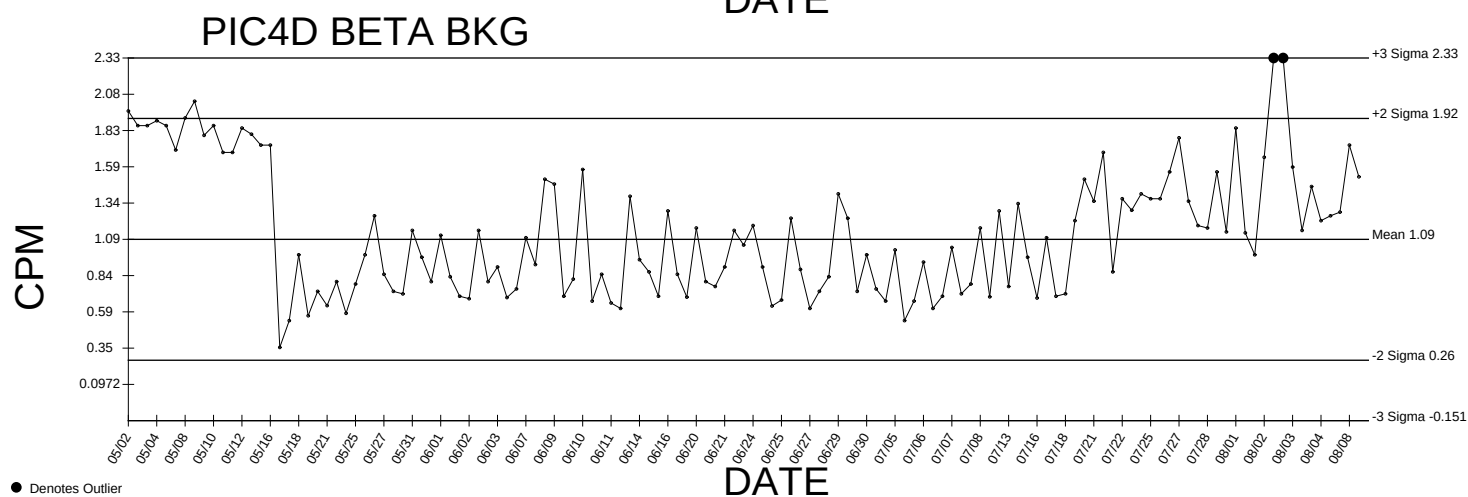
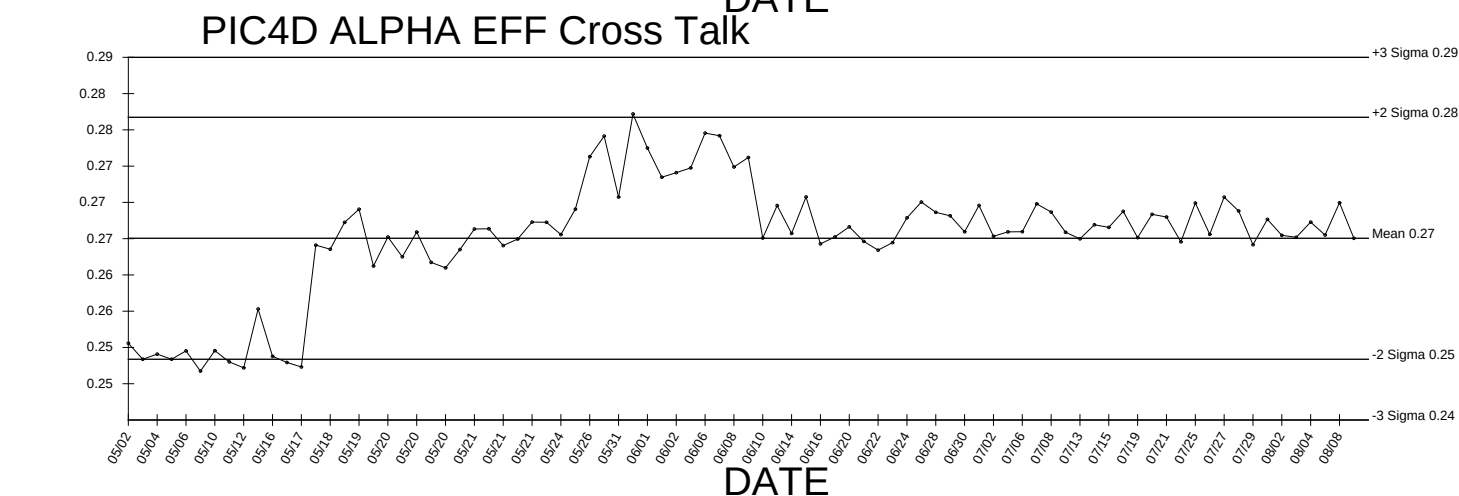
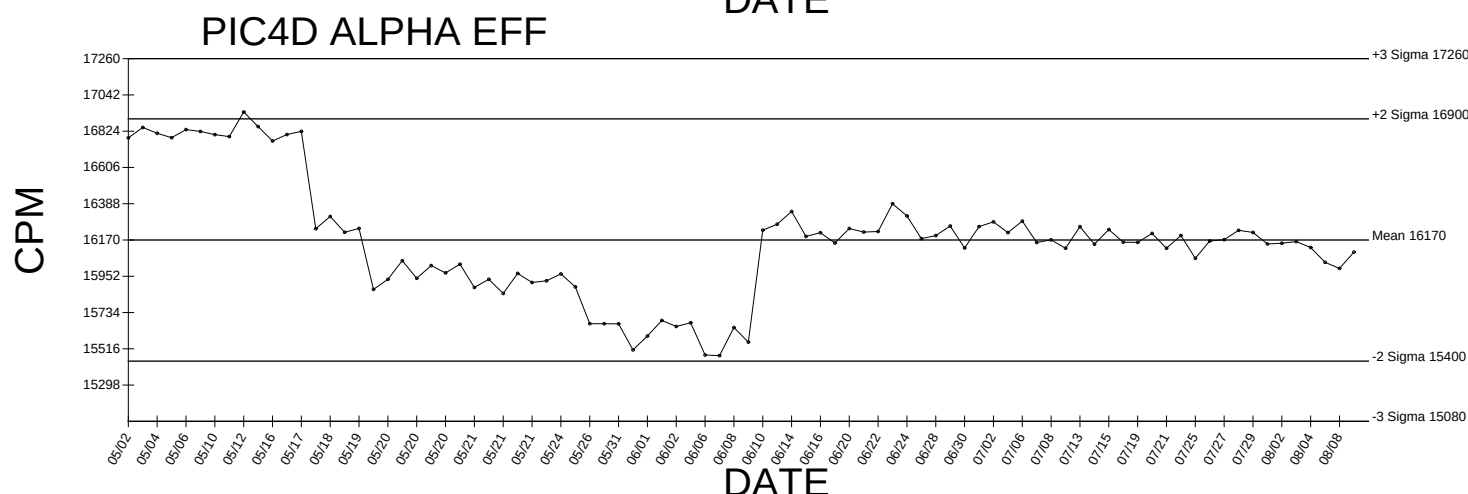
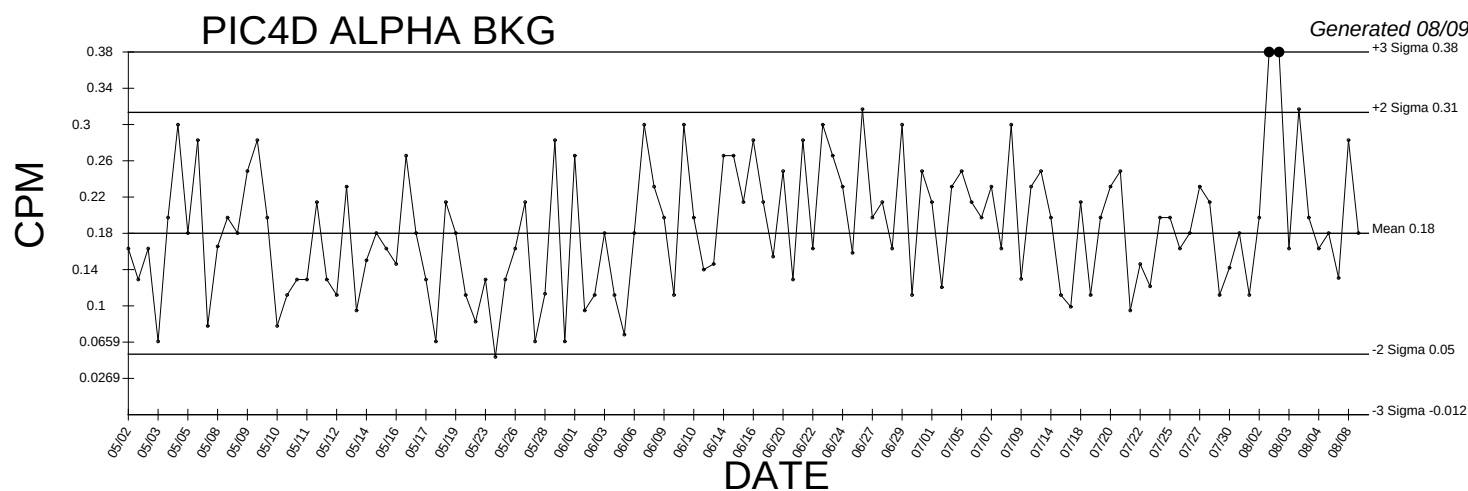
● Denotes Outlier



● Denotes Outlier



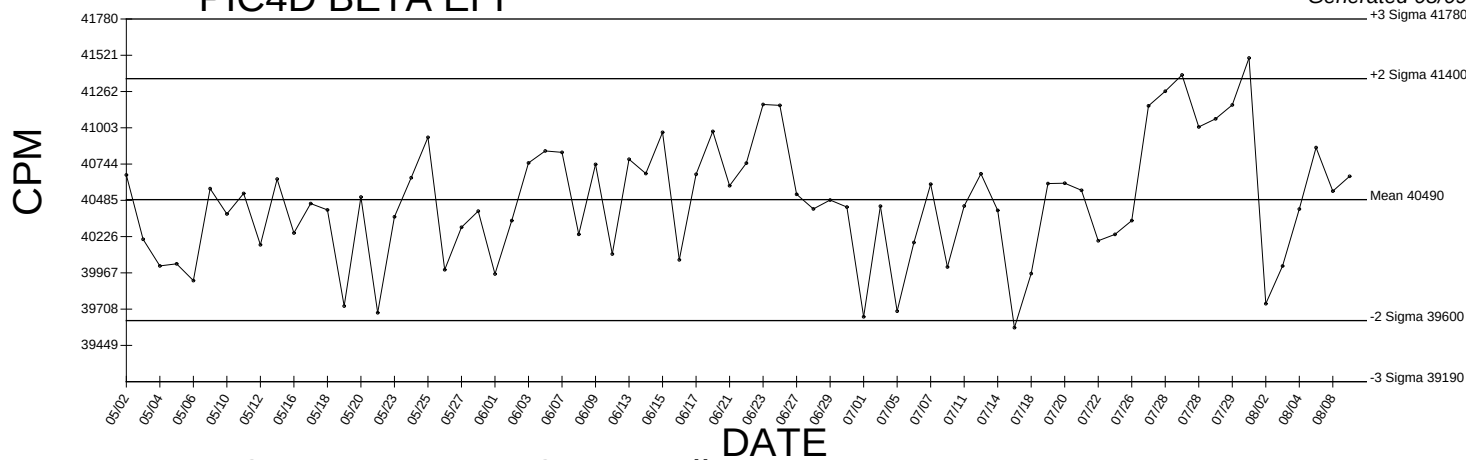
● Denotes Outlier



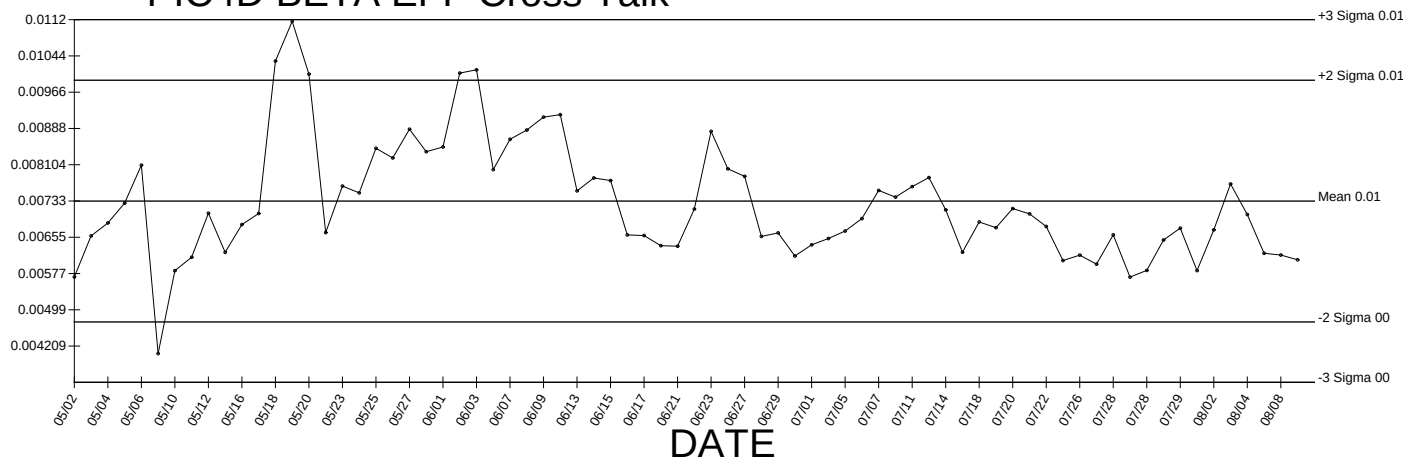
● Denotes Outlier

PIC4D BETA EFF

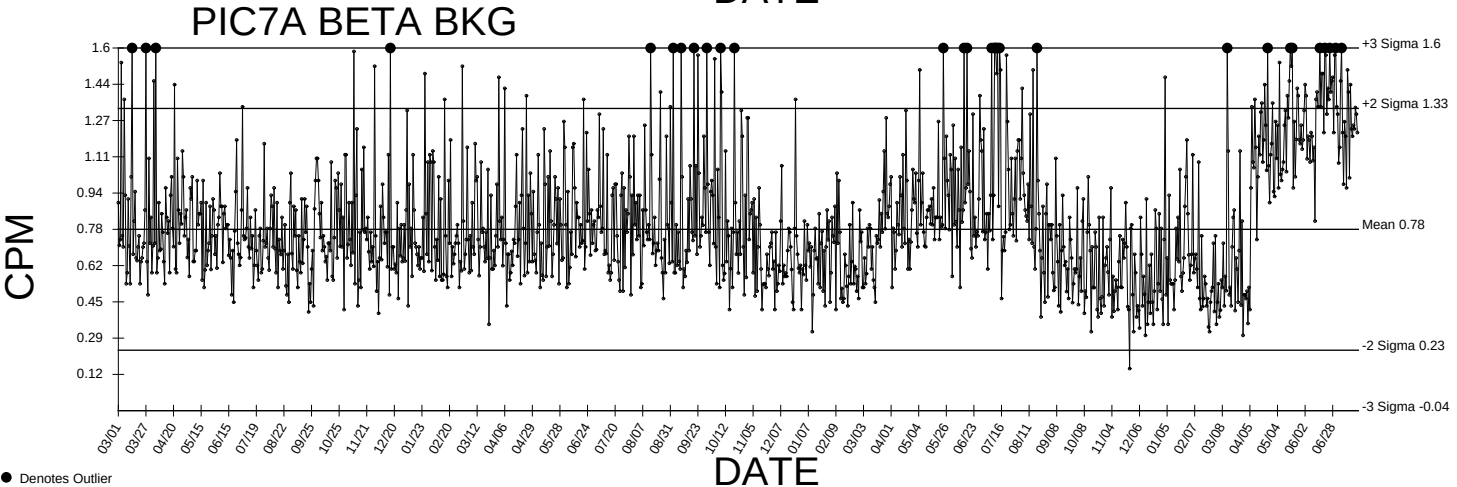
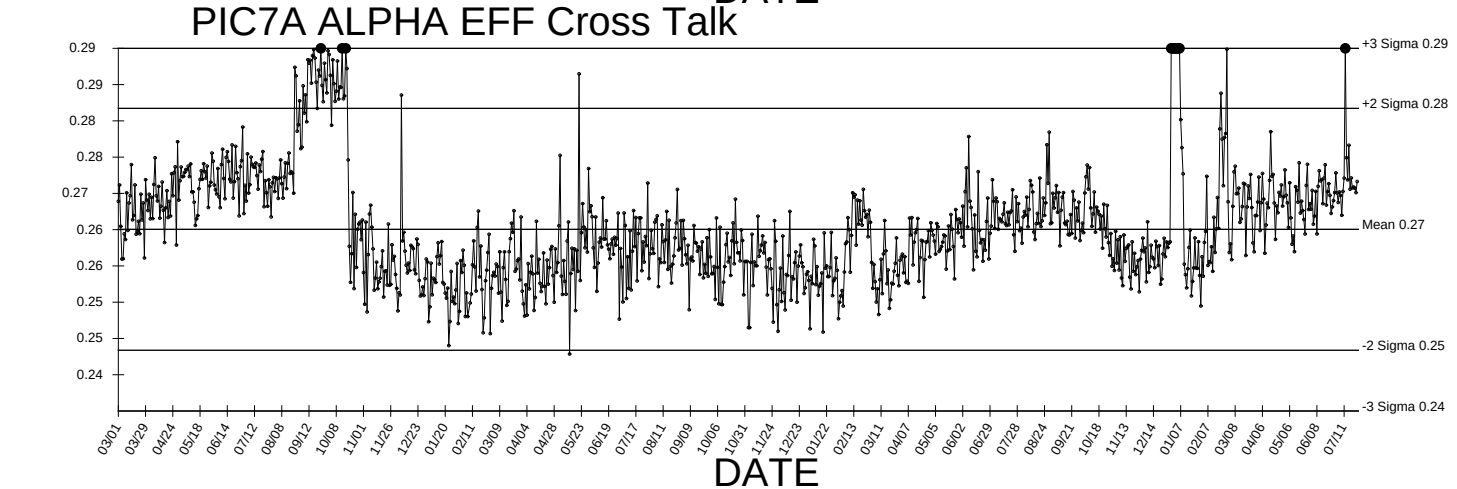
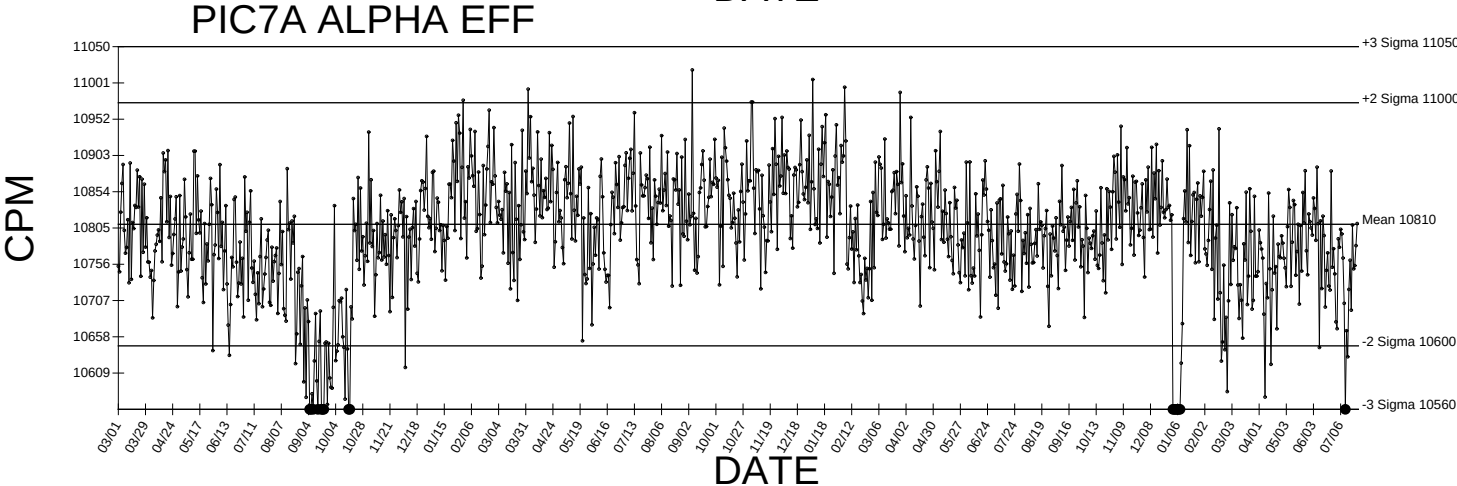
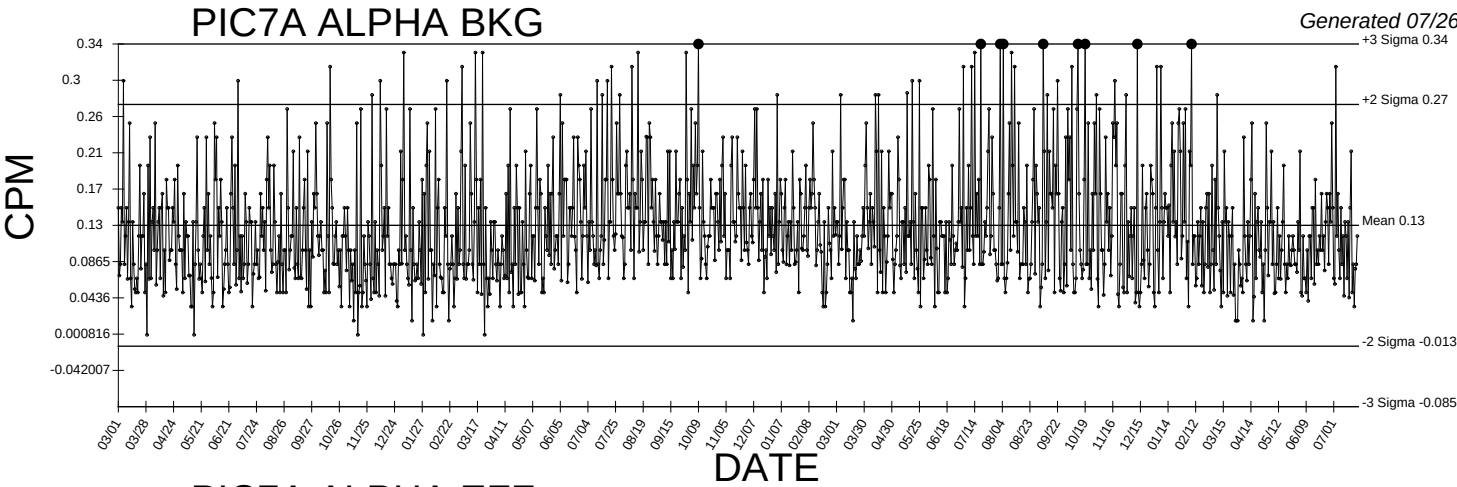
Generated 08/09/2022



PIC4D BETA EFF Cross Talk



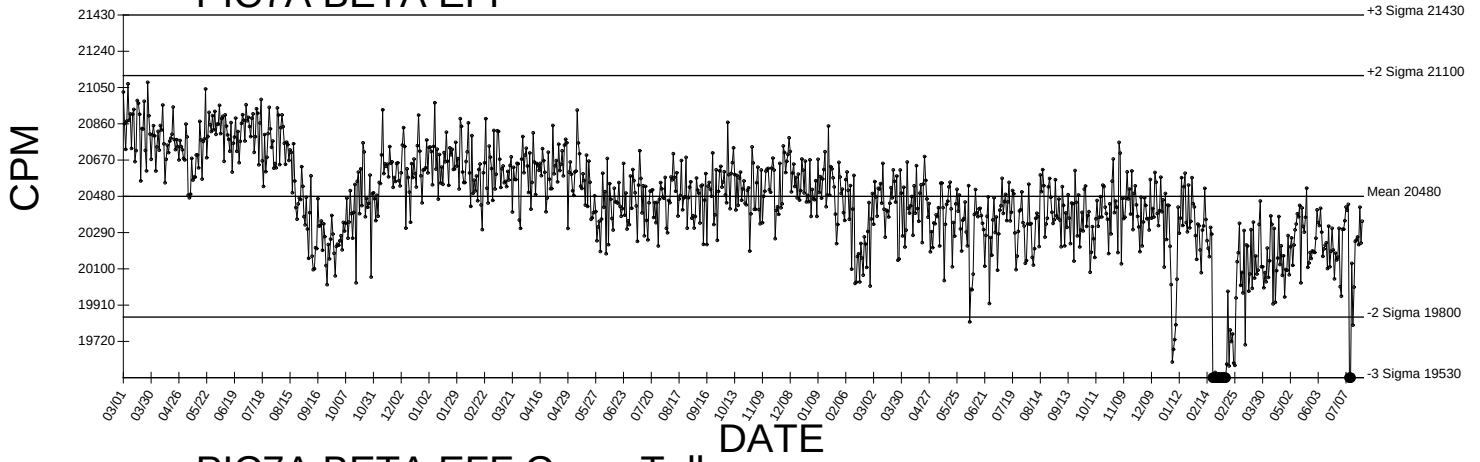
● Denotes Outlier



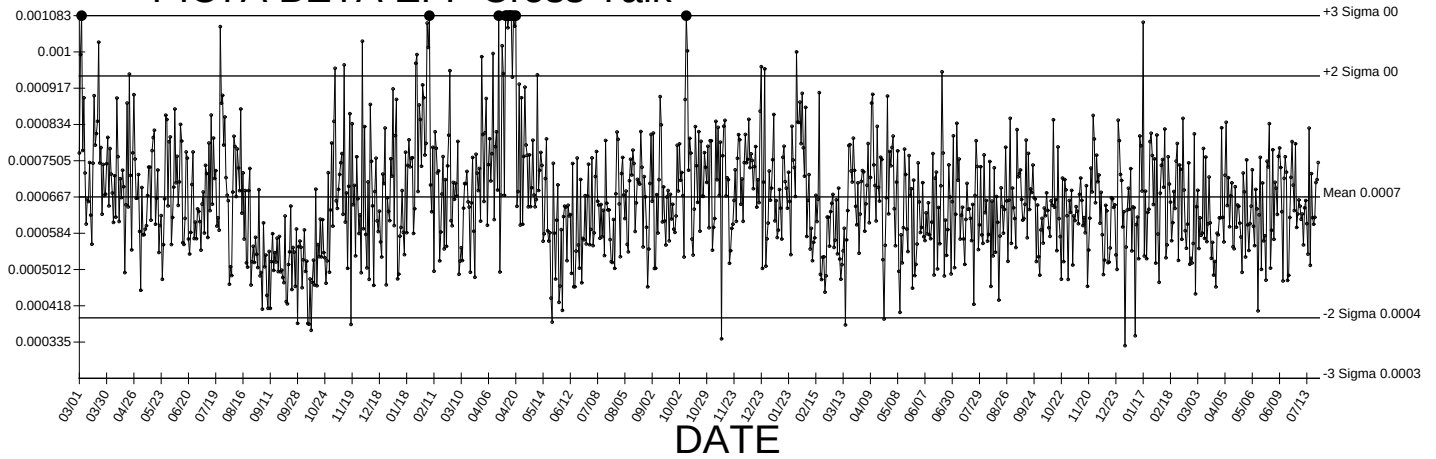
● Denotes Outlier

PIC7A BETA EFF

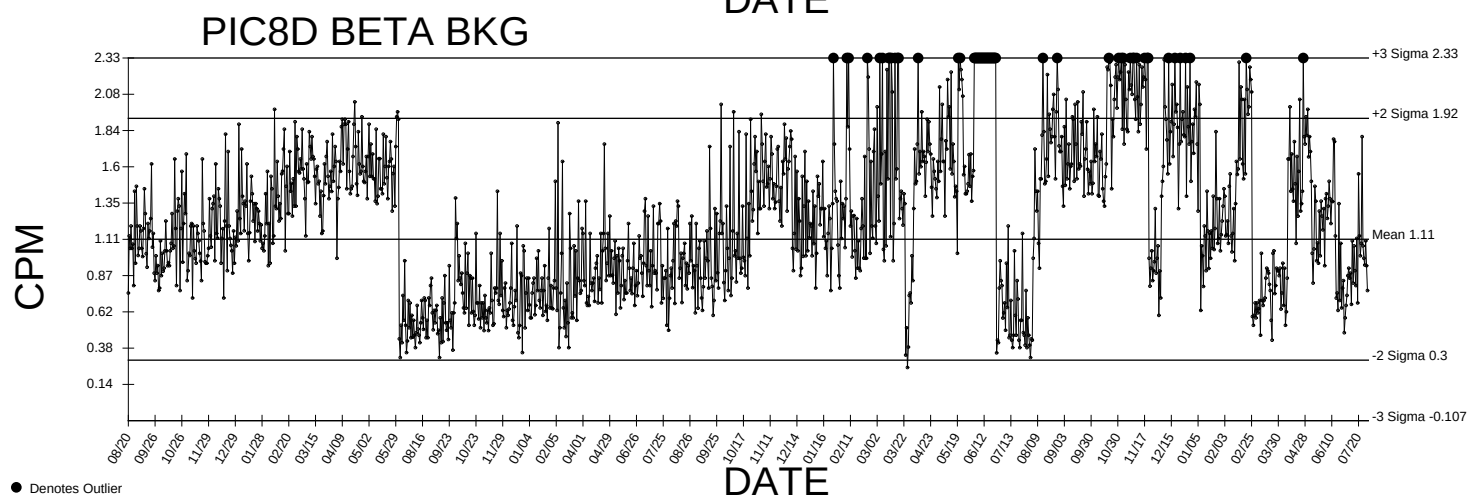
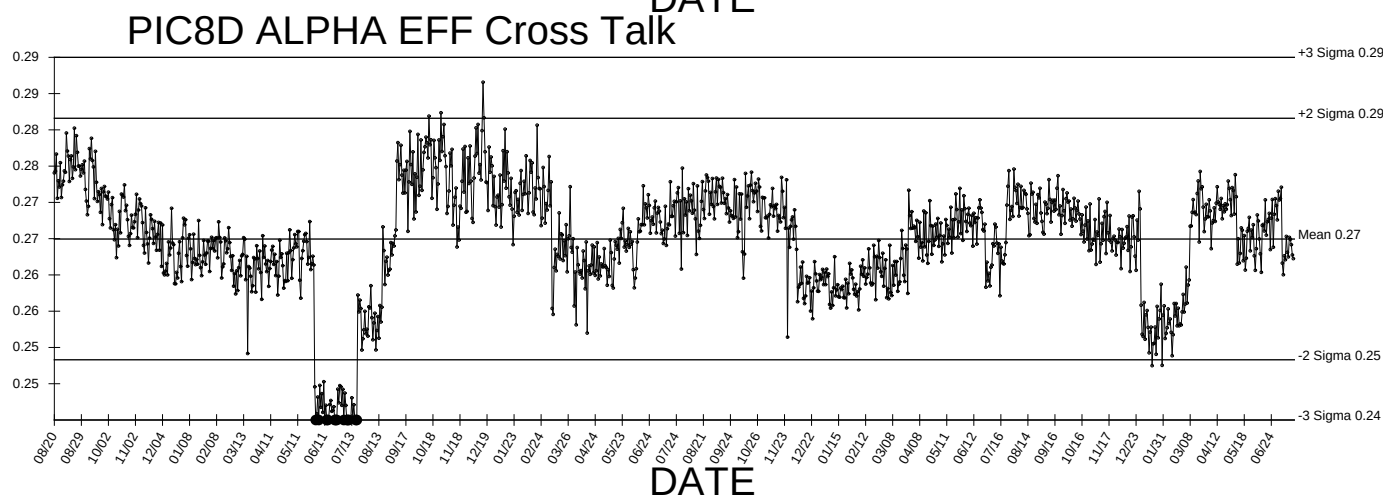
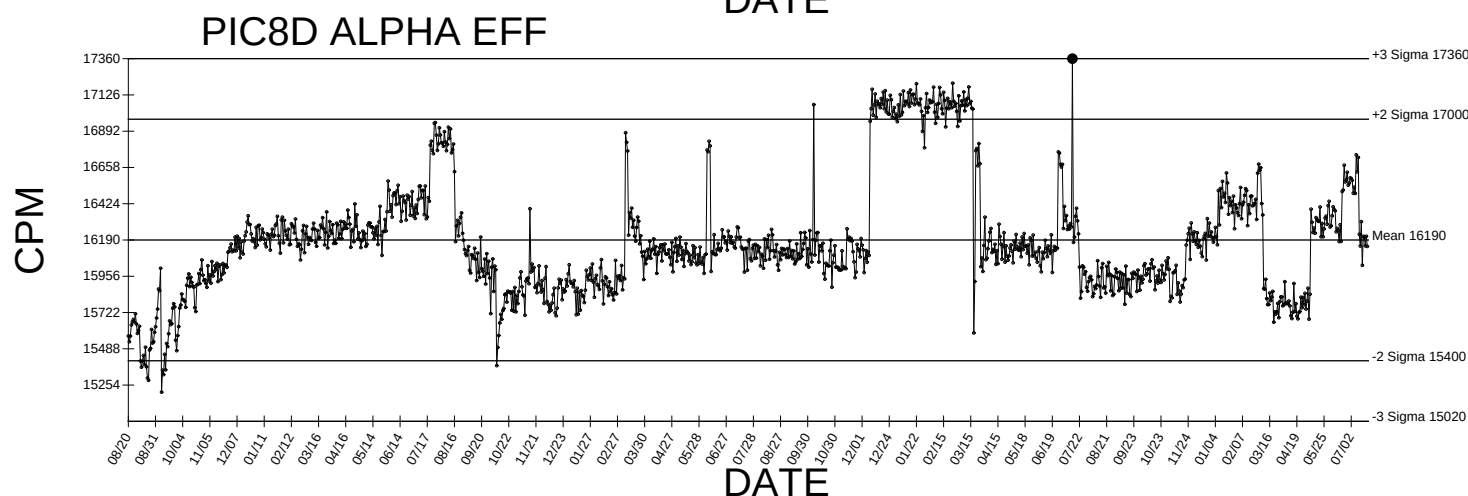
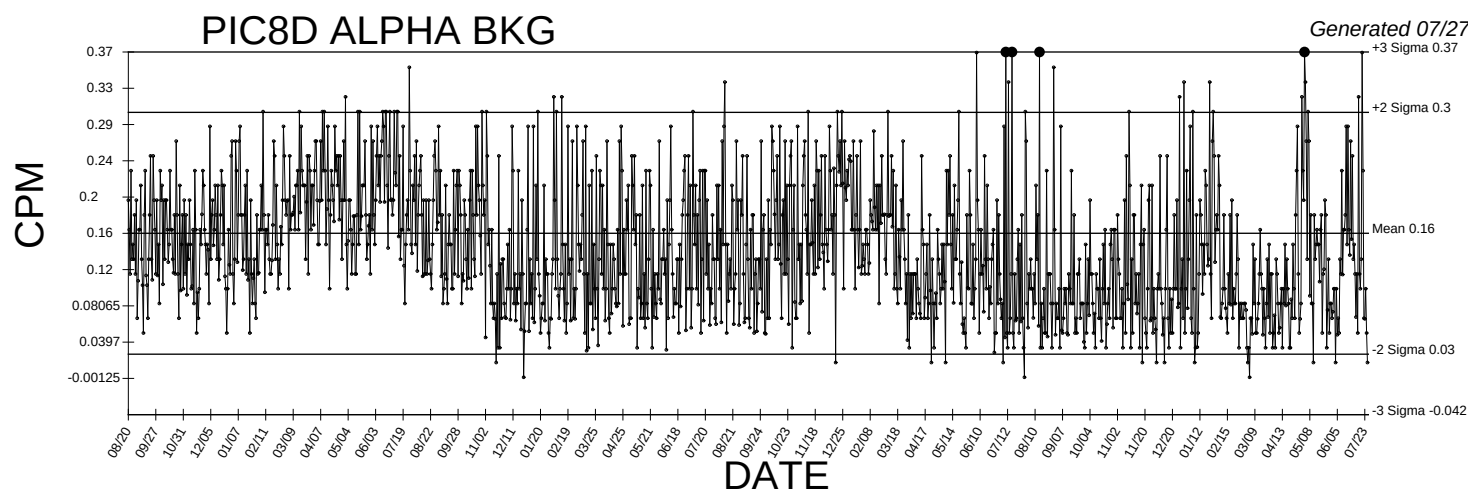
Generated 07/26/2022
+3 Sigma 21430



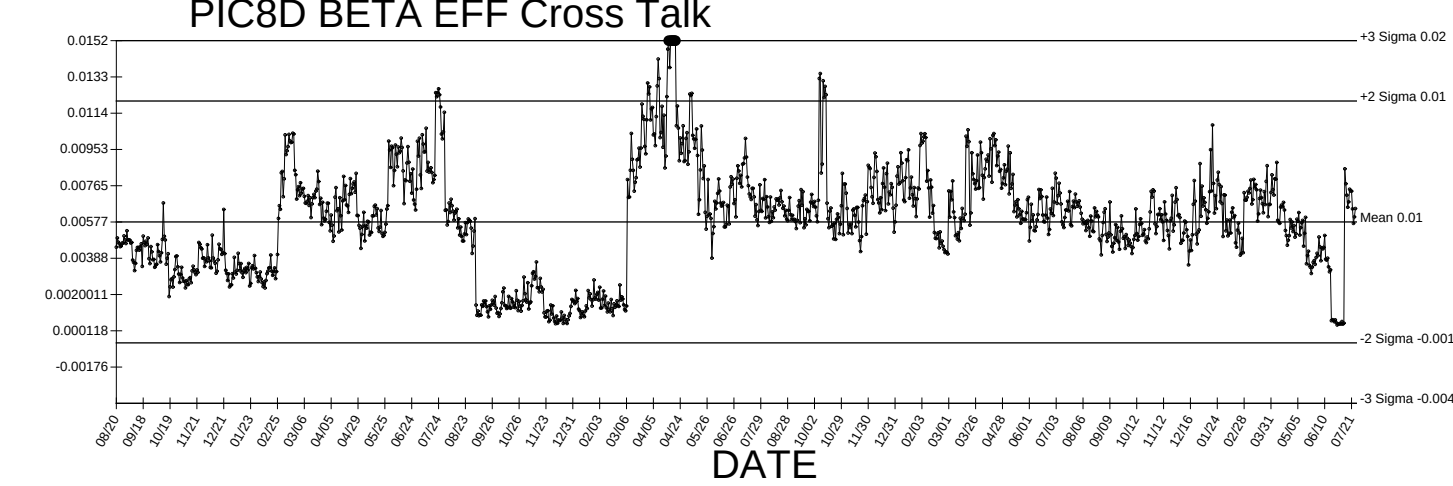
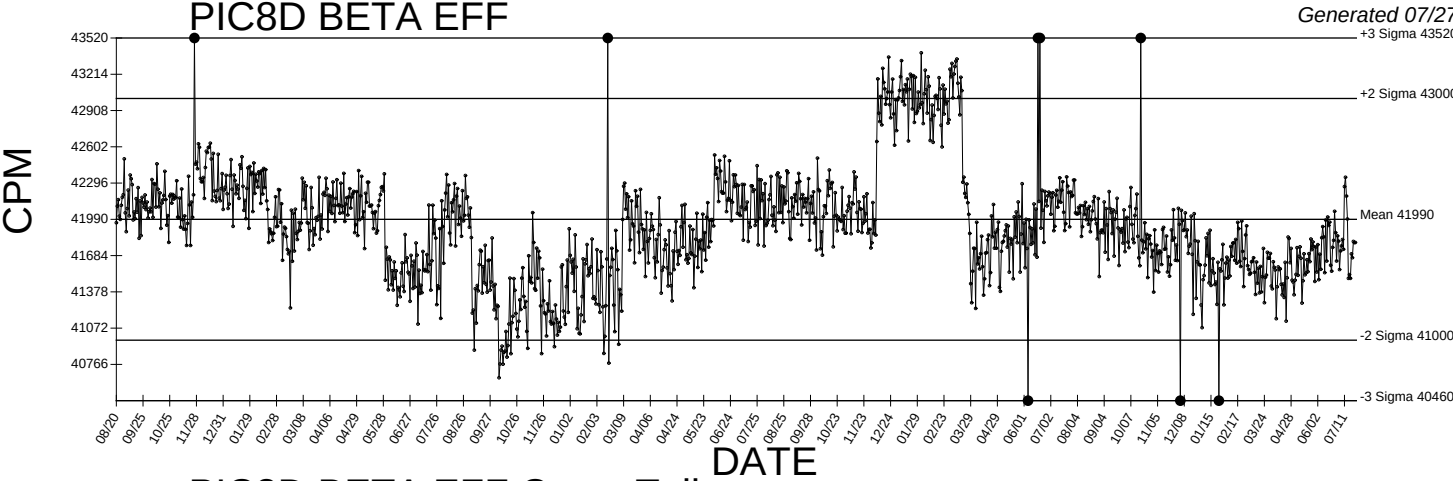
PIC7A BETA EFF Cross Talk



● Denotes Outlier



● Denotes Outlier



● Denotes Outlier

RAD Standards Traceability

Standardization of Strontium Carrier 3452293

v1.2.1

Analyst	JXK3
---------	------

Standard Information	
Isotope	Strontium
Serial Number	3452293
Amount of Std. (mL)	1.0
Standard Prepared	6/20/2022

Parent Information	
Parent Serial #	3268476.2
Parent Exp. Date	4/7/2024

Standardization Rule

A satisfactory standardization is obtained when results give a standard deviation of less than 1.0% of the mean value.

Std #	Weight of carrier added (g)	Weight of crucible or filter (g)	Weight of crucible or filter + ppt. (g)	Weight of ppt. (g)	mg Strontium/mL	mg Strontium/g
1	1.0168	0.0358	0.0445	0.0087	8.70	8.56
2	1.0134	0.0359	0.0445	0.0086	8.60	8.49
3	1.0172	0.0363	0.0449	0.0086	8.60	8.45
4	1.0206	0.0381	0.0468	0.0087	8.70	8.52

Mean Value (mg/mL) = 8.65
 Stdev (mg/mL) = ± 0.06
 1.0% of Mean Value = 0.086500
 Pass
 Expiration Date 6/20/2023
 Mean Value (mg/1.0mL) = 8.65

John Walker



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

1943

SRS Number: 115036

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8090-5FSA-37kBq

Customer: GEL Laboratories LLC

P.O. Number: GEL1924879, Item 4

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 23-January-2020 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Sr-90	1.052E+04	3.705E+04	0.1	1.0	2.1	4 π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4 π LS - 4 π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

GL-CED-297-236a

EZA Certificate Program Rev. 1, 01-FEB-2019

Dec
4-8-20

Page 1 of 2

SRS Number: 115036

Comments:

5.00204 g of 0.1 M HCl solution with approximately 30 µg/g each Sr and Y carriers.

Impurities:

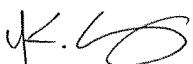
γ-impurities < 0.1%

Note:

This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total activity for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Eardley, Radiochemist

QC Approved by:


A. Chen, Spectroscopist

Date: 16 Jan 20

Standard Logbook

Serial ID: 1943 **Open/Reference Date:** 23 JAN 2020 **Aliquot :** 5.00204 g
Name: Strontium-90 **Received:** 23 JAN 2020 **Density :** Hand Calculated
Type: Source Material **Expires:** 23 JAN 2035 **Logbook Num :** GL-CED-297-236
Employee: Tim Chandler **Lot Number :** 115036
Supplier: Eckert & Zeigler **Solvent :** 0.1M HCl
Uncertainty : 1.05 percent
Description: Strontium-90
Comments: None

Analyte	Concentration	Analyte	Concentration
Strontium-90	37050 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1943
Prepared By:	Tim Chandler
Carrier Conc:	0.1M HCl
Reference Date:	01/23/2020
Ampoule Mass (g):	5.00204 g
Uncertainty:	+/- 1.05 %
LogBook No:	GL-CED-297-236
Supplier:	Eckert & Zeigler

A Solution Material Info			
Isotope:	Strontium-90		
Prepared By:	Jennie Kill-Bowden		
Prep Date:	08/13/2020		
Verification Date:	01/04/2022		
Expiration Date:	01/04/2023		
Primary Code:	1943-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9536 g		
Density(g/mL):	0.9995	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22014.7236 \text{ dpm/mL}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (0.9995 \text{ g/mL}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22025.6704 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/16/2021	Bethany Fiem	24.8842	1000	1943-B	548.091187 dpm/mL	02/16/2021	02/16/2022
01/04/2022	Jennie Kill-Bowden	25.0633	1000	1943-C	552.035985 dpm/ml	01/04/2022	01/04/2023
06/06/2022	Jennie Kill-Bowden	24.9802	1000	1943-D	550.2057 dpm/ml	06/04/2022	06/03/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Sr-90 Standard 1943-C

v1.0.2

Instrument	Red
Analyst	JXK3
Verification Prep Date	1/4/2022

Standard Information	
Isotope	Sr-90
Serial Number	1943-C
Isotope Halflife	28.9000 Y
Reference Date	1/23/2020
Ref. Act. (DPM/mL)	552.035984
Amount of Std. (mL)	1.0
Standard Prep Date	1/4/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	1/5/2022	88.50	1116.40	41.80
2	1/5/2022	87.90	1096.60	41.80
3	1/5/2022	89.00	1093.80	41.80

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	1074.60	2.021254	531.65	531.65
2	1054.80	2.021254	521.85	521.85
3	1052.00	2.021254	520.47	520.47

Mean Value =	dpm/mL 524.66
Stdev =	6.095043305
Certificate Value* =	526.8
Two sigma =	12.190
10 % of Mean =	52.466
Rule A (Pass/Fail)	Pass
% Recovery	99.60%
Rule B (Pass/Fail)	Pass
Expiration Date	1/4/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Sr-90 source 1943-C by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCRed for Sr-90 source standard verification. The Sr-90 efficiency calibration which was used for verification calculations was performed on 1/4/2022 using Sr-90 source 1689-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency (cpm/dpm), and
- D = volume used for standard verification.

RAD-M-001

Handwritten:
1/12/22
1/14/22

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2290790

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205141316	LCS	JXK3	PIC13A	JUL-26-22 17:47:26	DONE	Tuffryn Filter	01-APR-21 00:00
1205141317	LCSD	JXK3	PIC13B	JUL-26-22 17:47:29	DONE	Tuffryn Filter	01-APR-21 00:00
585885003	SAMPLE	JXK3	PIC7A	JUL-26-22 19:10:37	DONE	Tuffryn Filter	01-APR-21 00:00
585905001	SAMPLE	JXK3	PIC7B	JUL-26-22 19:10:43	DONE	Tuffryn Filter	01-APR-21 00:00
585905002	SAMPLE	JXK3	PIC7C	JUL-26-22 19:10:46	DONE	Tuffryn Filter	01-APR-21 00:00
585905003	SAMPLE	JXK3	PIC7D	JUL-26-22 19:10:54	DONE	Tuffryn Filter	01-APR-21 00:00
585905004	SAMPLE	JXK3	PIC8C	JUL-26-22 19:10:58	DONE	Tuffryn Filter	01-APR-21 00:00
1205141315	MB	JXK3	PIC8D	JUL-27-22 10:14:33	DONE	Tuffryn Filter	01-APR-21 00:00
585905005	SAMPLE	JXK3	PIC8C	JUL-27-22 10:14:37	DONE	Tuffryn Filter	01-APR-21 00:00
585885001	SAMPLE	JXK3	PIC4B	AUG-09-22 10:04:31	DONE	Tuffryn Filter	01-APR-21 00:00
585885002	SAMPLE	JXK3	PIC4D	AUG-09-22 10:04:35	DONE	Tuffryn Filter	01-APR-21 00:00

Liquid Scintillation Raw Data

Batch 2294040 Check-list

This check-list was completed on 28-JUL-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 28-JUL-22 and Jessica Davis on 28-JUL-22.

Batch ID: 2294040

Product: LSC41PUF

Description: LSC Plutonium Filter

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have client special requirements have been reviewed and met?	Yes		
4	Have samples been blank corrected?		No	
5	Has a hit notification been completed?		No	
6	Has an Aliquot Correction been completed for this batch?	Yes		
7	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
8	Were all the samples prepared/analyzed within the required holding time period?	Yes		
9	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
10	Was the method blank (MB) within the acceptance criteria?	Yes		
11	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
12	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
13	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
14	Has the method required detection limit been met?		No	
Miscellaneous Information				
15	Were manual integrations performed on any sample or QC data files in this batch?		No	
16	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium-241 in Filter per Liter

Batch ID: 2294040
Analyst: Brendon Viquez (BV1)
Method: DOE EML HASL-300, Pu-11-RC
 Modified
Lab SOP: GL-RAD-A-011 REV# 28
Instrument: ASP-33005595

Due Dates for Lab: 26-JUL-2022

Package: 27-JUL-2022

SDG: 27-JUL-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205147421	Plutonium-241 AS SPIKE	1714-B	.1	mL
LCSD	1205147422	Plutonium-241 AS SPIKE	1714-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	585885001 - 2	25-JUL-2022	5	40	0.10284
2	585885002 - 2	25-JUL-2022	5	40	0.10101
3	585885003 - 2	25-JUL-2022	5	40	0.11435
4	585905001 - 2	25-JUL-2022	5	40	0.10429
5	585905002 - 2	25-JUL-2022	5	40	0.09851
6	585905003 - 2	25-JUL-2022	5	40	0.09126
7	585905004 - 2	25-JUL-2022	5	40	0.0941
8	585905005 - 2	25-JUL-2022	5	40	0.10203
9	1205147420 MB	25-JUL-2022	5		0.11435
10	1205147421 LCS	25-JUL-2022	5		0.11435
11	1205147422 LCSD	25-JUL-2022	5		0.11435

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2020-A	Plutonium-242 AS TRACER	.1 mL	Pipet ID: RAD-ASP-184002Z
			Text Result: Pu

Plutonium-241 Filter

Filename : PU241.XLS
 File type : Excel
 Version # : 1.3.4

Tracer S/N : 2020-A
 Tracer Exp Date : 6/3/2023
 Tracer Volume Added: 0.10
 Tracer Error: 0.37%

Batch : 2294040
 Analyst : BRE02408
 Prep Date : 7/25/2022
 Method Uncertainty : 0.0935

Procedure Code : LSC41PUF
 Parmname : Plutonium-241
 Required MDA : 5 pCi/F
 Halflife of Pu-241 : 14.290 years
 Pu-241 Abundance : 1.00
 Tracer Abundance : 1.00
 Halflife of Tracer : 373500.000 years

Geometry:

Sample Characteristics					Tracer Calculations									
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Tracer Concentration DPM	Tracer Counts	Tracer Bkg Counts	Tracer Net CPM	Tracer Count Start Date/Time	Tracer Count Time (sec.)	Tracer Decay	Detector Serial #	Detector Efficiency (cpm/dpm)	Detector Efficiency StDev. (cpm/dpm)
1	585885001.2	0.1028	1.1543E-05	6/27/2022 9:24	4.2759	641	7.575	1.254	7/25/2022 18:29	30300	1.000	80020	0.334445	0.006454
2	585885002.2	0.1010	1.1432E-05	6/27/2022 9:38	4.2759	585	4.040	1.150	7/25/2022 18:29	30300	1.000	155835	0.329361	0.006358
3	585885003.2	0.1144	1.2216E-05	6/27/2022 10:00	4.2759	600	11.615	1.165	7/25/2022 18:29	30300	1.000	149001	0.319401	0.006170
4	585905001.2	0.1043	1.1630E-05	6/27/2022 9:43	4.2759	609	12.120	1.182	7/25/2022 18:29	30300	1.000	80010	0.312081	0.006033
5	585905002.2	0.0985	1.1278E-05	6/27/2022 9:52	4.2759	601	0.505	1.189	7/25/2022 18:29	30300	1.000	158161	0.333652	0.006439
6	585905003.2	0.0913	1.0821E-05	6/27/2022 10:01	4.2759	658	2.020	1.299	7/25/2022 18:29	30300	1.000	78785	0.375543	0.007229
7	585905004.2	0.0941	1.1002E-05	6/27/2022 10:08	4.2759	572	3.030	1.127	7/25/2022 18:29	30300	1.000	78265	0.372920	0.007180
8	585905005.2	0.1020	1.1494E-05	6/27/2022 12:00	4.2759	584	6.060	1.144	7/25/2022 18:29	30300	1.000	83294	0.355206	0.006846
9	1205147420.1	0.1144	1.2216E-05	7/25/2022 0:00	4.2759	542	9.090	1.055	7/25/2022 18:29	30300	1.000	78779	0.299106	0.005788
10	1205147421.1	0.1144	1.2216E-05	7/25/2022 0:00	4.2759	511	3.030	1.006	7/25/2022 18:29	30300	1.000	79778	0.359583	0.006929
11	1205147422.1	0.1144	1.2216E-05	7/25/2022 0:00	4.2759	600	5.555	1.177	7/25/2022 18:29	30300	1.000	79463	0.348191	0.006714

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-011
 Instrument SOP:

Count raw Data													Calibration Data						
Pos.	Rack Position #	Counting Time (min.)	Quench#	Gross cpm	Bkg cpm	Bkg Count Time (min.)	Bkg Quench#	Corrected Bkg cpm	Count Start Date/Time	Sample Decay	Calculated Sample Recovery %	Sample Recovery Error %	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Background Rack Position #	Background Count Start Date/Time
1	13-2	120	324.6	17.91	17.00	120	355.25	16.8611	7/26/2022 14:52	0.996	87.7%	4.47%	LSCNAVY	1/24/2022	1/31/2023	0.2847	0.00792	15-1	7/27/2022 22:21
2	13-3	120	330.53	17.08	17.00	120	355.25	16.9023	7/26/2022 16:54	0.996	81.7%	4.61%	LSCNAVY	1/24/2022	1/31/2023	0.2894	0.00792	15-1	7/27/2022 22:21
3	13-4	120	334.36	16.97	17.00	120	355.25	16.9250	7/26/2022 18:55	0.996	85.3%	4.63%	LSCNAVY	1/24/2022	1/31/2023	0.2924	0.00792	15-1	7/27/2022 22:21
4	13-5	120	336.59	18.04	17.00	120	355.25	16.9369	7/26/2022 20:57	0.996	88.6%	4.60%	LSCNAVY	1/24/2022	1/31/2023	0.2942	0.00792	15-1	7/27/2022 22:21
5	13-6	120	321.15	17.96	17.00	120	355.25	16.8336	7/26/2022 22:58	0.996	83.3%	4.54%	LSCNAVY	1/24/2022	1/31/2023	0.2819	0.00792	15-1	7/27/2022 22:21
6	17-1	120	326.46	17.04	17.00	120	355.25	16.8748	7/27/2022 2:09	0.996	80.9%	4.38%	LSCNAVY	1/24/2022	1/31/2023	0.2862	0.00792	15-1	7/27/2022 22:21
7	17-2	120	323.15	17.59	17.00	120	355.25	16.8499	7/27/2022 4:10	0.996	70.7%	4.65%	LSCNAVY	1/24/2022	1/31/2023	0.2835	0.00792	15-1	7/27/2022 22:21
8	14-1	120	329.46	17.19	17.00	120	355.25	16.8954	7/27/2022 7:06	0.996	75.4%	4.63%	LSCNAVY	1/24/2022	1/31/2023	0.2886	0.00792	15-1	7/27/2022 22:21
9	14-2	120	331.75	16.47	17.00	120	355.25	16.9099	7/27/2022 9:08	1.000	82.5%	4.81%	LSCNAVY	1/24/2022	1/31/2023	0.2904	0.00792	15-1	7/27/2022 22:21
10	15-1	15	332.92	50.75	17.00	120	355.25	16.9168	7/27/2022 11:09	1.000	65.4%	4.87%	LSCNAVY	1/24/2022	1/31/2023	0.2913	0.00792	15-1	7/27/2022 22:21
11	15-2	15	310.65	54.05	17.00	120	355.25	16.7332	7/27/2022 11:25	1.000	79.1%	4.58%	LSCNAVY	1/24/2022	1/31/2023	0.2735	0.00792	15-1	7/27/2022 22:21

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1714-B
LCS Exp Date : 1/19/2023
LCS Activity (dpm/ml): 1609.37
LCS Volume Added: 0.10

Results																
	Decision Level	Critical Level	Required MDA	MDA	Sample Act. Conc.	Sample Act. Error	Net Count Rate	Net Count Rate Error	2 SIGMA Counting Uncertainty	2 SIGMA Total Prop. Uncertainty	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery
Pos.	pCi/F	pCi/F	pCi/F	pCi/F	pCi/F	%	CPM	CPM	pCi/F	pCi/F						
1	21.7495	15.3553	5	31.1509	18.4696	51.52%	1.0489	0.5383	18.5781	18.9552		SAMPLE				
2	23.4169	16.5325	5	33.5384	3.3649	299.50%	0.1777	0.5322	19.7500	19.7621		SAMPLE				
3	19.6161	13.8491	5	28.0945	0.7133	1180.99%	0.0450	0.5315	16.5120	16.5127		SAMPLE				
4	20.6004	14.5441	5	29.5042	18.3574	49.16%	1.1031	0.5399	17.6090	18.0061		SAMPLE				
5	24.1088	17.0210	5	34.5304	22.0033	48.03%	1.1264	0.5385	20.6168	21.1011		SAMPLE				
6	26.4484	18.6728	5	37.8806	3.5352	321.90%	0.1652	0.5316	22.3028	22.3143		SAMPLE				
7	29.6177	20.9103	5	42.4203	17.7531	72.54%	0.7401	0.5357	25.1865	25.4487		SAMPLE				
8	25.2050	17.7950	5	36.0996	6.0053	180.98%	0.2946	0.5330	21.2947	21.3303		SAMPLE				
9	20.3433	14.3626	5	29.1363	-7.2340	120.01%	-0.4399	0.5274	17.0012	17.0012		MB				
10	54.2665	38.3126	5	80.7606	699.5664	7.43%	33.8332	1.8773	76.0815	163.7380		LCS			633.9656	110.3%
11	47.5739	33.5876	5	70.8204	680.1399	6.96%	37.3168	1.9346	69.1109	155.3926		LCSD	2.8%		633.9656	107.3%

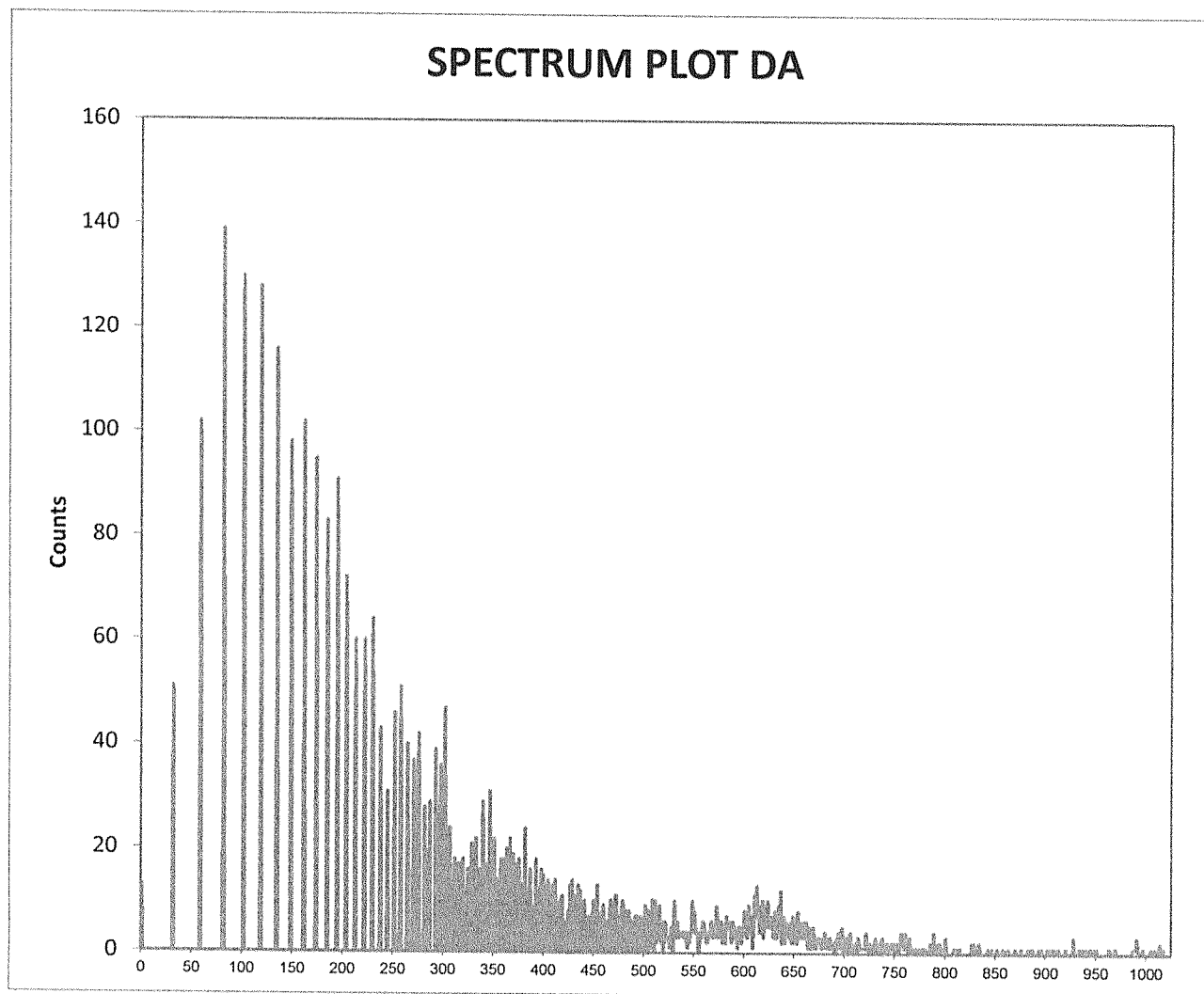
SampleID	Rack	Time (min.)	SQPE#	CPM Iso1	CPM Iso2	LumEx	Count Start Time	Count End Time	Machine
1	13-1	120	359.23	19.48			7/26/2022 12:50	7/26/2022 14:50	NAVY
2	13-2	120	324.6	17.91			7/26/2022 14:52	7/26/2022 16:52	NAVY
3	13-3	120	330.53	17.08			7/26/2022 16:54	7/26/2022 18:54	NAVY
4	13-4	120	334.36	16.97			7/26/2022 18:55	7/26/2022 20:55	NAVY
5	13-5	120	336.59	18.04			7/26/2022 20:57	7/26/2022 22:57	NAVY
6	13-6	120	321.15	17.96			7/26/2022 22:58	7/27/2022 0:58	NAVY
1	17-1	120	326.46	17.04			7/27/2022 2:09	7/27/2022 4:09	NAVY
2	17-2	120	323.15	17.59			7/27/2022 4:10	7/27/2022 6:10	NAVY
1	14-1	120	329.46	17.19			7/27/2022 7:06	7/27/2022 9:06	NAVY
2	14-2	120	331.75	16.47			7/27/2022 9:08	7/27/2022 11:08	NAVY
1	15-1	15	332.92	50.75			7/27/2022 11:09	7/27/2022 11:24	NAVY
2	15-2	15	310.65	54.05			7/27/2022 11:25	7/27/2022 11:40	NAVY

OP 7/28/2022

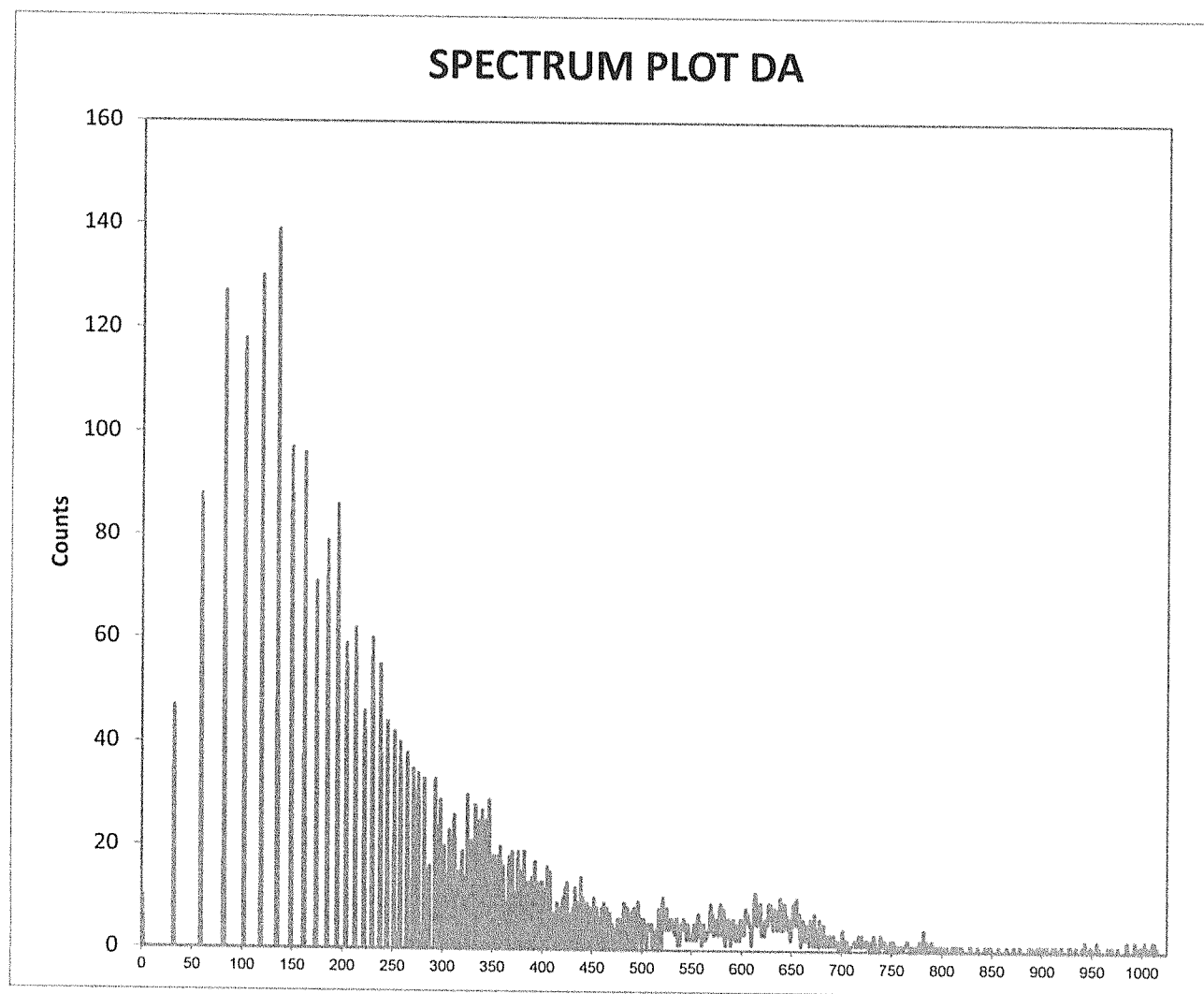
Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
26 Jul 2022 14:52:31
M:\LSC\FILES\navy\2294040A\SPu241_S0002_R01_20220726.
M:\LSC\FILES\navy\2294040A\U2294040A.xls
DA
NAVY
2, 13, 120:

Quench: 324.6
Start, End, X-Axis



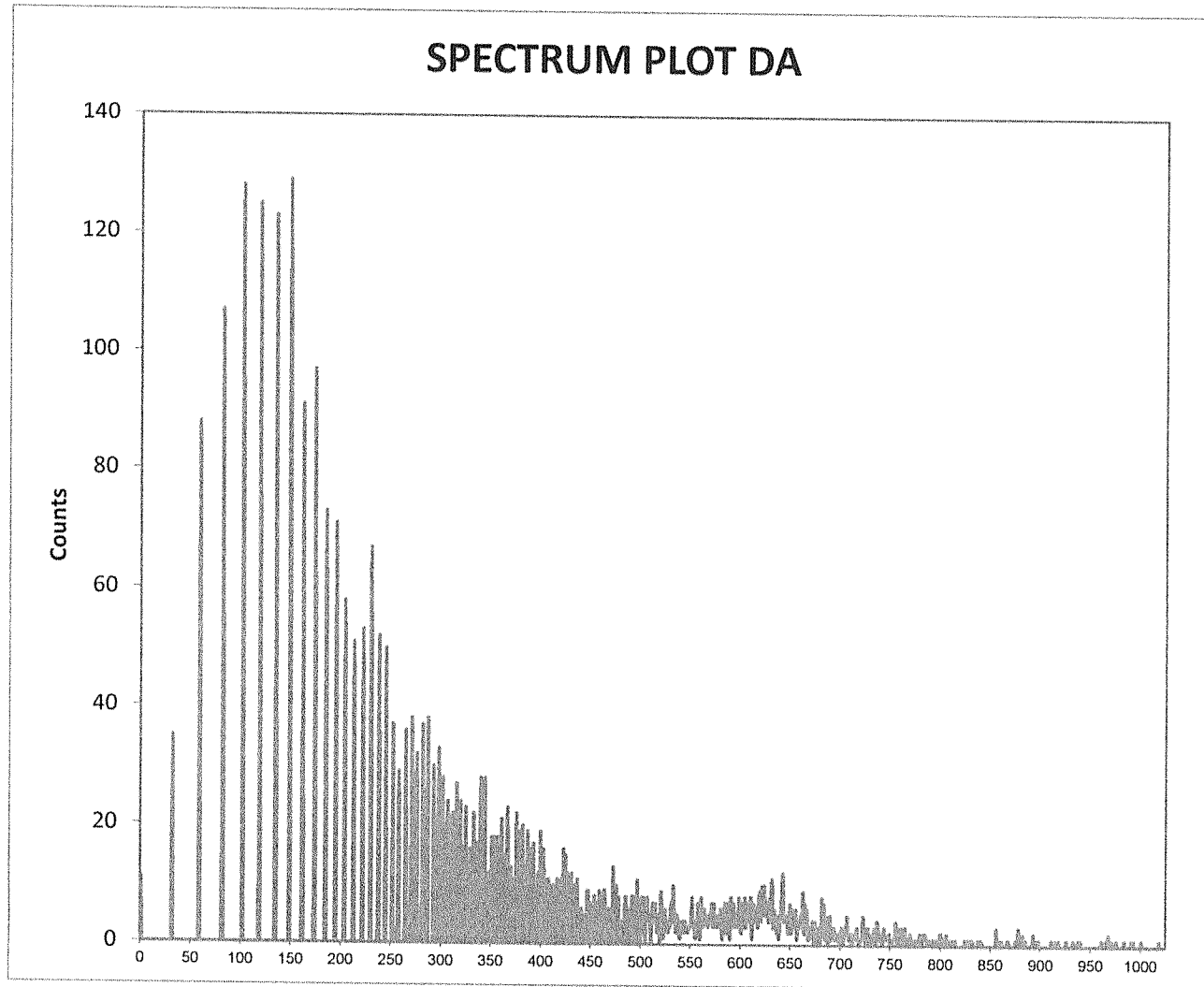
Instrument Type: PE
Sample Count Start Time: 26 Jul 2022 16:54:09
FileName: M:\LSC\FILES\navy\2294040A\SPu241_S0003_R01_20220726
File Info: M:\LSC\FILES\navy\2294040A\U2294040A.xls
ID: DA
Comments: NAVY
3, 13, 120:
Quench: 330.53
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
26 Jul 2022 18:55:46
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DA
NAVY
4, 13, 120:

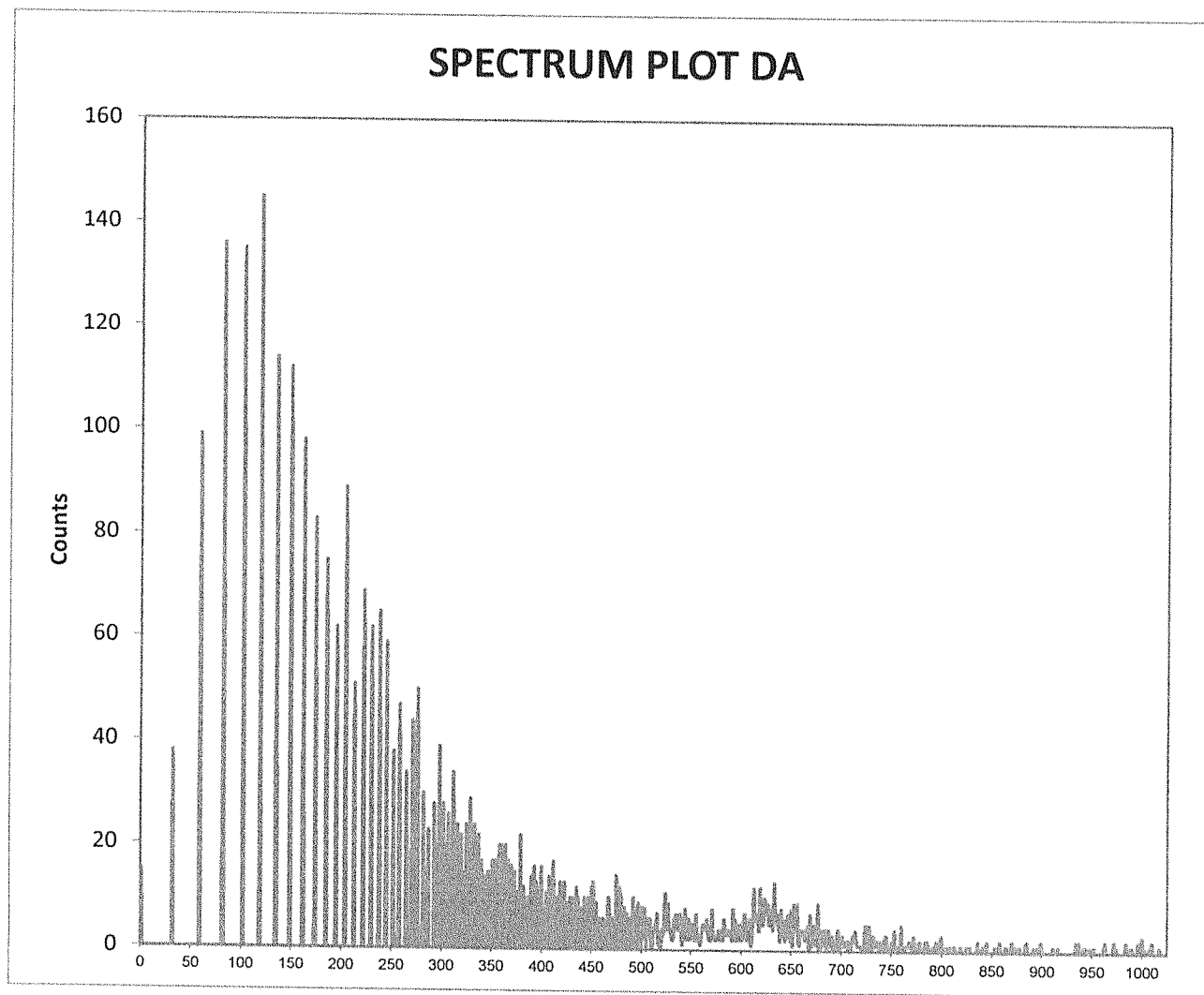
Quench:
Start, End, X-Axis
334.36



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
26 Jul 2022 20:57:22
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DA
NAVY
5, 13, 120:

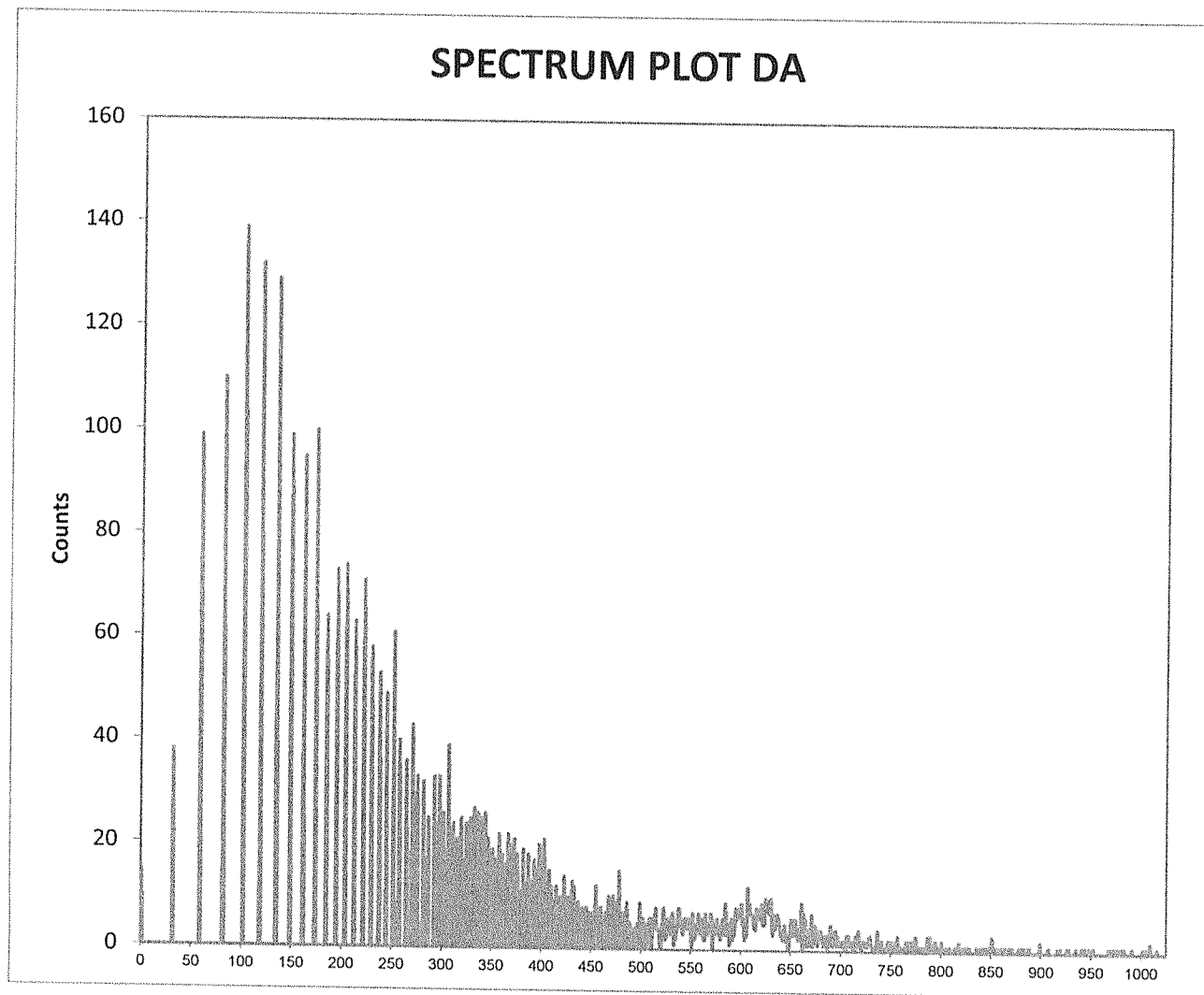
Quench: 336.59
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
26 Jul 2022 22:58:57
M:\LSC\FILES\navy\2294040A\SPu241_S0006_R01_20220727.
M:\LSC\FILES\navy\2294040A\U2294040A.xls
DA
NAVY
6, 13, 120:

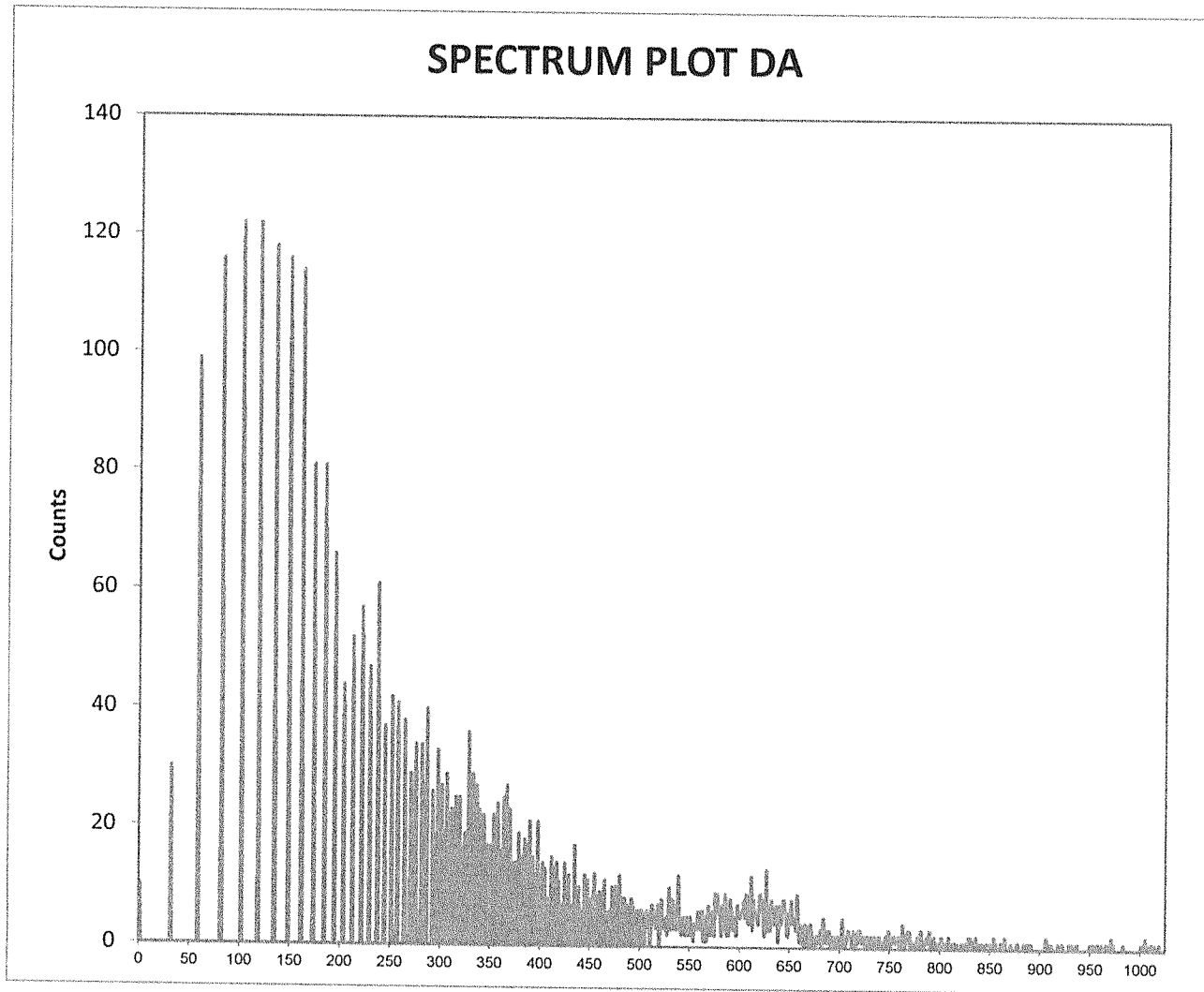
Quench:
Start, End, X-Axis 321.15



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
27 Jul 2022 02:09:06
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DA
NAVY
1, 17, 120:

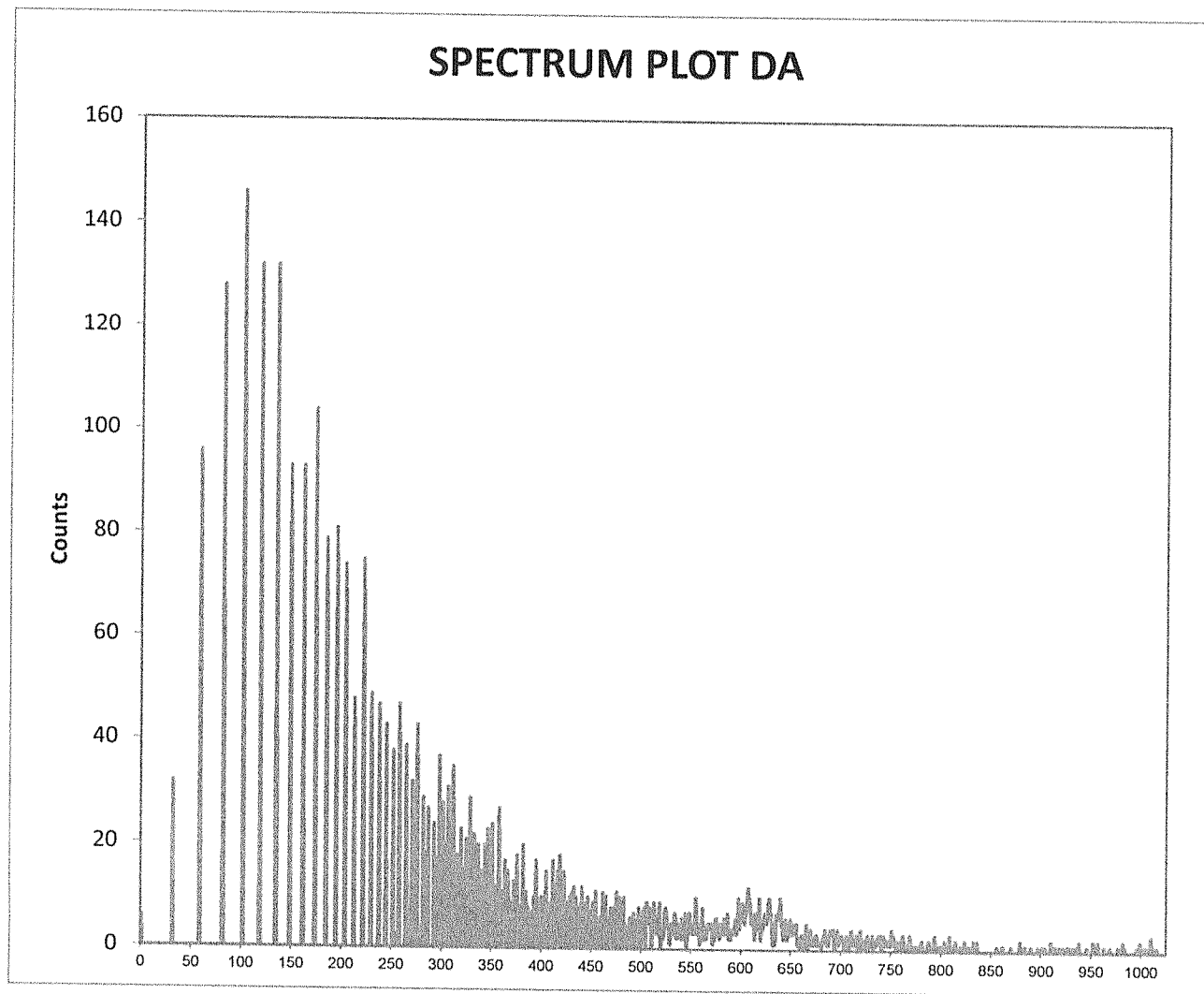
Quench: 326.46
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
27 Jul 2022 04:10:40
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DA
NAVY
2, 17, 120:

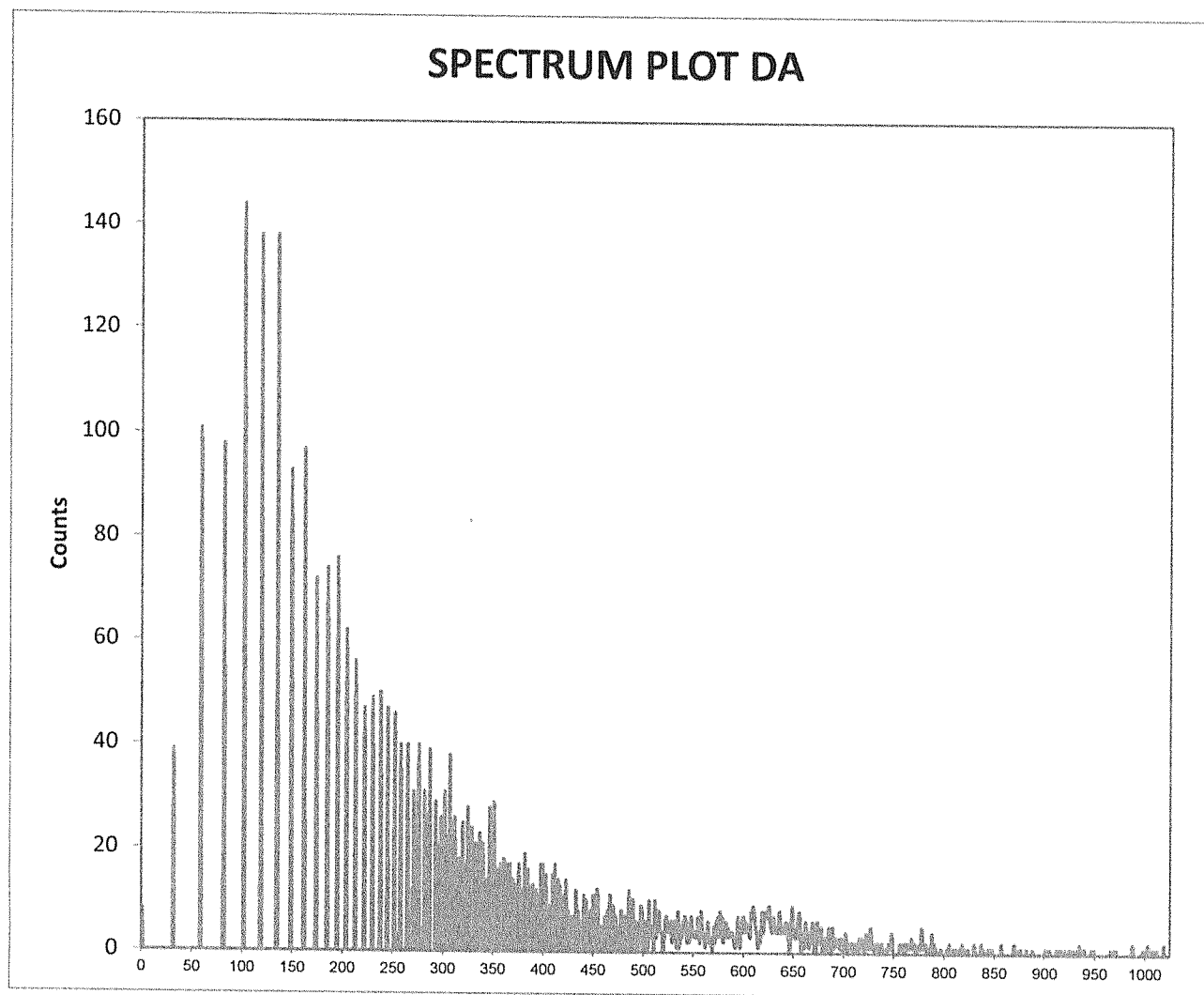
Quench:
Start, End, X-Axis 323.15



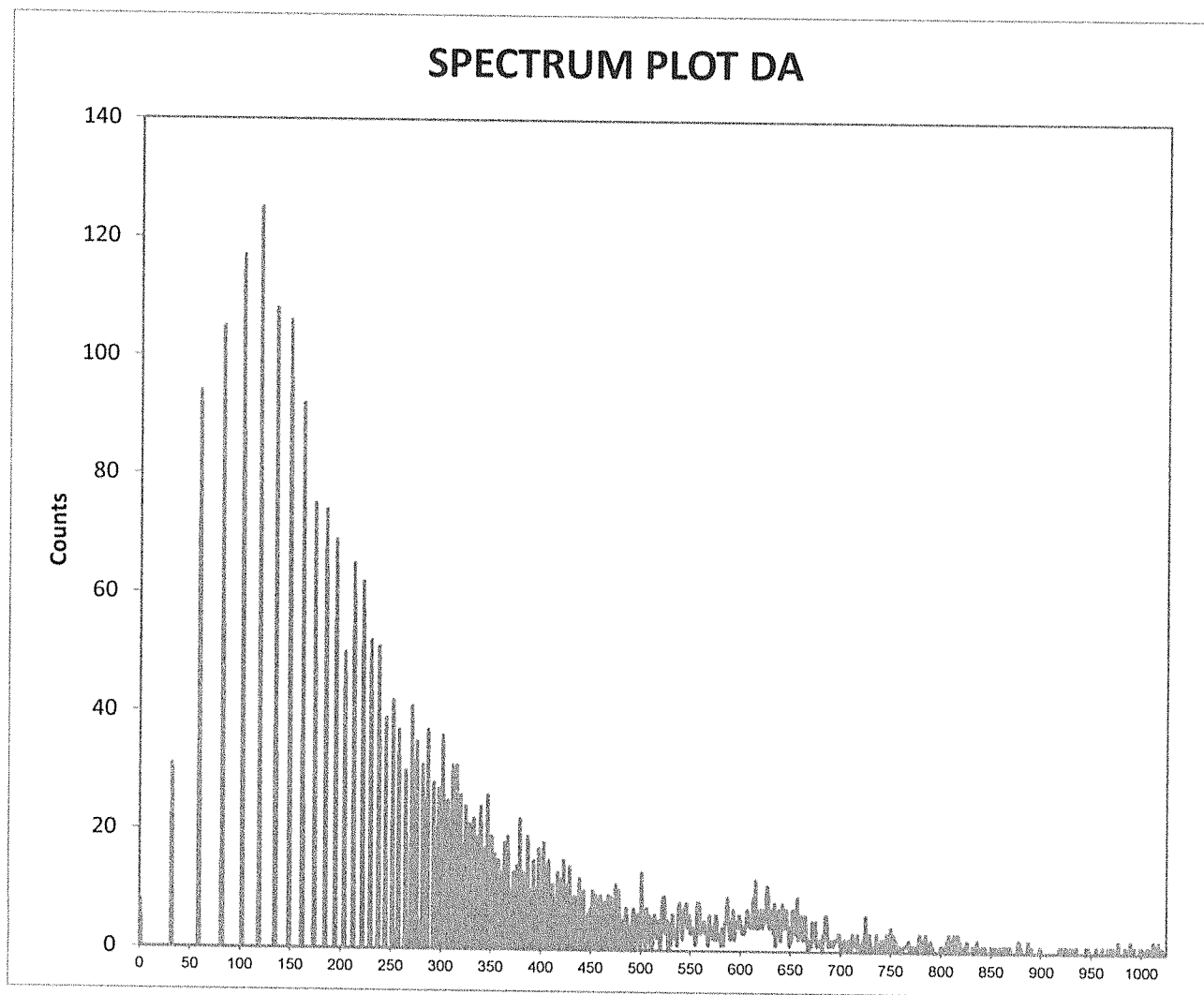
Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
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M:\LSC\FILES\navy\2294040D\U2294040D.xls
DA
NAVY
1, 14, 120:

Quench: 329.46
Start, End, X-Axis



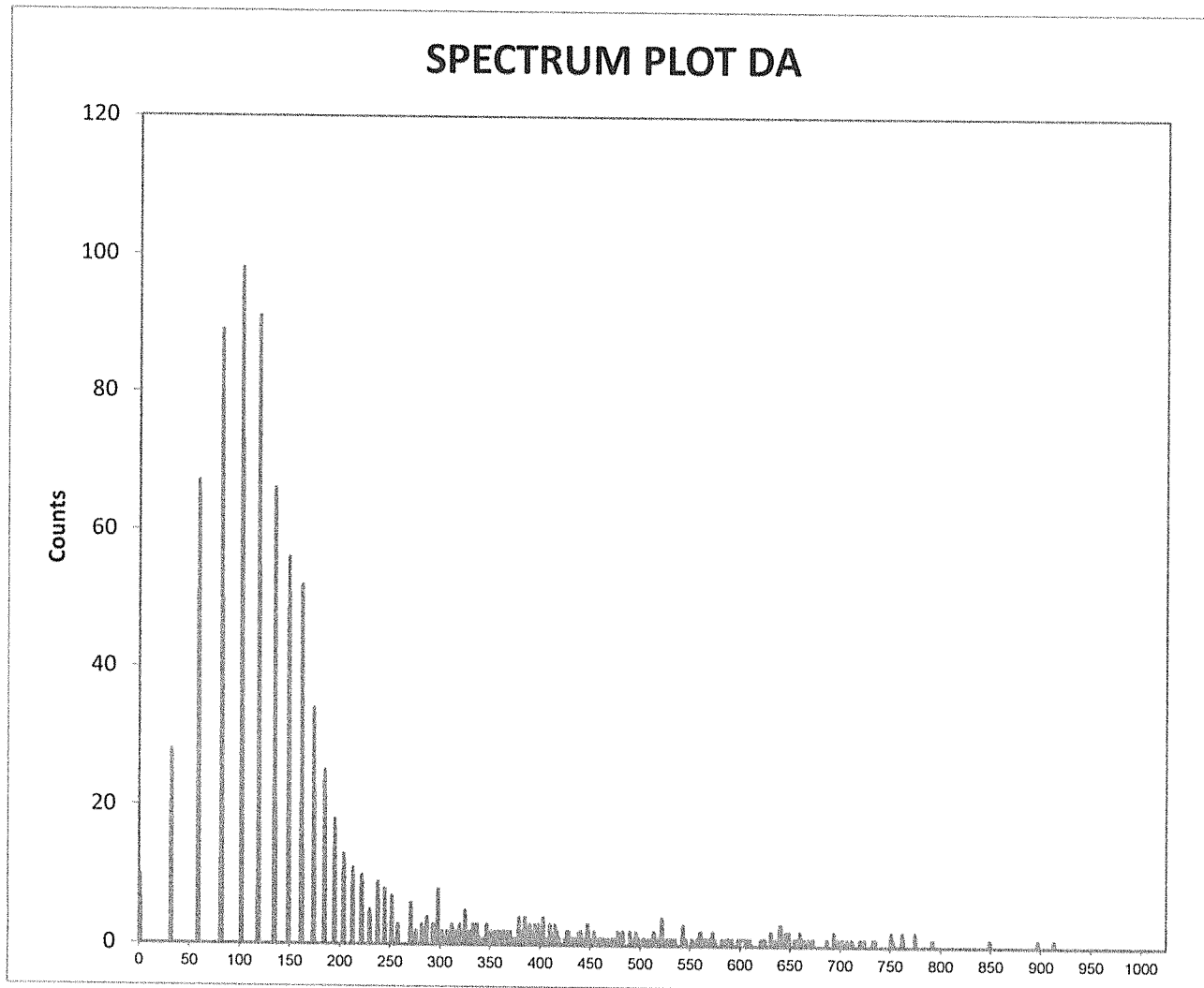
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File Info: M:\LSC\FILES\navy\2294040D\U2294040D.xls
ID: DA
Comments: NAVY
Quench: 2, 14, 120:
Start, End, X-Axis 331.75



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
27 Jul 2022 11:09:31
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DA
NAVY
1, 15, 15:

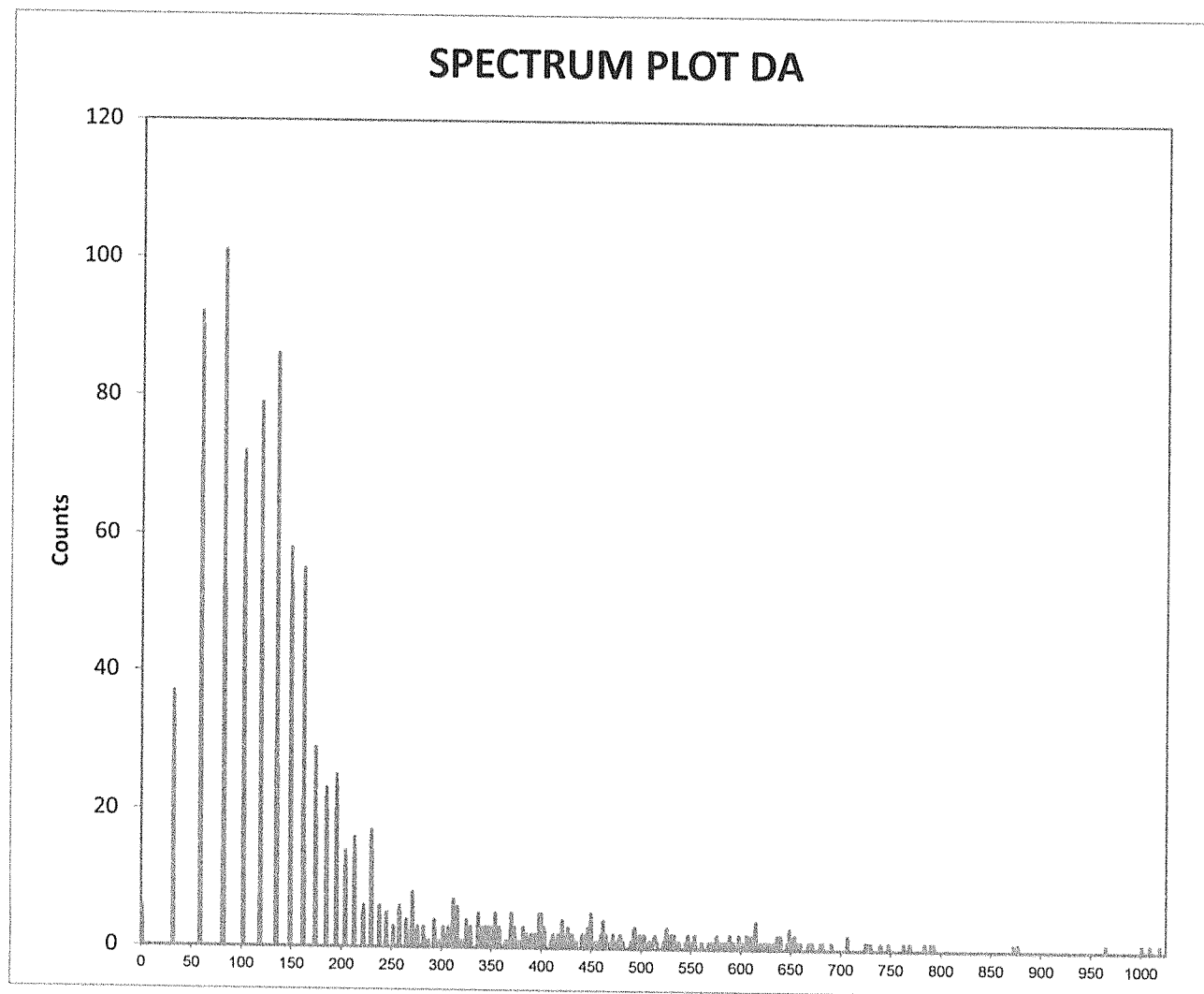
Quench: 332.92
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
27 Jul 2022 11:25:10
M:\LSC\FILES\navy\2294040C\SPu241_2_S0002_R01_202207
M:\LSC\FILES\navy\2294040C\U2294040C.xls
DA
NAVY
2, 15, 15:

Quench:
Start, End, X-Axis 310.65

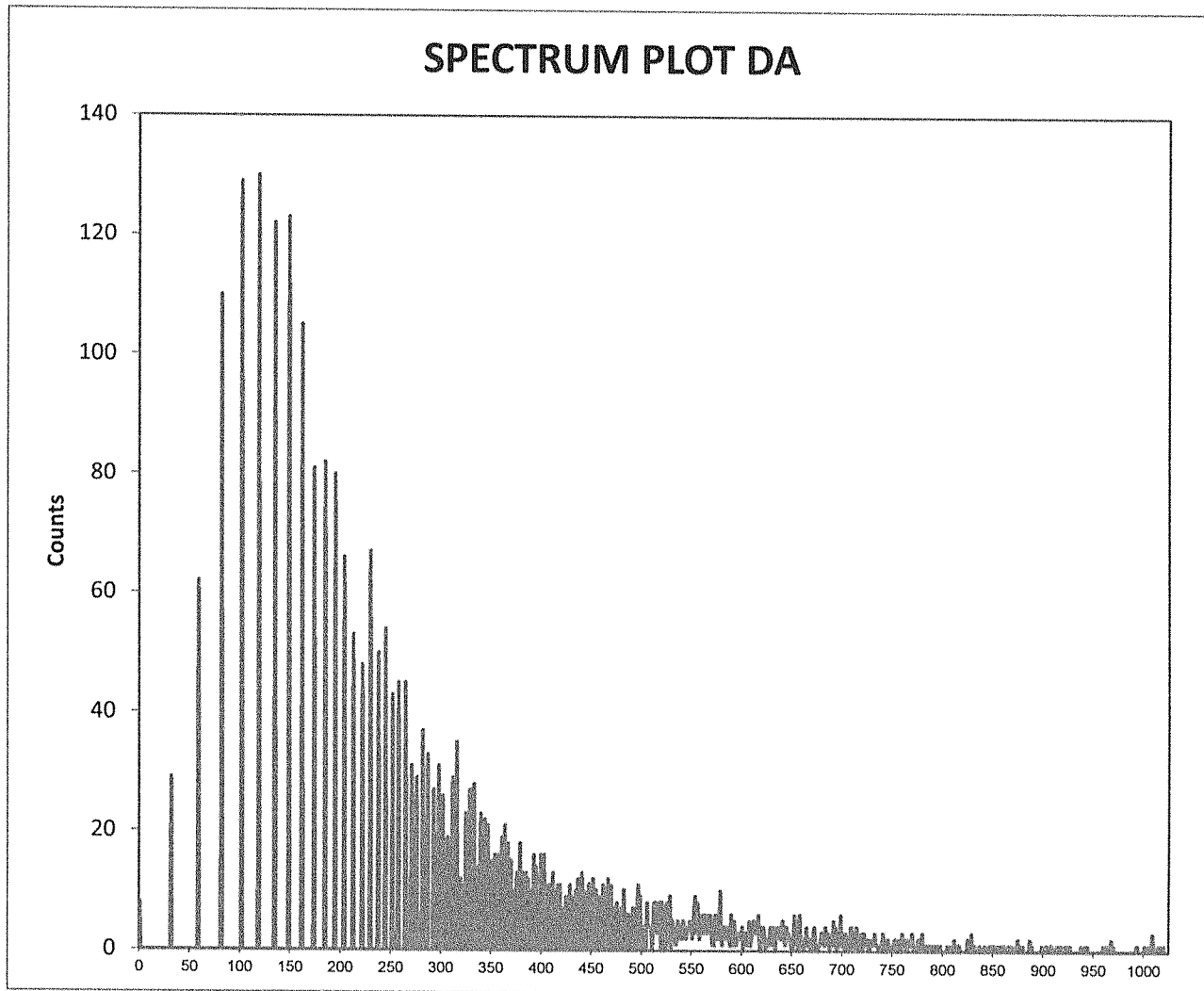


SampleID	Rack	Time (min.)	SQPE#	CPM Iso1	CPM Iso2	LumEx	Count Start Time	Count End Time	Machine
1	15-1	120	355.25	17			7/27/2022 22:21	7/28/2022 0:21	NAVY

Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
27 Jul 2022 22:21:20
M:\LSC\FILES\navy\2294040E\SPu241_S0001_R01_20220728.
M:\LSC\FILES\navy\2294040E\U2294040E.xls
DA
NAVY
1, 15, 120:

Quench:
Start, End, X-Axis 355.25



Alpha Spectroscopy Software Version 3.5.16
effective date: 19-AUG-2020

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

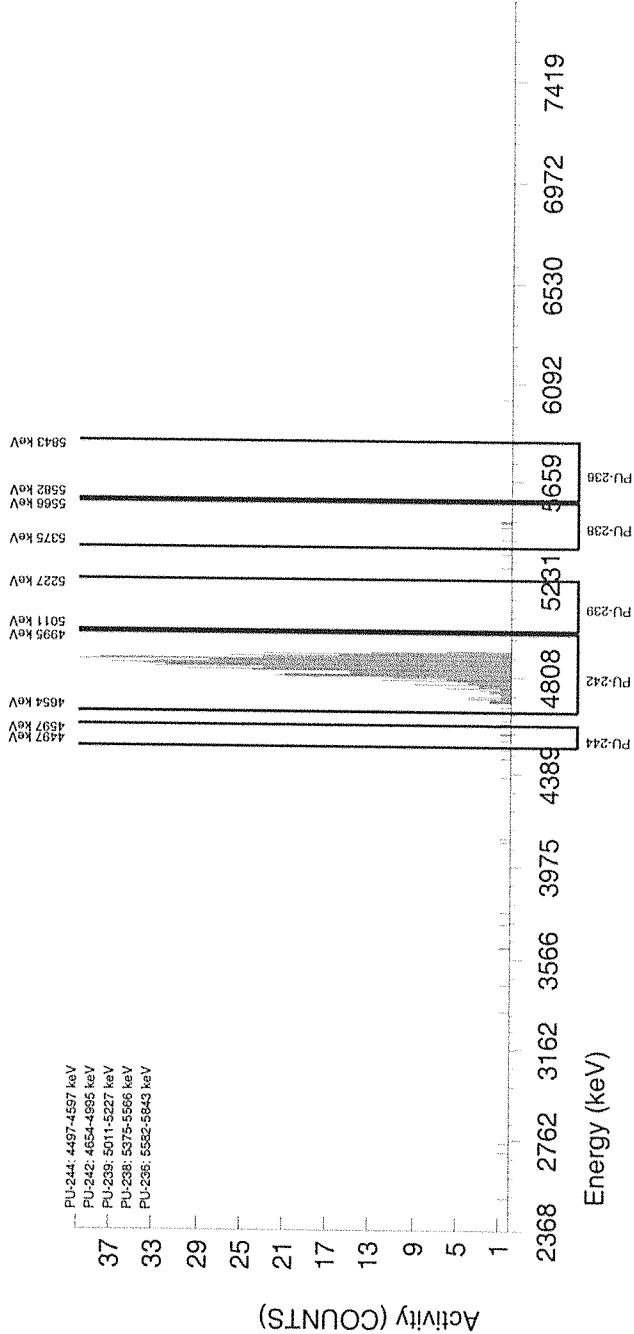
BATCH NUMBER : 2294040		CHAMBER : 071		LIB FILE : PU	
SAMPLE ID : R0585885001_PU		DETECTOR S/N : 80020		BKG FILE : B071.CNF;2434	
SAMPLE QTY : 0.103 F		AVERAGE %EFFICIENCY : 33.4445		BKG DATE : 22-Jul-2022	
SAMPLE DATE : 27-Jun-2022 00:00:00		AVERAGE %EFF ERROR : 0.6454		BKG LIVE TIME(SEC) : 59999.99	
ANALYST : BV1		COUNT DATE : 25-Jul-2022 18:29:37		EFF FILE : W071.CNF;617	
% YIELD : 87.7		ELAPSED LIVE TIME(SEC) : 30300.00		CAL DATE : 11-Jul-2022	

TRACER

ID : 2020-A
NUCLIDE : PU-242
NOMINAL : 4.2759E+00 dpm
RESULTS : 3.7504E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.23	0.000	0.000	-1.515	1.515	1.2309	100.000	-4.57E-02	8.40E-02	2.40E-01	7.49E-02	8.40E-02
PU-238	5486.00	5462.70	78.465	5.000	3.990	1.010	1.0050	99.900	1.18E-01	1.51E-01	2.09E-01	6.01E-02	1.51E-01
PU-239	5155.00	5118.67	0.000	0.000	-3.030	3.030	1.7407	99.900	-8.97E-02	9.69E-02	2.97E-01	1.04E-01	9.68E-02
PU-242	4890.00	4848.63	95.138	641.000	633.425	7.575	2.7523	100.000	1.87E+01	2.34E+00	4.17E-01	1.64E-01	1.47E+00
PU-244	4589.00	4549.04	34.328	3.000	2.495	0.505	0.7106	99.900	7.38E-02	1.23E-01	1.74E-01	4.24E-02	1.23E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

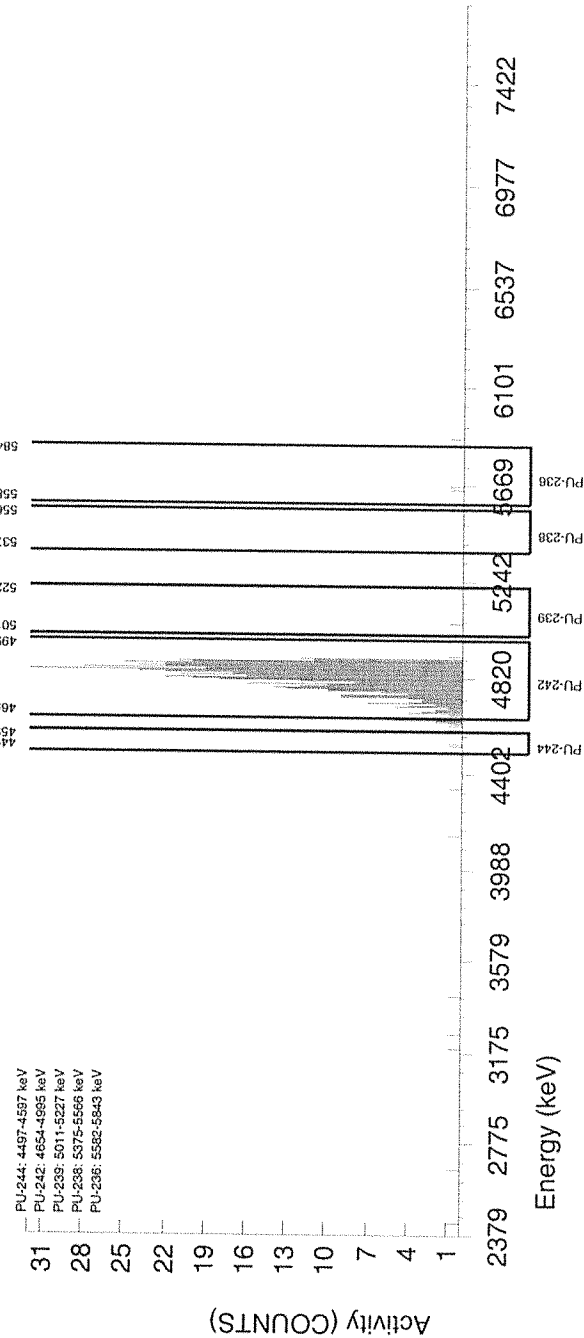
BATCH NUMBER : 2294040	CHAMBER : 072	LIB FILE : PU
SAMPLE ID : R058585002_PU	DETECTOR S/N : 155835	BKG FILE : B072.CNF;2448
SAMPLE QTY : 0.101 F	AVERAGE %EFFICIENCY : 32.9361	BKG DATE : 22-Jul-2022
SAMPLE DATE : 27-Jun-2022 00:00:00	AVERAGE %EFF ERROR : 0.6358	BKG LIVE TIME(SEC) : 59999.99
ANALYST : BV1	COUNT DATE : 25-Jul-2022 18:29:37	EFF FILE : W072.CNF;652
% YIELD : 81.7	ELAPSED LIVE TIME(SEC) : 30300.00	CAL DATE : 11-Jul-2022

TRACER

ID : 2020-A
NUCLIDE : PU-242
NOMINAL : 4.2759E+00 dpm
RESULTS : 3.4929E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5655.94	19.663	2.000	2.000	0.000	1.0000	100.000	6.69E-02	1.18E-01	1.00E-01	6.75E-02	1.18E-01
PU-238	5486.00	5470.34	0.000	0.000	-1.010	1.010	1.0050	99.900	-3.32E-02	8.57E-02	2.32E-01	6.67E-02	8.56E-02
PU-239	5155.00	5062.32	4.916	1.000	-3.545	4.545	2.1319	99.900	-1.16E-01	1.37E-01	3.81E-01	1.41E-01	1.37E-01
PU-242	4890.00	4828.84	82.747	585.000	580.960	4.040	2.0100	100.000	1.91E+01	2.46E+00	3.65E-01	1.33E-01	1.56E+00
PU-244	4589.00	4559.50	63.904	4.000	2.990	1.010	1.0050	99.900	9.82E-02	1.55E-01	2.32E-01	6.66E-02	1.55E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

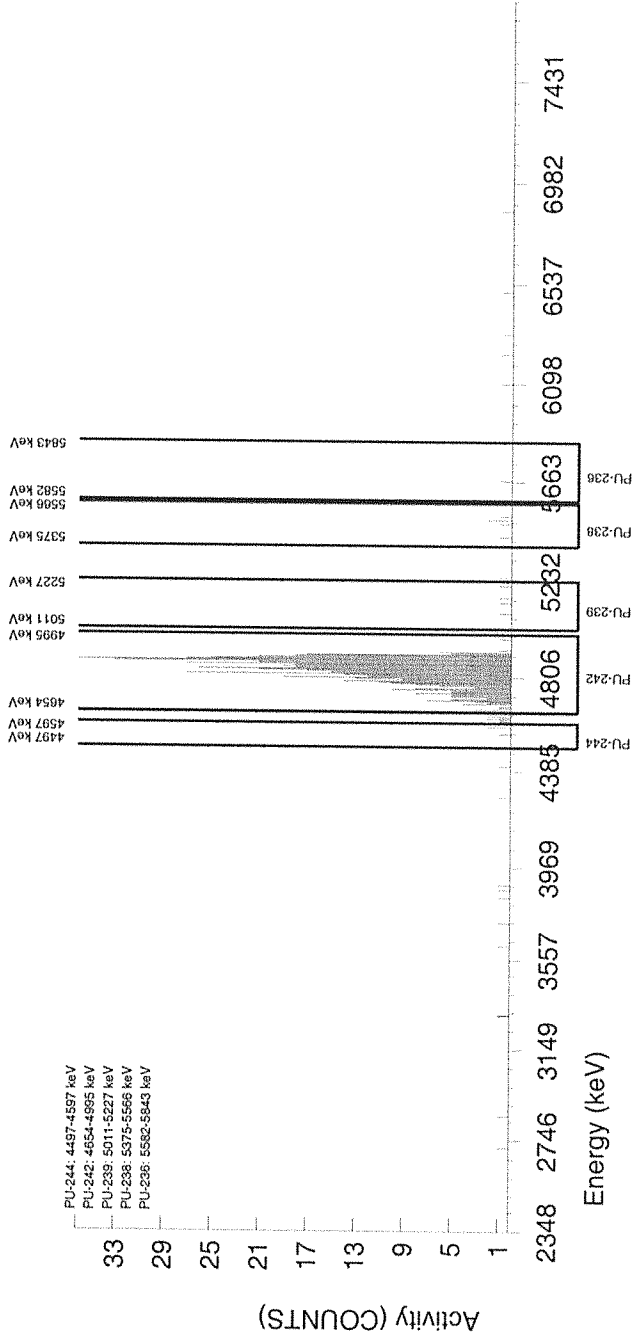
BATCH NUMBER : 2294040		CHAMBER : 074		LIB FILE : PU	
SAMPLE ID : R0585885003_PU		DETECTOR S/N : 149001		BKG FILE : B074.CNF;2468	
SAMPLE QTY : 0.114 F		AVERAGE %EFFICIENCY : 31.9401		BKG DATE : 22-Jul-2022	
SAMPLE DATE : 27-Jun-2022 00:00:00		AVERAGE %EFF ERROR : 0.6170		BKG LIVE TIME(SEC) : 59999.99	
ANALYST : BV1		COUNT DATE : 25-Jul-2022 18:29:37		EFF FILE : W074.CNF;685	
% YIELD : 85.3		ELAPSED LIVE TIME(SEC) : 30300.00		CAL DATE : 11-Jul-2022	

TRACER

ID : 2020-A
NUCLIDE : PU-242
NOMINAL : 4.2759E+00 dpm
RESULTS : 3.6478E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5668.11	4.948	1.000	-0.515	1.515	1.2309	100.000	-1.50E-02	9.94E-02	2.33E-01	7.25E-02	9.94E-02
PU-238	5486.00	5480.28	4.948	5.000	4.495	0.505	0.7106	99.900	1.29E-01	1.44E-01	1.68E-01	4.11E-02	1.43E-01
PU-239	5155.00	5142.72	118.750	4.000	2.990	1.010	1.0050	99.900	8.57E-02	1.35E-01	2.02E-01	5.81E-02	1.35E-01
PU-242	4890.00	4828.37	89.887	600.000	588.385	11.615	3.4081	100.000	1.68E+01	2.18E+00	4.80E-01	1.97E-01	1.38E+00
PU-244	4589.00	4562.61	4.948	5.000	3.990	1.010	1.0050	99.900	1.14E-01	1.47E-01	2.02E-01	5.81E-02	1.46E-01



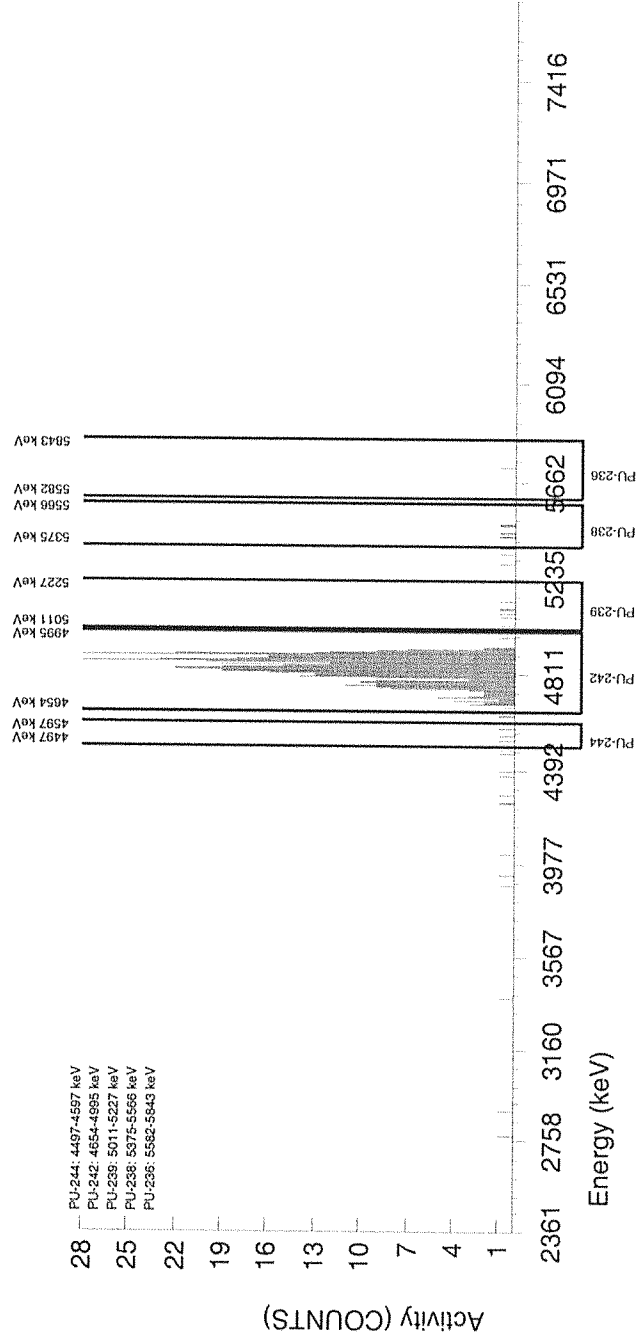
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2294040		CHAMBER : 086	LIB FILE : PU
SAMPLE ID : R1205147420_PU		DETECTOR S/N : 78779	BKG FILE : B086.CNF;2362
SAMPLE QTY : 0.114 F +/-0.875 %		AVERAGE %EFFICIENCY : 29.9106	BKG DATE : 22-Jul-2022
SAMPLE DATE : 25-Jul-2022 00:00:00		AVERAGE %EFF ERROR : 0.5788	BKG LIVE TIME(SEC) : 59999.99
ANALYST : BV1		COUNT DATE : 25-Jul-2022 18:29:38	EFF FILE : W086.CNF;628
% YIELD : 82.5 +/-4.814 %		ELAPSED LIVE TIME(SEC) : 30300.00	CAL DATE : 11-Jul-2022

TRACER	ID : 2020-A
NUCLIDE	: PU-242
NOMINAL	: 4.2759E+00 dpm
RESULTS	: 3.5281E+00 dpm

NUCLIDE ACTIVITY SUMMARY									
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F
PU-236	5749.00	5721.50	4.944	1.000	-0.515	1.515	1.2309	100.000	-1.63E-02
PU-238	5486.00	5449.74	0.000	9.000	3.950	5.050	2.2472	99.900	1.25E-01
PU-239	5155.00	5084.17	103.820	6.000	0.950	5.050	2.2472	99.900	3.01E-02
PU-242	4890.00	4836.50	86.791	542.000	532.910	9.090	3.0150	100.000	1.68E+01
PU-244	4589.00	4546.98	54.382	3.000	0.980	2.020	1.4213	99.900	3.10E-02
									1.96-sigma cnt Unc pCi/F
									1.08E-01
									2.22E-01
									1.94E-01
									1.45E+00
									1.42E-01



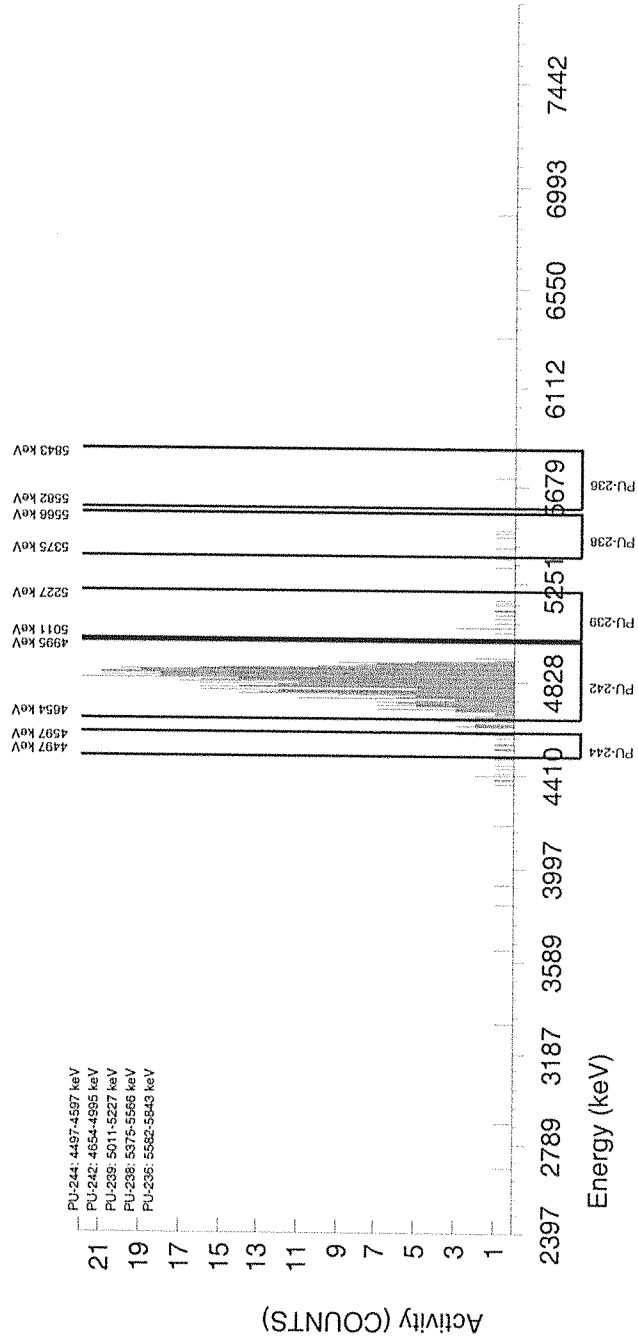
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2294040		CHAMBER : 108		LIB FILE : PU	
SAMPLE ID : R1205147421_PU		DETECTOR S/N : 79778		BKG FILE : B108.CNF;2065	
SAMPLE QTY : 0.114 F		AVERAGE %EFFICIENCY : 35.9583		BKG DATE : 22-Jul-2022	
SAMPLE DATE : 25-Jul-2022 00:00:00		AVERAGE %EFF ERROR : 0.6929		BKG LIVE TIME(SEC) : 59999.99	
ANALYST : BV1		COUNT DATE : 25-Jul-2022 18:29:41		EFF FILE : W108.CNF;598	
% YIELD : 65.4		ELAPSED LIVE TIME(SEC) : 30299.99		CAL DATE : 12-Jul-2022	

TRACER		LCS	
ID : 2020-A		ID	
NUCLIDE : PU-242		NUCLIDE	
NOMINAL : 4.2759E+00 dpm		NOMINAL (pCi/F)	
RESULTS : 2.7974E+00 dpm		% RECOVERY	

NUCLIDE ACTIVITY SUMMARY										
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F
PU-236	5749.00	5716.31	4.871	1.000	-0.010	1.010	1.0050	100.000	-3.32E-04	1.08E-01
PU-238	5486.00	5457.24	73.063	4.000	2.990	1.010	1.0050	99.900	9.92E-02	1.57E-01
PU-239	5155.00	5108.54	4.871	12.000	10.990	1.010	1.0050	99.900	3.65E-01	2.44E-01
PU-242	4890.00	4816.16	113.978	511.000	507.970	3.030	1.7407	100.000	1.68E+01	2.29E+00
PU-244	4589.00	4571.03	0.000	11.000	9.990	1.010	1.0050	99.900	3.32E-01	2.35E-01
									MDA pCi/F	1.96-sigma cnt Unc pCi/F
									2.34E-01	1.08E-01
									2.34E-01	1.56E-01
									2.34E-01	2.41E-01
									3.32E-01	1.47E+00
									2.34E-01	2.32E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2294040
SAMPLE ID : R1205147422_PU
SAMPLE QTY : 0.114 F +/-0.875 %
SAMPLE DATE : 25-Jul-2022 00:00:00
ANALYST : BV1
% YIELD : 79.1 +/-4.577 %

CHAMBER : 109
DETECTOR S/N : 79463
AVERAGE %EFFICIENCY : 34.8191
AVERAGE %EFF ERROR : 0.6714
COUNT DATE : 25-Jul-2022 18:29:41
ELAPSED LIVE TIME(SEC) : 30299.99

LIB FILE : PU
BKG FILE : B109.CNF;2063
BKG DATE : 22-Jul-2022
BKG LIVE TIME(SEC) : 59999.99
EFF FILE : W109.CNF;592
CAL DATE : 12-Jul-2022

TRACER

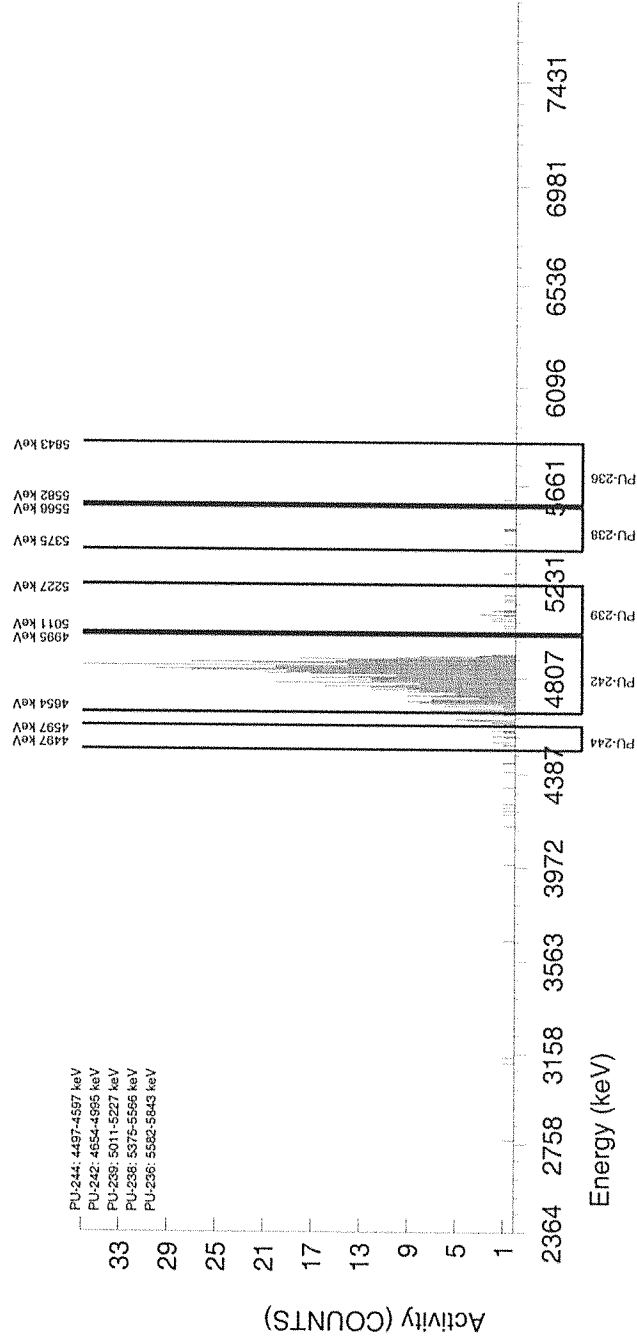
ID : 2020-A
NUCLIDE : PU-242
NOMINAL : 4.2759E+00 dpm
RESULTS : 3.3807E+00 dpm

LCSD

ID
NUCLIDE
NOMINAL (pCi/F)
% RECOVERY

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5596.46	4.901	1.000	-1.525	2.525	1.5890	100.000	-4.32E-02	1.04E-01	2.67E-01	9.09E-02	1.04E-01
PU-238	5486.00	5451.10	68.610	4.000	0.970	3.030	1.7407	99.900	2.75E-02	1.45E-01	2.84E-01	9.96E-02	1.45E-01
PU-239	5155.00	5099.58	42.881	19.000	15.465	3.535	1.8802	99.900	4.39E-01	2.65E-01	3.00E-01	1.08E-01	2.61E-01
PU-242	4890.00	4816.10	87.804	600.000	594.445	5.555	2.3569	100.000	1.68E+01	2.15E+00	3.55E-01	1.35E-01	1.36E+00
PU-244	4589.00	4557.07	0.000	13.000	12.495	0.505	0.7106	99.900	3.54E-01	2.15E-01	1.66E-01	4.07E-02	2.12E-01



Continuing Calibration Data



Liquid Scintillation Counter Checks for 26-JUL-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LSCBLUE	Carbon-14	03:53	1.3		123934	0.45		
	Carbon-14	03:54	1.3		123689	-0.38		
	Tritium	03:56	1.1		160440	-1.18		
	Tritium	03:58	1.1		160098	-1.91		
	BKG	04:00	30		24	0.9		
	BKG	04:31	30		25	3.16	Outside Three Sigma	
	BKG	07:37	30		22	-0.65		
	BKG	08:08	30		22	-0.89		
LSCBROWN	Carbon-14	04:15	1.3		123615	-1.85		
	Carbon-14	04:17	1.3		123755	-1.18		
	Tritium	04:19	1.15		153988	-0.66		
	Tritium	04:20	1.15		153786	-0.88		
	BKG	04:22	30		22	-1.73		
	BKG	04:53	30		23	-0.44		
LSCGOLD	Carbon-14	07:27	1.3		124295	0.83		
	Carbon-14	07:28	1.3		123603	-1.12		
	BKG	07:29	30		27	-0.29		
	Tritium	07:57	1.15		154147	0.56		
	Tritium	07:59	1.15		153619	-0.1		
	BKG	08:00	30		27	-0.38		
LSCMOCHA	Carbon-14	02:31	1.35		122662	-0.47		
	Carbon-14	02:33	1.35		122189	-2.07		
	Tritium	02:35	1.25		143456	-2.75		
	Tritium	02:36	1.25		143438	-2.77		
	BKG	02:38	30		20	-1.42		
	BKG	03:09	30		18	-2.47		
LSCNAVY	Carbon-14	04:13	1.3		125038	-0.17		
	Carbon-14	04:15	1.31		125396	0.83		
	Tritium	04:17	1.07		172733	-0.95		
	Tritium	04:18	1.06		172762	-0.88		

	BKG	04:20	30	19	-0.25
	BKG	04:51	30	21	2.12
LSCORANGE	Carbon-14	04:11	1.012433	123560	-0.12
	Tritium	04:14	1.012433	152990	-0.79
	BKG	04:47	30.01243	8.11	-0.75
	Carbon-14	04:48	1.012433	124017	1.24
	Tritium	04:49	1.012333	153507	0.01
	BKG	05:20	30.01243	9.44	1.91
LSCPINK	Carbon-14	04:03	1.012433	123769	-0.34
	Tritium	04:06	1.012433	138976	1.09
	BKG	04:39	30.01243	7.35	-0.47
	Carbon-14	04:40	1.012433	123376	-1.36
	Tritium	04:42	1.012433	138389	0.14
	BKG	05:12	30.01243	6.61	-1.21
LSCPURPLE	Carbon-14	04:03	.45	122791	-2.19
	Carbon-14	04:04	.4	123877	-0.04
	Tritium	04:05	.35	154005	-0.81
	Tritium	04:06	.35	153014	-1.38
	BKG	04:07	30	23	-0.23
	BKG	04:38	30	23	0.17

LSCBLUE: CLEARED BY RERUN

Reviewed by: 
Lyndsey Pace

Date: 26-JUL-22

GEL Laboratories LLC



Liquid Scintillation Counter Checks for 27-JUL-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LSCBLUE	Carbon-14	03:36	1.3		124399	2.03		
	Carbon-14	03:38	1.3		124543	2.51		
	Tritium	03:40	1.1		159847	-2.44		
	Tritium	03:41	1.1		160522	-1.01		
	BKG	03:44	30		22	-0.92		
	BKG	04:14	30		22	-1.13		
LSCBROWN	Carbon-14	03:51	1.3		123919	-0.39		
	Carbon-14	03:53	1.3		124062	0.3		
	Tritium	03:55	1.15		153230	-1.47		
	Tritium	03:56	1.15		154120	-0.52		
	BKG	03:58	30		23	-0.88		
	BKG	04:29	30		22	-1.22		
LSCGOLD	Tritium	04:10	1.15		153828	0.16		
	Tritium	04:12	1.15		153945	0.31		
	BKG	04:14	30		29	0.09		
	BKG	04:45	30		28	-0.17		
	Carbon-14	04:48	1.3		125050	2.97		
	Carbon-14	04:50	1.3		124433	1.22		
LSCMOCHA	Carbon-14	01:52	1.35		122841	0.14		
	Carbon-14	01:54	1.35		122501	-1.01		
	Tritium	01:56	1.2		144524	-1.24		
	Tritium	01:57	1.25		143662	-2.45		
	BKG	01:59	30		20	-1.42		
	BKG	02:30	30		19	-2.08		
LSCNAVY	Carbon-14	00:59	1.3		125321	0.62		
	Carbon-14	01:01	1.3		125150	0.14		
	Tritium	01:03	1.07		171927	-3.04	Outside Three Sigma	
	Tritium	01:04	1.07		172096	-2.6		
	BKG	01:06	30		19	-0.93		
	BKG	01:37	30		20	0.78		

	Carbon-14	06:11	1.31	125498	1.11
	Carbon-14	06:13	1.3	125063	-0.1
	Tritium	06:15	1.05	173476	0.97
	Tritium	06:16	1.06	174205	2.86
LSCORANGE	Carbon-14	04:11	1.012433	124274	2.01
	Tritium	04:15	1.012433	151776	-2.66
	BKG	04:47	30.01243	8.79	0.61
	Carbon-14	04:49	1.012433	124128	1.57
	Tritium	04:50	1.012333	152490	-1.56
	BKG	05:20	30.01243	8.01	-0.95
LSCPINK	Carbon-14	04:05	1.012433	123826	-0.19
	Tritium	04:08	1.01235	138388	0.14
	BKG	04:41	30.01243	7.55	-0.27
	Carbon-14	04:42	1.012433	124394	1.28
	Tritium	04:44	1.012417	138753	0.73
	BKG	05:14	30.01243	7.18	-0.64
LSCPURPLE	Carbon-14	02:49	.4	124120	0.44
	Carbon-14	02:50	.4	123650	-0.49
	Tritium	02:51	.35	153418	-1.15
	Tritium	02:51	.35	152728	-1.55
	BKG	02:53	30	22	-0.84
	BKG	03:23	30	22	-1.12

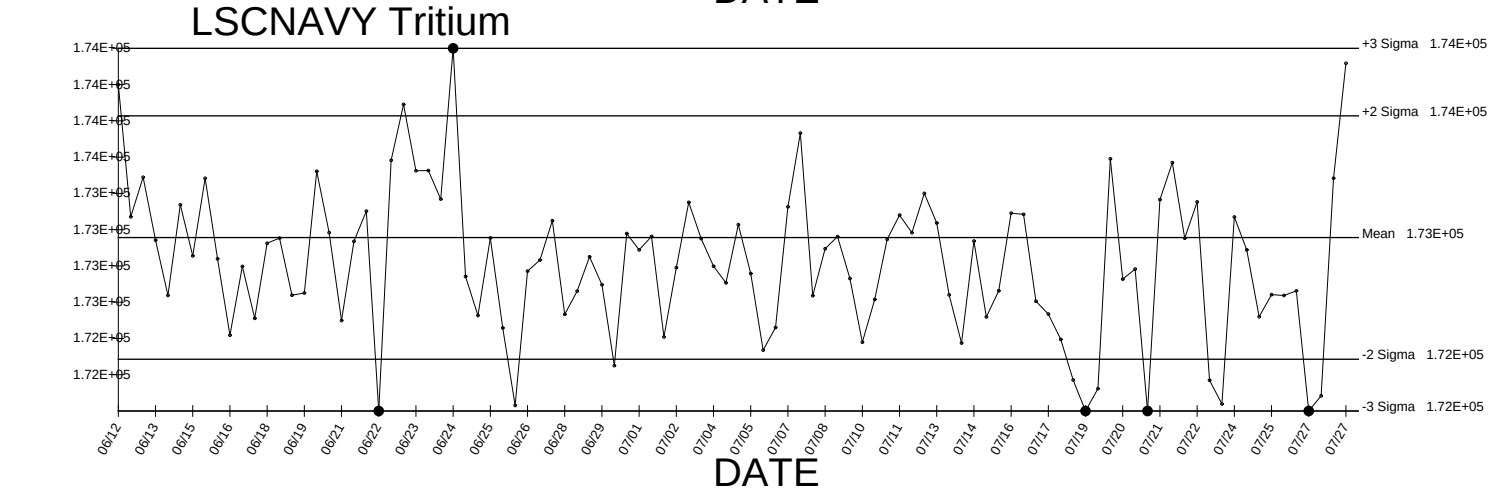
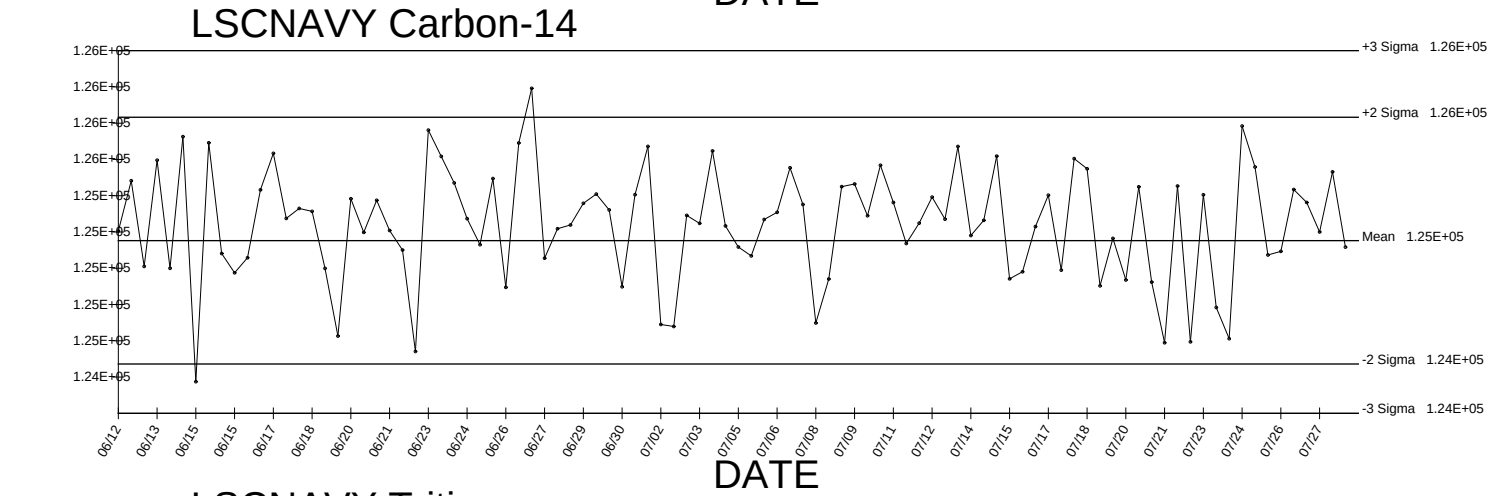
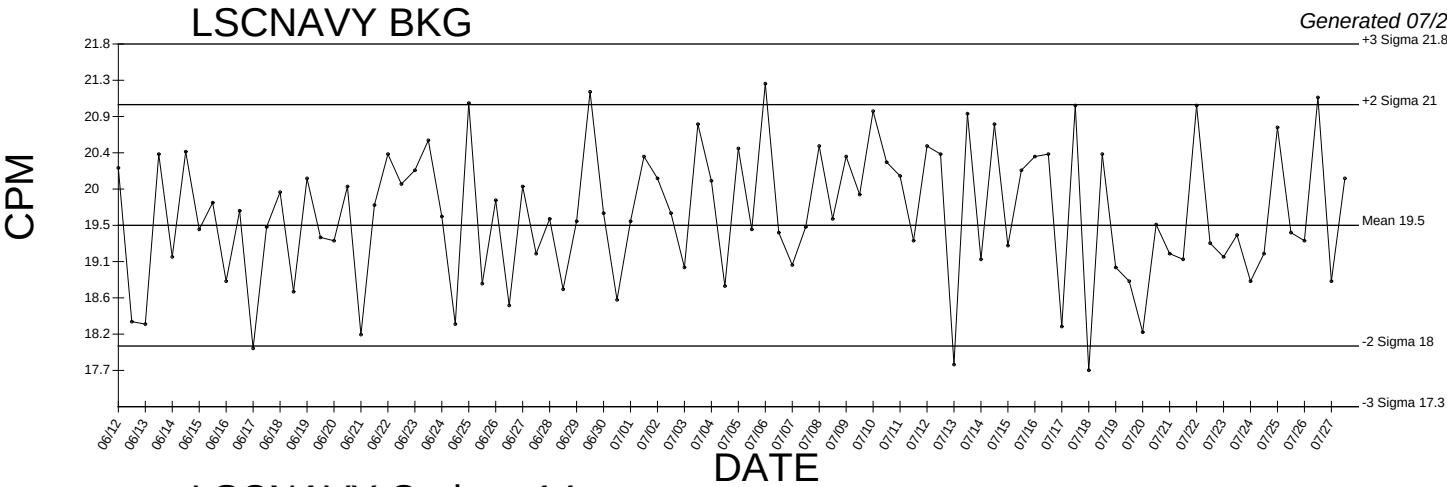
LSCNAVY: CLEARED BY RERUN

Reviewed by: 
Lyndsey Pace

Date: 27-JUL-22

GEL Laboratories LLC

Background and Efficiency Data



RAD Standards Traceability



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

1714

98366

Pu-241 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL 1408580, Item 6 **Product Code:** 8341

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u_A	u_B	U	
Pu-241	5.232E+03	4.016E+04	0.2	1.7	3.5	09/09/2014

*Uncertainty: U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: α -impurities < 0.08%, γ -impurities (other than decay products) < 0.1%.
5.46647 g 3M HNO₃ solution. Carrier free.

Source Prepared by:

R. Ormsby, Radiochemist

QC Approved:

J. S. Lafr, Spectroscopist

Date: 9/5/14



Standard Logbook

Serial ID: 1714 **Open/Reference Date:** 09 SEP 2014 **Aliquot :** 5.46647 g
Name: Plutonium-241 **Received:** 10 SEP 2014 **Density :** Hand Calculated
Type: Source Material **Expires:** 11 SEP 2075 **Logbook Num :** GL-CED-297-007
Employee: Gregory Ramsay **Lot Number :** 98366
Supplier: Eckert & Ziegler **Solvent :** 3M HNO3
Uncertainty : 1.75 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-241	40160 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1714
Prepared By:	Gregory Ramsay
Carrier Conc:	3M HNO ₃
Reference Date:	09/09/2014
Ampoule Mass (g):	5.46647 g
Uncertainty:	+/- 1.75 %
LogBook No:	GL-CED-297-007
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Plutonium-241		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2019		
Verification Date:	01/25/2021		
Expiration Date:	01/25/2022		
Primary Code:	1714-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.4425 g		
Density(g/mL):	1.0331	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23990.3411 \text{ dpm/mL}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0331 \text{ g/mL}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23220.6511 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
07/22/2019	Tim Chandler	50.7721	500	1714-B	2357.9224 dpm/mL	01/19/2022	01/19/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-241 Standard 1714-B

1/19/2022	Isotope	Detector CPM	BKG CPM	NET CPM	Detector Eff	Mass, Used (mL)	Source DPM/mL
Matelon DeFreese	1714-B	418.9300	10.5300	408.4000	0.2541	1.0000	1607.241244
	1714-B	423.9300	10.5300	413.4000	0.2551	1.0000	1620.540964
	1714-B	413.8700	10.5300	403.3400	0.253	1.0000	1594.229249
Mean Value (Counting) =	1607.337152	dpm/mL	97.4108307	Pass		Average =	1607.337152
Stdev =	13.15611985	dpm/mL	0.00818504	Rule B (Pass/Fail)			
Certificate Value =	1650.06	dpm/mL					
Two sigma =	26.31223971						
10 % of Mean =	160.7337152						
Rule A (Pass/Fail)	Pass						

Verification Rules

- Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule B = The determined mean value shall be within 5% of the certificate value.

The analyst prepared three standard verification sources for Pu-241 source 1714-B by transferring 1 mL portions of the standard into plastic liquid scintillation vials. Thirteen mL of Ecoscint Ultra liquid scintillation cocktail and 2 mL of DI water were added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion. The standard verification vials and Background source were dark adapted for two hours and counted on LSC Brown for Pu-241 source standard verification. The Pu-241 efficiency calibration which was used for verification calculations was created during instrument calibrations. Each verification source calculation was performed as follows:

Source dpm/g = (A - B)/(C)(D)

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency, (cpm/dpm), and
- D = mass used for standard verification.

Reference RAD SOP M-001

8/24/22



National Institute of Standards & Technology

Certificate

2020

Standard Reference Material® 4334j

Plutonium-242 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}.$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterwieser, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

Steven J. Choquette, Director
Office of Reference Materials

62-CEJ-797-312a

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq·g^{-1(a)}
Relative expanded uncertainty ($k = 2$)	0.51 % ^(b)

^(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

^(b) The uncertainties on certified values are expanded uncertainties, $U = k u_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

GL-CED-297-3126

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ^{-1(a,b,c,d)}
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ^{-1(a,d)}
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

^(a) The stated uncertainty is two times the standard uncertainty [5].

^(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

^(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,

0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and

0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

^(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclides follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ^{-6 (3)}	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ^{-5 (3)}	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

^(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,

5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and

3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

^(f) The stated uncertainty is the standard uncertainty. See reference 6.

GL-CED-297-312c

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ²⁴² Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	²⁴² Pu decay corrections for half-life uncertainty of 0.22 %.	B	< 10 ⁻¹⁰
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty (k = 2)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

GL-CED-297-312d

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

GL-CEN-297-312e

Standard Logbook

Serial ID: 2020 **Open/Reference Date:** 09 AUG 2017 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 18 JAN 2022 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18 JAN 2050 **Logbook Num :** GL-CED-297-312
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
Uncertainty : .255 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2020
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO3
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-312
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	06/03/2022		
Verification Date:	06/03/2022		
Expiration Date:	06/03/2023		
Primary Code:	2020-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.4651 g		
Density(g/mL):	1.0325	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.4651 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 42.7589 \text{ dpm/mL}$
$(5.4651 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0325 \text{ g/mL}) / (200 \text{ mL}) = 41.4130 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
-----------	----------	--------------	---------------	------	-------------	-------------------	-----------------

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2020-A

v1.2

Analyst	MXS2
Verification Prep Date	6/3/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.1
Expiration Date	8/17/2022

Standard Information	
Isotope	Pu-242
Serial Number	2020-A
Isotope Half-life	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	42.7589
Amount of Std. (mL)	0.1
Standard Prep Date	6/3/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	6/6/2022	1.960	43.51
2	6/6/2022	1.900	42.18
3	6/6/2022	1.810	40.18

Mean Value = 1.890 41.958
Stdev = 0.075498344 1.676063245

pCi 1.9261 42.7585
Certificate Value* = 3.3521
Two sigma = 4.1958
10 % of Mean = Pass
Rule A (Pass/Fail) 98.13%
% Recovery Pass
Rule B (Pass/Fail) 98.13%
Expiration Date 6/3/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2020-A using 0.1 mL for each source. Each standard was combined with 0.1 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. Added 0.1mL of neodymium carrier and 3-4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

6/8/22

Runlogs

Instrument Run Log

Instrument Type: LSC

Batch ID: 2294040

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885001	SAMPLE	BV1	LSCNAVY	JUL-26-22 14:52:31	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
585885002	SAMPLE	BV1	LSCNAVY	JUL-26-22 16:54:09	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
585885003	SAMPLE	BV1	LSCNAVY	JUL-26-22 18:55:46	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
585905001	SAMPLE	BV1	LSCNAVY	JUL-26-22 20:57:22	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
585905002	SAMPLE	BV1	LSCNAVY	JUL-26-22 22:58:57	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
585905003	SAMPLE	BV1	LSCNAVY	JUL-27-22 02:09:06	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
585905004	SAMPLE	BV1	LSCNAVY	JUL-27-22 04:10:40	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
585905005	SAMPLE	BV1	LSCNAVY	JUL-27-22 07:06:57	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205147420	MB	BV1	LSCNAVY	JUL-27-22 09:08:30	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205147421	LCS	BV1	LSCNAVY	JUL-27-22 11:09:31	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205147422	LCSD	BV1	LSCNAVY	JUL-27-22 11:25:10	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00



July 28, 2022

Ms. Candace Christensen
Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607

Re: Project # 080153.007 Air Monitoring at SSFL
Work Order: 585905

Dear Ms. Christensen:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on July 13, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4422.

Sincerely,

Jake Crook
Project Manager

Purchase Order: 8-00000942
Chain of Custody: 07112022-2
Enclosures

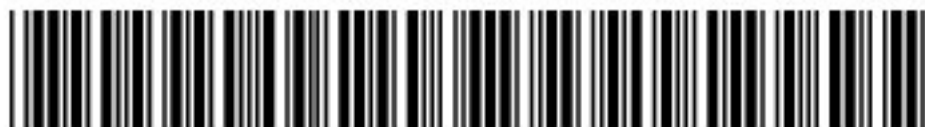


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Case Narrative

**Receipt Narrative
for
North Wind Solutions
SDG: 585905**

July 28, 2022

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on July 13, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

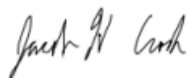
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
585905001	DOE-1_Qtr 17_S
585905002	DOE-2_Qtr 17_S
585905003	DOE-3_Qtr 17_S
585905004	DOE-4_Qtr 17_S
585905005	BLANK_Qtr 17_S

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink, appearing to read "Jake H Crook". The signature is written in a cursive, slightly slanted style.

Jake Crook
Project Manager

Chain of Custody and Supporting Documentation

Client Name: North Wind Portage, Inc. Phone # 805-587-0691

[illegible][illegible][illegible][illegible][illegible]

Sample	Date Collected	Collected	Remarks
0066	11/13	11/13	11/13
0067	11/13	11/13	11/13
0068	11/13	11/13	11/13
0069	11/13	11/13	11/13
0070	11/13	11/13	11/13
0071	11/13	11/13	11/13
0072	11/13	11/13	11/13
0073	11/13	11/13	11/13
0074	11/13	11/13	11/13
0075	11/13	11/13	11/13
0076	11/13	11/13	11/13
0077	11/13	11/13	11/13
0078	11/13	11/13	11/13
0079	11/13	11/13	11/13
0080	11/13	11/13	11/13
0081	11/13	11/13	11/13
0082	11/13	11/13	11/13
0083	11/13	11/13	11/13
0084	11/13	11/13	11/13
0085	11/13	11/13	11/13
0086	11/13	11/13	11/13
0087	11/13	11/13	11/13
0088	11/13	11/13	11/13
0089	11/13	11/13	11/13
0090	11/13	11/13	11/13
0091	11/13	11/13	11/13
0092	11/13	11/13	11/13
0093	11/13	11/13	11/13
0094	11/13	11/13	11/13
0095	11/13	11/13	11/13
0096	11/13	11/13	11/13
0097	11/13	11/13	11/13
0098	11/13	11/13	11/13
0099	11/13	11/13	11/13
0100	11/13	11/13	11/13

[illegible]

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466
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[illegible]

			No	None	1 X	X	X	X	X	B-7, K-40, Co-60, Cs-137,
DOE-2_Qtr 17_S (4/1/22 1057-6/27/22 0952)			F	N/A	0952 C	06-27-22				

[illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible]

Chain of Custody Signatures	TAI Requested: Normal: X Rush: X	Specifc: (Subject to Surcharge)
-----------------------------	----------------------------------	---------------------------------

[illegible]

		Fax Results:		Yes	No
1	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓
4	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✓
6	✓	✓	✓	✓	✓
7	✓	✓	✓	✓	✓
8	✓	✓	✓	✓	✓
9	✓	✓	✓	✓	✓
10	✓	✓	✓	✓	✓
11	✓	✓	✓	✓	✓
12	✓	✓	✓	✓	✓
13	✓	✓	✓	✓	✓
14	✓	✓	✓	✓	✓
15	✓	✓	✓	✓	✓
16	✓	✓	✓	✓	✓
17	✓	✓	✓	✓	✓
18	✓	✓	✓	✓	✓
19	✓	✓	✓	✓	✓
20	✓	✓	✓	✓	✓
21	✓	✓	✓	✓	✓
22	✓	✓	✓	✓	✓
23	✓	✓	✓	✓	✓
24	✓	✓	✓	✓	✓
25	✓	✓	✓	✓	✓
26	✓	✓	✓	✓	✓
27	✓	✓	✓	✓	✓
28	✓	✓	✓	✓	✓
29	✓	✓	✓	✓	✓
30	✓	✓	✓	✓	✓
31	✓	✓	✓	✓	✓
32	✓	✓	✓	✓	✓
33	✓	✓	✓	✓	✓
34	✓	✓	✓	✓	✓
35	✓	✓	✓	✓	✓
36	✓	✓	✓	✓	✓
37	✓	✓	✓	✓	✓
38	✓	✓	✓	✓	✓
39	✓	✓	✓	✓	✓
40	✓	✓	✓	✓	✓
41	✓	✓	✓	✓	✓
42	✓	✓	✓	✓	✓
43	✓	✓	✓	✓	✓
44	✓	✓	✓	✓	✓
45	✓	✓	✓	✓	✓
46	✓	✓	✓	✓	✓
47	✓	✓	✓	✓	✓
48	✓	✓	✓	✓	✓
49	✓	✓	✓	✓	✓
50	✓	✓	✓	✓	✓
51	✓	✓	✓	✓	✓
52	✓	✓	✓	✓	✓
53	✓	✓	✓	✓	✓
54	✓	✓	✓	✓	✓
55	✓	✓	✓	✓	✓
56	✓	✓	✓	✓	✓
57	✓	✓	✓	✓	✓
58	✓	✓	✓	✓	✓
59	✓	✓	✓	✓	✓
60	✓	✓	✓	✓	✓
61	✓	✓	✓	✓	✓
62	✓	✓	✓	✓	✓
63	✓	✓	✓	✓	✓
64	✓	✓	✓	✓	✓
65	✓	✓	✓	✓	✓
66	✓	✓	✓	✓	✓
67	✓	✓	✓	✓	✓
68	✓	✓	✓	✓	✓
69	✓	✓	✓	✓	✓
70	✓	✓	✓	✓	✓
71	✓	✓	✓	✓	✓
72	✓	✓	✓	✓	✓
73	✓	✓	✓	✓	✓
74	✓	✓	✓	✓	✓
75	✓	✓	✓	✓	✓
76	✓	✓	✓	✓	✓
77	✓	✓	✓	✓	✓
78	✓	✓	✓	✓	✓
79	✓	✓	✓	✓	✓
80	✓	✓	✓	✓	✓
81	✓	✓	✓	✓	✓

[illegible][illegible]

3	3	For Lab Receiving Use Only: Custody Seal Intact? ☐ Yes ☐ No	Cooler Temp: _____ °C
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> For sample shipping and delivery details, see *Sample Receipt & Review form (SRR)*.

Sample Collection Time Zone: [] Eastern [x] Pacific [] Central [] Mountain [] Other:

1.) Chain of Custody Number = Client Determined

2.) OC Codes: **N** = Normal Sample, **FD** = Field Duplicate, **MS** = Matrix Spike Sample, **MSD** = Matrix Spike Duplicate Sample, **G** = Grab, **C** = Composite, **EB** = Enrichment Blank, **TB** = Trip Blank, **MS** = Matrix Spike Sample, **MSD** = Matrix Spike Duplicate Sample, **G** = Grab, **C** = Composite

[illegible][illegible]

1, 4.) Matrix Codes: **DW**=Drinking Water, **GW**=Groundwater, **SW**=Surface Water, **WW**=Waste Water, **W**=Water, **ML**=Misc Liquid, **SO**=Soil, **SD**=Sediment, **SL**=Sludge, **SS**=Solid Waste, **O**=Oil, **F**=Filter, **P**=Pipe, **U**=Urine, **F**=Fecal, **N**=Nasal

5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B - 3, 6010B/7470A - 1).

6.) Preservative Type: **HA** = Hydrochloric Acid, **NI** = Nitric Acid, **SH** = Sodium Hydroxide, **SA** = Sulfuric Acid, **AA** = Ascorbic Acid, **ST** = Sodium Thiosulfate. If no preservative is added = leave field blank

7.) KNOWN OR POSSIBLE HAZARDS	Characteristic Hazards	Listed Waste	Other	Please provide any additional details

PCBA Metals	FL = Flammable/ignitable CO = Corrosive CE = Corrosive P = Poisonous D = Dangerous U = Unknown	U1 = Other / Unknown U2 = Flammable/ignitable U3 = Corrosive U4 = Poisonous U5 = Dangerous U6 = Unknown	below regarding handling and/or disposal
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ROCKA means	CO = Cohesive	(i.e., high-flow pit, asbestos, vermiculite, other	of concs. collected from old mine sites)
ROCKA means	CO = Cohesive	(i.e., high-flow pit, asbestos, vermiculite, other	of concs. collected from old mine sites)
RE = Reactive	RE = Reactive	misc. health hazards, etc.)	
Hg = Mercury	Hg = Mercury		
Hg = Arsenic	Hg = Arsenic		

	(<i>continued from p. 68</i>)
Ba = Barium	Description:
Se= Selenium	

Cd = Cadmium	TSCA Regulated
Ag = Silver	

Pb = Lead
 Cr = Chromium
 Mn = Misc. KCRA metals
 PCB = Polychlorinated
 bi-aryls

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035

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SAMPLE RECEIPT & REVIEW FORM

Client: <u>NORV</u>		SDG/AR/COC/Work Order: <u>585885 / 585905</u>	
Received By: <u>PG</u>		Date Received: <u>7/13/22</u>	
Carrier and Tracking Number		Circle Applicable: ☒ FedEx Express ☐ FedEx Ground ☐ UPS ☐ Field Services ☐ Courier ☐ Other	
		7773 5412 4410	
Suspected Hazard Information	Yes ☐ No ☒	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.	
A) Shipped as a DOT Hazardous?	Yes ☐ No ☒	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___	
B) Did the client designate the samples are to be received as radioactive?	Yes ☐ No ☒	COC notation or radioactive stickers on containers equal client designation.	
C) Did the RSO classify the samples as radioactive?	Yes ☐ No ☒	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3	
D) Did the client designate samples are hazardous?	Yes ☐ No ☒	COC notation or hazard labels on containers equal client designation.	
E) Did the RSO identify possible hazards?	Yes ☐ No ☒	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____	
Sample Receipt Criteria		Yes ☐ NA ☒ No ☐	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	☒	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	☒	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	☒	Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius TEMP: <u>22</u>
4	Daily check performed and passed on IR temperature gun?	☒	Temperature Device Serial #: <u>182-22</u> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	☒	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	☒	Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?	☒	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
			Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
			Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___
8	Samples received within holding time?	☒	ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles?	☒	ID's and containers affected: _____
10	Date & time on COC match date & time on bottles?	☒	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	☒	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	☒	
13	COC form is properly signed in relinquished/received sections?	☒	Circle Applicable: Not relinquished Other (describe)
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials EM Date 7/19/22 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 28 July 2022

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122022-5
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122021-36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
North Wind Solutions
SDG #: 585905**

Product: Alphaspec U, Filter

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2290611

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290586

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585905001	DOE-1_Qtr 17_S
585905002	DOE-2_Qtr 17_S
585905003	DOE-3_Qtr 17_S
585905004	DOE-4_Qtr 17_S
585905005	BLANK_Qtr 17_S
1205140833	Method Blank (MB)
1205140834	Laboratory Control Sample (LCS)
1205140835	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec Th, Filter

Analytical Method: DOE EML HASL-300, Th-01-RC Modified

Analytical Procedure: GL-RAD-A-038 REV# 18

Analytical Batch: 2290612

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290586

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585905001	DOE-1_Qtr 17_S

585905002	DOE-2_Qtr 17_S
585905003	DOE-3_Qtr 17_S
585905004	DOE-4_Qtr 17_S
585905005	BLANK_Qtr 17_S
1205140836	Method Blank (MB)
1205140838	Laboratory Control Sample (LCS)
1205140839	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Method Blank Criteria

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205140836 (MB)	Thorium-230	Result: 0.509 pCi/Sample > MDA: 0.346 pCi/Sample <= RDL: 1.00 pCi/Sample

Duplication Criteria between LCS and LCSD

The Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD), 1205140838 and 1205140839, Thorium-230 relative percent difference (RPD) is not applicable as both the LCS and LCSD were spiked with Thorium-232. The Thorium-232 RPD meets acceptance criteria.

Miscellaneous Information

Manual Integration

Manual integration of alpha spectroscopy spectra 585905004 (DOE-4_Qtr 17_S) was performed to fully separate counts in Regions of Interest which would have been biased.

Product: Alphaspec Po210, Filter

Analytical Method: DOE EML HASL-300, Po-01-RC Modified

Analytical Procedure: GL-RAD-A-016 REV# 19

Analytical Batch: 2290613

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290586

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585905001	DOE-1_Qtr 17_S

585905002	DOE-2_Qtr 17_S
585905003	DOE-3_Qtr 17_S
585905004	DOE-4_Qtr 17_S
585905005	BLANK_Qtr 17_S
1205140840	Method Blank (MB)
1205140841	Laboratory Control Sample (LCS)
1205140842	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

Sample 1205140840 (MB) did not meet the resolution requirement of having a full width half maximum of 100 keV or less for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest. The tracer peak centroid for samples 1205140840 (MB), 1205140841 (LCS), 585905001 (DOE-1_Qtr 17_S), 585905002 (DOE-2_Qtr 17_S), 585905003 (DOE-3_Qtr 17_S), 585905004 (DOE-4_Qtr 17_S) and 585905005 (BLANK_Qtr 17_S) are greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peaks are within the tracer region of interest.

Product: Alphaspec Am241, Filter

Analytical Method: DOE EML HASL-300, Am-05-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2293754

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290586

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585905001	DOE-1_Qtr 17_S
585905002	DOE-2_Qtr 17_S
585905003	DOE-3_Qtr 17_S
585905004	DOE-4_Qtr 17_S
585905005	BLANK_Qtr 17_S
1205146816	Method Blank (MB)
1205146817	Laboratory Control Sample (LCS)
1205146818	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information**Sample Re-prep/Re-analysis**

Samples were reprepared due to low carrier/tracer yield. The re-analysis is being reported.

Product: Alphaspec Pu, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2294036

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290586

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585905001	DOE-1_Qtr 17_S
585905002	DOE-2_Qtr 17_S
585905003	DOE-3_Qtr 17_S
585905004	DOE-4_Qtr 17_S
585905005	BLANK_Qtr 17_S
1205147417	Method Blank (MB)
1205147418	Laboratory Control Sample (LCS)
1205147419	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information**Sample Re-prep/Re-analysis**

Batch was reprepared due to analyst error. The re-analysis is being reported.

Miscellaneous Information**Additional Comments**

Samples 1205147418 (LCS), 1205147419 (LCSD), 585905002 (DOE-2_Qtr 17_S), 585905004 (DOE-4_Qtr 17_S) and 585905005 (BLANK_Qtr 17_S) did not meet the resolution requirement of having a full width half maximum of 100 keV or less for the tracer; however, the tracer yield requirement was met and the tracer peaks

are within the tracer region of interest. The tracer peak centroid for samples 1205147417 (MB), 1205147418 (LCS), 1205147419 (LCSD), 585905001 (DOE-1_Qtr 17_S), 585905002 (DOE-2_Qtr 17_S), 585905004 (DOE-4_Qtr 17_S) and 585905005 (BLANK_Qtr 17_S) are greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peaks are within the tracer region of interest.

Product: Gammaspec, Gamma, Filter

Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R

Analytical Procedure: GL-RAD-A-013 REV# 27

Analytical Batch: 2290721

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290586

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585905001	DOE-1_Qtr 17_S
585905002	DOE-2_Qtr 17_S
585905003	DOE-3_Qtr 17_S
585905004	DOE-4_Qtr 17_S
585905005	BLANK_Qtr 17_S
1205141122	Method Blank (MB)
1205141123	585885001(A-3-RMHF-2022-Qtr2) Sample Duplicate (DUP)
1205141124	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Qualifier Information

Qualifier	Reason	Analyte	Sample	Client Sample
UI	Results are considered a false positive due to high counting uncertainty.	Beryllium-7	585905002	DOE-2_Qtr 17_S
		Potassium-40	585905005	BLANK_Qtr 17_S

Product: GFPC Ra228, Filter

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2290786

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290586

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585905001	DOE-1_Qtr 17_S
585905002	DOE-2_Qtr 17_S
585905003	DOE-3_Qtr 17_S
585905004	DOE-4_Qtr 17_S
585905005	BLANK_Qtr 17_S
1205141306	Method Blank (MB)
1205141307	Laboratory Control Sample (LCS)
1205141308	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205141306 (MB)	Radium-228	Result -2.03 < MDA 6.72 > RDL 1 pCi/Sample

Samples did not meet the detection limits due to limited sample volume.

Sample	Analyte	Value
585905001 (DOE-1_Qtr 17_S)	Radium-228	Result -4.82 < MDA 15.2 > RDL 1 pCi/Sample
585905002 (DOE-2_Qtr 17_S)	Radium-228	Result 2.56 < MDA 12.3 > RDL 1 pCi/Sample
585905003 (DOE-3_Qtr 17_S)	Radium-228	Result -7.09 < MDA 16.4 > RDL 1 pCi/Sample
585905004 (DOE-4_Qtr 17_S)	Radium-228	Result 1.58 < MDA 8.92 > RDL 1 pCi/Sample
585905005 (BLANK_Qtr 17_S)	Radium-228	Result 0.871 < MDA 11.3 > RDL 1 pCi/Sample

Product: GFPC Total Alpha Radium, Filter

Analytical Method: EPA 900.1 Mod/ EPA 903.0 Mod

Analytical Procedure: GL-RAD-A-010 REV# 21

Analytical Batch: 2290788

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290586

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585905001	DOE-1_Qtr 17_S
585905002	DOE-2_Qtr 17_S
585905003	DOE-3_Qtr 17_S
585905004	DOE-4_Qtr 17_S
585905005	BLANK_Qtr 17_S
1205141312	Method Blank (MB)
1205141313	Laboratory Control Sample (LCS)
1205141314	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Preparation Information

Aliquot Reduced

585905001 (DOE-1_Qtr 17_S), 585905002 (DOE-2_Qtr 17_S), 585905003 (DOE-3_Qtr 17_S), 585905004 (DOE-4_Qtr 17_S) and 585905005 (BLANK_Qtr 17_S) Aliquots were reduced due to limited sample volume.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205141312 (MB)	Total Radium	Result 0.508 < MDA 5.57 > RDL 1 pCi/Sample

Samples (See Below) did not meet the detection limits due to limited sample volume. Samples were counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
585905001 (DOE-1_Qtr 17_S)	Total Radium	Result 4.02 < MDA 4.65 > RDL 1 pCi/Sample
585905002 (DOE-2_Qtr 17_S)	Total Radium	Result -1.99 < MDA 5.37 > RDL 1 pCi/Sample

585905003 (DOE-3_Qtr 17_S)	Total Radium	Result 6.08 < MDA 6.79 > RDL 1 pCi/Sample
585905005 (BLANK_Qtr 17_S)	Total Radium	Result 4.29 < MDA 5.01 > RDL 1 pCi/Sample

Product: GFPC, Sr90, Filter

Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified

Analytical Procedure: GL-RAD-A-004 REV# 22

Analytical Batch: 2290790

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290586

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585905001	DOE-1_Qtr 17_S
585905002	DOE-2_Qtr 17_S
585905003	DOE-3_Qtr 17_S
585905004	DOE-4_Qtr 17_S
585905005	BLANK_Qtr 17_S
1205141315	Method Blank (MB)
1205141316	Laboratory Control Sample (LCS)
1205141317	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205141315 (MB)	Strontium-90	Result -0.285 < MDA 5.38 > RDL 3 pCi/Sample

Samples (See Below) did not meet the detection limits due to limited sample volume. Samples were counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
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585905001 (DOE-1_Qtr 17_S)	Strontium-90	Result 1.79 < MDA 8.18 > RDL 3 pCi/Sample
585905002 (DOE-2_Qtr 17_S)	Strontium-90	Result 2.79 < MDA 7.29 > RDL 3 pCi/Sample
585905003 (DOE-3_Qtr 17_S)	Strontium-90	Result 4 < MDA 7.45 > RDL 3 pCi/Sample
585905004 (DOE-4_Qtr 17_S)	Strontium-90	Result 4.77 < MDA 6.75 > RDL 3 pCi/Sample
585905005 (BLANK_Qtr 17_S)	Strontium-90	Result 1.32 < MDA 5.06 > RDL 3 pCi/Sample

Technical Information

Recounts

Sample 1205141315 (MB) was recounted due to a suspected blank false positive. The recount is reported.
Sample 585905005 (BLANK_Qtr 17_S) was recounted due to a suspected false positive. The recount is reported.

Product: Liquid Scint Pu241, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2294040

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2290586

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
585905001	DOE-1_Qtr 17_S
585905002	DOE-2_Qtr 17_S
585905003	DOE-3_Qtr 17_S
585905004	DOE-4_Qtr 17_S
585905005	BLANK_Qtr 17_S
1205147420	Method Blank (MB)
1205147421	Laboratory Control Sample (LCS)
1205147422	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205147420 (MB)	Plutonium-241	Result -7.23 < MDA 29.1 > RDL 5 pCi/Sample

Samples (See Below) did not meet the detection limits due to limited sample volume. Samples were counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
585905001 (DOE-1_Qtr 17_S)	Plutonium-241	Result 18.4 < MDA 29.5 > RDL 5 pCi/Sample
585905002 (DOE-2_Qtr 17_S)	Plutonium-241	Result 22 < MDA 34.5 > RDL 5 pCi/Sample
585905003 (DOE-3_Qtr 17_S)	Plutonium-241	Result 3.54 < MDA 37.9 > RDL 5 pCi/Sample
585905004 (DOE-4_Qtr 17_S)	Plutonium-241	Result 17.8 < MDA 42.4 > RDL 5 pCi/Sample
585905005 (BLANK_Qtr 17_S)	Plutonium-241	Result 6.01 < MDA 36.1 > RDL 5 pCi/Sample

Technical Information

Sample Re-prep/Re-analysis

Batch was reprepared due to analyst error. The re-analysis is being reported.

Miscellaneous Information

Additional Comments

Samples 1205147421 (LCS), 585905002 (DOE-2_Qtr 17_S), 585905004 (DOE-4_Qtr 17_S) and 585905005 (BLANK_Qtr 17_S) did not meet the resolution requirement of having a full width half maximum of 100 keV or less for the tracer; however, the tracer yield requirement was met and the tracer peaks are within the tracer region of interest. The tracer peak centroid for samples 1205147420 (MB), 1205147421 (LCS), 1205147422 (LCSD), 585905001 (DOE-1_Qtr 17_S), 585905002 (DOE-2_Qtr 17_S), 585905004 (DOE-4_Qtr 17_S) and 585905005 (BLANK_Qtr 17_S) are greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peaks are within the tracer region of interest.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Prep Logbook

The Preparation of Special Matrices for the Determination of Radionuclides

Batch ID: 2290586

Analyst: Celeste Drayton (CXB7)

Method: Filter Prep

Lab SOP: GL-RAD-A-026 REV# 18

Instrument: NONE

SP-15750050

Due Dates for Lab: 25-JUL-2022

Package: 27-JUL-2022

SDG: 27-JUL-2022

Type Sample Id Description Serial Number Spike Amount Spike Units

#	Sample ID	Prep Date	Min RDL ()	Number of Filters	Container Wt (g)	Weight of total filter with container (g)	Weight of filter Diluted with container (g)	Not Saved Final Volume of filter diluted to in Liters (mL)	Total Filter Weight (g)	Weight of Filter Diluted (g)
1	585905001	18-JUL-2022		1	66.227	69.863	68.123	200	3.636	1.896
2	585905002	18-JUL-2022		1	65.656	69.282	67.442	200	3.626	1.786
3	585905003	18-JUL-2022		1	64.789	68.429	66.45	200	3.64	1.661
4	585905004	18-JUL-2022		1	66.408	70.038	68.116	200	3.63	1.708
5	585905005	18-JUL-2022		1	67.743	71.297	69.556	200	3.554	1.813
6	1205140797 MFB	18-JUL-2022		1	0	1	1	200	1	1

Reagent/Solvent Lot ID	Description	Amount	Comments:
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GEL LABORATORIES LLC

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Qualifier Definition Report for

NORW002 North Wind Solutions

Client SDG: 585905 GEL Work Order: 585905

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- UI Gamma Spectroscopy--Uncertain identification

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Theresa Austin

Date: 28 JUL 2022

Title: Group Leader

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: July 28, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-1_Qtr 17_S
Sample ID: 585905001
Matrix: Filter
Collect Date: 27-JUN-22 09:43
Receive Date: 13-JUL-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.133	+/-0.175	0.223	1.00	pCi/Sample		BV1	07/25/22	1829	2293754		1
Alphaspec Po210, Filter "As Received"													
Polonium-210		6.10	+/-0.562	0.188	0.500	pCi/Sample		BV1	07/23/22	1217	2290613		2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.0614	+/-0.152	0.271	1.00	pCi/Sample		BV1	07/25/22	1829	2294036		3
Plutonium-239/240	U	-0.0322	+/-0.152	0.344	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.580	+/-0.498	0.731	1.00	pCi/Sample		MP2	07/24/22	1400	2290612		4
Thorium-230		1.37	+/-0.615	0.667	1.00	pCi/Sample							
Thorium-232		0.846	+/-0.436	0.317	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		0.986	+/-0.321	0.216	1.00	pCi/Sample		MP2	07/24/22	1437	2290611		5
Uranium-235/236	U	0.121	+/-0.155	0.214	1.00	pCi/Sample							
Uranium-238		0.958	+/-0.311	0.173	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	18.4	+/-17.6	29.5	5.00	pCi/Sample		BV1	07/26/22	2057	2294040		6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-6.48	+/-18.4	30.6		pCi/Sample		MJH1	07/21/22	2247	2290721		7
Beryllium-7		106	+/-53.4	58.4		pCi/Sample							
Cesium-137	U	-1.85	+/-3.12	5.44	20.0	pCi/Sample							
Cobalt-60	U	0.268	+/-4.19	8.08		pCi/Sample							
Potassium-40		143	+/-84.2	53.3		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228	U	-4.82	+/-8.20	15.2	1.00	pCi/Sample		JXC9	07/28/22	0904	2290786		8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium	U	4.02	+/-2.95	4.65	1.00	pCi/Sample		JXC9	07/26/22	1906	2290788		9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	1.79	+/-4.77	8.18	3.00	pCi/Sample		JXK3	07/26/22	1910	2290790		10
The following Prep Methods were performed:													
Method	Description			Analyst	Date	Time	Prep Batch						
Filter Prep	Filter Prep			CXB7	07/18/22	1459	2290586						

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: July 28, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-1_Qtr 17_S
Sample ID: 585905001

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			59.9	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			70.5	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			88.6	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			43	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			76.3	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			88.6	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			47.3	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			97	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			46.2	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: July 28, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-2_Qtr 17_S
Sample ID: 585905002
Matrix: Filter
Collect Date: 27-JUN-22 09:52
Receive Date: 13-JUL-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0405	+/-0.186	0.361	1.00	pCi/Sample		BV1	07/25/22	1829	2293754		1
Alphaspec Po210, Filter "As Received"													
Polonium-210		6.37	+/-0.623	0.257	0.500	pCi/Sample		BV1	07/23/22	1217	2290613		2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	-0.0168	+/-0.111	0.260	1.00	pCi/Sample		BV1	07/25/22	1829	2294036		3
Plutonium-239/240	U	-0.0165	+/-0.0785	0.191	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.413	+/-0.363	0.420	1.00	pCi/Sample		MP2	07/24/22	1400	2290612		4
Thorium-230		1.36	+/-0.611	0.568	1.00	pCi/Sample							
Thorium-232		0.742	+/-0.427	0.243	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		0.855	+/-0.307	0.259	1.00	pCi/Sample		MP2	07/24/22	1339	2290611		5
Uranium-235/236	U	0.0148	+/-0.0926	0.175	1.00	pCi/Sample							
Uranium-238		0.458	+/-0.235	0.242	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	22.0	+/-20.6	34.5	5.00	pCi/Sample		BV1	07/26/22	2258	2294040		6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	5.37	+/-19.1	31.6		pCi/Sample		MJH1	07/21/22	2248	2290721		7
Beryllium-7	UI	86.0	+/-91.9	70.6		pCi/Sample							
Cesium-137	U	1.40	+/-5.43	7.61	20.0	pCi/Sample							
Cobalt-60	U	4.19	+/-4.26	9.21		pCi/Sample							
Potassium-40		128	+/-98.2	85.1		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228	U	2.56	+/-6.96	12.3	1.00	pCi/Sample		JXC9	07/28/22	0905	2290786		8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium	U	-1.99	+/-2.76	5.37	1.00	pCi/Sample		JXC9	07/26/22	1906	2290788		9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	2.79	+/-4.31	7.29	3.00	pCi/Sample		JXK3	07/26/22	1910	2290790		10

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXB7	07/18/22	1459	2290586

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: July 28, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-2_Qtr 17_S
Sample ID: 585905002
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			61.8	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			61	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			83.3	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			39	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			85.1	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			83.3	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			46	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			104	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			62.4	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: July 28, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-3_Qtr 17_S
Sample ID: 585905003
Matrix: Filter
Collect Date: 27-JUN-22 10:01
Receive Date: 13-JUL-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	-0.0819	+/-0.198	0.505	1.00	pCi/Sample			BV1	07/25/22	1829	2293754	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		5.65	+/-0.634	0.318	0.500	pCi/Sample			BV1	07/23/22	1217	2290613	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.0319	+/-0.123	0.227	1.00	pCi/Sample			BV1	07/25/22	1829	2294036	3
Plutonium-239/240	U	0.0319	+/-0.122	0.227	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228		0.866	+/-0.539	0.704	1.00	pCi/Sample			MP2	07/24/22	1400	2290612	4
Thorium-230		0.994	+/-0.567	0.729	1.00	pCi/Sample							
Thorium-232		0.538	+/-0.400	0.506	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		0.619	+/-0.298	0.343	1.00	pCi/Sample			MP2	07/24/22	1339	2290611	5
Uranium-235/236	U	0.0933	+/-0.182	0.315	1.00	pCi/Sample							
Uranium-238		0.875	+/-0.325	0.295	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	3.54	+/-22.3	37.9	5.00	pCi/Sample			BV1	07/27/22	0209	2294040	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-15.7	+/-20.4	32.0		pCi/Sample			MJH1	07/21/22	2249	2290721	7
Beryllium-7		136	+/-86.3	66.9		pCi/Sample							
Cesium-137	U	0.659	+/-5.16	7.77	20.0	pCi/Sample							
Cobalt-60	U	-0.246	+/-4.21	7.88		pCi/Sample							
Potassium-40		84.4	+/-77.1	76.9		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228	U	-7.09	+/-8.59	16.4	1.00	pCi/Sample			JXC9	07/28/22	0905	2290786	8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium	U	6.08	+/-4.25	6.79	1.00	pCi/Sample			JXC9	07/26/22	1906	2290788	9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	4.00	+/-4.43	7.45	3.00	pCi/Sample			JXK3	07/26/22	1910	2290790	10

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXB7	07/18/22	1459	2290586

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: July 28, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-3_Qtr 17_S
Sample ID: 585905003
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			54.6	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			53.5	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			80.9	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			48.2	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			82.1	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			80.9	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			45.4	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			103	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			53.2	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: July 28, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-4_Qtr 17_S
Sample ID: 585905004
Matrix: Filter
Collect Date: 27-JUN-22 10:08
Receive Date: 13-JUL-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0725	+/-0.128	0.109	1.00	pCi/Sample		BV1	07/25/22	1829	2293754		1
Alphaspec Po210, Filter "As Received"													
Polonium-210		6.07	+/-0.569	0.131	0.500	pCi/Sample		BV1	07/23/22	1219	2290613		2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	-0.0186	+/-0.123	0.287	1.00	pCi/Sample		BV1	07/25/22	1829	2294036		3
Plutonium-239/240	U	-0.0185	+/-0.123	0.287	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.535	+/-0.451	0.600	1.00	pCi/Sample		MP2	07/24/22	1400	2290612		4
Thorium-230		1.36	+/-0.599	0.500	1.00	pCi/Sample							
Thorium-232	U	0.282	+/-0.317	0.421	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		0.866	+/-0.327	0.294	1.00	pCi/Sample		MP2	07/24/22	1339	2290611		5
Uranium-235/236	U	-0.000972	+/-0.153	0.325	1.00	pCi/Sample							
Uranium-238		0.405	+/-0.257	0.328	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	17.8	+/-25.2	42.4	5.00	pCi/Sample		BV1	07/27/22	0410	2294040		6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-33.3	+/-27.0	29.1		pCi/Sample		MJH1	07/21/22	2250	2290721		7
Beryllium-7		90.3	+/-72.8	69.4		pCi/Sample							
Cesium-137	U	-1.50	+/-3.40	5.95	20.0	pCi/Sample							
Cobalt-60	U	1.37	+/-3.28	7.05		pCi/Sample							
Potassium-40		163	+/-90.4	63.8		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228	U	1.58	+/-5.08	8.92	1.00	pCi/Sample		JXC9	07/28/22	0905	2290786		8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium		5.04	+/-2.69	3.91	1.00	pCi/Sample		JXC9	07/26/22	1906	2290788		9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	4.77	+/-4.07	6.75	3.00	pCi/Sample		JXK3	07/26/22	1910	2290790		10
The following Prep Methods were performed:													
Method	Description			Analyst	Date	Time	Prep Batch						
Filter Prep	Filter Prep			CXB7	07/18/22	1459	2290586						

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Certificate of Analysis

Report Date: July 28, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-4_Qtr 17_S
Sample ID: 585905004
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			73.9	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			66	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			70.7	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			40.3	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			80.6	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			70.7	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			78.5	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			106	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			48.6	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: July 28, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: BLANK_Qtr 17_S
Sample ID: 585905005
Matrix: Filter
Collect Date: 27-JUN-22 12:00
Receive Date: 13-JUL-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0305	+/-0.140	0.272	1.00	pCi/Sample		BV1	07/25/22	1829	2293754		1
Alphaspec Po210, Filter "As Received"													
Polonium-210		0.283	+/-0.180	0.251	0.500	pCi/Sample		BV1	07/23/22	1219	2290613		2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.195	+/-0.220	0.328	1.00	pCi/Sample		BV1	07/25/22	1829	2294036		3
Plutonium-239/240	U	0.0311	+/-0.201	0.395	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228		0.690	+/-0.489	0.645	1.00	pCi/Sample		MP2	07/24/22	1400	2290612		4
Thorium-230		1.29	+/-0.584	0.602	1.00	pCi/Sample							
Thorium-232		0.926	+/-0.464	0.376	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		1.14	+/-0.346	0.256	1.00	pCi/Sample		MP2	07/24/22	1339	2290611		5
Uranium-235/236	U	-0.121	+/-0.177	0.428	1.00	pCi/Sample							
Uranium-238		0.610	+/-0.259	0.225	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	6.01	+/-21.3	36.1	5.00	pCi/Sample		BV1	07/27/22	0706	2294040		6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-1.13	+/-21.6	35.3		pCi/Sample		MJH1	07/21/22	2252	2290721		7
Beryllium-7	U	-7.00	+/-37.1	66.9		pCi/Sample							
Cesium-137	U	1.08	+/-3.89	7.33	20.0	pCi/Sample							
Cobalt-60	U	0.801	+/-4.18	8.36		pCi/Sample							
Potassium-40	UI	78.8	+/-90.0	53.2		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228	U	0.871	+/-6.25	11.3	1.00	pCi/Sample		JXC9	07/28/22	0905	2290786		8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium	U	4.29	+/-3.26	5.01	1.00	pCi/Sample		JXC9	07/26/22	1906	2290788		9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	1.32	+/-2.95	5.06	3.00	pCi/Sample		JXK3	07/27/22	1014	2290790		10

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXB7	07/18/22	1459	2290586

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: July 28, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: BLANK_Qtr 17_S
Sample ID: 585905005
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			84.4	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			63.2	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			75.4	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			40.7	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			78.7	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			75.4	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			46.6	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			57.5	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			50.9	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: July 28, 2022

Page 1 of 6

Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina
Ms. Candace Christensen

Contact:
Workorder: 585905

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2290611										
QC1205140834	LCS										
Uranium-233/234				17.9 pCi/Sample					MP2	07/25/22	08:43
	Uncertainty			+/-2.57							
Uranium-235/236				0.663 pCi/Sample							
	Uncertainty			+/-0.611							
Uranium-238	21.3			19.3 pCi/Sample			90.5	(75%-125%)			
	Uncertainty			+/-2.66							
QC1205140835	LCSD										
Uranium-233/234				20.2 pCi/Sample		12.2				07/25/22	08:43
	Uncertainty			+/-2.84							
Uranium-235/236				1.07 pCi/Sample		47.2					
	Uncertainty			+/-0.789							
Uranium-238	21.3			23.4 pCi/Sample		19.5	110	(0%-20%)			
	Uncertainty			+/-3.05							
QC1205140833	MB										
Uranium-233/234			U	-0.0155 pCi/Sample						07/24/22	13:39
	Uncertainty			+/-0.139							
Uranium-235/236			U	0.0464 pCi/Sample							
	Uncertainty			+/-0.114							
Uranium-238			U	0.0626 pCi/Sample							
	Uncertainty			+/-0.104							
Batch	2290612										
QC1205140838	LCS										
Thorium-228				15.8 pCi/Sample					MP2	07/24/22	14:00
	Uncertainty			+/-1.16							
Thorium-230				1.96 pCi/Sample				(75%-125%)			
	Uncertainty			+/-0.431							
Thorium-232	15.3			15.7 pCi/Sample			102	(75%-125%)			
	Uncertainty			+/-1.15							

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 585905

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2290612										
QC1205140839	LCSD										
Thorium-228				15.8 pCi/Sample		0.273			MP2	07/24/22	14:00
	Uncertainty			+/-1.69							
Thorium-230				2.69 pCi/Sample		31.2*		(0%-20%)			
	Uncertainty			+/-0.745							
Thorium-232	15.3			16.6 pCi/Sample		5.36	108	(0%-20%)			
	Uncertainty			+/-1.69							
QC1205140836	MB										
Thorium-228			U	0.0232 pCi/Sample						07/24/22	14:00
	Uncertainty			+/-0.128							
Thorium-230				0.509 pCi/Sample							
	Uncertainty			+/-0.279							
Thorium-232			U	0.0428 pCi/Sample							
	Uncertainty			+/-0.106							
Batch	2290613										
QC1205140841	LCS										
Polonium-210	16.5			15.3 pCi/Sample			92.6	(75%-125%)	BV1	07/23/22	12:19
	Uncertainty			+/-0.871							
QC1205140842	LCSD										
Polonium-210	16.5			15.3 pCi/Sample		0.0727	92.7	(0%-20%)		07/23/22	12:19
	Uncertainty			+/-0.892							
QC1205140840	MB										
Polonium-210			U	-0.0811 pCi/Sample						07/23/22	12:19
	Uncertainty			+/-0.119							
Batch	2293754										
QC1205146817	LCS										
Americium-241	17.2			14.5 pCi/Sample			84.3	(75%-125%)	BV1	07/25/22	18:29
	Uncertainty			+/-1.18							
QC1205146818	LCSD										
Americium-241	17.2			13.9 pCi/Sample		3.97	81	(0%-20%)		07/25/22	18:29
	Uncertainty			+/-1.13							
QC1205146816	MB										
Americium-241			U	-0.0653 pCi/Sample						07/25/22	18:29
	Uncertainty			+/-0.0806							

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QC Summary

Workorder: 585905

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2294036										
QC1205147418	LCS			0.0837 pCi/Sample					BV1	07/25/22	18:29
Plutonium-238				+/-0.113							
	Uncertainty										
Plutonium-239/240	18.0			15.0 pCi/Sample			83.3	(75%-125%)			
	Uncertainty			+/-1.27							
QC1205147419	LCSD										
Plutonium-238			U	0.117 pCi/Sample		98.2				07/25/22	18:29
				+/-0.158							
	Uncertainty										
Plutonium-239/240	18.0			14.1 pCi/Sample		6.31	78.2	(0%-20%)			
	Uncertainty			+/-1.20							
QC1205147417	MB										
Plutonium-238			U	0.125 pCi/Sample						07/25/22	18:29
				+/-0.222							
	Uncertainty										
Plutonium-239/240			U	0.0301 pCi/Sample							
				+/-0.194							
	Uncertainty										
Batch	2294040										
QC1205147421	LCS										
Plutonium-241	634			700 pCi/Sample			110	(75%-125%)	BV1	07/27/22	11:09
	Uncertainty			+/-76.1							
QC1205147422	LCSD										
Plutonium-241	634			680 pCi/Sample		2.82	107	(0%-20%)		07/27/22	11:25
	Uncertainty			+/-69.1							
QC1205147420	MB										
Plutonium-241			U	-7.23 pCi/Sample						07/27/22	09:08
				+/-17.0							
	Uncertainty										
Rad Gamma Spec											
Batch	2290721										
QC1205141123	585885001	DUP									
Actinium-228			U	52.0 pCi/Sample		74.4		(0% - 100%)	MJH1	07/21/22	23:03
				+/-26.3							
	Uncertainty										
Beryllium-7				228 pCi/Sample		20.1		(0% - 100%)			
				+/-68.7							
	Uncertainty										
Cesium-137			U	5.81 pCi/Sample		N/A			N/A		
				+/-4.33							
	Uncertainty										

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QC Summary

Workorder: 585905

Page 4 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	2290721										
Cobalt-60	U	-3.40	U	-0.457	pCi/Sample	N/A		N/A	MJH1	07/21/22	23:03
	Uncertainty	+/-3.21		+/-4.07							
Potassium-40		83.2	U	89.7	pCi/Sample	44		(0% - 100%)			
	Uncertainty	+/-79.9		+/-59.4							
QC1205141124	LCS										
Americium-241	99800			1.06E+05	pCi/Sample		106	(75%-125%)		07/21/22	22:56
	Uncertainty			+/-3000							
Actinium-228			U	386	pCi/Sample						
	Uncertainty			+/-439							
Beryllium-7			U	-123	pCi/Sample						
	Uncertainty			+/-985							
Cesium-137	29700			29600	pCi/Sample		99.6	(75%-125%)			
	Uncertainty			+/-712							
Cobalt-60	11300			11600	pCi/Sample		102	(75%-125%)			
	Uncertainty			+/-553							
Potassium-40			U	-1.61	pCi/Sample						
	Uncertainty			+/-306							
QC1205141122	MB										
Actinium-228			U	-7.70	pCi/Sample					07/21/22	22:54
	Uncertainty			+/-25.7							
Beryllium-7			U	-2.83	pCi/Sample						
	Uncertainty			+/-31.0							
Cesium-137			U	3.69	pCi/Sample						
	Uncertainty			+/-8.15							
Cobalt-60			U	0.699	pCi/Sample						
	Uncertainty			+/-5.57							
Potassium-40			U	15.5	pCi/Sample						
	Uncertainty			+/-113							
Rad Gas Flow											
Batch	2290786										
QC1205141307	LCS										
Radium-228	175			181	pCi/Sample		104	(75%-125%)	JXC9	07/28/22	09:04
	Uncertainty			+/-13.5							

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QC Summary

Workorder: 585905

Page 5 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2290786										
QC1205141308	LCSD										
Radium-228	175			211 pCi/Sample		15.3	121	(0%-20%)	JXC9	07/28/22	09:04
	Uncertainty			+/-15.5							
QC1205141306	MB										
Radium-228			U	-2.03 pCi/Sample						07/28/22	09:05
	Uncertainty			+/-3.48							
Batch	2290788										
QC1205141313	LCS										
Total Radium	8310			7850 pCi/Sample			94.5	(75%-125%)	JXC9	07/26/22	14:57
	Uncertainty			+/-202							
QC1205141314	LCSD										
Total Radium	8310			7610 pCi/Sample		3.1	91.6	(0%-20%)		07/26/22	14:57
	Uncertainty			+/-196							
QC1205141312	MB										
Total Radium			U	0.508 pCi/Sample						07/26/22	19:06
	Uncertainty			+/-3.07							
Batch	2290790										
QC1205141316	LCS										
Strontium-90	410			454 pCi/Sample			111	(75%-125%)	JXK3	07/26/22	17:47
	Uncertainty			+/-32.5							
QC1205141317	LCSD										
Strontium-90	410			417 pCi/Sample		8.38	102	(0%-20%)		07/26/22	17:47
	Uncertainty			+/-30.9							
QC1205141315	MB										
Strontium-90			U	-0.285 pCi/Sample						07/27/22	10:14
	Uncertainty			+/-3.10							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- ** Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

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QC Summary

Workorder: 585905

Page 6 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J	See case narrative for an explanation										
J	Value is estimated										
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.										
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.										
M	M if above MDC and less than LLD										
M	REMP Result > MDC/CL and < RDL										
N/A	RPD or %Recovery limits do not apply.										
N1	See case narrative										
ND	Analyte concentration is not detected above the detection limit										
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.										
R	Sample results are rejected										
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.										
UI	Gamma Spectroscopy--Uncertain identification										
UJ	Gamma Spectroscopy--Uncertain identification										
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.										
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.										
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.										
h	Preparation or preservation holding time was exceeded										

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Alpha Spectroscopy Raw Data

Batch 2290612 Check-list

This check-list was completed on 25-JUL-22 by Melanie Aycock

This batch was reviewed by Jessica Davis on 25-JUL-22 and Melanie Aycock on 25-JUL-22.

Batch ID:
2290612

Product:
ASP__THF

Description: Alpha Spec Thorium
GL-RAD-A-038

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?	Yes		
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Thorium

Batch ID: 2290612
Analyst: Michael Potts (MP2)
Method: DOE EML HASL-300, Th-01-RC
 Modified
Lab SOP: GL-RAD-A-038 REV# 18
Instrument: SP-C018367602

Due Dates for Lab: 26-JUL-2022

Package: 27-JUL-2022

SDG: 27-JUL-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205140838	Thorium-232 AS SPIKE	1513-C	.1	mL
LCSD	1205140839	Thorium-232 AS SPIKE	1513-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	585885001	22-JUL-2022	1	45.6	0.11724
3	585885003	22-JUL-2022	1	45.3	0.1295
4	585905001	22-JUL-2022	1	45.6	0.11889
5	585905002	22-JUL-2022	1	45.9	0.11304
6	585905003	22-JUL-2022	1	45.6	0.10404
7	585905004	22-JUL-2022	1	45.5	0.10704
8	585905005	22-JUL-2022	1	45	0.11477
9	1205140836 MB	22-JUL-2022	1		0.1295
10	1205140838 LCS	22-JUL-2022	1		0.1295
11	1205140839 LCSD	22-JUL-2022	1		0.1295

Reagent/Solvent Lot ID	Description	Amount
WORK 1845-G	Thorium-229 AS TRACER, RASP	.1 mL

Comments:

Pipet ID: RAD-ASP-184002Z
 Data Entry Date2: 22-JUL-2022 00:00

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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

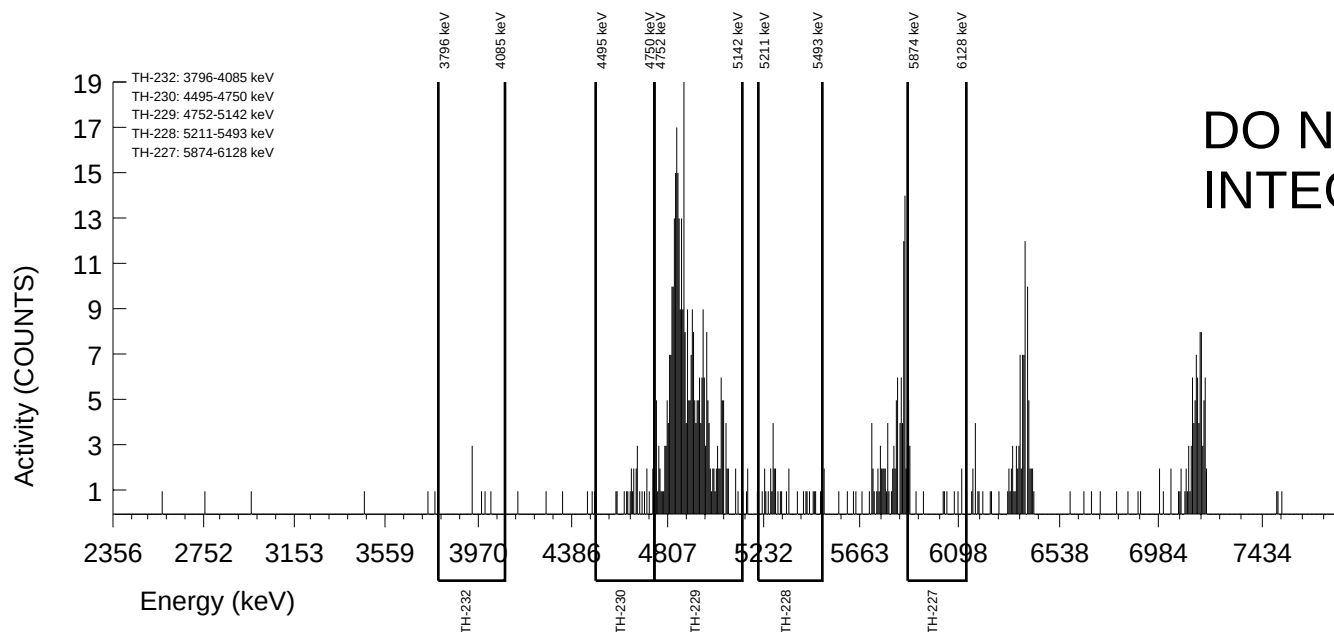
BATCH NUMBER : 2290612 SAMPLE ID : S0585905004_TH SAMPLE QTY : 0.107 F +/-0.934 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 40.3 +/-5.960 %	CHAMBER : 043 DETECTOR S/N : 155792 AVERAGE %EFFICIENCY : 35.6168 AVERAGE %EFF ERROR : 0.6864 COUNT DATE : 24-Jul-2022 14:00:46 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : TH(2) BKG FILE : B043.CNF;2475 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W043.CNF;692 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 1.9578E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5961.48	0.000	17.000	6.395	10.605	3.2565	57.440	1.81E+00	2.71E+00	4.58E+00	1.86E+00	2.70E+00
TH-228	5363.00	5322.03	8.198	32.000	25.918	6.060	2.4617	99.940	1.55E+00	7.32E-01	7.74E-01	2.97E-01	7.06E-01
TH-229	4900.00	4901.23	54.259	356.000	350.445	5.555	2.3569	99.520	2.05E+01	3.34E+00	7.31E-01	2.78E-01	2.17E+00
TH-230	4671.39	4674.75	0.000	26.000	23.387	0.505	0.7106	99.700	1.36E+00	6.27E-01	5.00E-01	1.62E-01	5.99E-01
TH-232	3972.00	3974.43	4.919	6.000	4.849	1.010	1.0050	100.000	2.82E-01	3.19E-01	4.21E-01	1.23E-01	3.17E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.022 +/-0.000)
TH-230 (2.108 +/-0.033)
TH-232 (0.141 +/-0.002)



DO NOT REPORT
INTEGRATED

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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

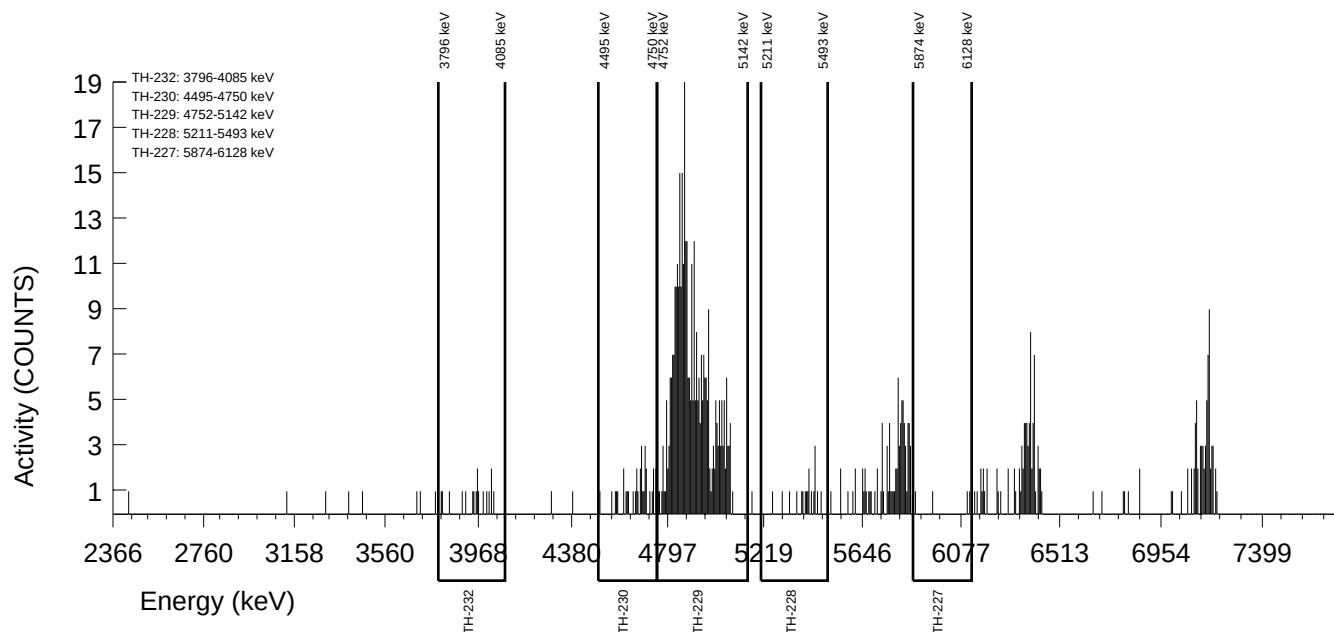
BATCH NUMBER : 2290612 SAMPLE ID : S0585905001_TH SAMPLE QTY : 0.119 F +/-0.841 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 43.0 +/-5.922 %	CHAMBER : 040 DETECTOR S/N : 78773 AVERAGE %EFFICIENCY : 33.6905 AVERAGE %EFF ERROR : 0.6501 COUNT DATE : 24-Jul-2022 14:00:45 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : TH(2) BKG FILE : B040.CNF;2447 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W040.CNF;644 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 2.0934E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5968.59	0.000	6.000	-6.120	12.120	3.4814	57.440	-1.54E+00	1.81E+00	4.30E+00	1.77E+00	1.81E+00
TH-228	5363.00	5398.89	29.320	18.000	10.908	7.070	2.6589	99.940	5.80E-01	5.03E-01	7.31E-01	2.86E-01	4.98E-01
TH-229	4900.00	4904.59	80.745	359.000	354.455	4.545	2.1319	99.520	1.84E+01	2.99E+00	6.03E-01	2.24E-01	1.94E+00
TH-230	4671.39	4660.95	134.382	33.000	26.323	4.545	2.1319	99.700	1.37E+00	6.41E-01	6.67E-01	2.56E-01	6.15E-01
TH-232	3972.00	3946.60	65.969	17.000	16.352	0.505	0.7106	100.000	8.46E-01	4.49E-01	3.17E-01	8.09E-02	4.36E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.022 +/-0.000)
TH-230 (2.132 +/-0.033)
TH-232 (0.143 +/-0.002)



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ALPHA SPECTROSCOPY REPORT

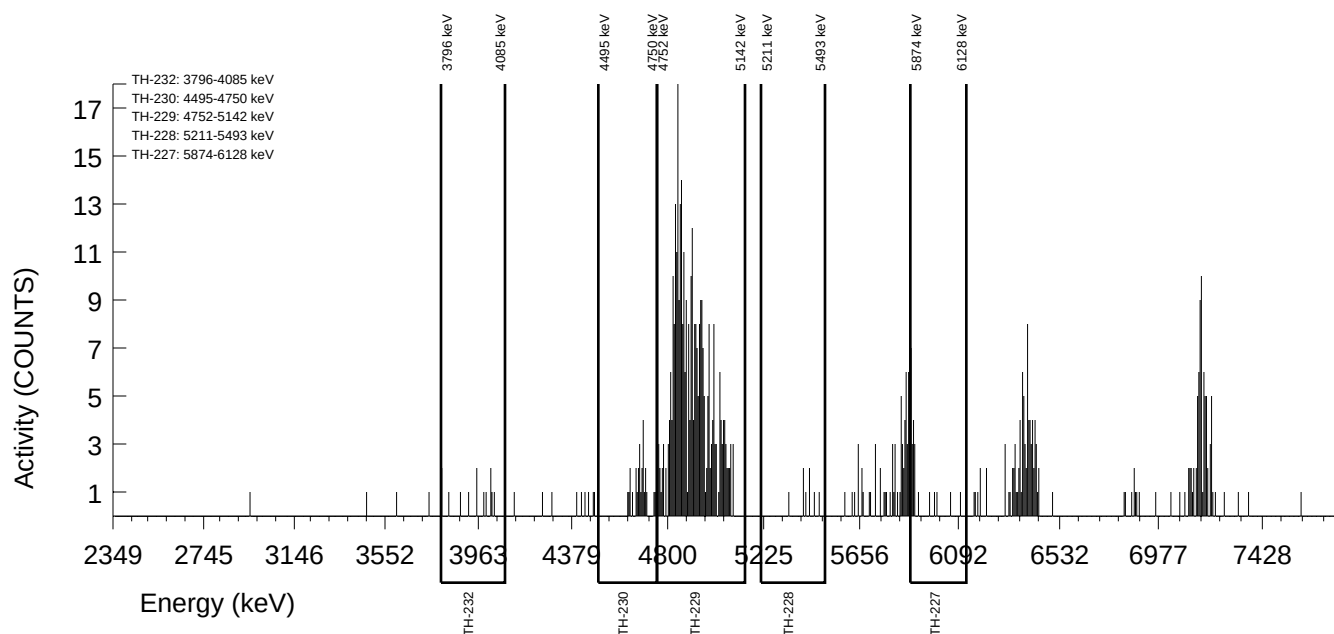
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2290612 SAMPLE ID : S0585905002_TH SAMPLE QTY : 0.113 F +/-0.885 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 39.0 +/-6.102 %	CHAMBER : 041 DETECTOR S/N : 158121 AVERAGE %EFFICIENCY : 35.1225 AVERAGE %EFF ERROR : 0.6771 COUNT DATE : 24-Jul-2022 14:00:45 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : TH(2) BKG FILE : B041.CNF;2456 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W041.CNF;692 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 1.8946E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5907.45	0.000	28.000	9.315	18.685	4.3226	57.440	2.62E+00	3.45E+00	5.75E+00	2.45E+00	3.43E+00
TH-228	5363.00	5417.26	29.523	8.000	6.969	1.010	1.0050	99.940	4.13E-01	3.67E-01	4.20E-01	1.21E-01	3.63E-01
TH-229	4900.00	4909.46	81.392	342.000	334.425	7.575	2.7523	99.520	1.94E+01	3.24E+00	8.18E-01	3.22E-01	2.12E+00
TH-230	4671.39	4683.13	22.962	27.000	23.473	1.515	1.2309	99.700	1.36E+00	6.39E-01	5.68E-01	1.97E-01	6.11E-01
TH-232	3972.00	3942.43	214.040	13.000	12.865	0.000	1.0000	100.000	7.42E-01	4.37E-01	2.43E-01	1.21E-01	4.27E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.021 +/-0.000)
 TH-230 (2.012 +/-0.031)
 TH-232 (0.135 +/-0.002)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

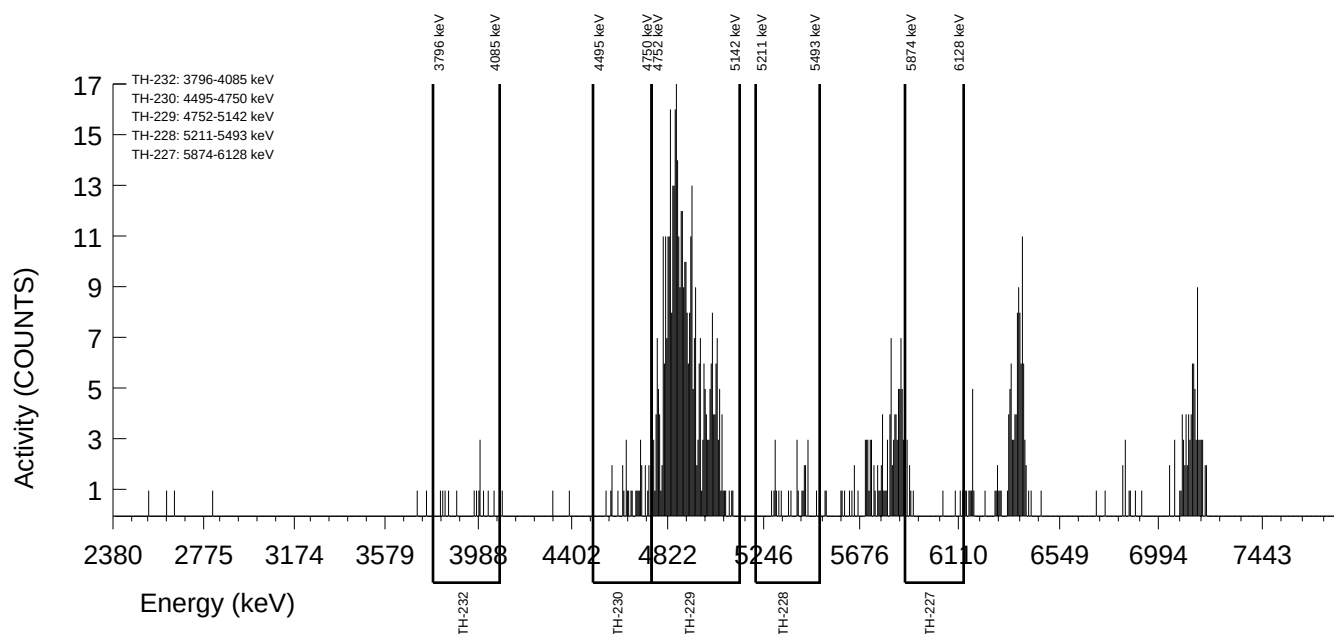
BATCH NUMBER : 2290612 SAMPLE ID : S0585905003_TH SAMPLE QTY : 0.104 F +/-0.961 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 48.2 +/-5.534 %	CHAMBER : 042 DETECTOR S/N : 78793 AVERAGE %EFFICIENCY : 35.6923 AVERAGE %EFF ERROR : 0.6878 COUNT DATE : 24-Jul-2022 14:00:45 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : TH(2) BKG FILE : B042.CNF;2443 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W042.CNF;640 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 2.3466E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5964.26	14.696	11.000	0.395	10.605	3.2565	57.440	9.59E-02	2.00E+00	3.92E+00	1.60E+00	2.00E+00
TH-228	5363.00	5379.81	138.384	24.000	16.904	7.070	2.6589	99.940	8.66E-01	5.48E-01	7.04E-01	2.75E-01	5.39E-01
TH-229	4900.00	4900.23	133.971	428.000	420.930	7.070	2.6589	99.520	2.11E+01	3.19E+00	6.87E-01	2.68E-01	2.04E+00
TH-230	4671.39	4666.62	155.529	29.000	19.903	6.565	2.5622	99.700	9.94E-01	5.82E-01	7.29E-01	2.89E-01	5.67E-01
TH-232	3972.00	3950.45	6.123	14.000	10.801	3.030	1.7407	100.000	5.38E-01	4.05E-01	5.06E-01	1.78E-01	4.00E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.026 +/-0.000)
 TH-230 (2.532 +/-0.039)
 TH-232 (0.169 +/-0.003)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2290612 SAMPLE ID : S0585905004_TH SAMPLE QTY : 0.107 F +/-0.934 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 40.3 +/-5.960 %	CHAMBER : 043 DETECTOR S/N : 155792 AVERAGE %EFFICIENCY : 35.6168 AVERAGE %EFF ERROR : 0.6864 COUNT DATE : 24-Jul-2022 14:00:46 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : TH(2) BKG FILE : B043.CNF;2475 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W043.CNF;692 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 1.9578E+00 dpm		

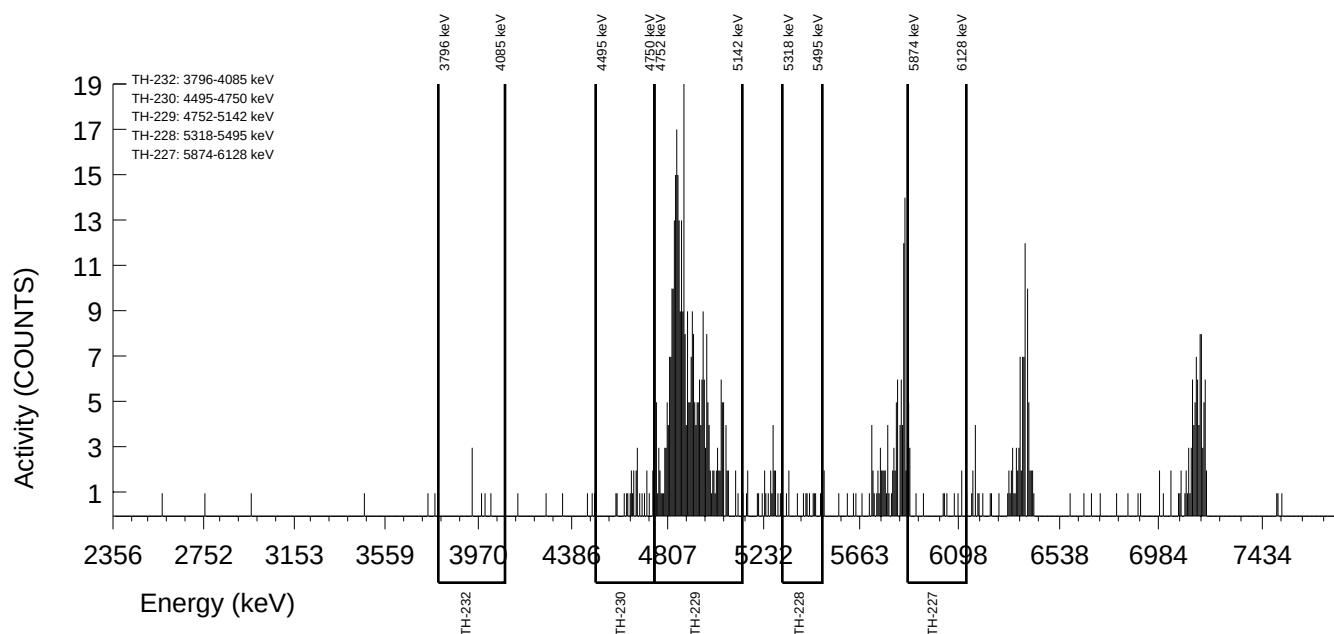
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5961.48	0.000	17.000	6.395	10.605	3.2565	57.440	1.81E+00	2.71E+00	4.58E+00	1.86E+00	2.70E+00
TH-228	5363.00	5412.70	4.919	12.000	8.948	3.030	1.7407	99.940	5.35E-01	4.55E-01	6.00E-01	2.10E-01	4.51E-01
TH-229	4900.00	4901.23	54.259	356.000	350.445	5.555	2.3569	99.520	2.05E+01	3.34E+00	7.31E-01	2.78E-01	2.17E+00
TH-230	4671.39	4674.75	0.000	26.000	23.387	0.505	0.7106	99.700	1.36E+00	6.27E-01	5.00E-01	1.62E-01	5.99E-01
TH-232	3972.00	3974.43	4.919	6.000	4.849	1.010	1.0050	100.000	2.82E-01	3.19E-01	4.21E-01	1.23E-01	3.17E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.022 +/-0.000)
 TH-230 (2.108 +/-0.033)
 TH-232 (0.141 +/-0.002)

* Regions have been manually adjusted



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

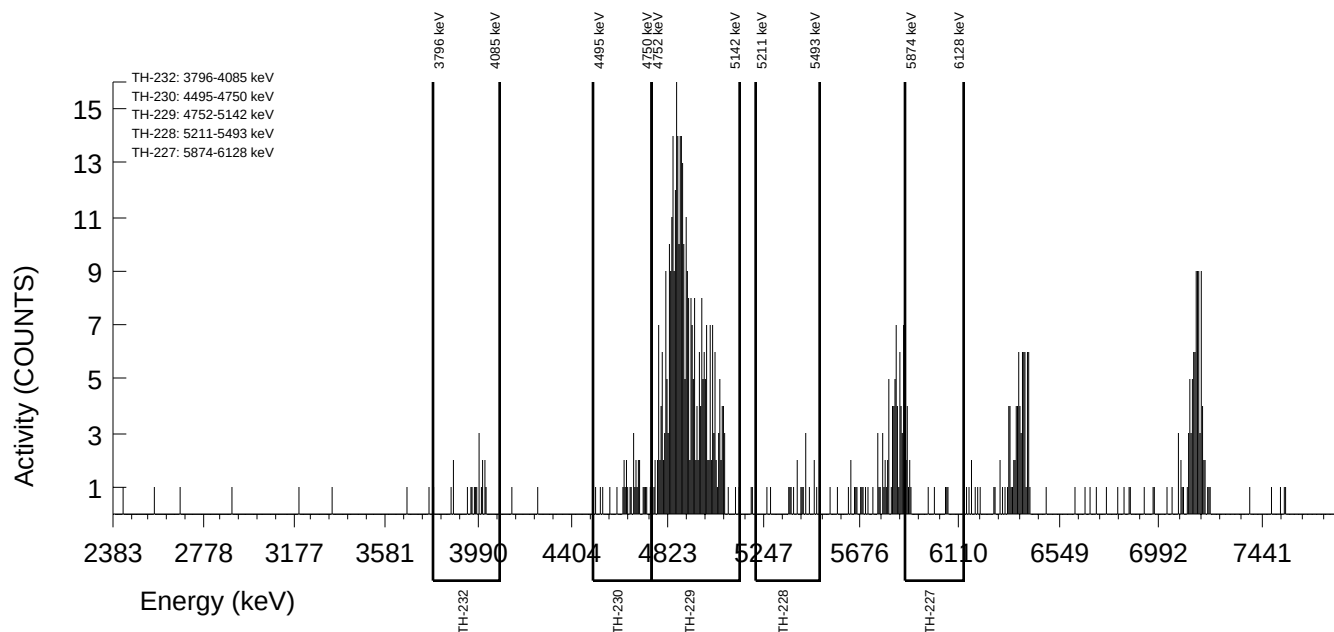
BATCH NUMBER : 2290612 SAMPLE ID : S0585905005_TH SAMPLE QTY : 0.115 F +/-0.871 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 40.7 +/-5.856 %	CHAMBER : 044 DETECTOR S/N : 80060 AVERAGE %EFFICIENCY : 36.8199 AVERAGE %EFF ERROR : 0.7091 COUNT DATE : 24-Jul-2022 14:00:46 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : TH(2) BKG FILE : B044.CNF;2474 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W044.CNF;674 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 1.9776E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5932.62	8.163	15.000	0.860	14.140	3.7603	57.440	2.18E-01	2.40E+00	4.60E+00	1.92E+00	2.40E+00
TH-228	5363.00	5402.55	71.021	18.000	12.928	5.050	2.2472	99.940	6.90E-01	4.96E-01	6.45E-01	2.43E-01	4.89E-01
TH-229	4900.00	4909.10	93.878	372.000	365.940	6.060	2.4617	99.520	1.91E+01	3.06E+00	6.75E-01	2.59E-01	1.98E+00
TH-230	4671.39	4659.46	67.348	30.000	24.768	3.030	1.7407	99.700	1.29E+00	6.09E-01	6.02E-01	2.23E-01	5.84E-01
TH-232	3972.00	3964.41	135.920	19.000	17.843	1.010	1.0050	100.000	9.26E-01	4.77E-01	3.76E-01	1.10E-01	4.64E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.022 +/-0.000)
 TH-230 (2.202 +/-0.034)
 TH-232 (0.147 +/-0.002)



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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

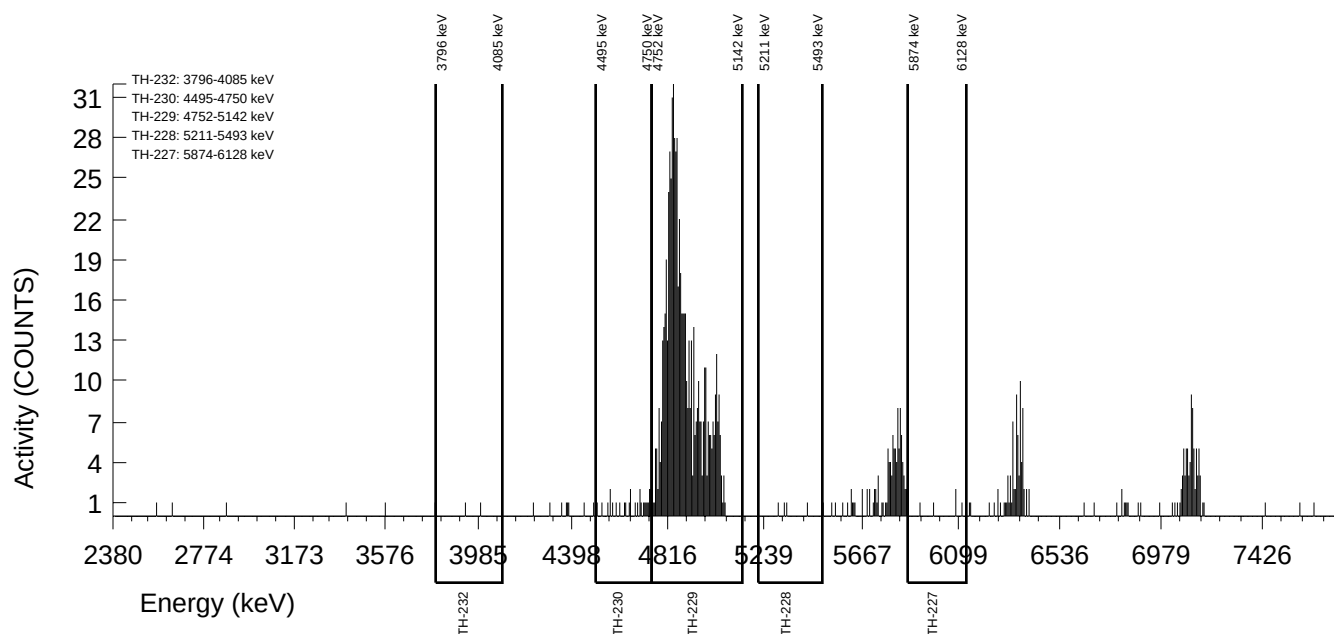
BATCH NUMBER : 2290612 SAMPLE ID : S1205140836_TH SAMPLE QTY : 0.130 F +/-0.772 % SAMPLE DATE : 22-Jul-2022 00:00:00 ANALYST : MP2 % YIELD : 80.1 +/-4.608 %	CHAMBER : 045 DETECTOR S/N : 78783 AVERAGE %EFFICIENCY : 34.5344 AVERAGE %EFF ERROR : 0.6659 COUNT DATE : 24-Jul-2022 14:00:46 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : TH(2) BKG FILE : B045.CNF;2459 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W045.CNF;650 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 3.8974E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	6038.70	0.000	8.000	-2.605	10.605	3.2565	57.440	-1.25E-01	3.60E-01	7.75E-01	3.15E-01	3.60E-01
TH-228	5363.00	5350.73	122.338	4.000	0.928	3.030	1.7407	99.940	2.32E-02	1.28E-01	2.51E-01	8.81E-02	1.28E-01
TH-229	4900.00	4885.97	65.655	683.000	676.435	6.565	2.5622	99.520	1.69E+01	2.11E+00	3.34E-01	1.29E-01	1.29E+00
TH-230	4671.39	4662.69	0.000	29.000	20.385	4.545	2.1319	99.700	5.09E-01	2.86E-01	3.46E-01	1.36E-01	2.79E-01
TH-232	3972.00	3906.12	0.000	3.000	1.718	1.010	1.0050	100.000	4.28E-02	1.07E-01	1.84E-01	5.48E-02	1.06E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.042 +/-0.001)
 TH-230 (4.070 +/-0.063)
 TH-232 (0.272 +/-0.004)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

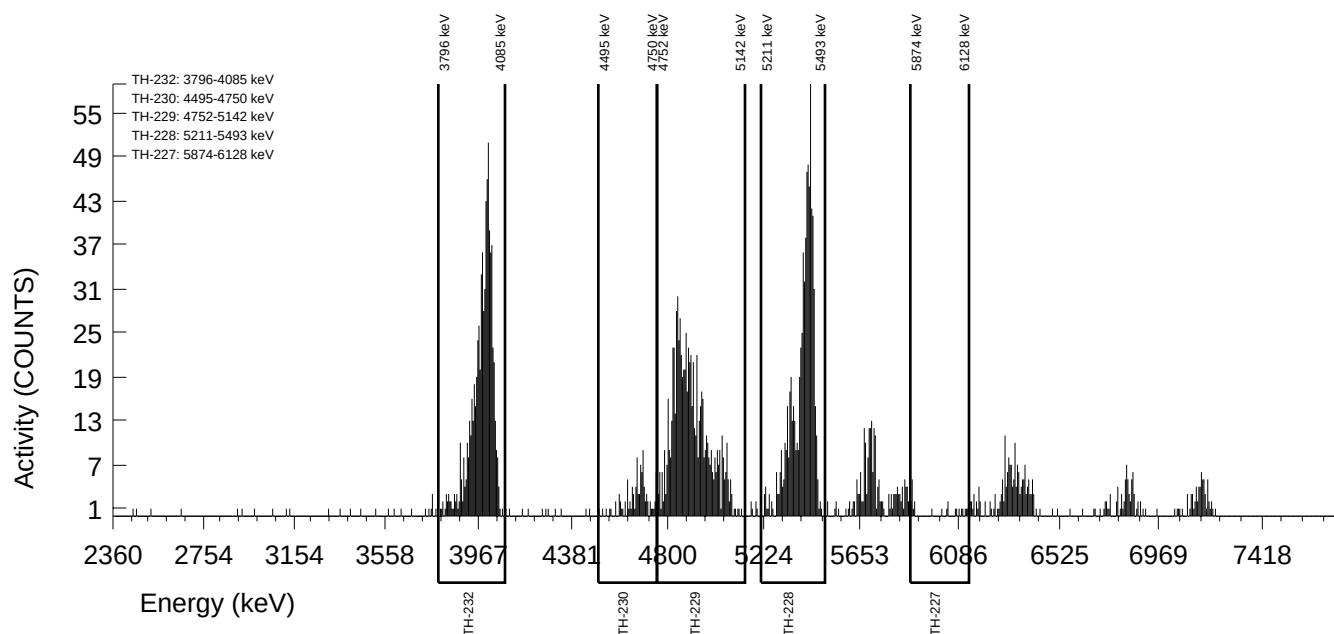
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2290612 SAMPLE ID : S1205140838_TH SAMPLE QTY : 0.130 F +/-0.772 % SAMPLE DATE : 22-Jul-2022 00:00:00 ANALYST : MP2 % YIELD : 88.5 +/-4.404 %	CHAMBER : 047 DETECTOR S/N : 80064 AVERAGE %EFFICIENCY : 35.4924 AVERAGE %EFF ERROR : 0.6840 COUNT DATE : 24-Jul-2022 14:00:46 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : TH(2) BKG FILE : B047.CNF;2465 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W047.CNF;654 CAL DATE : 02-Jul-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 4.3052E+00 dpm	LCS ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.5335E+01 % RECOVERY 102.390	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma	MDA pCi/F	Lc	1.96-sigma
										TPU pCi/F		pCi/F	cnt Unc pCi/F
TH-227	5994.04	5986.16	7.140	23.000	3.810	19.190	4.3806	57.440	1.61E-01	4.83E-01	8.74E-01	3.74E-01	4.83E-01
TH-228	5363.00	5396.81	47.414	721.000	716.408	4.545	2.1319	99.940	1.58E+01	1.90E+00	2.56E-01	9.50E-02	1.16E+00
TH-229	4900.00	4904.36	143.135	774.000	767.940	6.060	2.4617	99.520	1.69E+01	2.01E+00	2.85E-01	1.09E-01	1.20E+00
TH-230	4671.39	4667.43	0.000	97.000	89.350	3.030	1.7407	99.700	1.96E+00	4.74E-01	2.85E-01	1.10E-01	4.31E-01
TH-232	3972.00	3984.61	59.100	717.000	716.186	0.505	0.7106	100.000	1.57E+01	1.89E+00	1.40E-01	3.73E-02	1.15E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.047 +/-0.001)
 TH-230 (4.620 +/-0.072)
 TH-232 (0.309 +/-0.005)



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ALPHA SPECTROSCOPY REPORT

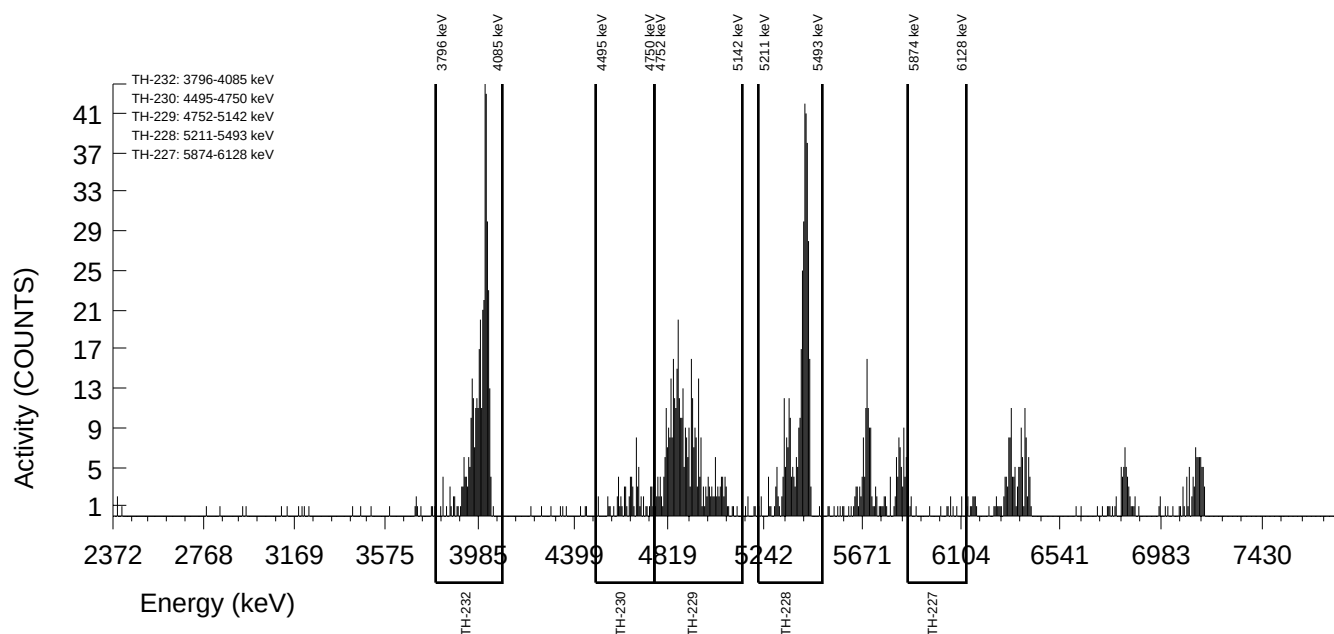
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2290612 SAMPLE ID : S1205140839_TH SAMPLE QTY : 0.130 F +/-0.772 % SAMPLE DATE : 22-Jul-2022 00:00:00 ANALYST : MP2 % YIELD : 48.2 +/-5.796 %			CHAMBER : 048 DETECTOR S/N : 140242 AVERAGE %EFFICIENCY : 32.2813 AVERAGE %EFF ERROR : 0.6235 COUNT DATE : 24-Jul-2022 14:00:46 ELAPSED LIVE TIME(SEC) : 30300.00			LIB FILE : TH(2) BKG FILE : B048.CNF;2475 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W048.CNF;735 CAL DATE : 02-Jul-2022		
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8637E+00 dpm RESULTS : 2.3447E+00 dpm			LCSD ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.5335E+01 % RECOVERY 108.034					

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			1.96-sigma
NUCLIDE	LIBRARY	PEAK	PEAK	GROSS	NET	BKG	BKG	%ABUN	ACTIVITY	TPU	MDA	Lc	cnt Unc
	ENERGY	ENERGY	FWHM	AREA	AREA	AREA	StDev		pCi/F	pCi/F	pCi/F	pCi/F	pCi/F
TH-227	5994.04	6009.78	209.316	14.000	5.415	8.585	2.9300	57.440	4.62E-01	7.43E-01	1.27E+00	5.05E-01	7.41E-01
TH-228	5363.00	5394.74	29.961	369.000	355.847	13.130	3.6235	99.940	1.58E+01	2.55E+00	7.83E-01	3.25E-01	1.69E+00
TH-229	4900.00	4896.28	135.932	390.000	380.405	9.595	3.0976	99.520	1.69E+01	2.68E+00	6.89E-01	2.78E-01	1.73E+00
TH-230	4671.39	4654.43	13.544	69.000	60.651	6.060	2.4617	99.700	2.69E+00	8.18E-01	6.26E-01	2.47E-01	7.45E-01
TH-232	3972.00	3986.32	20.193	377.000	374.322	2.525	1.5890	100.000	1.66E+01	2.62E+00	4.22E-01	1.45E-01	1.69E+00

NOTES:

* Corrections made to the following net areas
due to tracer impurity:
TH-228 (0.023 +/-0.000)
TH-230 (2.289 +/-0.035)
TH-232 (0.153 +/-0.002)



Batch 2294036 Check-list

This check-list was completed on 26-JUL-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 26-JUL-22 and Jessica Davis on 26-JUL-22.

Batch ID:
2294036

Product:
ASP_PUF

Description: Alpha Spec Plutonium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium

Batch ID: 2294036
Analyst: Brendon Viquez (BV1)
Method: DOE EML HASL-300, Pu-11-RC
 Modified
Lab SOP: GL-RAD-A-011 REV# 28
Instrument: ASP-33005595

Due Dates for Lab: 26-JUL-2022			Package: 27-JUL-2022	SDG: 27-JUL-2022		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205147418	Plutonium-239 AS SPIKE		1472-C	.1	mL
LCSD	1205147419	Plutonium-239 AS SPIKE		1472-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	585885001 - 2	25-JUL-2022	1	40	0.10284
2	585885002 - 2	25-JUL-2022	1	40	0.10101
3	585885003 - 2	25-JUL-2022	1	40	0.11435
4	585905001 - 3	25-JUL-2022	1	40	0.10429
5	585905002 - 2	25-JUL-2022	1	40	0.09851
6	585905003 - 2	25-JUL-2022	1	40	0.09126
7	585905004 - 2	25-JUL-2022	1	40	0.0941
8	585905005 - 2	25-JUL-2022	1	40	0.10203
9	1205147417 MB	25-JUL-2022	1		0.11435
10	1205147418 LCS	25-JUL-2022	1		0.11435
11	1205147419 LCSD	25-JUL-2022	1		0.11435

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2020-A	Plutonium-242 AS TRACER	.1 ml	Pipet ID: RAD-ASP-184002Z Analyzed With: Am Data Entry Date2: 25-JUL-2022 00:00

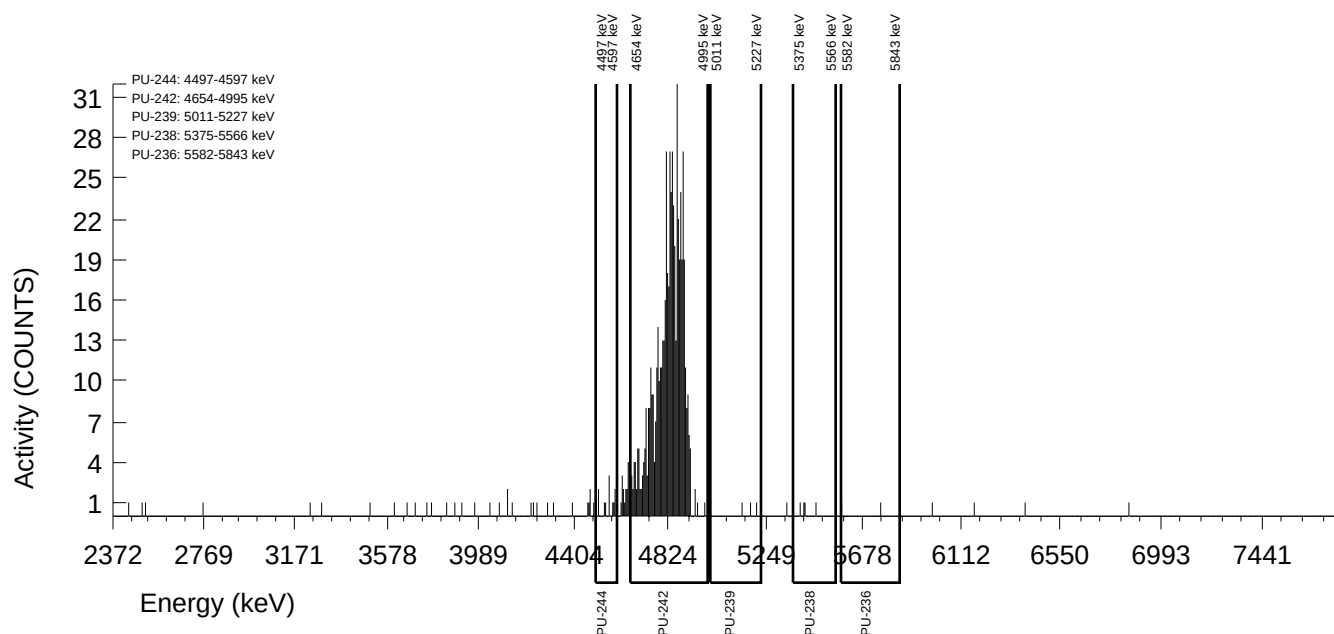
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2294036 SAMPLE ID : S0585905001_PU SAMPLE QTY : 0.104 F +/-0.959 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 88.6 +/-4.602 %	CHAMBER : 075 DETECTOR S/N : 80010 AVERAGE %EFFICIENCY : 31.2081 AVERAGE %EFF ERROR : 0.6033 COUNT DATE : 25-Jul-2022 18:29:37 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : PU BKG FILE : B075.CNF;2441 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W075.CNF;652 CAL DATE : 11-Jul-2022
TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 3.7873E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5672.82	162.927	2.000	0.485	1.515	1.2309	100.000	1.53E-02	1.24E-01	2.51E-01	7.83E-02	1.24E-01
PU-238	5486.00	5430.84	69.120	4.000	1.980	2.020	1.4213	99.900	6.14E-02	1.52E-01	2.71E-01	8.89E-02	1.52E-01
PU-239	5155.00	5181.42	64.183	3.000	-1.040	4.040	2.0100	99.900	-3.22E-02	1.52E-01	3.44E-01	1.26E-01	1.52E-01
PU-242	4890.00	4823.93	80.846	609.000	596.880	12.120	3.4814	100.000	1.85E+01	2.38E+00	5.28E-01	2.17E-01	1.51E+00
PU-244	4589.00	4555.57	0.000	15.000	13.990	1.010	1.0050	99.900	4.33E-01	2.52E-01	2.19E-01	6.28E-02	2.49E-01

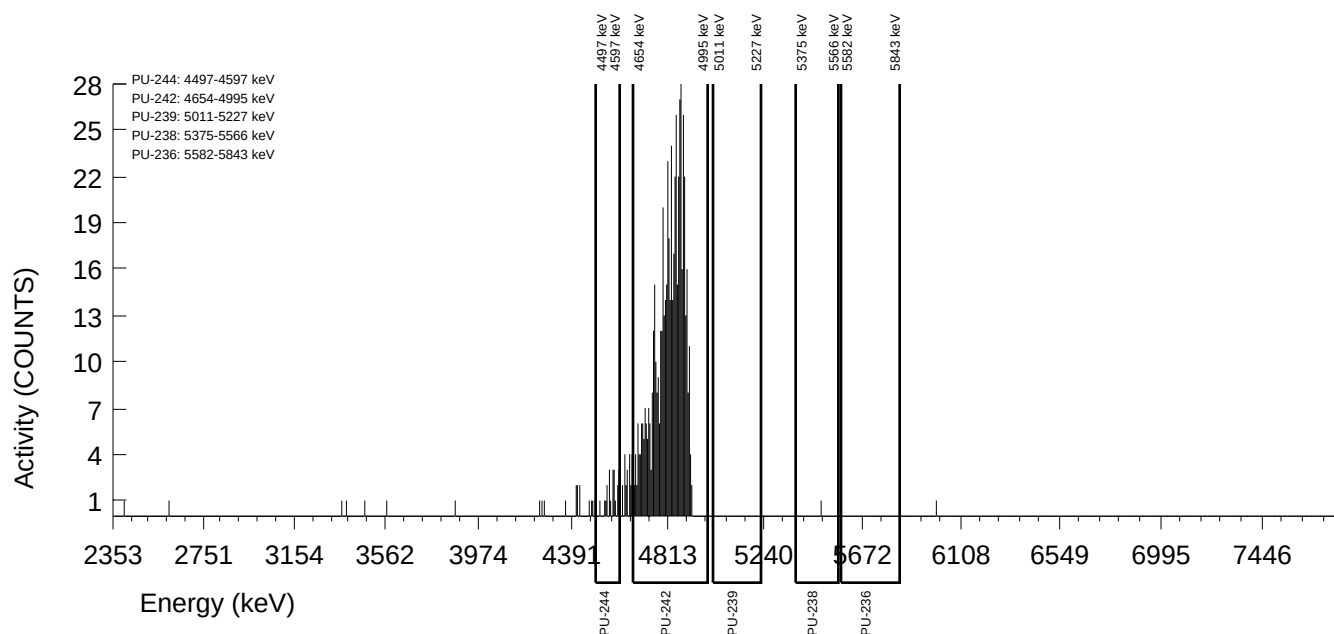


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2294036 SAMPLE ID : S0585905002_PU SAMPLE QTY : 0.099 F +/-1.015 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 83.3 +/-4.536 %	CHAMBER : 076 DETECTOR S/N : 158161 AVERAGE %EFFICIENCY : 33.3652 AVERAGE %EFF ERROR : 0.6439 COUNT DATE : 25-Jul-2022 18:29:37 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : PU BKG FILE : B076.CNF;2460 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W076.CNF;627 CAL DATE : 11-Jul-2022
TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 3.5639E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.24	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	7.30E-02	9.96E-02	6.70E-02	7.29E-02
PU-238	5486.00	5492.98	4.944	1.000	-0.515	1.515	1.2309	99.900	-1.68E-02	1.11E-01	2.60E-01	8.10E-02	1.11E-01
PU-239	5155.00	5118.67	0.000	0.000	-0.505	0.505	0.7106	99.900	-1.65E-02	7.86E-02	1.91E-01	4.67E-02	7.85E-02
PU-242	4890.00	4818.14	136.385	601.000	600.495	0.505	0.7106	100.000	1.96E+01	2.48E+00	1.91E-01	4.67E-02	1.57E+00
PU-244	4589.00	4562.59	0.000	22.000	22.000	0.000	1.0000	99.900	7.17E-01	3.16E-01	9.78E-02	6.58E-02	3.08E-01

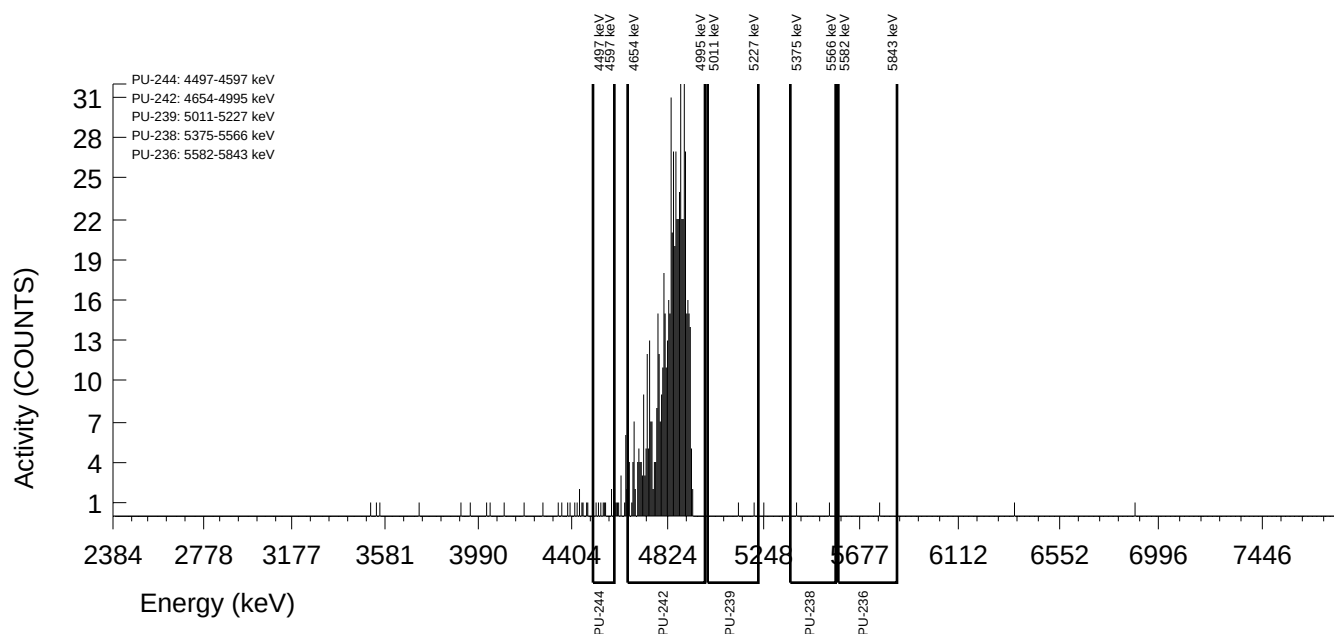


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2294036 SAMPLE ID : S0585905003_PU SAMPLE QTY : 0.091 F +/-1.096 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 80.9 +/-4.381 %	CHAMBER : 083 DETECTOR S/N : 78785 AVERAGE %EFFICIENCY : 37.5543 AVERAGE %EFF ERROR : 0.7229 COUNT DATE : 25-Jul-2022 18:29:38 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : PU BKG FILE : B083.CNF;2364 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W083.CNF;635 CAL DATE : 11-Jul-2022
TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 3.4589E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5763.96	4.893	1.000	-1.020	2.020	1.4213	100.000	-3.35E-02	1.16E-01	2.87E-01	9.41E-02	1.16E-01
PU-238	5486.00	5470.16	136.990	2.000	0.990	1.010	1.0050	99.900	3.19E-02	1.23E-01	2.27E-01	6.54E-02	1.23E-01
PU-239	5155.00	5176.05	68.495	2.000	0.990	1.010	1.0050	99.900	3.19E-02	1.23E-01	2.27E-01	6.53E-02	1.22E-01
PU-242	4890.00	4841.21	93.948	658.000	655.980	2.020	1.4213	100.000	2.11E+01	2.60E+00	2.81E-01	9.23E-02	1.62E+00
PU-244	4589.00	4548.41	4.893	10.000	8.990	1.010	1.0050	99.900	2.90E-01	2.18E-01	2.27E-01	6.53E-02	2.17E-01

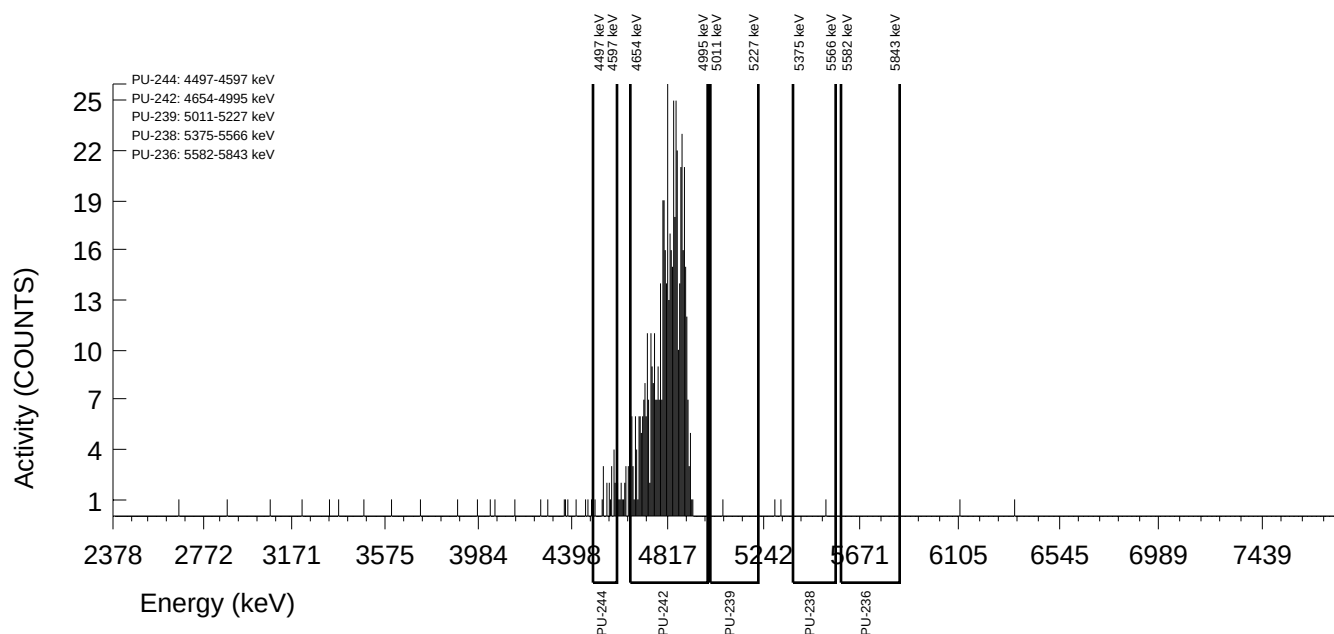


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2294036 SAMPLE ID : S0585905004_PU SAMPLE QTY : 0.094 F +/-1.063 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 70.7 +/-4.648 %	CHAMBER : 084 DETECTOR S/N : 78265 AVERAGE %EFFICIENCY : 37.2920 AVERAGE %EFF ERROR : 0.7180 COUNT DATE : 25-Jul-2022 18:29:38 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : PU BKG FILE : B084.CNF;2354 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W084.CNF;645 CAL DATE : 11-Jul-2022
TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 3.0212E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.22	0.000	0.000	-1.515	1.515	1.2309	100.000	-5.56E-02	1.02E-01	2.92E-01	9.11E-02	1.02E-01
PU-238	5486.00	5520.05	4.891	1.000	-0.515	1.515	1.2309	99.900	-1.86E-02	1.23E-01	2.87E-01	8.95E-02	1.23E-01
PU-239	5155.00	5065.98	4.891	1.000	-0.515	1.515	1.2309	99.900	-1.85E-02	1.23E-01	2.87E-01	8.94E-02	1.23E-01
PU-242	4890.00	4820.20	106.661	572.000	568.970	3.030	1.7407	100.000	2.05E+01	2.67E+00	3.61E-01	1.26E-01	1.69E+00
PU-244	4589.00	4564.16	51.351	19.000	17.485	1.515	1.2309	99.900	6.30E-01	3.30E-01	2.87E-01	8.94E-02	3.24E-01

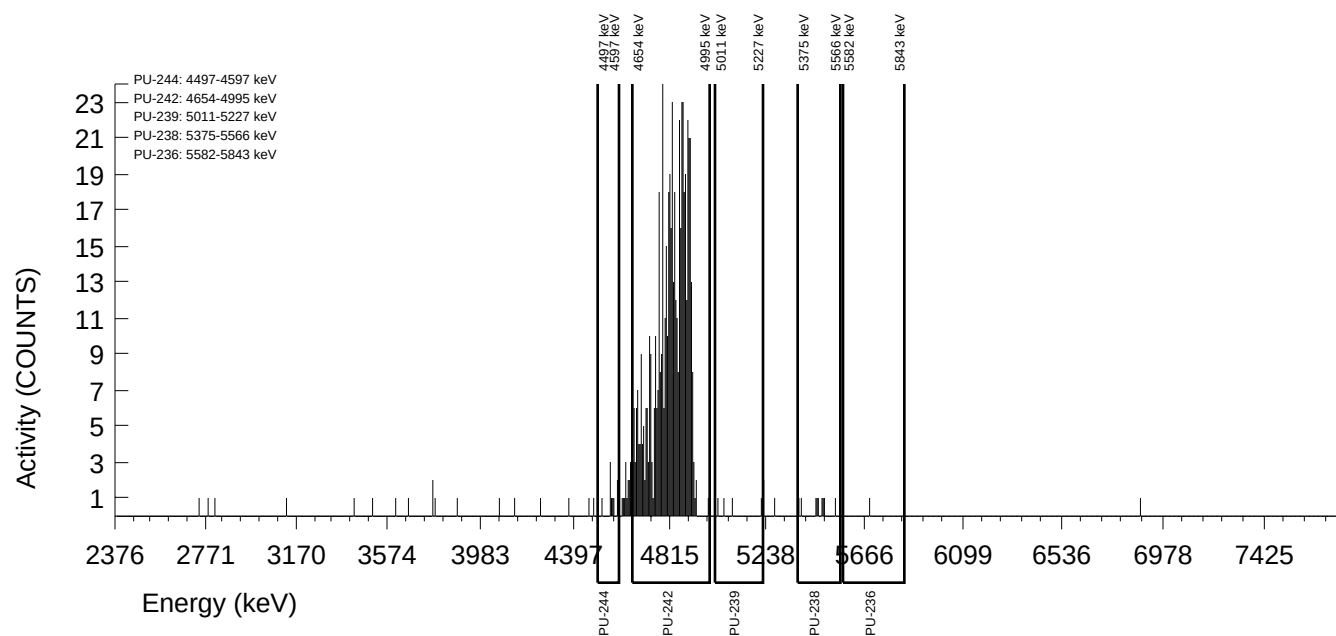


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2294036 SAMPLE ID : S0585905005_PU SAMPLE QTY : 0.102 F +/-0.980 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 75.4 +/-4.633 %	CHAMBER : 085 DETECTOR S/N : 83294 AVERAGE %EFFICIENCY : 35.5206 AVERAGE %EFF ERROR : 0.6846 COUNT DATE : 25-Jul-2022 18:29:38 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : PU BKG FILE : B085.CNF;2360 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W085.CNF;634 CAL DATE : 11-Jul-2022
TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 3.2219E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5693.19	4.905	1.000	-0.515	1.515	1.2309	100.000	-1.71E-02	1.13E-01	2.65E-01	8.27E-02	1.13E-01
PU-238	5486.00	5463.69	152.065	9.000	5.970	3.030	1.7407	99.900	1.95E-01	2.21E-01	3.28E-01	1.15E-01	2.20E-01
PU-239	5155.00	5140.23	0.000	6.000	0.950	5.050	2.2472	99.900	3.11E-02	2.01E-01	3.95E-01	1.48E-01	2.01E-01
PU-242	4890.00	4818.89	136.100	584.000	577.940	6.060	2.4617	100.000	1.89E+01	2.45E+00	4.23E-01	1.62E-01	1.55E+00
PU-244	4589.00	4565.21	38.016	11.000	10.495	0.505	0.7106	99.900	3.43E-01	2.29E-01	1.92E-01	4.69E-02	2.27E-01

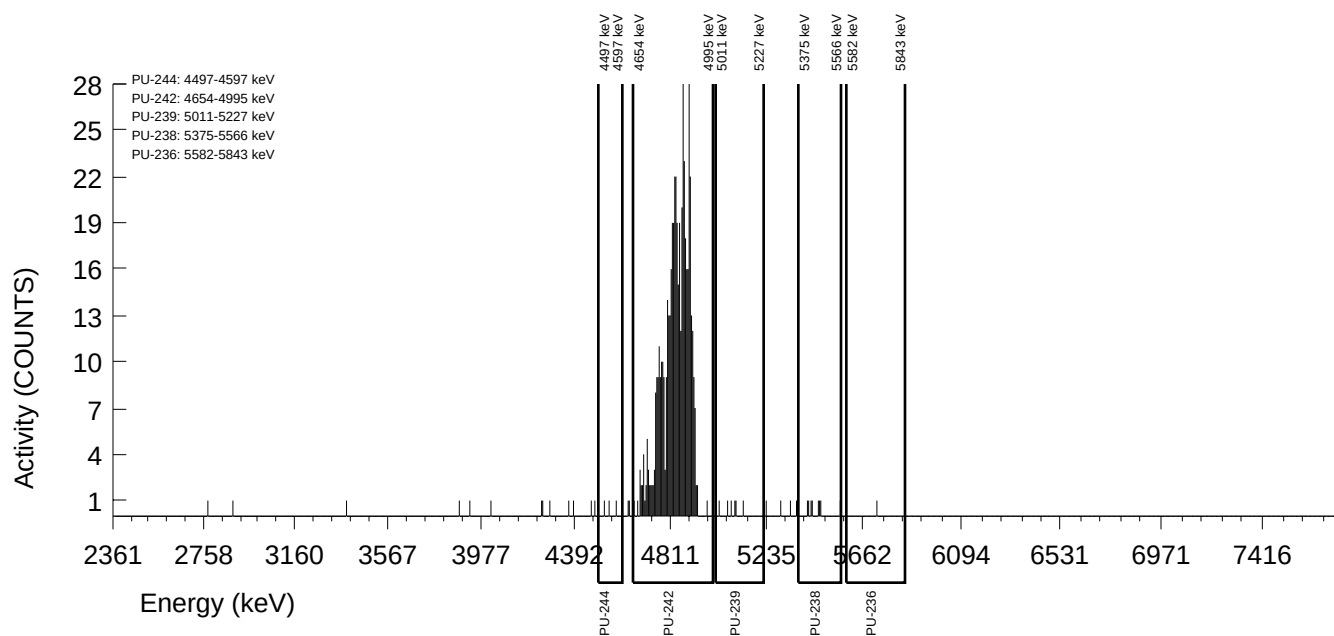


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2294036 SAMPLE ID : S1205147417_PU SAMPLE QTY : 0.114 F +/-0.875 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 82.5 +/-4.814 %	CHAMBER : 086 DETECTOR S/N : 78779 AVERAGE %EFFICIENCY : 29.9106 AVERAGE %EFF ERROR : 0.5788 COUNT DATE : 25-Jul-2022 18:29:38 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : PU BKG FILE : B086.CNF;2362 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W086.CNF;628 CAL DATE : 11-Jul-2022
TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 3.5281E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5721.50	4.944	1.000	-0.515	1.515	1.2309	100.000	-1.63E-02	1.08E-01	2.52E-01	7.86E-02	1.08E-01
PU-238	5486.00	5449.74	0.000	9.000	3.950	5.050	2.2472	99.900	1.25E-01	2.22E-01	3.82E-01	1.43E-01	2.22E-01
PU-239	5155.00	5084.17	103.820	6.000	0.950	5.050	2.2472	99.900	3.01E-02	1.94E-01	3.82E-01	1.43E-01	1.94E-01
PU-242	4890.00	4836.50	86.791	542.000	532.910	9.090	3.0150	100.000	1.68E+01	2.26E+00	4.79E-01	1.92E-01	1.45E+00
PU-244	4589.00	4546.98	54.382	3.000	0.980	2.020	1.4213	99.900	3.10E-02	1.42E-01	2.76E-01	9.07E-02	1.42E-01

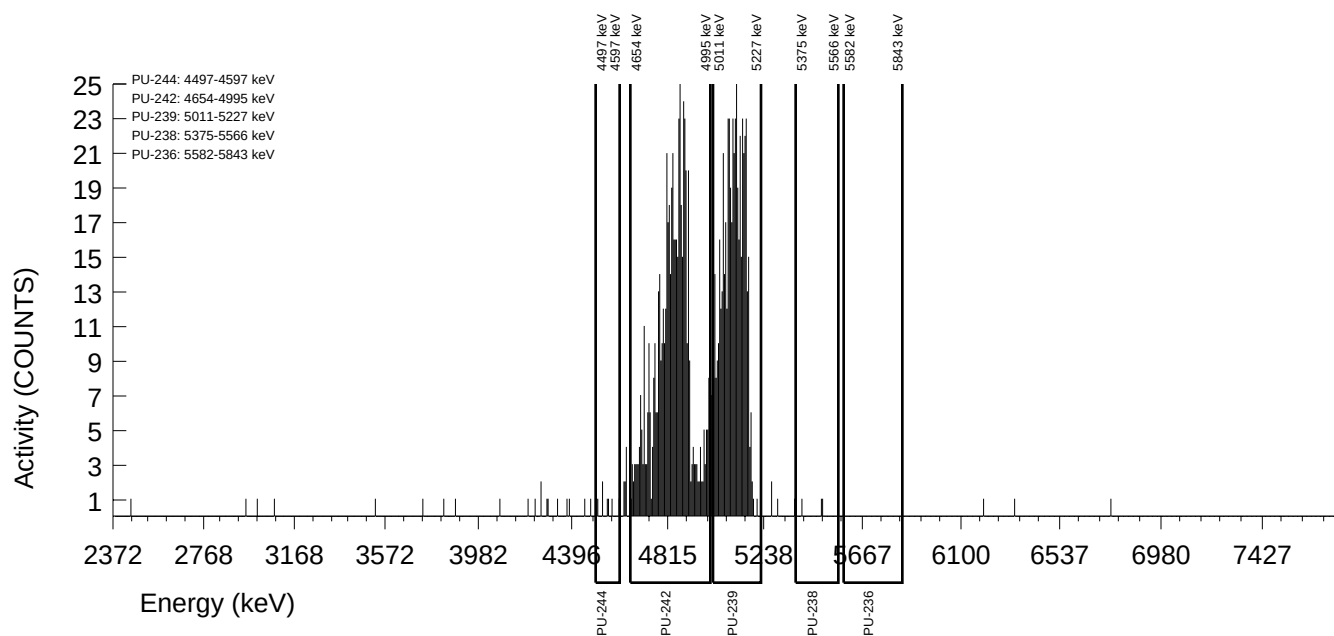


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2294036 SAMPLE ID : S1205147418_PU SAMPLE QTY : 0.114 F +/-0.875 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 85.5 +/-4.533 %	CHAMBER : 088 DETECTOR S/N : 83291 AVERAGE %EFFICIENCY : 32.7339 AVERAGE %EFF ERROR : 0.6320 COUNT DATE : 25-Jul-2022 18:29:38 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : PU BKG FILE : B088.CNF;2359 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W088.CNF;617 CAL DATE : 11-Jul-2022
TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 3.6567E+00 dpm	LCS ID : 1472-C NUCLIDE : PU-239 NOMINAL (pCi/F) : 1.8002E+01 % RECOVERY : 83.282	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.24	0.000	0.000	-1.010	1.010	1.0050	100.000	-2.82E-02	7.27E-02	1.97E-01	5.65E-02	7.26E-02
PU-238	5486.00	5462.72	88.412	3.000	3.000	0.000	1.0000	99.900	8.37E-02	1.13E-01	8.37E-02	5.63E-02	1.13E-01
PU-239	5155.00	5101.10	139.874	538.000	537.495	0.505	0.7106	99.900	1.50E+01	1.94E+00	1.64E-01	4.00E-02	1.27E+00
PU-242	4890.00	4833.56	126.494	607.000	604.475	2.525	1.5890	100.000	1.68E+01	2.13E+00	2.62E-01	8.94E-02	1.35E+00
PU-244	4589.00	4535.68	4.912	9.000	9.000	0.000	1.0000	99.900	2.51E-01	1.77E-01	8.37E-02	5.63E-02	1.75E-01

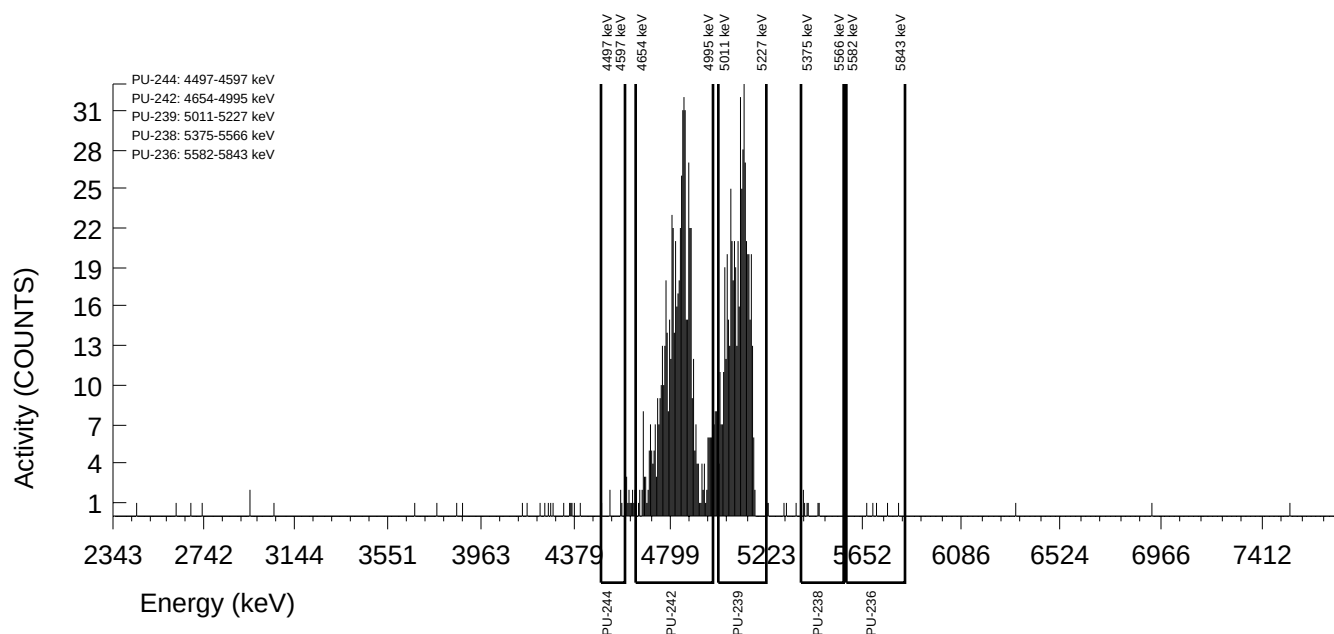


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2294036 SAMPLE ID : S1205147419_PU SAMPLE QTY : 0.114 F +/-0.875 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 95.6 +/-4.454 %	CHAMBER : 107 DETECTOR S/N : 140237 AVERAGE %EFFICIENCY : 31.3643 AVERAGE %EFF ERROR : 0.6062 COUNT DATE : 25-Jul-2022 18:29:41 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : PU BKG FILE : B107.CNF;2076 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W107.CNF;603 CAL DATE : 12-Jul-2022
TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 4.0872E+00 dpm	LCSD ID 1472-C NUCLIDE PU-239 NOMINAL (pCi/F) 1.8002E+01 % RECOVERY 78.191	

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
PU-236	5749.00	5729.02	133.674	5.000	0.960	4.040	2.0100	100.000	2.50E-02	1.47E-01	2.89E-01	1.06E-01	1.47E-01	1.47E-01
PU-238	5486.00	5414.40	7.426	7.000	4.475	2.525	1.5890	99.900	1.17E-01	1.58E-01	2.45E-01	8.35E-02	1.58E-01	1.58E-01
PU-239	5155.00	5099.51	112.942	546.000	540.445	5.555	2.3569	99.900	1.41E+01	1.81E+00	3.26E-01	1.24E-01	1.20E+00	1.20E+00
PU-242	4890.00	4837.22	108.234	661.000	647.365	13.635	3.6926	100.000	1.68E+01	2.10E+00	4.66E-01	1.94E-01	1.32E+00	1.32E+00
PU-244	4589.00	4554.04	51.984	6.000	4.485	1.515	1.2309	99.900	1.17E-01	1.45E-01	2.08E-01	6.47E-02	1.45E-01	1.45E-01



Batch 2293754 Check-list

This check-list was completed on 26-JUL-22 by Melanie Aycock

This batch was reviewed by Jessica Downey on 26-JUL-22 and Melanie Aycock on 26-JUL-22.

Batch ID:
2293754

Product:
ASPAMCMF

Description: Alpha Spec Am241Curium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Americium/Curium

Batch ID: 2293754
Analyst: Brendon Viquez (BV1)
Method: DOE EML HASL-300, Am-05-RC
 Modified
Lab SOP: GL-RAD-A-011 REV# 28
Instrument: ASP-33005595

Due Dates for Lab: 26-JUL-2022

Package: 27-JUL-2022

SDG: 27-JUL-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205146817	Americium-241 SPIKE	0533-II	.1	mL
LCSD	1205146818	Americium-241 SPIKE	0533-II	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	585885001 - 2	25-JUL-2022	1	40	0.10284
2	585885002 - 2	25-JUL-2022	1	40	0.10101
3	585885003 - 2	25-JUL-2022	1	40	0.11435
4	585905001 - 2	25-JUL-2022	1	40	0.10429
5	585905002 - 2	25-JUL-2022	1	40	0.09851
6	585905003 - 2	25-JUL-2022	1	40	0.09126
7	585905004 - 2	25-JUL-2022	1	40	0.0941
8	585905005 - 2	25-JUL-2022	1	40	0.10203
9	1205146816 MB	25-JUL-2022	1		0.11435
10	1205146817 LCS	25-JUL-2022	1		0.11435
11	1205146818 LCSD	25-JUL-2022	1		0.11435

Reagent/Solvent Lot ID	Description	Amount
WORK 1752-I	Americium-243 AS TRACER	.1 ml

Comments:

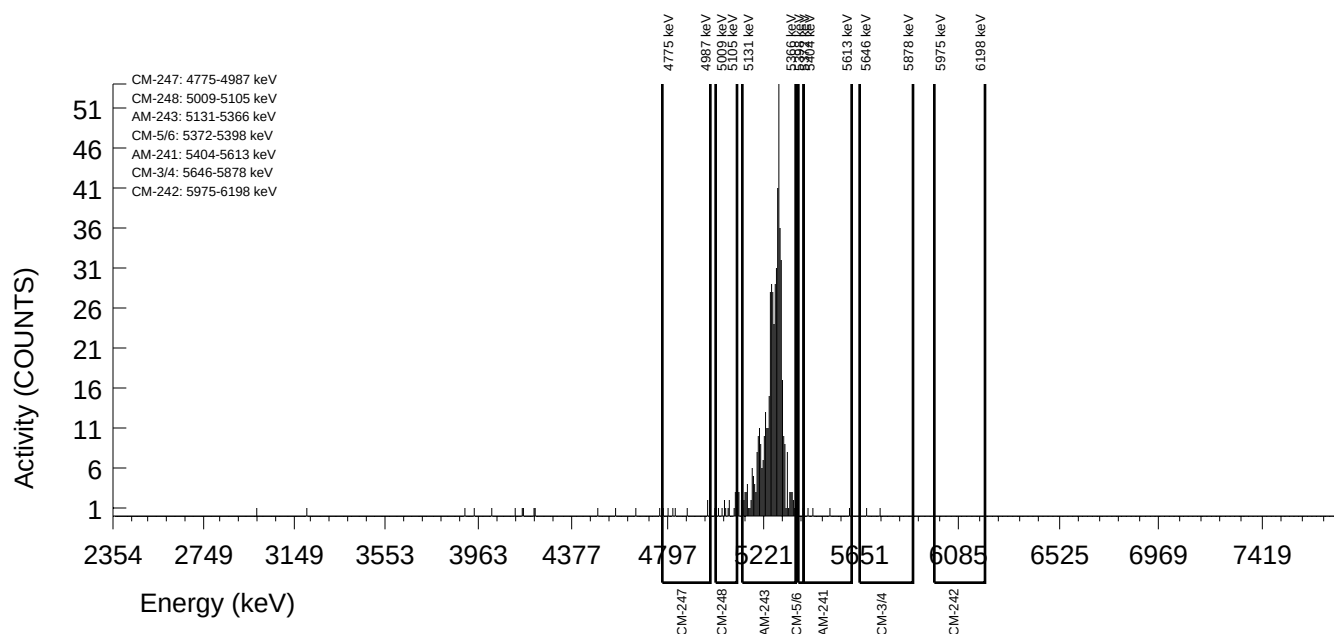
Pipet ID: RAD-ASP-184002Z
 Analyzed With: Pu
 Data Entry Date2: 25-JUL-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2293754 SAMPLE ID : S0585905001_AM SAMPLE QTY : 0.104 F +/-0.959 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 59.9 +/-5.121 %	CHAMBER : 098 DETECTOR S/N : 158118 AVERAGE %EFFICIENCY : 38.1888 AVERAGE %EFF ERROR : 0.7349 COUNT DATE : 25-Jul-2022 18:29:39 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : AM BKG FILE : B098.CNF;2041 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W098.CNF;582 CAL DATE : 12-Jul-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6088E+00 dpm RESULTS : 2.7616E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5494.61	171.552	4.000	3.495	0.505	0.7106	98.525	1.33E-01	1.75E-01	2.23E-01	5.44E-02	1.75E-01
AM-243	5269.50	5265.09	46.124	536.000	532.465	3.535	1.8802	99.980	1.99E+01	2.76E+00	3.96E-01	1.42E-01	1.70E+00
CM-242	6102.00	6086.55	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	9.29E-02	1.27E-01	8.53E-02	9.28E-02
CM-3/4	5795.02	5707.61	58.818	2.000	-0.020	2.020	1.4213	100.000	-7.50E-04	1.52E-01	3.28E-01	1.08E-01	1.52E-01
CM-5/6	5386.00	5381.86	0.000	3.000	3.000	0.000	1.0000	86.090	1.30E-01	1.76E-01	1.30E-01	8.76E-02	1.76E-01
CM-247	4946.00	4868.52	4.901	7.000	3.970	3.030	1.7407	79.300	1.87E-01	2.90E-01	4.73E-01	1.66E-01	2.89E-01
CM-248	5078.60	5071.57	0.000	16.000	16.000	0.000	1.0000	91.000	6.57E-01	3.42E-01	1.23E-01	8.29E-02	3.34E-01

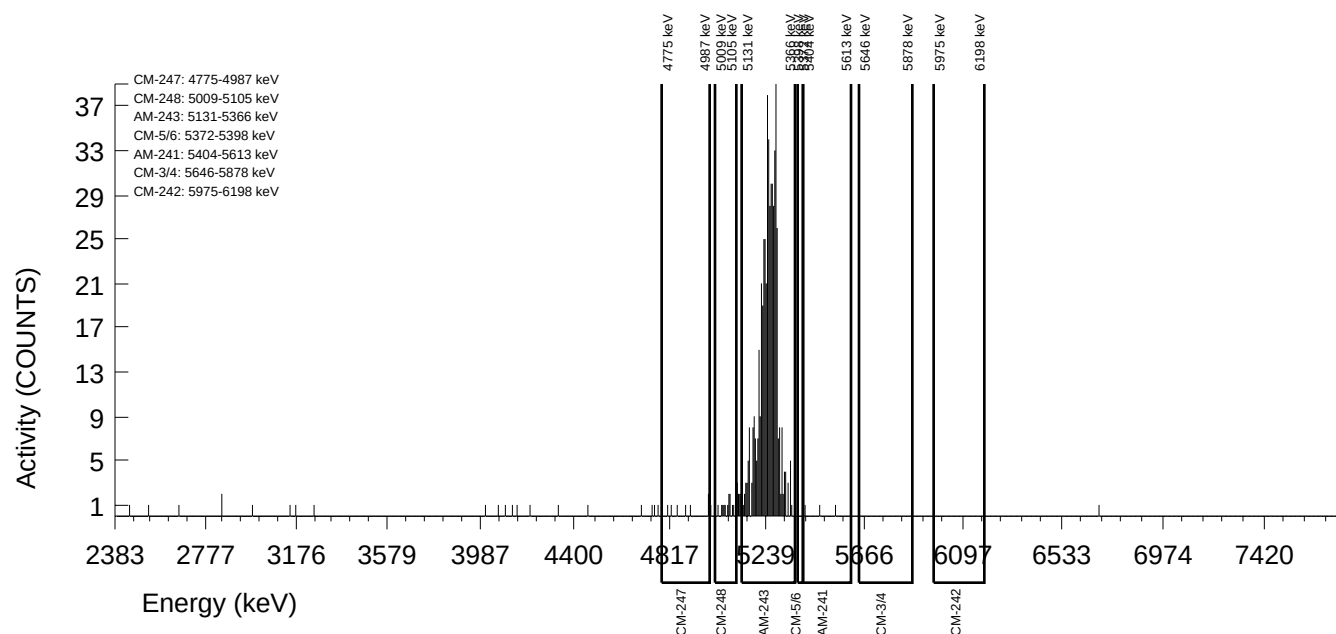


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2293754 SAMPLE ID : S0585905002_AM SAMPLE QTY : 0.099 F +/-1.015 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 61.8 +/-5.199 %	CHAMBER : 099 DETECTOR S/N : 158120 AVERAGE %EFFICIENCY : 36.0375 AVERAGE %EFF ERROR : 0.6943 COUNT DATE : 25-Jul-2022 18:29:39 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : AM BKG FILE : B099.CNF;2022 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W099.CNF;545 CAL DATE : 12-Jul-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6088E+00 dpm RESULTS : 2.8465E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5475.05	127.242	3.000	0.980	2.020	1.4213	98.525	4.05E-02	1.86E-01	3.61E-01	1.18E-01	1.86E-01
AM-243	5269.50	5248.81	65.907	526.000	517.920	8.080	2.8425	99.980	2.11E+01	2.97E+00	5.89E-01	2.33E-01	1.84E+00
CM-242	6102.00	6086.56	0.000	0.000	-0.505	0.505	0.7106	100.000	-2.32E-02	1.11E-01	2.70E-01	6.60E-02	1.11E-01
CM-3/4	5795.02	5761.58	0.000	0.000	-3.535	3.535	1.8802	100.000	-1.44E-01	1.40E-01	4.32E-01	1.55E-01	1.39E-01
CM-5/6	5386.00	5385.09	0.000	0.000	-0.505	0.505	0.7106	86.090	-2.39E-02	1.14E-01	2.77E-01	6.78E-02	1.14E-01
CM-247	4946.00	4891.34	0.000	7.000	-1.080	8.080	2.8425	79.300	-5.54E-02	3.53E-01	7.42E-01	2.94E-01	3.53E-01
CM-248	5078.60	5072.38	0.000	14.000	13.495	0.505	0.7106	91.000	6.03E-01	3.51E-01	2.62E-01	6.41E-02	3.45E-01

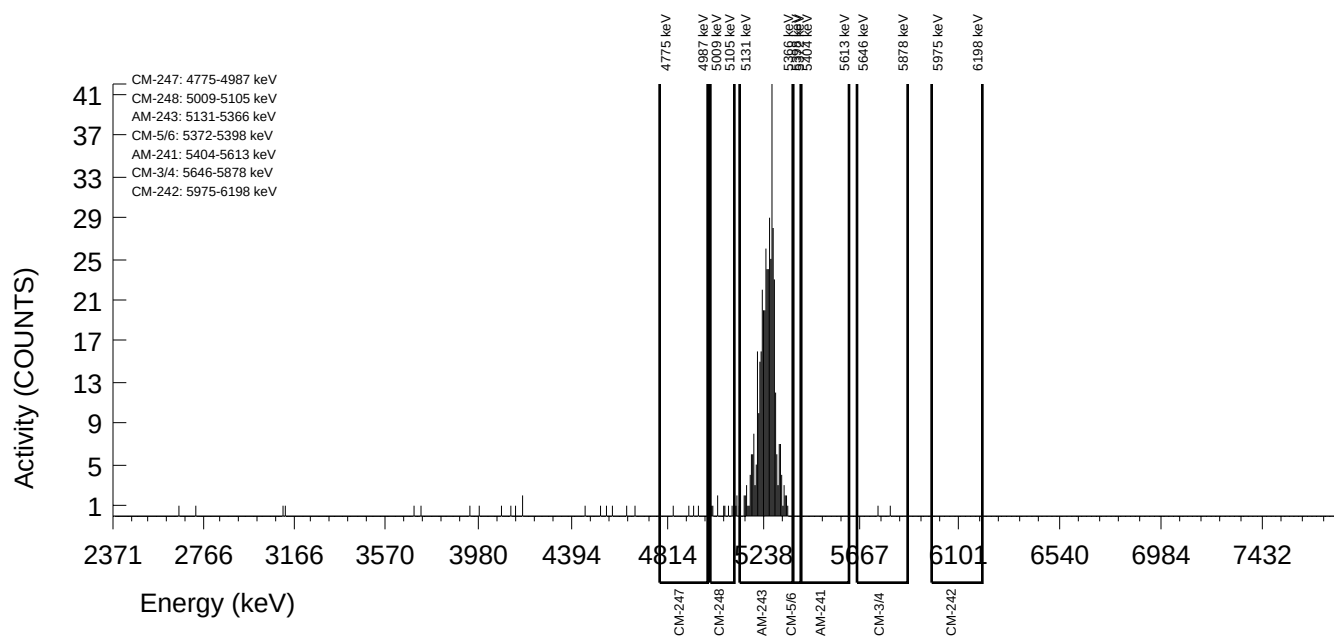


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2293754 SAMPLE ID : S0585905003_AM SAMPLE QTY : 0.091 F +/-1.096 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 54.6 +/-5.550 %	CHAMBER : 100 DETECTOR S/N : 155848 AVERAGE %EFFICIENCY : 33.8255 AVERAGE %EFF ERROR : 0.6526 COUNT DATE : 25-Jul-2022 18:29:39 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : AM BKG FILE : B100.CNF;2022 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W100.CNF;618 CAL DATE : 12-Jul-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6088E+00 dpm RESULTS : 2.5176E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5403.65	0.000	1.000	-1.525	2.525	1.5890	98.525	-8.19E-02	1.98E-01	5.05E-01	1.72E-01	1.98E-01
AM-243	5269.50	5252.67	50.771	433.000	429.970	3.030	1.7407	99.980	2.27E+01	3.43E+00	5.30E-01	1.86E-01	2.16E+00
CM-242	6102.00	6086.55	0.000	0.000	-1.010	1.010	1.0050	100.000	-6.04E-02	1.56E-01	4.22E-01	1.21E-01	1.56E-01
CM-3/4	5795.02	5769.66	53.967	2.000	-1.535	3.535	1.8802	100.000	-8.14E-02	2.34E-01	5.62E-01	2.01E-01	2.33E-01
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	1.35E-01	1.84E-01	1.24E-01	1.35E-01
CM-247	4946.00	4882.35	161.901	5.000	-3.585	8.585	2.9300	79.300	-2.39E-01	4.26E-01	9.89E-01	3.94E-01	4.25E-01
CM-248	5078.60	5051.10	4.906	8.000	6.485	1.515	1.2309	91.000	3.77E-01	3.63E-01	4.63E-01	1.44E-01	3.61E-01

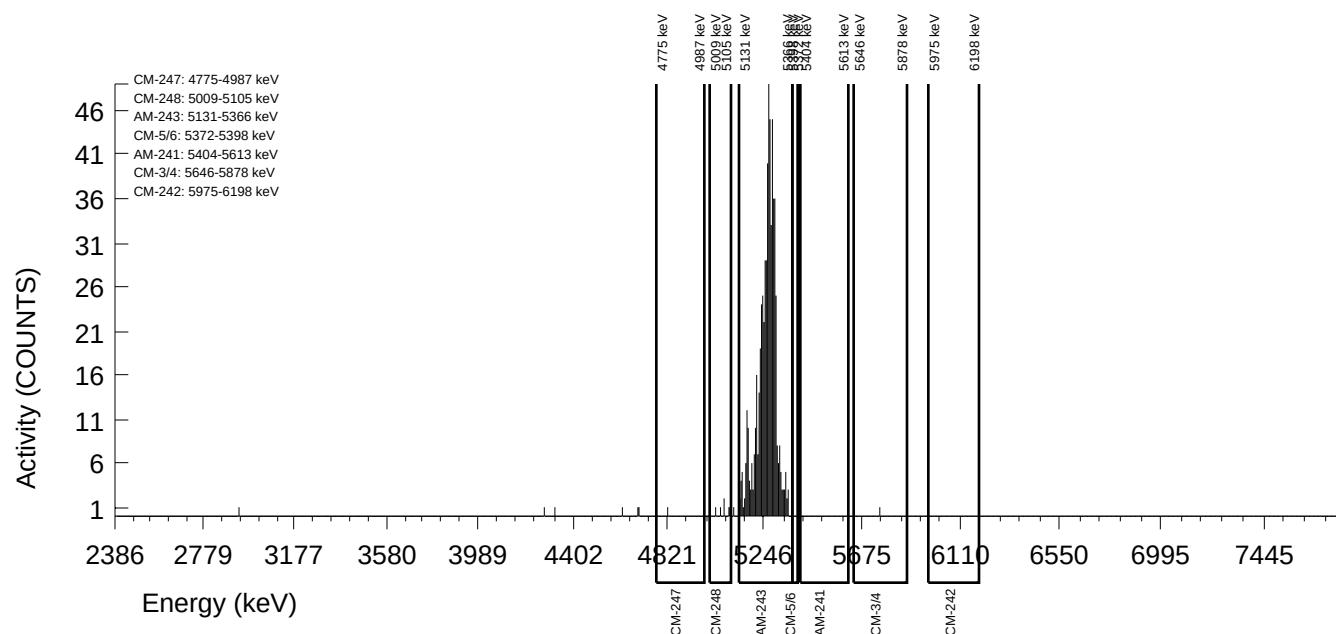


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2293754 SAMPLE ID : S0585905004_AM SAMPLE QTY : 0.094 F +/-1.063 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 73.9 +/-4.849 %	CHAMBER : 102 DETECTOR S/N : 155796 AVERAGE %EFFICIENCY : 35.9167 AVERAGE %EFF ERROR : 0.6921 COUNT DATE : 25-Jul-2022 18:29:40 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : AM BKG FILE : B102.CNF;2046 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W102.CNF;608 CAL DATE : 12-Jul-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6088E+00 dpm RESULTS : 3.4051E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5405.99	0.000	2.000	2.000	0.000	1.0000	98.525	7.25E-02	1.28E-01	1.09E-01	7.32E-02	1.28E-01
AM-243	5269.50	5257.04	56.225	619.000	617.485	1.515	1.2309	99.980	2.21E+01	2.89E+00	2.85E-01	8.87E-02	1.75E+00
CM-242	6102.00	6086.54	0.000	0.000	-0.505	0.505	0.7106	100.000	-2.04E-02	9.74E-02	2.37E-01	5.79E-02	9.73E-02
CM-3/4	5795.02	5756.09	4.877	1.000	0.495	0.505	0.7106	100.000	1.77E-02	1.11E-01	2.10E-01	5.14E-02	1.11E-01
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	9.12E-02	1.24E-01	8.37E-02	9.11E-02
CM-247	4946.00	4900.51	151.177	2.000	-6.080	8.080	2.8425	79.300	-2.74E-01	2.39E-01	6.52E-01	2.58E-01	2.39E-01
CM-248	5078.60	5077.26	34.137	8.000	8.000	0.000	1.0000	91.000	3.14E-01	2.36E-01	1.18E-01	7.92E-02	2.34E-01

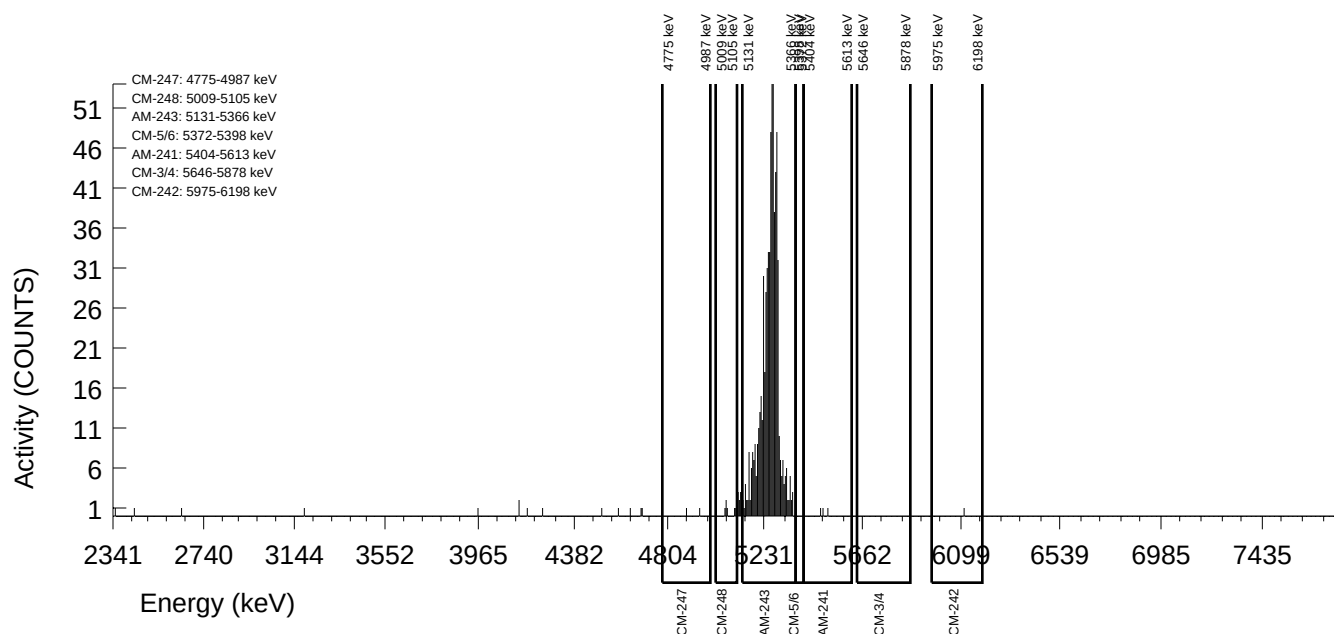


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2293754 SAMPLE ID : S0585905005_AM SAMPLE QTY : 0.102 F +/-0.980 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 84.4 +/-4.732 %	CHAMBER : 103 DETECTOR S/N : 79461 AVERAGE %EFFICIENCY : 33.8208 AVERAGE %EFF ERROR : 0.6525 COUNT DATE : 25-Jul-2022 18:29:40 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : AM BKG FILE : B103.CNF;2040 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W103.CNF;572 CAL DATE : 12-Jul-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6088E+00 dpm RESULTS : 3.8884E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5492.90	34.690	3.000	0.980	2.020	1.4213	98.525	3.05E-02	1.40E-01	2.72E-01	8.92E-02	1.40E-01
AM-243	5269.50	5253.63	61.421	666.000	663.980	2.020	1.4213	99.980	2.03E+01	2.59E+00	2.68E-01	8.79E-02	1.55E+00
CM-242	6102.00	6114.95	4.956	1.000	1.000	0.000	1.0000	100.000	3.47E-02	1.02E-01	1.04E-01	6.99E-02	1.02E-01
CM-3/4	5795.02	5761.59	0.000	0.000	-1.515	1.515	1.2309	100.000	-4.66E-02	8.57E-02	2.45E-01	7.63E-02	8.56E-02
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	7.82E-02	1.07E-01	7.18E-02	7.81E-02
CM-247	4946.00	4913.15	59.469	2.000	-3.050	5.050	2.2472	79.300	-1.18E-01	1.83E-01	4.66E-01	1.75E-01	1.82E-01
CM-248	5078.60	5073.09	9.911	6.000	4.485	1.515	1.2309	91.000	1.51E-01	1.88E-01	2.68E-01	8.36E-02	1.87E-01

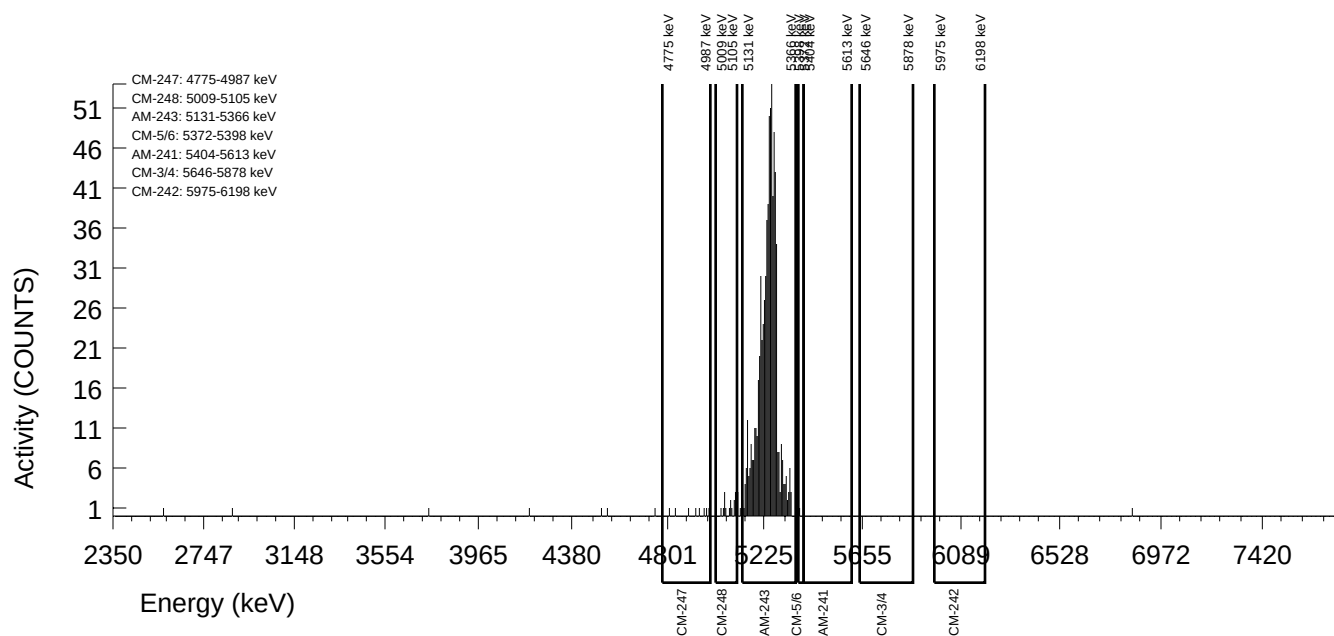


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2293754 SAMPLE ID : S1205146816_AM SAMPLE QTY : 0.114 F +/-0.875 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 93.4 +/-4.636 %	CHAMBER : 104 DETECTOR S/N : 80011 AVERAGE %EFFICIENCY : 32.7705 AVERAGE %EFF ERROR : 0.6327 COUNT DATE : 25-Jul-2022 18:29:40 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : AM BKG FILE : B104.CNF;2027 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W104.CNF;551 CAL DATE : 12-Jul-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6088E+00 dpm RESULTS : 4.3058E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5508.47	0.000	0.000	-2.525	2.525	1.5890	98.525	-6.53E-02	8.07E-02	2.43E-01	8.29E-02	8.06E-02
AM-243	5269.50	5240.71	66.861	719.000	712.435	6.565	2.5622	99.980	1.82E+01	2.26E+00	3.40E-01	1.32E-01	1.34E+00
CM-242	6102.00	6086.56	0.000	0.000	-0.505	0.505	0.7106	100.000	-1.29E-02	6.17E-02	1.50E-01	3.67E-02	6.16E-02
CM-3/4	5795.02	5761.59	0.000	0.000	-2.020	2.020	1.4213	100.000	-5.15E-02	7.54E-02	2.23E-01	7.31E-02	7.53E-02
CM-5/6	5386.00	5377.84	9.855	2.000	1.495	0.505	0.7106	86.090	4.42E-02	1.09E-01	1.74E-01	4.24E-02	1.09E-01
CM-247	4946.00	4912.30	167.532	8.000	0.425	7.575	2.7523	79.300	1.37E-02	2.28E-01	4.53E-01	1.78E-01	2.28E-01
CM-248	5078.60	5069.78	0.000	20.000	18.485	1.515	1.2309	91.000	5.18E-01	2.63E-01	2.23E-01	6.95E-02	2.58E-01

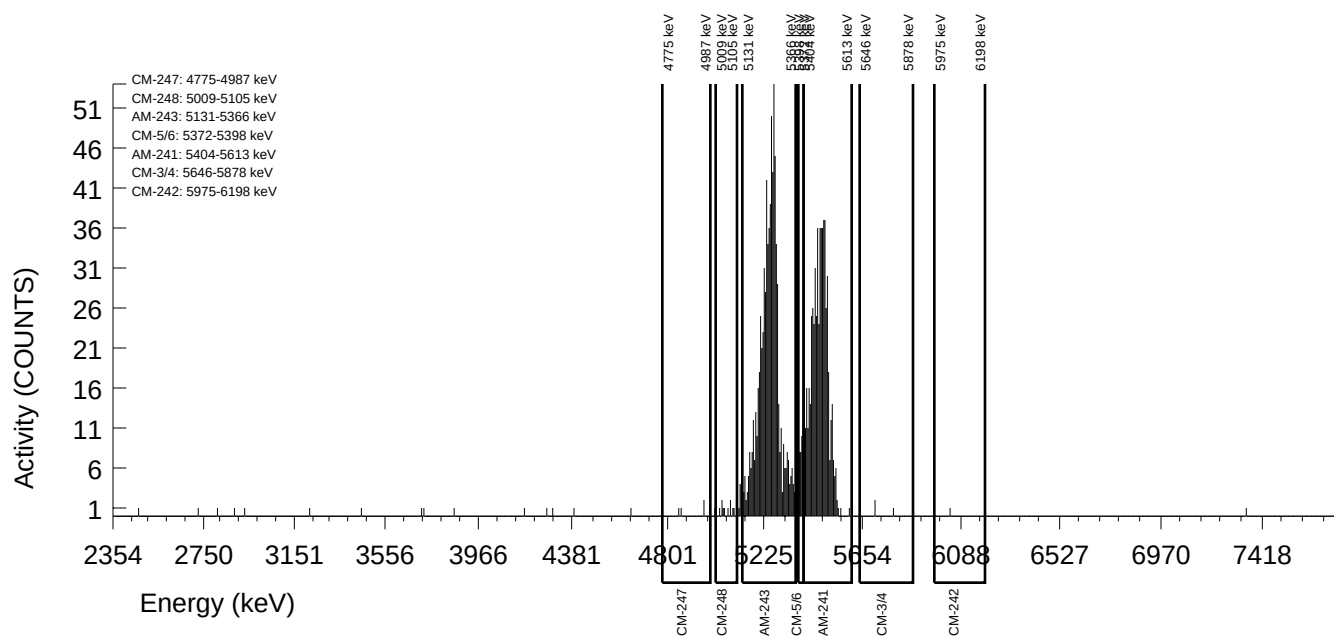


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2293754 SAMPLE ID : S1205146817_AM SAMPLE QTY : 0.114 F +/-0.875 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 90.0 +/-4.574 %			CHAMBER : 105 DETECTOR S/N : 158117 AVERAGE %EFFICIENCY : 35.4639 AVERAGE %EFF ERROR : 0.6835 COUNT DATE : 25-Jul-2022 18:29:40 ELAPSED LIVE TIME(SEC) : 30299.99			LIB FILE : AM BKG FILE : B105.CNF;2026 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W105.CNF;527 CAL DATE : 12-Jul-2022		
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6088E+00 dpm RESULTS : 4.1463E+00 dpm			LCS ID 0533-II NUCLIDE AM-241 NOMINAL (pCi/F) 1.7203E+01 % RECOVERY 84.308					

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5469.32	71.592	588.000	584.465	3.535	1.8802	98.525	1.45E+01	1.86E+00	2.63E-01	9.42E-02	1.18E+00
AM-243	5269.50	5248.22	57.244	750.000	742.425	7.575	2.7523	99.980	1.82E+01	2.23E+00	3.45E-01	1.36E-01	1.32E+00
CM-242	6102.00	6044.65	4.921	1.000	1.000	0.000	1.0000	100.000	2.45E-02	7.23E-02	7.36E-02	4.95E-02	7.23E-02
CM-3/4	5795.02	5740.81	4.921	3.000	1.485	1.515	1.2309	100.000	3.63E-02	1.07E-01	1.95E-01	6.07E-02	1.07E-01
CM-5/6	5386.00	5385.04	0.000	51.000	51.000	0.000	1.0000	86.090	1.45E+00	4.27E-01	8.52E-02	5.73E-02	4.02E-01
CM-247	4946.00	4906.56	4.921	4.000	-2.565	6.565	2.5622	79.300	-7.91E-02	1.77E-01	4.11E-01	1.59E-01	1.77E-01
CM-248	5078.60	5055.69	0.000	15.000	14.495	0.505	0.7106	91.000	3.89E-01	2.17E-01	1.58E-01	3.85E-02	2.14E-01

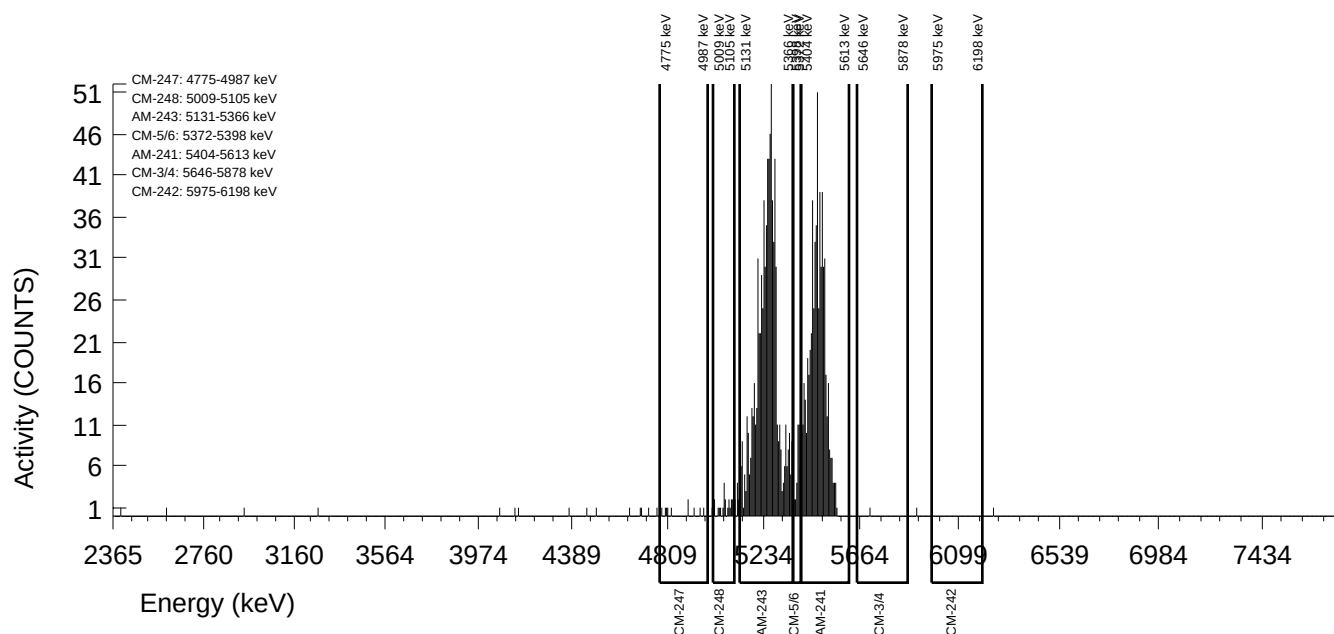


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2293754 SAMPLE ID : S1205146818_AM SAMPLE QTY : 0.114 F +/-0.875 % SAMPLE DATE : 25-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 96.4 +/-4.496 %	CHAMBER : 106 DETECTOR S/N : 80012 AVERAGE %EFFICIENCY : 34.8790 AVERAGE %EFF ERROR : 0.6725 COUNT DATE : 25-Jul-2022 18:29:40 ELAPSED LIVE TIME(SEC) : 30299.99	LIB FILE : AM BKG FILE : B106.CNF;2026 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W106.CNF;519 CAL DATE : 12-Jul-2022
TRACER ID : 1752-I NUCLIDE : AM-243 NOMINAL : 4.6088E+00 dpm RESULTS : 4.4430E+00 dpm	LCSD ID 0533-II NUCLIDE AM-241 NOMINAL (pCi/F) 1.7203E+01 % RECOVERY 81.025	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5474.64	54.765	595.000	591.970	3.030	1.7407	98.525	1.39E+01	1.77E+00	2.36E-01	8.27E-02	1.13E+00
AM-243	5269.50	5253.51	75.909	790.000	782.425	7.575	2.7523	99.980	1.82E+01	2.18E+00	3.27E-01	1.29E-01	1.28E+00
CM-242	6102.00	6086.55	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	5.12E-02	6.99E-02	4.70E-02	5.11E-02
CM-3/4	5795.02	5706.89	4.901	1.000	-1.525	2.525	1.5890	100.000	-3.54E-02	8.55E-02	2.18E-01	7.44E-02	8.54E-02
CM-5/6	5386.00	5390.28	0.000	36.000	35.495	0.505	0.7106	86.090	9.56E-01	3.37E-01	1.58E-01	3.86E-02	3.23E-01
CM-247	4946.00	4871.11	4.901	10.000	-2.120	12.120	3.4814	79.300	-6.20E-02	2.39E-01	4.99E-01	2.06E-01	2.39E-01
CM-248	5078.60	5062.13	8.168	22.000	17.960	4.040	2.0100	91.000	4.58E-01	2.55E-01	2.83E-01	1.03E-01	2.51E-01



Batch 2290611 Check-list

This check-list was completed on 25-JUL-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 25-JUL-22 and Jessica Davis on 25-JUL-22.

Batch ID:
2290611

Product:
ASP__UUF

Description: Alpha Spec Uranium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Uranium

Batch ID: 2290611

Analyst: Michael Potts (MP2)

Method: DOE EML HASL-300, U-02-RC
Modified

Lab SOP: GL-RAD-A-011 REV# 28

Instrument: SP-C018367602

Due Dates for Lab: 26-JUL-2022

Package: 27-JUL-2022

SDG: 27-JUL-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205140834	Uranium-238 AS SPIKE	1600-M	.1	mL
LCSD	1205140835	Uranium-238 AS SPIKE	1600-M	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	585885001	22-JUL-2022	1	45.9	0.11801
2	585885002	22-JUL-2022	1	45	0.11364
3	585885003	22-JUL-2022	1	45.6	0.13036
4	585905001	22-JUL-2022	1	45.1	0.11759
5	585905002	22-JUL-2022	1	45.5	0.11206
6	585905003	22-JUL-2022	1	45.4	0.10358
7	585905004	22-JUL-2022	1	45.3	0.10657
8	585905005	22-JUL-2022	1	45.6	0.11631
9	1205140833 MB	22-JUL-2022	1		0.13036
10	1205140834 LCS	22-JUL-2022	1		0.13036
11	1205140835 LCSD	22-JUL-2022	1		0.13036

Reagent/Solvent Lot ID	Description	Amount
WORK 1564-DD	Uranium-232 AS TRACER	.1 ml

Comments:

Pipet ID: R2-428724
Pu-236 Tracer Used: no
Analyzed With: Am , Pu
Data Entry Date2: 22-JUL-2022 00:00

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ALPHA SPECTROSCOPY REPORT

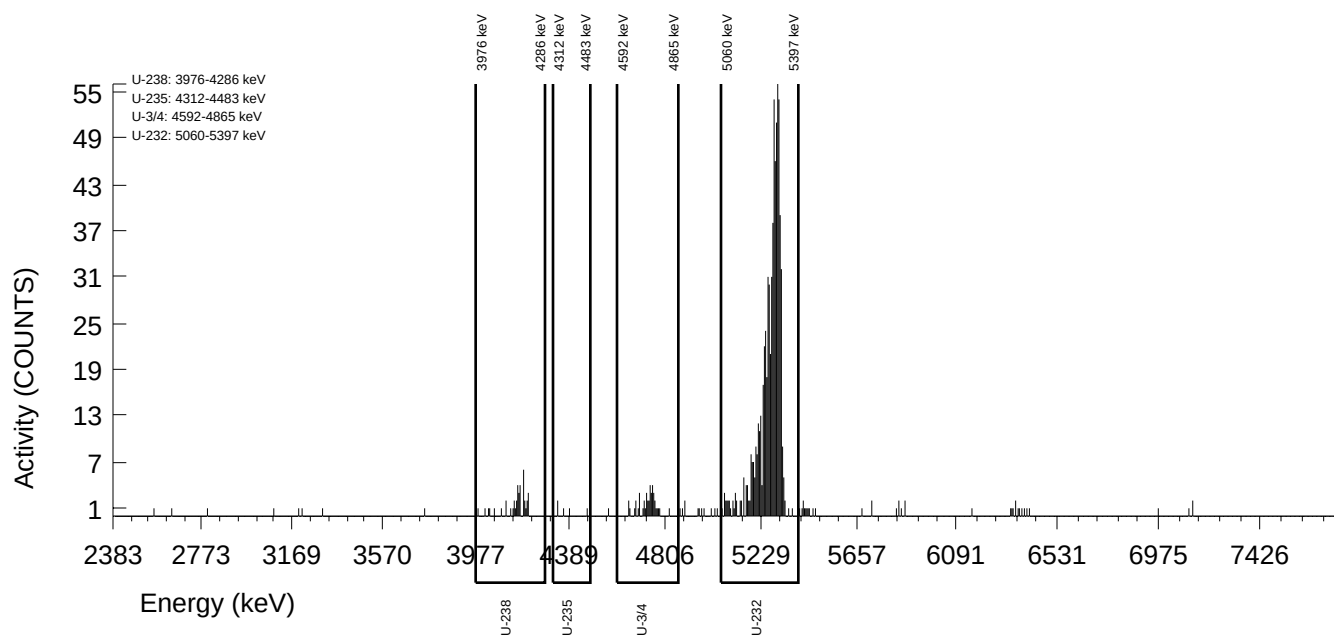
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2290611 SAMPLE ID : S0585905001_UU SAMPLE QTY : 0.118 F +/-0.850 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 76.3 +/-4.910 %	CHAMBER : 149 DETECTOR S/N : 155293 AVERAGE %EFFICIENCY : 40.4567 AVERAGE %EFF ERROR : 0.7777 COUNT DATE : 24-Jul-2022 14:37:18 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : UU BKG FILE : B149.CNF;1728 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W149.CNF;71 CAL DATE : 14-Jul-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5216E+00 dpm RESULTS : 3.4507E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5269.19	55.211	708.000	704.465	3.535	1.8802	100.000	1.73E+01	2.22E+00	2.60E-01	9.33E-02	1.29E+00
U-3/4	4763.02	4734.63	65.354	43.000	40.138	0.505	0.7106	100.000	9.86E-01	3.39E-01	2.16E-01	7.14E-02	3.21E-01
U-235	4391.00	4378.18	4.841	5.000	3.990	1.010	1.0050	80.900	1.21E-01	1.55E-01	2.14E-01	6.16E-02	1.55E-01
U-238	4184.73	4150.72	30.257	40.000	38.990	1.010	1.0050	100.000	9.58E-01	3.27E-01	1.73E-01	4.98E-02	3.11E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (2.357 +/-0.071)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

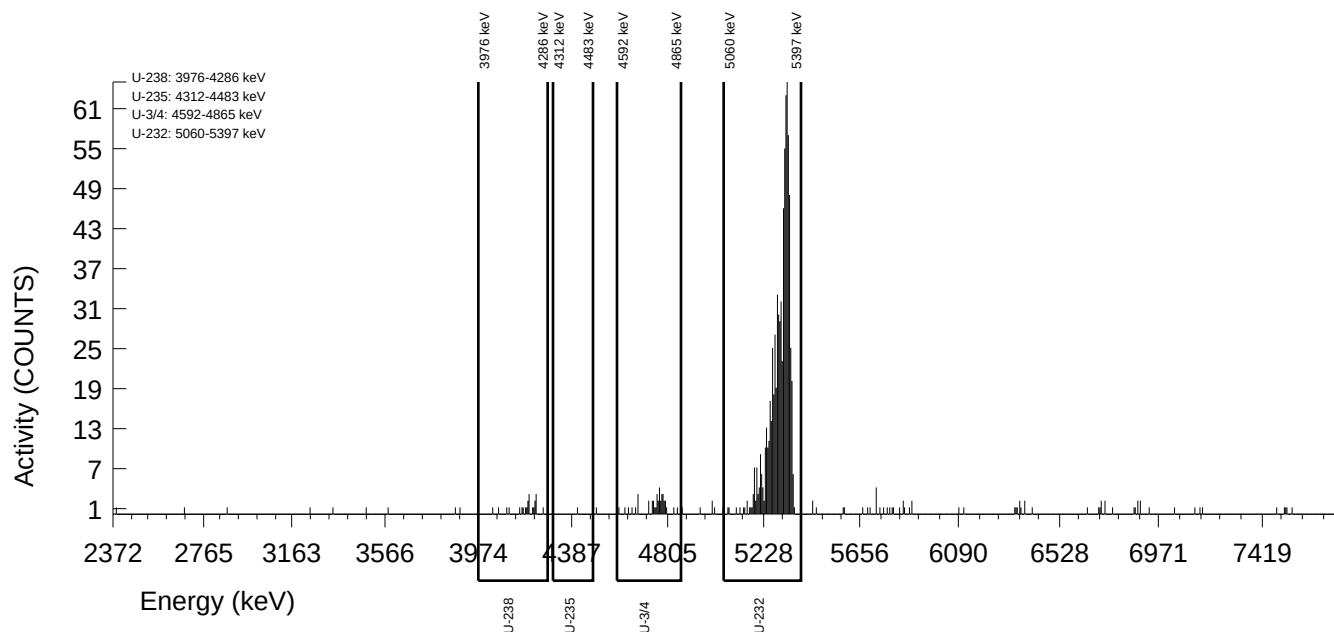
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2290611 SAMPLE ID : S0585905002_UU SAMPLE QTY : 0.112 F +/-0.892 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 85.1 +/-4.814 %	CHAMBER : 152 DETECTOR S/N : 155296 AVERAGE %EFFICIENCY : 38.7994 AVERAGE %EFF ERROR : 0.7464 COUNT DATE : 24-Jul-2022 13:39:36 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : UU BKG FILE : B152.CNF;1712 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W152.CNF;66 CAL DATE : 14-Jul-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5216E+00 dpm RESULTS : 3.8459E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5303.52	52.278	756.000	752.970	3.030	1.7407	100.000	1.82E+01	2.28E+00	2.42E-01	8.48E-02	1.30E+00
U-3/4	4763.02	4751.05	109.018	40.000	35.460	2.020	1.4213	100.000	8.55E-01	3.22E-01	2.59E-01	9.36E-02	3.07E-01
U-235	4391.00	4413.19	4.881	1.000	0.495	0.505	0.7106	80.900	1.48E-02	9.26E-02	1.75E-01	4.28E-02	9.26E-02
U-238	4184.73	4183.80	39.051	22.000	18.970	3.030	1.7407	100.000	4.58E-01	2.40E-01	2.42E-01	8.47E-02	2.35E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (2.520 +/-0.076)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

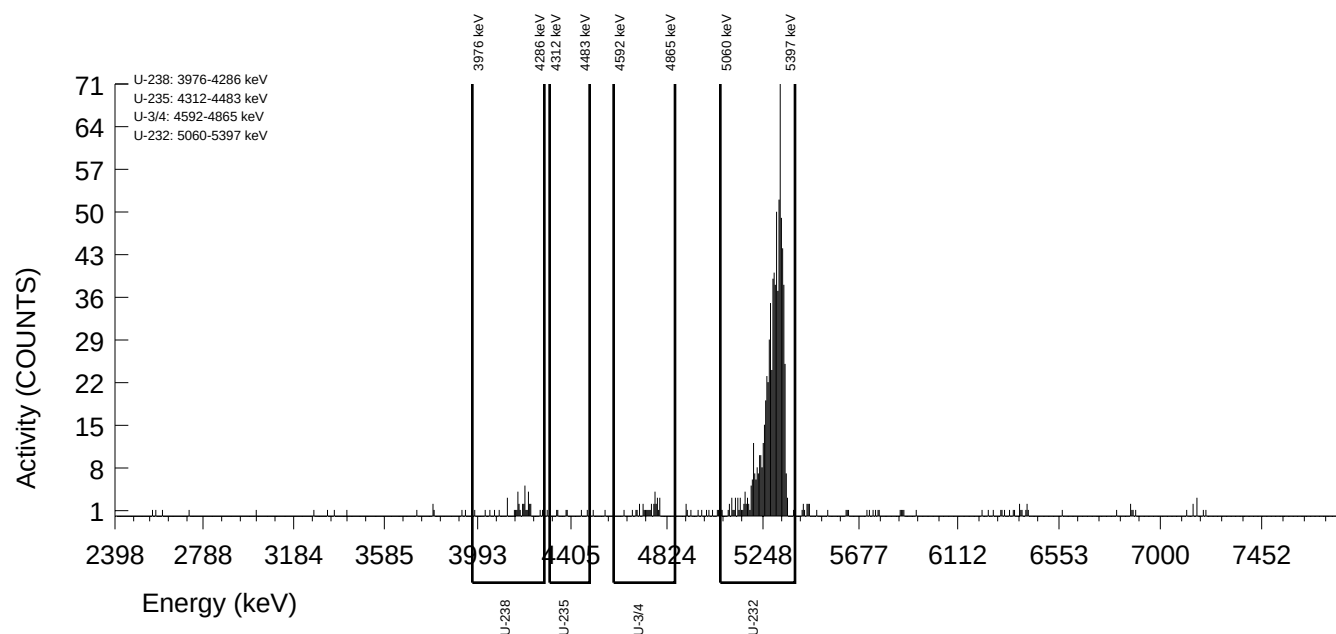
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2290611 SAMPLE ID : S0585905003_UU SAMPLE QTY : 0.104 F +/-0.965 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 82.1 +/-4.806 %	CHAMBER : 155 DETECTOR S/N : 155300 AVERAGE %EFFICIENCY : 41.2966 AVERAGE %EFF ERROR : 0.7935 COUNT DATE : 24-Jul-2022 13:39:39 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : UU BKG FILE : B155.CNF;1733 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W155.CNF;71 CAL DATE : 14-Jul-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5216E+00 dpm RESULTS : 3.7111E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5293.99	45.633	788.000	773.355	14.645	3.8269	100.000	1.97E+01	2.47E+00	4.69E-01	1.96E-01	1.41E+00
U-3/4	4763.02	4755.03	25.821	32.000	24.362	5.050	2.2472	100.000	6.19E-01	3.06E-01	3.43E-01	1.33E-01	2.98E-01
U-235	4391.00	4399.17	130.718	6.000	2.970	3.030	1.7407	80.900	9.33E-02	1.83E-01	3.15E-01	1.10E-01	1.82E-01
U-238	4184.73	4175.96	91.583	39.000	34.455	4.545	2.1319	100.000	8.75E-01	3.37E-01	2.95E-01	1.09E-01	3.25E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (2.588 +/-0.078)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

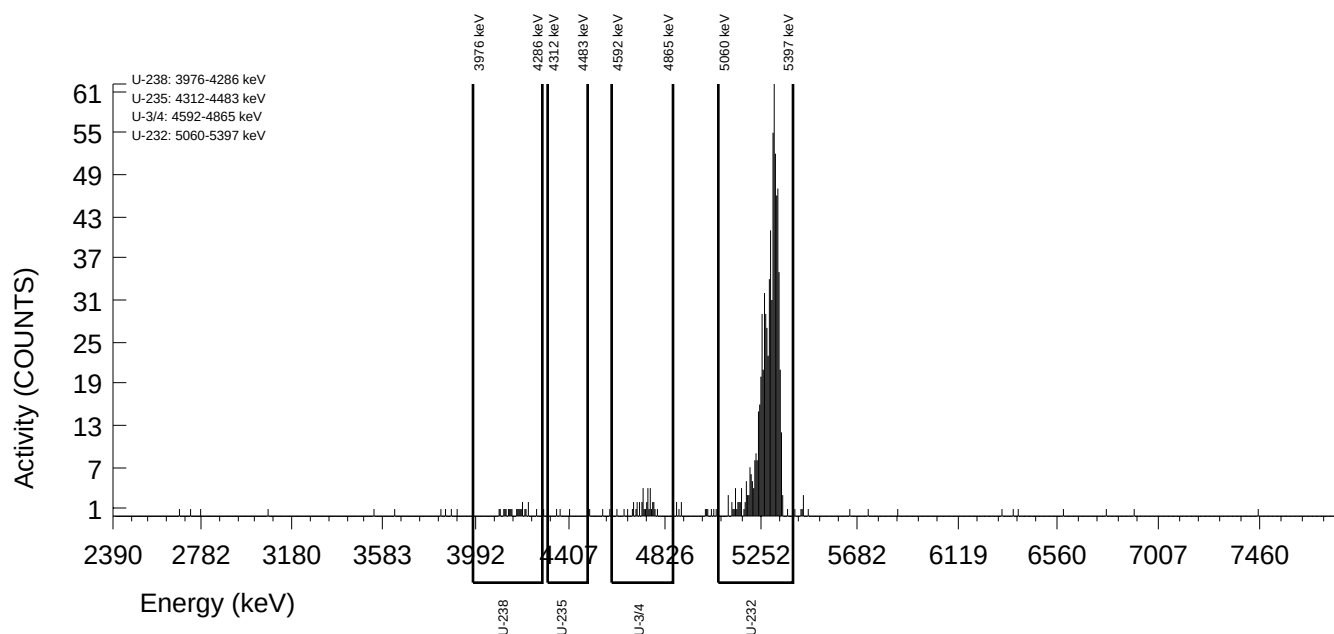
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2290611 SAMPLE ID : S0585905004_UU SAMPLE QTY : 0.107 F +/-0.938 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 80.6 +/-4.871 %	CHAMBER : 156 DETECTOR S/N : 155301 AVERAGE %EFFICIENCY : 39.6146 AVERAGE %EFF ERROR : 0.7619 COUNT DATE : 24-Jul-2022 13:39:41 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : UU BKG FILE : B156.CNF;1736 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W156.CNF;65 CAL DATE : 14-Jul-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5216E+00 dpm RESULTS : 3.6440E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5286.13	60.290	735.000	728.435	6.565	2.5622	100.000	1.91E+01	2.43E+00	3.50E-01	1.36E-01	1.40E+00
U-3/4	4763.02	4737.36	37.346	38.000	33.037	2.525	1.5890	100.000	8.66E-01	3.41E-01	2.94E-01	1.08E-01	3.27E-01
U-235	4391.00	4373.68	58.455	3.000	-0.030	3.030	1.7407	80.900	-9.72E-04	1.53E-01	3.25E-01	1.14E-01	1.53E-01
U-238	4184.73	4170.73	31.663	21.000	15.445	5.555	2.3569	100.000	4.05E-01	2.61E-01	3.28E-01	1.25E-01	2.57E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (2.438 +/-0.073)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

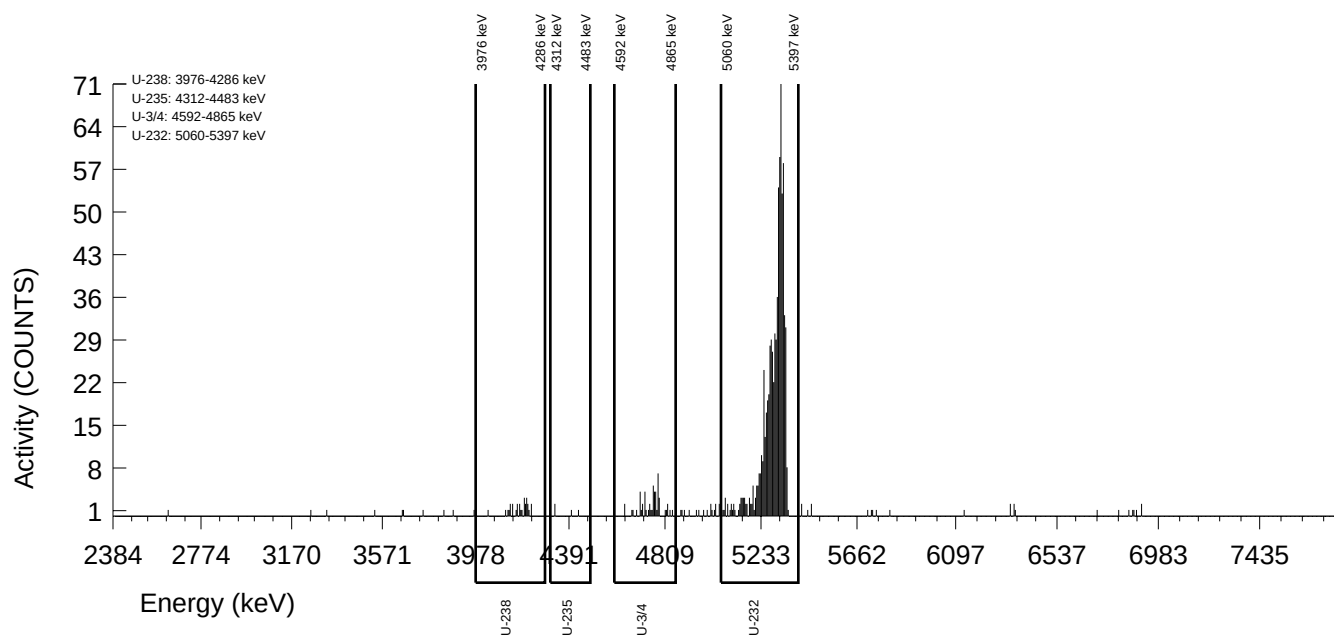
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2290611 SAMPLE ID : S0585905005_UU SAMPLE QTY : 0.116 F +/-0.860 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : MP2 % YIELD : 78.7 +/-4.914 %	CHAMBER : 159 DETECTOR S/N : 155814 AVERAGE %EFFICIENCY : 40.6993 AVERAGE %EFF ERROR : 0.7822 COUNT DATE : 24-Jul-2022 13:39:43 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : UU BKG FILE : B159.CNF;1713 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W159.CNF;66 CAL DATE : 14-Jul-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5216E+00 dpm RESULTS : 3.5582E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5292.84	28.922	754.000	730.770	23.230	4.8198	100.000	1.75E+01	2.25E+00	5.38E-01	2.33E-01	1.30E+00
U-3/4	4763.02	4753.35	77.494	52.000	47.535	2.020	1.4213	100.000	1.14E+00	3.68E-01	2.56E-01	9.23E-02	3.46E-01
U-235	4391.00	4372.73	4.843	4.000	-4.080	8.080	2.8425	80.900	-1.21E-01	1.77E-01	4.28E-01	1.70E-01	1.77E-01
U-238	4184.73	4172.12	90.813	28.000	25.475	2.525	1.5890	100.000	6.10E-01	2.67E-01	2.25E-01	7.68E-02	2.59E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (2.445 +/-0.073)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

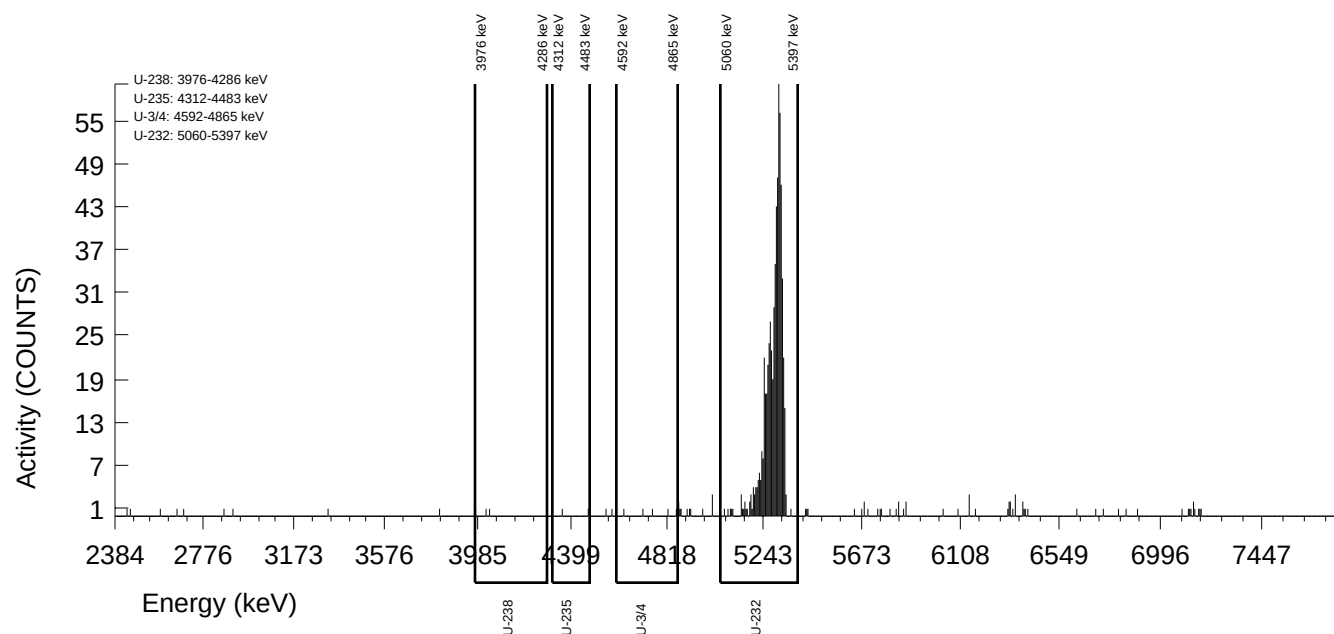
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2290611 SAMPLE ID : S1205140833_UU SAMPLE QTY : 0.130 F +/-0.767 % SAMPLE DATE : 22-Jul-2022 00:00:00 ANALYST : MP2 % YIELD : 70.0 +/-5.109 %	CHAMBER : 160 DETECTOR S/N : 155815 AVERAGE %EFFICIENCY : 38.9919 AVERAGE %EFF ERROR : 0.7501 COUNT DATE : 24-Jul-2022 13:39:45 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : UU BKG FILE : B160.CNF;1710 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W160.CNF;67 CAL DATE : 14-Jul-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5185E+00 dpm RESULTS : 3.1613E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5289.10	34.595	628.000	622.445	5.555	2.3569	100.000	1.56E+01	2.09E+00	3.14E-01	1.19E-01	1.24E+00
U-3/4	4763.02	4755.91	219.079	5.000	-0.618	3.535	1.8802	100.000	-1.55E-02	1.39E-01	3.00E-01	1.12E-01	1.39E-01
U-235	4391.00	4414.45	111.974	2.000	1.495	0.505	0.7106	80.900	4.64E-02	1.14E-01	1.82E-01	4.45E-02	1.14E-01
U-238	4184.73	4010.67	0.000	3.000	2.495	0.505	0.7106	100.000	6.26E-02	1.05E-01	1.47E-01	3.60E-02	1.04E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (2.083 +/-0.062)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

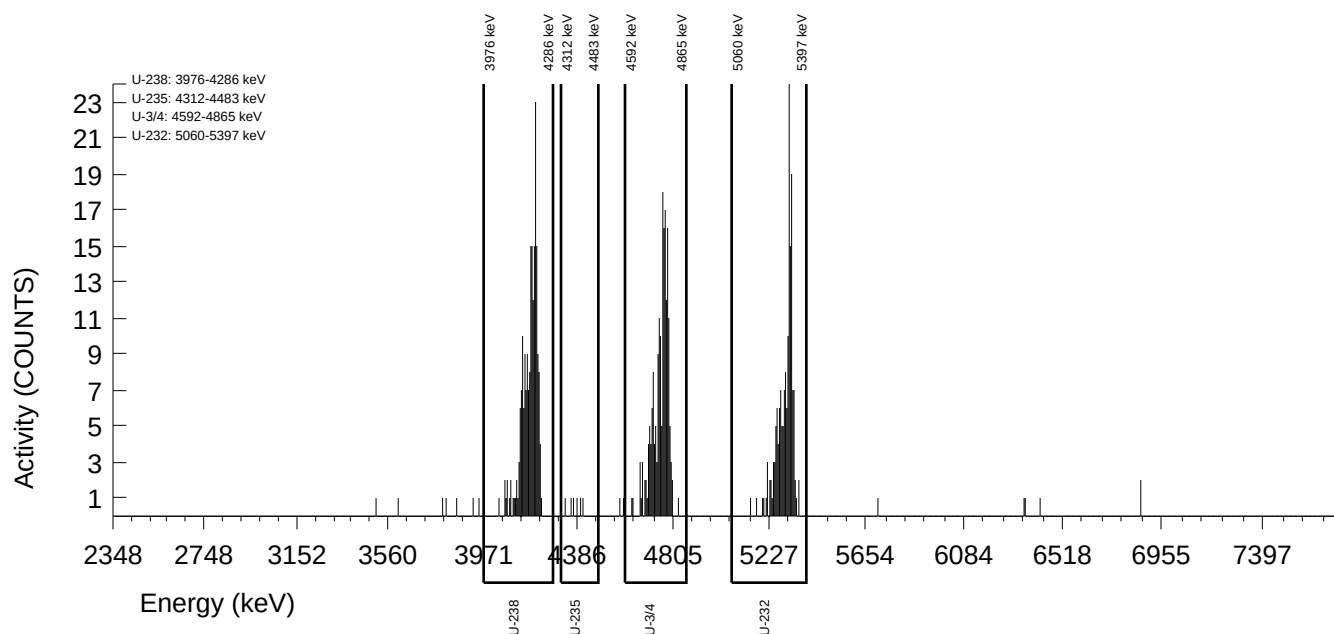
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2290611 SAMPLE ID : S1205140834_UU SAMPLE QTY : 0.130 F +/-0.767 % SAMPLE DATE : 22-Jul-2022 00:00:00 ANALYST : MP2 % YIELD : 83.1 +/-8.451 %	CHAMBER : 113 DETECTOR S/N : 67598 AVERAGE %EFFICIENCY : 25.9324 AVERAGE %EFF ERROR : 0.5038 COUNT DATE : 25-Jul-2022 08:43:36 ELAPSED LIVE TIME(SEC) : 10159.12	LIB FILE : UU BKG FILE : B113.CNF;1785 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W113.CNF;476 CAL DATE : 13-Jul-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5185E+00 dpm RESULTS : 3.7540E+00 dpm	LCS ID 1600-M NUCLIDE U-238 NOMINAL (pCi/F) 2.1276E+01 % RECOVERY 90.522	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			1.96-sigma
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5298.01	17.125	166.000	164.815	1.185	1.0887	100.000	1.56E+01	3.59E+00	6.51E-01	1.83E-01	2.40E+00
U-3/4	4763.02	4751.08	46.457	190.000	188.602	0.847	0.9201	100.000	1.79E+01	3.99E+00	6.71E-01	1.93E-01	2.57E+00
U-235	4391.00	4377.33	79.641	6.000	5.661	0.339	0.5819	80.900	6.63E-01	6.21E-01	5.94E-01	1.21E-01	6.11E-01
U-238	4184.73	4177.41	30.280	204.000	203.323	0.677	0.8230	100.000	1.93E+01	4.23E+00	5.62E-01	1.39E-01	2.66E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.552 +/-0.017)



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ALPHA SPECTROSCOPY REPORT

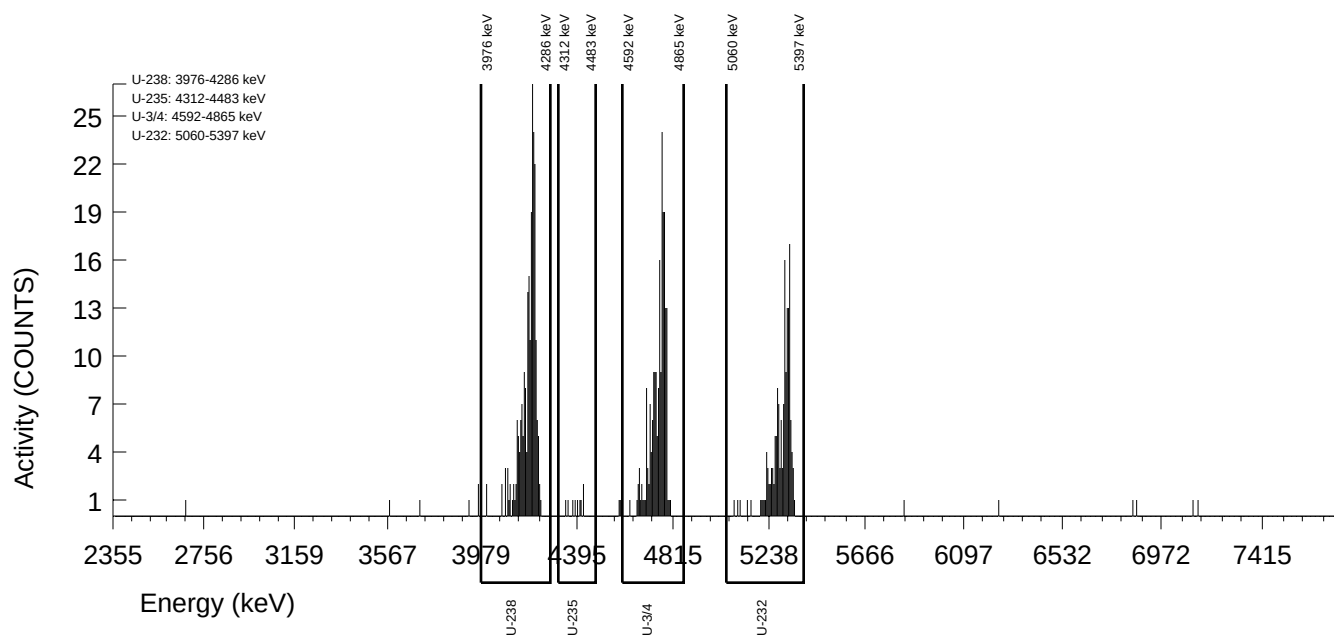
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2290611 SAMPLE ID : S1205140835_UU SAMPLE QTY : 0.130 F +/-0.767 % SAMPLE DATE : 22-Jul-2022 00:00:00 ANALYST : MP2 % YIELD : 74.2 +/-8.778 %	CHAMBER : 114 DETECTOR S/N : 155766 AVERAGE %EFFICIENCY : 26.3352 AVERAGE %EFF ERROR : 0.5113 COUNT DATE : 25-Jul-2022 08:43:38 ELAPSED LIVE TIME(SEC) : 10372.94	LIB FILE : UU BKG FILE : B114.CNF;1796 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W114.CNF;505 CAL DATE : 13-Jul-2022
TRACER ID : 1564-DD NUCLIDE : U-232 NOMINAL : 4.5185E+00 dpm RESULTS : 3.3516E+00 dpm	LCSD ID 1600-M NUCLIDE U-238 NOMINAL (pCi/F) 2.1276E+01 % RECOVERY 110.111	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5296.30	27.892	155.000	152.580	2.420	1.5557	100.000	1.56E+01	3.73E+00	8.74E-01	2.84E-01	2.51E+00
U-3/4	4763.02	4755.51	32.755	199.000	197.279	1.210	1.1001	100.000	2.02E+01	4.57E+00	7.75E-01	2.34E-01	2.84E+00
U-235	4391.00	4394.90	4.975	9.000	8.481	0.519	0.7202	80.900	1.07E+00	8.11E-01	7.04E-01	1.62E-01	7.89E-01
U-238	4184.73	4182.68	33.946	230.000	228.963	1.037	1.0185	100.000	2.34E+01	5.14E+00	6.78E-01	1.86E-01	3.05E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.511 +/-0.015)



Batch 2290613 Check-list

This check-list was completed on 24-JUL-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 24-JUL-22 and Jessica Davis on 25-JUL-22.

Batch ID: 2290613

Product: ASP10POF

Description: Alpha Spec Polonium

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Polonium

Batch ID: 2290613

Analyst: Brendon Viquez (BV1)

Method: DOE EML HASL-300, Po-01-RC
Modified

Lab SOP: GL-RAD-A-016 REV# 19

Instrument: BAL-18550299

Due Dates for Lab: 26-JUL-2022

Package: 27-JUL-2022

SDG: 27-JUL-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205140841	Polonium-210 AS SPIKE	2012-A	.1	mL
LCSD	1205140842	Polonium-210 AS SPIKE	2012-A	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (g)	Aliquot (Filter)
1	585885001	18-JUL-2022	.5	0.476	0.21118
2	585885002	18-JUL-2022	.5	0.462	0.20379
3	585885003	18-JUL-2022	.5	0.479	0.21684
4	585905001	18-JUL-2022	.5	0.766	0.21067
5	585905002	18-JUL-2022	.5	0.756	0.20849
6	585905003	18-JUL-2022	.5	0.76	0.20879
7	585905004	18-JUL-2022	.5	0.764	0.21047
8	585905005	18-JUL-2022	.5	0.753	0.21187
9	1205140840 MB	18-JUL-2022	.5		0.21684
10	1205140841 LCS	18-JUL-2022	.5		0.21684
11	1205140842 LCSD	18-JUL-2022	.5		0.21684

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1720-D	Polonium-209 AS TRACER	.1 ml	Data Entry Date2: 18-JUL-2022 00:00

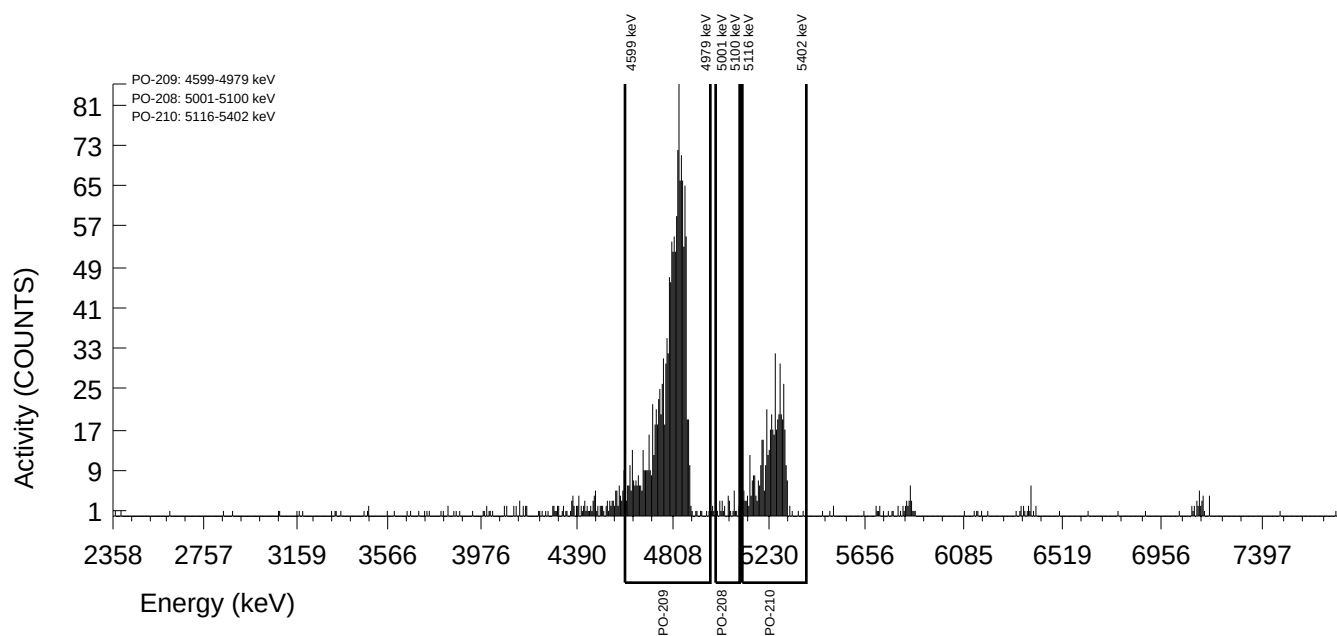
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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2290613 SAMPLE ID : S0585905001_PO SAMPLE QTY : 0.211 F +/-0.475 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 70.5 +/-3.502 %	CHAMBER : 178 DETECTOR S/N : 92562 AVERAGE %EFFICIENCY : 26.5236 AVERAGE %EFF ERROR : 0.5149 COUNT DATE : 23-Jul-2022 12:17:21 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B178.CNF;1508 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W178.CNF;396 CAL DATE : 15-Jul-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8794E+00 dpm RESULTS : 5.5552E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5052.76	63.418	31.000	29.000	2.000	1.4142	100.000	3.37E-01	1.38E-01	1.11E-01	3.83E-02	1.35E-01
PO-209	4882.00	4799.42	72.617	1479.000	1469.000	10.000	3.1623	99.740	1.68E+01	1.59E+00	2.03E-01	8.44E-02	8.68E-01
PO-210	5304.38	5244.49	77.328	472.000	466.000	6.000	2.4495	100.000	6.10E+00	7.40E-01	1.88E-01	7.45E-02	5.62E-01

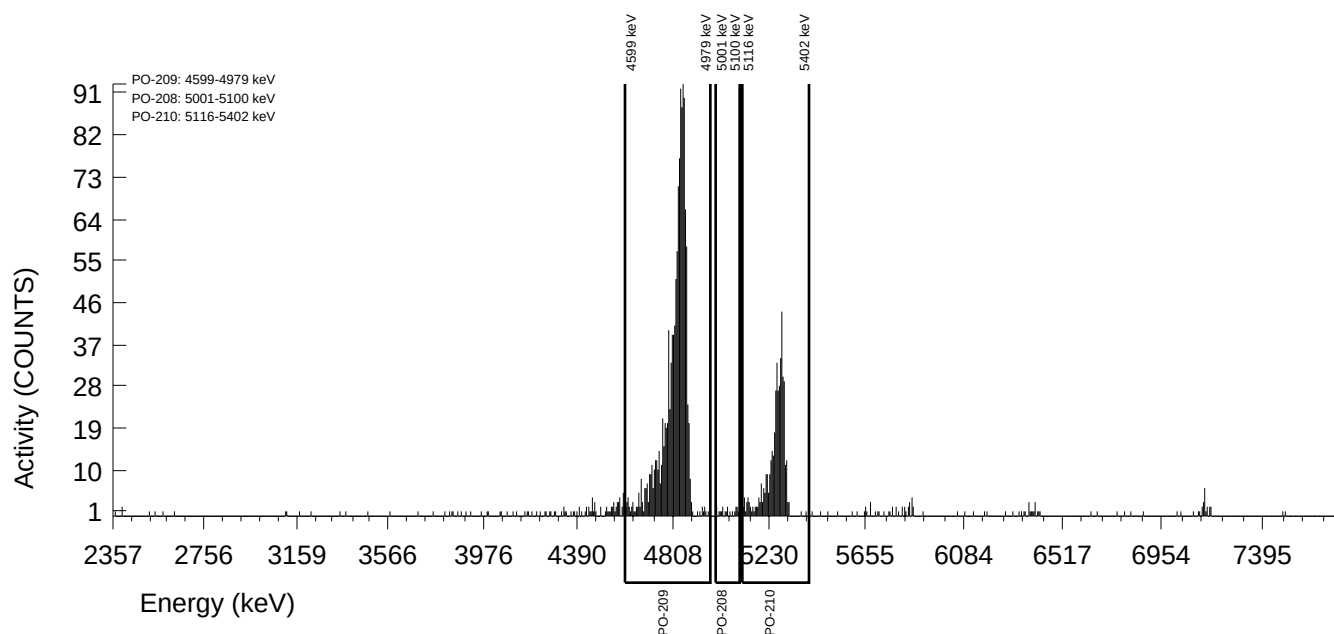


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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2290613 SAMPLE ID : S0585905002_PO SAMPLE QTY : 0.208 F +/-0.480 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 61.0 +/-3.653 %	CHAMBER : 179 DETECTOR S/N : 92563 AVERAGE %EFFICIENCY : 26.7534 AVERAGE %EFF ERROR : 0.5192 COUNT DATE : 23-Jul-2022 12:17:23 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B179.CNF;1499 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W179.CNF;404 CAL DATE : 15-Jul-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8794E+00 dpm RESULTS : 4.8026E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5051.07	0.000	19.000	18.000	1.000	1.0000	100.000	2.43E-01	1.26E-01	1.03E-01	3.14E-02	1.24E-01
PO-209	4882.00	4819.11	48.583	1295.000	1281.000	14.000	3.7417	99.740	1.70E+01	1.68E+00	2.71E-01	1.16E-01	9.43E-01
PO-210	5304.38	5260.51	39.432	429.000	420.000	9.000	3.0000	100.000	6.37E+00	8.11E-01	2.57E-01	1.06E-01	6.23E-01



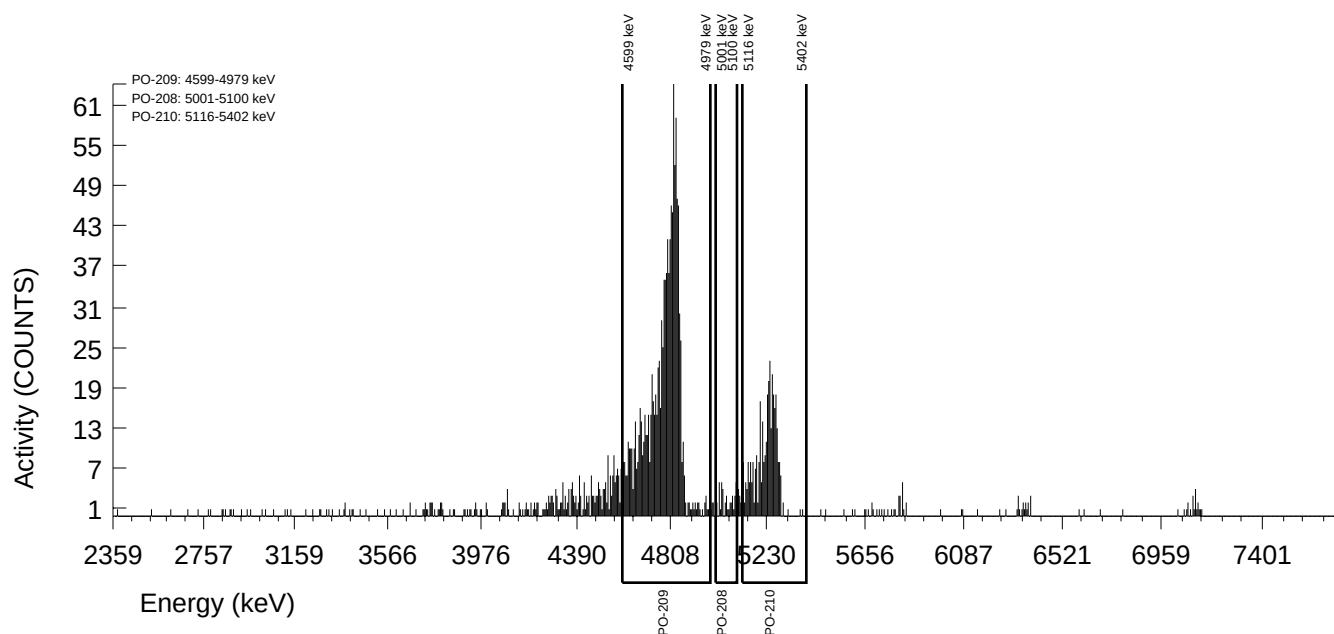
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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2290613 SAMPLE ID : S0585905003_PO SAMPLE QTY : 0.209 F +/-0.479 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 53.5 +/-3.818 %	CHAMBER : 180 DETECTOR S/N : 92564 AVERAGE %EFFICIENCY : 26.7596 AVERAGE %EFF ERROR : 0.5194 COUNT DATE : 23-Jul-2022 12:17:26 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B180.CNF;1502 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W180.CNF;64 CAL DATE : 15-Jul-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8794E+00 dpm RESULTS : 4.2168E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5055.19	0.000	45.000	45.000	0.000	1.0000	100.000	6.90E-01	2.14E-01	4.60E-02	3.57E-02	2.06E-01
PO-209	4882.00	4773.86	65.231	1145.000	1125.000	20.000	4.4721	99.740	1.70E+01	1.76E+00	3.60E-01	1.57E-01	1.01E+00
PO-210	5304.38	5221.85	73.826	339.000	328.000	11.000	3.3166	100.000	5.65E+00	7.94E-01	3.18E-01	1.33E-01	6.34E-01

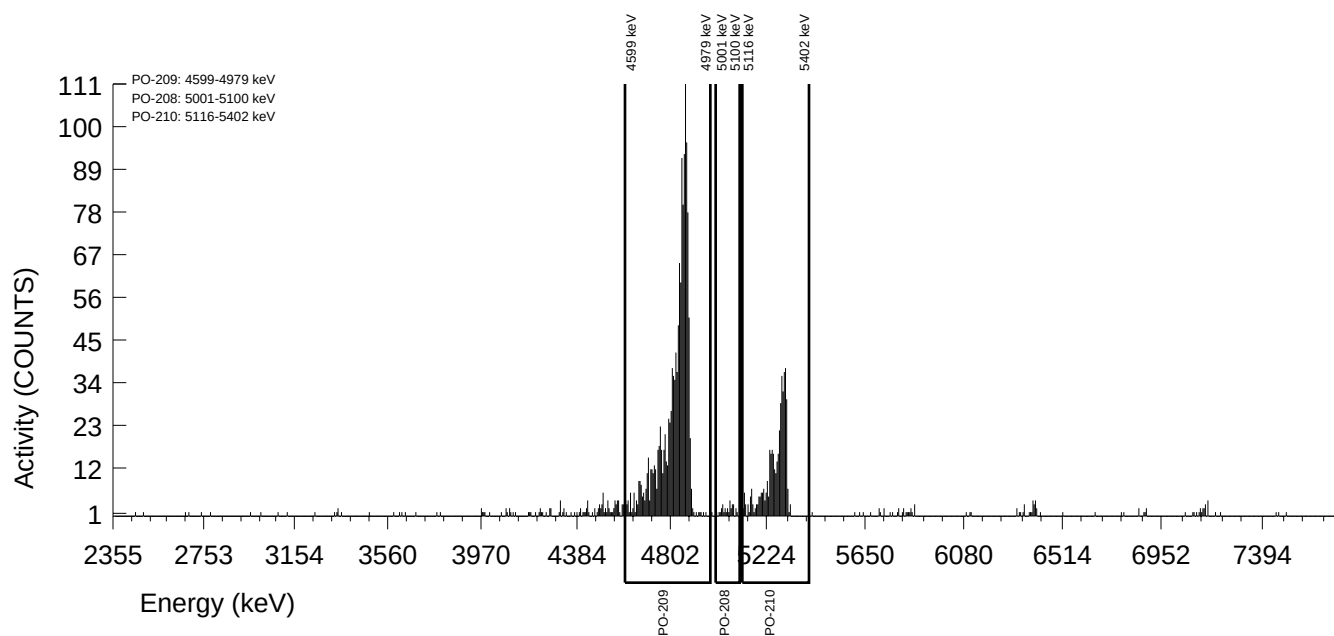


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2290613 SAMPLE ID : S0585905004_PO SAMPLE QTY : 0.210 F +/-0.475 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 66.0 +/-3.539 %	CHAMBER : 191 DETECTOR S/N : 140615 AVERAGE %EFFICIENCY : 27.1366 AVERAGE %EFF ERROR : 0.5264 COUNT DATE : 23-Jul-2022 12:19:46 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B191.CNF;1499 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W191.CNF;452 CAL DATE : 18-Jul-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8794E+00 dpm RESULTS : 5.1968E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5054.80	51.131	32.000	31.000	1.000	1.0000	100.000	3.77E-01	1.44E-01	9.31E-02	2.83E-02	1.41E-01
PO-209	4882.00	4818.85	41.699	1411.000	1406.000	5.000	2.2361	99.740	1.69E+01	1.61E+00	1.61E-01	6.24E-02	8.85E-01
PO-210	5304.38	5260.73	34.530	446.000	444.000	2.000	1.4142	100.000	6.07E+00	7.47E-01	1.31E-01	4.50E-02	5.69E-01



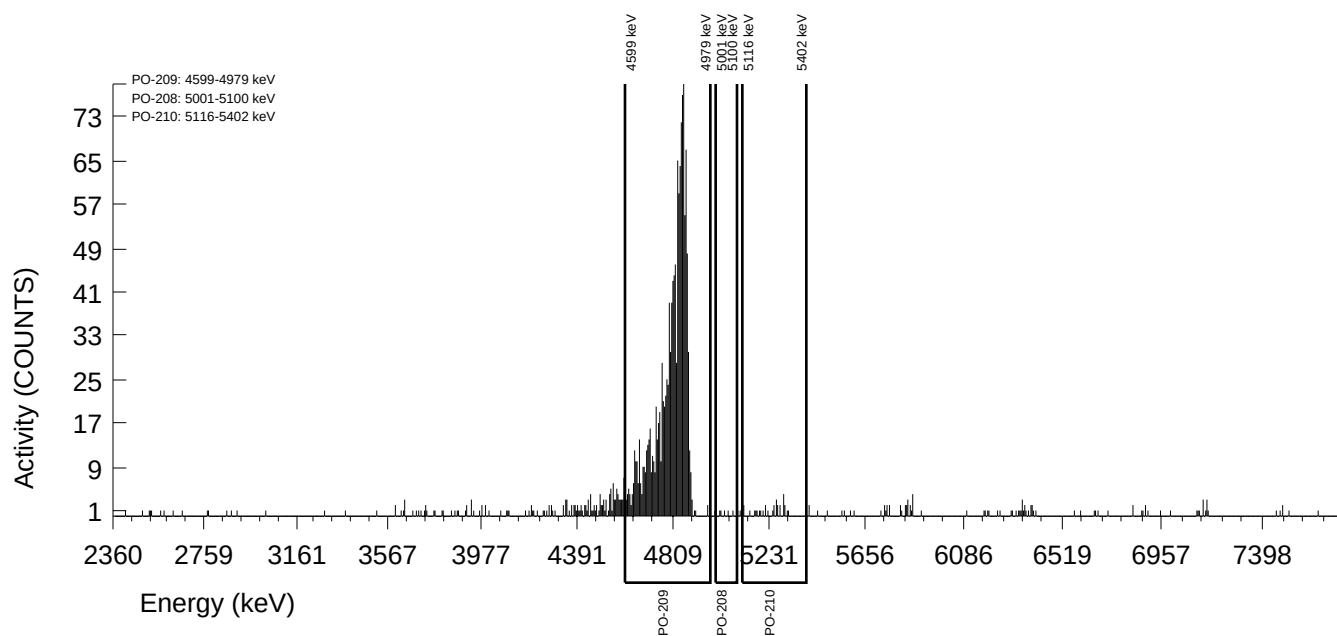
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2290613 SAMPLE ID : S0585905005_PO SAMPLE QTY : 0.212 F +/-0.472 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 63.2 +/-3.578 %	CHAMBER : 192 DETECTOR S/N : 140616 AVERAGE %EFFICIENCY : 27.1689 AVERAGE %EFF ERROR : 0.5271 COUNT DATE : 23-Jul-2022 12:19:48 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B192.CNF;1505 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W192.CNF;472 CAL DATE : 18-Jul-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8794E+00 dpm RESULTS : 4.9765E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5050.85	0.000	8.000	-1.000	9.000	3.0000	100.000	-1.26E-02	1.08E-01	2.14E-01	8.80E-02	1.08E-01
PO-209	4882.00	4806.21	66.129	1350.000	1348.000	2.000	1.4142	99.740	1.68E+01	1.62E+00	1.19E-01	4.09E-02	8.96E-01
PO-210	5304.38	5244.34	36.333	30.000	20.000	10.000	3.1623	100.000	2.83E-01	1.81E-01	2.51E-01	1.04E-01	1.80E-01

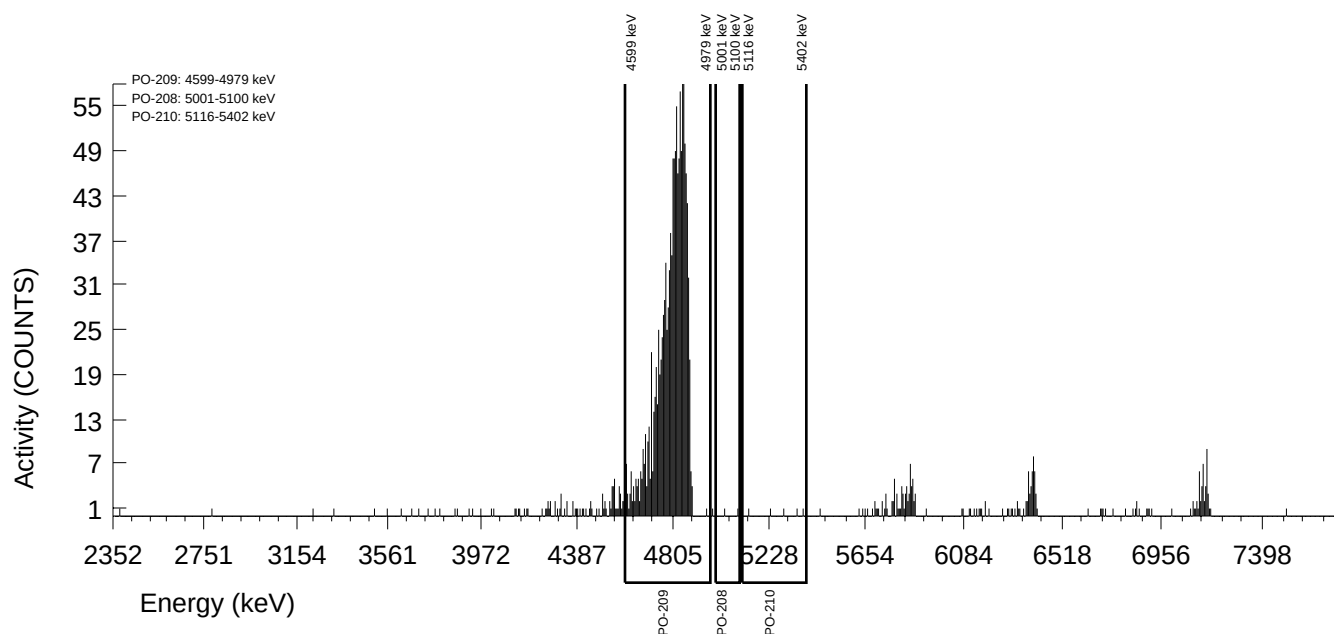


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2290613 SAMPLE ID : S1205140840_PO SAMPLE QTY : 0.217 F +/-0.461 % SAMPLE DATE : 18-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 61.4 +/-3.699 %	CHAMBER : 194 DETECTOR S/N : 140618 AVERAGE %EFFICIENCY : 25.7555 AVERAGE %EFF ERROR : 0.5004 COUNT DATE : 23-Jul-2022 12:19:51 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B194.CNF;1495 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W194.CNF;438 CAL DATE : 18-Jul-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8769E+00 dpm RESULTS : 4.8392E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5066.30	59.585	2.000	-1.000	3.000	1.7321	100.000	-1.32E-02	6.84E-02	1.46E-01	5.31E-02	6.83E-02
PO-209	4882.00	4803.44	100.662	1263.000	1243.000	20.000	4.4721	99.740	1.64E+01	1.63E+00	3.13E-01	1.37E-01	9.25E-01
PO-210	5304.38	5301.25	238.338	6.000	-6.000	12.000	3.4641	100.000	-8.11E-02	1.19E-01	2.58E-01	1.09E-01	1.19E-01

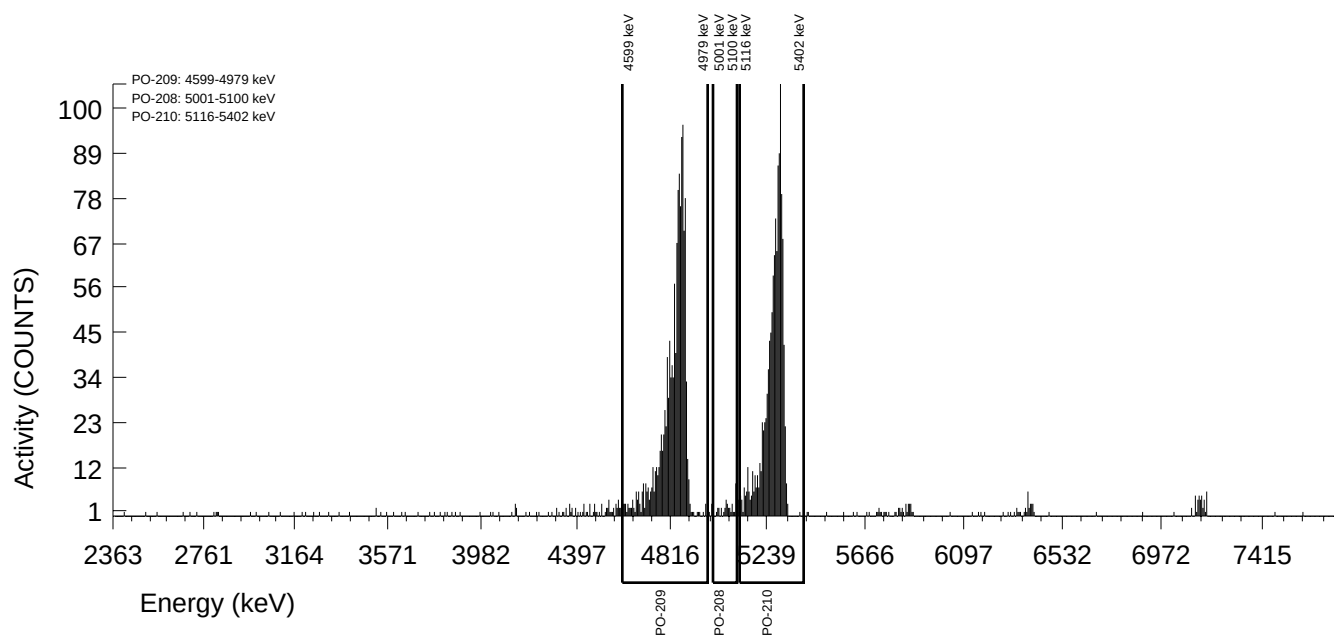


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2290613 SAMPLE ID : S1205140841_PO SAMPLE QTY : 0.217 F +/-0.461 % SAMPLE DATE : 18-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 61.7 +/-3.614 %	CHAMBER : 195 DETECTOR S/N : 140619 AVERAGE %EFFICIENCY : 26.9871 AVERAGE %EFF ERROR : 0.5237 COUNT DATE : 23-Jul-2022 12:19:53 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B195.CNF;1510 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W195.CNF;421 CAL DATE : 18-Jul-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8769E+00 dpm RESULTS : 4.8598E+00 dpm	LCS ID 2012-A NUCLIDE PO-210 NOMINAL (pCi/F) 1.6509E+01 % RECOVERY 92.612	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
PO-208	5080.00	5066.02	0.000	36.000	34.000	2.000	1.4142	100.000	4.26E-01	1.59E-01	1.20E-01	4.12E-02	1.55E-01
PO-209	4882.00	4826.21	49.849	1312.000	1308.000	4.000	2.0000	99.740	1.64E+01	1.60E+00	1.54E-01	5.82E-02	8.90E-01
PO-210	5304.38	5266.20	45.813	1192.000	1190.000	2.000	1.4142	100.000	1.53E+01	1.51E+00	1.23E-01	4.23E-02	8.71E-01

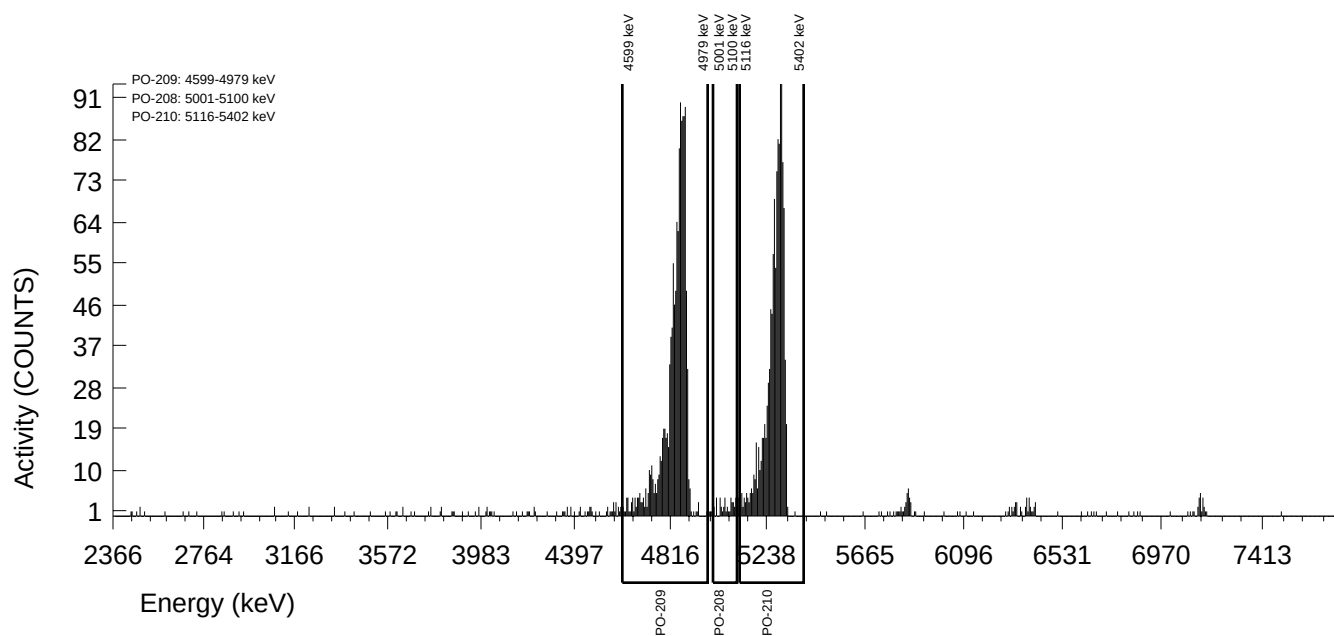


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2290613 SAMPLE ID : S1205140842_PO SAMPLE QTY : 0.217 F +/-0.461 % SAMPLE DATE : 18-Jul-2022 00:00:00 ANALYST : BV1 % YIELD : 60.2 +/-3.653 %	CHAMBER : 196 DETECTOR S/N : 140620 AVERAGE %EFFICIENCY : 26.9069 AVERAGE %EFF ERROR : 0.5221 COUNT DATE : 23-Jul-2022 12:19:55 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : PO BKG FILE : B196.CNF;1490 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W196.CNF;427 CAL DATE : 18-Jul-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8769E+00 dpm RESULTS : 4.7439E+00 dpm	LCSD ID2012-A NUCLIDEPO-210 NOMINAL (pCi/F)1.6509E+01 % RECOVERY92.680	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			1.96-sigma
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
PO-208	5080.00	5059.79	0.000	40.000	36.000	4.000	2.0000	100.000	4.63E-01	1.75E-01	1.58E-01	5.99E-02	1.71E-01
PO-209	4882.00	4832.45	59.157	1283.000	1273.000	10.000	3.1623	99.740	1.64E+01	1.61E+00	2.28E-01	9.46E-02	9.07E-01
PO-210	5304.38	5270.59	51.364	1173.000	1159.000	14.000	3.7417	100.000	1.53E+01	1.53E+00	2.69E-01	1.15E-01	8.92E-01



Continuing Calibration Data

Review of Alpha Spectrometer QA results (Daily checks) 23-JUL-2022 15:45:59.87

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
23-JUL-2022	18	PSFWHM-5000	Below
23-JUL-2022	18	PSENERGY-5000	Above
23-JUL-2022	18	PSCENTRD-5000	Above
23-JUL-2022	18	PSCTSS-5000	Below
23-JUL-2022	19	Second Check Required for D	
23-JUL-2022	23	PSFWHM-5000	Above
23-JUL-2022	23	PSCTSS-5000	Below
23-JUL-2022	46	PSFWHM-5000	Below
23-JUL-2022	46	PSCTSS-5000	Below
23-JUL-2022	91	PSENERGY-5000	Above
23-JUL-2022	94	PSFWHM-5000	Below
23-JUL-2022	94	PSCTSS-5000	Below
23-JUL-2022	101	PSFWHM-5000	Below
23-JUL-2022	101	PSCTSS-5000	Below
23-JUL-2022	137	Second Check Required for D	
23-JUL-2022	142	PSENERGY-5000	Above
23-JUL-2022	142	PSCENTRD-5000	Above
23-JUL-2022	145	PSFWHM-5000	Above
23-JUL-2022	145	PSENERGY-5000	Below
23-JUL-2022	151	PSENERGY-5000	Below
23-JUL-2022	161	PSENERGY-5000	Above
23-JUL-2022	161	PSCENTRD-5000	Above
23-JUL-2022	162	PSENERGY-5000	Above
23-JUL-2022	172	PSENERGY-5000	Above
23-JUL-2022	173	PSCTSS-5000	Below
23-JUL-2022	176	Second Check Required for D	
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below

15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

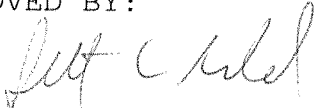
23-JUL-2022	249	Second Check Required for D	
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The following detectors that may not have properly transfered to the QA file

115	may not have run since 23-JUL-2022
116	may not have run since 23-JUL-2022
119	may not have run since 23-JUL-2022
120	may not have run since 23-JUL-2022
147	may not have run since 23-JUL-2022
148	may not have run since 23-JUL-2022
163	may not have run since 23-JUL-2022
164	may not have run since 23-JUL-2022
183	may not have run since 23-JUL-2022
184	may not have run since 23-JUL-2022
187	may not have run since 23-JUL-2022
188	may not have run since 23-JUL-2022
198	may not have run since 23-JUL-2022
221	may not have run since 23-JUL-2022
227	may not have run since 23-JUL-2022
228	may not have run since 23-JUL-2022
241	may not have run since 23-JUL-2022
242	may not have run since 23-JUL-2022
247	may not have run since 23-JUL-2022
248	may not have run since 23-JUL-2022

APPROVAL DATE:
7/23/22

APPROVAL TIME:
1600

APPROVED BY:


PROCEDURE # GL-RAD-I-009

Report completed at 23-JUL-2022 15:48:59.14

Review of Alpha Spectrometer QA results (Daily checks) 24-JUL-2022 23:00:00.76

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
24-JUL-2022	18	PSFWHM-5000	Below
24-JUL-2022	18	PSENERGY-5000	Above
24-JUL-2022	18	PSCENTRD-5000	Above
24-JUL-2022	18	PSCTSS-5000	Below
24-JUL-2022	23	PSFWHM-5000	Above
24-JUL-2022	23	PSCTSS-5000	Below
24-JUL-2022	46	PSFWHM-5000	Below
24-JUL-2022	46	PSCTSS-5000	Below
24-JUL-2022	73	PSENERGY-5000	Above
24-JUL-2022	91	PSENERGY-5000	Above
24-JUL-2022	94	PSFWHM-5000	Below
24-JUL-2022	94	PSCTSS-5000	Below
24-JUL-2022	101	PSFWHM-5000	Below
24-JUL-2022	101	PSCTSS-5000	Below
24-JUL-2022	137	PSCTSS-5000	Below
24-JUL-2022	142	PSENERGY-5000	Above
24-JUL-2022	142	PSCENTRD-5000	Above
24-JUL-2022	145	PSFWHM-5000	Above
24-JUL-2022	145	PSENERGY-5000	Below
24-JUL-2022	151	PSENERGY-5000	Below
24-JUL-2022	161	PSENERGY-5000	Above
24-JUL-2022	161	PSCENTRD-5000	Above
24-JUL-2022	162	PSENERGY-5000	Above
24-JUL-2022	172	PSENERGY-5000	Above
24-JUL-2022	173	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below

15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transferred to the QA file

115	may not have run since 24-JUL-2022
116	may not have run since 24-JUL-2022
119	may not have run since 24-JUL-2022
120	may not have run since 24-JUL-2022
147	may not have run since 24-JUL-2022
148	may not have run since 24-JUL-2022
163	may not have run since 24-JUL-2022
164	may not have run since 24-JUL-2022
183	may not have run since 24-JUL-2022
184	may not have run since 24-JUL-2022
187	may not have run since 24-JUL-2022
188	may not have run since 24-JUL-2022
198	may not have run since 24-JUL-2022
221	may not have run since 24-JUL-2022
227	may not have run since 24-JUL-2022
228	may not have run since 24-JUL-2022
241	may not have run since 24-JUL-2022
242	may not have run since 24-JUL-2022
247	may not have run since 24-JUL-2022
248	may not have run since 24-JUL-2022

APPROVAL DATE: 7/24/2022 APPROVAL TIME: 23:10

APPROVED BY:  PROCEDURE # GL-RAD-I-009

Report completed at 24-JUL-2022 23:02:30.95

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
25-JUL-2022	18	PSFWHM-5000	Below
25-JUL-2022	18	PSENERGY-5000	Above
25-JUL-2022	18	PSCTSS-5000	Below
25-JUL-2022	23	PSFWHM-5000	Above
25-JUL-2022	23	PSCTSS-5000	Below
25-JUL-2022	46	PSFWHM-5000	Below
25-JUL-2022	46	PSCTSS-5000	Below
25-JUL-2022	73	Second Check Required for D	
25-JUL-2022	91	PSENERGY-5000	Above
25-JUL-2022	94	PSFWHM-5000	Below
25-JUL-2022	94	PSCTSS-5000	Below
25-JUL-2022	101	PSFWHM-5000	Below
25-JUL-2022	101	PSCTSS-5000	Below
25-JUL-2022	137	Second Check Required for D	
25-JUL-2022	142	PSENERGY-5000	Above
25-JUL-2022	142	PSCENTRD-5000	Above
25-JUL-2022	145	PSFWHM-5000	Above
25-JUL-2022	145	PSENERGY-5000	Below
25-JUL-2022	151	PSENERGY-5000	Below
25-JUL-2022	161	PSENERGY-5000	Above
25-JUL-2022	161	PSCENTRD-5000	Above
25-JUL-2022	162	PSENERGY-5000	Above
25-JUL-2022	172	PSENERGY-5000	Above
25-JUL-2022	173	PSCTSS-5000	Below
25-JUL-2022	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below

15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transfered to the QA file

115	may not have run since 25-JUL-2022
116	may not have run since 25-JUL-2022
119	may not have run since 25-JUL-2022
120	may not have run since 25-JUL-2022
147	may not have run since 25-JUL-2022
148	may not have run since 25-JUL-2022
157	may not have run since 25-JUL-2022
158	may not have run since 25-JUL-2022
163	may not have run since 25-JUL-2022
164	may not have run since 25-JUL-2022
183	may not have run since 25-JUL-2022
184	may not have run since 25-JUL-2022
198	may not have run since 25-JUL-2022
221	may not have run since 25-JUL-2022
227	may not have run since 25-JUL-2022
228	may not have run since 25-JUL-2022
241	may not have run since 25-JUL-2022
242	may not have run since 25-JUL-2022
247	may not have run since 25-JUL-2022
248	may not have run since 25-JUL-2022

APPROVAL DATE:

7/25/22

APPROVAL TIME:

1015

APPROVED BY:

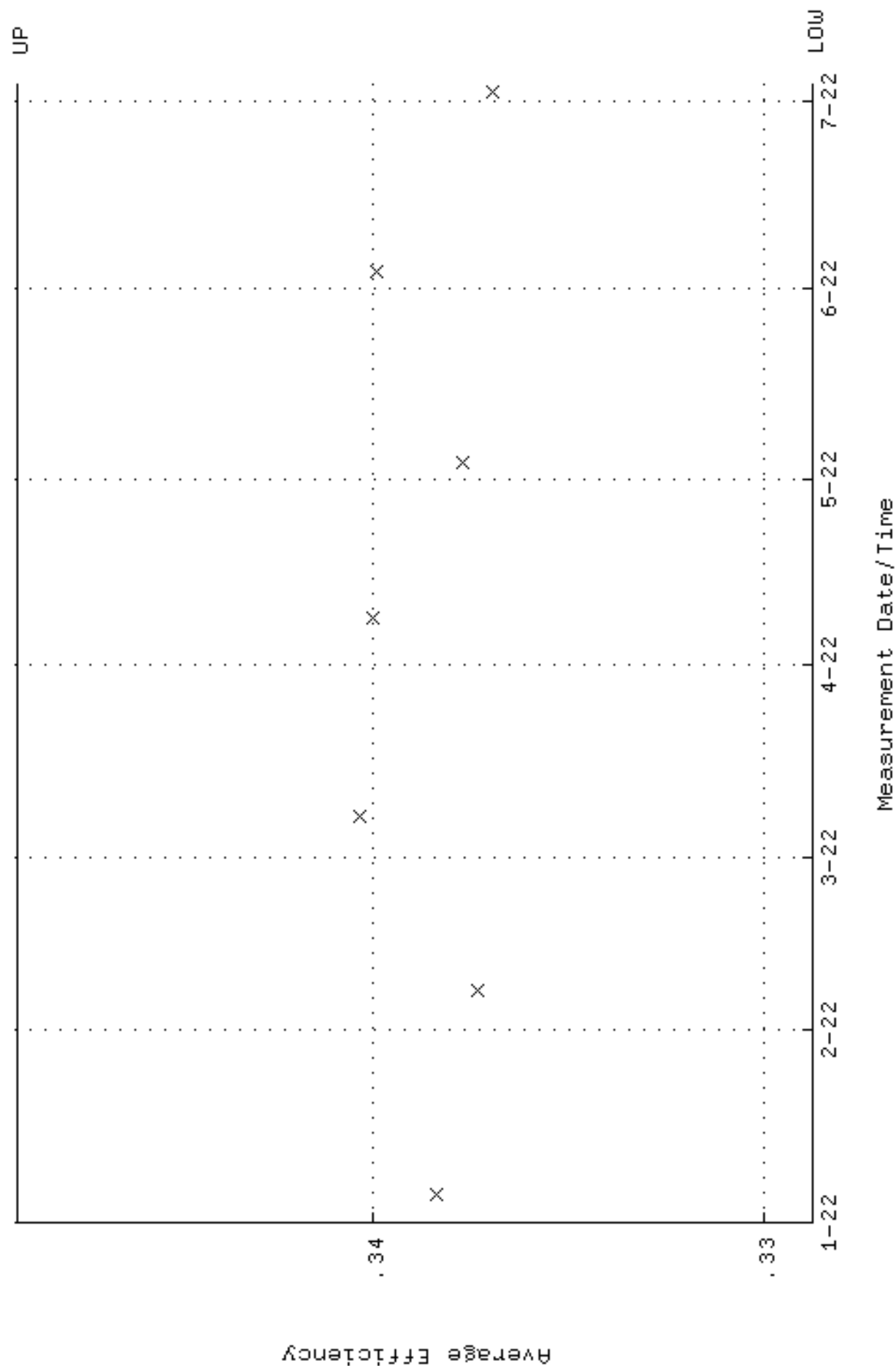
[Signature]

PROCEDURE # GL-RAD-I-009

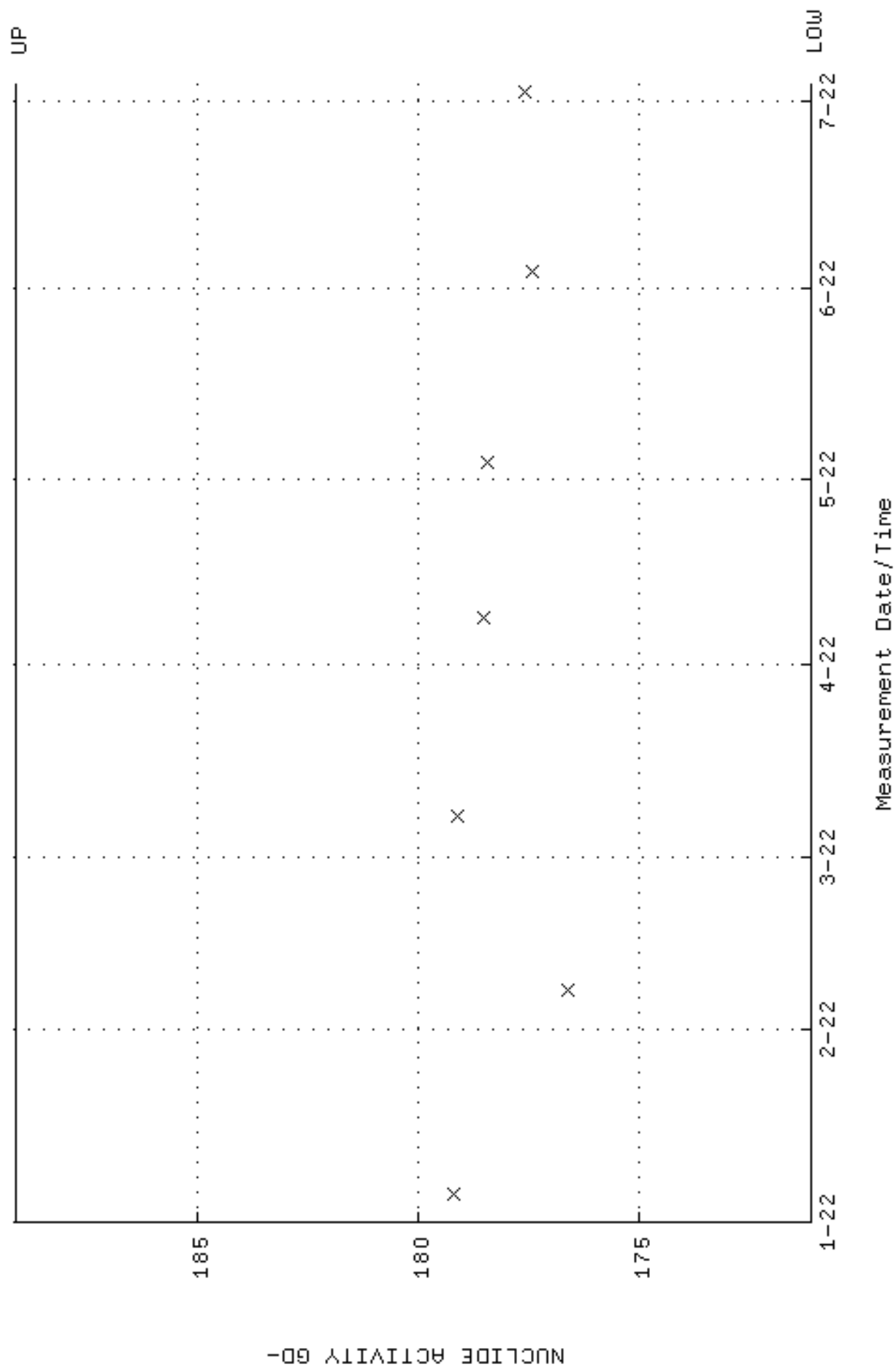
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Background and Efficiency Data

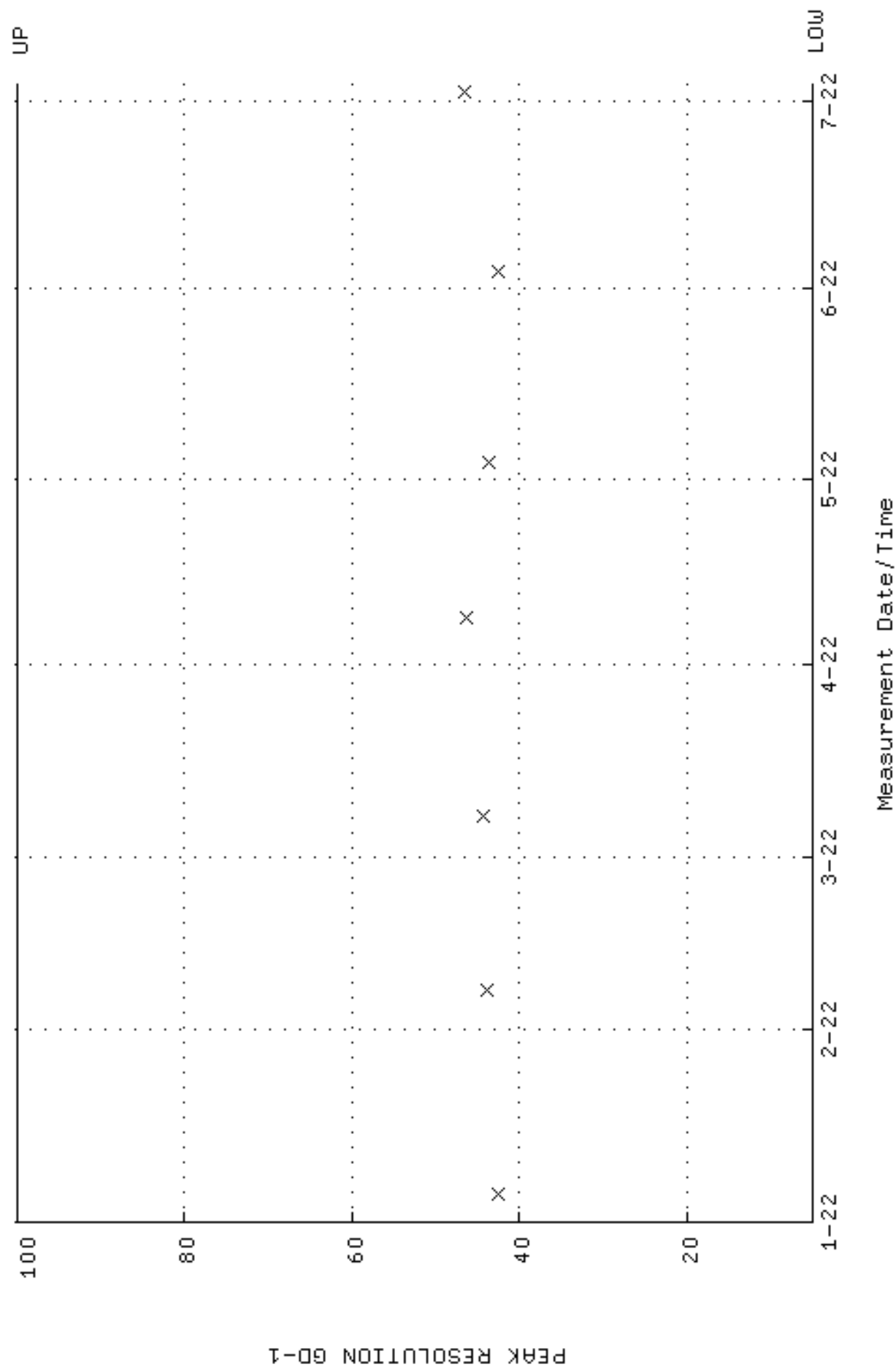
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 Parameter Name : AVRGEFF (Average Efficiency)
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 Lower/Upper Lmts: 0.328745 through 0.349079



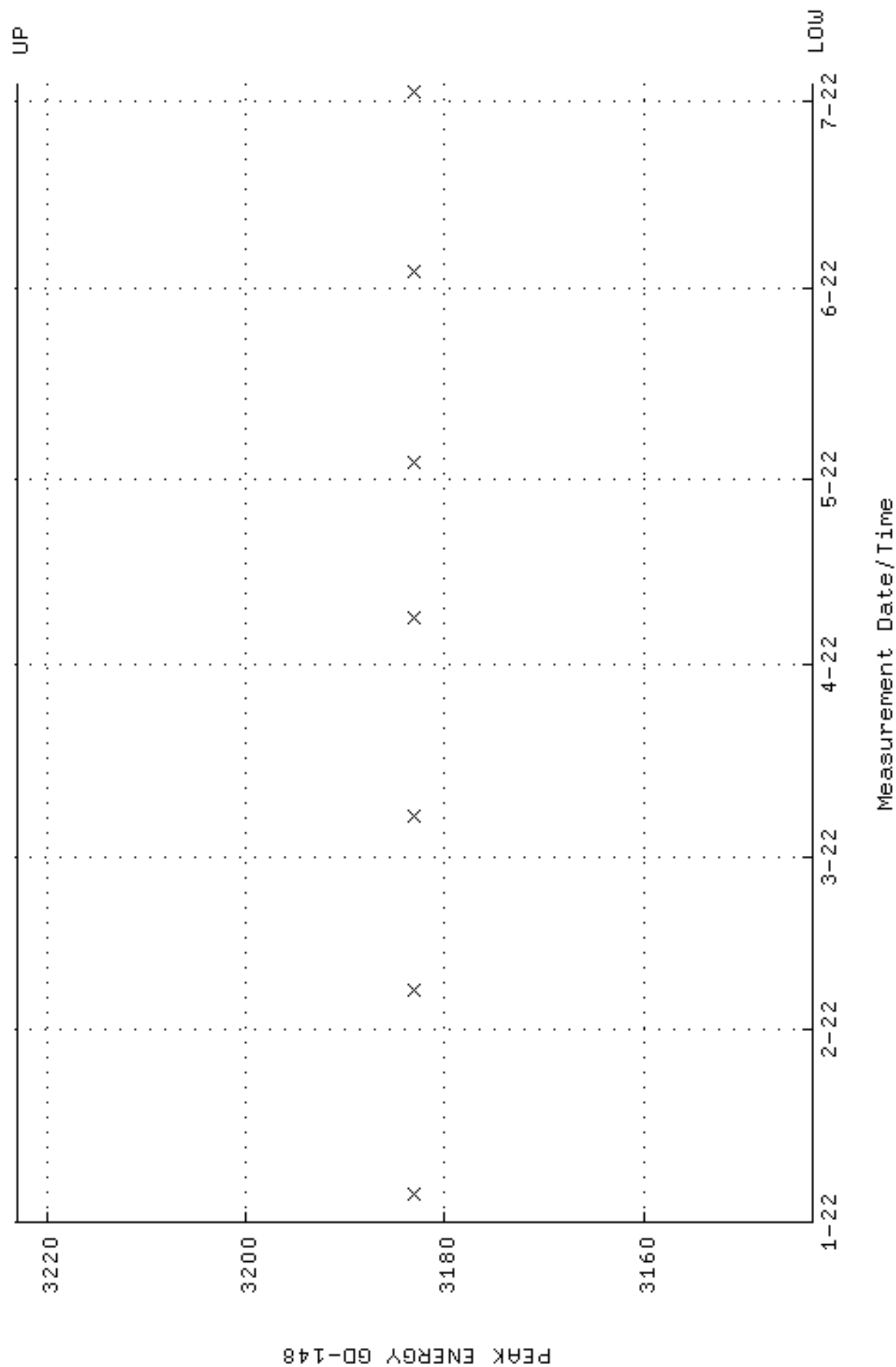
QA filename : DKA100:[ENV_ALPHA.QA.W]W040.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-JAN-2022 09:50:34 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



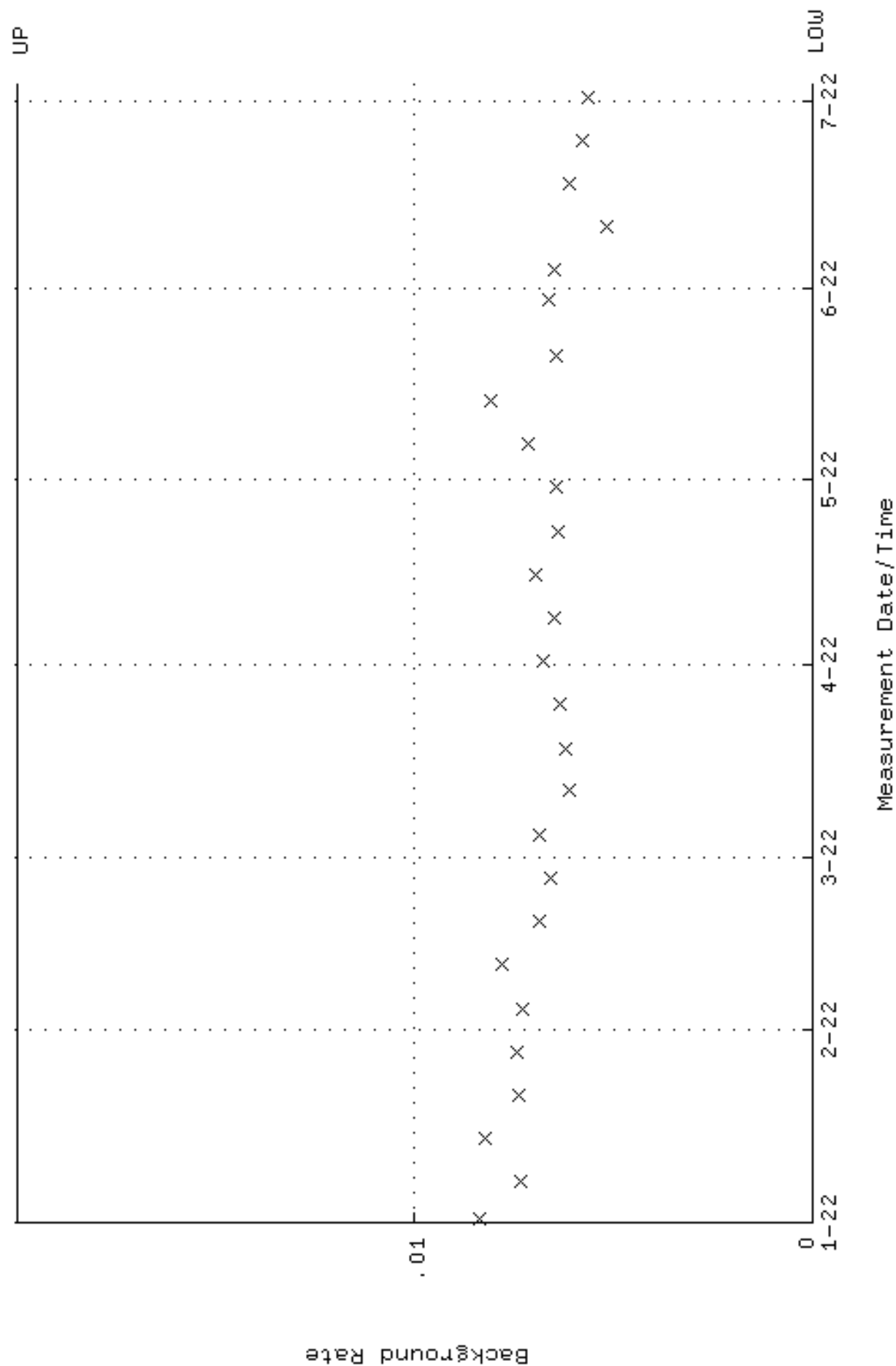
QA filename : DKA100:[ENV_ALPHA.QA.W]W040.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-JAN-2022 09:50:34 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



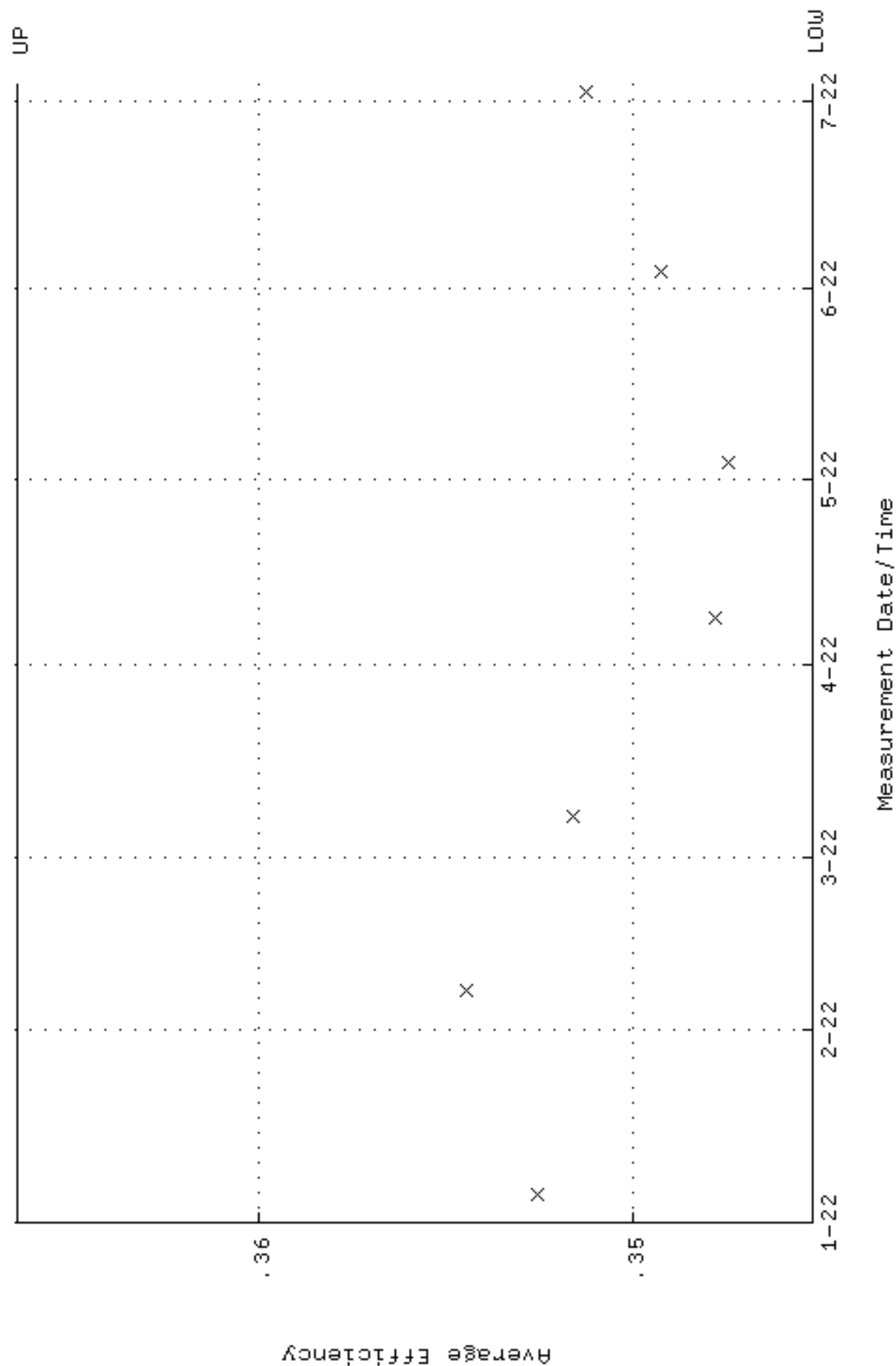
QA filename : DKA100:[ENV_ALPHA.QA.W]W040.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-JAN-2022 09:50:34 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



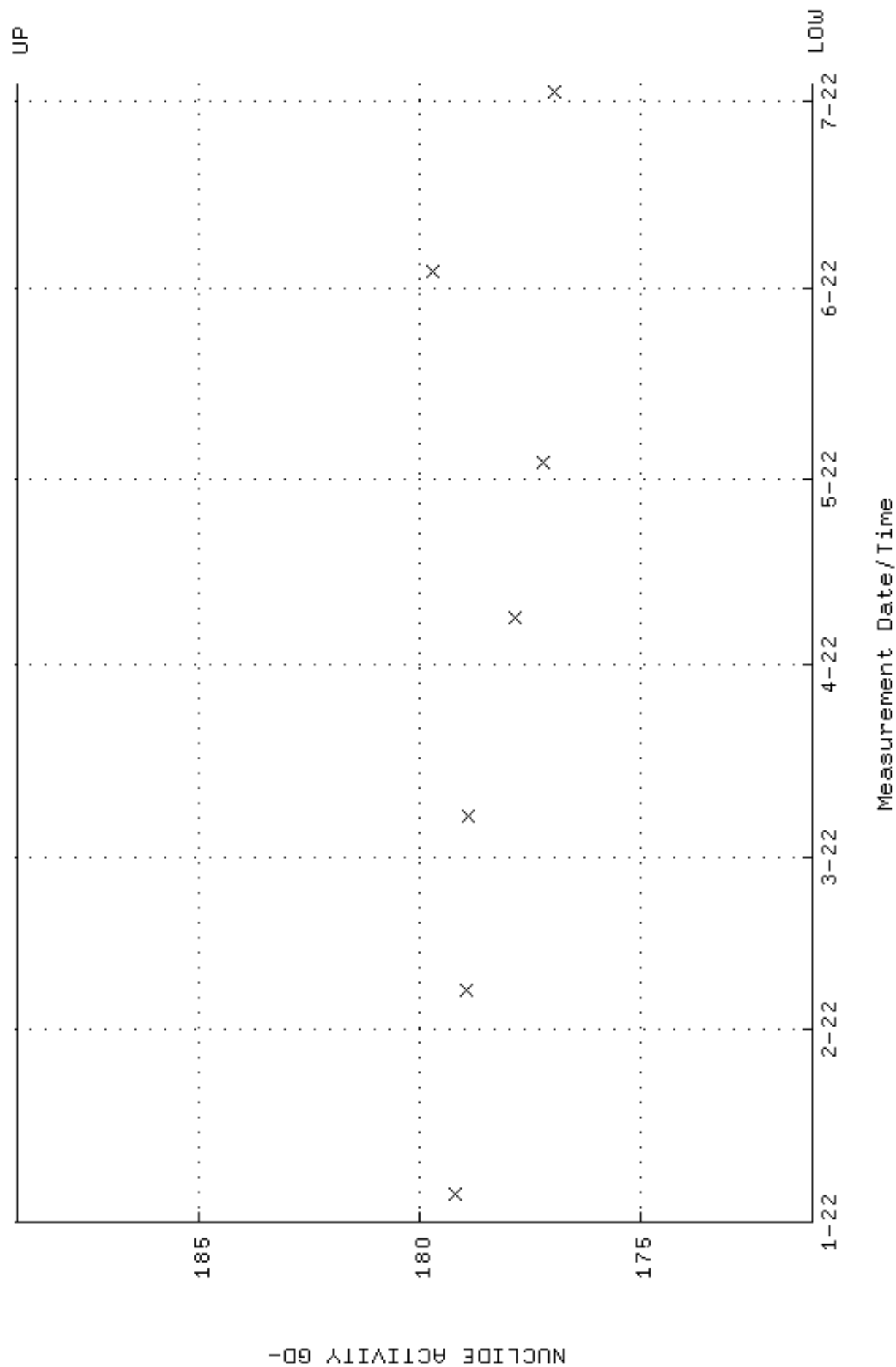
QA filename : DKA100:[ENV_ALPHA.QA.B]B040.QAF;4
 Parameter Name : BACKRATE (Background Rate)
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 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



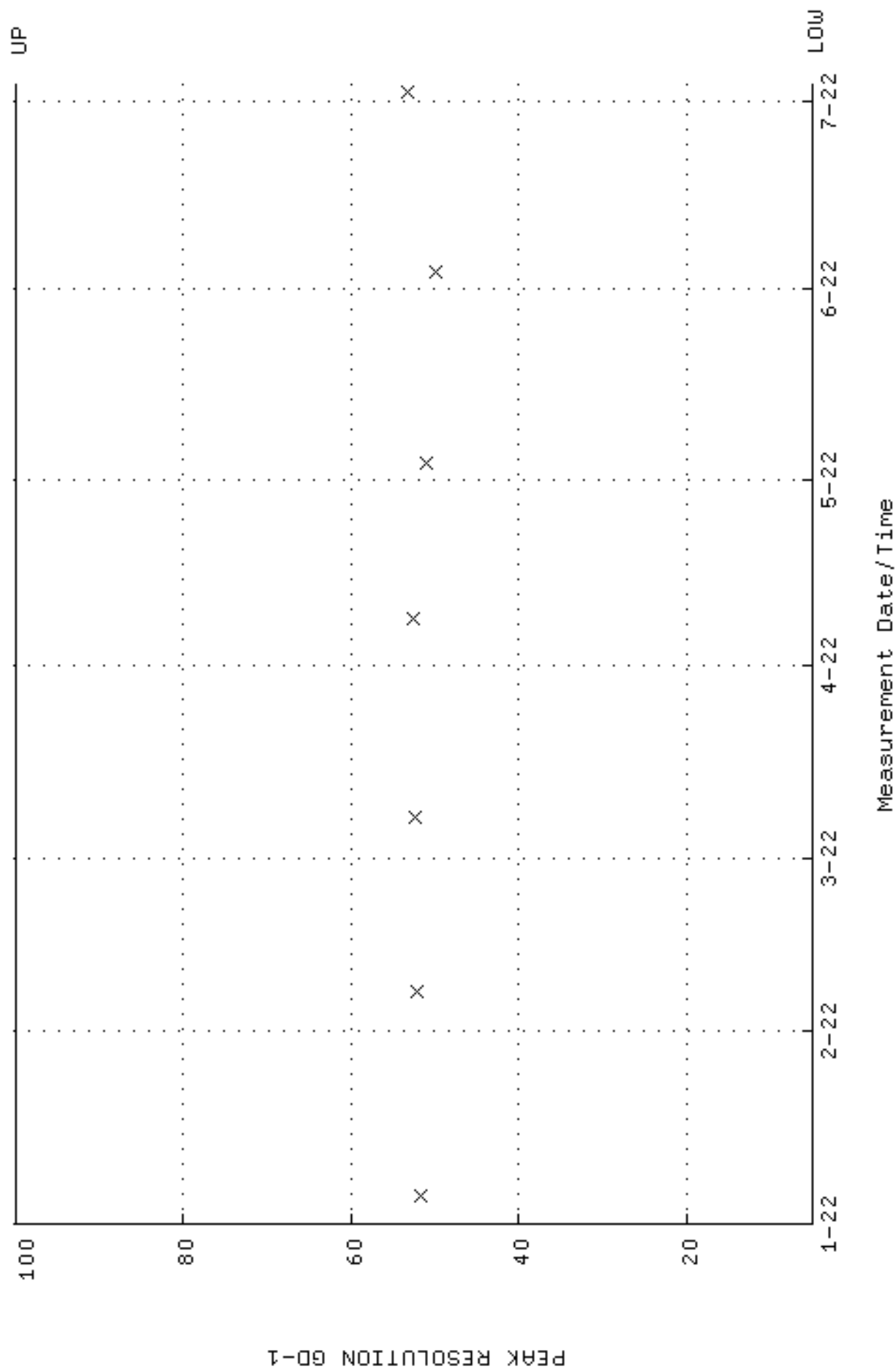
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 Parameter Name : AVRGEFF (Average Efficiency)
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 Lower/Upper Lmts: 0.345155 through 0.366505



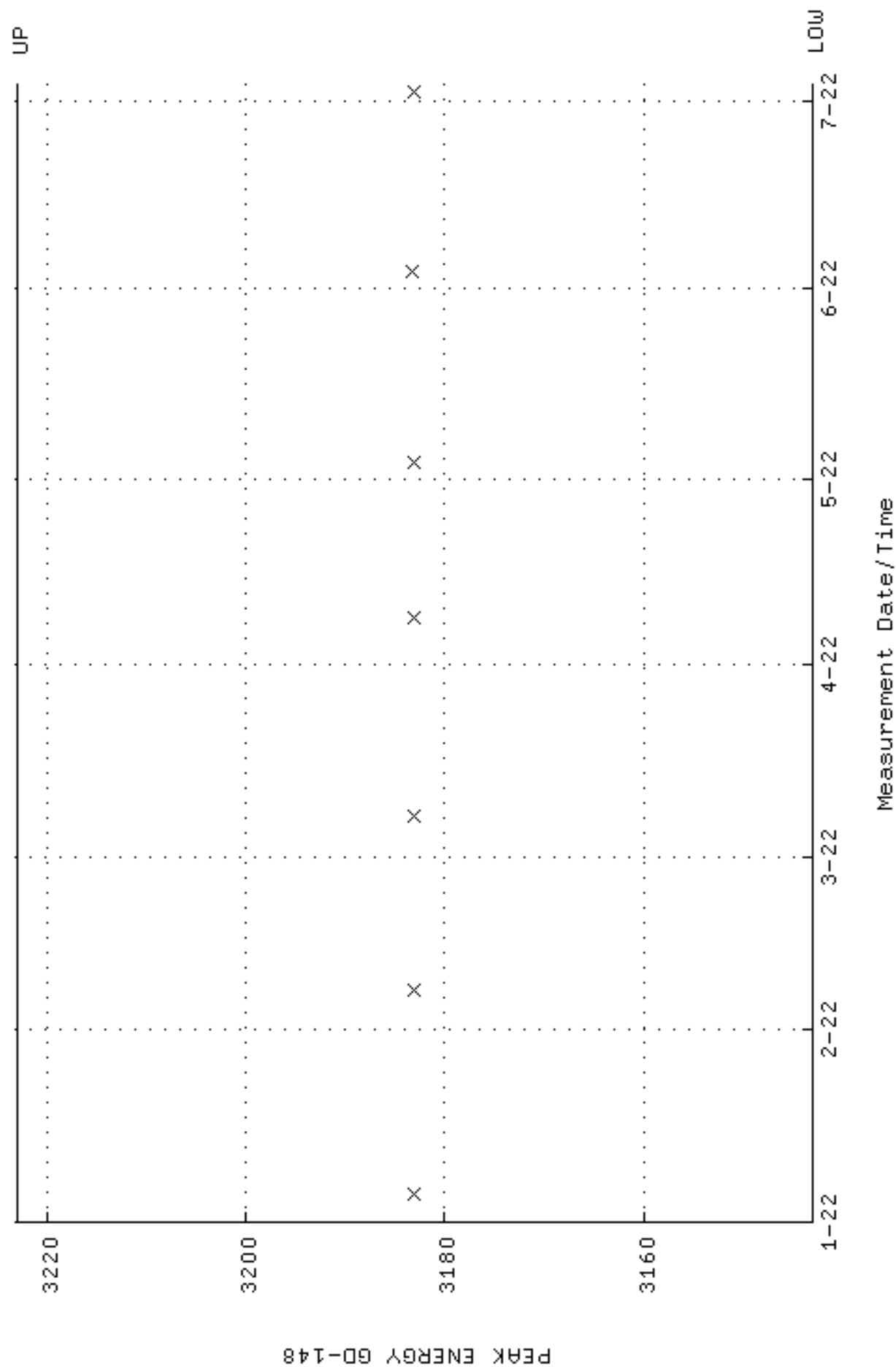
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
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 Lower/Upper Lmts: 171.090 through 189.100



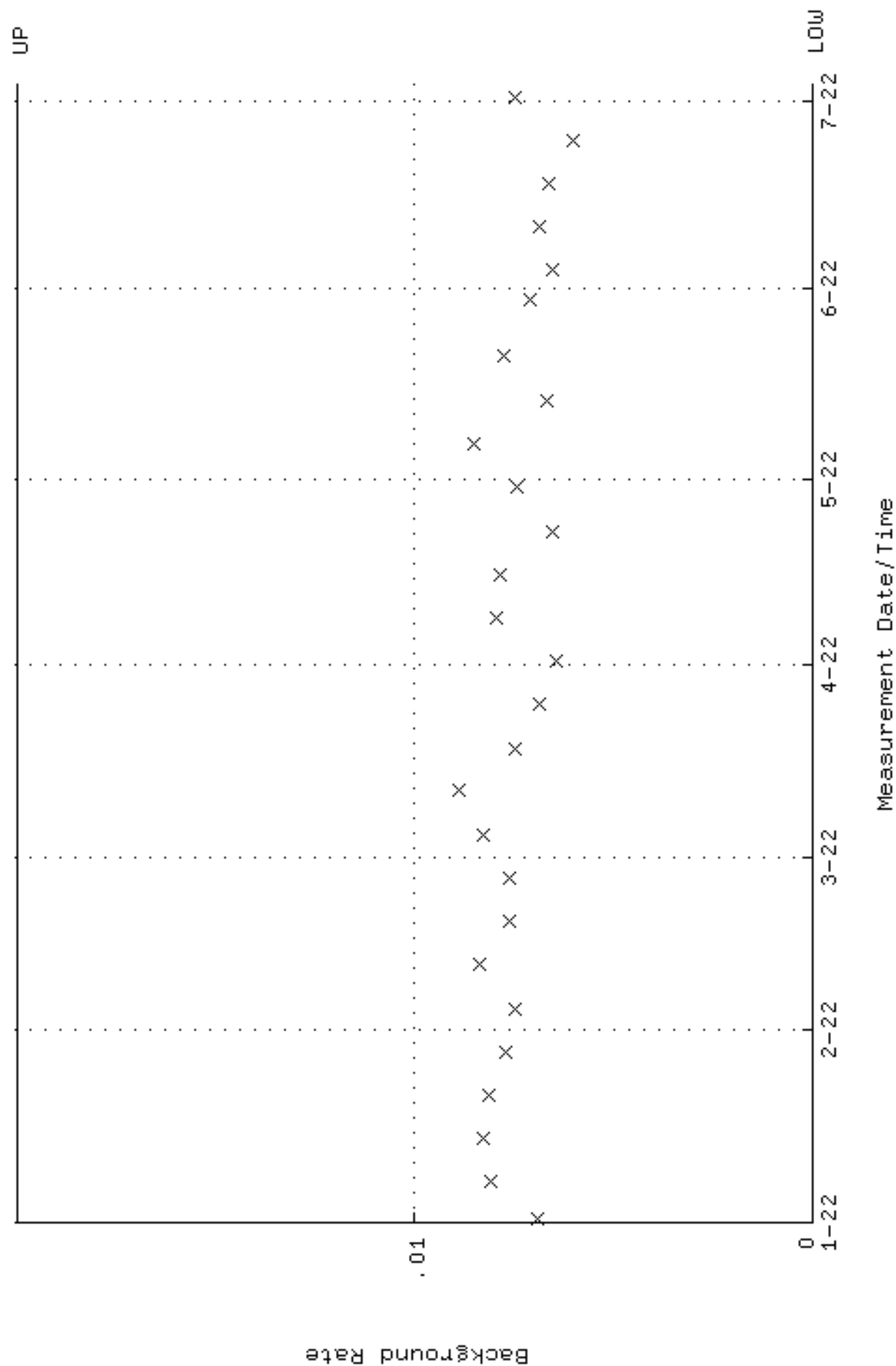
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-JAN-2022 09:50:34 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



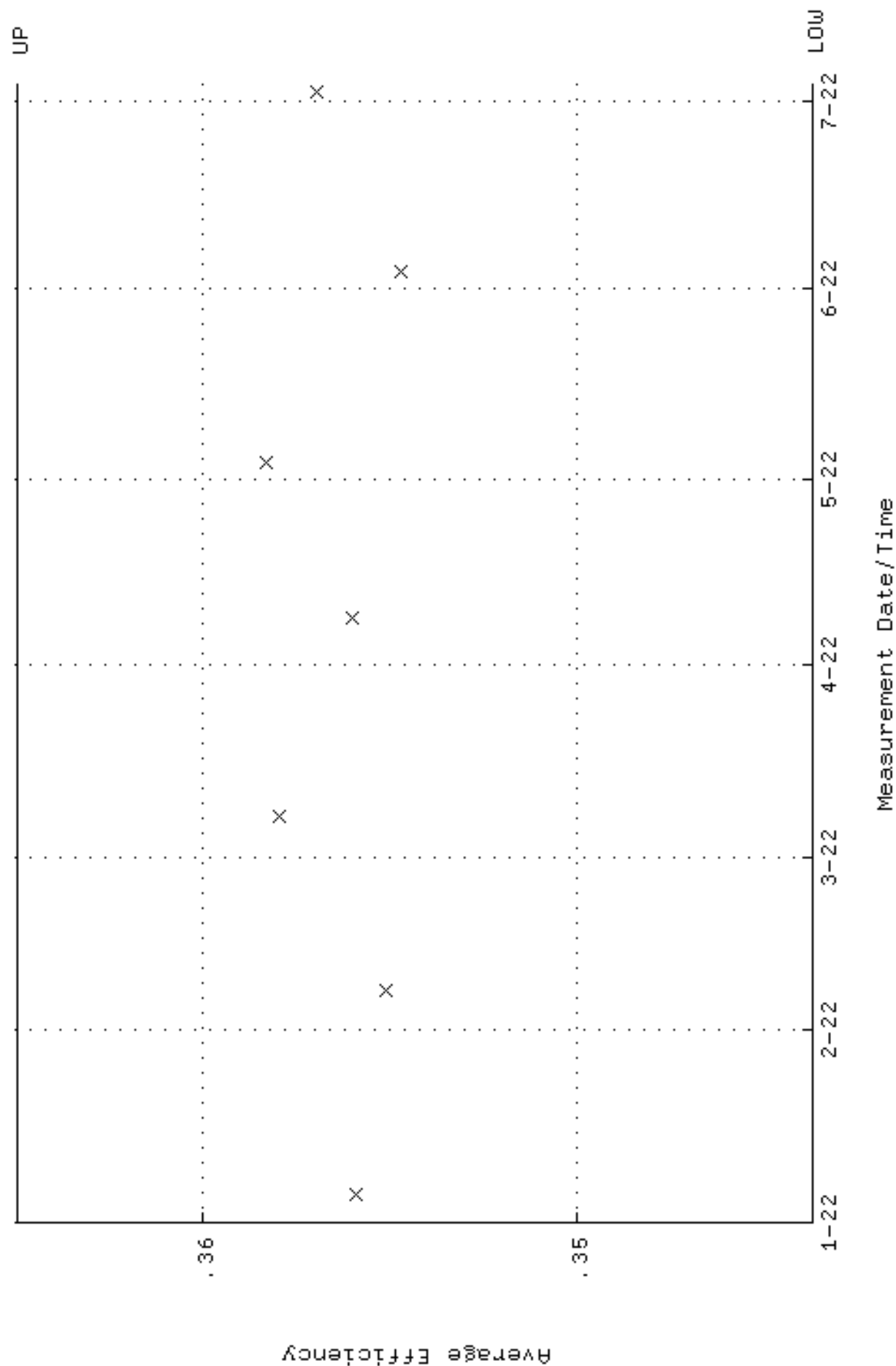
QA filename : DKA100:[ENV_ALPHA.QA.W]W041.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-JAN-2022 09:50:34 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



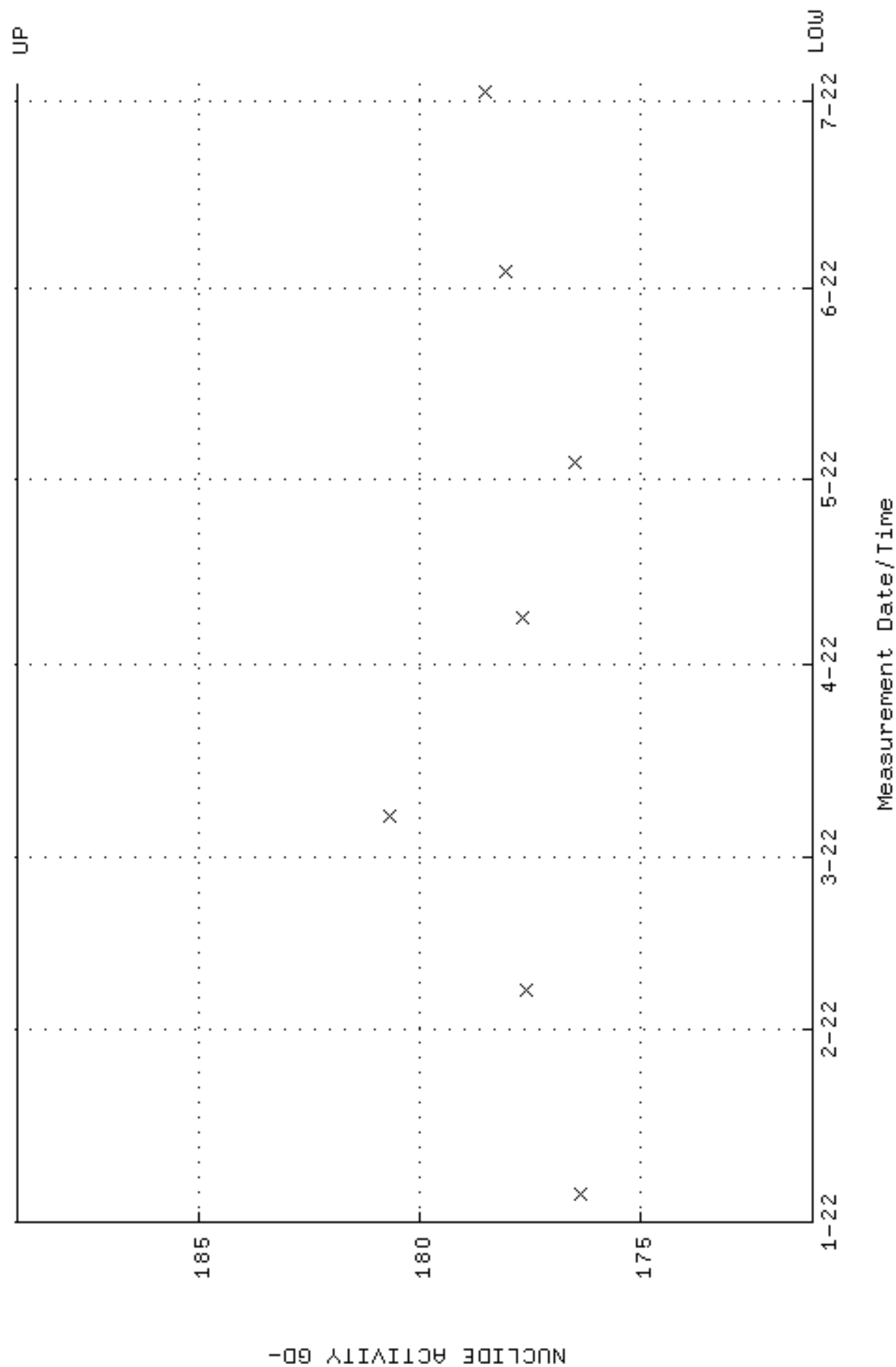
QA filename : DKA100:[ENV_ALPHA.QA.B]B041.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:43:03 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



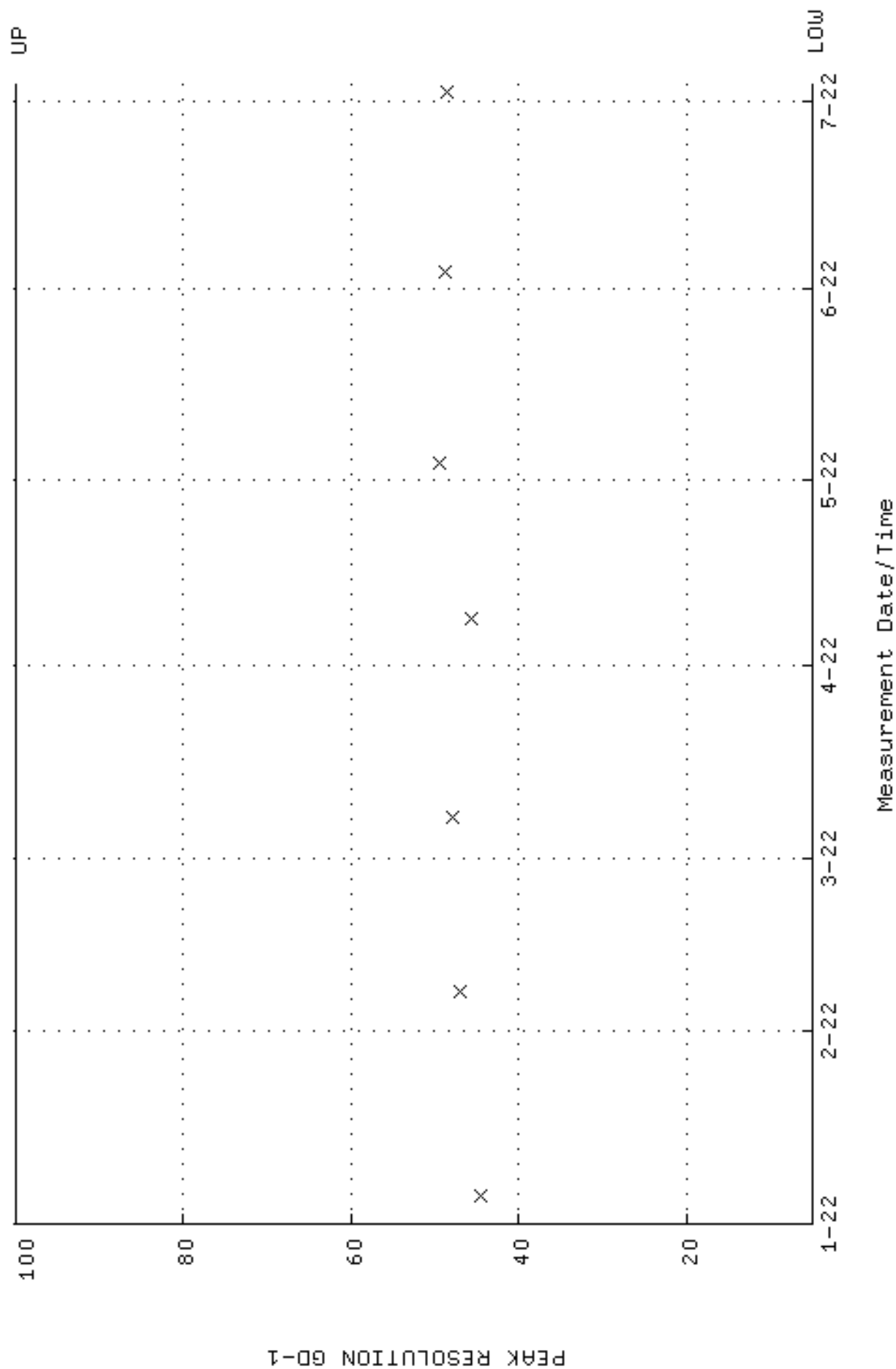
QA filename : DKA100:[ENV_ALPHA.QA.W]W042.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
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 Lower/Upper Lmts: 0.343717 through 0.364977



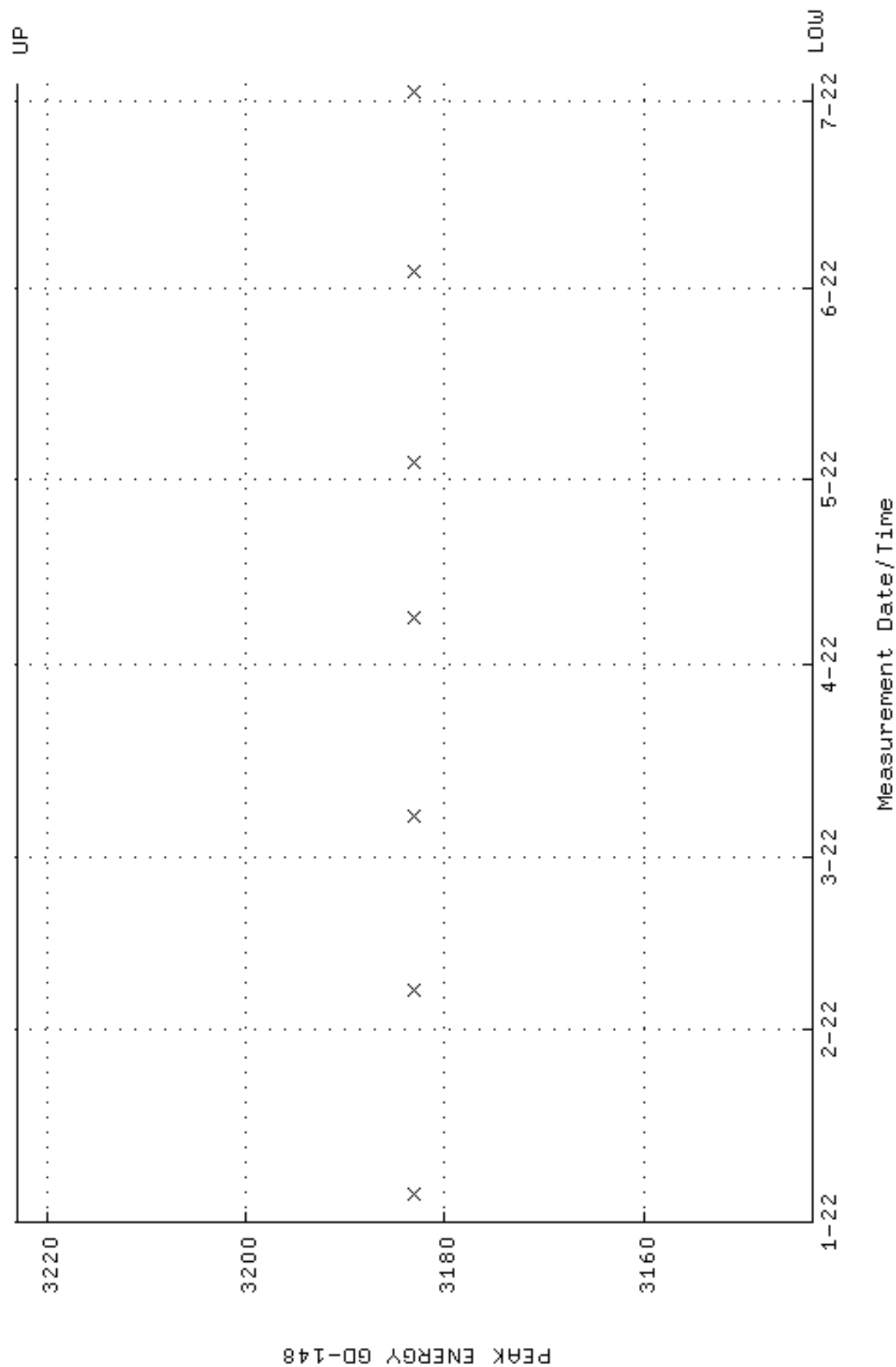
QA filename : DKA100:[ENV_ALPHA.QA.W]W042.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-JAN-2022 09:50:34 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



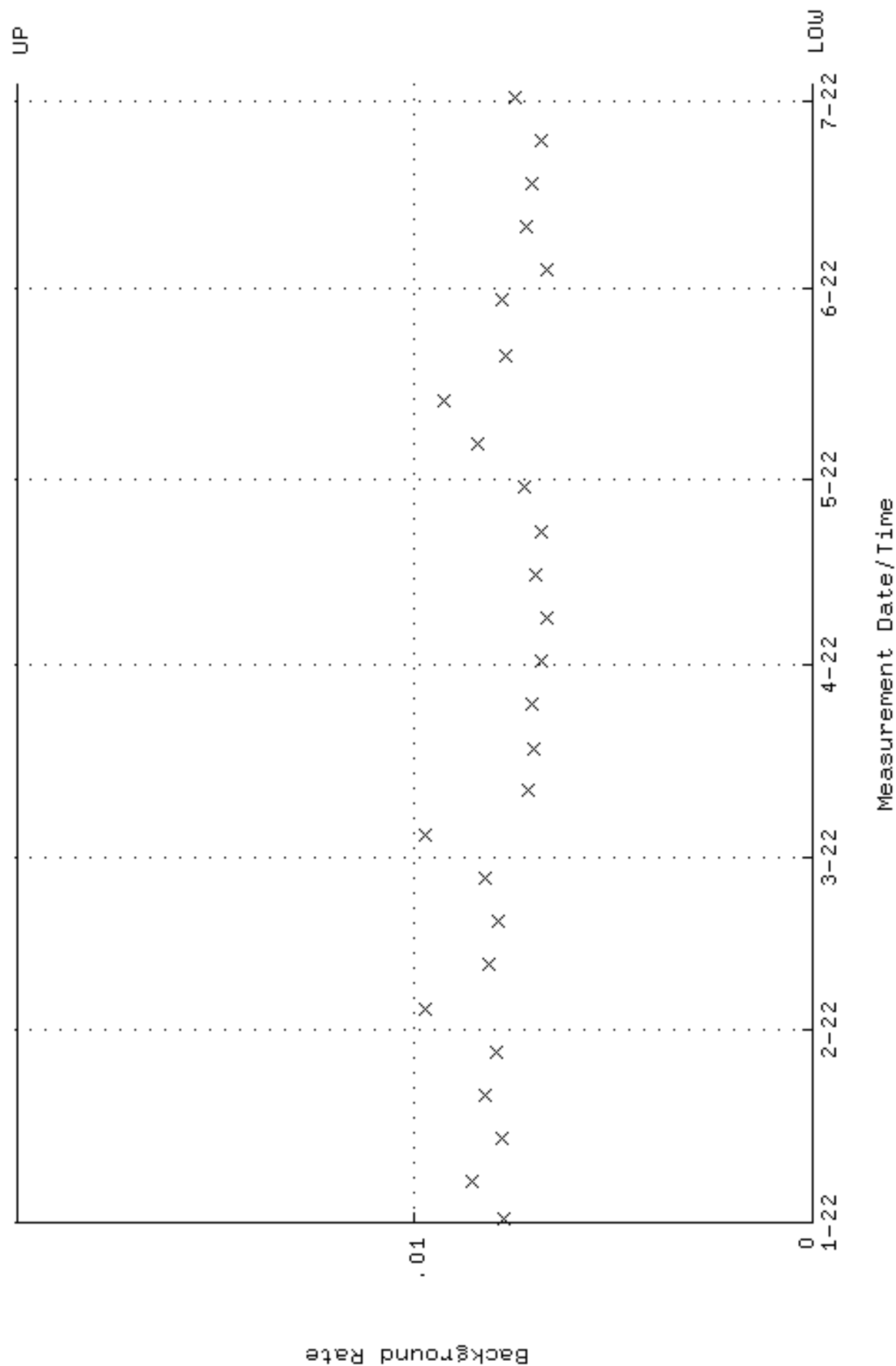
QA filename : DKA100:[ENV_ALPHA.QA.W]W042.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-JAN-2022 09:50:34 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



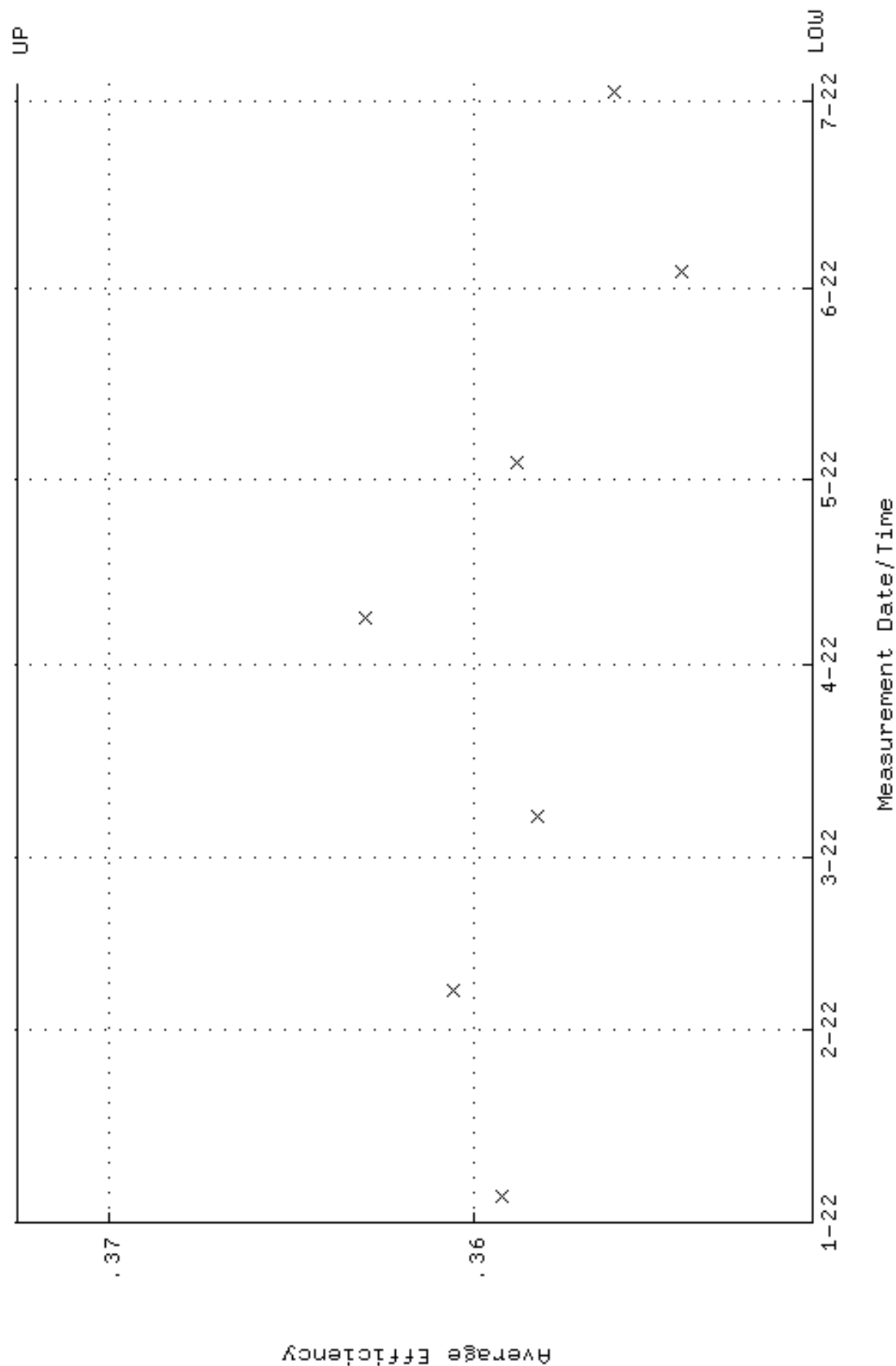
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-JAN-2022 09:50:34 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



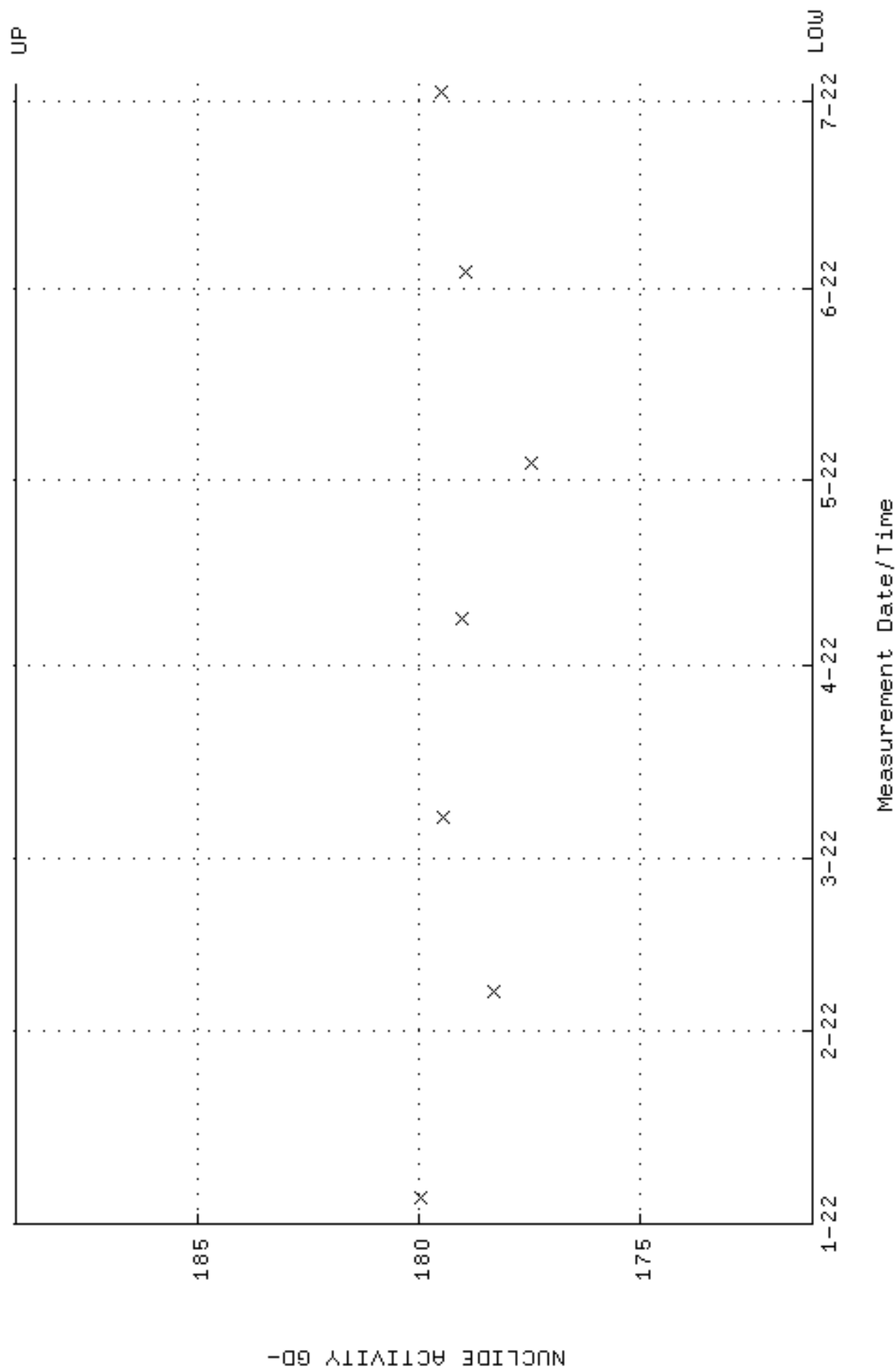
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 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:43:03 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



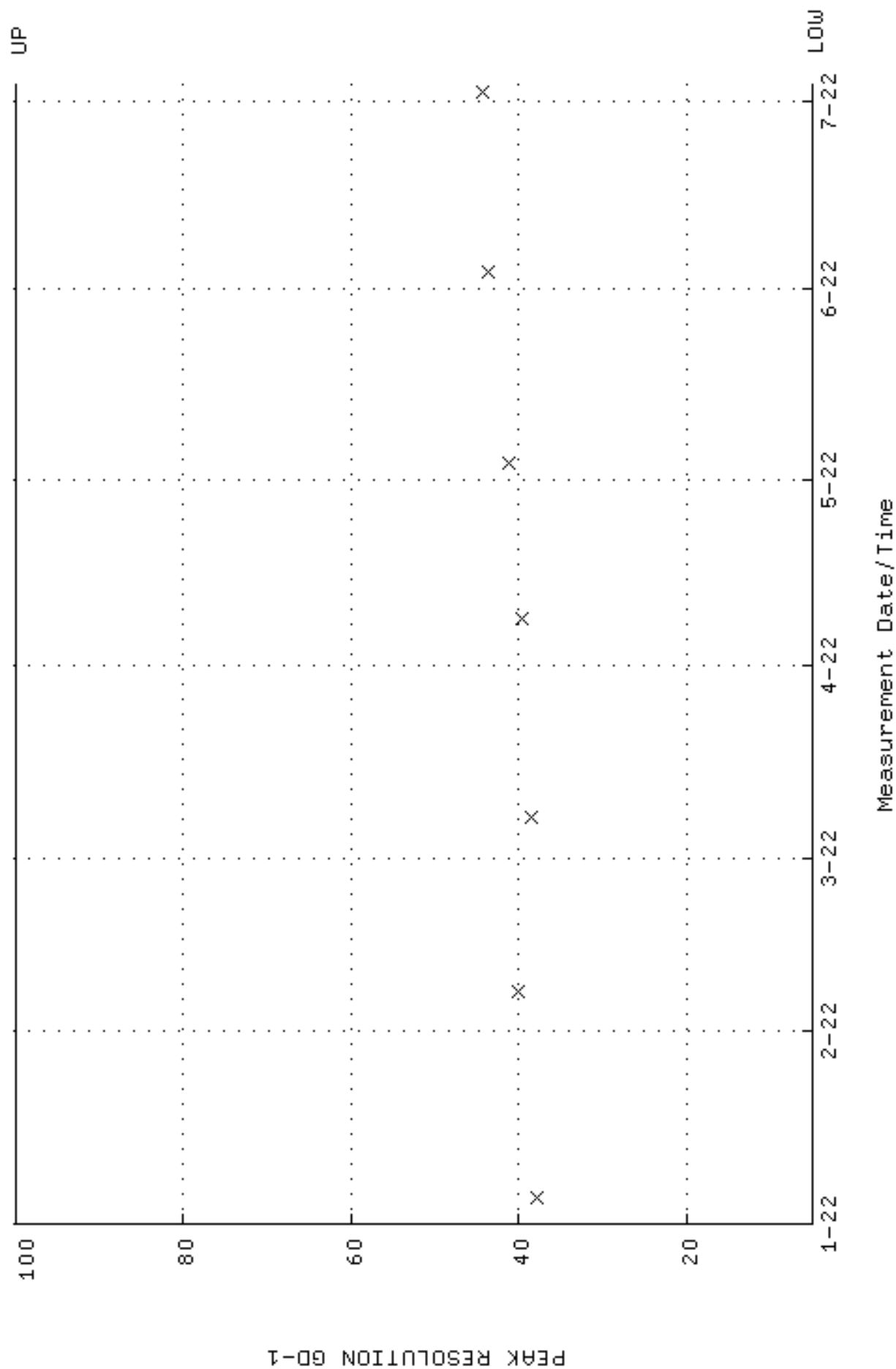
QA filename : DKA100:[ENV_ALPHA.QA.W]W043.QAF;109
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.350783 through 0.372480



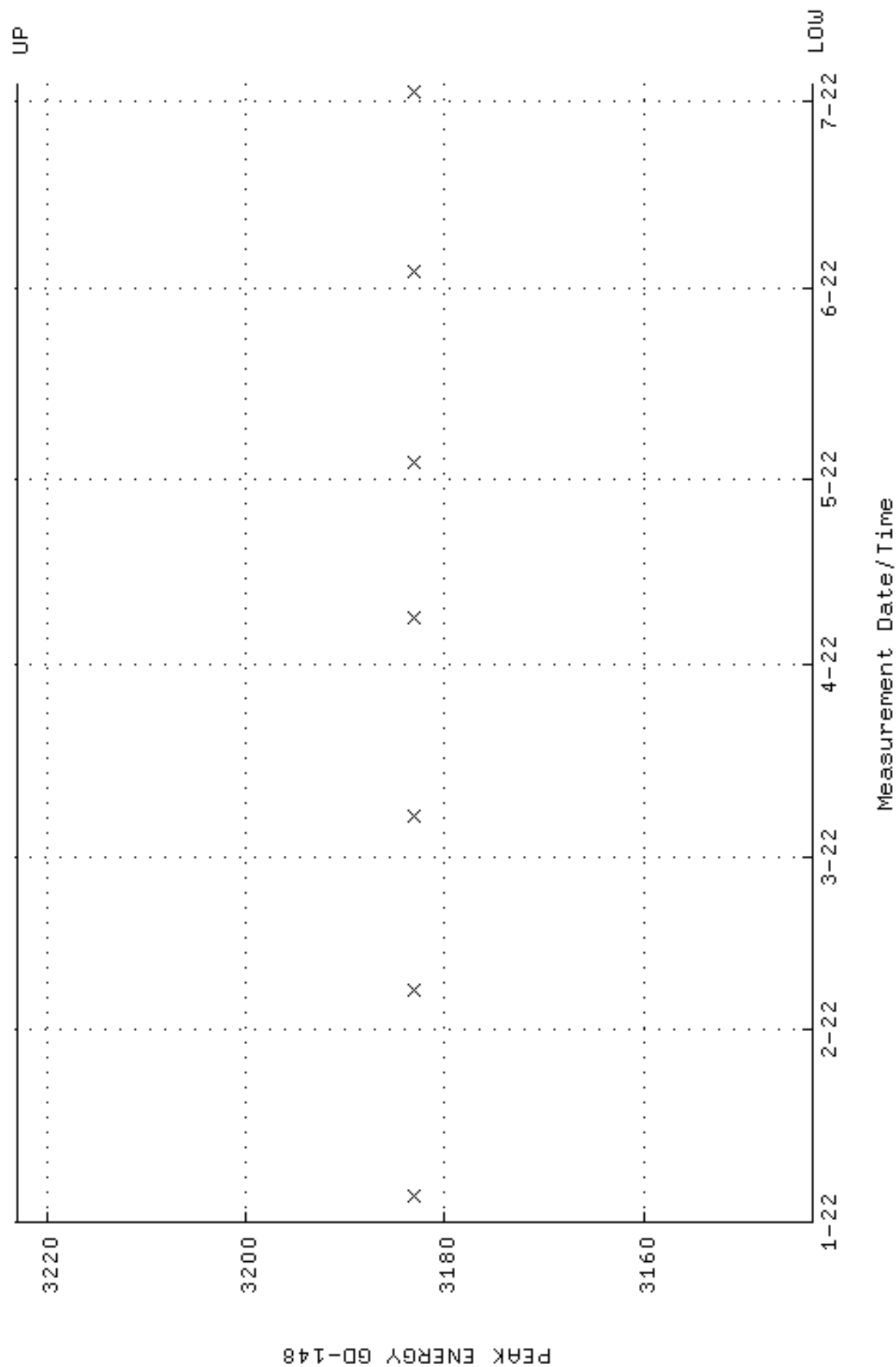
QA filename : DKA100:[ENV_ALPHA.QA.W]W043.QAF;109
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



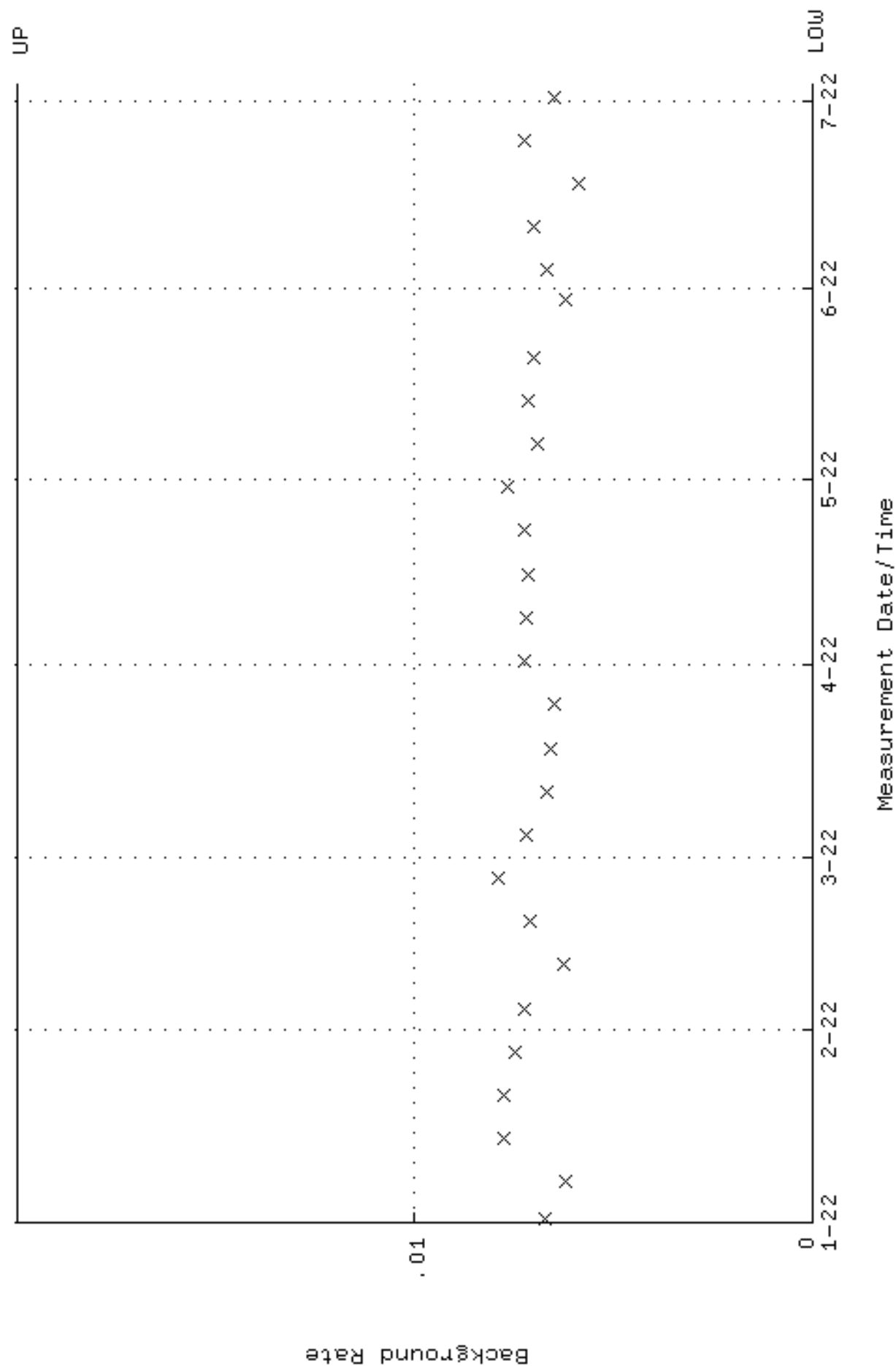
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



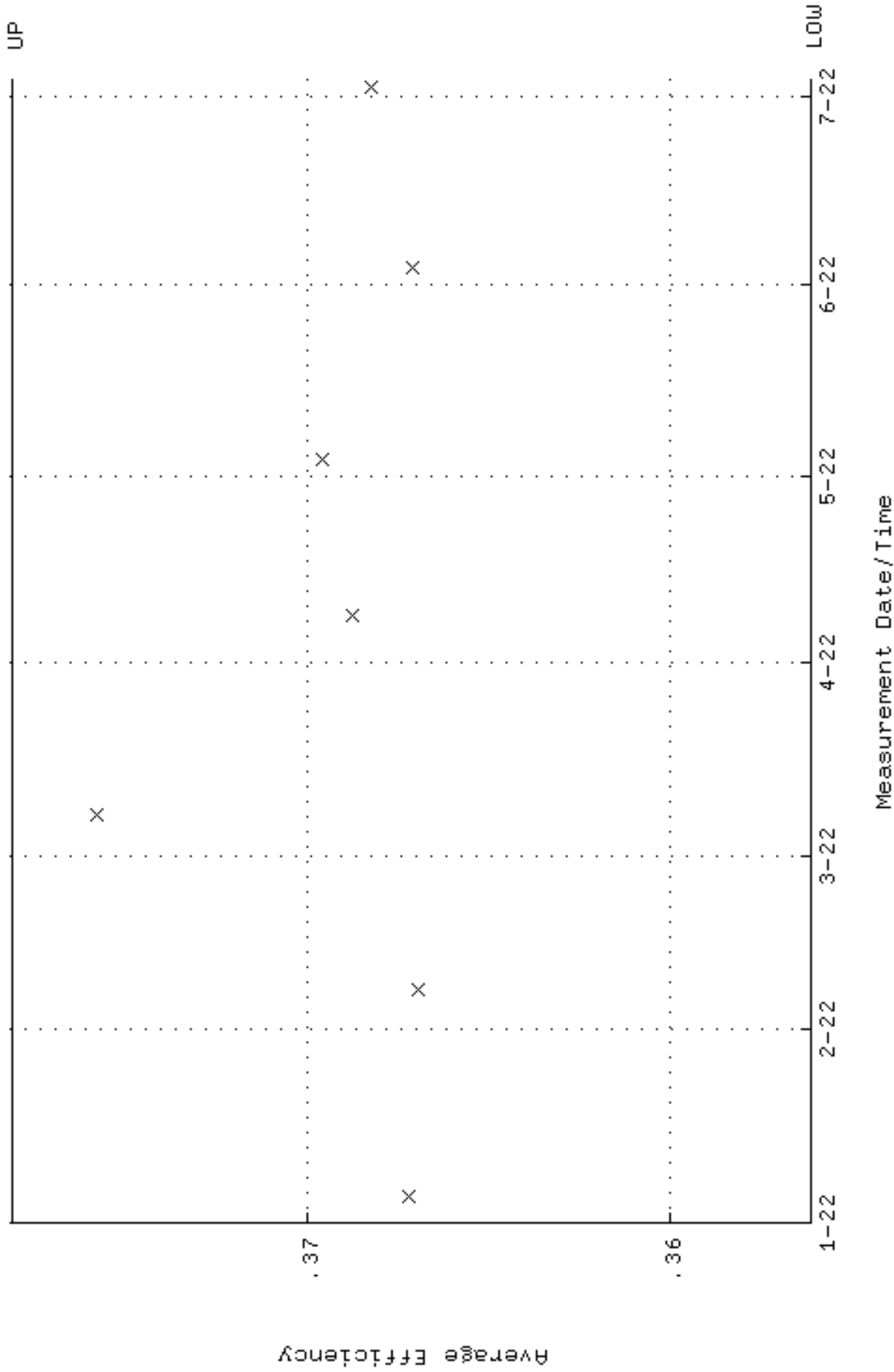
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



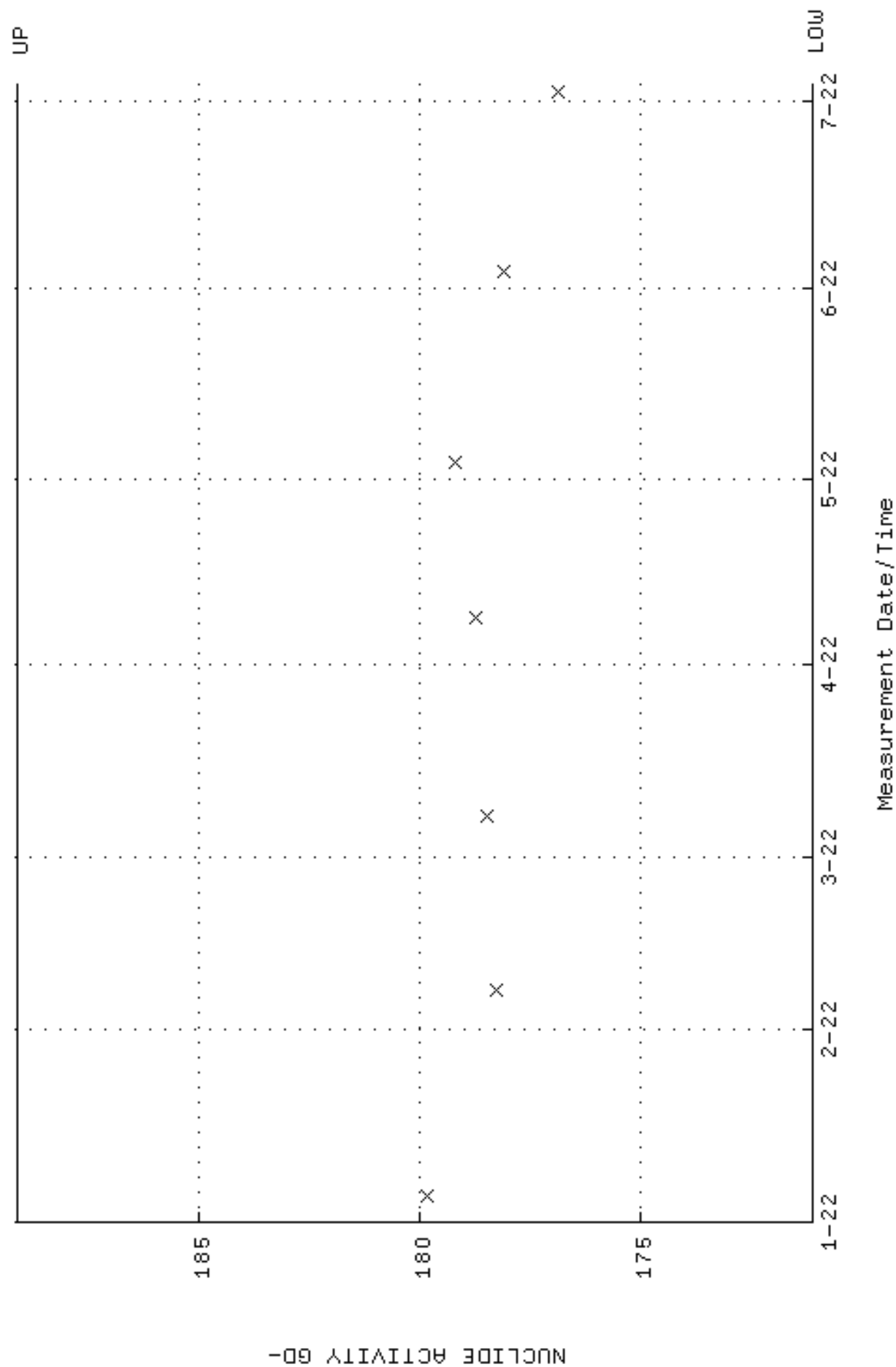
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 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:43:07 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



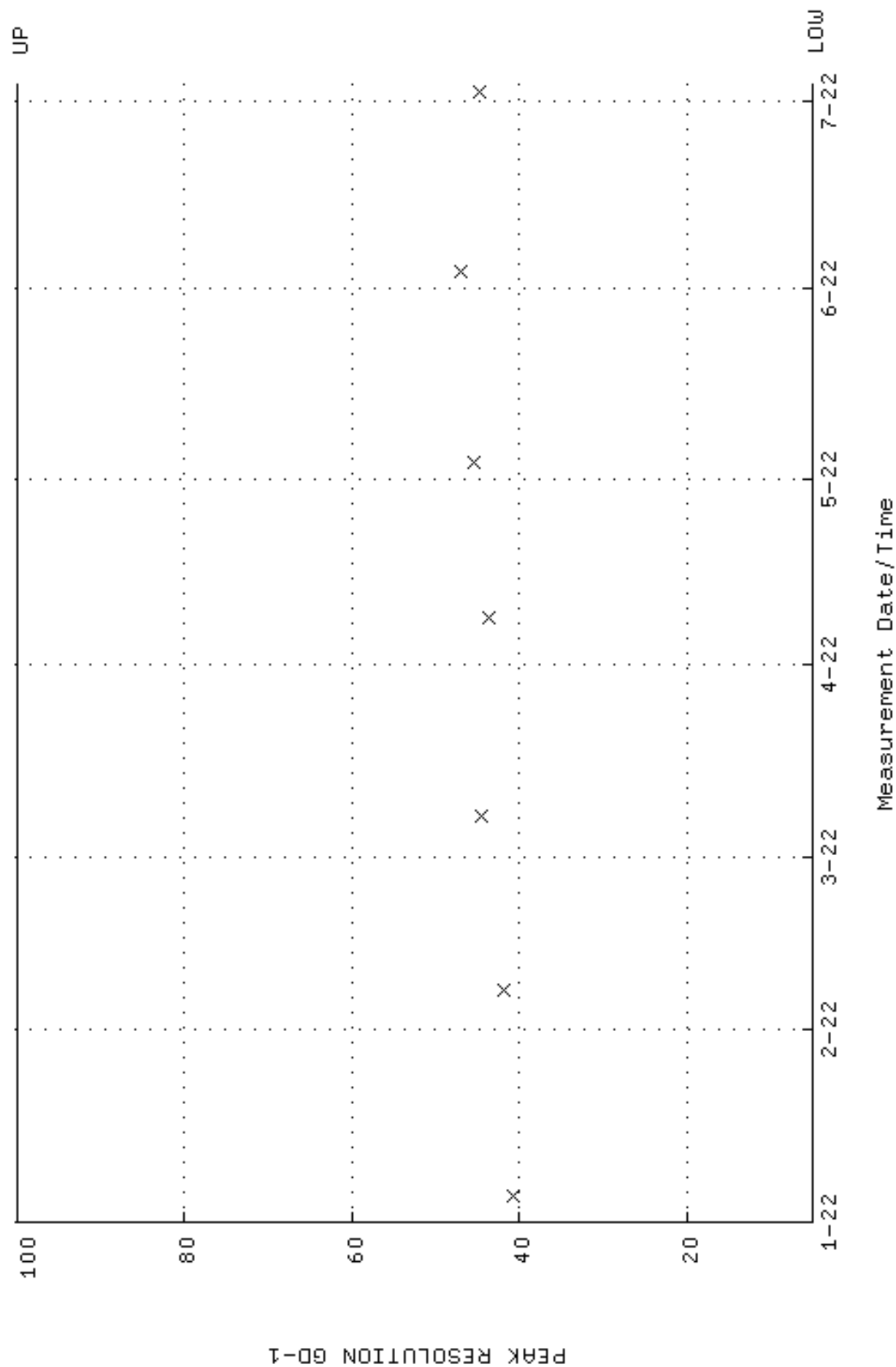
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Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
Lower/Upper Lmts: 0.356120 through 0.378148



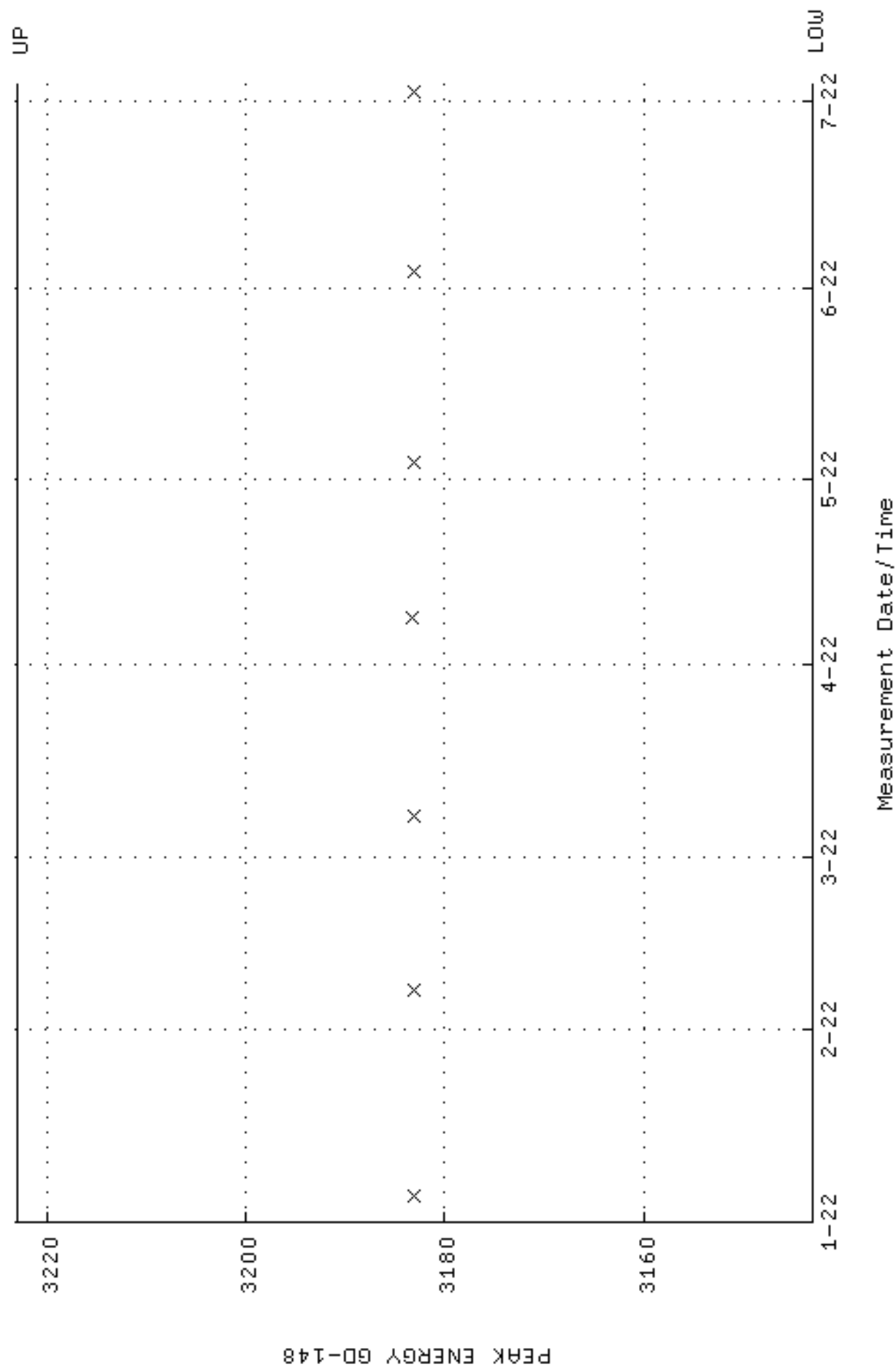
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



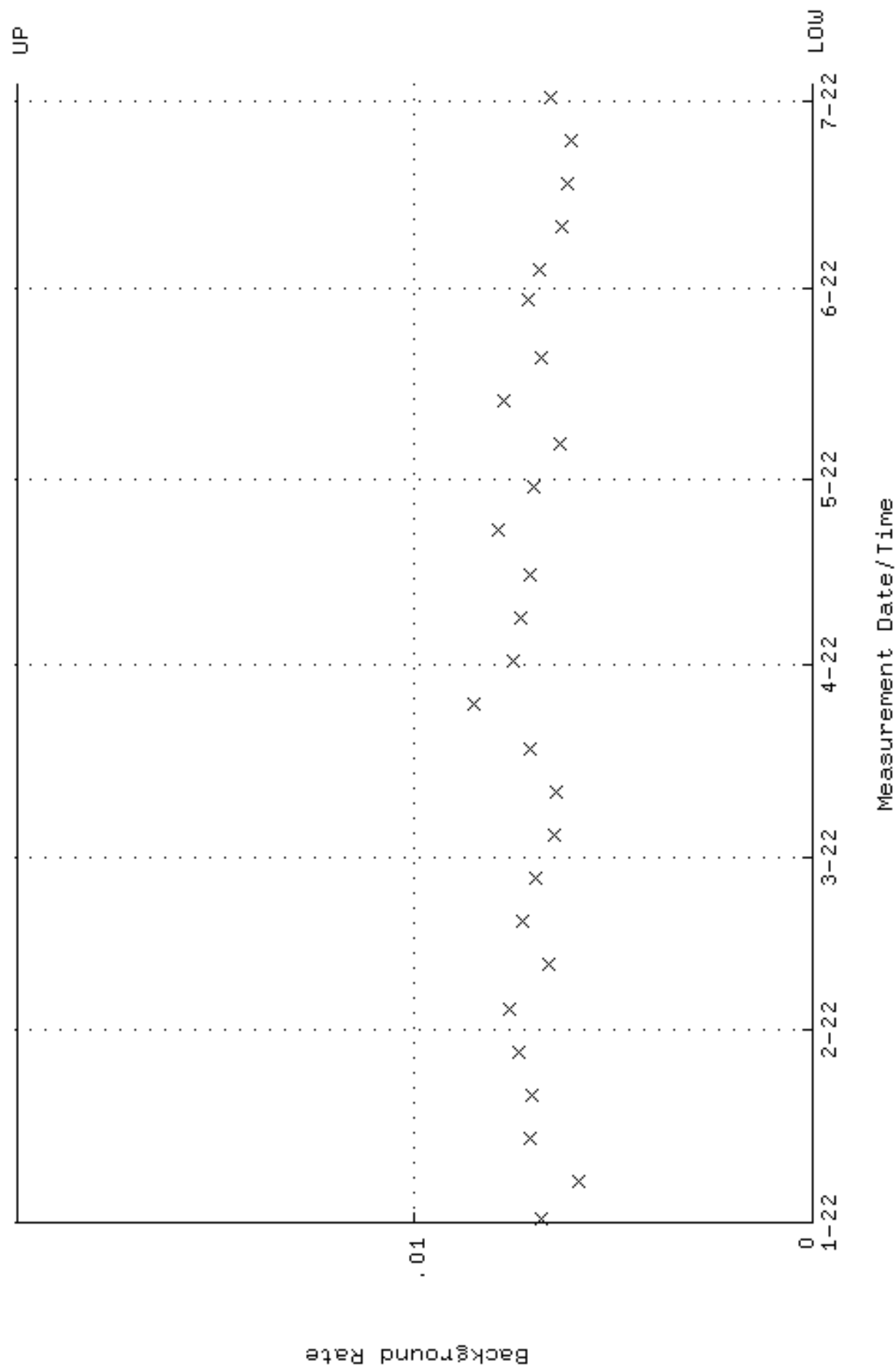
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



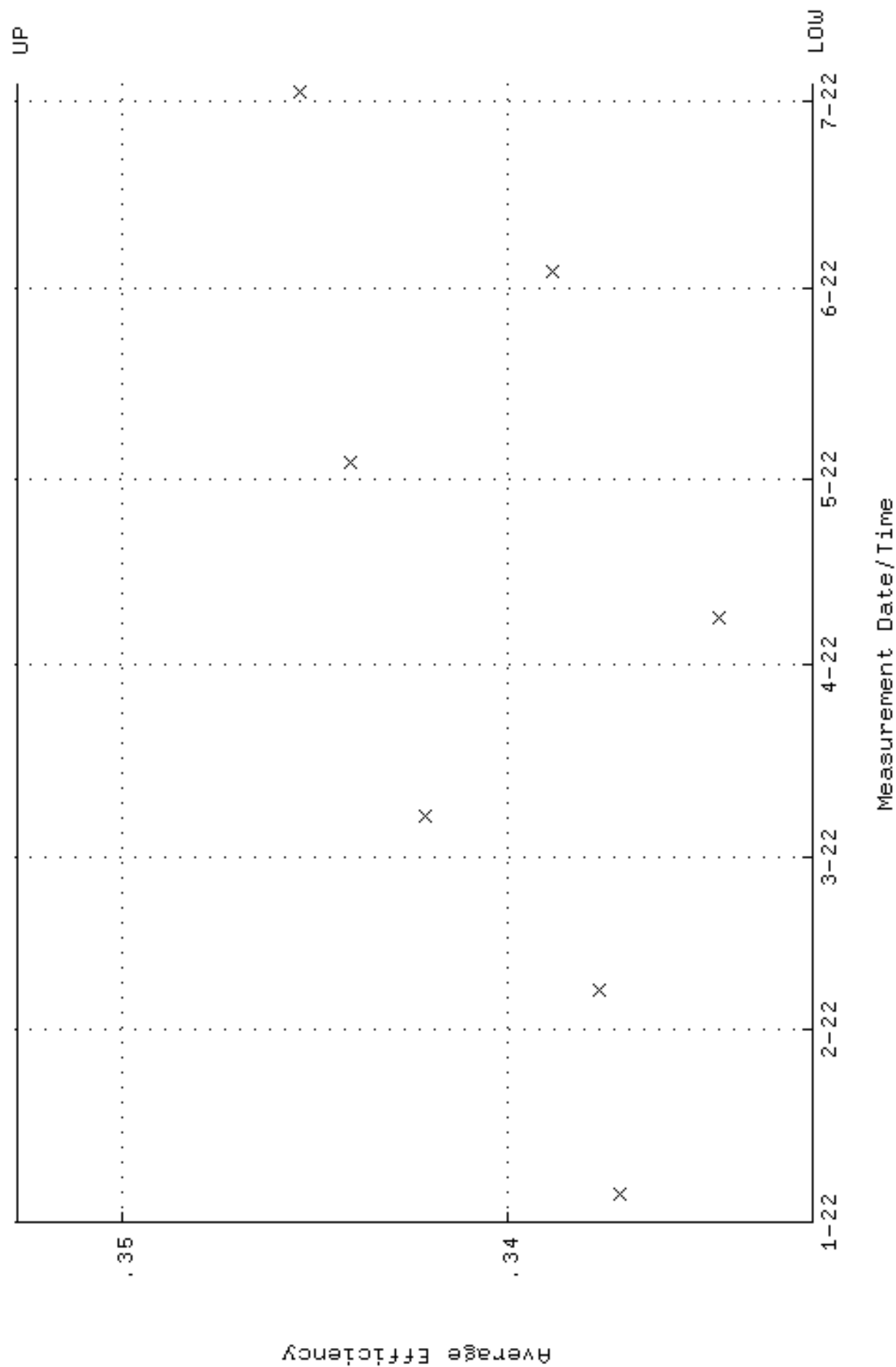
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



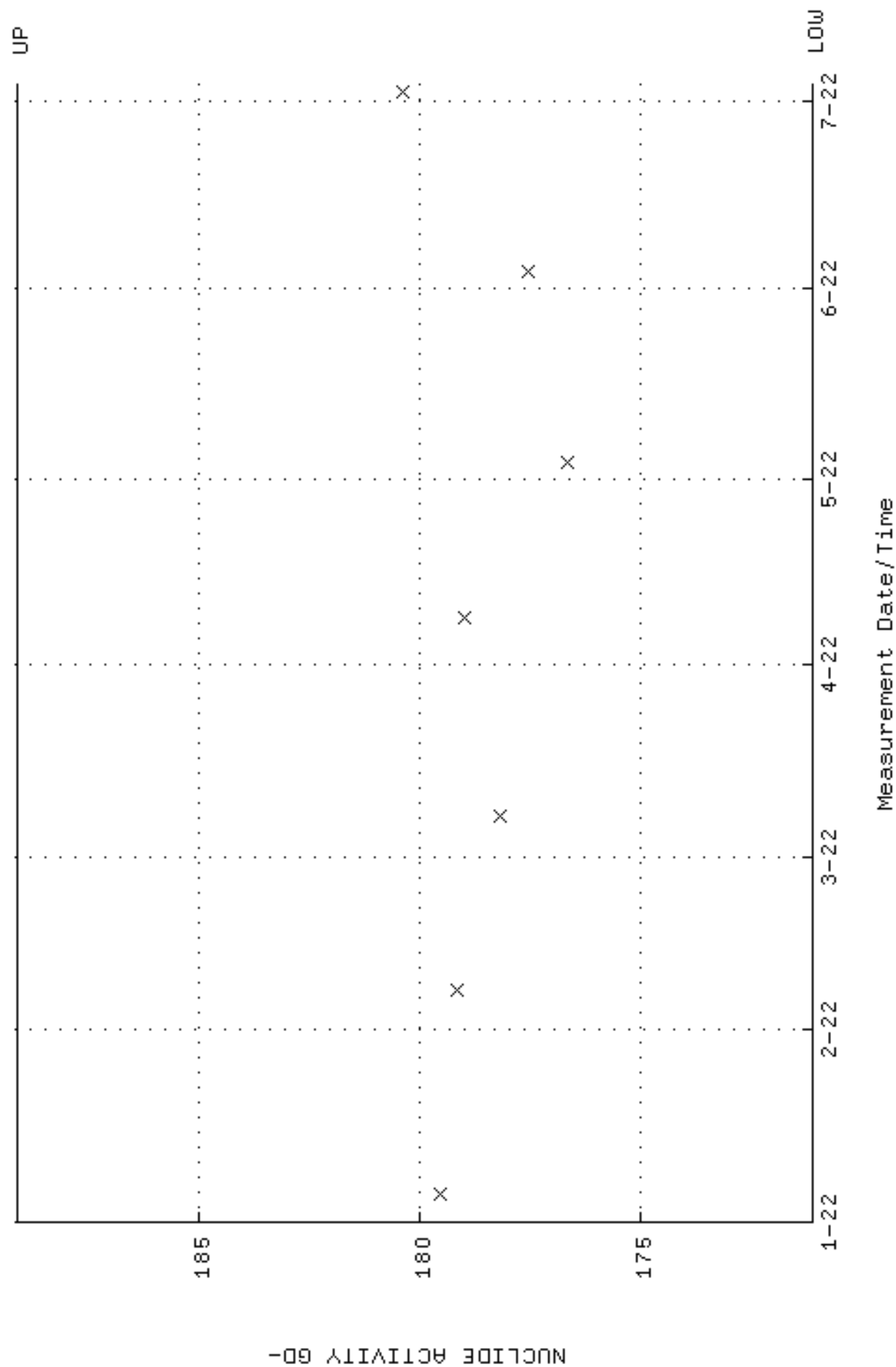
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 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:43:07 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



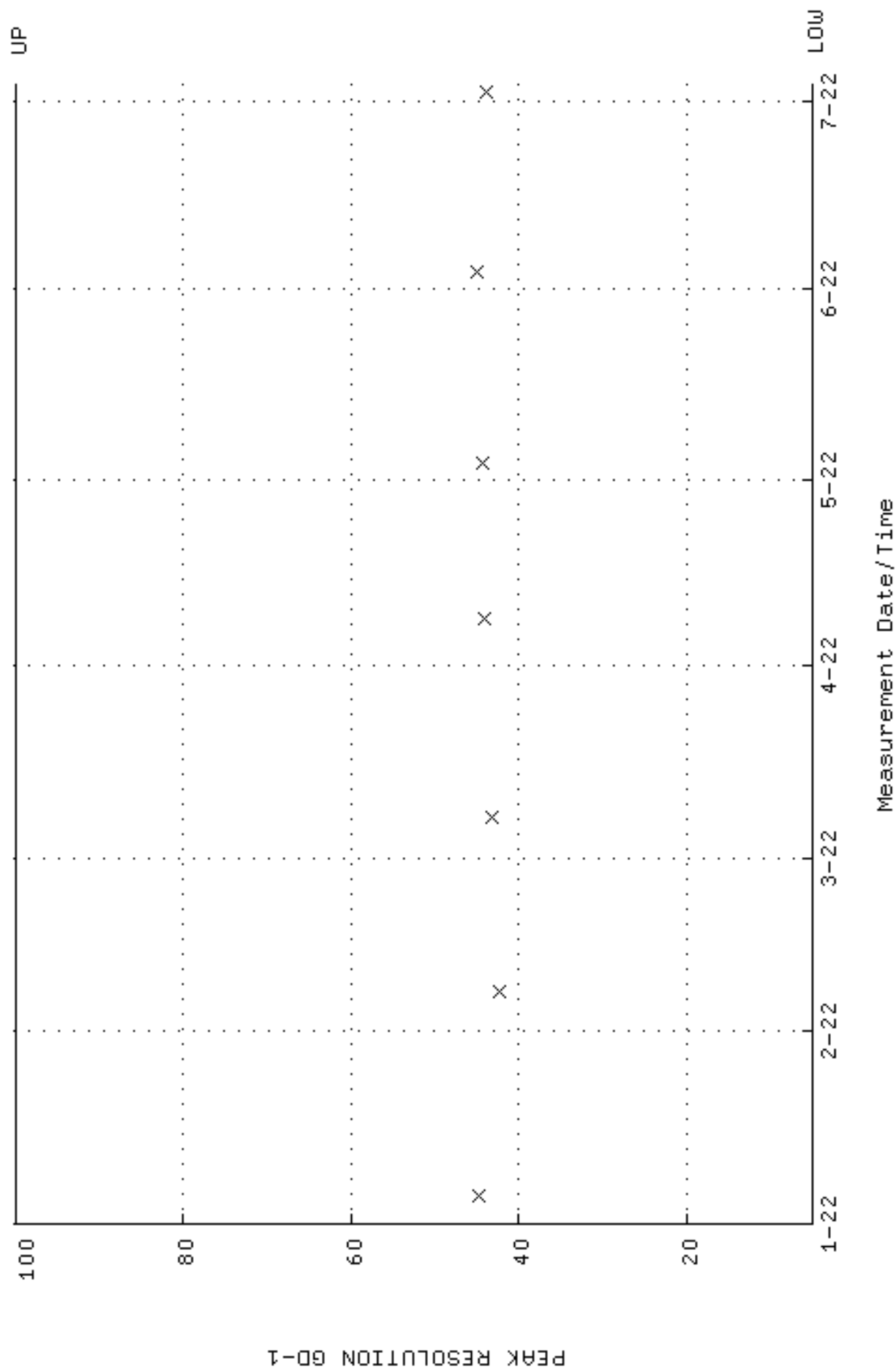
QA filename : DKA100:[ENV_ALPHA.QA.W]W045.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-JAN-2022 10:51:40 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.332140 through 0.352690



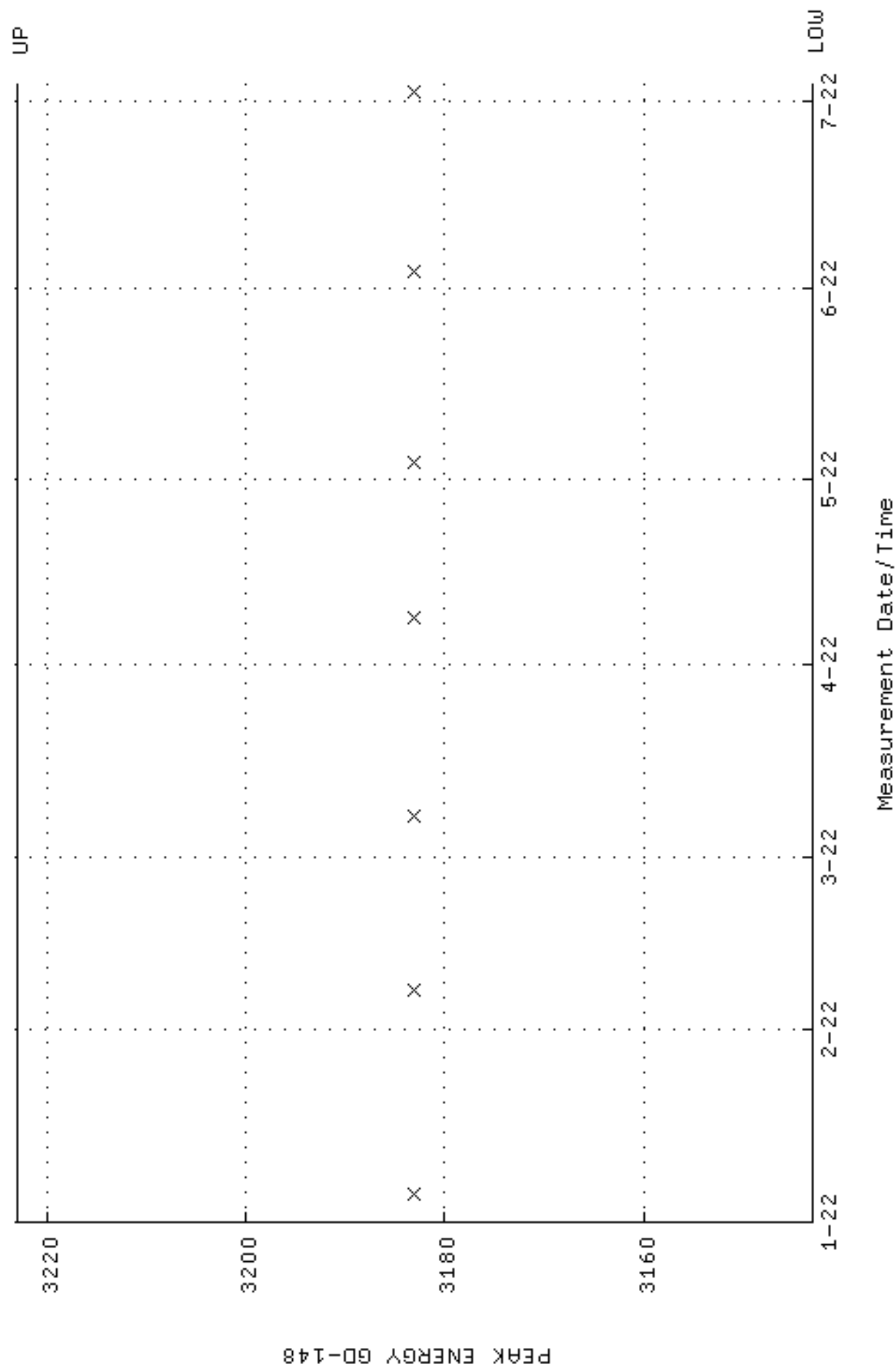
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-JAN-2022 10:51:40 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



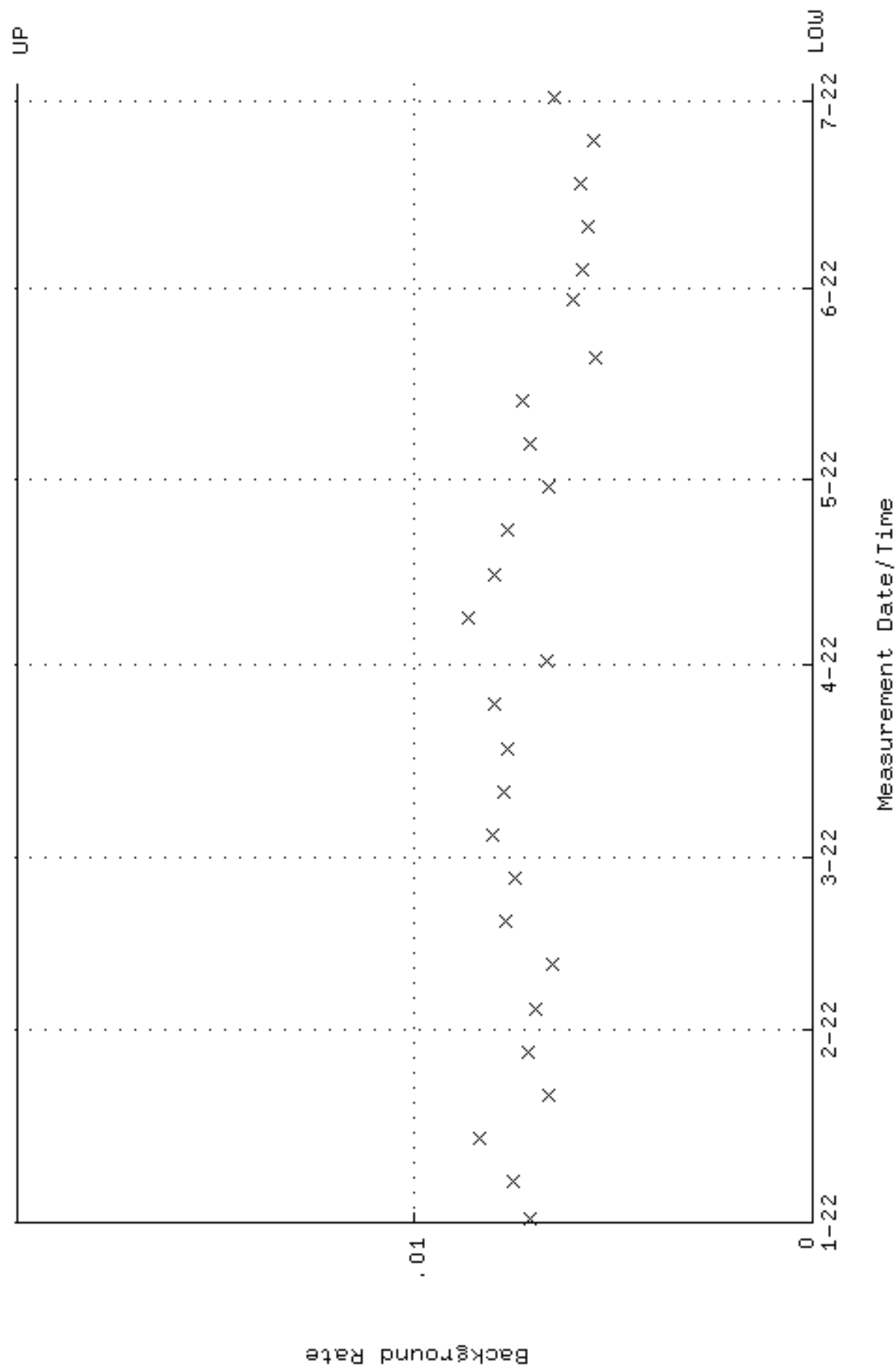
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-JAN-2022 10:51:40 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



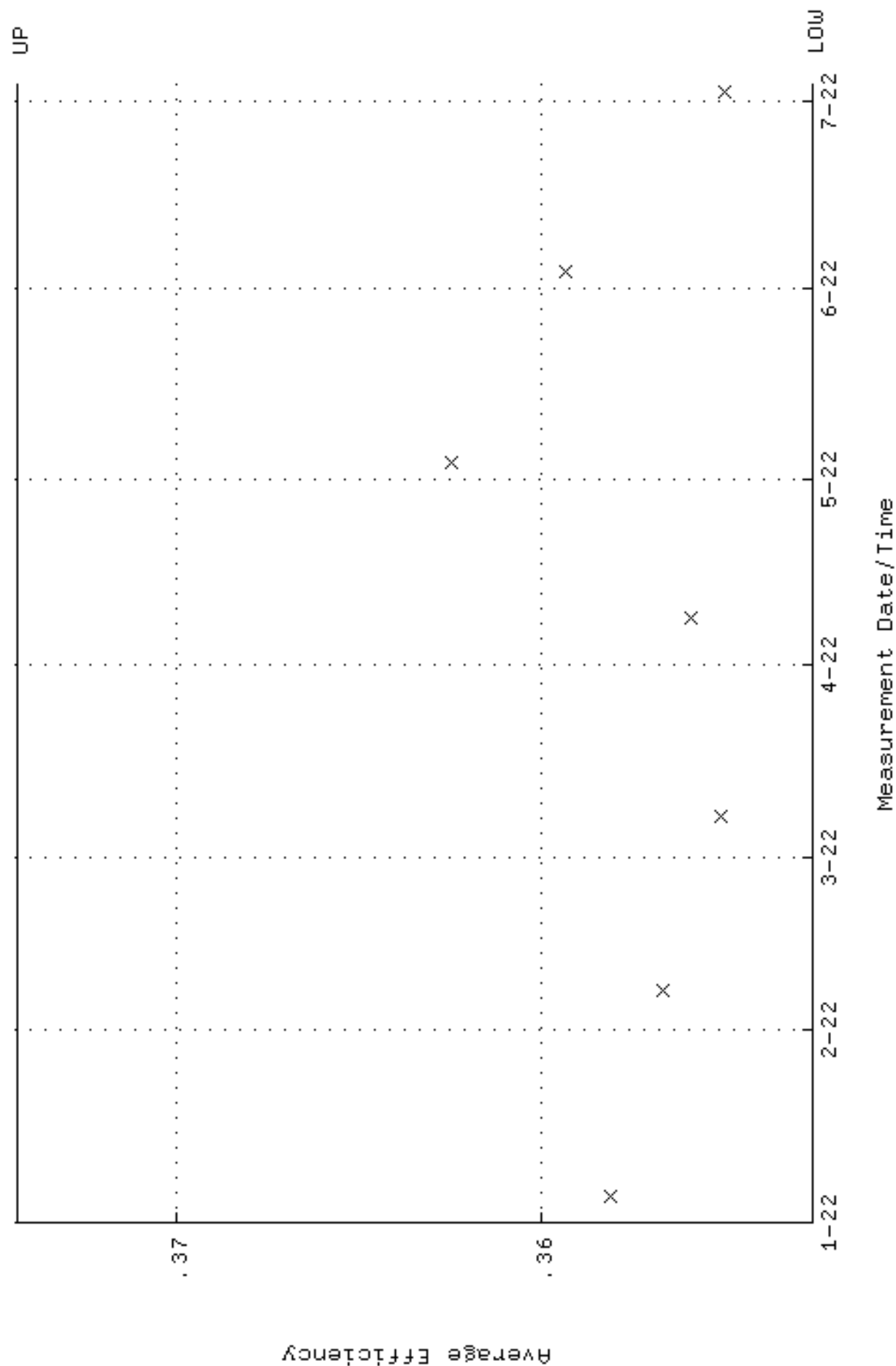
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-JAN-2022 10:51:40 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



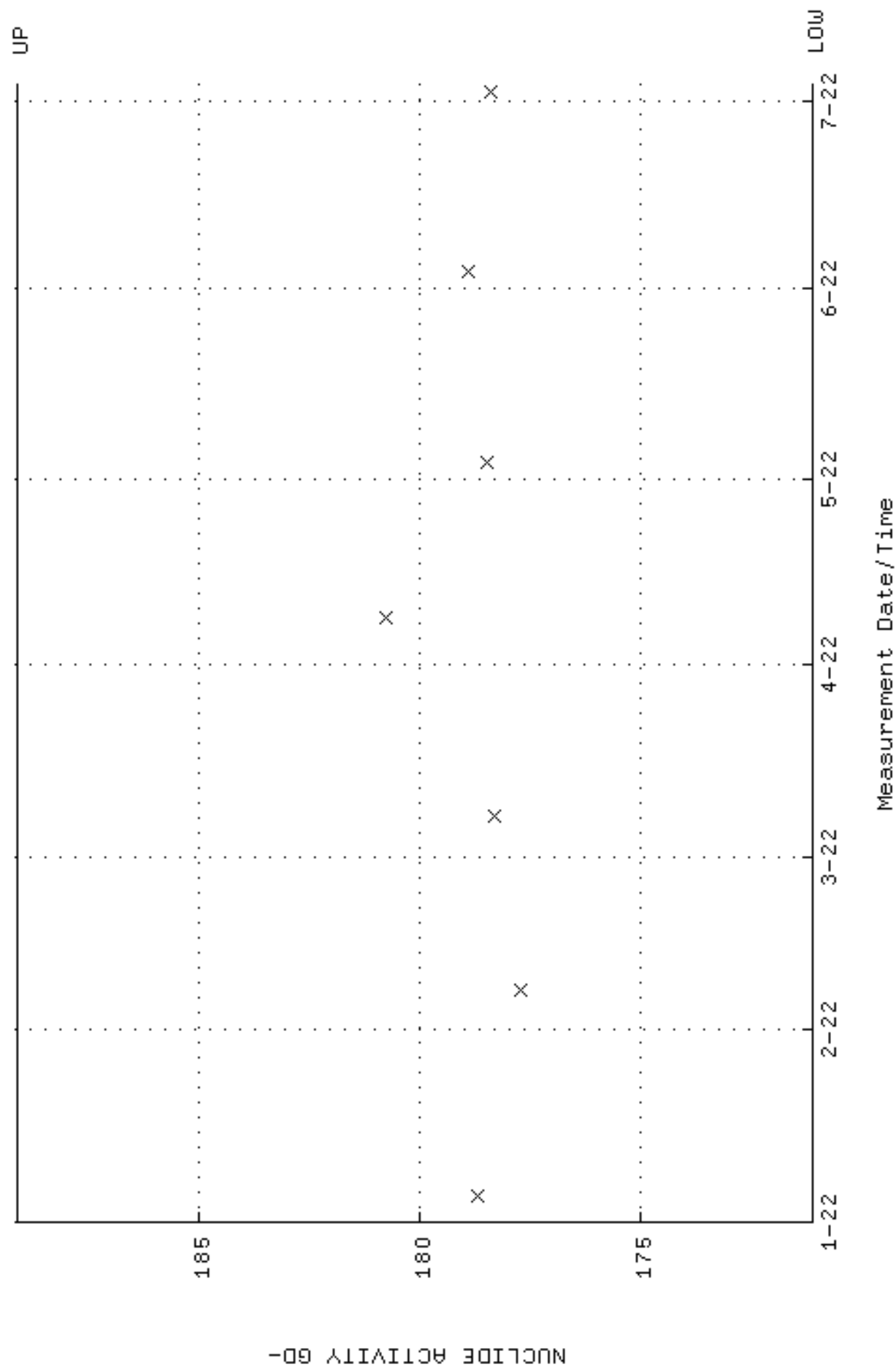
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 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:43:07 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



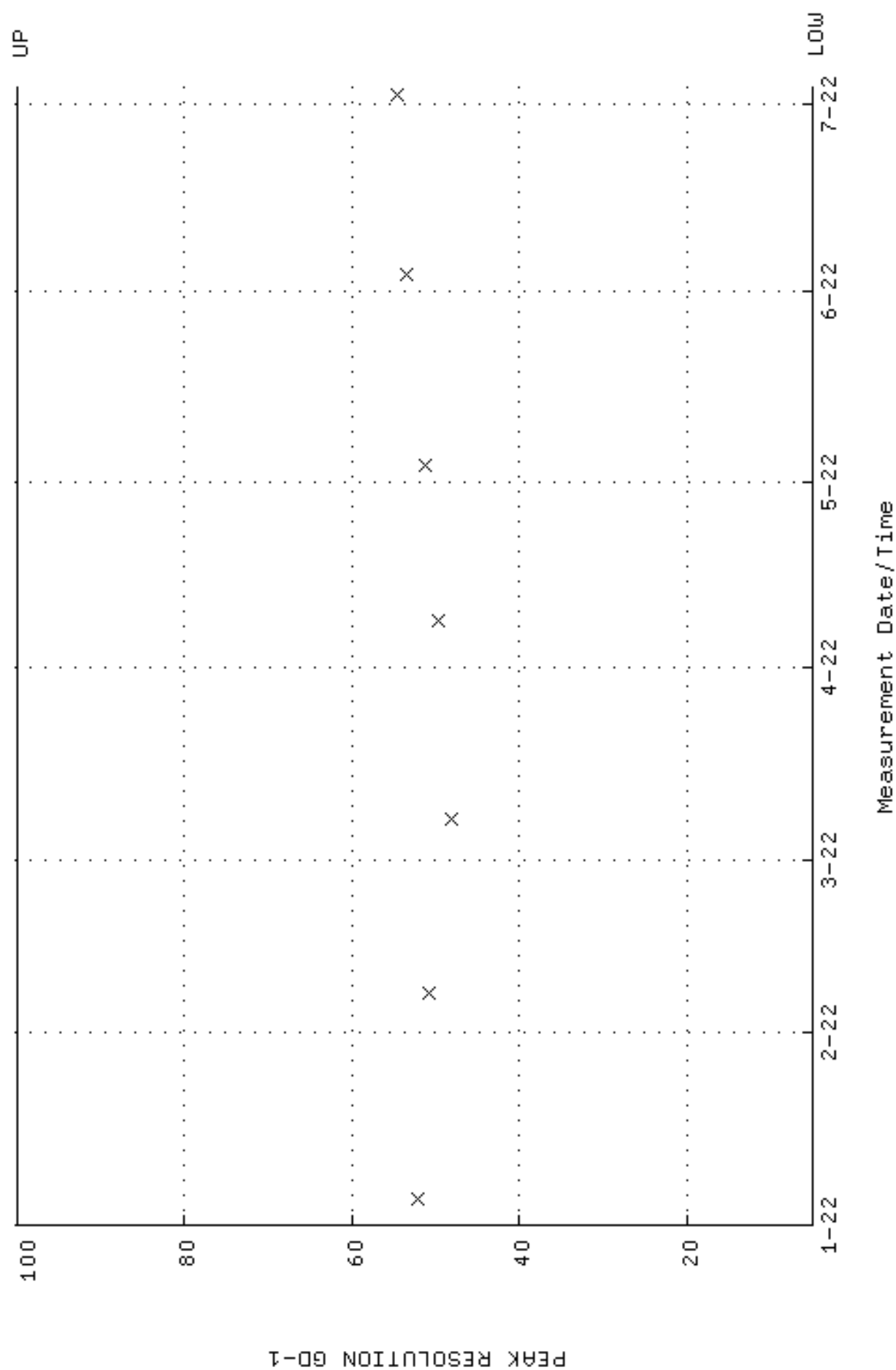
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.352538 through 0.374344



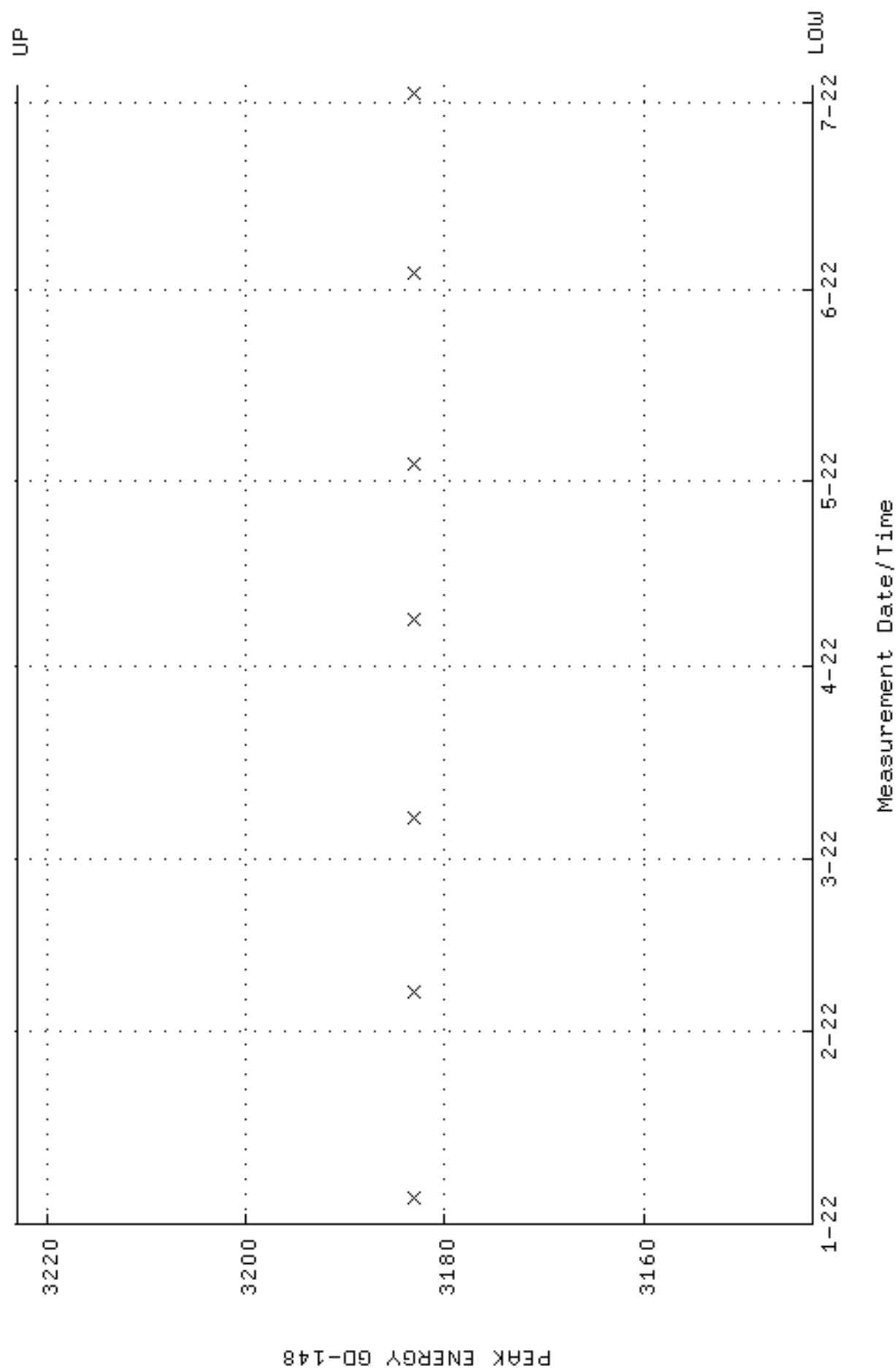
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



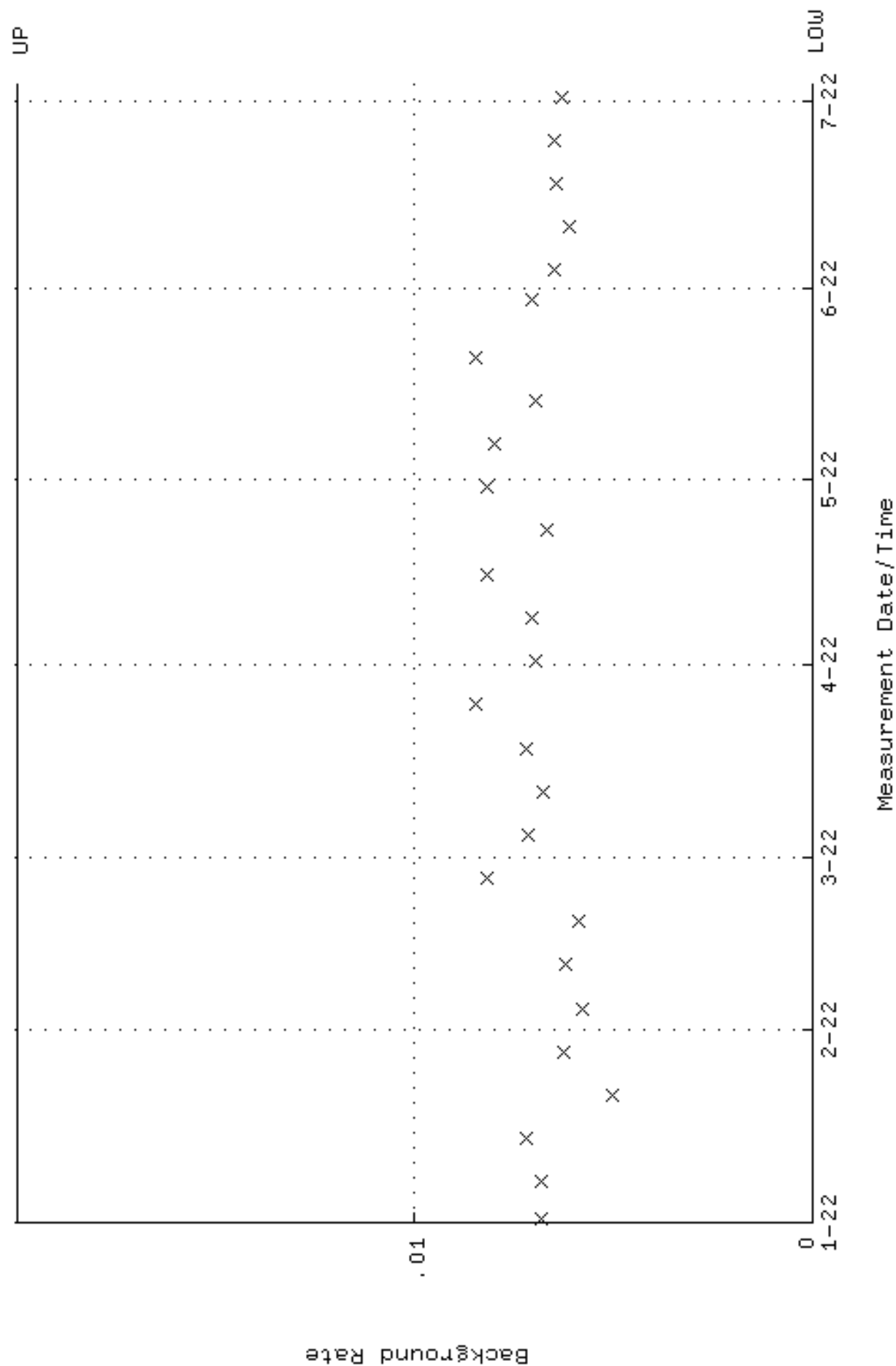
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



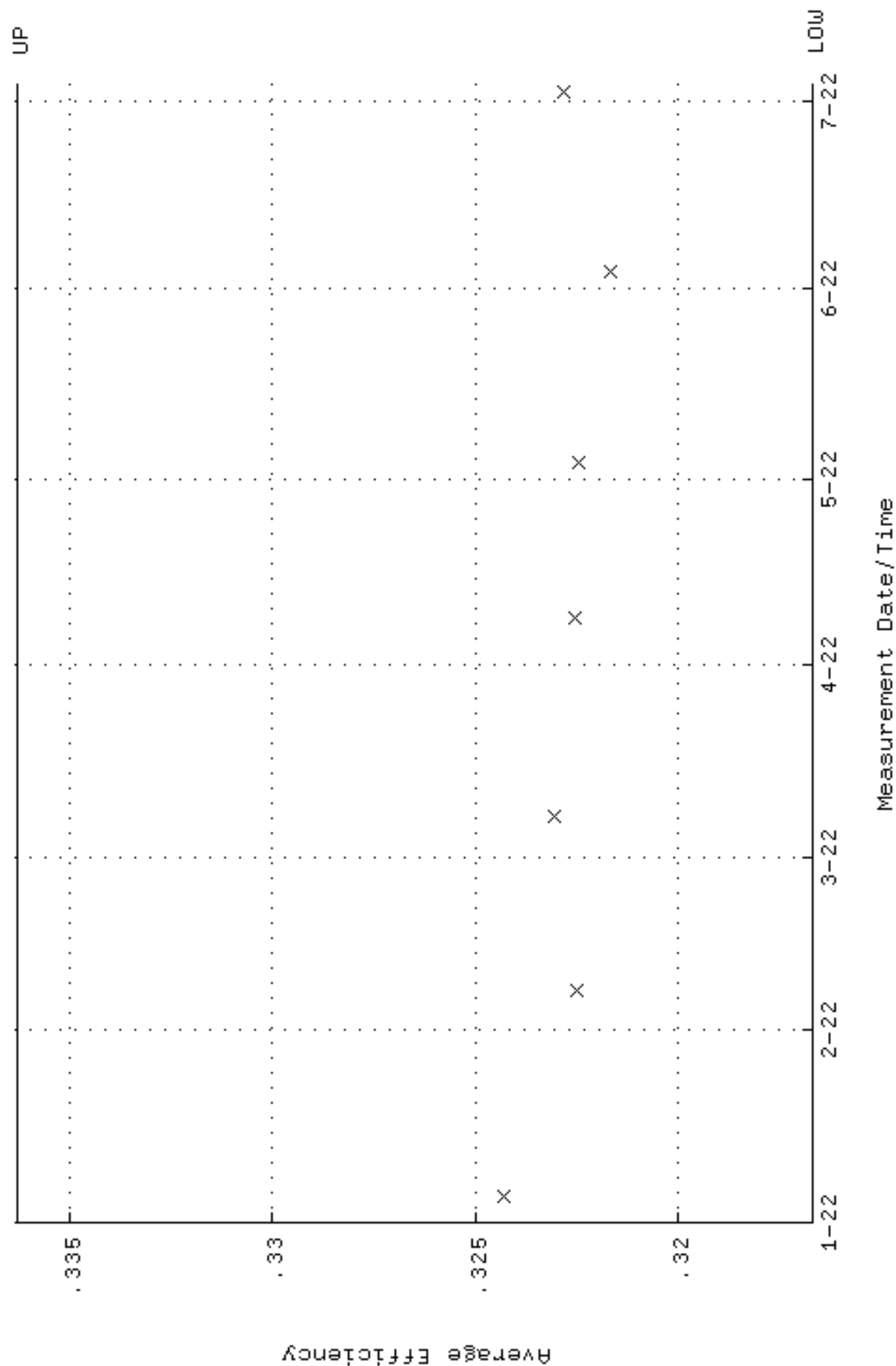
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



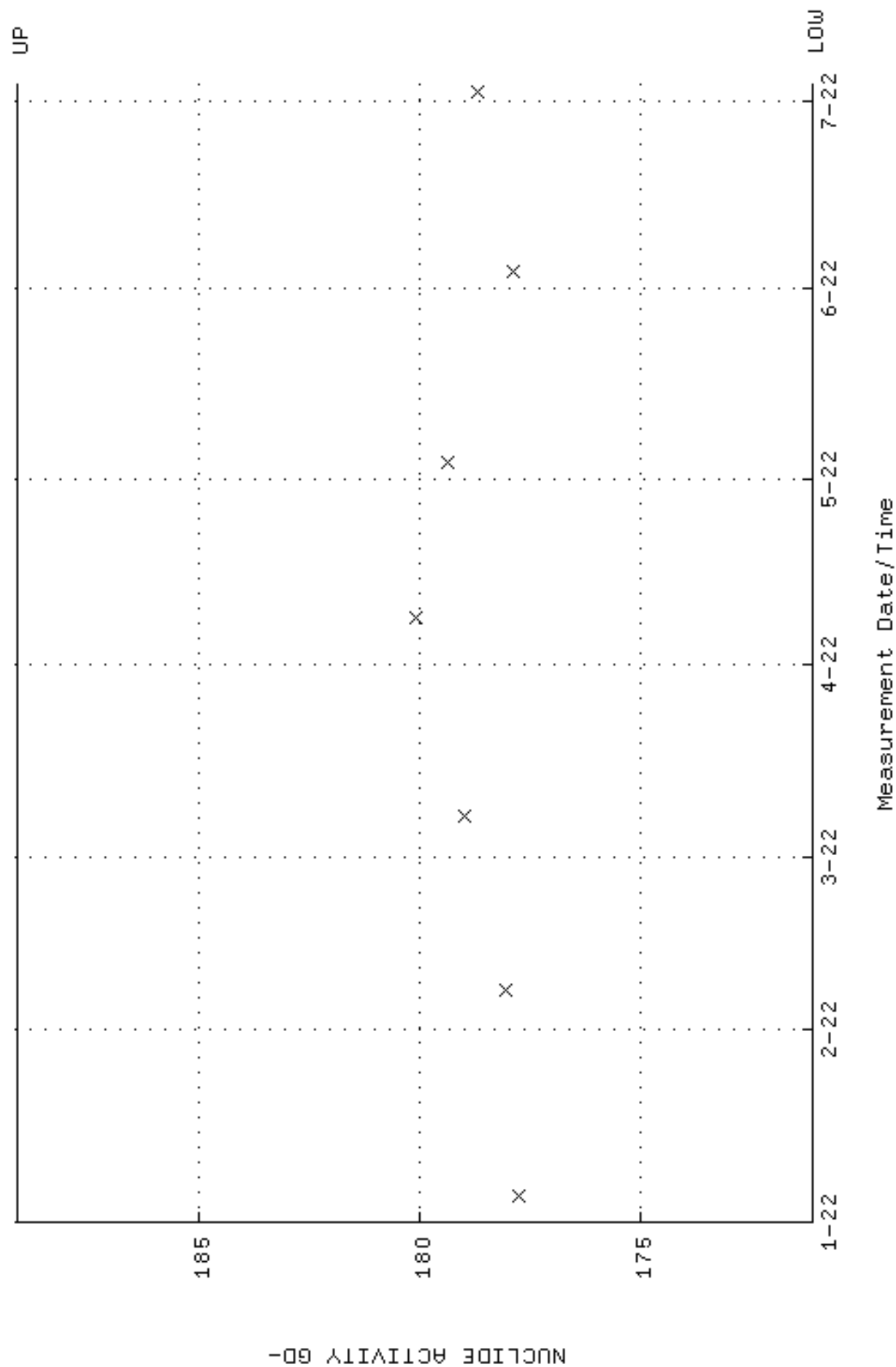
QA filename : DKA100:[ENV_ALPHA.QA.B]B047.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:43:07 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



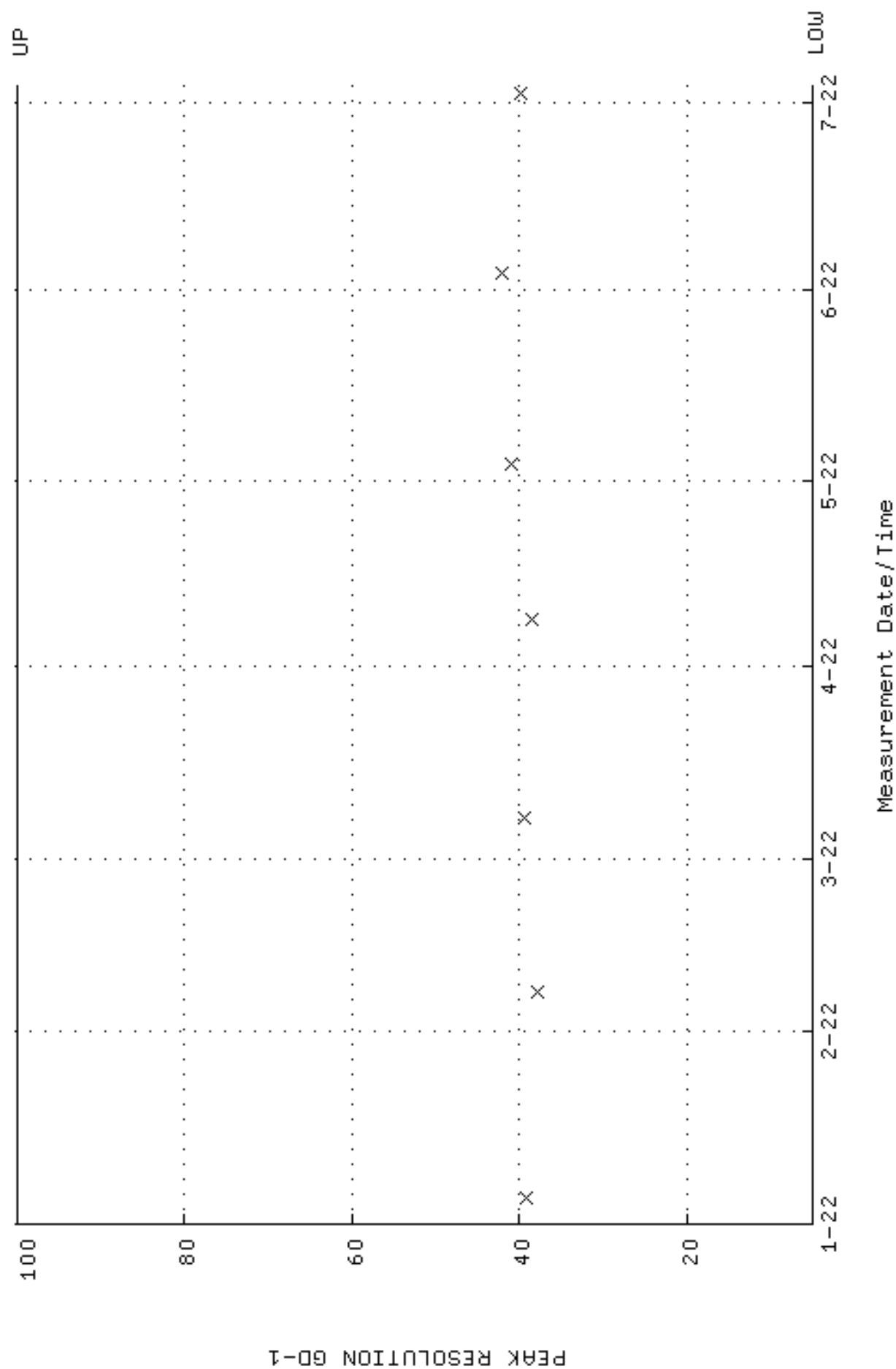
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.316695 through 0.336285



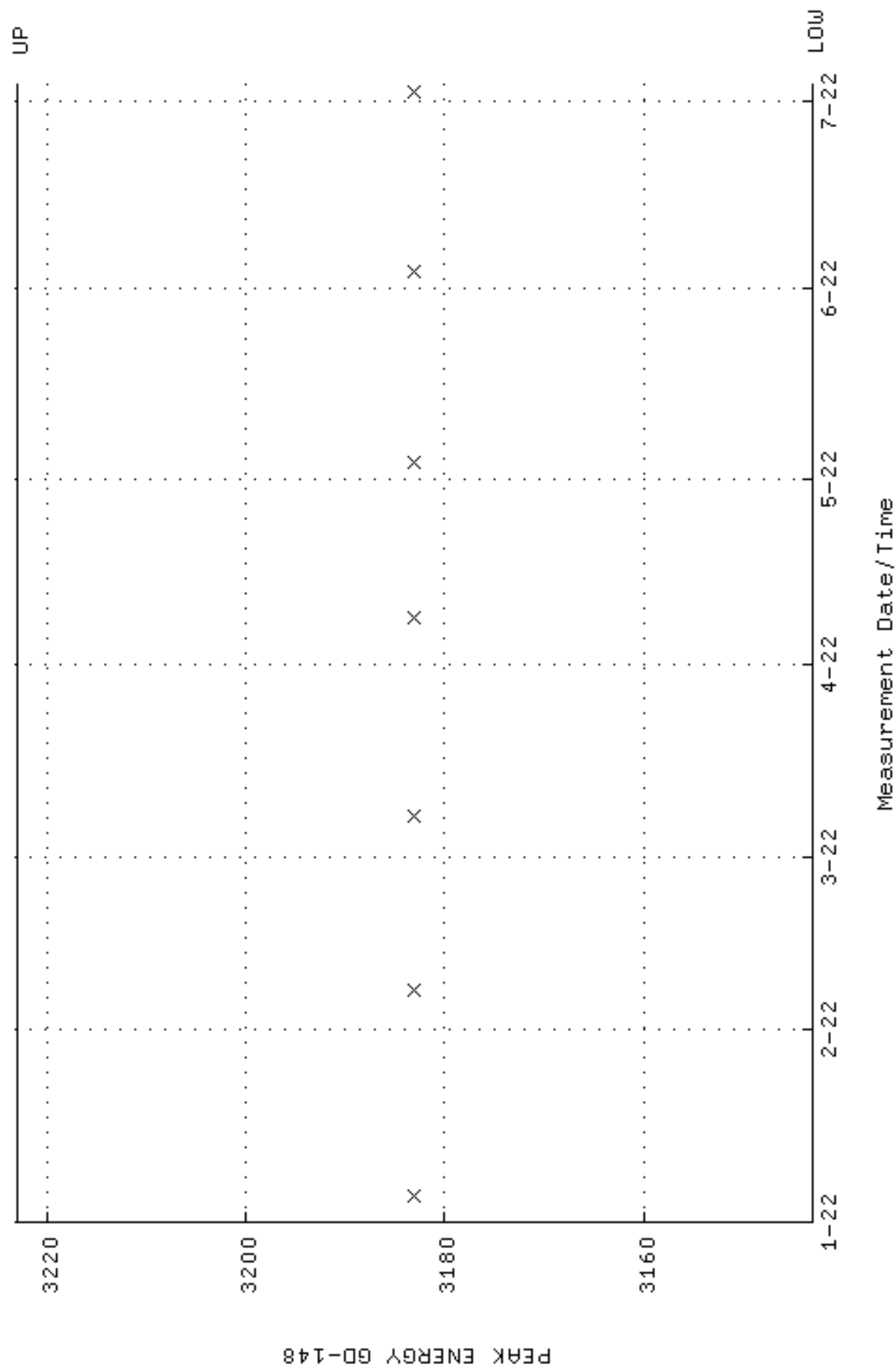
QA filename : DKA100:[ENV_ALPHA.QA.W]W048.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



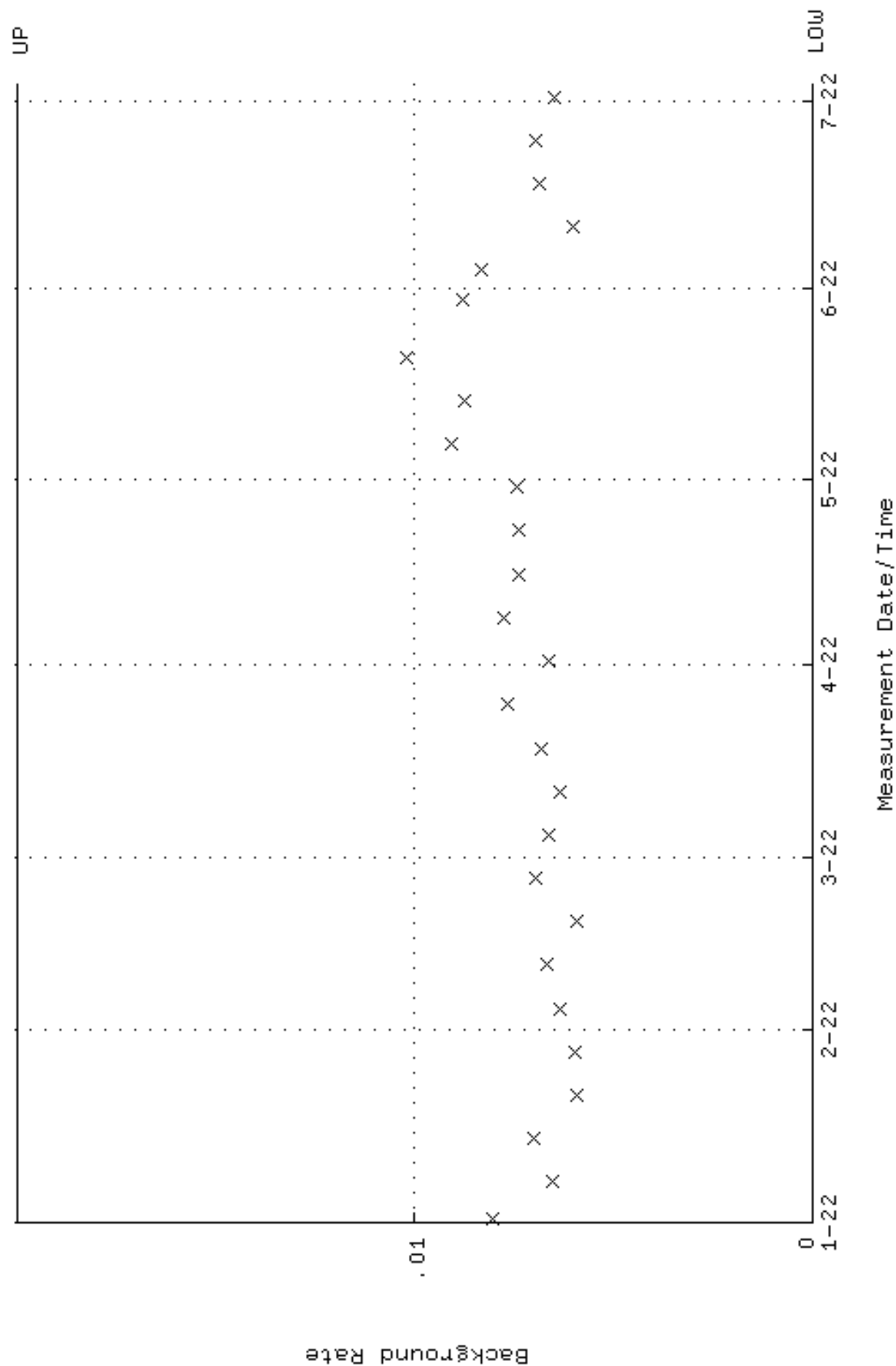
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



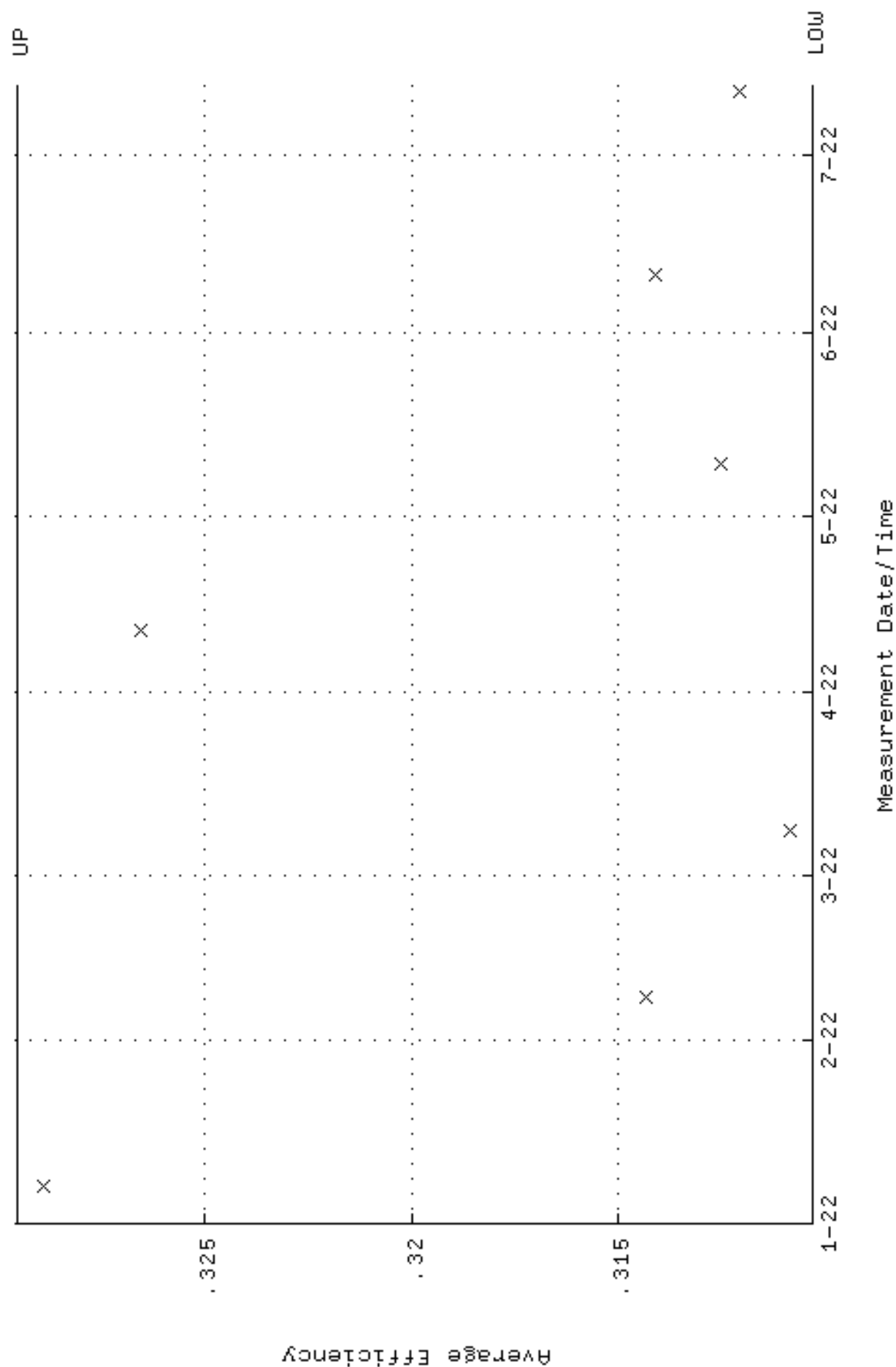
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 5-JAN-2022 08:43:30 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



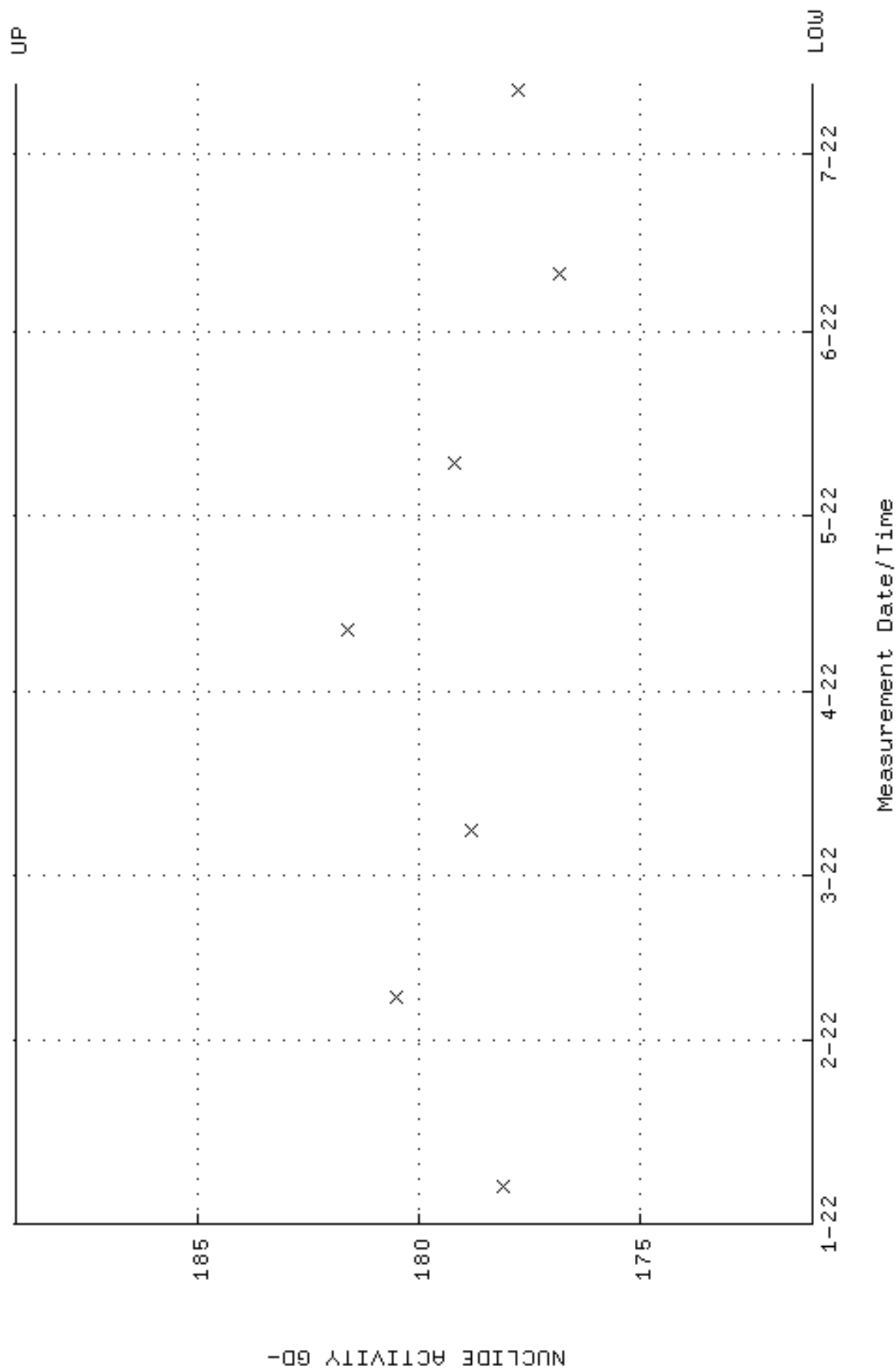
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 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:43:07 through 3-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



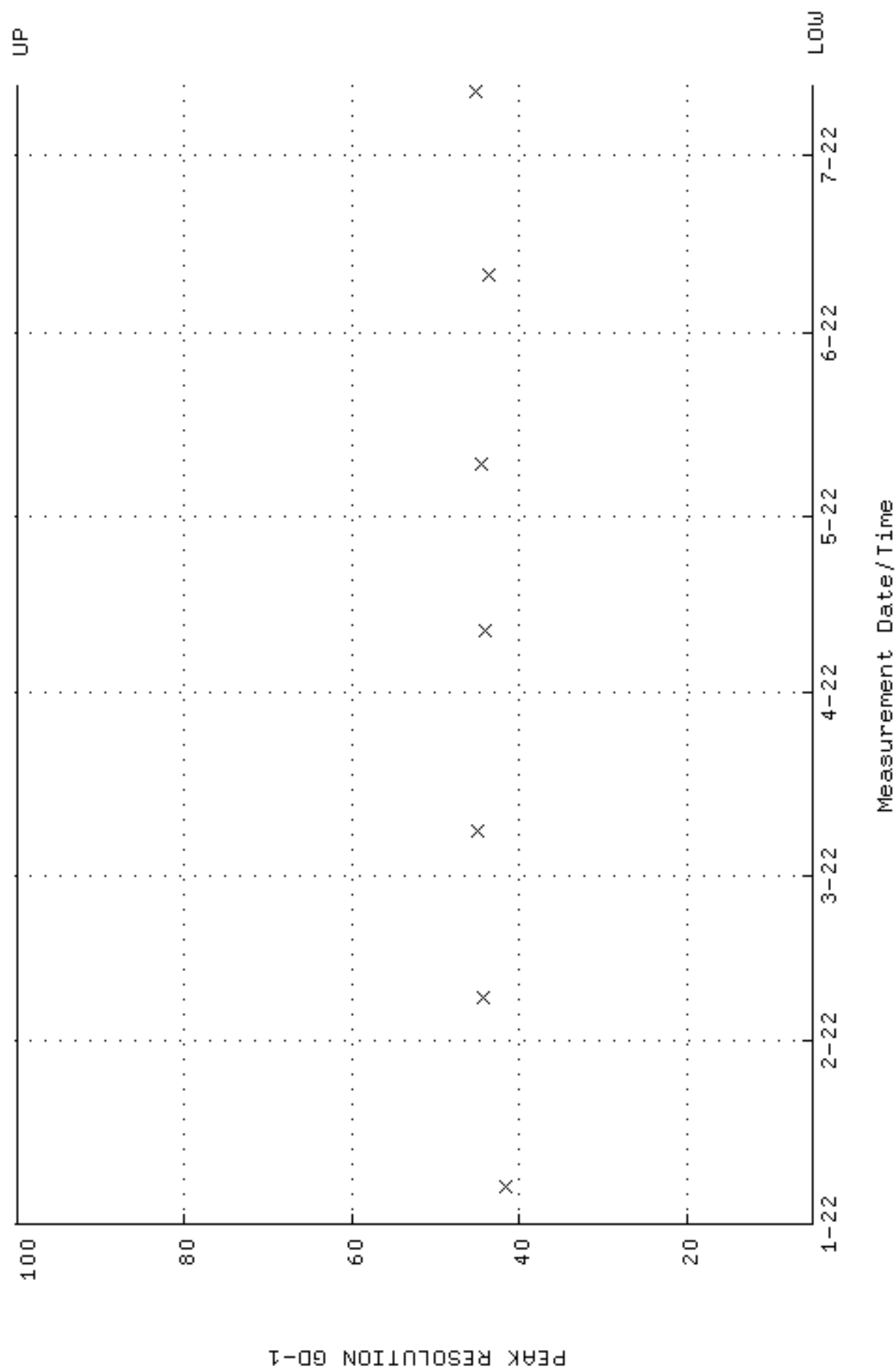
QA filename : DKA100:[ENV_ALPHA.QA.W]W075.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.310320 through 0.329500



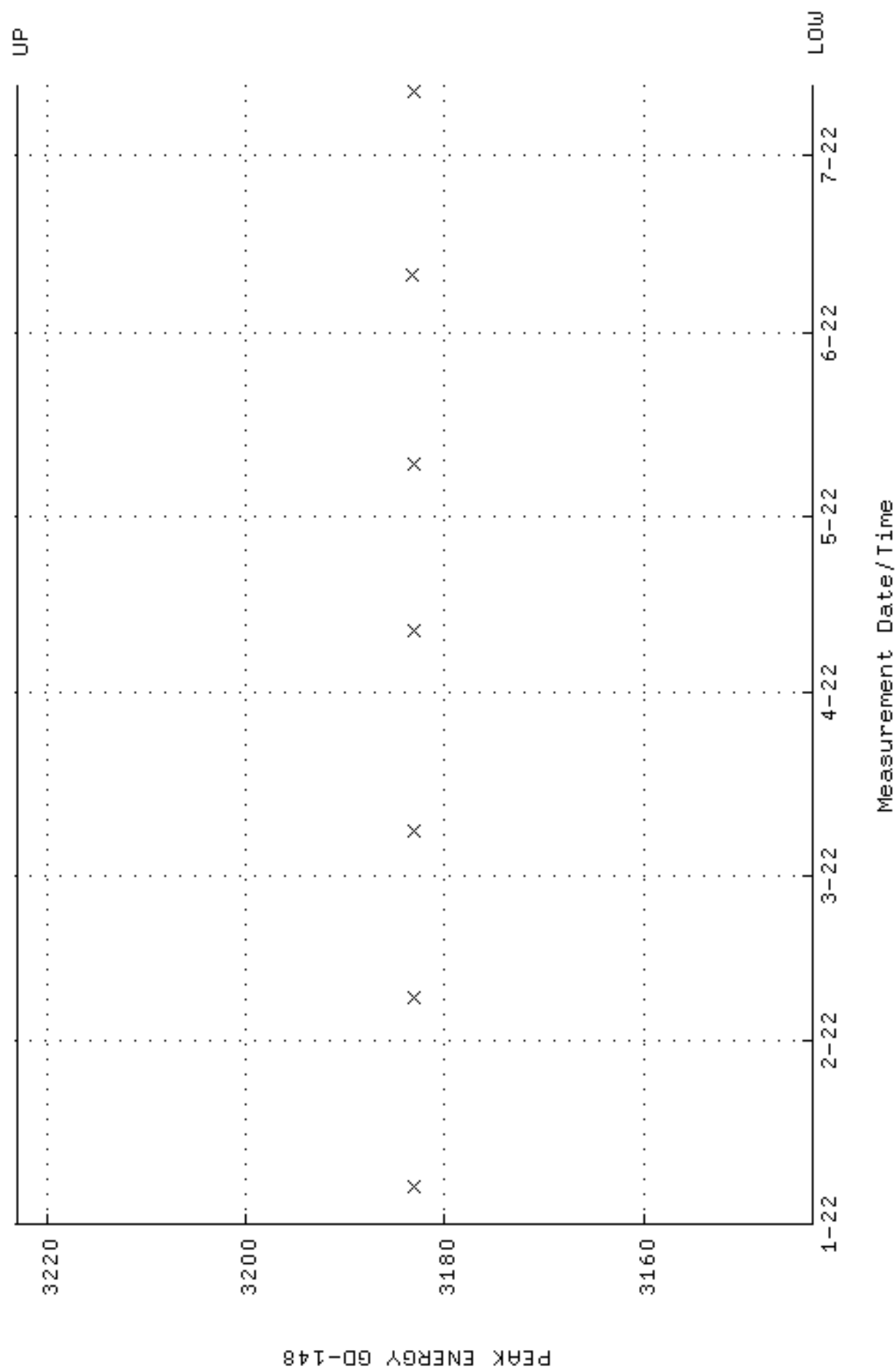
QA filename : DKA100:[ENV_ALPHA.QA.W]W075.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



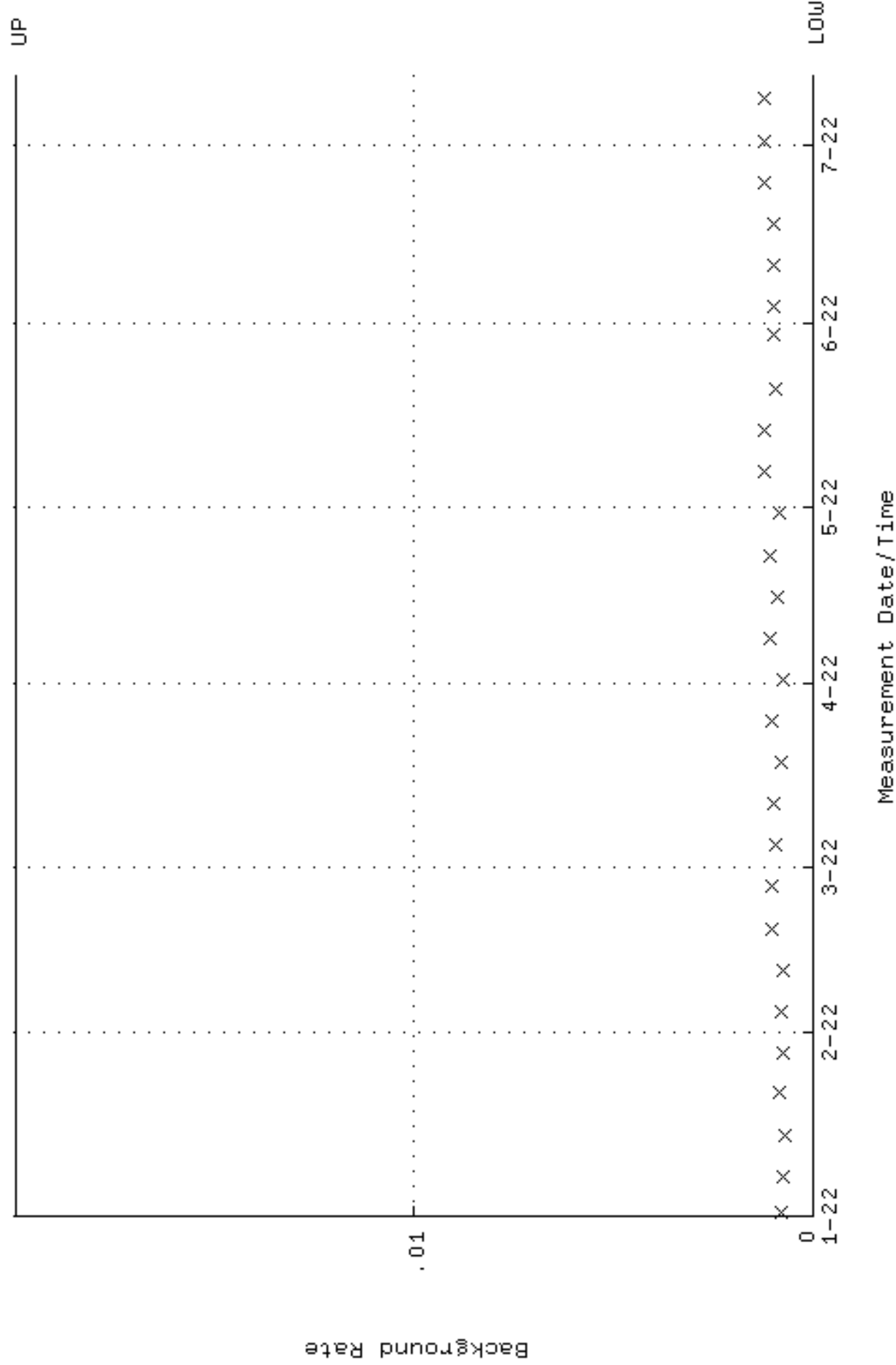
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



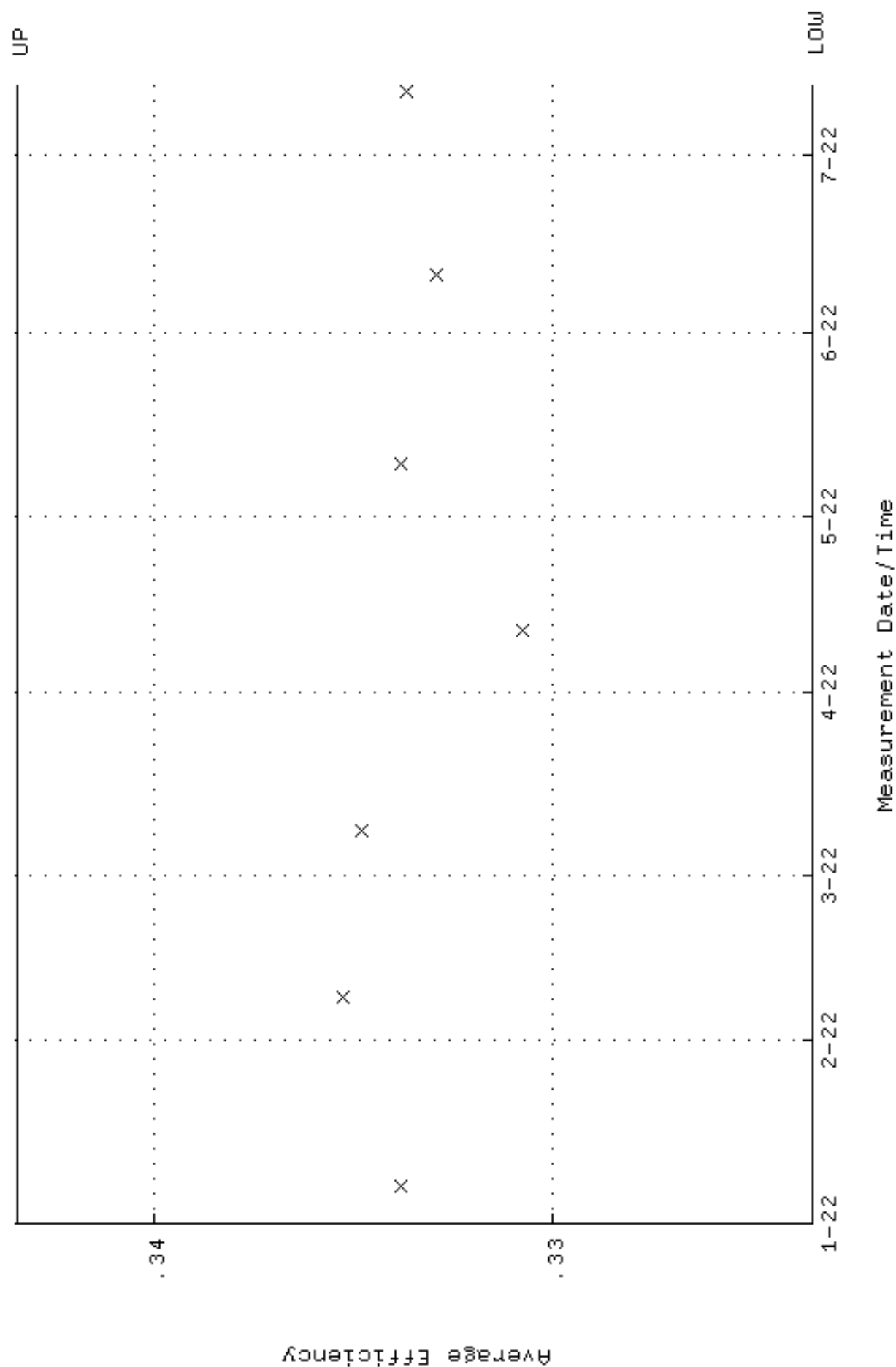
QA filename : DKA100:[ENV_ALPHA.QA.W]W075.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



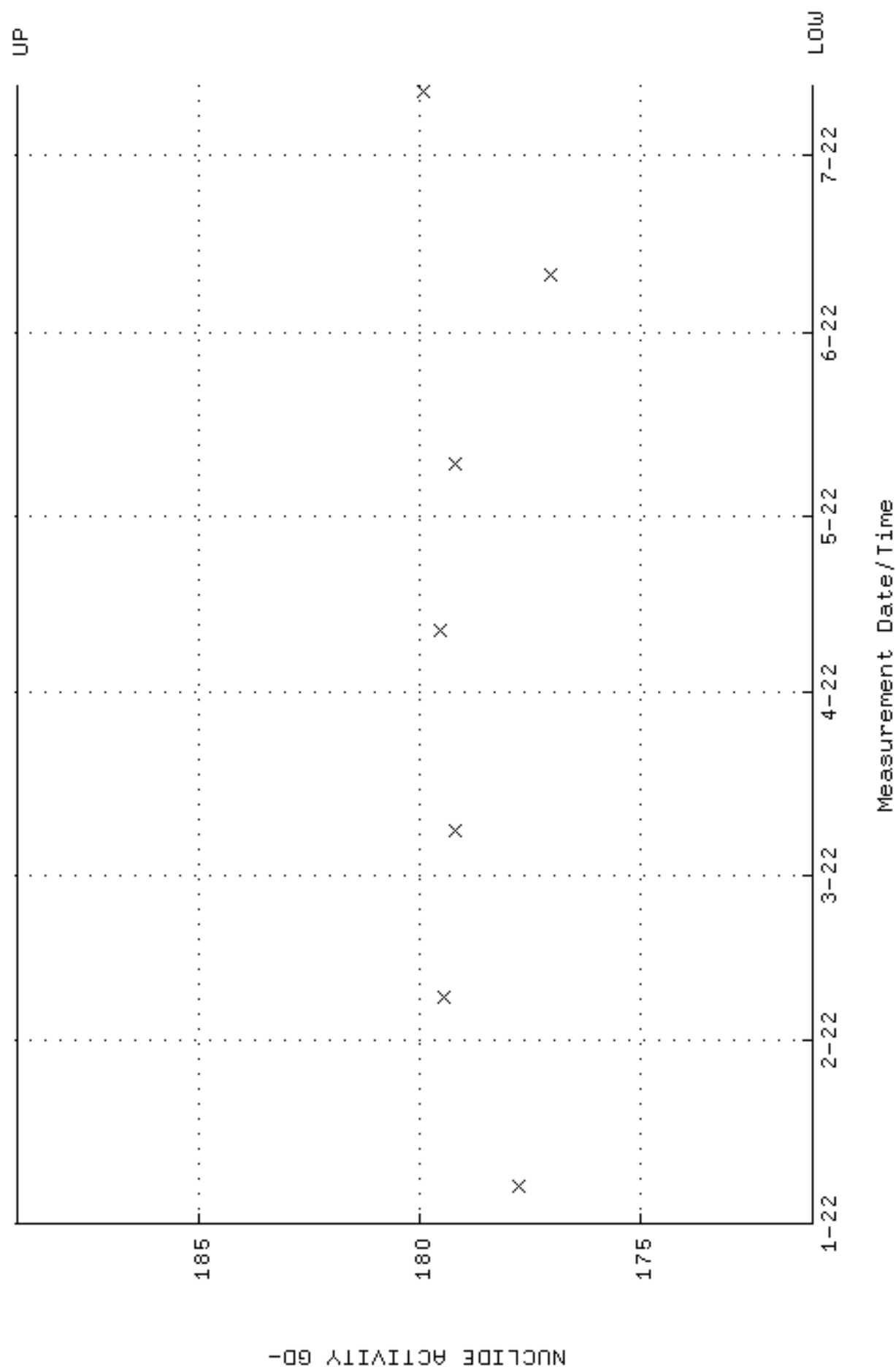
QA filename : DKA100:[ENV_ALPHA.QA.B]B075.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:51:14 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



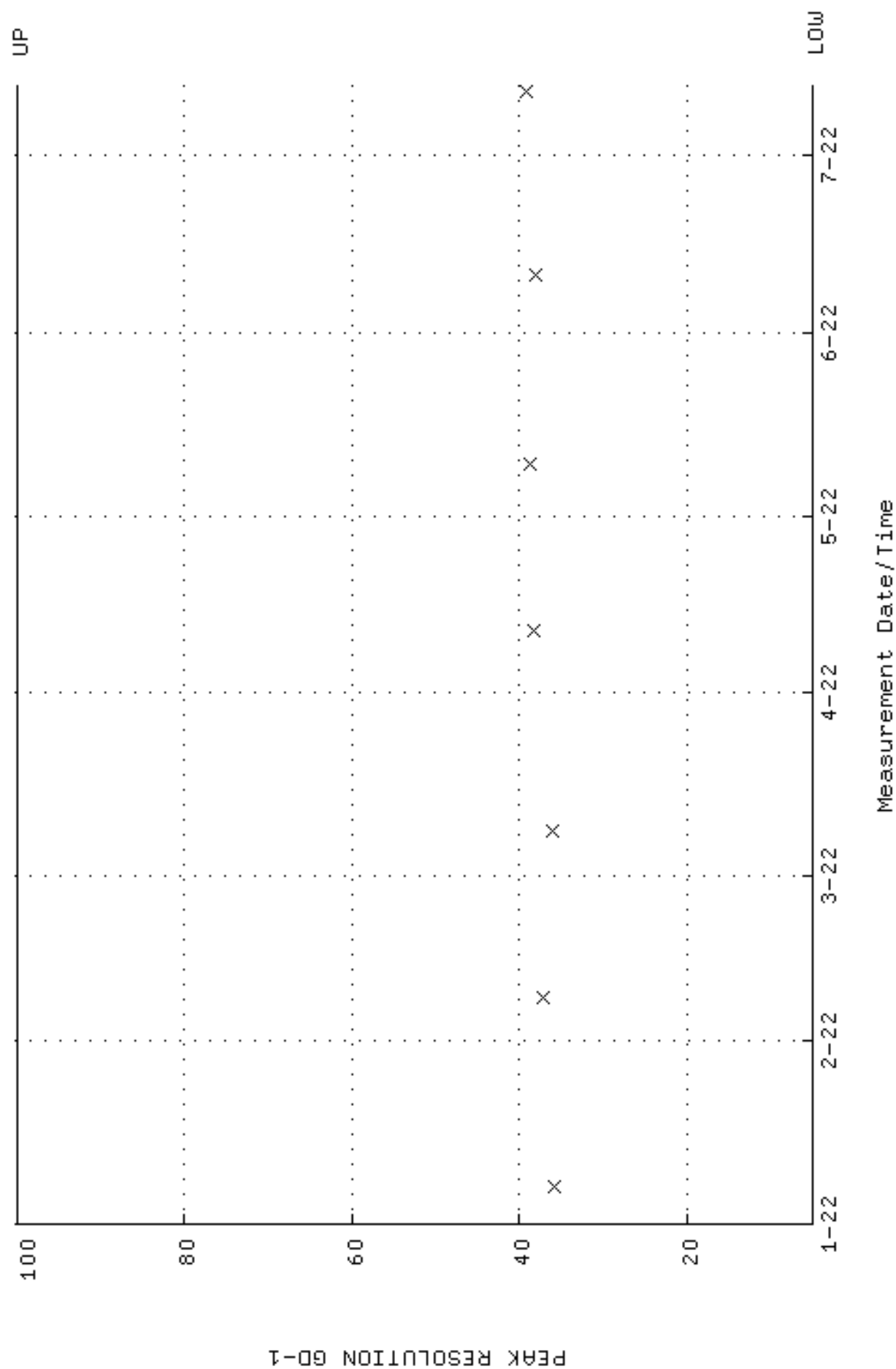
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.323450 through 0.343450



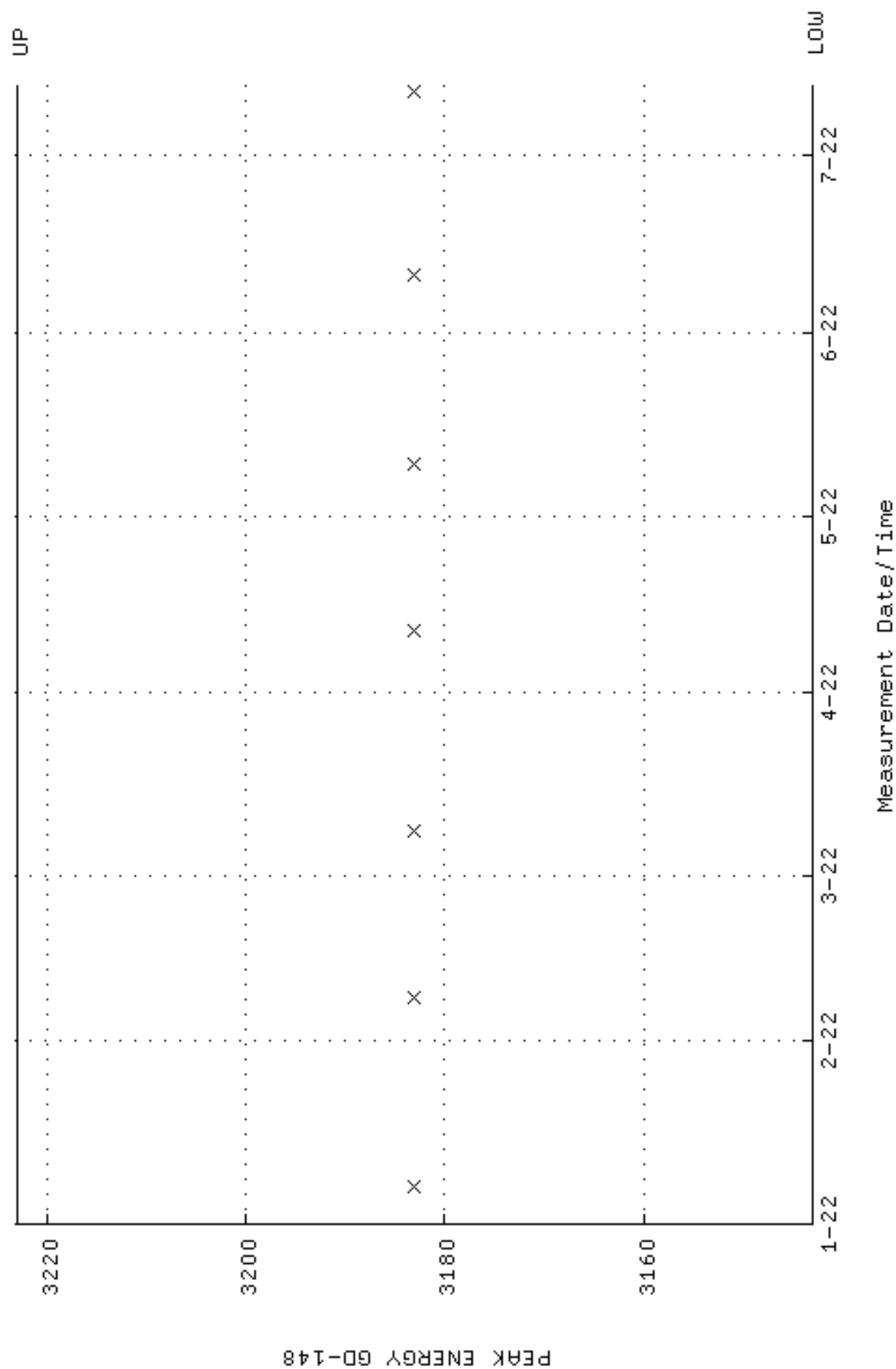
QA filename : DKA100:[ENV_ALPHA.QA.W]W076.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W076.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



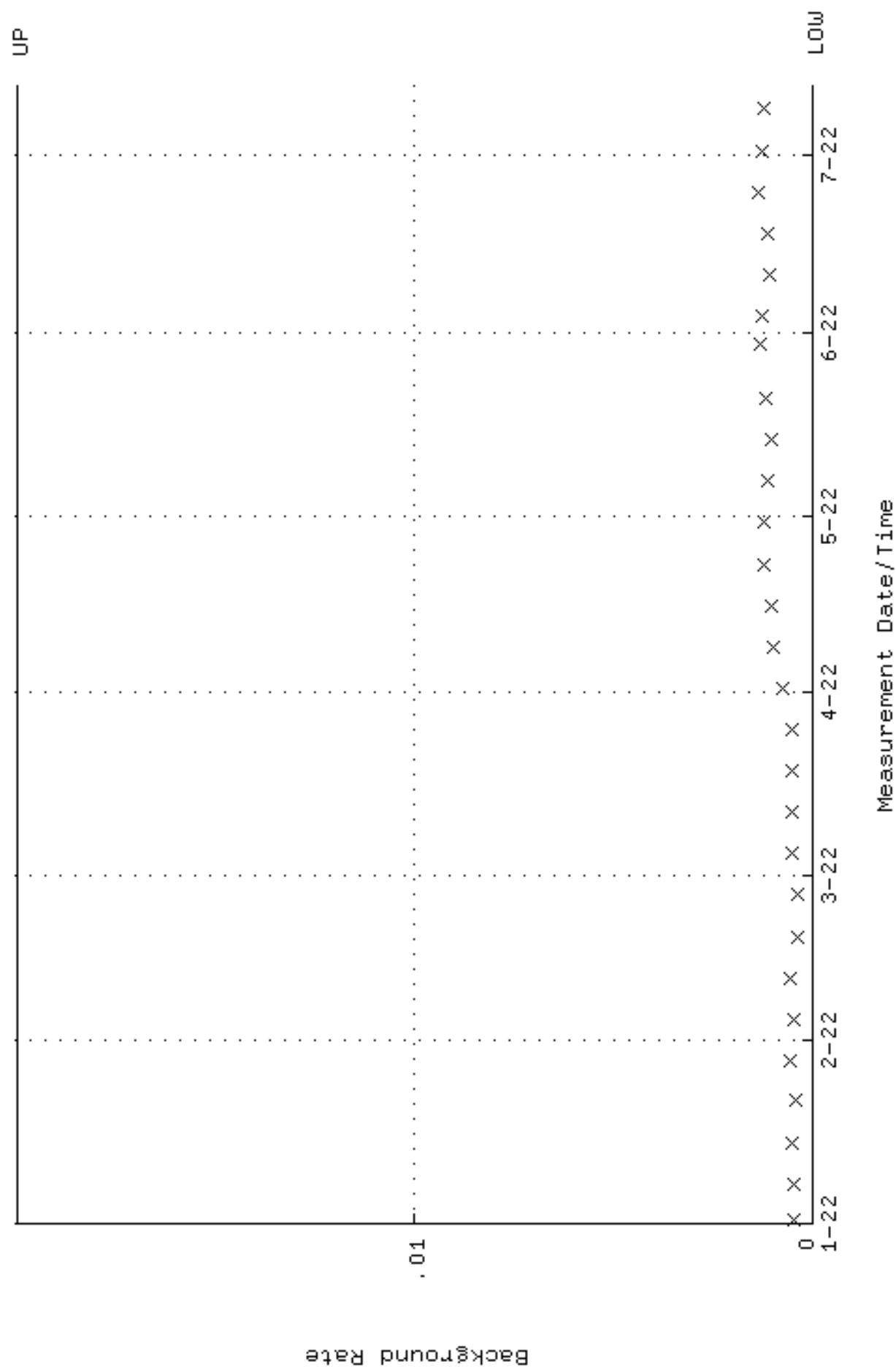
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 Start/End Dates : 7-JAN-2022 10:03:48 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



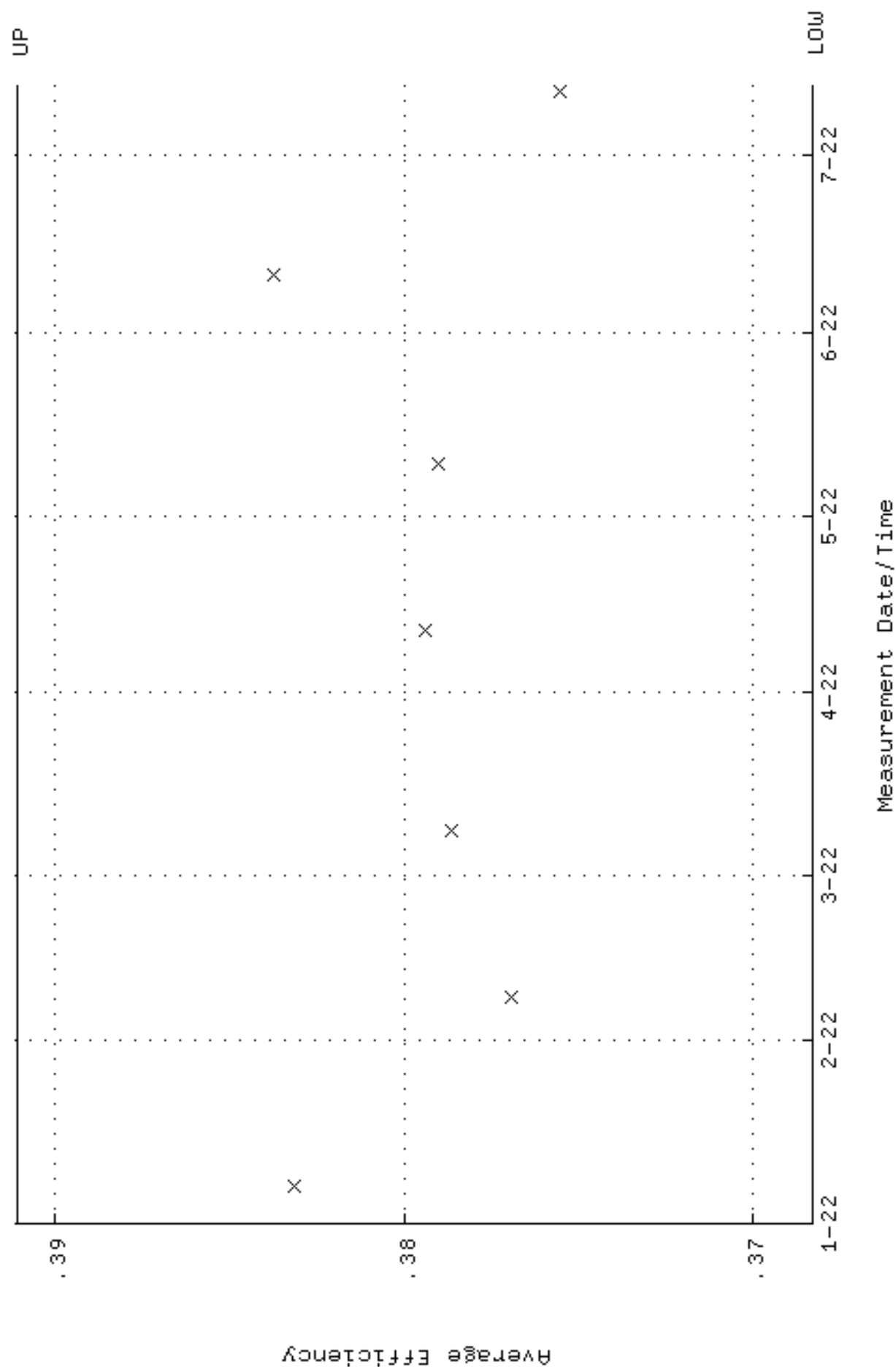
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QA filename      : DKA100:[ENV_ALPHA.QA.B]B076.QAF;4
Parameter Name   : BACKRATE (Background Rate)
Start/End Dates  : 1-JAN-2022 12:51:14 through 12-JUN
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02

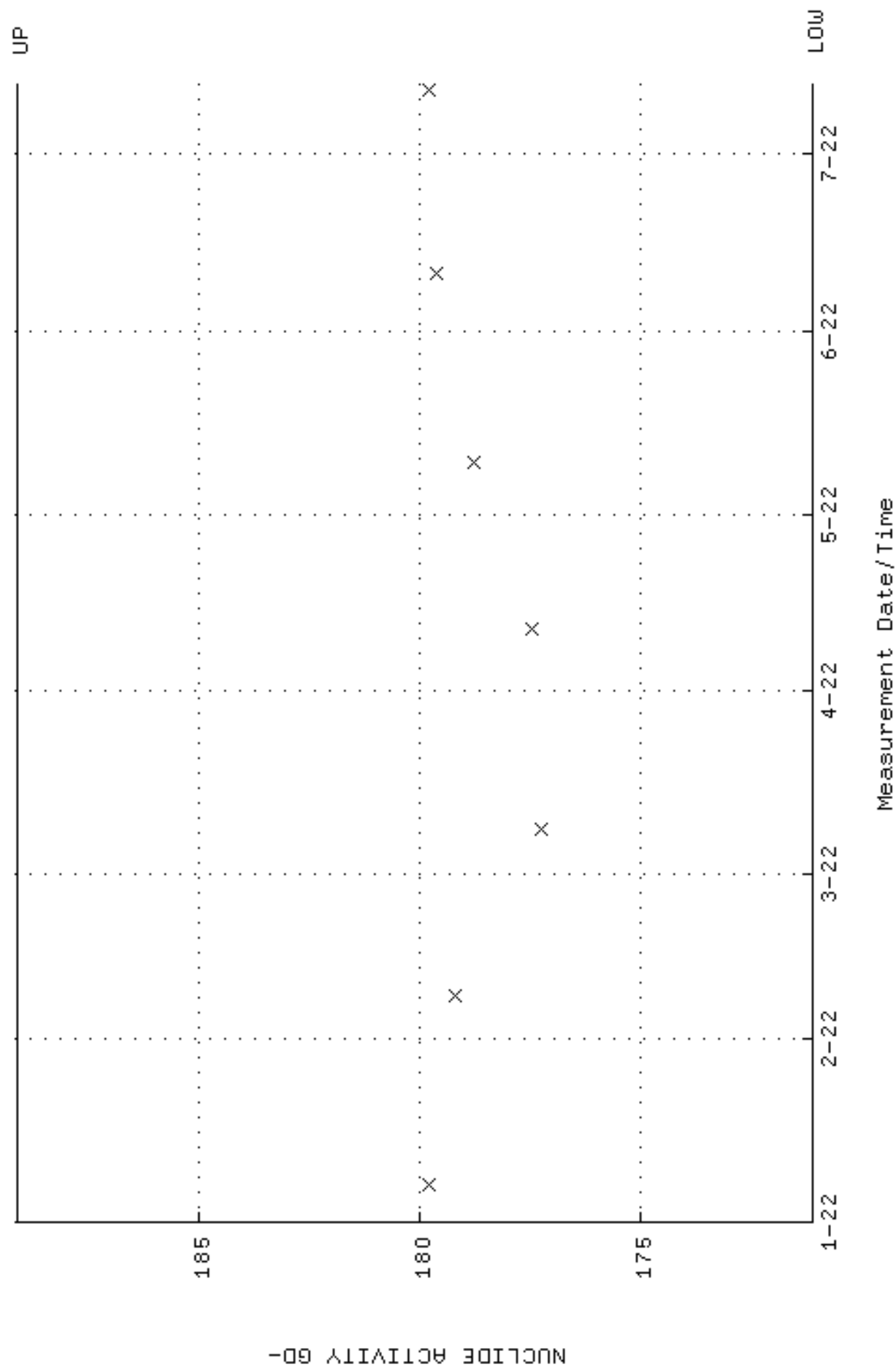
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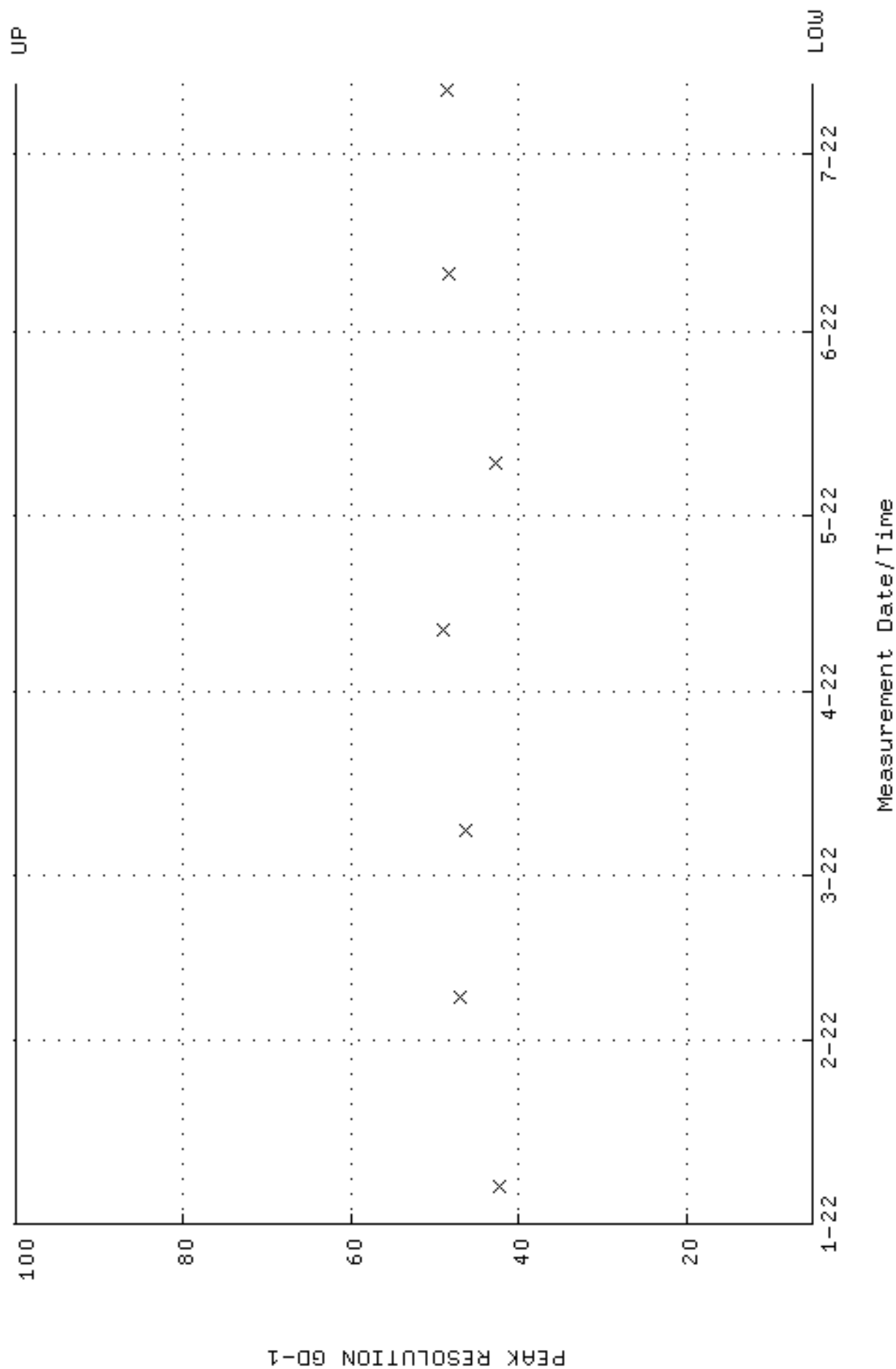
QA filename : DKA100:[ENV_ALPHA.QA.W]W083.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.368300 through 0.391080



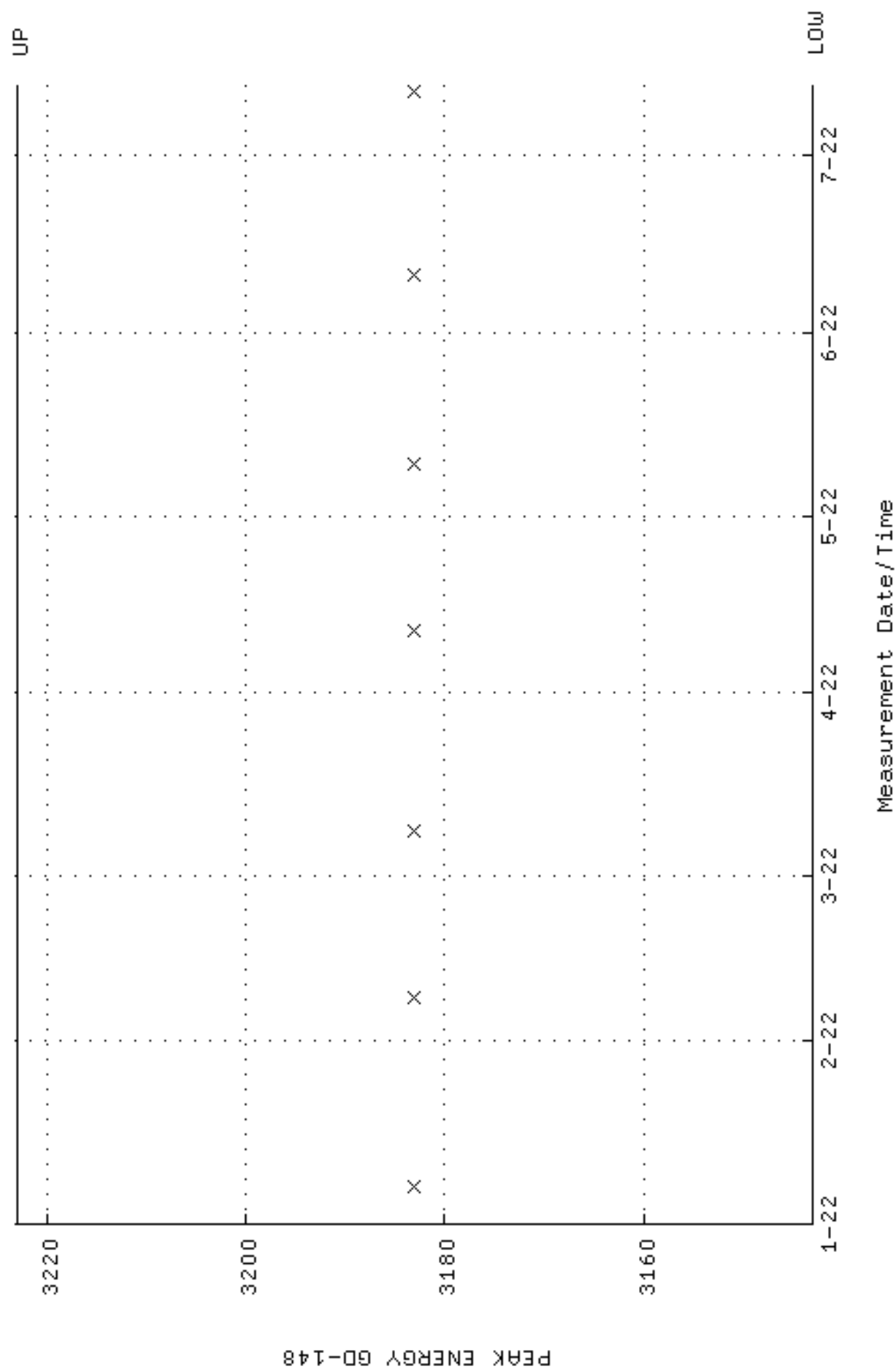
QA filename : DKA100:[ENV_ALPHA.QA.W]W083.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W083.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



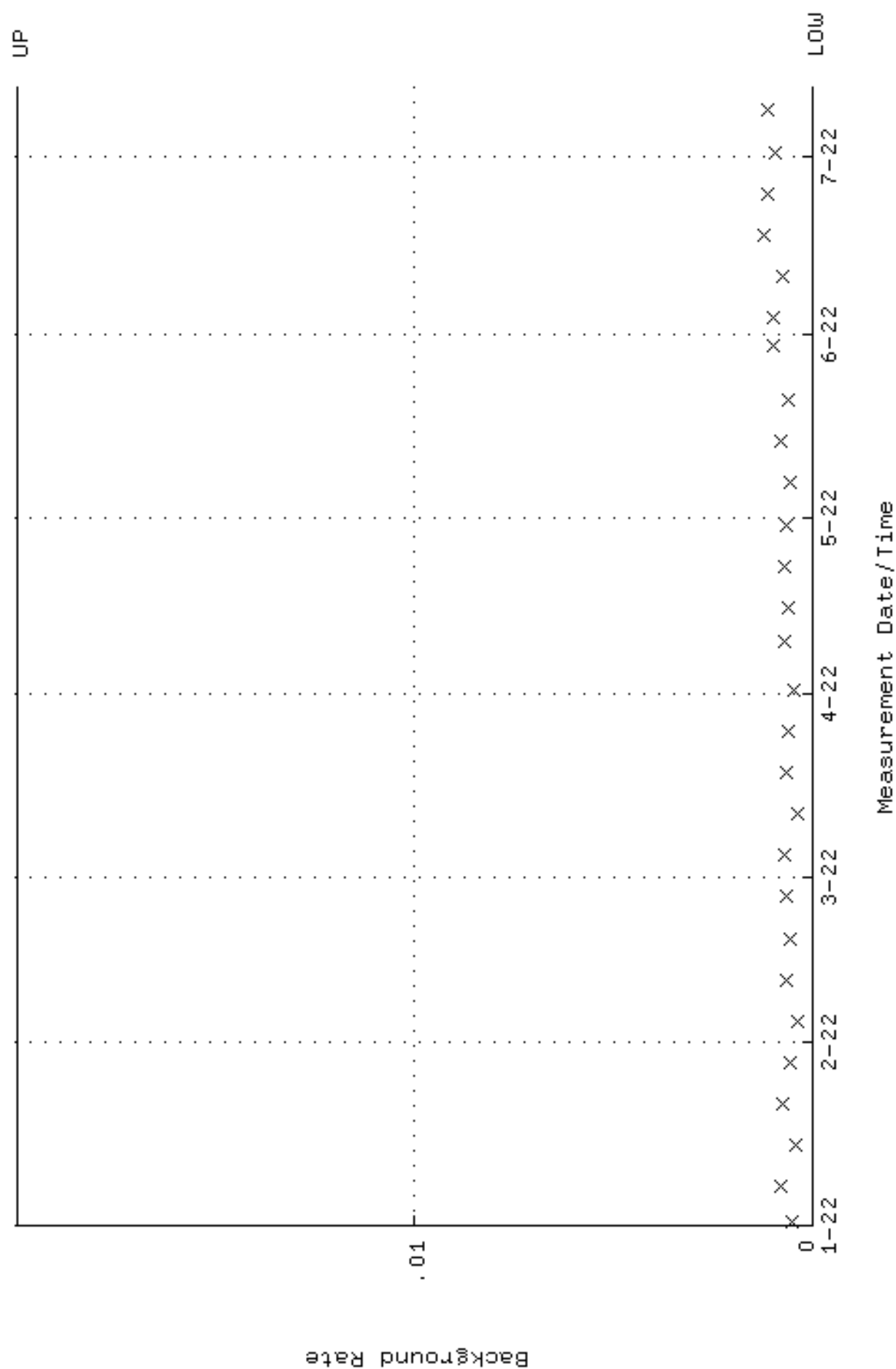
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



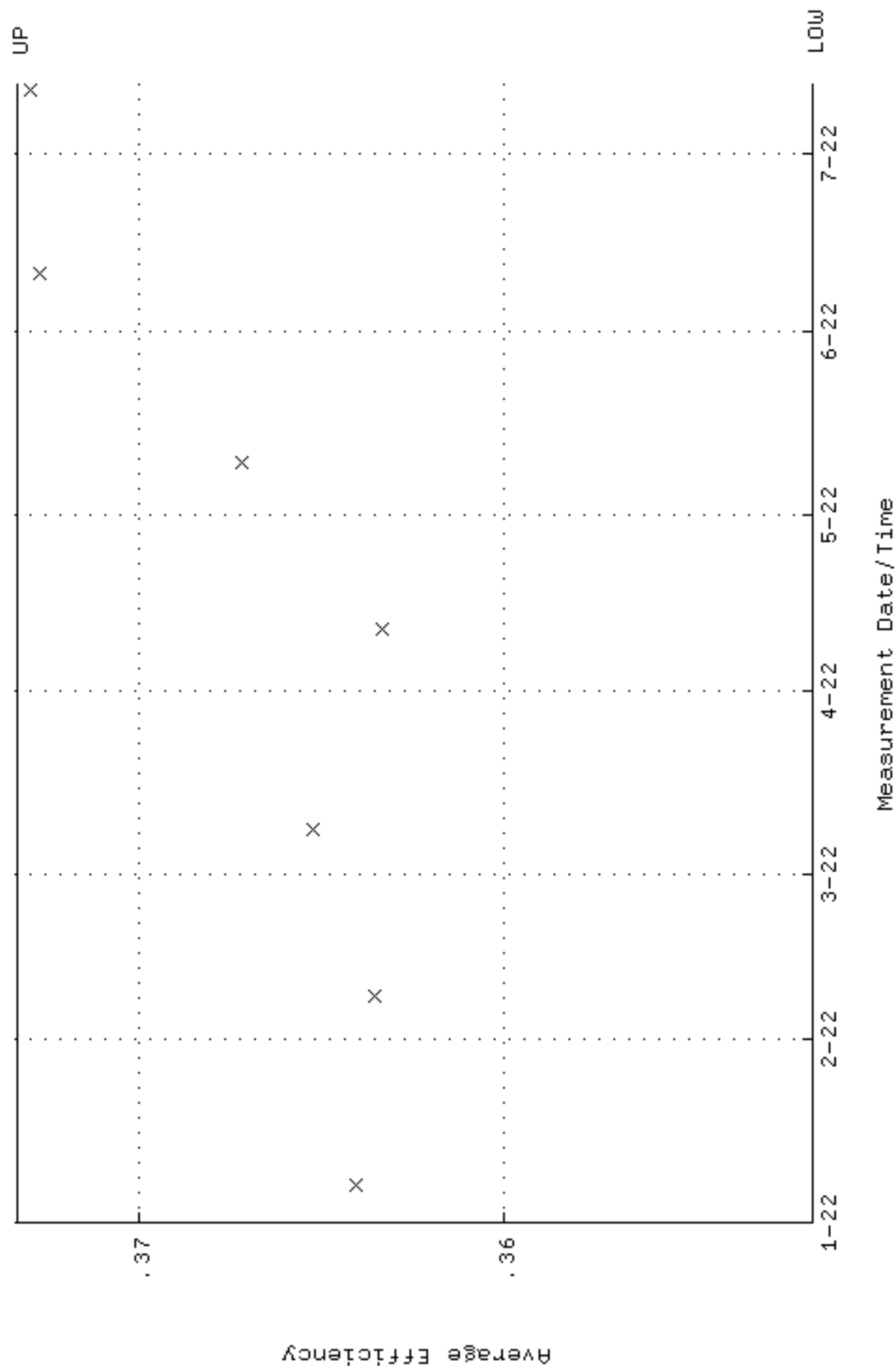
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QA filename      : DKA100:[ENV_ALPHA.QA.B]B083.QAF;6
Parameter Name   : BACKRATE (Background Rate)
Start/End Dates  : 1-JAN-2022 12:51:15 through 12-JUN-2022 12:51:15
Lower/Upper Lmts: 0.000000E+00 through 2.000000E+02

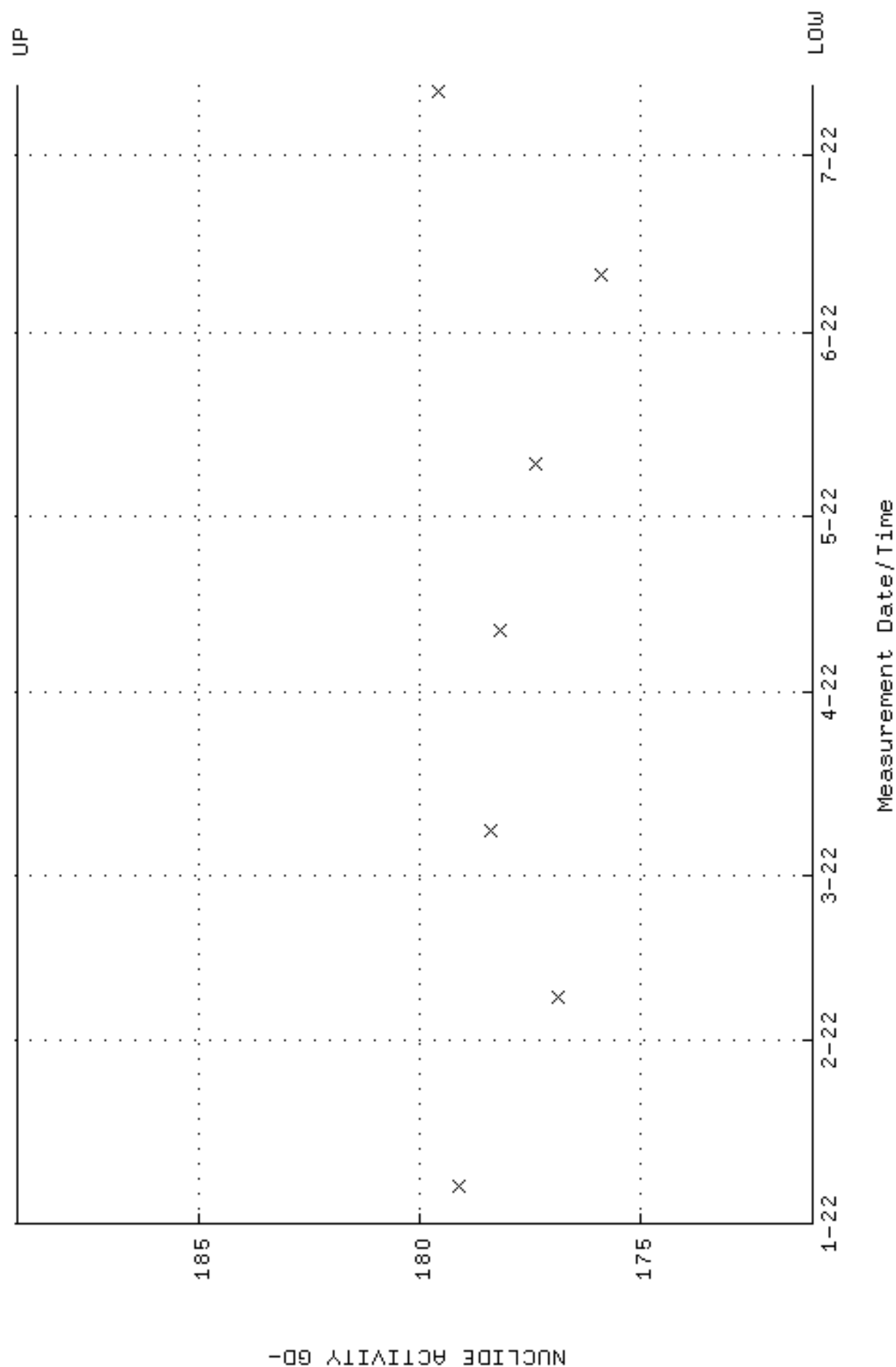
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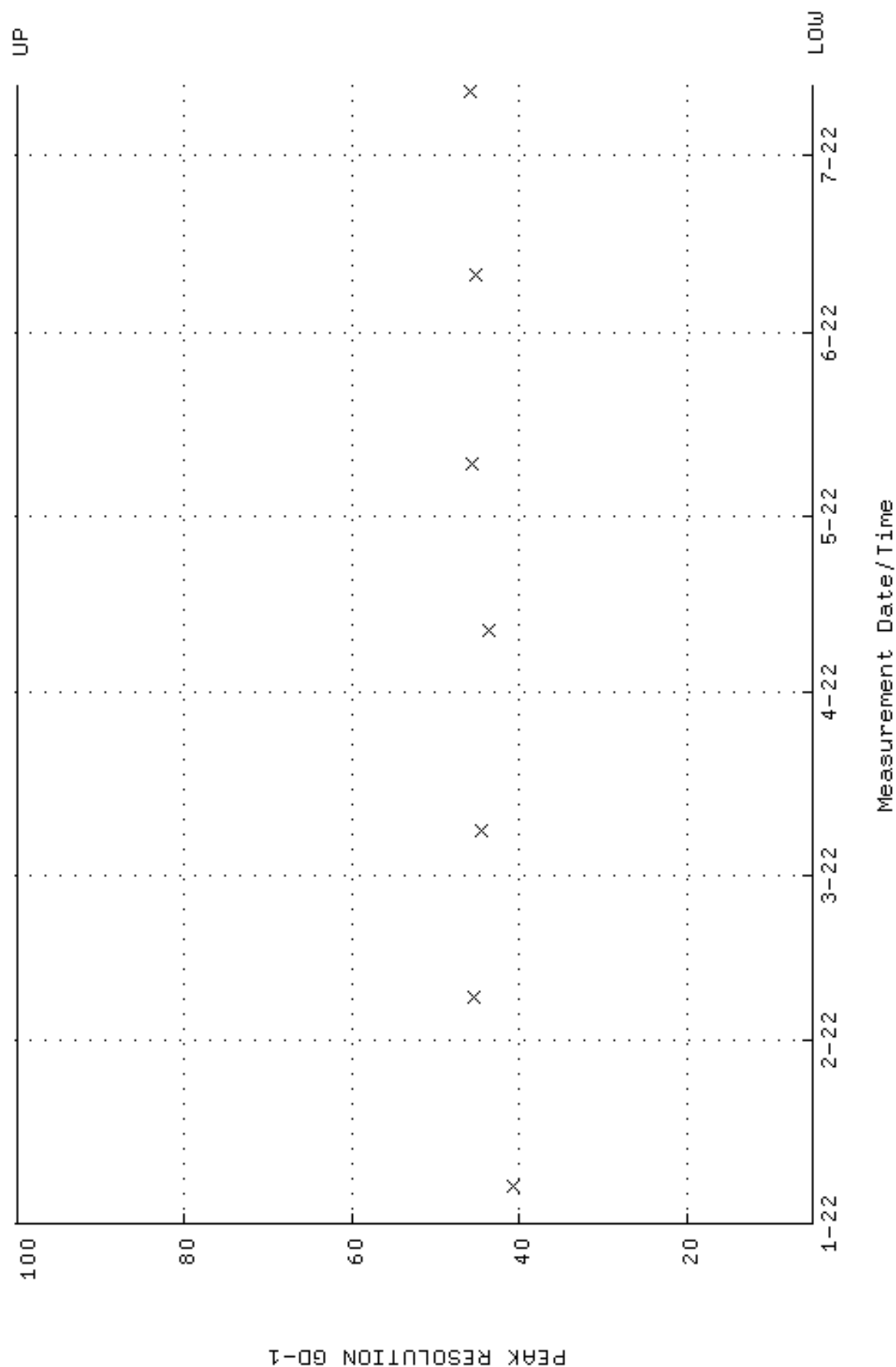
QA filename : DKA100:[ENV_ALPHA.QA.W]W084.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.351580 through 0.373330



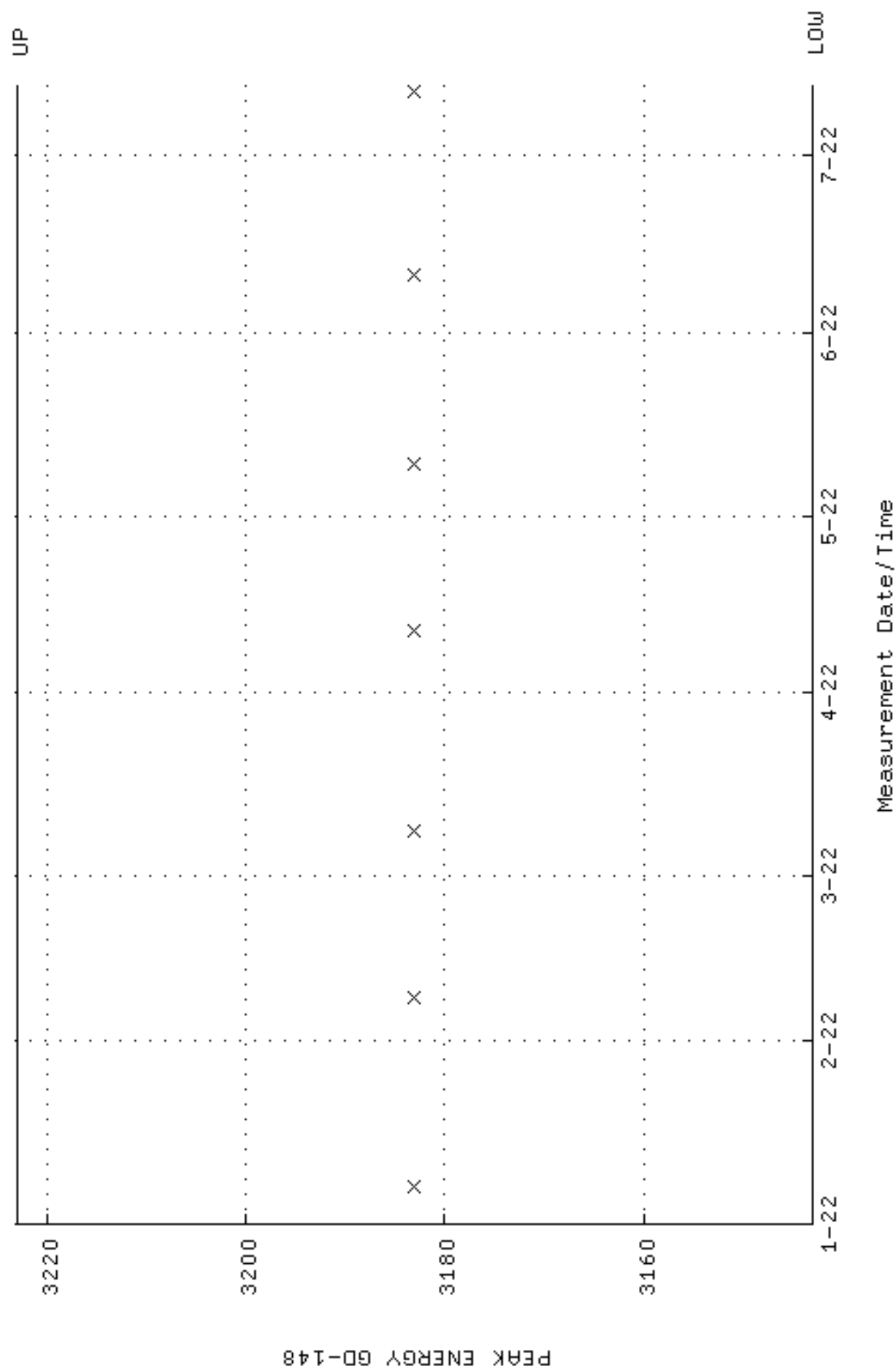
QA filename : DKA100:[ENV_ALPHA.QA.W]W084.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



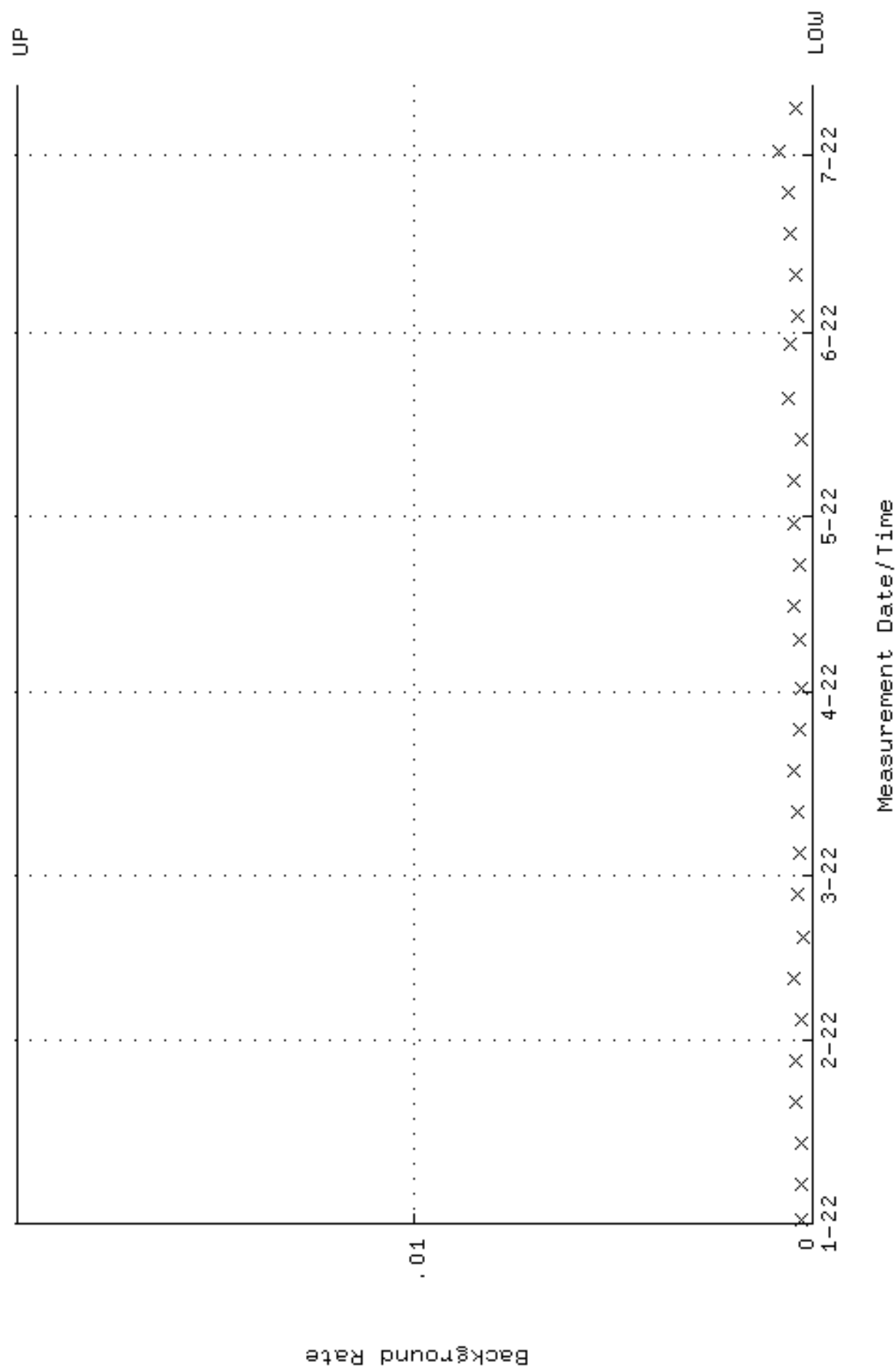
QA filename : DKA100:[ENV_ALPHA.QA.W]W084.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



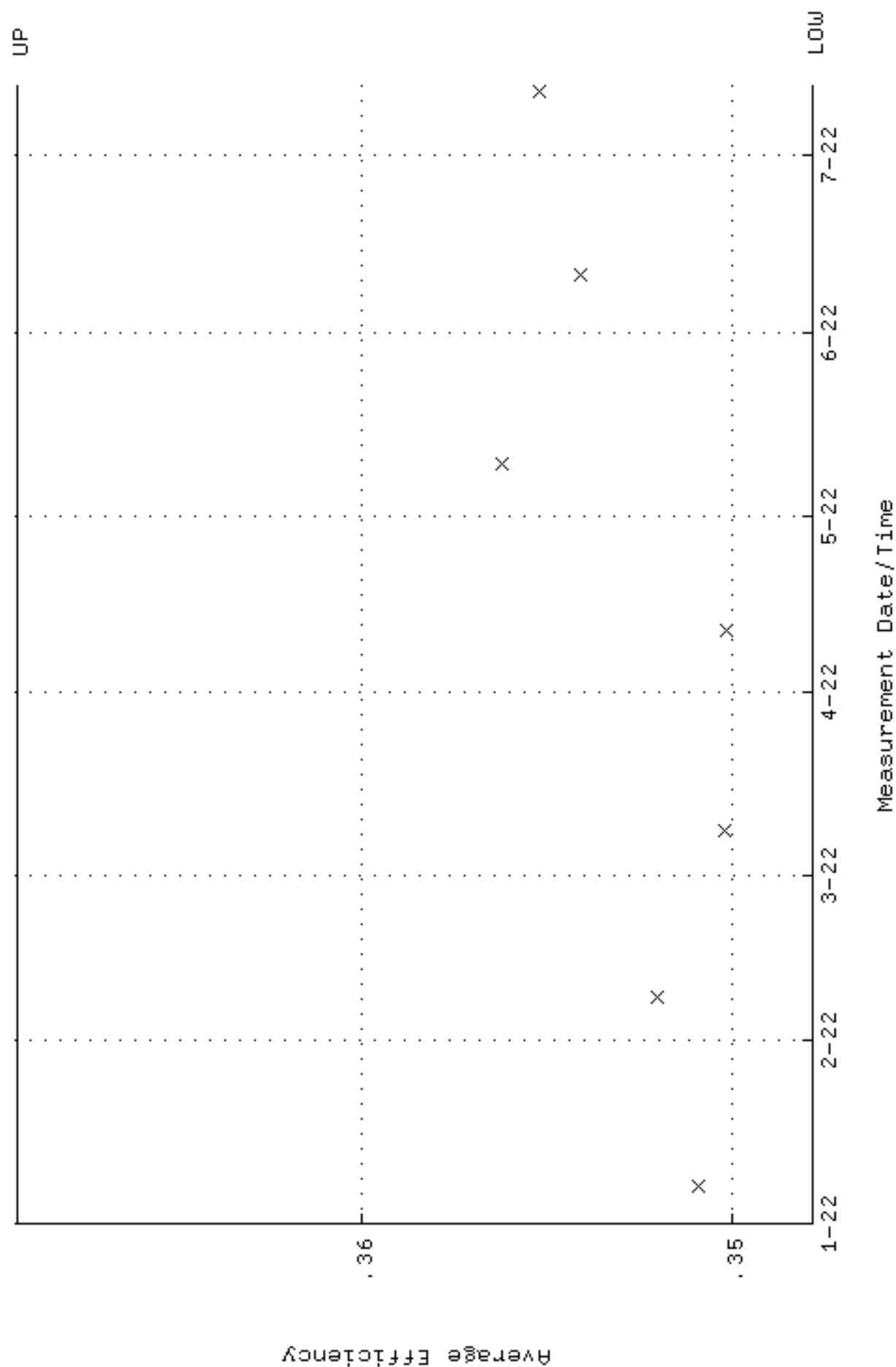
QA filename : DKA100:[ENV_ALPHA.QA.W]W084.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



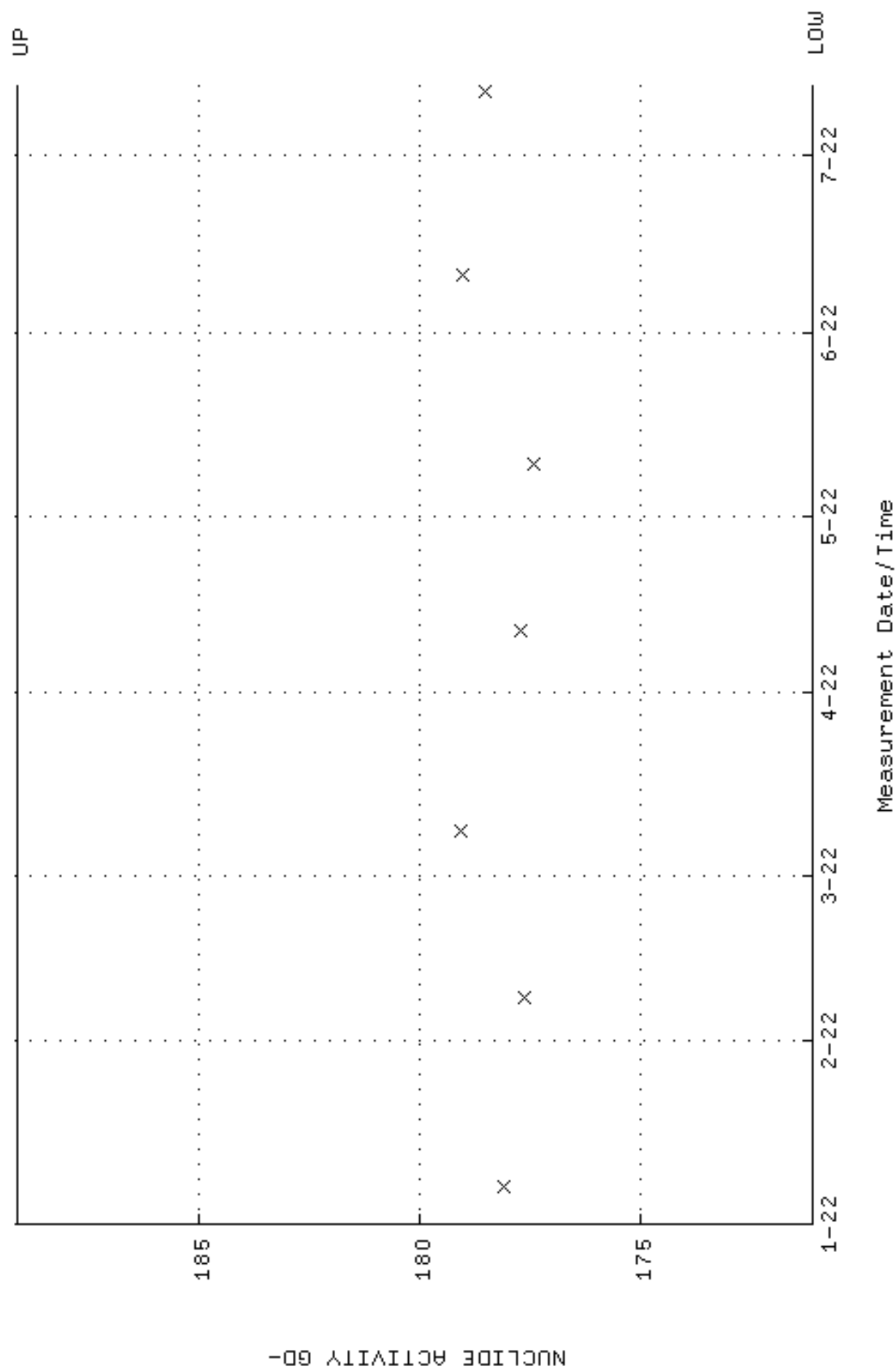
QA filename : DKA100:[ENV_ALPHA.QA.B]B084.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:51:15 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



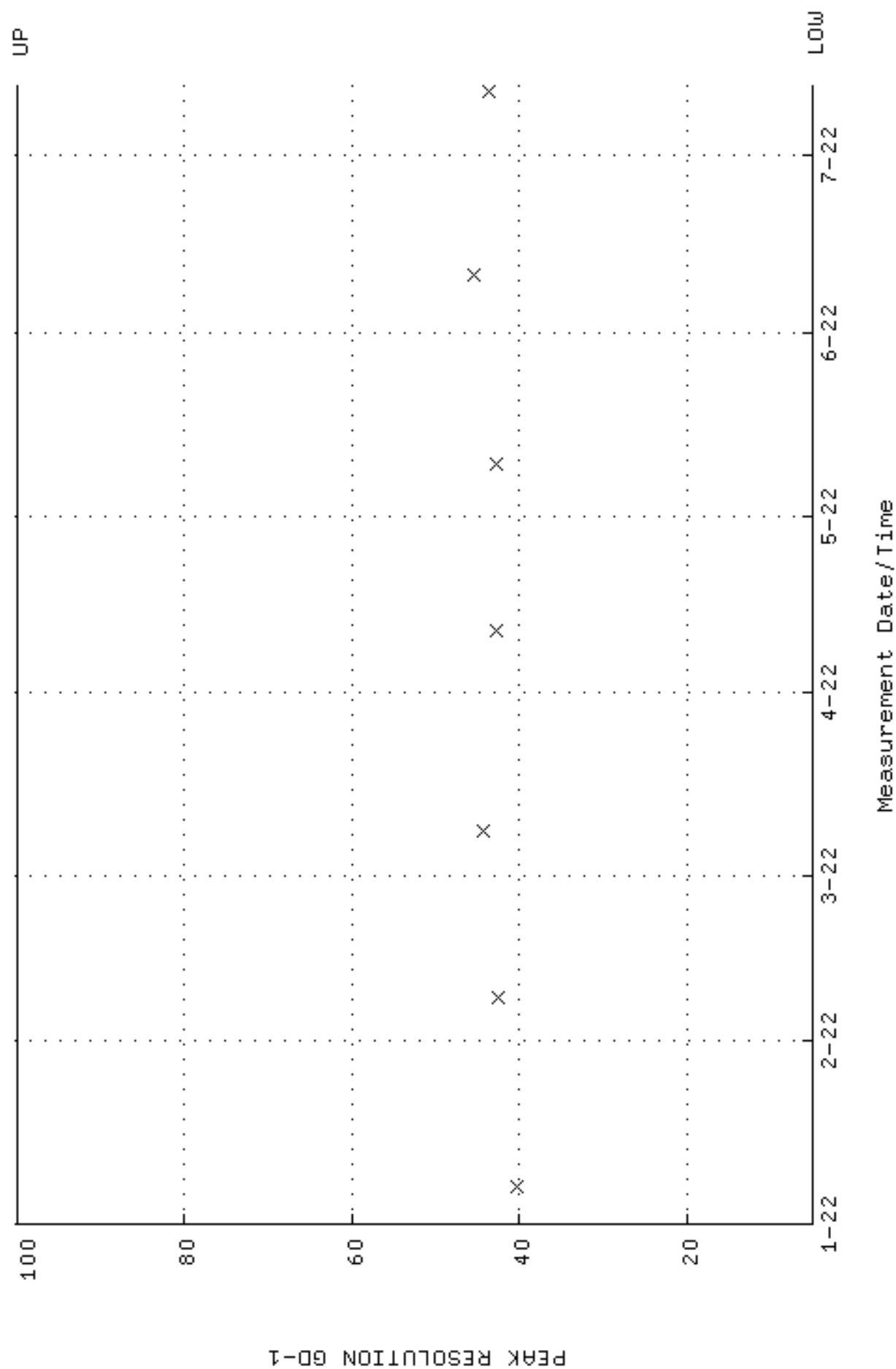
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.347820 through 0.369340



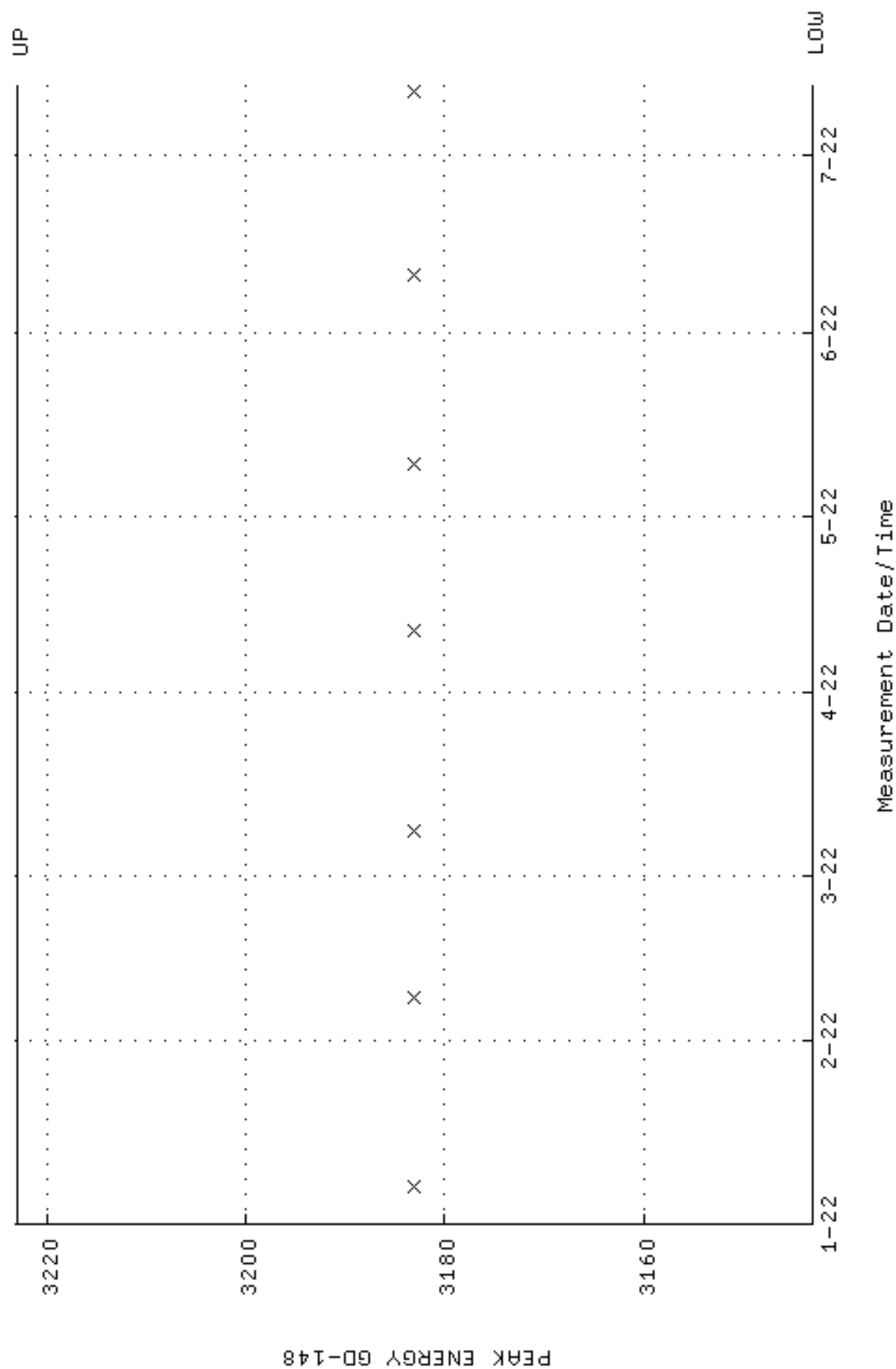
QA filename : DKA100:[ENV_ALPHA.QA.W]W085.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



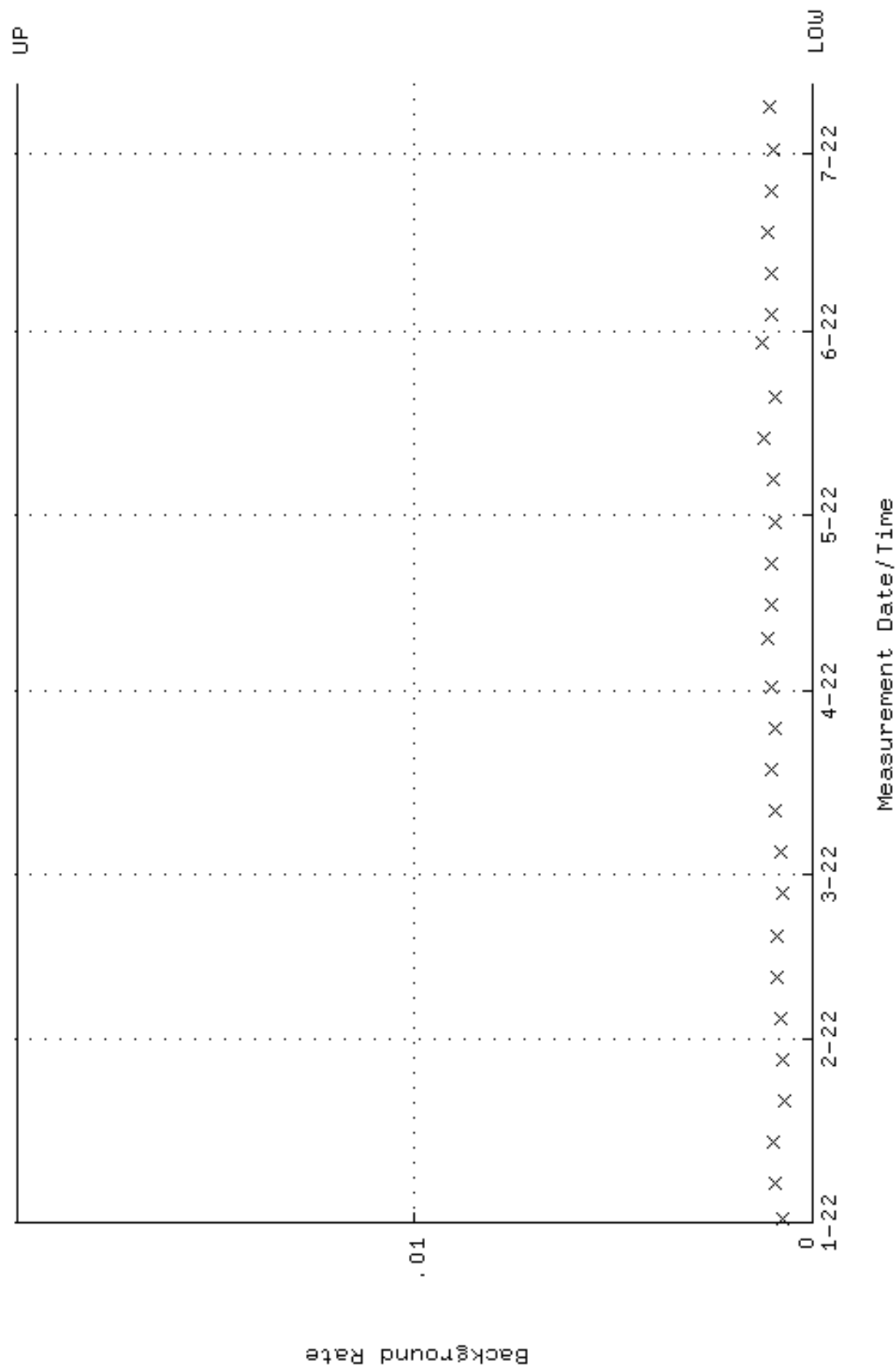
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



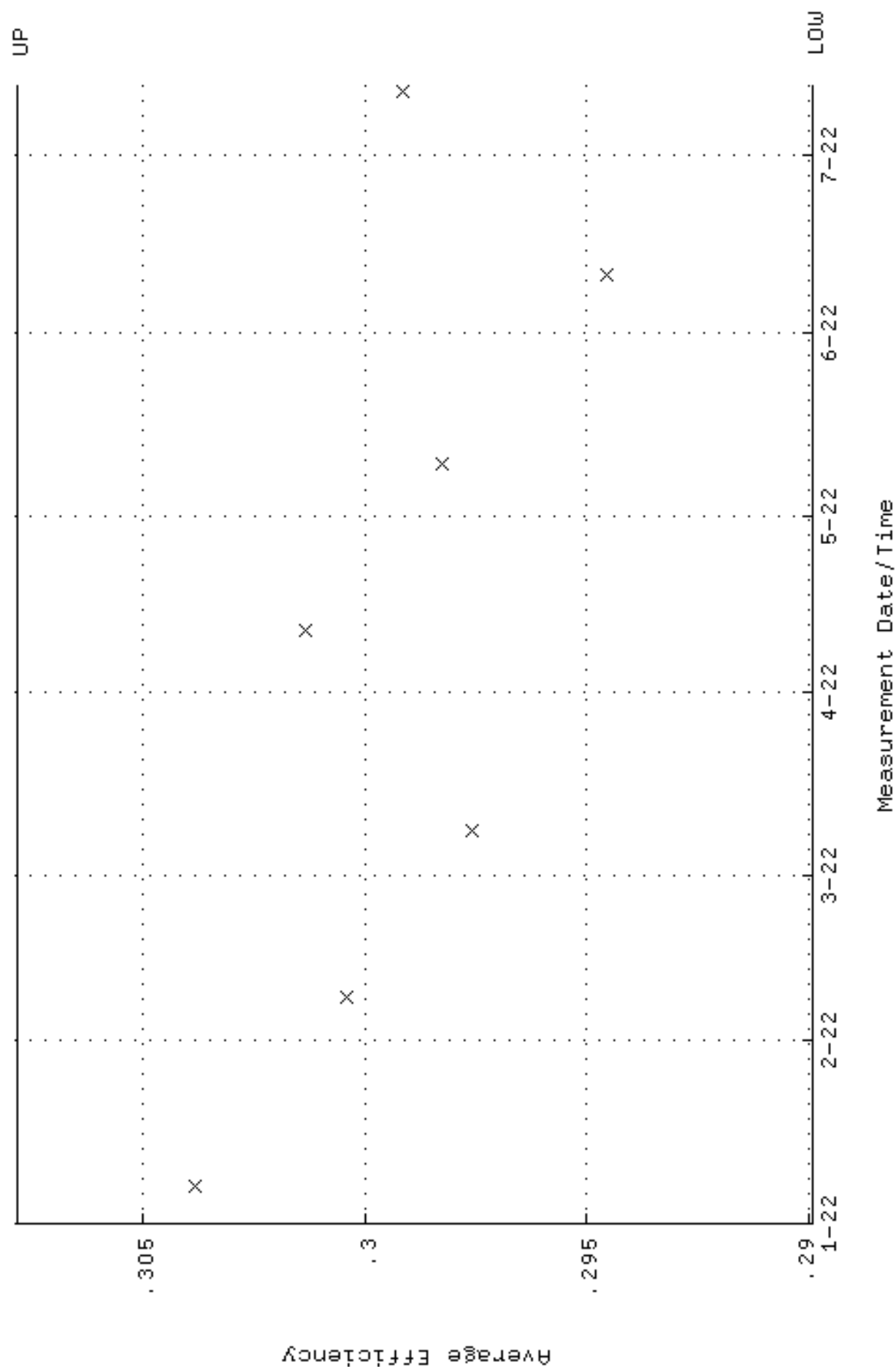
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



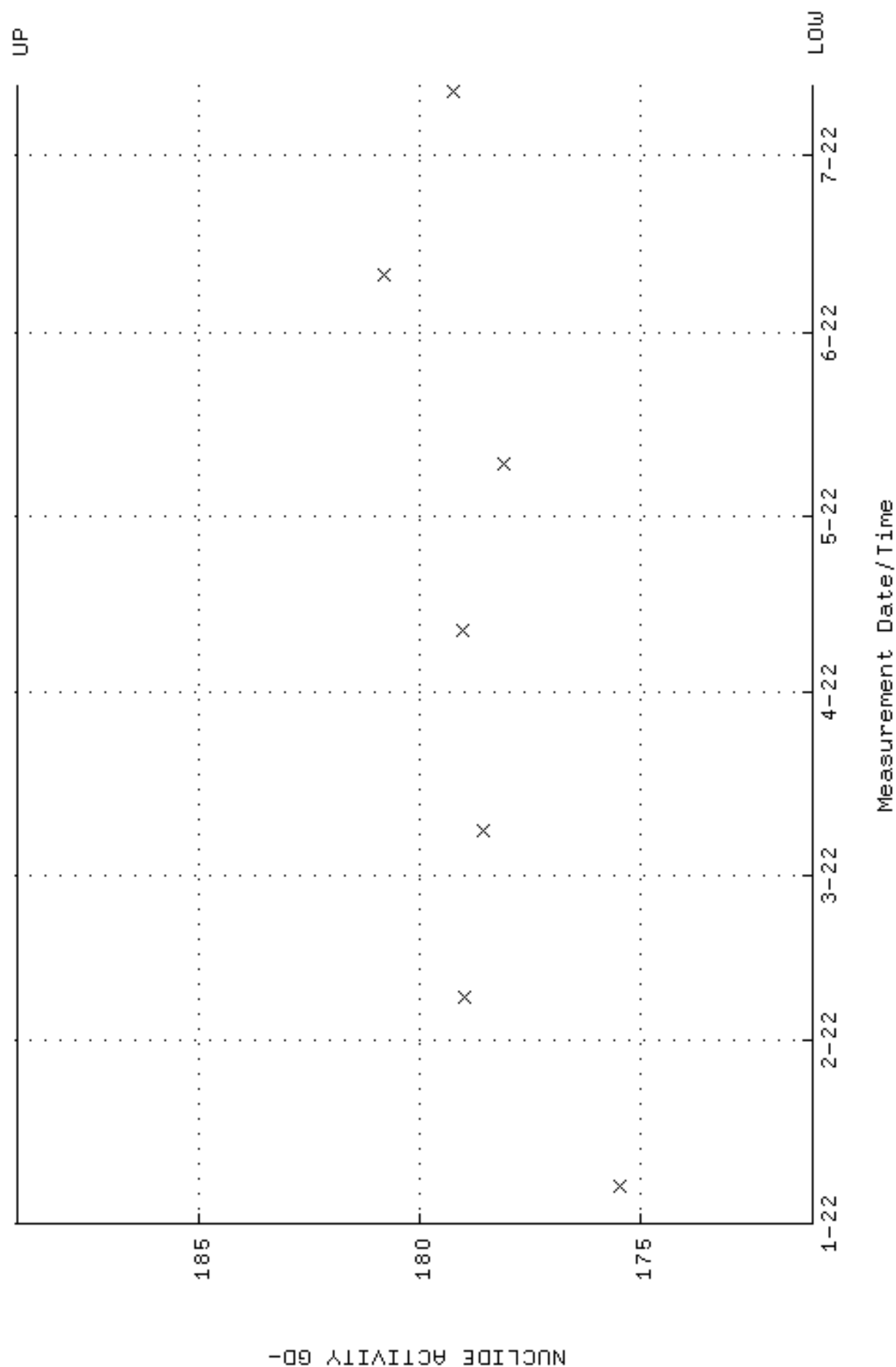
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 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



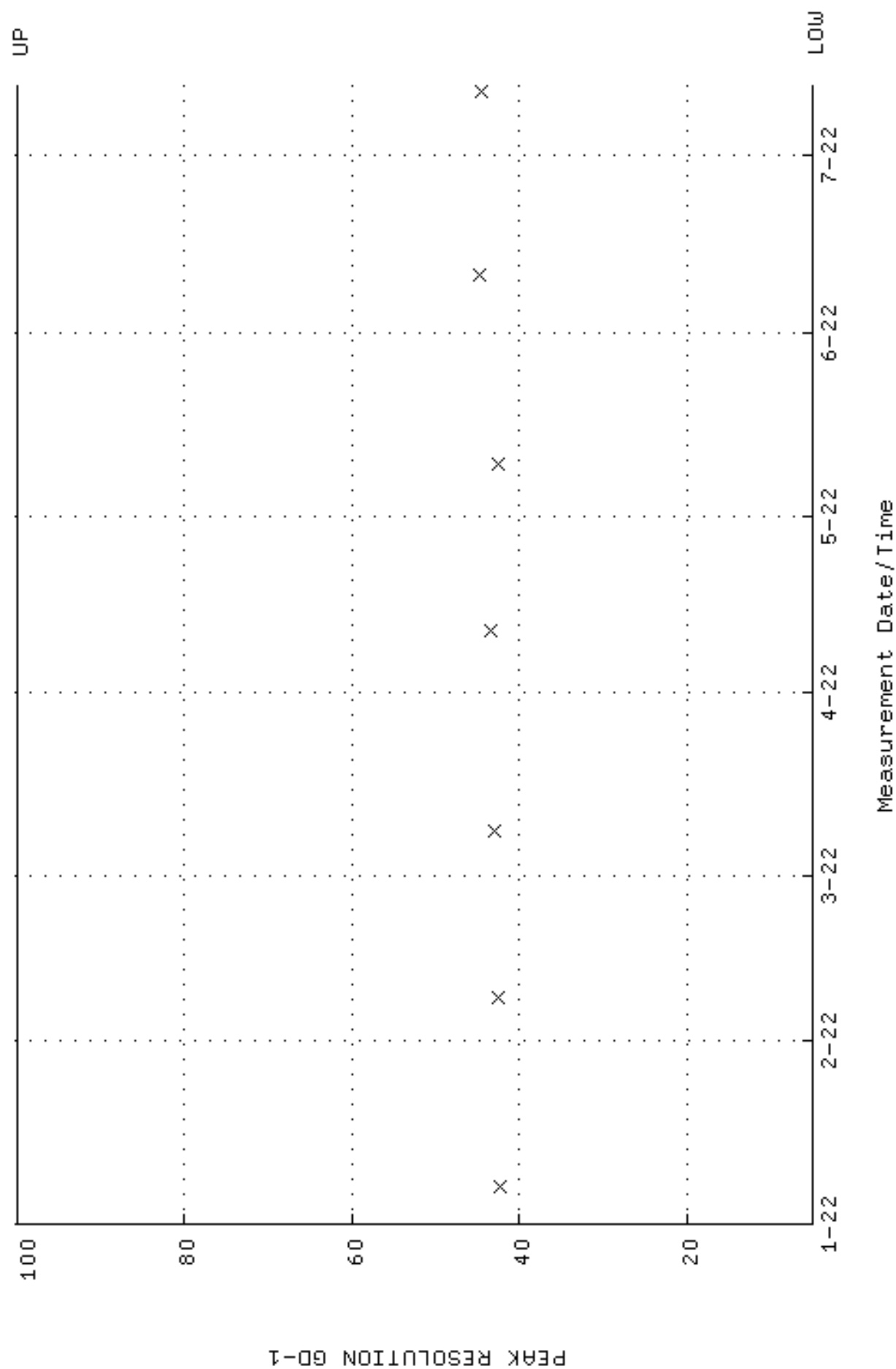
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.289900 through 0.307830



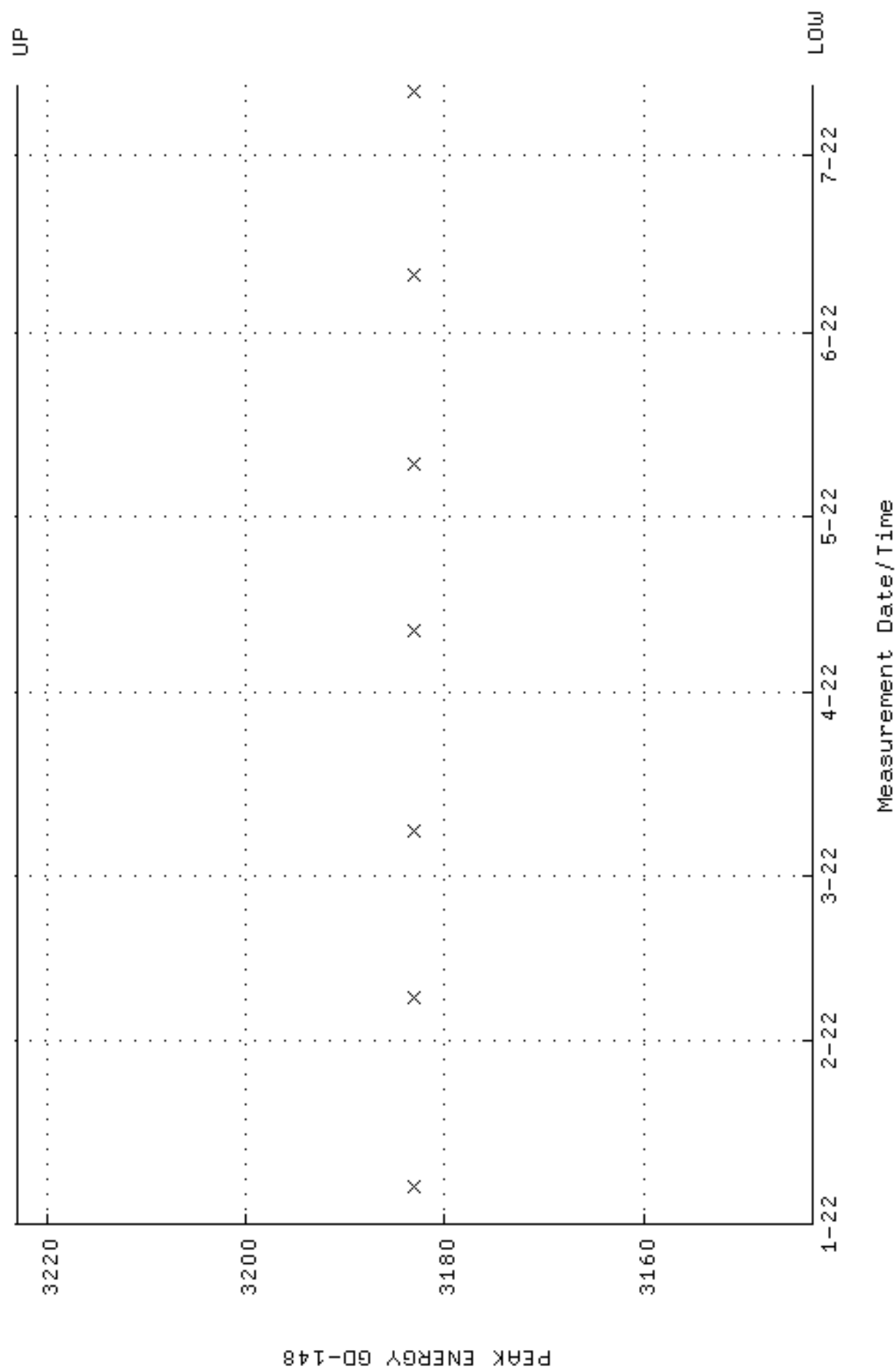
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W086.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



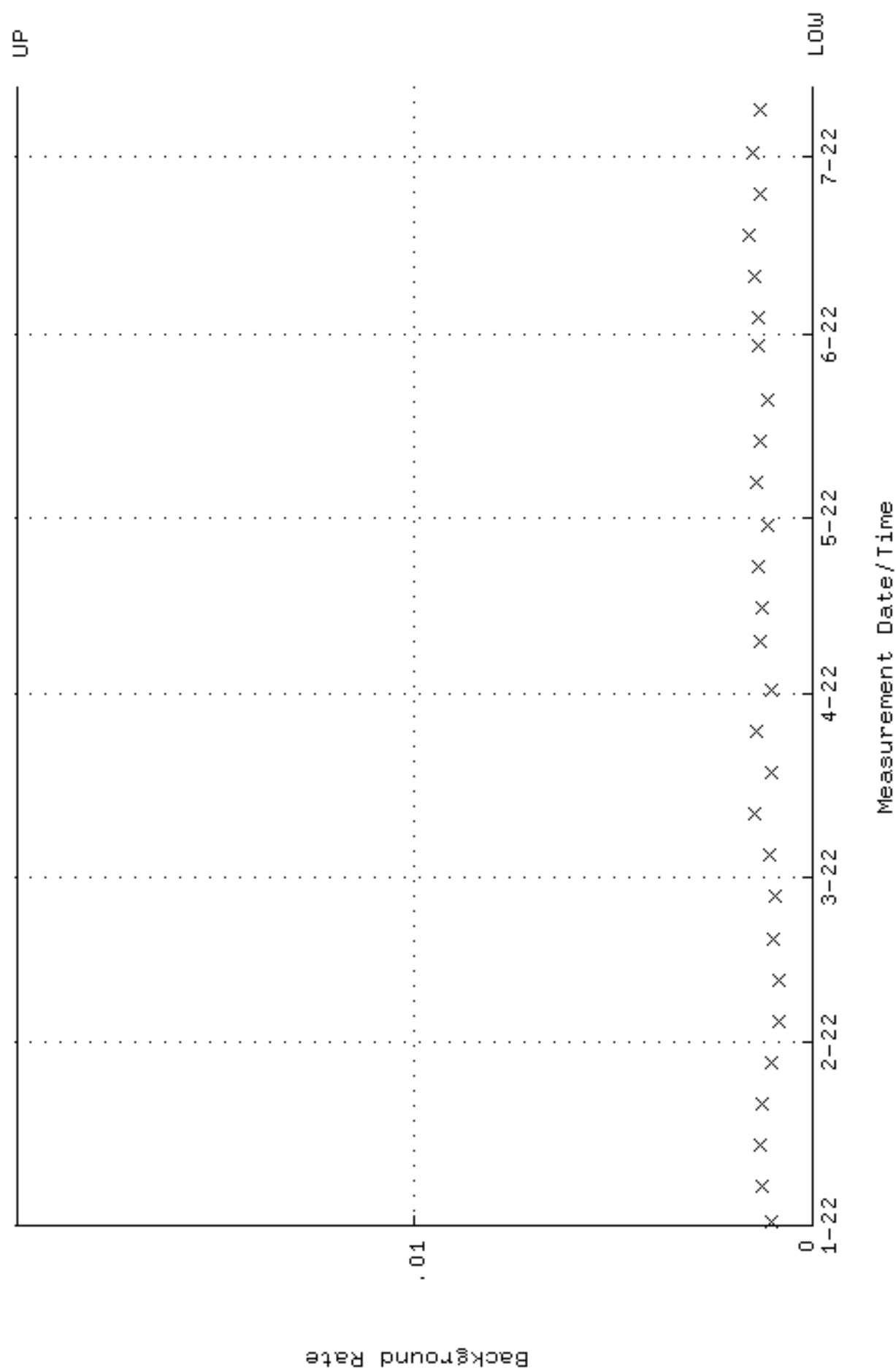
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



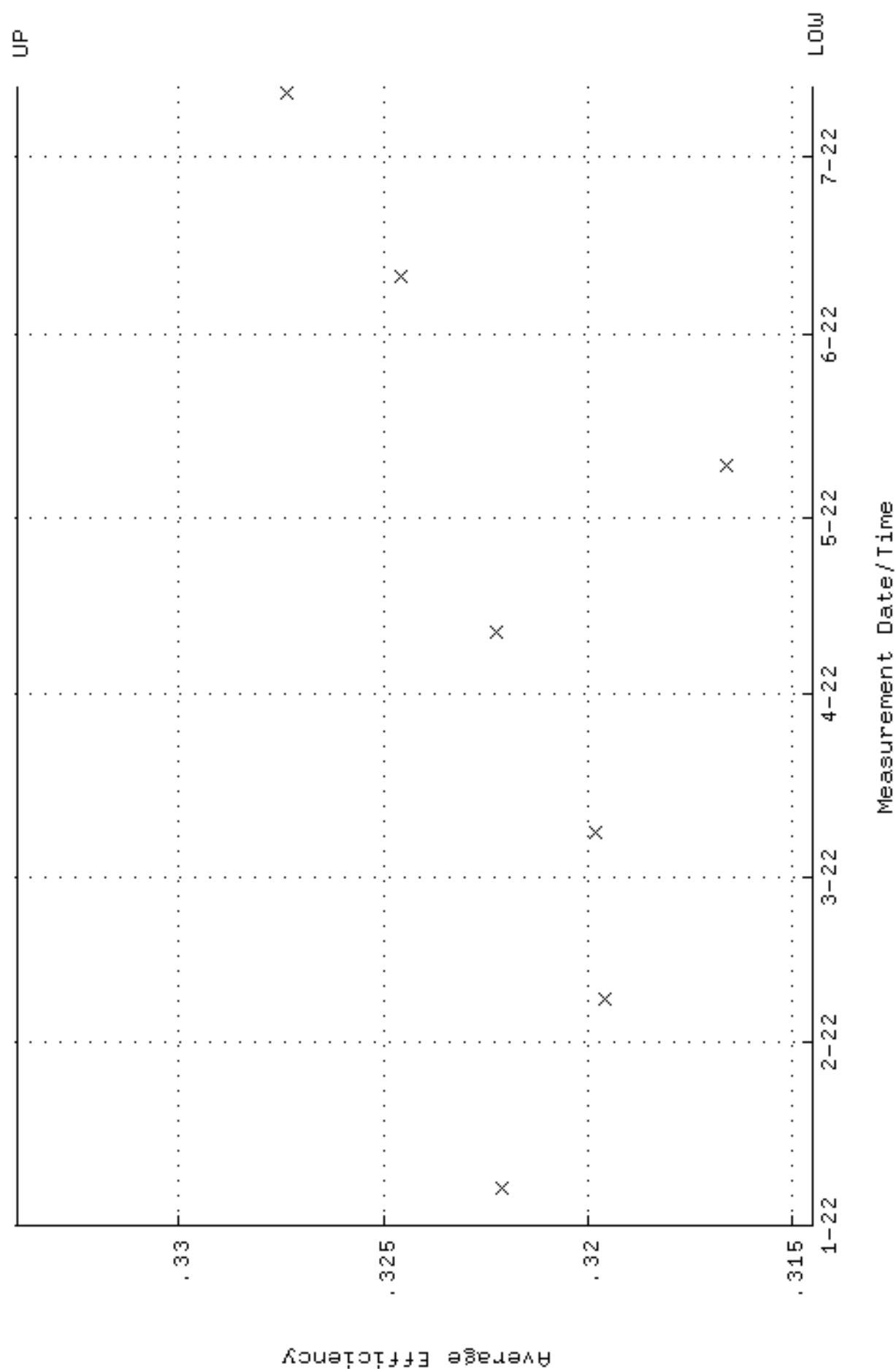
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QA filename      : DKA100:[ENV_ALPHA.QA.B]B086.QAF;4
Parameter Name   : BACKRATE (Background Rate)
Start/End Dates  : 1-JAN-2022 12:51:15 through 12-JUN
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02

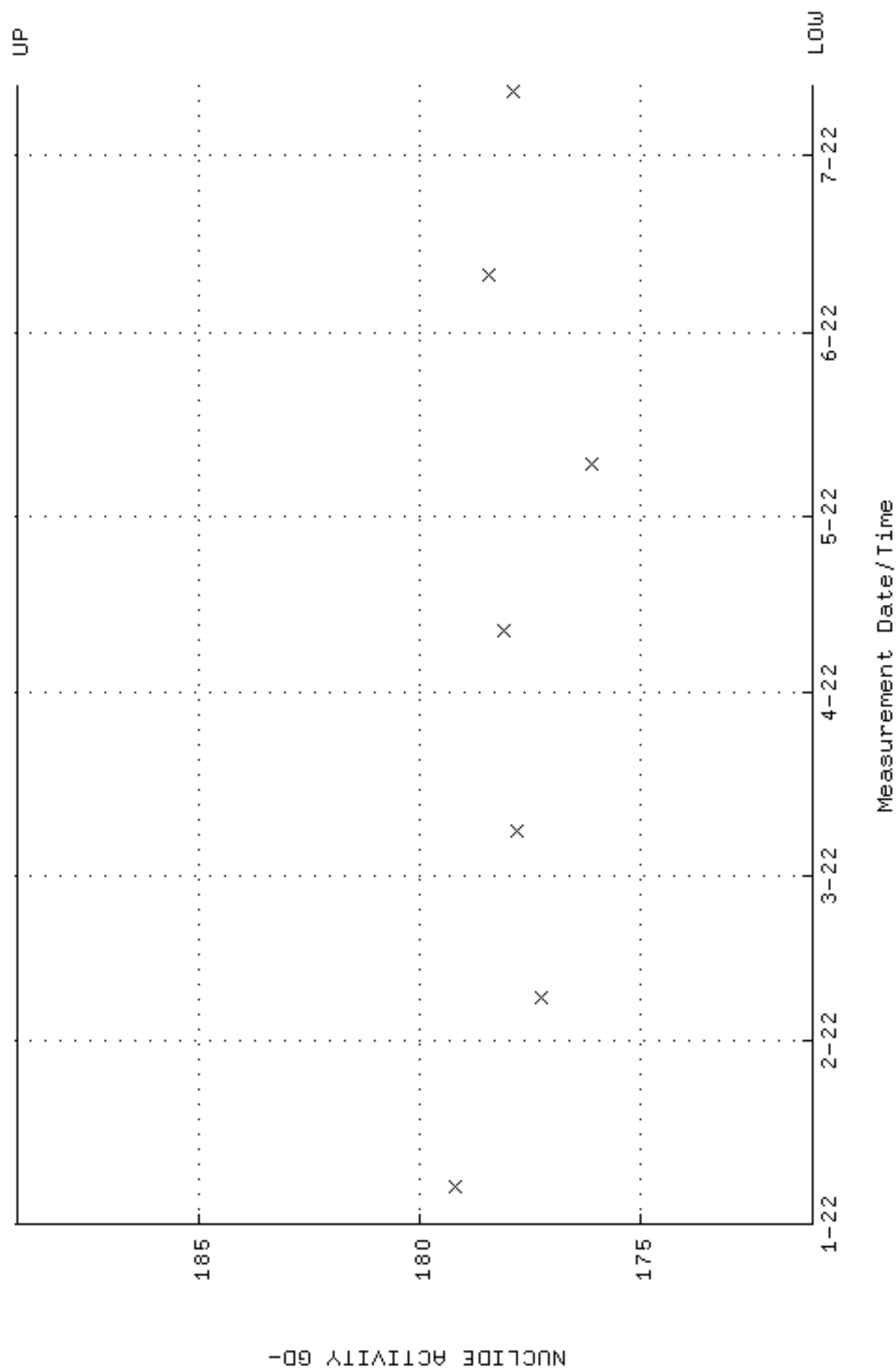
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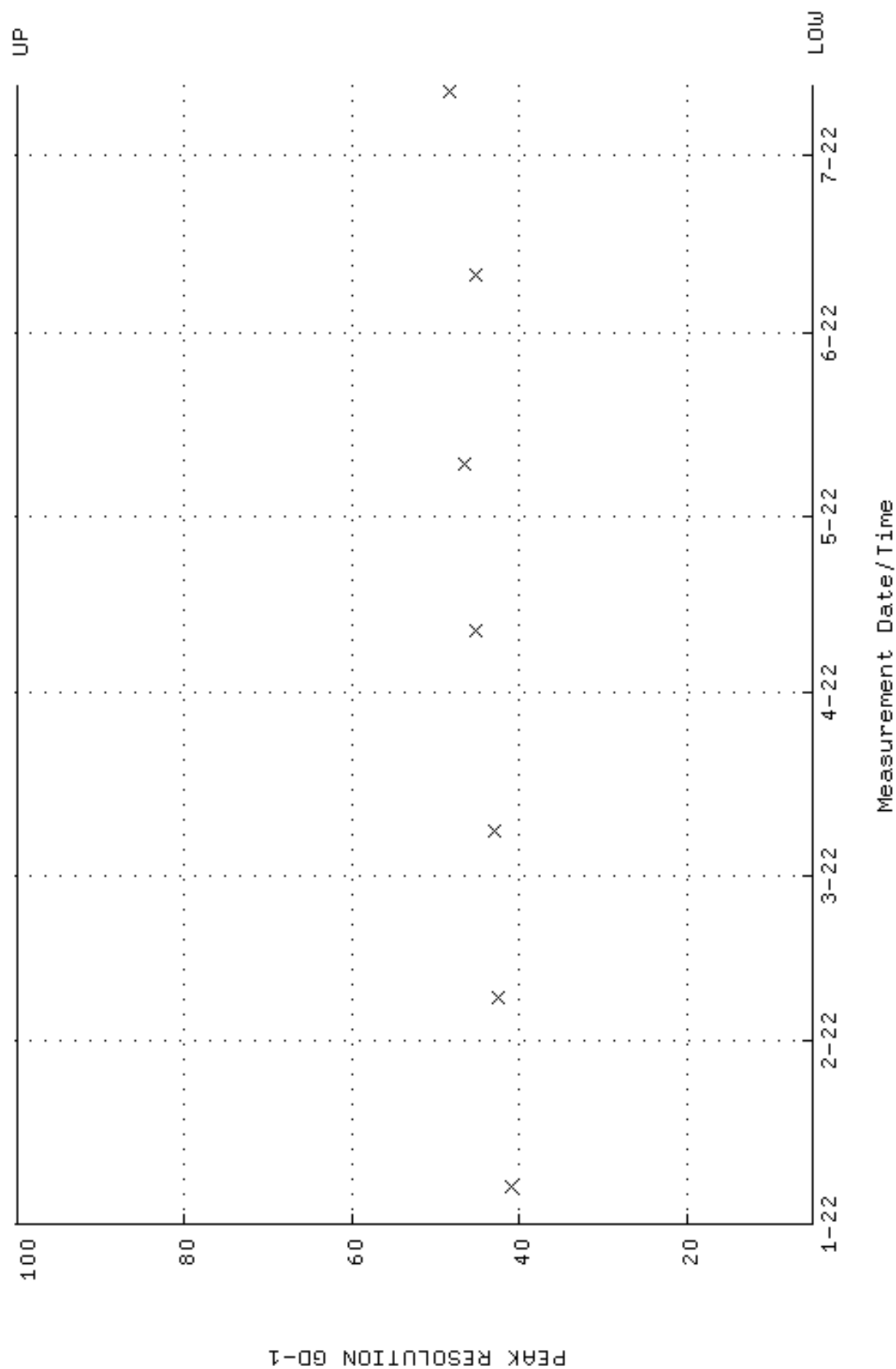
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.314500 through 0.333950



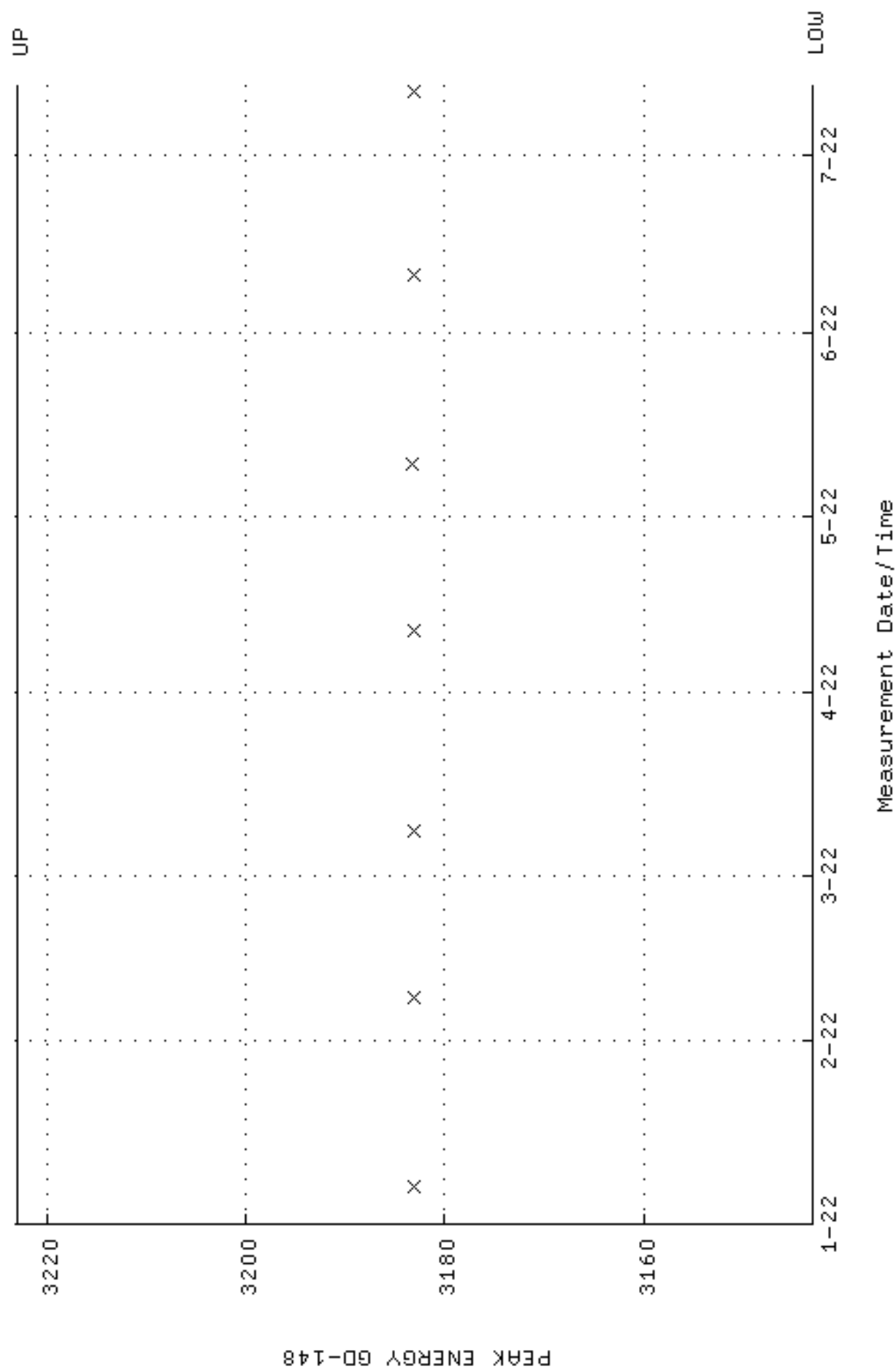
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



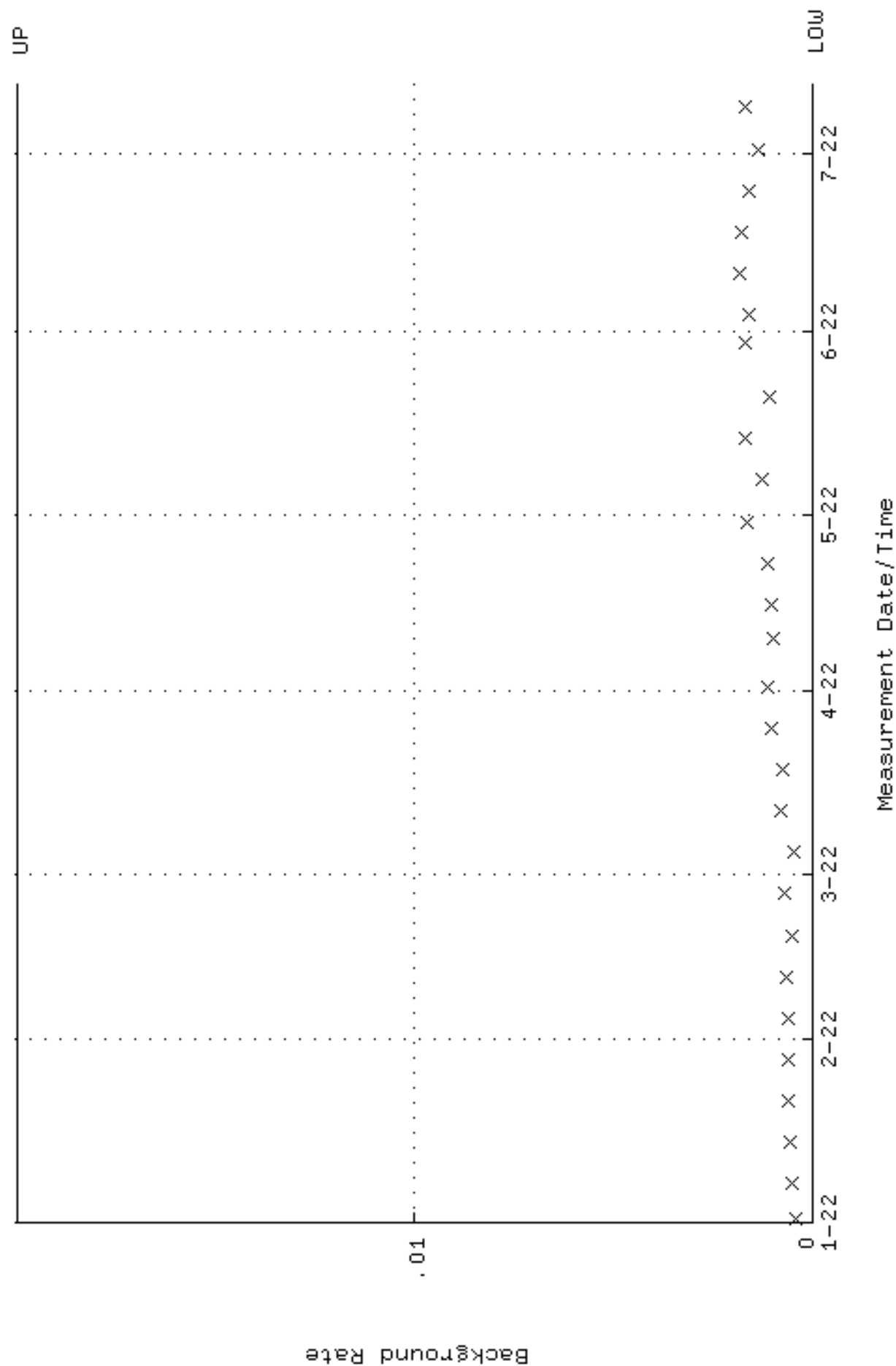
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



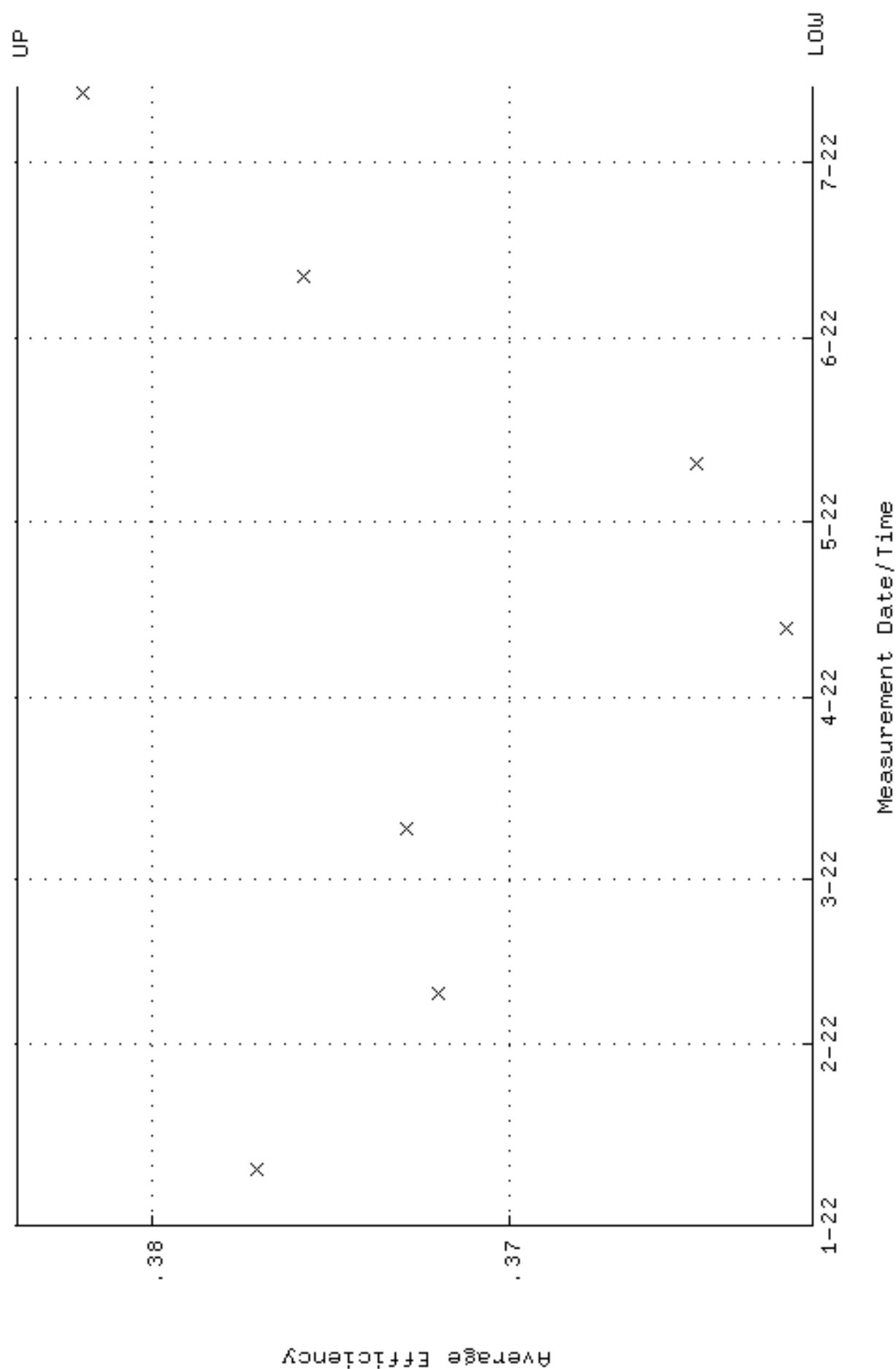
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 7-JAN-2022 09:59:44 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



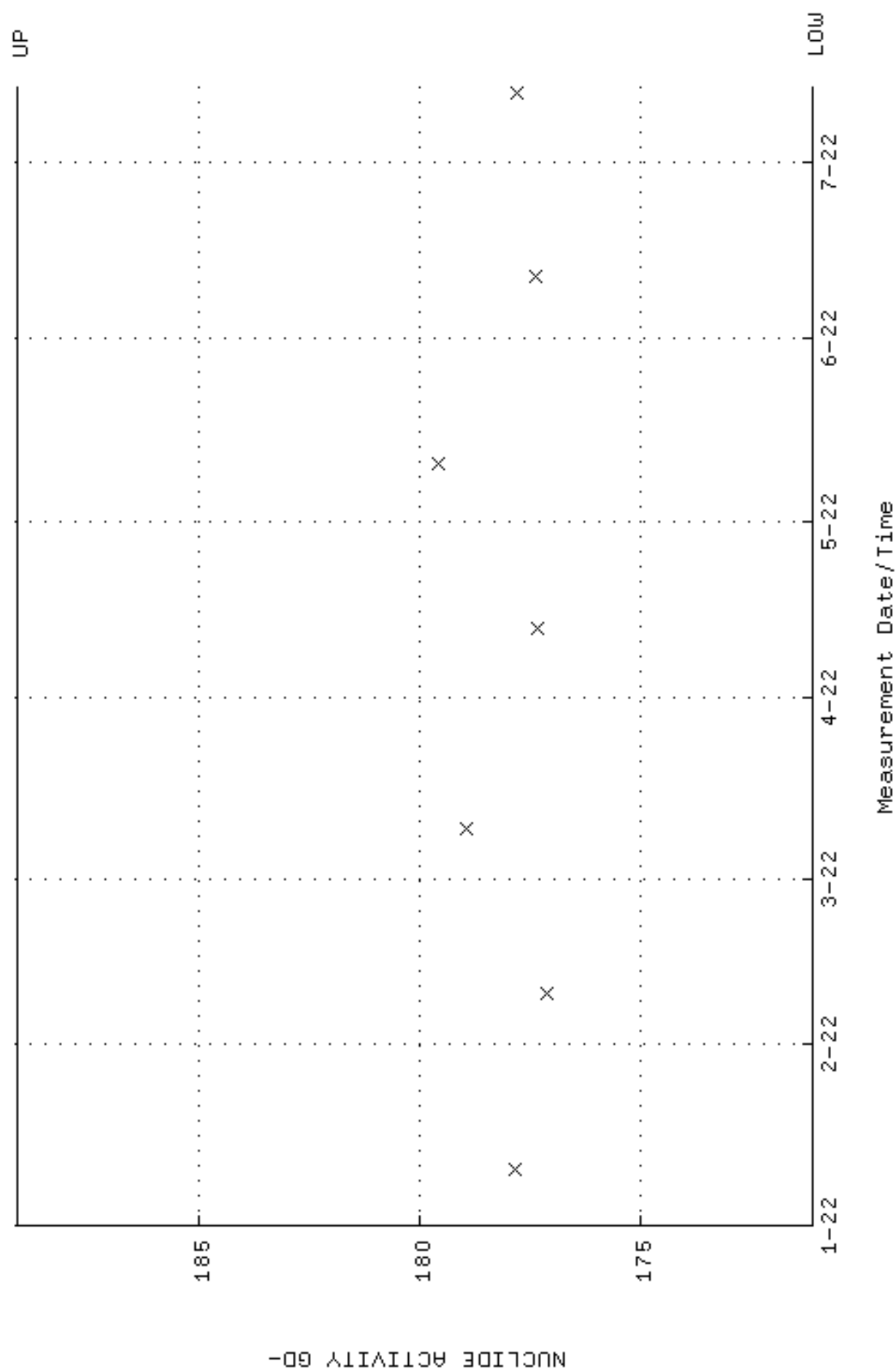
QA filename : DKA100:[ENV_ALPHA.QA.B]B088.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:51:15 through 12-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



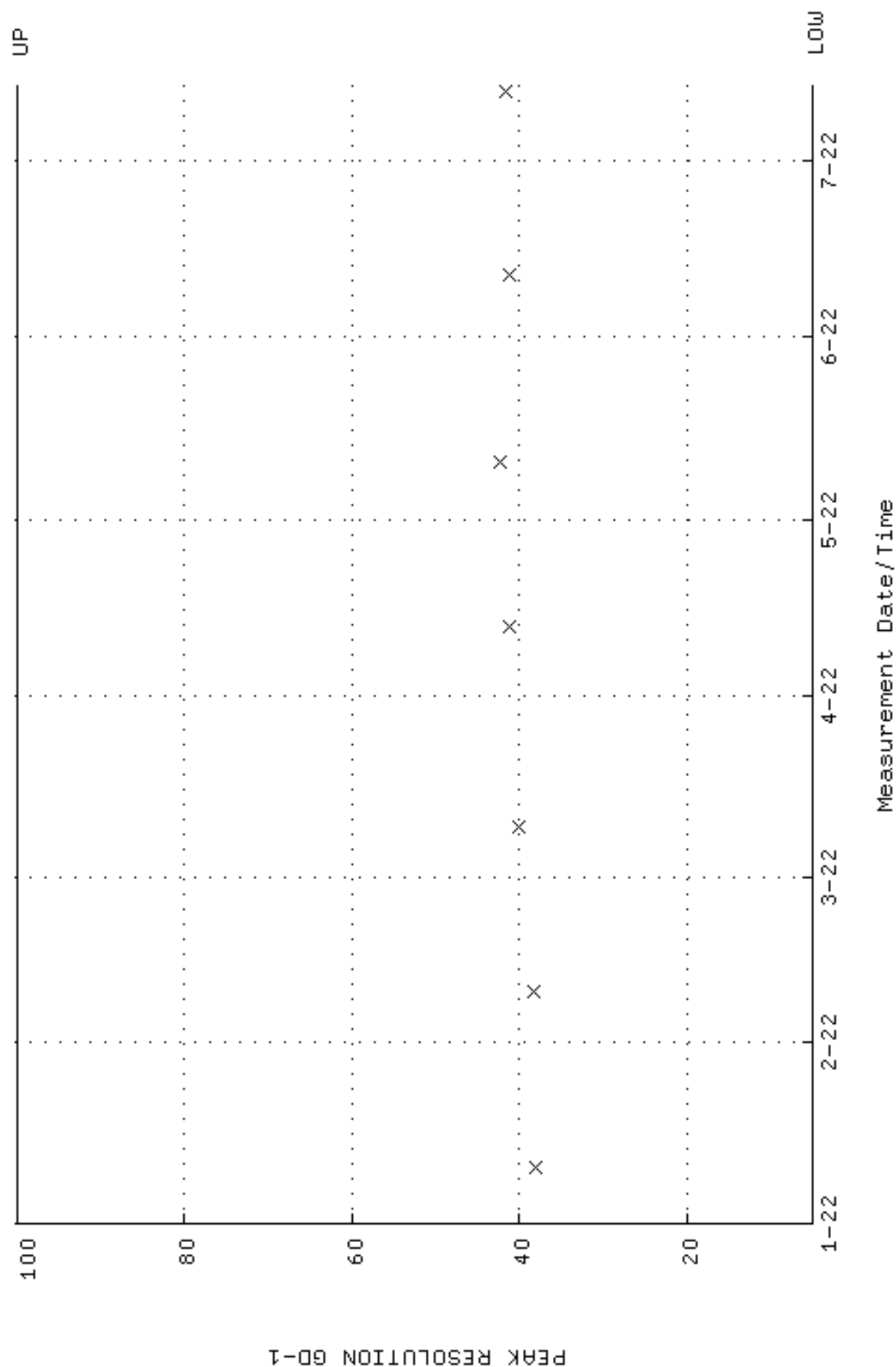
QA filename : DKA100:[ENV_ALPHA.QA.W]W098.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.361468 through 0.383800



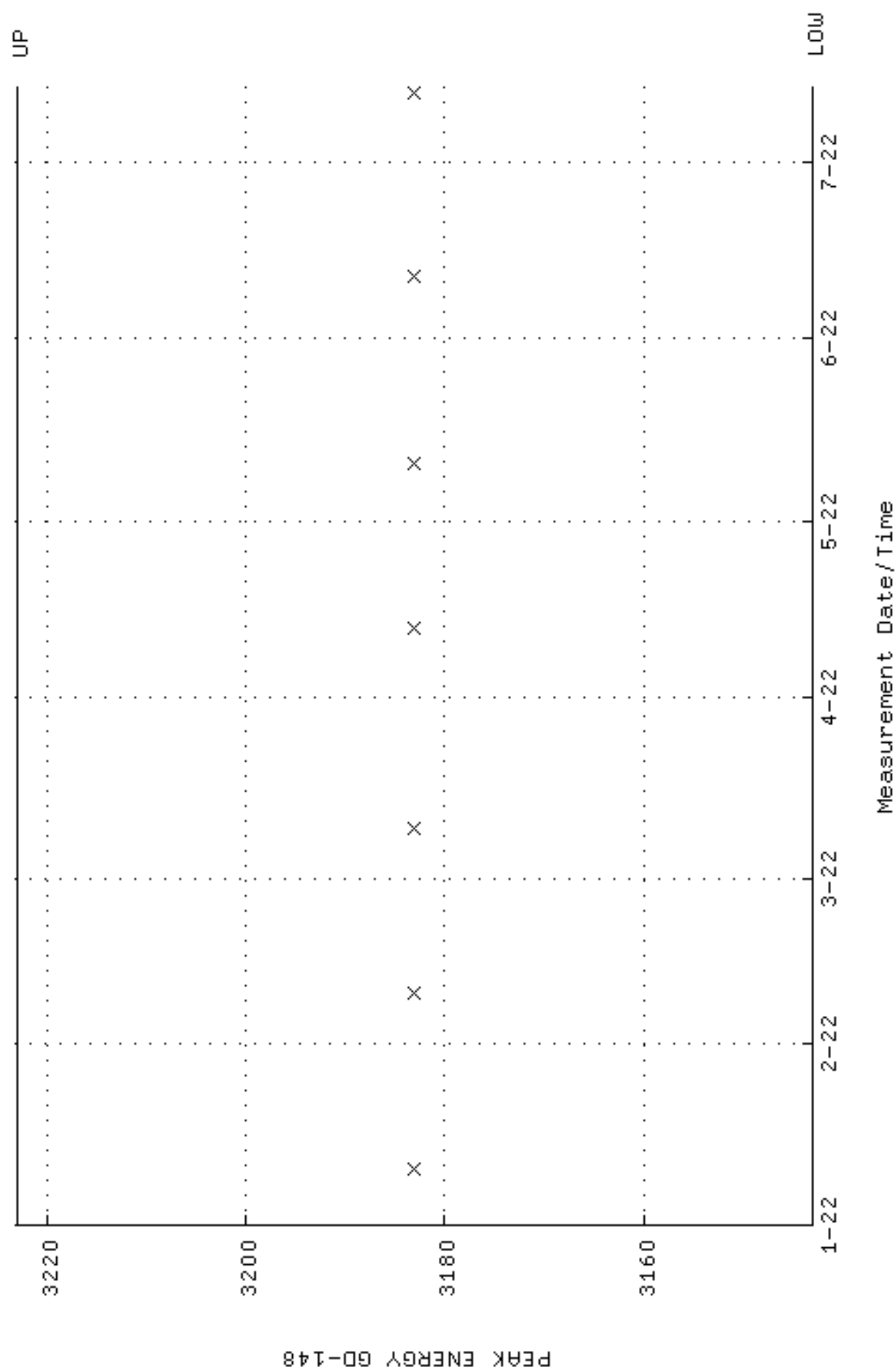
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



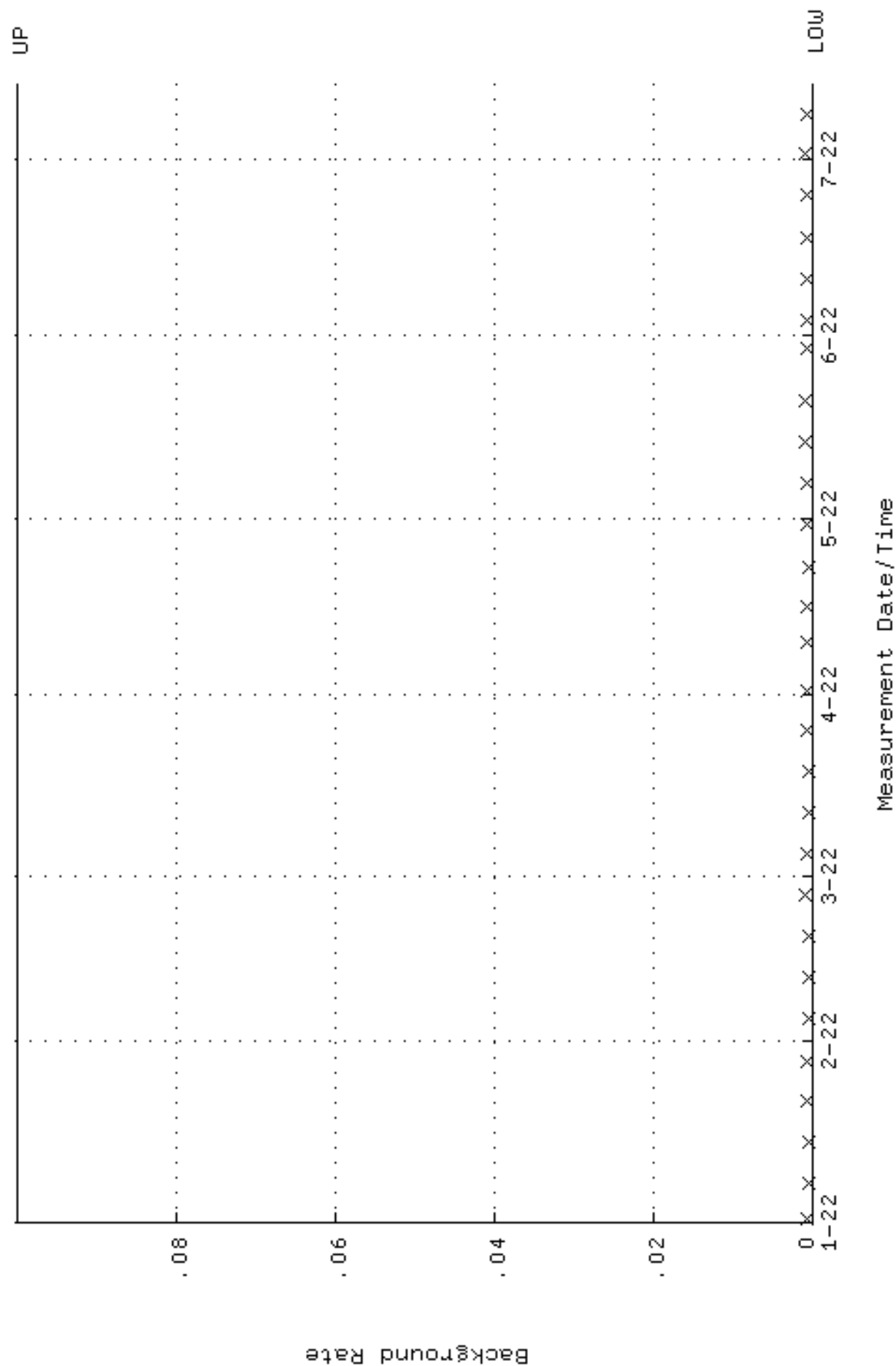
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



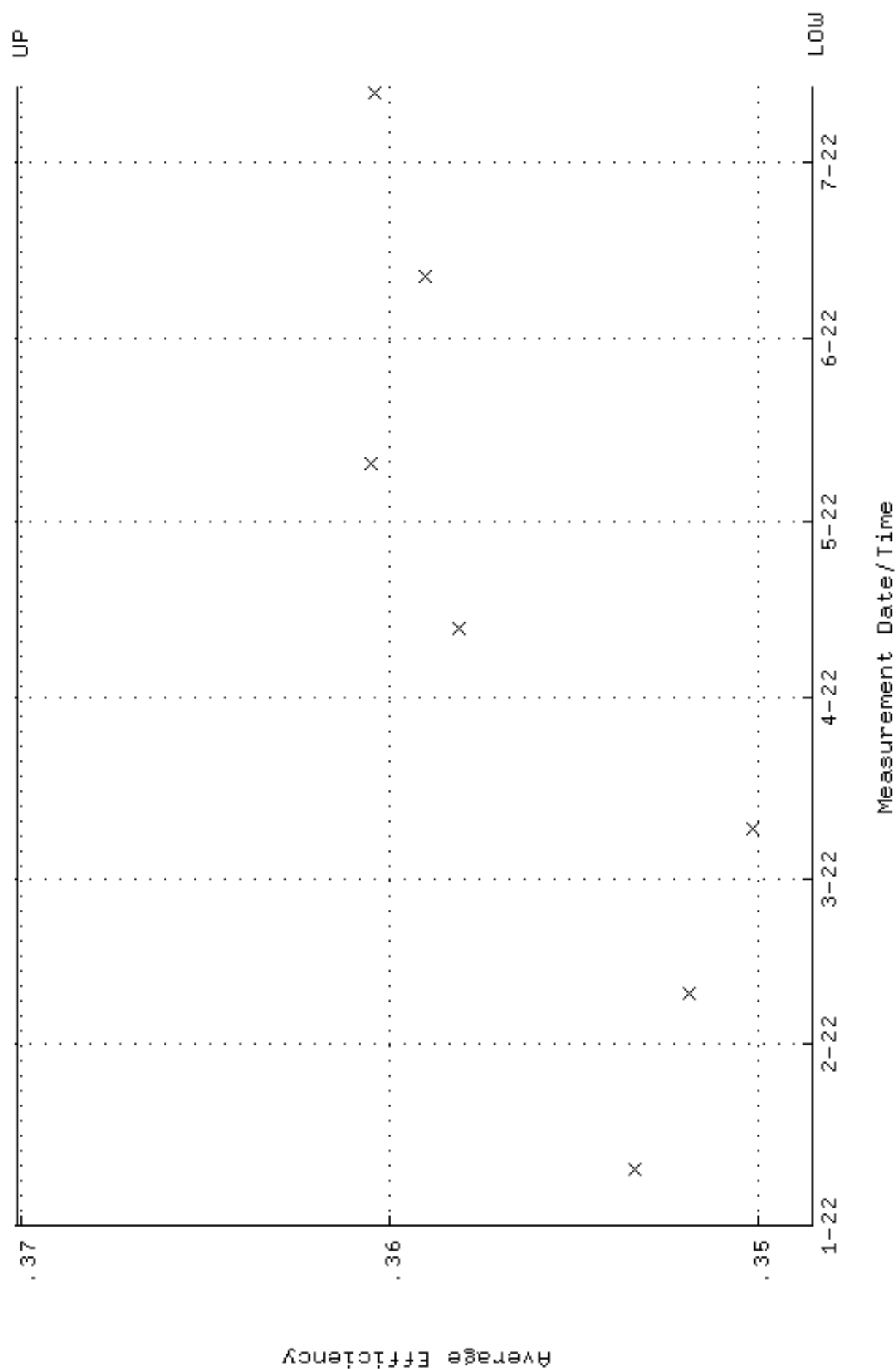
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



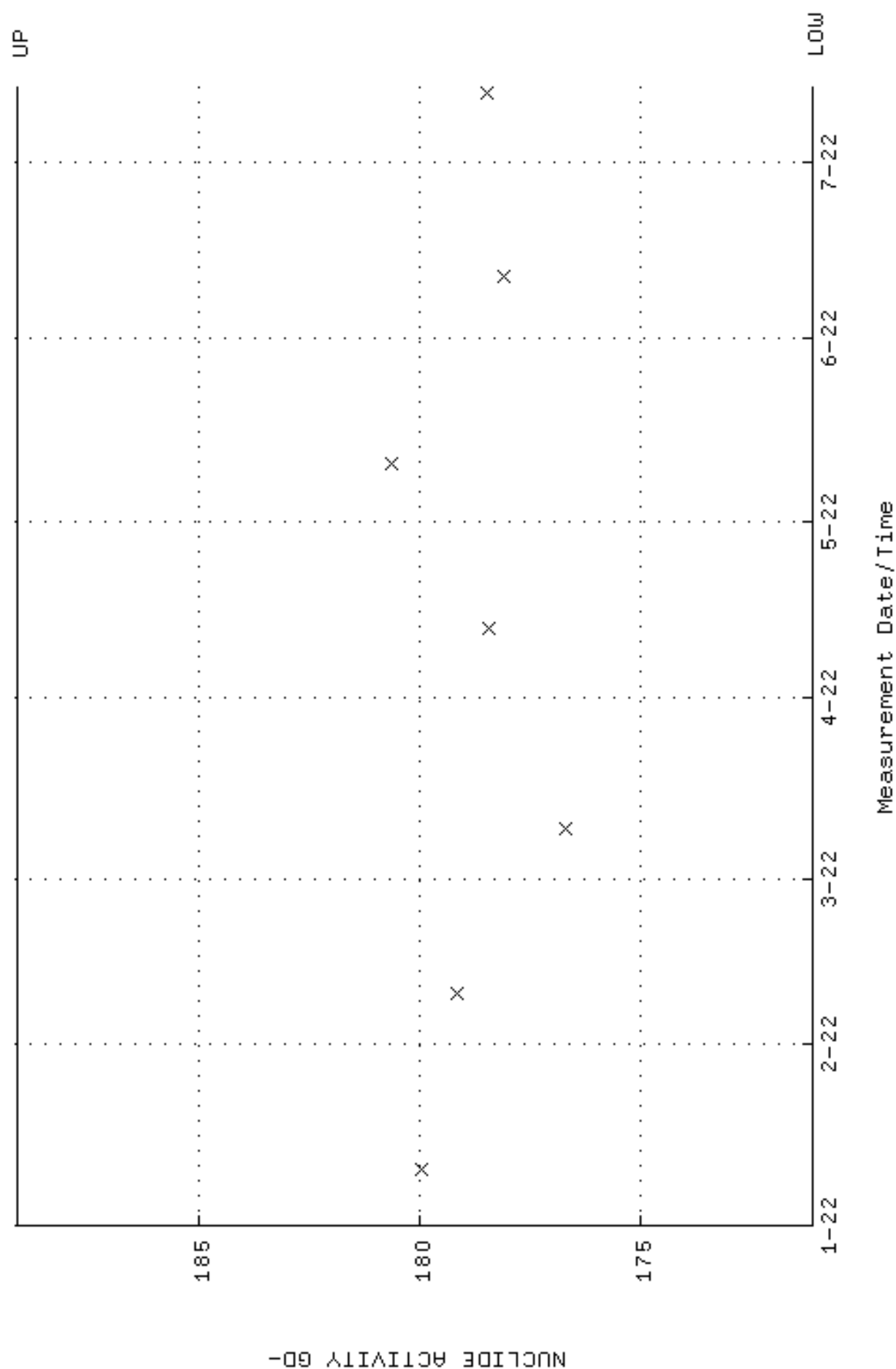
QA filename : DKA100:[ENV_ALPHA.QA.B]B098.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:54:59 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



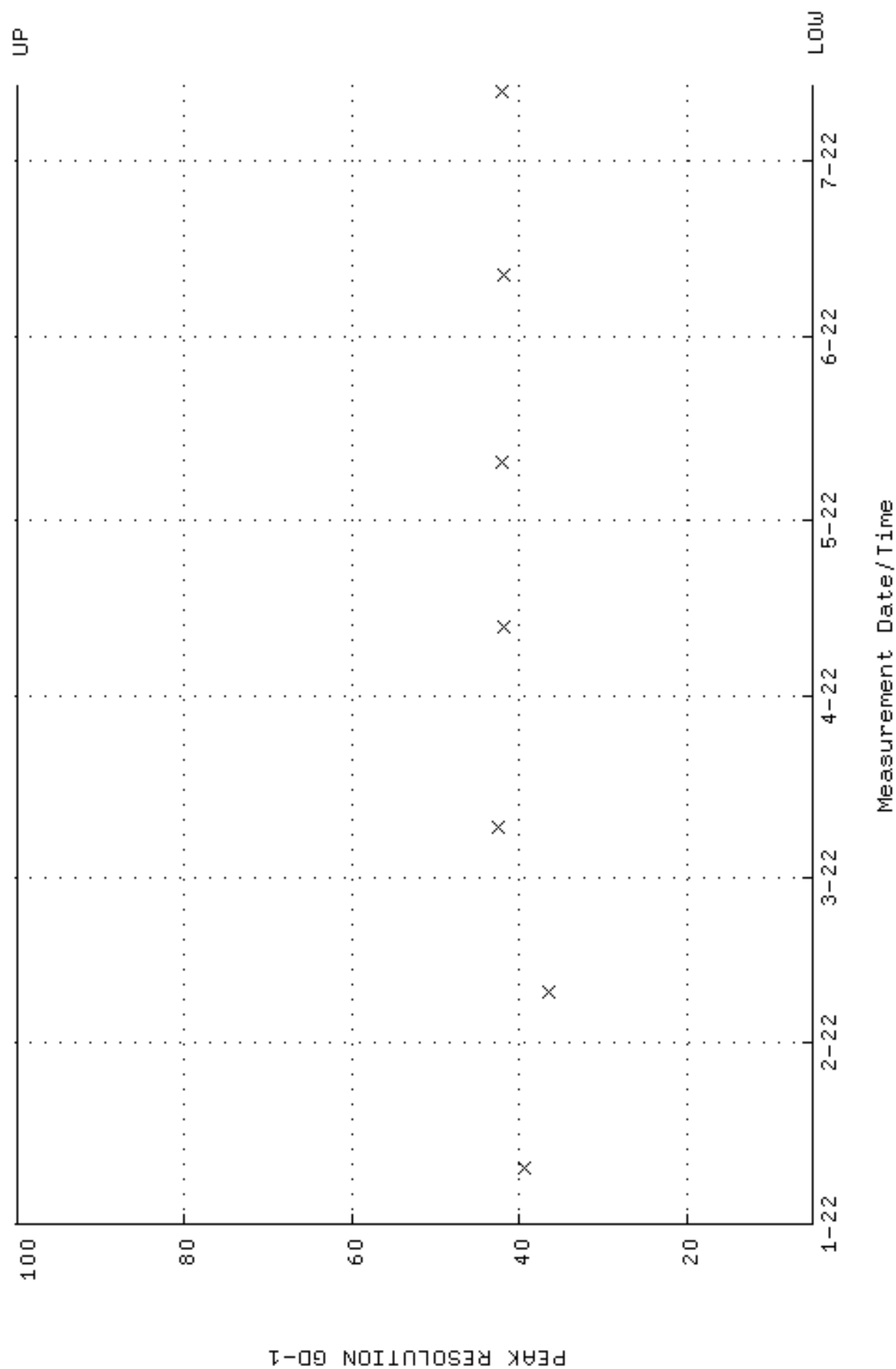
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.348530 through 0.370089



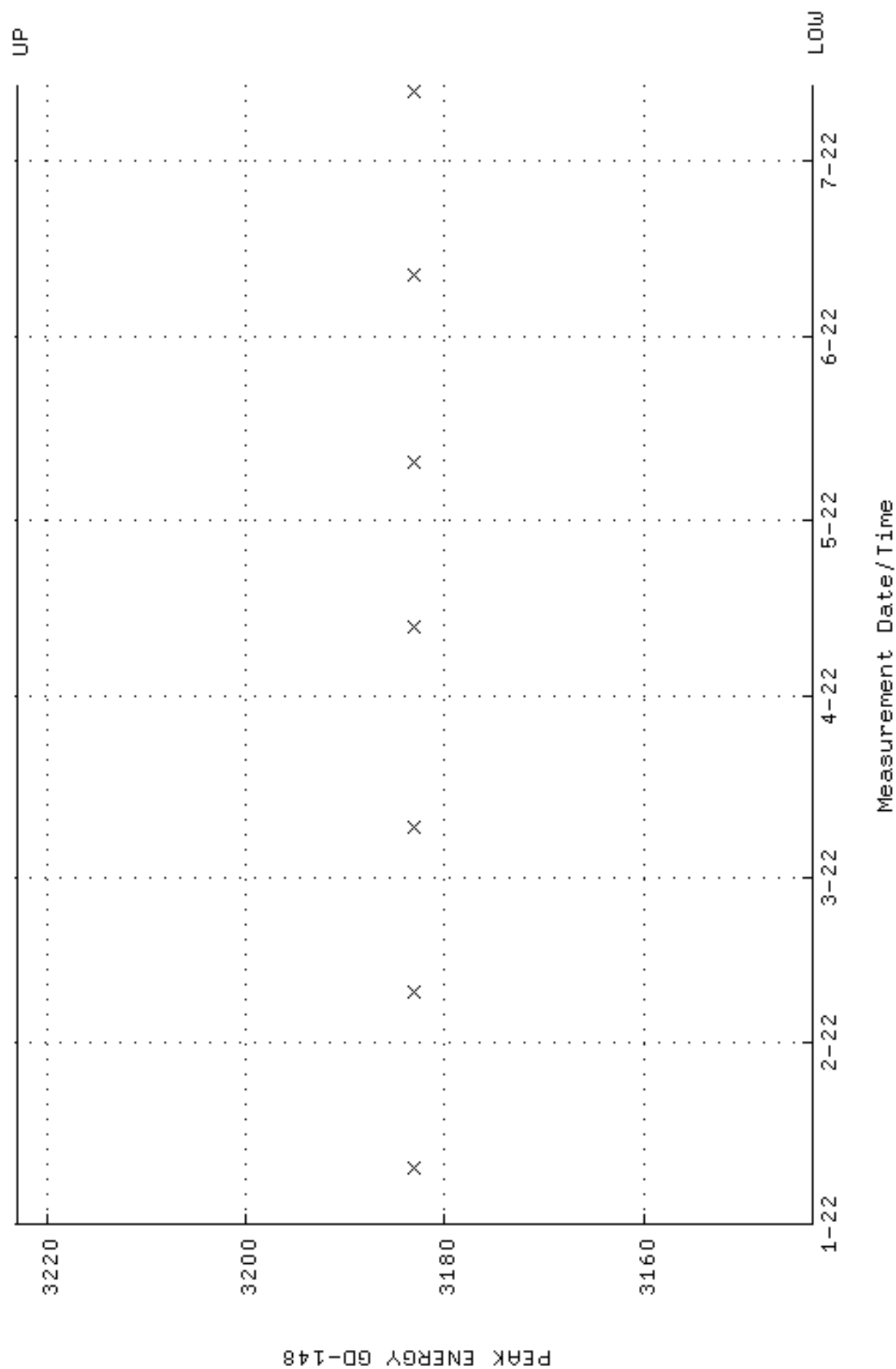
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



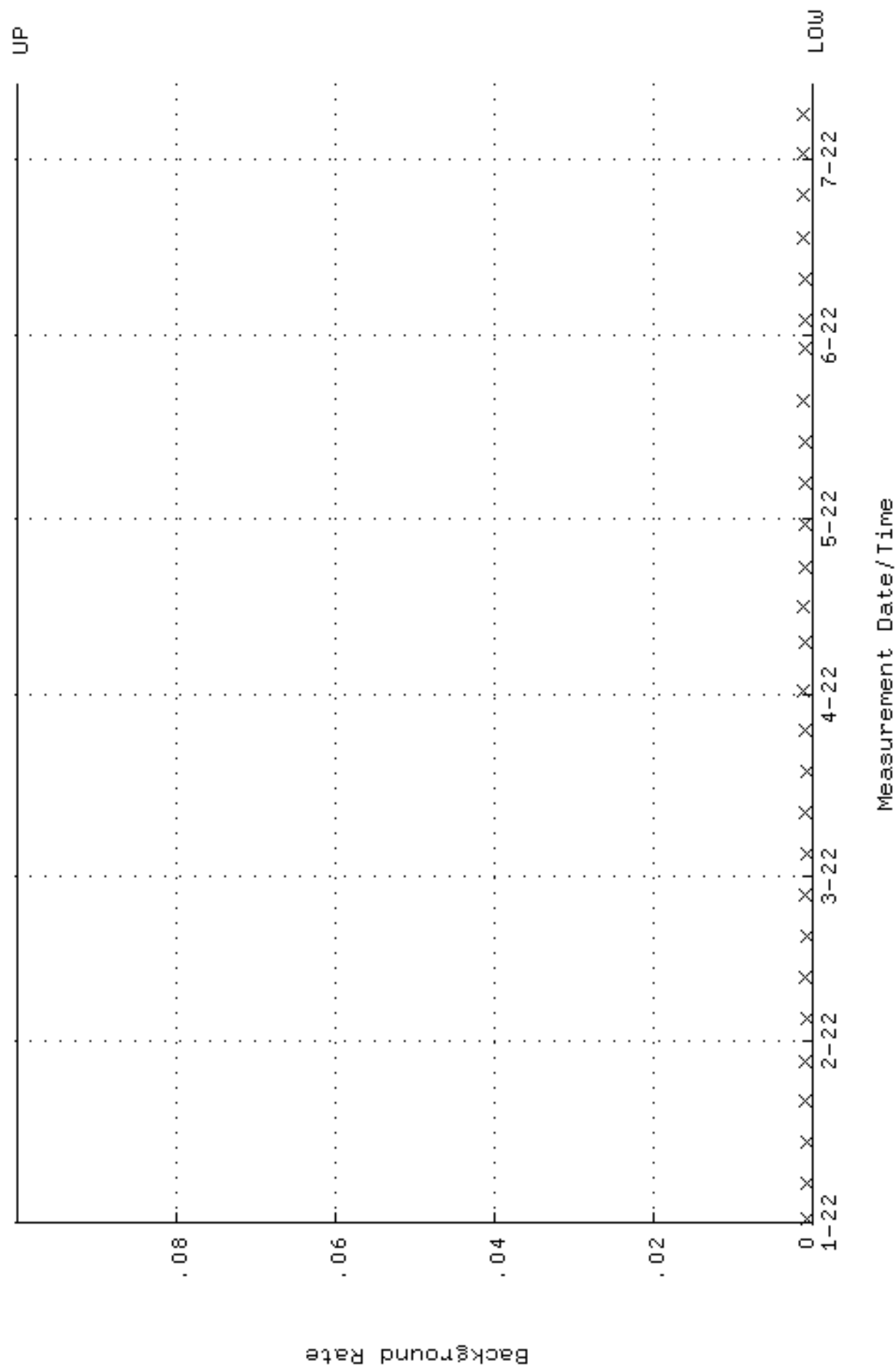
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



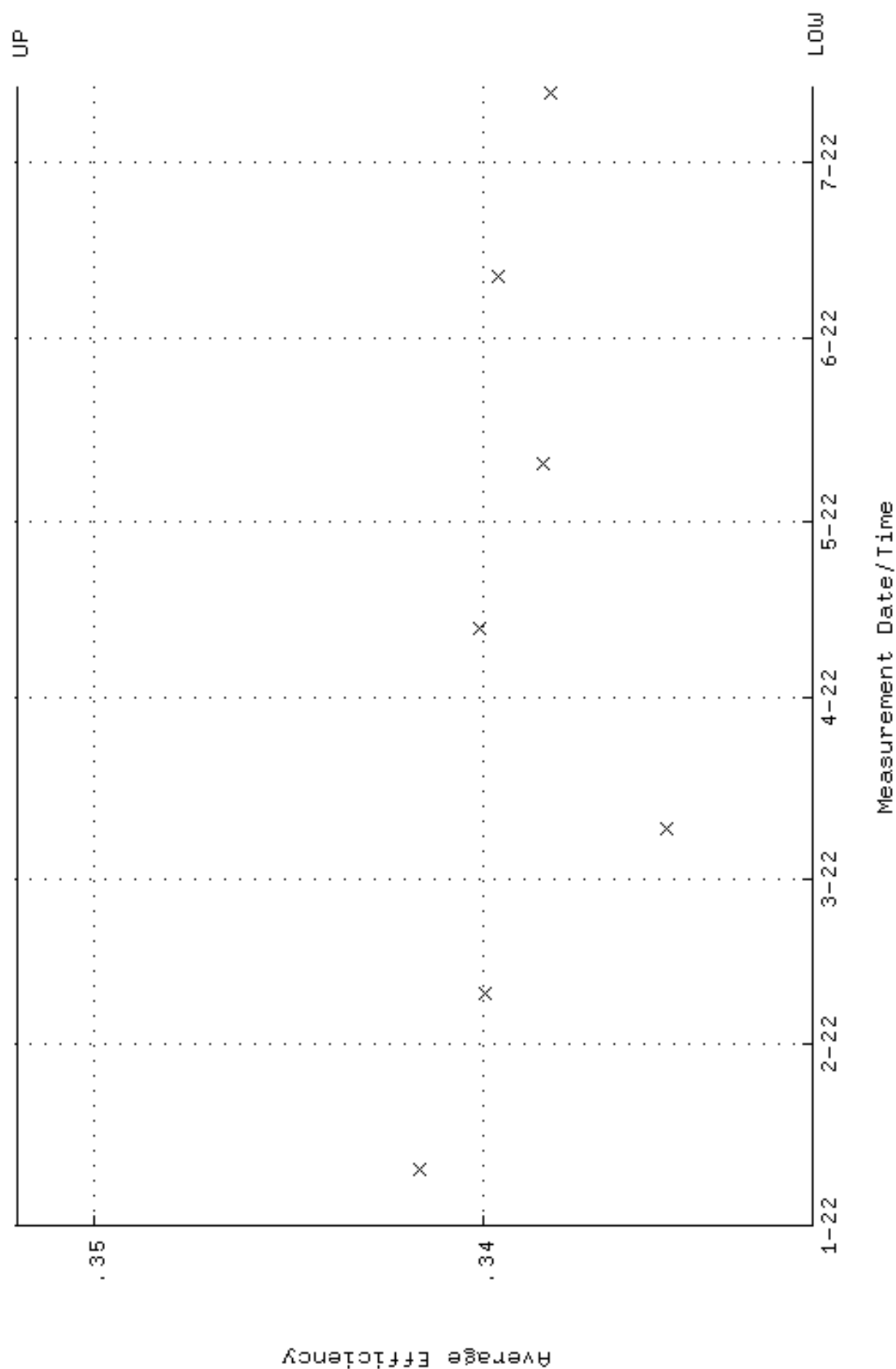
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



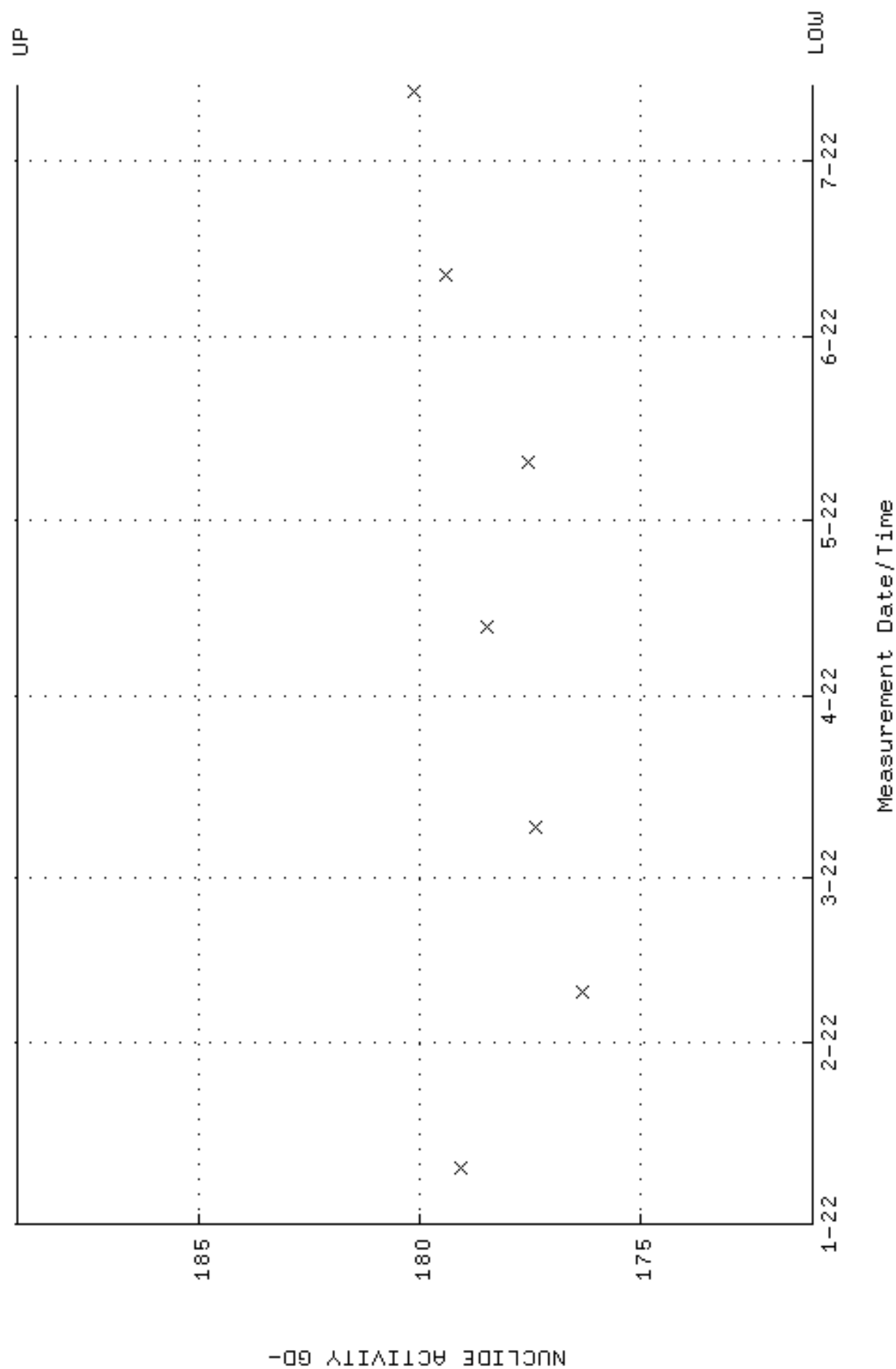
QA filename : DKA100:[ENV_ALPHA.QA.B]B099.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:54:59 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



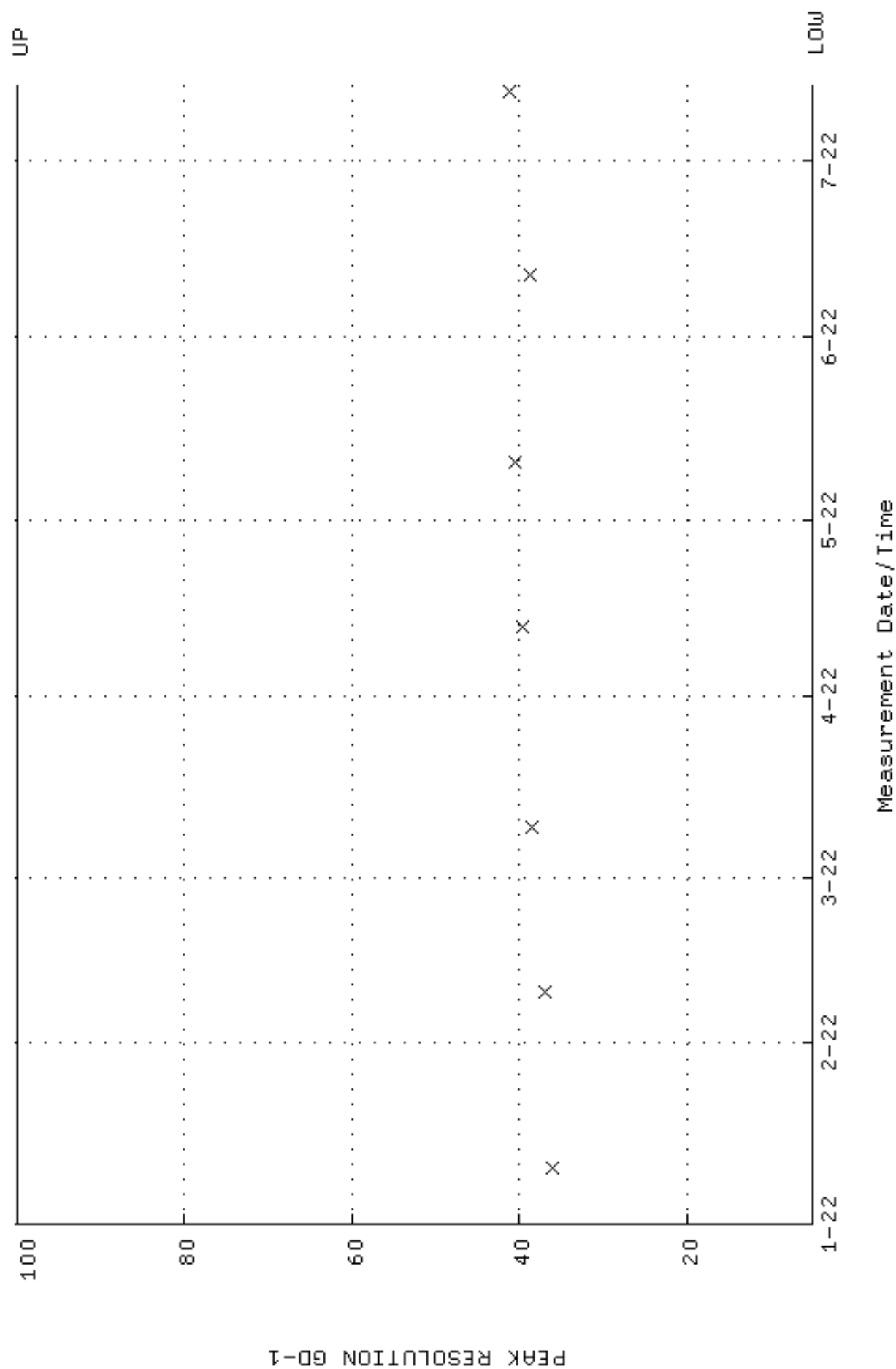
QA filename : DKA100:[ENV_ALPHA.QA.W]W100.QAF;12
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.331500 through 0.352000



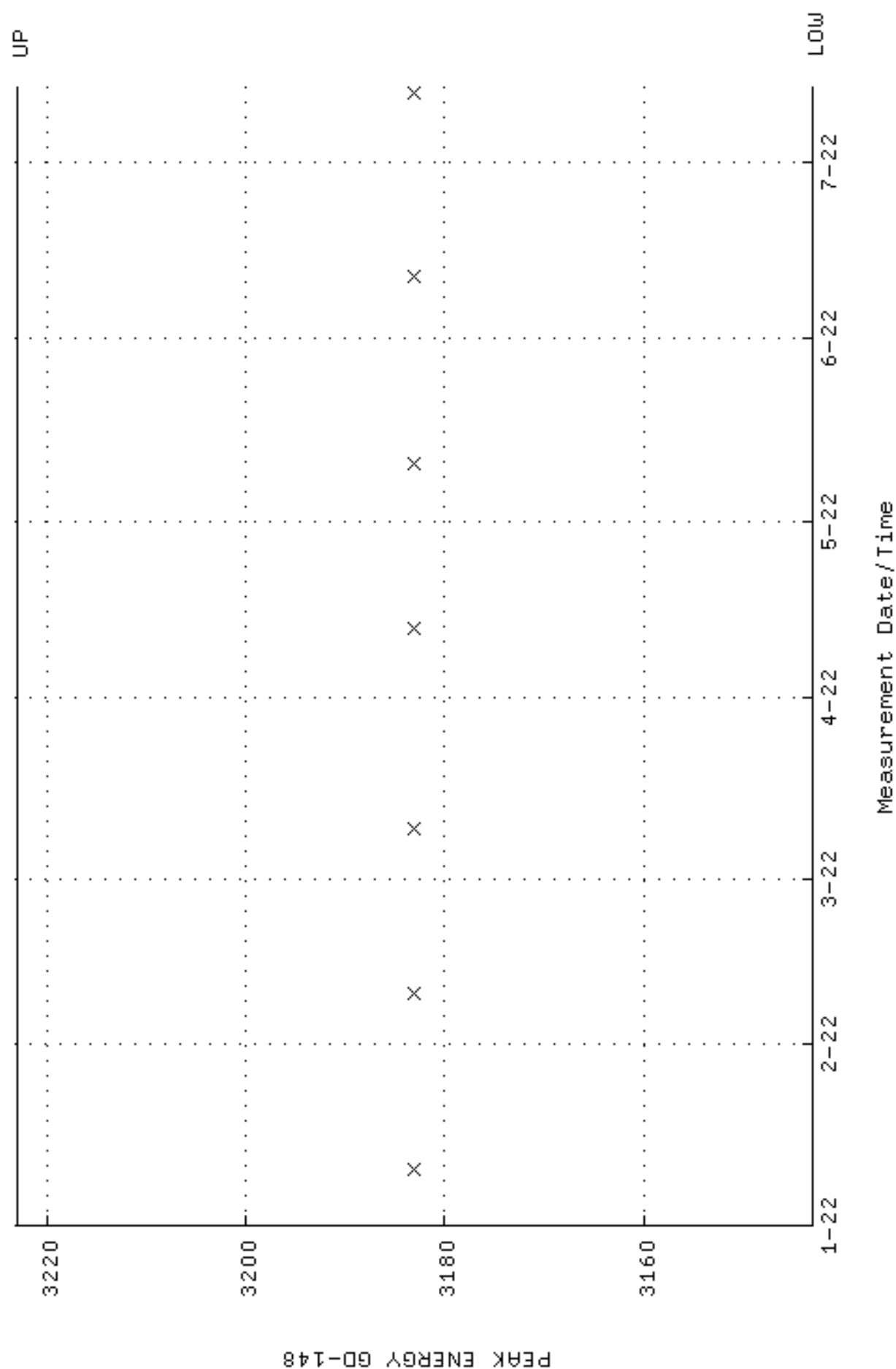
QA filename : DKA100:[ENV_ALPHA.QA.W]W100.QAF;12
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



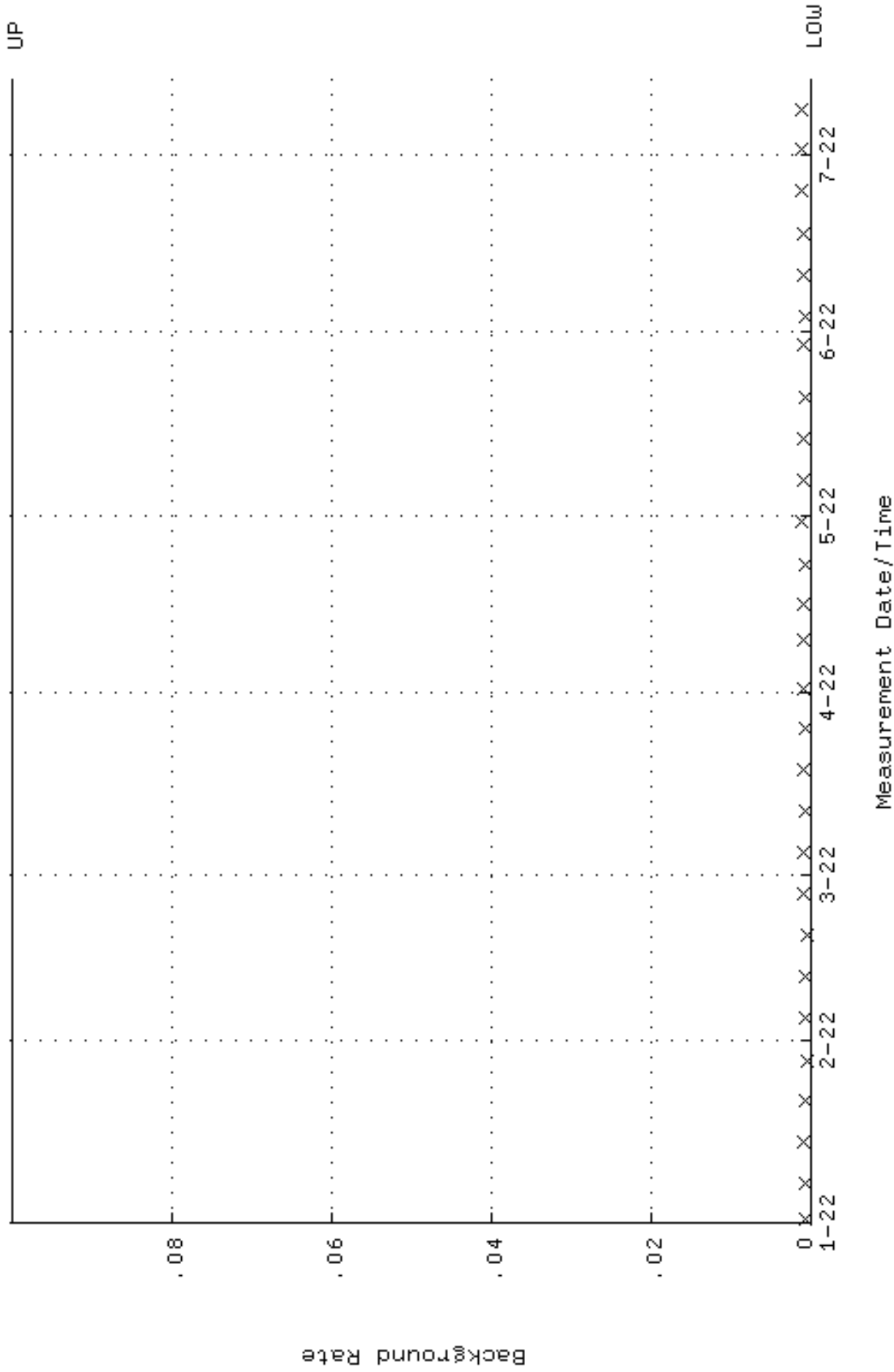
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



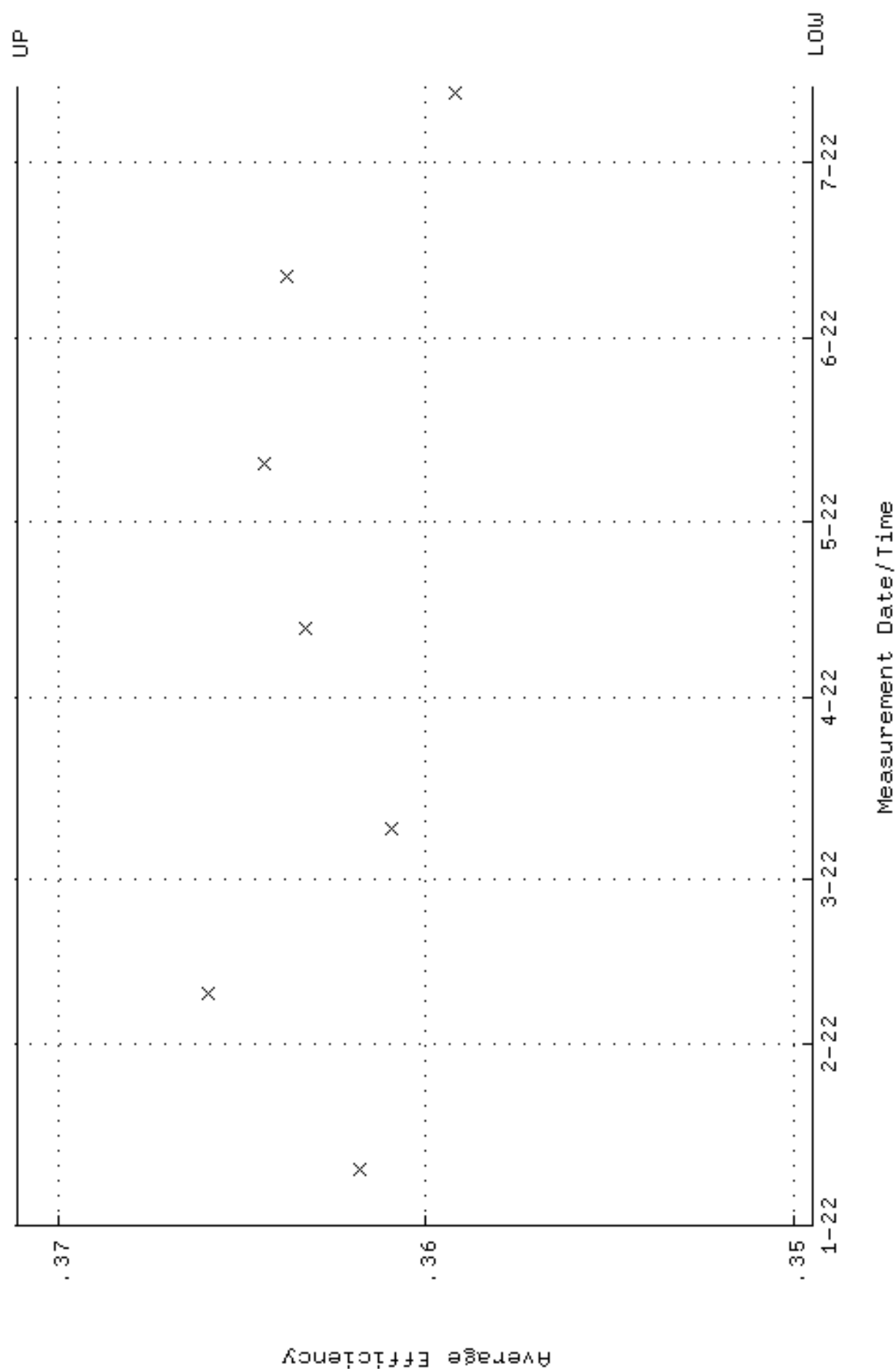
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:00:03 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



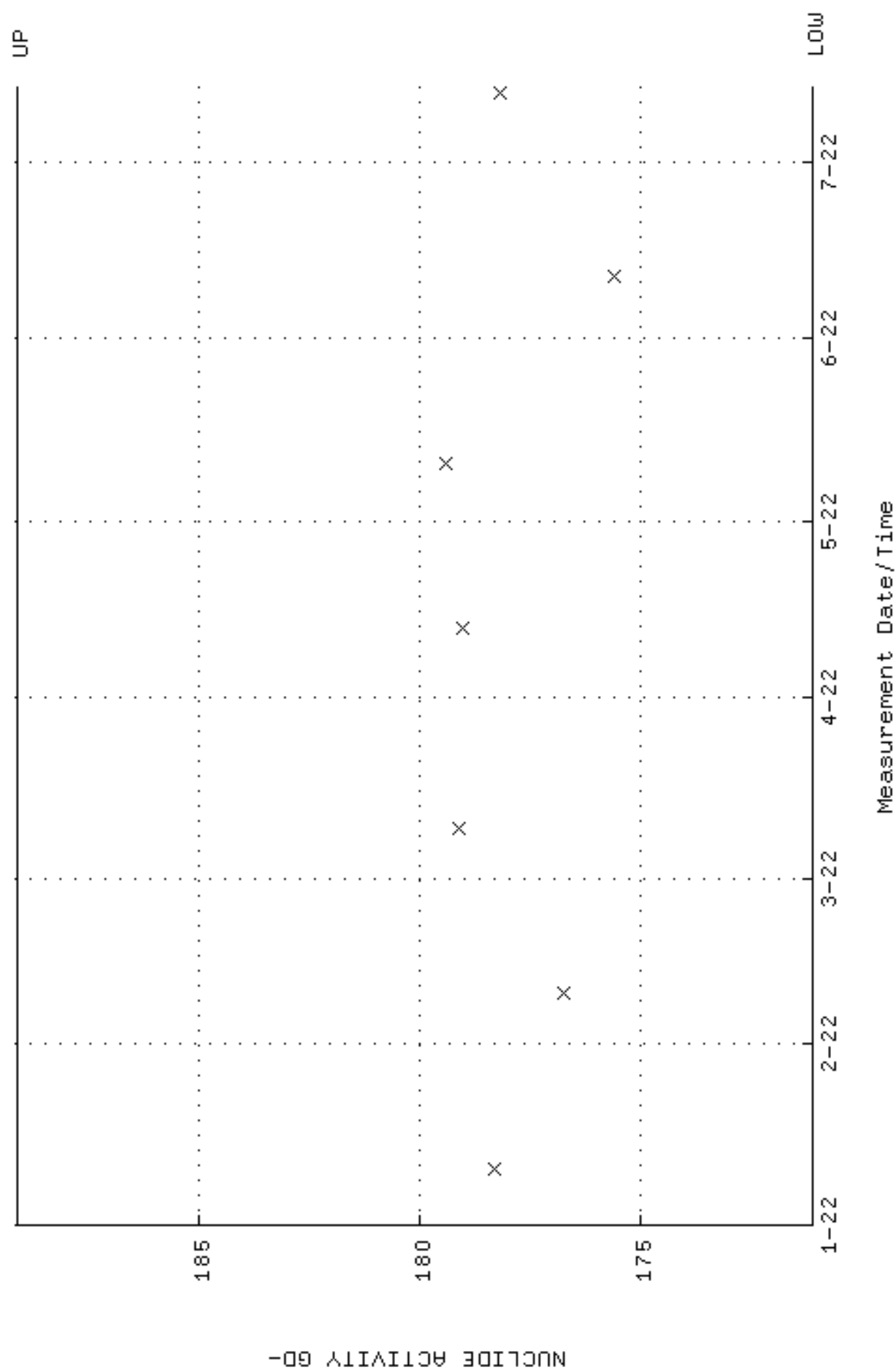
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Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JAN-2022 12:54:59 through 13-JUL-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 0.100000



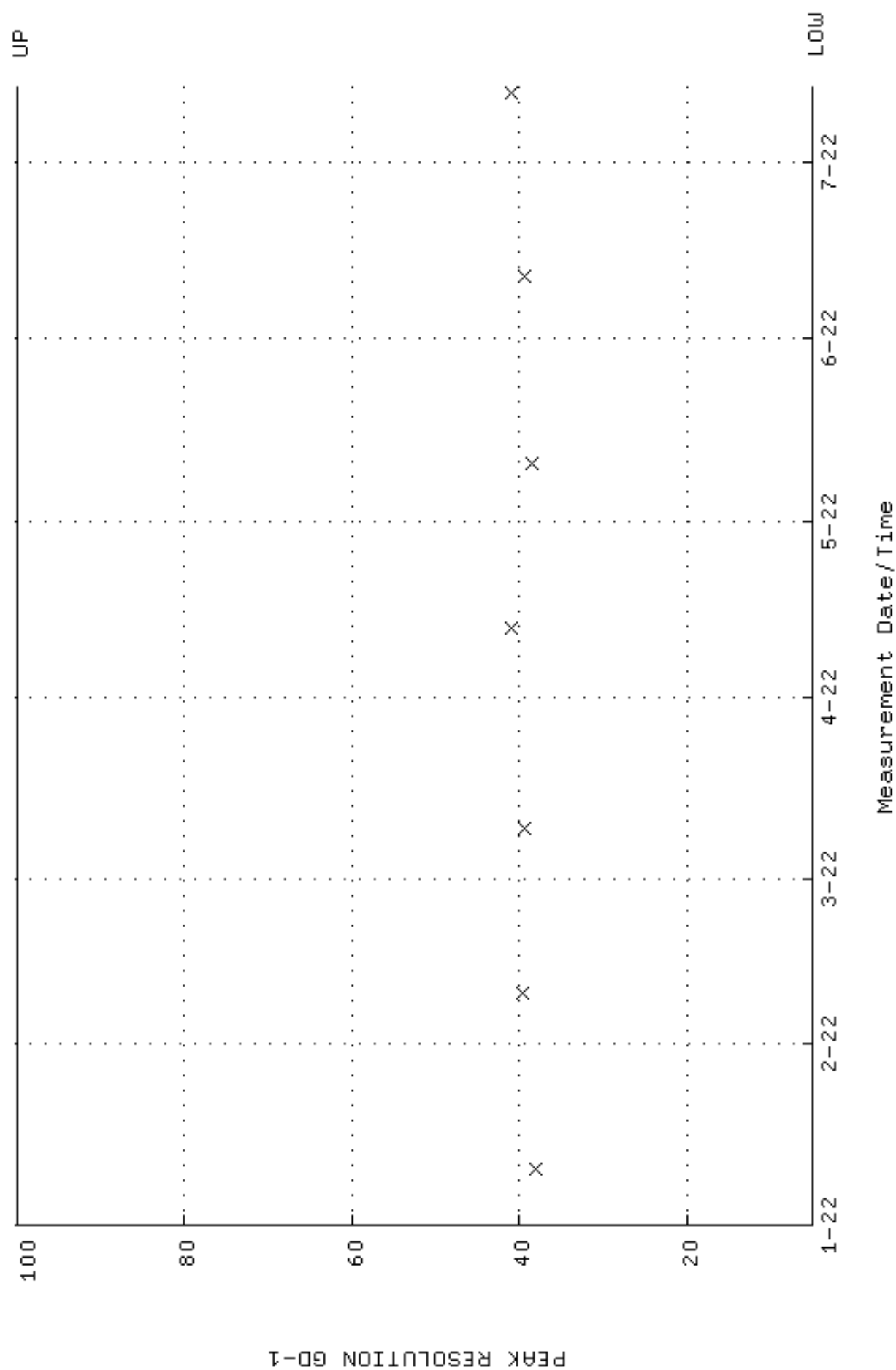
QA filename : DKA100:[ENV_ALPHA.QA.W]W102.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.349500 through 0.371100



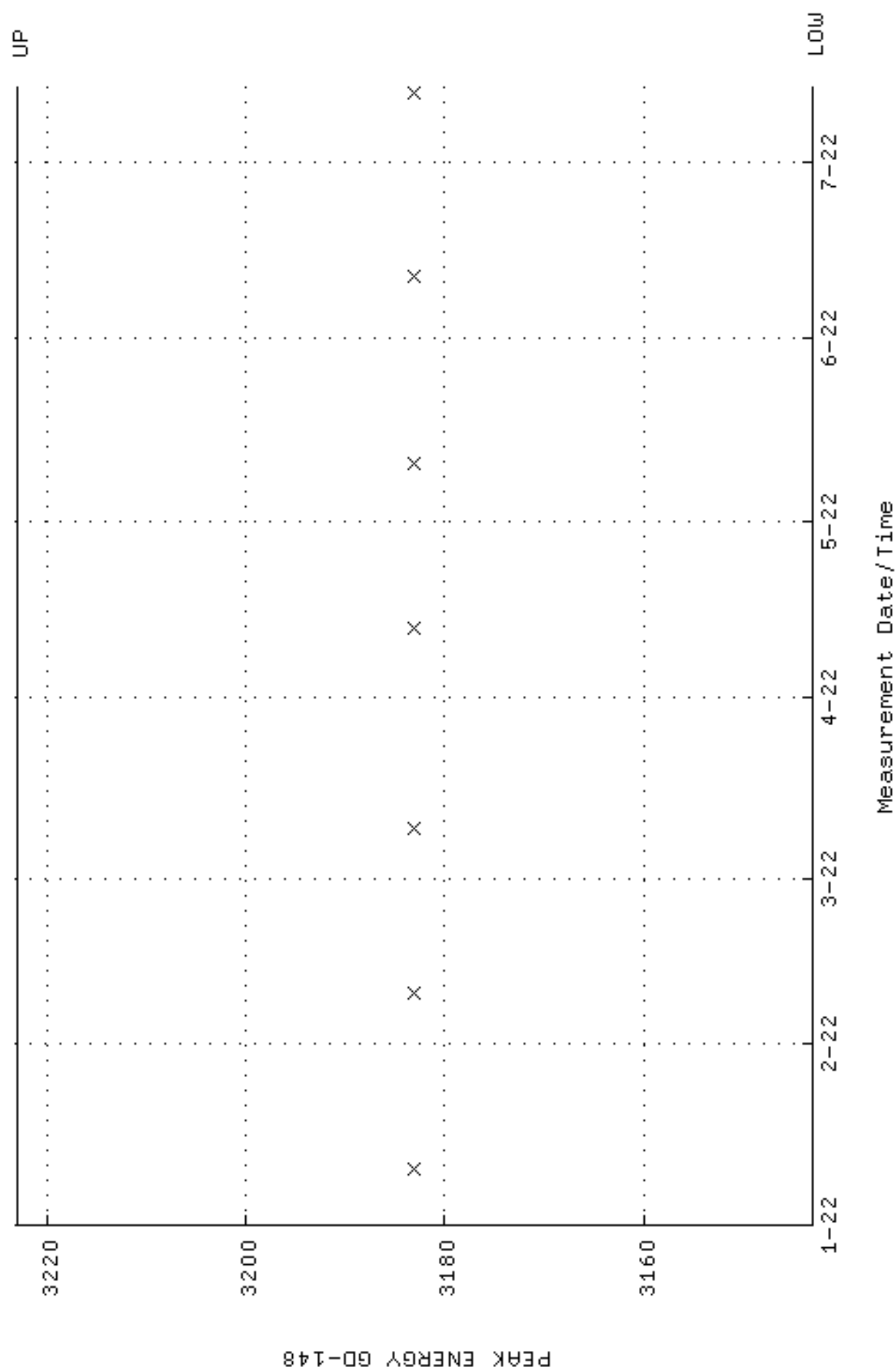
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



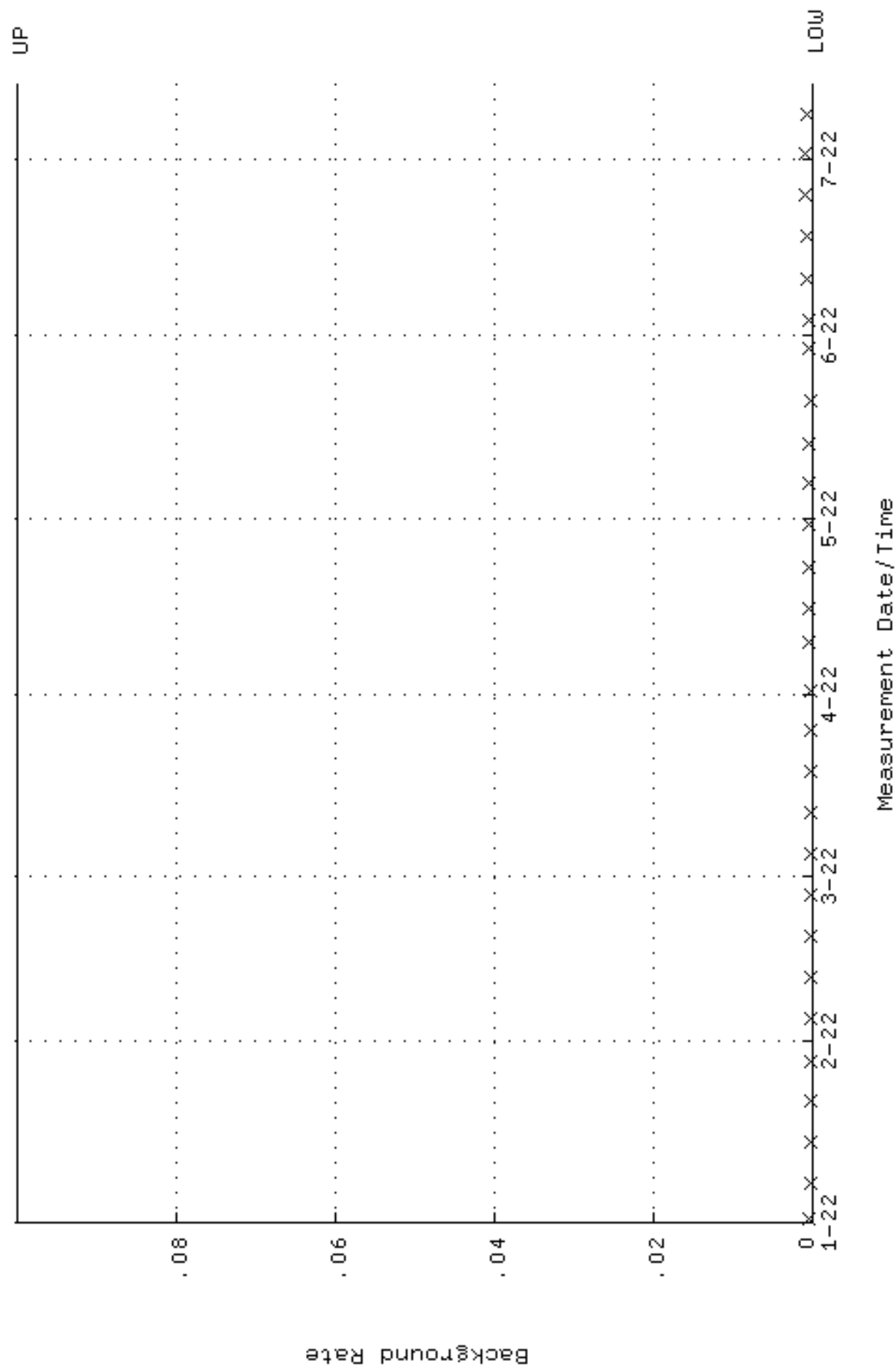
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



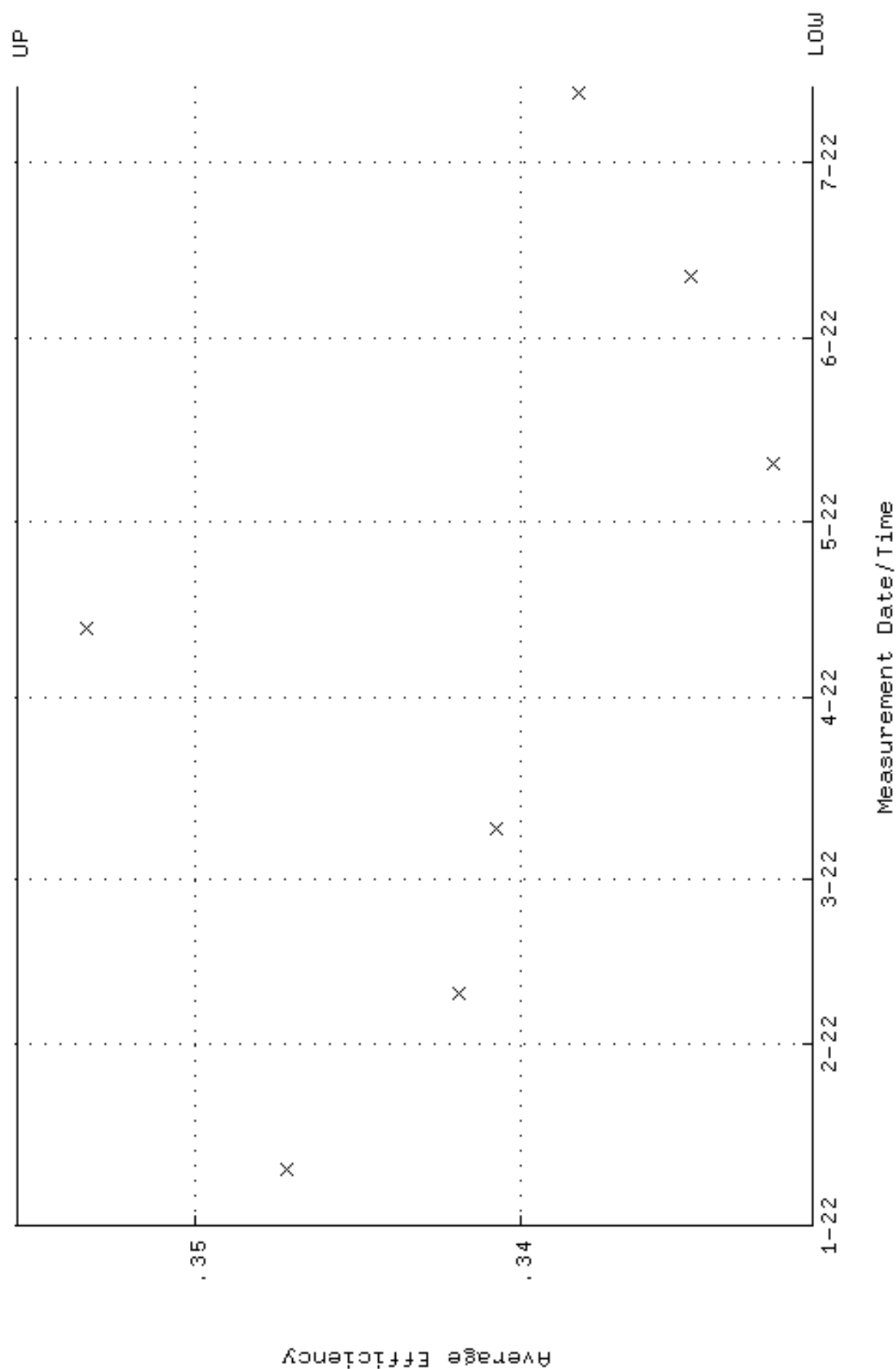
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



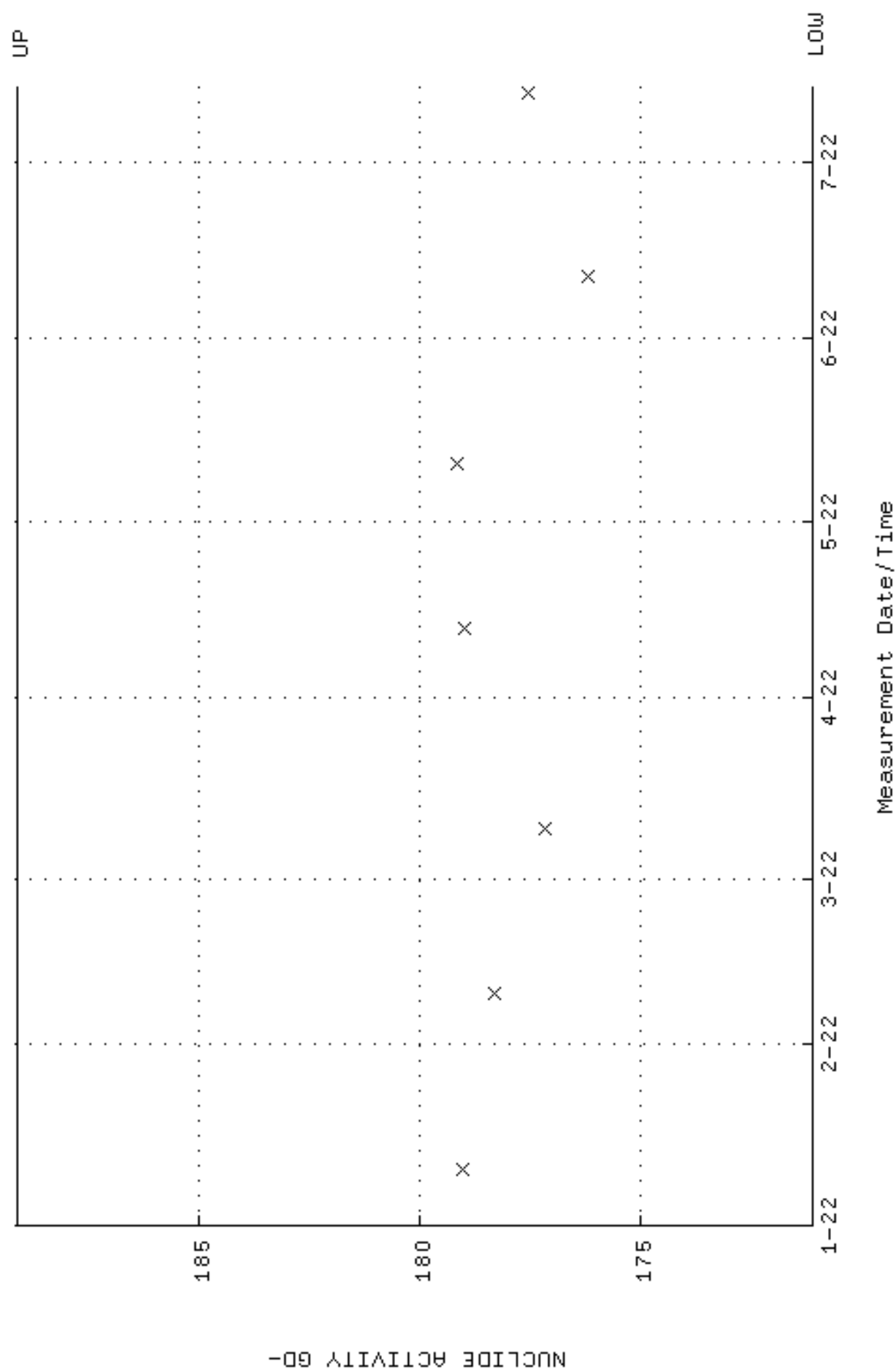
QA filename : DKA100:[ENV_ALPHA.QA.B]B102.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:55:00 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



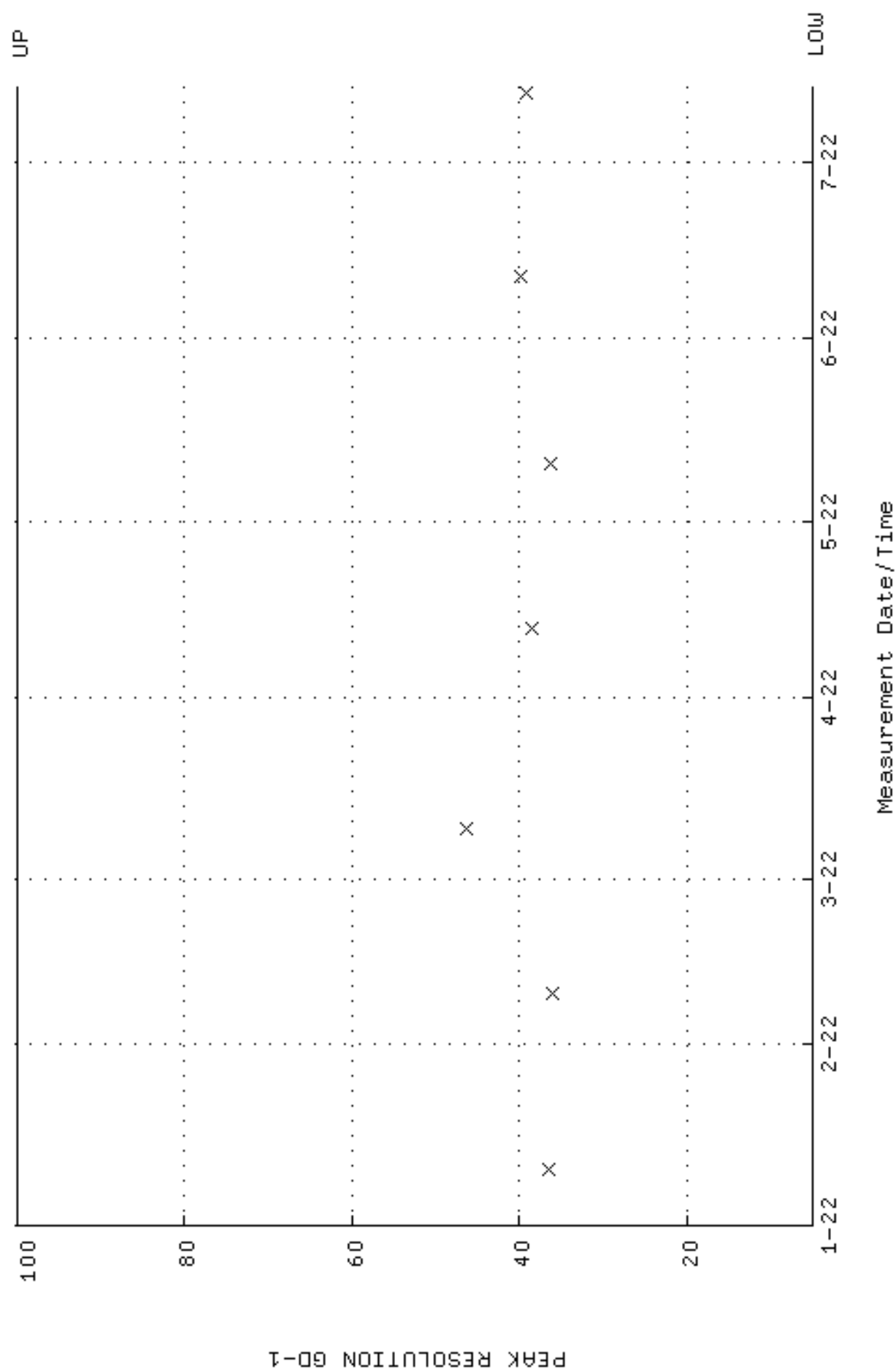
QA filename : DKA100:[ENV_ALPHA.QA.W]W103.QAF;12
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.331050 through 0.355430



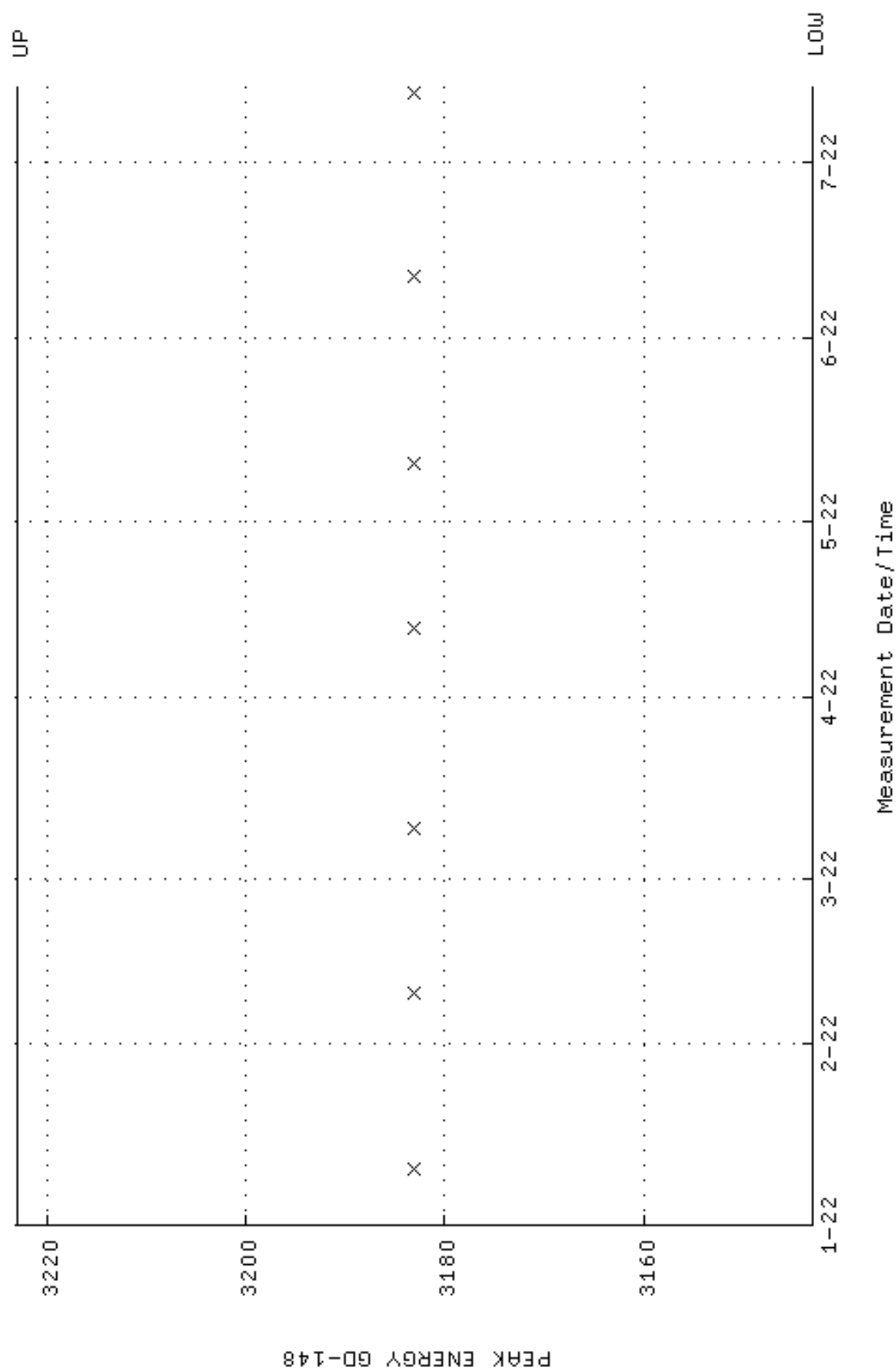
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



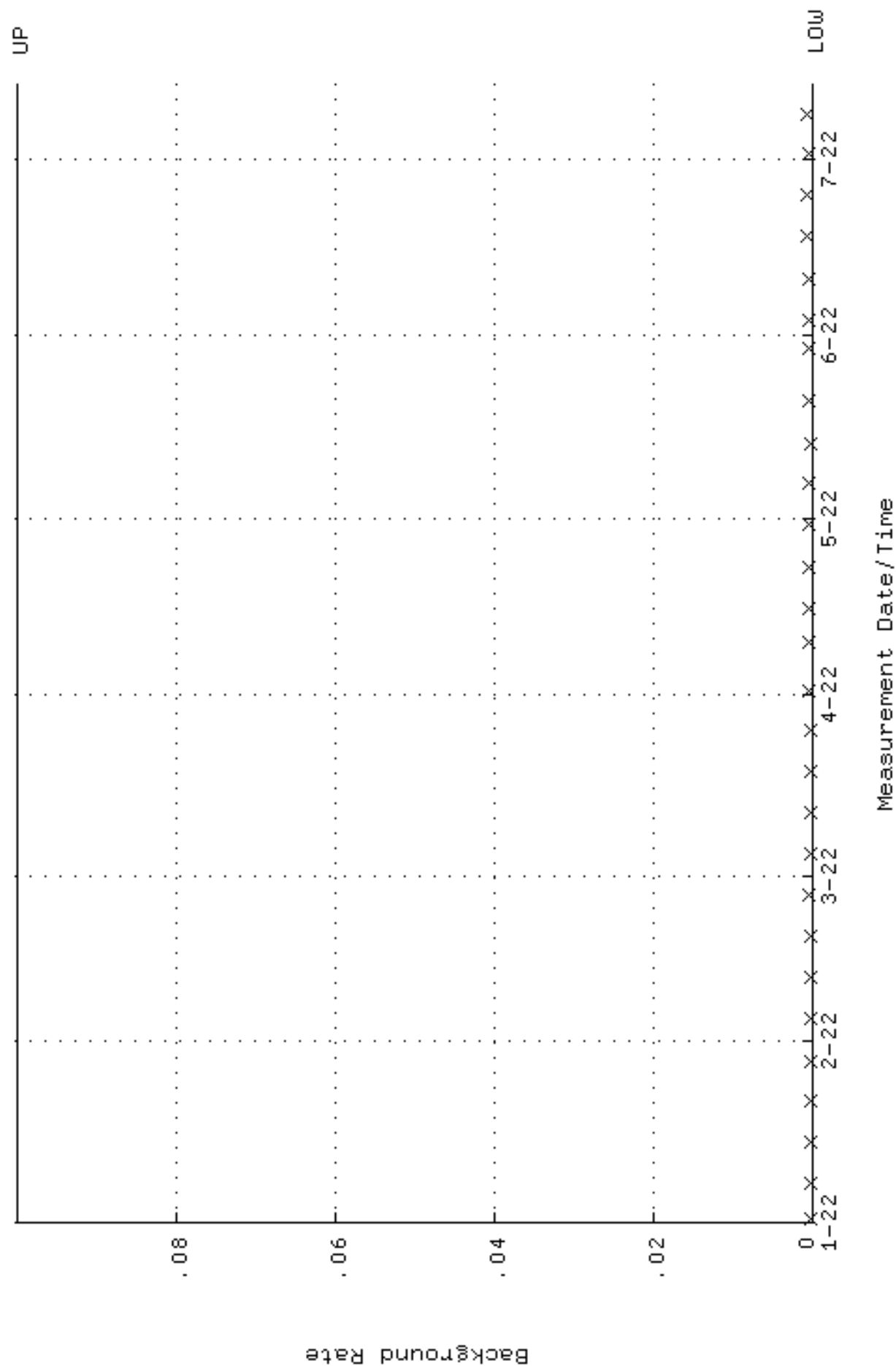
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 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



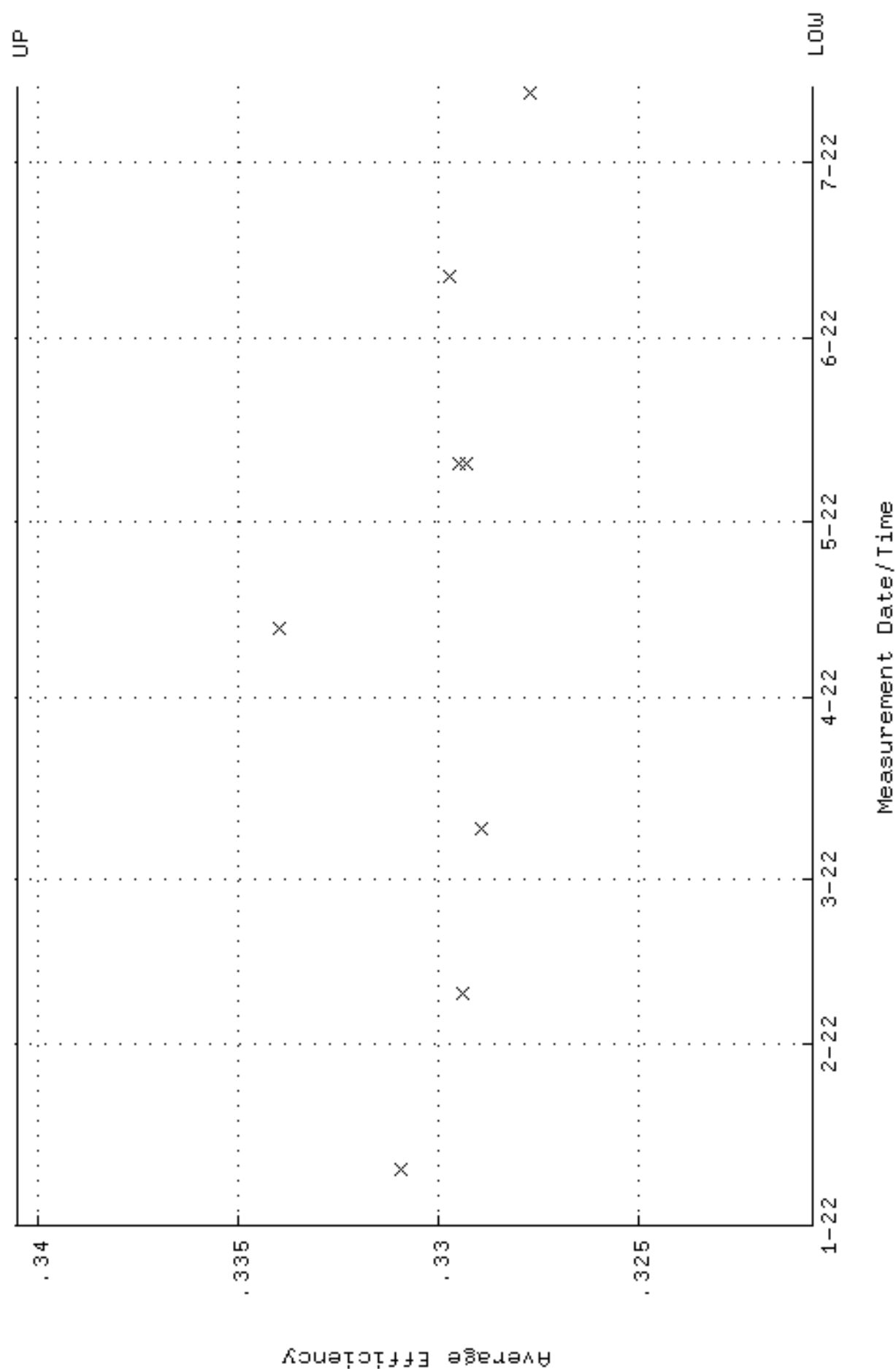
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



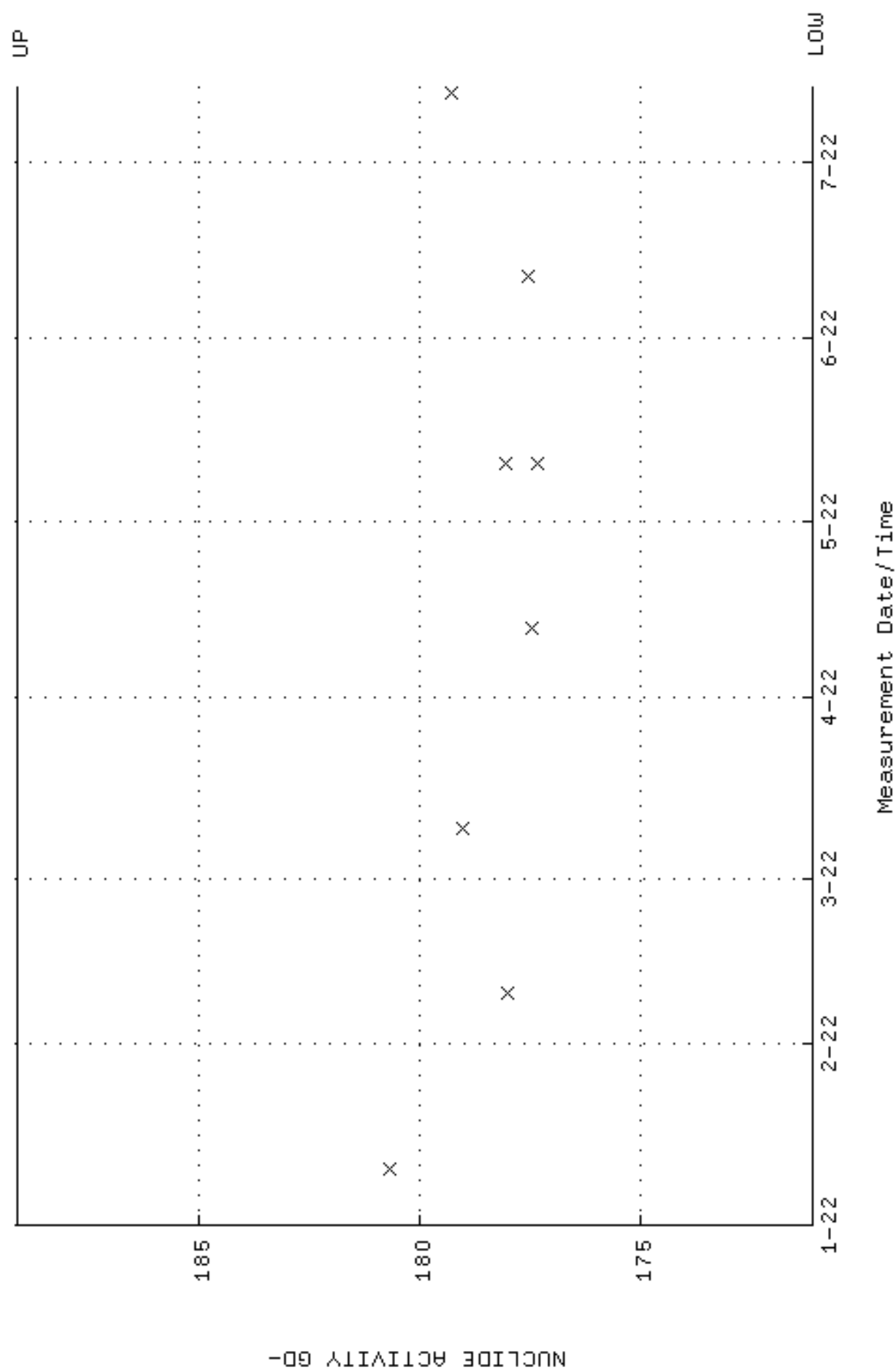
QA filename : DKA100:[ENV_ALPHA.QA.B]B103.QAF;6
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:55:00 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



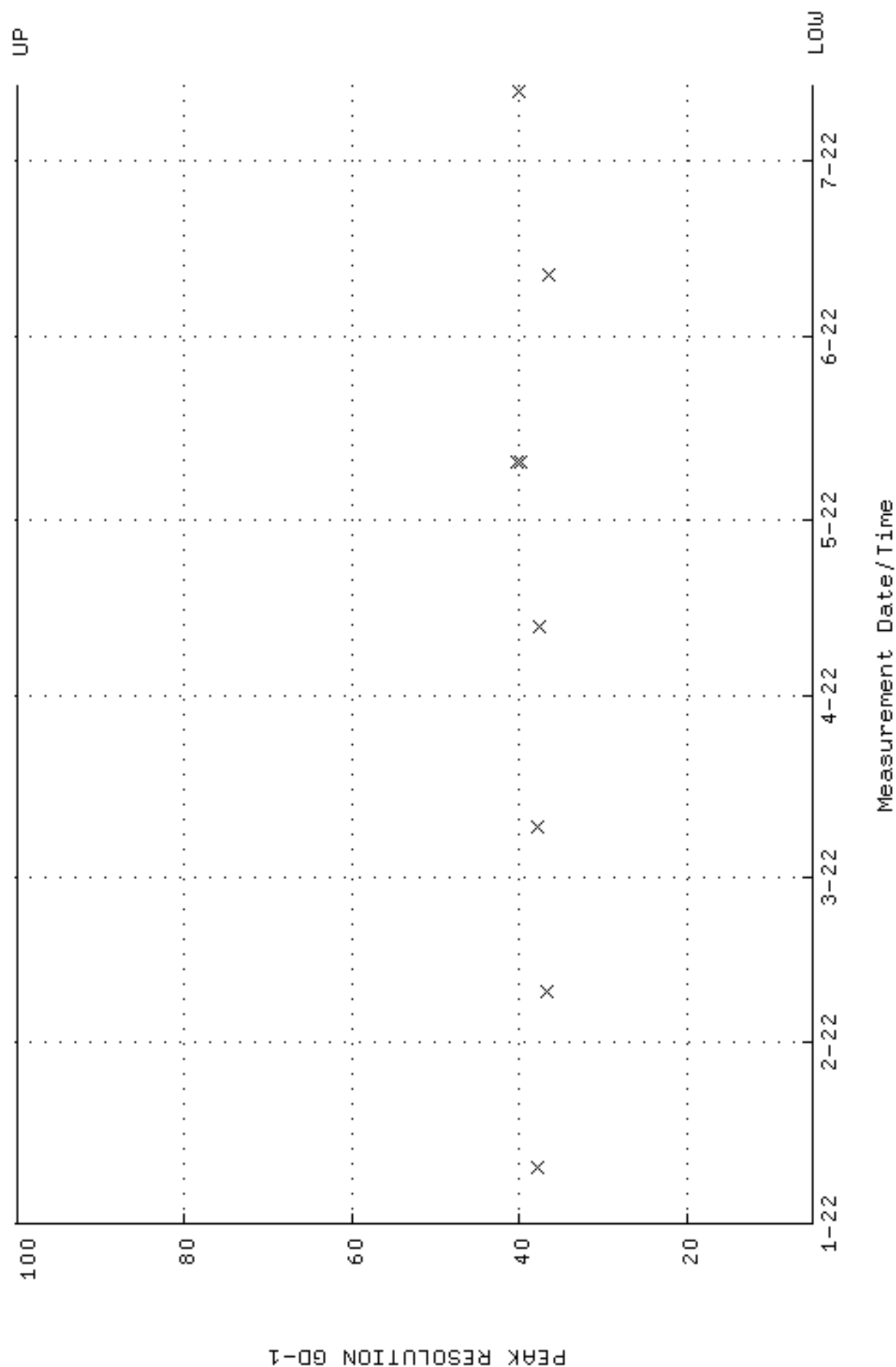
QA filename : DKA100:[ENV_ALPHA.QA.W]W104.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.320670 through 0.340510



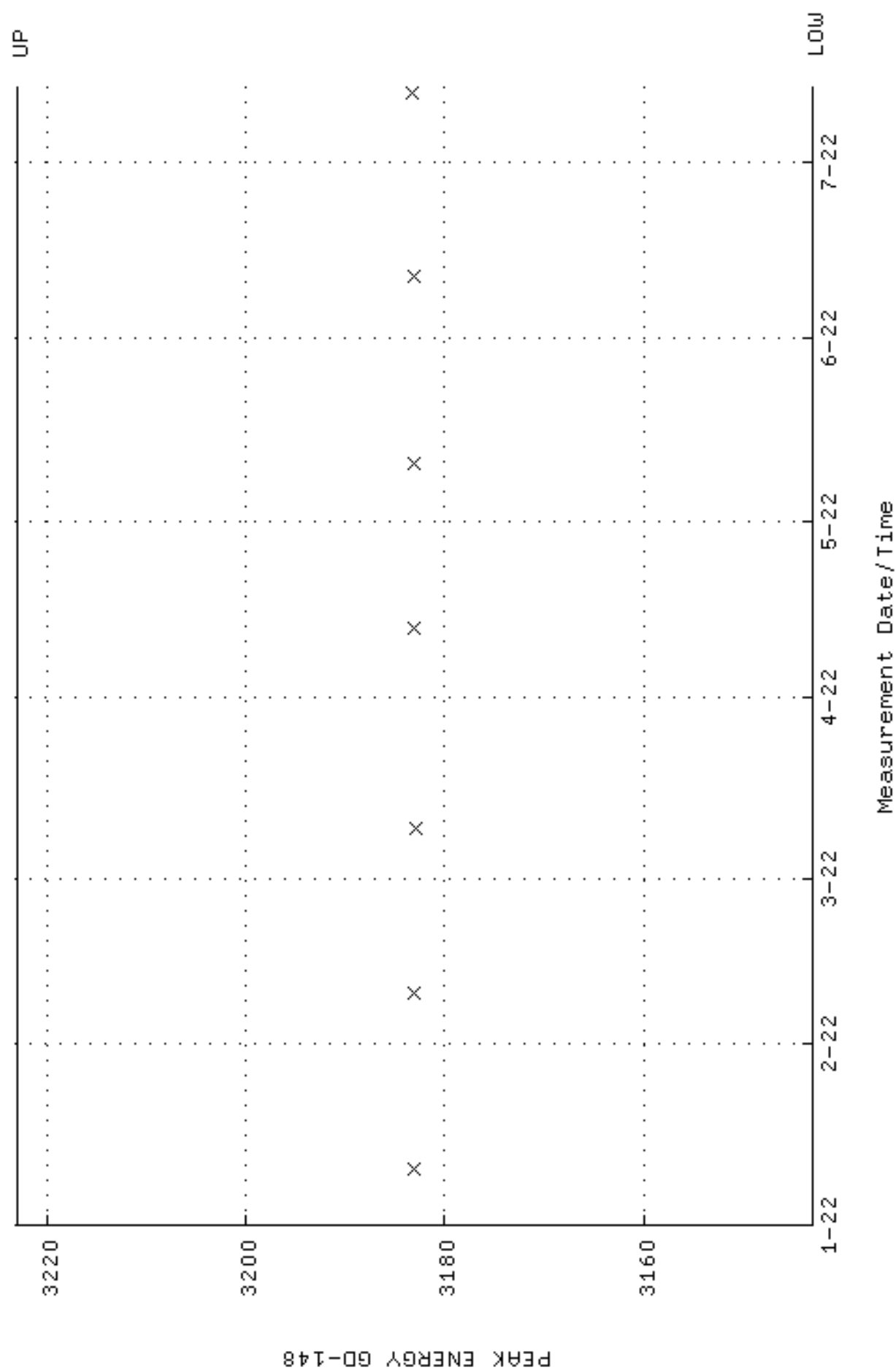
QA filename : DKA100:[ENV_ALPHA.QA.W]W104.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



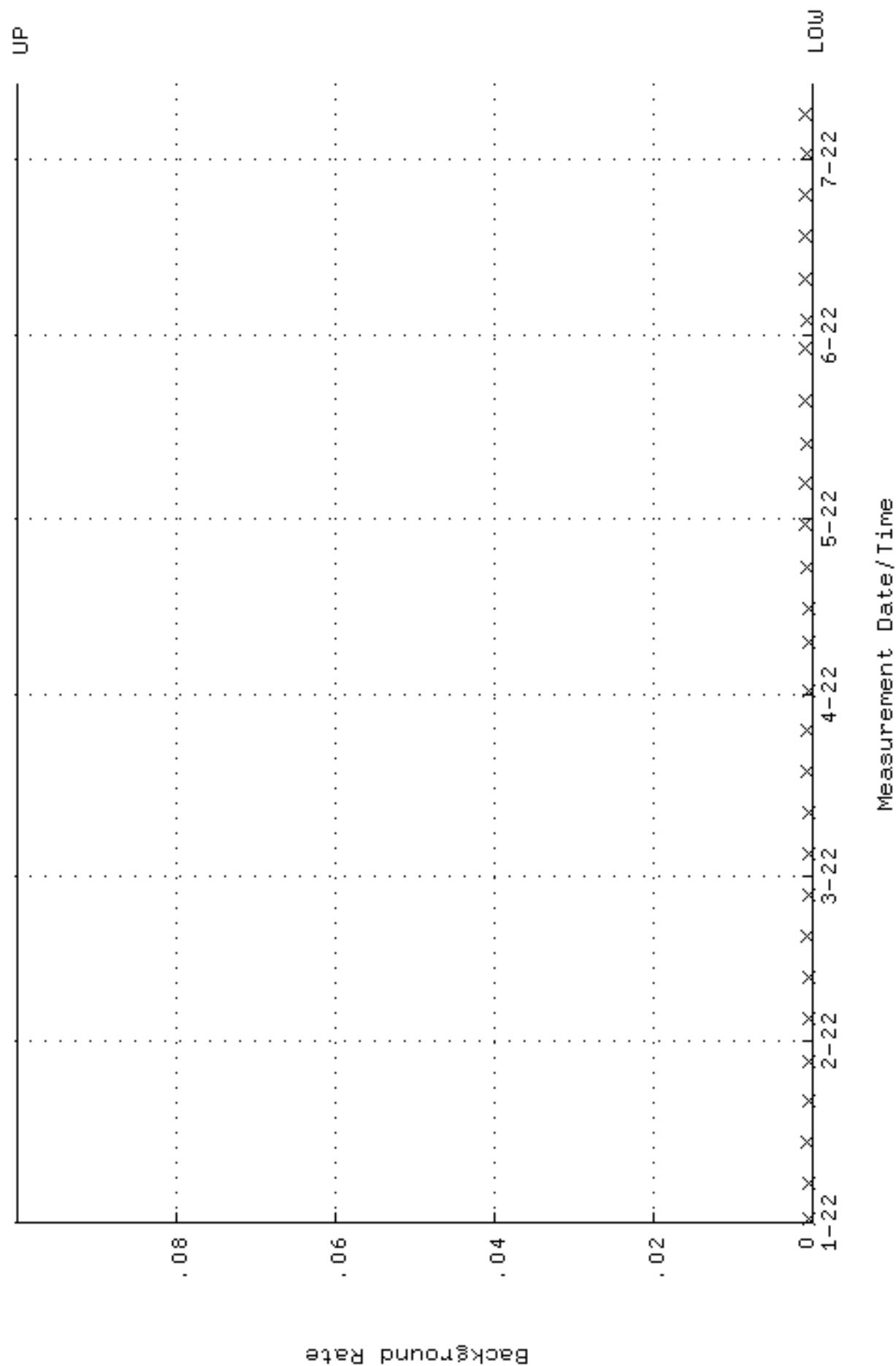
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



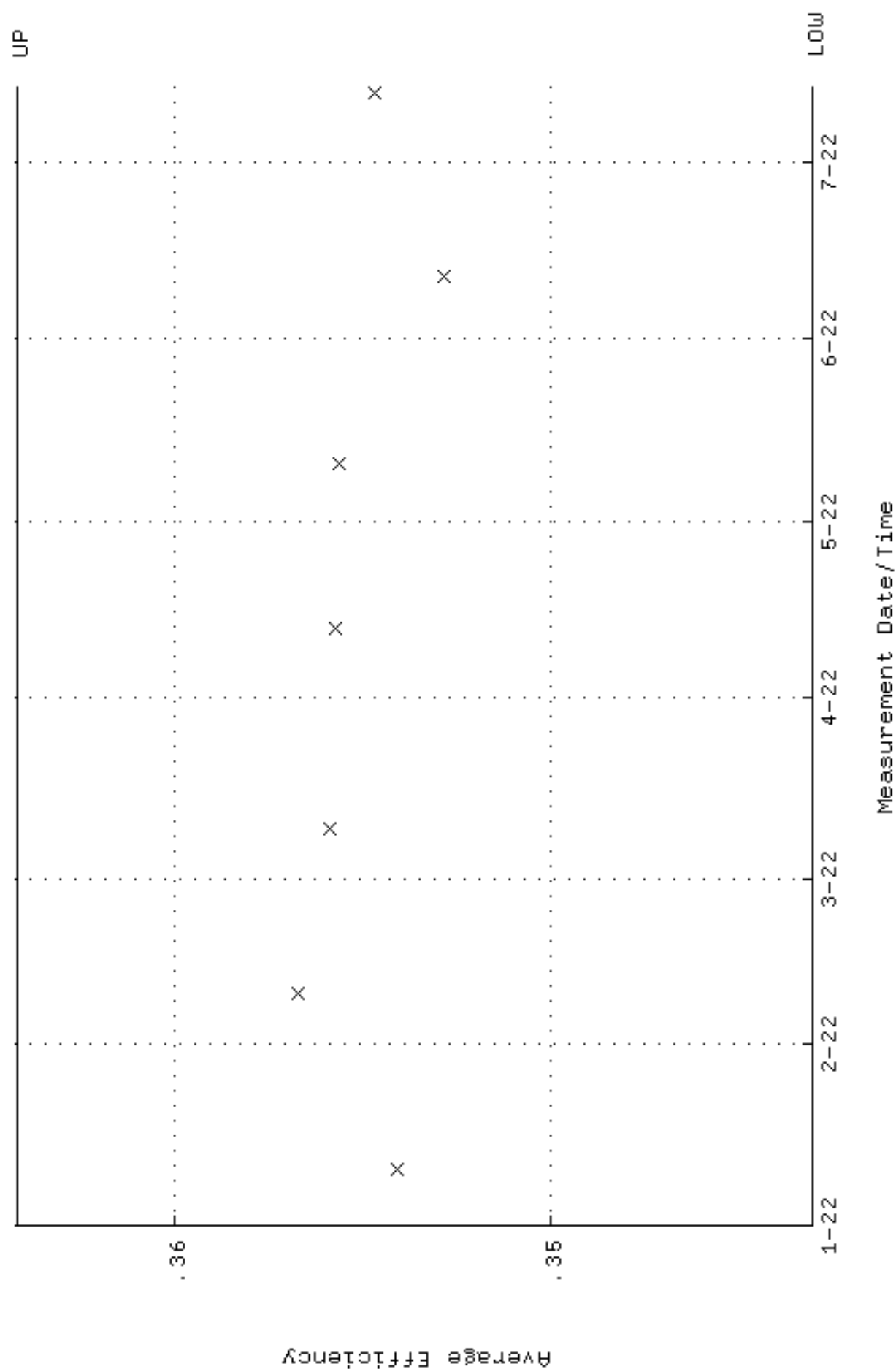
QA filename : DKA100:[ENV_ALPHA.QA.W]W104.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



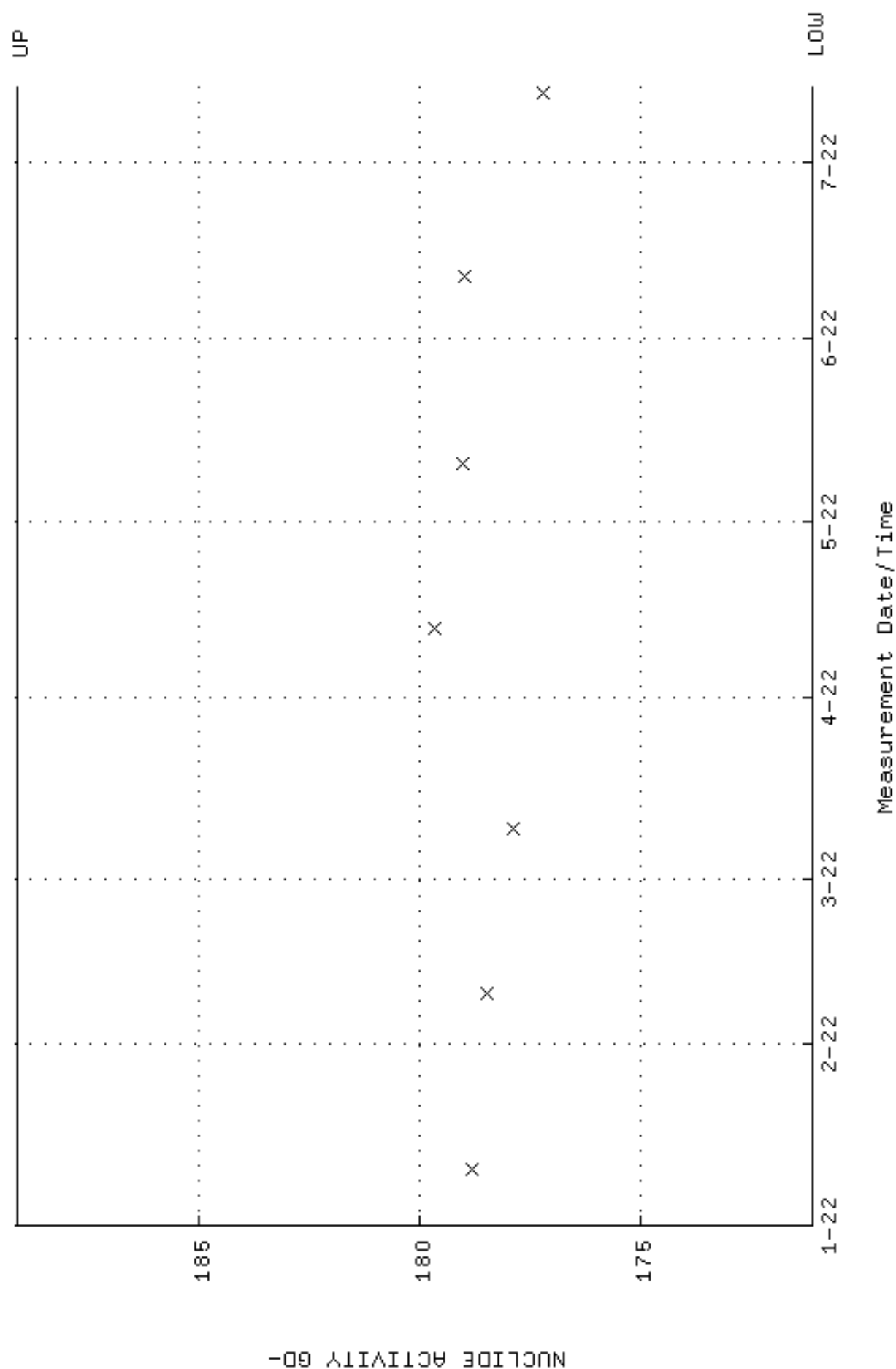
QA filename : DKA100:[ENV_ALPHA.QA.B]B104.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:55:00 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



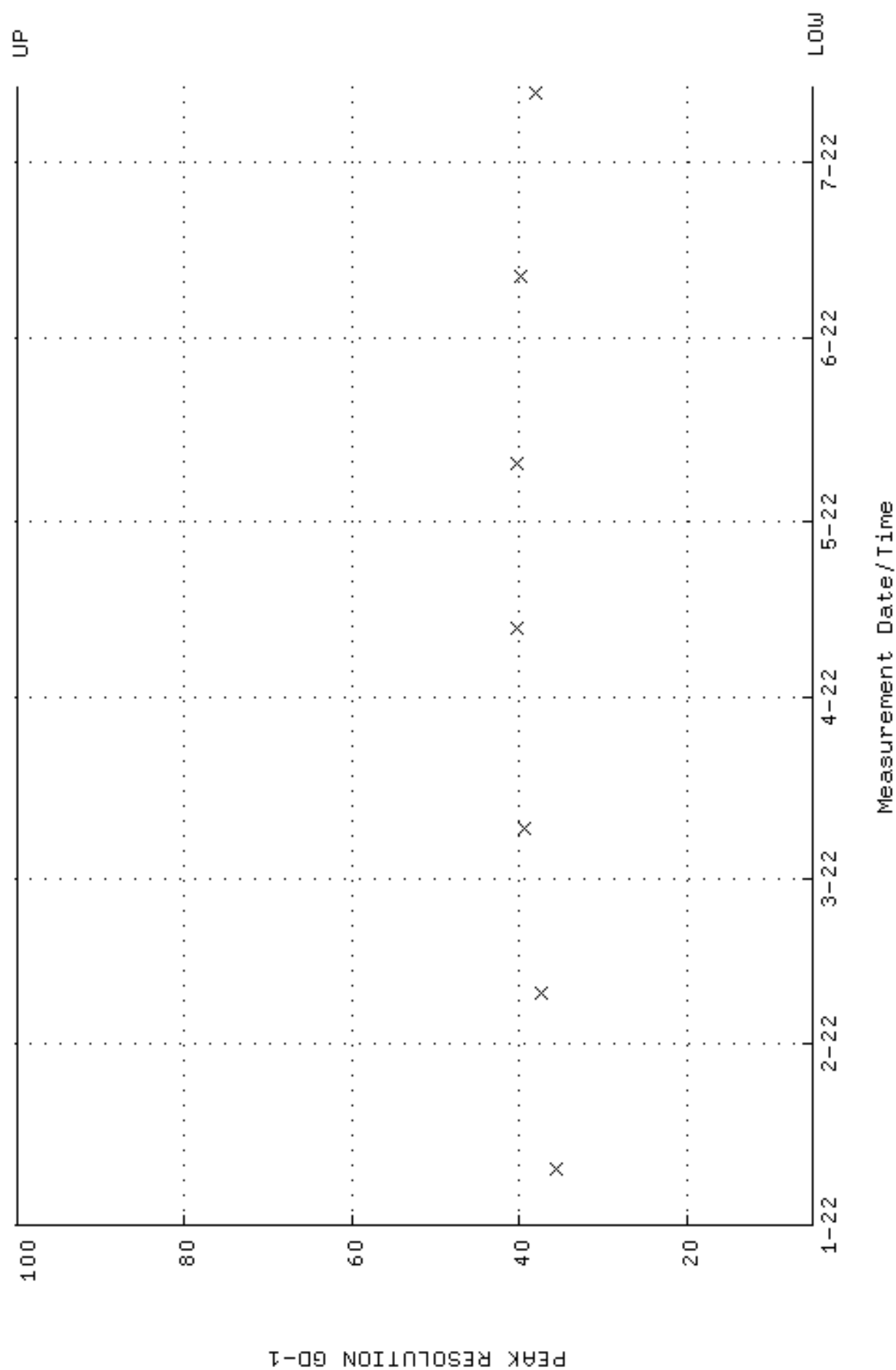
QA filename : DKA100:[ENV_ALPHA.QA.W]W105.QAF;12
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.343000 through 0.364200



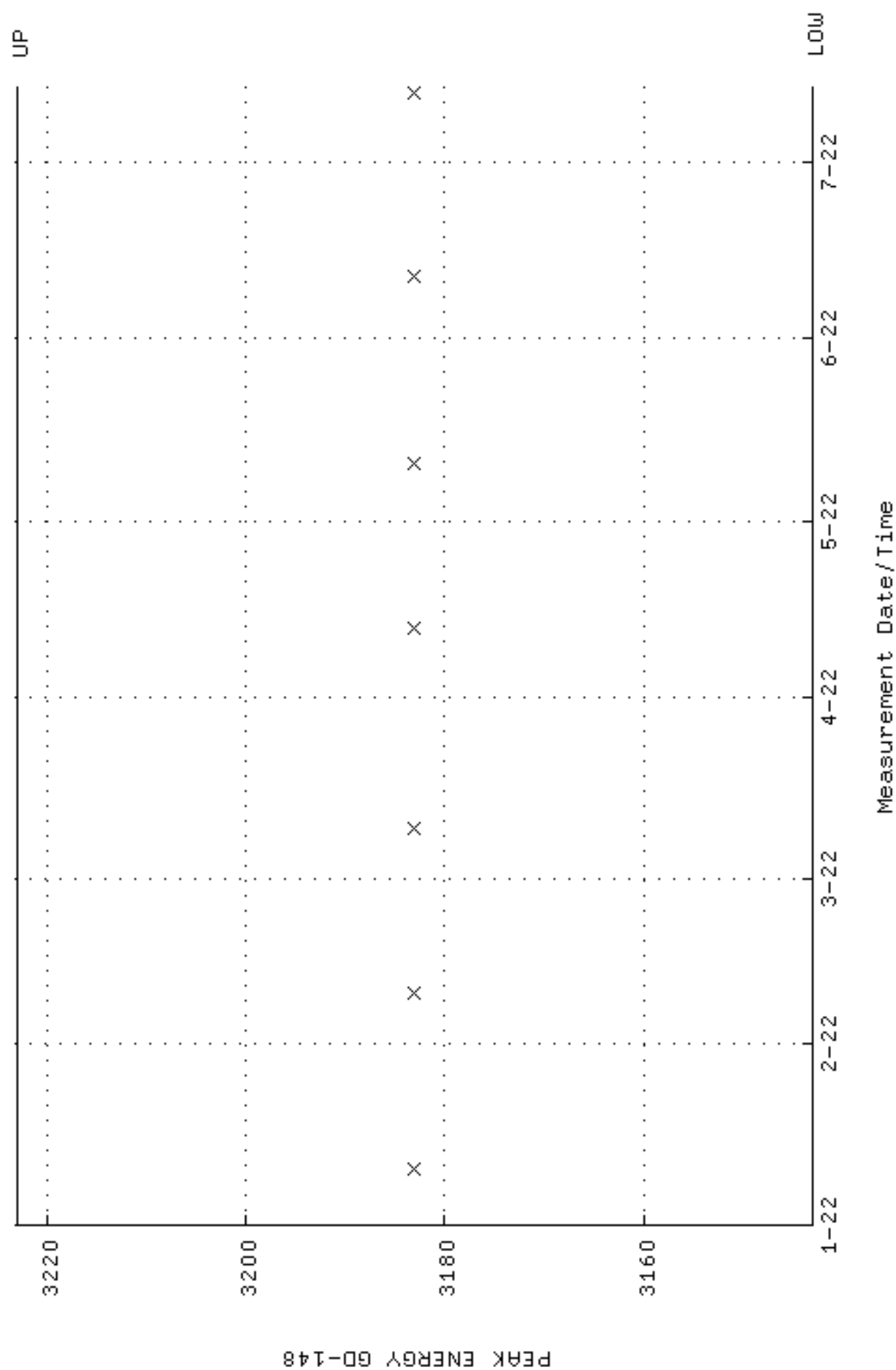
QA filename : DKA100:[ENV_ALPHA.QA.W]W105.QAF;12
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



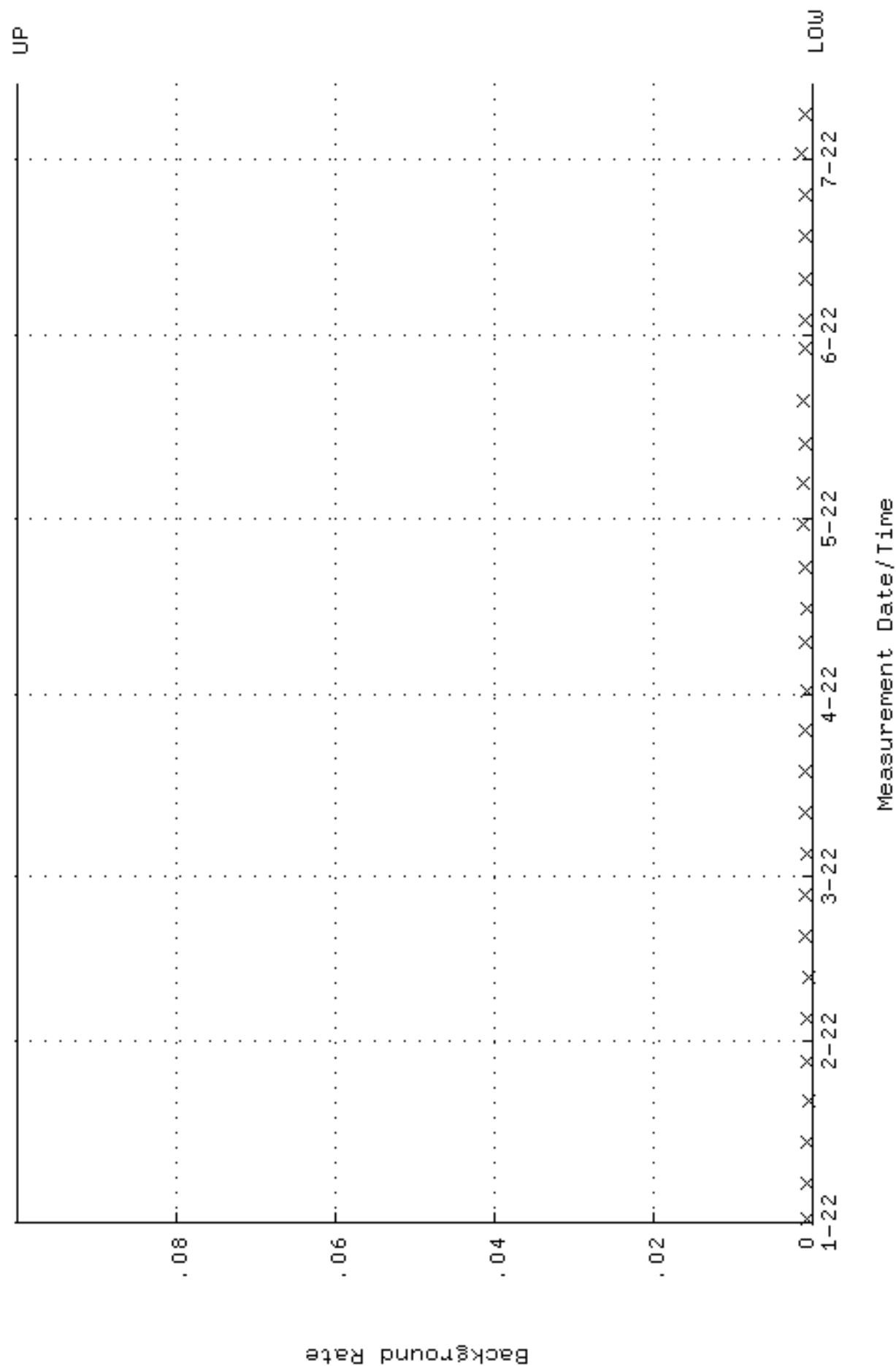
QA filename : DKA100:[ENV_ALPHA.QA.W]W105.QAF;12
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



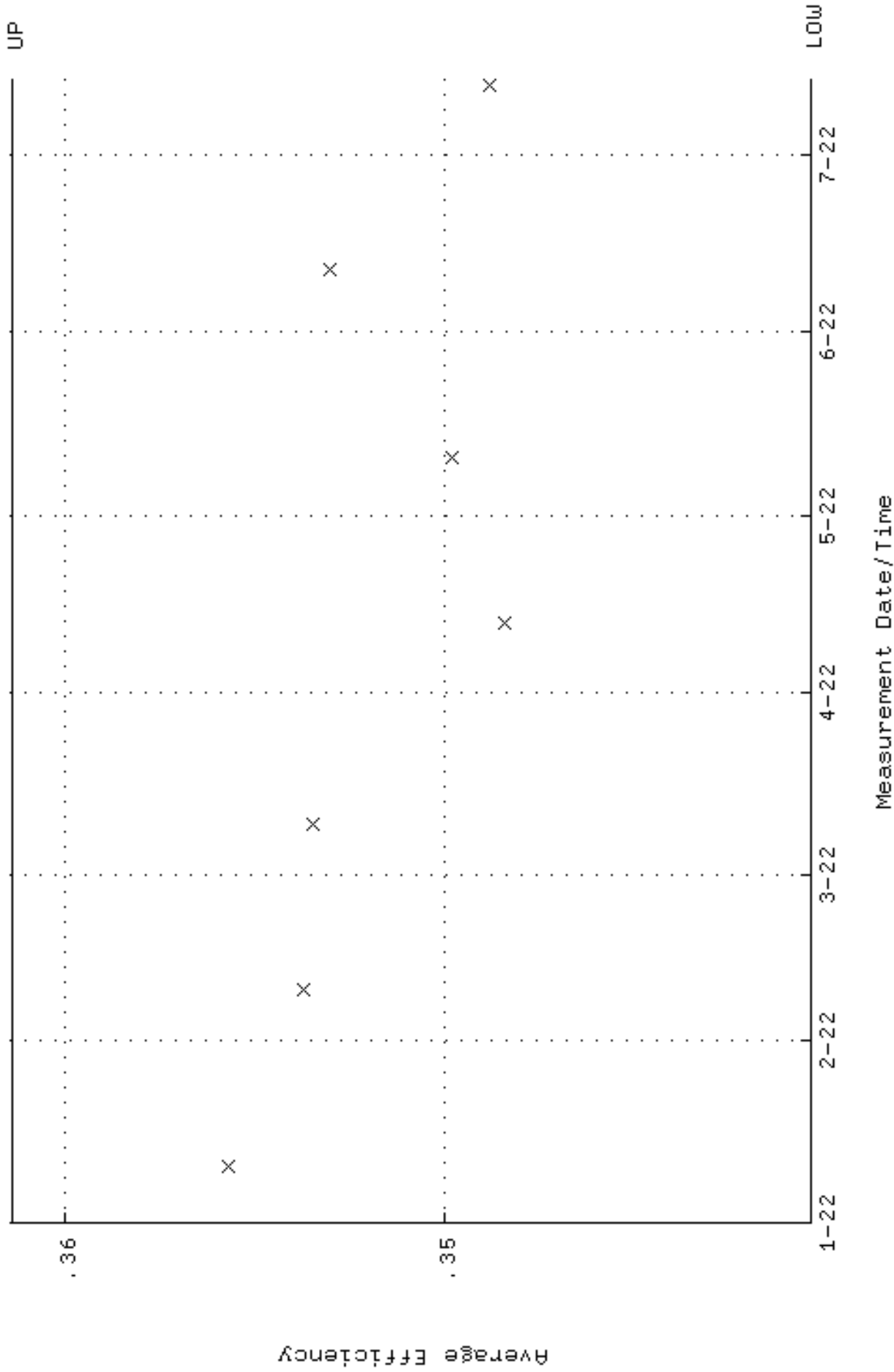
QA filename : DKA100:[ENV_ALPHA.QA.W]W105.QAF;12
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



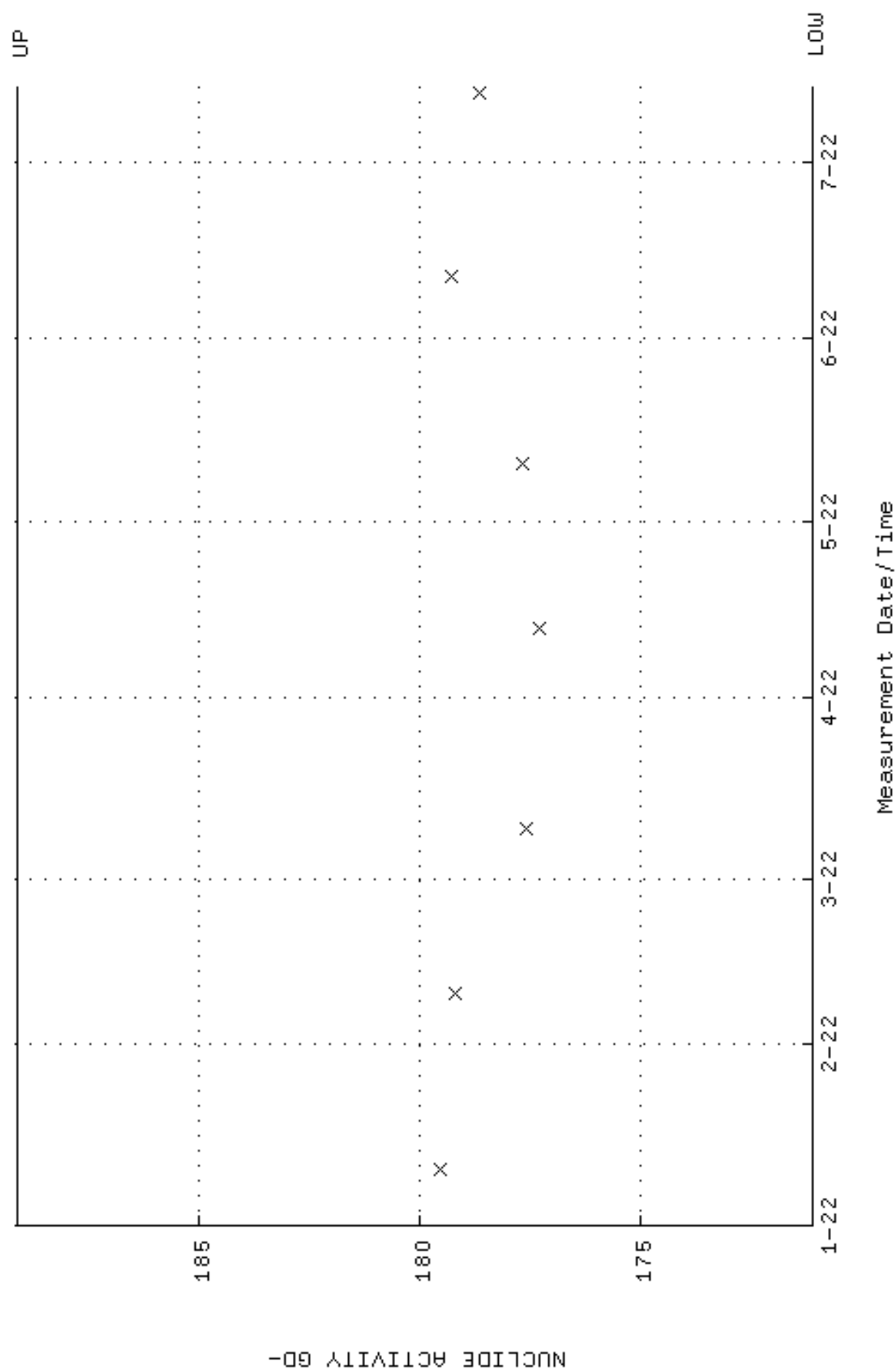
QA filename : DKA100:[ENV_ALPHA.QA.B]B105.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:55:00 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



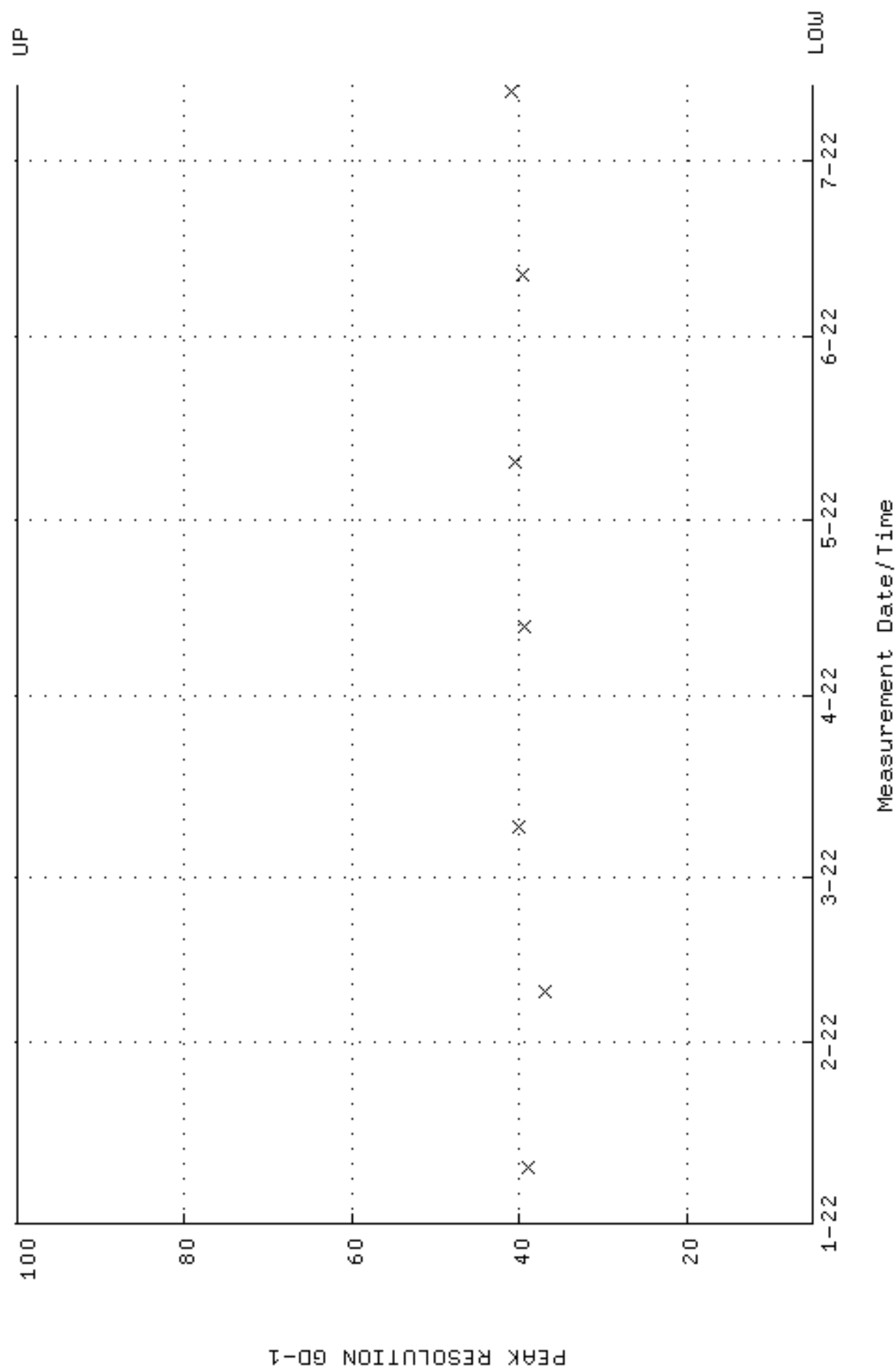
QA filename : DKA100:[ENV_ALPHA.QA.W]W106.QAF;11
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
Lower/Upper Lmts: 0.340300 through 0.361400



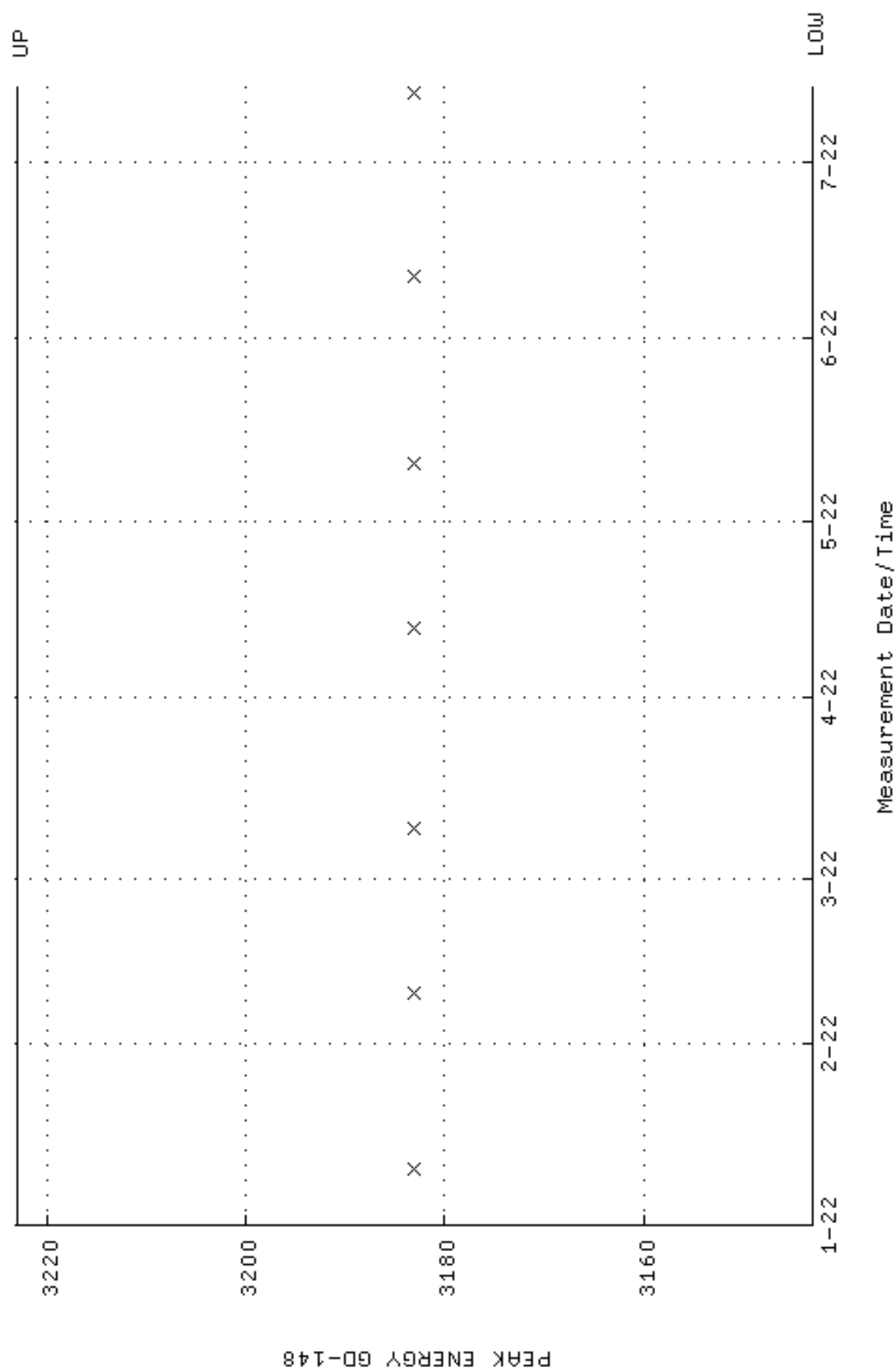
QA filename : DKA100:[ENV_ALPHA.QA.W]W106.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



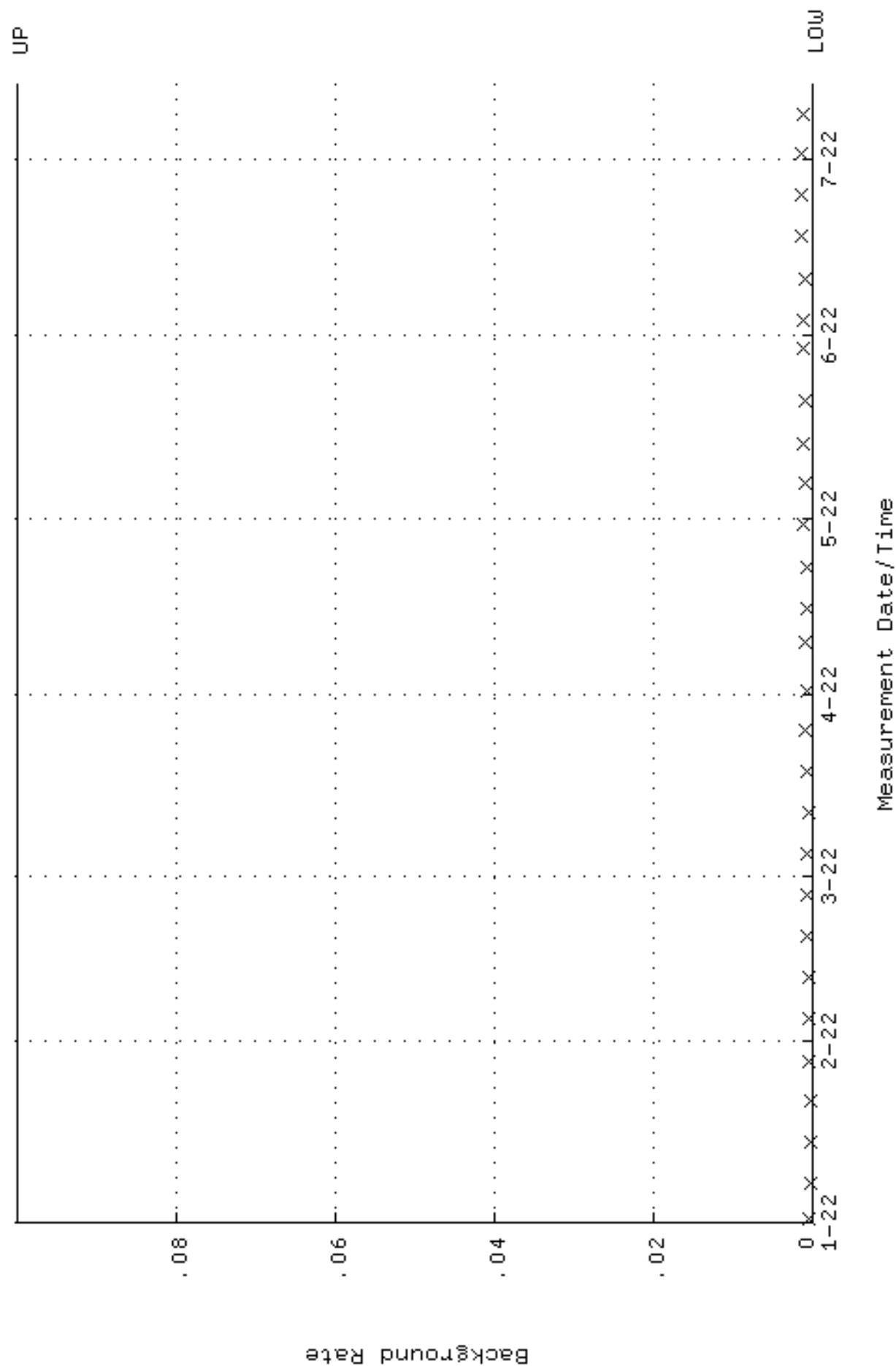
QA filename : DKA100:[ENV_ALPHA.QA.W]W106.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



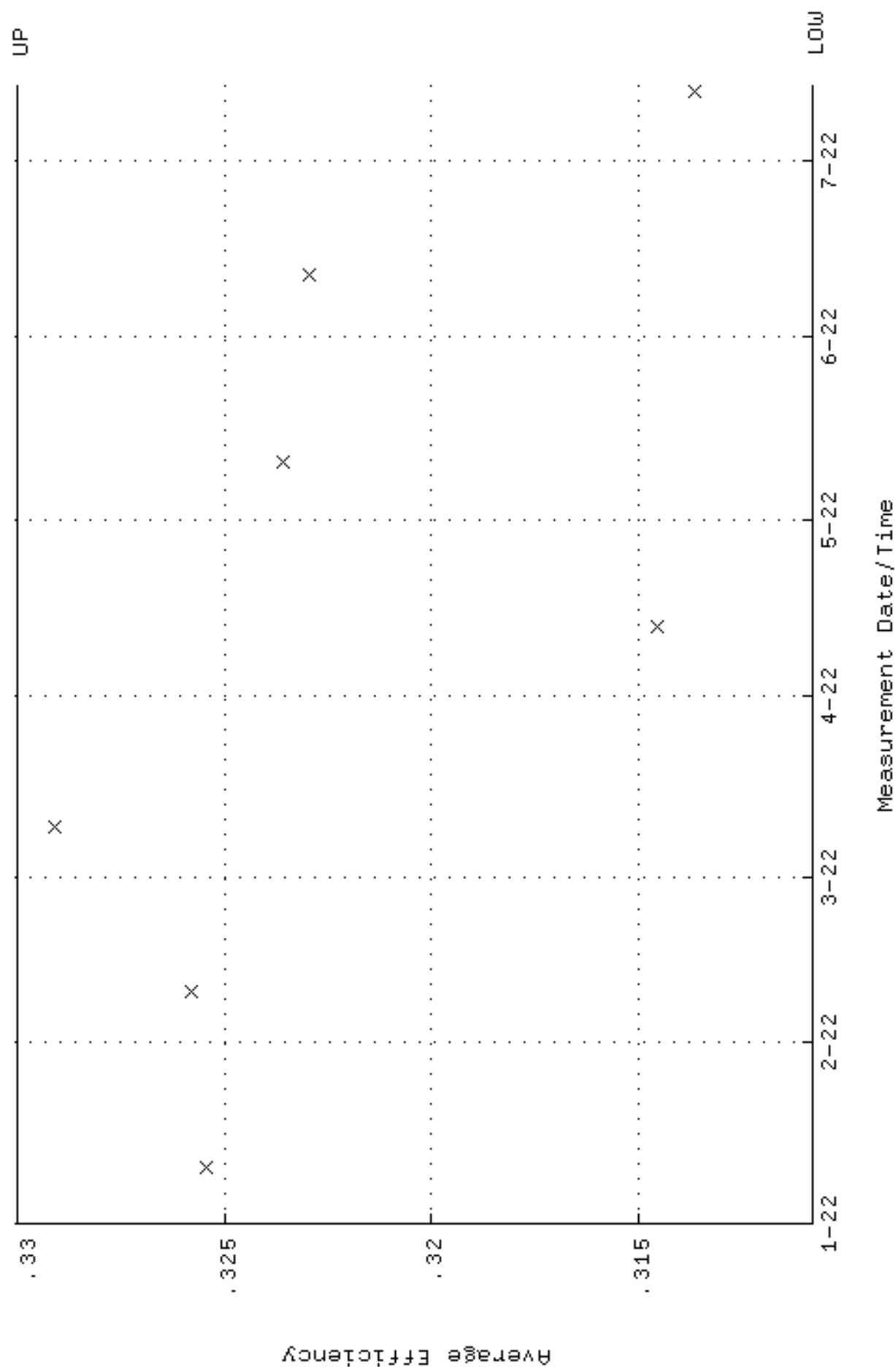
QA filename : DKA100:[ENV_ALPHA.QA.W]W106.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:14:26 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



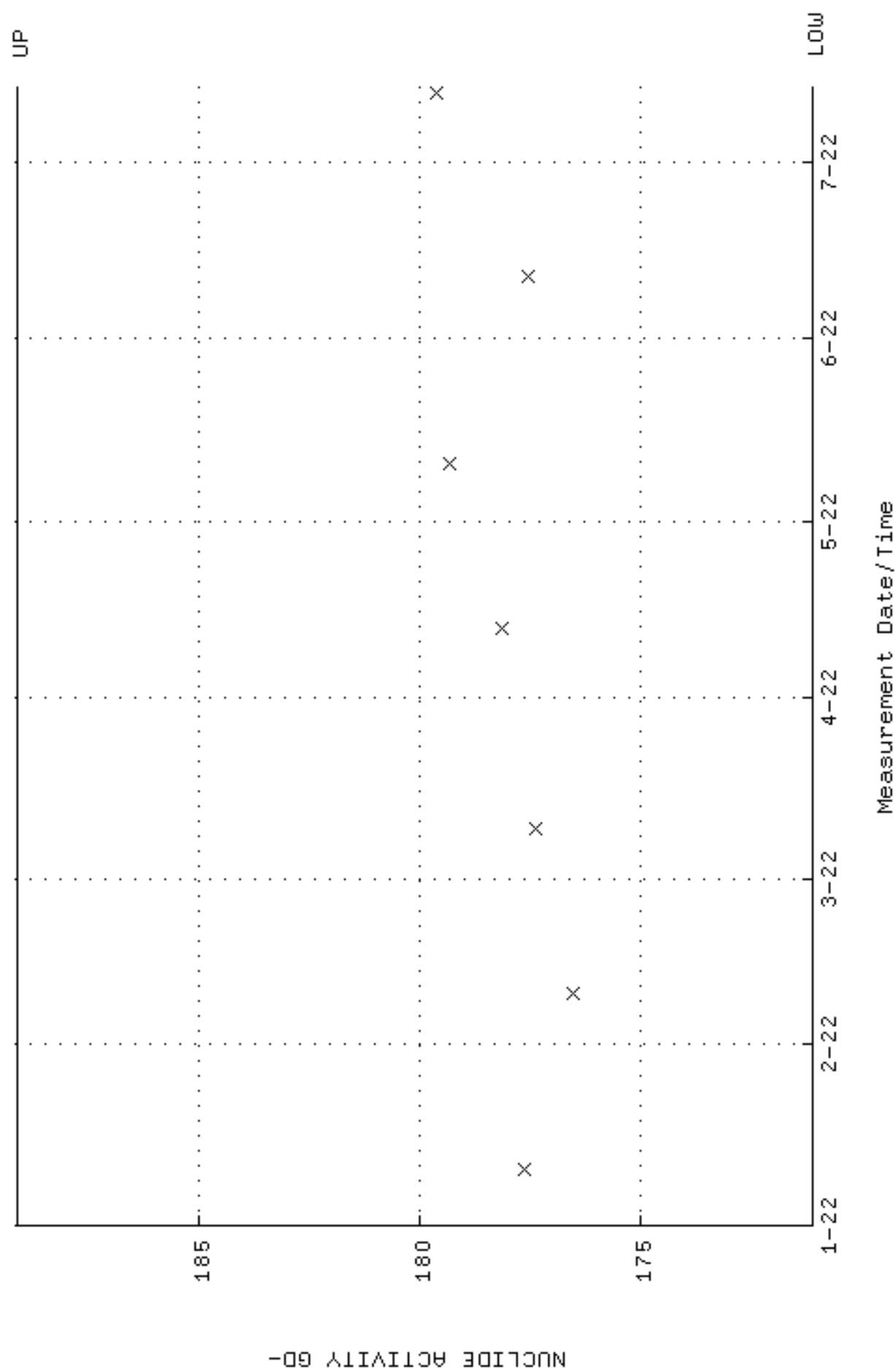
QA filename : DKA100:[ENV_ALPHA.QA.B]B106.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:55:00 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



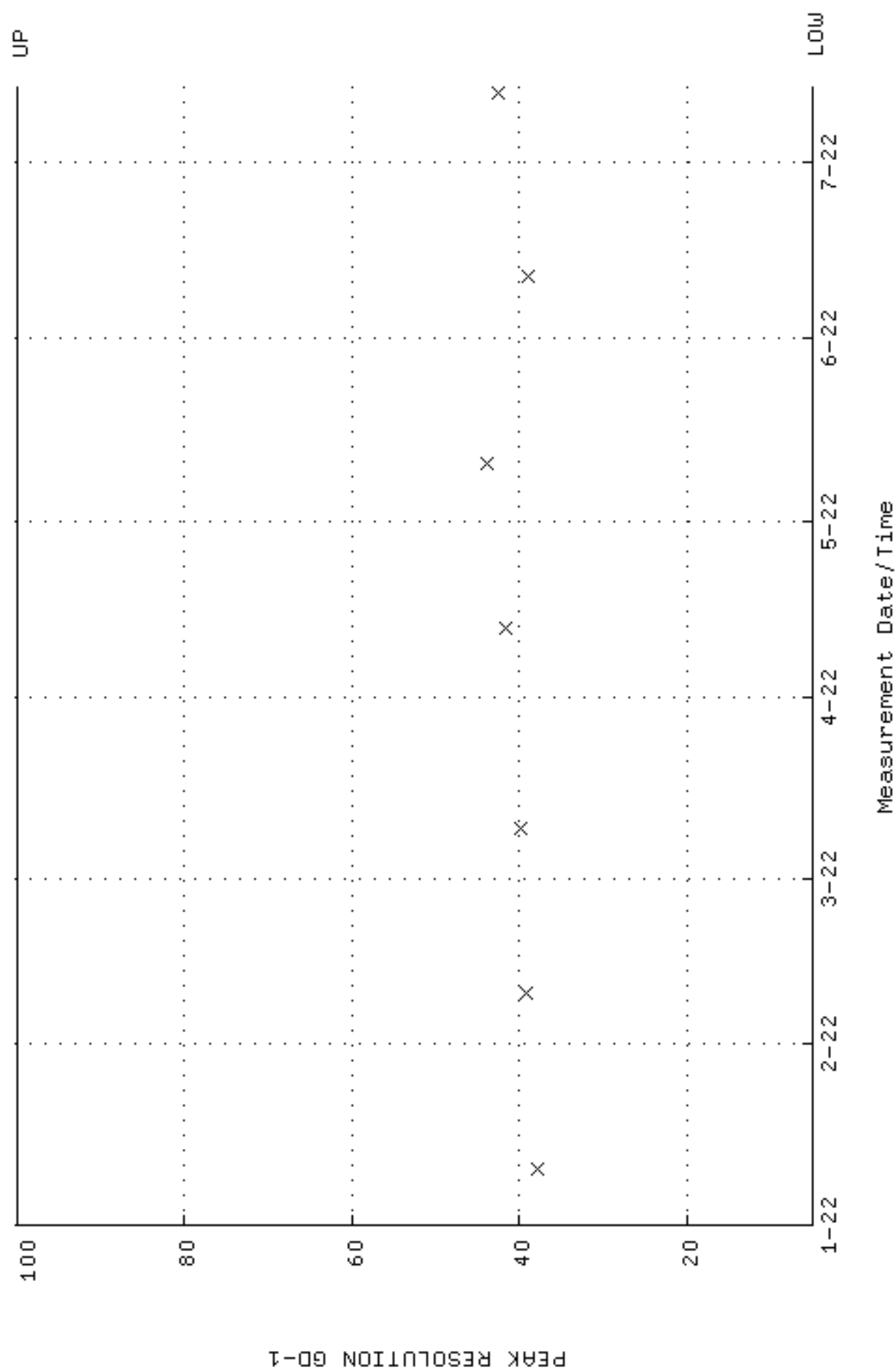
QA filename : DKA100:[ENV_ALPHA.QA.W]W107.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-JAN-2022 11:18:01 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.310800 through 0.330000



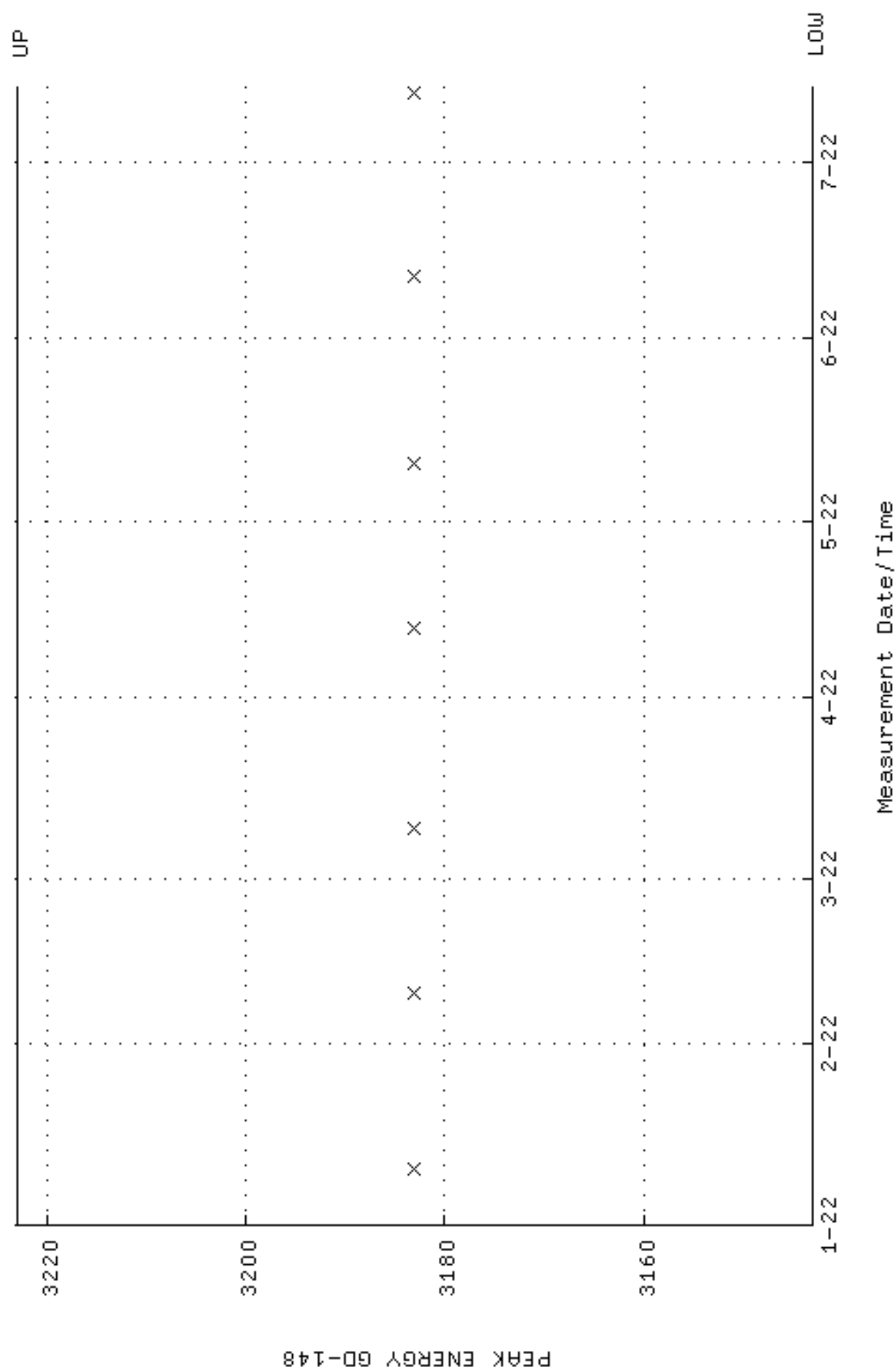
QA filename : DKA100:[ENV_ALPHA.QA.W]W107.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-JAN-2022 11:18:01 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



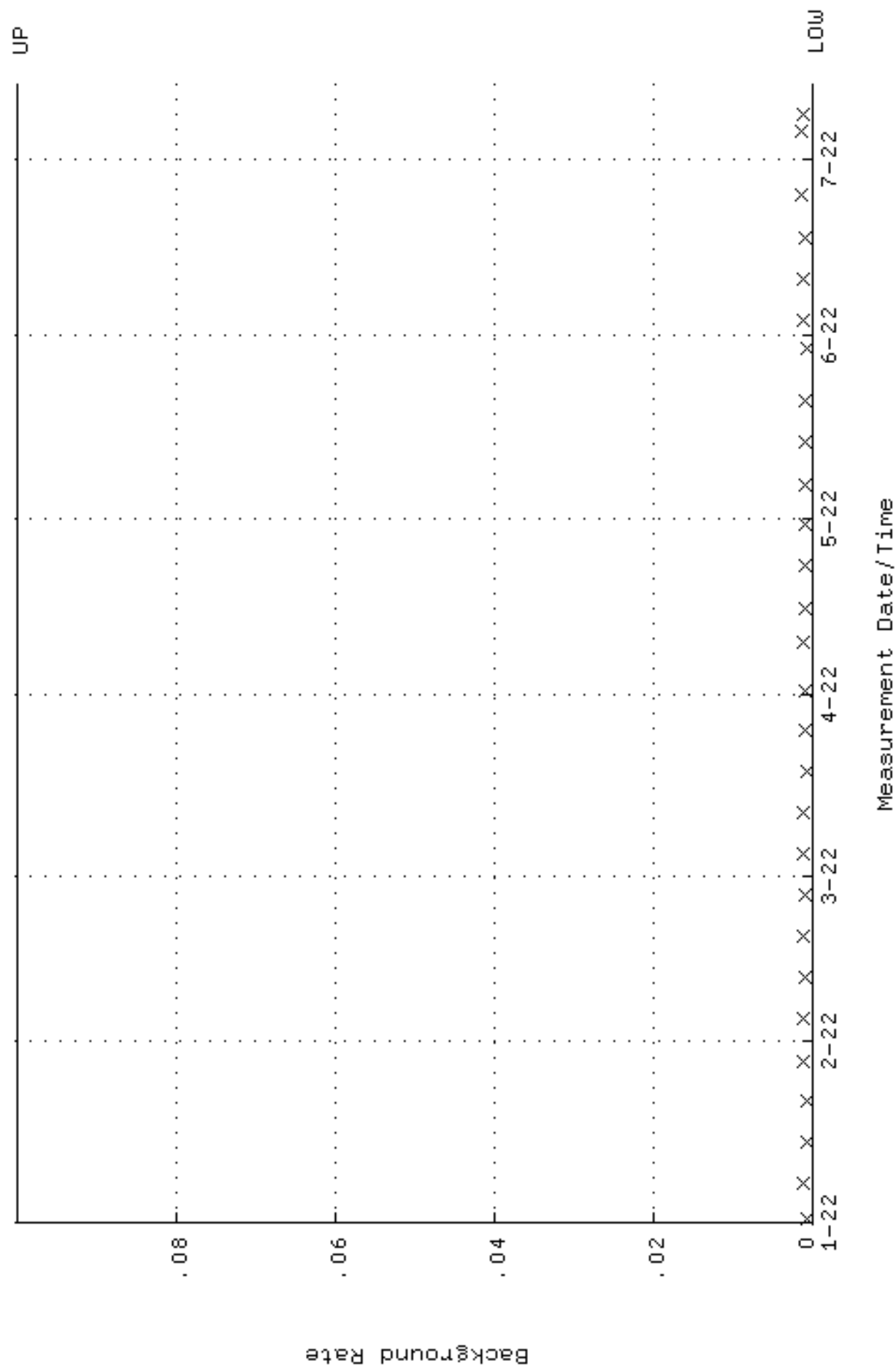
QA filename : DKA100:[ENV_ALPHA.QA.W]W107.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-JAN-2022 11:18:01 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



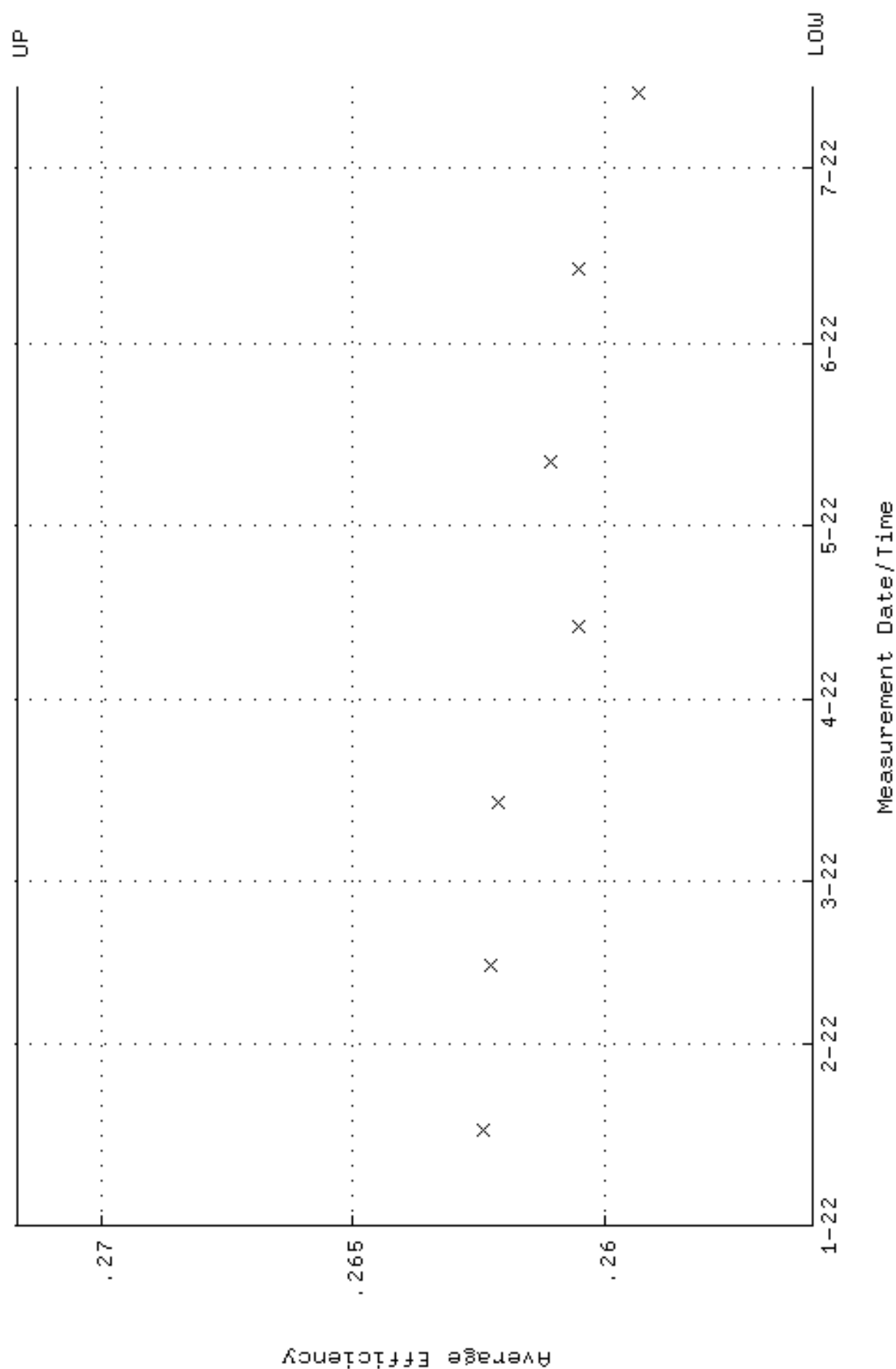
QA filename : DKA100:[ENV_ALPHA.QA.W]W107.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-JAN-2022 11:18:01 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



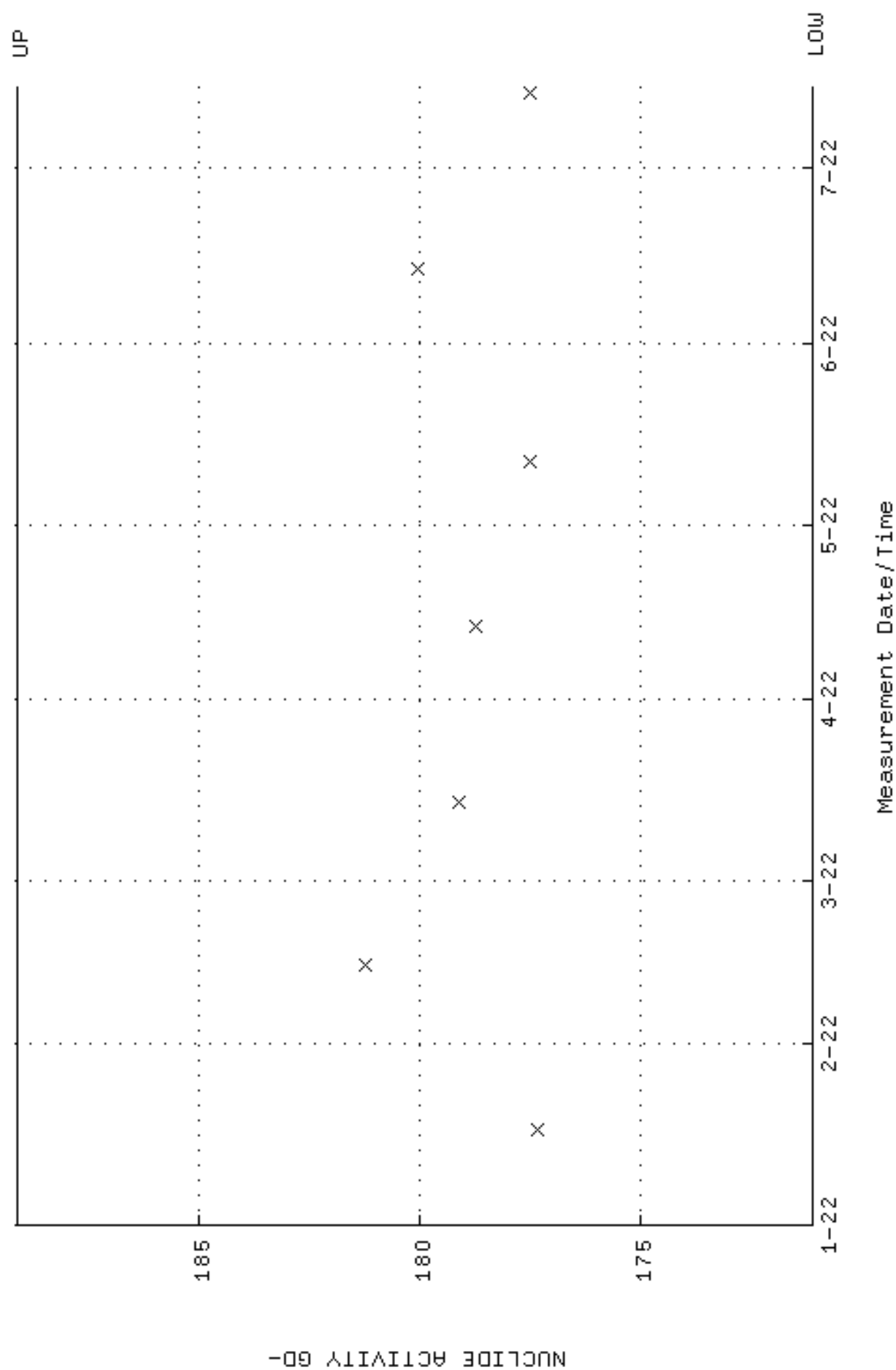
QA filename : DKA100:[ENV_ALPHA.QA.B]B107.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 12:55:01 through 13-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



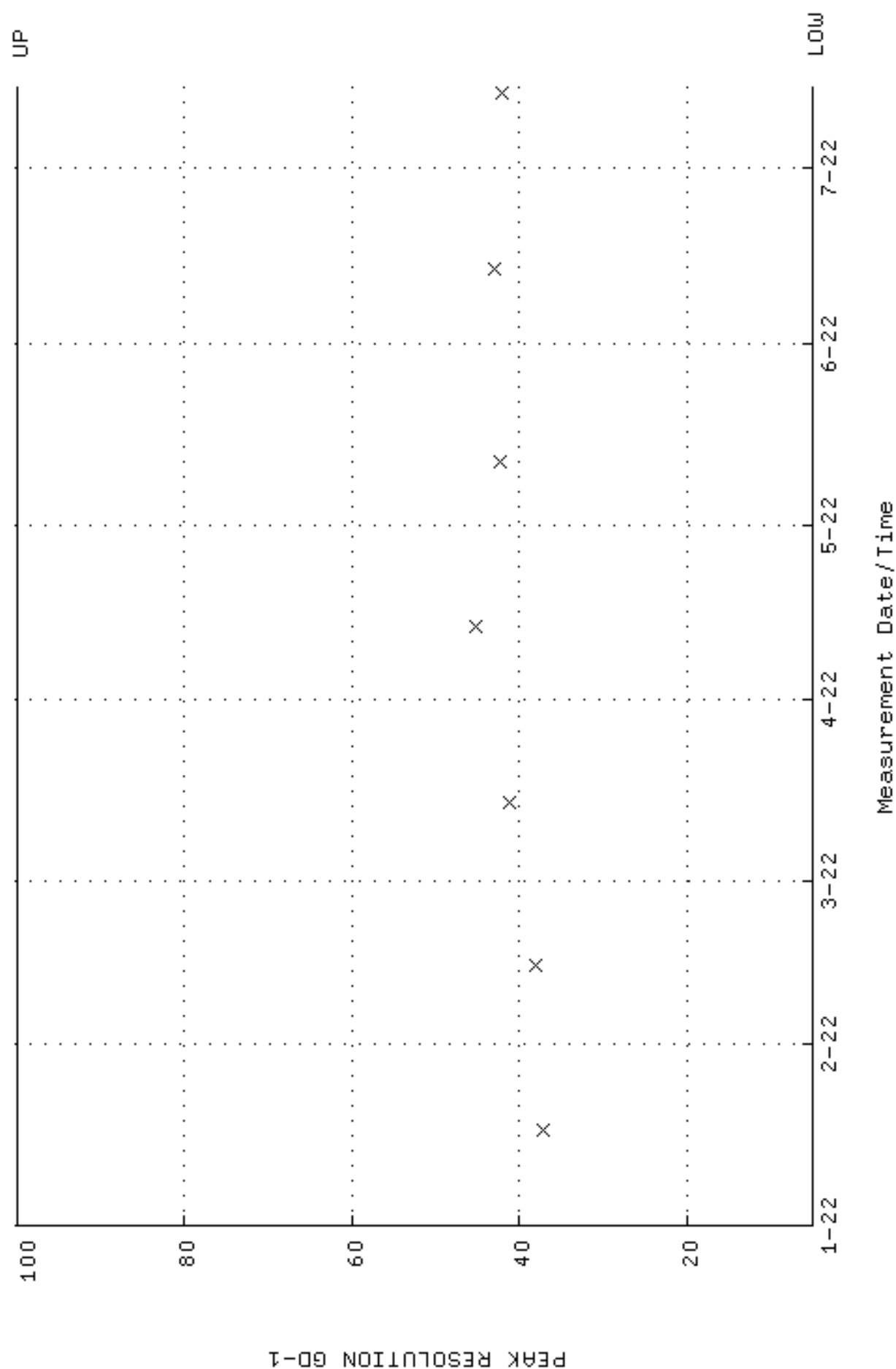
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 17-JAN-2022 08:51:51 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.255850 through 0.271680



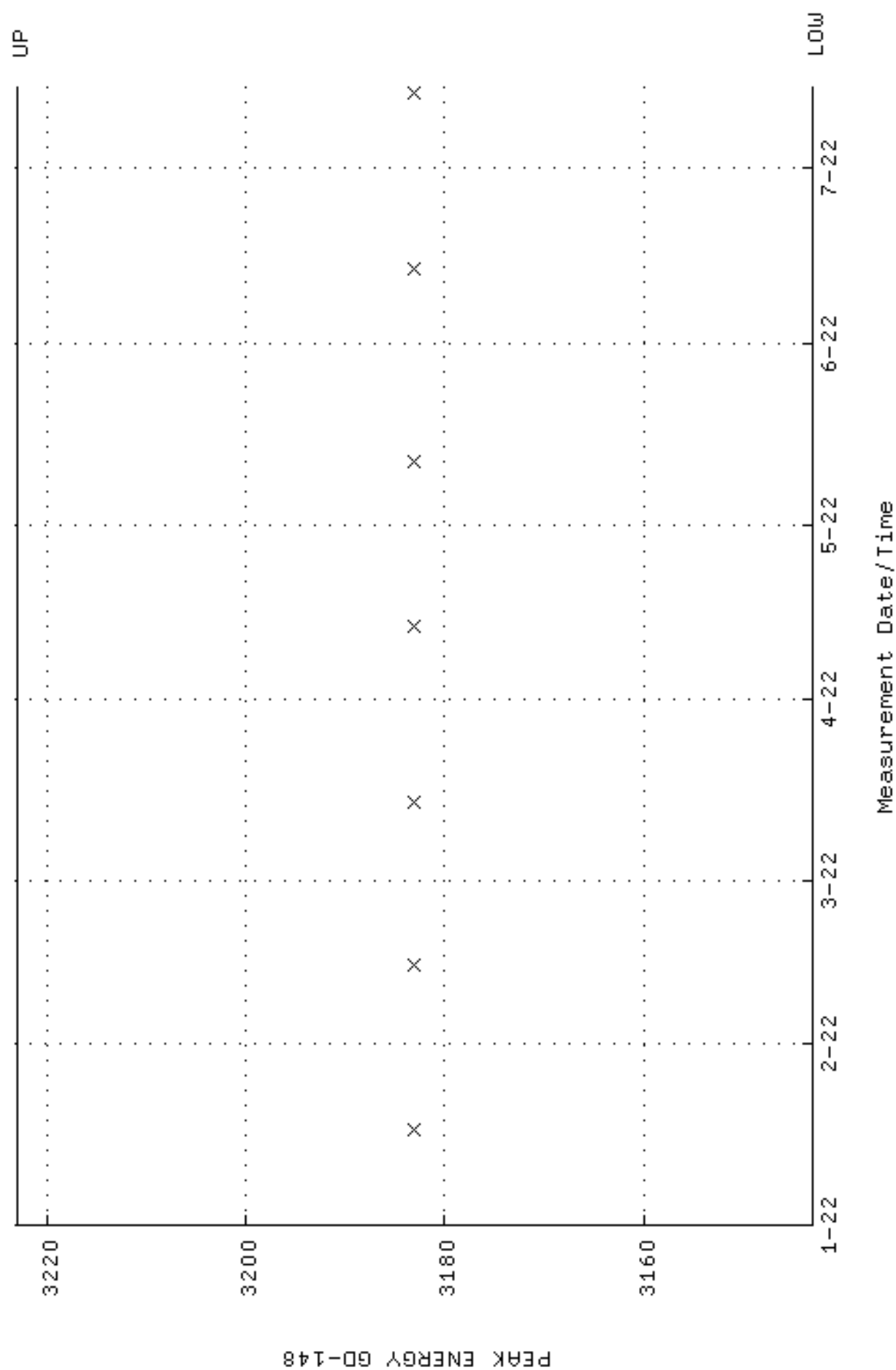
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 17-JAN-2022 08:51:51 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



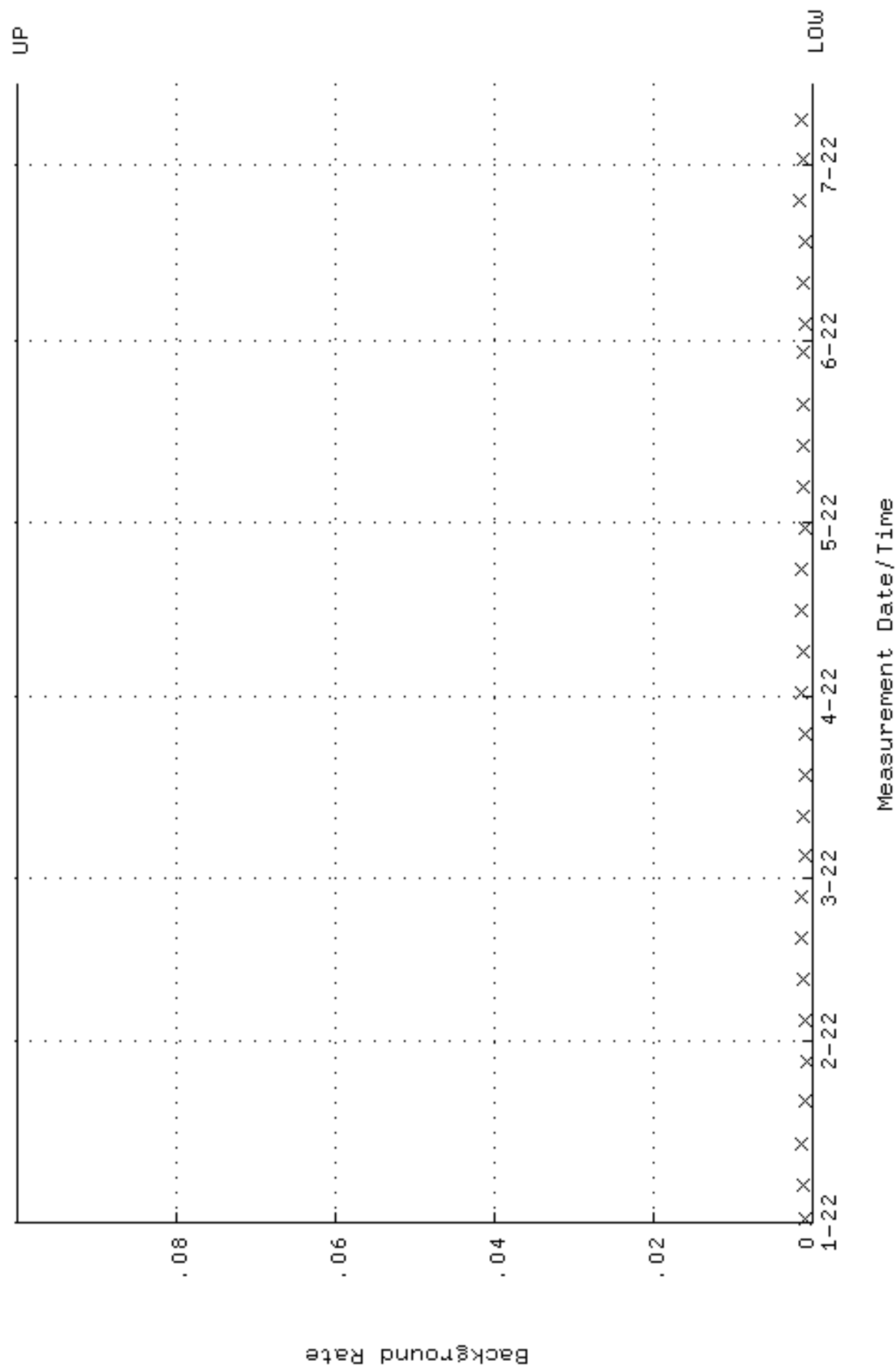
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 17-JAN-2022 08:51:51 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



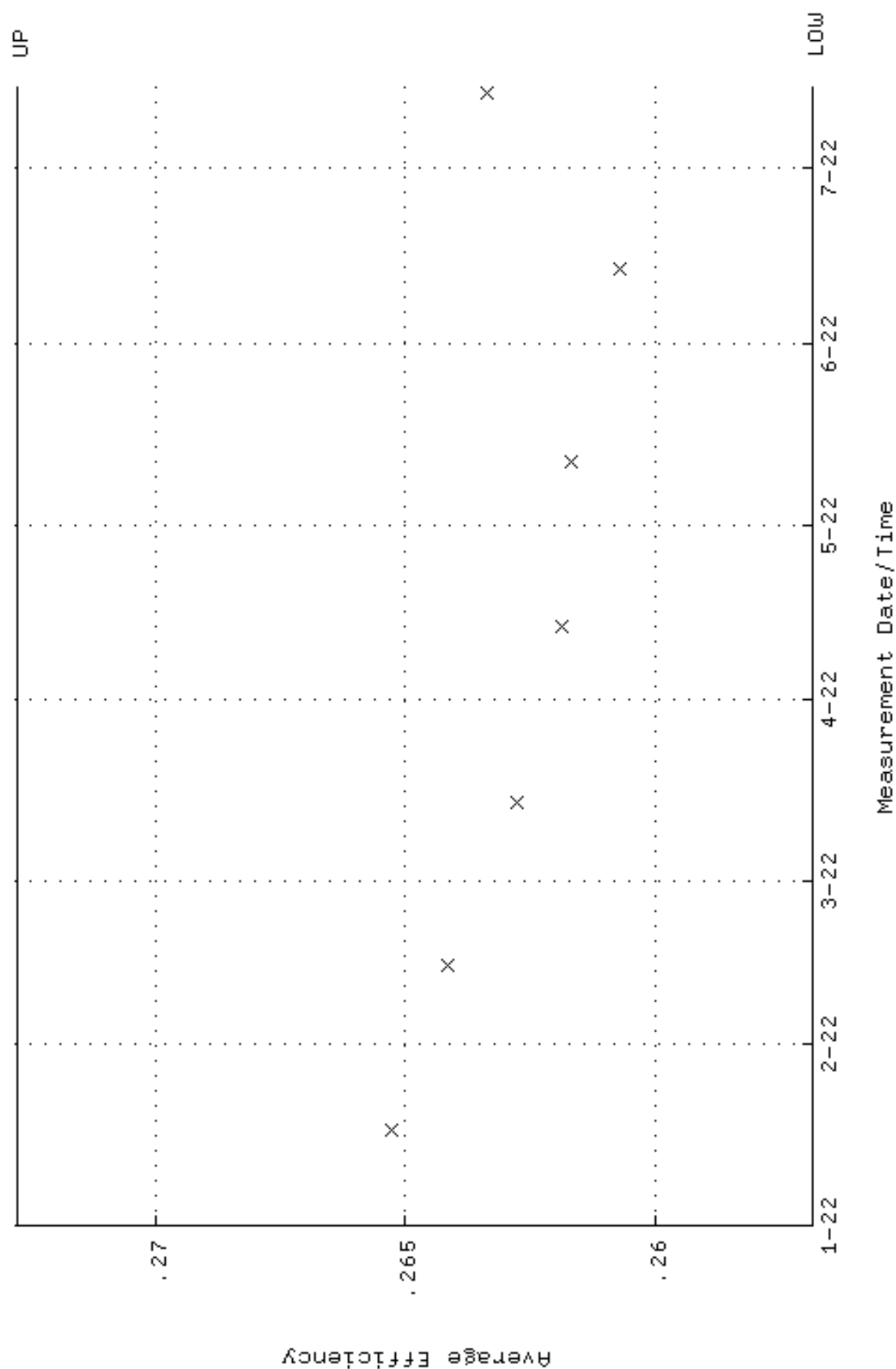
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 17-JAN-2022 08:51:51 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



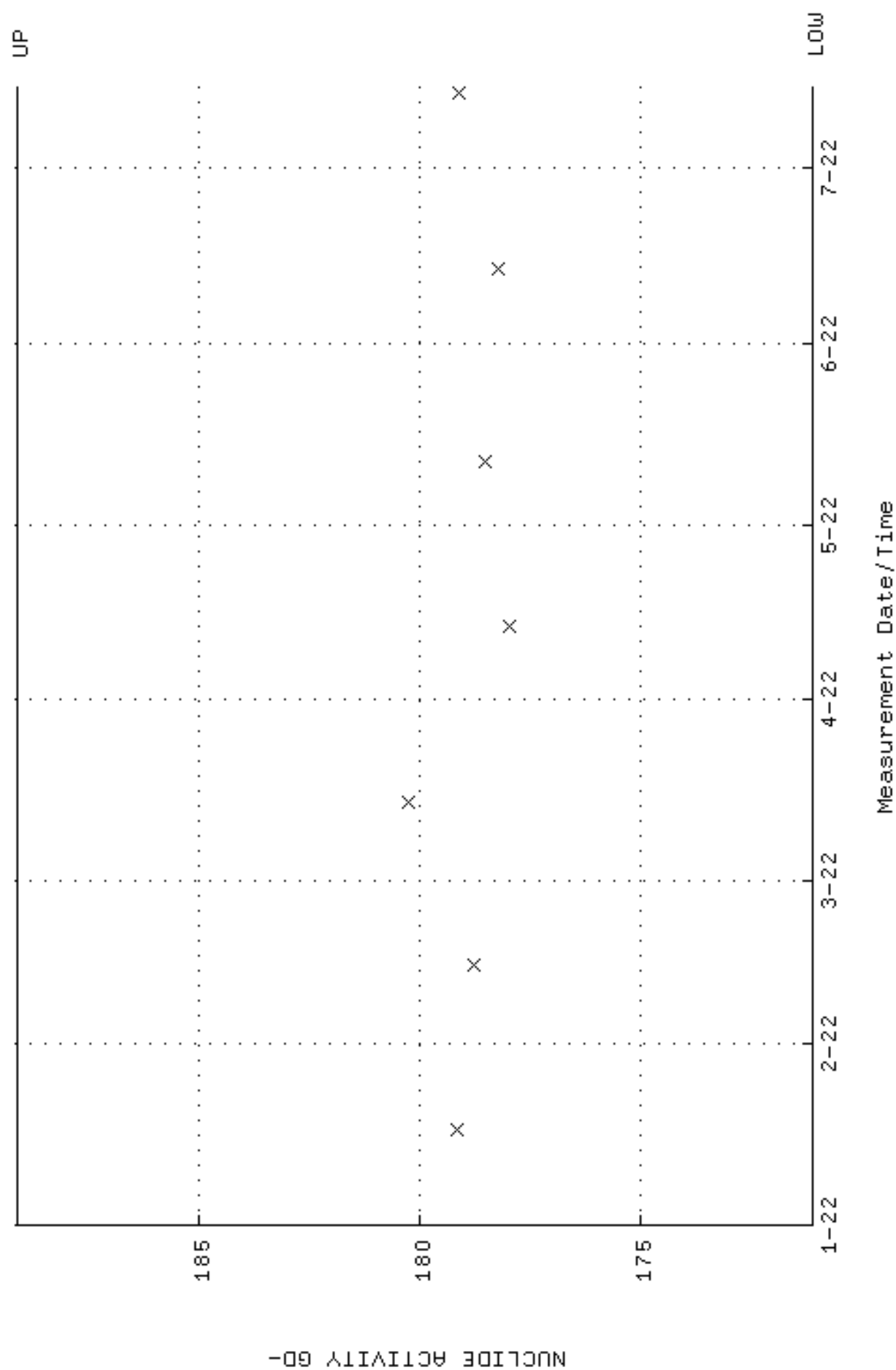
QA filename : DKA100:[ENV_ALPHA.QA.B]B113.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:04:29 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



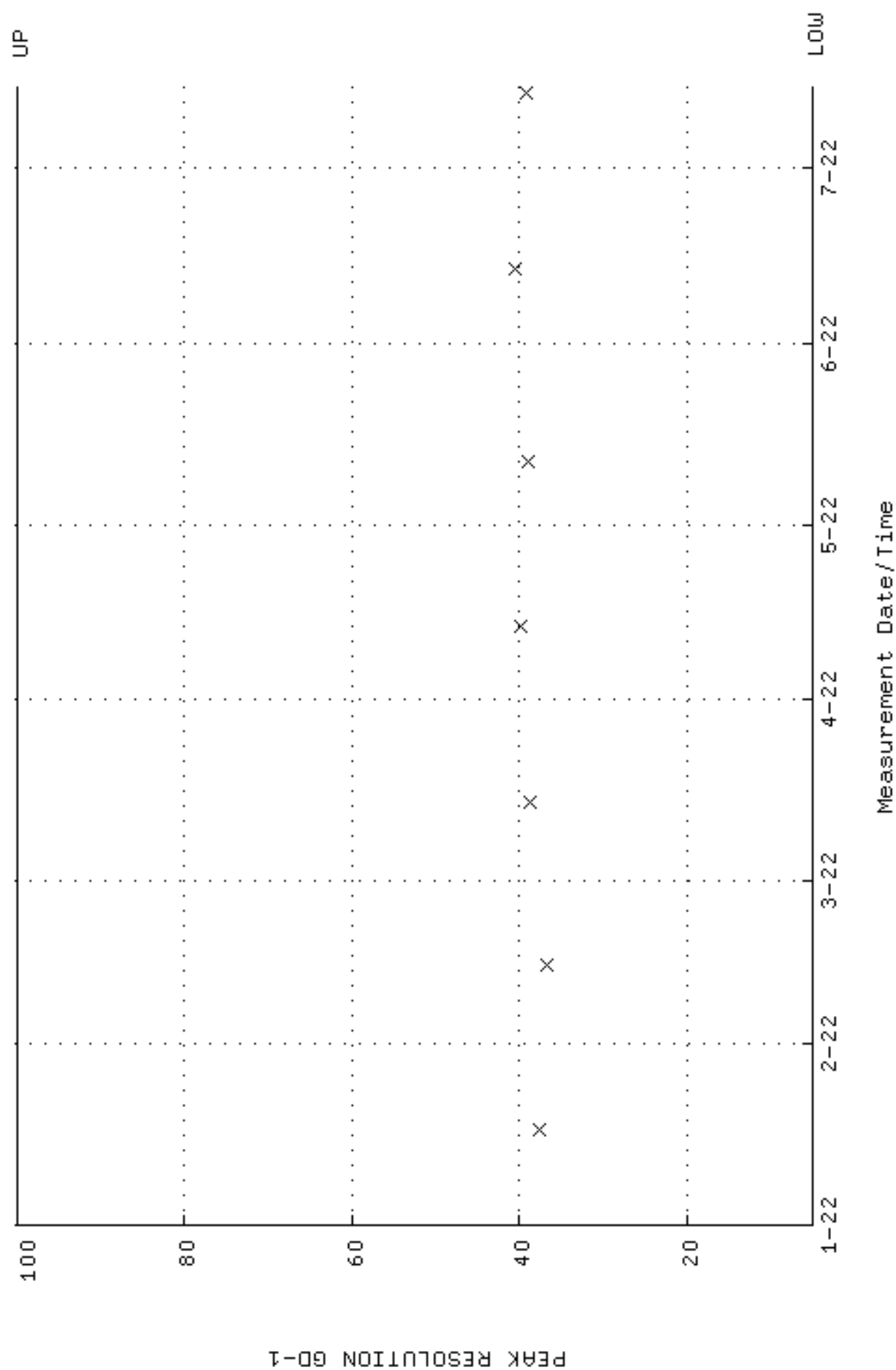
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 17-JAN-2022 09:45:58 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.256860 through 0.272750



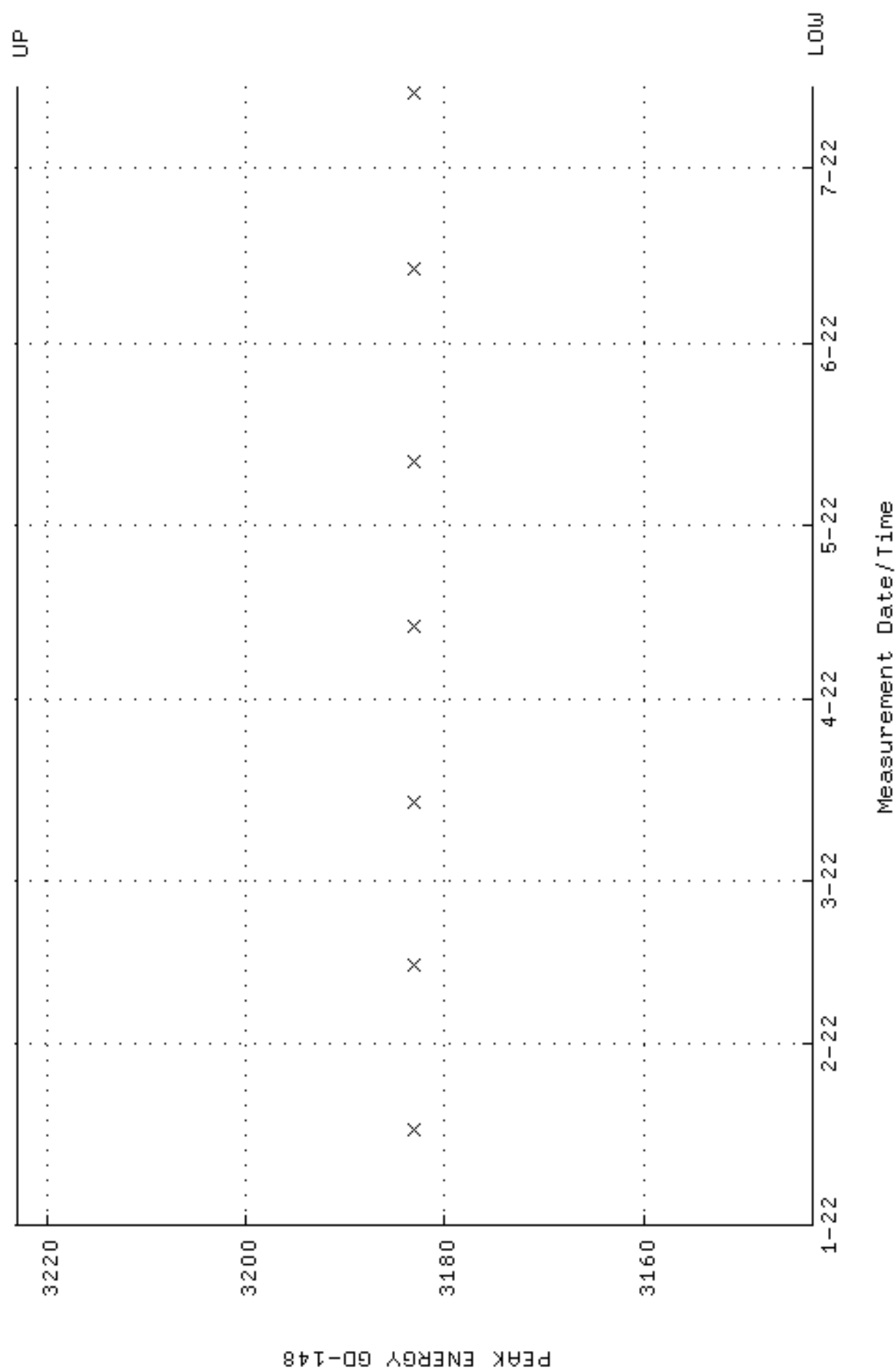
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 17-JAN-2022 09:45:58 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



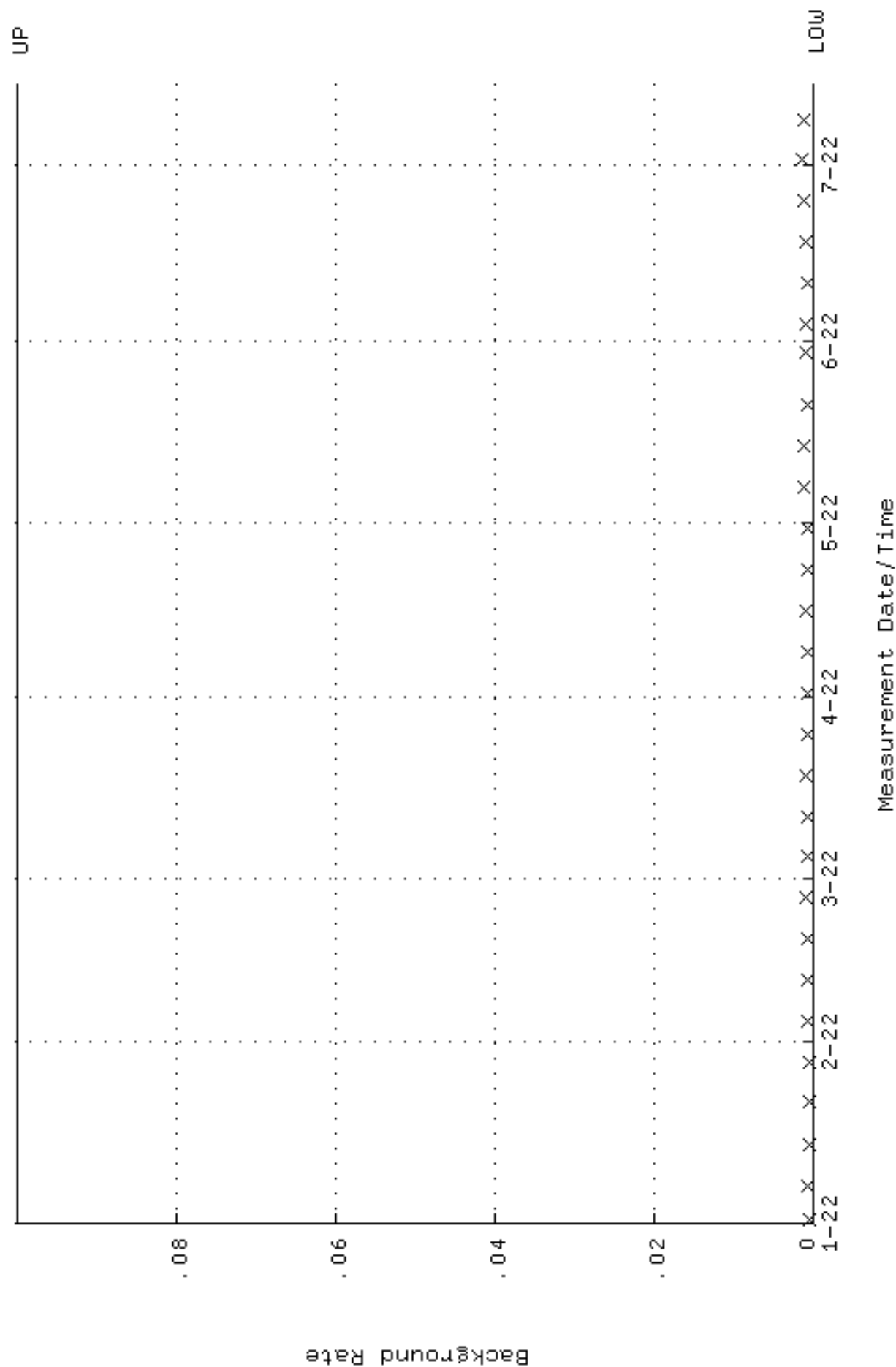
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 17-JAN-2022 09:45:58 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



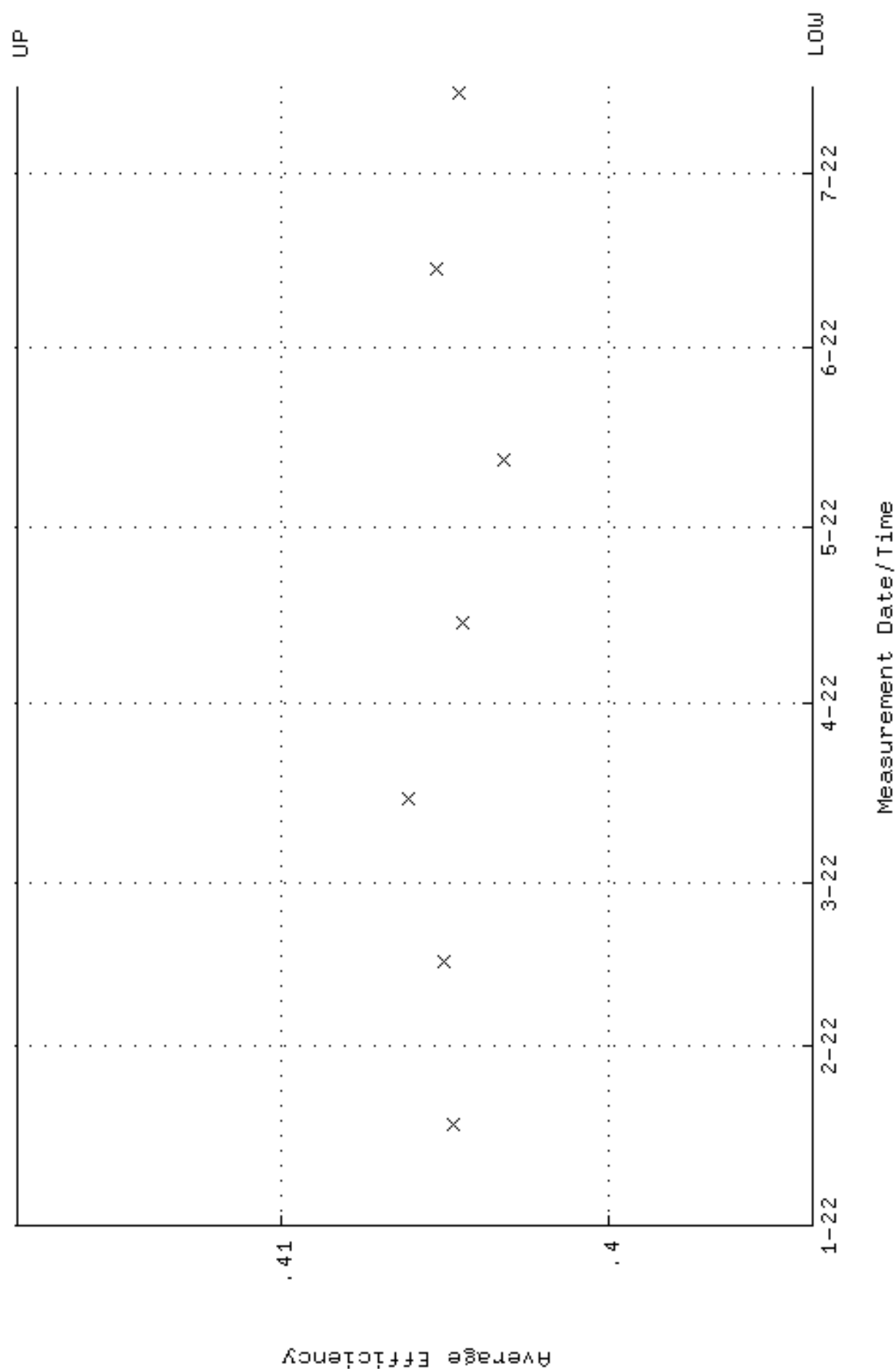
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 17-JAN-2022 09:45:58 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



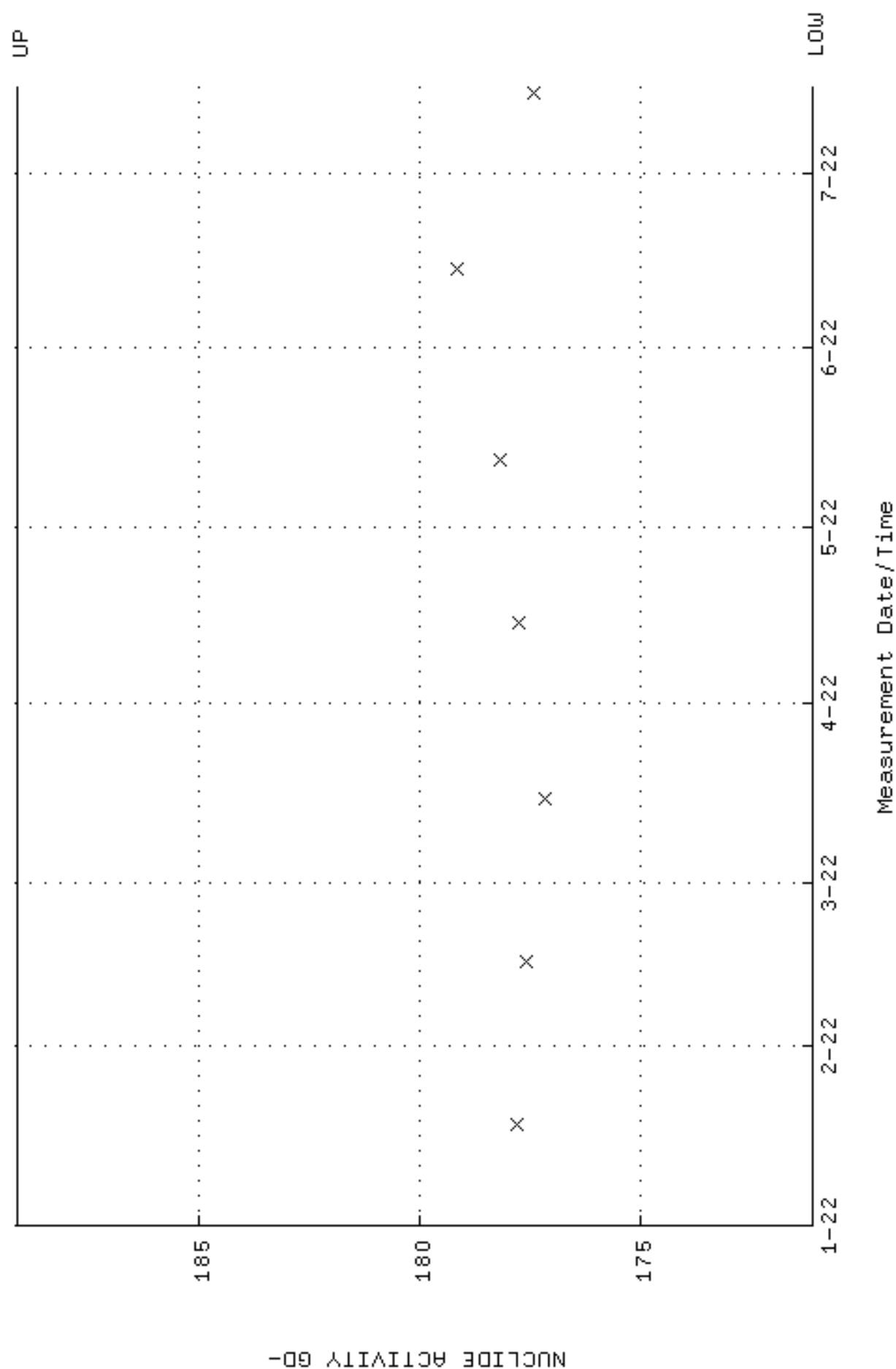
QA filename : DKA100:[ENV_ALPHA.QA.B]B114.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:04:33 through 14-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



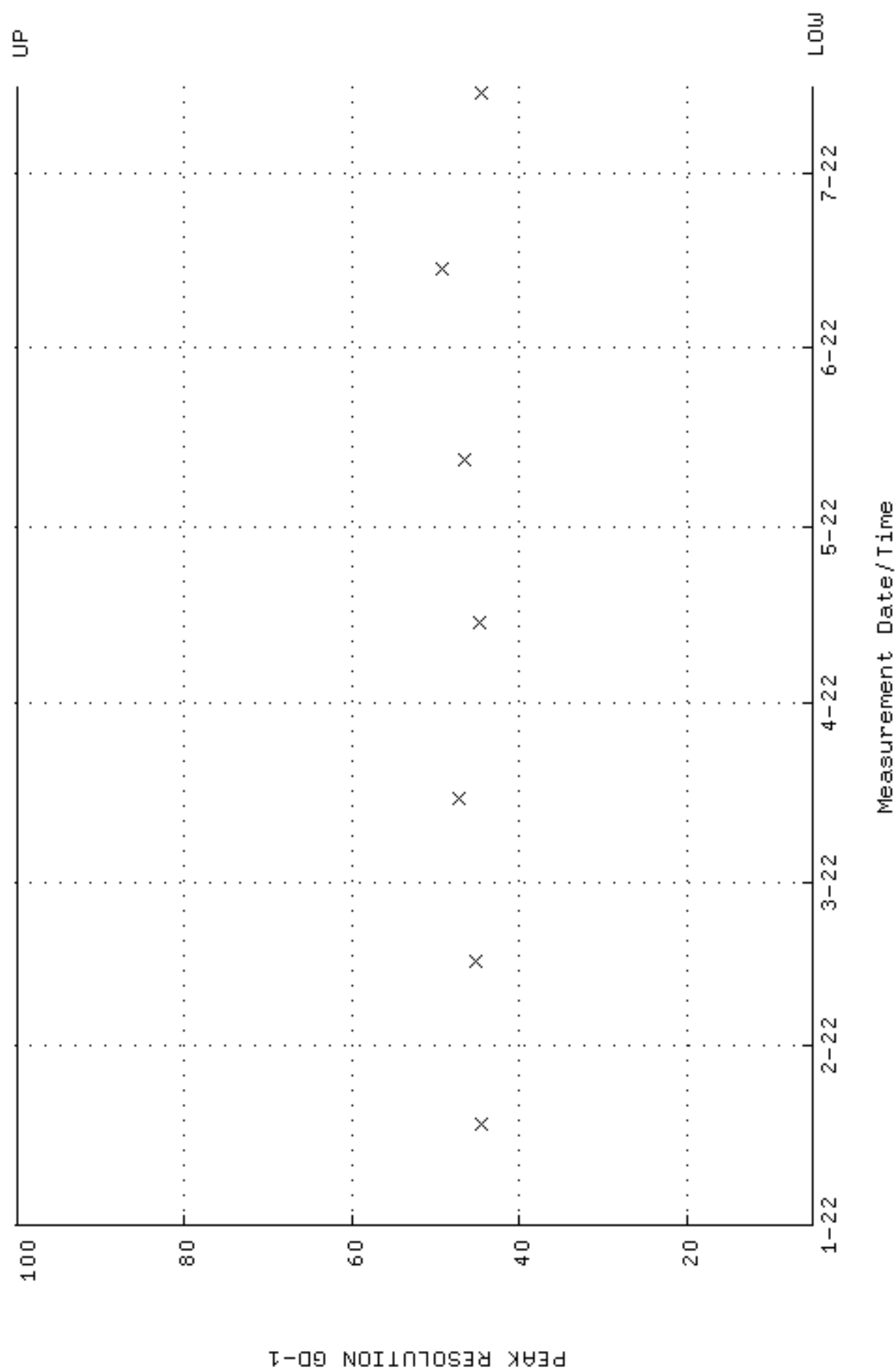
QA filename : DKA100:[ENV_ALPHA.QA.W]W149.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JAN-2022 09:20:18 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.393740 through 0.418090



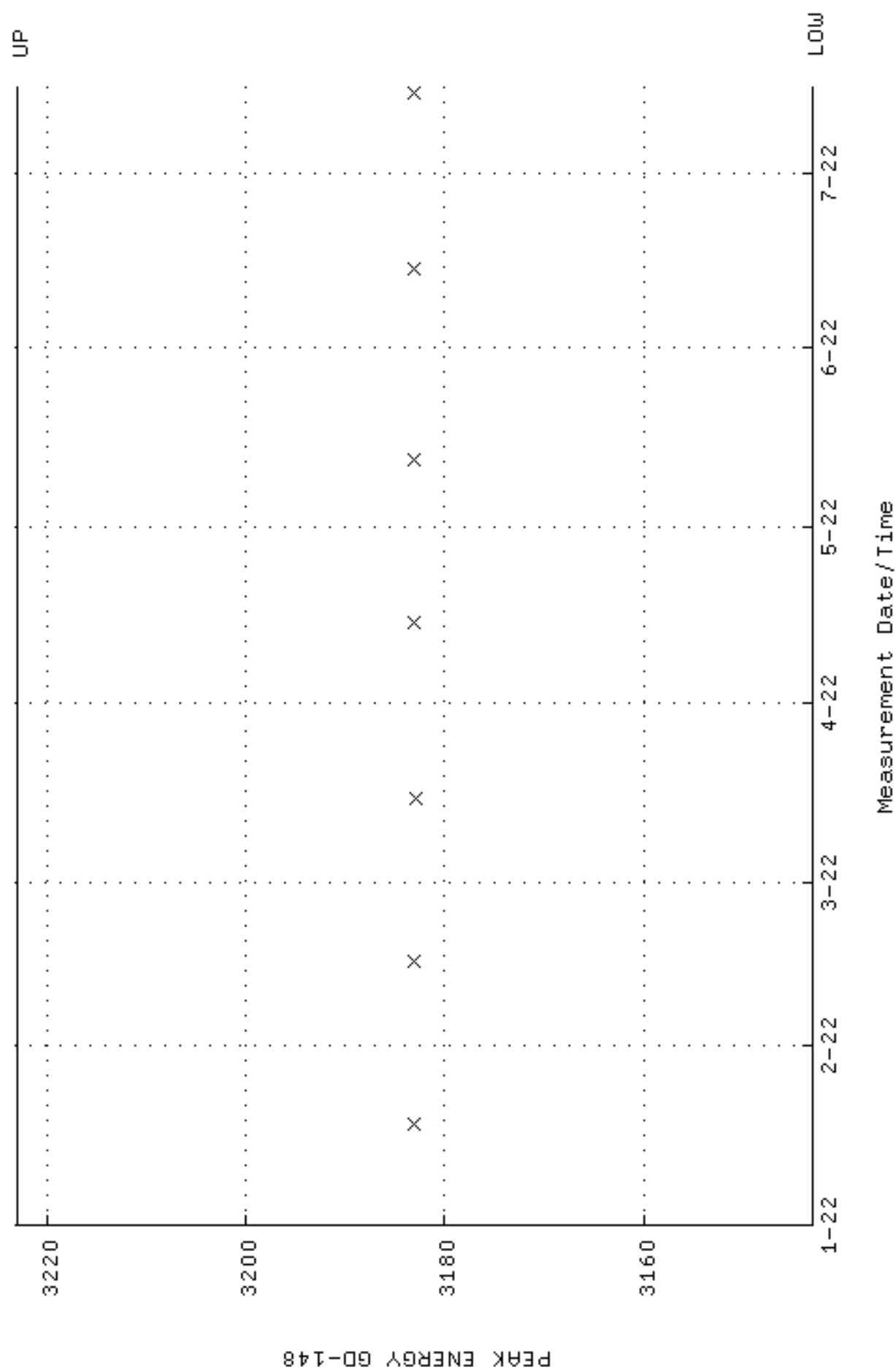
QA filename : DKA100:[ENV_ALPHA.QA.W]W149.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JAN-2022 09:20:18 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



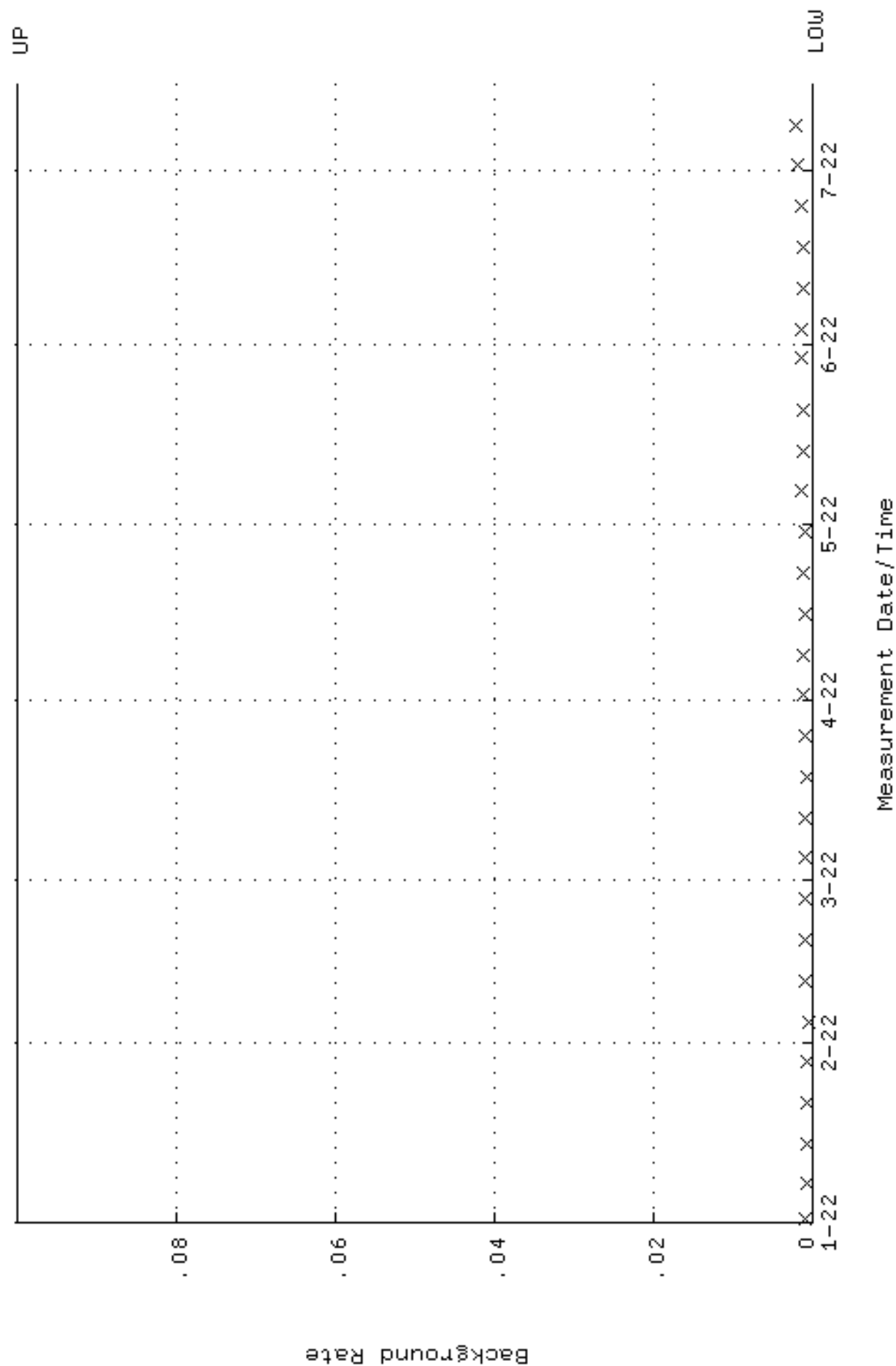
QA filename : DKA100:[ENV_ALPHA.QA.W]W149.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JAN-2022 09:20:18 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



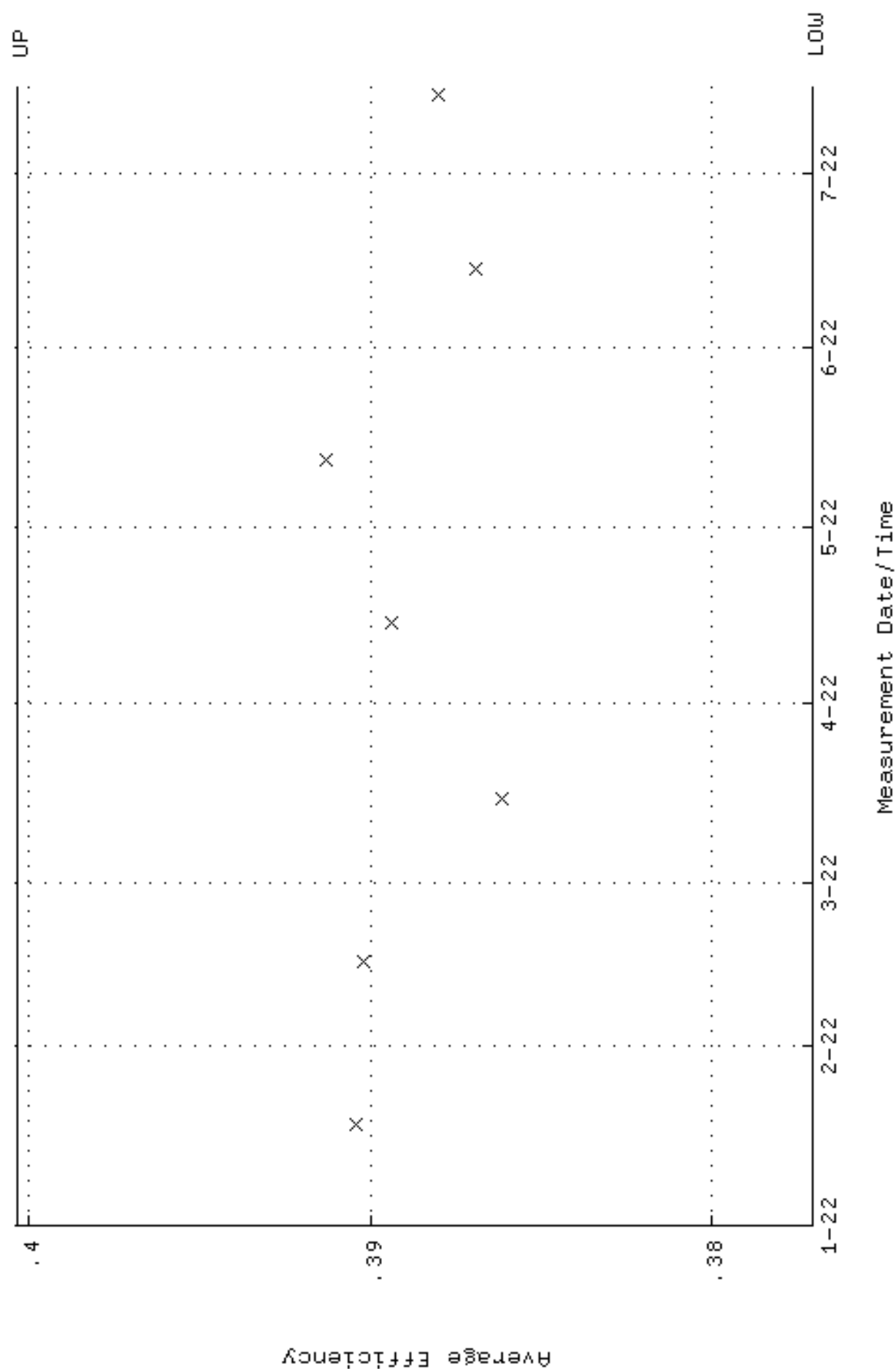
QA filename : DKA100:[ENV_ALPHA.QA.W]W149.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JAN-2022 09:20:18 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



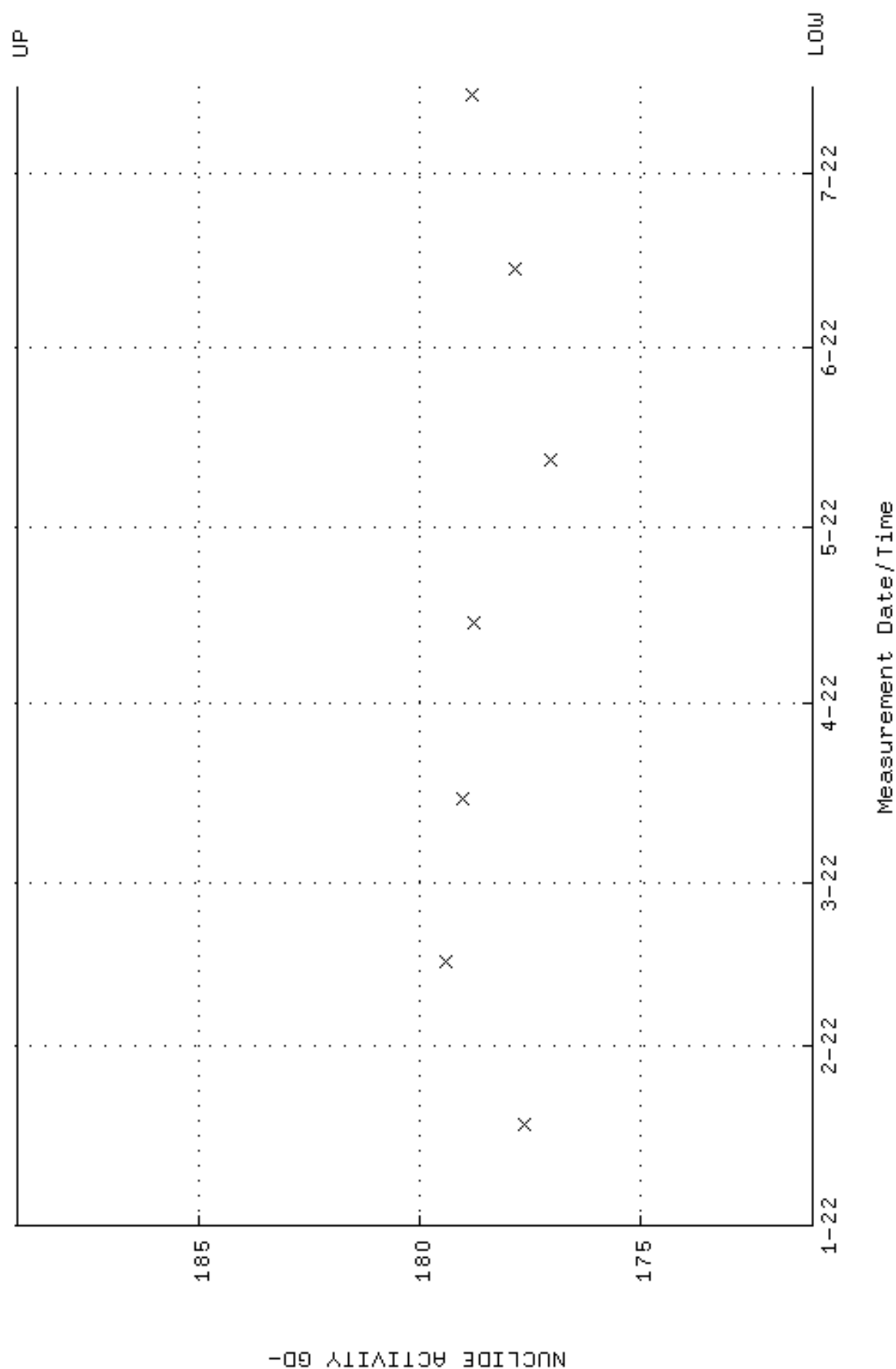
QA filename : DKA100:[ENV_ALPHA.QA.B]B149.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:07:03 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



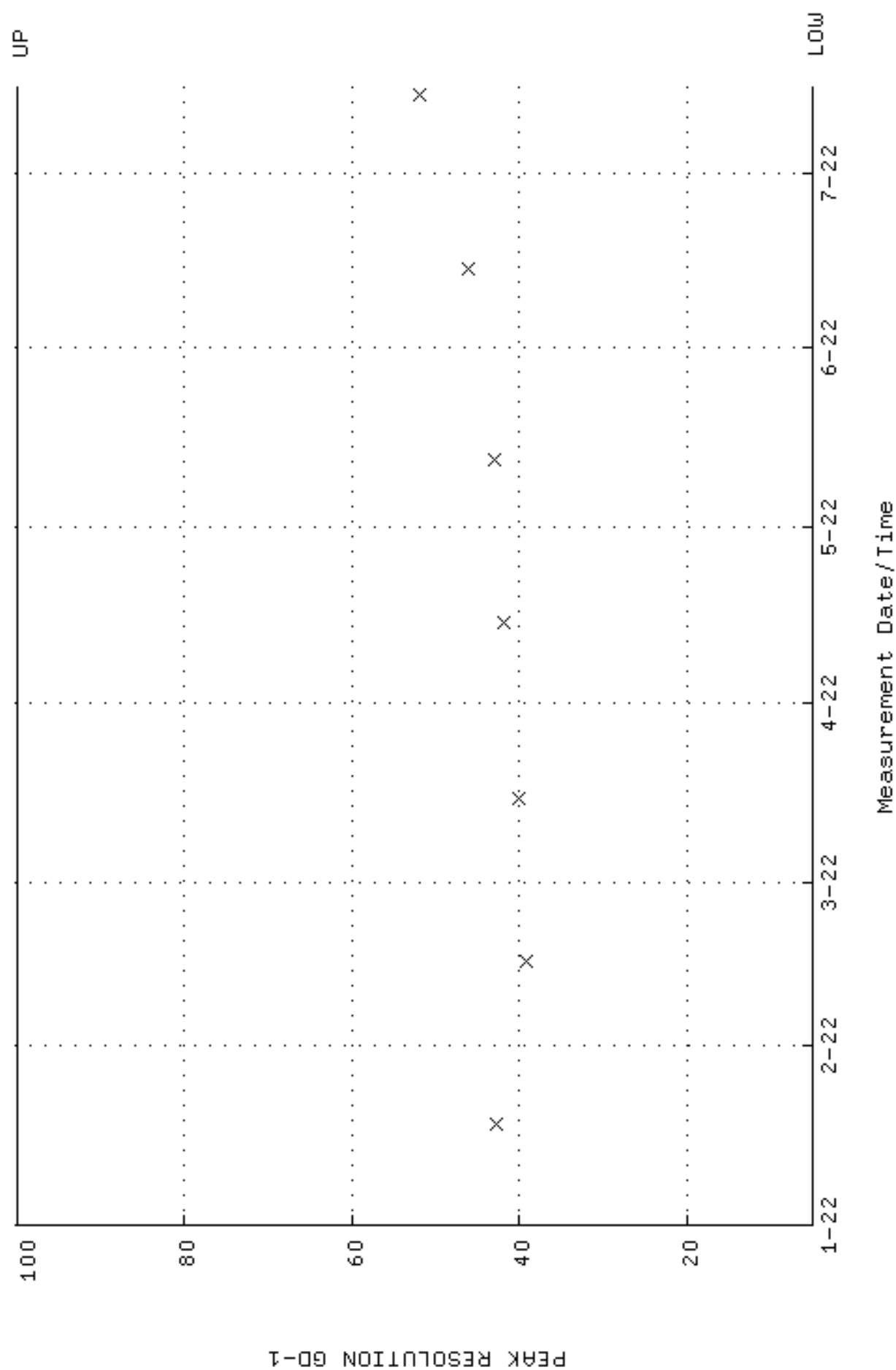
QA filename : DKA100:[ENV_ALPHA.QA.W]W152.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JAN-2022 08:56:42 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.377030 through 0.400350



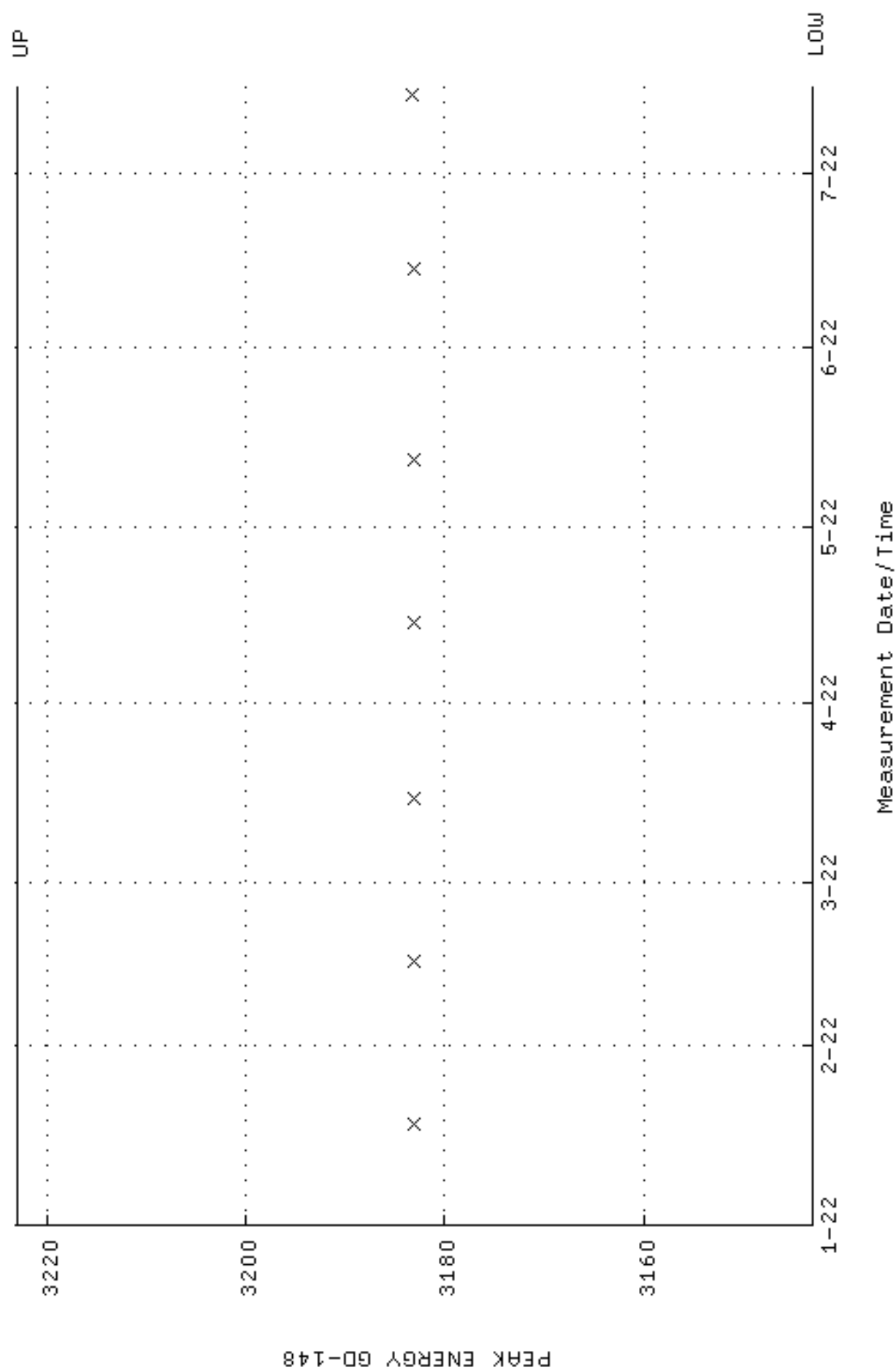
QA filename : DKA100:[ENV_ALPHA.QA.W]W152.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JAN-2022 08:56:42 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



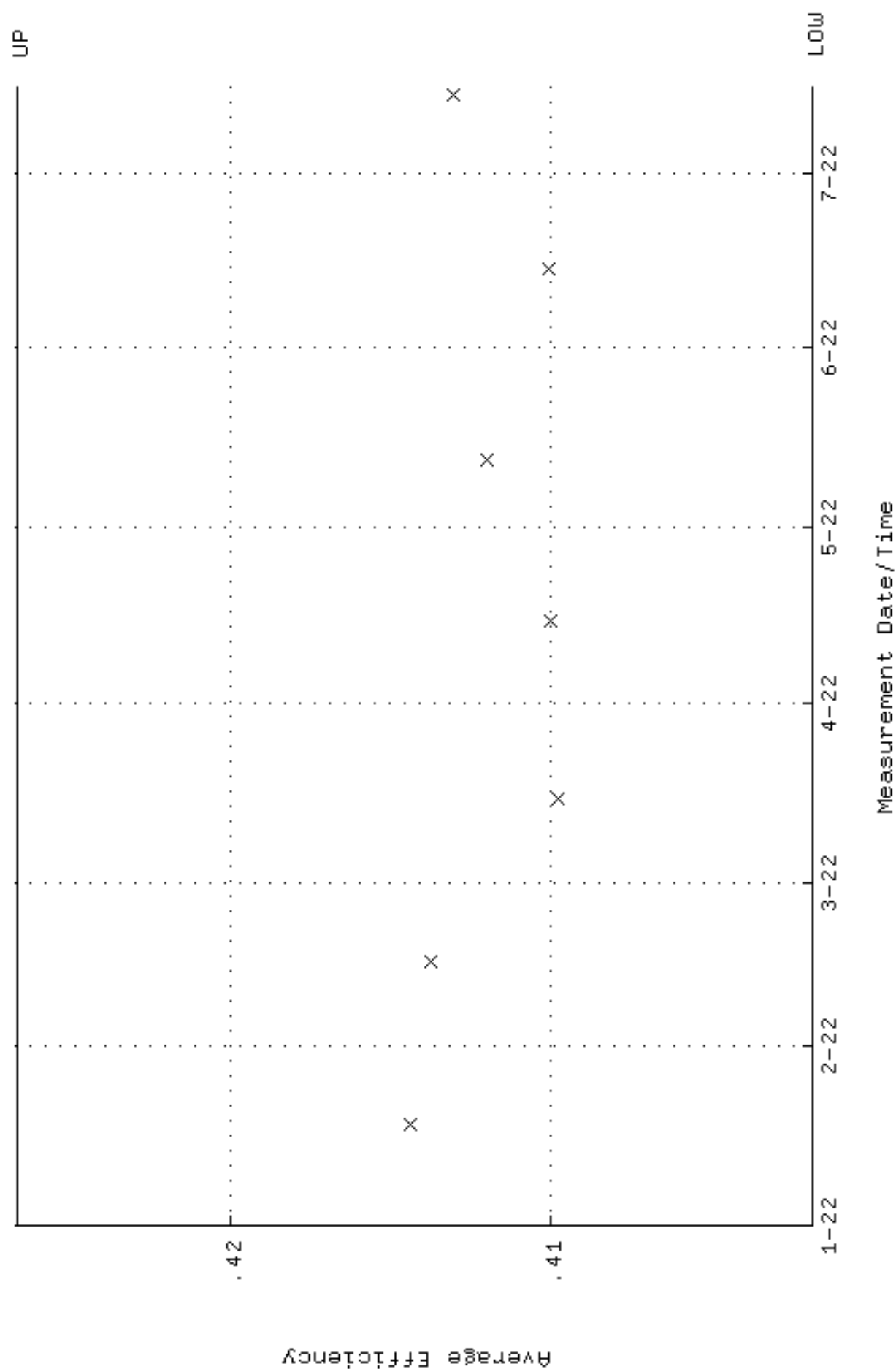
QA filename : DKA100:[ENV_ALPHA.QA.W]W152.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JAN-2022 08:56:42 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



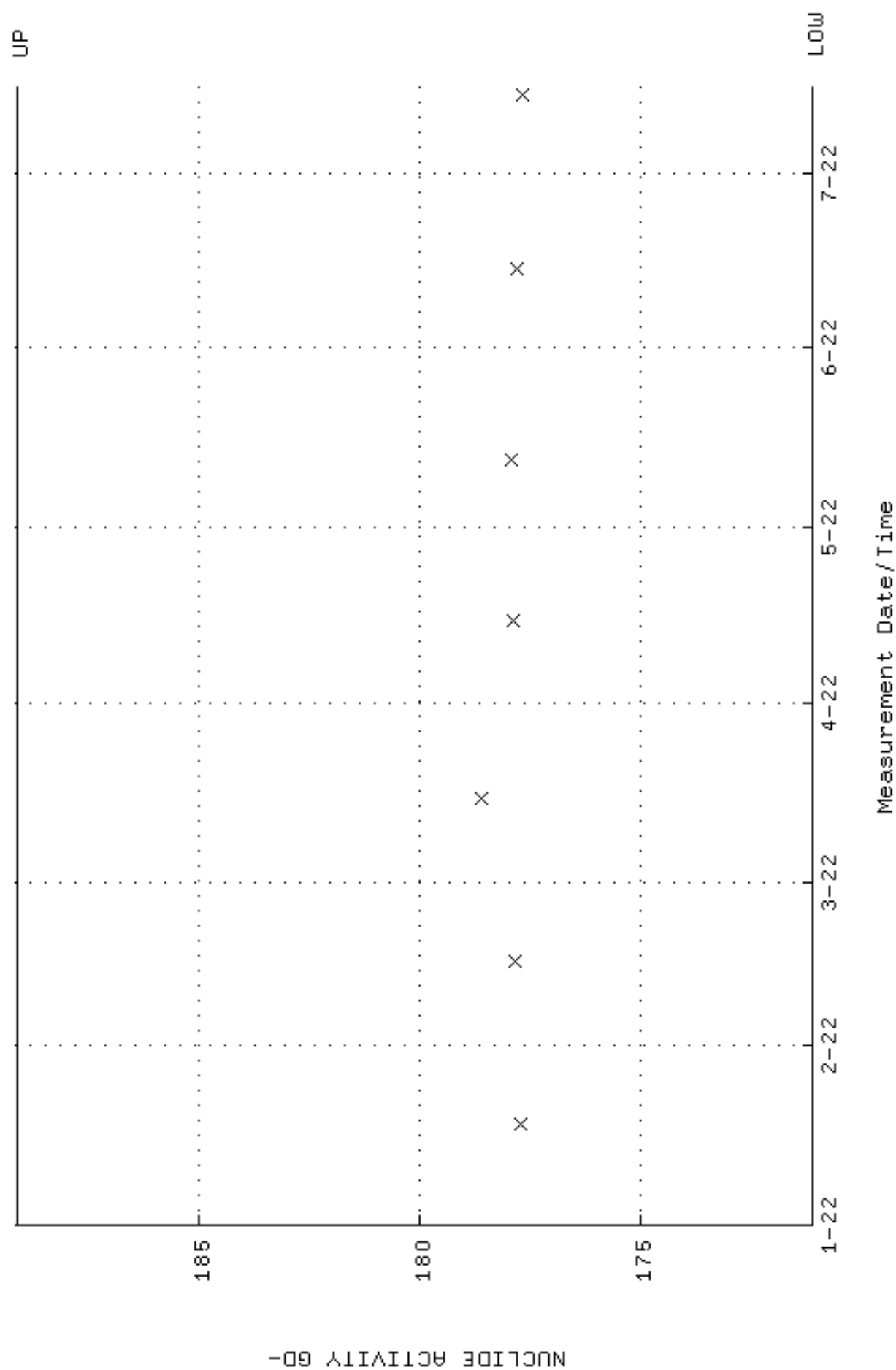
QA filename : DKA100:[ENV_ALPHA.QA.W]W152.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JAN-2022 08:56:42 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



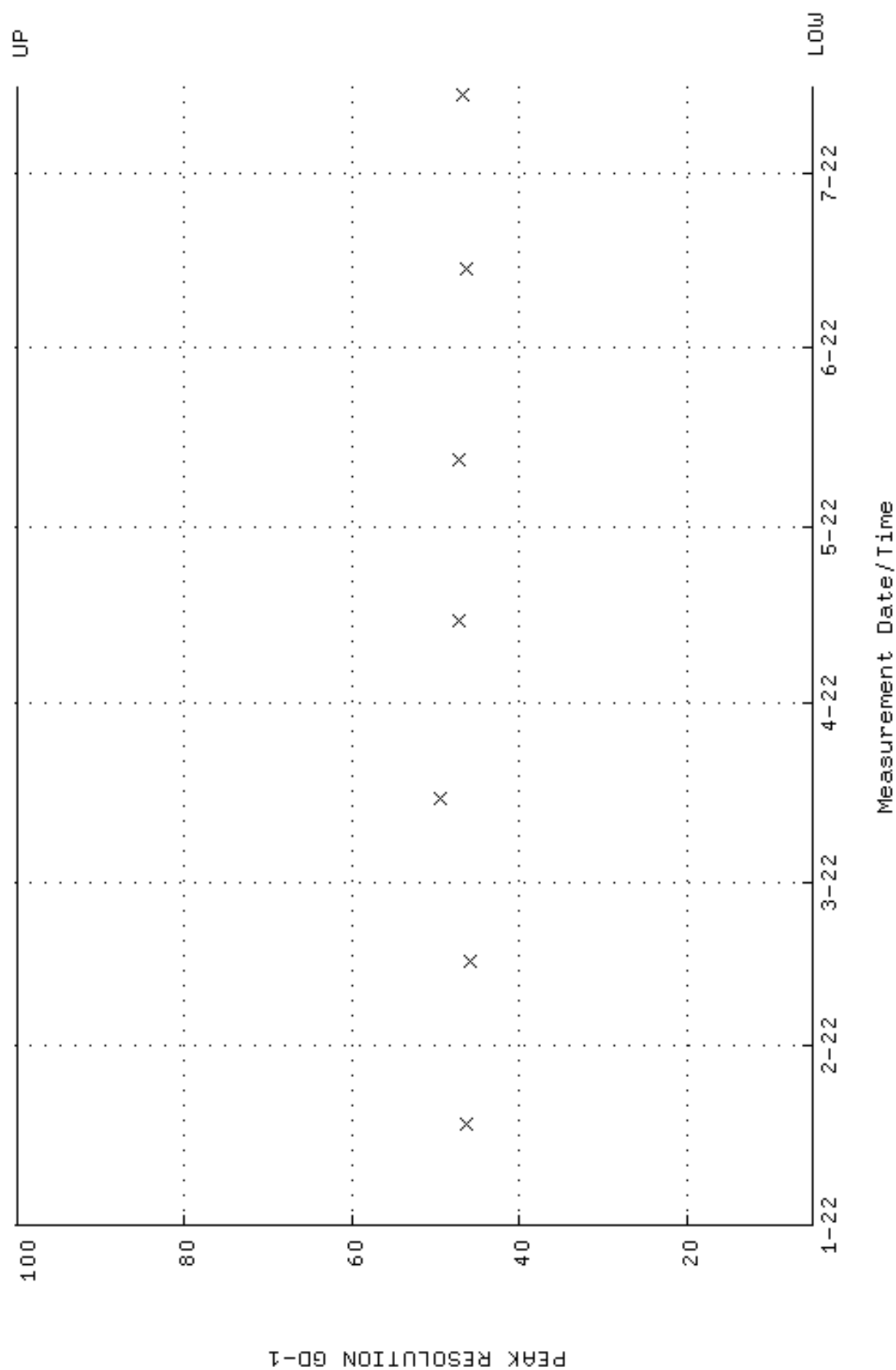
QA filename : DKA100:[ENV_ALPHA.QA.W]W155.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JAN-2022 08:56:59 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.401790 through 0.426640



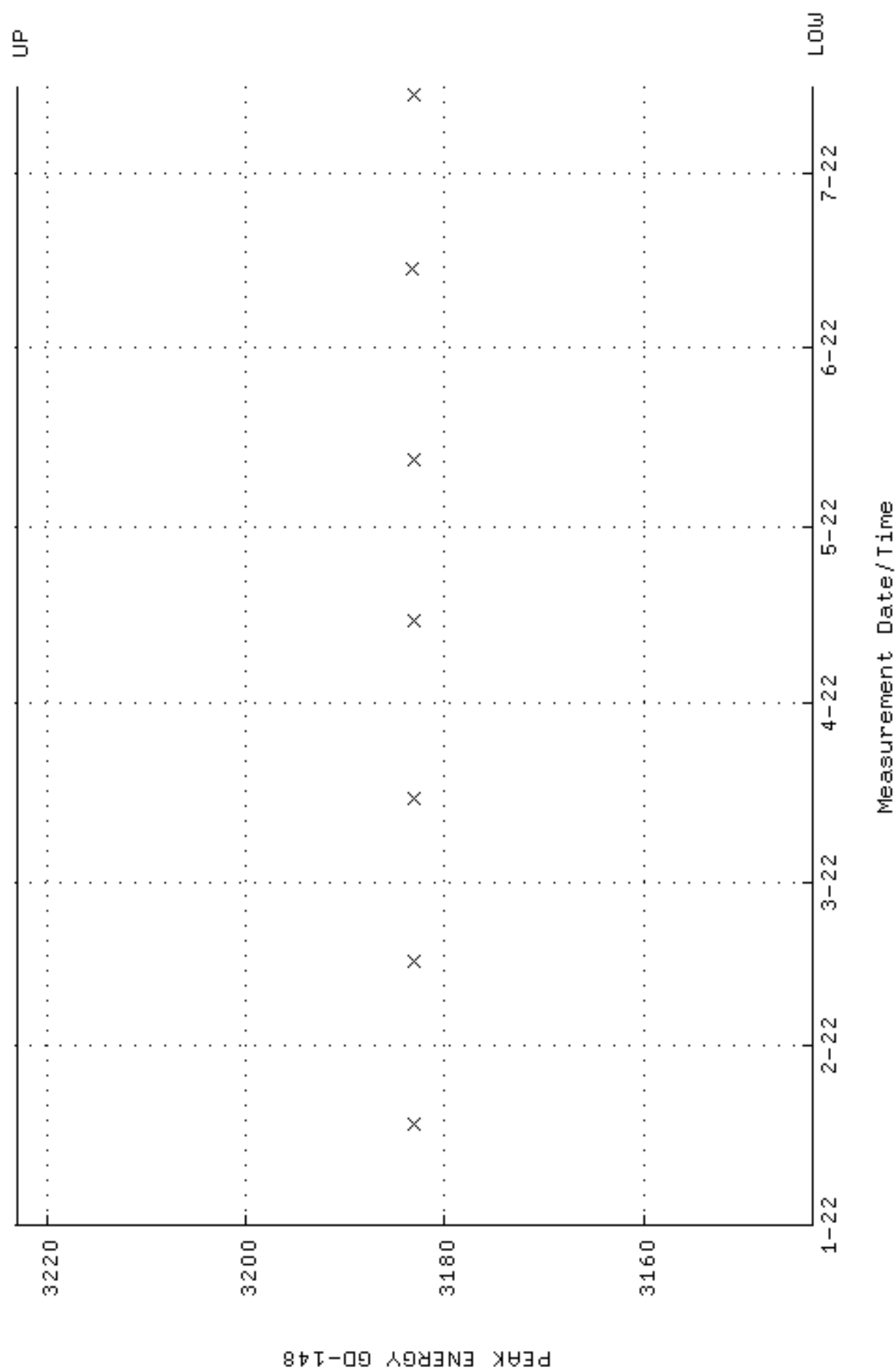
QA filename : DKA100:[ENV_ALPHA.QA.W]W155.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JAN-2022 08:56:59 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



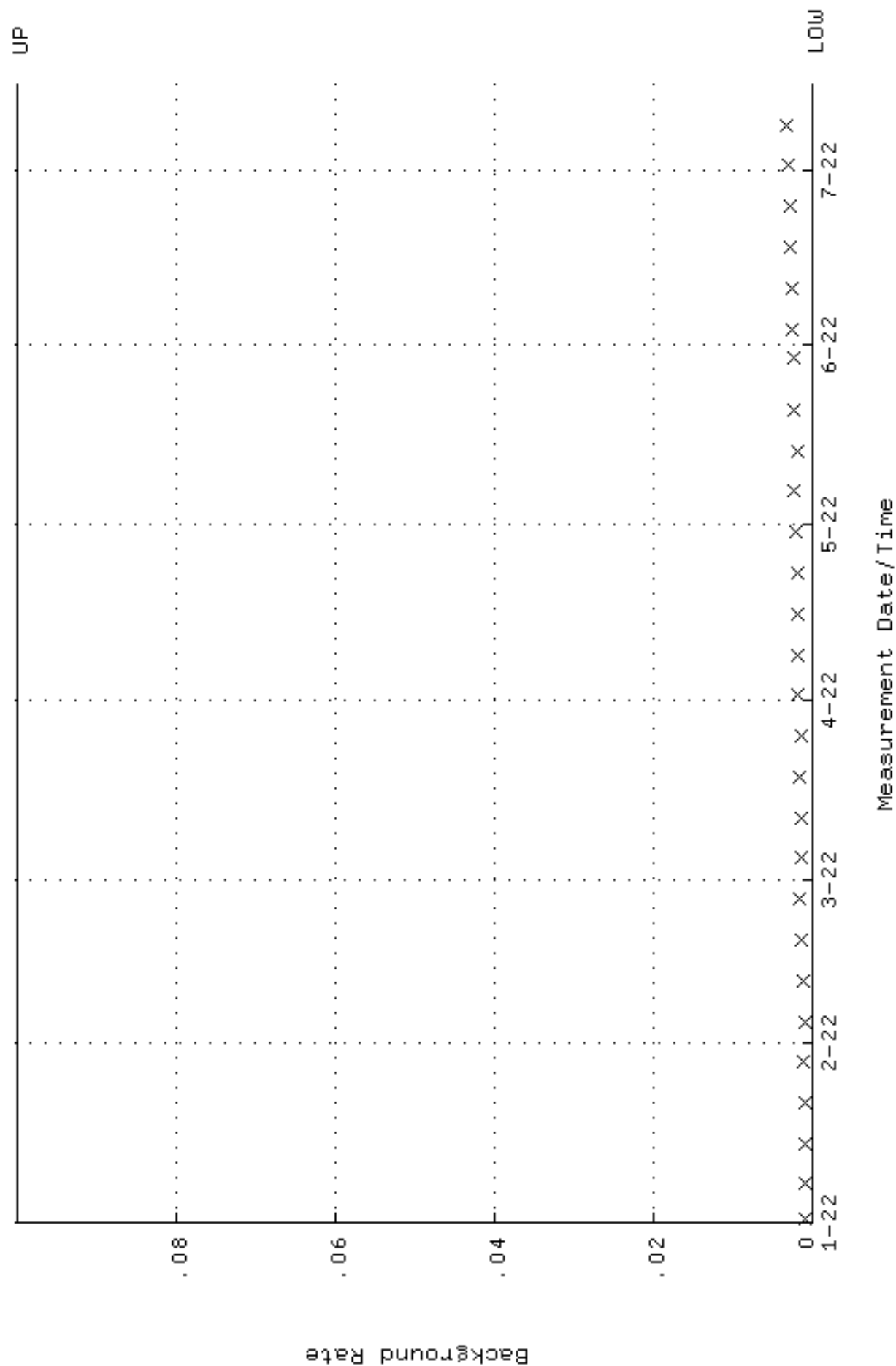
QA filename : DKA100:[ENV_ALPHA.QA.W]W155.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JAN-2022 08:56:59 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



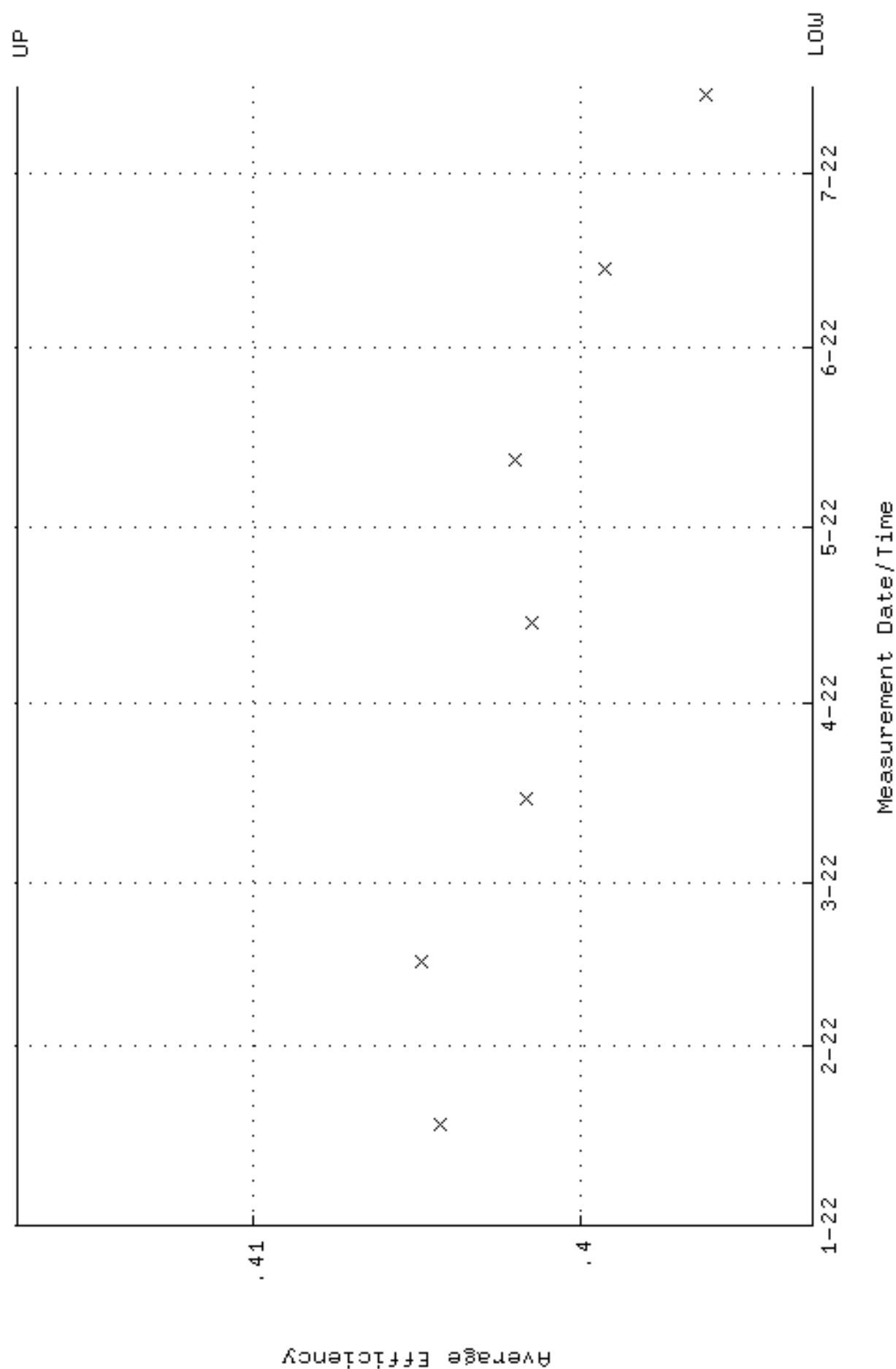
QA filename : DKA100:[ENV_ALPHA.QA.W]W155.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JAN-2022 08:56:59 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



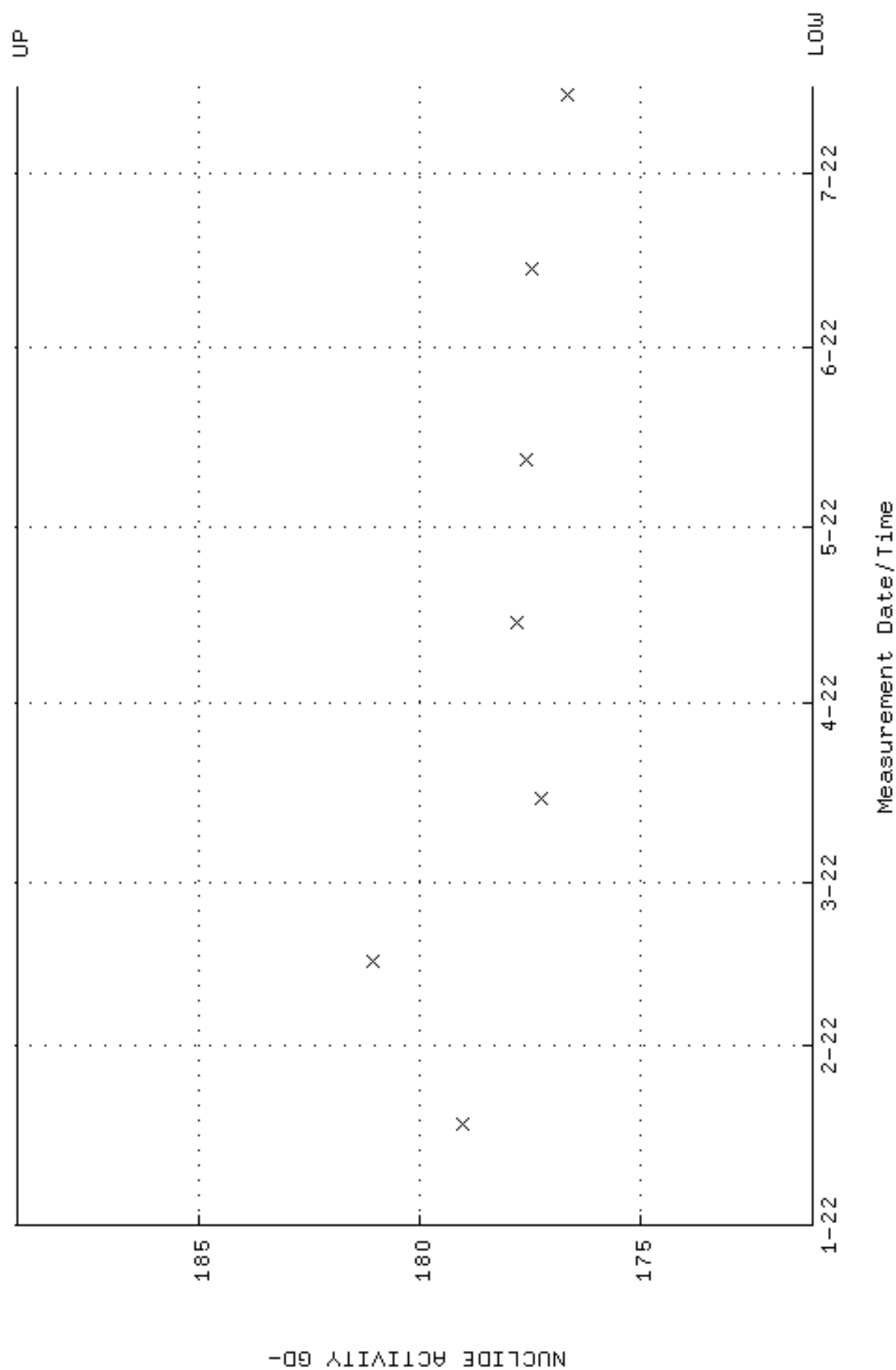
QA filename : DKA100:[ENV_ALPHA.QA.B]B155.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:07:28 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



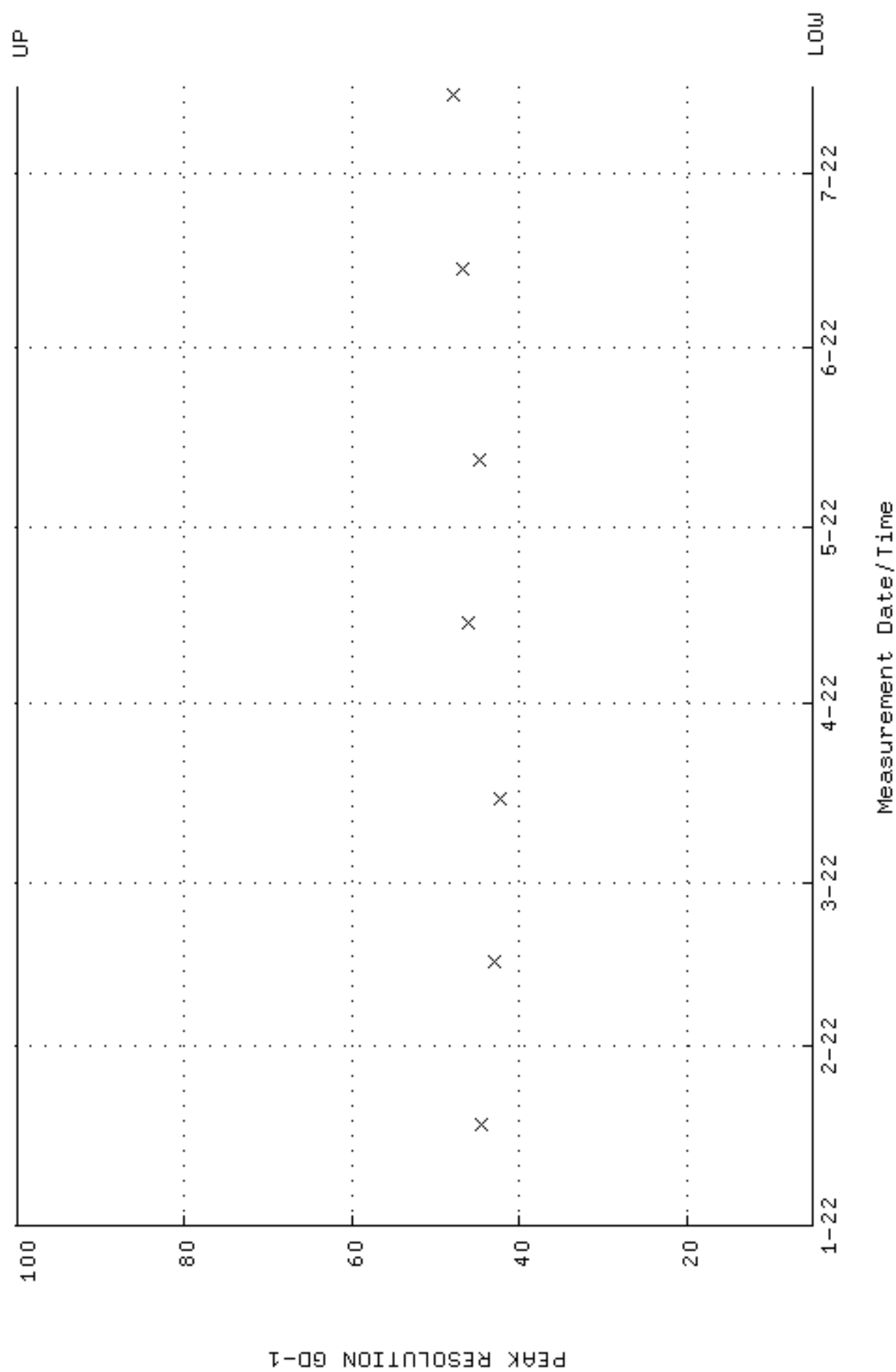
QA filename : DKA100:[ENV_ALPHA.QA.W]W156.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JAN-2022 08:57:04 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.392920 through 0.417230



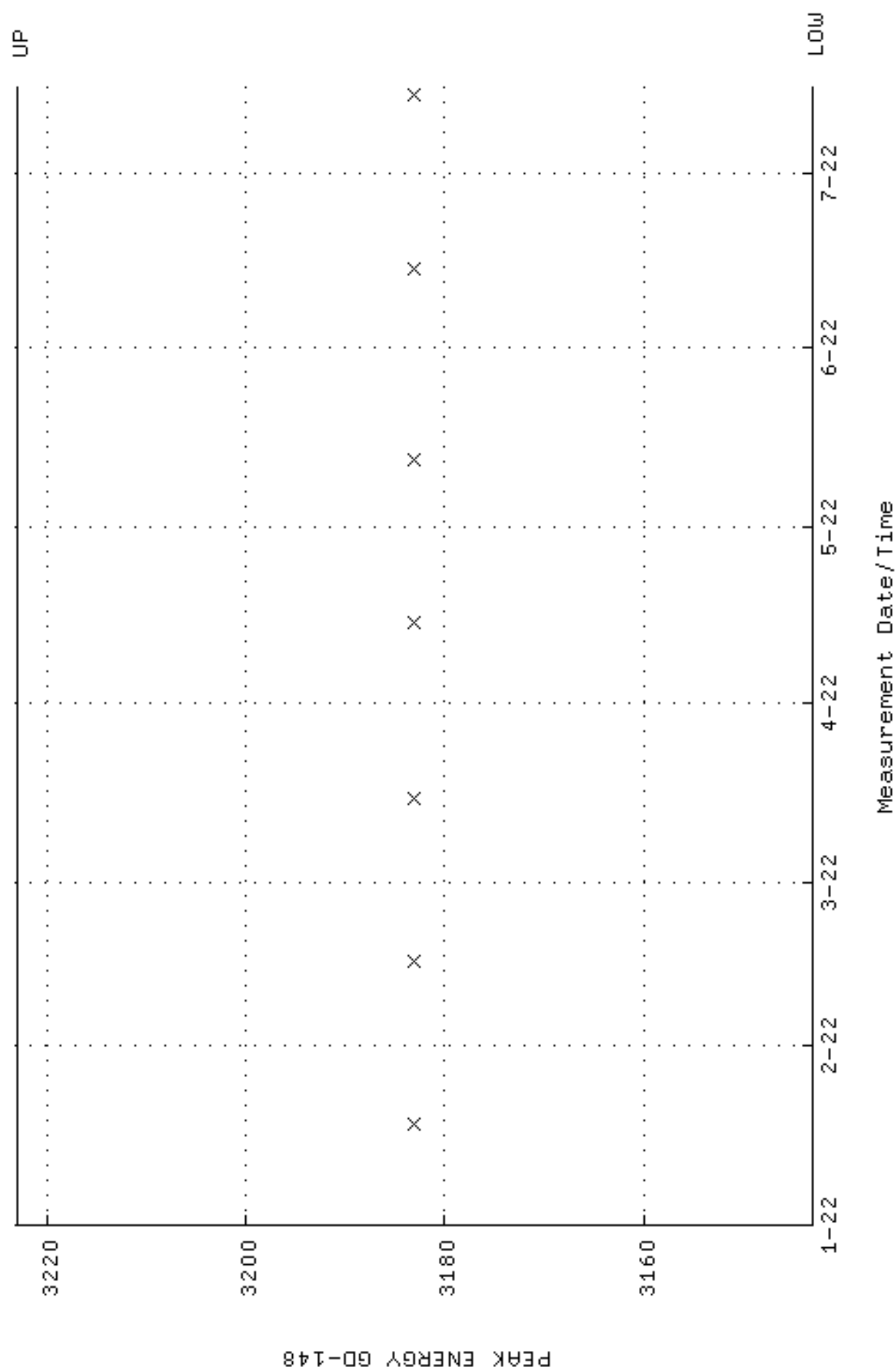
QA filename : DKA100:[ENV_ALPHA.QA.W]W156.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JAN-2022 08:57:04 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



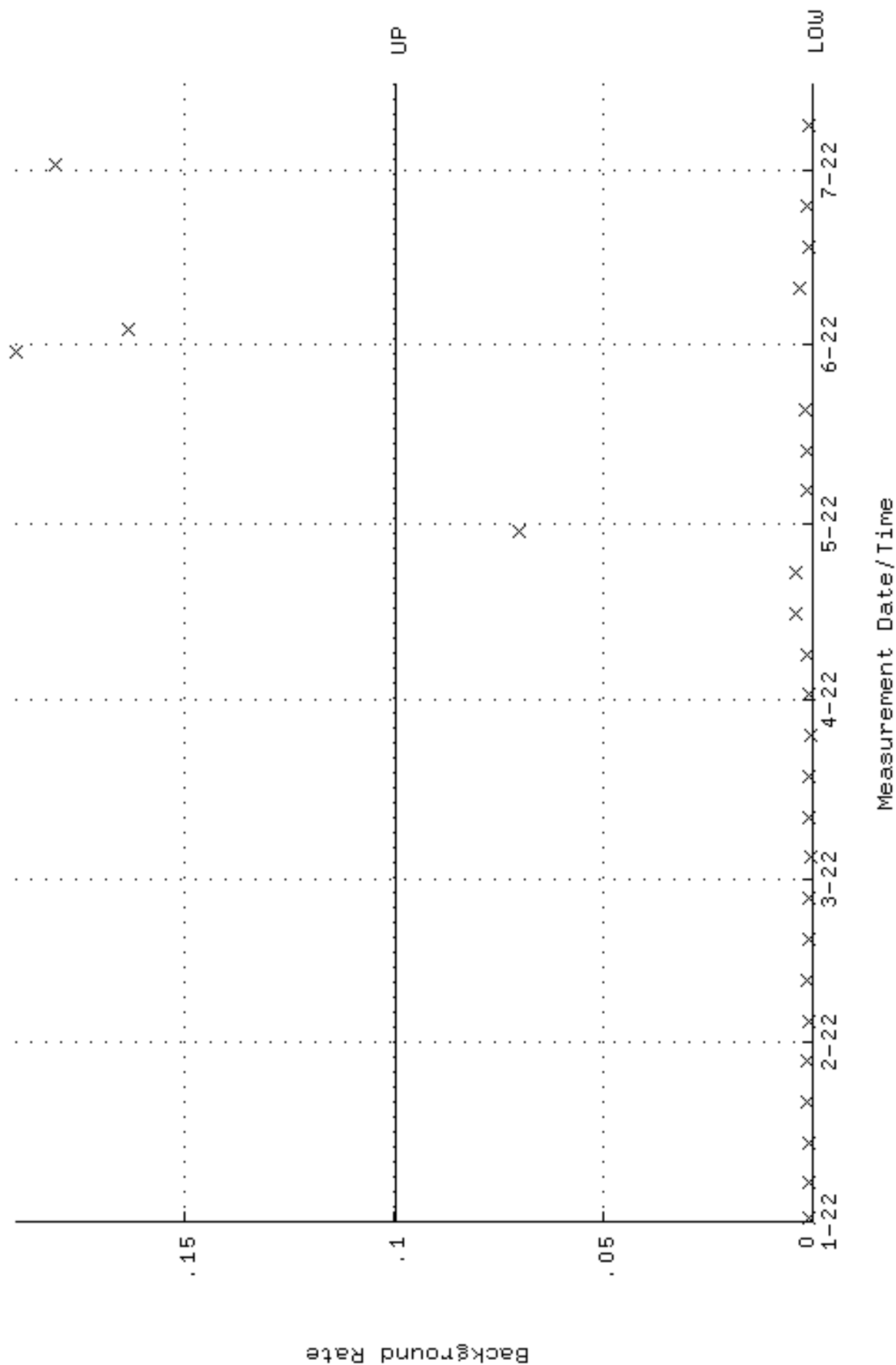
QA filename : DKA100:[ENV_ALPHA.QA.W]W156.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JAN-2022 08:57:04 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



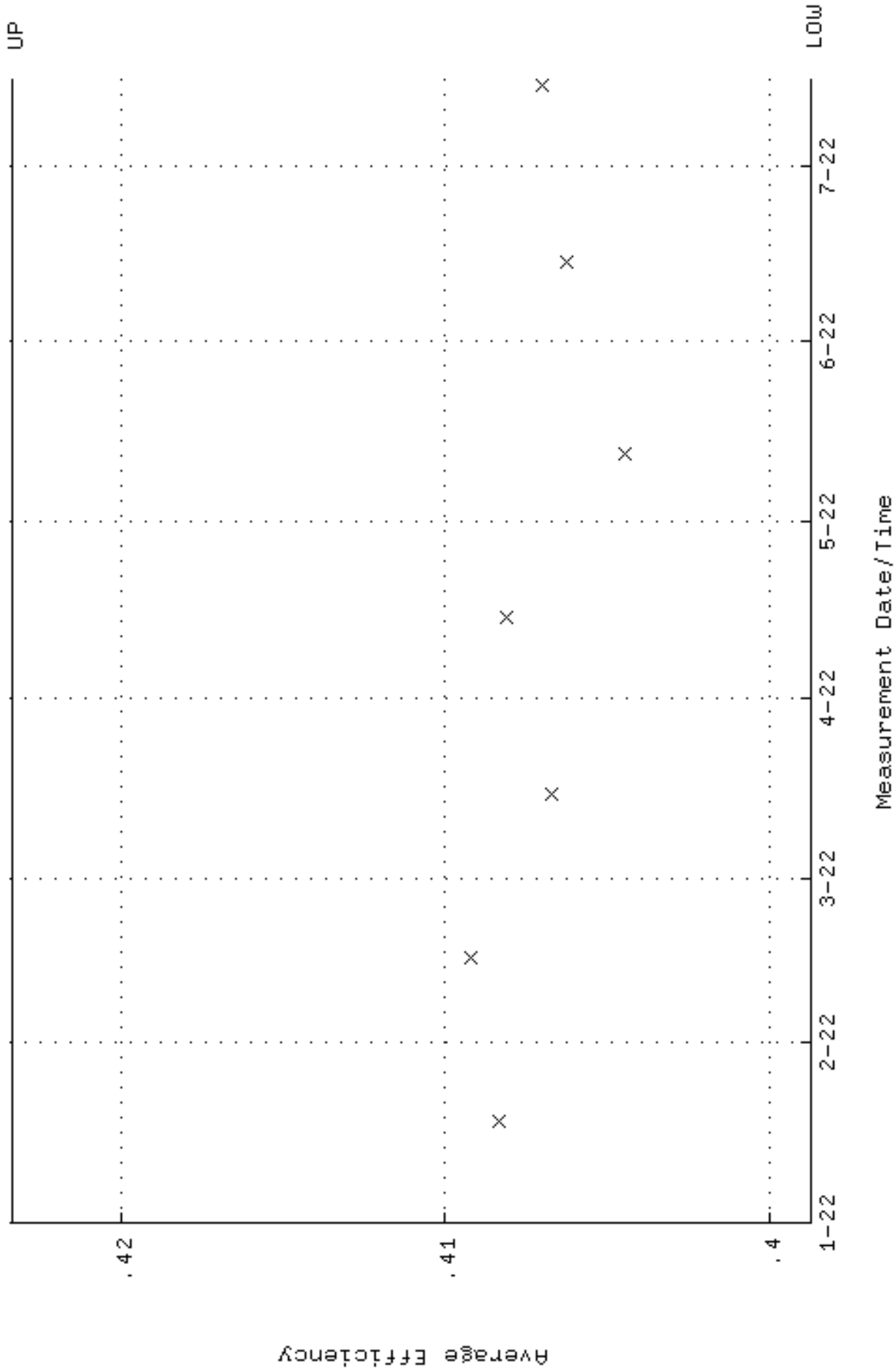
QA filename : DKA100:[ENV_ALPHA.QA.W]W156.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JAN-2022 08:57:04 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



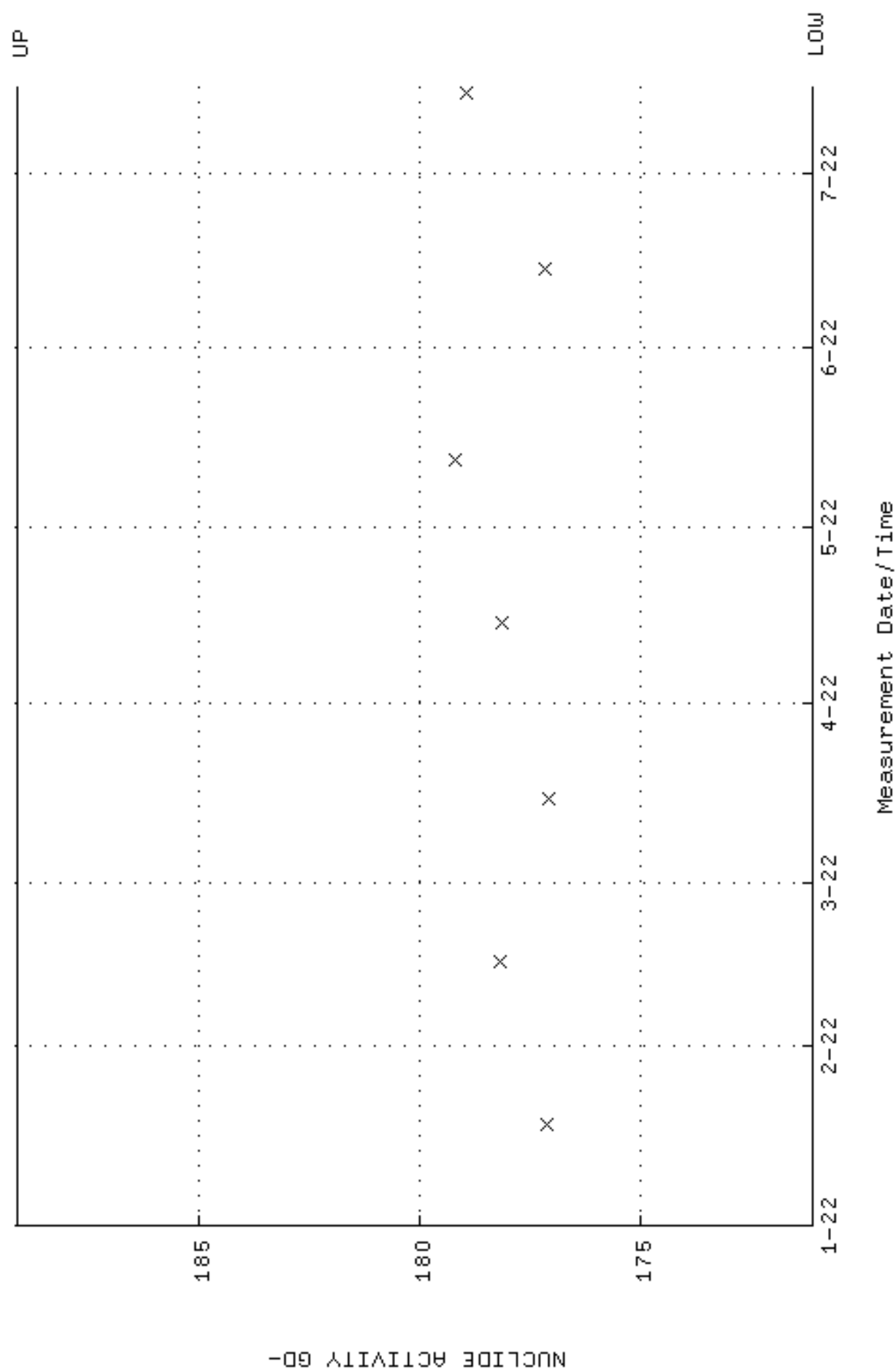
QA filename : DKA100:[ENV_ALPHA.QA.B]B156.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:07:32 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



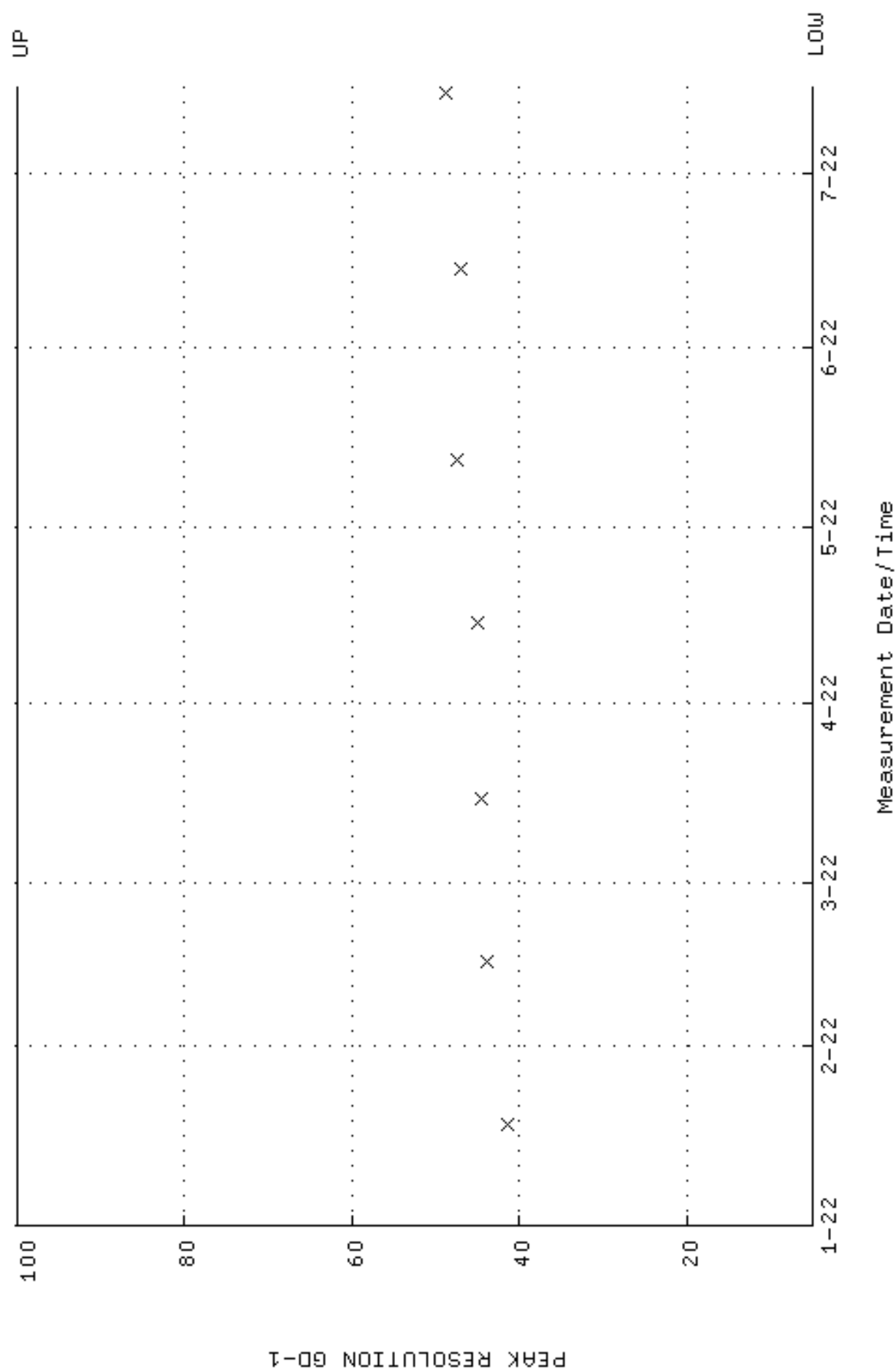
QA filename : DKA100:[ENV_ALPHA.QA.W]W159.QAF;3
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 18-JAN-2022 09:59:22 through 15-JUL-2022 12:00:00
Lower/Upper Lmts: 0.398700 through 0.423370



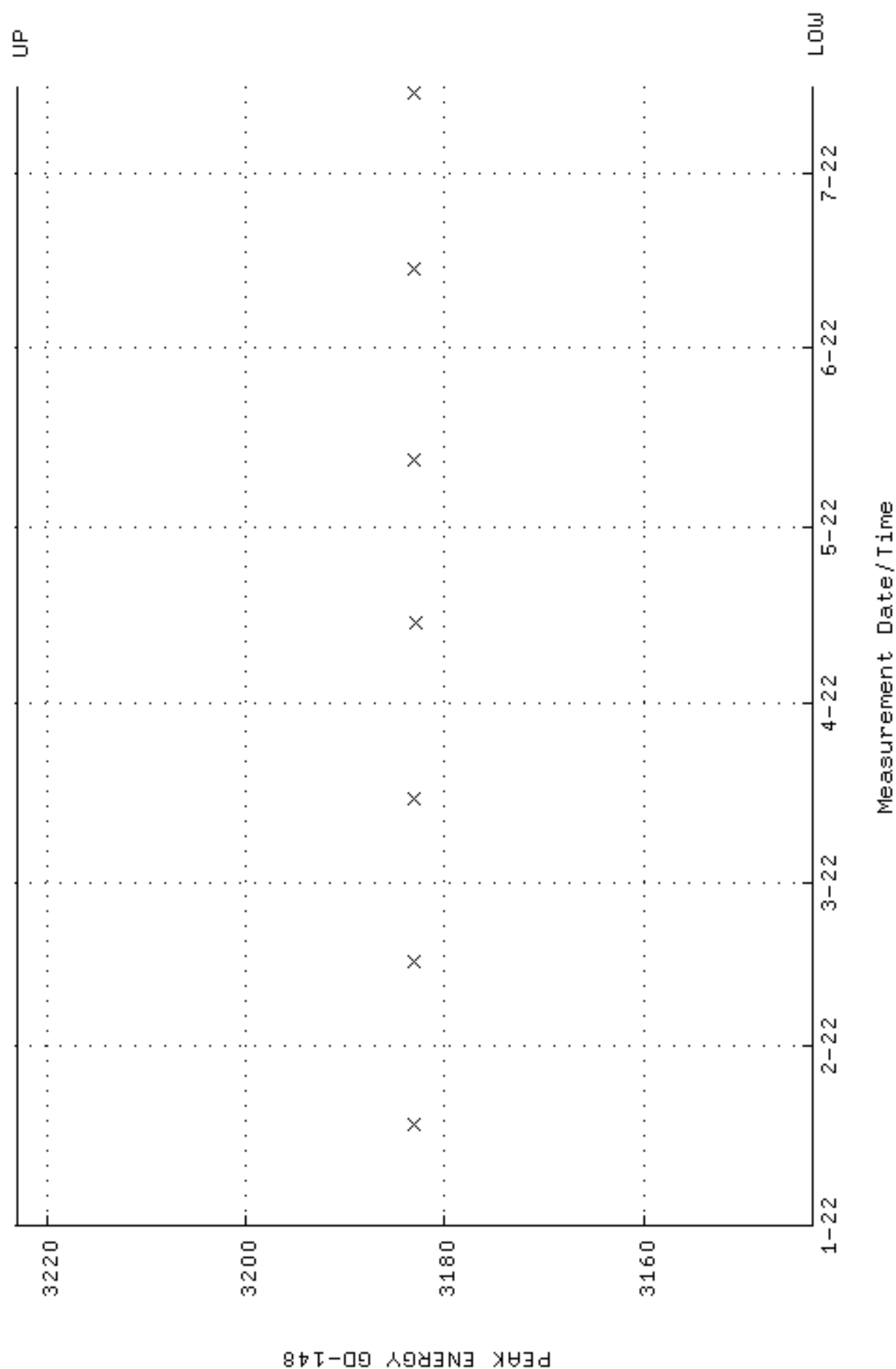
QA filename : DKA100:[ENV_ALPHA.QA.W]W159.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JAN-2022 09:59:22 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



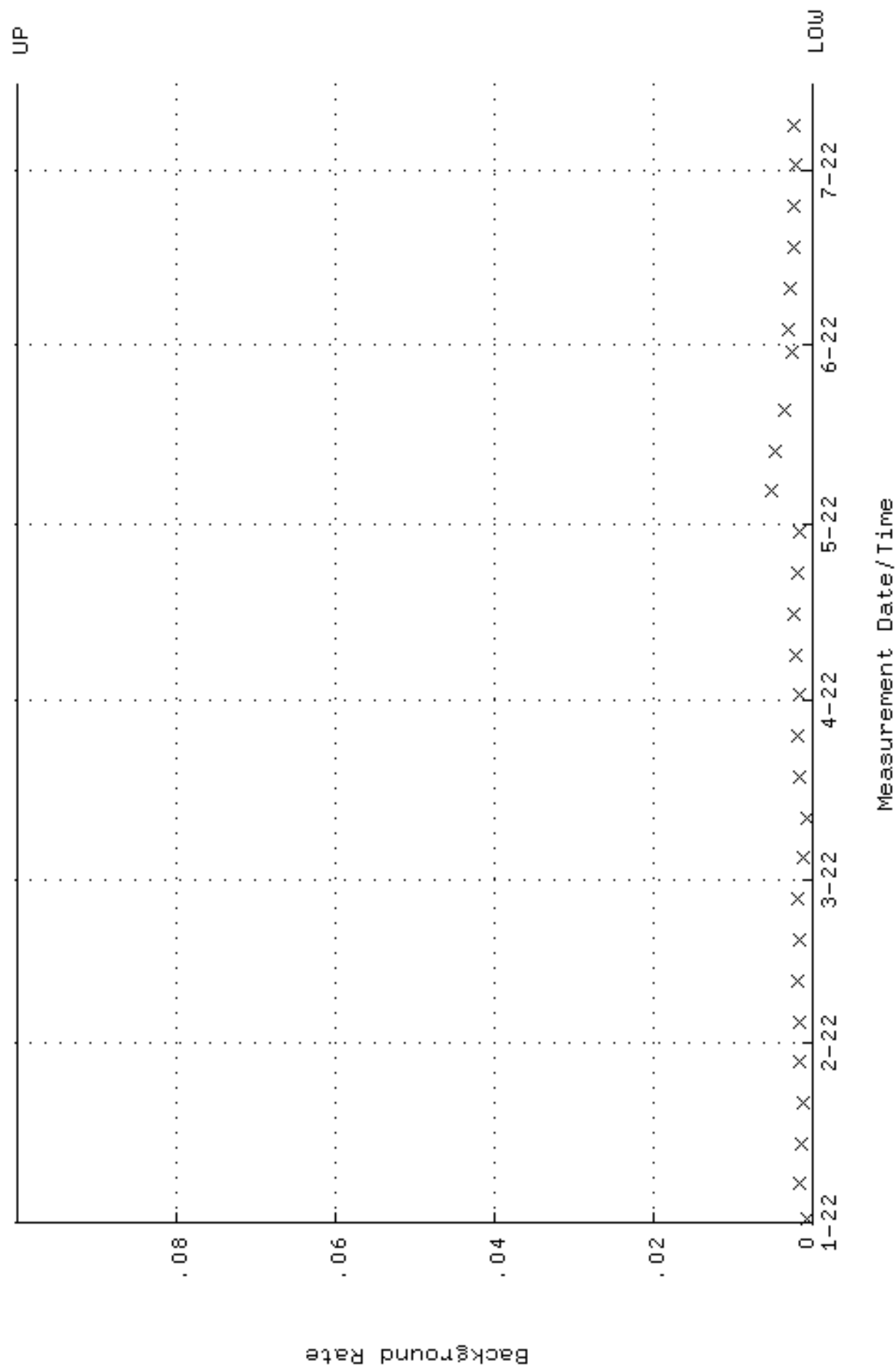
QA filename : DKA100:[ENV_ALPHA.QA.W]W159.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JAN-2022 09:59:22 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



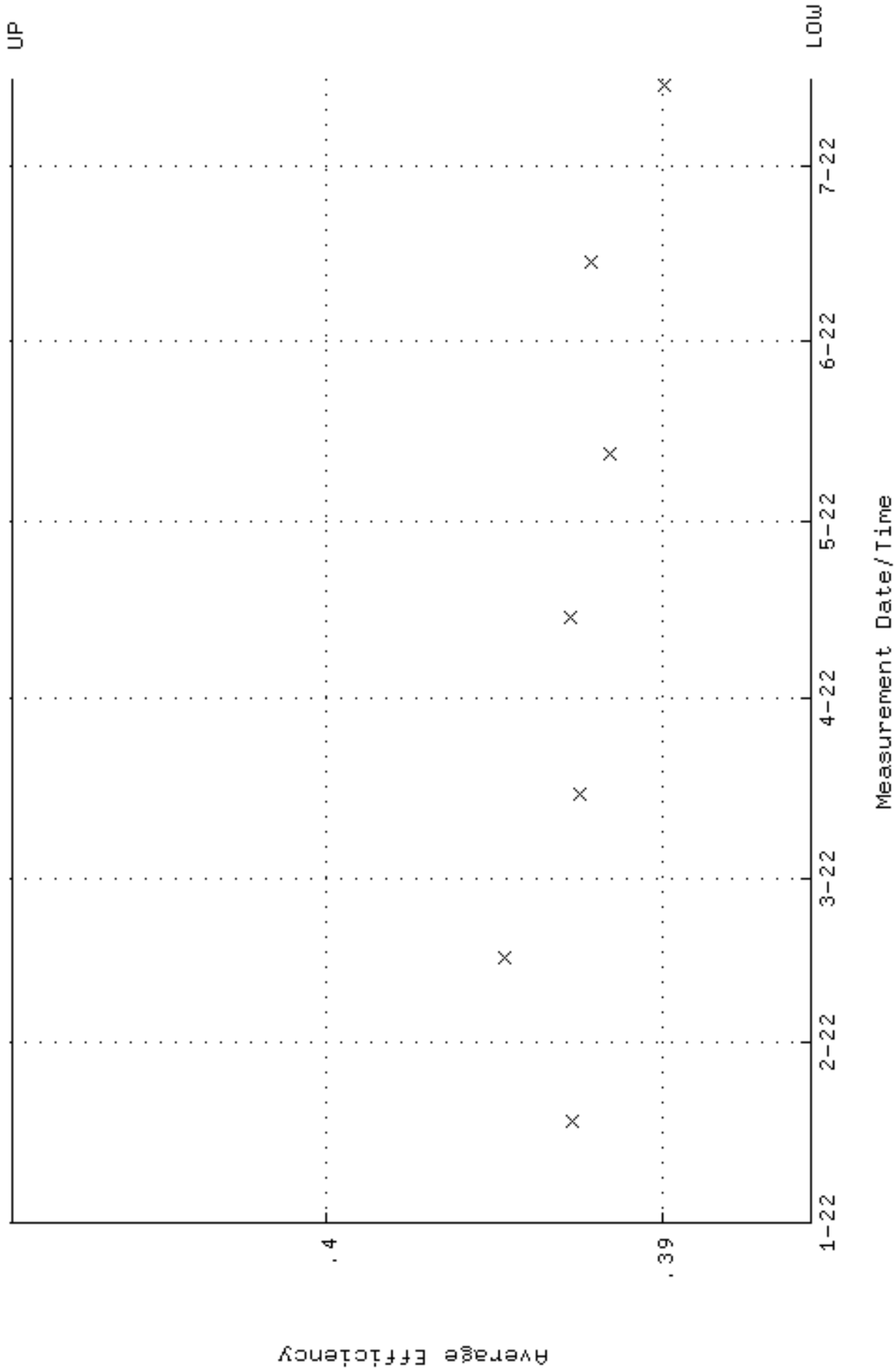
QA filename : DKA100:[ENV_ALPHA.QA.W]W159.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JAN-2022 09:59:22 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



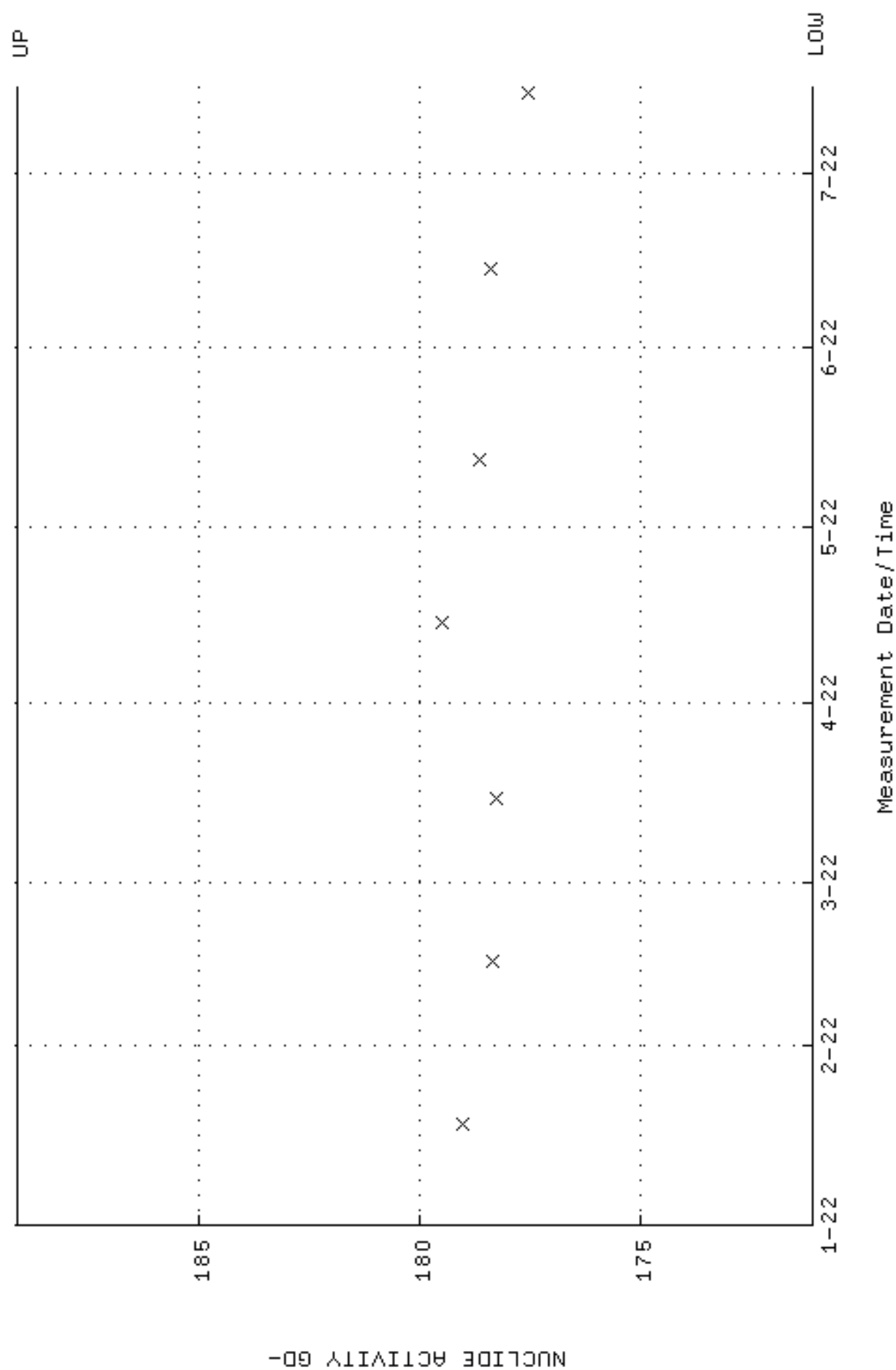
QA filename : DKA100:[ENV_ALPHA.QA.B]B159.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:07:37 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



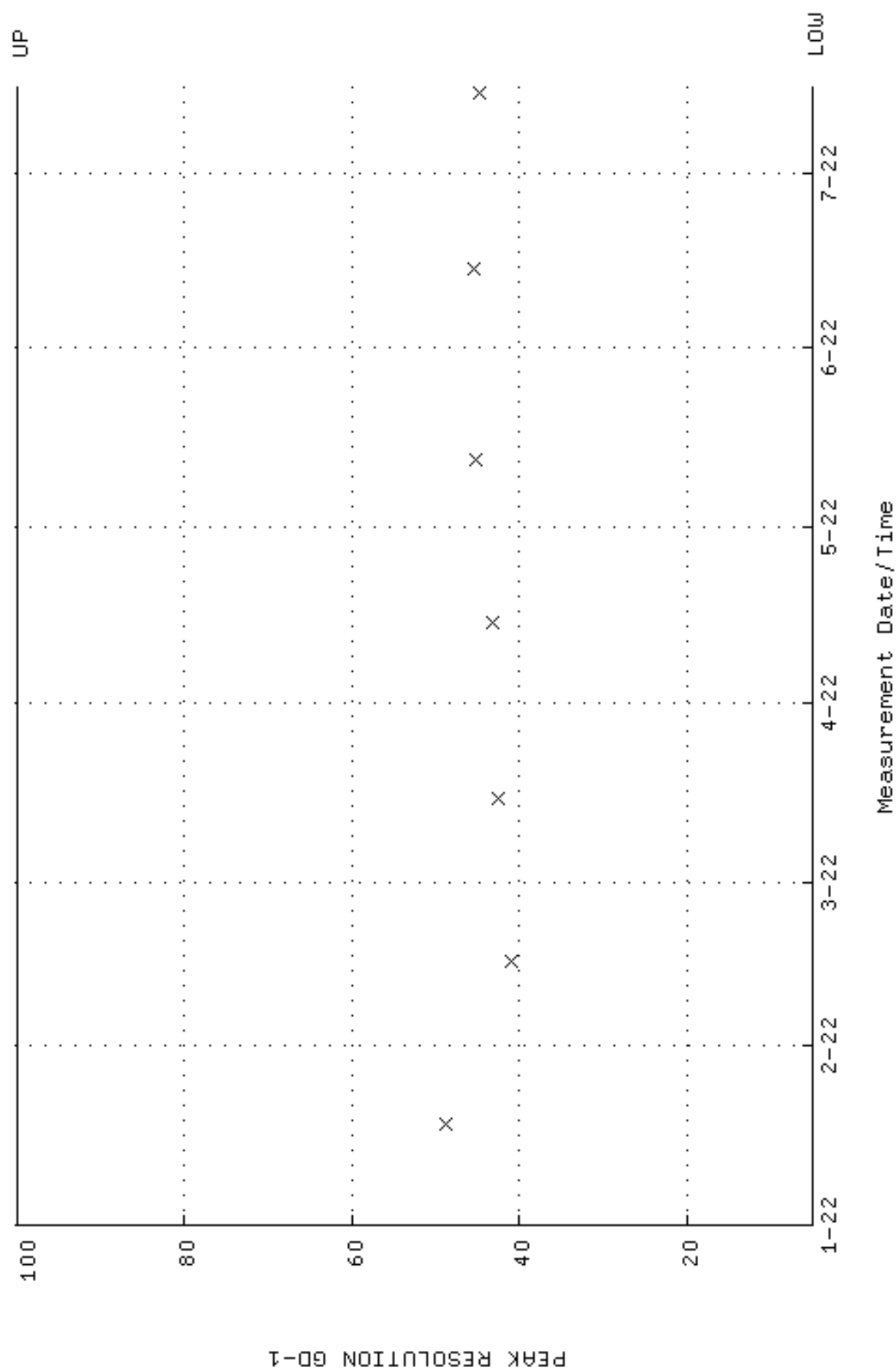
QA filename : DKA100:[ENV_ALPHA.QA.W]W160.QAF;3
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 18-JAN-2022 08:57:15 through 15-JUL-2022 12:00:00
Lower/Upper Lmts: 0.385540 through 0.409390



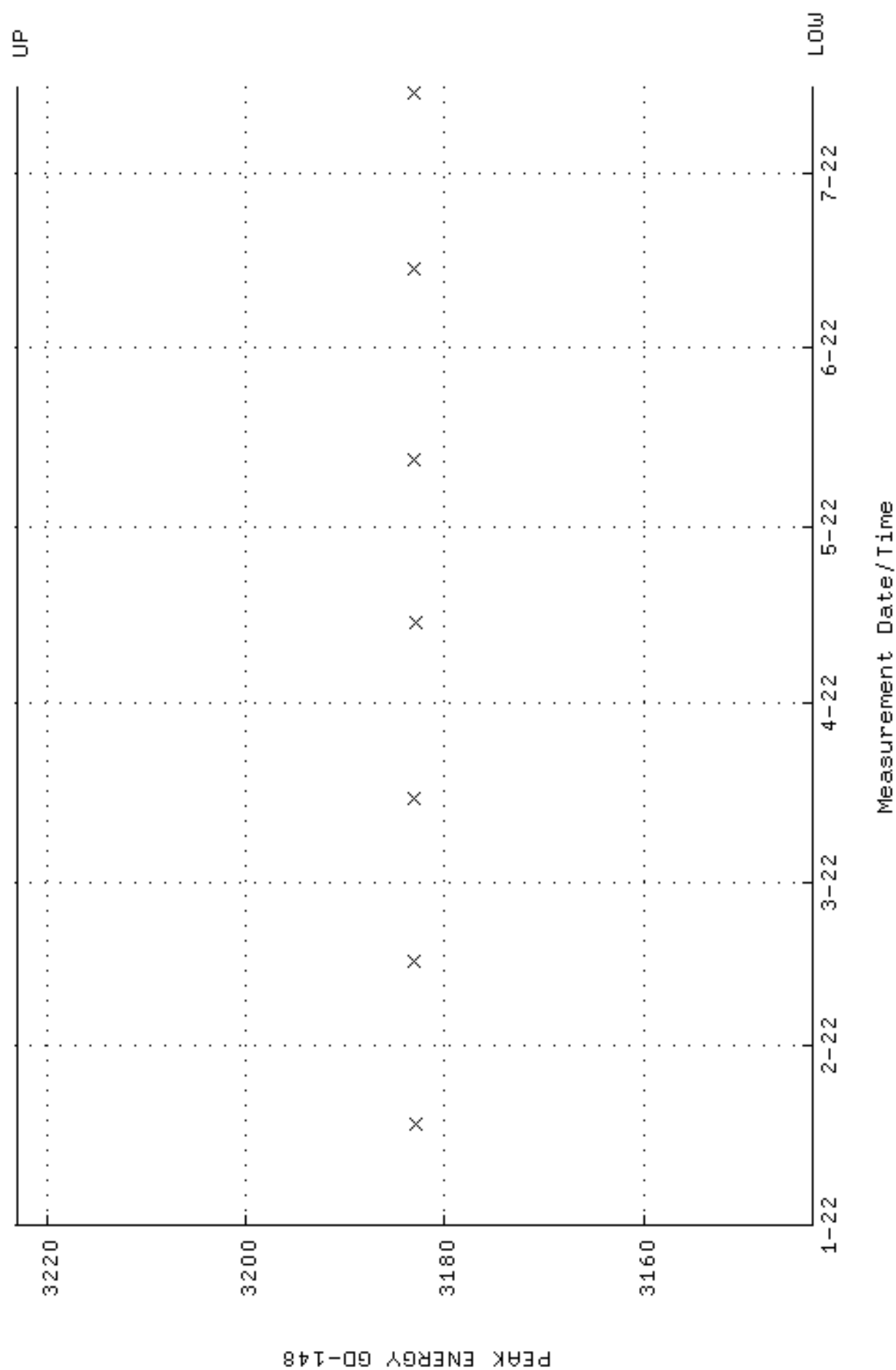
QA filename : DKA100:[ENV_ALPHA.QA.W]W160.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JAN-2022 08:57:15 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



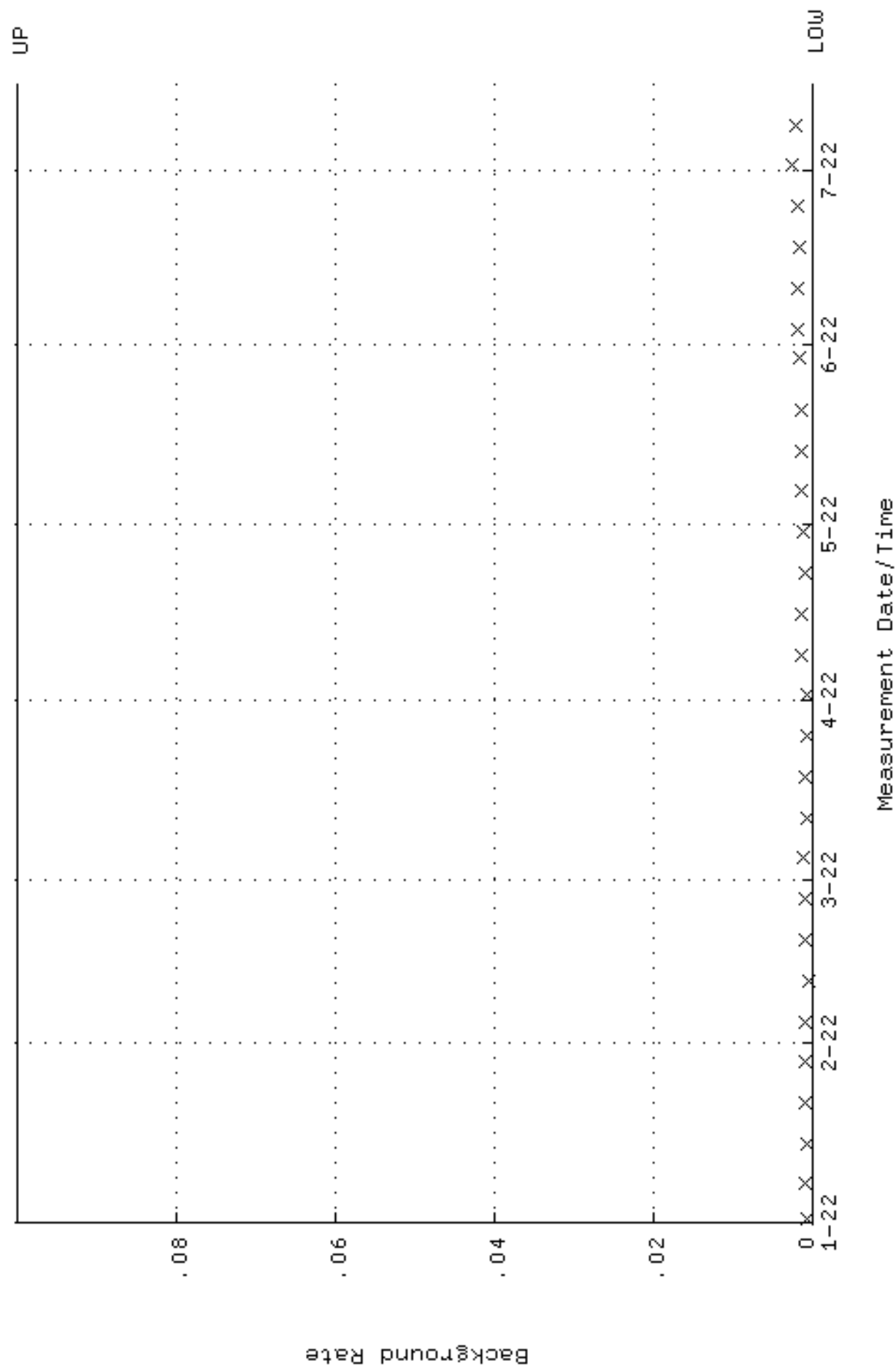
QA filename : DKA100:[ENV_ALPHA.QA.W]W160.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JAN-2022 08:57:15 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



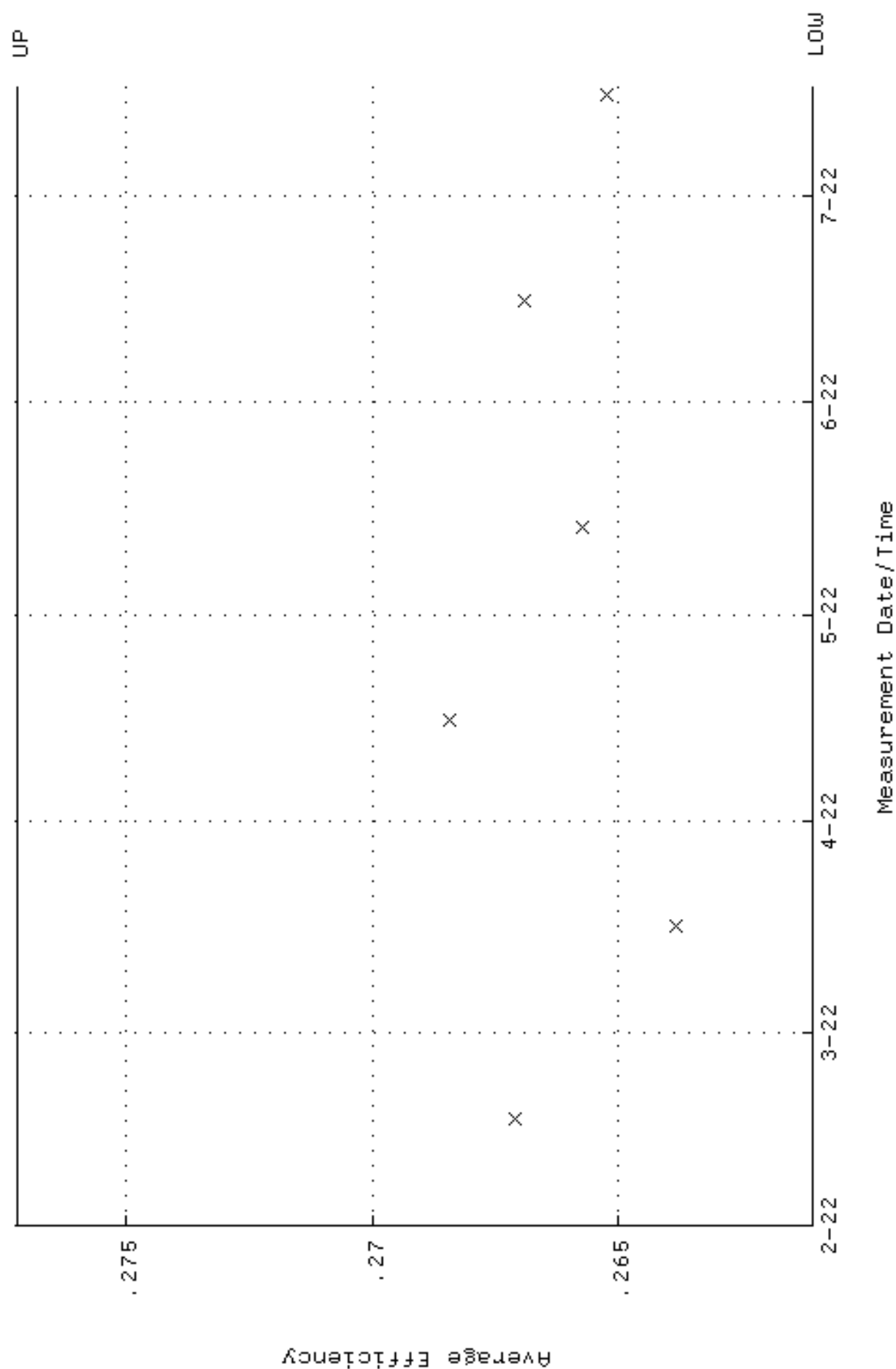
QA filename : DKA100:[ENV_ALPHA.QA.W]W160.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JAN-2022 08:57:15 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



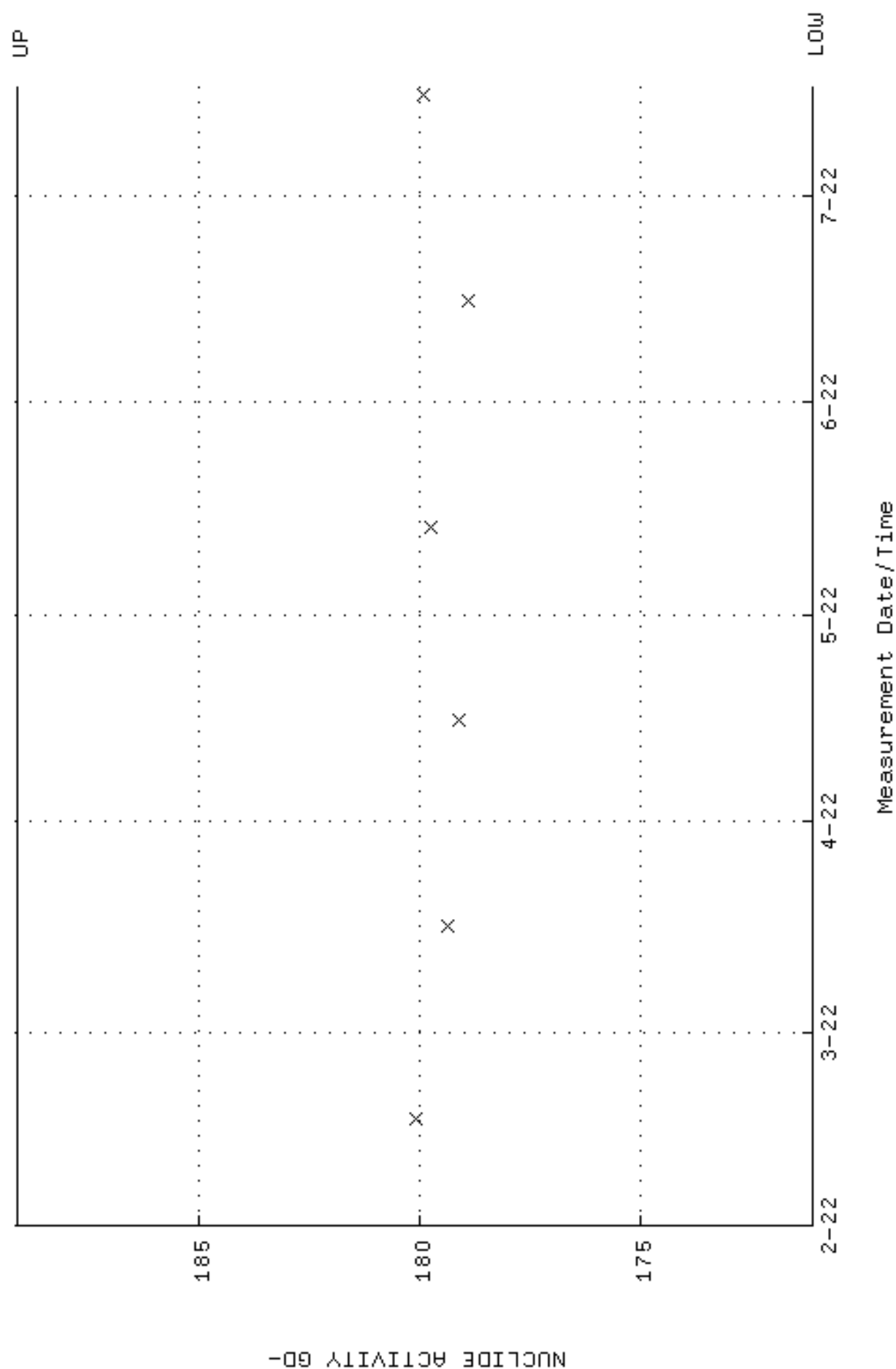
QA filename : DKA100:[ENV_ALPHA.QA.B]B160.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:07:42 through 15-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



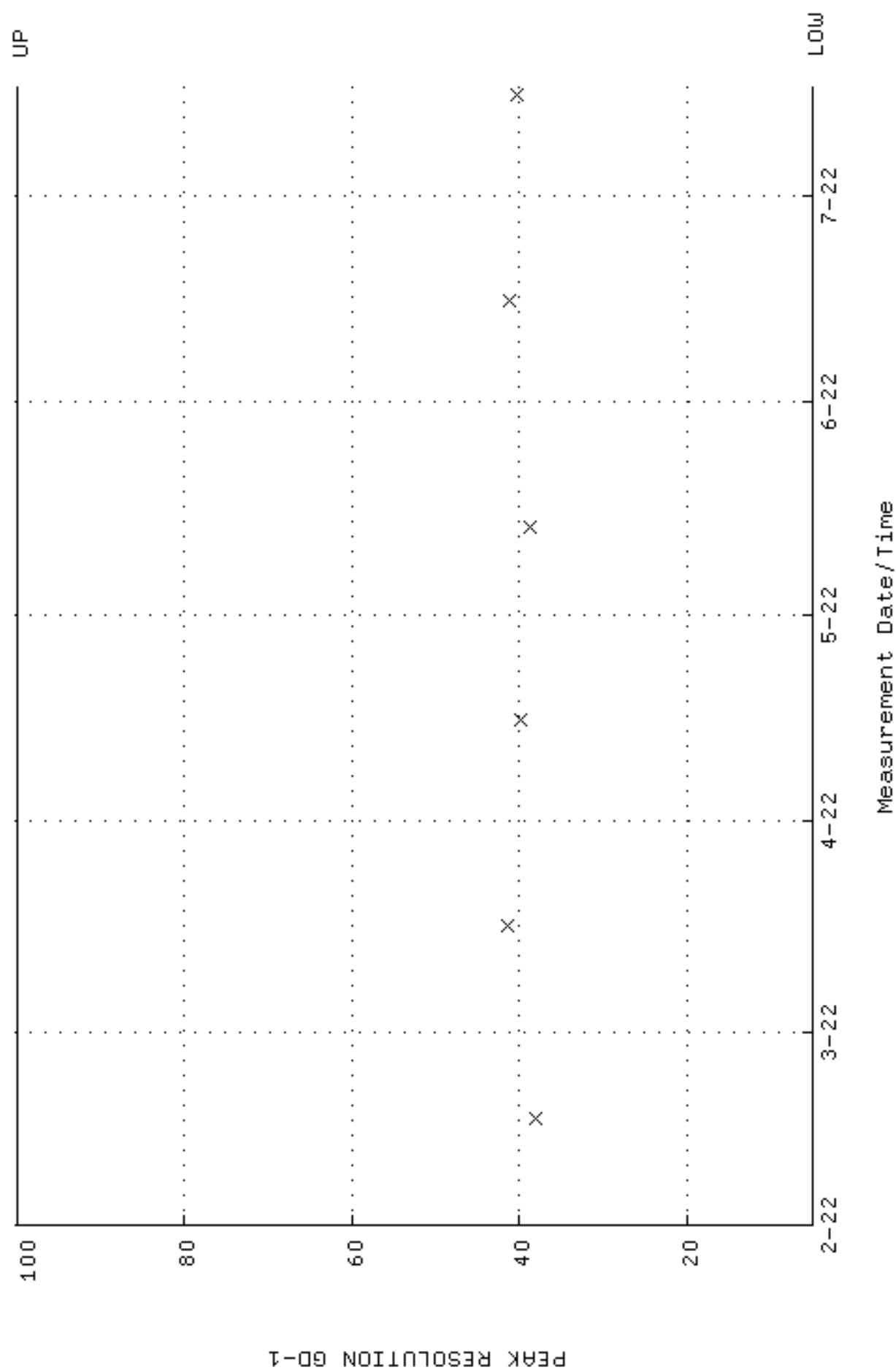
QA filename : DKA100:[ENV_ALPHA.QA.W]W178.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 16-FEB-2022 09:18:51 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.261060 through 0.277210



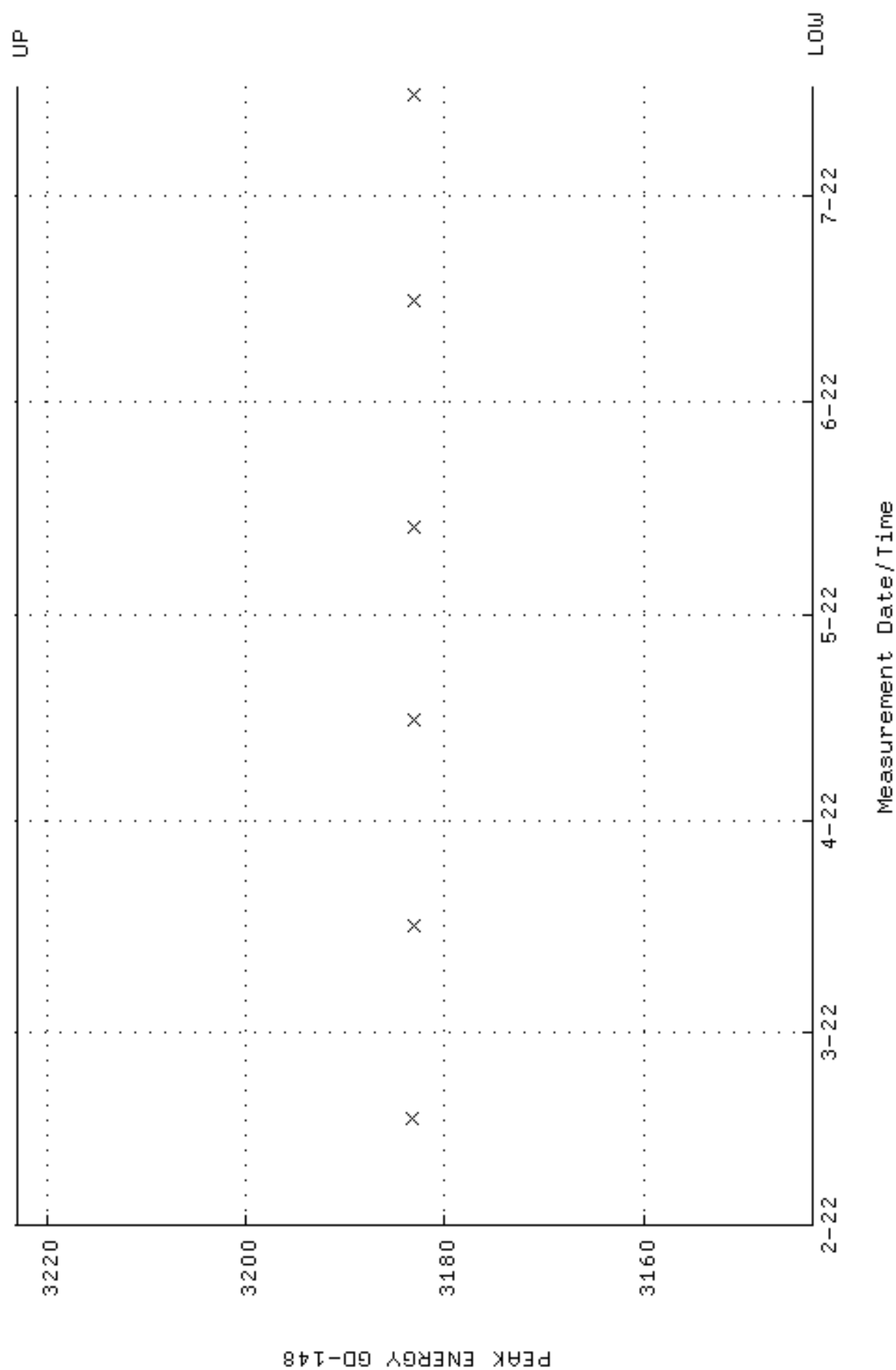
QA filename : DKA100:[ENV_ALPHA.QA.W]W178.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 16-FEB-2022 09:18:51 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



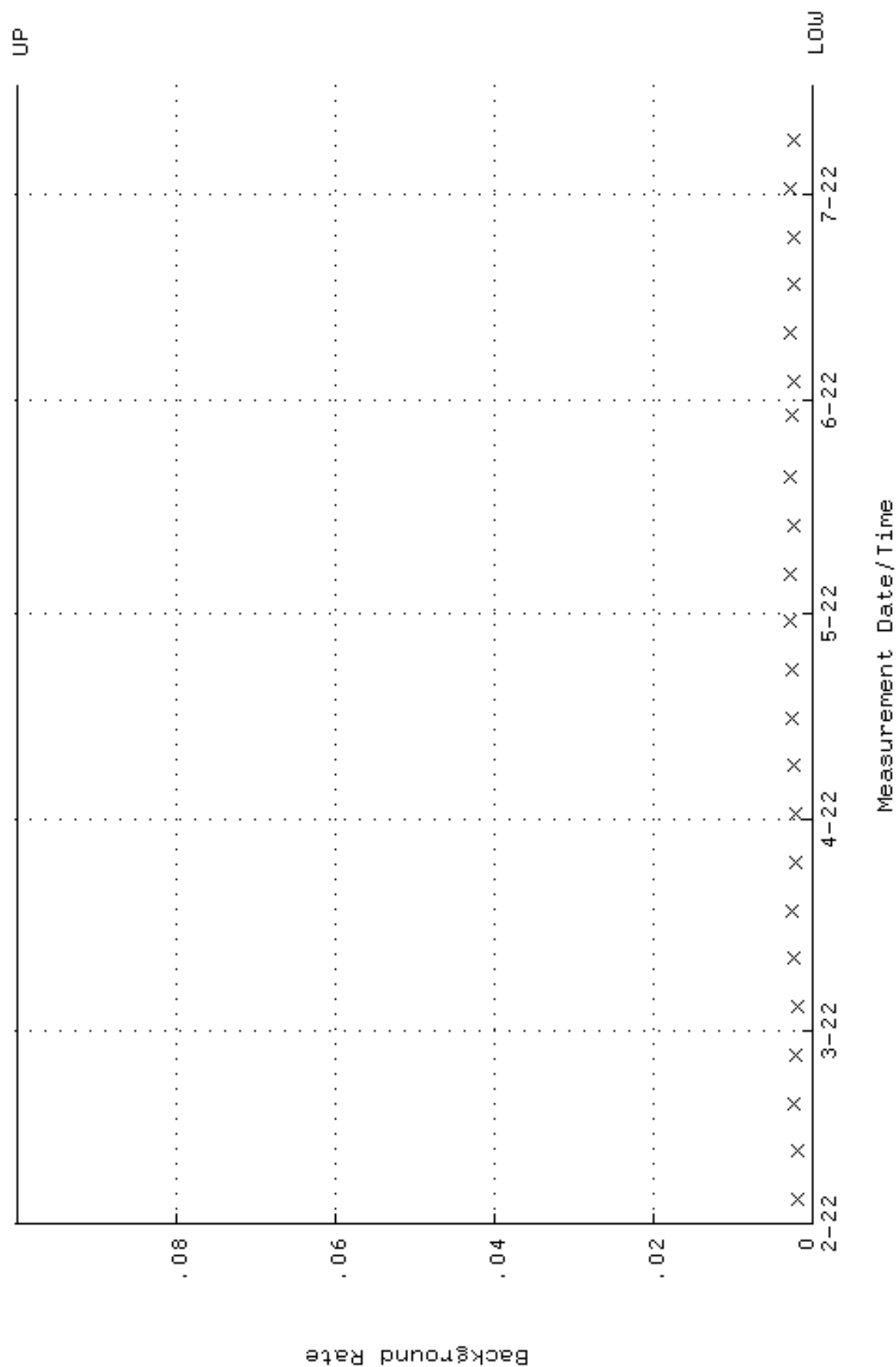
QA filename : DKA100:[ENV_ALPHA.QA.W]W178.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 16-FEB-2022 09:18:51 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



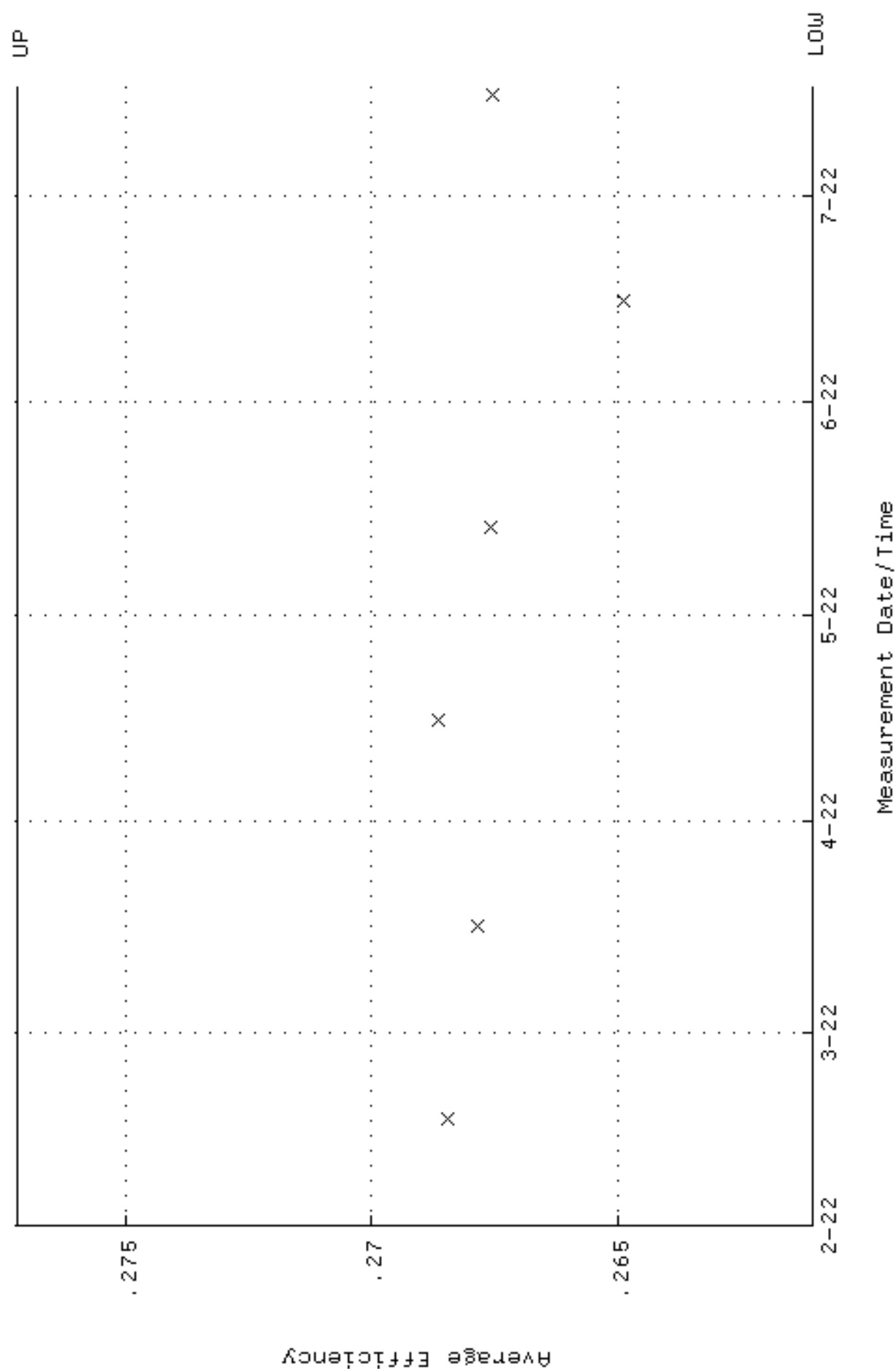
QA filename : DKA100:[ENV_ALPHA.QA.W]W178.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 16-FEB-2022 09:18:51 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



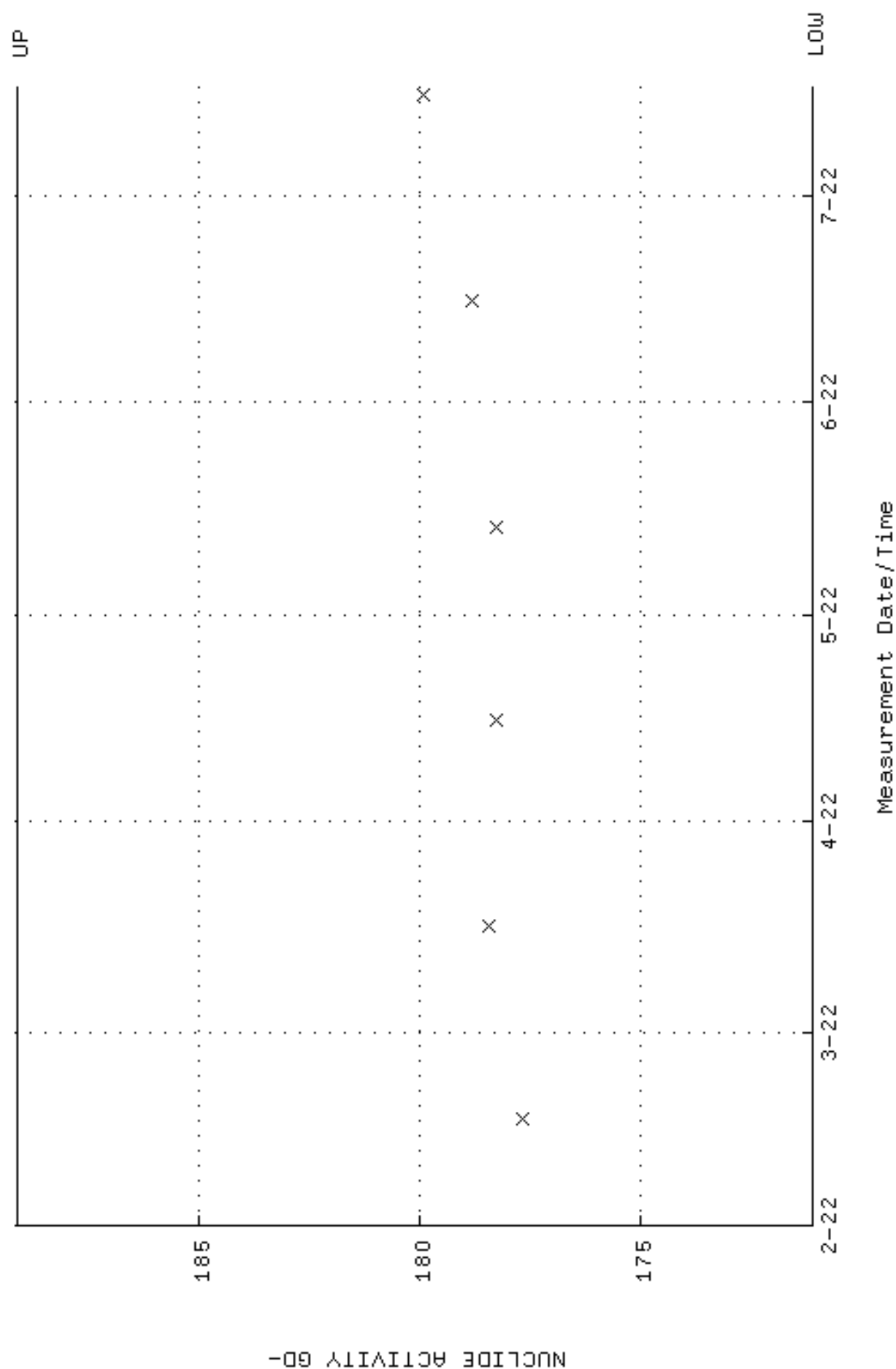
QA filename : DKA100:[ENV_ALPHA.QA.B]B178.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 4-FEB-2022 13:10:44 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



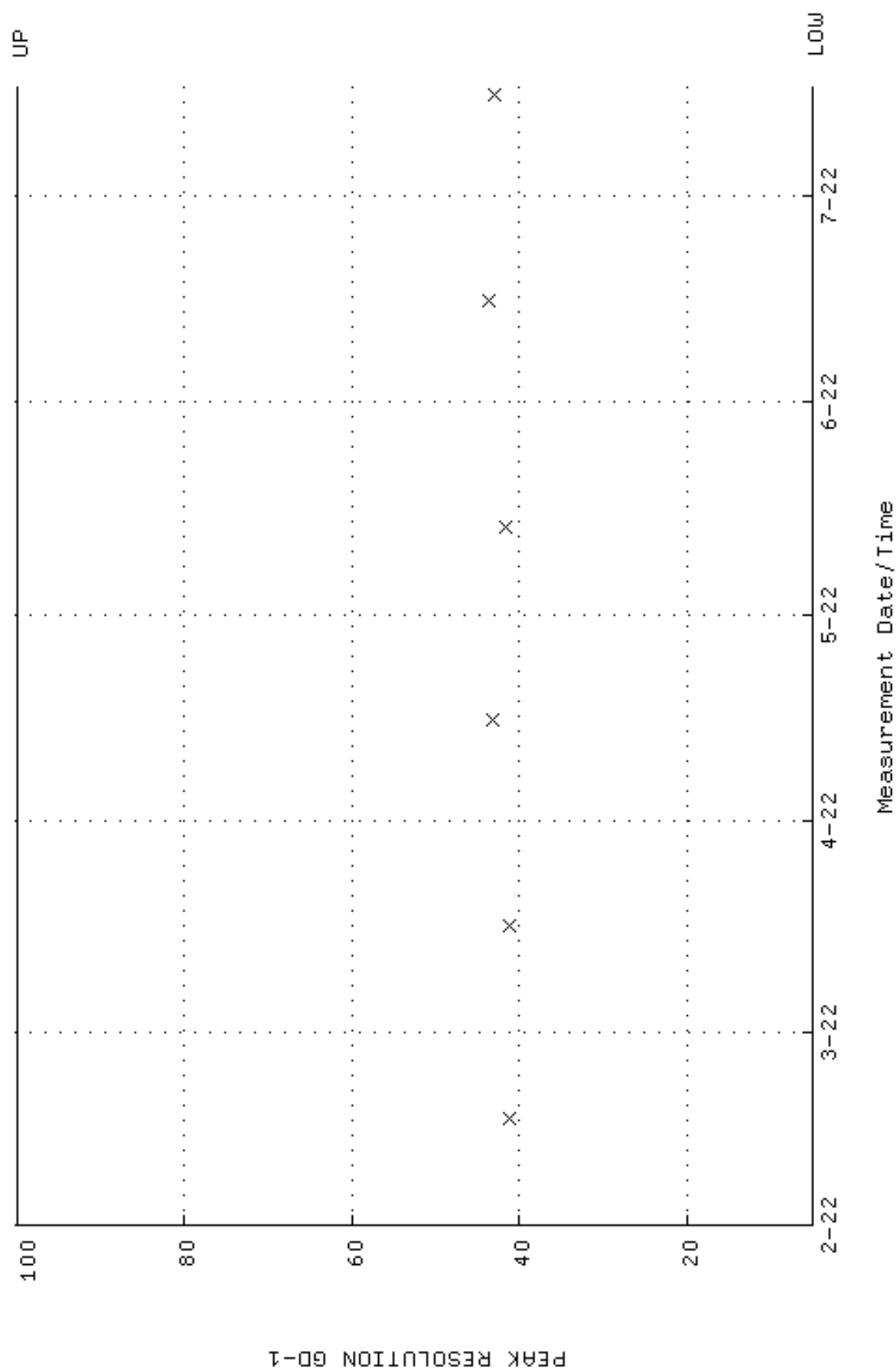
QA filename : DKA100:[ENV_ALPHA.QA.W]W179.QAF;5
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 16-FEB-2022 09:19:11 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.261050 through 0.277200



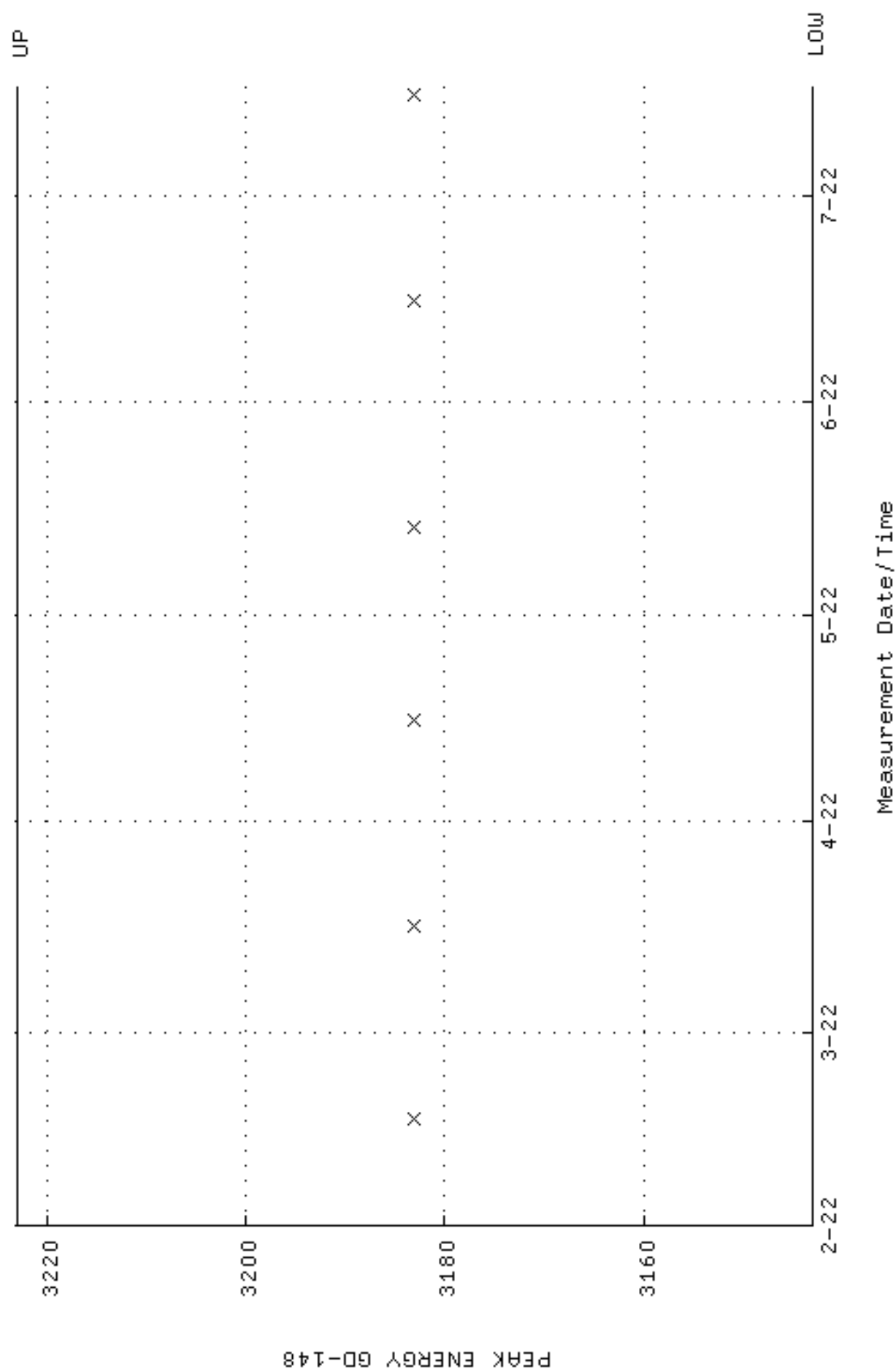
QA filename : DKA100:[ENV_ALPHA.QA.W]W179.QAF;5
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 16-FEB-2022 09:19:11 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



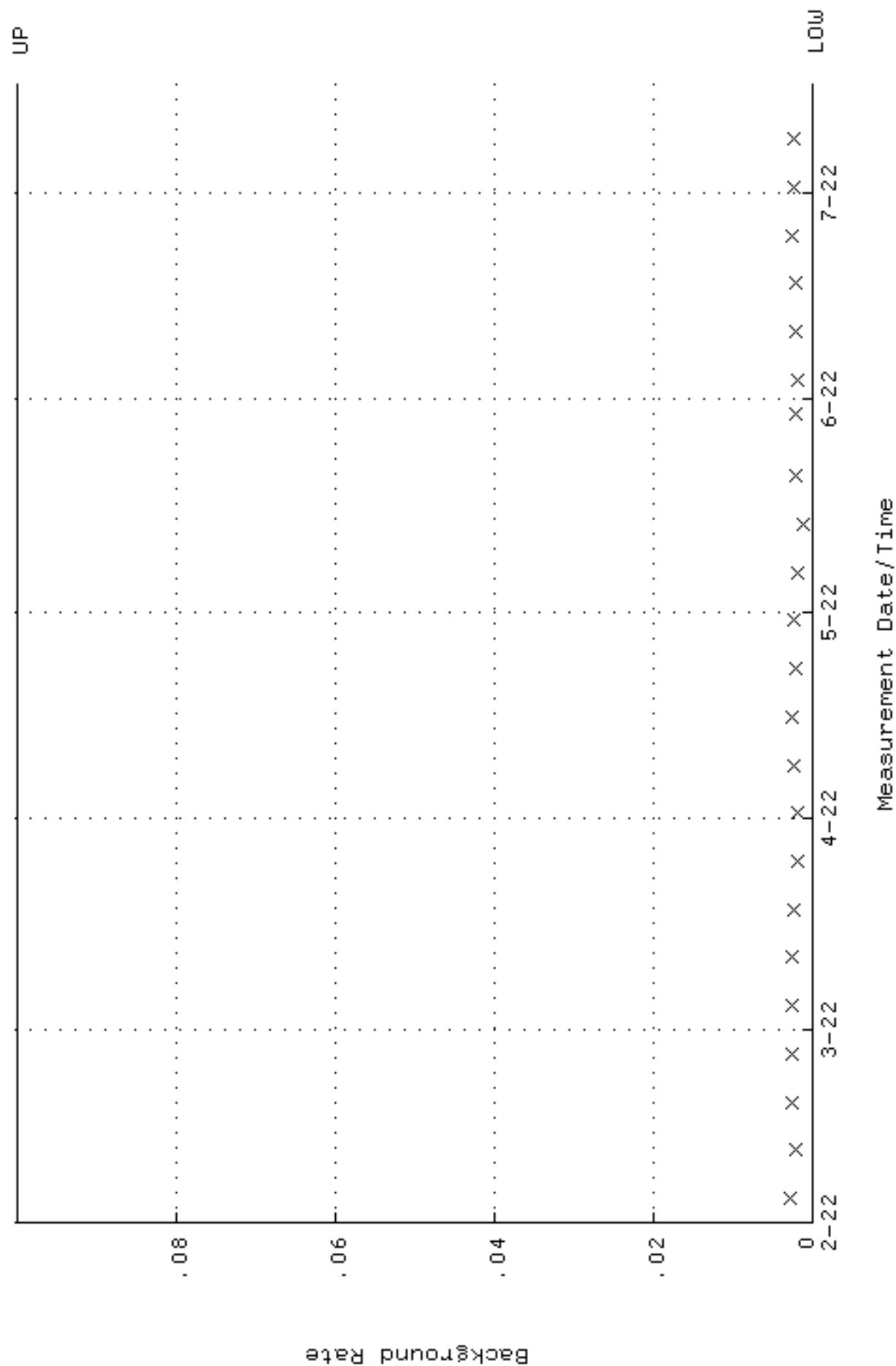
QA filename : DKA100:[ENV_ALPHA.QA.W]W179.QAF;5
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 16-FEB-2022 09:19:11 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



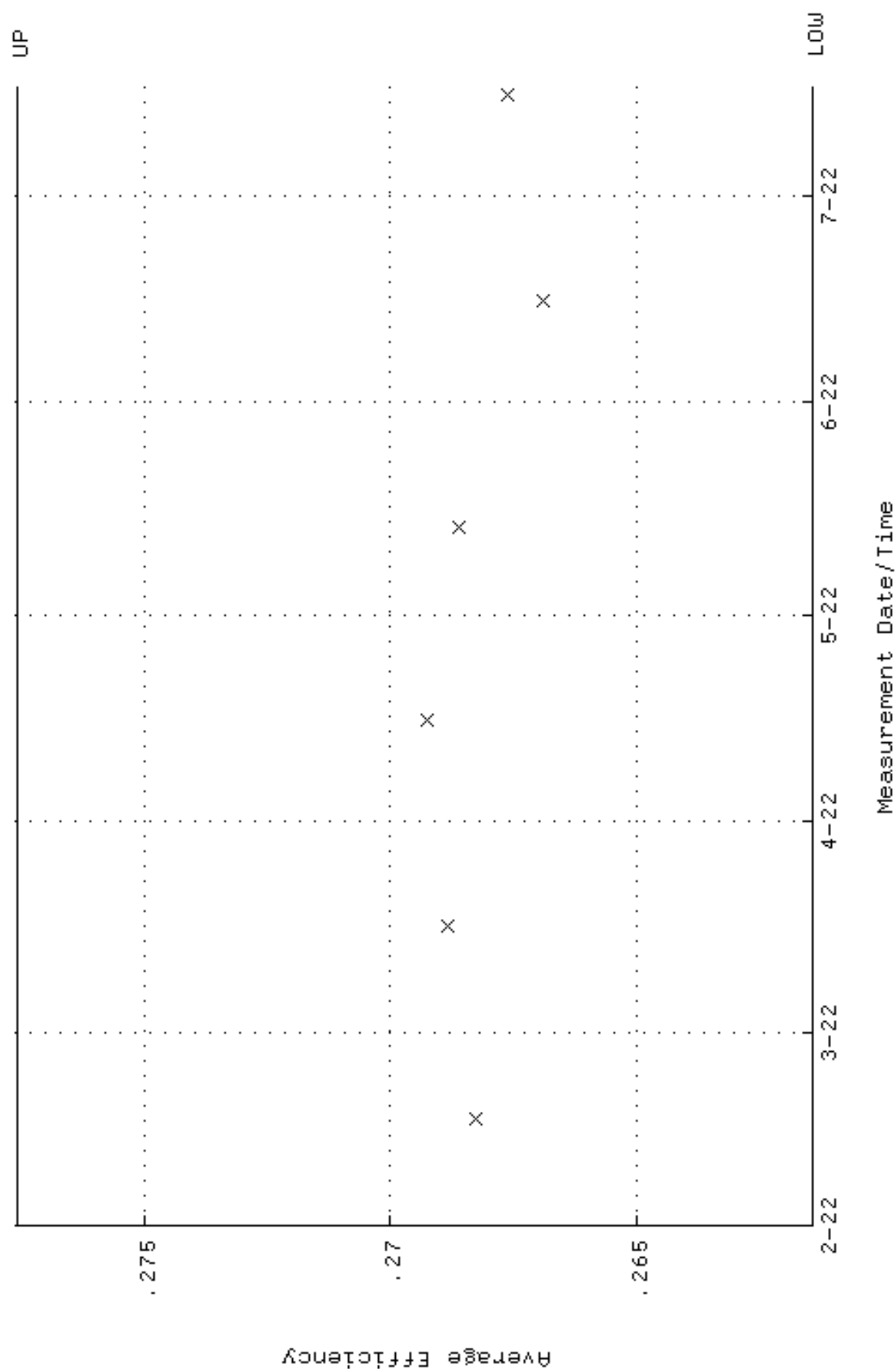
QA filename : DKA100:[ENV_ALPHA.QA.W]W179.QAF;5
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 16-FEB-2022 09:19:11 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



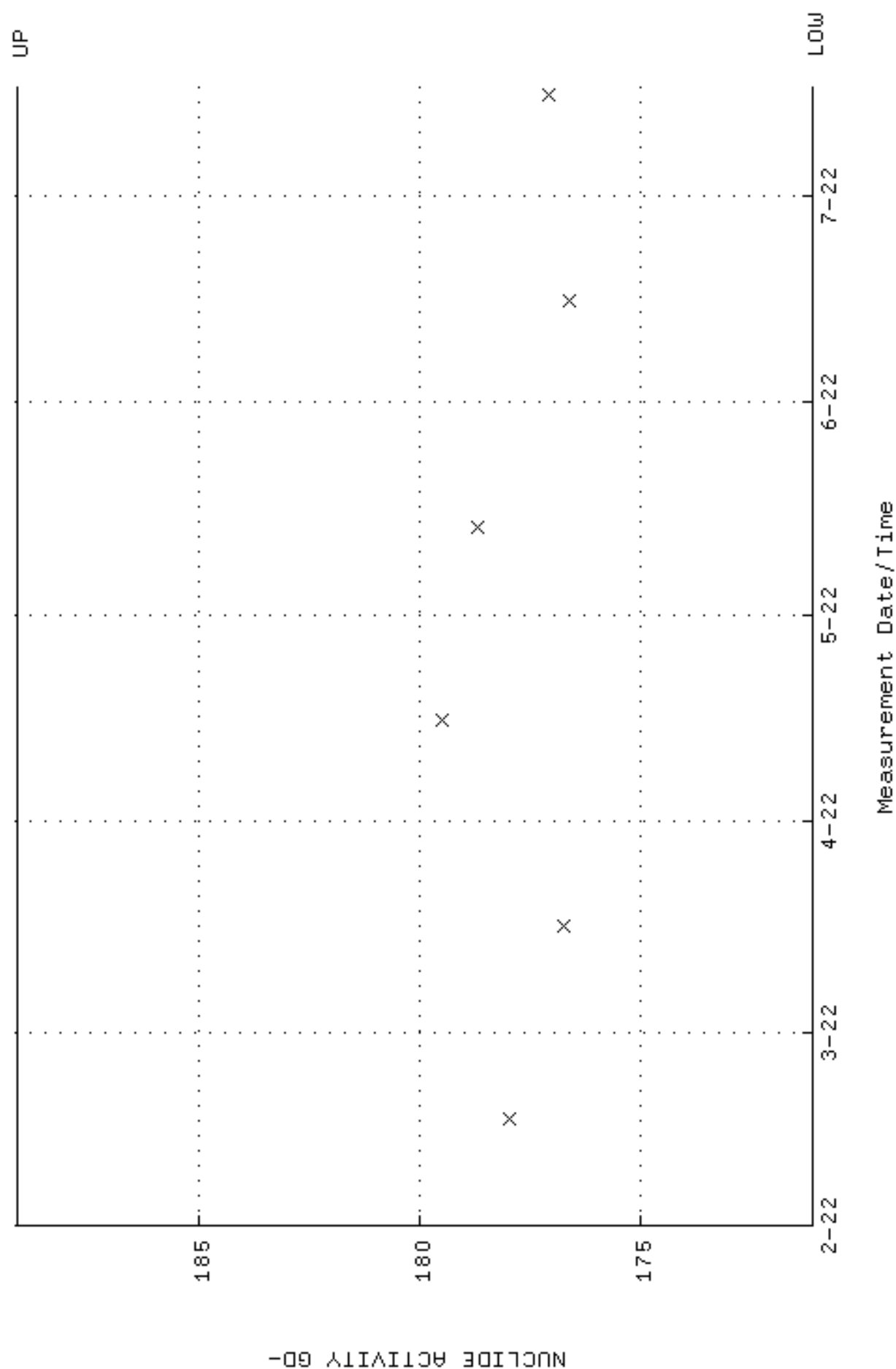
QA filename : DKA100:[ENV_ALPHA.QA.B]B179.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 4-FEB-2022 13:10:48 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



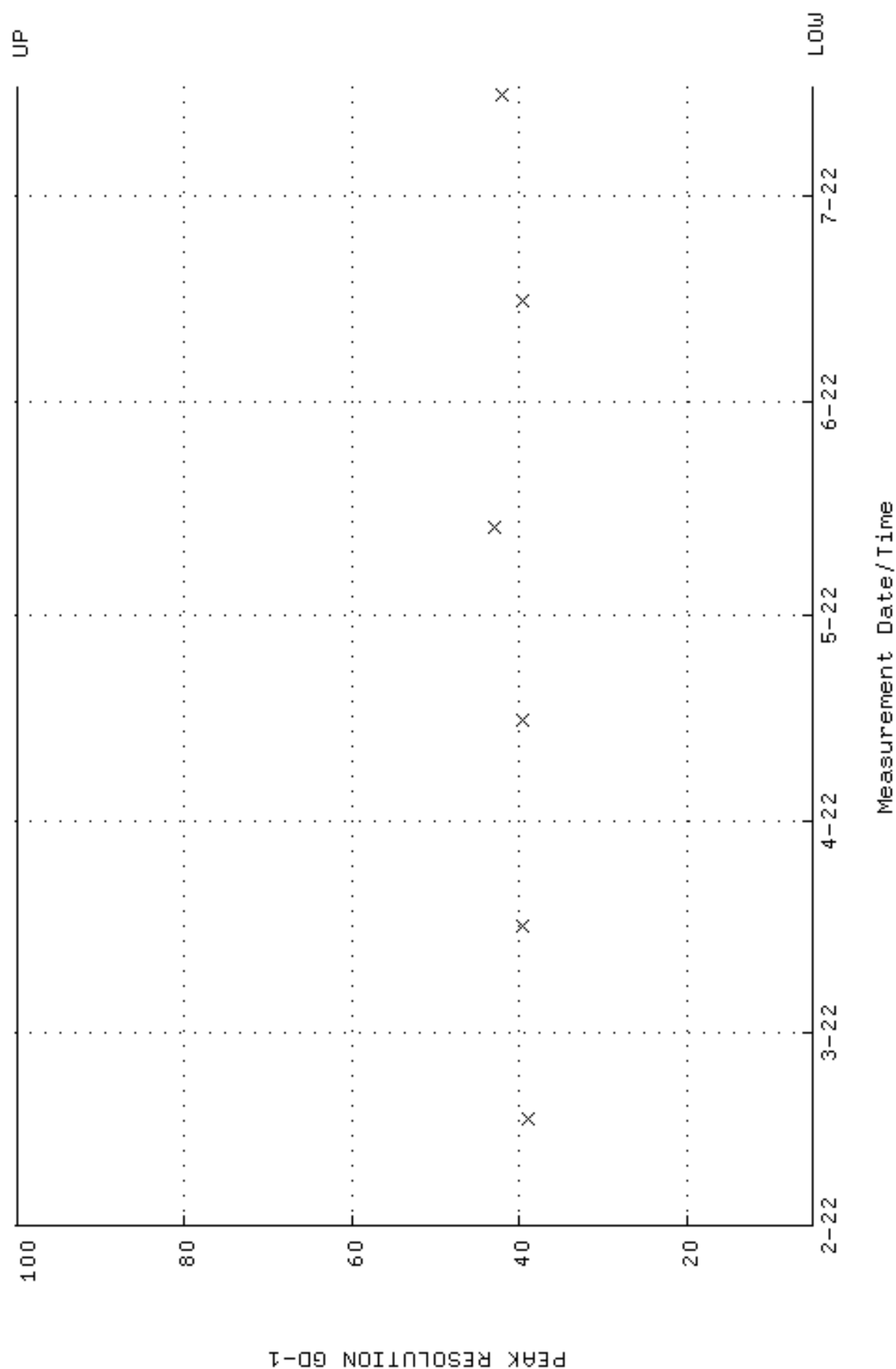
QA filename : DKA100:[ENV_ALPHA.QA.W]W180.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 16-FEB-2022 09:19:27 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.261420 through 0.277590



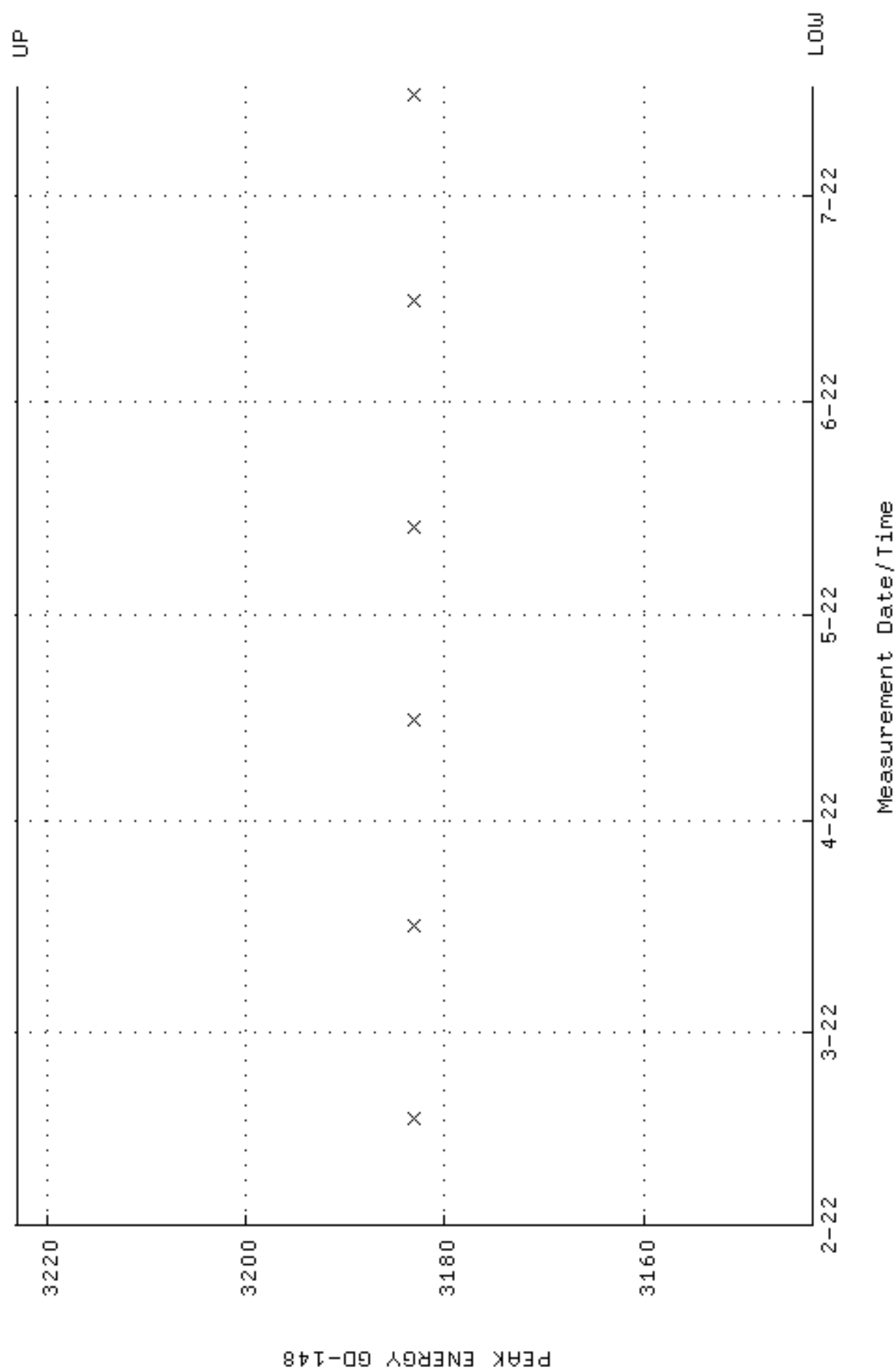
QA filename : DKA100:[ENV_ALPHA.QA.W]W180.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 16-FEB-2022 09:19:27 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



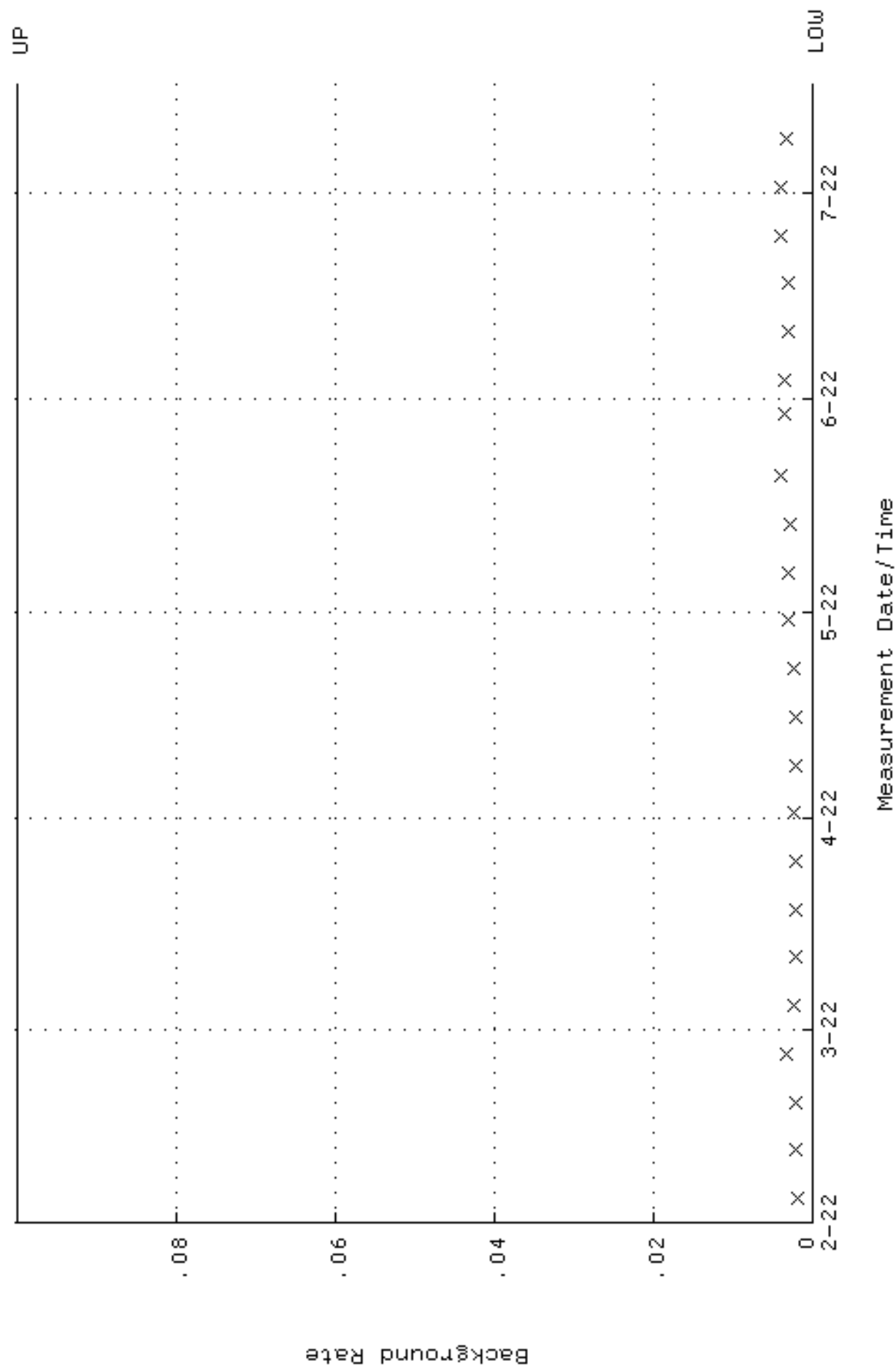
QA filename : DKA100:[ENV_ALPHA.QA.W]W180.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 16-FEB-2022 09:19:27 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



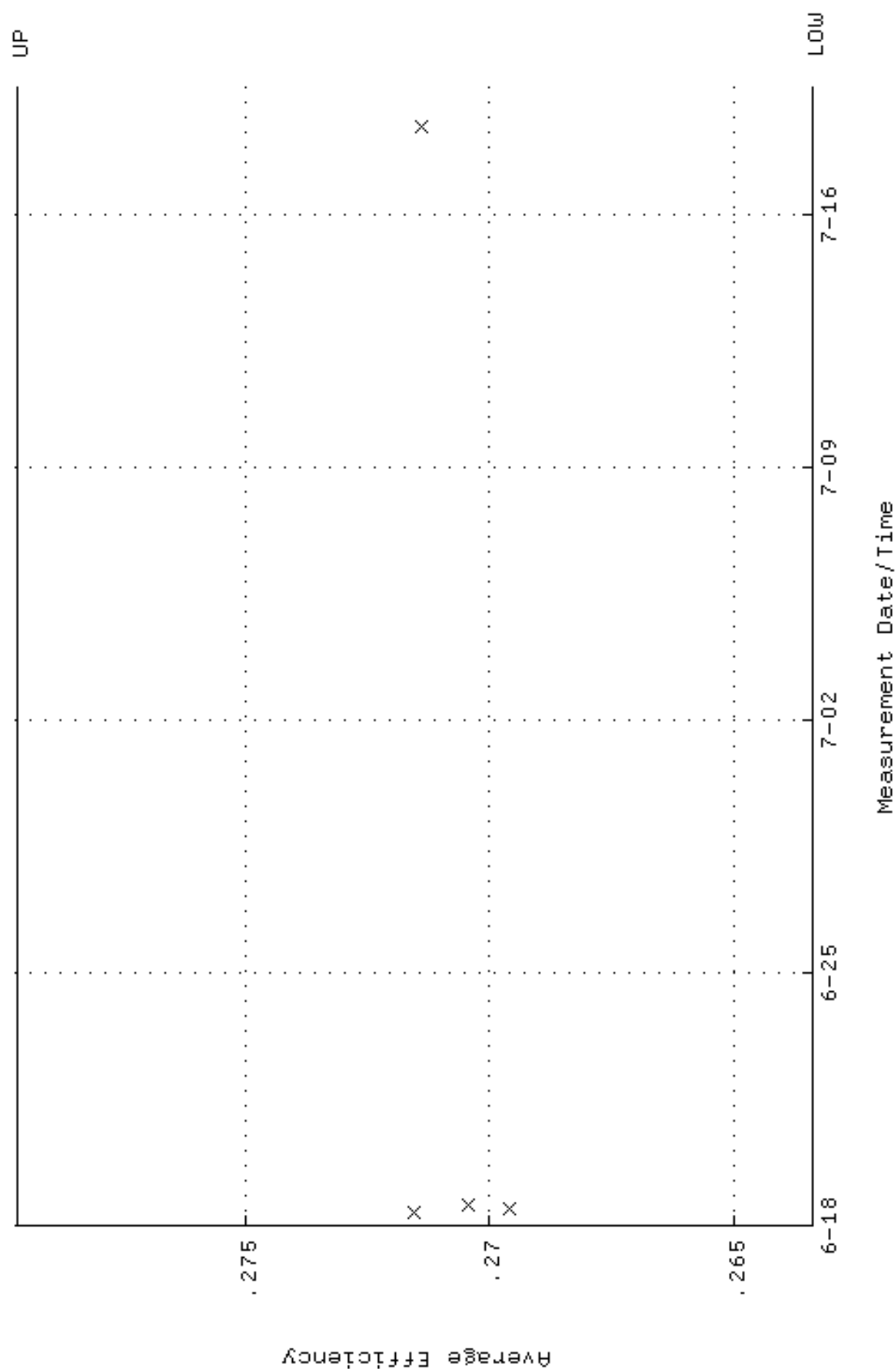
QA filename : DKA100:[ENV_ALPHA.QA.W]W180.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 16-FEB-2022 09:19:27 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



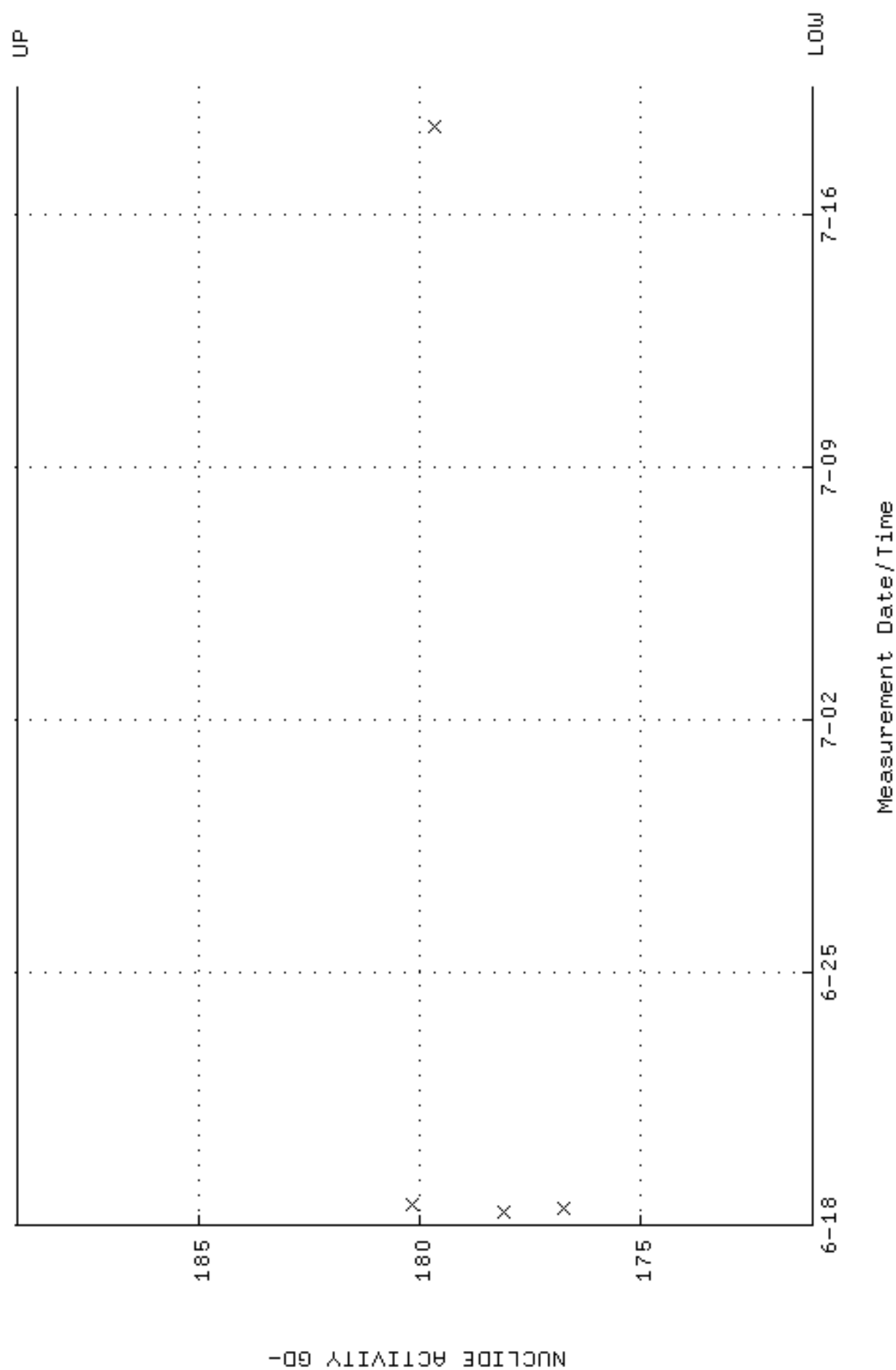
QA filename : DKA100:[ENV_ALPHA.QA.B]B180.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 4-FEB-2022 13:10:53 through 16-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



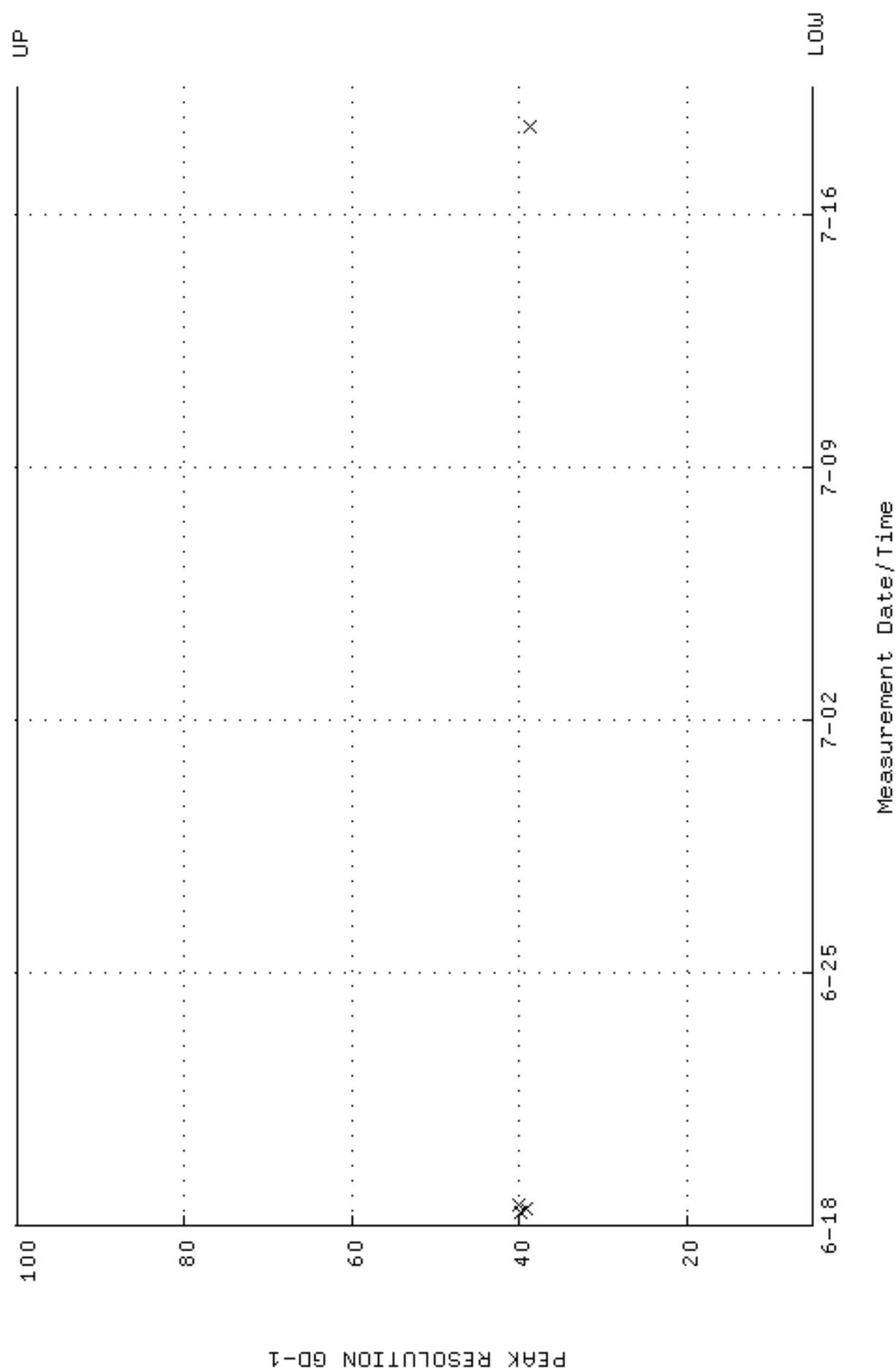
QA filename : DKA100:[ENV_ALPHA.QA.W]W191.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUN-2022 09:02:39 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.263380 through 0.279670



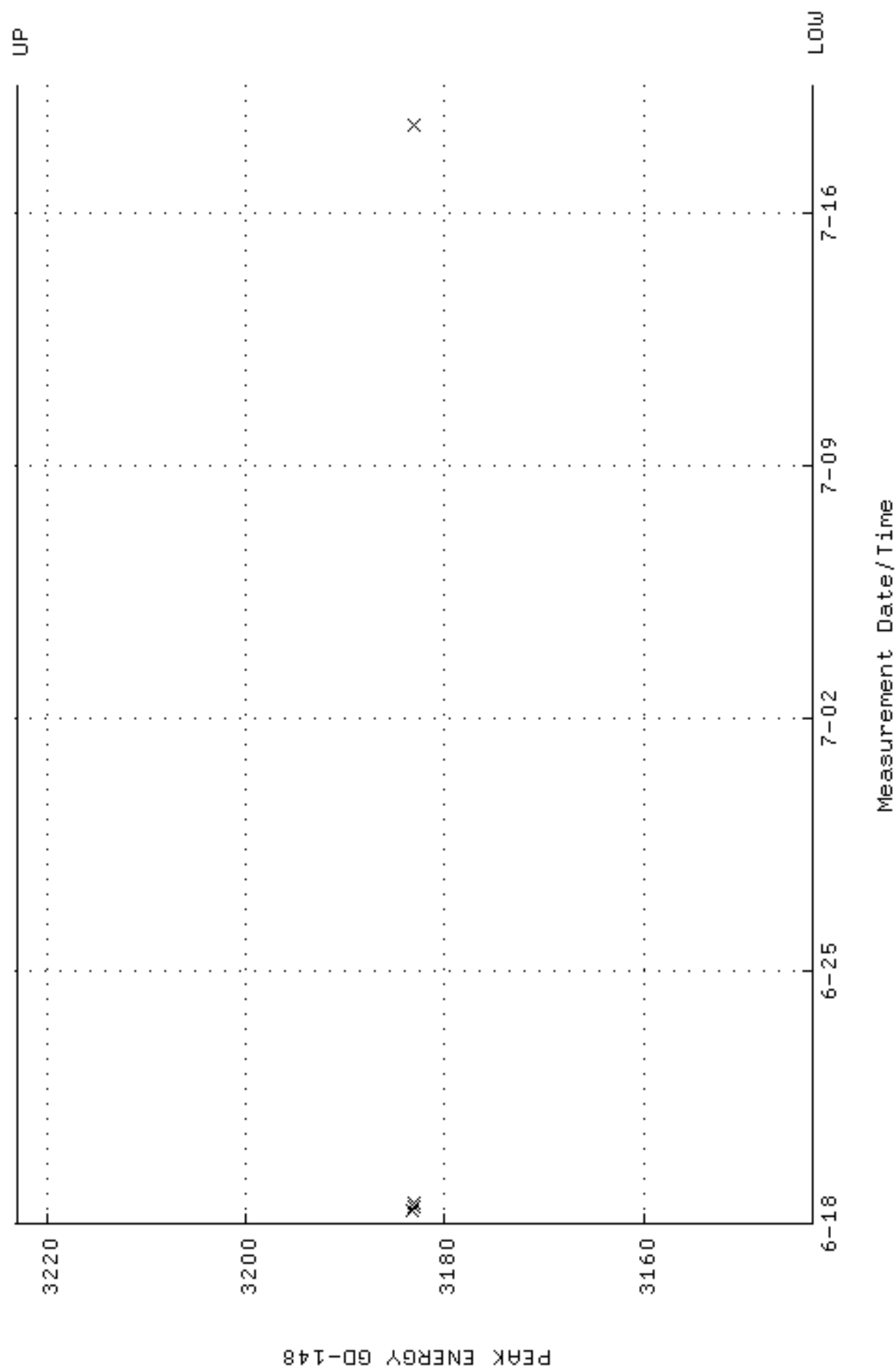
QA filename : DKA100:[ENV_ALPHA.QA.W]W191.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:39 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



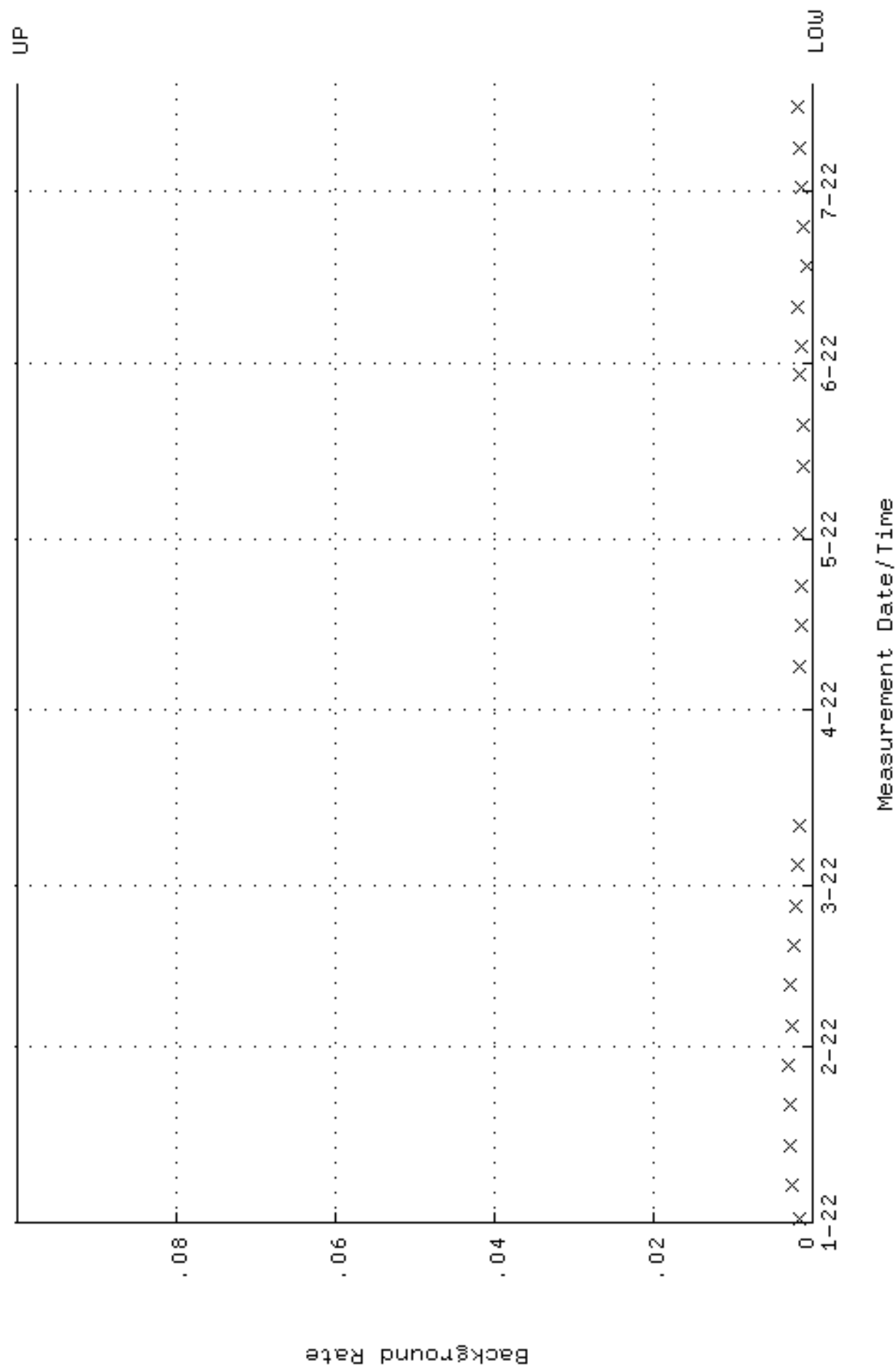
QA filename : DKA100:[ENV_ALPHA.QA.W]W191.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUN-2022 09:02:39 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



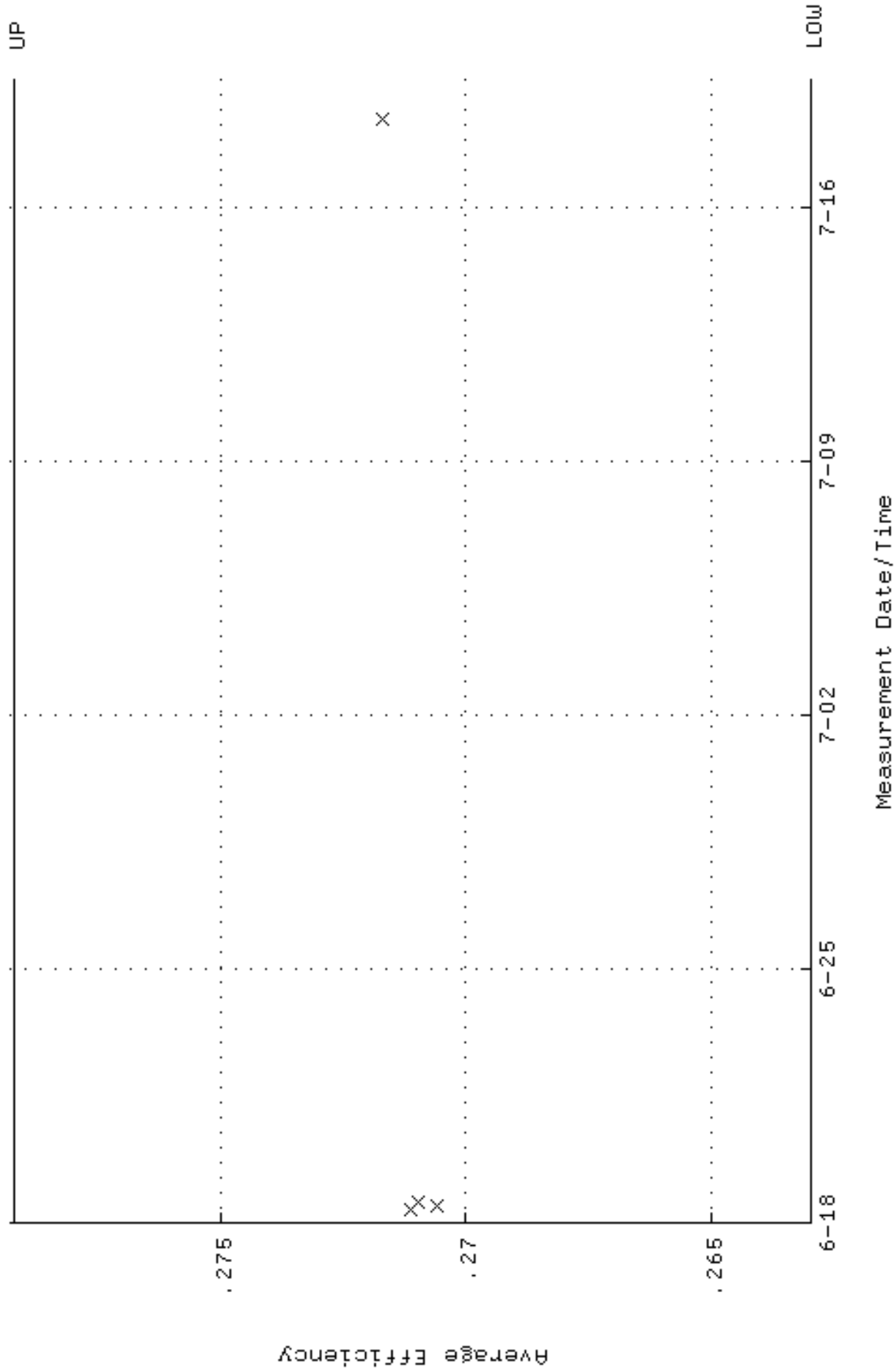
QA filename : DKA100:[ENV_ALPHA.QA.W]W191.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:39 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



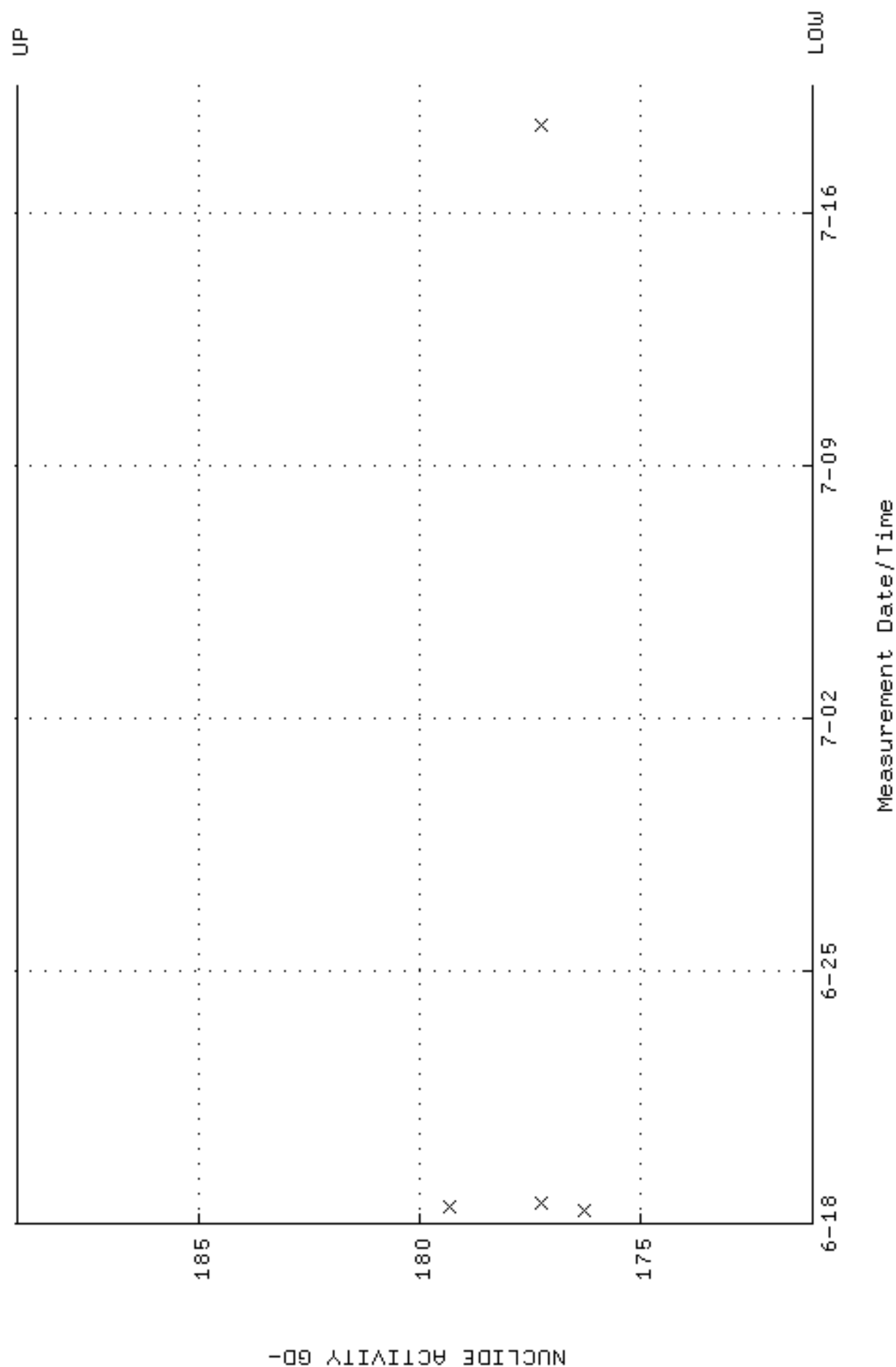
QA filename : DKA100:[ENV_ALPHA.QA.B]B191.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:20:37 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



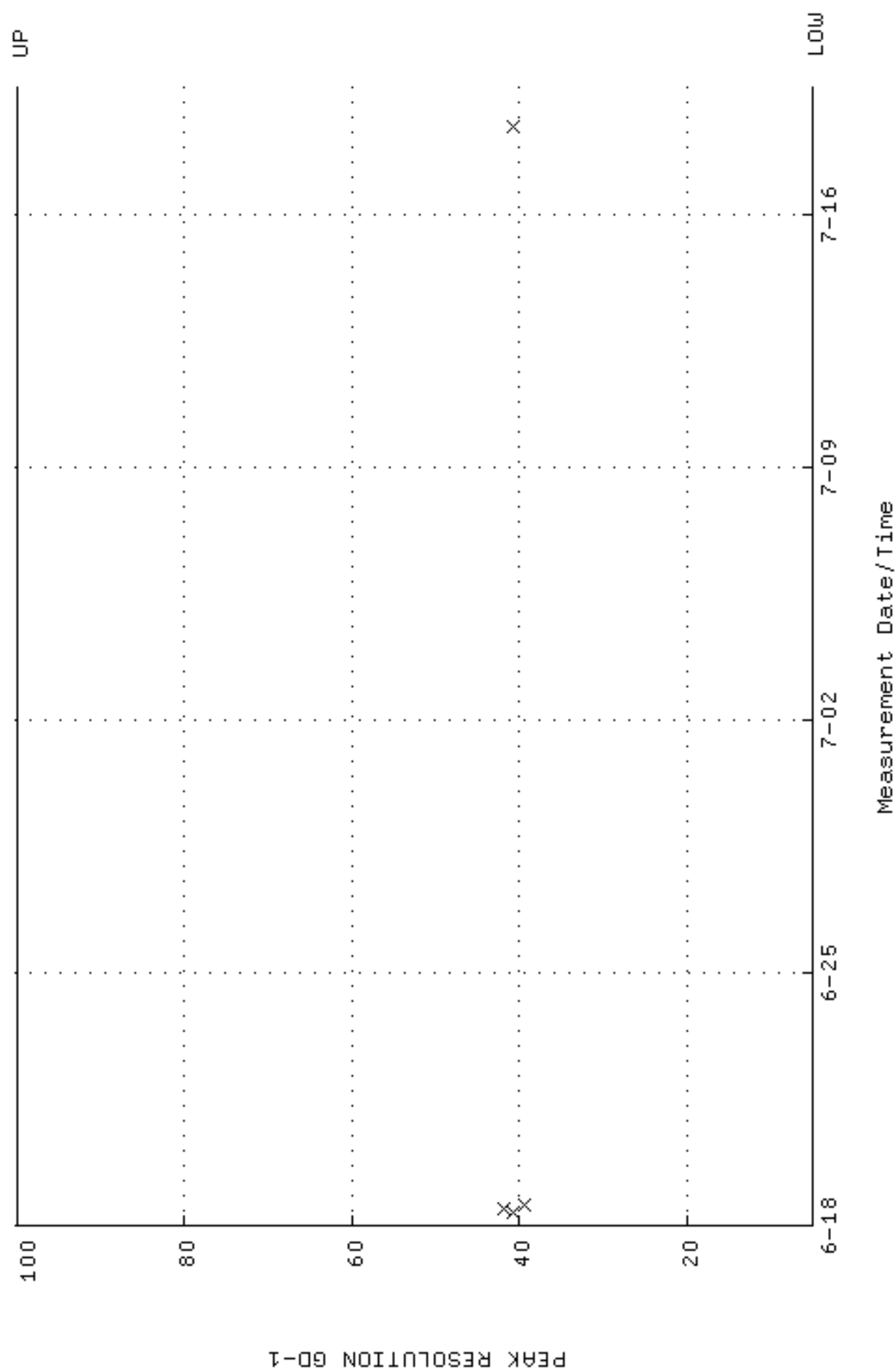
QA filename : DKA100:[ENV_ALPHA.QA.W]W192.QAF;4
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 18-JUN-2022 09:02:43 through 19-JUL-2022 12:00:00
Lower/Upper Lmts: 0.262970 through 0.279240



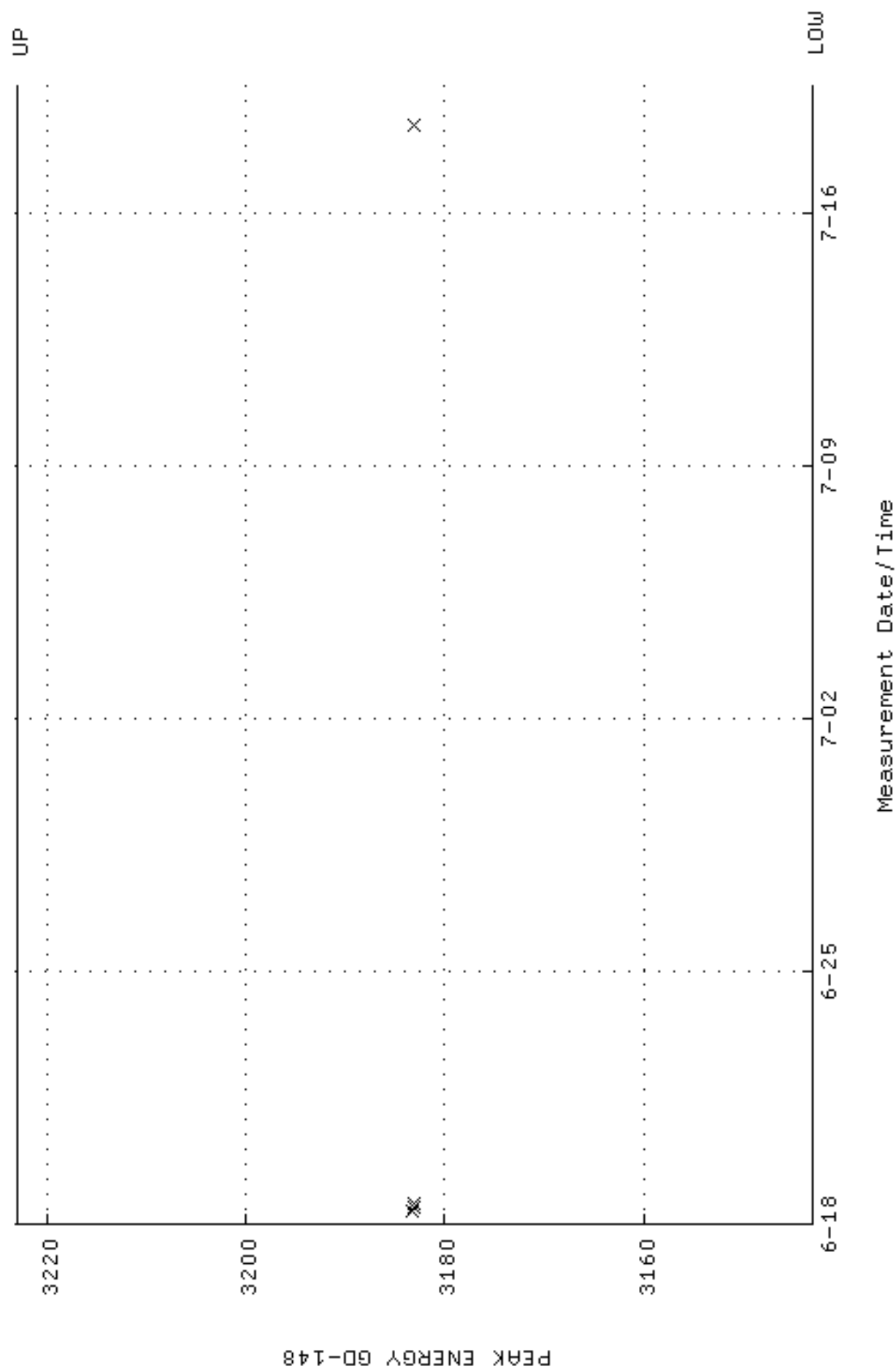
QA filename : DKA100:[ENV_ALPHA.QA.W]W192.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:43 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



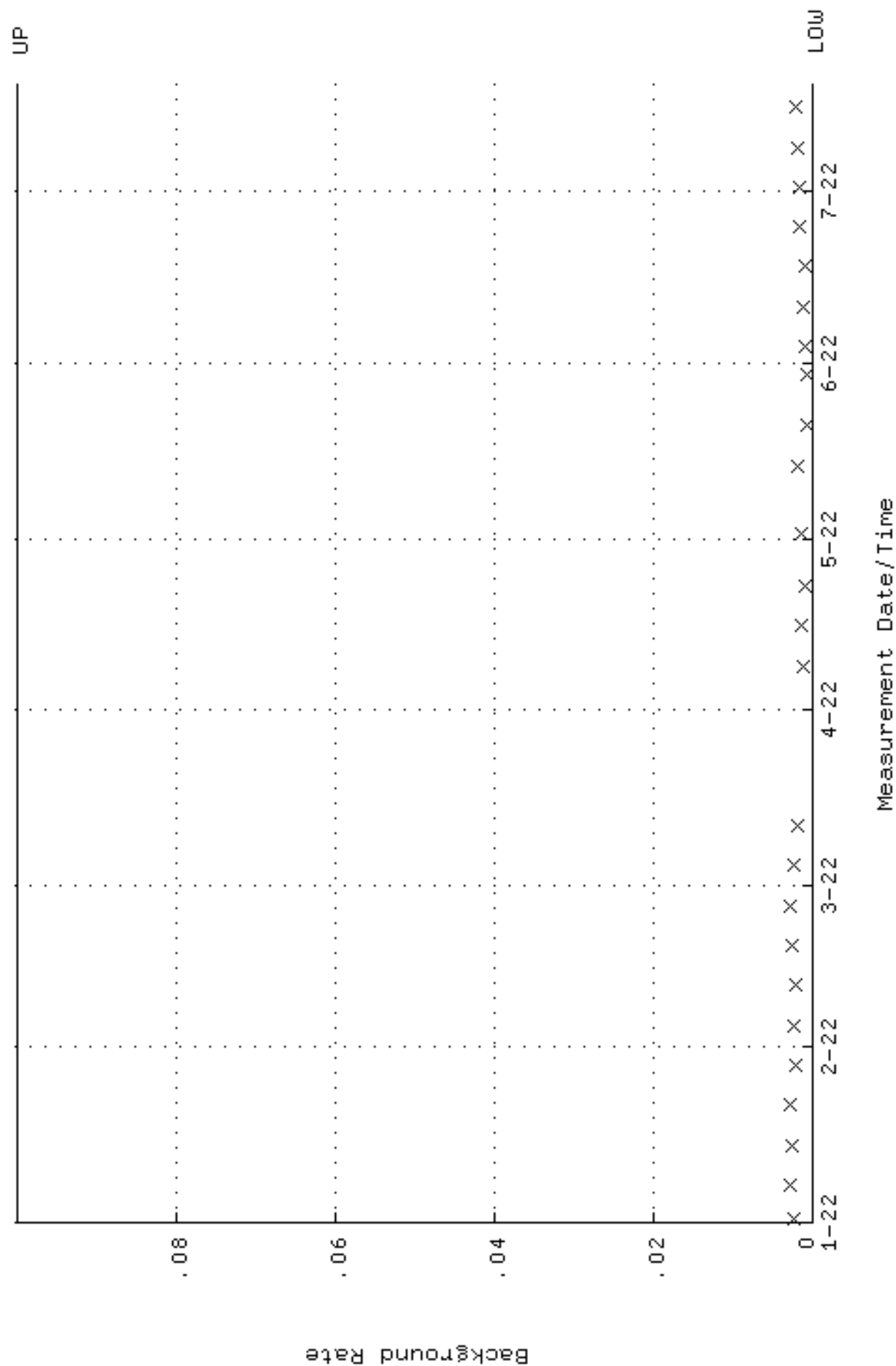
QA filename : DKA100:[ENV_ALPHA.QA.W]W192.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUN-2022 09:02:43 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



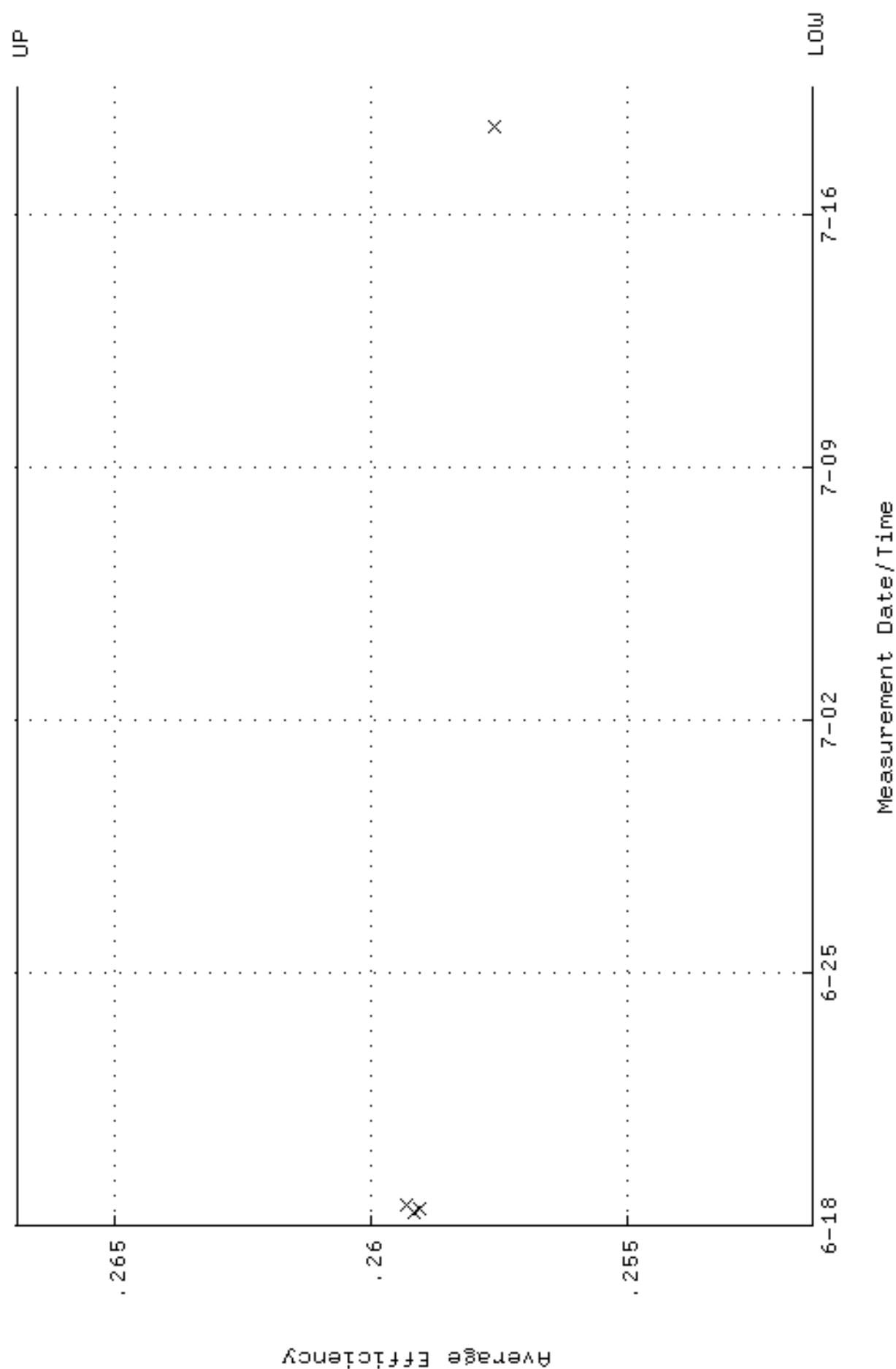
QA filename : DKA100:[ENV_ALPHA.QA.W]W192.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:43 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



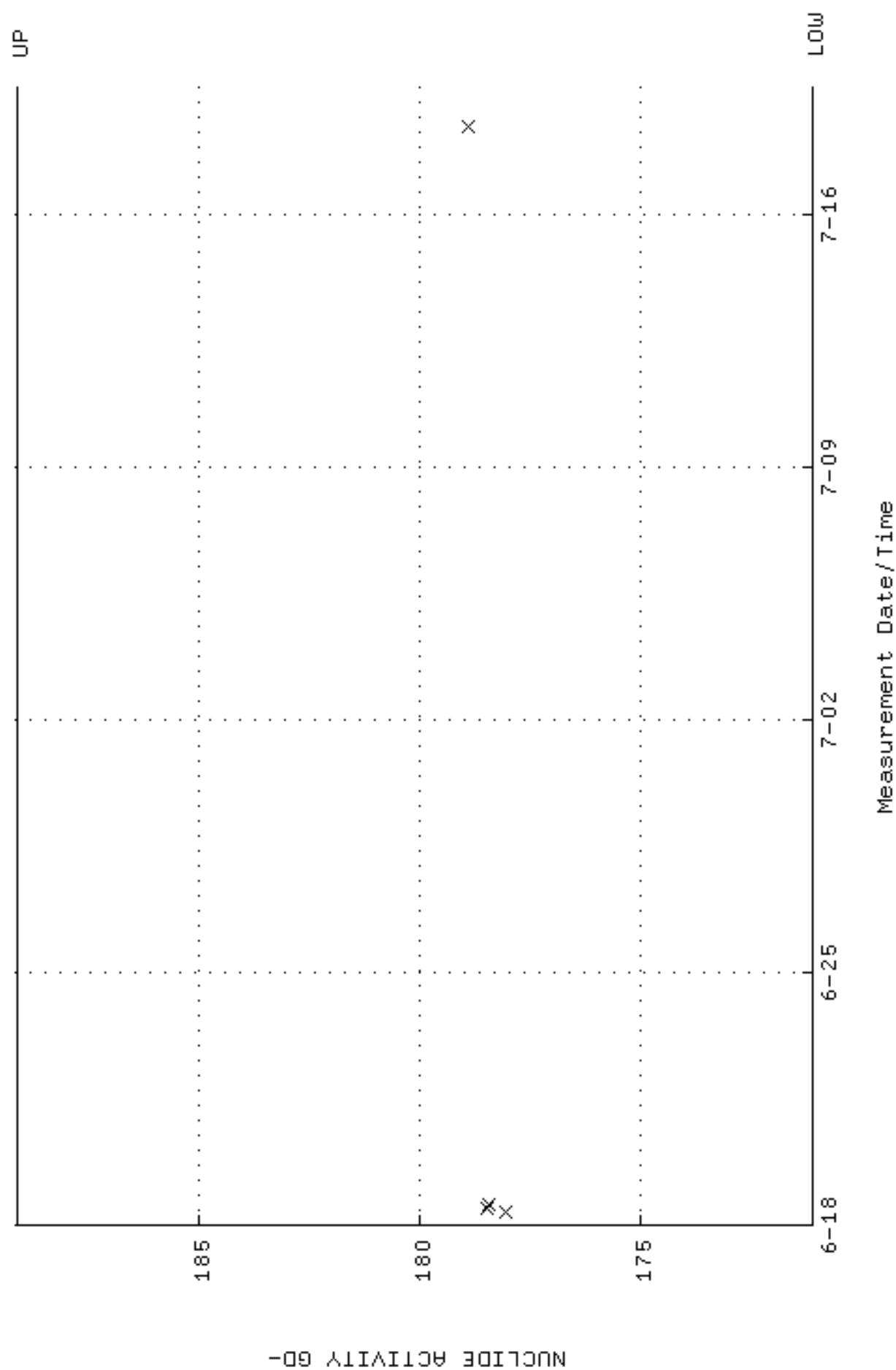
QA filename : DKA100:[ENV_ALPHA.QA.B]B192.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:20:42 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



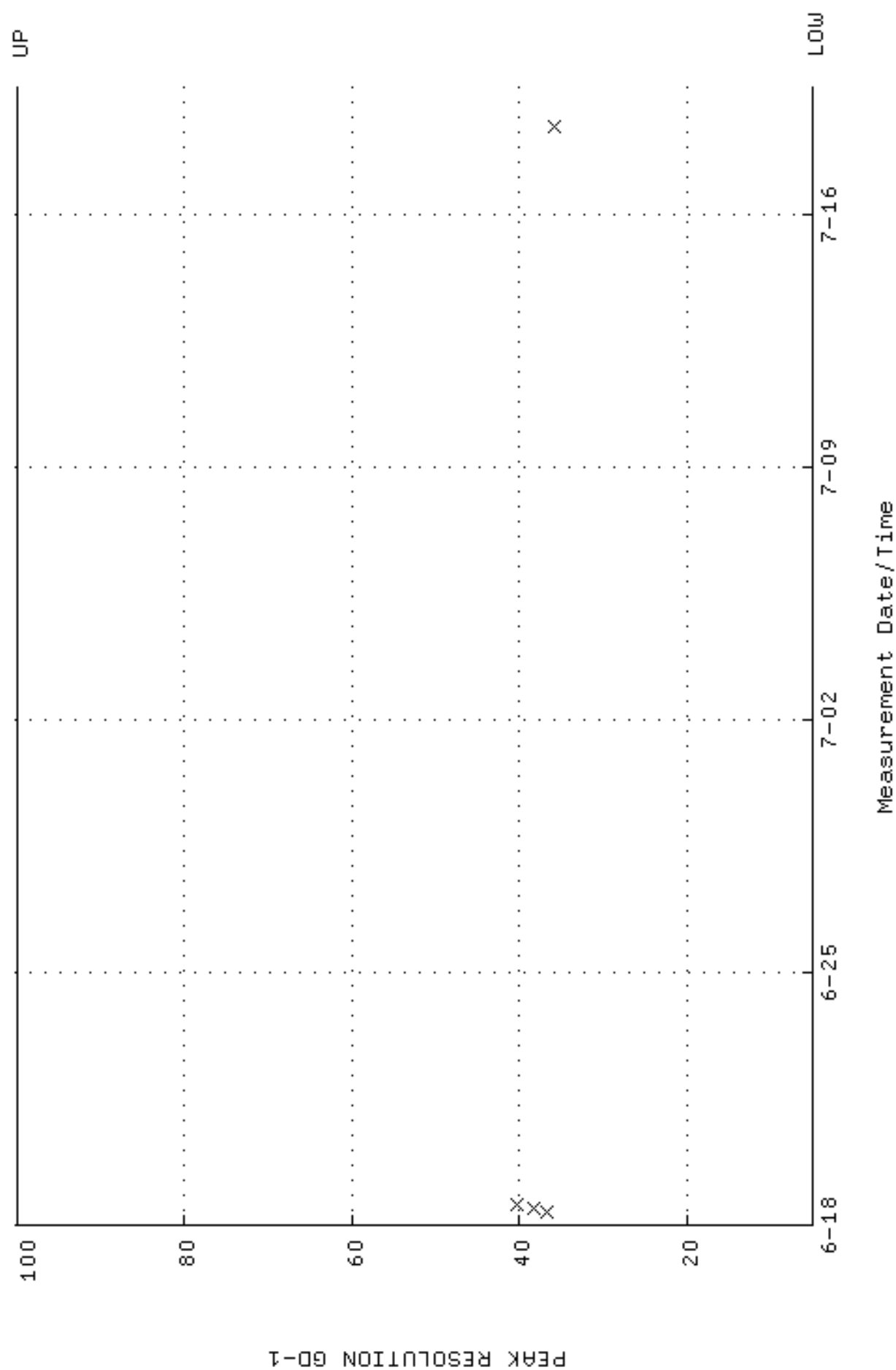
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUN-2022 09:02:52 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.251370 through 0.266910



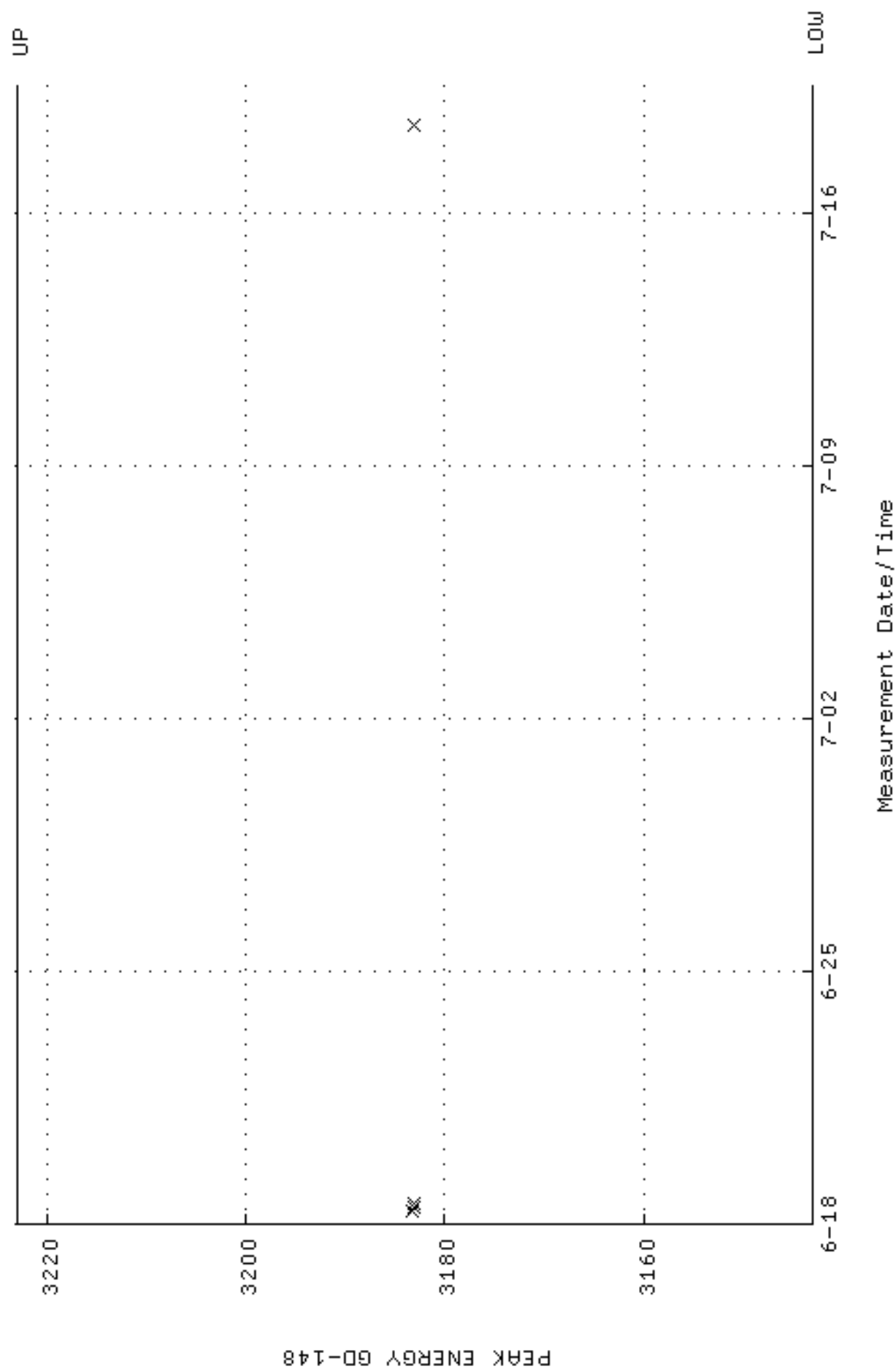
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:52 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



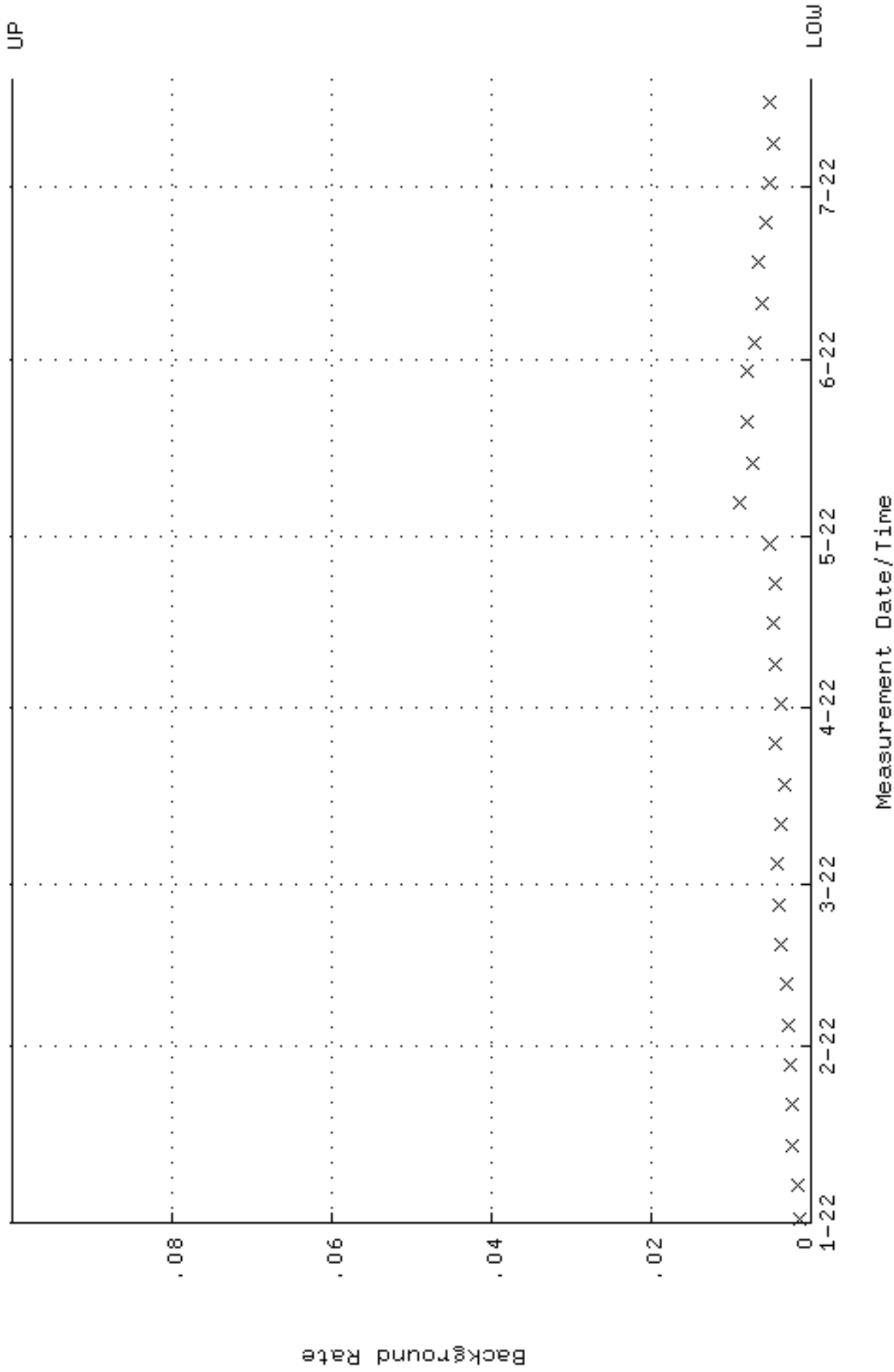
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUN-2022 09:02:52 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



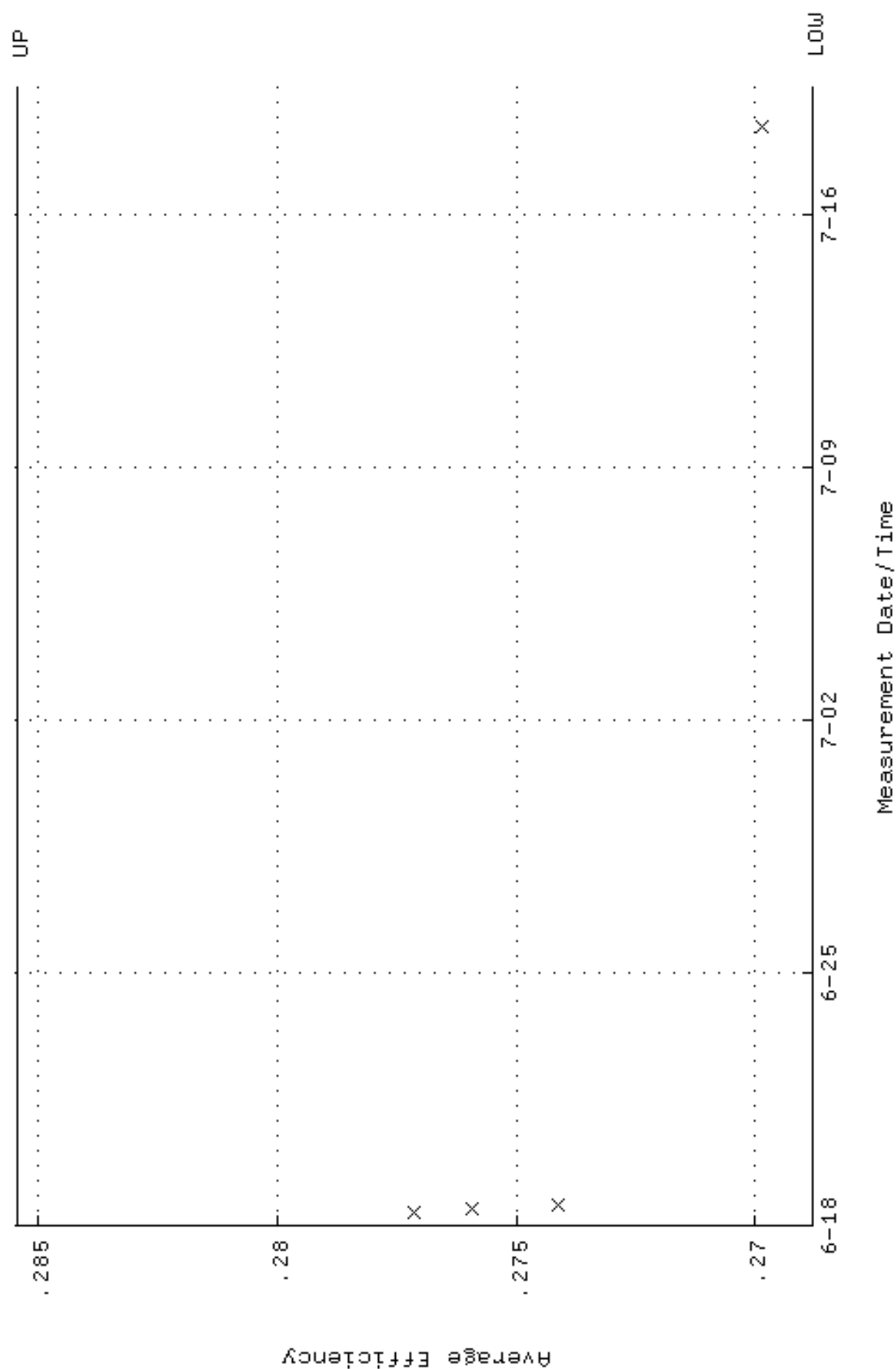
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:52 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



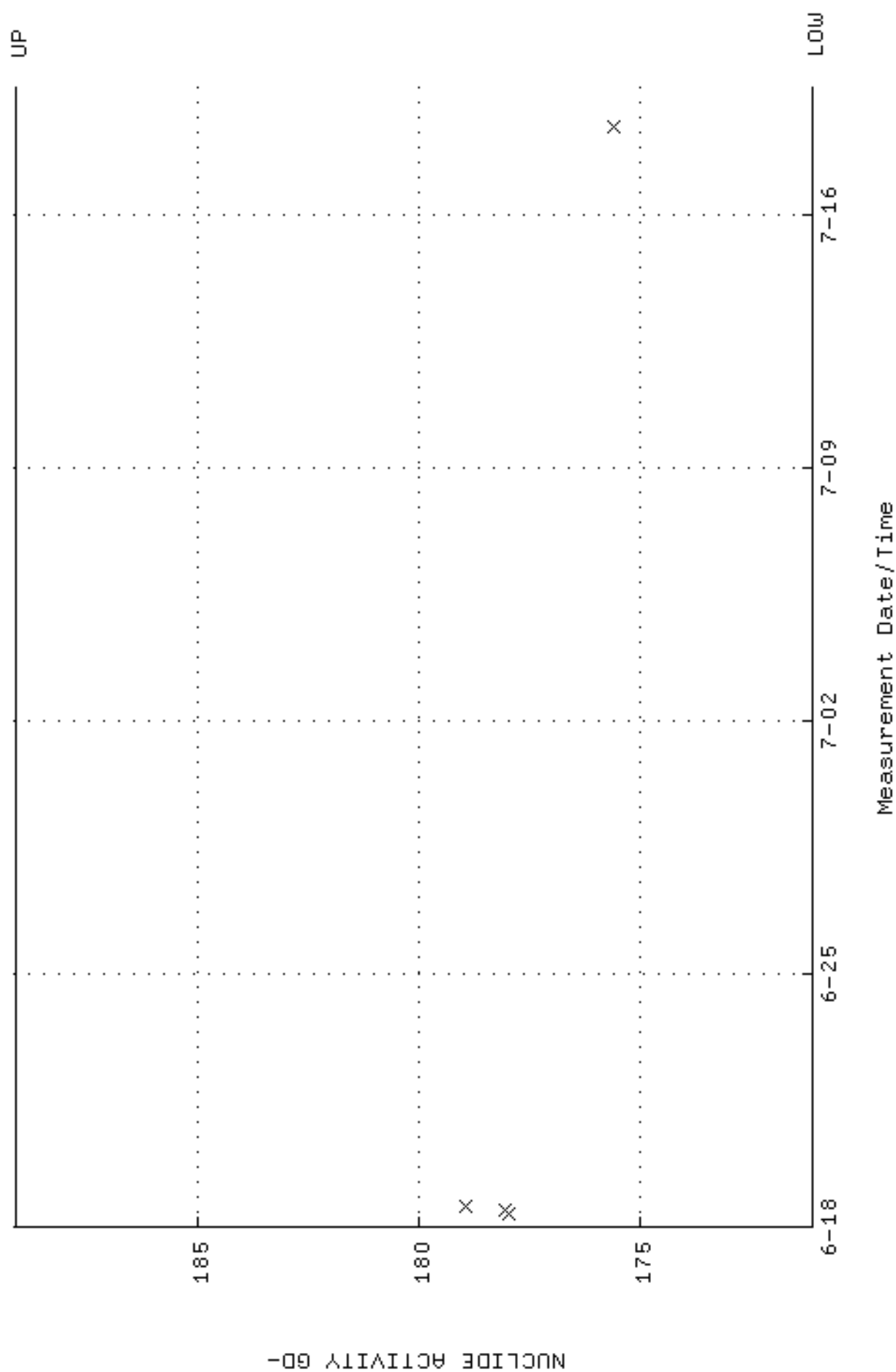
QA filename : DKA100:[ENV_ALPHA.QA.B]B194.QAF;3
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JAN-2022 13:20:50 through 19-JUL-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 0.100000



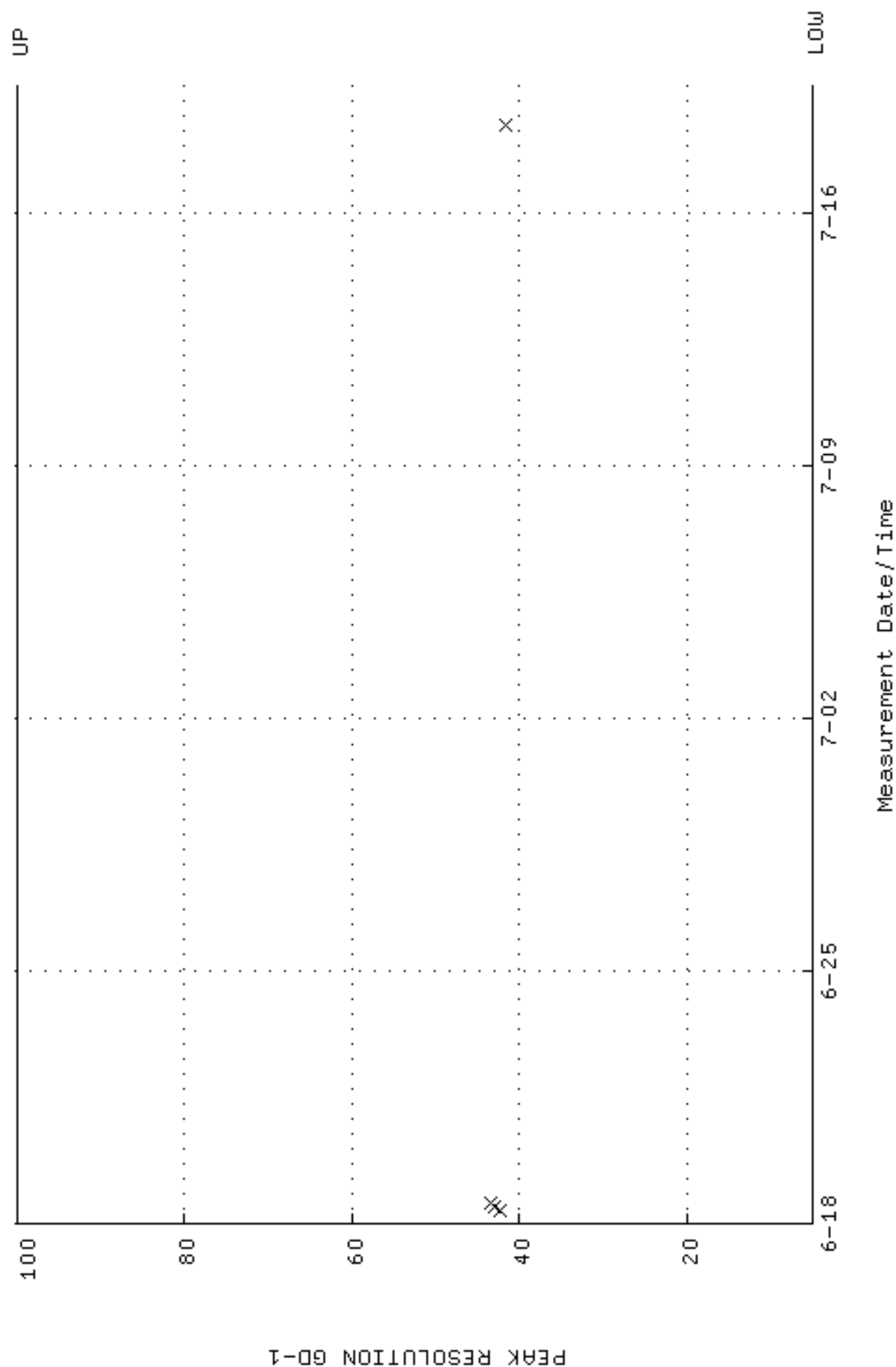
QA filename : DKA100:[ENV_ALPHA.QA.W]W195.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUN-2022 09:02:56 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.268800 through 0.285430



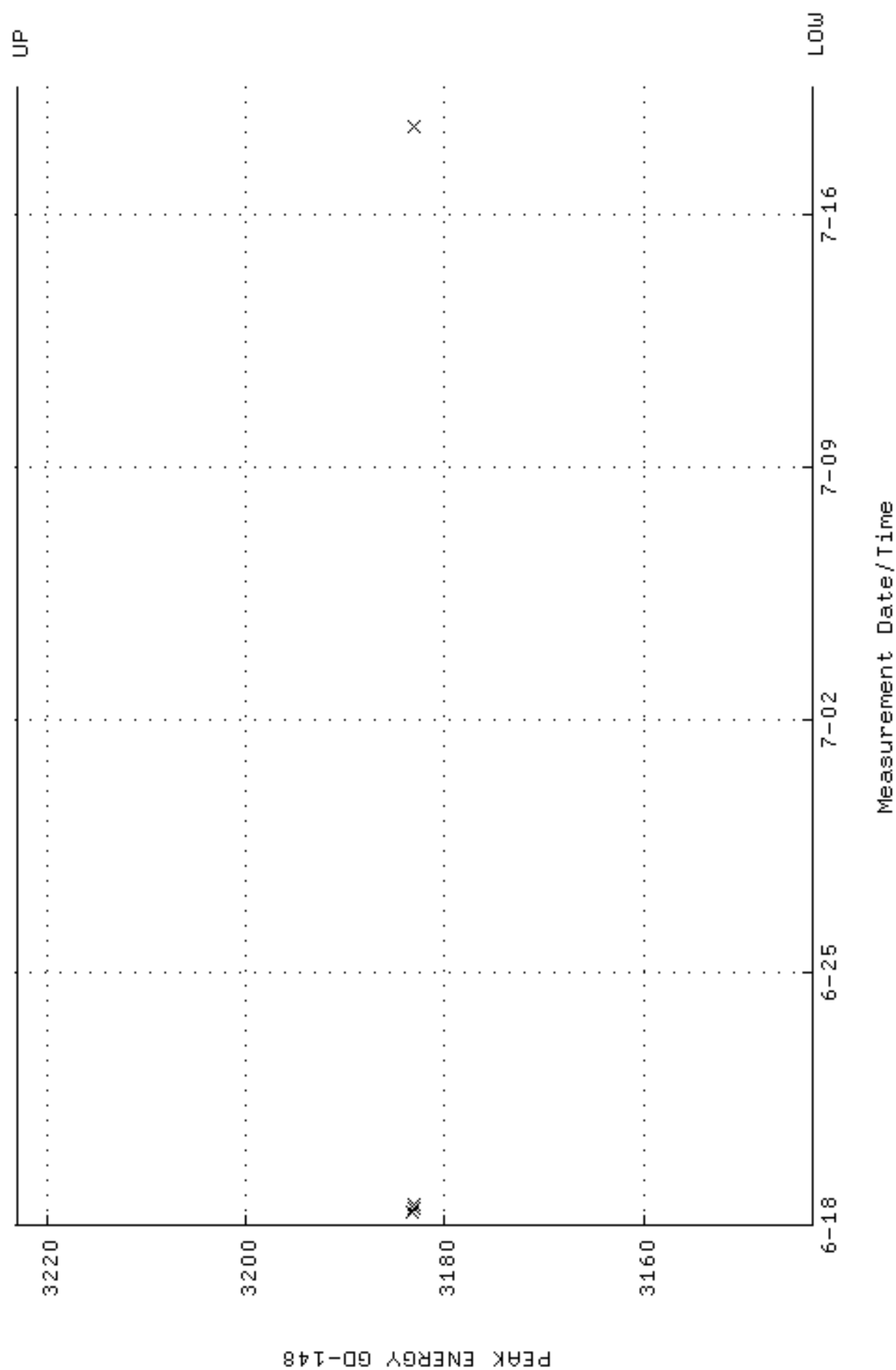
QA filename : DKA100:[ENV_ALPHA.QA.W]W195.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:56 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



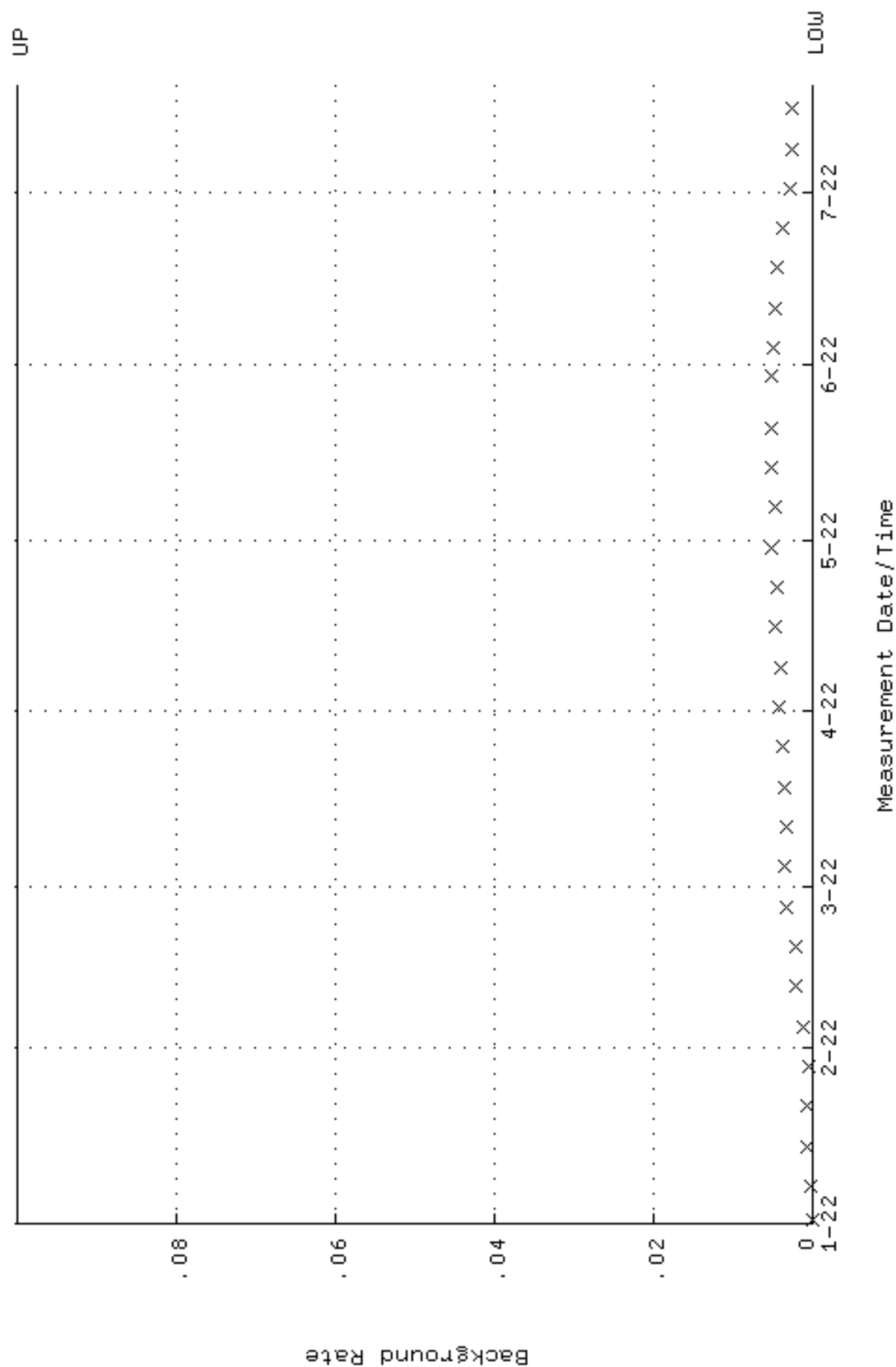
QA filename : DKA100:[ENV_ALPHA.QA.W]W195.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUN-2022 09:02:56 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



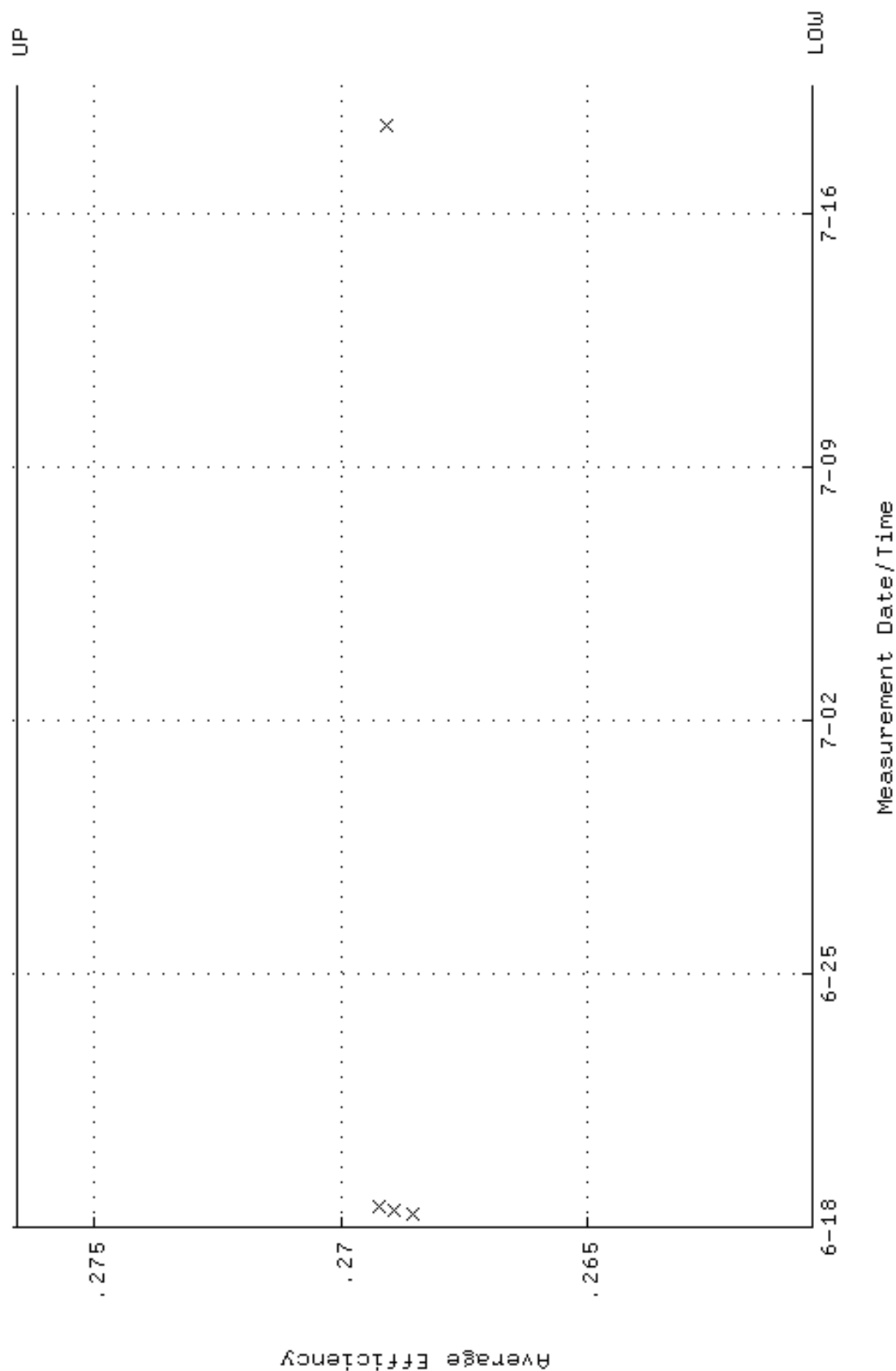
QA filename : DKA100:[ENV_ALPHA.QA.W]W195.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:56 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



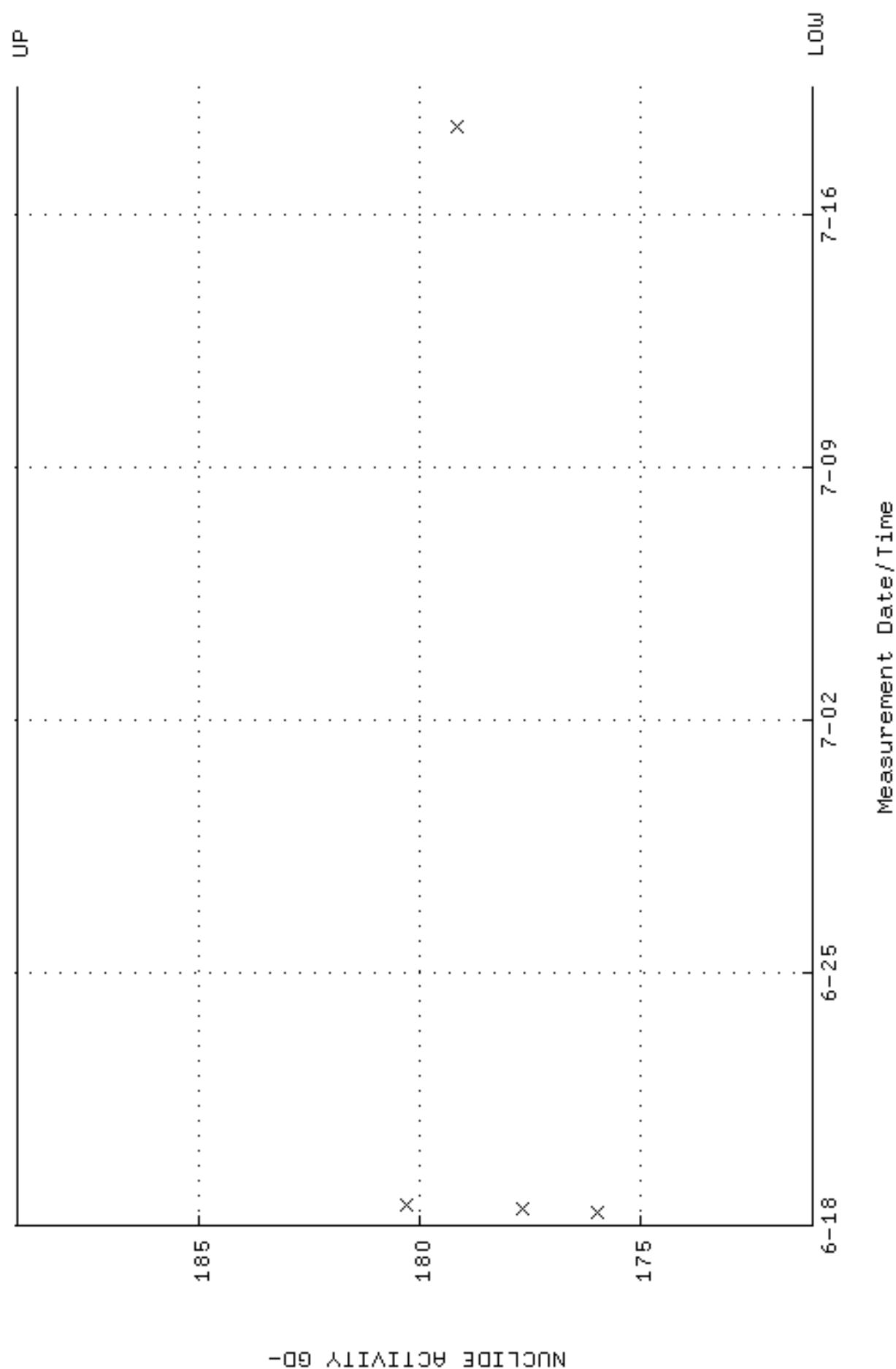
QA filename : DKA100:[ENV_ALPHA.QA.B]B195.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:20:55 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



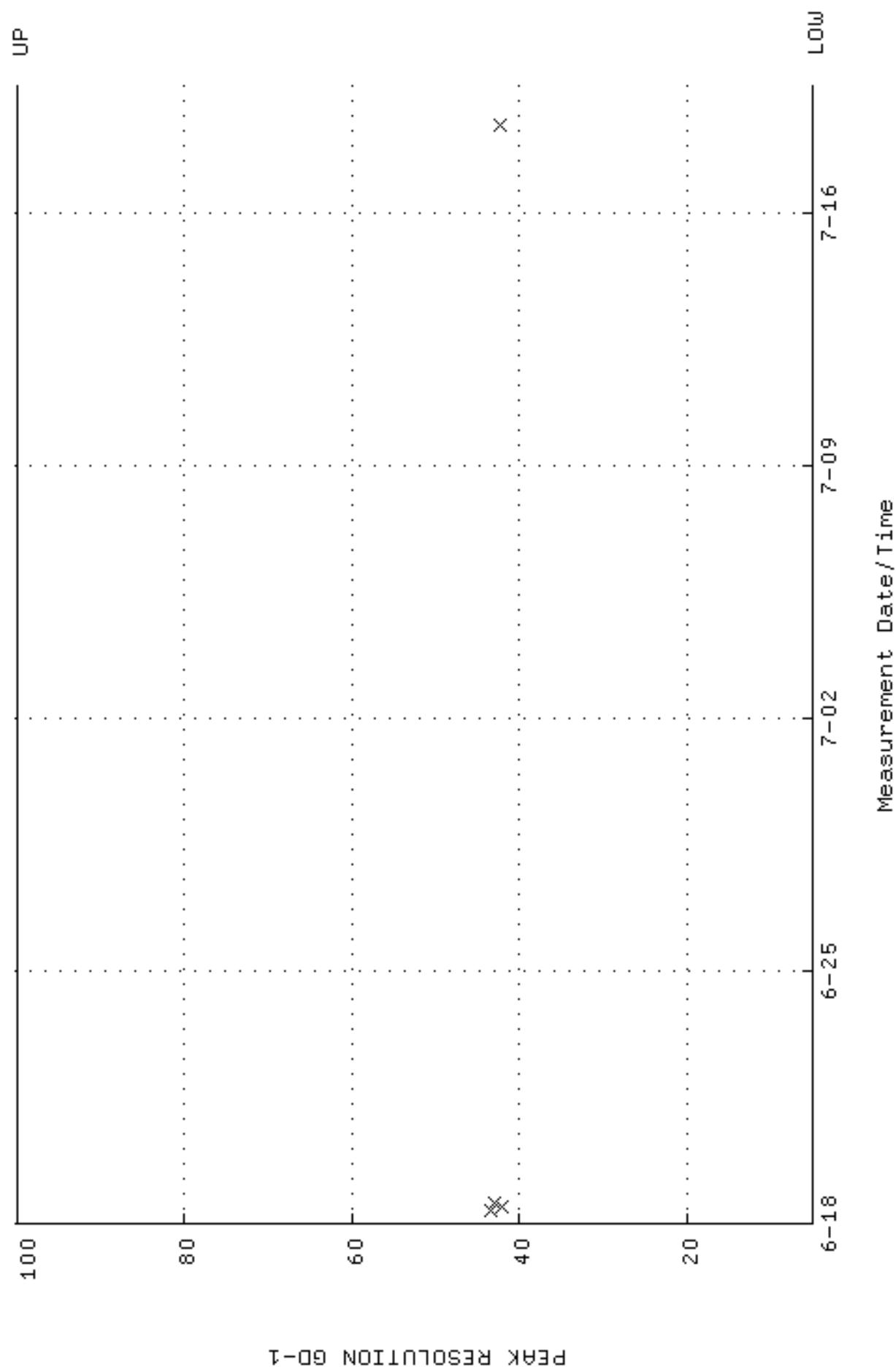
QA filename : DKA100:[ENV_ALPHA.QA.W]W196.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUN-2022 09:02:59 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.260470 through 0.276580



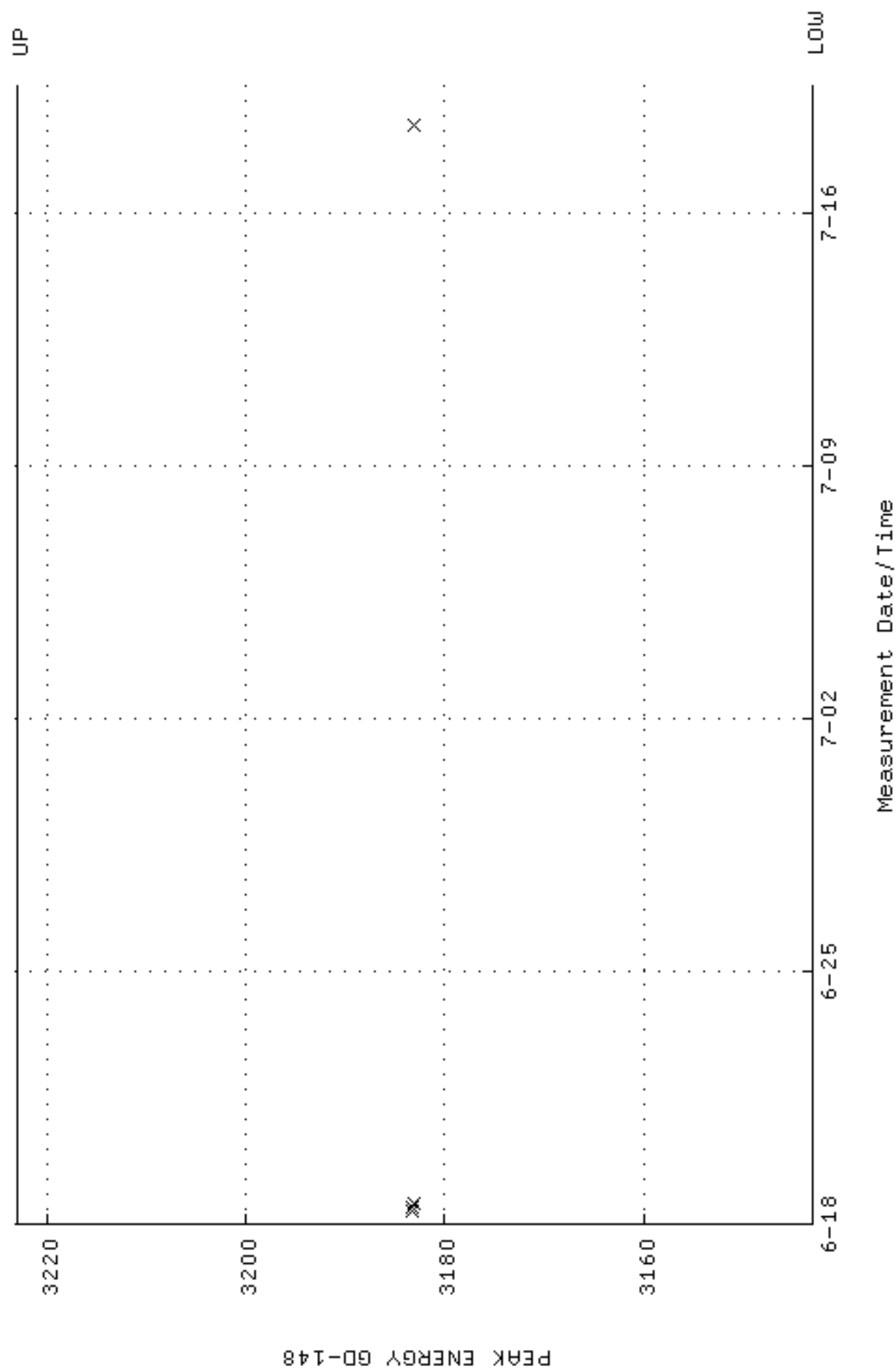
QA filename : DKA100:[ENV_ALPHA.QA.W]W196.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:59 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



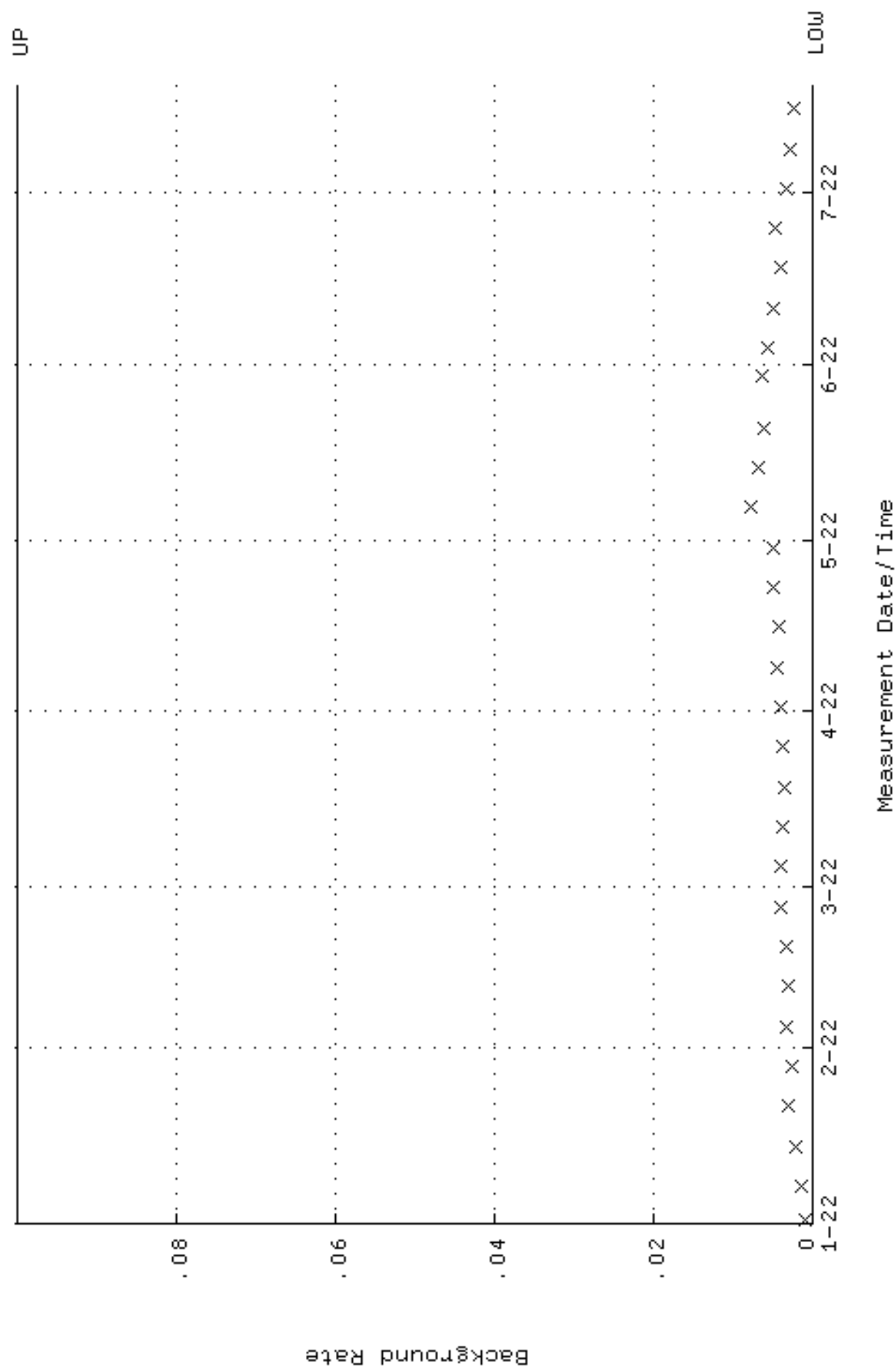
QA filename : DKA100:[ENV_ALPHA.QA.W]W196.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUN-2022 09:02:59 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



QA filename : DKA100:[ENV_ALPHA.QA.W]W196.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUN-2022 09:02:59 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



QA filename : DKA100:[ENV_ALPHA.QA.B]B196.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JAN-2022 13:20:59 through 19-JUL-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



RAD Standards Traceability

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

65338-278

Am-241 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Am-241
ACTIVITY (dps):	3.920 E4
HALF-LIFE:	4.322 E2 years
CALIBRATION DATE:	January 15, 2003 12:00 EST
TOTAL UNCERTAINTY*:	3.2%
SYSTEMATIC:	2.2%
RANDOM:	1.0%

*99% confidence level.

5.10649 grams 1M HCl solution.

Impurities: γ -impurities <0.1%
 α -impurities <0.1%

P O NUMBER 3213 RD, Item 1

SOURCE PREPARED BY: M. Taskaeva
M. Taskaeva, Radiochemist

Q A APPROVED:

UM [Signature] 1-16-03

RC-S-035-046a

Standard Logbook

Serial ID: 0533 **Open/Reference Date:** 15 JAN 2003 **Aliquot :** 5.10649 g
Name: Americium-241 **Received:** 27 JAN 2003 **Density :** Hand Calculated
Type: Source Material **Expires:** 05 FEB 2020 **Logbook Num :** RC S 035 048
Employee: Angela Johnson **Lot Number :** 65338-278
Supplier: Analytics **Solvent :** 1 M HCL
Uncertainty : 1.25 percent
Description: 65338-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	39200 dps		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	0533
Prepared By:	Angela Johnson
Carrier Conc:	1 M HCL
Reference Date:	01/15/2003
Ampoule Mass (g):	5.10649 g
Uncertainty:	+/- 1.25 %
LogBook No:	RC S 035 048
Supplier:	Analytics

A Solution Material Info		
Isotope:	Americium-241	
Prepared By:	Angela Johnson	
Prep Date:	02/05/2003	
Verification Date:	07/08/2022	
Expiration Date:	07/08/2023	
Primary Code:	0533-A	
Dilution(mL):	100 mL	
Mass of Parent(g):	4.8225 g	
Density(g/mL):	1.0139	Balance ID:

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (5.10649 \text{ g} * 100 \text{ mL}) = 22211.9695 \text{ dpm/mL}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (1.0139 \text{ g/mL}) / (5.10649 \text{ g} * 100 \text{ mL}) = 21907.2185 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/20/2003	Angela Johnson	1.0151	100	0533-B	222.38 dpm/mL	03/01/2006	03/01/2007
01/16/2015	Christina Kimball	.005081	500	0533-BB	.22263 dpm/mL	01/14/2016	01/14/2017
02/20/2003	Angela Johnson	.6819	250	0533-C	59.754 dpm/mL	02/20/2004	02/20/2005
05/04/2015	Tim Chandler	1.02	500	0533-CC	44.6907 dpm/mL	04/17/2017	04/17/2018
05/07/2003	Tim Chandler	.1245	100	0533-D	27.2745 dpm/mL	05/03/2004	05/03/2005
01/22/2016	Christina Kimball	.103	500	0533-DD	4.51289 dpm/mL	01/05/2022	01/05/2023
09/10/2004	Amanda Fehr	.6933	250	0533-E	60.753 dpm/mL	09/10/2005	09/10/2006
10/31/2016	Christina Kimball	.00508	500	0533-EE	.22259 dpm/mL	10/30/2017	10/30/2018

12/17/2004	Brenda Burke	.0093	100	0533-F	2.0374 dpm/mL	12/20/2004	12/20/2005
10/13/2017	Tim Chandler	1.0219	500	0533-FF	44.774 dpm/mL	10/01/2019	10/01/2020
12/21/2004	Brenda Burke	.009273	100	0533-G	2.0315 dpm/mL	12/07/2005	12/07/2006
11/13/2017	Christina Kimball	.00507	500	0533-GG	.2222 dpm/mL	11/09/2018	11/09/2019
04/28/2005	Brenda Burke	.1347	100	0533-H	29.4598 dpm/mL	04/27/2006	04/27/2007
01/23/2018	Tim Chandler	1.2536	100	0533-HH	274.6289 dpm/mL	01/23/2018	01/23/2019
10/19/2005	Mary Aders	.6948	250	0533-I	60.7831 dpm/mL	10/18/2006	10/18/2007
01/30/2020	Tim Chandler	1.0284	500	0533-II	45.0588 dpm/mL	01/18/2022	01/18/2023
05/08/2006	Julie Strock	.0711	100	0533-J	15.576 dpm/mL	05/10/2008	05/10/2009
07/08/2022	Matelon DeFreese	1.0349	500	0533-JJ	45.3435609 dpm/mL	07/18/2022	07/18/2023
05/11/2006	Brenda Burke	.00092601	100	0533-K	.20286 dpm/mL	08/02/2007	07/28/2007
11/15/2006	Tara Sides	.132	1000	0533-L	2.88586 dpm/mL	09/15/2015	09/15/2016
06/12/2007	Julie Strock	.000979	100	0533-M	.21448 dpm/mL	05/20/2009	05/20/2010
08/03/2007	Daniel Roy	.7042	250	0533-N	61.7083 dpm/ml	08/02/2008	08/02/2009
09/25/2008	Daniel Roy	1.4561	500	0533-O	63.7982 dpm/ml	09/07/2010	09/07/2011
09/29/2008	Tara Sides	.1004	100	0533-P	21.9948 dpm/mL	09/07/2010	09/07/2011
06/03/2009	Julie Strock	.0009751	100	0533-Q	.2136 dpm/mL	06/01/2010	06/01/2011
11/08/2010	Ashley Drochter	1.4675	500	0533-R	64.2977 dpm/mL	11/08/2010	11/08/2011
11/09/2010	Ashley Drochter	.7295	500	0533-S	31.9626 dpm/mL	10/31/2011	10/31/2012
01/03/2011	Christina Kimball	.097	100	0533-T	21.25 dpm/mL	01/03/2011	01/03/2012
01/05/2011	Christina Kimball	.1009	100	0533-U	22.10438 dpm/mL	12/18/2013	12/18/2014
05/23/2011	Christina Kimball	.001008999	100	0533-V	.2210438 dpm/mL	05/11/2012	05/11/2013
05/11/2012	Christina Kimball	.001016	100	0533-W	.222676 dpm/mL	05/01/2014	05/01/2015

06/13/2012	Ashley Drochter	.728	500	0533-X	31.8969 dpm/mL	06/02/2014	06/02/2015
01/23/2013	Salina Pizarro	2	500	1641	.1498555 dpm/mL	12/19/2013	12/01/2038
07/16/2013	Julie Strock	1	500	1641-A	.07492775 dpm/mL	07/16/2038	07/16/2039
03/17/2014	Christina Kimball	.1013	100	0533-Y	22.19201 dpm/mL	02/26/2019	02/26/2020
05/05/2014	Christina Kimball	.00101595	100	0533-Z	.222567 dpm/mL	05/05/2014	05/05/2015

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Am-241 Standard 0533-II

v1.2

Analyst	MXS2
Verification Prep Date	1/18/2022

Tracer Information	
Isotope	Am-243
Serial Number	1752-H
Amount of Std. (mL)	0.2
Expiration Date	6/18/2022

Standard Information	
Isotope	Am-241
Serial Number	0533-II
Isotope Halflife	432.6000 Y
Reference Date	1/15/2003
Ref. Act. (dpm/mL)	45.0588
Amount of Std. (mL)	0.2
Standard Prep Date	1/30/2020

Std #	Count Date	Activity pCi	Standard dpm/mL
1	1/18/2022	3.910	43.40
2	1/18/2022	3.790	42.07
3	1/18/2022	3.890	43.18

Mean Value = 3.863 42.883
Stdev = 0.064291005 0.713630156

	pCi	dpm/mL
Certificate Value* =	3.9376	43.7071
Two sigma =	0.1286	1.4273
10 % of Mean =	0.3863	4.2883
Rule A (Pass/Fail)	Pass	Pass
% Recovery	98.11%	98.11%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	1/18/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

*** Certificate Value is decay corrected to Verification Prep Date.**

The analyst prepared three standard verification sources for Am-241 standard 0533-II using 0.2 mL for each source. Each standard was combined with 0.2 mL of Am-243 standard 1752-H and was diluted in a centrifuge tube containing 20 mL 3M/HCl and 20 mL DI water. 0.1g of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-241 were calculated by comparison to Am-243 certified values.

CERTIFICATE OF CALIBRATION
Standard Reference Source

1752

101294

Am-243 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL1511998, Item 1 **Product Code:** 8243



This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
Am-243	2.692E+06	3.809E+04	0.5	1.8	3.7	09/01/2015

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

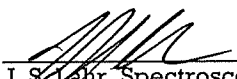
Comments:

Impurities: γ -impurities (other than decay products) < 0.1%.
5.10528 g 1M HCl solution, carrier free.

Source Prepared by:


Z. Dimitrova, Radiochemist

QC Approved:


J. S. Lehr, Spectroscopist

Date: 28 AUG 15

Standard Logbook

Serial ID: 1752 **Open/Reference Date:** 01 SEP 2015 **Aliquot :** 5.10528 g
Name: Americium-243 **Received:** 01 SEP 2015 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18 SEP 2025 **Logbook Num :** GL-CED-297-045
Employee: Gregory Ramsay **Lot Number :** 101294
Supplier: Eckert & Ziegler **Solvent :** 1M HCl
Uncertainty : 1.85 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-243	38090 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1752
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HCl
Reference Date:	09/01/2015
Ampoule Mass (g):	5.10528 g
Uncertainty:	+/- 1.85 %
LogBook No:	GL-CED-297-045
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Americium-243		
Prepared By:	Tim Chandler		
Prep Date:	11/23/2015		
Verification Date:	01/06/2017		
Expiration Date:	01/20/2022		
Primary Code:	1752-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0826 g		
Density(g/mL):	1.0282	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22752.4720 \text{ dpm/mL}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0282 \text{ g/mL}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22128.4498 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/23/2015	Tim Chandler	1.0432	500	1752-B	46.1688 dpm/mL	11/24/2015	11/23/2016
05/26/2016	Tim Chandler	1.072	500	1752-C	47.4434 dpm/mL	05/26/2016	05/26/2017
01/06/2017	Tim Chandler	2.1043	1000	1752-D	46.5649 dpm/mL	12/20/2017	12/20/2018
05/30/2018	Tim Chandler	2.3853	1000	1752-E	52.783 dpm/mL	05/21/2019	05/21/2020
08/05/2019	Tim Chandler	2.2432	1000	1752-F	49.6385 dpm/mL	08/03/2020	08/03/2021
08/12/2020	Tim Chandler	2.2247	1000	1752-G	49.2292 dpm/mL	08/12/2020	08/12/2021
06/18/2021	Tim Chandler	2.2608	1000	1752-H	50.028 dpm/mL	06/18/2021	06/18/2022
01/20/2022	Matelon DeFreese	2.0841	1000	1752-I	46.1179022 dpm/mL	01/21/2022	01/21/2023

Verification for Am-243 Standard 1752-I

v1.2

Analyst	MXS2
Verification Prep Date	1/21/2022

Tracer Information	
Isotope	Cm-244
Serial Number	1216-N
Amount of Std. (mL)	0.2
Expiration Date	4/12/2022

Standard Information	
Isotope	Am-243
Serial Number	1752-I
Isotope Half-life	7.3700E+03 Y
Reference Date	9/1/2015
Ref. Act. (dpm/mL)	46.1179022
Amount of Std. (mL)	0.5
Standard Prep Date	1/20/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	1/23/2022	10.300	45.73
2	1/23/2022	10.700	47.51
3	1/23/2022	10.500	46.62

Mean Value = 10.500 46.620
Stddev = 0.2 0.888

Certificate Value* = 10.3807 pCi
Two sigma = 0.4000
10 % of Mean = 1.0500
Rule A (Pass/Fail) Pass
% Recovery 101.15%
Rule B (Pass/Fail) Pass
Expiration Date 1/21/2023

dpm/mL
46.0902
1.7760
4.6620
Pass
101.15%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Am-243 standard 1752-I using 0.5 mL for each source. Each standard was combined with 0.2 mL of Cm-244 standard 1216-N and was diluted in a centrifuge tube containing 20 mL of 3M HCl and 20 mL of DI water. 0.1 mL of neodymium carrier and five mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-243 were calculated by comparison to Cm-244 certified values.

1/24/22



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010

Fax 661•257•8303

1521

CERTIFICATE OF CALIBRATION GAMMA STANDARD SOLUTION

Radionuclide:	Pb-210	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	22.3 ± 0.2 years	P.O. No.:	936803 RD	
Catalog No.:	7210	Reference Date:	15-Feb-11	12:00 PST
Source No.:	1476-99	Contained Radioactivity:	4.973 μCi	184.0 kBq

Physical Description:

A. Mass of solution:	5.21292 g in 5 mL flame-sealed ampoule
B. Chemical form:	Pb(NO ₃) ₂ in 1M HNO ₃
C. Carrier content:	10 μg Pb/mL of solution
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.9540 μCi/g, 35.30 kBq/g

Method of Calibration:

This source was prepared from a weighed aliquot of solution whose activity in μCi/g was determined using gamma ray spectrometry.

Peak energy used for integration:	46.5 keV
Branching ratio used:	0.0418 gammas per decay

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5 %
B. Type B (systematic) uncertainty:	± 7.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 7.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.



Quality Control

11-Jan-11
Date

EZIP Ref. No.: 1476-99

ISO 9001 CERTIFIED

Medical Imaging Laboratory

24937 Avenue Tibbitts Valencia, California 91355

Page 313 of 739 SDG: 585905

Industrial Gauging Laboratory

1800 North Keystone Street Burbank, California 91504

Standard Logbook

Serial ID: 1521 **Open/Reference Date:** 15 FEB 2011 **Aliquot :** 5.21292 g
Name: Lead-210 **Received:** 14 JAN 2011 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 02 MAR 2013 **Logbook Num :** RC-S-060-066
Employee: Gregory Ramsay **Lot Number :** 1426-99
Supplier: Eckert & Ziegler **Solvent :** 1M HNO₃
Uncertainty : 7 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Lead-210	35.3 kBq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1521
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	02/15/2011
Ampoule Mass (g):	5.21292 g
Uncertainty:	+/- 7 %
LogBook No:	RC-S-060-066
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Lead-210		
Prepared By:	Bethany Fiem		
Prep Date:	03/22/2011		
Verification Date:	12/03/2020		
Expiration Date:	12/23/2021		
Primary Code:	1521-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0705 g		
Density(g/mL):	1.0272	Balance ID:	1113021018

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 107393.1900 \text{ dpm/mL}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0272 \text{ g/mL}) / (100 \text{ mL}) = 104549.4451 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/07/2013	Ashley Drochter	.5177	100	1521-B	541.2525 dpm/mL	10/29/2013	10/29/2014
10/29/2013	Tim Chandler	5.1002	100	1521-C	5332.2308 dpm/mL	08/09/2018	08/09/2019
02/01/2019	Bethany Fiem	5.0359	100	1521-D	5265.0055 dpm/mL	11/30/2021	11/30/2022
06/05/2018	Tim Chandler	.6059	200	1867-A		06/06/2018	06/05/2019
06/14/2018	Tim Chandler	.6646	200	1867-B		06/15/2018	06/14/2019
06/14/2018	Tim Chandler	.6646	200	1868-A		06/14/2018	06/14/2019
06/13/2019	Tim Chandler	.6984	200	1907-A		06/15/2021	06/15/2022
06/13/2019	Tim Chandler	.6984	200	1907-A1		06/15/2021	06/15/2022
11/06/2019	Tim Chandler	15.0553	100	1920-A		11/07/2019	11/07/2020
12/14/2021	Matelon DeFreese	.6276	200	2012-A		12/15/2021	12/15/2022

Verification for Po-210 Standard 2012-A

v1.2

Analyst	MXS2
Verification Prep Date	12/15/2021

Tracer Information	
Isotope	Po-209
Serial Number	1720-C
Amount of Std. (mL)	0.2
Expiration Date	11/11/2022

Standard Information	
Isotope	Po-210
Serial Number	2012-A
Isotope Half-life	138.3800 D
Reference Date	12/14/2021
Ref. Act. (dpm/mL)	233.932217
Amount of Std. (mL)	0.2
Standard Prep Date	12/14/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	12/16/2021	20.500	227.55
2	12/16/2021	19.700	218.67
3	12/16/2021	20.000	222.00

Mean Value = 20.067 222.740
 Stdev = 0.404145188 4.486011592

pCi
 Certificate Value* = 20.9697 232.7634
 Two sigma = 0.8083 8.9720
 10 % of Mean = 2.0067 22.2740
 Rule A (Pass/Fail) Pass
 % Recovery 95.69%
 Rule B (Pass/Fail) Pass
 Expiration Date 12/15/2022

dpm/mL

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-210 standard 2012-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-209 standard 1720-C and was diluted in a centrifuge tube containing 15 mL of 0.05M HNO₃. Precipitated by adding 0.1mL of 30% H₂O₂, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-210 were calculated by comparison to Po-209 certified values.

12/16/2021

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

82308-278

Pu-239 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: 7340 RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u_A	u_B	U	
Pu-239	8.803E+06	3.758E+04	0.1	0.9	1.8	05/07/2010

*Uncertainty: U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities < 0.1 %, α -impurities < 0.1 %, Am-241 330.1 Bq. 5.56111 g 3M HNO₃ solution, carrier free.

Source Prepared by: W. Mao

W. Mao, Radiochemist

QA Approved: J. D. McCorvey

J. D. McCorvey, QA Manager Alternate

Date: 5/10/10



Standard Logbook

Serial ID: 1472 **Open/Reference Date:** 07 MAY 2010 **Aliquot :** 5.56111 g
Name: Plutonium-239 **Received:** 12 MAY 2010 **Density :** Hand Calculated
Type: Source Material **Expires:** 03 JUN 2030 **Logbook Num :** RC-S-060-019
Employee: Ashley Drochter **Lot Number :** 82308-278
Supplier: Eckert & Zeigler Analytics **Solvent :** 3M HNO₃
Uncertainty : .9 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-239	37580 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1472
Prepared By:	Ashley Drochter
Carrier Conc:	3M HNO3
Reference Date:	05/07/2010
Ampoule Mass (g):	5.56111 g
Uncertainty:	+/- .9 %
LogBook No:	RC-S-060-019
Supplier:	Eckert & Zeigler Analytics

A Solution Material Info			
Isotope:	Plutonium-239		
Prepared By:	Julie Strock		
Prep Date:	10/20/2020		
Verification Date:	08/17/2021		
Expiration Date:	08/17/2022		
Primary Code:	1472-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.5071 g		
Density(g/mL):	1.1056	Balance ID:	BIOFA-B952846238

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.56111 \text{ g} * 100 \text{ mL}) = 22329.0118 \text{ dpm/mL}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.1056 \text{ g/mL}) / (5.56111 \text{ g} * 100 \text{ mL}) = 20195.4985 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
10/20/2020	Julie Strock	.0117	1000	1472-B	.2363 dpm/mL	10/14/2021	10/14/2022
08/17/2021	Tim Chandler	1.1318	500	1472-C	45.7145 dpm/mL	08/17/2021	08/17/2022
04/07/2022	Christina Kimball	.01	1000	1472-D	.20195 dpm/mL	04/07/2022	04/07/2023
04/15/2022	Christina Kimball	.011283	1000	1472-E	.2279 dpm/mL	04/15/2022	04/15/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-239 Standard 1472-C

v1.2

Analyst	TC1
Verification Prep Date	8/17/2021

Tracer Information	
Isotope	Pu-236
Serial Number	1980-B
Amount of Std. (mL)	0.2
Expiration Date	5/10/2022

Standard Information	
Isotope	Pu-239
Serial Number	1472-C
Isotope Halflife	2.4131E+04 Y
Reference Date	5/7/2010
Ref. Act. (dpm/mL)	45.7145
Amount of Std. (mL)	0.2
Standard Prep Date	8/17/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	8/17/2021	4.140	45.95
2	8/17/2021	4.330	48.06
3	8/17/2021	4.200	46.62

Mean Value = 4.223 46.879
Stdev = 0.097125349 1.078091369

	pCi	dpm/mL
Certificate Value* =	4.1171	45.6997
Two sigma =	0.1943	2.1562
10 % of Mean =	0.4223	4.6879
Rule A (Pass/Fail)	Pass	Pass
% Recovery	102.58%	102.58%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	8/17/2022	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-239 standard 1472-C using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-236 standard 1980-B and was diluted in a 50 mL plastic centrifuge tube containing 15 mL of 2M HCl. 100 micrograms of neodymium carrier, 6 drops of 25% hydrazine dichloride and five mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-239 were calculated by comparison to Pu-236 certified values.



National Institute of Standards & Technology

Certificate

2020

Standard Reference Material® 4334j

Plutonium-242 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}.$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterwieser, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

Steven J. Choquette, Director
Office of Reference Materials

62-CEJ-797-312a

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq·g^{-1(a)}
Relative expanded uncertainty ($k = 2$)	0.51 % ^(b)

^(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

^(b) The uncertainties on certified values are expanded uncertainties, $U = k u_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

GL-CED-297-3126

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ^{-1(a,b,c,d)}
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ^{-1(a,d)}
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

(a) The stated uncertainty is two times the standard uncertainty [5].

(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,

0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and

0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclidic impurities follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ^{-6 (3)}	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ^{-5 (3)}	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,

5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and

3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

(f) The stated uncertainty is the standard uncertainty. See reference 6.

GL-CED-297-312c

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ²⁴² Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	²⁴² Pu decay corrections for half-life uncertainty of 0.22 %.	B	< 10 ⁻¹⁰
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty (k = 2)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

GL-CED-297-312d

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

GL-CEN-297-312e

Standard Logbook

Serial ID: 2020 **Open/Reference Date:** 09 AUG 2017 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 18 JAN 2022 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18 JAN 2050 **Logbook Num :** GL-CED-297-312
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
Uncertainty : .255 PERCENT

Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2020
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO3
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-312
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	06/03/2022		
Verification Date:	06/03/2022		
Expiration Date:	06/03/2023		
Primary Code:	2020-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.4651 g		
Density(g/mL):	1.0325	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.4651 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 42.7589 \text{ dpm/mL}$
$(5.4651 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0325 \text{ g/mL}) / (200 \text{ mL}) = 41.4130 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
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GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2020-A

v1.2

Analyst	MXS2
Verification Prep Date	6/3/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.1
Expiration Date	8/17/2022

Standard Information	
Isotope	Pu-242
Serial Number	2020-A
Isotope Half-life	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	42.7589
Amount of Std. (mL)	0.1
Standard Prep Date	6/3/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	6/6/2022	1.960	43.51
2	6/6/2022	1.900	42.18
3	6/6/2022	1.810	40.18

Mean Value = 1.890 41.958
 Stdev = 0.075498344 1.676063245

pCi 1.9261 42.7585
 Certificate Value* = 3.3521
 Two sigma = 4.1958
 10 % of Mean = Pass
 Rule A (Pass/Fail) 98.13%
 % Recovery Pass
 Rule B (Pass/Fail) 98.13%
 Expiration Date 6/3/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2020-A using 0.1 mL for each source. Each standard was combined with 0.1 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. Added 0.1mL of neodymium carrier and 3-4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

6/8/22



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661-309-1010

Fax 661-257-8303

1720

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Po-209	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	102 ± 5 years	P.O. No.:	GEL1408569	
Catalog No.:	7209	Reference Date:	1-Oct-14	12:00 PST
Source No.:	1760-53-1	Contained Radioactivity:	0.05281 µCi	1.954 kBq

Physical Description:

A. Mass of solution:	5.21650 g in 5 mL flame-sealed ampoule
B. Chemical form:	Po(NO ₃) ₄ in 1M HNO ₃
C. Carrier content:	None
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.01012 µCi/g, 0.3744 kBq/g

Method of Calibration:

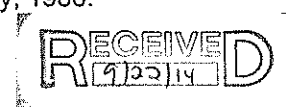
This source was prepared from a weighed aliquot of solution whose activity in µCi/g was determined using a liquid scintillation counter.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.4 %
D. Total uncertainty at the 99% confidence level:	± 3.1 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.



Daniel James Van Dorem
Quality Control

11-Sep-14
Date

EZIP Ref. No.: 1760-53

ISO 9001 CERTIFIED

GEL-CED-297-013

Standard Logbook

Serial ID: 1720 **Open/Reference Date:** 01 OCT 2014 **Aliquot :** 5.2165 g
Name: Polonium-209 **Received:** 22 SEP 2014 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 22 SEP 2035 **Logbook Num :** GL-CED-297-013
Employee: Gregory Ramsay **Lot Number :** 1760-53-1
Supplier: Eckert & Ziegler **Solvent :** 1M HNO3
Uncertainty : 1.211 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Polonium-209	1.954 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1720
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	10/01/2014
Ampoule Mass (g):	5.2165 g
Uncertainty:	+/- 1.211 %
LogBook No:	GL-CED-297-013
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Polonium-209		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2016		
Verification Date:	07/12/2017		
Expiration Date:	12/06/2019		
Primary Code:	1720-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1896 g		
Density(g/mL):	1.0290	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1166.3543 \text{ dpm/mL}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0290 \text{ g/mL}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1133.4833 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
12/06/2018	Tim Chandler	14.42	200	1720-B	81.7241 dpm/mL	12/07/2018	12/07/2019
11/26/2019	Tim Chandler	14.5183	200	1720-C	82.2813 dpm/mL	11/11/2021	11/11/2022
11/26/2019	Tim Chandler	14.5183	200	1720-C1	82.2813 dpm/mL	11/11/2021	11/11/2022
02/21/2022	Matelon DeFreese	14.5109	200	1720-D	82.239314 dpm/mL	03/07/2022	03/07/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Po-209 Standard 1720-D

v1.2

Analyst	MXS2
Verification Prep Date	3/7/2022

Tracer Information	
Isotope	Po-210
Serial Number	2012-A
Amount of Std. (mL)	0.2
Expiration Date	12/15/2022

Standard Information	
Isotope	Po-209
Serial Number	1720-D
Isotope Half-life	125.3000 Y
Reference Date	10/1/2014
Ref. Act. (dpm/mL)	82.239314
Amount of Std. (mL)	0.2
Standard Prep Date	2/21/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	3/7/2022	7.180	79.70
2	3/7/2022	7.480	83.03
3	3/7/2022	7.700	85.47

Mean Value = 7.453 82.732
Stdev = 0.261023626 2.897362249

Certificate Value* = 7.1106 pCi
Two sigma = 0.5220
10 % of Mean = 0.7453
Rule A (Pass/Fail) Pass
% Recovery 104.82%
Rule B (Pass/Fail) Pass
Expiration Date 3/7/2023

dpm/mL
78.9274
5.7947
8.2732
Pass
104.82%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-209 standard 1720-D using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-210 standard 2012-A and was diluted in a centrifuge tube containing 15mL of 0.05M HNO₃. Precipitated by adding 0.1mL of 30% H₂O₂, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-209 were calculated by comparison to Po-210 certified values.

3/15/22



Eckert & Ziegler

Analytics

1845

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION

Standard Reference Source

Received: 12-1-17 12:00

SRS Number: 108018

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8229

Customer: GEL Laboratories LLC

P.O. Number: GEL1718798, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 29-November-2017 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Th-229	2.897E+06	1.999E+04	0.5	1.5	3.1	4π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 108018

Comments:

5.21561 g of 0.5 M HNO₃ solution, carrier free.

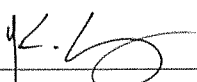
Impurities:

γ-impurities (other than decay products) < 0.1%

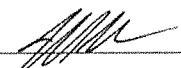
α-impurities: Th-228 6.6E+00 Bq, Th-230 1.2E+02 Bq, Th-232 8.0E+00 Bq

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Hardley, Radiochemist

QC Approved by:


J. Lahr, Spectroscopist

Date: 27-Nov-17

Standard Logbook

Serial ID: 1845 **Open/Reference Date:** 29 NOV 2017 **Aliquot :** 5.21561 g
Name: Thorium-229 **Received:** 01 DEC 2017 **Density :** Hand Calculated
Type: Source Material **Expires:** 01 DEC 2018 **Logbook Num :** GL-CED-297-138
Employee: Tim Chandler **Lot Number :** 108018
Supplier: Eckert & Ziegler **Solvent :** 0.5M HNO₃
Uncertainty : 1.55 percent
Description: 1 ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-229	19990 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1845
Prepared By:	Tim Chandler
Carrier Conc:	0.5M HNO3
Reference Date:	11/29/2017
Ampoule Mass (g):	5.21561 g
Uncertainty:	+/- 1.55 %
LogBook No:	GL-CED-297-138
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-229		
Prepared By:	Tim Chandler		
Prep Date:	06/08/2018		
Verification Date:	07/07/2020		
Expiration Date:	11/10/2022		
Primary Code:	1845-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1906 g		
Density(g/mL):	1.0291	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11936.4861 \text{ dpm/mL}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0291 \text{ g/mL}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11598.7987 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/08/2018	Tim Chandler	2.0385	1000	1845-B	23.6442 dpm/mL	06/01/2020	06/01/2021
07/10/2019	Tim Chandler	4.0198	1000	1845-C	46.62485 dpm/mL	07/07/2020	07/07/2021
10/26/2020	Tim Chandler	4.0184	1000	1845-D	46.6086 dpm/mL	10/27/2020	10/27/2021
04/23/2021	Tim Chandler	4.2911	1000	1845-E	49.7716 dpm/mL	04/26/2021	04/26/2022
11/10/2021	Matelon DeFreese	4.211	1000	1845-F	48.8425 dpm/mL	11/10/2021	11/10/2022
05/11/2022	Matelon DeFreese	4.1951	1000	1845-G	48.6581 dpm/mL	05/12/2022	05/11/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Th-229 Standard 1845-G

v1.2

Analyst	MXS2
Verification Prep Date	5/12/2022

Tracer Information	
Isotope	Th-232
Serial Number	1513-C
Amount of Std. (mL)	0.1
Expiration Date	12/22/2022

Standard Information	
Isotope	Th-229
Serial Number	1845-G
Isotope Half-life	7.3400E+03 Y
Reference Date	11/29/2017
Ref. Act. (dpm/mL)	48.6581
Amount of Std. (mL)	0.1
Standard Prep Date	5/11/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	5/12/2022	2.190	48.62
2	5/12/2022	2.070	45.95
3	5/12/2022	2.120	47.06

Mean Value = 2.127 47.212
Stdev = 0.060277138 1.338152458

Certificate Value* = 2.1909 pCi
Two sigma = 0.1206
10 % of Mean = 0.2127
Rule A (Pass/Fail) Pass
% Recovery 97.07%
Rule B (Pass/Fail) Pass
Expiration Date 5/12/2023
dpm/mL
48.6377
2.6763
4.7212
Pass
97.07%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-229 standard 1845-G using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-232 standard 1513-C and was diluted in a centrifuge tube containing 10 mL 8M HNO₃. The standard was isolated following the standard operating procedure for the separation of thorium (GL-RAD-A-038). After dissolving the sources in 5 mL of 2M HCl, the sources were diluted to 40 mL with deionized water. 100 micrograms of neodymium carrier and five mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-229 were calculated by comparison to Th-232 certified values.

5/16/22



Eckert & Ziegler

Isotope Products

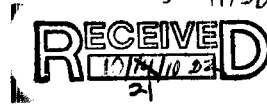
24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010

Fax 661•257•8303

1506 1513

3-11/30/10



CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide: Th-232
Half-life: (1.405 ± 0.006)E+10 years
Catalog No.: 7232
Source No.: 1451-62

Customer: GEL LABORATORIES, LLC
P.O. No.: 7347RD
Reference Date: 1-Nov-10 12:00 PST
Contained Radioactivity: 50.26 nCi 1860 Bq
(Th-232 only)

Physical Description:

A. Mass of solution: 5.73256 g in 5 mL flame-sealed ampoule
B. Chemical form: Th(NO₃)₄ in H₂O
C. Carrier content: None
D. Density: 1.15 g/mL @ 20°C

Radioimpurities:

Not determined

Radionuclide Concentration: 8.767 nCi/g, 324.4 Bq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.

Daniel James Van Dalsem
Quality Control

15-OCT-10
Date

EZIP Ref. No.: 1451-62

RC-S-060-058

ISO 9001 CERTIFIED

Medical Imaging Laboratory

Industrial Gauging Laboratory

Standard Logbook

Serial ID: 1513 **Open/Reference Date:** 01 NOV 2010 **Aliquot :** 5.73256 g
Name: Thorium-232 **Received:** 21 OCT 2010 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 30 NOV 2011 **Logbook Num :** RC-S-060-058
Employee: Gregory Ramsay **Verified:** 28 APR 2011 **Lot Number :** 1451-62
Supplier: Eckert & Ziegler **Solvent :** DI water
Uncertainty : 1.172 PERCENT

Description: in water
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-232	324.4 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1513
Prepared By:	Gregory Ramsay
Carrier Conc:	DI water
Reference Date:	11/01/2010
Ampoule Mass (g):	5.73256 g
Uncertainty:	+/- 1.172 %
LogBook No:	RC-S-060-058
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-232		
Prepared By:	Christina Kimball		
Prep Date:	04/19/2011		
Verification Date:	02/21/2020		
Expiration Date:	02/21/2021		
Primary Code:	1513-A		
Dilution(mL):	250 mL		
Mass of Parent(g):	5.672 g		
Density(g/mL):	1.0020	Balance ID:	60108592

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (250 \text{ mL}) = 441.5992 \text{ dpm/mL}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0020 \text{ g/mL}) / (250 \text{ mL}) = 440.7354 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
04/19/2011	Christina Kimball	5.0665	100	1513-B	22.3299 dpm/mL	04/11/2013	04/11/2014
02/26/2014	Matelon DeFreese	100.0316	1000	1513-C	44.08747 dpm/mL	12/22/2021	12/22/2022
04/18/2014	Christina Kimball	5.0477	100	1513-D	22.247 dpm/mL	06/28/2022	06/28/2023
01/04/2016	Christina Kimball	.2487	100	1513-E	1.096117 dpm/mL	02/11/2020	02/11/2021
08/01/2016	Christina Kimball	2.053	250	1513-F	3.61932 dpm/mL	07/26/2021	07/26/2022
02/21/2020	Christina Kimball	.248	100	1513-G	1.093 dpm/mL	02/23/2022	02/23/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Th-232 Standard 1513-C

v1.2

Analyst	MXS2
Verification Prep Date	12/22/2021

Tracer Information	
Isotope	Th-229
Serial Number	1845-F
Amount of Std. (mL)	0.1
Expiration Date	11/10/2022

Standard Information	
Isotope	Th-232
Serial Number	1513-C
Isotope Half-life	1.4050E+10 Y
Reference Date	11/1/2010
Ref. Act. (dpm/mL)	44.08747
Amount of Std. (mL)	0.1
Standard Prep Date	2/26/2014

Std #	Count Date	Activity pCi	Standard dpm/mL
1	12/22/2021	1.970	43.73
2	12/22/2021	2.070	45.95
3	12/22/2021	1.920	42.62

Mean Value = 1.987 44.104

Stdev = 0.076376262 1.695553007

Certificate Value* = 1.9859 pCi
 Two sigma = 0.1528
 10 % of Mean = 0.1987
 Rule A (Pass/Fail) Pass
 % Recovery 100.04%
 Rule B (Pass/Fail) Pass
 Expiration Date 12/22/2022

dpm/mL
 44.0875
 3.3911
 4.4104
 Pass
 100.04%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-232 standard 1513-C using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-229 standard 1845-F and was diluted in a centrifuge tube containing 10 mL of 8M HNO₃, then poured onto AG columns following SOP 038. 0.1 mL of neodymium carrier and 2 mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-232 were calculated by comparison to Th-229 certified values.

2/14/22



Eckert & Ziegler

Analytics

1564

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION Standard Radionuclide Source

85621-278

5 mL Liquid in Flame Sealed Vial

Customer: General Engineering Labs/Charleston, SC
P.O. No.: 936814RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
U-232	2.517E+04	3.393E+04	0.5	2.4	4.9	09/12/2011

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

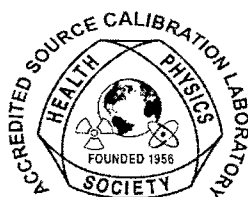
Impurities: γ -impurities (other than decay products) < 0.1 %, U-233 < 1.20E2 Bq, Am-241 < 5.8E1 Bq. 5.06048 grams 2M HNO3 solution.

Source Prepared by: M. I. Taskaeva
M. I. Taskaeva, Radiochemist

QA Approved: J. D. McCorvey
J. D. McCorvey, QA Manager Alternate

Date: 9/12/11

RECEIVED
9/14/11
AM



Standard Logbook

Serial ID: 1564 **Open/Reference Date:** 12 SEP 2011 **Aliquot :** 5.06048 g
Name: Uranium-232 **Received:** 14 SEP 2011 **Density :** Hand Calculated
Type: Source Material **Expires:** 26 SEP 2014 **Logbook Num :** RC-S-060-109
Employee: Ashley Drochter **Lot Number :** 85621-278
Supplier: Eckert & Ziegler **Solvent :** 2M HNO3
Uncertainty : 2.45 PERCENT

Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-232	33930 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1564
Prepared By:	Ashley Drochter
Carrier Conc:	2M HNO3
Reference Date:	09/12/2011
Ampoule Mass (g):	5.06048 g
Uncertainty:	+/- 2.45 %
LogBook No:	RC-S-060-109
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-232		
Prepared By:	Ashley Drochter		
Prep Date:	11/15/2012		
Verification Date:	07/26/2021		
Expiration Date:	07/26/2022		
Primary Code:	1564-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9067 g		
Density(g/mL):	1.0615	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.06048 \text{ g} * 100 \text{ mL}) = 19739.3525 \text{ dpm/mL}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0615 \text{ g/mL}) / (5.06048 \text{ g} * 100 \text{ mL}) = 18595.7160 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/16/2012	Ashley Drochter	2.6179	1000	1564-B	48.6817 dpm/mL	11/13/2013	11/13/2014
07/26/2021	Christina Kimball	.635	500	1564-BB	23.6166 dpm/mL	07/26/2021	07/26/2022
07/26/2021	Christina Kimball	.635	500	1564-BB Spike	23.6166 dpm/mL	07/26/2021	07/26/2022
01/15/2013	Christina Kimball	.265	250	1564-C	19.7115 dpm/mL	01/13/2014	01/13/2015
12/14/2021	Tim Chandler	2.6412	1000	1564-CC	49.115 dpm/mL	12/15/2021	12/15/2022
02/18/2013	Christina Kimball	.116	500	1564-D	4.31421 dpm/mL	02/16/2015	02/13/2016
04/13/2022	Matelon DeFreese	2.7103	1000	1564-DD	50.4 dpm/mL	04/13/2022	04/13/2023
01/02/2014	Gregory Ramsay	2.6936	1000	1564-E	50.08942 dpm/mL	12/10/2014	12/10/2015

03/17/2014	Christina Kimball	.266	250	1564-F	19.78584 dpm/mL	03/25/2015	03/25/2016
12/10/2014	Tim Chandler	2.6312	1000	1564-G	48.929 dpm/mL	12/10/2014	12/10/2015
07/20/2015	Christina Kimball	.266	250	1564-H	19.78584 dpm/mL	07/25/2016	07/25/2017
11/23/2015	Tim Chandler	2.6117	1000	1564-I	48.5664 dpm/mL	11/23/2015	11/23/2016
01/05/2016	Christina Kimball	.119	500	1564-J	4.4258 dpm/mL	12/27/2017	12/27/2018
01/05/2016	Christina Kimball	.119	500	1564-J Spike	4.4258 dpm/mL	12/27/2017	12/27/2018
09/20/2016	Tim Chandler	2.6389	1000	1564-K	49.0722 dpm/mL	09/18/2017	09/18/2018
12/20/2016	Christina Kimball	.276	250	1564-L	20.52974 dpm/mL	12/21/2017	12/21/2018
06/20/2017	Tim Chandler	2.6611	1000	1564-M	49.4851 dpm/mL	06/19/2018	06/19/2019
01/18/2018	Tim Chandler	2.6367	1000	1564-N	49.0313 dpm/mL	04/25/2018	04/25/2019
04/25/2018	Tim Chandler	2.6505	1000	1564-O	49.2879 dpm/mL	04/25/2018	04/25/2019
08/06/2018	Christina Kimball	.106	500	1564-P	3.9423 dpm/mL	12/19/2019	12/19/2020
08/06/2018	Christina Kimball	.106	500	1564-P Spike	3.9423 dpm/mL	12/19/2019	12/19/2020
12/13/2018	Tim Chandler	2.6502	1000	1564-Q	49.2824 dpm/mL	12/13/2018	12/13/2019
01/08/2019	Christina Kimball	.29	250	1564-R	21.571 dpm/mL	01/08/2019	01/08/2020
01/08/2019	Christina Kimball	.29	250	1564-R Spike	21.571 dpm/mL	01/08/2019	01/08/2020
10/01/2019	Tim Chandler	2.6957	1000	1564-S	50.1285 dpm/mL	10/01/2019	10/01/2020
12/18/2019	Christina Kimball	.307	250	1564-T	22.83554 dpm/mL	12/19/2019	12/19/2020
12/18/2019	Christina Kimball	.307	250	1564-T Spike	22.83554 dpm/mL	12/19/2019	12/19/2020
03/31/2020	Tim Chandler	2.6645	1000	1564-U	49.5483 dpm/mL	03/31/2020	03/31/2021
08/14/2020	Christina Kimball	.111	500	1564-V	4.1282 dpm/mL	08/14/2020	08/14/2021
08/14/2020	Christina Kimball	.111	500	1564-V Spike	4.1282 dpm/mL	08/14/2020	08/14/2021

10/13/2020	Tim Chandler	2.6983	1000	1564-W	50.1768 dpm/mL	10/13/2020	10/13/2021
11/04/2020	Christina Kimball	.315	250	1564-X	23.4306 dpm/mL	11/04/2020	11/04/2021
11/04/2020	Christina Kimball	.315	250	1564-X Spike	23.4306 dpm/mL	11/04/2020	11/04/2021
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Y	51.32232 dpm/mL	03/19/2021	03/19/2022
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Z	51.32232 dpm/mL	03/20/2021	03/20/2022

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-232 Standard 1564-DD

v1.2

Analyst	MXS2
Verification Prep Date	4/13/2022

Tracer Information	
Isotope	U-238
Serial Number	1600-M
Amount of Std. (mL)	0.2
Expiration Date	1/21/2023

Standard Information	
Isotope	U-232
Serial Number	1564-DD
Isotope Half-life	68.9000 Y
Reference Date	9/12/2011
Ref. Act. (dpm/mL)	50.4
Amount of Std. (mL)	0.2
Standard Prep Date	4/13/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	4/13/2022	3.880	43.07
2	4/13/2022	4.090	45.40
3	4/13/2022	3.840	42.62

Mean Value = 3.937 43.697
Stdev = 0.134288247 1.490599544

Certificate Value* = 4.0819 pCi
Two sigma = 0.2686
10 % of Mean = 0.3937
Rule A (Pass/Fail) Pass
% Recovery 96.44%
Rule B (Pass/Fail) Pass
Expiration Date 4/13/2023

dpm/mL
45.3091
2.9812
4.3697
Pass
96.44%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-232 standard 1564-DD using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-238 standard 1600-M and was diluted in a centrifuge tube containing 15 mL of 0.1M HCl diluted to 40 mL with DI water. 0.1 mL of neodymium carrier, 0.5 mL of titanium chloride and five mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-232 were calculated by comparison to U-238 certified values.

4/6/22

15 Apr 3/24/12
1600

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide: U-238 (Nat)
Half-life: (4.468 ± 0.005)E+09 years
Catalog No.: 7338
Source No.: 1577-71-2

Customer: GENERAL ENGINEERING LABS.
P.O. No.: 936823 RD
Reference Date: 15-Apr-12 12:00 PST
Contained Radioactivity: 1.023 µCi 37.85 kBq
(Total Uranium)

Physical Description:

A. Mass of solution: 7.05210 g in 10 mL flame-sealed ampoule
B. Chemical form: $\text{UO}_2(\text{NO}_3)_2$ in dilute HNO_3
C. Carrier content: None
D. Density: Approximately 1.41 g/mL @ 20°C

Radioimpurities:

See Technical Data Sheet

Radionuclide Concentration: 0.1451 µCi/g, 5.369 kBq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.


Quality Control

21-Mar-12
Date

EZIP Ref. No.: 1577-71

RC-S-065-030a

ISO 9001 CERTIFIED

U-238 Natural Technical Data

The U-238 Natural used to prepare your order was taken from Eckert & Ziegler Isotope Products Lot #4550102. It had the following composition as of 9 Feb 10:

<u>Nuclide</u>	<u>Atom %</u>	<u>Activity %</u>
U-234	0.0055	49.086
U-235	0.7200	2.241
U-238	99.274	48.673

Isotopic composition provided by New Brunswick Laboratory.

If you have any question, please contact Eckert & Ziegler Isotope Products Technical Service: (661) 309-1010

Standard Logbook

Serial ID: 1600 **Open/Reference Date:** 15 APR 2012 **Aliquot :** 7.0521 g
Name: Uranium-238 **Received:** 24 MAR 2012 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 26 MAR 2015 **Logbook Num :** RC-S-065-030
Employee: Ashley Drochter **Lot Number :** 4550102
Supplier: Eckert & Ziegler **Solvent :** UO₂(NO₃)₂ in dilute HNO₃
Uncertainty : 1.17 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-238	18.42 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1600
Prepared By:	Ashley Drochter
Carrier Conc:	UO ₂ (NO ₃) ₂ in dilute HNO ₃
Reference Date:	04/15/2012
Ampoule Mass (g):	7.0521 g
Uncertainty:	+/- 1.17 %
LogBook No:	RC-S-065-030
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-238		
Prepared By:	Ashley Drochter		
Prep Date:	09/04/2012		
Verification Date:	05/20/2022		
Expiration Date:	05/20/2023		
Primary Code:	1600-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	6.8204 g		
Density(g/mL):	1.0789	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (7.0521 \text{ g} * 100 \text{ mL}) = 10688.8814 \text{ dpm/mL}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0789 \text{ g/mL}) / (7.0521 \text{ g} * 100 \text{ mL}) = 9907.0626 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
09/04/2012	Ashley Drochter	1.4579	500	1600-B	28.8913 dpm/mL	09/04/2012	09/04/2013
09/11/2012	Ashley Drochter	3.0288	500	1600-C	60.0219 dpm/mL	09/04/2013	09/04/2014
03/27/2014	Tim Chandler	3.0445	500	1600-D	60.3241 dpm/mL	03/18/2015	03/18/2016
07/24/2015	Tim Chandler	3.0177	500	1600-E	59.7931 dpm/mL	07/10/2017	07/10/2018
02/16/2017	Tim Chandler	3.0261	500	1600-F	59.9595 dpm/mL	02/06/2018	02/06/2019
10/10/2017	Christina Kimball	.539	250	1600-G	21.3596 dpm/mL	07/26/2021	07/26/2022

04/02/2018	Tim Chandler	3.0544	500	1600-H	60.5203 dpm/mL	03/29/2019	03/29/2020
06/21/2019	Tim Chandler	3.0536	500	1600-I	60.5044 dpm/mL	06/21/2019	06/21/2020
01/30/2020	Tim Chandler	3.0563	500	1600-J	60.5579 dpm/mL	01/26/2021	01/26/2022
03/13/2020	Christina Kimball	.01222	500	1600-K	.24207 dpm/mL	03/15/2022	03/15/2023
04/23/2021	Tim Chandler	3.0507	500	1600-L	60.4469 dpm/mL	04/26/2021	04/26/2022
01/21/2022	Matelon DeFreese	3.1075	500	1600-M	61.5723941 dpm/mL	01/21/2022	01/21/2023
05/19/2022	Christina Kimball	.01275	500	1600-N	.2527 dpm/mL	05/20/2022	05/20/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-238 Standard 1600-M

v1.2

Analyst	MXS2
Verification Prep Date	1/21/2022

Tracer Information	
Isotope	U-232
Serial Number	1564-CC
Amount of Std. (mL)	0.2
Expiration Date	12/15/2022

Standard Information	
Isotope	U-238
Serial Number	1600-M
Isotope Half-life	4.4680E+09 Y
Reference Date	4/15/2012
Ref. Act. (dpm/mL)	61.5723941
Amount of Std. (mL)	0.2
Standard Prep Date	1/20/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	1/23/2022	5.500	61.05
2	1/23/2022	5.370	59.61
3	1/23/2022	5.410	60.05

Mean Value = 5.427 60.236
 Stdev = 0.066583281 0.739074421

Certificate Value* = 5.5471 pCi
 Two sigma = 0.1332
 10 % of Mean = 0.5427
 Rule A (Pass/Fail) Pass
 % Recovery 97.83%
 Rule B (Pass/Fail) Pass
 Expiration Date 1/21/2023

dpm/mL
 61.5724
 1.4781
 6.0236
 Pass
 97.83%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-238 standard 1600-M using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-232 standard 1564-CC and was diluted in a centrifuge tube containing 15 mL 0.1M HCl and 25 mL of DI water 0.1 mL of neodymium carrier, 0.5 mL titanium chloride, and five mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-238 were calculated by comparison to U-232 certified values.

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Runlogs

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2290611

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885001	SAMPLE	MP2	1139	JUL-24-22 13:39:28	DONE		14-JUL-22 12:05
585885002	SAMPLE	MP2	1140	JUL-24-22 13:39:30	DONE		14-JUL-22 12:06
585885003	SAMPLE	MP2	1141	JUL-24-22 13:39:32	DONE		14-JUL-22 12:06
585905002	SAMPLE	MP2	1152	JUL-24-22 13:39:36	DONE		14-JUL-22 12:06
585905003	SAMPLE	MP2	1155	JUL-24-22 13:39:39	DONE		14-JUL-22 12:06
585905004	SAMPLE	MP2	1156	JUL-24-22 13:39:41	DONE		14-JUL-22 12:06
585905005	SAMPLE	MP2	1159	JUL-24-22 13:39:43	DONE		14-JUL-22 13:06
1205140833	MB	MP2	1160	JUL-24-22 13:39:45	DONE		14-JUL-22 13:06
585905001	SAMPLE	MP2	1149	JUL-24-22 14:37:18	DONE		14-JUL-22 13:25
1205140834	LCS	MP2	1113	JUL-25-22 08:43:36	DONE		13-JUL-22 12:48
1205140835	LCSD	MP2	1114	JUL-25-22 08:43:38	DONE		13-JUL-22 12:48

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2290612

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885001	SAMPLE	MP2	1037	JUL-24-22 14:00:45	DONE		02-JUL-22 10:46
585885002	SAMPLE	MP2	1038	JUL-24-22 14:00:45	DUSE		02-JUL-22 10:46
585885003	SAMPLE	MP2	1039	JUL-24-22 14:00:45	DONE		02-JUL-22 10:46
585905001	SAMPLE	MP2	1040	JUL-24-22 14:00:45	DONE		02-JUL-22 10:46
585905002	SAMPLE	MP2	1041	JUL-24-22 14:00:45	DONE		02-JUL-22 10:46
585905003	SAMPLE	MP2	1042	JUL-24-22 14:00:45	DONE		02-JUL-22 10:46
585905004	SAMPLE	MP2	1043	JUL-24-22 14:00:46	DONE		02-JUL-22 10:46
585905005	SAMPLE	MP2	1044	JUL-24-22 14:00:46	DONE		02-JUL-22 10:46
1205140836	MB	MP2	1045	JUL-24-22 14:00:46	DONE		02-JUL-22 10:47
1205140838	LCS	MP2	1047	JUL-24-22 14:00:46	DONE		02-JUL-22 10:47
1205140839	LCSD	MP2	1048	JUL-24-22 14:00:46	DONE		02-JUL-22 10:47

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2290613

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885001	SAMPLE	BV1	1165	JUL-23-22 12:17:15	DONE		15-JUL-22 11:32
585885002	SAMPLE	BV1	1170	JUL-23-22 12:17:17	DONE		15-JUL-22 11:32
585885003	SAMPLE	BV1	1177	JUL-23-22 12:17:19	DONE		15-JUL-22 13:06
585905001	SAMPLE	BV1	1178	JUL-23-22 12:17:21	DONE		15-JUL-22 11:39
585905002	SAMPLE	BV1	1179	JUL-23-22 12:17:23	DONE		15-JUL-22 11:53
585905003	SAMPLE	BV1	1180	JUL-23-22 12:17:26	DONE		15-JUL-22 13:06
585905004	SAMPLE	BV1	1191	JUL-23-22 12:19:46	DONE		18-JUL-22 12:40
585905005	SAMPLE	BV1	1192	JUL-23-22 12:19:48	DONE		18-JUL-22 12:40
1205140840	MB	BV1	1194	JUL-23-22 12:19:51	DONE		18-JUL-22 12:41
1205140841	LCS	BV1	1195	JUL-23-22 12:19:53	DONE		18-JUL-22 12:41
1205140842	LCSD	BV1	1196	JUL-23-22 12:19:55	DONE		18-JUL-22 12:42

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2293754

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885001	SAMPLE	BV1	1095	JUL-25-22 18:29:39	DONE		12-JUL-22 12:20
585885002	SAMPLE	BV1	1096	JUL-25-22 18:29:39	DONE		12-JUL-22 12:21
585885003	SAMPLE	BV1	1097	JUL-25-22 18:29:39	DONE		12-JUL-22 12:21
585905001	SAMPLE	BV1	1098	JUL-25-22 18:29:39	DONE		12-JUL-22 16:57
585905002	SAMPLE	BV1	1099	JUL-25-22 18:29:39	DONE		12-JUL-22 12:22
585905003	SAMPLE	BV1	1100	JUL-25-22 18:29:39	DONE		12-JUL-22 12:22
585905004	SAMPLE	BV1	1102	JUL-25-22 18:29:40	DONE		12-JUL-22 12:08
585905005	SAMPLE	BV1	1103	JUL-25-22 18:29:40	DONE		12-JUL-22 12:10
1205146816	MB	BV1	1104	JUL-25-22 18:29:40	DONE		12-JUL-22 12:10
1205146817	LCS	BV1	1105	JUL-25-22 18:29:40	DONE		12-JUL-22 12:10
1205146818	LCSD	BV1	1106	JUL-25-22 18:29:40	DONE		12-JUL-22 12:10

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2294036

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885001	SAMPLE	BV1	1071	JUL-25-22 18:29:37	DONE		11-JUL-22 12:31
585885002	SAMPLE	BV1	1072	JUL-25-22 18:29:37	DONE		11-JUL-22 12:31
585885003	SAMPLE	BV1	1074	JUL-25-22 18:29:37	DONE		11-JUL-22 12:31
585905001	SAMPLE	BV1	1075	JUL-25-22 18:29:37	DONE		11-JUL-22 12:32
585905002	SAMPLE	BV1	1076	JUL-25-22 18:29:37	DONE		11-JUL-22 12:32
585905003	SAMPLE	BV1	1083	JUL-25-22 18:29:38	DONE		11-JUL-22 11:44
585905004	SAMPLE	BV1	1084	JUL-25-22 18:29:38	DONE		11-JUL-22 11:44
585905005	SAMPLE	BV1	1085	JUL-25-22 18:29:38	DONE		11-JUL-22 11:45
1205147417	MB	BV1	1086	JUL-25-22 18:29:38	DONE		11-JUL-22 11:45
1205147418	LCS	BV1	1088	JUL-25-22 18:29:38	DONE		11-JUL-22 11:45
1205147419	LCSD	BV1	1107	JUL-25-22 18:29:41	DONE		12-JUL-22 12:13

Gamma Spectroscopy Raw Data

Batch 2290721 Check-list

This check-list was completed on 22-JUL-22 by Michael Hilton

This batch was reviewed by Michael Hilton on 22-JUL-22 and Spencer Collins on 22-JUL-22.

Batch ID: 2290721

Product: GSCGAMMF

Description: Gamma Spec Filter RAD A-013

#	Criteria	Yes	No	Comments
Preparation Information				
1	Did any sample(s) require dilution?		No	
2	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
3	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
4	Are instrument source checks within limits?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were any additional radionuclides added that were not requested by the client?		No	
7	Were all the samples prepared/analyzed within the required holding time period?	Yes		
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Gamma Spectroscopy

Batch ID: 2290721
Analyst: Michael Hilton (MJH1)
Method: DOE HASL 300, 4.5.2.3/Ga-01-R
Lab SOP: GL-RAD-A-013 REV# 27
Instrument: No instrument-manual method

Due Dates for Lab: 26-JUL-2022 **Package:** 27-JUL-2022 **SDG:** 27-JUL-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205141124	78962-278	1298	1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	585885001	21-JUL-2022	20	200	0.5142
2	585885002	21-JUL-2022	20	200	0.50507
3	585885003	21-JUL-2022	20	200	0.57175
4	585905001	21-JUL-2022	20	200	0.52145
5	585905002	21-JUL-2022	20	200	0.49255
6	585905003	21-JUL-2022	20	200	0.45632
7	585905004	21-JUL-2022	20	200	0.47052
8	585905005	21-JUL-2022	20	200	0.51013
9	1205141122 MB	21-JUL-2022	20		0.57175
10	1205141123 DUP (585885001)	21-JUL-2022	20	200	0.5142
11	1205141124 LCS	21-JUL-2022	20		0.57175

Reagent/Solvent Lot ID	Description	Amount	Comments:
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VAX/VMS Nuclide Identification Report Generated 21-JUL-2022 20:33:54.35

```
*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885001.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM14.CNF;831
Background date    : 16-JUL-2022 13:55:22
Sample date       : 27-JUN-2022 09:24:00 Acquisition date : 21-JUL-2022 16:33:26
Sample ID        : G585885001 Sample quantity : 5.14200E-01 FILTER
Detector name    : GAM14 Detector geometry: JAR
Elapsed live time: 0 04:00:00.00 Elapsed real time: 0 04:00:01.47 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : MJH1
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID         : 2290721 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
```

BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	54.40	23	107	1.27	109.10	106	7	1.57E-03	78.7	
2	0	63.72*	52	135	0.80	127.74	124	9	3.61E-03	50.4	
3	0	149.40	27	121	1.03	299.09	296	8	1.85E-03	74.0	
4	1	240.76*	7	71	1.26	481.77	473	12	5.18E-04	221.6	2.15E+00
5	0	304.53	22	47	1.18	609.31	607	6	1.54E-03	53.1	
6	0	347.56	12	50	1.15	695.35	690	7	8.60E-04	98.1	
7	0	352.37*	21	43	1.80	704.98	701	8	1.47E-03	71.4	
8	0	395.16	31	69	3.53	790.55	785	12	2.13E-03	57.0	
9	0	474.27	10	36	1.39	948.76	942	8	6.73E-04	104.2	
10	0	477.66	87	62	0.79	955.54	950	14	6.06E-03	21.6	
11	0	511.65*	19	92	2.42	1023.50	1016	20	1.29E-03	178.5	
12	0	584.50*	7	45	2.26	1169.21	1162	11	4.87E-04	218.8	
13	0	687.11	5	20	1.30	1374.40	1369	8	3.47E-04	161.2	
14	0	747.55	42	32	7.34	1495.28	1486	19	2.94E-03	36.0	
15	0	755.06	33	20	0.72	1510.30	1505	13	2.26E-03	33.1	
16	0	882.53	15	18	0.63	1765.23	1759	12	1.04E-03	62.2	
17	0	911.68*	3	20	1.39	1823.53	1816	14	1.84E-04	457.3	
18	0	935.76	22	7	0.67	1871.70	1865	13	1.49E-03	32.6	
19	6	969.36	15	21	1.81	1938.88	1933	15	1.05E-03	64.1	1.04E+00
20	6	972.10*	2	4	2.02	1944.38	1933	15	1.66E-04	400.9	
21	0	1080.14	12	17	2.11	2160.44	2150	13	7.99E-04	78.2	
22	0	1282.87	9	9	4.85	2565.92	2558	12	6.31E-04	73.9	
23	0	1385.51	9	5	1.61	2771.20	2765	10	6.50E-04	55.0	
24	0	1461.24*	21	9	2.25	2922.66	2914	17	1.47E-03	49.0	
25	0	1491.01	7	10	1.38	2982.20	2977	9	5.07E-04	89.2	
26	0	1527.30	10	0	1.55	3054.80	3051	7	6.94E-04	31.6	
27	0	1586.70	5	9	3.34	3173.60	3167	9	3.47E-04	117.0	
28	0	1849.76	6	6	0.97	3699.76	3690	12	4.17E-04	91.3	
29	0	1859.59	8	5	3.83	3719.43	3712	11	5.34E-04	68.9	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 21-JUL-2022 20:33:55

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885001.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 27-JUN-2022 09:24:00	Acquisition date	: 21-JUL-2022 16:33:26
Sample ID	: G585885001	Sample quantity	: 0.51420 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA14	Detector geometry	: JAR
Elapsed live time	: 0 04:00:00.00	Elapsed real time	: 0 04:00:01.47 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	87	10.44*	2.248E+00	1.358E+02	1.865E+02	43.29
K-40	1460.82	21	10.66*	8.715E-01	8.316E+01	8.315E+01	98.10
AS-73	53.44	23	10.30*	9.253E-01	8.657E+01	1.069E+02	157.49
RB-84	881.60	15	68.90*	1.359E+00	5.847E+00	9.785E+00	124.37
TL-208	277.37	-----	6.60	3.299E+00	-----	Line Not Found	-----
	583.19	7	85.00*	1.927E+00	1.562E+00	1.600E+00	437.68
	860.56	-----	12.50	1.390E+00	-----	Line Not Found	-----
BI-211	72.87	-----	1.23	2.699E+00	-----	Line Not Found	-----
	351.06	21	12.92*	2.798E+00	2.135E+01	2.139E+01	142.75
RA-224	240.99	7	4.10*	3.623E+00	1.832E+01	1.877E+01	443.25
AC-228	338.32	-----	11.27	2.878E+00	-----	Line Not Found	-----
	911.20	3	25.80*	1.320E+00	2.835E+00	2.858E+00	914.50
	968.97	15	15.80	1.248E+00	2.811E+01	2.834E+01	128.30
RA-228	338.32	-----	11.27	2.878E+00	-----	Line Not Found	-----
	911.20	3	25.80*	1.320E+00	2.835E+00	2.858E+00	914.50
	968.97	15	15.80	1.248E+00	2.811E+01	2.834E+01	128.30
TH-232	63.81	52	0.26*	1.814E+00	4.022E+03	4.022E+03	100.89
	140.88	-----	0.02	4.699E+00	-----	Line Not Found	-----
U-234	53.20	23	0.12*	9.253E-01	7.431E+03	7.431E+03	157.49
	120.90	-----	0.04	4.726E+00	-----	Line Not Found	-----
ANH-511	511.00	19	100.00*	2.136E+00	3.173E+00	3.173E+00	357.09

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                           *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*                                     *                                               *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885001.CNF;1        *
* Acquisition date   : 21-JUL-2022 16:33:26 Sensitivity      : 3.000                *
* Detector ID        : GAM14 Energy tolerance: 1.500        *
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 04:00:01.47 Half life ratio : *****      *
* Sample date        : 27-JUN-2022 09:24:00 Analyst initials: MJH1        *
* Sample ID          : G585885001 Sample Quantity : 5.1420E-01 FILTER *
* Batch Number       : 2290721 Wet Weight : 0.00000        *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000         *
* Nuclide Library    : LIQUID.NLB;26                                             *
*****
*                                     CALIBRATION INFORMATION                       *
*                                     *                                               *
* Eff. Cal. date     : 9-MAY-2022 05:17:58 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13          *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.865E+02	7.914E+01	5.606E+01
K-40	8.315E+01	7.994E+01	7.446E+01
AS-73	1.069E+02	1.649E+02	1.909E+02
RB-84	9.785E+00	1.193E+01	1.262E+01
TL-208	1.600E+00	6.864E+00	5.778E+00
BI-211	2.139E+01	2.993E+01	3.419E+01
RA-224	1.877E+01	8.153E+01	1.017E+02
AC-228	2.858E+00	2.562E+01	2.379E+01
RA-228	2.858E+00	2.562E+01	2.379E+01
TH-232	4.022E+03	3.977E+03	3.050E+03
U-234	7.431E+03	1.147E+04	1.359E+04
ANH-511	3.173E+00	1.111E+01	4.956E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-2.383E+00	2.817E+00	4.807E+00	NOT IDENT.
NA-24	0.000E+00	1.788E+12	0.000E+00	SHORT HLIF
AL-26	-2.479E-02	3.274E+00	6.771E+00	NOT IDENT.
SC-46	1.972E+00	3.573E+00	7.378E+00	NOT IDENT.
V-48	5.999E+00	8.077E+00	1.757E+01	NOT IDENT.
CR-51	-2.081E+01	4.884E+01	8.022E+01	NOT IDENT.
MN-52	-1.189E+01	6.785E+01	1.341E+02	FAIL ABUN
MN-54	1.835E+00	3.486E+00	6.963E+00	NOT IDENT.
CO-56	9.738E-01	4.402E+00	8.394E+00	NOT IDENT.
CO-57	5.409E-01	2.003E+00	3.703E+00	NOT IDENT.
NI-57	0.000E+00	2.981E+05	0.000E+00	SHORT HLIF
CO-58	2.507E+00	4.330E+00	8.637E+00	NOT IDENT.
FE-59	7.357E+00	8.041E+00	1.785E+01	NOT IDENT.
CO-60	-3.400E+00	3.213E+00	5.143E+00	NOT IDENT.
ZN-65	3.422E+00	7.805E+00	1.560E+01	NOT IDENT.
CU-67	-1.653E+04	4.943E+03	5.601E+03	NOT IDENT.
GE-68	5.165E+01	1.078E+02	2.210E+02	NOT IDENT.
AS-74	8.345E+00	1.416E+01	2.781E+01	NOT IDENT.

SE-75	-2.075E+00	4.438E+00	7.356E+00	NOT IDENT.
BR-77	0.000E+00	1.659E+04	0.000E+00	SHORT HLIF
SR-82	-1.711E+01	3.757E+01	6.614E+01	NOT IDENT.
RB-83	-8.600E-01	7.018E+00	1.255E+01	NOT IDENT.
KR-85	1.372E+03	7.682E+02	1.626E+03	NOT IDENT.
SR-85	7.941E+00	4.446E+00	9.409E+00	NOT IDENT.
RB-86	2.594E+01	8.976E+01	1.799E+02	NOT IDENT.
Y-88	-2.349E+00	4.214E+00	7.466E+00	NOT IDENT.
Y-91	7.112E+02	1.750E+03	3.732E+03	NOT IDENT.
NB-94	-6.664E-01	3.144E+00	5.721E+00	NOT IDENT.
NB-95	-1.135E+00	4.205E+00	7.569E+00	NOT IDENT.
NB-95M	-4.591E+00	1.243E+01	1.915E+01	NOT IDENT.
TC-95M	-2.574E+00	4.325E+00	7.185E+00	NOT IDENT.
ZR-95	7.869E+00	7.059E+00	1.451E+01	NOT IDENT.
MO-99	8.285E+03	1.102E+04	2.289E+04	NOT IDENT.
TC-99M	0.000E+00	4.690E+29	0.000E+00	SHORT HLIF
RH-101	2.667E-01	2.600E+00	4.703E+00	NOT IDENT.
RH-102M	1.669E+00	3.407E+00	5.136E+00	FAIL ABUN
RU-103	-1.420E+00	4.322E+00	7.904E+00	NOT IDENT.
RH-106	-5.642E+00	2.865E+01	5.285E+01	NOT IDENT.
RU-106	-5.642E+00	2.865E+01	5.285E+01	NOT IDENT.
AG-108M	-1.273E+00	2.894E+00	5.245E+00	NOT IDENT.
CD-109	1.606E+01	6.440E+01	1.188E+02	NOT IDENT.
AG-110	3.837E+01	6.343E+01	1.295E+02	NOT IDENT.
AG-110M	-3.088E-01	4.710E+00	7.881E+00	FAIL ABUN
IN-111	6.585E+02	1.052E+03	1.924E+03	NOT IDENT.
SN-113	4.245E-01	4.165E+00	7.318E+00	NOT IDENT.
IN-114M	-2.144E+00	1.865E+01	3.245E+01	NOT IDENT.
CD-115	0.000E+00	1.753E+04	0.000E+00	SHORT HLIF
SN-117M	-1.010E+00	7.023E+00	1.236E+01	NOT IDENT.
SB-122	-9.464E+02	1.949E+03	3.473E+03	NOT IDENT.
I-123	0.000E+00	4.512E+13	0.000E+00	SHORT HLIF
TE-123M	1.595E-01	2.450E+00	4.383E+00	NOT IDENT.
SB-124	4.344E+00	9.813E+00	2.174E+01	NOT IDENT.
SB-125	5.401E+00	8.450E+00	1.695E+01	NOT IDENT.
TE-125M	-4.660E+02	8.886E+02	1.538E+03	NOT IDENT.
I-126	2.291E+00	3.073E+01	5.872E+01	FAIL ABUN
SB-126	1.234E-01	2.334E+01	4.358E+01	NOT IDENT.
SN-126	3.304E+00	6.198E+00	1.167E+01	FAIL ABUN
SB-127	2.366E+02	7.477E+02	1.117E+03	FAIL ABUN
TE-129	1.113E+01	5.165E+01	1.004E+02	NOT IDENT.
I-131	4.821E+00	2.277E+01	4.427E+01	NOT IDENT.
I-132	0.000E+00	8.910E+40	0.000E+00	SHORT HLIF
TE-132	2.378E+01	4.604E+02	8.112E+02	NOT IDENT.
BA-133	6.436E-01	4.376E+00	7.613E+00	NOT IDENT.
I-133	0.000E+00	8.264E+08	0.000E+00	SHORT HLIF
CS-134	2.006E+00	3.466E+00	7.093E+00	NOT IDENT.
I-135	0.000E+00	6.935E+27	0.000E+00	SHORT HLIF
CS-136	1.683E+00	1.798E+01	3.357E+01	NOT IDENT.
BA-137M	1.587E+00	3.092E+00	6.210E+00	NOT IDENT.
CS-137	1.676E+00	3.267E+00	6.560E+00	NOT IDENT.
LA-138	-2.599E+00	5.438E+00	1.001E+01	NOT IDENT.
CE-139	-3.876E-01	2.746E+00	4.799E+00	NOT IDENT.
BA-140	1.795E+00	4.018E+01	7.646E+01	FAIL ABUN
LA-140	-1.747E-01	1.059E+01	2.259E+01	NOT IDENT.
CE-141	-9.015E+00	8.138E+00	1.164E+01	NOT IDENT.
CE-143	0.000E+00	1.136E+06	0.000E+00	SHORT HLIF
CE-144	-1.679E+00	1.704E+01	3.024E+01	NOT IDENT.
PM-144	2.147E+00	3.225E+00	6.509E+00	FAIL ABUN
PR-144	1.608E+02	2.424E+02	4.892E+02	NOT IDENT.
PM-146	-1.804E+00	3.616E+00	6.535E+00	FAIL ABUN
ND-147	-1.940E+01	8.539E+01	1.586E+02	NOT IDENT.
PM-147	1.363E+04	5.934E+04	1.091E+05	NOT IDENT.
PM-149	0.000E+00	1.626E+05	0.000E+00	SHORT HLIF
EU-152	-7.324E+00	9.864E+00	1.390E+01	NOT IDENT.
GD-153	-3.920E+00	8.751E+00	1.307E+01	NOT IDENT.
EU-154	-8.821E+00	8.341E+00	1.337E+01	NOT IDENT.
EU-155	5.746E+00	8.593E+00	1.636E+01	NOT IDENT.
TB-160	-7.829E+00	1.512E+01	2.249E+01	NOT IDENT.
HO-166M	6.190E+00	5.881E+00	1.228E+01	NOT IDENT.
TM-171	-3.228E+01	2.215E+03	3.848E+03	NOT IDENT.
LU-176	1.408E+00	2.724E+00	4.630E+00	NOT IDENT.
LU-177	-4.488E+01	2.690E+02	4.635E+02	NOT IDENT.
HF-181	4.774E+00	4.355E+00	8.779E+00	NOT IDENT.
W-181	-7.953E-01	2.505E+01	4.303E+01	FAIL ABUN
TA-182	-3.529E-01	1.461E+01	2.932E+01	NOT IDENT.
RE-183	-1.102E+01	2.556E+01	4.222E+01	NOT IDENT.
RE-184	-5.705E+00	1.351E+01	2.365E+01	NOT IDENT.

RE-188	5.566E+00	1.502E+01	2.748E+01	FAIL ABUN
W-188	1.914E+02	7.170E+02	1.282E+03	FAIL ABUN
OS-191	2.027E-02	2.047E+01	3.662E+01	FAIL ABUN
IR-192	-1.983E-01	4.132E+00	7.049E+00	NOT IDENT.
PB-201	0.000E+00	2.330E+19	0.000E+00	SHORT HLIF
TL-201	2.280E+03	5.162E+03	9.422E+03	NOT IDENT.
TL-202	-3.088E+00	1.039E+01	1.918E+01	NOT IDENT.
HG-203	1.299E+00	4.070E+00	7.291E+00	NOT IDENT.
PB-203	0.000E+00	7.051E+03	0.000E+00	SHORT HLIF
TL-204	9.129E+01	4.376E+02	8.126E+02	NOT IDENT.
BI-207	3.037E-01	4.917E+00	9.241E+00	NOT IDENT.
PB-210	-1.878E+02	7.975E+02	1.176E+03	NOT IDENT.
PB-211	5.940E+01	6.262E+01	1.292E+02	NOT IDENT.
BI-212	1.689E+01	4.799E+01	9.363E+01	NOT IDENT.
PB-212	-1.965E+00	7.276E+00	1.224E+01	NOT IDENT.
BI-213	-5.551E+00	9.083E+00	1.622E+01	NOT IDENT.
BI-214	-1.244E+00	9.433E+00	1.453E+01	NOT IDENT.
PB-214	7.747E+00	1.084E+01	1.450E+01	FAIL ABUN
RN-219	-2.103E+01	3.406E+01	6.115E+01	NOT IDENT.
FR-221	8.833E+00	1.781E+01	3.268E+01	NOT IDENT.
RA-223	-3.904E+01	7.685E+01	1.156E+02	NOT IDENT.
AC-225	4.787E+01	9.651E+01	1.771E+02	NOT IDENT.
RA-226	-8.820E+01	9.794E+01	1.402E+02	NOT IDENT.
AC-227	-1.888E+01	2.383E+01	3.818E+01	FAIL ABUN
TH-227	-1.888E+01	2.383E+01	3.818E+01	FAIL ABUN
TH-228	-1.965E+00	7.276E+00	1.224E+01	NOT IDENT.
TH-229	3.822E+01	4.827E+01	8.988E+01	NOT IDENT.
TH-230	-8.827E+02	1.230E+03	1.781E+03	NOT IDENT.
PA-231	3.611E+01	4.635E+01	8.140E+01	NOT IDENT.
TH-231	-8.165E+00	4.556E+01	6.727E+01	NOT IDENT.
PA-233	6.636E+00	6.158E+00	1.184E+01	NOT IDENT.
PA-234	-1.995E+01	2.763E+01	4.542E+01	FAIL ABUN
PA-234M	3.207E+02	5.543E+02	9.503E+02	NOT IDENT.
TH-234	2.827E+02	2.795E+02	2.907E+02	FAIL ABUN
U-235	-7.380E-01	2.221E+01	3.516E+01	NOT IDENT.
NP-237	6.636E+00	6.158E+00	1.184E+01	NOT IDENT.
NP-238	0.000E+00	3.213E+04	0.000E+00	SHORT HLIF
U-238	2.827E+02	2.795E+02	2.907E+02	FAIL ABUN
NP-239	-1.206E+01	2.203E+01	3.793E+01	NOT IDENT.
AM-241	4.426E+00	1.563E+01	2.954E+01	NOT IDENT.
AM-242	-6.553E+01	6.644E+01	9.519E+01	NOT IDENT.
AM-243	6.955E+00	4.559E+00	9.152E+00	NOT IDENT.
CM-243	-1.137E+01	8.356E+00	1.339E+01	NOT IDENT.
BK-247	-5.126E+00	7.678E+00	1.244E+01	NOT IDENT.
CM-247	-3.237E+00	3.076E+00	5.249E+00	NOT IDENT.
CF-249	1.461E+00	3.394E+00	6.744E+00	NOT IDENT.
CF-251	4.266E+00	1.166E+01	2.113E+01	NOT IDENT.
CF-252	5.675E+03	1.515E+04	2.816E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.88	36	107	0.97	94.08	91	6	2.51E-03	48.5	
2	0	54.40	23	107	1.27	109.10	106	7	1.57E-03	78.7	
3	0	63.72	91	135	0.80	127.74	124	9	6.31E-03	25.2	
4	0	92.73	116	213	1.03	185.75	181	11	8.06E-03	26.2	
5	0	144.21	27	102	0.68	288.69	285	6	1.85E-03	63.2	
6	0	149.40	27	121	1.03	299.09	296	8	1.85E-03	74.0	
7	0	185.99	77	133	0.82	372.24	368	9	5.36E-03	29.3	
8	1	238.98	57	99	1.26	478.23	473	12	3.96E-03	32.9	2.15E+00
9	1	240.76	22	71	1.26	481.77	473	12	1.55E-03	65.3	
10	0	304.53	22	47	1.18	609.31	607	6	1.54E-03	53.1	
11	0	347.56	12	50	1.15	695.35	690	7	8.60E-04	98.1	
12	0	352.37	36	43	1.80	704.98	701	8	2.51E-03	35.8	
13	0	395.16	31	69	3.53	790.55	785	12	2.13E-03	57.0	
14	0	474.27	10	36	1.39	948.76	942	8	6.73E-04	104.2	
15	0	477.66	87	62	0.79	955.54	950	14	6.06E-03	21.6	
16	0	511.65	311	92	2.42	1023.50	1016	20	2.16E-02	9.5	
17	0	584.50	21	45	2.26	1169.21	1162	11	1.46E-03	66.3	
18	0	687.11	5	20	1.30	1374.40	1369	8	3.47E-04	161.2	
19	0	747.55	42	32	7.34	1495.28	1486	19	2.94E-03	36.0	
20	0	755.06	33	20	0.72	1510.30	1505	13	2.26E-03	33.1	
21	0	882.53	15	18	0.63	1765.23	1759	12	1.04E-03	62.2	
22	0	911.68	24	20	1.39	1823.53	1816	14	1.65E-03	45.6	
23	0	935.76	22	7	0.67	1871.70	1865	13	1.49E-03	32.6	
24	6	969.36	15	21	1.81	1938.88	1933	15	1.05E-03	64.1	1.04E+00
25	6	972.10	12	4	2.02	1944.38	1933	15	8.03E-04	61.8	
26	0	1080.14	12	17	2.11	2160.44	2150	13	7.99E-04	78.2	
27	0	1282.87	9	9	4.85	2565.92	2558	12	6.31E-04	73.9	
28	0	1385.51	9	5	1.61	2771.20	2765	10	6.50E-04	55.0	
29	0	1461.24	43	9	2.25	2922.66	2914	17	2.95E-03	22.0	
30	0	1491.01	7	10	1.38	2982.20	2977	9	5.07E-04	89.2	
31	0	1527.30	10	0	1.55	3054.80	3051	7	6.94E-04	31.6	
32	0	1586.70	5	9	3.34	3173.60	3167	9	3.47E-04	117.0	
33	0	1849.76	6	6	0.97	3699.76	3690	12	4.17E-04	91.3	
34	0	1859.59	8	5	3.83	3719.43	3712	11	5.34E-04	68.9	
35	0	1912.04	9	0	0.83	3824.33	3821	8	6.25E-04	33.3	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	87	10.44*	2.248E+00	1.358E+02	1.865E+02	43.29
K-40	1460.82	21	10.66*	8.715E-01	8.316E+01	8.315E+01	98.10
AS-73	53.44	23	10.30*	9.253E-01	8.657E+01	1.069E+02	157.49
RB-84	881.60	15	68.90*	1.359E+00	5.847E+00	9.785E+00	124.37
TL-208	277.37	-----	6.60	3.299E+00	-----	Line Not Found	-----
	583.19	7	85.00*	1.927E+00	1.562E+00	1.600E+00	437.68
	860.56	-----	12.50	1.390E+00	-----	Line Not Found	-----
BI-211	72.87	-----	1.23	2.699E+00	-----	Line Not Found	-----
	351.06	21	12.92*	2.798E+00	2.135E+01	2.139E+01	142.75
RA-224	240.99	7	4.10*	3.623E+00	1.832E+01	1.877E+01	443.25
AC-228	338.32	-----	11.27	2.878E+00	-----	Line Not Found	-----
	911.20	3	25.80*	1.320E+00	2.835E+00	2.858E+00	914.50
	968.97	15	15.80	1.248E+00	2.811E+01	2.834E+01	128.30
RA-228	338.32	-----	11.27	2.878E+00	-----	Line Not Found	-----
	911.20	3	25.80*	1.320E+00	2.835E+00	2.858E+00	914.50
	968.97	15	15.80	1.248E+00	2.811E+01	2.834E+01	128.30
TH-232	63.81	52	0.26*	1.814E+00	4.022E+03	4.022E+03	100.89
	140.88	-----	0.02	4.699E+00	-----	Line Not Found	-----
U-234	53.20	23	0.12*	9.253E-01	7.431E+03	7.431E+03	157.49
	120.90	-----	0.04	4.726E+00	-----	Line Not Found	-----
ANH-511	511.00	19	100.00*	2.136E+00	3.173E+00	3.173E+00	357.09

Flag: "*" = Keyline

Total number of lines in spectrum 29
Number of unidentified lines 11
Number of lines tentatively identified by NID 18 62.07%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.37	1.358E+02	1.865E+02	0.808E+02	43.29	
K-40	1.25E+09Y	1.00	8.316E+01	8.315E+01	8.157E+01	98.10	
AS-73	80.30D	1.23	8.657E+01	1.069E+02	1.683E+02	157.49	
RB-84	32.82D	1.67	5.847E+00	9.785E+00	12.17E+00	124.37	
TL-208	1.91Y	1.02	1.562E+00	1.600E+00	7.005E+00	437.68	
BI-211	21.77Y	1.00	2.135E+01	2.139E+01	3.054E+01	142.75	
RA-224	1.91Y	1.02	1.832E+01	1.877E+01	8.320E+01	443.25	
AC-228	5.75Y	1.01	2.835E+00	2.858E+00	26.14E+00	914.50	
RA-228	5.75Y	1.01	2.835E+00	2.858E+00	26.14E+00	914.50	
TH-232	1.41E+10Y	1.00	4.022E+03	4.022E+03	4.058E+03	100.89	
U-234	2.45E+05Y	1.00	7.431E+03	7.431E+03	11.70E+03	157.49	
ANH-511	1.00E+09Y	1.00	3.173E+00	3.173E+00	11.33E+00	357.09	
Total Activity :			1.181E+04	1.189E+04			

Grand Total Activity : 1.181E+04 1.189E+04

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	149.40	27	121	1.03	299.09	296	8	1.85E-03	****	4.63E+00	
0	304.53	22	47	1.18	609.31	607	6	1.54E-03	****	3.10E+00	T
0	347.56	12	50	1.15	695.35	690	7	8.60E-04	****	2.82E+00	
0	395.16	31	69	3.53	790.55	785	12	2.13E-03	****	2.58E+00	
0	474.27	10	36	1.39	948.76	942	8	6.73E-04	****	2.26E+00	T
0	687.11	5	20	1.30	1374.40	1369	8	3.47E-04	****	1.69E+00	T
0	747.55	42	32	7.34	1495.28	1486	19	2.94E-03	71.9	1.57E+00	T
0	755.06	33	20	0.72	1510.30	1505	13	2.26E-03	66.2	1.56E+00	T
0	935.76	22	7	0.67	1871.70	1865	13	1.49E-03	65.2	1.29E+00	T
6	972.10	2	4	2.02	1944.38	1933	15	1.66E-04	****	1.24E+00	
0	1080.14	12	17	2.11	2160.44	2150	13	7.99E-04	****	1.13E+00	
0	1282.87	9	9	4.85	2565.92	2558	12	6.31E-04	****	9.70E-01	
0	1385.51	9	5	1.61	2771.20	2765	10	6.50E-04	****	9.09E-01	T
0	1491.01	7	10	1.38	2982.20	2977	9	5.07E-04	****	8.58E-01	
0	1527.30	10	0	1.55	3054.80	3051	7	6.94E-04	63.2	8.43E-01	
0	1586.70	5	9	3.34	3173.60	3167	9	3.47E-04	****	8.21E-01	
0	1849.76	6	6	0.97	3699.76	3690	12	4.17E-04	****	7.55E-01	
0	1859.59	8	5	3.83	3719.43	3712	11	5.34E-04	****	7.53E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                          *
*****
*
*                                     DETECTOR AND SAMPLE DATA                       *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885001.CNF;1      *
* Acquisition date   : 21-JUL-2022 16:33:26 Sensitivity      : 3.000              *
* Detector ID       : GAM14 Energy tolerance: 1.500          *
* Elapsed live time : 0 04:00:00.00 Abundance limit : 75.000    *
* Elapsed real time : 0 04:00:01.47 Half life ratio : *****      *
* Sample date       : 27-JUN-2022 09:24:00 Nuclide Library : LIQUID      *
* Sample ID        : G585885001 Analyst initials: MJH1          *
* Batch Number     : 2290721 Sample Quantity : 5.1420E-01 FILTER *
* Wet wt corr      : 1.00000 Wet Weight      : 0.00000          *
*                                     Dry Weight      : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                       *
*
* Eff. Cal. date    : 9-MAY-2022 05:17:58 Eff. Geometry    : JAR          *
* Eff. File         : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	2.515E+01
K-40	3.193E+01
AS-73	8.846E+01
RB-84	5.428E+00
TL-208	2.582E+00
BI-211	1.574E+01
RA-224	4.746E+01
AC-228	1.044E+01
RA-228	1.044E+01
TH-232	1.422E+03
U-234	6.298E+03
ANH-511	2.248E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	1.888E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.736E+00	NOT IDENT.
SC-46	3.242E+00	NOT IDENT.
V-48	7.631E+00	NOT IDENT.
CR-51	3.706E+01	NOT IDENT.
MN-52	5.560E+01	FAIL ABUN
MN-54	3.118E+00	NOT IDENT.
CO-56	3.763E+00	NOT IDENT.
CO-57	1.722E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.890E+00	NOT IDENT.
FE-59	7.780E+00	NOT IDENT.
CO-60	2.041E+00	NOT IDENT.
ZN-65	6.851E+00	NOT IDENT.
CU-67	2.633E+03	NOT IDENT.
GE-68	9.615E+01	NOT IDENT.
AS-74	1.277E+01	NOT IDENT.
SE-75	3.396E+00	NOT IDENT.

BR-77	0.000E+00	SHORT HLIF
SR-82	2.889E+01	NOT IDENT.
RB-83	5.643E+00	NOT IDENT.
KR-85	7.590E+02	NOT IDENT.
SR-85	4.393E+00	NOT IDENT.
RB-86	7.749E+01	NOT IDENT.
Y-88	2.963E+00	NOT IDENT.
Y-91	1.619E+03	NOT IDENT.
NB-94	2.563E+00	NOT IDENT.
NB-95	3.368E+00	NOT IDENT.
NB-95M	8.871E+00	NOT IDENT.
TC-95M	3.337E+00	NOT IDENT.
ZR-95	6.496E+00	NOT IDENT.
MO-99	1.024E+04	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.197E+00	NOT IDENT.
RH-102M	2.336E+00	FAIL ABUN
RU-103	3.571E+00	NOT IDENT.
RH-106	2.360E+01	NOT IDENT.
RU-106	2.360E+01	NOT IDENT.
AG-108M	2.398E+00	NOT IDENT.
CD-109	5.583E+01	NOT IDENT.
AG-110	5.806E+01	NOT IDENT.
AG-110M	3.406E+00	FAIL ABUN
IN-111	9.012E+02	NOT IDENT.
SN-113	3.322E+00	NOT IDENT.
IN-114M	1.516E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	5.745E+00	NOT IDENT.
SB-122	1.561E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.043E+00	NOT IDENT.
SB-124	9.129E+00	NOT IDENT.
SB-125	7.788E+00	NOT IDENT.
TE-125M	7.159E+02	NOT IDENT.
I-126	2.617E+01	FAIL ABUN
SB-126	1.957E+01	NOT IDENT.
SN-126	5.485E+00	FAIL ABUN
SB-127	4.946E+02	FAIL ABUN
TE-129	4.566E+01	NOT IDENT.
I-131	2.032E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	3.764E+02	NOT IDENT.
BA-133	3.520E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.151E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.487E+01	NOT IDENT.
BA-137M	2.791E+00	NOT IDENT.
CS-137	2.948E+00	NOT IDENT.
LA-138	4.155E+00	NOT IDENT.
CE-139	2.244E+00	NOT IDENT.
BA-140	3.454E+01	FAIL ABUN
LA-140	8.914E+00	NOT IDENT.
CE-141	5.455E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.413E+01	NOT IDENT.
PM-144	2.945E+00	FAIL ABUN
PR-144	2.213E+02	NOT IDENT.
PM-146	2.941E+00	FAIL ABUN
ND-147	7.086E+01	NOT IDENT.
PM-147	5.084E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	6.296E+00	NOT IDENT.
GD-153	6.109E+00	NOT IDENT.
EU-154	5.229E+00	NOT IDENT.
EU-155	7.658E+00	NOT IDENT.
TB-160	9.726E+00	NOT IDENT.
HO-166M	5.588E+00	NOT IDENT.
TM-171	1.783E+03	NOT IDENT.
LU-176	2.145E+00	NOT IDENT.
LU-177	2.166E+02	NOT IDENT.
HF-181	3.982E+00	NOT IDENT.
W-181	2.006E+01	FAIL ABUN
TA-182	1.257E+01	NOT IDENT.
RE-183	1.966E+01	NOT IDENT.
RE-184	1.026E+01	NOT IDENT.
RE-188	1.287E+01	FAIL ABUN

W-188	5.921E+02	FAIL ABUN
OS-191	1.714E+01	FAIL ABUN
IR-192	3.277E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	4.425E+03	NOT IDENT.
TL-202	8.704E+00	NOT IDENT.
HG-203	3.382E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	3.812E+02	NOT IDENT.
BI-207	4.044E+00	NOT IDENT.
PB-210	5.560E+02	NOT IDENT.
PB-211	5.946E+01	NOT IDENT.
BI-212	4.212E+01	NOT IDENT.
PB-212	5.803E+00	NOT IDENT.
BI-213	7.315E+00	NOT IDENT.
BI-214	6.684E+00	NOT IDENT.
PB-214	6.759E+00	FAIL ABUN
RN-219	2.765E+01	NOT IDENT.
FR-221	1.522E+01	NOT IDENT.
RA-223	5.366E+01	NOT IDENT.
AC-225	8.251E+01	NOT IDENT.
RA-226	6.690E+01	NOT IDENT.
AC-227	1.760E+01	FAIL ABUN
TH-227	1.760E+01	FAIL ABUN
TH-228	5.803E+00	NOT IDENT.
TH-229	4.226E+01	NOT IDENT.
TH-230	8.320E+02	NOT IDENT.
PA-231	3.776E+01	NOT IDENT.
TH-231	3.157E+01	NOT IDENT.
PA-233	5.502E+00	NOT IDENT.
PA-234	1.949E+01	FAIL ABUN
PA-234M	4.268E+02	NOT IDENT.
TH-234	1.379E+02	FAIL ABUN
U-235	1.663E+01	NOT IDENT.
NP-237	5.502E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.379E+02	FAIL ABUN
NP-239	1.765E+01	NOT IDENT.
AM-241	1.379E+01	NOT IDENT.
AM-242	4.446E+01	NOT IDENT.
AM-243	4.321E+00	NOT IDENT.
CM-243	6.168E+00	NOT IDENT.
BK-247	5.741E+00	NOT IDENT.
CM-247	2.356E+00	NOT IDENT.
CF-249	3.087E+00	NOT IDENT.
CF-251	9.910E+00	NOT IDENT.
CF-252	1.320E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585885001.CNF;1
Acquisition date : 21-JUL-2022 16:33:26 Sensitivity : 3.000
Detector ID : GAM14 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:01.47 Half life ratio : *****
Sample date : 27-JUN-2022 09:24:00 Nuclide Library : LIQUID
Sample ID : G585885001 Analyst initials: MJH1
Batch Number : 2290721 Sample Quantity : 5.1420E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 9-MAY-2022 05:17:58 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.865E+02	8.068E+01	8.076E+01
K-40	8.315E+01	8.038E+01	8.039E+01
AS-73	1.069E+02	1.665E+02	1.665E+02
RB-84	9.785E+00	1.196E+01	1.197E+01
TL-208	1.600E+00	6.866E+00	6.866E+00
BI-211	2.139E+01	2.998E+01	2.998E+01
RA-224	1.877E+01	8.155E+01	8.155E+01
AC-228	2.858E+00	2.562E+01	2.562E+01
RA-228	2.858E+00	2.562E+01	2.562E+01
TH-232	4.022E+03	4.011E+03	4.012E+03
U-234	7.431E+03	1.149E+04	1.149E+04
ANH-511	3.173E+00	1.111E+01	1.111E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-2.383E+00	2.826E+00	3.023E+00	NOT IDENT.
NA-24	6.800E+11	1.789E+12	1.815E+12	SHORT HLIF
AL-26	-2.479E-02	3.274E+00	3.274E+00	NOT IDENT.
SC-46	1.972E+00	3.578E+00	3.687E+00	NOT IDENT.
V-48	5.999E+00	8.097E+00	8.538E+00	NOT IDENT.
CR-51	-2.081E+01	4.888E+01	4.977E+01	NOT IDENT.
MN-52	-1.189E+01	6.786E+01	6.807E+01	FAIL ABUN
MN-54	1.835E+00	3.490E+00	3.587E+00	NOT IDENT.
CO-56	9.738E-01	4.403E+00	4.425E+00	NOT IDENT.
CO-57	5.409E-01	2.003E+00	2.018E+00	NOT IDENT.
NI-57	-8.137E+04	2.982E+05	3.005E+05	SHORT HLIF
CO-58	2.507E+00	4.336E+00	4.481E+00	NOT IDENT.
FE-59	7.357E+00	8.080E+00	8.735E+00	NOT IDENT.
CO-60	-3.400E+00	3.229E+00	3.575E+00	NOT IDENT.
ZN-65	3.422E+00	7.811E+00	7.962E+00	NOT IDENT.
CU-67	-1.653E+04	5.118E+03	9.047E+03	NOT IDENT.
GE-68	5.165E+01	1.079E+02	1.104E+02	NOT IDENT.
AS-74	8.345E+00	1.418E+01	1.468E+01	NOT IDENT.

SE-75	-2.075E+00	4.442E+00	4.539E+00	NOT IDENT.
BR-77	-1.998E+03	1.659E+04	1.661E+04	SHORT HLIF
SR-82	-1.711E+01	3.760E+01	3.838E+01	NOT IDENT.
RB-83	-8.600E-01	7.019E+00	7.030E+00	NOT IDENT.
KR-85	1.372E+03	7.769E+02	9.934E+02	NOT IDENT.
SR-85	7.941E+00	4.497E+00	5.750E+00	NOT IDENT.
RB-86	2.594E+01	8.979E+01	9.055E+01	NOT IDENT.
Y-88	-2.349E+00	4.218E+00	4.349E+00	NOT IDENT.
Y-91	7.112E+02	1.751E+03	1.780E+03	NOT IDENT.
NB-94	-6.664E-01	3.145E+00	3.159E+00	NOT IDENT.
NB-95	-1.135E+00	4.206E+00	4.237E+00	NOT IDENT.
NB-95M	-4.591E+00	1.244E+01	1.261E+01	NOT IDENT.
TC-95M	-2.574E+00	4.330E+00	4.483E+00	NOT IDENT.
ZR-95	7.869E+00	7.093E+00	7.932E+00	NOT IDENT.
MO-99	8.285E+03	1.104E+04	1.166E+04	NOT IDENT.
TC-99M	8.698E+28	4.691E+29	0.000E+00	SHORT HLIF
RH-101	2.667E-01	2.600E+00	2.603E+00	NOT IDENT.
RH-102M	1.669E+00	3.412E+00	3.494E+00	FAIL ABUN
RU-103	-1.420E+00	4.324E+00	4.371E+00	NOT IDENT.
RH-106	-5.642E+00	2.865E+01	2.876E+01	NOT IDENT.
RU-106	-5.642E+00	2.865E+01	2.876E+01	NOT IDENT.
AG-108M	-1.273E+00	2.896E+00	2.952E+00	NOT IDENT.
CD-109	1.606E+01	6.442E+01	6.483E+01	NOT IDENT.
AG-110	3.837E+01	6.351E+01	6.583E+01	NOT IDENT.
AG-110M	-3.088E-01	4.711E+00	4.713E+00	FAIL ABUN
IN-111	6.585E+02	1.054E+03	1.095E+03	NOT IDENT.
SN-113	4.245E-01	4.165E+00	4.169E+00	NOT IDENT.
IN-114M	-2.144E+00	1.865E+01	1.868E+01	NOT IDENT.
CD-115	1.246E+04	1.757E+04	1.844E+04	SHORT HLIF
SN-117M	-1.010E+00	7.023E+00	7.038E+00	NOT IDENT.
SB-122	-9.464E+02	1.951E+03	1.997E+03	NOT IDENT.
I-123	2.330E+12	4.512E+13	4.513E+13	SHORT HLIF
TE-123M	1.595E-01	2.450E+00	2.451E+00	NOT IDENT.
SB-124	4.344E+00	9.820E+00	1.001E+01	NOT IDENT.
SB-125	5.401E+00	8.461E+00	8.805E+00	NOT IDENT.
TE-125M	-4.660E+02	8.894E+02	9.139E+02	NOT IDENT.
I-126	2.291E+00	3.073E+01	3.075E+01	FAIL ABUN
SB-126	1.234E-01	2.334E+01	2.334E+01	NOT IDENT.
SN-126	3.304E+00	6.204E+00	6.380E+00	FAIL ABUN
SB-127	2.366E+02	7.484E+02	7.560E+02	FAIL ABUN
TE-129	1.113E+01	5.169E+01	5.193E+01	NOT IDENT.
I-131	4.821E+00	2.277E+01	2.288E+01	NOT IDENT.
I-132	-1.000E+41	1.748E+41	0.000E+00	SHORT HLIF
TE-132	2.378E+01	4.604E+02	4.605E+02	NOT IDENT.
BA-133	6.436E-01	4.376E+00	4.386E+00	NOT IDENT.
I-133	-6.957E+08	8.355E+08	8.926E+08	SHORT HLIF
CS-134	2.006E+00	3.470E+00	3.586E+00	NOT IDENT.
I-135	6.304E+27	7.786E+27	0.000E+00	SHORT HLIF
CS-136	1.683E+00	1.799E+01	1.800E+01	NOT IDENT.
BA-137M	1.587E+00	3.095E+00	3.177E+00	NOT IDENT.
CS-137	1.676E+00	3.269E+00	3.356E+00	NOT IDENT.
LA-138	-2.599E+00	5.444E+00	5.569E+00	NOT IDENT.
CE-139	-3.876E-01	2.747E+00	2.753E+00	NOT IDENT.
BA-140	1.795E+00	4.018E+01	4.019E+01	FAIL ABUN
LA-140	-1.747E-01	1.059E+01	1.059E+01	NOT IDENT.
CE-141	-9.015E+00	8.166E+00	9.123E+00	NOT IDENT.
CE-143	-3.601E+05	1.137E+06	1.148E+06	SHORT HLIF
CE-144	-1.679E+00	1.704E+01	1.706E+01	NOT IDENT.
PM-144	2.147E+00	3.230E+00	3.372E+00	FAIL ABUN
PR-144	1.608E+02	2.428E+02	2.534E+02	NOT IDENT.
PM-146	-1.804E+00	3.621E+00	3.711E+00	FAIL ABUN
ND-147	-1.940E+01	8.540E+01	8.585E+01	NOT IDENT.
PM-147	1.363E+04	5.935E+04	5.967E+04	NOT IDENT.
PM-149	-6.026E+04	1.628E+05	1.651E+05	SHORT HLIF
EU-152	-7.324E+00	9.887E+00	1.042E+01	NOT IDENT.
GD-153	-3.920E+00	8.756E+00	8.933E+00	NOT IDENT.
EU-154	-8.821E+00	8.381E+00	9.279E+00	NOT IDENT.
EU-155	5.746E+00	8.609E+00	8.991E+00	NOT IDENT.
TB-160	-7.829E+00	1.515E+01	1.555E+01	NOT IDENT.
HO-166M	6.190E+00	5.908E+00	6.535E+00	NOT IDENT.
TM-171	-3.228E+01	2.215E+03	2.215E+03	NOT IDENT.
LU-176	1.408E+00	2.727E+00	2.800E+00	NOT IDENT.
LU-177	-4.488E+01	2.690E+02	2.698E+02	NOT IDENT.
HF-181	4.774E+00	4.374E+00	4.876E+00	NOT IDENT.
W-181	-7.953E-01	2.505E+01	2.505E+01	FAIL ABUN
TA-182	-3.529E-01	1.461E+01	1.461E+01	NOT IDENT.
RE-183	-1.102E+01	2.559E+01	2.607E+01	NOT IDENT.
RE-184	-5.705E+00	1.353E+01	1.377E+01	NOT IDENT.

RE-188	5.566E+00	1.503E+01	1.524E+01	FAIL ABUN
W-188	1.914E+02	7.174E+02	7.226E+02	FAIL ABUN
OS-191	2.027E-02	2.047E+01	2.047E+01	FAIL ABUN
IR-192	-1.983E-01	4.132E+00	4.133E+00	NOT IDENT.
PB-201	4.225E+18	2.334E+19	0.000E+00	SHORT HLIF
TL-201	2.280E+03	5.165E+03	5.267E+03	NOT IDENT.
TL-202	-3.088E+00	1.039E+01	1.049E+01	NOT IDENT.
HG-203	1.299E+00	4.071E+00	4.113E+00	NOT IDENT.
PB-203	2.250E+03	7.053E+03	7.126E+03	SHORT HLIF
TL-204	9.129E+01	4.376E+02	4.396E+02	NOT IDENT.
BI-207	3.037E-01	4.917E+00	4.918E+00	NOT IDENT.
PB-210	-1.878E+02	7.977E+02	8.022E+02	NOT IDENT.
PB-211	5.940E+01	6.284E+01	6.831E+01	NOT IDENT.
BI-212	1.689E+01	4.801E+01	4.861E+01	NOT IDENT.
PB-212	-1.965E+00	7.278E+00	7.332E+00	NOT IDENT.
BI-213	-5.551E+00	9.095E+00	9.433E+00	NOT IDENT.
BI-214	-1.244E+00	9.433E+00	9.450E+00	NOT IDENT.
PB-214	7.747E+00	1.086E+01	1.141E+01	FAIL ABUN
RN-219	-2.103E+01	3.419E+01	3.549E+01	NOT IDENT.
FR-221	8.833E+00	1.783E+01	1.827E+01	NOT IDENT.
RA-223	-3.904E+01	7.694E+01	7.894E+01	NOT IDENT.
AC-225	4.787E+01	9.663E+01	9.902E+01	NOT IDENT.
RA-226	-8.820E+01	9.818E+01	1.059E+02	NOT IDENT.
AC-227	-1.888E+01	2.400E+01	2.546E+01	FAIL ABUN
TH-227	-1.888E+01	2.400E+01	2.546E+01	FAIL ABUN
TH-228	-1.965E+00	7.278E+00	7.332E+00	NOT IDENT.
TH-229	3.822E+01	4.836E+01	5.134E+01	NOT IDENT.
TH-230	-8.827E+02	1.239E+03	1.302E+03	NOT IDENT.
PA-231	3.611E+01	4.706E+01	4.980E+01	NOT IDENT.
TH-231	-8.165E+00	4.558E+01	4.573E+01	NOT IDENT.
PA-233	6.636E+00	6.185E+00	6.872E+00	NOT IDENT.
PA-234	-1.995E+01	3.588E+01	3.699E+01	FAIL ABUN
PA-234M	3.207E+02	5.552E+02	5.737E+02	NOT IDENT.
TH-234	2.827E+02	2.868E+02	3.139E+02	FAIL ABUN
U-235	-7.380E-01	2.221E+01	2.221E+01	NOT IDENT.
NP-237	6.636E+00	6.185E+00	6.872E+00	NOT IDENT.
NP-238	7.429E+03	3.214E+04	3.231E+04	SHORT HLIF
U-238	2.827E+02	2.868E+02	3.139E+02	FAIL ABUN
NP-239	-1.206E+01	2.205E+01	2.271E+01	NOT IDENT.
AM-241	4.426E+00	1.564E+01	1.576E+01	NOT IDENT.
AM-242	-6.553E+01	6.749E+01	7.368E+01	NOT IDENT.
AM-243	6.955E+00	4.592E+00	5.562E+00	NOT IDENT.
CM-243	-1.137E+01	8.444E+00	9.880E+00	NOT IDENT.
BK-247	-5.126E+00	7.755E+00	8.093E+00	NOT IDENT.
CM-247	-3.237E+00	3.132E+00	3.456E+00	NOT IDENT.
CF-249	1.461E+00	3.398E+00	3.461E+00	NOT IDENT.
CF-251	4.266E+00	1.167E+01	1.183E+01	NOT IDENT.
CF-252	5.675E+03	1.600E+04	1.620E+04	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	67.5546	133.52	68.9109	116.30	78.2514
879.38	79.1327	364.49	67.9892	116.74	72.3562
46.54	62.9535	80.22	67.9936	117.23	65.4662
228.16	46.9686	711.68	64.3111	119.76	79.6539
52.39	58.2331	356.01	58.7674	120.54	57.8155
53.20	53.8283	323.87	67.1721	120.90	59.8412
53.44	53.8609	82.35	0.0000	264.66	57.8650
57.53	63.6746	82.47	76.7067	121.22	57.8739
293.27	0.0000	82.47	76.7067	344.28	53.9267
57.53	63.8674	83.79	85.3389	122.06	53.9489
482.18	63.8676	265.00	85.3722	1274.44	66.0347
57.98	71.0403	84.21	69.4512	123.68	50.0710
59.32	58.7951	84.86	0.0000	1377.63	0.0000
59.54	60.6082	193.51	79.9566	127.23	65.4248
155.04	59.6901	105.31	90.4915	129.43	71.6879
63.00	62.8910	86.79	85.8165	131.20	56.6827
129.43	62.9325	86.94	85.8401	133.02	86.2542
63.29	62.9325	87.09	83.9766	133.52	70.0665
290.67	62.9737	87.57	69.8848	135.34	64.1334
63.81	63.0064	88.03	74.6694	136.00	83.5503
87.57	63.0727	306.78	82.2774	136.28	79.5044
64.99	63.1726	88.47	82.2966	136.47	79.5258
65.08	63.1854	531.02	172.9814	739.50	65.6074
66.73	57.9800	184.58	157.8198	140.51	0.0000
66.98	58.0117	92.59	64.8000	140.88	65.6396
67.24	85.8574	93.31	66.7908	143.76	74.1248
67.67	72.6233	94.56	154.9105	144.24	71.0815
1221.41	67.7931	311.90	153.9789	145.44	79.4462
439.51	81.0059	946.00	153.9838	152.32	72.1686
70.82	81.0059	97.43	63.4244	152.43	72.1792
167.43	81.0066	98.43	70.2704	1048.07	61.1374
97.43	68.3773	98.44	70.2715	154.21	75.1223
70.82	72.1989	99.53	77.1515	155.04	63.7114
70.82	72.1989	103.37	77.1515	158.56	66.9258
279.20	0.0000	116.74	77.1515	158.97	0.0000
1063.66	89.0178	100.11	70.4692	159.00	61.9241
72.87	0.0000	100.20	66.6179	162.33	63.2281
351.06	89.0289	102.03	62.9474	537.26	68.5239
74.66	58.9565	103.18	74.7101	163.33	74.9099
238.63	66.3475	103.37	74.7330	165.86	73.0198
351.93	66.3475	105.31	57.4443	167.43	68.9147
238.63	66.3475	106.12	55.5697	245.35	67.0952
74.97	66.3676	106.47	58.5274	427.87	66.4133
77.11	69.4307	109.28	72.5073	176.60	69.6497
256.23	76.2969	111.00	72.7037	177.52	67.5768
79.82	76.3170	111.76	58.0349	181.07	72.1546
80.02	76.3464	208.37	79.8221	184.41	147.0068
80.03	76.3470	116.24	78.2442	184.58	101.6263

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	54.1245	300.09	70.9178	477.60	25.6223
186.21	66.0672	300.13	70.9196	477.99	25.6275
190.27	70.7109	301.36	38.5020	482.18	16.2231
193.51	63.3154	302.85	46.5763	487.02	20.7839
197.03	59.1688	304.50	44.6252	492.35	0.0000
198.01	81.1656	304.85	44.6376	497.08	34.5241
201.83	57.2630	306.78	41.8850	511.00	32.0324
204.12	70.6436	308.46	37.5022	514.00	32.0833
205.31	56.3626	311.90	36.3876	520.40	28.6939
208.37	72.0588	316.51	59.6395	520.69	0.0000
210.85	57.7906	319.41	58.5483	667.71	0.0000
215.65	61.4176	320.08	58.5776	527.90	0.0000
218.12	51.4917	321.04	47.6277	529.59	34.1877
222.11	55.0629	323.87	58.7417	529.87	0.0000
227.09	62.1016	325.23	50.2253	531.02	26.8158
227.38	49.6947	1596.21	49.1260	537.26	28.7547
228.16	54.2527	331.15	0.0000	1260.41	0.0000
228.18	54.2534	333.37	36.9672	552.55	25.2356
235.69	62.2249	334.37	41.9262	795.86	34.7628
235.96	56.1677	338.28	39.5703	564.24	33.8394
238.63	60.4911	911.20	39.5713	569.33	30.1536
238.98	0.0000	340.48	50.7795	569.50	30.1563
240.99	65.5787	340.55	50.7820	569.70	25.4465
242.00	44.2676	344.28	46.3613	582.08	23.7000
244.70	53.9400	345.93	36.0544	583.19	23.7132
245.35	58.5649	351.06	44.9176	595.83	32.4408
459.60	57.6874	351.93	43.6966	600.60	46.8547
685.70	75.1106	356.01	47.5754	604.72	40.2380
388.16	75.1374	361.25	0.0000	609.32	28.8013
256.23	63.7696	364.49	38.6150	610.33	25.9332
527.90	0.0000	366.42	47.0711	614.28	24.0550
264.66	58.3939	383.85	34.8607	618.01	33.7339
265.00	61.9153	388.16	32.3996	621.93	26.0695
269.46	71.5309	666.33	29.8510	630.19	0.0000
401.81	58.7189	391.70	30.7639	631.29	23.2695
273.65	64.7217	400.66	30.9382	632.98	23.2871
276.40	45.9983	401.32	0.0000	633.25	22.3196
583.19	50.7554	401.81	39.5612	634.78	20.3925
277.60	59.0302	402.40	42.1562	635.95	15.5449
402.40	59.0485	404.85	29.2962	636.99	17.4961
278.43	62.6140	410.95	35.4613	657.50	17.6521
279.20	0.0000	720.70	35.5430	884.68	16.6735
279.54	48.4810	423.72	27.8926	661.66	19.6484
280.46	55.6174	427.09	27.9492	664.57	0.0000
301.36	53.3908	427.87	32.3313	666.33	21.6563
284.31	43.9217	433.94	45.6026	666.50	21.6580
285.41	55.8412	439.51	36.9534	667.71	0.0000
285.90	0.0000	440.45	37.8542	677.62	22.7492
287.50	54.7457	453.88	34.5995	685.70	19.8486
290.67	44.1464	459.60	30.2619	692.65	22.8914
293.27	0.0000	463.37	24.9745	695.00	19.9251
295.22	45.5031	468.07	25.7561	696.49	20.9342
316.51	68.2928	473.00	34.9732	696.51	20.9342
298.58	54.0266	475.06	16.1598	697.00	23.9297
299.98	70.9124	696.49	25.6107	697.49	27.9237

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	27.9818	903.28	19.3652	1291.59	11.7265
706.68	24.0234	907.67	0.0000	1298.22	0.0000
711.68	19.0572	911.20	17.2585	1312.11	7.2529
720.70	26.1724	984.45	0.0000	1332.49	13.6670
721.93	0.0000	926.36	17.3451	1365.19	10.1017
1690.97	29.2171	935.54	13.0479	1368.63	0.0000
722.91	29.2183	937.49	13.0562	1377.63	0.0000
723.31	30.2307	983.53	11.9937	1384.29	9.2255
756.73	27.2175	945.96	0.0000	1408.01	16.6981
727.33	22.2050	946.00	20.7287	1434.09	9.3323
733.00	29.3351	949.00	19.6567	1435.80	12.1367
735.93	23.2929	954.55	0.0000	1457.56	0.0000
739.50	15.2124	962.31	17.5469	1460.82	12.2057
1434.09	15.2405	964.08	14.8134	1489.16	10.5827
747.24	15.2582	966.17	14.8233	1596.21	4.8346
752.31	6.1152	968.97	17.5840	1620.50	7.7749
753.82	10.7081	983.53	7.7280	1678.03	0.0000
756.73	10.7200	984.45	0.0000	1690.97	5.9150
763.94	26.6178	996.26	13.3003	1757.55	0.0000
765.80	25.6124	1001.03	13.3198	1764.49	8.0010
1001.03	28.6927	1004.73	17.7799	1770.23	7.0085
766.84	21.5229	1025.87	0.0000	1771.35	7.0103
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	21.6016	1037.84	11.2240	1808.65	6.0516
777.92	17.4960	1038.76	0.0000	1836.06	9.1241
778.90	17.5029	1046.59	13.5039		
783.70	18.5654	1048.07	19.1388		
1435.80	16.5339	1050.41	11.2663		
903.28	25.8657	1063.66	15.8343		
795.86	14.5053	1077.00	10.2188		
801.95	20.7682	1077.34	10.2195		
802.10	20.7690	1083.85	10.2393		
810.29	22.9149	1085.87	12.5218		
810.45	22.9158	1099.25	6.8560		
810.76	19.7932	1111.64	19.4944		
815.77	13.5676	1112.07	14.9085		
818.51	17.7595	1112.84	17.2058		
832.01	20.9953	1115.54	12.6274		
834.85	17.8640	1120.29	8.0465		
835.15	21.0181	1120.55	10.3462		
836.80	0.0000	1121.30	12.6480		
846.77	22.1604	1808.65	10.3726		
856.80	28.5919	1131.51	0.0000		
860.56	13.7845	1332.49	16.3288		
871.09	18.0909	1177.95	12.2620		
873.19	18.1040	1189.05	11.4202		
875.33	0.0000	1204.77	10.5857		
879.38	20.8108	1221.41	12.4047		
880.51	14.4130	1231.02	7.9942		
881.60	12.8164	1235.36	12.4491		
883.24	12.8232	1238.28	11.5686		
884.68	14.4333	1260.41	0.0000		
889.28	11.7788	1271.87	6.2831		
894.76	20.3823	1274.44	12.5739		
1836.06	13.9617	1274.54	10.7783		

VAX/VMS Nuclide Identification Report Generated 22-JUL-2022 02:48:04.92

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                    *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905001.CNF;1
Background file : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM14.CNF;831
Background date  : 16-JUL-2022 13:55:22
Sample date     : 27-JUN-2022 09:43:00 Acquisition date : 21-JUL-2022 22:47:37
Sample ID      : G585905001 Sample quantity : 5.21450E-01 FILTER
Detector name   : GAM14 Detector geometry: JAR
Elapsed live time: 0 04:00:00.00 Elapsed real time: 0 04:00:01.48 0.0%
Energy tolerance: 1.50000 keV Analyst Initials : MJH1
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2290721 Detector SN# :
Matrix Spike ID : LCS ID :
*****

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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.46*	1	161	2.27	93.22	90	10	6.89E-05	*****	
2	0	54.09	28	91	1.45	108.48	105	7	1.95E-03	59.8	
3	0	63.79*	25	130	0.66	127.89	124	8	1.74E-03	99.5	
4	0	71.04	20	79	0.46	142.37	140	5	1.40E-03	70.5	
5	0	92.89*	7	172	1.00	186.08	181	10	5.07E-04	15.2	
6	0	185.78*	0	126	0.87	371.83	368	9	4.55E-06	*****	
7	0	238.99*	1	131	0.91	478.25	474	10	3.63E-05	*****	
8	0	300.51	21	60	0.93	601.27	596	7	1.42E-03	66.2	
9	0	339.28*	52	70	4.03	678.79	673	12	3.58E-03	38.9	
10	0	433.49	35	93	5.66	867.21	857	18	2.40E-03	68.1	
11	1	474.03	34	34	1.48	948.27	942	19	2.39E-03	36.4	7.87E-01
12	1	477.95	50	38	1.48	956.12	942	19	3.48E-03	25.7	
13	0	498.53	36	72	4.76	997.27	987	19	2.51E-03	60.0	
14	0	511.29*	70	69	3.25	1022.80	1014	21	4.88E-03	45.3	
15	0	552.41	37	13	1.87	1105.03	1100	9	2.58E-03	24.1	
16	0	560.78	18	27	1.42	1121.75	1115	11	1.25E-03	60.8	
17	0	565.50	16	16	1.61	1131.20	1128	7	1.12E-03	49.3	
18	0	570.83	48	26	1.36	1141.86	1135	15	3.30E-03	27.6	
19	0	583.55*	34	55	2.94	1167.29	1158	16	2.35E-03	56.8	
20	0	614.83	3	13	1.50	1229.85	1228	4	1.98E-04	195.1	
21	0	617.81	27	26	1.79	1235.82	1232	10	1.90E-03	39.4	
22	0	720.85	27	23	4.39	1441.88	1436	11	1.86E-03	40.5	
23	0	760.88	17	14	0.95	1521.94	1516	9	1.15E-03	47.1	
24	0	803.16*	8	17	1.22	1606.49	1602	11	5.59E-04	132.0	
25	0	924.75	9	16	1.29	1849.66	1843	9	6.57E-04	82.2	
26	0	935.17	32	4	5.30	1870.51	1862	16	2.22E-03	22.5	
27	0	951.25	14	26	3.41	1902.67	1895	15	9.94E-04	82.2	
28	0	1138.68	16	2	2.21	2277.52	2274	8	1.13E-03	28.7	
29	0	1142.11	9	2	1.18	2284.38	2281	7	5.90E-04	42.5	
30	0	1175.67	8	14	3.84	2351.50	2342	11	5.87E-04	91.5	
31	0	1201.48	7	2	1.23	2403.12	2400	6	4.55E-04	56.0	
32	0	1246.66	13	14	2.35	2493.49	2484	12	8.72E-04	67.6	
33	0	1328.38	9	7	1.83	2656.93	2649	10	6.42E-04	63.7	
34	0	1461.63*	37	8	1.57	2923.44	2915	17	2.56E-03	30.1	

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
35	0	1490.24	5	8	3.84	2980.67	2973	9	3.12E-04	126.2	
36	0	1560.01	11	3	2.00	3120.21	3112	12	7.42E-04	44.9	
37	0	1679.87	18	0	1.50	3359.94	3355	11	1.25E-03	23.6	
38	0	1708.42	6	5	0.53	3417.06	3414	8	4.48E-04	67.5	
39	0	1736.85	11	7	1.40	3473.92	3470	12	7.45E-04	56.0	
40	0	1764.78*	4	6	1.54	3529.78	3524	11	2.47E-04	189.9	
41	0	1808.70	4	5	0.56	3617.63	3611	10	2.70E-04	119.2	
42	0	1960.02	5	4	1.33	3920.31	3914	9	3.47E-04	87.5	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 22-JUL-2022 02:48:05

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905001.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 27-JUN-2022 09:43:00	Acquisition date	: 21-JUL-2022 22:47:37
Sample ID	: G585905001	Sample quantity	: 0.52145 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA14	Detector geometry	: JAR
Elapsed live time	: 0 04:00:00.00	Elapsed real time	: 0 04:00:01.48 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	50	10.44*	2.247E+00	7.687E+01	1.059E+02	51.43
AL-26	1129.67	-----	2.50	1.085E+00	-----	Line Not Found	-----
	1808.65	4	99.76*	7.620E-01	1.841E+00	1.841E+00	238.46
K-40	1460.82	37	10.66*	8.713E-01	1.427E+02	1.427E+02	60.19
CU-67	91.27	-----	7.00	4.004E+00	-----	Line Not Found	-----
	93.31	7	16.10	4.082E+00	4.002E+00	3.020E+03	830.36
	184.58	0	48.70*	4.229E+00	1.144E-02	8.634E+00	82769.23
AS-73	53.44	28	10.30*	8.987E-01	1.091E+02	1.350E+02	119.55
RU-103	497.08	36	91.00*	2.178E+00	6.553E+00	1.012E+01	120.04
	610.33	-----	5.76	1.862E+00	-----	Line Not Found	-----
SB-122	564.24	16	70.67*	1.978E+00	4.137E+00	2.199E+03	98.54
	692.65	-----	3.85	1.678E+00	-----	Line Not Found	-----
TL-208	277.37	-----	6.60	3.299E+00	-----	Line Not Found	-----
	583.19	34	85.00*	1.929E+00	7.412E+00	7.595E+00	113.57
	860.56	-----	12.50	1.390E+00	-----	Line Not Found	-----
PB-210	46.54	1	4.25*	3.583E-01	2.344E+01	2.349E+01	5487.69
RA-226	186.21	0	3.59*	4.229E+00	1.552E-01	1.552E-01	82769.23
PA-231	283.69	-----	1.70	3.249E+00	-----	Line Not Found	-----
	301.36	21	5.35*	3.124E+00	4.415E+01	4.415E+01	132.38
TH-232	63.81	25	0.26*	1.822E+00	1.903E+03	1.903E+03	198.96
	140.88	-----	0.02	4.699E+00	-----	Line Not Found	-----
TH-234	63.29	25	3.70*	1.822E+00	1.337E+02	1.337E+02	198.96
	92.59	7	4.23	4.082E+00	1.523E+01	1.523E+01	830.36
U-234	53.20	28	0.12*	8.987E-01	9.365E+03	9.365E+03	119.55
	120.90	-----	0.04	4.726E+00	-----	Line Not Found	-----
U-238	63.29	25	3.70*	1.822E+00	1.337E+02	1.337E+02	198.96
	92.59	7	4.23	4.082E+00	1.523E+01	1.523E+01	830.36
ANH-511	511.00	70	100.00*	2.137E+00	1.183E+01	1.183E+01	90.60

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905001.CNF;1
Acquisition date : 21-JUL-2022 22:47:37 Sensitivity : 3.000
Detector ID : GAM14 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:01.48 Half life ratio : *****
Sample date : 27-JUN-2022 09:43:00 Analyst initials: MJH1
Sample ID : G585905001 Sample Quantity : 5.2145E-01 FILTER
Batch Number : 2290721 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 9-MAY-2022 05:17:58 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.059E+02	5.339E+01	5.843E+01
AL-26	1.841E+00	4.303E+00	8.684E+00
K-40	1.427E+02	8.416E+01	5.325E+01
CU-67	8.634E+00	7.004E+03	5.279E+03
AS-73	1.350E+02	1.581E+02	1.838E+02
RU-103	1.012E+01	1.191E+01	6.837E+00
SB-122	2.199E+03	2.124E+03	2.505E+03
TL-208	7.595E+00	8.453E+00	6.717E+00
PB-210	2.349E+01	1.263E+03	8.651E+02
RA-226	1.552E-01	1.259E+02	9.616E+01
PA-231	4.415E+01	5.728E+01	8.104E+01
TH-232	1.903E+03	3.711E+03	2.885E+03
TH-234	1.337E+02	2.608E+02	2.086E+02
U-234	9.365E+03	1.097E+04	1.306E+04
U-238	1.337E+02	2.608E+02	2.086E+02
ANH-511	1.183E+01	1.050E+01	4.627E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-2.995E-01	2.972E+00	6.022E+00	NOT IDENT.
NA-24	0.000E+00	2.576E+12	0.000E+00	SHORT HLIF
SC-46	-4.008E-02	3.564E+00	6.749E+00	NOT IDENT.
V-48	8.083E+00	8.841E+00	1.925E+01	NOT IDENT.
CR-51	1.666E+01	4.516E+01	8.103E+01	NOT IDENT.
MN-52	4.938E+01	7.925E+01	1.742E+02	FAIL ABUN
MN-54	-1.886E+00	3.486E+00	5.994E+00	NOT IDENT.
CO-56	3.680E+00	4.042E+00	8.463E+00	NOT IDENT.
CO-57	2.764E-01	2.185E+00	3.961E+00	NOT IDENT.
NI-57	0.000E+00	3.113E+05	0.000E+00	SHORT HLIF
CO-58	-3.273E-01	3.177E+00	6.017E+00	NOT IDENT.
FE-59	-6.961E+00	8.783E+00	1.390E+01	NOT IDENT.
CO-60	2.675E-01	4.185E+00	8.079E+00	NOT IDENT.
ZN-65	4.536E+00	7.901E+00	1.602E+01	NOT IDENT.

GE-68	-4.638E+01	1.207E+02	2.096E+02	NOT IDENT.
AS-74	4.888E+00	1.294E+01	2.520E+01	NOT IDENT.
SE-75	1.106E+00	4.189E+00	7.506E+00	NOT IDENT.
BR-77	0.000E+00	2.670E+04	0.000E+00	SHORT HLIF
SR-82	8.640E-01	3.387E+01	6.500E+01	NOT IDENT.
RB-83	7.894E-01	6.593E+00	1.271E+01	FAIL ABUN
RB-84	2.867E-01	7.337E+00	1.394E+01	NOT IDENT.
KR-85	1.577E+03	7.522E+02	1.626E+03	NOT IDENT.
SR-85	9.154E+00	4.365E+00	9.433E+00	NOT IDENT.
RB-86	-4.678E+01	1.045E+02	1.793E+02	NOT IDENT.
Y-88	-6.562E-01	3.671E+00	7.325E+00	NOT IDENT.
Y-91	4.372E+02	1.563E+03	3.080E+03	NOT IDENT.
NB-94	2.086E-01	2.919E+00	5.537E+00	NOT IDENT.
NB-95	1.305E+00	3.958E+00	7.750E+00	NOT IDENT.
NB-95M	2.972E+00	1.161E+01	1.932E+01	NOT IDENT.
TC-95M	1.844E+00	4.666E+00	8.393E+00	FAIL ABUN
ZR-95	8.152E-01	6.560E+00	1.158E+01	NOT IDENT.
MO-99	-1.073E+04	1.236E+04	2.036E+04	NOT IDENT.
TC-99M	0.000E+00	9.342E+29	0.000E+00	SHORT HLIF
RH-101	4.043E-01	2.816E+00	5.075E+00	NOT IDENT.
RH-102M	5.841E+00	4.167E+00	5.896E+00	FAIL ABUN
RH-106	-2.489E+01	3.382E+01	5.000E+01	NOT IDENT.
RU-106	-2.489E+01	3.382E+01	5.000E+01	NOT IDENT.
AG-108M	0.000E+00	7.596E+00	4.926E+00	FAIL ABUN
CD-109	2.016E+01	6.193E+01	1.151E+02	NOT IDENT.
AG-110	3.592E+00	5.565E+01	1.080E+02	NOT IDENT.
AG-110M	9.170E-01	4.273E+00	8.386E+00	NOT IDENT.
IN-111	3.785E+02	9.833E+02	1.784E+03	NOT IDENT.
SN-113	-3.182E+00	3.999E+00	7.050E+00	NOT IDENT.
IN-114M	-6.655E+00	1.895E+01	3.227E+01	NOT IDENT.
CD-115	0.000E+00	1.668E+04	0.000E+00	SHORT HLIF
SN-117M	-1.619E+00	7.491E+00	1.305E+01	NOT IDENT.
I-123	0.000E+00	6.478E+13	0.000E+00	SHORT HLIF
TE-123M	-9.627E-01	2.581E+00	4.434E+00	NOT IDENT.
SB-124	5.981E+00	1.071E+01	2.362E+01	NOT IDENT.
SB-125	2.595E+00	8.370E+00	1.503E+01	NOT IDENT.
TE-125M	-2.591E+02	9.148E+02	1.613E+03	NOT IDENT.
I-126	-1.228E+01	3.060E+01	5.482E+01	NOT IDENT.
SB-126	0.000E+00	3.498E+01	4.230E+01	FAIL ABUN
SN-126	-4.204E+00	5.846E+00	1.005E+01	FAIL ABUN
SB-127	1.019E+02	6.851E+02	1.306E+03	FAIL ABUN
TE-129	3.129E+00	4.482E+01	8.713E+01	FAIL ABUN
I-131	4.687E+00	2.362E+01	4.574E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	-4.013E+02	4.991E+02	8.057E+02	NOT IDENT.
BA-133	-2.185E+00	3.458E+00	6.241E+00	NOT IDENT.
I-133	0.000E+00	8.371E+08	0.000E+00	SHORT HLIF
CS-134	3.947E+00	3.131E+00	7.081E+00	FAIL ABUN
I-135	0.000E+00	1.269E+28	0.000E+00	SHORT HLIF
CS-136	5.045E+00	1.391E+01	2.821E+01	FAIL ABUN
BA-137M	-1.754E+00	2.956E+00	5.150E+00	NOT IDENT.
CS-137	-1.853E+00	3.123E+00	5.440E+00	NOT IDENT.
LA-138	-1.652E-01	5.640E+00	1.125E+01	NOT IDENT.
CE-139	8.604E-01	2.711E+00	4.913E+00	NOT IDENT.
BA-140	2.347E+01	4.169E+01	8.319E+01	NOT IDENT.
LA-140	-9.291E-01	1.233E+01	2.521E+01	NOT IDENT.
CE-141	-8.201E+00	7.782E+00	1.105E+01	NOT IDENT.
CE-143	0.000E+00	1.346E+06	0.000E+00	SHORT HLIF
CE-144	7.605E+00	1.745E+01	3.215E+01	NOT IDENT.
PM-144	1.195E+00	3.531E+00	6.785E+00	FAIL ABUN
PR-144	8.919E+01	2.655E+02	5.100E+02	FAIL ABUN
PM-146	1.398E+00	3.404E+00	6.809E+00	NOT IDENT.
ND-147	-5.248E+01	7.379E+01	1.288E+02	NOT IDENT.
PM-147	1.506E+04	5.915E+04	1.089E+05	NOT IDENT.
PM-149	0.000E+00	1.760E+05	0.000E+00	SHORT HLIF
EU-152	5.474E+00	1.031E+01	1.744E+01	NOT IDENT.
GD-153	-6.056E+00	9.084E+00	1.352E+01	FAIL ABUN
EU-154	-2.749E+00	8.785E+00	1.698E+01	NOT IDENT.
EU-155	1.230E+00	8.472E+00	1.552E+01	NOT IDENT.
TB-160	2.148E+00	1.288E+01	2.489E+01	FAIL ABUN
HO-166M	1.575E+00	6.060E+00	1.159E+01	FAIL ABUN
TM-171	-1.188E+01	2.163E+03	3.763E+03	NOT IDENT.
LU-176	-1.955E+00	2.744E+00	4.377E+00	NOT IDENT.
LU-177	-9.172E+01	2.812E+02	4.772E+02	NOT IDENT.
HF-181	-1.237E+00	5.308E+00	8.737E+00	NOT IDENT.
W-181	1.331E+00	2.169E+01	4.056E+01	FAIL ABUN
TA-182	7.118E+00	1.490E+01	3.195E+01	NOT IDENT.
RE-183	-2.273E+00	2.219E+01	4.090E+01	NOT IDENT.

RE-184	1.909E+01	1.446E+01	3.163E+01	NOT IDENT.
RE-188	-1.037E+01	1.501E+01	2.513E+01	FAIL ABUN
W-188	-1.854E+02	7.355E+02	1.242E+03	FAIL ABUN
OS-191	-3.820E+00	2.067E+01	3.642E+01	FAIL ABUN
IR-192	-2.201E+00	3.774E+00	6.097E+00	NOT IDENT.
PB-201	0.000E+00	3.975E+19	0.000E+00	SHORT HLIF
TL-201	1.209E+03	5.051E+03	9.128E+03	FAIL ABUN
TL-202	-4.847E+00	1.052E+01	1.815E+01	FAIL ABUN
HG-203	1.147E+00	3.825E+00	6.877E+00	FAIL ABUN
PB-203	0.000E+00	7.146E+03	0.000E+00	SHORT HLIF
TL-204	3.668E+02	5.068E+02	8.116E+02	FAIL ABUN
BI-207	7.673E-01	4.005E+00	7.930E+00	FAIL ABUN
BI-211	-2.604E+00	2.552E+01	3.735E+01	NOT IDENT.
PB-211	1.583E+01	6.580E+01	1.272E+02	NOT IDENT.
BI-212	3.554E+01	4.189E+01	8.830E+01	NOT IDENT.
PB-212	1.215E-01	1.101E+01	1.196E+01	FAIL ABUN
BI-213	7.336E+00	9.112E+00	1.866E+01	NOT IDENT.
BI-214	2.644E+00	9.836E+00	1.599E+01	FAIL ABUN
PB-214	-4.669E+00	9.585E+00	1.352E+01	NOT IDENT.
RN-219	4.237E+00	3.574E+01	6.871E+01	NOT IDENT.
FR-221	-1.057E+01	1.792E+01	2.967E+01	NOT IDENT.
RA-223	-3.041E+01	6.693E+01	9.924E+01	FAIL ABUN
RA-224	3.123E+00	7.005E+01	1.020E+02	NOT IDENT.
AC-225	-5.830E+01	9.878E+01	1.636E+02	NOT IDENT.
AC-227	9.982E+00	2.503E+01	4.490E+01	FAIL ABUN
TH-227	9.982E+00	2.503E+01	4.490E+01	FAIL ABUN
AC-228	-6.477E+00	1.838E+01	3.058E+01	FAIL ABUN
RA-228	-6.477E+00	1.838E+01	3.058E+01	FAIL ABUN
TH-228	1.215E-01	1.101E+01	1.196E+01	FAIL ABUN
TH-229	-2.172E+01	4.457E+01	7.507E+01	NOT IDENT.
TH-230	-1.196E+03	1.026E+03	1.448E+03	NOT IDENT.
TH-231	4.413E-02	4.545E+01	6.843E+01	NOT IDENT.
PA-233	5.837E+00	5.584E+00	1.086E+01	FAIL ABUN
PA-234	3.802E+01	2.294E+01	5.457E+01	FAIL ABUN
PA-234M	7.033E+01	5.152E+02	8.167E+02	NOT IDENT.
U-235	-7.554E+00	2.129E+01	3.270E+01	FAIL ABUN
NP-237	5.837E+00	5.584E+00	1.086E+01	FAIL ABUN
NP-238	0.000E+00	4.169E+04	0.000E+00	SHORT HLIF
NP-239	-1.304E+00	2.261E+01	4.045E+01	NOT IDENT.
AM-241	-2.011E+00	1.484E+01	2.724E+01	NOT IDENT.
AM-242	-2.327E+01	6.448E+01	9.735E+01	NOT IDENT.
AM-243	2.829E+00	4.674E+00	8.845E+00	NOT IDENT.
CM-243	-2.090E+00	8.195E+00	1.458E+01	NOT IDENT.
BK-247	8.478E-01	7.295E+00	1.286E+01	NOT IDENT.
CM-247	-1.691E+00	3.251E+00	5.885E+00	NOT IDENT.
CF-249	-5.182E-01	3.187E+00	6.023E+00	NOT IDENT.
CF-251	2.605E-03	1.097E+01	1.939E+01	NOT IDENT.
CF-252	-3.401E+03	1.490E+04	2.650E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.46	47	161	2.27	93.22	90	10	3.30E-03	51.7	
2	0	54.09	28	91	1.45	108.48	105	7	1.95E-03	59.8	
3	0	63.79	64	130	0.66	127.89	124	8	4.44E-03	33.5	
4	0	71.04	20	79	0.46	142.37	140	5	1.40E-03	70.5	
5	0	92.89	143	172	1.00	186.08	181	10	9.93E-03	19.1	
6	0	185.78	113	126	0.87	371.83	368	9	7.87E-03	20.1	
7	0	238.99	61	131	0.91	478.25	474	10	4.21E-03	37.5	
8	0	300.51	21	60	0.93	601.27	596	7	1.42E-03	66.2	
9	0	339.28	59	70	4.03	678.79	673	12	4.07E-03	31.7	
10	0	433.49	35	93	5.66	867.21	857	18	2.40E-03	68.1	
11	1	474.03	34	34	1.48	948.27	942	19	2.39E-03	36.4	7.87E-01
12	1	477.95	50	38	1.48	956.12	942	19	3.48E-03	25.7	
13	0	498.53	36	72	4.76	997.27	987	19	2.51E-03	60.0	
14	0	511.29	363	69	3.25	1022.80	1014	21	2.52E-02	7.7	
15	0	552.41	37	13	1.87	1105.03	1100	9	2.58E-03	24.1	
16	0	560.78	18	27	1.42	1121.75	1115	11	1.25E-03	60.8	
17	0	565.50	16	16	1.61	1131.20	1128	7	1.12E-03	49.3	
18	0	570.83	48	26	1.36	1141.86	1135	15	3.30E-03	27.6	
19	0	583.55	48	55	2.94	1167.29	1158	16	3.32E-03	37.8	
20	0	614.83	3	13	1.50	1229.85	1228	4	1.98E-04	195.1	
21	0	617.81	27	26	1.79	1235.82	1232	10	1.90E-03	39.4	
22	0	720.85	27	23	4.39	1441.88	1436	11	1.86E-03	40.5	
23	0	760.88	17	14	0.95	1521.94	1516	9	1.15E-03	47.1	
24	0	803.16	21	17	1.22	1606.49	1602	11	1.44E-03	44.0	
25	0	924.75	9	16	1.29	1849.66	1843	9	6.57E-04	82.2	
26	0	935.17	32	4	5.30	1870.51	1862	16	2.22E-03	22.5	
27	0	951.25	14	26	3.41	1902.67	1895	15	9.94E-04	82.2	
28	0	1138.68	16	2	2.21	2277.52	2274	8	1.13E-03	28.7	
29	0	1142.11	9	2	1.18	2284.38	2281	7	5.90E-04	42.5	
30	0	1175.67	8	14	3.84	2351.50	2342	11	5.87E-04	91.5	
31	0	1201.48	7	2	1.23	2403.12	2400	6	4.55E-04	56.0	
32	0	1246.66	13	14	2.35	2493.49	2484	12	8.72E-04	67.6	
33	0	1328.38	9	7	1.83	2656.93	2649	10	6.42E-04	63.7	
34	0	1461.63	58	8	1.57	2923.44	2915	17	4.04E-03	17.4	
35	0	1490.24	5	8	3.84	2980.67	2973	9	3.12E-04	126.2	
36	0	1560.01	11	3	2.00	3120.21	3112	12	7.42E-04	44.9	
37	0	1679.87	18	0	1.50	3359.94	3355	11	1.25E-03	23.6	
38	0	1708.42	6	5	0.53	3417.06	3414	8	4.48E-04	67.5	
39	0	1736.85	11	7	1.40	3473.92	3470	12	7.45E-04	56.0	
40	0	1764.78	14	6	1.54	3529.78	3524	11	9.37E-04	43.3	
41	0	1808.70	4	5	0.56	3617.63	3611	10	2.70E-04	119.2	
42	0	1960.02	5	4	1.33	3920.31	3914	9	3.47E-04	87.5	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	50	10.44*	2.247E+00	7.687E+01	1.059E+02	51.43
AL-26	1129.67	-----	2.50	1.085E+00	-----	Line Not Found	-----
	1808.65	4	99.76*	7.620E-01	1.841E+00	1.841E+00	238.46
K-40	1460.82	37	10.66*	8.713E-01	1.427E+02	1.427E+02	60.19
CU-67	91.27	-----	7.00	4.004E+00	-----	Line Not Found	-----
	93.31	7	16.10	4.082E+00	4.002E+00	3.020E+03	830.36
	184.58	0	48.70*	4.229E+00	1.144E-02	8.634E+00	82769.23
AS-73	53.44	28	10.30*	8.987E-01	1.091E+02	1.350E+02	119.55
RU-103	497.08	36	91.00*	2.178E+00	6.553E+00	1.012E+01	120.04
	610.33	-----	5.76	1.862E+00	-----	Line Not Found	-----
SB-122	564.24	16	70.67*	1.978E+00	4.137E+00	2.199E+03	98.54
	692.65	-----	3.85	1.678E+00	-----	Line Not Found	-----
TL-208	277.37	-----	6.60	3.299E+00	-----	Line Not Found	-----
	583.19	34	85.00*	1.929E+00	7.412E+00	7.595E+00	113.57
	860.56	-----	12.50	1.390E+00	-----	Line Not Found	-----
PB-210	46.54	1	4.25*	3.583E-01	2.344E+01	2.349E+01	5487.69
RA-226	186.21	0	3.59*	4.229E+00	1.552E-01	1.552E-01	82769.23
PA-231	283.69	-----	1.70	3.249E+00	-----	Line Not Found	-----
	301.36	21	5.35*	3.124E+00	4.415E+01	4.415E+01	132.38
TH-232	63.81	25	0.26*	1.822E+00	1.903E+03	1.903E+03	198.96
	140.88	-----	0.02	4.699E+00	-----	Line Not Found	-----
TH-234	63.29	25	3.70*	1.822E+00	1.337E+02	1.337E+02	198.96
	92.59	7	4.23	4.082E+00	1.523E+01	1.523E+01	830.36
U-234	53.20	28	0.12*	8.987E-01	9.365E+03	9.365E+03	119.55
	120.90	-----	0.04	4.726E+00	-----	Line Not Found	-----
U-238	63.29	25	3.70*	1.822E+00	1.337E+02	1.337E+02	198.96
	92.59	7	4.23	4.082E+00	1.523E+01	1.523E+01	830.36
ANH-511	511.00	70	100.00*	2.137E+00	1.183E+01	1.183E+01	90.60

Flag: "*" = Keyline

Total number of lines in spectrum 42
Number of unidentified lines 14
Number of lines tentatively identified by NID 28 66.67%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.38	7.687E+01	1.059E+02	0.545E+02	51.43	
AL-26	7.20E+05Y	1.00	1.841E+00	1.841E+00	4.391E+00	238.46	
K-40	1.25E+09Y	1.00	1.427E+02	1.427E+02	0.859E+02	60.19	
CU-67	61.83H	755.	1.144E-02	8.634E+00	7147.E+00	82769.23	
AS-73	80.30D	1.24	1.091E+02	1.350E+02	1.613E+02	119.55	
RU-103	39.26D	1.54	6.553E+00	1.012E+01	1.215E+01	120.04	
SB-122	2.72D	532.	4.137E+00	2.199E+03	2.167E+03	98.54	
TL-208	1.91Y	1.02	7.412E+00	7.595E+00	8.626E+00	113.57	
PB-210	22.20Y	1.00	2.344E+01	2.349E+01	128.9E+01	5487.69	
RA-226	1600.00Y	1.00	1.552E-01	1.552E-01	1285.E-01	82769.23	
PA-231	3.28E+04Y	1.00	4.415E+01	4.415E+01	5.845E+01	132.38	
TH-232	1.41E+10Y	1.00	1.903E+03	1.903E+03	3.787E+03	198.96	
TH-234	4.47E+09Y	1.00	1.337E+02	1.337E+02	2.661E+02	198.96	
U-234	2.45E+05Y	1.00	9.365E+03	9.365E+03	11.20E+03	119.55	
U-238	4.47E+09Y	1.00	1.337E+02	1.337E+02	2.661E+02	198.96	
ANH-511	1.00E+09Y	1.00	1.183E+01	1.183E+01	1.071E+01	90.60	
Total Activity :			1.196E+04	1.423E+04			

Grand Total Activity : 1.196E+04 1.423E+04

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	71.04	20	79	0.46	142.37	140	5	1.40E-03	****	2.53E+00	T
0	238.99	1	131	0.91	478.25	474	10	3.63E-05	****	3.64E+00	T
0	339.28	52	70	4.03	678.79	673	12	3.58E-03	77.8	2.87E+00	T
0	433.49	35	93	5.66	867.21	857	18	2.40E-03	****	2.41E+00	T
1	474.03	34	34	1.48	948.27	942	19	2.39E-03	72.8	2.26E+00	T
0	552.41	37	13	1.87	1105.03	1100	9	2.58E-03	48.3	2.01E+00	T
0	560.78	18	27	1.42	1121.75	1115	11	1.25E-03	****	1.99E+00	
0	570.83	48	26	1.36	1141.86	1135	15	3.30E-03	55.3	1.96E+00	T
0	614.83	3	13	1.50	1229.85	1228	4	1.98E-04	****	1.85E+00	T
0	617.81	27	26	1.79	1235.82	1232	10	1.90E-03	78.7	1.84E+00	T
0	720.85	27	23	4.39	1441.88	1436	11	1.86E-03	80.9	1.62E+00	T
0	760.88	17	14	0.95	1521.94	1516	9	1.15E-03	94.2	1.55E+00	
0	803.16	8	17	1.22	1606.49	1602	11	5.59E-04	****	1.48E+00	T
0	924.75	9	16	1.29	1849.66	1843	9	6.57E-04	****	1.30E+00	T
0	935.17	32	4	5.30	1870.51	1862	16	2.22E-03	45.1	1.29E+00	T
0	951.25	14	26	3.41	1902.67	1895	15	9.94E-04	****	1.27E+00	
0	1138.68	16	2	2.21	2277.52	2274	8	1.13E-03	57.4	1.08E+00	
0	1142.11	9	2	1.18	2284.38	2281	7	5.90E-04	85.0	1.07E+00	
0	1175.67	8	14	3.84	2351.50	2342	11	5.87E-04	****	1.05E+00	
0	1201.48	7	2	1.23	2403.12	2400	6	4.55E-04	****	1.03E+00	
0	1246.66	13	14	2.35	2493.49	2484	12	8.72E-04	****	9.94E-01	
0	1328.38	9	7	1.83	2656.93	2649	10	6.42E-04	****	9.41E-01	
0	1490.24	5	8	3.84	2980.67	2973	9	3.12E-04	****	8.59E-01	T
0	1560.01	11	3	2.00	3120.21	3112	12	7.42E-04	89.8	8.31E-01	
0	1679.87	18	0	1.50	3359.94	3355	11	1.25E-03	47.1	7.92E-01	
0	1708.42	6	5	0.53	3417.06	3414	8	4.48E-04	****	7.84E-01	
0	1736.85	11	7	1.40	3473.92	3470	12	7.45E-04	****	7.77E-01	
0	1764.78	4	6	1.54	3529.78	3524	11	2.47E-04	****	7.71E-01	T
0	1960.02	5	4	1.33	3920.31	3914	9	3.47E-04	****	7.40E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                    *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905001.CNF;1  *
* Acquisition date   : 21-JUL-2022 22:47:37 Sensitivity      : 3.000          *
* Detector ID       : GAM14 Energy tolerance: 1.500          *
* Elapsed live time : 0 04:00:00.00 Abundance limit : 75.000          *
* Elapsed real time : 0 04:00:01.48 Half life ratio : *****          *
* Sample date       : 27-JUN-2022 09:43:00 Nuclide Library : LIQUID          *
* Sample ID         : G585905001 Analyst initials: MJH1          *
* Batch Number      : 2290721 Sample Quantity : 5.2145E-01 FILTER          *
* Wet wt corr       : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date    : 9-MAY-2022 05:17:58 Eff. Geometry    : JAR          *
* Eff. File         : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	2.637E+01
AL-26	3.702E+00
K-40	2.139E+01
CU-67	2.463E+03
AS-73	8.501E+01
RU-103	3.041E+00
SB-122	1.068E+03
TL-208	3.056E+00
PB-210	4.011E+02
RA-226	4.489E+01
PA-231	3.762E+01
TH-232	1.340E+03
TH-234	9.690E+01
U-234	6.040E+03
U-238	9.690E+01
ANH-511	2.086E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	2.503E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
SC-46	2.933E+00	NOT IDENT.
V-48	8.478E+00	NOT IDENT.
CR-51	3.749E+01	NOT IDENT.
MN-52	7.543E+01	FAIL ABUN
MN-54	2.638E+00	NOT IDENT.
CO-56	3.802E+00	NOT IDENT.
CO-57	1.853E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	2.584E+00	NOT IDENT.
FE-59	5.817E+00	NOT IDENT.
CO-60	3.517E+00	NOT IDENT.
ZN-65	7.075E+00	NOT IDENT.
GE-68	9.063E+01	NOT IDENT.

AS-74	1.147E+01	NOT IDENT.
SE-75	3.475E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	2.835E+01	NOT IDENT.
RB-83	5.731E+00	FAIL ABUN
RB-84	6.098E+00	NOT IDENT.
KR-85	7.597E+02	NOT IDENT.
SR-85	4.409E+00	NOT IDENT.
RB-86	7.724E+01	NOT IDENT.
Y-88	2.902E+00	NOT IDENT.
Y-91	1.295E+03	NOT IDENT.
NB-94	2.475E+00	NOT IDENT.
NB-95	3.463E+00	NOT IDENT.
NB-95M	8.968E+00	NOT IDENT.
TC-95M	3.945E+00	FAIL ABUN
ZR-95	5.043E+00	NOT IDENT.
MO-99	8.922E+03	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.385E+00	NOT IDENT.
RH-102M	2.719E+00	FAIL ABUN
RH-106	2.221E+01	NOT IDENT.
RU-106	2.221E+01	NOT IDENT.
AG-108M	2.241E+00	FAIL ABUN
CD-109	5.401E+01	NOT IDENT.
AG-110	4.743E+01	NOT IDENT.
AG-110M	3.665E+00	NOT IDENT.
IN-111	8.283E+02	NOT IDENT.
SN-113	3.191E+00	NOT IDENT.
IN-114M	1.508E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	6.094E+00	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.070E+00	NOT IDENT.
SB-124	1.009E+01	NOT IDENT.
SB-125	6.836E+00	NOT IDENT.
TE-125M	7.539E+02	NOT IDENT.
I-126	2.422E+01	NOT IDENT.
SB-126	1.894E+01	FAIL ABUN
SN-126	4.683E+00	FAIL ABUN
SB-127	5.875E+02	FAIL ABUN
TE-129	3.904E+01	FAIL ABUN
I-131	2.105E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	3.724E+02	NOT IDENT.
BA-133	2.838E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.151E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	1.219E+01	FAIL ABUN
BA-137M	2.265E+00	NOT IDENT.
CS-137	2.392E+00	NOT IDENT.
LA-138	4.786E+00	NOT IDENT.
CE-139	2.303E+00	NOT IDENT.
BA-140	3.791E+01	NOT IDENT.
LA-140	1.023E+01	NOT IDENT.
CE-141	5.163E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.510E+01	NOT IDENT.
PM-144	3.087E+00	FAIL ABUN
PR-144	2.320E+02	FAIL ABUN
PM-146	3.082E+00	NOT IDENT.
ND-147	5.596E+01	NOT IDENT.
PM-147	5.078E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.077E+00	NOT IDENT.
GD-153	6.344E+00	FAIL ABUN
EU-154	7.058E+00	NOT IDENT.
EU-155	7.245E+00	NOT IDENT.
TB-160	1.094E+01	FAIL ABUN
HO-166M	5.250E+00	FAIL ABUN
TM-171	1.742E+03	NOT IDENT.
LU-176	2.020E+00	NOT IDENT.
LU-177	2.233E+02	NOT IDENT.
HF-181	3.965E+00	NOT IDENT.
W-181	1.884E+01	FAIL ABUN
TA-182	1.391E+01	NOT IDENT.
RE-183	1.901E+01	NOT IDENT.
RE-184	1.426E+01	NOT IDENT.

RE-188	1.170E+01	FAIL ABUN
W-188	5.727E+02	FAIL ABUN
OS-191	1.705E+01	FAIL ABUN
IR-192	2.804E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	4.265E+03	FAIL ABUN
TL-202	8.185E+00	FAIL ABUN
HG-203	3.178E+00	FAIL ABUN
PB-203	0.000E+00	SHORT HLIF
TL-204	3.811E+02	FAIL ABUN
BI-207	3.396E+00	FAIL ABUN
BI-211	1.734E+01	NOT IDENT.
PB-211	5.853E+01	NOT IDENT.
BI-212	3.952E+01	NOT IDENT.
PB-212	5.669E+00	FAIL ABUN
BI-213	8.545E+00	NOT IDENT.
BI-214	7.426E+00	FAIL ABUN
PB-214	6.273E+00	NOT IDENT.
RN-219	3.147E+01	NOT IDENT.
FR-221	1.374E+01	NOT IDENT.
RA-223	4.552E+01	FAIL ABUN
RA-224	4.767E+01	NOT IDENT.
AC-225	7.572E+01	NOT IDENT.
AC-227	2.098E+01	FAIL ABUN
TH-227	2.098E+01	FAIL ABUN
AC-228	1.385E+01	FAIL ABUN
RA-228	1.385E+01	FAIL ABUN
TH-228	5.669E+00	FAIL ABUN
TH-229	3.488E+01	NOT IDENT.
TH-230	6.661E+02	NOT IDENT.
TH-231	3.218E+01	NOT IDENT.
PA-233	5.017E+00	FAIL ABUN
PA-234	2.411E+01	FAIL ABUN
PA-234M	3.607E+02	NOT IDENT.
U-235	1.541E+01	FAIL ABUN
NP-237	5.017E+00	FAIL ABUN
NP-238	0.000E+00	SHORT HLIF
NP-239	1.893E+01	NOT IDENT.
AM-241	1.266E+01	NOT IDENT.
AM-242	4.558E+01	NOT IDENT.
AM-243	4.171E+00	NOT IDENT.
CM-243	6.772E+00	NOT IDENT.
BK-247	5.954E+00	NOT IDENT.
CM-247	2.678E+00	NOT IDENT.
CF-249	2.731E+00	NOT IDENT.
CF-251	9.048E+00	NOT IDENT.
CF-252	1.238E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905001.CNF;1
Acquisition date : 21-JUL-2022 22:47:37 Sensitivity : 3.000
Detector ID : GAM14 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:01.48 Half life ratio : *****
Sample date : 27-JUN-2022 09:43:00 Nuclide Library : LIQUID
Sample ID : G585905001 Analyst initials: MJH1
Batch Number : 2290721 Sample Quantity : 5.2145E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 9-MAY-2022 05:17:58 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM14_JAR.CNF;13

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.059E+02	5.413E+01	5.417E+01
AL-26	1.841E+00	4.306E+00	4.306E+00
K-40	1.427E+02	8.536E+01	8.541E+01
CU-67	8.634E+00	7.004E+03	7.004E+03
AS-73	1.350E+02	1.607E+02	1.608E+02
RU-103	1.012E+01	1.194E+01	1.194E+01
SB-122	2.199E+03	2.132E+03	2.132E+03
TL-208	7.595E+00	8.477E+00	8.479E+00
PB-210	2.349E+01	1.263E+03	1.263E+03
RA-226	1.552E-01	1.259E+02	1.259E+02
PA-231	4.415E+01	5.814E+01	5.814E+01
TH-232	1.903E+03	3.719E+03	3.719E+03
TH-234	1.337E+02	2.626E+02	2.626E+02
U-234	9.365E+03	1.101E+04	1.102E+04
U-238	1.337E+02	2.626E+02	2.626E+02
ANH-511	1.183E+01	1.055E+01	1.055E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-2.995E-01	2.972E+00	2.975E+00	NOT IDENT.
NA-24	5.290E+11	2.576E+12	2.588E+12	SHORT HLIF
SC-46	-4.008E-02	3.564E+00	3.564E+00	NOT IDENT.
V-48	8.083E+00	8.874E+00	9.594E+00	NOT IDENT.
CR-51	1.666E+01	4.518E+01	4.580E+01	NOT IDENT.
MN-52	4.938E+01	7.939E+01	8.246E+01	FAIL ABUN
MN-54	-1.886E+00	3.491E+00	3.593E+00	NOT IDENT.
CO-56	3.680E+00	4.057E+00	4.384E+00	NOT IDENT.
CO-57	2.764E-01	2.185E+00	2.188E+00	NOT IDENT.
NI-57	-6.951E+04	3.114E+05	3.130E+05	SHORT HLIF
CO-58	-3.273E-01	3.177E+00	3.180E+00	NOT IDENT.
FE-59	-6.961E+00	8.815E+00	9.358E+00	NOT IDENT.
CO-60	2.675E-01	4.185E+00	4.187E+00	NOT IDENT.
ZN-65	4.536E+00	7.910E+00	8.171E+00	NOT IDENT.

GE-68	-4.638E+01	1.208E+02	1.226E+02	NOT IDENT.
AS-74	4.888E+00	1.295E+01	1.314E+01	NOT IDENT.
SE-75	1.106E+00	4.190E+00	4.220E+00	NOT IDENT.
BR-77	2.946E+02	2.670E+04	2.670E+04	SHORT HLIF
SR-82	8.640E-01	3.387E+01	3.387E+01	NOT IDENT.
RB-83	7.894E-01	6.594E+00	6.604E+00	FAIL ABUN
RB-84	2.867E-01	7.337E+00	7.338E+00	NOT IDENT.
KR-85	1.577E+03	7.639E+02	1.044E+03	NOT IDENT.
SR-85	9.154E+00	4.433E+00	6.059E+00	NOT IDENT.
RB-86	-4.678E+01	1.046E+02	1.067E+02	NOT IDENT.
Y-88	-6.562E-01	3.671E+00	3.683E+00	NOT IDENT.
Y-91	4.372E+02	1.564E+03	1.576E+03	NOT IDENT.
NB-94	2.086E-01	2.919E+00	2.921E+00	NOT IDENT.
NB-95	1.305E+00	3.960E+00	4.003E+00	NOT IDENT.
NB-95M	2.972E+00	1.161E+01	1.169E+01	NOT IDENT.
TC-95M	1.844E+00	4.668E+00	4.742E+00	FAIL ABUN
ZR-95	8.152E-01	6.561E+00	6.571E+00	NOT IDENT.
MO-99	-1.073E+04	1.240E+04	1.331E+04	NOT IDENT.
TC-99M	9.679E+28	9.342E+29	0.000E+00	SHORT HLIF
RH-101	4.043E-01	2.817E+00	2.823E+00	NOT IDENT.
RH-102M	5.841E+00	4.223E+00	4.978E+00	FAIL ABUN
RH-106	-2.489E+01	3.390E+01	3.571E+01	NOT IDENT.
RU-106	-2.489E+01	3.390E+01	3.571E+01	NOT IDENT.
AG-108M	5.689E+00	7.610E+00	8.032E+00	FAIL ABUN
CD-109	2.016E+01	6.196E+01	6.262E+01	NOT IDENT.
AG-110	3.592E+00	5.565E+01	5.567E+01	NOT IDENT.
AG-110M	9.170E-01	4.274E+00	4.294E+00	NOT IDENT.
IN-111	3.785E+02	9.839E+02	9.986E+02	NOT IDENT.
SN-113	-3.182E+00	4.008E+00	4.257E+00	NOT IDENT.
IN-114M	-6.655E+00	1.895E+01	1.919E+01	NOT IDENT.
CD-115	-3.680E+02	1.668E+04	1.668E+04	SHORT HLIF
SN-117M	-1.619E+00	7.492E+00	7.527E+00	NOT IDENT.
I-123	-2.450E+13	6.480E+13	6.574E+13	SHORT HLIF
TE-123M	-9.627E-01	2.582E+00	2.618E+00	NOT IDENT.
SB-124	5.981E+00	1.072E+01	1.105E+01	NOT IDENT.
SB-125	2.595E+00	8.373E+00	8.455E+00	NOT IDENT.
TE-125M	-2.591E+02	9.150E+02	9.224E+02	NOT IDENT.
I-126	-1.228E+01	3.062E+01	3.112E+01	NOT IDENT.
SB-126	4.410E+01	3.540E+01	4.060E+01	FAIL ABUN
SN-126	-4.204E+00	5.856E+00	6.155E+00	FAIL ABUN
SB-127	1.019E+02	6.852E+02	6.867E+02	FAIL ABUN
TE-129	3.129E+00	4.482E+01	4.484E+01	FAIL ABUN
I-131	4.687E+00	2.362E+01	2.372E+01	NOT IDENT.
I-132	1.000E+41	2.221E+43	0.000E+00	SHORT HLIF
TE-132	-4.013E+02	5.010E+02	5.328E+02	NOT IDENT.
BA-133	-2.185E+00	3.463E+00	3.601E+00	NOT IDENT.
I-133	2.584E+07	8.371E+08	8.372E+08	SHORT HLIF
CS-134	3.947E+00	3.152E+00	3.620E+00	FAIL ABUN
I-135	1.125E+28	1.420E+28	0.000E+00	SHORT HLIF
CS-136	5.045E+00	1.392E+01	1.411E+01	FAIL ABUN
BA-137M	-1.754E+00	2.960E+00	3.064E+00	NOT IDENT.
CS-137	-1.853E+00	3.127E+00	3.237E+00	NOT IDENT.
LA-138	-1.652E-01	5.640E+00	5.640E+00	NOT IDENT.
CE-139	8.604E-01	2.717E+00	2.745E+00	NOT IDENT.
BA-140	2.347E+01	4.173E+01	4.306E+01	NOT IDENT.
LA-140	-9.291E-01	1.233E+01	1.234E+01	NOT IDENT.
CE-141	-8.201E+00	7.806E+00	8.639E+00	NOT IDENT.
CE-143	-7.612E+05	1.348E+06	1.391E+06	SHORT HLIF
CE-144	7.605E+00	1.746E+01	1.779E+01	NOT IDENT.
PM-144	1.195E+00	3.532E+00	3.573E+00	FAIL ABUN
PR-144	8.919E+01	2.656E+02	2.686E+02	FAIL ABUN
PM-146	1.398E+00	3.407E+00	3.465E+00	NOT IDENT.
ND-147	-5.248E+01	7.393E+01	7.763E+01	NOT IDENT.
PM-147	1.506E+04	5.917E+04	5.955E+04	NOT IDENT.
PM-149	-1.172E+05	1.769E+05	1.846E+05	SHORT HLIF
EU-152	5.474E+00	1.032E+01	1.062E+01	NOT IDENT.
GD-153	-6.056E+00	9.096E+00	9.497E+00	FAIL ABUN
EU-154	-2.749E+00	8.788E+00	8.876E+00	NOT IDENT.
EU-155	1.230E+00	8.472E+00	8.491E+00	NOT IDENT.
TB-160	2.148E+00	1.289E+01	1.292E+01	FAIL ABUN
HO-166M	1.575E+00	6.062E+00	6.104E+00	FAIL ABUN
TM-171	-1.188E+01	2.163E+03	2.163E+03	NOT IDENT.
LU-176	-1.955E+00	2.749E+00	2.887E+00	NOT IDENT.
LU-177	-9.172E+01	2.813E+02	2.843E+02	NOT IDENT.
HF-181	-1.237E+00	5.309E+00	5.338E+00	NOT IDENT.
W-181	1.331E+00	2.170E+01	2.171E+01	FAIL ABUN
TA-182	7.118E+00	1.491E+01	1.525E+01	NOT IDENT.
RE-183	-2.273E+00	2.220E+01	2.222E+01	NOT IDENT.

RE-184	1.909E+01	1.463E+01	1.698E+01	NOT IDENT.
RE-188	-1.037E+01	1.503E+01	1.575E+01	FAIL ABUN
W-188	-1.854E+02	7.359E+02	7.406E+02	FAIL ABUN
OS-191	-3.820E+00	2.067E+01	2.075E+01	FAIL ABUN
IR-192	-2.201E+00	3.779E+00	3.907E+00	NOT IDENT.
PB-201	-7.546E+18	3.982E+19	0.000E+00	SHORT HLIF
TL-201	1.209E+03	5.052E+03	5.081E+03	FAIL ABUN
TL-202	-4.847E+00	1.053E+01	1.075E+01	FAIL ABUN
HG-203	1.147E+00	3.827E+00	3.861E+00	FAIL ABUN
PB-203	2.143E+03	7.148E+03	7.213E+03	SHORT HLIF
TL-204	3.668E+02	5.081E+02	5.344E+02	FAIL ABUN
BI-207	7.673E-01	4.006E+00	4.021E+00	FAIL ABUN
BI-211	-2.604E+00	2.552E+01	2.555E+01	NOT IDENT.
PB-211	1.583E+01	6.582E+01	6.620E+01	NOT IDENT.
BI-212	3.554E+01	4.201E+01	4.497E+01	NOT IDENT.
PB-212	1.215E-01	1.101E+01	1.101E+01	FAIL ABUN
BI-213	7.336E+00	9.133E+00	9.714E+00	NOT IDENT.
BI-214	2.644E+00	9.838E+00	9.910E+00	FAIL ABUN
PB-214	-4.669E+00	9.593E+00	9.821E+00	NOT IDENT.
RN-219	4.237E+00	3.574E+01	3.580E+01	NOT IDENT.
FR-221	-1.057E+01	1.795E+01	1.857E+01	NOT IDENT.
RA-223	-3.041E+01	6.699E+01	6.838E+01	FAIL ABUN
RA-224	3.123E+00	7.005E+01	7.006E+01	NOT IDENT.
AC-225	-5.830E+01	9.895E+01	1.024E+02	NOT IDENT.
AC-227	9.982E+00	2.507E+01	2.547E+01	FAIL ABUN
TH-227	9.982E+00	2.507E+01	2.547E+01	FAIL ABUN
AC-228	-6.477E+00	1.839E+01	1.862E+01	FAIL ABUN
RA-228	-6.477E+00	1.839E+01	1.862E+01	FAIL ABUN
TH-228	1.215E-01	1.101E+01	1.101E+01	FAIL ABUN
TH-229	-2.172E+01	4.460E+01	4.566E+01	NOT IDENT.
TH-230	-1.196E+03	1.047E+03	1.178E+03	NOT IDENT.
TH-231	4.413E-02	4.545E+01	4.545E+01	NOT IDENT.
PA-233	5.837E+00	5.607E+00	6.195E+00	FAIL ABUN
PA-234	3.802E+01	4.929E+01	5.219E+01	FAIL ABUN
PA-234M	7.033E+01	5.152E+02	5.162E+02	NOT IDENT.
U-235	-7.554E+00	2.130E+01	2.157E+01	FAIL ABUN
NP-237	5.837E+00	5.607E+00	6.195E+00	FAIL ABUN
NP-238	2.237E+04	4.174E+04	4.295E+04	SHORT HLIF
NP-239	-1.304E+00	2.261E+01	2.261E+01	NOT IDENT.
AM-241	-2.011E+00	1.484E+01	1.486E+01	NOT IDENT.
AM-242	-2.327E+01	6.461E+01	6.546E+01	NOT IDENT.
AM-243	2.829E+00	4.680E+00	4.851E+00	NOT IDENT.
CM-243	-2.090E+00	8.198E+00	8.252E+00	NOT IDENT.
BK-247	8.478E-01	7.297E+00	7.307E+00	NOT IDENT.
CM-247	-1.691E+00	3.266E+00	3.353E+00	NOT IDENT.
CF-249	-5.182E-01	3.188E+00	3.196E+00	NOT IDENT.
CF-251	2.605E-03	1.097E+01	1.097E+01	NOT IDENT.
CF-252	-3.401E+03	1.522E+04	1.530E+04	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	47.8868	133.52	58.6674	116.30	65.3746
879.38	54.1887	364.49	59.6069	116.74	72.3562
46.54	54.3298	80.22	59.6108	117.23	80.3449
228.16	57.9859	711.68	55.9227	119.76	65.7145
52.39	66.3858	356.01	60.6330	120.54	82.7359
53.20	50.9029	323.87	57.8426	120.90	74.8014
53.44	50.9336	82.35	0.0000	264.66	58.8627
57.53	53.0621	82.47	70.1586	121.22	58.8717
293.27	0.0000	82.47	70.1586	344.28	67.9077
57.53	55.8839	83.79	60.9563	122.06	67.9357
482.18	55.8842	265.00	60.9801	1274.44	65.0342
57.98	60.3843	84.21	69.4512	123.68	84.1192
59.32	64.1401	84.86	0.0000	1377.63	0.0000
59.54	60.6082	193.51	65.8466	127.23	78.5097
155.04	66.8529	105.31	72.5817	129.43	75.7267
63.00	57.5004	86.79	89.5887	131.20	72.8778
129.43	57.5383	86.94	89.6133	133.02	71.0329
63.29	57.5383	87.09	83.0331	133.52	69.0511
290.67	57.5759	87.57	78.3843	135.34	80.4212
63.81	57.6058	88.03	69.9435	136.00	73.3612
87.57	57.6665	306.78	73.1354	136.28	64.2151
64.99	57.7578	88.47	73.1525	136.47	64.2324
65.08	57.7695	531.02	69.3826	739.50	71.7581
66.73	48.3167	184.58	69.4027	140.51	0.0000
66.98	48.3431	92.59	69.5648	140.88	72.8190
67.24	54.4167	93.31	69.6533	143.76	72.0657
67.67	57.1908	94.56	68.8491	144.24	64.9005
1221.41	58.1084	311.90	67.5849	145.44	70.1603
439.51	64.3193	946.00	67.5871	152.32	72.8625
70.82	64.3193	97.43	77.8390	152.43	72.8732
167.43	64.3199	98.43	67.3826	1048.07	70.8638
97.43	43.7615	98.44	67.3837	154.21	69.9055
70.82	58.4902	99.53	64.6144	155.04	77.2892
70.82	58.4902	103.37	64.6144	158.56	74.2458
279.20	0.0000	116.74	64.6144	158.97	0.0000
1063.66	77.0876	100.11	69.5039	159.00	75.5684
72.87	0.0000	100.20	73.3763	162.33	66.3896
351.06	77.0972	102.03	62.9474	537.26	64.3071
74.66	76.4593	103.18	62.0967	163.33	58.0288
238.63	75.5625	103.37	62.1157	165.86	67.7285
351.93	75.5625	105.31	63.2861	167.43	62.5534
238.63	75.5625	106.12	67.2686	245.35	75.6152
74.97	75.5853	106.47	67.3065	427.87	62.1286
77.11	83.3169	109.28	75.4467	176.60	63.2205
256.23	57.6879	111.00	75.6512	177.52	65.4315
79.82	57.7031	111.76	81.6423	181.07	58.1545
80.02	57.7253	208.37	73.9094	184.41	64.8560
80.03	57.7258	116.24	65.3686	184.58	64.8679

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	66.0318	300.09	46.4772	477.60	28.7689
186.21	66.0672	300.13	46.4784	477.99	28.7747
190.27	77.2381	301.36	56.1487	482.18	36.5021
193.51	68.7736	302.85	57.8188	487.02	28.9167
197.03	75.6046	304.50	41.0069	492.35	0.0000
198.01	62.5194	304.85	47.0504	497.08	21.8047
201.83	74.8824	306.78	64.0357	511.00	28.3716
204.12	71.7474	308.46	39.9217	514.00	28.4167
205.31	74.0449	311.90	30.3230	520.40	26.6707
208.37	78.7104	316.51	55.9881	520.69	0.0000
210.85	60.0134	319.41	50.0100	667.71	0.0000
215.65	58.0676	320.08	43.9332	527.90	0.0000
218.12	64.9243	321.04	53.7338	529.59	16.6318
222.11	59.5579	323.87	41.6087	529.87	0.0000
227.09	50.8104	325.23	45.3252	531.02	23.1171
227.38	54.2124	1596.21	54.0386	537.26	26.8996
228.16	67.8159	331.15	0.0000	1260.41	0.0000
228.18	67.8168	333.37	51.7540	552.55	19.6277
235.69	50.0834	334.37	37.8158	795.86	22.5488
235.96	37.9511	338.28	37.0972	564.24	11.2798
238.63	58.2085	911.20	37.0981	569.33	16.9614
238.98	0.0000	340.48	37.1558	569.50	16.9629
240.99	51.8529	340.55	37.1576	569.70	16.9644
242.00	51.8999	344.28	41.3940	582.08	34.1279
244.70	49.3493	345.93	43.5139	583.19	34.1470
245.35	48.2299	351.06	43.6699	595.83	28.6243
459.60	56.5336	351.93	53.6844	600.60	33.4676
685.70	57.7774	356.01	44.2368	604.72	32.5736
388.16	57.7980	361.25	0.0000	609.32	31.6814
256.23	59.1318	364.49	41.1334	610.33	31.6962
527.90	0.0000	366.42	44.5495	614.28	23.0928
264.66	46.7151	383.85	39.9622	618.01	13.0117
265.00	50.2332	388.16	34.1048	621.93	33.3110
269.46	63.3224	666.33	28.9981	630.19	0.0000
401.81	44.6263	391.70	43.5822	631.29	26.1782
273.65	64.7217	400.66	34.3758	632.98	28.1386
276.40	43.6394	401.32	0.0000	633.25	24.2605
583.19	59.0179	401.81	37.8411	634.78	18.4503
277.60	53.1271	402.40	43.0166	635.95	17.4880
402.40	64.9533	404.85	40.4977	636.99	20.4121
278.43	54.3442	410.95	44.1104	657.50	16.6714
279.20	0.0000	720.70	38.1437	884.68	17.6543
279.54	46.1161	423.72	32.2508	661.66	25.5430
280.46	50.8840	427.09	34.0631	664.57	0.0000
301.36	43.8991	427.87	28.8361	666.33	24.6094
284.31	52.2312	433.94	32.4480	666.50	24.6114
285.41	57.0293	439.51	35.8976	667.71	0.0000
285.90	0.0000	440.45	27.2902	677.62	20.7710
287.50	42.8445	453.88	24.8407	685.70	24.8108
290.67	52.4984	459.60	24.0315	692.65	33.8395
293.27	0.0000	463.37	33.8940	695.00	34.8690
295.22	45.5031	468.07	30.0487	696.49	28.9091
316.51	52.7173	473.00	28.6960	696.51	28.9091
298.58	60.8300	475.06	28.7285	697.00	35.8945
299.98	46.4736	696.49	28.7559	697.49	37.8964

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	22.9850	903.28	11.8343	1291.59	4.5102
706.68	22.0215	907.67	0.0000	1298.22	0.0000
711.68	27.0813	911.20	16.1798	1312.11	8.1595
720.70	24.1592	984.45	0.0000	1332.49	14.5781
721.93	0.0000	926.36	13.0088	1365.19	10.1017
1690.97	19.6460	935.54	10.8732	1368.63	0.0000
722.91	19.6468	937.49	9.7921	1377.63	0.0000
723.31	16.6269	983.53	17.0092	1384.29	8.3029
756.73	13.6088	945.96	0.0000	1408.01	12.0598
727.33	14.1305	946.00	3.2729	1434.09	8.3990
733.00	11.1271	949.00	15.2886	1435.80	11.2031
735.93	18.2292	954.55	0.0000	1457.56	0.0000
739.50	28.3965	962.31	10.9668	1460.82	5.6334
1434.09	32.5130	964.08	14.2648	1489.16	6.0473
747.24	21.3615	966.17	19.7644	1596.21	6.7684
752.31	19.3649	968.97	9.8910	1620.50	9.7186
753.82	17.3369	983.53	8.8320	1678.03	0.0000
756.73	13.7829	984.45	0.0000	1690.97	6.9009
763.94	13.8208	996.26	12.1919	1757.55	0.0000
765.80	19.4654	1001.03	13.3198	1764.49	6.0007
1001.03	23.5690	1004.73	24.4474	1770.23	5.3398
766.84	18.4482	1025.87	0.0000	1771.35	6.0088
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	15.4297	1037.84	15.7135	1808.65	11.2964
777.92	16.4668	1038.76	0.0000	1836.06	6.0828
778.90	19.5621	1046.59	21.3812		
783.70	17.5340	1048.07	10.1323		
1435.80	17.5672	1050.41	18.0260		
903.28	12.4155	1063.66	10.1792		
795.86	8.2887	1077.00	18.1667		
801.95	14.0186	1077.34	18.1680		
802.10	14.0191	1083.85	11.3770		
810.29	14.5822	1085.87	11.3835		
810.45	14.5828	1099.25	17.1399		
810.76	13.5427	1111.64	13.7607		
815.77	20.8732	1112.07	14.9085		
818.51	16.7148	1112.84	14.9117		
832.01	15.7465	1115.54	12.6274		
834.85	25.2197	1120.29	22.9899		
835.15	25.2217	1120.55	20.6924		
836.80	0.0000	1121.30	20.6968		
846.77	14.7736	1808.65	12.6776		
856.80	10.5896	1131.51	0.0000		
860.56	13.7845	1332.49	11.6634		
871.09	17.0267	1177.95	11.2109		
873.19	18.1040	1189.05	11.4202		
875.33	0.0000	1204.77	7.0571		
879.38	16.0083	1221.41	10.6326		
880.51	20.2849	1231.02	10.6589		
881.60	16.0205	1235.36	11.5599		
883.24	18.1663	1238.28	11.1872		
884.68	13.8987	1260.41	0.0000		
889.28	14.9912	1271.87	9.8734		
894.76	13.9458	1274.44	10.7776		
1836.06	13.9617	1274.54	8.9819		

VAX/VMS Nuclide Identification Report Generated 22-JUL-2022 02:48:42.70

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905002.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM16.CNF;775
Background date    : 16-JUL-2022 13:55:27
Sample date       : 27-JUN-2022 09:52:00 Acquisition date : 21-JUL-2022 22:48:20
Sample ID        : G585905002 Sample quantity : 4.92550E-01 FILTER
Detector name    : GAM16 Detector geometry: JAR
Elapsed live time: 0 04:00:00.00 Elapsed real time: 0 04:00:00.95 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : MJH1
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID        : 2290721 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	62.80*	8	240	0.98	125.88	122	11	5.72E-04	395.0	
2	0	124.68	34	108	1.12	249.61	247	7	2.39E-03	52.7	
3	0	172.84	10	153	1.24	345.90	344	8	7.24E-04	206.4	
4	0	238.20*	4	173	0.85	476.60	472	10	2.71E-04	713.1	
5	0	282.84	19	125	0.94	565.87	560	10	1.32E-03	112.5	
6	0	315.45	38	113	1.68	631.07	626	14	2.65E-03	61.2	
7	0	334.65	23	67	1.44	669.47	666	7	1.56E-03	63.7	
8	0	433.43	14	64	0.92	867.00	861	9	1.00E-03	104.0	
9	0	478.02	40	101	1.21	956.16	950	13	2.76E-03	54.5	
10	0	511.17*	33	105	2.31	1022.47	1015	21	2.26E-03	107.0	
11	0	520.93	16	26	1.12	1041.97	1038	8	1.09E-03	61.6	
12	0	583.38*	10	31	2.21	1166.88	1162	11	7.04E-04	146.1	
13	0	610.41*	19	72	1.43	1220.92	1215	14	1.29E-03	116.5	
14	0	752.24	43	110	15.35	1504.59	1475	40	2.96E-03	83.0	
15	0	887.63	18	19	1.01	1775.39	1768	12	1.24E-03	58.4	
16	0	921.54	14	12	1.44	1843.21	1839	8	9.72E-04	50.5	
17	0	935.73	9	23	1.44	1871.59	1864	9	5.90E-04	106.3	
18	0	974.31	25	10	5.77	1948.74	1942	14	1.73E-03	34.1	
19	0	1155.43	24	9	4.47	2311.05	2304	14	1.66E-03	35.0	
20	0	1182.54	35	14	4.19	2365.27	2355	19	2.43E-03	30.8	
21	1	1197.61	16	1	2.34	2395.43	2391	15	1.09E-03	25.5	1.08E+00
22	1	1200.40	21	3	2.13	2401.00	2391	15	1.44E-03	24.6	
23	0	1206.78	15	8	0.97	2413.76	2409	9	1.01E-03	45.2	
24	1	1274.38	30	8	2.18	2549.00	2540	19	2.07E-03	21.5	1.94E+00
25	1	1277.16	16	3	2.40	2554.56	2540	19	1.10E-03	37.6	
26	0	1394.76	14	3	3.10	2789.82	2784	12	9.99E-04	35.5	
27	0	1461.59*	33	14	1.35	2923.53	2917	16	2.30E-03	39.3	
28	0	1516.13	7	7	0.57	3032.64	3027	10	4.84E-04	82.2	
29	0	1565.06	7	6	1.37	3130.53	3126	8	4.86E-04	76.9	
30	0	1623.19	10	3	1.26	3246.83	3241	11	7.08E-04	44.5	
31	0	1642.02	19	8	1.28	3284.51	3275	16	1.34E-03	39.9	
32	0	1711.47*	3	5	1.25	3423.46	3419	9	2.18E-04	197.2	
33	0	1848.54	3	10	1.44	3697.73	3690	9	1.74E-04	227.2	
34	0	1935.94	10	2	0.58	3872.63	3867	10	6.74E-04	44.0	

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
35	0	1945.91	9	2	1.25	3892.58	3889	8	6.50E-04	41.4	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 22-JUL-2022 02:48:43

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905002.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 27-JUN-2022 09:52:00	Acquisition date	: 21-JUL-2022 22:48:20
Sample ID	: G585905002	Sample quantity	: 0.49255 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA16	Detector geometry	: JAR
Elapsed live time	: 0 04:00:00.00	Elapsed real time	: 0 04:00:00.95 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	40	10.44*	2.322E+00	6.243E+01	8.603E+01	108.97
NA-22	1274.54	30	99.94*	1.038E+00	1.096E+01	1.116E+01	42.99
K-40	1460.82	33	10.66*	9.303E-01	1.275E+02	1.275E+02	78.58
TL-208	277.37	-----	6.60	3.396E+00	-----	Line Not Found	-----
	583.19	10	85.00*	2.001E+00	2.271E+00	2.328E+00	292.14
	860.56	-----	12.50	1.458E+00	-----	Line Not Found	-----
TH-232	63.81	8	0.26*	1.939E+00	6.229E+02	6.229E+02	789.99
	140.88	-----	0.02	4.825E+00	-----	Line Not Found	-----
ANH-511	511.00	33	100.00*	2.211E+00	5.606E+00	5.606E+00	213.97

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                       *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905002.CNF;1  *
* Acquisition date   : 21-JUL-2022 22:48:20 Sensitivity      : 3.000          *
* Detector ID        : GAM16 Energy tolerance: 1.500         *
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000      *
* Elapsed real time  : 0 04:00:00.95 Half life ratio : *****      *
* Sample date        : 27-JUN-2022 09:52:00 Analyst initials: MJH1      *
* Sample ID          : G585905002 Sample Quantity : 4.9255E-01 FILTER *
* Batch Number       : 2290721 Wet Weight : 0.00000         *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                       *
* Eff. Cal. date     : 7-MAR-2022 08:22:40 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM16_JAR.CNF;15          *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	8.603E+01	9.188E+01	7.057E+01
NA-22	1.116E+01	4.700E+00	6.150E+00
K-40	1.275E+02	9.819E+01	8.513E+01
TL-208	2.328E+00	6.664E+00	6.496E+00
TH-232	6.229E+02	4.822E+03	2.999E+03
ANH-511	5.606E+00	1.176E+01	5.270E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-24	0.000E+00	2.896E+12	0.000E+00	SHORT HLIF
AL-26	1.893E+00	3.462E+00	7.857E+00	NOT IDENT.
SC-46	-5.349E-01	4.106E+00	6.842E+00	NOT IDENT.
V-48	-8.115E+00	8.495E+00	1.372E+01	NOT IDENT.
CR-51	-2.219E+01	5.130E+01	8.211E+01	NOT IDENT.
MN-52	3.544E+01	7.799E+01	1.681E+02	FAIL ABUN
MN-54	-1.471E+00	3.586E+00	6.513E+00	NOT IDENT.
CO-56	1.264E+00	4.870E+00	9.436E+00	NOT IDENT.
CO-57	-1.474E+00	2.671E+00	4.206E+00	NOT IDENT.
NI-57	0.000E+00	5.080E+05	0.000E+00	SHORT HLIF
CO-58	-5.746E-01	3.954E+00	7.498E+00	NOT IDENT.
FE-59	-4.223E+00	9.086E+00	1.606E+01	NOT IDENT.
CO-60	4.185E+00	4.259E+00	9.207E+00	NOT IDENT.
ZN-65	-4.811E+00	8.072E+00	1.386E+01	NOT IDENT.
CU-67	-9.624E+03	5.458E+03	7.578E+03	NOT IDENT.
GE-68	-1.136E+02	1.211E+02	1.953E+02	NOT IDENT.
AS-73	-1.003E+02	1.463E+02	1.881E+02	NOT IDENT.
AS-74	-1.262E+01	1.575E+01	2.568E+01	NOT IDENT.
SE-75	5.252E-01	5.345E+00	9.124E+00	NOT IDENT.
BR-77	0.000E+00	3.149E+04	0.000E+00	SHORT HLIF
SR-82	2.346E+01	3.781E+01	7.902E+01	NOT IDENT.
RB-83	7.458E+00	8.998E+00	1.471E+01	FAIL ABUN
RB-84	3.001E+00	1.002E+01	1.759E+01	NOT IDENT.
KR-85	1.244E+03	8.365E+02	1.646E+03	NOT IDENT.

SR-85	7.221E+00	4.854E+00	9.549E+00	NOT IDENT.
RB-86	-4.069E+01	9.965E+01	1.784E+02	NOT IDENT.
Y-88	4.004E-01	4.239E+00	8.777E+00	NOT IDENT.
Y-91	1.129E+03	3.032E+03	4.147E+03	NOT IDENT.
NB-94	1.176E+00	3.941E+00	7.196E+00	NOT IDENT.
NB-95	3.824E+00	4.056E+00	8.644E+00	NOT IDENT.
NB-95M	3.083E+00	1.520E+01	2.429E+01	NOT IDENT.
TC-95M	4.453E+00	5.128E+00	9.407E+00	FAIL ABUN
ZR-95	-1.205E+00	9.043E+00	1.498E+01	NOT IDENT.
MO-99	-4.553E+03	1.175E+04	2.176E+04	NOT IDENT.
TC-99M	0.000E+00	8.706E+29	0.000E+00	SHORT HLIF
RH-101	-2.788E+00	3.331E+00	5.084E+00	NOT IDENT.
RH-102M	9.507E-02	3.706E+00	6.041E+00	NOT IDENT.
RU-103	-7.112E-01	5.345E+00	9.568E+00	FAIL ABUN
RH-106	-4.645E+00	3.286E+01	5.837E+01	NOT IDENT.
RU-106	-4.645E+00	3.286E+01	5.837E+01	NOT IDENT.
AG-108M	2.436E+00	4.965E+00	6.070E+00	FAIL ABUN
CD-109	-6.092E+01	6.739E+01	1.155E+02	NOT IDENT.
AG-110	-3.371E+01	7.888E+01	1.340E+02	NOT IDENT.
AG-110M	-5.346E+00	7.550E+00	1.037E+01	NOT IDENT.
IN-111	1.012E+02	1.319E+03	2.249E+03	NOT IDENT.
SN-113	1.689E+00	4.976E+00	9.422E+00	NOT IDENT.
IN-114M	-1.789E+01	2.094E+01	3.377E+01	NOT IDENT.
CD-115	0.000E+00	2.156E+04	0.000E+00	SHORT HLIF
SN-117M	6.991E+00	8.435E+00	1.573E+01	NOT IDENT.
SB-122	5.879E+02	2.470E+03	4.562E+03	NOT IDENT.
I-123	0.000E+00	7.306E+13	0.000E+00	SHORT HLIF
TE-123M	1.612E+00	2.931E+00	5.348E+00	NOT IDENT.
SB-124	5.917E+00	1.163E+01	2.499E+01	NOT IDENT.
SB-125	6.452E+00	1.023E+01	1.821E+01	NOT IDENT.
TE-125M	-2.057E+02	1.017E+03	1.806E+03	NOT IDENT.
I-126	-2.529E+01	3.416E+01	5.526E+01	NOT IDENT.
SB-126	6.253E+00	2.381E+01	4.701E+01	NOT IDENT.
SN-126	-3.098E-01	6.308E+00	1.149E+01	FAIL ABUN
SB-127	5.380E+02	7.365E+02	1.449E+03	NOT IDENT.
TE-129	2.735E+00	6.610E+01	1.208E+02	NOT IDENT.
I-131	-7.285E+00	2.733E+01	4.944E+01	FAIL ABUN
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	-4.362E+02	6.219E+02	9.995E+02	NOT IDENT.
BA-133	-4.045E+00	4.363E+00	7.443E+00	NOT IDENT.
I-133	0.000E+00	1.175E+09	0.000E+00	SHORT HLIF
CS-134	-9.193E-01	4.485E+00	8.310E+00	NOT IDENT.
I-135	0.000E+00	1.704E+28	0.000E+00	SHORT HLIF
CS-136	5.497E+00	1.477E+01	3.022E+01	NOT IDENT.
BA-137M	1.324E+00	5.140E+00	7.207E+00	NOT IDENT.
CS-137	1.399E+00	5.430E+00	7.613E+00	NOT IDENT.
LA-138	1.181E+00	5.085E+00	1.081E+01	NOT IDENT.
CE-139	-4.101E-01	2.980E+00	5.167E+00	NOT IDENT.
BA-140	5.773E+00	4.826E+01	8.864E+01	NOT IDENT.
LA-140	-3.251E+00	1.617E+01	3.106E+01	NOT IDENT.
CE-141	-4.277E+00	8.050E+00	1.363E+01	NOT IDENT.
CE-143	0.000E+00	1.447E+06	0.000E+00	SHORT HLIF
CE-144	2.765E+00	1.980E+01	3.546E+01	NOT IDENT.
PM-144	1.725E+00	4.158E+00	7.681E+00	FAIL ABUN
PR-144	1.276E+02	3.125E+02	5.769E+02	NOT IDENT.
PM-146	-6.083E-01	4.613E+00	8.317E+00	NOT IDENT.
ND-147	-2.374E+01	1.044E+02	1.855E+02	NOT IDENT.
PM-147	3.173E+04	7.521E+04	1.294E+05	NOT IDENT.
PM-149	0.000E+00	2.003E+05	0.000E+00	SHORT HLIF
EU-152	2.680E+00	1.032E+01	1.946E+01	NOT IDENT.
GD-153	-2.605E+00	9.699E+00	1.481E+01	NOT IDENT.
EU-154	0.000E+00	1.325E+01	2.035E+01	FAIL ABUN
EU-155	-2.002E+00	9.568E+00	1.705E+01	NOT IDENT.
TB-160	3.359E+00	1.506E+01	2.942E+01	NOT IDENT.
HO-166M	-2.132E+00	6.649E+00	1.135E+01	FAIL ABUN
TM-171	-3.760E+03	2.970E+03	3.656E+03	NOT IDENT.
LU-176	9.901E-01	2.897E+00	5.501E+00	NOT IDENT.
LU-177	7.564E+01	3.094E+02	5.422E+02	NOT IDENT.
HF-181	-3.086E+00	6.581E+00	1.002E+01	NOT IDENT.
W-181	-1.037E+01	2.057E+01	3.740E+01	NOT IDENT.
TA-182	1.181E+01	1.964E+01	3.946E+01	NOT IDENT.
RE-183	-1.086E+01	2.112E+01	3.833E+01	NOT IDENT.
RE-184	-4.369E+00	1.350E+01	2.485E+01	NOT IDENT.
RE-188	2.921E+01	1.728E+01	3.393E+01	FAIL ABUN
W-188	-5.154E+02	7.755E+02	1.379E+03	FAIL ABUN
OS-191	9.149E+00	2.450E+01	4.452E+01	FAIL ABUN
IR-192	0.000E+00	8.519E+00	6.843E+00	FAIL ABUN
PB-201	0.000E+00	4.436E+19	0.000E+00	SHORT HLIF

TL-201	3.654E+03	5.989E+03	1.094E+04	NOT IDENT.
TL-202	1.901E+00	1.334E+01	2.463E+01	NOT IDENT.
HG-203	-2.363E+00	5.069E+00	8.169E+00	NOT IDENT.
PB-203	0.000E+00	9.452E+03	0.000E+00	SHORT HLIF
TL-204	-3.248E+02	3.887E+02	6.797E+02	NOT IDENT.
BI-207	2.151E+00	4.948E+00	9.988E+00	NOT IDENT.
PB-210	-4.328E+02	5.308E+02	8.065E+02	NOT IDENT.
BI-211	-2.694E+01	3.028E+01	4.273E+01	NOT IDENT.
PB-211	8.060E-02	6.688E+01	1.240E+02	NOT IDENT.
BI-212	-3.250E+01	6.946E+01	1.037E+02	NOT IDENT.
PB-212	9.307E-01	1.301E+01	1.394E+01	FAIL ABUN
BI-213	4.892E+00	1.165E+01	2.204E+01	NOT IDENT.
BI-214	8.049E+00	1.838E+01	1.794E+01	FAIL ABUN
PB-214	-1.581E+00	1.081E+01	1.617E+01	NOT IDENT.
RN-219	-1.577E+00	3.830E+01	7.075E+01	NOT IDENT.
FR-221	-1.989E-01	2.233E+01	3.822E+01	NOT IDENT.
RA-223	5.135E+01	6.805E+01	1.329E+02	NOT IDENT.
RA-224	-4.136E+01	8.580E+01	1.152E+02	NOT IDENT.
AC-225	-1.096E+00	1.230E+02	2.106E+02	NOT IDENT.
RA-226	-1.263E+02	1.016E+02	1.476E+02	NOT IDENT.
AC-227	-1.373E+01	2.812E+01	4.562E+01	FAIL ABUN
TH-227	-1.373E+01	2.812E+01	4.562E+01	FAIL ABUN
AC-228	5.372E+00	1.913E+01	3.156E+01	NOT IDENT.
RA-228	5.372E+00	1.913E+01	3.156E+01	NOT IDENT.
TH-228	9.307E-01	1.301E+01	1.394E+01	FAIL ABUN
TH-229	-3.779E+01	5.429E+01	8.866E+01	NOT IDENT.
TH-230	-1.159E+03	1.211E+03	1.633E+03	NOT IDENT.
PA-231	-1.928E+01	5.131E+01	9.276E+01	FAIL ABUN
TH-231	-9.414E+00	4.962E+01	7.372E+01	NOT IDENT.
PA-233	-2.853E+00	7.054E+00	1.135E+01	NOT IDENT.
PA-234	1.148E+01	2.974E+01	5.946E+01	NOT IDENT.
PA-234M	4.761E+02	4.964E+02	1.033E+03	NOT IDENT.
TH-234	4.377E+01	3.389E+02	3.041E+02	FAIL ABUN
U-234	-1.139E+04	1.051E+04	1.316E+04	NOT IDENT.
U-235	-1.707E+01	2.489E+01	3.612E+01	NOT IDENT.
NP-237	-2.853E+00	7.054E+00	1.135E+01	NOT IDENT.
NP-238	0.000E+00	3.445E+04	0.000E+00	SHORT HLIF
U-238	4.377E+01	3.389E+02	3.041E+02	FAIL ABUN
NP-239	-3.664E+00	2.342E+01	4.170E+01	NOT IDENT.
AM-241	1.068E+01	1.568E+01	2.895E+01	NOT IDENT.
AM-242	-2.156E+01	6.845E+01	1.025E+02	NOT IDENT.
AM-243	7.951E-01	4.267E+00	7.994E+00	NOT IDENT.
CM-243	1.740E+00	9.706E+00	1.779E+01	NOT IDENT.
BK-247	-3.574E-01	9.322E+00	1.570E+01	FAIL ABUN
CM-247	-4.341E-01	3.638E+00	6.652E+00	NOT IDENT.
CF-249	1.056E+00	4.303E+00	8.073E+00	FAIL ABUN
CF-251	-2.084E+00	1.465E+01	2.317E+01	NOT IDENT.
CF-252	-1.728E+04	1.950E+04	2.790E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	62.80	80	240	0.98	125.88	122	11	5.59E-03	38.7	
2	0	92.49	156	222	1.49	185.24	181	9	1.08E-02	19.0	
3	0	124.68	34	108	1.12	249.61	247	7	2.39E-03	52.7	
4	0	172.84	10	153	1.24	345.90	344	8	7.24E-04	206.4	
5	0	185.56	91	177	1.13	371.35	366	10	6.34E-03	29.2	
6	0	238.20	65	173	0.85	476.60	472	10	4.48E-03	40.1	
7	0	282.84	19	125	0.94	565.87	560	10	1.32E-03	112.5	
8	0	315.45	38	113	1.68	631.07	626	14	2.65E-03	61.2	
9	0	334.65	23	67	1.44	669.47	666	7	1.56E-03	63.7	
10	0	433.43	14	64	0.92	867.00	861	9	1.00E-03	104.0	
11	0	478.02	40	101	1.21	956.16	950	13	2.76E-03	54.5	
12	0	511.17	329	105	2.31	1022.47	1015	21	2.28E-02	9.5	
13	0	520.93	16	26	1.12	1041.97	1038	8	1.09E-03	61.6	
14	0	583.38	39	31	2.21	1166.88	1162	11	2.70E-03	32.7	
15	0	610.41	36	72	1.43	1220.92	1215	14	2.51E-03	53.0	
16	0	752.24	43	110	15.35	1504.59	1475	40	2.96E-03	83.0	
17	0	887.63	18	19	1.01	1775.39	1768	12	1.24E-03	58.4	
18	0	921.54	14	12	1.44	1843.21	1839	8	9.72E-04	50.5	
19	0	935.73	9	23	1.44	1871.59	1864	9	5.90E-04	106.3	
20	0	969.11	15	12	1.09	1938.36	1935	7	1.02E-03	48.7	
21	0	974.31	25	10	5.77	1948.74	1942	14	1.73E-03	34.1	
22	0	1155.43	24	9	4.47	2311.05	2304	14	1.66E-03	35.0	
23	0	1182.54	35	14	4.19	2365.27	2355	19	2.43E-03	30.8	
24	1	1197.61	16	1	2.34	2395.43	2391	15	1.09E-03	25.5	1.08E+00
25	1	1200.40	21	3	2.13	2401.00	2391	15	1.44E-03	24.6	
26	0	1206.78	15	8	0.97	2413.76	2409	9	1.01E-03	45.2	
27	1	1274.38	30	8	2.18	2549.00	2540	19	2.07E-03	21.5	1.94E+00
28	1	1277.16	16	3	2.40	2554.56	2540	19	1.10E-03	37.6	
29	0	1394.76	14	3	3.10	2789.82	2784	12	9.99E-04	35.5	
30	0	1461.59	53	14	1.35	2923.53	2917	16	3.66E-03	21.7	
31	0	1516.13	7	7	0.57	3032.64	3027	10	4.84E-04	82.2	
32	0	1565.06	7	6	1.37	3130.53	3126	8	4.86E-04	76.9	
33	0	1623.19	10	3	1.26	3246.83	3241	11	7.08E-04	44.5	
34	0	1642.02	19	8	1.28	3284.51	3275	16	1.34E-03	39.9	
35	0	1711.47	7	5	1.25	3423.46	3419	9	4.51E-04	70.7	
36	0	1848.54	3	10	1.44	3697.73	3690	9	1.74E-04	227.2	
37	0	1935.94	10	2	0.58	3872.63	3867	10	6.74E-04	44.0	
38	0	1945.91	9	2	1.25	3892.58	3889	8	6.50E-04	41.4	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	40	10.44*	2.322E+00	6.243E+01	8.603E+01	108.97
NA-22	1274.54	30	99.94*	1.038E+00	1.096E+01	1.116E+01	42.99
K-40	1460.82	33	10.66*	9.303E-01	1.275E+02	1.275E+02	78.58
TL-208	277.37	-----	6.60	3.396E+00	-----	Line Not Found	-----
	583.19	10	85.00*	2.001E+00	2.271E+00	2.328E+00	292.14
	860.56	-----	12.50	1.458E+00	-----	Line Not Found	-----
TH-232	63.81	8	0.26*	1.939E+00	6.229E+02	6.229E+02	789.99
	140.88	-----	0.02	4.825E+00	-----	Line Not Found	-----
ANH-511	511.00	33	100.00*	2.211E+00	5.606E+00	5.606E+00	213.97

Flag: "*" = Keyline

Total number of lines in spectrum 35
Number of unidentified lines 19
Number of lines tentatively identified by NID 16 45.71%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.38	6.243E+01	8.603E+01	9.375E+01	108.97	
NA-22	2.60Y	1.02	1.096E+01	1.116E+01	0.480E+01	42.99	
K-40	1.25E+09Y	1.00	1.275E+02	1.275E+02	1.002E+02	78.58	
TL-208	1.91Y	1.02	2.271E+00	2.328E+00	6.800E+00	292.14	
TH-232	1.41E+10Y	1.00	6.229E+02	6.229E+02	49.21E+02	789.99	
ANH-511	1.00E+09Y	1.00	5.606E+00	5.606E+00	11.99E+00	213.97	
Total Activity :			8.317E+02	8.555E+02			

Grand Total Activity : 8.317E+02 8.555E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	124.68	34	108	1.12	249.61	247	7	2.39E-03	****	4.88E+00	T
0	172.84	10	153	1.24	345.90	344	8	7.24E-04	****	4.50E+00	
0	238.20	4	173	0.85	476.60	472	10	2.71E-04	****	3.75E+00	T
0	282.84	19	125	0.94	565.87	560	10	1.32E-03	****	3.35E+00	T
0	315.45	38	113	1.68	631.07	626	14	2.65E-03	****	3.11E+00	T
0	334.65	23	67	1.44	669.47	666	7	1.56E-03	****	2.99E+00	T
0	433.43	14	64	0.92	867.00	861	9	1.00E-03	****	2.49E+00	T
0	520.93	16	26	1.12	1041.97	1038	8	1.09E-03	****	2.18E+00	T
0	610.41	19	72	1.43	1220.92	1215	14	1.29E-03	****	1.93E+00	T
0	752.24	43	110	15.35	1504.59	1475	40	2.96E-03	****	1.63E+00	T
0	887.63	18	19	1.01	1775.39	1768	12	1.24E-03	****	1.42E+00	
0	921.54	14	12	1.44	1843.21	1839	8	9.72E-04	****	1.37E+00	
0	935.73	9	23	1.44	1871.59	1864	9	5.90E-04	****	1.36E+00	T
0	974.31	25	10	5.77	1948.74	1942	14	1.73E-03	68.1	1.31E+00	
0	1155.43	24	9	4.47	2311.05	2304	14	1.66E-03	70.0	1.13E+00	
0	1182.54	35	14	4.19	2365.27	2355	19	2.43E-03	61.7	1.11E+00	
1	1197.61	16	1	2.34	2395.43	2391	15	1.09E-03	51.1	1.09E+00	
1	1200.40	21	3	2.13	2401.00	2391	15	1.44E-03	49.1	1.09E+00	
0	1206.78	15	8	0.97	2413.76	2409	9	1.01E-03	90.4	1.09E+00	
1	1277.16	16	3	2.40	2554.56	2540	19	1.10E-03	75.1	1.04E+00	
0	1394.76	14	3	3.10	2789.82	2784	12	9.99E-04	70.9	9.65E-01	
0	1516.13	7	7	0.57	3032.64	3027	10	4.84E-04	****	9.05E-01	
0	1565.06	7	6	1.37	3130.53	3126	8	4.86E-04	****	8.85E-01	
0	1623.19	10	3	1.26	3246.83	3241	11	7.08E-04	89.0	8.64E-01	
0	1642.02	19	8	1.28	3284.51	3275	16	1.34E-03	79.8	8.58E-01	
0	1711.47	3	5	1.25	3423.46	3419	9	2.18E-04	****	8.36E-01	
0	1848.54	3	10	1.44	3697.73	3690	9	1.74E-04	****	8.03E-01	
0	1935.94	10	2	0.58	3872.63	3867	10	6.74E-04	88.0	7.88E-01	
0	1945.91	9	2	1.25	3892.58	3889	8	6.50E-04	82.7	7.87E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                               DETECTOR AND SAMPLE DATA                      *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905002.CNF;1  *
* Acquisition date   : 21-JUL-2022 22:48:20 Sensitivity      : 3.000          *
* Detector ID        : GAM16 Energy tolerance: 1.500          *
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 04:00:00.95 Half life ratio : *****          *
* Sample date        : 27-JUN-2022 09:52:00 Nuclide Library : LIQUID          *
* Sample ID          : G585905002 Analyst initials: MJH1          *
* Batch Number       : 2290721 Sample Quantity : 4.9255E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                               Dry Weight : 0.00000          *
*****
*
*                               CALIBRATION INFORMATION                      *
*
* Eff. Cal. date     : 7-MAR-2022 08:22:40 Eff. Geometry    : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM16_JAR.CNF;15          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.237E+01
NA-22	2.570E+00
K-40	3.738E+01
TL-208	2.939E+00
TH-232	1.403E+03
ANH-511	2.403E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-24	0.000E+00	SHORT HLIF
AL-26	3.293E+00	NOT IDENT.
SC-46	2.976E+00	NOT IDENT.
V-48	5.707E+00	NOT IDENT.
CR-51	3.794E+01	NOT IDENT.
MN-52	7.252E+01	FAIL ABUN
MN-54	2.894E+00	NOT IDENT.
CO-56	4.285E+00	NOT IDENT.
CO-57	1.972E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.320E+00	NOT IDENT.
FE-59	6.898E+00	NOT IDENT.
CO-60	4.085E+00	NOT IDENT.
ZN-65	5.992E+00	NOT IDENT.
CU-67	3.608E+03	NOT IDENT.
GE-68	8.345E+01	NOT IDENT.
AS-73	8.796E+01	NOT IDENT.
AS-74	1.168E+01	NOT IDENT.
SE-75	4.276E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	3.531E+01	NOT IDENT.
RB-83	6.717E+00	FAIL ABUN
RB-84	7.916E+00	NOT IDENT.
KR-85	7.685E+02	NOT IDENT.
SR-85	4.459E+00	NOT IDENT.

RB-86	7.682E+01	NOT IDENT.
Y-88	3.633E+00	NOT IDENT.
Y-91	1.830E+03	NOT IDENT.
NB-94	3.300E+00	NOT IDENT.
NB-95	3.905E+00	NOT IDENT.
NB-95M	1.143E+01	NOT IDENT.
TC-95M	4.444E+00	FAIL ABUN
ZR-95	6.729E+00	NOT IDENT.
MO-99	9.606E+03	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.386E+00	NOT IDENT.
RH-102M	2.786E+00	NOT IDENT.
RU-103	4.398E+00	FAIL ABUN
RH-106	2.634E+01	NOT IDENT.
RU-106	2.634E+01	NOT IDENT.
AG-108M	2.808E+00	FAIL ABUN
CD-109	5.417E+01	NOT IDENT.
AG-110	6.028E+01	NOT IDENT.
AG-110M	4.655E+00	NOT IDENT.
IN-111	1.059E+03	NOT IDENT.
SN-113	4.369E+00	NOT IDENT.
IN-114M	1.580E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	7.418E+00	NOT IDENT.
SB-122	2.093E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.523E+00	NOT IDENT.
SB-124	1.079E+01	NOT IDENT.
SB-125	8.408E+00	NOT IDENT.
TE-125M	8.491E+02	NOT IDENT.
I-126	2.438E+01	NOT IDENT.
SB-126	2.126E+01	NOT IDENT.
SN-126	5.401E+00	FAIL ABUN
SB-127	6.578E+02	NOT IDENT.
TE-129	5.578E+01	NOT IDENT.
I-131	2.285E+01	FAIL ABUN
I-132	0.000E+00	SHORT HLIF
TE-132	4.685E+02	NOT IDENT.
BA-133	3.432E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.761E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.320E+01	NOT IDENT.
BA-137M	3.288E+00	NOT IDENT.
CS-137	3.474E+00	NOT IDENT.
LA-138	4.572E+00	NOT IDENT.
CE-139	2.425E+00	NOT IDENT.
BA-140	4.055E+01	NOT IDENT.
LA-140	1.317E+01	NOT IDENT.
CE-141	6.442E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.672E+01	NOT IDENT.
PM-144	3.530E+00	FAIL ABUN
PR-144	2.651E+02	NOT IDENT.
PM-146	3.829E+00	NOT IDENT.
ND-147	8.413E+01	NOT IDENT.
PM-147	6.093E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	9.071E+00	NOT IDENT.
GD-153	6.982E+00	NOT IDENT.
EU-154	8.751E+00	FAIL ABUN
EU-155	8.001E+00	NOT IDENT.
TB-160	1.320E+01	NOT IDENT.
HO-166M	5.122E+00	FAIL ABUN
TM-171	1.706E+03	NOT IDENT.
LU-176	2.578E+00	NOT IDENT.
LU-177	2.553E+02	NOT IDENT.
HF-181	4.599E+00	NOT IDENT.
W-181	1.739E+01	NOT IDENT.
TA-182	1.768E+01	NOT IDENT.
RE-183	1.785E+01	NOT IDENT.
RE-184	1.086E+01	NOT IDENT.
RE-188	1.608E+01	FAIL ABUN
W-188	6.402E+02	FAIL ABUN
OS-191	2.106E+01	FAIL ABUN
IR-192	3.170E+00	FAIL ABUN
PB-201	0.000E+00	SHORT HLIF
TL-201	5.160E+03	NOT IDENT.

TL-202	1.141E+01	NOT IDENT.
HG-203	3.817E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	3.158E+02	NOT IDENT.
BI-207	4.425E+00	NOT IDENT.
PB-210	3.774E+02	NOT IDENT.
BI-211	1.999E+01	NOT IDENT.
PB-211	5.682E+01	NOT IDENT.
BI-212	4.716E+01	NOT IDENT.
PB-212	6.649E+00	FAIL ABUN
BI-213	1.022E+01	NOT IDENT.
BI-214	8.386E+00	FAIL ABUN
PB-214	7.588E+00	NOT IDENT.
RN-219	3.241E+01	NOT IDENT.
FR-221	1.798E+01	NOT IDENT.
RA-223	6.222E+01	NOT IDENT.
RA-224	5.415E+01	NOT IDENT.
AC-225	9.906E+01	NOT IDENT.
RA-226	7.051E+01	NOT IDENT.
AC-227	2.130E+01	FAIL ABUN
TH-227	2.130E+01	FAIL ABUN
AC-228	1.433E+01	NOT IDENT.
RA-228	1.433E+01	NOT IDENT.
TH-228	6.649E+00	FAIL ABUN
TH-229	4.160E+01	NOT IDENT.
TH-230	7.611E+02	NOT IDENT.
PA-231	4.340E+01	FAIL ABUN
TH-231	3.482E+01	NOT IDENT.
PA-233	5.253E+00	NOT IDENT.
PA-234	2.654E+01	NOT IDENT.
PA-234M	4.688E+02	NOT IDENT.
TH-234	1.451E+02	FAIL ABUN
U-234	6.147E+03	NOT IDENT.
U-235	1.709E+01	NOT IDENT.
NP-237	5.253E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.451E+02	FAIL ABUN
NP-239	1.952E+01	NOT IDENT.
AM-241	1.359E+01	NOT IDENT.
AM-242	4.808E+01	NOT IDENT.
AM-243	3.750E+00	NOT IDENT.
CM-243	8.364E+00	NOT IDENT.
BK-247	7.362E+00	FAIL ABUN
CM-247	3.055E+00	NOT IDENT.
CF-249	3.748E+00	FAIL ABUN
CF-251	1.092E+01	NOT IDENT.
CF-252	1.307E+04	NOT IDENT.


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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                           *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905002.CNF;1      *
* Acquisition date   : 21-JUL-2022 22:48:20 Sensitivity      : 3.000                *
* Detector ID        : GAM16 Energy tolerance: 1.500          *
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 04:00:00.95 Half life ratio  : *****          *
* Sample date        : 27-JUN-2022 09:52:00 Nuclide Library : LIQUID          *
* Sample ID          : G585905002 Analyst initials: MJH1          *
* Batch Number       : 2290721 Sample Quantity : 4.9255E-01 FILTER *
*                                     Quantity Err(%) : 1.0000E+00 %          *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*                                     CALIBRATION INFORMATION                       *
*
* Eff. Cal. date     : 7-MAR-2022 08:22:40 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM16_JAR.CNF;15          *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	8.603E+01	9.216E+01	9.218E+01
NA-22	1.116E+01	4.808E+00	4.813E+00
K-40	1.275E+02	9.894E+01	9.897E+01
TL-208	2.328E+00	6.667E+00	6.667E+00
TH-232	6.229E+02	4.823E+03	4.823E+03
ANH-511	5.606E+00	1.176E+01	1.177E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-24	-1.605E+12	2.900E+12	2.989E+12	SHORT HLIF
AL-26	1.893E+00	3.466E+00	3.569E+00	NOT IDENT.
SC-46	-5.349E-01	4.107E+00	4.114E+00	NOT IDENT.
V-48	-8.115E+00	8.535E+00	9.287E+00	NOT IDENT.
CR-51	-2.219E+01	5.134E+01	5.230E+01	NOT IDENT.
MN-52	3.544E+01	7.805E+01	7.968E+01	FAIL ABUN
MN-54	-1.471E+00	3.589E+00	3.650E+00	NOT IDENT.
CO-56	1.264E+00	4.871E+00	4.905E+00	NOT IDENT.
CO-57	-1.474E+00	2.673E+00	2.755E+00	NOT IDENT.
NI-57	5.010E+04	5.081E+05	5.086E+05	SHORT HLIF
CO-58	-5.746E-01	3.955E+00	3.963E+00	NOT IDENT.
FE-59	-4.223E+00	9.099E+00	9.296E+00	NOT IDENT.
CO-60	4.185E+00	4.276E+00	4.674E+00	NOT IDENT.
ZN-65	-4.811E+00	8.084E+00	8.371E+00	NOT IDENT.
CU-67	-9.624E+03	5.514E+03	7.019E+03	NOT IDENT.
GE-68	-1.136E+02	1.216E+02	1.320E+02	NOT IDENT.
AS-73	-1.003E+02	1.479E+02	1.547E+02	NOT IDENT.
AS-74	-1.262E+01	1.580E+01	1.680E+01	NOT IDENT.
SE-75	5.252E-01	5.345E+00	5.350E+00	NOT IDENT.
BR-77	2.253E+03	3.149E+04	3.151E+04	SHORT HLIF
SR-82	2.346E+01	3.787E+01	3.933E+01	NOT IDENT.
RB-83	7.458E+00	9.072E+00	9.676E+00	FAIL ABUN
RB-84	3.001E+00	1.003E+01	1.012E+01	NOT IDENT.
KR-85	1.244E+03	8.431E+02	1.013E+03	NOT IDENT.

SR-85	7.221E+00	4.892E+00	5.878E+00	NOT IDENT.
RB-86	-4.069E+01	9.973E+01	1.014E+02	NOT IDENT.
Y-88	4.004E-01	4.239E+00	4.243E+00	NOT IDENT.
Y-91	1.129E+03	3.034E+03	3.076E+03	NOT IDENT.
NB-94	1.176E+00	3.942E+00	3.978E+00	NOT IDENT.
NB-95	3.824E+00	4.071E+00	4.422E+00	NOT IDENT.
NB-95M	3.083E+00	1.520E+01	1.526E+01	NOT IDENT.
TC-95M	4.453E+00	5.142E+00	5.521E+00	FAIL ABUN
ZR-95	-1.205E+00	9.044E+00	9.060E+00	NOT IDENT.
MO-99	-4.553E+03	1.176E+04	1.194E+04	NOT IDENT.
TC-99M	3.483E+29	8.715E+29	0.000E+00	SHORT HLIF
RH-101	-2.788E+00	3.373E+00	3.600E+00	NOT IDENT.
RH-102M	9.507E-02	3.706E+00	3.706E+00	NOT IDENT.
RU-103	-7.112E-01	5.345E+00	5.355E+00	FAIL ABUN
RH-106	-4.645E+00	3.286E+01	3.293E+01	NOT IDENT.
RU-106	-4.645E+00	3.286E+01	3.293E+01	NOT IDENT.
AG-108M	2.436E+00	4.969E+00	5.089E+00	FAIL ABUN
CD-109	-6.092E+01	6.766E+01	7.303E+01	NOT IDENT.
AG-110	-3.371E+01	7.893E+01	8.038E+01	NOT IDENT.
AG-110M	-5.346E+00	7.571E+00	7.946E+00	NOT IDENT.
IN-111	1.012E+02	1.319E+03	1.319E+03	NOT IDENT.
SN-113	1.689E+00	4.978E+00	5.036E+00	NOT IDENT.
IN-114M	-1.789E+01	2.098E+01	2.248E+01	NOT IDENT.
CD-115	1.586E+04	2.162E+04	2.277E+04	SHORT HLIF
SN-117M	6.991E+00	8.451E+00	9.021E+00	NOT IDENT.
SB-122	5.879E+02	2.470E+03	2.485E+03	NOT IDENT.
I-123	3.985E+13	7.312E+13	7.530E+13	SHORT HLIF
TE-123M	1.612E+00	2.934E+00	3.023E+00	NOT IDENT.
SB-124	5.917E+00	1.164E+01	1.194E+01	NOT IDENT.
SB-125	6.452E+00	1.024E+01	1.065E+01	NOT IDENT.
TE-125M	-2.057E+02	1.017E+03	1.021E+03	NOT IDENT.
I-126	-2.529E+01	3.424E+01	3.609E+01	NOT IDENT.
SB-126	6.253E+00	2.382E+01	2.399E+01	NOT IDENT.
SN-126	-3.098E-01	6.308E+00	6.309E+00	FAIL ABUN
SB-127	5.380E+02	7.404E+02	7.791E+02	NOT IDENT.
TE-129	2.735E+00	6.611E+01	6.612E+01	NOT IDENT.
I-131	-7.285E+00	2.734E+01	2.754E+01	FAIL ABUN
I-132	-1.000E+41	1.008E+42	0.000E+00	SHORT HLIF
TE-132	-4.362E+02	6.238E+02	6.541E+02	NOT IDENT.
BA-133	-4.045E+00	4.376E+00	4.742E+00	NOT IDENT.
I-133	-7.852E+08	1.184E+09	1.236E+09	SHORT HLIF
CS-134	-9.193E-01	4.485E+00	4.504E+00	NOT IDENT.
I-135	-3.219E+27	1.714E+28	0.000E+00	SHORT HLIF
CS-136	5.497E+00	1.479E+01	1.499E+01	NOT IDENT.
BA-137M	1.324E+00	5.141E+00	5.176E+00	NOT IDENT.
CS-137	1.399E+00	5.431E+00	5.468E+00	NOT IDENT.
LA-138	1.181E+00	5.086E+00	5.114E+00	NOT IDENT.
CE-139	-4.101E-01	2.981E+00	2.987E+00	NOT IDENT.
BA-140	5.773E+00	4.826E+01	4.833E+01	NOT IDENT.
LA-140	-3.251E+00	1.618E+01	1.624E+01	NOT IDENT.
CE-141	-4.277E+00	8.056E+00	8.284E+00	NOT IDENT.
CE-143	-2.074E+05	1.447E+06	1.450E+06	SHORT HLIF
CE-144	2.765E+00	1.980E+01	1.984E+01	NOT IDENT.
PM-144	1.725E+00	4.161E+00	4.233E+00	FAIL ABUN
PR-144	1.276E+02	3.127E+02	3.180E+02	NOT IDENT.
PM-146	-6.083E-01	4.613E+00	4.621E+00	NOT IDENT.
ND-147	-2.374E+01	1.044E+02	1.049E+02	NOT IDENT.
PM-147	3.173E+04	7.525E+04	7.660E+04	NOT IDENT.
PM-149	-1.579E+05	2.017E+05	2.140E+05	SHORT HLIF
EU-152	2.680E+00	1.032E+01	1.039E+01	NOT IDENT.
GD-153	-2.605E+00	9.702E+00	9.772E+00	NOT IDENT.
EU-154	3.146E+01	1.357E+01	1.964E+01	FAIL ABUN
EU-155	-2.002E+00	9.569E+00	9.612E+00	NOT IDENT.
TB-160	3.359E+00	1.506E+01	1.514E+01	NOT IDENT.
HO-166M	-2.132E+00	6.652E+00	6.722E+00	FAIL ABUN
TM-171	-3.760E+03	2.997E+03	3.444E+03	NOT IDENT.
LU-176	9.901E-01	2.898E+00	2.932E+00	NOT IDENT.
LU-177	7.564E+01	3.094E+02	3.113E+02	NOT IDENT.
HF-181	-3.086E+00	6.587E+00	6.732E+00	NOT IDENT.
W-181	-1.037E+01	2.074E+01	2.126E+01	NOT IDENT.
TA-182	1.181E+01	1.967E+01	2.038E+01	NOT IDENT.
RE-183	-1.086E+01	2.116E+01	2.172E+01	NOT IDENT.
RE-184	-4.369E+00	1.351E+01	1.366E+01	NOT IDENT.
RE-188	2.921E+01	1.743E+01	2.185E+01	FAIL ABUN
W-188	-5.154E+02	7.786E+02	8.126E+02	FAIL ABUN
OS-191	9.149E+00	2.451E+01	2.485E+01	FAIL ABUN
IR-192	7.108E+00	8.542E+00	9.124E+00	FAIL ABUN
PB-201	1.234E+19	4.454E+19	0.000E+00	SHORT HLIF

TL-201	3.654E+03	5.995E+03	6.217E+03	NOT IDENT.
TL-202	1.901E+00	1.334E+01	1.337E+01	NOT IDENT.
HG-203	-2.363E+00	5.073E+00	5.184E+00	NOT IDENT.
PB-203	-4.407E+03	9.460E+03	9.667E+03	SHORT HLIF
TL-204	-3.248E+02	3.900E+02	4.167E+02	NOT IDENT.
BI-207	2.151E+00	4.952E+00	5.047E+00	NOT IDENT.
PB-210	-4.328E+02	5.327E+02	5.673E+02	NOT IDENT.
BI-211	-2.694E+01	3.037E+01	3.272E+01	NOT IDENT.
PB-211	8.060E-02	6.688E+01	6.688E+01	NOT IDENT.
BI-212	-3.250E+01	6.952E+01	7.105E+01	NOT IDENT.
PB-212	9.307E-01	1.301E+01	1.302E+01	FAIL ABUN
BI-213	4.892E+00	1.166E+01	1.187E+01	NOT IDENT.
BI-214	8.049E+00	1.839E+01	1.875E+01	FAIL ABUN
PB-214	-1.581E+00	1.081E+01	1.084E+01	NOT IDENT.
RN-219	-1.577E+00	3.830E+01	3.831E+01	NOT IDENT.
FR-221	-1.989E-01	2.233E+01	2.233E+01	NOT IDENT.
RA-223	5.135E+01	6.823E+01	7.206E+01	NOT IDENT.
RA-224	-4.136E+01	8.588E+01	8.788E+01	NOT IDENT.
AC-225	-1.096E+00	1.230E+02	1.230E+02	NOT IDENT.
RA-226	-1.263E+02	1.021E+02	1.169E+02	NOT IDENT.
AC-227	-1.373E+01	2.820E+01	2.887E+01	FAIL ABUN
TH-227	-1.373E+01	2.820E+01	2.887E+01	FAIL ABUN
AC-228	5.372E+00	1.914E+01	1.930E+01	NOT IDENT.
RA-228	5.372E+00	1.914E+01	1.930E+01	NOT IDENT.
TH-228	9.307E-01	1.301E+01	1.302E+01	FAIL ABUN
TH-229	-3.779E+01	5.437E+01	5.698E+01	NOT IDENT.
TH-230	-1.159E+03	1.227E+03	1.334E+03	NOT IDENT.
PA-231	-1.928E+01	5.150E+01	5.223E+01	FAIL ABUN
TH-231	-9.414E+00	4.963E+01	4.982E+01	NOT IDENT.
PA-233	-2.853E+00	7.059E+00	7.175E+00	NOT IDENT.
PA-234	1.148E+01	3.253E+01	3.294E+01	NOT IDENT.
PA-234M	4.761E+02	4.988E+02	5.431E+02	NOT IDENT.
TH-234	4.377E+01	3.390E+02	3.396E+02	FAIL ABUN
U-234	-1.139E+04	1.058E+04	1.176E+04	NOT IDENT.
U-235	-1.707E+01	2.492E+01	2.608E+01	NOT IDENT.
NP-237	-2.853E+00	7.059E+00	7.175E+00	NOT IDENT.
NP-238	1.297E+04	3.447E+04	3.496E+04	SHORT HLIF
U-238	4.377E+01	3.390E+02	3.396E+02	FAIL ABUN
NP-239	-3.664E+00	2.342E+01	2.348E+01	NOT IDENT.
AM-241	1.068E+01	1.571E+01	1.643E+01	NOT IDENT.
AM-242	-2.156E+01	6.856E+01	6.924E+01	NOT IDENT.
AM-243	7.951E-01	4.268E+00	4.283E+00	NOT IDENT.
CM-243	1.740E+00	9.707E+00	9.739E+00	NOT IDENT.
BK-247	-3.574E-01	9.322E+00	9.324E+00	FAIL ABUN
CM-247	-4.341E-01	3.639E+00	3.645E+00	NOT IDENT.
CF-249	1.056E+00	4.305E+00	4.331E+00	FAIL ABUN
CF-251	-2.084E+00	1.465E+01	1.468E+01	NOT IDENT.
CF-252	-1.728E+04	2.503E+04	2.621E+04	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	67.3963	133.52	71.0736	116.30	80.1169
879.38	81.3452	364.49	71.0889	116.74	75.3075
46.54	69.1250	80.22	83.5380	117.23	76.3706
228.16	63.7274	711.68	88.0737	119.76	80.7482
52.39	69.7855	356.01	94.4232	120.54	78.9160
53.20	64.6655	323.87	99.7893	120.90	80.9540
53.44	53.4014	82.35	0.0000	264.66	79.0179
57.53	61.3784	82.47	90.3669	121.22	76.4011
293.27	0.0000	82.47	90.3677	344.28	91.0040
57.53	69.0802	83.79	81.7377	122.06	91.0602
482.18	69.0809	265.00	81.7884	1274.44	78.0365
57.98	72.4957	84.21	88.1336	123.68	68.8700
59.32	57.4111	84.86	0.0000	1377.63	0.0000
59.54	61.8789	193.51	93.8628	127.23	101.4315
155.04	70.1226	105.31	86.0176	129.43	92.5222
63.00	70.5111	86.79	86.0764	131.20	95.8944
129.43	70.5852	86.94	86.1133	133.02	88.1523
63.29	70.5852	87.09	76.1750	133.52	88.2439
290.67	70.6590	87.57	82.6361	135.34	95.6997
63.81	70.7177	88.03	100.0198	136.00	88.6926
87.57	70.8370	306.78	92.8274	136.28	87.7230
64.99	71.0160	88.47	92.8616	136.47	87.7571
65.08	71.0391	531.02	192.5988	739.50	94.6434
66.73	72.5859	184.58	153.2294	140.51	0.0000
66.98	65.8376	92.59	95.7711	140.88	89.5648
67.24	65.8972	93.31	129.1747	143.76	97.3197
67.67	73.9601	94.56	143.4985	144.24	92.2294
1221.41	73.9799	311.90	143.5328	145.44	114.2566
439.51	63.4142	946.00	143.5410	152.32	98.9183
70.82	63.4142	97.43	85.8246	152.43	98.9384
167.43	63.4153	98.43	73.8901	1048.07	94.8724
97.43	61.8640	98.44	73.8919	154.21	84.4812
70.82	75.9023	99.53	75.0391	155.04	64.5146
70.82	75.9030	103.37	75.0391	158.56	98.5358
279.20	0.0000	116.74	75.0391	158.97	0.0000
1063.66	67.7204	100.11	87.3635	159.00	78.8294
72.87	0.0000	100.20	87.3833	162.33	81.4423
351.06	67.7335	102.03	81.1847	537.26	80.4176
74.66	72.4933	103.18	78.5800	163.33	91.2476
238.63	88.2602	103.37	78.6180	165.86	81.9491
351.93	88.2602	105.31	82.8057	167.43	77.8469
238.63	88.2602	106.12	82.0180	245.35	65.3018
74.97	88.3026	106.47	81.1343	427.87	108.2946
77.11	70.4169	109.28	88.4175	176.60	106.8831
256.23	70.9802	111.00	90.7118	177.52	93.8477
79.82	70.1219	111.76	87.9750	181.07	84.0701
80.02	71.0516	208.37	83.3748	184.41	125.6749
80.03	71.0529	116.24	80.1057	184.58	86.7717

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	74.6706	300.09	80.1716	477.60	41.3312
186.21	89.2285	300.13	80.1754	477.99	41.3428
190.27	93.1686	301.36	79.4181	482.18	51.5842
193.51	95.8935	302.85	73.4930	487.02	44.6598
197.03	108.8877	304.50	82.2842	492.35	0.0000
198.01	106.7784	304.85	82.3152	497.08	46.0034
201.83	103.9649	306.78	66.8565	511.00	35.9236
204.12	74.5126	308.46	66.9740	514.00	35.9980
205.31	101.0558	311.90	60.2332	520.40	29.9215
208.37	80.7452	316.51	49.1196	520.69	0.0000
210.85	81.0347	319.41	55.4249	667.71	0.0000
215.65	95.5782	320.08	59.4237	527.90	0.0000
218.12	84.2146	321.04	71.3793	529.59	43.9072
222.11	74.0973	323.87	56.5612	529.87	0.0000
227.09	84.0763	325.23	69.0292	531.02	35.5785
227.38	91.2166	1596.21	57.7280	537.26	36.7773
228.16	93.6847	331.15	0.0000	1260.41	0.0000
228.18	93.6871	333.37	62.9009	552.55	30.7783
235.69	79.8553	334.37	57.1576	795.86	36.3325
235.96	75.0908	338.28	44.3780	564.24	37.4253
238.63	79.3619	911.20	44.3800	569.33	30.0371
238.98	0.0000	340.48	70.0797	569.50	30.0394
240.99	83.6251	340.55	71.8815	569.70	27.8980
242.00	88.5649	344.28	57.7122	582.08	34.0609
244.70	87.2556	345.93	67.7399	583.19	30.2969
245.35	84.9023	351.06	67.1634	595.83	49.0686
459.60	80.5845	351.93	51.7769	600.60	55.7729
685.70	79.5401	356.01	65.6543	604.72	46.0435
388.16	74.6826	361.25	0.0000	609.32	43.9714
256.23	78.6875	364.49	55.1440	610.33	43.9974
527.90	0.0000	366.42	48.7968	614.28	36.3824
264.66	72.0433	383.85	59.8516	618.01	32.0433
265.00	77.0421	388.16	51.6296	621.93	31.0090
269.46	73.7032	666.33	61.9811	630.19	0.0000
401.81	79.2826	391.70	48.0221	631.29	41.1989
273.65	95.4082	400.66	51.2391	632.98	28.9792
276.40	80.5996	401.32	0.0000	633.25	25.6392
583.19	66.5688	401.81	40.8409	634.78	31.2402
277.60	75.6665	402.40	44.6620	635.95	37.9609
402.40	94.6266	404.85	39.9937	636.99	37.9830
278.43	94.6747	410.95	52.6401	657.50	33.9038
279.20	0.0000	720.70	49.9233	884.68	33.9087
279.54	73.3071	423.72	50.2925	661.66	20.3892
280.46	72.1198	427.09	39.7621	664.57	0.0000
301.36	62.2250	427.87	36.3899	666.33	29.5272
284.31	49.5605	433.94	49.7310	666.50	32.9377
285.41	63.6185	439.51	49.9500	667.71	0.0000
285.90	0.0000	440.45	46.0667	677.62	21.7113
287.50	57.8163	453.88	47.5381	685.70	21.8056
290.67	69.9649	459.60	47.7451	692.65	33.4062
293.27	0.0000	463.37	42.8924	695.00	38.0609
295.22	72.8895	468.07	36.0366	696.49	35.7832
316.51	84.9633	473.00	40.6895	696.51	35.7832
298.58	74.8771	475.06	46.7885	697.00	42.7195
299.98	80.1622	696.49	41.3061	697.49	45.0414

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	35.8993	903.28	20.0393	1291.59	12.0608
706.68	35.9749	907.67	0.0000	1298.22	0.0000
711.68	33.7413	911.20	16.2763	1312.11	11.0333
720.70	26.3013	984.45	0.0000	1332.49	9.9910
721.93	0.0000	926.36	19.2694	1365.19	13.4502
1690.97	28.9616	935.54	20.1157	1368.63	0.0000
722.91	28.9636	937.49	30.9727	1377.63	0.0000
723.31	32.4811	983.53	25.2327	1384.29	20.7382
756.73	38.6437	945.96	0.0000	1408.01	15.4328
727.33	33.4274	946.00	18.4532	1434.09	9.1450
733.00	30.8771	949.00	17.5034	1435.80	8.2345
735.93	33.9270	954.55	0.0000	1457.56	0.0000
739.50	23.8977	962.31	32.2608	1460.82	17.5045
1434.09	23.9546	964.08	24.4576	1489.16	16.7115
747.24	23.9908	966.17	28.3947	1596.21	12.4122
752.31	24.0510	968.97	32.9345	1620.50	8.0054
753.82	24.0691	983.53	17.7451	1678.03	0.0000
756.73	28.5674	984.45	0.0000	1690.97	8.7965
763.94	23.2927	996.26	16.8423	1757.55	0.0000
765.80	17.0373	1001.03	18.8585	1764.49	6.9614
1001.03	26.9092	1004.73	28.8248	1770.23	13.9412
766.84	27.8118	1025.87	0.0000	1771.35	10.9565
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	16.2246	1037.84	27.1747	1808.65	5.0229
777.92	25.2554	1038.76	0.0000	1836.06	7.0755
778.90	26.1697	1046.59	21.2051		
783.70	25.3254	1048.07	12.1238		
1435.80	28.1060	1050.41	21.2346		
903.28	29.9667	1063.66	15.2417		
795.86	33.6588	1077.00	17.3580		
801.95	31.0179	1077.34	22.4659		
802.10	32.8447	1083.85	14.3298		
810.29	28.3918	1085.87	20.4858		
810.45	25.6459	1099.25	17.4960		
810.76	21.9851	1111.64	13.4380		
815.77	27.5455	1112.07	13.4404		
818.51	19.3062	1112.84	19.6483		
832.01	18.5004	1115.54	20.7019		
834.85	26.8600	1120.29	13.4785		
835.15	28.7162	1120.55	13.4800		
836.80	0.0000	1121.30	18.6691		
846.77	28.8657	1808.65	10.4022		
856.80	23.3833	1131.51	0.0000		
860.56	28.1058	1332.49	13.2720		
871.09	31.0594	1177.95	15.2262		
873.19	20.7250	1189.05	6.7922		
875.33	0.0000	1204.77	12.8013		
879.38	22.6699	1221.41	17.1602		
880.51	21.4209	1231.02	12.9104		
881.60	22.6919	1235.36	19.3920		
883.24	28.7630	1238.28	10.7837		
884.68	27.2663	1260.41	0.0000		
889.28	16.6955	1271.87	8.7183		
894.76	25.6718	1274.44	8.7256		
1836.06	19.9951	1274.54	8.7256		

VAX/VMS Nuclide Identification Report Generated 22-JUL-2022 02:49:44.23

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905003.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM18.CNF;784
Background date    : 16-JUL-2022 13:55:32
Sample date       : 27-JUN-2022 10:01:00 Acquisition date : 21-JUL-2022 22:49:13
Sample ID        : G585905003 Sample quantity : 4.56320E-01 FILTER
Detector name    : GAM18 Detector geometry: JAR
Elapsed live time: 0 04:00:00.00 Elapsed real time: 0 04:00:01.97 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : MJH1
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID         : 2290721 Detector SN# :
Matrix Spike ID  : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	53.14*	14	234	0.98	106.56	103	8	9.62E-04	220.5	
2	0	92.77*	19	271	0.84	185.76	181	10	1.35E-03	193.0	
3	0	99.11	27	122	0.89	198.42	197	5	1.86E-03	64.9	
4	0	185.80*	8	242	1.10	371.69	367	11	5.62E-04	436.5	
5	0	199.31*	5	228	0.74	398.69	393	11	3.50E-04	632.3	
6	0	270.82*	4	135	1.58	541.62	537	9	2.89E-04	582.4	
7	0	294.84*	50	168	1.61	589.62	584	12	3.46E-03	58.2	
8	0	351.81*	18	97	1.10	703.50	699	9	1.27E-03	119.7	
9	0	478.05	84	120	1.73	955.86	947	17	5.80E-03	32.3	
10	0	583.35*	5	96	1.42	1166.36	1161	10	3.35E-04	442.3	
11	3	596.67	38	72	2.02	1193.00	1185	17	2.67E-03	49.4	1.31E+00
12	3	599.40*	22	42	1.47	1198.44	1185	17	1.50E-03	76.5	
13	0	603.52	23	79	2.29	1206.69	1201	9	1.63E-03	71.2	
14	0	609.91*	62	148	5.17	1219.47	1211	19	4.28E-03	53.7	
15	0	749.55	46	87	4.15	1498.65	1488	22	3.20E-03	53.8	
16	0	802.21	53	67	6.17	1603.95	1594	19	3.71E-03	39.1	
17	0	944.12	15	30	2.49	1887.71	1881	12	1.07E-03	77.7	
18	0	972.99	41	115	12.12	1945.45	1926	30	2.84E-03	79.6	
19	0	1071.44	13	38	4.33	2142.34	2135	14	9.08E-04	104.2	
20	0	1087.82	15	46	5.76	2175.09	2163	20	1.02E-03	114.9	
21	0	1098.25	16	32	2.38	2195.96	2184	16	1.12E-03	82.3	
22	0	1135.98	14	18	1.36	2271.43	2267	9	9.72E-04	60.8	
23	0	1461.07*	32	17	1.53	2921.70	2913	14	2.19E-03	46.6	
24	0	1764.69*	16	8	2.04	3529.15	3520	18	1.12E-03	68.1	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 22-JUL-2022 02:49:45

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905003.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 27-JUN-2022 10:01:00	Acquisition date	: 21-JUL-2022 22:49:13
Sample ID	: G585905003	Sample quantity	: 0.45632 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA18	Detector geometry	: JAR
Elapsed live time	: 0 04:00:00.00	Elapsed real time	: 0 04:00:01.97 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	84	10.44*	3.326E+00	9.898E+01	1.364E+02	64.57
K-40	1460.82	32	10.66*	1.441E+00	8.438E+01	8.438E+01	93.22
CU-67	91.27	-----	7.00	4.580E+00	-----	Line Not Found	-----
	93.31	19	16.10	4.671E+00	1.064E+01	8.008E+03	385.94
	184.58	8	48.70*	5.318E+00	1.285E+00	9.671E+02	873.04
AS-73	53.44	14	10.30*	8.707E-01	6.353E+01	7.857E+01	441.04
AS-74	595.83	38	59.00*	2.891E+00	9.256E+00	2.418E+01	98.73
	634.78	-----	15.40	2.770E+00	-----	Line Not Found	-----
TL-208	277.37	-----	6.60	4.452E+00	-----	Line Not Found	-----
	583.19	5	85.00*	2.935E+00	7.947E-01	8.143E-01	884.66
	860.56	-----	12.50	2.198E+00	-----	Line Not Found	-----
BI-211	72.87	-----	1.23	3.009E+00	-----	Line Not Found	-----
	351.06	18	12.92*	3.944E+00	1.479E+01	1.483E+01	239.42
BI-214	609.32	62	45.49*	2.848E+00	1.956E+01	1.956E+01	107.36
	1120.29	-----	14.92	1.764E+00	-----	Line Not Found	-----
	1764.49	16	15.30	1.311E+00	3.297E+01	3.297E+01	136.30
RA-226	186.21	8	3.59*	5.318E+00	1.744E+01	1.744E+01	873.04
U-234	53.20	14	0.12*	8.707E-01	5.453E+03	5.453E+03	441.04
	120.90	-----	0.04	5.584E+00	-----	Line Not Found	-----
CF-252	100.20	27	0.01*	5.001E+00	1.699E+04	1.729E+04	129.80

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905003.CNF;1
Acquisition date : 21-JUL-2022 22:49:13 Sensitivity : 3.000
Detector ID : GAM18 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:01.97 Half life ratio : *****
Sample date : 27-JUN-2022 10:01:00 Analyst initials: MJH1
Sample ID : G585905003 Sample Quantity : 4.5632E-01 FILTER
Batch Number : 2290721 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 8-JUN-2022 11:06:14 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.364E+02	8.631E+01	6.685E+01
K-40	8.438E+01	7.708E+01	7.687E+01
CU-67	9.671E+02	8.274E+03	6.627E+03
AS-73	7.857E+01	3.396E+02	2.734E+02
AS-74	2.418E+01	2.339E+01	2.431E+01
TL-208	8.143E-01	7.060E+00	7.259E+00
BI-211	1.483E+01	3.479E+01	3.777E+01
BI-214	1.956E+01	2.058E+01	1.543E+01
RA-226	1.744E+01	1.492E+02	1.200E+02
U-234	5.453E+03	2.357E+04	1.944E+04
CF-252	1.729E+04	2.199E+04	3.219E+04

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-8.682E-01		4.089E+00	7.232E+00	NOT IDENT.
NA-24	0.000E+00		2.672E+12	0.000E+00	SHORT HLIF
AL-26	1.364E+00		3.755E+00	7.453E+00	NOT IDENT.
SC-46	-1.149E+00		4.252E+00	7.679E+00	NOT IDENT.
V-48	-4.956E+00		1.074E+01	1.885E+01	FAIL ABUN
CR-51	-1.061E+01		5.095E+01	8.769E+01	NOT IDENT.
MN-52	1.062E+01		8.435E+01	1.617E+02	NOT IDENT.
MN-54	1.155E+00		3.768E+00	7.154E+00	NOT IDENT.
CO-56	5.905E-01		4.642E+00	8.654E+00	NOT IDENT.
CO-57	-3.729E-01		2.921E+00	4.899E+00	NOT IDENT.
NI-57	0.000E+00		4.731E+05	0.000E+00	SHORT HLIF
CO-58	-1.912E+00		4.358E+00	7.581E+00	NOT IDENT.
FE-59	9.602E+00		1.548E+01	1.673E+01	FAIL ABUN
CO-60	-2.455E-01		4.205E+00	7.875E+00	NOT IDENT.
ZN-65	-4.708E+00		8.075E+00	1.379E+01	NOT IDENT.
GE-68	2.856E+01		1.484E+02	2.159E+02	NOT IDENT.
SE-75	-4.757E-02		5.152E+00	9.107E+00	NOT IDENT.
BR-77	0.000E+00		2.113E+04	0.000E+00	SHORT HLIF
SR-82	3.499E-01		4.480E+01	7.920E+01	NOT IDENT.

RB-83	-1.475E+00	7.850E+00	1.406E+01	NOT IDENT.
RB-84	8.843E+00	9.086E+00	1.808E+01	NOT IDENT.
KR-85	-6.500E+03	1.310E+03	1.777E+03	NOT IDENT.
SR-85	-3.772E+01	7.602E+00	1.031E+01	NOT IDENT.
RB-86	3.345E+01	1.247E+02	1.853E+02	NOT IDENT.
Y-88	-8.963E-01	4.455E+00	8.129E+00	NOT IDENT.
Y-91	-1.185E+03	2.052E+03	3.476E+03	NOT IDENT.
NB-94	-4.614E-01	3.524E+00	6.168E+00	NOT IDENT.
NB-95	8.966E-01	4.764E+00	8.530E+00	NOT IDENT.
NB-95M	-6.361E+00	1.455E+01	2.522E+01	NOT IDENT.
TC-95M	1.203E+00	5.292E+00	9.238E+00	FAIL ABUN
ZR-95	-2.858E+00	8.164E+00	1.203E+01	NOT IDENT.
MO-99	-4.125E+03	1.377E+04	2.370E+04	NOT IDENT.
TC-99M	0.000E+00	1.161E+30	0.000E+00	SHORT HLIF
RH-101	-1.460E+00	3.632E+00	5.949E+00	FAIL ABUN
RH-102M	3.876E-01	3.483E+00	5.664E+00	NOT IDENT.
RU-103	2.031E+00	4.770E+00	8.980E+00	FAIL ABUN
RH-106	-3.268E+01	3.506E+01	5.771E+01	NOT IDENT.
RU-106	-3.268E+01	3.506E+01	5.771E+01	NOT IDENT.
AG-108M	-2.340E+00	3.137E+00	5.461E+00	NOT IDENT.
CD-109	7.674E+00	9.575E+01	1.511E+02	NOT IDENT.
AG-110	-2.309E+00	7.821E+01	1.392E+02	NOT IDENT.
AG-110M	-1.806E+00	5.753E+00	1.029E+01	NOT IDENT.
IN-111	-1.858E+02	1.239E+03	2.181E+03	NOT IDENT.
SN-113	1.066E+00	5.130E+00	8.979E+00	NOT IDENT.
IN-114M	8.539E+00	2.124E+01	3.590E+01	NOT IDENT.
CD-115	0.000E+00	2.261E+04	0.000E+00	SHORT HLIF
SN-117M	1.987E+00	8.908E+00	1.654E+01	NOT IDENT.
SB-122	9.148E+02	2.371E+03	4.394E+03	NOT IDENT.
I-123	0.000E+00	7.396E+13	0.000E+00	SHORT HLIF
TE-123M	1.435E-01	2.984E+00	5.492E+00	NOT IDENT.
SB-124	3.358E+00	1.026E+01	2.036E+01	NOT IDENT.
SB-125	-3.531E+00	9.487E+00	1.700E+01	FAIL ABUN
TE-125M	4.151E+02	1.187E+03	2.074E+03	NOT IDENT.
I-126	-1.972E+01	3.791E+01	6.441E+01	NOT IDENT.
SB-126	-2.010E+01	2.670E+01	4.393E+01	NOT IDENT.
SN-126	-1.766E+00	9.429E+00	1.466E+01	NOT IDENT.
SB-127	-5.936E+02	7.610E+02	1.256E+03	NOT IDENT.
TE-129	1.553E+01	6.178E+01	1.149E+02	FAIL ABUN
I-131	-1.839E+01	3.006E+01	4.951E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	-1.103E+02	5.712E+02	1.011E+03	NOT IDENT.
BA-133	8.615E-01	5.025E+00	7.892E+00	NOT IDENT.
I-133	0.000E+00	1.179E+09	0.000E+00	SHORT HLIF
CS-134	4.186E-01	4.831E+00	7.894E+00	FAIL ABUN
I-135	0.000E+00	1.359E+28	0.000E+00	SHORT HLIF
CS-136	8.441E+00	1.733E+01	3.331E+01	NOT IDENT.
BA-137M	6.233E-01	4.886E+00	7.357E+00	NOT IDENT.
CS-137	6.585E-01	5.162E+00	7.772E+00	NOT IDENT.
LA-138	-1.123E+00	6.052E+00	1.119E+01	NOT IDENT.
CE-139	1.183E-01	3.209E+00	5.876E+00	NOT IDENT.
BA-140	1.670E+01	4.644E+01	8.646E+01	NOT IDENT.
LA-140	6.758E+00	1.720E+01	3.362E+01	NOT IDENT.
CE-141	-4.489E+00	8.650E+00	1.388E+01	NOT IDENT.
CE-143	0.000E+00	1.716E+06	0.000E+00	SHORT HLIF
CE-144	7.056E+00	2.226E+01	3.821E+01	NOT IDENT.
PM-144	1.990E+00	4.120E+00	7.515E+00	FAIL ABUN
PR-144	1.466E+02	3.096E+02	5.644E+02	NOT IDENT.
PM-146	5.589E-01	4.507E+00	8.309E+00	NOT IDENT.
ND-147	5.139E+01	1.001E+02	1.899E+02	NOT IDENT.
PM-147	4.243E+04	8.302E+04	1.454E+05	NOT IDENT.
PM-149	0.000E+00	1.946E+05	0.000E+00	SHORT HLIF
EU-152	6.936E-01	1.098E+01	1.911E+01	NOT IDENT.
GD-153	5.927E-01	1.071E+01	1.706E+01	NOT IDENT.
EU-154	-2.597E+00	1.151E+01	2.033E+01	NOT IDENT.
EU-155	-8.435E-01	1.181E+01	2.013E+01	NOT IDENT.
TB-160	1.694E+01	1.521E+01	3.070E+01	NOT IDENT.
HO-166M	-1.635E+00	7.030E+00	1.214E+01	FAIL ABUN
TM-171	1.427E+03	6.166E+03	6.176E+03	FAIL ABUN
LU-176	-2.561E+00	3.111E+00	5.133E+00	NOT IDENT.
LU-177	5.677E+01	3.096E+02	5.622E+02	NOT IDENT.
HF-181	1.679E+00	5.227E+00	8.799E+00	NOT IDENT.
W-181	-5.257E+00	3.402E+01	6.013E+01	NOT IDENT.
TA-182	-5.203E+00	1.878E+01	3.285E+01	FAIL ABUN
RE-183	8.305E+00	3.305E+01	5.990E+01	NOT IDENT.
RE-184	-1.267E+01	1.388E+01	2.338E+01	NOT IDENT.
RE-188	-2.027E+01	1.833E+01	3.170E+01	FAIL ABUN
W-188	-7.272E+02	9.456E+02	1.378E+03	NOT IDENT.

OS-191	9.968E+00	2.655E+01	4.585E+01	NOT IDENT.
IR-192	1.835E+00	3.930E+00	7.126E+00	FAIL ABUN
PB-201	0.000E+00	4.131E+19	0.000E+00	SHORT HLIF
TL-201	2.020E+03	6.082E+03	1.131E+04	NOT IDENT.
TL-202	-4.478E+00	1.237E+01	2.212E+01	NOT IDENT.
HG-203	4.182E+00	4.787E+00	8.886E+00	NOT IDENT.
PB-203	0.000E+00	8.911E+03	0.000E+00	SHORT HLIF
TL-204	3.300E+02	6.267E+02	1.131E+03	NOT IDENT.
BI-207	5.566E+00	5.437E+00	1.027E+01	NOT IDENT.
PB-210	7.311E+02	8.192E+02	1.543E+03	NOT IDENT.
PB-211	-2.811E+01	7.263E+01	1.210E+02	NOT IDENT.
BI-212	-4.292E+00	7.628E+01	1.020E+02	NOT IDENT.
PB-212	-7.281E+00	8.785E+00	1.386E+01	NOT IDENT.
BI-213	-3.554E+00	1.102E+01	1.976E+01	NOT IDENT.
PB-214	5.369E+00	1.260E+01	1.656E+01	FAIL ABUN
RN-219	3.114E+01	3.892E+01	7.213E+01	FAIL ABUN
FR-221	9.613E-01	2.099E+01	3.780E+01	NOT IDENT.
RA-223	4.452E+00	7.157E+01	1.252E+02	FAIL ABUN
RA-224	-8.340E+01	7.661E+01	1.276E+02	NOT IDENT.
AC-225	5.295E+00	1.156E+02	2.082E+02	NOT IDENT.
AC-227	9.674E+00	2.690E+01	4.881E+01	NOT IDENT.
TH-227	9.674E+00	2.690E+01	4.881E+01	NOT IDENT.
AC-228	-1.571E+01	2.042E+01	3.202E+01	NOT IDENT.
RA-228	-1.571E+01	2.042E+01	3.202E+01	NOT IDENT.
TH-228	-7.281E+00	8.785E+00	1.386E+01	NOT IDENT.
TH-229	1.174E+01	5.279E+01	9.287E+01	NOT IDENT.
TH-230	-2.713E+03	1.774E+03	2.541E+03	NOT IDENT.
PA-231	1.672E+01	5.386E+01	9.597E+01	NOT IDENT.
TH-231	1.550E+01	5.954E+01	9.153E+01	NOT IDENT.
TH-232	-1.307E+03	3.721E+03	4.723E+03	NOT IDENT.
PA-233	-5.152E+00	6.917E+00	1.146E+01	FAIL ABUN
PA-234	-1.061E+01	2.832E+01	4.319E+01	FAIL ABUN
PA-234M	-4.909E+01	5.229E+02	8.807E+02	NOT IDENT.
TH-234	-1.163E+02	2.697E+02	3.408E+02	FAIL ABUN
U-235	1.852E+01	2.620E+01	3.984E+01	FAIL ABUN
NP-237	-5.152E+00	6.917E+00	1.146E+01	FAIL ABUN
NP-238	0.000E+00	4.705E+04	0.000E+00	SHORT HLIF
U-238	-1.163E+02	2.697E+02	3.408E+02	FAIL ABUN
NP-239	-8.207E+00	2.911E+01	4.851E+01	FAIL ABUN
AM-241	4.515E+00	2.270E+01	4.087E+01	NOT IDENT.
AM-242	6.137E+01	7.806E+01	1.301E+02	FAIL ABUN
AM-243	2.000E-01	6.218E+00	1.090E+01	NOT IDENT.
CM-243	3.360E+00	1.175E+01	2.053E+01	FAIL ABUN
BK-247	3.232E-01	8.727E+00	1.548E+01	NOT IDENT.
CM-247	-3.118E-01	3.753E+00	6.431E+00	NOT IDENT.
CF-249	-1.823E+00	4.364E+00	7.265E+00	NOT IDENT.
CF-251	-2.663E+00	1.325E+01	2.385E+01	NOT IDENT.
ANH-511	-1.603E+01	7.921E+00	1.374E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	53.14	40	234	0.98	106.56	103	8	2.75E-03	68.6	
2	0	92.77	172	271	0.84	185.76	181	10	1.19E-02	19.5	
3	0	99.11	27	122	0.89	198.42	197	5	1.86E-03	64.9	
4	0	185.80	147	242	1.10	371.69	367	11	1.02E-02	22.2	
5	0	199.31	48	228	0.74	398.69	393	11	3.32E-03	63.1	
6	0	239.39	63	292	2.73	478.79	473	12	4.40E-03	55.7	
7	0	270.82	30	135	1.58	541.62	537	9	2.06E-03	73.4	
8	0	294.84	75	168	1.61	589.62	584	12	5.18E-03	36.6	
9	0	351.81	66	97	1.10	703.50	699	9	4.59E-03	29.5	
10	0	478.05	84	120	1.73	955.86	947	17	5.80E-03	32.3	
11	0	510.73	501	182	2.38	1021.19	1012	20	3.48E-02	7.9	
12	0	583.35	43	96	1.42	1166.36	1161	10	2.99E-03	45.4	
13	3	596.67	38	72	2.02	1193.00	1185	17	2.67E-03	49.4	1.31E+00
14	3	599.40	37	42	1.47	1198.44	1185	17	2.54E-03	34.0	
15	0	603.52	23	79	2.29	1206.69	1201	9	1.63E-03	71.2	
16	0	609.91	115	148	5.17	1219.47	1211	19	7.96E-03	27.4	
17	0	749.55	46	87	4.15	1498.65	1488	22	3.20E-03	53.8	
18	0	802.21	53	67	6.17	1603.95	1594	19	3.71E-03	39.1	
19	0	912.55	40	58	3.84	1824.60	1817	15	2.75E-03	45.4	
20	0	944.12	15	30	2.49	1887.71	1881	12	1.07E-03	77.7	
21	0	972.99	41	115	12.12	1945.45	1926	30	2.84E-03	79.6	
22	0	1071.44	13	38	4.33	2142.34	2135	14	9.08E-04	104.2	
23	0	1087.82	15	46	5.76	2175.09	2163	20	1.02E-03	114.9	
24	0	1098.25	16	32	2.38	2195.96	2184	16	1.12E-03	82.3	
25	0	1135.98	14	18	1.36	2271.43	2267	9	9.72E-04	60.8	
26	0	1461.07	57	17	1.53	2921.70	2913	14	3.96E-03	20.4	
27	0	1764.69	37	8	2.04	3529.15	3520	18	2.55E-03	23.1	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	84	10.44*	3.326E+00	9.898E+01	1.364E+02	64.57
K-40	1460.82	32	10.66*	1.441E+00	8.438E+01	8.438E+01	93.22
CU-67	91.27	-----	7.00	4.580E+00	-----	Line Not Found	-----
	93.31	19	16.10	4.671E+00	1.064E+01	8.008E+03	385.94
	184.58	8	48.70*	5.318E+00	1.285E+00	9.671E+02	873.04
AS-73	53.44	14	10.30*	8.707E-01	6.353E+01	7.857E+01	441.04
AS-74	595.83	38	59.00*	2.891E+00	9.256E+00	2.418E+01	98.73
	634.78	-----	15.40	2.770E+00	-----	Line Not Found	-----
TL-208	277.37	-----	6.60	4.452E+00	-----	Line Not Found	-----
	583.19	5	85.00*	2.935E+00	7.947E-01	8.143E-01	884.66
	860.56	-----	12.50	2.198E+00	-----	Line Not Found	-----
BI-211	72.87	-----	1.23	3.009E+00	-----	Line Not Found	-----
	351.06	18	12.92*	3.944E+00	1.479E+01	1.483E+01	239.42
BI-214	609.32	62	45.49*	2.848E+00	1.956E+01	1.956E+01	107.36
	1120.29	-----	14.92	1.764E+00	-----	Line Not Found	-----
	1764.49	16	15.30	1.311E+00	3.297E+01	3.297E+01	136.30
RA-226	186.21	8	3.59*	5.318E+00	1.744E+01	1.744E+01	873.04
U-234	53.20	14	0.12*	8.707E-01	5.453E+03	5.453E+03	441.04
	120.90	-----	0.04	5.584E+00	-----	Line Not Found	-----
CF-252	100.20	27	0.01*	5.001E+00	1.699E+04	1.729E+04	129.80

Flag: "*" = Keyline

Total number of lines in spectrum 24
Number of unidentified lines 5
Number of lines tentatively identified by NID 19 79.17%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.38	9.898E+01	1.364E+02	0.881E+02	64.57	
K-40	1.25E+09Y	1.00	8.438E+01	8.438E+01	7.865E+01	93.22	
CU-67	61.83H	752.	1.285E+00	9.671E+02	84.43E+02	873.04	
AS-73	80.30D	1.24	6.353E+01	7.857E+01	34.65E+01	441.04	
AS-74	17.77D	2.61	9.256E+00	2.418E+01	2.387E+01	98.73	
TL-208	1.91Y	1.02	7.947E-01	8.143E-01	72.04E-01	884.66	
BI-211	21.77Y	1.00	1.479E+01	1.483E+01	3.550E+01	239.42	
BI-214	1600.00Y	1.00	1.956E+01	1.956E+01	2.100E+01	107.36	
RA-226	1600.00Y	1.00	1.744E+01	1.744E+01	15.22E+01	873.04	
U-234	2.45E+05Y	1.00	5.453E+03	5.453E+03	24.05E+03	441.04	
CF-252	2.65Y	1.02	1.699E+04	1.729E+04	2.244E+04	129.80	
Total Activity :			2.275E+04	2.409E+04			

Grand Total Activity : 2.275E+04 2.409E+04

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	199.31	5	228	0.74	398.69	393	11	3.50E-04	****	5.18E+00	T
0	270.82	4	135	1.58	541.62	537	9	2.89E-04	****	4.50E+00	T
0	294.84	50	168	1.61	589.62	584	12	3.46E-03	****	4.32E+00	T
3	599.40	22	42	1.47	1198.44	1185	17	1.50E-03	****	2.88E+00	T
0	603.52	23	79	2.29	1206.69	1201	9	1.63E-03	****	2.87E+00	T
0	749.55	46	87	4.15	1498.65	1488	22	3.20E-03	****	2.45E+00	
0	802.21	53	67	6.17	1603.95	1594	19	3.71E-03	78.2	2.33E+00	T
0	944.12	15	30	2.49	1887.71	1881	12	1.07E-03	****	2.04E+00	T
0	972.99	41	115	12.12	1945.45	1926	30	2.84E-03	****	1.99E+00	
0	1071.44	13	38	4.33	2142.34	2135	14	9.08E-04	****	1.83E+00	
0	1087.82	15	46	5.76	2175.09	2163	20	1.02E-03	****	1.81E+00	
0	1098.25	16	32	2.38	2195.96	2184	16	1.12E-03	****	1.79E+00	T
0	1135.98	14	18	1.36	2271.43	2267	9	9.72E-04	****	1.74E+00	

Flags: "T" = Tentatively associated


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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905003.CNF;1  *
* Acquisition date   : 21-JUL-2022 22:49:13 Sensitivity      : 3.000          *
* Detector ID       : GAM18 Energy tolerance: 1.500          *
* Elapsed live time : 0 04:00:00.00 Abundance limit : 75.000      *
* Elapsed real time : 0 04:00:01.97 Half life ratio : *****          *
* Sample date       : 27-JUN-2022 10:01:00 Nuclide Library : LIQUID      *
* Sample ID        : G585905003 Analyst initials: MJH1          *
* Batch Number     : 2290721 Sample Quantity : 4.5632E-01 FILTER *
* Wet wt corr      : 1.00000 Wet Weight      : 0.00000          *
*                                     Dry Weight      : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date    : 8-JUN-2022 11:06:14 Eff. Geometry    : JAR          *
* Eff. File         : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19          *
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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.123E+01
K-40	3.483E+01
CU-67	3.154E+03
AS-73	1.293E+02
AS-74	1.131E+01
TL-208	3.403E+00
BI-211	1.780E+01
BI-214	7.290E+00
RA-226	5.713E+01
U-234	9.195E+03
CF-252	1.524E+04

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	3.261E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	3.299E+00	NOT IDENT.
SC-46	3.522E+00	NOT IDENT.
V-48	8.605E+00	FAIL ABUN
CR-51	4.135E+01	NOT IDENT.
MN-52	7.281E+01	NOT IDENT.
MN-54	3.318E+00	NOT IDENT.
CO-56	4.017E+00	NOT IDENT.
CO-57	2.327E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.483E+00	NOT IDENT.
FE-59	7.562E+00	FAIL ABUN
CO-60	3.574E+00	NOT IDENT.
ZN-65	6.234E+00	NOT IDENT.
GE-68	9.789E+01	NOT IDENT.
SE-75	4.317E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	3.659E+01	NOT IDENT.
RB-83	6.555E+00	NOT IDENT.

RB-84	8.414E+00	NOT IDENT.
KR-85	8.483E+02	NOT IDENT.
SR-85	4.922E+00	NOT IDENT.
RB-86	8.385E+01	NOT IDENT.
Y-88	3.558E+00	NOT IDENT.
Y-91	1.566E+03	NOT IDENT.
NB-94	2.869E+00	NOT IDENT.
NB-95	3.965E+00	NOT IDENT.
NB-95M	1.201E+01	NOT IDENT.
TC-95M	4.394E+00	FAIL ABUN
ZR-95	5.470E+00	NOT IDENT.
MO-99	1.094E+04	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.829E+00	FAIL ABUN
RH-102M	2.655E+00	NOT IDENT.
RU-103	4.202E+00	FAIL ABUN
RH-106	2.678E+01	NOT IDENT.
RU-106	2.678E+01	NOT IDENT.
AG-108M	2.557E+00	NOT IDENT.
CD-109	7.202E+01	NOT IDENT.
AG-110	6.471E+01	NOT IDENT.
AG-110M	4.765E+00	NOT IDENT.
IN-111	1.035E+03	NOT IDENT.
SN-113	4.225E+00	NOT IDENT.
IN-114M	1.700E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	7.866E+00	NOT IDENT.
SB-122	2.059E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.610E+00	NOT IDENT.
SB-124	9.020E+00	NOT IDENT.
SB-125	7.968E+00	FAIL ABUN
TE-125M	9.857E+02	NOT IDENT.
I-126	2.986E+01	NOT IDENT.
SB-126	2.034E+01	NOT IDENT.
SN-126	6.986E+00	NOT IDENT.
SB-127	5.797E+02	NOT IDENT.
TE-129	5.397E+01	FAIL ABUN
I-131	2.329E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	4.788E+02	NOT IDENT.
BA-133	3.718E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.664E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	1.530E+01	NOT IDENT.
BA-137M	3.450E+00	NOT IDENT.
CS-137	3.645E+00	NOT IDENT.
LA-138	5.015E+00	NOT IDENT.
CE-139	2.797E+00	NOT IDENT.
BA-140	4.044E+01	NOT IDENT.
LA-140	1.519E+01	NOT IDENT.
CE-141	6.600E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.818E+01	NOT IDENT.
PM-144	3.533E+00	FAIL ABUN
PR-144	2.653E+02	NOT IDENT.
PM-146	3.904E+00	NOT IDENT.
ND-147	8.853E+01	NOT IDENT.
PM-147	6.919E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	9.033E+00	NOT IDENT.
GD-153	8.118E+00	NOT IDENT.
EU-154	9.162E+00	NOT IDENT.
EU-155	9.560E+00	NOT IDENT.
TB-160	1.427E+01	NOT IDENT.
HO-166M	5.668E+00	FAIL ABUN
TM-171	2.939E+03	FAIL ABUN
LU-176	2.427E+00	NOT IDENT.
LU-177	2.675E+02	NOT IDENT.
HF-181	4.089E+00	NOT IDENT.
W-181	2.854E+01	NOT IDENT.
TA-182	1.498E+01	FAIL ABUN
RE-183	2.843E+01	NOT IDENT.
RE-184	1.057E+01	NOT IDENT.
RE-188	1.505E+01	FAIL ABUN
W-188	6.489E+02	NOT IDENT.
OS-191	2.181E+01	NOT IDENT.

IR-192	3.361E+00	FAIL ABUN
PB-201	0.000E+00	SHORT HLIF
TL-201	5.383E+03	NOT IDENT.
TL-202	1.037E+01	NOT IDENT.
HG-203	4.223E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	5.401E+02	NOT IDENT.
BI-207	4.730E+00	NOT IDENT.
PB-210	7.366E+02	NOT IDENT.
PB-211	5.647E+01	NOT IDENT.
BI-212	4.764E+01	NOT IDENT.
PB-212	6.662E+00	NOT IDENT.
BI-213	9.270E+00	NOT IDENT.
PB-214	7.890E+00	FAIL ABUN
RN-219	3.378E+01	FAIL ABUN
FR-221	1.793E+01	NOT IDENT.
RA-223	5.922E+01	FAIL ABUN
RA-224	6.091E+01	NOT IDENT.
AC-225	9.876E+01	NOT IDENT.
AC-227	2.315E+01	NOT IDENT.
TH-227	2.315E+01	NOT IDENT.
AC-228	1.498E+01	NOT IDENT.
RA-228	1.498E+01	NOT IDENT.
TH-228	6.662E+00	NOT IDENT.
TH-229	4.405E+01	NOT IDENT.
TH-230	1.211E+03	NOT IDENT.
PA-231	4.557E+01	NOT IDENT.
TH-231	4.372E+01	NOT IDENT.
TH-232	2.255E+03	NOT IDENT.
PA-233	5.388E+00	FAIL ABUN
PA-234	1.932E+01	FAIL ABUN
PA-234M	4.064E+02	NOT IDENT.
TH-234	1.627E+02	FAIL ABUN
U-235	1.903E+01	FAIL ABUN
NP-237	5.388E+00	FAIL ABUN
NP-238	0.000E+00	SHORT HLIF
U-238	1.627E+02	FAIL ABUN
NP-239	2.300E+01	FAIL ABUN
AM-241	1.943E+01	NOT IDENT.
AM-242	6.198E+01	FAIL ABUN
AM-243	5.192E+00	NOT IDENT.
CM-243	9.757E+00	FAIL ABUN
BK-247	7.334E+00	NOT IDENT.
CM-247	3.006E+00	NOT IDENT.
CF-249	3.409E+00	NOT IDENT.
CF-251	1.134E+01	NOT IDENT.
ANH-511	6.698E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905003.CNF;1
Acquisition date : 21-JUL-2022 22:49:13 Sensitivity : 3.000
Detector ID : GAM18 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:01.97 Half life ratio : *****
Sample date : 27-JUN-2022 10:01:00 Nuclide Library : LIQUID
Sample ID : G585905003 Analyst initials: MJH1
Batch Number : 2290721 Sample Quantity : 4.5632E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 8-JUN-2022 11:06:14 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.364E+02	8.706E+01	8.711E+01
K-40	8.438E+01	7.748E+01	7.749E+01
CU-67	9.671E+02	8.275E+03	8.275E+03
AS-73	7.857E+01	3.401E+02	3.401E+02
AS-74	2.418E+01	2.354E+01	2.354E+01
TL-208	8.143E-01	7.060E+00	7.060E+00
BI-211	1.483E+01	3.481E+01	3.481E+01
BI-214	1.956E+01	2.065E+01	2.065E+01
RA-226	1.744E+01	1.492E+02	1.492E+02
U-234	5.453E+03	2.358E+04	2.358E+04
CF-252	1.729E+04	2.702E+04	2.703E+04

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-8.682E-01	4.090E+00	4.109E+00	NOT IDENT.
NA-24	-4.306E+11	2.672E+12	2.679E+12	SHORT HLIF
AL-26	1.364E+00	3.756E+00	3.806E+00	NOT IDENT.
SC-46	-1.149E+00	4.253E+00	4.285E+00	NOT IDENT.
V-48	-4.956E+00	1.076E+01	1.099E+01	FAIL ABUN
CR-51	-1.061E+01	5.096E+01	5.118E+01	NOT IDENT.
MN-52	1.062E+01	8.436E+01	8.449E+01	NOT IDENT.
MN-54	1.155E+00	3.770E+00	3.806E+00	NOT IDENT.
CO-56	5.905E-01	4.643E+00	4.650E+00	NOT IDENT.
CO-57	-3.729E-01	2.921E+00	2.926E+00	NOT IDENT.
NI-57	1.854E+05	4.735E+05	4.809E+05	SHORT HLIF
CO-58	-1.912E+00	4.362E+00	4.446E+00	NOT IDENT.
FE-59	9.602E+00	1.552E+01	1.612E+01	FAIL ABUN
CO-60	-2.455E-01	4.205E+00	4.206E+00	NOT IDENT.
ZN-65	-4.708E+00	8.088E+00	8.362E+00	NOT IDENT.
GE-68	2.856E+01	1.484E+02	1.489E+02	NOT IDENT.
SE-75	-4.757E-02	5.152E+00	5.152E+00	NOT IDENT.
BR-77	-1.002E+04	2.115E+04	2.162E+04	SHORT HLIF
SR-82	3.499E-01	4.480E+01	4.480E+01	NOT IDENT.

RB-83	-1.475E+00	7.854E+00	7.882E+00	NOT IDENT.
RB-84	8.843E+00	9.131E+00	9.965E+00	NOT IDENT.
KR-85	-6.500E+03	1.419E+03	3.258E+03	NOT IDENT.
SR-85	-3.772E+01	8.234E+00	1.891E+01	NOT IDENT.
RB-86	3.345E+01	1.247E+02	1.256E+02	NOT IDENT.
Y-88	-8.963E-01	4.456E+00	4.474E+00	NOT IDENT.
Y-91	-1.185E+03	2.055E+03	2.124E+03	NOT IDENT.
NB-94	-4.614E-01	3.524E+00	3.530E+00	NOT IDENT.
NB-95	8.966E-01	4.764E+00	4.781E+00	NOT IDENT.
NB-95M	-6.361E+00	1.457E+01	1.485E+01	NOT IDENT.
TC-95M	1.203E+00	5.293E+00	5.320E+00	FAIL ABUN
ZR-95	-2.858E+00	8.168E+00	8.269E+00	NOT IDENT.
MO-99	-4.125E+03	1.378E+04	1.390E+04	NOT IDENT.
TC-99M	-1.133E+30	1.168E+30	0.000E+00	SHORT HLIF
RH-101	-1.460E+00	3.643E+00	3.702E+00	FAIL ABUN
RH-102M	3.876E-01	3.483E+00	3.488E+00	NOT IDENT.
RU-103	2.031E+00	4.773E+00	4.860E+00	FAIL ABUN
RH-106	-3.268E+01	3.519E+01	3.816E+01	NOT IDENT.
RU-106	-3.268E+01	3.519E+01	3.816E+01	NOT IDENT.
AG-108M	-2.340E+00	3.142E+00	3.315E+00	NOT IDENT.
CD-109	7.674E+00	9.575E+01	9.581E+01	NOT IDENT.
AG-110	-2.309E+00	7.821E+01	7.821E+01	NOT IDENT.
AG-110M	-1.806E+00	5.756E+00	5.814E+00	NOT IDENT.
IN-111	-1.858E+02	1.239E+03	1.242E+03	NOT IDENT.
SN-113	1.066E+00	5.131E+00	5.154E+00	NOT IDENT.
IN-114M	8.539E+00	2.125E+01	2.160E+01	NOT IDENT.
CD-115	2.872E+03	2.261E+04	2.265E+04	SHORT HLIF
SN-117M	1.987E+00	8.909E+00	8.954E+00	NOT IDENT.
SB-122	9.148E+02	2.372E+03	2.408E+03	NOT IDENT.
I-123	4.761E+12	7.397E+13	7.400E+13	SHORT HLIF
TE-123M	1.435E-01	2.984E+00	2.985E+00	NOT IDENT.
SB-124	3.358E+00	1.027E+01	1.038E+01	NOT IDENT.
SB-125	-3.531E+00	9.492E+00	9.624E+00	FAIL ABUN
TE-125M	4.151E+02	1.187E+03	1.202E+03	NOT IDENT.
I-126	-1.972E+01	3.796E+01	3.899E+01	NOT IDENT.
SB-126	-2.010E+01	2.682E+01	2.831E+01	NOT IDENT.
SN-126	-1.766E+00	9.430E+00	9.464E+00	NOT IDENT.
SB-127	-5.936E+02	7.656E+02	8.111E+02	NOT IDENT.
TE-129	1.553E+01	6.183E+01	6.223E+01	FAIL ABUN
I-131	-1.839E+01	3.010E+01	3.122E+01	NOT IDENT.
I-132	-1.000E+41	3.089E+41	0.000E+00	SHORT HLIF
TE-132	-1.103E+02	5.713E+02	5.735E+02	NOT IDENT.
BA-133	8.615E-01	5.026E+00	5.041E+00	NOT IDENT.
I-133	-8.514E+07	1.179E+09	1.180E+09	SHORT HLIF
CS-134	4.186E-01	4.831E+00	4.835E+00	FAIL ABUN
I-135	3.633E+27	1.375E+28	0.000E+00	SHORT HLIF
CS-136	8.441E+00	1.736E+01	1.777E+01	NOT IDENT.
BA-137M	6.233E-01	4.887E+00	4.895E+00	NOT IDENT.
CS-137	6.585E-01	5.162E+00	5.171E+00	NOT IDENT.
LA-138	-1.123E+00	6.053E+00	6.074E+00	NOT IDENT.
CE-139	1.183E-01	3.209E+00	3.210E+00	NOT IDENT.
BA-140	1.670E+01	4.646E+01	4.707E+01	NOT IDENT.
LA-140	6.758E+00	1.721E+01	1.748E+01	NOT IDENT.
CE-141	-4.489E+00	8.656E+00	8.890E+00	NOT IDENT.
CE-143	1.465E+06	1.720E+06	1.843E+06	SHORT HLIF
CE-144	7.056E+00	2.227E+01	2.250E+01	NOT IDENT.
PM-144	1.990E+00	4.123E+00	4.220E+00	FAIL ABUN
PR-144	1.466E+02	3.099E+02	3.168E+02	NOT IDENT.
PM-146	5.589E-01	4.507E+00	4.514E+00	NOT IDENT.
ND-147	5.139E+01	1.002E+02	1.029E+02	NOT IDENT.
PM-147	4.243E+04	8.308E+04	8.526E+04	NOT IDENT.
PM-149	-5.082E+04	1.948E+05	1.961E+05	SHORT HLIF
EU-152	6.936E-01	1.098E+01	1.098E+01	NOT IDENT.
GD-153	5.927E-01	1.071E+01	1.071E+01	NOT IDENT.
EU-154	-2.597E+00	1.151E+01	1.157E+01	NOT IDENT.
EU-155	-8.435E-01	1.182E+01	1.182E+01	NOT IDENT.
TB-160	1.694E+01	1.532E+01	1.712E+01	NOT IDENT.
HO-166M	-1.635E+00	7.031E+00	7.070E+00	FAIL ABUN
TM-171	1.427E+03	6.168E+03	6.202E+03	FAIL ABUN
LU-176	-2.561E+00	3.118E+00	3.325E+00	NOT IDENT.
LU-177	5.677E+01	3.096E+02	3.107E+02	NOT IDENT.
HF-181	1.679E+00	5.229E+00	5.284E+00	NOT IDENT.
W-181	-5.257E+00	3.404E+01	3.413E+01	NOT IDENT.
TA-182	-5.203E+00	1.878E+01	1.893E+01	FAIL ABUN
RE-183	8.305E+00	3.307E+01	3.328E+01	NOT IDENT.
RE-184	-1.267E+01	1.397E+01	1.509E+01	NOT IDENT.
RE-188	-2.027E+01	1.840E+01	2.055E+01	FAIL ABUN
W-188	-7.272E+02	9.504E+02	1.005E+03	NOT IDENT.

OS-191	9.968E+00	2.656E+01	2.694E+01	NOT IDENT.
IR-192	1.835E+00	3.933E+00	4.020E+00	FAIL ABUN
PB-201	-1.250E+19	4.151E+19	0.000E+00	SHORT HLIF
TL-201	2.020E+03	6.084E+03	6.151E+03	NOT IDENT.
TL-202	-4.478E+00	1.237E+01	1.254E+01	NOT IDENT.
HG-203	4.182E+00	4.799E+00	5.157E+00	NOT IDENT.
PB-203	7.785E+03	8.934E+03	9.600E+03	SHORT HLIF
TL-204	3.300E+02	6.277E+02	6.452E+02	NOT IDENT.
BI-207	5.566E+00	5.465E+00	6.014E+00	NOT IDENT.
PB-210	7.311E+02	8.230E+02	8.867E+02	NOT IDENT.
PB-211	-2.811E+01	7.268E+01	7.377E+01	NOT IDENT.
BI-212	-4.292E+00	7.628E+01	7.631E+01	NOT IDENT.
PB-212	-7.281E+00	8.805E+00	9.398E+00	NOT IDENT.
BI-213	-3.554E+00	1.103E+01	1.114E+01	NOT IDENT.
PB-214	5.369E+00	1.261E+01	1.284E+01	FAIL ABUN
RN-219	3.114E+01	3.918E+01	4.162E+01	FAIL ABUN
FR-221	9.613E-01	2.099E+01	2.099E+01	NOT IDENT.
RA-223	4.452E+00	7.157E+01	7.160E+01	FAIL ABUN
RA-224	-8.340E+01	7.692E+01	8.564E+01	NOT IDENT.
AC-225	5.295E+00	1.156E+02	1.156E+02	NOT IDENT.
AC-227	9.674E+00	2.694E+01	2.729E+01	NOT IDENT.
TH-227	9.674E+00	2.694E+01	2.729E+01	NOT IDENT.
AC-228	-1.571E+01	2.049E+01	2.168E+01	NOT IDENT.
RA-228	-1.571E+01	2.049E+01	2.168E+01	NOT IDENT.
TH-228	-7.281E+00	8.805E+00	9.398E+00	NOT IDENT.
TH-229	1.174E+01	5.280E+01	5.307E+01	NOT IDENT.
TH-230	-2.713E+03	1.841E+03	2.211E+03	NOT IDENT.
PA-231	1.672E+01	5.399E+01	5.451E+01	NOT IDENT.
TH-231	1.550E+01	5.959E+01	6.000E+01	NOT IDENT.
TH-232	-1.307E+03	3.725E+03	3.771E+03	NOT IDENT.
PA-233	-5.152E+00	6.931E+00	7.310E+00	FAIL ABUN
PA-234	-1.061E+01	3.083E+01	3.120E+01	FAIL ABUN
PA-234M	-4.909E+01	5.230E+02	5.234E+02	NOT IDENT.
TH-234	-1.163E+02	2.711E+02	2.761E+02	FAIL ABUN
U-235	1.852E+01	2.624E+01	2.754E+01	FAIL ABUN
NP-237	-5.152E+00	6.931E+00	7.310E+00	FAIL ABUN
NP-238	-3.060E+04	4.715E+04	4.913E+04	SHORT HLIF
U-238	-1.163E+02	2.711E+02	2.761E+02	FAIL ABUN
NP-239	-8.207E+00	2.911E+01	2.935E+01	FAIL ABUN
AM-241	4.515E+00	2.270E+01	2.280E+01	NOT IDENT.
AM-242	6.137E+01	7.886E+01	8.358E+01	FAIL ABUN
AM-243	2.000E-01	6.218E+00	6.219E+00	NOT IDENT.
CM-243	3.360E+00	1.175E+01	1.185E+01	FAIL ABUN
BK-247	3.232E-01	8.727E+00	8.728E+00	NOT IDENT.
CM-247	-3.118E-01	3.754E+00	3.756E+00	NOT IDENT.
CF-249	-1.823E+00	4.369E+00	4.446E+00	NOT IDENT.
CF-251	-2.663E+00	1.326E+01	1.331E+01	NOT IDENT.
ANH-511	-1.603E+01	8.035E+00	1.081E+01	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	140.5758	133.52	128.9486	116.30	124.4477
879.38	141.1783	364.49	133.1731	116.74	119.9267
46.54	120.8013	80.22	133.1886	117.23	124.7359
228.16	115.2581	711.68	133.3417	119.76	113.7836
52.39	118.6456	356.01	130.3773	120.54	110.4732
53.20	102.0254	323.87	130.4076	120.90	111.7463
53.44	102.1366	82.35	0.0000	264.66	111.8058
57.53	112.3704	82.47	151.0811	121.22	111.8326
293.27	0.0000	82.47	151.0833	344.28	128.4861
57.53	121.3237	83.79	124.1420	122.06	123.8544
482.18	121.3247	265.00	124.2259	1274.44	128.8837
57.98	109.0157	84.21	111.5601	123.68	133.8077
59.32	116.4258	84.86	0.0000	1377.63	0.0000
59.54	116.5329	193.51	143.9937	127.23	138.5089
155.04	140.9683	105.31	147.7147	129.43	115.2129
63.00	135.9214	86.79	142.4693	131.20	138.5735
129.43	142.9811	86.94	142.5373	133.02	113.7335
63.29	142.9811	87.09	144.7487	133.52	116.2837
290.67	143.1465	87.57	127.7848	135.34	114.3230
63.81	140.3129	88.03	118.2891	136.00	136.4128
87.57	168.2922	306.78	117.6848	136.28	136.4966
64.99	177.6972	88.47	117.7324	136.47	136.5547
65.08	177.7586	531.02	130.2640	739.50	132.8362
66.73	144.9170	184.58	124.8969	140.51	0.0000
66.98	145.0553	92.59	125.3926	140.88	132.9417
67.24	147.2019	93.31	125.6610	143.76	111.4645
67.67	163.4912	94.56	125.7596	144.24	127.6938
1221.41	163.5397	311.90	125.7928	145.44	141.6877
439.51	164.2436	946.00	125.7998	152.32	122.6900
70.82	164.2436	97.43	125.3357	152.43	120.1951
167.43	164.2461	98.43	133.0875	1048.07	124.6025
97.43	126.3218	98.44	133.0911	154.21	136.6512
70.82	132.9449	99.53	127.9396	155.04	149.5508
70.82	132.9459	103.37	127.9396	158.56	128.6768
279.20	0.0000	116.74	127.9396	158.97	0.0000
1063.66	145.1526	100.11	105.4903	159.00	120.9146
72.87	0.0000	100.20	105.5170	162.33	113.9789
351.06	145.1840	102.03	98.5878	537.26	119.1958
74.66	134.7909	103.18	120.2534	163.33	114.1968
238.63	134.8669	103.37	112.4451	165.86	128.5471
351.93	134.8669	105.31	122.0817	167.43	117.6760
238.63	134.8669	106.12	109.8865	245.35	112.4157
74.97	134.9378	106.47	108.8562	427.87	123.9946
77.11	145.2840	109.28	111.9532	176.60	127.5786
256.23	128.7628	111.00	112.4557	177.52	128.6693
79.82	128.8210	111.76	137.9709	181.07	142.3347
80.02	128.9055	208.37	118.7873	184.41	129.7828
80.03	128.9073	116.24	124.4290	184.58	129.3744

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	129.6274	300.09	114.7687	477.60	67.7313
186.21	129.7365	300.13	114.7732	477.99	67.7513
190.27	94.5955	301.36	109.1628	482.18	50.6514
193.51	106.5200	302.85	101.9889	487.02	71.0250
197.03	131.1899	304.50	115.8746	492.35	0.0000
198.01	121.3620	304.85	115.9194	497.08	61.2063
201.83	121.1920	306.78	125.6797	511.00	117.0138
204.12	119.4236	308.46	89.9407	514.00	361.3385
205.31	112.6313	311.90	103.0329	520.40	68.0034
208.37	122.4502	316.51	80.0720	520.69	0.0000
210.85	112.6780	319.41	100.6744	667.71	0.0000
215.65	111.6315	320.08	97.5317	527.90	0.0000
218.12	112.0479	321.04	99.7813	529.59	65.5575
222.11	102.2959	323.87	101.1621	529.87	0.0000
227.09	108.7687	325.23	94.8446	531.02	53.0782
227.38	102.1335	1596.21	96.2845	537.26	62.0332
228.16	113.7160	331.15	0.0000	1260.41	0.0000
228.18	107.0291	333.37	93.4921	552.55	60.7304
235.69	145.8512	334.37	103.3863	795.86	72.0220
235.96	180.6921	338.28	90.6951	564.24	65.1581
238.63	156.1522	911.20	90.6985	569.33	77.2668
238.98	0.0000	340.48	101.8531	569.50	73.3135
240.99	185.8551	340.55	101.8607	569.70	73.3225
242.00	156.8810	344.28	97.8544	582.08	83.1086
244.70	118.3413	345.93	98.0191	583.19	74.9725
245.35	122.3615	351.06	89.6732	595.83	59.6607
459.60	108.4469	351.93	89.7506	600.60	40.4333
685.70	104.7513	356.01	83.4427	604.72	97.2920
388.16	110.7388	361.25	0.0000	609.32	97.5703
256.23	102.3022	364.49	100.9698	610.33	97.6318
527.90	0.0000	366.42	82.0507	614.28	89.7161
264.66	110.4532	383.85	73.1367	618.01	65.3984
265.00	108.4922	388.16	88.3451	621.93	76.8242
269.46	100.0151	666.33	83.7914	630.19	0.0000
401.81	102.2617	391.70	79.4233	631.29	80.3518
273.65	92.9222	400.66	63.8254	632.98	60.8419
276.40	115.1473	401.32	0.0000	633.25	60.8510
583.19	109.1639	401.81	54.5981	634.78	62.9733
277.60	109.1943	402.40	70.8986	635.95	60.9500
402.40	99.0386	404.85	75.7130	636.99	63.0570
278.43	96.0253	410.95	81.6844	657.50	59.6406
279.20	0.0000	720.70	81.0728	884.68	64.8817
279.54	106.3846	423.72	80.8178	661.66	55.5895
280.46	122.8906	427.09	83.7231	664.57	0.0000
301.36	103.8378	427.87	83.7776	666.33	65.2052
284.31	113.1734	433.94	90.4787	666.50	67.3145
285.41	107.1421	439.51	83.6994	667.71	0.0000
285.90	0.0000	440.45	84.6654	677.62	53.9836
287.50	87.7877	453.88	78.3141	685.70	64.8628
290.67	110.4066	459.60	73.1860	692.65	69.3858
293.27	0.0000	463.37	71.5706	695.00	65.2016
295.22	94.8435	468.07	58.9424	696.49	70.6044
316.51	94.9250	473.00	76.9209	696.51	70.6044
298.58	111.4294	475.06	72.5992	697.00	71.6946
299.98	114.7531	696.49	67.6890	697.49	70.6426

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	62.2569	903.28	45.4793	1291.59	27.3682
706.68	75.3043	907.67	0.0000	1298.22	0.0000
711.68	72.2732	911.20	43.7359	1312.11	24.7917
720.70	69.3750	984.45	0.0000	1332.49	33.2666
721.93	0.0000	926.36	39.2383	1365.19	17.7336
1690.97	61.8567	935.54	40.3542	1368.63	0.0000
722.91	62.9454	937.49	70.5171	1377.63	0.0000
723.31	68.3871	983.53	24.1077	1384.29	26.2842
756.73	71.6779	945.96	0.0000	1408.01	25.5245
727.33	59.8306	946.00	30.5603	1434.09	25.7190
733.00	54.5563	949.00	30.5990	1435.80	27.6383
735.93	40.4337	954.55	0.0000	1457.56	0.0000
739.50	53.6491	962.31	43.7256	1460.82	31.2646
1434.09	36.8792	964.08	50.2400	1489.16	21.2865
747.24	41.7736	966.17	45.7424	1596.21	23.9043
752.31	41.8837	968.97	45.7952	1620.50	26.0603
753.82	38.8276	983.53	45.0892	1678.03	0.0000
756.73	40.6537	984.45	0.0000	1690.97	16.3262
763.94	53.2236	996.26	57.1447	1757.55	0.0000
765.80	54.3833	1001.03	26.6526	1764.49	13.5046
1001.03	61.0609	1004.73	55.3615	1770.23	10.6996
766.84	57.7430	1025.87	0.0000	1771.35	16.0539
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	49.0999	1037.84	33.0516	1808.65	15.7458
777.92	51.3682	1038.76	0.0000	1836.06	19.0151
778.90	41.3382	1046.59	36.1793		
783.70	42.5575	1048.07	34.1876		
1435.80	58.3826	1050.41	37.2385		
903.28	56.2286	1063.66	27.4556		
795.86	54.0806	1077.00	25.4163		
801.95	56.9553	1077.34	27.9606		
802.10	56.9599	1083.85	30.5771		
810.29	44.2511	1085.87	30.6006		
810.45	44.2547	1099.25	41.0039		
810.76	51.4496	1111.64	31.9218		
815.77	41.8661	1112.07	33.9861		
818.51	46.4777	1112.84	30.9053		
832.01	52.2811	1115.54	39.1856		
834.85	48.6769	1120.29	28.9242		
835.15	48.6847	1120.55	26.8607		
836.80	0.0000	1121.30	27.9004		
846.77	53.5679	1808.65	32.5749		
856.80	45.4662	1131.51	0.0000		
860.56	53.9105	1332.49	32.6287		
871.09	39.2263	1177.95	40.0614		
873.19	34.5899	1189.05	25.3992		
875.33	0.0000	1204.77	37.2405		
879.38	37.4990	1221.41	40.6589		
880.51	37.5176	1231.02	25.7613		
881.60	41.2897	1235.36	38.6982		
883.24	57.2858	1238.28	36.5832		
884.68	59.2009	1260.41	0.0000		
889.28	46.1409	1271.87	34.8109		
894.76	46.2533	1274.44	31.5743		
1836.06	36.8672	1274.54	31.5743		

VAX/VMS Nuclide Identification Report Generated 22-JUL-2022 02:50:53.63

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905004.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM30.CNF;620
Background date    : 16-JUL-2022 14:06:35
Sample date       : 27-JUN-2022 10:08:00 Acquisition date : 21-JUL-2022 22:50:24
Sample ID        : G585905004 Sample quantity : 4.70520E-01 FILTER
Detector name     : GAM30 Detector geometry: JAR
Elapsed live time : 0 04:00:00.00 Elapsed real time: 0 04:00:04.01 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : MJH1
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2290721 Detector SN# :
Matrix Spike ID   : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.60*	8	167	1.42	127.75	124	8	5.55E-04	330.6	
2	0	92.81*	11	178	0.95	186.22	182	9	7.38E-04	275.8	
3	0	139.72*	18	121	1.39	280.12	277	8	1.26E-03	123.3	
4	0	163.12	21	139	1.05	326.96	324	8	1.44E-03	100.4	
5	0	239.11*	6	99	1.01	479.06	475	8	4.17E-04	360.9	
6	0	296.29	32	108	1.75	593.53	588	11	2.25E-03	64.3	
7	0	359.54	11	58	1.64	720.15	715	8	7.94E-04	118.9	
8	0	382.93	24	61	1.21	766.96	761	9	1.68E-03	61.4	
9	0	478.06	42	69	0.67	957.40	949	11	2.92E-03	41.2	
10	0	598.09	13	31	1.44	1197.68	1194	7	8.78E-04	81.2	
11	0	610.21	24	58	1.78	1221.94	1217	11	1.65E-03	65.2	
12	0	898.56	36	8	6.23	1799.18	1791	16	2.50E-03	24.2	
13	0	1000.67	31	19	5.45	2003.59	1996	15	2.16E-03	35.2	
14	0	1008.41	16	12	0.90	2019.08	2011	12	1.12E-03	49.8	
15	0	1030.50	8	22	0.89	2063.31	2054	11	5.21E-04	126.1	
16	0	1185.60	11	11	1.16	2373.82	2367	11	7.64E-04	65.7	
17	0	1226.27	6	24	2.76	2455.23	2445	15	4.28E-04	173.4	
18	2	1258.22	9	0	1.75	2519.20	2517	10	6.24E-04	27.3	1.83E-01
19	2	1260.75	11	0	1.50	2524.26	2517	10	7.37E-04	28.3	
20	0	1263.78	10	2	1.78	2530.33	2527	7	7.03E-04	38.3	
21	0	1267.56	5	6	1.25	2537.89	2534	6	3.28E-04	94.6	
22	0	1284.40	12	5	1.61	2571.61	2567	9	7.99E-04	44.4	
23	3	1369.47	14	6	2.53	2741.93	2736	19	9.51E-04	43.3	1.30E+00
24	3	1374.39	18	4	2.53	2751.77	2736	19	1.22E-03	23.5	
25	0	1379.83	6	6	1.03	2762.67	2758	7	4.17E-04	82.1	
26	0	1461.96	44	20	2.28	2927.10	2918	17	3.04E-03	28.4	
27	0	1493.66	6	6	0.70	2990.56	2987	7	4.34E-04	73.6	
28	0	1613.51	7	2	1.34	3230.51	3226	8	4.94E-04	50.7	
29	0	1679.75	12	3	1.33	3363.12	3356	13	8.17E-04	43.0	
30	0	1764.49	17	3	1.12	3532.77	3525	13	1.15E-03	33.5	
31	0	1888.68	5	9	0.91	3781.42	3770	13	3.27E-04	143.4	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 22-JUL-2022 02:50:54

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905004.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 27-JUN-2022 10:08:00	Acquisition date	: 21-JUL-2022 22:50:24
Sample ID	: G585905004	Sample quantity	: 0.47052 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA30	Detector geometry	: JAR
Elapsed live time	: 0 04:00:00.00	Elapsed real time	: 0 04:00:04.01 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	42	10.44*	2.454E+00	6.554E+01	9.031E+01	82.30
K-40	1460.82	44	10.66*	1.008E+00	1.625E+02	1.625E+02	56.78
BI-214	609.32	24	45.49*	2.044E+00	1.022E+01	1.022E+01	130.31
	1120.29	-----	14.92	1.245E+00	-----	Line Not Found	-----
	1764.49	17	15.30	8.923E-01	4.828E+01	4.828E+01	66.91
TH-232	63.81	8	0.26*	2.662E+00	4.609E+02	4.609E+02	661.30
	140.88	18	0.02	5.125E+00	7.053E+03	7.053E+03	246.62
TH-234	63.29	8	3.70*	2.662E+00	3.239E+01	3.239E+01	661.30
	92.59	11	4.23	4.773E+00	2.099E+01	2.099E+01	551.53
U-238	63.29	8	3.70*	2.662E+00	3.239E+01	3.239E+01	661.30
	92.59	11	4.23	4.773E+00	2.099E+01	2.099E+01	551.53

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905004.CNF;1
Acquisition date : 21-JUL-2022 22:50:24 Sensitivity : 3.000
Detector ID : GAM30 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:04.01 Half life ratio : *****
Sample date : 27-JUN-2022 10:08:00 Analyst initials: MJH1
Sample ID : G585905004 Sample Quantity : 4.7052E-01 FILTER
Batch Number : 2290721 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 27-SEP-2021 06:08:34 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM30_JAR.CNF;11

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	9.031E+01	7.284E+01	6.940E+01
K-40	1.625E+02	9.042E+01	6.383E+01
BI-214	1.022E+01	1.305E+01	1.348E+01
TH-232	4.609E+02	2.987E+03	2.715E+03
TH-234	3.239E+01	2.099E+02	1.947E+02
U-238	3.239E+01	2.099E+02	1.947E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	7.663E-01	3.327E+00	6.914E+00	NOT IDENT.
NA-24	0.000E+00	3.129E+12	0.000E+00	SHORT HLIF
AL-26	-1.795E+00	3.461E+00	6.136E+00	NOT IDENT.
SC-46	6.761E-01	4.665E+00	8.648E+00	NOT IDENT.
V-48	-2.078E+00	9.972E+00	1.777E+01	NOT IDENT.
CR-51	-1.073E+01	4.101E+01	7.577E+01	NOT IDENT.
MN-52	1.307E+01	8.290E+01	1.667E+02	NOT IDENT.
MN-54	-1.465E+00	3.481E+00	6.024E+00	NOT IDENT.
CO-56	-1.710E+00	4.488E+00	7.776E+00	NOT IDENT.
CO-57	1.614E-01	2.240E+00	3.972E+00	NOT IDENT.
NI-57	0.000E+00	6.737E+05	0.000E+00	SHORT HLIF
CO-58	3.251E+00	3.528E+00	7.558E+00	NOT IDENT.
FE-59	-1.730E+00	7.996E+00	1.549E+01	NOT IDENT.
CO-60	1.368E+00	3.278E+00	7.048E+00	NOT IDENT.
ZN-65	-2.903E+00	6.565E+00	1.223E+01	NOT IDENT.
CU-67	-9.834E+03	5.149E+03	7.150E+03	FAIL ABUN
GE-68	-9.291E+01	1.149E+02	2.002E+02	NOT IDENT.
AS-73	-4.764E+01	8.337E+01	1.246E+02	NOT IDENT.
AS-74	5.700E+00	1.667E+01	2.853E+01	NOT IDENT.
SE-75	-1.101E-01	4.920E+00	8.352E+00	NOT IDENT.
BR-77	0.000E+00	2.433E+04	0.000E+00	SHORT HLIF
SR-82	-1.318E+01	4.406E+01	7.770E+01	NOT IDENT.
RB-83	-2.639E+00	7.167E+00	1.284E+01	NOT IDENT.
RB-84	1.723E+00	7.729E+00	1.484E+01	NOT IDENT.

KR-85	-3.966E+03	1.205E+03	1.683E+03	NOT IDENT.
SR-85	-2.301E+01	6.992E+00	9.764E+00	NOT IDENT.
RB-86	-8.375E+01	9.729E+01	1.680E+02	NOT IDENT.
Y-88	1.338E+00	4.138E+00	8.886E+00	FAIL ABUN
Y-91	-9.443E+02	1.814E+03	3.296E+03	NOT IDENT.
NB-94	-3.380E+00	3.412E+00	5.480E+00	NOT IDENT.
NB-95	2.394E+00	4.501E+00	8.782E+00	NOT IDENT.
NB-95M	4.762E-01	1.396E+01	2.199E+01	NOT IDENT.
TC-95M	-6.779E-01	5.068E+00	8.574E+00	NOT IDENT.
ZR-95	4.693E+00	7.547E+00	1.508E+01	NOT IDENT.
MO-99	-2.084E+03	1.234E+04	2.239E+04	FAIL ABUN
TC-99M	0.000E+00	1.310E+30	0.000E+00	SHORT HLIF
RH-101	-1.889E-01	3.068E+00	5.331E+00	NOT IDENT.
RH-102M	-8.162E-01	2.913E+00	5.272E+00	NOT IDENT.
RU-103	4.097E+00	4.481E+00	9.141E+00	FAIL ABUN
RH-106	-1.944E+01	3.112E+01	5.329E+01	NOT IDENT.
RU-106	-1.944E+01	3.112E+01	5.329E+01	NOT IDENT.
AG-108M	-1.254E+00	2.692E+00	4.814E+00	NOT IDENT.
CD-109	-1.478E+01	6.049E+01	1.056E+02	NOT IDENT.
AG-110	-2.250E+01	8.712E+01	1.322E+02	NOT IDENT.
AG-110M	2.106E+00	5.377E+00	1.034E+01	NOT IDENT.
IN-111	-5.946E+01	1.030E+03	1.759E+03	NOT IDENT.
SN-113	2.300E+00	4.538E+00	8.859E+00	NOT IDENT.
IN-114M	-1.717E+01	2.132E+01	3.417E+01	NOT IDENT.
CD-115	0.000E+00	2.134E+04	0.000E+00	SHORT HLIF
SN-117M	1.030E+00	1.040E+01	1.505E+01	NOT IDENT.
SB-122	2.261E+03	2.048E+03	4.276E+03	NOT IDENT.
I-123	0.000E+00	8.653E+13	0.000E+00	SHORT HLIF
TE-123M	1.795E+00	3.517E+00	5.272E+00	NOT IDENT.
SB-124	-1.236E+00	8.719E+00	1.729E+01	NOT IDENT.
SB-125	3.706E-01	9.387E+00	1.752E+01	NOT IDENT.
TE-125M	1.400E+02	1.067E+03	1.887E+03	NOT IDENT.
I-126	-1.142E+02	7.426E+01	6.824E+01	NOT IDENT.
SB-126	1.434E+01	2.067E+01	4.232E+01	NOT IDENT.
SN-126	2.205E+00	5.756E+00	1.054E+01	FAIL ABUN
SB-127	1.033E+02	6.065E+02	1.167E+03	NOT IDENT.
TE-129	7.193E+00	5.634E+01	1.066E+02	NOT IDENT.
I-131	-5.915E+00	2.455E+01	4.513E+01	NOT IDENT.
I-132	0.000E+00	6.962E+40	0.000E+00	SHORT HLIF
TE-132	4.648E+01	5.494E+02	9.477E+02	NOT IDENT.
BA-133	8.030E-01	4.355E+00	7.510E+00	FAIL ABUN
I-133	0.000E+00	1.119E+09	0.000E+00	SHORT HLIF
CS-134	3.026E+00	3.855E+00	7.851E+00	NOT IDENT.
I-135	0.000E+00	7.597E+27	0.000E+00	SHORT HLIF
CS-136	-8.053E+00	1.652E+01	3.031E+01	NOT IDENT.
BA-137M	-1.419E+00	3.214E+00	5.634E+00	NOT IDENT.
CS-137	-1.499E+00	3.396E+00	5.952E+00	NOT IDENT.
LA-138	2.597E+00	5.647E+00	1.200E+01	NOT IDENT.
CE-139	-9.466E-01	3.210E+00	4.971E+00	NOT IDENT.
BA-140	-1.721E+00	4.236E+01	7.867E+01	FAIL ABUN
LA-140	1.008E+01	1.472E+01	3.273E+01	NOT IDENT.
CE-141	2.419E-01	7.153E+00	1.247E+01	NOT IDENT.
CE-143	0.000E+00	1.319E+06	0.000E+00	SHORT HLIF
CE-144	-9.252E+00	1.835E+01	3.080E+01	NOT IDENT.
PM-144	6.601E-01	3.709E+00	6.908E+00	FAIL ABUN
PR-144	4.827E+01	2.788E+02	5.190E+02	NOT IDENT.
PM-146	-1.577E+00	4.069E+00	7.304E+00	NOT IDENT.
ND-147	1.737E+01	9.169E+01	1.759E+02	NOT IDENT.
PM-147	-3.533E+04	6.547E+04	1.102E+05	NOT IDENT.
PM-149	0.000E+00	1.715E+05	0.000E+00	SHORT HLIF
EU-152	-3.351E+00	9.284E+00	1.688E+01	NOT IDENT.
GD-153	-2.795E+00	7.524E+00	1.295E+01	NOT IDENT.
EU-154	3.106E+00	9.191E+00	1.949E+01	NOT IDENT.
EU-155	1.061E+00	9.587E+00	1.704E+01	NOT IDENT.
TB-160	5.438E+00	1.285E+01	2.552E+01	NOT IDENT.
HO-166M	-3.796E+00	5.686E+00	9.572E+00	NOT IDENT.
TM-171	3.778E+02	1.571E+03	2.502E+03	NOT IDENT.
LU-176	-1.532E+00	2.575E+00	4.610E+00	NOT IDENT.
LU-177	-1.683E+02	2.782E+02	4.519E+02	NOT IDENT.
HF-181	2.060E-01	5.270E+00	9.817E+00	NOT IDENT.
W-181	6.692E+00	1.579E+01	2.963E+01	FAIL ABUN
TA-182	3.604E+00	1.530E+01	2.855E+01	NOT IDENT.
RE-183	2.864E+00	1.608E+01	2.959E+01	FAIL ABUN
RE-184	9.192E+00	1.403E+01	2.664E+01	NOT IDENT.
RE-188	-6.704E+00	1.545E+01	2.595E+01	FAIL ABUN
W-188	2.555E+02	7.028E+02	1.317E+03	FAIL ABUN
OS-191	2.120E+00	2.413E+01	4.228E+01	FAIL ABUN
IR-192	5.955E-01	3.466E+00	6.623E+00	FAIL ABUN

PB-201	0.000E+00	3.494E+19	0.000E+00	SHORT HLIF
TL-201	-4.963E+02	6.155E+03	9.747E+03	NOT IDENT.
TL-202	2.547E+00	1.123E+01	2.146E+01	NOT IDENT.
HG-203	-5.025E-01	3.821E+00	7.152E+00	NOT IDENT.
PB-203	0.000E+00	7.105E+03	0.000E+00	SHORT HLIF
TL-204	7.916E+01	3.920E+02	7.100E+02	NOT IDENT.
BI-207	4.609E-01	4.371E+00	8.804E+00	NOT IDENT.
TL-208	-3.953E+00	5.624E+00	7.267E+00	NOT IDENT.
PB-210	-1.442E+02	3.363E+02	4.933E+02	NOT IDENT.
BI-211	-1.583E+01	2.802E+01	4.277E+01	NOT IDENT.
PB-211	-4.714E+01	6.161E+01	1.070E+02	NOT IDENT.
BI-212	3.647E+01	5.338E+01	1.052E+02	NOT IDENT.
PB-212	1.425E+00	1.008E+01	1.276E+01	FAIL ABUN
BI-213	2.174E+00	1.004E+01	1.914E+01	NOT IDENT.
PB-214	-1.092E+01	1.023E+01	1.498E+01	FAIL ABUN
RN-219	-1.141E+01	3.933E+01	7.154E+01	NOT IDENT.
FR-221	1.275E+01	2.121E+01	3.805E+01	NOT IDENT.
RA-223	-1.279E+01	5.849E+01	1.081E+02	NOT IDENT.
RA-224	6.488E+00	6.777E+01	1.073E+02	NOT IDENT.
AC-225	7.024E+01	1.168E+02	2.095E+02	NOT IDENT.
RA-226	-1.332E+02	9.357E+01	1.351E+02	NOT IDENT.
AC-227	1.158E+01	2.451E+01	4.387E+01	NOT IDENT.
TH-227	1.158E+01	2.451E+01	4.387E+01	NOT IDENT.
AC-228	-3.330E+01	2.704E+01	2.912E+01	NOT IDENT.
RA-228	-3.330E+01	2.704E+01	2.912E+01	NOT IDENT.
TH-228	1.425E+00	1.008E+01	1.276E+01	FAIL ABUN
TH-229	-1.913E+01	5.197E+01	8.654E+01	NOT IDENT.
TH-230	-3.631E+02	8.319E+02	1.445E+03	NOT IDENT.
PA-231	5.521E+00	4.472E+01	8.148E+01	NOT IDENT.
TH-231	-3.200E+00	4.470E+01	6.481E+01	NOT IDENT.
PA-233	-2.148E+00	6.170E+00	1.127E+01	NOT IDENT.
PA-234	-6.593E+00	2.724E+01	4.847E+01	NOT IDENT.
PA-234M	0.000E+00	7.462E+02	9.929E+02	FAIL ABUN
U-234	-2.938E+03	5.917E+03	8.922E+03	NOT IDENT.
U-235	-1.605E+00	2.303E+01	3.427E+01	FAIL ABUN
NP-237	-2.148E+00	6.170E+00	1.127E+01	NOT IDENT.
NP-238	0.000E+00	4.309E+04	0.000E+00	SHORT HLIF
NP-239	3.992E+00	2.430E+01	4.325E+01	NOT IDENT.
AM-241	-4.433E+00	1.288E+01	2.086E+01	NOT IDENT.
AM-242	1.721E+01	5.881E+01	1.059E+02	NOT IDENT.
AM-243	-4.450E-01	4.948E+00	7.976E+00	NOT IDENT.
CM-243	-1.457E-01	9.490E+00	1.674E+01	NOT IDENT.
BK-247	1.283E+00	8.507E+00	1.466E+01	NOT IDENT.
CM-247	-1.645E-01	3.511E+00	6.543E+00	NOT IDENT.
CF-249	2.668E+00	3.974E+00	7.827E+00	NOT IDENT.
CF-251	-2.235E+00	1.322E+01	2.244E+01	NOT IDENT.
CF-252	-1.964E+02	1.596E+04	2.817E+04	NOT IDENT.
ANH-511	-2.919E+01	8.056E+00	1.348E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.60	55	167	1.42	127.75	124	8	3.82E-03	43.0	
2	0	92.81	140	178	0.95	186.22	182	9	9.72E-03	19.2	
3	0	139.72	37	121	1.39	280.12	277	8	2.57E-03	54.0	
4	0	163.12	21	139	1.05	326.96	324	8	1.44E-03	100.4	
5	0	185.67	57	120	0.95	372.10	369	7	3.99E-03	34.4	
6	0	239.11	63	99	1.01	479.06	475	8	4.39E-03	30.1	
7	0	296.29	32	108	1.75	593.53	588	11	2.25E-03	64.3	
8	0	352.52	19	56	0.71	706.09	702	6	1.30E-03	68.0	
9	0	359.54	11	58	1.64	720.15	715	8	7.94E-04	118.9	
10	0	382.93	24	61	1.21	766.96	761	9	1.68E-03	61.4	
11	0	478.06	42	69	0.67	957.40	949	11	2.92E-03	41.2	
12	0	511.23	284	154	2.31	1023.79	1015	22	1.97E-02	12.6	
13	0	598.09	13	31	1.44	1197.68	1194	7	8.78E-04	81.2	
14	0	610.21	24	58	1.78	1221.94	1217	11	1.65E-03	65.2	
15	0	898.56	36	8	6.23	1799.18	1791	16	2.50E-03	24.2	
16	0	1000.67	31	19	5.45	2003.59	1996	15	2.16E-03	35.2	
17	0	1008.41	16	12	0.90	2019.08	2011	12	1.12E-03	49.8	
18	0	1030.50	8	22	0.89	2063.31	2054	11	5.21E-04	126.1	
19	0	1185.60	11	11	1.16	2373.82	2367	11	7.64E-04	65.7	
20	0	1226.27	6	24	2.76	2455.23	2445	15	4.28E-04	173.4	
21	2	1258.22	9	0	1.75	2519.20	2517	10	6.24E-04	27.3	1.83E-01
22	2	1260.75	11	0	1.50	2524.26	2517	10	7.37E-04	28.3	
23	0	1263.78	10	2	1.78	2530.33	2527	7	7.03E-04	38.3	
24	0	1267.56	5	6	1.25	2537.89	2534	6	3.28E-04	94.6	
25	0	1284.40	12	5	1.61	2571.61	2567	9	7.99E-04	44.4	
26	3	1369.47	14	6	2.53	2741.93	2736	19	9.51E-04	43.3	1.30E+00
27	3	1374.39	18	4	2.53	2751.77	2736	19	1.22E-03	23.5	
28	0	1379.83	6	6	1.03	2762.67	2758	7	4.17E-04	82.1	
29	0	1461.96	44	20	2.28	2927.10	2918	17	3.04E-03	28.4	
30	0	1493.66	6	6	0.70	2990.56	2987	7	4.34E-04	73.6	
31	0	1613.51	7	2	1.34	3230.51	3226	8	4.94E-04	50.7	
32	0	1679.75	12	3	1.33	3363.12	3356	13	8.17E-04	43.0	
33	0	1764.49	17	3	1.12	3532.77	3525	13	1.15E-03	33.5	
34	0	1888.68	5	9	0.91	3781.42	3770	13	3.27E-04	143.4	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	42	10.44*	2.454E+00	6.554E+01	9.031E+01	82.30
K-40	1460.82	44	10.66*	1.008E+00	1.625E+02	1.625E+02	56.78
BI-214	609.32	24	45.49*	2.044E+00	1.022E+01	1.022E+01	130.31
	1120.29	-----	14.92	1.245E+00	-----	Line Not Found	-----
	1764.49	17	15.30	8.923E-01	4.828E+01	4.828E+01	66.91
TH-232	63.81	8	0.26*	2.662E+00	4.609E+02	4.609E+02	661.30
	140.88	18	0.02	5.125E+00	7.053E+03	7.053E+03	246.62
TH-234	63.29	8	3.70*	2.662E+00	3.239E+01	3.239E+01	661.30
	92.59	11	4.23	4.773E+00	2.099E+01	2.099E+01	551.53
U-238	63.29	8	3.70*	2.662E+00	3.239E+01	3.239E+01	661.30
	92.59	11	4.23	4.773E+00	2.099E+01	2.099E+01	551.53

Flag: "*" = Keyline

Total number of lines in spectrum 31
Number of unidentified lines 16
Number of lines tentatively identified by NID 15 48.39%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.38	6.554E+01	9.031E+01	7.433E+01	82.30	
K-40	1.25E+09Y	1.00	1.625E+02	1.625E+02	0.923E+02	56.78	
BI-214	1600.00Y	1.00	1.022E+01	1.022E+01	1.331E+01	130.31	
TH-232	1.41E+10Y	1.00	4.609E+02	4.609E+02	30.48E+02	661.30	
TH-234	4.47E+09Y	1.00	3.239E+01	3.239E+01	21.42E+01	661.30	
U-238	4.47E+09Y	1.00	3.239E+01	3.239E+01	21.42E+01	661.30	
Total Activity :			7.639E+02	7.887E+02			

Grand Total Activity : 7.639E+02 7.887E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	163.12	21	139	1.05	326.96	324	8	1.44E-03	****	4.87E+00	T
0	239.11	6	99	1.01	479.06	475	8	4.17E-04	****	3.95E+00	T
0	296.29	32	108	1.75	593.53	588	11	2.25E-03	****	3.43E+00	T
0	359.54	11	58	1.64	720.15	715	8	7.94E-04	****	3.00E+00	
0	382.93	24	61	1.21	766.96	761	9	1.68E-03	****	2.88E+00	T
0	598.09	13	31	1.44	1197.68	1194	7	8.78E-04	****	2.08E+00	
0	898.56	36	8	6.23	1799.18	1791	16	2.50E-03	48.4	1.50E+00	T
0	1000.67	31	19	5.45	2003.59	1996	15	2.16E-03	70.4	1.37E+00	T
0	1008.41	16	12	0.90	2019.08	2011	12	1.12E-03	99.6	1.36E+00	
0	1030.50	8	22	0.89	2063.31	2054	11	5.21E-04	****	1.33E+00	
0	1185.60	11	11	1.16	2373.82	2367	11	7.64E-04	****	1.19E+00	
0	1226.27	6	24	2.76	2455.23	2445	15	4.28E-04	****	1.16E+00	
2	1258.22	9	0	1.75	2519.20	2517	10	6.24E-04	54.5	1.13E+00	
2	1260.75	11	0	1.50	2524.26	2517	10	7.37E-04	56.5	1.13E+00	T
0	1263.78	10	2	1.78	2530.33	2527	7	7.03E-04	76.7	1.13E+00	
0	1267.56	5	6	1.25	2537.89	2534	6	3.28E-04	****	1.12E+00	
0	1284.40	12	5	1.61	2571.61	2567	9	7.99E-04	88.9	1.11E+00	
3	1369.47	14	6	2.53	2741.93	2736	19	9.51E-04	86.5	1.06E+00	T
3	1374.39	18	4	2.53	2751.77	2736	19	1.22E-03	46.9	1.06E+00	
0	1379.83	6	6	1.03	2762.67	2758	7	4.17E-04	****	1.05E+00	
0	1493.66	6	6	0.70	2990.56	2987	7	4.34E-04	****	9.92E-01	
0	1613.51	7	2	1.34	3230.51	3226	8	4.94E-04	****	9.41E-01	
0	1679.75	12	3	1.33	3363.12	3356	13	8.17E-04	85.9	9.18E-01	
0	1888.68	5	9	0.91	3781.42	3770	13	3.27E-04	****	8.63E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905004.CNF;1  *
* Acquisition date   : 21-JUL-2022 22:50:24 Sensitivity      : 3.000          *
* Detector ID        : GAM30 Energy tolerance: 1.500         *
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 04:00:04.01 Half life ratio  : *****          *
* Sample date        : 27-JUN-2022 10:08:00 Nuclide Library : LIQUID         *
* Sample ID          : G585905004 Analyst initials: MJH1          *
* Batch Number       : 2290721 Sample Quantity : 4.7052E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000         *
*                                     Dry Weight    : 0.00000         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 27-SEP-2021 06:08:34 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM30_JAR.CNF;11          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.181E+01
K-40	2.690E+01
BI-214	6.163E+00
TH-232	1.281E+03
TH-234	9.187E+01
U-238	9.187E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	2.967E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.454E+00	NOT IDENT.
SC-46	3.888E+00	NOT IDENT.
V-48	7.757E+00	NOT IDENT.
CR-51	3.481E+01	NOT IDENT.
MN-52	7.221E+01	NOT IDENT.
MN-54	2.655E+00	NOT IDENT.
CO-56	3.461E+00	NOT IDENT.
CO-57	1.858E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.357E+00	NOT IDENT.
FE-59	6.637E+00	NOT IDENT.
CO-60	3.021E+00	NOT IDENT.
ZN-65	5.200E+00	NOT IDENT.
CU-67	3.395E+03	FAIL ABUN
GE-68	8.626E+01	NOT IDENT.
AS-73	5.811E+01	NOT IDENT.
AS-74	1.312E+01	NOT IDENT.
SE-75	3.892E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	3.471E+01	NOT IDENT.
RB-83	5.789E+00	NOT IDENT.
RB-84	6.555E+00	NOT IDENT.
KR-85	7.876E+02	NOT IDENT.

SR-85	4.570E+00	NOT IDENT.
RB-86	7.190E+01	NOT IDENT.
Y-88	3.714E+00	FAIL ABUN
Y-91	1.412E+03	NOT IDENT.
NB-94	2.445E+00	NOT IDENT.
NB-95	3.979E+00	NOT IDENT.
NB-95M	1.028E+01	NOT IDENT.
TC-95M	4.029E+00	NOT IDENT.
ZR-95	6.790E+00	NOT IDENT.
MO-99	9.940E+03	FAIL ABUN
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.512E+00	NOT IDENT.
RH-102M	2.404E+00	NOT IDENT.
RU-103	4.188E+00	FAIL ABUN
RH-106	2.383E+01	NOT IDENT.
RU-106	2.383E+01	NOT IDENT.
AG-108M	2.181E+00	NOT IDENT.
CD-109	4.951E+01	NOT IDENT.
AG-110	5.945E+01	NOT IDENT.
AG-110M	4.647E+00	NOT IDENT.
IN-111	8.147E+02	NOT IDENT.
SN-113	4.091E+00	NOT IDENT.
IN-114M	1.601E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	7.082E+00	NOT IDENT.
SB-122	1.952E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.486E+00	NOT IDENT.
SB-124	6.999E+00	NOT IDENT.
SB-125	8.069E+00	NOT IDENT.
TE-125M	8.918E+02	NOT IDENT.
I-126	3.092E+01	NOT IDENT.
SB-126	1.894E+01	NOT IDENT.
SN-126	4.953E+00	FAIL ABUN
SB-127	5.178E+02	NOT IDENT.
TE-129	4.871E+01	NOT IDENT.
I-131	2.071E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	4.429E+02	NOT IDENT.
BA-133	3.468E+00	FAIL ABUN
I-133	0.000E+00	SHORT HLIF
CS-134	3.537E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.329E+01	NOT IDENT.
BA-137M	2.505E+00	NOT IDENT.
CS-137	2.646E+00	NOT IDENT.
LA-138	5.193E+00	NOT IDENT.
CE-139	2.329E+00	NOT IDENT.
BA-140	3.560E+01	FAIL ABUN
LA-140	1.410E+01	NOT IDENT.
CE-141	5.866E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.441E+01	NOT IDENT.
PM-144	3.147E+00	FAIL ABUN
PR-144	2.364E+02	NOT IDENT.
PM-146	3.325E+00	NOT IDENT.
ND-147	7.939E+01	NOT IDENT.
PM-147	5.141E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	7.785E+00	NOT IDENT.
GD-153	6.070E+00	NOT IDENT.
EU-154	8.363E+00	NOT IDENT.
EU-155	8.018E+00	NOT IDENT.
TB-160	1.128E+01	NOT IDENT.
HO-166M	4.237E+00	NOT IDENT.
TM-171	1.168E+03	NOT IDENT.
LU-176	2.134E+00	NOT IDENT.
LU-177	2.103E+02	NOT IDENT.
HF-181	4.499E+00	NOT IDENT.
W-181	1.385E+01	FAIL ABUN
TA-182	1.228E+01	NOT IDENT.
RE-183	1.382E+01	FAIL ABUN
RE-184	1.179E+01	NOT IDENT.
RE-188	1.209E+01	FAIL ABUN
W-188	6.092E+02	FAIL ABUN
OS-191	1.997E+01	FAIL ABUN
IR-192	3.063E+00	FAIL ABUN
PB-201	0.000E+00	SHORT HLIF

TL-201	4.569E+03	NOT IDENT.
TL-202	9.832E+00	NOT IDENT.
HG-203	3.310E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	3.347E+02	NOT IDENT.
BI-207	3.846E+00	NOT IDENT.
TL-208	3.328E+00	NOT IDENT.
PB-210	2.313E+02	NOT IDENT.
BI-211	2.002E+01	NOT IDENT.
PB-211	4.833E+01	NOT IDENT.
BI-212	4.798E+01	NOT IDENT.
PB-212	6.065E+00	FAIL ABUN
BI-213	8.775E+00	NOT IDENT.
PB-214	6.995E+00	FAIL ABUN
RN-219	3.284E+01	NOT IDENT.
FR-221	1.790E+01	NOT IDENT.
RA-223	4.986E+01	NOT IDENT.
RA-224	5.022E+01	NOT IDENT.
AC-225	9.857E+01	NOT IDENT.
RA-226	6.427E+01	NOT IDENT.
AC-227	2.044E+01	NOT IDENT.
TH-227	2.044E+01	NOT IDENT.
AC-228	1.314E+01	NOT IDENT.
RA-228	1.314E+01	NOT IDENT.
TH-228	6.065E+00	FAIL ABUN
TH-229	4.055E+01	NOT IDENT.
TH-230	6.769E+02	NOT IDENT.
PA-231	3.778E+01	NOT IDENT.
TH-231	3.055E+01	NOT IDENT.
PA-233	5.216E+00	NOT IDENT.
PA-234	2.111E+01	NOT IDENT.
PA-234M	4.497E+02	FAIL ABUN
U-234	4.164E+03	NOT IDENT.
U-235	1.617E+01	FAIL ABUN
NP-237	5.216E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
NP-239	2.033E+01	NOT IDENT.
AM-241	9.757E+00	NOT IDENT.
AM-242	4.994E+01	NOT IDENT.
AM-243	3.774E+00	NOT IDENT.
CM-243	7.865E+00	NOT IDENT.
BK-247	6.847E+00	NOT IDENT.
CM-247	3.003E+00	NOT IDENT.
CF-249	3.628E+00	NOT IDENT.
CF-251	1.056E+01	NOT IDENT.
CF-252	1.325E+04	NOT IDENT.
ANH-511	6.514E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905004.CNF;1
Acquisition date : 21-JUL-2022 22:50:24 Sensitivity : 3.000
Detector ID : GAM30 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:04.01 Half life ratio : *****
Sample date : 27-JUN-2022 10:08:00 Nuclide Library : LIQUID
Sample ID : G585905004 Analyst initials: MJH1
Batch Number : 2290721 Sample Quantity : 4.7052E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 27-SEP-2021 06:08:34 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM30_JAR.CNF;11

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	9.031E+01	7.325E+01	7.327E+01
K-40	1.625E+02	9.156E+01	9.162E+01
BI-214	1.022E+01	1.308E+01	1.308E+01
TH-232	4.609E+02	2.987E+03	2.987E+03
TH-234	3.239E+01	2.100E+02	2.100E+02
U-238	3.239E+01	2.100E+02	2.100E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	7.663E-01	3.327E+00	3.345E+00	NOT IDENT.
NA-24	3.691E+12	3.147E+12	3.561E+12	SHORT HLIF
AL-26	-1.795E+00	3.463E+00	3.557E+00	NOT IDENT.
SC-46	6.761E-01	4.665E+00	4.675E+00	NOT IDENT.
V-48	-2.078E+00	9.973E+00	1.002E+01	NOT IDENT.
CR-51	-1.073E+01	4.102E+01	4.131E+01	NOT IDENT.
MN-52	1.307E+01	8.291E+01	8.312E+01	NOT IDENT.
MN-54	-1.465E+00	3.483E+00	3.546E+00	NOT IDENT.
CO-56	-1.710E+00	4.491E+00	4.557E+00	NOT IDENT.
CO-57	1.614E-01	2.241E+00	2.242E+00	NOT IDENT.
NI-57	5.880E+04	6.738E+05	6.743E+05	SHORT HLIF
CO-58	3.251E+00	3.540E+00	3.832E+00	NOT IDENT.
FE-59	-1.730E+00	7.998E+00	8.036E+00	NOT IDENT.
CO-60	1.368E+00	3.280E+00	3.338E+00	NOT IDENT.
ZN-65	-2.903E+00	6.569E+00	6.699E+00	NOT IDENT.
CU-67	-9.834E+03	5.216E+03	6.848E+03	FAIL ABUN
GE-68	-9.291E+01	1.151E+02	1.225E+02	NOT IDENT.
AS-73	-4.764E+01	8.396E+01	8.667E+01	NOT IDENT.
AS-74	5.700E+00	1.668E+01	1.688E+01	NOT IDENT.
SE-75	-1.101E-01	4.920E+00	4.920E+00	NOT IDENT.
BR-77	3.440E+03	2.433E+04	2.438E+04	SHORT HLIF
SR-82	-1.318E+01	4.407E+01	4.447E+01	NOT IDENT.
RB-83	-2.639E+00	7.179E+00	7.277E+00	NOT IDENT.
RB-84	1.723E+00	7.730E+00	7.769E+00	NOT IDENT.

KR-85	-3.966E+03	1.253E+03	2.184E+03	NOT IDENT.
SR-85	-2.301E+01	7.268E+00	1.267E+01	NOT IDENT.
RB-86	-8.375E+01	9.755E+01	1.046E+02	NOT IDENT.
Y-88	1.338E+00	4.139E+00	4.183E+00	FAIL ABUN
Y-91	-9.443E+02	1.815E+03	1.865E+03	NOT IDENT.
NB-94	-3.380E+00	3.425E+00	3.749E+00	NOT IDENT.
NB-95	2.394E+00	4.506E+00	4.634E+00	NOT IDENT.
NB-95M	4.762E-01	1.396E+01	1.396E+01	NOT IDENT.
TC-95M	-6.779E-01	5.068E+00	5.077E+00	NOT IDENT.
ZR-95	4.693E+00	7.559E+00	7.850E+00	NOT IDENT.
MO-99	-2.084E+03	1.234E+04	1.238E+04	FAIL ABUN
TC-99M	5.422E+29	1.312E+30	0.000E+00	SHORT HLIF
RH-101	-1.889E-01	3.068E+00	3.070E+00	NOT IDENT.
RH-102M	-8.162E-01	2.915E+00	2.938E+00	NOT IDENT.
RU-103	4.097E+00	4.496E+00	4.861E+00	FAIL ABUN
RH-106	-1.944E+01	3.118E+01	3.239E+01	NOT IDENT.
RU-106	-1.944E+01	3.118E+01	3.239E+01	NOT IDENT.
AG-108M	-1.254E+00	2.694E+00	2.753E+00	NOT IDENT.
CD-109	-1.478E+01	6.051E+01	6.088E+01	NOT IDENT.
AG-110	-2.250E+01	8.714E+01	8.773E+01	NOT IDENT.
AG-110M	2.106E+00	5.381E+00	5.464E+00	NOT IDENT.
IN-111	-5.946E+01	1.030E+03	1.030E+03	NOT IDENT.
SN-113	2.300E+00	4.542E+00	4.659E+00	NOT IDENT.
IN-114M	-1.717E+01	2.137E+01	2.273E+01	NOT IDENT.
CD-115	4.052E+02	2.134E+04	2.134E+04	SHORT HLIF
SN-117M	1.030E+00	1.040E+01	1.041E+01	NOT IDENT.
SB-122	2.261E+03	2.058E+03	2.297E+03	NOT IDENT.
I-123	4.257E+13	8.659E+13	8.869E+13	SHORT HLIF
TE-123M	1.795E+00	3.519E+00	3.611E+00	NOT IDENT.
SB-124	-1.236E+00	8.719E+00	8.737E+00	NOT IDENT.
SB-125	3.706E-01	9.387E+00	9.389E+00	NOT IDENT.
TE-125M	1.400E+02	1.067E+03	1.069E+03	NOT IDENT.
I-126	-1.142E+02	7.508E+01	9.107E+01	NOT IDENT.
SB-126	1.434E+01	2.075E+01	2.174E+01	NOT IDENT.
SN-126	2.205E+00	5.760E+00	5.845E+00	FAIL ABUN
SB-127	1.033E+02	6.067E+02	6.085E+02	NOT IDENT.
TE-129	7.193E+00	5.635E+01	5.645E+01	NOT IDENT.
I-131	-5.915E+00	2.455E+01	2.470E+01	NOT IDENT.
I-132	-1.000E+41	1.671E+41	0.000E+00	SHORT HLIF
TE-132	4.648E+01	5.494E+02	5.498E+02	NOT IDENT.
BA-133	8.030E-01	4.355E+00	4.370E+00	FAIL ABUN
I-133	6.517E+07	1.119E+09	1.119E+09	SHORT HLIF
CS-134	3.026E+00	3.864E+00	4.098E+00	NOT IDENT.
I-135	1.372E+28	1.086E+28	0.000E+00	SHORT HLIF
CS-136	-8.053E+00	1.654E+01	1.694E+01	NOT IDENT.
BA-137M	-1.419E+00	3.217E+00	3.280E+00	NOT IDENT.
CS-137	-1.499E+00	3.398E+00	3.465E+00	NOT IDENT.
LA-138	2.597E+00	5.651E+00	5.771E+00	NOT IDENT.
CE-139	-9.466E-01	3.216E+00	3.244E+00	NOT IDENT.
BA-140	-1.721E+00	4.236E+01	4.237E+01	FAIL ABUN
LA-140	1.008E+01	1.475E+01	1.543E+01	NOT IDENT.
CE-141	2.419E-01	7.153E+00	7.153E+00	NOT IDENT.
CE-143	-1.409E+05	1.319E+06	1.320E+06	SHORT HLIF
CE-144	-9.252E+00	1.836E+01	1.883E+01	NOT IDENT.
PM-144	6.601E-01	3.709E+00	3.721E+00	FAIL ABUN
PR-144	4.827E+01	2.788E+02	2.797E+02	NOT IDENT.
PM-146	-1.577E+00	4.072E+00	4.134E+00	NOT IDENT.
ND-147	1.737E+01	9.171E+01	9.204E+01	NOT IDENT.
PM-147	-3.533E+04	6.552E+04	6.743E+04	NOT IDENT.
PM-149	5.754E+04	1.717E+05	1.736E+05	SHORT HLIF
EU-152	-3.351E+00	9.288E+00	9.411E+00	NOT IDENT.
GD-153	-2.795E+00	7.527E+00	7.632E+00	NOT IDENT.
EU-154	3.106E+00	9.195E+00	9.301E+00	NOT IDENT.
EU-155	1.061E+00	9.587E+00	9.599E+00	NOT IDENT.
TB-160	5.438E+00	1.286E+01	1.309E+01	NOT IDENT.
HO-166M	-3.796E+00	5.697E+00	5.949E+00	NOT IDENT.
TM-171	3.778E+02	1.572E+03	1.581E+03	NOT IDENT.
LU-176	-1.532E+00	2.578E+00	2.669E+00	NOT IDENT.
LU-177	-1.683E+02	2.786E+02	2.887E+02	NOT IDENT.
HF-181	2.060E-01	5.270E+00	5.270E+00	NOT IDENT.
W-181	6.692E+00	1.589E+01	1.617E+01	FAIL ABUN
TA-182	3.604E+00	1.531E+01	1.539E+01	NOT IDENT.
RE-183	2.864E+00	1.608E+01	1.613E+01	FAIL ABUN
RE-184	9.192E+00	1.407E+01	1.467E+01	NOT IDENT.
RE-188	-6.704E+00	1.546E+01	1.576E+01	FAIL ABUN
W-188	2.555E+02	7.036E+02	7.130E+02	FAIL ABUN
OS-191	2.120E+00	2.413E+01	2.415E+01	FAIL ABUN
IR-192	5.955E-01	3.467E+00	3.477E+00	FAIL ABUN

PB-201	-2.212E+19	3.568E+19	0.000E+00	SHORT HLIF
TL-201	-4.963E+02	6.156E+03	6.160E+03	NOT IDENT.
TL-202	2.547E+00	1.123E+01	1.129E+01	NOT IDENT.
HG-203	-5.025E-01	3.822E+00	3.828E+00	NOT IDENT.
PB-203	-9.343E+02	7.105E+03	7.118E+03	SHORT HLIF
TL-204	7.916E+01	3.921E+02	3.937E+02	NOT IDENT.
BI-207	4.609E-01	4.371E+00	4.376E+00	NOT IDENT.
TL-208	-3.953E+00	5.634E+00	5.910E+00	NOT IDENT.
PB-210	-1.442E+02	3.366E+02	3.428E+02	NOT IDENT.
BI-211	-1.583E+01	2.805E+01	2.895E+01	NOT IDENT.
PB-211	-4.714E+01	6.175E+01	6.531E+01	NOT IDENT.
BI-212	3.647E+01	5.348E+01	5.596E+01	NOT IDENT.
PB-212	1.425E+00	1.008E+01	1.010E+01	FAIL ABUN
BI-213	2.174E+00	1.004E+01	1.009E+01	NOT IDENT.
PB-214	-1.092E+01	1.027E+01	1.139E+01	FAIL ABUN
RN-219	-1.141E+01	3.936E+01	3.970E+01	NOT IDENT.
FR-221	1.275E+01	2.124E+01	2.201E+01	NOT IDENT.
RA-223	-1.279E+01	5.850E+01	5.879E+01	NOT IDENT.
RA-224	6.488E+00	6.777E+01	6.783E+01	NOT IDENT.
AC-225	7.024E+01	1.170E+02	1.212E+02	NOT IDENT.
RA-226	-1.332E+02	9.422E+01	1.118E+02	NOT IDENT.
AC-227	1.158E+01	2.457E+01	2.512E+01	NOT IDENT.
TH-227	1.158E+01	2.457E+01	2.512E+01	NOT IDENT.
AC-228	-3.330E+01	2.722E+01	3.109E+01	NOT IDENT.
RA-228	-3.330E+01	2.722E+01	3.109E+01	NOT IDENT.
TH-228	1.425E+00	1.008E+01	1.010E+01	FAIL ABUN
TH-229	-1.913E+01	5.200E+01	5.271E+01	NOT IDENT.
TH-230	-3.631E+02	8.343E+02	8.502E+02	NOT IDENT.
PA-231	5.521E+00	4.473E+01	4.480E+01	NOT IDENT.
TH-231	-3.200E+00	4.470E+01	4.472E+01	NOT IDENT.
PA-233	-2.148E+00	6.173E+00	6.248E+00	NOT IDENT.
PA-234	-6.593E+00	2.827E+01	2.843E+01	NOT IDENT.
PA-234M	1.081E+03	7.524E+02	8.966E+02	FAIL ABUN
U-234	-2.938E+03	5.923E+03	6.070E+03	NOT IDENT.
U-235	-1.605E+00	2.303E+01	2.304E+01	FAIL ABUN
NP-237	-2.148E+00	6.173E+00	6.248E+00	NOT IDENT.
NP-238	-3.187E+04	4.318E+04	4.551E+04	SHORT HLIF
NP-239	3.992E+00	2.430E+01	2.437E+01	NOT IDENT.
AM-241	-4.433E+00	1.288E+01	1.304E+01	NOT IDENT.
AM-242	1.721E+01	5.889E+01	5.940E+01	NOT IDENT.
AM-243	-4.450E-01	4.949E+00	4.953E+00	NOT IDENT.
CM-243	-1.457E-01	9.490E+00	9.490E+00	NOT IDENT.
BK-247	1.283E+00	8.511E+00	8.531E+00	NOT IDENT.
CM-247	-1.645E-01	3.511E+00	3.512E+00	NOT IDENT.
CF-249	2.668E+00	3.985E+00	4.162E+00	NOT IDENT.
CF-251	-2.235E+00	1.322E+01	1.326E+01	NOT IDENT.
CF-252	-1.964E+02	1.596E+04	1.596E+04	NOT IDENT.
ANH-511	-2.919E+01	8.438E+00	1.564E+01	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	82.9619	133.52	72.5229	116.30	79.9335
879.38	56.2264	364.49	72.5323	116.74	77.8493
46.54	69.5094	80.22	72.5367	117.23	74.7008
228.16	64.3710	711.68	72.5806	119.76	83.5272
52.39	79.8244	356.01	80.7062	120.54	63.2479
53.20	66.8063	323.87	80.7166	120.90	75.0762
53.44	66.8429	82.35	0.0000	264.66	78.3172
57.53	70.1543	82.47	78.8914	121.22	78.3277
293.27	0.0000	82.47	78.8914	344.28	96.6412
57.53	58.7836	83.79	76.0300	122.06	68.7490
482.18	58.7838	265.00	66.9305	1274.44	72.0688
57.98	62.6995	84.21	66.9547	123.68	72.1275
59.32	82.2290	84.86	0.0000	1377.63	0.0000
59.54	78.7191	193.51	86.4092	127.23	90.8528
155.04	80.3400	105.31	72.3141	129.43	93.2830
63.00	92.6167	86.79	72.3428	131.20	78.2754
129.43	92.6720	86.94	72.3618	133.02	77.3681
63.29	92.6720	87.09	67.2825	133.52	82.8687
290.67	92.7271	87.57	71.4179	135.34	57.9227
63.81	92.7707	88.03	81.6827	136.00	64.1694
87.57	92.8597	306.78	81.7249	136.28	59.8150
64.99	95.2778	88.47	79.0178	136.47	74.4217
65.08	80.9354	531.02	93.0448	739.50	71.4944
66.73	79.8937	184.58	93.0690	140.51	0.0000
66.98	74.6919	92.59	94.6399	140.88	88.0334
67.24	78.6639	93.31	94.7494	143.76	78.0346
67.67	83.6511	94.56	67.4204	144.24	86.1825
1221.41	83.6641	311.90	67.4298	145.44	82.9868
439.51	94.7029	946.00	67.4323	152.32	62.4677
70.82	94.7029	97.43	85.0029	152.43	62.4753
167.43	94.7036	98.43	70.5997	1048.07	73.7021
97.43	72.1234	98.44	70.6007	154.21	67.0752
70.82	85.1549	99.53	85.2798	155.04	72.7342
70.82	85.1549	103.37	85.2798	158.56	66.0950
279.20	0.0000	116.74	85.2798	158.97	0.0000
1063.66	99.3919	100.11	83.2739	159.00	66.3183
72.87	0.0000	100.20	83.2855	162.33	85.7458
351.06	99.4034	102.03	81.4295	537.26	77.8766
74.66	90.7598	103.18	80.5254	163.33	77.9345
238.63	90.7869	103.37	80.5483	165.86	81.5493
351.93	90.7869	105.31	81.8306	167.43	77.1506
238.63	90.7869	106.12	91.3821	245.35	76.3319
74.97	81.8305	106.47	89.3274	427.87	67.5778
77.11	94.1736	109.28	94.9706	176.60	81.3462
256.23	80.5200	111.00	94.1483	177.52	89.4532
79.82	80.5389	111.76	104.8401	181.07	80.5743
80.02	72.5103	208.37	68.9509	184.41	98.1749
80.03	72.5109	116.24	79.9267	184.58	98.1918

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	92.5232	300.09	40.7832	477.60	40.6808
186.21	90.2553	300.13	40.7842	477.99	42.5812
190.27	95.2704	301.36	52.0459	482.18	39.8279
193.51	83.9213	302.85	61.2964	487.02	31.3705
197.03	97.0757	304.50	50.2890	492.35	0.0000
198.01	76.0955	304.85	46.8908	497.08	25.7970
201.83	74.0262	306.78	64.0305	511.00	84.6610
204.12	84.7859	308.46	59.8330	514.00	170.5325
205.31	70.7346	311.90	58.2646	520.40	33.8265
208.37	74.4847	316.51	47.2779	520.69	0.0000
210.85	67.5466	319.41	47.3730	667.71	0.0000
215.65	73.7972	320.08	47.3954	527.90	0.0000
218.12	69.1918	321.04	45.7021	529.59	29.1211
222.11	61.0598	323.87	51.8384	529.87	0.0000
227.09	64.9374	325.23	46.6985	531.02	26.2277
227.38	80.5920	1596.21	56.3460	537.26	31.1758
228.16	66.2029	331.15	0.0000	1260.41	0.0000
228.18	66.2038	333.37	56.5206	552.55	34.3435
235.69	69.4638	334.37	48.7277	795.86	19.7209
235.96	69.4796	338.28	51.4726	564.24	20.7163
238.63	71.6623	911.20	51.4738	569.33	25.7080
238.98	0.0000	340.48	55.9154	569.50	25.7101
240.99	69.7779	340.55	55.0443	569.70	24.7233
242.00	48.7238	344.28	54.3030	582.08	32.8160
244.70	65.9262	345.93	46.4710	583.19	28.8525
245.35	53.7465	351.06	46.6262	595.83	37.5168
459.60	68.7037	351.93	55.4544	600.60	28.5719
685.70	54.0607	356.01	45.0089	604.72	33.7449
388.16	65.1396	361.25	0.0000	609.32	38.2397
256.23	51.7643	364.49	46.1390	610.33	38.2551
527.90	0.0000	366.42	44.4183	614.28	27.2274
264.66	63.2815	383.85	43.1006	618.01	26.2603
265.00	63.2986	388.16	41.4124	621.93	33.3854
269.46	53.5571	666.33	45.9272	630.19	0.0000
401.81	57.3723	391.70	39.6960	631.29	24.3760
273.65	46.2342	400.66	52.6038	632.98	21.3444
276.40	47.5835	401.32	0.0000	633.25	22.3634
583.19	51.7966	401.81	47.1938	634.78	34.5824
277.60	56.8188	402.40	42.6712	635.95	37.6534
402.40	56.8368	404.85	41.8223	636.99	21.3794
278.43	49.3299	410.95	36.4958	657.50	27.7196
279.20	0.0000	720.70	34.7460	884.68	27.7229
279.54	54.3928	423.72	39.5190	661.66	27.7668
280.46	55.2686	427.09	46.9606	664.57	0.0000
301.36	61.2789	427.87	45.1380	666.33	25.7579
284.31	62.1469	433.94	38.8204	666.50	24.7295
285.41	58.8368	439.51	36.1586	667.71	0.0000
285.90	0.0000	440.45	37.1045	677.62	32.0835
287.50	59.7705	453.88	41.1121	685.70	18.6885
290.67	44.5543	459.60	35.6142	692.65	29.1496
293.27	0.0000	463.37	30.0508	695.00	30.2178
295.22	56.7262	468.07	40.4805	696.49	32.3207
316.51	56.7562	473.00	49.5509	696.51	32.3207
298.58	57.2896	475.06	40.6274	697.00	34.4126
299.98	53.5241	696.49	40.6633	697.49	37.5483

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	38.6681	903.28	11.7659	1291.59	9.3433
706.68	24.0744	907.67	0.0000	1298.22	0.0000
711.68	29.3638	911.20	22.4674	1312.11	8.4496
720.70	15.7843	984.45	0.0000	1332.49	8.4902
721.93	0.0000	926.36	23.7019	1365.19	10.6449
1690.97	30.5399	935.54	19.2419	1368.63	0.0000
722.91	31.5942	937.49	14.7234	1377.63	0.0000
723.31	29.4925	983.53	17.0227	1384.29	6.5453
756.73	29.5028	945.96	0.0000	1408.01	16.3131
727.33	25.3174	946.00	18.1680	1434.09	12.5469
733.00	12.6855	949.00	12.5021	1435.80	9.6552
735.93	20.1071	954.55	0.0000	1457.56	0.0000
739.50	23.3132	962.31	21.6812	1460.82	9.7076
1434.09	26.5381	964.08	19.4093	1489.16	9.3756
747.24	27.6303	966.17	20.5642	1596.21	6.9885
752.31	24.4871	968.97	19.4377	1620.50	8.0259
753.82	30.8927	983.53	18.3737	1678.03	0.0000
756.73	19.1946	984.45	0.0000	1690.97	7.1192
763.94	37.4211	996.26	13.8320	1757.55	0.0000
765.80	23.5370	1001.03	17.3138	1764.49	7.2179
1001.03	25.6826	1004.73	10.3997	1770.23	5.5052
766.84	19.2649	1025.87	0.0000	1771.35	6.1948
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	27.9233	1037.84	11.6650	1808.65	9.3554
777.92	20.4156	1038.76	0.0000	1836.06	6.2677
778.90	15.0487	1046.59	15.7874		
783.70	22.6116	1048.07	22.8135		
1435.80	19.4158	1050.41	19.3158		
903.28	21.5983	1063.66	14.9819		
795.86	17.3014	1077.00	21.2285		
801.95	20.5887	1077.34	22.1146		
802.10	20.5895	1083.85	15.0649		
810.29	10.8675	1085.87	10.6399		
810.45	9.7811	1099.25	14.2383		
810.76	10.8691	1111.64	10.7146		
815.77	14.1542	1112.07	12.5012		
818.51	18.5267	1112.84	9.8244		
832.01	19.7065	1115.54	15.1946		
834.85	24.1091	1120.29	14.3193		
835.15	24.1108	1120.55	17.0054		
836.80	0.0000	1121.30	17.0089		
846.77	27.5055	1808.65	13.4573		
856.80	12.1427	1131.51	0.0000		
860.56	18.7895	1332.49	11.7963		
871.09	21.0719	1177.95	12.7191		
873.19	13.3179	1189.05	10.2040		
875.33	0.0000	1204.77	17.3799		
879.38	14.4563	1221.41	10.2874		
880.51	18.9113	1231.02	25.0435		
881.60	16.6925	1235.36	15.6688		
883.24	27.8351	1238.28	19.3696		
884.68	21.1647	1260.41	0.0000		
889.28	24.5432	1271.87	11.6906		
894.76	15.0870	1274.44	9.3048		
1836.06	15.6617	1274.54	10.2360		

VAX/VMS Nuclide Identification Report Generated 22-JUL-2022 02:53:16.62

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905005.CNF:1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM33.CNF:534
Background date    : 16-JUL-2022 14:08:50
Sample date       : 27-JUN-2022 12:00:00 Acquisition date : 21-JUL-2022 22:52:48
Sample ID        : G585905005 Sample quantity : 5.10130E-01 FILTER
Detector name    : GAM33 Detector geometry: JAR
Elapsed live time: 0 04:00:00.00 Elapsed real time: 0 04:00:02.97 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : MJH1
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID        : 2290721 Detector SN# :
Matrix Spike ID  : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	39.27	37	112	1.11	78.05	76	7	2.56E-03	50.0	
2	5	61.18	25	99	1.72	121.93	119	15	1.75E-03	67.2	4.51E+00
3	5	63.30*	51	145	1.26	126.17	119	15	3.52E-03	54.1	
4	5	65.21	34	120	1.08	130.00	119	15	2.34E-03	55.0	
5	0	92.64*	33	238	1.01	184.91	179	11	2.31E-03	116.6	
6	3	110.13*	7	115	1.37	219.94	217	13	4.63E-04	307.2	1.21E+00
7	3	112.78*	9	182	1.54	225.23	217	13	6.00E-04	302.9	
8	0	143.98*	16	120	0.93	287.71	284	7	1.13E-03	139.9	
9	0	163.36*	20	119	1.31	326.51	323	8	1.42E-03	114.8	
10	0	185.73*	2	214	1.16	371.29	367	11	1.31E-04	*****	
11	0	197.20*	14	141	1.51	394.27	390	8	9.41E-04	179.4	
12	0	200.13	18	93	1.00	400.13	399	6	1.22E-03	90.2	
13	0	340.76	43	106	4.49	681.72	674	14	3.00E-03	52.6	
14	0	352.05*	17	90	0.67	704.32	699	11	1.16E-03	129.8	
15	0	524.38	15	37	3.02	1049.39	1044	9	1.06E-03	76.9	
16	0	583.43*	4	45	1.61	1167.64	1163	11	2.79E-04	391.6	
17	0	598.54	34	41	3.73	1197.88	1192	11	2.33E-03	40.9	
18	0	604.02	22	51	3.90	1208.86	1203	12	1.55E-03	67.3	
19	0	609.78*	13	38	1.44	1220.39	1215	12	8.97E-04	133.4	
20	0	698.13	37	81	7.59	1397.32	1386	20	2.59E-03	62.6	
21	0	767.57*	11	21	3.00	1536.36	1532	9	7.84E-04	97.7	
22	2	858.77	30	13	1.75	1719.00	1711	17	2.05E-03	28.9	4.32E+00
23	0	865.59	5	15	0.66	1732.66	1728	8	3.30E-04	145.9	
24	0	879.44	7	36	0.80	1760.39	1750	14	4.72E-04	189.4	
25	0	983.56	11	3	1.45	1968.90	1965	7	7.44E-04	41.9	
26	1	1001.27*	16	6	2.01	2004.37	1997	25	1.10E-03	58.5	1.47E+00
27	1	1008.39	13	3	2.02	2018.63	1997	25	9.36E-04	33.6	
28	0	1021.05	25	13	1.28	2043.99	2038	11	1.73E-03	34.9	
29	0	1025.53	7	9	0.53	2052.96	2049	8	5.08E-04	77.4	
30	0	1033.48	16	17	0.66	2068.88	2061	14	1.09E-03	61.8	
31	0	1070.72*	2	12	0.67	2143.45	2140	8	1.57E-04	355.1	
32	0	1081.34	9	15	3.96	2164.73	2157	12	6.34E-04	91.0	
33	0	1193.39	13	8	3.33	2389.13	2383	11	8.80E-04	52.2	
34	0	1260.04	15	8	1.73	2522.60	2518	8	1.04E-03	41.6	

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
35	0	1461.42*	20	14	2.66	2925.92	2919	14	1.36E-03	58.2	
36	0	1613.12	1	15	0.56	3229.76	3224	11	9.77E-05	521.6	
37	0	1764.91*	8	0	1.50	3533.79	3529	11	5.79E-04	73.0	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 22-JUL-2022 02:53:17

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905005.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 27-JUN-2022 12:00:00	Acquisition date	: 21-JUL-2022 22:52:48
Sample ID	: G585905005	Sample quantity	: 0.51013 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA33	Detector geometry	: JAR
Elapsed live time	: 0 04:00:00.00	Elapsed real time	: 0 04:00:02.97 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	20	10.66*	8.564E-01	7.884E+01	7.884E+01	116.49
CU-67	91.27	33	7.00	3.575E+00	4.898E+01	3.606E+04	233.16
	93.31	33	16.10	3.575E+00	2.130E+01	1.568E+04	233.16
	184.58	2	48.70*	3.778E+00	3.780E-01	2.783E+02	3709.54
TE-125M	109.28	7	0.27*	4.078E+00	2.229E+02	2.997E+02	614.39
CE-141	145.44	16	48.29*	4.161E+00	2.967E+00	5.006E+00	279.85
TL-208	277.37	-----	6.60	2.982E+00	-----	Line Not Found	-----
	583.19	4	85.00*	1.810E+00	9.602E-01	9.838E-01	783.11
	860.56	-----	12.50	1.329E+00	-----	Line Not Found	-----
BI-211	72.87	-----	1.23	2.321E+00	-----	Line Not Found	-----
	351.06	17	12.92*	2.558E+00	1.857E+01	1.861E+01	259.62
BI-214	609.32	13	45.49*	1.752E+00	5.963E+00	5.963E+00	266.75
	1120.29	-----	14.92	1.058E+00	-----	Line Not Found	-----
	1764.49	8	15.30	7.701E-01	2.602E+01	2.602E+01	146.08
RA-226	186.21	2	3.59*	3.778E+00	5.128E+00	5.128E+00	3709.54
TH-232	63.81	51	0.26*	1.490E+00	4.817E+03	4.817E+03	108.15
	140.88	-----	0.02	4.179E+00	-----	Line Not Found	-----
PA-234M	766.42	11	0.32	1.462E+00	8.875E+02	8.875E+02	195.45
	1001.03	16	0.84*	1.167E+00	5.960E+02	5.960E+02	117.10
TH-234	63.29	51	3.70*	1.490E+00	3.385E+02	3.385E+02	108.15
	92.59	33	4.23	3.575E+00	8.106E+01	8.106E+01	233.16
U-235	143.76	16	10.96*	4.161E+00	1.307E+01	1.307E+01	279.85
	163.33	20	5.08	4.003E+00	3.690E+01	3.690E+01	229.56
	185.72	2	57.20	3.778E+00	3.218E-01	3.218E-01	3709.54
	205.31	-----	5.01	3.581E+00	-----	Line Not Found	-----
U-238	63.29	51	3.70*	1.490E+00	3.385E+02	3.385E+02	108.15
	92.59	33	4.23	3.575E+00	8.106E+01	8.106E+01	233.16

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905005.CNF;1
Acquisition date : 21-JUL-2022 22:52:48 Sensitivity : 3.000
Detector ID : GAM33 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:02.97 Half life ratio : *****
Sample date : 27-JUN-2022 12:00:00 Analyst initials: MJH1
Sample ID : G585905005 Sample Quantity : 5.1013E-01 FILTER
Batch Number : 2290721 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 27-JUL-2021 10:51:23 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM33_JAR.CNF;12

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
K-40	7.884E+01	9.000E+01	5.323E+01
CU-67	2.783E+02	1.012E+04	7.107E+03
TE-125M	2.997E+02	1.805E+03	2.138E+03
CE-141	5.006E+00	1.373E+01	1.451E+01
TL-208	9.838E-01	7.551E+00	6.982E+00
BI-211	1.861E+01	4.735E+01	3.900E+01
BI-214	5.963E+00	1.559E+01	1.179E+01
RA-226	5.128E+00	1.864E+02	1.281E+02
TH-232	4.817E+03	5.106E+03	4.050E+03
PA-234M	5.960E+02	6.840E+02	7.697E+02
TH-234	3.385E+02	3.588E+02	2.932E+02
U-235	1.307E+01	3.585E+01	3.587E+01
U-238	3.385E+02	3.588E+02	2.932E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	-7.000E+00	3.708E+01	6.687E+01	NOT IDENT.
NA-22	-3.548E-01	3.813E+00	7.381E+00	NOT IDENT.
NA-24	0.000E+00	2.570E+12	0.000E+00	SHORT HLIF
AL-26	9.969E-01	3.164E+00	7.002E+00	NOT IDENT.
SC-46	1.921E+00	3.883E+00	8.142E+00	NOT IDENT.
V-48	9.654E+00	7.922E+00	1.732E+01	FAIL ABUN
CR-51	6.971E+00	5.394E+01	9.998E+01	NOT IDENT.
MN-52	-3.910E+01	6.973E+01	1.231E+02	NOT IDENT.
MN-54	4.944E+00	4.048E+00	8.455E+00	NOT IDENT.
CO-56	2.122E+00	5.248E+00	9.865E+00	NOT IDENT.
CO-57	6.279E-01	2.800E+00	4.889E+00	NOT IDENT.
NI-57	0.000E+00	5.082E+05	0.000E+00	SHORT HLIF
CO-58	-1.544E+00	4.665E+00	8.045E+00	NOT IDENT.
FE-59	2.923E+00	9.620E+00	1.960E+01	NOT IDENT.
CO-60	8.008E-01	4.176E+00	8.360E+00	NOT IDENT.
ZN-65	6.400E+00	8.434E+00	1.797E+01	NOT IDENT.
GE-68	-2.832E+01	1.351E+02	2.227E+02	NOT IDENT.

AS-73	-9.889E+01	1.663E+02	2.795E+02	NOT IDENT.
AS-74	1.257E+01	1.471E+01	2.739E+01	NOT IDENT.
SE-75	-1.707E+00	5.335E+00	9.608E+00	NOT IDENT.
BR-77	0.000E+00	2.236E+04	0.000E+00	SHORT HLIF
SR-82	-1.426E+01	4.306E+01	7.478E+01	NOT IDENT.
RB-83	-6.780E+00	1.018E+01	1.492E+01	NOT IDENT.
RB-84	1.833E+00	9.260E+00	1.656E+01	NOT IDENT.
KR-85	-4.886E+03	1.379E+03	1.834E+03	NOT IDENT.
SR-85	-2.833E+01	7.992E+00	1.063E+01	NOT IDENT.
RB-86	6.758E+00	1.111E+02	1.956E+02	NOT IDENT.
Y-88	-2.989E+00	5.563E+00	9.544E+00	NOT IDENT.
Y-91	-1.560E+02	1.818E+03	3.542E+03	NOT IDENT.
NB-94	3.318E-01	4.037E+00	6.590E+00	NOT IDENT.
NB-95	-2.012E+00	6.216E+00	8.735E+00	NOT IDENT.
NB-95M	-1.711E+01	1.551E+01	2.651E+01	NOT IDENT.
TC-95M	-7.904E+00	7.643E+00	9.552E+00	FAIL ABUN
ZR-95	-3.127E+00	8.681E+00	1.494E+01	NOT IDENT.
MO-99	-4.124E+03	1.404E+04	2.447E+04	NOT IDENT.
TC-99M	0.000E+00	8.556E+29	0.000E+00	SHORT HLIF
RH-101	-2.082E+00	3.777E+00	6.151E+00	FAIL ABUN
RH-102M	1.750E+00	3.122E+00	6.060E+00	FAIL ABUN
RU-103	-4.305E+00	4.834E+00	7.945E+00	FAIL ABUN
RH-106	1.569E+01	3.735E+01	7.070E+01	NOT IDENT.
RU-106	1.569E+01	3.735E+01	7.070E+01	NOT IDENT.
AG-108M	-2.498E+00	3.296E+00	5.576E+00	NOT IDENT.
CD-109	5.181E+01	9.850E+01	1.631E+02	NOT IDENT.
AG-110	-2.278E+01	7.540E+01	1.324E+02	NOT IDENT.
AG-110M	-8.252E-01	4.953E+00	9.188E+00	NOT IDENT.
IN-111	-1.154E+03	1.181E+03	2.029E+03	NOT IDENT.
SN-113	-1.772E-01	4.751E+00	8.747E+00	NOT IDENT.
IN-114M	1.155E+01	2.263E+01	3.982E+01	NOT IDENT.
CD-115	0.000E+00	2.443E+04	0.000E+00	SHORT HLIF
SN-117M	-4.585E+00	9.824E+00	1.597E+01	NOT IDENT.
SB-122	2.634E+03	2.462E+03	4.964E+03	NOT IDENT.
I-123	0.000E+00	7.441E+13	0.000E+00	SHORT HLIF
TE-123M	-4.220E-01	3.326E+00	5.570E+00	NOT IDENT.
SB-124	-5.127E+00	9.484E+00	1.659E+01	NOT IDENT.
SB-125	-2.719E+00	1.158E+01	1.867E+01	NOT IDENT.
I-126	-2.012E+01	3.824E+01	6.475E+01	NOT IDENT.
SB-126	3.430E+00	2.179E+01	4.125E+01	FAIL ABUN
SN-126	8.759E+00	9.514E+00	1.624E+01	FAIL ABUN
SB-127	-7.045E+02	7.756E+02	1.233E+03	NOT IDENT.
TE-129	-4.441E+00	6.773E+01	1.228E+02	NOT IDENT.
I-131	-2.783E+01	2.925E+01	4.906E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	3.841E+02	5.619E+02	1.092E+03	FAIL ABUN
BA-133	-9.928E-01	4.813E+00	7.767E+00	NOT IDENT.
I-133	0.000E+00	1.188E+09	0.000E+00	SHORT HLIF
CS-134	4.157E+00	4.718E+00	9.400E+00	FAIL ABUN
I-135	0.000E+00	1.418E+28	0.000E+00	SHORT HLIF
CS-136	8.177E+00	1.708E+01	3.535E+01	FAIL ABUN
BA-137M	1.018E+00	3.679E+00	6.938E+00	NOT IDENT.
CS-137	1.076E+00	3.886E+00	7.330E+00	NOT IDENT.
LA-138	-2.610E+00	5.144E+00	9.206E+00	NOT IDENT.
CE-139	-8.656E-01	3.758E+00	5.698E+00	NOT IDENT.
BA-140	-6.782E+00	4.808E+01	8.652E+01	FAIL ABUN
LA-140	-7.035E+00	1.392E+01	2.470E+01	NOT IDENT.
CE-143	0.000E+00	1.387E+06	0.000E+00	SHORT HLIF
CE-144	-6.771E-01	2.212E+01	3.763E+01	NOT IDENT.
PM-144	1.923E+00	4.178E+00	7.872E+00	NOT IDENT.
PR-144	1.388E+02	3.135E+02	5.898E+02	NOT IDENT.
PM-146	-5.687E-01	4.686E+00	8.472E+00	NOT IDENT.
ND-147	-1.394E+01	1.100E+02	1.985E+02	NOT IDENT.
PM-147	-9.910E+04	8.300E+04	1.277E+05	NOT IDENT.
PM-149	0.000E+00	1.799E+05	0.000E+00	SHORT HLIF
EU-152	9.314E+00	1.195E+01	2.136E+01	NOT IDENT.
GD-153	6.264E+00	1.032E+01	1.849E+01	NOT IDENT.
EU-154	-6.708E-02	1.051E+01	2.071E+01	NOT IDENT.
EU-155	2.953E+00	1.207E+01	2.112E+01	NOT IDENT.
TB-160	8.049E+00	2.989E+01	2.647E+01	FAIL ABUN
HO-166M	-2.370E+00	5.991E+00	1.033E+01	FAIL ABUN
TM-171	6.244E+02	3.206E+03	5.752E+03	NOT IDENT.
LU-176	-1.064E+00	3.166E+00	5.657E+00	NOT IDENT.
LU-177	-1.050E+02	3.118E+02	5.656E+02	FAIL ABUN
HF-181	3.020E-01	7.436E+00	1.117E+01	NOT IDENT.
W-181	2.962E+00	3.822E+01	6.234E+01	FAIL ABUN
TA-182	9.164E+00	1.626E+01	3.457E+01	NOT IDENT.
RE-183	1.034E+01	3.739E+01	6.212E+01	FAIL ABUN

RE-184	-5.055E+00	1.720E+01	3.192E+01	NOT IDENT.
RE-188	-3.874E+00	2.087E+01	3.472E+01	FAIL ABUN
W-188	-3.729E+01	8.043E+02	1.484E+03	FAIL ABUN
OS-191	1.175E+01	2.850E+01	4.991E+01	FAIL ABUN
IR-192	-6.836E-01	4.351E+00	7.893E+00	NOT IDENT.
PB-201	0.000E+00	3.554E+19	0.000E+00	SHORT HLIF
TL-201	2.586E+03	7.103E+03	1.145E+04	NOT IDENT.
TL-202	-1.169E+01	1.309E+01	2.177E+01	NOT IDENT.
HG-203	1.792E+00	4.595E+00	8.746E+00	NOT IDENT.
PB-203	0.000E+00	8.347E+03	0.000E+00	SHORT HLIF
TL-204	-3.352E+02	6.074E+02	1.014E+03	NOT IDENT.
BI-207	3.386E-01	4.751E+00	9.417E+00	NOT IDENT.
PB-210	6.844E+02	7.614E+02	1.439E+03	NOT IDENT.
PB-211	2.626E+01	7.737E+01	1.463E+02	NOT IDENT.
BI-212	-7.183E+00	6.633E+01	1.167E+02	NOT IDENT.
PB-212	-1.297E+00	9.513E+00	1.577E+01	NOT IDENT.
BI-213	-5.132E+00	1.150E+01	2.011E+01	NOT IDENT.
PB-214	6.741E+00	1.715E+01	1.816E+01	FAIL ABUN
RN-219	-4.713E+01	4.472E+01	7.357E+01	NOT IDENT.
FR-221	8.385E+00	2.181E+01	4.147E+01	NOT IDENT.
RA-223	-1.507E+01	6.329E+01	1.148E+02	FAIL ABUN
RA-224	-1.716E+02	7.885E+01	1.249E+02	NOT IDENT.
AC-225	4.593E+01	1.195E+02	2.272E+02	NOT IDENT.
AC-227	-1.093E+01	2.876E+01	5.160E+01	NOT IDENT.
TH-227	-1.093E+01	2.876E+01	5.160E+01	NOT IDENT.
AC-228	-1.132E+00	2.163E+01	3.532E+01	NOT IDENT.
RA-228	-1.132E+00	2.163E+01	3.532E+01	NOT IDENT.
TH-228	-1.297E+00	9.513E+00	1.577E+01	NOT IDENT.
TH-229	-3.533E+01	6.152E+01	9.798E+01	NOT IDENT.
TH-230	6.481E+01	1.549E+03	2.498E+03	NOT IDENT.
PA-231	7.481E+00	5.643E+01	1.043E+02	NOT IDENT.
TH-231	-1.375E+01	6.950E+01	9.692E+01	NOT IDENT.
PA-233	1.028E+00	7.313E+00	1.359E+01	FAIL ABUN
PA-234	1.841E+01	2.892E+01	6.107E+01	FAIL ABUN
U-234	-3.970E+03	1.169E+04	2.007E+04	NOT IDENT.
NP-237	1.028E+00	7.313E+00	1.359E+01	FAIL ABUN
NP-238	0.000E+00	3.304E+04	0.000E+00	SHORT HLIF
NP-239	-2.549E+01	3.321E+01	4.836E+01	NOT IDENT.
AM-241	-6.109E+00	2.403E+01	3.805E+01	NOT IDENT.
AM-242	-6.810E+00	7.530E+01	1.285E+02	NOT IDENT.
AM-243	-2.431E-01	7.840E+00	1.197E+01	NOT IDENT.
CM-243	-1.067E+01	1.256E+01	2.015E+01	NOT IDENT.
BK-247	-1.385E+00	9.169E+00	1.671E+01	NOT IDENT.
CM-247	-3.309E+00	3.983E+00	6.716E+00	NOT IDENT.
CF-249	1.395E+00	4.448E+00	8.380E+00	NOT IDENT.
CF-251	-3.860E+00	1.559E+01	2.565E+01	NOT IDENT.
CF-252	-1.752E+04	2.130E+04	3.430E+04	NOT IDENT.
ANH-511	-2.581E+01	9.420E+00	1.568E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	39.27	37	112	1.11	78.05	76	7	2.56E-03	50.0	
2	5	61.18	25	99	1.72	121.93	119	15	1.75E-03	67.2	4.51E+00
3	5	63.30	118	145	1.26	126.17	119	15	8.18E-03	20.0	
4	5	65.21	34	120	1.08	130.00	119	15	2.34E-03	55.0	
5	0	84.36	21	171	1.48	168.33	165	8	1.43E-03	112.2	
6	0	92.64	319	238	1.01	184.91	179	11	2.22E-02	10.9	
7	3	110.13	31	115	1.37	219.94	217	13	2.16E-03	56.8	1.21E+00
8	3	112.78	25	182	1.54	225.23	217	13	1.73E-03	97.8	
9	0	143.98	55	120	0.93	287.71	284	7	3.83E-03	35.7	
10	0	163.36	51	119	1.31	326.51	323	8	3.55E-03	39.6	
11	0	185.73	203	214	1.16	371.29	367	11	1.41E-02	15.6	
12	0	197.20	43	141	1.51	394.27	390	8	2.99E-03	50.3	
13	0	200.13	18	93	1.00	400.13	399	6	1.22E-03	90.2	
14	0	238.49	64	160	1.05	476.93	472	10	4.42E-03	39.2	
15	0	340.76	43	106	4.49	681.72	674	14	3.00E-03	52.6	
16	0	352.05	38	90	0.67	704.32	699	11	2.61E-03	51.8	
17	0	511.11	332	106	2.57	1022.81	1015	17	2.31E-02	9.0	
18	0	524.38	15	37	3.02	1049.39	1044	9	1.06E-03	76.9	
19	0	583.43	29	45	1.61	1167.64	1163	11	2.01E-03	48.3	
20	0	598.54	34	41	3.73	1197.88	1192	11	2.33E-03	40.9	
21	0	604.02	22	51	3.90	1208.86	1203	12	1.55E-03	67.3	
22	0	609.78	47	38	1.44	1220.39	1215	12	3.28E-03	30.1	
23	0	698.13	37	81	7.59	1397.32	1386	20	2.59E-03	62.6	
24	0	767.57	23	21	3.00	1536.36	1532	9	1.63E-03	40.4	
25	2	858.77	30	13	1.75	1719.00	1711	17	2.05E-03	28.9	4.32E+00
26	2	861.60	11	5	1.42	1724.67	1711	17	7.45E-04	50.5	
27	0	865.59	5	15	0.66	1732.66	1728	8	3.30E-04	145.9	
28	0	879.44	7	36	0.80	1760.39	1750	14	4.72E-04	189.4	
29	0	912.24	13	33	2.32	1826.08	1820	11	9.03E-04	90.0	
30	0	983.56	11	3	1.45	1968.90	1965	7	7.44E-04	41.9	
31	1	1001.27	36	6	2.01	2004.37	1997	25	2.53E-03	21.2	1.47E+00
32	1	1008.39	13	3	2.02	2018.63	1997	25	9.36E-04	33.6	
33	0	1021.05	25	13	1.28	2043.99	2038	11	1.73E-03	34.9	
34	0	1025.53	7	9	0.53	2052.96	2049	8	5.08E-04	77.4	
35	0	1033.48	16	17	0.66	2068.88	2061	14	1.09E-03	61.8	
36	0	1070.72	10	12	0.67	2143.45	2140	8	6.94E-04	67.8	
37	0	1081.34	9	15	3.96	2164.73	2157	12	6.34E-04	91.0	
38	0	1193.39	13	8	3.33	2389.13	2383	11	8.80E-04	52.2	
39	0	1260.04	15	8	1.73	2522.60	2518	8	1.04E-03	41.6	
40	0	1461.42	37	14	2.66	2925.92	2919	14	2.57E-03	27.0	
41	0	1613.12	1	15	0.56	3229.76	3224	11	9.77E-05	521.6	
42	0	1764.91	24	0	1.50	3533.79	3529	11	1.67E-03	20.4	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	20	10.66*	8.564E-01	7.884E+01	7.884E+01	116.49
CU-67	91.27	33	7.00	3.575E+00	4.898E+01	3.606E+04	233.16
	93.31	33	16.10	3.575E+00	2.130E+01	1.568E+04	233.16
	184.58	2	48.70*	3.778E+00	3.780E-01	2.783E+02	3709.54
TE-125M	109.28	7	0.27*	4.078E+00	2.229E+02	2.997E+02	614.39
CE-141	145.44	16	48.29*	4.161E+00	2.967E+00	5.006E+00	279.85
TL-208	277.37	-----	6.60	2.982E+00	-----	Line Not Found	-----
	583.19	4	85.00*	1.810E+00	9.602E-01	9.838E-01	783.11
	860.56	-----	12.50	1.329E+00	-----	Line Not Found	-----
BI-211	72.87	-----	1.23	2.321E+00	-----	Line Not Found	-----
	351.06	17	12.92*	2.558E+00	1.857E+01	1.861E+01	259.62
BI-214	609.32	13	45.49*	1.752E+00	5.963E+00	5.963E+00	266.75
	1120.29	-----	14.92	1.058E+00	-----	Line Not Found	-----
	1764.49	8	15.30	7.701E-01	2.602E+01	2.602E+01	146.08
RA-226	186.21	2	3.59*	3.778E+00	5.128E+00	5.128E+00	3709.54
TH-232	63.81	51	0.26*	1.490E+00	4.817E+03	4.817E+03	108.15
	140.88	-----	0.02	4.179E+00	-----	Line Not Found	-----
PA-234M	766.42	11	0.32	1.462E+00	8.875E+02	8.875E+02	195.45
	1001.03	16	0.84*	1.167E+00	5.960E+02	5.960E+02	117.10
TH-234	63.29	51	3.70*	1.490E+00	3.385E+02	3.385E+02	108.15
	92.59	33	4.23	3.575E+00	8.106E+01	8.106E+01	233.16
U-235	143.76	16	10.96*	4.161E+00	1.307E+01	1.307E+01	279.85
	163.33	20	5.08	4.003E+00	3.690E+01	3.690E+01	229.56
	185.72	2	57.20	3.778E+00	3.218E-01	3.218E-01	3709.54
	205.31	-----	5.01	3.581E+00	-----	Line Not Found	-----
U-238	63.29	51	3.70*	1.490E+00	3.385E+02	3.385E+02	108.15
	92.59	33	4.23	3.575E+00	8.106E+01	8.106E+01	233.16

Flag: "*" = Keyline

Total number of lines in spectrum 37
Number of unidentified lines 13
Number of lines tentatively identified by NID 24 64.86%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
K-40	1.25E+09Y	1.00	7.884E+01	7.884E+01	9.184E+01	116.49	
CU-67	61.83H	736.	3.780E-01	2.783E+02	103.2E+02	3709.54	
TE-125M	57.40D	1.34	2.229E+02	2.997E+02	18.42E+02	614.39	
CE-141	32.51D	1.69	2.967E+00	5.006E+00	14.01E+00	279.85	
TL-208	1.91Y	1.02	9.602E-01	9.838E-01	77.05E-01	783.11	
BI-211	21.77Y	1.00	1.857E+01	1.861E+01	4.832E+01	259.62	
BI-214	1600.00Y	1.00	5.963E+00	5.963E+00	15.91E+00	266.75	
RA-226	1600.00Y	1.00	5.128E+00	5.128E+00	190.2E+00	3709.54	
TH-232	1.41E+10Y	1.00	4.817E+03	4.817E+03	5.210E+03	108.15	
PA-234M	4.47E+09Y	1.00	5.960E+02	5.960E+02	6.979E+02	117.10	
TH-234	4.47E+09Y	1.00	3.385E+02	3.385E+02	3.661E+02	108.15	
U-235	7.04E+08Y	1.00	1.307E+01	1.307E+01	3.658E+01	279.85	
U-238	4.47E+09Y	1.00	3.385E+02	3.385E+02	3.661E+02	108.15	
Total Activity :			6.439E+03	6.796E+03			

Grand Total Activity : 6.439E+03 6.796E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	39.27	37	112	1.11	78.05	76	7	2.56E-03	****	6.28E-02	
5	61.18	25	99	1.72	121.93	119	15	1.75E-03	****	1.30E+00	T
5	65.21	34	120	1.08	130.00	119	15	2.34E-03	****	1.66E+00	T
3	112.78	9	182	1.54	225.23	217	13	6.00E-04	****	4.12E+00	T
0	197.20	14	141	1.51	394.27	390	8	9.41E-04	****	3.66E+00	T
0	200.13	18	93	1.00	400.13	399	6	1.22E-03	****	3.63E+00	
0	340.76	43	106	4.49	681.72	674	14	3.00E-03	****	2.61E+00	T
0	524.38	15	37	3.02	1049.39	1044	9	1.06E-03	****	1.96E+00	
0	598.54	34	41	3.73	1197.88	1192	11	2.33E-03	81.9	1.78E+00	
0	604.02	22	51	3.90	1208.86	1203	12	1.55E-03	****	1.76E+00	T
0	698.13	37	81	7.59	1397.32	1386	20	2.59E-03	****	1.58E+00	T
2	858.77	30	13	1.75	1719.00	1711	17	2.05E-03	57.7	1.33E+00	
0	865.59	5	15	0.66	1732.66	1728	8	3.30E-04	****	1.32E+00	
0	879.44	7	36	0.80	1760.39	1750	14	4.72E-04	****	1.30E+00	T
0	983.56	11	3	1.45	1968.90	1965	7	7.44E-04	83.7	1.18E+00	T
1	1008.39	13	3	2.02	2018.63	1997	25	9.36E-04	67.2	1.16E+00	
0	1021.05	25	13	1.28	2043.99	2038	11	1.73E-03	69.9	1.15E+00	
0	1025.53	7	9	0.53	2052.96	2049	8	5.08E-04	****	1.14E+00	T
0	1033.48	16	17	0.66	2068.88	2061	14	1.09E-03	****	1.13E+00	
0	1070.72	2	12	0.67	2143.45	2140	8	1.57E-04	****	1.10E+00	
0	1081.34	9	15	3.96	2164.73	2157	12	6.34E-04	****	1.09E+00	
0	1193.39	13	8	3.33	2389.13	2383	11	8.80E-04	****	1.00E+00	
0	1260.04	15	8	1.73	2522.60	2518	8	1.04E-03	83.3	9.59E-01	T
0	1613.12	1	15	0.56	3229.76	3224	11	9.77E-05	****	8.04E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905005.CNF;1  *
* Acquisition date   : 21-JUL-2022 22:52:48 Sensitivity      : 3.000          *
* Detector ID        : GAM33 Energy tolerance: 1.500         *
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 04:00:02.97 Half life ratio  : *****          *
* Sample date        : 27-JUN-2022 12:00:00 Nuclide Library : LIQUID         *
* Sample ID          : G585905005 Analyst initials: MJH1          *
* Batch Number       : 2290721 Sample Quantity  : 5.1013E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight       : 0.00000         *
*                                     Dry Weight      : 0.00000         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 27-JUL-2021 10:51:23 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM33_JAR.CNF;12          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
K-40	2.117E+01
CU-67	3.356E+03
TE-125M	1.009E+03
CE-141	6.838E+00
TL-208	3.161E+00
BI-211	1.800E+01
BI-214	5.273E+00
RA-226	6.039E+01
TH-232	1.901E+03
PA-234M	3.342E+02
TH-234	1.376E+02
U-235	1.685E+01
U-238	1.376E+02

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	3.030E+01	NOT IDENT.
NA-22	3.158E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.848E+00	NOT IDENT.
SC-46	3.601E+00	NOT IDENT.
V-48	7.442E+00	FAIL ABUN
CR-51	4.660E+01	NOT IDENT.
MN-52	4.953E+01	NOT IDENT.
MN-54	3.844E+00	NOT IDENT.
CO-56	4.474E+00	NOT IDENT.
CO-57	2.298E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.569E+00	NOT IDENT.
FE-59	8.604E+00	NOT IDENT.
CO-60	3.633E+00	NOT IDENT.
ZN-65	7.994E+00	NOT IDENT.
GE-68	9.636E+01	NOT IDENT.
AS-73	1.311E+02	NOT IDENT.

AS-74	1.247E+01	NOT IDENT.
SE-75	4.489E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	3.294E+01	NOT IDENT.
RB-83	6.779E+00	NOT IDENT.
RB-84	7.350E+00	NOT IDENT.
KR-85	8.589E+02	NOT IDENT.
SR-85	4.979E+00	NOT IDENT.
RB-86	8.474E+01	NOT IDENT.
Y-88	3.998E+00	NOT IDENT.
Y-91	1.514E+03	NOT IDENT.
NB-94	2.979E+00	NOT IDENT.
NB-95	3.925E+00	NOT IDENT.
NB-95M	1.247E+01	NOT IDENT.
TC-95M	4.489E+00	FAIL ABUN
ZR-95	6.665E+00	NOT IDENT.
MO-99	1.091E+04	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.901E+00	FAIL ABUN
RH-102M	2.778E+00	FAIL ABUN
RU-103	3.559E+00	FAIL ABUN
RH-106	3.233E+01	NOT IDENT.
RU-106	3.233E+01	NOT IDENT.
AG-108M	2.542E+00	NOT IDENT.
CD-109	7.743E+01	NOT IDENT.
AG-110	5.905E+01	NOT IDENT.
AG-110M	4.031E+00	NOT IDENT.
IN-111	9.436E+02	NOT IDENT.
SN-113	4.003E+00	NOT IDENT.
IN-114M	1.871E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	7.492E+00	NOT IDENT.
SB-122	2.286E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.617E+00	NOT IDENT.
SB-124	6.528E+00	NOT IDENT.
SB-125	8.584E+00	NOT IDENT.
I-126	2.894E+01	NOT IDENT.
SB-126	1.825E+01	FAIL ABUN
SN-126	7.721E+00	FAIL ABUN
SB-127	5.469E+02	NOT IDENT.
TE-129	5.640E+01	NOT IDENT.
I-131	2.251E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	5.122E+02	FAIL ABUN
BA-133	3.568E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	4.282E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	1.566E+01	FAIL ABUN
BA-137M	3.134E+00	NOT IDENT.
CS-137	3.310E+00	NOT IDENT.
LA-138	3.728E+00	NOT IDENT.
CE-139	2.673E+00	NOT IDENT.
BA-140	3.925E+01	FAIL ABUN
LA-140	9.904E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.769E+01	NOT IDENT.
PM-144	3.606E+00	NOT IDENT.
PR-144	2.701E+02	NOT IDENT.
PM-146	3.880E+00	NOT IDENT.
ND-147	9.004E+01	NOT IDENT.
PM-147	5.965E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	9.959E+00	NOT IDENT.
GD-153	8.761E+00	NOT IDENT.
EU-154	8.851E+00	NOT IDENT.
EU-155	9.967E+00	NOT IDENT.
TB-160	1.164E+01	FAIL ABUN
HO-166M	4.577E+00	FAIL ABUN
TM-171	2.699E+03	NOT IDENT.
LU-176	2.640E+00	NOT IDENT.
LU-177	2.655E+02	FAIL ABUN
HF-181	5.140E+00	NOT IDENT.
W-181	2.938E+01	FAIL ABUN
TA-182	1.512E+01	NOT IDENT.
RE-183	2.928E+01	FAIL ABUN
RE-184	1.431E+01	NOT IDENT.

RE-188	1.637E+01	FAIL ABUN
W-188	6.879E+02	FAIL ABUN
OS-191	2.362E+01	FAIL ABUN
IR-192	3.672E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	5.388E+03	NOT IDENT.
TL-202	9.910E+00	NOT IDENT.
HG-203	4.079E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	4.773E+02	NOT IDENT.
BI-207	4.106E+00	NOT IDENT.
PB-210	6.776E+02	NOT IDENT.
PB-211	6.754E+01	NOT IDENT.
BI-212	5.335E+01	NOT IDENT.
PB-212	7.530E+00	NOT IDENT.
BI-213	9.191E+00	NOT IDENT.
PB-214	8.536E+00	FAIL ABUN
RN-219	3.358E+01	NOT IDENT.
FR-221	1.948E+01	NOT IDENT.
RA-223	5.281E+01	FAIL ABUN
RA-224	5.864E+01	NOT IDENT.
AC-225	1.067E+02	NOT IDENT.
AC-227	2.413E+01	NOT IDENT.
TH-227	2.413E+01	NOT IDENT.
AC-228	1.613E+01	NOT IDENT.
RA-228	1.613E+01	NOT IDENT.
TH-228	7.530E+00	NOT IDENT.
TH-229	4.596E+01	NOT IDENT.
TH-230	1.180E+03	NOT IDENT.
PA-231	4.886E+01	NOT IDENT.
TH-231	4.608E+01	NOT IDENT.
PA-233	6.332E+00	FAIL ABUN
PA-234	2.716E+01	FAIL ABUN
U-234	9.417E+03	NOT IDENT.
NP-237	6.332E+00	FAIL ABUN
NP-238	0.000E+00	SHORT HLIF
NP-239	2.268E+01	NOT IDENT.
AM-241	1.784E+01	NOT IDENT.
AM-242	6.066E+01	NOT IDENT.
AM-243	5.685E+00	NOT IDENT.
CM-243	9.472E+00	NOT IDENT.
BK-247	7.818E+00	NOT IDENT.
CM-247	3.064E+00	NOT IDENT.
CF-249	3.877E+00	NOT IDENT.
CF-251	1.208E+01	NOT IDENT.
CF-252	1.614E+04	NOT IDENT.
ANH-511	7.593E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G585905005.CNF;1
* Acquisition date   : 21-JUL-2022 22:52:48 Sensitivity      : 3.000
* Detector ID        : GAM33 Energy tolerance: 1.500
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 04:00:02.97 Half life ratio  : *****
* Sample date        : 27-JUN-2022 12:00:00 Nuclide Library : LIQUID
* Sample ID          : G585905005 Analyst initials: MJH1
* Batch Number       : 2290721 Sample Quantity : 5.1013E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 27-JUL-2021 10:51:23 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM33_JAR.CNF;12

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
K-40	7.884E+01	9.030E+01	9.031E+01
CU-67	2.783E+02	1.012E+04	1.012E+04
TE-125M	2.997E+02	1.805E+03	1.805E+03
CE-141	5.006E+00	1.374E+01	1.374E+01
TL-208	9.838E-01	7.551E+00	7.551E+00
BI-211	1.861E+01	4.738E+01	4.738E+01
BI-214	5.963E+00	1.560E+01	1.560E+01
RA-226	5.128E+00	1.864E+02	1.864E+02
TH-232	4.817E+03	5.152E+03	5.153E+03
PA-234M	5.960E+02	6.862E+02	6.863E+02
TH-234	3.385E+02	3.676E+02	3.676E+02
U-235	1.307E+01	3.587E+01	3.587E+01
U-238	3.385E+02	3.676E+02	3.676E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	-7.000E+00	3.709E+01	3.722E+01	NOT IDENT.
NA-22	-3.548E-01	3.813E+00	3.817E+00	NOT IDENT.
NA-24	4.691E+11	2.571E+12	2.579E+12	SHORT HLIF
AL-26	9.969E-01	3.165E+00	3.197E+00	NOT IDENT.
SC-46	1.921E+00	3.887E+00	3.982E+00	NOT IDENT.
V-48	9.654E+00	7.971E+00	9.084E+00	FAIL ABUN
CR-51	6.971E+00	5.394E+01	5.404E+01	NOT IDENT.
MN-52	-3.910E+01	6.981E+01	7.201E+01	NOT IDENT.
MN-54	4.944E+00	4.072E+00	4.643E+00	NOT IDENT.
CO-56	2.122E+00	5.251E+00	5.338E+00	NOT IDENT.
CO-57	6.279E-01	2.801E+00	2.815E+00	NOT IDENT.
NI-57	-3.366E+05	5.096E+05	5.317E+05	SHORT HLIF
CO-58	-1.544E+00	4.667E+00	4.719E+00	NOT IDENT.
FE-59	2.923E+00	9.625E+00	9.715E+00	NOT IDENT.
CO-60	8.008E-01	4.176E+00	4.192E+00	NOT IDENT.
ZN-65	6.400E+00	8.453E+00	8.932E+00	NOT IDENT.
GE-68	-2.832E+01	1.351E+02	1.357E+02	NOT IDENT.

AS-73	-9.889E+01	1.678E+02	1.737E+02	NOT IDENT.
AS-74	1.257E+01	1.477E+01	1.583E+01	NOT IDENT.
SE-75	-1.707E+00	5.337E+00	5.392E+00	NOT IDENT.
BR-77	-2.301E+03	2.236E+04	2.238E+04	SHORT HLIF
SR-82	-1.426E+01	4.308E+01	4.356E+01	NOT IDENT.
RB-83	-6.780E+00	1.023E+01	1.068E+01	NOT IDENT.
RB-84	1.833E+00	9.261E+00	9.298E+00	NOT IDENT.
KR-85	-4.886E+03	1.440E+03	2.633E+03	NOT IDENT.
SR-85	-2.833E+01	8.346E+00	1.526E+01	NOT IDENT.
RB-86	6.758E+00	1.111E+02	1.111E+02	NOT IDENT.
Y-88	-2.989E+00	5.568E+00	5.729E+00	NOT IDENT.
Y-91	-1.560E+02	1.818E+03	1.820E+03	NOT IDENT.
NB-94	3.318E-01	4.037E+00	4.040E+00	NOT IDENT.
NB-95	-2.012E+00	6.218E+00	6.284E+00	NOT IDENT.
NB-95M	-1.711E+01	1.561E+01	1.742E+01	NOT IDENT.
TC-95M	-7.904E+00	7.677E+00	8.465E+00	FAIL ABUN
ZR-95	-3.127E+00	8.685E+00	8.799E+00	NOT IDENT.
MO-99	-4.124E+03	1.405E+04	1.417E+04	NOT IDENT.
TC-99M	-6.403E+27	8.556E+29	0.000E+00	SHORT HLIF
RH-101	-2.082E+00	3.798E+00	3.912E+00	FAIL ABUN
RH-102M	1.750E+00	3.128E+00	3.227E+00	FAIL ABUN
RU-103	-4.305E+00	4.849E+00	5.223E+00	FAIL ABUN
RH-106	1.569E+01	3.738E+01	3.805E+01	NOT IDENT.
RU-106	1.569E+01	3.738E+01	3.805E+01	NOT IDENT.
AG-108M	-2.498E+00	3.303E+00	3.490E+00	NOT IDENT.
CD-109	5.181E+01	9.865E+01	1.014E+02	NOT IDENT.
AG-110	-2.278E+01	7.543E+01	7.612E+01	NOT IDENT.
AG-110M	-8.252E-01	4.954E+00	4.968E+00	NOT IDENT.
IN-111	-1.154E+03	1.185E+03	1.295E+03	NOT IDENT.
SN-113	-1.772E-01	4.751E+00	4.751E+00	NOT IDENT.
IN-114M	1.155E+01	2.265E+01	2.324E+01	NOT IDENT.
CD-115	1.319E+04	2.447E+04	2.518E+04	SHORT HLIF
SN-117M	-4.585E+00	9.832E+00	1.005E+01	NOT IDENT.
SB-122	2.634E+03	2.472E+03	2.743E+03	NOT IDENT.
I-123	-1.029E+13	7.442E+13	7.456E+13	SHORT HLIF
TE-123M	-4.220E-01	3.326E+00	3.331E+00	NOT IDENT.
SB-124	-5.127E+00	9.494E+00	9.771E+00	NOT IDENT.
SB-125	-2.719E+00	1.158E+01	1.164E+01	NOT IDENT.
I-126	-2.012E+01	3.828E+01	3.935E+01	NOT IDENT.
SB-126	3.430E+00	2.180E+01	2.185E+01	FAIL ABUN
SN-126	8.759E+00	9.549E+00	1.033E+01	FAIL ABUN
SB-127	-7.045E+02	7.818E+02	8.439E+02	NOT IDENT.
TE-129	-4.441E+00	6.774E+01	6.777E+01	NOT IDENT.
I-131	-2.783E+01	2.935E+01	3.192E+01	NOT IDENT.
I-132	-1.000E+41	5.736E+41	0.000E+00	SHORT HLIF
TE-132	3.841E+02	5.635E+02	5.896E+02	FAIL ABUN
BA-133	-9.928E-01	4.814E+00	4.835E+00	NOT IDENT.
I-133	-4.507E+08	1.191E+09	1.208E+09	SHORT HLIF
CS-134	4.157E+00	4.733E+00	5.091E+00	FAIL ABUN
I-135	1.737E+28	1.724E+28	0.000E+00	SHORT HLIF
CS-136	8.177E+00	1.711E+01	1.750E+01	FAIL ABUN
BA-137M	1.018E+00	3.680E+00	3.708E+00	NOT IDENT.
CS-137	1.076E+00	3.887E+00	3.917E+00	NOT IDENT.
LA-138	-2.610E+00	5.149E+00	5.282E+00	NOT IDENT.
CE-139	-8.656E-01	3.763E+00	3.783E+00	NOT IDENT.
BA-140	-6.782E+00	4.808E+01	4.818E+01	FAIL ABUN
LA-140	-7.035E+00	1.393E+01	1.429E+01	NOT IDENT.
CE-143	-4.954E+05	1.388E+06	1.406E+06	SHORT HLIF
CE-144	-6.771E-01	2.212E+01	2.212E+01	NOT IDENT.
PM-144	1.923E+00	4.181E+00	4.270E+00	NOT IDENT.
PR-144	1.388E+02	3.138E+02	3.199E+02	NOT IDENT.
PM-146	-5.687E-01	4.686E+00	4.693E+00	NOT IDENT.
ND-147	-1.394E+01	1.100E+02	1.102E+02	NOT IDENT.
PM-147	-9.910E+04	8.342E+04	9.465E+04	NOT IDENT.
PM-149	-6.366E+04	1.801E+05	1.824E+05	SHORT HLIF
EU-152	9.314E+00	1.198E+01	1.270E+01	NOT IDENT.
GD-153	6.264E+00	1.033E+01	1.071E+01	NOT IDENT.
EU-154	-6.708E-02	1.051E+01	1.051E+01	NOT IDENT.
EU-155	2.953E+00	1.208E+01	1.215E+01	NOT IDENT.
TB-160	8.049E+00	2.990E+01	3.012E+01	FAIL ABUN
HO-166M	-2.370E+00	5.995E+00	6.089E+00	FAIL ABUN
TM-171	6.244E+02	3.207E+03	3.220E+03	NOT IDENT.
LU-176	-1.064E+00	3.168E+00	3.204E+00	NOT IDENT.
LU-177	-1.050E+02	3.120E+02	3.155E+02	FAIL ABUN
HF-181	3.020E-01	7.436E+00	7.437E+00	NOT IDENT.
W-181	2.962E+00	3.823E+01	3.825E+01	FAIL ABUN
TA-182	9.164E+00	1.628E+01	1.680E+01	NOT IDENT.
RE-183	1.034E+01	3.742E+01	3.771E+01	FAIL ABUN

RE-184	-5.055E+00	1.721E+01	1.736E+01	NOT IDENT.
RE-188	-3.874E+00	2.087E+01	2.094E+01	FAIL ABUN
W-188	-3.729E+01	8.043E+02	8.045E+02	FAIL ABUN
OS-191	1.175E+01	2.852E+01	2.900E+01	FAIL ABUN
IR-192	-6.836E-01	4.351E+00	4.362E+00	NOT IDENT.
PB-201	-6.343E+17	3.554E+19	0.000E+00	SHORT HLIF
TL-201	2.586E+03	7.106E+03	7.201E+03	NOT IDENT.
TL-202	-1.169E+01	1.312E+01	1.414E+01	NOT IDENT.
HG-203	1.792E+00	4.597E+00	4.668E+00	NOT IDENT.
PB-203	3.256E+03	8.351E+03	8.479E+03	SHORT HLIF
TL-204	-3.352E+02	6.085E+02	6.271E+02	NOT IDENT.
BI-207	3.386E-01	4.751E+00	4.753E+00	NOT IDENT.
PB-210	6.844E+02	7.653E+02	8.252E+02	NOT IDENT.
PB-211	2.626E+01	7.740E+01	7.830E+01	NOT IDENT.
BI-212	-7.183E+00	6.633E+01	6.641E+01	NOT IDENT.
PB-212	-1.297E+00	9.513E+00	9.531E+00	NOT IDENT.
BI-213	-5.132E+00	1.150E+01	1.174E+01	NOT IDENT.
PB-214	6.741E+00	1.716E+01	1.743E+01	FAIL ABUN
RN-219	-4.713E+01	4.524E+01	4.999E+01	NOT IDENT.
FR-221	8.385E+00	2.183E+01	2.215E+01	NOT IDENT.
RA-223	-1.507E+01	6.331E+01	6.367E+01	FAIL ABUN
RA-224	-1.716E+02	8.028E+01	1.115E+02	NOT IDENT.
AC-225	4.593E+01	1.196E+02	1.214E+02	NOT IDENT.
AC-227	-1.093E+01	2.880E+01	2.922E+01	NOT IDENT.
TH-227	-1.093E+01	2.880E+01	2.922E+01	NOT IDENT.
AC-228	-1.132E+00	2.163E+01	2.163E+01	NOT IDENT.
RA-228	-1.132E+00	2.163E+01	2.163E+01	NOT IDENT.
TH-228	-1.297E+00	9.513E+00	9.531E+00	NOT IDENT.
TH-229	-3.533E+01	6.159E+01	6.362E+01	NOT IDENT.
TH-230	6.481E+01	1.549E+03	1.549E+03	NOT IDENT.
PA-231	7.481E+00	5.646E+01	5.656E+01	NOT IDENT.
TH-231	-1.375E+01	6.953E+01	6.981E+01	NOT IDENT.
PA-233	1.028E+00	7.313E+00	7.328E+00	FAIL ABUN
PA-234	1.841E+01	3.580E+01	3.675E+01	FAIL ABUN
U-234	-3.970E+03	1.171E+04	1.184E+04	NOT IDENT.
NP-237	1.028E+00	7.313E+00	7.328E+00	FAIL ABUN
NP-238	4.026E+04	3.325E+04	3.789E+04	SHORT HLIF
NP-239	-2.549E+01	3.329E+01	3.522E+01	NOT IDENT.
AM-241	-6.109E+00	2.404E+01	2.419E+01	NOT IDENT.
AM-242	-6.810E+00	7.531E+01	7.537E+01	NOT IDENT.
AM-243	-2.431E-01	7.840E+00	7.841E+00	NOT IDENT.
CM-243	-1.067E+01	1.262E+01	1.350E+01	NOT IDENT.
BK-247	-1.385E+00	9.174E+00	9.195E+00	NOT IDENT.
CM-247	-3.309E+00	4.028E+00	4.296E+00	NOT IDENT.
CF-249	1.395E+00	4.450E+00	4.495E+00	NOT IDENT.
CF-251	-3.860E+00	1.560E+01	1.570E+01	NOT IDENT.
CF-252	-1.752E+04	2.659E+04	2.774E+04	NOT IDENT.
ANH-511	-2.581E+01	9.672E+00	1.514E+01	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	81.5742	81.00	86.5104	120.90	109.0589
45.60	75.7393	81.07	88.7390	121.12	98.5317
46.54	65.5030	82.35	0.0000	121.22	98.5439
49.72	75.3863	82.47	130.0691	121.78	76.3068
51.35	76.6999	167.43	130.0700	122.06	76.3330
52.39	72.6558	82.47	130.0700	123.07	62.3176
53.20	85.4356	83.79	105.8306	265.00	81.1910
53.44	90.7543	84.00	90.2642	127.16	0.0000
56.28	74.2973	84.21	86.9496	127.23	107.5373
57.36	0.0000	84.86	0.0000	129.43	92.4167
57.53	87.9598	85.43	116.1518	131.20	110.4176
57.53	87.9601	86.55	121.9456	133.02	98.7550
57.98	82.3578	86.79	120.8713	133.52	83.3354
59.32	83.9972	86.94	120.8993	135.34	76.3525
59.54	82.6086	87.09	110.8493	136.00	72.8284
61.49	78.2712	87.57	94.1232	57.53	95.5432
63.00	78.4937	88.03	100.1688	136.47	95.5640
63.29	78.5362	88.34	104.7031	140.51	97.6010
63.58	78.5784	88.47	104.7237	140.88	91.2392
63.81	78.6121	91.11	100.2567	143.76	80.6922
64.28	78.6803	91.27	100.2805	144.24	88.3668
64.99	78.7829	92.59	100.4754	145.44	90.0920
65.08	78.7960	93.31	100.5813	152.32	89.9515
66.73	105.3764	94.56	90.5743	152.43	89.9628
66.98	95.3148	94.65	90.5865	153.25	92.4742
67.24	95.3591	94.67	90.5890	323.87	95.0042
67.67	95.4323	97.43	90.9479	155.04	96.3054
67.75	95.4457	98.43	86.5228	156.02	80.5402
68.89	82.5979	98.44	86.5240	158.56	89.3185
68.89	82.5985	99.53	98.0590	158.97	0.0000
69.67	91.4181	100.11	109.5498	159.00	84.4622
70.82	102.5056	100.20	109.5637	162.33	88.4366
70.82	102.5063	102.03	90.3902	162.66	77.4080
70.83	0.0000	103.18	100.8470	163.33	77.4599
72.81	94.1038	103.37	106.6053	165.86	83.8213
72.87	0.0000	105.31	87.3479	167.43	75.7224
74.66	110.8641	106.12	85.1422	171.28	73.1198
74.82	110.8933	106.47	84.4146	176.31	94.6498
74.97	114.2166	109.28	92.4335	176.60	92.1850
77.11	116.8271	111.00	93.8002	177.52	96.0068
79.69	111.7849	111.76	93.8936	181.07	106.0906
79.82	111.8095	112.95	94.0382	184.41	96.6354
80.02	105.2000	116.24	82.3876	184.58	96.6507
80.03	105.2015	116.30	83.9482	185.72	91.3079
80.12	97.4645	116.74	99.5495	186.21	91.3500
80.19	97.4753	117.23	99.2222	190.27	68.1386
80.22	97.4807	119.76	78.4584	193.51	92.3851
80.57	88.6682	99.53	96.1169	197.03	87.5998

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
198.01	83.8646	256.23	68.9148	492.35	0.0000
201.83	67.5739	304.85	71.6873	497.08	38.8272
204.12	76.6516	306.78	72.6995	511.00	85.3531
205.31	84.4044	308.46	61.7247	514.00	185.3540
208.37	86.3376	311.90	59.0938	520.40	46.4740
210.85	74.5284	316.51	62.9753	520.69	0.0000
215.65	76.5523	319.41	53.8133	522.65	0.0000
218.12	71.5392	320.08	60.3345	527.90	0.0000
222.11	70.0469	321.04	53.8700	529.59	37.3315
227.09	69.4645	323.87	48.3840	529.87	0.0000
227.38	69.4808	325.23	52.1514	531.02	34.2434
228.16	60.8341	328.76	39.2007	537.26	34.3374
228.18	60.8349	331.15	0.0000	546.56	0.0000
116.74	60.8349	333.37	50.5459	552.55	35.6145
235.69	112.7858	334.37	49.1718	563.25	27.3595
235.96	112.8107	338.28	60.0885	564.24	27.3711
238.63	86.7569	338.32	60.0898	569.33	28.4854
238.98	0.0000	311.90	60.1693	946.00	28.4875
240.99	140.4736	340.55	60.1719	569.70	28.4897
242.00	92.2574	344.28	46.6449	582.08	30.2279
244.70	68.6777	345.93	52.3508	583.19	30.7724
245.35	81.0447	351.06	48.2556	595.83	20.7997
250.62	71.6429	351.93	48.2805	427.87	28.8556
252.40	72.6250	356.01	46.9742	604.72	22.4808
252.80	75.3045	361.25	0.0000	609.32	24.1315
256.23	79.0520	364.49	60.0840	610.33	24.1406
260.90	0.0000	366.42	44.8753	614.28	29.0149
264.66	75.0757	356.01	53.0396	618.01	38.7437
265.00	74.2005	388.16	45.4337	621.93	31.2585
269.46	65.4731	388.63	46.4131	630.19	0.0000
271.23	54.7799	391.70	39.7121	631.29	37.8654
273.65	63.8700	264.66	48.6684	155.04	30.3128
276.40	49.5741	401.32	0.0000	633.25	29.2324
277.37	53.2155	401.81	56.4908	634.78	27.0833
277.60	59.5399	402.40	51.6370	635.95	33.5985
278.00	56.8489	404.85	41.9502	636.99	34.6966
278.43	61.3801	410.95	47.9612	657.50	27.3204
279.20	0.0000	414.70	56.8837	657.76	30.6022
279.54	53.2971	423.72	37.4465	661.66	25.1750
280.46	59.6594	427.09	45.4095	664.57	0.0000
283.69	41.6744	427.87	40.4903	666.33	31.7978
284.31	30.8167	433.94	49.5331	666.50	31.8002
285.41	51.7026	439.51	50.6680	667.71	0.0000
285.90	0.0000	440.45	45.7230	677.62	26.4268
287.50	60.8605	453.88	42.0299	685.70	34.2355
290.67	54.6204	459.60	44.1567	692.65	26.5732
293.27	0.0000	463.37	39.2119	695.00	32.1365
351.93	52.0505	468.07	40.3092	696.49	32.1542
295.96	56.6454	473.00	36.3655	696.51	32.1542
879.38	64.9822	475.06	31.3456	697.00	32.1601
299.98	67.7912	476.78	40.4793	697.49	32.1648
300.09	73.2926	477.60	34.4213	702.65	28.3358
300.13	73.2959	477.99	30.3772	706.68	35.6107
301.36	71.5222	482.18	42.6135	711.68	25.6410
302.85	67.9207	487.02	46.7796	720.70	17.8945

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
721.93	0.0000	935.54	23.3578	1368.63	0.0000
722.78	27.9805	937.49	16.1801	1377.63	0.0000
722.91	24.6238	944.13	15.3103	1384.29	13.0500
723.31	27.9856	945.96	0.0000	1408.01	10.0885
724.19	31.3542	946.00	14.4175	1434.09	10.1440
727.33	40.3564	949.00	20.7434	1435.80	10.1477
733.00	31.4510	667.71	0.0000	1457.56	0.0000
735.93	19.1146	962.31	17.2008	1460.82	5.0998
739.50	27.0186	964.08	28.0786	1489.16	9.2329
744.23	32.7017	966.17	24.4696	1596.21	9.4279
747.24	20.3188	968.97	16.3262	1620.50	9.4713
752.31	21.4848	983.53	13.6610	1678.03	0.0000
753.82	28.2837	984.45	0.0000	1690.97	8.5293
756.73	28.3122	996.26	17.5477	1757.55	0.0000
763.94	15.3259	1001.03	14.6426	1764.49	7.5618
765.80	20.4478	1274.44	14.6572	1063.66	5.4068
766.42	17.0428	1025.87	0.0000	1771.35	5.4077
766.84	17.0453	1028.54	0.0000	1791.20	0.0000
772.60	0.0000	1037.84	13.3102	1808.65	4.3542
776.52	22.8011	1038.76	0.0000	1836.06	14.2180
739.50	20.5305	475.06	15.7507		
778.90	22.8198	1048.07	14.8301		
783.70	21.7129	1050.41	21.3309		
788.74	28.6173	1063.66	14.8906		
792.07	32.0868	1077.00	13.4481		
795.86	21.8002	1077.34	16.4388		
802.10	21.8451	459.60	14.9697		
810.29	17.2919	1085.87	19.4708		
344.28	25.3632	1099.25	14.0891		
810.76	25.3659	1111.64	16.9607		
815.77	28.8706	1112.07	17.9053		
1048.07	18.4935	1112.84	16.0236		
832.01	37.1471	1115.54	13.2045		
834.85	16.2667	1120.29	16.9980		
835.15	16.2678	1120.55	16.9991		
836.80	0.0000	1221.41	16.0579		
846.77	25.6577	1129.67	16.0911		
856.80	21.0586	1131.51	0.0000		
860.56	21.0828	1173.23	14.3518		
871.09	16.4513	1177.95	9.5789		
873.19	14.1099	1189.05	7.6836		
875.33	0.0000	1204.77	12.5327		
879.38	24.0324	1221.41	10.6462		
880.51	22.6266	1231.02	18.4306		
881.60	18.3898	1235.36	11.6521		
883.24	15.5687	1238.28	9.7168		
884.68	19.2160	1260.41	0.0000		
889.28	14.1792	1271.87	14.6887		
894.76	23.9661	1274.44	11.7576		
898.04	21.3245	1274.54	12.7382		
903.28	29.3675	1291.59	10.8201		
907.67	0.0000	1298.22	0.0000		
911.20	16.0560	1312.11	10.8698		
923.98	0.0000	1332.49	12.9040		
926.36	12.5439	1365.19	12.9960		

VAX/VMS Nuclide Identification Report Generated 22-JUL-2022 02:54:54.15

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                   *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141122.CNF;1
Background file  : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM36.CNF;317
Background date  : 16-JUL-2022 14:09:01
Sample date     : 21-JUL-2022 00:00:00 Acquisition date : 21-JUL-2022 22:54:38
Sample ID      : G1205141122 Sample quantity : 5.71750E-01 FILTER
Detector name   : GAM36 Detector geometry: JAR
Elapsed live time: 0 04:00:00.00 Elapsed real time: 0 04:00:00.70 0.0%
Energy tolerance: 1.50000 keV Analyst Initials : MJH1
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2290721 Detector SN# :
Matrix Spike ID : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	62.90*	14	162	1.26	125.42	121	10	9.96E-04	193.9	
2	0	93.29*	15	247	1.06	186.16	181	11	1.02E-03	245.7	
3	0	112.54	34	101	0.68	224.61	222	6	2.35E-03	49.7	
4	0	144.77*	49	220	3.30	289.03	284	11	3.38E-03	63.1	
5	0	186.22*	27	155	1.16	371.86	368	9	1.88E-03	103.4	
6	0	213.63	32	83	1.13	426.63	424	7	2.22E-03	50.4	
7	0	239.23*	33	127	1.09	477.80	474	9	2.32E-03	73.1	
8	0	295.37*	5	96	1.04	590.00	586	8	3.40E-04	389.9	
9	0	377.86	15	37	0.93	754.87	753	6	1.07E-03	67.1	
10	0	464.10	21	30	1.58	927.24	921	10	1.45E-03	53.6	
11	0	511.30*	4	59	2.05	1021.58	1013	17	3.04E-04	597.7	
12	0	609.74*	24	35	1.38	1218.37	1212	13	1.64E-03	65.9	
13	0	623.17	12	11	1.41	1245.22	1242	7	7.99E-04	55.3	
14	0	647.90	12	9	1.16	1294.66	1291	6	8.45E-04	49.8	
15	0	662.22*	10	21	1.93	1323.29	1319	10	6.94E-04	112.7	
16	0	777.79	10	12	0.71	1554.33	1549	13	7.28E-04	69.9	
17	0	936.42	23	19	0.82	1871.51	1865	15	1.58E-03	46.6	
18	0	971.05*	13	15	5.04	1940.77	1935	14	8.97E-04	85.3	
19	0	1092.60	11	11	0.58	2183.85	2177	11	7.95E-04	63.1	
20	0	1117.19	6	5	1.21	2233.03	2229	6	3.82E-04	74.4	
21	0	1172.75*	12	13	3.23	2344.15	2337	17	8.34E-04	81.9	
22	0	1230.35	3	10	0.58	2459.33	2453	10	2.08E-04	205.5	
23	0	1280.07	16	7	4.97	2558.79	2552	13	1.08E-03	42.4	
24	0	1452.73	6	0	1.37	2904.17	2901	6	4.17E-04	40.8	
25	0	1461.88*	2	10	0.86	2922.47	2914	12	1.73E-04	369.5	
26	0	1521.58	6	4	1.19	3041.91	3037	7	3.82E-04	70.7	
27	0	1592.96	14	3	1.32	3184.71	3178	11	9.76E-04	35.3	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 22-JUL-2022 02:54:54

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141122.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 21-JUL-2022 00:00:00	Acquisition date	: 21-JUL-2022 22:54:38
Sample ID	: G1205141122	Sample quantity	: 0.57175 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA36	Detector geometry	: JAR
Elapsed live time	: 0 04:00:00.00	Elapsed real time	: 0 04:00:00.70 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	2	10.66*	4.952E-01	1.553E+01	1.553E+01	739.06
SR-82	776.52	10	15.08*	8.978E-01	2.540E+01	2.613E+01	139.87
RH-106	621.93	12	9.93*	1.105E+00	3.441E+01	3.447E+01	110.51
	1050.41	-----	1.56	6.713E-01	-----	Line Not Found	-----
RU-106	621.93	12	9.93*	1.105E+00	3.441E+01	3.447E+01	110.51
	1050.41	-----	1.56	6.713E-01	-----	Line Not Found	-----
BA-137M	661.66	10	89.90*	1.045E+00	3.492E+00	3.492E+00	225.46
CS-137	661.66	10	85.10*	1.045E+00	3.689E+00	3.689E+00	225.46
CE-141	145.44	49	48.29*	3.439E+00	9.621E+00	9.836E+00	126.22
RA-226	186.21	27	3.59*	3.022E+00	8.202E+01	8.202E+01	206.84
TH-232	63.81	14	0.26*	1.421E+00	1.275E+03	1.275E+03	387.88
	140.88	-----	0.02	3.469E+00	-----	Line Not Found	-----
TH-234	63.29	14	3.70*	1.421E+00	8.957E+01	8.957E+01	387.88
	92.59	15	4.23	3.155E+00	3.630E+01	3.630E+01	491.36
U-235	143.76	49	10.96*	3.439E+00	4.239E+01	4.239E+01	126.22
	163.33	-----	5.08	3.264E+00	-----	Line Not Found	-----
	185.72	27	57.20	3.022E+00	5.148E+00	5.148E+00	206.84
	205.31	-----	5.01	2.826E+00	-----	Line Not Found	-----
U-238	63.29	14	3.70*	1.421E+00	8.957E+01	8.957E+01	387.88
	92.59	15	4.23	3.155E+00	3.630E+01	3.630E+01	491.36
ANH-511	511.00	4	100.00*	1.321E+00	1.087E+00	1.087E+00	1195.45

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                       *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141122.CNF;1 *
* Acquisition date   : 21-JUL-2022 22:54:38 Sensitivity      : 3.000          *
* Detector ID        : GAM36 Energy tolerance: 1.500          *
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 04:00:00.70 Half life ratio : *****          *
* Sample date        : 21-JUL-2022 00:00:00 Analyst initials: MJH1          *
* Sample ID          : G1205141122 Sample Quantity : 5.7175E-01 FILTER *
* Batch Number       : 2290721 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                       *
* Eff. Cal. date     : 20-SEP-2021 05:19:44 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM36_JAR.CNF;13          *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
K-40	1.553E+01	1.125E+02	8.095E+01
SR-82	2.613E+01	3.582E+01	5.427E+01
RH-106	3.447E+01	3.734E+01	8.351E+01
RU-106	3.447E+01	3.734E+01	8.351E+01
BA-137M	3.492E+00	7.716E+00	7.832E+00
CS-137	3.689E+00	8.151E+00	8.274E+00
CE-141	9.836E+00	1.217E+01	9.156E+00
RA-226	8.202E+01	1.663E+02	1.391E+02
TH-232	1.275E+03	4.845E+03	3.212E+03
TH-234	8.957E+01	3.405E+02	2.317E+02
U-235	4.239E+01	5.243E+01	3.926E+01
U-238	8.957E+01	3.405E+02	2.317E+02
ANH-511	1.087E+00	1.273E+01	6.101E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	-2.829E+00	3.100E+01	5.887E+01	NOT IDENT.
NA-22	6.484E+00	4.431E+00	1.128E+01	NOT IDENT.
NA-24	7.022E+00	1.586E+01	3.485E+01	NOT IDENT.
AL-26	2.301E+00	3.450E+00	9.330E+00	NOT IDENT.
SC-46	-1.423E+00	3.863E+00	6.899E+00	NOT IDENT.
V-48	5.877E-01	4.529E+00	8.864E+00	NOT IDENT.
CR-51	-1.384E+01	3.792E+01	6.291E+01	NOT IDENT.
MN-52	1.811E+00	4.637E+00	1.070E+01	FAIL ABUN
MN-54	-6.933E-01	4.488E+00	8.240E+00	NOT IDENT.
CO-56	-1.982E+00	5.474E+00	9.201E+00	NOT IDENT.
CO-57	1.836E+00	2.845E+00	5.345E+00	NOT IDENT.
NI-57	4.983E-01	1.130E+01	2.270E+01	NOT IDENT.
CO-58	2.524E+00	4.769E+00	9.579E+00	NOT IDENT.
FE-59	-4.923E+00	7.309E+00	1.313E+01	NOT IDENT.
CO-60	6.986E-01	5.572E+00	1.136E+01	FAIL ABUN
ZN-65	1.411E+00	1.020E+01	1.890E+01	NOT IDENT.
CU-67	-1.743E+01	1.124E+01	1.424E+01	FAIL ABUN

GE-68	-5.324E+01	1.472E+02	2.797E+02	NOT IDENT.
AS-73	7.608E+01	9.294E+01	1.857E+02	NOT IDENT.
AS-74	2.636E+00	6.339E+00	1.273E+01	NOT IDENT.
SE-75	1.889E+00	5.452E+00	9.786E+00	NOT IDENT.
BR-77	2.551E+01	3.657E+01	4.353E+01	FAIL ABUN
RB-83	2.474E+00	8.301E+00	1.623E+01	NOT IDENT.
RB-84	9.335E-01	7.204E+00	1.373E+01	NOT IDENT.
KR-85	1.269E+03	9.830E+02	1.948E+03	NOT IDENT.
SR-85	5.746E+00	4.451E+00	8.822E+00	NOT IDENT.
RB-86	-1.706E+01	5.551E+01	1.067E+02	NOT IDENT.
Y-88	-1.071E+00	4.834E+00	9.493E+00	NOT IDENT.
Y-91	3.225E+02	2.175E+03	4.411E+03	NOT IDENT.
NB-94	-7.142E+00	6.286E+00	7.132E+00	NOT IDENT.
NB-95	-3.881E+00	4.690E+00	7.682E+00	NOT IDENT.
NB-95M	2.338E+00	1.295E+01	2.135E+01	NOT IDENT.
TC-95M	1.284E+00	4.612E+00	8.284E+00	NOT IDENT.
ZR-95	1.078E+00	7.032E+00	1.380E+01	NOT IDENT.
MO-99	3.864E+00	4.043E+01	7.852E+01	FAIL ABUN
TC-99M	3.045E+01	5.388E+01	9.329E+01	NOT IDENT.
RH-101	-2.396E+00	3.555E+00	6.109E+00	NOT IDENT.
RH-102M	2.344E+00	3.477E+00	7.122E+00	NOT IDENT.
RU-103	1.391E+00	4.092E+00	8.027E+00	FAIL ABUN
AG-108M	-4.931E-01	3.717E+00	6.991E+00	NOT IDENT.
CD-109	-1.017E+02	9.222E+01	1.224E+02	NOT IDENT.
AG-110	9.776E+01	7.797E+01	1.689E+02	NOT IDENT.
AG-110M	-7.484E-01	6.678E+00	1.226E+01	FAIL ABUN
IN-111	-2.371E+00	4.329E+00	7.190E+00	NOT IDENT.
SN-113	4.874E-01	5.404E+00	1.033E+01	NOT IDENT.
IN-114M	8.000E+00	1.901E+01	3.229E+01	NOT IDENT.
CD-115	-4.230E+00	1.691E+01	3.136E+01	NOT IDENT.
SN-117M	1.246E+00	3.102E+00	5.681E+00	NOT IDENT.
SB-122	-6.760E-01	6.705E+00	1.259E+01	NOT IDENT.
I-123	5.597E+00	1.134E+01	2.089E+01	NOT IDENT.
TE-123M	1.537E+00	3.073E+00	5.661E+00	NOT IDENT.
SB-124	-5.028E+00	8.394E+00	1.463E+01	NOT IDENT.
SB-125	1.130E+01	1.195E+01	2.453E+01	FAIL ABUN
TE-125M	1.315E+03	8.011E+02	1.571E+03	NOT IDENT.
I-126	-3.047E+00	1.504E+01	2.440E+01	NOT IDENT.
SB-126	-4.744E+00	7.947E+00	1.367E+01	NOT IDENT.
SN-126	-2.675E+00	9.075E+00	1.284E+01	FAIL ABUN
SB-127	-1.086E+01	1.327E+01	2.205E+01	NOT IDENT.
TE-129	-6.003E+00	4.574E+01	7.754E+01	NOT IDENT.
I-131	-3.597E+00	4.674E+00	7.303E+00	NOT IDENT.
I-132	9.990E+02	7.168E+03	1.323E+04	NOT IDENT.
TE-132	-4.844E+00	5.132E+00	7.309E+00	FAIL ABUN
BA-133	-1.294E+00	5.763E+00	9.676E+00	NOT IDENT.
I-133	2.796E+00	8.571E+00	1.712E+01	NOT IDENT.
CS-134	-3.462E+00	5.135E+00	8.612E+00	NOT IDENT.
I-135	-7.951E+01	2.118E+02	4.032E+02	NOT IDENT.
CS-136	-2.695E-02	6.647E+00	1.245E+01	NOT IDENT.
LA-138	2.812E+00	6.905E+00	1.557E+01	NOT IDENT.
CE-139	1.649E-01	3.146E+00	5.625E+00	NOT IDENT.
BA-140	6.857E+00	1.663E+01	3.281E+01	NOT IDENT.
LA-140	5.304E+00	5.124E+00	1.273E+01	NOT IDENT.
CE-143	2.538E-01	1.350E+01	2.169E+01	NOT IDENT.
CE-144	-6.021E+00	2.304E+01	4.059E+01	NOT IDENT.
PM-144	1.284E-01	4.849E+00	9.032E+00	NOT IDENT.
PR-144	1.053E+01	3.604E+02	6.714E+02	NOT IDENT.
PM-146	-1.230E+00	5.447E+00	1.011E+01	NOT IDENT.
ND-147	-9.920E+00	2.774E+01	5.068E+01	NOT IDENT.
PM-147	-7.083E+04	8.735E+04	1.491E+05	NOT IDENT.
PM-149	1.543E+01	1.373E+02	2.424E+02	NOT IDENT.
EU-152	7.025E+00	1.407E+01	2.537E+01	FAIL ABUN
GD-153	6.351E+00	9.051E+00	1.628E+01	NOT IDENT.
EU-154	1.884E+01	1.273E+01	3.240E+01	NOT IDENT.
EU-155	1.324E+00	1.098E+01	2.021E+01	NOT IDENT.
TB-160	4.018E-01	1.596E+01	3.001E+01	NOT IDENT.
HO-166M	6.900E+00	8.095E+00	1.682E+01	NOT IDENT.
TM-171	-1.515E+03	2.329E+03	4.210E+03	NOT IDENT.
LU-176	-2.049E+00	3.872E+00	6.331E+00	NOT IDENT.
LU-177	-4.229E+00	3.291E+01	5.710E+01	FAIL ABUN
HF-181	7.674E-01	4.234E+00	8.247E+00	NOT IDENT.
W-181	-9.256E+00	2.012E+01	3.687E+01	NOT IDENT.
TA-182	-1.698E+00	1.406E+01	2.897E+01	FAIL ABUN
RE-183	-8.126E+00	1.843E+01	3.381E+01	NOT IDENT.
RE-184	7.146E+00	1.254E+01	2.569E+01	NOT IDENT.
RE-188	-7.477E+00	2.083E+01	2.965E+01	FAIL ABUN
W-188	-1.717E+02	7.804E+02	1.330E+03	FAIL ABUN

OS-191	2.819E+00	9.314E+00	1.713E+01	FAIL ABUN
IR-192	-1.018E+00	3.832E+00	6.473E+00	FAIL ABUN
PB-201	-1.278E+01	2.913E+01	4.789E+01	NOT IDENT.
TL-201	2.483E+01	3.229E+01	6.059E+01	NOT IDENT.
TL-202	-6.871E-01	3.776E+00	7.082E+00	NOT IDENT.
HG-203	-1.394E+00	4.073E+00	6.845E+00	NOT IDENT.
PB-203	-1.930E+00	5.638E+00	9.475E+00	NOT IDENT.
TL-204	-3.275E+02	4.977E+02	8.855E+02	NOT IDENT.
BI-207	2.301E+00	6.047E+00	1.298E+01	NOT IDENT.
TL-208	-1.045E+01	6.712E+00	9.399E+00	NOT IDENT.
PB-210	1.944E+02	5.185E+02	1.007E+03	NOT IDENT.
BI-211	-3.282E+01	3.573E+01	5.481E+01	NOT IDENT.
PB-211	-6.717E+00	8.820E+01	1.669E+02	NOT IDENT.
BI-212	1.488E+01	6.746E+01	1.300E+02	NOT IDENT.
PB-212	9.997E+00	1.433E+01	1.673E+01	FAIL ABUN
BI-213	-3.970E+00	1.255E+01	2.321E+01	NOT IDENT.
BI-214	1.514E+01	1.955E+01	2.730E+01	FAIL ABUN
PB-214	-3.734E+00	1.299E+01	2.120E+01	FAIL ABUN
RN-219	-2.004E+01	6.337E+01	9.791E+01	NOT IDENT.
FR-221	1.265E+01	2.884E+01	5.184E+01	NOT IDENT.
RA-223	2.659E+00	8.618E+01	1.495E+02	FAIL ABUN
RA-224	5.244E+00	8.817E+01	1.422E+02	NOT IDENT.
AC-225	1.359E+01	3.099E+01	5.570E+01	NOT IDENT.
AC-227	3.408E+01	3.442E+01	6.472E+01	NOT IDENT.
TH-227	3.408E+01	3.442E+01	6.472E+01	NOT IDENT.
AC-228	-7.695E+00	2.574E+01	4.339E+01	NOT IDENT.
RA-228	-7.695E+00	2.574E+01	4.339E+01	NOT IDENT.
TH-228	9.997E+00	1.433E+01	1.673E+01	FAIL ABUN
TH-229	-6.994E+00	6.126E+01	1.073E+02	NOT IDENT.
TH-230	-7.812E+02	1.344E+03	2.016E+03	NOT IDENT.
PA-231	5.380E+00	6.131E+01	1.074E+02	NOT IDENT.
TH-231	-1.110E+01	5.435E+01	7.888E+01	NOT IDENT.
PA-233	-6.222E+00	9.389E+00	1.511E+01	FAIL ABUN
PA-234	2.006E+01	3.209E+01	6.975E+01	FAIL ABUN
PA-234M	-5.735E+02	7.037E+02	1.054E+03	NOT IDENT.
U-234	4.056E+03	8.102E+03	1.587E+04	NOT IDENT.
NP-237	-6.222E+00	9.389E+00	1.511E+01	FAIL ABUN
NP-238	-6.374E+00	2.348E+01	4.246E+01	NOT IDENT.
NP-239	-6.467E-01	2.878E+01	5.215E+01	NOT IDENT.
AM-241	5.497E+00	1.563E+01	2.869E+01	NOT IDENT.
AM-242	-3.041E+01	6.615E+01	1.173E+02	NOT IDENT.
AM-243	-2.758E+00	6.451E+00	9.817E+00	NOT IDENT.
CM-243	-3.570E+00	1.146E+01	2.048E+01	NOT IDENT.
BK-247	9.948E+00	1.030E+01	1.952E+01	NOT IDENT.
CM-247	-5.047E+00	5.809E+00	8.404E+00	NOT IDENT.
CF-249	5.845E+00	5.315E+00	1.096E+01	NOT IDENT.
CF-251	-1.677E+00	1.464E+01	2.578E+01	NOT IDENT.
CF-252	-7.002E+03	1.838E+04	3.276E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	62.90	74	162	1.26	125.42	121	10	5.16E-03	34.0	
2	0	93.29	132	247	1.06	186.16	181	11	9.17E-03	24.7	
3	0	112.54	34	101	0.68	224.61	222	6	2.35E-03	49.7	
4	0	144.77	59	220	3.30	289.03	284	11	4.10E-03	50.4	
5	0	186.22	103	155	1.16	371.86	368	9	7.17E-03	24.0	
6	0	213.63	32	83	1.13	426.63	424	7	2.22E-03	50.4	
7	0	239.23	85	127	1.09	477.80	474	9	5.87E-03	26.3	
8	0	295.37	20	96	1.04	590.00	586	8	1.39E-03	87.7	
9	0	352.35	16	76	1.00	703.88	702	8	1.13E-03	98.0	
10	0	377.86	15	37	0.93	754.87	753	6	1.07E-03	67.1	
11	0	464.10	21	30	1.58	927.24	921	10	1.45E-03	53.6	
12	0	511.30	204	59	2.05	1021.58	1013	17	1.41E-02	11.2	
13	0	609.74	66	35	1.38	1218.37	1212	13	4.59E-03	22.3	
14	0	623.17	12	11	1.41	1245.22	1242	7	7.99E-04	55.3	
15	0	647.90	12	9	1.16	1294.66	1291	6	8.45E-04	49.8	
16	0	662.22	27	21	1.93	1323.29	1319	10	1.89E-03	36.4	
17	0	777.79	10	12	0.71	1554.33	1549	13	7.28E-04	69.9	
18	0	936.42	23	19	0.82	1871.51	1865	15	1.58E-03	46.6	
19	0	971.05	23	15	5.04	1940.77	1935	14	1.60E-03	43.1	
20	0	1092.60	11	11	0.58	2183.85	2177	11	7.95E-04	63.1	
21	0	1117.19	6	5	1.21	2233.03	2229	6	3.82E-04	74.4	
22	0	1172.75	16	13	3.23	2344.15	2337	17	1.09E-03	58.0	
23	0	1230.35	3	10	0.58	2459.33	2453	10	2.08E-04	205.5	
24	0	1280.07	16	7	4.97	2558.79	2552	13	1.08E-03	42.4	
25	0	1452.73	6	0	1.37	2904.17	2901	6	4.17E-04	40.8	
26	0	1461.88	22	10	0.86	2922.47	2914	12	1.56E-03	34.2	
27	0	1521.58	6	4	1.19	3041.91	3037	7	3.82E-04	70.7	
28	0	1592.96	14	3	1.32	3184.71	3178	11	9.76E-04	35.3	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	2	10.66*	4.952E-01	1.553E+01	1.553E+01	739.06
SR-82	776.52	10	15.08*	8.978E-01	2.540E+01	2.613E+01	139.87
RH-106	621.93	12	9.93*	1.105E+00	3.441E+01	3.447E+01	110.51
	1050.41	-----	1.56	6.713E-01	-----	Line Not Found	-----
RU-106	621.93	12	9.93*	1.105E+00	3.441E+01	3.447E+01	110.51
	1050.41	-----	1.56	6.713E-01	-----	Line Not Found	-----
BA-137M	661.66	10	89.90*	1.045E+00	3.492E+00	3.492E+00	225.46
CS-137	661.66	10	85.10*	1.045E+00	3.689E+00	3.689E+00	225.46
CE-141	145.44	49	48.29*	3.439E+00	9.621E+00	9.836E+00	126.22
RA-226	186.21	27	3.59*	3.022E+00	8.202E+01	8.202E+01	206.84
TH-232	63.81	14	0.26*	1.421E+00	1.275E+03	1.275E+03	387.88
	140.88	-----	0.02	3.469E+00	-----	Line Not Found	-----
TH-234	63.29	14	3.70*	1.421E+00	8.957E+01	8.957E+01	387.88
	92.59	15	4.23	3.155E+00	3.630E+01	3.630E+01	491.36
U-235	143.76	49	10.96*	3.439E+00	4.239E+01	4.239E+01	126.22
	163.33	-----	5.08	3.264E+00	-----	Line Not Found	-----
	185.72	27	57.20	3.022E+00	5.148E+00	5.148E+00	206.84
	205.31	-----	5.01	2.826E+00	-----	Line Not Found	-----
U-238	63.29	14	3.70*	1.421E+00	8.957E+01	8.957E+01	387.88
	92.59	15	4.23	3.155E+00	3.630E+01	3.630E+01	491.36
ANH-511	511.00	4	100.00*	1.321E+00	1.087E+00	1.087E+00	1195.45

Flag: "*" = Keyline

Total number of lines in spectrum 27
Number of unidentified lines 10
Number of lines tentatively identified by NID 17 62.96%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
K-40	1.25E+09Y	1.00	1.553E+01	1.553E+01	11.48E+01	739.06	
SR-82	25.35D	1.03	2.540E+01	2.613E+01	3.655E+01	139.87	
RH-106	371.80D	1.00	3.441E+01	3.447E+01	3.810E+01	110.51	
RU-106	371.80D	1.00	3.441E+01	3.447E+01	3.810E+01	110.51	
BA-137M	30.08Y	1.00	3.492E+00	3.492E+00	7.873E+00	225.46	
CS-137	30.08Y	1.00	3.689E+00	3.689E+00	8.317E+00	225.46	
CE-141	32.51D	1.02	9.621E+00	9.836E+00	12.41E+00	126.22	
RA-226	1600.00Y	1.00	8.202E+01	8.202E+01	16.97E+01	206.84	
TH-232	1.41E+10Y	1.00	1.275E+03	1.275E+03	4.944E+03	387.88	
TH-234	4.47E+09Y	1.00	8.957E+01	8.957E+01	34.74E+01	387.88	
U-235	7.04E+08Y	1.00	4.239E+01	4.239E+01	5.350E+01	126.22	
U-238	4.47E+09Y	1.00	8.957E+01	8.957E+01	34.74E+01	387.88	
ANH-511	1.00E+09Y	1.00	1.087E+00	1.087E+00	12.99E+00	1195.45	
Total Activity :			1.706E+03	1.707E+03			

Grand Total Activity : 1.706E+03 1.707E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	112.54	34	101	0.68	224.61	222	6	2.35E-03	99.4	3.51E+00	T
0	213.63	32	83	1.13	426.63	424	7	2.22E-03	****	2.75E+00	
0	239.23	33	127	1.09	477.80	474	9	2.32E-03	****	2.52E+00	T
0	295.37	5	96	1.04	590.00	586	8	3.40E-04	****	2.12E+00	T
0	377.86	15	37	0.93	754.87	753	6	1.07E-03	****	1.72E+00	
0	464.10	21	30	1.58	927.24	921	10	1.45E-03	****	1.44E+00	T
0	609.74	24	35	1.38	1218.37	1212	13	1.64E-03	****	1.13E+00	T
0	647.90	12	9	1.16	1294.66	1291	6	8.45E-04	99.7	1.07E+00	
0	936.42	23	19	0.82	1871.51	1865	15	1.58E-03	93.2	7.51E-01	T
0	971.05	13	15	5.04	1940.77	1935	14	8.97E-04	****	7.25E-01	
0	1092.60	11	11	0.58	2183.85	2177	11	7.95E-04	****	6.46E-01	
0	1117.19	6	5	1.21	2233.03	2229	6	3.82E-04	****	6.33E-01	
0	1172.75	12	13	3.23	2344.15	2337	17	8.34E-04	****	6.04E-01	T
0	1230.35	3	10	0.58	2459.33	2453	10	2.08E-04	****	5.77E-01	T
0	1280.07	16	7	4.97	2558.79	2552	13	1.08E-03	84.7	5.56E-01	
0	1452.73	6	0	1.37	2904.17	2901	6	4.17E-04	81.6	4.98E-01	
0	1521.58	6	4	1.19	3041.91	3037	7	3.82E-04	****	4.79E-01	
0	1592.96	14	3	1.32	3184.71	3178	11	9.76E-04	70.5	4.63E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141122.CNF;1
* Acquisition date   : 21-JUL-2022 22:54:38 Sensitivity      : 3.000
* Detector ID        : GAM36 Energy tolerance: 1.500
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 04:00:00.70 Half life ratio : *****
* Sample date        : 21-JUL-2022 00:00:00 Nuclide Library : LIQUID
* Sample ID          : G1205141122 Analyst initials: MJH1
* Batch Number       : 2290721 Sample Quantity : 5.7175E-01 FILTER
* Wet wt corr        : 1.00000 Wet Weight : 0.00000
*                                     Dry Weight : 0.00000
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 20-SEP-2021 05:19:44 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM36_JAR.CNF;13
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
K-40	3.207E+01
SR-82	2.377E+01
RH-106	3.772E+01
RU-106	3.772E+01
BA-137M	3.445E+00
CS-137	3.639E+00
CE-141	4.306E+00
RA-226	6.551E+01
TH-232	1.492E+03
TH-234	1.076E+02
U-235	1.846E+01
U-238	1.076E+02
ANH-511	2.716E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	2.637E+01	NOT IDENT.
NA-22	4.843E+00	NOT IDENT.
NA-24	1.475E+01	NOT IDENT.
AL-26	3.618E+00	NOT IDENT.
SC-46	2.883E+00	NOT IDENT.
V-48	3.784E+00	NOT IDENT.
CR-51	2.915E+01	NOT IDENT.
MN-52	4.349E+00	FAIL ABUN
MN-54	3.591E+00	NOT IDENT.
CO-56	4.060E+00	NOT IDENT.
CO-57	2.527E+00	NOT IDENT.
NI-57	9.660E+00	NOT IDENT.
CO-58	4.268E+00	NOT IDENT.
FE-59	5.322E+00	NOT IDENT.
CO-60	4.852E+00	FAIL ABUN
ZN-65	8.061E+00	NOT IDENT.
CU-67	6.724E+00	FAIL ABUN
GE-68	1.188E+02	NOT IDENT.

AS-73	8.692E+01	NOT IDENT.
AS-74	5.686E+00	NOT IDENT.
SE-75	4.568E+00	NOT IDENT.
BR-77	2.074E+01	FAIL ABUN
RB-83	7.352E+00	NOT IDENT.
RB-84	6.039E+00	NOT IDENT.
KR-85	8.960E+02	NOT IDENT.
SR-85	4.057E+00	NOT IDENT.
RB-86	4.522E+01	NOT IDENT.
Y-88	3.678E+00	NOT IDENT.
Y-91	1.912E+03	NOT IDENT.
NB-94	3.117E+00	NOT IDENT.
NB-95	3.349E+00	NOT IDENT.
NB-95M	9.970E+00	NOT IDENT.
TC-95M	3.894E+00	NOT IDENT.
ZR-95	6.006E+00	NOT IDENT.
MO-99	3.422E+01	FAIL ABUN
TC-99M	4.416E+01	NOT IDENT.
RH-101	2.871E+00	NOT IDENT.
RH-102M	3.231E+00	NOT IDENT.
RU-103	3.648E+00	FAIL ABUN
AG-108M	3.175E+00	NOT IDENT.
CD-109	5.720E+01	NOT IDENT.
AG-110	7.509E+01	NOT IDENT.
AG-110M	5.359E+00	FAIL ABUN
IN-111	3.349E+00	NOT IDENT.
SN-113	4.756E+00	NOT IDENT.
IN-114M	1.518E+01	NOT IDENT.
CD-115	1.395E+01	NOT IDENT.
SN-117M	2.678E+00	NOT IDENT.
SB-122	5.622E+00	NOT IDENT.
I-123	9.854E+00	NOT IDENT.
TE-123M	2.671E+00	NOT IDENT.
SB-124	5.183E+00	NOT IDENT.
SB-125	1.131E+01	FAIL ABUN
TE-125M	7.378E+02	NOT IDENT.
I-126	1.083E+01	NOT IDENT.
SB-126	5.932E+00	NOT IDENT.
SN-126	6.016E+00	FAIL ABUN
SB-127	9.592E+00	NOT IDENT.
TE-129	3.473E+01	NOT IDENT.
I-131	3.317E+00	NOT IDENT.
I-132	5.874E+03	NOT IDENT.
TE-132	3.414E+00	FAIL ABUN
BA-133	4.444E+00	NOT IDENT.
I-133	7.651E+00	NOT IDENT.
CS-134	3.715E+00	NOT IDENT.
I-135	1.641E+02	NOT IDENT.
CS-136	5.357E+00	NOT IDENT.
LA-138	6.440E+00	NOT IDENT.
CE-139	2.642E+00	NOT IDENT.
BA-140	1.489E+01	NOT IDENT.
LA-140	5.301E+00	NOT IDENT.
CE-143	1.003E+01	NOT IDENT.
CE-144	1.916E+01	NOT IDENT.
PM-144	4.069E+00	NOT IDENT.
PR-144	3.025E+02	NOT IDENT.
PM-146	4.590E+00	NOT IDENT.
ND-147	2.252E+01	NOT IDENT.
PM-147	7.016E+04	NOT IDENT.
PM-149	1.121E+02	NOT IDENT.
EU-152	1.179E+01	FAIL ABUN
GD-153	7.677E+00	NOT IDENT.
EU-154	1.393E+01	NOT IDENT.
EU-155	9.496E+00	NOT IDENT.
TB-160	1.314E+01	NOT IDENT.
HO-166M	7.575E+00	NOT IDENT.
TM-171	1.962E+03	NOT IDENT.
LU-176	2.936E+00	NOT IDENT.
LU-177	2.686E+01	FAIL ABUN
HF-181	3.722E+00	NOT IDENT.
W-181	1.707E+01	NOT IDENT.
TA-182	1.164E+01	FAIL ABUN
RE-183	1.566E+01	NOT IDENT.
RE-184	1.132E+01	NOT IDENT.
RE-188	1.397E+01	FAIL ABUN
W-188	6.131E+02	FAIL ABUN
OS-191	8.072E+00	FAIL ABUN

IR-192	2.967E+00	FAIL ABUN
PB-201	2.205E+01	NOT IDENT.
TL-201	2.856E+01	NOT IDENT.
TL-202	3.201E+00	NOT IDENT.
HG-203	3.175E+00	NOT IDENT.
PB-203	4.395E+00	NOT IDENT.
TL-204	4.149E+02	NOT IDENT.
BI-207	5.594E+00	NOT IDENT.
TL-208	4.256E+00	NOT IDENT.
PB-210	4.720E+02	NOT IDENT.
BI-211	2.554E+01	NOT IDENT.
PB-211	7.621E+01	NOT IDENT.
BI-212	5.805E+01	NOT IDENT.
PB-212	7.964E+00	FAIL ABUN
BI-213	1.047E+01	NOT IDENT.
BI-214	1.279E+01	FAIL ABUN
PB-214	9.924E+00	FAIL ABUN
RN-219	4.485E+01	NOT IDENT.
FR-221	2.449E+01	NOT IDENT.
RA-223	6.909E+01	FAIL ABUN
RA-224	6.679E+01	NOT IDENT.
AC-225	2.632E+01	NOT IDENT.
AC-227	3.041E+01	NOT IDENT.
TH-227	3.041E+01	NOT IDENT.
AC-228	1.947E+01	NOT IDENT.
RA-228	1.947E+01	NOT IDENT.
TH-228	7.964E+00	FAIL ABUN
TH-229	5.026E+01	NOT IDENT.
TH-230	9.429E+02	NOT IDENT.
PA-231	4.972E+01	NOT IDENT.
TH-231	3.706E+01	NOT IDENT.
PA-233	6.991E+00	FAIL ABUN
PA-234	2.991E+01	FAIL ABUN
PA-234M	4.518E+02	NOT IDENT.
U-234	7.418E+03	NOT IDENT.
NP-237	6.991E+00	FAIL ABUN
NP-238	1.777E+01	NOT IDENT.
NP-239	2.450E+01	NOT IDENT.
AM-241	1.329E+01	NOT IDENT.
AM-242	5.496E+01	NOT IDENT.
AM-243	4.619E+00	NOT IDENT.
CM-243	9.617E+00	NOT IDENT.
BK-247	9.125E+00	NOT IDENT.
CM-247	3.825E+00	NOT IDENT.
CF-249	5.083E+00	NOT IDENT.
CF-251	1.207E+01	NOT IDENT.
CF-252	1.536E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141122.CNF;1
Acquisition date : 21-JUL-2022 22:54:38 Sensitivity : 3.000
Detector ID : GAM36 Energy tolerance: 1.500
Elapsed live time: 0 04:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 04:00:00.70 Half life ratio : *****
Sample date : 21-JUL-2022 00:00:00 Nuclide Library : LIQUID
Sample ID : G1205141122 Analyst initials: MJH1
Batch Number : 2290721 Sample Quantity : 5.7175E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 20-SEP-2021 05:19:44 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM36_JAR.CNF;13

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
K-40	1.553E+01	1.125E+02	1.125E+02
SR-82	2.613E+01	3.589E+01	3.589E+01
RH-106	3.447E+01	3.749E+01	3.749E+01
RU-106	3.447E+01	3.749E+01	3.749E+01
BA-137M	3.492E+00	7.721E+00	7.722E+00
CS-137	3.689E+00	8.157E+00	8.157E+00
CE-141	9.836E+00	1.219E+01	1.219E+01
RA-226	8.202E+01	1.664E+02	1.664E+02
TH-232	1.275E+03	4.849E+03	4.849E+03
TH-234	8.957E+01	3.411E+02	3.411E+02
U-235	4.239E+01	5.255E+01	5.256E+01
U-238	8.957E+01	3.411E+02	3.411E+02
ANH-511	1.087E+00	1.273E+01	1.273E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	-2.829E+00	3.100E+01	3.102E+01	NOT IDENT.
NA-22	6.484E+00	4.465E+00	5.338E+00	NOT IDENT.
NA-24	7.022E+00	1.588E+01	1.619E+01	NOT IDENT.
AL-26	2.301E+00	3.455E+00	3.607E+00	NOT IDENT.
SC-46	-1.423E+00	3.865E+00	3.918E+00	NOT IDENT.
V-48	5.877E-01	4.529E+00	4.537E+00	NOT IDENT.
CR-51	-1.384E+01	3.795E+01	3.846E+01	NOT IDENT.
MN-52	1.811E+00	4.640E+00	4.712E+00	FAIL ABUN
MN-54	-6.933E-01	4.489E+00	4.499E+00	NOT IDENT.
CO-56	-1.982E+00	5.476E+00	5.549E+00	NOT IDENT.
CO-57	1.836E+00	2.849E+00	2.967E+00	NOT IDENT.
NI-57	4.983E-01	1.130E+01	1.130E+01	NOT IDENT.
CO-58	2.524E+00	4.773E+00	4.907E+00	NOT IDENT.
FE-59	-4.923E+00	7.326E+00	7.656E+00	NOT IDENT.
CO-60	6.986E-01	5.573E+00	5.582E+00	FAIL ABUN
ZN-65	1.411E+00	1.020E+01	1.022E+01	NOT IDENT.
CU-67	-1.743E+01	1.134E+01	1.380E+01	FAIL ABUN

GE-68	-5.324E+01	1.473E+02	1.492E+02	NOT IDENT.
AS-73	7.608E+01	9.456E+01	1.006E+02	NOT IDENT.
AS-74	2.636E+00	6.346E+00	6.456E+00	NOT IDENT.
SE-75	1.889E+00	5.456E+00	5.522E+00	NOT IDENT.
BR-77	2.551E+01	3.664E+01	3.841E+01	FAIL ABUN
RB-83	2.474E+00	8.310E+00	8.385E+00	NOT IDENT.
RB-84	9.335E-01	7.204E+00	7.217E+00	NOT IDENT.
KR-85	1.269E+03	9.894E+02	1.143E+03	NOT IDENT.
SR-85	5.746E+00	4.480E+00	5.176E+00	NOT IDENT.
RB-86	-1.706E+01	5.552E+01	5.605E+01	NOT IDENT.
Y-88	-1.071E+00	4.834E+00	4.858E+00	NOT IDENT.
Y-91	3.225E+02	2.176E+03	2.180E+03	NOT IDENT.
NB-94	-7.142E+00	6.314E+00	7.089E+00	NOT IDENT.
NB-95	-3.881E+00	4.701E+00	5.017E+00	NOT IDENT.
NB-95M	2.338E+00	1.296E+01	1.300E+01	NOT IDENT.
TC-95M	1.284E+00	4.614E+00	4.650E+00	NOT IDENT.
ZR-95	1.078E+00	7.033E+00	7.050E+00	NOT IDENT.
MO-99	3.864E+00	4.043E+01	4.047E+01	FAIL ABUN
TC-99M	3.045E+01	5.400E+01	5.572E+01	NOT IDENT.
RH-101	-2.396E+00	3.584E+00	3.744E+00	NOT IDENT.
RH-102M	2.344E+00	3.488E+00	3.645E+00	NOT IDENT.
RU-103	1.391E+00	4.094E+00	4.142E+00	FAIL ABUN
AG-108M	-4.931E-01	3.717E+00	3.724E+00	NOT IDENT.
CD-109	-1.017E+02	9.296E+01	1.037E+02	NOT IDENT.
AG-110	9.776E+01	7.840E+01	8.996E+01	NOT IDENT.
AG-110M	-7.484E-01	6.678E+00	6.686E+00	FAIL ABUN
IN-111	-2.371E+00	4.335E+00	4.465E+00	NOT IDENT.
SN-113	4.874E-01	5.405E+00	5.409E+00	NOT IDENT.
IN-114M	8.000E+00	1.902E+01	1.936E+01	NOT IDENT.
CD-115	-4.230E+00	1.691E+01	1.702E+01	NOT IDENT.
SN-117M	1.246E+00	3.103E+00	3.154E+00	NOT IDENT.
SB-122	-6.760E-01	6.705E+00	6.712E+00	NOT IDENT.
I-123	5.597E+00	1.135E+01	1.163E+01	NOT IDENT.
TE-123M	1.537E+00	3.076E+00	3.153E+00	NOT IDENT.
SB-124	-5.028E+00	8.404E+00	8.705E+00	NOT IDENT.
SB-125	1.130E+01	1.199E+01	1.303E+01	FAIL ABUN
TE-125M	1.315E+03	8.093E+02	1.004E+03	NOT IDENT.
I-126	-3.047E+00	1.504E+01	1.510E+01	NOT IDENT.
SB-126	-4.744E+00	7.968E+00	8.251E+00	NOT IDENT.
SN-126	-2.675E+00	9.079E+00	9.159E+00	FAIL ABUN
SB-127	-1.086E+01	1.330E+01	1.418E+01	NOT IDENT.
TE-129	-6.003E+00	4.575E+01	4.583E+01	NOT IDENT.
I-131	-3.597E+00	4.685E+00	4.959E+00	NOT IDENT.
I-132	9.990E+02	7.169E+03	7.183E+03	NOT IDENT.
TE-132	-4.844E+00	5.161E+00	5.605E+00	FAIL ABUN
BA-133	-1.294E+00	5.764E+00	5.793E+00	NOT IDENT.
I-133	2.796E+00	8.576E+00	8.668E+00	NOT IDENT.
CS-134	-3.462E+00	5.143E+00	5.375E+00	NOT IDENT.
I-135	-7.951E+01	2.119E+02	2.149E+02	NOT IDENT.
CS-136	-2.695E-02	6.647E+00	6.647E+00	NOT IDENT.
LA-138	2.812E+00	6.910E+00	7.025E+00	NOT IDENT.
CE-139	1.649E-01	3.146E+00	3.147E+00	NOT IDENT.
BA-140	6.857E+00	1.664E+01	1.693E+01	NOT IDENT.
LA-140	5.304E+00	5.143E+00	5.673E+00	NOT IDENT.
CE-143	2.538E-01	1.350E+01	1.350E+01	NOT IDENT.
CE-144	-6.021E+00	2.305E+01	2.321E+01	NOT IDENT.
PM-144	1.284E-01	4.849E+00	4.850E+00	NOT IDENT.
PR-144	1.053E+01	3.604E+02	3.604E+02	NOT IDENT.
PM-146	-1.230E+00	5.449E+00	5.477E+00	NOT IDENT.
ND-147	-9.920E+00	2.775E+01	2.811E+01	NOT IDENT.
PM-147	-7.083E+04	8.754E+04	9.319E+04	NOT IDENT.
PM-149	1.543E+01	1.374E+02	1.375E+02	NOT IDENT.
EU-152	7.025E+00	1.409E+01	1.444E+01	FAIL ABUN
GD-153	6.351E+00	9.070E+00	9.512E+00	NOT IDENT.
EU-154	1.884E+01	1.283E+01	1.539E+01	NOT IDENT.
EU-155	1.324E+00	1.098E+01	1.100E+01	NOT IDENT.
TB-160	4.018E-01	1.596E+01	1.596E+01	NOT IDENT.
HO-166M	6.900E+00	8.119E+00	8.695E+00	NOT IDENT.
TM-171	-1.515E+03	2.337E+03	2.435E+03	NOT IDENT.
LU-176	-2.049E+00	3.877E+00	3.986E+00	NOT IDENT.
LU-177	-4.229E+00	3.292E+01	3.297E+01	FAIL ABUN
HF-181	7.674E-01	4.234E+00	4.248E+00	NOT IDENT.
W-181	-9.256E+00	2.028E+01	2.071E+01	NOT IDENT.
TA-182	-1.698E+00	1.406E+01	1.408E+01	FAIL ABUN
RE-183	-8.126E+00	1.847E+01	1.883E+01	NOT IDENT.
RE-184	7.146E+00	1.256E+01	1.296E+01	NOT IDENT.
RE-188	-7.477E+00	2.084E+01	2.111E+01	FAIL ABUN
W-188	-1.717E+02	7.808E+02	7.846E+02	FAIL ABUN

OS-191	2.819E+00	9.316E+00	9.403E+00	FAIL ABUN
IR-192	-1.018E+00	3.833E+00	3.860E+00	FAIL ABUN
PB-201	-1.278E+01	2.922E+01	2.978E+01	NOT IDENT.
TL-201	2.483E+01	3.235E+01	3.424E+01	NOT IDENT.
TL-202	-6.871E-01	3.776E+00	3.789E+00	NOT IDENT.
HG-203	-1.394E+00	4.075E+00	4.123E+00	NOT IDENT.
PB-203	-1.930E+00	5.641E+00	5.708E+00	NOT IDENT.
TL-204	-3.275E+02	4.992E+02	5.206E+02	NOT IDENT.
BI-207	2.301E+00	6.050E+00	6.138E+00	NOT IDENT.
TL-208	-1.045E+01	6.775E+00	8.255E+00	NOT IDENT.
PB-210	1.944E+02	5.189E+02	5.263E+02	NOT IDENT.
BI-211	-3.282E+01	3.586E+01	3.880E+01	NOT IDENT.
PB-211	-6.717E+00	8.820E+01	8.825E+01	NOT IDENT.
BI-212	1.488E+01	6.748E+01	6.781E+01	NOT IDENT.
PB-212	9.997E+00	1.436E+01	1.505E+01	FAIL ABUN
BI-213	-3.970E+00	1.256E+01	1.269E+01	NOT IDENT.
BI-214	1.514E+01	1.960E+01	2.075E+01	FAIL ABUN
PB-214	-3.734E+00	1.299E+01	1.310E+01	FAIL ABUN
RN-219	-2.004E+01	6.344E+01	6.408E+01	NOT IDENT.
FR-221	1.265E+01	2.887E+01	2.943E+01	NOT IDENT.
RA-223	2.659E+00	8.618E+01	8.619E+01	FAIL ABUN
RA-224	5.244E+00	8.817E+01	8.821E+01	NOT IDENT.
AC-225	1.359E+01	3.102E+01	3.162E+01	NOT IDENT.
AC-227	3.408E+01	3.484E+01	3.808E+01	NOT IDENT.
TH-227	3.408E+01	3.484E+01	3.808E+01	NOT IDENT.
AC-228	-7.695E+00	2.575E+01	2.598E+01	NOT IDENT.
RA-228	-7.695E+00	2.575E+01	2.598E+01	NOT IDENT.
TH-228	9.997E+00	1.436E+01	1.505E+01	FAIL ABUN
TH-229	-6.994E+00	6.126E+01	6.134E+01	NOT IDENT.
TH-230	-7.812E+02	1.352E+03	1.397E+03	NOT IDENT.
PA-231	5.380E+00	6.132E+01	6.137E+01	NOT IDENT.
TH-231	-1.110E+01	5.437E+01	5.460E+01	NOT IDENT.
PA-233	-6.222E+00	9.409E+00	9.819E+00	FAIL ABUN
PA-234	2.006E+01	3.948E+01	4.050E+01	FAIL ABUN
PA-234M	-5.735E+02	7.053E+02	7.513E+02	NOT IDENT.
U-234	4.056E+03	8.119E+03	8.323E+03	NOT IDENT.
NP-237	-6.222E+00	9.409E+00	9.819E+00	FAIL ABUN
NP-238	-6.374E+00	2.348E+01	2.366E+01	NOT IDENT.
NP-239	-6.467E-01	2.878E+01	2.878E+01	NOT IDENT.
AM-241	5.497E+00	1.564E+01	1.584E+01	NOT IDENT.
AM-242	-3.041E+01	6.639E+01	6.780E+01	NOT IDENT.
AM-243	-2.758E+00	6.457E+00	6.576E+00	NOT IDENT.
CM-243	-3.570E+00	1.147E+01	1.158E+01	NOT IDENT.
BK-247	9.948E+00	1.052E+01	1.144E+01	NOT IDENT.
CM-247	-5.047E+00	5.883E+00	6.308E+00	NOT IDENT.
CF-249	5.845E+00	5.355E+00	5.969E+00	NOT IDENT.
CF-251	-1.677E+00	1.464E+01	1.466E+01	NOT IDENT.
CF-252	-7.002E+03	1.945E+04	1.971E+04	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	70.0471	81.00	84.2600	120.90	100.9770
45.60	67.4355	81.07	84.2741	121.12	107.6265
46.54	66.8728	82.35	81.9180	121.22	107.6456
49.72	72.3778	82.47	81.9416	121.78	86.9596
51.35	66.3727	167.43	81.9416	122.06	83.2211
52.39	77.0292	82.47	81.9416	123.07	102.3203
53.20	57.9229	83.79	70.8293	265.00	91.9987
53.44	53.9419	84.00	78.7383	127.16	99.2464
56.28	41.4280	84.21	71.7744	127.23	99.2567
57.36	61.1258	84.86	72.7605	129.43	81.4346
57.53	61.1572	85.43	82.5125	131.20	81.6823
57.53	61.1578	86.55	78.3259	133.02	100.2501
57.98	62.0573	86.79	73.0854	133.52	102.2654
59.32	45.9108	86.94	66.0639	135.34	99.6744
59.54	45.9408	87.09	77.5411	136.00	106.5659
61.49	56.9308	87.57	70.5695	57.53	94.0146
63.00	57.1793	88.03	89.1872	136.47	85.3198
63.29	57.2267	88.34	79.5293	140.51	88.4905
63.58	57.2738	88.47	79.5534	140.88	83.3346
63.81	57.3113	91.11	91.2871	143.76	83.3956
64.28	57.3875	91.27	91.3200	144.24	83.4592
64.99	60.0022	92.59	80.2860	145.44	83.6187
65.08	60.0172	93.31	80.4124	152.32	85.5145
66.73	75.9238	94.56	80.6307	152.43	85.5289
66.98	67.0380	94.65	80.6465	153.25	78.6661
67.24	64.8494	94.67	80.6499	323.87	83.7667
67.67	73.0412	97.43	72.1124	155.04	77.8810
67.75	73.0568	98.43	79.4908	156.02	91.9958
68.89	67.3865	98.44	79.4929	158.56	80.3015
68.89	67.3871	99.53	85.1065	158.97	80.3503
69.67	74.2802	100.11	85.2090	159.00	80.3540
70.82	89.7464	100.20	85.2248	162.33	74.6933
70.82	89.7472	102.03	87.3669	162.66	78.7677
70.83	89.7497	103.18	87.5713	163.33	77.8342
72.81	80.8535	103.37	87.6057	165.86	78.1197
72.87	80.8658	105.31	77.8711	167.43	71.1781
74.66	76.9627	106.12	87.1730	171.28	70.5456
74.82	66.7283	106.47	86.3156	176.31	87.5136
74.97	66.7533	109.28	43.0888	176.60	74.1588
77.11	87.7636	111.00	64.2314	177.52	75.2835
79.69	91.7860	111.76	66.7996	181.07	62.1762
79.82	90.0836	112.95	66.9518	184.41	80.4969
80.02	90.1272	116.24	75.7886	184.58	80.5158
80.03	90.1280	116.30	75.7972	185.72	86.5461
80.12	88.4150	116.74	81.4782	186.21	86.6019
80.19	88.4298	117.23	87.1769	190.27	71.3297
80.22	88.4376	119.76	82.8746	193.51	75.8419
80.57	82.4372	99.53	85.8214	197.03	97.3457

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
198.01	92.1693	256.23	49.8327	492.35	20.0158
201.83	78.7729	304.85	58.1561	497.08	28.2867
204.12	74.7264	306.78	66.5803	511.00	22.0864
205.31	74.8354	308.46	50.0109	514.00	22.1260
208.37	86.9203	311.90	65.6918	520.40	26.8382
210.85	77.4943	316.51	45.5738	520.69	25.9173
215.65	76.4959	319.41	51.7016	522.65	29.6536
218.12	85.7662	320.08	61.3563	527.90	25.0983
222.11	85.0745	321.04	56.5913	529.59	16.7483
227.09	62.5264	323.87	49.4883	529.87	19.5431
227.38	64.7410	325.23	45.9217	531.02	26.0757
228.16	72.4866	328.76	32.7274	537.26	26.1702
228.18	76.8819	331.15	54.6570	546.56	22.5518
116.74	76.8819	333.37	47.4586	552.55	21.6860
235.69	62.0242	334.37	51.1529	563.25	24.6617
235.96	62.0430	338.28	47.6550	564.24	24.6755
238.63	74.4488	338.32	47.6574	569.33	31.4075
238.98	74.4774	311.90	58.7607	946.00	28.5547
240.99	78.7258	340.55	58.7637	569.70	28.5583
242.00	62.4548	344.28	47.8931	582.08	23.9604
244.70	86.1257	345.93	50.4179	583.19	26.8516
245.35	74.9926	351.06	49.3945	595.83	18.3444
250.62	73.1637	351.93	42.0154	427.87	23.2305
252.40	50.7465	356.01	47.1138	604.72	33.4668
252.80	53.0242	361.25	44.8209	609.32	28.2000
256.23	57.7431	364.49	47.4327	610.33	28.2141
260.90	61.4339	366.42	30.8363	614.28	19.0104
264.66	58.2435	356.01	38.8565	618.01	13.6753
265.00	47.9819	388.16	34.7456	621.93	29.3628
269.46	47.0497	388.63	40.6924	630.19	20.6411
271.23	57.4799	391.70	43.3342	631.29	18.6853
273.65	66.8359	264.66	38.4906	155.04	20.6702
276.40	48.5292	401.32	33.3744	633.25	20.6727
277.37	77.4892	401.81	35.0984	634.78	21.6742
277.60	69.4098	402.40	41.1084	635.95	17.7437
278.00	57.8629	404.85	38.6087	636.99	18.7395
278.43	52.0985	410.95	38.7790	657.50	7.4728
279.20	62.5660	414.70	39.7465	657.76	7.4741
279.54	59.1088	423.72	36.5227	661.66	17.9714
280.46	51.0415	427.09	40.0956	664.57	14.9976
283.69	58.1833	427.87	30.5239	666.33	24.0166
284.31	43.0805	433.94	35.0309	666.50	25.5197
285.41	46.6235	439.51	32.5271	667.71	19.2266
285.90	48.9765	440.45	33.4278	677.62	16.0983
287.50	46.7163	453.88	36.3930	685.70	25.2513
290.67	51.5424	459.60	26.7297	692.65	25.3337
293.27	50.1016	463.37	19.6501	695.00	27.3911
351.93	50.5848	468.07	29.5659	696.49	27.4098
295.96	58.0760	473.00	31.4574	696.51	27.4098
879.38	62.9378	475.06	22.4991	697.00	28.4318
299.98	50.8079	476.78	33.3355	697.49	28.4386
300.09	50.8132	477.60	26.1414	702.65	28.5070
300.13	50.8158	477.99	28.8529	706.68	16.3203
301.36	50.8722	482.18	26.2175	711.68	16.3581
302.85	58.0499	487.02	28.1108	720.70	21.5588

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
721.93	24.6523	935.54	13.4448	1368.63	6.7257
722.78	19.5234	937.49	13.4541	1377.63	10.5938
722.91	19.5249	944.13	6.7434	1384.29	6.7535
723.31	19.5280	945.96	6.7478	1408.01	8.7369
724.19	18.5083	946.00	6.7480	1434.09	3.9089
727.33	20.5933	949.00	9.0072	1435.80	4.8883
733.00	19.6139	667.71	15.7939	1457.56	1.9661
735.93	20.6730	962.31	16.9690	1460.82	4.9194
739.50	14.4945	964.08	11.3200	1489.16	10.8986
744.23	12.4497	966.17	23.7899	1596.21	1.6263
747.24	14.5440	968.97	13.6079	1620.50	4.0886
752.31	14.5765	983.53	10.2583	1678.03	6.2128
753.82	14.5862	984.45	11.4018	1690.97	5.1920
756.73	13.5618	996.26	10.3041	1757.55	6.3208
763.94	16.7441	1001.03	9.1742	1764.49	8.4404
765.80	26.1831	1274.44	10.3341	1063.66	10.5634
766.42	23.0474	1025.87	5.7829	1771.35	10.5658
766.84	27.2431	1028.54	8.1034	1791.20	6.3658
772.60	15.7562	1037.84	12.7734	1808.65	1.0649
776.52	16.8346	1038.76	9.2930	1836.06	5.3546
739.50	16.8451	475.06	16.3048		
778.90	16.8522	1048.07	12.8172		
783.70	17.4138	1050.41	8.1627		
788.74	11.6342	1063.66	9.6626		
792.07	15.8868	1077.00	13.2339		
795.86	21.2166	1077.34	14.1172		
802.10	19.1448	459.60	16.8001		
810.29	11.7394	1085.87	8.2578		
344.28	11.7399	1099.25	11.5519		
810.76	16.0114	1111.64	11.2148		
815.77	8.5570	1112.07	10.7065		
1048.07	13.9204	1112.84	11.4234		
832.01	12.9204	1115.54	10.0037		
834.85	17.2474	1120.29	10.0188		
835.15	16.1713	1120.55	10.0194		
836.80	15.1029	1221.41	9.2040		
846.77	15.1632	1129.67	7.1772		
856.80	15.2236	1131.51	12.5679		
860.56	16.3354	1173.23	9.0924		
871.09	9.8416	1177.95	10.1979		
873.19	19.6992	1189.05	10.0493		
875.33	15.3341	1204.77	12.8499		
879.38	16.4551	1221.41	6.4561		
880.51	20.8524	1231.02	4.4396		
881.60	16.4691	1235.36	15.8758		
883.24	12.0850	1238.28	6.4882		
884.68	17.5879	1260.41	9.3274		
889.28	12.1132	1271.87	11.2295		
894.76	14.3452	1274.44	1.4983		
898.04	14.3632	1274.54	1.4983		
903.28	12.1776	1291.59	7.5273		
907.67	21.0688	1298.22	9.4269		
911.20	12.2139	1312.11	8.5166		
923.98	11.1564	1332.49	10.4669		
926.36	12.2828	1365.19	12.4795		

VAX/VMS Nuclide Identification Report Generated 22-JUL-2022 03:03:38.53

```
*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141123.CNF;1
Background file : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM43.CNF;510
Background date : 16-JUL-2022 14:00:37
Sample date     : 27-JUN-2022 09:24:00 Acquisition date : 21-JUL-2022 23:03:14
Sample ID      : G1205141123 Sample quantity : 5.14200E-01 FILTER
Detector name   : GAM43 Detector geometry: JAR
Elapsed live time: 0 04:00:00.00 Elapsed real time: 0 04:00:01.57 0.0%
Energy tolerance: 1.50000 keV Analyst Initials : MJH1
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2290721 Detector SN# :
Matrix Spike ID : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	62.91*	15	119	1.15	125.66	121	8	1.02E-03	152.6	
2	0	139.91*	18	80	1.42	279.64	278	6	1.24E-03	98.4	
3	0	143.76*	7	72	1.07	287.34	285	5	5.01E-04	234.1	
4	0	146.36	32	77	0.67	292.53	290	7	2.21E-03	49.7	
5	0	271.17	22	82	1.78	542.06	535	11	1.53E-03	82.8	
6	0	454.71	18	38	0.87	908.98	903	9	1.26E-03	66.9	
7	1	477.84	92	36	1.87	955.23	947	32	6.41E-03	15.4	1.74E+00
8	1	486.90	24	15	1.89	973.34	947	32	1.66E-03	49.0	
9	0	525.78	41	68	10.65	1051.05	1033	27	2.87E-03	57.4	
10	1	550.59*	23	22	1.98	1100.64	1096	16	1.59E-03	45.8	4.10E+00
11	1	554.59	20	5	1.99	1108.64	1096	16	1.42E-03	31.9	
12	0	584.37*	13	32	2.08	1168.17	1162	11	9.17E-04	106.7	
13	0	595.98	19	22	1.55	1191.37	1188	8	1.30E-03	49.2	
14	0	699.92	12	15	1.00	1399.12	1396	7	8.08E-04	63.5	
15	0	793.52*	17	7	2.49	1586.18	1579	15	1.15E-03	65.3	
16	0	831.87	13	23	0.59	1662.80	1652	15	8.68E-04	87.4	
17	0	874.80	12	19	1.27	1748.59	1741	14	8.00E-04	88.8	
18	0	911.66	42	13	1.54	1822.25	1813	18	2.89E-03	25.8	
19	1	958.96	19	3	2.49	1916.77	1913	16	1.33E-03	30.2	1.77E+00
20	1	962.08*	6	17	2.27	1923.00	1913	16	3.93E-04	204.3	
21	0	968.94*	14	12	1.34	1936.72	1929	14	9.53E-04	72.0	
22	0	985.45	12	11	4.15	1969.70	1963	12	8.15E-04	65.4	
23	0	1002.21	24	14	2.12	2003.19	1995	15	1.64E-03	41.0	
24	0	1027.61	21	10	4.43	2053.93	2047	13	1.49E-03	36.9	
25	0	1062.01	12	7	1.06	2122.67	2114	14	8.33E-04	55.0	
26	0	1086.65*	3	0	0.56	2171.89	2169	8	1.91E-04	222.9	
27	0	1132.28	17	7	1.40	2263.06	2256	13	1.15E-03	40.3	
28	0	1154.32	11	12	3.22	2307.08	2299	12	7.82E-04	68.2	
29	0	1422.59	11	9	2.52	2843.00	2829	18	7.64E-04	70.7	
30	0	1656.32	19	5	4.01	3309.80	3298	21	1.31E-03	38.1	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 22-JUL-2022 03:03:39

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141123.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 27-JUN-2022 09:24:00	Acquisition date	: 21-JUL-2022 23:03:14
Sample ID	: G1205141123	Sample quantity	: 0.51420 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA43	Detector geometry	: JAR
Elapsed live time	: 0 04:00:00.00	Elapsed real time	: 0 04:00:01.57 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	92	10.44*	1.951E+00	1.655E+02	2.281E+02	30.72
AS-74	595.83	19	59.00*	1.621E+00	7.157E+00	1.872E+01	98.31
	634.78	-----	15.40	1.539E+00	-----	Line Not Found	-----
CE-141	145.44	32	48.29*	4.217E+00	5.704E+00	9.648E+00	99.35
TL-208	277.37	-----	6.60	3.062E+00	-----	Line Not Found	-----
	583.19	13	85.00*	1.648E+00	3.441E+00	3.527E+00	213.47
	860.56	-----	12.50	1.198E+00	-----	Line Not Found	-----
AC-228	338.32	-----	11.27	2.610E+00	-----	Line Not Found	-----
	911.20	42	25.80*	1.143E+00	5.158E+01	5.200E+01	51.62
	968.97	14	15.80	1.088E+00	2.914E+01	2.938E+01	144.04
RA-228	338.32	-----	11.27	2.610E+00	-----	Line Not Found	-----
	911.20	42	25.80*	1.143E+00	5.158E+01	5.200E+01	51.62
	968.97	14	15.80	1.088E+00	2.914E+01	2.938E+01	144.04
TH-232	63.81	15	0.26*	1.198E+00	1.729E+03	1.729E+03	305.21
	140.88	18	0.02	4.216E+00	7.718E+03	7.718E+03	196.76

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                 *
*                                     *                                     *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141123.CNF;1 *
* Acquisition date   : 21-JUL-2022 23:03:14 Sensitivity      : 3.000          *
* Detector ID        : GAM43 Energy tolerance: 1.500          *
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 04:00:01.57 Half life ratio : *****          *
* Sample date        : 27-JUN-2022 09:24:00 Analyst initials: MJH1          *
* Sample ID          : G1205141123 Sample Quantity : 5.1420E-01 FILTER *
* Batch Number       : 2290721 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*                                     CALIBRATION INFORMATION                 *
*                                     *                                     *
* Eff. Cal. date     : 22-MAR-2022 09:17:22 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM43_JAR.CNF;16          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	2.281E+02	6.867E+01	7.259E+01
AS-74	1.872E+01	1.804E+01	2.993E+01
CE-141	9.648E+00	9.394E+00	1.169E+01
TL-208	3.527E+00	7.378E+00	7.457E+00
AC-228	5.200E+01	2.631E+01	2.854E+01
RA-228	5.200E+01	2.631E+01	2.854E+01
TH-232	1.729E+03	5.172E+03	4.309E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	1.114E+00	4.383E+00	8.819E+00	NOT IDENT.
NA-24	0.000E+00	3.033E+12	0.000E+00	SHORT HLIF
AL-26	-1.086E+00	3.437E+00	6.696E+00	NOT IDENT.
K-40	8.967E+01	5.937E+01	1.300E+02	NOT IDENT.
SC-46	-5.324E+00	7.514E+00	9.012E+00	NOT IDENT.
V-48	3.303E+00	1.312E+01	2.333E+01	NOT IDENT.
CR-51	1.298E+01	5.112E+01	9.508E+01	NOT IDENT.
MN-52	5.804E+01	1.022E+02	2.129E+02	NOT IDENT.
MN-54	1.710E+00	4.620E+00	8.038E+00	NOT IDENT.
CO-56	-1.209E+00	5.329E+00	9.501E+00	NOT IDENT.
CO-57	4.266E-01	2.475E+00	4.475E+00	NOT IDENT.
NI-57	0.000E+00	5.331E+05	0.000E+00	SHORT HLIF
CO-58	-3.923E+00	5.154E+00	8.527E+00	NOT IDENT.
FE-59	3.885E+00	1.043E+01	2.138E+01	NOT IDENT.
CO-60	-4.570E-01	4.065E+00	7.774E+00	NOT IDENT.
ZN-65	4.035E+00	9.049E+00	1.855E+01	NOT IDENT.
CU-67	-1.083E+04	5.507E+03	8.063E+03	NOT IDENT.
GE-68	-4.454E+01	1.332E+02	2.462E+02	NOT IDENT.
AS-73	4.828E+01	1.521E+02	2.953E+02	NOT IDENT.
SE-75	4.218E+00	4.426E+00	8.579E+00	NOT IDENT.
BR-77	0.000E+00	1.780E+04	0.000E+00	SHORT HLIF
SR-82	-1.268E+00	5.171E+01	9.555E+01	NOT IDENT.
RB-83	5.133E-01	7.963E+00	1.535E+01	NOT IDENT.

RB-84	9.435E+00	1.010E+01	2.053E+01	NOT IDENT.
KR-85	-7.432E+03	1.859E+03	2.058E+03	NOT IDENT.
SR-85	-4.314E+01	1.079E+01	1.195E+01	NOT IDENT.
RB-86	-3.091E+01	1.180E+02	2.202E+02	NOT IDENT.
Y-88	3.323E+00	5.681E+00	1.252E+01	NOT IDENT.
Y-91	1.112E+03	1.868E+03	4.067E+03	NOT IDENT.
NB-94	2.279E+00	4.501E+00	7.900E+00	NOT IDENT.
NB-95	3.579E+00	4.896E+00	9.964E+00	NOT IDENT.
NB-95M	-9.411E+00	1.273E+01	2.237E+01	NOT IDENT.
TC-95M	-1.853E+00	5.589E+00	8.162E+00	NOT IDENT.
ZR-95	-3.396E+00	8.628E+00	1.529E+01	NOT IDENT.
MO-99	1.109E+04	1.527E+04	3.104E+04	FAIL ABUN
TC-99M	0.000E+00	1.276E+30	0.000E+00	SHORT HLIF
RH-101	-3.317E+00	2.966E+00	4.746E+00	NOT IDENT.
RH-102M	-5.834E-01	3.851E+00	5.954E+00	NOT IDENT.
RU-103	9.741E-01	5.846E+00	1.054E+01	NOT IDENT.
RH-106	-1.126E+01	2.964E+01	5.409E+01	NOT IDENT.
RU-106	-1.126E+01	2.964E+01	5.409E+01	NOT IDENT.
AG-108M	-1.315E+00	3.095E+00	5.304E+00	NOT IDENT.
CD-109	-8.291E+01	7.743E+01	1.294E+02	NOT IDENT.
AG-110	-5.981E+01	8.840E+01	1.523E+02	NOT IDENT.
AG-110M	-4.934E+00	5.982E+00	9.646E+00	NOT IDENT.
IN-111	1.768E+01	1.125E+03	2.087E+03	NOT IDENT.
SN-113	-1.356E+00	4.792E+00	8.432E+00	NOT IDENT.
IN-114M	-1.024E+01	2.017E+01	3.286E+01	NOT IDENT.
CD-115	0.000E+00	2.410E+04	0.000E+00	SHORT HLIF
SN-117M	-4.286E+00	7.746E+00	1.282E+01	NOT IDENT.
SB-122	-2.080E+03	2.547E+03	4.395E+03	NOT IDENT.
I-123	0.000E+00	6.768E+13	0.000E+00	SHORT HLIF
TE-123M	-2.161E-01	2.549E+00	4.427E+00	NOT IDENT.
SB-124	4.527E+00	1.165E+01	2.543E+01	NOT IDENT.
SB-125	-5.983E+00	9.483E+00	1.583E+01	NOT IDENT.
TE-125M	-4.941E+02	1.049E+03	1.813E+03	NOT IDENT.
I-126	1.056E+00	3.761E+01	7.139E+01	NOT IDENT.
SB-126	-5.471E+00	2.641E+01	4.821E+01	NOT IDENT.
SN-126	-2.526E-01	7.122E+00	1.302E+01	FAIL ABUN
SB-127	-3.640E+02	6.909E+02	1.219E+03	NOT IDENT.
TE-129	-7.698E+01	6.535E+01	9.953E+01	NOT IDENT.
I-131	7.522E+00	2.814E+01	5.242E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	3.314E+02	5.415E+02	1.051E+03	NOT IDENT.
BA-133	1.033E+00	4.730E+00	8.715E+00	NOT IDENT.
I-133	0.000E+00	1.496E+09	0.000E+00	SHORT HLIF
CS-134	-8.001E+00	6.860E+00	7.280E+00	NOT IDENT.
I-135	0.000E+00	1.725E+28	0.000E+00	SHORT HLIF
CS-136	-1.105E+01	1.953E+01	3.472E+01	NOT IDENT.
BA-137M	5.503E+00	4.096E+00	8.738E+00	NOT IDENT.
CS-137	5.813E+00	4.327E+00	9.231E+00	NOT IDENT.
LA-138	2.135E+00	7.827E+00	1.544E+01	NOT IDENT.
CE-139	2.596E-01	2.780E+00	4.876E+00	NOT IDENT.
BA-140	7.928E+00	4.393E+01	8.623E+01	NOT IDENT.
LA-140	-5.427E+00	2.099E+01	3.959E+01	FAIL ABUN
CE-143	0.000E+00	1.473E+06	0.000E+00	SHORT HLIF
CE-144	-9.111E+00	1.772E+01	2.998E+01	NOT IDENT.
PM-144	-2.595E+00	4.868E+00	7.235E+00	FAIL ABUN
PR-144	-1.952E+02	3.661E+02	5.441E+02	NOT IDENT.
PM-146	5.050E+00	6.617E+00	9.363E+00	FAIL ABUN
ND-147	5.609E+01	1.209E+02	2.182E+02	NOT IDENT.
PM-147	-6.991E+03	7.123E+04	1.260E+05	NOT IDENT.
PM-149	0.000E+00	1.821E+05	0.000E+00	SHORT HLIF
EU-152	3.356E+00	1.008E+01	1.893E+01	FAIL ABUN
GD-153	7.421E+00	8.630E+00	1.670E+01	NOT IDENT.
EU-154	2.901E+00	1.231E+01	2.472E+01	NOT IDENT.
EU-155	-2.544E+00	9.564E+00	1.695E+01	NOT IDENT.
TB-160	4.394E+00	1.915E+01	3.236E+01	FAIL ABUN
HO-166M	2.892E+00	7.317E+00	1.418E+01	NOT IDENT.
TM-171	-4.189E+02	3.028E+03	5.702E+03	NOT IDENT.
LU-176	3.839E-01	2.758E+00	5.109E+00	NOT IDENT.
LU-177	5.092E+01	2.760E+02	4.786E+02	NOT IDENT.
HF-181	-9.349E-01	5.667E+00	9.933E+00	NOT IDENT.
W-181	-3.604E+00	2.954E+01	5.561E+01	NOT IDENT.
TA-182	-1.053E+00	2.093E+01	3.952E+01	NOT IDENT.
RE-183	7.311E+00	3.066E+01	5.913E+01	NOT IDENT.
RE-184	-6.738E+00	1.642E+01	2.595E+01	FAIL ABUN
RE-188	-5.543E+00	1.739E+01	2.941E+01	FAIL ABUN
W-188	-1.757E+02	7.814E+02	1.410E+03	FAIL ABUN
OS-191	1.546E+01	2.414E+01	4.472E+01	FAIL ABUN
IR-192	1.430E+00	3.735E+00	7.099E+00	NOT IDENT.

PB-201	0.000E+00	3.912E+19	0.000E+00	SHORT HLIF
TL-201	-2.292E+03	5.629E+03	9.393E+03	NOT IDENT.
TL-202	6.705E+00	1.322E+01	2.501E+01	NOT IDENT.
HG-203	-3.481E+00	4.631E+00	7.994E+00	NOT IDENT.
PB-203	0.000E+00	8.715E+03	0.000E+00	SHORT HLIF
TL-204	-1.501E+02	5.626E+02	1.024E+03	NOT IDENT.
BI-207	4.184E+00	4.748E+00	1.004E+01	NOT IDENT.
PB-210	4.614E+01	6.288E+02	1.215E+03	NOT IDENT.
BI-211	-2.319E+01	2.936E+01	4.305E+01	NOT IDENT.
PB-211	-4.371E+01	8.060E+01	1.366E+02	FAIL ABUN
BI-212	2.866E+01	5.629E+01	1.118E+02	NOT IDENT.
PB-212	-7.966E+00	7.315E+00	1.173E+01	NOT IDENT.
BI-213	-2.880E+00	1.189E+01	2.072E+01	NOT IDENT.
BI-214	-4.997E+00	1.039E+01	1.683E+01	NOT IDENT.
PB-214	-7.121E+00	1.081E+01	1.614E+01	NOT IDENT.
RN-219	1.818E+01	4.232E+01	8.004E+01	FAIL ABUN
FR-221	1.004E+01	1.947E+01	3.766E+01	NOT IDENT.
RA-223	-2.576E+01	6.916E+01	1.218E+02	FAIL ABUN
RA-224	-5.499E+01	6.316E+01	1.096E+02	NOT IDENT.
AC-225	5.541E+01	1.075E+02	2.080E+02	NOT IDENT.
RA-226	2.341E+00	9.544E+01	1.594E+02	NOT IDENT.
AC-227	-1.461E+01	2.156E+01	3.788E+01	NOT IDENT.
TH-227	-1.461E+01	2.156E+01	3.788E+01	NOT IDENT.
TH-228	-7.966E+00	7.315E+00	1.173E+01	NOT IDENT.
TH-229	4.777E+01	5.006E+01	9.280E+01	NOT IDENT.
TH-230	-1.741E+03	1.594E+03	2.392E+03	NOT IDENT.
PA-231	-8.849E+00	5.083E+01	9.147E+01	NOT IDENT.
TH-231	-7.149E+00	5.459E+01	8.428E+01	NOT IDENT.
PA-233	3.128E+00	6.472E+00	1.238E+01	NOT IDENT.
PA-234	-2.679E+01	2.748E+01	4.596E+01	NOT IDENT.
PA-234M	9.723E+02	7.812E+02	1.119E+03	FAIL ABUN
TH-234	1.215E+02	3.634E+02	3.806E+02	FAIL ABUN
U-234	2.649E+03	1.072E+04	2.073E+04	NOT IDENT.
U-235	5.699E+00	2.615E+01	3.691E+01	FAIL ABUN
NP-237	3.128E+00	6.472E+00	1.238E+01	NOT IDENT.
NP-238	0.000E+00	6.435E+04	0.000E+00	SHORT HLIF
U-238	1.215E+02	3.634E+02	3.806E+02	FAIL ABUN
NP-239	4.944E+00	2.640E+01	4.783E+01	NOT IDENT.
AM-241	5.617E-01	2.279E+01	4.014E+01	NOT IDENT.
AM-242	6.388E+00	6.362E+01	1.162E+02	NOT IDENT.
AM-243	-3.865E-01	6.962E+00	1.070E+01	NOT IDENT.
CM-243	1.327E+00	9.166E+00	1.695E+01	NOT IDENT.
BK-247	4.191E+00	7.677E+00	1.434E+01	NOT IDENT.
CM-247	-8.919E-01	4.132E+00	7.270E+00	NOT IDENT.
CF-249	1.708E+00	4.001E+00	7.608E+00	NOT IDENT.
CF-251	1.793E+00	1.287E+01	2.236E+01	NOT IDENT.
CF-252	-4.399E+03	1.796E+04	3.187E+04	NOT IDENT.
ANH-511	-1.973E+01	9.169E+00	1.501E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	62.91	53	119	1.15	125.66	121	8	3.69E-03	38.2	
2	0	77.34	10	131	0.53	154.53	151	8	7.06E-04	198.0	
3	0	92.91	86	148	1.07	185.65	181	8	5.95E-03	27.0	
4	0	139.91	30	80	1.42	279.64	278	6	2.08E-03	50.0	
5	0	143.76	25	72	1.07	287.34	285	5	1.77E-03	53.9	
6	0	146.36	32	77	0.67	292.53	290	7	2.21E-03	49.7	
7	0	185.87	84	159	0.89	371.53	367	10	5.86E-03	30.2	
8	0	239.19	38	80	1.20	478.13	474	8	2.64E-03	43.9	
9	0	271.17	22	82	1.78	542.06	535	11	1.53E-03	82.8	
10	0	454.71	18	38	0.87	908.98	903	9	1.26E-03	66.9	
11	1	477.84	92	36	1.87	955.23	947	32	6.41E-03	15.4	1.74E+00
12	1	486.90	24	15	1.89	973.34	947	32	1.66E-03	49.0	
13	0	511.39	250	82	2.45	1022.29	1015	17	1.74E-02	10.7	
14	0	525.78	41	68	10.65	1051.05	1033	27	2.87E-03	57.4	
15	1	550.59	26	22	1.98	1100.64	1096	16	1.84E-03	34.8	4.10E+00
16	1	554.59	20	5	1.99	1108.64	1096	16	1.42E-03	31.9	
17	0	584.37	22	32	2.08	1168.17	1162	11	1.53E-03	54.7	
18	0	595.98	19	22	1.55	1191.37	1188	8	1.30E-03	49.2	
19	0	699.92	12	15	1.00	1399.12	1396	7	8.08E-04	63.5	
20	0	793.52	32	7	2.49	1586.18	1579	15	2.25E-03	25.3	
21	0	831.87	13	23	0.59	1662.80	1652	15	8.68E-04	87.4	
22	0	874.80	12	19	1.27	1748.59	1741	14	8.00E-04	88.8	
23	0	911.66	42	13	1.54	1822.25	1813	18	2.89E-03	25.8	
24	1	958.96	19	3	2.49	1916.77	1913	16	1.33E-03	30.2	1.77E+00
25	1	962.08	21	17	2.27	1923.00	1913	16	1.47E-03	40.6	
26	0	968.94	20	12	1.34	1936.72	1929	14	1.40E-03	44.7	
27	0	985.45	12	11	4.15	1969.70	1963	12	8.15E-04	65.4	
28	0	1002.21	24	14	2.12	2003.19	1995	15	1.64E-03	41.0	
29	0	1027.61	21	10	4.43	2053.93	2047	13	1.49E-03	36.9	
30	0	1062.01	12	7	1.06	2122.67	2114	14	8.33E-04	55.0	
31	0	1086.65	9	0	0.56	2171.89	2169	8	6.25E-04	33.3	
32	0	1132.28	17	7	1.40	2263.06	2256	13	1.15E-03	40.3	
33	0	1154.32	11	12	3.22	2307.08	2299	12	7.82E-04	68.2	
34	0	1422.59	11	9	2.52	2843.00	2829	18	7.64E-04	70.7	
35	0	1656.32	19	5	4.01	3309.80	3298	21	1.31E-03	38.1	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	92	10.44*	1.951E+00	1.655E+02	2.281E+02	30.72
AS-74	595.83	19	59.00*	1.621E+00	7.157E+00	1.872E+01	98.31
	634.78	-----	15.40	1.539E+00	-----	Line Not Found	-----
CE-141	145.44	32	48.29*	4.217E+00	5.704E+00	9.648E+00	99.35
TL-208	277.37	-----	6.60	3.062E+00	-----	Line Not Found	-----
	583.19	13	85.00*	1.648E+00	3.441E+00	3.527E+00	213.47
	860.56	-----	12.50	1.198E+00	-----	Line Not Found	-----
AC-228	338.32	-----	11.27	2.610E+00	-----	Line Not Found	-----
	911.20	42	25.80*	1.143E+00	5.158E+01	5.200E+01	51.62
	968.97	14	15.80	1.088E+00	2.914E+01	2.938E+01	144.04
RA-228	338.32	-----	11.27	2.610E+00	-----	Line Not Found	-----
	911.20	42	25.80*	1.143E+00	5.158E+01	5.200E+01	51.62
	968.97	14	15.80	1.088E+00	2.914E+01	2.938E+01	144.04
TH-232	63.81	15	0.26*	1.198E+00	1.729E+03	1.729E+03	305.21
	140.88	18	0.02	4.216E+00	7.718E+03	7.718E+03	196.76

Flag: "*" = Keyline

Total number of lines in spectrum 30
Number of unidentified lines 9
Number of lines tentatively identified by NID 21 70.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.38	1.655E+02	2.281E+02	0.701E+02	30.72	
AS-74	17.77D	2.62	7.157E+00	1.872E+01	1.841E+01	98.31	
CE-141	32.51D	1.69	5.704E+00	9.648E+00	9.585E+00	99.35	
TL-208	1.91Y	1.02	3.441E+00	3.527E+00	7.528E+00	213.47	
AC-228	5.75Y	1.01	5.158E+01	5.200E+01	2.684E+01	51.62	
RA-228	5.75Y	1.01	5.158E+01	5.200E+01	2.684E+01	51.62	
TH-232	1.41E+10Y	1.00	1.729E+03	1.729E+03	5.278E+03	305.21	
Total Activity :			2.014E+03	2.093E+03			

Grand Total Activity : 2.014E+03 2.093E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	143.76	7	72	1.07	287.34	285	5	5.01E-04	****	4.22E+00	T
0	271.17	22	82	1.78	542.06	535	11	1.53E-03	****	3.12E+00	T
0	454.71	18	38	0.87	908.98	903	9	1.26E-03	****	2.03E+00	T
1	486.90	24	15	1.89	973.34	947	32	1.66E-03	97.9	1.92E+00	T
0	525.78	41	68	10.65	1051.05	1033	27	2.87E-03	****	1.80E+00	
1	550.59	23	22	1.98	1100.64	1096	16	1.59E-03	91.7	1.73E+00	
1	554.59	20	5	1.99	1108.64	1096	16	1.42E-03	63.8	1.72E+00	
0	699.92	12	15	1.00	1399.12	1396	7	8.08E-04	****	1.42E+00	
0	793.52	17	7	2.49	1586.18	1579	15	1.15E-03	****	1.28E+00	T
0	831.87	13	23	0.59	1662.80	1652	15	8.68E-04	****	1.23E+00	T
0	874.80	12	19	1.27	1748.59	1741	14	8.00E-04	****	1.18E+00	T
1	958.96	19	3	2.49	1916.77	1913	16	1.33E-03	60.4	1.10E+00	
1	962.08	6	17	2.27	1923.00	1913	16	3.93E-04	****	1.09E+00	T
0	985.45	12	11	4.15	1969.70	1963	12	8.15E-04	****	1.07E+00	T
0	1002.21	24	14	2.12	2003.19	1995	15	1.64E-03	82.0	1.06E+00	T
0	1027.61	21	10	4.43	2053.93	2047	13	1.49E-03	73.7	1.04E+00	T
0	1062.01	12	7	1.06	2122.67	2114	14	8.33E-04	****	1.01E+00	
0	1086.65	3	0	0.56	2171.89	2169	8	1.91E-04	****	9.91E-01	T
0	1132.28	17	7	1.40	2263.06	2256	13	1.15E-03	80.5	9.58E-01	T
0	1154.32	11	12	3.22	2307.08	2299	12	7.82E-04	****	9.43E-01	
0	1422.59	11	9	2.52	2843.00	2829	18	7.64E-04	****	7.96E-01	
0	1656.32	19	5	4.01	3309.80	3298	21	1.31E-03	76.2	7.04E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141123.CNF;1
* Acquisition date   : 21-JUL-2022 23:03:14 Sensitivity      : 3.000
* Detector ID        : GAM43 Energy tolerance: 1.500
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 04:00:01.57 Half life ratio : *****
* Sample date        : 27-JUN-2022 09:24:00 Nuclide Library : LIQUID
* Sample ID          : G1205141123 Analyst initials: MJH1
* Batch Number       : 2290721 Sample Quantity : 5.1420E-01 FILTER
* Wet wt corr        : 1.00000 Wet Weight : 0.00000
*                                     Dry Weight : 0.00000
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 22-MAR-2022 09:17:22 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM43_JAR.CNF;16
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.297E+01
AS-74	1.362E+01
CE-141	5.440E+00
TL-208	3.369E+00
AC-228	1.259E+01
RA-228	1.259E+01
TH-232	2.005E+03

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	3.833E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.594E+00	NOT IDENT.
K-40	5.910E+01	NOT IDENT.
SC-46	3.988E+00	NOT IDENT.
V-48	1.033E+01	NOT IDENT.
CR-51	4.418E+01	NOT IDENT.
MN-52	9.319E+01	NOT IDENT.
MN-54	3.596E+00	NOT IDENT.
CO-56	4.244E+00	NOT IDENT.
CO-57	2.088E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.763E+00	NOT IDENT.
FE-59	9.388E+00	NOT IDENT.
CO-60	3.294E+00	NOT IDENT.
ZN-65	8.201E+00	NOT IDENT.
CU-67	3.840E+03	NOT IDENT.
GE-68	1.068E+02	NOT IDENT.
AS-73	1.375E+02	NOT IDENT.
SE-75	3.987E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	4.286E+01	NOT IDENT.
RB-83	6.942E+00	NOT IDENT.
RB-84	9.244E+00	NOT IDENT.

KR-85	9.666E+02	NOT IDENT.
SR-85	5.610E+00	NOT IDENT.
RB-86	9.583E+01	NOT IDENT.
Y-88	5.361E+00	NOT IDENT.
Y-91	1.755E+03	NOT IDENT.
NB-94	3.602E+00	NOT IDENT.
NB-95	4.494E+00	NOT IDENT.
NB-95M	1.043E+01	NOT IDENT.
TC-95M	3.809E+00	NOT IDENT.
ZR-95	6.756E+00	NOT IDENT.
MO-99	1.402E+04	FAIL ABUN
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.196E+00	NOT IDENT.
RH-102M	2.710E+00	NOT IDENT.
RU-103	4.825E+00	NOT IDENT.
RH-106	2.372E+01	NOT IDENT.
RU-106	2.372E+01	NOT IDENT.
AG-108M	2.395E+00	NOT IDENT.
CD-109	6.003E+01	NOT IDENT.
AG-110	6.832E+01	NOT IDENT.
AG-110M	4.204E+00	NOT IDENT.
IN-111	9.741E+02	NOT IDENT.
SN-113	3.835E+00	NOT IDENT.
IN-114M	1.529E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	5.934E+00	NOT IDENT.
SB-122	1.978E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.052E+00	NOT IDENT.
SB-124	1.073E+01	NOT IDENT.
SB-125	7.132E+00	NOT IDENT.
TE-125M	8.423E+02	NOT IDENT.
I-126	3.190E+01	NOT IDENT.
SB-126	2.147E+01	NOT IDENT.
SN-126	6.057E+00	FAIL ABUN
SB-127	5.310E+02	NOT IDENT.
TE-129	4.450E+01	NOT IDENT.
I-131	2.415E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	4.925E+02	NOT IDENT.
BA-133	4.040E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.178E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.515E+01	NOT IDENT.
BA-137M	4.001E+00	NOT IDENT.
CS-137	4.227E+00	NOT IDENT.
LA-138	6.768E+00	NOT IDENT.
CE-139	2.270E+00	NOT IDENT.
BA-140	3.876E+01	NOT IDENT.
LA-140	1.707E+01	FAIL ABUN
CE-143	0.000E+00	SHORT HLIF
CE-144	1.387E+01	NOT IDENT.
PM-144	3.254E+00	FAIL ABUN
PR-144	2.447E+02	NOT IDENT.
PM-146	4.308E+00	FAIL ABUN
ND-147	9.913E+01	NOT IDENT.
PM-147	5.871E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.744E+00	FAIL ABUN
GD-153	7.820E+00	NOT IDENT.
EU-154	1.073E+01	NOT IDENT.
EU-155	7.841E+00	NOT IDENT.
TB-160	1.442E+01	FAIL ABUN
HO-166M	6.441E+00	NOT IDENT.
TM-171	2.645E+03	NOT IDENT.
LU-176	2.369E+00	NOT IDENT.
LU-177	2.227E+02	NOT IDENT.
HF-181	4.494E+00	NOT IDENT.
W-181	2.567E+01	NOT IDENT.
TA-182	1.741E+01	NOT IDENT.
RE-183	2.743E+01	NOT IDENT.
RE-184	1.115E+01	FAIL ABUN
RE-188	1.375E+01	FAIL ABUN
W-188	6.523E+02	FAIL ABUN
OS-191	2.102E+01	FAIL ABUN
IR-192	3.278E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF

TL-201	4.367E+03	NOT IDENT.
TL-202	1.148E+01	NOT IDENT.
HG-203	3.712E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	4.769E+02	NOT IDENT.
BI-207	4.366E+00	NOT IDENT.
PB-210	5.626E+02	NOT IDENT.
BI-211	2.002E+01	NOT IDENT.
PB-211	6.250E+01	FAIL ABUN
BI-212	5.039E+01	NOT IDENT.
PB-212	5.530E+00	NOT IDENT.
BI-213	9.452E+00	NOT IDENT.
BI-214	7.738E+00	NOT IDENT.
PB-214	7.523E+00	NOT IDENT.
RN-219	3.672E+01	FAIL ABUN
FR-221	1.765E+01	NOT IDENT.
RA-223	5.634E+01	FAIL ABUN
RA-224	5.120E+01	NOT IDENT.
AC-225	9.744E+01	NOT IDENT.
RA-226	7.624E+01	NOT IDENT.
AC-227	1.735E+01	NOT IDENT.
TH-227	1.735E+01	NOT IDENT.
TH-228	5.530E+00	NOT IDENT.
TH-229	4.354E+01	NOT IDENT.
TH-230	1.113E+03	NOT IDENT.
PA-231	4.254E+01	NOT IDENT.
TH-231	3.940E+01	NOT IDENT.
PA-233	5.733E+00	NOT IDENT.
PA-234	1.928E+01	NOT IDENT.
PA-234M	5.043E+02	FAIL ABUN
TH-234	1.795E+02	FAIL ABUN
U-234	9.641E+03	NOT IDENT.
U-235	1.740E+01	FAIL ABUN
NP-237	5.733E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.795E+02	FAIL ABUN
NP-239	2.237E+01	NOT IDENT.
AM-241	1.865E+01	NOT IDENT.
AM-242	5.420E+01	NOT IDENT.
AM-243	4.995E+00	NOT IDENT.
CM-243	7.831E+00	NOT IDENT.
BK-247	6.655E+00	NOT IDENT.
CM-247	3.332E+00	NOT IDENT.
CF-249	3.484E+00	NOT IDENT.
CF-251	1.048E+01	NOT IDENT.
CF-252	1.485E+04	NOT IDENT.
ANH-511	7.239E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141123.CNF;1
* Acquisition date   : 21-JUL-2022 23:03:14 Sensitivity      : 3.000
* Detector ID        : GAM43 Energy tolerance: 1.500
* Elapsed live time  : 0 04:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 04:00:01.57 Half life ratio  : *****
* Sample date        : 27-JUN-2022 09:24:00 Nuclide Library : LIQUID
* Sample ID          : G1205141123 Analyst initials: MJH1
* Batch Number       : 2290721 Sample Quantity : 5.1420E-01 FILTER
* Quantity Err(%)    : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight : 0.00000
* Dry Weight         : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 22-MAR-2022 09:17:22 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM43_JAR.CNF;16

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	2.281E+02	7.164E+01	7.178E+01
AS-74	1.872E+01	1.817E+01	1.817E+01
CE-141	9.648E+00	9.421E+00	9.423E+00
TL-208	3.527E+00	7.386E+00	7.386E+00
AC-228	5.200E+01	2.667E+01	2.669E+01
RA-228	5.200E+01	2.667E+01	2.669E+01
TH-232	1.729E+03	5.180E+03	5.180E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	1.114E+00	4.384E+00	4.413E+00	NOT IDENT.
NA-24	-6.814E+11	3.033E+12	3.049E+12	SHORT HLIF
AL-26	-1.086E+00	3.438E+00	3.473E+00	NOT IDENT.
K-40	8.967E+01	5.985E+01	7.224E+01	NOT IDENT.
SC-46	-5.324E+00	7.526E+00	7.900E+00	NOT IDENT.
V-48	3.303E+00	1.312E+01	1.321E+01	NOT IDENT.
CR-51	1.298E+01	5.113E+01	5.146E+01	NOT IDENT.
MN-52	5.804E+01	1.023E+02	1.056E+02	NOT IDENT.
MN-54	1.710E+00	4.622E+00	4.686E+00	NOT IDENT.
CO-56	-1.209E+00	5.330E+00	5.358E+00	NOT IDENT.
CO-57	4.266E-01	2.475E+00	2.482E+00	NOT IDENT.
NI-57	-2.107E+05	5.336E+05	5.420E+05	SHORT HLIF
CO-58	-3.923E+00	5.165E+00	5.460E+00	NOT IDENT.
FE-59	3.885E+00	1.044E+01	1.058E+01	NOT IDENT.
CO-60	-4.570E-01	4.066E+00	4.071E+00	NOT IDENT.
ZN-65	4.035E+00	9.055E+00	9.236E+00	NOT IDENT.
CU-67	-1.083E+04	5.583E+03	7.418E+03	NOT IDENT.
GE-68	-4.454E+01	1.333E+02	1.348E+02	NOT IDENT.
AS-73	4.828E+01	1.525E+02	1.541E+02	NOT IDENT.
SE-75	4.218E+00	4.437E+00	4.828E+00	NOT IDENT.
BR-77	-1.268E+04	1.783E+04	1.872E+04	SHORT HLIF
SR-82	-1.268E+00	5.171E+01	5.172E+01	NOT IDENT.
RB-83	5.133E-01	7.964E+00	7.967E+00	NOT IDENT.

RB-84	9.435E+00	1.013E+01	1.099E+01	NOT IDENT.
KR-85	-7.432E+03	1.980E+03	3.895E+03	NOT IDENT.
SR-85	-4.314E+01	1.149E+01	2.261E+01	NOT IDENT.
RB-86	-3.091E+01	1.180E+02	1.188E+02	NOT IDENT.
Y-88	3.323E+00	5.686E+00	5.881E+00	NOT IDENT.
Y-91	1.112E+03	1.870E+03	1.936E+03	NOT IDENT.
NB-94	2.279E+00	4.507E+00	4.623E+00	NOT IDENT.
NB-95	3.579E+00	4.907E+00	5.166E+00	NOT IDENT.
NB-95M	-9.411E+00	1.276E+01	1.345E+01	NOT IDENT.
TC-95M	-1.853E+00	5.591E+00	5.653E+00	NOT IDENT.
ZR-95	-3.396E+00	8.634E+00	8.769E+00	NOT IDENT.
MO-99	1.109E+04	1.531E+04	1.610E+04	FAIL ABUN
TC-99M	6.618E+29	1.278E+30	0.000E+00	SHORT HLIF
RH-101	-3.317E+00	3.030E+00	3.379E+00	NOT IDENT.
RH-102M	-5.834E-01	3.851E+00	3.860E+00	NOT IDENT.
RU-103	9.741E-01	5.847E+00	5.864E+00	NOT IDENT.
RH-106	-1.126E+01	2.966E+01	3.010E+01	NOT IDENT.
RU-106	-1.126E+01	2.966E+01	3.010E+01	NOT IDENT.
AG-108M	-1.315E+00	3.097E+00	3.154E+00	NOT IDENT.
CD-109	-8.291E+01	7.866E+01	8.710E+01	NOT IDENT.
AG-110	-5.981E+01	8.859E+01	9.261E+01	NOT IDENT.
AG-110M	-4.934E+00	5.997E+00	6.397E+00	NOT IDENT.
IN-111	1.768E+01	1.125E+03	1.125E+03	NOT IDENT.
SN-113	-1.356E+00	4.794E+00	4.832E+00	NOT IDENT.
IN-114M	-1.024E+01	2.019E+01	2.071E+01	NOT IDENT.
CD-115	7.697E+03	2.411E+04	2.436E+04	SHORT HLIF
SN-117M	-4.286E+00	7.753E+00	7.991E+00	NOT IDENT.
SB-122	-2.080E+03	2.555E+03	2.722E+03	NOT IDENT.
I-123	-2.413E+13	6.771E+13	6.858E+13	SHORT HLIF
TE-123M	-2.161E-01	2.549E+00	2.551E+00	NOT IDENT.
SB-124	4.527E+00	1.165E+01	1.183E+01	NOT IDENT.
SB-125	-5.983E+00	9.496E+00	9.873E+00	NOT IDENT.
TE-125M	-4.941E+02	1.050E+03	1.073E+03	NOT IDENT.
I-126	1.056E+00	3.761E+01	3.761E+01	NOT IDENT.
SB-126	-5.471E+00	2.642E+01	2.654E+01	NOT IDENT.
SN-126	-2.526E-01	7.122E+00	7.123E+00	FAIL ABUN
SB-127	-3.640E+02	6.931E+02	7.123E+02	NOT IDENT.
TE-129	-7.698E+01	6.674E+01	7.524E+01	NOT IDENT.
I-131	7.522E+00	2.815E+01	2.835E+01	NOT IDENT.
I-132	-1.000E+41	1.761E+42	0.000E+00	SHORT HLIF
TE-132	3.314E+02	5.427E+02	5.629E+02	NOT IDENT.
BA-133	1.033E+00	4.731E+00	4.754E+00	NOT IDENT.
I-133	3.275E+08	1.497E+09	1.505E+09	SHORT HLIF
CS-134	-8.001E+00	6.898E+00	7.785E+00	NOT IDENT.
I-135	1.165E+28	1.846E+28	0.000E+00	SHORT HLIF
CS-136	-1.105E+01	1.957E+01	2.019E+01	NOT IDENT.
BA-137M	5.503E+00	4.131E+00	4.820E+00	NOT IDENT.
CS-137	5.813E+00	4.364E+00	5.092E+00	NOT IDENT.
LA-138	2.135E+00	7.829E+00	7.888E+00	NOT IDENT.
CE-139	2.596E-01	2.781E+00	2.783E+00	NOT IDENT.
BA-140	7.928E+00	4.394E+01	4.409E+01	NOT IDENT.
LA-140	-5.427E+00	2.099E+01	2.114E+01	FAIL ABUN
CE-143	-6.062E+05	1.473E+06	1.499E+06	SHORT HLIF
CE-144	-9.111E+00	1.774E+01	1.821E+01	NOT IDENT.
PM-144	-2.595E+00	4.874E+00	5.013E+00	FAIL ABUN
PR-144	-1.952E+02	3.666E+02	3.771E+02	NOT IDENT.
PM-146	5.050E+00	6.638E+00	7.019E+00	FAIL ABUN
ND-147	5.609E+01	1.210E+02	1.237E+02	NOT IDENT.
PM-147	-6.991E+03	7.123E+04	7.130E+04	NOT IDENT.
PM-149	-3.072E+04	1.822E+05	1.827E+05	SHORT HLIF
EU-152	3.356E+00	1.009E+01	1.020E+01	FAIL ABUN
GD-153	7.421E+00	8.677E+00	9.301E+00	NOT IDENT.
EU-154	2.901E+00	1.232E+01	1.238E+01	NOT IDENT.
EU-155	-2.544E+00	9.568E+00	9.637E+00	NOT IDENT.
TB-160	4.394E+00	1.916E+01	1.926E+01	FAIL ABUN
HO-166M	2.892E+00	7.323E+00	7.438E+00	NOT IDENT.
TM-171	-4.189E+02	3.028E+03	3.034E+03	NOT IDENT.
LU-176	3.839E-01	2.758E+00	2.764E+00	NOT IDENT.
LU-177	5.092E+01	2.760E+02	2.769E+02	NOT IDENT.
HF-181	-9.349E-01	5.668E+00	5.683E+00	NOT IDENT.
W-181	-3.604E+00	2.956E+01	2.960E+01	NOT IDENT.
TA-182	-1.053E+00	2.093E+01	2.094E+01	NOT IDENT.
RE-183	7.311E+00	3.068E+01	3.085E+01	NOT IDENT.
RE-184	-6.738E+00	1.644E+01	1.671E+01	FAIL ABUN
RE-188	-5.543E+00	1.739E+01	1.757E+01	FAIL ABUN
W-188	-1.757E+02	7.817E+02	7.857E+02	FAIL ABUN
OS-191	1.546E+01	2.416E+01	2.515E+01	FAIL ABUN
IR-192	1.430E+00	3.736E+00	3.792E+00	NOT IDENT.

PB-201	2.394E+19	3.989E+19	0.000E+00	SHORT HLIF
TL-201	-2.292E+03	5.632E+03	5.726E+03	NOT IDENT.
TL-202	6.705E+00	1.323E+01	1.357E+01	NOT IDENT.
HG-203	-3.481E+00	4.638E+00	4.896E+00	NOT IDENT.
PB-203	-6.551E+03	8.727E+03	9.214E+03	SHORT HLIF
TL-204	-1.501E+02	5.630E+02	5.671E+02	NOT IDENT.
BI-207	4.184E+00	4.760E+00	5.120E+00	NOT IDENT.
PB-210	4.614E+01	6.288E+02	6.291E+02	NOT IDENT.
BI-211	-2.319E+01	2.942E+01	3.122E+01	NOT IDENT.
PB-211	-4.371E+01	8.069E+01	8.307E+01	FAIL ABUN
BI-212	2.866E+01	5.636E+01	5.782E+01	NOT IDENT.
PB-212	-7.966E+00	7.341E+00	8.174E+00	NOT IDENT.
BI-213	-2.880E+00	1.189E+01	1.196E+01	NOT IDENT.
BI-214	-4.997E+00	1.041E+01	1.065E+01	NOT IDENT.
PB-214	-7.121E+00	1.083E+01	1.129E+01	NOT IDENT.
RN-219	1.818E+01	4.240E+01	4.319E+01	FAIL ABUN
FR-221	1.004E+01	1.950E+01	2.001E+01	NOT IDENT.
RA-223	-2.576E+01	6.920E+01	7.017E+01	FAIL ABUN
RA-224	-5.499E+01	6.330E+01	6.799E+01	NOT IDENT.
AC-225	5.541E+01	1.077E+02	1.105E+02	NOT IDENT.
RA-226	2.341E+00	9.544E+01	9.545E+01	NOT IDENT.
AC-227	-1.461E+01	2.166E+01	2.264E+01	NOT IDENT.
TH-227	-1.461E+01	2.166E+01	2.264E+01	NOT IDENT.
TH-228	-7.966E+00	7.341E+00	8.174E+00	NOT IDENT.
TH-229	4.777E+01	5.020E+01	5.463E+01	NOT IDENT.
TH-230	-1.741E+03	1.635E+03	1.814E+03	NOT IDENT.
PA-231	-8.849E+00	5.087E+01	5.102E+01	NOT IDENT.
TH-231	-7.149E+00	5.461E+01	5.471E+01	NOT IDENT.
PA-233	3.128E+00	6.476E+00	6.628E+00	NOT IDENT.
PA-234	-2.679E+01	4.120E+01	4.294E+01	NOT IDENT.
PA-234M	9.723E+02	7.852E+02	8.994E+02	FAIL ABUN
TH-234	1.215E+02	3.647E+02	3.688E+02	FAIL ABUN
U-234	2.649E+03	1.073E+04	1.079E+04	NOT IDENT.
U-235	5.699E+00	2.615E+01	2.628E+01	FAIL ABUN
NP-237	3.128E+00	6.476E+00	6.628E+00	NOT IDENT.
NP-238	5.018E+04	6.448E+04	6.834E+04	SHORT HLIF
U-238	1.215E+02	3.647E+02	3.688E+02	FAIL ABUN
NP-239	4.944E+00	2.640E+01	2.649E+01	NOT IDENT.
AM-241	5.617E-01	2.279E+01	2.279E+01	NOT IDENT.
AM-242	6.388E+00	6.363E+01	6.370E+01	NOT IDENT.
AM-243	-3.865E-01	6.963E+00	6.965E+00	NOT IDENT.
CM-243	1.327E+00	9.168E+00	9.188E+00	NOT IDENT.
BK-247	4.191E+00	7.726E+00	7.955E+00	NOT IDENT.
CM-247	-8.919E-01	4.135E+00	4.155E+00	NOT IDENT.
CF-249	1.708E+00	4.005E+00	4.078E+00	NOT IDENT.
CF-251	1.793E+00	1.287E+01	1.289E+01	NOT IDENT.
CF-252	-4.399E+03	1.840E+04	1.851E+04	NOT IDENT.
ANH-511	-1.973E+01	9.345E+00	1.291E+01	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	53.6517	133.52	54.6611	116.30	75.7496
879.38	61.3023	364.49	54.6758	116.74	65.5933
46.54	50.7150	80.22	54.6826	117.23	62.6033
228.16	52.4248	711.68	52.0159	119.76	67.1726
52.39	56.8964	356.01	60.3261	120.54	62.1364
53.20	54.2174	323.87	60.3417	120.90	64.2700
53.44	54.2852	82.35	0.0000	264.66	64.3083
57.53	54.2524	82.47	58.8174	121.22	64.3254
293.27	0.0000	82.47	58.8184	344.28	62.3442
57.53	50.4528	83.79	58.1786	122.06	61.3511
482.18	50.4533	265.00	60.0716	1274.44	55.2604
57.98	50.5638	84.21	60.1173	123.68	57.4384
59.32	52.2821	84.86	0.0000	1377.63	0.0000
59.54	56.7912	193.51	69.6711	127.23	76.9465
155.04	59.8434	105.31	55.0267	129.43	65.7227
63.00	60.2608	86.79	53.2061	131.20	66.0179
129.43	60.3403	86.94	60.7064	133.02	70.5978
63.29	60.3403	87.09	60.7386	133.52	62.1180
290.67	60.1361	87.57	59.9048	135.34	54.8669
63.81	60.1986	88.03	78.7519	136.00	64.6536
87.57	64.8792	306.78	83.5298	136.28	58.2278
64.99	66.2271	88.47	84.5068	136.47	62.5702
65.08	66.2536	531.02	130.7574	739.50	66.8129
66.73	58.6819	184.58	130.8290	140.51	0.0000
66.98	58.7457	92.59	55.2312	140.88	67.5987
67.24	62.2716	93.31	91.6377	143.76	81.2311
67.67	66.7200	94.56	130.3586	144.24	59.3427
1221.41	75.4108	311.90	130.3970	145.44	59.5083
439.51	60.9718	946.00	130.4063	152.32	68.2787
70.82	60.9718	97.43	53.2133	152.43	68.2955
167.43	60.9728	98.43	66.9727	1048.07	72.9058
97.43	62.9220	98.44	66.9748	154.21	67.4405
70.82	66.7366	99.53	62.3369	155.04	76.5726
70.82	66.7372	103.37	62.3369	158.56	57.5524
279.20	0.0000	116.74	62.3369	158.97	0.0000
1063.66	62.8590	100.11	67.3302	159.00	55.6529
72.87	0.0000	100.20	67.3491	162.33	60.6238
351.06	62.8742	102.03	53.0100	537.26	58.3765
74.66	58.8689	103.18	50.2428	163.33	63.0432
238.63	59.7986	103.37	46.3291	165.86	58.7672
351.93	59.7986	105.31	56.5190	167.43	68.2061
238.63	59.7986	106.12	45.7231	245.35	75.7335
74.97	77.6954	106.47	55.7214	427.87	72.9647
77.11	52.2342	109.28	68.2267	176.60	69.4737
256.23	60.0295	111.00	62.5189	177.52	70.7785
79.82	53.6902	111.76	58.6138	181.07	77.2063
80.02	54.6405	208.37	73.0102	184.41	101.6068
80.03	54.6414	116.24	75.7366	184.58	108.8137

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	67.1067	300.09	69.3657	477.60	32.9377
186.21	62.3705	300.13	69.3702	477.99	32.9483
190.27	72.5116	301.36	62.8136	482.18	33.0622
193.51	54.7071	302.85	55.3013	487.02	33.1926
197.03	74.6304	304.50	50.6375	492.35	0.0000
198.01	61.2793	304.85	57.3499	497.08	36.9232
201.83	76.5010	306.78	51.7368	511.00	66.4936
204.12	64.4192	308.46	54.7224	514.00	239.9344
205.31	72.0000	311.90	43.3823	520.40	29.0825
208.37	56.1559	316.51	41.6834	520.69	0.0000
210.85	59.3169	319.41	54.4710	667.71	0.0000
215.65	69.0590	320.08	52.5674	527.90	0.0000
218.12	62.5753	321.04	42.8810	529.59	32.6571
222.11	59.5788	323.87	58.6682	529.87	0.0000
227.09	55.7655	325.23	56.8023	531.02	25.5858
227.38	54.9323	1596.21	46.2169	537.26	24.0988
228.16	61.0163	331.15	0.0000	1260.41	0.0000
228.18	61.0178	333.37	46.4607	552.55	25.2725
235.69	81.7336	334.37	38.5961	795.86	33.6532
235.96	81.7671	338.28	39.7607	564.24	40.0482
238.63	68.1262	911.20	39.7624	569.33	27.4045
238.98	0.0000	340.48	59.7876	569.50	28.3208
240.99	87.6536	340.55	59.7925	569.70	28.3255
242.00	75.4967	344.28	43.0289	582.08	25.0684
244.70	66.9871	345.93	48.1191	583.19	29.5146
245.35	65.2875	351.06	52.4221	595.83	34.4221
459.60	56.9030	351.93	53.4798	600.60	43.3060
685.70	57.9415	356.01	49.6619	604.72	41.1802
388.16	51.7318	361.25	0.0000	609.32	38.4901
256.23	51.9869	364.49	40.9058	610.33	30.9999
527.90	0.0000	366.42	43.0382	614.28	39.5583
264.66	39.1834	383.85	33.3809	618.01	21.7155
265.00	44.6466	388.16	32.4771	621.93	21.7717
269.46	45.6523	666.33	32.4922	630.19	0.0000
401.81	45.7621	391.70	38.8985	631.29	27.6176
273.65	57.8500	400.66	31.8158	632.98	28.6011
276.40	61.7506	401.32	0.0000	633.25	30.5127
583.19	60.9069	401.81	33.9746	634.78	36.2698
277.60	57.2332	402.40	44.6173	635.95	38.2068
402.40	60.0343	404.85	48.9808	636.99	22.9395
278.43	65.6135	410.95	36.4135	657.50	35.8223
279.20	0.0000	720.70	30.0935	884.68	37.7658
279.54	56.4553	423.72	36.8485	661.66	19.4135
280.46	58.3781	427.09	40.2241	664.57	0.0000
301.36	66.0699	427.87	38.0769	666.33	23.3628
284.31	58.6729	433.94	36.0984	666.50	23.3650
285.41	53.1615	439.51	32.9803	667.71	0.0000
285.90	0.0000	440.45	40.7104	677.62	28.4239
287.50	54.2405	453.88	46.7578	685.70	21.6677
290.67	55.4013	459.60	43.6314	692.65	28.6796
293.27	0.0000	463.37	30.3036	695.00	34.3313
295.22	56.6663	468.07	38.3116	696.49	36.4766
316.51	72.7906	473.00	52.6133	696.51	36.4766
298.58	65.4427	475.06	37.4023	697.00	26.9684
299.98	69.3568	696.49	32.9153	697.49	25.3898

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	27.0581	903.28	17.6597	1291.59	12.3311
706.68	39.8840	907.67	0.0000	1298.22	0.0000
711.68	27.0000	911.20	18.8319	1312.11	23.7951
720.70	25.1289	984.45	0.0000	1332.49	11.4560
721.93	0.0000	926.36	16.7317	1365.19	10.5239
1690.97	22.1396	935.54	12.3206	1368.63	0.0000
722.91	22.1417	937.49	13.4524	1377.63	0.0000
723.31	18.1198	983.53	13.4923	1384.29	11.6456
756.73	27.1936	945.96	0.0000	1408.01	12.7980
727.33	21.1878	946.00	18.9051	1434.09	10.7500
733.00	23.2801	949.00	9.0144	1435.80	13.9826
735.93	28.3871	954.55	0.0000	1457.56	0.0000
739.50	19.3012	962.31	9.0674	1460.82	13.0037
1434.09	29.5372	964.08	18.1484	1489.16	7.6491
747.24	22.4445	966.17	18.1650	1596.21	15.9548
752.31	25.5768	968.97	21.2188	1620.50	11.3364
753.82	19.4540	983.53	16.7766	1678.03	0.0000
756.73	24.6130	984.45	0.0000	1690.97	6.7371
763.94	24.7090	996.26	12.2676	1757.55	0.0000
765.80	18.5504	1001.03	17.5166	1764.49	8.8250
1001.03	21.6492	1004.73	24.6230	1770.23	11.7832
766.84	24.7478	1025.87	0.0000	1771.35	5.8933
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	25.9125	1037.84	17.7856	1808.65	5.9475
777.92	21.7828	1038.76	0.0000	1836.06	6.9846
778.90	24.9075	1046.59	18.7881		
783.70	23.9307	1048.07	22.5598		
1435.80	21.6988	1050.41	16.9356		
903.28	24.0360	1063.66	6.3057		
795.86	23.4548	1077.00	18.0667		
801.95	21.0083	1077.34	18.0695		
802.10	23.1105	1083.85	11.1232		
810.29	23.2085	1085.87	12.7227		
810.45	28.4848	1099.25	13.4285		
810.76	29.5449	1111.64	14.4558		
815.77	21.1572	1112.07	20.2422		
818.51	24.3652	1112.84	21.2126		
832.01	23.8909	1115.54	14.4778		
834.85	18.7983	1120.29	16.4380		
835.15	15.3826	1120.55	18.3738		
836.80	0.0000	1121.30	18.3784		
846.77	26.8593	1808.65	9.7036		
856.80	25.9116	1131.51	0.0000		
860.56	20.5511	1332.49	13.8059		
871.09	19.1334	1177.95	7.9027		
873.19	17.4116	1189.05	14.8770		
875.33	0.0000	1204.77	7.9789		
879.38	19.2092	1221.41	19.0612		
880.51	17.4722	1231.02	19.1252		
881.60	14.9841	1235.36	12.0979		
883.24	17.4951	1238.28	12.1096		
884.68	26.2603	1260.41	0.0000		
889.28	18.6415	1271.87	10.2080		
894.76	21.9873	1274.44	12.2602		
1836.06	15.4146	1274.54	12.2607		

VAX/VMS Nuclide Identification Report Generated 21-JUL-2022 23:11:57.91

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                    *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141124.CNF;1
Background file : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM40.CNF;411
Background date  : 16-JUL-2022 14:12:17
Sample date     : 21-JUL-2022 00:00:00 Acquisition date : 21-JUL-2022 22:56:30
Sample ID      : G1205141124 Sample quantity : 5.71750E-01 FILTER
Detector name   : GAM40 Detector geometry: JAR
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.63 0.2%
Energy tolerance: 1.50000 keV Analyst Initials : MJH1
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2290721 Detector SN# :
Matrix Spike ID : LCS ID :
*****
```

BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.37*	1398	1140	0.86	93.74	89	9	1.55E+00	5.1	2.84E+00
2	2	57.67	109	432	0.97	116.38	115	12	1.21E-01	22.9	
3	2	59.48	6332	771	0.97	120.00	115	12	7.04E+00	1.4	
4	0	75.96*	45	417	1.46	152.98	150	7	4.96E-02	77.1	
5	0	141.24	48	330	1.33	283.67	281	7	5.30E-02	64.6	
6	0	146.30	48	355	2.10	293.80	291	8	5.35E-02	69.2	
7	0	230.52	60	229	1.43	462.38	460	6	6.68E-02	42.1	
8	0	572.44	25	77	1.47	1146.58	1145	7	2.75E-02	61.4	
9	0	661.92	7325	158	1.47	1325.58	1318	15	8.14E+00	1.2	
10	0	873.03	26	58	1.15	1747.82	1745	8	2.93E-02	54.2	
11	0	1156.75	25	62	4.00	2315.07	2307	15	2.82E-02	71.2	
12	0	1173.56	2053	51	1.82	2348.67	2339	18	2.28E+00	2.3	
13	0	1184.41	62	47	9.22	2370.35	2357	31	6.83E-02	35.2	
14	0	1332.96	1822	29	1.73	2667.27	2657	18	2.02E+00	2.4	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 21-JUL-2022 23:11:58

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141124.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MJH1		
Sample date	: 21-JUL-2022 00:00:00	Acquisition date	: 21-JUL-2022 22:56:30
Sample ID	: G1205141124	Sample quantity	: 0.57175 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA40	Detector geometry	: JAR
Elapsed live time	: 0 00:15:00.00	Elapsed real time	: 0 00:15:01.63 0.2%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
CO-60	1173.23	2053	99.85	9.229E-01	1.170E+04	1.170E+04	4.70
	1332.49	1822	99.98*	8.268E-01	1.157E+04	1.158E+04	4.88
TC-99M	140.51	48	89.06*	4.013E+00	7.011E+01	9.983E+02	129.26
BA-137M	661.66	7325	89.90*	1.527E+00	2.802E+04	2.802E+04	2.45
CS-137	661.66	7325	85.10*	1.527E+00	2.960E+04	2.961E+04	2.45
CE-141	145.44	48	48.29*	3.992E+00	1.312E+02	1.339E+02	138.43
W-181	56.28	109	18.70	7.482E-01	4.076E+03	4.099E+03	45.75
	57.53	109	32.00*	7.482E-01	2.382E+03	2.395E+03	45.75
	65.08	-----	10.60	1.311E+00	-----	Line Not Found	-----
	66.98	-----	2.40	1.465E+00	-----	Line Not Found	-----
	136.28	-----	0.03	4.024E+00	-----	Line Not Found	-----
	152.32	-----	0.08	3.956E+00	-----	Line Not Found	-----
PB-210	46.54	1398	4.25*	1.712E-01	1.009E+06	1.009E+06	10.22
AM-241	59.54	6332	35.90*	8.768E-01	1.057E+05	1.057E+05	2.89
AM-243	43.53	-----	5.90	9.770E-02	-----	Line Not Found	-----
	74.66	45	67.20*	2.184E+00	1.598E+02	1.598E+02	154.22

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141124.CNF;1
Acquisition date : 21-JUL-2022 22:56:30 Sensitivity : 3.000
Detector ID : GAM40 Energy tolerance: 1.500
Elapsed live time: 0 00:15:00.00 Abundance limit : 75.000
Elapsed real time: 0 00:15:01.63 Half life ratio : *****
Sample date : 21-JUL-2022 00:00:00 Analyst initials: MJH1
Sample ID : G1205141124 Sample Quantity : 5.7175E-01 FILTER
Batch Number : 2290721 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 13-OCT-2021 04:34:22 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM40_JAR.CNF;17

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
CO-60	1.158E+04	5.533E+02	1.131E+02
TC-99M	9.983E+02	1.265E+03	1.464E+03
BA-137M	2.802E+04	6.738E+02	1.629E+02
CS-137	2.961E+04	7.118E+02	1.721E+02
CE-141	1.339E+02	1.817E+02	2.003E+02
W-181	2.395E+03	1.074E+03	3.082E+03
PB-210	1.009E+06	1.011E+05	7.433E+04
AM-241	1.057E+05	2.995E+03	1.811E+03
AM-243	1.598E+02	2.415E+02	2.722E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	-1.229E+02	9.854E+02	1.734E+03	NOT IDENT.
NA-22	2.415E+01	4.918E+01	1.091E+02	NOT IDENT.
NA-24	3.967E+01	1.032E+02	2.471E+02	NOT IDENT.
AL-26	1.661E+01	2.228E+01	7.395E+01	NOT IDENT.
K-40	-1.610E+00	3.061E+02	7.609E+02	NOT IDENT.
SC-46	-2.523E+01	1.011E+02	1.726E+02	NOT IDENT.
V-48	-2.392E+01	1.218E+02	2.066E+02	NOT IDENT.
CR-51	8.154E+01	7.428E+02	1.355E+03	NOT IDENT.
MN-52	-6.303E+00	4.429E+01	9.173E+01	NOT IDENT.
MN-54	-8.167E+00	8.985E+01	1.569E+02	NOT IDENT.
CO-56	-5.906E+01	1.045E+02	1.735E+02	NOT IDENT.
CO-57	-1.510E+01	6.758E+01	1.146E+02	NOT IDENT.
NI-57	1.641E+00	6.826E+01	1.503E+02	NOT IDENT.
CO-58	-1.836E+01	8.629E+01	1.495E+02	NOT IDENT.
FE-59	1.912E+02	2.136E+02	4.185E+02	NOT IDENT.
ZN-65	-7.784E+00	2.297E+02	4.229E+02	NOT IDENT.
CU-67	-5.969E+01	1.757E+02	2.911E+02	NOT IDENT.
GE-68	1.877E+03	3.238E+03	6.299E+03	NOT IDENT.
AS-73	-1.144E+04	7.477E+03	1.251E+04	NOT IDENT.
AS-74	5.840E+00	1.338E+02	2.400E+02	NOT IDENT.
SE-75	6.840E+01	1.275E+02	2.165E+02	NOT IDENT.

BR-77	-1.174E+02	4.100E+02	6.752E+02	NOT IDENT.
SR-82	-2.312E+02	5.299E+02	9.024E+02	NOT IDENT.
RB-83	-4.713E+01	1.826E+02	3.206E+02	NOT IDENT.
RB-84	1.841E+01	1.592E+02	2.794E+02	NOT IDENT.
KR-85	-1.832E+04	2.023E+04	3.406E+04	NOT IDENT.
SR-85	-8.290E+01	9.152E+01	1.541E+02	NOT IDENT.
RB-86	1.039E+03	1.236E+03	2.453E+03	NOT IDENT.
Y-88	2.277E+01	4.183E+01	1.038E+02	NOT IDENT.
Y-91	-1.653E+03	2.758E+04	5.287E+04	NOT IDENT.
NB-94	1.313E+01	7.573E+01	1.373E+02	NOT IDENT.
NB-95	4.536E+01	7.929E+01	1.486E+02	NOT IDENT.
NB-95M	-1.526E+02	3.041E+02	4.910E+02	NOT IDENT.
TC-95M	-2.404E+01	1.123E+02	1.854E+02	NOT IDENT.
ZR-95	-9.560E+00	1.586E+02	2.790E+02	NOT IDENT.
MO-99	6.886E+00	8.491E+02	1.509E+03	FAIL ABUN
RH-101	-2.206E+01	8.532E+01	1.441E+02	NOT IDENT.
RH-102M	2.550E+01	1.115E+02	1.990E+02	NOT IDENT.
RU-103	-3.271E+01	9.671E+01	1.689E+02	NOT IDENT.
RH-106	-2.107E+02	7.810E+02	1.364E+03	NOT IDENT.
RU-106	-2.107E+02	7.810E+02	1.364E+03	NOT IDENT.
AG-108M	3.734E+01	1.052E+02	1.902E+02	NOT IDENT.
CD-109	9.255E+02	2.177E+03	3.837E+03	NOT IDENT.
AG-110	-5.464E+02	2.287E+03	3.521E+03	NOT IDENT.
AG-110M	-5.900E+01	1.427E+02	2.397E+02	NOT IDENT.
IN-111	-8.010E+01	1.001E+02	1.587E+02	NOT IDENT.
SN-113	-1.177E+02	1.337E+02	2.300E+02	NOT IDENT.
IN-114M	3.151E+02	4.336E+02	7.504E+02	NOT IDENT.
CD-115	6.923E+01	4.256E+02	7.640E+02	NOT IDENT.
SN-117M	2.017E+01	7.078E+01	1.215E+02	NOT IDENT.
SB-122	5.868E+01	1.428E+02	2.620E+02	NOT IDENT.
I-123	2.161E+02	2.304E+02	4.077E+02	NOT IDENT.
TE-123M	6.468E+01	6.857E+01	1.214E+02	NOT IDENT.
SB-124	3.141E+01	6.318E+01	1.720E+02	NOT IDENT.
SB-125	1.118E+02	3.171E+02	5.737E+02	NOT IDENT.
TE-125M	-1.297E+04	2.267E+04	3.802E+04	NOT IDENT.
I-126	4.362E+01	2.370E+02	3.906E+02	NOT IDENT.
SB-126	-1.327E+00	1.406E+02	2.517E+02	NOT IDENT.
SN-126	1.516E+02	2.179E+02	3.884E+02	NOT IDENT.
SB-127	-7.466E+01	2.099E+02	3.653E+02	NOT IDENT.
TE-129	-1.557E+02	1.387E+03	2.443E+03	NOT IDENT.
I-131	1.070E+02	1.005E+02	1.905E+02	NOT IDENT.
I-132	-1.746E+04	8.216E+04	1.283E+05	NOT IDENT.
TE-132	2.099E+01	1.099E+02	1.697E+02	NOT IDENT.
BA-133	3.889E+01	1.292E+02	2.359E+02	NOT IDENT.
I-133	-1.379E+02	2.110E+02	3.604E+02	NOT IDENT.
CS-134	2.675E+01	9.897E+01	1.794E+02	NOT IDENT.
I-135	1.074E+03	2.052E+03	4.512E+03	NOT IDENT.
CS-136	-9.119E+01	1.371E+02	2.415E+02	NOT IDENT.
LA-138	2.791E+01	5.894E+01	1.417E+02	NOT IDENT.
CE-139	-7.054E+00	7.388E+01	1.243E+02	NOT IDENT.
BA-140	4.219E+02	3.681E+02	6.992E+02	NOT IDENT.
LA-140	1.494E+01	5.467E+01	1.200E+02	NOT IDENT.
CE-143	-3.203E+01	2.694E+02	4.877E+02	FAIL ABUN
CE-144	2.845E+02	5.117E+02	8.955E+02	NOT IDENT.
PM-144	1.537E+01	7.419E+01	1.352E+02	NOT IDENT.
PR-144	1.141E+03	5.511E+03	1.004E+04	NOT IDENT.
PM-146	4.590E+01	1.599E+02	2.867E+02	NOT IDENT.
ND-147	-1.415E+02	6.703E+02	1.179E+03	NOT IDENT.
PM-147	-8.328E+04	1.981E+06	3.391E+06	NOT IDENT.
PM-149	-2.263E+03	2.960E+03	5.219E+03	NOT IDENT.
EU-152	-1.173E+02	2.810E+02	4.985E+02	NOT IDENT.
GD-153	7.518E+01	2.313E+02	4.055E+02	NOT IDENT.
EU-154	6.893E+01	1.404E+02	3.114E+02	FAIL ABUN
EU-155	5.336E+01	3.001E+02	5.209E+02	NOT IDENT.
TB-160	4.278E+01	3.622E+02	6.356E+02	FAIL ABUN
HO-166M	-4.707E+01	1.291E+02	2.234E+02	NOT IDENT.
TM-171	-4.428E+04	1.759E+05	3.050E+05	NOT IDENT.
LU-176	-3.123E+00	7.681E+01	1.393E+02	NOT IDENT.
LU-177	-4.256E+02	7.228E+02	1.171E+03	NOT IDENT.
HF-181	-2.284E+01	1.176E+02	2.069E+02	FAIL ABUN
TA-182	-3.303E+01	2.717E+02	5.152E+02	NOT IDENT.
RE-183	2.244E+03	1.006E+03	3.805E+03	FAIL ABUN
RE-184	7.943E+01	2.967E+02	5.257E+02	NOT IDENT.
RE-188	1.308E+02	3.621E+02	6.254E+02	NOT IDENT.
W-188	-1.010E+04	1.810E+04	3.216E+04	NOT IDENT.
OS-191	-1.573E+01	2.229E+02	3.799E+02	NOT IDENT.
IR-192	3.409E+01	8.980E+01	1.655E+02	NOT IDENT.
PB-201	-3.060E+02	5.173E+02	9.123E+02	NOT IDENT.

TL-201	3.394E+02	7.269E+02	1.256E+03	NOT IDENT.
TL-202	-2.292E+01	1.145E+02	2.016E+02	NOT IDENT.
HG-203	-4.106E+00	8.622E+01	1.569E+02	NOT IDENT.
PB-203	-5.552E+00	1.166E+02	2.121E+02	NOT IDENT.
TL-204	4.374E+03	1.584E+04	2.806E+04	NOT IDENT.
BI-207	1.077E+02	1.402E+02	2.760E+02	FAIL ABUN
TL-208	1.067E+01	1.005E+02	1.807E+02	NOT IDENT.
BI-211	-2.030E+02	6.360E+02	1.132E+03	NOT IDENT.
PB-211	1.367E+03	2.310E+03	4.245E+03	NOT IDENT.
BI-212	-2.161E+02	1.144E+03	2.012E+03	NOT IDENT.
PB-212	3.704E+01	1.619E+02	2.740E+02	FAIL ABUN
BI-213	-1.909E+02	3.887E+02	6.753E+02	NOT IDENT.
BI-214	1.121E+00	1.748E+02	3.129E+02	NOT IDENT.
PB-214	2.394E+02	2.283E+02	4.302E+02	FAIL ABUN
RN-219	7.474E+02	1.300E+03	2.389E+03	NOT IDENT.
FR-221	-3.142E+02	6.324E+02	1.026E+03	NOT IDENT.
RA-223	1.106E+03	1.889E+03	3.506E+03	NOT IDENT.
RA-224	-8.049E+02	1.821E+03	2.949E+03	NOT IDENT.
AC-225	-3.359E+02	6.760E+02	1.097E+03	NOT IDENT.
RA-226	5.193E+02	1.836E+03	3.132E+03	NOT IDENT.
AC-227	-1.834E+02	7.544E+02	1.231E+03	NOT IDENT.
TH-227	-1.834E+02	7.544E+02	1.231E+03	NOT IDENT.
AC-228	3.859E+02	4.387E+02	8.125E+02	NOT IDENT.
RA-228	3.859E+02	4.387E+02	8.125E+02	NOT IDENT.
TH-228	3.704E+01	1.619E+02	2.740E+02	FAIL ABUN
TH-229	-4.252E+02	1.486E+03	2.455E+03	NOT IDENT.
TH-230	-2.253E+04	3.749E+04	6.416E+04	NOT IDENT.
PA-231	3.039E+02	1.354E+03	2.483E+03	NOT IDENT.
TH-231	7.972E+01	1.225E+03	2.142E+03	NOT IDENT.
TH-232	-2.548E+04	7.324E+04	1.175E+05	FAIL ABUN
PA-233	4.042E+01	1.867E+02	3.423E+02	NOT IDENT.
PA-234	-6.201E+01	1.083E+03	1.851E+03	NOT IDENT.
PA-234M	3.442E+03	1.238E+04	2.351E+04	NOT IDENT.
TH-234	-4.776E+03	5.382E+03	8.377E+03	NOT IDENT.
U-234	-6.657E+05	6.397E+05	1.085E+06	NOT IDENT.
U-235	7.516E+01	6.077E+02	8.477E+02	NOT IDENT.
NP-237	4.042E+01	1.867E+02	3.423E+02	NOT IDENT.
NP-238	-1.999E+02	6.401E+02	1.074E+03	NOT IDENT.
U-238	-4.776E+03	5.382E+03	8.377E+03	NOT IDENT.
NP-239	4.786E+02	7.039E+02	1.248E+03	NOT IDENT.
AM-242	-1.804E+02	1.783E+03	3.069E+03	NOT IDENT.
CM-243	-1.073E+01	3.083E+02	5.306E+02	NOT IDENT.
BK-247	1.049E+02	2.502E+02	4.220E+02	NOT IDENT.
CM-247	-1.310E+01	1.189E+02	2.119E+02	NOT IDENT.
CF-249	7.302E+01	1.296E+02	2.381E+02	NOT IDENT.
CF-251	-1.211E+02	3.360E+02	5.564E+02	NOT IDENT.
CF-252	-4.159E+05	4.930E+05	8.195E+05	NOT IDENT.
ANH-511	2.894E+01	9.195E+01	1.699E+02	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.37	1399	1140	0.86	93.74	89	9	1.55E+00	5.1	2.84E+00
2	2	57.67	109	432	0.97	116.38	115	12	1.21E-01	22.9	
3	2	59.48	6332	771	0.97	120.00	115	12	7.04E+00	1.4	
4	0	75.96	46	417	1.46	152.98	150	7	5.10E-02	75.0	
5	0	141.24	48	330	1.33	283.67	281	7	5.30E-02	64.6	
6	0	146.30	48	355	2.10	293.80	291	8	5.35E-02	69.2	
7	0	230.52	60	229	1.43	462.38	460	6	6.68E-02	42.1	
8	0	572.44	25	77	1.47	1146.58	1145	7	2.75E-02	61.4	
9	0	661.92	7325	158	1.47	1325.58	1318	15	8.14E+00	1.2	
10	0	873.03	26	58	1.15	1747.82	1745	8	2.93E-02	54.2	
11	0	1156.75	25	62	4.00	2315.07	2307	15	2.82E-02	71.2	
12	0	1173.56	2053	51	1.82	2348.67	2339	18	2.28E+00	2.3	
13	0	1184.41	62	47	9.22	2370.35	2357	31	6.83E-02	35.2	
14	0	1332.96	1822	29	1.73	2667.27	2657	18	2.02E+00	2.4	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
CO-60	1173.23	2053	99.85	9.229E-01	1.170E+04	1.170E+04	4.70
	1332.49	1822	99.98*	8.268E-01	1.157E+04	1.158E+04	4.88
TC-99M	140.51	48	89.06*	4.013E+00	7.011E+01	9.983E+02	129.26
BA-137M	661.66	7325	89.90*	1.527E+00	2.802E+04	2.802E+04	2.45
CS-137	661.66	7325	85.10*	1.527E+00	2.960E+04	2.961E+04	2.45
CE-141	145.44	48	48.29*	3.992E+00	1.312E+02	1.339E+02	138.43
W-181	56.28	109	18.70	7.482E-01	4.076E+03	4.099E+03	45.75
	57.53	109	32.00*	7.482E-01	2.382E+03	2.395E+03	45.75
	65.08	-----	10.60	1.311E+00	-----	Line Not Found	-----
	66.98	-----	2.40	1.465E+00	-----	Line Not Found	-----
	136.28	-----	0.03	4.024E+00	-----	Line Not Found	-----
	152.32	-----	0.08	3.956E+00	-----	Line Not Found	-----
PB-210	46.54	1398	4.25*	1.712E-01	1.009E+06	1.009E+06	10.22
AM-241	59.54	6332	35.90*	8.768E-01	1.057E+05	1.057E+05	2.89
AM-243	43.53	-----	5.90	9.770E-02	-----	Line Not Found	-----
	74.66	45	67.20*	2.184E+00	1.598E+02	1.598E+02	154.22

Flag: "*" = Keyline

Total number of lines in spectrum 14
Number of unidentified lines 4
Number of lines tentatively identified by NID 10 71.43%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
CO-60	1925.28D	1.00	1.157E+04	1.158E+04	0.056E+04	4.88	
TC-99M	6.02H	14.2	7.011E+01	9.983E+02	12.90E+02	129.26	
BA-137M	30.08Y	1.00	2.802E+04	2.802E+04	0.069E+04	2.45	
CS-137	30.08Y	1.00	2.960E+04	2.961E+04	0.073E+04	2.45	
CE-141	32.51D	1.02	1.312E+02	1.339E+02	1.854E+02	138.43	
W-181	121.20D	1.01	2.382E+03	2.395E+03	1.096E+03	45.75	
PB-210	22.20Y	1.00	1.009E+06	1.009E+06	0.103E+06	10.22	
AM-241	432.60Y	1.00	1.057E+05	1.057E+05	0.031E+05	2.89	
AM-243	7370.00Y	1.00	1.598E+02	1.598E+02	2.465E+02	154.22	
Total Activity :			1.187E+06	1.188E+06			

Grand Total Activity : 1.187E+06 1.188E+06

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	230.52	60	229	1.43	462.38	460	6	6.68E-02	84.3	3.24E+00	
0	572.44	25	77	1.47	1146.58	1145	7	2.75E-02	****	1.71E+00	
0	873.03	26	58	1.15	1747.82	1745	8	2.93E-02	****	1.21E+00	T
0	1156.75	25	62	4.00	2315.07	2307	15	2.82E-02	****	9.35E-01	
0	1184.41	62	47	9.22	2370.35	2357	31	6.83E-02	70.4	9.15E-01	

Flags: "T" = Tentatively associated


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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141124.CNF;1 *
* Acquisition date   : 21-JUL-2022 22:56:30 Sensitivity      : 3.000          *
* Detector ID        : GAM40 Energy tolerance: 1.500         *
* Elapsed live time  : 0 00:15:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 00:15:01.63 Half life ratio  : *****          *
* Sample date        : 21-JUL-2022 00:00:00 Nuclide Library : LIQUID         *
* Sample ID          : G1205141124 Analyst initials: MJH1          *
* Batch Number       : 2290721 Sample Quantity  : 5.7175E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight       : 0.00000         *
*                                     Dry Weight    : 0.00000         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 13-OCT-2021 04:34:22 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM40_JAR.CNF;17 *
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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
CO-60	4.796E+01
TC-99M	7.043E+02
BA-137M	7.631E+01
CS-137	8.062E+01
CE-141	9.643E+01
W-181	1.512E+03
PB-210	3.624E+04
AM-241	8.838E+02
AM-243	1.311E+02

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	8.326E+02	NOT IDENT.
NA-22	4.628E+01	NOT IDENT.
NA-24	9.806E+01	NOT IDENT.
AL-26	2.645E+01	NOT IDENT.
K-40	2.938E+02	NOT IDENT.
SC-46	8.028E+01	NOT IDENT.
V-48	9.652E+01	NOT IDENT.
CR-51	6.494E+02	NOT IDENT.
MN-52	3.561E+01	NOT IDENT.
MN-54	7.281E+01	NOT IDENT.
CO-56	8.101E+01	NOT IDENT.
CO-57	5.524E+01	NOT IDENT.
NI-57	5.824E+01	NOT IDENT.
CO-58	6.918E+01	NOT IDENT.
FE-59	1.963E+02	NOT IDENT.
ZN-65	1.970E+02	NOT IDENT.
CU-67	1.405E+02	NOT IDENT.
GE-68	2.929E+03	NOT IDENT.
AS-73	6.115E+03	NOT IDENT.
AS-74	1.125E+02	NOT IDENT.
SE-75	1.042E+02	NOT IDENT.
BR-77	3.249E+02	NOT IDENT.

SR-82	4.152E+02	NOT IDENT.
RB-83	1.518E+02	NOT IDENT.
RB-84	1.310E+02	NOT IDENT.
KR-85	1.615E+04	NOT IDENT.
SR-85	7.306E+01	NOT IDENT.
RB-86	1.142E+03	NOT IDENT.
Y-88	4.120E+01	NOT IDENT.
Y-91	2.338E+04	NOT IDENT.
NB-94	6.377E+01	NOT IDENT.
NB-95	6.900E+01	NOT IDENT.
NB-95M	2.365E+02	NOT IDENT.
TC-95M	8.948E+01	NOT IDENT.
ZR-95	1.299E+02	NOT IDENT.
MO-99	7.012E+02	FAIL ABUN
RH-101	6.950E+01	NOT IDENT.
RH-102M	9.577E+01	NOT IDENT.
RU-103	8.035E+01	NOT IDENT.
RH-106	6.377E+02	NOT IDENT.
RU-106	6.377E+02	NOT IDENT.
AG-108M	9.141E+01	NOT IDENT.
CD-109	1.855E+03	NOT IDENT.
AG-110	1.658E+03	NOT IDENT.
AG-110M	1.117E+02	NOT IDENT.
IN-111	7.629E+01	NOT IDENT.
SN-113	1.102E+02	NOT IDENT.
IN-114M	3.626E+02	NOT IDENT.
CD-115	3.631E+02	NOT IDENT.
SN-117M	5.856E+01	NOT IDENT.
SB-122	1.237E+02	NOT IDENT.
I-123	1.966E+02	NOT IDENT.
TE-123M	5.854E+01	NOT IDENT.
SB-124	6.438E+01	NOT IDENT.
SB-125	2.758E+02	NOT IDENT.
TE-125M	1.832E+04	NOT IDENT.
I-126	1.804E+02	NOT IDENT.
SB-126	1.161E+02	NOT IDENT.
SN-126	1.878E+02	NOT IDENT.
SB-127	1.672E+02	NOT IDENT.
TE-129	1.175E+03	NOT IDENT.
I-131	9.130E+01	NOT IDENT.
I-132	5.922E+04	NOT IDENT.
TE-132	8.184E+01	NOT IDENT.
BA-133	1.132E+02	NOT IDENT.
I-133	1.706E+02	NOT IDENT.
CS-134	8.339E+01	NOT IDENT.
I-135	1.932E+03	NOT IDENT.
CS-136	1.116E+02	NOT IDENT.
LA-138	5.693E+01	NOT IDENT.
CE-139	5.986E+01	NOT IDENT.
BA-140	3.327E+02	NOT IDENT.
LA-140	4.916E+01	NOT IDENT.
CE-143	2.342E+02	FAIL ABUN
CE-144	4.320E+02	NOT IDENT.
PM-144	6.273E+01	NOT IDENT.
PR-144	4.660E+03	NOT IDENT.
PM-146	1.381E+02	NOT IDENT.
ND-147	5.580E+02	NOT IDENT.
PM-147	1.634E+06	NOT IDENT.
PM-149	2.500E+03	NOT IDENT.
EU-152	2.386E+02	NOT IDENT.
GD-153	1.957E+02	NOT IDENT.
EU-154	1.321E+02	FAIL ABUN
EU-155	2.515E+02	NOT IDENT.
TB-160	2.981E+02	FAIL ABUN
HO-166M	1.026E+02	NOT IDENT.
TM-171	1.490E+05	NOT IDENT.
LU-176	6.684E+01	NOT IDENT.
LU-177	5.637E+02	NOT IDENT.
HF-181	9.888E+01	FAIL ABUN
TA-182	2.280E+02	NOT IDENT.
RE-183	1.876E+03	FAIL ABUN
RE-184	2.467E+02	NOT IDENT.
RE-188	3.012E+02	NOT IDENT.
W-188	1.544E+04	NOT IDENT.
OS-191	1.831E+02	NOT IDENT.
IR-192	7.949E+01	NOT IDENT.
PB-201	4.362E+02	NOT IDENT.
TL-201	6.054E+02	NOT IDENT.

TL-202	9.690E+01	NOT IDENT.
HG-203	7.538E+01	NOT IDENT.
PB-203	1.019E+02	NOT IDENT.
TL-204	1.353E+04	NOT IDENT.
BI-207	1.286E+02	FAIL ABUN
TL-208	8.542E+01	NOT IDENT.
BI-211	5.436E+02	NOT IDENT.
PB-211	2.038E+03	NOT IDENT.
BI-212	9.309E+02	NOT IDENT.
PB-212	1.319E+02	FAIL ABUN
BI-213	3.247E+02	NOT IDENT.
BI-214	1.469E+02	NOT IDENT.
PB-214	2.070E+02	FAIL ABUN
RN-219	1.147E+03	NOT IDENT.
FR-221	4.947E+02	NOT IDENT.
RA-223	1.685E+03	NOT IDENT.
RA-224	1.420E+03	NOT IDENT.
AC-225	5.288E+02	NOT IDENT.
RA-226	1.513E+03	NOT IDENT.
AC-227	5.912E+02	NOT IDENT.
TH-227	5.912E+02	NOT IDENT.
AC-228	3.827E+02	NOT IDENT.
RA-228	3.827E+02	NOT IDENT.
TH-228	1.319E+02	FAIL ABUN
TH-229	1.183E+03	NOT IDENT.
TH-230	3.087E+04	NOT IDENT.
PA-231	1.193E+03	NOT IDENT.
TH-231	1.032E+03	NOT IDENT.
TH-232	5.654E+04	FAIL ABUN
PA-233	1.643E+02	NOT IDENT.
PA-234	8.733E+02	NOT IDENT.
PA-234M	1.097E+04	NOT IDENT.
TH-234	4.026E+03	NOT IDENT.
U-234	5.300E+05	NOT IDENT.
U-235	4.079E+02	NOT IDENT.
NP-237	1.643E+02	NOT IDENT.
NP-238	5.017E+02	NOT IDENT.
U-238	4.026E+03	NOT IDENT.
NP-239	6.016E+02	NOT IDENT.
AM-242	1.479E+03	NOT IDENT.
CM-243	2.561E+02	NOT IDENT.
BK-247	2.031E+02	NOT IDENT.
CM-247	1.015E+02	NOT IDENT.
CF-249	1.144E+02	NOT IDENT.
CF-251	2.674E+02	NOT IDENT.
CF-252	3.945E+05	NOT IDENT.
ANH-511	8.118E+01	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205141124.CNF;1
Acquisition date : 21-JUL-2022 22:56:30 Sensitivity : 3.000
Detector ID : GAM40 Energy tolerance: 1.500
Elapsed live time: 0 00:15:00.00 Abundance limit : 75.000
Elapsed real time: 0 00:15:01.63 Half life ratio : *****
Sample date : 21-JUL-2022 00:00:00 Nuclide Library : LIQUID
Sample ID : G1205141124 Analyst initials: MJH1
Batch Number : 2290721 Sample Quantity : 5.7175E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 13-OCT-2021 04:34:22 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM40_JAR.CNF;17

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
CO-60	1.158E+04	1.216E+03	1.237E+03
TC-99M	9.983E+02	1.270E+03	1.270E+03
BA-137M	2.802E+04	2.370E+03	2.433E+03
CS-137	2.961E+04	2.502E+03	2.568E+03
CE-141	1.339E+02	1.820E+02	1.820E+02
W-181	2.395E+03	1.267E+03	1.267E+03
PB-210	1.009E+06	1.540E+05	1.553E+05
AM-241	1.057E+05	1.443E+04	1.457E+04
AM-243	1.598E+02	2.422E+02	2.422E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	-1.229E+02	9.855E+02	9.871E+02	NOT IDENT.
NA-22	2.415E+01	4.923E+01	5.042E+01	NOT IDENT.
NA-24	3.967E+01	1.032E+02	1.048E+02	NOT IDENT.
AL-26	1.661E+01	2.232E+01	2.354E+01	NOT IDENT.
K-40	-1.610E+00	3.061E+02	3.061E+02	NOT IDENT.
SC-46	-2.523E+01	1.011E+02	1.018E+02	NOT IDENT.
V-48	-2.392E+01	1.218E+02	1.223E+02	NOT IDENT.
CR-51	8.154E+01	7.428E+02	7.437E+02	NOT IDENT.
MN-52	-6.303E+00	4.429E+01	4.438E+01	NOT IDENT.
MN-54	-8.167E+00	8.985E+01	8.993E+01	NOT IDENT.
CO-56	-5.906E+01	1.046E+02	1.079E+02	NOT IDENT.
CO-57	-1.510E+01	6.759E+01	6.793E+01	NOT IDENT.
NI-57	1.641E+00	6.826E+01	6.826E+01	NOT IDENT.
CO-58	-1.836E+01	8.630E+01	8.670E+01	NOT IDENT.
FE-59	1.912E+02	2.145E+02	2.312E+02	NOT IDENT.
ZN-65	-7.784E+00	2.297E+02	2.297E+02	NOT IDENT.
CU-67	-5.969E+01	1.757E+02	1.778E+02	NOT IDENT.
GE-68	1.877E+03	3.242E+03	3.351E+03	NOT IDENT.
AS-73	-1.144E+04	7.967E+03	9.493E+03	NOT IDENT.
AS-74	5.840E+00	1.338E+02	1.339E+02	NOT IDENT.
SE-75	6.840E+01	1.277E+02	1.314E+02	NOT IDENT.

BR-77	-1.174E+02	4.101E+02	4.135E+02	NOT IDENT.
SR-82	-2.312E+02	5.302E+02	5.404E+02	NOT IDENT.
RB-83	-4.713E+01	1.828E+02	1.840E+02	NOT IDENT.
RB-84	1.841E+01	1.592E+02	1.594E+02	NOT IDENT.
KR-85	-1.832E+04	2.029E+04	2.191E+04	NOT IDENT.
SR-85	-8.290E+01	9.179E+01	9.912E+01	NOT IDENT.
RB-86	1.039E+03	1.239E+03	1.325E+03	NOT IDENT.
Y-88	2.277E+01	4.186E+01	4.311E+01	NOT IDENT.
Y-91	-1.653E+03	2.758E+04	2.759E+04	NOT IDENT.
NB-94	1.313E+01	7.574E+01	7.597E+01	NOT IDENT.
NB-95	4.536E+01	7.939E+01	8.198E+01	NOT IDENT.
NB-95M	-1.526E+02	3.045E+02	3.122E+02	NOT IDENT.
TC-95M	-2.404E+01	1.123E+02	1.128E+02	NOT IDENT.
ZR-95	-9.560E+00	1.586E+02	1.586E+02	NOT IDENT.
MO-99	6.886E+00	8.491E+02	8.491E+02	FAIL ABUN
RH-101	-2.206E+01	8.543E+01	8.600E+01	NOT IDENT.
RH-102M	2.550E+01	1.115E+02	1.121E+02	NOT IDENT.
RU-103	-3.271E+01	9.675E+01	9.787E+01	NOT IDENT.
RH-106	-2.107E+02	7.812E+02	7.870E+02	NOT IDENT.
RU-106	-2.107E+02	7.812E+02	7.870E+02	NOT IDENT.
AG-108M	3.734E+01	1.052E+02	1.066E+02	NOT IDENT.
CD-109	9.255E+02	2.179E+03	2.219E+03	NOT IDENT.
AG-110	-5.464E+02	2.287E+03	2.300E+03	NOT IDENT.
AG-110M	-5.900E+01	1.428E+02	1.453E+02	NOT IDENT.
IN-111	-8.010E+01	1.004E+02	1.067E+02	NOT IDENT.
SN-113	-1.177E+02	1.341E+02	1.442E+02	NOT IDENT.
IN-114M	3.151E+02	4.344E+02	4.571E+02	NOT IDENT.
CD-115	6.923E+01	4.257E+02	4.268E+02	NOT IDENT.
SN-117M	2.017E+01	7.080E+01	7.138E+01	NOT IDENT.
SB-122	5.868E+01	1.429E+02	1.453E+02	NOT IDENT.
I-123	2.161E+02	2.311E+02	2.508E+02	NOT IDENT.
TE-123M	6.468E+01	6.878E+01	7.471E+01	NOT IDENT.
SB-124	3.141E+01	6.323E+01	6.480E+01	NOT IDENT.
SB-125	1.118E+02	3.173E+02	3.212E+02	NOT IDENT.
TE-125M	-1.297E+04	2.270E+04	2.344E+04	NOT IDENT.
I-126	4.362E+01	2.371E+02	2.379E+02	NOT IDENT.
SB-126	-1.327E+00	1.406E+02	1.406E+02	NOT IDENT.
SN-126	1.516E+02	2.185E+02	2.290E+02	NOT IDENT.
SB-127	-7.466E+01	2.100E+02	2.127E+02	NOT IDENT.
TE-129	-1.557E+02	1.387E+03	1.389E+03	NOT IDENT.
I-131	1.070E+02	1.009E+02	1.119E+02	NOT IDENT.
I-132	-1.746E+04	8.218E+04	8.256E+04	NOT IDENT.
TE-132	2.099E+01	1.099E+02	1.103E+02	NOT IDENT.
BA-133	3.889E+01	1.292E+02	1.304E+02	NOT IDENT.
I-133	-1.379E+02	2.115E+02	2.204E+02	NOT IDENT.
CS-134	2.675E+01	9.900E+01	9.973E+01	NOT IDENT.
I-135	1.074E+03	2.056E+03	2.112E+03	NOT IDENT.
CS-136	-9.119E+01	1.375E+02	1.435E+02	NOT IDENT.
LA-138	2.791E+01	5.899E+01	6.032E+01	NOT IDENT.
CE-139	-7.054E+00	7.390E+01	7.397E+01	NOT IDENT.
BA-140	4.219E+02	3.698E+02	4.160E+02	NOT IDENT.
LA-140	1.494E+01	5.468E+01	5.510E+01	NOT IDENT.
CE-143	-3.203E+01	2.694E+02	2.698E+02	FAIL ABUN
CE-144	2.845E+02	5.123E+02	5.282E+02	NOT IDENT.
PM-144	1.537E+01	7.420E+01	7.452E+01	NOT IDENT.
PR-144	1.141E+03	5.512E+03	5.536E+03	NOT IDENT.
PM-146	4.590E+01	1.600E+02	1.613E+02	NOT IDENT.
ND-147	-1.415E+02	6.704E+02	6.734E+02	NOT IDENT.
PM-147	-8.328E+04	1.981E+06	1.981E+06	NOT IDENT.
PM-149	-2.263E+03	2.981E+03	3.151E+03	NOT IDENT.
EU-152	-1.173E+02	2.813E+02	2.862E+02	NOT IDENT.
GD-153	7.518E+01	2.314E+02	2.339E+02	NOT IDENT.
EU-154	6.893E+01	1.405E+02	1.439E+02	FAIL ABUN
EU-155	5.336E+01	3.001E+02	3.011E+02	NOT IDENT.
TB-160	4.278E+01	3.623E+02	3.628E+02	FAIL ABUN
HO-166M	-4.707E+01	1.292E+02	1.309E+02	NOT IDENT.
TM-171	-4.428E+04	1.761E+05	1.772E+05	NOT IDENT.
LU-176	-3.123E+00	7.681E+01	7.683E+01	NOT IDENT.
LU-177	-4.256E+02	7.238E+02	7.488E+02	NOT IDENT.
HF-181	-2.284E+01	1.176E+02	1.181E+02	FAIL ABUN
TA-182	-3.303E+01	2.717E+02	2.721E+02	NOT IDENT.
RE-183	2.244E+03	1.064E+03	1.469E+03	FAIL ABUN
RE-184	7.943E+01	2.968E+02	2.989E+02	NOT IDENT.
RE-188	1.308E+02	3.623E+02	3.671E+02	NOT IDENT.
W-188	-1.010E+04	1.815E+04	1.872E+04	NOT IDENT.
OS-191	-1.573E+01	2.229E+02	2.231E+02	NOT IDENT.
IR-192	3.409E+01	8.986E+01	9.117E+01	NOT IDENT.
PB-201	-3.060E+02	5.202E+02	5.382E+02	NOT IDENT.

TL-201	3.394E+02	7.275E+02	7.434E+02	NOT IDENT.
TL-202	-2.292E+01	1.145E+02	1.149E+02	NOT IDENT.
HG-203	-4.106E+00	8.622E+01	8.624E+01	NOT IDENT.
PB-203	-5.552E+00	1.166E+02	1.166E+02	NOT IDENT.
TL-204	4.374E+03	1.585E+04	1.597E+04	NOT IDENT.
BI-207	1.077E+02	1.405E+02	1.486E+02	FAIL ABUN
TL-208	1.067E+01	1.005E+02	1.006E+02	NOT IDENT.
BI-211	-2.030E+02	6.362E+02	6.428E+02	NOT IDENT.
PB-211	1.367E+03	2.313E+03	2.394E+03	NOT IDENT.
BI-212	-2.161E+02	1.144E+03	1.148E+03	NOT IDENT.
PB-212	3.704E+01	1.619E+02	1.628E+02	FAIL ABUN
BI-213	-1.909E+02	3.890E+02	3.985E+02	NOT IDENT.
BI-214	1.121E+00	1.748E+02	1.748E+02	NOT IDENT.
PB-214	2.394E+02	2.293E+02	2.535E+02	FAIL ABUN
RN-219	7.474E+02	1.304E+03	1.347E+03	NOT IDENT.
FR-221	-3.142E+02	6.332E+02	6.489E+02	NOT IDENT.
RA-223	1.106E+03	1.892E+03	1.957E+03	NOT IDENT.
RA-224	-8.049E+02	1.823E+03	1.859E+03	NOT IDENT.
AC-225	-3.359E+02	6.768E+02	6.936E+02	NOT IDENT.
RA-226	5.193E+02	1.837E+03	1.852E+03	NOT IDENT.
AC-227	-1.834E+02	7.549E+02	7.594E+02	NOT IDENT.
TH-227	-1.834E+02	7.549E+02	7.594E+02	NOT IDENT.
AC-228	3.859E+02	4.401E+02	4.733E+02	NOT IDENT.
RA-228	3.859E+02	4.401E+02	4.733E+02	NOT IDENT.
TH-228	3.704E+01	1.619E+02	1.628E+02	FAIL ABUN
TH-229	-4.252E+02	1.487E+03	1.499E+03	NOT IDENT.
TH-230	-2.253E+04	3.774E+04	3.908E+04	NOT IDENT.
PA-231	3.039E+02	1.356E+03	1.363E+03	NOT IDENT.
TH-231	7.972E+01	1.226E+03	1.226E+03	NOT IDENT.
TH-232	-2.548E+04	7.334E+04	7.424E+04	FAIL ABUN
PA-233	4.042E+01	1.868E+02	1.877E+02	NOT IDENT.
PA-234	-6.201E+01	1.086E+03	1.086E+03	NOT IDENT.
PA-234M	3.442E+03	1.239E+04	1.248E+04	NOT IDENT.
TH-234	-4.776E+03	5.508E+03	5.914E+03	NOT IDENT.
U-234	-6.657E+05	6.475E+05	7.138E+05	NOT IDENT.
U-235	7.516E+01	6.077E+02	6.087E+02	NOT IDENT.
NP-237	4.042E+01	1.868E+02	1.877E+02	NOT IDENT.
NP-238	-1.999E+02	6.403E+02	6.467E+02	NOT IDENT.
U-238	-4.776E+03	5.508E+03	5.914E+03	NOT IDENT.
NP-239	4.786E+02	7.051E+02	7.375E+02	NOT IDENT.
AM-242	-1.804E+02	1.784E+03	1.785E+03	NOT IDENT.
CM-243	-1.073E+01	3.083E+02	3.083E+02	NOT IDENT.
BK-247	1.049E+02	2.512E+02	2.556E+02	NOT IDENT.
CM-247	-1.310E+01	1.189E+02	1.190E+02	NOT IDENT.
CF-249	7.302E+01	1.298E+02	1.339E+02	NOT IDENT.
CF-251	-1.211E+02	3.364E+02	3.408E+02	NOT IDENT.
CF-252	-4.159E+05	6.213E+05	6.491E+05	NOT IDENT.
ANH-511	2.894E+01	9.199E+01	9.291E+01	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	409.1144	81.00	240.0604	121.12	230.6767
45.60	493.7099	81.07	240.0917	121.22	230.7099
46.54	494.9490	82.35	226.6805	121.78	245.7900
49.72	536.2910	82.47	226.7298	122.06	245.8887
51.35	550.6484	82.47	226.7316	123.07	234.5137
52.39	605.4944	83.79	240.2948	123.68	235.7837
53.20	663.9857	84.00	240.3864	127.16	251.9403
53.44	712.2963	84.21	232.4620	127.23	251.9609
56.28	753.1003	84.86	223.7078	129.43	236.5933
57.36	844.7953	85.43	231.9711	131.20	244.7067
57.53	845.1284	86.55	292.8094	133.02	232.3415
57.53	845.1317	86.79	265.7543	133.52	223.8447
57.98	521.4730	86.94	265.8268	135.34	225.4719
59.32	523.0751	87.09	265.8973	136.00	243.0278
59.54	523.3369	87.57	253.0184	136.28	235.5193
61.49	525.6342	88.03	262.3050	136.47	235.5789
63.00	221.5859	88.34	264.4666	140.51	209.5371
63.29	239.6694	88.47	264.5266	140.88	227.1064
63.58	239.8206	91.11	246.4734	143.76	208.2184
63.81	224.5432	91.27	257.7013	144.24	208.3459
64.28	224.7724	92.59	240.9979	145.44	222.5728
64.99	206.4635	93.31	249.4394	152.32	222.6347
65.08	206.5027	94.56	258.1286	152.43	222.6623
66.73	240.1535	94.65	258.1672	153.25	211.7974
66.98	246.0935	94.67	258.1750	154.21	236.4659
67.24	243.3190	97.43	239.8861	155.04	210.0352
67.67	236.7473	98.43	222.8243	156.02	230.3071
67.75	228.0525	98.44	222.8293	158.56	225.4284
68.89	225.6757	99.53	239.6840	158.97	204.3252
68.89	225.6775	100.11	249.1766	159.00	204.3308
69.67	237.7302	100.20	257.4520	162.33	208.4951
70.82	229.4976	102.03	247.8827	162.66	225.3981
70.82	229.4994	103.18	244.1978	163.33	253.6293
70.83	229.5029	103.37	256.6923	165.86	229.6121
72.81	253.6244	105.31	250.2118	167.43	213.1124
72.87	253.6560	106.12	242.2118	171.28	211.7789
74.66	225.6888	106.47	235.0626	176.31	208.4160
74.82	249.3847	109.28	255.9311	176.60	206.2046
74.97	249.4581	111.00	216.8010	177.52	215.5349
77.11	255.7696	111.76	233.8274	181.07	227.8194
79.69	243.7779	112.95	232.1434	184.41	263.1075
79.82	238.5388	116.24	207.9448	184.58	263.1564
80.02	238.6267	116.30	207.9628	185.72	243.9184
80.03	238.6285	116.74	207.0403	186.21	246.3469
80.12	238.6707	117.23	229.3870	190.27	238.1529
80.19	238.7018	119.76	209.0089	193.51	247.0775
80.22	229.7663	120.54	215.6163	197.03	217.7054
80.57	229.9144	120.90	248.6714	198.01	230.7412

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
201.83	255.0297	306.78	189.4805	511.00	127.6132
204.12	263.8229	308.46	181.1739	514.00	139.4297
205.31	251.2221	311.90	179.9219	520.40	111.7104
208.37	247.2729	316.51	181.3882	520.69	115.6105
210.85	198.2977	319.41	183.4932	522.65	114.7542
215.65	232.4240	320.08	174.9611	527.90	117.0020
218.12	261.4984	321.04	193.1927	529.59	123.9304
222.11	256.5198	323.87	179.7614	529.87	123.9511
227.09	244.5286	325.23	181.6650	531.02	110.3470
227.38	230.2061	328.76	158.7065	537.26	95.0147
228.16	233.5697	331.15	178.9550	546.56	113.1563
228.18	233.5757	333.37	161.8304	552.55	101.6421
235.69	252.4928	334.37	168.0386	563.25	87.2839
235.96	228.3856	338.28	171.1172	564.24	83.3540
238.63	204.7077	338.32	166.7558	569.33	74.6033
238.98	220.5211	340.48	173.9995	569.50	76.1016
240.99	242.7643	340.55	174.0076	569.70	76.1078
242.00	195.5997	344.28	179.7128	582.08	78.0476
244.70	230.1649	345.93	180.7948	583.19	95.1082
245.35	242.4796	351.06	206.9637	595.83	74.5119
250.62	187.2835	351.93	174.4827	600.60	84.7622
252.40	210.8638	356.01	182.0270	604.72	75.8209
252.80	214.6137	361.25	168.4727	609.32	78.0026
256.23	202.9430	364.49	141.2859	610.33	88.1753
260.90	208.6816	366.42	179.7254	614.28	69.0376
264.66	195.7111	383.85	179.0482	618.01	70.1680
265.00	199.4812	388.16	176.8275	621.93	75.3821
269.46	174.1028	388.63	171.4646	630.19	66.4547
271.23	178.0867	391.70	206.1519	631.29	66.4864
273.65	192.1663	400.66	168.1982	632.98	75.7464
276.40	194.2567	401.32	160.9896	633.25	75.7554
277.37	198.5803	401.81	168.3149	634.78	70.6818
277.60	198.6190	402.40	180.2069	635.95	76.8677
278.00	188.6644	404.85	172.2733	636.99	64.5970
278.43	189.5638	410.95	154.6107	657.50	94.6423
279.20	202.2132	414.70	176.9638	657.76	94.6535
279.54	211.4613	423.72	203.7209	661.66	73.5654
280.46	194.0508	427.09	187.4958	664.57	43.5706
283.69	197.9006	427.87	190.3547	666.33	45.1603
284.31	193.8065	433.94	189.1707	666.50	45.1620
285.41	191.4519	439.51	213.0336	667.71	52.9756
285.90	201.6064	440.45	225.2453	677.62	58.4085
287.50	169.8991	453.88	211.9486	685.70	46.0428
290.67	216.6921	459.60	219.2102	692.65	51.4205
293.27	199.3843	463.37	210.2376	695.00	55.6698
295.22	204.7586	468.07	224.0101	696.49	51.5002
295.96	193.0244	473.00	211.3401	696.51	51.5002
298.58	212.0717	475.06	205.8833	697.00	53.6127
299.98	188.5184	476.78	191.8285	697.49	57.8288
300.09	188.5320	477.60	194.7608	702.65	53.7330
300.13	188.5410	477.99	202.4046	706.68	56.9861
301.36	192.1129	482.18	162.8591	711.68	49.6965
302.85	187.2229	487.02	136.5413	720.70	47.7502
304.50	184.0474	492.35	136.9253	721.93	44.5891
304.85	186.6526	497.08	136.3029	722.78	55.2225

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
722.91	55.2267	937.49	91.6048	1377.63	3.8689
723.31	53.1108	944.13	92.9443	1384.29	3.8750
724.19	47.8162	945.96	94.1485	1408.01	2.9220
727.33	54.2581	946.00	94.1485	1434.09	4.8990
733.00	52.2439	949.00	102.2834	1435.80	2.9405
735.93	45.8992	954.55	96.7046	1457.56	2.9548
739.50	57.7178	962.31	101.5531	1460.82	1.9713
744.23	51.3984	964.08	75.0531	1489.16	2.9755
747.24	41.8088	966.17	85.4993	1596.21	5.0728
752.31	41.8898	968.97	68.2283	1620.50	5.0980
753.82	62.3330	983.53	72.0180	1678.03	3.0943
756.73	62.4015	984.45	74.3620	1690.97	1.0341
763.94	50.7025	996.26	48.9761	1757.55	1.0474
765.80	45.3411	1001.03	58.6802	1764.49	0.0000
766.42	53.9897	1004.73	65.7600	1770.23	5.2499
766.84	52.9179	1025.87	53.8218	1771.35	2.1003
772.60	53.0315	1028.54	52.9834	1791.20	2.1082
776.52	53.1073	1037.84	60.2097	1808.65	0.0000
777.92	57.4727	1038.76	67.3118	1836.06	2.1257
778.90	52.0684	1046.59	59.4756		
783.70	78.2402	1048.07	63.9404		
788.74	64.2336	1050.41	49.7656		
792.07	67.5804	1063.66	47.2808		
795.86	52.3926	1077.00	43.8799		
801.95	62.3530	1077.34	47.4651		
802.10	59.0735	1083.85	64.5996		
810.29	60.3442	1085.87	61.9459		
810.45	60.3465	1099.25	56.7708		
810.76	55.9639	1111.64	47.9245		
815.77	53.8649	1112.07	52.4528		
818.51	81.4283	1112.84	69.6497		
832.01	56.3851	1115.54	62.4597		
834.85	57.5479	1120.29	60.7269		
835.15	67.5155	1120.55	60.7310		
836.80	59.8008	1121.30	54.3970		
846.77	80.0098	1129.67	46.3464		
856.80	75.8249	1131.51	41.8223		
860.56	65.8732	1173.23	26.4797		
871.09	58.8254	1177.95	11.0471		
873.19	66.1565	1189.05	14.7725		
875.33	70.6930	1204.77	20.3954		
879.38	73.0351	1221.41	21.4137		
880.51	85.4258	1231.02	12.1335		
881.60	71.9635	1235.36	11.2126		
883.24	73.1276	1238.28	5.6104		
884.68	72.0391	1260.41	7.5225		
889.28	65.3845	1271.87	9.4299		
894.76	68.8906	1274.44	6.6052		
898.04	55.3982	1274.54	6.6052		
903.28	71.3492	1291.59	9.4757		
907.67	82.7933	1298.22	9.4910		
911.20	65.8565	1312.11	8.5710		
923.98	69.5483	1332.49	10.5267		
926.36	67.3185	1365.19	7.7153		
935.54	91.5495	1368.63	2.8956		

Continuing Calibration Data

Review of Gamma Spectrometer QA results (Daily calibration & background checks)
21-JUL-2022 09:34:18

Run Date	Detector	Parameter	Flag	Status	Comments
21-JUL-22	GAM01	Cal Check PSFWHM-59	Investigate		
21-JUL-22	GAM03	Cal Check PSFWHM-662	Investigate		
21-JUL-22	GAM03	Cal Check NLACTVTY-59	Investigate		
21-JUL-22	GAM03	Cal Check PSFWHM-59	Action	Lockout	Detector locked out.
21-JUL-22	GAM04	Cal Check NLACTVTY-662	Investigate		
21-JUL-22	GAM06	All Parameters Passed			
21-JUL-22	GAM07	All Parameters Passed			
21-JUL-22	GAM08	Cal Check NLACTVTY-59	Investigate		
21-JUL-22	GAM09	Cal Check PSFWHM-662	Investigate		
21-JUL-22	GAM09	Cal Check NLACTVTY-1332	Investigate		
21-JUL-22	GAM10	Cal Check PSFWHM-662	Investigate		
21-JUL-22	GAM11	All Parameters Passed			
21-JUL-22	GAM12	All Parameters Passed			
21-JUL-22	GAM14	All Parameters Passed			
21-JUL-22	GAM16	Cal Check NLACTVTY-59	Investigate		
20-JUL-22	GAM17	Cal Check may not have run since 21-JUL-2022			Detector locked out.
21-JUL-22	GAM18	All Parameters Passed			
21-JUL-22	GAM19	All Parameters Passed			
21-JUL-22	GAM20	All Parameters Passed			
21-JUL-22	GAM21	All Parameters Passed			
	GAM22	Cal Check may not have run since 21-JUL-2022			Detector locked out.
10-JUL-22	GAM22	Bkg Check may not have run since 21-JUL-2022			Detector locked out.
21-JUL-22	GAM23	All Parameters Passed			
21-JUL-22	GAM24	Bkg Check BACKRATE	Action	Approved	
21-JUL-22	GAM26	All Parameters Passed			
21-JUL-22	GAM27	Cal Check PSFWHM-59	Action	Lockout	Detector locked out.
21-JUL-22	GAM27	Cal Check PSFWHM-662	Action	Lockout	Detector locked out.
21-JUL-22	GAM27	Cal Check PSFWHM-1332	Action	Lockout	Detector locked out.
21-JUL-22	GAM27	Bkg Check BACKRATE	Action	Approved	
21-JUL-22	GAM28	All Parameters Passed			
21-JUL-22	GAM29	Cal Check PSFWHM-662	Investigate		
21-JUL-22	GAM29	Bkg Check BACKRATE	Investigate		
21-JUL-22	GAM30	Cal Check PSFWHM-1332	Investigate		
21-JUL-22	GAM30	Bkg Check BACKRATE	Investigate		
21-JUL-22	GAM31	Cal Check NLACTVTY-1332	Investigate		
21-JUL-22	GAM32	All Parameters Passed			
21-JUL-22	GAM33	All Parameters Passed			
21-JUL-22	GAM34	All Parameters Passed			
21-JUL-22	GAM36	All Parameters Passed			
21-JUL-22	GAM38	All Parameters Passed			
21-JUL-22	GAM40	Cal Check PSFWHM-59	Action	Approved	Low FWHM, approved for use.
21-JUL-22	GAM41	Cal Check NLACTVTY-1332	Investigate		
21-JUL-22	GAM43	All Parameters Passed			
21-JUL-22	GAM44	All Parameters Passed			
20-JUL-22	GAM45	Cal Check may not have run since 21-JUL-2022			Detector locked out.
16-JUL-22	GAM45	Bkg Check may not have run since 21-JUL-2022			Detector locked out.

21-JUL-22	GAM47	Cal Check NLACTVTY-59	Investigate		
21-JUL-22	XRAY1	All Parameters Passed			
21-JUL-22	XRAY2	All Parameters Passed			
21-JUL-22	XRAY3	Cal Check PSFWHM-29	Action	Approved	Low FWHM, approved for use.
21-JUL-22	XRAY3	Cal Check PSFWHM-33	Action	Approved	Low FWHM, approved for use.
21-JUL-22	XRAY3	Cal Check PSFWHM-39	Action	Approved	Low FWHM, approved for use.
21-JUL-22	XRAY4	All Parameters Passed			
21-JUL-22	XRAY6	All Parameters Passed			
21-JUL-22	XRAY7	All Parameters Passed			

APPROVAL DATE: 21-JUL-2022

APPROVAL TIME: 09:48:23

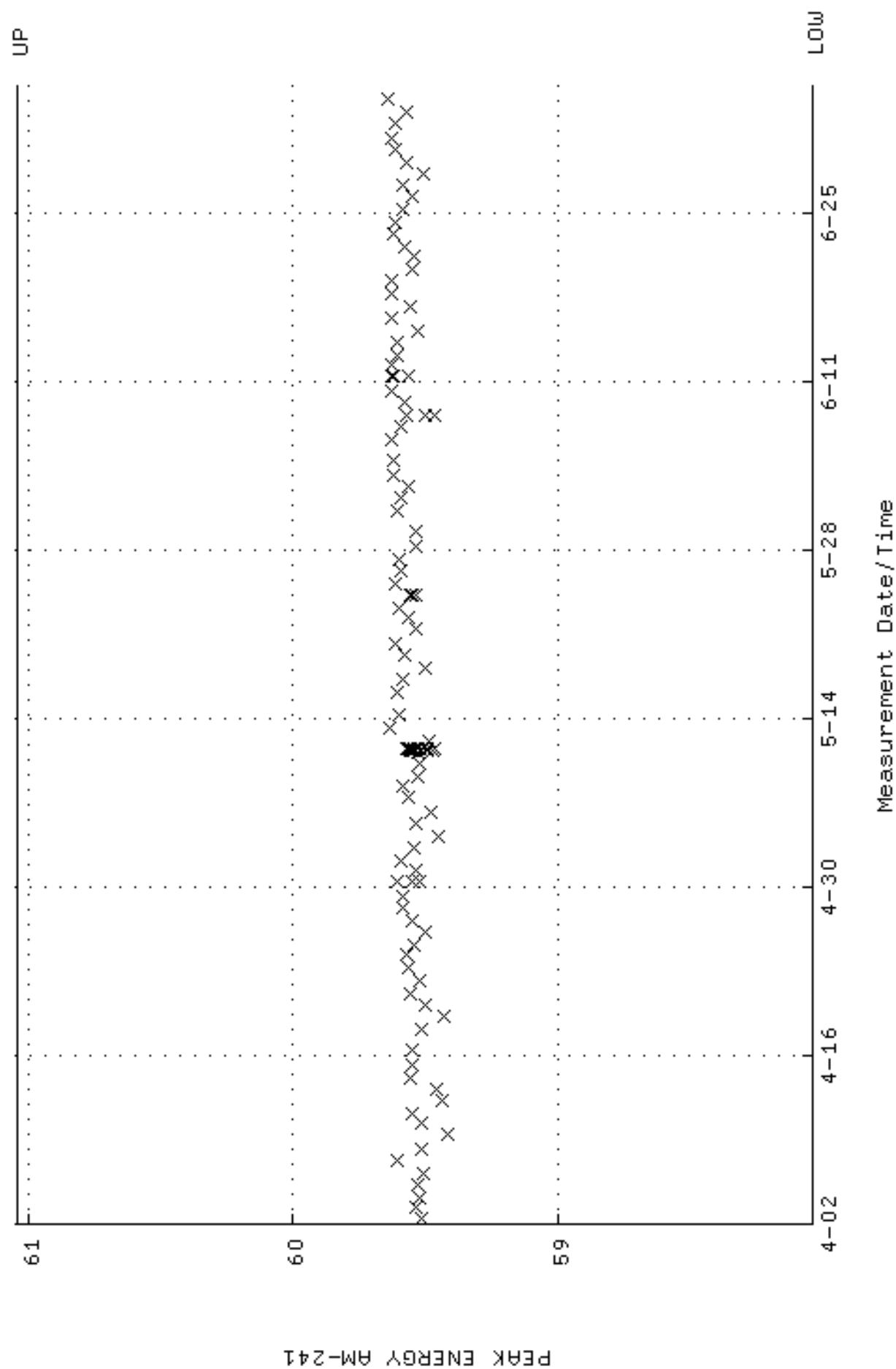
APPROVED BY: Rebekah Futch

PROCEDURE # GL-RAD-I-001

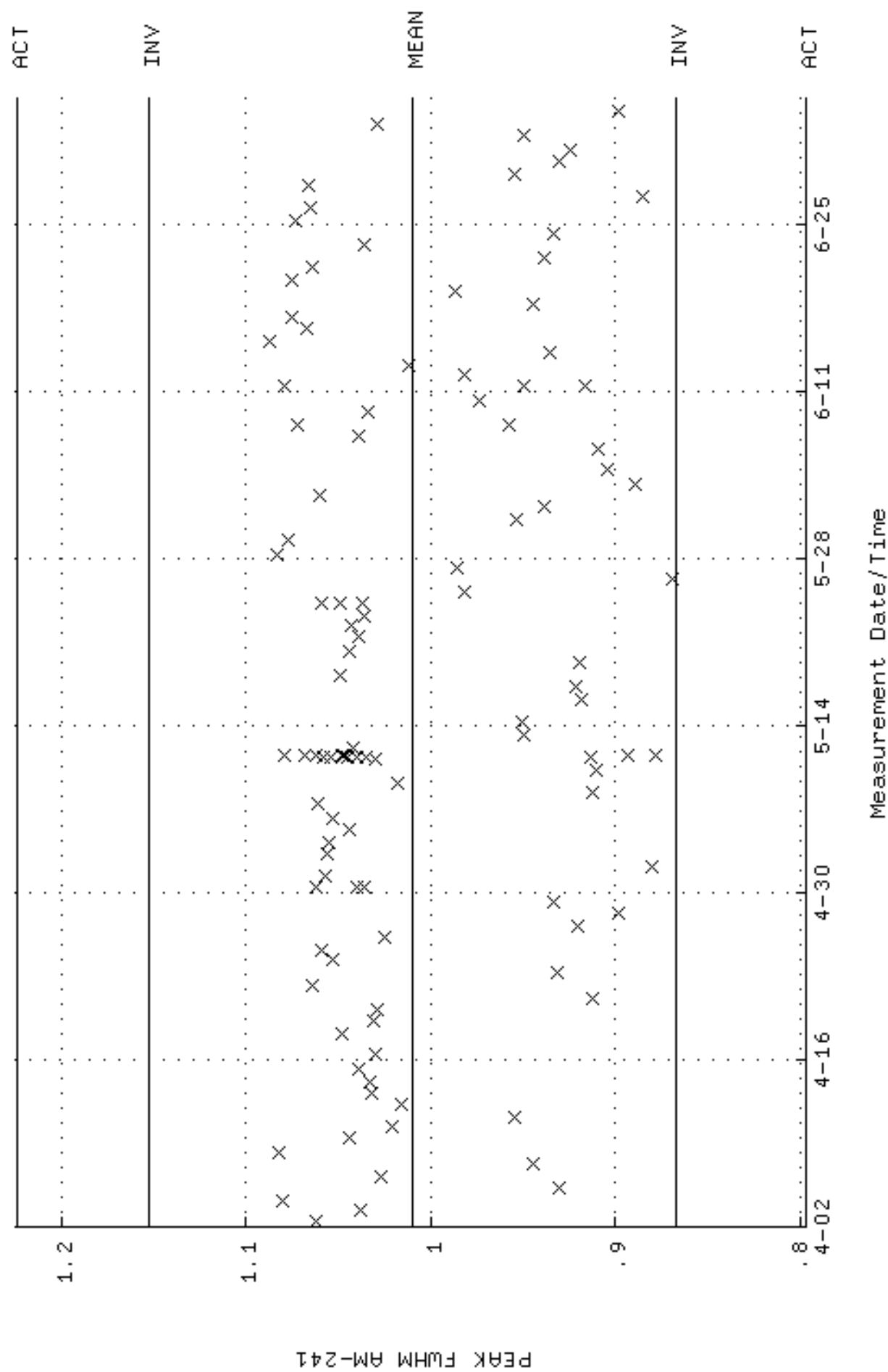
The Investigate flag does not indicate a lockout and is approved for use. Action flags that have not been approved are locked out of service.

Background and Efficiency Data

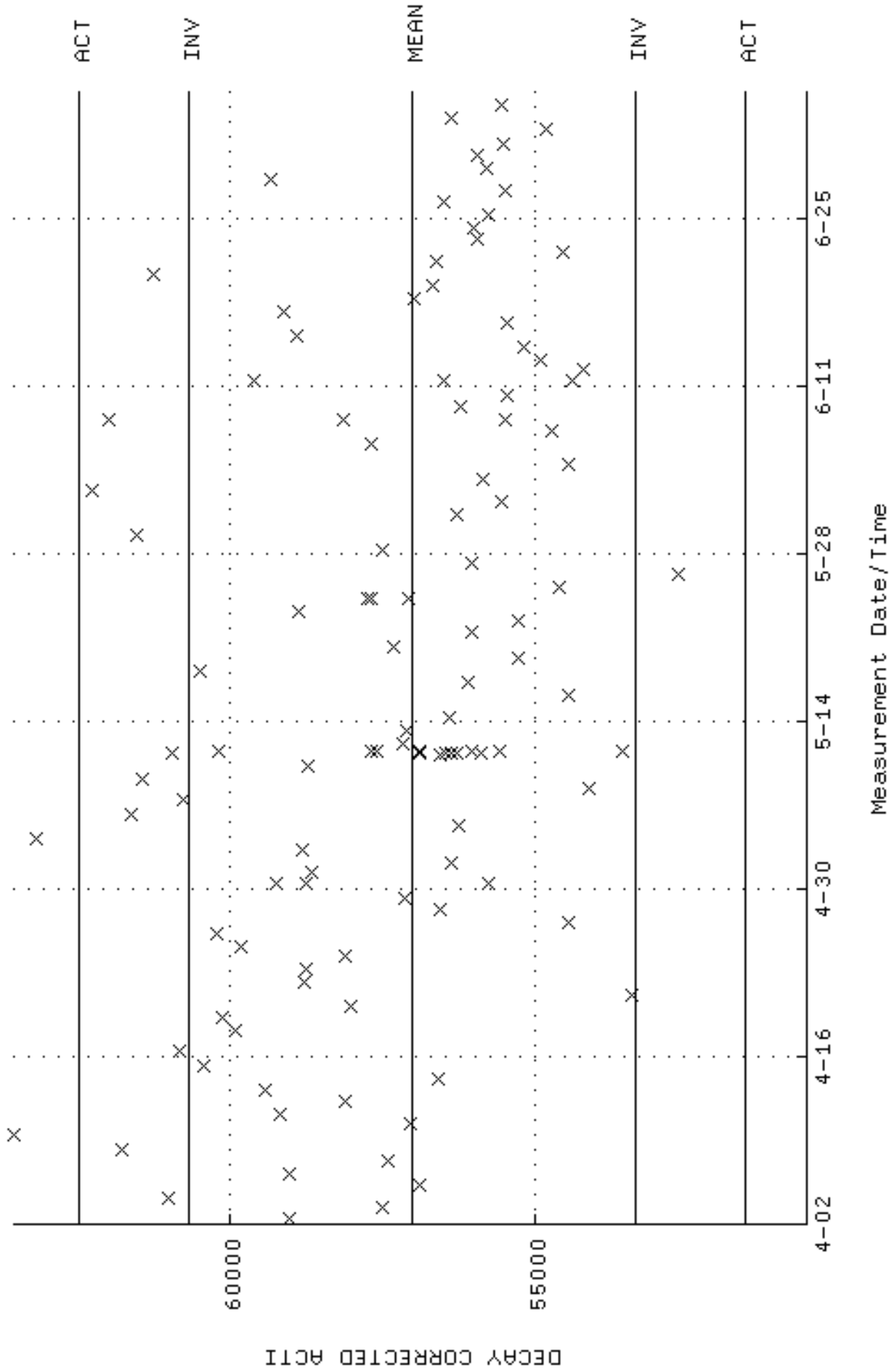
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM14_JAR.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-APR-2022 10:02:09 through 5-JUL-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



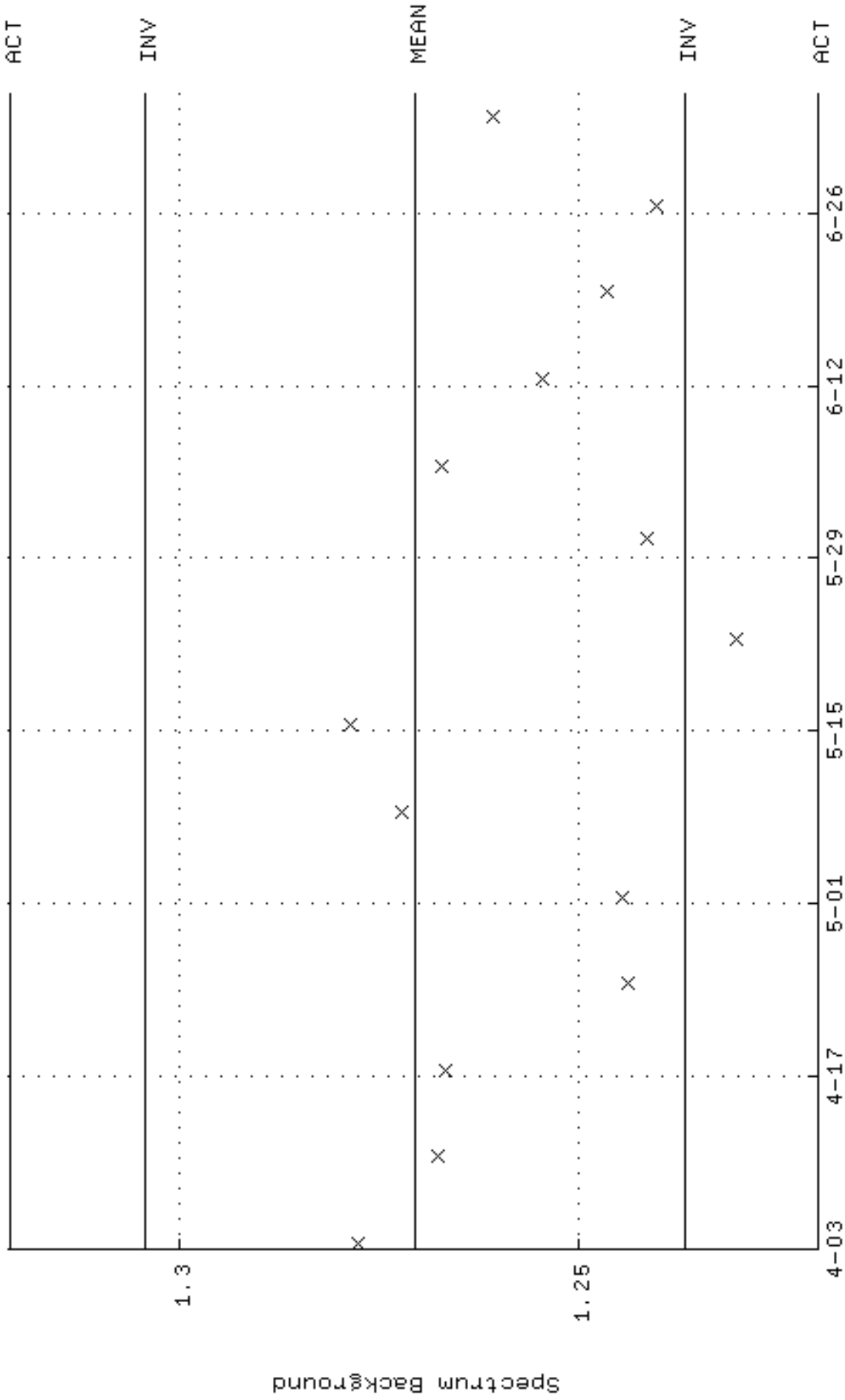
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM14_JAR.QAF;1
 Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
 Start/End Dates : 2-APR-2022 10:02:09 through 5-JUL-2022 12:00:00
 Mean +- Std Dev : 1.01037 +- 7.108480E-02 (7.04 %)



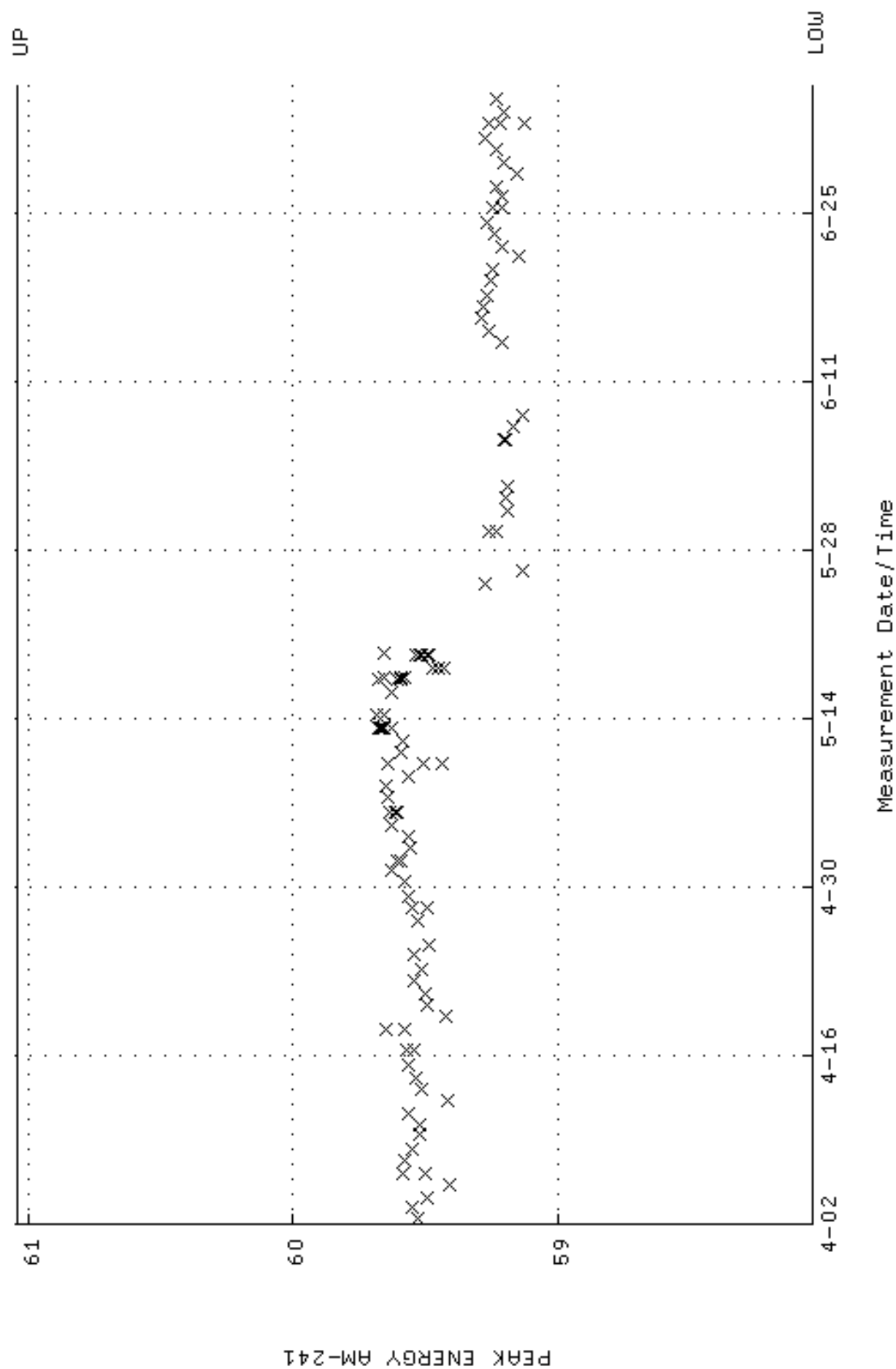
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM14_JAR.QAF;1
Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-APR-2022 10:02:09 through 5-JUL-2022 12:00:00
Mean +- Std Dev : 57019.6 +- 1818.51 (3.19 %)



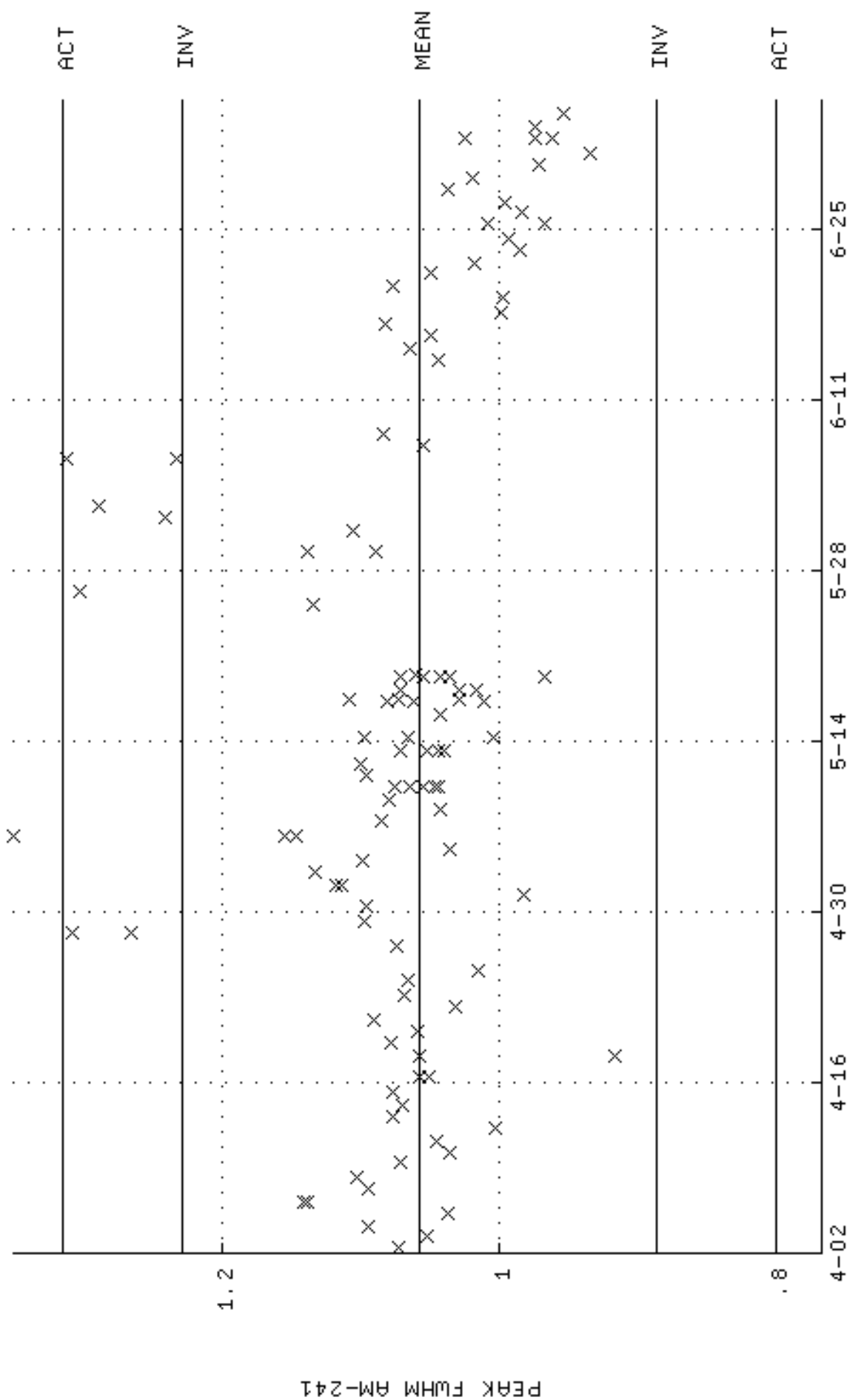
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM14.QAF;1
 Parameter Name : BACKRATE (Spectrum Background Rate)
 Start/End Dates : 3-APR-2022 10:47:22 through 5-JUL-2022 12:00:00
 Mean +- Std Dev : 1.27070 +- 1.686246E-02 (1.33 %)



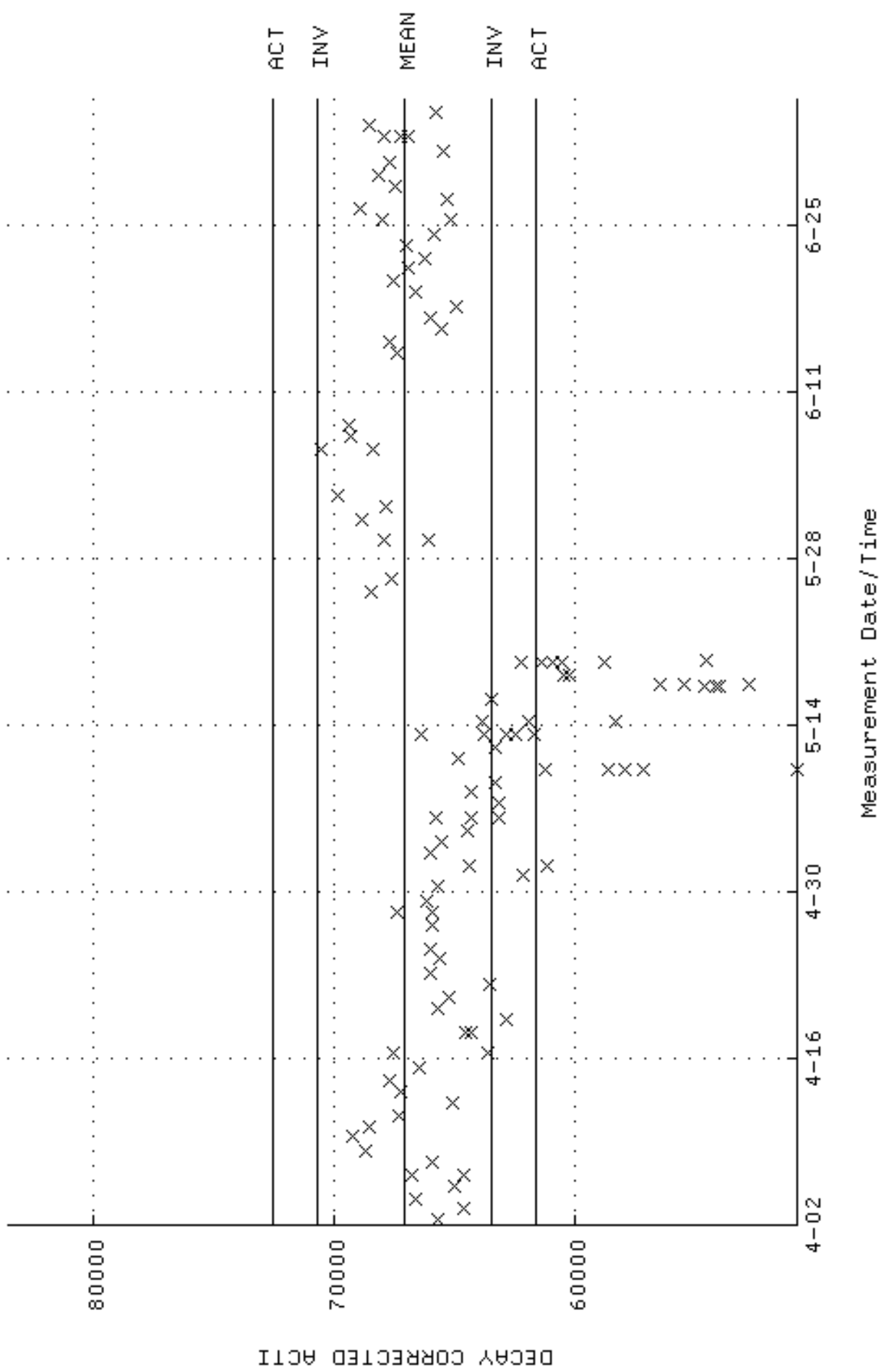
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM16_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-APR-2022 10:02:13 through 5-JUL-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



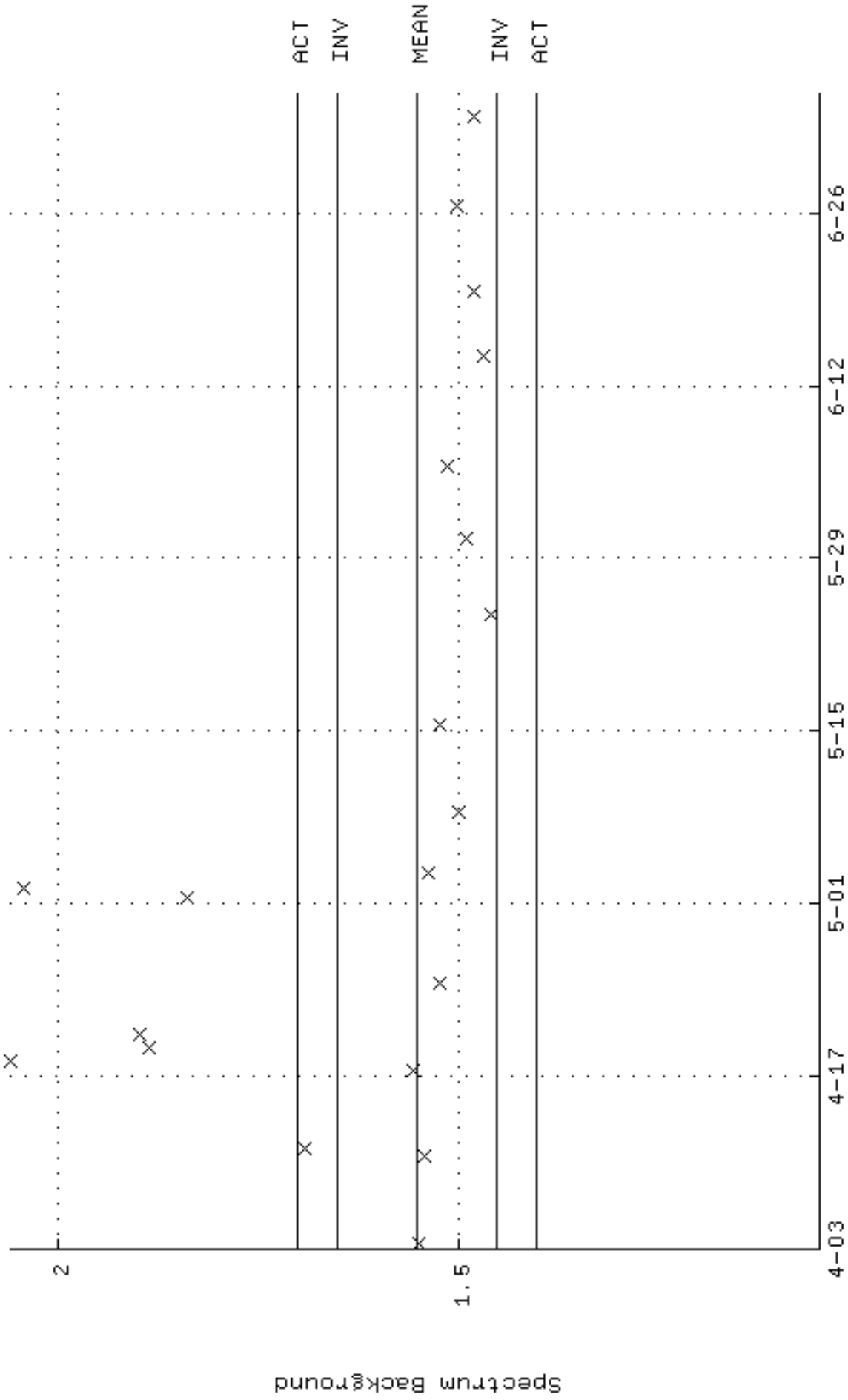
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM16_CAN.QAF;1
 Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
 Start/End Dates : 2-APR-2022 10:02:13 through 5-JUL-2022 12:00:00
 Mean +- Std Dev : 1.05846 +- 8.611610E-02 (8.14 %)



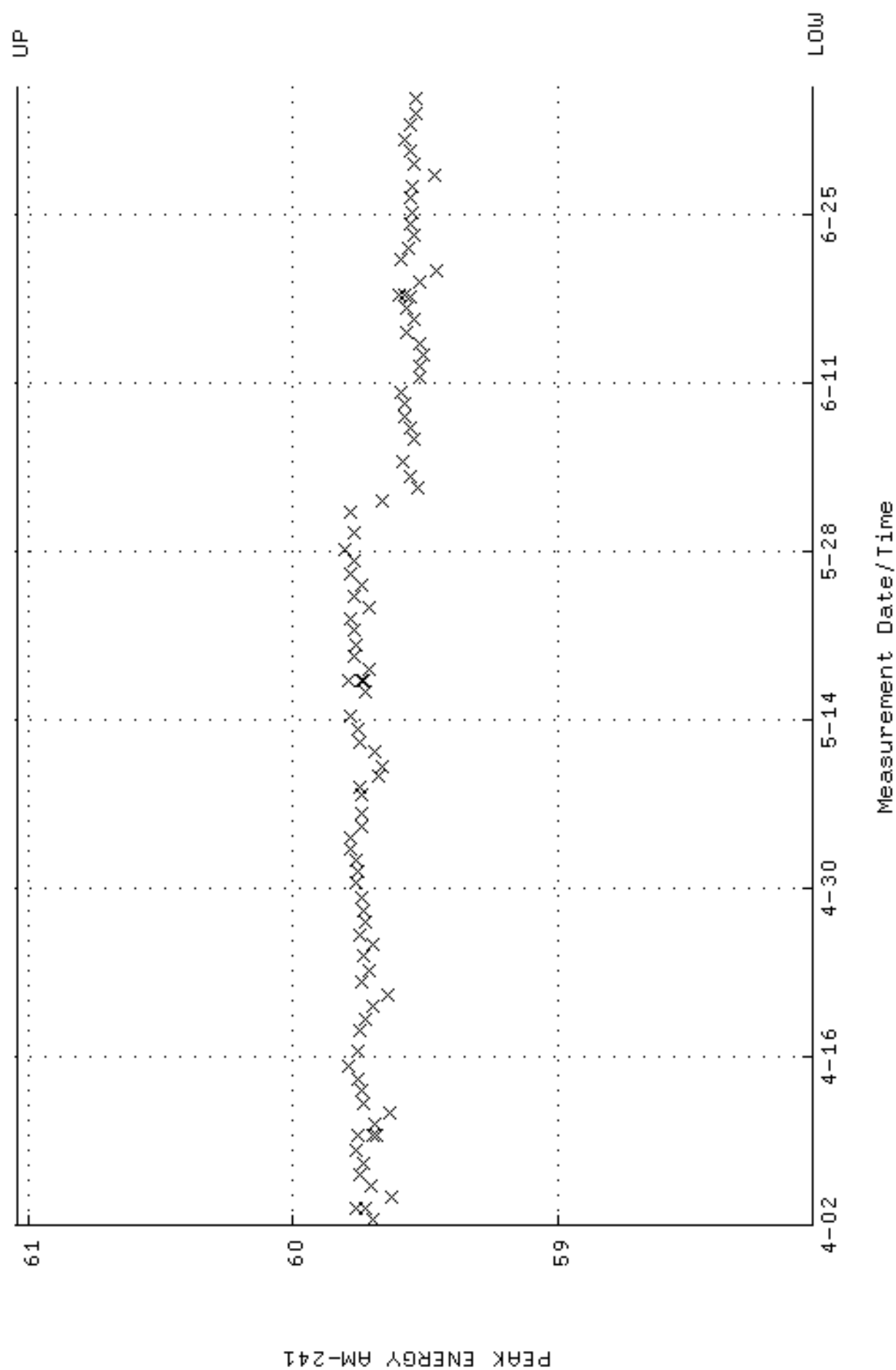
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM16_CAN.QAF;1
Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-APR-2022 10:02:13 through 5-JUL-2022 12:00:00
Mean +- Std Dev : 67094.1 +- 1812.53 (2.70 %)



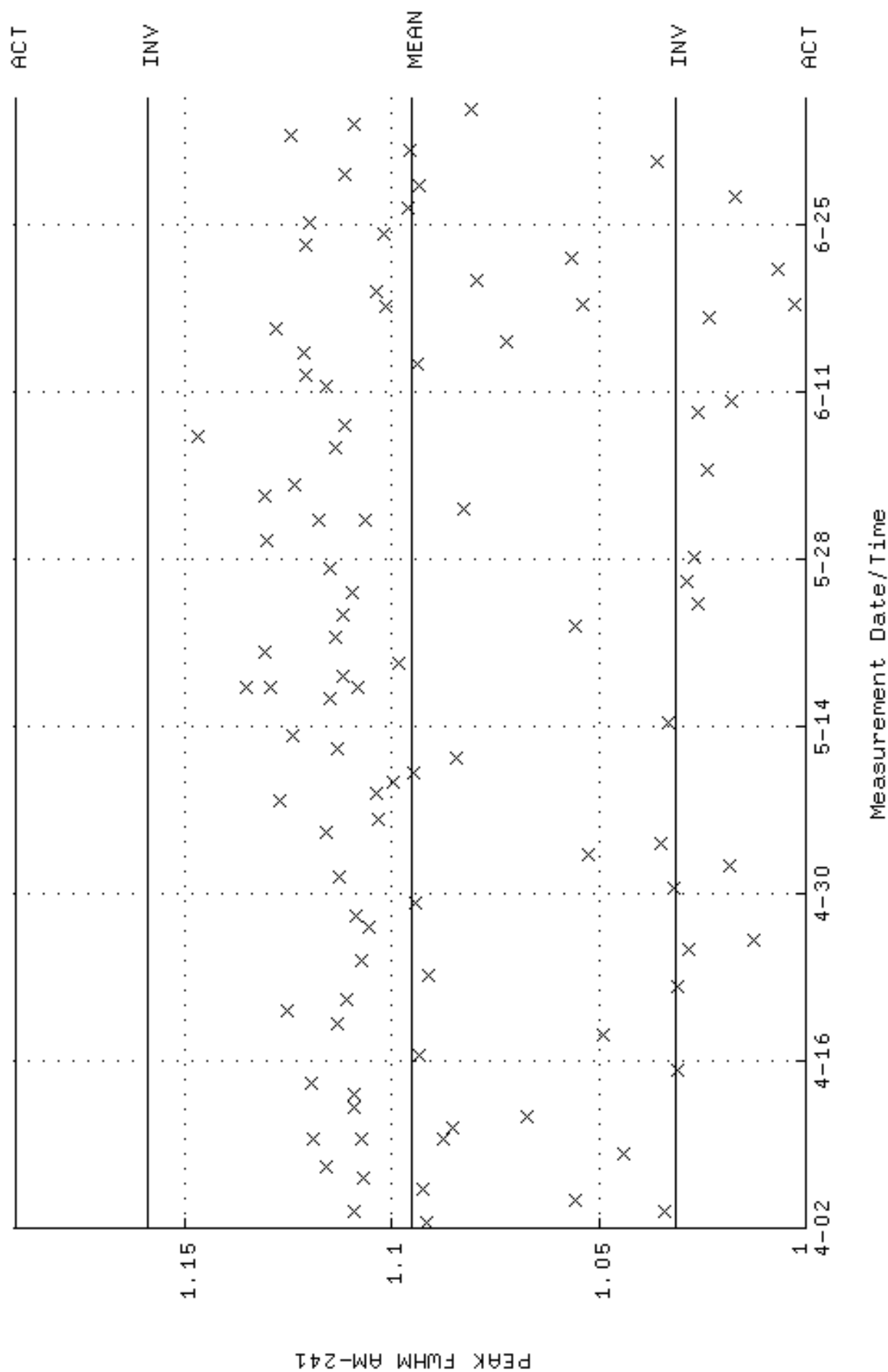
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM16.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 3-APR-2022 11:20:25 through 5-JUL-2022 12:00:00
Mean +- Std Dev : 1.55437 +- 4.963390E-02 (3.19 %)



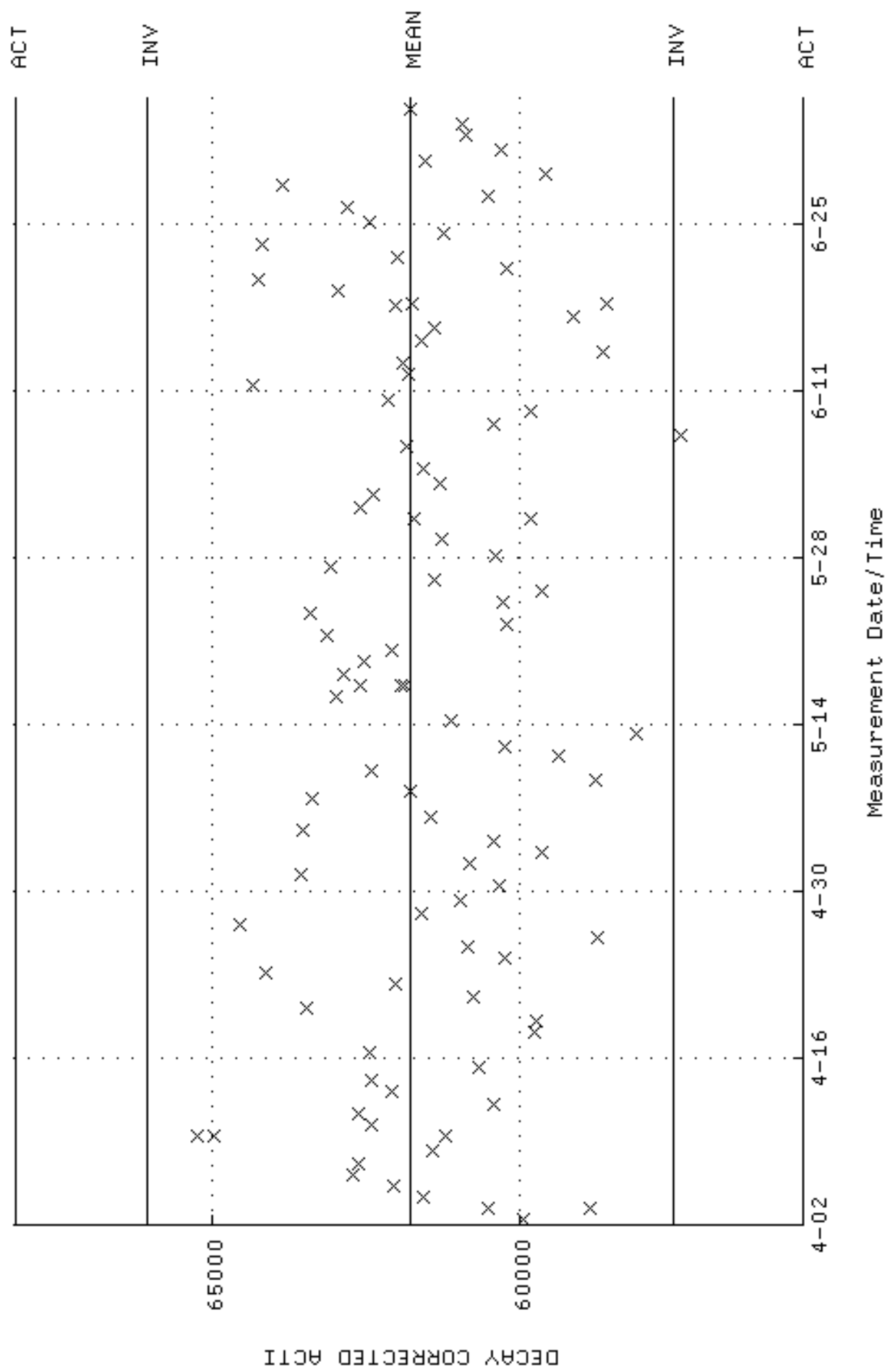
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM18_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-APR-2022 10:21:13 through 5-JUL-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



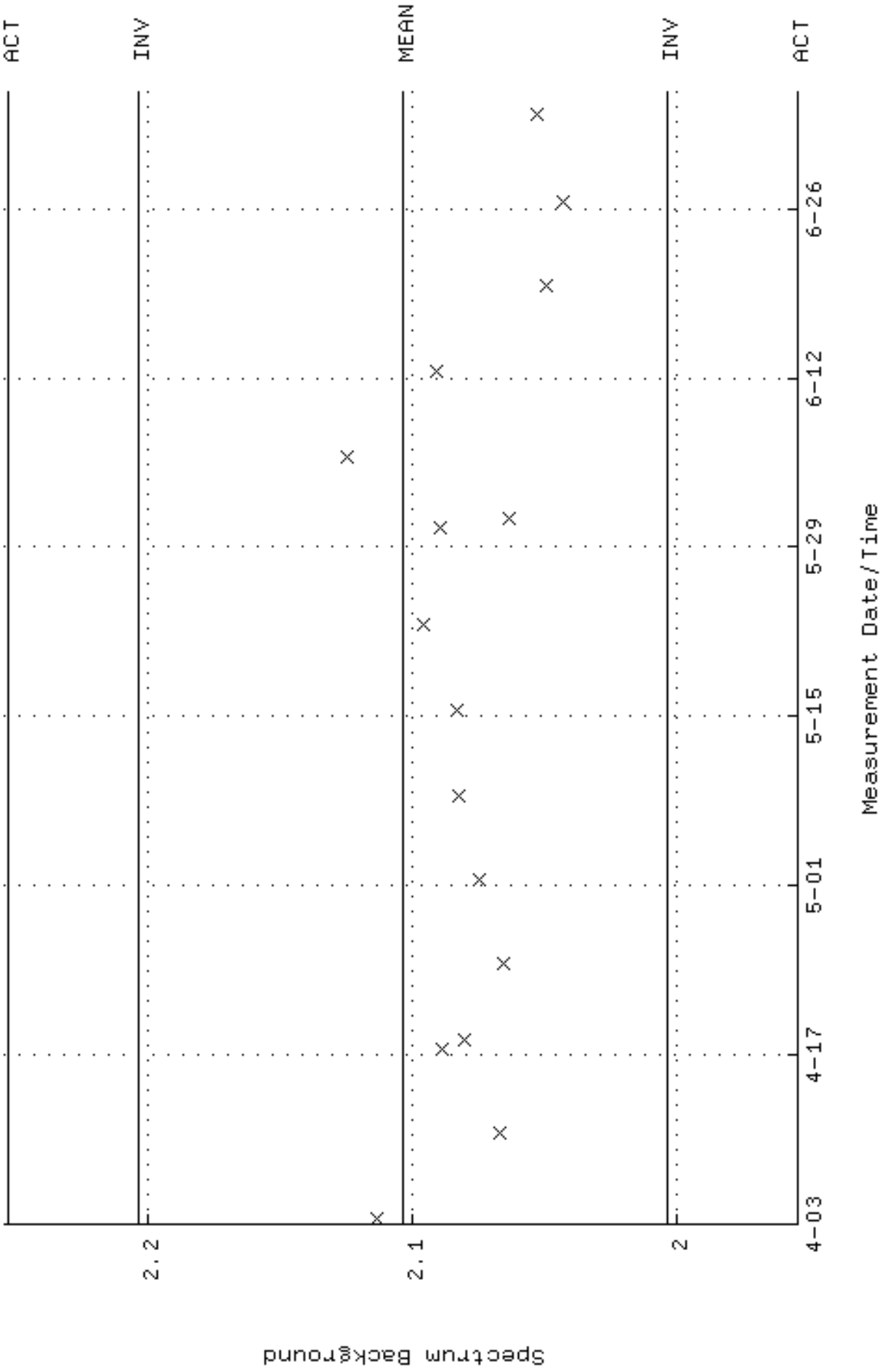
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM18_CAN.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-APR-2022 10:21:13 through 5-JUL-2022 12:00:00
 Mean +- Std Dev : 1.09545 +- 3.182907E-02 (2.91 %)



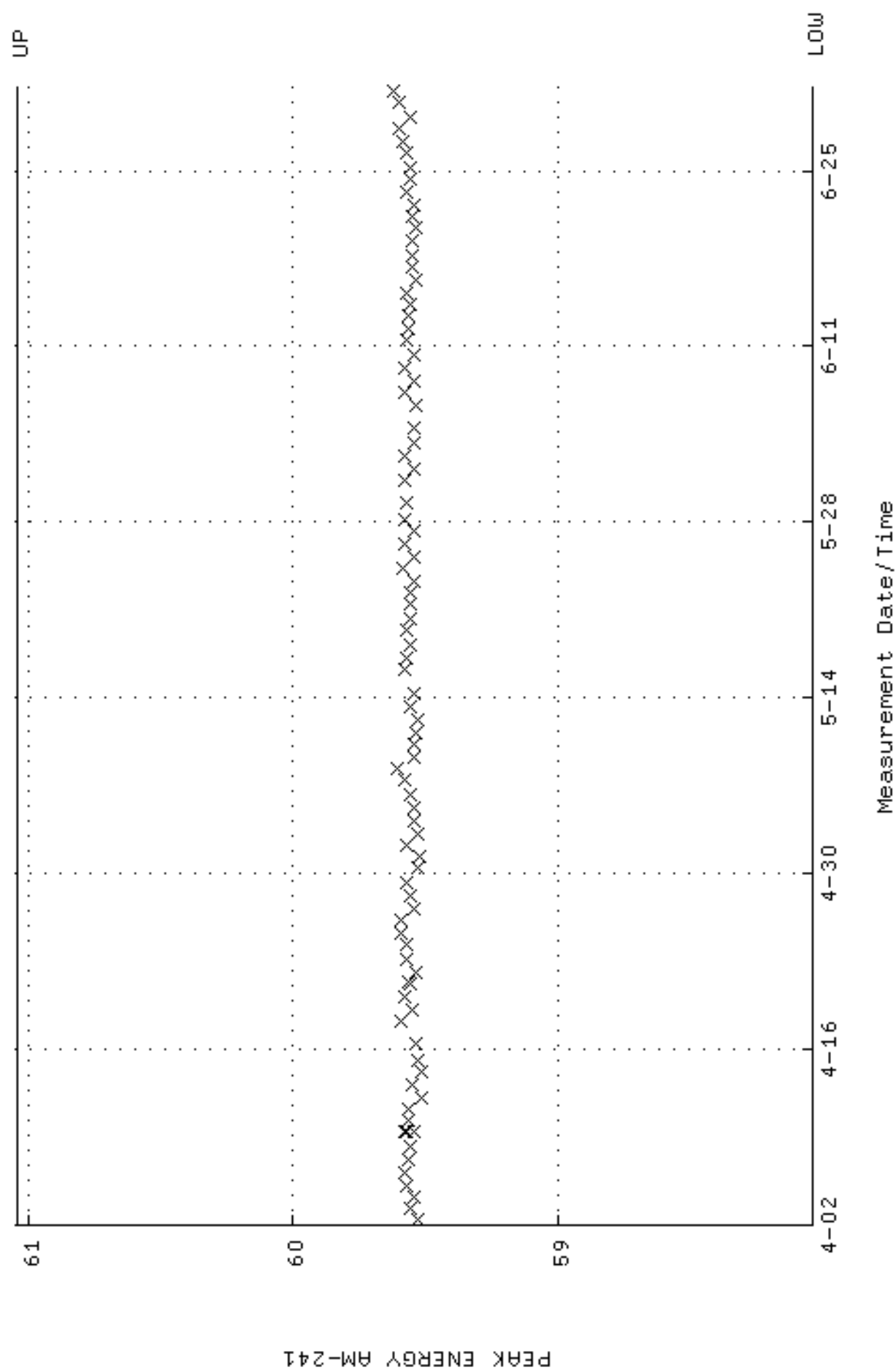
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM18-CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-APR-2022 10:21:13 through 5-JUL-2022 12:00:00
 Mean +- Std Dev : 61779.1 +- 2134.12 (3.45 %)



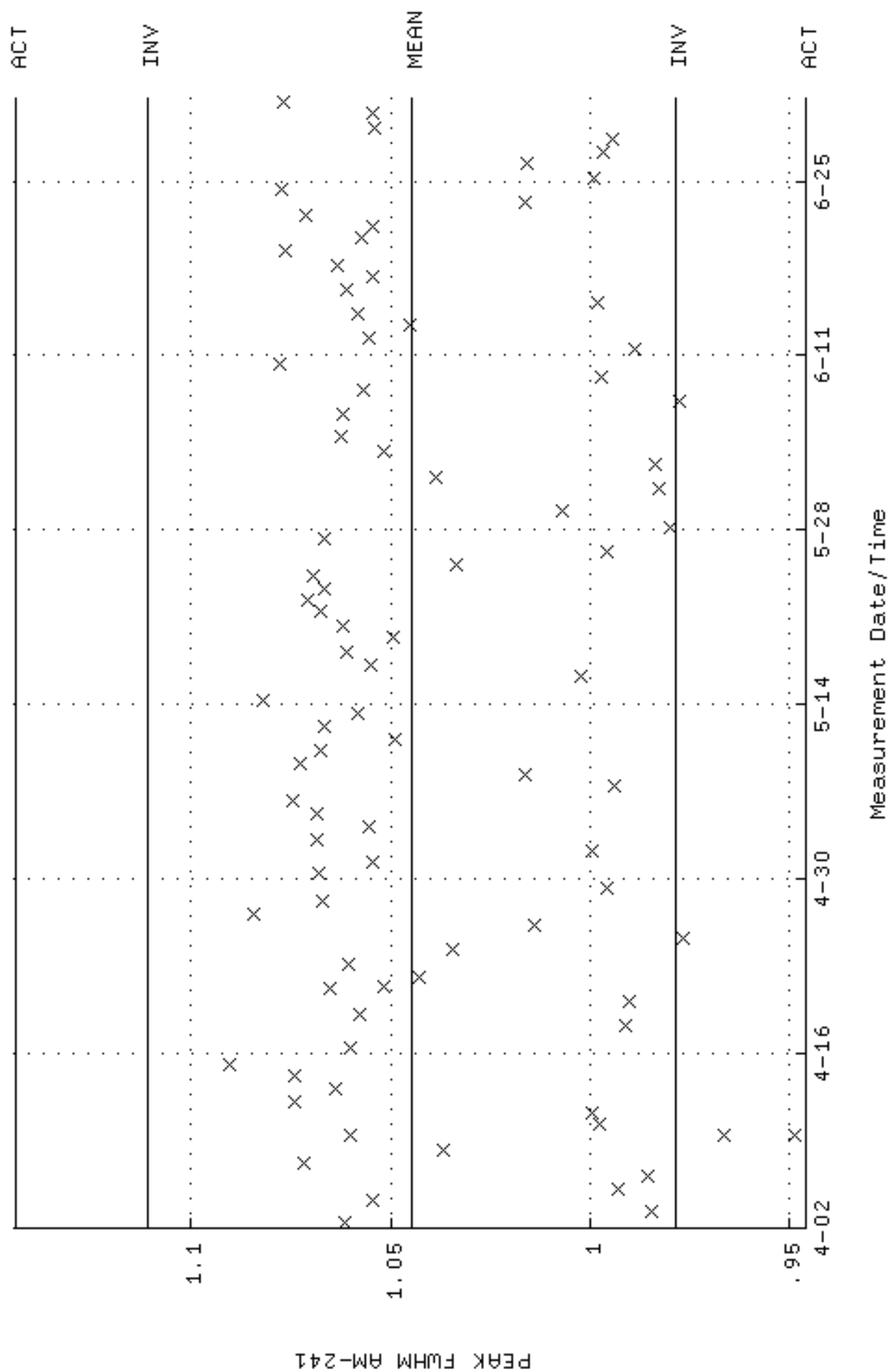
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM18.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 3-APR-2022 10:49:38 through 5-JUL-2022 12:00:00
Mean +- Std Dev : 2.10393 +- 4.992997E-02 (2.37 %)



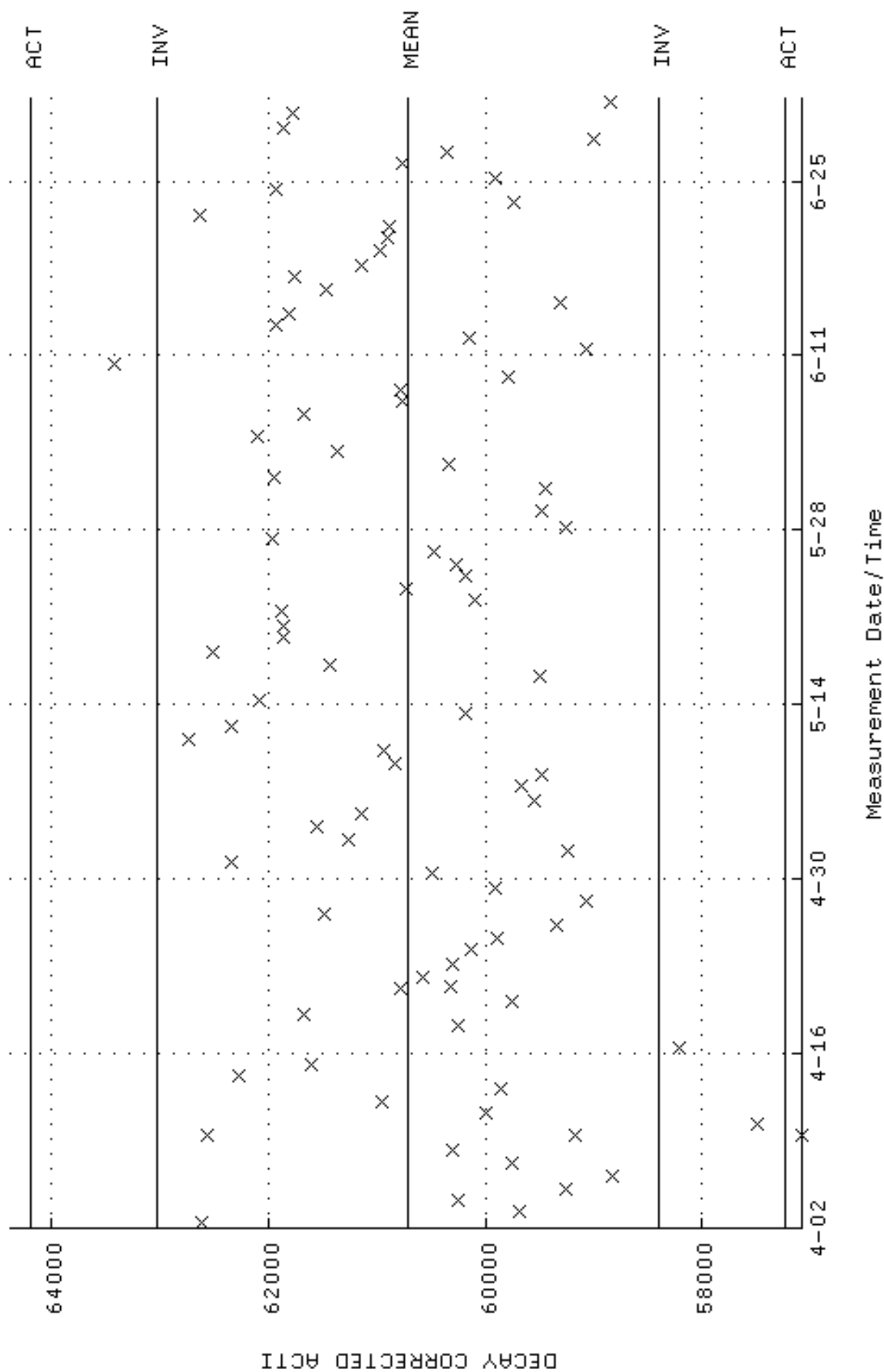
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM30_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-APR-2022 10:02:39 through 1-JUL-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



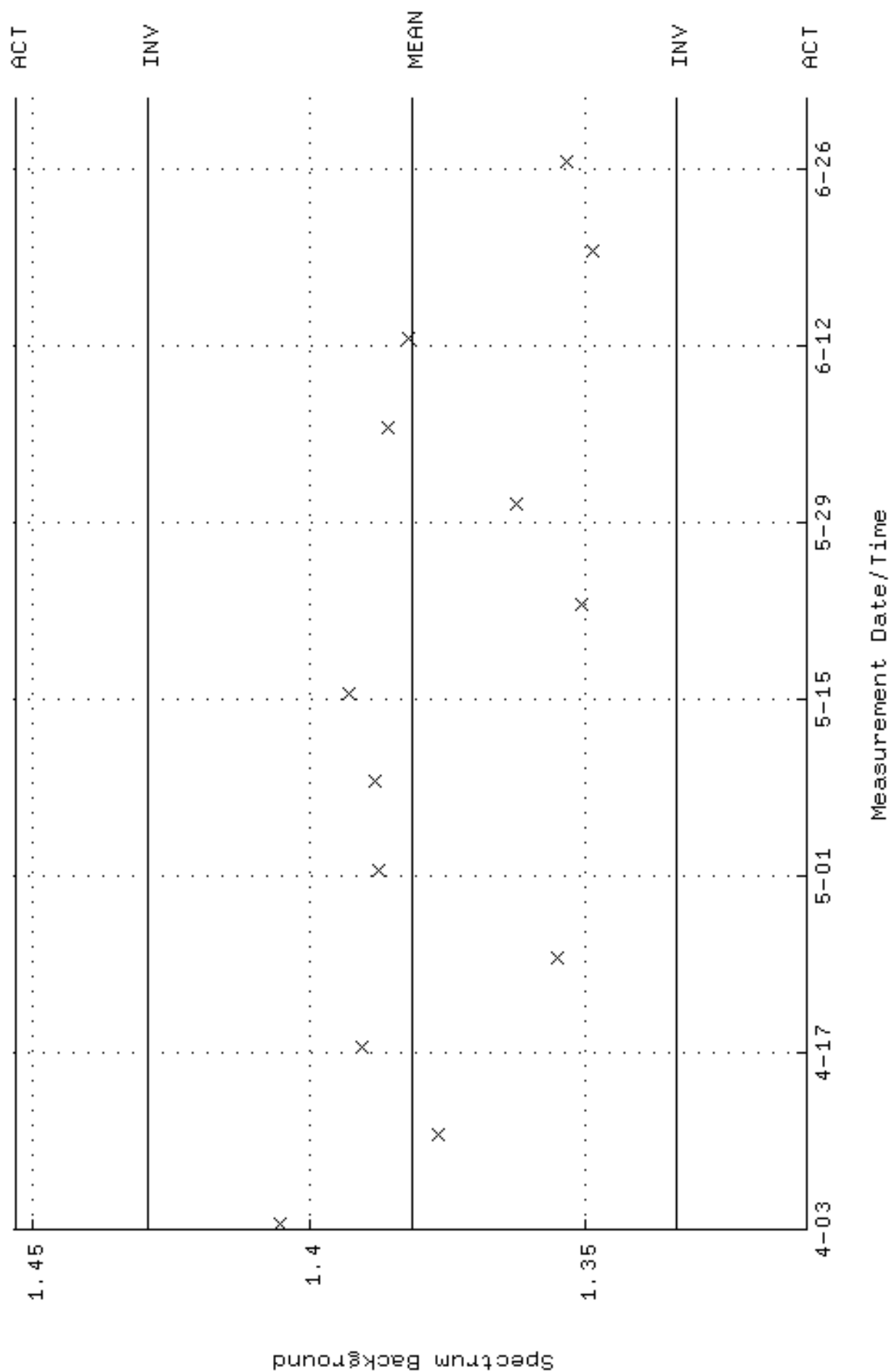
QA filename : DKA100:[CANSBERRA.GAMMA.SCUSR.QA]QCC-GAM30-CAN.QAF;1
 Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
 Start/End Dates : 2-APR-2022 10:02:39 through 1-JUL-2022 12:00:00
 Mean +- Std Dev : 1.04491 +- 3.300933E-02 (3.16 %)



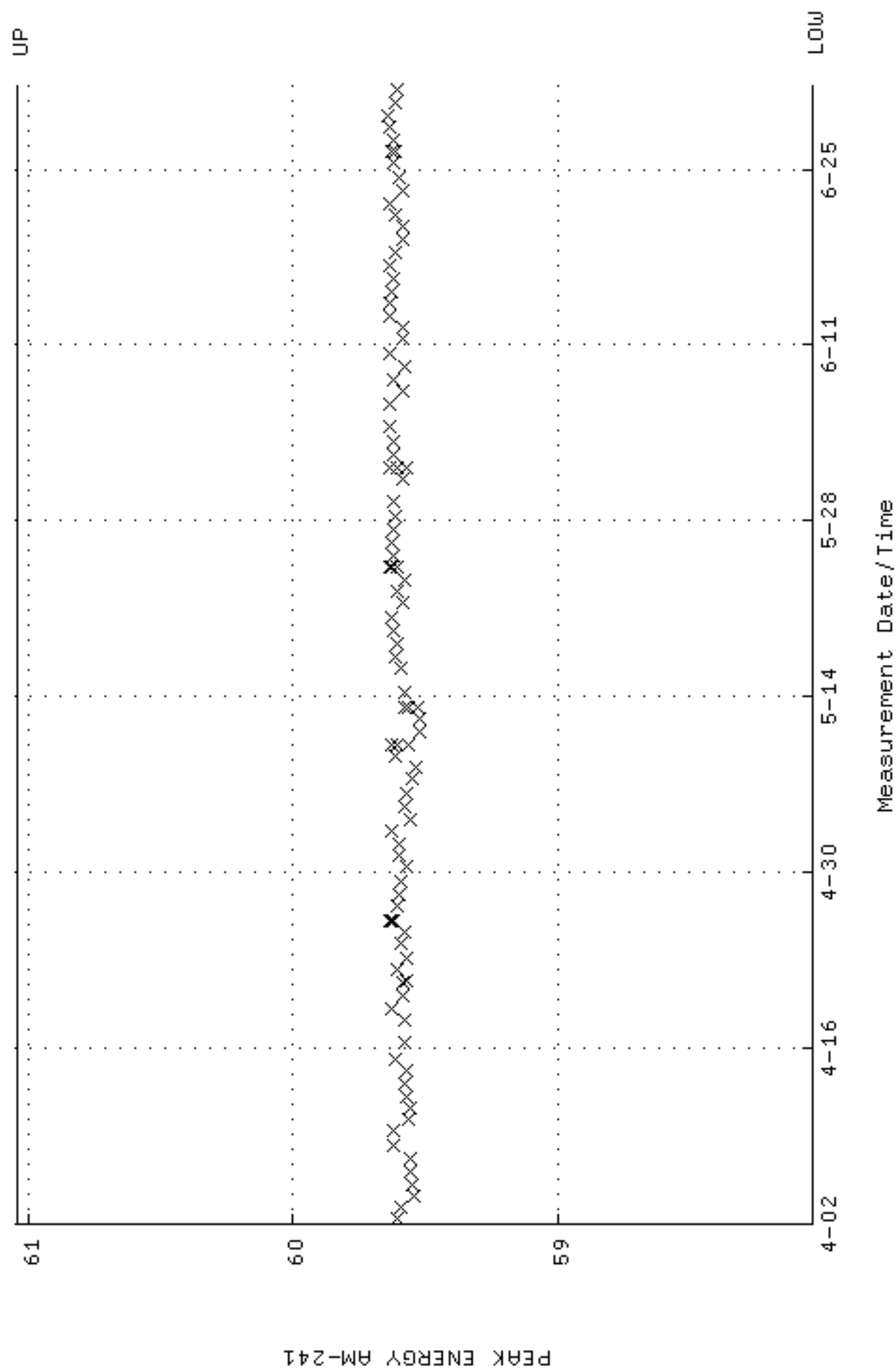
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM30-CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-APR-2022 10:02:39 through 1-JUL-2022 12:00:00
 Mean +- Std Dev : 60719.9 +- 1157.24 (1.91 %)



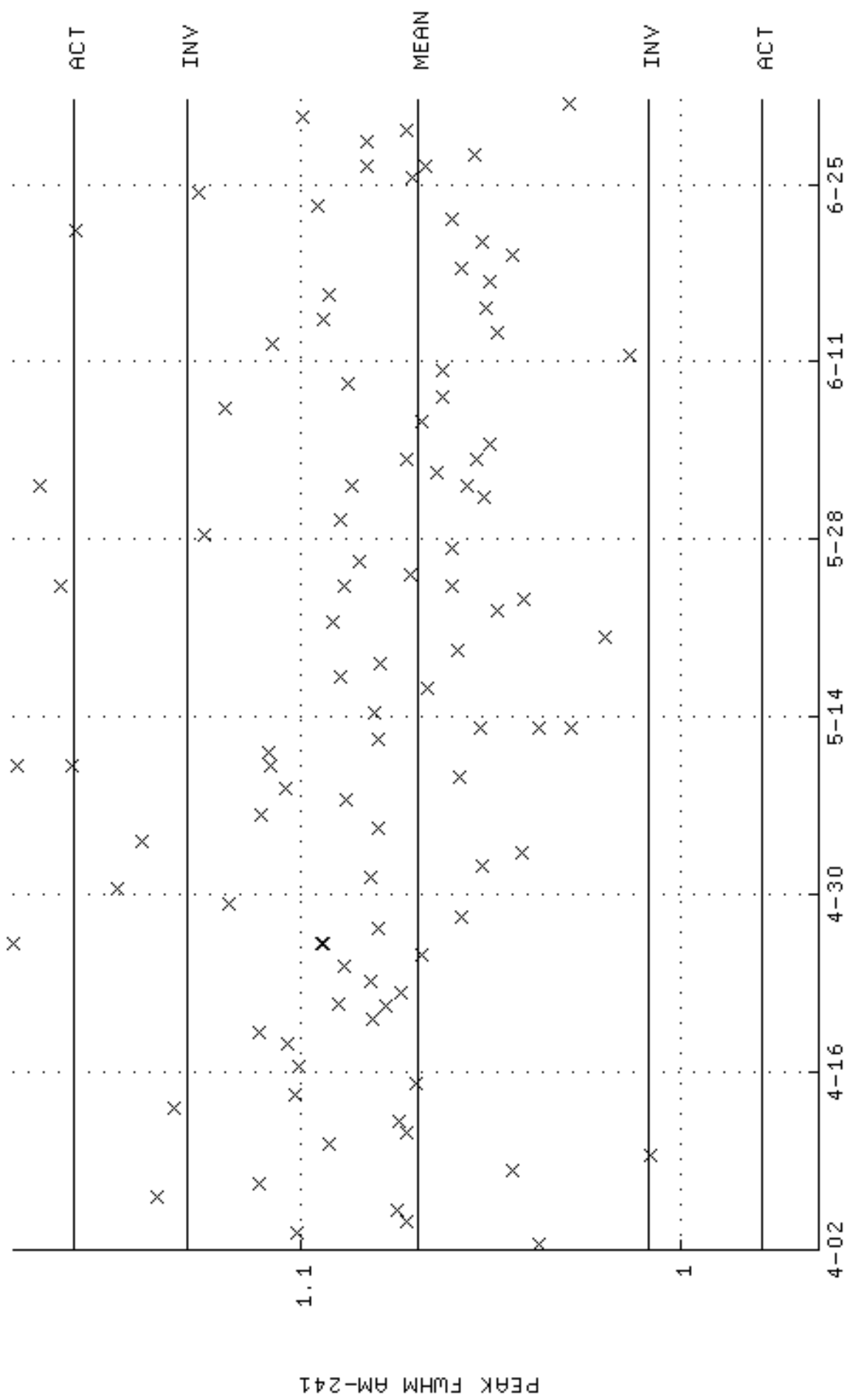
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM30.QAF;1
 Parameter Name : BACKRATE (Spectrum Background Rate)
 Start/End Dates : 3-APR-2022 11:20:40 through 1-JUL-2022 12:00:00
 Mean +- Std Dev : 1.38155 +- 2.378993E-02 (1.72 %)



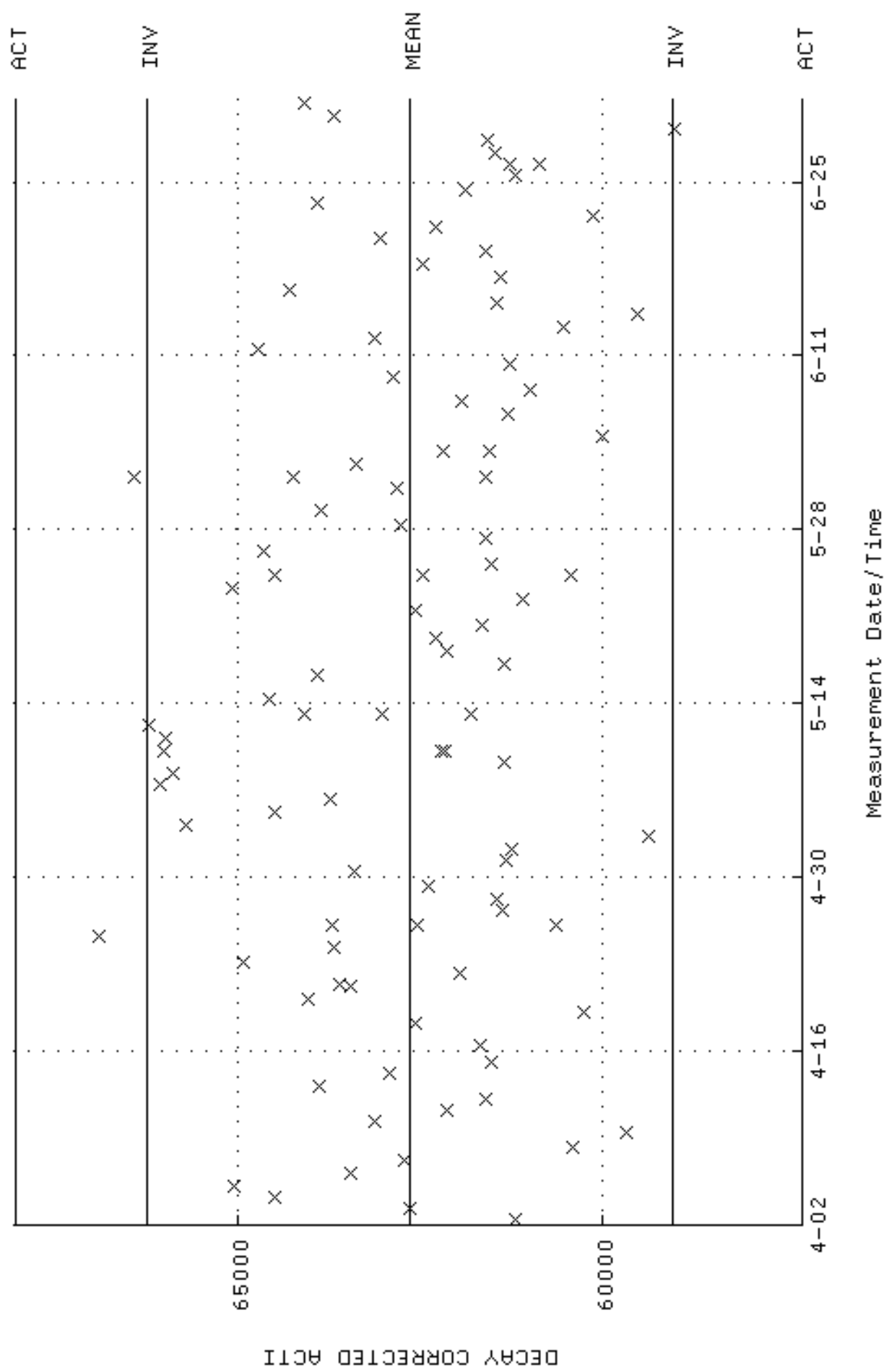
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM33_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-APR-2022 10:21:29 through 1-JUL-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



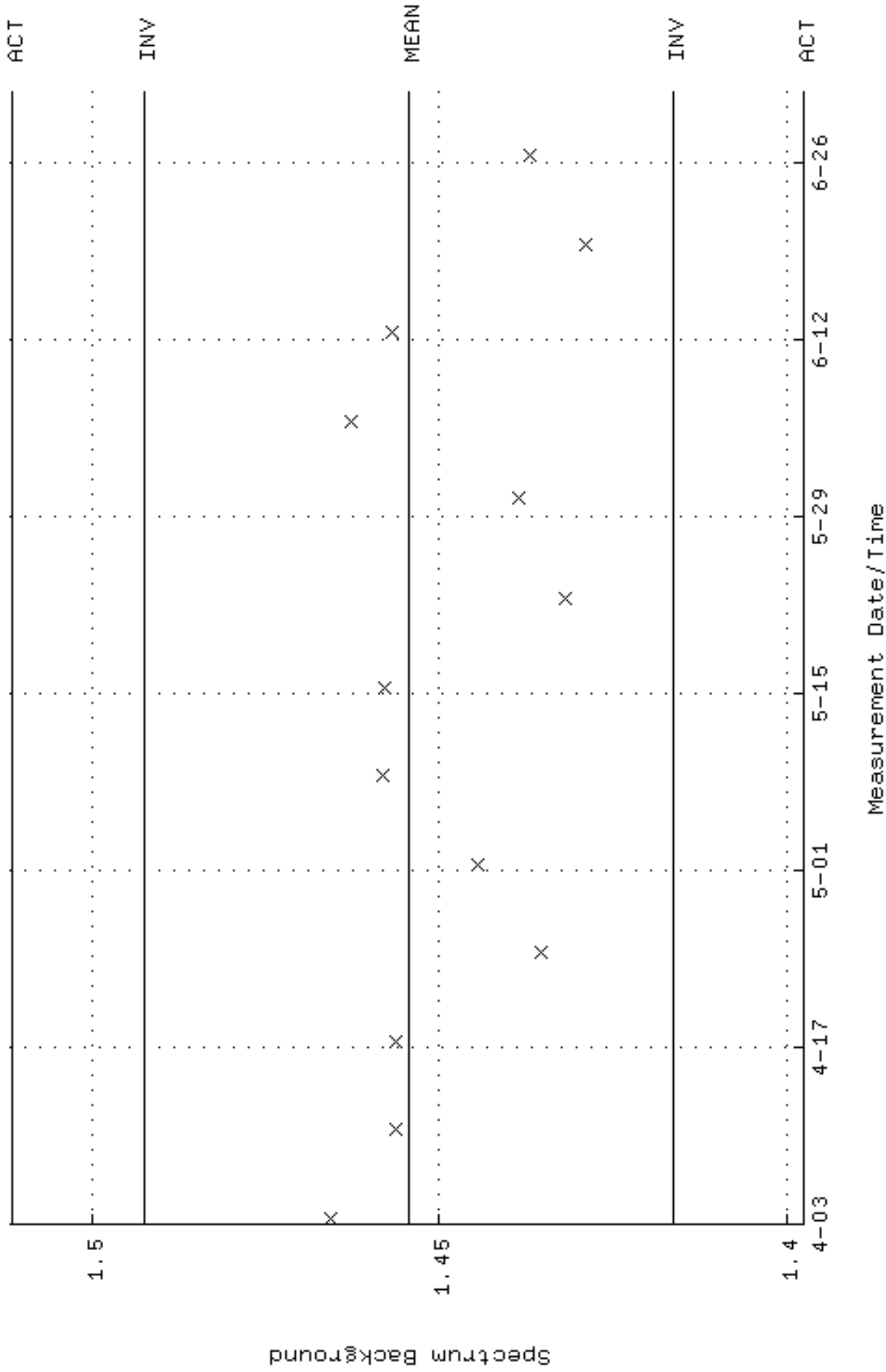
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC-GAM33-CAN.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-APR-2022 10:21:29 through 1-JUL-2022 12:00:00
 Mean +- Std Dev : 1.06954 +- 3.028659E-02 (2.83 %)



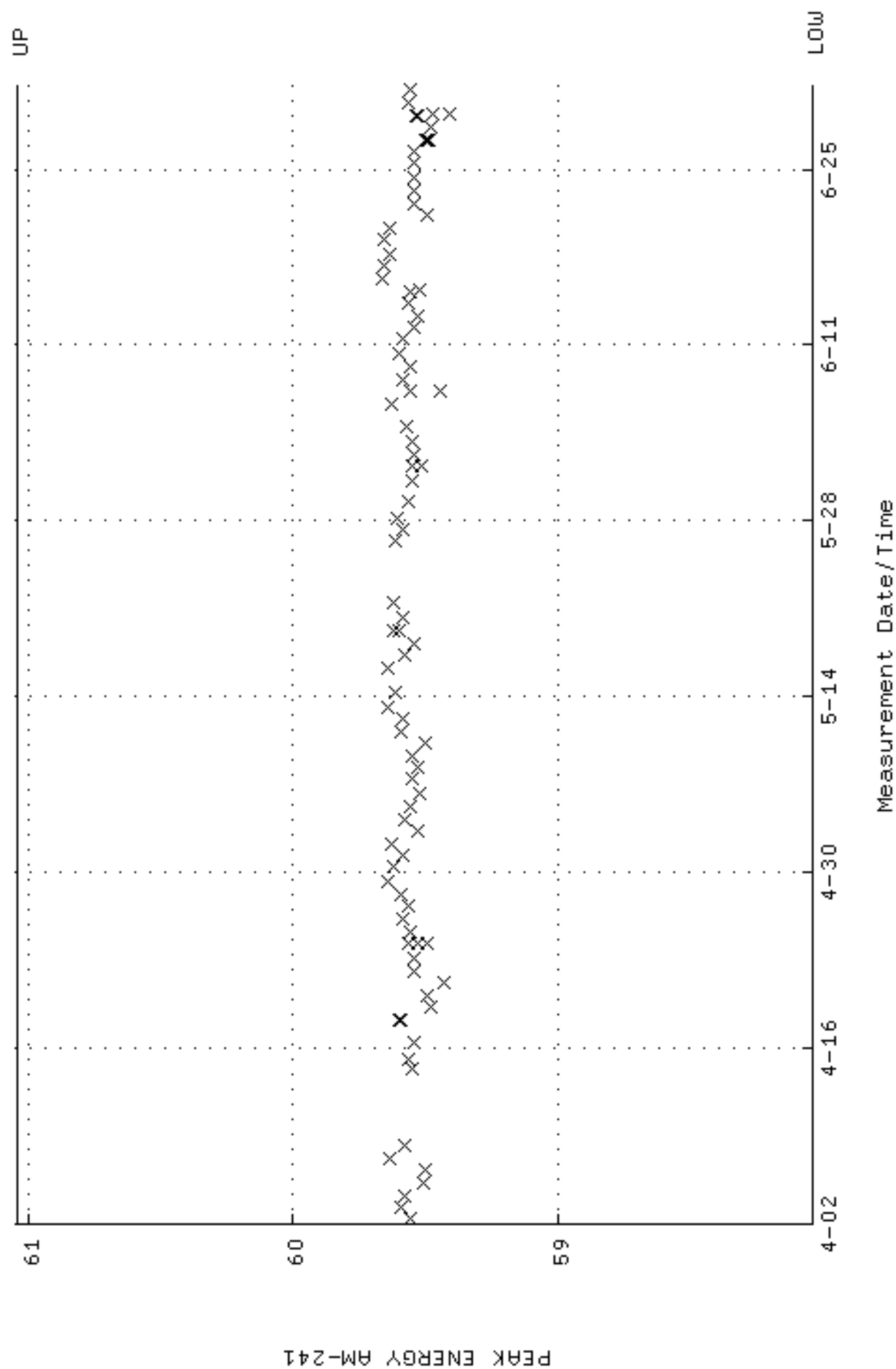
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM33_CAN.QAF;1
Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-APR-2022 10:21:29 through 1-JUL-2022 12:00:00
Mean +- Std Dev : 62660.7 +- 1800.47 (2.87 %)



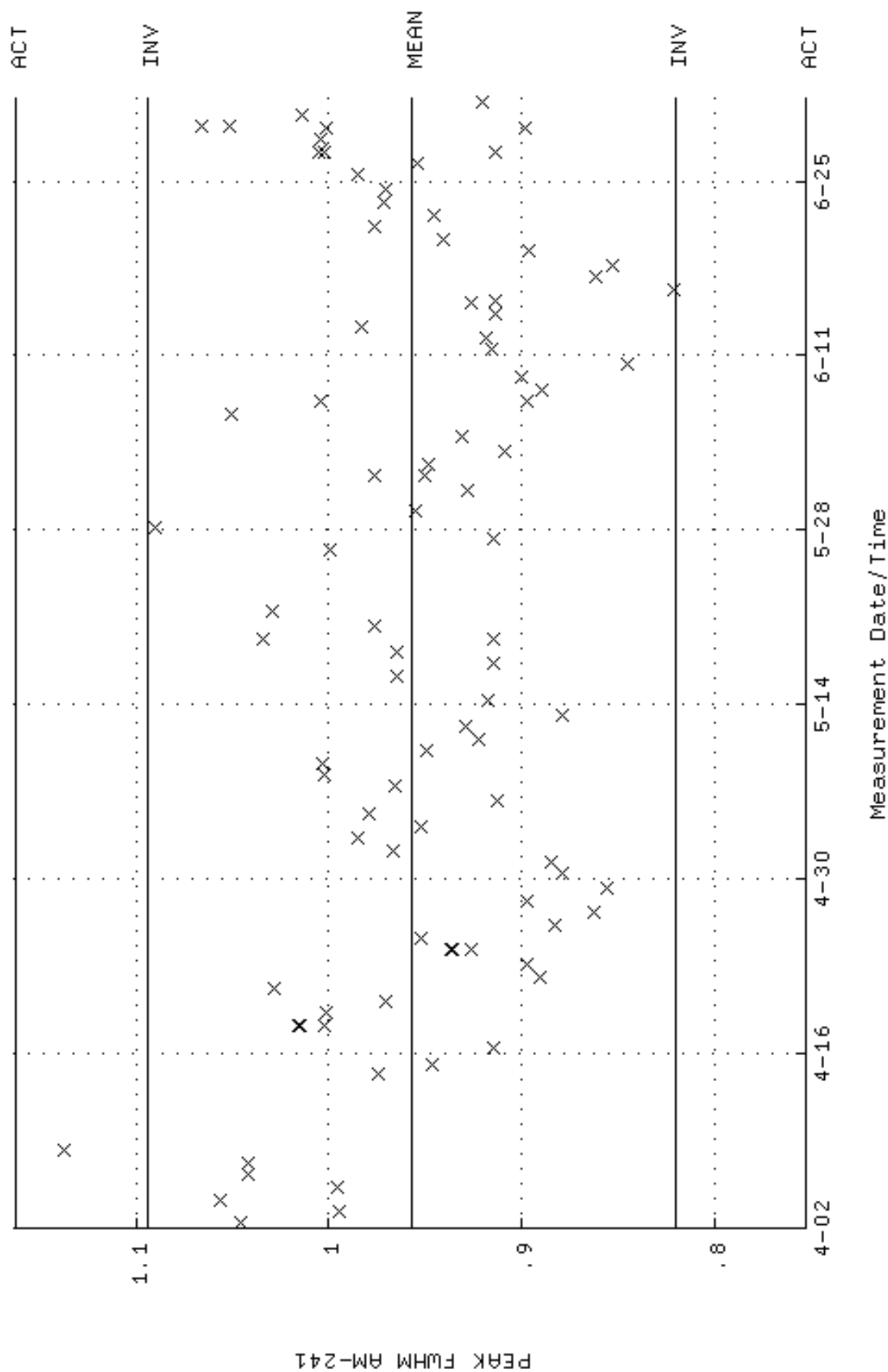
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM33.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 3-APR-2022 11:20:55 through 1-JUL-2022 12:00:00
Mean +- Std Dev : 1.45454 +- 1.896337E-02 (1.30 %)



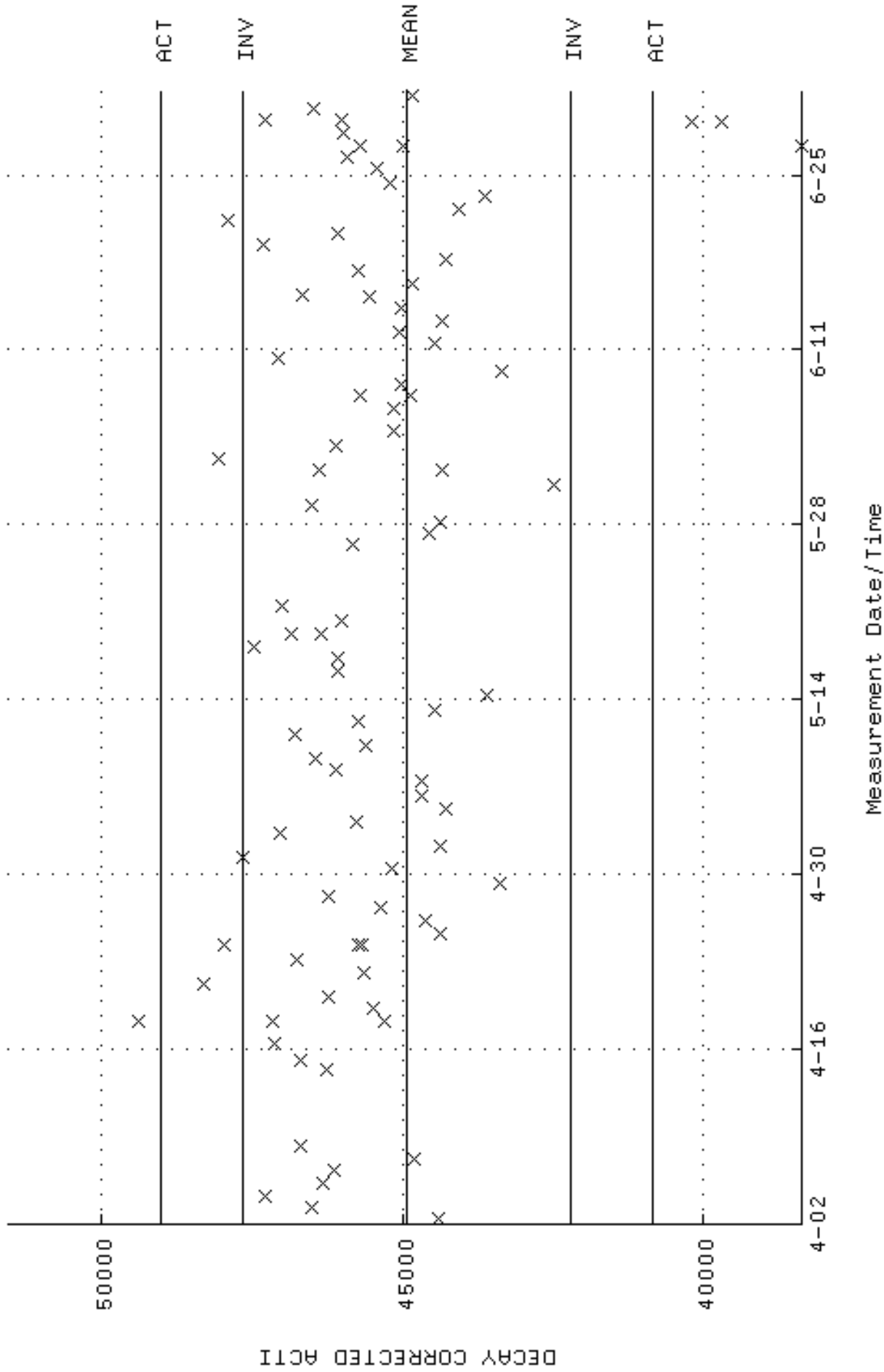
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM36_SCAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-APR-2022 10:02:49 through 1-JUL-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



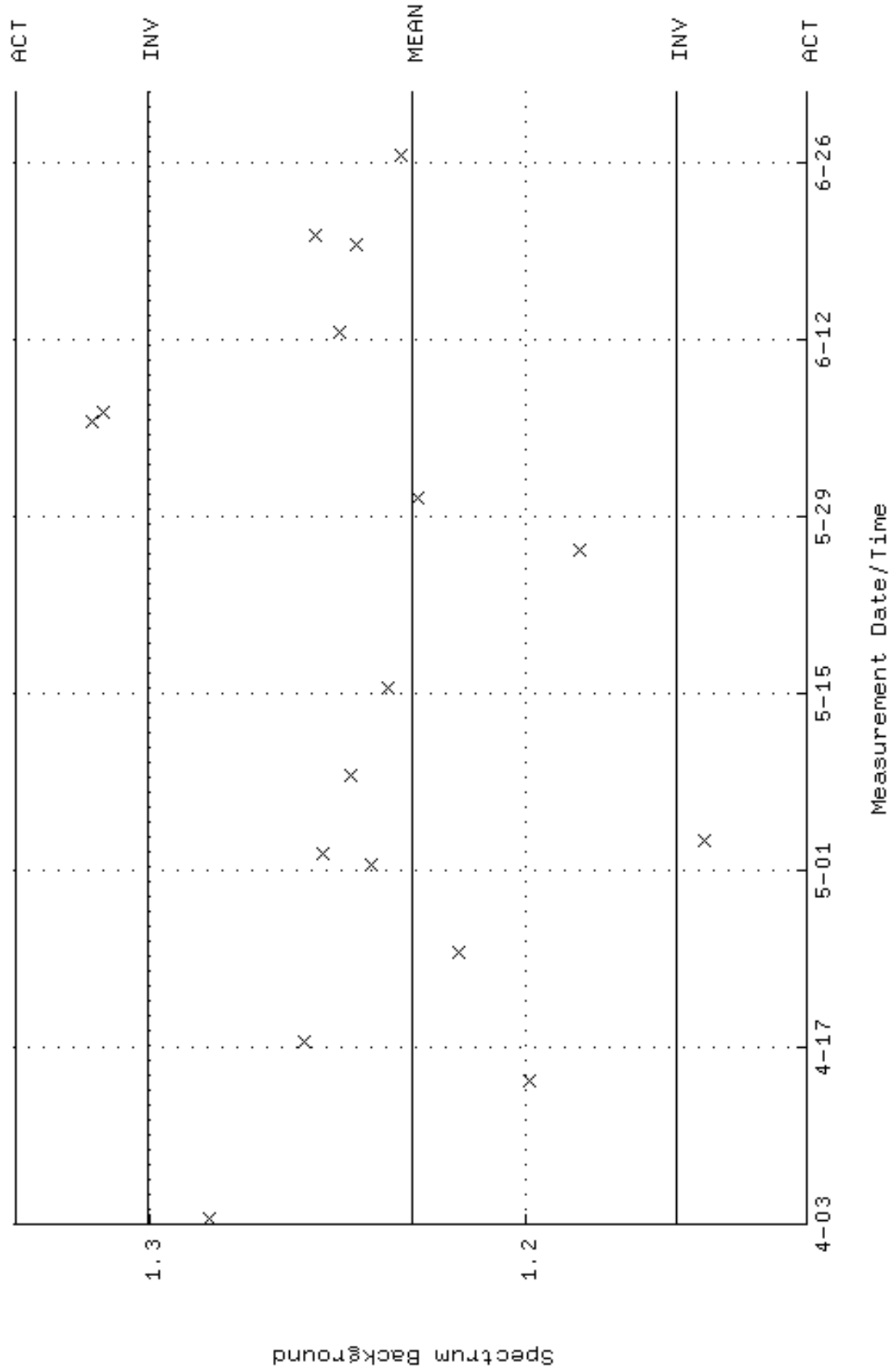
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM36_SCAN.QAF;1
 Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
 Start/End Dates : 2-APR-2022 10:02:49 through 1-JUL-2022 12:00:00
 Mean +- Std Dev : 0.957433 +- 6.836953E-02 (7.14 %)



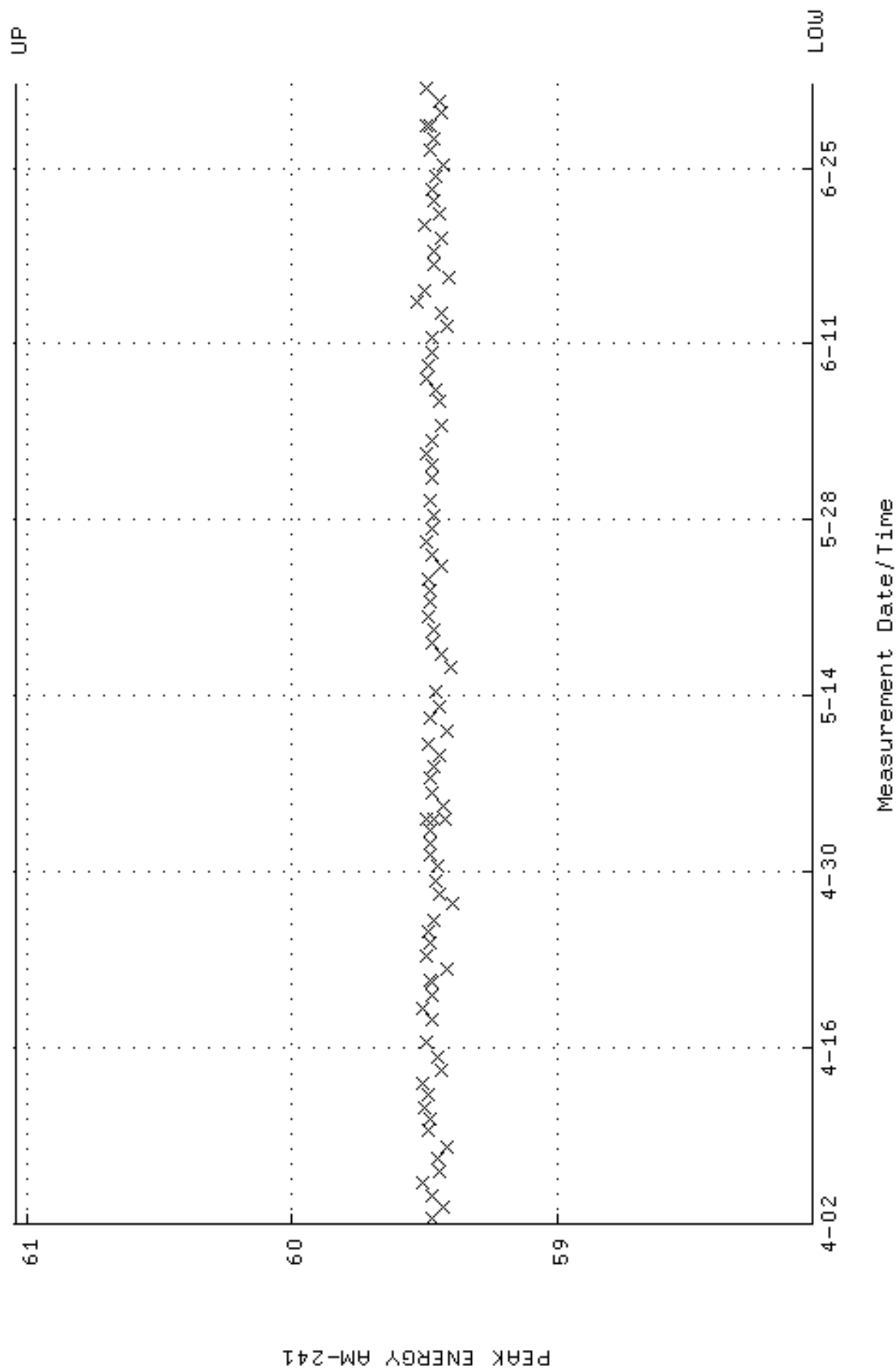
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM36_SCAN.QAF;1
Parameter Name : NLACTIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-APR-2022 10:02:49 through 1-JUL-2022 12:00:00
Mean +- Std Dev : 44948.0 +- 1362.20 (3.03 %)



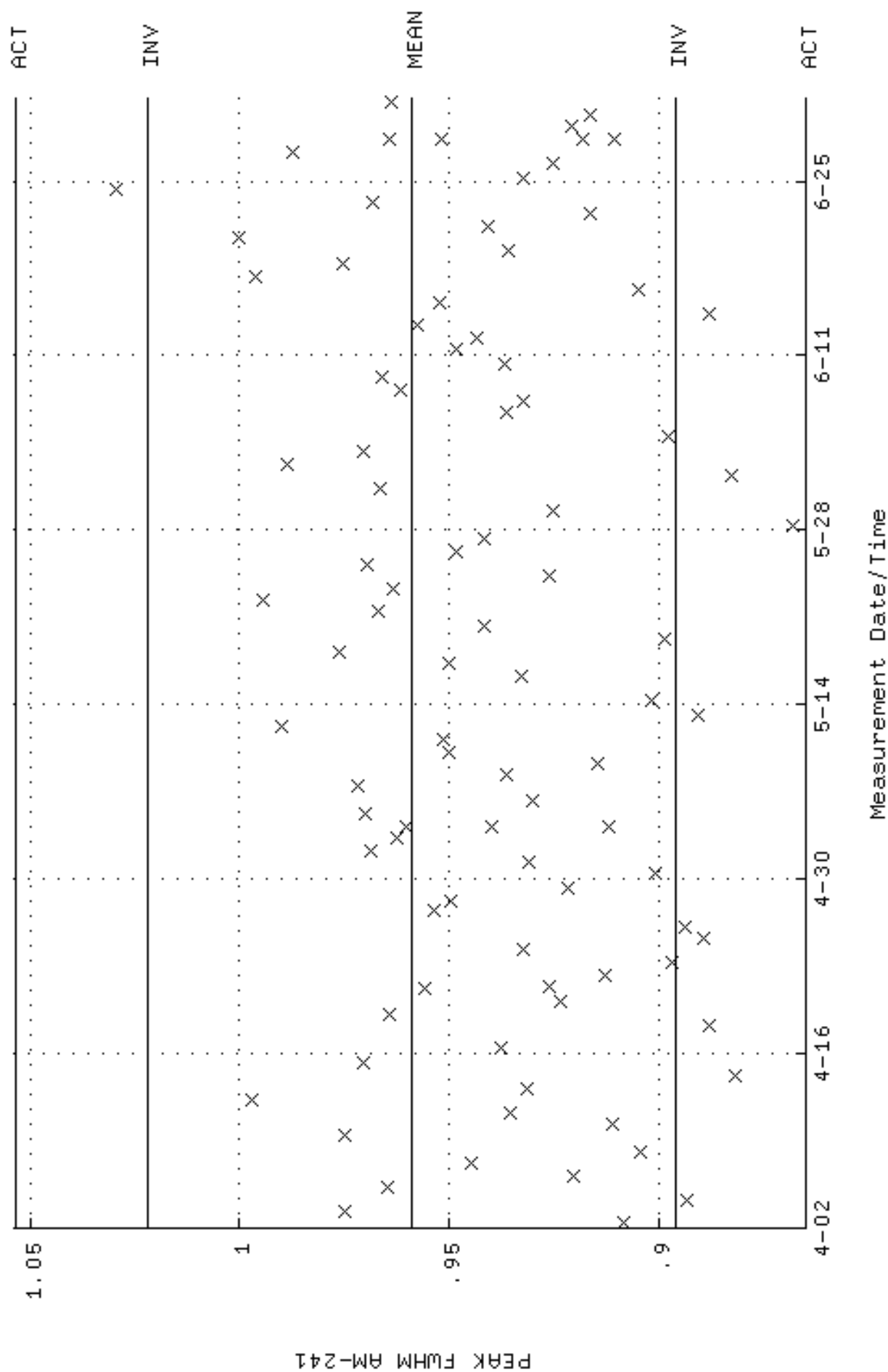
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM36.QAF;1
 Parameter Name : BACKRATE (Spectrum Background Rate)
 Start/End Dates : 3-APR-2022 11:29:34 through 1-JUL-2022 12:00:00
 Mean +- Std Dev : 1.23043 +- 3.503159E-02 (2.85 %)



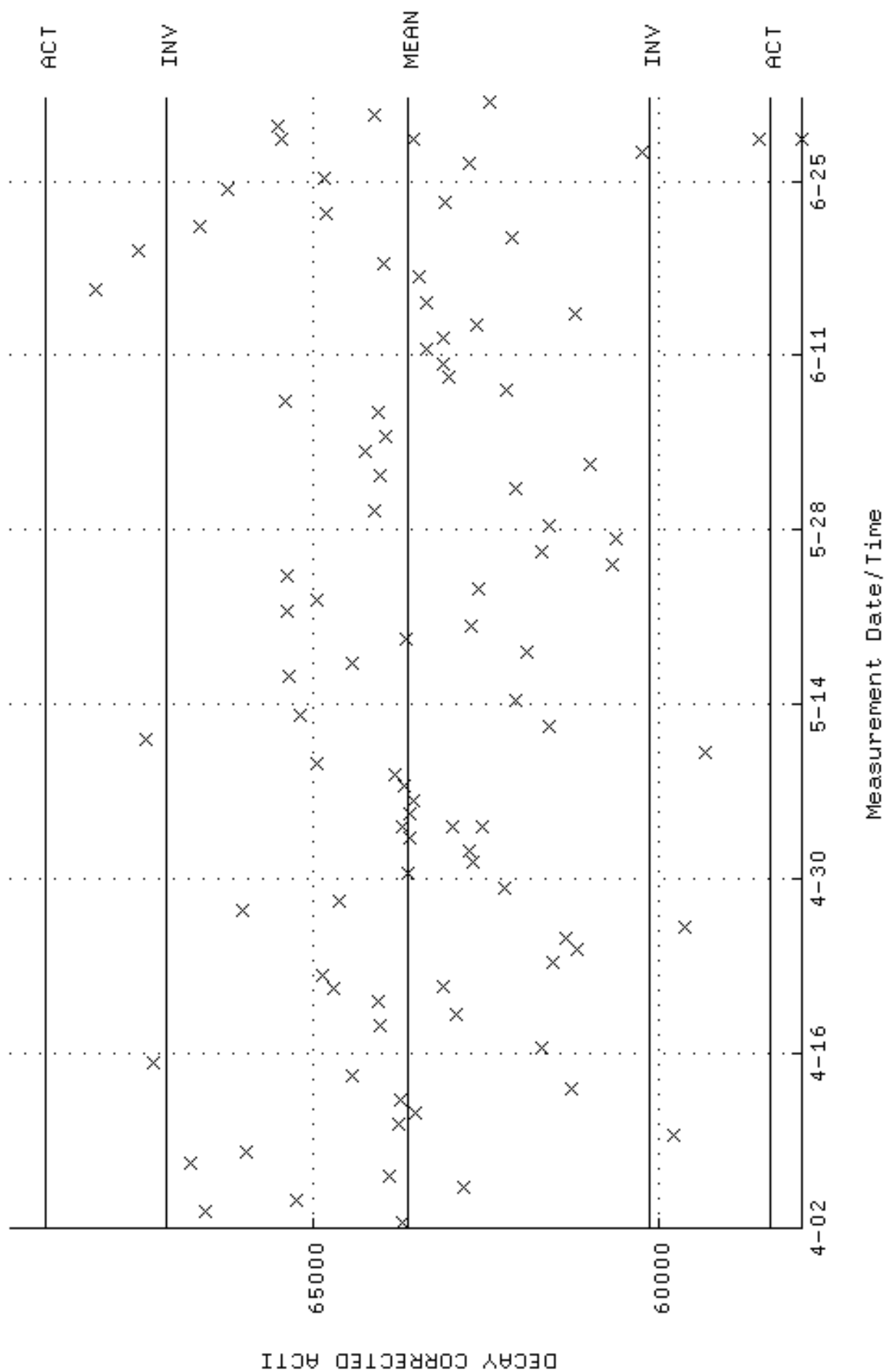
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM40_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-APR-2022 10:02:57 through 1-JUL-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



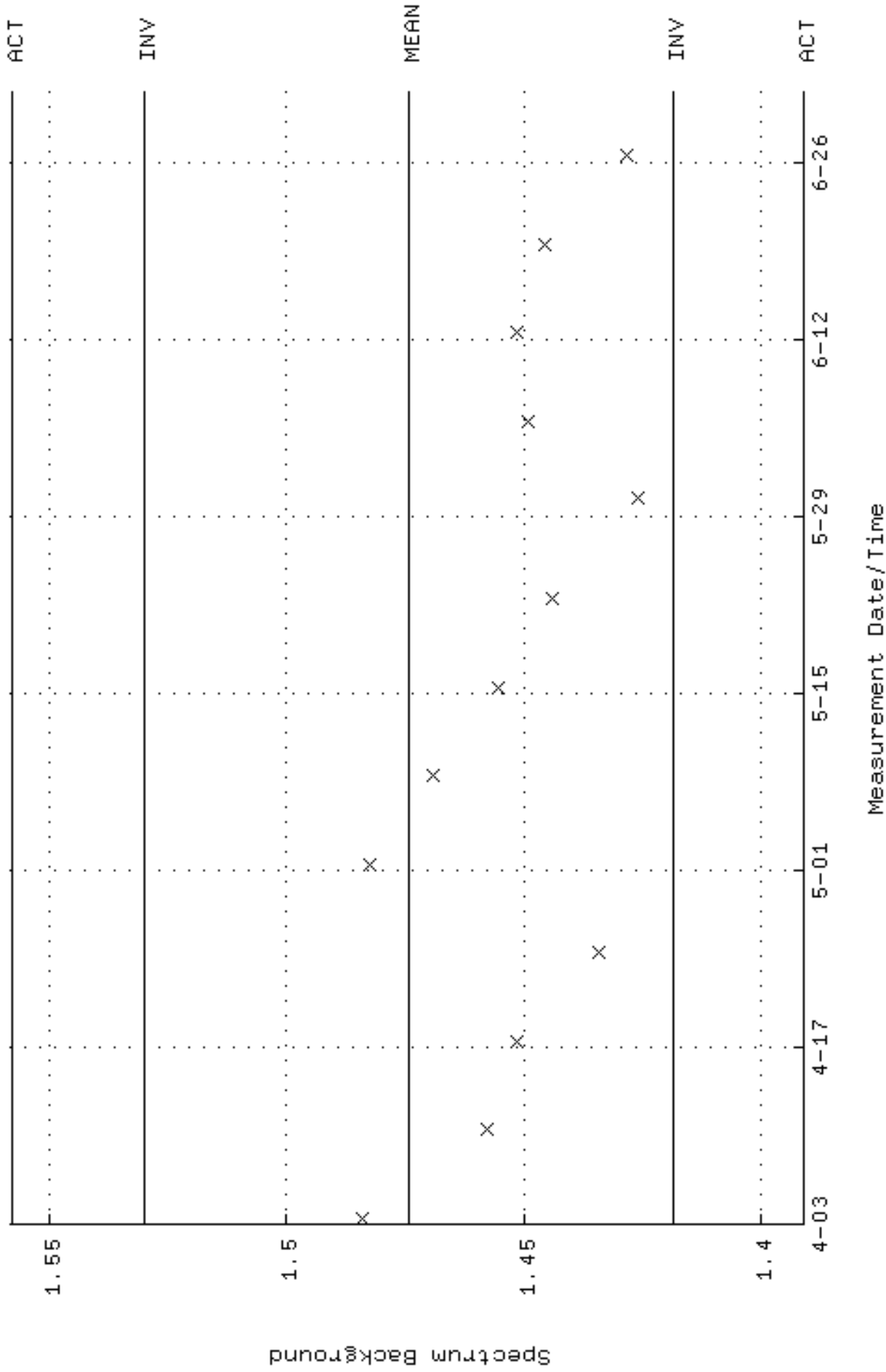
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC-GAM40-CAN.QAF;1
 Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
 Start/End Dates : 2-APR-2022 10:02:57 through 1-JUL-2022 12:00:00
 Mean +- Std Dev : 0.959091 +- 3.142089E-02 (3.28 %)



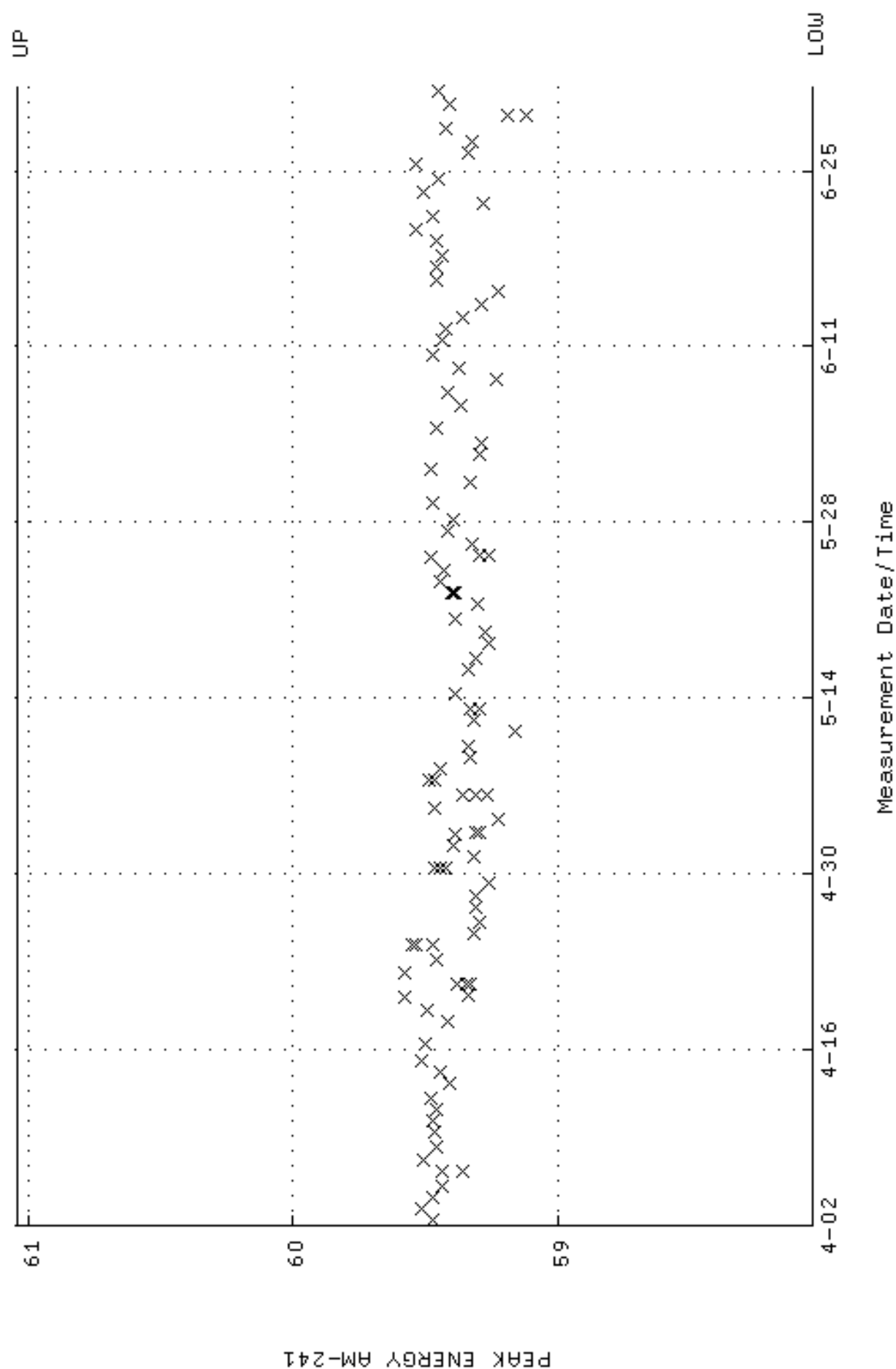
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM40-CAN.QAF;1
 Parameter Name : NLACTIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-APR-2022 10:02:57 through 1-JUL-2022 12:00:00
 Mean +- Std Dev : 63652.7 +- 1747.14 (2.74 %)



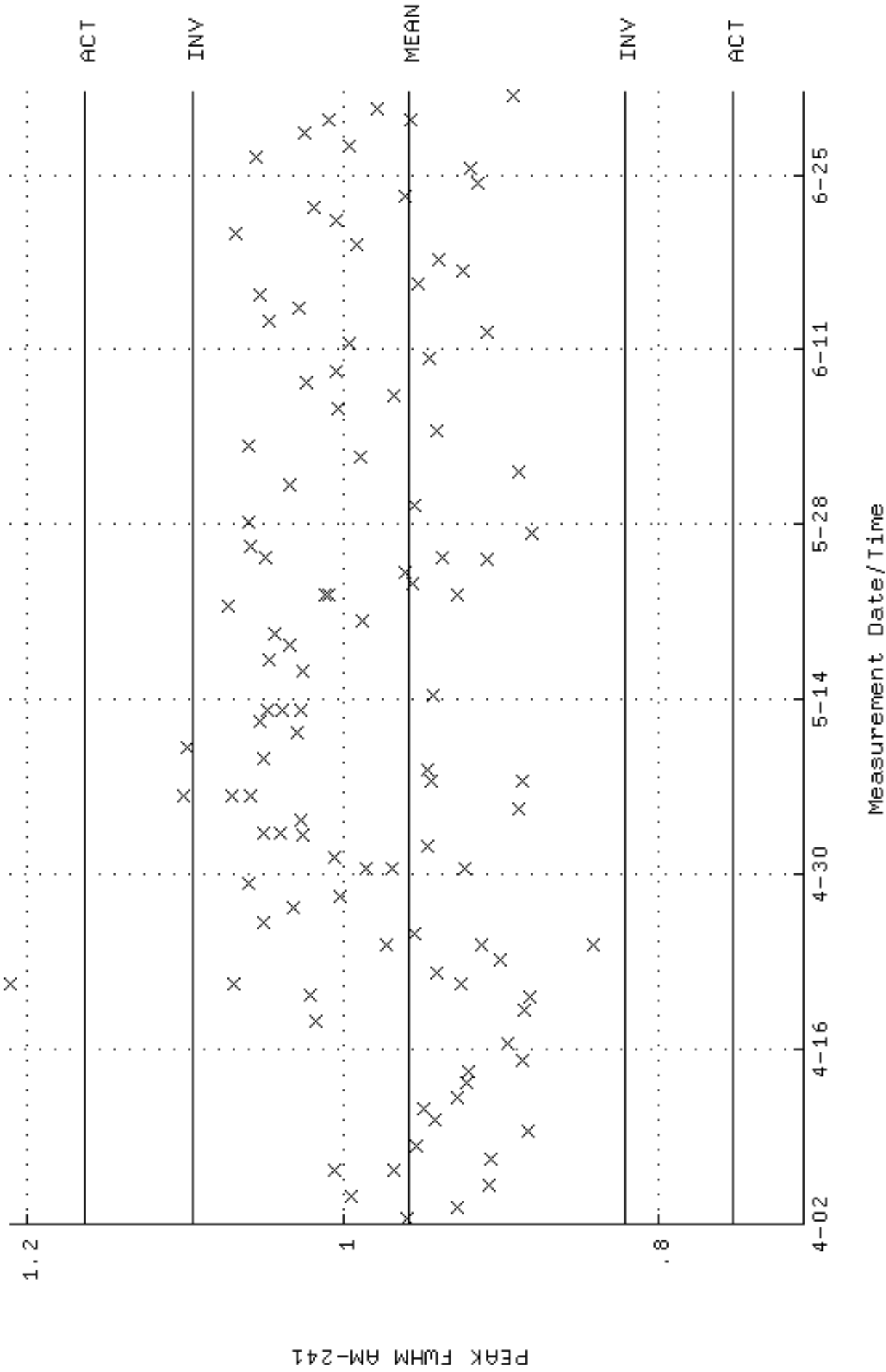
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM40.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 3-APR-2022 11:21:00 through 1-JUL-2022 12:00:00
Mean +- Std Dev : 1.47438 +- 2.782692E-02 (1.89 %)



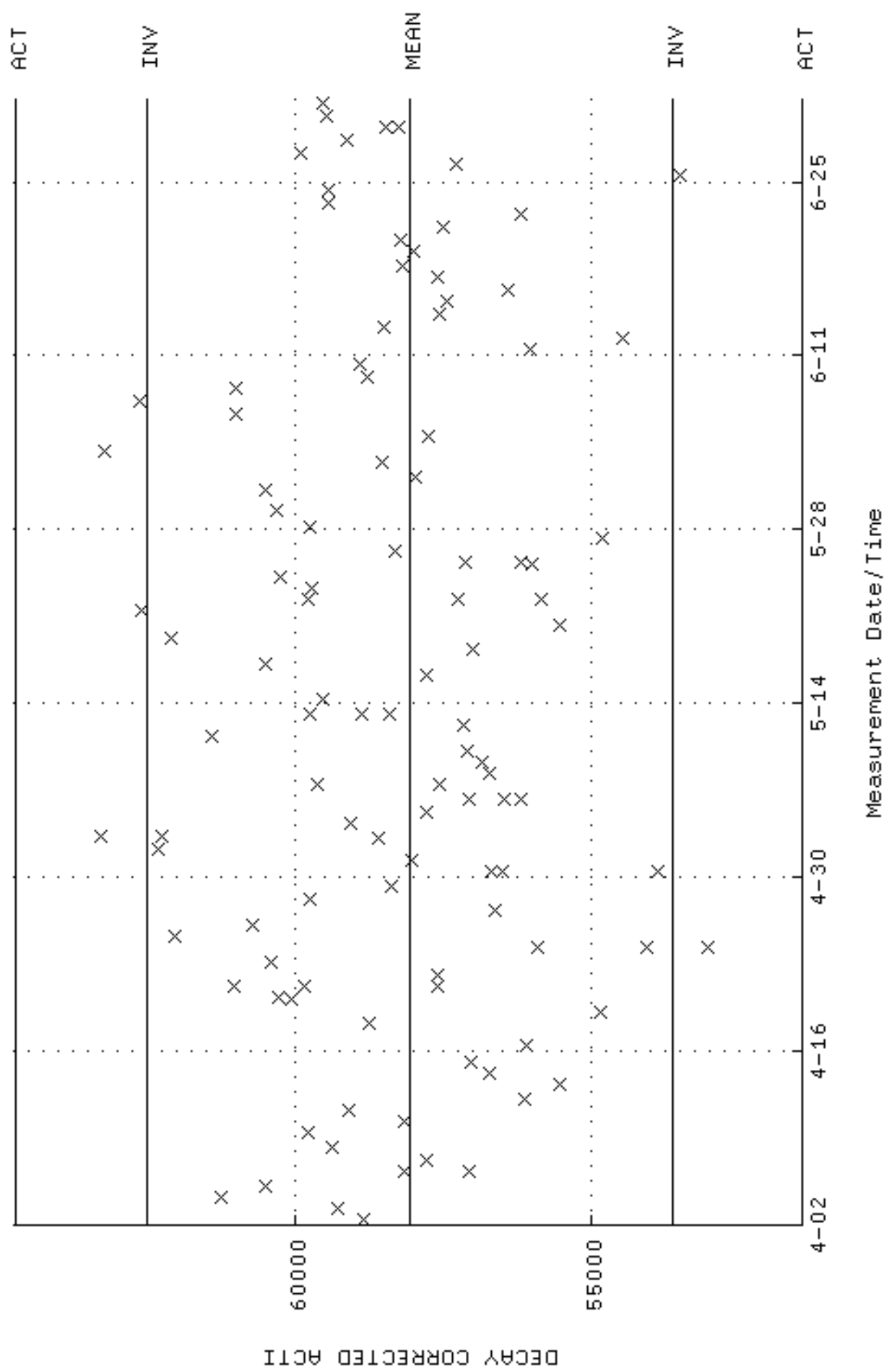
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM43_JAR.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-APR-2022 10:03:04 through 1-JUL-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



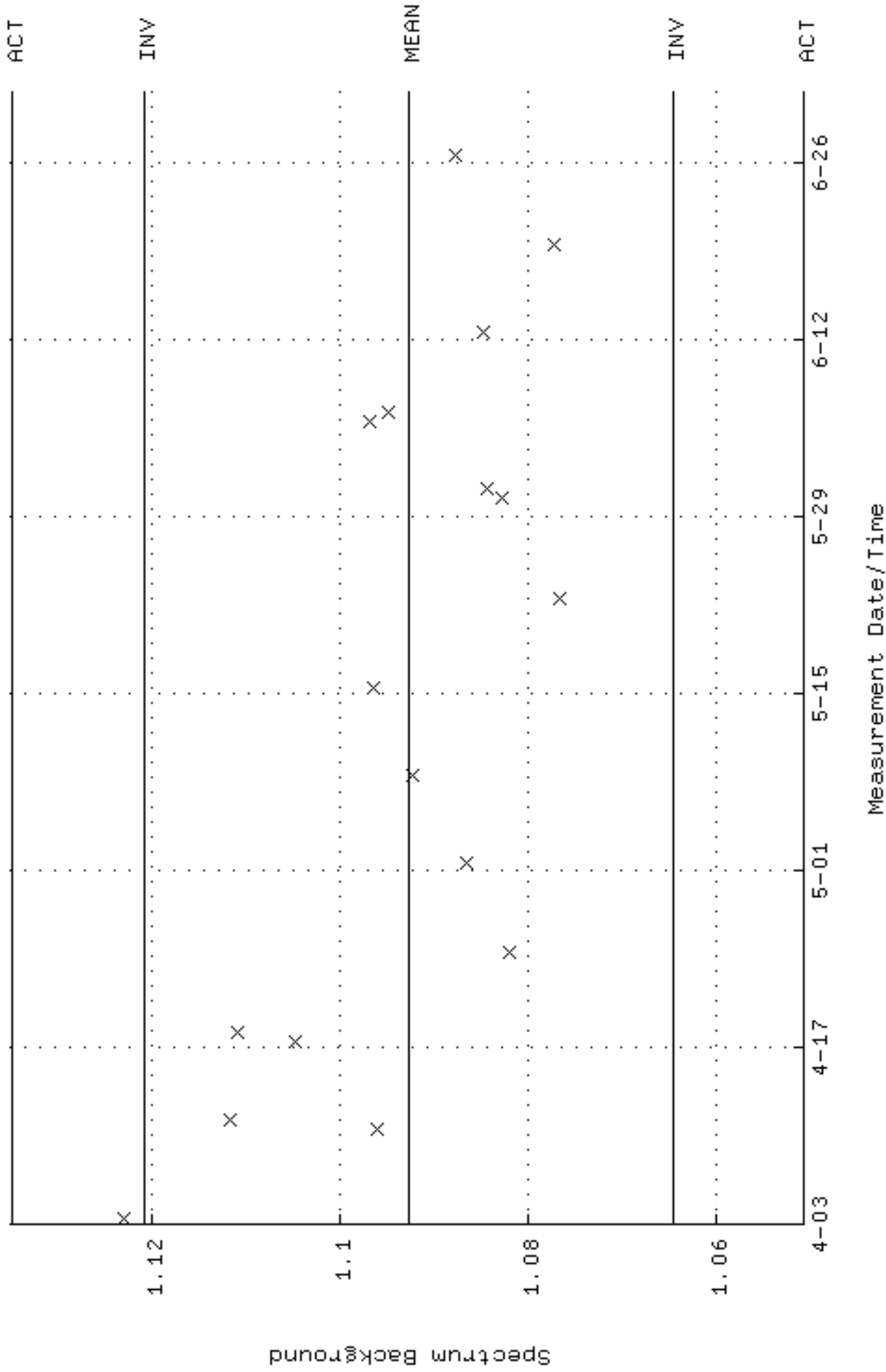
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC-GAM43_JAR.QAF;1
Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
Start/End Dates : 2-APR-2022 10:03:04 through 1-JUL-2022 12:00:00
Mean +- Std Dev : 0.958943 +- 6.834434E-02 (7.13 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM43-JAR.QAF;1
Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-APR-2022 10:03:04 through 1-JUL-2022 12:00:00
Mean +- Std Dev : 58085.1 +- 2213.88 (3.81 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM43.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 3-APR-2022 11:31:06 through 1-JUL-2022 12:00:00
Mean +- Std Dev : 1.09279 +- 1.406415E-02 (1.29 %)



RAD Standards Traceability

1298

CERTIFICATE OF CALIBRATION
 Standard Radionuclide Source

78962-278

200 mL Solid in 250 mL PP MRP Jar

Customer: GEL Laboratories, LLC

P.O. No.: 88007 RD, Item 1

Calibration Date: 01-Jan-2009

12:00 EST

Grams of Master Source: 0.0068241

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* yps/gram	This Source yps	Uncertainty, %			Calibration Method
					Type	u _A	u _F	U
Pb-210	46.5	8145.1	—	1.305E+03	0.30	1.50	3.06	4π LS
Am-241	59.5	157860	—	7.746E+02	0.3	1.5	3.1	4π LS
Cd-109	88.0	462.60	1.694E+05	1.156E+03	0.6	1.7	3.6	HPGe
Co-57	122.1	271.79	8.597E+04	5.867E+02	0.7	1.3	3.0	HPGe
Ce-139	165.9	137.6	1.217E+05	8.305E+02	0.5	1.1	2.4	HPGe
Hg-203	279.2	46.61	2.692E+05	1.837E+03	0.5	1.1	2.4	HPGe
Sn-113	391.7	115.1	1.709E+05	1.166E+03	0.6	1.1	2.5	HPGe
Cs-137	661.7	10983	1.071E+05	7.309E+02	0.7	1.2	2.8	HPGe
Y-88	898.0	106.6	4.084E+05	2.787E+03	0.7	1.1	2.6	HPGe
Co-60	1173.2	1925.4	2.084E+05	1.422E+03	0.8	1.1	2.7	HPGe
Co-60	1332.5	1925.4	2.086E+05	1.424E+03	1.0	1.1	3.0	HPGe
Y-88	1836.1	106.6	4.320E+05	2.948E+03	0.8	1.1	2.7	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

This standard will expire one year after the calibration date.

Source Prepared by:

W. Mao, Radiochemist

QA Approved:

D. M. Montgomery, QA Manager

Date:

2-10-07

End of Certificate

RC-S-051-017

Standard Logbook

Serial ID: 1298 Open/Reference Date: 01-JAN-09 Aliquot : 1 mL
Name: Mixed Gamma LCS JAR Received: 12-FEB-09 Density : Hand Calculated
Type: Source Material Expires: 01-JAN-35 Lot Number : 78962-278
Employee: Maggie Stamps Verified: 07-NOV-11
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

Verification for Mixed Gamma Standard

1298

JAR

M. Stamps 11/7/2011	Isotope Am-241	Result pCi/L	Isotopic Abundance: Certificate Value (dps):
	Mixed Gamma N1	60560	0.359
	Mixed Gamma N2	56920	774.6
	Mixed Gamma N3	59450	

Mean Value (Counting) =	58976.67	pCi/L	101.1344	Pass
Stdev =	1865.592	pCi/L		Rule 3 (Pass/Fail)
Certificate Value =	58315.1	pCi/L		
Lower Limit =	55245.48276	pCi/L		
Upper Limit =	62707.85057	pCi/L		
Rule 1 Pass/Fail	Pass			
Two sigma =	3731.183905			
10 % of Mean =	5897.666667			
Rule 2 (Pass/Fail)	Pass			

Stamp
11/7/11
Rec'd
11/19/11

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard 1298 JAR

M. Stamps 11/7/2011	Isotope Cs-137	Result pCi/L	Isotopic Abundance: Certificate Value (dps):	0.851 730.9
	Mixed Gamma N1	24390		
	Mixed Gamma N2	24610		
	Mixed Gamma N3	24450		
Mean Value (Counting) =	24483.33	pCi/L	105.4736	
Stdev =	113.725	pCi/L		
			Fail	
			Rule 3 (Pass/Fail)	

*Exception taken due to the high uncertainty of the certified value

Certificate Value =
 Lower Limit =
 Upper Limit =
 Rule 1 Pass/Fail
 Two sigma =
 10 % of Mean =
 Rule 2 (Pass/Fail)

*exception taken due to full recovery of standard

Handwritten signature
11/7/11

Handwritten signature
R. Futch
11/8/11

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard

1298

JAR

M. Stamps
11/7/2011

Isotope	Result
Co-60 (1332.50)	pCi/L
Mixed Gamma N1	41290
Mixed Gamma N2	40800
Mixed Gamma N3	41060

Result	
pCi/L	
41290	
40800	
41060	

Isotopic Abundance:	0.9998
Certificate Value (dps):	1424

Mean Value (Counting) =
Stdev =

41050.00	pCi/L	106.6395
245.153	pCi/L	

Fail
Rule 3 (Pass/Fail)

Fail
Rule 3 (Pas

*Exception taken due to the high uncertainty of the certified value

Certificate Value =
Lower Limit =
Upper Limit =
Rule 1 Pass/Fail
Two sigma =
10 % of Mean =
Rule 2 (Pass/Fail)

38494.2
40559.69397
41540.30603
Fail
490.3060269
4105
Pass

*exception taken due to full recovery of standard

Verification Rules

Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements

Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule 3 = The determined mean value shall be within 5% of the certificate value.

Stamp
11/7/11

R. Fuchs
11/8/11

Standard Logbook

Serial ID: 1298 **Open/Reference Date:** 01 JAN 2009 **Aliquot :** 1 mL
Name: Mixed Gamma LCS JAR **Received:** 12 FEB 2009 **Density :** Hand Calculated
Type: Source Material **Expires:** 01 JAN 2035 **Lot Number :** 78962-278
Employee: Maggie Stamps **Verified:** 07 NOV 2011
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

Runlogs

Instrument Run Log

Instrument Type: GAMMA SPECTROMETER

Batch ID: 2290721

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885001	SAMPLE	MJH1	GAM14	JUL-21-22 16:33:26	DONE JAR		09-MAY-22 00:00
585885002	SAMPLE	MJH1	GAM11	JUL-21-22 22:46:28	DONE JAR		07-MAR-22 00:00
585885003	SAMPLE	MJH1	GAM12	JUL-21-22 22:47:05	DONE JAR		21-APR-22 00:00
585905001	SAMPLE	MJH1	GAM14	JUL-21-22 22:47:37	DONE JAR		09-MAY-22 00:00
585905002	SAMPLE	MJH1	GAM16	JUL-21-22 22:48:20	DONE JAR		07-MAR-22 00:00
585905003	SAMPLE	MJH1	GAM18	JUL-21-22 22:49:13	DONE JAR		08-JUN-22 00:00
585905004	SAMPLE	MJH1	GAM30	JUL-21-22 22:50:24	DONE JAR		27-SEP-21 00:00
585905005	SAMPLE	MJH1	GAM33	JUL-21-22 22:52:48	DONE JAR		27-JUL-21 00:00
1205141122	MB	MJH1	GAM36	JUL-21-22 22:54:38	DONE JAR		20-SEP-21 00:00
1205141124	LCS	MJH1	GAM40	JUL-21-22 22:56:30	DONE JAR		13-OCT-21 00:00
1205141123	DUP	MJH1	GAM43	JUL-21-22 23:03:14	DONE JAR		22-MAR-22 00:00

Gas Flow Raw Data

Batch 2290790 Check-list

This check-list was completed on 28-JUL-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 28-JUL-22 and Nat Long on 28-JUL-22.

Batch ID:
2290790

Product:
GFC90SRF

Description: Gas Flow Strontium 90
GL-RAD-A-004

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
8	Are there any equilibrium assumptions?		No	
Quality Control (QC) Information				
9	Was the method blank (MB) within the acceptance criteria?	Yes		
10	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
11	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
13	Has the method required detection limit been met?		No	
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Strontium-90 in Filter

Batch ID: 2290790
Analyst: Jennie Kill-Bowden (JXK3)
Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified
Lab SOP: GL-RAD-A-004 REV# 22
Instrument: GAB-C133357449

Due Dates for Lab: 25-JUL-2022			Package: 27-JUL-2022		SDG: 27-JUL-2022	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205141316	Strontium-90 SPIKE	1943-C	.1	mL	
LCSD	1205141317	Strontium-90 SPIKE	1943-C	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Initial Wt (g)	Final Wt (g)	Net Weight (mg)	Sr Separation (date)	Strontium Carrier Yield (percent)
1	585885001	25-JUL-2022	3	20	0.05142	0.0357	0.0377	2	07/26/22 14:00	46
2	585885002	25-JUL-2022	3	20	0.05051	0.0355	0.0371	1.6	07/26/22 14:00	37
3	585885003	25-JUL-2022	3	20	0.05718	0.0356	0.0371	1.5	07/26/22 14:00	35
4	585905001	25-JUL-2022	3	20	0.05215	0.0358	0.0378	2	07/26/22 14:00	46
5	585905002	25-JUL-2022	3	20	0.04926	0.0357	0.0384	2.7	07/26/22 14:00	62
6	585905003	25-JUL-2022	3	20	0.04563	0.0365	0.0388	2.3	07/26/22 14:00	53
7	585905004	25-JUL-2022	3	20	0.04705	0.0359	0.038	2.1	07/26/22 14:00	49
8	585905005	25-JUL-2022	3	20	0.05101	0.0359	0.0381	2.2	07/26/22 14:00	51
9	1205141315 MB	25-JUL-2022	3		0.05718	0.0356	0.0383	2.7	07/26/22 14:00	62
10	1205141316 LCS	25-JUL-2022	3		0.05718	0.0357	0.0386	2.9	07/26/22 14:00	67
11	1205141317 LCSD	25-JUL-2022	3		0.05718	0.0359	0.0387	2.8	07/26/22 14:00	65

Reagent/Solvent Lot ID	Description	Amount	Comments:
CARR 3452293	Strontium Carrier 0.5mL=4.325 mg/mL	.5 mL	Spike Pipet ID: RAD-GFC-1795419
REGNT 3089709.7	Thymol Blue Indicator 0.04%	1 mL	Carrier Pipet ID: RAD-GFC-2154115
REGNT 3432260	RGF-0.05M Nitric Acid	15 mL	Data Entry Date2: 25-JUL-2022 13:52 GFC-C045440487 Jennie Kill-Bowden
REGNT 3444489	80% ethanol	3 mL	Data Entry Date3: 25-JUL-2022 00:00
REGNT 3454205	3M HNO3 0.05M Oxalic	10 mL	
REGNT 3461483	RGF-8M Nitric Acid	40 mL	
REGNT 3464132	RGF-6M Sodium Hydroxide	10 mL	
REGNT 3465454	0.75M Sodium Carbonate	13 mL	
REGNT SR0062	SR Resin	2 g	

Strontium-90 Filter

Filename : SR90.XLS
 File type : Excel
 Version # : 1.3.10

Carrier S/N : 3452293
 Carrier Exp Date : 6/20/2023
 Carrier Volume Added: 0.50
 Carrier Weight (mg/ml): 8.65
 Carrier Weight StDev.: 0.06

Batch : 2290790
 Analyst : JEN02186
 Prep Date : 7/25/2022
 Method Uncertainty : 0.1315

Procedure Code : GFC90SRF
 Parmname : Strontium-90
 Required MDA : 3 pCi/F
 Sr-90 Abundance : 1.00
 Halflife of Sr-90 : 28.90 years
 Halflife of Y-90 : 64.053 hours

Geometry: Tuffryn Filter

Sample Characteristics					Carrier Calculations				
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Carrier Weight (mg) (Standard)	Net Weight (mg) (Sample)	Net Weight StDev. (mg)	Carrier Aliquot (mL)	Carrier Aliquot StDev. (mL)
1	585885001.1	0.0514	7.9479E-06	6/27/2022 9:24	8.65	2.00	0.015926	0.5	0.001000
2	585885002.1	0.0505	7.8746E-06	6/27/2022 9:38	8.65	1.60	0.014207	0.5	0.001000
3	585885003.1	0.0572	8.4023E-06	6/27/2022 10:00	8.65	1.50	0.013777	0.5	0.001000
4	585905001.1	0.0521	8.0060E-06	6/27/2022 9:43	8.65	2.00	0.015926	0.5	0.001000
5	585905002.1	0.0493	7.7734E-06	6/27/2022 9:52	8.65	2.70	0.018935	0.5	0.001000
6	585905003.1	0.0456	7.4767E-06	6/27/2022 10:01	8.65	2.30	0.017215	0.5	0.001000
7	585905004.1	0.0471	7.5937E-06	6/27/2022 10:08	8.65	2.10	0.016356	0.5	0.001000
8	585905005.1	0.0510	7.9153E-06	6/27/2022 12:00	8.65	2.20	0.016786	0.5	0.001000
9	1205141315.1	0.0572	8.4023E-06	7/25/2022 0:00	8.65	2.70	0.018935	0.5	0.001000
10	1205141316.1	0.0572	8.4023E-06	7/25/2022 0:00	8.65	2.90	0.019794	0.5	0.001000
11	1205141317.1	0.0572	8.4023E-06	7/25/2022 0:00	8.65	2.80	0.019364	0.5	0.001000

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-004
 Instrument SOP: GL-RAD-I-016

Count Raw Data												
	Counting			Gross Counts		Gross Beta	Count	Strontium			Calculated	
	Detector	Time				Start	Separation		Yttrium	Sr-90	Sample	Sample
Pos.	ID	(min.)	Alpha	Beta	CPM	Date/Time	Date/Time		Ingrowth	Decay	Recovery %	Recovery Error %
1	6A	500	57	8559	17.108	7/26/2022 19:10	7/26/2022 14:00		0.096	0.998	46.2%	1.34%
2	6C	500	21	2328	4.653	7/26/2022 19:10	7/26/2022 14:00		0.096	0.998	37.0%	1.45%
3	7A	500	41	588	1.171	7/26/2022 19:10	7/26/2022 14:00		0.096	0.998	34.7%	1.49%
4	7B	500	21	342	0.682	7/26/2022 19:10	7/26/2022 14:00		0.096	0.998	46.2%	1.34%
5	7C	500	59	462	0.915	7/26/2022 19:10	7/26/2022 14:00		0.096	0.998	62.4%	1.23%
6	7D	500	94	318	0.623	7/26/2022 19:10	7/26/2022 14:00		0.096	0.998	53.2%	1.28%
7	8C	500	28	254	0.506	7/26/2022 19:10	7/26/2022 14:00		0.096	0.998	48.6%	1.32%
8	8C	500	27	223	0.444	7/27/2022 10:14	7/26/2022 14:00		0.232	0.998	50.9%	1.30%
9	8D	500	17	464	0.927	7/27/2022 10:14	7/26/2022 14:00		0.232	1.000	62.4%	1.23%
10	13A	60	5	916	15.262	7/26/2022 17:47	7/26/2022 14:00		0.045	1.000	67.1%	1.21%
11	13B	60	3	838	13.964	7/26/2022 17:47	7/26/2022 14:00		0.045	1.000	64.7%	1.22%

Calibration Data										
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)		Detector Efficiency Error (cpm/dpm)	Alpha X-Talk	Weekly Bkg CPM	Weekly Bkg Count Start Date/Time	Weekly Bkg Count Time (min.)
1	PIC	4/1/2021	3/31/2023	0.3453	0.4802	0.02228	0.08391	0.990	7/23/2022 12:20	500
2	PIC	4/1/2021	3/31/2023	0.3478	0.4867	0.01970	0.06795	1.084	7/23/2022 12:20	500
3	PIC	4/1/2021	3/31/2023	0.3442	0.5013	0.00594	0.06005	1.330	7/23/2022 12:20	500
4	PIC	4/1/2021	3/31/2023	0.3471	0.5082	0.00627	0.05180	0.644	7/23/2022 12:20	500
5	PIC	4/1/2021	3/31/2023	0.3486	0.4907	0.00790	0.07364	0.840	7/23/2022 12:20	500
6	PIC	4/1/2021	3/31/2023	0.3482	0.4994	0.01113	0.06820	0.538	7/23/2022 12:20	500
7	PIC	4/1/2021	3/31/2023	0.3562	0.5218	0.01955	0.03167	0.408	7/23/2022 12:20	500
8	PIC	4/1/2021	3/31/2023	0.3563	0.5218	0.01955	0.03167	0.408	7/23/2022 12:20	500
9	PIC	4/1/2021	3/31/2023	0.3640	0.5289	0.00609	0.02922	0.938	7/23/2022 12:20	500
10	PIC	4/1/2021	3/31/2023	0.3369	0.4928	0.00714	0.05461	1.384	7/23/2022 12:20	500
11	PIC	4/1/2021	3/31/2023	0.3510	0.5164	0.00967	0.05782	1.120	7/23/2022 12:20	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1943-C
LCS Exp Date : 1/4/2023
LCS Activity (dpm/ml): 519.88
LCS Volume Added: 0.10

Results																		Scanned Detector
Pos.	Decision	Critical	Required	Sample Act. Conc. pCi/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA	2 SIGMA	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery			
	Level	Level	MDA					Total Prop.										
	pCi/F	pCi/F	pCi/F					Uncertainty pCi/F	Uncertainty pCi/F									
1	7.1088	5.0189	3	10.3286	781.4746	2.85%	16.1184	0.1903	18.0794	208.9124	SAMPLE							
2	9.3908	6.6300	3	13.6273	218.4579	3.87%	3.5691	0.1071	12.8506	59.2981	SAMPLE							
3	9.8584	6.9601	3	14.2682	-9.2190	44.53%	-0.1589	0.0707	8.0413	8.0414	SAMPLE							
4	5.5899	3.9465	3	8.1767	1.7879	136.15%	0.0378	0.0515	4.7708	4.7934	SAMPLE							
5	5.0080	3.5357	3	7.2939	2.7925	78.69%	0.0753	0.0593	4.3061	4.3668	SAMPLE							
6	5.0734	3.5818	3	7.4453	3.9980	56.60%	0.0852	0.0482	4.4334	4.5544	SAMPLE							
7	4.5753	3.2302	3	6.7520	4.7745	43.60%	0.0982	0.0428	4.0738	4.2652	SAMPLE							
8	3.4294	2.4212	3	5.0610	1.3222	113.79%	0.0363	0.0413	2.9483	2.9690	SAMPLE							
9	3.7005	2.6126	3	5.3808	-0.2850	555.55%	-0.0110	0.0611	3.1037	3.1038	MB							
10	12.2511	8.6494	3	18.9344	453.9923	3.91%	13.8781	0.5071	32.5129	122.2486	LCS			409.5823	110.8%			
11	10.9509	7.7315	3	17.0882	417.4897	4.08%	12.8438	0.4847	30.8827	112.9446	LCSD	8.4%		409.5823	101.9%			

Results (DPM)															
Decision Level DPM/F	Critical Level DPM/F	Required MDA DPM/F	MDA DPM/F	Sample Act. Conc. DPM/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	1 SIGMA Counting Uncertainty DPM/F	1 SIGMA Total Prop. Uncertainty DPM/F	Sample QC	Sample Type	RPD	RER	Nominal DPM/F	Recovery
15.7815	11.1419	6.66	22.9296	1734.8737	2.85%	16.1184	0.1903	40.1362	463.7854		SAMPLE				
20.8476	14.7186	6.66	30.2525	484.9765	3.87%	3.5691	0.1071	28.5283	131.6418		SAMPLE				
21.8856	15.4514	6.66	31.6755	-20.4662	44.53%	-0.1589	0.0707	17.8517	17.8519		SAMPLE				
12.4097	8.7613	6.66	18.1523	3.9692	136.15%	0.0378	0.0515	10.5912	10.6412		SAMPLE				
11.1178	7.8492	6.66	16.1924	6.1993	78.69%	0.0753	0.0593	9.5596	9.6943		SAMPLE				
11.2629	7.9517	6.66	16.5286	8.8756	56.60%	0.0852	0.0482	9.8422	10.1107		SAMPLE				
10.1571	7.1710	6.66	14.9894	10.5994	43.60%	0.0982	0.0428	9.0438	9.4688		SAMPLE				
7.6134	5.3751	6.66	11.2355	2.9353	113.79%	0.0363	0.0413	6.5452	6.5912		SAMPLE				
8.2151	5.8000	6.66	11.9453	-0.6328	555.55%	-0.0110	0.0611	6.8903	6.8904		MB				
27.1975	19.2016	6.66	42.0344	1007.8628	3.91%	13.8781	0.5071	72.1787	271.3918		LCS			909.27	110.8%
24.3111	17.1638	6.66	37.9357	926.8270	4.08%	12.8438	0.4847	68.5595	250.7371		LCSD	8.4%		909.27	101.9%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
585885001	6A	500	57	8559	7/26/2022 19:10	7/27/2022 3:30	PIC	2290790
585885002	6C	500	21	2328	7/26/2022 19:10	7/27/2022 3:30	PIC	2290790
585885003	7A	500	41	588	7/26/2022 19:10	7/27/2022 3:30	PIC	2290790
585905001	7B	500	21	342	7/26/2022 19:10	7/27/2022 3:30	PIC	2290790
585905002	7C	500	59	462	7/26/2022 19:10	7/27/2022 3:30	PIC	2290790
585905003	7D	500	94	318	7/26/2022 19:10	7/27/2022 3:30	PIC	2290790
585905004	8C	500	28	254	7/26/2022 19:10	7/27/2022 3:30	PIC	2290790
585905005	8C	500	27	223	7/27/2022 10:14	7/27/2022 18:34	PIC	2290790
1205141315	8D	500	17	464	7/27/2022 10:14	7/27/2022 18:34	PIC	2290790
1205141316	13A	60	5	916	7/26/2022 17:47	7/26/2022 18:47	PIC	2290790
1205141317	13B	60	3	838	7/26/2022 17:47	7/26/2022 18:47	PIC	2290790

Batch 2290788 Check-list

This check-list was completed on 27-JUL-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 27-JUL-22 and Nat Long on 27-JUL-22.

Batch ID:
2290788

Product:
GFCTORAF

Description: Gas Flow Total Radium
GL-RAD-A-010

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?		No	
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Total Radium in Filter

Batch ID: 2290788

Analyst: Jasmine Conley (JXC9)
 Prep: Kyle Hollandsworth (KH1)
Method: EPA 900.1 Mod/ EPA 903.0 Mod
Lab SOP: GL-RAD-A-010 REV# 21
Instrument: GFC-C008029151

Due Dates for Lab: 25-JUL-2022

Package: 27-JUL-2022

SDG: 27-JUL-2022

Type	Sample ID	Description	Serial Number	Spike Amount	Spike Units
LCS	1205141313		1926-C	.1	mL
LCSD	1205141314		1926-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Precipitation (date)	Initial Weight (g)	Final Weight (g)	Net Weight (mg)	Barium Carrier Yield (percent)
1	585905001	19-JUL-2022	1	5	0.01304	07/25/22 14:19	0.088	0.1128	24.8	97
2	585905002	19-JUL-2022	1	5	0.01231	07/25/22 14:19	0.0873	0.1139	26.6	104
3	585905003	19-JUL-2022	1	5	0.01141	07/25/22 14:19	0.0877	0.1141	26.4	103
4	585905004	19-JUL-2022	1	5	0.01176	07/25/22 14:19	0.0864	0.1135	27.1	106
5	585905005	19-JUL-2022	1	5	0.01275	07/25/22 14:19	0.086	0.1007	14.7	57
6	1205141312 MB	19-JUL-2022	1		0.01304	07/25/22 14:19	0.0882	0.1117	23.5	92
7	1205141313 LCS	19-JUL-2022	1		0.01304	07/25/22 14:19	0.0881	0.1115	23.4	91
8	1205141314 LCSD	19-JUL-2022	1		0.01304	07/25/22 14:19	0.0874	0.1119	24.5	96

Reagent/Solvent Lot ID	Description	Amount
CARR 3437074	Barium Carrier TR 1ml=25.58mg	1 mL
REGNT 3439264	1:1 Sulfuric Acid	10 mL

Comments:

Pipet ID: RAD-GFC-1795419
 Pipet ID: RAD-GFC-1608405
 Data Entry Date2: 19-JUL-2022 00:00
 Data Entry Date3: 19-JUL-2022 15:03 GFC-C008029151 Jasmine Conley

Total Radium Filter

Filename : TOTRA.XLS
File type : Excel
Version # : 1.3.9

Carrier S/N : 3437074
Carrier Exp Date : 5/11/2023
Carrier Volume Added: 1.00
Carrier Weight (mg/ml): 25.58
Carrier Weight StDev.: 0.05

Batch : 2290788
Analyst : KYL02443
Prep Date : 7/19/2022
Method Uncertainty: 0.0802

Procedure Code : GFCTORAF
Parmname : Total Radium
Required MDA : 1 pCi/F
Half-life of Rn-222 : 3.8235 days

Geometry: 47mm Filter

Sample Characteristics					Carrier Calculations				
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Carrier Weight (mg) (Standard)	Residue Weight (mg) (Sample)	Residue Weight StDev. (mg)	Carrier Aliquot (mL)	Carrier Aliquot StDev. (mL)
1	585905001.1	0.0130	4.5387E-06	6/27/2022 9:43	25.58	24.80	0.113920	1.0	0.002000
2	585905002.1	0.0123	4.4679E-06	6/27/2022 9:52	25.58	26.60	0.121657	1.0	0.002000
3	585905003.1	0.0114	4.3786E-06	6/27/2022 10:01	25.58	26.40	0.120797	1.0	0.002000
4	585905004.1	0.0118	4.4137E-06	6/27/2022 10:08	25.58	27.10	0.123806	1.0	0.002000
5	585905005.1	0.0128	4.5110E-06	6/27/2022 12:00	25.58	14.70	0.070511	1.0	0.002000
6	1205141312.1	0.0130	4.5387E-06	7/19/2022 0:00	25.58	23.50	0.108333	1.0	0.002000
7	1205141313.1	0.0130	4.5387E-06	7/19/2022 0:00	25.58	23.40	0.107903	1.0	0.002000
8	1205141314.1	0.0130	4.5387E-06	7/19/2022 0:00	25.58	24.50	0.112631	1.0	0.002000

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml
 Pipet, 5 ml Stdev : +/- 0.010000 ml

Analytical SOP: GL-RAD-A-010
 Instrument SOP: GL-RAD-I-016

Count Raw Data										
Pos.	Detector ID	Counting	Gross Counts		Gross Alpha	Count	Precipitation	Ingrowth	Calculated	Sample
		Time (min.)	Alpha	Beta	CPM	Start Date/Time			Recovery %	
1	2A	500	67	471	0.134	7/26/2022 19:06	7/25/2022 14:19	1.661	97.0%	0.71%
2	2B	500	41	464	0.082	7/26/2022 19:06	7/25/2022 14:19	1.661	104%	0.70%
3	2C	500	127	585	0.254	7/26/2022 19:06	7/25/2022 14:19	1.661	103%	0.70%
4	3B	500	54	348	0.108	7/26/2022 19:06	7/25/2022 14:19	1.661	106%	0.70%
5	3C	500	30	672	0.060	7/26/2022 19:06	7/25/2022 14:19	1.661	57.5%	0.73%
6	3D	500	43	351	0.086	7/26/2022 19:06	7/25/2022 14:19	1.661	91.9%	0.71%
7	13D	60	5801	4604	96.683	7/26/2022 14:57	7/25/2022 14:19	1.519	91.5%	0.71%
8	14A	60	5789	4808	96.483	7/26/2022 14:57	7/25/2022 14:19	1.519	95.8%	0.71%

Calibration Data								
Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Beta X-Talk	Weekly Bkg Count CPM	Weekly Bkg Count Start Date/Time	Weekly Bkg Count Time (min.)
PIC	6/1/2022	5/31/2023	0.2924	0.01946	0.00348	0.076	7/23/2022 12:19	500
PIC	6/1/2022	5/31/2023	0.2934	0.02011	0.00164	0.108	7/23/2022 12:19	500
PIC	6/1/2022	5/31/2023	0.3078	0.01156	0.00571	0.166	7/23/2022 12:19	500
PIC	6/1/2022	5/31/2023	0.2761	0.00853	0.00011	0.044	7/23/2022 12:18	500
PIC	6/1/2022	5/31/2023	0.2921	0.00568	0.00010	0.026	7/23/2022 12:19	500
PIC	6/1/2022	5/31/2023	0.2636	0.00657	0.00012	0.080	7/23/2022 12:19	500
PIC	6/1/2022	5/31/2023	0.3061	0.01236	0.00012	0.054	7/23/2022 12:20	500
PIC	6/1/2022	5/31/2023	0.3005	0.02505	0.00136	0.108	7/23/2022 12:20	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1926-C
LCS Exp Date : 9/15/2022
LCS Activity (dpm/ml): 2403.84
LCS Volume Added: 0.10

Results																
	Decision	Critical	Required		Sample Act.	Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA						
Pos.	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.	Sample	Sample			Nominal	
	pCi/F	pCi/F	pCi/F	pCi/F	pCi/F	%	CPM	CPM	Uncertainty	Uncertainty	QC	Type			pCi/F	Recovery
1	2.9811	2.1047	1	4.6497	4.0153	35.39%	0.0580	0.0205	2.9476	3.0275		SAMPLE				
2	3.4955	2.4679	1	5.3688	-1.9863	75.01%	-0.0260	0.0195	2.7578	2.7579		SAMPLE				
3	4.4919	3.1713	1	6.7915	6.0840	32.96%	0.0880	0.0290	4.2500	4.3776		SAMPLE				
4	2.4356	1.7195	1	3.9119	5.0365	27.27%	0.0640	0.0174	2.6927	2.8091		SAMPLE				
5	3.0098	2.1249	1	5.0099	4.2904	38.58%	0.0340	0.0131	3.2560	3.3265		SAMPLE				
6	3.5803	2.5277	1	5.5709	0.5084	303.68%	0.0060	0.0182	3.0677	3.0688		MB				
7	6.0093	4.2426	1	12.5469	7848.8057	1.94%	96.6293	1.2694	202.1191	1269.4268		LCS			8306.1179	94.5%
8	8.2690	5.8380	1	15.6279	7608.9381	2.92%	96.3753	1.2682	196.4650	1274.1731		LCSD	3.1%		8306.1179	91.6%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
585905001	2A	500	67	471	7/26/2022 19:06	7/27/2022 3:26	PIC	2290788
585905002	2B	500	41	464	7/26/2022 19:06	7/27/2022 3:26	PIC	2290788
585905003	2C	500	127	585	7/26/2022 19:06	7/27/2022 3:26	PIC	2290788
585905004	3B	500	54	348	7/26/2022 19:06	7/27/2022 3:26	PIC	2290788
585905005	3C	500	30	672	7/26/2022 19:06	7/27/2022 3:26	PIC	2290788
1205141312	3D	500	43	351	7/26/2022 19:06	7/27/2022 3:26	PIC	2290788
1205141313	13D	60	5801	4604	7/26/2022 14:57	7/26/2022 15:57	PIC	2290788
1205141314	14A	60	5789	4808	7/26/2022 14:57	7/26/2022 15:57	PIC	2290788

Batch 2290786 Check-list

This check-list was completed on 28-JUL-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 28-JUL-22 and Nat Long on 28-JUL-22.

Batch ID:
2290786

Product:
GFC28RAF

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
11	Has the method required detection limit been met?		No	
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Filter

Batch ID: 2290786
Analyst: Jasmine Conley (JXC9)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: LUCAS-C037036045

Due Dates for Lab: 25-JUL-2022			Package: 27-JUL-2022		SDG: 27-JUL-2022	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205141307	Radium-228	1965-C	.1	mL	
LCSD	1205141308	Radium-228	1965-C	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	585905001	25-JUL-2022	1	30	0.07822	07/26/22 12:00	07/28/22 07:00
2	585905002	25-JUL-2022	1	30	0.07388	07/26/22 12:00	07/28/22 07:00
3	585905003	25-JUL-2022	1	30	0.06845	07/26/22 12:00	07/28/22 07:00
4	585905004	25-JUL-2022	1	30	0.07058	07/26/22 12:00	07/28/22 07:00
5	585905005	25-JUL-2022	1	30	0.07652	07/26/22 12:00	07/28/22 07:00
6	1205141306 MB	25-JUL-2022	1		0.07822	07/26/22 12:00	07/28/22 07:00
7	1205141307 LCS	25-JUL-2022	1		0.07822	07/26/22 12:00	07/28/22 07:00
8	1205141308 LCSD	25-JUL-2022	1		0.07822	07/26/22 12:00	07/28/22 07:00

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 25-JUL-2022 00:00
REGNT 3413388	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3413919	RGF-50% Potassium Carbonate	2 mL	
REGNT 3418276.6	29M HF (48-50%)	4 mL	
REGNT 3424228	RGF-Neodymium Subtrate	5 mL	
REGNT 3426198	2M HCl	20 mL	
REGNT 3450331	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3455703	RGF-7M Nitric Acid	25 mL	
REGNT 3460112.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3461476	RGF-1M Citric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT DGA0035	2281828	2 g	

Radium-228 Filter

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.2

Tracer S/N : 1951-D
 Tracer Exp Date : 6/2/2023
 Tracer Volume Added: 0.10

Batch : 2290786
 Analyst : JAS02031
 Prep Date : 7/25/2022
 Ra-228 Method Uncertainty : 0

Procedure Code : GFC28RAF
 Parmname : Radium-228
 Required MDA : 1 pCi/F
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations					
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	585905001.1	0.0782	9.9481E-06	6/27/2022 9:43	1272.1	1.62%	601.5	2.35%	0.1	0.000200
2	585905002.1	0.0739	9.6440E-06	6/27/2022 9:52	1272.1	1.62%	584.6	2.39%	0.1	0.000200
3	585905003.1	0.0684	9.2524E-06	6/27/2022 10:01	1272.1	1.62%	577.9	2.40%	0.1	0.000200
4	585905004.1	0.0706	9.4073E-06	6/27/2022 10:08	1272.1	1.62%	999.2	1.83%	0.1	0.000200
5	585905005.1	0.0765	9.8299E-06	6/27/2022 12:00	1272.1	1.62%	592.6	2.37%	0.1	0.000200
6	1205141306.1	0.0782	9.9481E-06	7/25/2022 0:00	1272.1	1.62%	975.6	1.85%	0.1	0.000200
7	1205141307.1	0.0782	9.9481E-06	7/25/2022 0:00	1272.1	1.62%	1094.6	1.75%	0.1	0.000200
8	1205141308.1	0.0782	9.9481E-06	7/25/2022 0:00	1272.1	1.62%	997.6	1.83%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
1	1A	90	11	157	1.744	7/28/2022 9:04	7/26/2022 12:00	7/28/2022 7:00	0.990	0.791	0.992	1.087	47.3%	1.45%
2	1D	90	18	93	1.033	7/28/2022 9:05	7/26/2022 12:00	7/28/2022 7:00	0.990	0.790	0.992	1.087	46.0%	1.47%
3	4B	90	18	128	1.422	7/28/2022 9:05	7/26/2022 12:00	7/28/2022 7:00	0.990	0.790	0.992	1.087	45.4%	1.48%
4	5B	90	15	144	1.600	7/28/2022 9:05	7/26/2022 12:00	7/28/2022 7:00	0.990	0.790	0.992	1.087	78.5%	1.25%
5	5D	90	18	87	0.967	7/28/2022 9:05	7/26/2022 12:00	7/28/2022 7:00	0.990	0.790	0.992	1.087	46.6%	1.46%
6	6A	90	15	78	0.867	7/28/2022 9:05	7/26/2022 12:00	7/28/2022 7:00	0.999	0.791	0.992	1.087	76.7%	1.26%
7	6B	60	18	821	13.683	7/28/2022 9:04	7/26/2022 12:00	7/28/2022 7:00	0.999	0.792	0.992	1.057	86.0%	1.23%
8	6C	60	6	848	14.133	7/28/2022 9:04	7/26/2022 12:00	7/28/2022 7:00	0.999	0.791	0.992	1.057	78.4%	1.25%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6209	0.00738	1.920	7/23/2022 12:19	500
2	PIC	6/1/2022	5/31/2023	0.6048	0.00692	0.950	7/23/2022 12:19	500
3	PIC	6/1/2022	5/31/2023	0.6400	0.01519	1.646	7/23/2022 12:19	500
4	PIC	6/1/2022	5/31/2023	0.6336	0.00426	1.512	7/23/2022 12:20	500
5	PIC	6/1/2022	5/31/2023	0.6236	0.00925	0.936	7/23/2022 12:20	500
6	PIC	6/1/2022	5/31/2023	0.6328	0.02228	0.990	7/23/2022 12:20	500
7	PIC	6/1/2022	5/31/2023	0.6280	0.00851	1.084	7/23/2022 12:20	500
8	PIC	6/1/2022	5/31/2023	0.6123	0.01970	1.084	7/23/2022 12:20	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1965-C
LCS Exp Date : 8/5/2022
LCS Activity (dpm/ml): 303.04
LCS Volume Added: 0.10

Results																
Pos.	Decision	Critical	Required	MDA	Sample Act.	Sample Act.	Net Count	Net Count	2 SIGMA		Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA						Counting	Total Prop.						
	pCi/F	pCi/F	pCi/F	pCi/F	Conc.	Error	Rate	Rate Error	Uncertainty	Uncertainty	QC	Type			pCi/F	
1	10.1470	7.1639	1	15.2427	-4.8187	86.82%	-0.1756	0.1524	8.1983	8.1983		SAMPLE				
2	7.9879	5.6395	1	12.3030	2.5598	138.82%	0.0833	0.1157	6.9647	6.9652		SAMPLE				
3	10.8512	7.6610	1	16.3788	-7.0942	61.79%	-0.2238	0.1382	8.5861	8.5861		SAMPLE				
4	5.8953	4.1621	1	8.9232	1.5814	163.90%	0.0880	0.1442	5.0799	5.0801		SAMPLE				
5	7.3313	5.1760	1	11.2988	0.8710	366.22%	0.0307	0.1123	6.2522	6.2522		SAMPLE				
6	4.3701	3.0853	1	6.7194	-2.0304	87.40%	-0.1233	0.1077	3.4767	3.4767		MB				
7	4.7618	3.3619	1	7.4421	181.0142	4.09%	12.5993	0.4798	13.5113	14.5114		LCS			174.5186	103.7%
8	5.3595	3.7838	1	8.3762	211.0113	4.41%	13.0493	0.4876	15.4529	18.2242		LCSD	15.3%		174.5186	120.9%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
585905001	1A	90	11	157	7/28/2022 9:04	7/28/2022 10:34	PIC	2290786
585905002	1D	90	18	93	7/28/2022 9:05	7/28/2022 10:35	PIC	2290786
585905003	4B	90	18	128	7/28/2022 9:05	7/28/2022 10:35	PIC	2290786
585905004	5B	90	15	144	7/28/2022 9:05	7/28/2022 10:35	PIC	2290786
585905005	5D	90	18	87	7/28/2022 9:05	7/28/2022 10:35	PIC	2290786
1205141306	6A	90	15	78	7/28/2022 9:05	7/28/2022 10:35	PIC	2290786
1205141307	6B	60	18	821	7/28/2022 9:04	7/28/2022 10:04	PIC	2290786
1205141308	6C	60	6	848	7/28/2022 9:04	7/28/2022 10:04	PIC	2290786

ASSAY 28-Jul-22 7:25:17
 Wizard 2480 s/n 46190630
 Protocol id 9 Ba-133_1
 Time limit
 Count limit
 Isotope Ba-133_1
 Protocol date 7/28/2022
 Run id. 5305

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF	1	92	1	180	3817	1272.1	1.62		07:25:17
585905001	2	92	2	180	1805	601.54	2.35	47.29	07:28:31
585905002	3	92	3	180	1754.28	584.64	2.39	45.96	07:31:45
585905003	4	92	4	180	1734	577.92	2.4	45.43	07:34:59
585905004	5	92	5	180	2998.28	999.23	1.83	78.55	07:38:13
585905005	1	18	1	180	1778	592.59	2.37	46.58	07:41:49
1205141306	2	18	2	180	2927.28	975.57	1.85	76.69	07:45:03
1205141307	3	18	3	180	3284	1094.55	1.75	86.04	07:48:16
1205141308	4	18	4	180	2993.28	997.56	1.83	78.42	07:51:30

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 26-Jul-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	Above	Beta bkg	26-Jul 05:27	60	2.183	-2.15E-1	2.577	+2.15
LB4100A2	Above	Beta eff	26-Jul 06:46	5	24152	19870	23260	+4.58
LB4100E2	Above	Beta bkg	26-Jul 04:57	60	2.467	1.385	3.072	+0.85
LB4100E3	Above	Beta bkg	26-Jul 04:57	60	2.433	0.506	2.576	+2.59
LB4100F3	Above	Alpha bkg	26-Jul 04:57	60	0.317	0.119	0.404	+1.16
LB4100G1	need 2nd	Alpha XTalk	26-Jul 06:04	5	0.307	0.088	0.447	+0.66
LB4100G1	Above	Beta bkg	26-Jul 04:57	60	1496	0.380	1.675	+6,928.12
LB4100G2	Above	Alpha eff	26-Jul 06:04	5	9721	7308	9581	+3.37
LB4100G2	Above	Beta bkg	26-Jul 04:57	60	4.217	1.159	2.203	+14.57
LB4100G3	Below	Alpha bkg	26-Jul 04:57	60	0.00E+0	0.002	0.276	-3.05
LB4100G3	need 2nd	Alpha eff	26-Jul 06:04	5	6634	6620	7779	-2.93
LB4100G3	Above	Beta bkg	26-Jul 04:57	60	7.167	0.810	1.674	+41.14
PIC1A	need 2nd	Alpha bkg	26-Jul 06:29	60	0.233	-1.13E-1	0.365	+1.35
PIC1A	Above	Beta bkg	26-Jul 06:29	60	2.250	-7.65E-1	2.862	+1.99
PIC2D	Below	Beta eff	26-Jul 06:38	5	38291	38700	42550	-3.64
PIC6B	Above	Beta bkg	26-Jul 06:49	60	5.133	0.389	2.636	+9.67
PIC8A	Above	Beta bkg	26-Jul 05:39	60	2.650	-2.72E-1	2.644	+3.01
PIC8B	Above	Alpha bkg	26-Jul 05:39	60	0.983	-1.16E-1	0.388	+10.11
PIC8B	Above	Beta bkg	26-Jul 05:39	60	2.467	-1.80E-1	2.341	+3.30
PIC8B	need 2nd	Beta eff	26-Jul 05:32	5	21906	20290	21980	+2.74
PIC14B	Above	Beta bkg	26-Jul 09:18	60	2.167	-2.13E-1	2.672	+1.95

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100I3
LB4100I4

Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Laura Pliskin

Date 7/26/22

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 27-Jul-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

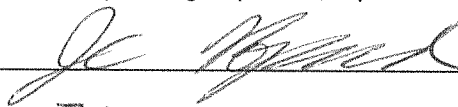
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LB4100A2	Above	Beta bkg	27-Jul 05:15	60	2.400	-2.15E-1	2.577	+2.62
LB4100A2	Above	Beta eff	27-Jul 06:34	5	24170	19870	23260	+4.61
LB4100A3	Above	Beta eff	27-Jul 06:34	5	23996	18490	23930	+3.07
LB4100E1	Below	Beta eff	27-Jul 05:51	5	13899	13920	15150	-3.10
LB4100E2	Above	Beta bkg	27-Jul 04:45	60	2.283	1.385	3.072	+0.20
LB4100E3	Above	Beta bkg	27-Jul 04:45	60	2.633	0.506	2.576	+3.17
LB4100F3	Above	Alpha bkg	27-Jul 04:45	60	0.317	0.119	0.404	+1.16
LB4100G1	Above	Alpha XTalk	27-Jul 05:51	5	1.440	0.088	0.447	+19.63
LB4100G1	Above	Beta bkg	27-Jul 04:45	60	123	0.380	1.675	+562.89
LB4100G1	Above	Beta eff	27-Jul 05:58	5	18708	12880	18320	+3.43
LB4100G2	Above	Alpha eff	27-Jul 05:51	5	9965	7308	9581	+4.01
LB4100G2	Below	Alpha XTalk	27-Jul 05:51	5	0.315	0.324	0.423	-3.56
LB4100G2	Above	Beta bkg	27-Jul 04:45	60	5.167	1.159	2.203	+20.03
LB4100G3	need 2nd	Alpha bkg	27-Jul 04:45	60	0.050	0.002	0.276	-1.95
LB4100G3	Below	Alpha eff	27-Jul 05:51	5	6512	6620	7779	-3.56
LB4100G3	Above	Beta bkg	27-Jul 04:45	60	9.617	0.810	1.674	+58.16
PIC1A	need 2nd	Alpha bkg	27-Jul 06:17	60	0.233	-1.13E-1	0.365	+1.35
PIC1A	Above	Beta bkg	27-Jul 06:17	60	2.017	-7.65E-1	2.862	+1.60
PIC8A	Above	Alpha bkg	27-Jul 05:30	60	0.333	-7.00E-2	0.356	+2.68
PIC8A	Above	Beta bkg	27-Jul 05:30	60	2.250	-2.72E-1	2.644	+2.19
PIC8B	Above	Alpha bkg	27-Jul 05:30	60	1.050	-1.16E-1	0.388	+10.90
PIC8B	Above	Beta bkg	27-Jul 05:30	60	2.483	-1.80E-1	2.341	+3.34
PIC8B	Above	Beta eff	27-Jul 05:23	5	22149	20290	21980	+3.60

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100I2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 7/27/22

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 28-Jul-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	Above	Beta bkg	28-Jul 05:18	60	2.067	-2.15E-1	2.577	+1.90
LB4100A2	Above	Beta eff	28-Jul 06:33	5	24676	19870	23260	+5.51
LB4100A3	Above	Beta eff	28-Jul 06:33	5	24257	18490	23930	+3.36
LB4100E1	Below	Beta eff	28-Jul 06:48	5	13915	13920	15150	-3.03
LB4100E2	Above	Beta bkg	28-Jul 04:48	60	2.333	1.385	3.072	+0.37
LB4100E3	Above	Beta bkg	28-Jul 04:48	60	2.300	0.506	2.576	+2.20
LB4100F3	Above	Alpha bkg	28-Jul 04:48	60	0.350	0.119	0.404	+1.87
LB4100G1	Above	Alpha XTalk	28-Jul 05:52	5	1.755	0.088	0.447	+24.90
LB4100G1	Above	Beta bkg	28-Jul 04:49	60	9374	0.380	1.675	+43,433.76
LB4100G1	Above	Beta eff	28-Jul 05:58	5	35230	12880	18320	+21.65
LB4100G2	Above	Alpha eff	28-Jul 05:52	5	9944	7308	9581	+3.96
LB4100G2	Below	Alpha XTalk	28-Jul 05:52	5	0.316	0.324	0.423	-3.47
LB4100G2	Above	Beta bkg	28-Jul 04:49	60	4.367	1.159	2.203	+15.43
LB4100G3	need 2nd	Alpha eff	28-Jul 05:52	5	6643	6620	7779	-2.88
LB4100G3	Above	Beta bkg	28-Jul 04:49	60	7.283	0.810	1.674	+41.95
PIC2D	Above	Beta bkg	28-Jul 06:20	60	2.100	0.171	2.681	+1.61
PIC4D	Above	Beta eff	28-Jul 06:29	5	41381	39320	41200	+3.58
PIC5A	Above	Alpha bkg	28-Jul 06:36	60	0.367	0.017	0.370	+2.94
PIC5A	need 2nd	Beta bkg	28-Jul 06:36	60	1.217	-4.52E-1	2.082	+0.95
PIC8A	need 2nd	Alpha bkg	28-Jul 05:37	60	0.267	-7.00E-2	0.356	+1.74
PIC8A	Above	Beta bkg	28-Jul 05:37	60	2.200	-2.72E-1	2.644	+2.09
PIC8B	Above	Alpha bkg	28-Jul 05:37	60	0.633	-1.16E-1	0.388	+5.93
PIC8B	Above	Beta bkg	28-Jul 05:37	60	2.150	-1.80E-1	2.341	+2.55
PIC8B	Above	Beta eff	28-Jul 05:29	5	22258	20290	21980	+3.99
PIC11D	Above	Alpha bkg	28-Jul 06:50	60	0.367	-4.15E-2	0.378	+2.84
PIC11D	need 2nd	Beta bkg	28-Jul 06:50	60	1.800	0.055	2.401	+1.46
PIC14B	Above	Beta bkg	28-Jul 07:01	60	2.317	-2.13E-1	2.672	+2.26
PIC14B	Above	Beta eff	28-Jul 05:46	5	22049	20700	22000	+3.23

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

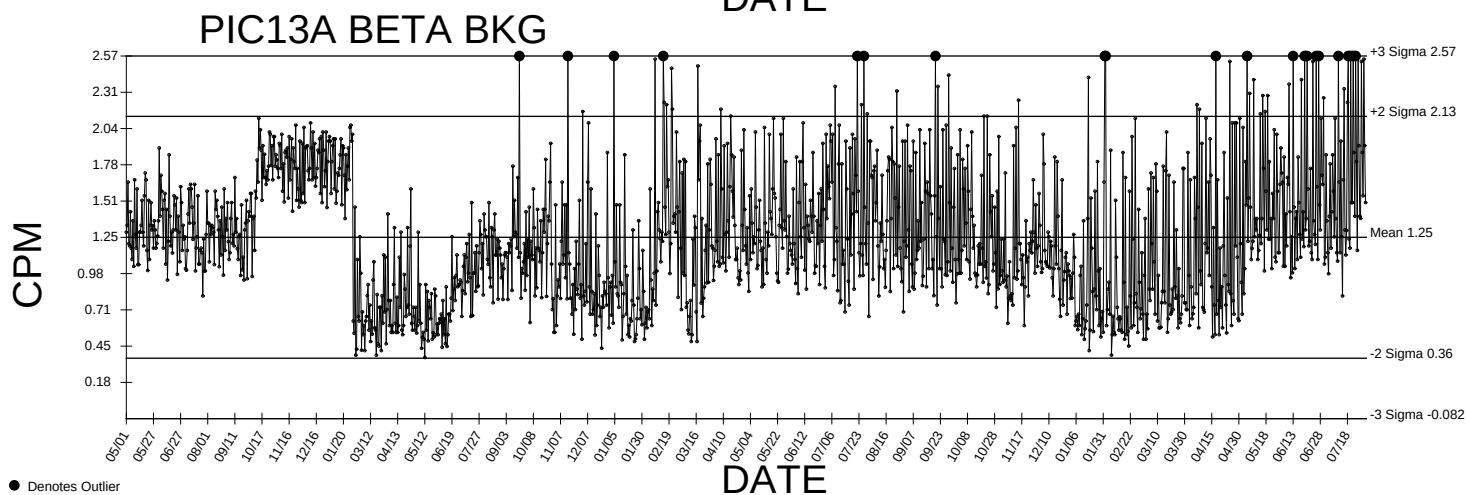
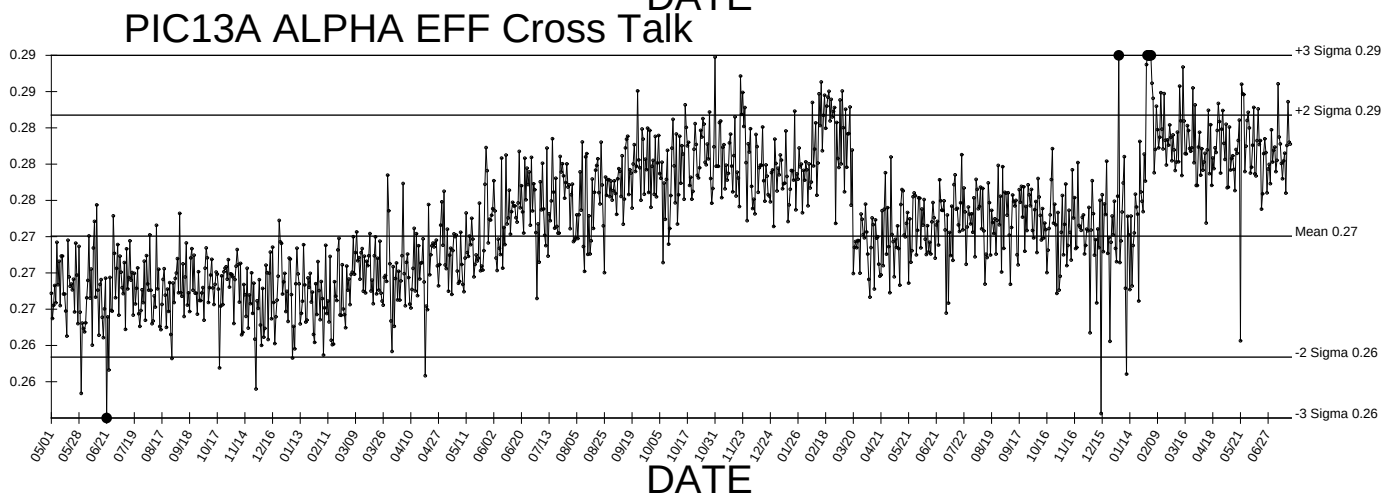
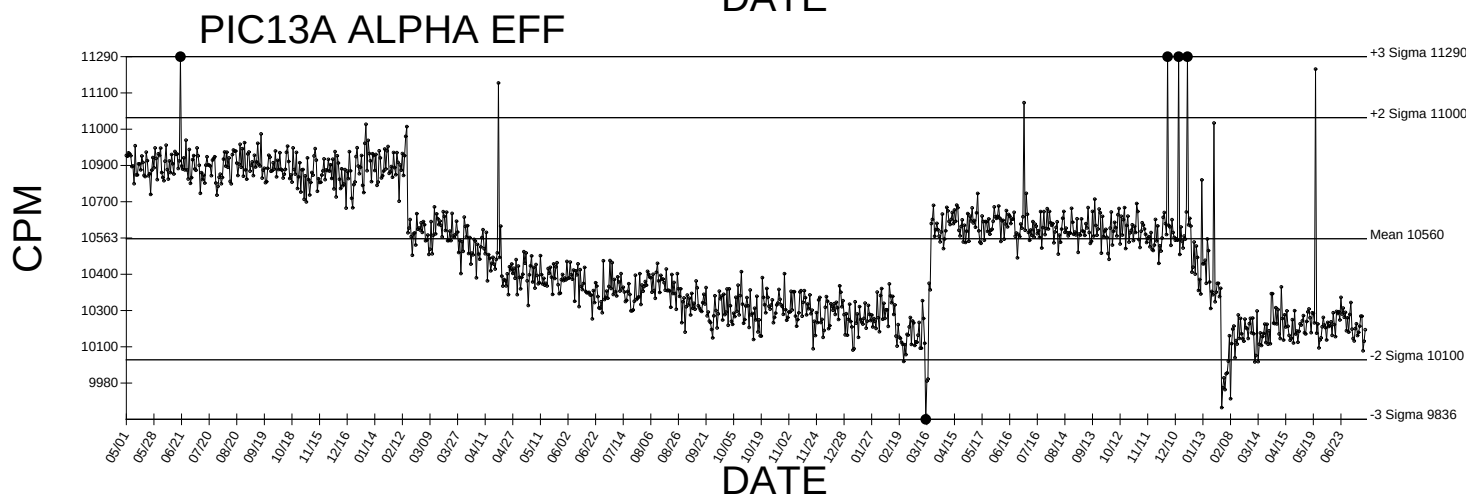
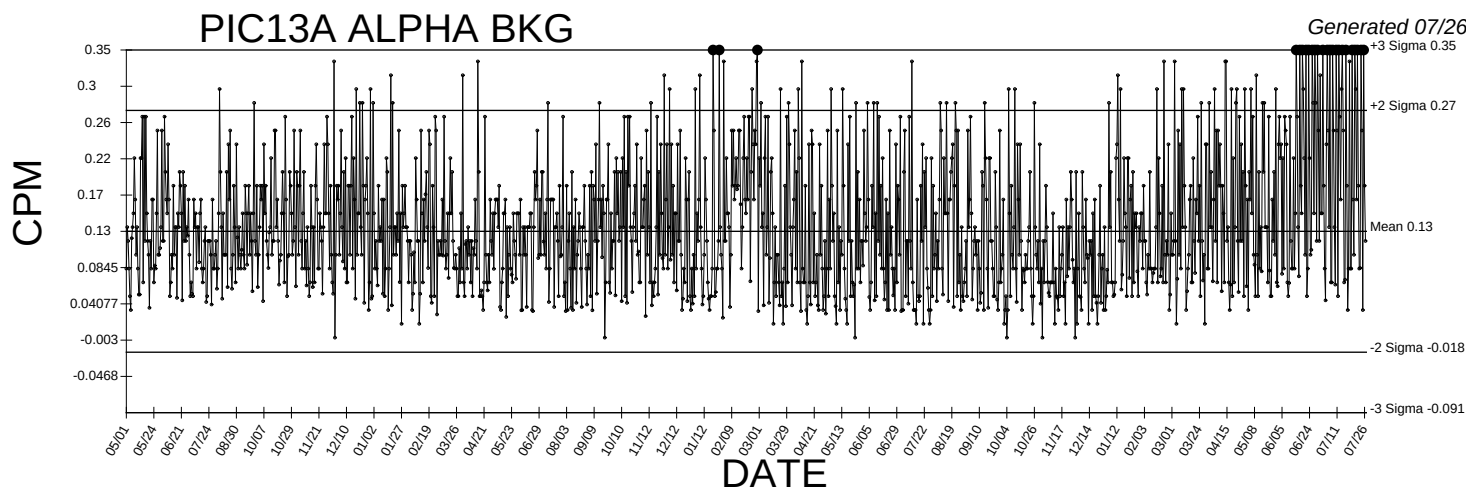
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LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Laura Fisher

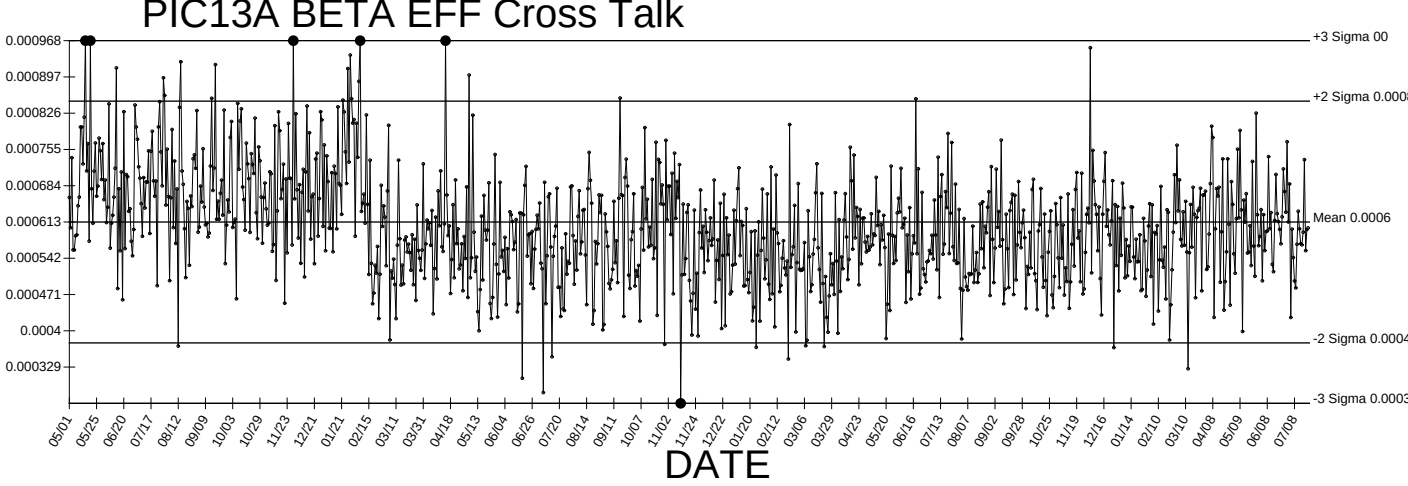
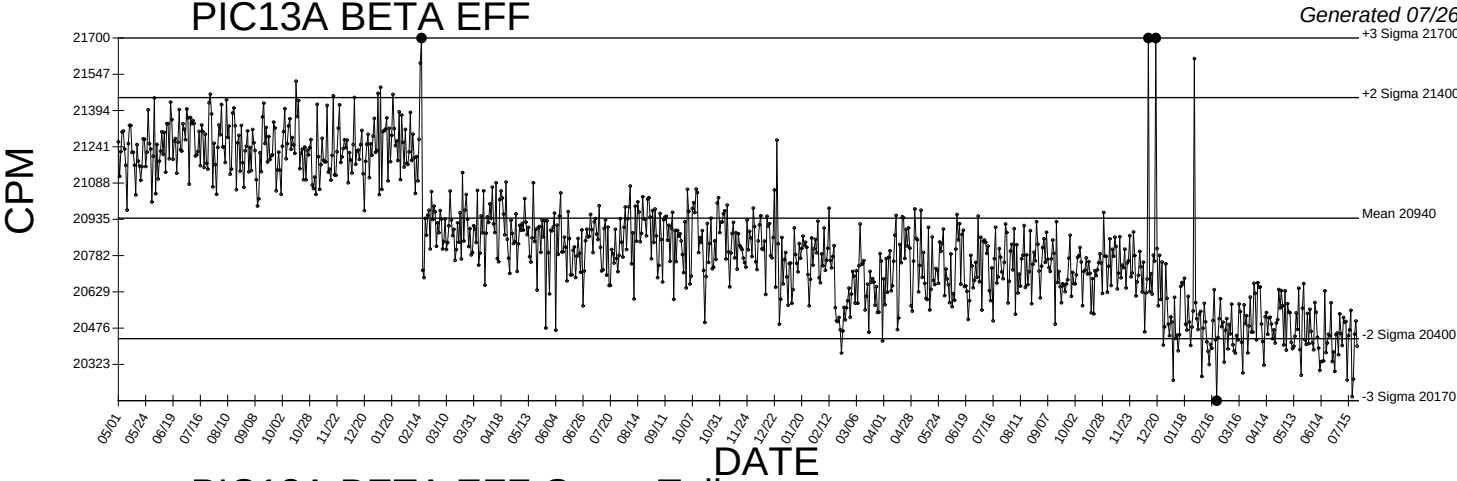
Date 7/28/22

GEL Laboratories LLC

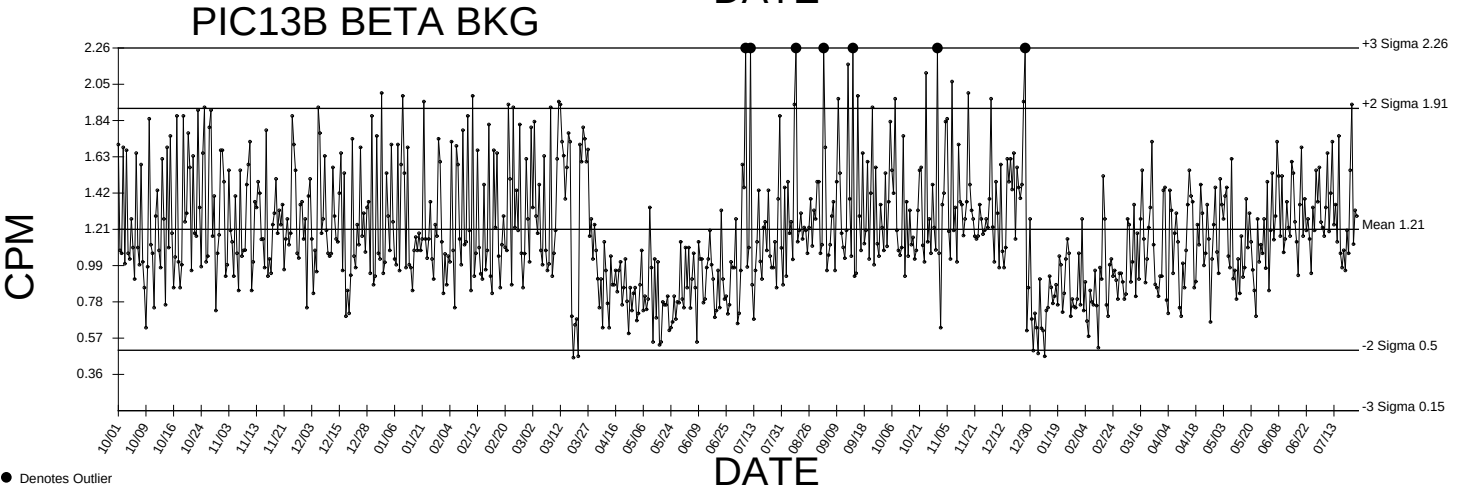
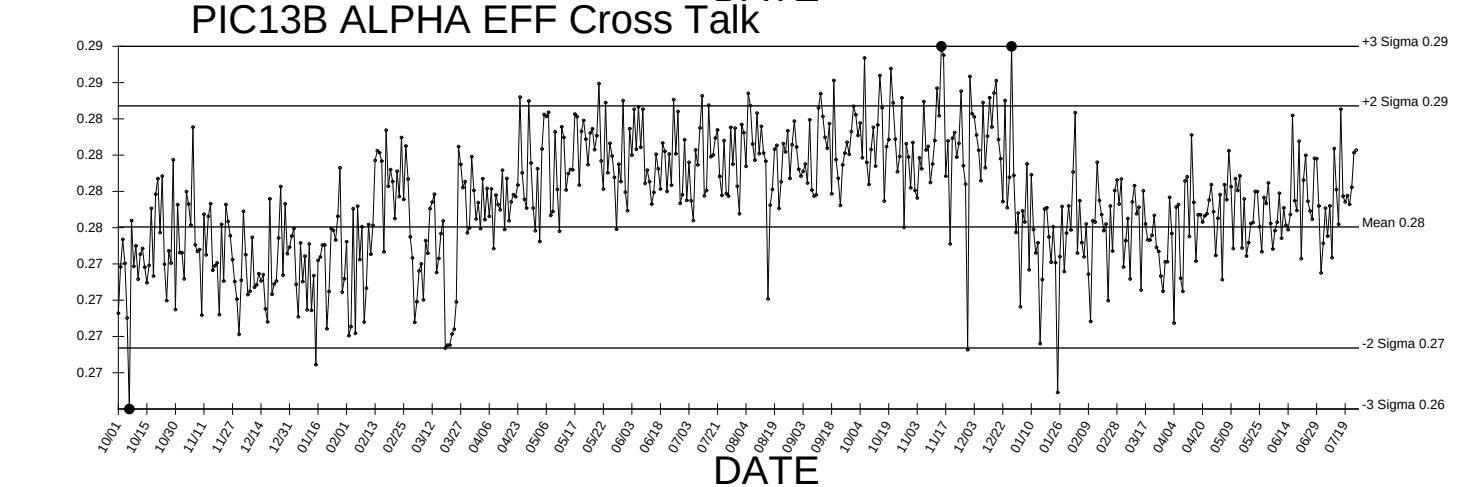
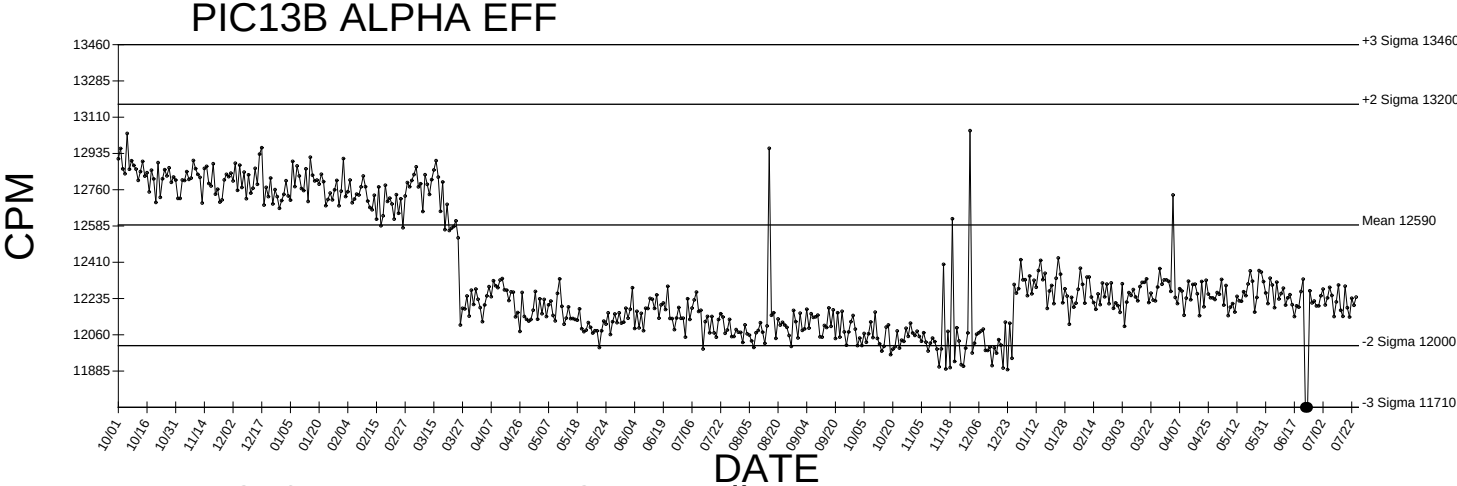
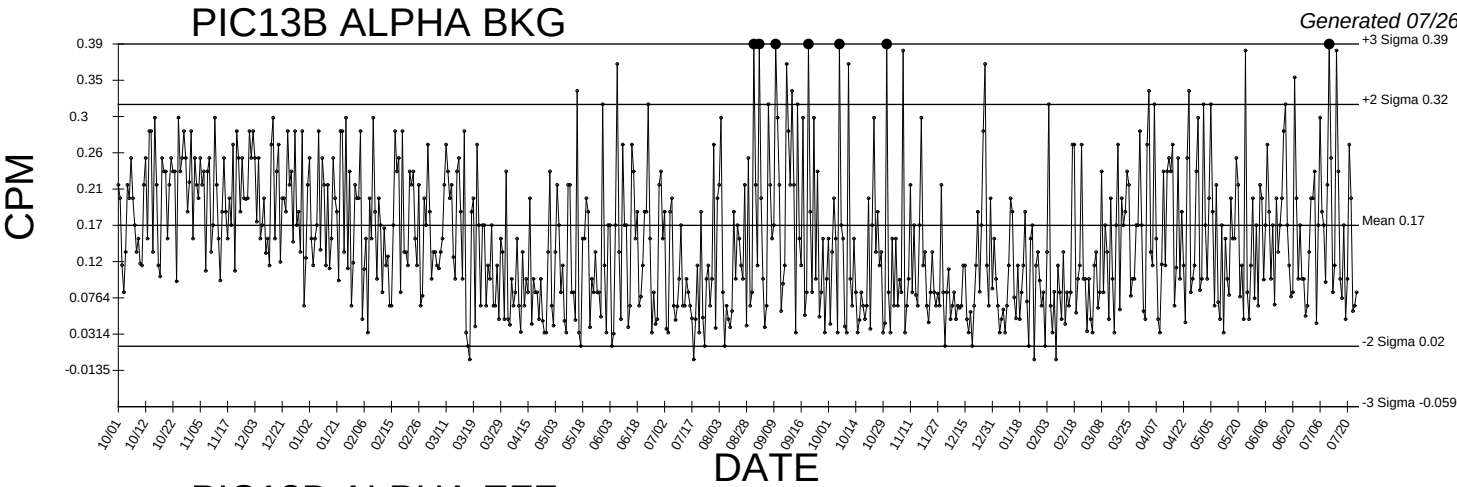
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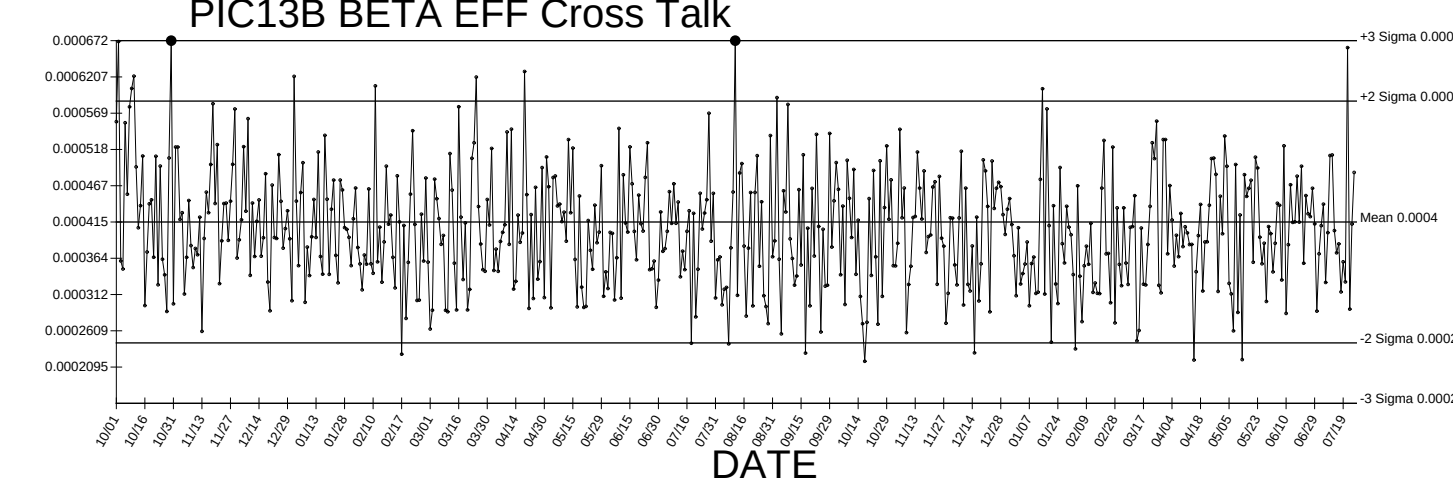
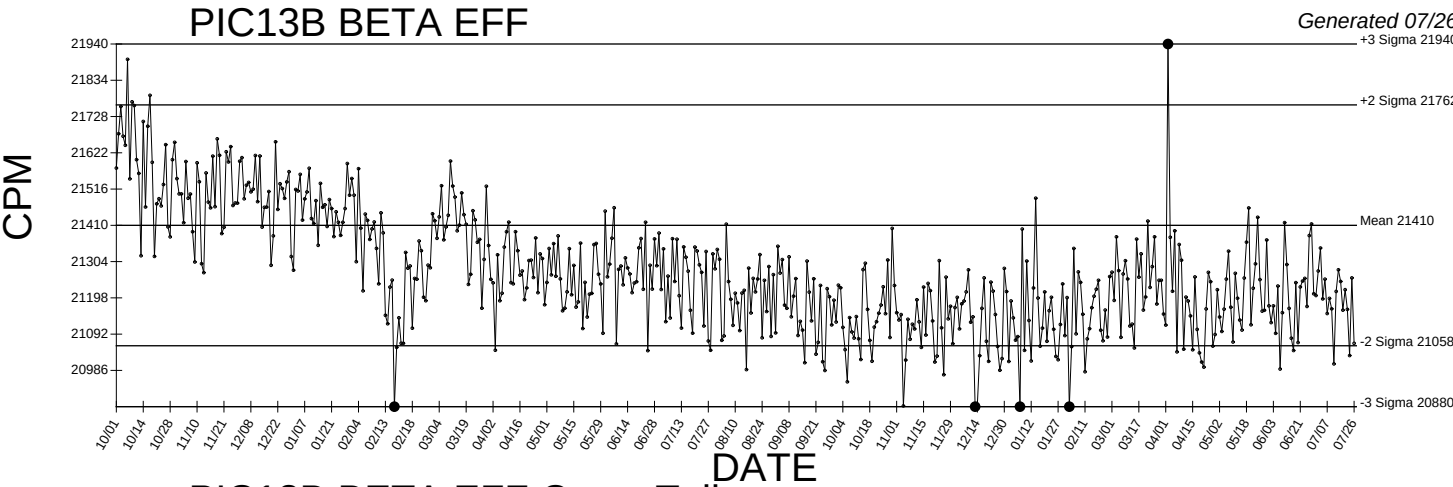
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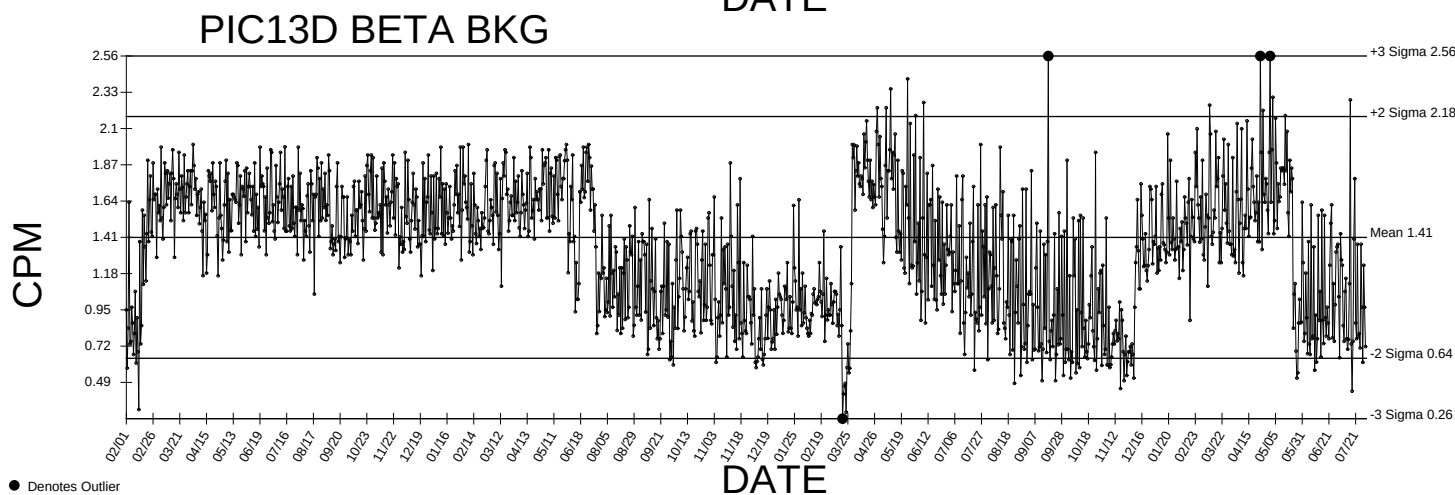
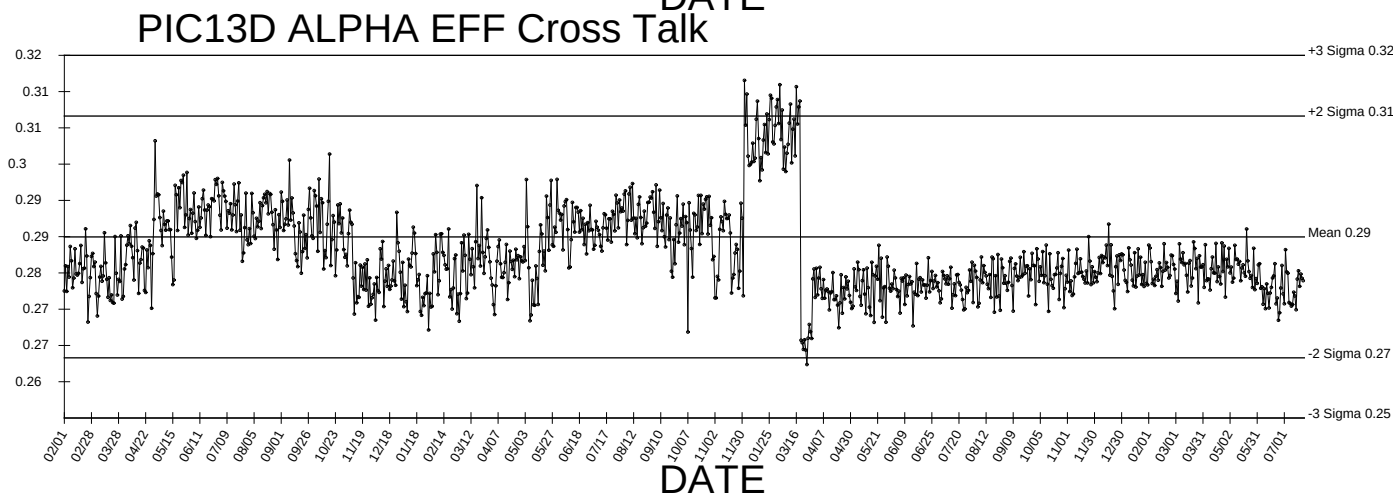
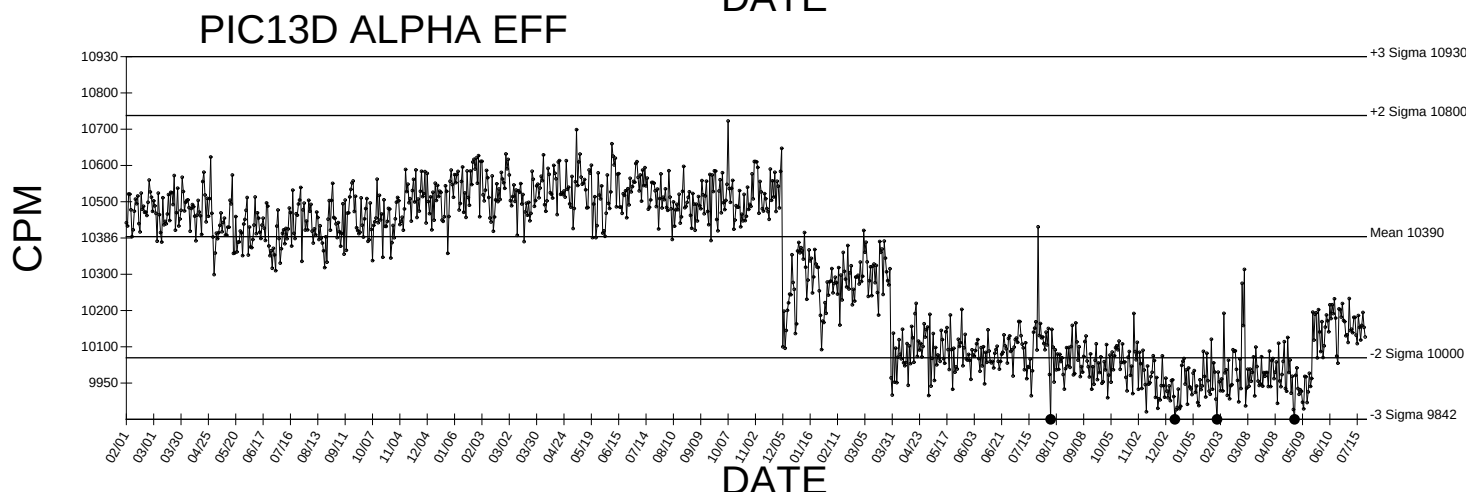
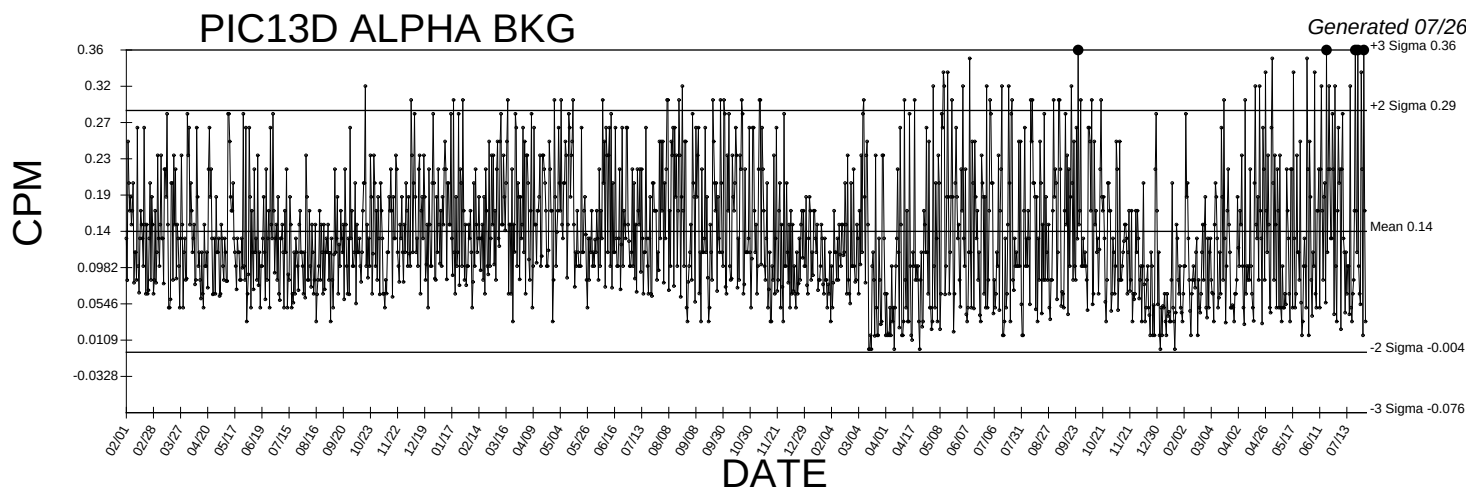
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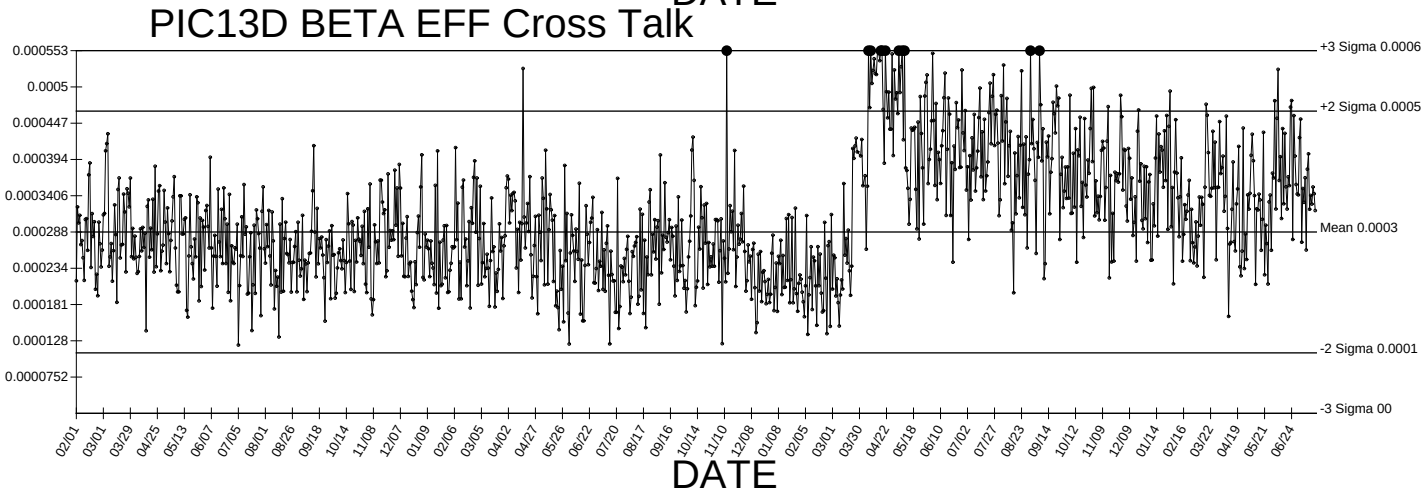
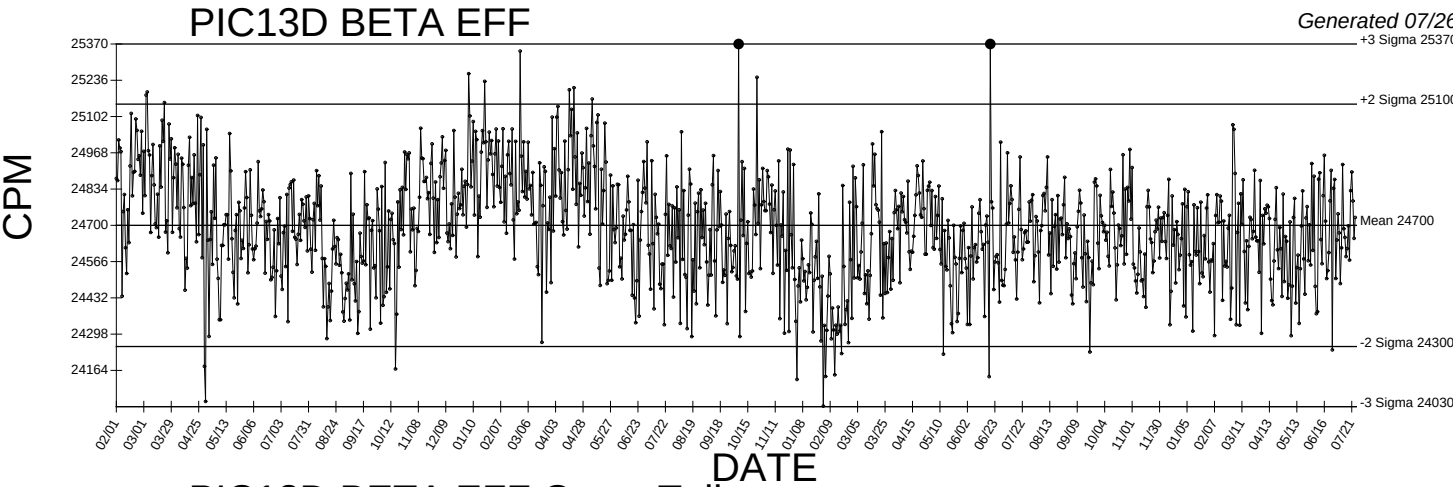
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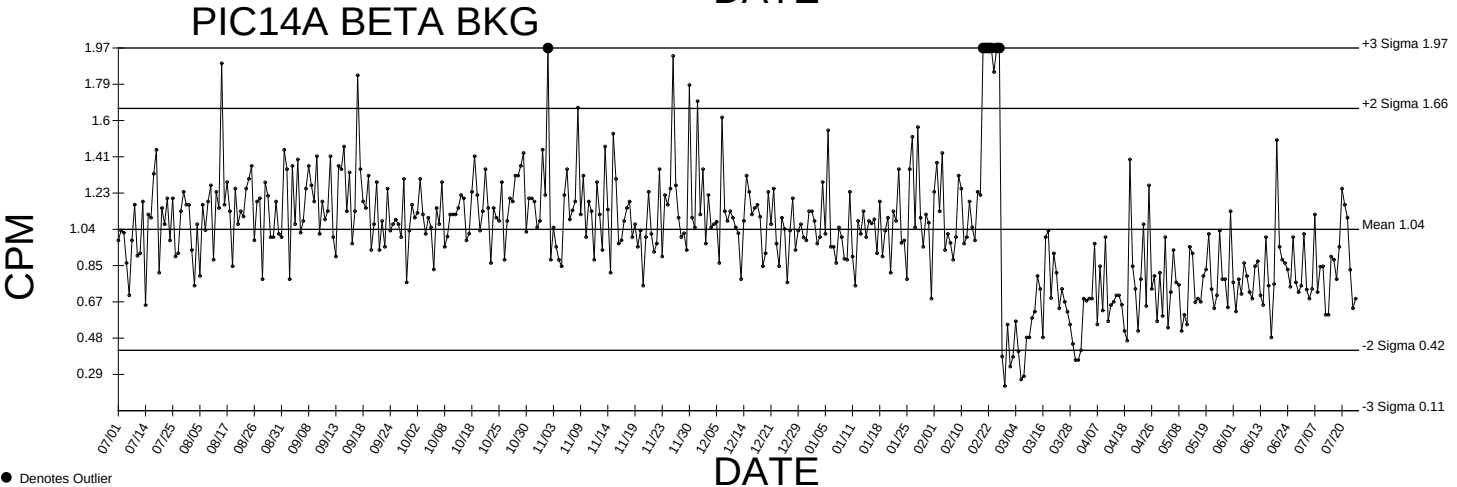
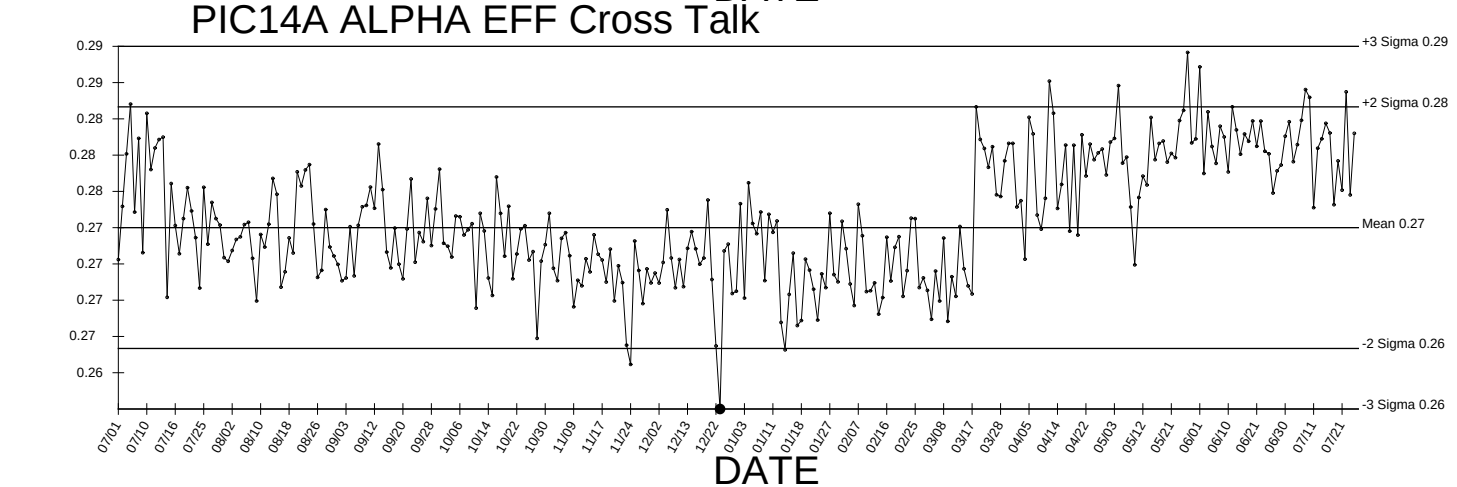
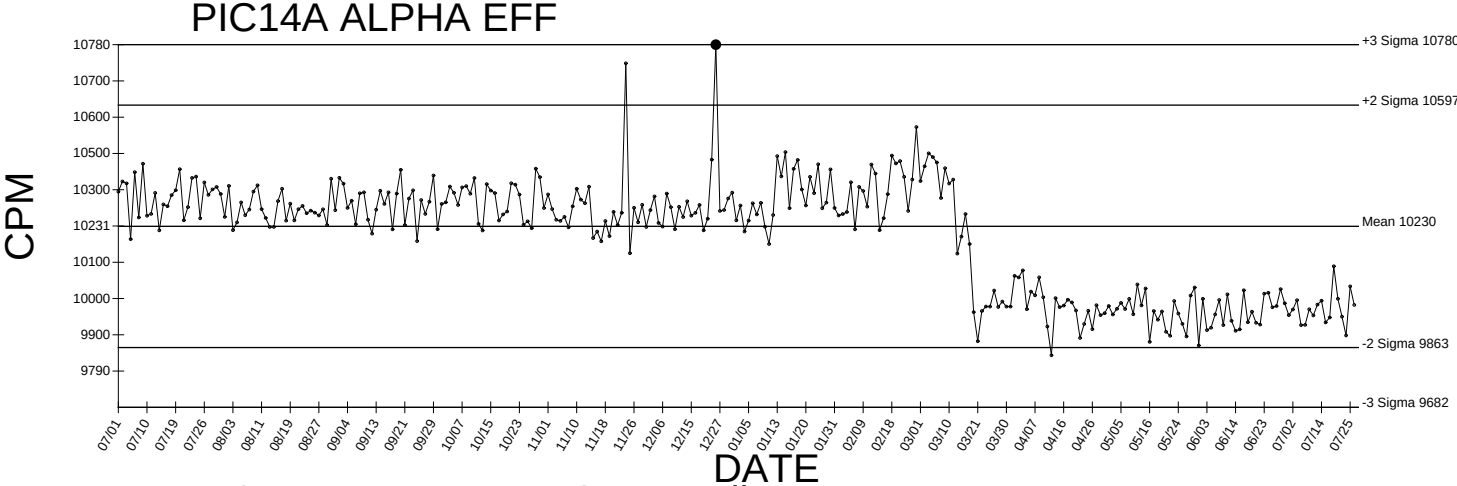
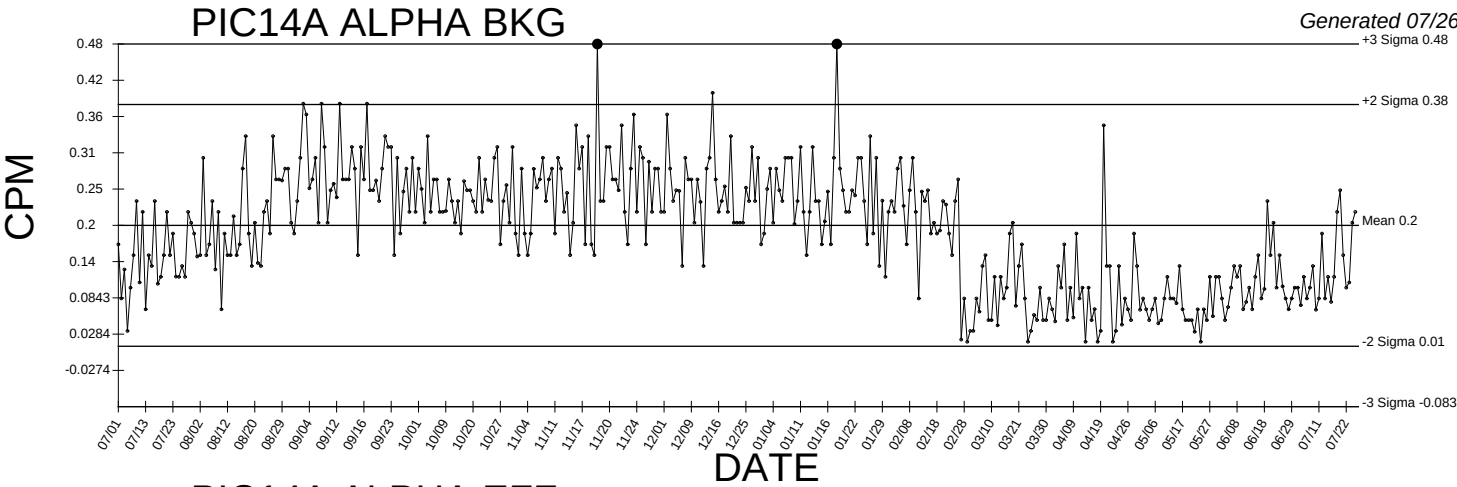
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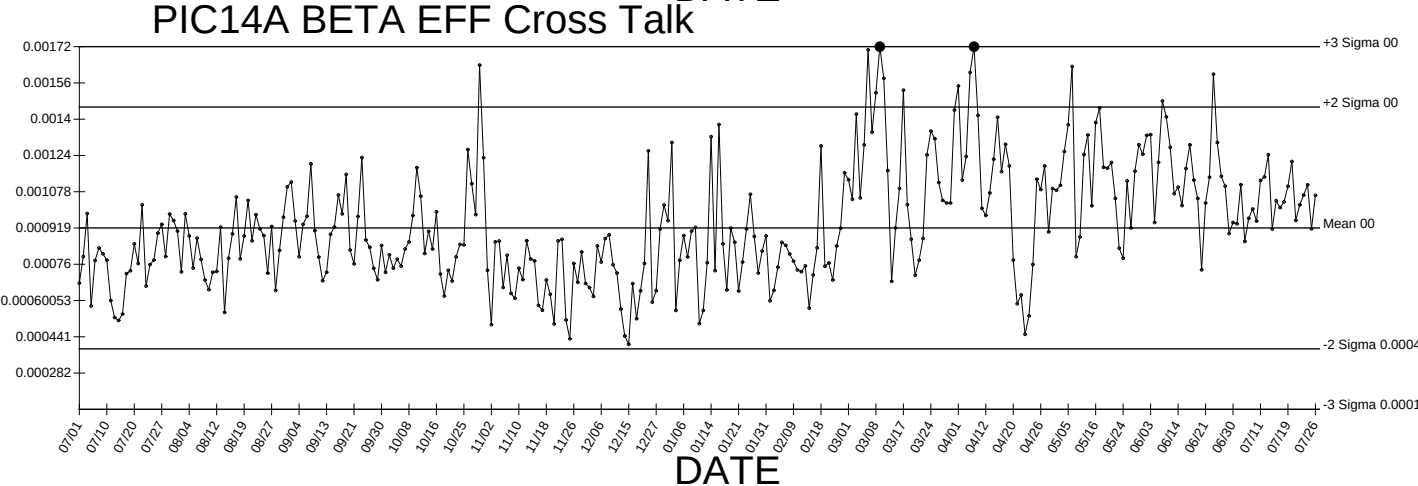
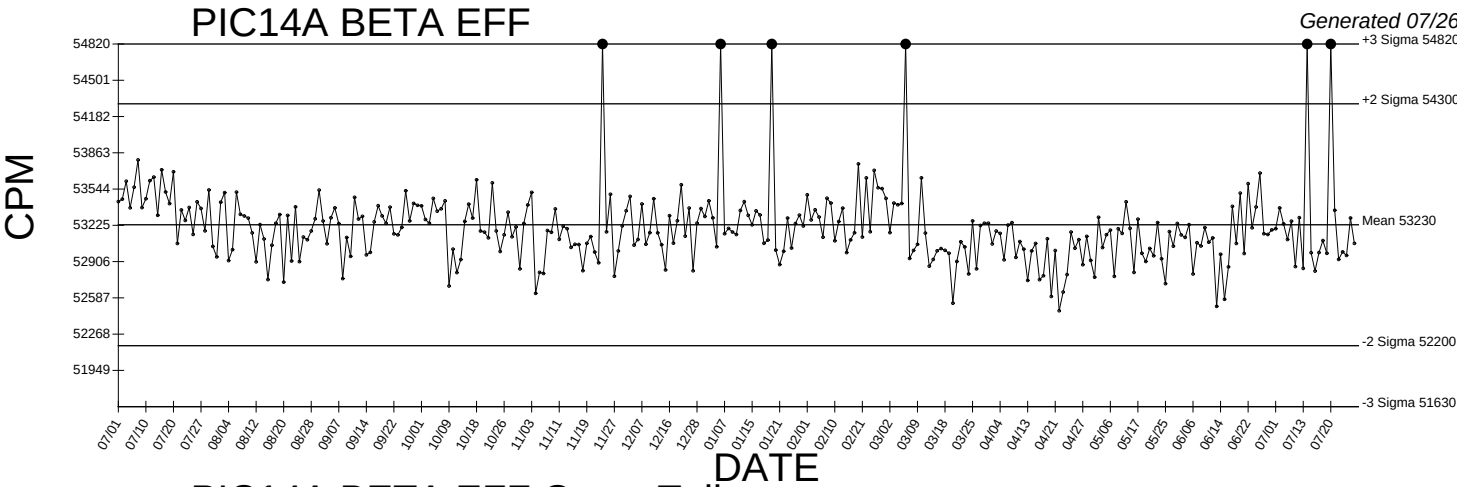
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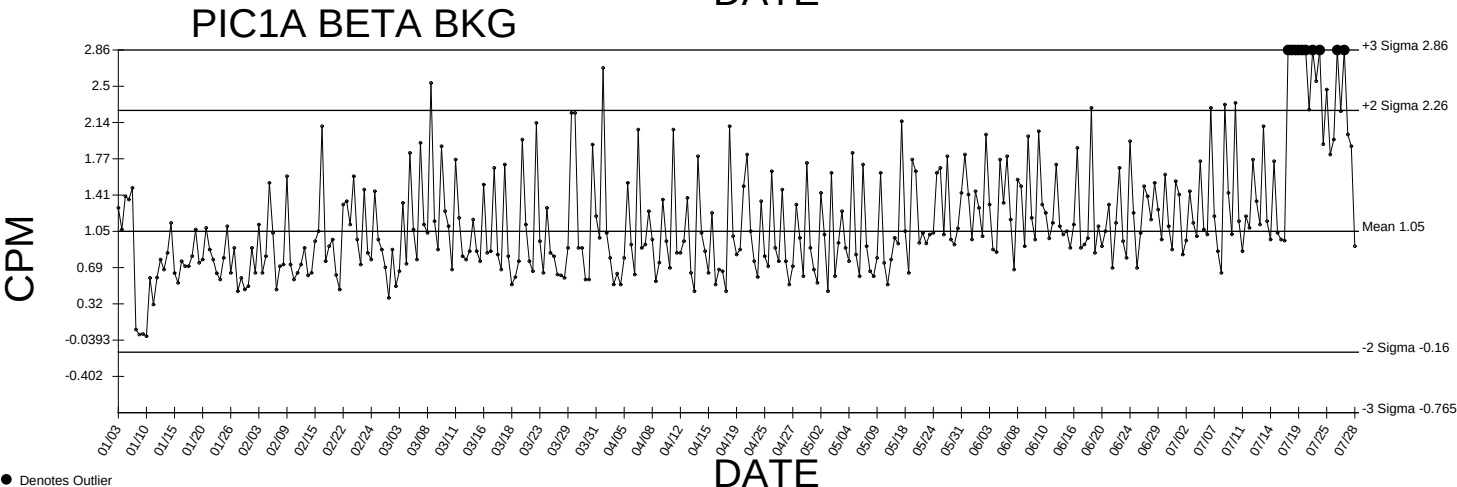
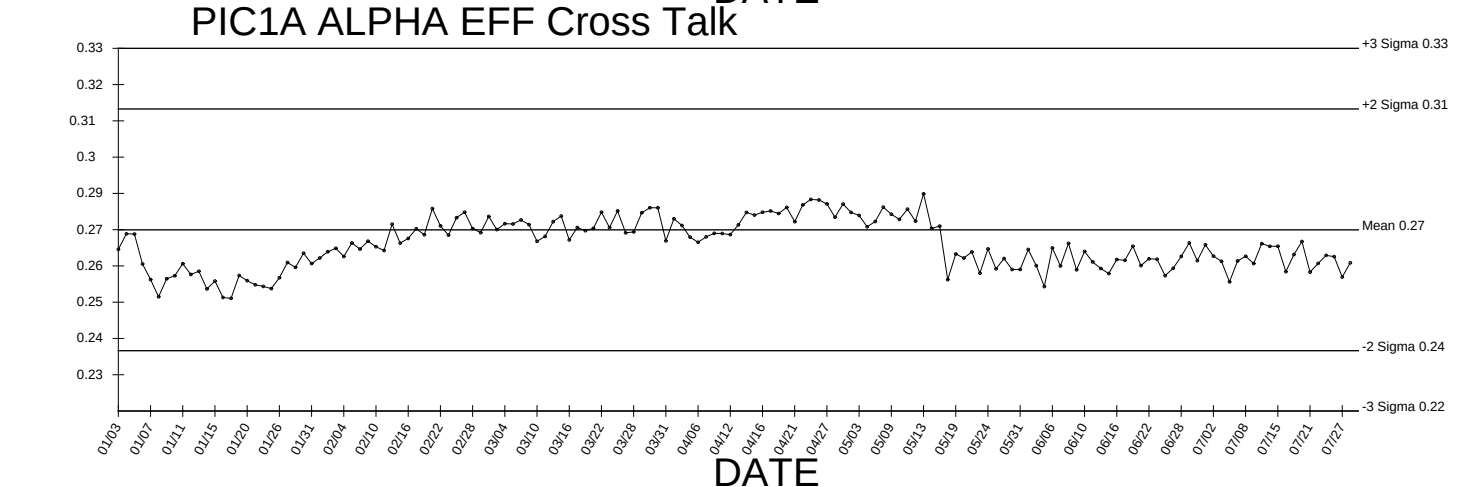
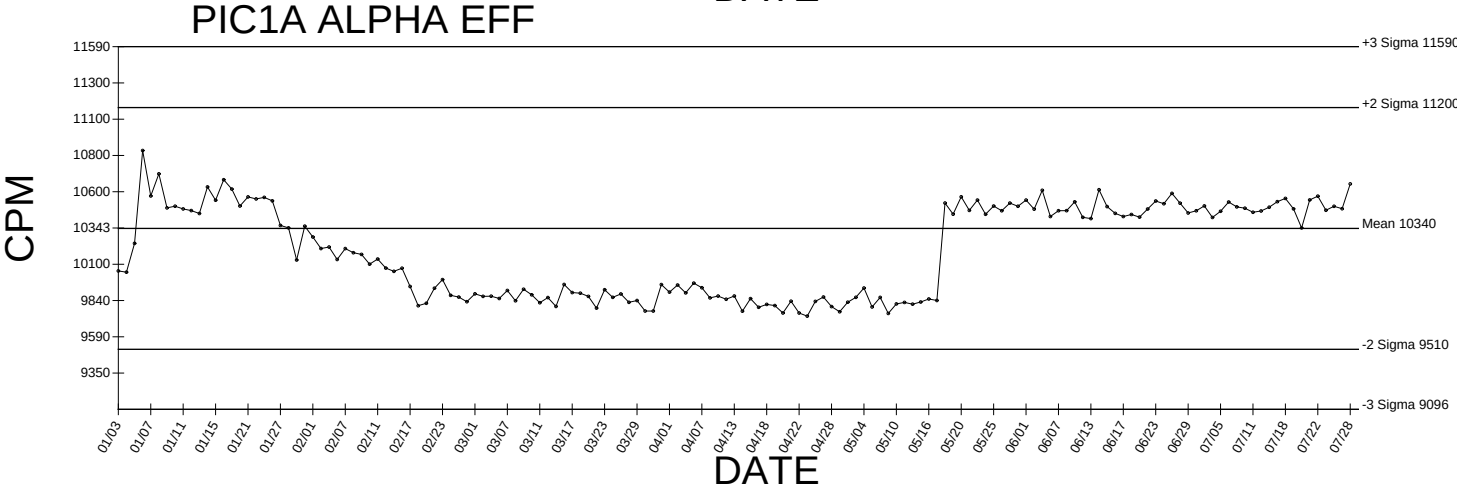
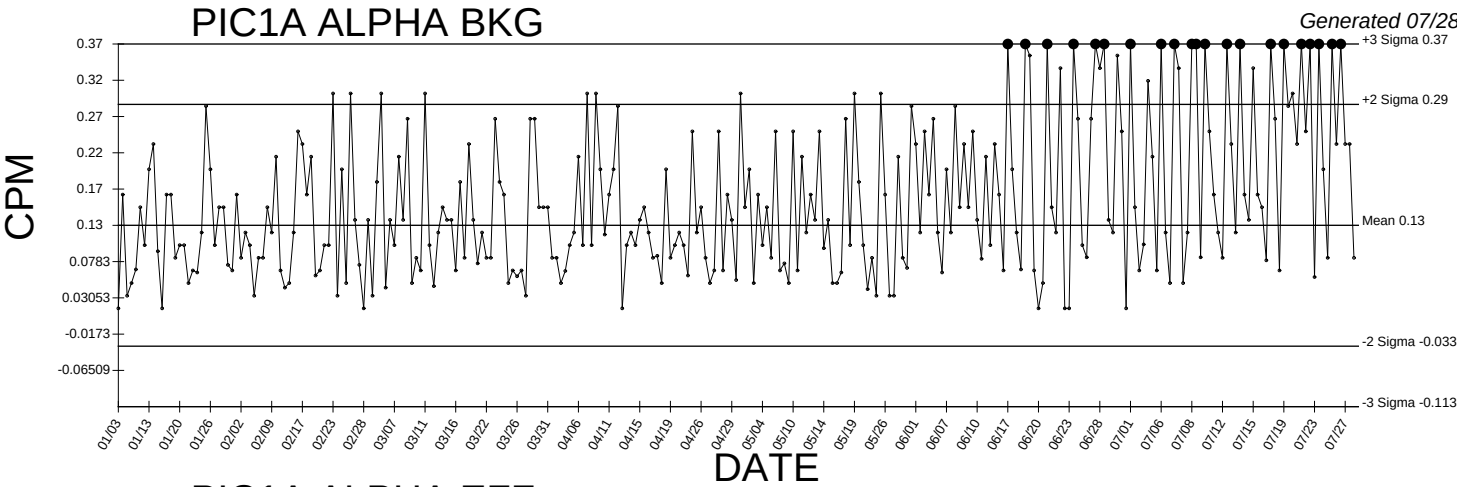
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● Denotes Outlier



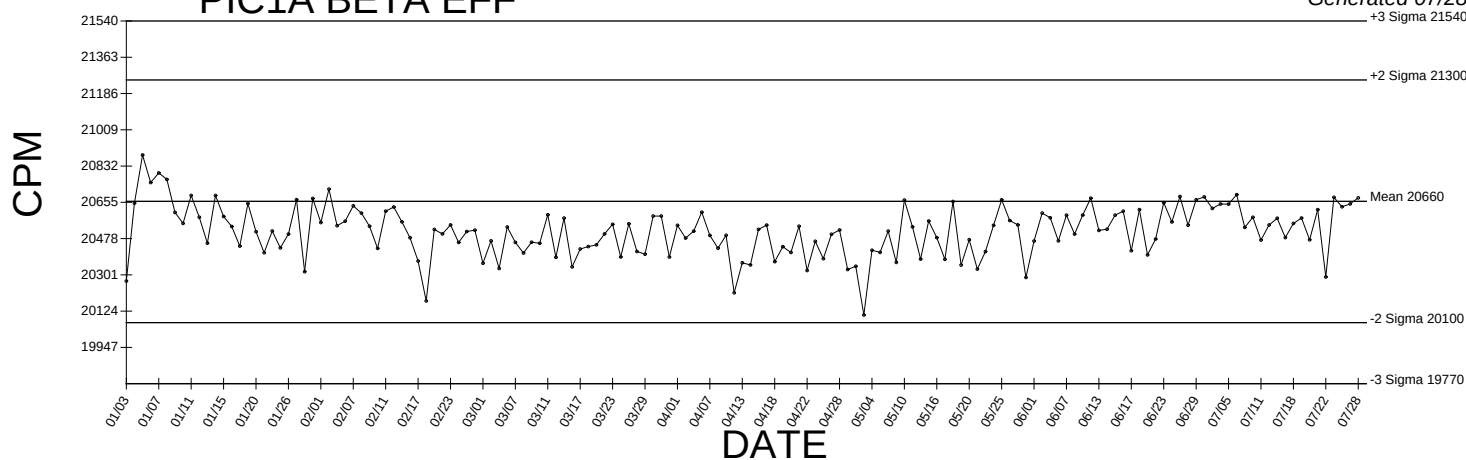
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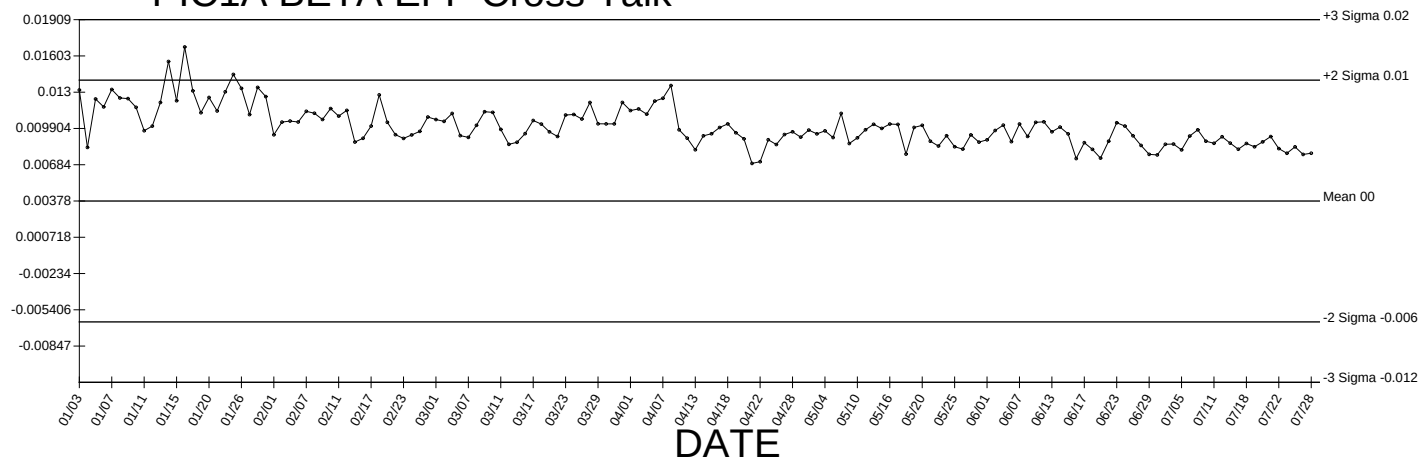
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PIC1A BETA EFF

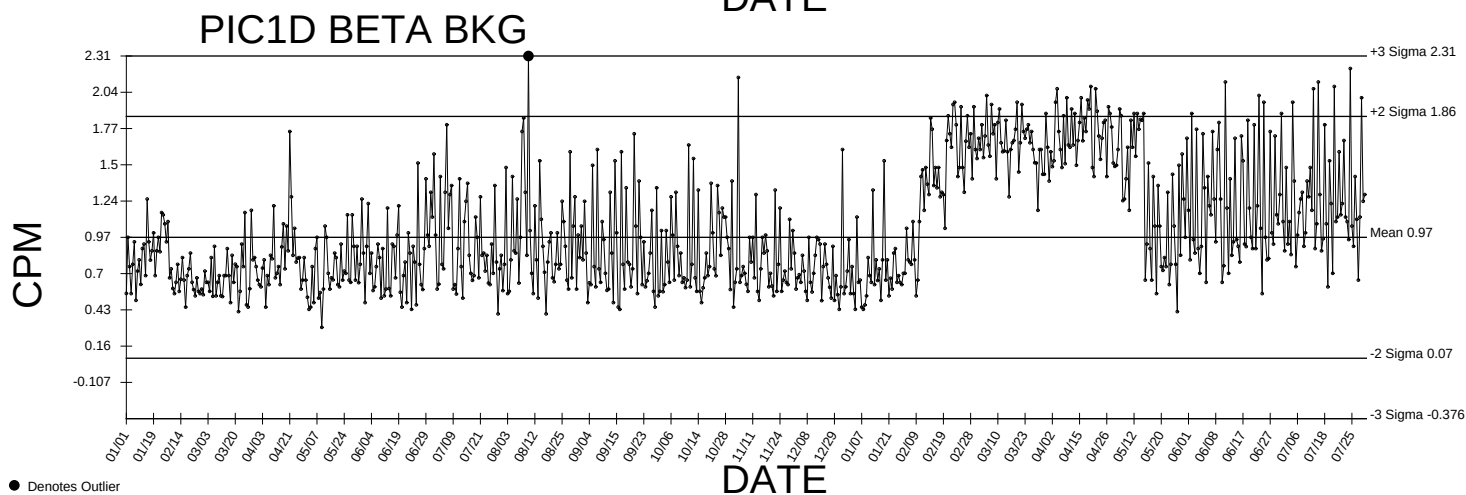
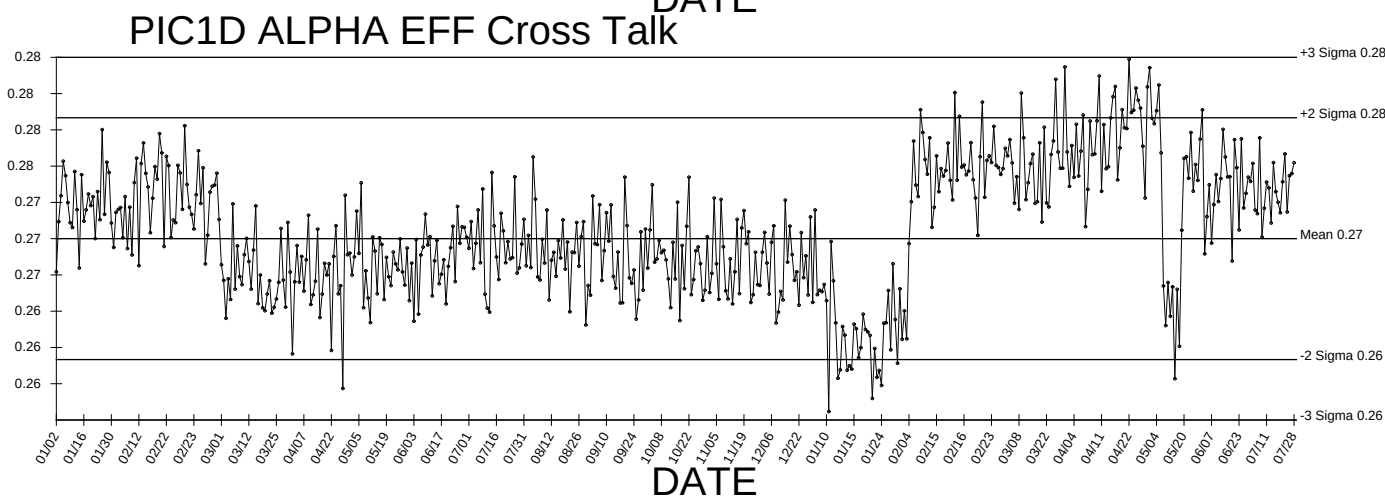
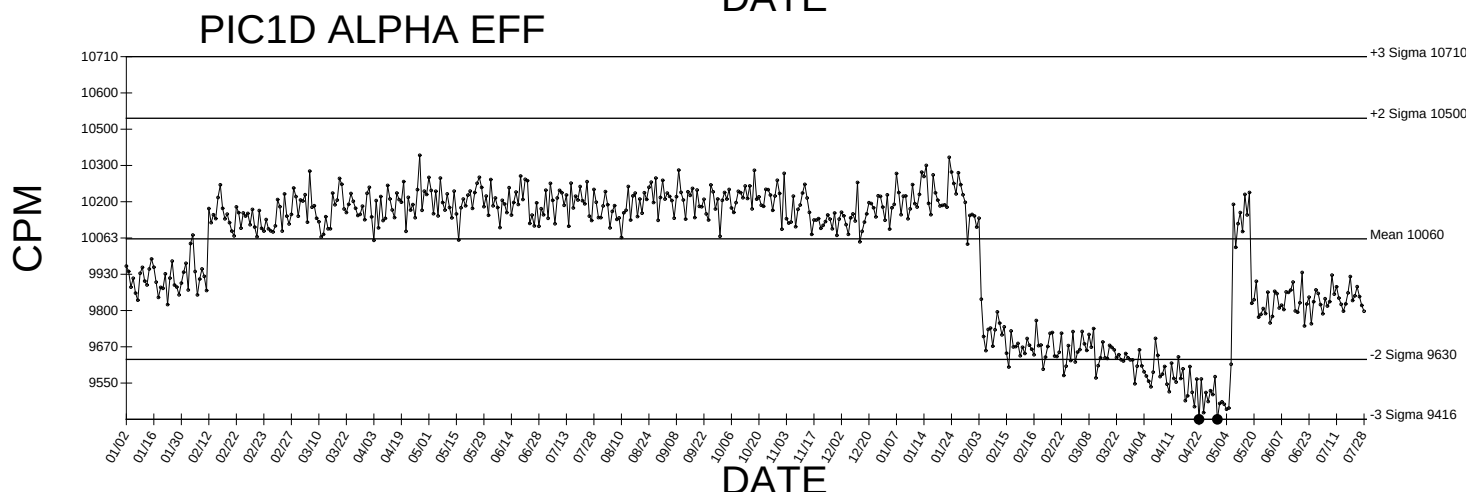
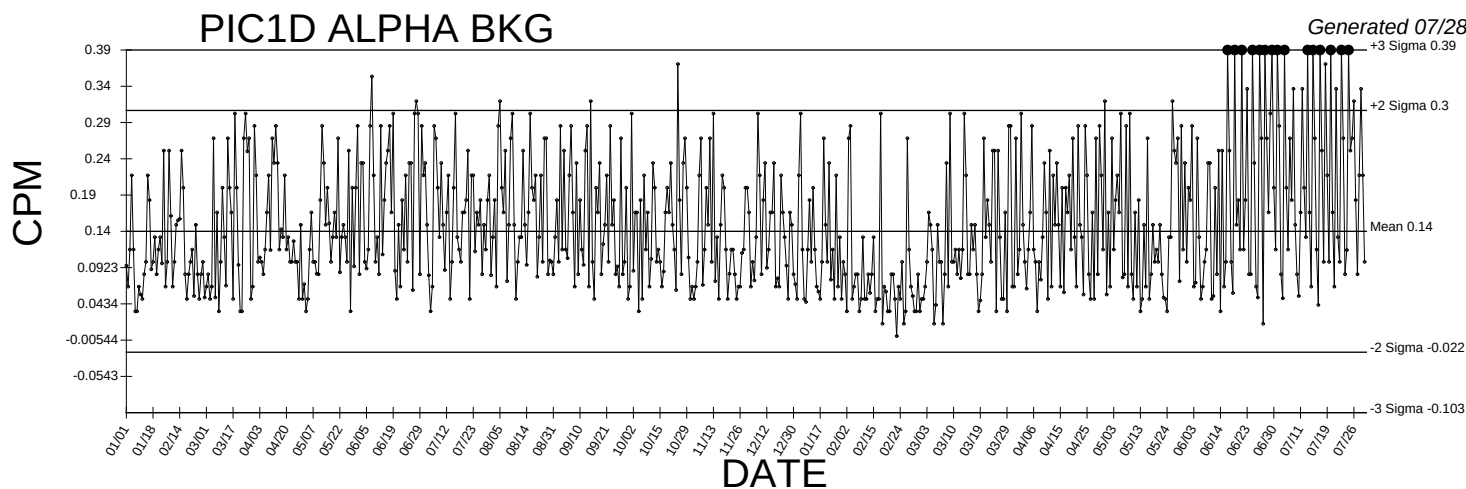
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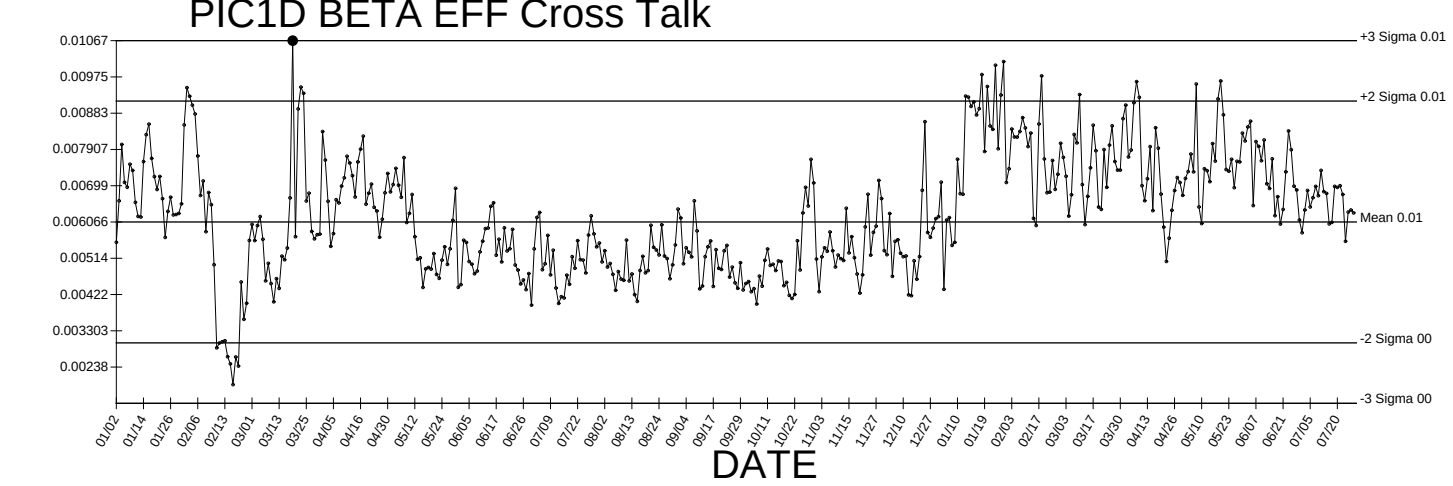
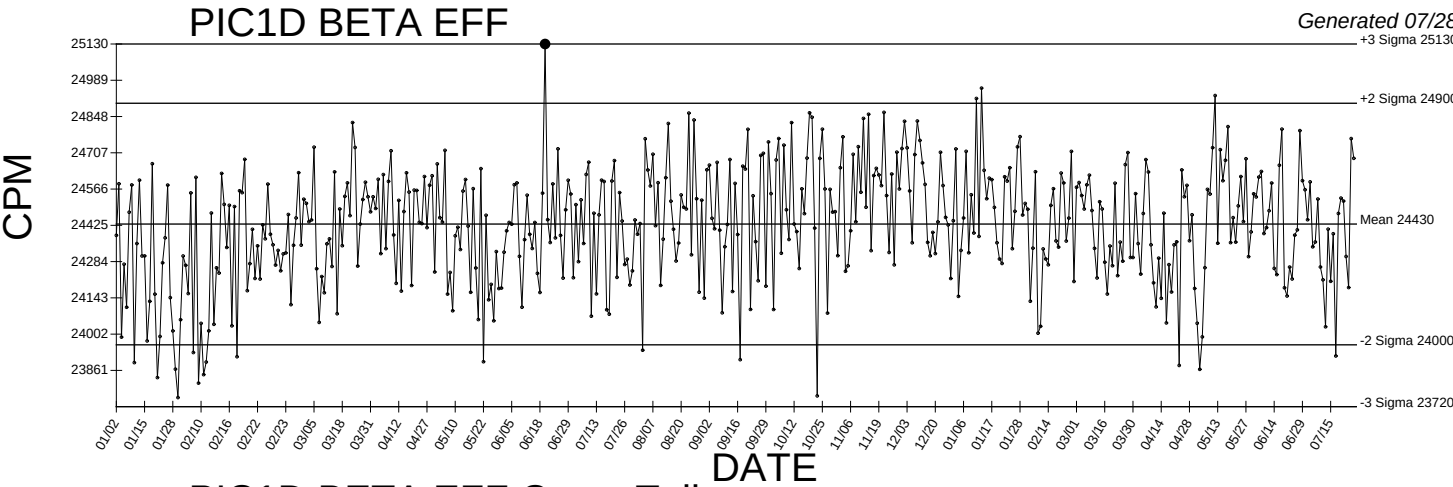
PIC1A BETA EFF Cross Talk



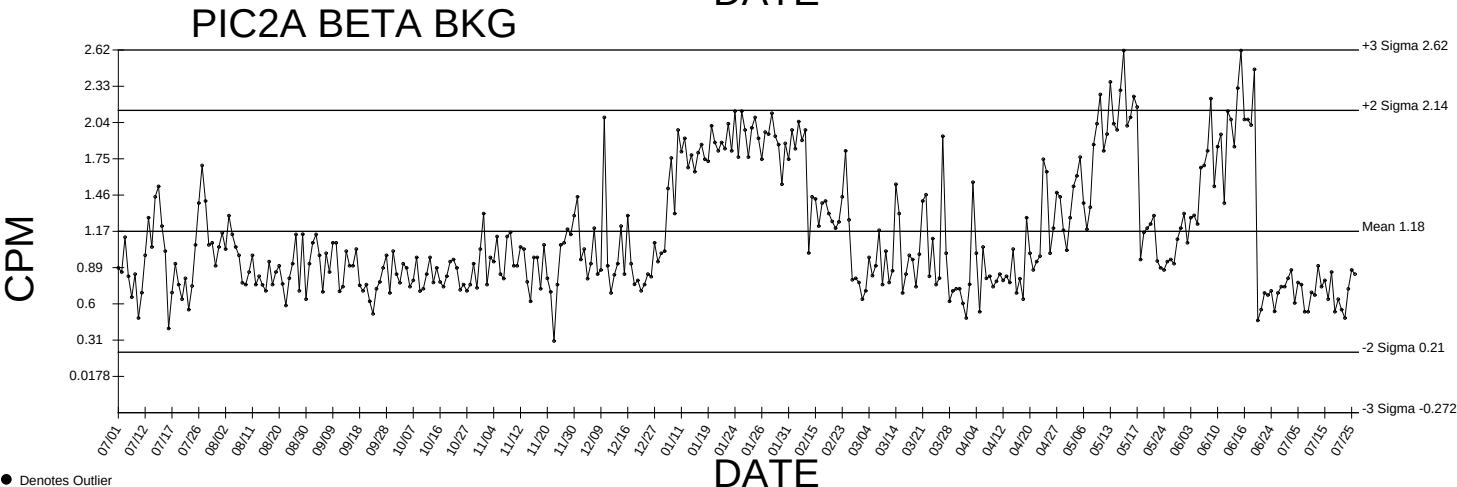
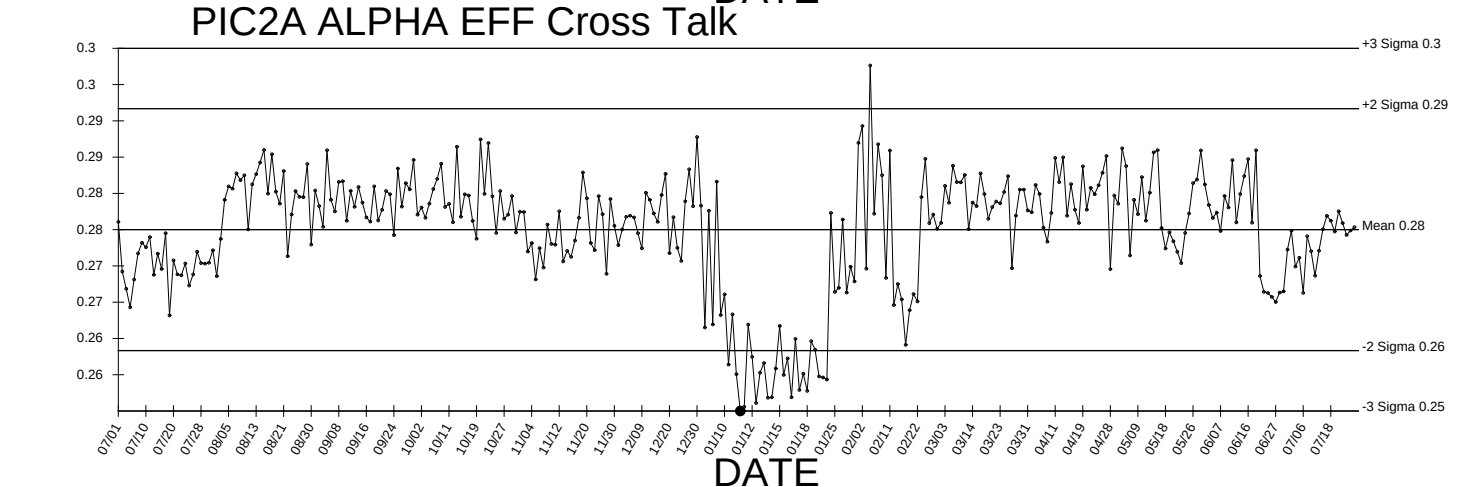
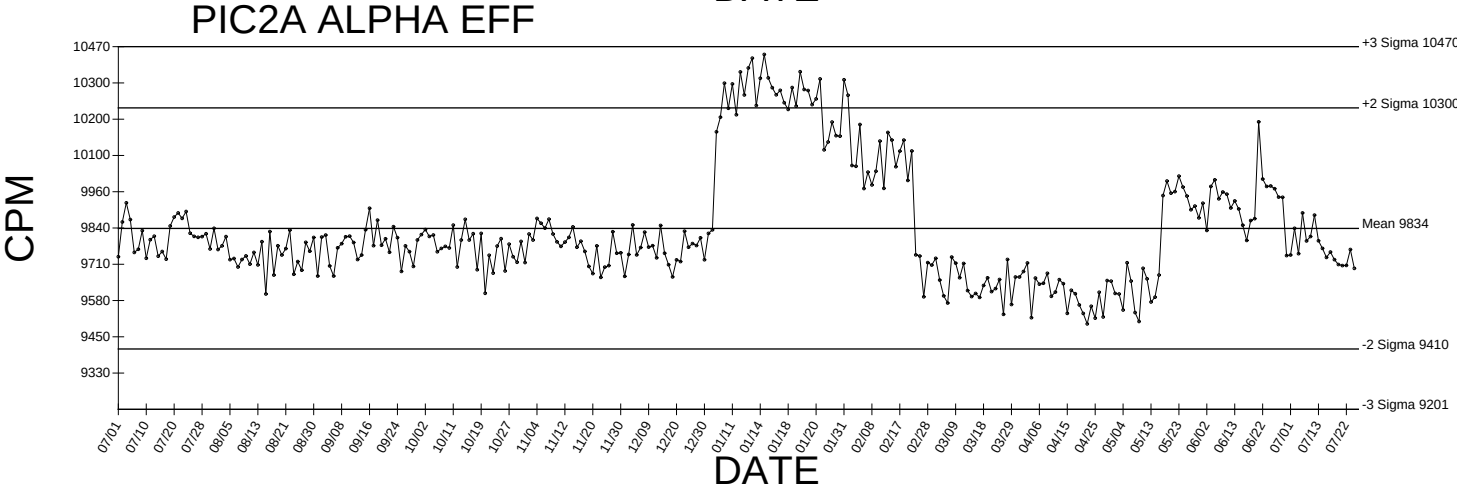
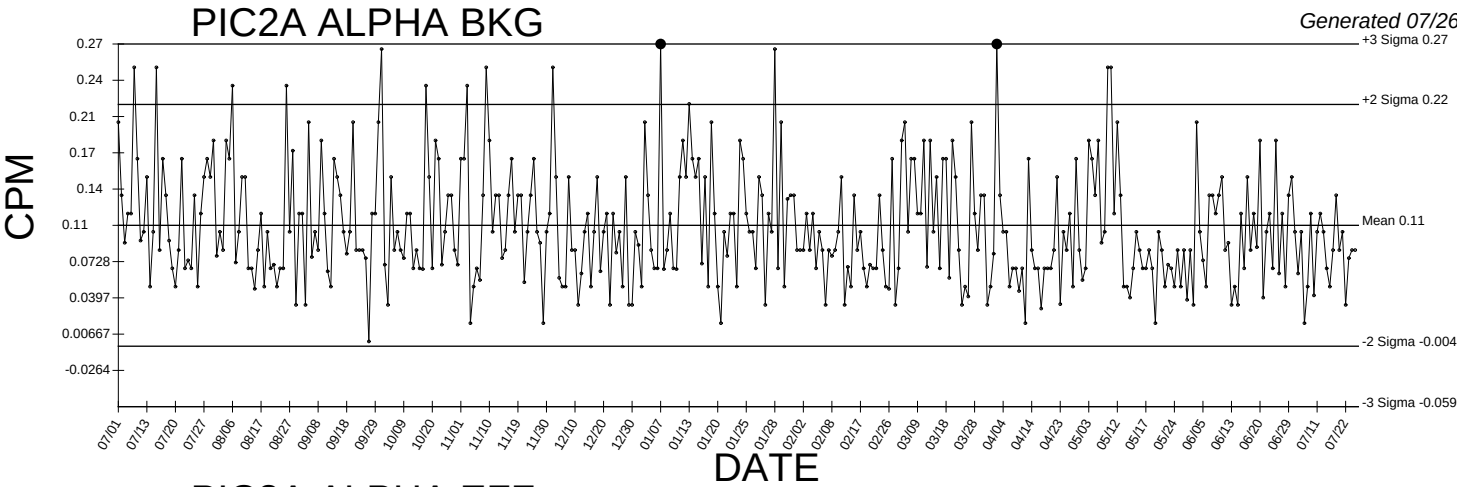
● Denotes Outlier



● Denotes Outlier



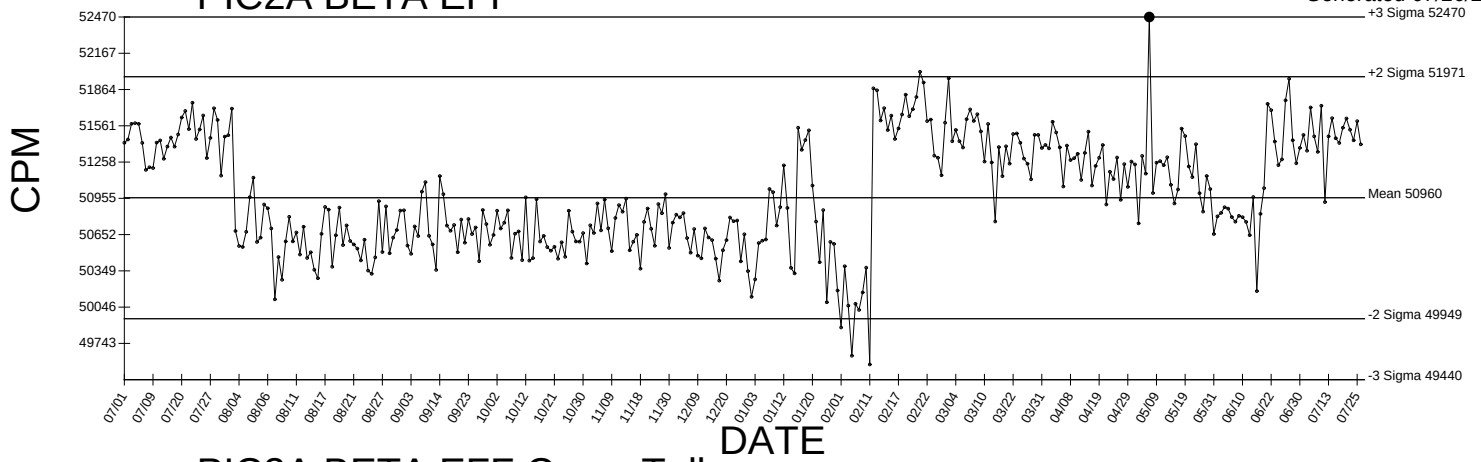
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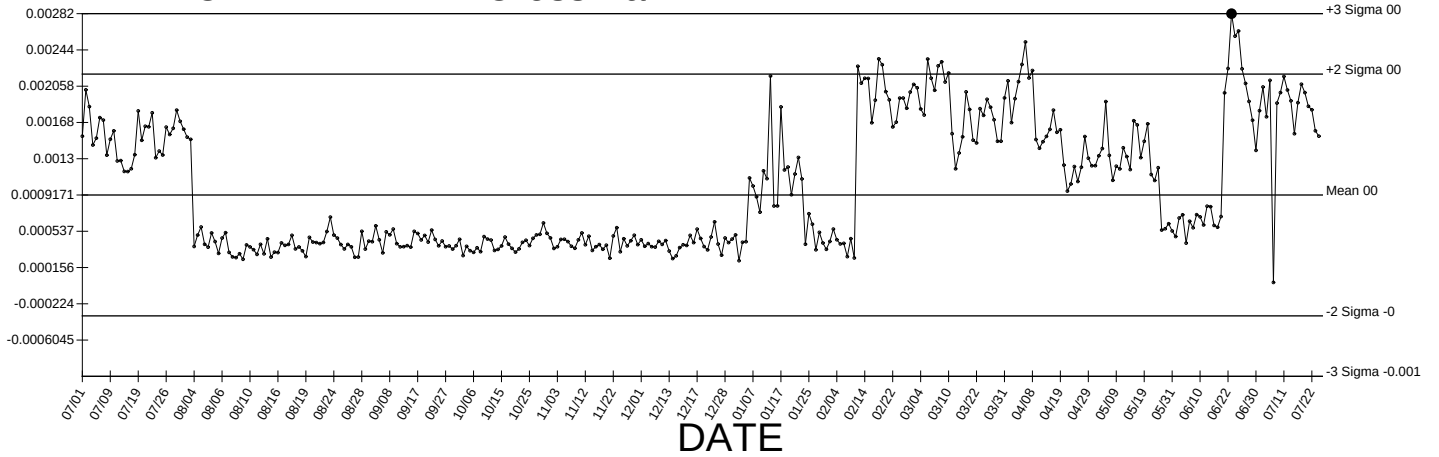
● Denotes Outlier

PIC2A BETA EFF

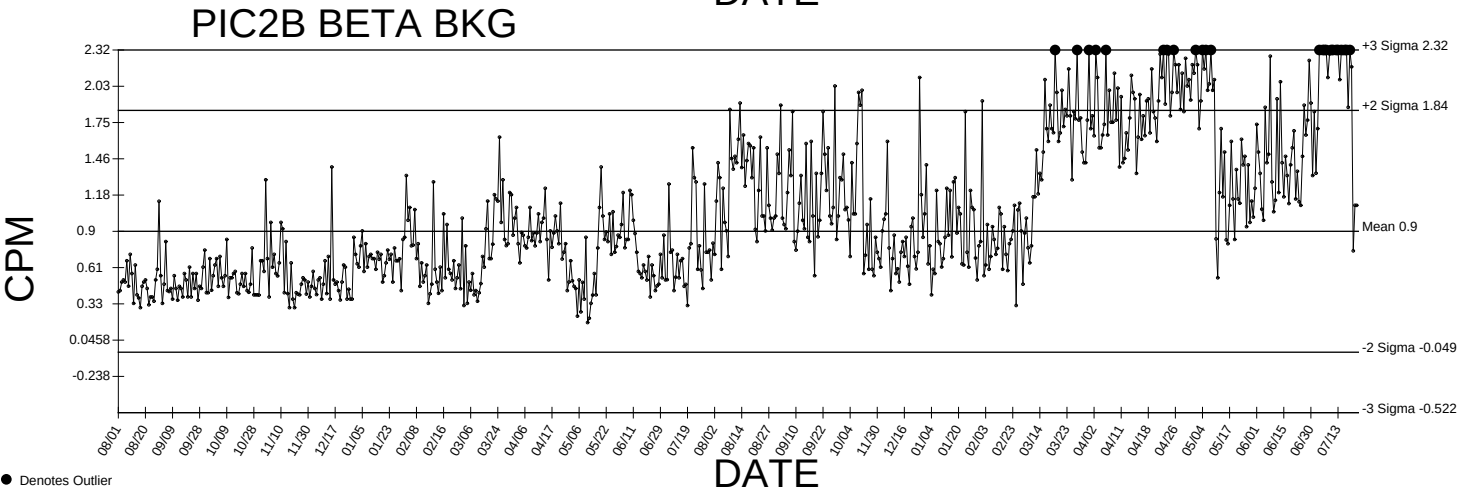
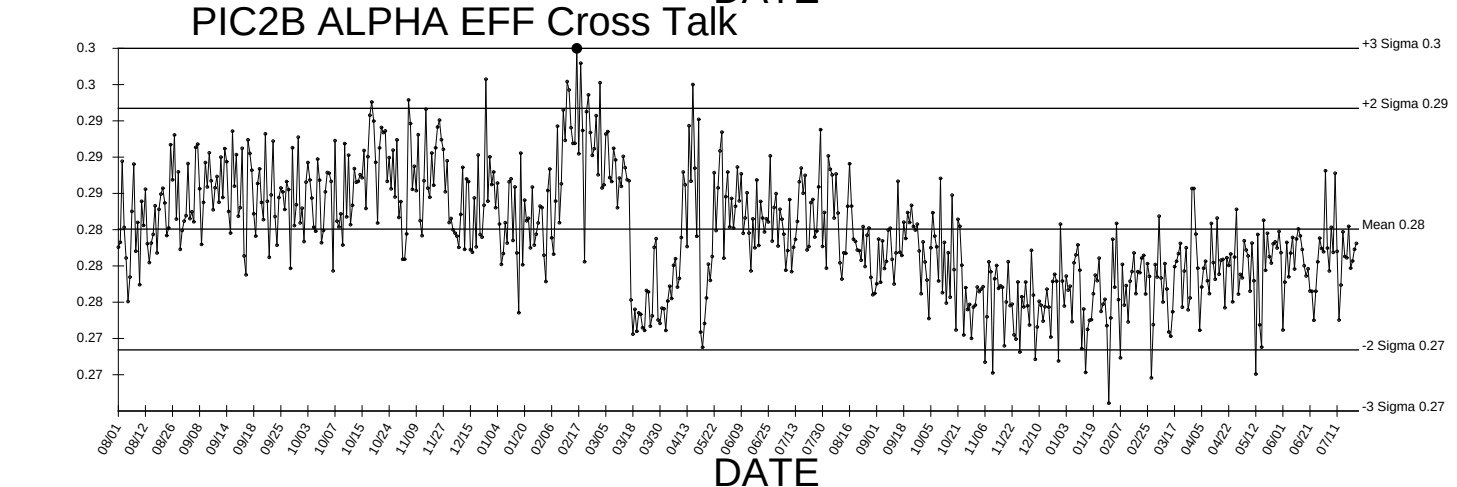
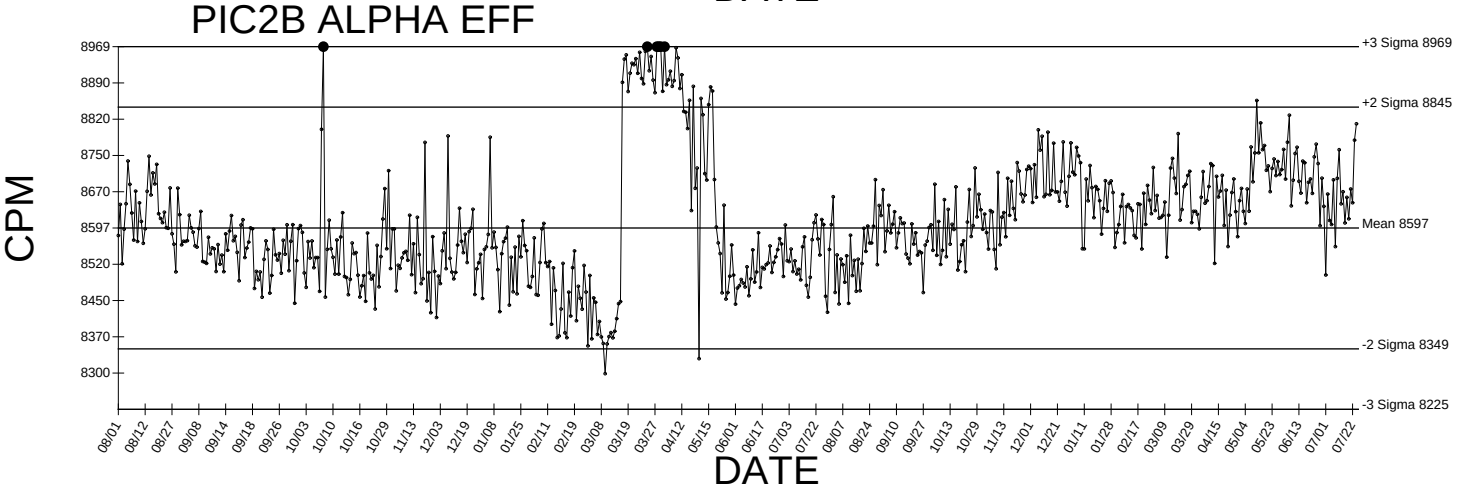
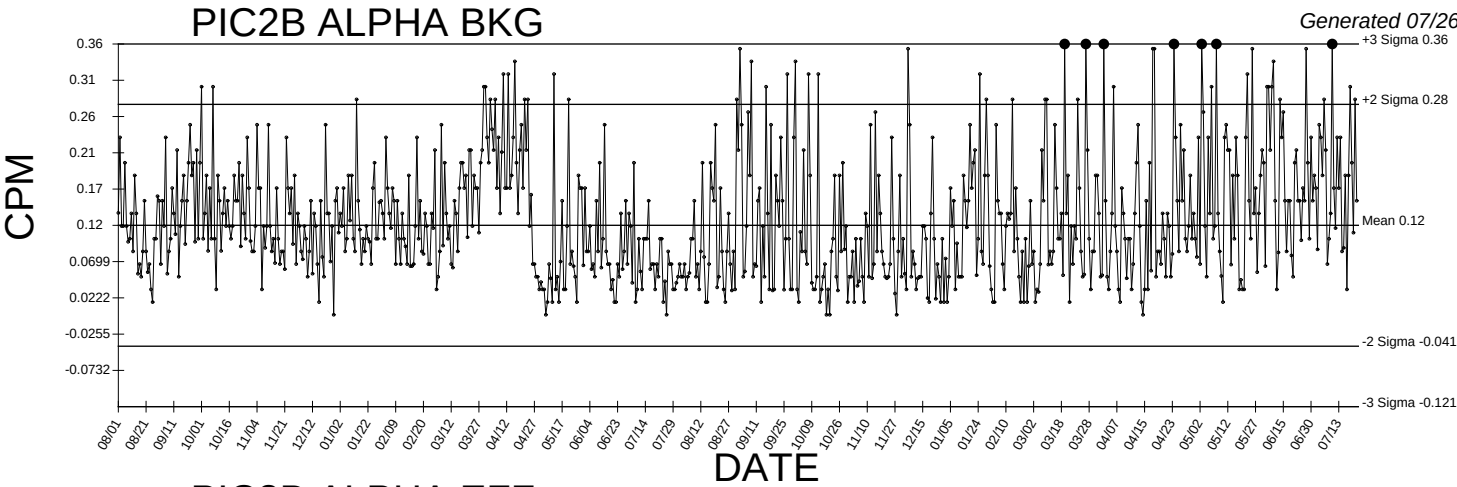
Generated 07/26/2022



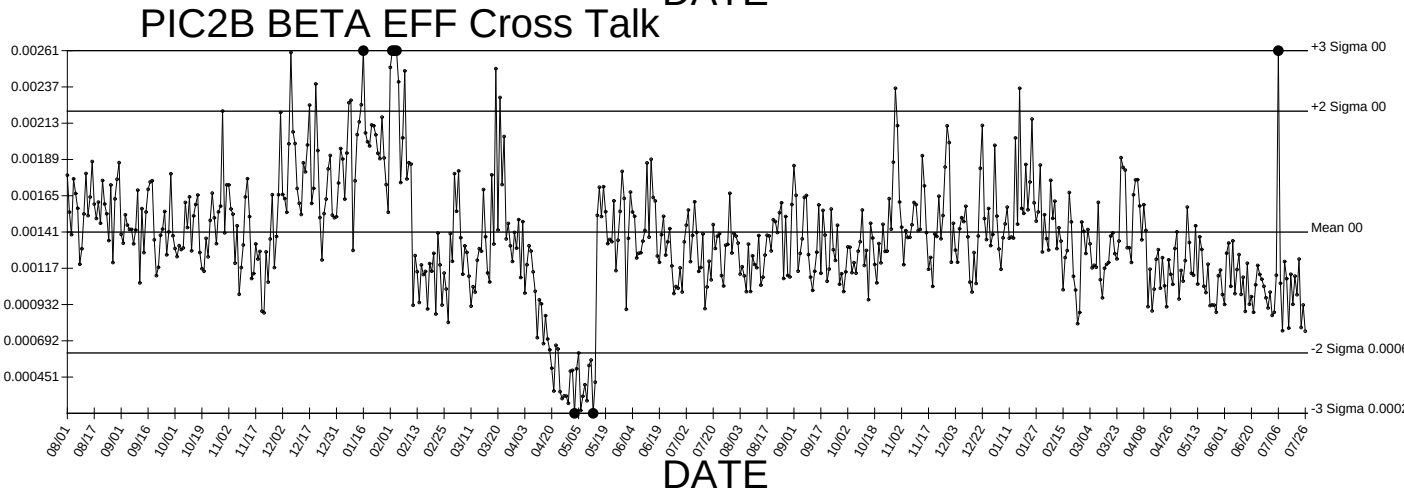
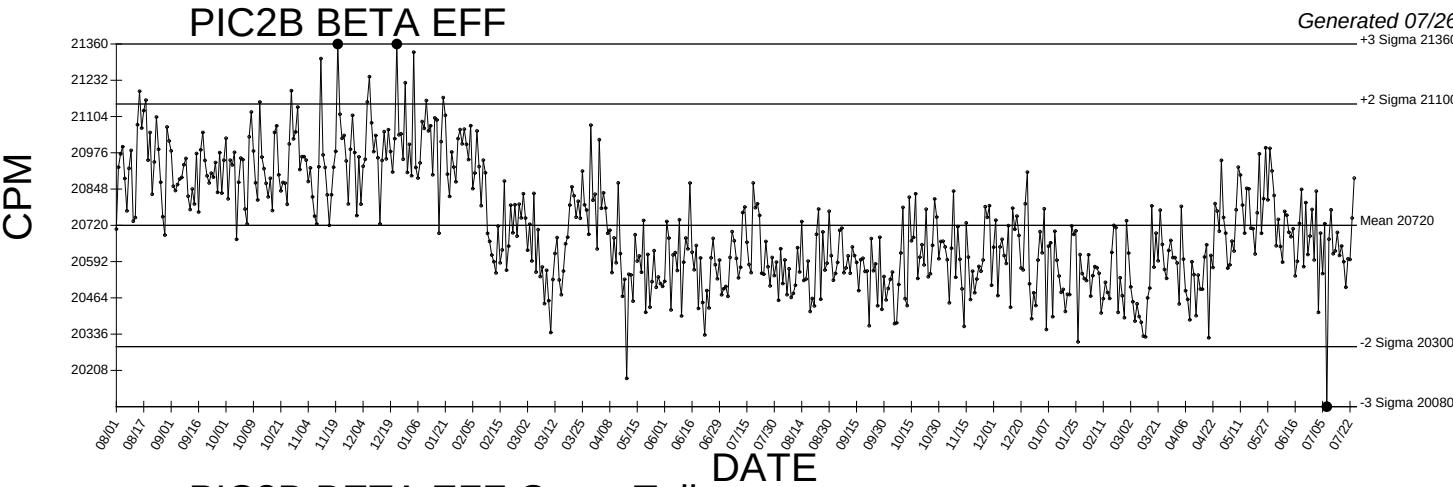
PIC2A BETA EFF Cross Talk



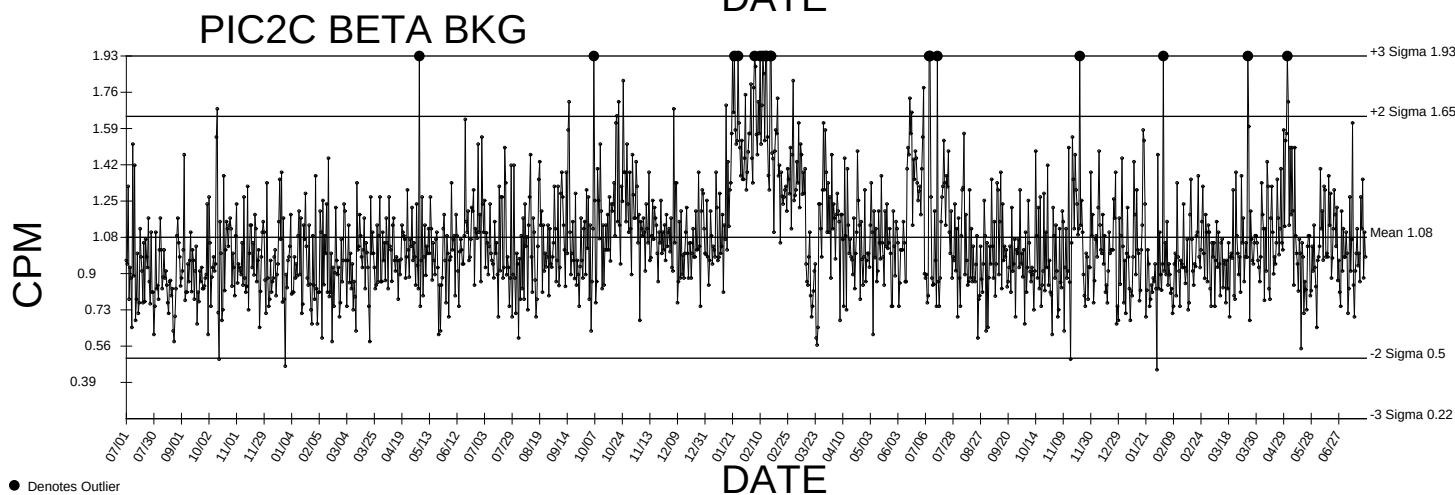
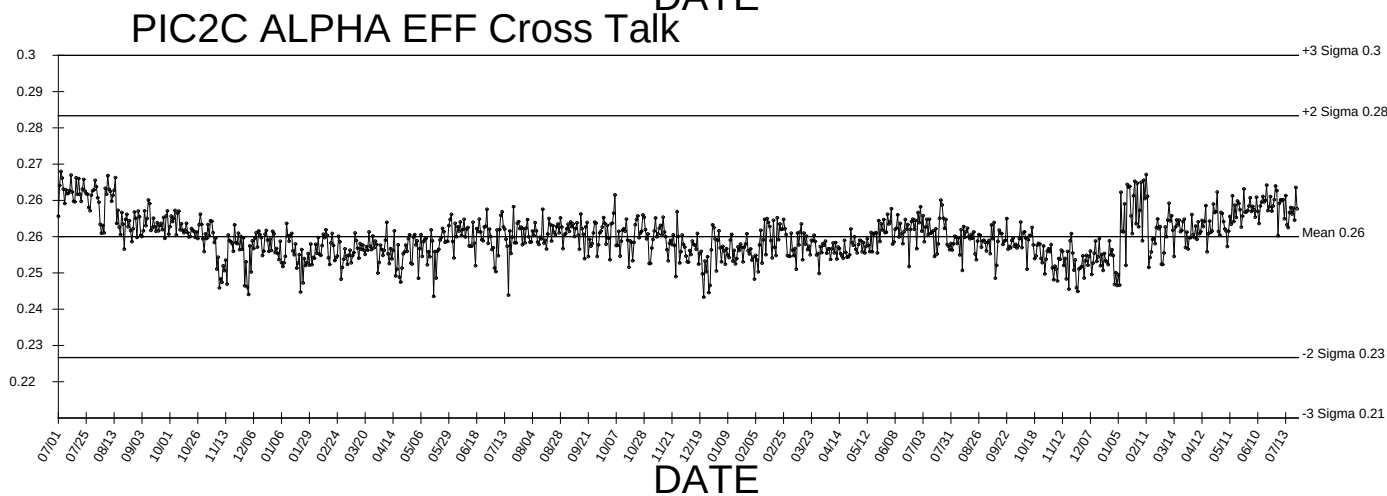
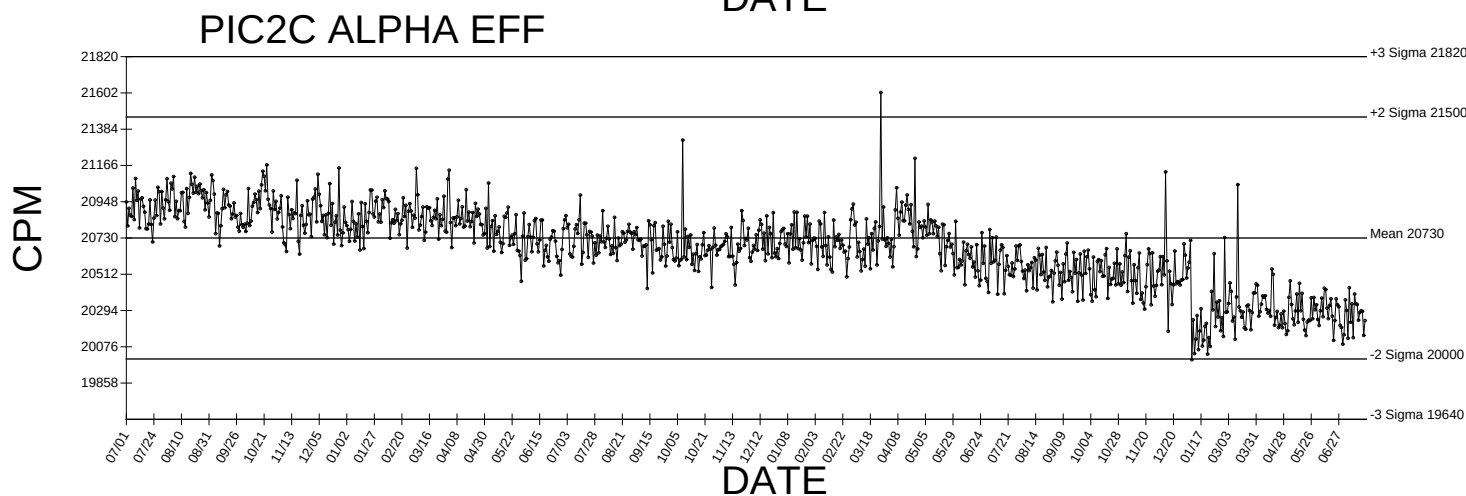
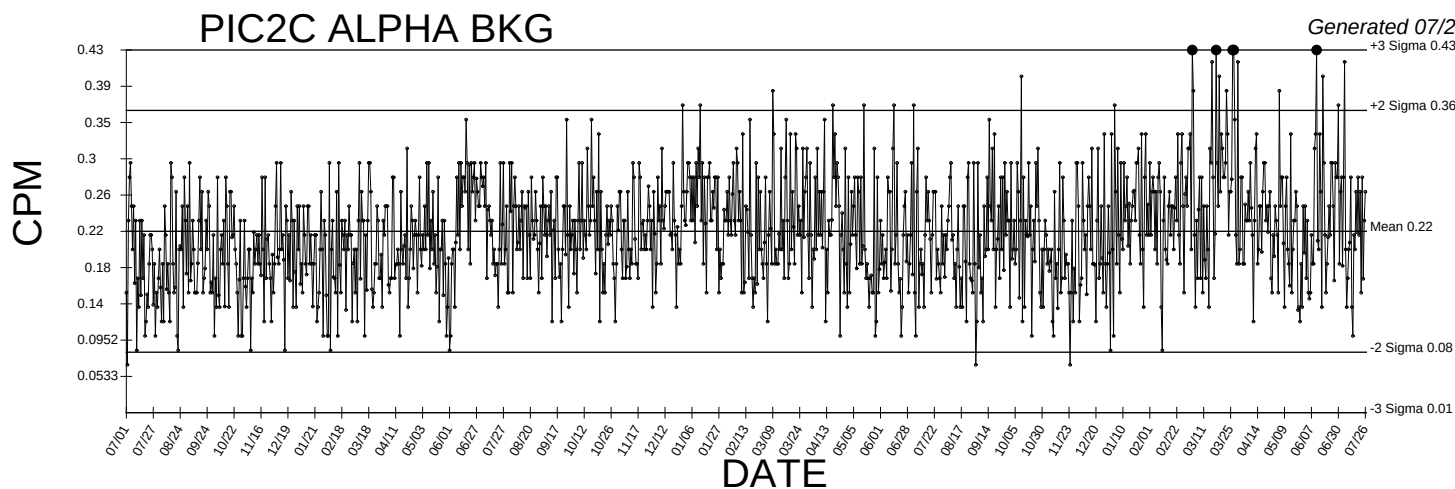
● Denotes Outlier



● Denotes Outlier

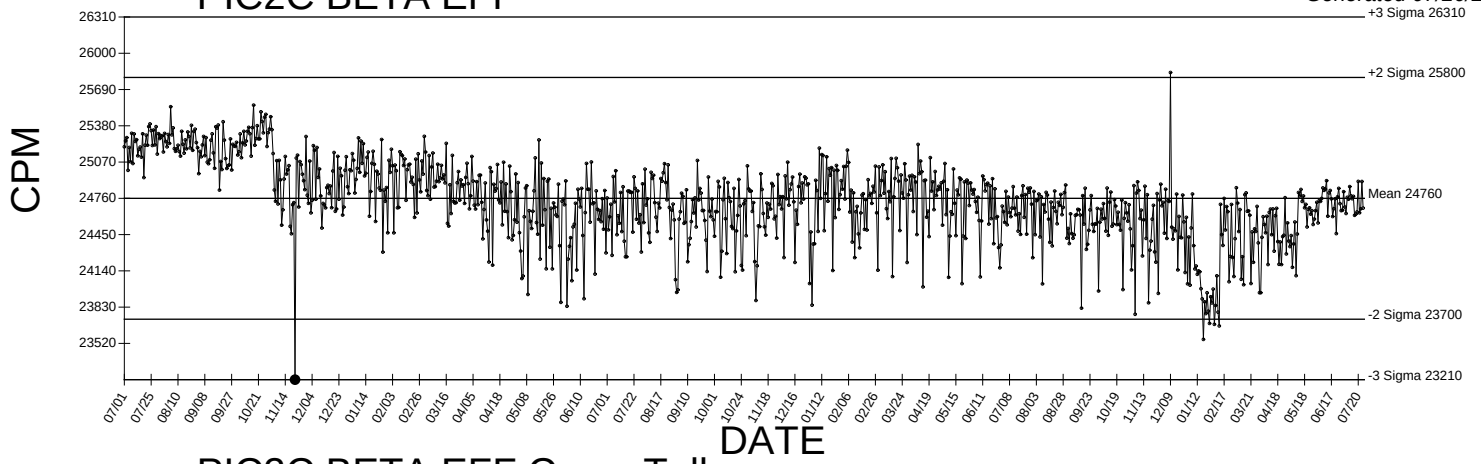


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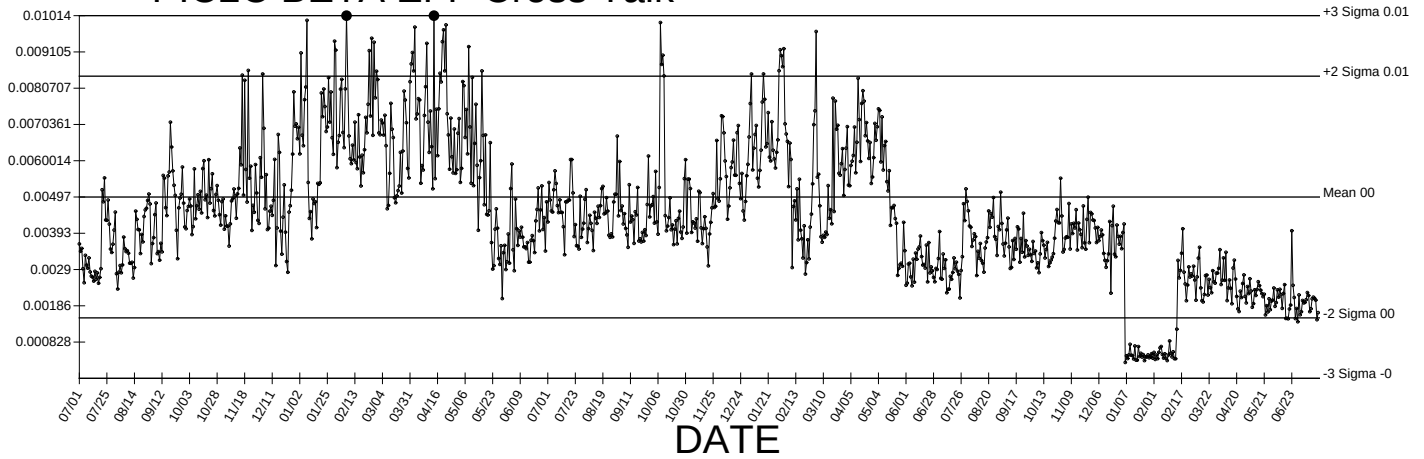


PIC2C BETA EFF

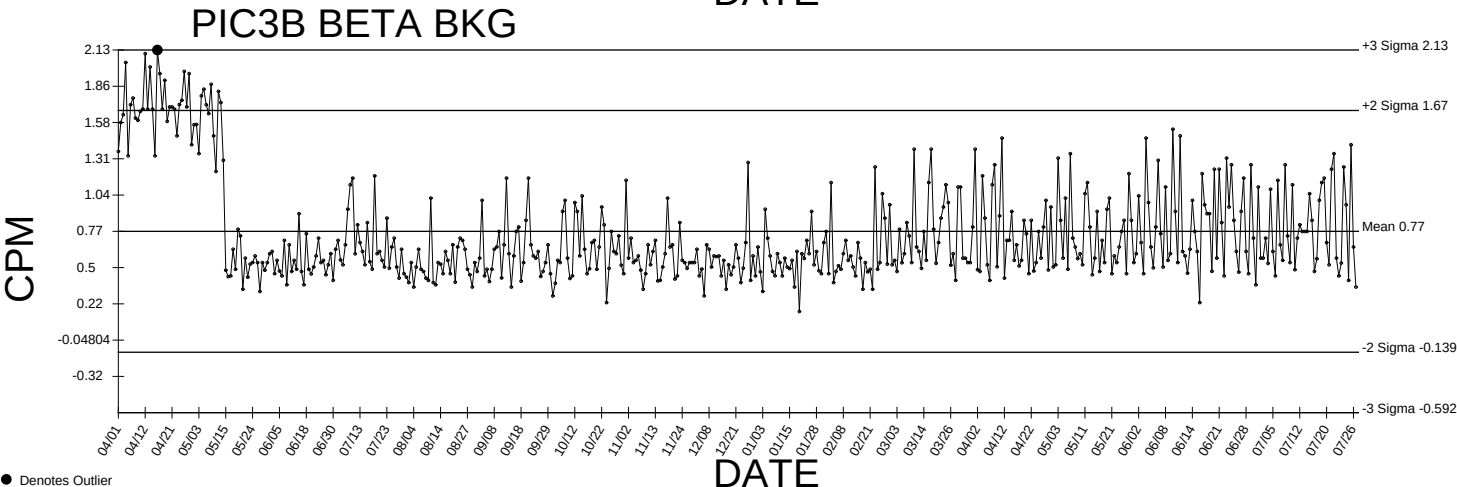
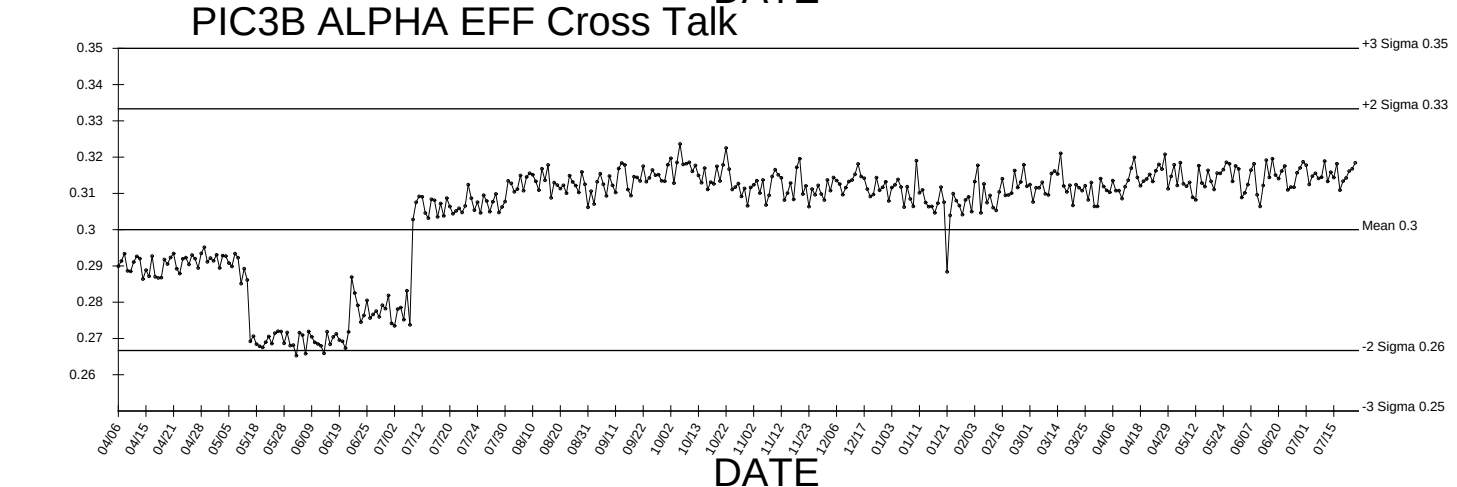
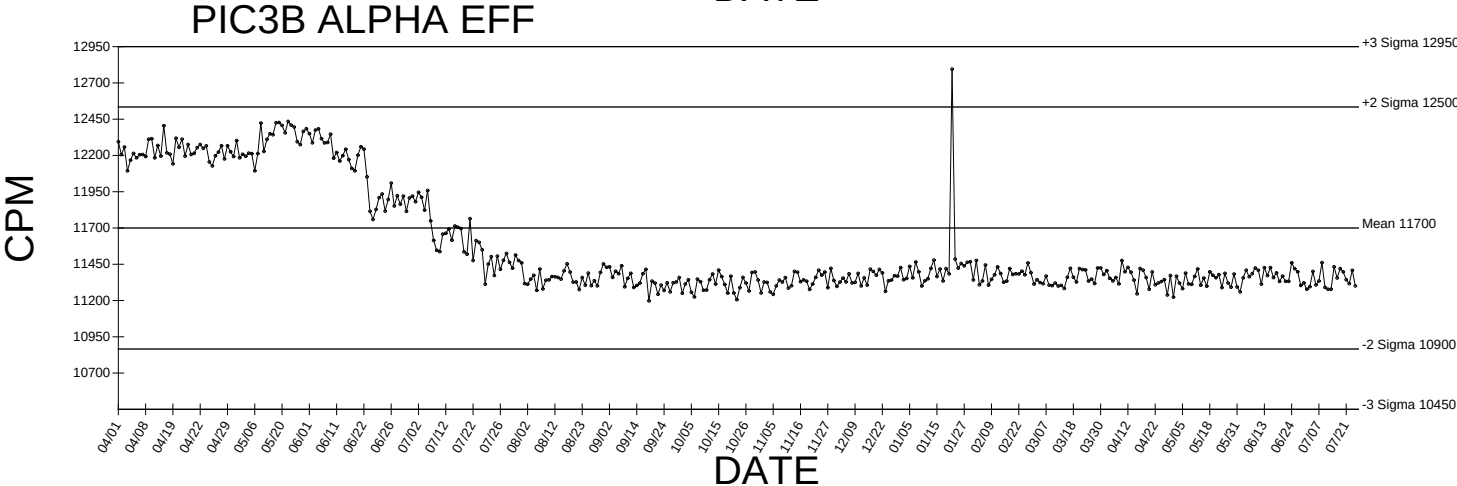
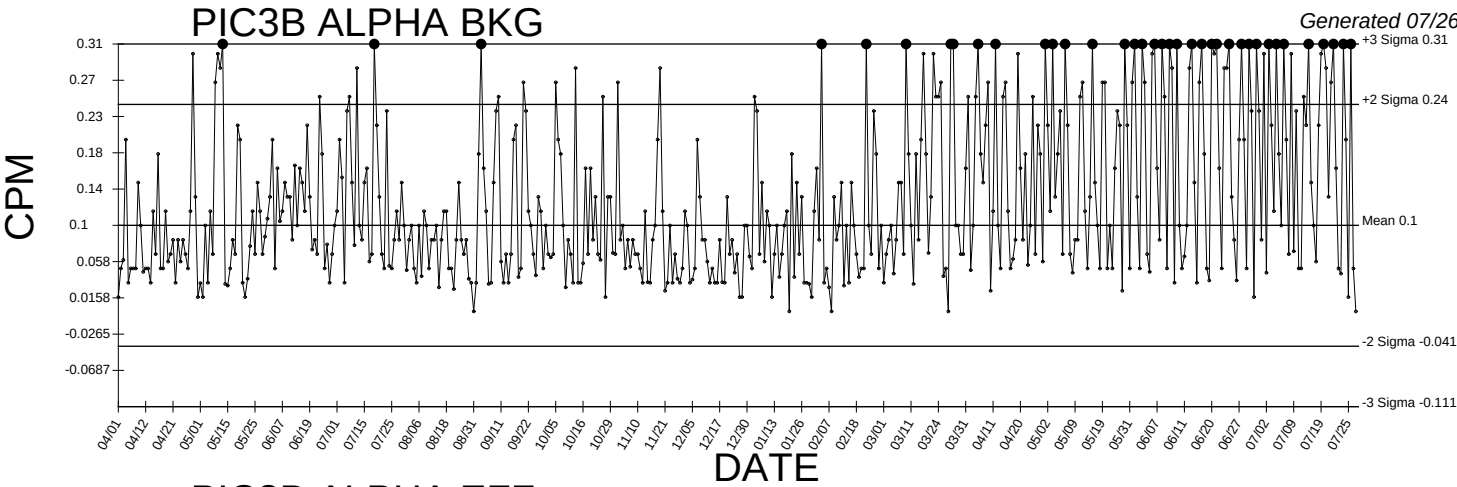
Generated 07/26/2022

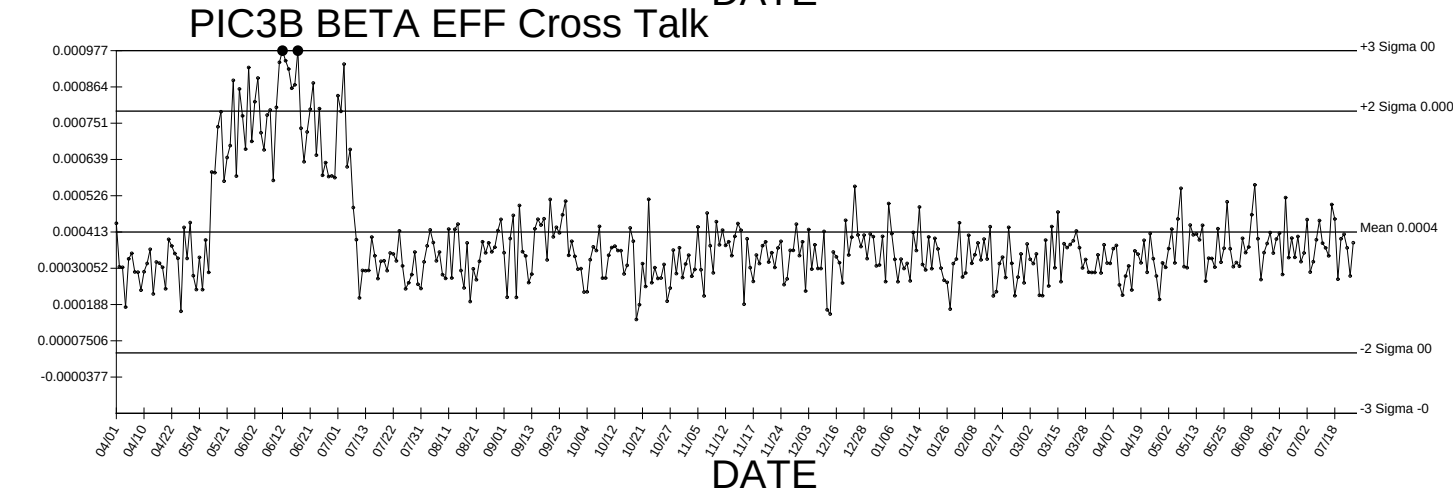
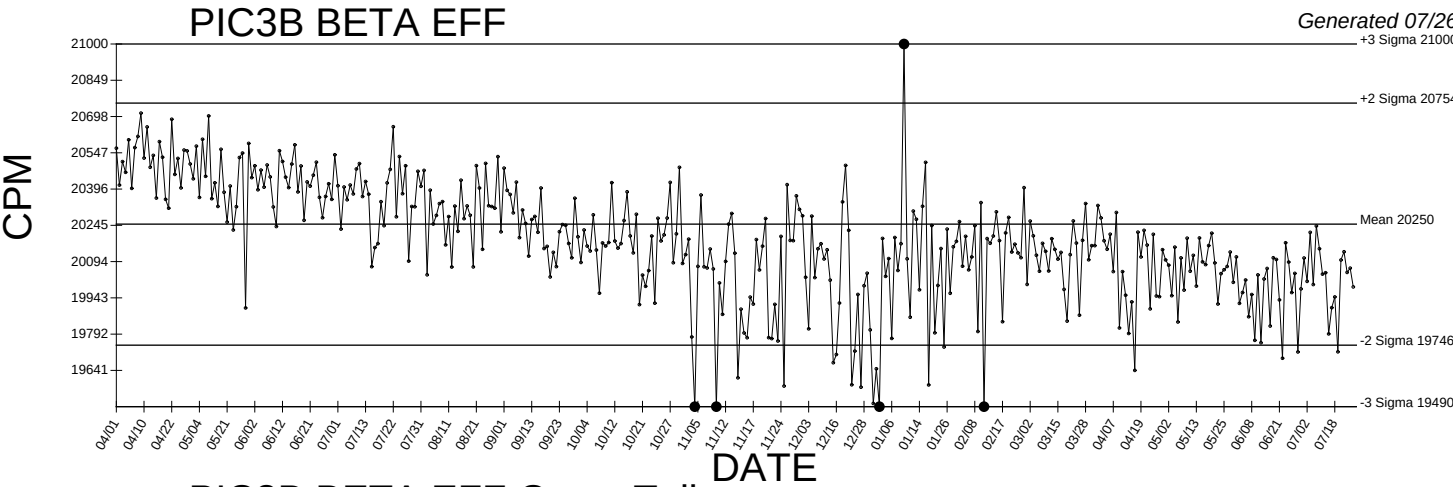


PIC2C BETA EFF Cross Talk

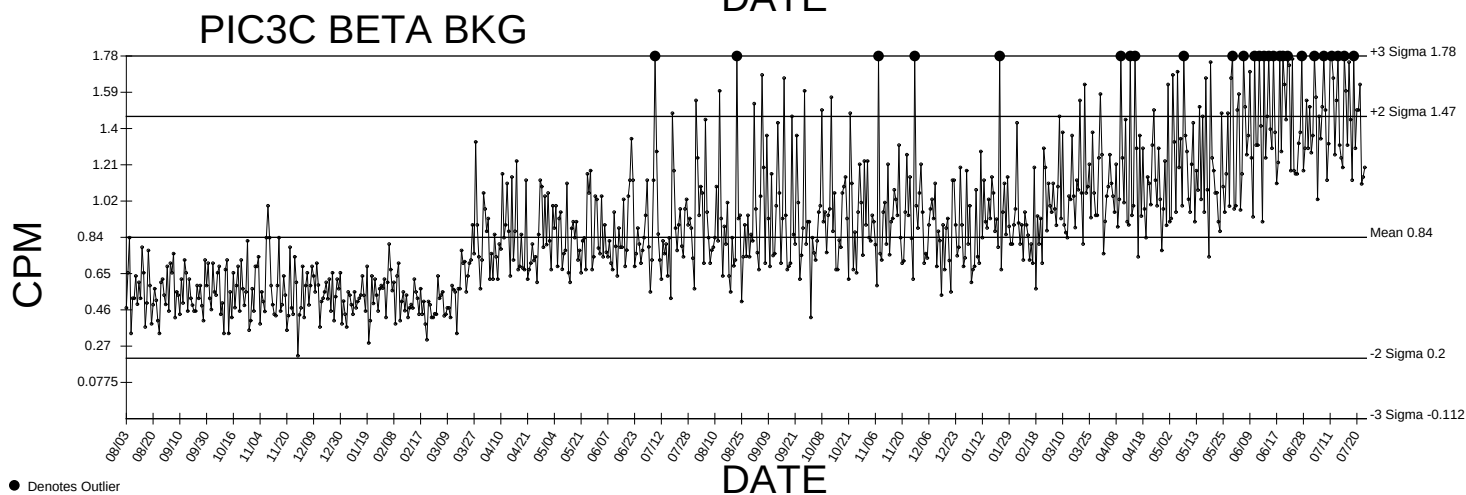
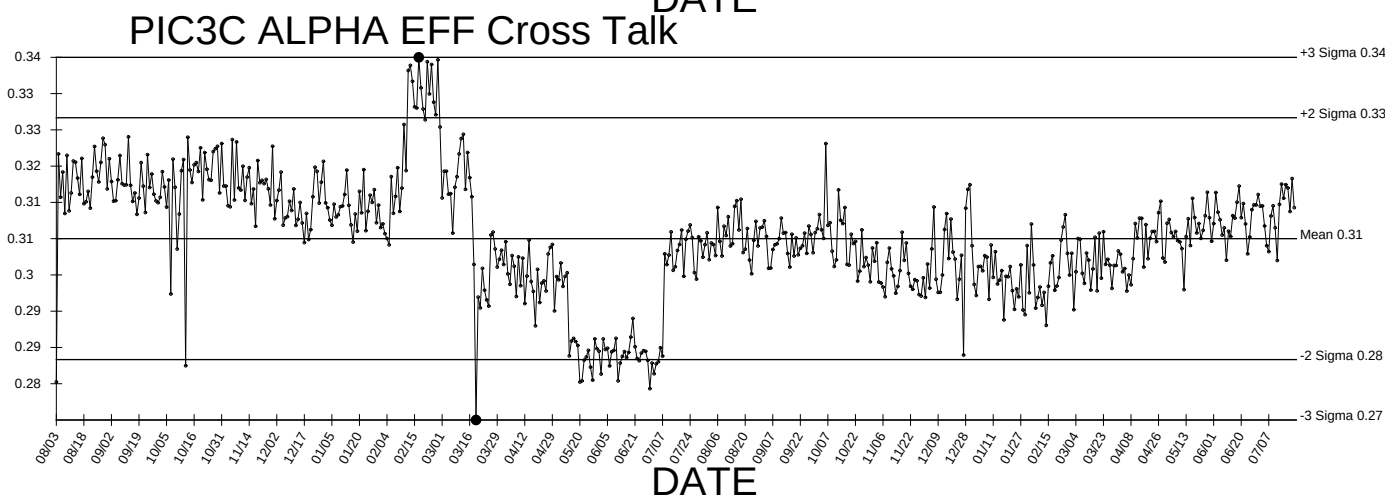
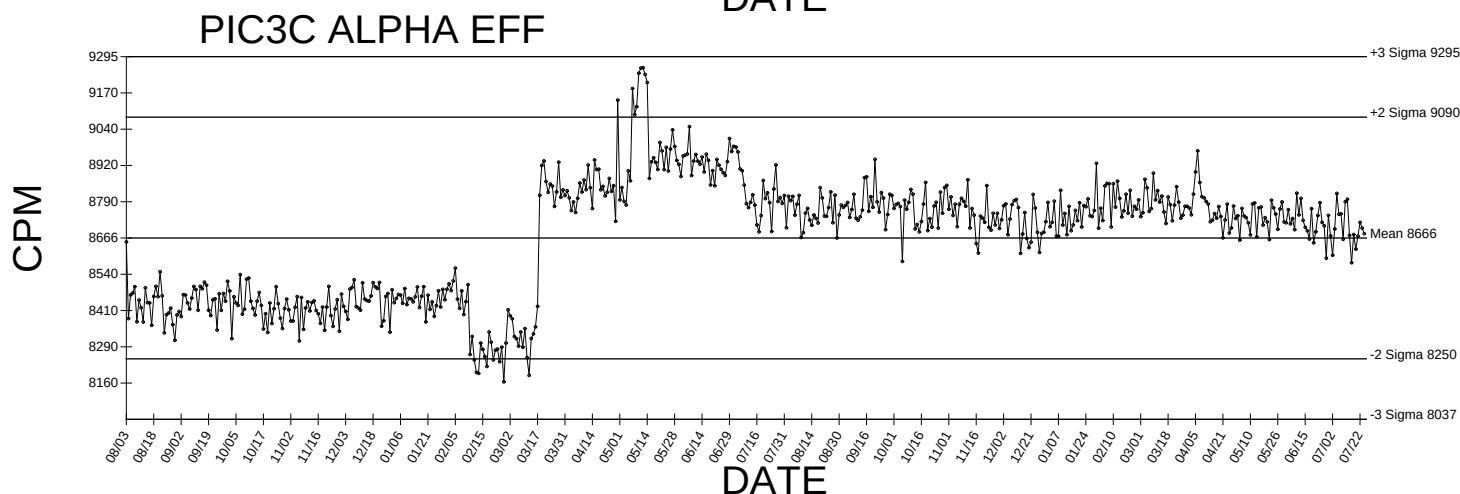
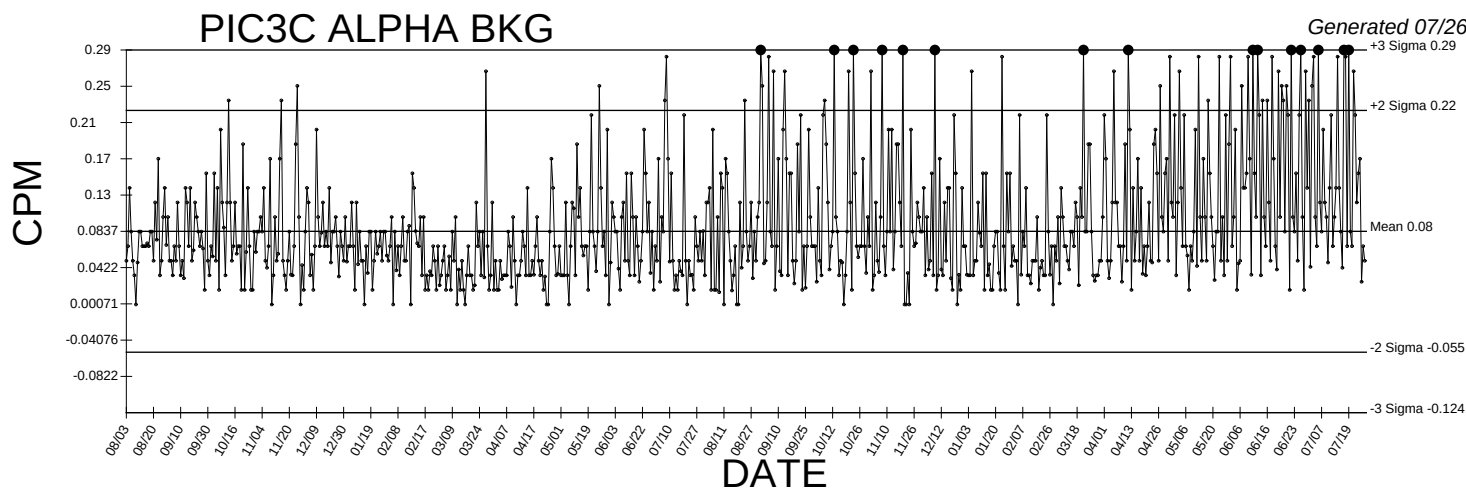


● Denotes Outlier

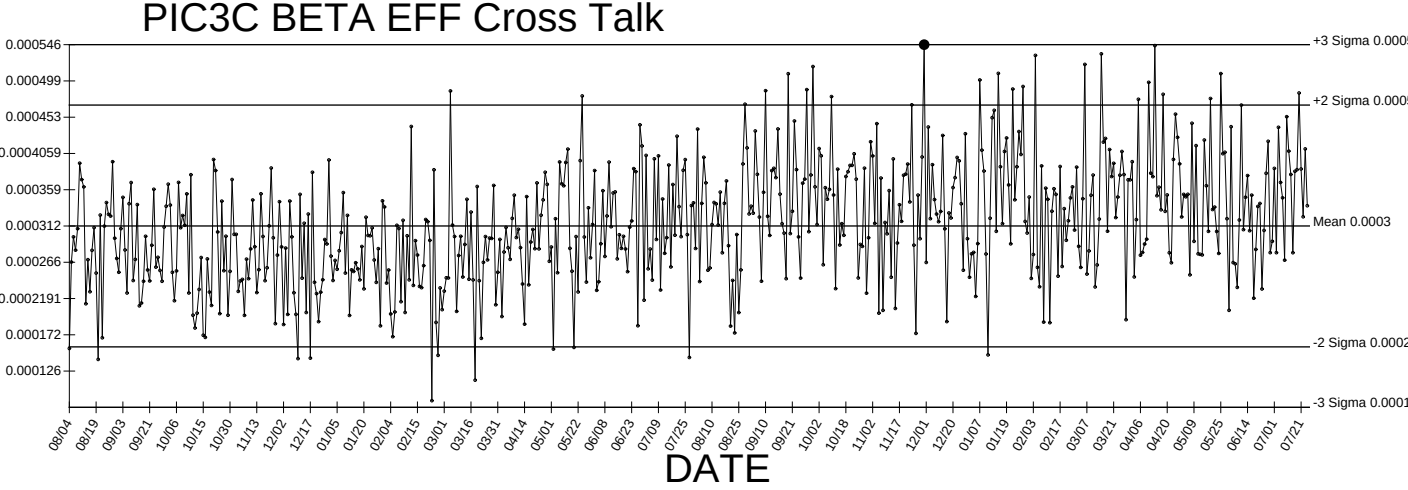
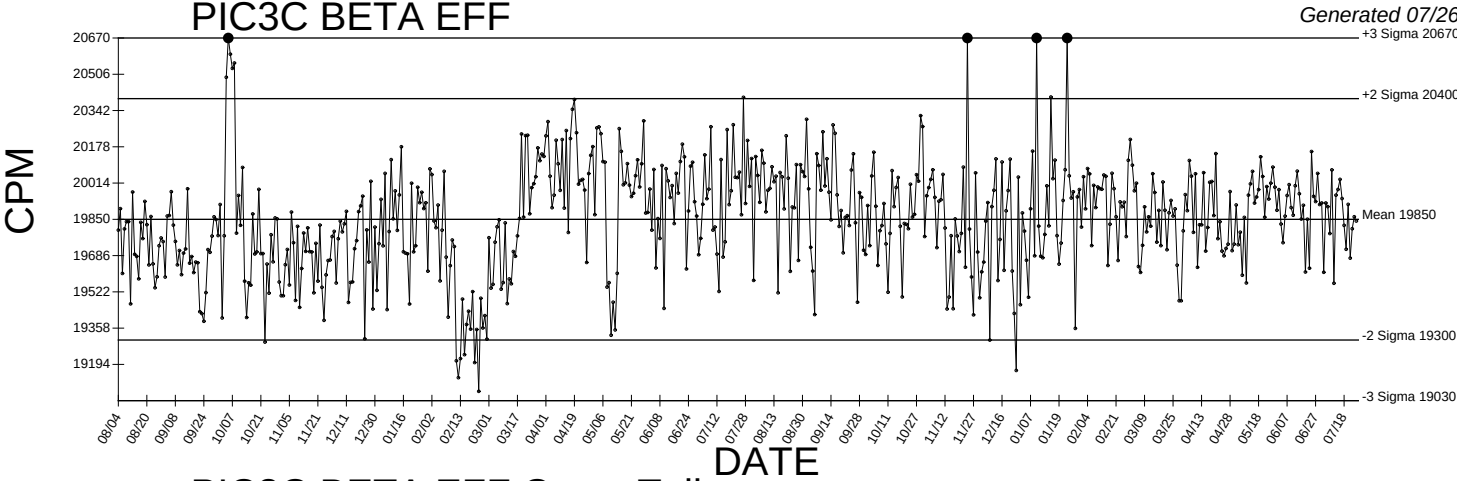




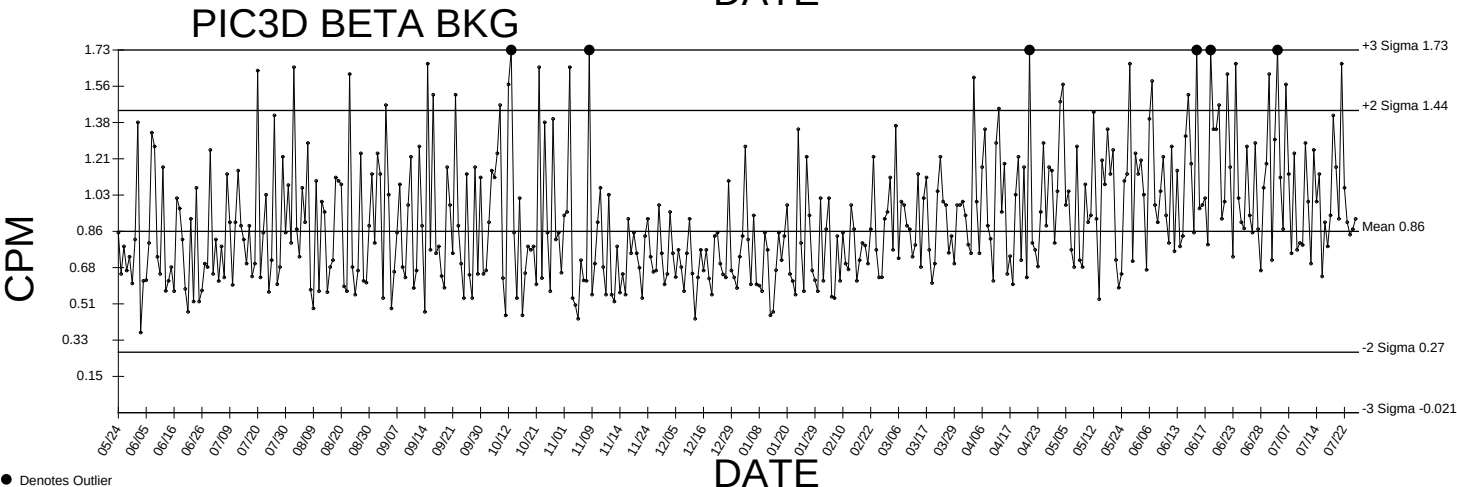
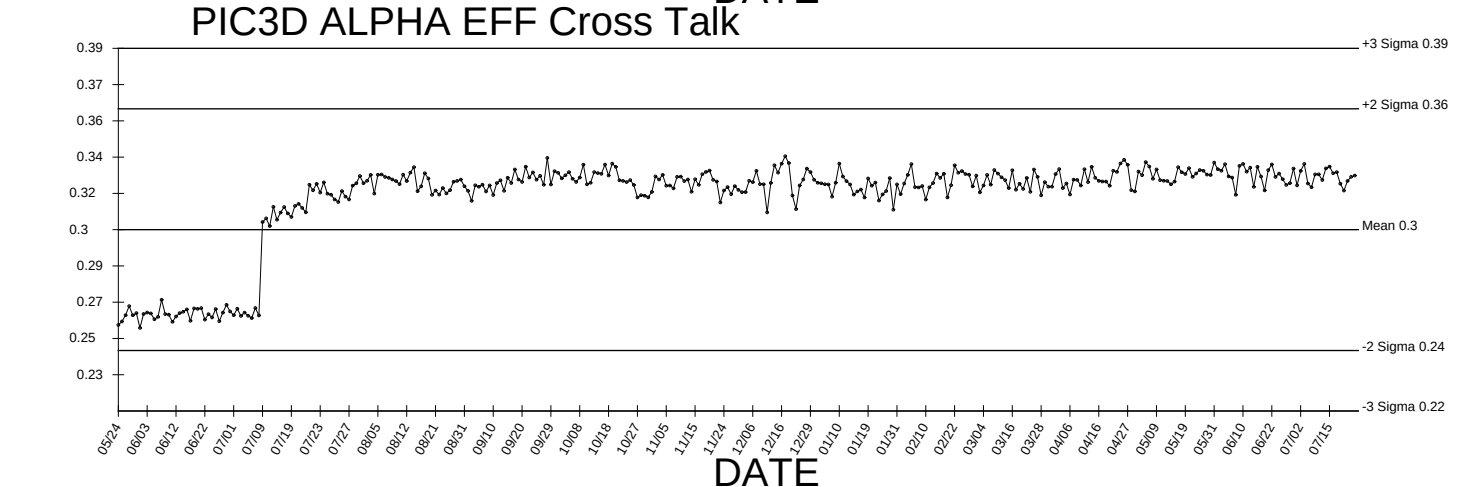
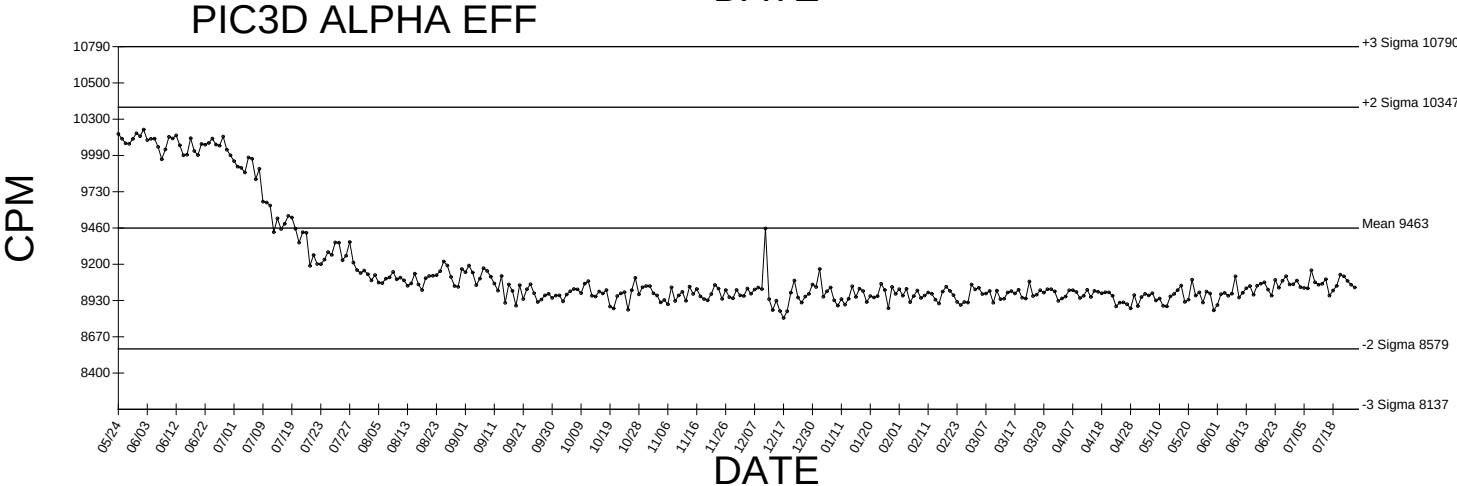
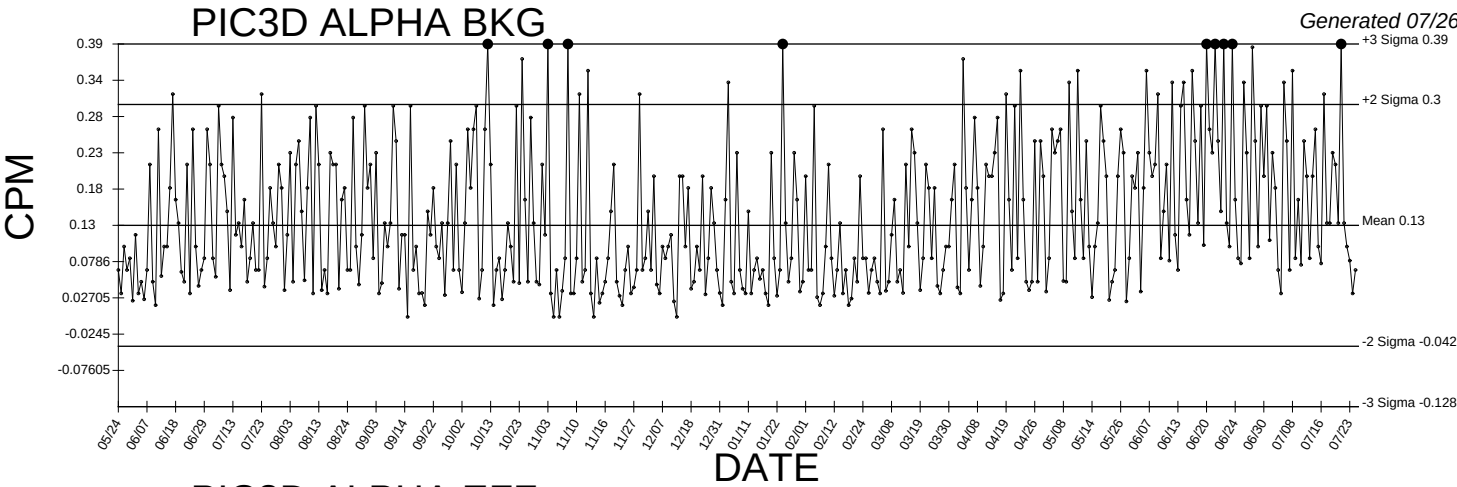
● Denotes Outlier



● Denotes Outlier



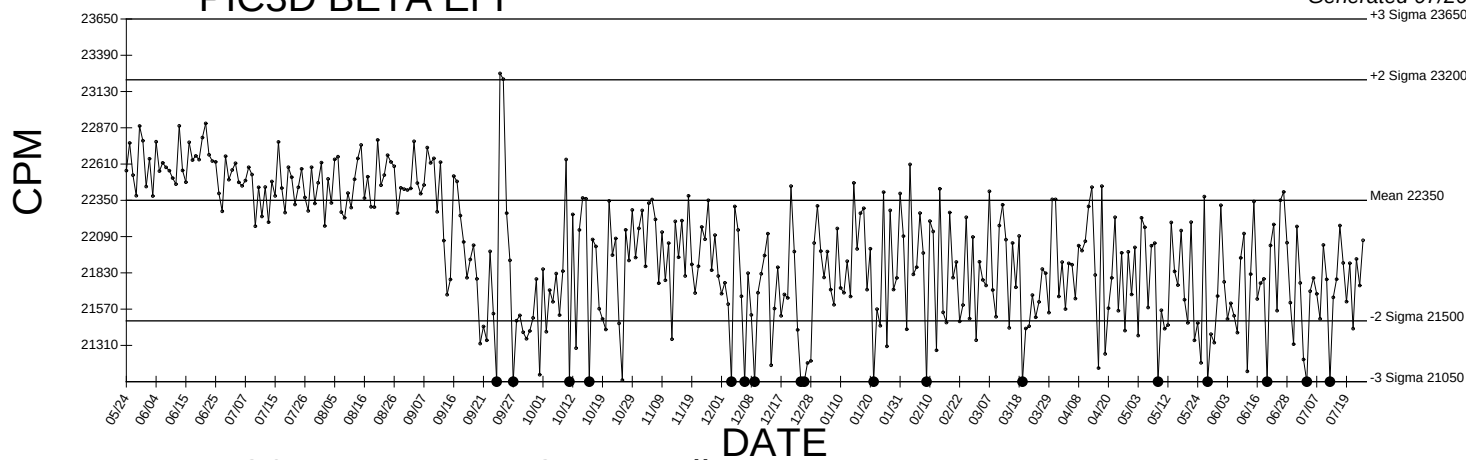
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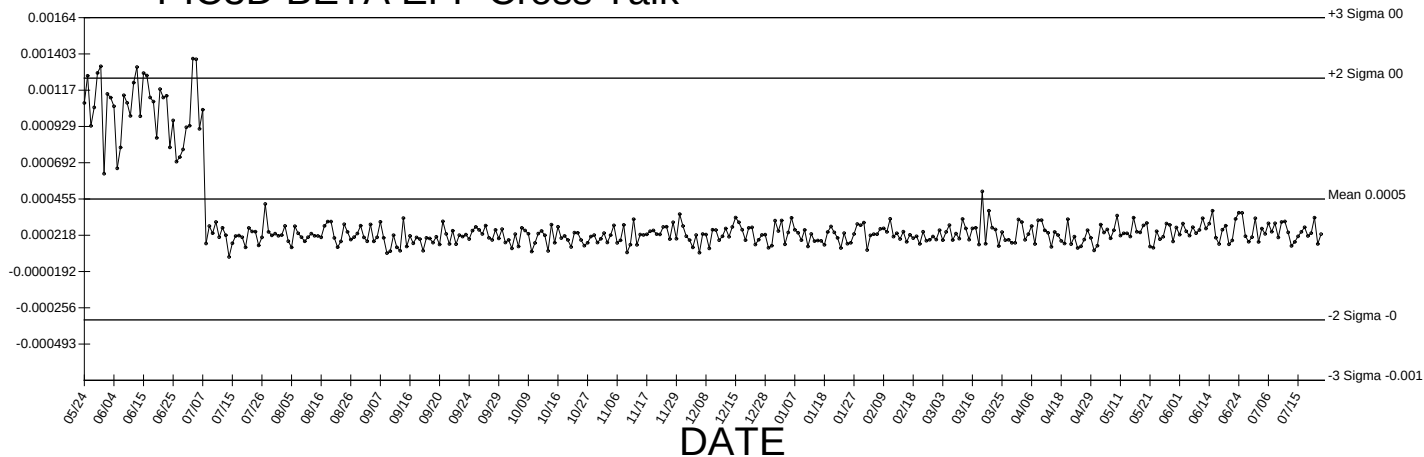
● Denotes Outlier

PIC3D BETA EFF

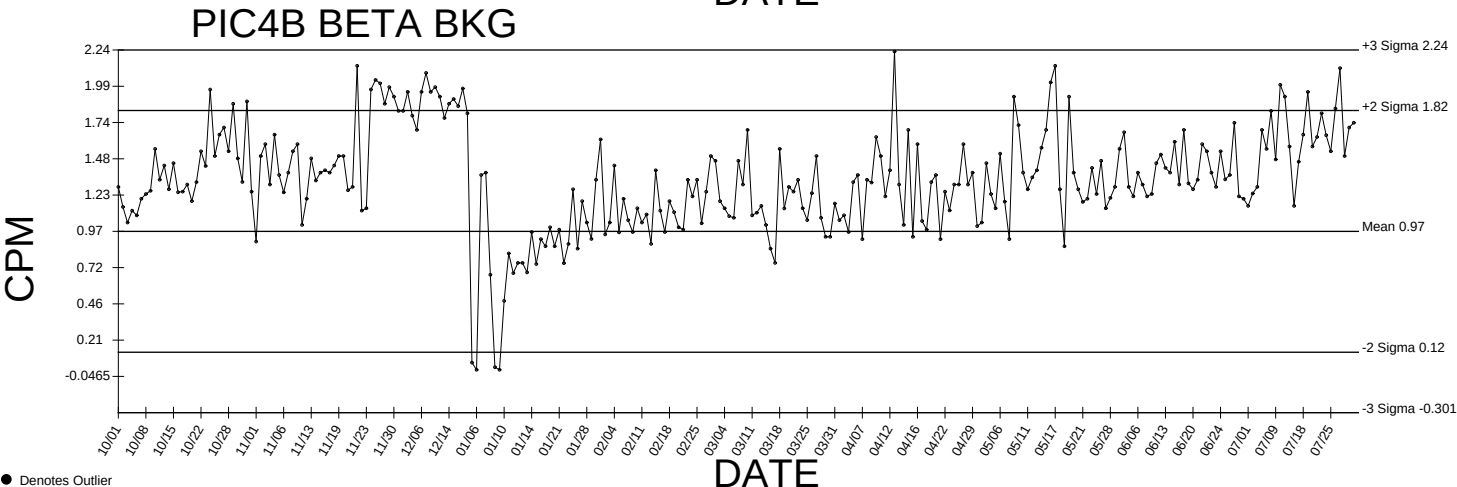
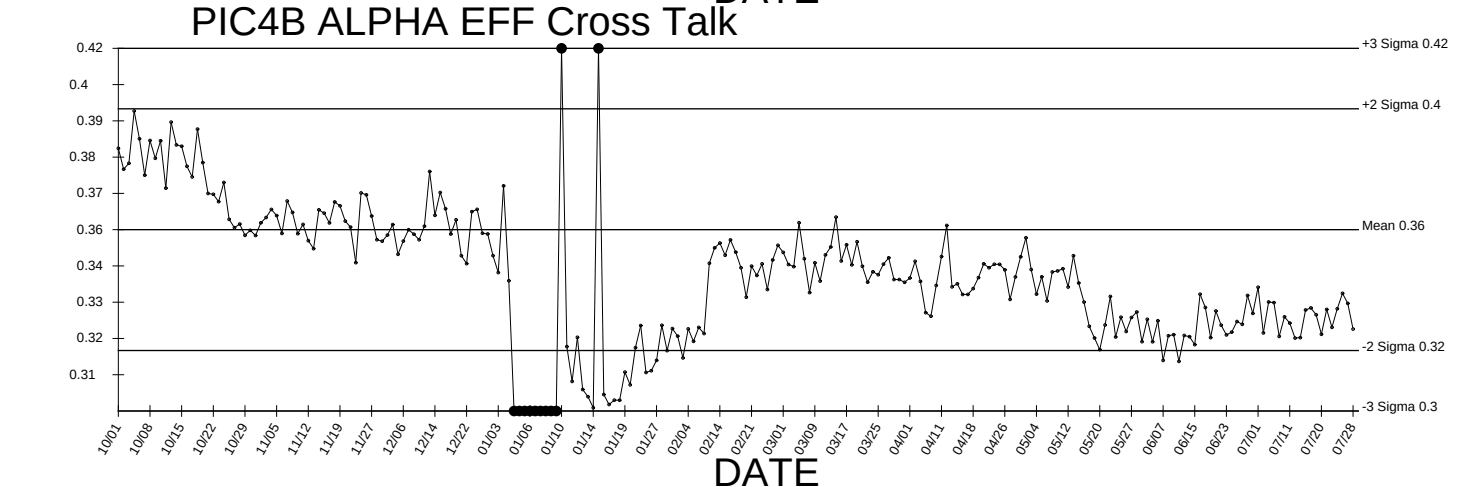
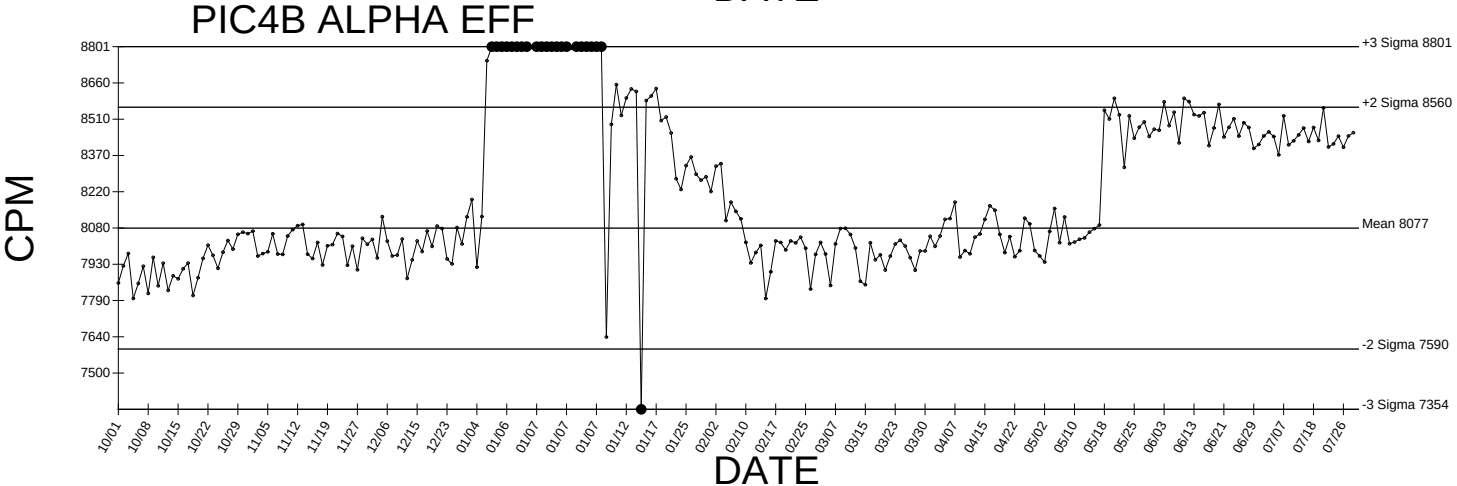
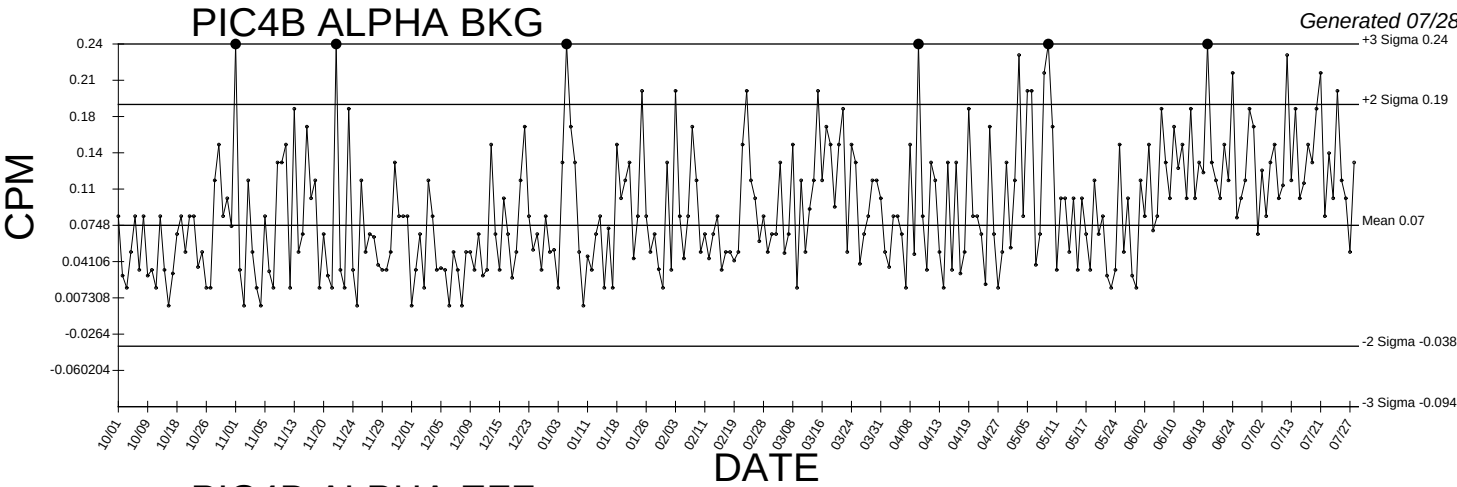
Generated 07/26/2022
+3 Sigma 23650



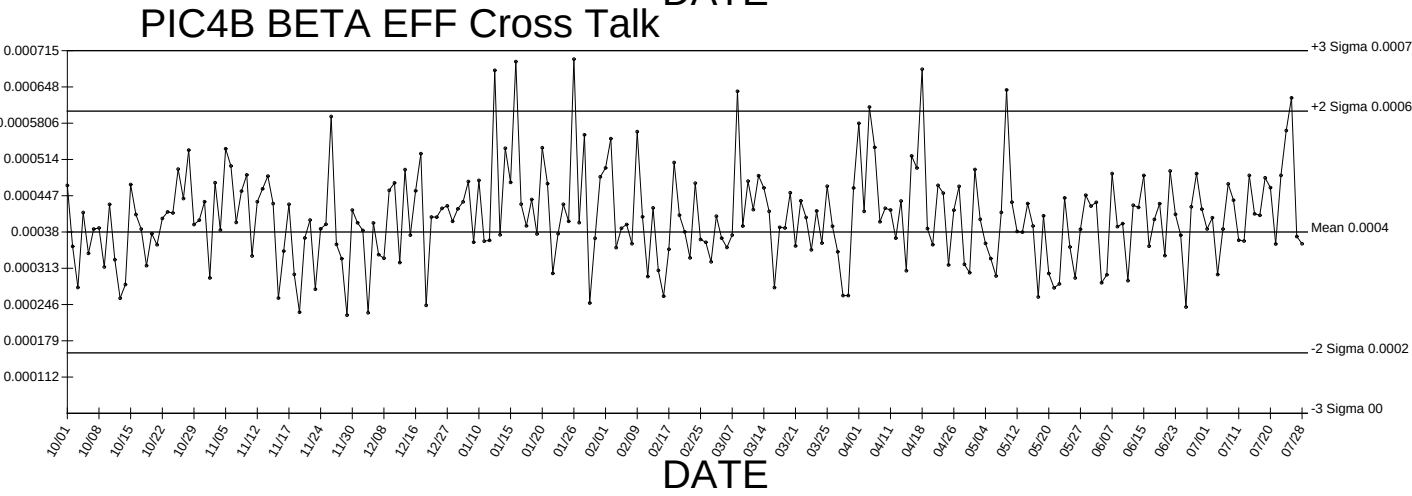
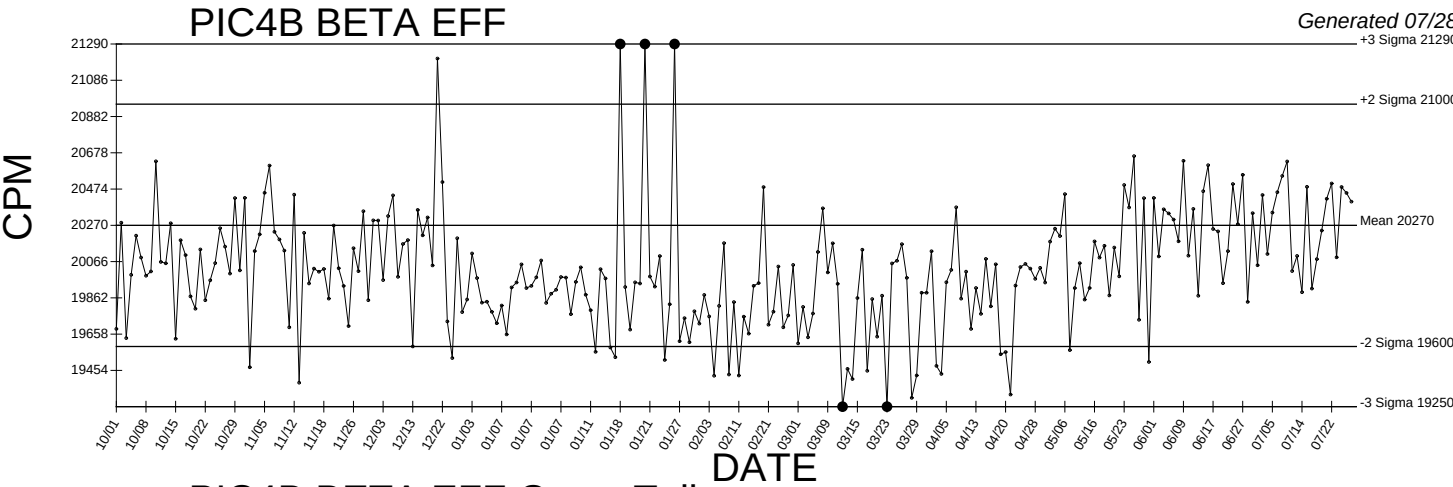
PIC3D BETA EFF Cross Talk



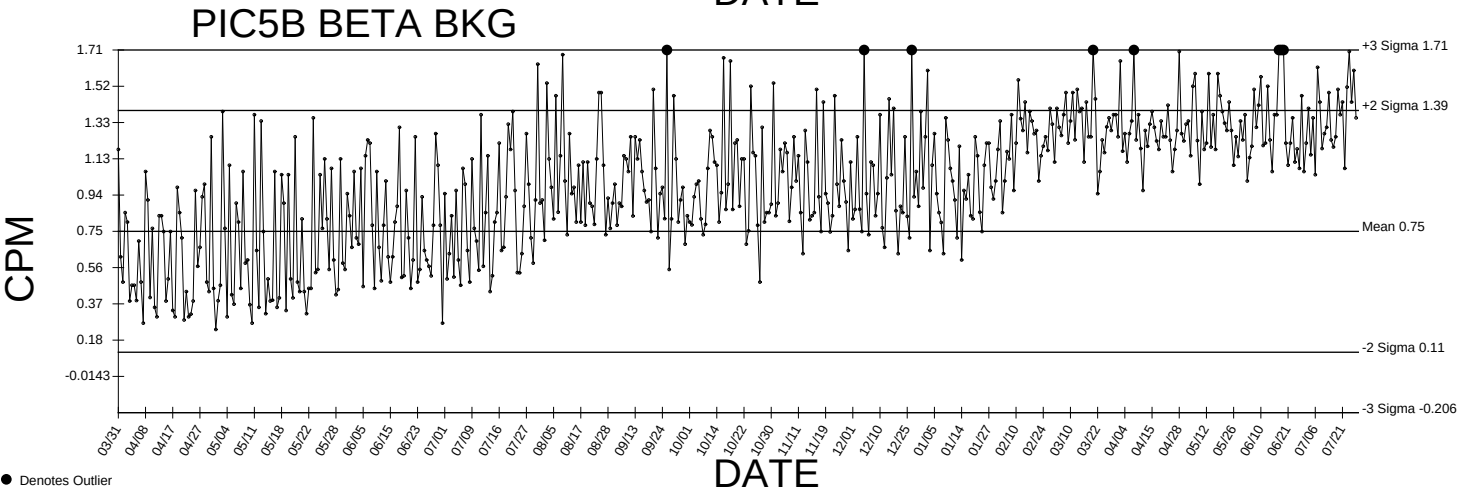
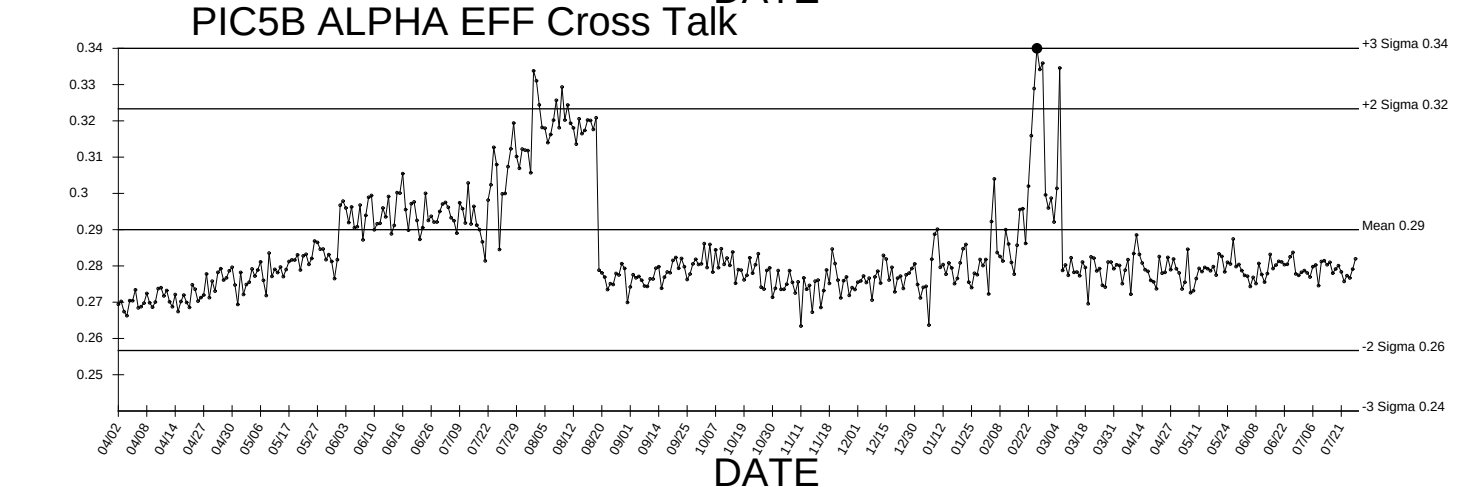
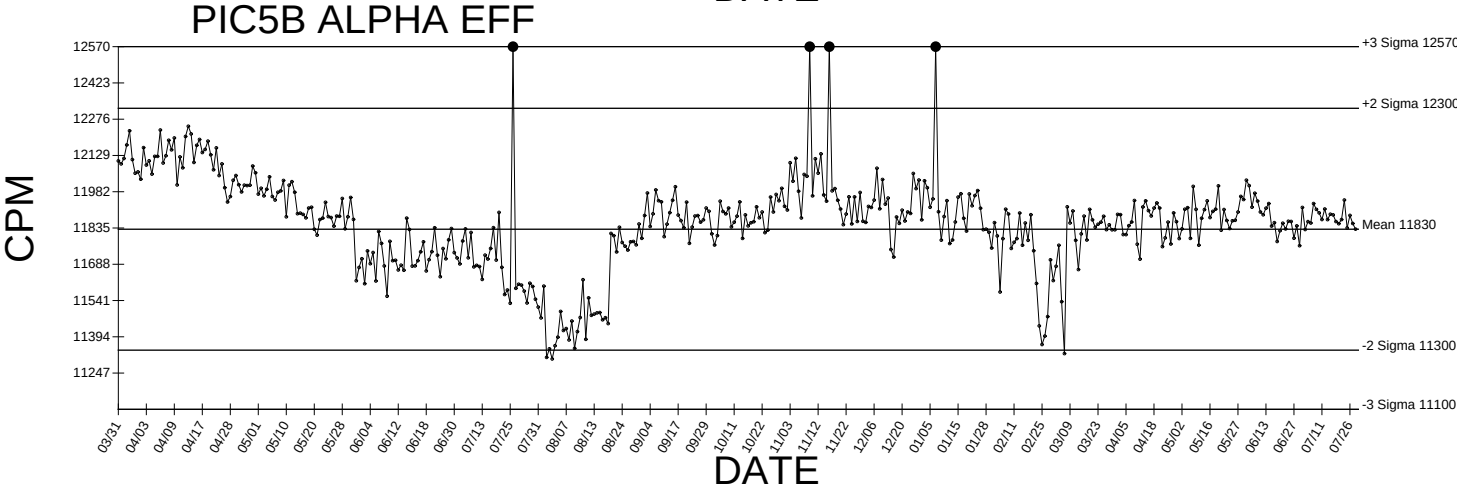
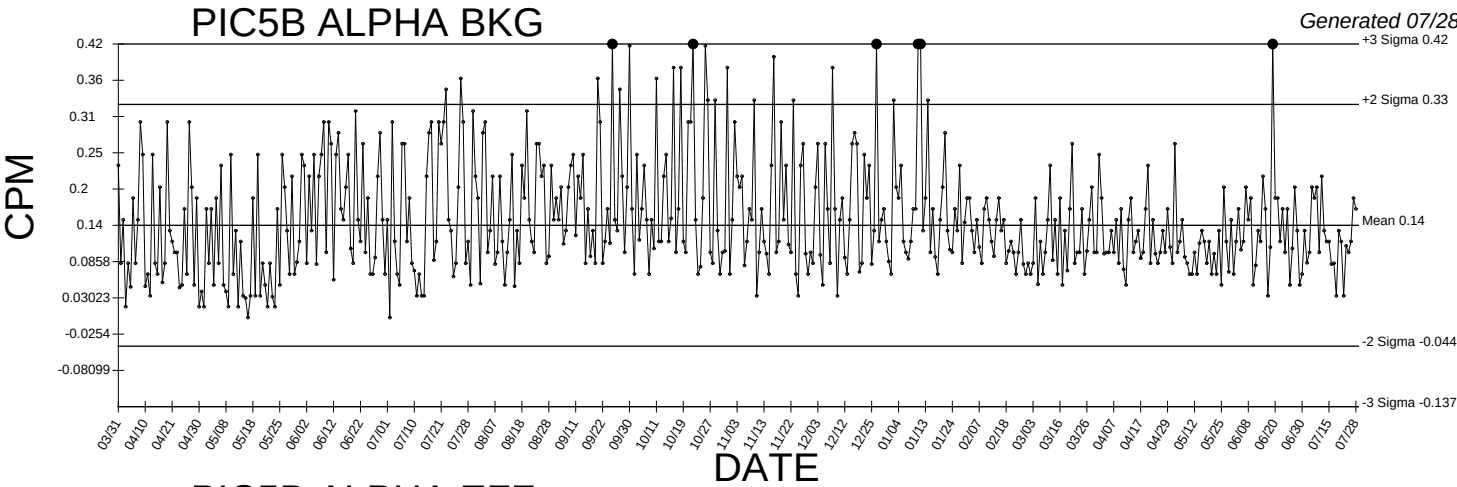
● Denotes Outlier



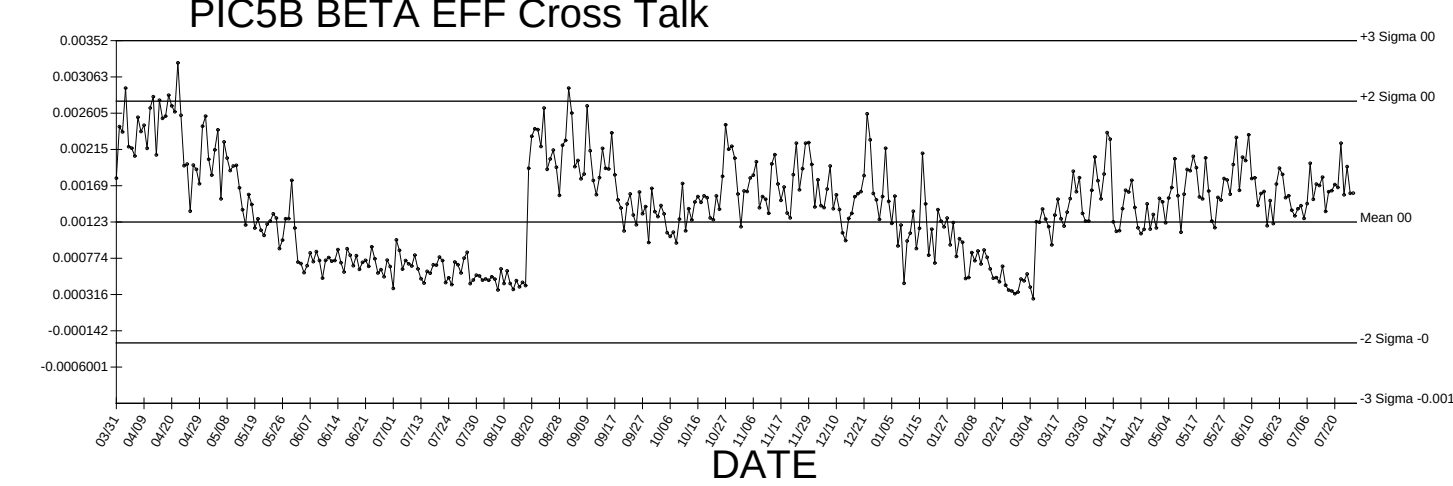
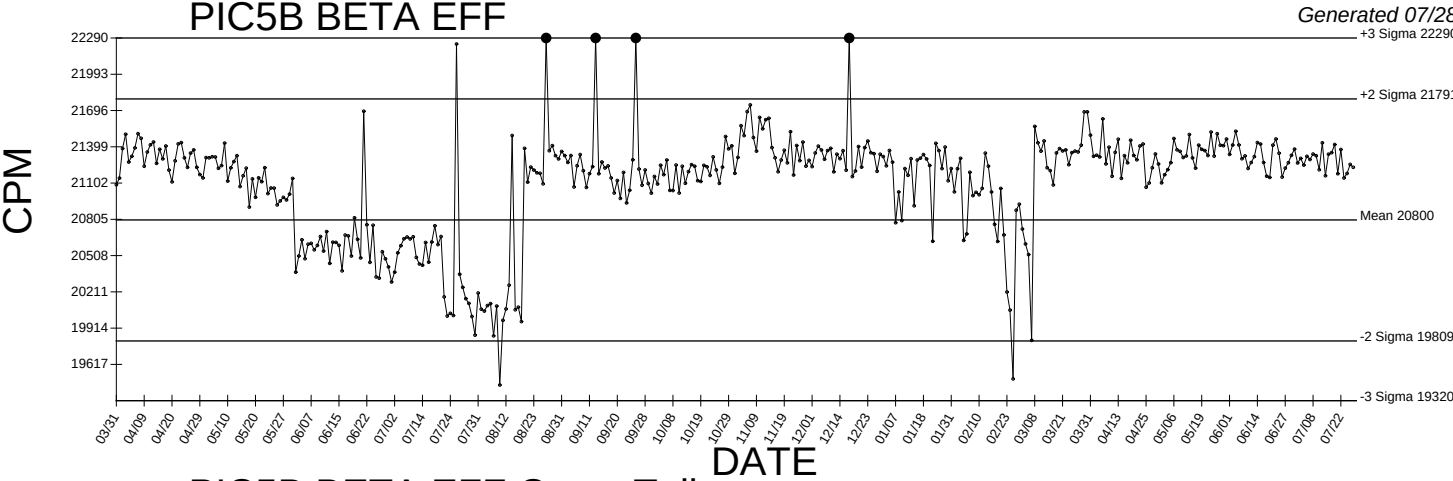
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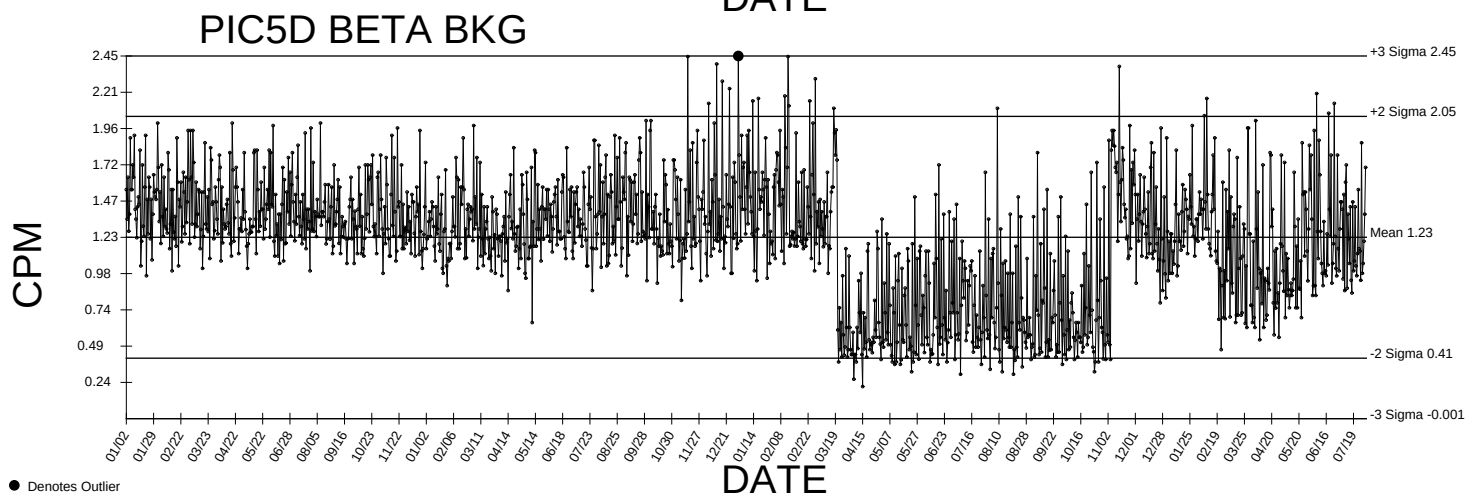
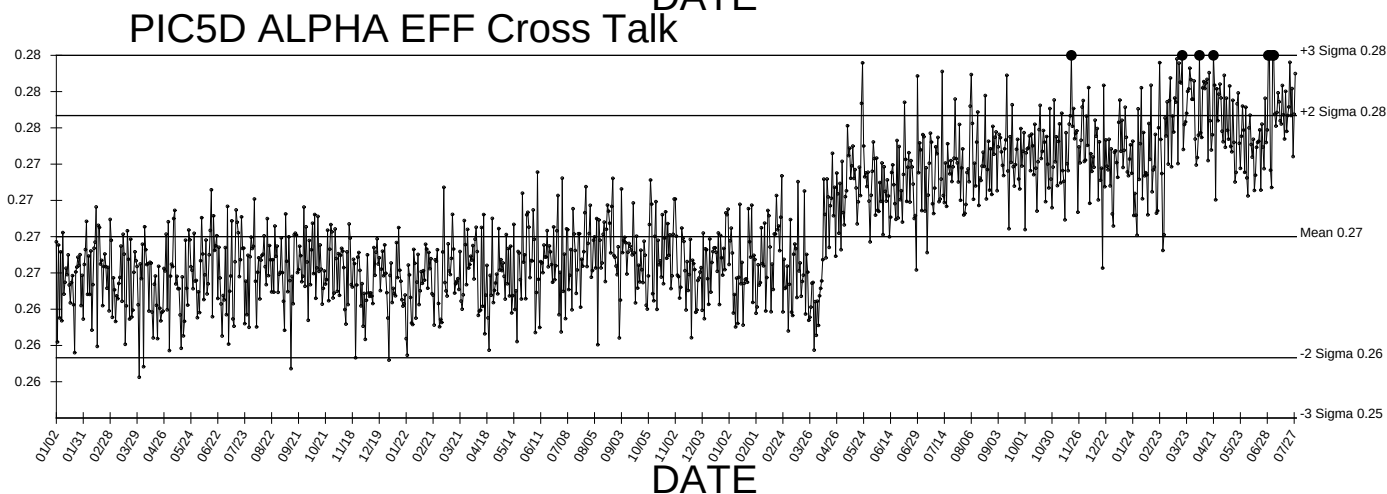
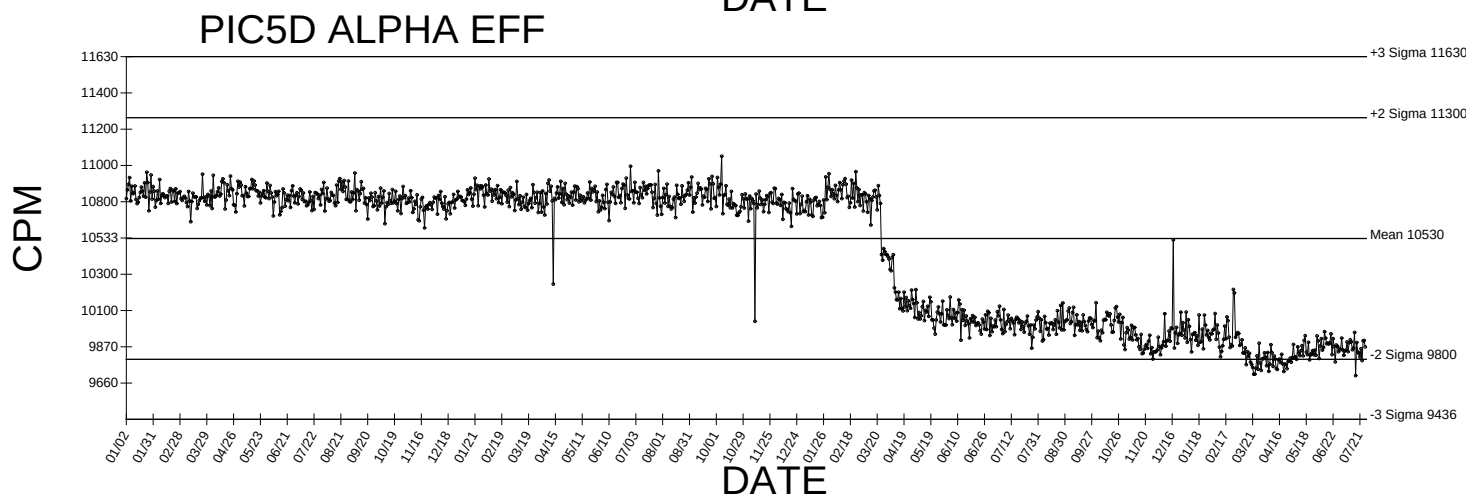
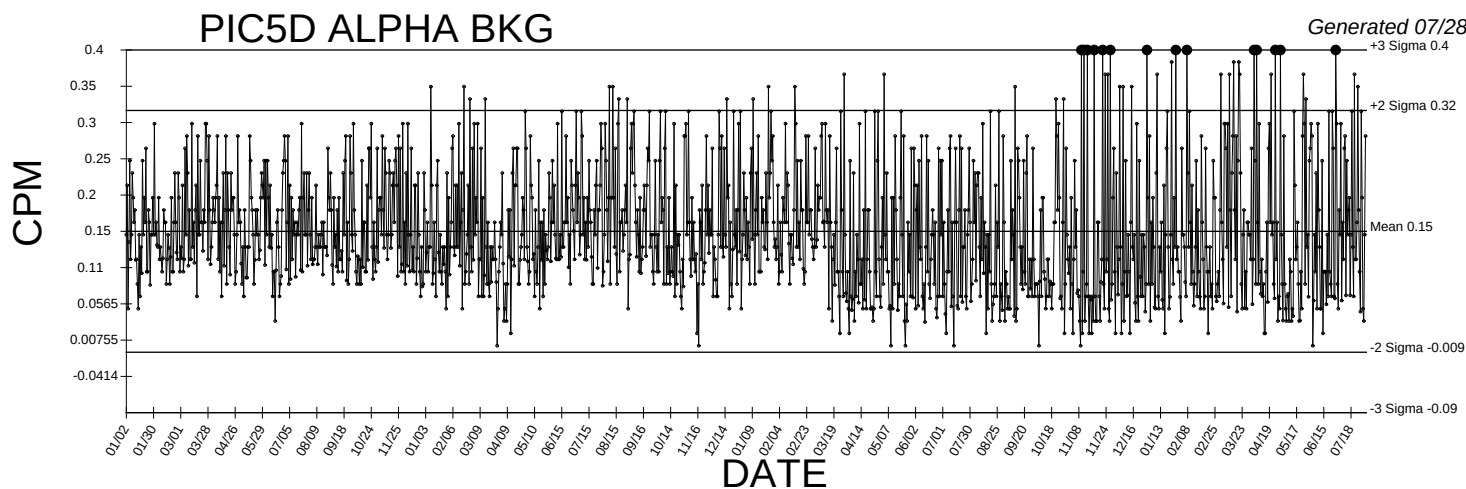
● Denotes Outlier



● Denotes Outlier



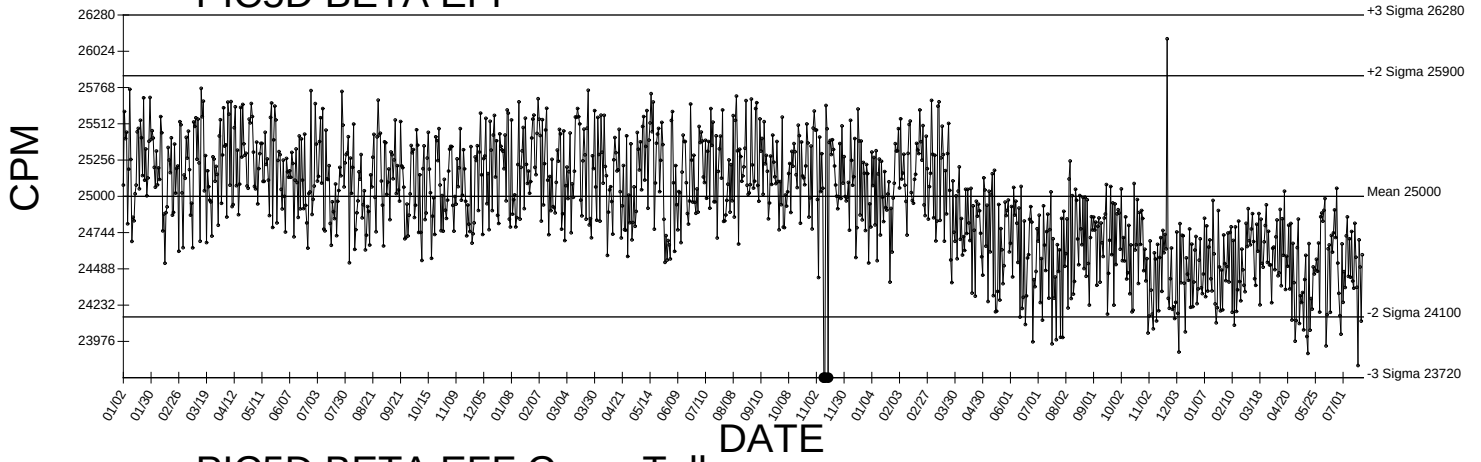
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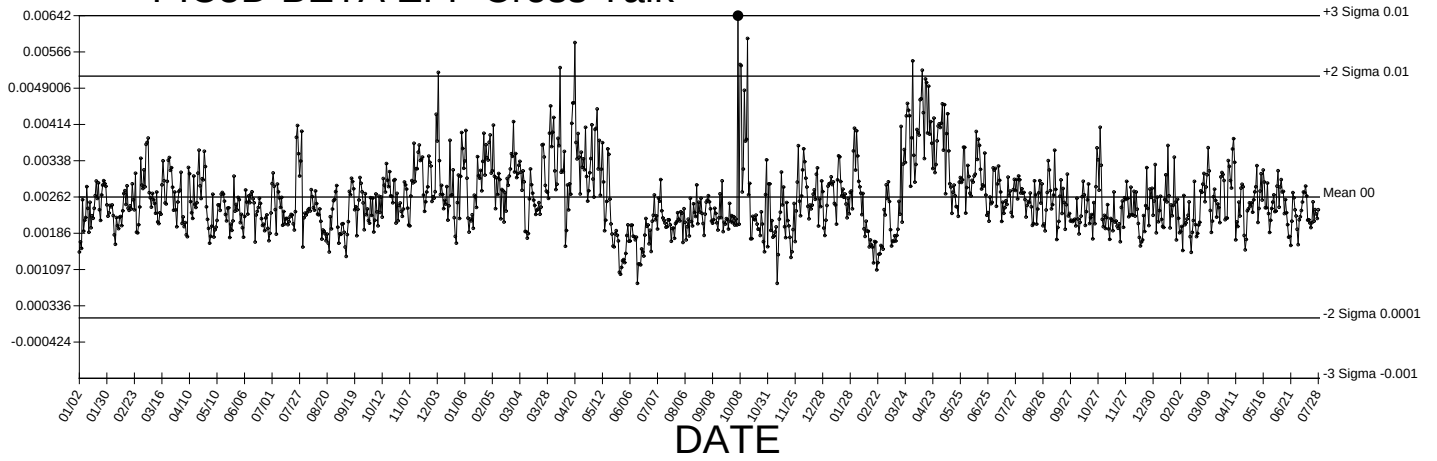
● Denotes Outlier

PIC5D BETA EFF

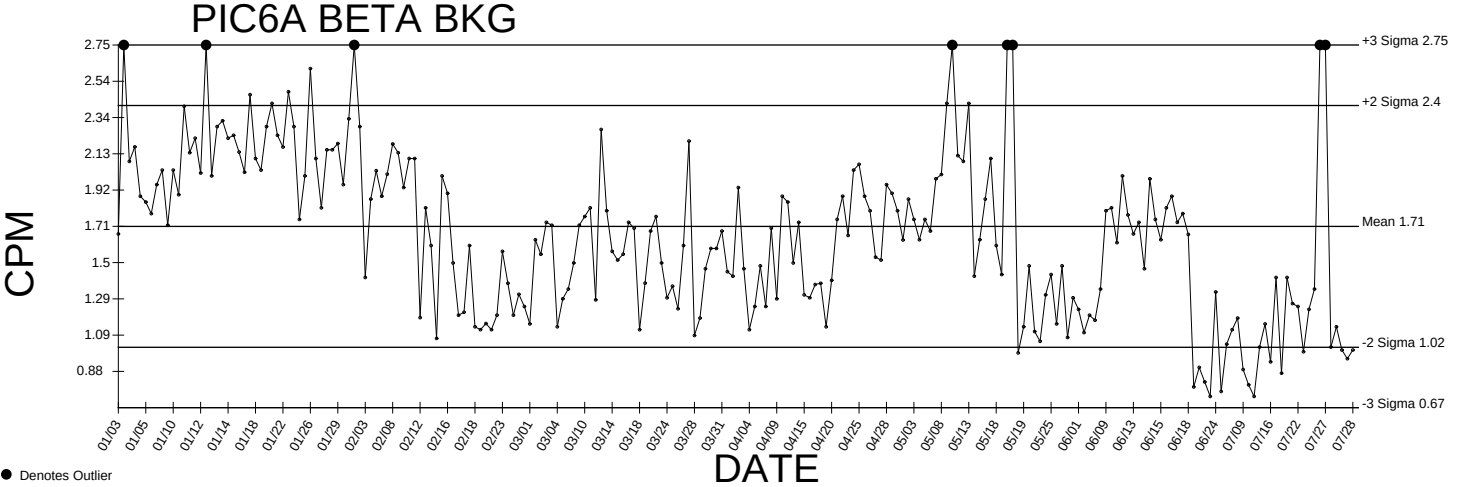
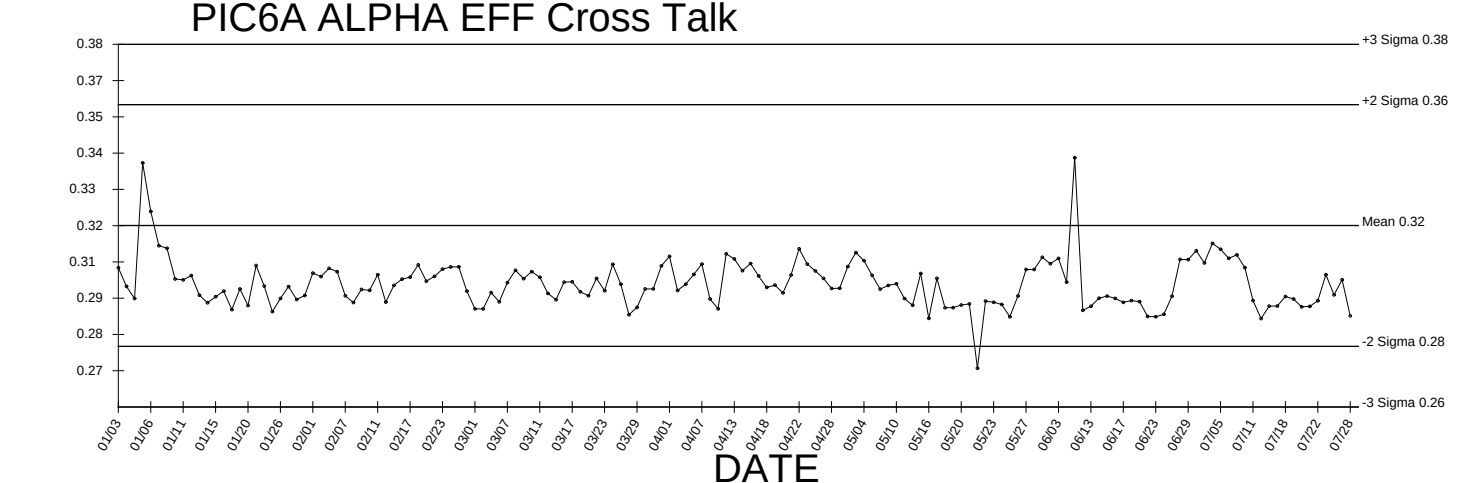
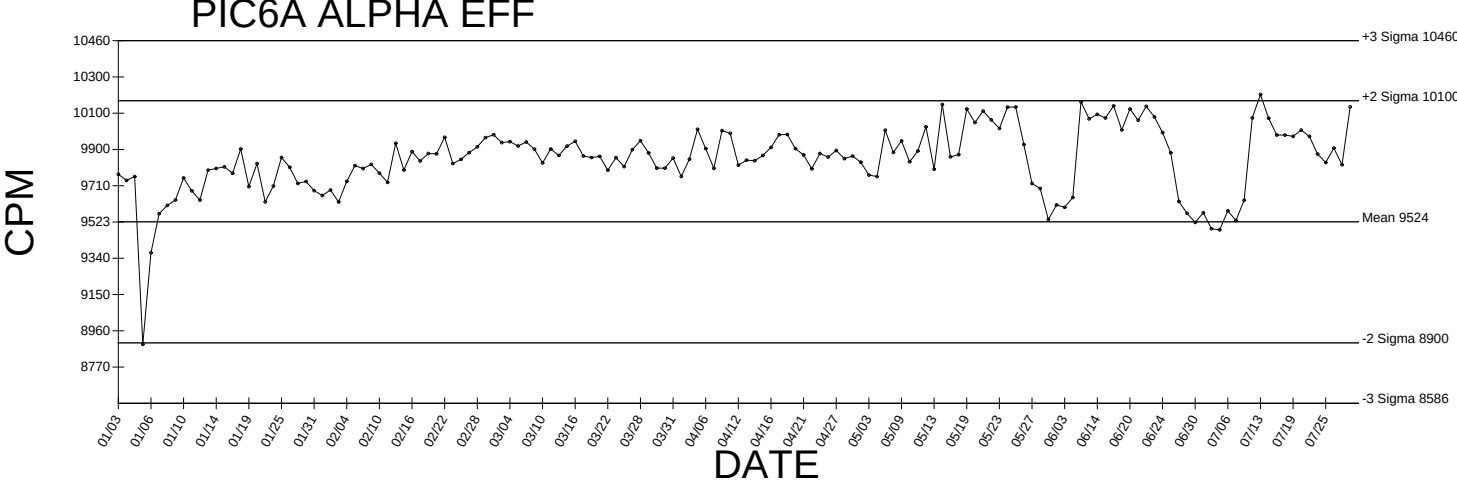
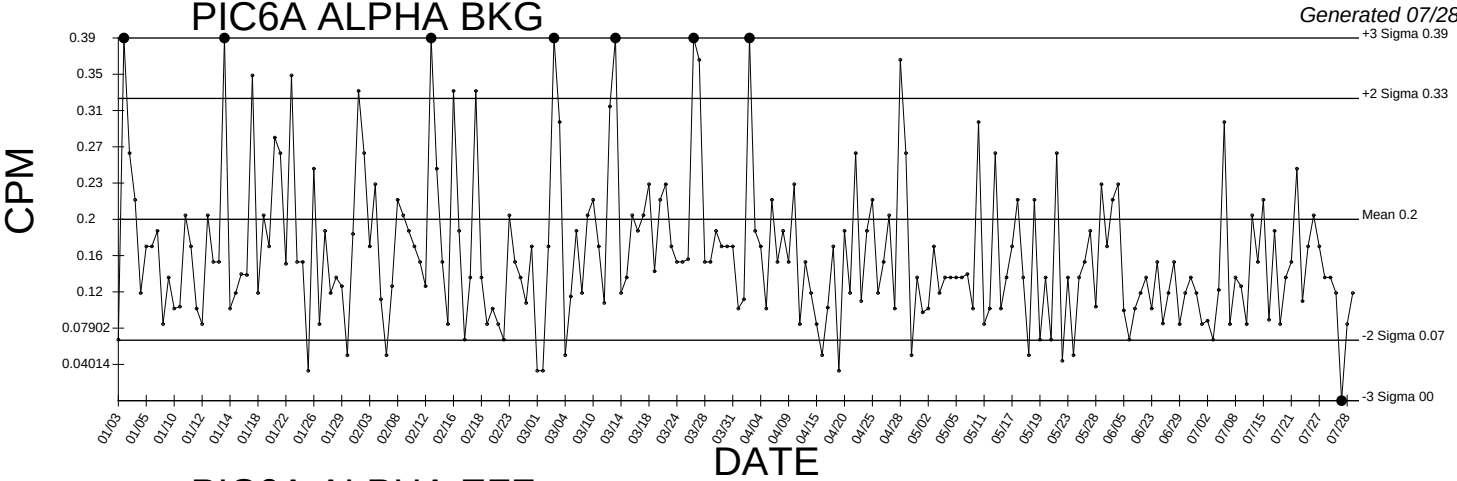
Generated 07/28/2022
+3 Sigma 26280



PIC5D BETA EFF Cross Talk



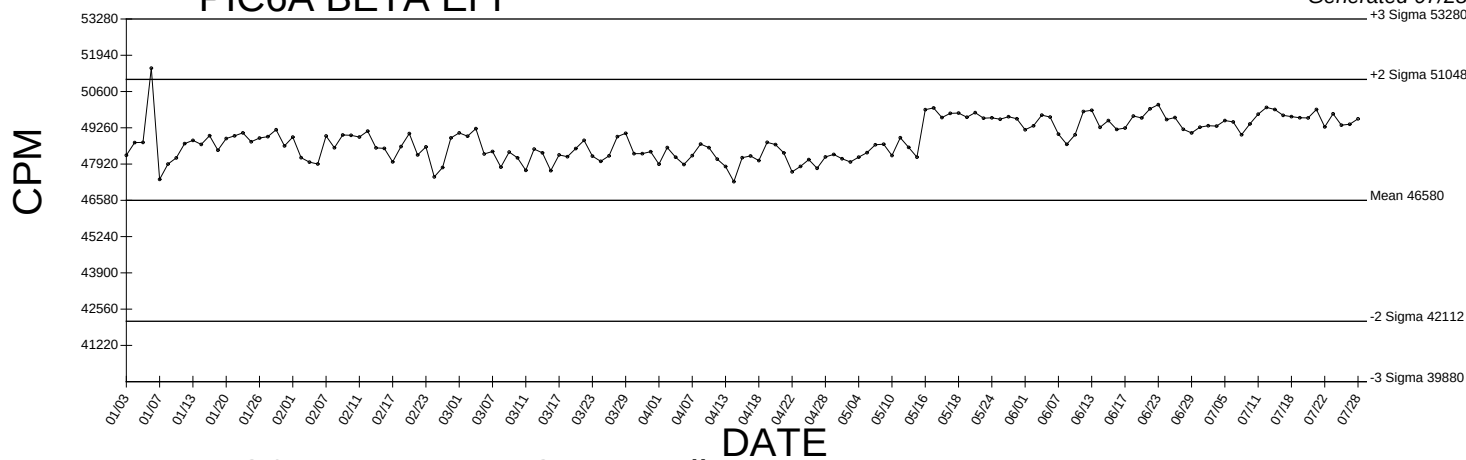
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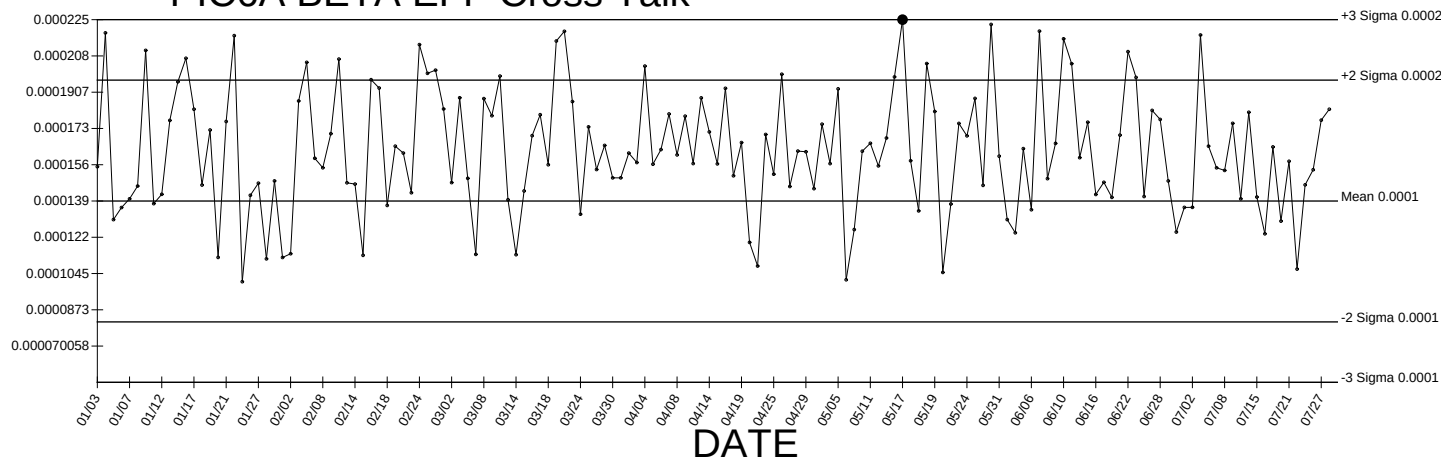
● Denotes Outlier

PIC6A BETA EFF

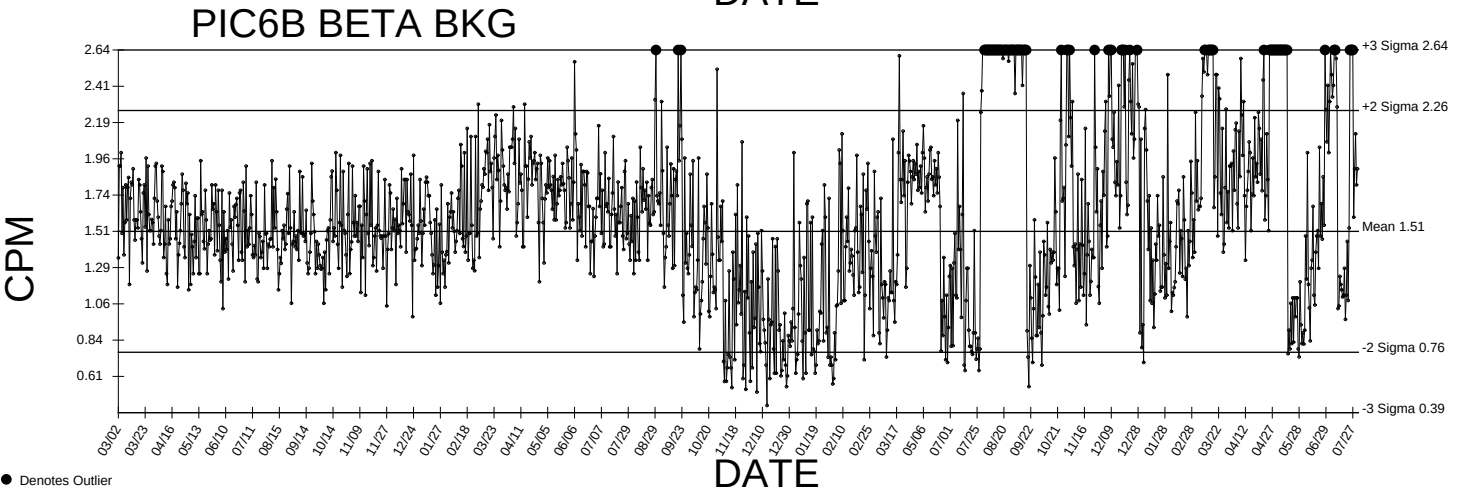
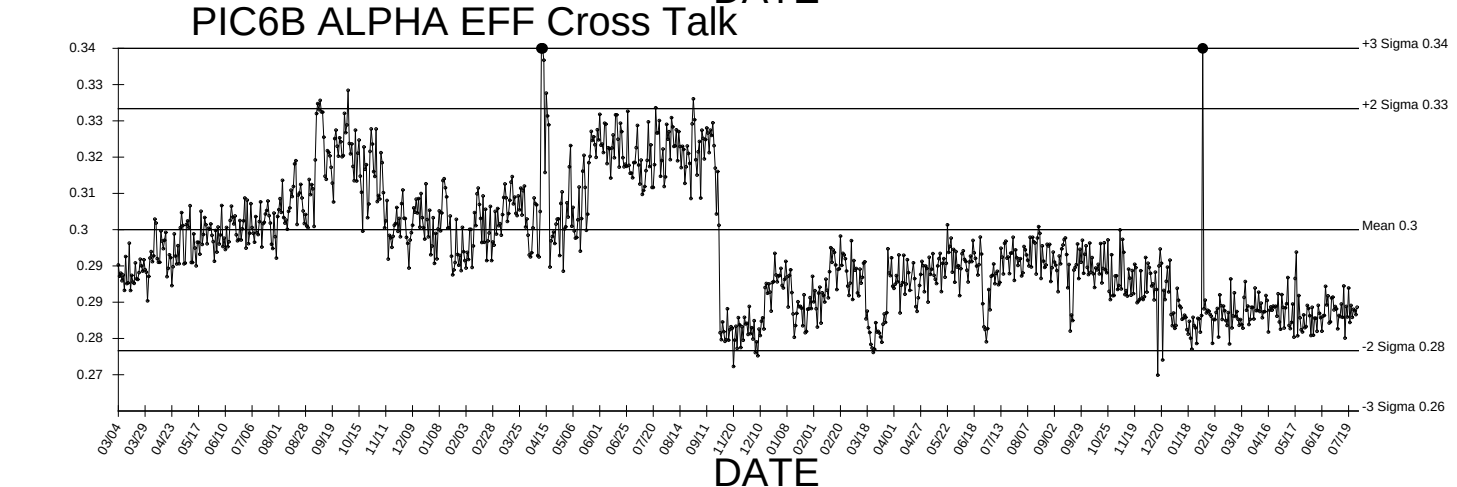
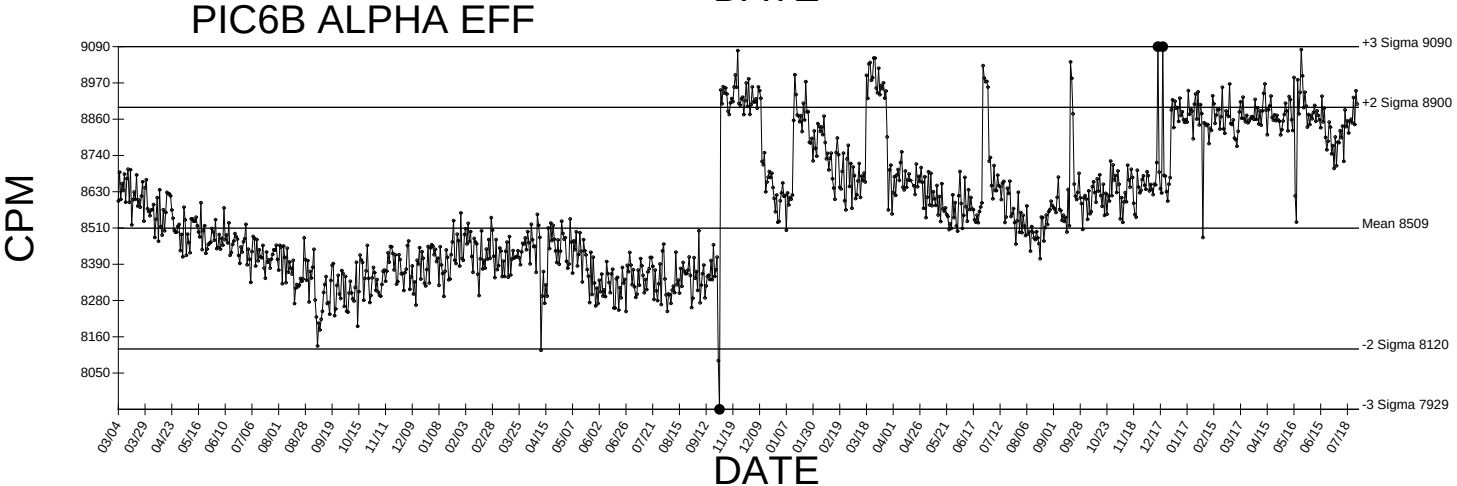
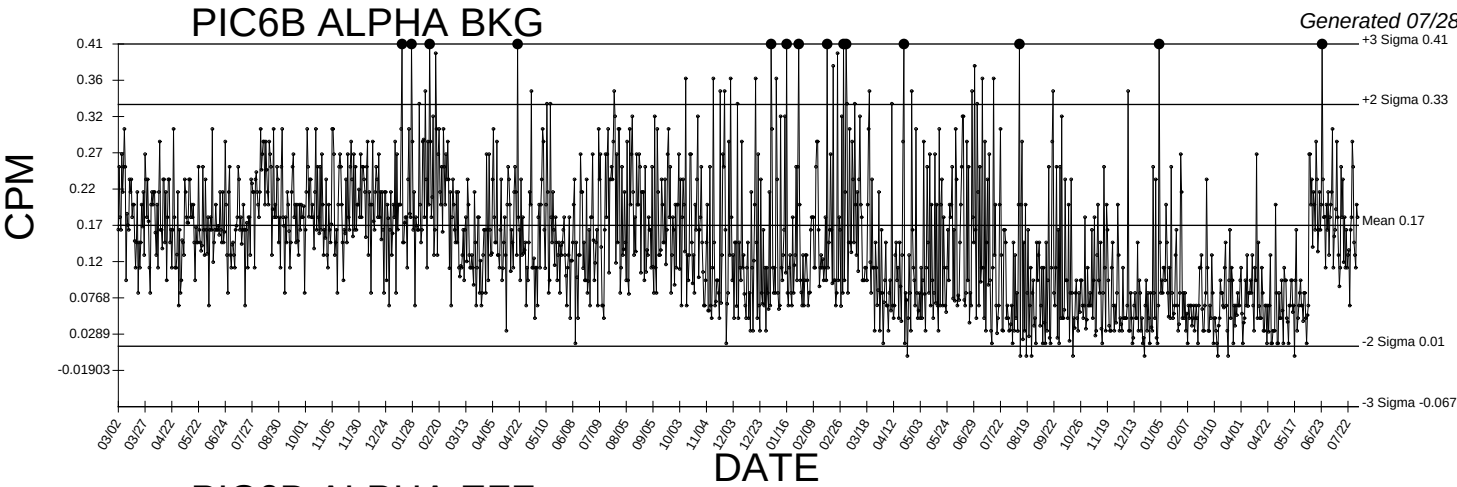
Generated 07/28/2022



PIC6A BETA EFF Cross Talk



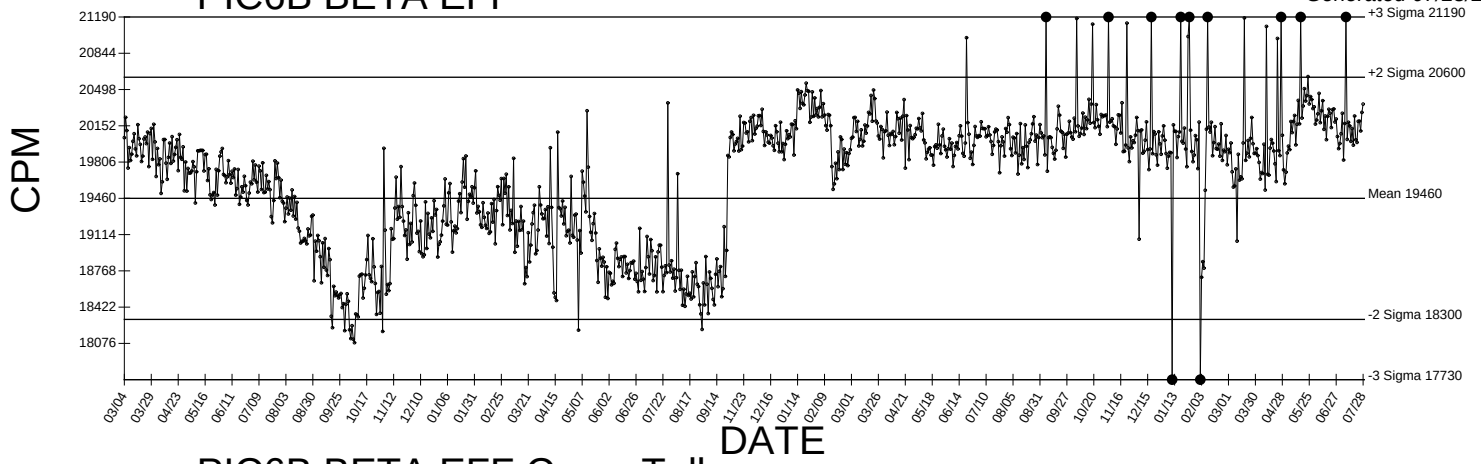
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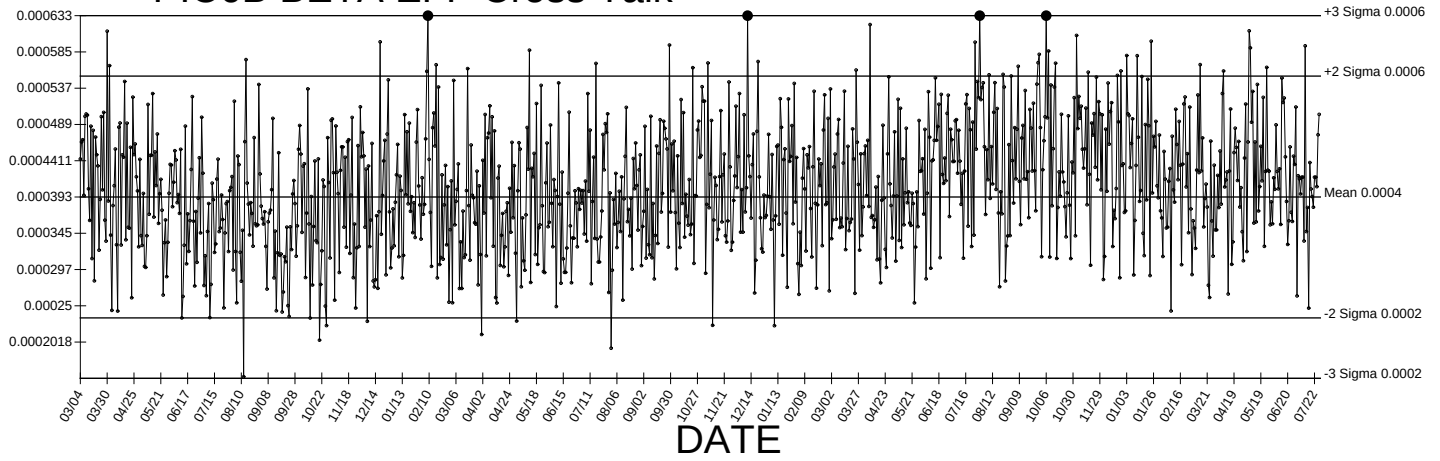
● Denotes Outlier

PIC6B BETA EFF

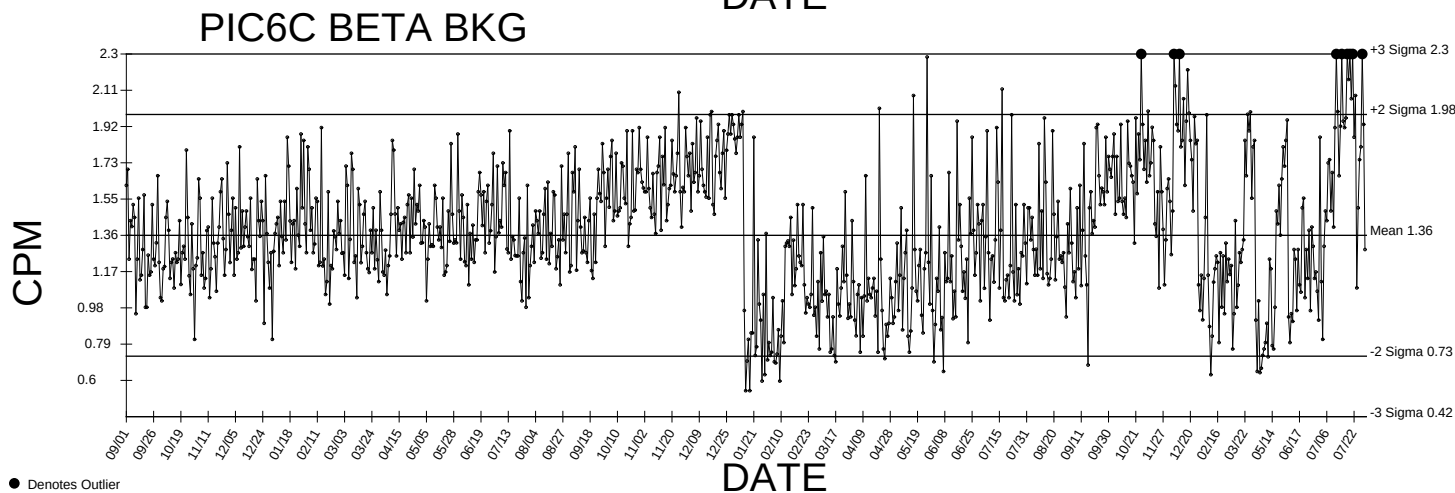
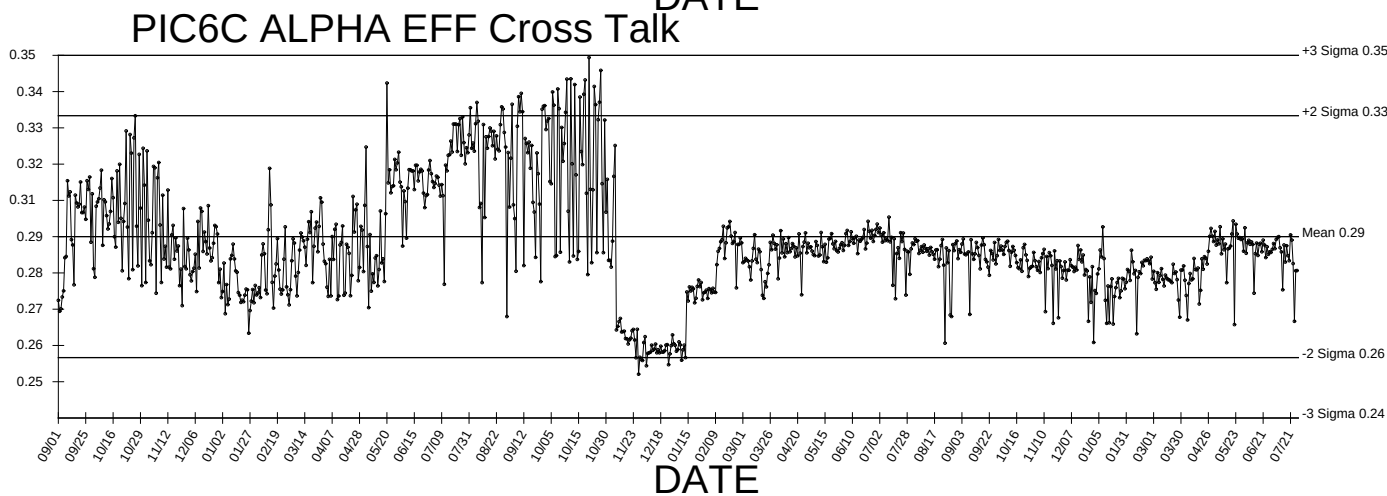
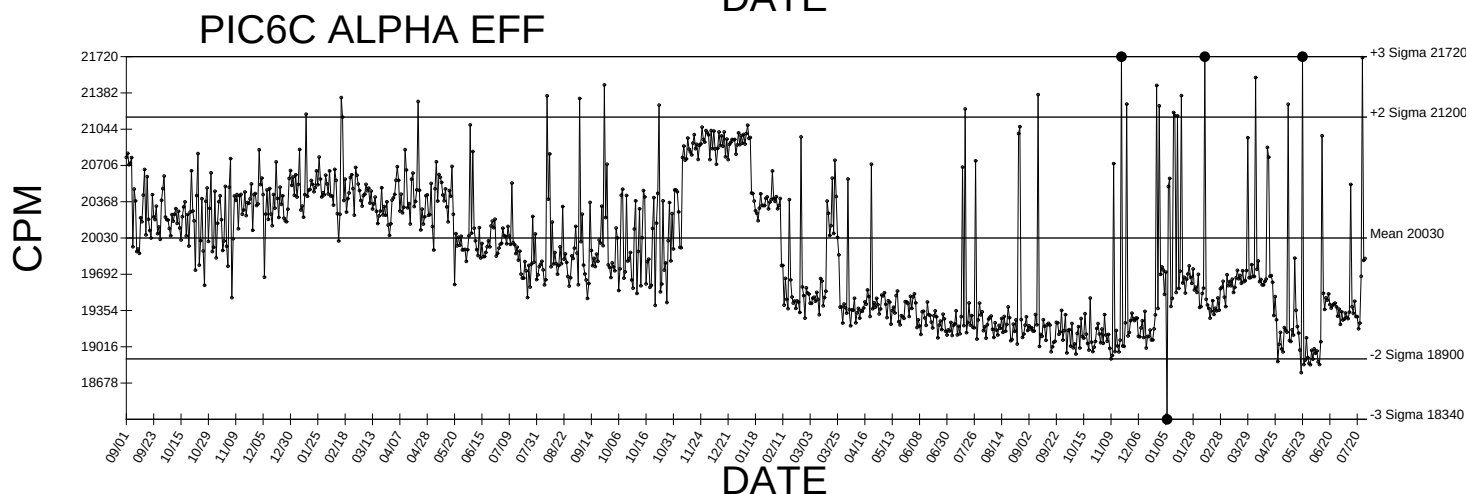
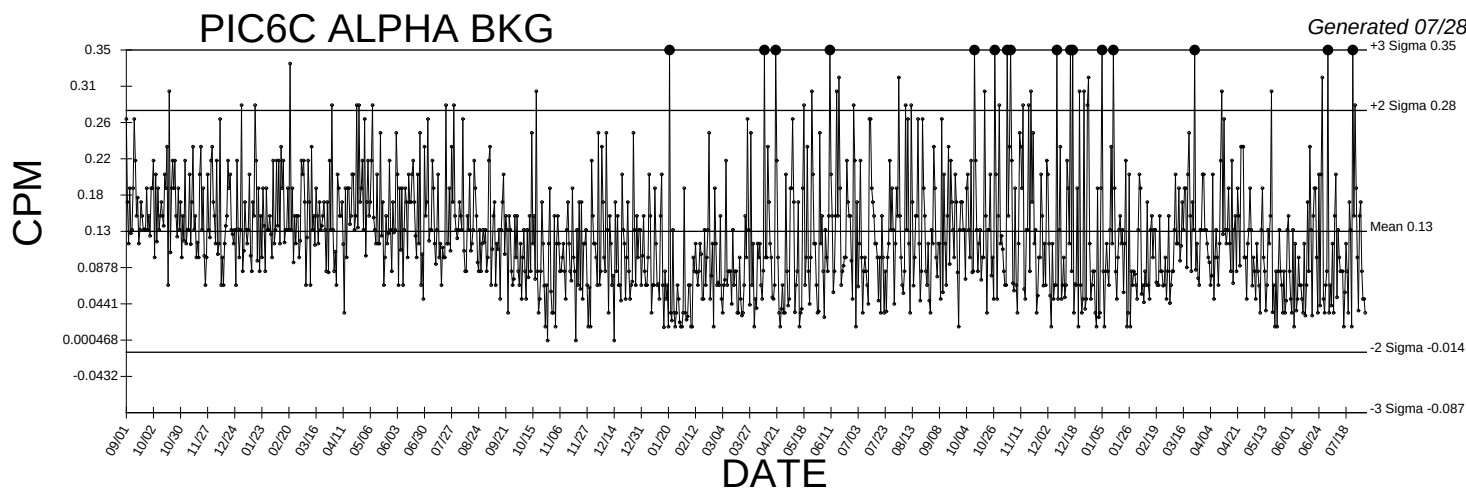
Generated 07/28/2022



PIC6B BETA EFF Cross Talk

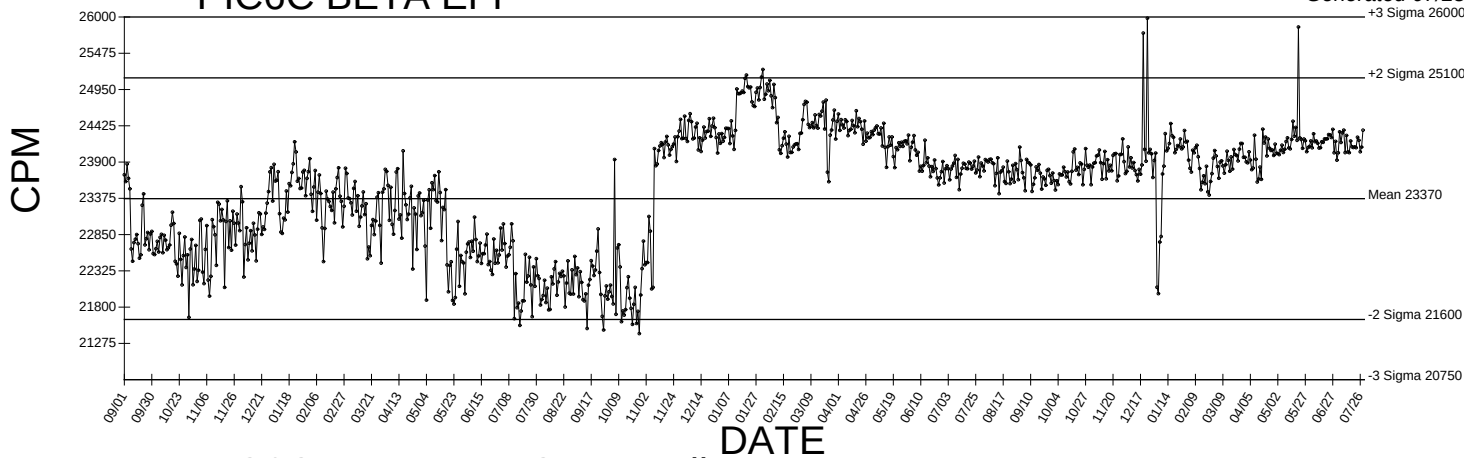


● Denotes Outlier

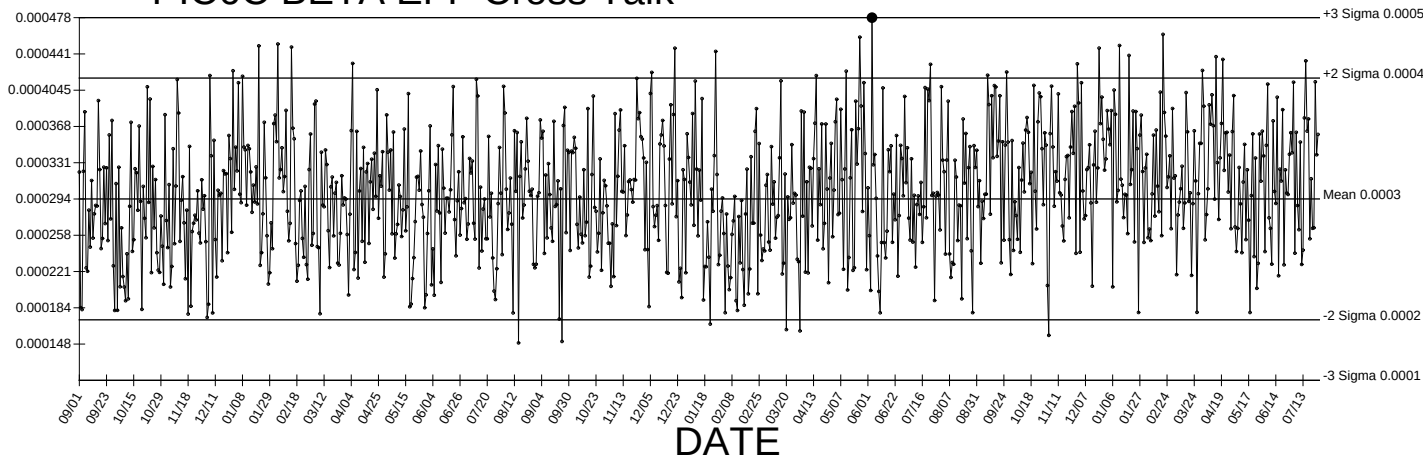


PIC6C BETA EFF

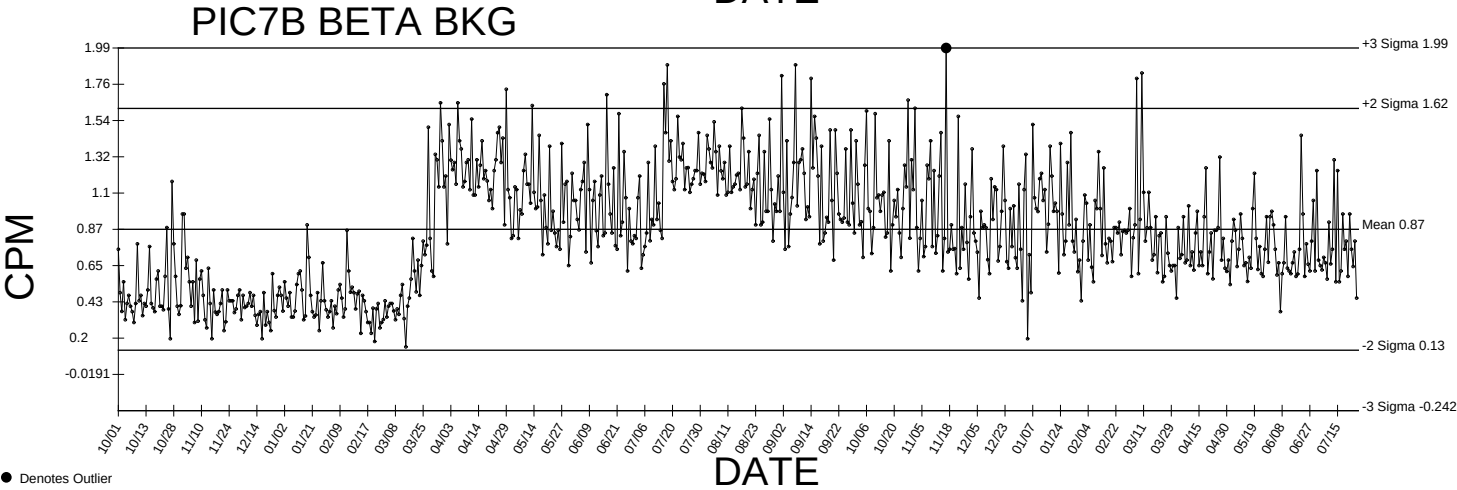
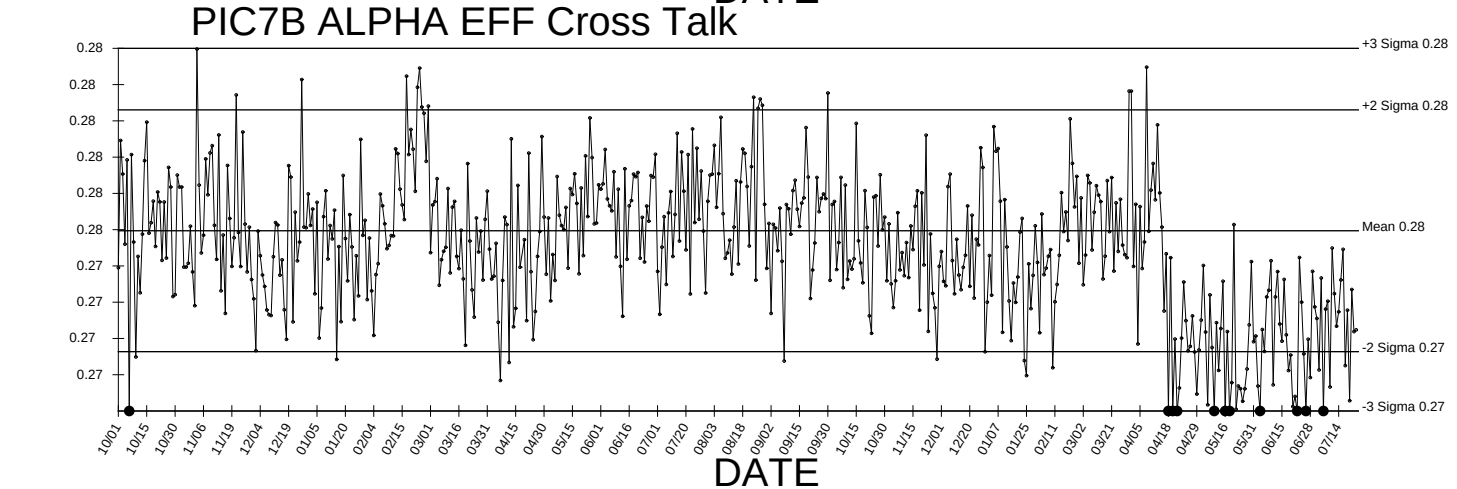
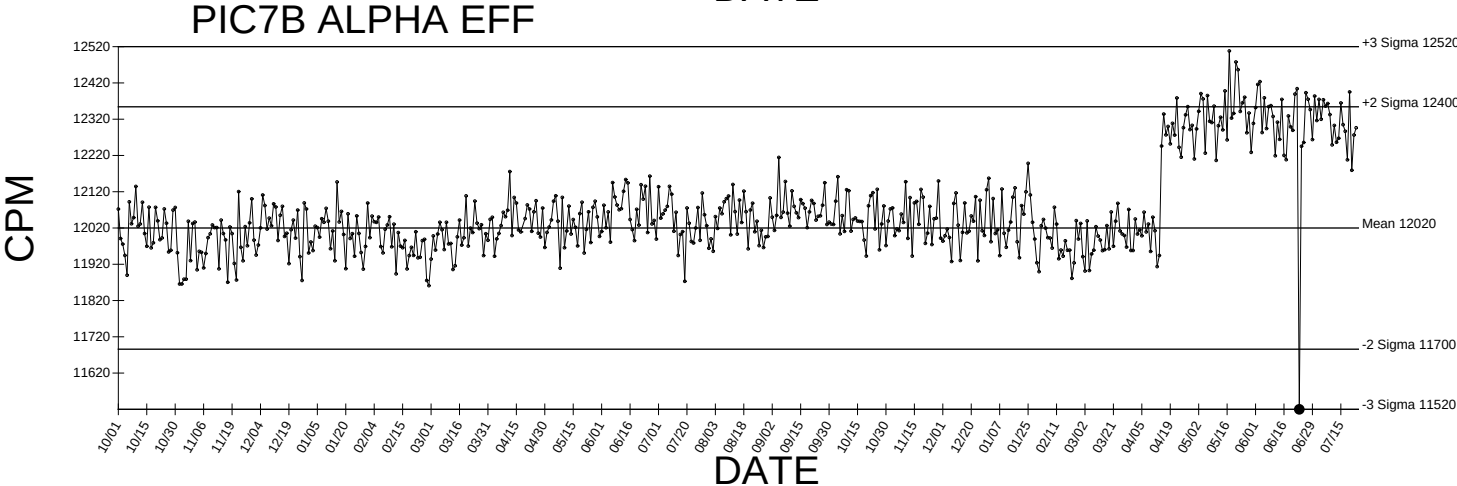
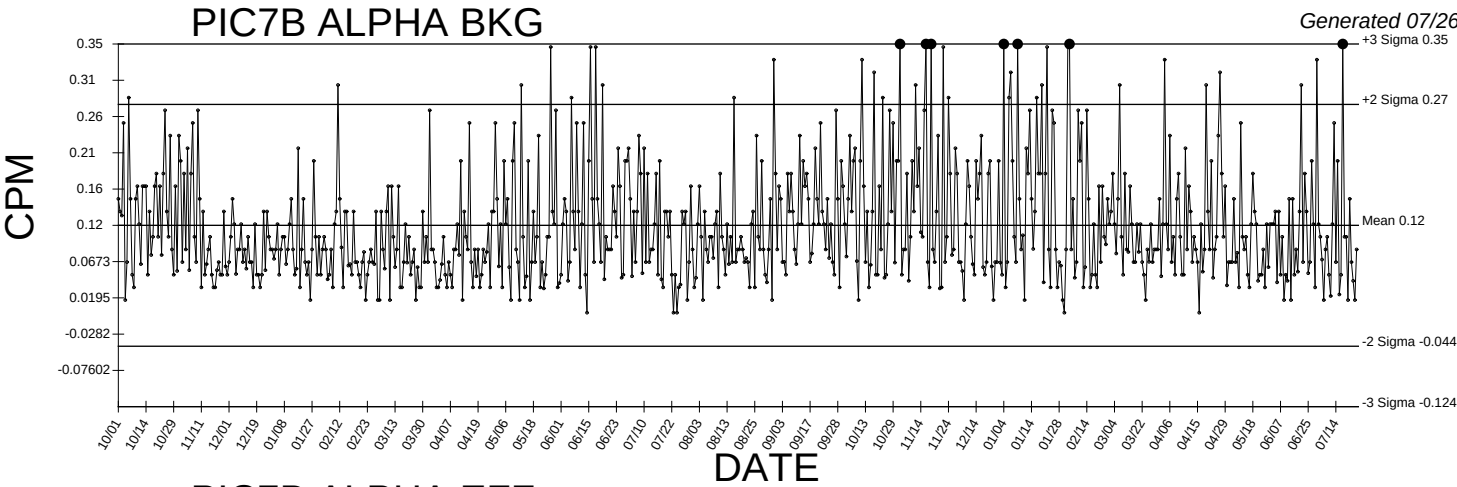
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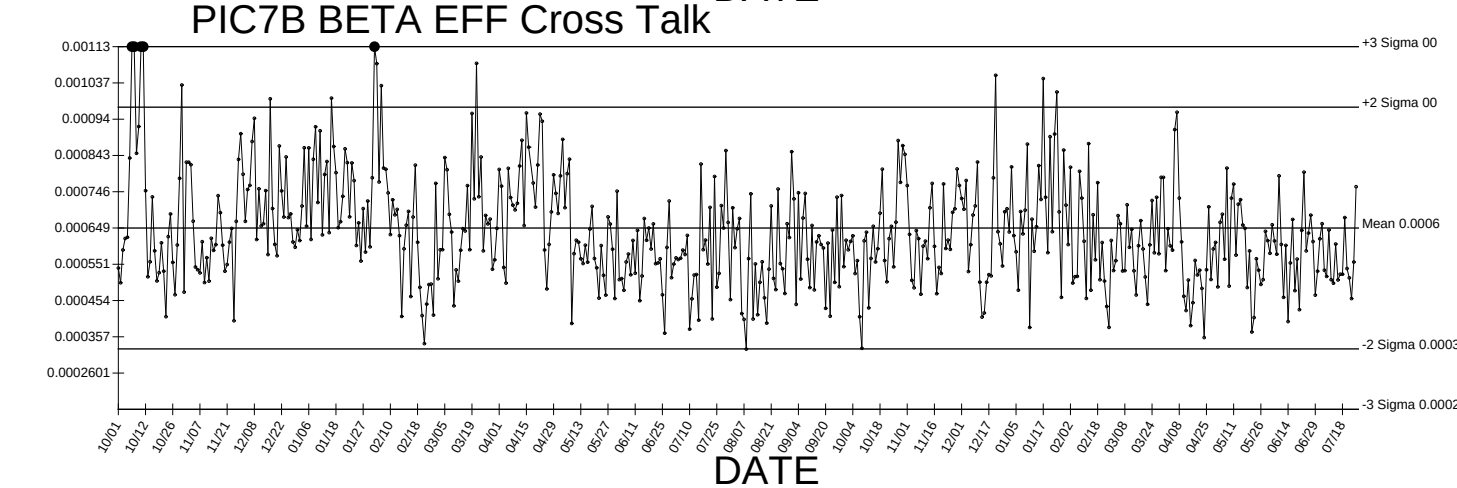
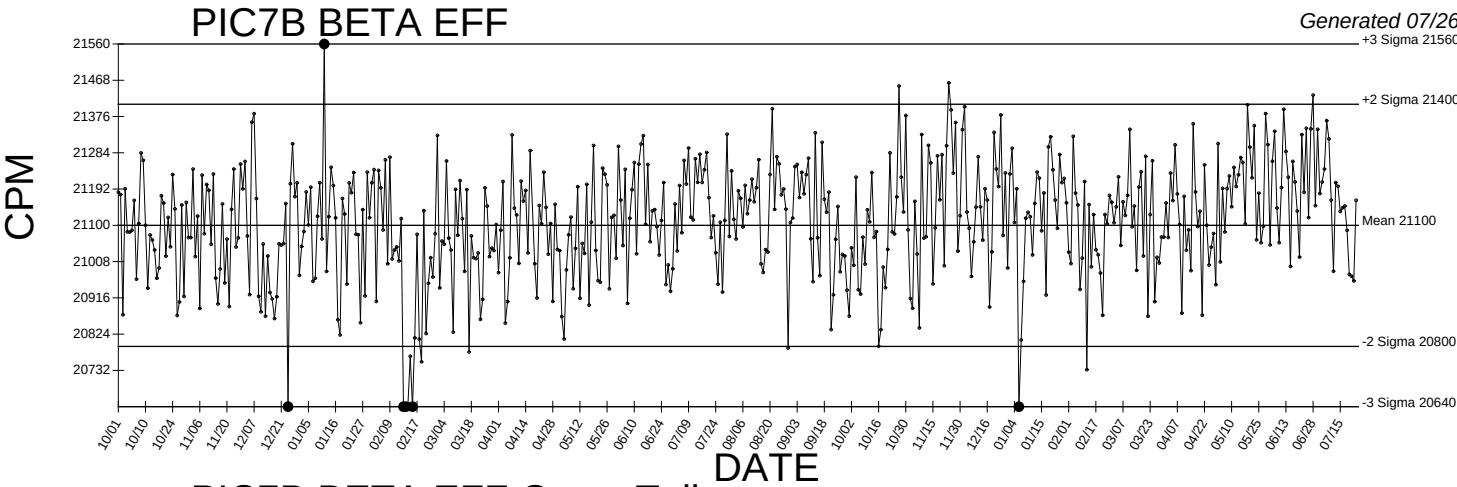
PIC6C BETA EFF Cross Talk



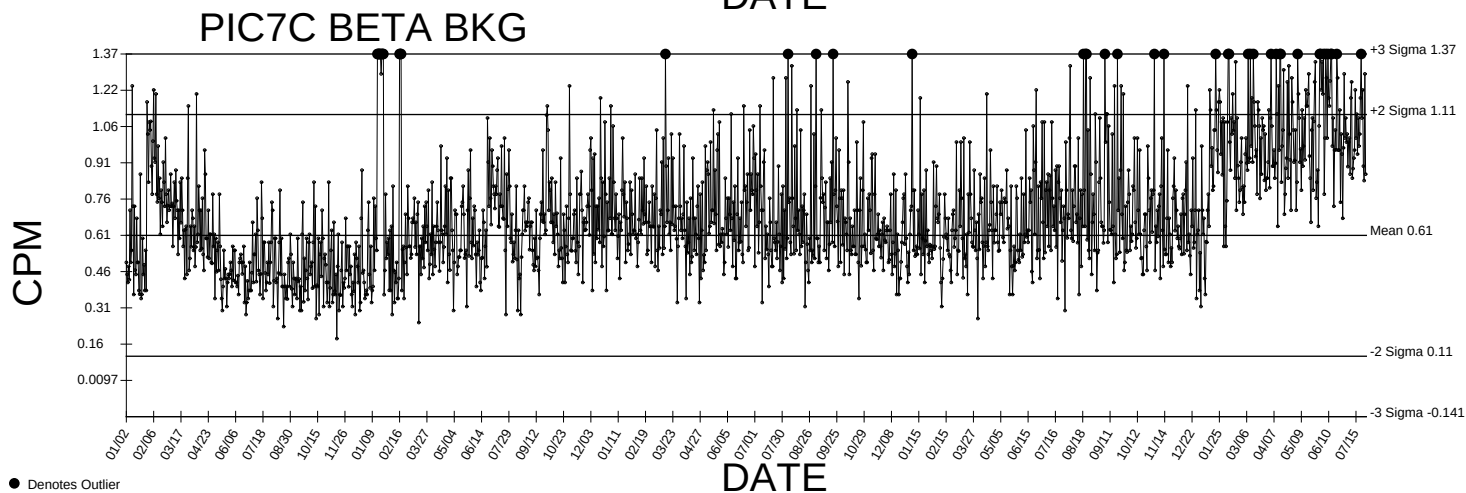
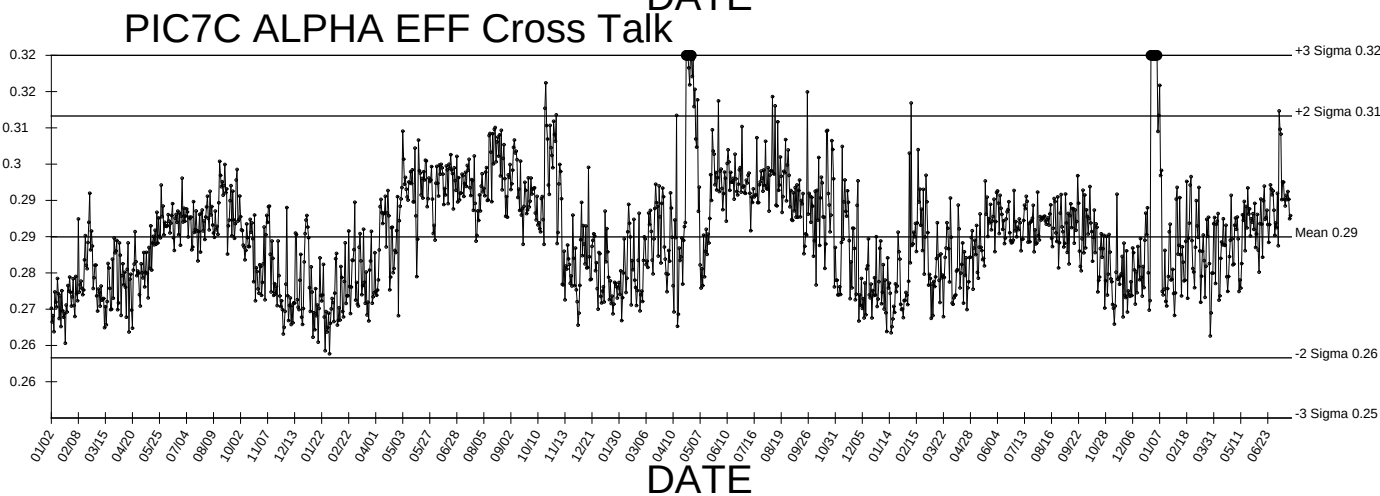
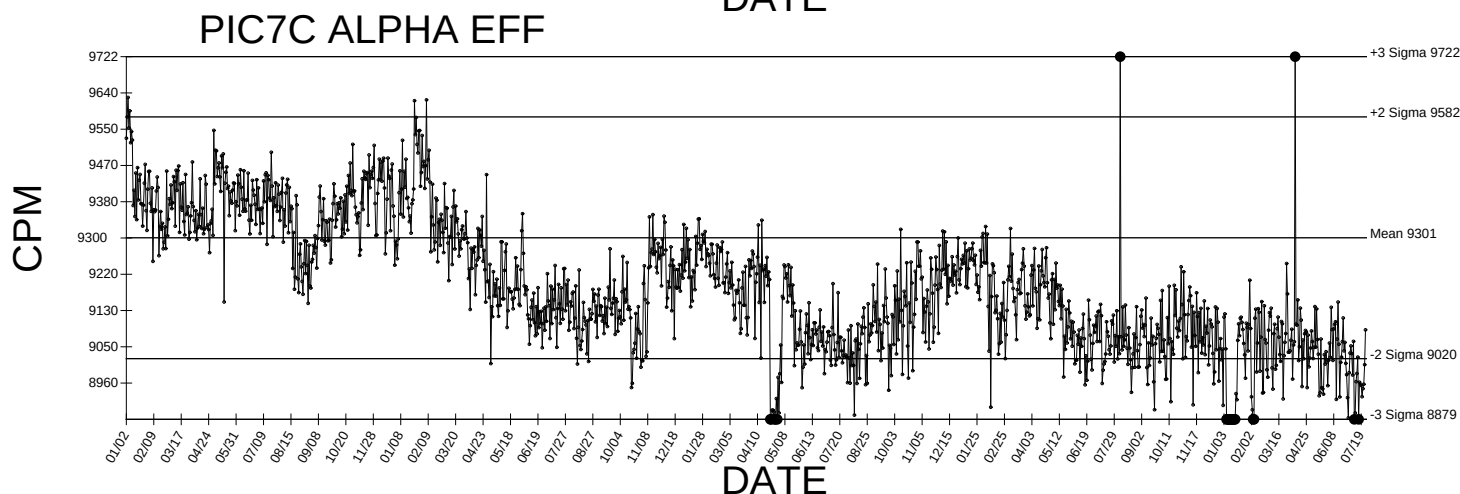
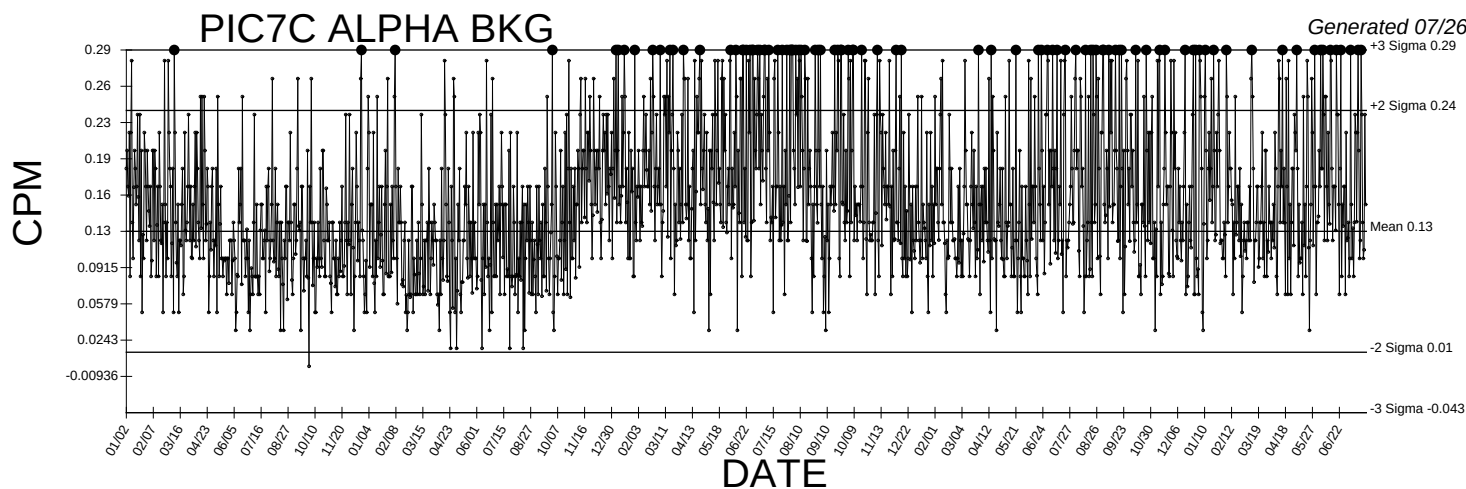
● Denotes Outlier



● Denotes Outlier



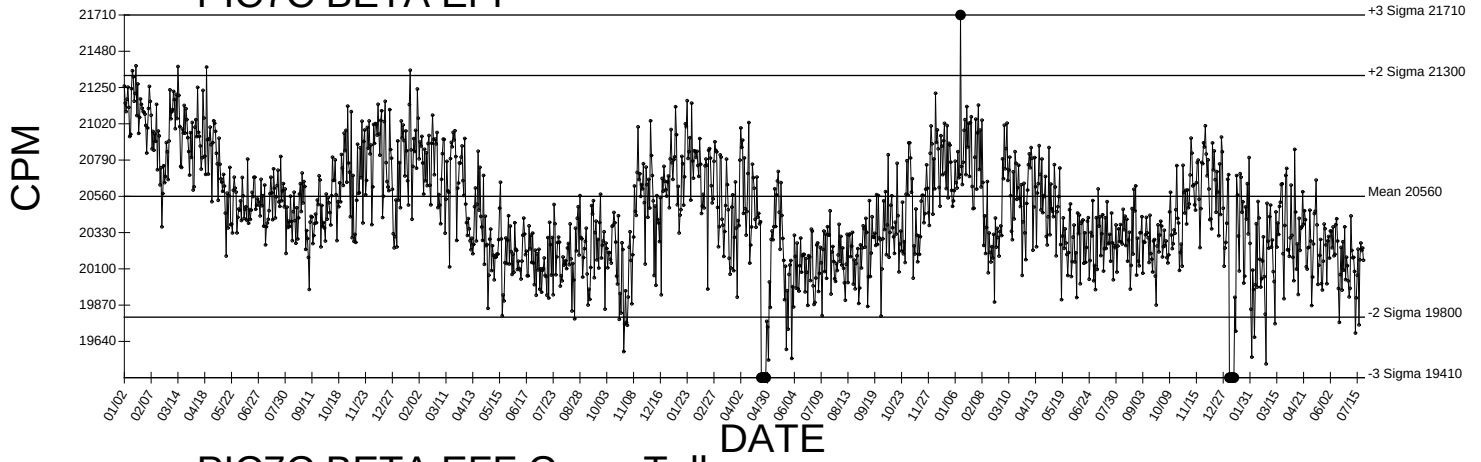
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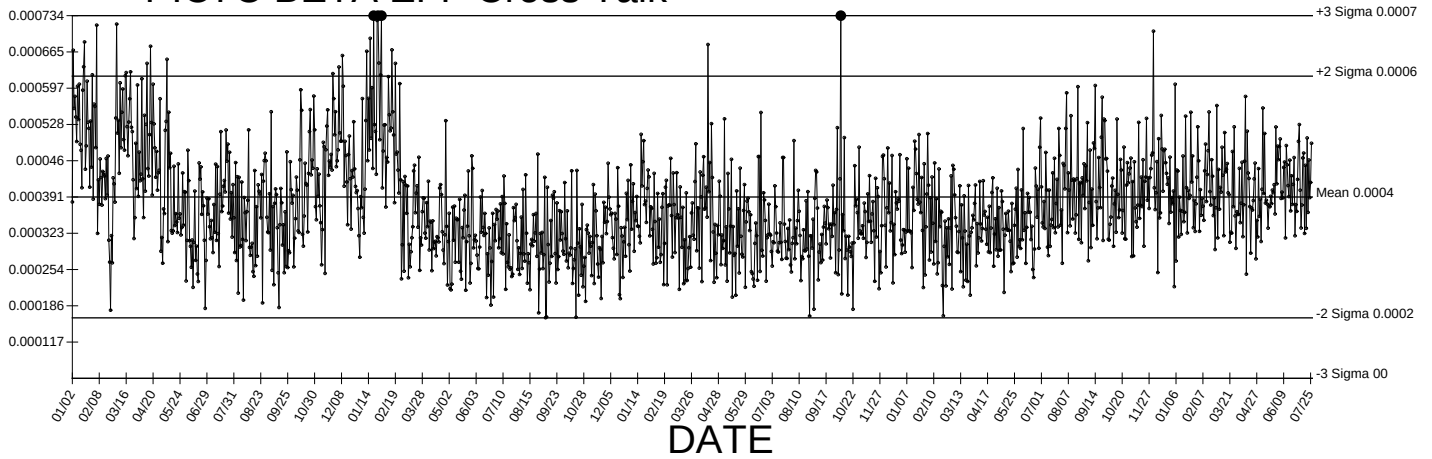
● Denotes Outlier

PIC7C BETA EFF

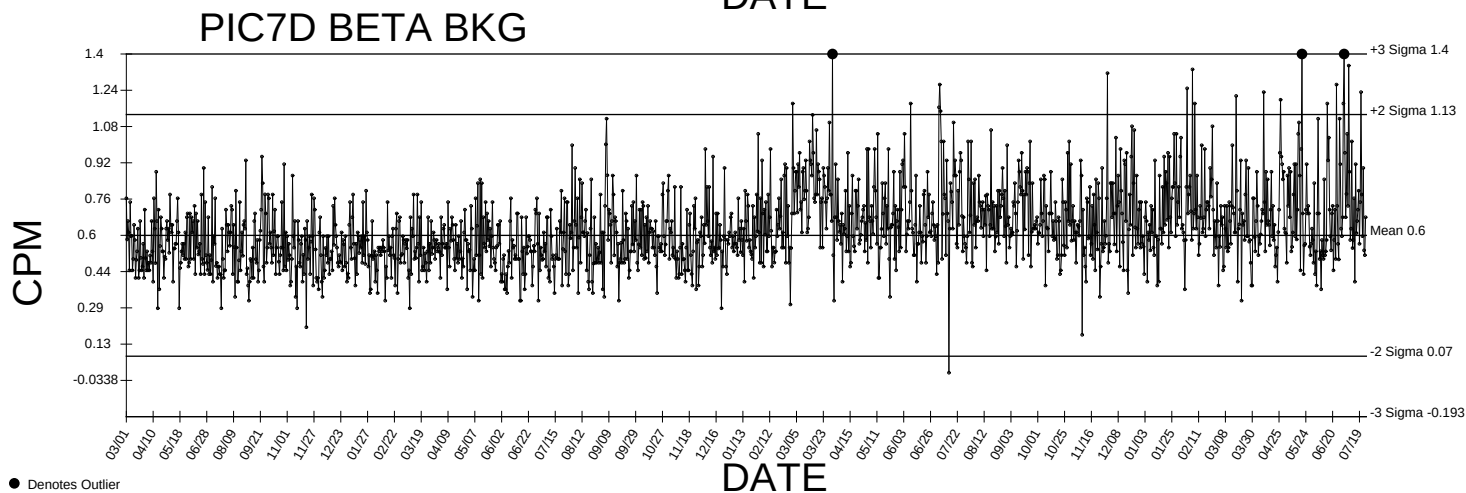
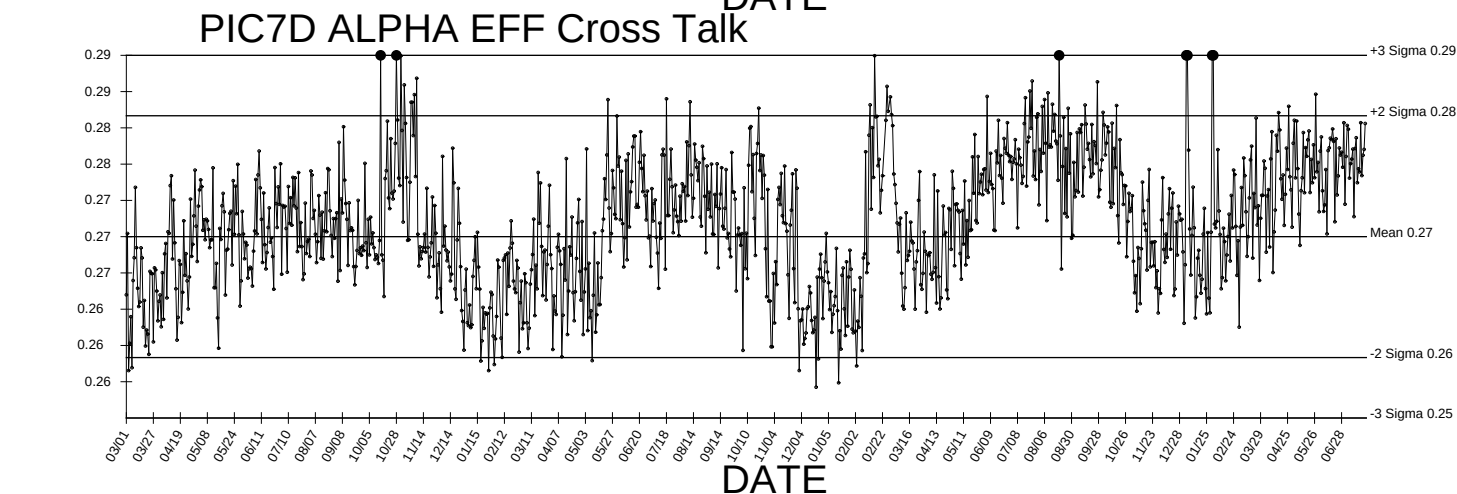
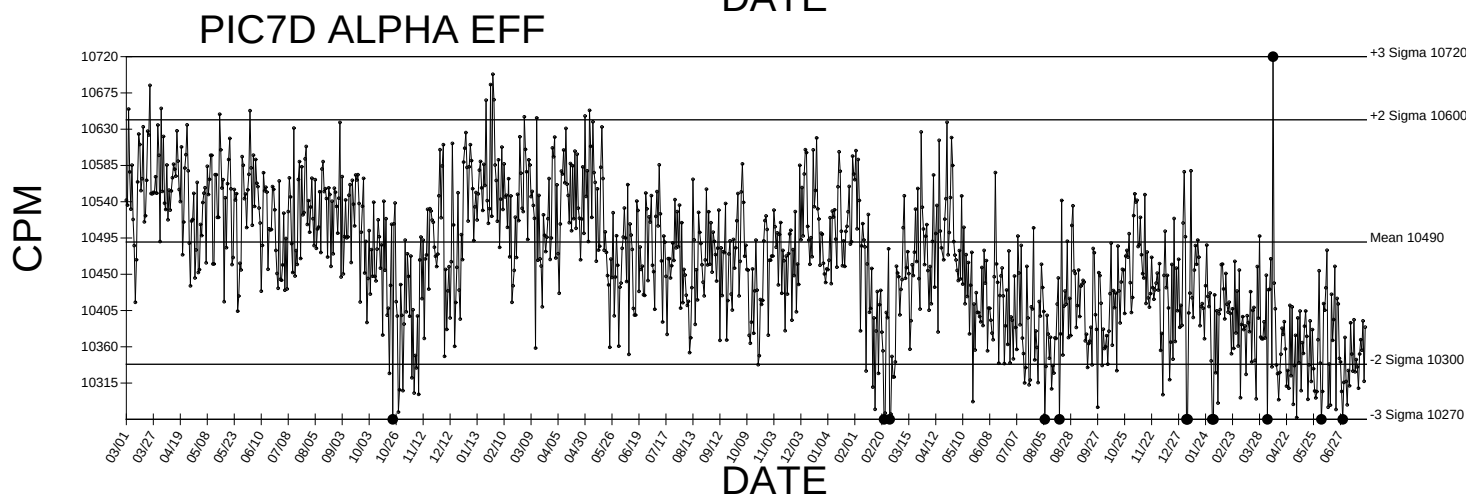
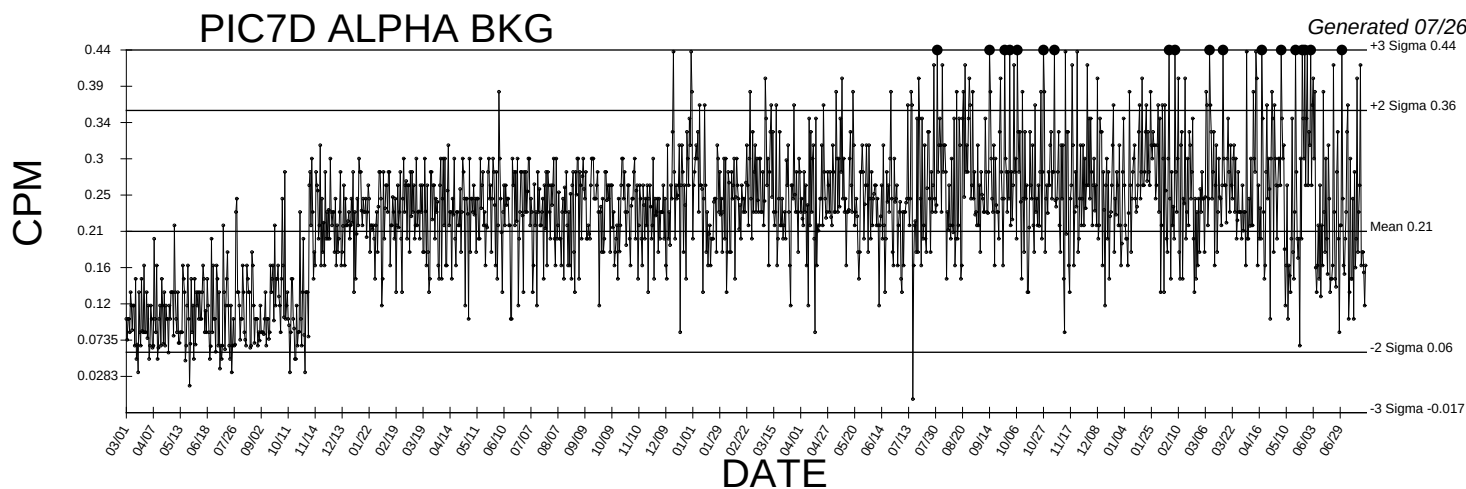
Generated 07/26/2022



PIC7C BETA EFF Cross Talk



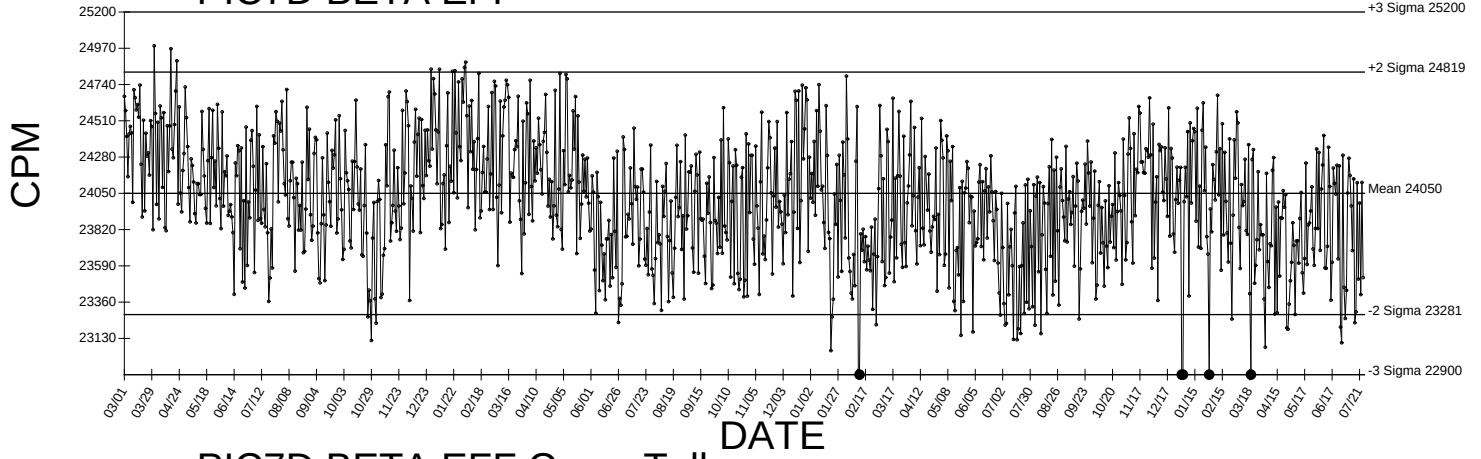
● Denotes Outlier



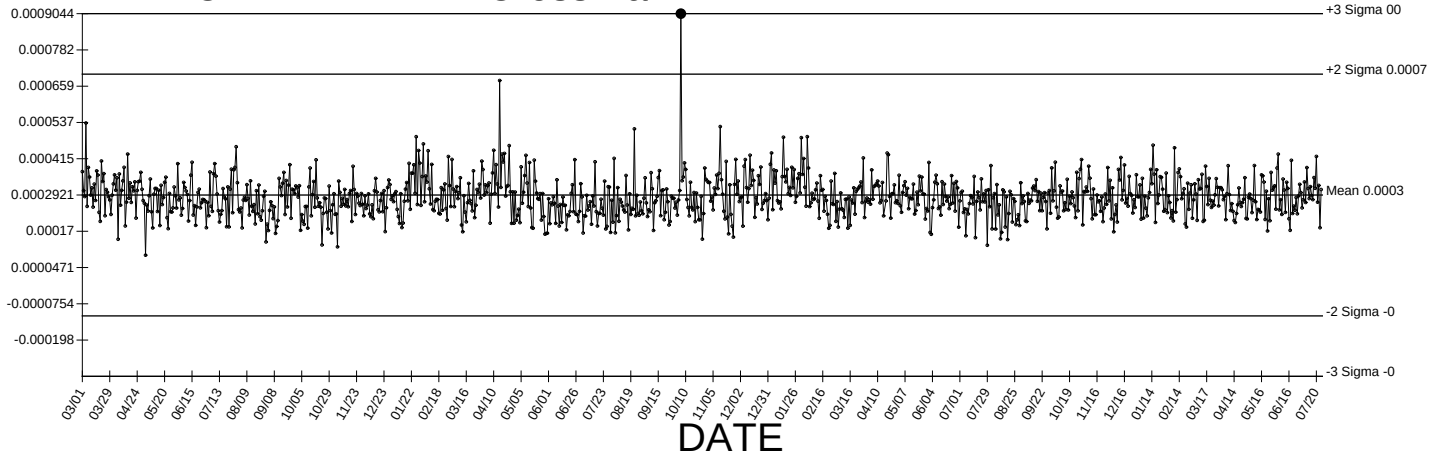
● Denotes Outlier

PIC7D BETA EFF

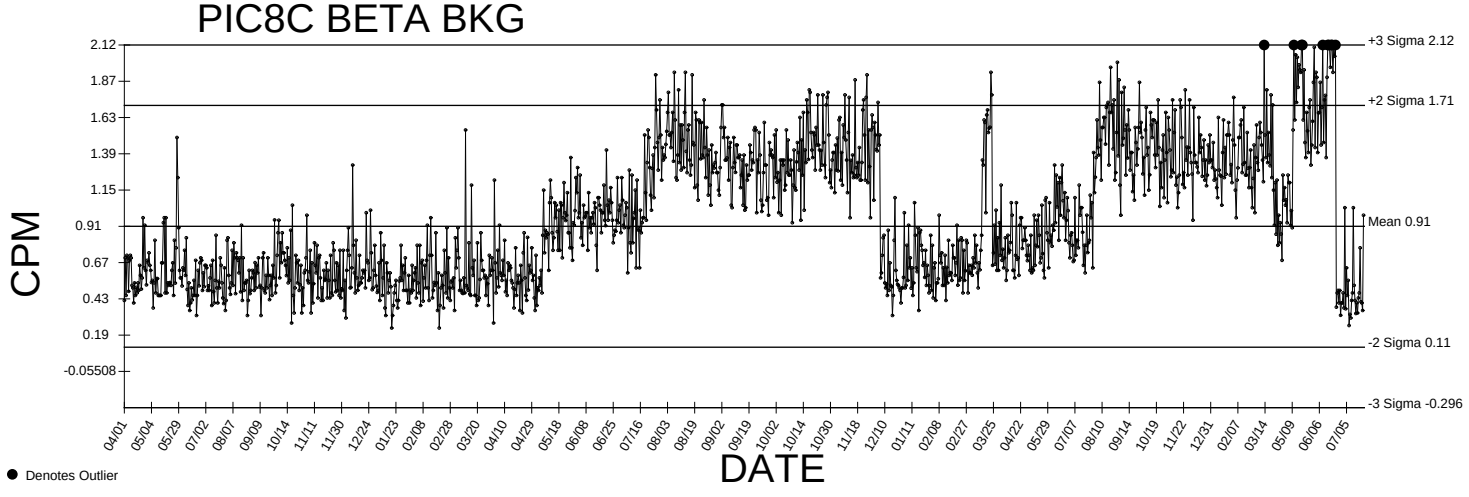
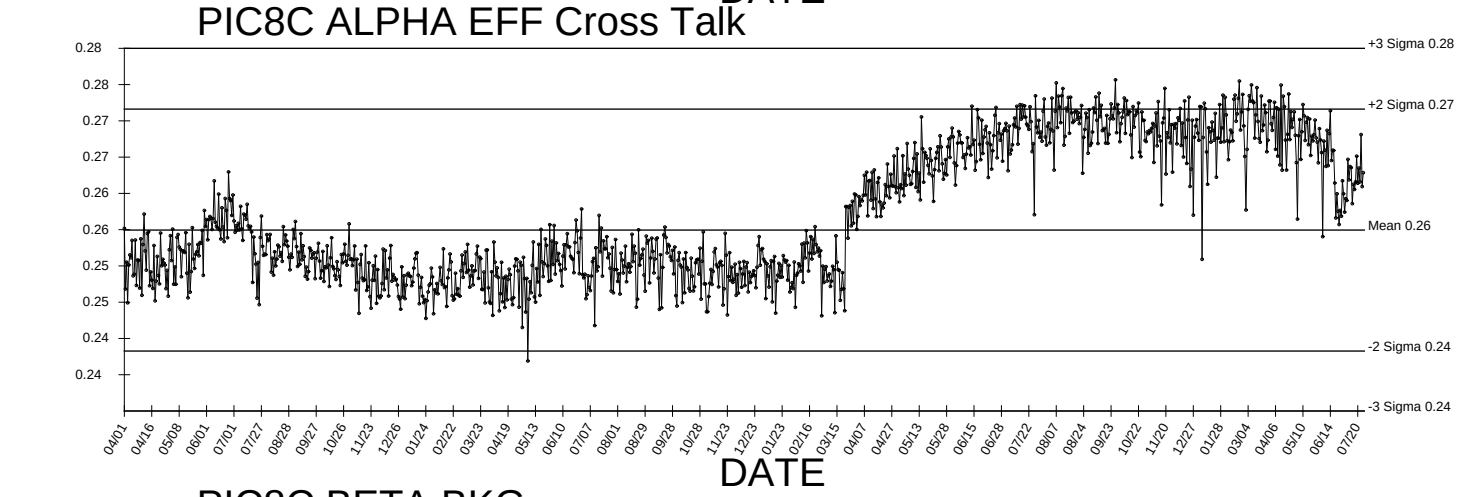
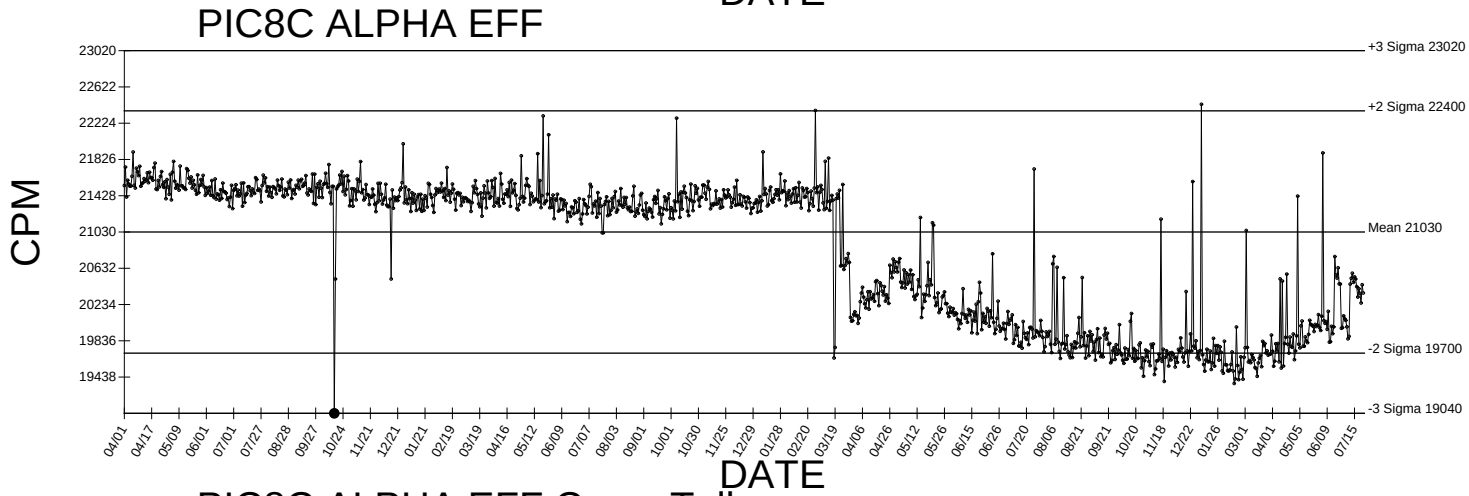
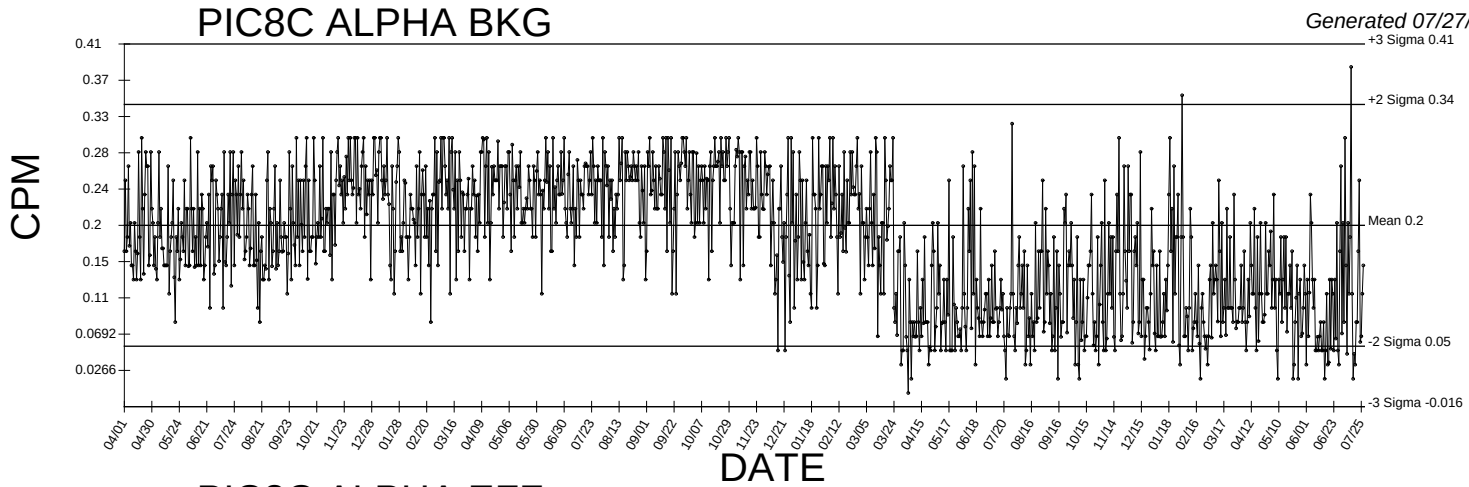
Generated 07/26/2022
+3 Sigma 25200



PIC7D BETA EFF Cross Talk



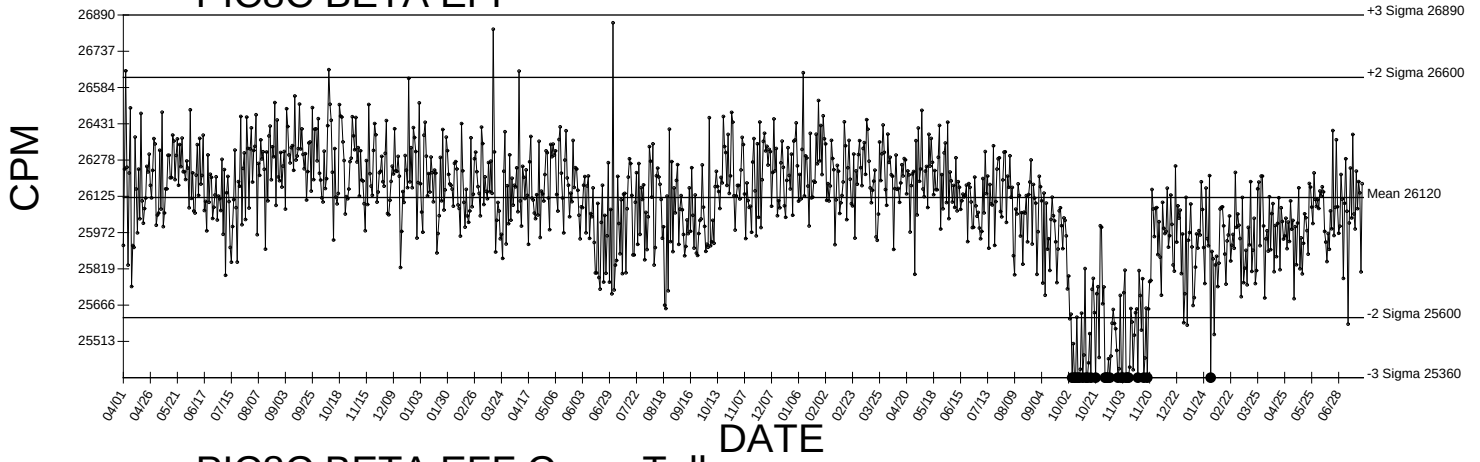
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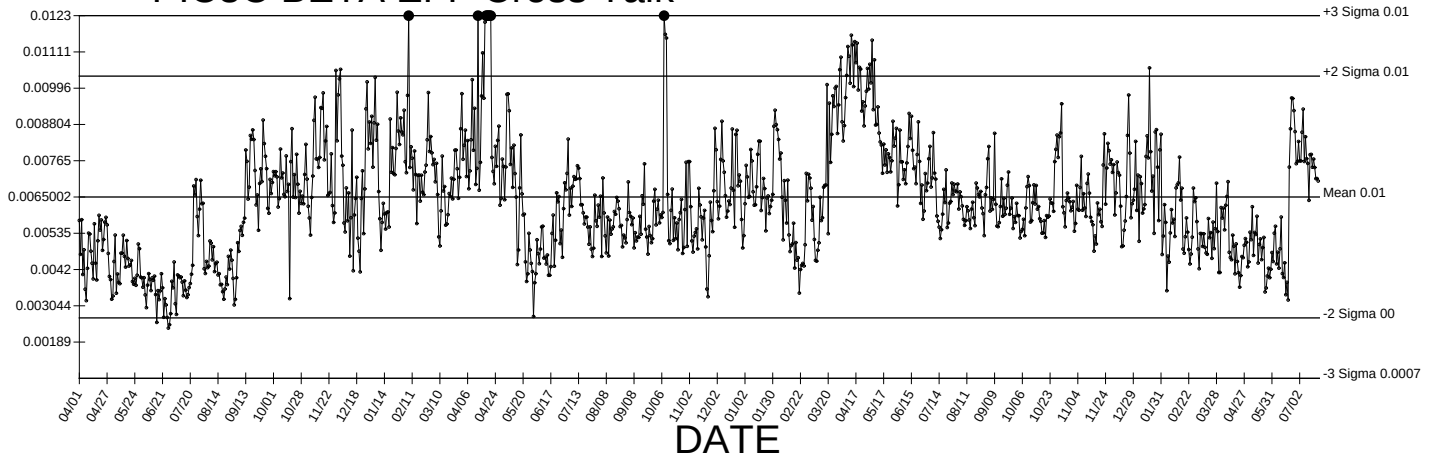
● Denotes Outlier

PIC8C BETA EFF

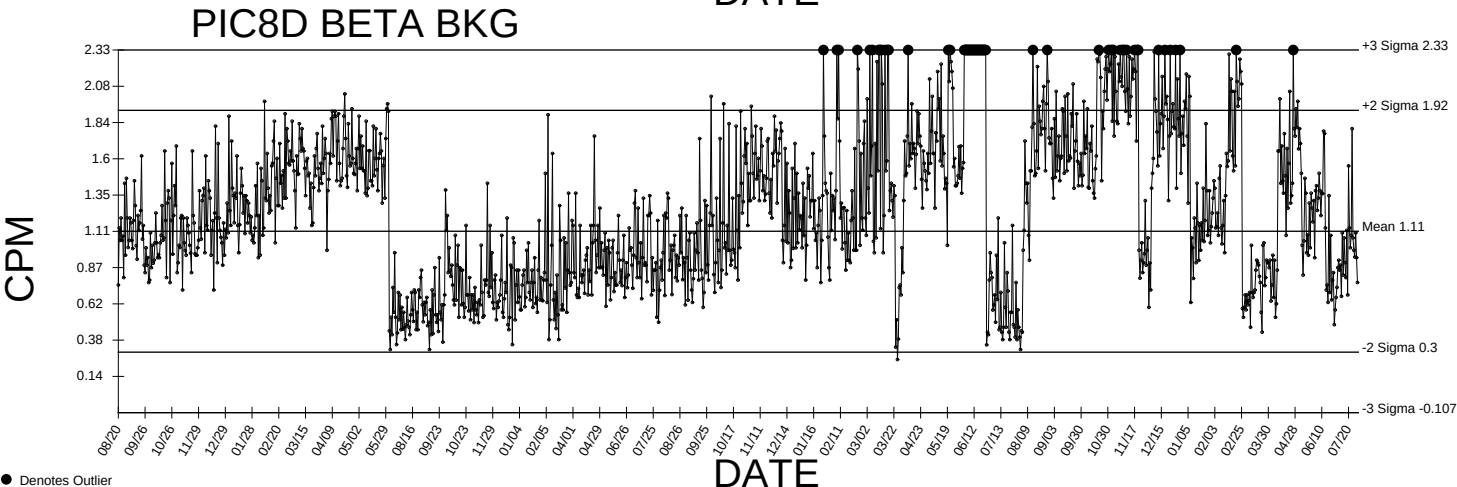
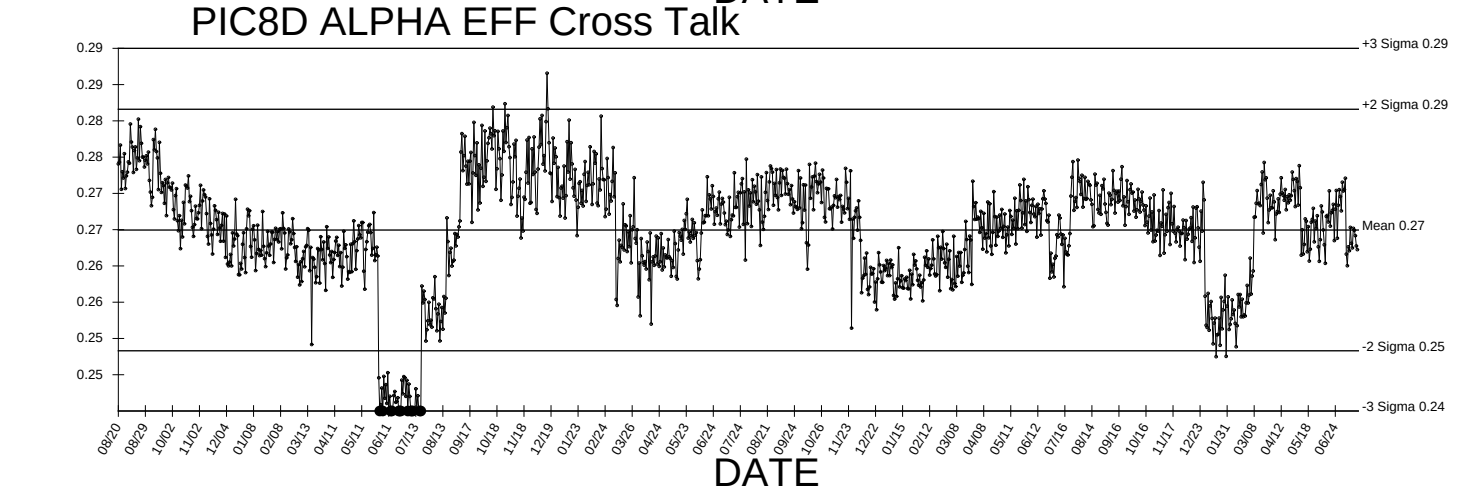
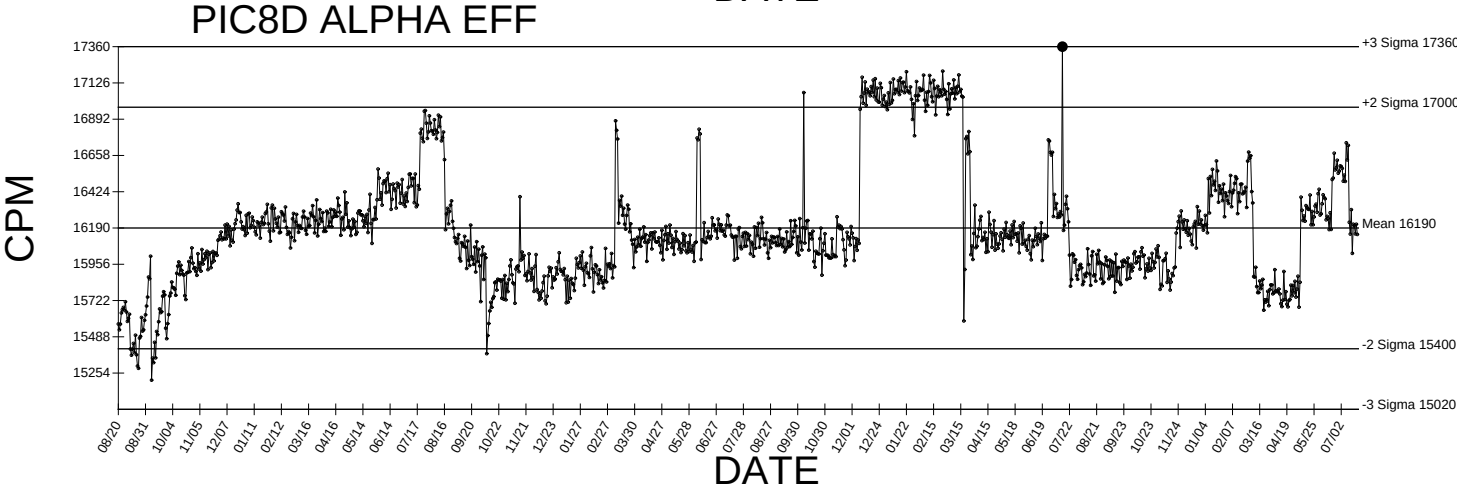
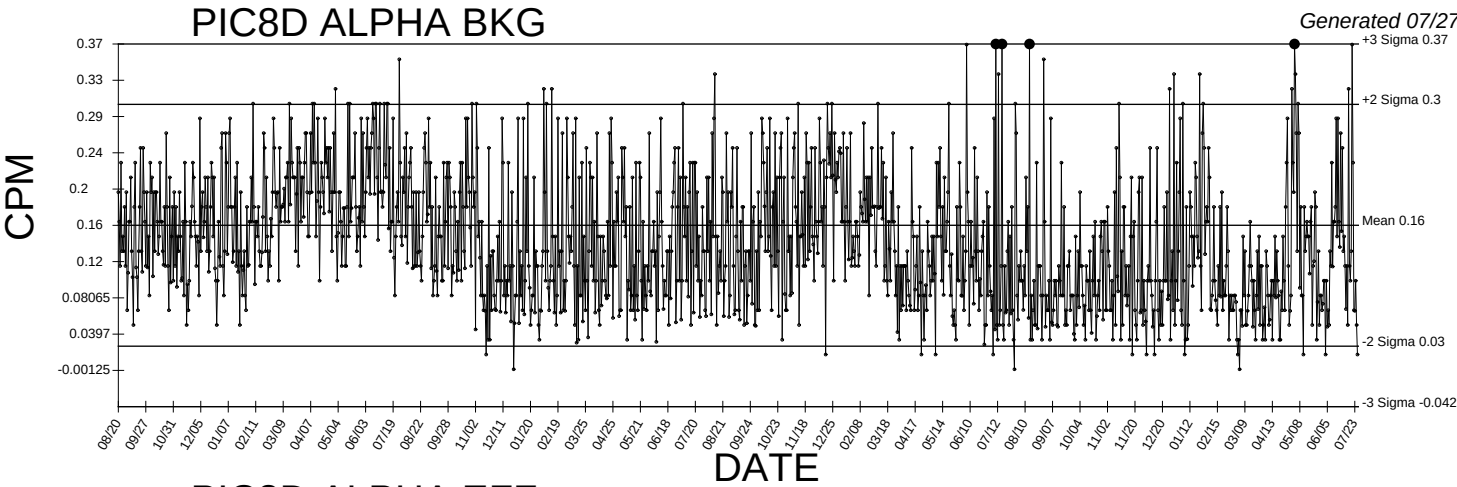
Generated 07/27/2022
+3 Sigma 26890



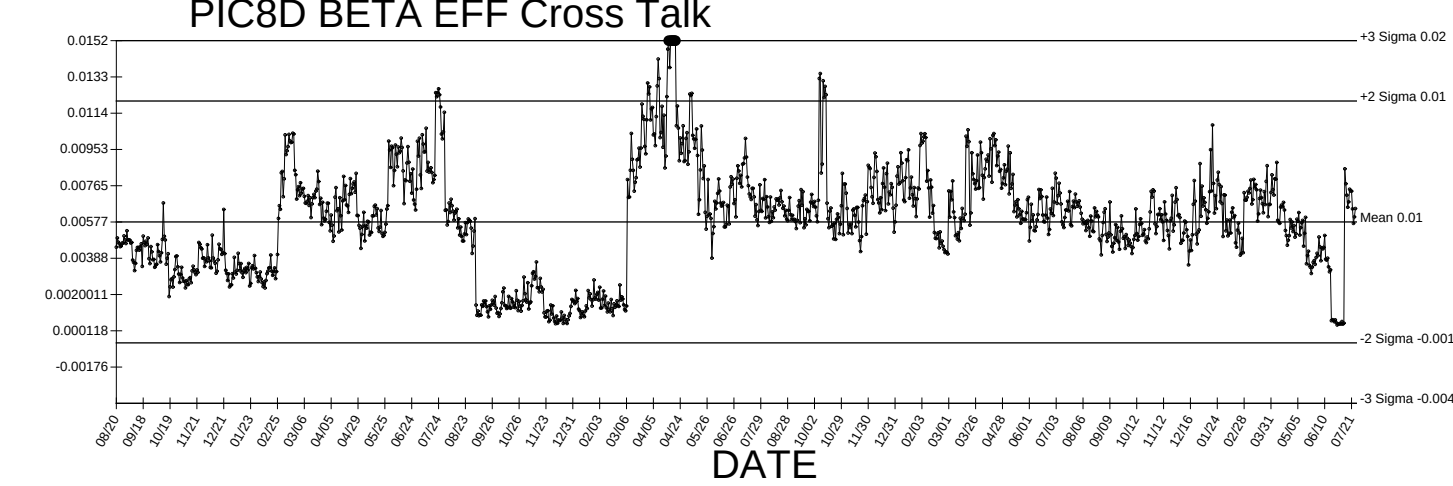
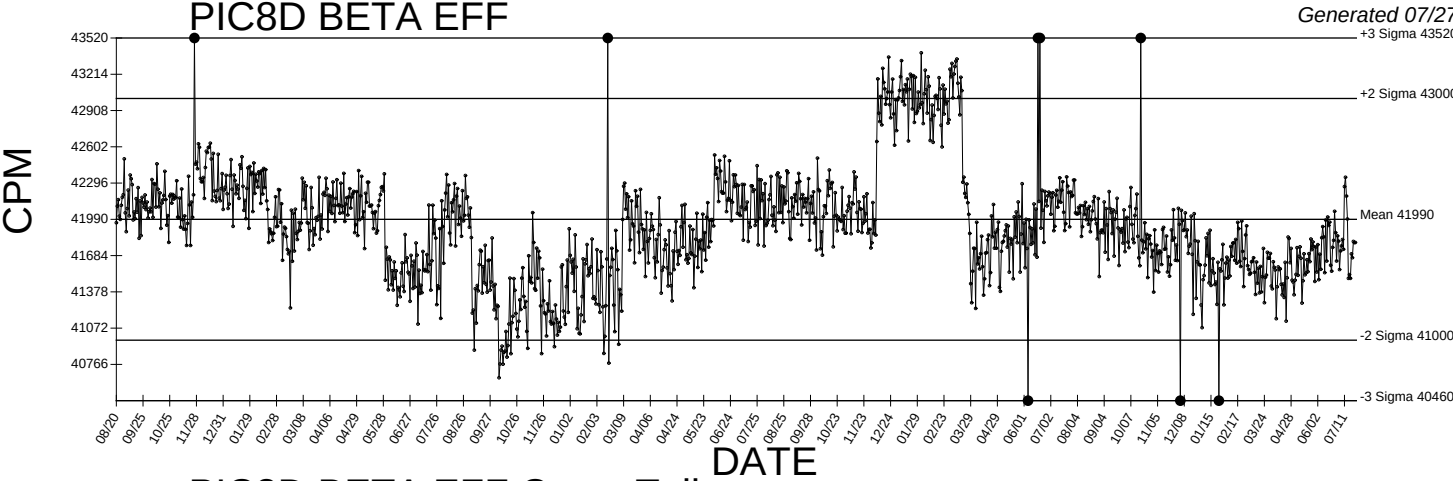
PIC8C BETA EFF Cross Talk



● Denotes Outlier



● Denotes Outlier



● Denotes Outlier

RAD Standards Traceability



National Institute of Standards & Technology

Certificate

1951

Standard Reference Material® 4251d

Received
3-31-20

Barium-133 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive Barium-133 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4251d consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Barium-133** massic activity, at a **Reference Time of 1200 EST, 13 July 2018**, is:

$(382.6 \pm 4.6) \text{ kBq} \cdot \text{g}^{-1}$.

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4251d** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Use and Handling"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared by the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of B.E. Zimmerman, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Fitzgerald, R. Collé and L. Laureano-Pérez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida of the NIST Radiation Physics Division, Radioactivity Group.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

James M. Adams, Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 17 October 2019

Steven J. Choquette, Director
Office of Reference Materials

Table 1. Certified Massic Activity of SRM 4251d

Radionuclide	Barium-133
Reference time	1200 EST, 13 July 2018
Massic activity of the solution	382.6 kBq·g ⁻¹
Relative expanded uncertainty ($k = 2$)	1.2 % ^(a)

^(a) The uncertainties on certified values are expanded uncertainties, $U = ku_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO and NIST Guides [4, 5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

Table 2. Uncertified Information of SRM 4251d

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	88 µg·g ⁻¹ Ba ⁺² in 0.98 mol·L ⁻¹ HCl
Solution density	(1.015 ± 0.002) g·mL ⁻¹ at 22.6 °C ^(a)
Solution mass	(5.063 ± 0.003) g ^(a)
Photon-emitting impurities	None detected ^(b)
Half-lives used [6]	¹³³ Ba: (10.539 ± 0.006) a ^(c)
Calibration methods (and instruments)	The certified massic activity for ¹³³ Ba was obtained by 4π (e, X) - γ(NaI) live-timed anti-coincidence (LTAC) counting. Confirmatory measurements were performed by five other methods: (i) 4παβ liquid scintillation (LS) spectrometry (with ³ H standard efficiency tracing for β efficiencies) and two counters; (ii) 4παβ liquid scintillation (LS) spectrometry (with ⁵⁵ Fe standard efficiency tracing for β efficiencies) and two counters; (iii) an LS-based 4παβ triple-to-double coincidence ratio (TDCR) method; (iv) 4πγ ionization chamber measurements using NIST chamber "A"; and (v) HPGe γ-ray spectrometry. ^(d)

^(a) The stated uncertainty is two times the standard uncertainty [5].

^(b) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

336 s⁻¹·g⁻¹ for energies between 15 keV and 95 keV,

150 s⁻¹·g⁻¹ for energies between 100 keV and 280 keV,

276 s⁻¹·g⁻¹ for energies between 285 keV and 370 keV,

142 s⁻¹·g⁻¹ for energies between 380 keV and 400 keV,

16 s⁻¹·g⁻¹ for energies between 410 keV and 1430 keV,

24 s⁻¹·g⁻¹ for energies between 1440 keV and 1480 keV, and

13 s⁻¹·g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ¹³³Ba.

^(c) The stated uncertainty is the standard uncertainty. See reference 6.

^(d) The expanded ($k = 2$) uncertainties for the five confirmatory methods were: (i) 2.4 %; (ii) 2.4 %; (iii) 1.2 %; (iv) 1.6 %; and (v) 1.7 %, respectively. All of the confirmatory measurements agreed with the certified value within their respective measurement uncertainties. The results for methods (iii) and (iv) agreed with the certified anti-coincidence value to better than 0.2 %.

Table 2. Uncertainty evaluation for the massic activity of SRM 4251d

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ¹³³ Ba (%)
1	Measurement repeatability; standard deviation of the distribution for 6 samples, each measured once	A	0.35
2	Background; estimated by half the difference of using the middle background measurement rather than the background measurement closest in time to each sample measurement	A	0.06
3	Extrapolation fit; median uncertainty on least-squares intercept value for a single set of γ -ray gates	A	0.05
4	Analysis model, standard deviation between extrapolation intercept for two gate settings	A	0.46
5	Dead time; from previous systematic studies	B	0.1
6	Gravimetric (mass) measurements; includes uncertainty on average sample mass and dilution to SRM solution. From previous systematic studies.	B	0.05
7	¹³³ Ba decay corrections; from DDEP half-life of ¹³³ Ba of (10.539 $\pm$ 0.006) a	B	0.00004
8	Impurity limit, from limit (no impurities seen) from γ -ray spectrometry	A	0.04
Relative combined standard uncertainty			0.60
Relative expanded uncertainty ($k = 2$)			1.2

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4251d should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to the SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed Oct 2019). Note: This SRM is contained in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM); BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed Oct 2019).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed Oct 2019).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Oct 2019).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Oct 2019).
- [6] Chechev, V.P. and N.K. Kuzmenko ; *LNE-LNHB/CEA Table of Radionuclides*, ¹³³Ba; (October 2016); available at www.lnhb.fr/nuclides/Ba-133_tables.pdf (accessed Oct 2019).

Users of this SRM should ensure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

Standard Logbook

Serial ID: 1951 **Open/Reference Date:** 13 JUL 2018 **Aliquot :** 5.063 g
Name: Barium-133 **Received:** 31 MAR 2020 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 31 MAR 2035 **Logbook Num :** GL-CED-297-244
Employee: Tim Chandler **Lot Number :** 4251d
Supplier: NIST **Solvent :** 0.98M HCl
Uncertainty : .6 percent

Description: Barium-133
Comments: None

Analyte	Concentration	Analyte	Concentration
Barium-133	382.6 kBq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1951
Prepared By:	Tim Chandler
Carrier Conc:	0.98M HCl
Reference Date:	07/13/2018
Ampoule Mass (g):	5.063 g
Uncertainty:	+/- .6 %
LogBook No:	GL-CED-297-244
Supplier:	NIST

A Solution Material Info			
Isotope:	Barium-133		
Prepared By:	Bethany Fiem		
Prep Date:	09/23/2020		
Verification Date:	09/16/2021		
Expiration Date:	09/16/2022		
Primary Code:	1951-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.034 g		
Density(g/mL):	1.0167	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.034 \text{ g}) * (382.6 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 1155605.0400 \text{ dpm/mL}$
$(5.034 \text{ g}) * (382.6 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0167 \text{ g/mL}) / (100 \text{ mL}) = 1136603.3060 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
09/23/2020	Bethany Fiem	19.301	1000	1951-B	21937.5804 dpm/mL	09/16/2021	09/16/2022
09/16/2021	Bethany Fiem	19.02	1000	1951-C	21618.1948 dpm/mL	09/16/2021	09/16/2022
06/02/2022	Jennie Kill-Bowden	19.0813	1000	1951-D	21687.8687 dpm/mL	06/03/2022	06/02/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ba-133 Standard 1951-D

v1.0.2

Instrument	Purple
Analyst	JXK3
Verification Prep Date	6/2/2022

Standard Information	
Isotope	Ba-133
Serial Number	1951-D
Isotope Half-life	3.8410E+03 D
Reference Date	7/13/2018
Ref. Act. (DPM/mL)	21687.8687
Amount of Std. (mL)	1.0
Standard Prep Date	6/2/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	6/3/2022	104.40	13752.00	42.40
2	6/3/2022	104.90	13833.33	42.40
3	6/3/2022	104.10	13909.33	42.40

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	13709.60	0.826295	16591.66	16591.66
2	13790.93	0.826295	16690.09	16690.09
3	13866.93	0.826295	16782.07	16782.07

dpm/mL
16687.94
95.22033877

Mean Value =
Stddev =

Certificate Value* = 16782.2
Two sigma = 190.441
10 % of Mean = 1668.794
Rule A (Pass/Fail) Pass
% Recovery 99.44%
Rule B (Pass/Fail) Pass
Expiration Date 6/2/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Ba-133 source 1951-D by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCPurple for Ba-133 source standard verification. The Ba-133 efficiency calibration which was used for verification calculations was performed on 6/2/2022 using Ba-133 source 1601-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

A = Ver. source cpm,

B = BKG cpm,

C = System efficiency (cpm/dpm), and

D = volume used for standard verification.

RAD-M-001

Standardization of Barium Carrier 3437074

v1.2.1

Analyst	JXK3
---------	------

Standard Information	
Isotope	Barium
Serial Number	3437074
Amount of Std. (mL)	1.0
Standard Prepared	5/11/2022

Parent Information	
Parent Serial #	3268059.1
Parent Exp. Date	1/18/2024

Std #	Weight of carrier added (g)	Weight of crucible or filter (g)	Weight of crucible or filter + ppt. (g)	Weight of ppt. (g)	mg Barium/mL	mg Barium/g
1	1.0367	0.0794	0.1049	0.0255	25.50	24.60
2	1.0295	0.0799	0.1055	0.0256	25.60	24.87
3	1.0284	0.0799	0.1055	0.0256	25.60	24.89
4	1.0277	0.0802	0.1058	0.0256	25.60	24.91

Mean Value (mg/mL) = 25.58
 Stdev (mg/mL) = ± 0.05
 1.0% of Mean Value = 0.255750
 Pass
 Expiration Date 5/11/2023
 Mean Value (mg/1.0mL) = 25.58

Standardization Rule

A satisfactory standardization is obtained when results give a standard deviation of less than 1.0% of the mean value.

5/25/22

Standardization of Strontium Carrier 3452293

v1.2.1

Analyst	JXK3
---------	------

Standard Information	
Isotope	Strontium
Serial Number	3452293
Amount of Std. (mL)	1.0
Standard Prepared	6/20/2022

Parent Information	
Parent Serial #	3268476.2
Parent Exp. Date	4/7/2024

Standardization Rule

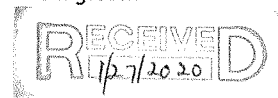
A satisfactory standardization is obtained when results give a standard deviation of less than 1.0% of the mean value.

Std #	Weight of carrier added (g)	Weight of crucible or filter (g)	Weight of crucible or filter + ppt. (g)	Weight of ppt. (g)	mg Strontium/mL	mg Strontium/g
1	1.0168	0.0358	0.0445	0.0087	8.70	8.56
2	1.0134	0.0359	0.0445	0.0086	8.60	8.49
3	1.0172	0.0363	0.0449	0.0086	8.60	8.45
4	1.0206	0.0381	0.0468	0.0087	8.70	8.52

Mean Value (mg/mL) = 8.65
 Stdev (mg/mL) = ± 0.06
 1.0% of Mean Value = 0.086500
 Pass
 Expiration Date 6/20/2023
 Mean Value (mg/1.0mL) = 8.65

John Walker

CERTIFICATE OF CALIBRATION
Standard Reference Source



1926

SRS Number: 115032

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8226

Customer: GEL Laboratories LLC

P.O. Number: GEL1924879, Item 8

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated using a germanium gamma-ray spectrometer system. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 23-January-2020

12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Ra-226	5.844E+05	3.733E+04	1.0	2.1	4.7	HPGe

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 115032

Comments:

5.00345 g of 0.1 M HCl solution with approximately 30 µg/g Ba carrier.

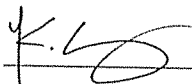
Impurities:

α-impurities (other than decay products) < 0.1%

γ-impurities (other than decay products) < 0.1%

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Eardley, Radiochemist

QC Approved by:


A. Chen, Spectroscopist

Date: 16 Jan 20

Standard Logbook

Serial ID: 1926 **Open/Reference Date:** 23 JAN 2020 **Aliquot :** 5.00345 g
Name: Radium-226 **Received:** 27 JAN 2020 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 26 JAN 2030 **Logbook Num :** GL-CED-297-219
Employee: Gregory Ramsay **Lot Number :** 115032
Supplier: Eckert and Ziegler **Solvent :** 0.1M HCl
Uncertainty : 4.7 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Radium-226	37330 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1926
Prepared By:	Gregory Ramsay
Carrier Conc:	0.1M HCl
Reference Date:	01/23/2020
Ampoule Mass (g):	5.00345 g
Uncertainty:	+/- 4.7 %
LogBook No:	GL-CED-297-219
Supplier:	Eckert and Ziegler

A Solution Material Info			
Isotope:	Radium-226		
Prepared By:	Bethany Fiem		
Prep Date:	03/10/2020		
Verification Date:	09/15/2021		
Expiration Date:	09/15/2022		
Primary Code:	1926-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9415 g		
Density(g/mL):	0.9974	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9415 \text{ g}) * (37330 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00345 \text{ g} * 100 \text{ mL}) = 22120.6801 \text{ dpm/mL}$
$(4.9415 \text{ g}) * (37330 \text{ Bq}) * (60 \text{ dpm/Bq}) / (0.9974 \text{ g/mL}) / (5.00345 \text{ g} * 100 \text{ mL}) = 22178.3439 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
03/10/2020	Bethany Fiem	11.4143	100	1926-B	2531.50269 dpm/mL	04/06/2021	04/06/2022
09/14/2021	Gregory Ramsay	27.1259	250	1926-C	2406.4301 dpm/mL	09/15/2021	09/15/2022

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-226 Standard 1926-C

v1.0.2

Instrument	GOLD
Analyst	GXR1
Verification Prep Date	9/15/2021

Standard Information	
Isotope	Ra-226
Serial Number	1926-C
Isotope Half-life	1,6000E+03 Y
Reference Date	1/23/2020
Ref. Act. (DPM/mL)	2406.4301
Amount of Std. (mL)	0.2
Standard Prep Date	9/14/2021

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	10/21/2021	71.70	3220.32	52.60
2	10/21/2021	70.60	3163.44	52.60
3	10/21/2021	71.60	3227.62	52.60

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	3167.72	6.809877	2325.83	465.17
2	3110.84	6.809877	2284.06	456.81
3	3175.02	6.809877	2331.19	466.24

dpm/mL
2313.69
Mean Value =
25.79863504
Stddev =
Certificate Value* = 2404.6
Two sigma = 51.597
10 % of Mean = 231.369
Rule A (Pass/Fail) Pass
% Recovery 96.22%
Rule B (Pass/Fail) Pass
Expiration Date 9/15/2022

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Ra-226 source 1926-C by transferring 0.2 mL portions of the standard into glass liquid scintillation vials. 15 mL of Ecosint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 15 mL of Ecosint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCGOLD for Ra-226 source standard verification. The Ra-226 efficiency calibration which was used for verification calculations was performed on 9/15/2021 using Ra-226 source 1715-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

A = Ver. source cpm,

B = BKG cpm,

C = System efficiency (cpm/dpm), and

D = volume used for standard verification.

RAD-M-001

10/22/21

Eckert & Ziegler Analytics, Inc.
1380 Seaboard Industrial Blvd.
Atlanta, GA 30318, USA
Tel 1-404-352-8677
Fax 1-404-352-2837



Eckert & Ziegler
Analytics

1965
Received
9-22-20
JML
9-22-20

akkreditiert durch die / *accredited by the*

Deutsche Akkreditierungsstelle GmbH



Deutsche
Akkreditierungsstelle
D-K-19023-01-00

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst



Kalibrierschein
Calibration certificate

Kalibrierzeichen
Calibration mark

001443
D-K- 19023-01-00
2020-09

Gegenstand
Object **5 mL Liquid in 5 mL Flame Sealed Ampoule**

Hersteller
Manufacturer **Eckert & Ziegler Analytics, Inc.**

Typ
Type **8328-5FSA-3700BQ-D**

Fabrikat/Serien-Nr.
Serial number **114437**

Auftraggeber
Customer **GEL Laboratories LLC**

Auftragsnummer
Order No. **CO-047265**

Anzahl der Seiten des Kalibrierscheines
Number of pages of the certificate **2**

Datum der Kalibrierung
Date of calibration **18-Sep-2020 1200 EST
(1700 UTC)**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).

Die DAKKS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine. Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).

The DAKKS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.

The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung sowohl der Deutschen Akkreditierungsstelle GmbH als auch des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine ohne Unterschrift haben keine Gültigkeit.

This calibration certificate may not be reproduced other than in full except with the permission of both the Deutsche Akkreditierungsstelle GmbH and the issuing laboratory. Calibration certificates without signature are not valid.

Datum
Date

Leiter des Kalibrierlaboratoriums
Head of the calibration laboratory

Bearbeiter
Person in charge

14-Sep-20

Levan Tkavadze

Karlee Eardley

001443
D-K- 19023-01-00
2020-09

- **Customer Purchase Order No.:**
GEL2026750, Item 1

- **Calibration Results:**

Nuclide	Half-Life *, d	Activity, Bq	Uncertainty, %	Calibration Method
Ra-228	2.100E+03	3.172E+03	4.9	HPGe

- **Calibration Method(s):**

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics using a germanium gamma-ray spectrometer system (HPGe).

- **Uncertainty:**

The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k = 2$. It has been determined in accordance with EA-4/02 M. The value of the measurand lies within the assigned range of values with a probability of approximately 95%. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

- **Traceability:**

Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

- **Impurities:**

γ -impurities (other than decay products) < 0.1 %

- **Expiration Date:**

No expiration date has been given for this source.

- **Wipe Test *:**

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

- **Additional Information:**

- 5.00785 g of 0.1 M HCl solution with approximately 30 $\mu\text{g/g}$ Ba carrier.
- Separation date: 01-March-2018
- *Values not calibrated by EZA (i.e. published nuclear data, uncertified values, etc.)
- Date of Calibration corresponds to Reference Date for this source.
- Expiration Date refers to useful life of this source.

End of Certificate

Standard Logbook

Serial ID: 1965 **Open/Reference Date:** 18 SEP 2020 **Aliquot :** 5.00785 g
Name: Radium-228 **Received:** 22 SEP 2020 **Density :** Hand Calculated
Type: Source Material **Expires:** 22 SEP 2035 **Logbook Num :** GL-CED-297-258
Employee: Tim Chandler **Lot Number :** 114437
Supplier: Eckert & Zeigler Analytics **Solvent :** 0.1M HCl
Uncertainty : 2.45 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Radium-228	3172 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1965
Prepared By:	Tim Chandler
Carrier Conc:	0.1M HCl
Reference Date:	09/18/2020
Ampoule Mass (g):	5.00785 g
Uncertainty:	+/- 2.45 %
LogBook No:	GL-CED-297-258
Supplier:	Eckert & Zeigler Analytics

A Solution Material Info			
Isotope:	Radium-228		
Prepared By:	Bethany Fiem		
Prep Date:	09/23/2020		
Verification Date:	08/05/2021		
Expiration Date:	08/05/2022		
Primary Code:	1965-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9411 g		
Density(g/mL):	0.9999	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9411 \text{ g}) * (3172 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00785 \text{ g} * 100 \text{ mL}) = 1877.8321 \text{ dpm/mL}$
$(4.9411 \text{ g}) * (3172 \text{ Bq}) * (60 \text{ dpm/Bq}) / (0.9999 \text{ g/mL}) / (5.00785 \text{ g} * 100 \text{ mL}) = 1877.9260 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
09/23/2020	Bethany Fiem	40.8755	200	1965-B	383.805821 dpm/mL	08/05/2021	08/05/2022
09/24/2020	Bethany Fiem	20.1605	100	1965-C	378.599271 dpm/mL	08/05/2021	08/05/2022

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-228 Standard 1965-C

v1.0.2

Instrument	BLUE
Analyst	BXF1
Verification Prep Date	8/5/2021

Standard Information	
Isotope	Ra-228
Serial Number	1965-C
Isotope Half-life	5.7500 Y
Reference Date	9/16/2020
Ref. Act. (DPM/mL)	378.599271
Amount of Std. (mL)	1.0
Standard Prep Date	9/24/2020

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	8/6/2021	105.30	2460.24	35.80
2	8/6/2021	105.00	2479.51	35.80
3	8/6/2021	104.20	2402.62	35.80

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	2424.44	7.130420	340.01	340.01
2	2443.71	7.130420	342.72	342.72
3	2366.82	7.130420	331.93	331.93

dpm/mL
338.22
5.610781665

Mean Value =
Stddev =

Certificate Value* = 340.4
Two sigma = 11.222
10 % of Mean = 33.822
Rule A (Pass/Fail) Pass
% Recovery 99.35%
Rule B (Pass/Fail) Pass
Expiration Date 8/5/2022

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Ra-228 source 1965-C by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecosint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecosint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCBLUE for Ra-228 source standard verification. The Ra-228 efficiency calibration which was used for verification calculations was performed on 8/5/2021 using Ra-228 source 1952-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

A = Ver. source cpm,

B = BKG cpm,

C = System efficiency (cpm/dpm), and

D = volume used for standard verification.

RAD-M-001

8/19/21
[Signature]

afg-296 8/19/21



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

1943

SRS Number: 115036

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8090-5FSA-37kBq

Customer: GEL Laboratories LLC

P.O. Number: GEL1924879, Item 4

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 23-January-2020 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Sr-90	1.052E+04	3.705E+04	0.1	1.0	2.1	4 π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4 π LS - 4 π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

GL-CED-297-236a

EZA Certificate Program Rev. 1, 01-FEB-2019

Dec
4-8-20

Page 1 of 2

SRS Number: 115036

Comments:

5.00204 g of 0.1 M HCl solution with approximately 30 µg/g each Sr and Y carriers.

Impurities:

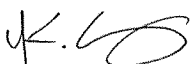
γ-impurities < 0.1%

Note:

This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total activity for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Eardley, Radiochemist

QC Approved by:


A. Chen, Spectroscopist

Date: 16 Jan 20

Standard Logbook

Serial ID: 1943 **Open/Reference Date:** 23 JAN 2020 **Aliquot :** 5.00204 g
Name: Strontium-90 **Received:** 23 JAN 2020 **Density :** Hand Calculated
Type: Source Material **Expires:** 23 JAN 2035 **Logbook Num :** GL-CED-297-236
Employee: Tim Chandler **Lot Number :** 115036
Supplier: Eckert & Zeigler **Solvent :** 0.1M HCl
Uncertainty : 1.05 percent
Description: Strontium-90
Comments: None

Analyte	Concentration	Analyte	Concentration
Strontium-90	37050 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1943
Prepared By:	Tim Chandler
Carrier Conc:	0.1M HCl
Reference Date:	01/23/2020
Ampoule Mass (g):	5.00204 g
Uncertainty:	+/- 1.05 %
LogBook No:	GL-CED-297-236
Supplier:	Eckert & Zeigler

A Solution Material Info			
Isotope:	Strontium-90		
Prepared By:	Jennie Kill-Bowden		
Prep Date:	08/13/2020		
Verification Date:	01/04/2022		
Expiration Date:	01/04/2023		
Primary Code:	1943-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9536 g		
Density(g/mL):	0.9995	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22014.7236 \text{ dpm/mL}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (0.9995 \text{ g/mL}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22025.6704 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/16/2021	Bethany Fiem	24.8842	1000	1943-B	548.091187 dpm/mL	02/16/2021	02/16/2022
01/04/2022	Jennie Kill-Bowden	25.0633	1000	1943-C	552.035985 dpm/ml	01/04/2022	01/04/2023
06/06/2022	Jennie Kill-Bowden	24.9802	1000	1943-D	550.2057 dpm/ml	06/04/2022	06/03/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Sr-90 Standard 1943-C

v1.0.2

Instrument	Red
Analyst	JXK3
Verification Prep Date	1/4/2022

Standard Information	
Isotope	Sr-90
Serial Number	1943-C
Isotope Halflife	28.9000 Y
Reference Date	1/23/2020
Ref. Act. (DPM/mL)	552.035984
Amount of Std. (mL)	1.0
Standard Prep Date	1/4/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	1/5/2022	88.50	1116.40	41.80
2	1/5/2022	87.90	1096.60	41.80
3	1/5/2022	89.00	1093.80	41.80

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	1074.60	2.021254	531.65	531.65
2	1054.80	2.021254	521.85	521.85
3	1052.00	2.021254	520.47	520.47

Mean Value = 524.66 dpm/mL
 Stdev = 6.095043305
 Certificate Value* = 526.8
 Two sigma = 12.190
 10 % of Mean = 52.466
 Rule A (Pass/Fail) Pass
 % Recovery 99.60%
 Rule B (Pass/Fail) Pass
 Expiration Date 1/4/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Sr-90 source 1943-C by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCRed for Sr-90 source standard verification. The Sr-90 efficiency calibration which was used for verification calculations was performed on 1/4/2022 using Sr-90 source 1689-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency (cpm/dpm), and
- D = volume used for standard verification.

RAD-M-001

Handwritten:
 1/12/22
 1/14/22

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2290786

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205141307	LCS	JXC9	PIC6B	JUL-28-22 09:04:27	DONE	25mm Filter	01-JUN-22 00:00
1205141308	LCSD	JXC9	PIC6C	JUL-28-22 09:04:32	DONE	25mm Filter	01-JUN-22 00:00
585905001	SAMPLE	JXC9	PIC1A	JUL-28-22 09:04:52	DONE	25mm Filter	01-JUN-22 00:00
1205141306	MB	JXC9	PIC6A	JUL-28-22 09:05:04	DONE	25mm Filter	01-JUN-22 00:00
585905002	SAMPLE	JXC9	PIC1D	JUL-28-22 09:05:15	DONE	25mm Filter	01-JUN-22 00:00
585905003	SAMPLE	JXC9	PIC4B	JUL-28-22 09:05:23	DONE	25mm Filter	01-JUN-22 00:00
585905004	SAMPLE	JXC9	PIC5B	JUL-28-22 09:05:39	DONE	25mm Filter	01-JUN-22 00:00
585905005	SAMPLE	JXC9	PIC5D	JUL-28-22 09:05:44	DONE	25mm Filter	01-JUN-22 00:00

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2290788

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205141313	LCS	JXC9	PIC13D	JUL-26-22 14:57:23	DONE	47mm Filter	01-JUN-22 00:00
1205141314	LCSD	JXC9	PIC14A	JUL-26-22 14:57:24	DONE	47mm Filter	01-JUN-22 00:00
1205141312	MB	JXC9	PIC3D	JUL-26-22 19:06:32	DONE	47mm Filter	01-JUN-22 00:00
585905001	SAMPLE	JXC9	PIC2A	JUL-26-22 19:06:36	DONE	47mm Filter	01-JUN-22 00:00
585905002	SAMPLE	JXC9	PIC2B	JUL-26-22 19:06:40	DONE	47mm Filter	01-JUN-22 00:00
585905003	SAMPLE	JXC9	PIC2C	JUL-26-22 19:06:44	DONE	47mm Filter	01-JUN-22 00:00
585905004	SAMPLE	JXC9	PIC3B	JUL-26-22 19:06:48	DONE	47mm Filter	01-JUN-22 00:00
585905005	SAMPLE	JXC9	PIC3C	JUL-26-22 19:06:52	DONE	47mm Filter	01-JUN-22 00:00

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2290790

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205141316	LCS	JXK3	PIC13A	JUL-26-22 17:47:26	DONE	Tuffryn Filter	01-APR-21 00:00
1205141317	LCSD	JXK3	PIC13B	JUL-26-22 17:47:29	DONE	Tuffryn Filter	01-APR-21 00:00
585885001	SAMPLE	JXK3	PIC6A	JUL-26-22 19:10:25	DONE	Tuffryn Filter	01-APR-21 00:00
585885002	SAMPLE	JXK3	PIC6C	JUL-26-22 19:10:28	DONE	Tuffryn Filter	01-APR-21 00:00
585885003	SAMPLE	JXK3	PIC7A	JUL-26-22 19:10:37	DONE	Tuffryn Filter	01-APR-21 00:00
585905001	SAMPLE	JXK3	PIC7B	JUL-26-22 19:10:43	DONE	Tuffryn Filter	01-APR-21 00:00
585905002	SAMPLE	JXK3	PIC7C	JUL-26-22 19:10:46	DONE	Tuffryn Filter	01-APR-21 00:00
585905003	SAMPLE	JXK3	PIC7D	JUL-26-22 19:10:54	DONE	Tuffryn Filter	01-APR-21 00:00
585905004	SAMPLE	JXK3	PIC8C	JUL-26-22 19:10:58	DONE	Tuffryn Filter	01-APR-21 00:00
1205141315	MB	JXK3	PIC8D	JUL-27-22 10:14:33	DONE	Tuffryn Filter	01-APR-21 00:00
585905005	SAMPLE	JXK3	PIC8C	JUL-27-22 10:14:37	DONE	Tuffryn Filter	01-APR-21 00:00

Liquid Scintillation Raw Data

Batch 2294040 Check-list

This check-list was completed on 28-JUL-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 28-JUL-22 and Jessica Davis on 28-JUL-22.

Batch ID: 2294040

Product: LSC41PUF

Description: LSC Plutonium Filter

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have client special requirements have been reviewed and met?	Yes		
4	Have samples been blank corrected?		No	
5	Has a hit notification been completed?		No	
6	Has an Aliquot Correction been completed for this batch?	Yes		
7	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
8	Were all the samples prepared/analyzed within the required holding time period?	Yes		
9	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
10	Was the method blank (MB) within the acceptance criteria?	Yes		
11	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
12	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
13	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
14	Has the method required detection limit been met?		No	
Miscellaneous Information				
15	Were manual integrations performed on any sample or QC data files in this batch?		No	
16	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium-241 in Filter per Liter

Batch ID: 2294040

Analyst: Brendon Viquez (BV1)

Method: DOE EML HASL-300, Pu-11-RC
Modified

Lab SOP: GL-RAD-A-011 REV# 28

Instrument: ASP-33005595

Due Dates for Lab: 26-JUL-2022

Package: 27-JUL-2022

SDG: 27-JUL-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205147421	Plutonium-241 AS SPIKE	1714-B	.1	mL
LCSD	1205147422	Plutonium-241 AS SPIKE	1714-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	585885001 - 2	25-JUL-2022	5	40	0.10284
2	585885002 - 2	25-JUL-2022	5	40	0.10101
3	585885003 - 2	25-JUL-2022	5	40	0.11435
4	585905001 - 2	25-JUL-2022	5	40	0.10429
5	585905002 - 2	25-JUL-2022	5	40	0.09851
6	585905003 - 2	25-JUL-2022	5	40	0.09126
7	585905004 - 2	25-JUL-2022	5	40	0.0941
8	585905005 - 2	25-JUL-2022	5	40	0.10203
9	1205147420 MB	25-JUL-2022	5		0.11435
10	1205147421 LCS	25-JUL-2022	5		0.11435
11	1205147422 LCSD	25-JUL-2022	5		0.11435

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2020-A	Plutonium-242 AS TRACER	.1 mL	Pipet ID: RAD-ASP-184002Z
			Text Result: Pu

Plutonium-241 Filter

Filename : PU241.XLS
 File type : Excel
 Version # : 1.3.4

Tracer S/N : 2020-A
 Tracer Exp Date : 6/3/2023
 Tracer Volume Added: 0.10
 Tracer Error: 0.37%

Batch : 2294040
 Analyst : BRE02408
 Prep Date : 7/25/2022
 Method Uncertainty : 0.0935

Procedure Code : LSC41PUF
 Parmname : Plutonium-241
 Required MDA : 5 pCi/F
 Halflife of Pu-241 : 14.290 years
 Pu-241 Abundance : 1.00
 Tracer Abundance : 1.00
 Halflife of Tracer : 373500.000 years

Geometry:

Sample Characteristics					Tracer Calculations									
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Tracer Concentration DPM	Tracer Counts	Tracer Bkg Counts	Tracer Net CPM	Tracer Count Start Date/Time	Tracer Count Time (sec.)	Tracer Decay	Detector Serial #	Detector Efficiency (cpm/dpm)	Detector Efficiency StDev. (cpm/dpm)
1	585885001.2	0.1028	1.1543E-05	6/27/2022 9:24	4.2759	641	7.575	1.254	7/25/2022 18:29	30300	1.000	80020	0.334445	0.006454
2	585885002.2	0.1010	1.1432E-05	6/27/2022 9:38	4.2759	585	4.040	1.150	7/25/2022 18:29	30300	1.000	155835	0.329361	0.006358
3	585885003.2	0.1144	1.2216E-05	6/27/2022 10:00	4.2759	600	11.615	1.165	7/25/2022 18:29	30300	1.000	149001	0.319401	0.006170
4	585905001.2	0.1043	1.1630E-05	6/27/2022 9:43	4.2759	609	12.120	1.182	7/25/2022 18:29	30300	1.000	80010	0.312081	0.006033
5	585905002.2	0.0985	1.1278E-05	6/27/2022 9:52	4.2759	601	0.505	1.189	7/25/2022 18:29	30300	1.000	158161	0.333652	0.006439
6	585905003.2	0.0913	1.0821E-05	6/27/2022 10:01	4.2759	658	2.020	1.299	7/25/2022 18:29	30300	1.000	78785	0.375543	0.007229
7	585905004.2	0.0941	1.1002E-05	6/27/2022 10:08	4.2759	572	3.030	1.127	7/25/2022 18:29	30300	1.000	78265	0.372920	0.007180
8	585905005.2	0.1020	1.1494E-05	6/27/2022 12:00	4.2759	584	6.060	1.144	7/25/2022 18:29	30300	1.000	83294	0.355206	0.006846
9	1205147420.1	0.1144	1.2216E-05	7/25/2022 0:00	4.2759	542	9.090	1.055	7/25/2022 18:29	30300	1.000	78779	0.299106	0.005788
10	1205147421.1	0.1144	1.2216E-05	7/25/2022 0:00	4.2759	511	3.030	1.006	7/25/2022 18:29	30300	1.000	79778	0.359583	0.006929
11	1205147422.1	0.1144	1.2216E-05	7/25/2022 0:00	4.2759	600	5.555	1.177	7/25/2022 18:29	30300	1.000	79463	0.348191	0.006714

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-011
 Instrument SOP:

Count raw Data													Calibration Data						
Pos.	Rack Position #	Counting Time (min.)	Quench#	Gross cpm	Bkg cpm	Bkg Count Time (min.)	Bkg Quench#	Corrected Bkg cpm	Count Start Date/Time	Sample Decay	Calculated Sample Recovery %	Sample Recovery Error %	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Background Rack Position #	Background Count Start Date/Time
1	13-2	120	324.6	17.91	17.00	120	355.25	16.8611	7/26/2022 14:52	0.996	87.7%	4.47%	LSCNAVY	1/24/2022	1/31/2023	0.2847	0.00792	15-1	7/27/2022 22:21
2	13-3	120	330.53	17.08	17.00	120	355.25	16.9023	7/26/2022 16:54	0.996	81.7%	4.61%	LSCNAVY	1/24/2022	1/31/2023	0.2894	0.00792	15-1	7/27/2022 22:21
3	13-4	120	334.36	16.97	17.00	120	355.25	16.9250	7/26/2022 18:55	0.996	85.3%	4.63%	LSCNAVY	1/24/2022	1/31/2023	0.2924	0.00792	15-1	7/27/2022 22:21
4	13-5	120	336.59	18.04	17.00	120	355.25	16.9369	7/26/2022 20:57	0.996	88.6%	4.60%	LSCNAVY	1/24/2022	1/31/2023	0.2942	0.00792	15-1	7/27/2022 22:21
5	13-6	120	321.15	17.96	17.00	120	355.25	16.8336	7/26/2022 22:58	0.996	83.3%	4.54%	LSCNAVY	1/24/2022	1/31/2023	0.2819	0.00792	15-1	7/27/2022 22:21
6	17-1	120	326.46	17.04	17.00	120	355.25	16.8748	7/27/2022 2:09	0.996	80.9%	4.38%	LSCNAVY	1/24/2022	1/31/2023	0.2862	0.00792	15-1	7/27/2022 22:21
7	17-2	120	323.15	17.59	17.00	120	355.25	16.8499	7/27/2022 4:10	0.996	70.7%	4.65%	LSCNAVY	1/24/2022	1/31/2023	0.2835	0.00792	15-1	7/27/2022 22:21
8	14-1	120	329.46	17.19	17.00	120	355.25	16.8954	7/27/2022 7:06	0.996	75.4%	4.63%	LSCNAVY	1/24/2022	1/31/2023	0.2886	0.00792	15-1	7/27/2022 22:21
9	14-2	120	331.75	16.47	17.00	120	355.25	16.9099	7/27/2022 9:08	1.000	82.5%	4.81%	LSCNAVY	1/24/2022	1/31/2023	0.2904	0.00792	15-1	7/27/2022 22:21
10	15-1	15	332.92	50.75	17.00	120	355.25	16.9168	7/27/2022 11:09	1.000	65.4%	4.87%	LSCNAVY	1/24/2022	1/31/2023	0.2913	0.00792	15-1	7/27/2022 22:21
11	15-2	15	310.65	54.05	17.00	120	355.25	16.7332	7/27/2022 11:25	1.000	79.1%	4.58%	LSCNAVY	1/24/2022	1/31/2023	0.2735	0.00792	15-1	7/27/2022 22:21

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1714-B
LCS Exp Date : 1/19/2023
LCS Activity (dpm/ml): 1609.37
LCS Volume Added: 0.10

Results																
	Decision Level	Critical Level	Required MDA	MDA	Sample Act. Conc.	Sample Act. Error	Net Count Rate	Net Count Rate Error	2 SIGMA Counting Uncertainty	2 SIGMA Total Prop. Uncertainty	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery
Pos.	pCi/F	pCi/F	pCi/F	pCi/F	pCi/F	%	CPM	CPM	pCi/F	pCi/F						
1	21.7495	15.3553	5	31.1509	18.4696	51.52%	1.0489	0.5383	18.5781	18.9552		SAMPLE				
2	23.4169	16.5325	5	33.5384	3.3649	299.50%	0.1777	0.5322	19.7500	19.7621		SAMPLE				
3	19.6161	13.8491	5	28.0945	0.7133	1180.99%	0.0450	0.5315	16.5120	16.5127		SAMPLE				
4	20.6004	14.5441	5	29.5042	18.3574	49.16%	1.1031	0.5399	17.6090	18.0061		SAMPLE				
5	24.1088	17.0210	5	34.5304	22.0033	48.03%	1.1264	0.5385	20.6168	21.1011		SAMPLE				
6	26.4484	18.6728	5	37.8806	3.5352	321.90%	0.1652	0.5316	22.3028	22.3143		SAMPLE				
7	29.6177	20.9103	5	42.4203	17.7531	72.54%	0.7401	0.5357	25.1865	25.4487		SAMPLE				
8	25.2050	17.7950	5	36.0996	6.0053	180.98%	0.2946	0.5330	21.2947	21.3303		SAMPLE				
9	20.3433	14.3626	5	29.1363	-7.2340	120.01%	-0.4399	0.5274	17.0012	17.0012		MB				
10	54.2665	38.3126	5	80.7606	699.5664	7.43%	33.8332	1.8773	76.0815	163.7380		LCS			633.9656	110.3%
11	47.5739	33.5876	5	70.8204	680.1399	6.96%	37.3168	1.9346	69.1109	155.3926		LCSD	2.8%		633.9656	107.3%

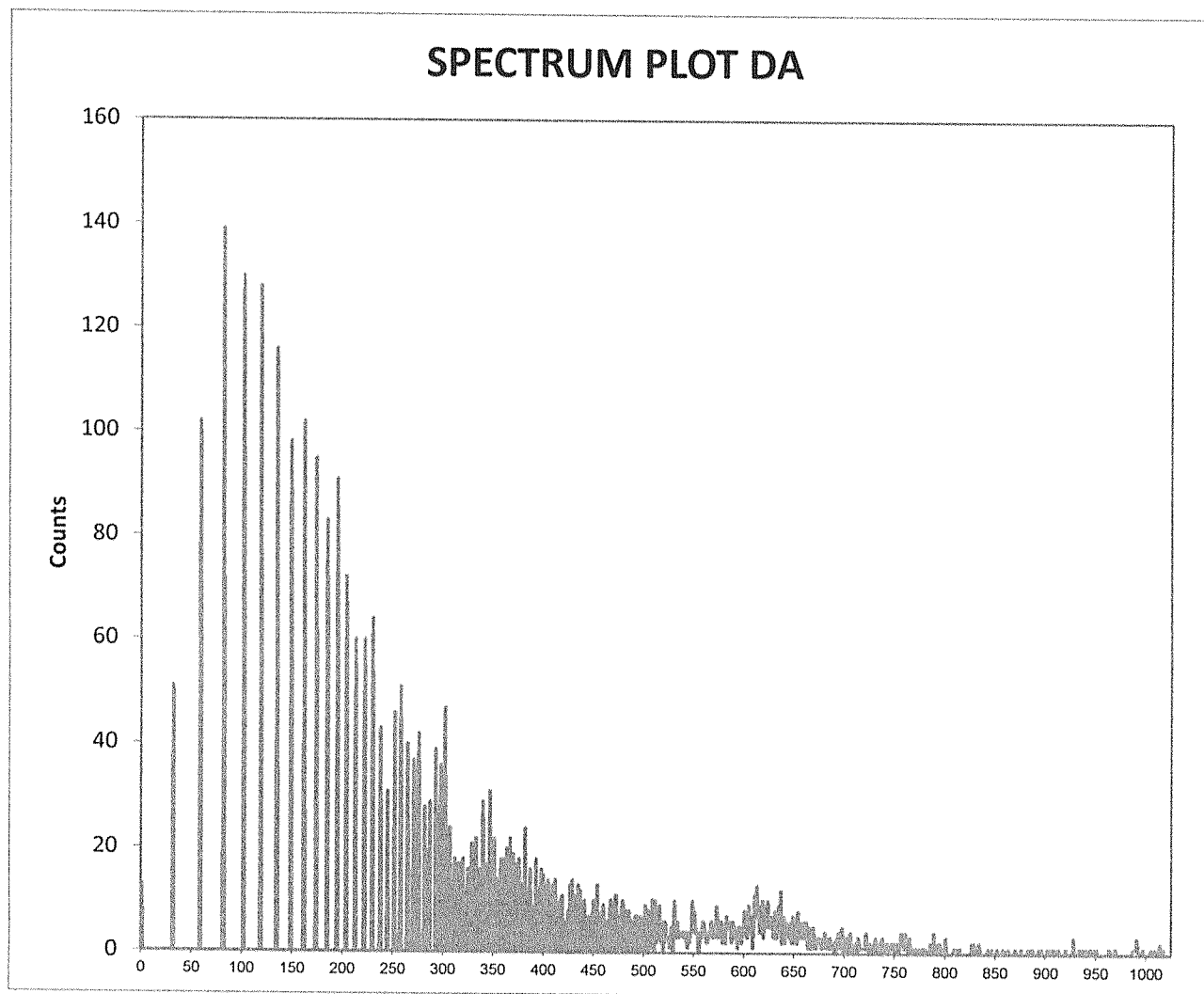
SampleID	Rack	Time (min.)	SQPE#	CPM Iso1	CPM Iso2	LumEx	Count Start Time	Count End Time	Machine
1	13-1	120	359.23	19.48			7/26/2022 12:50	7/26/2022 14:50	NAVY
2	13-2	120	324.6	17.91			7/26/2022 14:52	7/26/2022 16:52	NAVY
3	13-3	120	330.53	17.08			7/26/2022 16:54	7/26/2022 18:54	NAVY
4	13-4	120	334.36	16.97			7/26/2022 18:55	7/26/2022 20:55	NAVY
5	13-5	120	336.59	18.04			7/26/2022 20:57	7/26/2022 22:57	NAVY
6	13-6	120	321.15	17.96			7/26/2022 22:58	7/27/2022 0:58	NAVY
1	17-1	120	326.46	17.04			7/27/2022 2:09	7/27/2022 4:09	NAVY
2	17-2	120	323.15	17.59			7/27/2022 4:10	7/27/2022 6:10	NAVY
1	14-1	120	329.46	17.19			7/27/2022 7:06	7/27/2022 9:06	NAVY
2	14-2	120	331.75	16.47			7/27/2022 9:08	7/27/2022 11:08	NAVY
1	15-1	15	332.92	50.75			7/27/2022 11:09	7/27/2022 11:24	NAVY
2	15-2	15	310.65	54.05			7/27/2022 11:25	7/27/2022 11:40	NAVY

OP 7/28/2022

Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
26 Jul 2022 14:52:31
M:\LSC\FILES\navy\2294040A\SPu241_S0002_R01_20220726.
M:\LSC\FILES\navy\2294040A\U2294040A.xls
DA
NAVY
2, 13, 120:

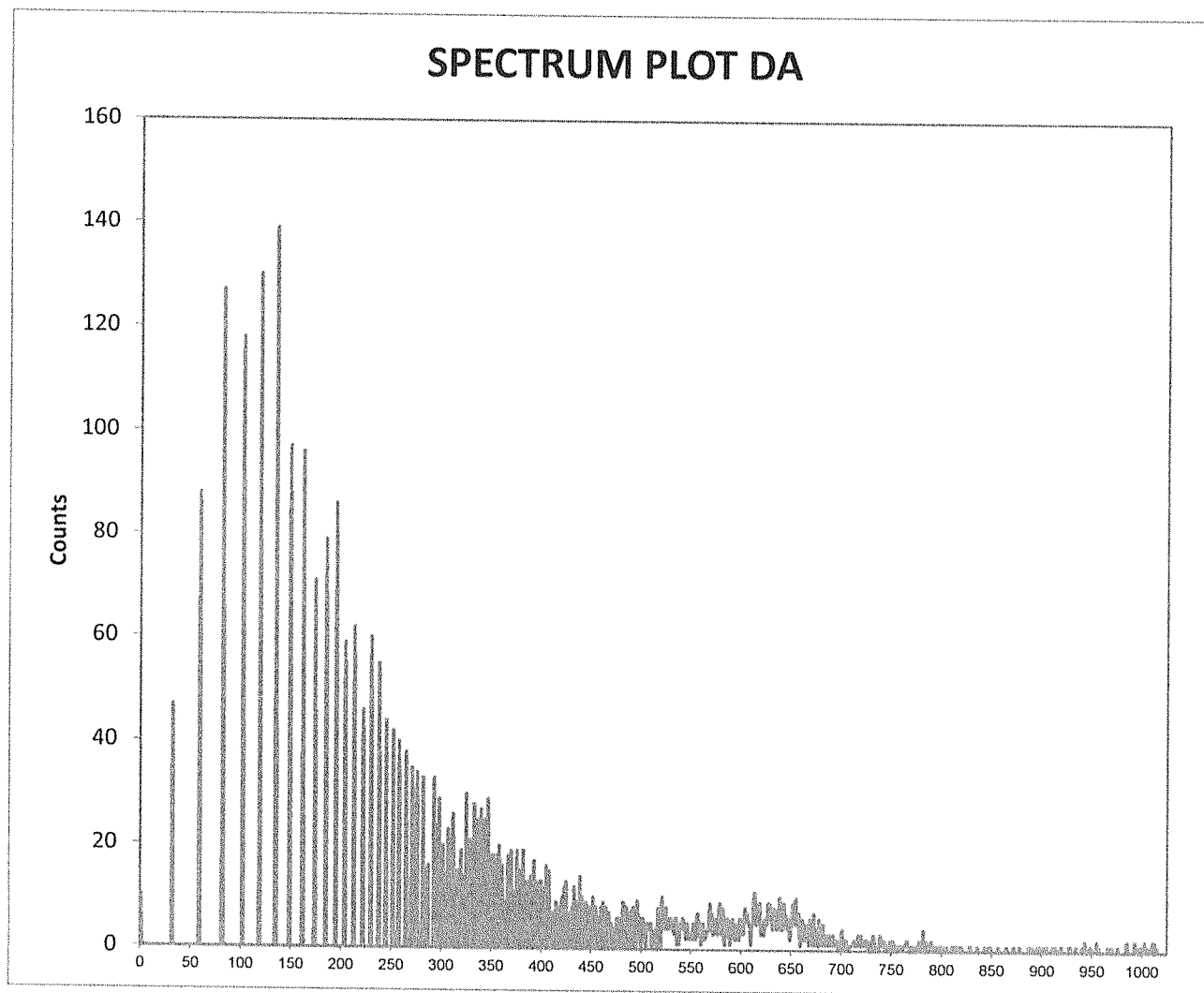
Quench: 324.6
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
26 Jul 2022 16:54:09
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NAVY
3, 13, 120:

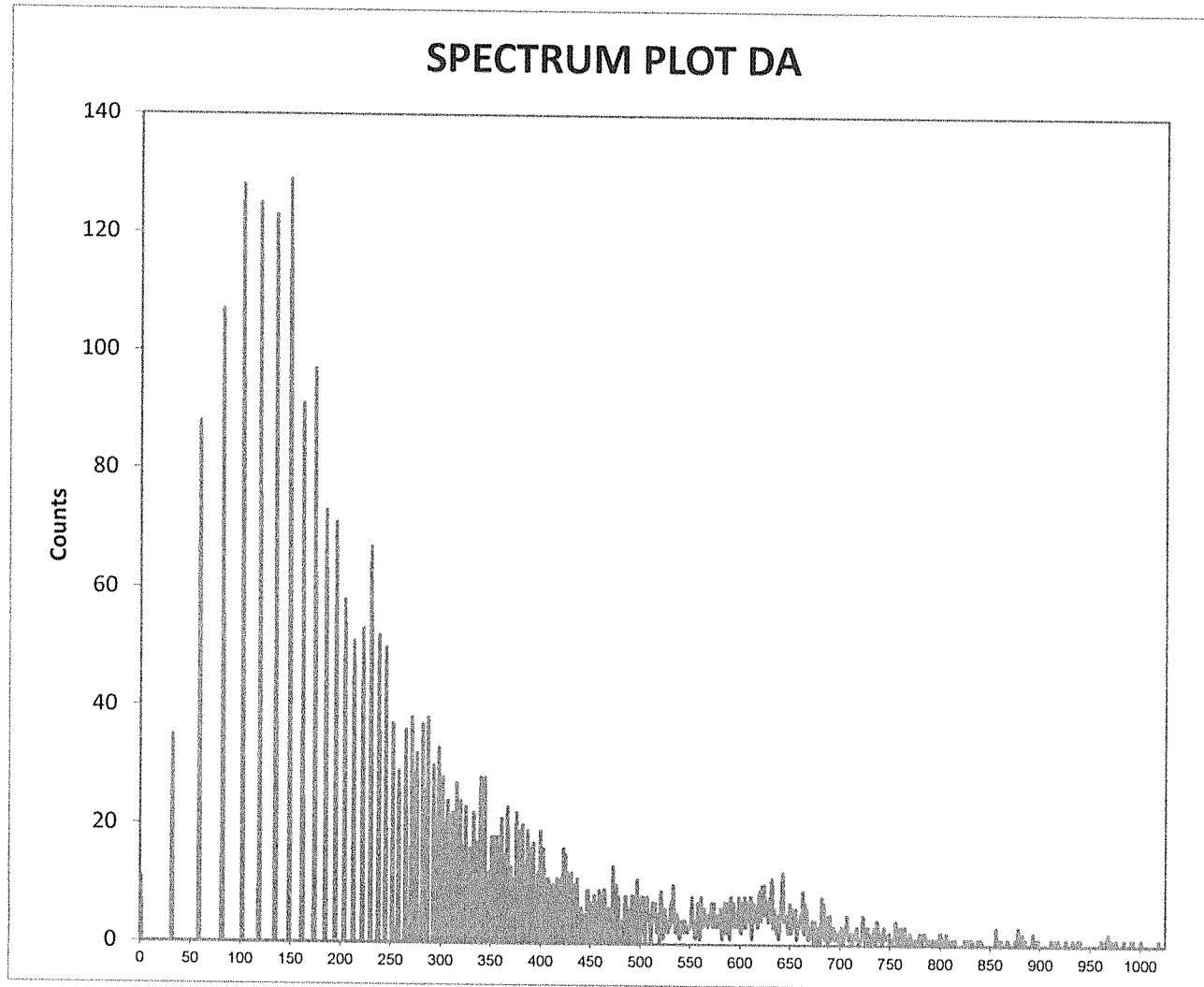
Quench:
Start, End, X-Axis 330.53



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
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DA
NAVY
4, 13, 120:

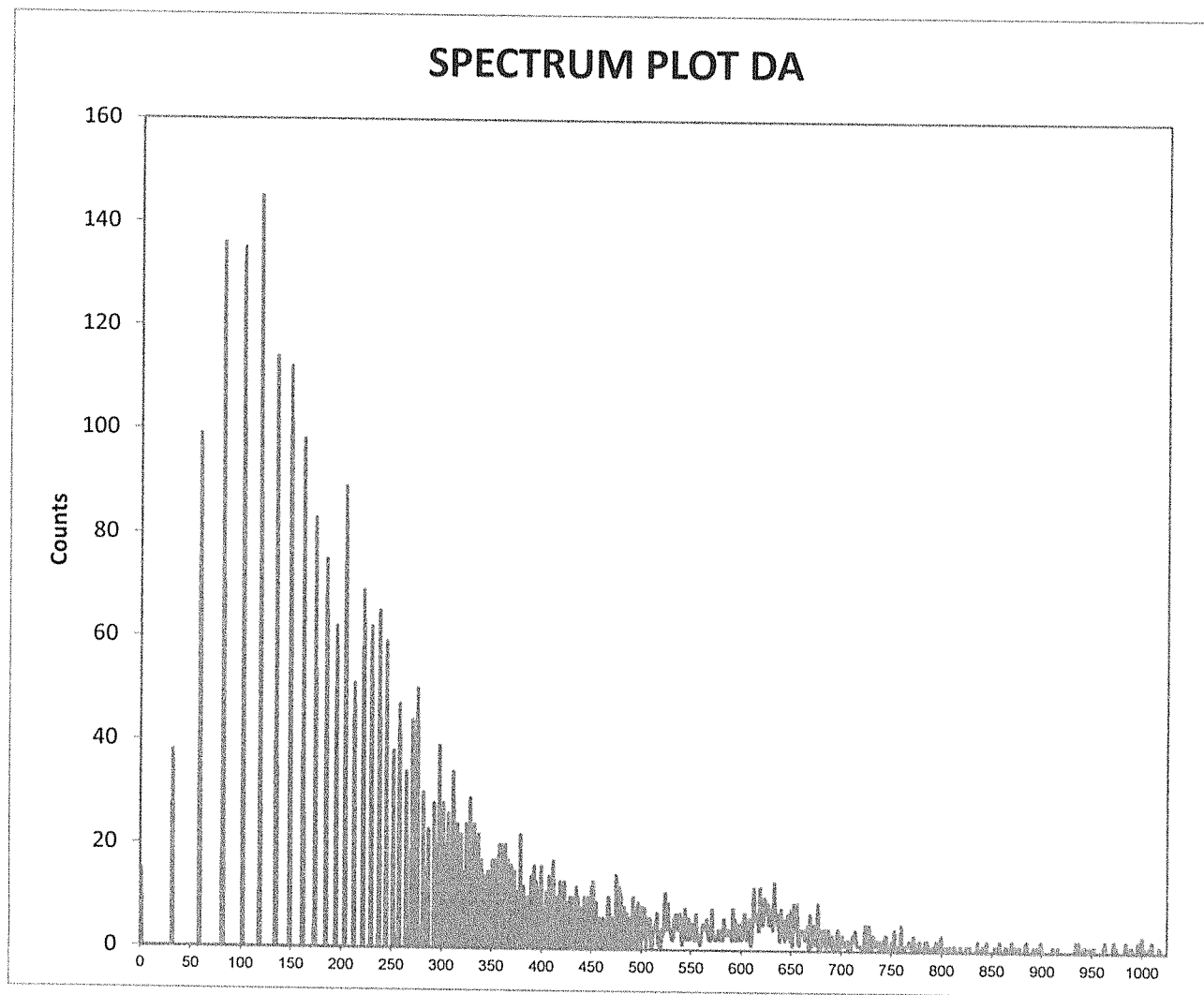
Quench:
Start, End, X-Axis
334.36



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
26 Jul 2022 20:57:22
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DA
NAVY
5, 13, 120:

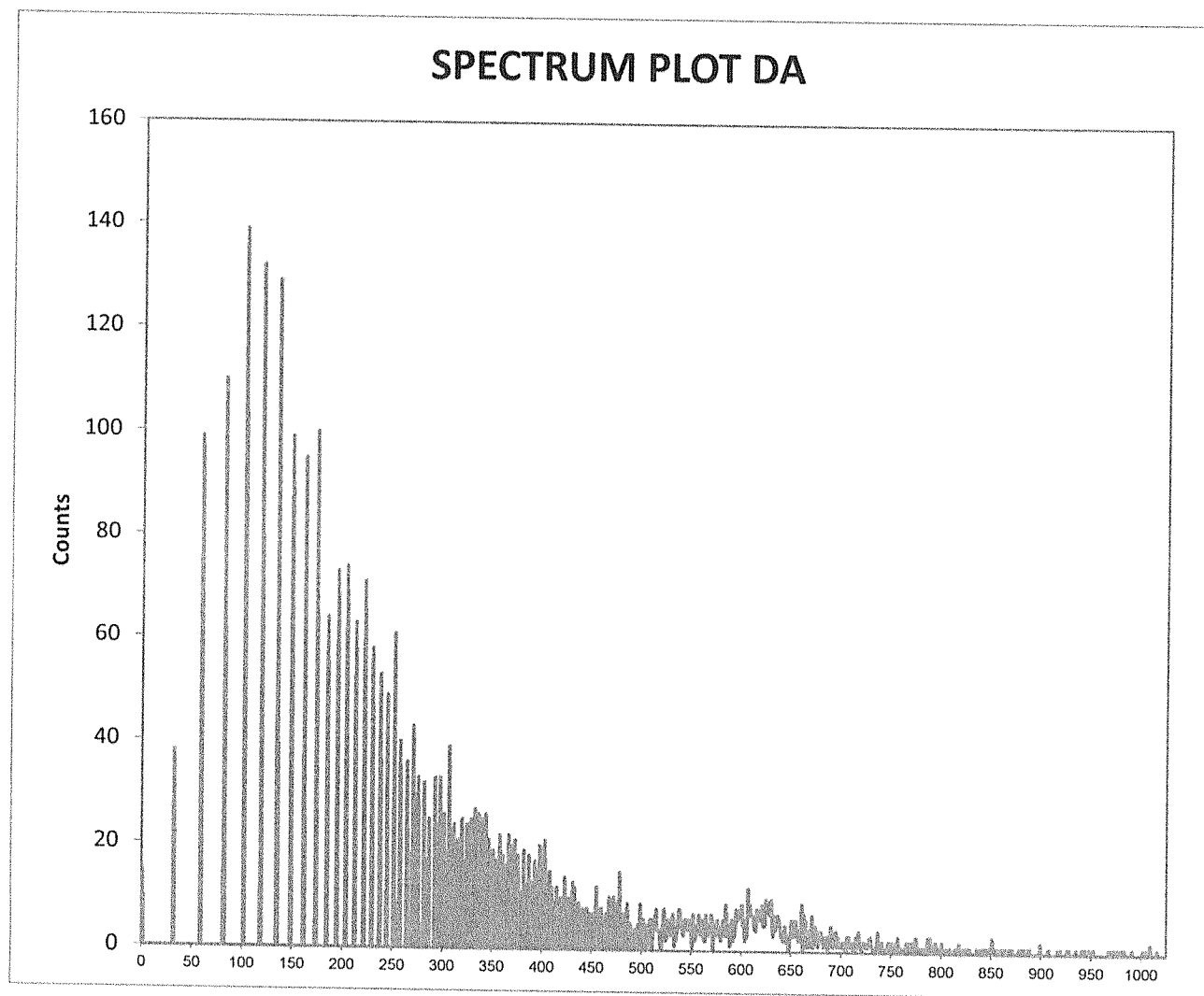
Quench: 336.59
Start, End, X-Axis



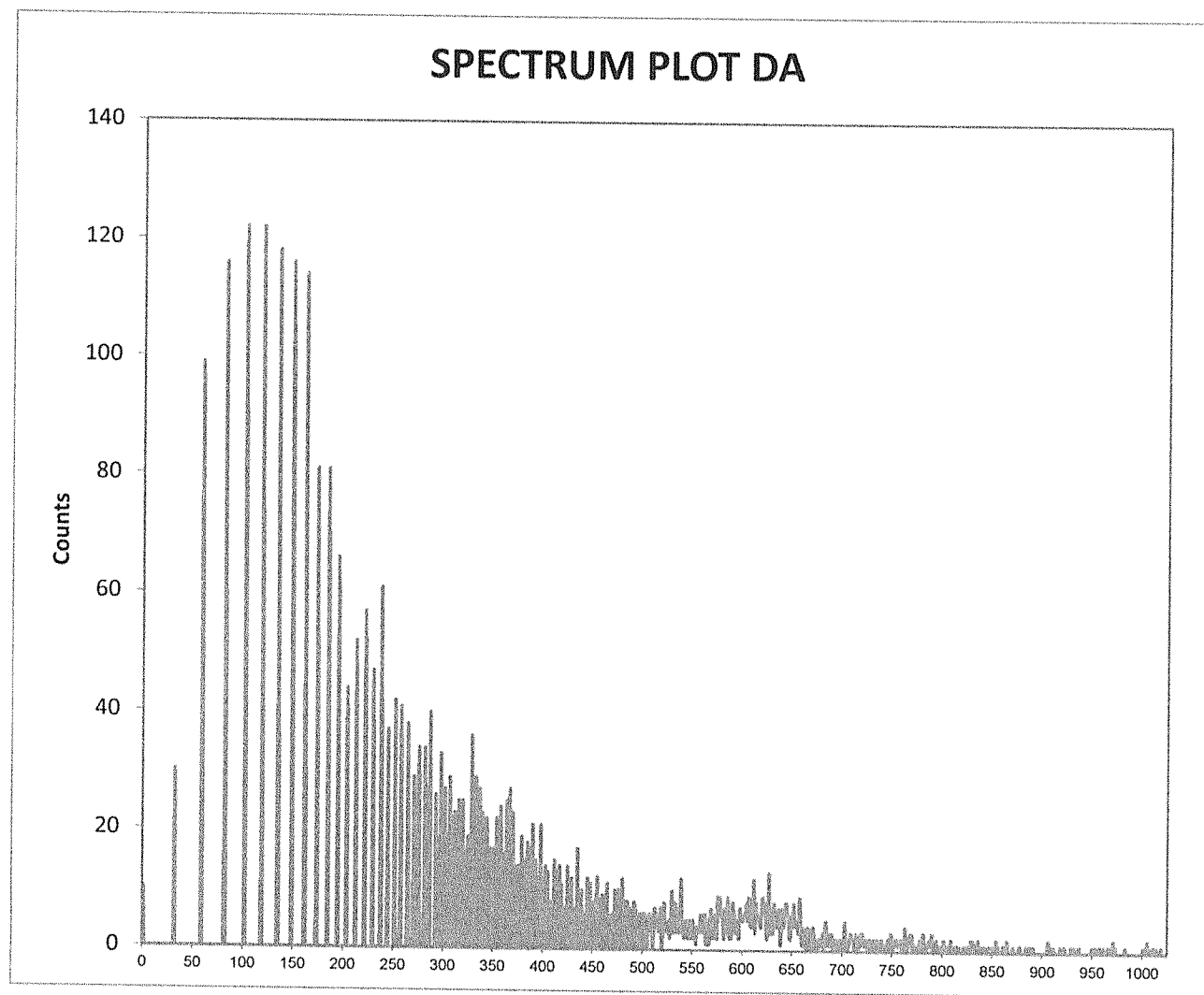
Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
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DA
NAVY
6, 13, 120:

Quench:
Start, End, X-Axis 321.15



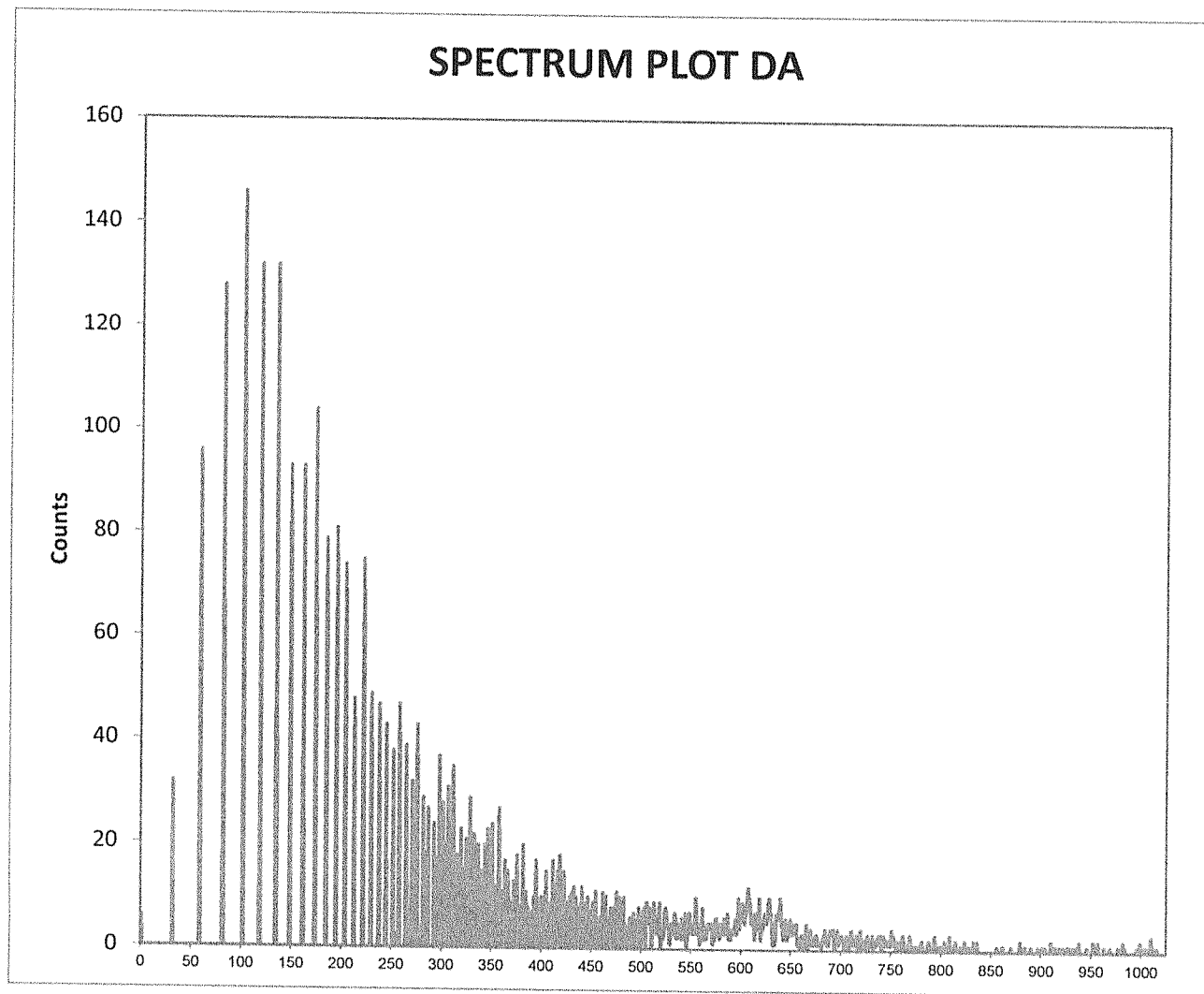
Instrument Type: PE
Sample Count Start Time: 27 Jul 2022 02:09:06
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File Info: M:\LSC\FILES\navy\2294040B\U2294040B.xls
ID: DA
Comments: NAVY
1, 17, 120:
Quench: 326.46
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
27 Jul 2022 04:10:40
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DA
NAVY
2, 17, 120:

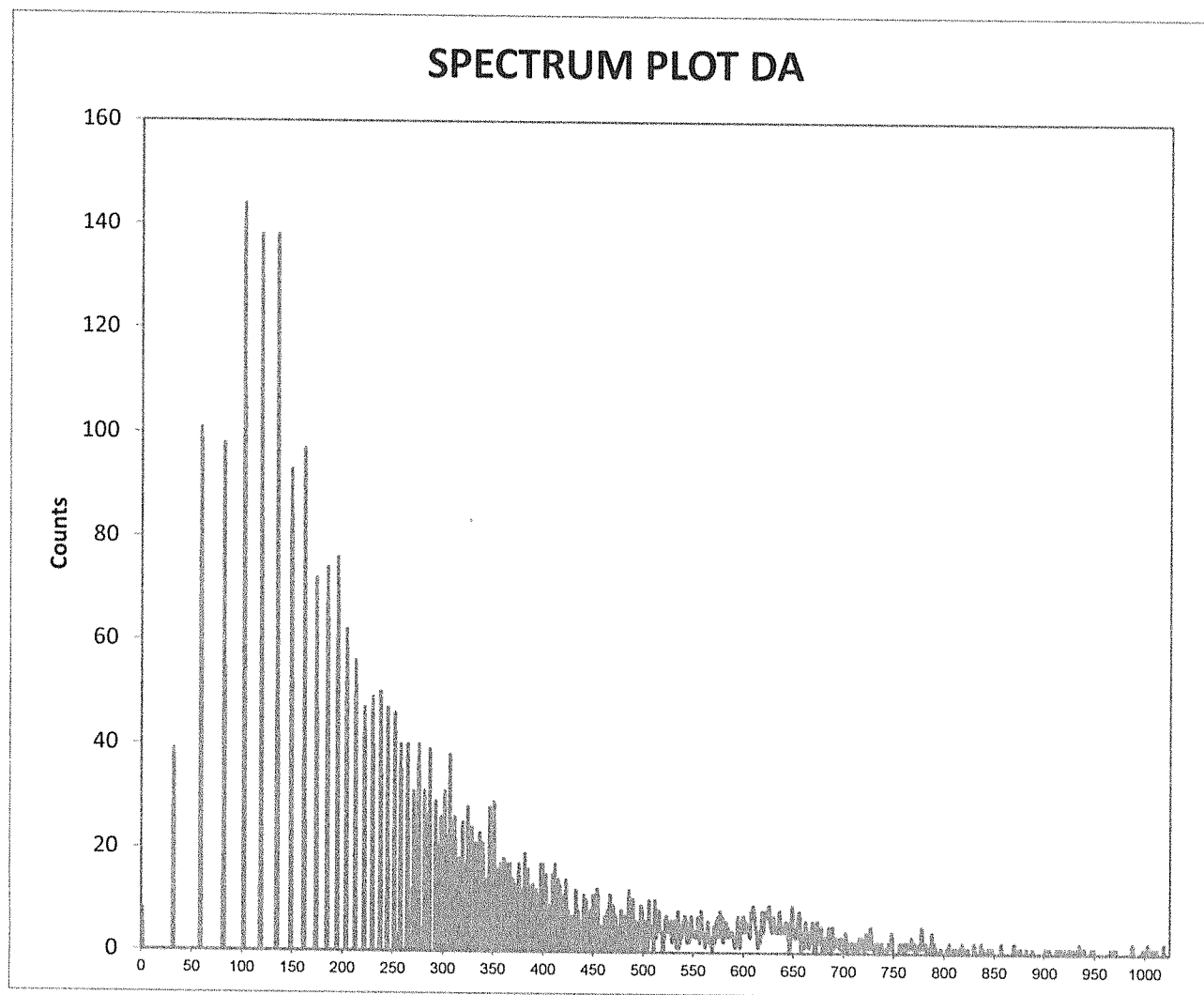
Quench:
Start, End, X-Axis 323.15



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
27 Jul 2022 07:06:57
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DA
NAVY
1, 14, 120:

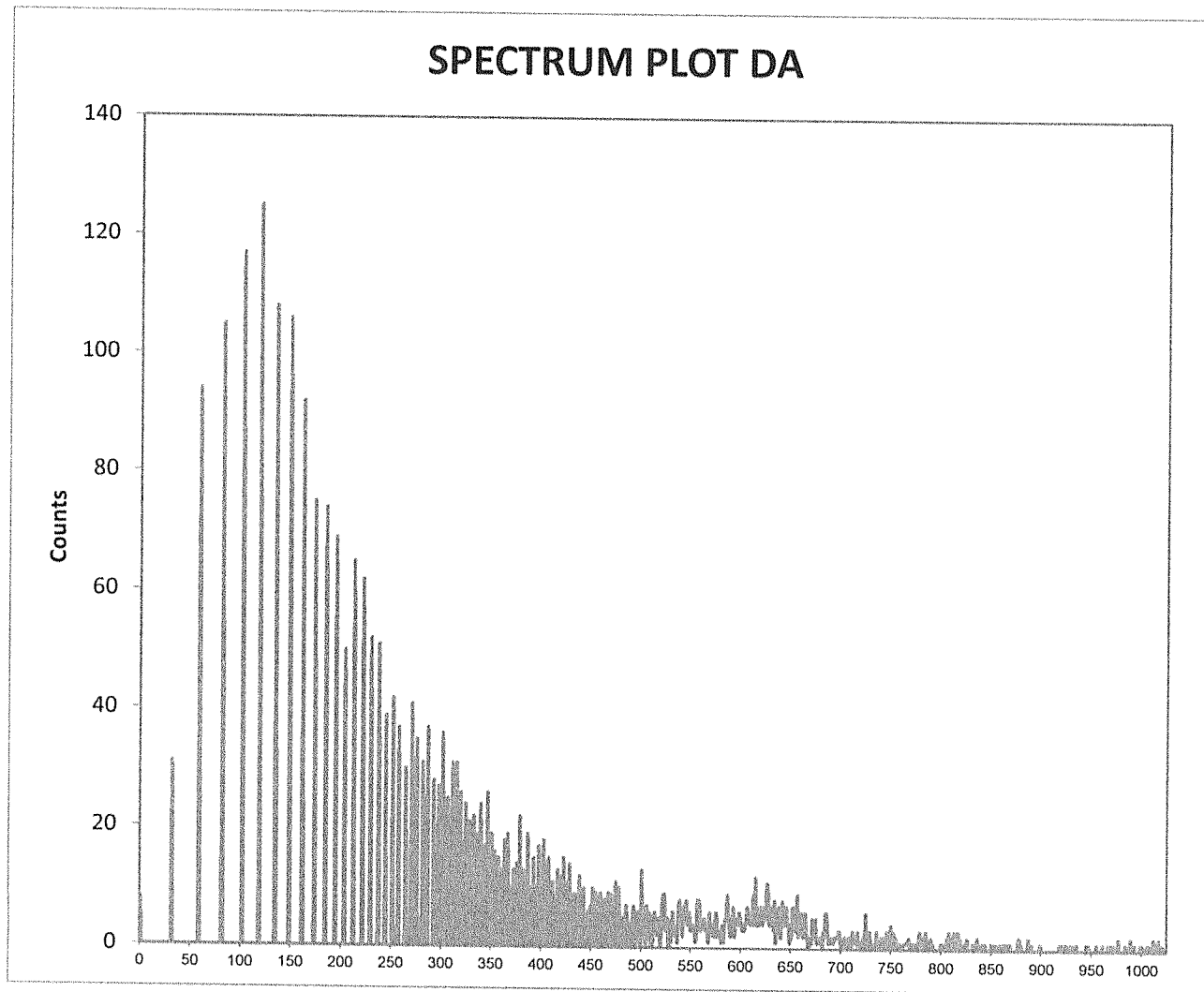
Quench: 329.46
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
27 Jul 2022 09:08:30
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DA
NAVY
2, 14, 120:

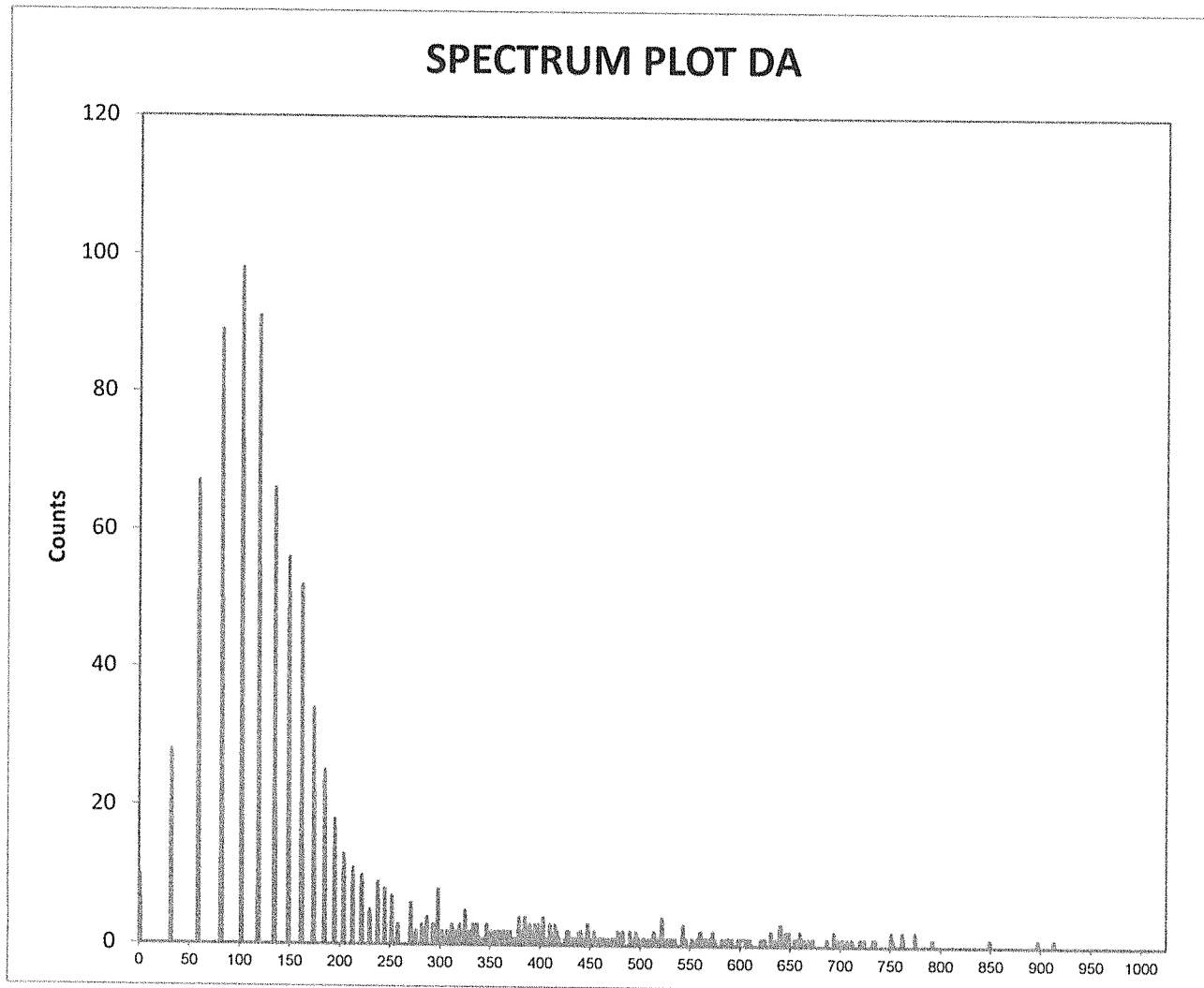
Quench: 331.75
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
27 Jul 2022 11:09:31
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DA
NAVY
1, 15, 15:

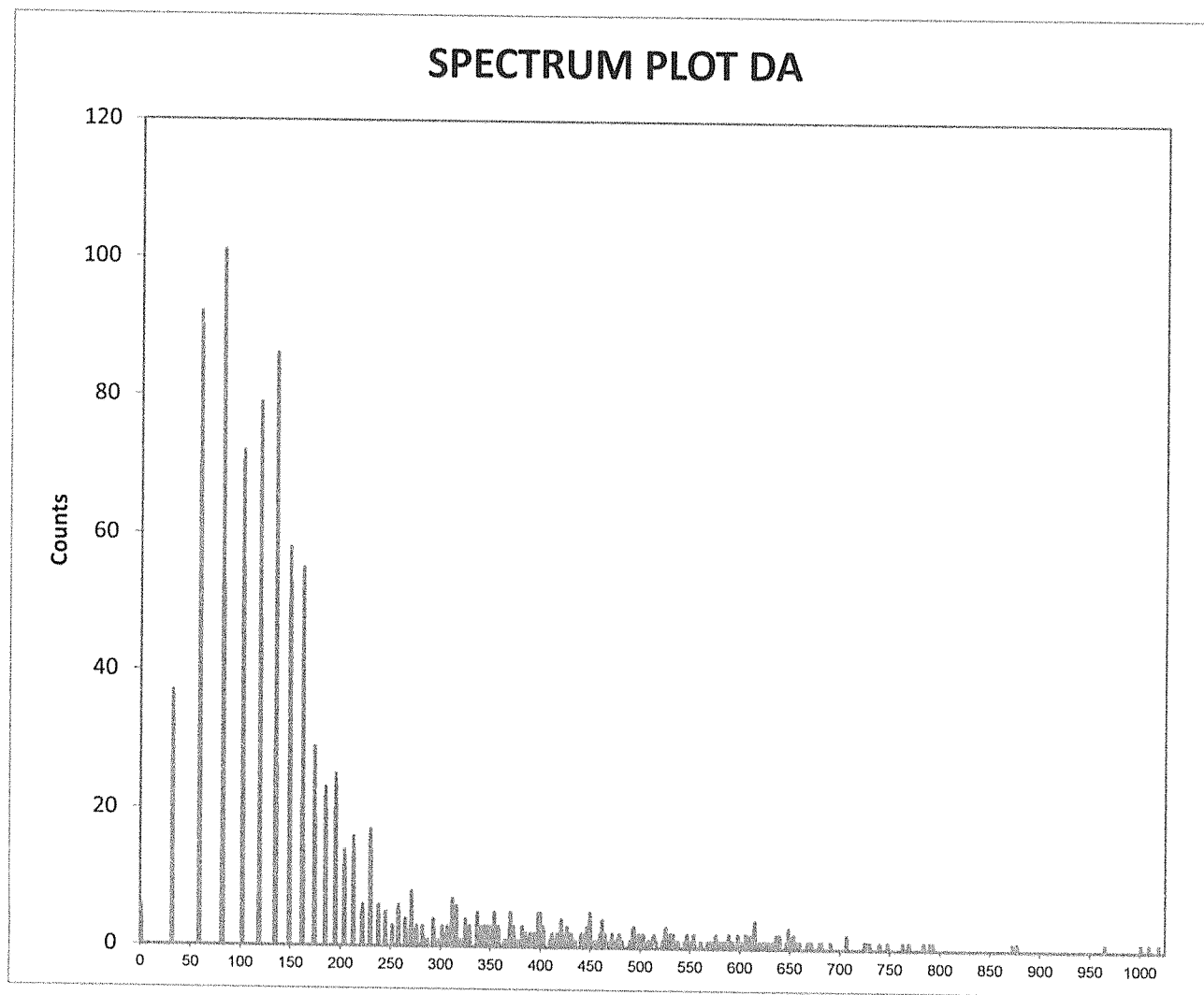
Quench: 332.92
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
27 Jul 2022 11:25:10
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DA
NAVY
2, 15, 15:

Quench:
Start, End, X-Axis 310.65

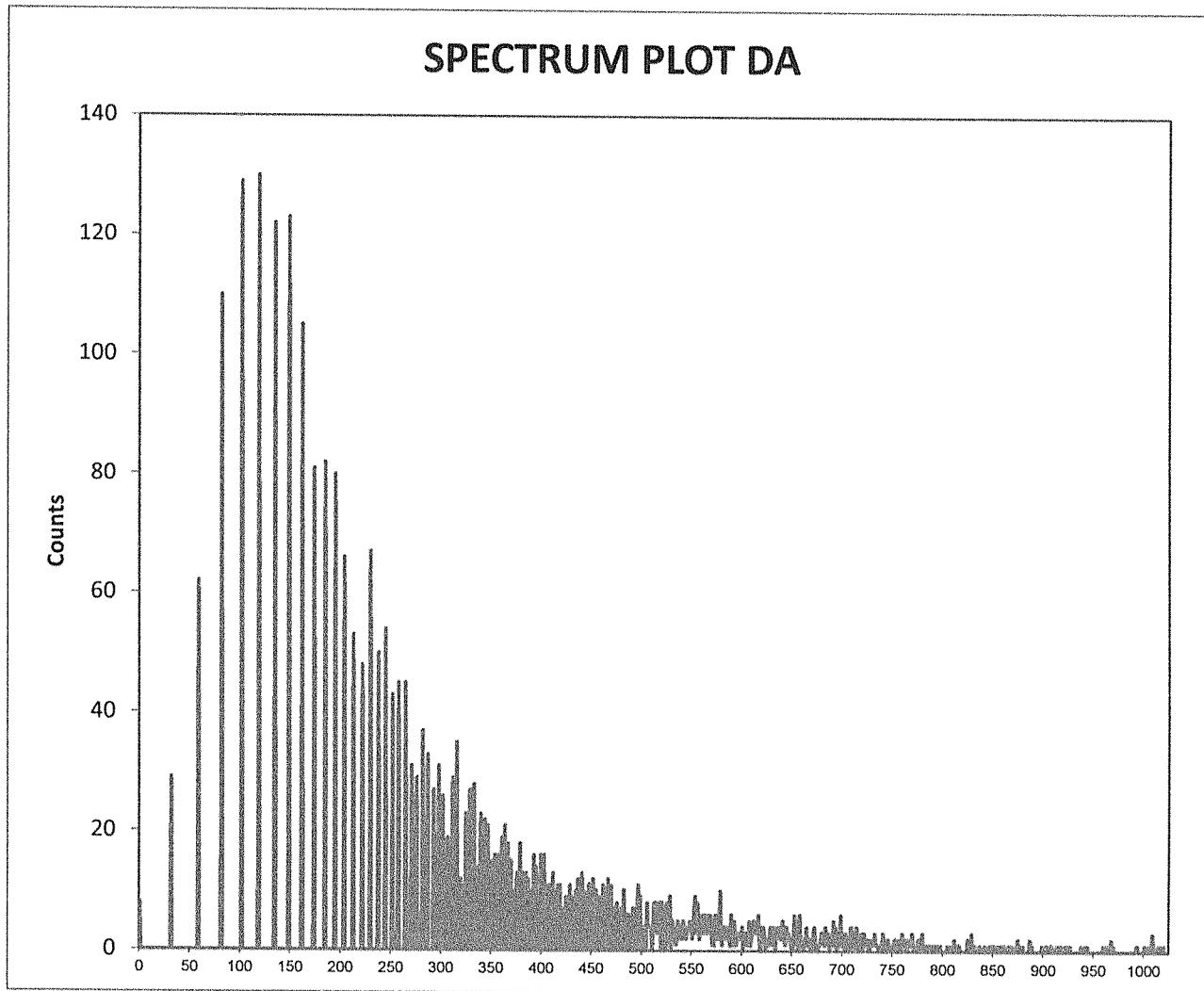


SampleID	Rack	Time (min.)	SQPE#	CPM Iso1	CPM Iso2	LumEx	Count Start Time	Count End Time	Machine
1	15-1	120	355.25	17			7/27/2022 22:21	7/28/2022 0:21	NAVY

Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
27 Jul 2022 22:21:20
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DA
NAVY
1, 15, 120:

Quench:
Start, End, X-Axis 355.25



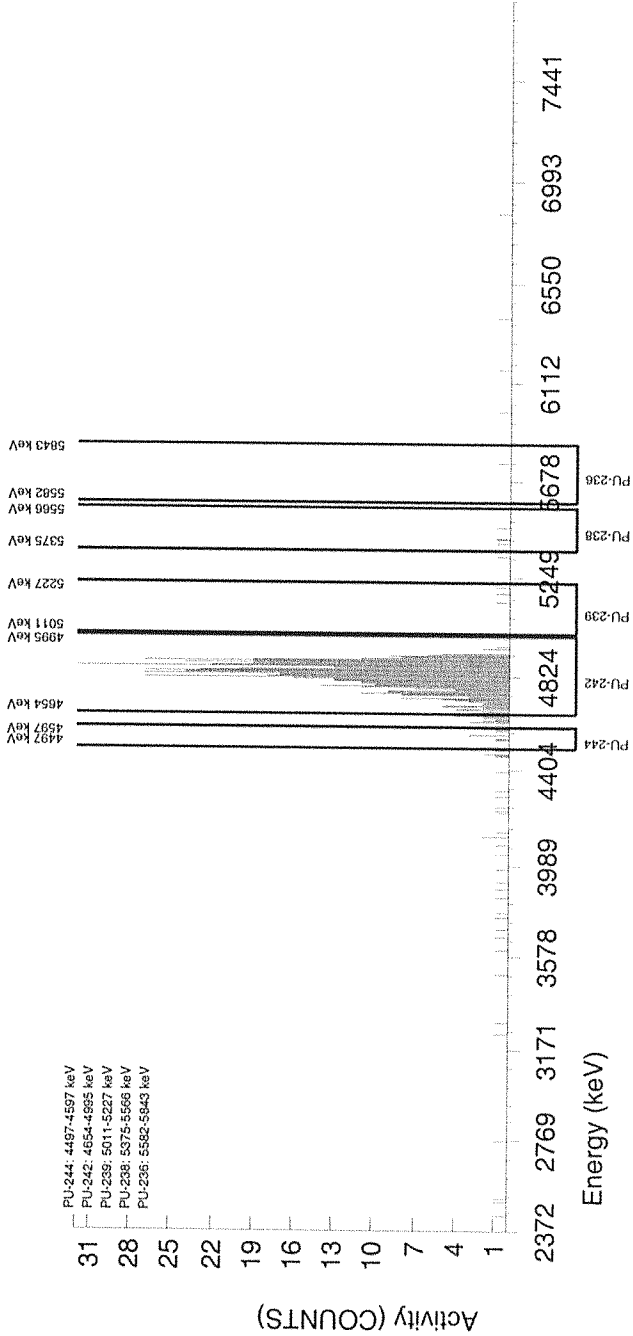
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2294040		CHAMBER : 075		LIB FILE : PU	
SAMPLE ID : R0585905001_PU		DETECTOR S/N : 80010		BKG FILE : B075.CNF;2441	
SAMPLE QTY : 0.104 F		AVERAGE %EFFICIENCY : 31.2081		BKG DATE : 22-Jul-2022	
SAMPLE DATE : 27-Jun-2022 00:00:00		AVERAGE %EFF ERROR : 0.6033		BKG LIVE TIME(SEC) : 59999.99	
ANALYST : BV1		COUNT DATE : 25-Jul-2022 18:29:37		EFF FILE : W075.CNF;652	
% YIELD : 88.6		ELAPSED LIVE TIME(SEC) : 30300.00		CAL DATE : 11-Jul-2022	

TRACER	
ID : 2020-A	
NUCLIDE : PU-242	
NOMINAL : 4.2759E+00 dpm	
RESULTS : 3.7873E+00 dpm	

NUCLIDE ACTIVITY SUMMARY										
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F
PU-236	5749.00	5672.82	162.927	2.000	0.485	1.515	1.2309	100.000	1.53E-02	1.24E-01
PU-238	5486.00	5430.84	69.120	4.000	1.980	2.020	1.4213	99.900	6.14E-02	1.52E-01
PU-239	5155.00	5181.42	64.183	3.000	-1.040	4.040	2.0100	99.900	-3.22E-02	1.52E-01
PU-242	4890.00	4823.93	80.846	609.000	596.880	12.120	3.4814	100.000	1.85E+01	2.38E+00
PU-244	4589.00	4555.57	0.000	15.000	13.990	1.010	1.0050	99.900	4.33E-01	2.52E-01
									MDA pCi/F	Lc pCi/F
									2.51E-01	7.83E-02
									2.71E-01	8.89E-02
									3.44E-01	1.26E-01
									5.28E-01	2.17E-01
									2.19E-01	6.28E-02
										1.96-sigma cnt Unc pCi/F
										1.24E-01
										1.52E-01
										1.52E-01
										1.51E+00
										2.49E-01



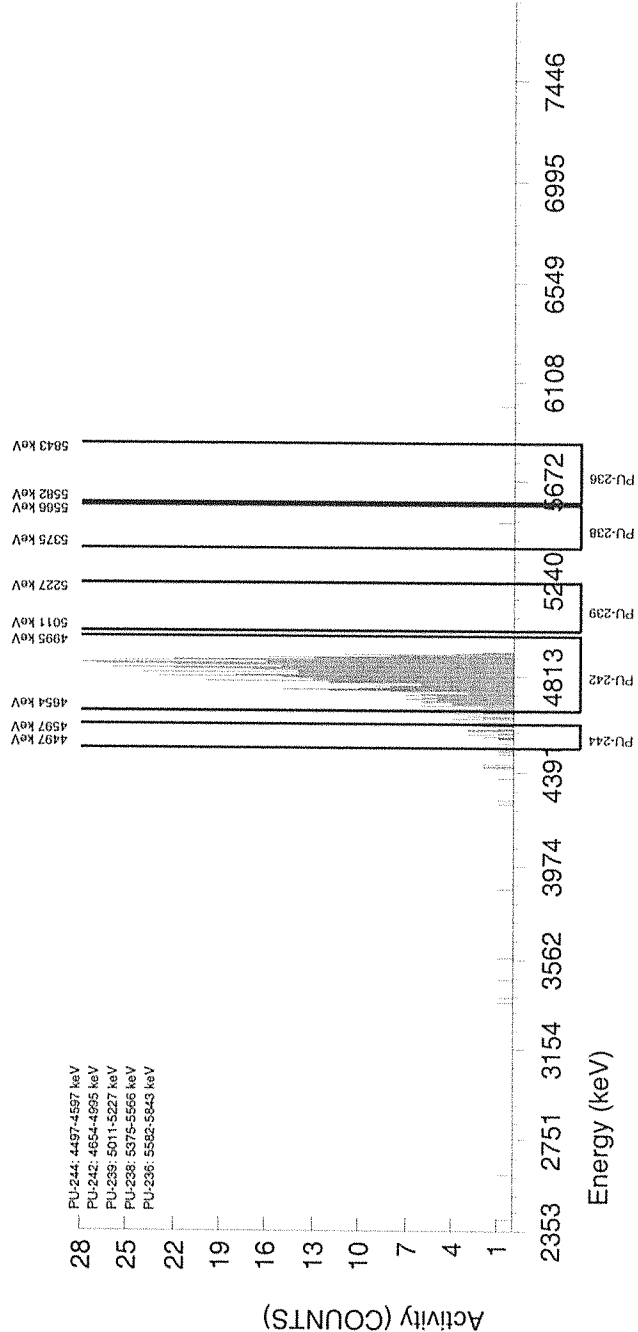
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2294040 SAMPLE ID : R0585905002_PU SAMPLE QTY : 0.099 F +/-1.015 % SAMPLE DATE : 27-Jun-2022 00:00:00 ANALYST : BV1 % YIELD : 83.3 +/-4.536 %		CHAMBER : 076 DETECTOR SN : 158161 AVERAGE %EFFICIENCY : 33.3652 AVERAGE %EFF ERROR : 0.6439 COUNT DATE : 25-Jul-2022 18:29:37 ELAPSED LIVE TIME(SEC) : 30300.00	LIB FILE : PU BKG FILE : B076.CNF;2460 BKG DATE : 22-Jul-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W076.CNF;627 CAL DATE : 11-Jul-2022
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TRACER ID : 2020-A NUCLIDE : PU-242 NOMINAL : 4.2759E+00 dpm RESULTS : 3.5639E+00 dpm	
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NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.24	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	7.30E-02	9.96E-02	6.70E-02	7.29E-02
PU-238	5486.00	5492.98	4.944	1.000	-0.515	1.515	1.2309	99.900	-1.68E-02	1.11E-01	2.60E-01	8.10E-02	1.11E-01
PU-239	5155.00	5118.67	0.000	0.000	-0.505	0.505	0.7106	99.900	-1.65E-02	7.86E-02	1.91E-01	4.67E-02	7.85E-02
PU-242	4890.00	4818.14	136.385	601.000	600.495	0.505	0.7106	100.000	1.96E+01	2.48E+00	1.91E-01	4.67E-02	1.57E+00
PU-244	4589.00	4562.59	0.000	22.000	22.000	0.000	1.0000	99.900	7.17E-01	3.16E-01	9.78E-02	6.58E-02	3.08E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2294040
SAMPLE ID : R0585905003_PU
SAMPLE QTY : 0.091 F +/-1.096 %
SAMPLE DATE : 27-Jun-2022 00:00:00
ANALYST : BV1
% YIELD : 80.9 +/-4.381 %

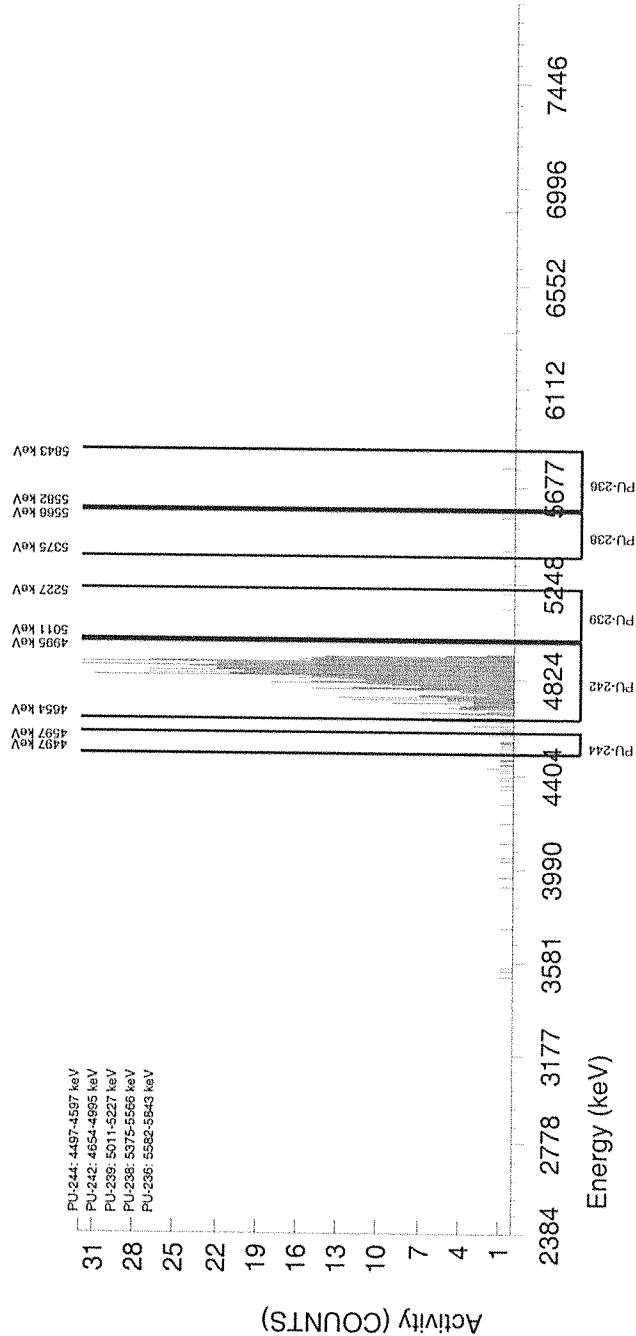
CHAMBER : 083
DETECTOR S/N : 78785
AVERAGE %EFFICIENCY : 37.5543
AVERAGE %EFF ERROR : 0.7229
COUNT DATE : 25-Jul-2022 18:29:38
ELAPSED LIVE TIME(SEC) : 30300.00

LIB FILE : PU
BKG FILE : B083.CNF;2364
BKG DATE : 22-Jul-2022
BKG LIVE TIME(SEC) : 59999.99
EFF FILE : W083.CNF;635
CAL DATE : 11-Jul-2022

TRACER
ID : 2020-A
NUCLIDE : PU-242
NOMINAL : 4.2759E+00 dpm
RESULTS : 3.4589E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5763.96	4.893	1.000	-1.020	2.020	1.4213	100.000	-3.35E-02	1.16E-01	2.87E-01	9.41E-02	1.16E-01
PU-238	5486.00	5470.16	136.990	2.000	0.990	1.010	1.0050	99.900	3.19E-02	1.23E-01	2.27E-01	6.54E-02	1.23E-01
PU-239	5155.00	5176.05	68.495	2.000	0.990	1.010	1.0050	99.900	3.19E-02	1.23E-01	2.27E-01	6.53E-02	1.22E-01
PU-242	4890.00	4841.21	93.948	658.000	655.980	2.020	1.4213	100.000	2.11E+01	2.60E+00	2.81E-01	9.23E-02	1.62E+00
PU-244	4589.00	4548.41	4.893	10.000	8.990	1.010	1.0050	99.900	2.90E-01	2.18E-01	2.27E-01	6.53E-02	2.17E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2294040
SAMPLE ID : R0585905004_PU
SAMPLE QTY : 0.094 F +/-1.063 %
SAMPLE DATE : 27-Jun-2022 00:00:00
ANALYST : BV1
% YIELD : 70.7 +/-4.648 %

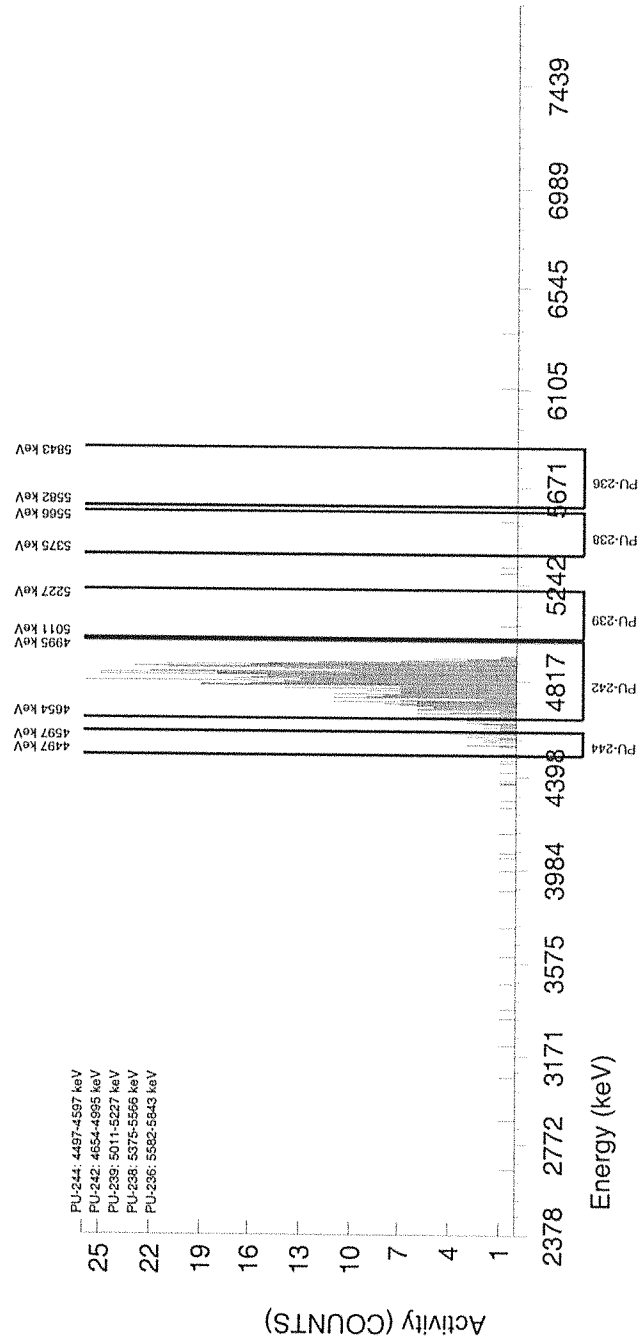
CHAMBER : 084
DETECTOR S/N : 78265
AVERAGE %EFFICIENCY : 37.2920
AVERAGE %EFF ERROR : 0.7180
COUNT DATE : 25-Jul-2022 18:29:38
ELAPSED LIVE TIME(SEC) : 30300.00

LIB FILE : PU
BKG FILE : B084.CNF;2354
BKG DATE : 22-Jul-2022
BKG LIVE TIME(SEC) : 59999.99
EFF FILE : W084.CNF;645
CAL DATE : 11-Jul-2022

TRACER
ID : 2020-A
NUCLIDE : PU-242
NOMINAL : 4.2759E+00 dpm
RESULTS : 3.0212E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.22	0.000	0.000	-1.515	1.515	1.2309	100.000	-5.56E-02	1.02E-01	2.92E-01	9.11E-02	1.02E-01
PU-238	5486.00	5520.05	4.891	1.000	-0.515	1.515	1.2309	99.900	-1.86E-02	1.23E-01	2.87E-01	8.95E-02	1.23E-01
PU-239	5155.00	5065.98	4.891	1.000	-0.515	1.515	1.2309	99.900	-1.85E-02	1.23E-01	2.87E-01	8.94E-02	1.23E-01
PU-242	4890.00	4820.20	106.661	572.000	568.970	3.030	1.7407	100.000	2.05E+01	2.67E+00	3.61E-01	1.26E-01	1.69E+00
PU-244	4589.00	4564.16	51.351	19.000	17.485	1.515	1.2309	99.900	6.30E-01	3.30E-01	2.87E-01	8.94E-02	3.24E-01



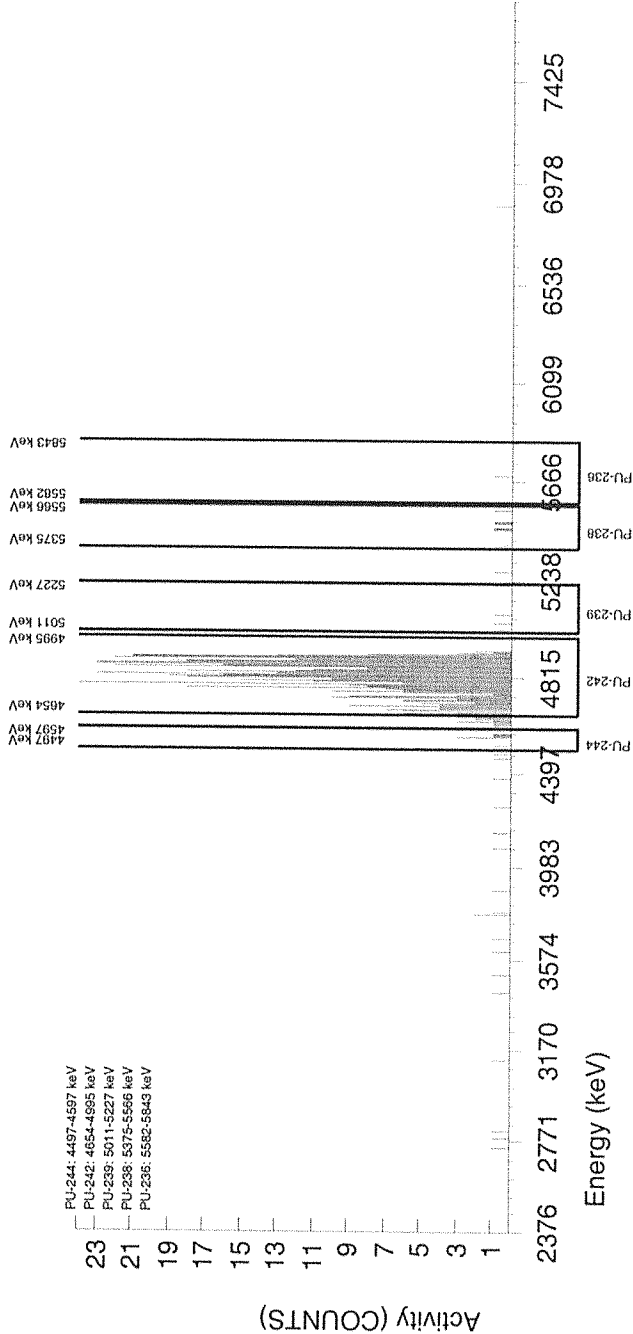
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2294040		CHAMBER : 085		LIB FILE : PU	
SAMPLE ID : R0585905005_PU		DETECTOR S/N : 83294		BKG FILE : B085.CNF;2360	
SAMPLE QTY : 0.102 F		AVERAGE %EFFICIENCY : 35.5206		BKG DATE : 22-Jul-2022	
SAMPLE DATE : 27-Jun-2022 00:00:00		AVERAGE %EFF ERROR : 0.6846		BKG LIVE TIME(SEC) : 59999.99	
ANALYST : BV1		COUNT DATE : 25-Jul-2022 18:29:38		EFF FILE : W085.CNF;634	
% YIELD : 75.4 +/-4.633 %		ELAPSED LIVE TIME(SEC) : 30300.00		CAL DATE : 11-Jul-2022	

TRACER	
ID : 2020-A	
NUCLIDE : PU-242	
NOMINAL : 4.2759E+00 dpm	
RESULTS : 3.2219E+00 dpm	

NUCLIDE ACTIVITY SUMMARY										
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F
PU-236	5749.00	5693.19	4.905	1.000	-0.515	1.515	1.2309	100.000	-1.71E-02	1.13E-01
PU-238	5486.00	5463.69	152.065	9.000	5.970	3.030	1.7407	99.900	1.95E-01	2.21E-01
PU-239	5155.00	5140.23	0.000	6.000	0.950	5.050	2.2472	99.900	3.11E-02	2.01E-01
PU-242	4890.00	4818.89	136.100	584.000	577.940	6.060	2.4617	100.000	1.89E+01	2.45E+00
PU-244	4589.00	4565.21	38.016	11.000	10.495	0.505	0.7106	99.900	3.43E-01	2.29E-01
									MDA pCi/F	1.96-sigma cnt Unc pCi/F
									2.65E-01	1.13E-01
									3.28E-01	2.20E-01
									3.95E-01	2.01E-01
									4.23E-01	1.55E+00
									1.92E-01	2.27E-01



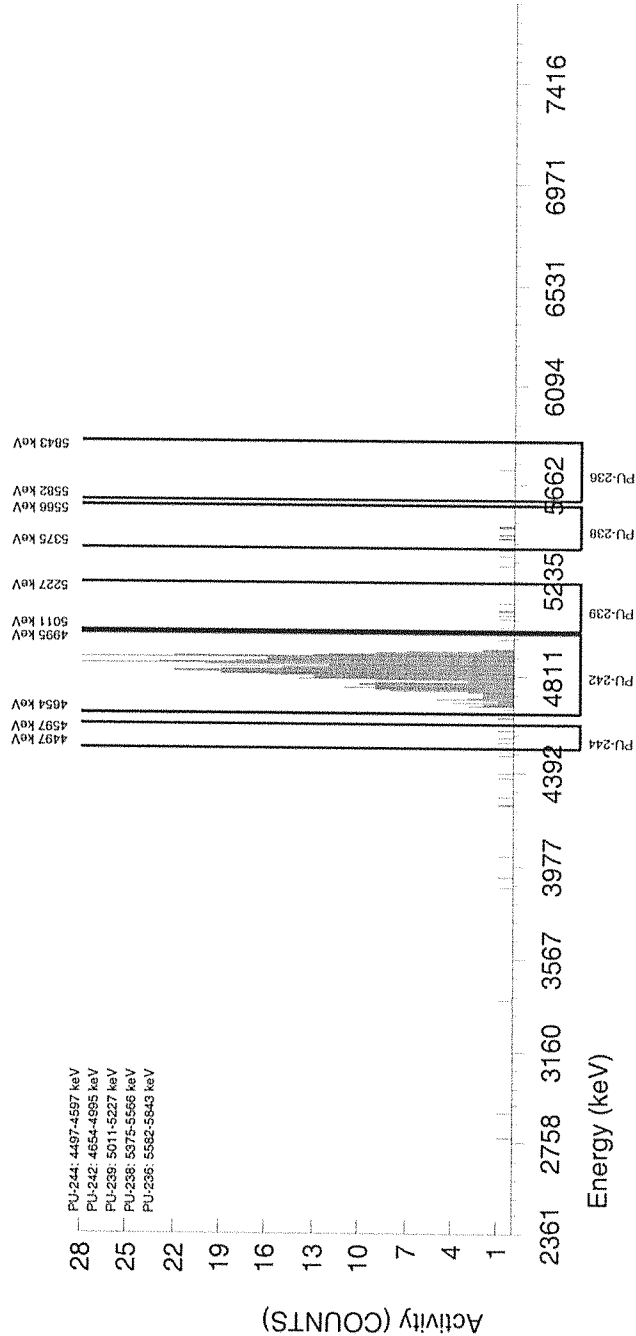
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2294040		CHAMBER : 086	LIB FILE : PU
SAMPLE ID : R1205147420_PU		DETECTOR S/N : 78779	BKG FILE : B086.CNF;2362
SAMPLE QTY : 0.114 F		AVERAGE %EFFICIENCY : 29.9106	BKG DATE : 22-Jul-2022
SAMPLE DATE : 25-Jul-2022 00:00:00		AVERAGE %EFF ERROR : 0.5788	BKG LIVE TIME(SEC) : 59999.99
ANALYST : BV1		COUNT DATE : 25-Jul-2022 18:29:38	EFF FILE : W086.CNF;628
% YIELD : 82.5 +/-4.814 %		ELAPSED LIVE TIME(SEC) : 30300.00	CAL DATE : 11-Jul-2022

TRACER	
ID : 2020-A	
NUCLIDE : PU-242	
NOMINAL : 4.2759E+00 dpm	
RESULTS : 3.5281E+00 dpm	

NUCLIDE ACTIVITY SUMMARY										
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F
PU-236	5749.00	5721.50	4.944	1.000	-0.515	1.515	1.2309	100.000	-1.63E-02	1.08E-01
PU-238	5486.00	5449.74	0.000	9.000	3.950	5.050	2.2472	99.900	1.25E-01	2.22E-01
PU-239	5155.00	5084.17	103.820	6.000	0.950	5.050	2.2472	99.900	3.01E-02	1.94E-01
PU-242	4890.00	4836.50	86.791	542.000	532.910	9.090	3.0150	100.000	1.68E+01	2.26E+00
PU-244	4589.00	4546.98	54.382	3.000	0.980	2.020	1.4213	99.900	3.10E-02	1.42E-01
									MDA pCi/F	Lc pCi/F
									2.52E-01	7.86E-02
									3.82E-01	1.43E-01
									3.82E-01	1.43E-01
									4.79E-01	1.92E-01
									2.76E-01	9.07E-02
										1.96-sigma cnt Unc pCi/F
										1.08E-01
										2.22E-01
										1.94E-01
										1.45E+00
										1.42E-01



Alpha Spectroscopy Software Version 3.5.16
effective date: 19-AUG-2020

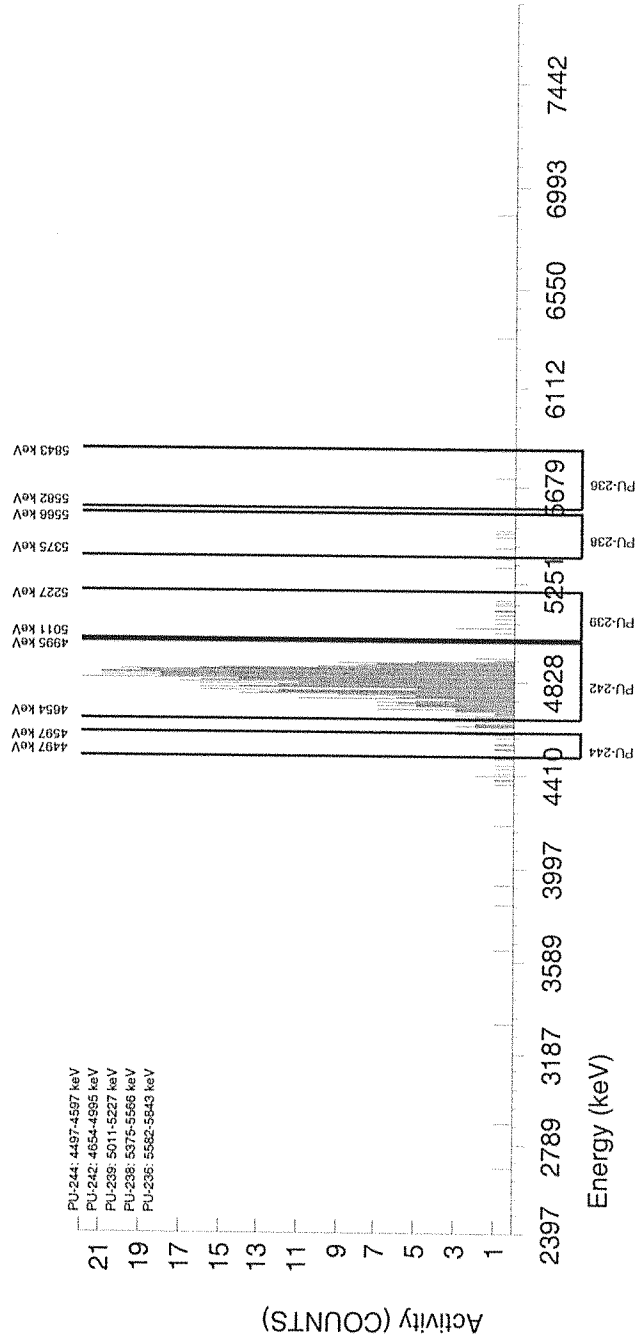
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2294040		CHAMBER : 108		LIB FILE : PU	
SAMPLE ID : R1205147421_PU		DETECTOR S/N : 79778		BKG FILE : B108.CNF;2065	
SAMPLE QTY : 0.114 F		AVERAGE %EFFICIENCY : 35.9583		BKG DATE : 22-Jul-2022	
SAMPLE DATE : 25-Jul-2022 00:00:00		AVERAGE %EFF ERROR : 0.6929		BKG LIVE TIME(SEC) : 59999.99	
ANALYST : BV1		COUNT DATE : 25-Jul-2022 18:29:41		EFF FILE : W108.CNF;598	
% YIELD : 65.4		ELAPSED LIVE TIME(SEC) : 30299.99		CAL DATE : 12-Jul-2022	

TRACER		LCS	
ID : 2020-A		ID	
NUCLIDE : PU-242		NUCLIDE	
NOMINAL : 4.2759E+00 dpm		NOMINAL (pCi/F)	
RESULTS : 2.7974E+00 dpm		% RECOVERY	

NUCLIDE ACTIVITY SUMMARY										
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F
PU-236	5749.00	5716.31	4.871	1.000	-0.010	1.010	1.0050	100.000	-3.32E-04	1.08E-01
PU-238	5486.00	5457.24	73.063	4.000	2.990	1.010	1.0050	99.900	9.92E-02	1.57E-01
PU-239	5155.00	5108.54	4.871	12.000	10.990	1.010	1.0050	99.900	3.65E-01	2.44E-01
PU-242	4890.00	4816.16	113.978	511.000	507.970	3.030	1.7407	100.000	1.68E+01	2.29E+00
PU-244	4589.00	4571.03	0.000	11.000	9.990	1.010	1.0050	99.900	3.32E-01	2.35E-01
									MDA pCi/F	1.96-sigma cnt Unc pCi/F
									2.34E-01	1.08E-01
									2.34E-01	1.56E-01
									2.34E-01	2.41E-01
									3.32E-01	1.47E+00
									2.34E-01	2.32E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORTInstrument SOP:
Analytical SOP: GL-RAD-A-035BATCH NUMBER : 2294040
SAMPLE ID : R1205147422_PU
SAMPLE QTY : 0.114 F +/-0.875 %
SAMPLE DATE : 25-Jul-2022 00:00:00
ANALYST : BV1
% YIELD : 79.1 +/-4.577 %CHAMBER : 109
DETECTOR S/N : 79463
AVERAGE %EFFICIENCY : 34.8191
AVERAGE %EFF ERROR : 0.6714
COUNT DATE : 25-Jul-2022 18:29:41
ELAPSED LIVE TIME(SEC) : 30299.99LIB FILE : PU
BKG FILE : B109.CNF;2063
BKG DATE : 22-Jul-2022
BKG LIVE TIME(SEC) : 59999.99
EFF FILE : W109.CNF;592
CAL DATE : 12-Jul-2022

TRACER

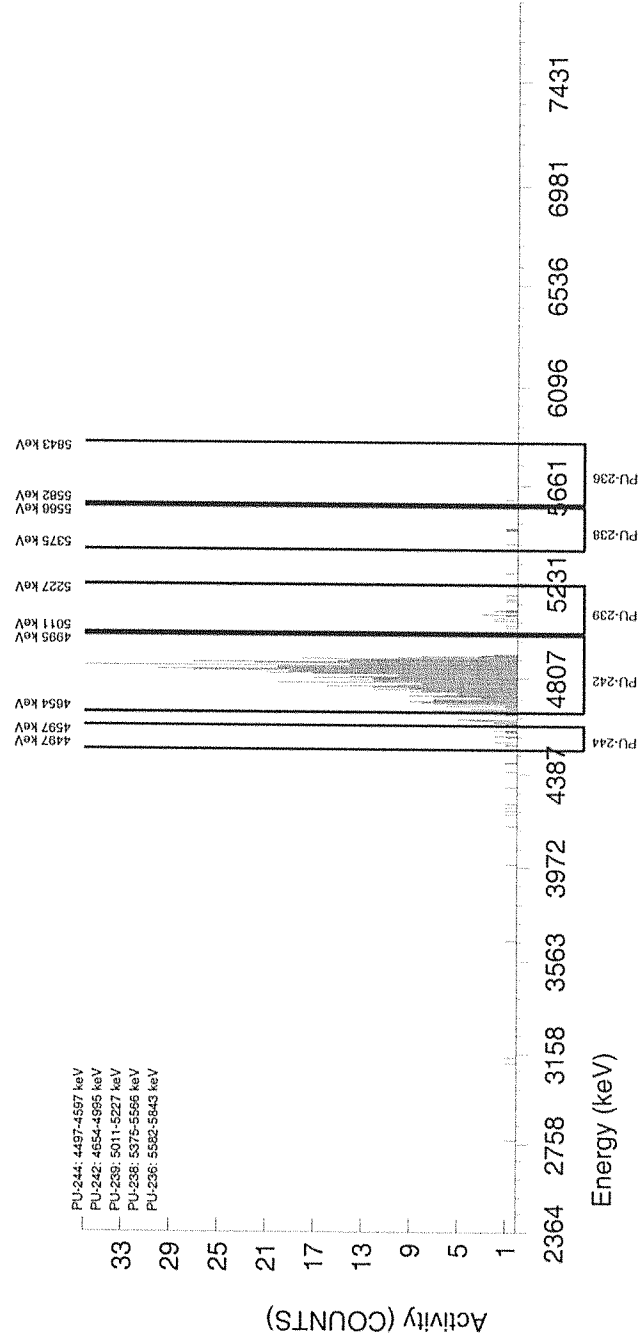
ID : 2020-A
NUCLIDE : PU-242
NOMINAL : 4.2759E+00 dpm
RESULTS : 3.3807E+00 dpm

LCSD

ID
NUCLIDE
NOMINAL (pCi/F)
% RECOVERY

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5596.46	4.901	1.000	-1.525	2.525	1.5890	100.000	-4.32E-02	1.04E-01	2.67E-01	9.09E-02	1.04E-01
PU-238	5486.00	5451.10	68.610	4.000	0.970	3.030	1.7407	99.900	2.75E-02	1.45E-01	2.84E-01	9.96E-02	1.45E-01
PU-239	5155.00	5099.58	42.881	19.000	15.465	3.535	1.8802	99.900	4.39E-01	2.65E-01	3.00E-01	1.08E-01	2.61E-01
PU-242	4890.00	4816.10	87.804	600.000	594.445	5.555	2.3569	100.000	1.68E+01	2.15E+00	3.55E-01	1.35E-01	1.36E+00
PU-244	4589.00	4557.07	0.000	13.000	12.495	0.505	0.7106	99.900	3.54E-01	2.15E-01	1.66E-01	4.07E-02	2.12E-01



Continuing Calibration Data



Liquid Scintillation Counter Checks for 26-JUL-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LSCBLUE	Carbon-14	03:53	1.3		123934	0.45		
	Carbon-14	03:54	1.3		123689	-0.38		
	Tritium	03:56	1.1		160440	-1.18		
	Tritium	03:58	1.1		160098	-1.91		
	BKG	04:00	30		24	0.9		
	BKG	04:31	30		25	3.16	Outside Three Sigma	
	BKG	07:37	30		22	-0.65		
	BKG	08:08	30		22	-0.89		
LSCBROWN	Carbon-14	04:15	1.3		123615	-1.85		
	Carbon-14	04:17	1.3		123755	-1.18		
	Tritium	04:19	1.15		153988	-0.66		
	Tritium	04:20	1.15		153786	-0.88		
	BKG	04:22	30		22	-1.73		
	BKG	04:53	30		23	-0.44		
LSCGOLD	Carbon-14	07:27	1.3		124295	0.83		
	Carbon-14	07:28	1.3		123603	-1.12		
	BKG	07:29	30		27	-0.29		
	Tritium	07:57	1.15		154147	0.56		
	Tritium	07:59	1.15		153619	-0.1		
	BKG	08:00	30		27	-0.38		
LSCMOCHA	Carbon-14	02:31	1.35		122662	-0.47		
	Carbon-14	02:33	1.35		122189	-2.07		
	Tritium	02:35	1.25		143456	-2.75		
	Tritium	02:36	1.25		143438	-2.77		
	BKG	02:38	30		20	-1.42		
	BKG	03:09	30		18	-2.47		
LSCNAVY	Carbon-14	04:13	1.3		125038	-0.17		
	Carbon-14	04:15	1.31		125396	0.83		
	Tritium	04:17	1.07		172733	-0.95		
	Tritium	04:18	1.06		172762	-0.88		

	BKG	04:20	30	19	-0.25
	BKG	04:51	30	21	2.12
LSCORANGE	Carbon-14	04:11	1.012433	123560	-0.12
	Tritium	04:14	1.012433	152990	-0.79
	BKG	04:47	30.01243	8.11	-0.75
	Carbon-14	04:48	1.012433	124017	1.24
	Tritium	04:49	1.012333	153507	0.01
	BKG	05:20	30.01243	9.44	1.91
LSCPINK	Carbon-14	04:03	1.012433	123769	-0.34
	Tritium	04:06	1.012433	138976	1.09
	BKG	04:39	30.01243	7.35	-0.47
	Carbon-14	04:40	1.012433	123376	-1.36
	Tritium	04:42	1.012433	138389	0.14
	BKG	05:12	30.01243	6.61	-1.21
LSCPURPLE	Carbon-14	04:03	.45	122791	-2.19
	Carbon-14	04:04	.4	123877	-0.04
	Tritium	04:05	.35	154005	-0.81
	Tritium	04:06	.35	153014	-1.38
	BKG	04:07	30	23	-0.23
	BKG	04:38	30	23	0.17

LSCBLUE: CLEARED BY RERUN

Reviewed by:



Lyndsey Pace

Date: 26-JUL-22

GEL Laboratories LLC



Liquid Scintillation Counter Checks for 27-JUL-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LSCBLUE	Carbon-14	03:36	1.3		124399	2.03		
	Carbon-14	03:38	1.3		124543	2.51		
	Tritium	03:40	1.1		159847	-2.44		
	Tritium	03:41	1.1		160522	-1.01		
	BKG	03:44	30		22	-0.92		
	BKG	04:14	30		22	-1.13		
LSCBROWN	Carbon-14	03:51	1.3		123919	-0.39		
	Carbon-14	03:53	1.3		124062	0.3		
	Tritium	03:55	1.15		153230	-1.47		
	Tritium	03:56	1.15		154120	-0.52		
	BKG	03:58	30		23	-0.88		
	BKG	04:29	30		22	-1.22		
LSCGOLD	Tritium	04:10	1.15		153828	0.16		
	Tritium	04:12	1.15		153945	0.31		
	BKG	04:14	30		29	0.09		
	BKG	04:45	30		28	-0.17		
	Carbon-14	04:48	1.3		125050	2.97		
	Carbon-14	04:50	1.3		124433	1.22		
LSCMOCHA	Carbon-14	01:52	1.35		122841	0.14		
	Carbon-14	01:54	1.35		122501	-1.01		
	Tritium	01:56	1.2		144524	-1.24		
	Tritium	01:57	1.25		143662	-2.45		
	BKG	01:59	30		20	-1.42		
	BKG	02:30	30		19	-2.08		
LSCNAVY	Carbon-14	00:59	1.3		125321	0.62		
	Carbon-14	01:01	1.3		125150	0.14		
	Tritium	01:03	1.07		171927	-3.04	Outside Three Sigma	
	Tritium	01:04	1.07		172096	-2.6		
	BKG	01:06	30		19	-0.93		
	BKG	01:37	30		20	0.78		

	Carbon-14	06:11	1.31	125498	1.11
	Carbon-14	06:13	1.3	125063	-0.1
	Tritium	06:15	1.05	173476	0.97
	Tritium	06:16	1.06	174205	2.86
LSCORANGE	Carbon-14	04:11	1.012433	124274	2.01
	Tritium	04:15	1.012433	151776	-2.66
	BKG	04:47	30.01243	8.79	0.61
	Carbon-14	04:49	1.012433	124128	1.57
	Tritium	04:50	1.012333	152490	-1.56
	BKG	05:20	30.01243	8.01	-0.95
LSCPINK	Carbon-14	04:05	1.012433	123826	-0.19
	Tritium	04:08	1.01235	138388	0.14
	BKG	04:41	30.01243	7.55	-0.27
	Carbon-14	04:42	1.012433	124394	1.28
	Tritium	04:44	1.012417	138753	0.73
	BKG	05:14	30.01243	7.18	-0.64
LSCPURPLE	Carbon-14	02:49	.4	124120	0.44
	Carbon-14	02:50	.4	123650	-0.49
	Tritium	02:51	.35	153418	-1.15
	Tritium	02:51	.35	152728	-1.55
	BKG	02:53	30	22	-0.84
	BKG	03:23	30	22	-1.12

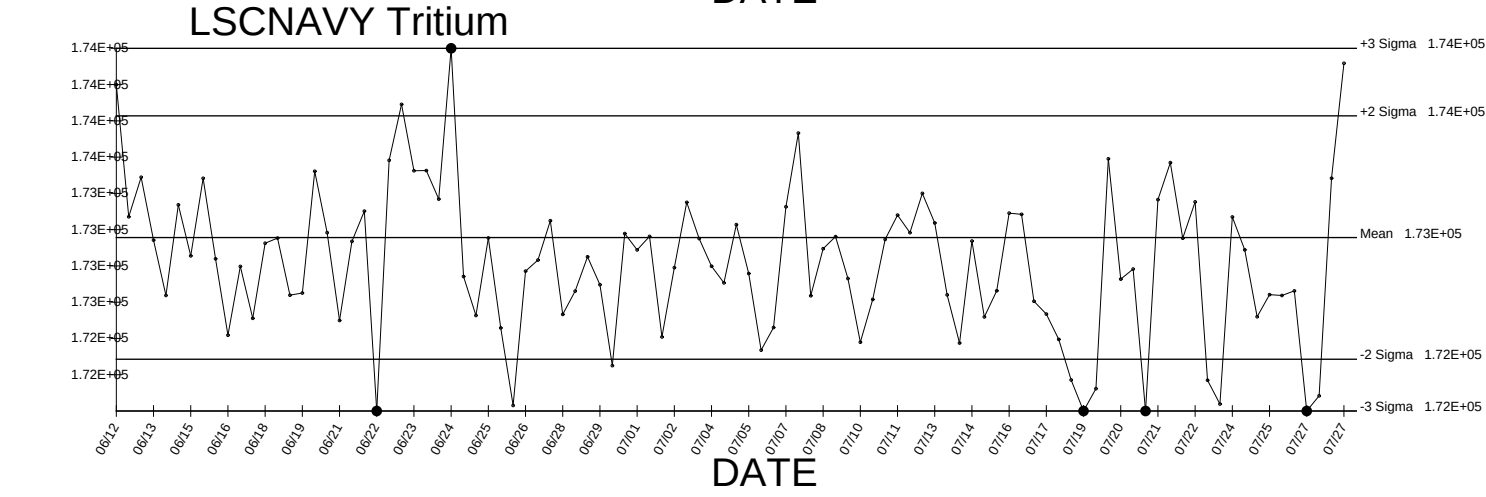
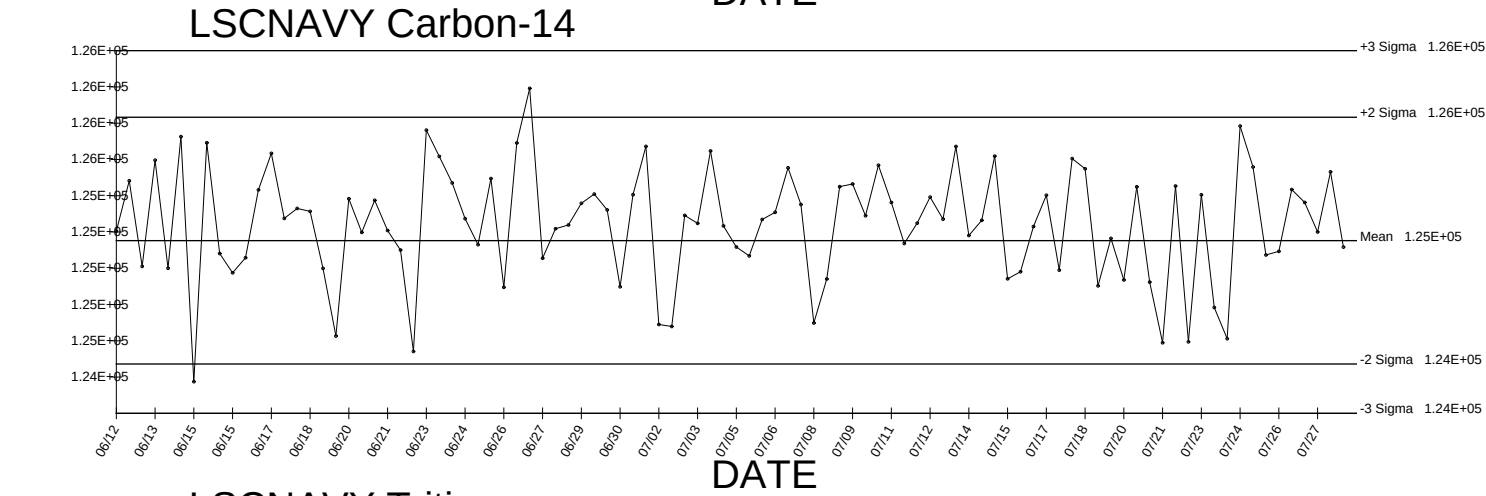
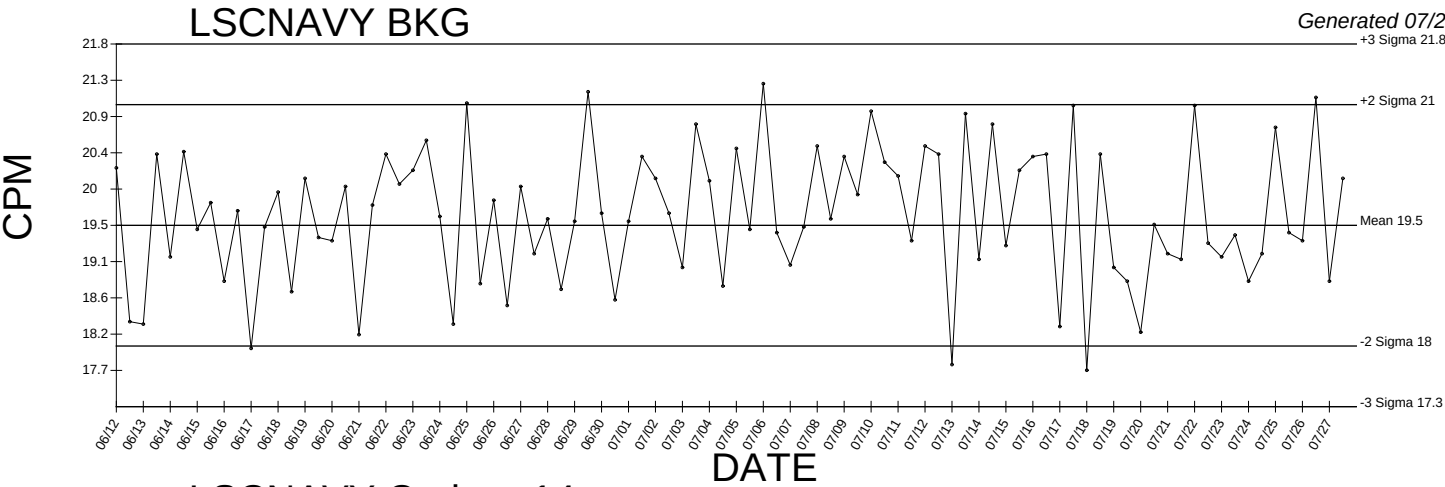
LSCNAVY: CLEARED BY RERUN

Reviewed by: 
Lyndsey Pace

Date: 27-JUL-22

GEL Laboratories LLC

Background and Efficiency Data



RAD Standards Traceability



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

1714

98366

Pu-241 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL 1408580, Item 6 **Product Code:** 8341

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
Pu-241	5.232E+03	4.016E+04	0.2	1.7	3.5	09/09/2014

*Uncertainty: U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: α -impurities < 0.08%, γ -impurities (other than decay products) < 0.1%.
5.46647 g 3M HNO₃ solution. Carrier free.

Source Prepared by:

R. Ormsby, Radiochemist

QC Approved:

J. S. Lahr, Spectroscopist

Date: 9/5/14



Standard Logbook

Serial ID: 1714 **Open/Reference Date:** 09 SEP 2014 **Aliquot :** 5.46647 g
Name: Plutonium-241 **Received:** 10 SEP 2014 **Density :** Hand Calculated
Type: Source Material **Expires:** 11 SEP 2075 **Logbook Num :** GL-CED-297-007
Employee: Gregory Ramsay **Lot Number :** 98366
Supplier: Eckert & Ziegler **Solvent :** 3M HNO3
Uncertainty : 1.75 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-241	40160 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1714
Prepared By:	Gregory Ramsay
Carrier Conc:	3M HNO3
Reference Date:	09/09/2014
Ampoule Mass (g):	5.46647 g
Uncertainty:	+/- 1.75 %
LogBook No:	GL-CED-297-007
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Plutonium-241		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2019		
Verification Date:	01/25/2021		
Expiration Date:	01/25/2022		
Primary Code:	1714-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.4425 g		
Density(g/mL):	1.0331	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23990.3411 \text{ dpm/mL}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0331 \text{ g/mL}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23220.6511 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
07/22/2019	Tim Chandler	50.7721	500	1714-B	2357.9224 dpm/mL	01/19/2022	01/19/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-241 Standard 1714-B

1/19/2022	Isotope	Detector CPM	BKG CPM	NET CPM	Detector Eff Mass. Used (mL)	Source DPM/mL
Matelon DeFreese	1714-B	418.9300	10.5300	408.4000	0.2541	1607.241244
	1714-B	423.9300	10.5300	413.4000	0.2551	1620.540964
	1714-B	413.8700	10.5300	403.3400	0.253	1594.229249
Mean Value (Counting) =	1607.337152	dpm/mL	97.4108307	Pass	Average =	1607.337152
Stdev =	13.15611985	dpm/mL	0.00818504	Rule B (Pass/Fail)		
Certificate Value =	1650.06	dpm/mL				
Two sigma =	26.31223971					
10 % of Mean =	160.7337152					
Rule A (Pass/Fail)	Pass					

Verification Rules

- Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule B = The determined mean value shall be within 5% of the certificate value.

The analyst prepared three standard verification sources for Pu-241 source 1714-B by transferring 1 mL portions of the standard into plastic liquid scintillation vials. Thirteen mL of Ecoscint Ultra liquid scintillation cocktail and 2 mL of DI water were added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion. The standard verification vials and Background source were dark adapted for two hours and counted on LSC Brown for Pu-241 source standard verification. The Pu-241 efficiency calibration which was used for verification calculations was created during instrument calibrations. Each verification source calculation was performed as follows:

Source dpm/g = (A - B)/(C)(D)

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency, (cpm/dpm), and
- D = mass used for standard verification.

Reference RAD SOP M-001

8/24/22



National Institute of Standards & Technology

Certificate

2020

Standard Reference Material® 4334j

Plutonium-242 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}.$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterwieser, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

Steven J. Choquette, Director
Office of Reference Materials

62-CEJ-797-312a

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq·g^{-1(a)}
Relative expanded uncertainty ($k = 2$)	0.51 % ^(b)

^(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

^(b) The uncertainties on certified values are expanded uncertainties, $U = k u_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

GL-CED-297-3126

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ^{-1(a,b,c,d)}
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ^{-1(a,d)}
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

(a) The stated uncertainty is two times the standard uncertainty [5].

(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,

0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and

0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclidic impurities follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ^{-6 (3)}	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ^{-5 (3)}	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,

5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and

3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

(f) The stated uncertainty is the standard uncertainty. See reference 6.

GL-CED-297-312c

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ²⁴² Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	²⁴² Pu decay corrections for half-life uncertainty of 0.22 %.	B	< 10 ⁻¹⁰
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty (k = 2)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

GL-CED-297-312d

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

GL-CEN-297-312e

Standard Logbook

Serial ID: 2020 **Open/Reference Date:** 09 AUG 2017 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 18 JAN 2022 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18 JAN 2050 **Logbook Num :** GL-CED-297-312
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
Uncertainty : .255 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2020
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO3
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-312
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	06/03/2022		
Verification Date:	06/03/2022		
Expiration Date:	06/03/2023		
Primary Code:	2020-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.4651 g		
Density(g/mL):	1.0325	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.4651 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 42.7589 \text{ dpm/mL}$
$(5.4651 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0325 \text{ g/mL}) / (200 \text{ mL}) = 41.4130 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
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GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2020-A

v1.2

Analyst	MXS2
Verification Prep Date	6/3/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.1
Expiration Date	8/17/2022

Standard Information	
Isotope	Pu-242
Serial Number	2020-A
Isotope Half-life	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	42.7589
Amount of Std. (mL)	0.1
Standard Prep Date	6/3/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	6/6/2022	1.960	43.51
2	6/6/2022	1.900	42.18
3	6/6/2022	1.810	40.18

Mean Value = 1.890 41.958
 Stdev = 0.075498344 1.676063245

pCi 1.9261 42.7585
 0.1510 3.3521
 0.1890 4.1958
 Pass Pass
 % Recovery 98.13% 98.13%
 Rule A (Pass/Fail) Pass
 Rule B (Pass/Fail) Pass
 Expiration Date 6/3/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2020-A using 0.1 mL for each source. Each standard was combined with 0.1 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. Added 0.1mL of neodymium carrier and 3-4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

6/8/22

Runlogs

Instrument Run Log

Instrument Type: LSC

Batch ID: 2294040

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
585885001	SAMPLE	BV1	LSCNAVY	JUL-26-22 14:52:31	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
585885002	SAMPLE	BV1	LSCNAVY	JUL-26-22 16:54:09	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
585885003	SAMPLE	BV1	LSCNAVY	JUL-26-22 18:55:46	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
585905001	SAMPLE	BV1	LSCNAVY	JUL-26-22 20:57:22	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
585905002	SAMPLE	BV1	LSCNAVY	JUL-26-22 22:58:57	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
585905003	SAMPLE	BV1	LSCNAVY	JUL-27-22 02:09:06	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
585905004	SAMPLE	BV1	LSCNAVY	JUL-27-22 04:10:40	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
585905005	SAMPLE	BV1	LSCNAVY	JUL-27-22 07:06:57	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205147420	MB	BV1	LSCNAVY	JUL-27-22 09:08:30	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205147421	LCS	BV1	LSCNAVY	JUL-27-22 11:09:31	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205147422	LCSD	BV1	LSCNAVY	JUL-27-22 11:25:10	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00



November 07, 2022

Ms. Candace Christensen
Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607

Re: Project # 080153.007 Air Monitoring at SSFL
Work Order: 597531

Dear Ms. Christensen:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on October 20, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4422.

Sincerely,

Adrian Melendrez for
Jake Crook
Project Manager

Purchase Order: 8-00000942
Chain of Custody: 10182022-1
Enclosures

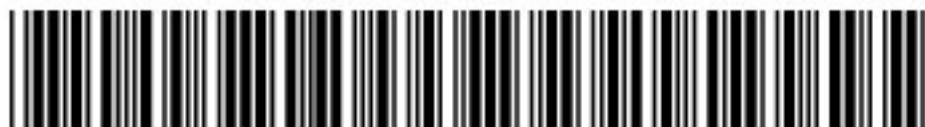


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Case Narrative

**Receipt Narrative
for
North Wind Solutions
SDG: 597531**

November 07, 2022

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on October 20, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
597531001	A-3-RMHF-2022-Qtr3
597531002	A-2-Area 20-2022-Qtr3
597531003	Blank-2022-Qtr3

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.


Adrian Melendrez for
Jake Crook
Project Manager

Chain of Custody and Supporting Documentation



Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: <u>NORW</u>		SDG/AR/COC/Work Order: <u>597531, 597533</u>	
Received By: <u>[Signature]</u>		Date Received: <u>10/20/22</u>	
Carrier and Tracking Number		Circle Applicable: ☒ FedEx Express ☐ FedEx Ground ☐ UPS ☐ Field Services ☐ Courier ☐ Other <u>770236265623</u>	
Suspected Hazard Information		*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.	
A) Shipped as a DOT Hazardous?		Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___	
B) Did the client designate the samples are to be received as radioactive?		COC notation or radioactive stickers on containers equal client designation.	
C) Did the RSO classify the samples as radioactive?		Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM/mR/Hr Classified as: Rad 1 Rad 2 Rad 3	
D) Did the client designate samples are hazardous?		COC notation or hazard labels on containers equal client designation.	
E) Did the RSO identify possible hazards?		If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____	
Sample Receipt Criteria		Comments/Qualifiers (Required for Non-Conforming Items)	
1	Shipping containers received intact and sealed?	☒ Yes ☐ NA ☐ No	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	☒ Yes ☐ NA ☐ No	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	☒ Yes ☐ NA ☐ No	Preservation Method: Wet Ice Ice Packs Dry Ice ☒ None Other: _____ *all temperatures are recorded in Celsius
4	Daily check performed and passed on IR temperature gun?	☒ Yes ☐ NA ☐ No	Temperature Device Serial #: <u>122-21</u> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	☒ Yes ☐ NA ☐ No	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	☒ Yes ☐ NA ☐ No	Sample ID's and Containers Affected: If Preservation added, Lot#: _____ If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
7	Do any samples require Volatile Analysis?	☒ Yes ☐ NA ☐ No	Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8	Samples received within holding time?	☒ Yes ☐ NA ☐ No	ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles?	☒ Yes ☐ NA ☐ No	ID's and containers affected: _____
10	Date & time on COC match date & time on bottles?	☒ Yes ☐ NA ☐ No	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	☒ Yes ☐ NA ☐ No	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	☒ Yes ☐ NA ☐ No	Circle Applicable: Not relinquished Other (describe)
13	COC form is properly signed in relinquished/received sections?	☒ Yes ☐ NA ☐ No	
Comments (Use Continuation Form if needed):			

Laboratory Certifications

List of current GEL Certifications as of 07 November 2022

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
North Wind Solutions
SDG #: 597531**

Product: Alphaspec Am241, Filter

Analytical Method: DOE EML HASL-300, Am-05-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2333132

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597531001	A-3-RMHF-2022-Qtr3
597531002	A-2-Area 20-2022-Qtr3
597531003	Blank-2022-Qtr3
1205225991	Method Blank (MB)
1205225992	Laboratory Control Sample (LCS)
1205225993	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Sample 597531001 (A-3-RMHF-2022-Qtr3) was recounted due to high MDC. The recount is reported.

Product: Alphaspec Pu, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2333138

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597531001	A-3-RMHF-2022-Qtr3
597531002	A-2-Area 20-2022-Qtr3
597531003	Blank-2022-Qtr3
1205225998	Method Blank (MB)
1205225999	Laboratory Control Sample (LCS)
1205226000	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Laboratory Control Sample (LCS) Recovery

The Laboratory Control Sample (See Below) does not meet the recovery requirement, however, all sample results are less than the MDC. Since the sample results are non-detects, the implied high bias does not carry over to the associated samples.

Sample	Analyte	Value
1205225999 (LCS)	Plutonium-239/240	126* (75%-125%)

Duplication Criteria between LCS and LCSD

The Laboratory Control Sample and Laboratory Control Sample Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below and the spike recovery limit.

Sample	Analyte	Value
1205225999 (LCS) and 1205226000 (LCSD)	Plutonium-239/240	RPD 24.1* (0%-20%) RER 1.8 (0-3)

Product: Alphaspec U, Filter

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2333141

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597531001	A-3-RMHF-2022-Qtr3
597531002	A-2-Area 20-2022-Qtr3
597531003	Blank-2022-Qtr3
1205226004	Method Blank (MB)
1205226005	Laboratory Control Sample (LCS)
1205226006	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec Th, Filter

Analytical Method: DOE EML HASL-300, Th-01-RC Modified

Analytical Procedure: GL-RAD-A-038 REV# 18

Analytical Batch: 2333142

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597531001	A-3-RMHF-2022-Qtr3
597531002	A-2-Area 20-2022-Qtr3
597531003	Blank-2022-Qtr3
1205226007	Method Blank (MB)
1205226008	Laboratory Control Sample (LCS)
1205226009	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Duplication Criteria between LCS and LCSD

The Laboratory Control Sample and Laboratory Control Sample Duplicate, 1205226008 (LCS) and 1205226009 (LCSD), Thorium-230 relative percent difference (RPD) requirement is not applicable as both were spiked with Thorium-232. The Thorium-232 RPD meets acceptance criteria.

Product: Alphaspec Po210, Filter

Analytical Method: DOE EML HASL-300, Po-01-RC Modified

Analytical Procedure: GL-RAD-A-016 REV# 19

Analytical Batch: 2333147

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597531001	A-3-RMHF-2022-Qtr3
597531002	A-2-Area 20-2022-Qtr3
597531003	Blank-2022-Qtr3
1205226018	Method Blank (MB)
1205226019	Laboratory Control Sample (LCS)
1205226020	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Sample 597531003 (Blank-2022-Qtr3) was recounted due to high MDC. The recount is reported.

Miscellaneous Information

Additional Comments

The tracer peak centroid for samples 597531001 (A-3-RMHF-2022-Qtr3) and 597531003 (Blank-2022-Qtr3) are greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peaks are within the tracer region of interest.

Product: Gammaspec, Gamma, Filter

Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R

Analytical Procedure: GL-RAD-A-013 REV# 27

Analytical Batch: 2333342

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597531001	A-3-RMHF-2022-Qtr3
597531002	A-2-Area 20-2022-Qtr3
597531003	Blank-2022-Qtr3
1205226444	Method Blank (MB)
1205226445	597531001(A-3-RMHF-2022-Qtr3) Sample Duplicate (DUP)
1205226446	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC, Sr90, Filter

Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified

Analytical Procedure: GL-RAD-A-004 REV# 22

Analytical Batch: 2333238

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597531001	A-3-RMHF-2022-Qtr3
597531002	A-2-Area 20-2022-Qtr3
597531003	Blank-2022-Qtr3
1205226267	Method Blank (MB)
1205226268	Laboratory Control Sample (LCS)
1205226269	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Sample 597531003 (Blank-2022-Qtr3) was recounted due to high MDC. The recount is reported. Sample 597531001 (A-3-RMHF-2022-Qtr3) was recounted due to a suspected false positive. The recount is reported.

Product: Liquid Scint Pu241, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-035 REV# 23

Analytical Batch: 2333140

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597531001	A-3-RMHF-2022-Qtr3
597531002	A-2-Area 20-2022-Qtr3
597531003	Blank-2022-Qtr3
1205226001	Method Blank (MB)
1205226002	Laboratory Control Sample (LCS)
1205226003	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205226001 (MB)	Plutonium-241	Result 10.3 < MDA 41.7 > RDL 5 pCi/Sample

Samples did not meet the detection limits due to limited sample volume.

Sample	Analyte	Value
597531001 (A-3-RMHF-2022-Qtr3)	Plutonium-241	Result -8.55 < MDA 32.4 > RDL 5 pCi/Sample
597531002 (A-2-Area 20-2022-Qtr3)	Plutonium-241	Result 13.1 < MDA 35.5 > RDL 5 pCi/Sample
597531003 (Blank-2022-Qtr3)	Plutonium-241	Result 12.5 < MDA 36.7 > RDL 5 pCi/Sample

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Prep Logbook

The Preparation of Special Matrices for the Determination of Radionuclides

Batch ID: 2333105

Analyst: Christine Carter (CXC1)

Method: Filter Prep

Lab SOP: GL-RAD-A-026 REV# 18

Instrument: NONE

SP-15750050

Due Dates for Lab: 01-NOV-2022

Package: 03-NOV-2022

SDG: 03-NOV-2022

Type Sample Id Description

Serial Number

Spike Amount

Spike Units

#	Sample ID	Prep Date	Min RDL ()	Number of Filters	Container Wt (g)	Weight of total filter with container (g)	Weight of filter Diluted with container (g)	Not Saved Final Volume of filter diluted to in Liters (mL)	Total Filter Weight (g)	Weight of Filter Diluted (g)
1	597531001	26-OCT-2022		1	81.196	83.434	82.846	200	2.238	1.65
2	597531002	26-OCT-2022		1	81.429	83.669	83.09	200	2.24	1.661
3	597531003	26-OCT-2022		1	81.37	83.561	83.026	200	2.191	1.656
4	597533001	26-OCT-2022		1	80.907	84.664	83.827	200	3.757	2.92
5	597533002	26-OCT-2022		1	81.441	85.19	84.336	200	3.749	2.895
6	597533003	26-OCT-2022		1	81.445	85.21	84.298	200	3.765	2.853
7	597533004	26-OCT-2022		1	81.356	85.103	84.21	200	3.747	2.854
8	597533005	26-OCT-2022		1	81.877	85.538	84.649	200	3.661	2.772
9	597649003	26-OCT-2022		1	81.683	83.363	83.363	200	1.68	1.68
10	597649004	26-OCT-2022		1	81.899	82.158	82.158	200	0.259	0.259
11	597649005	26-OCT-2022		1	81.824	83.503	83.503	200	1.679	1.679
12	1205225940 MFB	26-OCT-2022		1	0	1	1	200	1	1

Reagent/Solvent Lot ID	Description	Amount	Comments:
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GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

NORW002 North Wind Solutions

Client SDG: 597531 GEL Work Order: 597531

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Theresa Austin

Date: 15 NOV 2022

Title: Group Leader

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 15, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-3-RMHF-2022-Qtr3
Sample ID: 597531001
Matrix: Filter
Collect Date: 26-SEP-22 08:18
Receive Date: 20-OCT-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.000	+/-0.186	0.372	1.00	pCi/Sample			BV1	11/05/22	1456	2333132	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		10.6	+/-1.61	0.659	0.500	pCi/Sample			BV1	11/04/22	0835	2333147	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	-0.0542	+/-0.126	0.372	1.00	pCi/Sample			BV1	11/03/22	1026	2333138	3
Plutonium-239/240	U	0.117	+/-0.260	0.456	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.124	+/-0.363	0.678	1.00	pCi/Sample			MP2	11/03/22	1202	2333142	4
Thorium-230	U	0.565	+/-0.522	0.718	1.00	pCi/Sample							
Thorium-232		0.689	+/-0.493	0.472	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.604	+/-0.501	0.655	1.00	pCi/Sample			BV1	11/03/22	0850	2333141	5
Uranium-235/236	U	-0.0617	+/-0.186	0.523	1.00	pCi/Sample							
Uranium-238		0.676	+/-0.453	0.332	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	-8.55	+/-18.4	32.4	5.00	pCi/Sample			BV1	11/05/22	1222	2333140	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-6.69	+/-17.8	34.3		pCi/Sample			RXF2	10/31/22	0815	2333342	7
Beryllium-7	U	38.0	+/-57.5	112		pCi/Sample							
Cesium-137	U	2.19	+/-4.85	9.76	20.0	pCi/Sample							
Cobalt-60	U	0.395	+/-5.24	10.7		pCi/Sample							
Potassium-40	U	53.2	+/-71.7	75.7		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	1.34	+/-1.72	2.91	3.00	pCi/Sample			JXK3	11/02/22	0911	2333238	8

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	10/26/22	0716	2333105

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 15, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-3-RMHF-2022-Qtr3
Sample ID: 597531001
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			38.9	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			72.9	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			96.6	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			59.6	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			75.3	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			96.6	(15%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			88.9	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 15, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-2-Area 20-2022-Qtr3
Sample ID: 597531002
Matrix: Filter
Collect Date: 26-SEP-22 08:25
Receive Date: 20-OCT-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0200	+/-0.209	0.436	1.00	pCi/Sample			BV1	11/03/22	1013	2333132	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		9.32	+/-1.40	0.508	0.500	pCi/Sample			BV1	11/04/22	0835	2333147	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	-0.0520	+/-0.120	0.357	1.00	pCi/Sample			BV1	11/03/22	1026	2333138	3
Plutonium-239/240	U	-0.156	+/-0.140	0.498	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.204	+/-0.492	0.891	1.00	pCi/Sample			MP2	11/03/22	1202	2333142	4
Thorium-230		1.38	+/-0.781	0.759	1.00	pCi/Sample							
Thorium-232	U	0.412	+/-0.452	0.531	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.352	+/-0.448	0.693	1.00	pCi/Sample			BV1	11/03/22	0850	2333141	5
Uranium-235/236	U	0.0473	+/-0.263	0.504	1.00	pCi/Sample							
Uranium-238		0.833	+/-0.549	0.570	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	13.1	+/-21.0	35.5	5.00	pCi/Sample			BV1	11/05/22	1324	2333140	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-1.00	+/-15.0	27.7		pCi/Sample			RXF2	10/31/22	0815	2333342	7
Beryllium-7		103	+/-62.8	75.2		pCi/Sample							
Cesium-137	U	-0.423	+/-3.93	6.83	20.0	pCi/Sample							
Cobalt-60	U	1.10	+/-3.69	7.50		pCi/Sample							
Potassium-40	U	12.2	+/-50.0	96.4		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	0.264	+/-1.29	2.22	3.00	pCi/Sample			JXK3	11/01/22	1909	2333238	8

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	10/26/22	0716	2333105

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Certificate of Analysis

Report Date: November 15, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-2-Area 20-2022-Qtr3
Sample ID: 597531002
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
The following Analytical Methods were performed:												
Method	Description								Analyst Comments			
1	DOE EML HASL-300, Am-05-RC Modified											
2	DOE EML HASL-300, Po-01-RC Modified											
3	DOE EML HASL-300, Pu-11-RC Modified											
4	DOE EML HASL-300, Th-01-RC Modified											
5	DOE EML HASL-300, U-02-RC Modified											
6	DOE EML HASL-300, Pu-11-RC Modified											
7	DOE HASL 300, 4.5.2.3/Ga-01-R											
8	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified											
Surrogate/Tracer Recovery	Test					Result	Nominal	Recovery%	Acceptable Limits			
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"							91.3	(15%-125%)			
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"							84.6	(15%-125%)			
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"							88.3	(15%-125%)			
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"							49.6	(15%-125%)			
Uranium-232 Tracer	Alphaspec U, Filter "As Received"							72.2	(15%-125%)			
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"							88.3	(15%-125%)			
Strontium Carrier	GFPC, Sr90, Filter "As Received"							97.8	(25%-125%)			

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 15, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: Blank-2022-Qtr3
Sample ID: 597531003
Matrix: Filter
Collect Date: 26-SEP-22 09:00
Receive Date: 20-OCT-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	-0.372	+/-0.310	0.991	1.00	pCi/Sample			BV1	11/03/22	1013	2333132	1
Alphaspec Po210, Filter "As Received"													
Polonium-210	U	0.311	+/-0.354	0.519	0.500	pCi/Sample			BV1	11/05/22	1014	2333147	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	-0.0653	+/-0.177	0.472	1.00	pCi/Sample			BV1	11/03/22	1026	2333138	3
Plutonium-239/240	U	-0.216	+/-0.155	0.573	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228		0.637	+/-0.449	0.458	1.00	pCi/Sample			MP2	11/03/22	1202	2333142	4
Thorium-230	U	0.485	+/-0.434	0.582	1.00	pCi/Sample							
Thorium-232		0.621	+/-0.430	0.424	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.0753	+/-0.367	0.727	1.00	pCi/Sample			BV1	11/03/22	0850	2333141	5
Uranium-235/236	U	0.0922	+/-0.315	0.584	1.00	pCi/Sample							
Uranium-238	U	0.258	+/-0.388	0.622	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	12.5	+/-21.6	36.7	5.00	pCi/Sample			BV1	11/05/22	1426	2333140	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	1.19	+/-16.9	31.7		pCi/Sample			RXF2	10/31/22	0816	2333342	7
Beryllium-7	U	46.8	+/-36.8	78.2		pCi/Sample							
Cesium-137	U	-0.0525	+/-3.53	5.88	20.0	pCi/Sample							
Cobalt-60	U	2.32	+/-3.70	8.38		pCi/Sample							
Potassium-40	U	30.5	+/-50.5	58.9		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	-1.27	+/-1.52	2.90	3.00	pCi/Sample			JXK3	11/02/22	0911	2333238	8

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	10/26/22	0716	2333105

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 15, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: Blank-2022-Qtr3
Sample ID: 597531003
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
The following Analytical Methods were performed:												
Method	Description								Analyst Comments			
1	DOE EML HASL-300, Am-05-RC Modified											
2	DOE EML HASL-300, Po-01-RC Modified											
3	DOE EML HASL-300, Pu-11-RC Modified											
4	DOE EML HASL-300, Th-01-RC Modified											
5	DOE EML HASL-300, U-02-RC Modified											
6	DOE EML HASL-300, Pu-11-RC Modified											
7	DOE HASL 300, 4.5.2.3/Ga-01-R											
8	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified											
Surrogate/Tracer Recovery	Test					Result	Nominal	Recovery%	Acceptable Limits			
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"							73.4	(15%-125%)			
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"							72.7	(15%-125%)			
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"							86.6	(15%-125%)			
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"							71.3	(15%-125%)			
Uranium-232 Tracer	Alphaspec U, Filter "As Received"							71.7	(15%-125%)			
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"							86.6	(15%-125%)			
Strontium Carrier	GFPC, Sr90, Filter "As Received"							60	(25%-125%)			

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: November 15, 2022

Page 1 of 6

Northwind Solutions

535 North Pleasantburg, Suite 136

Greenville, South Carolina

Ms. Candace Christensen

Contact:

Workorder: 597531

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2333132										
QC1205225992	LCS										
Americium-241	17.0			15.1 pCi/Sample			89.3	(75%-125%)	BV1	11/03/22	10:20
	Uncertainty			+/-1.94							
QC1205225993	LCSD										
Americium-241	17.0			13.4 pCi/Sample	12.6		78.8	(0%-20%)		11/03/22	10:20
	Uncertainty			+/-1.67							
QC1205225991	MB										
Americium-241			U	0.140 pCi/Sample						11/03/22	10:13
	Uncertainty			+/-0.407							
Batch	2333138										
QC1205225999	LCS										
Plutonium-238			U	0.158 pCi/Sample					BV1	11/03/22	10:26
	Uncertainty			+/-0.307							
Plutonium-239/240	17.6			22.3 pCi/Sample			126 *	(75%-125%)			
	Uncertainty			+/-2.29							
QC1205226000	LCSD										
Plutonium-238			U	-0.181 pCi/Sample	0					11/03/22	10:12
	Uncertainty			+/-0.280							
Plutonium-239/240	17.6			17.5 pCi/Sample	24.1 *		99.2	(0%-20%)			
	Uncertainty			+/-2.41							
QC1205225998	MB										
Plutonium-238			U	0.0486 pCi/Sample						11/03/22	10:26
	Uncertainty			+/-0.218							
Plutonium-239/240			U	0.0510 pCi/Sample							
	Uncertainty			+/-0.255							
Batch	2333140										
QC1205226002	LCS										
Plutonium-241	613			542 pCi/Sample			88.4	(75%-125%)	BV1	11/05/22	21:39
	Uncertainty			+/-35.7							
QC1205226003	LCSD										
Plutonium-241	613			566 pCi/Sample	4.34		92.3	(0%-20%)		11/05/22	22:40
	Uncertainty			+/-34.3							

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Workorder: 597531

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GEL LABORATORIES LLC

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QC Summary

Workorder: 597531

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2333142										
QC1205226009	LCSD										
Thorium-228				15.2 pCi/Sample		11.8			MP2	11/03/22	12:02
	Uncertainty			+/-1.82							
Thorium-230				1.93 pCi/Sample		37.9*		(0%-20%)			
	Uncertainty			+/-0.713							
Thorium-232	16.9			18.0 pCi/Sample		4.58	106	(0%-20%)			
	Uncertainty			+/-1.96							
QC1205226007	MB										
Thorium-228			U	0.0320 pCi/Sample						11/03/22	12:02
	Uncertainty			+/-0.390							
Thorium-230			U	0.677 pCi/Sample							
	Uncertainty			+/-0.639							
Thorium-232			U	-0.00382 pCi/Sample							
	Uncertainty			+/-0.271							
Batch	2333147										
QC1205226019	LCS										
Polonium-210	10.2			11.3 pCi/Sample			112	(75%-125%)	BV1	11/04/22	08:41
	Uncertainty			+/-1.48							
QC1205226020	LCSD										
Polonium-210	10.2			11.2 pCi/Sample		1.31	110	(0%-20%)		11/04/22	08:41
	Uncertainty			+/-1.68							
QC1205226018	MB										
Polonium-210			U	0.00452 pCi/Sample						11/04/22	08:41
	Uncertainty			+/-0.208							
Rad Gamma Spec											
Batch	2333342										
QC1205226445	597531001	DUP									
Actinium-228	U	-6.69	U	3.52 pCi/Sample		N/A			N/A	RXF2	10/31/22 10:42
	Uncertainty	+/-17.8		+/-18.4							
Beryllium-7	U	38.0		144 pCi/Sample		25.5		(0% - 100%)			
	Uncertainty	+/-57.5		+/-98.6							
Cesium-137	U	2.19	U	2.19 pCi/Sample		N/A			N/A		
	Uncertainty	+/-4.85		+/-6.28							

GEL LABORATORIES LLC

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QC Summary

Workorder: 597531

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	2333342										
Cobalt-60	U	0.395	U	5.53 pCi/Sample		N/A		N/A	RXF2	10/31/22	10:42
	Uncertainty	+/-5.24		+/-4.36							
Potassium-40	U	53.2		95.5 pCi/Sample		23.1		(0% - 100%)			
	Uncertainty	+/-71.7		+/-68.3							
QC1205226446	LCS										
Americium-241	73400			81200 pCi/Sample			111	(75%-125%)		10/31/22	10:43
	Uncertainty			+/-2580							
Actinium-228			U	131 pCi/Sample							
	Uncertainty			+/-333							
Beryllium-7				1500 pCi/Sample							
	Uncertainty			+/-961							
Cesium-137	21700			22200 pCi/Sample			102	(75%-125%)			
	Uncertainty			+/-522							
Cobalt-60	8040			8400 pCi/Sample			104	(75%-125%)			
	Uncertainty			+/-383							
Potassium-40			U	130 pCi/Sample							
	Uncertainty			+/-268							
QC1205226444	MB										
Actinium-228			U	-2.34 pCi/Sample						11/01/22	05:09
	Uncertainty			+/-12.8							
Beryllium-7			U	-11.3 pCi/Sample							
	Uncertainty			+/-30.8							
Cesium-137			U	-6.71 pCi/Sample							
	Uncertainty			+/-4.93							
Cobalt-60			U	0.0141 pCi/Sample							
	Uncertainty			+/-2.59							
Potassium-40			U	16.6 pCi/Sample							
	Uncertainty			+/-74.6							
Rad Gas Flow											
Batch	2333238										
QC1205226268	LCS										
Strontium-90	199			231 pCi/Sample			116	(75%-125%)	JXK3	11/02/22	06:22
	Uncertainty			+/-18.2							

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QC Summary

Workorder: 597531

Page 5 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2333238										
QC1205226269	LCSD										
Strontium-90	199			247 pCi/Sample		6.69	124	(0%-20%)	JXK3	11/02/22	06:22
	Uncertainty			+/-13.6							
QC1205226267	MB										
Strontium-90			U	0.102 pCi/Sample						11/01/22	19:09
	Uncertainty			+/-1.16							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- ** Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded
- J See case narrative for an explanation
- J Value is estimated
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- M M if above MDC and less than LLD
- M REMP Result > MDC/CL and < RDL
- N/A RPD or %Recovery limits do not apply.
- N1 See case narrative
- ND Analyte concentration is not detected above the detection limit
- NJ Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Q One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
- R Sample results are rejected
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- UI Gamma Spectroscopy--Uncertain identification
- UJ Gamma Spectroscopy--Uncertain identification
- UL Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Y Other specific qualifiers were required to properly define the results. Consult case narrative.
- ^ RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
- h Preparation or preservation holding time was exceeded

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 597531

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
----------	-----	--------	------	----	-------	------	------	-------	-------	------	------

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Alpha Spectroscopy Raw Data

Batch 2333141 Check-list

This check-list was completed on 03-NOV-22 by Melanie Aycok

This batch was reviewed by Jessica Davis on 03-NOV-22 and Melanie Aycok on 03-NOV-22.

Batch ID:
2333141

Product:
ASP__UUF

Description: Alpha Spec Uranium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Uranium

Batch ID: 2333141

Analyst: Brendon Viquez (BV1)

Method: DOE EML HASL-300, U-02-RC
Modified

Lab SOP: GL-RAD-A-011 REV# 28

Instrument: GFC-B742840386

Due Dates for Lab: 02-NOV-2022

Package: 03-NOV-2022

SDG: 03-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205226005	Uranium-238 AS SPIKE	1600-O	.1	mL
LCSD	1205226006	Uranium-238 AS SPIKE	1600-O	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	597531001	01-NOV-2022	1	30.16	0.11118
2	597531002	01-NOV-2022	1	30.21	0.11201
3	597531003	01-NOV-2022	1	30.02	0.11345
4	597533001	01-NOV-2022	1	30.04	0.11674
5	597533002	01-NOV-2022	1	30.05	0.11602
6	597533003	01-NOV-2022	1	30.23	0.11454
7	597533004	01-NOV-2022	1	30.15	0.11482
8	597533005	01-NOV-2022	1	30.3	0.11471
9	1205226004 MB	01-NOV-2022	1		0.11674
10	1205226005 LCS	01-NOV-2022	1		0.11674
11	1205226006 LCSD	01-NOV-2022	1		0.11674

Reagent/Solvent Lot ID	Description	Amount
WORK 1564-EE	Uranium-232 AS TRACER	.1 ml

Comments:

Pipet ID: R2-428724
Pu-236 Tracer Used: No
Analyzed With: N/A
Data Entry Date2: 01-NOV-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

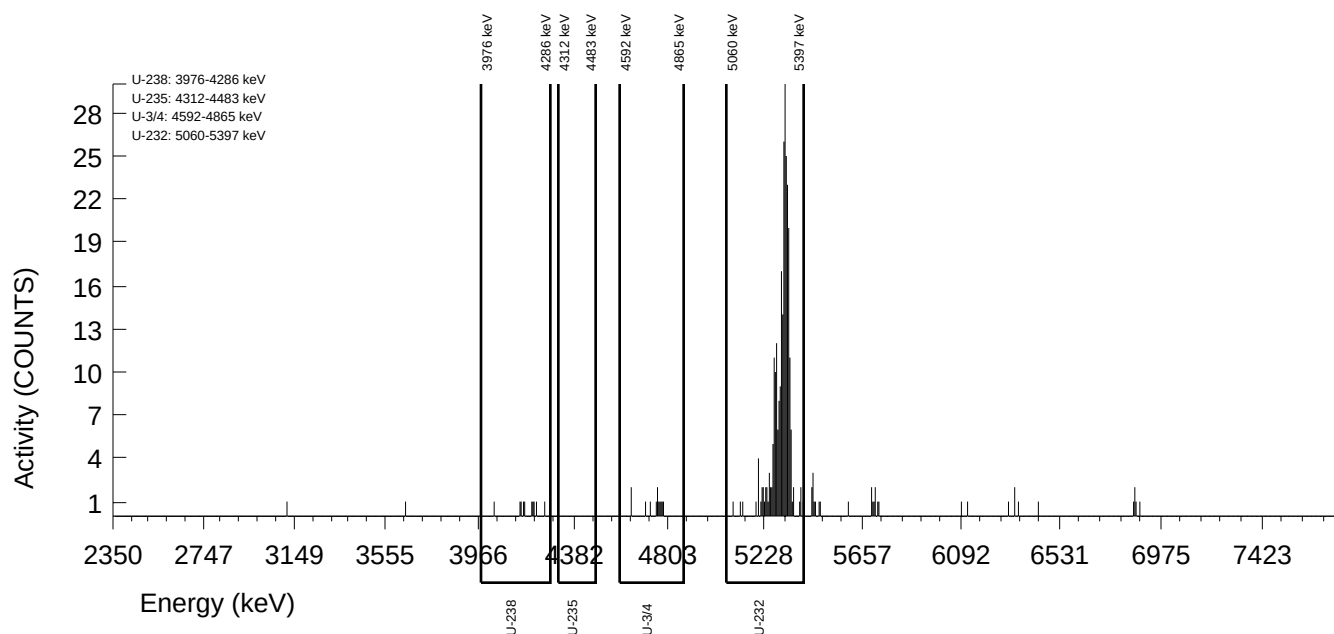
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333141 SAMPLE ID : S0597531001_UU SAMPLE QTY : 0.111 F +/-0.899 % SAMPLE DATE : 26-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 75.3 +/-7.004 %	CHAMBER : 002 DETECTOR S/N : 149009 AVERAGE %EFFICIENCY : 32.3521 AVERAGE %EFF ERROR : 0.6249 COUNT DATE : 03-Nov-2022 08:50:14 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B002.CNF;2505 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W002.CNF;687 CAL DATE : 02-Nov-2022
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4760E+00 dpm RESULTS : 3.3707E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5303.52	33.577	266.000	261.440	4.560	2.1354	100.000	1.81E+01	3.42E+00	7.51E-01	2.71E-01	2.23E+00
U-3/4	4763.02	4734.84	115.943	12.000	8.723	2.400	1.5492	100.000	6.04E-01	5.10E-01	6.55E-01	2.24E-01	5.01E-01
U-235	4391.00	4397.17	0.000	0.000	-0.720	0.720	0.8485	80.900	-6.17E-02	1.87E-01	5.23E-01	1.33E-01	1.86E-01
U-238	4184.73	4175.77	217.084	10.000	9.760	0.240	0.4899	100.000	6.76E-01	4.63E-01	3.32E-01	6.22E-02	4.53E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.877 +/-0.026)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

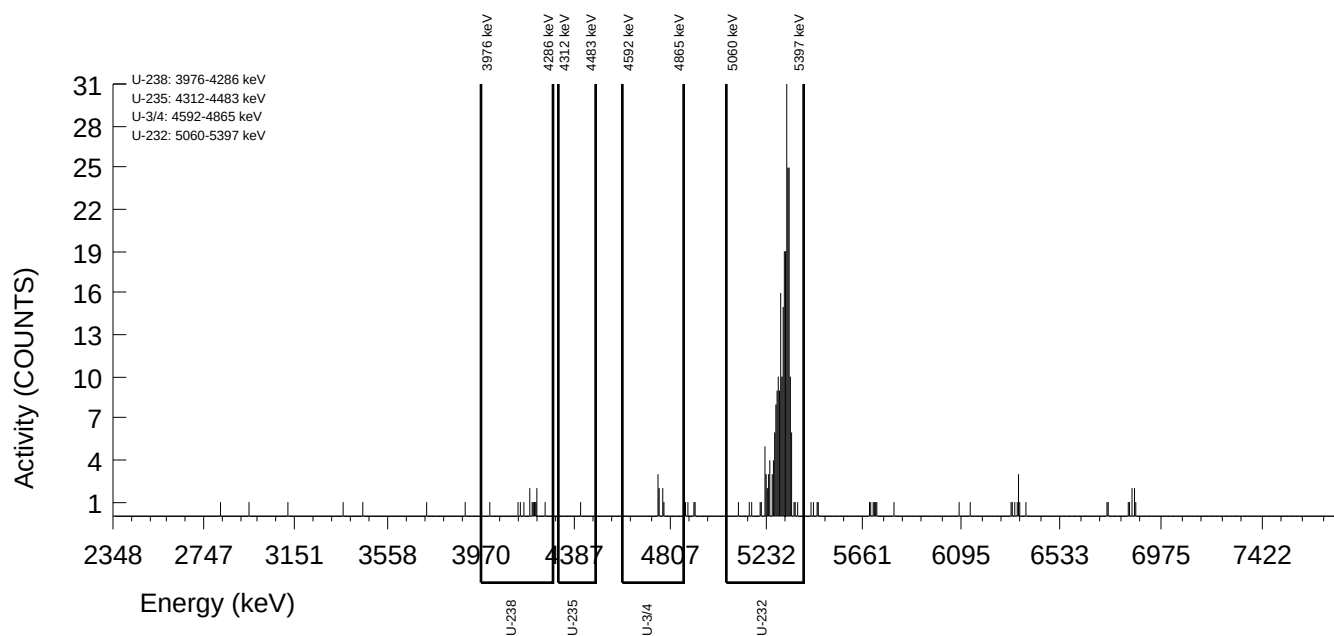
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333141 SAMPLE ID : S0597531002_UU SAMPLE QTY : 0.112 F +/-0.893 % SAMPLE DATE : 26-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 72.2 +/-7.221 %	CHAMBER : 003 DETECTOR S/N : 149012 AVERAGE %EFFICIENCY : 31.5440 AVERAGE %EFF ERROR : 0.6096 COUNT DATE : 03-Nov-2022 08:50:14 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B003.CNF;2501 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W003.CNF;714 CAL DATE : 02-Nov-2022
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4760E+00 dpm RESULTS : 3.2296E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5303.72	38.209	250.000	244.240	5.760	2.4000	100.000	1.80E+01	3.51E+00	8.69E-01	3.24E-01	2.30E+00
U-3/4	4763.02	4764.21	24.796	8.000	4.780	2.400	1.5492	100.000	3.52E-01	4.52E-01	6.93E-01	2.36E-01	4.48E-01
U-235	4391.00	4412.69	4.959	1.000	0.520	0.480	0.6928	80.900	4.73E-02	2.63E-01	5.04E-01	1.15E-01	2.63E-01
U-238	4184.73	4181.06	34.714	13.000	11.320	1.680	1.2961	100.000	8.33E-01	5.62E-01	5.70E-01	1.75E-01	5.49E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.820 +/-0.025)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

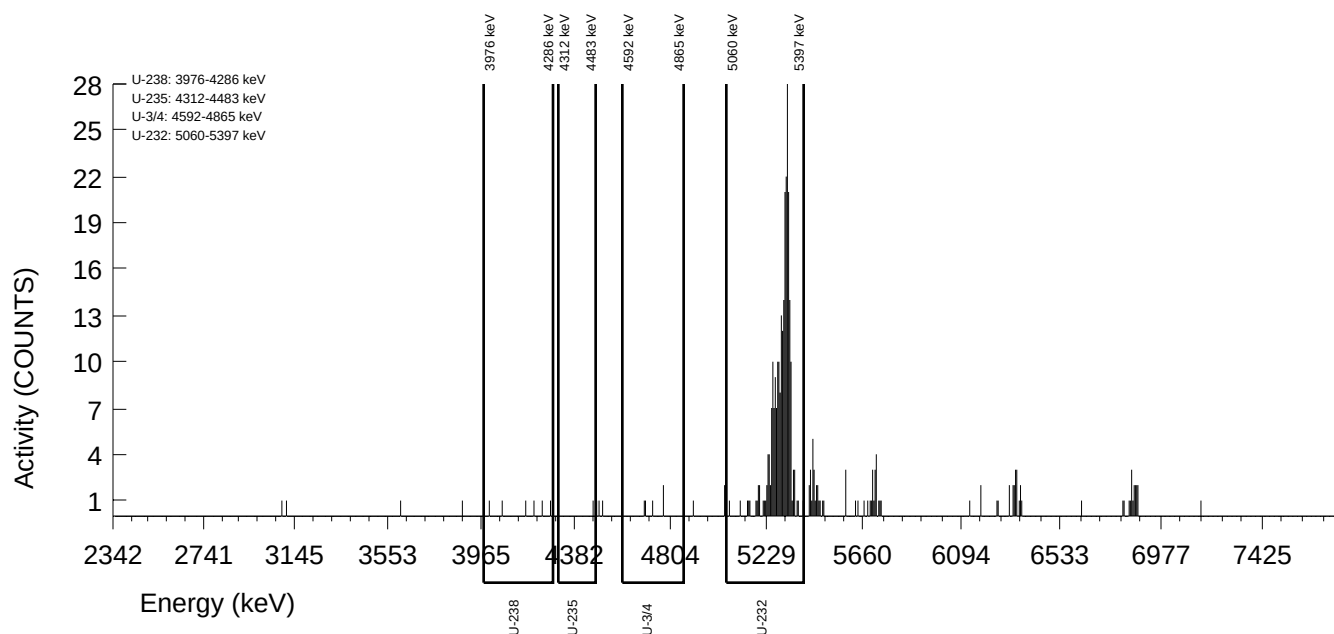
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333141 SAMPLE ID : S0597531003_UU SAMPLE QTY : 0.113 F +/-0.881 % SAMPLE DATE : 26-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 71.7 +/-7.262 %	CHAMBER : 004 DETECTOR S/N : 79994 AVERAGE %EFFICIENCY : 32.1777 AVERAGE %EFF ERROR : 0.6216 COUNT DATE : 03-Nov-2022 08:50:14 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B004.CNF;2516 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W004.CNF;729 CAL DATE : 02-Nov-2022
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4760E+00 dpm RESULTS : 3.2080E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5299.25	24.803	259.000	247.480	11.520	3.3941	100.000	1.78E+01	3.49E+00	1.11E+00	4.46E-01	2.28E+00
U-3/4	4763.02	4734.87	4.961	5.000	1.050	3.120	1.7664	100.000	7.53E-02	3.67E-01	7.27E-01	2.56E-01	3.67E-01
U-235	4391.00	4474.09	0.000	2.000	1.040	0.960	0.9798	80.900	9.22E-02	3.15E-01	5.84E-01	1.59E-01	3.15E-01
U-238	4184.73	4160.28	262.914	6.000	3.600	2.400	1.5492	100.000	2.58E-01	3.90E-01	6.22E-01	2.04E-01	3.88E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.830 +/-0.025)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

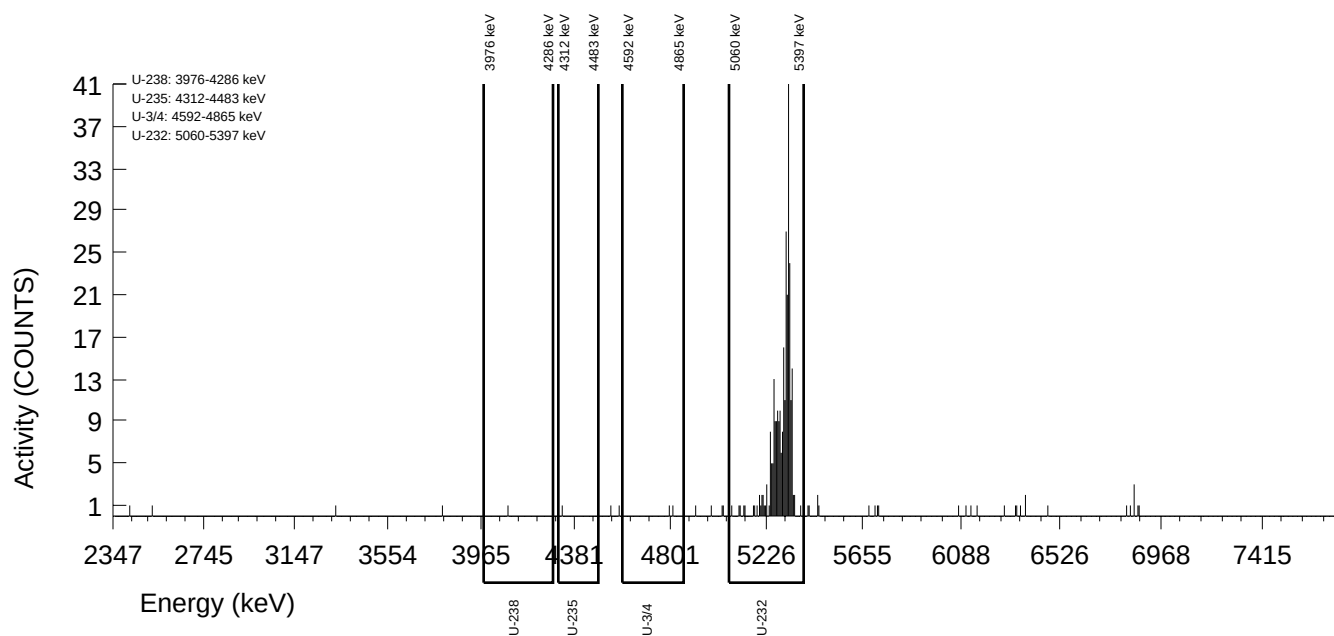
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333141 SAMPLE ID : S1205226004_UU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 78.4 +/-6.863 %	CHAMBER : 010 DETECTOR S/N : 149014 AVERAGE %EFFICIENCY : 32.9129 AVERAGE %EFF ERROR : 0.6355 COUNT DATE : 03-Nov-2022 08:50:15 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B010.CNF;2541 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W010.CNF;682 CAL DATE : 02-Nov-2022
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4715E+00 dpm RESULTS : 3.5039E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5298.52	18.182	283.000	276.760	6.240	2.4980	100.000	1.73E+01	3.19E+00	7.58E-01	2.85E-01	2.06E+00
U-3/4	4763.02	4808.99	19.787	2.000	-0.609	1.680	1.2961	100.000	-3.79E-02	2.27E-01	5.43E-01	1.78E-01	2.27E-01
U-235	4391.00	4328.72	4.947	1.000	0.760	0.240	0.4899	80.900	5.86E-02	2.20E-01	3.69E-01	6.91E-02	2.20E-01
U-238	4184.73	4089.47	4.947	1.000	-0.680	1.680	1.2961	100.000	-4.24E-02	1.92E-01	4.83E-01	1.48E-01	1.92E-01

NOTES:

* Correction made to the following net area
due to tracer impurity:
U-3/4 (0.929 +/-0.028)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

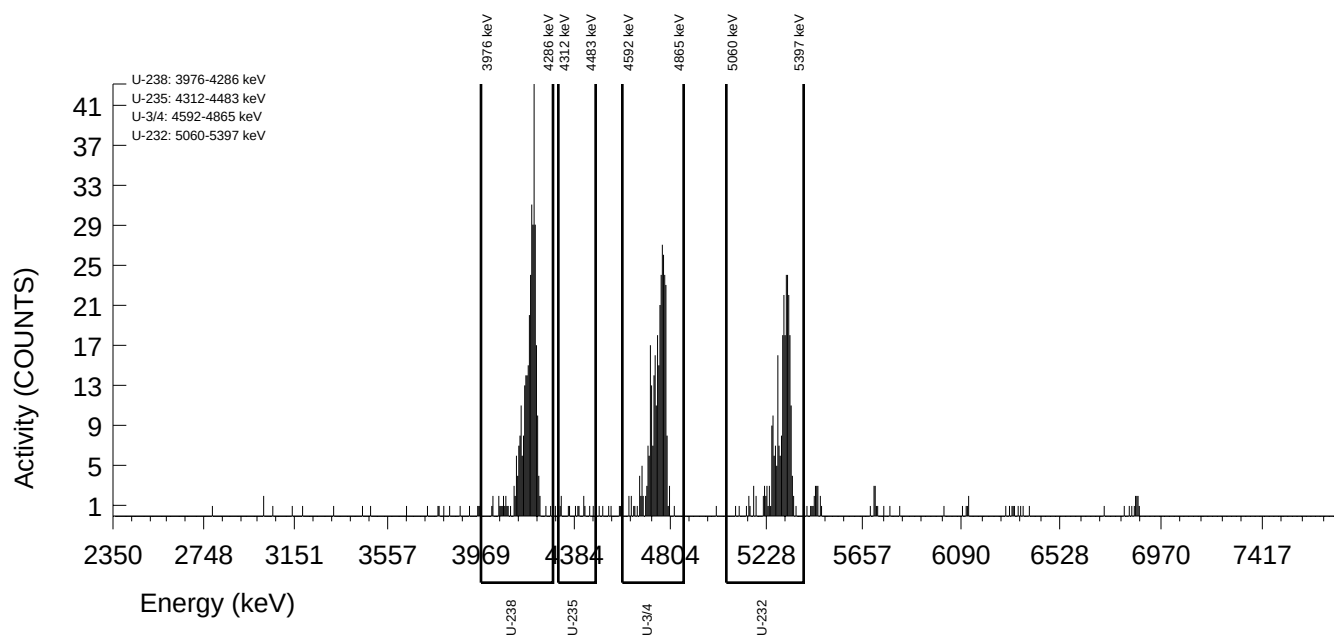
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333141 SAMPLE ID : S1205226005_UU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 76.0 +/-7.151 %	CHAMBER : 011 DETECTOR S/N : 72531 AVERAGE %EFFICIENCY : 31.1898 AVERAGE %EFF ERROR : 0.6030 COUNT DATE : 03-Nov-2022 08:50:15 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B011.CNF;2514 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W011.CNF;688 CAL DATE : 02-Nov-2022
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4715E+00 dpm RESULTS : 3.3988E+00 dpm	LCS ID : 1600-O NUCLIDE : U-238 NOMINAL (pCi/F) : 2.4083E+01 % RECOVERY : 94.506	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			1.96-sigma
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5297.21	55.496	264.000	254.400	9.600	3.0984	100.000	1.73E+01	3.33E+00	9.73E-01	3.85E-01	2.17E+00
U-3/4	4763.02	4752.02	69.002	307.000	304.466	1.680	1.2961	100.000	2.06E+01	3.82E+00	5.86E-01	1.91E-01	2.33E+00
U-235	4391.00	4391.75	103.863	13.000	11.560	1.440	1.2000	80.900	9.69E-01	6.39E-01	6.20E-01	1.84E-01	6.24E-01
U-238	4184.73	4182.82	25.966	338.000	335.600	2.400	1.5492	100.000	2.28E+01	4.13E+00	5.88E-01	1.92E-01	2.45E+00

NOTES:

* Correction made to the following net area
due to tracer impurity:
U-3/4 (0.854 +/-0.026)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

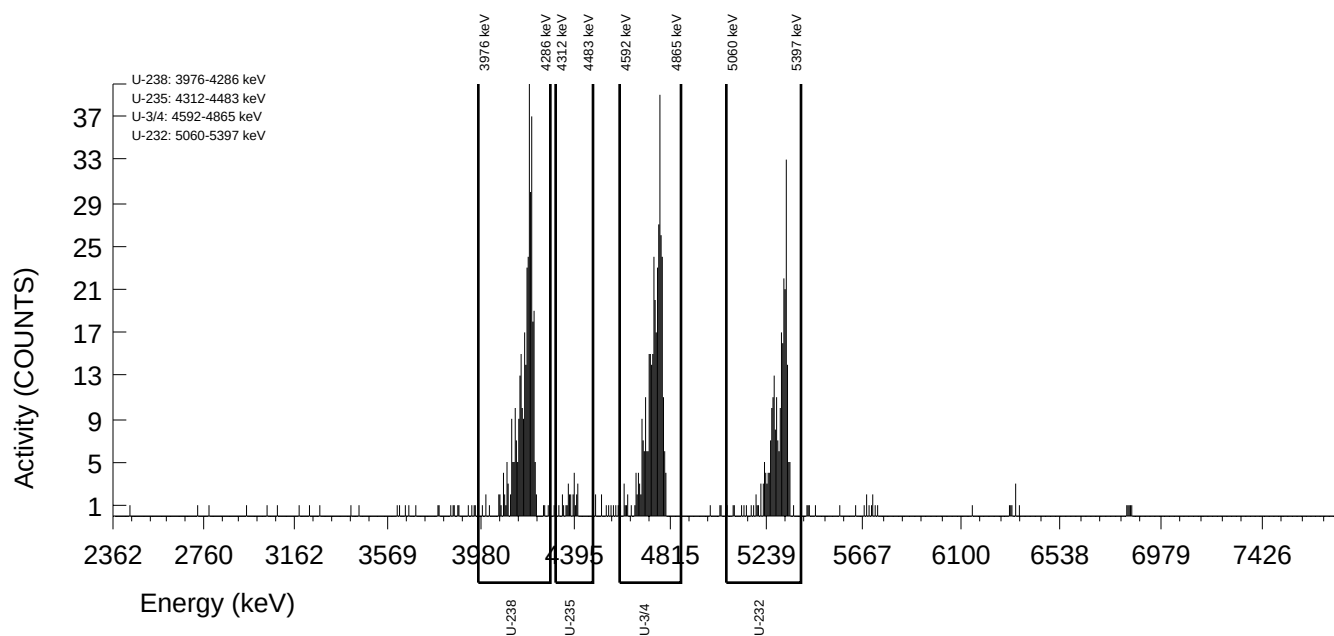
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333141 SAMPLE ID : S1205226006_UU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 74.8 +/-7.142 %	CHAMBER : 012 DETECTOR S/N : 158176 AVERAGE %EFFICIENCY : 31.1442 AVERAGE %EFF ERROR : 0.6021 COUNT DATE : 03-Nov-2022 08:50:15 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B012.CNF;2513 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W012.CNF;660 CAL DATE : 02-Nov-2022
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4715E+00 dpm RESULTS : 3.3444E+00 dpm	LCSD ID 1600-O NUCLIDE U-238 NOMINAL (pCi/F) 2.4083E+01 % RECOVERY 101.332	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5293.24	24.414	255.000	249.960	5.040	2.2450	100.000	1.73E+01	3.32E+00	7.75E-01	2.84E-01	2.17E+00
U-3/4	4763.02	4745.84	38.777	351.000	347.521	2.640	1.6248	100.000	2.40E+01	4.33E+00	6.68E-01	2.30E-01	2.54E+00
U-235	4391.00	4379.84	43.656	25.000	24.280	0.720	0.8485	80.900	2.07E+00	9.08E-01	5.21E-01	1.33E-01	8.56E-01
U-238	4184.73	4176.79	25.838	355.000	353.560	1.440	1.2000	100.000	2.44E+01	4.38E+00	5.11E-01	1.52E-01	2.55E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.839 +/-0.025)



Batch 2333142 Check-list

This check-list was completed on 07-NOV-22 by Melanie Aycok

This batch was reviewed by Jessica Davis on 07-NOV-22 and Melanie Aycok on 07-NOV-22.

Batch ID:
2333142

Product:
ASP__THF

Description: Alpha Spec Thorium
GL-RAD-A-038

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Thorium

Batch ID: 2333142

Analyst: Brendon Viquez (BV1)
Prep: Brendon Viquez (BV1)
Michael Potts (MP2)

Method: DOE EML HASL-300, Th-01-RC
Modified

Lab SOP: GL-RAD-A-038 REV# 18

Instrument: GFC-B742840386

Due Dates for Lab: 02-NOV-2022

Package: 03-NOV-2022

SDG: 03-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205226008	Thorium-232 AS SPIKE	1513-C	.1	mL
LCSD	1205226009	Thorium-232 AS SPIKE	1513-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	597531001	01-NOV-2022	1	30.16	0.11118
2	597531002	01-NOV-2022	1	30.23	0.11208
3	597531003	01-NOV-2022	1	30.16	0.11398
4	597533001	01-NOV-2022	1	30.18	0.11728
5	597533002	01-NOV-2022	1	30.01	0.11587
6	597533003	01-NOV-2022	1	30.25	0.11461
7	597533004	01-NOV-2022	1	30.05	0.11444
8	597533005	01-NOV-2022	1	30.04	0.11373
9	1205226007 MB	01-NOV-2022	1		0.11728
10	1205226008 LCS	01-NOV-2022	1		0.11728
11	1205226009 LCSD	01-NOV-2022	1		0.11728

Reagent/Solvent Lot ID	Description	Amount
WORK 1845-G	Thorium-229 AS TRACER, RASP	.1 mL

Comments:

Pipet ID: RAD-ASP-184002Z
Data Entry Date2: 01-NOV-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

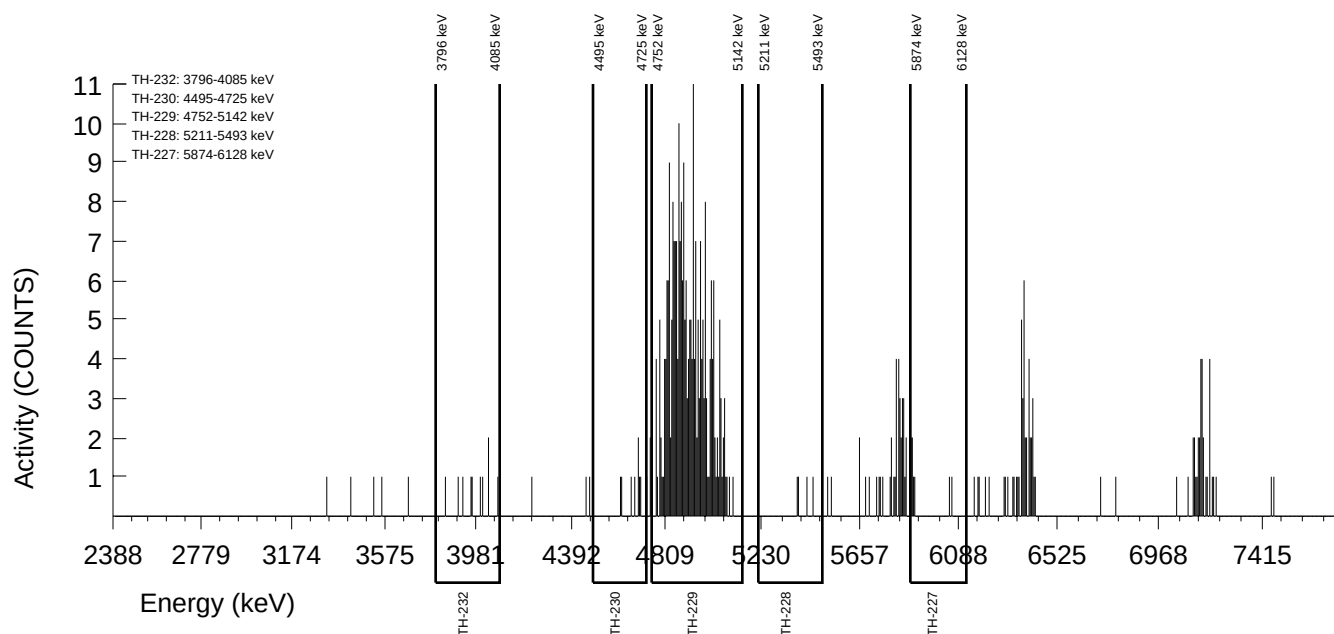
BATCH NUMBER : 2333142 SAMPLE ID : S0597531001_TH SAMPLE QTY : 0.111 F +/-0.899 % SAMPLE DATE : 26-Sep-2022 00:00:00 ANALYST : MP2 % YIELD : 59.6 +/-6.702 %	CHAMBER : 037 DETECTOR S/N : 140606 AVERAGE %EFFICIENCY : 37.7309 AVERAGE %EFF ERROR : 0.7264 COUNT DATE : 03-Nov-2022 12:02:40 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH BKG FILE : B037.CNF;2491 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W037.CNF;693 CAL DATE : 03-Nov-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8636E+00 dpm RESULTS : 2.8997E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5944.31	14.542	10.000	5.680	4.320	2.0785	57.440	3.10E+00	3.75E+00	5.80E+00	2.08E+00	3.72E+00
TH-228	5363.00	5413.38	67.862	4.000	1.585	2.400	1.5492	99.940	1.24E-01	3.63E-01	6.78E-01	2.22E-01	3.63E-01
TH-229	4900.00	4909.65	190.863	263.000	261.320	1.680	1.2961	99.520	1.97E+01	3.63E+00	5.84E-01	1.79E-01	2.40E+00
TH-230	4671.39	4680.76	36.355	11.000	7.508	1.920	1.3856	99.700	5.65E-01	5.30E-01	7.18E-01	2.46E-01	5.22E-01
TH-232	3972.00	3971.96	4.847	10.000	9.175	0.720	0.8485	100.000	6.89E-01	5.02E-01	4.72E-01	1.23E-01	4.93E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.015 +/-0.000)
 TH-230 (1.572 +/-0.024)
 TH-232 (0.105 +/-0.002)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

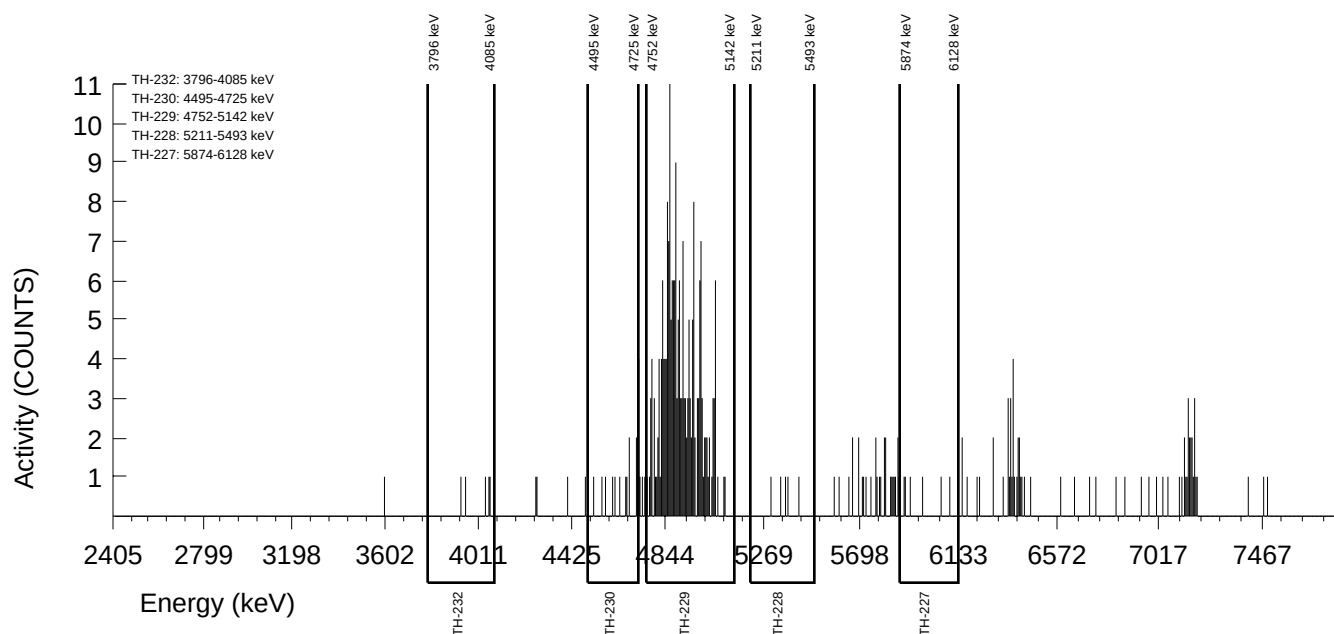
BATCH NUMBER : 2333142 SAMPLE ID : S0597531002_TH SAMPLE QTY : 0.112 F +/-0.892 % SAMPLE DATE : 26-Sep-2022 00:00:00 ANALYST : MP2 % YIELD : 49.6 +/-7.431 %	CHAMBER : 038 DETECTOR S/N : 72532 AVERAGE %EFFICIENCY : 36.3132 AVERAGE %EFF ERROR : 0.6996 COUNT DATE : 03-Nov-2022 12:02:40 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH BKG FILE : B038.CNF;2476 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W038.CNF;660 CAL DATE : 03-Nov-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8636E+00 dpm RESULTS : 2.4143E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5958.92	0.000	7.000	5.080	1.920	1.3856	57.440	3.43E+00	3.90E+00	5.46E+00	1.72E+00	3.87E+00
TH-228	5363.00	5366.91	117.326	5.000	2.108	2.880	1.6971	99.940	2.04E-01	4.93E-01	8.91E-01	3.01E-01	4.92E-01
TH-229	4900.00	4909.59	216.727	213.000	209.400	3.600	1.8974	99.520	1.95E+01	3.99E+00	9.29E-01	3.24E-01	2.68E+00
TH-230	4671.39	4662.38	0.000	17.000	14.780	0.960	0.9798	99.700	1.38E+00	8.13E-01	7.59E-01	2.40E-01	7.81E-01
TH-232	3972.00	4015.03	127.103	5.000	4.436	0.480	0.6928	100.000	4.12E-01	4.57E-01	5.31E-01	1.26E-01	4.52E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.012 +/-0.000)
 TH-230 (1.260 +/-0.020)
 TH-232 (0.084 +/-0.001)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

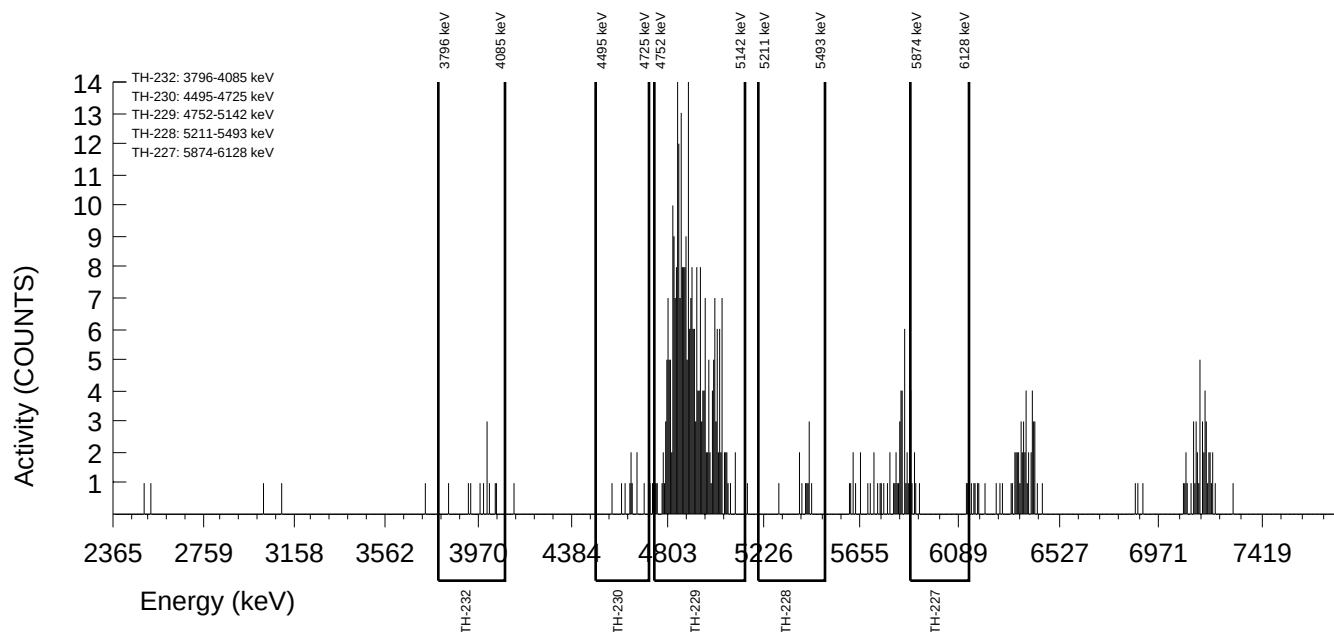
BATCH NUMBER : 2333142 SAMPLE ID : S0597531003_TH SAMPLE QTY : 0.114 F +/-0.877 % SAMPLE DATE : 26-Sep-2022 00:00:00 ANALYST : MP2 % YIELD : 71.3 +/-6.278 %	CHAMBER : 039 DETECTOR S/N : 158115 AVERAGE %EFFICIENCY : 36.8868 AVERAGE %EFF ERROR : 0.7104 COUNT DATE : 03-Nov-2022 12:02:40 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH BKG FILE : B039.CNF;2510 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W039.CNF;726 CAL DATE : 03-Nov-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8636E+00 dpm RESULTS : 3.4660E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5930.41	0.000	11.000	6.680	4.320	2.0785	57.440	3.05E+00	3.26E+00	4.84E+00	1.74E+00	3.23E+00
TH-228	5363.00	5404.62	42.813	11.000	9.783	1.200	1.0954	99.940	6.37E-01	4.56E-01	4.58E-01	1.31E-01	4.49E-01
TH-229	4900.00	4908.27	115.351	308.000	305.360	2.640	1.6248	99.520	1.92E+01	3.31E+00	5.64E-01	1.87E-01	2.17E+00
TH-230	4671.39	4648.56	31.804	11.000	7.723	1.440	1.2000	99.700	4.85E-01	4.41E-01	5.82E-01	1.97E-01	4.34E-01
TH-232	3972.00	3985.78	4.893	11.000	9.917	0.960	0.9798	100.000	6.21E-01	4.38E-01	4.24E-01	1.18E-01	4.30E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.017 +/-0.000)
TH-230 (1.837 +/-0.028)
TH-232 (0.123 +/-0.002)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

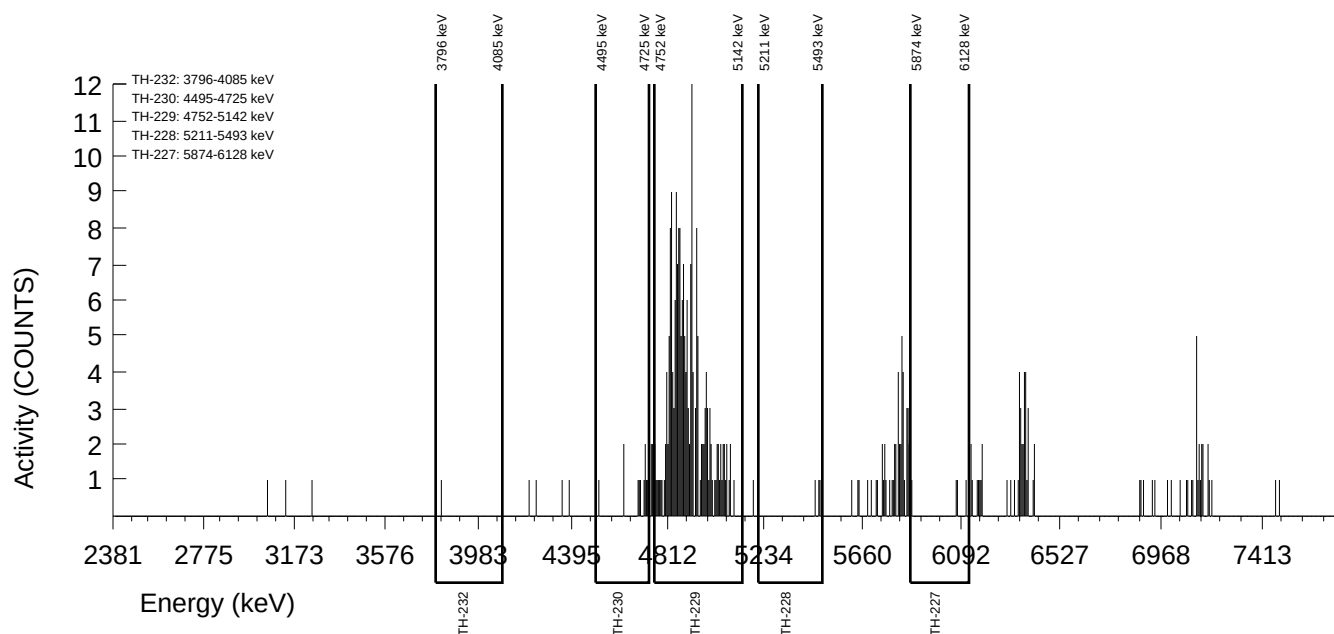
BATCH NUMBER : 2333142 SAMPLE ID : S1205226007_TH SAMPLE QTY : 0.117 F +/-0.853 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : MP2 % YIELD : 52.2 +/-7.540 %	CHAMBER : 045 DETECTOR S/N : 78783 AVERAGE %EFFICIENCY : 33.5256 AVERAGE %EFF ERROR : 0.6472 COUNT DATE : 03-Nov-2022 12:02:41 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : TH BKG FILE : B045.CNF;2487 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W045.CNF;658 CAL DATE : 03-Nov-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8635E+00 dpm RESULTS : 2.5371E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	6038.74	219.944	4.000	-0.800	4.800	2.1909	57.440	-1.40E-01	8.57E-01	1.93E+00	7.04E-01	8.56E-01
TH-228	5363.00	5469.77	24.438	3.000	0.349	2.640	1.6248	99.940	3.20E-02	3.90E-01	8.23E-01	2.74E-01	3.90E-01
TH-229	4900.00	4898.64	114.045	207.000	203.160	3.840	1.9596	99.520	1.87E+01	3.87E+00	9.36E-01	3.30E-01	2.61E+00
TH-230	4671.39	4671.15	95.309	11.000	7.378	2.400	1.5492	99.700	6.77E-01	6.51E-01	8.94E-01	3.09E-01	6.39E-01
TH-232	3972.00	3819.60	4.888	1.000	-0.042	0.960	0.9798	100.000	-3.82E-03	2.72E-01	6.14E-01	1.70E-01	2.71E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.011 +/-0.000)
TH-230 (1.222 +/-0.019)
TH-232 (0.082 +/-0.001)



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ALPHA SPECTROSCOPY REPORT

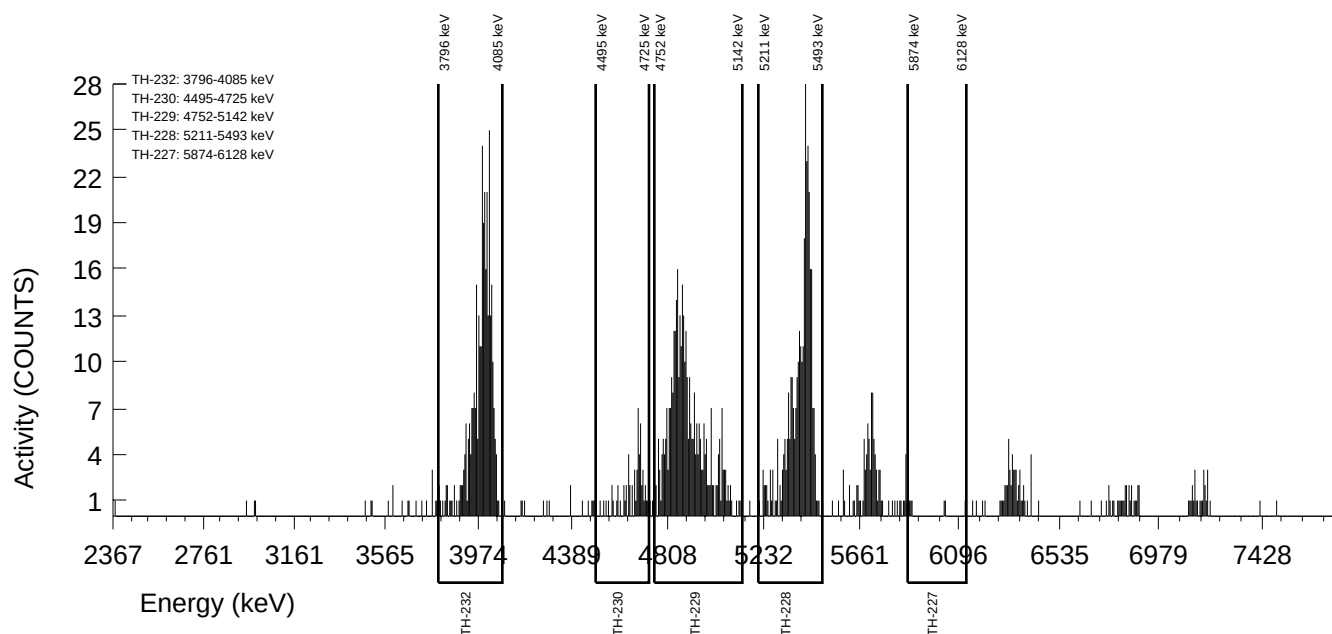
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2333142 SAMPLE ID : S1205226008_TH SAMPLE QTY : 0.117 F +/-0.853 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : MP2 % YIELD : 86.9 +/-5.868 %	CHAMBER : 047 DETECTOR S/N : 80064 AVERAGE %EFFICIENCY : 35.4142 AVERAGE %EFF ERROR : 0.6826 COUNT DATE : 03-Nov-2022 12:02:41 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : TH BKG FILE : B047.CNF;2493 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W047.CNF;664 CAL DATE : 03-Nov-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8635E+00 dpm RESULTS : 4.2243E+00 dpm	LCS ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.6933E+01 % RECOVERY 101.360	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
TH-227	5994.04	5958.59	0.000	7.000	3.880	3.120	1.7664	57.440	3.87E-01	5.82E-01	9.44E-01	3.23E-01	5.80E-01
TH-228	5363.00	5393.79	33.287	330.000	327.820	2.160	1.4697	99.940	1.71E+01	2.80E+00	4.39E-01	1.41E-01	1.86E+00
TH-229	4900.00	4899.66	77.578	359.000	357.320	1.680	1.2961	99.520	1.87E+01	3.00E+00	4.05E-01	1.24E-01	1.95E+00
TH-230	4671.39	4654.17	52.672	58.000	54.410	1.440	1.2000	99.700	2.84E+00	8.67E-01	4.97E-01	1.70E-01	7.88E-01
TH-232	3972.00	3987.80	67.677	331.000	329.896	0.960	0.9798	100.000	1.72E+01	2.80E+00	3.54E-01	9.89E-02	1.86E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.020 +/-0.000)
 TH-230 (2.150 +/-0.033)
 TH-232 (0.144 +/-0.002)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

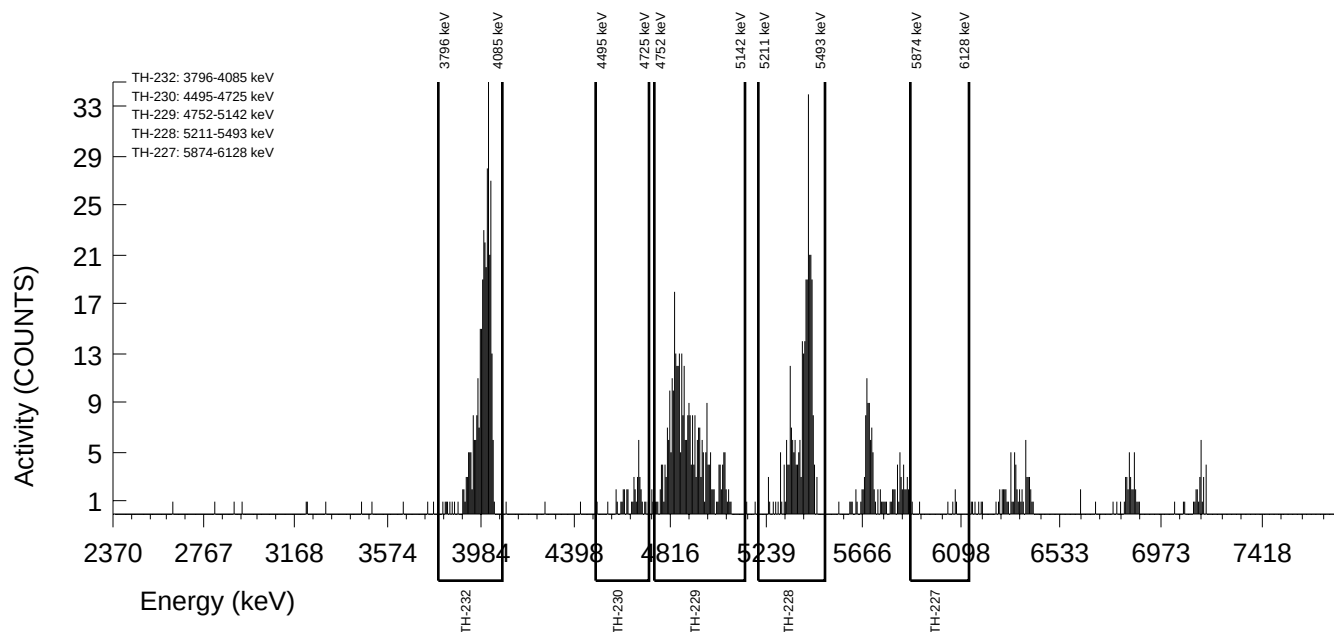
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2333142 SAMPLE ID : S1205226009_TH SAMPLE QTY : 0.117 F +/-0.853 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : MP2 % YIELD : 90.4 +/-6.044 %	CHAMBER : 048 DETECTOR S/N : 140242 AVERAGE %EFFICIENCY : 32.0519 AVERAGE %EFF ERROR : 0.6192 COUNT DATE : 03-Nov-2022 12:02:41 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : TH BKG FILE : B048.CNF;2503 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W048.CNF;743 CAL DATE : 03-Nov-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8635E+00 dpm RESULTS : 4.3947E+00 dpm	LCSD ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.6933E+01 % RECOVERY 106.113	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
TH-227	5994.04	6015.54	7.399	7.000	4.840	2.160	1.4697	57.440	5.12E-01	6.11E-01	8.88E-01	2.85E-01	6.08E-01
TH-228	5363.00	5399.09	27.535	279.000	274.181	4.800	2.1909	99.940	1.52E+01	2.64E+00	6.12E-01	2.23E-01	1.82E+00
TH-229	4900.00	4897.21	62.895	341.000	336.440	4.560	2.1354	99.520	1.87E+01	3.09E+00	6.01E-01	2.17E-01	2.02E+00
TH-230	4671.39	4649.28	9.866	41.000	34.896	4.080	2.0199	99.700	1.93E+00	7.57E-01	6.52E-01	2.43E-01	7.13E-01
TH-232	3972.00	3994.54	39.728	327.000	325.185	1.680	1.2961	100.000	1.80E+01	2.99E+00	4.37E-01	1.35E-01	1.96E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.019 +/-0.000)
TH-230 (2.024 +/-0.031)
TH-232 (0.135 +/-0.002)



Batch 2333138 Check-list

This check-list was completed on 03-NOV-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 03-NOV-22 and Jessica Davis on 03-NOV-22.

Batch ID:
2333138

Product:
ASP_PUF

Description: Alpha Spec Plutonium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?		No	
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?		No	
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium

Batch ID: 2333138

Analyst: Brendon Viquez (BV1)

Method: DOE EML HASL-300, Pu-11-RC
Modified

Lab SOP: GL-RAD-A-011 REV# 28

Instrument: GFC-B742840386

Due Dates for Lab: 02-NOV-2022

Package: 03-NOV-2022

SDG: 03-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205225999	Plutonium-239 AS SPIKE	1472-C	.1	mL
LCSD	1205226000	Plutonium-239 AS SPIKE	1472-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	597531001	01-NOV-2022	1	30.16	0.11118
2	597531002	01-NOV-2022	1	30.21	0.11201
3	597531003	01-NOV-2022	1	30.02	0.11345
4	597533001	01-NOV-2022	1	30.04	0.11674
5	597533002	01-NOV-2022	1	30.05	0.11602
6	597533003	01-NOV-2022	1	30.23	0.11454
7	597533004	01-NOV-2022	1	30.15	0.11482
8	597533005	01-NOV-2022	1	30.3	0.11471
9	1205225998 MB	01-NOV-2022	1		0.11674
10	1205225999 LCS	01-NOV-2022	1		0.11674
11	1205226000 LCSD	01-NOV-2022	1		0.11674

Reagent/Solvent Lot ID	Description	Amount
WORK 2022-A	Plutonium-242 AS TRACER	.1 ml

Comments:

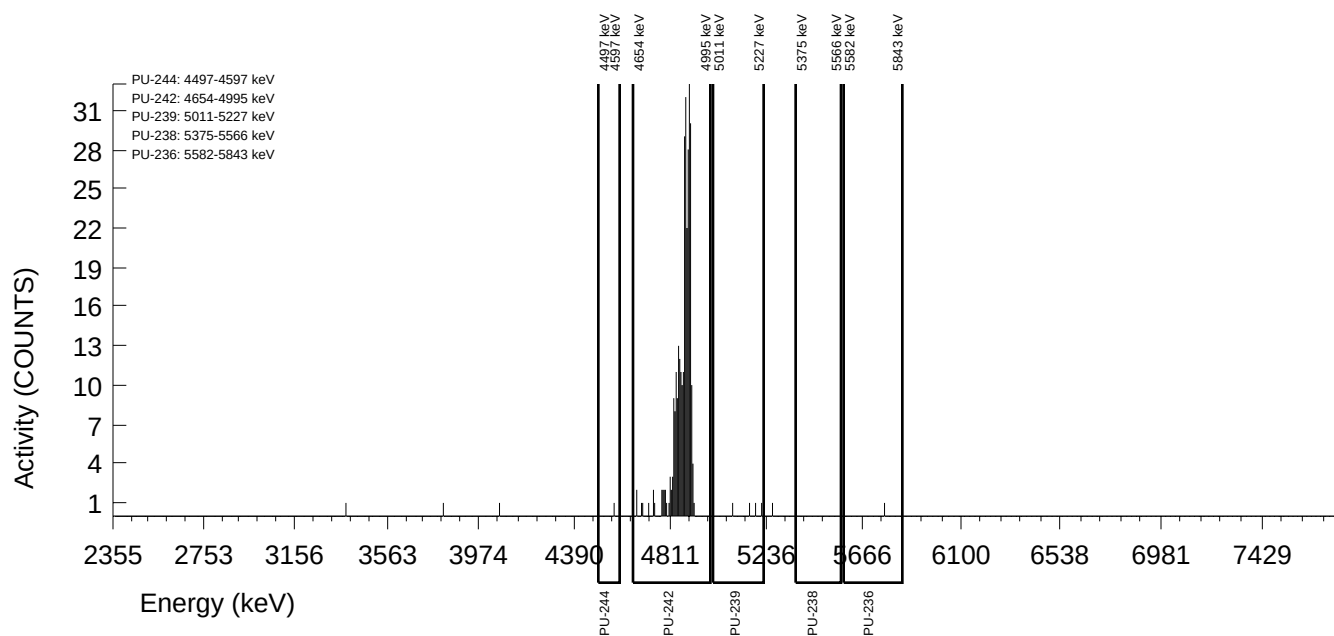
Pipet ID: RAD-ASP-184002Z
Analyzed With: Am , U
Data Entry Date2: 01-NOV-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333138 SAMPLE ID : S0597531001_PU SAMPLE QTY : 0.111 F +/-0.899 % SAMPLE DATE : 26-Sep-2022 08:18:00 ANALYST : BV1 % YIELD : 96.6 +/-6.120 %	CHAMBER : 089 DETECTOR S/N : 79988 AVERAGE %EFFICIENCY : 30.9886 AVERAGE %EFF ERROR : 0.5992 COUNT DATE : 03-Nov-2022 10:26:51 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B089.CNF;2092 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W089.CNF;548 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 4.0934E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5762.89	4.947	1.000	0.520	0.480	0.6928	100.000	3.01E-02	1.67E-01	3.20E-01	7.34E-02	1.67E-01
PU-238	5486.00	5470.34	0.000	0.000	-0.960	0.960	0.9798	99.900	-5.42E-02	1.26E-01	3.72E-01	1.01E-01	1.26E-01
PU-239	5155.00	5167.95	123.678	4.000	2.080	1.920	1.3856	99.900	1.17E-01	2.60E-01	4.56E-01	1.43E-01	2.60E-01
PU-242	4870.00	4872.32	31.510	309.000	304.440	4.560	2.1354	100.000	1.72E+01	2.92E+00	6.10E-01	2.21E-01	1.95E+00
PU-244	4589.00	4568.51	4.947	1.000	0.280	0.720	0.8485	99.900	1.58E-02	1.65E-01	3.45E-01	8.77E-02	1.65E-01

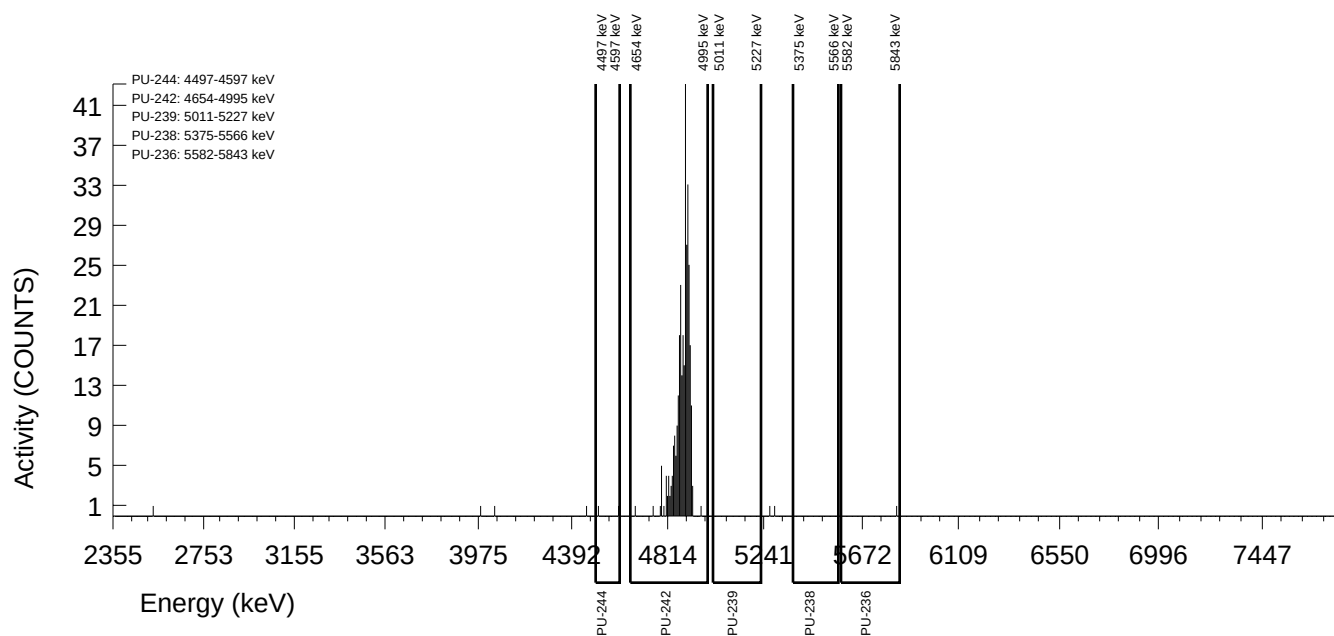


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333138 SAMPLE ID : S0597531002_PU SAMPLE QTY : 0.112 F +/-0.893 % SAMPLE DATE : 26-Sep-2022 08:25:00 ANALYST : BV1 % YIELD : 88.3 +/-6.000 %	CHAMBER : 090 DETECTOR S/N : 158119 AVERAGE %EFFICIENCY : 35.1247 AVERAGE %EFF ERROR : 0.6772 COUNT DATE : 03-Nov-2022 10:26:51 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B090.CNF;2093 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W090.CNF;540 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.7410E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5829.79	4.940	1.000	-0.200	1.200	1.0954	100.000	-1.11E-02	1.66E-01	3.89E-01	1.11E-01	1.66E-01
PU-238	5486.00	5470.33	0.000	0.000	-0.960	0.960	0.9798	99.900	-5.20E-02	1.21E-01	3.57E-01	9.71E-02	1.20E-01
PU-239	5155.00	5118.67	0.000	0.000	-2.880	2.880	1.6971	99.900	-1.56E-01	1.40E-01	4.98E-01	1.68E-01	1.40E-01
PU-242	4870.00	4881.01	38.223	318.000	315.360	2.640	1.6248	100.000	1.70E+01	2.85E+00	4.84E-01	1.61E-01	1.89E+00
PU-244	4589.00	4552.13	0.000	2.000	2.000	0.000	1.0000	99.900	1.08E-01	1.86E-01	1.62E-01	9.91E-02	1.85E-01

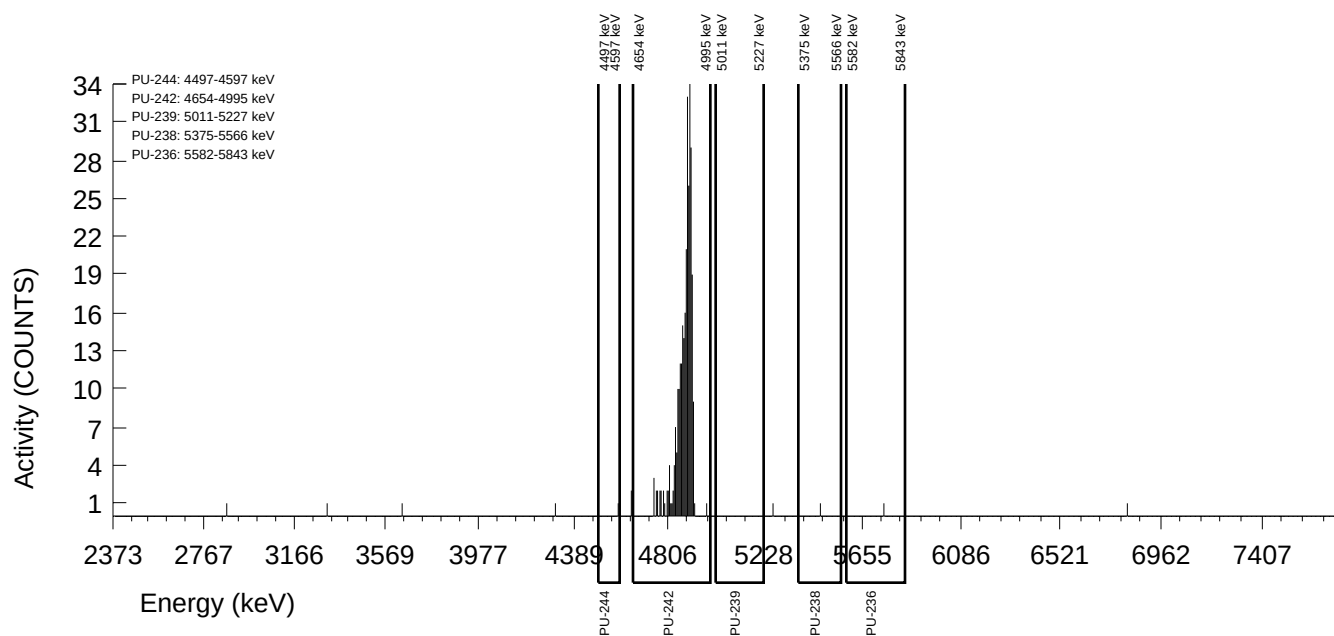


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333138 SAMPLE ID : S0597531003_PU SAMPLE QTY : 0.113 F +/-0.881 % SAMPLE DATE : 26-Sep-2022 09:00:00 ANALYST : BV1 % YIELD : 86.6 +/-6.170 %	CHAMBER : 092 DETECTOR S/N : 158160 AVERAGE %EFFICIENCY : 33.9981 AVERAGE %EFF ERROR : 0.6559 COUNT DATE : 03-Nov-2022 10:26:51 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B092.CNF;2101 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W092.CNF;586 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.6669E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5751.15	4.894	1.000	-0.920	1.920	1.3856	100.000	-5.30E-02	1.80E-01	4.66E-01	1.46E-01	1.79E-01
PU-238	5486.00	5472.79	4.894	1.000	-1.160	2.160	1.4697	99.900	-6.53E-02	1.77E-01	4.72E-01	1.52E-01	1.77E-01
PU-239	5155.00	5118.68	0.000	0.000	-3.840	3.840	1.9596	99.900	-2.16E-01	1.55E-01	5.73E-01	2.02E-01	1.55E-01
PU-242	4870.00	4876.87	29.364	304.000	299.200	4.800	2.1909	100.000	1.68E+01	2.89E+00	6.20E-01	2.26E-01	1.93E+00
PU-244	4589.00	4586.89	4.894	1.000	0.280	0.720	0.8485	99.900	1.58E-02	1.65E-01	3.44E-01	8.75E-02	1.65E-01



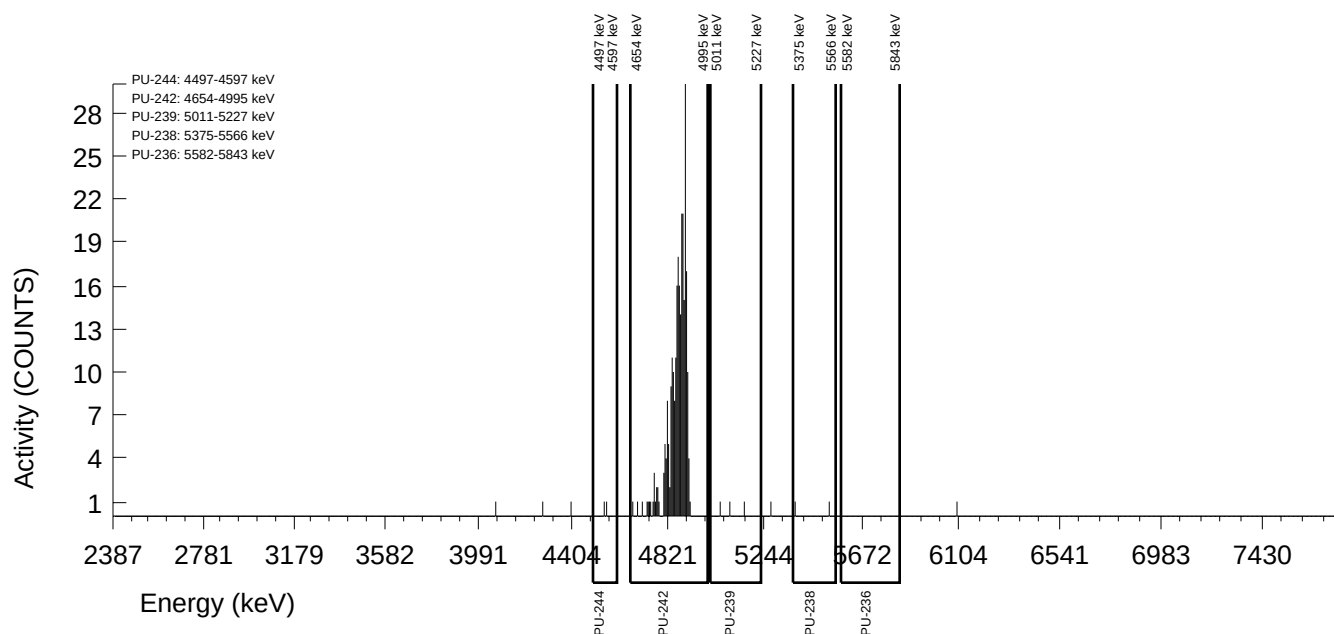
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333138 SAMPLE ID : S1205225998_PU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 74.3 +/-6.497 %	CHAMBER : 099 DETECTOR S/N : 158120 AVERAGE %EFFICIENCY : 35.6810 AVERAGE %EFF ERROR : 0.6877 COUNT DATE : 03-Nov-2022 10:26:52 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B099.CNF;2050 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W099.CNF;551 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.1473E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY	PEAK	PEAK	GROSS	NET	BKG	BKG	%ABUN	ACTIVITY	1.96-sigma	MDA	Lc	1.96-sigma
	ENERGY	ENERGY	FWHM	AREA	AREA	AREA	StDev		pCi/F	TPU	pCi/F	pCi/F	cnt Unc
PU-236	5749.00	5712.23	0.000	0.000	-2.640	2.640	1.6248	100.000	-1.60E-01	1.55E-01	5.44E-01	1.81E-01	1.55E-01
PU-238	5486.00	5457.20	141.784	2.000	0.800	1.200	1.0954	99.900	4.86E-02	2.18E-01	4.26E-01	1.22E-01	2.18E-01
PU-239	5155.00	5102.63	102.671	3.000	0.840	2.160	1.4697	99.900	5.10E-02	2.55E-01	5.09E-01	1.63E-01	2.55E-01
PU-242	4870.00	4865.60	41.487	276.000	269.520	6.480	2.5456	100.000	1.63E+01	2.95E+00	7.48E-01	2.83E-01	1.98E+00
PU-244	4589.00	4549.27	14.667	2.000	1.520	0.480	0.6928	99.900	9.23E-02	2.12E-01	3.36E-01	7.71E-02	2.12E-01

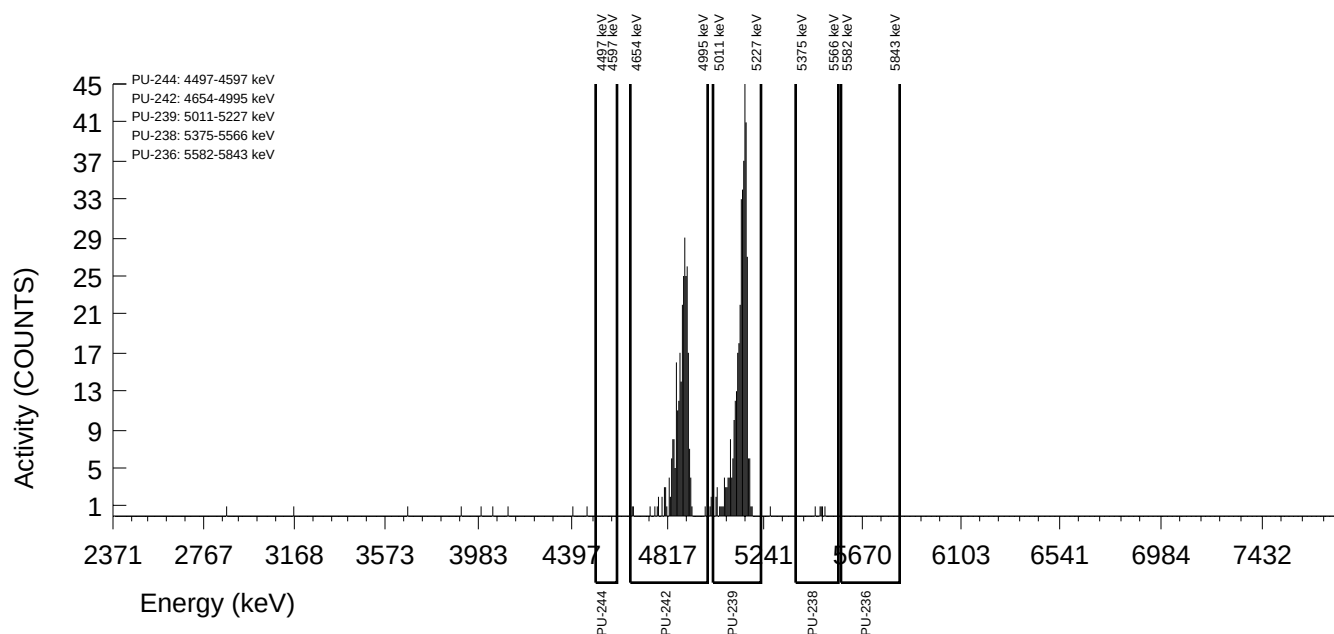


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333138 SAMPLE ID : S1205225999_PU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 79.1 +/-6.527 %	CHAMBER : 100 DETECTOR S/N : 155848 AVERAGE %EFFICIENCY : 33.4290 AVERAGE %EFF ERROR : 0.6452 COUNT DATE : 03-Nov-2022 10:26:52 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B100.CNF;2050 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W100.CNF;624 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.3509E+00 dpm	LCS ID 1472-C NUCLIDE PU-239 NOMINAL (pCi/F) 1.7633E+01 % RECOVERY 126.365	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.24	0.000	0.000	-3.360	3.360	1.8330	100.000	-2.05E-01	1.63E-01	5.92E-01	2.05E-01	1.63E-01
PU-238	5486.00	5489.97	44.252	5.000	2.600	2.400	1.5492	99.900	1.58E-01	3.08E-01	5.28E-01	1.73E-01	3.07E-01
PU-239	5155.00	5137.13	30.332	368.000	366.080	1.920	1.3856	99.900	2.23E+01	3.77E+00	4.92E-01	1.54E-01	2.29E+00
PU-242	4870.00	4873.55	51.069	277.000	268.840	8.160	2.8566	100.000	1.63E+01	2.97E+00	8.19E-01	3.18E-01	1.99E+00
PU-244	4589.00	4546.97	0.000	0.000	-0.240	0.240	0.4899	99.900	-1.46E-02	1.26E-01	2.92E-01	5.46E-02	1.26E-01

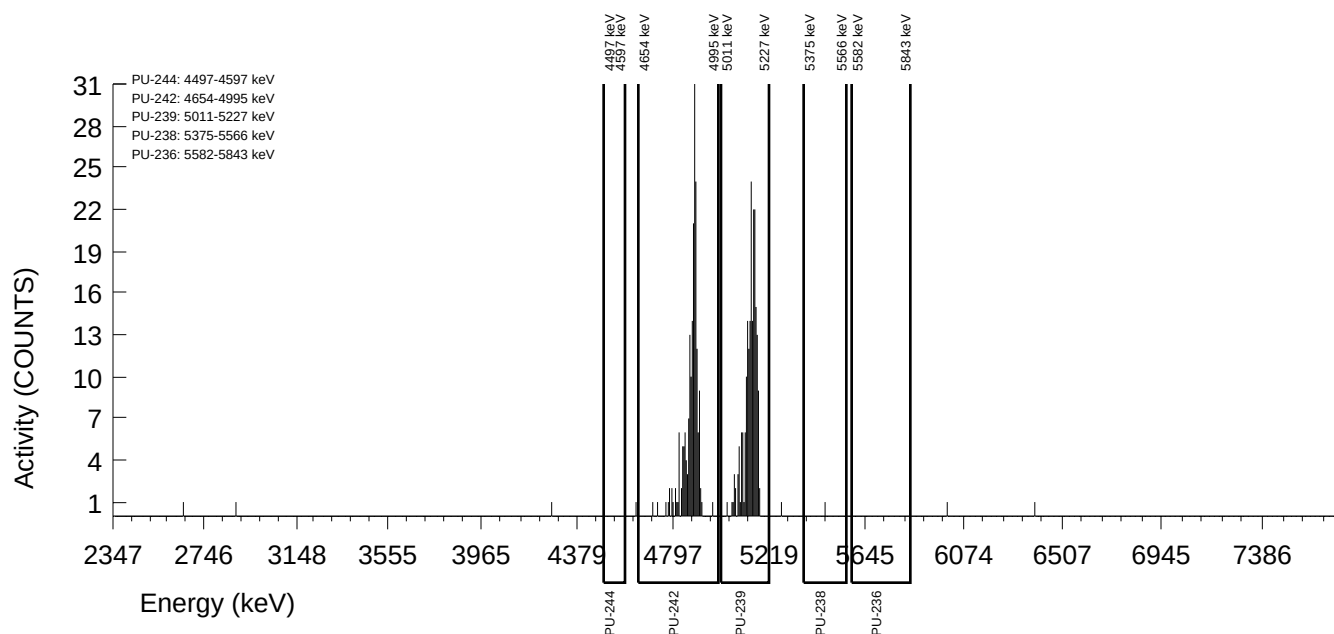


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333138 SAMPLE ID : S1205226000_PU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 72.1 +/-7.564 %	CHAMBER : 213 DETECTOR S/N : 155838 AVERAGE %EFFICIENCY : 26.2169 AVERAGE %EFF ERROR : 0.5092 COUNT DATE : 03-Nov-2022 10:12:56 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B213.CNF;1105 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W213.CNF;333 CAL DATE : 20-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.0534E+00 dpm	LCSD ID 1472-C NUCLIDE PU-239 NOMINAL (pCi/F) 1.7633E+01 % RECOVERY 99.175	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.27	0.000	0.000	-0.960	0.960	0.9798	100.000	-8.18E-02	1.90E-01	5.62E-01	1.53E-01	1.90E-01
PU-238	5486.00	5468.54	4.960	1.000	-2.120	3.120	1.7664	99.900	-1.81E-01	2.80E-01	8.07E-01	2.76E-01	2.80E-01
PU-239	5155.00	5141.25	43.400	207.000	205.320	1.680	1.2961	99.900	1.75E+01	3.61E+00	6.60E-01	2.02E-01	2.41E+00
PU-242	4870.00	4880.94	17.331	195.000	192.120	2.880	1.6971	100.000	1.63E+01	3.44E+00	7.84E-01	2.65E-01	2.34E+00
PU-244	4589.00	4546.97	0.000	0.000	-0.720	0.720	0.8485	99.900	-6.13E-02	1.86E-01	5.20E-01	1.32E-01	1.85E-01



Batch 2333147 Check-list

This check-list was completed on 07-NOV-22 by Melanie Aycock

This batch was reviewed by Jessica Davis on 07-NOV-22 and Melanie Aycock on 07-NOV-22.

Batch ID: 2333147

Product: ASP10POF

Description: Alpha Spec Polonium

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Polonium

Batch ID: 2333147

Analyst: Brendon Viquez (BV1)

Method: DOE EML HASL-300, Po-01-RC
Modified

Lab SOP: GL-RAD-A-016 REV# 19

Instrument: BAL-18550299

Due Dates for Lab: 02-NOV-2022

Package: 03-NOV-2022

SDG: 03-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205226019	Polonium-210 AS SPIKE	2012-A	.1	mL
LCSD	1205226020	Polonium-210 AS SPIKE	2012-A	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (g)	Aliquot (Filter)
1	597531001	31-OCT-2022	.5	0.452	0.20197
2	597531002	31-OCT-2022	.5	0.453	0.20223
3	597531003	31-OCT-2022	.5	0.456	0.20812
4	597533001	31-OCT-2022	.5	0.767	0.20415
5	597533002	31-OCT-2022	.5	0.761	0.20299
6	597533003	31-OCT-2022	.5	0.764	0.20292
7	597533004	31-OCT-2022	.5	0.769	0.20523
8	597533005	31-OCT-2022	.5	0.763	0.20841
9	1205226018 MB	31-OCT-2022	.5		0.20841
10	1205226019 LCS	31-OCT-2022	.5		0.20841
11	1205226020 LCSD	31-OCT-2022	.5		0.20841

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1720-D	Polonium-209 AS TRACER	.1 ml	Data Entry Date2: 31-OCT-2022 00:00

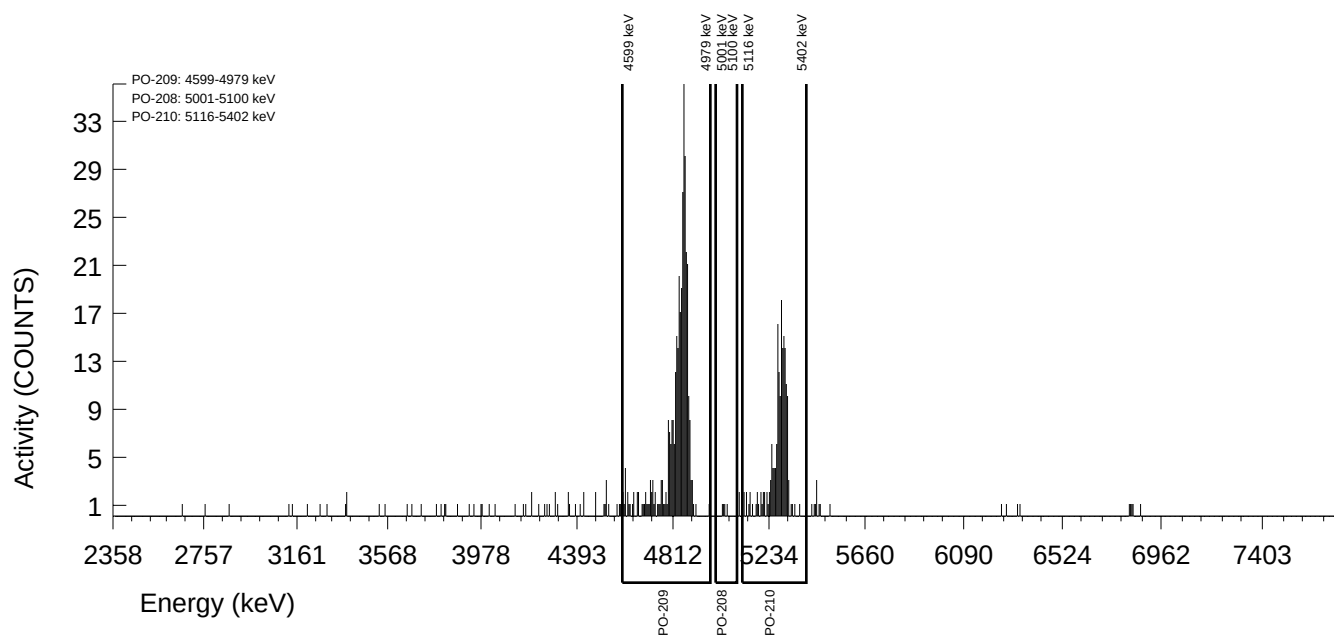
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2333147 SAMPLE ID : S0597531001_PO SAMPLE QTY : 0.202 F +/-0.495 % SAMPLE DATE : 26-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 72.9 +/-5.865 %	CHAMBER : 121 DETECTOR S/N : 155765 AVERAGE %EFFICIENCY : 25.5141 AVERAGE %EFF ERROR : 0.4959 COUNT DATE : 04-Nov-2022 08:35:00 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B121.CNF;1787 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W121.CNF;481 CAL DATE : 14-Oct-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8685E+00 dpm RESULTS : 5.7367E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5042.10	24.836	4.000	4.000	0.000	1.0000	100.000	2.05E-01	2.27E-01	1.54E-01	9.39E-02	2.26E-01
PO-209	4882.00	4831.36	37.781	354.000	350.160	3.840	1.9596	99.740	1.75E+01	2.83E+00	5.10E-01	1.80E-01	1.85E+00
PO-210	5304.38	5277.17	43.924	179.000	174.440	4.560	2.1354	100.000	1.06E+01	2.06E+00	6.59E-01	2.38E-01	1.61E+00

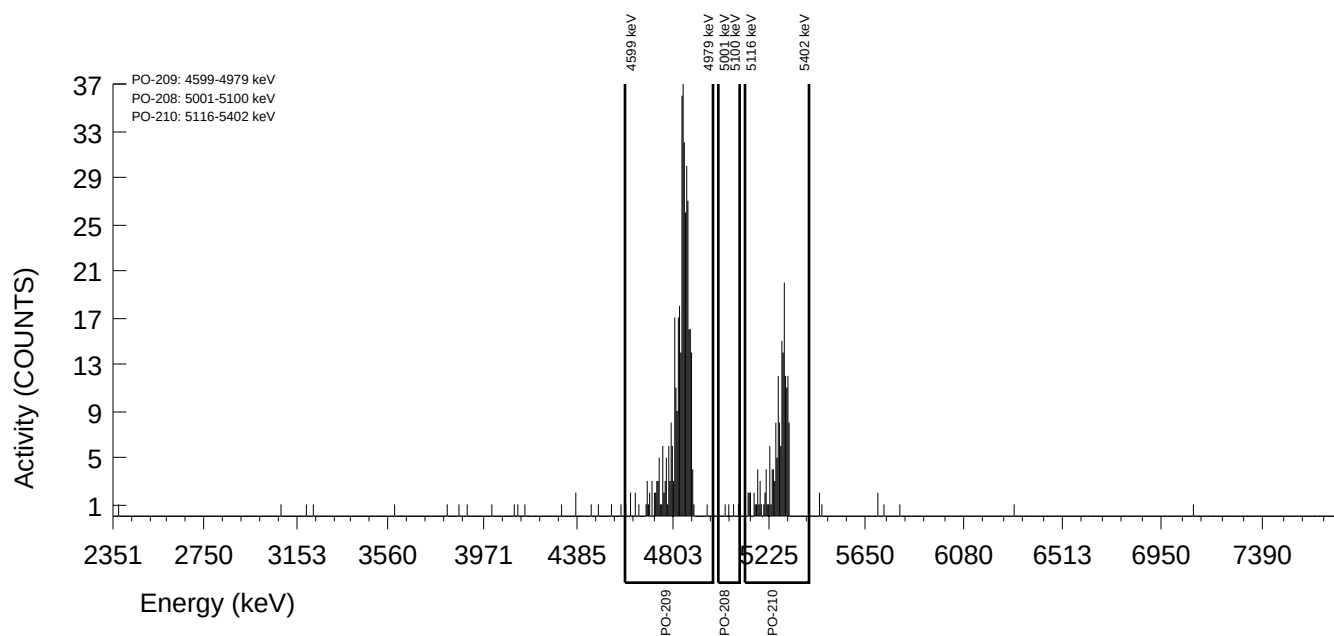


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2333147 SAMPLE ID : S0597531002_PO SAMPLE QTY : 0.202 F +/-0.494 % SAMPLE DATE : 26-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 84.6 +/-5.567 %	CHAMBER : 122 DETECTOR S/N : 155769 AVERAGE %EFFICIENCY : 24.9440 AVERAGE %EFF ERROR : 0.4851 COUNT DATE : 04-Nov-2022 08:35:02 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B122.CNF;1831 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W122.CNF;496 CAL DATE : 14-Oct-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8685E+00 dpm RESULTS : 6.6561E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5062.31	59.610	4.000	4.000	0.000	1.0000	100.000	1.81E-01	2.00E-01	1.35E-01	8.27E-02	1.99E-01
PO-209	4882.00	4834.37	32.628	402.000	397.200	4.800	2.1909	99.740	1.75E+01	2.67E+00	4.87E-01	1.77E-01	1.74E+00
PO-210	5304.38	5266.36	43.643	177.000	173.880	3.120	1.7664	100.000	9.32E+00	1.77E+00	5.08E-01	1.73E-01	1.40E+00

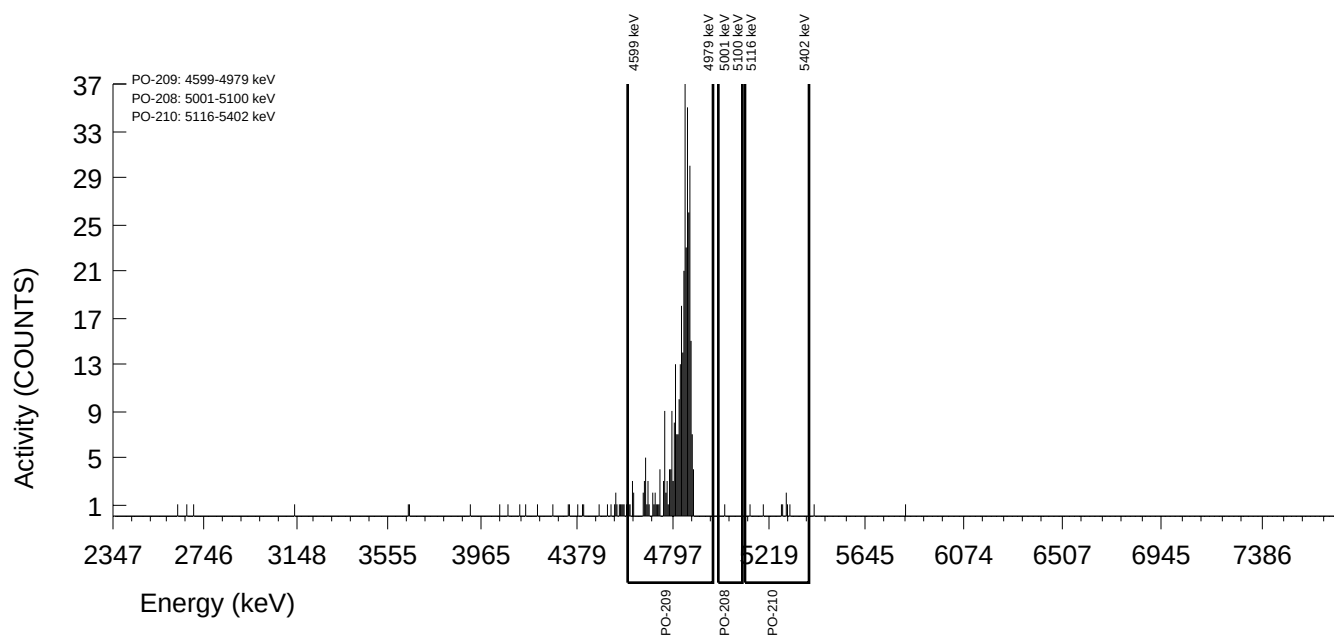


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2333147 SAMPLE ID : S0597531003_PO SAMPLE QTY : 0.208 F +/-0.480 % SAMPLE DATE : 26-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 72.7 +/-5.793 %	CHAMBER : 213 DETECTOR S/N : 155838 AVERAGE %EFFICIENCY : 26.2169 AVERAGE %EFF ERROR : 0.5092 COUNT DATE : 05-Nov-2022 10:14:25 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B213.CNF;1107 BKG DATE : 04-Nov-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W213.CNF;333 CAL DATE : 20-Oct-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8685E+00 dpm RESULTS : 5.7176E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5028.63	4.960	1.000	0.040	0.960	0.9798	100.000	1.94E-03	1.44E-01	3.20E-01	8.72E-02	1.44E-01
PO-209	4882.00	4830.16	30.374	361.000	358.600	2.400	1.5492	99.740	1.70E+01	2.71E+00	4.12E-01	1.35E-01	1.77E+00
PO-210	5304.38	5263.97	7.440	8.000	5.360	2.640	1.6248	100.000	3.11E-01	3.56E-01	5.19E-01	1.73E-01	3.54E-01

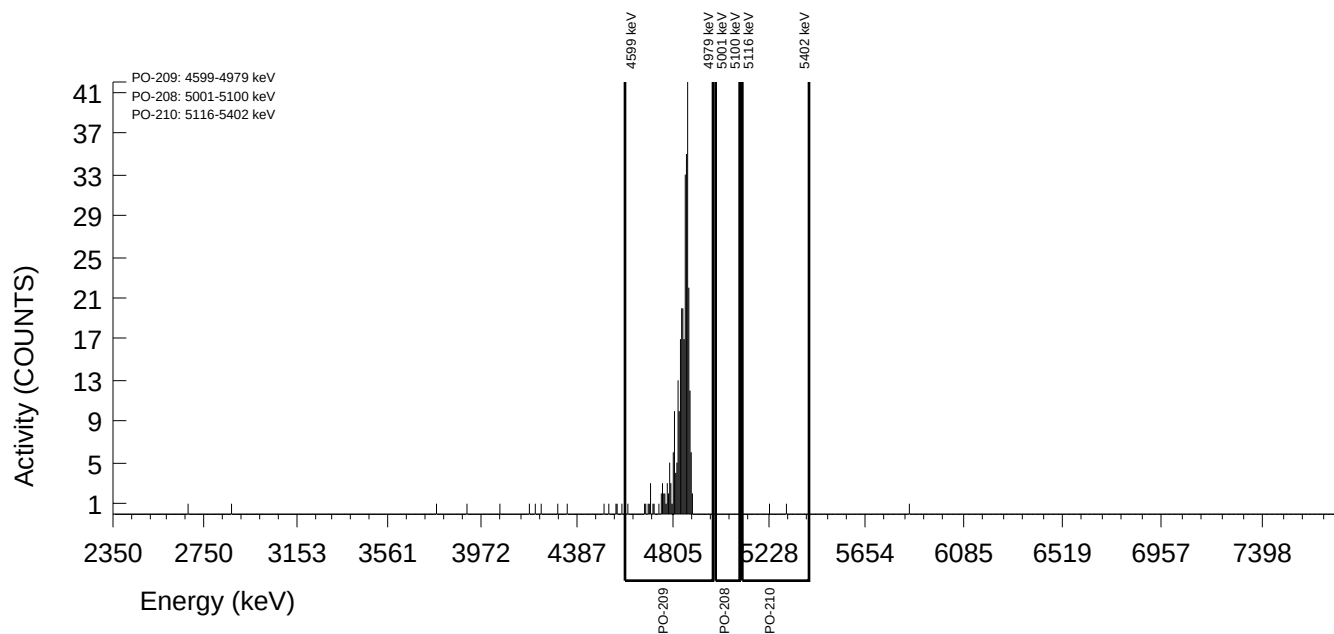


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2333147 SAMPLE ID : S1205226018_PO SAMPLE QTY : 0.208 F +/-0.480 % SAMPLE DATE : 31-Oct-2022 00:00:00 ANALYST : BV1 % YIELD : 59.9 +/-6.187 %	CHAMBER : 215 DETECTOR S/N : 155839 AVERAGE %EFFICIENCY : 27.2396 AVERAGE %EFF ERROR : 0.5285 COUNT DATE : 04-Nov-2022 08:41:21 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B215.CNF;985 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W215.CNF;79 CAL DATE : 20-Oct-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8643E+00 dpm RESULTS : 4.7098E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5050.47	0.000	0.000	-0.480	0.480	0.6928	100.000	-2.66E-02	1.18E-01	3.07E-01	7.03E-02	1.18E-01
PO-209	4882.00	4846.86	19.135	309.000	307.080	1.920	1.3856	99.740	1.70E+01	2.89E+00	4.47E-01	1.40E-01	1.91E+00
PO-210	5304.38	5270.39	74.551	2.000	0.080	1.920	1.3856	100.000	4.52E-03	2.08E-01	4.56E-01	1.43E-01	2.08E-01

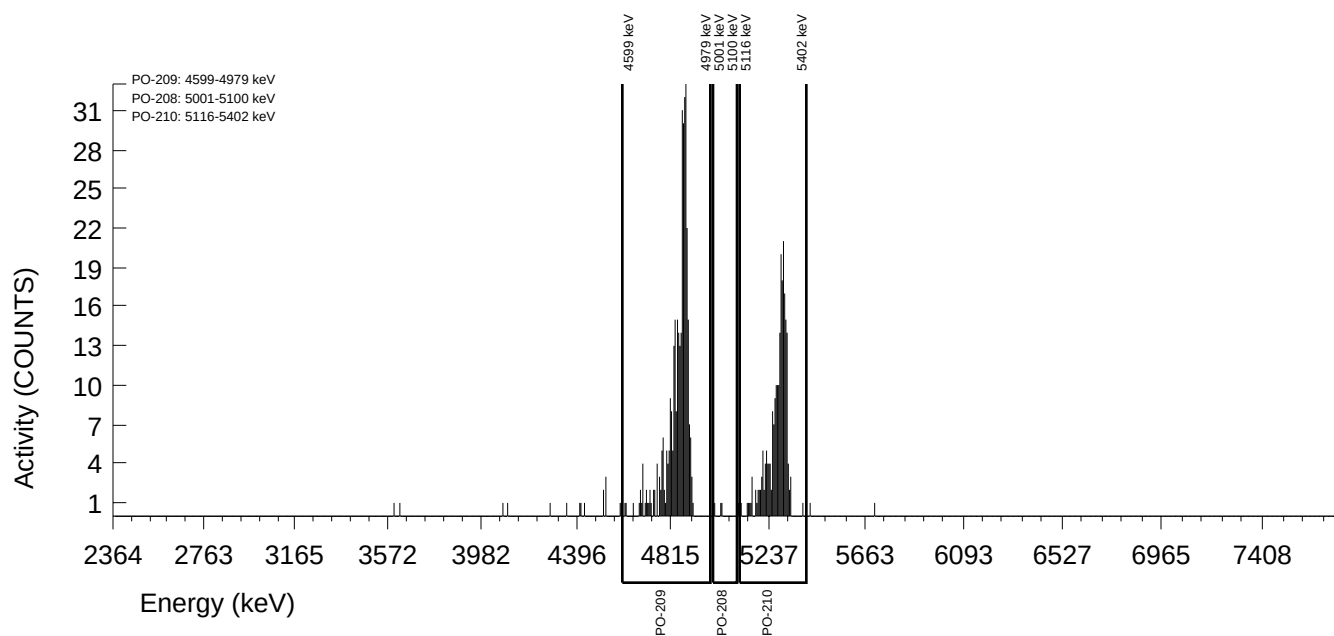


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2333147 SAMPLE ID : S1205226019_PO SAMPLE QTY : 0.208 F +/-0.480 % SAMPLE DATE : 31-Oct-2022 00:00:00 ANALYST : BV1 % YIELD : 71.5 +/-5.839 %	CHAMBER : 217 DETECTOR S/N : 155841 AVERAGE %EFFICIENCY : 26.1786 AVERAGE %EFF ERROR : 0.5084 COUNT DATE : 04-Nov-2022 08:41:24 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B217.CNF;1120 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W217.CNF;75 CAL DATE : 20-Oct-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8643E+00 dpm RESULTS : 5.6233E+00 dpm	LCS ID 2012-A NUCLIDE PO-210 NOMINAL (pCi/F) 1.0151E+01 % RECOVERY 111.636	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5023.57	34.695	3.000	2.760	0.240	0.4899	100.000	1.33E-01	1.93E-01	2.31E-01	4.33E-02	1.92E-01
PO-209	4882.00	4840.65	27.947	355.000	352.360	2.640	1.6248	99.740	1.70E+01	2.72E+00	4.32E-01	1.44E-01	1.79E+00
PO-210	5304.38	5279.24	35.810	233.000	230.360	2.640	1.6248	100.000	1.13E+01	2.02E+00	4.40E-01	1.46E-01	1.48E+00

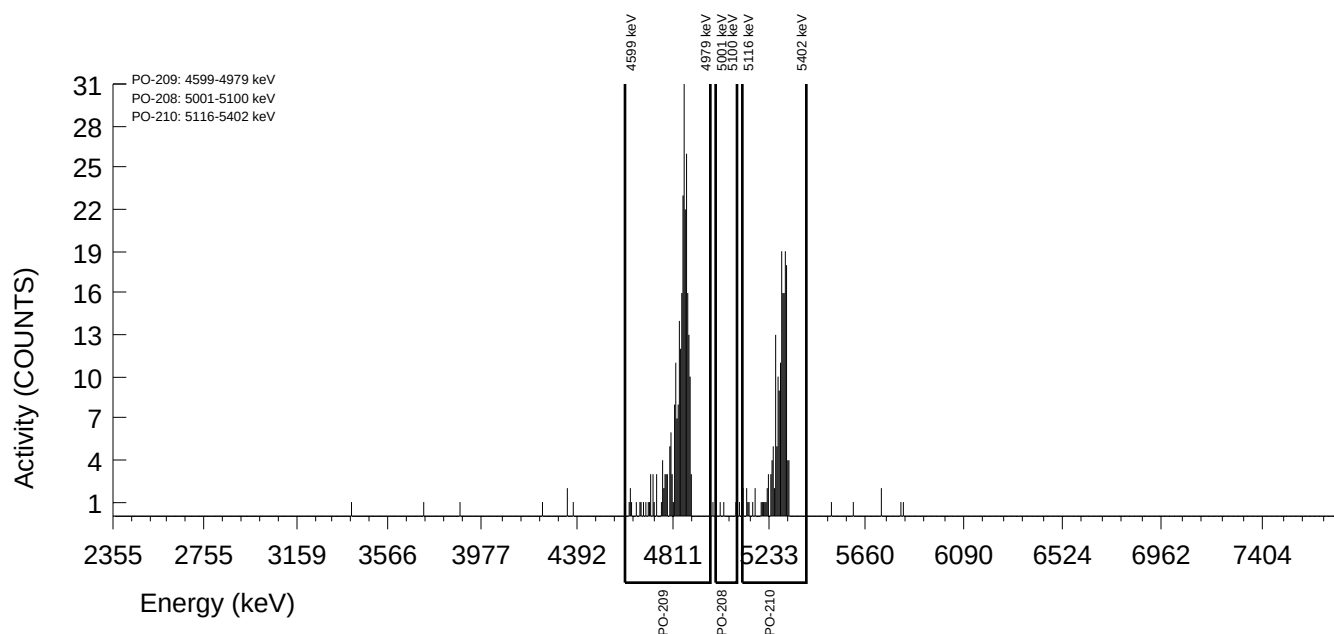


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2333147 SAMPLE ID : S1205226020_PO SAMPLE QTY : 0.208 F +/-0.480 % SAMPLE DATE : 31-Oct-2022 00:00:00 ANALYST : BV1 % YIELD : 56.7 +/-6.553 %	CHAMBER : 218 DETECTOR S/N : 155842 AVERAGE %EFFICIENCY : 25.2650 AVERAGE %EFF ERROR : 0.4912 COUNT DATE : 04-Nov-2022 08:41:25 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B218.CNF;1122 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W218.CNF;81 CAL DATE : 20-Oct-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8643E+00 dpm RESULTS : 4.4621E+00 dpm	LCSD ID2012-A NUCLIDEPO-210 NOMINAL (pCi/F)1.0151E+01 % RECOVERY110.186	

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
PO-208	5080.00	5049.83	69.608	3.000	2.280	0.720	0.8485	100.000	1.44E-01	2.55E-01	3.85E-01	9.79E-02	2.54E-01	
PO-209	4882.00	4839.70	26.310	272.000	269.840	2.160	1.4697	99.740	1.70E+01	3.06E+00	5.28E-01	1.70E-01	2.04E+00	
PO-210	5304.38	5279.65	49.349	177.000	174.120	2.880	1.6971	100.000	1.12E+01	2.26E+00	5.92E-01	2.00E-01	1.68E+00	



Batch 2333132 Check-list

This check-list was completed on 07-NOV-22 by Melanie Aycok

This batch was reviewed by Jessica Davis on 07-NOV-22 and Melanie Aycok on 07-NOV-22.

Batch ID:
2333132

Product:
ASPAMCMF

Description: Alpha Spec Am241Curium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Americium/Curium

Batch ID: 2333132
Analyst: Brendon Viquez (BV1)
Method: DOE EML HASL-300, Am-05-RC
 Modified
Lab SOP: GL-RAD-A-011 REV# 28
Instrument: GFC-B742840386

Due Dates for Lab: 02-NOV-2022			Package: 03-NOV-2022	SDG: 03-NOV-2022		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205225992	Americium-241 SPIKE		0533-JJ	.1	mL
LCSD	1205225993	Americium-241 SPIKE		0533-JJ	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	597531001	01-NOV-2022	1	30.16	0.11118
2	597531002	01-NOV-2022	1	30.21	0.11201
3	597531003	01-NOV-2022	1	30.02	0.11345
4	597533001	01-NOV-2022	1	30.04	0.11674
5	597533002	01-NOV-2022	1	30.05	0.11602
6	597533003	01-NOV-2022	1	30.23	0.11454
7	597533004	01-NOV-2022	1	30.15	0.11482
8	597533005	01-NOV-2022	1	30.3	0.11471
9	1205225991 MB	01-NOV-2022	1		0.11674
10	1205225992 LCS	01-NOV-2022	1		0.11674
11	1205225993 LCSD	01-NOV-2022	1		0.11674

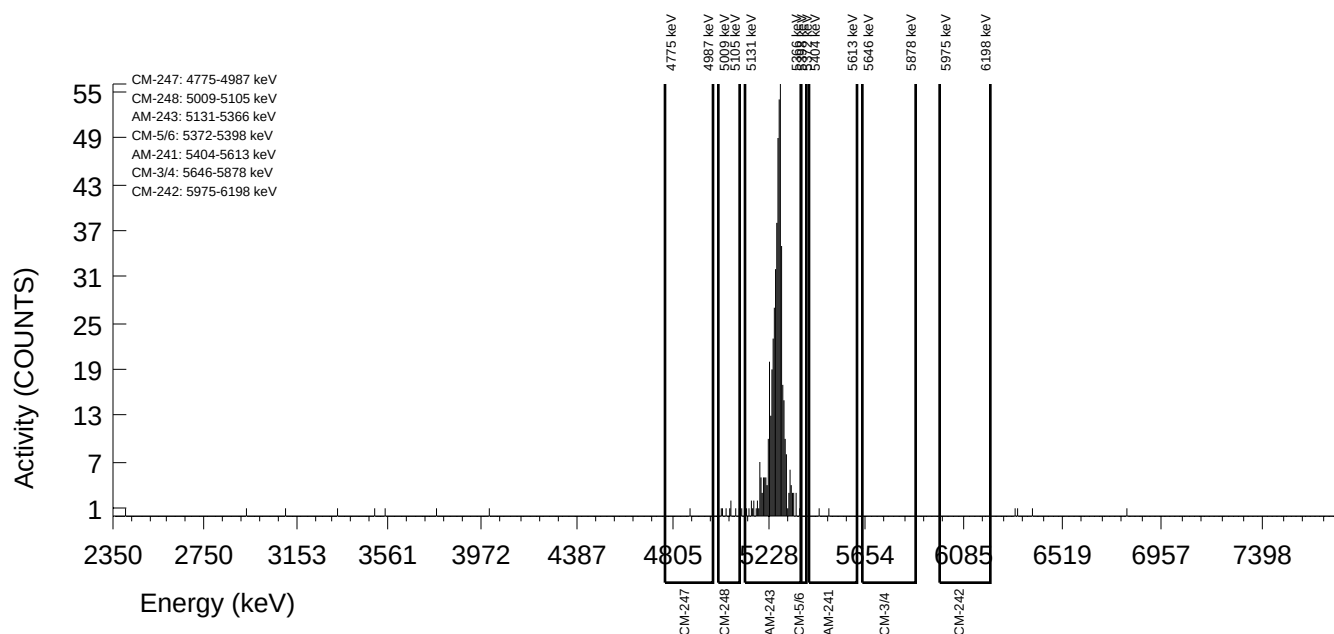
Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1752-J	Americium-243 AS TRACER	.1 ml	Pipet ID: R2-428724 Analyzed With: Pu , U Data Entry Date2: 01-NOV-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333132 SAMPLE ID : S0597531001_AM SAMPLE QTY : 0.111 F +/-0.899 % SAMPLE DATE : 26-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 38.9 +/-5.285 %	CHAMBER : 215 DETECTOR S/N : 155839 AVERAGE %EFFICIENCY : 27.2396 AVERAGE %EFF ERROR : 0.5285 COUNT DATE : 05-Nov-2022 14:56:48 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : AM BKG FILE : B215.CNF;987 BKG DATE : 04-Nov-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W215.CNF;79 CAL DATE : 20-Oct-2022
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6468E+00 dpm RESULTS : 1.8066E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5472.64	44.731	2.000	0.000	2.000	1.4142	98.525	0.00E+00	1.87E-01	3.72E-01	1.28E-01	1.86E-01
AM-243	5269.50	5265.04	30.759	495.000	492.000	3.000	1.7321	99.980	1.88E+01	2.69E+00	4.23E-01	1.54E-01	1.68E+00
CM-242	6102.00	6086.58	0.000	0.000	-1.000	1.000	1.0000	100.000	-4.55E-02	1.55E-01	3.49E-01	1.06E-01	1.55E-01
CM-3/4	5795.02	5761.61	0.000	0.000	-4.000	4.000	2.0000	100.000	-1.54E-01	1.85E-01	4.73E-01	1.79E-01	1.84E-01
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	1.23E-01	1.33E-01	1.03E-01	1.23E-01
CM-247	4946.00	4884.29	4.970	1.000	-1.000	2.000	1.4142	79.300	-4.82E-02	2.12E-01	4.62E-01	1.59E-01	2.11E-01
CM-248	5078.60	5063.13	7.455	9.000	8.000	1.000	1.0000	91.000	3.36E-01	2.88E-01	3.22E-01	9.78E-02	2.85E-01

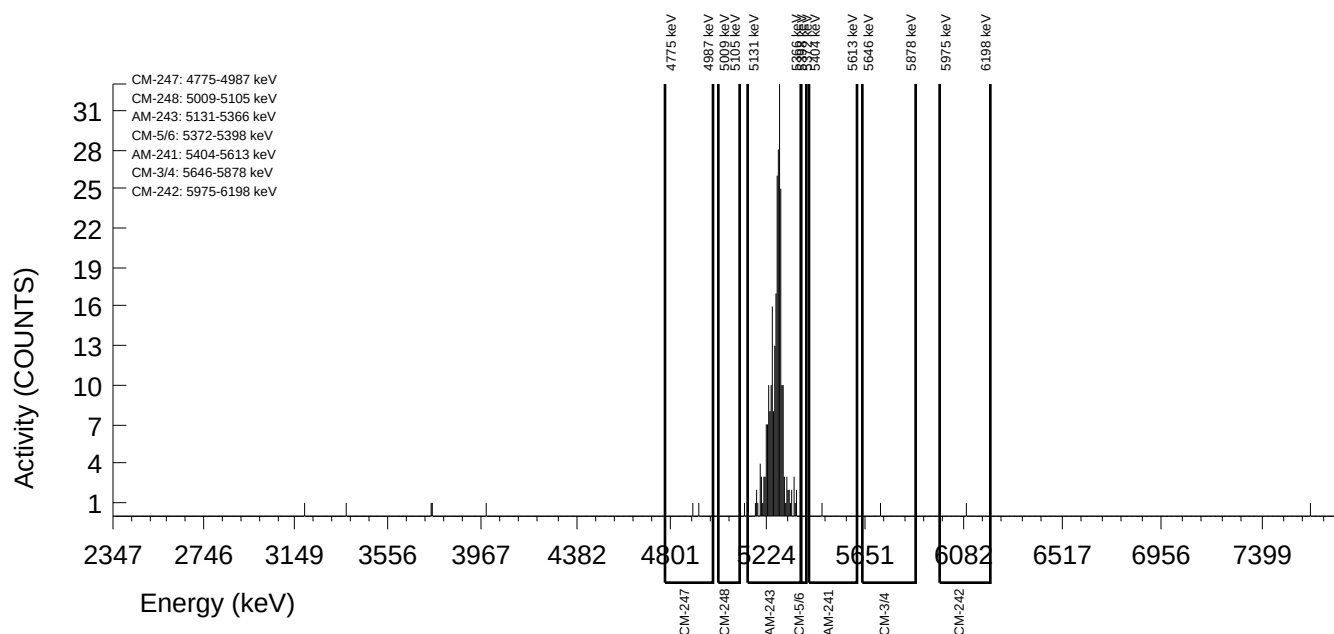


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333132 SAMPLE ID : S0597531002_AM SAMPLE QTY : 0.112 F +/-0.893 % SAMPLE DATE : 26-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 91.3 +/-6.734 %	CHAMBER : 219 DETECTOR S/N : 155843 AVERAGE %EFFICIENCY : 26.0813 AVERAGE %EFF ERROR : 0.5066 COUNT DATE : 03-Nov-2022 10:13:05 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B219.CNF;1130 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W219.CNF;74 CAL DATE : 20-Oct-2022
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6468E+00 dpm RESULTS : 4.2434E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5463.72	4.963	1.000	0.280	0.720	0.8485	98.525	2.00E-02	2.09E-01	4.36E-01	1.11E-01	2.09E-01
AM-243	5269.50	5262.36	23.285	267.000	265.560	1.440	1.2000	99.980	1.87E+01	3.44E+00	5.20E-01	1.55E-01	2.26E+00
CM-242	6102.00	6098.27	4.963	1.000	0.520	0.480	0.6928	100.000	4.31E-02	2.40E-01	4.59E-01	1.05E-01	2.39E-01
CM-3/4	5795.02	5720.79	4.963	1.000	-1.160	2.160	1.4697	100.000	-8.19E-02	2.22E-01	5.92E-01	1.90E-01	2.22E-01
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	1.65E-01	2.45E-01	1.50E-01	1.65E-01
CM-247	4946.00	4909.02	29.778	2.000	1.040	0.960	0.9798	79.300	9.23E-02	3.16E-01	5.85E-01	1.59E-01	3.15E-01
CM-248	5078.60	5101.99	0.000	1.000	0.520	0.480	0.6928	91.000	4.02E-02	2.24E-01	4.28E-01	9.81E-02	2.23E-01

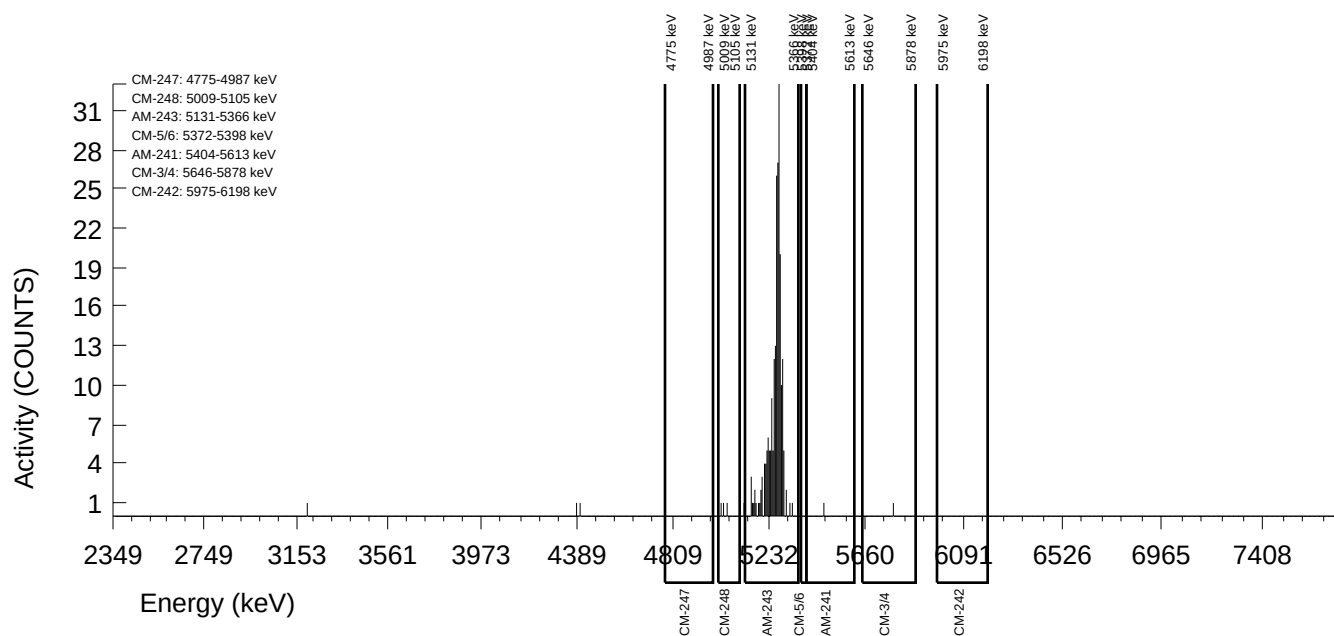


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333132 SAMPLE ID : S0597531003_AM SAMPLE QTY : 0.113 F +/-0.881 % SAMPLE DATE : 26-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 73.4 +/-7.434 %	CHAMBER : 220 DETECTOR S/N : 155844 AVERAGE %EFFICIENCY : 26.3611 AVERAGE %EFF ERROR : 0.5119 COUNT DATE : 03-Nov-2022 10:13:07 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B220.CNF;1115 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W220.CNF;334 CAL DATE : 20-Oct-2022
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6468E+00 dpm RESULTS : 3.4104E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5477.46	4.979	1.000	-4.280	5.280	2.2978	98.525	-3.72E-01	3.11E-01	9.91E-01	3.65E-01	3.10E-01
AM-243	5269.50	5263.41	20.320	221.000	215.720	5.280	2.2978	99.980	1.85E+01	3.75E+00	9.77E-01	3.60E-01	2.51E+00
CM-242	6102.00	6086.58	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	2.04E-01	3.02E-01	1.85E-01	2.03E-01
CM-3/4	5795.02	5783.15	4.979	1.000	-2.120	3.120	1.7664	100.000	-1.82E-01	2.82E-01	8.13E-01	2.78E-01	2.82E-01
CM-5/6	5386.00	5385.09	0.000	0.000	-0.480	0.480	0.6928	86.090	-4.77E-02	2.11E-01	5.50E-01	1.26E-01	2.11E-01
CM-247	4946.00	4881.20	0.000	0.000	-3.840	3.840	1.9596	79.300	-4.14E-01	2.98E-01	1.10E+00	3.87E-01	2.97E-01
CM-248	5078.60	5037.60	29.876	3.000	-2.040	5.040	2.2450	91.000	-1.92E-01	4.23E-01	1.05E+00	3.86E-01	4.23E-01

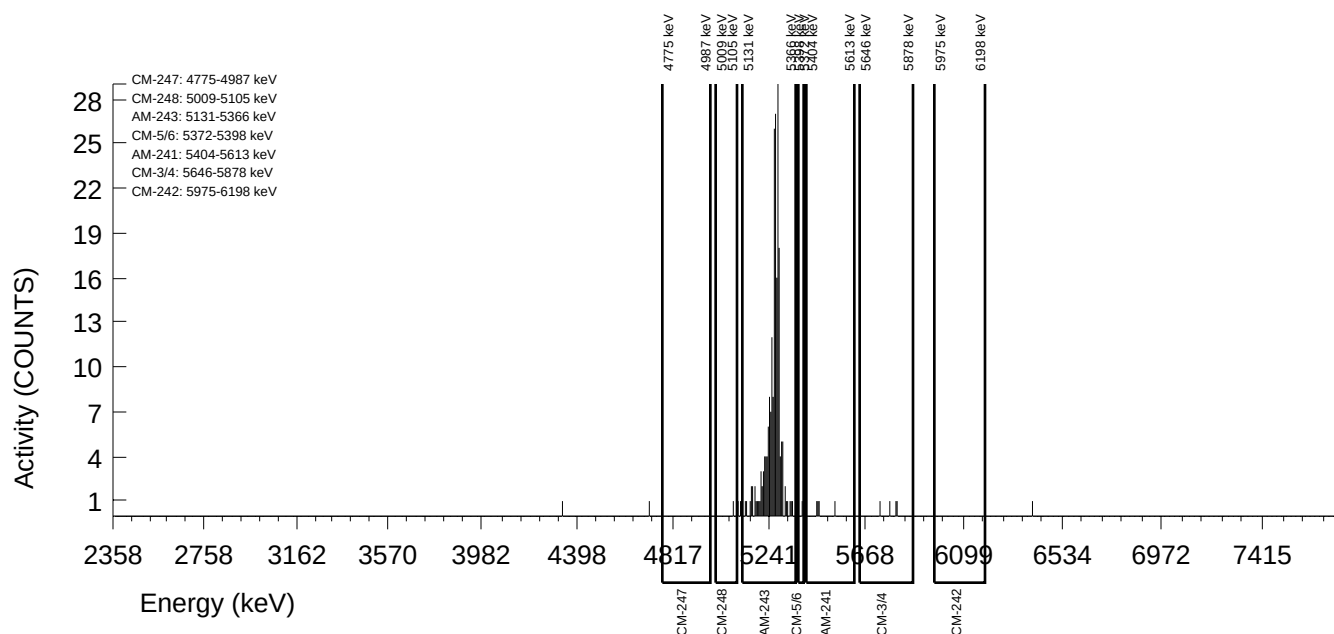


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333132 SAMPLE ID : S1205225991_AM SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 73.9 +/-7.511 %	CHAMBER : 230 DETECTOR S/N : 155830 AVERAGE %EFFICIENCY : 25.2588 AVERAGE %EFF ERROR : 0.4911 COUNT DATE : 03-Nov-2022 10:13:19 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B230.CNF;1121 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W230.CNF;65 CAL DATE : 20-Oct-2022
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6467E+00 dpm RESULTS : 3.4338E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5477.87	79.685	4.000	1.600	2.400	1.5492	98.525	1.40E-01	4.07E-01	7.58E-01	2.48E-01	4.07E-01
AM-243	5269.50	5264.23	24.348	211.000	208.120	2.880	1.6971	99.980	1.79E+01	3.69E+00	7.94E-01	2.68E-01	2.46E+00
CM-242	6102.00	6086.59	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.76E-01	2.61E-01	1.59E-01	1.75E-01
CM-3/4	5795.02	5779.34	74.705	4.000	-2.480	6.480	2.5456	100.000	-2.14E-01	4.34E-01	1.06E+00	4.02E-01	4.34E-01
CM-5/6	5386.00	5389.80	4.980	1.000	0.520	0.480	0.6928	86.090	5.20E-02	2.89E-01	5.54E-01	1.27E-01	2.89E-01
CM-247	4946.00	4881.20	0.000	0.000	-1.440	1.440	1.2000	79.300	-1.56E-01	2.53E-01	8.03E-01	2.39E-01	2.52E-01
CM-248	5078.60	5086.81	4.980	1.000	1.000	0.000	1.0000	91.000	9.47E-02	2.67E-01	2.84E-01	1.73E-01	2.66E-01

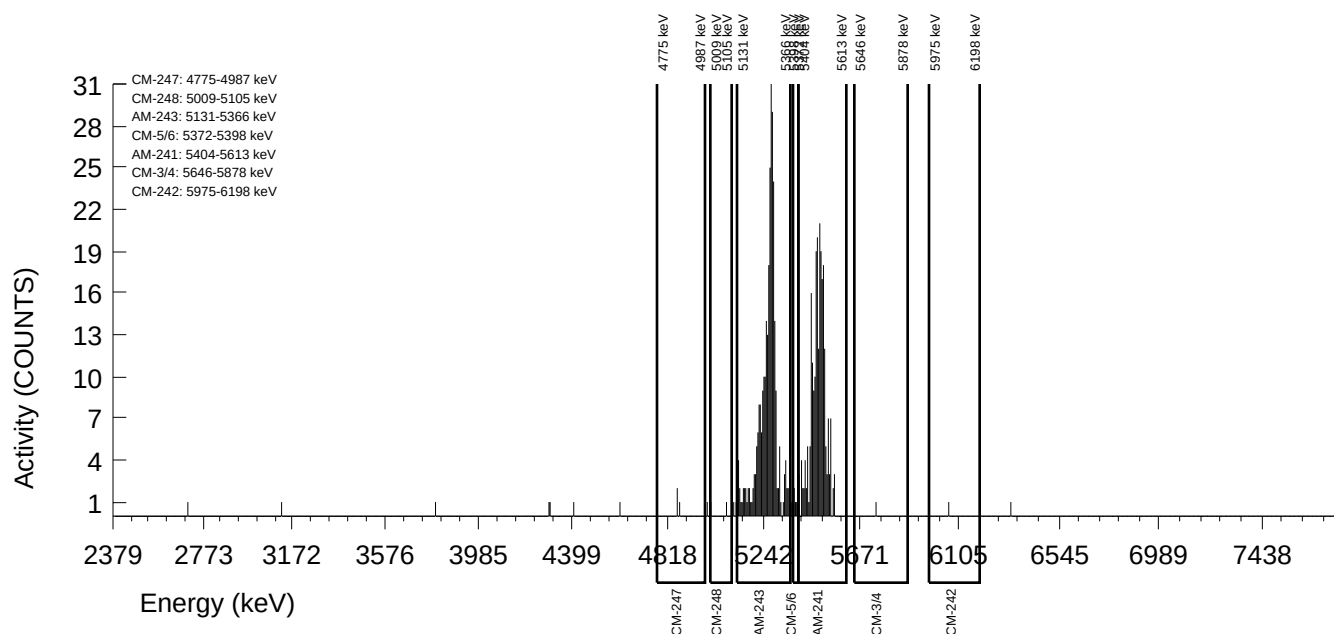


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333132 SAMPLE ID : S1205225992_AM SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 67.4 +/-6.564 %	CHAMBER : 234 DETECTOR S/N : 140622 AVERAGE %EFFICIENCY : 38.0969 AVERAGE %EFF ERROR : 0.7333 COUNT DATE : 03-Nov-2022 10:20:08 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B234.CNF;1116 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W234.CNF;71 CAL DATE : 21-Oct-2022
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6467E+00 dpm RESULTS : 3.1339E+00 dpm	LCS ID 0533-JJ NUCLIDE AM-241 NOMINAL (pCi/F) 1.6950E+01 % RECOVERY 89.328	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5486.53	57.278	242.000	238.400	3.600	1.8974	98.525	1.51E+01	2.82E+00	6.32E-01	2.21E-01	1.94E+00
AM-243	5269.50	5264.00	26.159	292.000	286.480	5.520	2.3495	99.980	1.79E+01	3.21E+00	7.26E-01	2.69E-01	2.10E+00
CM-242	6102.00	6061.70	4.890	1.000	1.000	0.000	1.0000	100.000	6.32E-02	1.78E-01	1.90E-01	1.16E-01	1.78E-01
CM-3/4	5795.02	5741.35	4.890	1.000	-10.760	11.760	3.4293	100.000	-6.73E-01	2.71E-01	9.74E-01	3.93E-01	2.71E-01
CM-5/6	5386.00	5383.20	9.779	7.000	6.520	0.480	0.6928	86.090	4.74E-01	4.12E-01	4.03E-01	9.22E-02	4.07E-01
CM-247	4946.00	4868.86	4.890	3.000	-1.080	4.080	2.0199	79.300	-8.52E-02	3.47E-01	8.21E-01	2.92E-01	3.47E-01
CM-248	5078.60	5047.86	68.454	2.000	1.280	0.720	0.8485	91.000	8.80E-02	2.43E-01	4.20E-01	1.07E-01	2.42E-01

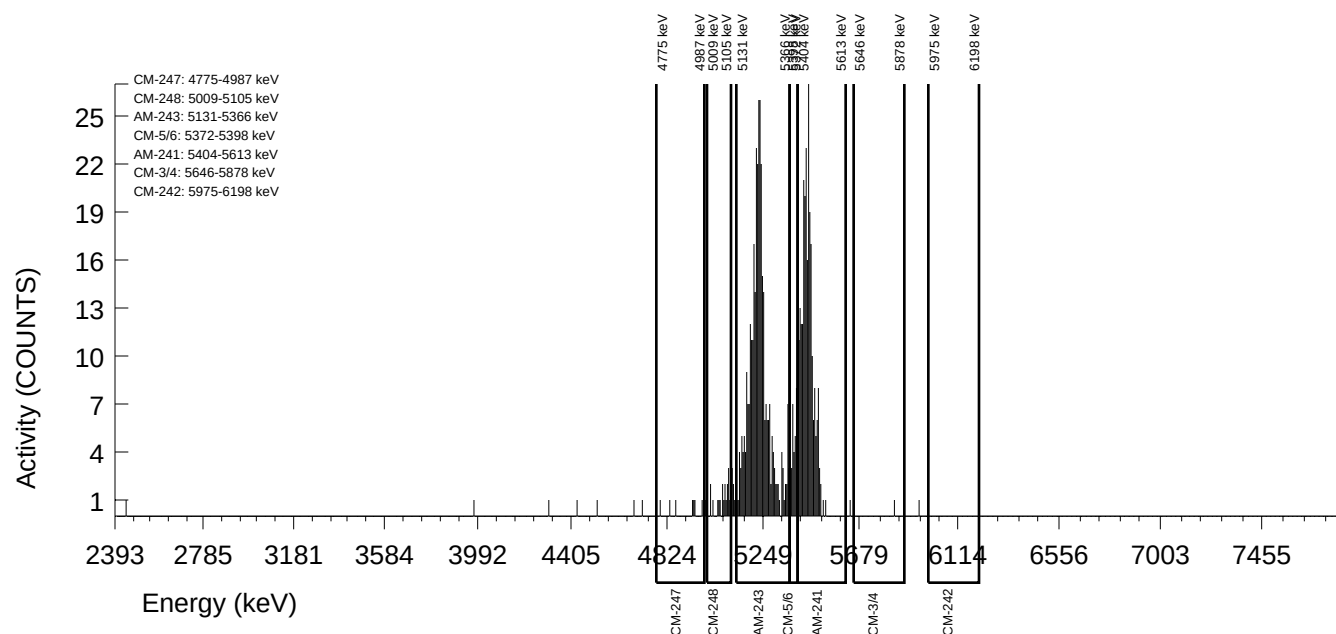


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333132 SAMPLE ID : S1205225993_AM SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 76.3 +/-6.103 %	CHAMBER : 239 DETECTOR S/N : 158110 AVERAGE %EFFICIENCY : 39.7652 AVERAGE %EFF ERROR : 0.7647 COUNT DATE : 03-Nov-2022 10:20:05 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B239.CNF;1114 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W239.CNF;87 CAL DATE : 21-Oct-2022
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6467E+00 dpm RESULTS : 3.5465E+00 dpm	LCSD ID 0533-JJ NUCLIDE AM-241 NOMINAL (pCi/F) 1.6950E+01 % RECOVERY 78.769	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5447.06	35.598	250.000	248.320	1.680	1.2961	98.525	1.34E+01	2.38E+00	4.17E-01	1.28E-01	1.67E+00
AM-243	5269.50	5234.45	42.677	342.000	338.400	3.600	1.8974	99.980	1.79E+01	2.98E+00	5.27E-01	1.84E-01	1.93E+00
CM-242	6102.00	6086.53	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.29E-02	1.11E-01	2.57E-01	4.80E-02	1.11E-01
CM-3/4	5795.02	5830.63	4.854	1.000	-6.200	7.200	2.6833	100.000	-3.29E-01	2.02E-01	6.80E-01	2.60E-01	2.02E-01
CM-5/6	5386.00	5388.19	0.000	29.000	29.000	0.000	1.0000	86.090	1.78E+00	6.99E-01	1.85E-01	1.13E-01	6.61E-01
CM-247	4946.00	4903.25	174.754	7.000	5.800	1.200	1.0954	79.300	3.87E-01	3.81E-01	4.69E-01	1.34E-01	3.78E-01
CM-248	5078.60	5072.83	77.669	18.000	18.000	0.000	1.0000	91.000	1.05E+00	5.15E-01	1.75E-01	1.07E-01	4.98E-01



Continuing Calibration Data

Review of Alpha Spectrometer QA results (Daily checks) 3-NOV-2022 12:10:43.87

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
3-NOV-2022	6	PSENERGY-5000	Above
3-NOV-2022	23	PSFWHM-5000	Above
3-NOV-2022	46	PSFWHM-5000	Below
3-NOV-2022	46	PSCTSS-5000	Below
3-NOV-2022	73	PSENERGY-5000	Above
3-NOV-2022	91	PSFWHM-5000	Below
3-NOV-2022	91	PSCTSS-5000	Below
3-NOV-2022	94	PSFWHM-5000	Below
3-NOV-2022	94	PSCTSS-5000	Below
3-NOV-2022	101	PSFWHM-5000	Below
3-NOV-2022	101	PSCTSS-5000	Below
21-SEP-2022	115	PSCTSS-5000	Below
3-NOV-2022	118	PSENERGY-5000	Below
3-NOV-2022	143	PSFWHM-5000	Below
3-NOV-2022	143	PSCENTRD-5000	Below
3-NOV-2022	143	PSCTSS-5000	Below
3-NOV-2022	149	PSENERGY-5000	Above
3-NOV-2022	156	PSENERGY-5000	Above
3-NOV-2022	161	PSFWHM-5000	Above
3-NOV-2022	167	PSFWHM-5000	Above
3-NOV-2022	171	PSENERGY-5000	Above
3-NOV-2022	171	PSCENTRD-5000	Above
3-NOV-2022	173	PSCTSS-5000	Below
3-NOV-2022	177	PSCTSS-5000	Below
3-NOV-2022	186	PSENERGY-5000	Below
3-NOV-2022	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below

24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

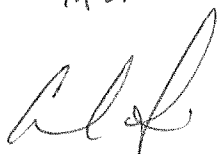
The following detectors that may not have properly transfered to the QA file

115	may not have run since 3-NOV-2022
116	may not have run since 3-NOV-2022
119	may not have run since 3-NOV-2022
120	may not have run since 3-NOV-2022
137	may not have run since 3-NOV-2022
145	may not have run since 3-NOV-2022
146	may not have run since 3-NOV-2022
147	may not have run since 3-NOV-2022
148	may not have run since 3-NOV-2022
163	may not have run since 3-NOV-2022
164	may not have run since 3-NOV-2022
183	may not have run since 3-NOV-2022
184	may not have run since 3-NOV-2022
198	may not have run since 3-NOV-2022
221	may not have run since 3-NOV-2022
227	may not have run since 3-NOV-2022
228	may not have run since 3-NOV-2022
241	may not have run since 3-NOV-2022
242	may not have run since 3-NOV-2022
247	may not have run since 3-NOV-2022
248	may not have run since 3-NOV-2022

APPROVAL DATE: 11/3/22

APPROVAL TIME: 1215

APPROVED BY:



PROCEDURE # GL-RAD-I-009

Report completed at 3-NOV-2022 12:13:34.86

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag

4-NOV-2022	23	PSFWHM-5000	Above
4-NOV-2022	46	PSFWHM-5000	Below
4-NOV-2022	46	PSCTSS-5000	Below
4-NOV-2022	73	PSENERGY-5000	Above
4-NOV-2022	91	PSFWHM-5000	Below
4-NOV-2022	91	PSCTSS-5000	Below
4-NOV-2022	94	PSFWHM-5000	Below
4-NOV-2022	94	PSCTSS-5000	Below
4-NOV-2022	101	PSFWHM-5000	Below
4-NOV-2022	101	PSCTSS-5000	Below
21-SEP-2022	115	PSCTSS-5000	Below
4-NOV-2022	118	PSENERGY-5000	Below
4-NOV-2022	143	PSFWHM-5000	Below
4-NOV-2022	143	PSCENTRD-5000	Below
4-NOV-2022	143	PSCTSS-5000	Below
4-NOV-2022	149	PSENERGY-5000	Above
4-NOV-2022	161	PSFWHM-5000	Above
4-NOV-2022	167	PSFWHM-5000	Above
4-NOV-2022	171	PSENERGY-5000	Above
4-NOV-2022	171	PSCENTRD-5000	Above
4-NOV-2022	173	PSCTSS-5000	Below
4-NOV-2022	177	PSCTSS-5000	Below
4-NOV-2022	186	PSENERGY-5000	Below
4-NOV-2022	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below

15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

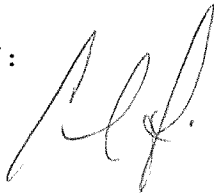
The following detectors that may not have properly transfered to the QA file

115	may not have run since 4-NOV-2022
116	may not have run since 4-NOV-2022
119	may not have run since 4-NOV-2022
120	may not have run since 4-NOV-2022
137	may not have run since 4-NOV-2022
147	may not have run since 4-NOV-2022
148	may not have run since 4-NOV-2022
163	may not have run since 4-NOV-2022
164	may not have run since 4-NOV-2022
183	may not have run since 4-NOV-2022
184	may not have run since 4-NOV-2022
198	may not have run since 4-NOV-2022
221	may not have run since 4-NOV-2022
227	may not have run since 4-NOV-2022
228	may not have run since 4-NOV-2022
241	may not have run since 4-NOV-2022
242	may not have run since 4-NOV-2022
247	may not have run since 4-NOV-2022
248	may not have run since 4-NOV-2022

APPROVAL DATE: 11/4/22

APPROVAL TIME: 1131

APPROVED BY:



PROCEDURE # GL-RAD-I-009

Report completed at 4-NOV-2022 11:30:44.47

Review of Alpha Spectrometer QA results (Daily checks) 5-NOV-2022 09:21:02.00

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
5-NOV-2022	23	PSFWHM-5000	Above
5-NOV-2022	46	PSFWHM-5000	Below
5-NOV-2022	46	PSCTSS-5000	Below
5-NOV-2022	73	PSENERGY-5000	Above
5-NOV-2022	91	PSFWHM-5000	Below
5-NOV-2022	91	PSCTSS-5000	Below
5-NOV-2022	94	PSFWHM-5000	Below
5-NOV-2022	94	PSCTSS-5000	Below
5-NOV-2022	101	PSFWHM-5000	Below
5-NOV-2022	101	PSCTSS-5000	Below
21-SEP-2022	115	PSCTSS-5000	Below
5-NOV-2022	118	PSENERGY-5000	Below
5-NOV-2022	143	PSFWHM-5000	Below
5-NOV-2022	143	PSCENTRD-5000	Below
5-NOV-2022	143	PSCTSS-5000	Below
5-NOV-2022	149	PSENERGY-5000	Above
5-NOV-2022	161	PSFWHM-5000	Above
5-NOV-2022	162	PSFWHM-5000	Above
5-NOV-2022	171	PSENERGY-5000	Above
5-NOV-2022	171	PSCENTRD-5000	Above
5-NOV-2022	173	PSCTSS-5000	Below
5-NOV-2022	177	PSCTSS-5000	Below
5-NOV-2022	186	PSENERGY-5000	Below
5-NOV-2022	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below

15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transfered to the QA file

115	may not have run since 5-NOV-2022
116	may not have run since 5-NOV-2022
119	may not have run since 5-NOV-2022
120	may not have run since 5-NOV-2022
137	may not have run since 5-NOV-2022
147	may not have run since 5-NOV-2022
148	may not have run since 5-NOV-2022
163	may not have run since 5-NOV-2022
164	may not have run since 5-NOV-2022
183	may not have run since 5-NOV-2022
184	may not have run since 5-NOV-2022
198	may not have run since 5-NOV-2022
221	may not have run since 5-NOV-2022
227	may not have run since 5-NOV-2022
228	may not have run since 5-NOV-2022
241	may not have run since 5-NOV-2022
242	may not have run since 5-NOV-2022
247	may not have run since 5-NOV-2022
248	may not have run since 5-NOV-2022

APPROVAL DATE: 11/5/22

APPROVAL TIME: 1000

APPROVED BY:

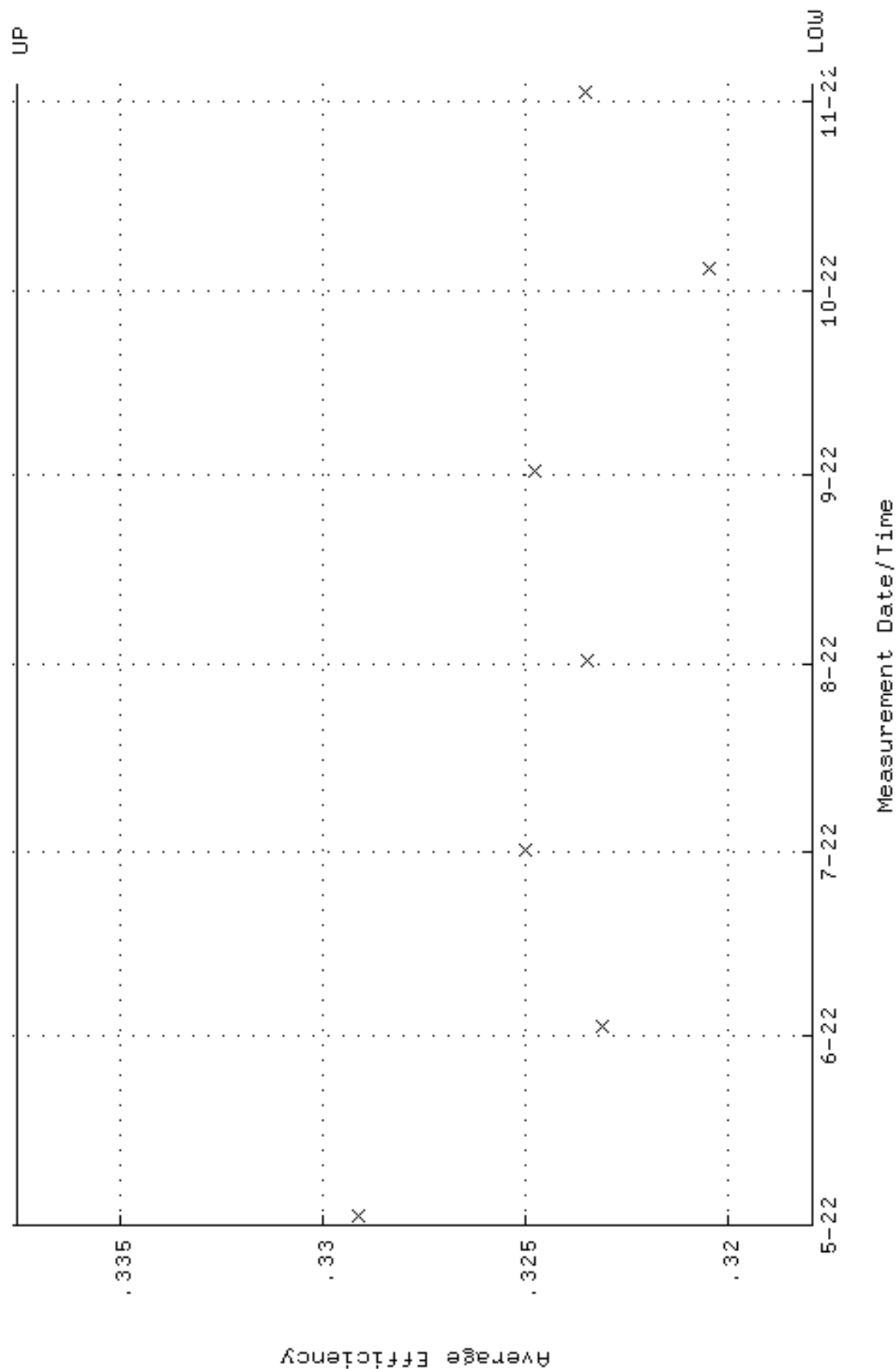


PROCEDURE # GL-RAD-I-009

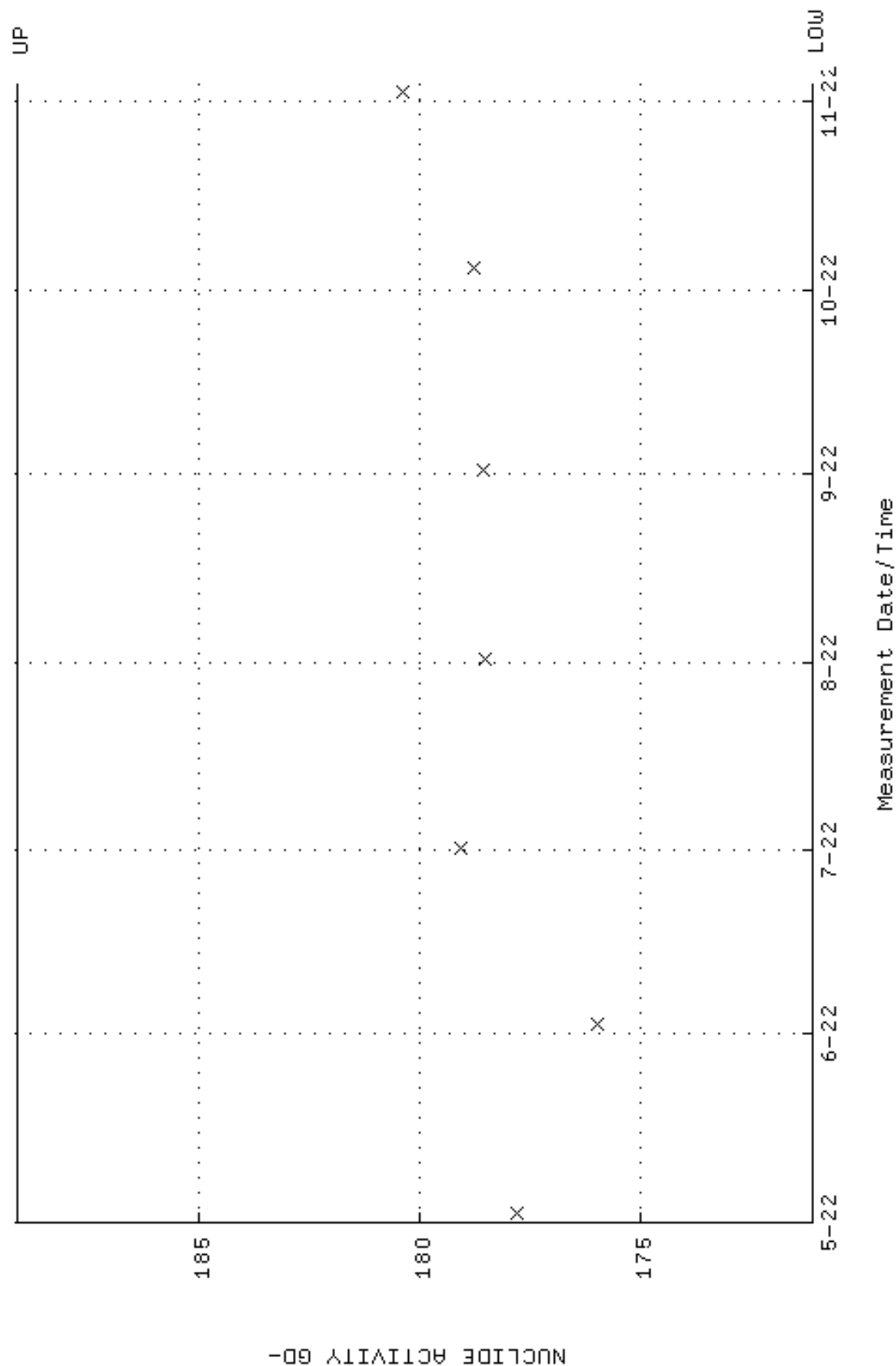
Report completed at 5-NOV-2022 09:24:09.98

Background and Efficiency Data

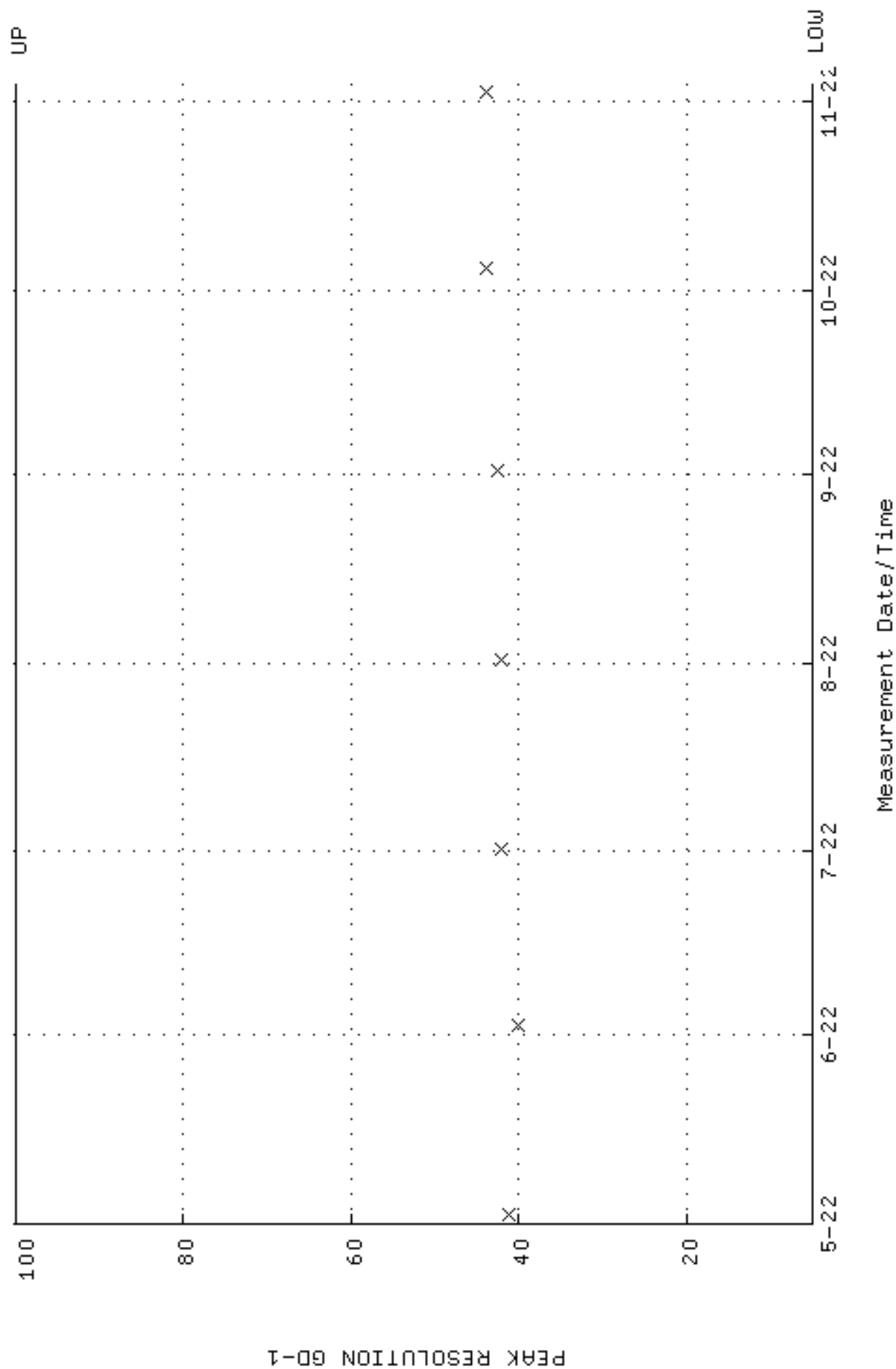
QA filename : DKA100:[ENV_ALPHA.QA.W]W002.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.317920 through 0.337590



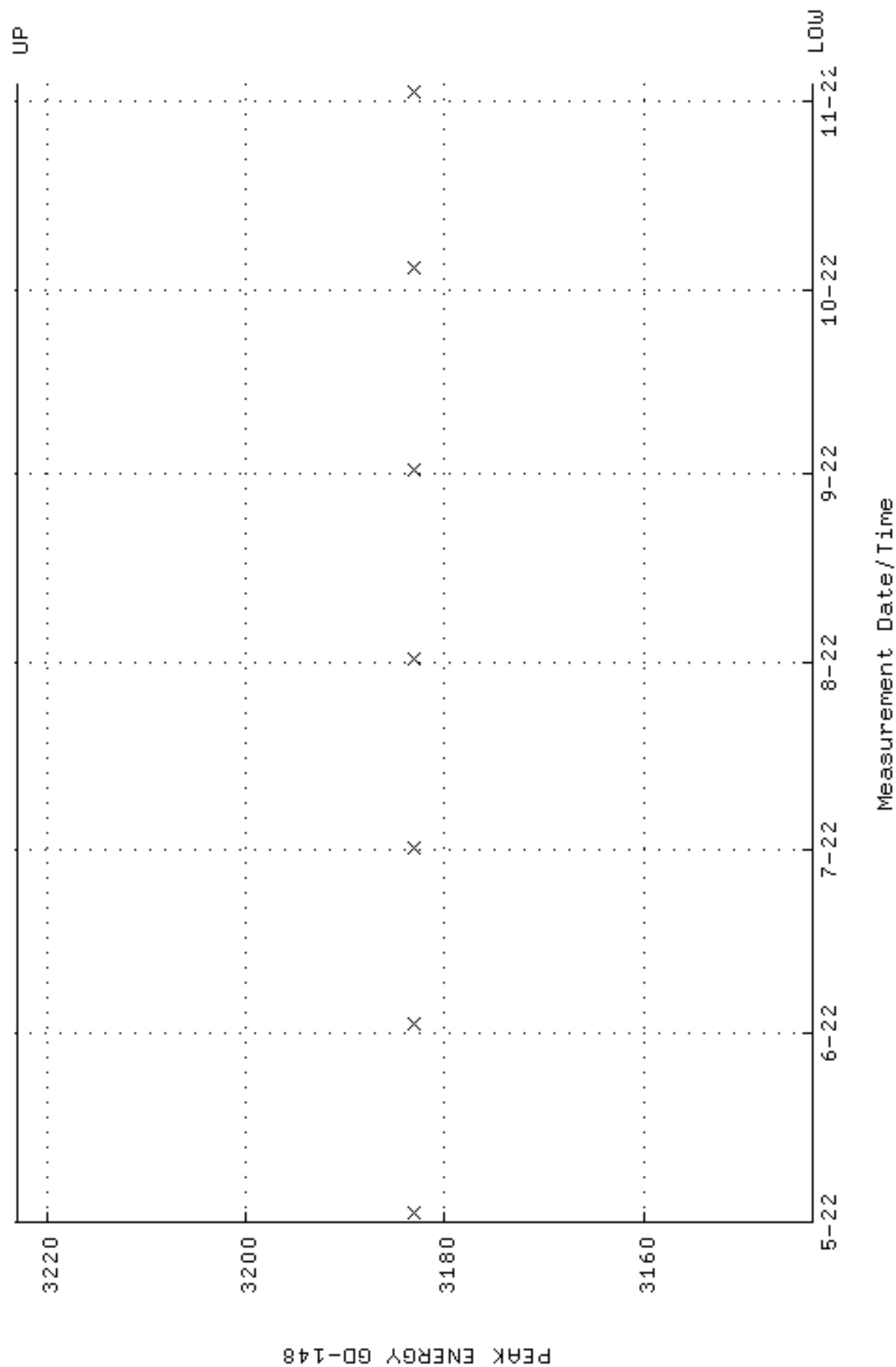
QA filename : DKA100:[ENV_ALPHA.QA.W]W002.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



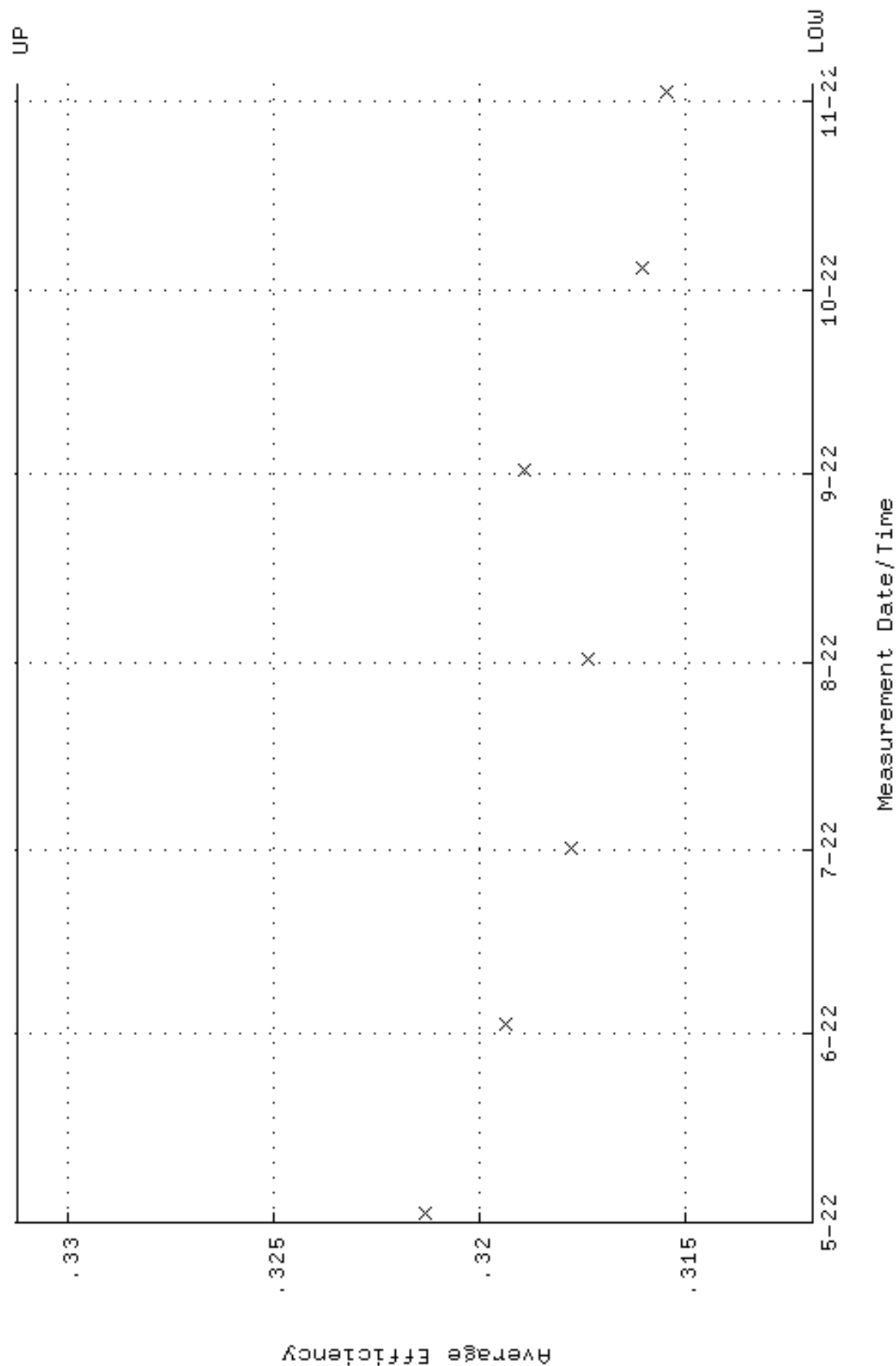
QA filename : DKA100:[ENV_ALPHA.QA.W]W002.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



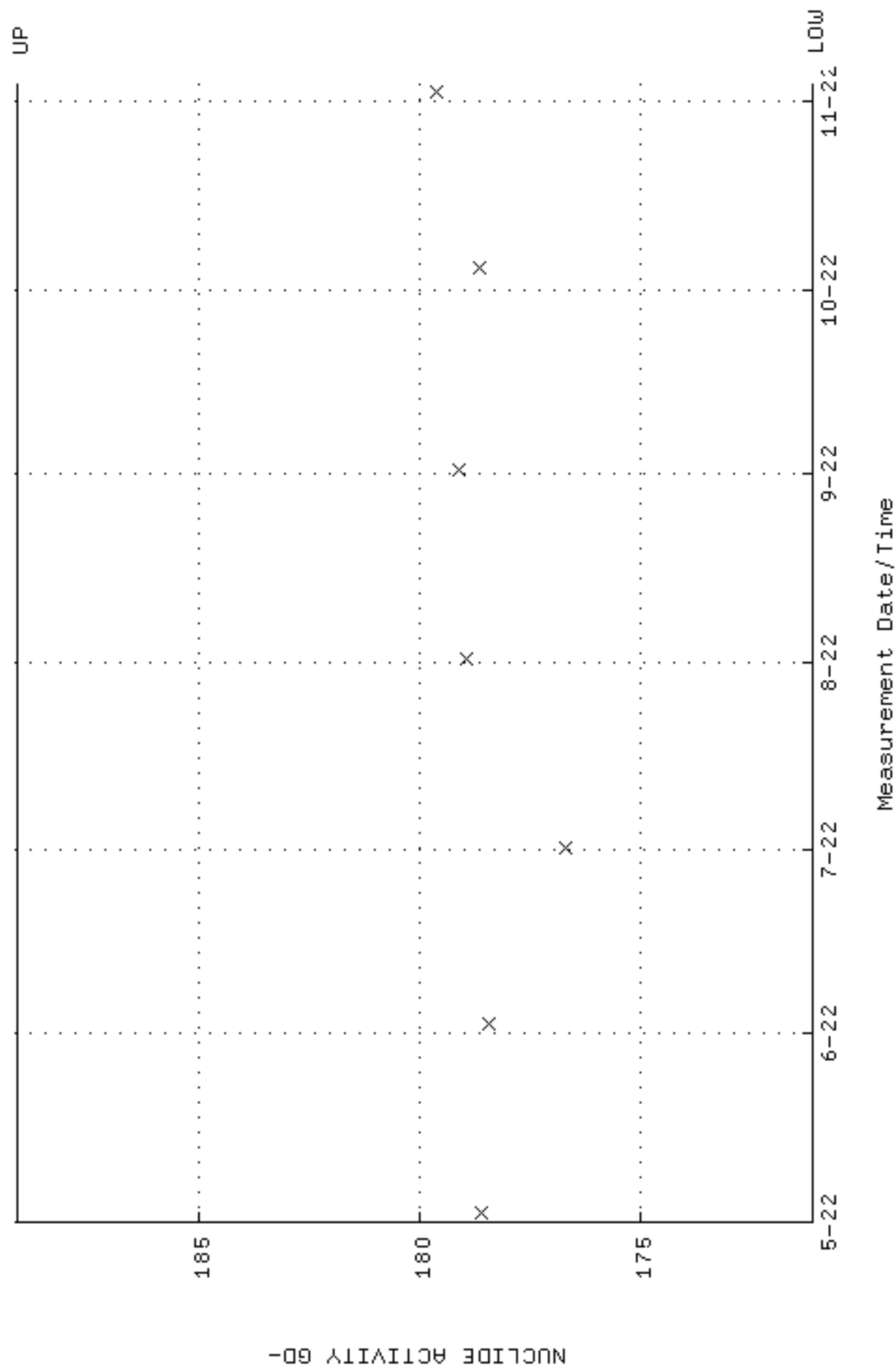
QA filename : DKA100:[ENV_ALPHA.QA.W]W002.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



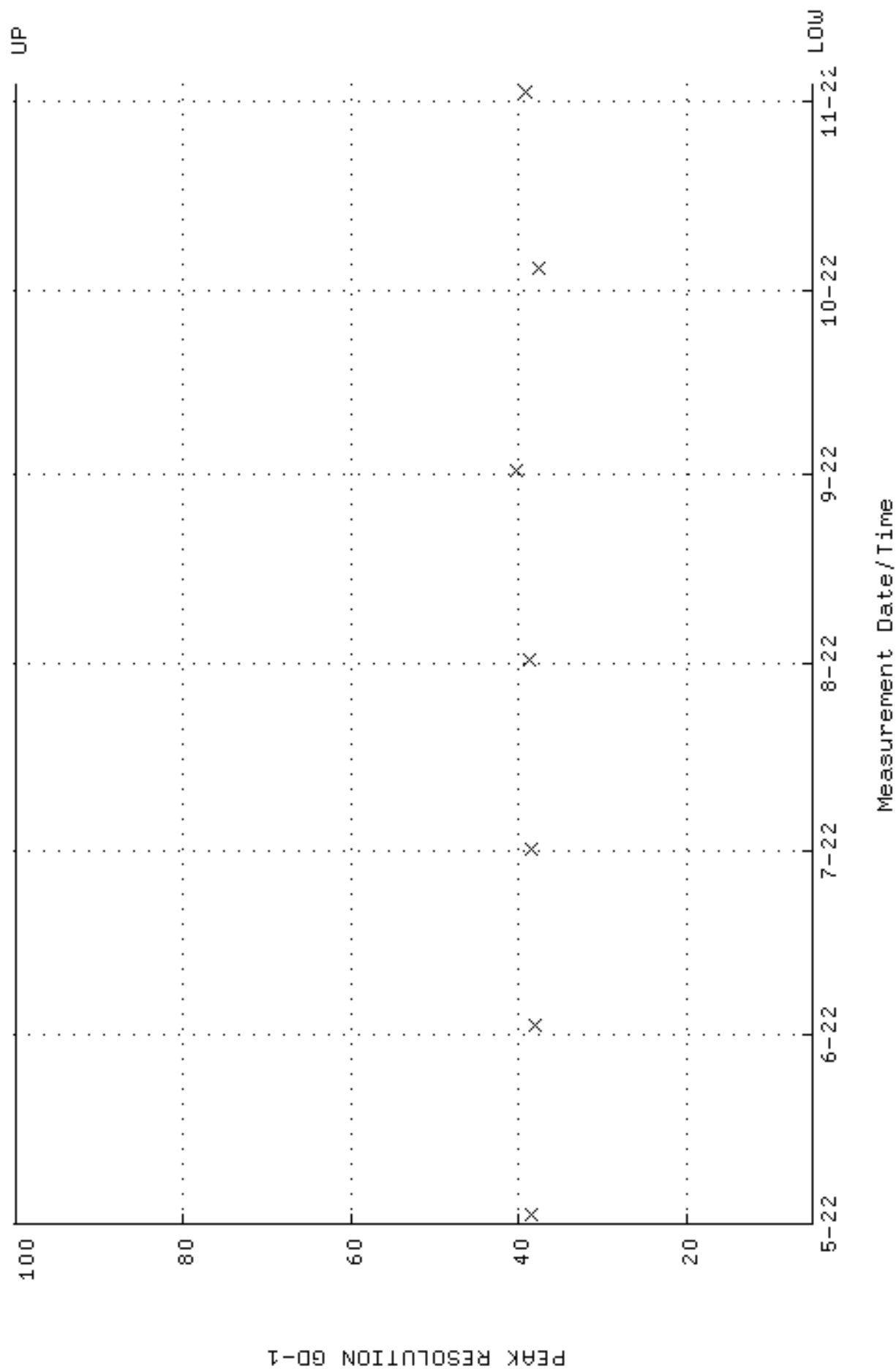
QA filename : DKA100:[ENV_ALPHA.QA.W]W003.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.311924 through 0.331220



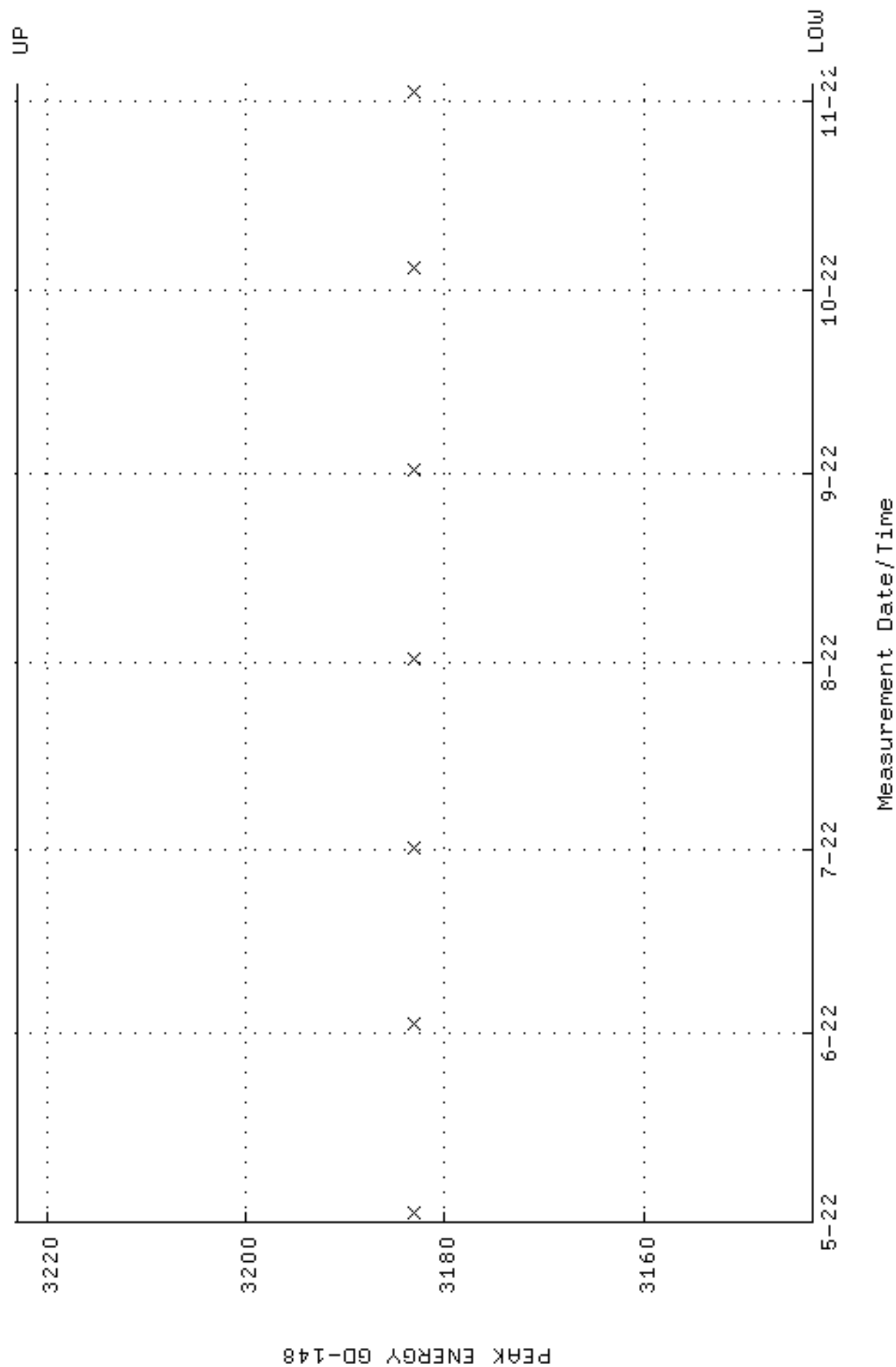
QA filename : DKA100:[ENV_ALPHA.QA.W]W003.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



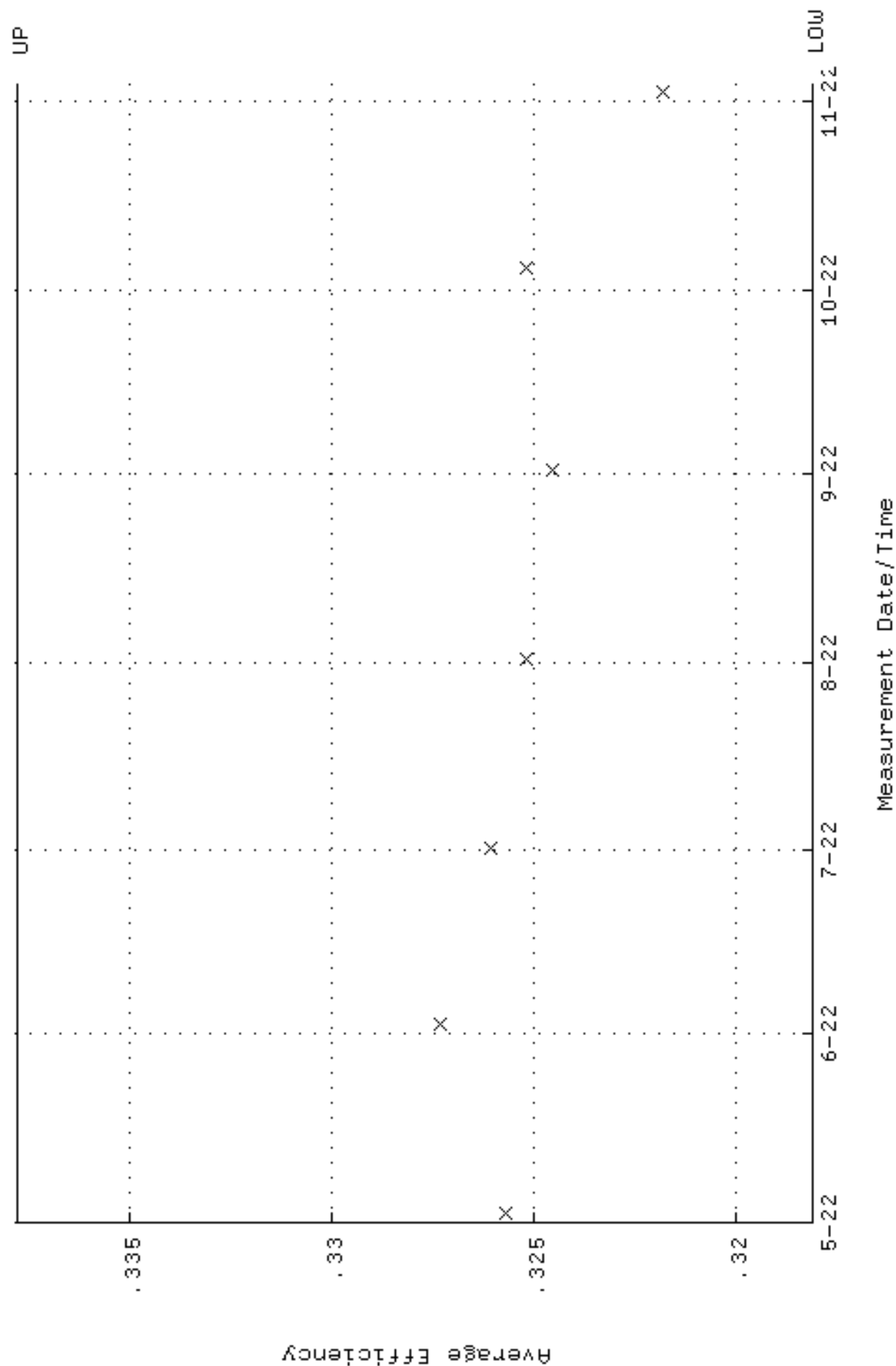
QA filename : DKA100:[ENV_ALPHA.QA.W]W003.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



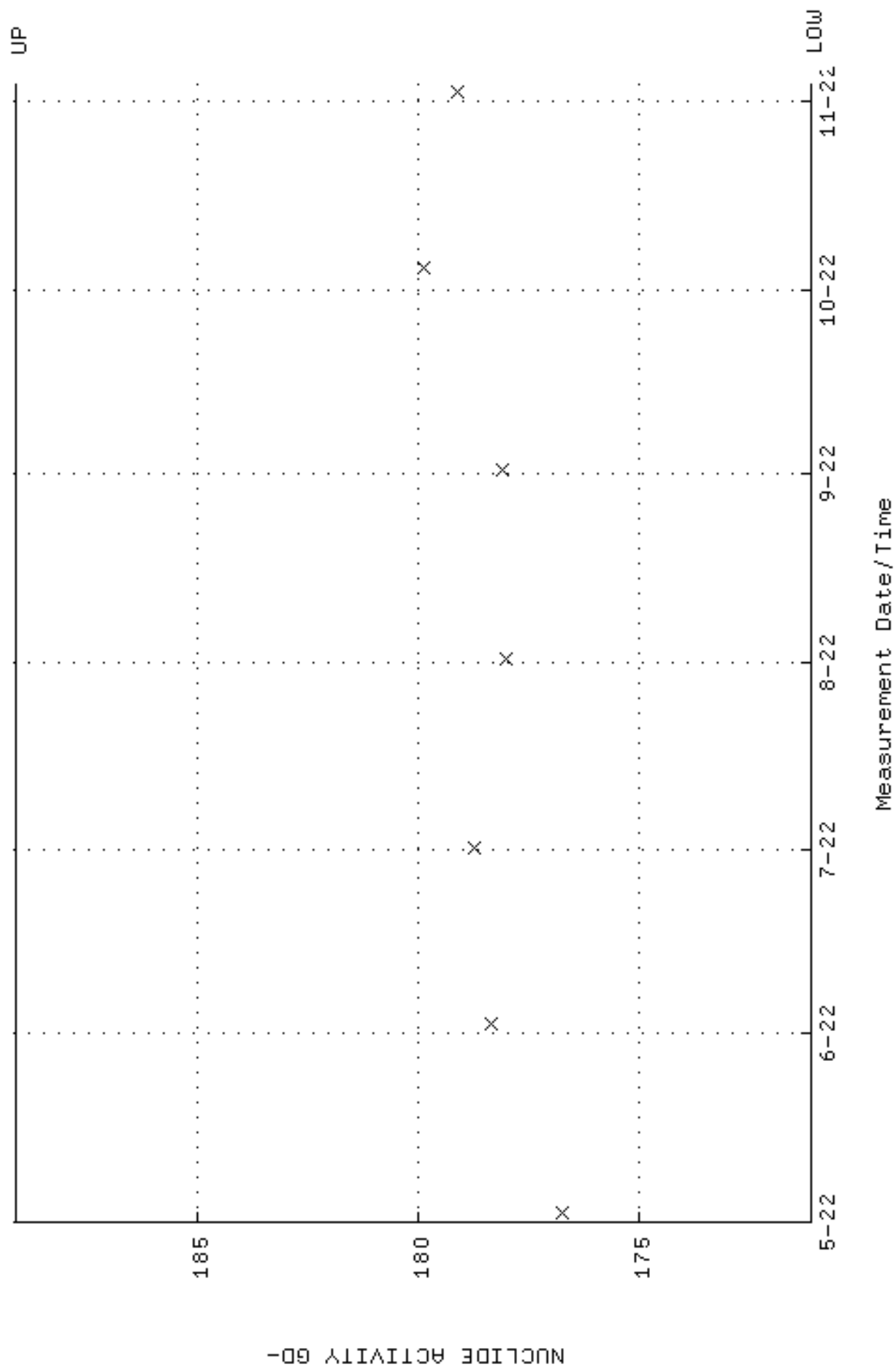
QA filename : DKA100:[ENV_ALPHA.QA.W]W003.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



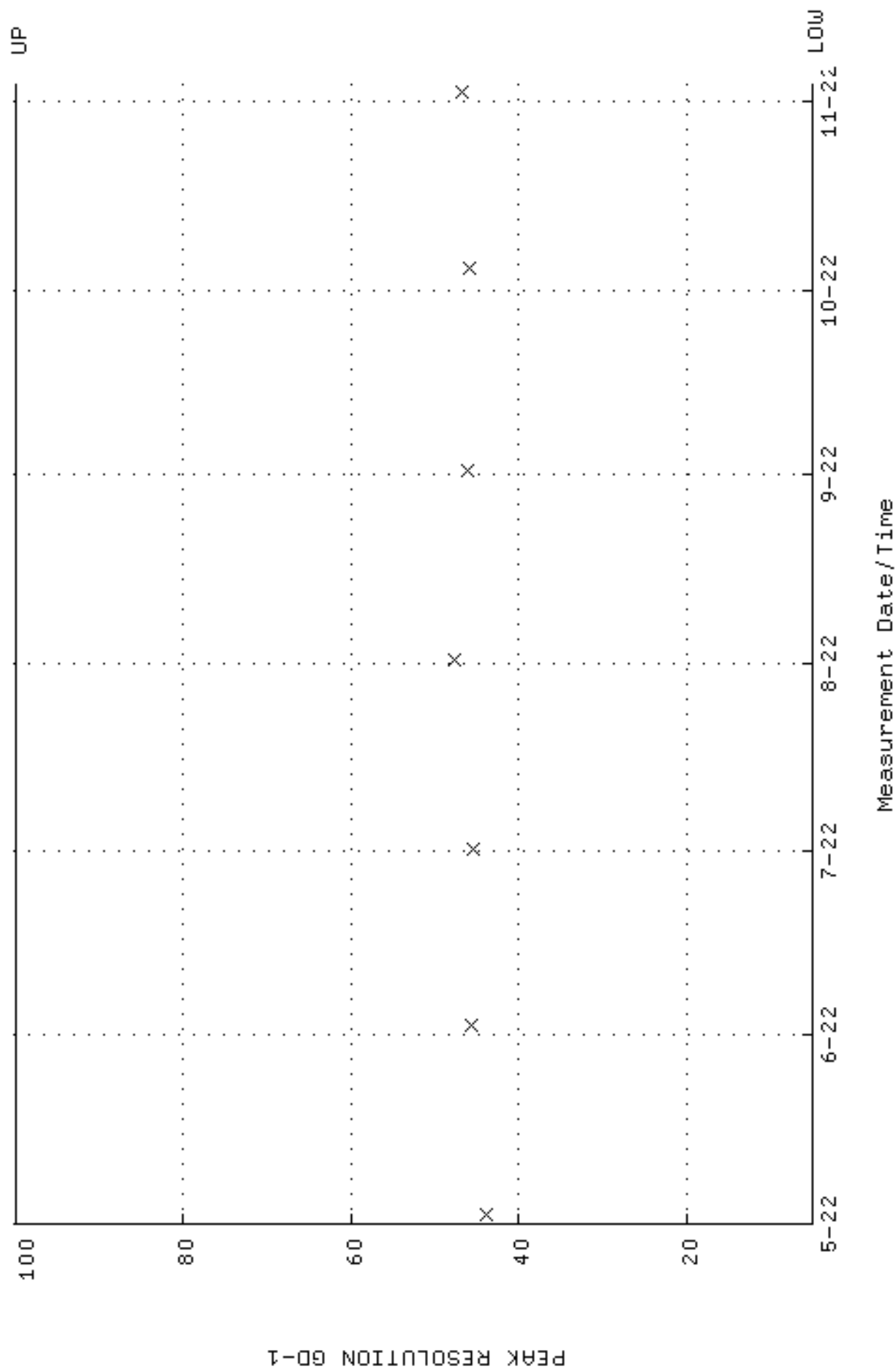
QA filename : DKA100:[ENV_ALPHA.QA.W]W004.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.318087 through 0.337796



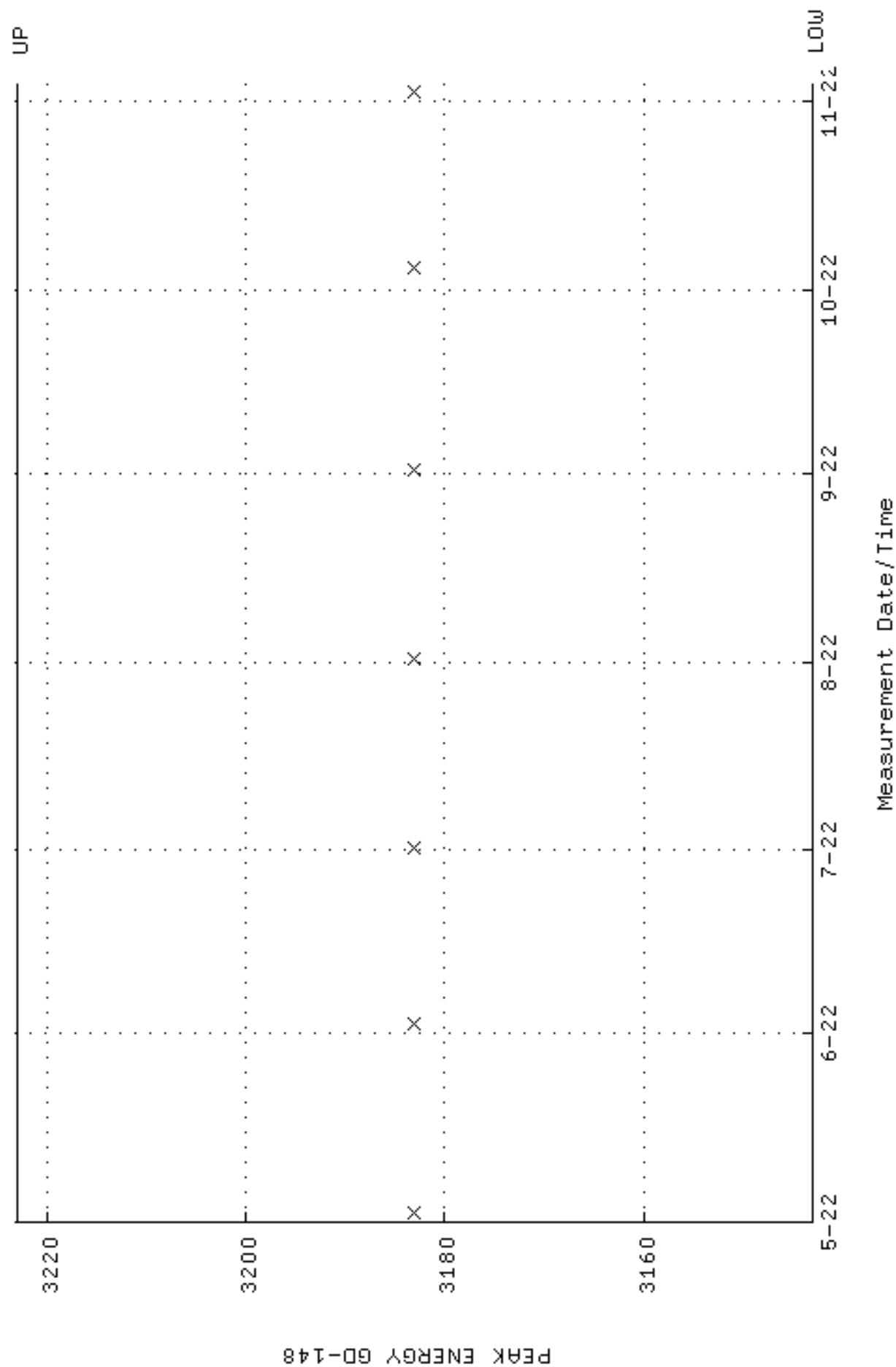
QA filename : DKA100:[ENV_ALPHA.QA.W]W004.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



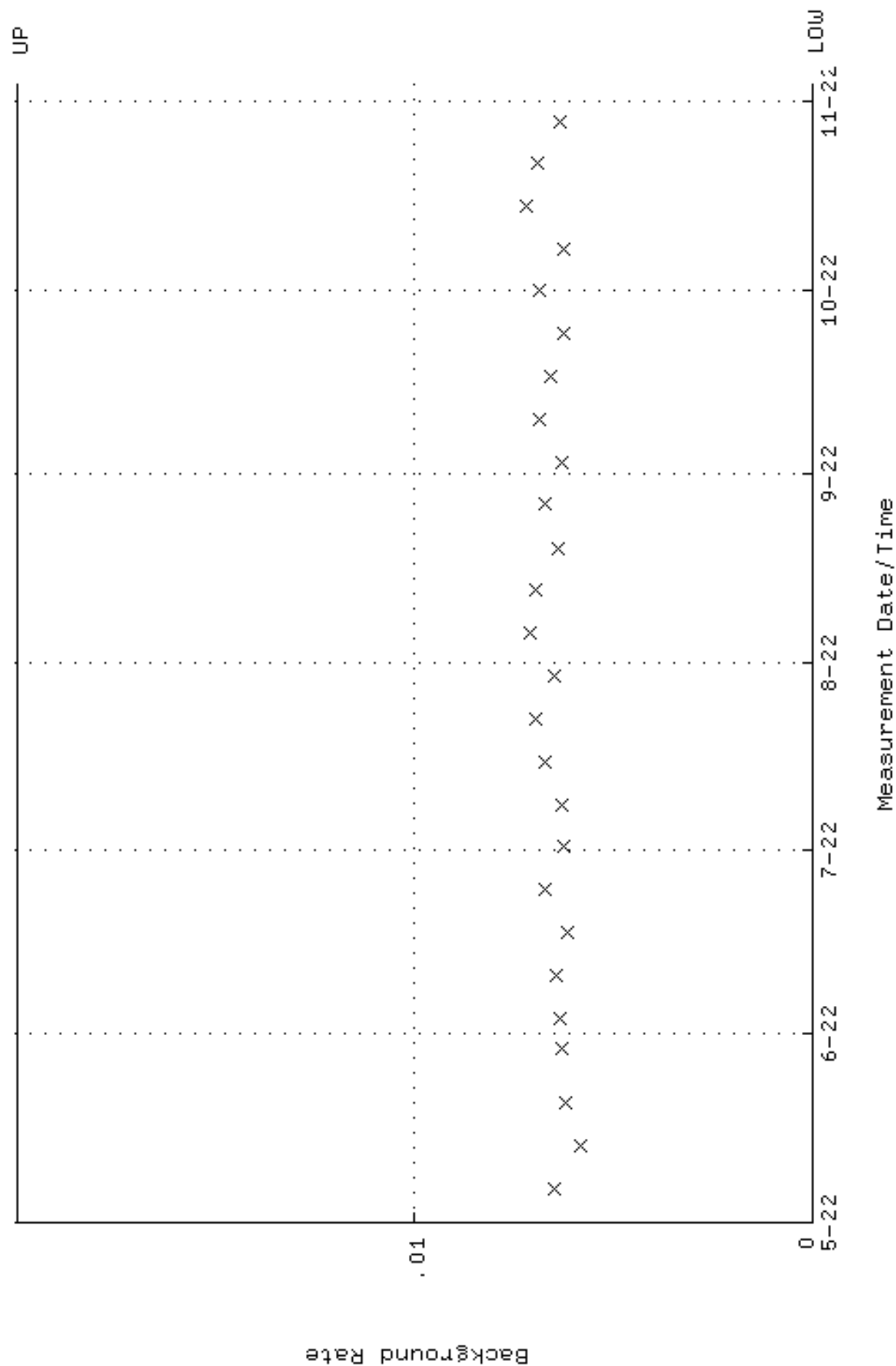
QA filename : DKA100:[ENV_ALPHA.QA.W]W004.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



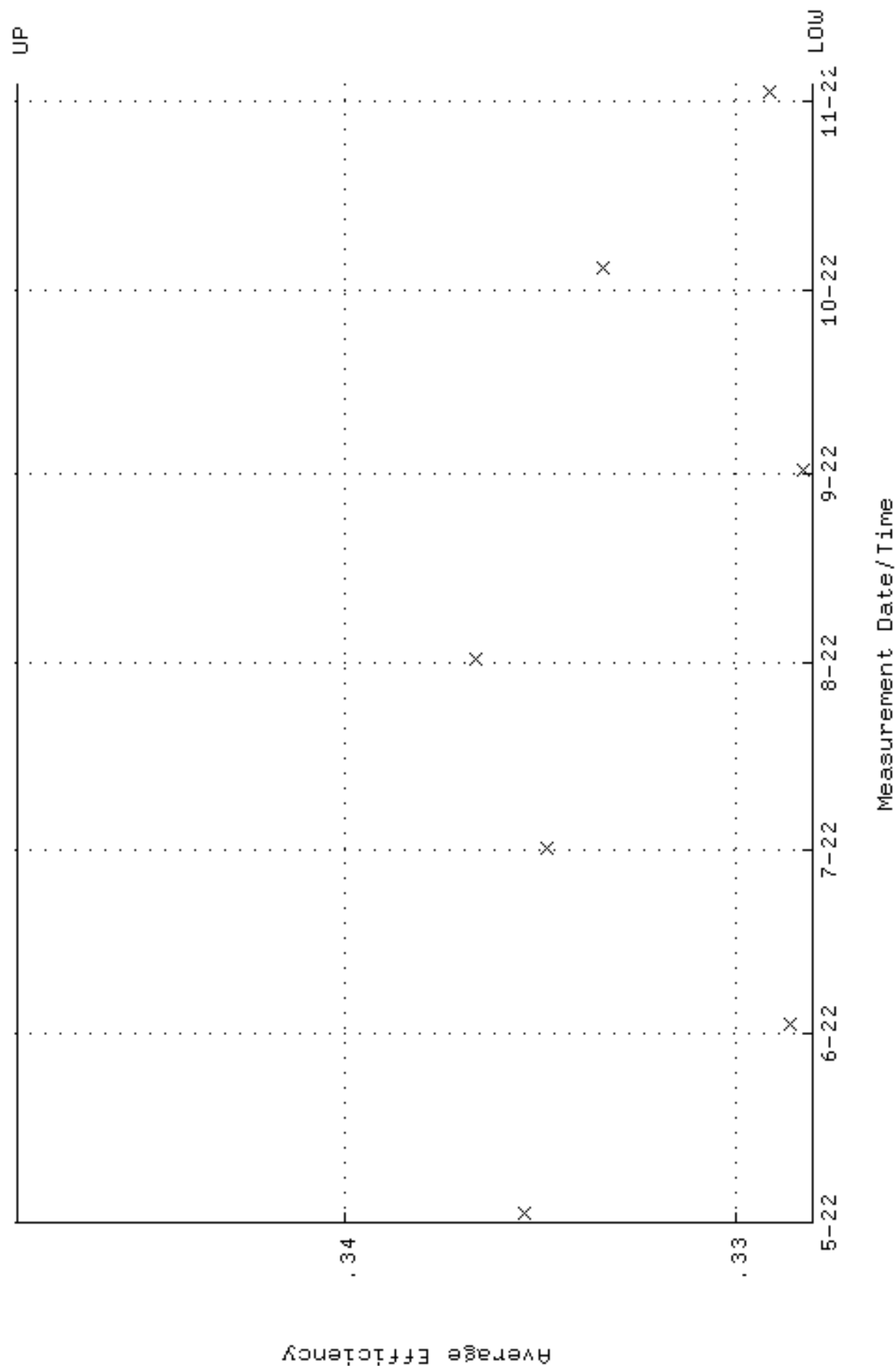
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



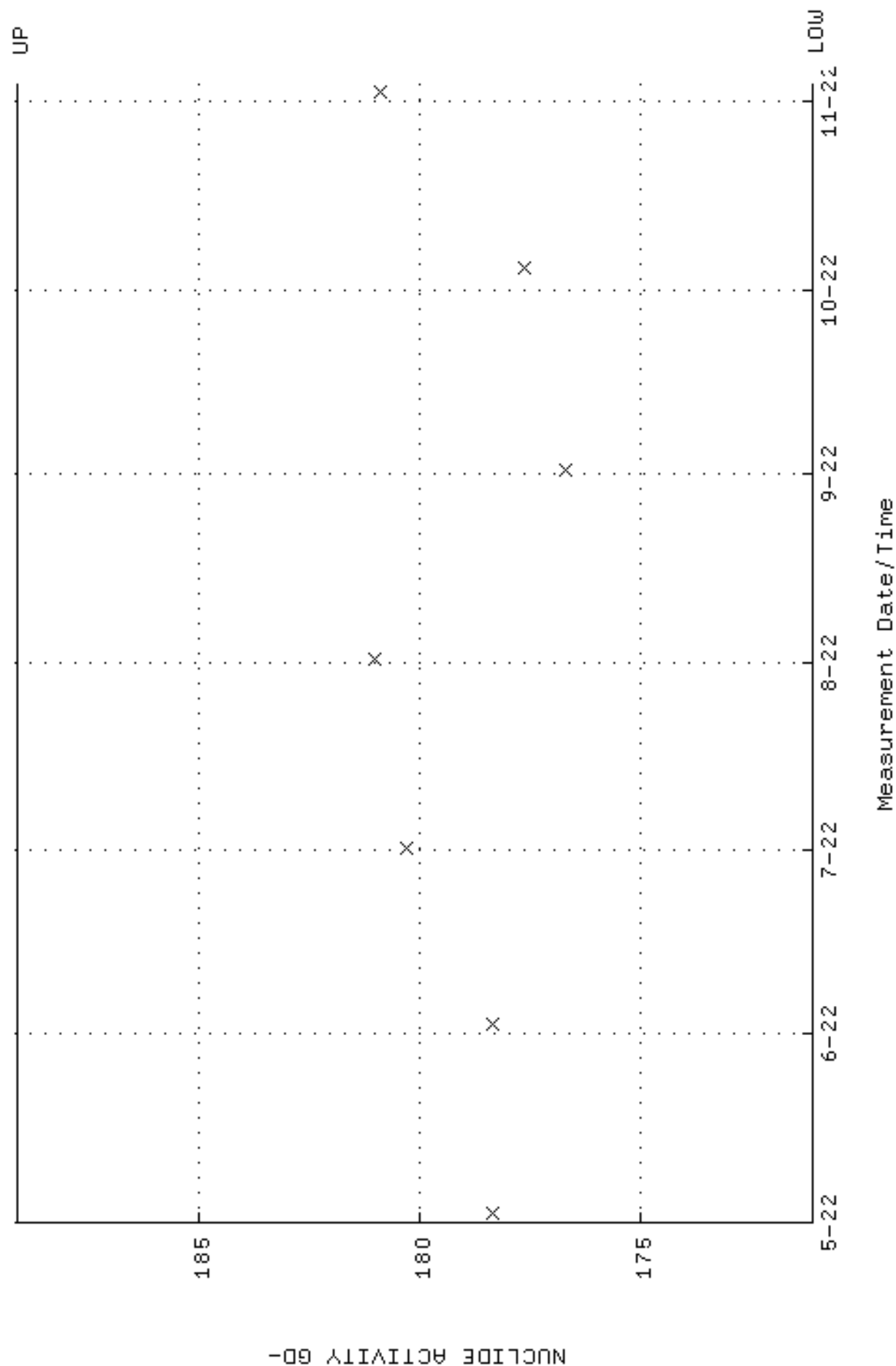
QA filename : DKA100:[ENV_ALPHA.QA.B]B004.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-MAY-2022 14:17:28 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



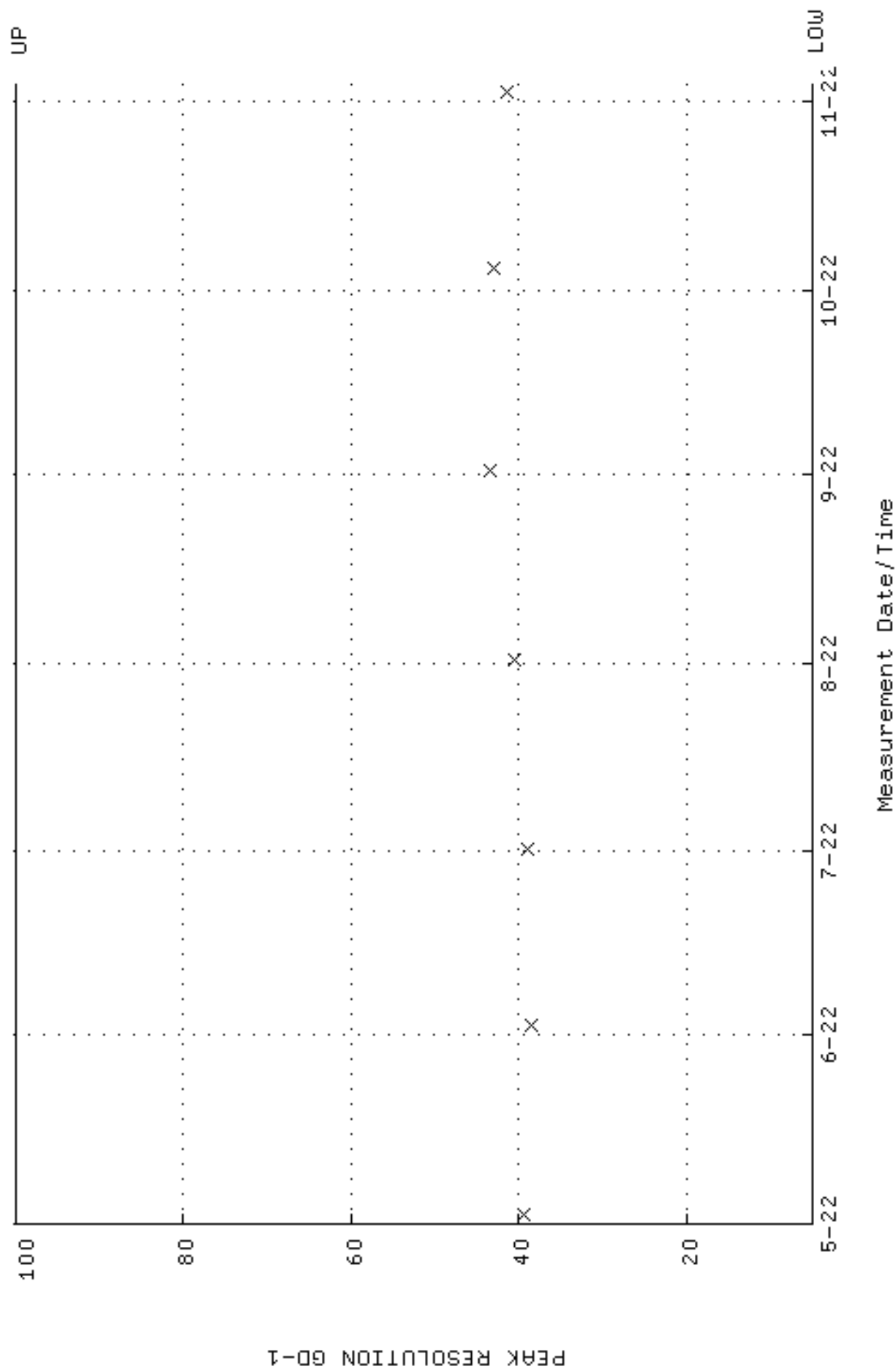
QA filename : DKA100:[ENV_ALPHA.QA.W]W010.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.328050 through 0.348350



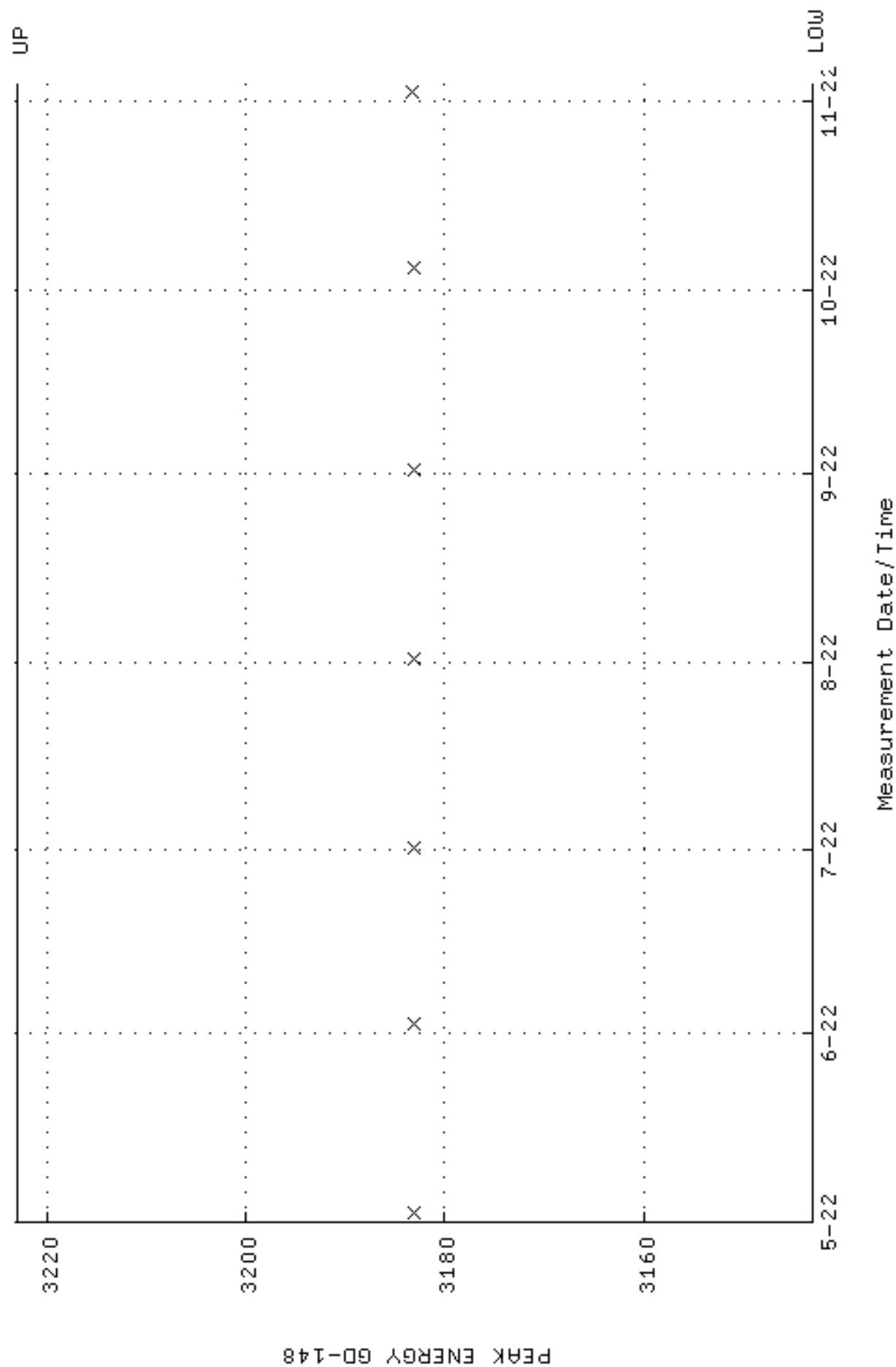
QA filename : DKA100:[ENV_ALPHA.QA.W]W010.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



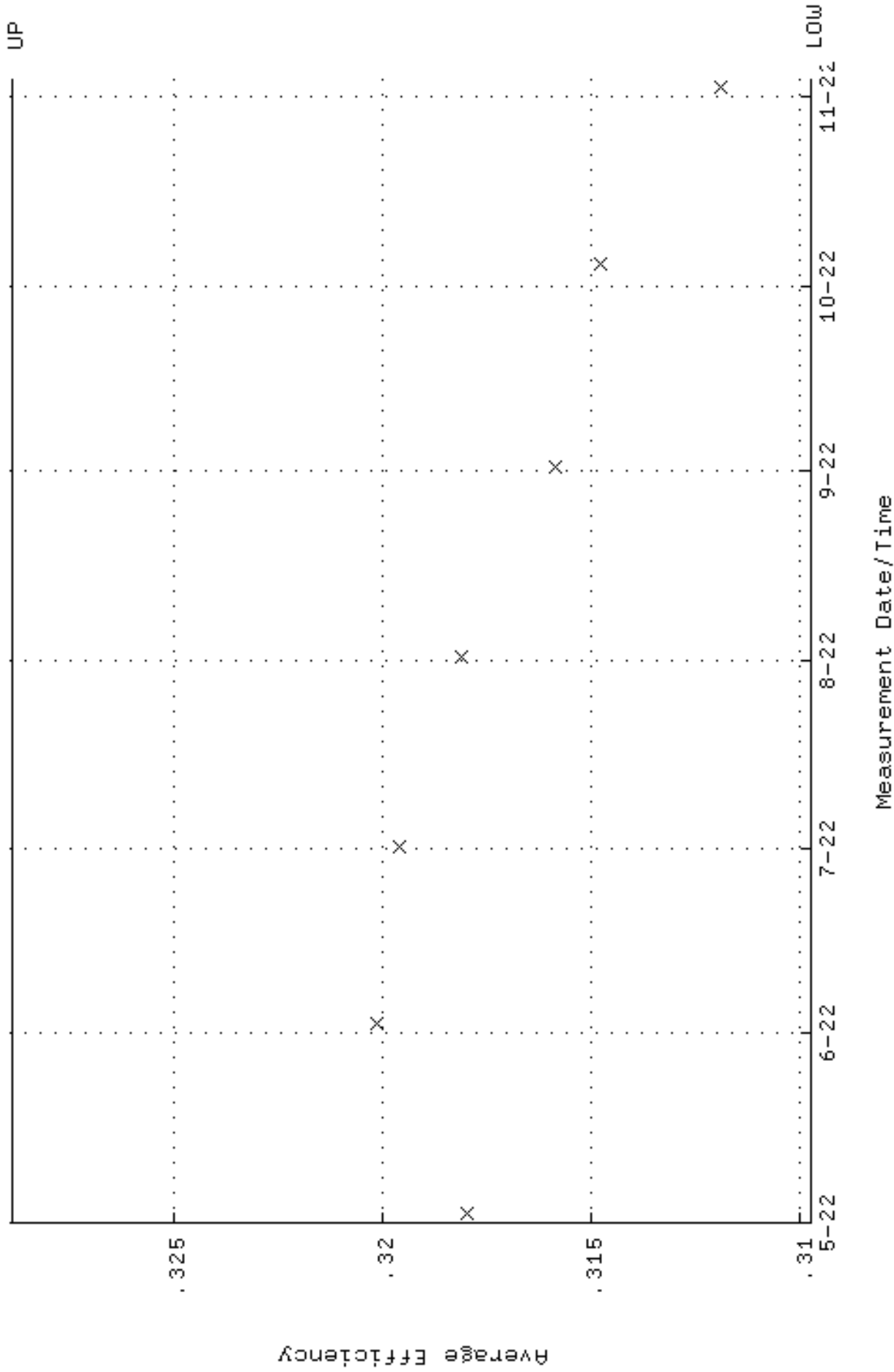
QA filename : DKA100:[ENV_ALPHA.QA.W]W010.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



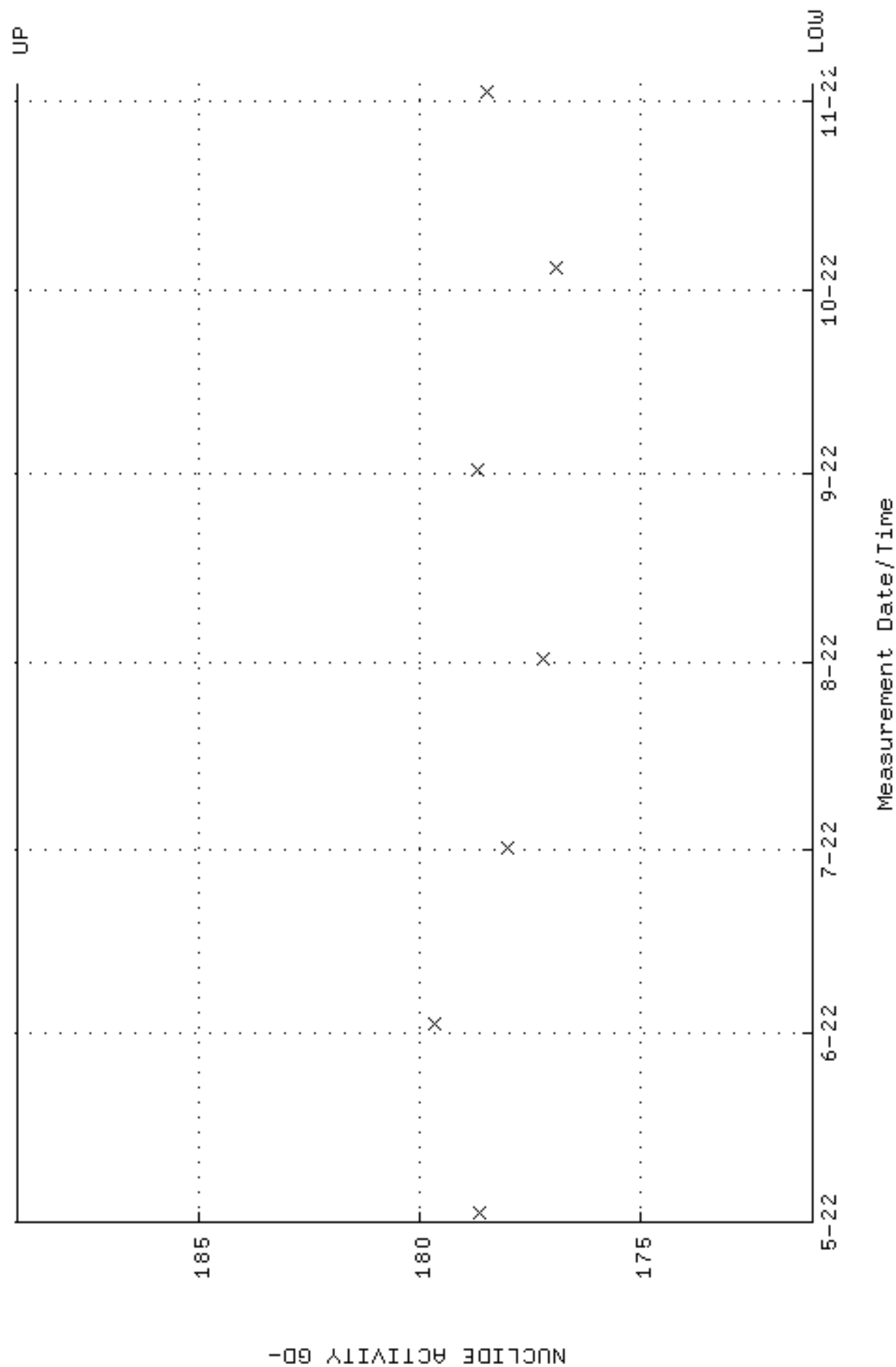
QA filename : DKA100:[ENV_ALPHA.QA.W]W010.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



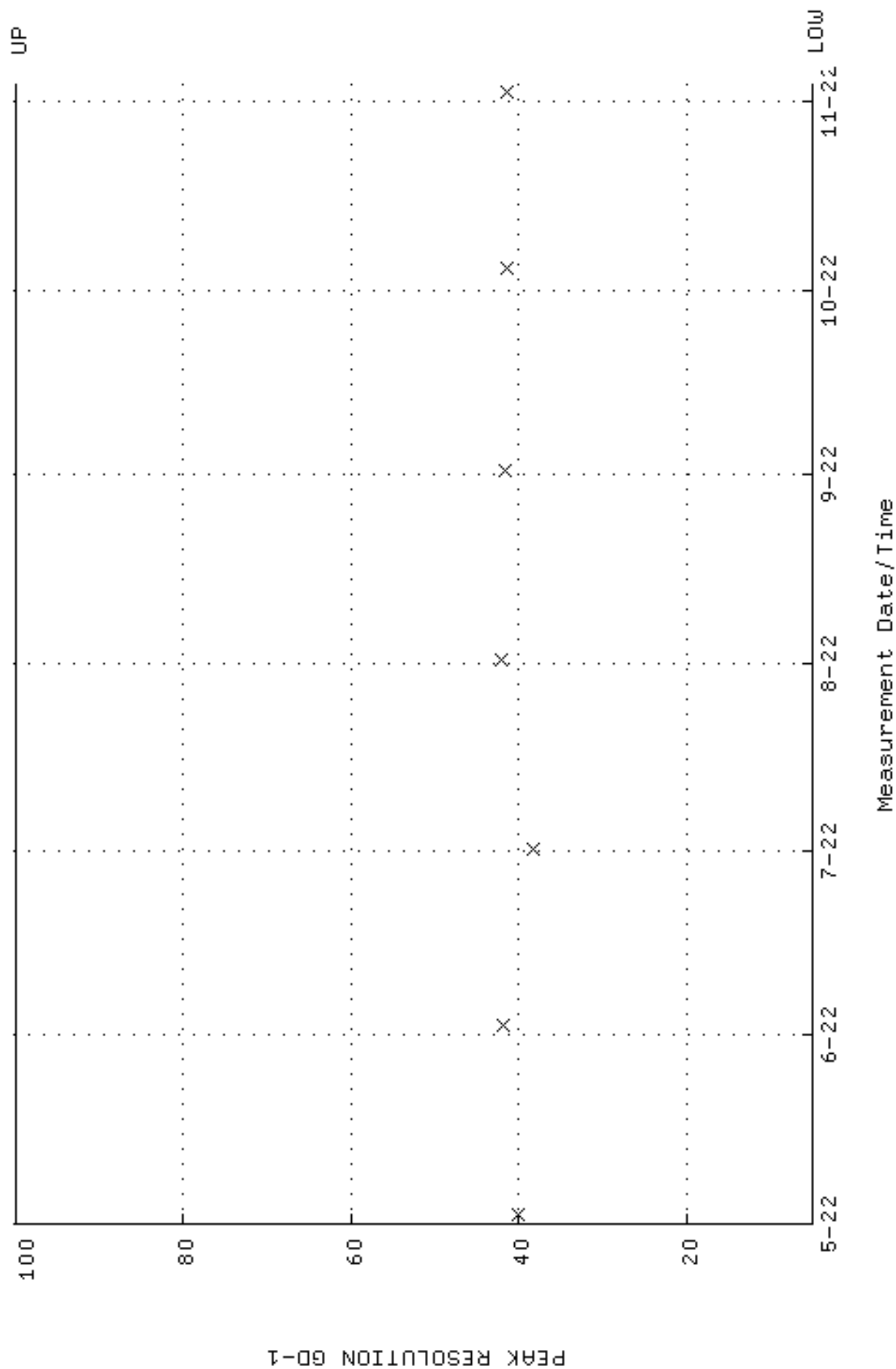
QA filename : DKA100:[ENV_ALPHA.QA.W]W011.QAF;8
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
Lower/Upper Lmts: 0.309718 through 0.328876



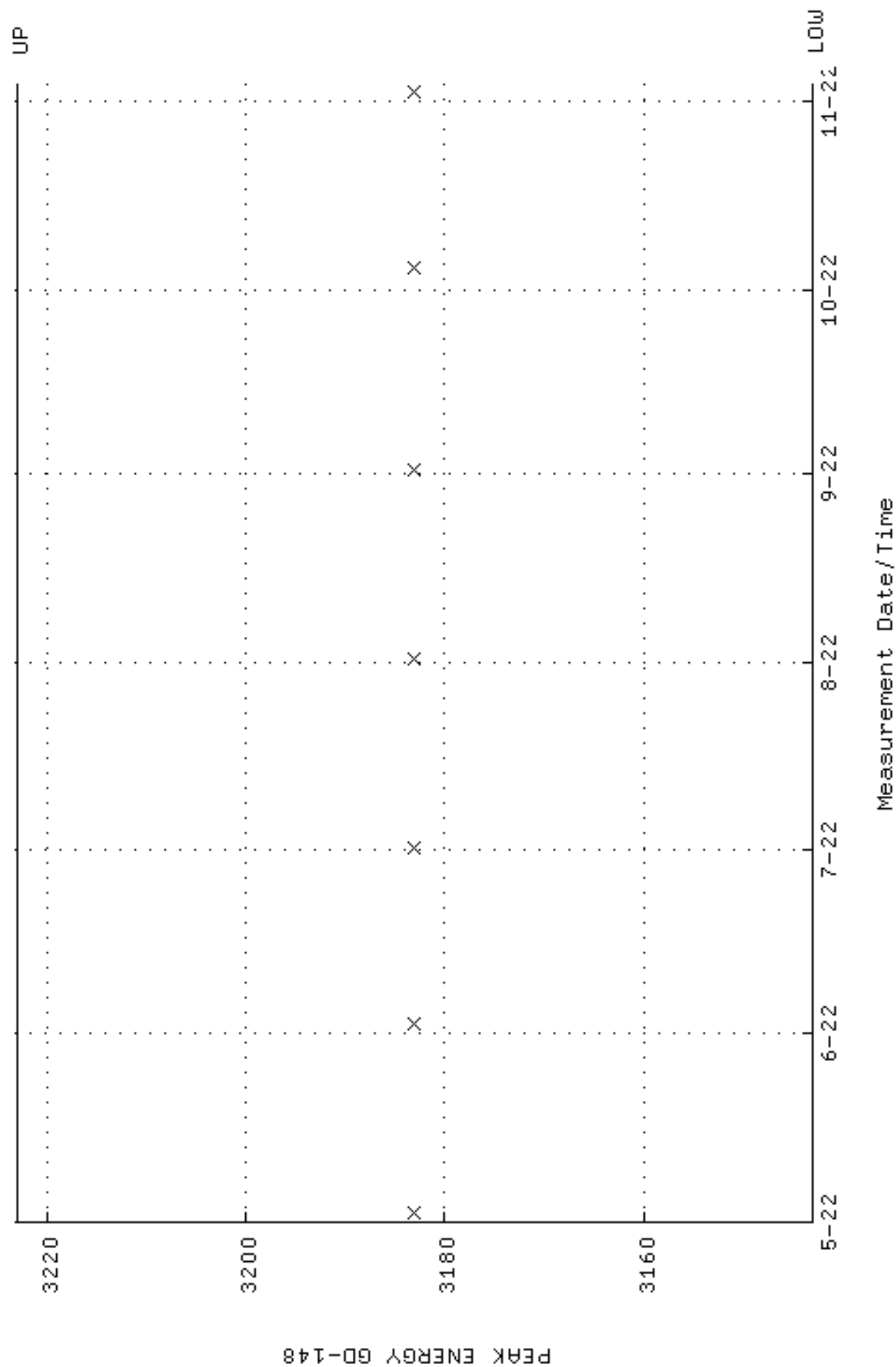
QA filename : DKA100:[ENV_ALPHA.QA.W]W011.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



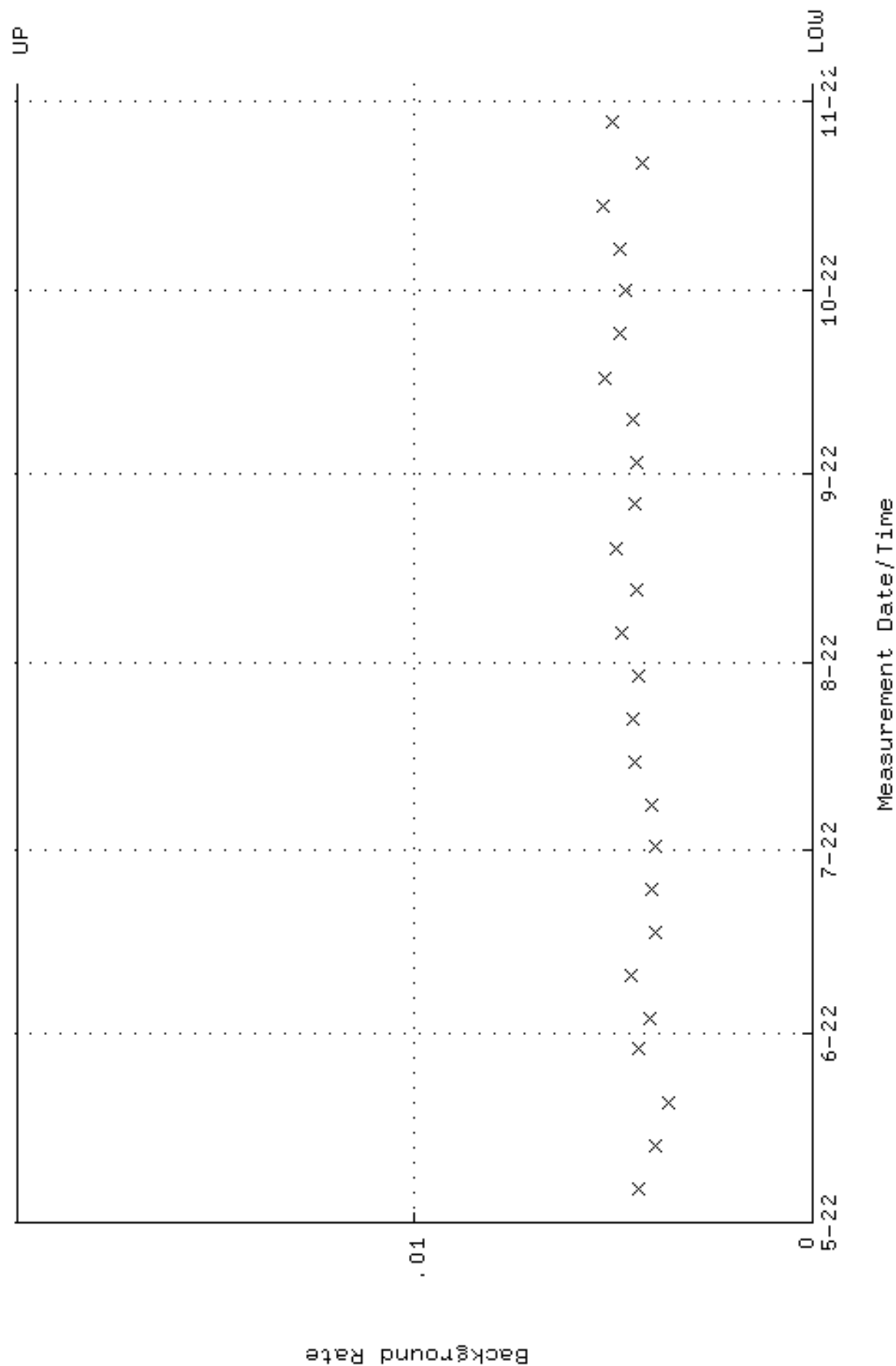
QA filename : DKA100:[ENV_ALPHA.QA.W]W011.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



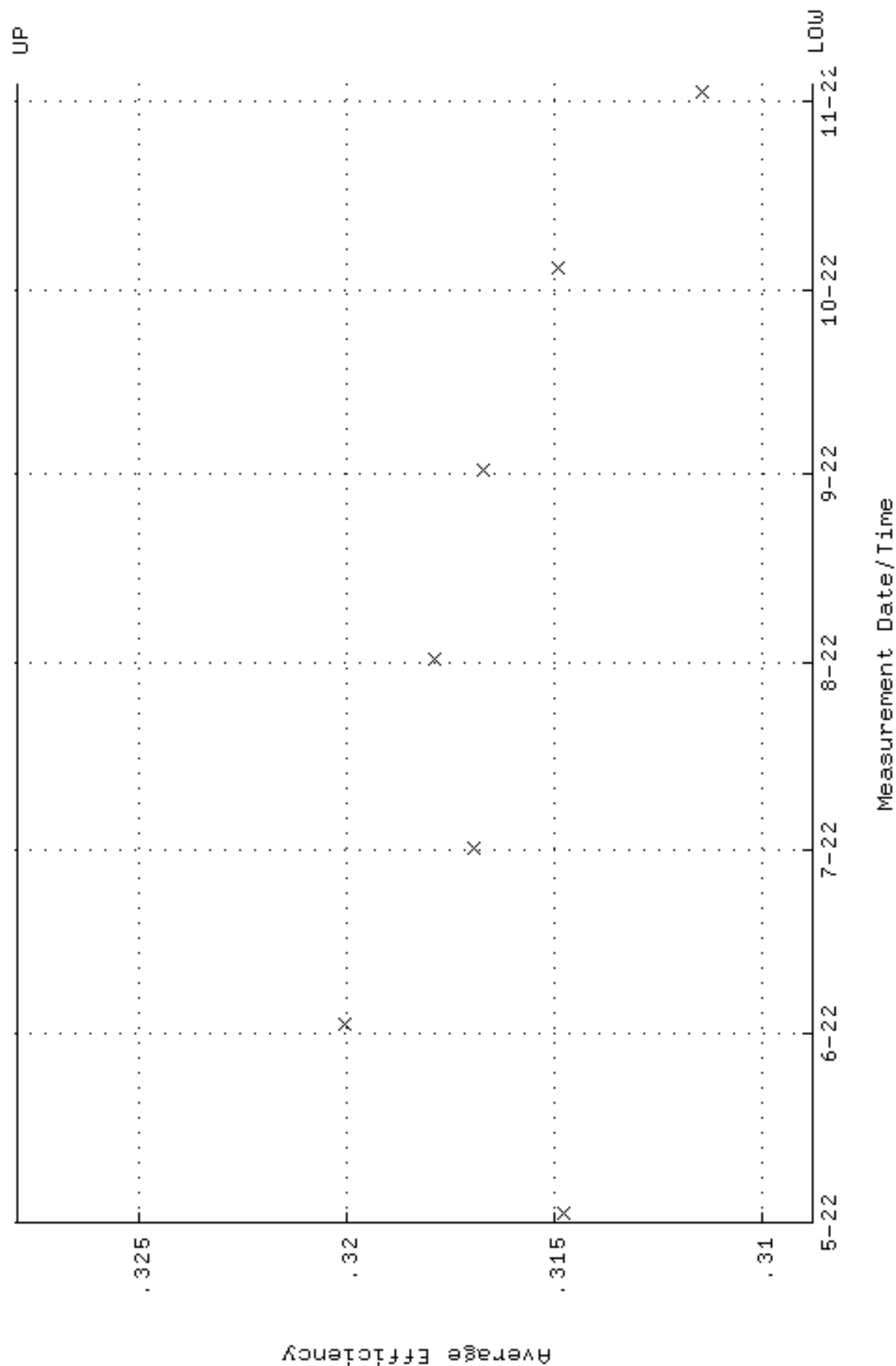
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



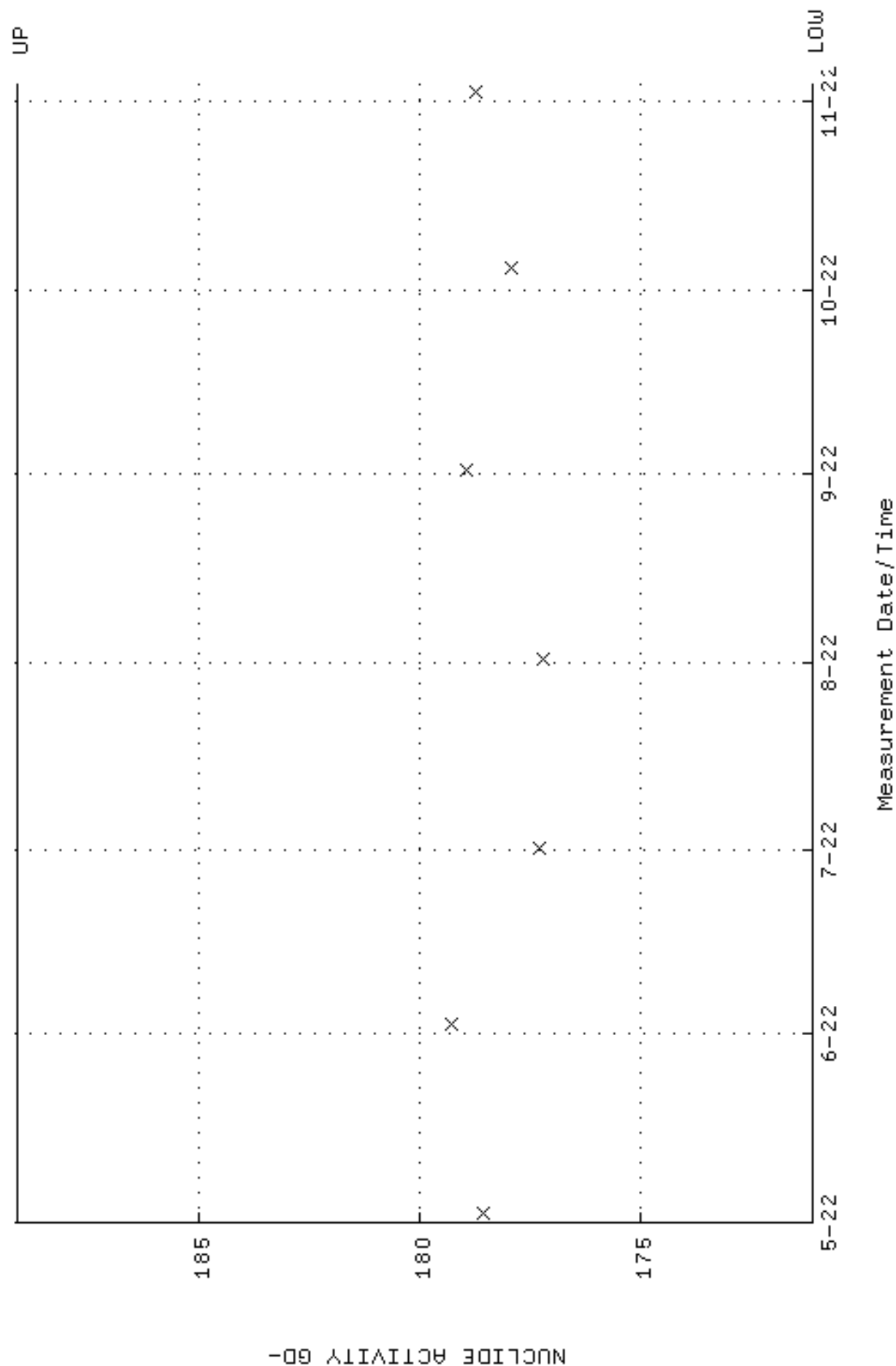
QA filename : DKA100:[ENV_ALPHA.QA.B]B011.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-MAY-2022 14:17:29 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



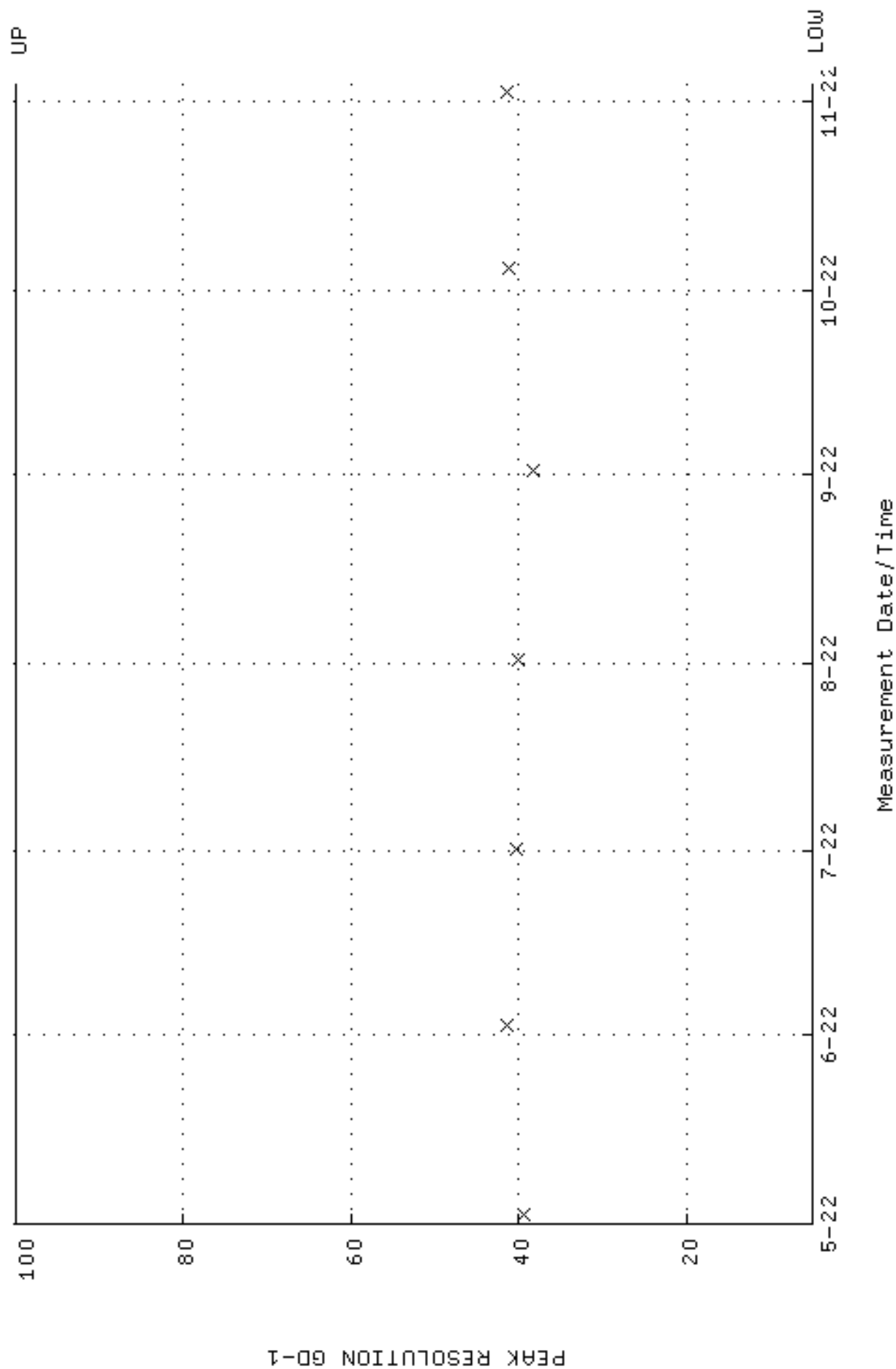
QA filename : DKA100:[ENV_ALPHA.QA.W]W012.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.308796 through 0.327900



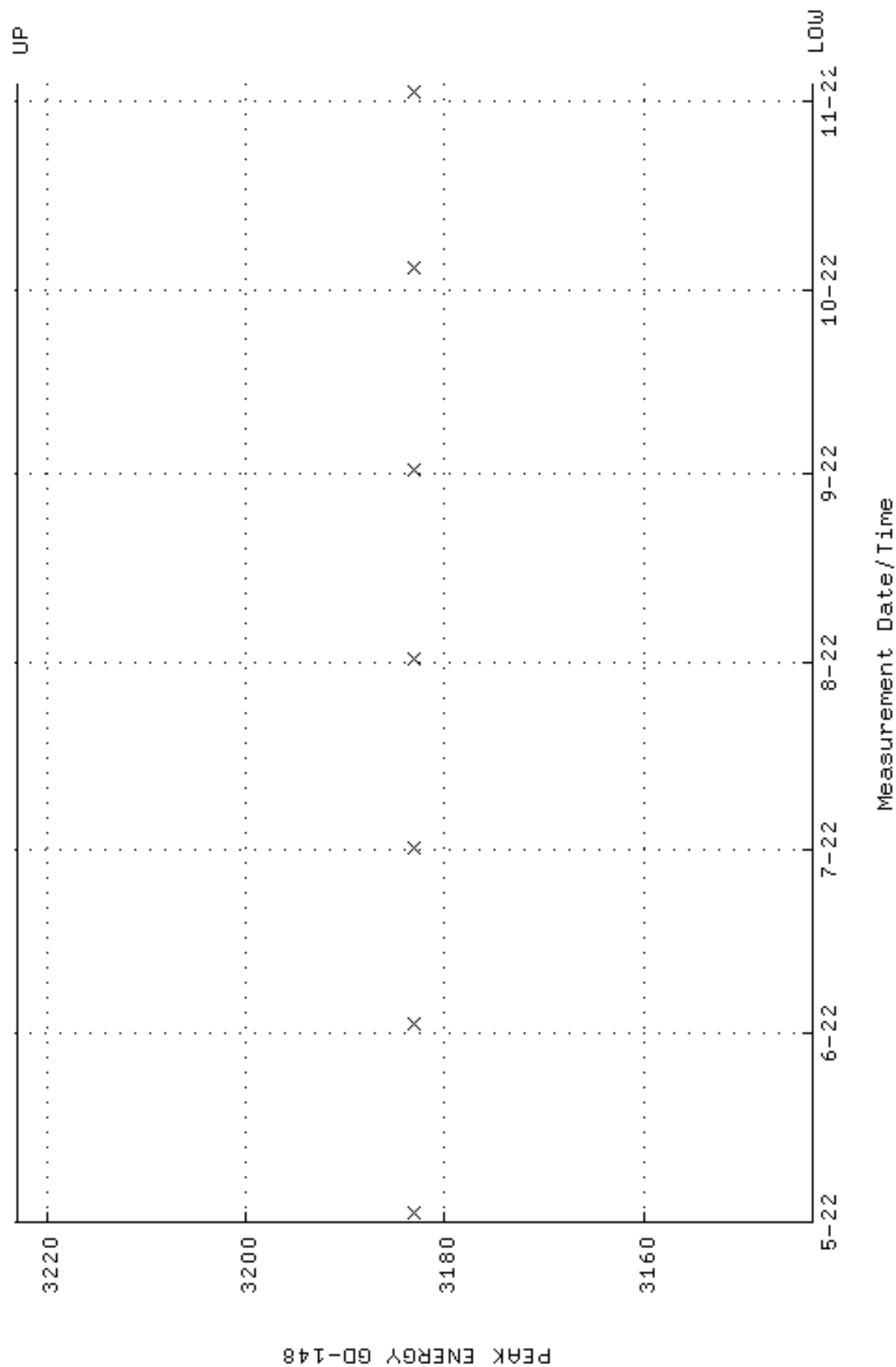
QA filename : DKA100:[ENV_ALPHA.QA.W]W012.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



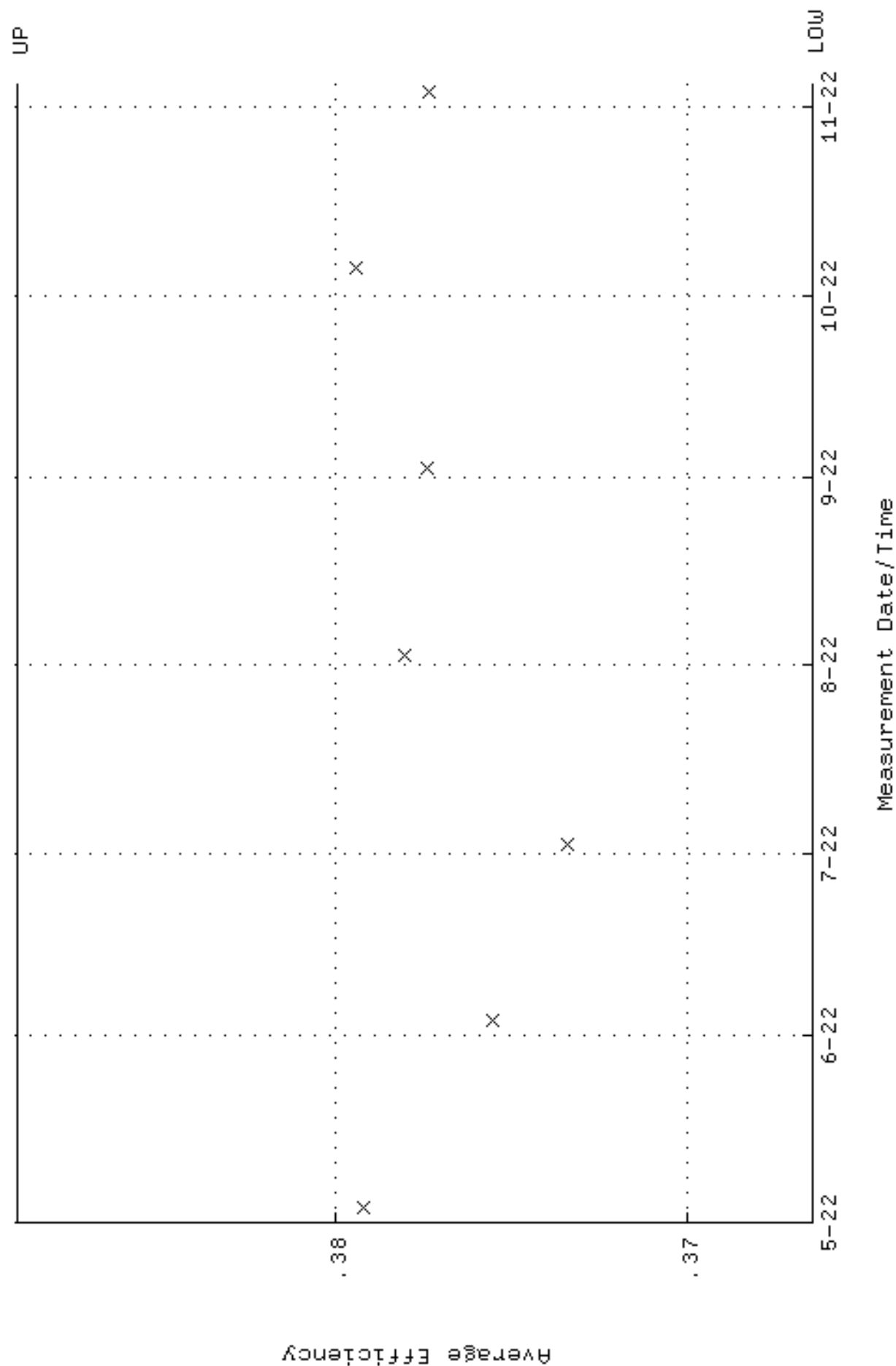
QA filename : DKA100:[ENV_ALPHA.QA.W]W012.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



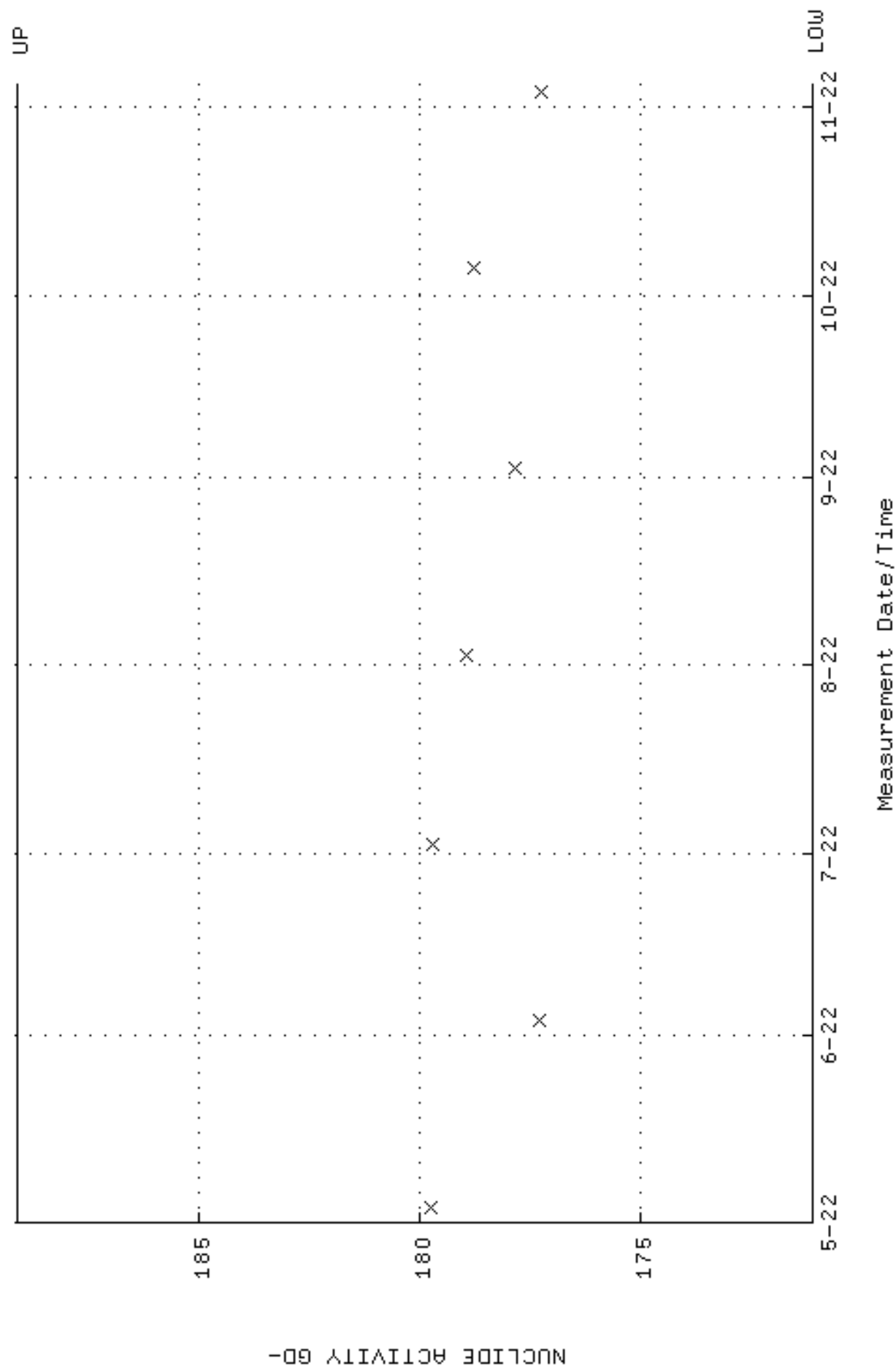
QA filename : DKA100:[ENV_ALPHA.QA.W]W012.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



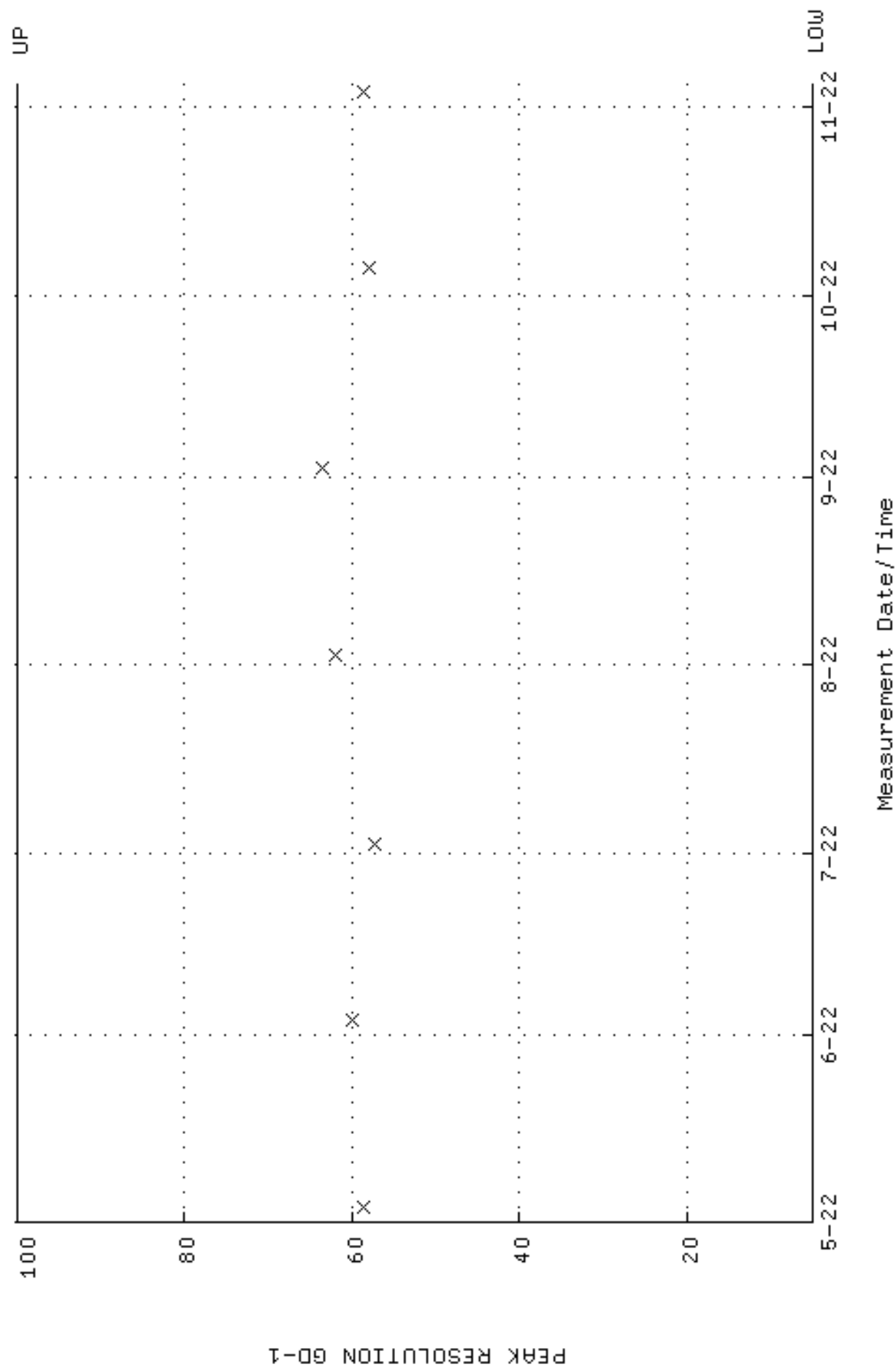
QA filename : DKA100:[ENV_ALPHA.QA.W]W037.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.366408 through 0.389072



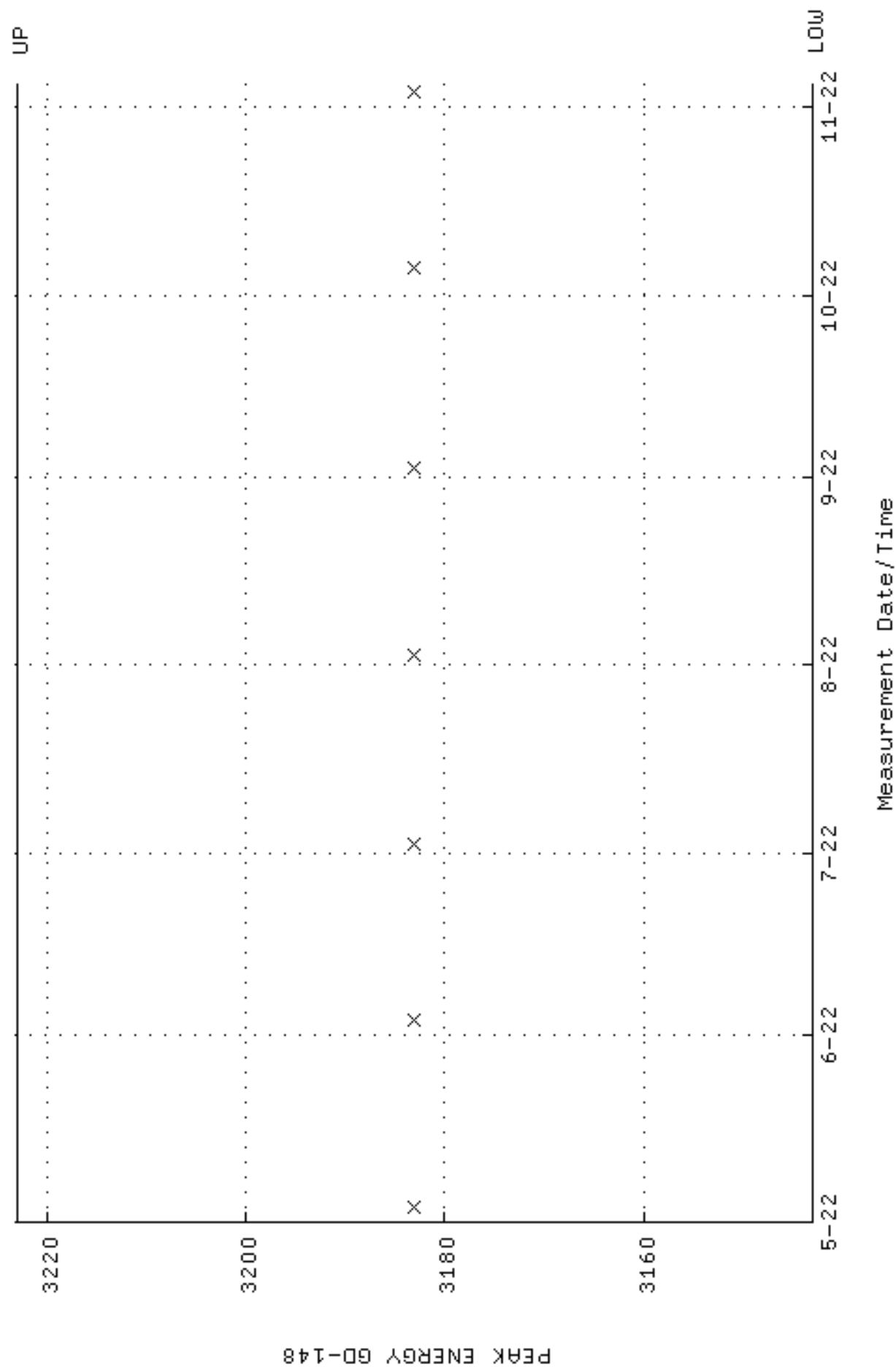
QA filename : DKA100:[ENV_ALPHA.QA.W]W037.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



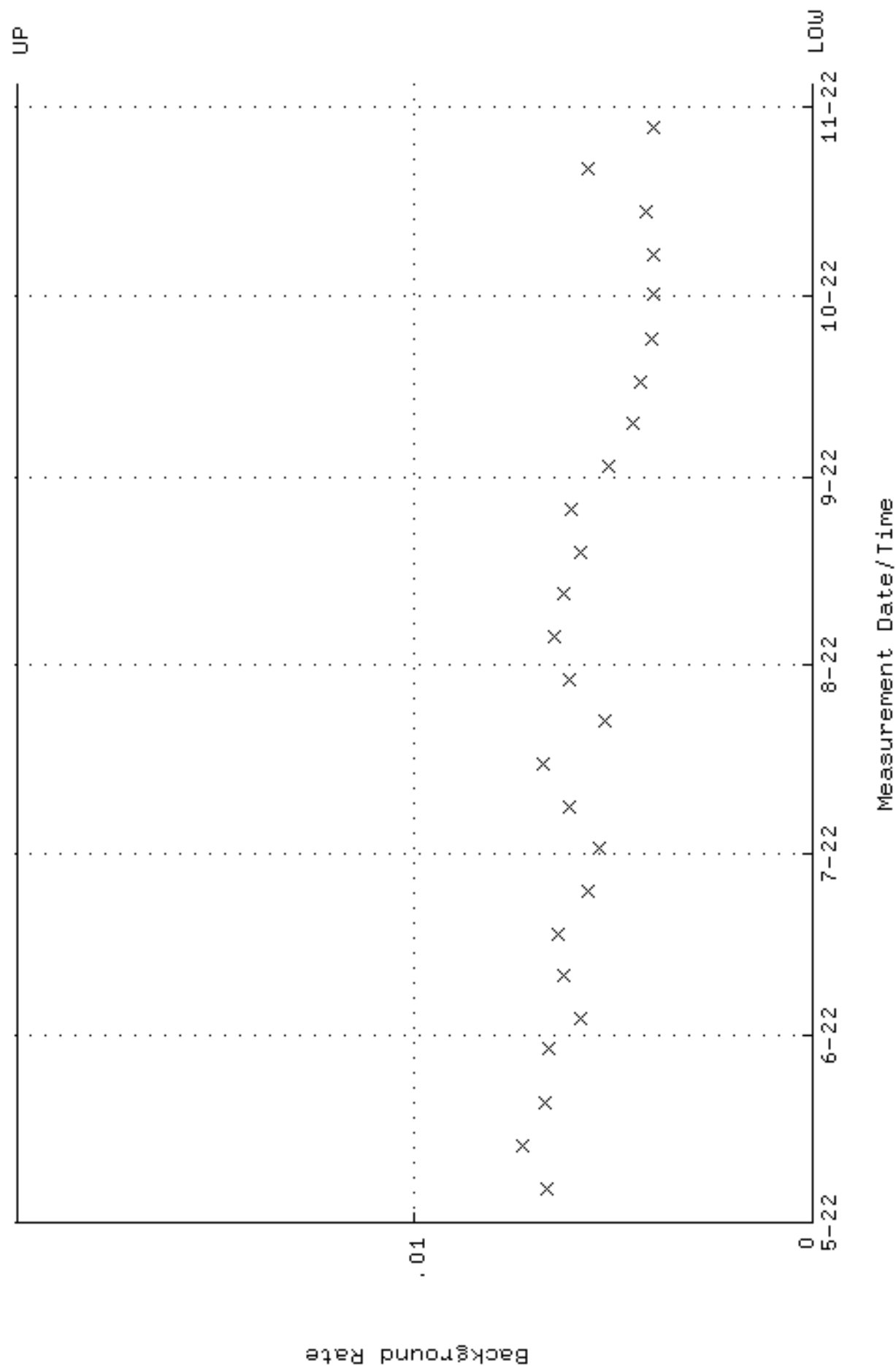
QA filename : DKA100:[ENV_ALPHA.QA.W]W037.QAF;10
Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



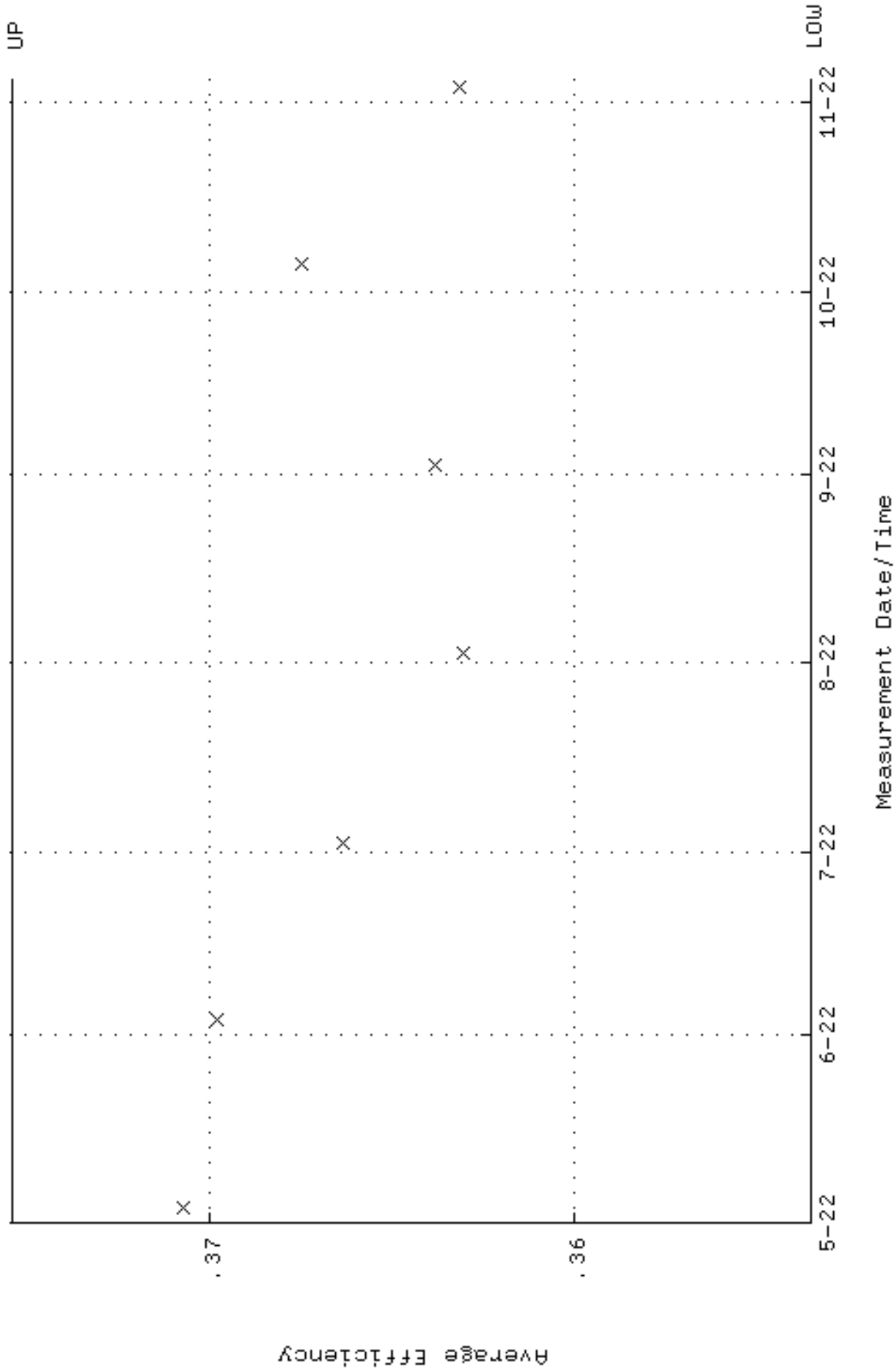
QA filename : DKA100:[ENV_ALPHA.QA.W]W037.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



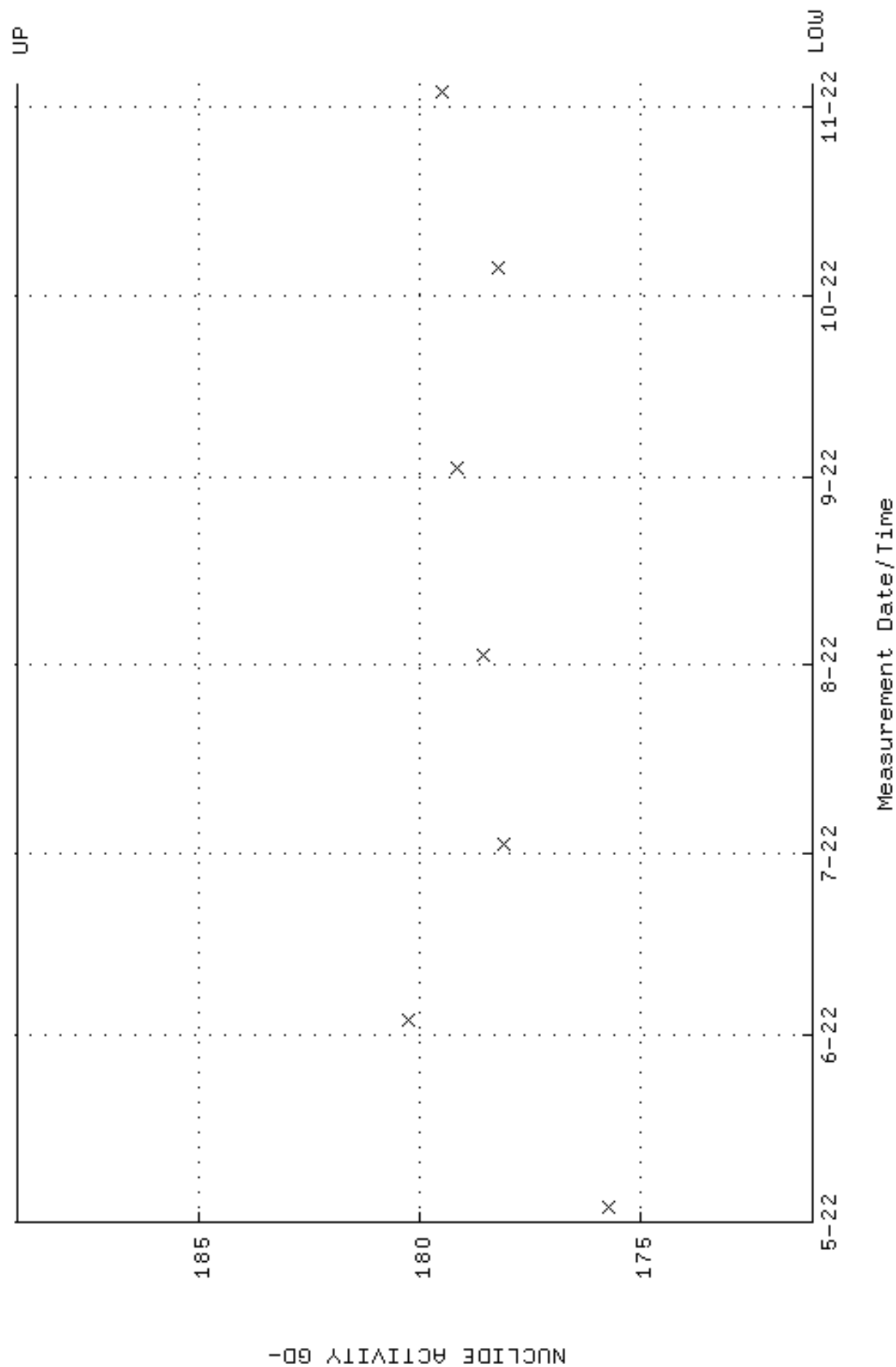
QA filename : DKA100:[ENV_ALPHA.QA.B]B037.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-MAY-2022 13:56:32 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



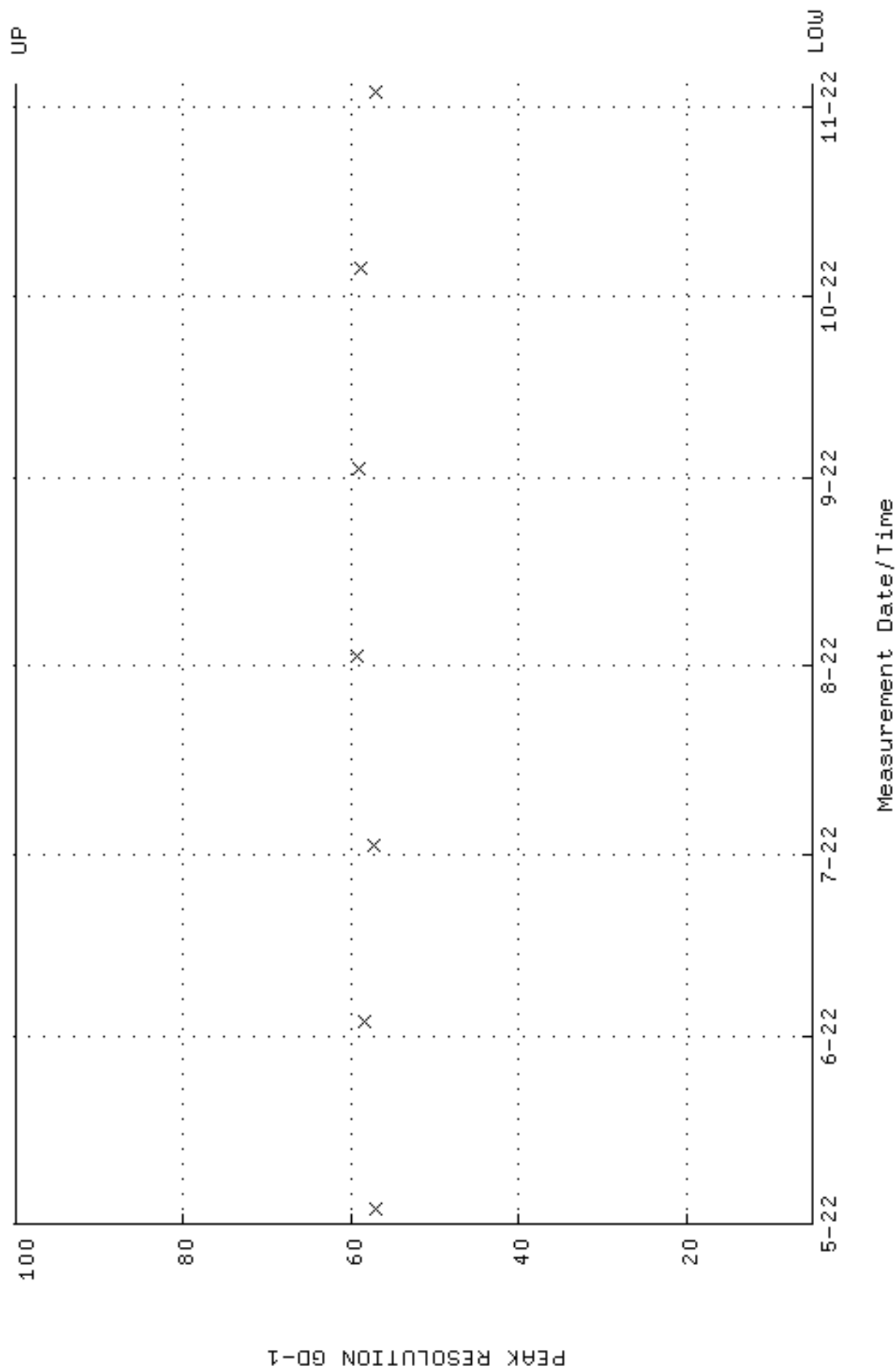
QA filename : DKA100:[ENV_ALPHA.QA.W]W038.QAF;6
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
Lower/Upper Lmts: 0.353514 through 0.375380



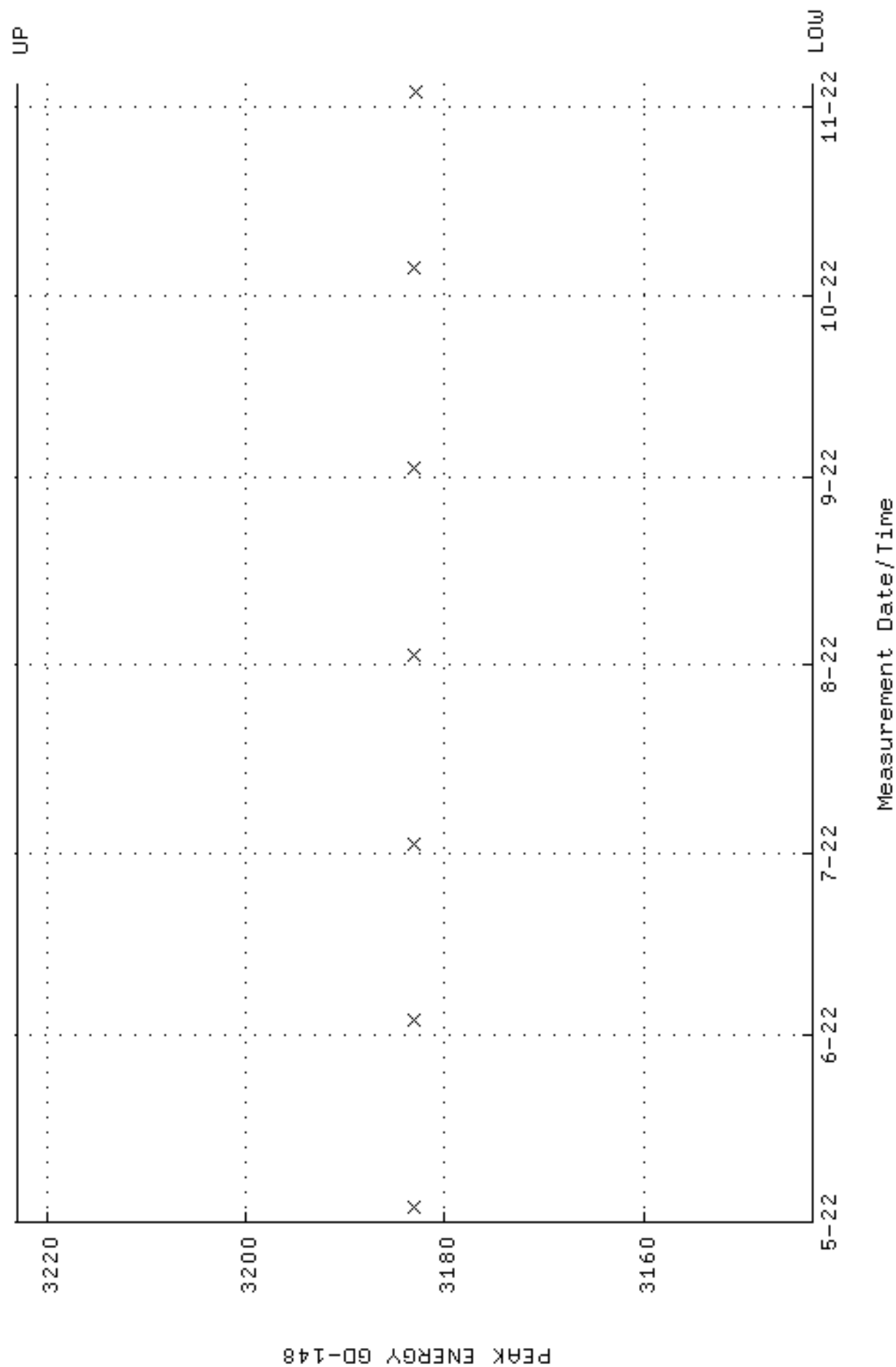
QA filename : DKA100:[ENV_ALPHA.QA.W]W038.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



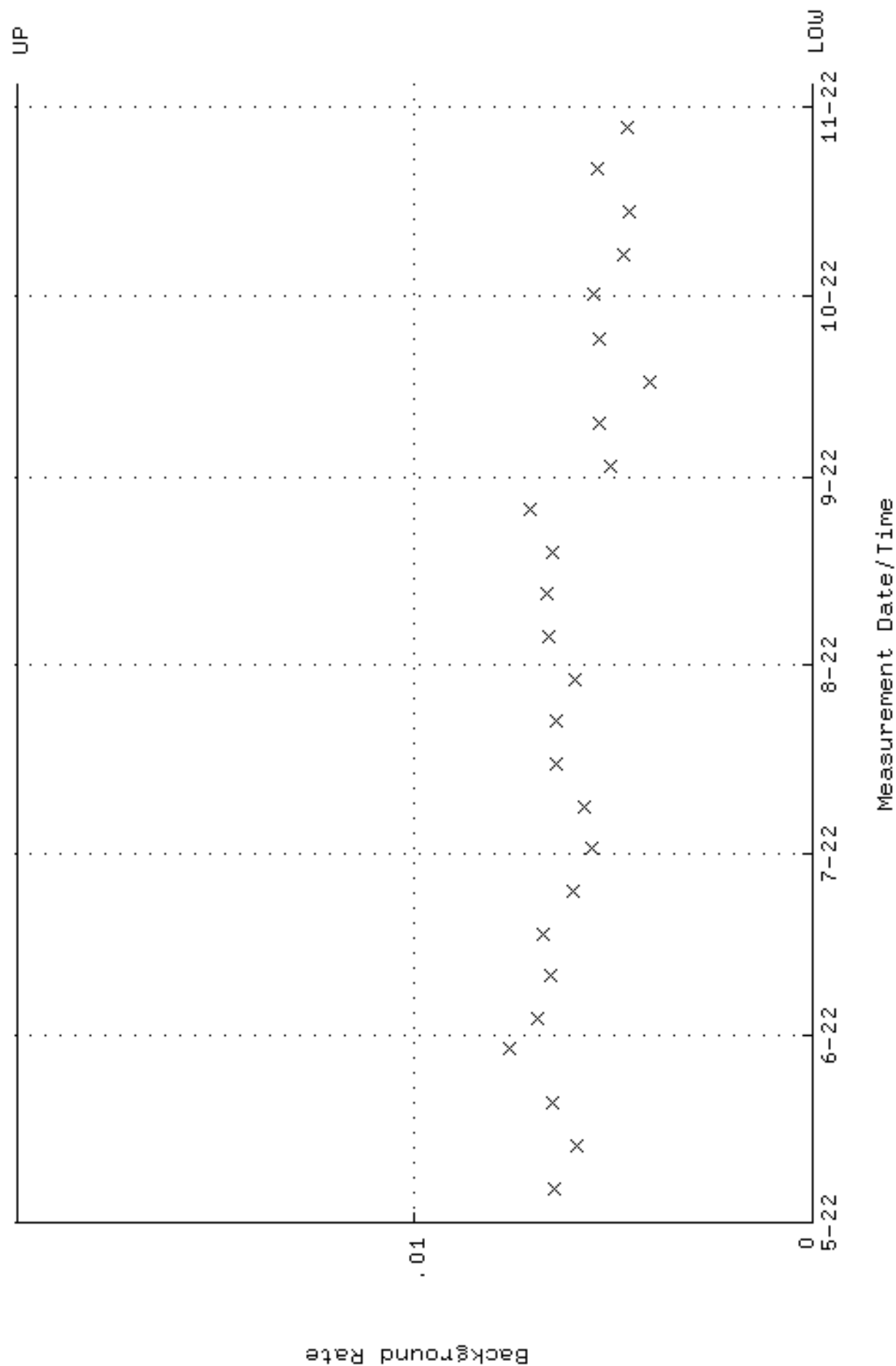
QA filename : DKA100:[ENV_ALPHA.QA.W]W038.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



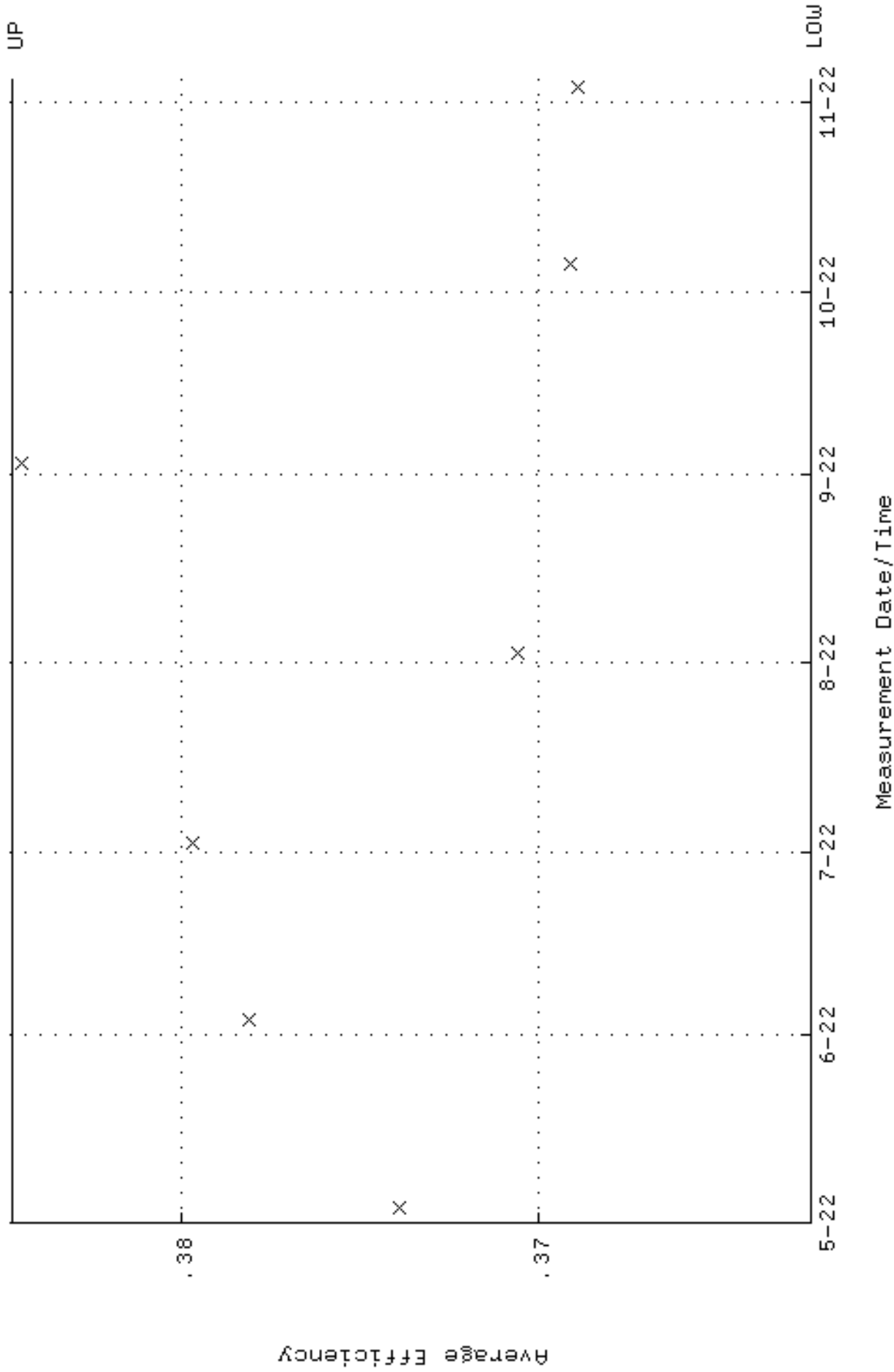
QA filename : DKA100:[ENV_ALPHA.QA.W]W038.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



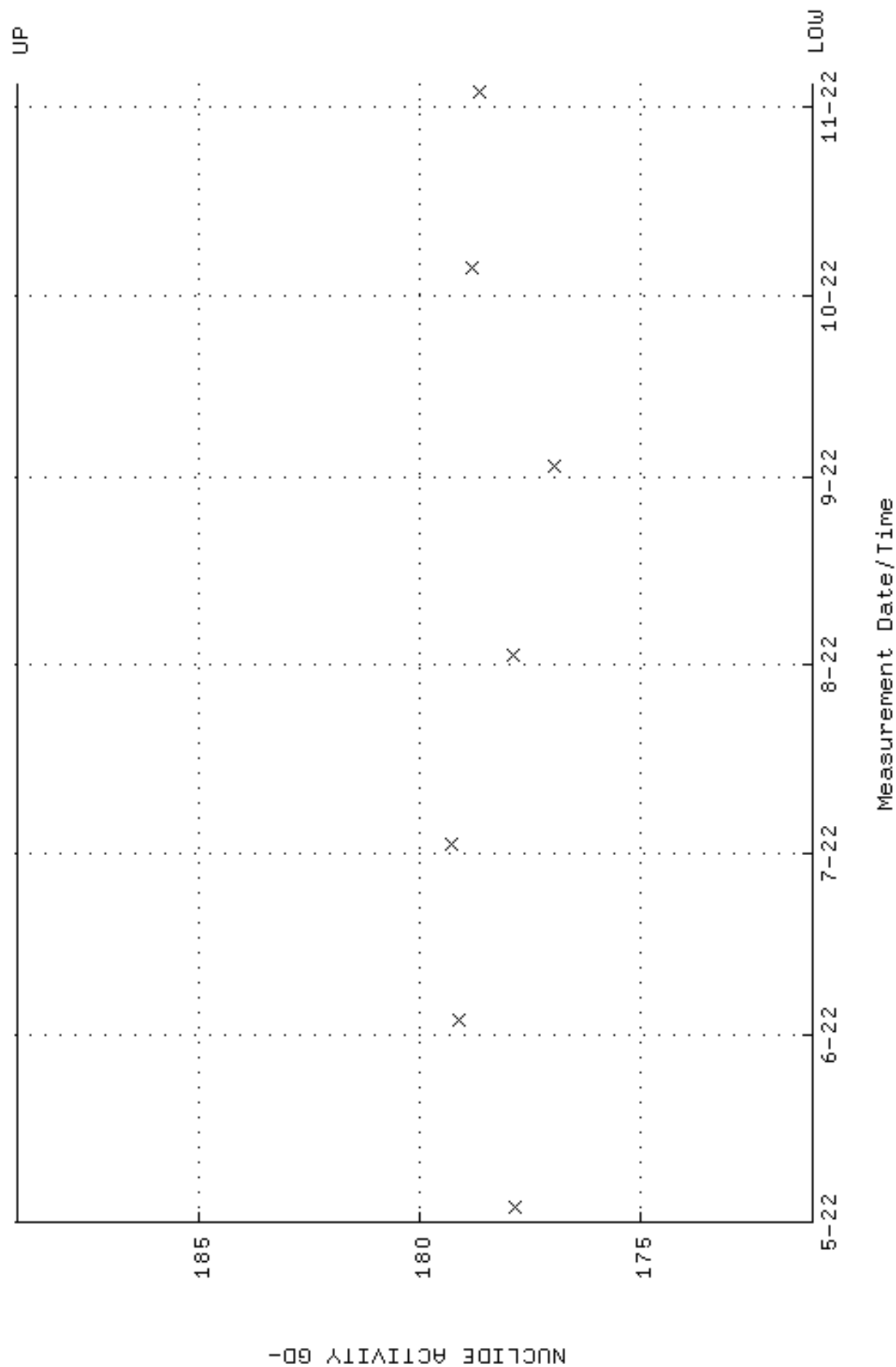
QA filename : DKA100:[ENV_ALPHA.QA.B]B038.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-MAY-2022 13:56:32 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



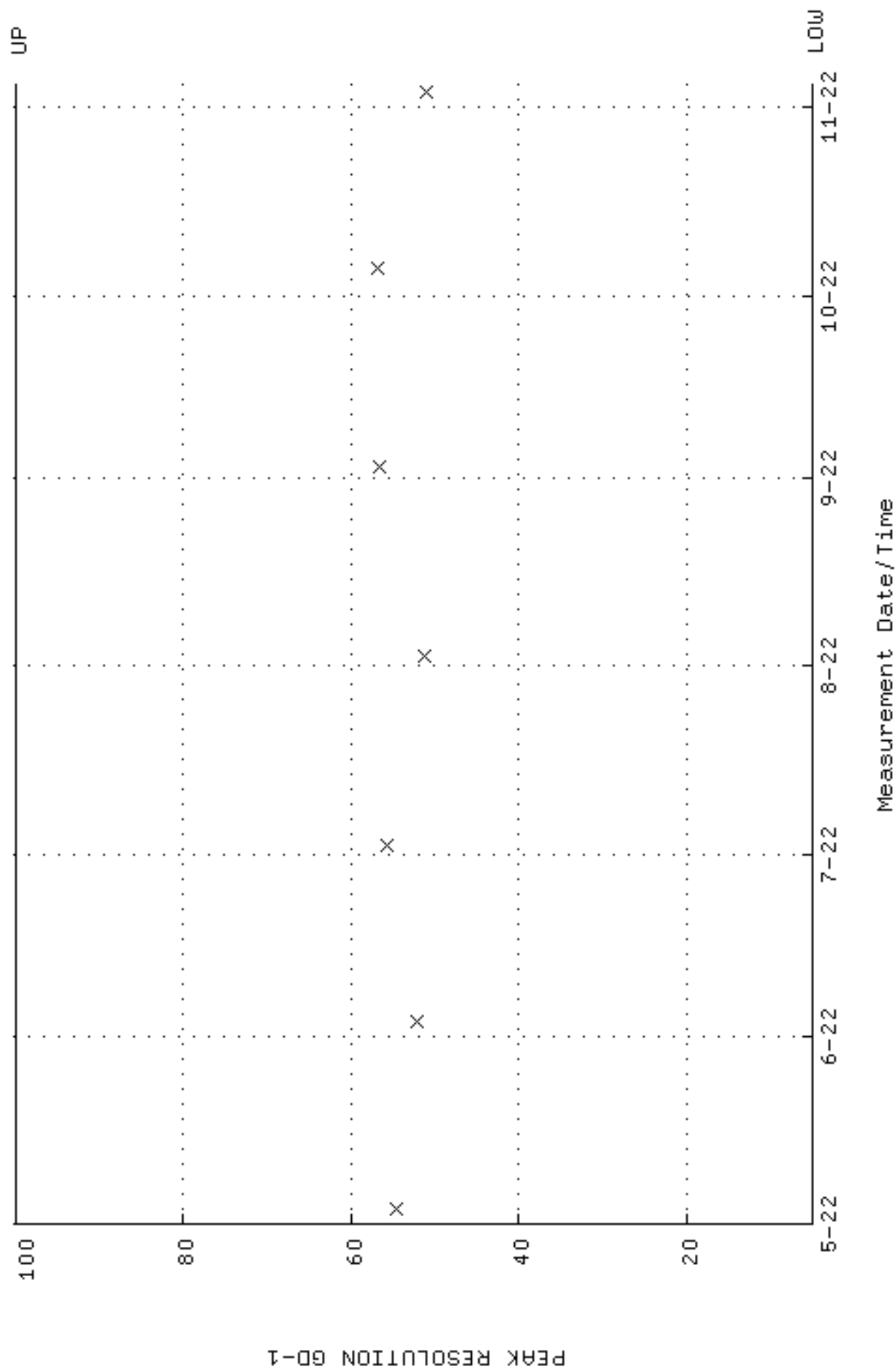
QA filename : DKA100:[ENV_ALPHA.QA.W]W039.QAF;8
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
Lower/Upper Lmts: 0.362349 through 0.384763



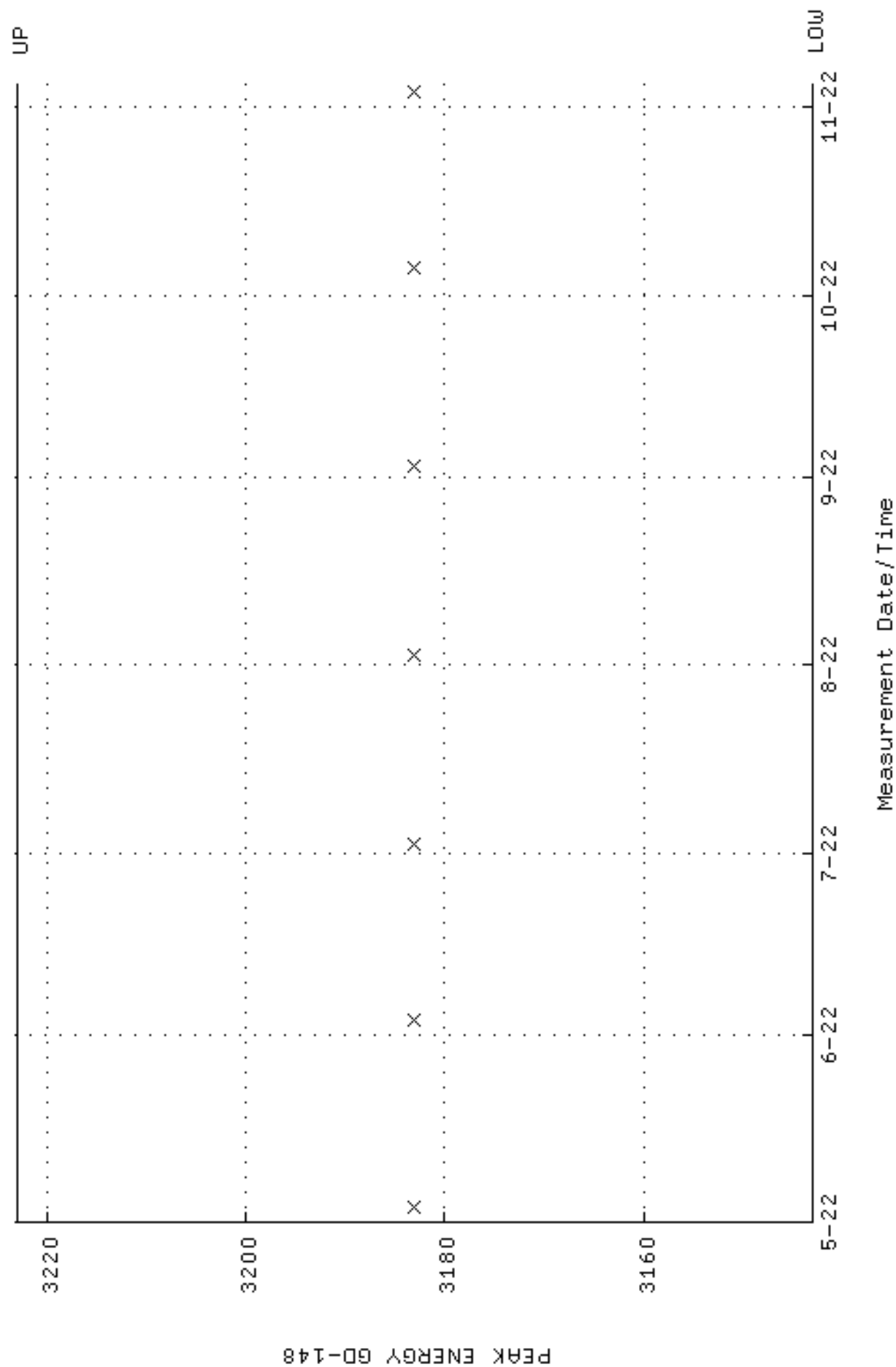
QA filename : DKA100:[ENV_ALPHA.QA.W]W039.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



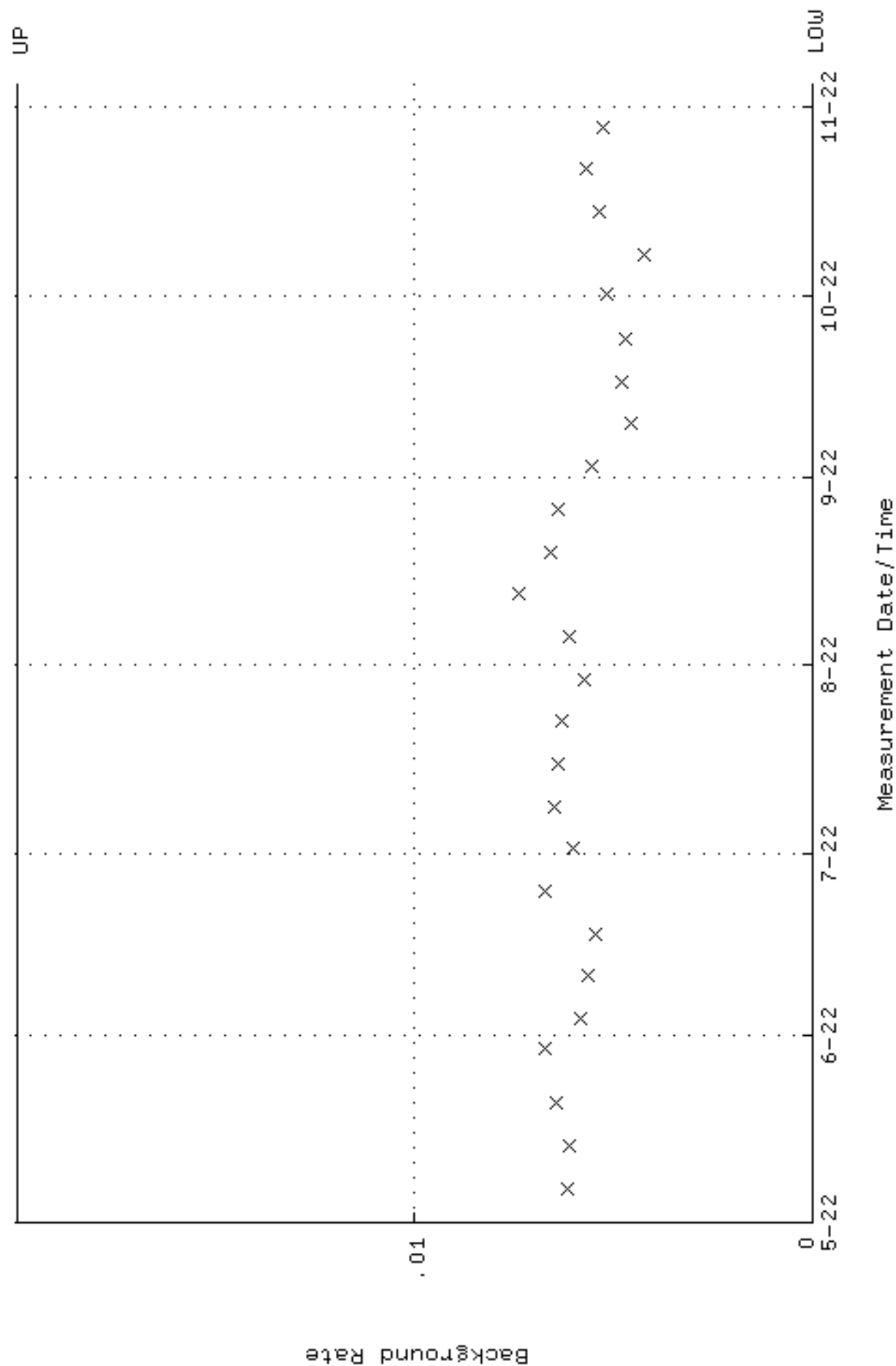
QA filename : DKA100:[ENV_ALPHA.QA.W]W039.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



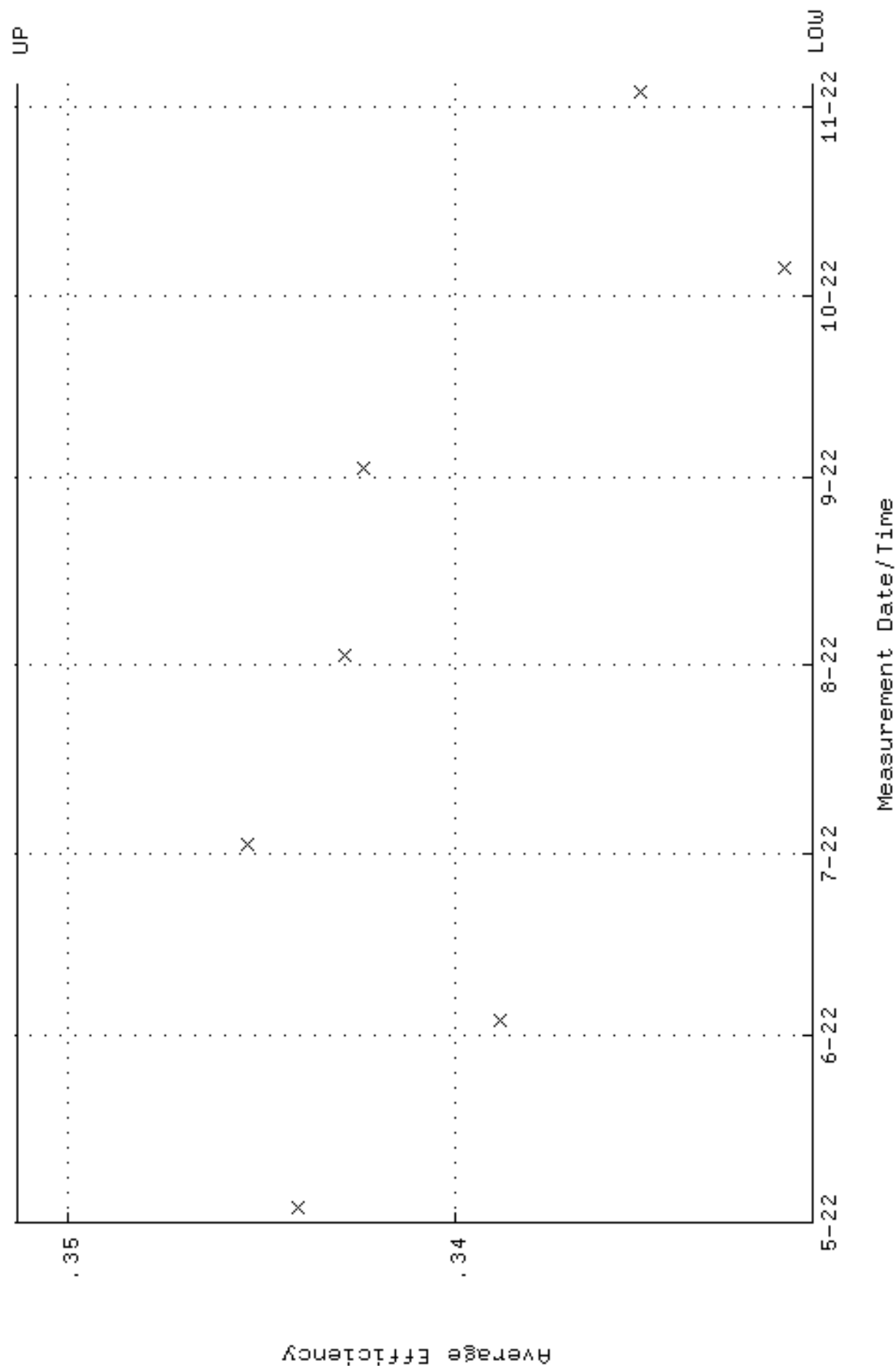
QA filename : DKA100:[ENV_ALPHA.QA.W]W039.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



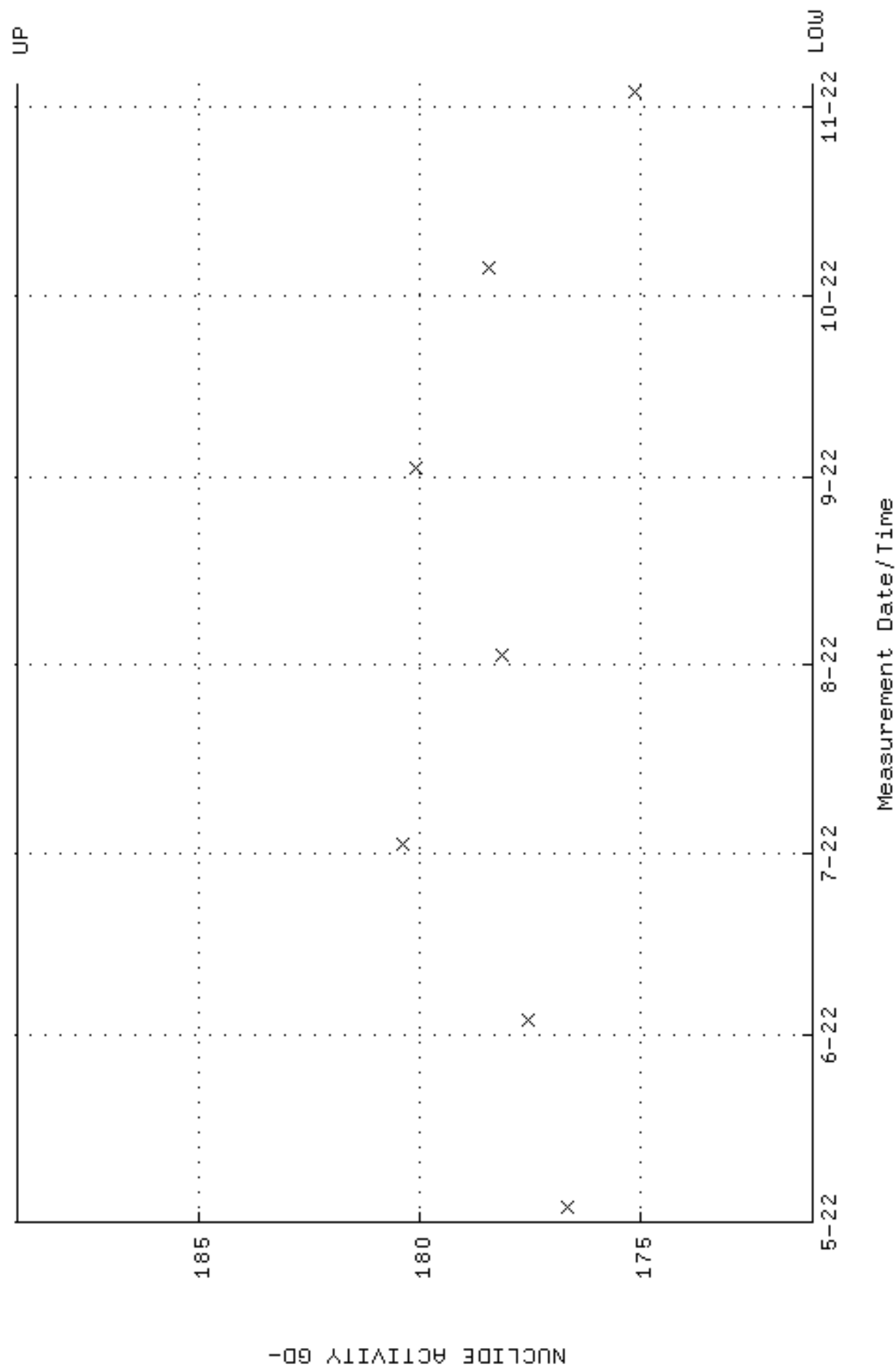
QA filename : DKA100:[ENV_ALPHA.QA.B]B039.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-MAY-2022 13:56:32 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



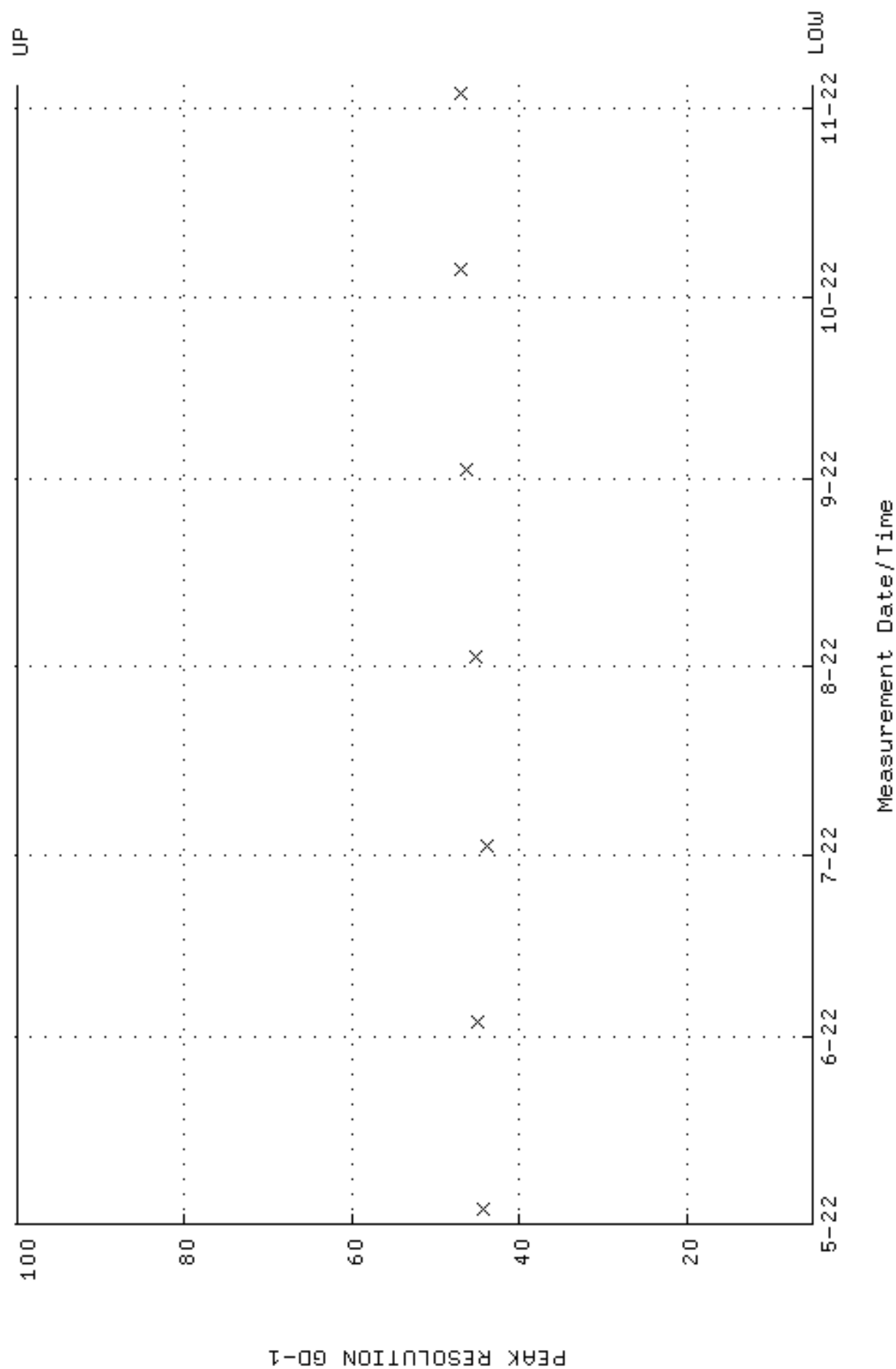
QA filename : DKA100:[ENV_ALPHA.QA.W]W045.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.330826 through 0.351290



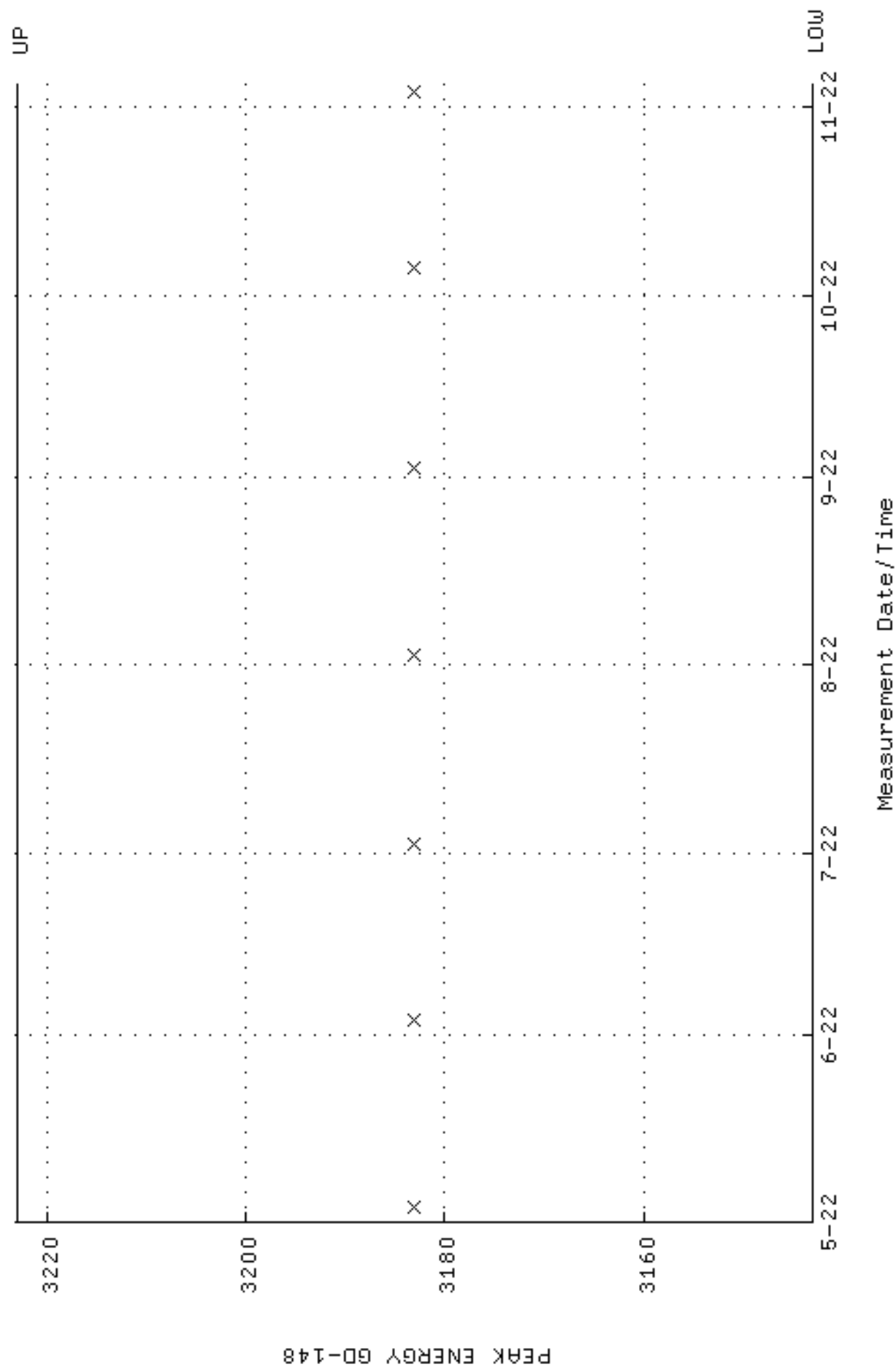
QA filename : DKA100:[ENV_ALPHA.QA.W]W045.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



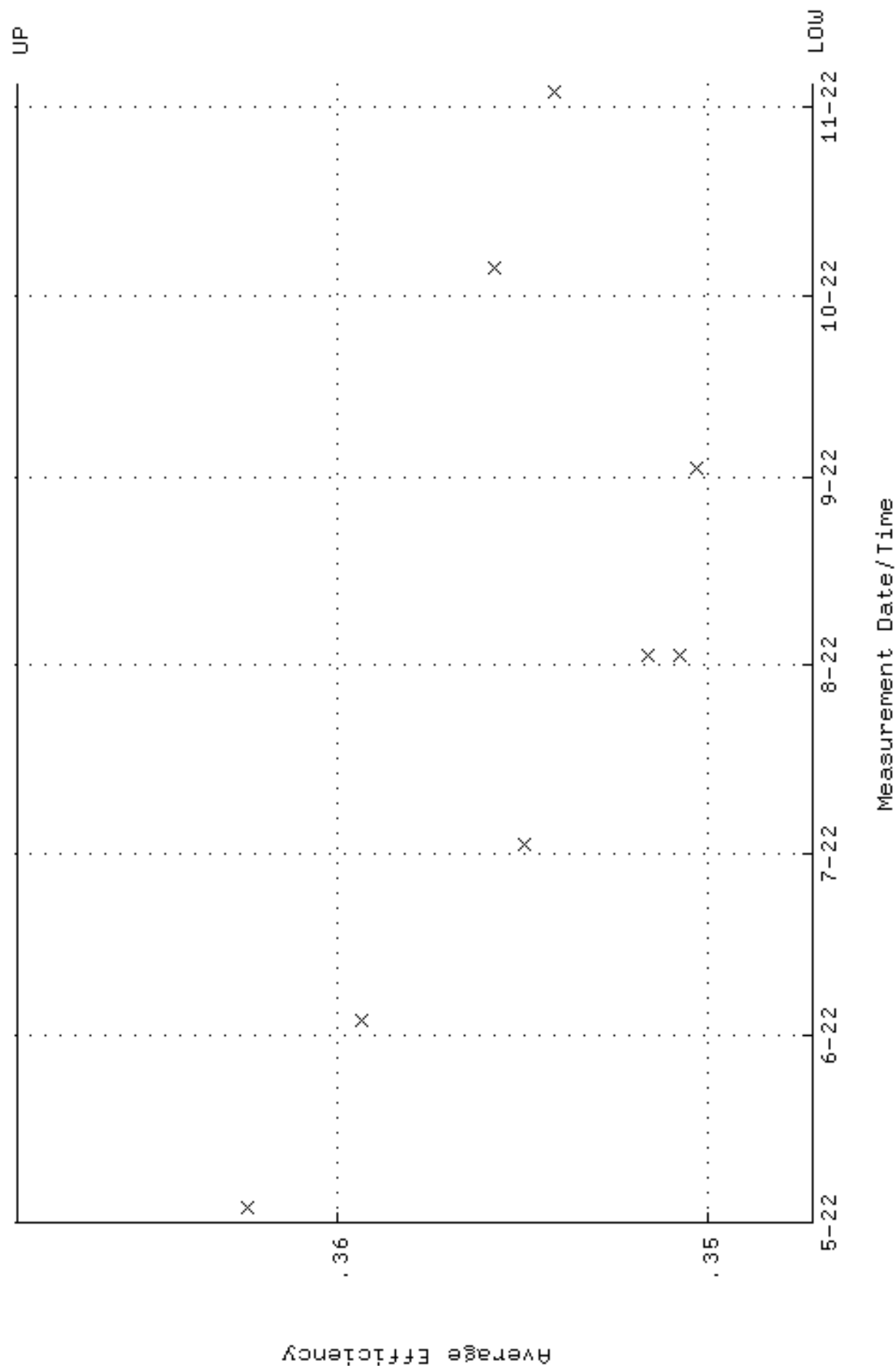
QA filename : DKA100:[ENV_ALPHA.QA.W]W045.QAF;8
Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



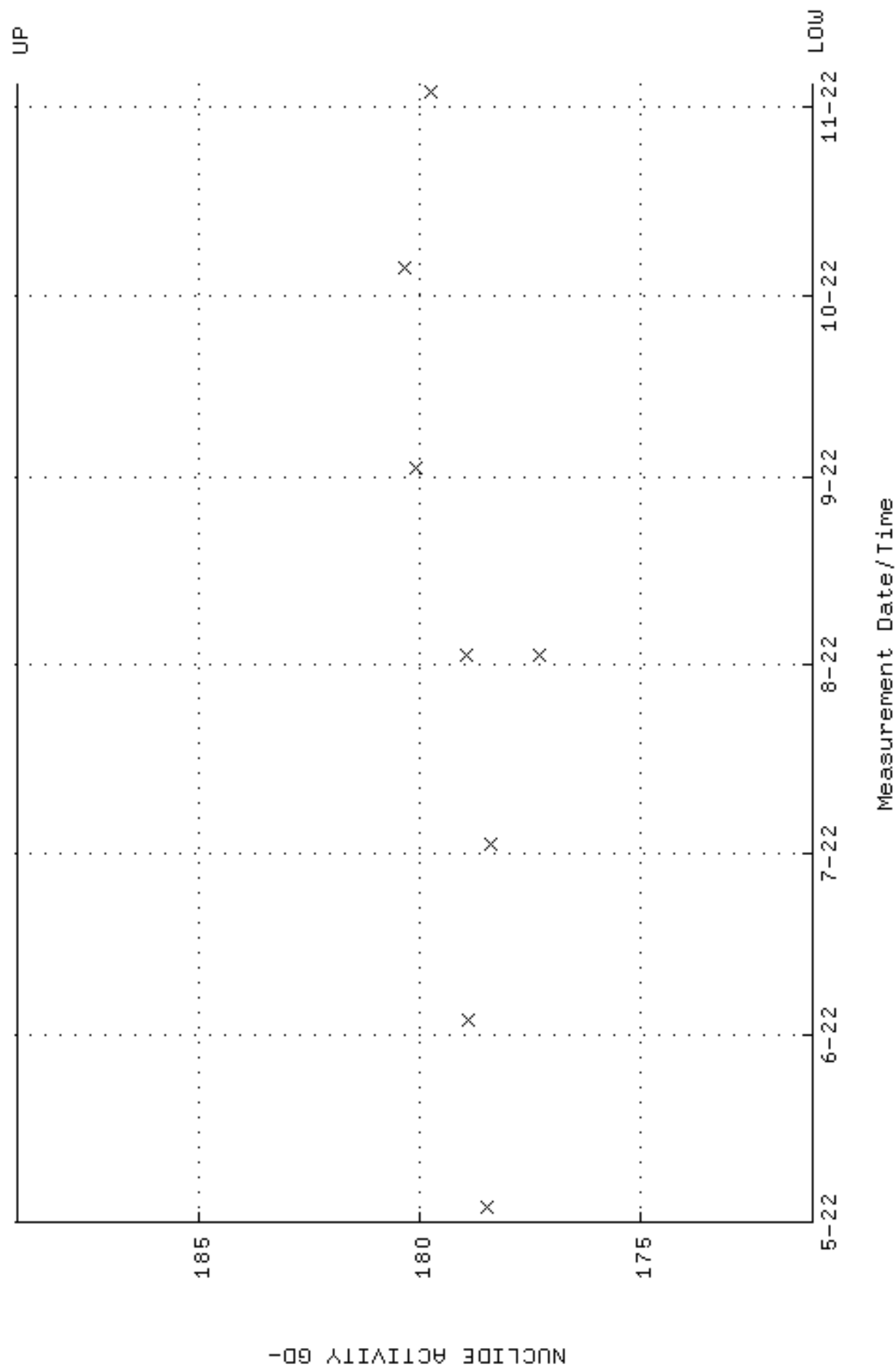
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



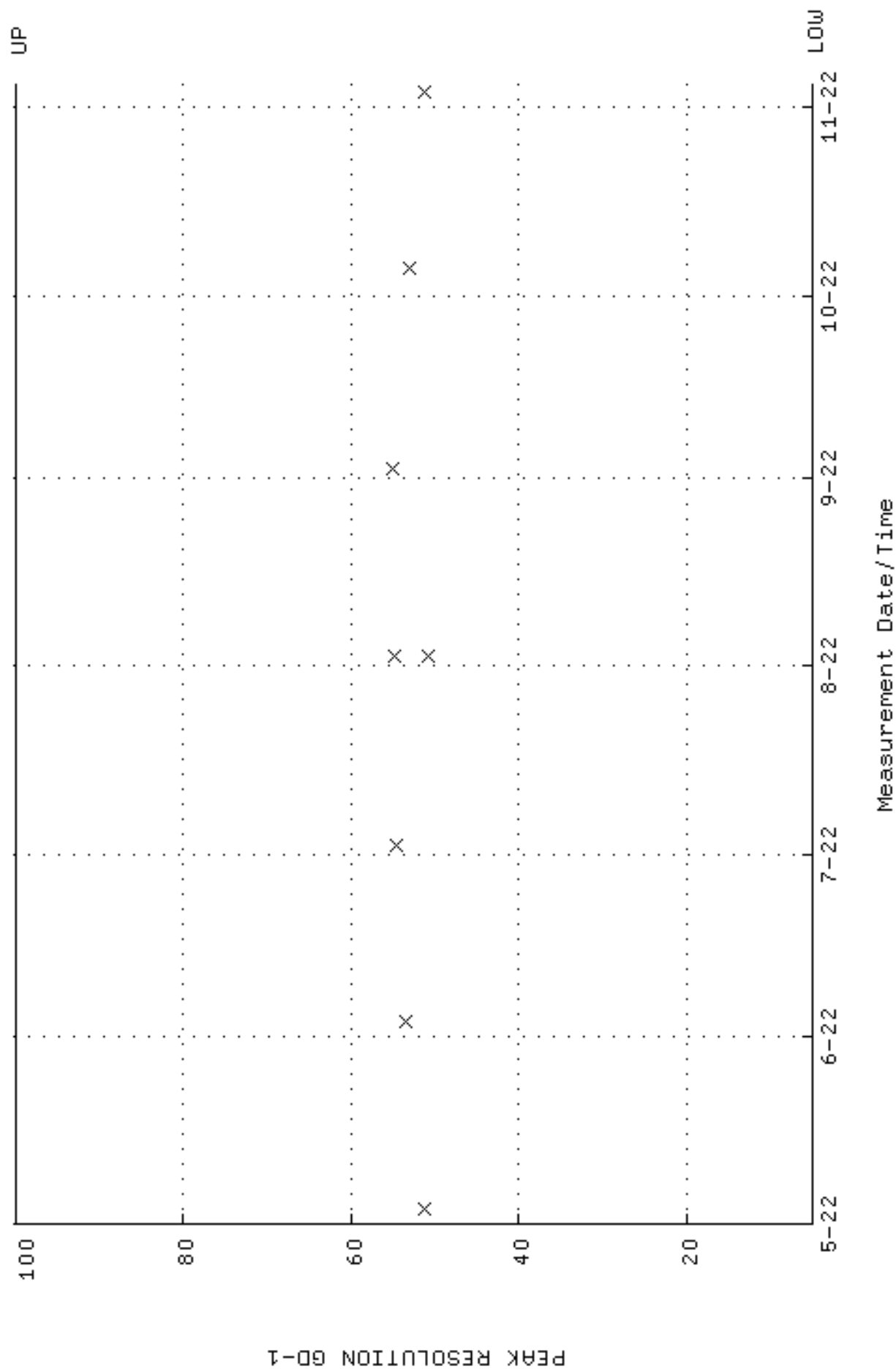
QA filename : DKA100:[ENV_ALPHA.QA.W]W047.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.347176 through 0.368651



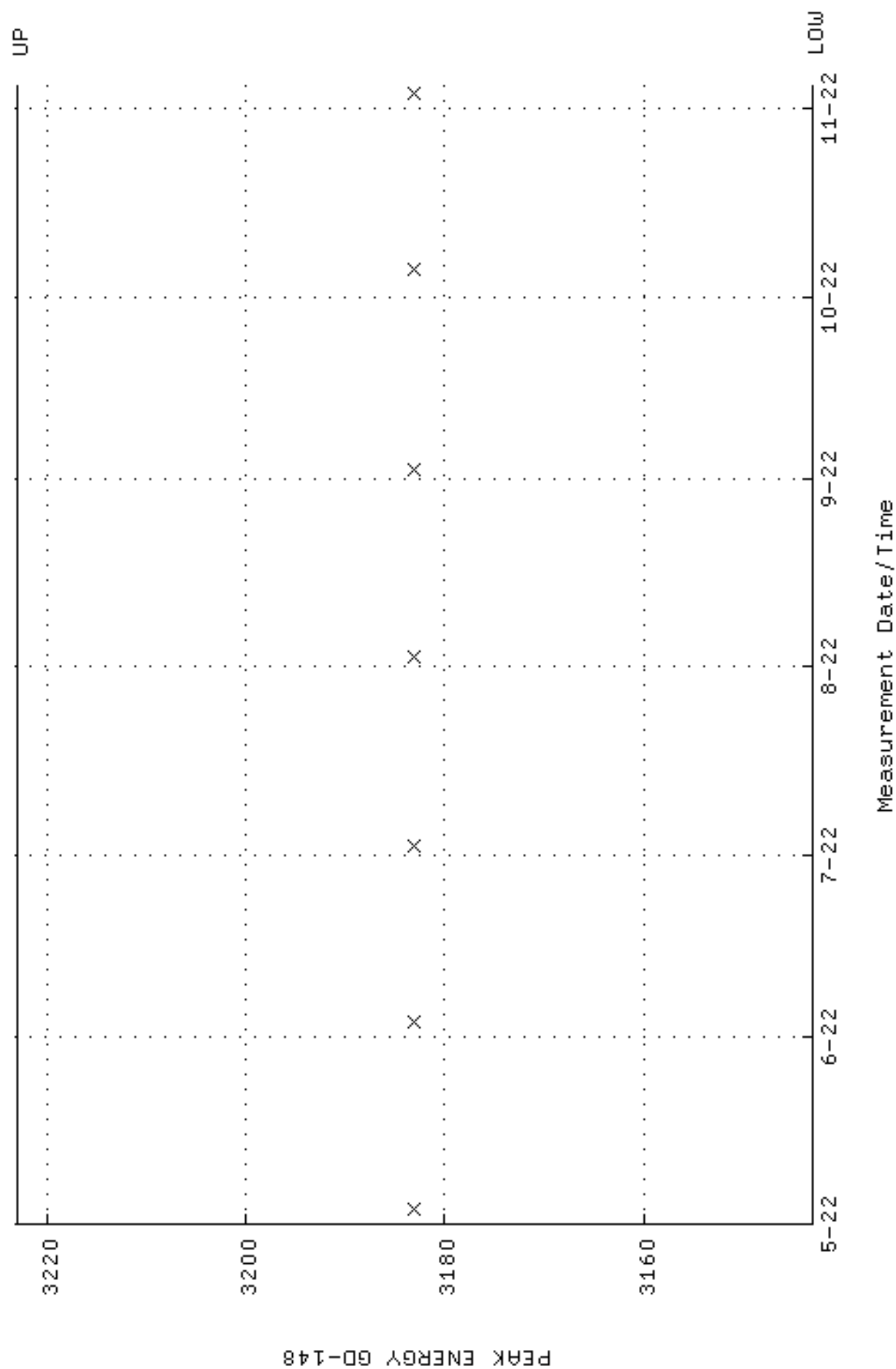
QA filename : DKA100:[ENV_ALPHA.QA.W]W047.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



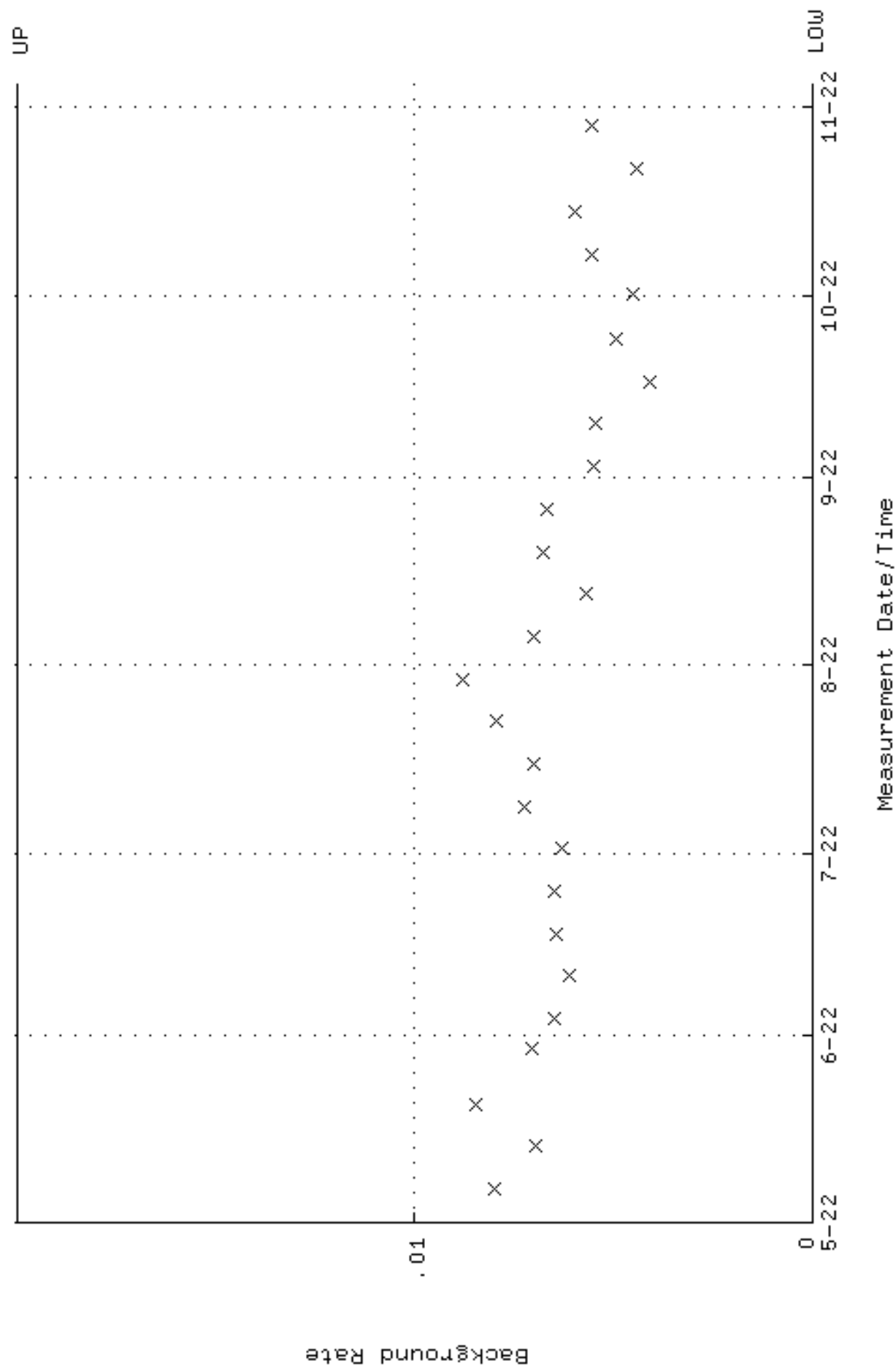
QA filename : DKA100:[ENV_ALPHA.QA.W]W047.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



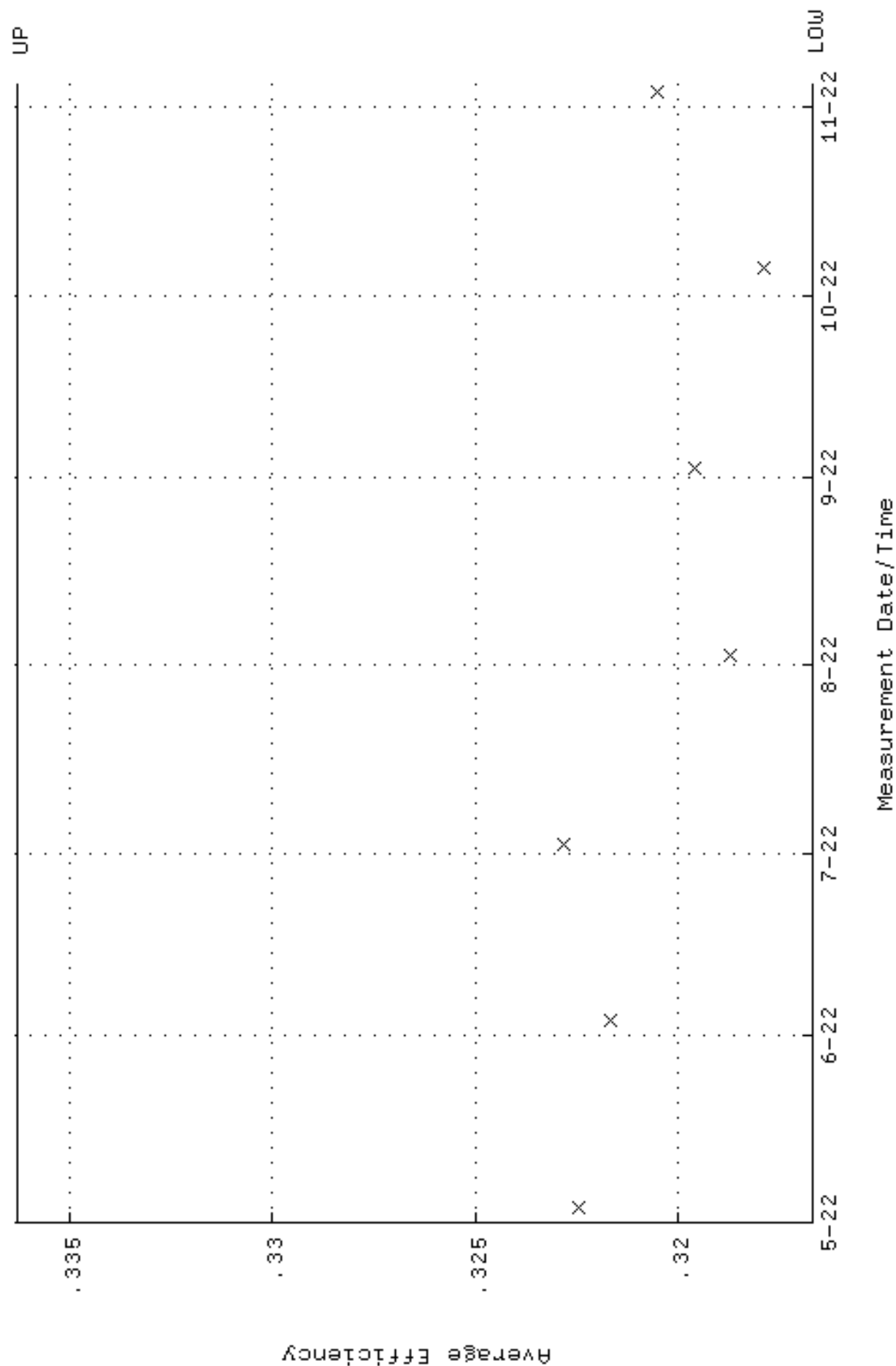
QA filename : DKA100:[ENV_ALPHA.QA.W]W047.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



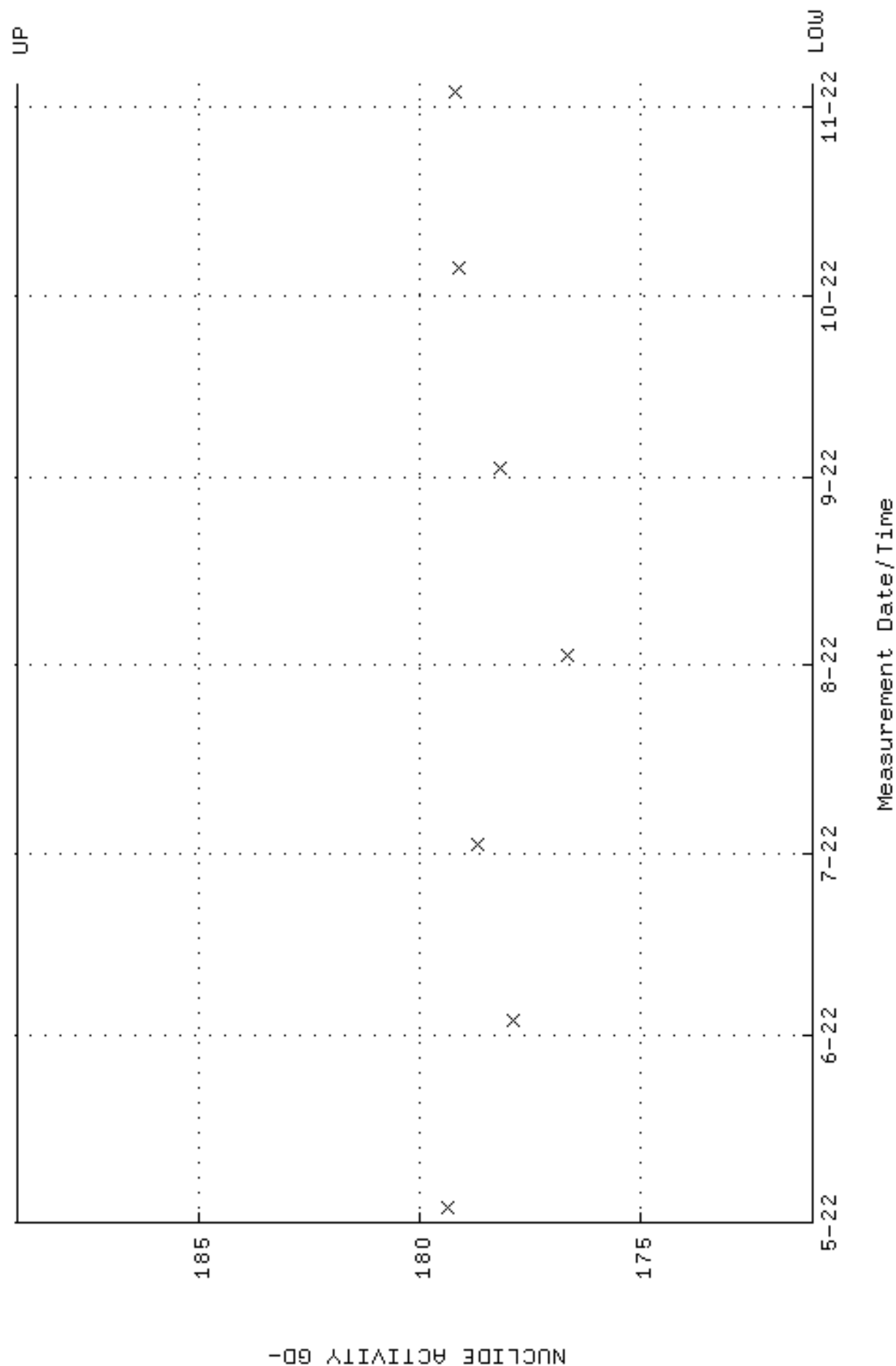
QA filename : DKA100:[ENV_ALPHA.QA.B]B047.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-MAY-2022 11:08:56 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



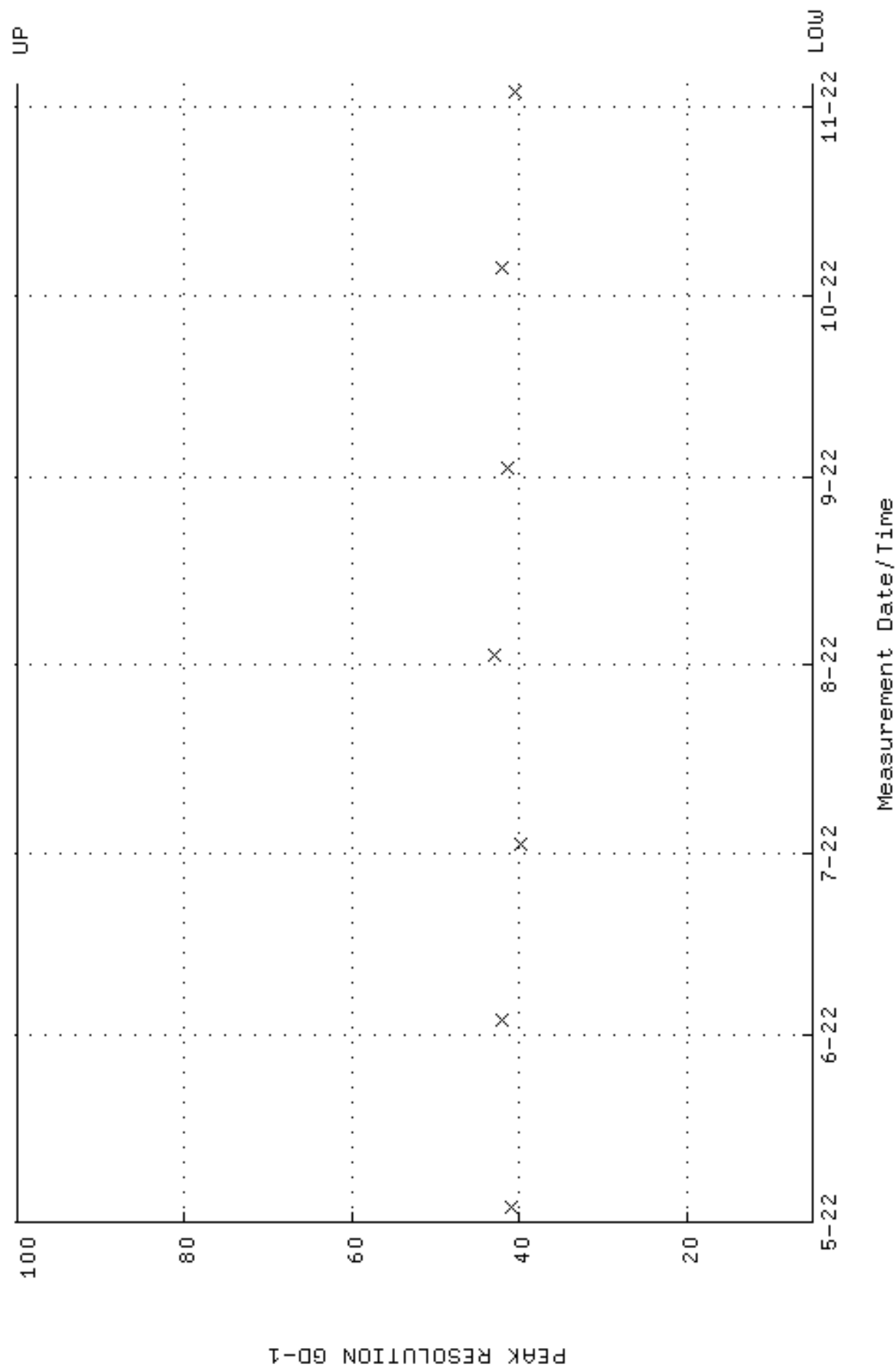
QA filename : DKA100:[ENV_ALPHA.QA.W]W048.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.316695 through 0.336285



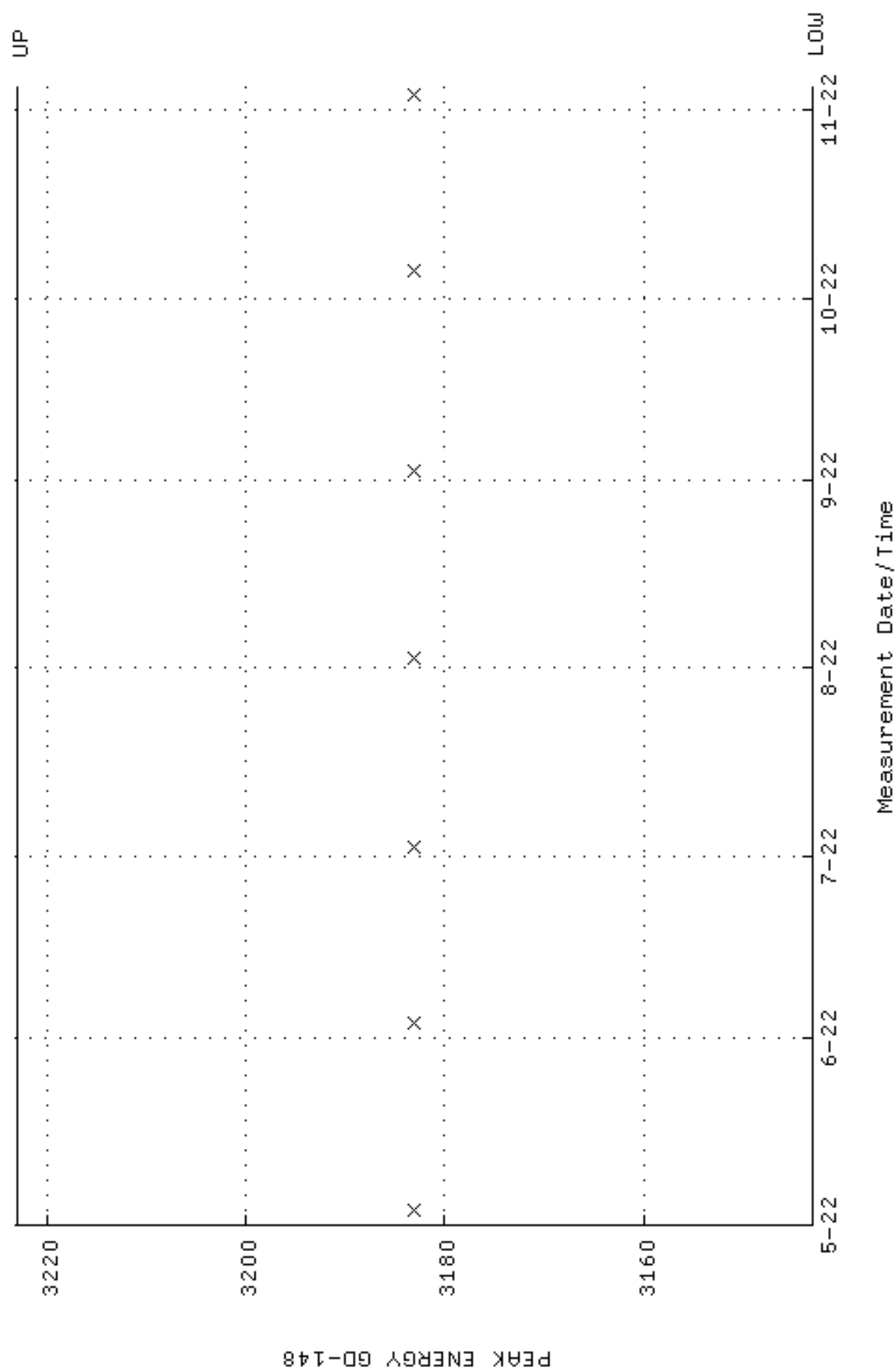
QA filename : DKA100:[ENV_ALPHA.QA.W]W048.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



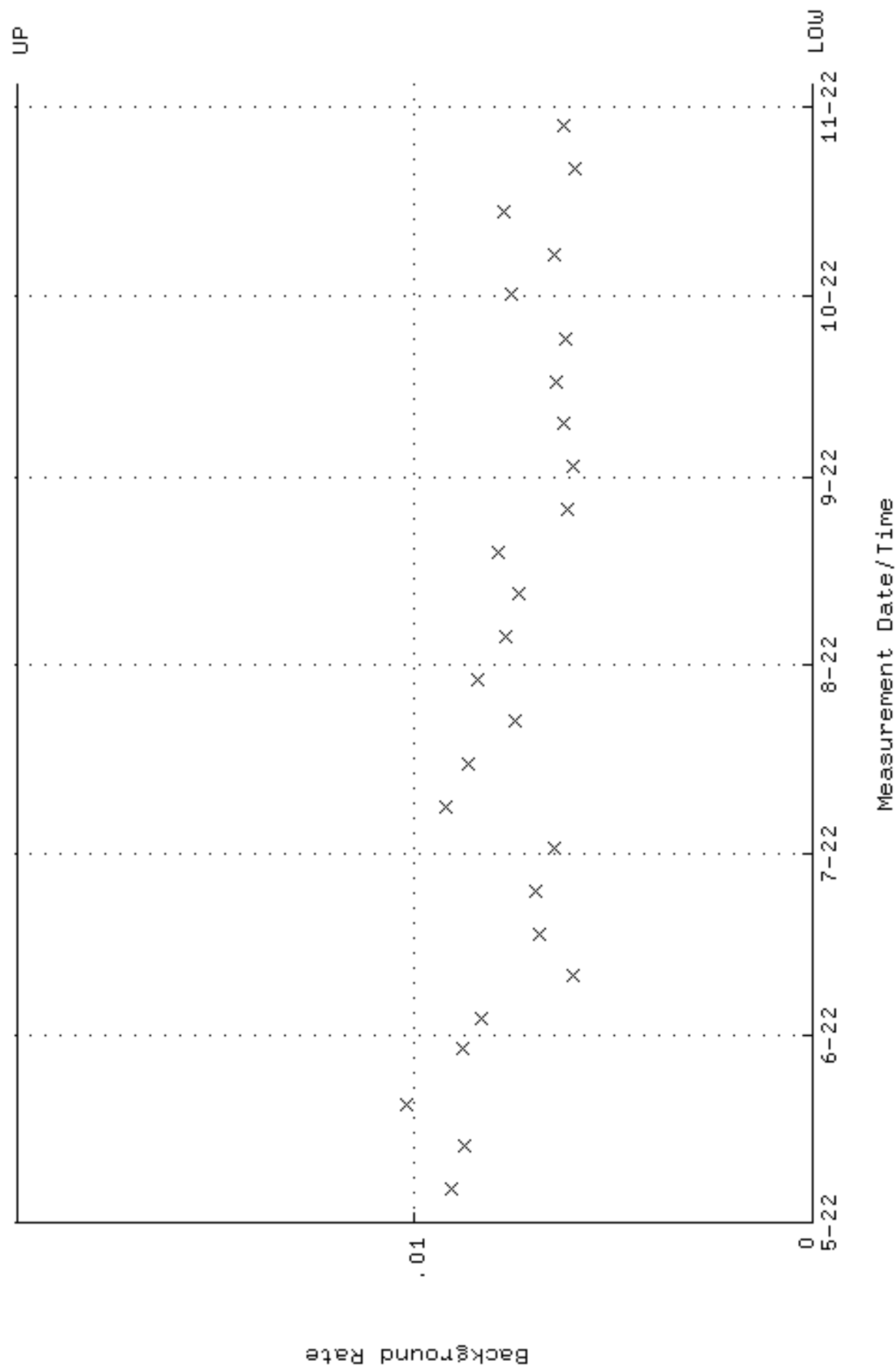
QA filename : DKA100:[ENV_ALPHA.QA.W]W048.QAF;9
Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



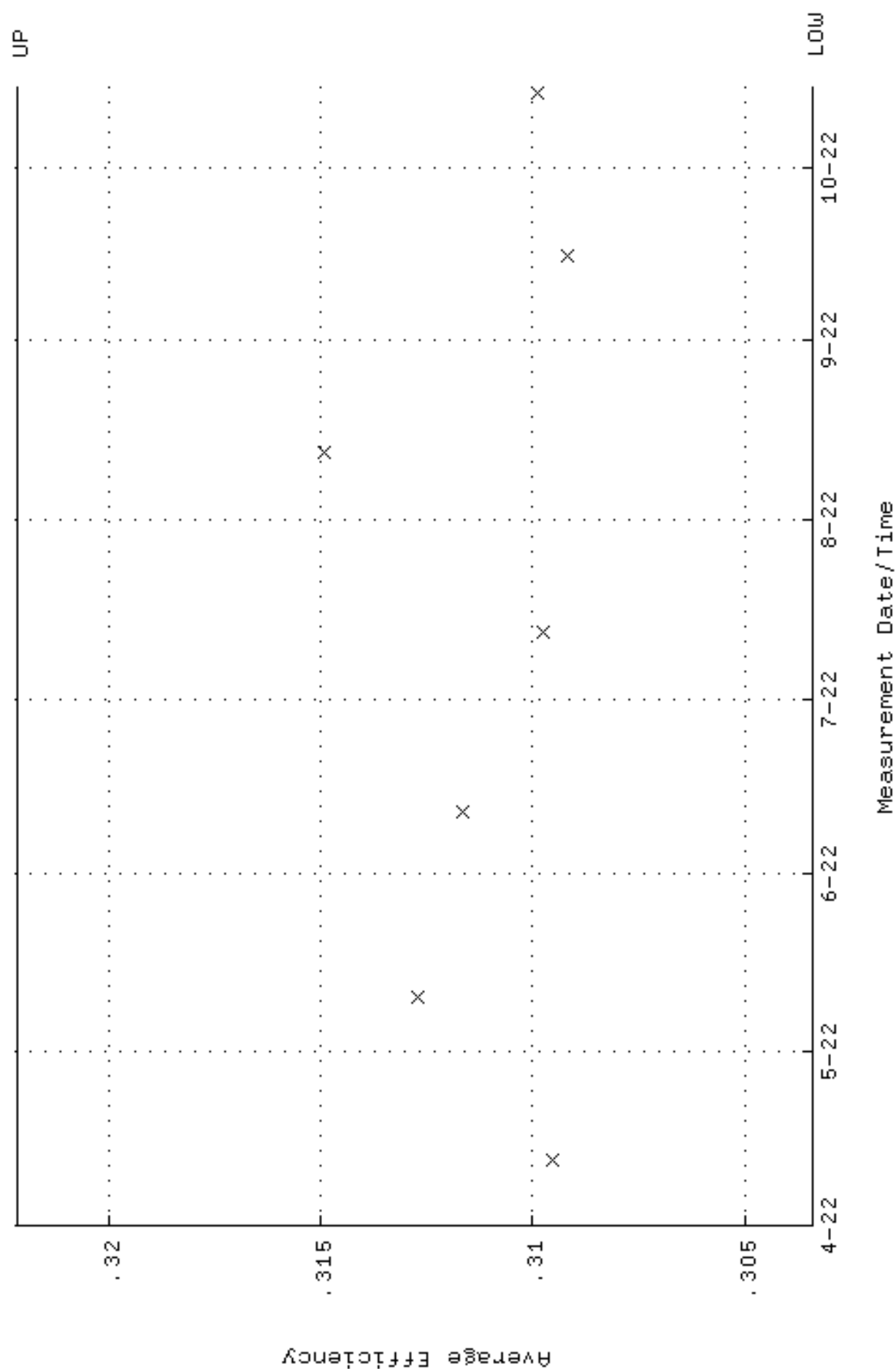
QA filename : DKA100:[ENV_ALPHA.QA.W]W048.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



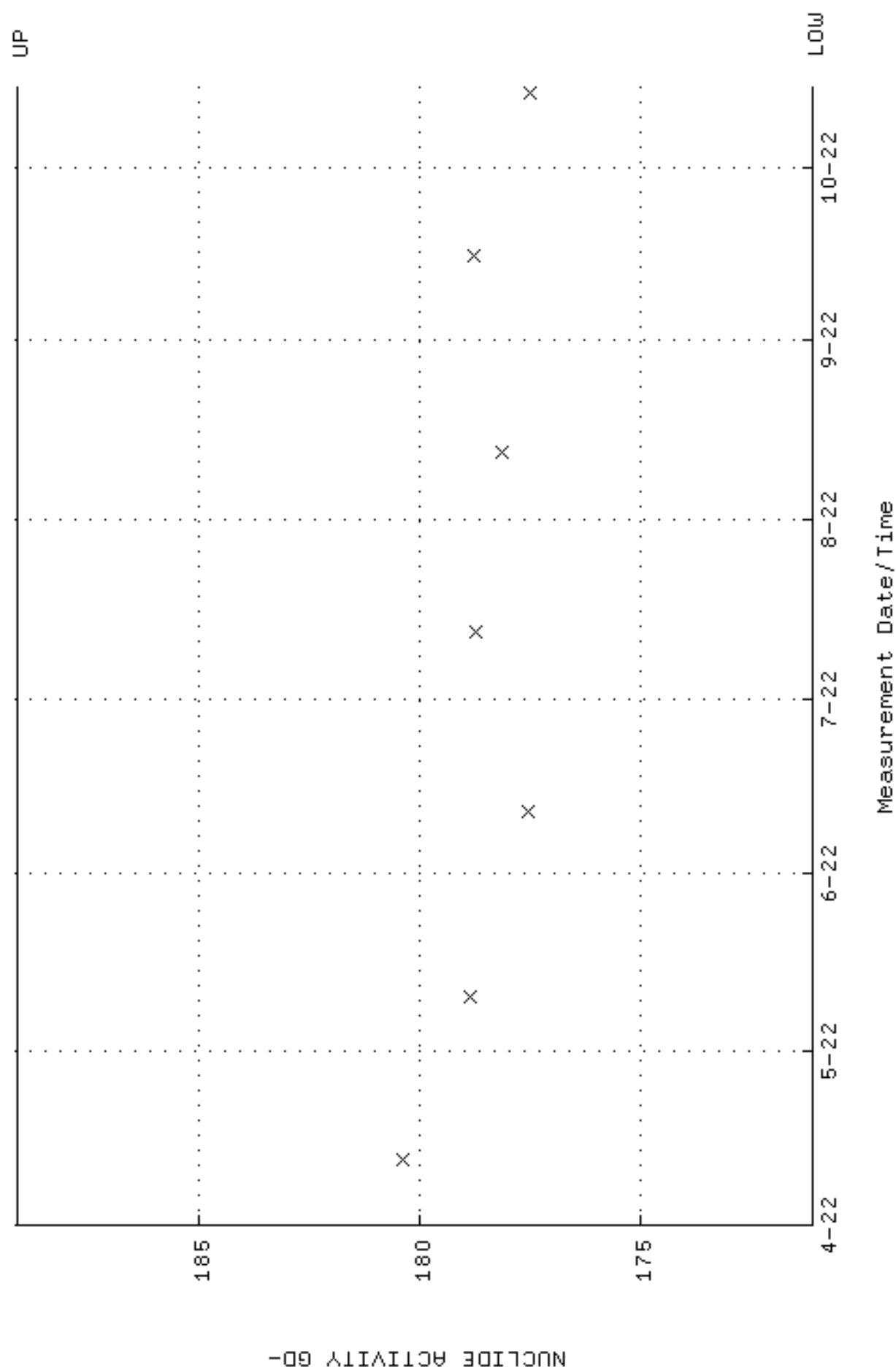
QA filename : DKA100:[ENV_ALPHA.QA.B]B048.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-MAY-2022 11:08:56 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



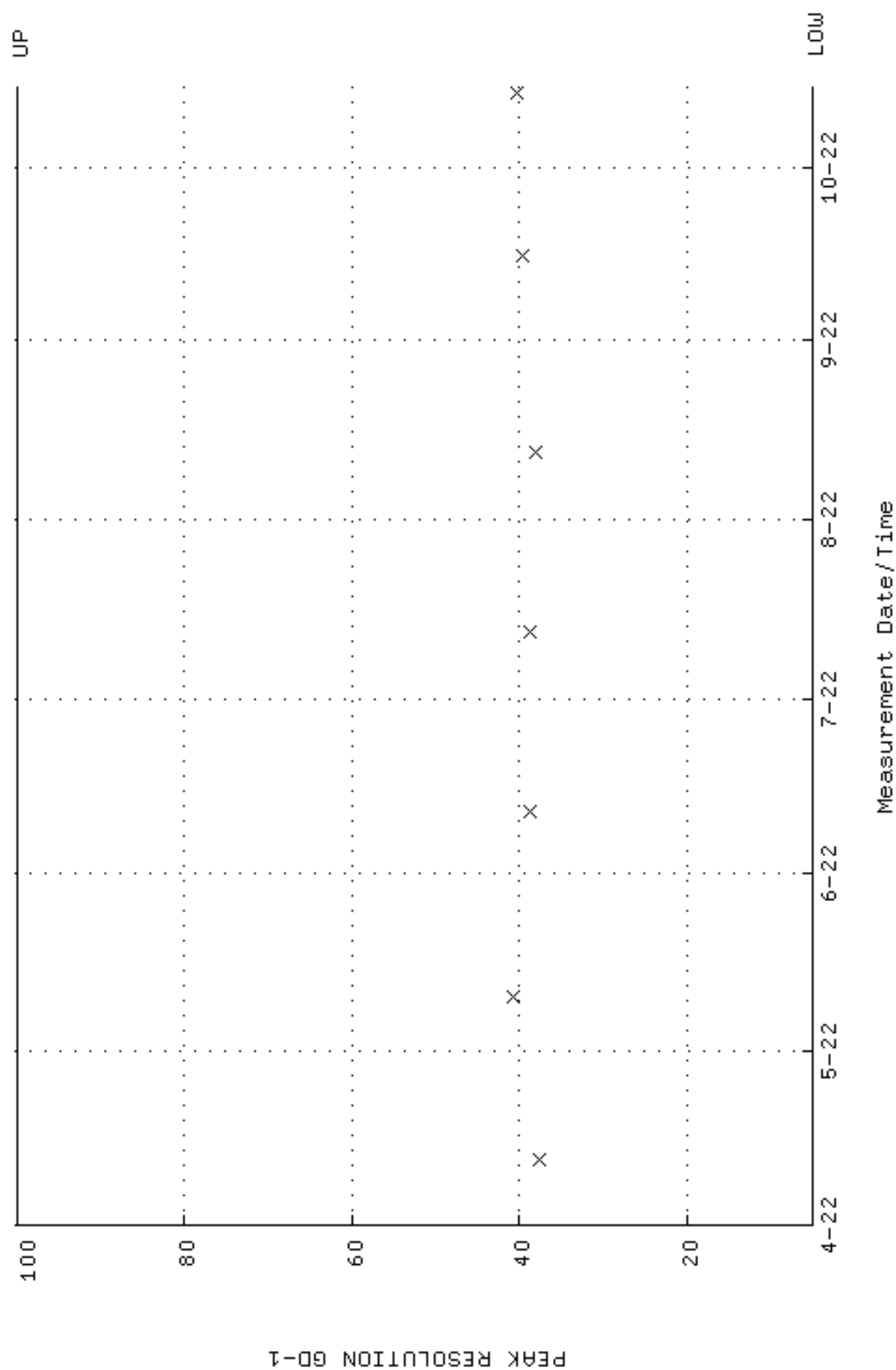
QA filename : DKA100:[ENV_ALPHA.QA.W]W089.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 12-APR-2022 08:47:14 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.303389 through 0.322155



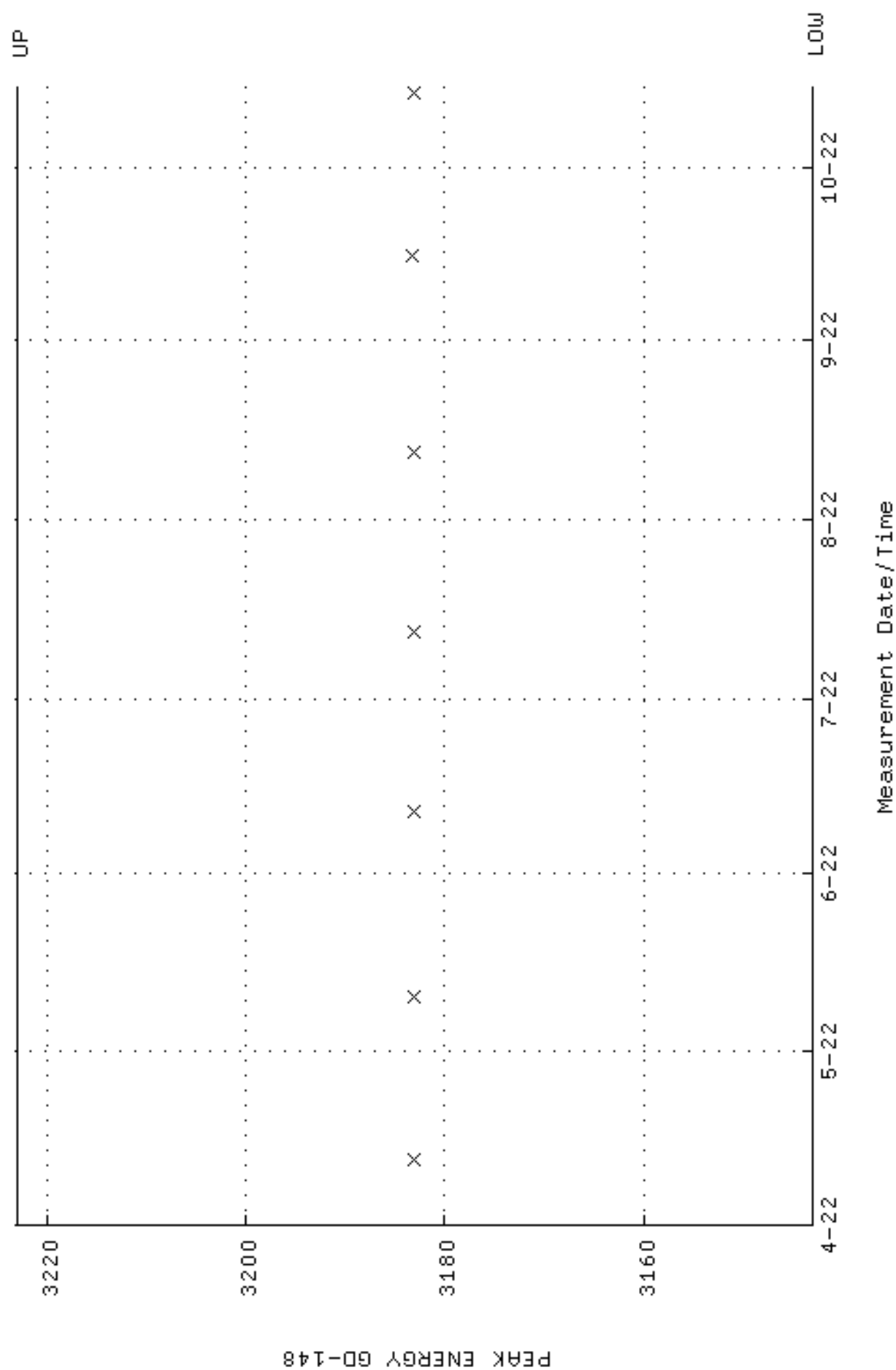
QA filename : DKA100:[ENV_ALPHA.QA.W]W089.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-APR-2022 08:47:14 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



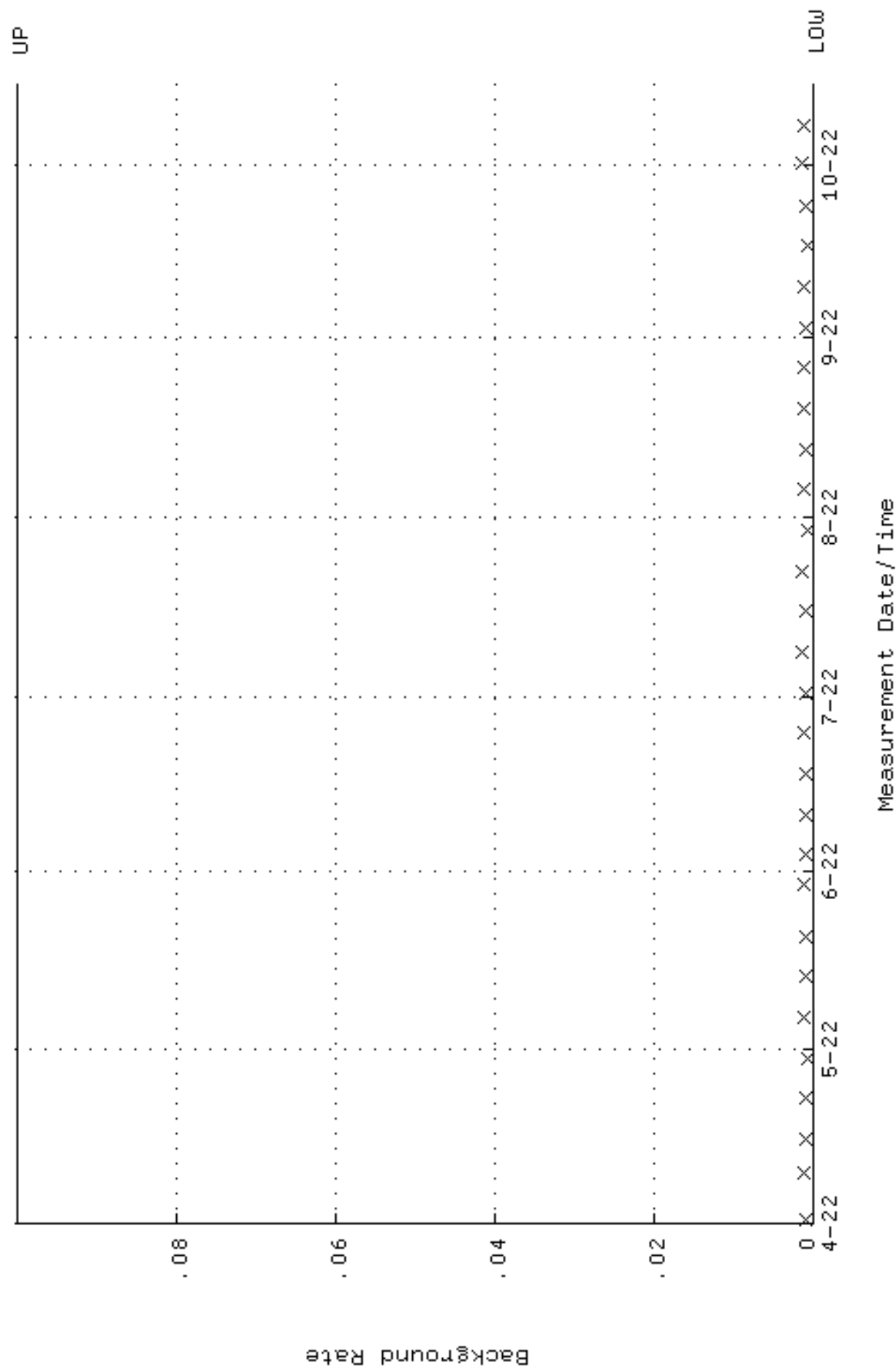
QA filename : DKA100:[ENV_ALPHA.QA.W]W089.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 12-APR-2022 08:47:14 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



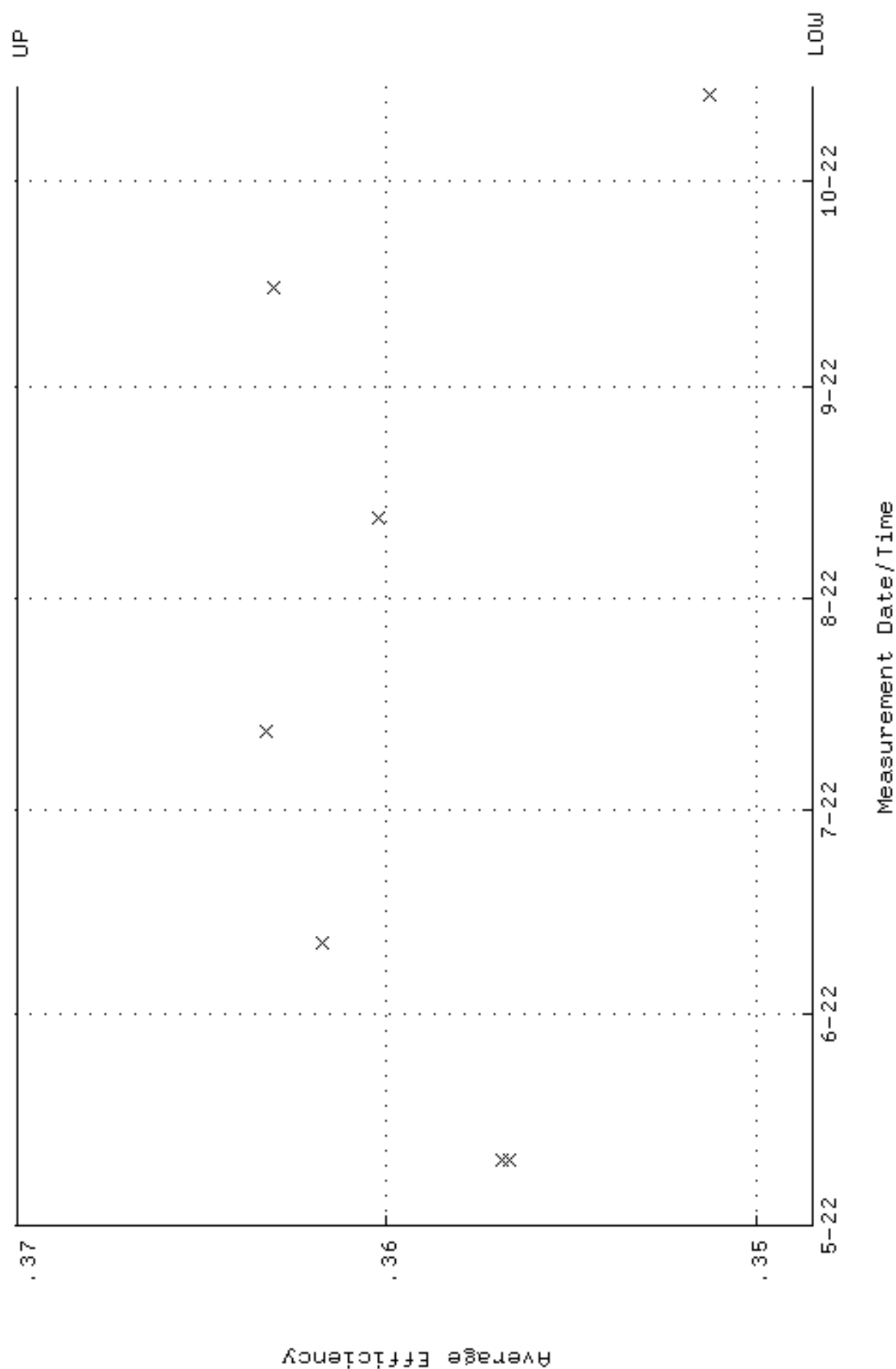
QA filename : DKA100:[ENV_ALPHA.QA.W]W089.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 12-APR-2022 08:47:14 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



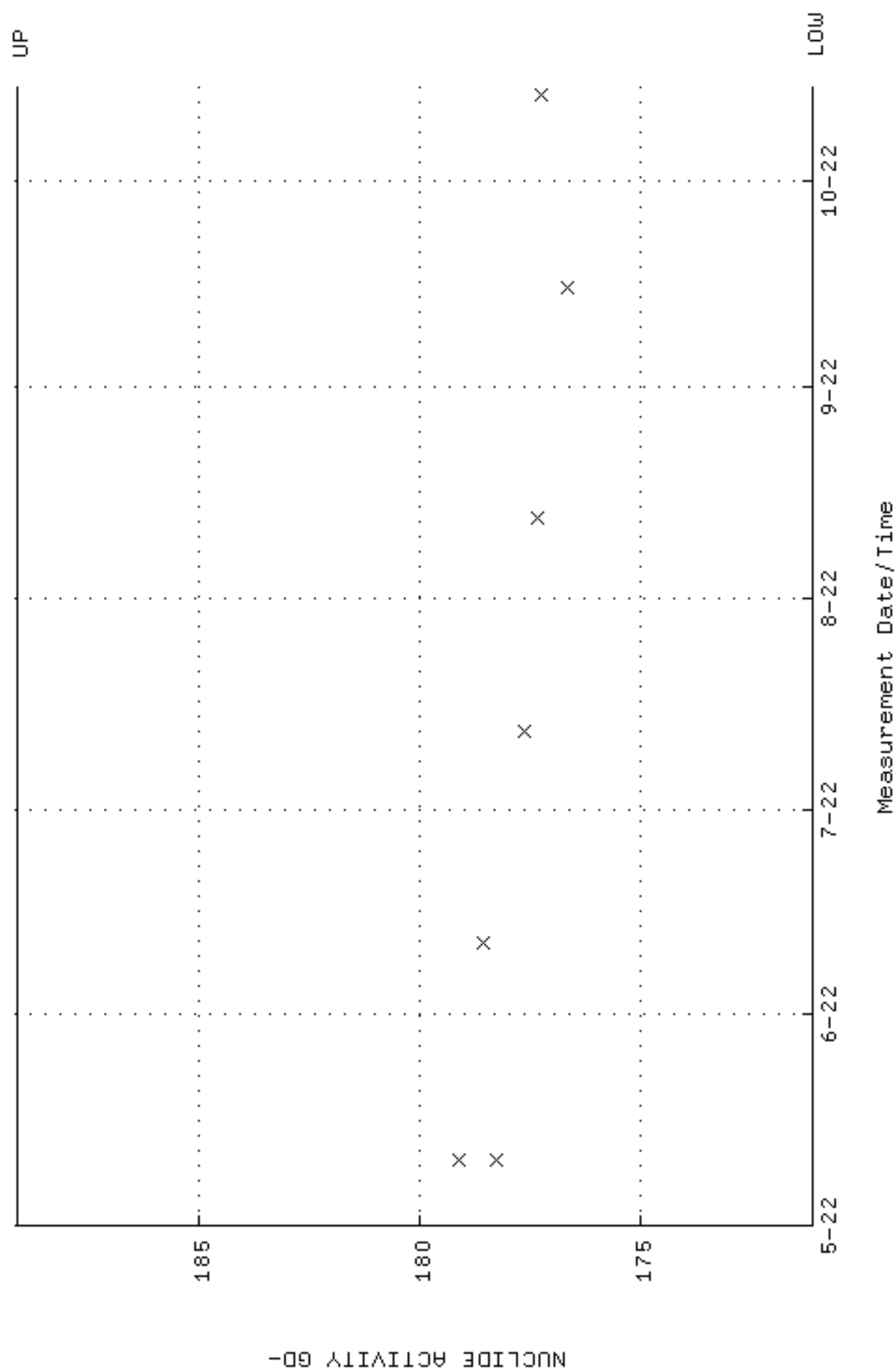
QA filename : DKA100:[ENV_ALPHA.QA.B]B089.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 12:51:53 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



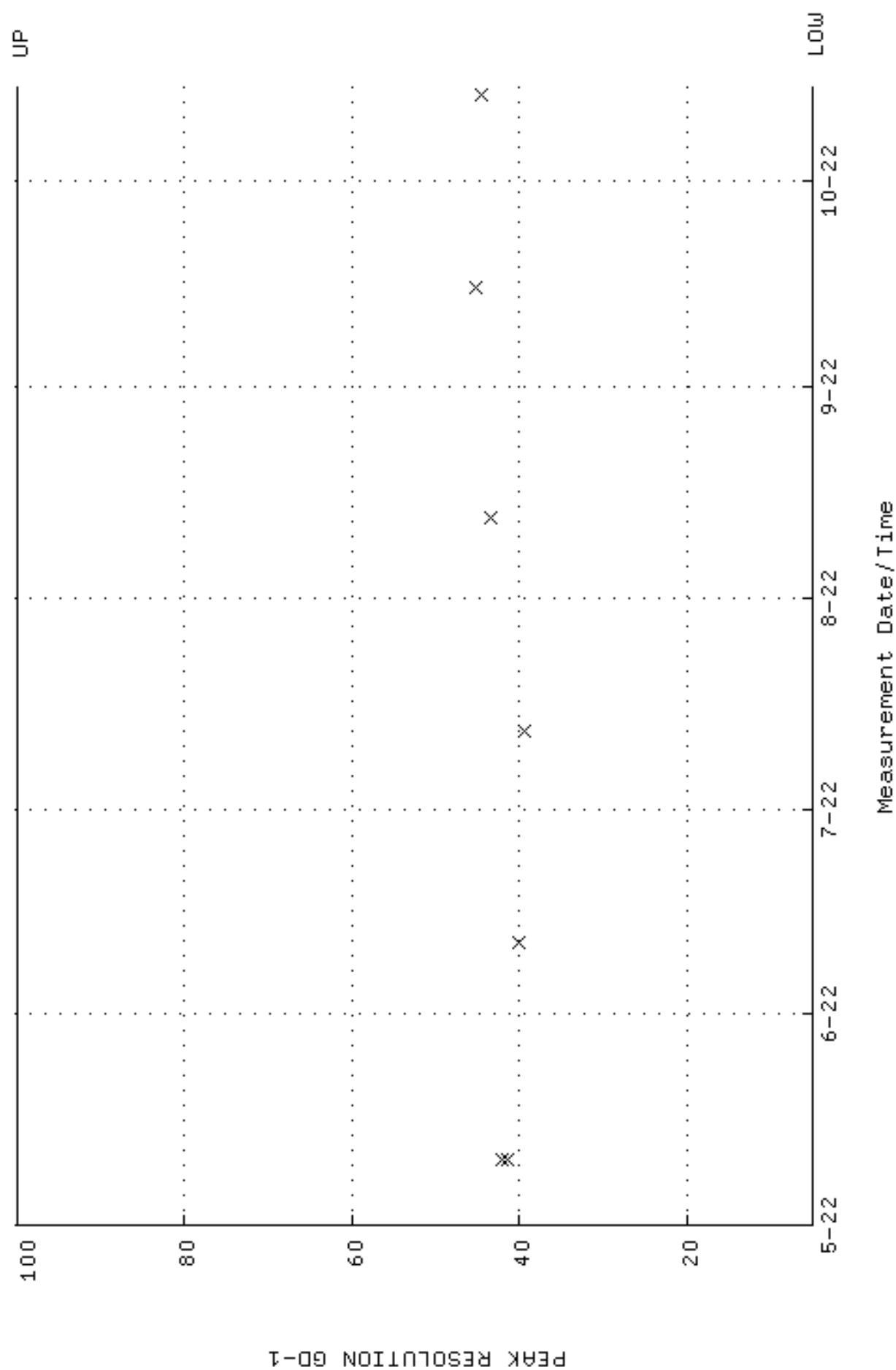
QA filename : DKA100:[ENV_ALPHA.QA.W]W090.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 10-MAY-2022 11:25:43 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.348461 through 0.370015



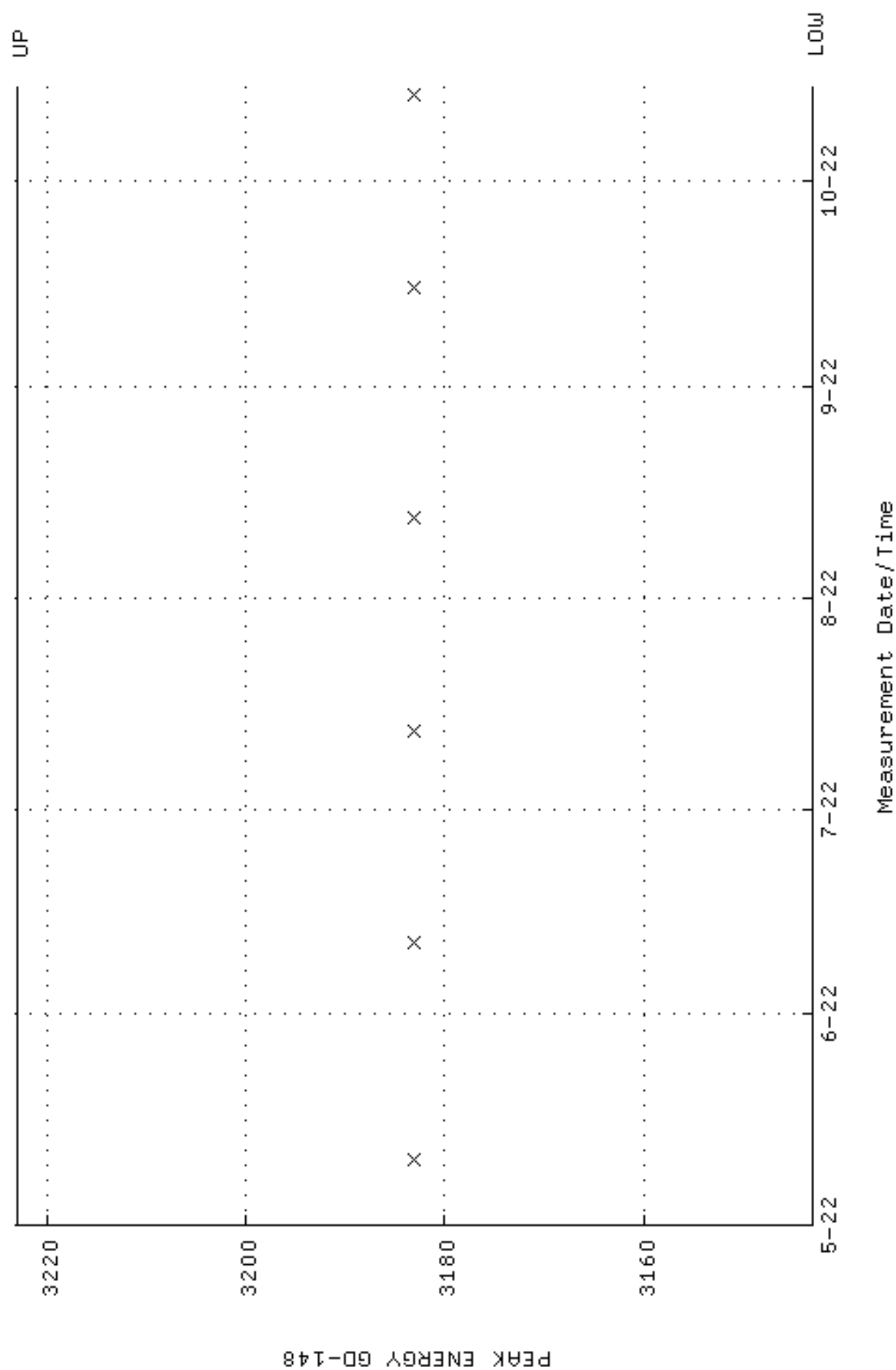
QA filename : DKA100:[ENV_ALPHA.QA.W]W090.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 10-MAY-2022 11:25:43 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



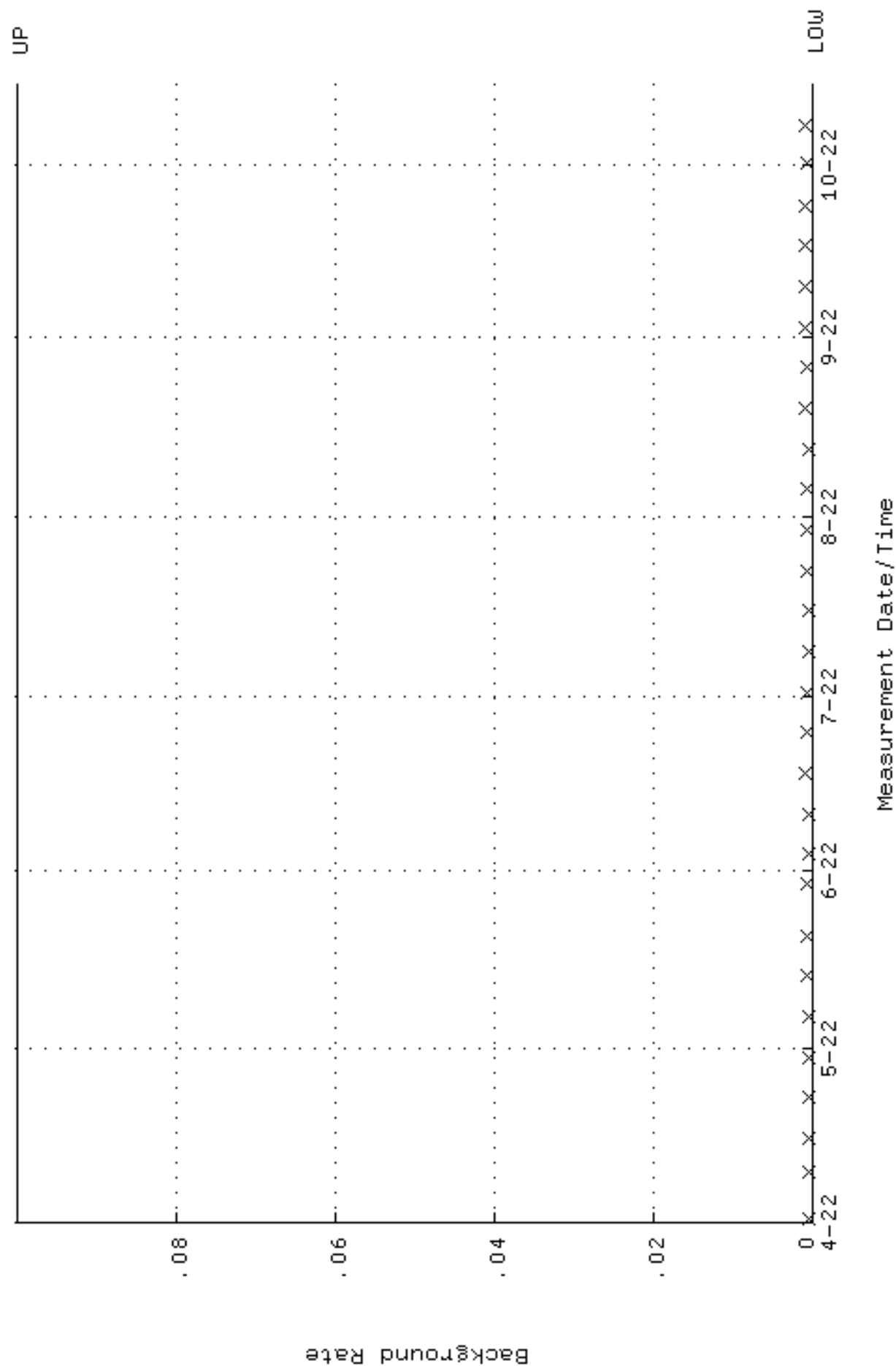
QA filename : DKA100:[ENV_ALPHA.QA.W]W090.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 10-MAY-2022 11:25:43 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



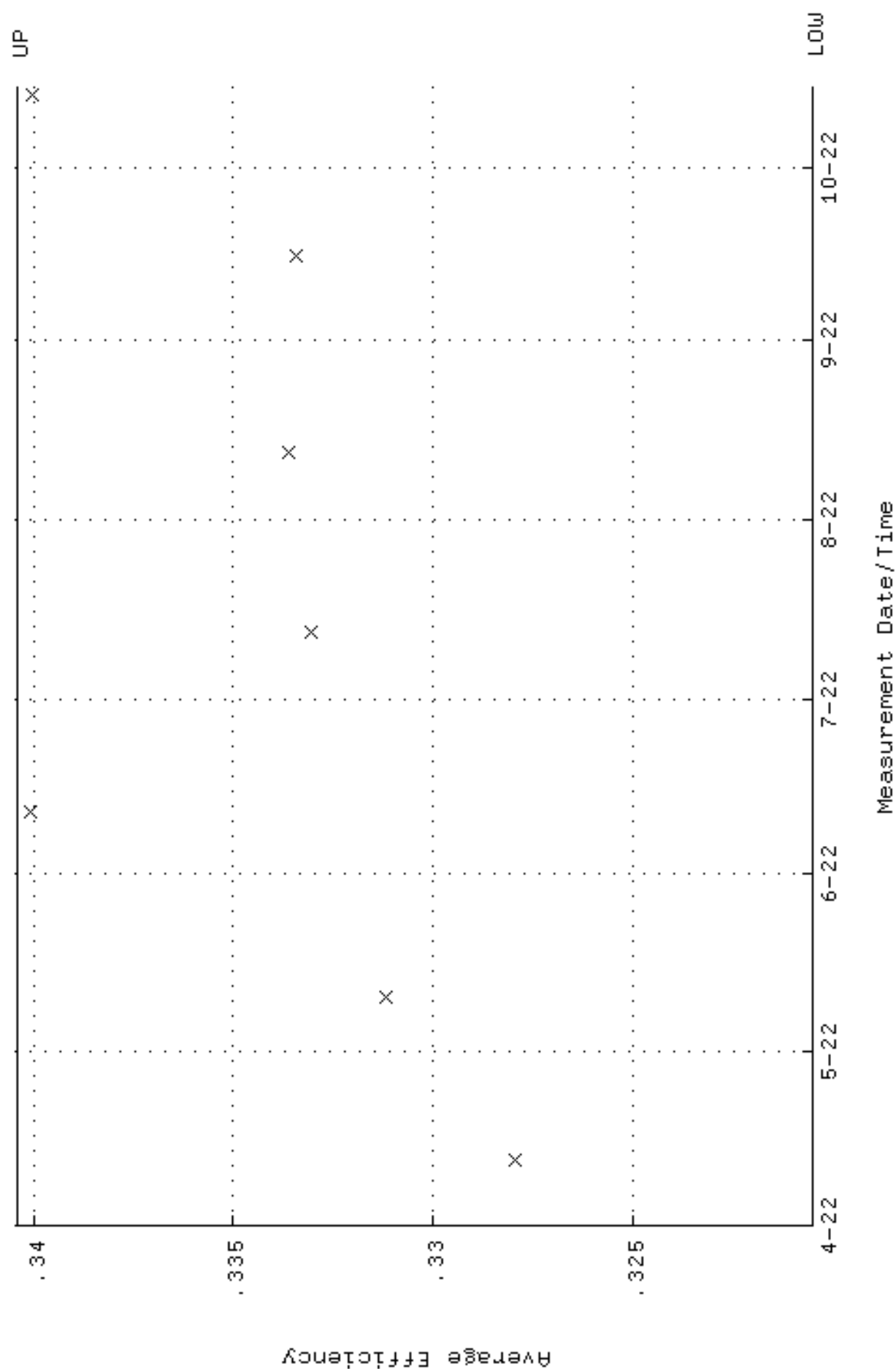
QA filename : DKA100:[ENV_ALPHA.QA.W]W090.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 10-MAY-2022 11:25:43 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



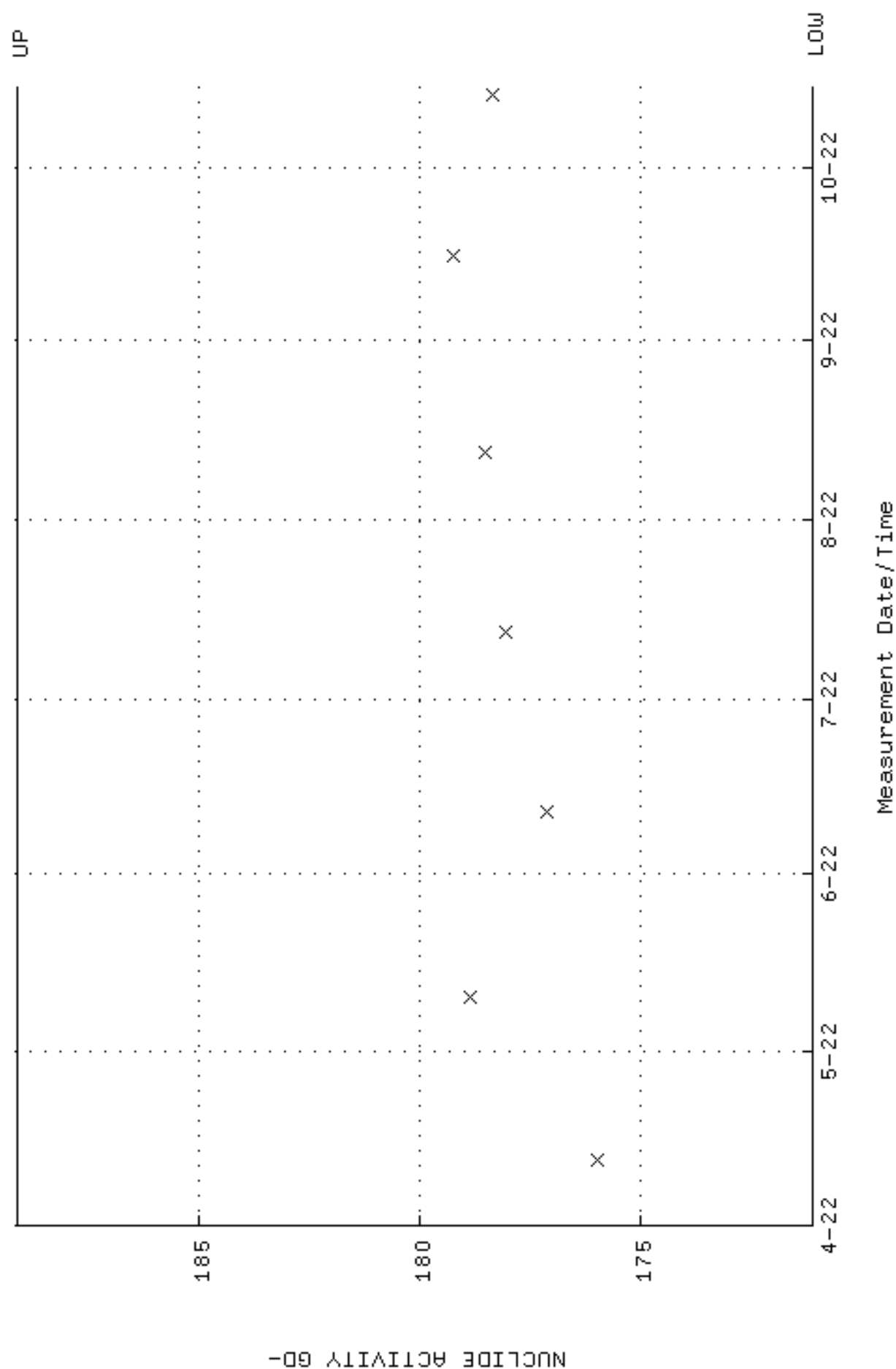
QA filename : DKA100:[ENV_ALPHA.QA.B]B090.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 12:51:53 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



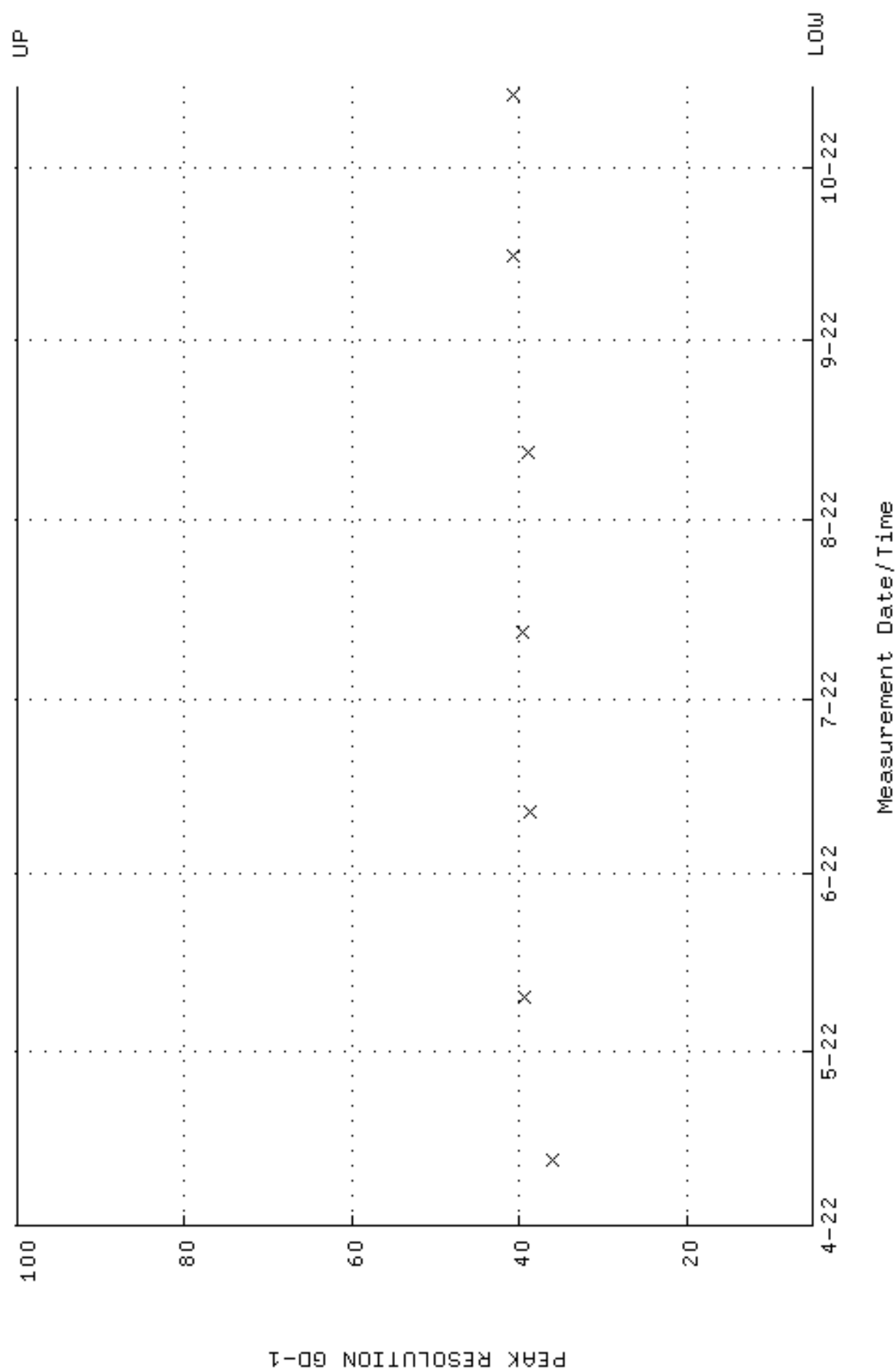
QA filename : DKA100:[ENV_ALPHA.QA.W]W092.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 12-APR-2022 08:47:14 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.320500 through 0.340400



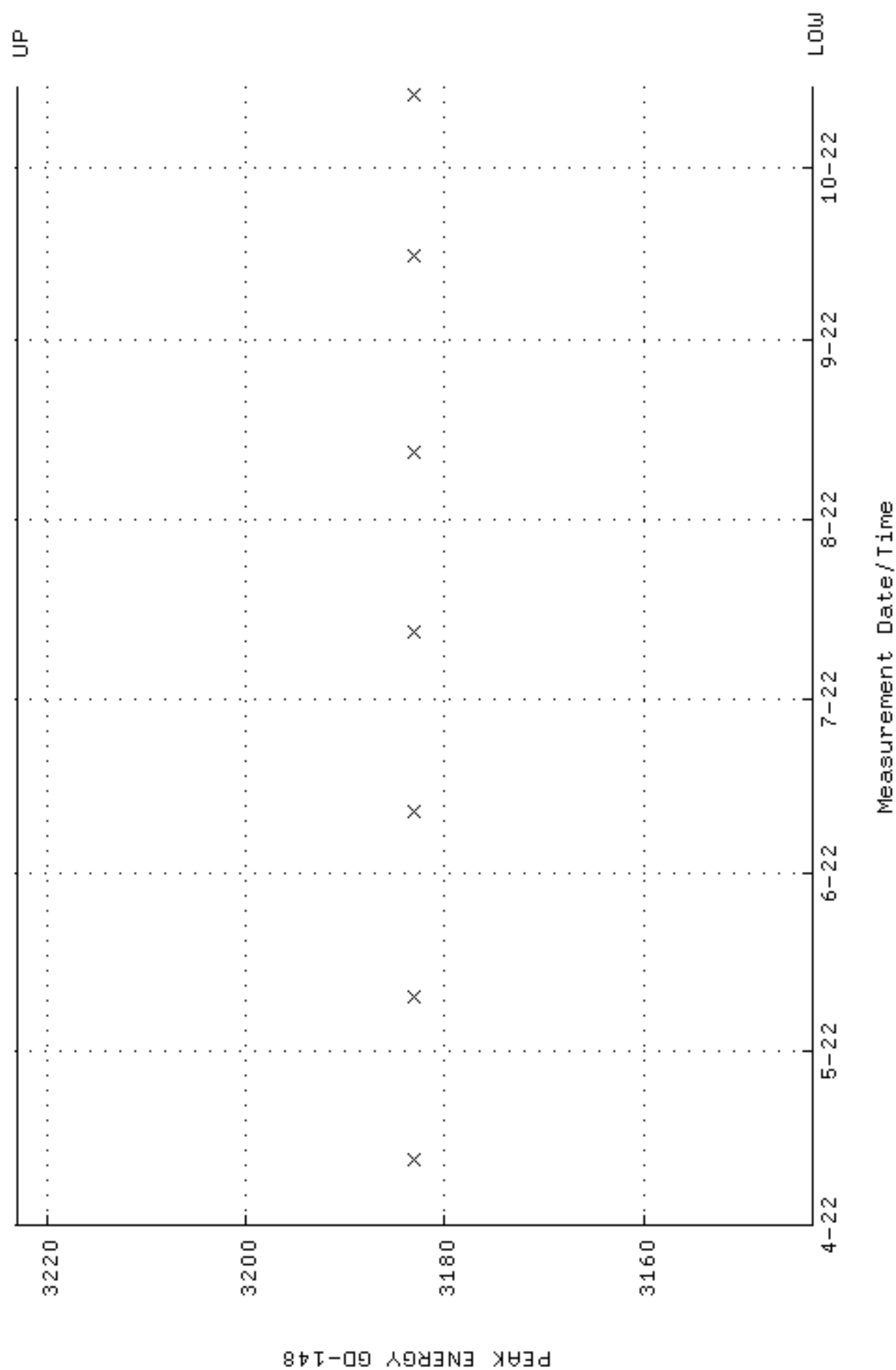
QA filename : DKA100:[ENV_ALPHA.QA.W]W092.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-APR-2022 08:47:14 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



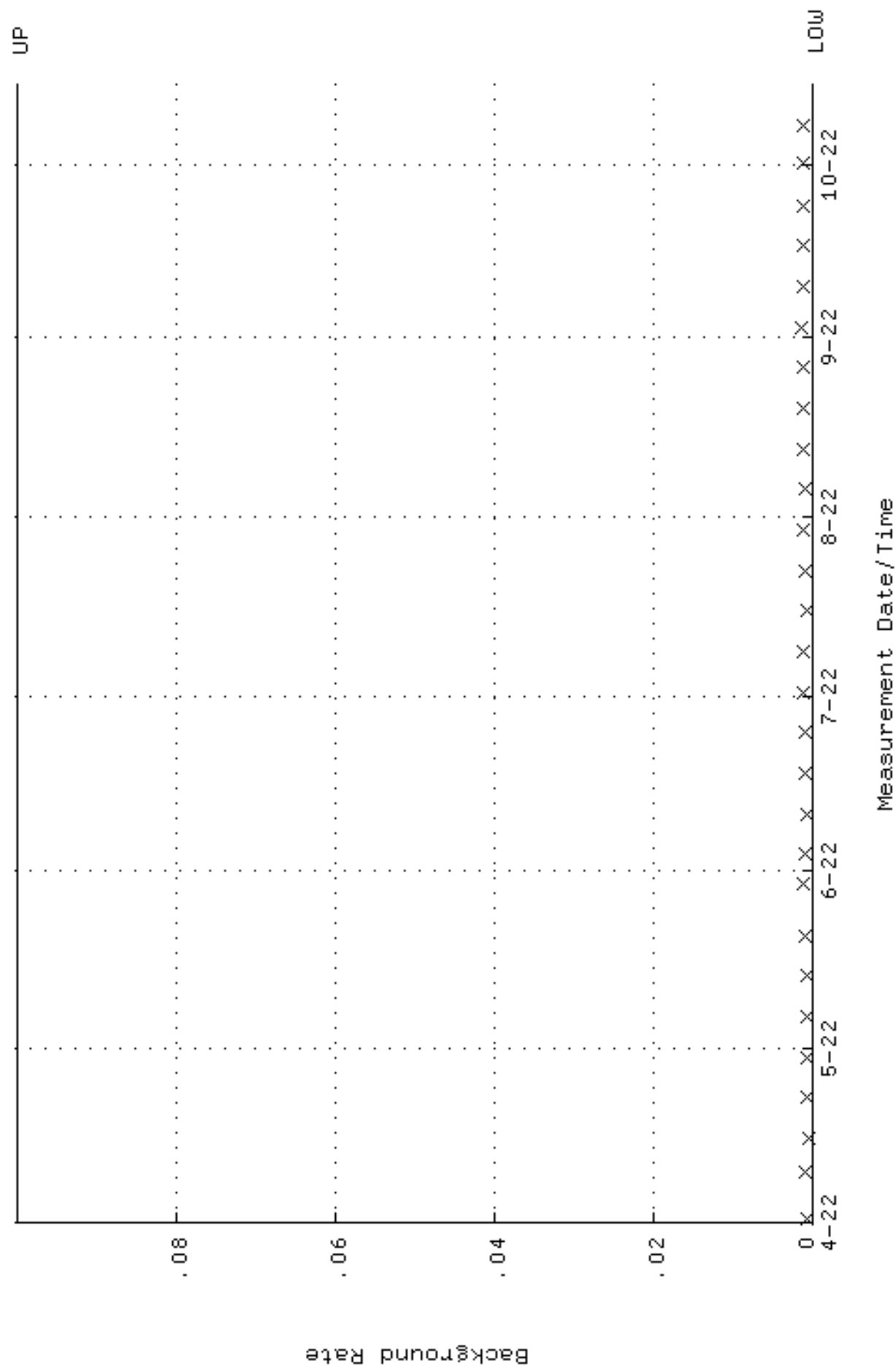
QA filename : DKA100:[ENV_ALPHA.QA.W]W092.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 12-APR-2022 08:47:14 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



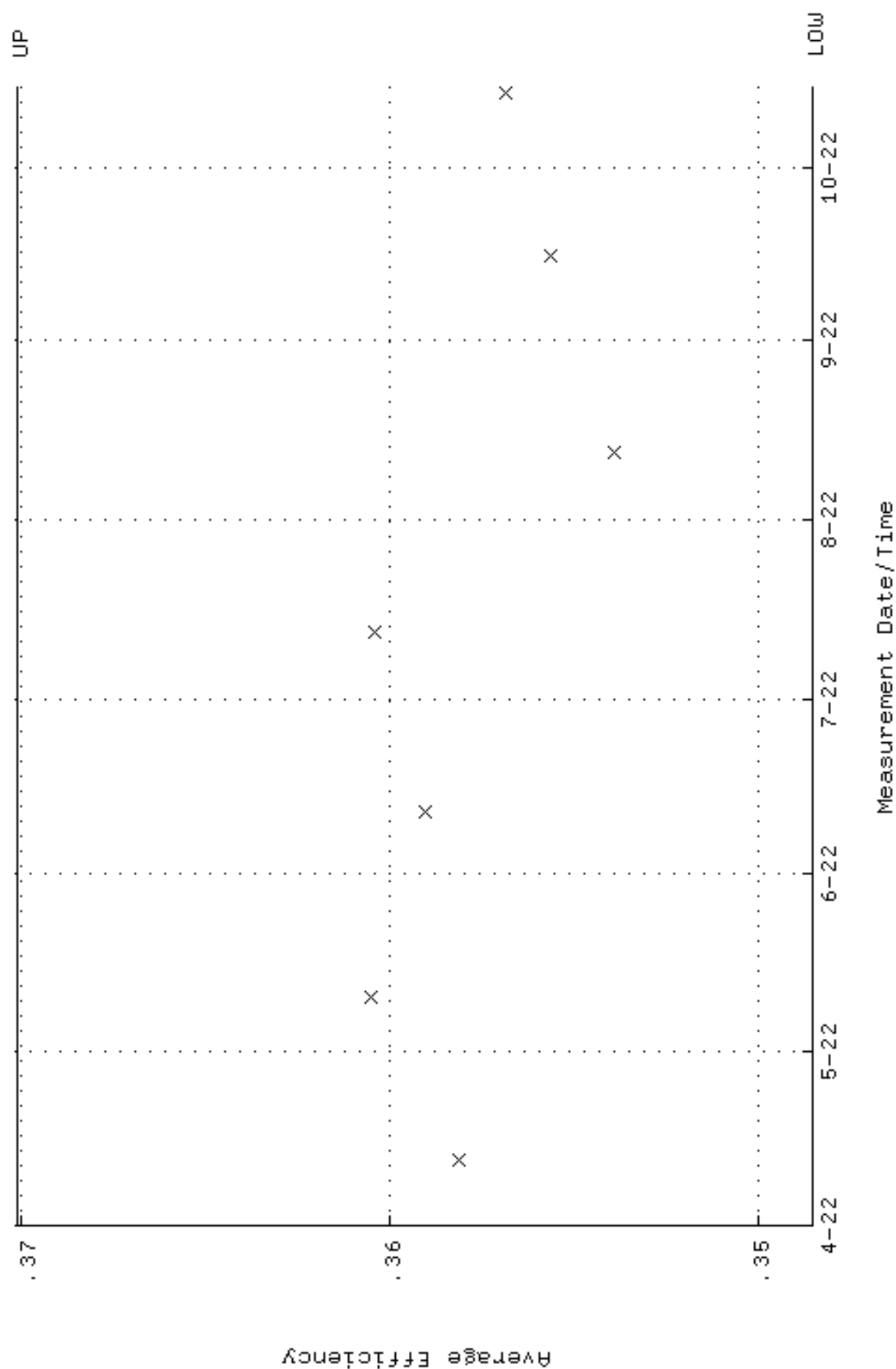
QA filename : DKA100:[ENV_ALPHA.QA.W]W092.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 12-APR-2022 08:47:14 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



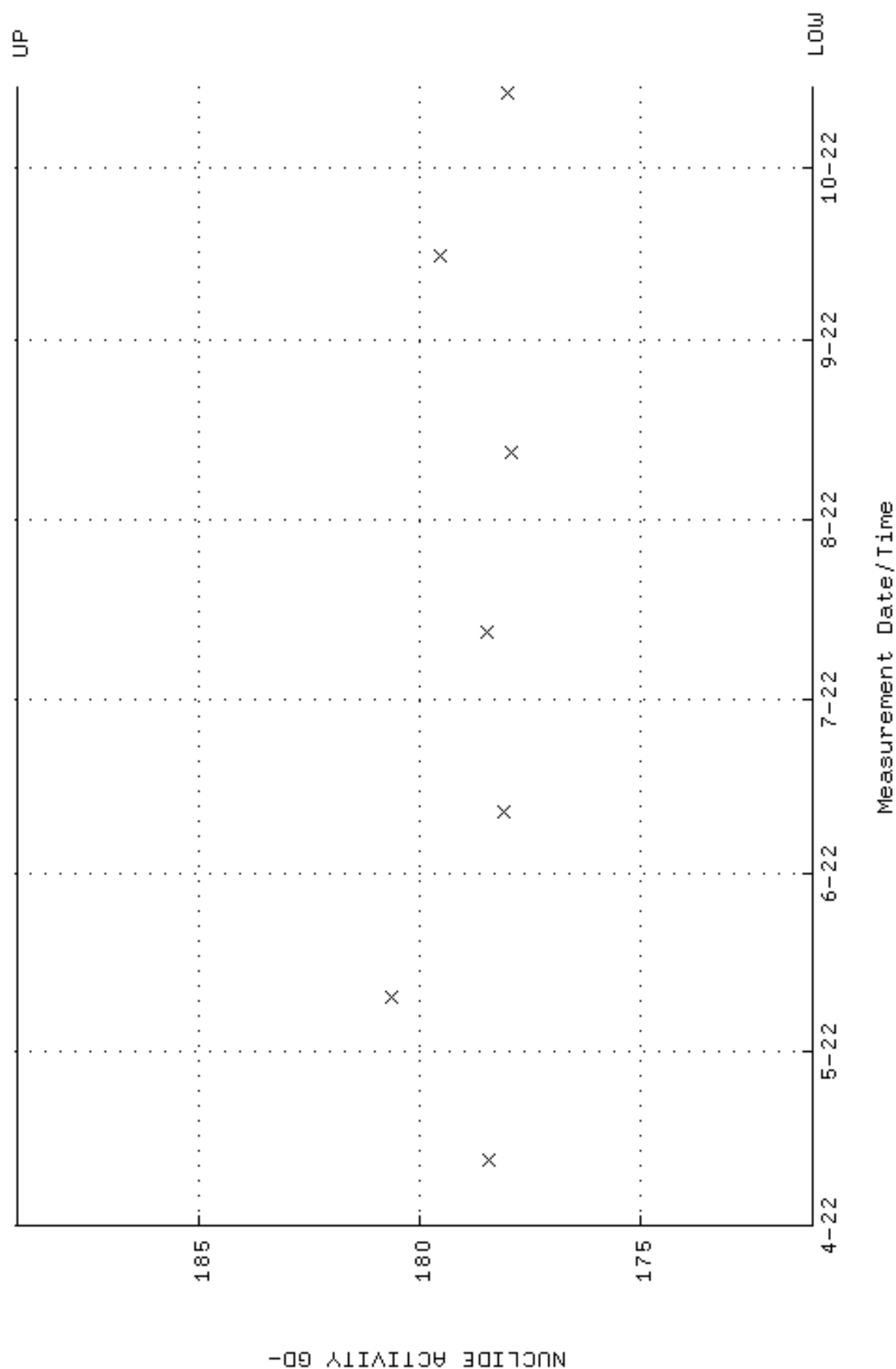
QA filename : DKA100:[ENV_ALPHA.QA.B]B092.QAF;3
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 12:51:53 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



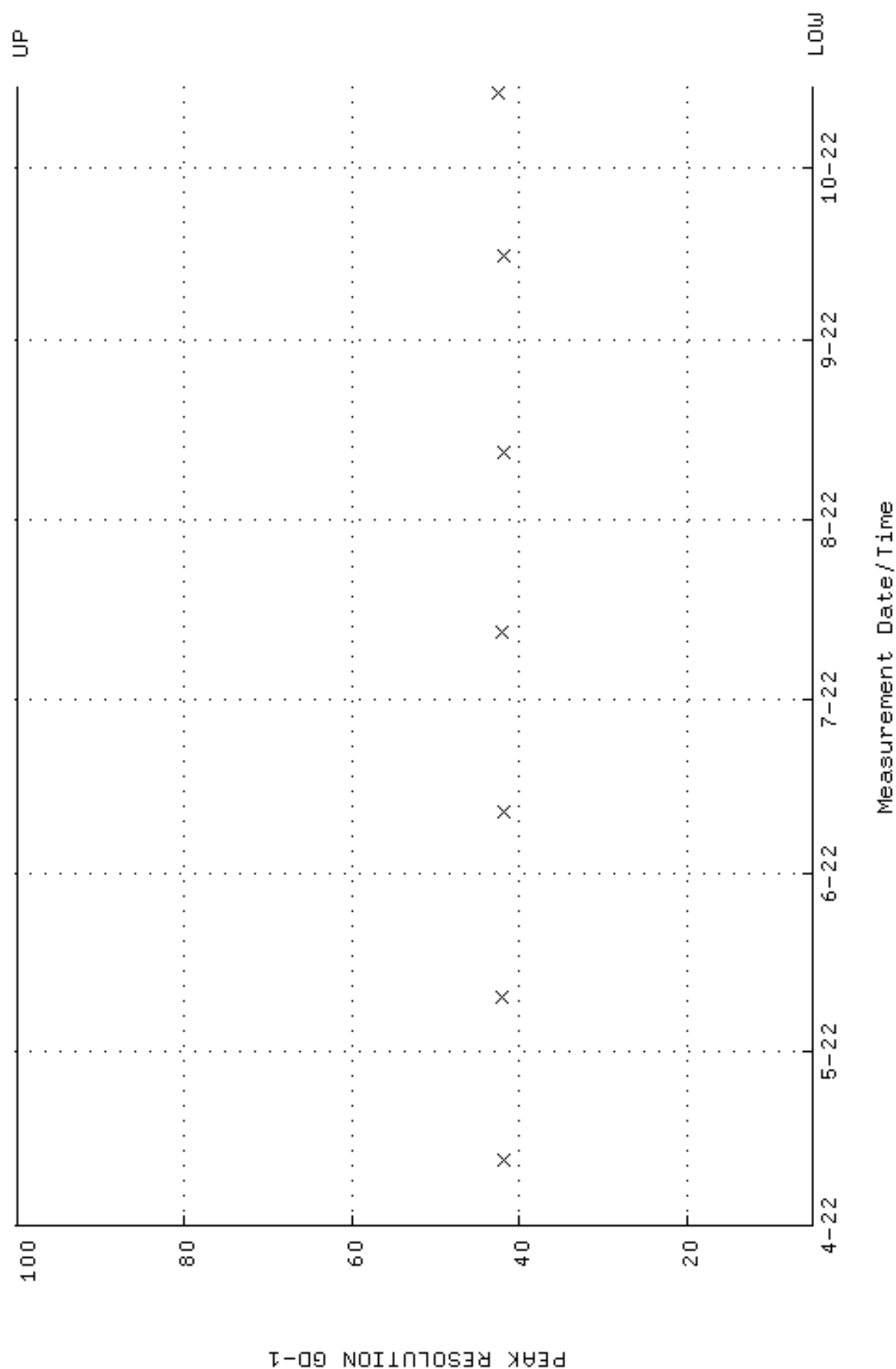
QA filename : DKA100:[ENV_ALPHA.QA.W]W099.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.348530 through 0.370089



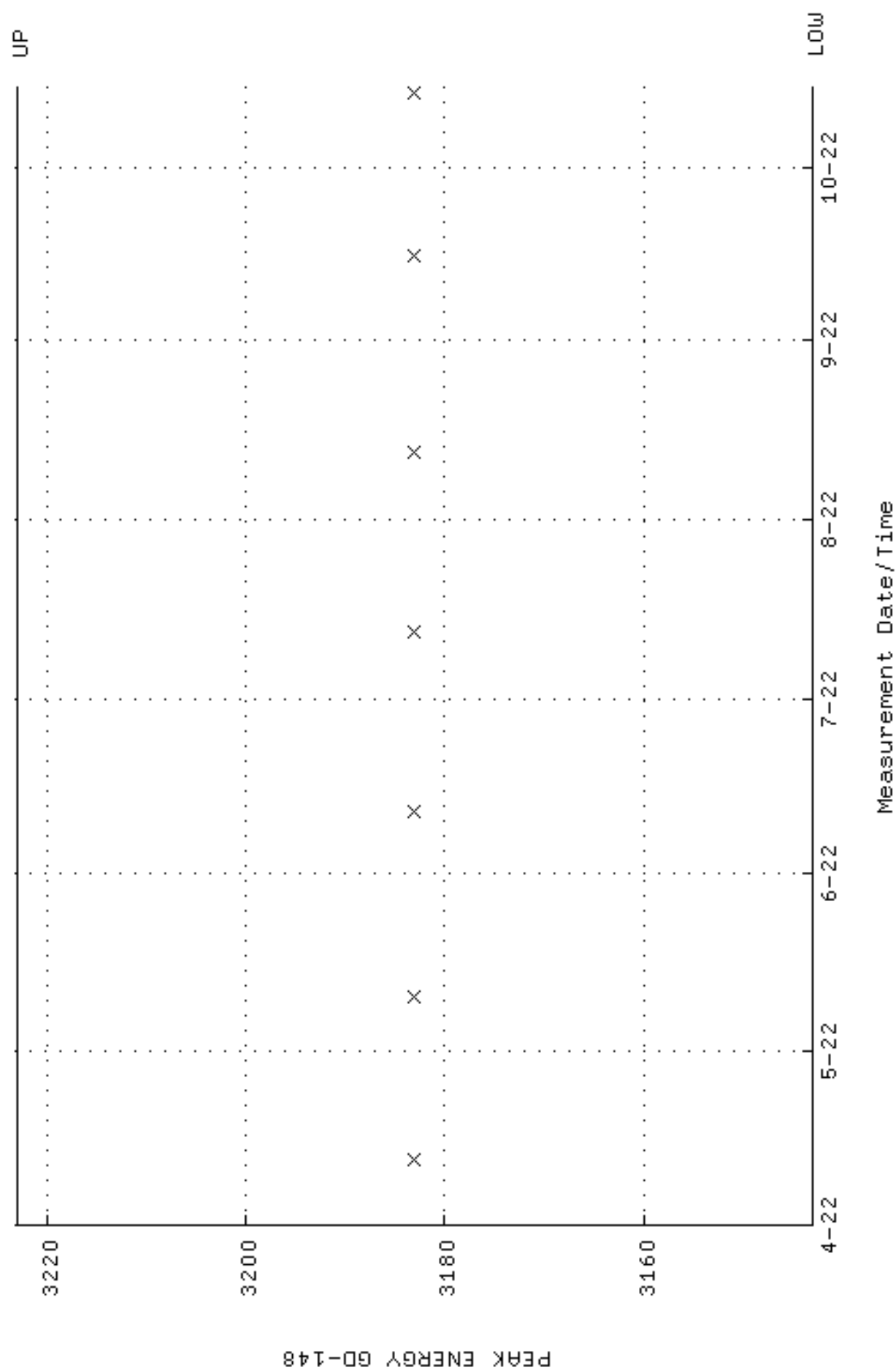
QA filename : DKA100:[ENV_ALPHA.QA.W]W099.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



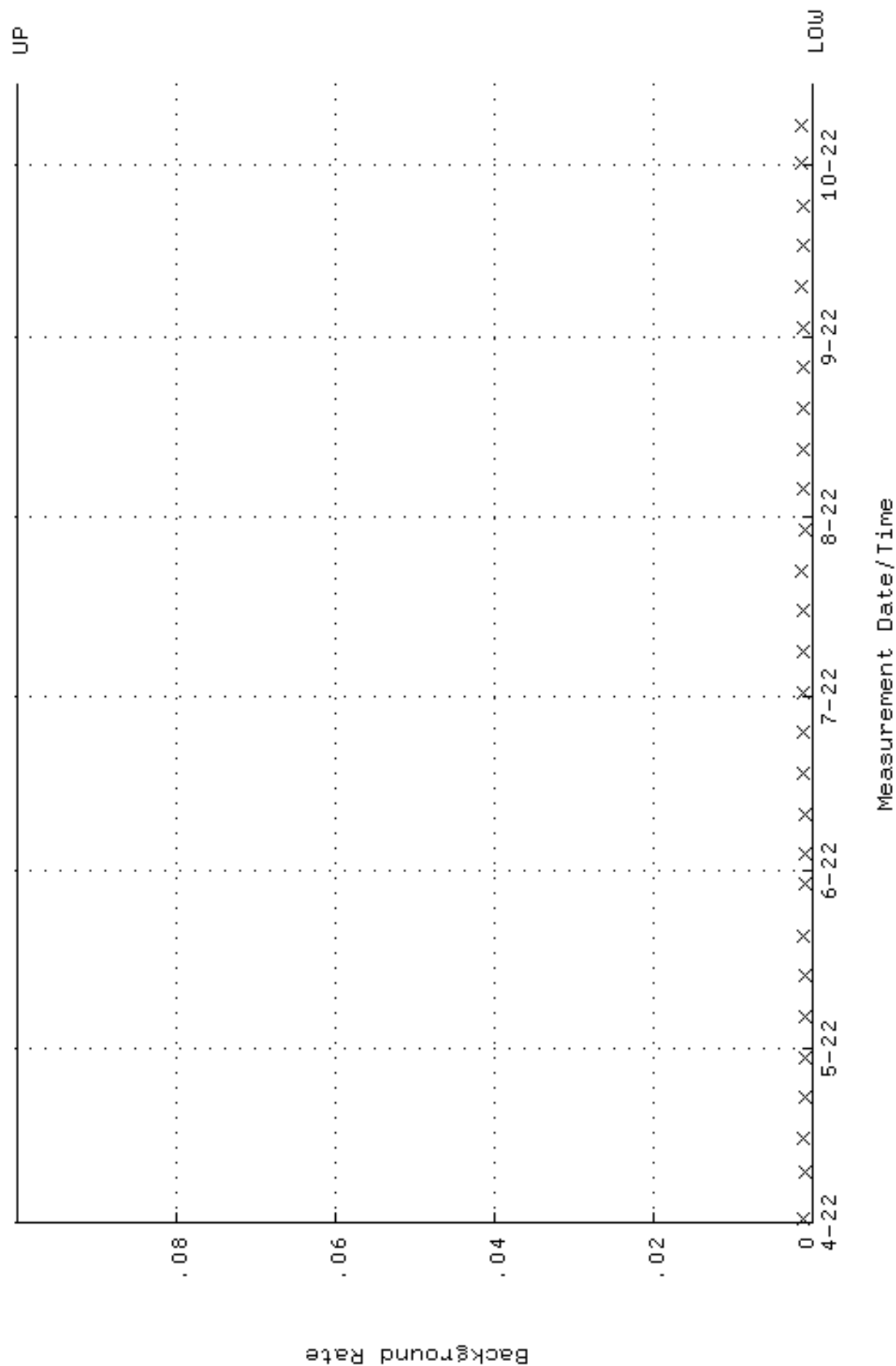
QA filename : DKA100:[ENV_ALPHA.QA.W]W099.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



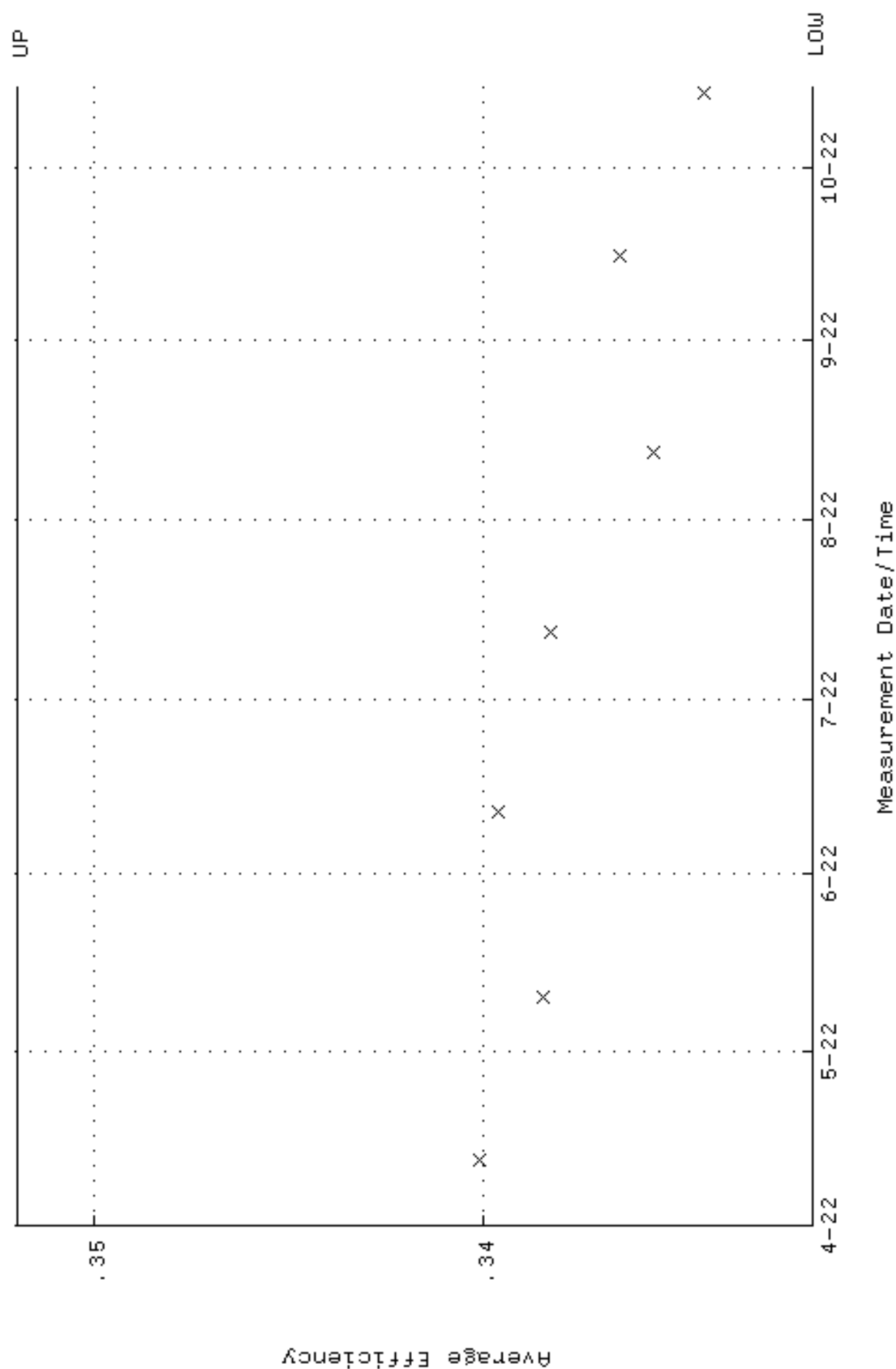
QA filename : DKA100:[ENV_ALPHA.QA.W]W099.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



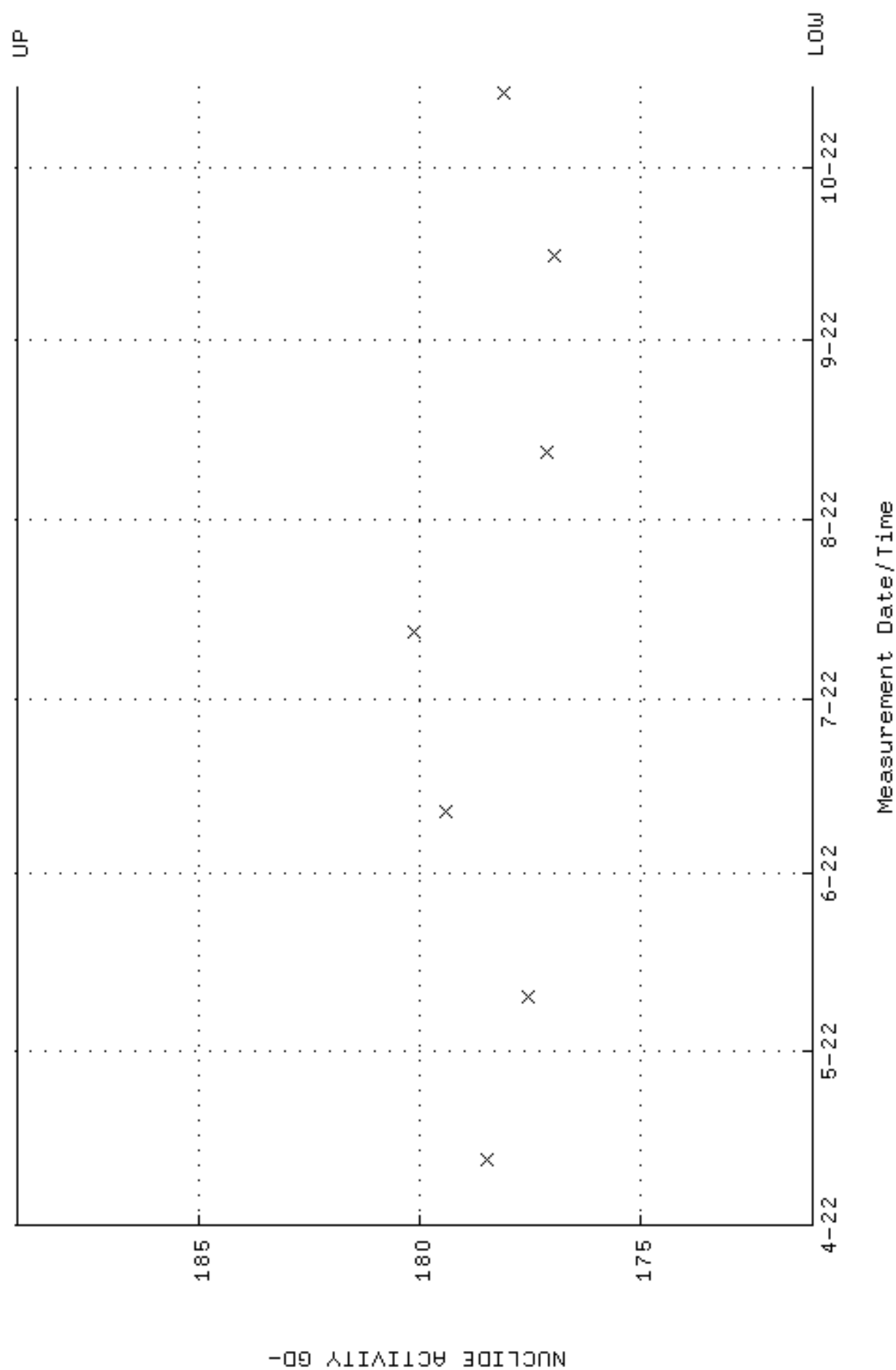
QA filename : DKA100:[ENV_ALPHA.QA.B]B099.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 12:51:54 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



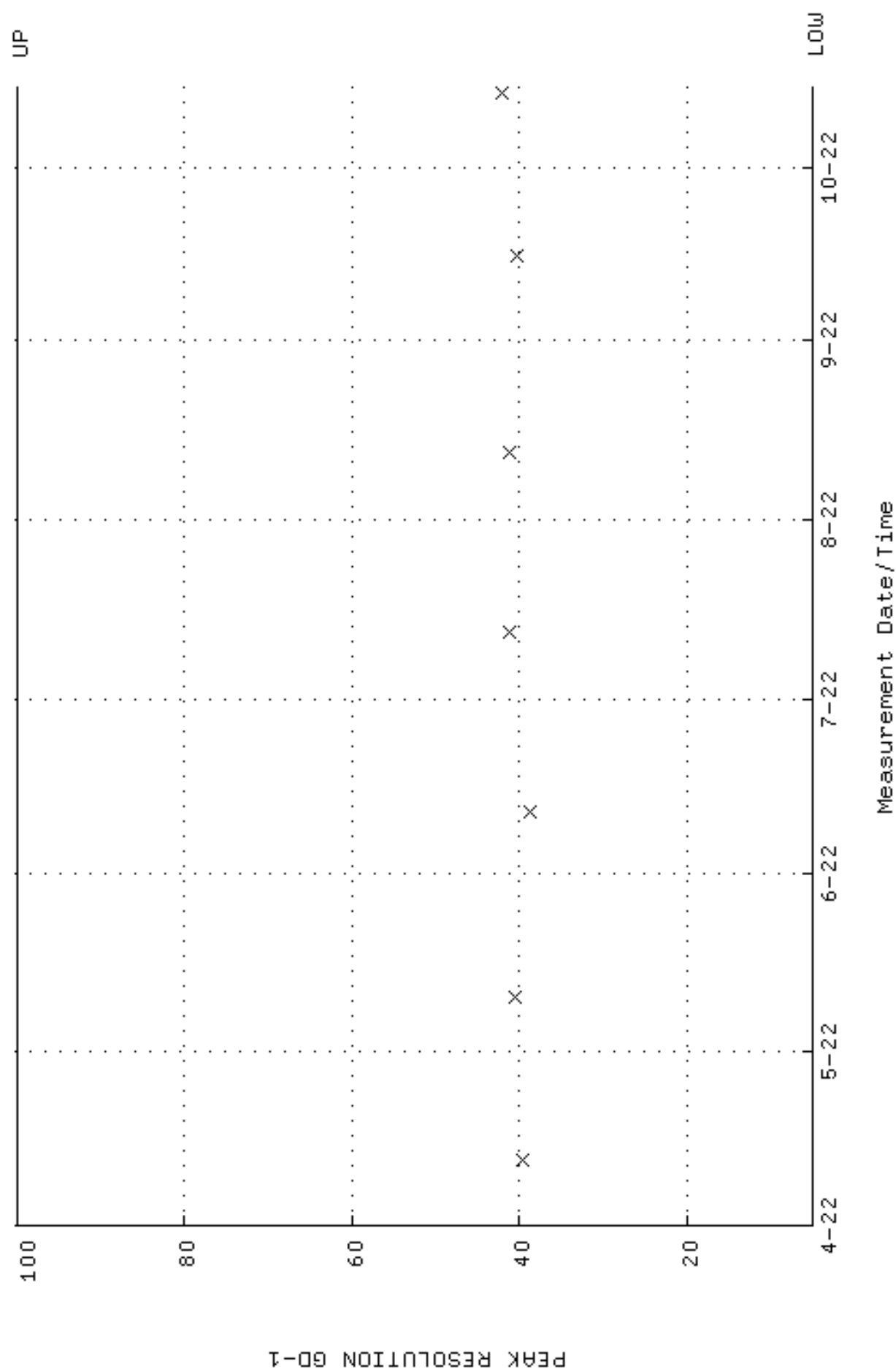
QA filename : DKA100:[ENV_ALPHA.QA.W]W100.QAF;12
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.331500 through 0.352000



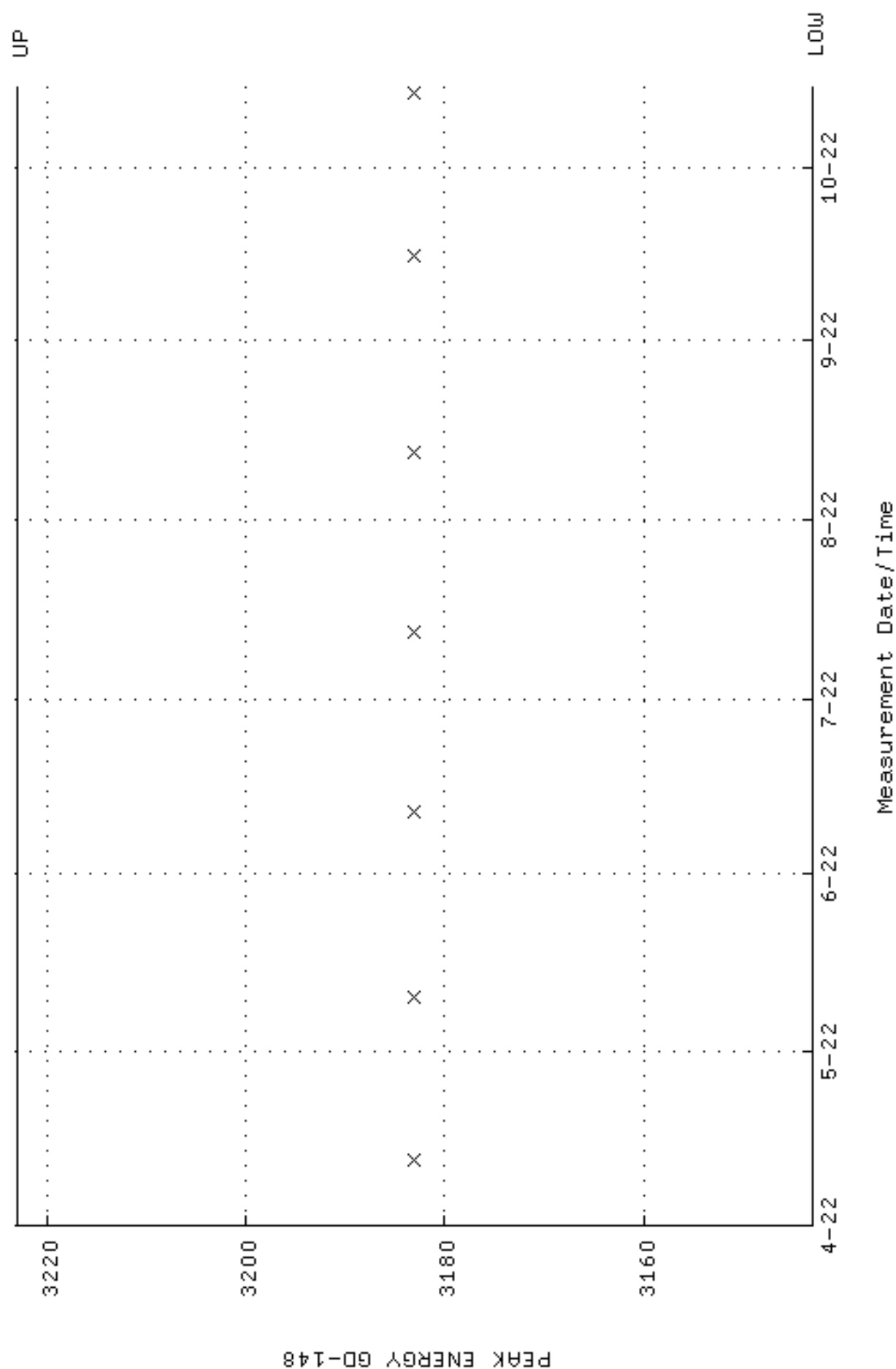
QA filename : DKA100:[ENV_ALPHA.QA.W]W100.QAF;12
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



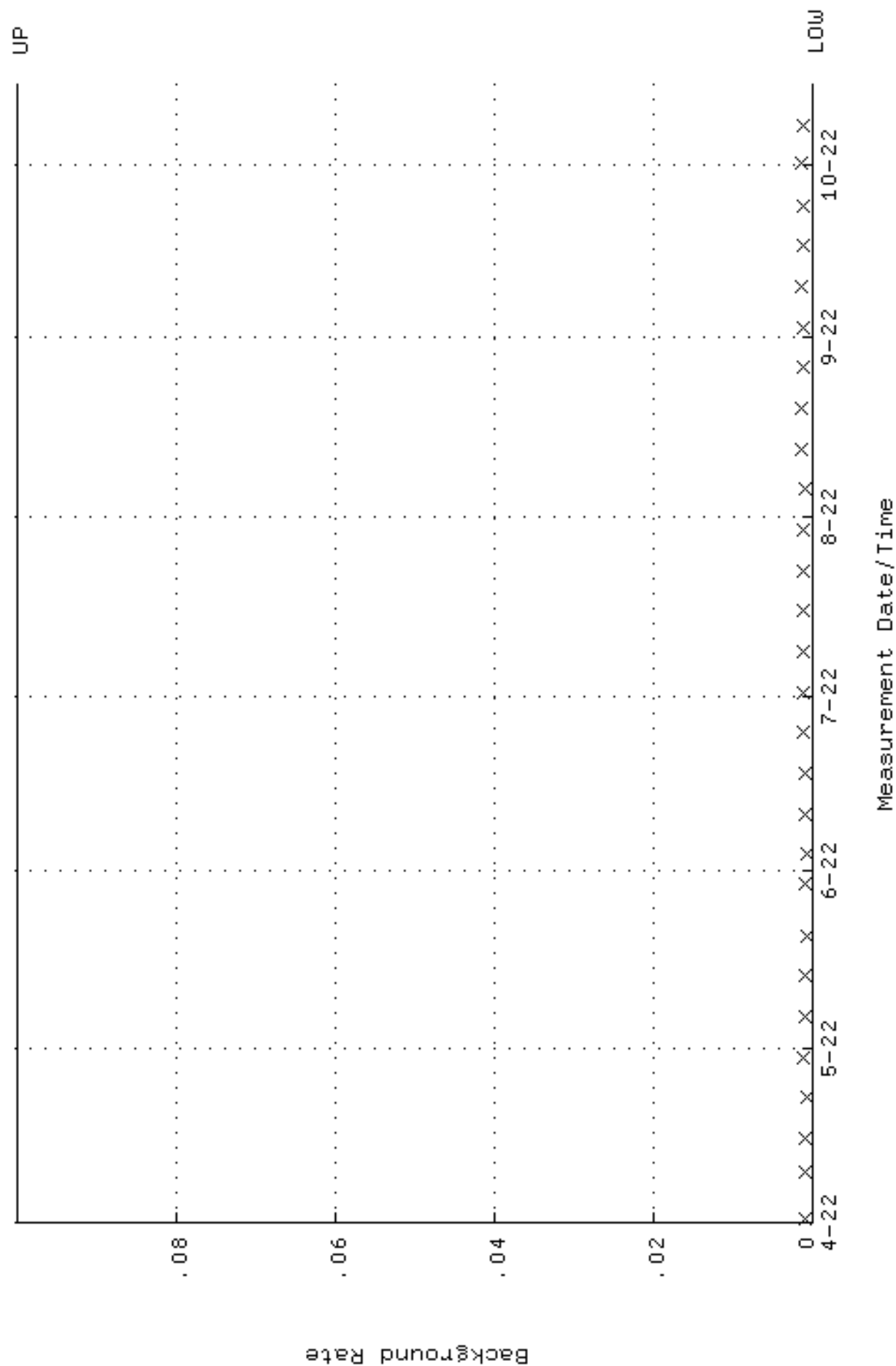
QA filename : DKA100:[ENV_ALPHA.QA.W]W100.QAF;12
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



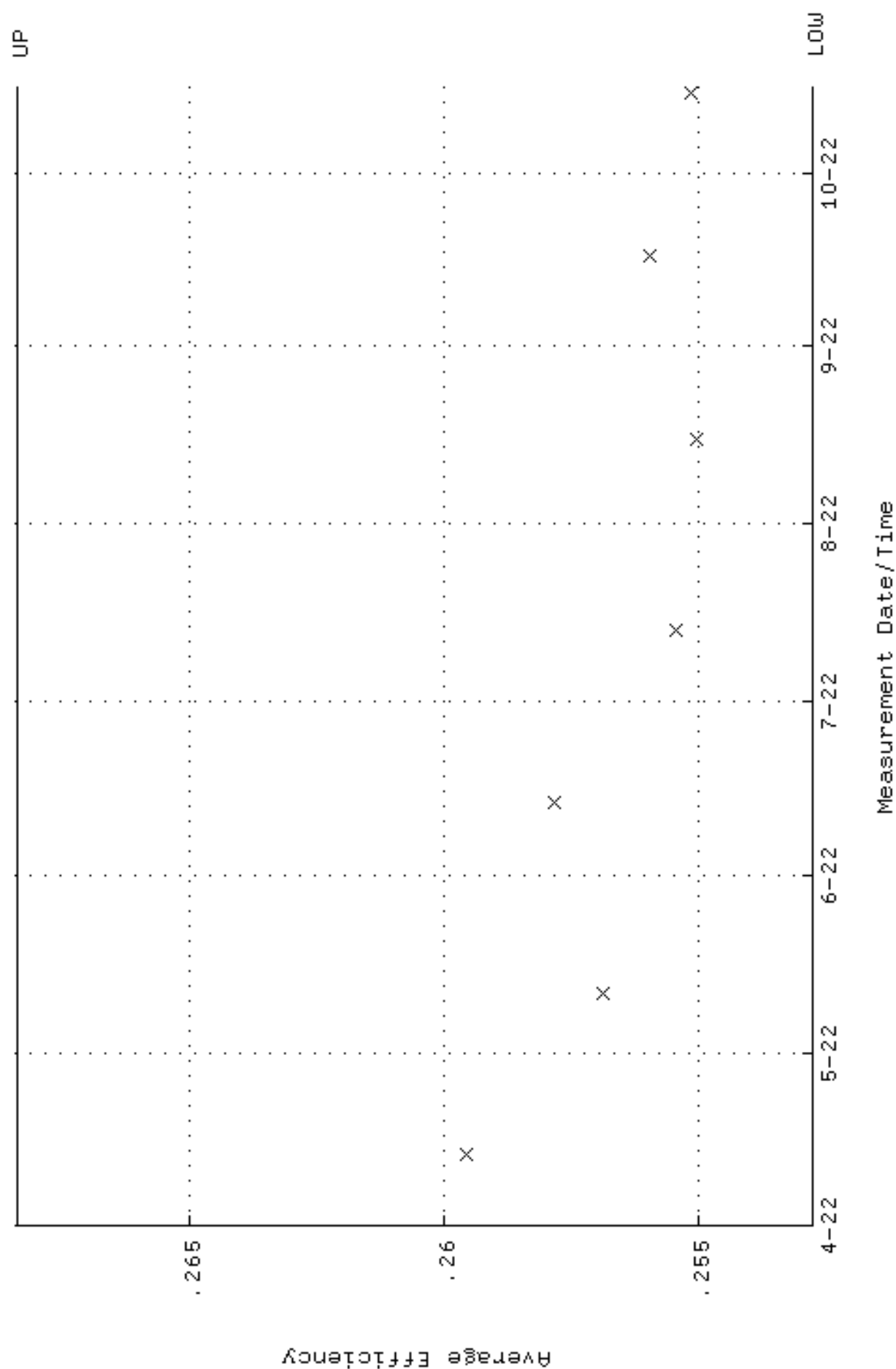
QA filename : DKA100:[ENV_ALPHA.QA.W]W100.QAF;12
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



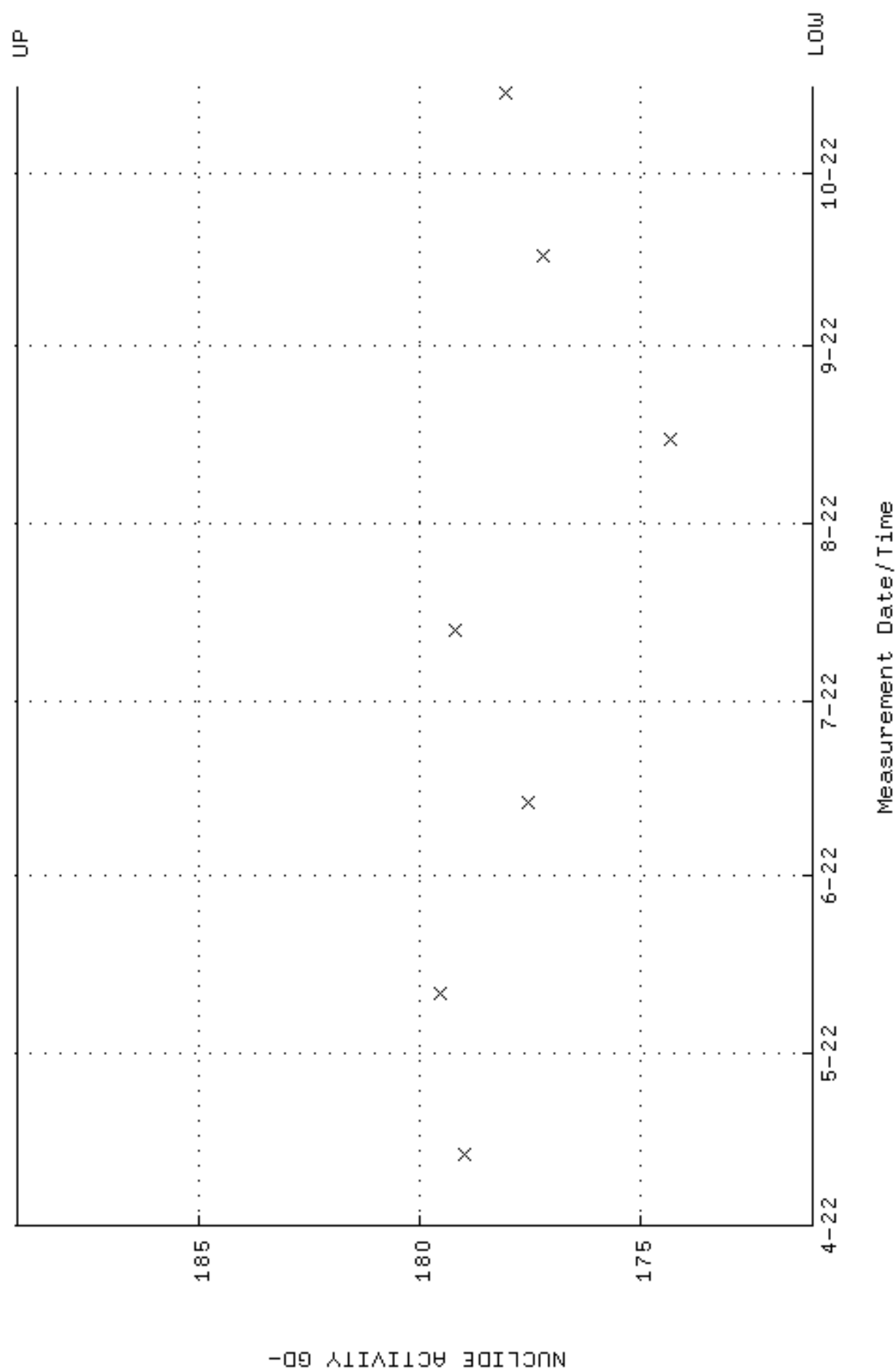
QA filename : DKA100:[ENV_ALPHA.QA.B]B100.QAF;5
 Parameter Name : BACKRATE (Background Rate)
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 Lower/Upper Lmts: 0.000000E+00 through 0.100000



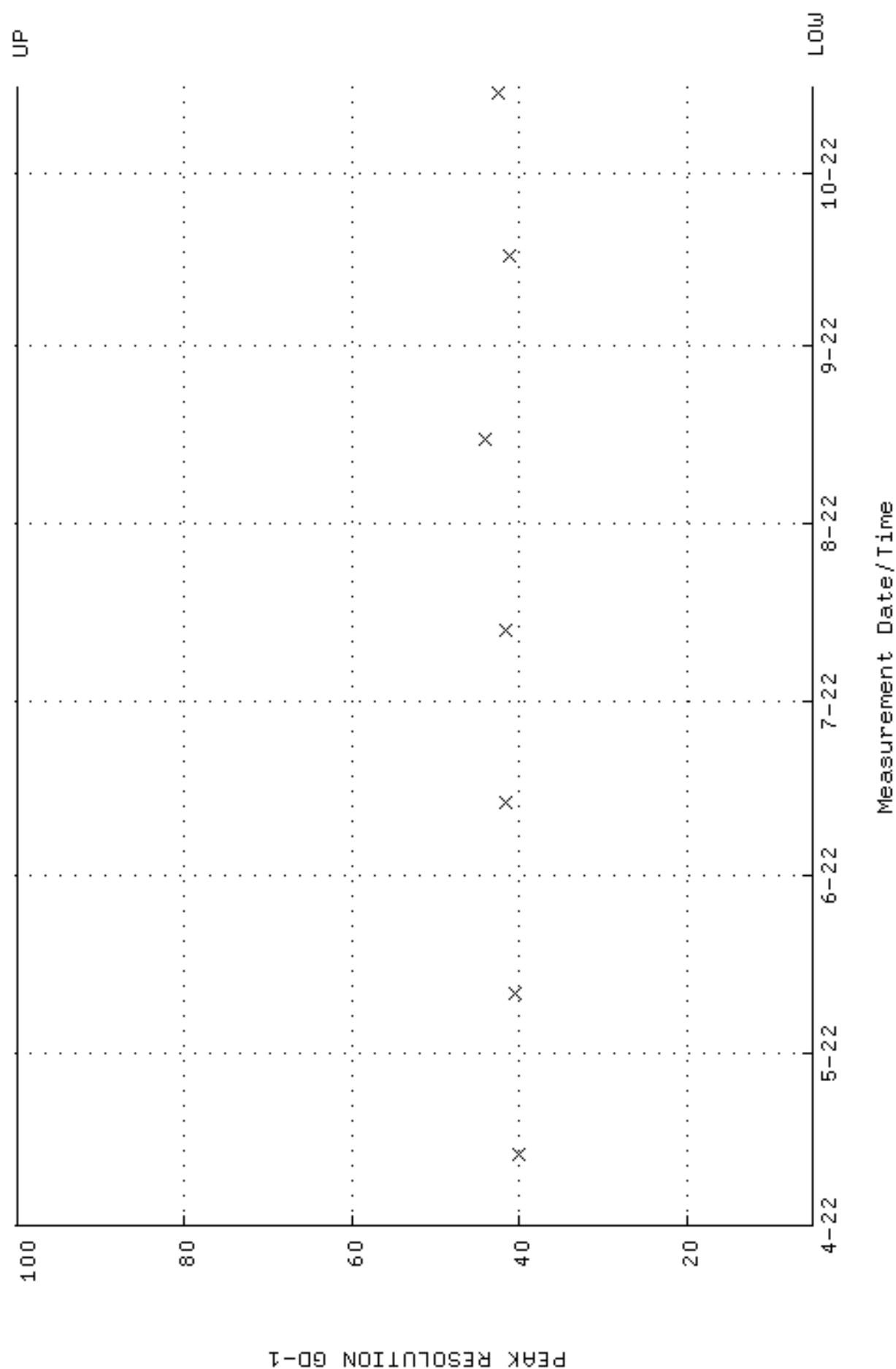
QA filename : DKA100:[ENV_ALPHA.QA.W]W121.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-APR-2022 10:22:47 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.252740 through 0.268370



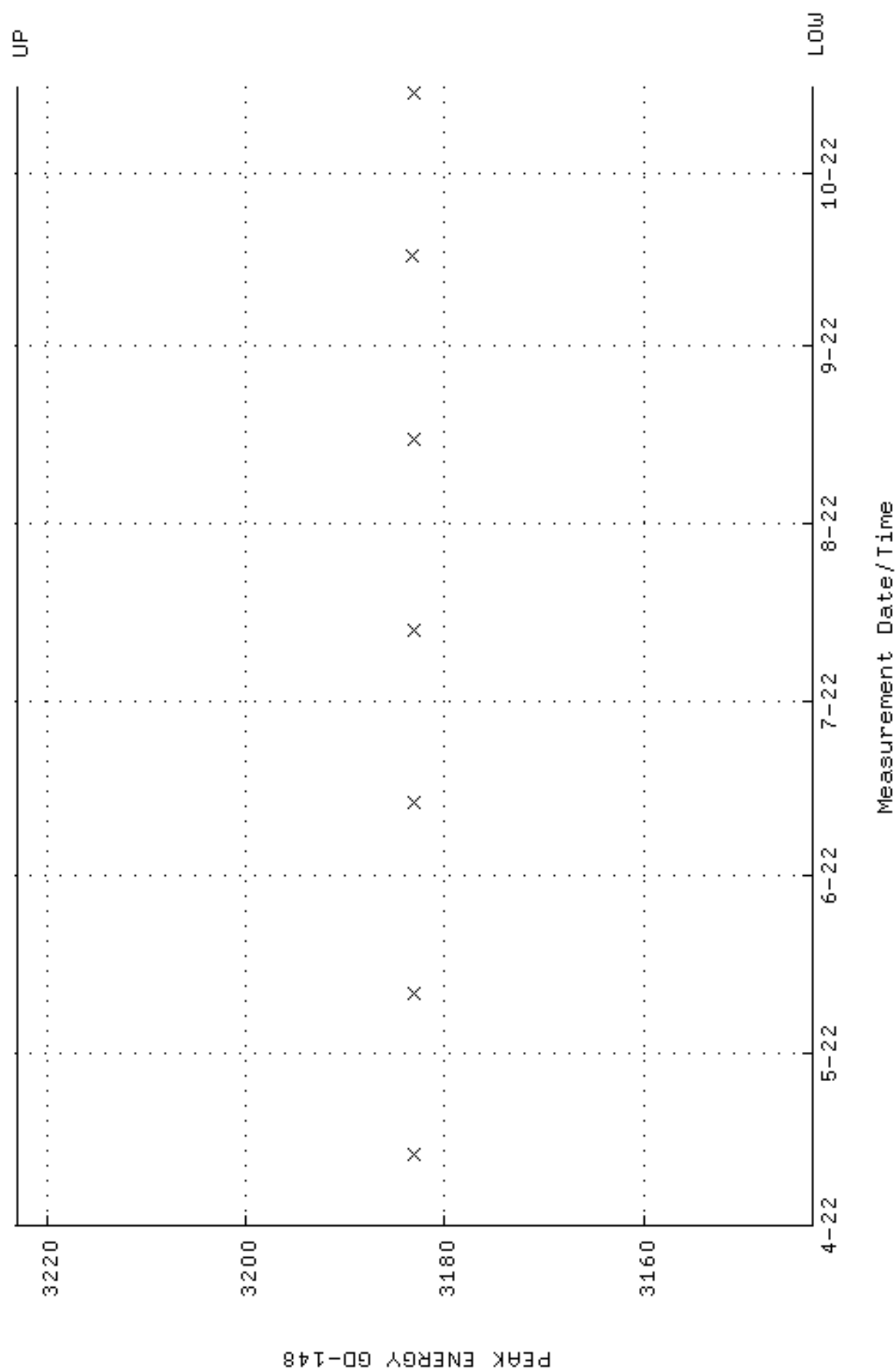
QA filename : DKA100:[ENV_ALPHA.QA.W]W121.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-APR-2022 10:22:47 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



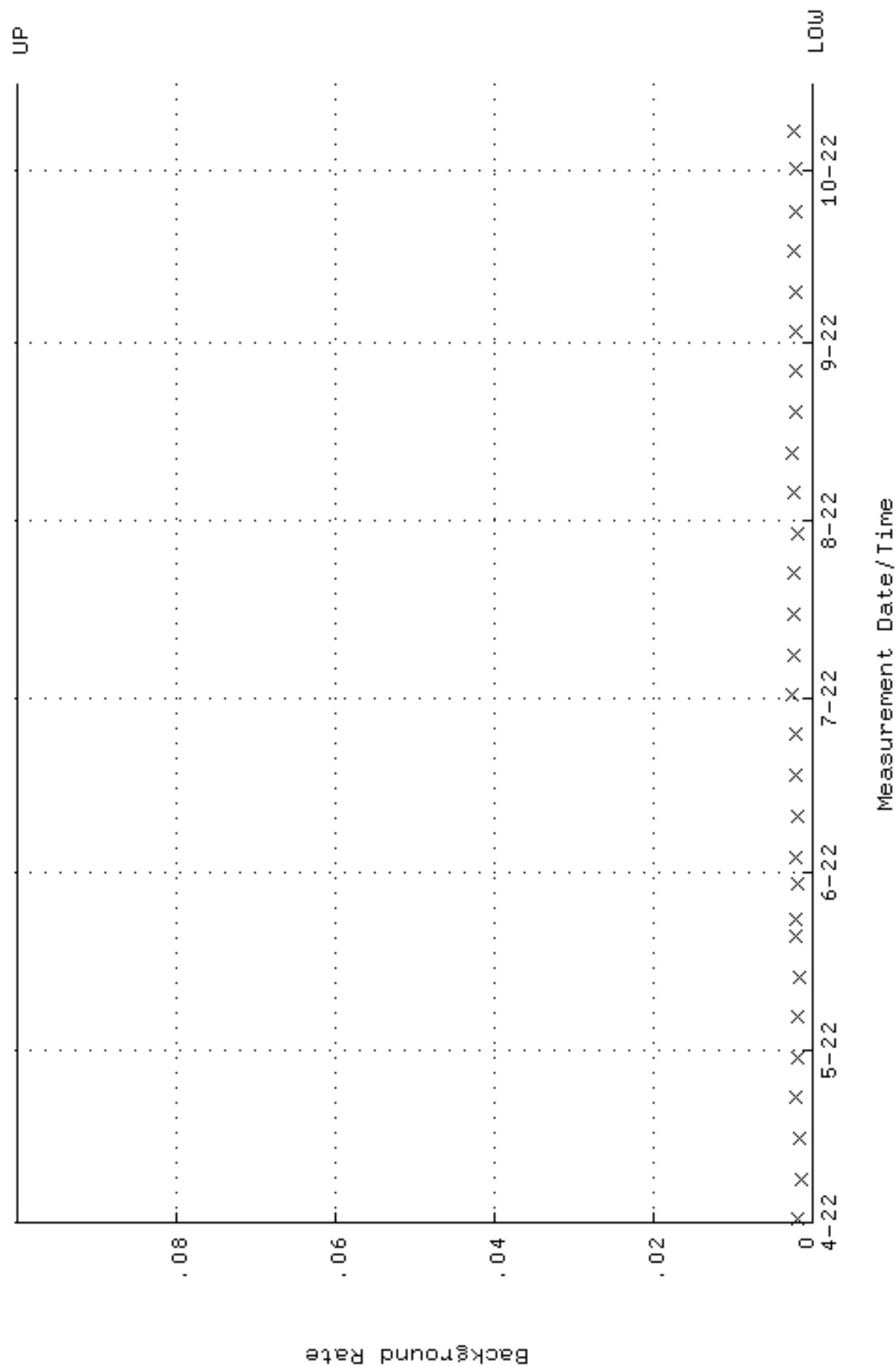
QA filename : DKA100:[ENV_ALPHA.QA.W]W121.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-APR-2022 10:22:47 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



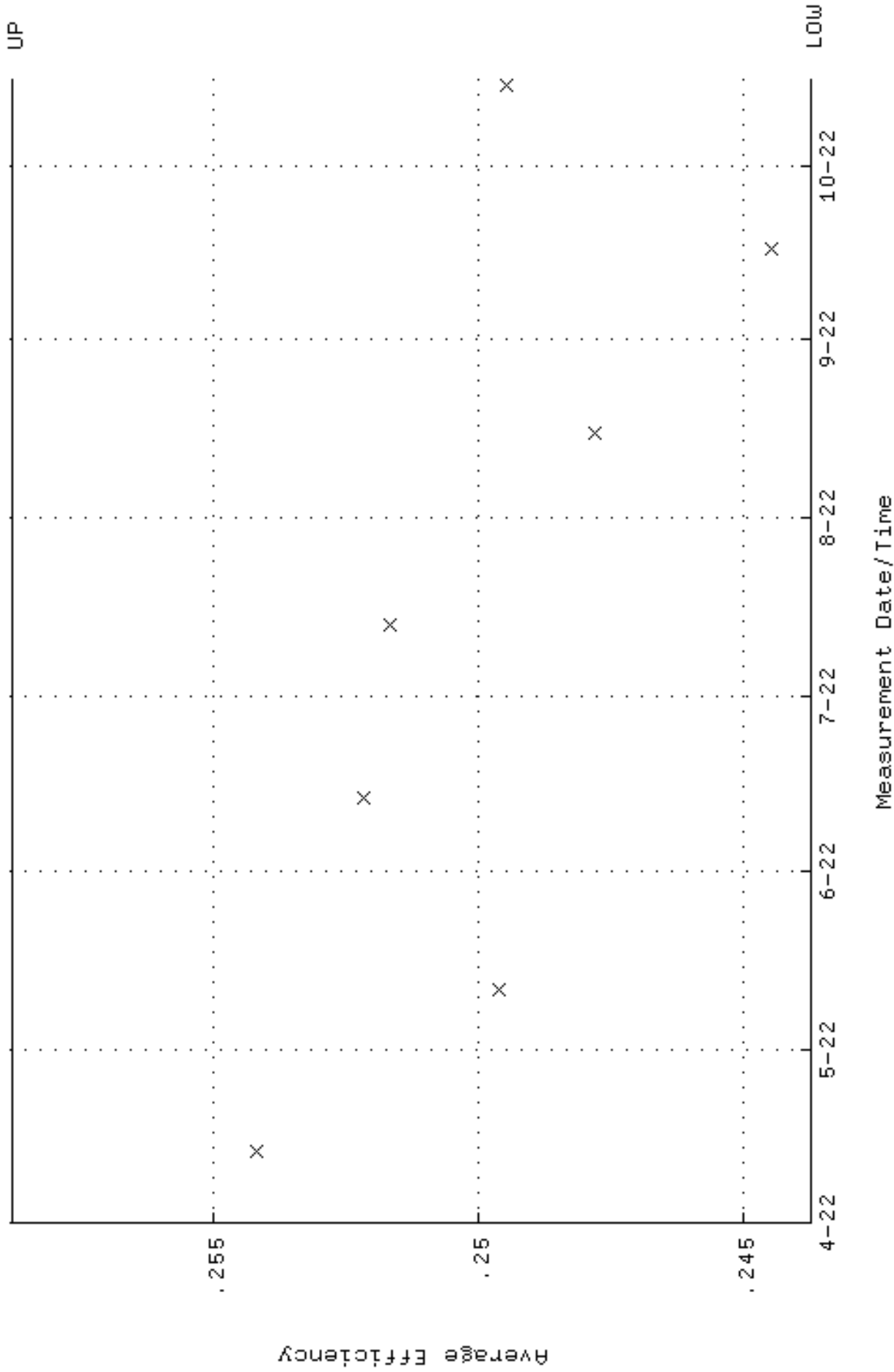
QA filename : DKA100:[ENV_ALPHA.QA.W]W121.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-APR-2022 10:22:47 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



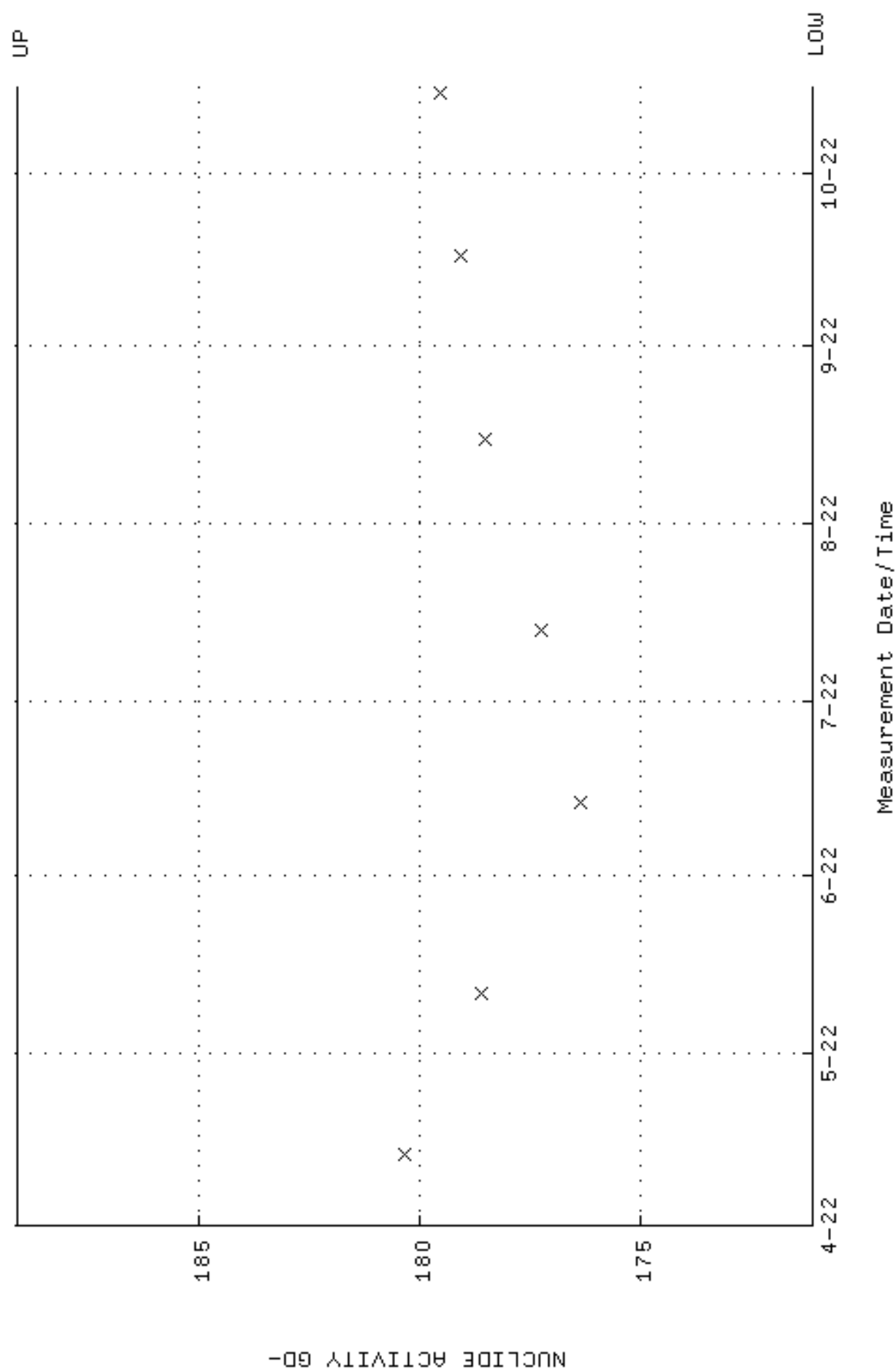
QA filename : DKA100:[ENV_ALPHA.QA.B]B121.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:16:39 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



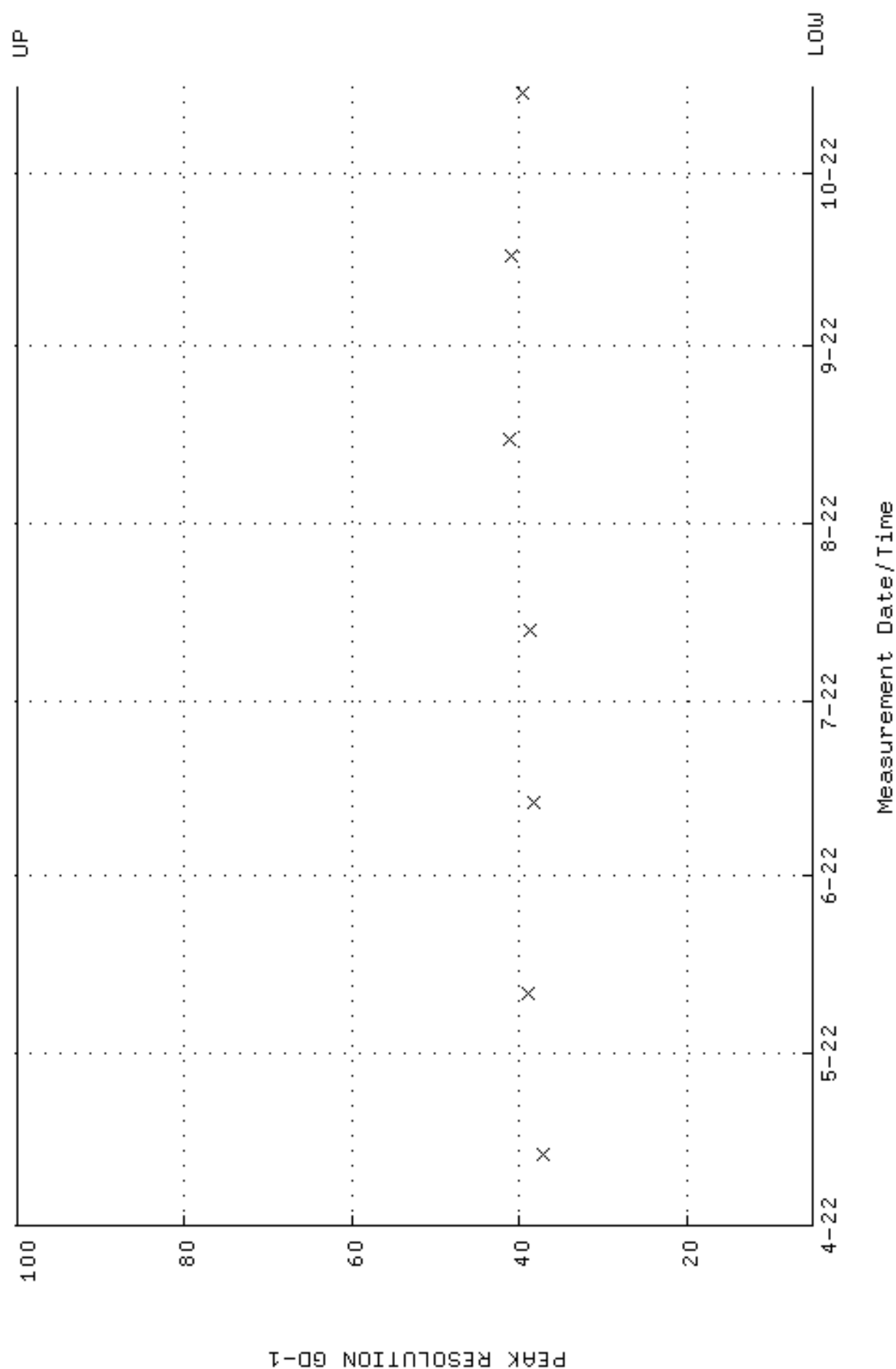
QA filename : DKA100:[ENV_ALPHA.QA.W]W122.QAF;7
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 13-APR-2022 10:22:51 through 15-OCT-2022 12:00:00
Lower/Upper Lmts: 0.243720 through 0.258800



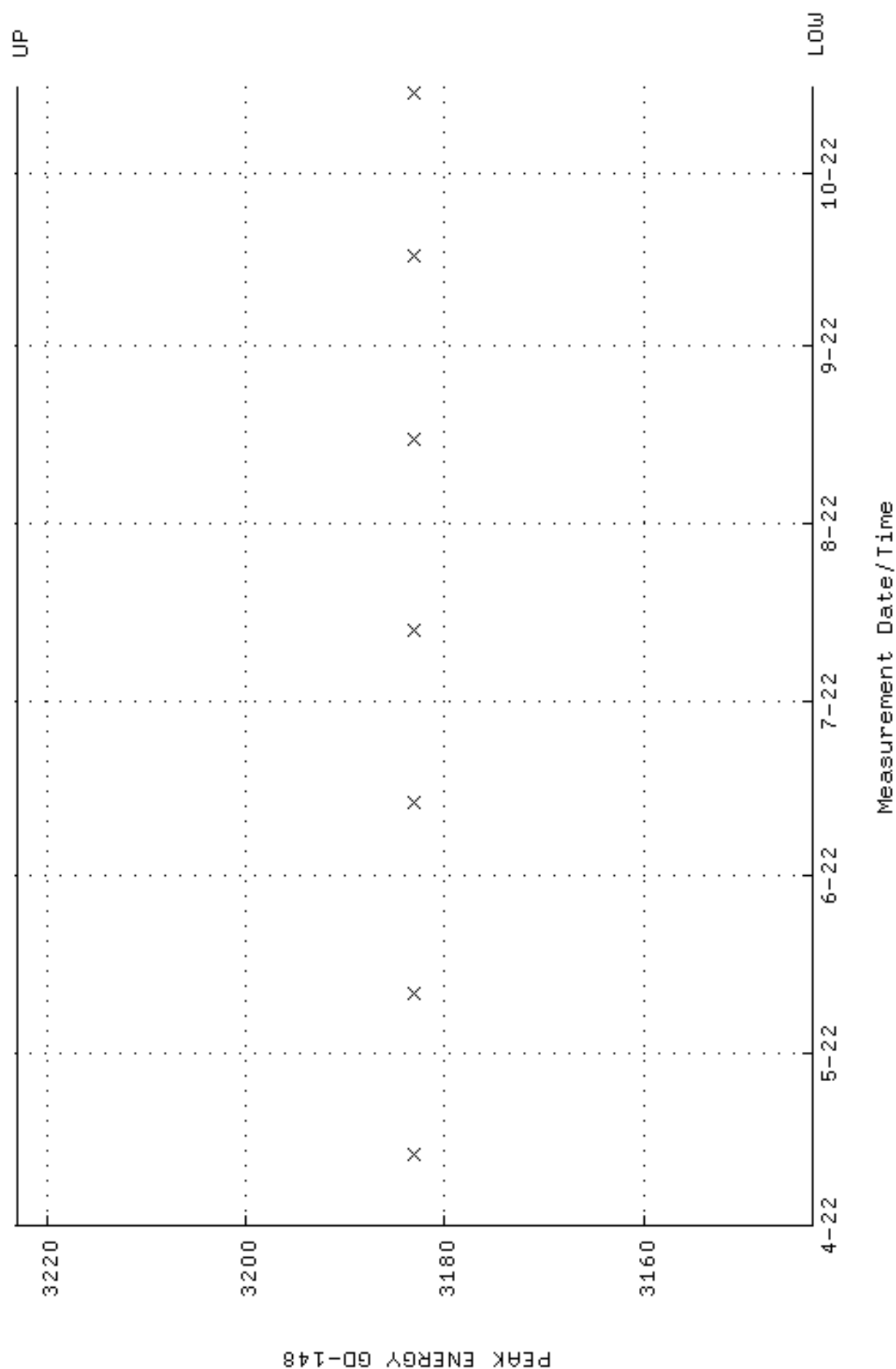
QA filename : DKA100:[ENV_ALPHA.QA.W]W122.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-APR-2022 10:22:51 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



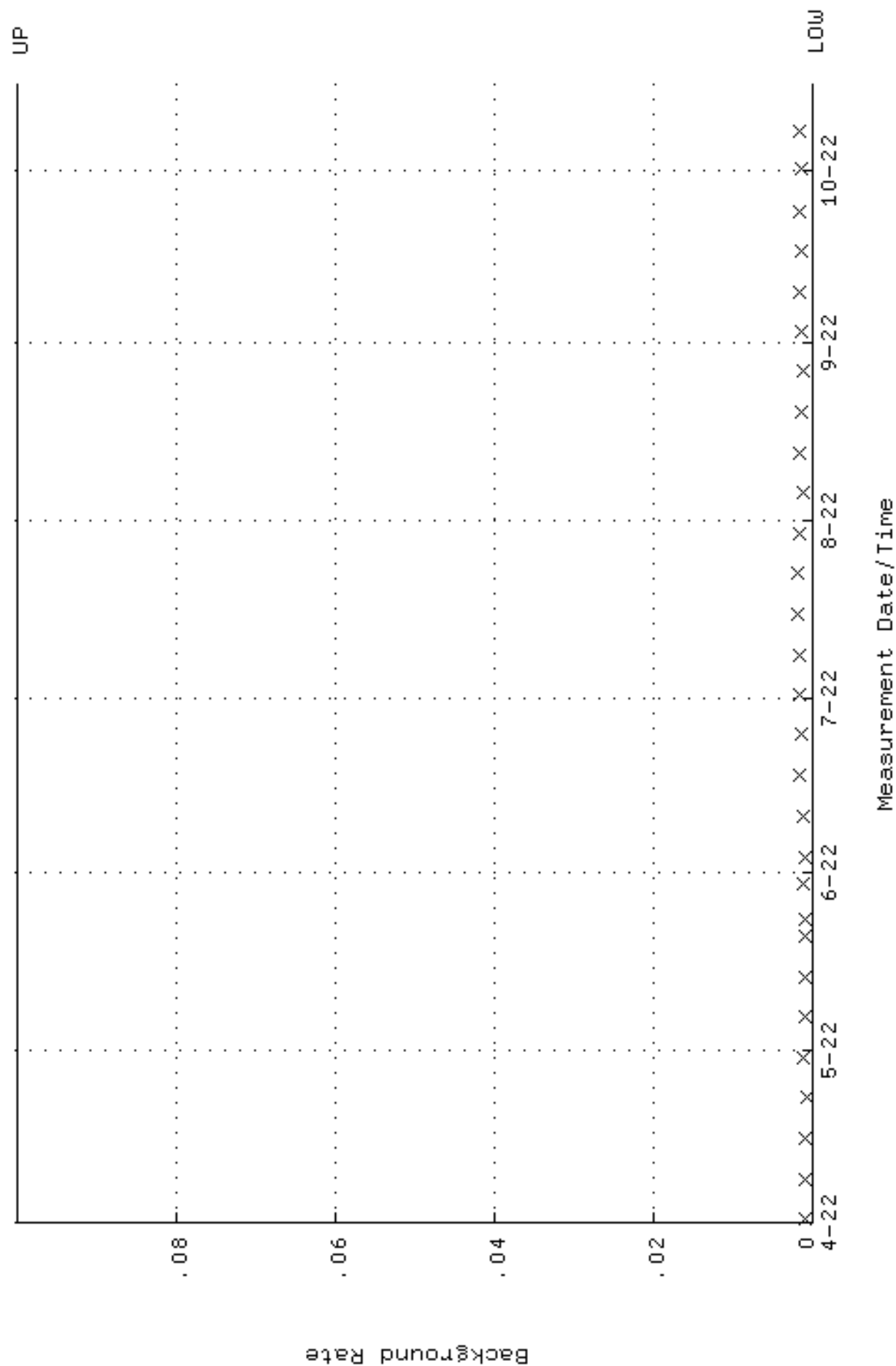
QA filename : DKA100:[ENV_ALPHA.QA.W]W122.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-APR-2022 10:22:51 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



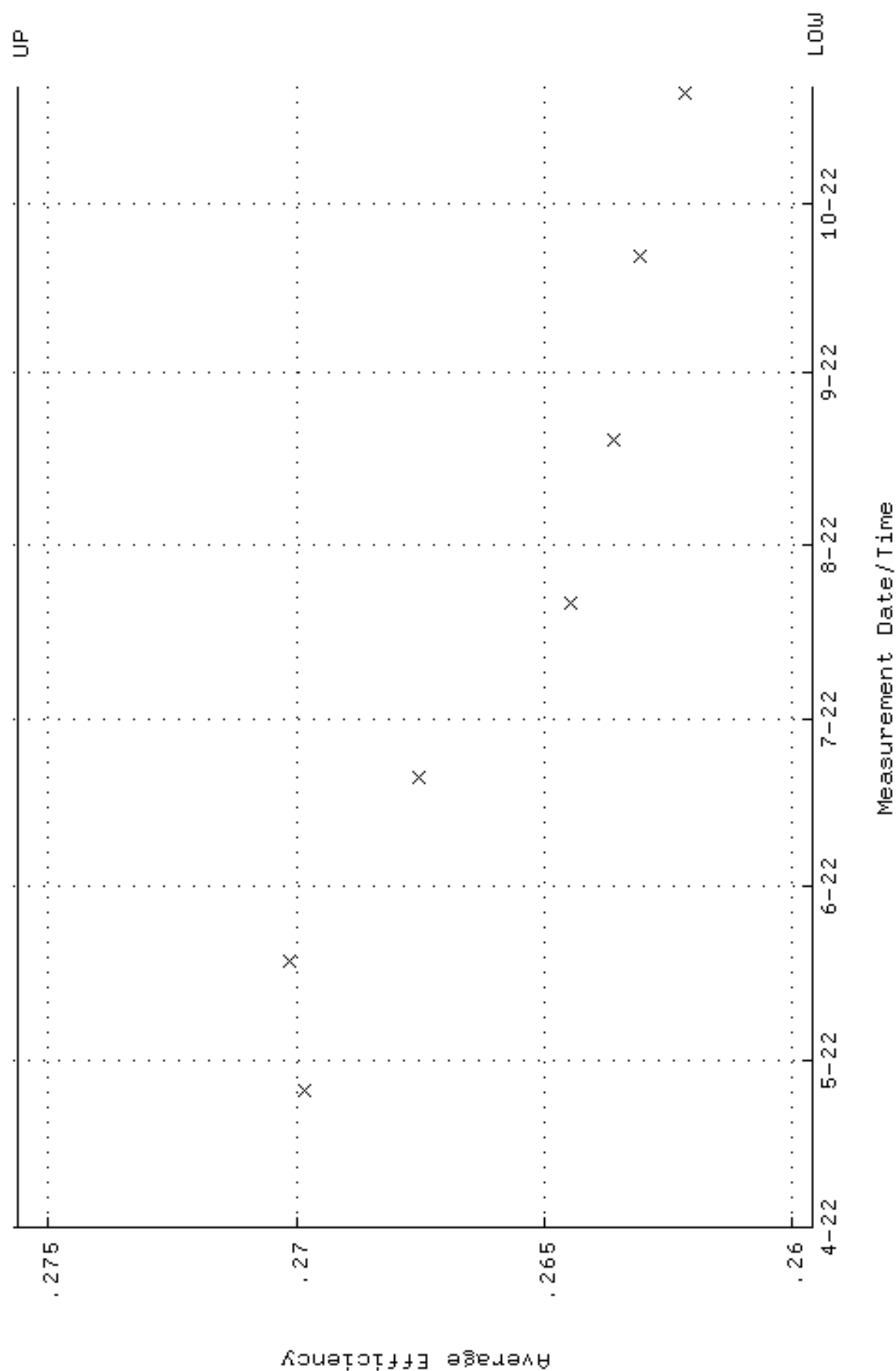
QA filename : DKA100:[ENV_ALPHA.QA.W]W122.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-APR-2022 10:22:51 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



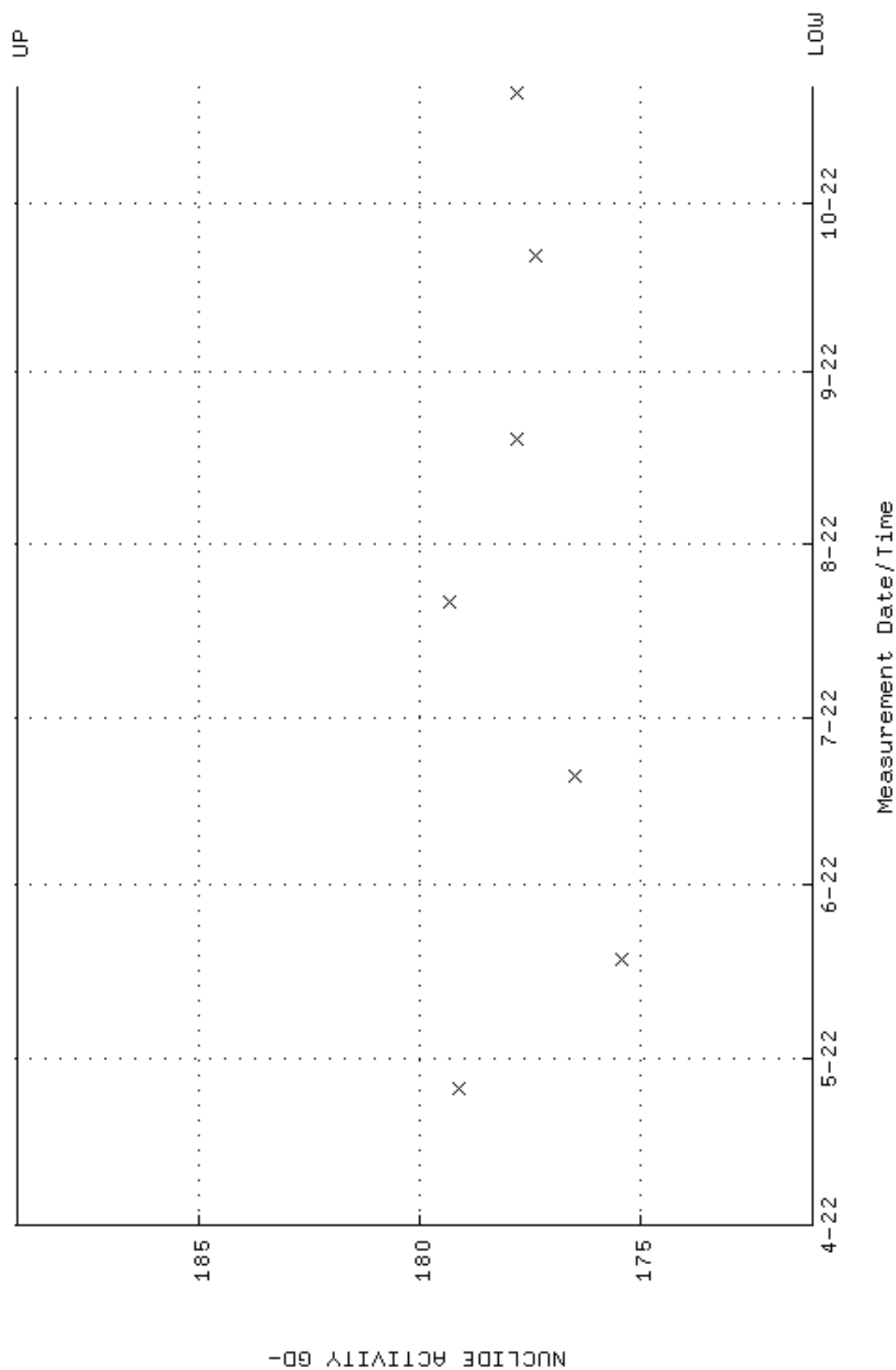
QA filename : DKA100:[ENV_ALPHA.QA.B]B122.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:16:42 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



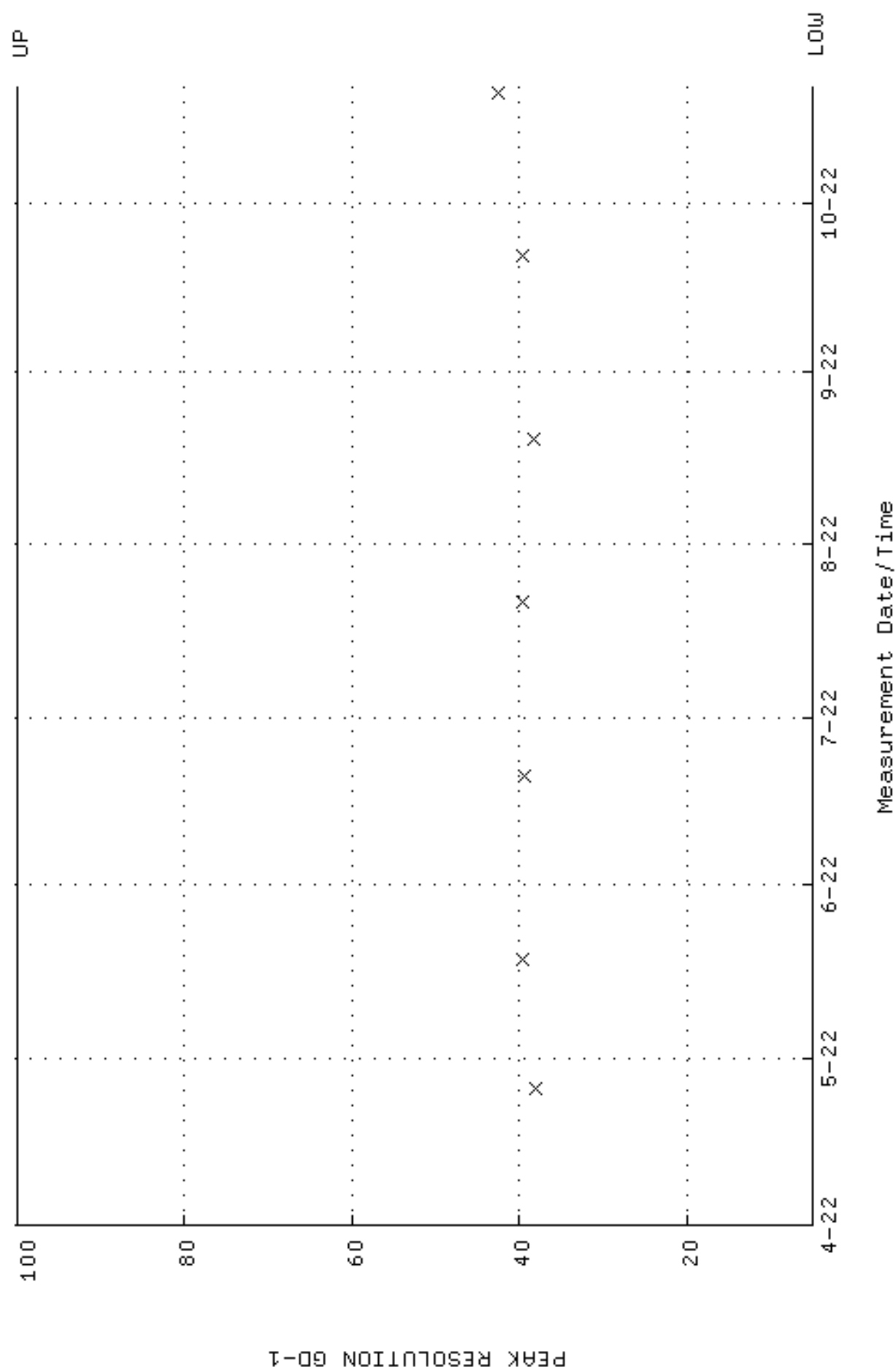
QA filename : DKA100:[ENV_ALPHA.QA.W]W213.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 25-APR-2022 10:44:57 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.259600 through 0.275660



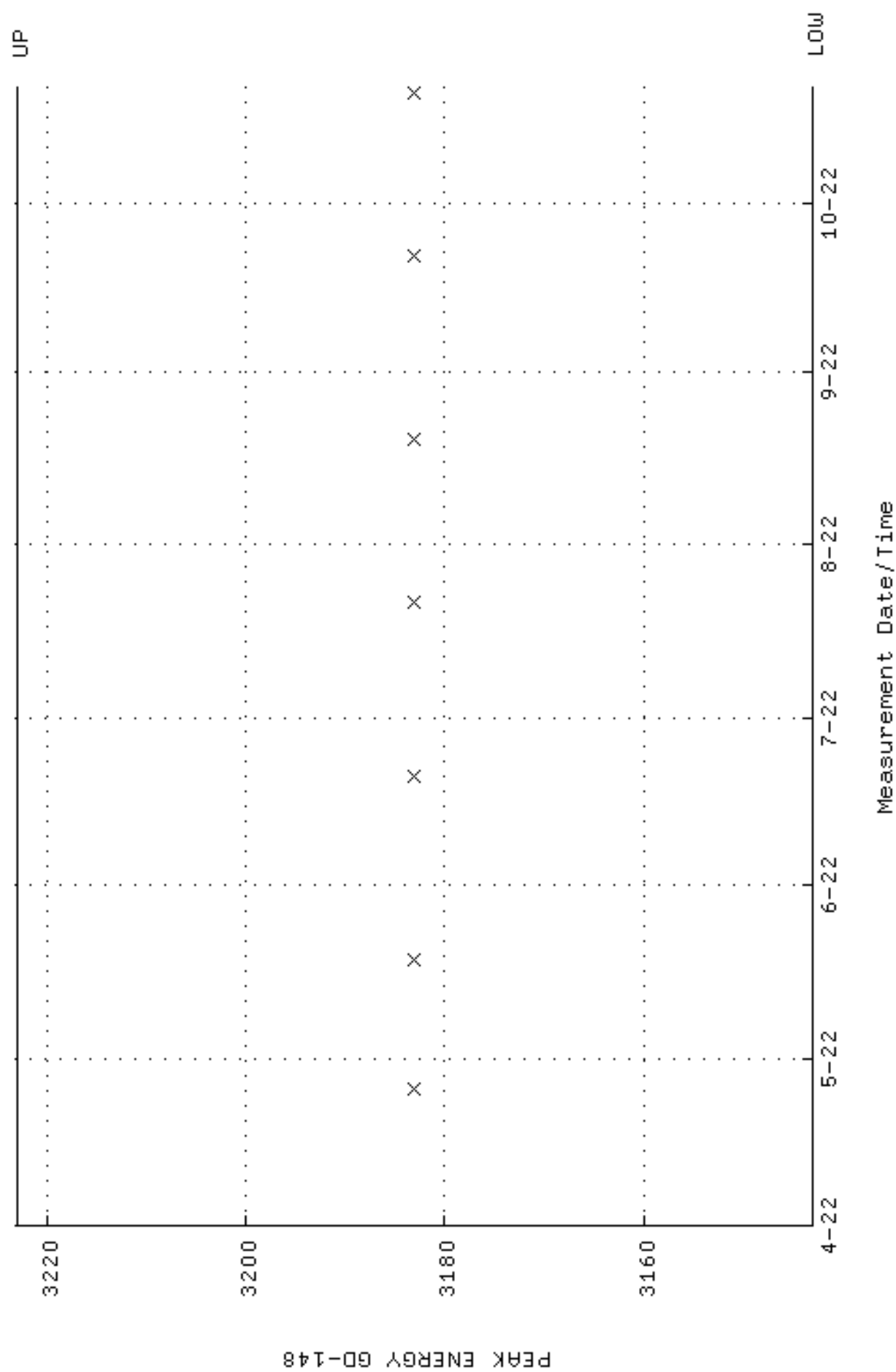
QA filename : DKA100:[ENV_ALPHA.QA.W]W213.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 10:44:57 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



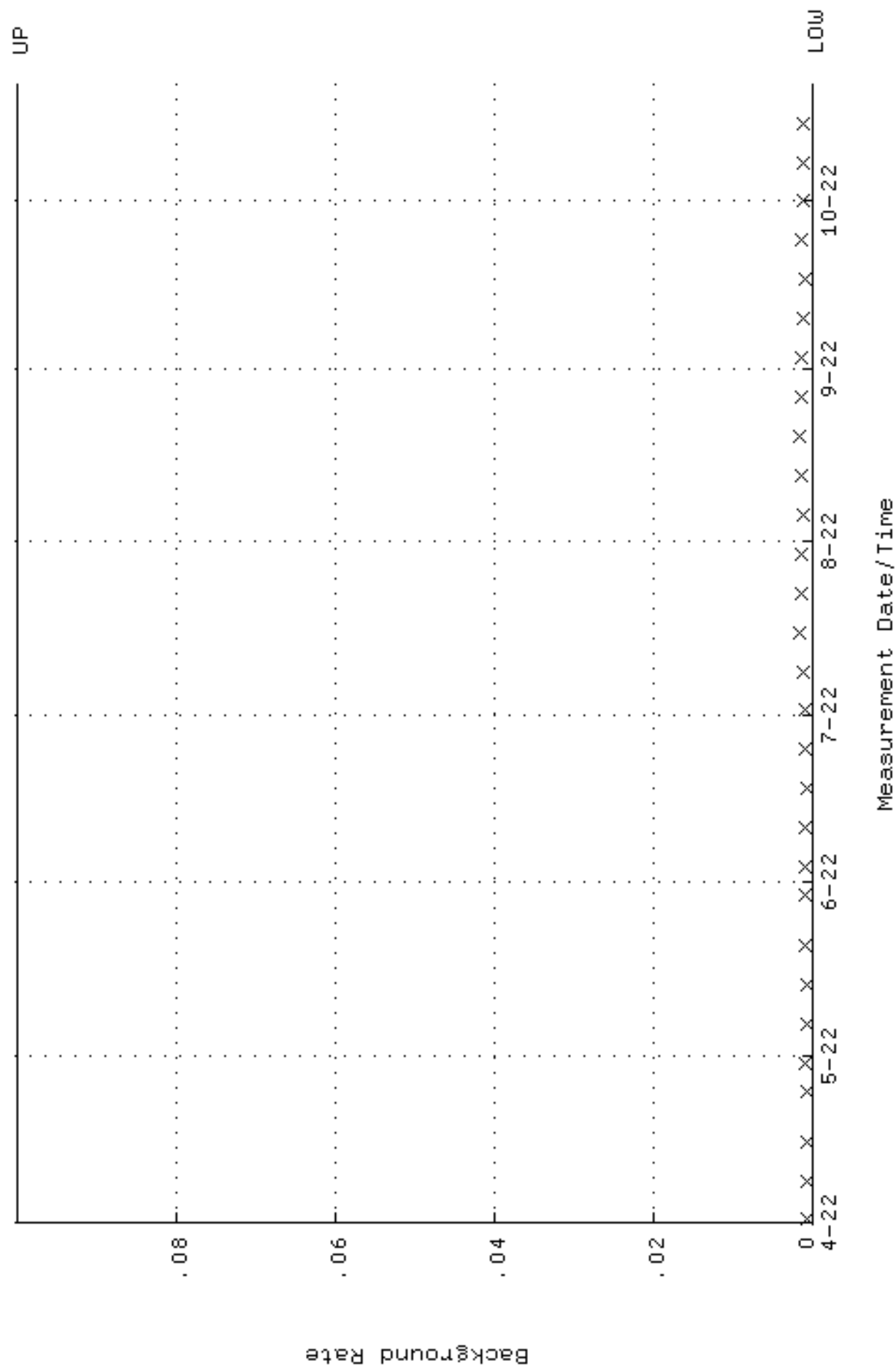
QA filename : DKA100:[ENV_ALPHA.QA.W]W213.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 10:44:57 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



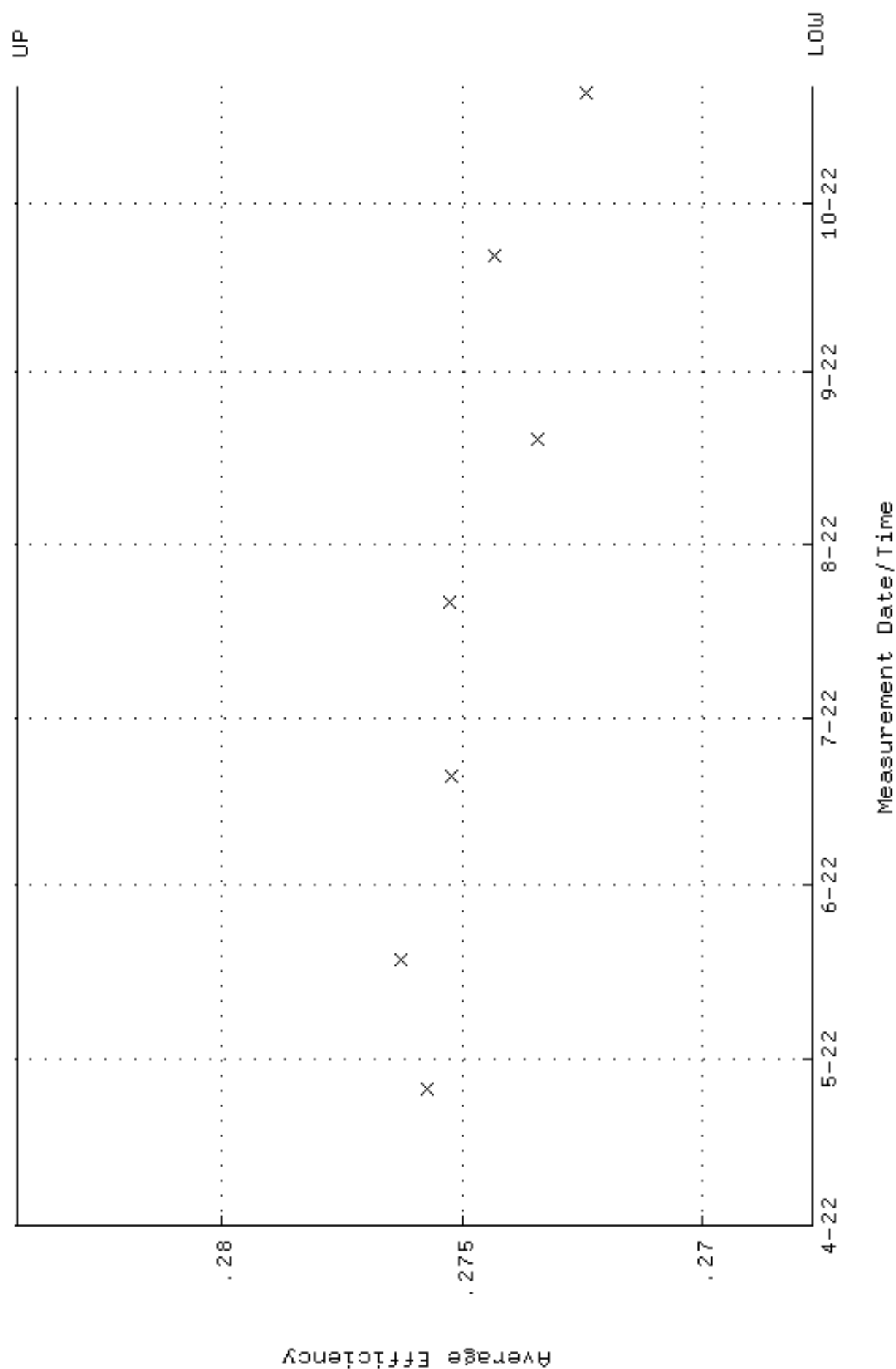
QA filename : DKA100:[ENV_ALPHA.QA.W]W213.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 10:44:57 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



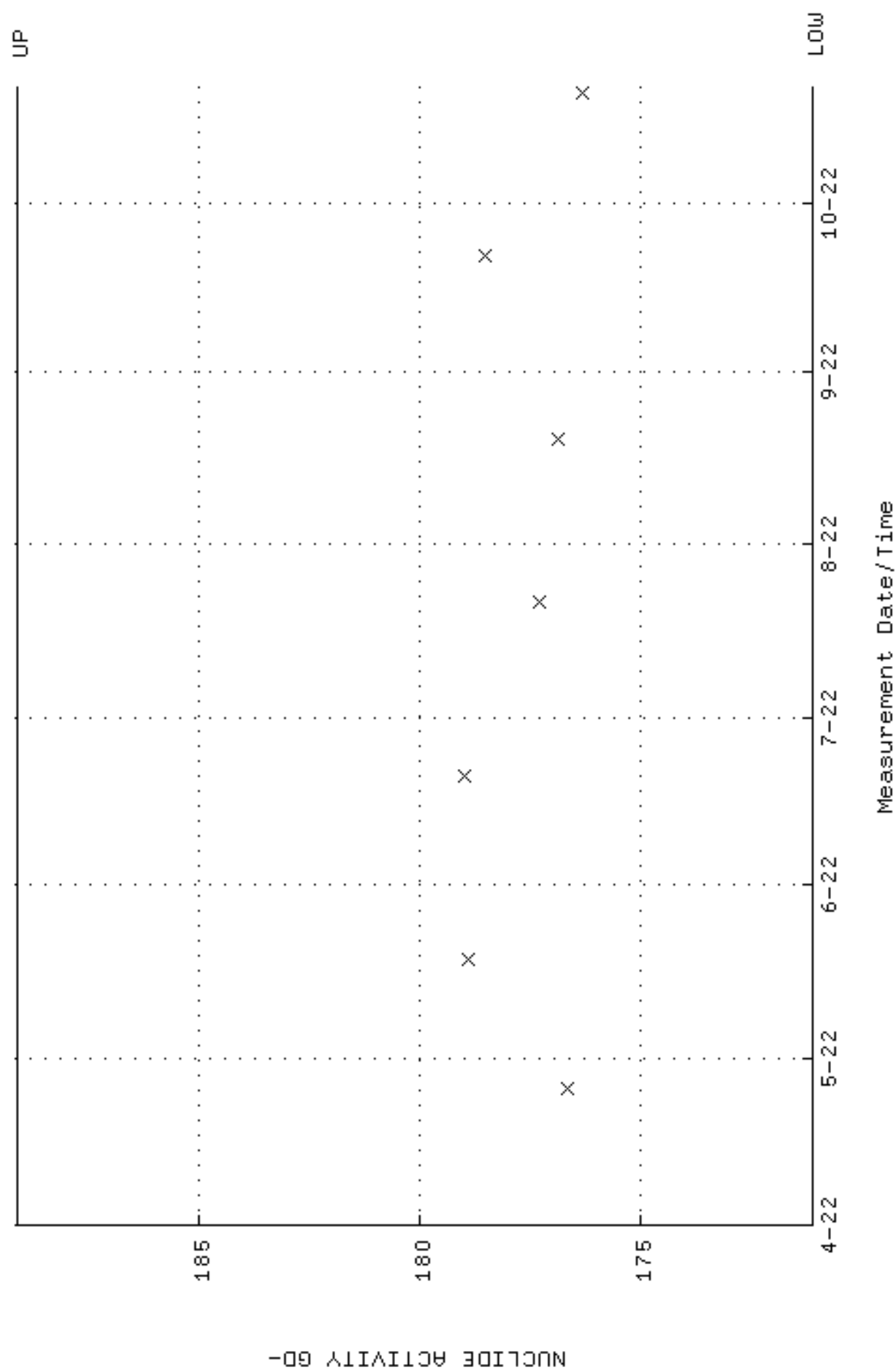
QA filename : DKA100:[ENV_ALPHA.QA.B]B213.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:11:53 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



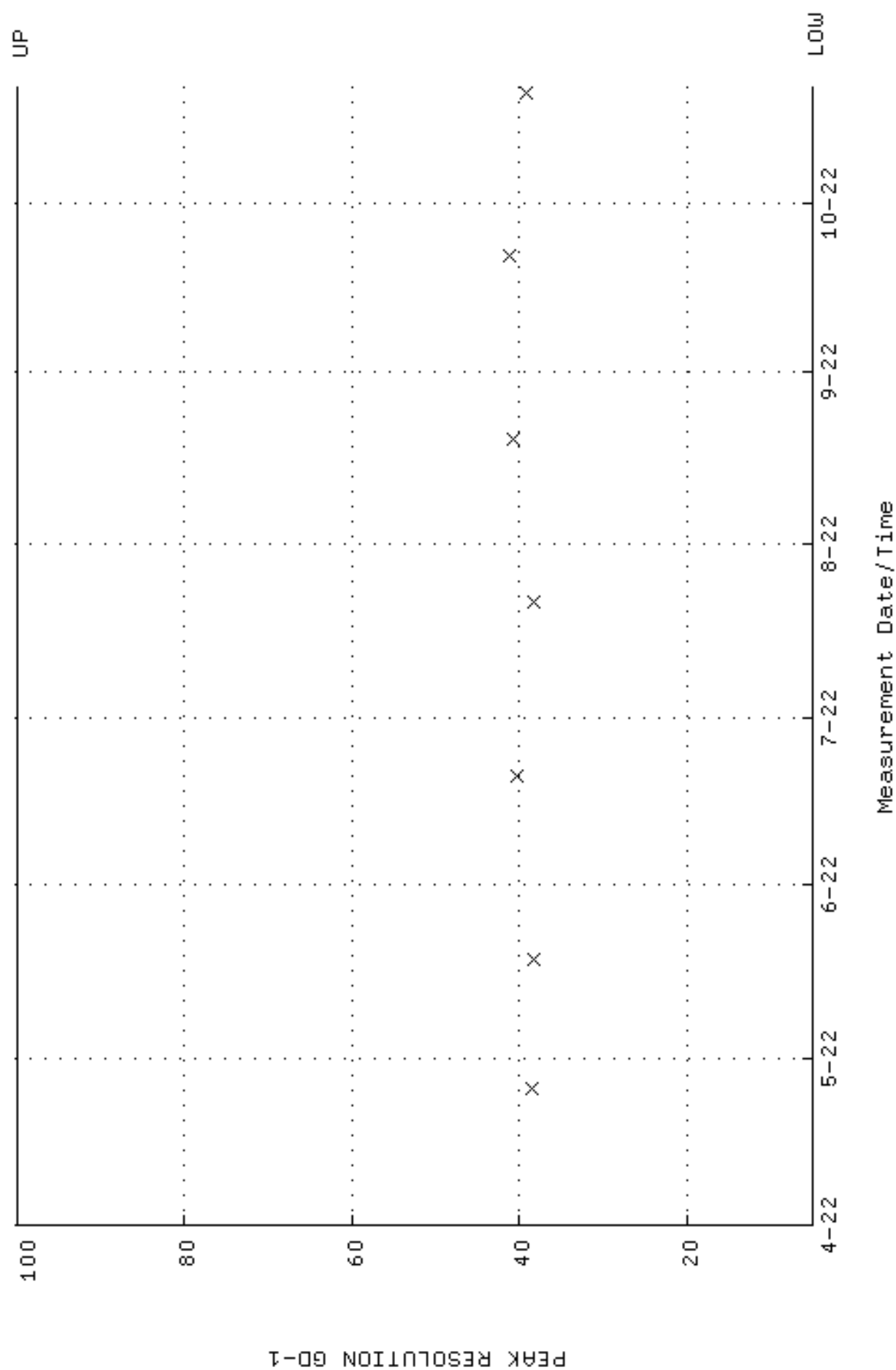
QA filename : DKA100:[ENV_ALPHA.QA.W]W215.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 25-APR-2022 10:45:05 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.267700 through 0.284260



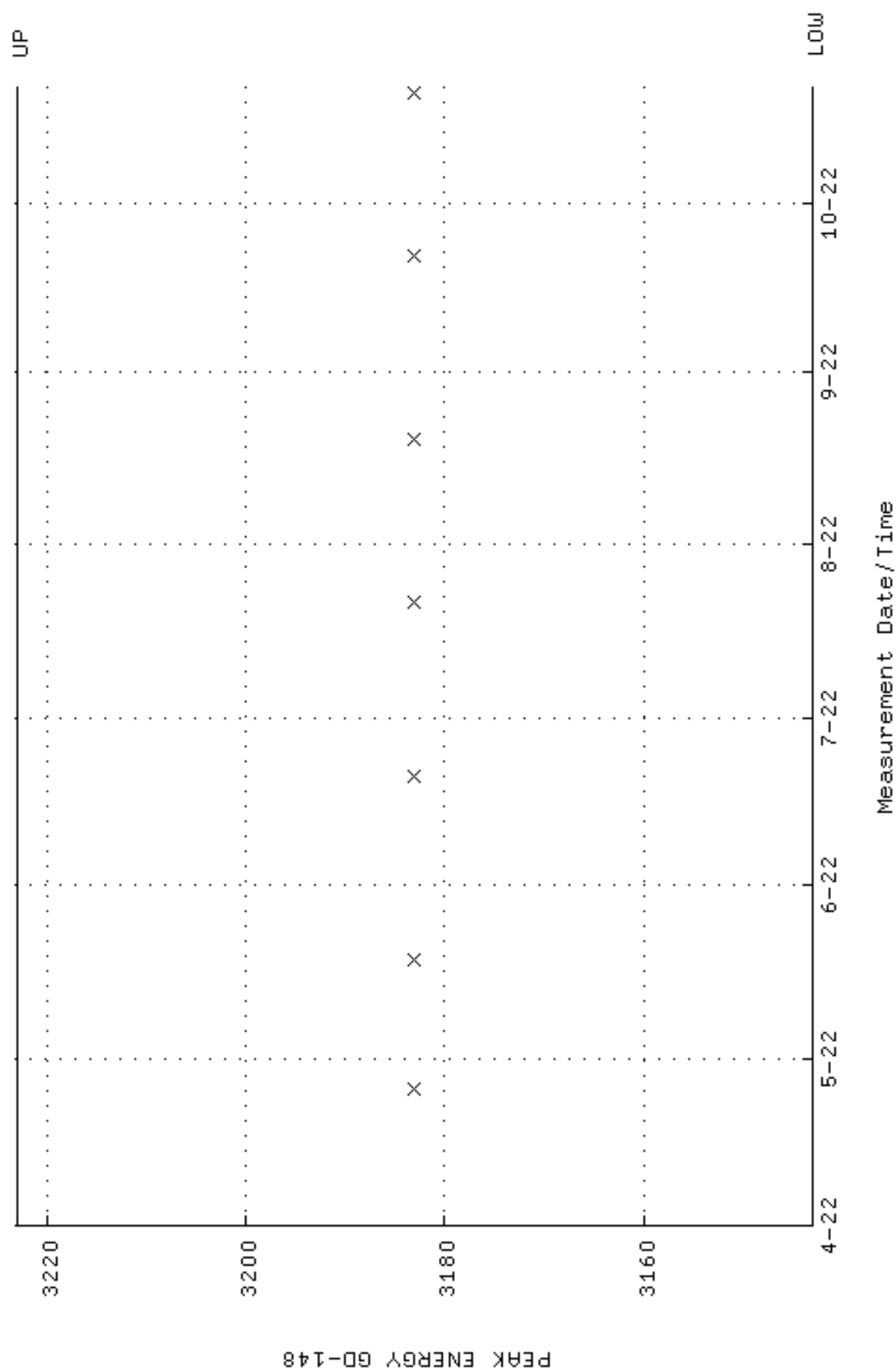
QA filename : DKA100:[ENV_ALPHA.QA.W]W215.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 10:45:05 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



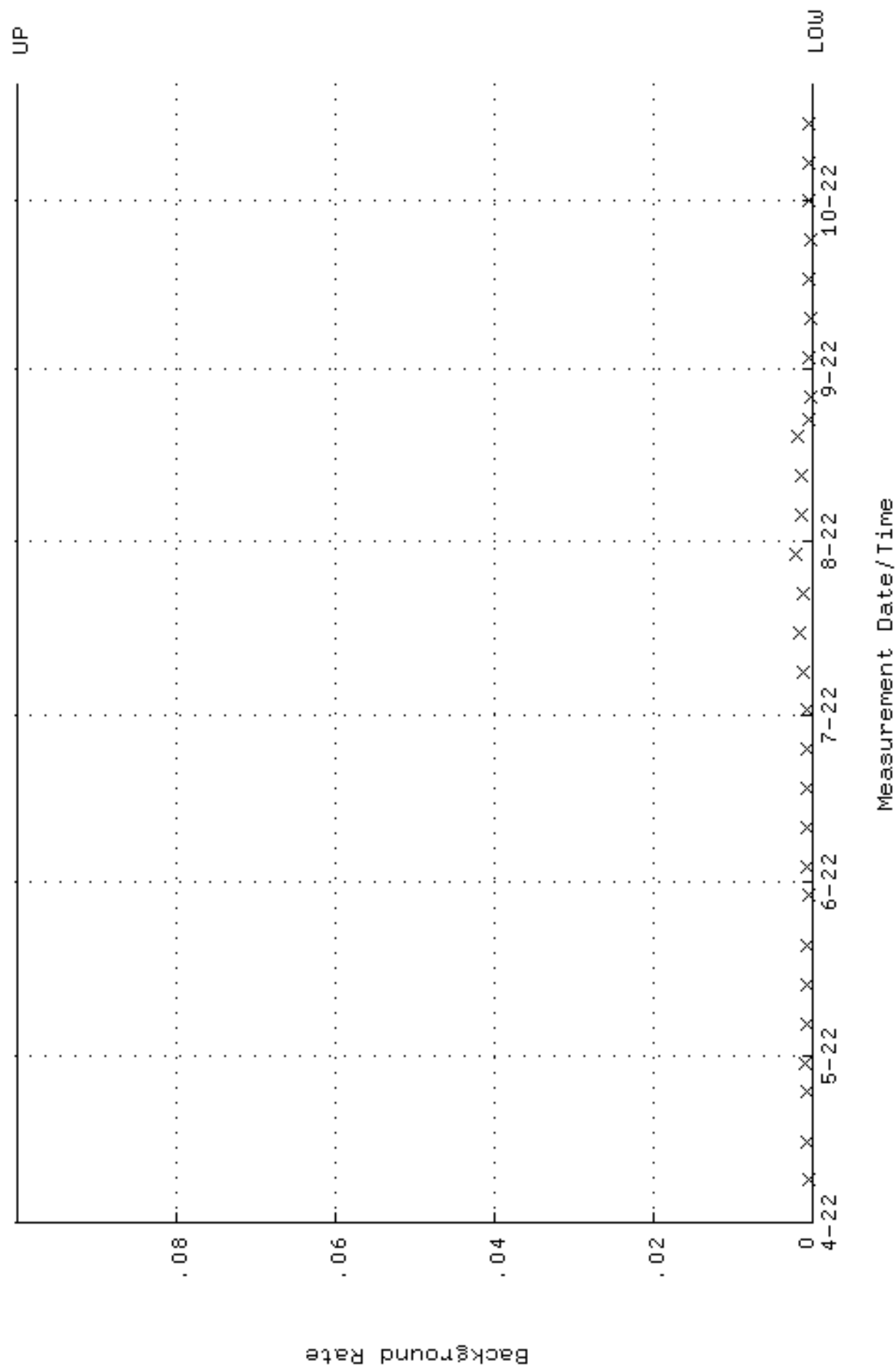
QA filename : DKA100:[ENV_ALPHA.QA.W]W215.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 10:45:05 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



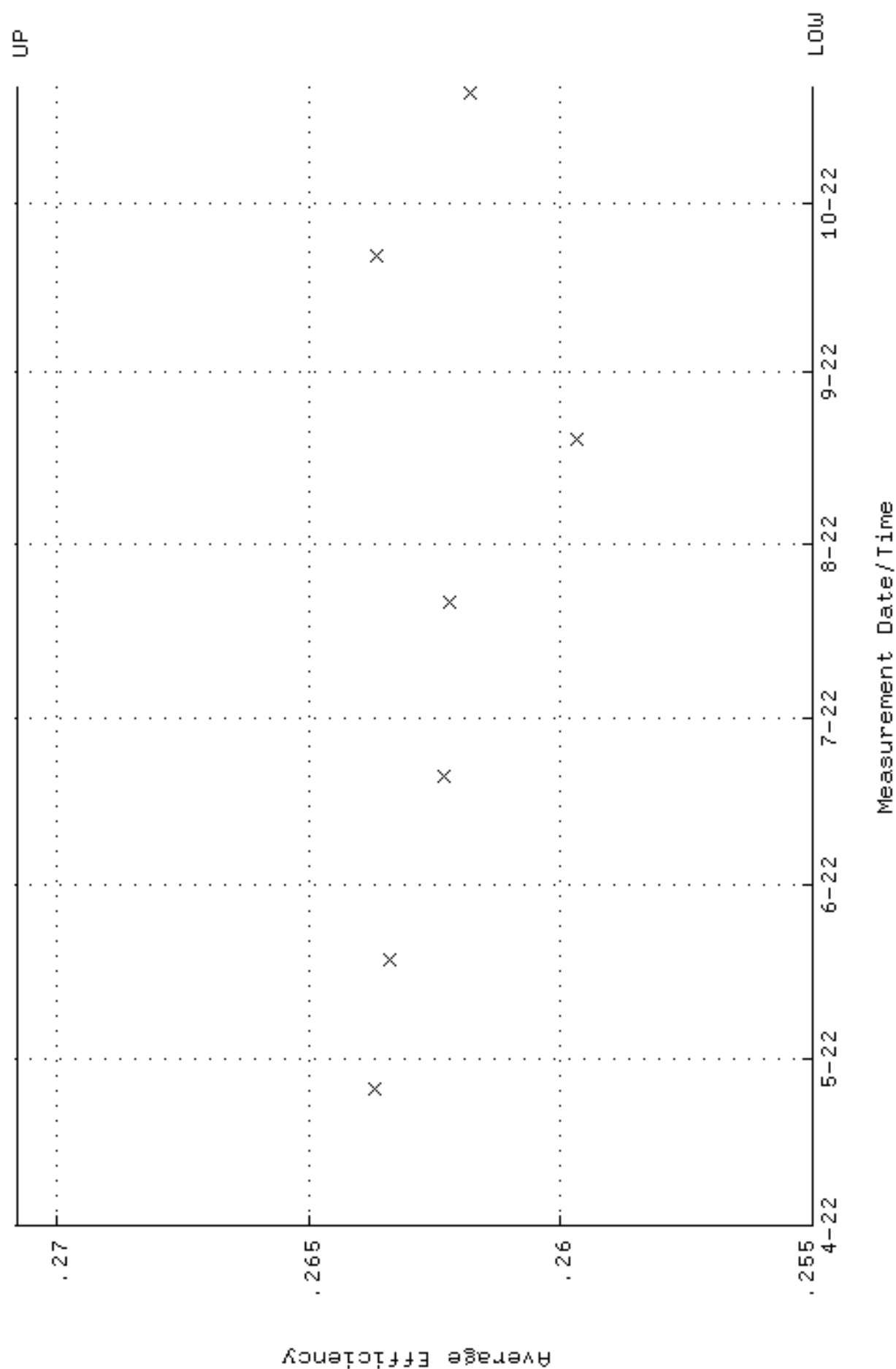
QA filename : DKA100:[ENV_ALPHA.QA.W]W215.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 10:45:05 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



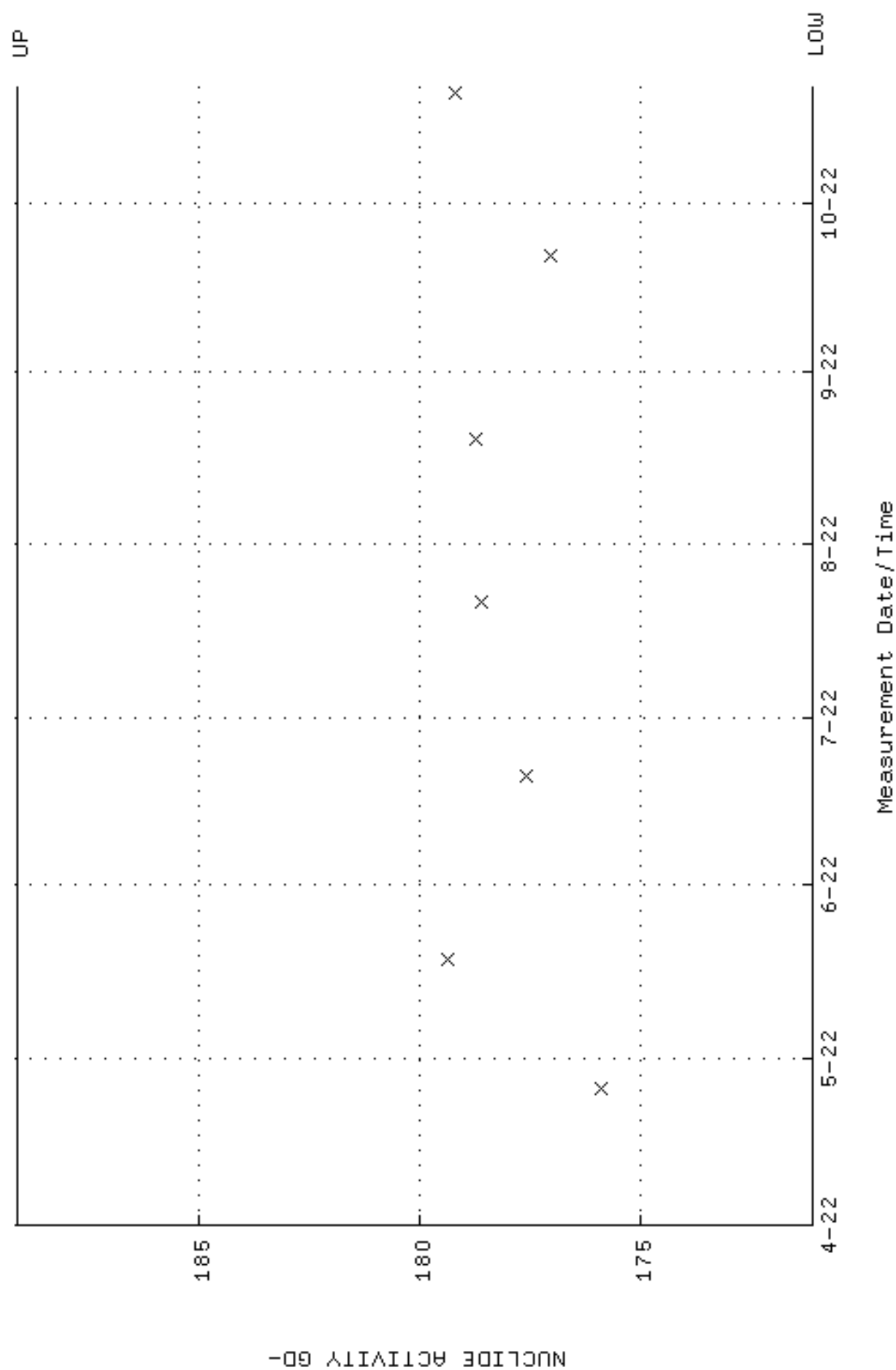
QA filename : DKA100:[ENV_ALPHA.QA.B]B215.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 8-APR-2022 12:46:30 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



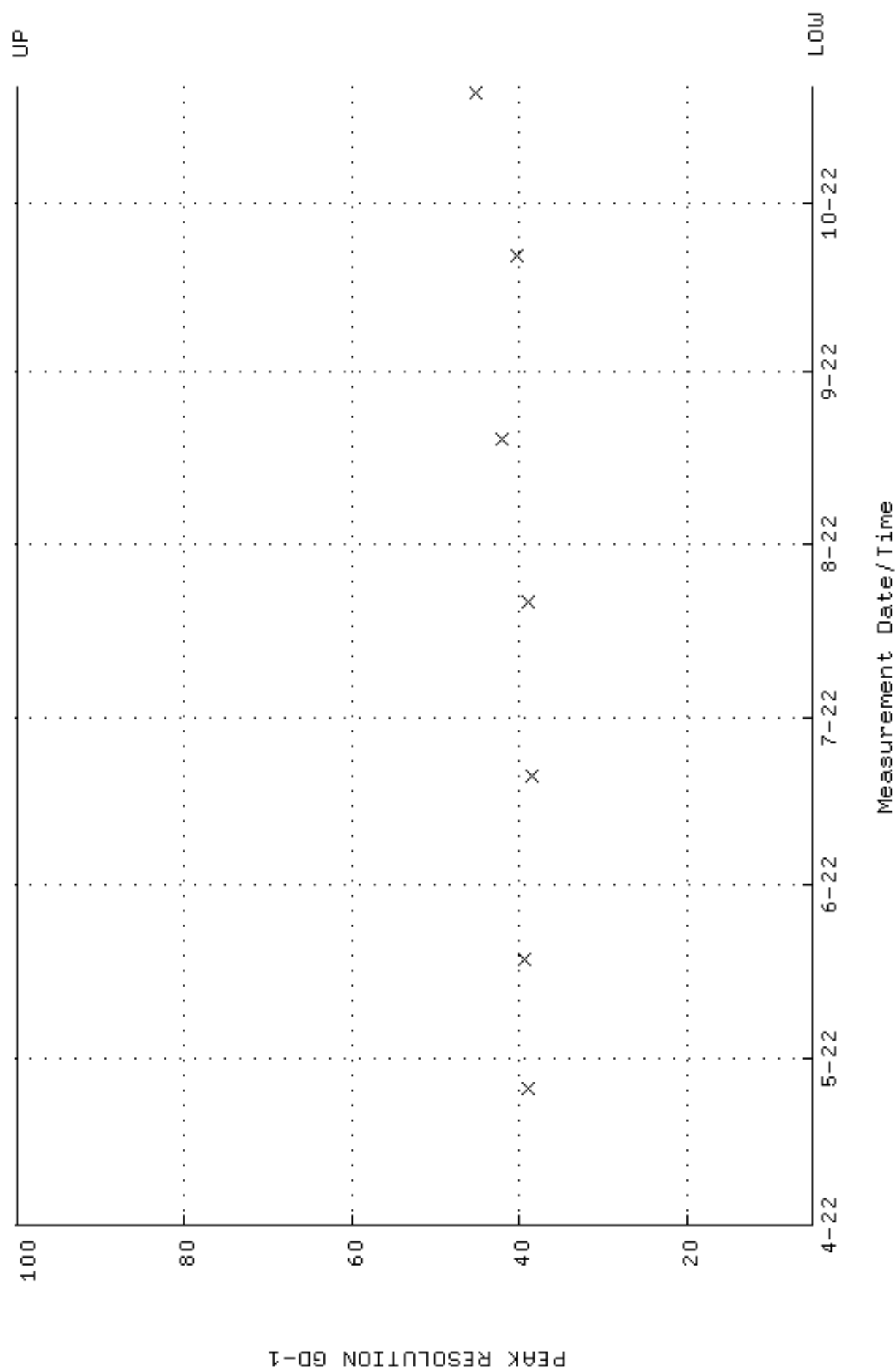
QA filename : DKA100:[ENV_ALPHA.QA.W]W217.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 25-APR-2022 11:23:42 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.255000 through 0.270770



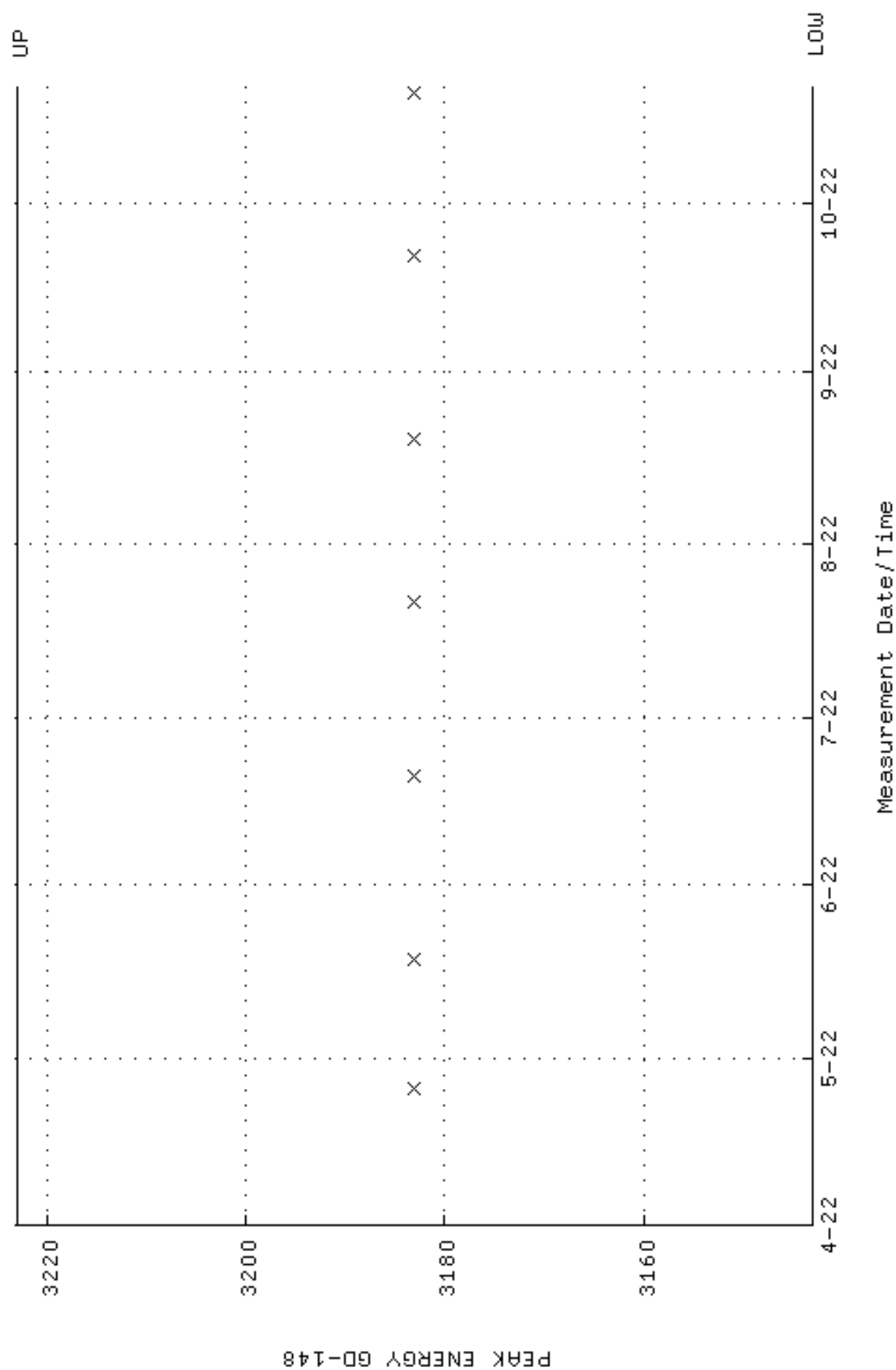
QA filename : DKA100:[ENV_ALPHA.QA.W]W217.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 11:23:42 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



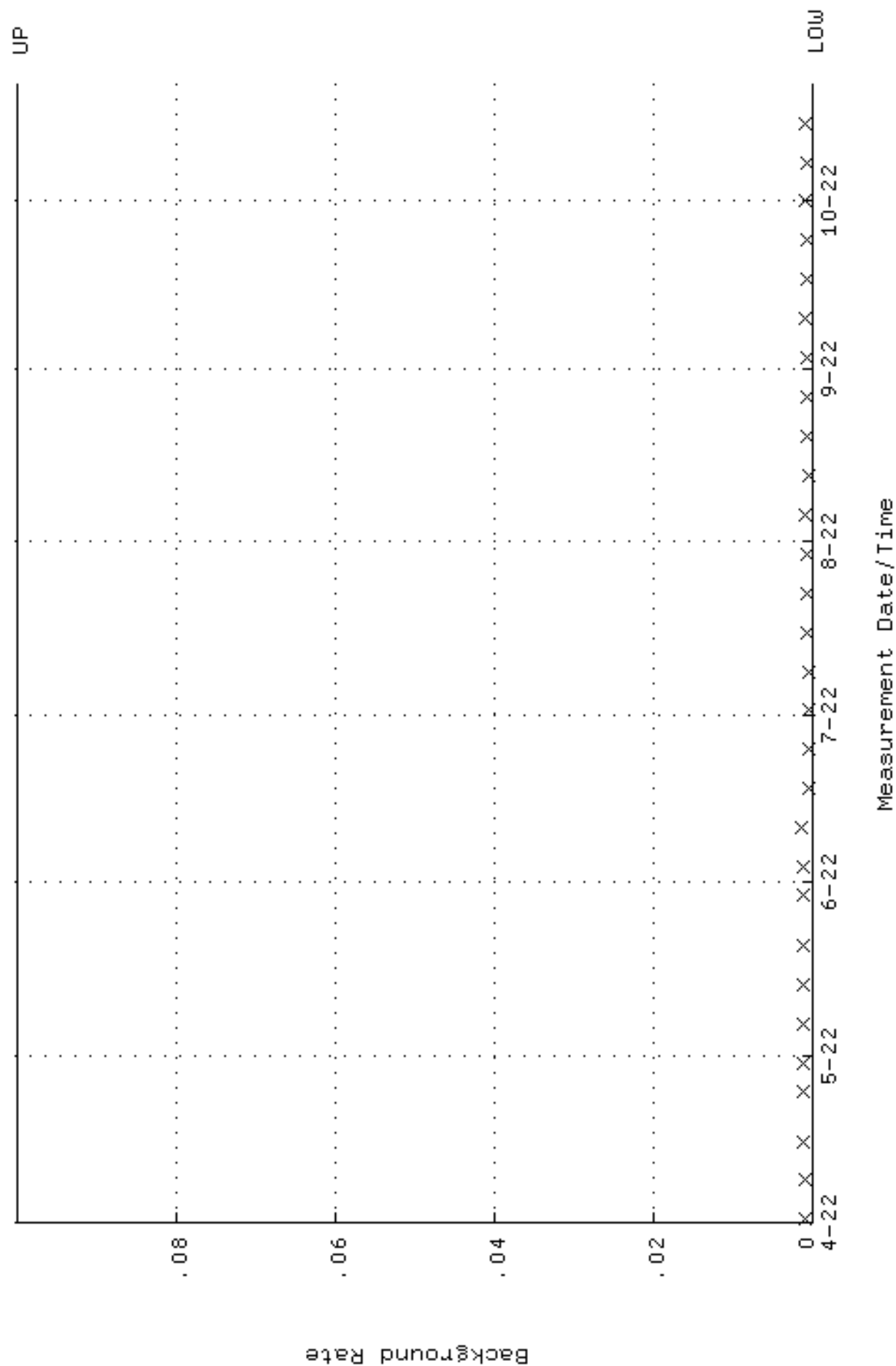
QA filename : DKA100:[ENV_ALPHA.QA.W]W217.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 11:23:42 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



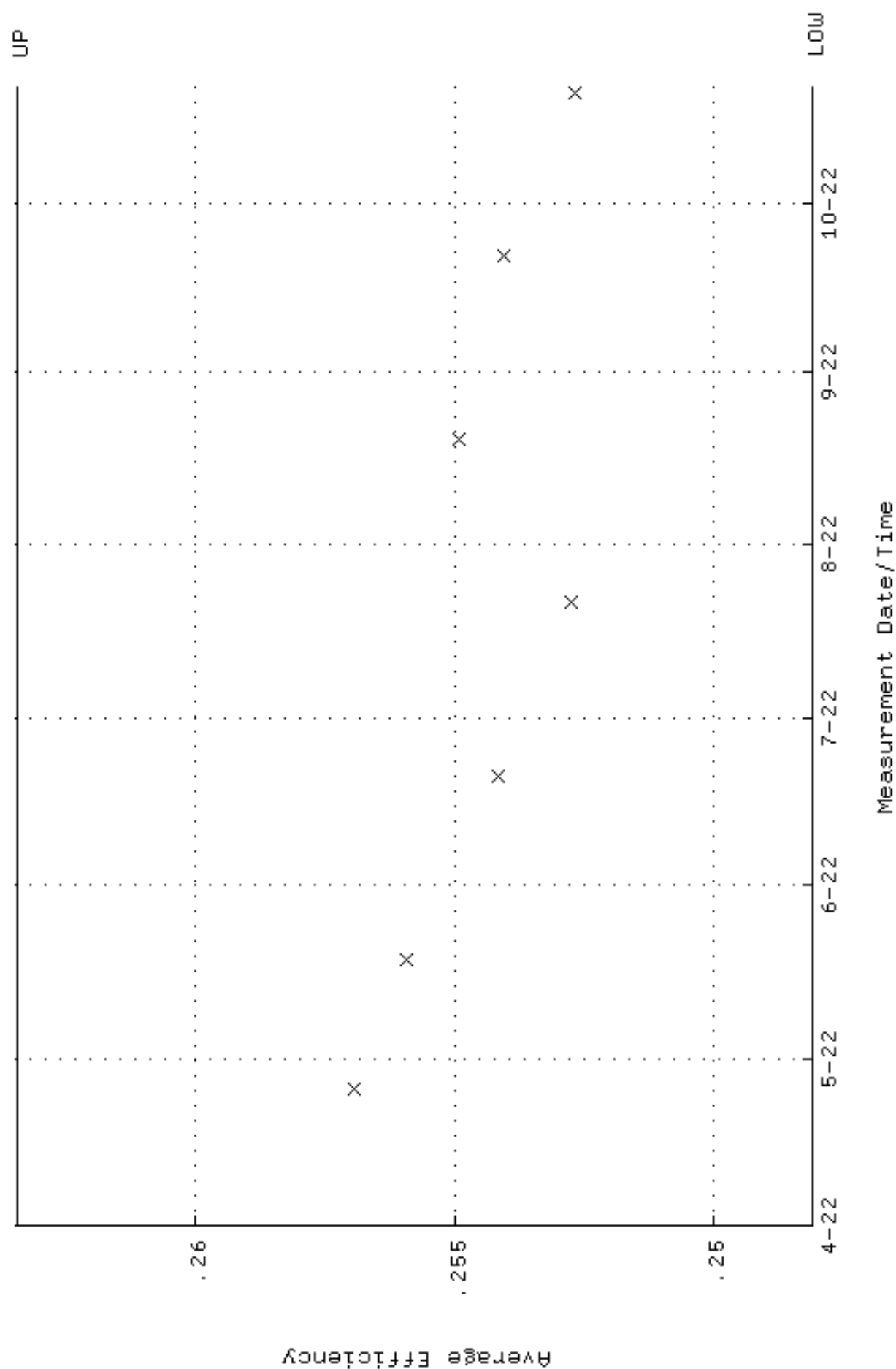
QA filename : DKA100:[ENV_ALPHA.QA.W]W217.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 11:23:42 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



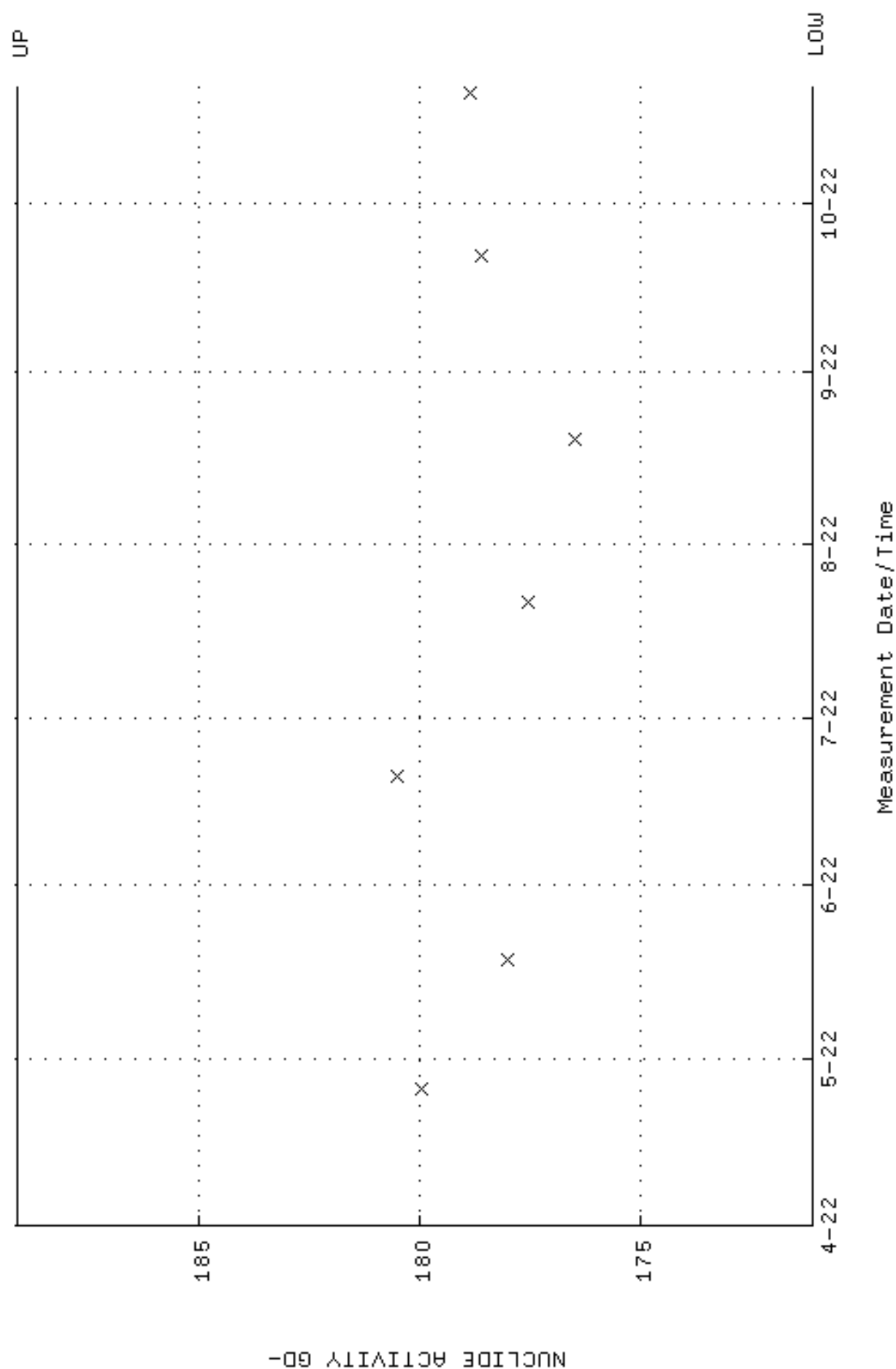
QA filename : DKA100:[ENV_ALPHA.QA.B]B217.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:12:01 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



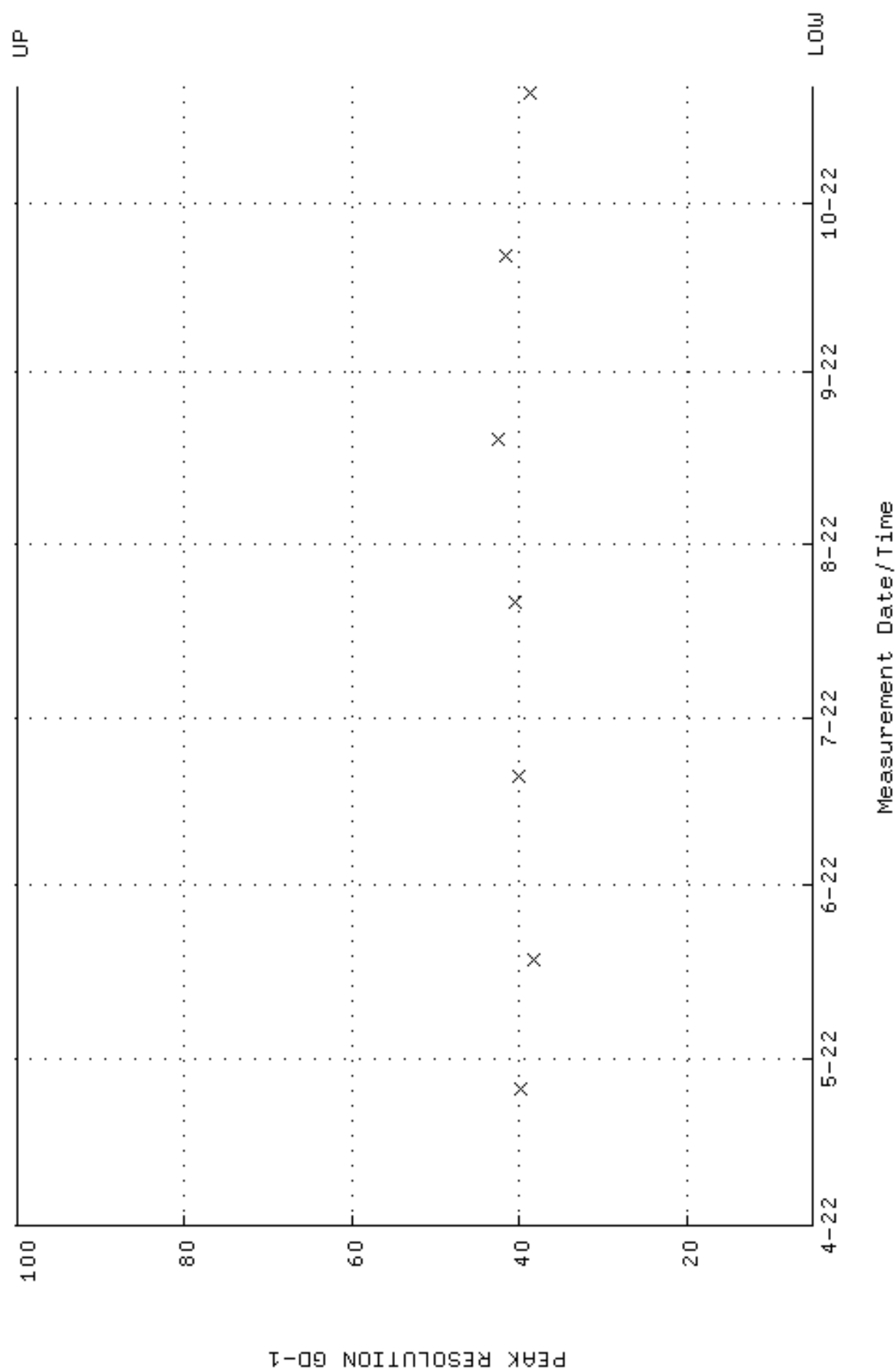
QA filename : DKA100:[ENV_ALPHA.QA.W]W218.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 25-APR-2022 10:45:16 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.248090 through 0.263440



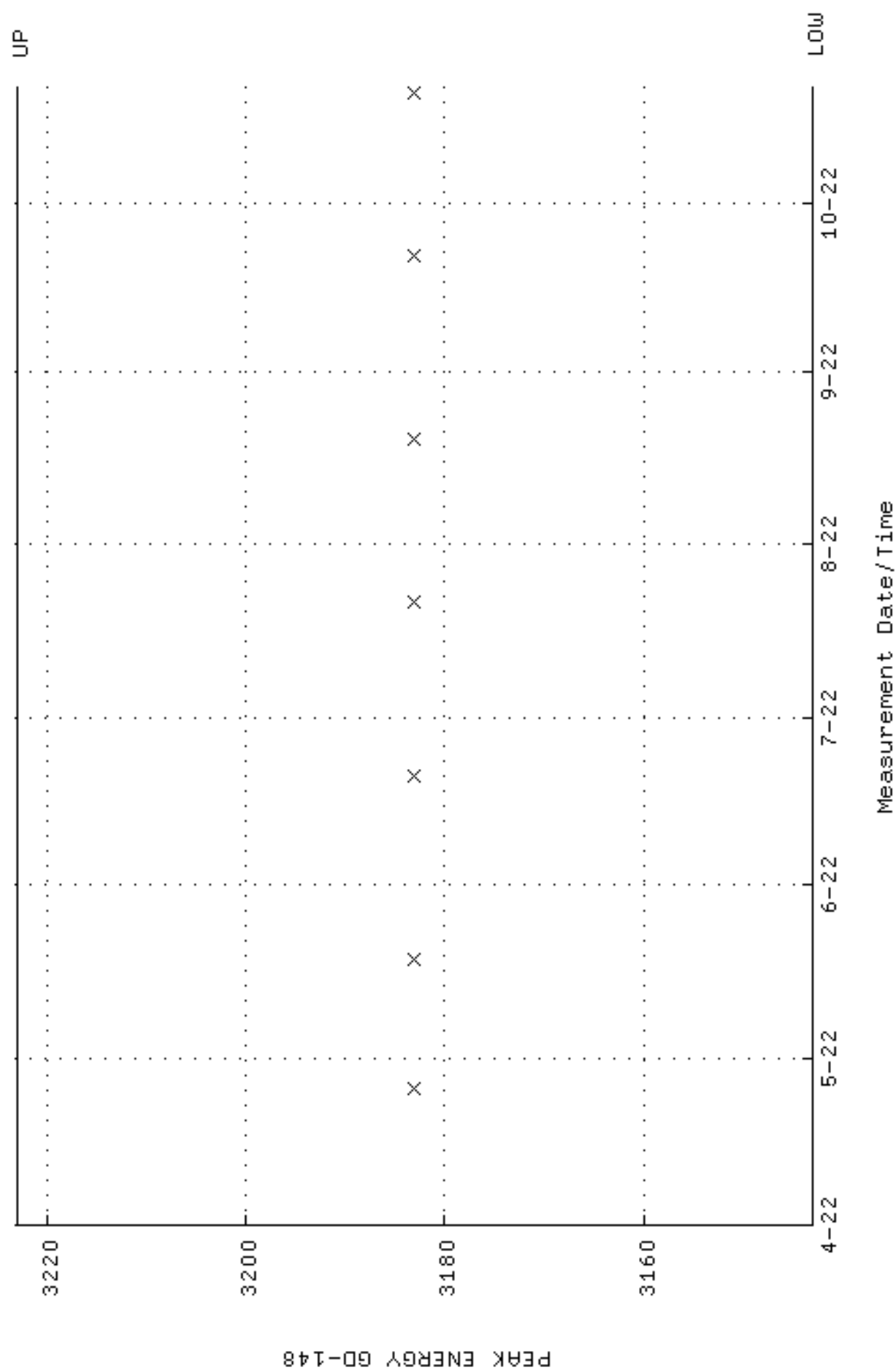
QA filename : DKA100:[ENV_ALPHA.QA.W]W218.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 10:45:16 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



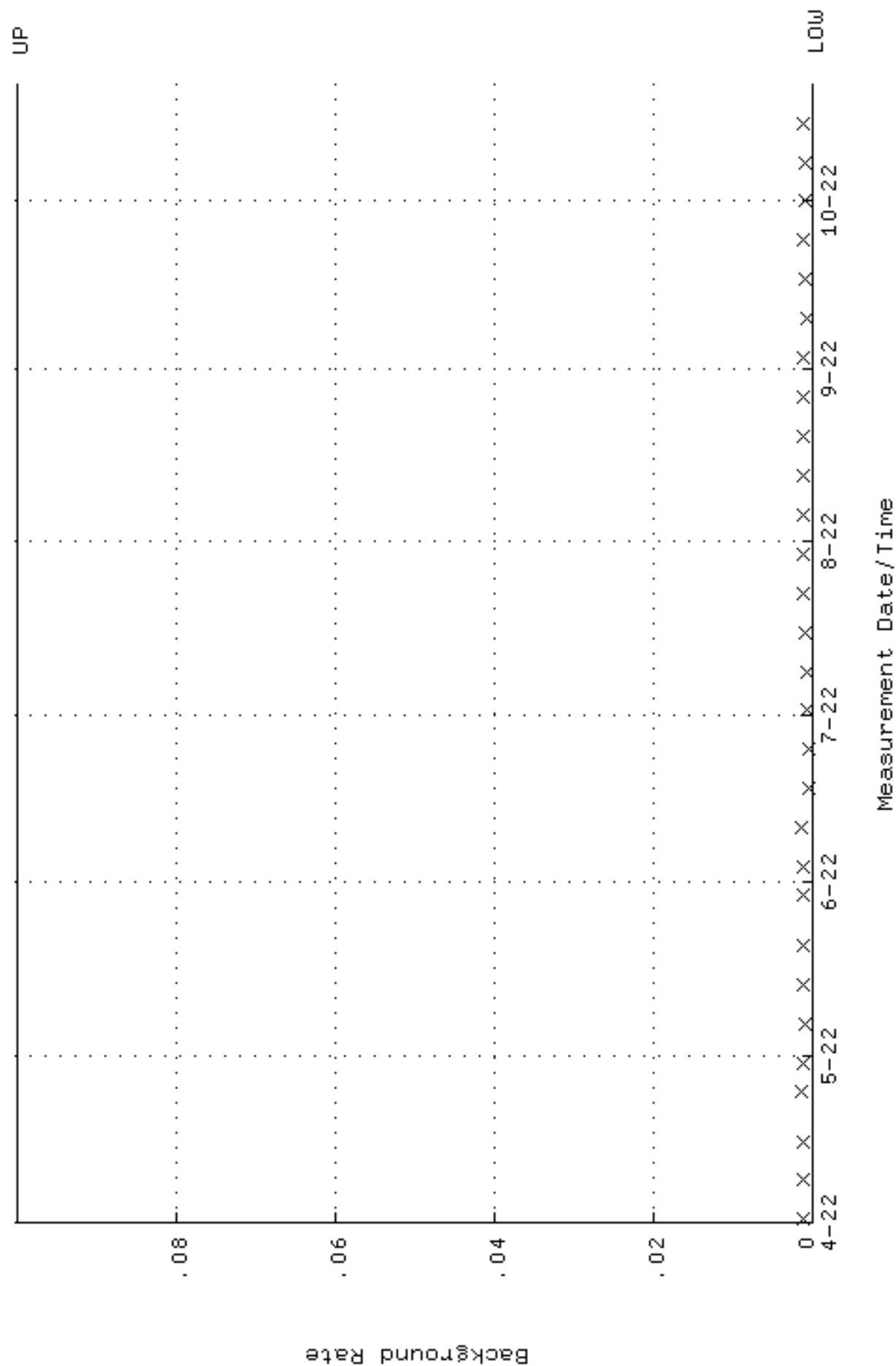
QA filename : DKA100:[ENV_ALPHA.QA.W]W218.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 10:45:16 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



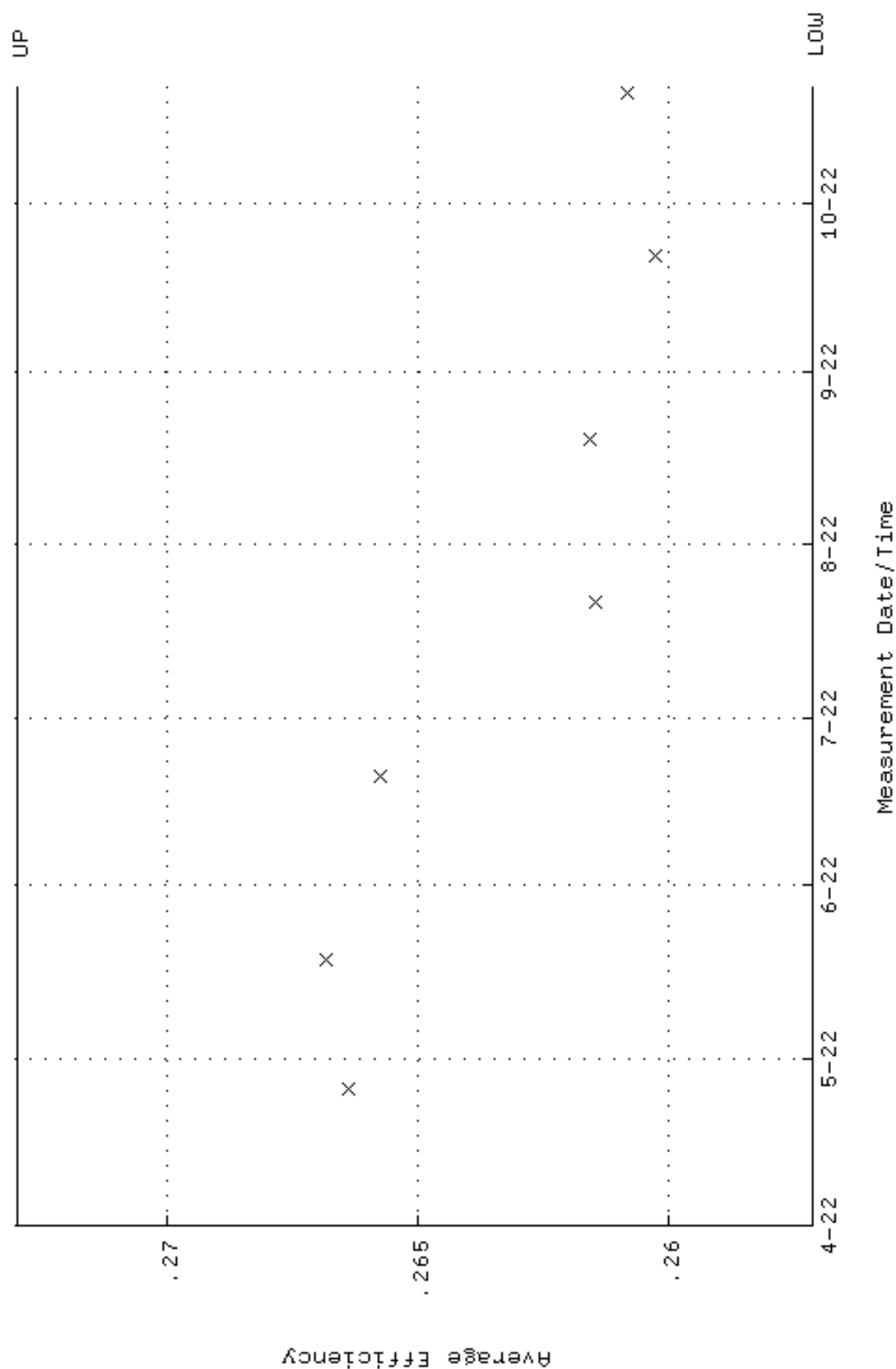
QA filename : DKA100:[ENV_ALPHA.QA.W]W218.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 10:45:16 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



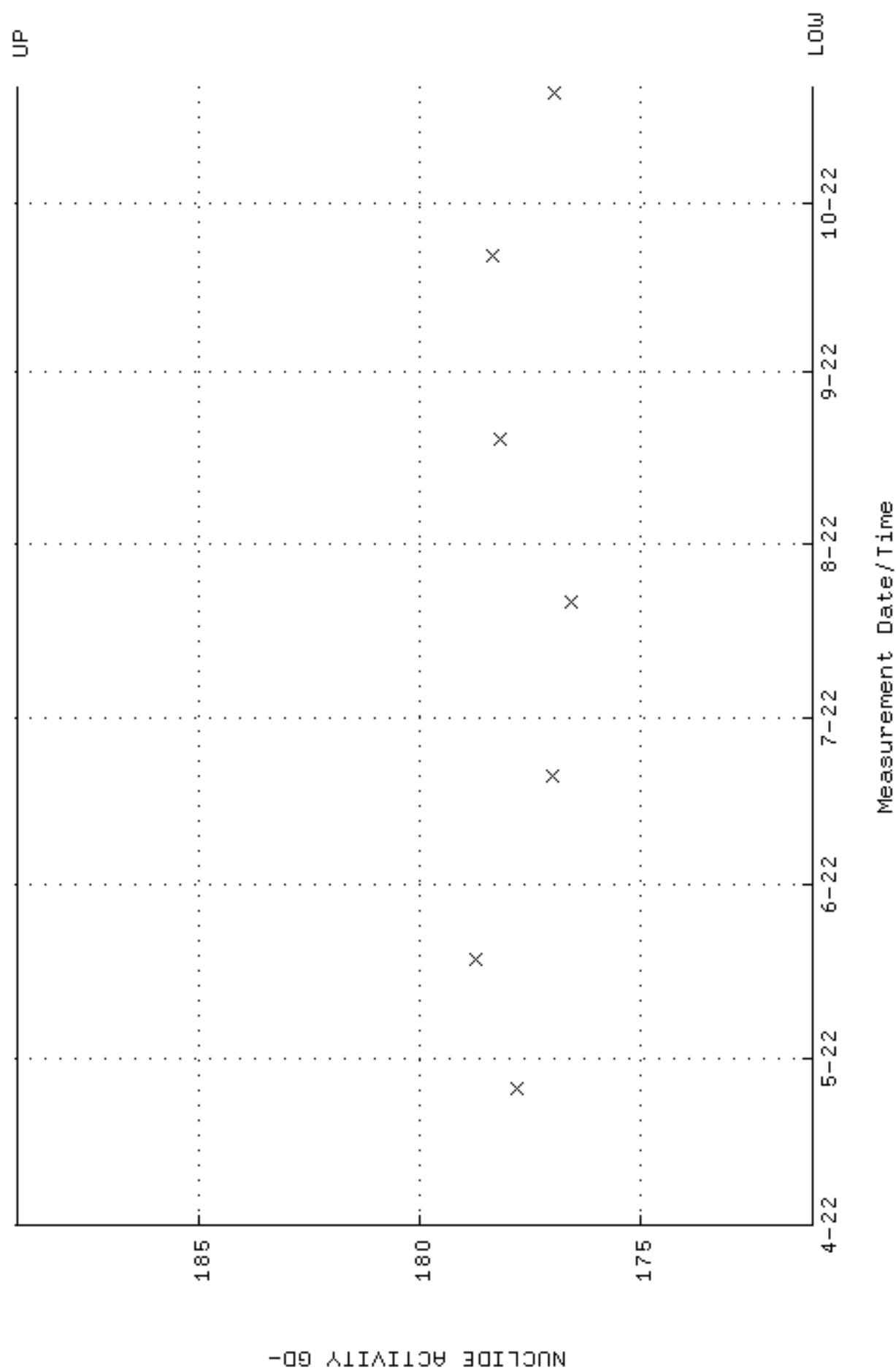
QA filename : DKA100:[ENV_ALPHA.QA.B]B218.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:12:04 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



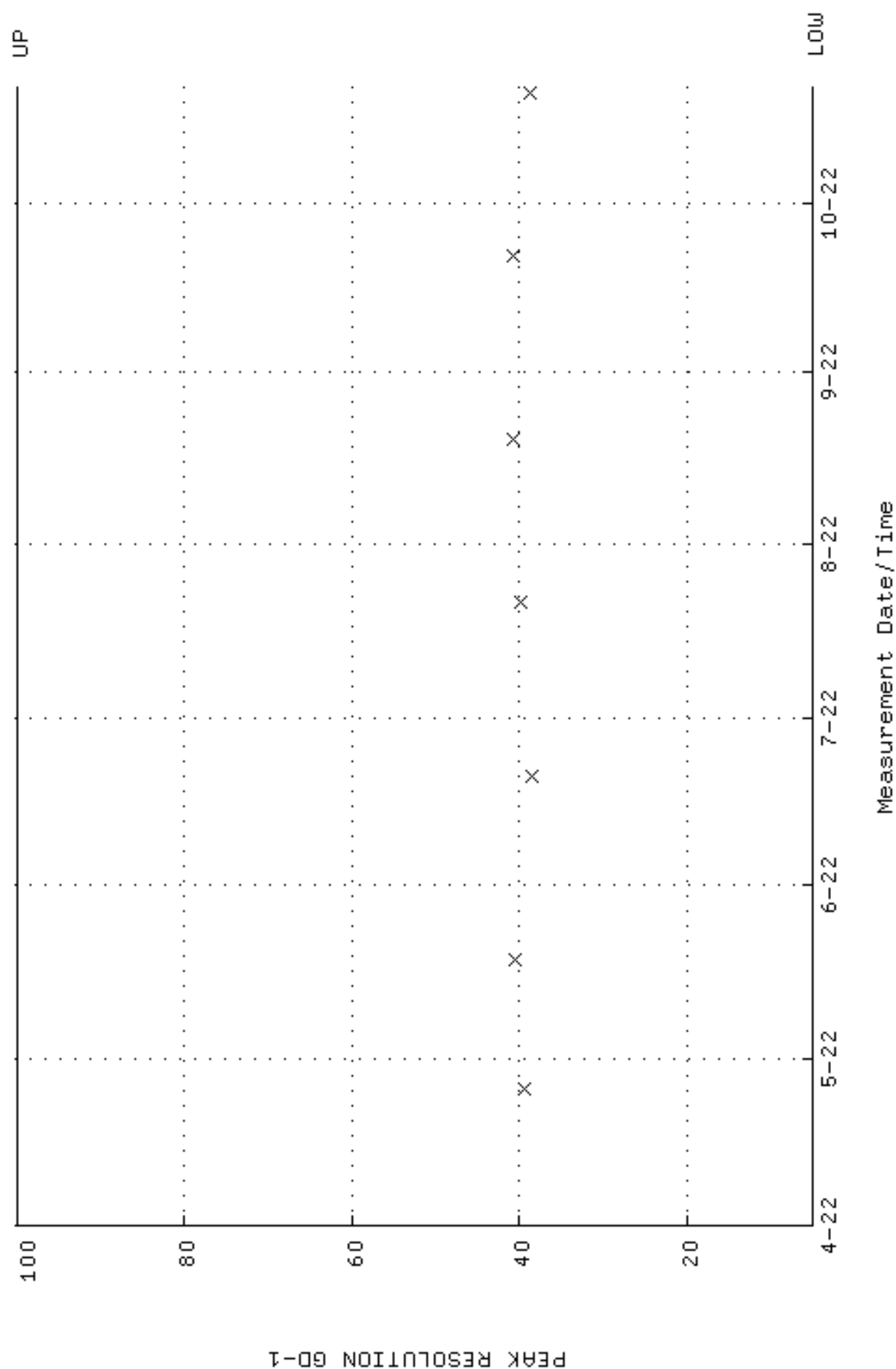
QA filename : DKA100:[ENV_ALPHA.QA.W]W219.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 25-APR-2022 13:47:18 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.257100 through 0.273010



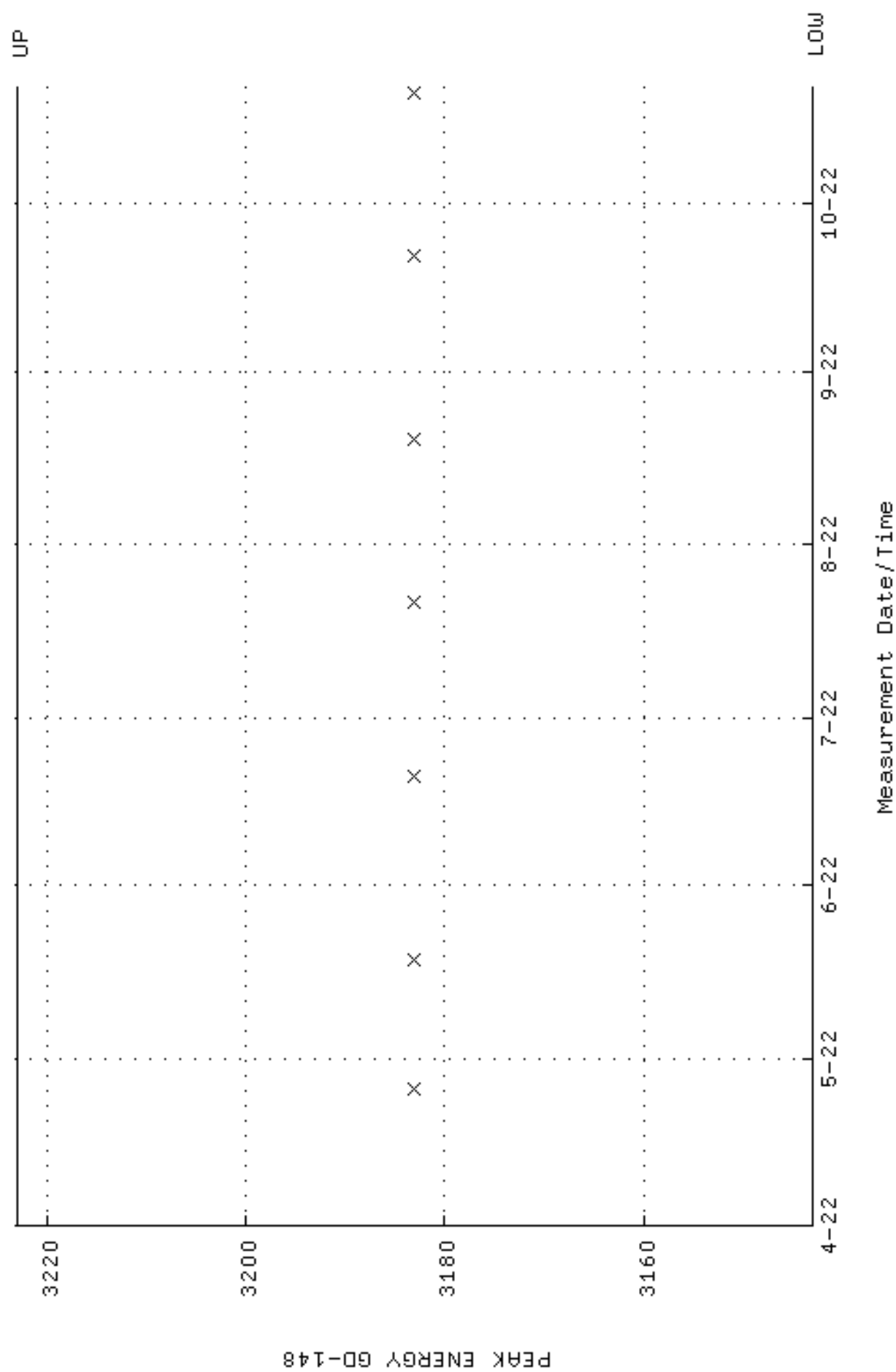
QA filename : DKA100:[ENV_ALPHA.QA.W]W219.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 13:47:18 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



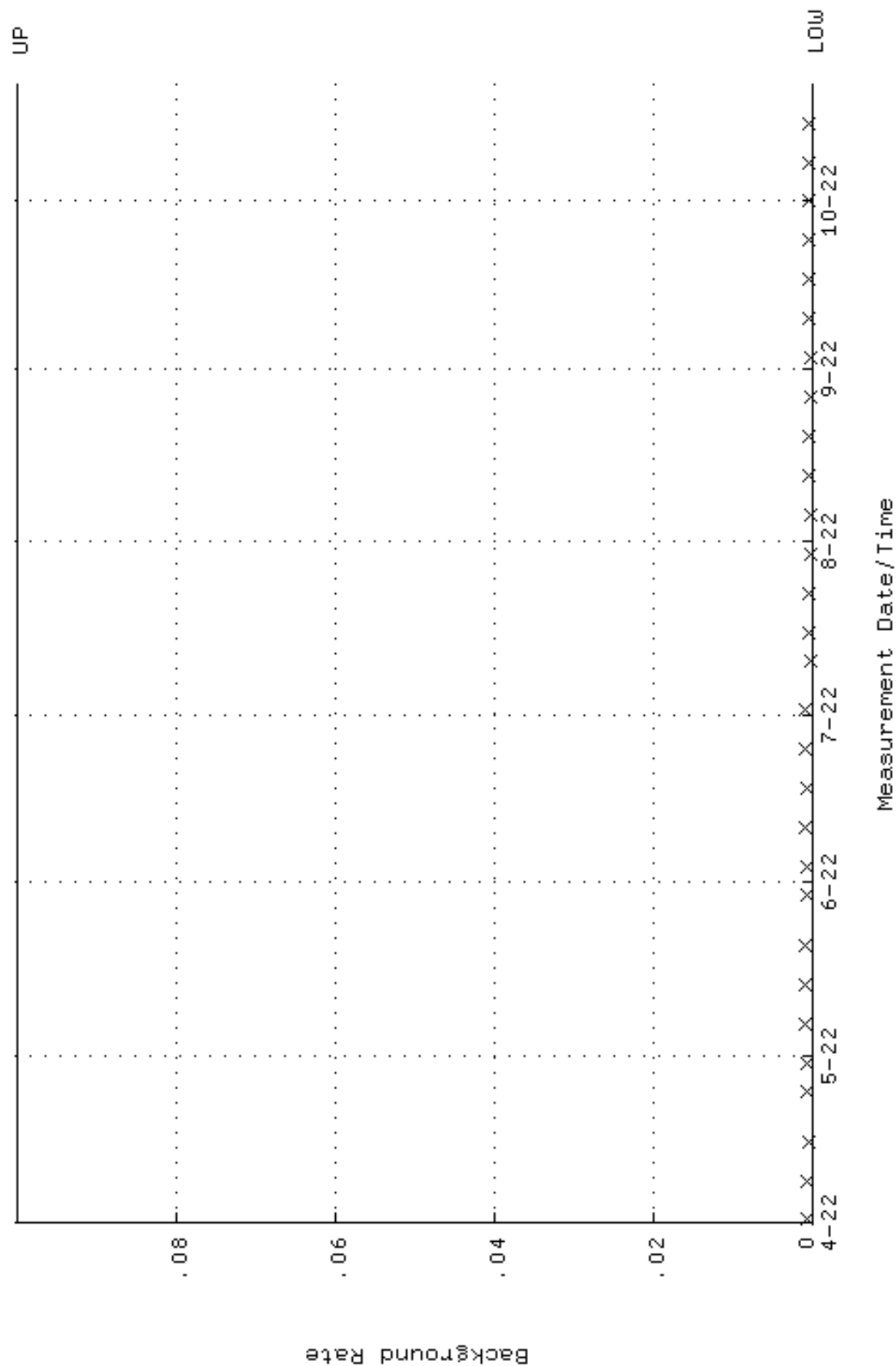
QA filename : DKA100:[ENV_ALPHA.QA.W]W219.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 13:47:18 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



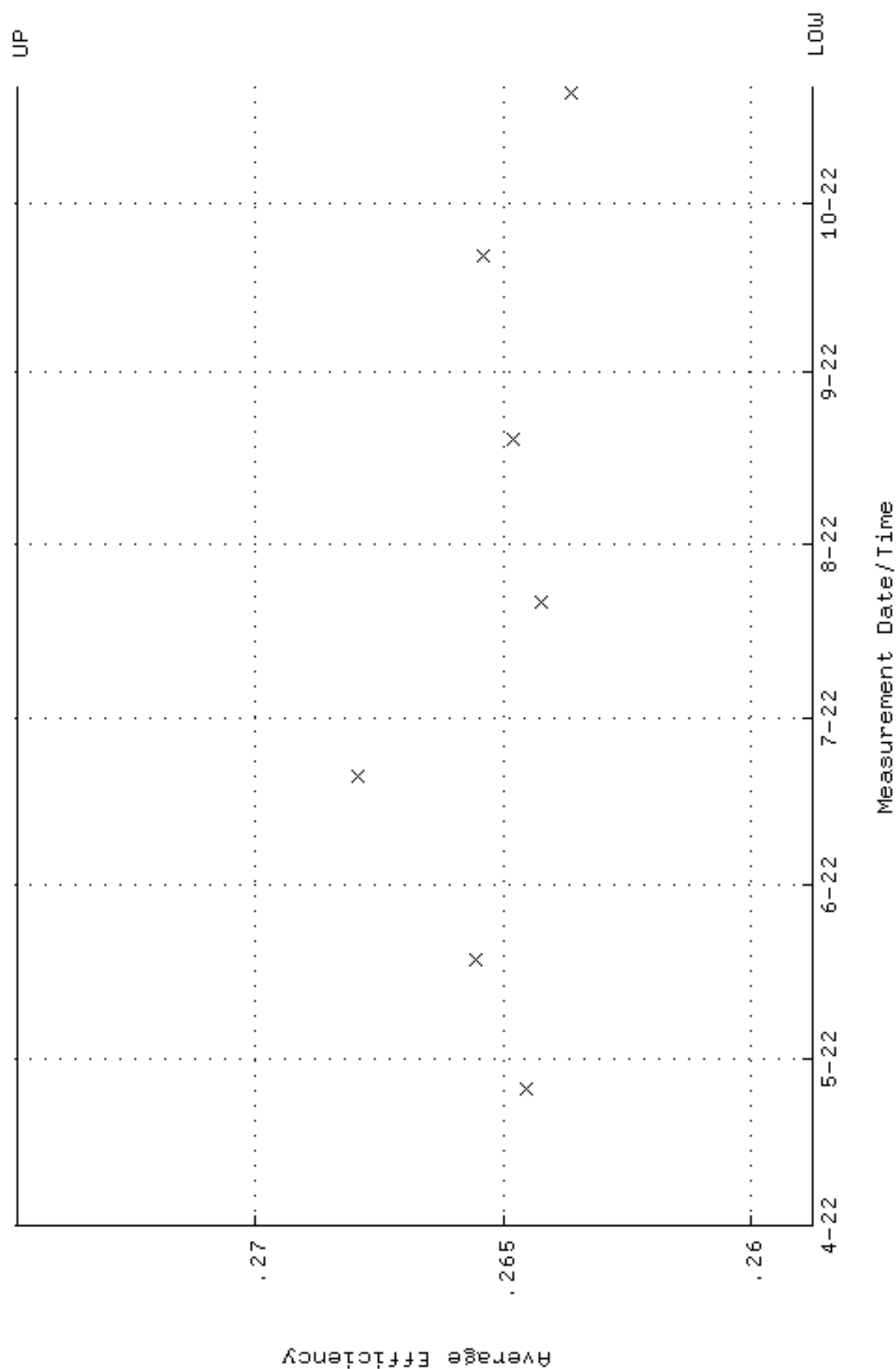
QA filename : DKA100:[ENV_ALPHA.QA.W]W219.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 13:47:18 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



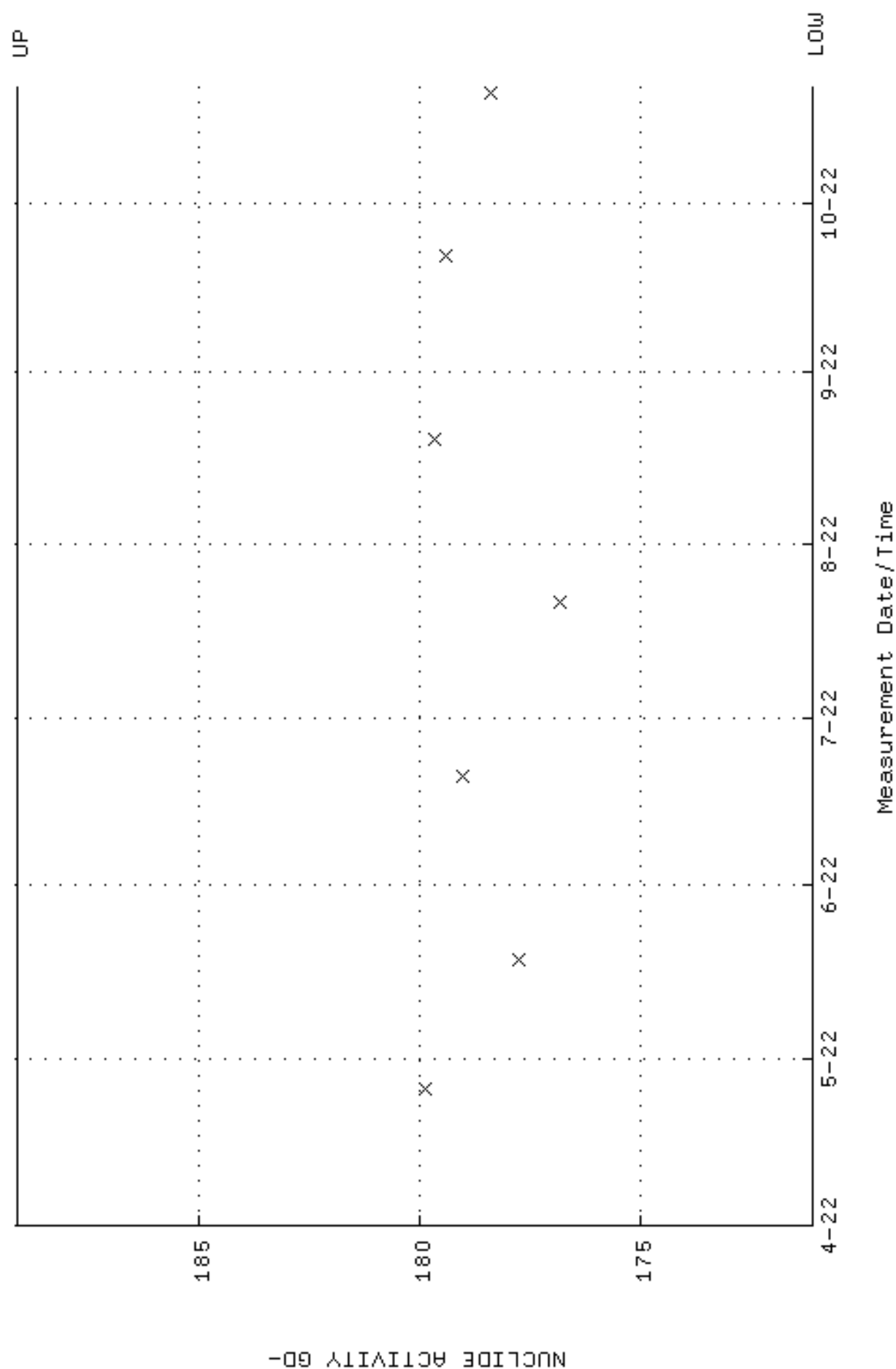
QA filename : DKA100:[ENV_ALPHA.QA.B]B219.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:12:08 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



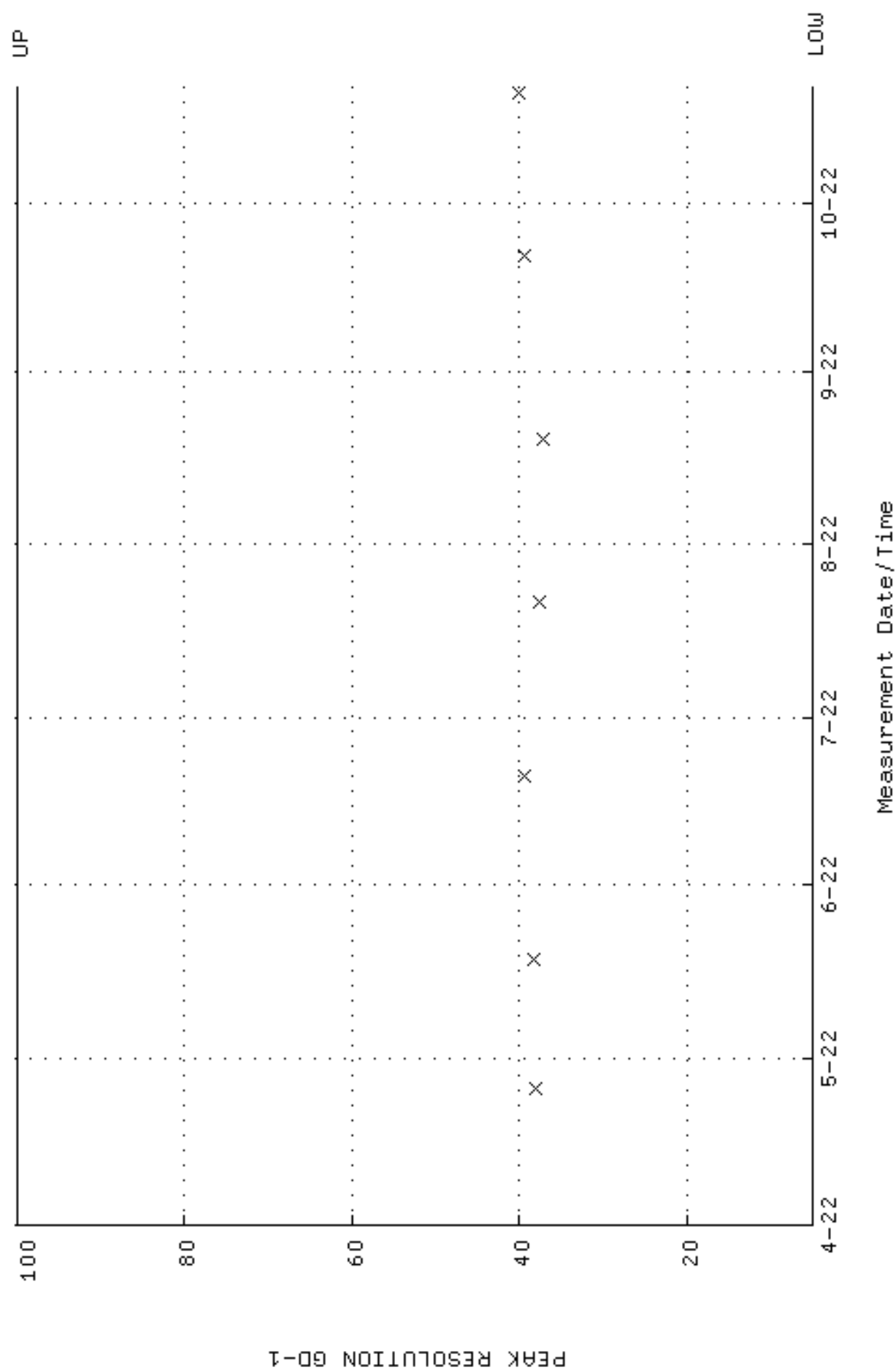
QA filename : DKA100:[ENV_ALPHA.QA.W]W220.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 25-APR-2022 10:45:24 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.258770 through 0.274780



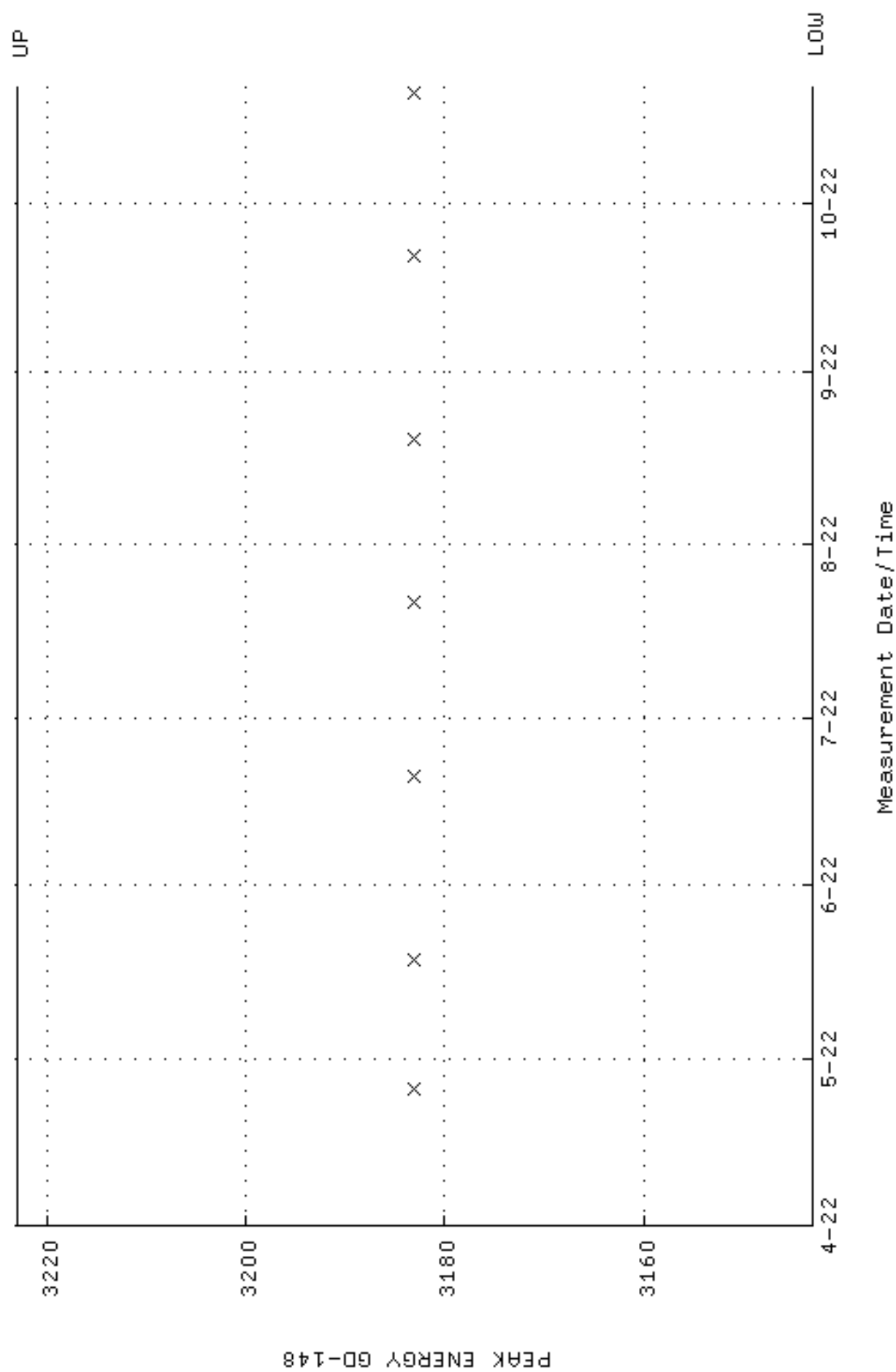
QA filename : DKA100:[ENV_ALPHA.QA.W]W220.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 10:45:24 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



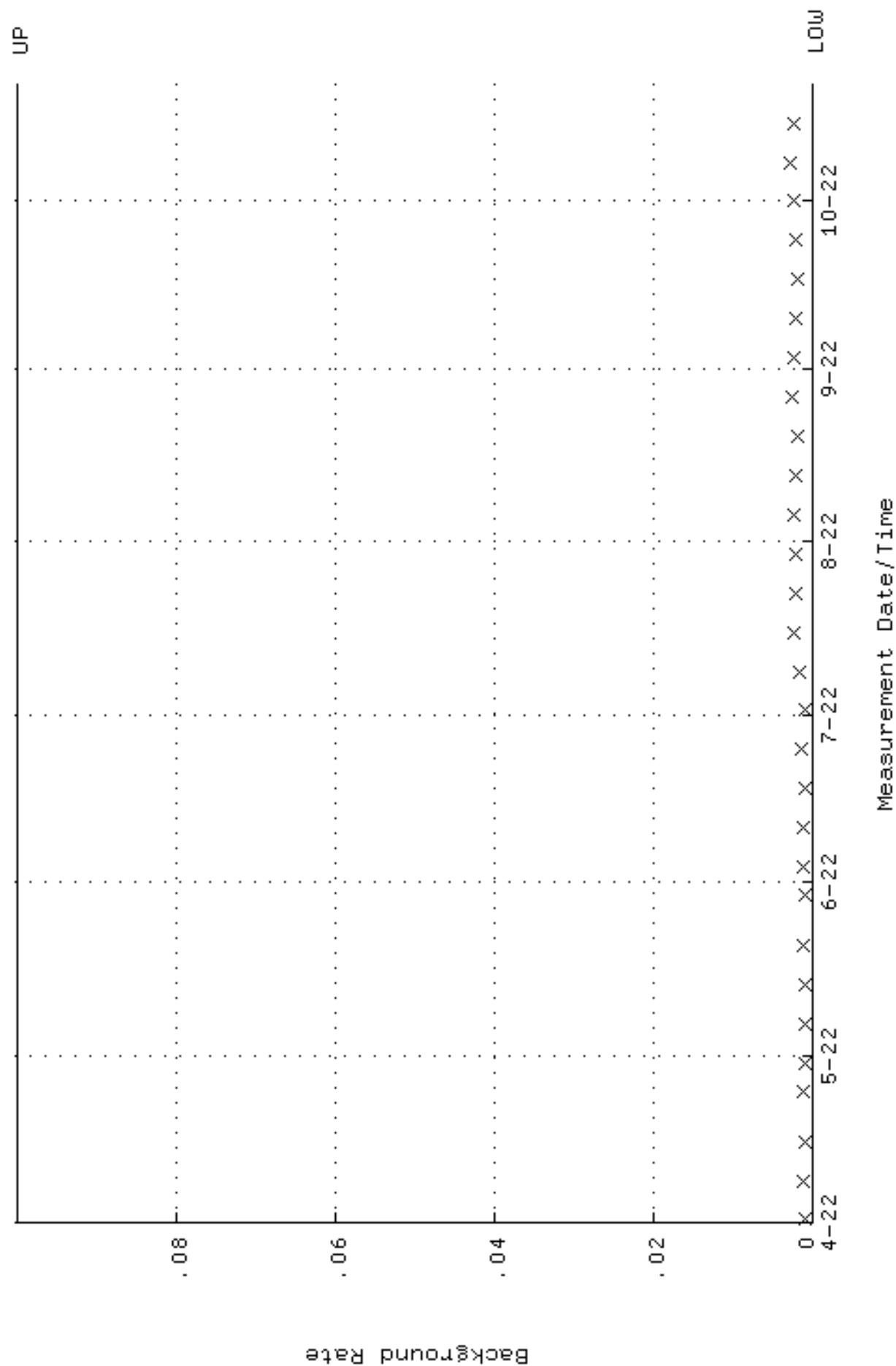
QA filename : DKA100:[ENV_ALPHA.QA.W]W220.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 10:45:24 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



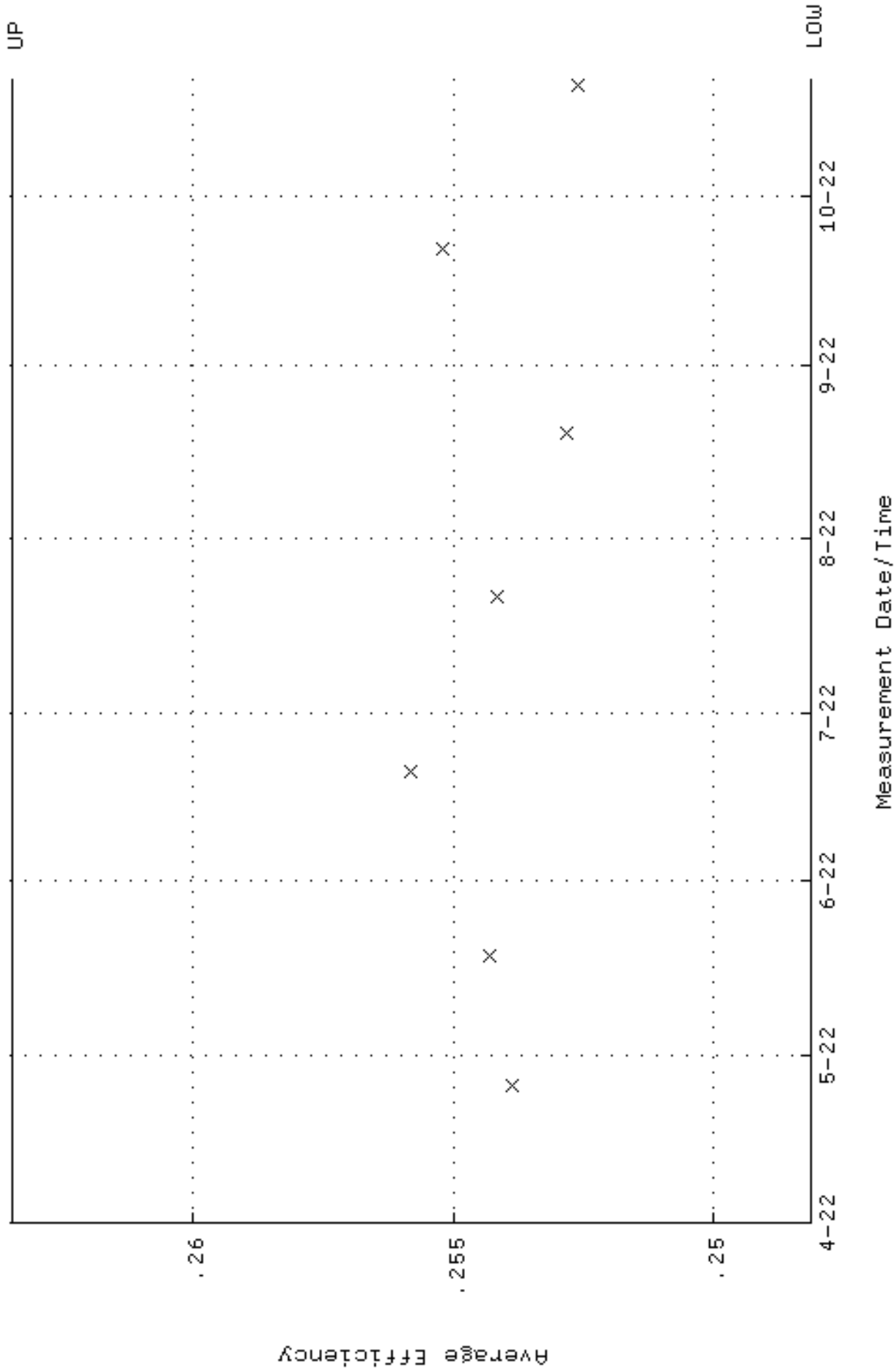
QA filename : DKA100:[ENV_ALPHA.QA.W]W220.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 10:45:24 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



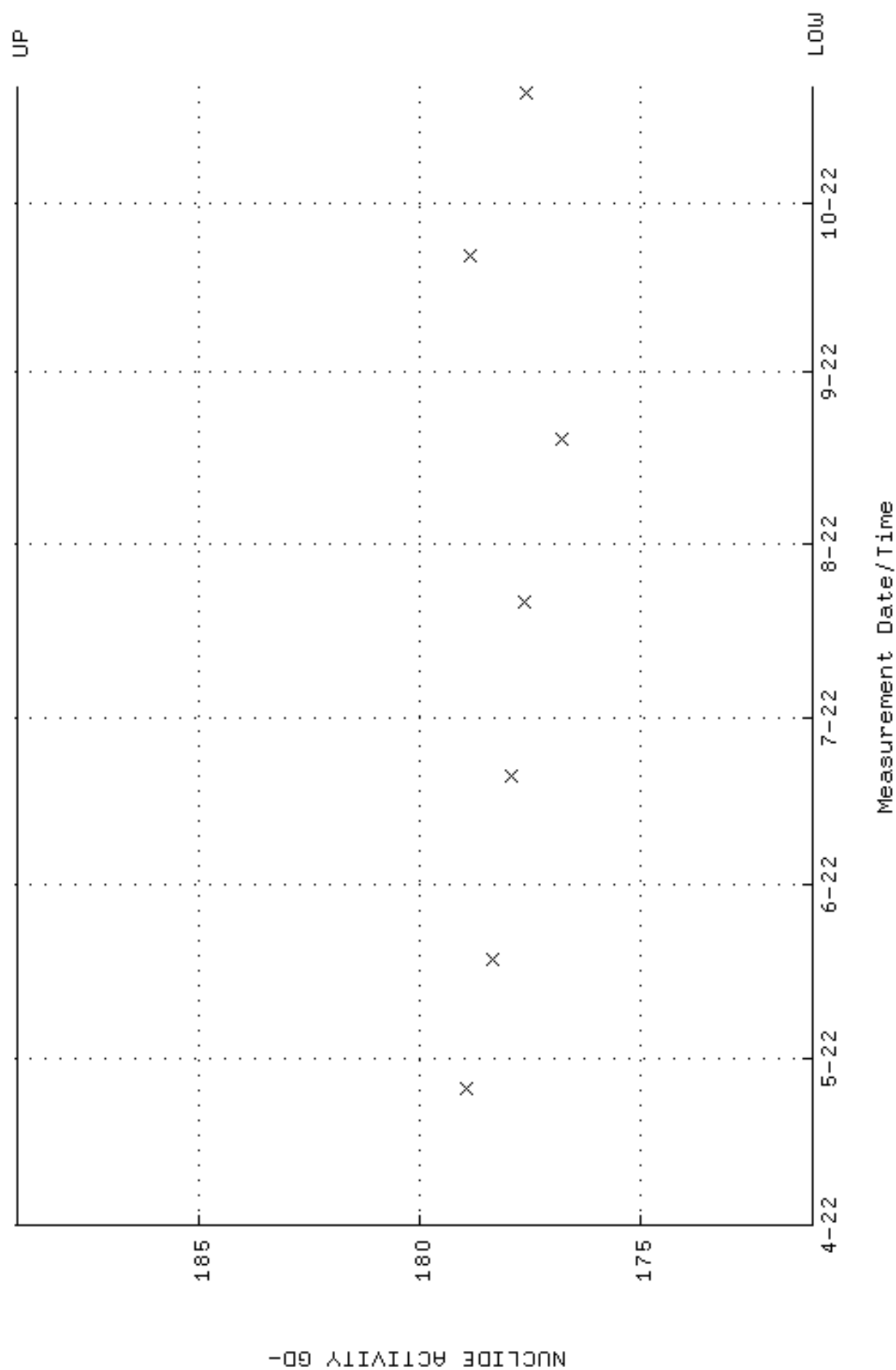
QA filename : DKA100:[ENV_ALPHA.QA.B]B220.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:12:12 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



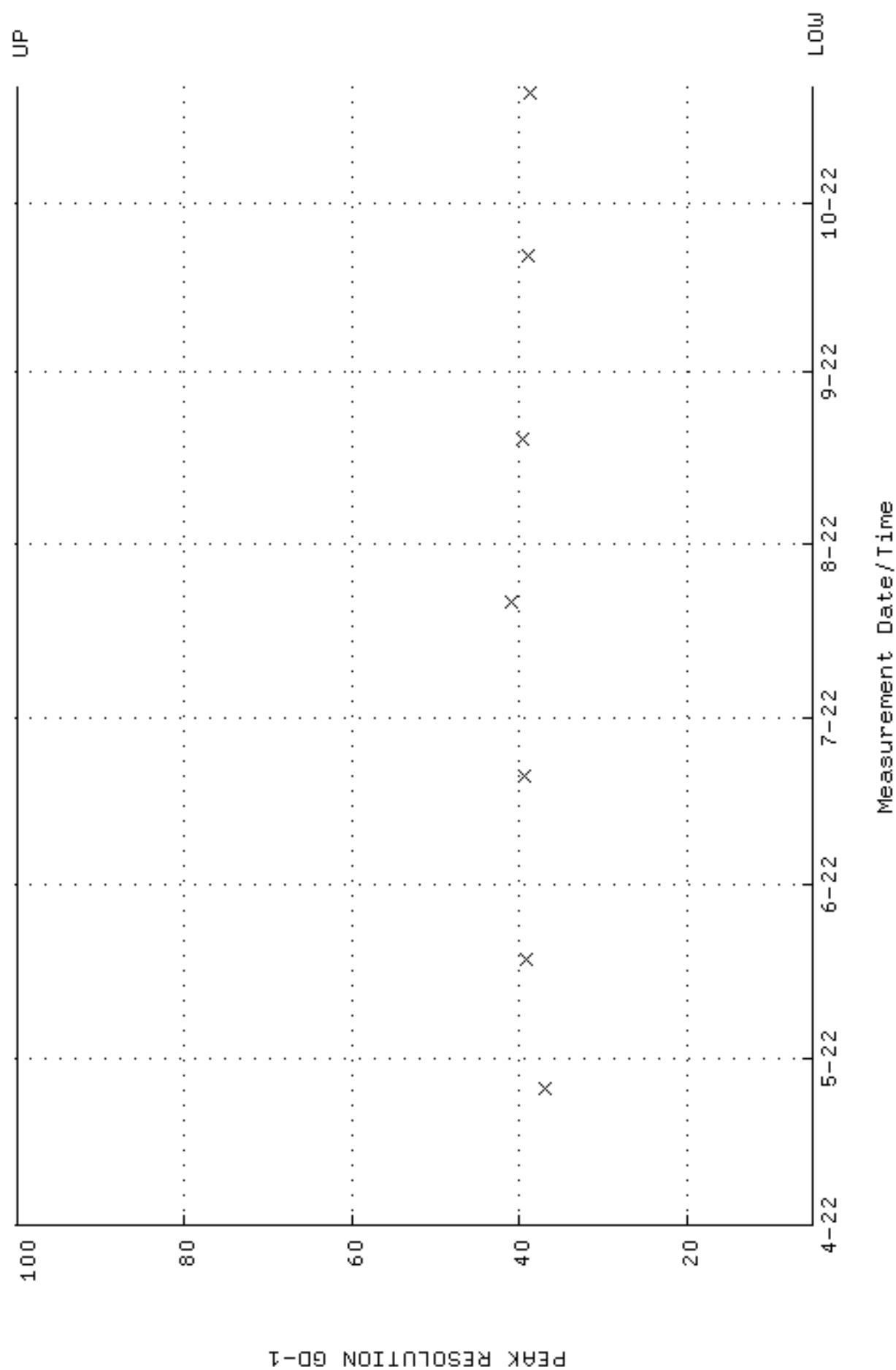
QA filename : DKA100:[ENV_ALPHA.QA.W]W230.QAF;3
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 25-APR-2022 10:47:19 through 21-OCT-2022 12:00:00
Lower/Upper Lmts: 0.248130 through 0.263470



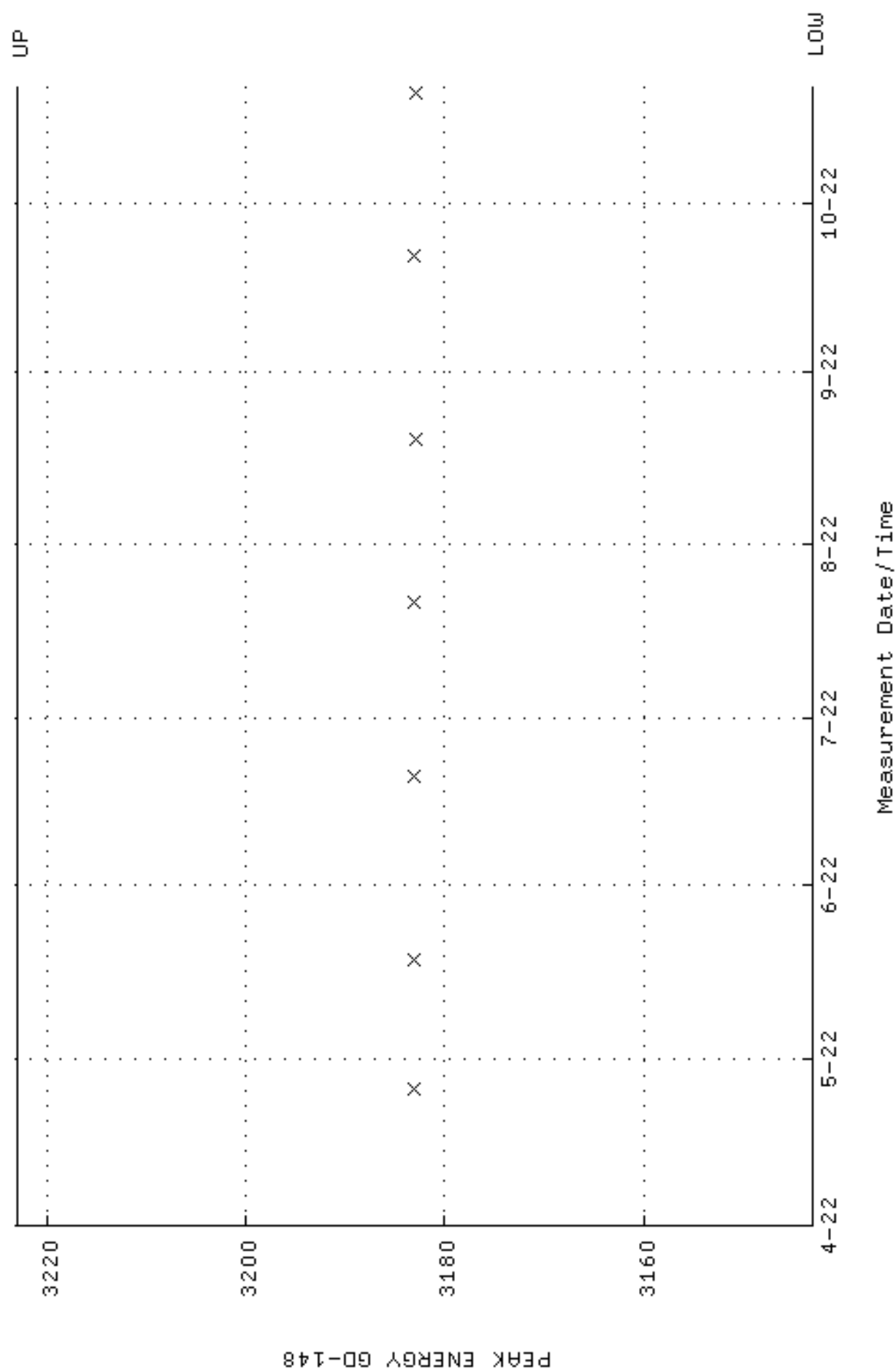
QA filename : DKA100:[ENV_ALPHA.QA.W]W230.QAF;3
Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
Start/End Dates : 25-APR-2022 10:47:19 through 21-OCT-2022 12:00:00
Lower/Upper Lmts: 171.090 through 189.100



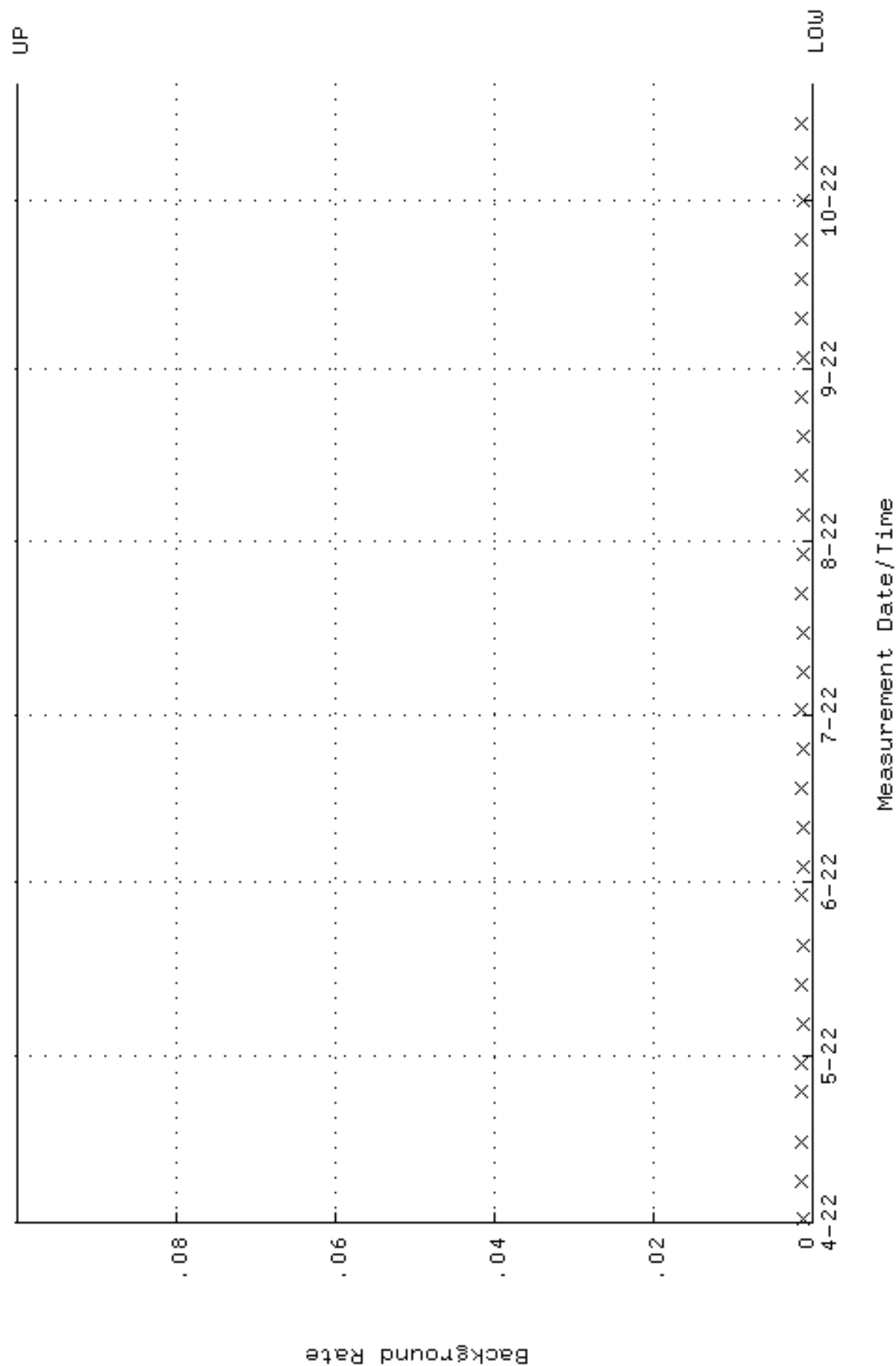
QA filename : DKA100:[ENV_ALPHA.QA.W]W230.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 10:47:19 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



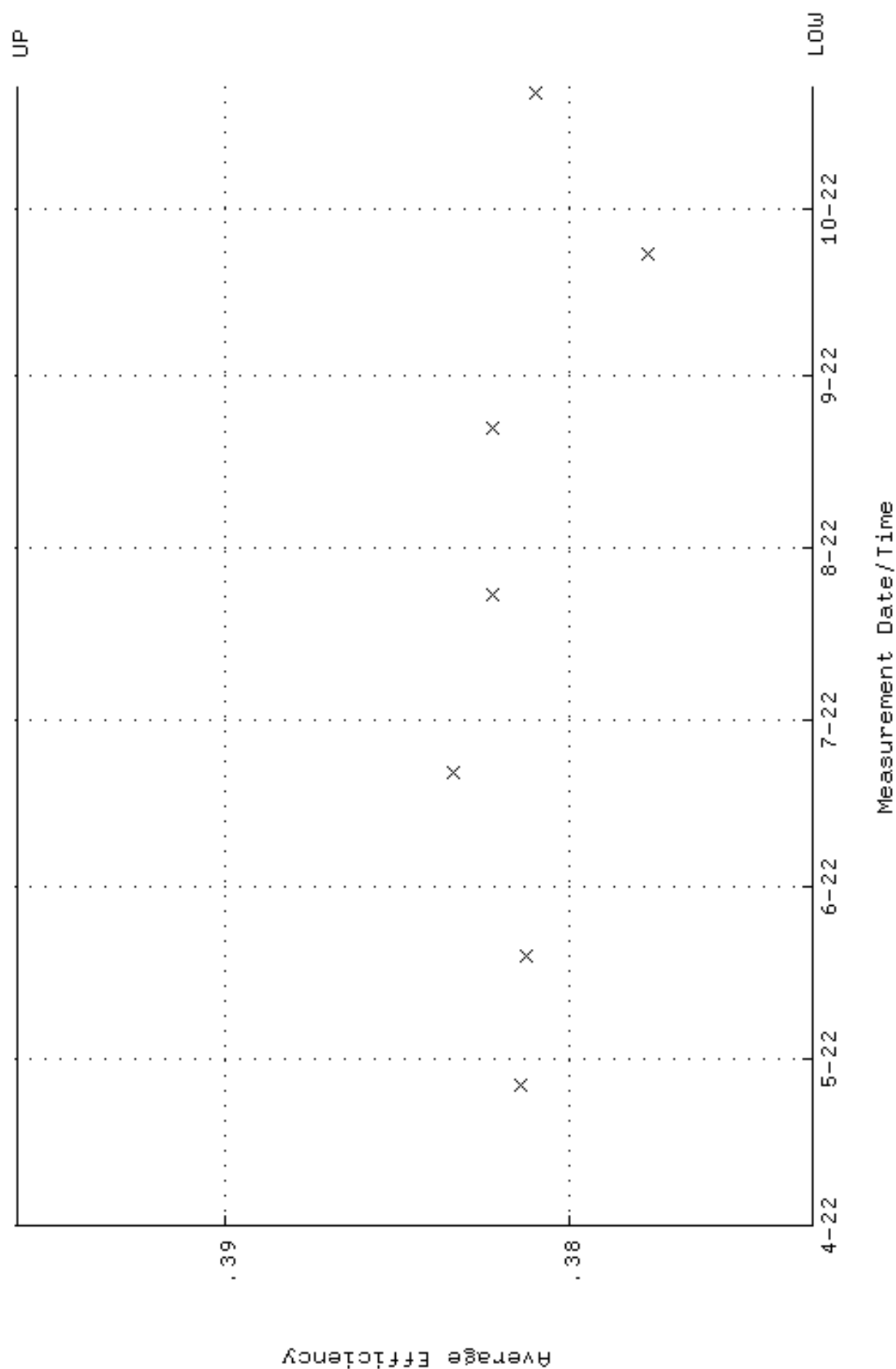
QA filename : DKA100:[ENV_ALPHA.QA.W]W230.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 10:47:19 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



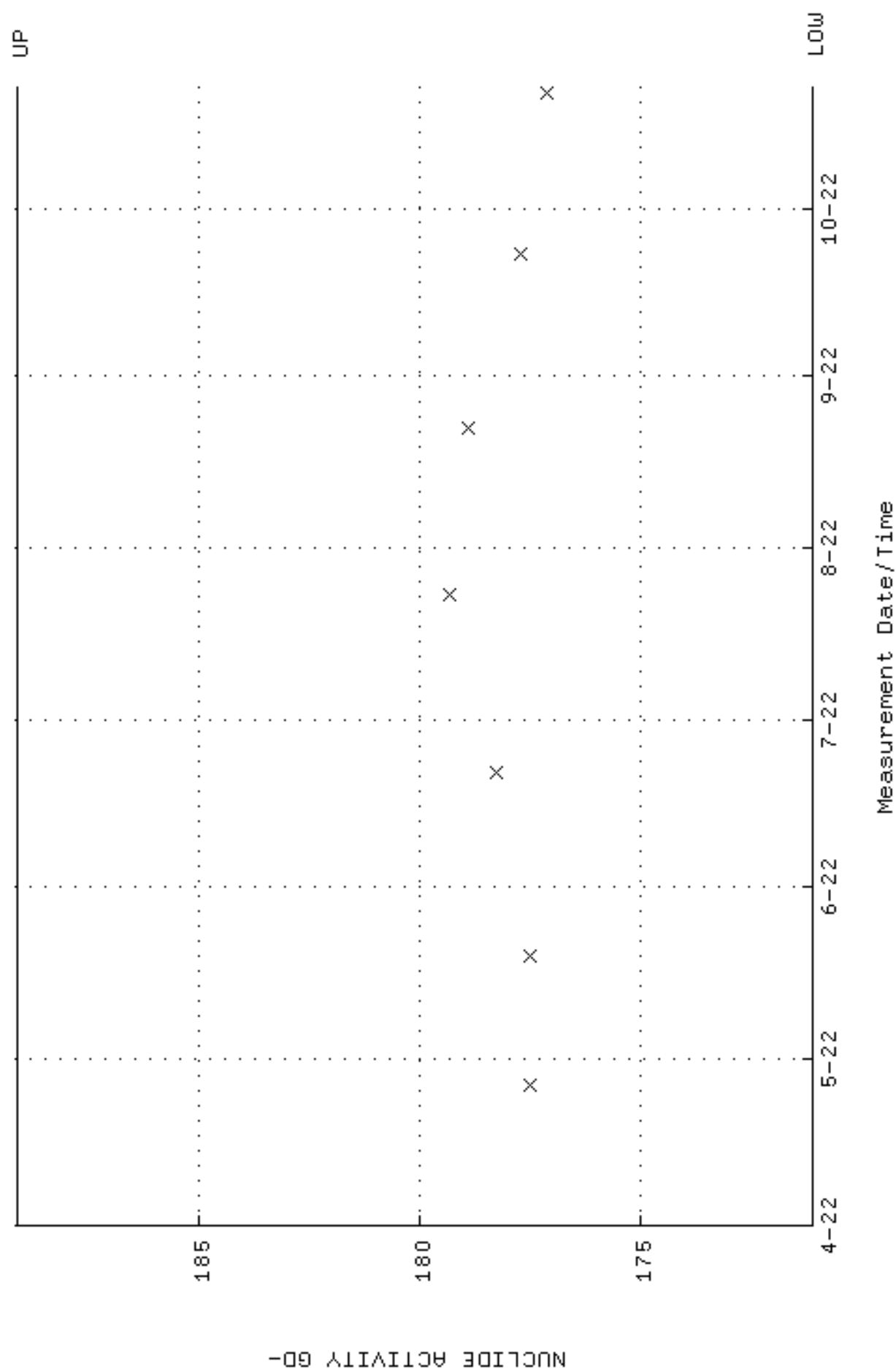
QA filename : DKA100:[ENV_ALPHA.QA.B]B230.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:12:37 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



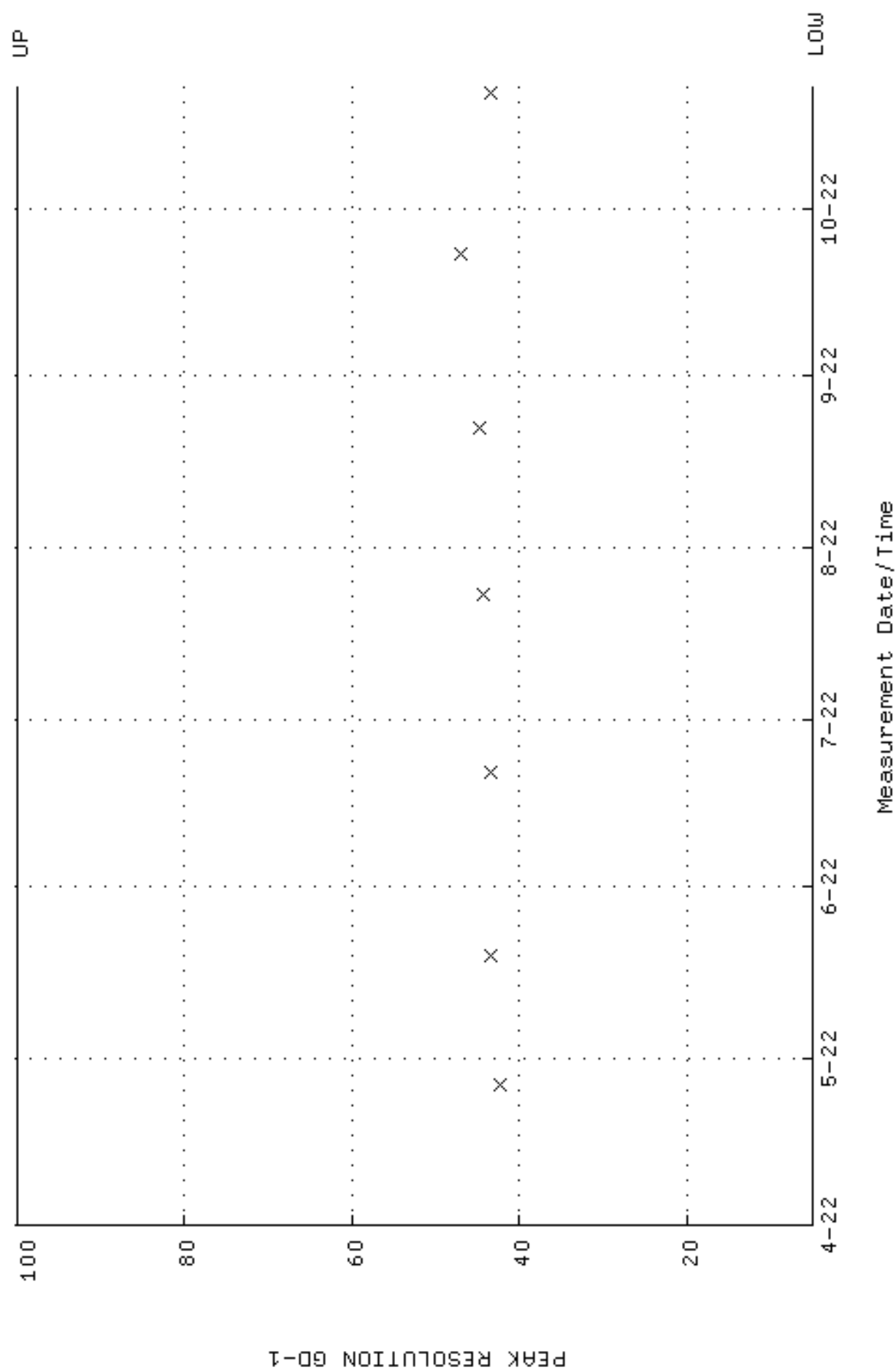
QA filename : DKA100:[ENV_ALPHA.QA.W]W234.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 26-APR-2022 09:27:31 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.372940 through 0.396010



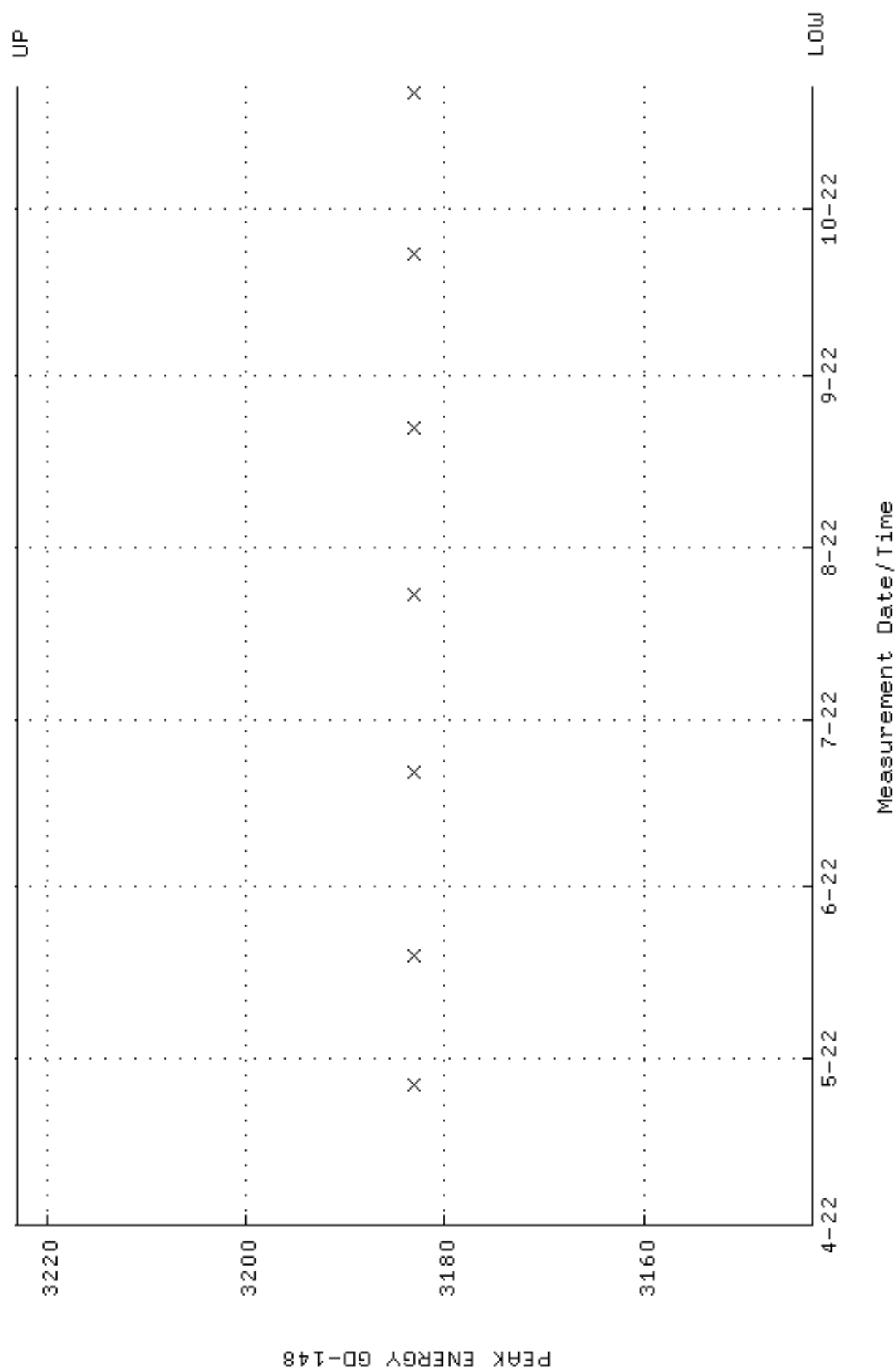
QA filename : DKA100:[ENV_ALPHA.QA.W]W234.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 26-APR-2022 09:27:31 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



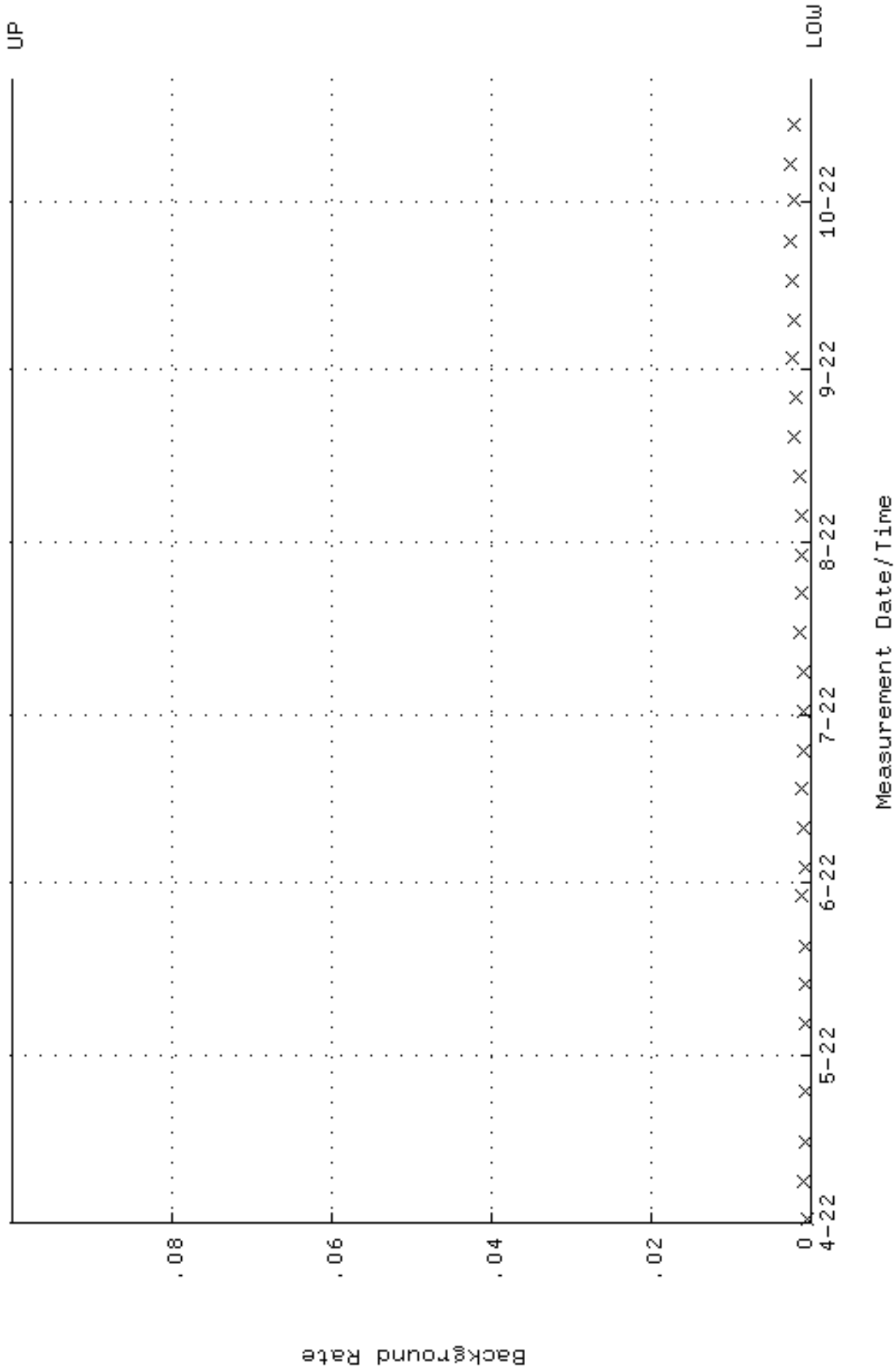
QA filename : DKA100:[ENV_ALPHA.QA.W]W234.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 26-APR-2022 09:27:31 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



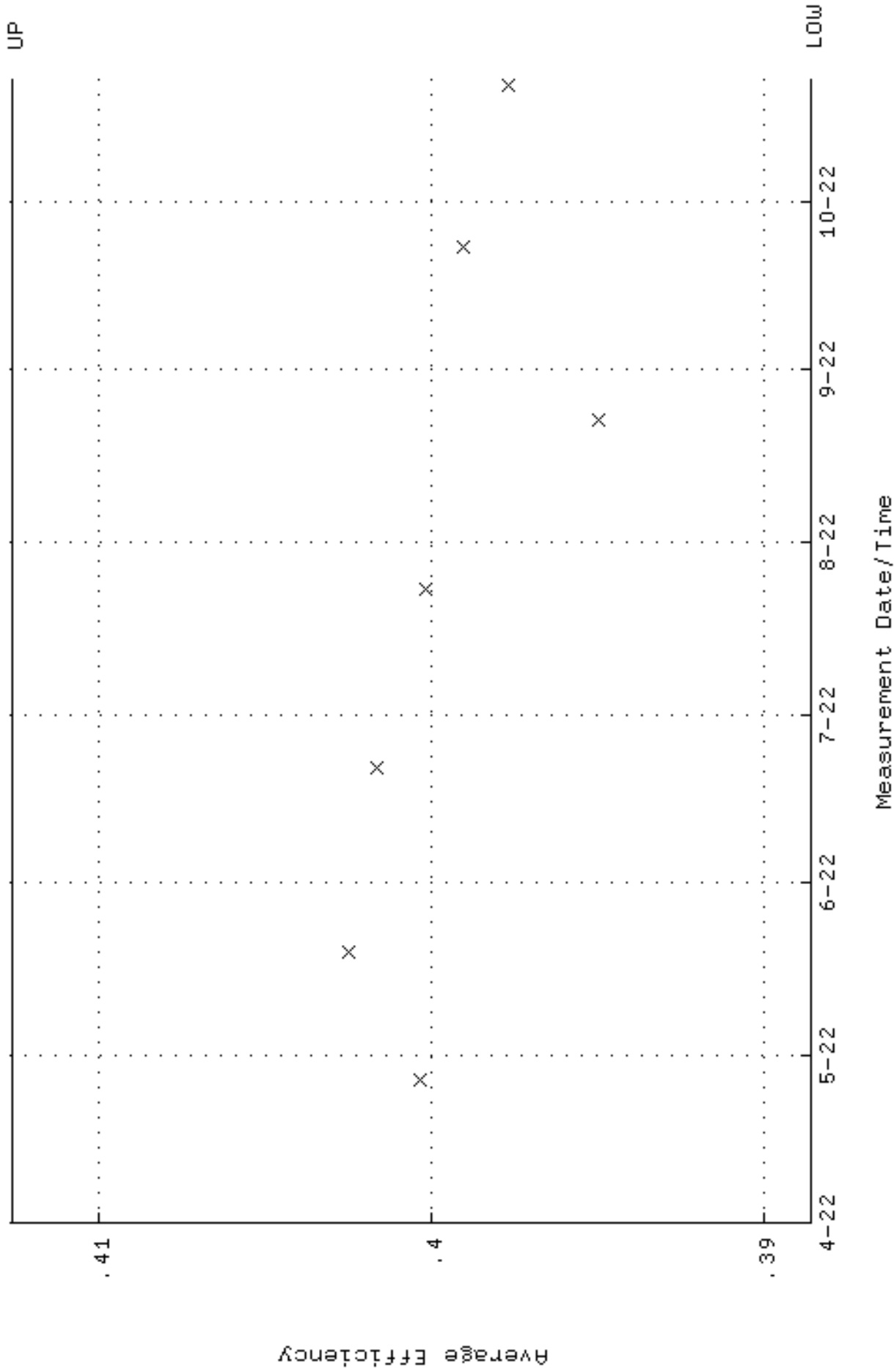
QA filename : DKA100:[ENV_ALPHA.QA.W]W234.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 26-APR-2022 09:27:31 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



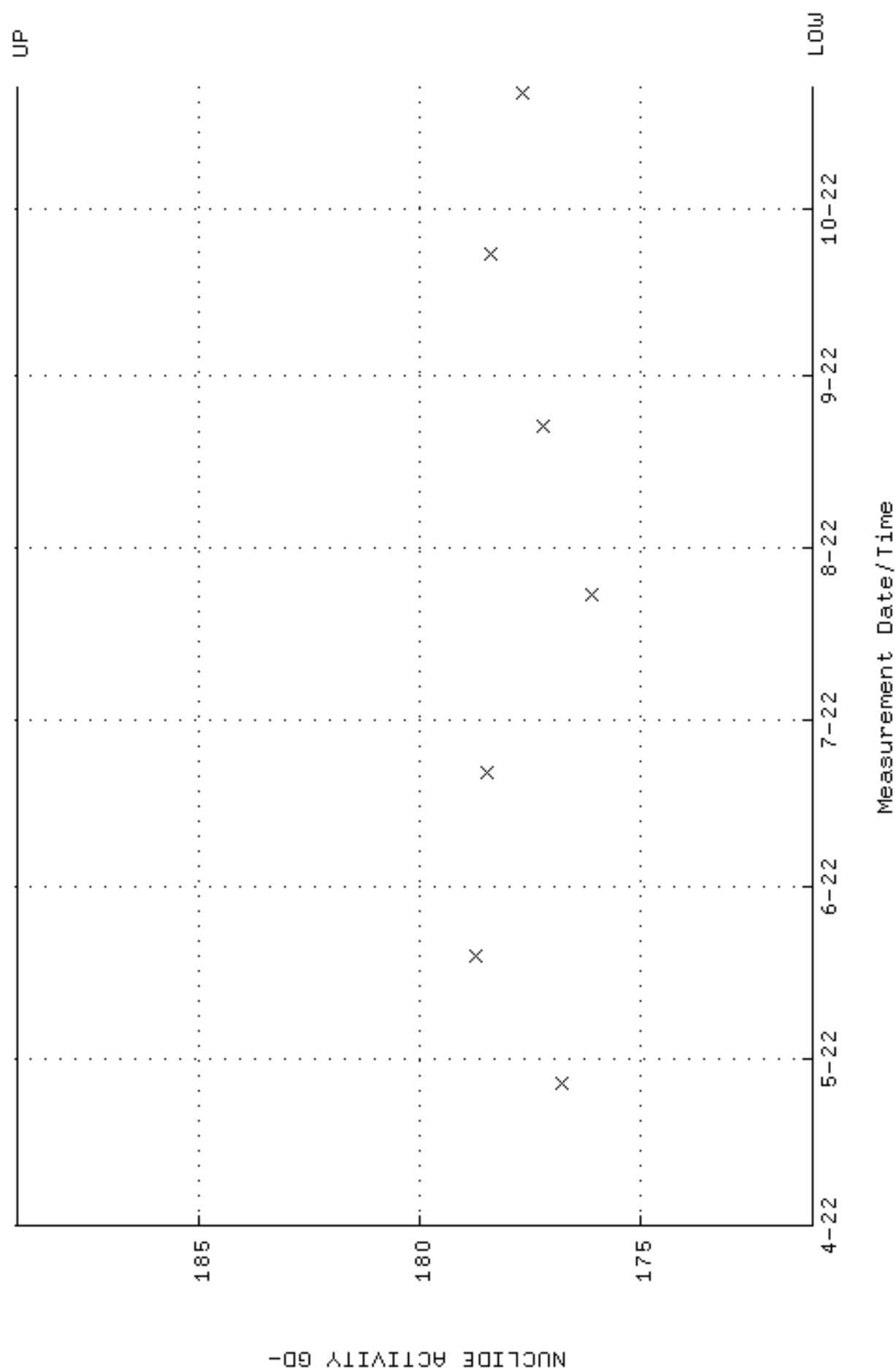
QA filename : DKA100:[ENV_ALPHA.QA.B]B234.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-APR-2022 13:36:21 through 22-OCT-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 0.100000



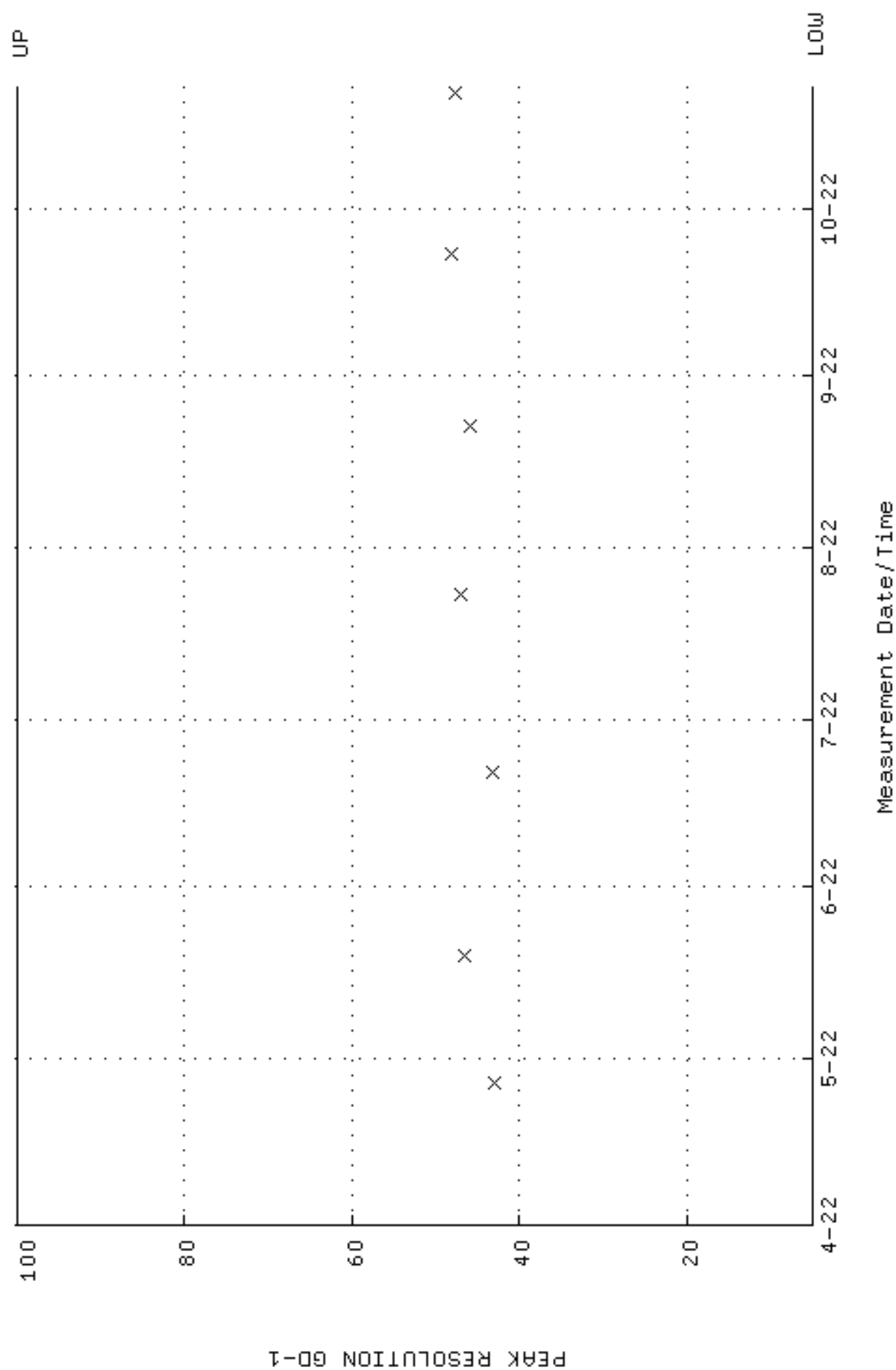
QA filename : DKA100:[ENV_ALPHA.QA.W]W239.QAF;3
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 26-APR-2022 09:27:54 through 22-OCT-2022 12:00:00
Lower/Upper Lmts: 0.388590 through 0.412630



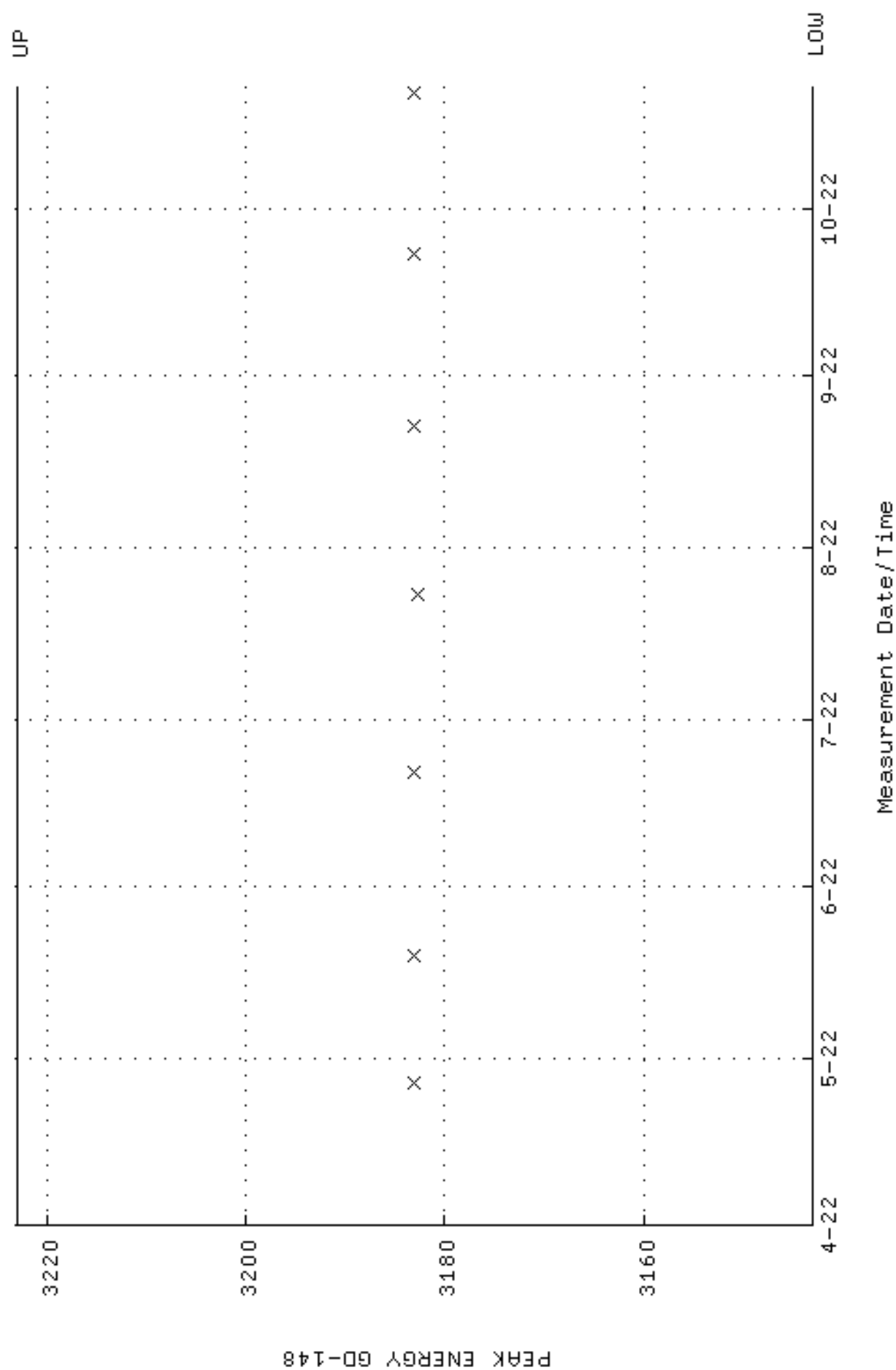
QA filename : DKA100:[ENV_ALPHA.QA.W]W239.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 26-APR-2022 09:27:54 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



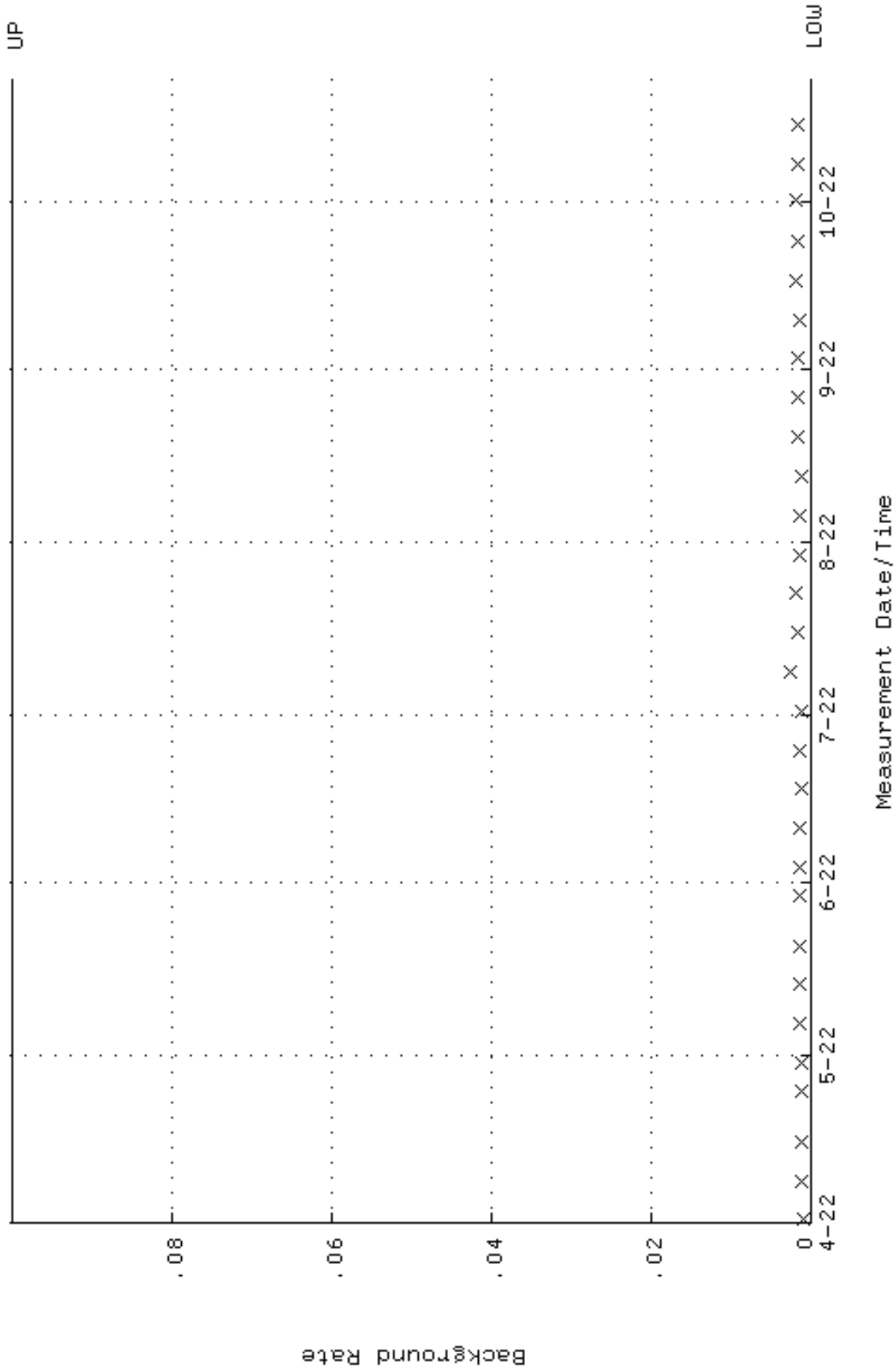
QA filename : DKA100:[ENV_ALPHA.QA.W]W239.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 26-APR-2022 09:27:54 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



QA filename : DKA100:[ENV_ALPHA.QA.W]W239.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 26-APR-2022 09:27:54 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



QA filename : DKA100:[ENV_ALPHA.QA.B]B239.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-APR-2022 13:13:35 through 22-OCT-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 0.100000



RAD Standards Traceability

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

65338-278

Am-241 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Am-241
ACTIVITY (dps):	3.920 E4
HALF-LIFE:	4.322 E2 years
CALIBRATION DATE:	January 15, 2003 12:00 EST
TOTAL UNCERTAINTY*:	3.2%
SYSTEMATIC:	2.2%
RANDOM:	1.0%

*99% confidence level.

5.10649 grams 1M HCl solution.

Impurities: γ -impurities <0.1%
 α -impurities <0.1%

P O NUMBER 3213 RD, Item 1

SOURCE PREPARED BY: M. Taskaeva
M. Taskaeva, Radiochemist

Q A APPROVED:

UM [Signature] 1-16-03

RC-S-035-046a

Standard Logbook

Serial ID: 0533 **Open/Reference Date:** 15 JAN 2003 **Aliquot :** 5.10649 g
Name: Americium-241 **Received:** 27 JAN 2003 **Density :** Hand Calculated
Type: Source Material **Expires:** 05 FEB 2020 **Logbook Num :** RC S 035 048
Employee: Angela Johnson **Lot Number :** 65338-278
Supplier: Analytics **Solvent :** 1 M HCL
Uncertainty : 1.25 percent
Description: 65338-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	39200 dps		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	0533
Prepared By:	Angela Johnson
Carrier Conc:	1 M HCL
Reference Date:	01/15/2003
Ampoule Mass (g):	5.10649 g
Uncertainty:	+/- 1.25 %
LogBook No:	RC S 035 048
Supplier:	Analytics

A Solution Material Info		
Isotope:	Americium-241	
Prepared By:	Angela Johnson	
Prep Date:	02/05/2003	
Verification Date:	07/08/2022	
Expiration Date:	07/08/2023	
Primary Code:	0533-A	
Dilution(mL):	100 mL	
Mass of Parent(g):	4.8225 g	
Density(g/mL):	1.0139	Balance ID:

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (5.10649 \text{ g} * 100 \text{ mL}) = 22211.9695 \text{ dpm/mL}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (1.0139 \text{ g/mL}) / (5.10649 \text{ g} * 100 \text{ mL}) = 21907.2185 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/20/2003	Angela Johnson	1.0151	100	0533-B	222.38 dpm/mL	03/01/2006	03/01/2007
01/16/2015	Christina Kimball	.005081	500	0533-BB	.22263 dpm/mL	01/14/2016	01/14/2017
02/20/2003	Angela Johnson	.6819	250	0533-C	59.754 dpm/mL	02/20/2004	02/20/2005
05/04/2015	Tim Chandler	1.02	500	0533-CC	44.6907 dpm/mL	04/17/2017	04/17/2018
05/07/2003	Tim Chandler	.1245	100	0533-D	27.2745 dpm/mL	05/03/2004	05/03/2005
01/22/2016	Christina Kimball	.103	500	0533-DD	4.51289 dpm/mL	01/05/2022	01/05/2023
09/10/2004	Amanda Fehr	.6933	250	0533-E	60.753 dpm/mL	09/10/2005	09/10/2006
10/31/2016	Christina Kimball	.00508	500	0533-EE	.22259 dpm/mL	10/30/2017	10/30/2018

12/17/2004	Brenda Burke	.0093	100	0533-F	2.0374 dpm/mL	12/20/2004	12/20/2005
10/13/2017	Tim Chandler	1.0219	500	0533-FF	44.774 dpm/mL	10/01/2019	10/01/2020
12/21/2004	Brenda Burke	.009273	100	0533-G	2.0315 dpm/mL	12/07/2005	12/07/2006
11/13/2017	Christina Kimball	.00507	500	0533-GG	.2222 dpm/mL	11/09/2018	11/09/2019
04/28/2005	Brenda Burke	.1347	100	0533-H	29.4598 dpm/mL	04/27/2006	04/27/2007
01/23/2018	Tim Chandler	1.2536	100	0533-HH	274.6289 dpm/mL	01/23/2018	01/23/2019
10/19/2005	Mary Aders	.6948	250	0533-I	60.7831 dpm/mL	10/18/2006	10/18/2007
01/30/2020	Tim Chandler	1.0284	500	0533-II	45.0588 dpm/mL	01/18/2022	01/18/2023
05/08/2006	Julie Strock	.0711	100	0533-J	15.576 dpm/mL	05/10/2008	05/10/2009
07/08/2022	Matelon DeFreese	1.0349	500	0533-JJ	45.3435609 dpm/mL	07/18/2022	07/18/2023
05/11/2006	Brenda Burke	.00092601	100	0533-K	.20286 dpm/mL	08/02/2007	07/28/2007
11/15/2006	Tara Sides	.132	1000	0533-L	2.88586 dpm/mL	09/15/2015	09/15/2016
06/12/2007	Julie Strock	.000979	100	0533-M	.21448 dpm/mL	05/20/2009	05/20/2010
08/03/2007	Daniel Roy	.7042	250	0533-N	61.7083 dpm/ml	08/02/2008	08/02/2009
09/25/2008	Daniel Roy	1.4561	500	0533-O	63.7982 dpm/ml	09/07/2010	09/07/2011
09/29/2008	Tara Sides	.1004	100	0533-P	21.9948 dpm/mL	09/07/2010	09/07/2011
06/03/2009	Julie Strock	.0009751	100	0533-Q	.2136 dpm/mL	06/01/2010	06/01/2011
11/08/2010	Ashley Drochter	1.4675	500	0533-R	64.2977 dpm/mL	11/08/2010	11/08/2011
11/09/2010	Ashley Drochter	.7295	500	0533-S	31.9626 dpm/mL	10/31/2011	10/31/2012
01/03/2011	Christina Kimball	.097	100	0533-T	21.25 dpm/mL	01/03/2011	01/03/2012
01/05/2011	Christina Kimball	.1009	100	0533-U	22.10438 dpm/mL	12/18/2013	12/18/2014
05/23/2011	Christina Kimball	.001008999	100	0533-V	.2210438 dpm/mL	05/11/2012	05/11/2013
05/11/2012	Christina Kimball	.001016	100	0533-W	.222676 dpm/mL	05/01/2014	05/01/2015

06/13/2012	Ashley Drochter	.728	500	0533-X	31.8969 dpm/mL	06/02/2014	06/02/2015
01/23/2013	Salina Pizarro	2	500	1641	.1498555 dpm/mL	12/19/2013	12/01/2038
07/16/2013	Julie Strock	1	500	1641-A	.07492775 dpm/mL	07/16/2038	07/16/2039
03/17/2014	Christina Kimball	.1013	100	0533-Y	22.19201 dpm/mL	02/26/2019	02/26/2020
05/05/2014	Christina Kimball	.00101595	100	0533-Z	.222567 dpm/mL	05/05/2014	05/05/2015

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Am-243 Standard 0533-JJ

v1.2

Analyst	MXS2
Verification Prep Date	7/18/2022

Tracer Information	
Isotope	Cm-244
Serial Number	1216-N2
Amount of Std. (mL)	0.2
Expiration Date	4/7/2023

Standard Information	
Isotope	Am-243
Serial Number	0533-JJ
Isotope Half-life	7.3700E+03 Y
Reference Date	1/15/2003
Ref. Act. (dpm/mL)	45.3435609
Amount of Std. (mL)	0.2
Standard Prep Date	7/8/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	7/21/2022	3.880	43.07
2	7/23/2022	3.980	44.18
3	7/21/2022	3.790	42.07

Mean Value = 3.883 43.105
Stdev = 0.09504385 1.05498673

Certificate Value* = 4.0775 pCi
Two sigma = 0.1901
10 % of Mean = 0.3883
Rule A (Pass/Fail) Pass
% Recovery 95.24%
Rule B (Pass/Fail) Pass
Expiration Date 7/18/2023

dpm/mL
45.2605
2.1100
4.3105
Pass
95.24%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Am-243 standard 0533-JJ using 0.2 mL for each source. Each standard was combined with 0.2 mL of Cm-244 standard 1216-N2 and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. 0.1mL of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-243 were calculated by comparison to Cm-244 certified values.

7/25/22



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

1752

101294

Am-243 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL1511998, Item 1 **Product Code:** 8243



This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
Am-243	2.692E+06	3.809E+04	0.5	1.8	3.7	09/01/2015

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities (other than decay products) < 0.1%.
5.10528 g 1M HCl solution, carrier free.

Source Prepared by:

Z. Dimitrova, Radiochemist

QC Approved:

J. S. Lehr, Spectroscopist

Date: 28 AUG 15

Standard Logbook

Serial ID: 1752 **Open/Reference Date:** 01 SEP 2015 **Aliquot :** 5.10528 g
Name: Americium-243 **Received:** 01 SEP 2015 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18 SEP 2025 **Logbook Num :** GL-CED-297-045
Employee: Gregory Ramsay **Lot Number :** 101294
Supplier: Eckert & Ziegler **Solvent :** 1M HCl
Uncertainty : 1.85 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-243	38090 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1752
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HCl
Reference Date:	09/01/2015
Ampoule Mass (g):	5.10528 g
Uncertainty:	+/- 1.85 %
LogBook No:	GL-CED-297-045
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Americium-243		
Prepared By:	Tim Chandler		
Prep Date:	11/23/2015		
Verification Date:	01/06/2017		
Expiration Date:	01/20/2022		
Primary Code:	1752-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0826 g		
Density(g/mL):	1.0282	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22752.4720 \text{ dpm/mL}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0282 \text{ g/mL}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22128.4498 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/23/2015	Tim Chandler	1.0432	500	1752-B	46.1688 dpm/mL	11/24/2015	11/23/2016
05/26/2016	Tim Chandler	1.072	500	1752-C	47.4434 dpm/mL	05/26/2016	05/26/2017
01/06/2017	Tim Chandler	2.1043	1000	1752-D	46.5649 dpm/mL	12/20/2017	12/20/2018
05/30/2018	Tim Chandler	2.3853	1000	1752-E	52.783 dpm/mL	05/21/2019	05/21/2020
08/05/2019	Tim Chandler	2.2432	1000	1752-F	49.6385 dpm/mL	08/03/2020	08/03/2021
08/12/2020	Tim Chandler	2.2247	1000	1752-G	49.2292 dpm/mL	08/12/2020	08/12/2021
06/18/2021	Tim Chandler	2.2608	1000	1752-H	50.028 dpm/mL	06/18/2021	06/18/2022
01/20/2022	Matelon DeFreese	2.0841	1000	1752-I	46.1179022 dpm/mL	01/21/2022	01/21/2023
09/06/2022	Matelon DeFreese	2.1013	1000	1752-J	46.4985116 dpm/mL	09/06/2022	09/06/2023

Verification for Am-243 Standard 1752-J

v1.2

Analyst	MXS2
Verification Prep Date	9/6/2022

Tracer Information	
Isotope	Am-241
Serial Number	0533-JJ
Amount of Std. (mL)	0.2
Expiration Date	7/18/2023

Standard Information	
Isotope	Am-243
Serial Number	1752-J
Isotope Half-life	7.3700E+03 Y
Reference Date	9/1/2015
Ref. Act. (dpm/mL)	46.4985116
Amount of Std. (mL)	0.2
Standard Prep Date	9/6/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	9/7/2022	4.280	47.51
2	9/8/2022	4.310	47.84
3	9/8/2022	4.200	46.62

Mean Value = 4.263 47.323
Stdev = 0.056862407 0.631172718

Certificate Value* = 4.1863 pCi
Two sigma = 0.1137
10 % of Mean = 0.4263
Rule A (Pass/Fail) Pass
% Recovery 101.84%
Rule B (Pass/Fail) Pass
Expiration Date 9/6/2023

dpm/mL
46.4678
1.2623
4.7323
Pass
101.84%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Am-243 standard 1752-J using 0.2 mL for each source. Each standard was combined with 0.2 mL of Am-241 standard 0533-JJ and was diluted in a centrifuge tube containing 20 mL 3M HCl, diluted to 40 mL with DI water. 0.1 mL of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-243 were calculated by comparison to Am-241 certified values.

8-2/14/22



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010

Fax 661•257•8303

1521

CERTIFICATE OF CALIBRATION GAMMA STANDARD SOLUTION

Radionuclide:	Pb-210	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	22.3 ± 0.2 years	P.O. No.:	936803 RD	
Catalog No.:	7210	Reference Date:	15-Feb-11	12:00 PST
Source No.:	1476-99	Contained Radioactivity:	4.973 μCi	184.0 kBq

Physical Description:

A. Mass of solution:	5.21292 g in 5 mL flame-sealed ampoule
B. Chemical form:	Pb(NO ₃) ₂ in 1M HNO ₃
C. Carrier content:	10 μg Pb/mL of solution
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.9540 μCi/g, 35.30 kBq/g

Method of Calibration:

This source was prepared from a weighed aliquot of solution whose activity in μCi/g was determined using gamma ray spectrometry.

Peak energy used for integration:	46.5 keV
Branching ratio used:	0.0418 gammas per decay

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5 %
B. Type B (systematic) uncertainty:	± 7.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 7.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.



Daniel James Van Dalsen
Quality Control

11-Jan-11
Date

EZIP Ref. No.: 1476-99

ISO 9001 CERTIFIED

Medical Imaging Laboratory

24937 Avenue Tibbitts Valencia, California 91355

Page 234 of 510 SDG: 597531

Industrial Gauging Laboratory

1800 North Keystone Street Burbank, California 91504

Standard Logbook

Serial ID: 1521 **Open/Reference Date:** 15 FEB 2011 **Aliquot :** 5.21292 g
Name: Lead-210 **Received:** 14 JAN 2011 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 02 MAR 2013 **Logbook Num :** RC-S-060-066
Employee: Gregory Ramsay **Lot Number :** 1426-99
Supplier: Eckert & Ziegler **Solvent :** 1M HNO₃
Uncertainty : 7 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Lead-210	35.3 kBq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1521
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	02/15/2011
Ampoule Mass (g):	5.21292 g
Uncertainty:	+/- 7 %
LogBook No:	RC-S-060-066
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Lead-210		
Prepared By:	Bethany Fiem		
Prep Date:	03/22/2011		
Verification Date:	12/03/2020		
Expiration Date:	12/23/2021		
Primary Code:	1521-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0705 g		
Density(g/mL):	1.0272	Balance ID:	1113021018

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 107393.1900 \text{ dpm/mL}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0272 \text{ g/mL}) / (100 \text{ mL}) = 104549.4451 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/07/2013	Ashley Drochter	.5177	100	1521-B	541.2525 dpm/mL	10/29/2013	10/29/2014
10/29/2013	Tim Chandler	5.1002	100	1521-C	5332.2308 dpm/mL	08/09/2018	08/09/2019
02/01/2019	Bethany Fiem	5.0359	100	1521-D	5265.0055 dpm/mL	11/30/2021	11/30/2022
06/05/2018	Tim Chandler	.6059	200	1867-A		06/06/2018	06/05/2019
06/14/2018	Tim Chandler	.6646	200	1867-B		06/15/2018	06/14/2019
06/14/2018	Tim Chandler	.6646	200	1868-A		06/14/2018	06/14/2019
06/13/2019	Tim Chandler	.6984	200	1907-A		06/15/2021	06/15/2022
06/13/2019	Tim Chandler	.6984	200	1907-A1		06/15/2021	06/15/2022
11/06/2019	Tim Chandler	15.0553	100	1920-A		11/07/2019	11/07/2020
12/14/2021	Matelon DeFreese	.6276	200	2012-A		12/15/2021	12/15/2022

Verification for Po-210 Standard 2012-A

v1.2

Analyst	MXS2
Verification Prep Date	12/15/2021

Tracer Information	
Isotope	Po-209
Serial Number	1720-C
Amount of Std. (mL)	0.2
Expiration Date	11/11/2022

Standard Information	
Isotope	Po-210
Serial Number	2012-A
Isotope Half-life	138.3800 D
Reference Date	12/14/2021
Ref. Act. (dpm/mL)	233.932217
Amount of Std. (mL)	0.2
Standard Prep Date	12/14/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	12/16/2021	20.500	227.55
2	12/16/2021	19.700	218.67
3	12/16/2021	20.000	222.00

Mean Value = 20.067 222.740
Stdev = 0.404145188 4.486011592

pCi
Certificate Value* = 20.9697
Two sigma = 0.8083
10 % of Mean = 2.0067
Rule A (Pass/Fail) Pass
% Recovery 95.69%
Rule B (Pass/Fail) Pass
Expiration Date 12/15/2022

dpm/mL
232.7634
8.9720
22.2740
Pass
95.69%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-210 standard 2012-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-209 standard 1720-C and was diluted in a centrifuge tube containing 15 mL of 0.05M HNO3. Precipitated by adding 0.1mL of 30% H2O2, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-210 were calculated by comparison to Po-209 certified values.

12/16/2021

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

82308-278

Pu-239 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: 7340 RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u_A	u_B	U	
Pu-239	8.803E+06	3.758E+04	0.1	0.9	1.8	05/07/2010

*Uncertainty: U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities < 0.1 %, α -impurities < 0.1 %, Am-241 330.1 Bq. 5.56111 g 3M HNO₃ solution, carrier free.

Source Prepared by: W. Mao

W. Mao, Radiochemist

QA Approved: J. D. McCorvey

J. D. McCorvey, QA Manager Alternate

Date: 5/10/10



Standard Logbook

Serial ID: 1472 **Open/Reference Date:** 07 MAY 2010 **Aliquot :** 5.56111 g
Name: Plutonium-239 **Received:** 12 MAY 2010 **Density :** Hand Calculated
Type: Source Material **Expires:** 03 JUN 2030 **Logbook Num :** RC-S-060-019
Employee: Ashley Drochter **Lot Number :** 82308-278
Supplier: Eckert & Zeigler Analytics **Solvent :** 3M HNO₃
Uncertainty : .9 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-239	37580 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1472
Prepared By:	Ashley Drochter
Carrier Conc:	3M HNO3
Reference Date:	05/07/2010
Ampoule Mass (g):	5.56111 g
Uncertainty:	+/- .9 %
LogBook No:	RC-S-060-019
Supplier:	Eckert & Zeigler Analytics

A Solution Material Info			
Isotope:	Plutonium-239		
Prepared By:	Julie Strock		
Prep Date:	10/20/2020		
Verification Date:	08/17/2021		
Expiration Date:	08/17/2022		
Primary Code:	1472-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.5071 g		
Density(g/mL):	1.1056	Balance ID:	BIOFA-B952846238

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.56111 \text{ g} * 100 \text{ mL}) = 22329.0118 \text{ dpm/mL}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.1056 \text{ g/mL}) / (5.56111 \text{ g} * 100 \text{ mL}) = 20195.4985 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
10/20/2020	Julie Strock	.0117	1000	1472-B	.2363 dpm/mL	10/14/2021	10/14/2022
08/17/2021	Tim Chandler	1.1318	500	1472-C	45.7145 dpm/mL	08/11/2022	08/11/2023
04/07/2022	Christina Kimball	.01	1000	1472-D	.20195 dpm/mL	04/07/2022	04/07/2023
04/15/2022	Christina Kimball	.011283	1000	1472-E	.2279 dpm/mL	04/15/2022	04/15/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-239 Standard 1472-C

v1.2

Analyst	MXS2
Verification Prep Date	8/11/2022

Tracer Information	
Isotope	Pu-242
Serial Number	2021-A
Amount of Std. (mL)	0.2
Expiration Date	7/19/2023

Standard Information	
Isotope	Pu-239
Serial Number	1472-C
Isotope Half-life	2.4131E+04 Y
Reference Date	5/7/2010
Ref. Act. (dpm/mL)	45.7145
Amount of Std. (mL)	0.2
Standard Prep Date	8/17/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	8/11/2022	3.960	43.96
2	8/11/2022	4.190	46.51
3	8/15/2022	4.220	46.84

Certificate Value* = 4.1170 pCi
 Two sigma = 0.2845
 10 % of Mean = 0.4123
 Rule A (Pass/Fail) Pass
 % Recovery 100.15%
 Rule B (Pass/Fail) Pass
 Expiration Date 8/11/2023

Mean Value = 4.123
 Stdev = 0.142243922
 45.769
 1.578907534

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-239 standard 1472-C using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-242 standard 2021-A and was diluted in a centrifuge tube containing 20 mL of 0.1M HCl, diluted to 40 mL with DI water. 0.1 mL of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-239 were calculated by comparison to Pu-242 certified values.

8/10/22



National Institute of Standards & Technology

Certificate

2022

Standard Reference Material[®] 4334j

Plutonium-242 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}.$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterwieser, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

Steven J. Choquette, Director
Office of Reference Materials

GL-CE0-797-314a

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq·g^{-1(a)}
Relative expanded uncertainty ($k = 2$)	0.51 %^(b)

^(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

^(b) The uncertainties on certified values are expanded uncertainties, $U = k u_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ⁻¹ (a,b,c,d)
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ⁻¹ (a,d)
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π α liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

^(a) The stated uncertainty is two times the standard uncertainty [5].

^(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

^(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,

0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and

0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

^(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclidic impurities follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ⁻⁶ ⁽³⁾	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ⁻⁵ ⁽³⁾	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

^(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,

5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and

3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

^(f) The stated uncertainty is the standard uncertainty. See reference 6.

GL-CEB-297-314c

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ^{242}Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	^{242}Pu decay corrections for half-life uncertainty of 0.22 %.	B	$< 10^{-10}$
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty ($k = 2$)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

GL-CE0-297-314d

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

GL-CE0-297-314e

Standard Logbook

Serial ID: 2022 **Open/Reference Date:** 09 AUG 2017 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 18 JAN 2022 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18 JAN 2050 **Logbook Num :** GL-CED-297-314
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
Uncertainty : .255 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2022
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO3
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-314
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	07/18/2022		
Verification Date:	07/21/2022		
Expiration Date:	07/21/2023		
Primary Code:	2022-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.4148 g		
Density(g/mL):	1.0405	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.4148 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 42.3654 \text{ dpm/mL}$
$(5.4148 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0405 \text{ g/mL}) / (200 \text{ mL}) = 40.7183 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
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GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2022-A

v1.2

Analyst	MXS2
Verification Prep Date	7/21/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.2
Expiration Date	8/17/2022

Standard Information	
Isotope	Pu-242
Serial Number	2022-A
Isotope Half-life	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	42.3654
Amount of Std. (mL)	0.2
Standard Prep Date	7/18/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	7/21/2022	3.800	42.18
2	7/21/2022	3.760	41.74
3	7/21/2022	3.730	41.40

Mean Value = 3.763 41.773
Stdev = 0.035118846 0.389819189

Certificate Value* = 3.8167 pCi
Two sigma = 0.0702
10 % of Mean = 0.3763
Rule A (Pass/Fail) Pass
% Recovery 98.60%
Rule B (Pass/Fail) Pass
Expiration Date 7/21/2023

dpm/mL
42.3650
0.7796
4.1773
Pass
98.60%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2022-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. Added 0.1 mL of neodymium carrier and 3-4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

8/25/22



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661-309-1010
Fax 661-257-8303

1720

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Po-209	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	102 ± 5 years	P.O. No.:	GEL1408569	
Catalog No.:	7209	Reference Date:	1-Oct-14	12:00 PST
Source No.:	1760-53-1	Contained Radioactivity:	0.05281 µCi	1.954 kBq

Physical Description:

A. Mass of solution:	5.21650 g in 5 mL flame-sealed ampoule
B. Chemical form:	Po(NO ₃) ₄ in 1M HNO ₃
C. Carrier content:	None
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.01012 µCi/g, 0.3744 kBq/g

Method of Calibration:

This source was prepared from a weighed aliquot of solution whose activity in µCi/g was determined using a liquid scintillation counter.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.4 %
D. Total uncertainty at the 99% confidence level:	± 3.1 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.



Daniel James Van Dusen
Quality Control

11-Sep-14
Date

EZIP Ref. No.: 1760-53

ISO 9001 CERTIFIED

GEL-CEP-297-013

Standard Logbook

Serial ID: 1720 **Open/Reference Date:** 01 OCT 2014 **Aliquot :** 5.2165 g
Name: Polonium-209 **Received:** 22 SEP 2014 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 22 SEP 2035 **Logbook Num :** GL-CED-297-013
Employee: Gregory Ramsay **Lot Number :** 1760-53-1
Supplier: Eckert & Ziegler **Solvent :** 1M HNO3
Uncertainty : 1.211 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Polonium-209	1.954 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1720
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	10/01/2014
Ampoule Mass (g):	5.2165 g
Uncertainty:	+/- 1.211 %
LogBook No:	GL-CED-297-013
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Polonium-209		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2016		
Verification Date:	07/12/2017		
Expiration Date:	12/06/2019		
Primary Code:	1720-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1896 g		
Density(g/mL):	1.0290	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1166.3543 \text{ dpm/mL}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0290 \text{ g/mL}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1133.4833 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
12/06/2018	Tim Chandler	14.42	200	1720-B	81.7241 dpm/mL	12/07/2018	12/07/2019
11/26/2019	Tim Chandler	14.5183	200	1720-C	82.2813 dpm/mL	11/11/2021	11/11/2022
11/26/2019	Tim Chandler	14.5183	200	1720-C1	82.2813 dpm/mL	11/11/2021	11/11/2022
02/21/2022	Matelon DeFreese	14.5109	200	1720-D	82.239314 dpm/mL	03/07/2022	03/07/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Po-209 Standard 1720-D

v1.2

Analyst	MXS2
Verification Prep Date	3/7/2022

Tracer Information	
Isotope	Po-210
Serial Number	2012-A
Amount of Std. (mL)	0.2
Expiration Date	12/15/2022

Standard Information	
Isotope	Po-209
Serial Number	1720-D
Isotope Half-life	125.3000 Y
Reference Date	10/1/2014
Ref. Act. (dpm/mL)	82.239314
Amount of Std. (mL)	0.2
Standard Prep Date	2/21/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	3/7/2022	7.180	79.70
2	3/7/2022	7.480	83.03
3	3/7/2022	7.700	85.47

Mean Value = 7.453 82.732
Stdev = 0.261023626 2.897362249

Certificate Value* = 7.1106 pCi
Two sigma = 0.5220
10 % of Mean = 0.7453
Rule A (Pass/Fail) Pass
% Recovery 104.82%
Rule B (Pass/Fail) Pass
Expiration Date 3/7/2023

dpm/mL
78.9274
5.7947
8.2732
Pass
104.82%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-209 standard 1720-D using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-210 standard 2012-A and was diluted in a centrifuge tube containing 15mL of 0.05M HNO3. Precipitated by adding 0.1mL of 30% H2O2, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-209 were calculated by comparison to Po-210 certified values.

3/15/22



Eckert & Ziegler

Analytics

1845

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

Received: 12-1-17 12:00

SRS Number: 108018

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8229

Customer: GEL Laboratories LLC

P.O. Number: GEL1718798, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 29-November-2017 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Th-229	2.897E+06	1.999E+04	0.5	1.5	3.1	4π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 108018

Comments:

5.21561 g of 0.5 M HNO₃ solution, carrier free.

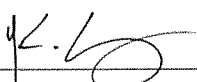
Impurities:

γ-impurities (other than decay products) < 0.1%

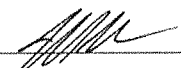
α-impurities: Th-228 6.6E+00 Bq, Th-230 1.2E+02 Bq, Th-232 8.0E+00 Bq

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Hardley, Radiochemist

QC Approved by:


J. Lahr, Spectroscopist

Date: 27-Nov-17

Standard Logbook

Serial ID: 1845 **Open/Reference Date:** 29 NOV 2017 **Aliquot :** 5.21561 g
Name: Thorium-229 **Received:** 01 DEC 2017 **Density :** Hand Calculated
Type: Source Material **Expires:** 01 DEC 2018 **Logbook Num :** GL-CED-297-138
Employee: Tim Chandler **Lot Number :** 108018
Supplier: Eckert & Ziegler **Solvent :** 0.5M HNO₃
Uncertainty : 1.55 percent
Description: 1 ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-229	19990 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1845
Prepared By:	Tim Chandler
Carrier Conc:	0.5M HNO3
Reference Date:	11/29/2017
Ampoule Mass (g):	5.21561 g
Uncertainty:	+/- 1.55 %
LogBook No:	GL-CED-297-138
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-229		
Prepared By:	Tim Chandler		
Prep Date:	06/08/2018		
Verification Date:	07/07/2020		
Expiration Date:	11/10/2022		
Primary Code:	1845-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1906 g		
Density(g/mL):	1.0291	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11936.4861 \text{ dpm/mL}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0291 \text{ g/mL}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11598.7987 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/08/2018	Tim Chandler	2.0385	1000	1845-B	23.6442 dpm/mL	06/01/2020	06/01/2021
07/10/2019	Tim Chandler	4.0198	1000	1845-C	46.62485 dpm/mL	07/07/2020	07/07/2021
10/26/2020	Tim Chandler	4.0184	1000	1845-D	46.6086 dpm/mL	10/27/2020	10/27/2021
04/23/2021	Tim Chandler	4.2911	1000	1845-E	49.7716 dpm/mL	04/26/2021	04/26/2022
11/10/2021	Matelon DeFreese	4.211	1000	1845-F	48.8425 dpm/mL	11/10/2021	11/10/2022
05/11/2022	Matelon DeFreese	4.1951	1000	1845-G	48.6581 dpm/mL	05/12/2022	05/11/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Th-229 Standard 1845-G

v1.2

Analyst	MXS2
Verification Prep Date	5/12/2022

Tracer Information	
Isotope	Th-232
Serial Number	1513-C
Amount of Std. (mL)	0.1
Expiration Date	12/22/2022

Standard Information	
Isotope	Th-229
Serial Number	1845-G
Isotope Half-life	7.3400E+03 Y
Reference Date	11/29/2017
Ref. Act. (dpm/mL)	48.6581
Amount of Std. (mL)	0.1
Standard Prep Date	5/11/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	5/12/2022	2.190	48.62
2	5/12/2022	2.070	45.95
3	5/12/2022	2.120	47.06

Mean Value = 2.127 47.212
Stdev = 0.060277138 1.338152458

Certificate Value* = 2.1909 pCi
Two sigma = 0.1206
10 % of Mean = 0.2127
Rule A (Pass/Fail) Pass
% Recovery 97.07%
Rule B (Pass/Fail) Pass
Expiration Date 5/12/2023
dpm/mL
48.6377
2.6763
4.7212
Pass
97.07%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-229 standard 1845-G using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-232 standard 1513-C and was diluted in a centrifuge tube containing 10 mL 8M HNO₃. The standard was isolated following the standard operating procedure for the separation of thorium (GL-RAD-A-038). After dissolving the sources in 5 mL of 2M HCl, the sources were diluted to 40 mL with deionized water. 100 micrograms of neodymium carrier and five mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-229 were calculated by comparison to Th-232 certified values.

5/16/22

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Th-232	Customer:	GEL LABORATORIES, LLC
Half-life:	(1.405 ± 0.006)E+10 years	P.O. No.:	7347RD
Catalog No.:	7232	Reference Date:	1-Nov-10 12:00 PST
Source No.:	1451-62	Contained Radioactivity:	50.26 nCi 1860 Bq
		(Th-232 only)	

Physical Description:

A. Mass of solution:	5.73256 g in 5 mL flame-sealed ampoule
B. Chemical form:	Th(NO ₃) ₄ in H ₂ O
C. Carrier content:	None
D. Density:	1.15 g/mL @ 20°C

Radioimpurities:

Not determined

Radionuclide Concentration: 8.767 nCi/g, 324.4 Bq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.


Quality Control

15-OCT-10
Date

EZIP Ref. No.: 1451-62

RC-S-060-058

ISO 9001 CERTIFIED

Standard Logbook

Serial ID: 1513 **Open/Reference Date:** 01 NOV 2010 **Aliquot :** 5.73256 g
Name: Thorium-232 **Received:** 21 OCT 2010 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 30 NOV 2011 **Logbook Num :** RC-S-060-058
Employee: Gregory Ramsay **Verified:** 28 APR 2011 **Lot Number :** 1451-62
Supplier: Eckert & Ziegler **Solvent :** DI water
Uncertainty : 1.172 PERCENT

Description: in water
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-232	324.4 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1513
Prepared By:	Gregory Ramsay
Carrier Conc:	DI water
Reference Date:	11/01/2010
Ampoule Mass (g):	5.73256 g
Uncertainty:	+/- 1.172 %
LogBook No:	RC-S-060-058
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-232		
Prepared By:	Christina Kimball		
Prep Date:	04/19/2011		
Verification Date:	11/14/2022		
Expiration Date:	11/14/2023		
Primary Code:	1513-A		
Dilution(mL):	250 mL		
Mass of Parent(g):	5.672 g		
Density(g/mL):	1.0020	Balance ID:	60108592

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (250 \text{ mL}) = 441.5992 \text{ dpm/mL}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0020 \text{ g/mL}) / (250 \text{ mL}) = 440.7354 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
04/19/2011	Christina Kimball	5.0665	100	1513-B	22.3299 dpm/mL	04/11/2013	04/11/2014
02/26/2014	Matelon DeFreese	100.0316	1000	1513-C	44.08747 dpm/mL	12/22/2021	12/22/2022
04/18/2014	Christina Kimball	5.0477	100	1513-D	22.247 dpm/mL	06/28/2022	06/28/2023
01/04/2016	Christina Kimball	.2487	100	1513-E	1.096117 dpm/mL	02/11/2020	02/11/2021
08/01/2016	Christina Kimball	2.053	250	1513-F	3.61932 dpm/mL	07/21/2022	07/21/2023
02/21/2020	Christina Kimball	.248	100	1513-G	1.093 dpm/mL	02/23/2022	02/23/2023
11/11/2022	Christina Kimball	.3	100	1513-H	1.3222 dpm/mL	11/14/2022	11/14/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Th-232 Standard 1513-C

v1.2

Analyst	MXS2
Verification Prep Date	12/22/2021

Tracer Information	
Isotope	Th-229
Serial Number	1845-F
Amount of Std. (mL)	0.1
Expiration Date	11/10/2022

Standard Information	
Isotope	Th-232
Serial Number	1513-C
Isotope Half-life	1.4050E+10 Y
Reference Date	11/1/2010
Ref. Act. (dpm/mL)	44.08747
Amount of Std. (mL)	0.1
Standard Prep Date	2/26/2014

Std #	Count Date	Activity pCi	Standard dpm/mL
1	12/22/2021	1.970	43.73
2	12/22/2021	2.070	45.95
3	12/22/2021	1.920	42.62

Mean Value = 1.987 44.104

Stdev = 0.076376262 1.695553007

Certificate Value* = 1.9859 pCi
 Two sigma = 0.1528
 10 % of Mean = 0.1987
 Rule A (Pass/Fail) Pass
 % Recovery 100.04%
 Rule B (Pass/Fail) Pass
 Expiration Date 12/22/2022

dpm/mL
 44.0875
 3.3911
 4.4104
 Pass
 100.04%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-232 standard 1513-C using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-229 standard 1845-F and was diluted in a centrifuge tube containing 10 mL of 8M HNO₃, then poured onto AG columns following SOP 038. 0.1 mL of neodymium carrier and 2 mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-232 were calculated by comparison to Th-229 certified values.

2/14/22



Eckert & Ziegler

Analytics

1564

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION Standard Radionuclide Source

85621-278

5 mL Liquid in Flame Sealed Vial

Customer: General Engineering Labs/Charleston, SC
P.O. No.: 936814RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
U-232	2.517E+04	3.393E+04	0.5	2.4	4.9	09/12/2011

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities (other than decay products) < 0.1 %, U-233 < 1.20E2 Bq, Am-241 < 5.8E1 Bq. 5.06048 grams 2M HNO3 solution.

Source Prepared by: M. I. Taskaeva
M. I. Taskaeva, Radiochemist

QA Approved: J. D. McCorvey
J. D. McCorvey, QA Manager Alternate

Date: 9/12/11

RECEIVED
9/14/11
AM



Standard Logbook

Serial ID: 1564 **Open/Reference Date:** 12 SEP 2011 **Aliquot :** 5.06048 g
Name: Uranium-232 **Received:** 14 SEP 2011 **Density :** Hand Calculated
Type: Source Material **Expires:** 26 SEP 2014 **Logbook Num :** RC-S-060-109
Employee: Ashley Drochter **Lot Number :** 85621-278
Supplier: Eckert & Ziegler **Solvent :** 2M HNO3
Uncertainty : 2.45 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-232	33930 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1564
Prepared By:	Ashley Drochter
Carrier Conc:	2M HNO3
Reference Date:	09/12/2011
Ampoule Mass (g):	5.06048 g
Uncertainty:	+/- 2.45 %
LogBook No:	RC-S-060-109
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-232		
Prepared By:	Ashley Drochter		
Prep Date:	11/15/2012		
Verification Date:	09/21/2022		
Expiration Date:	09/21/2023		
Primary Code:	1564-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9067 g		
Density(g/mL):	1.0615	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.06048 \text{ g} * 100 \text{ mL}) = 19739.3525 \text{ dpm/mL}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0615 \text{ g/mL}) / (5.06048 \text{ g} * 100 \text{ mL}) = 18595.7160 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/16/2012	Ashley Drochter	2.6179	1000	1564-B	48.6817 dpm/mL	11/13/2013	11/13/2014
07/26/2021	Christina Kimball	.635	500	1564-BB	23.6166 dpm/mL	07/21/2022	07/21/2023
07/26/2021	Christina Kimball	.635	500	1564-BB Spike	23.6166 dpm/mL	07/21/2022	07/21/2023
01/15/2013	Christina Kimball	.265	250	1564-C	19.7115 dpm/mL	01/13/2014	01/13/2015
12/14/2021	Tim Chandler	2.6412	1000	1564-CC	49.115 dpm/mL	12/15/2021	12/15/2022
02/18/2013	Christina Kimball	.116	500	1564-D	4.31421 dpm/mL	02/16/2015	02/13/2016
04/13/2022	Matelon DeFreese	2.7103	1000	1564-DD	50.4 dpm/mL	04/13/2022	04/13/2023
01/02/2014	Gregory Ramsay	2.6936	1000	1564-E	50.08942 dpm/mL	12/10/2014	12/10/2015

09/21/2022	Tim Chandler	2.6897	1000	1564-EE	50.0169 dpm/mL	09/21/2022	09/21/2023
03/17/2014	Christina Kimball	.266	250	1564-F	19.78584 dpm/mL	03/25/2015	03/25/2016
12/10/2014	Tim Chandler	2.6312	1000	1564-G	48.929 dpm/mL	12/10/2014	12/10/2015
07/20/2015	Christina Kimball	.266	250	1564-H	19.78584 dpm/mL	07/25/2016	07/25/2017
11/23/2015	Tim Chandler	2.6117	1000	1564-I	48.5664 dpm/mL	11/23/2015	11/23/2016
01/05/2016	Christina Kimball	.119	500	1564-J	4.4258 dpm/mL	12/27/2017	12/27/2018
01/05/2016	Christina Kimball	.119	500	1564-J Spike	4.4258 dpm/mL	12/27/2017	12/27/2018
09/20/2016	Tim Chandler	2.6389	1000	1564-K	49.0722 dpm/mL	09/18/2017	09/18/2018
12/20/2016	Christina Kimball	.276	250	1564-L	20.52974 dpm/mL	12/21/2017	12/21/2018
06/20/2017	Tim Chandler	2.6611	1000	1564-M	49.4851 dpm/mL	06/19/2018	06/19/2019
01/18/2018	Tim Chandler	2.6367	1000	1564-N	49.0313 dpm/mL	04/25/2018	04/25/2019
04/25/2018	Tim Chandler	2.6505	1000	1564-O	49.2879 dpm/mL	04/25/2018	04/25/2019
08/06/2018	Christina Kimball	.106	500	1564-P	3.9423 dpm/mL	12/19/2019	12/19/2020
08/06/2018	Christina Kimball	.106	500	1564-P Spike	3.9423 dpm/mL	12/19/2019	12/19/2020
12/13/2018	Tim Chandler	2.6502	1000	1564-Q	49.2824 dpm/mL	12/13/2018	12/13/2019
01/08/2019	Christina Kimball	.29	250	1564-R	21.571 dpm/mL	01/08/2019	01/08/2020
01/08/2019	Christina Kimball	.29	250	1564-R Spike	21.571 dpm/mL	01/08/2019	01/08/2020
10/01/2019	Tim Chandler	2.6957	1000	1564-S	50.1285 dpm/mL	10/01/2019	10/01/2020
12/18/2019	Christina Kimball	.307	250	1564-T	22.83554 dpm/mL	12/19/2019	12/19/2020
12/18/2019	Christina Kimball	.307	250	1564-T Spike	22.83554 dpm/mL	12/19/2019	12/19/2020
03/31/2020	Tim Chandler	2.6645	1000	1564-U	49.5483 dpm/mL	03/31/2020	03/31/2021
08/14/2020	Christina Kimball	.111	500	1564-V	4.1282 dpm/mL	08/14/2020	08/14/2021

08/14/2020	Christina Kimball	.111	500	1564-V Spike	4.1282 dpm/mL	08/14/2020	08/14/2021
10/13/2020	Tim Chandler	2.6983	1000	1564-W	50.1768 dpm/mL	10/13/2020	10/13/2021
11/04/2020	Christina Kimball	.315	250	1564-X	23.4306 dpm/mL	11/04/2020	11/04/2021
11/04/2020	Christina Kimball	.315	250	1564-X Spike	23.4306 dpm/mL	11/04/2020	11/04/2021
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Y	51.32232 dpm/mL	03/19/2021	03/19/2022
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Z	51.32232 dpm/mL	03/20/2021	03/20/2022

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-232 Standard 1564-EE

v1.2

Analyst	MXS2
Verification Prep Date	9/21/2022

Tracer Information	
Isotope	U-238
Serial Number	1600-M
Amount of Std. (mL)	0.2
Expiration Date	1/21/2023

Standard Information	
Isotope	U-232
Serial Number	1564-EE
Isotope Halflife	68.9000 Y
Reference Date	9/12/2011
Ref. Act. (dpm/mL)	50.0169
Amount of Std. (mL)	0.2
Standard Prep Date	9/21/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	9/22/2022	4.030	44.73
2	9/22/2022	3.960	43.96
3	9/22/2022	3.920	43.51

Mean Value = 3.970 44.067
Stdev = 0.055677644 0.618021844

pCi 4.0330
Certificate Value* = 0.1114
Two sigma = 0.3970
10 % of Mean = Pass
Rule A (Pass/Fail) 98.44%
% Recovery Pass
Rule B (Pass/Fail) 98.44%
Expiration Date 9/21/2023

dpm/mL
44.7658
1.2360
4.4067
Pass
98.44%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-232 standard 1564-EE using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-238 standard 1600-M and was diluted in a centrifuge tube containing 20 mL of 0.1M HCL diluted to 40 mL with DI water. 0.1 mL of neodymium carrier, 0.5 mL of titanium (III) chloride, and 5 mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-232 were calculated by comparison to U-238 certified values.

9/20/22

15 Apr 3/24/12
1600

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	U-238 (Nat)	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	(4.468 ± 0.005)E+09 years	P.O. No.:	936823 RD	
Catalog No.:	7338	Reference Date:	15-Apr-12 12:00 PST	
Source No.:	1577-71-2	Contained Radioactivity:	1.023 µCi 37.85 kBq	
		(Total Uranium)		

Physical Description:

A. Mass of solution:	7.05210 g in 10 mL flame-sealed ampoule
B. Chemical form:	UO ₂ (NO ₃) ₂ in dilute HNO ₃
C. Carrier content:	None
D. Density:	Approximately 1.41 g/mL @ 20°C

Radioimpurities:

See Technical Data Sheet

Radionuclide Concentration: 0.1451 µCi/g, 5.369 kBq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.


Quality Control

21-Mar-12
Date

EZIP Ref. No.: 1577-71

RC-S-065-030a

ISO 9001 CERTIFIED

Medical Imaging Laboratory

24937 Avenue Tibbitts Valencia, California 91355

Industrial Gauging Laboratory

1800 North Keystone Street Burbank, California 91504

U-238 Natural Technical Data

The U-238 Natural used to prepare your order was taken from Eckert & Ziegler Isotope Products Lot #4550102. It had the following composition as of 9 Feb 10:

<u>Nuclide</u>	<u>Atom %</u>	<u>Activity %</u>
U-234	0.0055	49.086
U-235	0.7200	2.241
U-238	99.274	48.673

Isotopic composition provided by New Brunswick Laboratory.

If you have any question, please contact Eckert & Ziegler Isotope Products Technical Service: (661) 309-1010

Standard Logbook

Serial ID: 1600 **Open/Reference Date:** 15 APR 2012 **Aliquot :** 7.0521 g
Name: Uranium-238 **Received:** 24 MAR 2012 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 26 MAR 2015 **Logbook Num :** RC-S-065-030
Employee: Ashley Drochter **Lot Number :** 4550102
Supplier: Eckert & Ziegler **Solvent :** UO₂(NO₃)₂ in dilute HNO₃
Uncertainty : 1.17 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-238	18.42 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1600
Prepared By:	Ashley Drochter
Carrier Conc:	UO ₂ (NO ₃) ₂ in dilute HNO ₃
Reference Date:	04/15/2012
Ampoule Mass (g):	7.0521 g
Uncertainty:	+/- 1.17 %
LogBook No:	RC-S-065-030
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-238		
Prepared By:	Ashley Drochter		
Prep Date:	09/04/2012		
Verification Date:	05/20/2022		
Expiration Date:	05/20/2023		
Primary Code:	1600-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	6.8204 g		
Density(g/mL):	1.0789	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (7.0521 \text{ g} * 100 \text{ mL}) = 10688.8814 \text{ dpm/mL}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0789 \text{ g/mL}) / (7.0521 \text{ g} * 100 \text{ mL}) = 9907.0626 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
09/04/2012	Ashley Drochter	1.4579	500	1600-B	28.8913 dpm/mL	09/04/2012	09/04/2013
09/11/2012	Ashley Drochter	3.0288	500	1600-C	60.0219 dpm/mL	09/04/2013	09/04/2014
03/27/2014	Tim Chandler	3.0445	500	1600-D	60.3241 dpm/mL	03/18/2015	03/18/2016
07/24/2015	Tim Chandler	3.0177	500	1600-E	59.7931 dpm/mL	07/10/2017	07/10/2018
02/16/2017	Tim Chandler	3.0261	500	1600-F	59.9595 dpm/mL	02/06/2018	02/06/2019
10/10/2017	Christina Kimball	.539	250	1600-G	21.3596 dpm/mL	07/21/2022	07/21/2023

04/02/2018	Tim Chandler	3.0544	500	1600-H	60.5203 dpm/mL	03/29/2019	03/29/2020
06/21/2019	Tim Chandler	3.0536	500	1600-I	60.5044 dpm/mL	06/21/2019	06/21/2020
01/30/2020	Tim Chandler	3.0563	500	1600-J	60.5579 dpm/mL	01/26/2021	01/26/2022
03/13/2020	Christina Kimball	.01222	500	1600-K	.24207 dpm/mL	03/15/2022	03/15/2023
04/23/2021	Tim Chandler	3.0507	500	1600-L	60.4469 dpm/mL	04/26/2021	04/26/2022
01/21/2022	Matelon DeFreese	3.1075	500	1600-M	61.5723941 dpm/mL	01/21/2022	01/21/2023
05/19/2022	Christina Kimball	.01275	500	1600-N	.2527 dpm/mL	05/20/2022	05/20/2023
09/06/2022	Matelon DeFreese	3.1499	500	1600-O	62.412513 dpm/mL	09/06/2022	09/06/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-238 Standard 1600-O

v1.2

Analyst	MXS2
Verification Prep Date	9/6/2022

Tracer Information	
Isotope	U-232
Serial Number	1564-DD
Amount of Std. (mL)	0.2
Expiration Date	4/13/2023

Standard Information	
Isotope	U-238
Serial Number	1600-O
Isotope Half-life	4.4680E+09 Y
Reference Date	4/15/2012
Ref. Act. (dpm/mL)	62.412513
Amount of Std. (mL)	0.2
Standard Prep Date	9/6/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	9/6/2022	5.560	61.72
2	9/6/2022	5.840	64.82
3	9/6/2022	5.440	60.38

Mean Value = 5.613 62.308
Stdev = 0.205264058 2.278431039

pCi
5.6227
62.4125
4.5569
6.2308
Pass
99.83%
Pass

Certificate Value* =
Two sigma =
10 % of Mean =
Rule A (Pass/Fail)
% Recovery
Rule B (Pass/Fail)
Expiration Date

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-238 standard 1600-O using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-232 standard 1564-DD and was diluted in a centrifuge tube containing 15 mL of 0.1M HCl, diluted to 40 mL with DI water. 0.1 mL of neodymium carrier, 0.5 mL of titanium (III) chloride, and 5 mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-238 were calculated by comparison to U-232 certified values.

for
9/7/22

Runlogs

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2333132

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
597531002	SAMPLE	BV1	1219	NOV-03-22 10:13:05	DONE		20-OCT-22 11:20
597531003	SAMPLE	BV1	1220	NOV-03-22 10:13:07	DONE		20-OCT-22 11:20
597533001	SAMPLE	BV1	1222	NOV-03-22 10:13:09	DONE		20-OCT-22 12:25
597533002	SAMPLE	BV1	1223	NOV-03-22 10:13:10	DONE		20-OCT-22 11:33
597533003	SAMPLE	BV1	1225	NOV-03-22 10:13:14	DONE		20-OCT-22 11:41
597533004	SAMPLE	BV1	1226	NOV-03-22 10:13:16	DONE		20-OCT-22 12:25
597533005	SAMPLE	BV1	1229	NOV-03-22 10:13:18	DONE		20-OCT-22 12:25
1205225991	MB	BV1	1230	NOV-03-22 10:13:19	DONE		20-OCT-22 12:27
1205225993	LCSD	BV1	1239	NOV-03-22 10:20:05	DONE		21-OCT-22 12:36
1205225992	LCS	BV1	1234	NOV-03-22 10:20:08	DONE		21-OCT-22 12:09
597531001	SAMPLE	BV1	1215	NOV-05-22 14:56:48	DONE		20-OCT-22 12:24

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2333138

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205226000	LCSD	BV1	1213	NOV-03-22 10:12:56	DONE		20-OCT-22 11:24
597531001	SAMPLE	BV1	1089	NOV-03-22 10:26:51	DONE		13-OCT-22 14:30
597531002	SAMPLE	BV1	1090	NOV-03-22 10:26:51	DONE		13-OCT-22 14:30
597531003	SAMPLE	BV1	1092	NOV-03-22 10:26:51	DONE		13-OCT-22 11:06
597533001	SAMPLE	BV1	1093	NOV-03-22 10:26:51	DONE		13-OCT-22 11:06
597533002	SAMPLE	BV1	1095	NOV-03-22 10:26:52	DONE		13-OCT-22 11:14
597533003	SAMPLE	BV1	1096	NOV-03-22 10:26:52	DONE		13-OCT-22 11:14
597533004	SAMPLE	BV1	1097	NOV-03-22 10:26:52	DONE		13-OCT-22 11:15
597533005	SAMPLE	BV1	1098	NOV-03-22 10:26:52	DONE		13-OCT-22 11:15
1205225998	MB	BV1	1099	NOV-03-22 10:26:52	DONE		13-OCT-22 11:15
1205225999	LCS	BV1	1100	NOV-03-22 10:26:52	DONE		13-OCT-22 11:15

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2333141

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
597531001	SAMPLE	BV1	1002	NOV-03-22 08:50:14	DONE		02-NOV-22 12:09
597531002	SAMPLE	BV1	1003	NOV-03-22 08:50:14	DONE		02-NOV-22 12:09
597531003	SAMPLE	BV1	1004	NOV-03-22 08:50:14	DONE		02-NOV-22 12:09
597533001	SAMPLE	BV1	1005	NOV-03-22 08:50:14	DONE		02-NOV-22 12:09
597533003	SAMPLE	BV1	1007	NOV-03-22 08:50:15	DONE		02-NOV-22 12:10
597533004	SAMPLE	BV1	1008	NOV-03-22 08:50:15	DONE		02-NOV-22 12:10
597533005	SAMPLE	BV1	1009	NOV-03-22 08:50:15	DONE		02-NOV-22 12:10
1205226004	MB	BV1	1010	NOV-03-22 08:50:15	DONE		02-NOV-22 12:10
1205226005	LCS	BV1	1011	NOV-03-22 08:50:15	DONE		02-NOV-22 12:10
1205226006	LCSD	BV1	1012	NOV-03-22 08:50:15	DONE		02-NOV-22 12:11
597533002	SAMPLE	BV1	1113	NOV-03-22 09:35:17	DONE		14-OCT-22 11:26

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2333142

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
597531001	SAMPLE	MP2	1037	NOV-03-22 12:02:40	DONE		03-NOV-22 11:32
597531002	SAMPLE	MP2	1038	NOV-03-22 12:02:40	DONE		03-NOV-22 11:32
597531003	SAMPLE	MP2	1039	NOV-03-22 12:02:40	DONE		03-NOV-22 11:32
597533001	SAMPLE	MP2	1040	NOV-03-22 12:02:40	DONE		03-NOV-22 11:32
597533002	SAMPLE	MP2	1041	NOV-03-22 12:02:40	DONE		03-NOV-22 11:32
597533004	SAMPLE	MP2	1043	NOV-03-22 12:02:41	DONE		03-NOV-22 11:33
1205226007	MB	MP2	1045	NOV-03-22 12:02:41	DONE		03-NOV-22 11:33
1205226008	LCS	MP2	1047	NOV-03-22 12:02:41	DONE		03-NOV-22 11:33
1205226009	LCSD	MP2	1048	NOV-03-22 12:02:41	DONE		03-NOV-22 11:33
597533003	SAMPLE	MP2	1031	NOV-05-22 15:19:43	DONE		03-NOV-22 11:31
597533005	SAMPLE	MP2	1033	NOV-05-22 15:19:43	DONE		03-NOV-22 11:31

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2333147

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
597531001	SAMPLE	BV1	1121	NOV-04-22 08:35:00	DONE		14-OCT-22 11:59
597531002	SAMPLE	BV1	1122	NOV-04-22 08:35:02	DONE		14-OCT-22 11:27
597533001	SAMPLE	BV1	1124	NOV-04-22 08:35:07	DONE		14-OCT-22 12:26
597533002	SAMPLE	BV1	1139	NOV-04-22 08:35:11	DONE		17-OCT-22 09:40
597533004	SAMPLE	BV1	1141	NOV-04-22 08:35:15	DONE		17-OCT-22 09:40
597533003	SAMPLE	BV1	1140	NOV-04-22 08:35:20	DONE		17-OCT-22 09:40
597533005	SAMPLE	BV1	1213	NOV-04-22 08:41:19	DONE		20-OCT-22 11:24
1205226018	MB	BV1	1215	NOV-04-22 08:41:21	DONE		20-OCT-22 12:24
1205226019	LCS	BV1	1217	NOV-04-22 08:41:24	DONE		20-OCT-22 12:26
1205226020	LCSD	BV1	1218	NOV-04-22 08:41:25	DONE		20-OCT-22 12:24
597531003	SAMPLE	BV1	1213	NOV-05-22 10:14:25	DONE		20-OCT-22 11:24

Gamma Spectroscopy Raw Data

Batch 2333342 Check-list

This check-list was completed on 01-NOV-22 by Tim Winters

This batch was reviewed by Spencer Collins on 01-NOV-22 and Tim Winters on 01-NOV-22.

Batch ID: 2333342

Product: GSCGAMMF

Description: Gamma Spec Filter RAD A-013

#	Criteria	Yes	No	Comments
Preparation Information				
1	Did any sample(s) require dilution?		No	
2	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
3	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
4	Are instrument source checks within limits?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were any additional radionuclides added that were not requested by the client?		No	
7	Were all the samples prepared/analyzed within the required holding time period?	Yes		
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Gamma Spectroscopy

Batch ID: 2333342
Analyst: Rebekah Futch (RXF2)
Method: DOE HASL 300, 4.5.2.3/Ga-01-R
Lab SOP: GL-RAD-A-013 REV# 27
Instrument: No instrument-manual method

Due Dates for Lab: 02-NOV-2022			Package: 03-NOV-2022	SDG: 03-NOV-2022	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205226446	78962-278	1298	1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	597531001	31-OCT-2022	20	200	0.73727
2	597531002	31-OCT-2022	20	200	0.74152
3	597531003	31-OCT-2022	20	200	0.75582
4	597533001	31-OCT-2022	20	200	0.77722
5	597533002	31-OCT-2022	20	200	0.77221
6	597533003	31-OCT-2022	20	200	0.75777
7	597533004	31-OCT-2022	20	200	0.76168
8	597533005	31-OCT-2022	20	200	0.75717
9	1205226444 MB	31-OCT-2022	20		0.77722
10	1205226445 DUP (597531001)	31-OCT-2022	20	200	0.73727
11	1205226446 LCS	31-OCT-2022	20		0.77722

Reagent/Solvent Lot ID	Description	Amount	Comments:
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VAX/VMS Nuclide Identification Report Generated 31-OCT-2022 10:16:13.79

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531001.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM03.CNF;650
Background date    : 30-OCT-2022 10:39:18
Sample date       : 26-SEP-2022 08:18:00 Acquisition date : 31-OCT-2022 08:15:23
Sample ID        : G597531001 Sample quantity : 7.37270E-01 FILTER
Detector name    : GAM03 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:00.47 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : RXF2
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID        : 2333342 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	110.54	21	120	1.37	220.57	214	12	2.92E-03	106.6	
2	2	128.75	36	47	1.39	256.97	251	24	5.05E-03	35.7	1.57E+00
3	2	131.53	32	52	1.59	262.55	251	24	4.44E-03	48.4	
4	2	134.75	26	45	1.60	268.97	251	24	3.58E-03	59.7	
5	0	139.46	22	34	1.40	278.40	275	7	3.06E-03	48.5	
6	0	143.65*	22	63	1.64	286.78	282	10	3.00E-03	80.3	
7	0	185.75*	1	72	1.09	370.97	366	9	1.89E-04	*****	
8	1	238.92*	12	50	1.63	477.30	473	15	1.64E-03	135.2	7.97E-01
9	1	241.77	26	61	1.48	483.00	473	15	3.58E-03	58.0	
10	0	300.50	14	28	0.93	600.45	597	6	1.91E-03	66.8	
11	0	353.42*	12	48	3.51	706.29	696	15	1.73E-03	133.6	
12	0	369.12	24	39	4.37	737.68	730	14	3.38E-03	57.8	
13	0	511.17*	5	53	1.58	1021.79	1014	17	6.31E-04	474.0	
14	0	531.16	10	15	2.84	1061.77	1054	10	1.43E-03	76.9	
15	0	749.23	11	3	1.73	1497.97	1494	7	1.48E-03	42.2	
16	0	795.18	16	2	0.83	1589.90	1585	10	2.18E-03	31.3	
17	0	804.28	9	12	0.88	1608.09	1601	11	1.26E-03	84.5	
18	0	809.30	18	7	2.21	1618.14	1612	13	2.43E-03	38.4	
19	0	883.12	10	9	3.33	1765.82	1756	14	1.37E-03	75.9	
20	0	969.86	20	5	1.74	1939.34	1933	12	2.72E-03	33.5	
21	0	1002.52*	1	12	0.86	2004.68	1995	12	1.80E-04	636.2	
22	0	1075.91	12	7	5.06	2151.52	2146	13	1.65E-03	53.3	
23	0	1121.27	18	9	2.34	2242.29	2233	17	2.43E-03	45.0	
24	0	1148.16	6	3	0.67	2296.08	2291	8	7.72E-04	74.2	
25	0	1353.19	9	7	0.50	2706.33	2697	14	1.25E-03	70.7	
26	0	1461.82*	9	4	2.98	2923.71	2913	15	1.26E-03	68.8	
27	0	1526.74	4	5	0.59	3053.63	3046	10	5.56E-04	115.9	
28	0	1554.53	8	0	1.38	3109.25	3105	8	1.11E-03	35.4	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 31-OCT-2022 10:16:18

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531001.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 26-SEP-2022 08:18:00	Acquisition date	: 31-OCT-2022 08:15:23
Sample ID	: G597531001	Sample quantity	: 0.73727 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA3	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.47 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	9	10.66*	8.156E-01	5.318E+01	5.318E+01	137.58
CO-58	810.76	18	99.45*	1.348E+00	6.647E+00	9.364E+00	76.77
GE-68	1077.34	12	3.22*	1.054E+00	1.785E+02	1.952E+02	106.51
RB-86	1077.00	12	8.64*	1.054E+00	6.651E+01	2.448E+02	106.51
TE-125M	109.28	21	0.27*	4.014E+00	9.865E+02	1.506E+03	213.17
CE-144	80.12	-----	1.36	2.720E+00	-----	Line Not Found	-----
	133.52	26	11.09*	4.196E+00	2.818E+01	3.069E+01	119.35
RA-224	240.99	26	4.10*	3.270E+00	9.779E+01	1.013E+02	115.91
RA-226	186.21	1	3.59*	3.813E+00	5.054E+00	5.054E+00	2881.34
PA-231	283.69	-----	1.70	2.940E+00	-----	Line Not Found	-----
	301.36	14	5.35*	2.826E+00	4.638E+01	4.638E+01	133.67
U-235	143.76	22	10.96*	4.171E+00	2.405E+01	2.405E+01	160.58
	163.33	-----	5.08	4.031E+00	-----	Line Not Found	-----
	185.72	1	57.20	3.813E+00	3.172E-01	3.172E-01	2881.34
	205.31	-----	5.01	3.614E+00	-----	Line Not Found	-----
ANH-511	511.00	5	100.00*	1.937E+00	1.194E+00	1.194E+00	948.09

Flag: "*" = Keyline

```

*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                       *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531001.CNF;1  *
* Acquisition date   : 31-OCT-2022 08:15:23 Sensitivity      : 3.000          *
* Detector ID        : GAM03 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 02:00:00.47 Half life ratio : *****          *
* Sample date        : 26-SEP-2022 08:18:00 Analyst initials: RXF2       *
* Sample ID          : G597531001 Sample Quantity : 7.3727E-01 FILTER *
* Batch Number       : 2333342 Wet Weight : 0.00000         *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                       *
* Eff. Cal. date     : 20-APR-2022 11:51:08 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
K-40	5.318E+01	7.170E+01	7.572E+01
CO-58	9.364E+00	7.045E+00	1.095E+01
GE-68	1.952E+02	2.038E+02	3.124E+02
RB-86	2.448E+02	2.555E+02	3.568E+02
TE-125M	1.506E+03	3.147E+03	2.530E+03
CE-144	3.069E+01	3.589E+01	3.807E+01
RA-224	1.013E+02	1.150E+02	1.310E+02
RA-226	5.054E+00	1.427E+02	1.349E+02
PA-231	4.638E+01	6.076E+01	1.182E+02
U-235	2.405E+01	3.784E+01	3.690E+01
ANH-511	1.194E+00	1.110E+01	5.458E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	3.797E+01		5.754E+01	1.117E+02	NOT IDENT.
NA-22	-2.392E+00		3.876E+00	7.000E+00	NOT IDENT.
NA-24	0.000E+00		2.549E+17	0.000E+00	SHORT HLIF
AL-26	-4.645E+00		4.553E+00	6.474E+00	NOT IDENT.
SC-46	-1.524E-01		4.367E+00	8.681E+00	FAIL ABUN
V-48	-4.516E+00		1.786E+01	3.320E+01	NOT IDENT.
CR-51	1.171E+00		7.905E+01	1.435E+02	NOT IDENT.
MN-52	9.329E+01		3.619E+02	7.787E+02	NOT IDENT.
MN-54	1.280E+00		4.479E+00	9.000E+00	NOT IDENT.
CO-56	-1.580E+00		6.348E+00	1.160E+01	NOT IDENT.
CO-57	1.954E-01		3.291E+00	5.806E+00	NOT IDENT.
NI-57	0.000E+00		7.314E+07	0.000E+00	SHORT HLIF
FE-59	3.569E+00		1.191E+01	2.505E+01	NOT IDENT.
CO-60	3.954E-01		5.239E+00	1.065E+01	NOT IDENT.
ZN-65	2.727E-02		9.478E+00	1.646E+01	NOT IDENT.
CU-67	0.000E+00		1.307E+05	0.000E+00	SHORT HLIF
AS-73	1.131E+02		2.108E+02	3.910E+02	NOT IDENT.
AS-74	-8.839E-01		2.653E+01	5.048E+01	NOT IDENT.
SE-75	-1.638E+00		5.724E+00	1.019E+01	FAIL ABUN

BR-77	0.000E+00	5.753E+05	0.000E+00	SHORT HLIF
SR-82	-6.599E+00	6.854E+01	1.302E+02	NOT IDENT.
RB-83	8.241E+00	9.415E+00	2.028E+01	NOT IDENT.
RB-84	2.021E+00	1.205E+01	2.407E+01	NOT IDENT.
KR-85	2.123E+03	1.100E+03	2.283E+03	NOT IDENT.
SR-85	1.375E+01	7.122E+00	1.478E+01	NOT IDENT.
Y-88	-1.511E+00	2.894E+00	5.274E+00	NOT IDENT.
Y-91	1.534E+03	2.246E+03	5.288E+03	NOT IDENT.
NB-94	1.253E+00	4.267E+00	8.435E+00	NOT IDENT.
NB-95	2.347E+00	5.491E+00	1.136E+01	NOT IDENT.
NB-95M	-5.682E+00	1.700E+01	2.676E+01	NOT IDENT.
TC-95M	-4.507E+00	6.799E+00	1.071E+01	NOT IDENT.
ZR-95	1.074E+00	1.006E+01	1.986E+01	NOT IDENT.
MO-99	0.000E+00	1.927E+05	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	9.509E+40	0.000E+00	SHORT HLIF
RH-101	1.766E+00	3.579E+00	6.427E+00	NOT IDENT.
RH-102M	-3.649E+00	4.020E+00	6.271E+00	NOT IDENT.
RU-103	1.836E+00	6.088E+00	1.241E+01	NOT IDENT.
RH-106	-4.448E+01	3.618E+01	5.668E+01	NOT IDENT.
RU-106	-4.448E+01	3.618E+01	5.668E+01	NOT IDENT.
AG-108M	-2.674E+00	3.746E+00	6.093E+00	NOT IDENT.
CD-109	7.578E+01	8.922E+01	1.677E+02	NOT IDENT.
AG-110	-5.351E+01	9.380E+01	1.661E+02	NOT IDENT.
AG-110M	2.072E+00	5.539E+00	1.075E+01	NOT IDENT.
IN-111	0.000E+00	1.812E+04	0.000E+00	SHORT HLIF
SN-113	2.083E+00	5.396E+00	1.048E+01	NOT IDENT.
IN-114M	-3.160E+00	2.829E+01	4.928E+01	NOT IDENT.
CD-115	0.000E+00	6.066E+05	0.000E+00	SHORT HLIF
SN-117M	-8.428E+00	1.742E+01	2.841E+01	NOT IDENT.
SB-122	0.000E+00	3.568E+04	0.000E+00	SHORT HLIF
I-123	0.000E+00	4.243E+19	0.000E+00	SHORT HLIF
TE-123M	-2.392E+00	3.660E+00	5.853E+00	NOT IDENT.
SB-124	-3.674E-01	1.205E+01	2.581E+01	NOT IDENT.
SB-125	-1.694E+01	1.345E+01	1.868E+01	NOT IDENT.
I-126	1.000E+01	7.821E+01	1.527E+02	NOT IDENT.
SB-126	-1.138E+01	4.752E+01	8.905E+01	NOT IDENT.
SN-126	6.627E+00	8.582E+00	1.601E+01	NOT IDENT.
SB-127	9.954E+02	4.965E+03	1.005E+04	NOT IDENT.
TE-129	-4.370E+01	1.009E+02	1.704E+02	NOT IDENT.
I-131	-5.922E+00	8.106E+01	1.309E+02	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	5.956E+03	0.000E+00	SHORT HLIF
BA-133	-9.648E-01	5.680E+00	8.957E+00	NOT IDENT.
I-133	0.000E+00	7.138E+12	0.000E+00	SHORT HLIF
CS-134	7.071E+00	4.341E+00	9.658E+00	FAIL ABUN
I-135	0.000E+00	4.244E+39	0.000E+00	SHORT HLIF
CS-136	-6.381E+00	2.973E+01	5.610E+01	NOT IDENT.
BA-137M	2.073E+00	4.586E+00	9.243E+00	NOT IDENT.
CS-137	2.190E+00	4.845E+00	9.764E+00	NOT IDENT.
LA-138	-4.865E+00	8.105E+00	1.438E+01	NOT IDENT.
CE-139	-2.749E-01	3.845E+00	7.063E+00	NOT IDENT.
BA-140	8.615E+01	1.049E+02	2.185E+02	NOT IDENT.
LA-140	-9.267E+00	2.590E+01	5.043E+01	NOT IDENT.
CE-141	-7.509E+00	1.280E+01	1.914E+01	NOT IDENT.
CE-143	0.000E+00	3.339E+08	0.000E+00	SHORT HLIF
PM-144	-1.835E-01	4.513E+00	8.564E+00	NOT IDENT.
PR-144	-1.388E+01	3.413E+02	6.476E+02	NOT IDENT.
PM-146	-2.228E+00	5.605E+00	9.543E+00	NOT IDENT.
ND-147	1.939E+02	2.922E+02	4.613E+02	FAIL ABUN
PM-147	-9.626E+03	9.141E+04	1.589E+05	NOT IDENT.
PM-149	0.000E+00	5.477E+06	0.000E+00	SHORT HLIF
EU-152	-1.920E+00	1.089E+01	1.952E+01	FAIL ABUN
GD-153	-3.820E+00	1.336E+01	2.140E+01	NOT IDENT.
EU-154	-6.970E+00	1.080E+01	1.933E+01	NOT IDENT.
EU-155	-5.049E+00	1.404E+01	2.158E+01	NOT IDENT.
TB-160	-2.945E+00	1.992E+01	3.282E+01	NOT IDENT.
HO-166M	2.236E+00	6.105E+00	1.272E+01	FAIL ABUN
TM-171	5.731E+01	3.848E+03	6.801E+03	NOT IDENT.
LU-176	1.988E+00	3.246E+00	6.301E+00	NOT IDENT.
LU-177	-3.063E+02	1.033E+03	1.845E+03	NOT IDENT.
HF-181	4.578E-01	8.691E+00	1.562E+01	FAIL ABUN
W-181	4.554E-01	4.246E+01	7.450E+01	NOT IDENT.
TA-182	3.085E+00	1.889E+01	4.028E+01	FAIL ABUN
RE-183	5.780E+00	4.474E+01	7.935E+01	NOT IDENT.
RE-184	-7.240E-01	1.837E+01	3.608E+01	NOT IDENT.
RE-188	2.272E+01	2.239E+01	4.482E+01	NOT IDENT.
W-188	-1.880E+02	1.133E+03	2.021E+03	NOT IDENT.
OS-191	8.071E+01	5.653E+01	9.006E+01	FAIL ABUN

IR-192	-6.274E-01	5.344E+00	9.580E+00	NOT IDENT.
PB-201	0.000E+00	5.401E+27	0.000E+00	SHORT HLIF
TL-201	0.000E+00	7.320E+04	0.000E+00	SHORT HLIF
TL-202	5.363E+00	2.604E+01	4.860E+01	NOT IDENT.
HG-203	4.208E+00	5.787E+00	1.142E+01	NOT IDENT.
PB-203	0.000E+00	2.603E+05	0.000E+00	SHORT HLIF
TL-204	3.269E+02	6.858E+02	1.244E+03	NOT IDENT.
BI-207	2.630E+00	5.648E+00	1.198E+01	NOT IDENT.
TL-208	2.797E+00	5.362E+00	1.075E+01	NOT IDENT.
PB-210	6.217E+02	9.312E+02	1.754E+03	NOT IDENT.
BI-211	1.123E+01	2.949E+01	5.319E+01	NOT IDENT.
PB-211	-1.556E+01	9.016E+01	1.595E+02	NOT IDENT.
BI-212	5.916E+01	5.606E+01	1.256E+02	NOT IDENT.
PB-212	4.341E+00	1.151E+01	1.686E+01	FAIL ABUN
BI-213	-9.925E-01	1.320E+01	2.364E+01	NOT IDENT.
BI-214	8.481E-01	1.241E+01	2.065E+01	FAIL ABUN
PB-214	7.068E+00	1.850E+01	1.893E+01	FAIL ABUN
RN-219	3.395E+00	5.084E+01	9.286E+01	NOT IDENT.
FR-221	4.111E+00	2.366E+01	4.419E+01	NOT IDENT.
RA-223	1.238E+01	8.842E+01	1.614E+02	FAIL ABUN
AC-225	4.663E+01	2.685E+02	5.013E+02	NOT IDENT.
AC-227	1.289E+01	3.099E+01	5.884E+01	FAIL ABUN
TH-227	1.289E+01	3.099E+01	5.884E+01	FAIL ABUN
AC-228	-6.689E+00	1.784E+01	3.431E+01	FAIL ABUN
RA-228	-6.689E+00	1.784E+01	3.431E+01	FAIL ABUN
TH-228	4.341E+00	1.151E+01	1.686E+01	FAIL ABUN
TH-229	-9.573E+00	5.994E+01	1.088E+02	NOT IDENT.
TH-230	3.619E+02	1.621E+03	2.873E+03	NOT IDENT.
TH-231	4.966E+01	5.981E+01	1.061E+02	NOT IDENT.
TH-232	5.840E+01	3.827E+03	6.035E+03	FAIL ABUN
PA-233	9.542E-01	7.535E+00	1.400E+01	FAIL ABUN
PA-234	1.559E+01	3.284E+01	6.955E+01	FAIL ABUN
PA-234M	7.023E+01	8.758E+02	1.243E+03	FAIL ABUN
TH-234	-1.909E+02	2.815E+02	4.164E+02	NOT IDENT.
U-234	7.331E+03	1.337E+04	2.490E+04	NOT IDENT.
NP-237	9.542E-01	7.535E+00	1.400E+01	FAIL ABUN
NP-238	0.000E+00	1.319E+06	0.000E+00	SHORT HLIF
U-238	-1.909E+02	2.815E+02	4.164E+02	NOT IDENT.
NP-239	-1.913E+01	2.601E+01	4.607E+01	NOT IDENT.
AM-241	1.189E+01	2.569E+01	4.724E+01	NOT IDENT.
AM-242	-1.145E+02	8.858E+01	1.410E+02	NOT IDENT.
AM-243	-4.716E-01	8.206E+00	1.341E+01	NOT IDENT.
CM-243	-3.739E+00	1.201E+01	2.216E+01	NOT IDENT.
BK-247	-3.382E+00	9.099E+00	1.604E+01	NOT IDENT.
CM-247	2.396E+00	4.455E+00	8.658E+00	NOT IDENT.
CF-249	-3.765E+00	4.362E+00	6.965E+00	NOT IDENT.
CF-251	-4.734E+00	1.306E+01	2.351E+01	NOT IDENT.
CF-252	-1.321E+04	2.147E+04	3.858E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.98	37	87	0.96	127.47	121	10	5.07E-03	50.7	
2	0	93.01	156	120	1.34	185.52	179	13	2.17E-02	16.5	
3	0	110.54	21	120	1.37	220.57	214	12	2.92E-03	106.6	
4	2	128.75	36	47	1.39	256.97	251	24	5.05E-03	35.7	1.57E+00
5	2	131.53	32	52	1.59	262.55	251	24	4.44E-03	48.4	
6	2	134.75	26	45	1.60	268.97	251	24	3.58E-03	59.7	
7	0	139.46	22	34	1.40	278.40	275	7	3.06E-03	48.5	
8	0	143.65	42	63	1.64	286.78	282	10	5.84E-03	38.4	
9	0	185.75	99	72	1.09	370.97	366	9	1.37E-02	18.4	
10	1	238.92	58	50	1.63	477.30	473	15	8.04E-03	24.7	7.97E-01
11	1	241.77	26	61	1.48	483.00	473	15	3.58E-03	58.0	
12	0	300.50	14	28	0.93	600.45	597	6	1.91E-03	66.8	
13	0	353.42	26	48	3.51	706.29	696	15	3.64E-03	61.2	
14	0	369.12	24	39	4.37	737.68	730	14	3.38E-03	57.8	
15	0	511.17	146	53	1.58	1021.79	1014	17	2.03E-02	13.9	
16	0	531.16	10	15	2.84	1061.77	1054	10	1.43E-03	76.9	
17	0	749.23	11	3	1.73	1497.97	1494	7	1.48E-03	42.2	
18	0	795.18	16	2	0.83	1589.90	1585	10	2.18E-03	31.3	
19	0	804.28	9	12	0.88	1608.09	1601	11	1.26E-03	84.5	
20	0	809.30	18	7	2.21	1618.14	1612	13	2.43E-03	38.4	
21	0	883.12	10	9	3.33	1765.82	1756	14	1.37E-03	75.9	
22	0	969.86	20	5	1.74	1939.34	1933	12	2.72E-03	33.5	
23	0	1002.52	9	12	0.86	2004.68	1995	12	1.32E-03	79.7	
24	0	1075.91	12	7	5.06	2151.52	2146	13	1.65E-03	53.3	
25	0	1121.27	18	9	2.34	2242.29	2233	17	2.43E-03	45.0	
26	0	1148.16	6	3	0.67	2296.08	2291	8	7.72E-04	74.2	
27	0	1353.19	9	7	0.50	2706.33	2697	14	1.25E-03	70.7	
28	0	1461.82	16	4	2.98	2923.71	2913	15	2.16E-03	37.6	
29	0	1526.74	4	5	0.59	3053.63	3046	10	5.56E-04	115.9	
30	0	1554.53	8	0	1.38	3109.25	3105	8	1.11E-03	35.4	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	9	10.66*	8.156E-01	5.318E+01	5.318E+01	137.58
CO-58	810.76	18	99.45*	1.348E+00	6.647E+00	9.364E+00	76.77
GE-68	1077.34	12	3.22*	1.054E+00	1.785E+02	1.952E+02	106.51
RB-86	1077.00	12	8.64*	1.054E+00	6.651E+01	2.448E+02	106.51
TE-125M	109.28	21	0.27*	4.014E+00	9.865E+02	1.506E+03	213.17
CE-144	80.12	-----	1.36	2.720E+00	-----	Line Not Found	-----
	133.52	26	11.09*	4.196E+00	2.818E+01	3.069E+01	119.35
RA-224	240.99	26	4.10*	3.270E+00	9.779E+01	1.013E+02	115.91
RA-226	186.21	1	3.59*	3.813E+00	5.054E+00	5.054E+00	2881.34
PA-231	283.69	-----	1.70	2.940E+00	-----	Line Not Found	-----
	301.36	14	5.35*	2.826E+00	4.638E+01	4.638E+01	133.67
U-235	143.76	22	10.96*	4.171E+00	2.405E+01	2.405E+01	160.58
	163.33	-----	5.08	4.031E+00	-----	Line Not Found	-----
	185.72	1	57.20	3.813E+00	3.172E-01	3.172E-01	2881.34
	205.31	-----	5.01	3.614E+00	-----	Line Not Found	-----
ANH-511	511.00	5	100.00*	1.937E+00	1.194E+00	1.194E+00	948.09

Flag: "*" = Keyline

Total number of lines in spectrum 28
Number of unidentified lines 7
Number of lines tentatively identified by NID 21 75.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
K-40	1.25E+09Y	1.00	5.318E+01	5.318E+01	7.316E+01	137.58	
CO-58	70.86D	1.41	6.647E+00	9.364E+00	7.189E+00	76.77	
GE-68	270.95D	1.09	1.785E+02	1.952E+02	2.079E+02	106.51	
RB-86	18.64D	3.68	6.651E+01	2.448E+02	2.607E+02	106.51	
TE-125M	57.40D	1.53	9.865E+02	1.506E+03	3.211E+03	213.17	
CE-144	284.91D	1.09	2.818E+01	3.069E+01	3.662E+01	119.35	
RA-224	1.91Y	1.04	9.779E+01	1.013E+02	1.174E+02	115.91	
RA-226	1600.00Y	1.00	5.054E+00	5.054E+00	145.6E+00	2881.34	
PA-231	3.28E+04Y	1.00	4.638E+01	4.638E+01	6.200E+01	133.67	
U-235	7.04E+08Y	1.00	2.405E+01	2.405E+01	3.862E+01	160.58	
ANH-511	1.00E+09Y	1.00	1.194E+00	1.194E+00	11.32E+00	948.09	
Total Activity :			1.494E+03	2.217E+03			

Grand Total Activity : 1.494E+03 2.217E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
2	128.75	36	47	1.39	256.97	251	24	5.05E-03	71.5	4.19E+00	T
2	131.53	32	52	1.59	262.55	251	24	4.44E-03	96.9	4.20E+00	T
0	139.46	22	34	1.40	278.40	275	7	3.06E-03	97.0	4.19E+00	T
1	238.92	12	50	1.63	477.30	473	15	1.64E-03	****	3.29E+00	T
0	353.42	12	48	3.51	706.29	696	15	1.73E-03	****	2.52E+00	T
0	369.12	24	39	4.37	737.68	730	14	3.38E-03	****	2.45E+00	
0	531.16	10	15	2.84	1061.77	1054	10	1.43E-03	****	1.88E+00	T
0	749.23	11	3	1.73	1497.97	1494	7	1.48E-03	84.3	1.44E+00	
0	795.18	16	2	0.83	1589.90	1585	10	2.18E-03	62.6	1.37E+00	T
0	804.28	9	12	0.88	1608.09	1601	11	1.26E-03	****	1.35E+00	
0	883.12	10	9	3.33	1765.82	1756	14	1.37E-03	****	1.25E+00	T
0	969.86	20	5	1.74	1939.34	1933	12	2.72E-03	67.0	1.15E+00	T
0	1002.52	1	12	0.86	2004.68	1995	12	1.80E-04	****	1.12E+00	T
0	1121.27	18	9	2.34	2242.29	2233	17	2.43E-03	90.1	1.02E+00	T
0	1148.16	6	3	0.67	2296.08	2291	8	7.72E-04	****	9.96E-01	
0	1353.19	9	7	0.50	2706.33	2697	14	1.25E-03	****	8.67E-01	
0	1526.74	4	5	0.59	3053.63	3046	10	5.56E-04	****	7.90E-01	
0	1554.53	8	0	1.38	3109.25	3105	8	1.11E-03	70.7	7.80E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531001.CNF;1  *
* Acquisition date   : 31-OCT-2022 08:15:23 Sensitivity      : 3.000          *
* Detector ID        : GAM03 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000      *
* Elapsed real time  : 0 02:00:00.47 Half life ratio  : *****          *
* Sample date        : 26-SEP-2022 08:18:00 Nuclide Library : LIQUID      *
* Sample ID          : G597531001 Analyst initials:  RXF2          *
* Batch Number       : 2333342 Sample Quantity  : 7.3727E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight       : 0.00000        *
*                                     Dry Weight    : 0.00000        *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 20-APR-2022 11:51:08 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
K-40	2.994E+01
CO-58	4.750E+00
GE-68	1.340E+02
RB-86	1.506E+02
TE-125M	1.168E+03
CE-144	1.743E+01
RA-224	6.020E+01
RA-226	6.246E+01
PA-231	5.455E+01
U-235	1.695E+01
ANH-511	2.374E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	5.074E+01	NOT IDENT.
NA-22	2.724E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.265E+00	NOT IDENT.
SC-46	3.601E+00	FAIL ABUN
V-48	1.384E+01	NOT IDENT.
CR-51	6.559E+01	NOT IDENT.
MN-52	3.253E+02	NOT IDENT.
MN-54	3.934E+00	NOT IDENT.
CO-56	5.077E+00	NOT IDENT.
CO-57	2.693E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
FE-59	1.050E+01	NOT IDENT.
CO-60	4.534E+00	NOT IDENT.
ZN-65	6.760E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
AS-73	1.810E+02	NOT IDENT.
AS-74	2.260E+01	NOT IDENT.
SE-75	4.631E+00	FAIL ABUN
BR-77	0.000E+00	SHORT HLIF

SR-82	5.661E+01	NOT IDENT.
RB-83	9.084E+00	NOT IDENT.
RB-84	1.037E+01	NOT IDENT.
KR-85	1.059E+03	NOT IDENT.
SR-85	6.853E+00	NOT IDENT.
Y-88	1.400E+00	NOT IDENT.
Y-91	2.225E+03	NOT IDENT.
NB-94	3.763E+00	NOT IDENT.
NB-95	4.966E+00	NOT IDENT.
NB-95M	1.216E+01	NOT IDENT.
TC-95M	4.912E+00	NOT IDENT.
ZR-95	8.634E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.968E+00	NOT IDENT.
RH-102M	2.776E+00	NOT IDENT.
RU-103	5.496E+00	NOT IDENT.
RH-106	2.391E+01	NOT IDENT.
RU-106	2.391E+01	NOT IDENT.
AG-108M	2.699E+00	NOT IDENT.
CD-109	7.779E+01	NOT IDENT.
AG-110	7.250E+01	NOT IDENT.
AG-110M	4.538E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	4.682E+00	NOT IDENT.
IN-114M	2.273E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	1.304E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.680E+00	NOT IDENT.
SB-124	9.967E+00	NOT IDENT.
SB-125	8.269E+00	NOT IDENT.
I-126	6.769E+01	NOT IDENT.
SB-126	3.837E+01	NOT IDENT.
SN-126	7.423E+00	NOT IDENT.
SB-127	4.360E+03	NOT IDENT.
TE-129	7.644E+01	NOT IDENT.
I-131	5.845E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	4.036E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	4.222E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	2.300E+01	NOT IDENT.
BA-137M	4.140E+00	NOT IDENT.
CS-137	4.373E+00	NOT IDENT.
LA-138	5.920E+00	NOT IDENT.
CE-139	3.277E+00	NOT IDENT.
BA-140	9.911E+01	NOT IDENT.
LA-140	1.888E+01	NOT IDENT.
CE-141	8.853E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
PM-144	3.798E+00	NOT IDENT.
PR-144	2.872E+02	NOT IDENT.
PM-146	4.266E+00	NOT IDENT.
ND-147	2.052E+02	FAIL ABUN
PM-147	7.352E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.751E+00	FAIL ABUN
GD-153	9.985E+00	NOT IDENT.
EU-154	7.489E+00	NOT IDENT.
EU-155	9.943E+00	NOT IDENT.
TB-160	1.386E+01	NOT IDENT.
HO-166M	5.512E+00	FAIL ABUN
TM-171	3.127E+03	NOT IDENT.
LU-176	2.888E+00	NOT IDENT.
LU-177	8.514E+02	NOT IDENT.
HF-181	7.063E+00	FAIL ABUN
W-181	3.437E+01	NOT IDENT.
TA-182	1.680E+01	FAIL ABUN
RE-183	3.667E+01	NOT IDENT.
RE-184	1.512E+01	NOT IDENT.
RE-188	2.090E+01	NOT IDENT.
W-188	9.271E+02	NOT IDENT.
OS-191	4.205E+01	FAIL ABUN
IR-192	4.367E+00	NOT IDENT.

PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF
TL-202	2.180E+01	NOT IDENT.
HG-203	5.236E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	5.780E+02	NOT IDENT.
BI-207	5.123E+00	NOT IDENT.
TL-208	4.898E+00	NOT IDENT.
PB-210	8.126E+02	NOT IDENT.
BI-211	2.450E+01	NOT IDENT.
PB-211	7.179E+01	NOT IDENT.
BI-212	5.558E+01	NOT IDENT.
PB-212	7.939E+00	FAIL ABUN
BI-213	1.059E+01	NOT IDENT.
BI-214	9.438E+00	FAIL ABUN
PB-214	8.704E+00	FAIL ABUN
RN-219	4.191E+01	NOT IDENT.
FR-221	2.037E+01	NOT IDENT.
RA-223	7.430E+01	FAIL ABUN
AC-225	2.311E+02	NOT IDENT.
AC-227	2.712E+01	FAIL ABUN
TH-227	2.712E+01	FAIL ABUN
AC-228	1.494E+01	FAIL ABUN
RA-228	1.494E+01	FAIL ABUN
TH-228	7.939E+00	FAIL ABUN
TH-229	5.026E+01	NOT IDENT.
TH-230	1.333E+03	NOT IDENT.
TH-231	4.957E+01	NOT IDENT.
TH-232	2.832E+03	FAIL ABUN
PA-233	6.352E+00	FAIL ABUN
PA-234	2.992E+01	FAIL ABUN
PA-234M	5.488E+02	FAIL ABUN
TH-234	1.947E+02	NOT IDENT.
U-234	1.150E+04	NOT IDENT.
NP-237	6.352E+00	FAIL ABUN
NP-238	0.000E+00	SHORT HLIF
U-238	1.947E+02	NOT IDENT.
NP-239	2.093E+01	NOT IDENT.
AM-241	2.183E+01	NOT IDENT.
AM-242	6.540E+01	NOT IDENT.
AM-243	6.266E+00	NOT IDENT.
CM-243	1.023E+01	NOT IDENT.
BK-247	7.279E+00	NOT IDENT.
CM-247	3.916E+00	NOT IDENT.
CF-249	3.042E+00	NOT IDENT.
CF-251	1.074E+01	NOT IDENT.
CF-252	1.785E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531001.CNF;1
Acquisition date : 31-OCT-2022 08:15:23 Sensitivity : 3.000
Detector ID : GAM03 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.47 Half life ratio : *****
Sample date : 26-SEP-2022 08:18:00 Nuclide Library : LIQUID
Sample ID : G597531001 Analyst initials: RXF2
Batch Number : 2333342 Sample Quantity : 7.3727E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 20-APR-2022 11:51:08 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
K-40	5.318E+01	7.189E+01	7.190E+01
CO-58	9.364E+00	7.096E+00	7.099E+00
GE-68	1.952E+02	2.045E+02	2.045E+02
RB-86	2.448E+02	2.564E+02	2.565E+02
TE-125M	1.506E+03	3.149E+03	3.149E+03
CE-144	3.069E+01	3.597E+01	3.598E+01
RA-224	1.013E+02	1.153E+02	1.153E+02
RA-226	5.054E+00	1.427E+02	1.427E+02
PA-231	4.638E+01	6.164E+01	6.165E+01
U-235	2.405E+01	3.789E+01	3.789E+01
ANH-511	1.194E+00	1.110E+01	1.110E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	3.797E+01	5.763E+01	6.012E+01	NOT IDENT.
NA-22	-2.392E+00	3.882E+00	4.029E+00	NOT IDENT.
NA-24	-3.260E+16	2.549E+17	0.000E+00	SHORT HLIF
AL-26	-4.645E+00	4.567E+00	5.025E+00	NOT IDENT.
SC-46	-1.524E-01	4.367E+00	4.368E+00	FAIL ABUN
V-48	-4.516E+00	1.786E+01	1.798E+01	NOT IDENT.
CR-51	1.171E+00	7.905E+01	7.905E+01	NOT IDENT.
MN-52	9.329E+01	3.620E+02	3.645E+02	NOT IDENT.
MN-54	1.280E+00	4.481E+00	4.518E+00	NOT IDENT.
CO-56	-1.580E+00	6.350E+00	6.390E+00	NOT IDENT.
CO-57	1.954E-01	3.291E+00	3.292E+00	NOT IDENT.
NI-57	8.457E+06	7.315E+07	7.325E+07	SHORT HLIF
FE-59	3.569E+00	1.191E+01	1.202E+01	NOT IDENT.
CO-60	3.954E-01	5.239E+00	5.242E+00	NOT IDENT.
ZN-65	2.727E-02	9.478E+00	9.478E+00	NOT IDENT.
CU-67	4.630E+03	1.307E+05	1.307E+05	SHORT HLIF
AS-73	1.131E+02	2.122E+02	2.183E+02	NOT IDENT.
AS-74	-8.839E-01	2.653E+01	2.653E+01	NOT IDENT.
SE-75	-1.638E+00	5.726E+00	5.773E+00	FAIL ABUN

BR-77	2.170E+05	5.756E+05	5.839E+05	SHORT HLIF
SR-82	-6.599E+00	6.854E+01	6.861E+01	NOT IDENT.
RB-83	8.241E+00	9.502E+00	1.020E+01	NOT IDENT.
RB-84	2.021E+00	1.205E+01	1.208E+01	NOT IDENT.
KR-85	2.123E+03	1.114E+03	1.470E+03	NOT IDENT.
SR-85	1.375E+01	7.215E+00	9.515E+00	NOT IDENT.
Y-88	-1.511E+00	2.896E+00	2.976E+00	NOT IDENT.
Y-91	1.534E+03	2.249E+03	2.353E+03	NOT IDENT.
NB-94	1.253E+00	4.269E+00	4.306E+00	NOT IDENT.
NB-95	2.347E+00	5.495E+00	5.596E+00	NOT IDENT.
NB-95M	-5.682E+00	1.701E+01	1.720E+01	NOT IDENT.
TC-95M	-4.507E+00	6.810E+00	7.107E+00	NOT IDENT.
ZR-95	1.074E+00	1.006E+01	1.008E+01	NOT IDENT.
MO-99	-9.754E+04	1.929E+05	1.979E+05	SHORT HLIF
TC-99M	1.000E+41	9.576E+40	0.000E+00	SHORT HLIF
RH-101	1.766E+00	3.594E+00	3.682E+00	NOT IDENT.
RH-102M	-3.649E+00	4.043E+00	4.365E+00	NOT IDENT.
RU-103	1.836E+00	6.090E+00	6.146E+00	NOT IDENT.
RH-106	-4.448E+01	3.643E+01	4.159E+01	NOT IDENT.
RU-106	-4.448E+01	3.643E+01	4.159E+01	NOT IDENT.
AG-108M	-2.674E+00	3.753E+00	3.942E+00	NOT IDENT.
CD-109	7.578E+01	8.953E+01	9.584E+01	NOT IDENT.
AG-110	-5.351E+01	9.390E+01	9.695E+01	NOT IDENT.
AG-110M	2.072E+00	5.543E+00	5.621E+00	NOT IDENT.
IN-111	1.141E+04	1.814E+04	1.886E+04	SHORT HLIF
SN-113	2.083E+00	5.399E+00	5.480E+00	NOT IDENT.
IN-114M	-3.160E+00	2.829E+01	2.833E+01	NOT IDENT.
CD-115	-5.354E+04	6.066E+05	6.071E+05	SHORT HLIF
SN-117M	-8.428E+00	1.744E+01	1.785E+01	NOT IDENT.
SB-122	-2.201E+04	3.573E+04	3.708E+04	SHORT HLIF
I-123	-2.772E+19	4.248E+19	0.000E+00	SHORT HLIF
TE-123M	-2.392E+00	3.664E+00	3.820E+00	NOT IDENT.
SB-124	-3.674E-01	1.205E+01	1.205E+01	NOT IDENT.
SB-125	-1.694E+01	1.352E+01	1.554E+01	NOT IDENT.
I-126	1.000E+01	7.822E+01	7.835E+01	NOT IDENT.
SB-126	-1.138E+01	4.754E+01	4.781E+01	NOT IDENT.
SN-126	6.627E+00	8.599E+00	9.104E+00	NOT IDENT.
SB-127	9.954E+02	4.968E+03	4.988E+03	NOT IDENT.
TE-129	-4.370E+01	1.012E+02	1.031E+02	NOT IDENT.
I-131	-5.922E+00	8.106E+01	8.110E+01	NOT IDENT.
I-132	-1.000E+41	3.243E+41	0.000E+00	SHORT HLIF
TE-132	-1.943E+03	5.960E+03	6.025E+03	SHORT HLIF
BA-133	-9.648E-01	5.681E+00	5.697E+00	NOT IDENT.
I-133	4.735E+12	7.223E+12	7.532E+12	SHORT HLIF
CS-134	7.071E+00	4.387E+00	5.425E+00	FAIL ABUN
I-135	-1.965E+39	4.525E+39	0.000E+00	SHORT HLIF
CS-136	-6.381E+00	2.974E+01	2.988E+01	NOT IDENT.
BA-137M	2.073E+00	4.589E+00	4.684E+00	NOT IDENT.
CS-137	2.190E+00	4.848E+00	4.948E+00	NOT IDENT.
LA-138	-4.865E+00	8.118E+00	8.410E+00	NOT IDENT.
CE-139	-2.749E-01	3.846E+00	3.848E+00	NOT IDENT.
BA-140	8.615E+01	1.052E+02	1.121E+02	NOT IDENT.
LA-140	-9.267E+00	2.591E+01	2.625E+01	NOT IDENT.
CE-141	-7.509E+00	1.281E+01	1.325E+01	NOT IDENT.
CE-143	-1.473E+08	3.342E+08	3.407E+08	SHORT HLIF
PM-144	-1.835E-01	4.513E+00	4.514E+00	NOT IDENT.
PR-144	-1.388E+01	3.413E+02	3.414E+02	NOT IDENT.
PM-146	-2.228E+00	5.610E+00	5.699E+00	NOT IDENT.
ND-147	1.939E+02	2.927E+02	3.055E+02	FAIL ABUN
PM-147	-9.626E+03	9.141E+04	9.151E+04	NOT IDENT.
PM-149	-2.440E+06	5.489E+06	5.598E+06	SHORT HLIF
EU-152	-1.920E+00	1.089E+01	1.092E+01	FAIL ABUN
GD-153	-3.820E+00	1.336E+01	1.347E+01	NOT IDENT.
EU-154	-6.970E+00	1.082E+01	1.126E+01	NOT IDENT.
EU-155	-5.049E+00	1.404E+01	1.423E+01	NOT IDENT.
TB-160	-2.945E+00	1.993E+01	1.997E+01	NOT IDENT.
HO-166M	2.236E+00	6.108E+00	6.191E+00	FAIL ABUN
TM-171	5.731E+01	3.848E+03	3.848E+03	NOT IDENT.
LU-176	1.988E+00	3.250E+00	3.372E+00	NOT IDENT.
LU-177	-3.063E+02	1.033E+03	1.043E+03	NOT IDENT.
HF-181	4.578E-01	8.691E+00	8.693E+00	FAIL ABUN
W-181	4.554E-01	4.246E+01	4.246E+01	NOT IDENT.
TA-182	3.085E+00	1.889E+01	1.894E+01	FAIL ABUN
RE-183	5.780E+00	4.474E+01	4.482E+01	NOT IDENT.
RE-184	-7.240E-01	1.837E+01	1.837E+01	NOT IDENT.
RE-188	2.272E+01	2.245E+01	2.468E+01	NOT IDENT.
W-188	-1.880E+02	1.134E+03	1.137E+03	NOT IDENT.
OS-191	8.071E+01	5.685E+01	6.751E+01	FAIL ABUN

IR-192	-6.274E-01	5.344E+00	5.352E+00	NOT IDENT.
PB-201	3.762E+25	5.401E+27	0.000E+00	SHORT HLIF
TL-201	-2.573E+04	7.322E+04	7.414E+04	SHORT HLIF
TL-202	5.363E+00	2.604E+01	2.616E+01	NOT IDENT.
HG-203	4.208E+00	5.797E+00	6.100E+00	NOT IDENT.
PB-203	1.893E+05	2.607E+05	2.744E+05	SHORT HLIF
TL-204	3.269E+02	6.866E+02	7.022E+02	NOT IDENT.
BI-207	2.630E+00	5.653E+00	5.776E+00	NOT IDENT.
TL-208	2.797E+00	5.368E+00	5.514E+00	NOT IDENT.
PB-210	6.217E+02	9.337E+02	9.749E+02	NOT IDENT.
BI-211	1.123E+01	2.951E+01	2.994E+01	NOT IDENT.
PB-211	-1.556E+01	9.017E+01	9.045E+01	NOT IDENT.
BI-212	5.916E+01	5.631E+01	6.232E+01	NOT IDENT.
PB-212	4.341E+00	1.151E+01	1.168E+01	FAIL ABUN
BI-213	-9.925E-01	1.320E+01	1.321E+01	NOT IDENT.
BI-214	8.481E-01	1.241E+01	1.241E+01	FAIL ABUN
PB-214	7.068E+00	1.851E+01	1.878E+01	FAIL ABUN
RN-219	3.395E+00	5.084E+01	5.087E+01	NOT IDENT.
FR-221	4.111E+00	2.367E+01	2.374E+01	NOT IDENT.
RA-223	1.238E+01	8.842E+01	8.860E+01	FAIL ABUN
AC-225	4.663E+01	2.685E+02	2.693E+02	NOT IDENT.
AC-227	1.289E+01	3.105E+01	3.159E+01	FAIL ABUN
TH-227	1.289E+01	3.105E+01	3.159E+01	FAIL ABUN
AC-228	-6.689E+00	1.785E+01	1.811E+01	FAIL ABUN
RA-228	-6.689E+00	1.785E+01	1.811E+01	FAIL ABUN
TH-228	4.341E+00	1.151E+01	1.168E+01	FAIL ABUN
TH-229	-9.573E+00	5.995E+01	6.010E+01	NOT IDENT.
TH-230	3.619E+02	1.622E+03	1.630E+03	NOT IDENT.
TH-231	4.966E+01	6.024E+01	6.427E+01	NOT IDENT.
TH-232	5.840E+01	3.827E+03	3.827E+03	FAIL ABUN
PA-233	9.542E-01	7.536E+00	7.548E+00	FAIL ABUN
PA-234	1.559E+01	3.739E+01	3.805E+01	FAIL ABUN
PA-234M	7.023E+01	8.759E+02	8.764E+02	FAIL ABUN
TH-234	-1.909E+02	2.849E+02	2.976E+02	NOT IDENT.
U-234	7.331E+03	1.339E+04	1.379E+04	NOT IDENT.
NP-237	9.542E-01	7.536E+00	7.548E+00	FAIL ABUN
NP-238	8.477E+05	1.321E+06	1.375E+06	SHORT HLIF
U-238	-1.909E+02	2.849E+02	2.976E+02	NOT IDENT.
NP-239	-1.913E+01	2.605E+01	2.744E+01	NOT IDENT.
AM-241	1.189E+01	2.571E+01	2.627E+01	NOT IDENT.
AM-242	-1.145E+02	9.093E+01	1.046E+02	NOT IDENT.
AM-243	-4.716E-01	8.206E+00	8.209E+00	NOT IDENT.
CM-243	-3.739E+00	1.202E+01	1.214E+01	NOT IDENT.
BK-247	-3.382E+00	9.127E+00	9.254E+00	NOT IDENT.
CM-247	2.396E+00	4.477E+00	4.605E+00	NOT IDENT.
CF-249	-3.765E+00	4.381E+00	4.698E+00	NOT IDENT.
CF-251	-4.734E+00	1.307E+01	1.325E+01	NOT IDENT.
CF-252	-1.321E+04	2.459E+04	2.530E+04	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	50.1505	81.00	63.1005	120.90	49.2369
45.60	47.0755	81.07	63.1088	121.12	49.2525
46.54	40.4532	82.35	0.0000	121.22	48.3956
49.72	0.0000	82.47	55.9737	121.78	48.4346
51.35	54.6180	167.43	0.0000	122.06	48.4543
52.39	43.3523	82.47	55.9741	123.07	55.1098
53.20	38.8670	83.79	37.8139	265.00	55.9382
53.44	41.1777	84.00	37.8286	127.16	0.0000
56.28	48.3725	84.21	37.8432	127.23	39.2225
57.36	0.0000	84.86	0.0000	129.43	39.3428
57.53	47.3607	85.43	68.5145	131.20	39.4386
57.53	47.3610	86.55	60.0724	133.02	39.5366
57.98	47.4108	86.79	56.4187	133.52	39.5631
59.32	44.0788	86.94	56.4342	135.34	0.0000
59.54	40.6195	87.09	56.4492	136.00	39.6954
61.49	75.7719	87.57	39.3030	57.53	21.1787
63.00	51.4653	88.03	38.1062	136.47	21.1841
63.29	47.9871	88.34	51.6563	140.51	0.0000
63.58	38.6485	88.47	51.6682	140.88	29.2980
63.81	36.3246	91.11	150.7846	143.76	42.7744
64.28	46.9189	91.27	0.0000	144.24	42.8008
64.99	71.6623	92.59	64.4343	145.44	44.2063
65.08	71.6765	93.31	0.0000	152.32	55.8494
66.73	53.0647	94.56	144.2247	152.43	58.5598
66.98	54.2726	94.65	144.2469	153.25	56.8156
67.24	44.8589	94.67	144.2513	323.87	49.6591
67.67	50.8076	97.43	54.9715	155.04	43.3833
67.75	57.9067	98.43	50.0574	156.02	49.7693
68.89	58.0462	98.44	50.0583	158.56	43.5688
68.89	0.0000	99.53	67.7006	158.97	0.0000
69.67	62.8874	100.11	63.5823	159.00	44.4995
70.82	0.0000	100.20	63.5916	162.33	50.1470
70.82	47.5751	102.03	45.3183	162.66	50.1666
70.83	0.0000	103.18	47.0842	163.33	45.6421
72.81	66.8760	103.37	53.8271	165.86	56.7640
72.87	0.0000	105.31	49.3540	167.43	0.0000
74.66	61.1314	106.12	41.8145	171.28	0.0000
74.82	65.9470	106.47	38.0342	176.31	48.1798
74.97	65.9667	109.28	48.3886	176.60	50.0488
77.11	67.4493	111.00	48.5169	177.52	43.6054
79.69	67.7856	111.76	0.0000	181.07	0.0000
79.82	0.0000	112.95	46.1000	184.41	53.2844
80.02	43.6039	116.24	42.8963	184.58	0.0000
80.03	43.6042	116.30	0.0000	185.72	53.3598
80.12	43.6122	116.74	45.5040	186.21	51.9833
80.19	43.6179	117.23	44.6777	190.27	49.6687
80.22	0.0000	119.76	34.4952	193.51	51.9150
80.57	40.0118	99.53	40.5778	197.03	47.3689

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
198.01	50.2617	256.23	36.2323	492.35	0.0000
201.83	39.9860	304.85	35.4084	497.08	16.7337
204.12	43.8957	306.78	30.2455	511.00	15.0808
205.31	49.6805	308.46	36.5495	514.00	19.9020
208.37	53.6655	311.90	30.3617	520.40	14.2622
210.85	55.7190	316.51	37.8186	520.69	0.0000
215.65	48.2595	319.41	46.3212	522.65	0.0000
218.12	43.5370	320.08	37.9175	527.90	0.0000
222.11	50.5014	321.04	31.6205	529.59	20.5967
227.09	41.9572	323.87	42.2469	529.87	0.0000
227.38	41.9686	325.23	40.1740	531.02	20.0737
228.16	0.0000	328.76	33.9167	537.26	20.6753
228.18	43.9536	331.15	0.0000	546.56	0.0000
116.74	43.9536	333.37	26.5844	552.55	15.3964
235.69	39.8326	334.37	24.4749	563.25	20.0275
235.96	39.8421	338.28	27.7435	564.24	0.0000
238.63	43.3904	338.32	27.7440	569.33	19.1722
238.98	0.0000	311.90	33.1292	946.00	19.1742
240.99	43.4821	340.55	33.1311	569.70	17.3498
242.00	43.5215	344.28	27.8593	582.08	20.2061
244.70	40.1560	345.93	28.9638	583.19	13.7837
245.35	0.0000	351.06	24.7599	595.83	24.9557
250.62	34.8836	351.93	24.7744	427.87	27.7890
252.40	30.9448	356.01	30.7834	604.72	28.7692
252.80	31.9541	361.25	0.0000	609.32	22.3191
256.23	39.0591	364.49	24.4409	610.33	17.6774
260.90	0.0000	366.42	0.0000	614.28	23.3002
264.66	38.3301	356.01	36.3005	618.01	14.9370
265.00	38.3409	388.16	27.5757	621.93	23.3795
269.46	38.4840	388.63	29.7905	630.19	0.0000
271.23	22.3124	391.70	18.7933	631.29	19.7202
273.65	38.6162	264.66	31.1269	155.04	15.0356
276.40	25.4623	401.32	0.0000	633.25	13.1579
277.37	36.6951	401.81	27.8117	634.78	13.1664
277.60	34.6627	402.40	22.2575	635.95	14.1142
278.00	33.6539	404.85	30.0927	636.99	16.0034
278.43	30.6055	410.95	23.4926	657.50	22.7922
279.20	0.0000	414.70	25.7884	657.76	21.8454
279.54	30.6323	423.72	25.9274	661.66	19.0271
280.46	37.8085	427.09	28.2384	664.57	0.0000
283.69	20.4895	427.87	38.4215	666.33	19.0643
284.31	27.6746	433.94	30.6200	666.50	17.1590
285.41	43.0869	439.51	22.7547	667.71	0.0000
285.90	0.0000	440.45	26.1820	677.62	13.4078
287.50	43.1587	453.88	29.8239	685.70	12.4918
290.67	44.2965	459.60	32.2206	692.65	0.0000
293.27	0.0000	463.37	25.3695	695.00	11.5745
351.93	40.3179	468.07	16.1861	696.49	21.2326
295.96	37.2378	473.00	19.7074	696.51	21.2326
879.38	41.9774	475.06	33.6563	697.00	19.3066
299.98	39.4279	476.78	16.2633	697.49	16.4138
300.09	38.3941	477.60	23.2434	702.65	19.3506
300.13	38.3949	477.99	23.2483	706.68	16.4745
301.36	48.2984	482.18	29.1260	711.68	10.6814
302.85	42.1142	487.02	23.6534	720.70	15.5918

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
721.93	0.0000	935.54	9.4642	1368.63	0.0000
722.78	16.5798	937.49	15.7837	1377.63	0.0000
722.91	16.5808	944.13	14.7626	1384.29	9.5039
723.31	23.4119	945.96	0.0000	1408.01	7.6449
724.19	16.5891	946.00	8.4407	1434.09	6.7293
727.33	8.7935	949.00	11.6170	1435.80	12.5023
733.00	10.7711	667.71	0.0000	1457.56	0.0000
735.93	9.8032	962.31	12.7266	1460.82	4.8357
739.50	0.0000	964.08	20.3736	1489.16	2.9196
744.23	12.5883	966.17	13.5914	1596.21	4.9783
747.24	15.7534	968.97	9.5647	1620.50	8.0055
752.31	11.0489	983.53	10.6754	1678.03	0.0000
753.82	10.5286	984.45	0.0000	1690.97	4.0598
756.73	13.8342	996.26	12.0032	1757.55	0.0000
763.94	22.7894	1001.03	15.0258	1764.49	7.2068
765.80	11.8986	1274.44	17.1914	1063.66	5.1533
766.42	10.9094	1025.87	0.0000	1771.35	4.1234
766.84	8.9275	1028.54	0.0000	1791.20	0.0000
772.60	0.0000	1037.84	7.5960	1808.65	8.3051
776.52	15.9282	1038.76	0.0000	1836.06	2.0869
739.50	0.0000	475.06	5.4398		
778.90	14.9460	1048.07	8.7075		
783.70	16.9689	1050.41	11.9809		
788.74	11.4289	1063.66	7.6537		
792.07	12.8160	1077.00	9.8778		
795.86	11.2294	1077.34	12.2937		
802.10	12.8629	459.60	9.8976		
810.29	11.2882	1085.87	12.1038		
344.28	11.2889	1099.25	6.6270		
810.76	14.5160	1111.64	6.6500		
815.77	16.1577	1112.07	6.6508		
1048.07	9.0975	1112.84	7.3914		
832.01	20.3137	1115.54	7.1012		
834.85	13.2170	1120.29	11.1102		
835.15	7.1177	1120.55	11.1108		
836.80	0.0000	1221.41	11.1133		
846.77	19.3978	1129.67	8.9111		
856.80	14.3427	1131.51	0.0000		
860.56	12.3094	1173.23	9.9188		
871.09	15.4422	1177.95	6.3198		
873.19	12.3625	1189.05	9.0552		
875.33	0.0000	1204.77	4.5461		
879.38	11.5626	1221.41	7.3055		
880.51	11.3605	1231.02	7.3234		
881.60	11.3646	1235.36	14.6633		
883.24	11.5777	1238.28	11.0057		
884.68	6.6189	1260.41	0.0000		
889.28	8.2864	1271.87	6.4747		
894.76	8.3015	1274.44	8.3298		
898.04	15.5823	1274.54	8.3303		
903.28	9.3656	1291.59	6.5064		
907.67	0.0000	1298.22	0.0000		
911.20	7.3033	1312.11	4.6709		
923.98	0.0000	1332.49	10.3270		
926.36	11.5334	1365.19	3.7846		

VAX/VMS Nuclide Identification Report Generated 31-OCT-2022 10:17:52.96

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531002.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM18.CNF;800
Background date    : 30-OCT-2022 11:28:53
Sample date       : 26-SEP-2022 08:25:00 Acquisition date : 31-OCT-2022 08:15:48
Sample ID        : G597531002 Sample quantity : 7.41520E-01 FILTER
Detector name     : GAM18 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:00.82 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : RXF2
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2333342 Detector SN# :
Matrix Spike ID   : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	92.73*	18	121	1.53	185.68	181	8	2.54E-03	128.4	
2	0	185.76*	2	107	0.75	371.61	367	10	2.57E-04	*****	
3	0	200.43	24	168	4.79	400.93	392	15	3.31E-03	120.4	
4	0	278.10	14	61	1.25	556.17	550	8	2.01E-03	97.5	
5	0	295.26*	19	74	1.32	590.47	586	9	2.68E-03	89.9	
6	0	313.04	28	28	1.09	626.00	623	7	3.89E-03	37.6	
7	0	351.54*	3	61	0.70	702.96	698	12	4.48E-04	548.9	
8	0	477.93	45	49	0.94	955.62	949	10	6.23E-03	31.1	
9	0	497.38	32	88	9.41	994.51	979	25	4.42E-03	81.2	
10	0	544.82	33	30	5.40	1089.34	1083	15	4.57E-03	40.3	
11	0	610.05*	16	56	1.74	1219.75	1211	14	2.24E-03	115.6	
12	0	803.54*	9	17	2.22	1606.62	1601	10	1.28E-03	116.6	
13	0	874.95	15	13	1.80	1749.41	1744	11	2.04E-03	55.2	
14	0	913.25	16	23	2.31	1826.00	1816	13	2.23E-03	66.3	
15	0	1077.22	18	8	2.78	2153.90	2148	14	2.55E-03	38.7	
16	0	1237.42	17	13	4.48	2474.31	2464	18	2.30E-03	57.4	
17	2	1352.76	20	10	3.38	2705.03	2698	21	2.73E-03	35.0	2.90E-01
18	2	1358.17	15	1	2.27	2715.85	2698	21	2.12E-03	28.2	
19	0	1412.36	20	25	4.47	2824.25	2811	22	2.78E-03	70.0	
20	0	1470.60	12	3	2.97	2940.75	2934	13	1.60E-03	43.8	
21	0	1476.12	20	0	1.42	2951.80	2946	12	2.78E-03	22.4	
22	0	1614.10	13	0	2.55	3227.85	3223	10	1.81E-03	27.7	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 31-OCT-2022 10:17:53

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531002.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 26-SEP-2022 08:25:00	Acquisition date	: 31-OCT-2022 08:15:48
Sample ID	: G597531002	Sample quantity	: 0.74152 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA18	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.82 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	45	10.44*	3.326E+00	6.533E+01	1.031E+02	62.15
GE-68	1077.34	18	3.22*	1.823E+00	1.582E+02	1.730E+02	77.47
RB-86	1077.00	18	8.64*	1.823E+00	5.896E+01	2.170E+02	77.47
RU-103	497.08	32	91.00*	3.248E+00	5.450E+00	1.012E+01	162.33
	610.33	16	5.76	2.848E+00	4.984E+01	9.252E+01	231.11
HG-203	70.83	-----	3.69	2.789E+00	-----	Line Not Found	-----
	72.87	-----	6.19	3.009E+00	-----	Line Not Found	-----
	279.20	14	81.56*	4.446E+00	2.020E+00	3.401E+00	195.02
BI-211	72.87	-----	1.23	3.009E+00	-----	Line Not Found	-----
	351.06	3	12.92*	3.946E+00	3.205E+00	3.214E+00	1097.81
RA-226	186.21	2	3.59*	5.319E+00	4.905E+00	4.905E+00	2424.50

Flag: "*" = Keyline


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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                           *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*                                     *                                               *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531002.CNF;1        *
* Acquisition date   : 31-OCT-2022 08:15:48 Sensitivity      : 3.000                *
* Detector ID        : GAM18 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:00.82 Half life ratio : *****      *
* Sample date        : 26-SEP-2022 08:25:00 Analyst initials: RXF2        *
* Sample ID          : G597531002 Sample Quantity : 7.4152E-01 FILTER *
* Batch Number       : 2333342 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000           *
* Nuclide Library    : LIQUID.NLB;26                                             *
*****
*                                     CALIBRATION INFORMATION                       *
*                                     *                                               *
* Eff. Cal. date     : 8-JUN-2022 11:06:14 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.031E+02	6.280E+01	7.517E+01
GE-68	1.730E+02	1.314E+02	1.969E+02
RB-86	2.170E+02	1.647E+02	2.468E+02
RU-103	1.012E+01	1.609E+01	9.702E+00
HG-203	3.401E+00	6.501E+00	7.556E+00
BI-211	3.214E+00	3.458E+01	3.025E+01
RA-226	4.905E+00	1.165E+02	9.135E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-1.758E+00	3.151E+00	5.389E+00	NOT IDENT.
NA-24	0.000E+00	2.631E+17	0.000E+00	SHORT HLIF
AL-26	6.101E-01	3.116E+00	6.468E+00	NOT IDENT.
K-40	1.217E+01	5.003E+01	9.641E+01	NOT IDENT.
SC-46	8.857E-01	3.508E+00	7.071E+00	NOT IDENT.
V-48	3.146E+00	1.378E+01	2.726E+01	NOT IDENT.
CR-51	2.460E+01	5.917E+01	1.097E+02	NOT IDENT.
MN-52	-4.249E+01	2.490E+02	4.809E+02	NOT IDENT.
MN-54	-1.092E+00	3.710E+00	6.793E+00	NOT IDENT.
CO-56	1.459E+00	4.278E+00	8.477E+00	FAIL ABUN
CO-57	-1.847E+00	2.736E+00	4.415E+00	NOT IDENT.
NI-57	0.000E+00	4.979E+07	0.000E+00	SHORT HLIF
CO-58	-1.141E+00	4.311E+00	7.996E+00	NOT IDENT.
FE-59	-1.199E+00	8.555E+00	1.620E+01	NOT IDENT.
CO-60	1.102E+00	3.685E+00	7.503E+00	NOT IDENT.
ZN-65	-2.601E+00	7.302E+00	1.309E+01	NOT IDENT.
CU-67	0.000E+00	1.066E+05	0.000E+00	SHORT HLIF
AS-73	1.143E+02	1.629E+02	3.127E+02	NOT IDENT.
AS-74	1.599E+01	2.045E+01	4.023E+01	NOT IDENT.
SE-75	-3.637E-01	5.109E+00	9.134E+00	FAIL ABUN
BR-77	0.000E+00	3.587E+05	0.000E+00	SHORT HLIF
SR-82	1.918E+01	5.435E+01	1.030E+02	NOT IDENT.
RB-83	-2.278E+00	7.646E+00	1.380E+01	NOT IDENT.

RB-84	2.443E+00	1.057E+01	1.953E+01	NOT IDENT.
KR-85	-2.988E+03	1.147E+03	1.720E+03	NOT IDENT.
SR-85	-1.935E+01	7.429E+00	1.113E+01	NOT IDENT.
Y-88	5.074E-01	4.154E+00	8.412E+00	NOT IDENT.
Y-91	1.509E+03	1.699E+03	3.775E+03	NOT IDENT.
NB-94	3.576E+00	3.317E+00	6.678E+00	NOT IDENT.
NB-95	1.921E+00	3.982E+00	7.833E+00	NOT IDENT.
NB-95M	-3.581E+00	1.506E+01	2.669E+01	NOT IDENT.
TC-95M	2.774E+00	5.827E+00	1.003E+01	NOT IDENT.
ZR-95	5.909E+00	7.930E+00	1.585E+01	NOT IDENT.
MO-99	0.000E+00	1.551E+05	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
RH-101	-1.668E+00	3.028E+00	4.935E+00	NOT IDENT.
RH-102M	8.155E-01	3.252E+00	5.510E+00	NOT IDENT.
RH-106	1.717E+01	3.381E+01	6.477E+01	NOT IDENT.
RU-106	1.717E+01	3.381E+01	6.477E+01	NOT IDENT.
AG-108M	7.778E-01	2.897E+00	5.548E+00	NOT IDENT.
CD-109	-7.056E+00	7.924E+01	1.384E+02	NOT IDENT.
AG-110	-1.333E+01	6.532E+01	1.176E+02	NOT IDENT.
AG-110M	2.082E-01	4.755E+00	9.116E+00	NOT IDENT.
IN-111	0.000E+00	1.314E+04	0.000E+00	SHORT HLIF
SN-113	-5.884E+00	4.633E+00	6.911E+00	NOT IDENT.
IN-114M	-7.408E+00	2.300E+01	3.699E+01	NOT IDENT.
CD-115	0.000E+00	5.259E+05	0.000E+00	SHORT HLIF
SN-117M	-5.131E+00	1.260E+01	2.294E+01	NOT IDENT.
SB-122	0.000E+00	2.688E+04	0.000E+00	SHORT HLIF
I-123	0.000E+00	2.948E+19	0.000E+00	SHORT HLIF
TE-123M	-1.165E+00	2.559E+00	4.645E+00	NOT IDENT.
SB-124	4.932E+00	9.523E+00	2.105E+01	NOT IDENT.
SB-125	7.541E-01	8.084E+00	1.541E+01	NOT IDENT.
TE-125M	3.434E+01	1.125E+03	1.974E+03	NOT IDENT.
I-126	9.454E-01	6.596E+01	1.196E+02	NOT IDENT.
SB-126	-1.471E+01	3.376E+01	5.858E+01	NOT IDENT.
SN-126	-2.365E+00	7.600E+00	1.304E+01	NOT IDENT.
SB-127	1.265E+03	4.424E+03	8.359E+03	NOT IDENT.
TE-129	-5.238E+01	6.648E+01	1.149E+02	FAIL ABUN
I-131	5.699E+01	6.012E+01	1.173E+02	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	5.095E+03	0.000E+00	SHORT HLIF
BA-133	-2.857E-02	4.330E+00	6.849E+00	NOT IDENT.
I-133	0.000E+00	4.395E+12	0.000E+00	SHORT HLIF
CS-134	9.549E-02	4.191E+00	7.142E+00	NOT IDENT.
I-135	0.000E+00	3.326E+39	0.000E+00	SHORT HLIF
CS-136	-1.083E+01	2.353E+01	4.190E+01	NOT IDENT.
BA-137M	-4.000E-01	3.719E+00	6.461E+00	NOT IDENT.
CS-137	-4.226E-01	3.929E+00	6.825E+00	NOT IDENT.
LA-138	4.003E+00	5.316E+00	1.163E+01	NOT IDENT.
CE-139	7.607E-01	2.856E+00	5.439E+00	NOT IDENT.
BA-140	-4.931E+01	7.138E+01	1.226E+02	NOT IDENT.
LA-140	1.061E+01	1.771E+01	4.146E+01	NOT IDENT.
CE-141	6.470E-01	1.005E+01	1.708E+01	NOT IDENT.
CE-143	0.000E+00	3.015E+08	0.000E+00	SHORT HLIF
CE-144	2.843E-01	1.826E+01	3.156E+01	NOT IDENT.
PM-144	1.654E-01	3.482E+00	6.345E+00	FAIL ABUN
PR-144	1.314E+01	2.634E+02	4.801E+02	NOT IDENT.
PM-146	1.002E+00	3.965E+00	7.600E+00	NOT IDENT.
ND-147	2.583E+01	1.812E+02	3.423E+02	NOT IDENT.
PM-147	-1.262E+03	7.780E+04	1.337E+05	NOT IDENT.
PM-149	0.000E+00	4.856E+06	0.000E+00	SHORT HLIF
EU-152	2.423E+00	9.911E+00	1.793E+01	NOT IDENT.
GD-153	-6.571E+00	9.727E+00	1.503E+01	NOT IDENT.
EU-154	-4.931E+00	8.838E+00	1.511E+01	NOT IDENT.
EU-155	4.199E+00	1.035E+01	1.873E+01	NOT IDENT.
TB-160	2.556E+00	1.740E+01	2.945E+01	NOT IDENT.
HO-166M	-2.003E+00	5.953E+00	1.036E+01	FAIL ABUN
TM-171	5.669E+02	2.900E+03	5.396E+03	NOT IDENT.
LU-176	-1.225E+00	2.464E+00	4.204E+00	FAIL ABUN
LU-177	-3.012E+02	8.678E+02	1.452E+03	NOT IDENT.
HF-181	3.500E+00	5.940E+00	1.066E+01	NOT IDENT.
W-181	-1.629E+01	3.373E+01	5.885E+01	NOT IDENT.
TA-182	3.610E+00	1.601E+01	3.128E+01	NOT IDENT.
RE-183	-1.374E+01	3.523E+01	6.190E+01	NOT IDENT.
RE-184	-9.485E-01	1.512E+01	2.815E+01	NOT IDENT.
RE-188	8.101E+00	1.695E+01	3.293E+01	FAIL ABUN
W-188	7.652E+02	8.582E+02	1.538E+03	NOT IDENT.
OS-191	2.570E+00	3.630E+01	6.292E+01	NOT IDENT.
IR-192	-1.920E+00	4.143E+00	6.204E+00	FAIL ABUN
PB-201	0.000E+00	4.144E+27	0.000E+00	SHORT HLIF

TL-201	0.000E+00	5.693E+04	0.000E+00	SHORT HLIF
TL-202	-4.588E+00	1.951E+01	3.585E+01	NOT IDENT.
PB-203	0.000E+00	2.919E+05	0.000E+00	SHORT HLIF
TL-204	3.132E+02	6.264E+02	1.070E+03	NOT IDENT.
BI-207	5.739E-01	4.587E+00	8.822E+00	NOT IDENT.
TL-208	-2.520E+00	4.367E+00	7.544E+00	FAIL ABUN
PB-210	3.223E+02	6.673E+02	1.276E+03	NOT IDENT.
PB-211	-1.686E+00	6.842E+01	1.199E+02	NOT IDENT.
BI-212	1.399E+01	4.622E+01	8.757E+01	NOT IDENT.
PB-212	-8.519E+00	7.213E+00	1.152E+01	NOT IDENT.
BI-213	-1.683E-01	9.605E+00	1.802E+01	NOT IDENT.
BI-214	6.311E+00	1.429E+01	1.635E+01	FAIL ABUN
PB-214	1.163E+00	1.251E+01	1.475E+01	FAIL ABUN
RN-219	-1.036E+01	4.065E+01	6.932E+01	NOT IDENT.
FR-221	-4.088E+00	2.213E+01	3.666E+01	NOT IDENT.
RA-223	-7.595E+00	5.792E+01	1.023E+02	NOT IDENT.
RA-224	-3.441E+01	6.241E+01	1.079E+02	NOT IDENT.
AC-225	-4.637E+01	2.510E+02	4.158E+02	NOT IDENT.
AC-227	-1.178E+01	2.338E+01	4.050E+01	NOT IDENT.
TH-227	-1.178E+01	2.338E+01	4.050E+01	NOT IDENT.
AC-228	-1.003E+00	1.497E+01	2.771E+01	NOT IDENT.
RA-228	-1.003E+00	1.497E+01	2.771E+01	NOT IDENT.
TH-228	-8.519E+00	7.213E+00	1.152E+01	NOT IDENT.
TH-229	1.085E+01	5.015E+01	8.530E+01	NOT IDENT.
TH-230	-6.481E+02	1.298E+03	2.234E+03	NOT IDENT.
PA-231	7.066E+00	4.570E+01	8.287E+01	NOT IDENT.
TH-231	1.375E+01	5.195E+01	8.615E+01	NOT IDENT.
TH-232	-3.842E+03	2.756E+03	4.295E+03	NOT IDENT.
PA-233	8.788E+00	6.485E+00	1.174E+01	FAIL ABUN
PA-234	3.128E+00	2.492E+01	4.861E+01	NOT IDENT.
PA-234M	-7.474E+01	4.816E+02	8.700E+02	NOT IDENT.
TH-234	-2.619E+02	1.995E+02	3.132E+02	FAIL ABUN
U-234	7.437E+03	1.058E+04	2.032E+04	NOT IDENT.
U-235	5.377E-02	2.293E+01	3.707E+01	FAIL ABUN
NP-237	8.788E+00	6.485E+00	1.174E+01	FAIL ABUN
NP-238	0.000E+00	1.173E+06	0.000E+00	SHORT HLIF
U-238	-2.619E+02	1.995E+02	3.132E+02	FAIL ABUN
NP-239	-8.564E+00	2.540E+01	4.267E+01	FAIL ABUN
AM-241	4.613E+00	2.362E+01	4.140E+01	NOT IDENT.
AM-242	-4.666E+01	6.924E+01	1.068E+02	NOT IDENT.
AM-243	1.240E+00	5.800E+00	1.046E+01	NOT IDENT.
CM-243	-2.290E+00	1.127E+01	1.928E+01	FAIL ABUN
BK-247	4.089E+00	8.018E+00	1.504E+01	NOT IDENT.
CM-247	-1.088E+00	3.706E+00	6.292E+00	FAIL ABUN
CF-249	2.470E+00	3.671E+00	6.973E+00	NOT IDENT.
CF-251	4.772E+00	1.113E+01	2.139E+01	NOT IDENT.
CF-252	-5.224E+03	1.768E+04	3.016E+04	NOT IDENT.
ANH-511	-9.175E+00	6.282E+00	1.198E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	92.73	99	121	1.53	185.68	181	8	1.38E-02	21.9	
2	0	139.76	9	146	3.22	279.66	269	12	1.18E-03	287.1	
3	0	185.76	80	107	0.75	371.61	367	10	1.12E-02	26.6	
4	0	200.43	24	168	4.79	400.93	392	15	3.31E-03	120.4	
5	0	239.89	40	112	3.23	479.80	474	12	5.53E-03	55.9	
6	0	278.10	14	61	1.25	556.17	550	8	2.01E-03	97.5	
7	0	295.26	32	74	1.32	590.47	586	9	4.51E-03	50.9	
8	0	313.04	28	28	1.09	626.00	623	7	3.89E-03	37.6	
9	0	351.54	36	61	0.70	702.96	698	12	4.95E-03	46.7	
10	0	477.93	45	49	0.94	955.62	949	10	6.23E-03	31.1	
11	0	497.38	32	88	9.41	994.51	979	25	4.42E-03	81.2	
12	0	511.05	242	69	2.88	1021.83	1013	15	3.36E-02	9.8	
13	0	544.82	33	30	5.40	1089.34	1083	15	4.57E-03	40.3	
14	0	583.35	24	71	3.99	1166.37	1155	18	3.35E-03	84.9	
15	0	610.05	45	56	1.74	1219.75	1211	14	6.22E-03	39.3	
16	0	803.54	18	17	2.22	1606.62	1601	10	2.50E-03	53.0	
17	0	874.95	15	13	1.80	1749.41	1744	11	2.04E-03	55.2	
18	0	913.25	16	23	2.31	1826.00	1816	13	2.23E-03	66.3	
19	0	1002.10	6	20	1.47	2003.67	1998	10	8.33E-04	145.3	
20	0	1077.22	18	8	2.78	2153.90	2148	14	2.55E-03	38.7	
21	0	1237.42	17	13	4.48	2474.31	2464	18	2.30E-03	57.4	
22	2	1352.76	20	10	3.38	2705.03	2698	21	2.73E-03	35.0	2.90E-01
23	2	1358.17	15	1	2.27	2715.85	2698	21	2.12E-03	28.2	
24	0	1412.36	20	25	4.47	2824.25	2811	22	2.78E-03	70.0	
25	0	1470.60	12	3	2.97	2940.75	2934	13	1.60E-03	43.8	
26	0	1476.12	20	0	1.42	2951.80	2946	12	2.78E-03	22.4	
27	0	1614.10	13	0	2.55	3227.85	3223	10	1.81E-03	27.7	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	45	10.44*	3.326E+00	6.533E+01	1.031E+02	62.15
GE-68	1077.34	18	3.22*	1.823E+00	1.582E+02	1.730E+02	77.47
RB-86	1077.00	18	8.64*	1.823E+00	5.896E+01	2.170E+02	77.47
RU-103	497.08	32	91.00*	3.248E+00	5.450E+00	1.012E+01	162.33
	610.33	16	5.76	2.848E+00	4.984E+01	9.252E+01	231.11
HG-203	70.83	-----	3.69	2.789E+00	-----	Line Not Found	-----
	72.87	-----	6.19	3.009E+00	-----	Line Not Found	-----
	279.20	14	81.56*	4.446E+00	2.020E+00	3.401E+00	195.02
BI-211	72.87	-----	1.23	3.009E+00	-----	Line Not Found	-----
	351.06	3	12.92*	3.946E+00	3.205E+00	3.214E+00	1097.81
RA-226	186.21	2	3.59*	5.319E+00	4.905E+00	4.905E+00	2424.50

Flag: "*" = Keyline

Total number of lines in spectrum 22
Number of unidentified lines 8
Number of lines tentatively identified by NID 14 63.64%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.58	6.533E+01	1.031E+02	0.641E+02	62.15	
GE-68	270.95D	1.09	1.582E+02	1.730E+02	1.341E+02	77.47	
RB-86	18.64D	3.68	5.896E+01	2.170E+02	1.681E+02	77.47	
RU-103	39.26D	1.86	5.450E+00	1.012E+01	1.642E+01	162.33	
HG-203	46.59D	1.68	2.020E+00	3.401E+00	6.633E+00	195.02	
BI-211	21.77Y	1.00	3.205E+00	3.214E+00	35.29E+00	1097.81	
RA-226	1600.00Y	1.00	4.905E+00	4.905E+00	118.9E+00	2424.50	
Total Activity :			2.981E+02	5.148E+02			

Grand Total Activity : 2.981E+02 5.148E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	92.73	18	121	1.53	185.68	181	8	2.54E-03	****	4.67E+00	T
0	200.43	24	168	4.79	400.93	392	15	3.31E-03	****	5.17E+00	T
0	295.26	19	74	1.32	590.47	586	9	2.68E-03	****	4.32E+00	T
0	313.04	28	28	1.09	626.00	623	7	3.89E-03	75.3	4.19E+00	T
0	544.82	33	30	5.40	1089.34	1083	15	4.57E-03	80.6	3.07E+00	
0	803.54	9	17	2.22	1606.62	1601	10	1.28E-03	****	2.32E+00	T
0	874.95	15	13	1.80	1749.41	1744	11	2.04E-03	****	2.17E+00	T
0	913.25	16	23	2.31	1826.00	1816	13	2.23E-03	****	2.09E+00	
0	1237.42	17	13	4.48	2474.31	2464	18	2.30E-03	****	1.63E+00	T
2	1352.76	20	10	3.38	2705.03	2698	21	2.73E-03	70.1	1.52E+00	
2	1358.17	15	1	2.27	2715.85	2698	21	2.12E-03	56.5	1.52E+00	
0	1412.36	20	25	4.47	2824.25	2811	22	2.78E-03	****	1.47E+00	
0	1470.60	12	3	2.97	2940.75	2934	13	1.60E-03	87.7	1.43E+00	
0	1476.12	20	0	1.42	2951.80	2946	12	2.78E-03	44.7	1.43E+00	
0	1614.10	13	0	2.55	3227.85	3223	10	1.81E-03	55.5	1.36E+00	

Flags: "T" = Tentatively associated

```

*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531002.CNF;1  *
* Acquisition date   : 31-OCT-2022 08:15:48 Sensitivity      : 3.000          *
* Detector ID        : GAM18 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 02:00:00.82 Half life ratio  : *****          *
* Sample date        : 26-SEP-2022 08:25:00 Nuclide Library : LIQUID         *
* Sample ID          : G597531002 Analyst initials: RXF2           *
* Batch Number       : 2333342 Sample Quantity : 7.4152E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000         *
*                                     Dry Weight    : 0.00000         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 8-JUN-2022 11:06:14 Eff. Geometry    : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.449E+01
GE-68	8.570E+01
RB-86	1.074E+02
RU-103	4.423E+00
HG-203	3.461E+00
BI-211	1.378E+01
RA-226	4.211E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	2.253E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.707E+00	NOT IDENT.
K-40	4.376E+01	NOT IDENT.
SC-46	3.109E+00	NOT IDENT.
V-48	1.204E+01	NOT IDENT.
CR-51	5.084E+01	NOT IDENT.
MN-52	2.043E+02	NOT IDENT.
MN-54	3.069E+00	NOT IDENT.
CO-56	3.819E+00	FAIL ABUN
CO-57	2.052E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.579E+00	NOT IDENT.
FE-59	6.934E+00	NOT IDENT.
CO-60	3.301E+00	NOT IDENT.
ZN-65	5.703E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
AS-73	1.464E+02	NOT IDENT.
AS-74	1.855E+01	NOT IDENT.
SE-75	4.256E+00	FAIL ABUN
BR-77	0.000E+00	SHORT HLIF
SR-82	4.655E+01	NOT IDENT.
RB-83	6.263E+00	NOT IDENT.
RB-84	8.804E+00	NOT IDENT.

KR-85	8.099E+02	NOT IDENT.
SR-85	5.243E+00	NOT IDENT.
Y-88	3.539E+00	NOT IDENT.
Y-91	1.648E+03	NOT IDENT.
NB-94	3.074E+00	NOT IDENT.
NB-95	3.502E+00	NOT IDENT.
NB-95M	1.251E+01	NOT IDENT.
TC-95M	4.702E+00	NOT IDENT.
ZR-95	7.174E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.286E+00	NOT IDENT.
RH-102M	2.536E+00	NOT IDENT.
RH-106	2.978E+01	NOT IDENT.
RU-106	2.978E+01	NOT IDENT.
AG-108M	2.560E+00	NOT IDENT.
CD-109	6.478E+01	NOT IDENT.
AG-110	5.261E+01	NOT IDENT.
AG-110M	4.076E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	3.107E+00	NOT IDENT.
IN-114M	1.714E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	1.063E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.144E+00	NOT IDENT.
SB-124	8.908E+00	NOT IDENT.
SB-125	7.044E+00	NOT IDENT.
TE-125M	9.152E+02	NOT IDENT.
I-126	5.475E+01	NOT IDENT.
SB-126	2.570E+01	NOT IDENT.
SN-126	6.094E+00	NOT IDENT.
SB-127	3.792E+03	NOT IDENT.
TE-129	5.209E+01	FAIL ABUN
I-131	5.421E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	3.143E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.219E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.805E+01	NOT IDENT.
BA-137M	2.948E+00	NOT IDENT.
CS-137	3.114E+00	NOT IDENT.
LA-138	5.098E+00	NOT IDENT.
CE-139	2.536E+00	NOT IDENT.
BA-140	5.525E+01	NOT IDENT.
LA-140	1.721E+01	NOT IDENT.
CE-141	8.016E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.460E+01	NOT IDENT.
PM-144	2.890E+00	FAIL ABUN
PR-144	2.187E+02	NOT IDENT.
PM-146	3.491E+00	NOT IDENT.
ND-147	1.559E+02	NOT IDENT.
PM-147	6.249E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.319E+00	NOT IDENT.
GD-153	6.986E+00	NOT IDENT.
EU-154	6.318E+00	NOT IDENT.
EU-155	8.740E+00	NOT IDENT.
TB-160	1.326E+01	NOT IDENT.
HO-166M	4.686E+00	FAIL ABUN
TM-171	2.512E+03	NOT IDENT.
LU-176	1.930E+00	FAIL ABUN
LU-177	6.763E+02	NOT IDENT.
HF-181	4.877E+00	NOT IDENT.
W-181	2.743E+01	NOT IDENT.
TA-182	1.374E+01	NOT IDENT.
RE-183	2.887E+01	NOT IDENT.
RE-184	1.239E+01	NOT IDENT.
RE-188	1.536E+01	FAIL ABUN
W-188	7.137E+02	NOT IDENT.
OS-191	2.926E+01	NOT IDENT.
IR-192	2.827E+00	FAIL ABUN
PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF

TL-202	1.639E+01	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	5.034E+02	NOT IDENT.
BI-207	3.913E+00	NOT IDENT.
TL-208	3.490E+00	FAIL ABUN
PB-210	5.951E+02	NOT IDENT.
PB-211	5.503E+01	NOT IDENT.
BI-212	3.956E+01	NOT IDENT.
PB-212	5.425E+00	NOT IDENT.
BI-213	8.255E+00	NOT IDENT.
BI-214	7.650E+00	FAIL ABUN
PB-214	6.892E+00	FAIL ABUN
RN-219	3.184E+01	NOT IDENT.
FR-221	1.713E+01	NOT IDENT.
RA-223	4.701E+01	NOT IDENT.
RA-224	5.034E+01	NOT IDENT.
AC-225	1.943E+02	NOT IDENT.
AC-227	1.870E+01	NOT IDENT.
TH-227	1.870E+01	NOT IDENT.
AC-228	1.258E+01	NOT IDENT.
RA-228	1.258E+01	NOT IDENT.
TH-228	5.425E+00	NOT IDENT.
TH-229	3.970E+01	NOT IDENT.
TH-230	1.044E+03	NOT IDENT.
PA-231	3.845E+01	NOT IDENT.
TH-231	4.055E+01	NOT IDENT.
TH-232	2.017E+03	NOT IDENT.
PA-233	5.451E+00	FAIL ABUN
PA-234	2.150E+01	NOT IDENT.
PA-234M	3.931E+02	NOT IDENT.
TH-234	1.471E+02	FAIL ABUN
U-234	9.515E+03	NOT IDENT.
U-235	1.744E+01	FAIL ABUN
NP-237	5.451E+00	FAIL ABUN
NP-238	0.000E+00	SHORT HLIF
U-238	1.471E+02	FAIL ABUN
NP-239	1.978E+01	FAIL ABUN
AM-241	1.945E+01	NOT IDENT.
AM-242	4.962E+01	NOT IDENT.
AM-243	4.915E+00	NOT IDENT.
CM-243	9.012E+00	FAIL ABUN
BK-247	7.021E+00	NOT IDENT.
CM-247	2.888E+00	FAIL ABUN
CF-249	3.210E+00	NOT IDENT.
CF-251	9.968E+00	NOT IDENT.
CF-252	1.402E+04	NOT IDENT.
ANH-511	5.779E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531002.CNF;1
* Acquisition date   : 31-OCT-2022 08:15:48 Sensitivity      : 3.000
* Detector ID        : GAM18 Energy tolerance: 1.500
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 02:00:00.82 Half life ratio  : *****
* Sample date        : 26-SEP-2022 08:25:00 Nuclide Library : LIQUID
* Sample ID          : G597531002 Analyst initials: RXF2
* Batch Number       : 2333342 Sample Quantity  : 7.4152E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 8-JUN-2022 11:06:14 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.031E+02	6.340E+01	6.343E+01
GE-68	1.730E+02	1.325E+02	1.325E+02
RB-86	2.170E+02	1.661E+02	1.661E+02
RU-103	1.012E+01	1.612E+01	1.612E+01
HG-203	3.401E+00	6.507E+00	6.507E+00
BI-211	3.214E+00	3.458E+01	3.458E+01
RA-226	4.905E+00	1.166E+02	1.166E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-1.758E+00	3.155E+00	3.253E+00	NOT IDENT.
NA-24	-1.479E+17	2.636E+17	0.000E+00	SHORT HLIF
AL-26	6.101E-01	3.116E+00	3.128E+00	NOT IDENT.
K-40	1.217E+01	5.004E+01	5.034E+01	NOT IDENT.
SC-46	8.857E-01	3.510E+00	3.532E+00	NOT IDENT.
V-48	3.146E+00	1.378E+01	1.386E+01	NOT IDENT.
CR-51	2.460E+01	5.921E+01	6.024E+01	NOT IDENT.
MN-52	-4.249E+01	2.491E+02	2.498E+02	NOT IDENT.
MN-54	-1.092E+00	3.711E+00	3.744E+00	NOT IDENT.
CO-56	1.459E+00	4.280E+00	4.330E+00	FAIL ABUN
CO-57	-1.847E+00	2.739E+00	2.863E+00	NOT IDENT.
NI-57	5.323E+06	4.979E+07	4.985E+07	SHORT HLIF
CO-58	-1.141E+00	4.312E+00	4.343E+00	NOT IDENT.
FE-59	-1.199E+00	8.556E+00	8.573E+00	NOT IDENT.
CO-60	1.102E+00	3.686E+00	3.720E+00	NOT IDENT.
ZN-65	-2.601E+00	7.306E+00	7.400E+00	NOT IDENT.
CU-67	4.488E+03	1.066E+05	1.066E+05	SHORT HLIF
AS-73	1.143E+02	1.648E+02	1.727E+02	NOT IDENT.
AS-74	1.599E+01	2.052E+01	2.176E+01	NOT IDENT.
SE-75	-3.637E-01	5.109E+00	5.111E+00	FAIL ABUN
BR-77	-4.523E+05	3.610E+05	4.147E+05	SHORT HLIF
SR-82	1.918E+01	5.438E+01	5.506E+01	NOT IDENT.
RB-83	-2.278E+00	7.655E+00	7.723E+00	NOT IDENT.

RB-84	2.443E+00	1.057E+01	1.063E+01	NOT IDENT.
KR-85	-2.988E+03	1.175E+03	1.788E+03	NOT IDENT.
SR-85	-1.935E+01	7.604E+00	1.158E+01	NOT IDENT.
Y-88	5.074E-01	4.155E+00	4.161E+00	NOT IDENT.
Y-91	1.509E+03	1.704E+03	1.835E+03	NOT IDENT.
NB-94	3.576E+00	3.331E+00	3.701E+00	NOT IDENT.
NB-95	1.921E+00	3.986E+00	4.079E+00	NOT IDENT.
NB-95M	-3.581E+00	1.506E+01	1.515E+01	NOT IDENT.
TC-95M	2.774E+00	5.832E+00	5.965E+00	NOT IDENT.
ZR-95	5.909E+00	7.948E+00	8.384E+00	NOT IDENT.
MO-99	-7.363E+04	1.553E+05	1.588E+05	SHORT HLIF
TC-99M	-1.000E+41	9.963E+41	0.000E+00	SHORT HLIF
RH-101	-1.668E+00	3.044E+00	3.136E+00	NOT IDENT.
RH-102M	8.155E-01	3.254E+00	3.274E+00	NOT IDENT.
RH-106	1.717E+01	3.385E+01	3.473E+01	NOT IDENT.
RU-106	1.717E+01	3.385E+01	3.473E+01	NOT IDENT.
AG-108M	7.778E-01	2.898E+00	2.919E+00	NOT IDENT.
CD-109	-7.056E+00	7.924E+01	7.930E+01	NOT IDENT.
AG-110	-1.333E+01	6.533E+01	6.560E+01	NOT IDENT.
AG-110M	2.082E-01	4.755E+00	4.756E+00	NOT IDENT.
IN-111	-8.174E+02	1.314E+04	1.314E+04	SHORT HLIF
SN-113	-5.884E+00	4.658E+00	5.362E+00	NOT IDENT.
IN-114M	-7.408E+00	2.301E+01	2.325E+01	NOT IDENT.
CD-115	-5.211E+05	5.282E+05	5.782E+05	SHORT HLIF
SN-117M	-5.131E+00	1.261E+01	1.282E+01	NOT IDENT.
SB-122	1.615E+04	2.692E+04	2.788E+04	SHORT HLIF
I-123	-1.352E+19	2.950E+19	0.000E+00	SHORT HLIF
TE-123M	-1.165E+00	2.560E+00	2.613E+00	NOT IDENT.
SB-124	4.932E+00	9.531E+00	9.788E+00	NOT IDENT.
SB-125	7.541E-01	8.084E+00	8.091E+00	NOT IDENT.
TE-125M	3.434E+01	1.125E+03	1.125E+03	NOT IDENT.
I-126	9.454E-01	6.596E+01	6.596E+01	NOT IDENT.
SB-126	-1.471E+01	3.381E+01	3.446E+01	NOT IDENT.
SN-126	-2.365E+00	7.603E+00	7.677E+00	NOT IDENT.
SB-127	1.265E+03	4.430E+03	4.466E+03	NOT IDENT.
TE-129	-5.238E+01	6.710E+01	7.114E+01	FAIL ABUN
I-131	5.699E+01	6.031E+01	6.557E+01	NOT IDENT.
I-132	-1.000E+41	7.500E+41	0.000E+00	SHORT HLIF
TE-132	-2.263E+03	5.102E+03	5.203E+03	SHORT HLIF
BA-133	-2.857E-02	4.330E+00	4.330E+00	NOT IDENT.
I-133	2.137E+12	4.423E+12	4.527E+12	SHORT HLIF
CS-134	9.549E-02	4.191E+00	4.191E+00	NOT IDENT.
I-135	-1.276E+39	3.479E+39	0.000E+00	SHORT HLIF
CS-136	-1.083E+01	2.357E+01	2.407E+01	NOT IDENT.
BA-137M	-4.000E-01	3.719E+00	3.724E+00	NOT IDENT.
CS-137	-4.226E-01	3.929E+00	3.934E+00	NOT IDENT.
LA-138	4.003E+00	5.327E+00	5.625E+00	NOT IDENT.
CE-139	7.607E-01	2.860E+00	2.881E+00	NOT IDENT.
BA-140	-4.931E+01	7.150E+01	7.488E+01	NOT IDENT.
LA-140	1.061E+01	1.773E+01	1.837E+01	NOT IDENT.
CE-141	6.470E-01	1.005E+01	1.006E+01	NOT IDENT.
CE-143	9.149E+07	3.016E+08	3.044E+08	SHORT HLIF
CE-144	2.843E-01	1.826E+01	1.826E+01	NOT IDENT.
PM-144	1.654E-01	3.482E+00	3.483E+00	FAIL ABUN
PR-144	1.314E+01	2.634E+02	2.635E+02	NOT IDENT.
PM-146	1.002E+00	3.966E+00	3.992E+00	NOT IDENT.
ND-147	2.583E+01	1.812E+02	1.816E+02	NOT IDENT.
PM-147	-1.262E+03	7.780E+04	7.781E+04	NOT IDENT.
PM-149	3.374E+06	4.883E+06	5.115E+06	SHORT HLIF
EU-152	2.423E+00	9.914E+00	9.974E+00	NOT IDENT.
GD-153	-6.571E+00	9.742E+00	1.018E+01	NOT IDENT.
EU-154	-4.931E+00	8.849E+00	9.124E+00	NOT IDENT.
EU-155	4.199E+00	1.035E+01	1.053E+01	NOT IDENT.
TB-160	2.556E+00	1.741E+01	1.744E+01	NOT IDENT.
HO-166M	-2.003E+00	5.956E+00	6.024E+00	FAIL ABUN
TM-171	5.669E+02	2.901E+03	2.912E+03	NOT IDENT.
LU-176	-1.225E+00	2.466E+00	2.528E+00	FAIL ABUN
LU-177	-3.012E+02	8.681E+02	8.787E+02	NOT IDENT.
HF-181	3.500E+00	5.947E+00	6.153E+00	NOT IDENT.
W-181	-1.629E+01	3.401E+01	3.480E+01	NOT IDENT.
TA-182	3.610E+00	1.602E+01	1.610E+01	NOT IDENT.
RE-183	-1.374E+01	3.528E+01	3.582E+01	NOT IDENT.
RE-184	-9.485E-01	1.512E+01	1.512E+01	NOT IDENT.
RE-188	8.101E+00	1.697E+01	1.736E+01	FAIL ABUN
W-188	7.652E+02	8.641E+02	9.305E+02	NOT IDENT.
OS-191	2.570E+00	3.631E+01	3.632E+01	NOT IDENT.
IR-192	-1.920E+00	4.146E+00	4.236E+00	FAIL ABUN
PB-201	3.827E+27	4.459E+27	0.000E+00	SHORT HLIF

TL-201	1.578E+02	5.693E+04	5.693E+04	SHORT HLIF
TL-202	-4.588E+00	1.951E+01	1.962E+01	NOT IDENT.
PB-203	1.528E+05	2.922E+05	3.002E+05	SHORT HLIF
TL-204	3.132E+02	6.273E+02	6.430E+02	NOT IDENT.
BI-207	5.739E-01	4.587E+00	4.595E+00	NOT IDENT.
TL-208	-2.520E+00	4.372E+00	4.517E+00	FAIL ABUN
PB-210	3.223E+02	6.682E+02	6.839E+02	NOT IDENT.
PB-211	-1.686E+00	6.842E+01	6.842E+01	NOT IDENT.
BI-212	1.399E+01	4.624E+01	4.667E+01	NOT IDENT.
PB-212	-8.519E+00	7.248E+00	8.204E+00	NOT IDENT.
BI-213	-1.683E-01	9.605E+00	9.605E+00	NOT IDENT.
BI-214	6.311E+00	1.430E+01	1.458E+01	FAIL ABUN
PB-214	1.163E+00	1.251E+01	1.252E+01	FAIL ABUN
RN-219	-1.036E+01	4.068E+01	4.095E+01	NOT IDENT.
FR-221	-4.088E+00	2.213E+01	2.221E+01	NOT IDENT.
RA-223	-7.595E+00	5.792E+01	5.802E+01	NOT IDENT.
RA-224	-3.441E+01	6.247E+01	6.437E+01	NOT IDENT.
AC-225	-4.637E+01	2.510E+02	2.519E+02	NOT IDENT.
AC-227	-1.178E+01	2.344E+01	2.404E+01	NOT IDENT.
TH-227	-1.178E+01	2.344E+01	2.404E+01	NOT IDENT.
AC-228	-1.003E+00	1.497E+01	1.498E+01	NOT IDENT.
RA-228	-1.003E+00	1.497E+01	1.498E+01	NOT IDENT.
TH-228	-8.519E+00	7.248E+00	8.204E+00	NOT IDENT.
TH-229	1.085E+01	5.016E+01	5.040E+01	NOT IDENT.
TH-230	-6.481E+02	1.304E+03	1.336E+03	NOT IDENT.
PA-231	7.066E+00	4.573E+01	4.584E+01	NOT IDENT.
TH-231	1.375E+01	5.200E+01	5.236E+01	NOT IDENT.
TH-232	-3.842E+03	2.807E+03	3.299E+03	NOT IDENT.
PA-233	8.788E+00	6.528E+00	7.638E+00	FAIL ABUN
PA-234	3.128E+00	2.518E+01	2.522E+01	NOT IDENT.
PA-234M	-7.474E+01	4.817E+02	4.828E+02	NOT IDENT.
TH-234	-2.619E+02	2.087E+02	2.398E+02	FAIL ABUN
U-234	7.437E+03	1.062E+04	1.114E+04	NOT IDENT.
U-235	5.377E-02	2.293E+01	2.293E+01	FAIL ABUN
NP-237	8.788E+00	6.528E+00	7.638E+00	FAIL ABUN
NP-238	-4.064E+05	1.174E+06	1.188E+06	SHORT HLIF
U-238	-2.619E+02	2.087E+02	2.398E+02	FAIL ABUN
NP-239	-8.564E+00	2.541E+01	2.571E+01	FAIL ABUN
AM-241	4.613E+00	2.362E+01	2.371E+01	NOT IDENT.
AM-242	-4.666E+01	6.976E+01	7.287E+01	NOT IDENT.
AM-243	1.240E+00	5.801E+00	5.828E+00	NOT IDENT.
CM-243	-2.290E+00	1.128E+01	1.132E+01	FAIL ABUN
BK-247	4.089E+00	8.065E+00	8.273E+00	NOT IDENT.
CM-247	-1.088E+00	3.711E+00	3.743E+00	FAIL ABUN
CF-249	2.470E+00	3.681E+00	3.846E+00	NOT IDENT.
CF-251	4.772E+00	1.115E+01	1.135E+01	NOT IDENT.
CF-252	-5.224E+03	1.831E+04	1.846E+04	NOT IDENT.
ANH-511	-9.175E+00	6.329E+00	7.563E+00	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	57.6721	133.52	60.8050	116.30	0.0000
879.38	75.5987	364.49	57.6734	116.74	61.7099
46.54	53.9945	80.22	0.0000	117.23	67.6139
228.16	0.0000	711.68	57.7464	119.76	68.0356
52.39	71.1874	356.01	67.2915	120.54	52.8861
53.20	56.6808	323.87	67.3071	120.90	59.9901
53.44	56.7426	82.35	0.0000	264.66	68.2604
57.53	52.6736	82.47	82.4079	121.22	68.2767
293.27	0.0000	82.47	0.0000	344.28	71.9051
57.53	74.1423	83.79	59.4184	122.06	74.3126
482.18	74.1429	265.00	59.4586	1274.44	68.5803
57.98	73.3203	84.21	65.8736	123.68	65.1277
59.32	62.0938	84.86	0.0000	1377.63	0.0000
59.54	62.1509	193.51	92.7959	127.23	65.6723
155.04	79.2947	105.31	62.0830	129.43	57.6064
63.00	76.8251	86.79	69.6278	131.20	55.4294
129.43	83.8165	86.94	69.6611	133.02	60.4965
63.29	83.8165	87.09	69.6938	133.52	50.8741
290.67	83.9134	87.57	76.2414	135.34	0.0000
63.81	84.9782	88.03	73.1242	136.00	53.5908
87.57	84.1461	306.78	87.5460	136.28	53.6237
64.99	87.3595	88.47	87.5814	136.47	58.5234
65.08	87.3897	531.02	85.3953	739.50	0.0000
66.73	72.9582	184.58	0.0000	140.51	0.0000
66.98	73.0278	92.59	70.8741	140.88	60.3161
67.24	69.0948	93.31	0.0000	143.76	69.3557
67.67	79.2381	94.56	57.0305	144.24	69.4258
1221.41	79.2616	311.90	57.0456	145.44	75.8153
439.51	90.6866	946.00	57.0488	152.32	67.2274
70.82	90.6866	97.43	58.6129	152.43	68.0826
167.43	0.0000	98.43	59.8894	1048.07	61.4593
97.43	61.6450	98.44	59.8910	154.21	61.5774
70.82	0.0000	99.53	57.8510	155.04	54.9198
70.82	62.9210	103.37	57.8510	158.56	64.3384
279.20	0.0000	116.74	57.8510	158.97	0.0000
1063.66	88.9315	100.11	64.6314	159.00	57.0513
72.87	0.0000	100.20	64.6478	162.33	43.7062
351.06	88.9508	102.03	57.1361	537.26	49.7364
74.66	75.1125	103.18	66.3079	163.33	59.2449
238.63	75.1548	103.37	73.0893	165.86	57.8030
351.93	75.1548	105.31	56.5193	167.43	0.0000
238.63	75.1548	106.12	57.7754	245.35	0.0000
74.97	75.1944	106.47	63.4995	427.87	59.7988
77.11	73.6797	109.28	53.6918	176.60	61.5897
256.23	60.7174	111.00	58.5228	177.52	53.7591
79.82	0.0000	111.76	0.0000	181.07	0.0000
80.02	60.7847	208.37	59.9703	184.41	40.1390
80.03	60.7856	116.24	61.6330	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	46.4871	300.09	45.2786	477.60	41.5666
186.21	46.5262	300.13	45.2804	477.99	41.5789
190.27	60.8114	301.36	52.4821	482.18	28.3052
193.51	55.7056	302.85	52.5716	487.02	25.4195
197.03	53.2959	304.50	42.1362	492.35	0.0000
198.01	66.6122	304.85	44.2601	497.08	35.7821
201.83	67.0229	306.78	51.7505	511.00	54.2259
204.12	63.5820	308.46	43.1715	514.00	167.7983
205.31	49.8532	311.90	62.1384	520.40	37.3540
208.37	62.1528	316.51	44.8403	520.69	0.0000
210.85	65.1857	319.41	38.5562	667.71	0.0000
215.65	74.1083	320.08	46.0864	527.90	0.0000
218.12	64.0274	321.04	49.3542	529.59	34.7069
222.11	63.4613	323.87	45.2001	529.87	0.0000
227.09	53.4303	325.23	37.7223	531.02	32.8120
227.38	62.9982	1596.21	57.3379	537.26	38.7708
228.16	0.0000	331.15	0.0000	1260.41	0.0000
228.18	63.0707	333.37	40.2233	552.55	23.5085
235.69	81.1357	334.37	43.5311	795.86	35.5177
235.96	82.1328	338.28	49.1721	564.24	0.0000
238.63	75.6514	911.20	49.1739	569.33	38.6334
238.98	0.0000	340.48	62.4261	569.50	42.6011
240.99	77.8450	340.55	62.4307	569.70	42.6063
242.00	49.6952	344.28	50.5764	582.08	36.9594
244.70	61.6157	345.93	48.8994	583.19	32.9879
245.35	0.0000	351.06	35.4264	595.83	33.2568
459.60	55.2093	351.93	35.4570	600.60	46.4984
685.70	45.4581	356.01	41.7213	604.72	63.2398
388.16	49.4370	361.25	0.0000	609.32	43.7034
256.23	58.6003	364.49	32.5347	610.33	43.7309
527.90	0.0000	366.42	0.0000	614.28	22.8368
264.66	64.2637	383.85	47.9960	618.01	44.9614
265.00	55.2507	388.16	33.2728	621.93	34.8270
269.46	65.6665	666.33	33.2870	630.19	0.0000
401.81	47.5871	391.70	49.4957	631.29	24.7236
273.65	56.3627	400.66	34.8138	632.98	25.7805
276.40	47.8931	401.32	0.0000	633.25	25.7843
583.19	38.2584	401.81	47.6281	634.78	25.8087
277.60	38.2690	402.40	47.6532	635.95	29.9585
402.40	32.1620	404.85	41.9333	636.99	35.1465
278.43	41.3726	410.95	45.6730	657.50	27.2045
279.20	0.0000	720.70	35.2490	884.68	26.1620
279.54	42.9630	423.72	43.5173	661.66	32.5146
280.46	64.5176	427.09	41.8615	664.57	0.0000
301.36	64.7701	427.87	36.5413	666.33	38.9128
284.31	51.4425	433.94	42.9998	666.50	34.7090
285.41	50.4804	439.51	42.2997	667.71	0.0000
285.90	0.0000	440.45	40.5313	677.62	25.4041
287.50	63.0006	453.88	38.2464	685.70	27.6464
290.67	37.3206	459.60	44.8264	692.65	0.0000
293.27	0.0000	463.37	32.1150	695.00	25.6531
295.22	54.1963	468.07	37.7600	696.49	34.2324
316.51	61.0232	473.00	45.8567	696.51	34.2324
298.58	58.0688	475.06	40.0036	697.00	34.2422
299.98	45.2725	696.49	38.0171	697.49	40.6730

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	26.8349	903.28	18.9497	1291.59	14.2314
706.68	40.8795	907.67	0.0000	1298.22	0.0000
711.68	35.5973	911.20	19.9664	1312.11	12.8550
720.70	22.7637	984.45	0.0000	1332.49	14.7852
721.93	0.0000	926.36	16.2695	1365.19	9.1638
1690.97	23.8745	935.54	19.2163	1368.63	0.0000
722.91	22.7906	937.49	24.0399	1377.63	0.0000
723.31	22.7957	983.53	19.2861	1384.29	8.4485
756.73	19.5485	945.96	0.0000	1408.01	17.8267
727.33	25.0201	946.00	18.3362	1434.09	12.3832
733.00	25.0959	949.00	20.2920	1435.80	9.5304
735.93	20.7633	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	29.1504	1460.82	12.4784
1434.09	20.8543	964.08	22.3649	1489.16	15.4811
747.24	26.3833	966.17	22.3846	1596.21	3.9840
752.31	26.4529	968.97	22.4104	1620.50	13.0302
753.82	27.5764	983.53	16.6634	1678.03	0.0000
756.73	19.8850	984.45	0.0000	1690.97	6.1223
763.94	19.9589	996.26	25.6166	1757.55	0.0000
765.80	17.7578	1001.03	20.7298	1764.49	11.4270
1001.03	18.8734	1004.73	34.6010	1770.23	21.8451
766.84	21.0984	1025.87	0.0000	1771.35	13.5269
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	24.5499	1037.84	18.0281	1808.65	7.3481
777.92	0.0000	1038.76	0.0000	1836.06	8.4512
778.90	31.2830	1046.59	13.0647		
783.70	22.3987	1048.07	18.0993		
1435.80	19.0866	1050.41	14.0902		
903.28	28.1143	1063.66	19.2189		
795.86	21.0313	1077.00	15.2498		
801.95	27.1216	1077.34	15.2512		
802.10	27.1238	1083.85	15.2886		
810.29	29.9546	1085.87	13.6003		
810.45	29.9570	1099.25	13.3263		
810.76	28.1460	1111.64	14.4163		
815.77	21.8432	1112.07	16.4781		
818.51	30.0738	1112.84	15.4526		
832.01	30.2680	1115.54	19.5928		
834.85	33.9820	1120.29	19.6271		
835.15	33.9874	1120.55	15.4966		
836.80	0.0000	1121.30	13.4335		
846.77	23.0896	1808.65	15.5471		
856.80	25.9807	1131.51	0.0000		
860.56	14.8719	1332.49	15.7881		
871.09	14.0094	1177.95	22.1392		
873.19	10.9067	1189.05	14.8162		
875.33	0.0000	1204.77	7.4481		
879.38	24.9993	1221.41	14.9796		
880.51	21.8853	1231.02	23.2568		
881.60	24.6331	1235.36	16.1243		
883.24	26.2951	1238.28	16.1396		
884.68	23.4924	1260.41	0.0000		
889.28	15.0664	1271.87	13.0541		
894.76	21.7107	1274.44	14.1540		
1836.06	20.7969	1274.54	14.1540		

VAX/VMS Nuclide Identification Report Generated 31-OCT-2022 10:18:26.76

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531003.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM20.CNF;868
Background date    : 30-OCT-2022 11:30:02
Sample date       : 26-SEP-2022 09:00:00 Acquisition date : 31-OCT-2022 08:16:13
Sample ID        : G597531003 Sample quantity : 7.55820E-01 FILTER
Detector name     : GAM20 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:01.26 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : RXF2
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2333342 Detector SN# :
Matrix Spike ID   : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	6	28.62*	31	25	1.95	57.40	50	28	4.30E-03	59.2	1.66E+00
2	6	33.47*	7	58	1.97	67.09	50	28	9.11E-04	268.1	
3	6	36.53*	3	46	1.23	73.22	50	28	4.59E-04	372.5	
4	0	47.05*	12	69	1.30	94.26	90	7	1.67E-03	132.2	
5	0	139.65*	19	47	1.58	279.46	276	8	2.68E-03	70.6	
6	0	239.20*	15	66	0.80	478.60	473	10	2.11E-03	113.4	
7	0	353.96	62	43	5.83	708.21	699	19	8.61E-03	28.3	
8	0	441.12	7	61	4.14	882.61	866	20	9.54E-04	279.3	
9	0	483.22	6	15	0.76	966.86	960	8	7.80E-04	129.6	
10	0	511.00*	9	64	2.47	1022.47	1013	22	1.20E-03	296.5	
11	0	583.71*	10	18	1.48	1167.99	1163	11	1.41E-03	99.2	
12	0	590.75	30	12	1.61	1182.07	1174	16	4.21E-03	31.3	
13	0	665.80	14	18	4.84	1332.30	1323	14	2.00E-03	67.0	
14	0	796.81	15	10	0.67	1594.58	1590	9	2.06E-03	47.9	
15	0	805.65	6	18	0.70	1612.29	1602	14	8.54E-04	150.2	
16	0	927.01	9	2	1.66	1855.31	1852	7	1.18E-03	42.5	
17	0	961.82	10	9	0.71	1925.02	1918	12	1.42E-03	66.4	
18	0	1001.55*	8	3	0.98	2004.58	2000	10	1.15E-03	63.5	
19	0	1041.90	8	2	0.77	2085.41	2082	7	1.13E-03	44.3	
20	0	1460.99*	6	0	1.58	2925.10	2918	13	8.86E-04	84.4	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 31-OCT-2022 10:18:27

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531003.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 26-SEP-2022 09:00:00	Acquisition date	: 31-OCT-2022 08:16:13
Sample ID	: G597531003	Sample quantity	: 0.75582 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA20	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:01.26 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	6	10.66*	9.738E-01	3.054E+01	3.054E+01	168.78
TL-208	277.37	-----	6.60	3.501E+00	-----	Line Not Found	-----
	583.19	10	85.00*	2.064E+00	2.863E+00	2.965E+00	198.37
	860.56	-----	12.50	1.507E+00	-----	Line Not Found	-----
PB-210	46.54	12	4.25*	1.303E+00	1.080E+02	1.083E+02	264.32
BI-213	440.45	7	25.94*	2.544E+00	5.168E+00	5.168E+00	558.66
ANH-511	511.00	9	100.00*	2.284E+00	1.884E+00	1.884E+00	593.09

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                           *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531003.CNF;1        *
* Acquisition date   : 31-OCT-2022 08:16:13 Sensitivity      : 3.000                *
* Detector ID        : GAM20 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:01.26 Half life ratio : *****      *
* Sample date        : 26-SEP-2022 09:00:00 Analyst initials: RXF2        *
* Sample ID          : G597531003 Sample Quantity : 7.5582E-01 FILTER *
* Batch Number       : 2333342 Wet Weight : 0.00000        *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000         *
* Nuclide Library    : LIQUID.NLB;26
*****
*                                     CALIBRATION INFORMATION                       *
*
* Eff. Cal. date     : 18-APR-2022 07:13:03 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM20_JAR.CNF;19          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
K-40	3.054E+01	5.051E+01	5.885E+01
TL-208	2.965E+00	5.763E+00	5.798E+00
PB-210	1.083E+02	2.805E+02	3.253E+02
BI-213	5.168E+00	2.829E+01	1.687E+01
ANH-511	1.884E+00	1.095E+01	5.074E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	4.678E+01		3.681E+01	7.824E+01	NOT IDENT.
NA-22	-2.905E+00		2.665E+00	3.465E+00	NOT IDENT.
NA-24	0.000E+00		2.220E+17	0.000E+00	SHORT HLIF
AL-26	6.990E-01		2.478E+00	6.320E+00	NOT IDENT.
SC-46	2.075E+00		4.046E+00	8.808E+00	NOT IDENT.
V-48	-6.315E+00		1.279E+01	2.350E+01	NOT IDENT.
CR-51	4.129E+01		5.861E+01	1.169E+02	NOT IDENT.
MN-52	5.824E+00		2.971E+02	5.986E+02	NOT IDENT.
MN-54	1.185E+00		3.760E+00	7.079E+00	NOT IDENT.
CO-56	3.752E-01		4.418E+00	8.882E+00	NOT IDENT.
CO-57	-4.825E-01		2.219E+00	4.124E+00	NOT IDENT.
NI-57	0.000E+00		5.883E+07	0.000E+00	SHORT HLIF
CO-58	3.883E-01		4.094E+00	8.138E+00	NOT IDENT.
FE-59	5.703E+00		1.092E+01	2.370E+01	NOT IDENT.
CO-60	2.318E+00		3.699E+00	8.382E+00	NOT IDENT.
ZN-65	9.067E-01		7.597E+00	1.555E+01	NOT IDENT.
CU-67	0.000E+00		7.872E+04	0.000E+00	SHORT HLIF
GE-68	3.369E+00		1.054E+02	2.157E+02	NOT IDENT.
AS-73	-1.374E+01		6.461E+01	1.104E+02	NOT IDENT.
AS-74	-7.257E+00		2.455E+01	3.754E+01	NOT IDENT.
SE-75	-1.496E+00		4.822E+00	8.662E+00	NOT IDENT.
BR-77	0.000E+00		5.124E+05	0.000E+00	SHORT HLIF
SR-82	-3.168E+01		5.273E+01	9.497E+01	NOT IDENT.
RB-83	-4.654E+00		6.369E+00	1.040E+01	NOT IDENT.
RB-84	2.820E-02		8.499E+00	1.729E+01	NOT IDENT.

KR-85	9.664E+02	7.770E+02	1.615E+03	NOT IDENT.
SR-85	6.255E+00	5.029E+00	1.045E+01	NOT IDENT.
RB-86	3.886E+01	1.402E+02	2.969E+02	NOT IDENT.
Y-88	-1.085E+00	4.382E+00	8.973E+00	NOT IDENT.
Y-91	7.718E+02	1.813E+03	4.060E+03	NOT IDENT.
NB-94	9.050E-01	2.984E+00	6.161E+00	NOT IDENT.
NB-95	-4.024E+00	5.298E+00	8.850E+00	NOT IDENT.
NB-95M	2.049E+00	1.438E+01	2.444E+01	NOT IDENT.
TC-95M	-5.676E+00	4.853E+00	8.014E+00	NOT IDENT.
ZR-95	-2.948E+00	8.082E+00	1.519E+01	NOT IDENT.
MO-99	0.000E+00	1.780E+05	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	1.384E+41	0.000E+00	SHORT HLIF
RH-101	-9.186E-01	2.595E+00	4.761E+00	NOT IDENT.
RH-102M	-1.082E+00	2.315E+00	4.040E+00	NOT IDENT.
RU-103	-1.196E+00	5.093E+00	9.185E+00	NOT IDENT.
RH-106	1.963E+01	3.326E+01	6.672E+01	NOT IDENT.
RU-106	1.963E+01	3.326E+01	6.672E+01	NOT IDENT.
AG-108M	1.635E+00	3.034E+00	5.544E+00	NOT IDENT.
CD-109	-8.507E+00	6.519E+01	1.102E+02	NOT IDENT.
AG-110	6.865E+01	6.091E+01	1.393E+02	NOT IDENT.
AG-110M	4.108E+00	3.910E+00	9.538E+00	NOT IDENT.
IN-111	0.000E+00	1.250E+04	0.000E+00	SHORT HLIF
SN-113	-3.992E+00	4.889E+00	8.076E+00	NOT IDENT.
IN-114M	-1.899E+00	2.234E+01	3.927E+01	NOT IDENT.
CD-115	0.000E+00	5.377E+05	0.000E+00	SHORT HLIF
SN-117M	-2.386E+00	1.416E+01	2.399E+01	NOT IDENT.
SB-122	0.000E+00	2.443E+04	0.000E+00	SHORT HLIF
I-123	0.000E+00	3.349E+19	0.000E+00	SHORT HLIF
TE-123M	-7.230E-01	3.029E+00	5.103E+00	NOT IDENT.
SB-124	-6.739E-01	7.203E+00	1.598E+01	NOT IDENT.
SB-125	5.597E+00	8.014E+00	1.650E+01	NOT IDENT.
TE-125M	-2.955E+02	1.050E+03	1.940E+03	NOT IDENT.
I-126	7.632E+01	1.003E+02	1.217E+02	FAIL ABUN
SB-126	1.838E+01	3.299E+01	7.308E+01	FAIL ABUN
SN-126	5.812E-02	6.212E+00	1.065E+01	NOT IDENT.
SB-127	-1.133E+03	4.359E+03	8.336E+03	NOT IDENT.
TE-129	2.837E+01	6.345E+01	1.271E+02	NOT IDENT.
I-131	-6.589E+00	5.442E+01	1.008E+02	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	4.726E+03	0.000E+00	SHORT HLIF
BA-133	3.269E+00	4.028E+00	8.154E+00	NOT IDENT.
I-133	0.000E+00	4.091E+12	0.000E+00	SHORT HLIF
CS-134	5.524E+00	5.189E+00	9.205E+00	FAIL ABUN
I-135	0.000E+00	2.926E+39	0.000E+00	SHORT HLIF
CS-136	8.483E+00	2.946E+01	6.084E+01	NOT IDENT.
BA-137M	-4.969E-02	3.338E+00	5.567E+00	NOT IDENT.
CS-137	-5.249E-02	3.526E+00	5.881E+00	NOT IDENT.
LA-138	2.281E+00	5.149E+00	1.167E+01	NOT IDENT.
CE-139	2.777E+00	2.981E+00	5.985E+00	NOT IDENT.
BA-140	1.302E+01	6.922E+01	1.340E+02	NOT IDENT.
LA-140	-2.735E+00	2.447E+01	4.899E+01	NOT IDENT.
CE-141	-5.456E+00	7.557E+00	1.333E+01	NOT IDENT.
CE-143	0.000E+00	2.436E+08	0.000E+00	SHORT HLIF
CE-144	-2.487E+00	1.871E+01	3.475E+01	NOT IDENT.
PM-144	1.595E+00	3.285E+00	6.899E+00	NOT IDENT.
PR-144	1.162E+02	2.476E+02	5.193E+02	NOT IDENT.
PM-146	-2.530E-01	4.198E+00	7.706E+00	NOT IDENT.
ND-147	6.635E+01	1.599E+02	3.254E+02	NOT IDENT.
PM-147	-4.617E+03	6.163E+04	1.161E+05	NOT IDENT.
PM-149	0.000E+00	4.148E+06	0.000E+00	SHORT HLIF
EU-152	4.385E-01	9.831E+00	1.822E+01	NOT IDENT.
GD-153	4.178E-01	9.051E+00	1.526E+01	NOT IDENT.
EU-154	-6.794E+00	6.990E+00	9.717E+00	NOT IDENT.
EU-155	-1.817E+00	8.270E+00	1.545E+01	NOT IDENT.
TB-160	-7.797E+00	1.488E+01	2.702E+01	FAIL ABUN
HO-166M	-7.260E-01	5.450E+00	1.063E+01	NOT IDENT.
TM-171	3.448E+02	1.083E+03	1.967E+03	NOT IDENT.
LU-176	-7.854E-02	2.506E+00	4.641E+00	NOT IDENT.
LU-177	-1.788E+02	7.785E+02	1.420E+03	NOT IDENT.
HF-181	2.581E+00	6.555E+00	1.018E+01	FAIL ABUN
W-181	-2.341E+00	1.351E+01	2.333E+01	NOT IDENT.
TA-182	5.798E-01	2.471E+01	3.705E+01	NOT IDENT.
RE-183	-5.042E+00	1.469E+01	2.480E+01	NOT IDENT.
RE-184	3.788E+00	1.505E+01	3.184E+01	NOT IDENT.
RE-188	1.411E+00	1.659E+01	3.145E+01	NOT IDENT.
W-188	3.803E+01	6.933E+02	1.318E+03	NOT IDENT.
OS-191	-6.572E+00	3.279E+01	6.082E+01	NOT IDENT.
IR-192	-1.535E+00	3.863E+00	6.857E+00	NOT IDENT.

PB-201	0.000E+00	4.441E+27	0.000E+00	SHORT HLIF
TL-201	0.000E+00	5.721E+04	0.000E+00	SHORT HLIF
TL-202	6.458E-01	1.834E+01	3.464E+01	NOT IDENT.
HG-203	-6.396E-01	4.569E+00	8.389E+00	NOT IDENT.
PB-203	0.000E+00	2.037E+05	0.000E+00	SHORT HLIF
TL-204	2.739E+02	3.600E+02	6.673E+02	NOT IDENT.
BI-207	8.137E-01	3.759E+00	8.133E+00	NOT IDENT.
BI-211	1.161E+01	2.276E+01	4.110E+01	NOT IDENT.
PB-211	-5.225E+00	6.455E+01	1.191E+02	NOT IDENT.
BI-212	1.661E+01	4.405E+01	9.290E+01	NOT IDENT.
PB-212	4.648E+00	1.034E+01	1.299E+01	FAIL ABUN
BI-214	-4.038E+00	9.636E+00	1.641E+01	NOT IDENT.
PB-214	8.236E+00	8.678E+00	1.632E+01	NOT IDENT.
RN-219	9.495E+00	3.508E+01	6.824E+01	NOT IDENT.
FR-221	8.488E-01	1.853E+01	3.469E+01	NOT IDENT.
RA-223	-5.113E+01	6.041E+01	1.007E+02	NOT IDENT.
RA-224	1.815E+01	6.133E+01	1.064E+02	NOT IDENT.
AC-225	9.610E+00	2.098E+02	3.927E+02	NOT IDENT.
RA-226	-8.248E+01	8.604E+01	1.548E+02	NOT IDENT.
AC-227	7.613E+00	2.408E+01	4.608E+01	NOT IDENT.
TH-227	7.613E+00	2.408E+01	4.608E+01	NOT IDENT.
AC-228	1.189E+00	1.686E+01	3.172E+01	NOT IDENT.
RA-228	1.189E+00	1.686E+01	3.172E+01	NOT IDENT.
TH-228	4.648E+00	1.034E+01	1.299E+01	FAIL ABUN
TH-229	-1.881E+01	4.327E+01	7.778E+01	NOT IDENT.
TH-230	-2.479E+02	7.969E+02	1.335E+03	NOT IDENT.
PA-231	-1.340E+00	4.322E+01	8.012E+01	NOT IDENT.
TH-231	-3.134E+01	3.957E+01	5.887E+01	NOT IDENT.
TH-232	2.616E+02	1.674E+03	3.074E+03	FAIL ABUN
PA-233	-1.400E+00	5.717E+00	1.038E+01	NOT IDENT.
PA-234	-1.320E+01	2.696E+01	4.915E+01	FAIL ABUN
PA-234M	3.709E+02	4.618E+02	9.209E+02	FAIL ABUN
TH-234	3.401E+01	1.168E+02	2.173E+02	NOT IDENT.
U-234	-8.832E+02	4.155E+03	7.103E+03	NOT IDENT.
U-235	5.483E+00	1.858E+01	3.201E+01	NOT IDENT.
NP-237	-1.400E+00	5.717E+00	1.038E+01	NOT IDENT.
NP-238	0.000E+00	1.185E+06	0.000E+00	SHORT HLIF
U-238	3.401E+01	1.168E+02	2.173E+02	NOT IDENT.
NP-239	-1.078E+01	2.085E+01	3.786E+01	NOT IDENT.
AM-241	1.678E+00	9.154E+00	1.643E+01	NOT IDENT.
AM-242	-6.384E+01	6.693E+01	1.016E+02	NOT IDENT.
AM-243	-2.105E-01	4.247E+00	6.954E+00	NOT IDENT.
CM-243	1.059E+00	8.036E+00	1.551E+01	NOT IDENT.
BK-247	-3.114E+00	7.456E+00	1.326E+01	NOT IDENT.
CM-247	-4.957E-01	3.328E+00	6.089E+00	NOT IDENT.
CF-249	1.654E+00	4.052E+00	7.829E+00	NOT IDENT.
CF-251	4.033E+00	1.080E+01	2.098E+01	NOT IDENT.
CF-252	-5.304E+03	1.635E+04	2.701E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	6	26.82	40	4	1.54	53.80	50	28	5.51E-03	26.9	1.66E+00
2	6	28.62	67	25	1.95	57.40	50	28	9.37E-03	26.0	
3	6	30.68	35	36	1.78	61.52	50	28	4.90E-03	46.8	
4	6	33.47	32	58	1.97	67.09	50	28	4.46E-03	51.9	
5	6	36.53	22	46	1.23	73.22	50	28	3.06E-03	50.0	
6	0	47.05	30	69	1.30	94.26	90	7	4.21E-03	49.5	
7	0	63.43	49	101	1.10	127.01	122	10	6.87E-03	40.4	
8	0	92.85	96	113	1.67	185.86	182	10	1.33E-02	23.0	
9	0	139.65	28	47	1.58	279.46	276	8	3.94E-03	46.2	
10	0	145.26	14	55	1.32	290.68	285	9	1.94E-03	98.8	
11	0	185.86	63	87	1.18	371.90	366	11	8.77E-03	31.4	
12	0	239.20	35	66	0.80	478.60	473	10	4.83E-03	47.2	
13	0	353.96	62	43	5.83	708.21	699	19	8.61E-03	28.3	
14	0	441.12	7	61	4.14	882.61	866	20	9.54E-04	279.3	
15	0	483.22	6	15	0.76	966.86	960	8	7.80E-04	129.6	
16	0	511.00	180	64	2.47	1022.47	1013	22	2.49E-02	13.7	
17	0	583.71	16	18	1.48	1167.99	1163	11	2.28E-03	56.9	
18	0	590.75	30	12	1.61	1182.07	1174	16	4.21E-03	31.3	
19	0	665.80	14	18	4.84	1332.30	1323	14	2.00E-03	67.0	
20	0	796.81	15	10	0.67	1594.58	1590	9	2.06E-03	47.9	
21	0	805.65	6	18	0.70	1612.29	1602	14	8.54E-04	150.2	
22	0	927.01	9	2	1.66	1855.31	1852	7	1.18E-03	42.5	
23	0	961.82	10	9	0.71	1925.02	1918	12	1.42E-03	66.4	
24	0	1001.55	14	3	0.98	2004.58	2000	10	1.98E-03	33.9	
25	0	1041.90	8	2	0.77	2085.41	2082	7	1.13E-03	44.3	
26	0	1460.99	21	0	1.58	2925.10	2918	13	2.92E-03	21.8	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	6	10.66*	9.738E-01	3.054E+01	3.054E+01	168.78
TL-208	277.37	-----	6.60	3.501E+00	-----	Line Not Found	-----
	583.19	10	85.00*	2.064E+00	2.863E+00	2.965E+00	198.37
	860.56	-----	12.50	1.507E+00	-----	Line Not Found	-----
PB-210	46.54	12	4.25*	1.303E+00	1.080E+02	1.083E+02	264.32
BI-213	440.45	7	25.94*	2.544E+00	5.168E+00	5.168E+00	558.66
ANH-511	511.00	9	100.00*	2.284E+00	1.884E+00	1.884E+00	593.09

Flag: "*" = Keyline

Total number of lines in spectrum 20
Number of unidentified lines 7
Number of lines tentatively identified by NID 13 65.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
K-40	1.25E+09Y	1.00	3.054E+01	3.054E+01	5.154E+01	168.78	
TL-208	1.91Y	1.04	2.863E+00	2.965E+00	5.881E+00	198.37	
PB-210	22.20Y	1.00	1.080E+02	1.083E+02	2.863E+02	264.32	
BI-213	7340.00Y	1.00	5.168E+00	5.168E+00	28.87E+00	558.66	
ANH-511	1.00E+09Y	1.00	1.884E+00	1.884E+00	11.17E+00	593.09	

Total Activity : 1.484E+02 1.489E+02

Grand Total Activity : 1.484E+02 1.489E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
6	28.62	31	25	1.95	57.40	50	28	4.30E-03	****	5.07E-02	
6	33.47	7	58	1.97	67.09	50	28	9.11E-04	****	1.92E-01	
6	36.53	3	46	1.23	73.22	50	28	4.59E-04	****	3.53E-01	
0	139.65	19	47	1.58	279.46	276	8	2.68E-03	****	5.02E+00	T
0	239.20	15	66	0.80	478.60	473	10	2.11E-03	****	3.85E+00	T
0	353.96	62	43	5.83	708.21	699	19	8.61E-03	56.6	2.97E+00	
0	483.22	6	15	0.76	966.86	960	8	7.80E-04	****	2.38E+00	T
0	590.75	30	12	1.61	1182.07	1174	16	4.21E-03	62.6	2.05E+00	
0	665.80	14	18	4.84	1332.30	1323	14	2.00E-03	****	1.86E+00	T
0	796.81	15	10	0.67	1594.58	1590	9	2.06E-03	95.9	1.61E+00	T
0	805.65	6	18	0.70	1612.29	1602	14	8.54E-04	****	1.59E+00	
0	927.01	9	2	1.66	1855.31	1852	7	1.18E-03	85.0	1.42E+00	T
0	961.82	10	9	0.71	1925.02	1918	12	1.42E-03	****	1.37E+00	T
0	1001.55	8	3	0.98	2004.58	2000	10	1.15E-03	****	1.33E+00	T
0	1041.90	8	2	0.77	2085.41	2082	7	1.13E-03	88.7	1.28E+00	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531003.CNF;1  *
* Acquisition date   : 31-OCT-2022 08:16:13 Sensitivity      : 3.000          *
* Detector ID       : GAM20 Energy tolerance: 1.500          *
* Elapsed live time : 0 02:00:00.00 Abundance limit : 75.000          *
* Elapsed real time : 0 02:00:01.26 Half life ratio : *****          *
* Sample date       : 26-SEP-2022 09:00:00 Nuclide Library : LIQUID          *
* Sample ID         : G597531003 Analyst initials: RXF2          *
* Batch Number      : 2333342 Sample Quantity : 7.5582E-01 FILTER          *
* Wet wt corr       : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date    : 18-APR-2022 07:13:03 Eff. Geometry   : JAR          *
* Eff. File         : DKA100:[CANBERRA.GAMMA]EFF_GAM20_JAR.CNF;19          *
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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
K-40	2.296E+01
TL-208	2.503E+00
PB-210	1.500E+02
BI-213	7.421E+00
ANH-511	2.244E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	3.491E+01	NOT IDENT.
NA-22	1.095E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.366E+00	NOT IDENT.
SC-46	3.793E+00	NOT IDENT.
V-48	9.468E+00	NOT IDENT.
CR-51	5.336E+01	NOT IDENT.
MN-52	2.471E+02	NOT IDENT.
MN-54	3.071E+00	NOT IDENT.
CO-56	3.840E+00	NOT IDENT.
CO-57	1.896E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.470E+00	NOT IDENT.
FE-59	1.018E+01	NOT IDENT.
CO-60	3.541E+00	NOT IDENT.
ZN-65	6.563E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	8.957E+01	NOT IDENT.
AS-73	5.091E+01	NOT IDENT.
AS-74	1.658E+01	NOT IDENT.
SE-75	3.946E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	4.043E+01	NOT IDENT.
RB-83	4.323E+00	NOT IDENT.
RB-84	7.266E+00	NOT IDENT.
KR-85	7.388E+02	NOT IDENT.

SR-85	4.782E+00	NOT IDENT.
RB-86	1.255E+02	NOT IDENT.
Y-88	3.476E+00	NOT IDENT.
Y-91	1.685E+03	NOT IDENT.
NB-94	2.704E+00	NOT IDENT.
NB-95	3.834E+00	NOT IDENT.
NB-95M	1.120E+01	NOT IDENT.
TC-95M	3.634E+00	NOT IDENT.
ZR-95	6.521E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.185E+00	NOT IDENT.
RH-102M	1.722E+00	NOT IDENT.
RU-103	4.006E+00	NOT IDENT.
RH-106	2.969E+01	NOT IDENT.
RU-106	2.969E+01	NOT IDENT.
AG-108M	2.485E+00	NOT IDENT.
CD-109	5.112E+01	NOT IDENT.
AG-110	6.093E+01	NOT IDENT.
AG-110M	4.079E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	3.578E+00	NOT IDENT.
IN-114M	1.804E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	1.104E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.348E+00	NOT IDENT.
SB-124	5.591E+00	NOT IDENT.
SB-125	7.367E+00	NOT IDENT.
TE-125M	8.966E+02	NOT IDENT.
I-126	5.370E+01	FAIL ABUN
SB-126	3.145E+01	FAIL ABUN
SN-126	4.947E+00	NOT IDENT.
SB-127	3.620E+03	NOT IDENT.
TE-129	5.628E+01	NOT IDENT.
I-131	4.458E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	3.710E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	4.100E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	2.626E+01	NOT IDENT.
BA-137M	2.384E+00	NOT IDENT.
CS-137	2.519E+00	NOT IDENT.
LA-138	4.798E+00	NOT IDENT.
CE-139	2.781E+00	NOT IDENT.
BA-140	5.862E+01	NOT IDENT.
LA-140	1.933E+01	NOT IDENT.
CE-141	6.075E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.608E+01	NOT IDENT.
PM-144	3.048E+00	NOT IDENT.
PR-144	2.293E+02	NOT IDENT.
PM-146	3.434E+00	NOT IDENT.
ND-147	1.417E+02	NOT IDENT.
PM-147	5.339E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.277E+00	NOT IDENT.
GD-153	7.120E+00	NOT IDENT.
EU-154	3.072E+00	NOT IDENT.
EU-155	7.099E+00	NOT IDENT.
TB-160	1.140E+01	FAIL ABUN
HO-166M	4.611E+00	NOT IDENT.
TM-171	9.065E+02	NOT IDENT.
LU-176	2.102E+00	NOT IDENT.
LU-177	6.508E+02	NOT IDENT.
HF-181	4.472E+00	FAIL ABUN
W-181	1.065E+01	NOT IDENT.
TA-182	1.579E+01	NOT IDENT.
RE-183	1.133E+01	NOT IDENT.
RE-184	1.351E+01	NOT IDENT.
RE-188	1.447E+01	NOT IDENT.
W-188	5.897E+02	NOT IDENT.
OS-191	2.803E+01	NOT IDENT.
IR-192	3.078E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF

TL-201	0.000E+00	SHORT HLIF
TL-202	1.526E+01	NOT IDENT.
HG-203	3.798E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	3.110E+02	NOT IDENT.
BI-207	3.351E+00	NOT IDENT.
BI-211	1.881E+01	NOT IDENT.
PB-211	5.296E+01	NOT IDENT.
BI-212	4.045E+01	NOT IDENT.
PB-212	6.085E+00	FAIL ABUN
BI-214	7.468E+00	NOT IDENT.
PB-214	7.530E+00	NOT IDENT.
RN-219	3.038E+01	NOT IDENT.
FR-221	1.590E+01	NOT IDENT.
RA-223	4.503E+01	NOT IDENT.
RA-224	4.878E+01	NOT IDENT.
AC-225	1.801E+02	NOT IDENT.
RA-226	7.324E+01	NOT IDENT.
AC-227	2.112E+01	NOT IDENT.
TH-227	2.112E+01	NOT IDENT.
AC-228	1.403E+01	NOT IDENT.
RA-228	1.403E+01	NOT IDENT.
TH-228	6.085E+00	FAIL ABUN
TH-229	3.541E+01	NOT IDENT.
TH-230	6.176E+02	NOT IDENT.
PA-231	3.628E+01	NOT IDENT.
TH-231	2.724E+01	NOT IDENT.
TH-232	1.457E+03	FAIL ABUN
PA-233	4.651E+00	NOT IDENT.
PA-234	2.055E+01	FAIL ABUN
PA-234M	4.003E+02	FAIL ABUN
TH-234	1.029E+02	NOT IDENT.
U-234	3.275E+03	NOT IDENT.
U-235	1.478E+01	NOT IDENT.
NP-237	4.651E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.029E+02	NOT IDENT.
NP-239	1.730E+01	NOT IDENT.
AM-241	7.534E+00	NOT IDENT.
AM-242	4.714E+01	NOT IDENT.
AM-243	3.234E+00	NOT IDENT.
CM-243	7.128E+00	NOT IDENT.
BK-247	6.011E+00	NOT IDENT.
CM-247	2.702E+00	NOT IDENT.
CF-249	3.551E+00	NOT IDENT.
CF-251	9.643E+00	NOT IDENT.
CF-252	1.247E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531003.CNF;1
* Acquisition date   : 31-OCT-2022 08:16:13 Sensitivity      : 3.000
* Detector ID        : GAM20 Energy tolerance: 1.500
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 02:00:01.26 Half life ratio  : *****
* Sample date        : 26-SEP-2022 09:00:00 Nuclide Library : LIQUID
* Sample ID          : G597531003 Analyst initials: RXF2
* Batch Number       : 2333342 Sample Quantity : 7.5582E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 18-APR-2022 07:13:03 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM20_JAR.CNF;19

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
K-40	3.054E+01	5.059E+01	5.059E+01
TL-208	2.965E+00	5.769E+00	5.769E+00
PB-210	1.083E+02	2.807E+02	2.807E+02
BI-213	5.168E+00	2.830E+01	2.830E+01
ANH-511	1.884E+00	1.095E+01	1.095E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	4.678E+01	3.703E+01	4.262E+01	NOT IDENT.
NA-22	-2.905E+00	2.677E+00	2.981E+00	NOT IDENT.
NA-24	-9.130E+16	2.222E+17	0.000E+00	SHORT HLIF
AL-26	6.990E-01	2.479E+00	2.499E+00	NOT IDENT.
SC-46	2.075E+00	4.051E+00	4.158E+00	NOT IDENT.
V-48	-6.315E+00	1.281E+01	1.312E+01	NOT IDENT.
CR-51	4.129E+01	5.870E+01	6.159E+01	NOT IDENT.
MN-52	5.824E+00	2.971E+02	2.971E+02	NOT IDENT.
MN-54	1.185E+00	3.762E+00	3.799E+00	NOT IDENT.
CO-56	3.752E-01	4.418E+00	4.421E+00	NOT IDENT.
CO-57	-4.825E-01	2.219E+00	2.230E+00	NOT IDENT.
NI-57	-2.820E+07	5.893E+07	6.028E+07	SHORT HLIF
CO-58	3.883E-01	4.094E+00	4.098E+00	NOT IDENT.
FE-59	5.703E+00	1.094E+01	1.123E+01	NOT IDENT.
CO-60	2.318E+00	3.705E+00	3.850E+00	NOT IDENT.
ZN-65	9.067E-01	7.597E+00	7.608E+00	NOT IDENT.
CU-67	-1.295E+05	7.948E+04	9.865E+04	SHORT HLIF
GE-68	3.369E+00	1.054E+02	1.054E+02	NOT IDENT.
AS-73	-1.374E+01	6.467E+01	6.497E+01	NOT IDENT.
AS-74	-7.257E+00	2.457E+01	2.478E+01	NOT IDENT.
SE-75	-1.496E+00	4.824E+00	4.871E+00	NOT IDENT.
BR-77	2.304E+05	5.128E+05	5.233E+05	SHORT HLIF
SR-82	-3.168E+01	5.281E+01	5.471E+01	NOT IDENT.
RB-83	-4.654E+00	6.410E+00	6.745E+00	NOT IDENT.
RB-84	2.820E-02	8.499E+00	8.499E+00	NOT IDENT.

KR-85	9.664E+02	7.814E+02	8.949E+02	NOT IDENT.
SR-85	6.255E+00	5.058E+00	5.792E+00	NOT IDENT.
RB-86	3.886E+01	1.403E+02	1.414E+02	NOT IDENT.
Y-88	-1.085E+00	4.383E+00	4.410E+00	NOT IDENT.
Y-91	7.718E+02	1.814E+03	1.847E+03	NOT IDENT.
NB-94	9.050E-01	2.985E+00	3.013E+00	NOT IDENT.
NB-95	-4.024E+00	5.310E+00	5.612E+00	NOT IDENT.
NB-95M	2.049E+00	1.438E+01	1.441E+01	NOT IDENT.
TC-95M	-5.676E+00	4.877E+00	5.508E+00	NOT IDENT.
ZR-95	-2.948E+00	8.087E+00	8.195E+00	NOT IDENT.
MO-99	-7.893E+04	1.781E+05	1.817E+05	SHORT HLIF
TC-99M	1.000E+41	1.389E+41	0.000E+00	SHORT HLIF
RH-101	-9.186E-01	2.600E+00	2.633E+00	NOT IDENT.
RH-102M	-1.082E+00	2.318E+00	2.369E+00	NOT IDENT.
RU-103	-1.196E+00	5.095E+00	5.123E+00	NOT IDENT.
RH-106	1.963E+01	3.332E+01	3.448E+01	NOT IDENT.
RU-106	1.963E+01	3.332E+01	3.448E+01	NOT IDENT.
AG-108M	1.635E+00	3.037E+00	3.125E+00	NOT IDENT.
CD-109	-8.507E+00	6.520E+01	6.531E+01	NOT IDENT.
AG-110	6.865E+01	6.119E+01	6.858E+01	NOT IDENT.
AG-110M	4.108E+00	3.932E+00	4.347E+00	NOT IDENT.
IN-111	-6.597E+03	1.251E+04	1.286E+04	SHORT HLIF
SN-113	-3.992E+00	4.899E+00	5.220E+00	NOT IDENT.
IN-114M	-1.899E+00	2.234E+01	2.235E+01	NOT IDENT.
CD-115	-5.989E+05	5.409E+05	6.047E+05	SHORT HLIF
SN-117M	-2.386E+00	1.416E+01	1.420E+01	NOT IDENT.
SB-122	-8.037E+03	2.444E+04	2.471E+04	SHORT HLIF
I-123	-3.671E+18	3.349E+19	0.000E+00	SHORT HLIF
TE-123M	-7.230E-01	3.030E+00	3.047E+00	NOT IDENT.
SB-124	-6.739E-01	7.203E+00	7.210E+00	NOT IDENT.
SB-125	5.597E+00	8.028E+00	8.416E+00	NOT IDENT.
TE-125M	-2.955E+02	1.050E+03	1.058E+03	NOT IDENT.
I-126	7.632E+01	1.005E+02	1.063E+02	FAIL ABUN
SB-126	1.838E+01	3.307E+01	3.409E+01	FAIL ABUN
SN-126	5.812E-02	6.212E+00	6.212E+00	NOT IDENT.
SB-127	-1.133E+03	4.364E+03	4.393E+03	NOT IDENT.
TE-129	2.837E+01	6.364E+01	6.491E+01	NOT IDENT.
I-131	-6.589E+00	5.442E+01	5.450E+01	NOT IDENT.
I-132	-1.000E+41	1.244E+42	0.000E+00	SHORT HLIF
TE-132	4.266E+02	4.727E+03	4.731E+03	SHORT HLIF
BA-133	3.269E+00	4.037E+00	4.298E+00	NOT IDENT.
I-133	-2.070E+12	4.119E+12	4.224E+12	SHORT HLIF
CS-134	5.524E+00	5.214E+00	5.779E+00	FAIL ABUN
I-135	5.882E+38	2.963E+39	0.000E+00	SHORT HLIF
CS-136	8.483E+00	2.948E+01	2.973E+01	NOT IDENT.
BA-137M	-4.969E-02	3.338E+00	3.338E+00	NOT IDENT.
CS-137	-5.249E-02	3.526E+00	3.526E+00	NOT IDENT.
LA-138	2.281E+00	5.153E+00	5.255E+00	NOT IDENT.
CE-139	2.777E+00	3.037E+00	3.285E+00	NOT IDENT.
BA-140	1.302E+01	6.923E+01	6.948E+01	NOT IDENT.
LA-140	-2.735E+00	2.447E+01	2.450E+01	NOT IDENT.
CE-141	-5.456E+00	7.567E+00	7.957E+00	NOT IDENT.
CE-143	-1.835E+08	2.441E+08	2.577E+08	SHORT HLIF
CE-144	-2.487E+00	1.871E+01	1.874E+01	NOT IDENT.
PM-144	1.595E+00	3.288E+00	3.366E+00	NOT IDENT.
PR-144	1.162E+02	2.479E+02	2.533E+02	NOT IDENT.
PM-146	-2.530E-01	4.198E+00	4.199E+00	NOT IDENT.
ND-147	6.635E+01	1.600E+02	1.628E+02	NOT IDENT.
PM-147	-4.617E+03	6.163E+04	6.167E+04	NOT IDENT.
PM-149	1.294E+06	4.153E+06	4.194E+06	SHORT HLIF
EU-152	4.385E-01	9.831E+00	9.833E+00	NOT IDENT.
GD-153	4.178E-01	9.051E+00	9.053E+00	NOT IDENT.
EU-154	-6.794E+00	7.016E+00	7.657E+00	NOT IDENT.
EU-155	-1.817E+00	8.272E+00	8.313E+00	NOT IDENT.
TB-160	-7.797E+00	1.491E+01	1.532E+01	FAIL ABUN
HO-166M	-7.260E-01	5.451E+00	5.461E+00	NOT IDENT.
TM-171	3.448E+02	1.083E+03	1.094E+03	NOT IDENT.
LU-176	-7.854E-02	2.506E+00	2.506E+00	NOT IDENT.
LU-177	-1.788E+02	7.786E+02	7.828E+02	NOT IDENT.
HF-181	2.581E+00	6.559E+00	6.661E+00	FAIL ABUN
W-181	-2.341E+00	1.353E+01	1.357E+01	NOT IDENT.
TA-182	5.798E-01	2.471E+01	2.471E+01	NOT IDENT.
RE-183	-5.042E+00	1.470E+01	1.488E+01	NOT IDENT.
RE-184	3.788E+00	1.505E+01	1.515E+01	NOT IDENT.
RE-188	1.411E+00	1.659E+01	1.661E+01	NOT IDENT.
W-188	3.803E+01	6.934E+02	6.936E+02	NOT IDENT.
OS-191	-6.572E+00	3.279E+01	3.293E+01	NOT IDENT.
IR-192	-1.535E+00	3.865E+00	3.927E+00	NOT IDENT.

PB-201	1.488E+27	4.487E+27	0.000E+00	SHORT HLIF
TL-201	-4.002E+04	5.729E+04	6.007E+04	SHORT HLIF
TL-202	6.458E-01	1.834E+01	1.834E+01	NOT IDENT.
HG-203	-6.396E-01	4.569E+00	4.579E+00	NOT IDENT.
PB-203	-2.851E+04	2.037E+05	2.041E+05	SHORT HLIF
TL-204	2.739E+02	3.610E+02	3.815E+02	NOT IDENT.
BI-207	8.137E-01	3.760E+00	3.778E+00	NOT IDENT.
BI-211	1.161E+01	2.278E+01	2.337E+01	NOT IDENT.
PB-211	-5.225E+00	6.455E+01	6.459E+01	NOT IDENT.
BI-212	1.661E+01	4.408E+01	4.471E+01	NOT IDENT.
PB-212	4.648E+00	1.034E+01	1.055E+01	FAIL ABUN
BI-214	-4.038E+00	9.643E+00	9.813E+00	NOT IDENT.
PB-214	8.236E+00	8.704E+00	9.464E+00	NOT IDENT.
RN-219	9.495E+00	3.511E+01	3.537E+01	NOT IDENT.
FR-221	8.488E-01	1.853E+01	1.853E+01	NOT IDENT.
RA-223	-5.113E+01	6.059E+01	6.484E+01	NOT IDENT.
RA-224	1.815E+01	6.135E+01	6.190E+01	NOT IDENT.
AC-225	9.610E+00	2.098E+02	2.098E+02	NOT IDENT.
RA-226	-8.248E+01	8.629E+01	9.397E+01	NOT IDENT.
AC-227	7.613E+00	2.410E+01	2.435E+01	NOT IDENT.
TH-227	7.613E+00	2.410E+01	2.435E+01	NOT IDENT.
AC-228	1.189E+00	1.686E+01	1.687E+01	NOT IDENT.
RA-228	1.189E+00	1.686E+01	1.687E+01	NOT IDENT.
TH-228	4.648E+00	1.034E+01	1.055E+01	FAIL ABUN
TH-229	-1.881E+01	4.329E+01	4.411E+01	NOT IDENT.
TH-230	-2.479E+02	7.980E+02	8.058E+02	NOT IDENT.
PA-231	-1.340E+00	4.322E+01	4.323E+01	NOT IDENT.
TH-231	-3.134E+01	3.982E+01	4.226E+01	NOT IDENT.
TH-232	2.616E+02	1.675E+03	1.679E+03	FAIL ABUN
PA-233	-1.400E+00	5.718E+00	5.753E+00	NOT IDENT.
PA-234	-1.320E+01	3.092E+01	3.149E+01	FAIL ABUN
PA-234M	3.709E+02	4.631E+02	4.924E+02	FAIL ABUN
TH-234	3.401E+01	1.170E+02	1.180E+02	NOT IDENT.
U-234	-8.832E+02	4.156E+03	4.175E+03	NOT IDENT.
U-235	5.483E+00	1.858E+01	1.875E+01	NOT IDENT.
NP-237	-1.400E+00	5.718E+00	5.753E+00	NOT IDENT.
NP-238	-1.654E+05	1.185E+06	1.187E+06	SHORT HLIF
U-238	3.401E+01	1.170E+02	1.180E+02	NOT IDENT.
NP-239	-1.078E+01	2.087E+01	2.143E+01	NOT IDENT.
AM-241	1.678E+00	9.155E+00	9.186E+00	NOT IDENT.
AM-242	-6.384E+01	6.790E+01	7.376E+01	NOT IDENT.
AM-243	-2.105E-01	4.247E+00	4.248E+00	NOT IDENT.
CM-243	1.059E+00	8.037E+00	8.051E+00	NOT IDENT.
BK-247	-3.114E+00	7.485E+00	7.615E+00	NOT IDENT.
CM-247	-4.957E-01	3.329E+00	3.337E+00	NOT IDENT.
CF-249	1.654E+00	4.056E+00	4.124E+00	NOT IDENT.
CF-251	4.033E+00	1.081E+01	1.096E+01	NOT IDENT.
CF-252	-5.304E+03	1.705E+04	1.721E+04	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	51.6782	81.00	42.5241	120.90	38.3183
45.60	53.4241	81.07	42.5283	121.12	45.1414
46.54	47.0256	82.35	0.0000	121.22	45.1466
49.72	0.0000	82.47	51.1353	121.78	48.5840
51.35	55.5696	167.43	0.0000	122.06	47.7465
52.39	40.5984	82.47	51.1356	123.07	35.8498
53.20	51.1147	83.79	43.9118	265.00	39.2903
53.44	51.1372	84.00	48.8052	127.16	0.0000
56.28	44.3915	84.21	48.8193	127.23	48.0161
57.36	0.0000	84.86	0.0000	129.43	49.8485
57.53	39.8067	85.43	48.9023	131.20	53.3866
57.53	39.8068	86.55	58.7732	133.02	43.1361
57.98	43.3532	86.79	58.7922	133.52	54.3797
59.32	30.5354	86.94	58.8043	135.34	0.0000
59.54	37.5963	87.09	61.2671	136.00	40.2410
61.49	95.4827	87.57	56.4026	57.53	40.2523
63.00	38.9990	88.03	57.6649	136.47	42.8578
63.29	39.0177	88.34	57.6890	140.51	0.0000
63.58	44.9512	88.47	51.5611	140.88	40.4415
63.81	44.9682	91.11	126.8954	143.76	23.5500
64.28	48.5560	91.27	0.0000	144.24	35.6037
64.99	105.5245	92.59	55.5482	145.44	48.0523
65.08	105.5402	93.31	0.0000	152.32	51.0137
66.73	43.9937	94.56	132.4218	152.43	50.1394
66.98	40.4430	94.65	132.4373	153.25	48.4182
67.24	41.6498	94.67	132.4406	323.87	44.9378
67.67	58.3497	97.43	52.1706	155.04	43.2095
67.75	58.3568	98.43	46.0182	156.02	48.5457
68.89	54.8833	98.44	46.0188	158.56	40.6987
68.89	0.0000	99.53	66.0094	158.97	0.0000
69.67	54.9507	100.11	54.8402	159.00	42.4858
70.82	0.0000	100.20	54.8463	162.33	56.8226
70.82	46.6719	102.03	42.4780	162.66	55.0636
70.83	0.0000	103.18	40.8700	163.33	51.5430
72.81	60.0193	103.37	40.8794	165.86	40.0822
72.87	0.0000	105.31	46.8302	167.43	0.0000
74.66	56.5763	106.12	42.6907	171.28	0.0000
74.82	56.5899	106.47	43.5462	176.31	47.6490
74.97	62.6240	109.28	55.4559	176.60	44.0638
77.11	54.3662	111.00	49.6750	177.52	36.8993
79.69	50.9331	111.76	0.0000	181.07	0.0000
79.82	0.0000	112.95	64.9778	184.41	53.4135
80.02	44.8908	116.24	37.2709	184.58	0.0000
80.03	44.8911	116.30	0.0000	185.72	43.5034
80.12	44.8973	116.74	46.6149	186.21	44.4277
80.19	44.9018	117.23	57.6652	190.27	36.3908
80.22	0.0000	119.76	34.0175	193.51	41.9617
80.57	47.3548	99.53	41.7076	197.03	39.3375

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
198.01	39.3690	256.23	25.6329	492.35	0.0000
201.83	36.7346	304.85	33.5269	497.08	18.4748
204.12	52.4425	306.78	31.5918	511.00	19.6774
205.31	40.5200	308.46	18.7766	514.00	19.7021
208.37	44.3096	311.90	28.7180	520.40	15.3649
210.85	28.6721	316.51	31.7754	520.69	0.0000
215.65	34.3480	319.41	26.8561	522.65	0.0000
218.12	39.9932	320.08	25.8715	527.90	0.0000
222.11	40.1135	321.04	28.8726	529.59	15.4236
227.09	45.8802	323.87	36.8984	529.87	0.0000
227.38	42.1436	325.23	25.9492	531.02	11.0234
228.16	0.0000	328.76	38.0031	537.26	14.3669
228.18	37.4833	331.15	0.0000	546.56	0.0000
116.74	37.4833	333.37	29.0785	552.55	22.2388
235.69	38.1595	334.37	35.1146	563.25	17.8665
235.96	38.1669	338.28	31.1703	564.24	0.0000
238.63	40.6008	338.32	31.1709	569.33	17.9095
238.98	0.0000	311.90	40.2694	946.00	17.9102
240.99	35.4668	340.55	40.2710	569.70	21.2706
242.00	31.2332	344.28	32.2839	582.08	16.8732
244.70	32.2409	345.93	27.2648	583.19	13.5039
245.35	0.0000	351.06	22.2784	595.83	23.7455
250.62	36.1828	351.93	22.2891	427.87	18.1243
252.40	40.9940	356.01	22.3388	604.72	19.2869
252.80	39.0981	361.25	0.0000	609.32	28.4119
256.23	35.3665	364.49	21.4213	610.33	19.3277
260.90	0.0000	366.42	0.0000	614.28	19.3553
264.66	40.3739	356.01	30.9143	618.01	25.0830
265.00	38.4603	388.16	25.8189	621.93	14.8429
269.46	35.6804	388.63	21.6930	630.19	0.0000
271.23	28.9636	391.70	32.0734	631.29	13.7480
273.65	33.8443	264.66	16.6289	155.04	20.6345
276.40	24.2177	401.32	0.0000	633.25	20.6367
277.37	31.0182	401.81	18.7181	634.78	13.7651
277.60	31.0228	402.40	22.8844	635.95	13.7710
278.00	31.0306	404.85	22.9126	636.99	10.3323
278.43	32.9797	410.95	20.8923	657.50	5.7821
279.20	0.0000	414.70	29.3034	657.76	8.3268
279.54	33.0032	423.72	16.8180	661.66	12.1599
280.46	33.0226	427.09	17.8982	664.57	0.0000
283.69	32.1171	427.87	14.7451	666.33	15.6599
284.31	29.2090	433.94	17.4285	666.50	15.6605
285.41	30.2034	439.51	18.0037	667.71	0.0000
285.90	0.0000	440.45	18.0117	677.62	13.9741
287.50	26.3408	453.88	23.4547	685.70	17.5159
290.67	23.4609	459.60	14.9647	692.65	0.0000
293.27	0.0000	463.37	17.1318	695.00	15.8143
351.93	30.3895	468.07	20.3870	696.49	14.0640
295.96	26.4803	473.00	20.4318	696.51	14.0640
879.38	40.2760	475.06	16.1453	697.00	19.3413
299.98	29.4952	476.78	10.3408	697.49	17.5861
300.09	29.4971	477.60	8.0817	702.65	14.0933
300.13	30.4809	477.99	11.3163	706.68	11.4662
301.36	31.4883	482.18	21.0548	711.68	15.9027
302.85	29.5468	487.02	19.4766	720.70	7.9750

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
721.93	0.0000	935.54	10.3897	1368.63	0.0000
722.78	14.1875	937.49	17.9551	1377.63	0.0000
722.91	14.1880	944.13	12.3069	1384.29	9.4307
723.31	12.4162	945.96	0.0000	1408.01	4.2112
724.19	13.3067	946.00	13.2604	1434.09	7.4076
727.33	11.5444	949.00	8.5314	1435.80	4.2341
733.00	16.0142	667.71	0.0000	1457.56	0.0000
735.93	16.0291	962.31	12.1766	1460.82	4.2549
739.50	0.0000	964.08	15.2275	1489.16	5.3473
744.23	16.0719	966.17	12.1891	1596.21	5.4538
747.24	13.4061	968.97	16.2005	1620.50	5.4773
752.31	10.7424	983.53	9.5660	1678.03	0.0000
753.82	16.1213	984.45	0.0000	1690.97	2.2180
756.73	16.1362	996.26	1.5356	1757.55	0.0000
763.94	13.4775	1001.03	9.6094	1764.49	3.3684
765.80	17.0813	1274.44	6.1559	1063.66	3.3715
766.42	13.4880	1025.87	0.0000	1771.35	2.2482
766.84	13.4898	1028.54	0.0000	1791.20	0.0000
772.60	0.0000	1037.84	7.7593	1808.65	1.8095
776.52	17.1387	1038.76	0.0000	1836.06	5.4524
739.50	0.0000	475.06	10.3685		
778.90	18.0542	1048.07	10.6965		
783.70	12.6567	1050.41	13.6215		
788.74	9.0546	1063.66	5.8568		
792.07	17.4023	1077.00	7.8345		
795.86	15.9704	1077.34	7.8354		
802.10	7.2732	459.60	7.8477		
810.29	12.1517	1085.87	2.9443		
344.28	10.9373	1099.25	7.8770		
810.76	10.4175	1111.64	13.8248		
815.77	12.7806	1112.07	13.8265		
1048.07	10.0500	1112.84	12.8413		
832.01	14.6768	1115.54	8.8956		
834.85	10.0990	1120.29	9.8956		
835.15	16.5267	1120.55	10.8859		
836.80	0.0000	1221.41	7.9180		
846.77	12.8981	1129.67	8.9253		
856.80	11.0878	1131.51	0.0000		
860.56	8.3246	1173.23	3.0051		
871.09	12.9887	1177.95	12.0337		
873.19	15.7813	1189.05	6.0319		
875.33	0.0000	1204.77	5.0443		
879.38	14.8794	1221.41	8.1011		
880.51	14.8838	1231.02	7.1034		
881.60	9.3054	1235.36	8.1255		
883.24	12.1026	1238.28	5.0818		
884.68	3.7253	1260.41	0.0000		
889.28	8.3930	1271.87	7.1662		
894.76	10.2739	1274.44	6.1461		
898.04	4.6742	1274.54	7.1705		
903.28	8.4257	1291.59	8.2246		
907.67	0.0000	1298.22	0.0000		
911.20	10.3209	1312.11	5.1627		
923.98	0.0000	1332.49	5.1843		
926.36	6.5952	1365.19	4.1753		

VAX/VMS Nuclide Identification Report Generated 1-NOV-2022 07:10:05.27

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226444.CNF;3
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM07.CNF;789
Background date    : 30-OCT-2022 10:39:38
Sample date       : 31-OCT-2022 00:00:00 Acquisition date : 1-NOV-2022 05:09:30.
Sample ID        : G1205226444 Sample quantity : 7.77220E-01 FILTER
Detector name     : GAM07 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:00.48 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : RXF2
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2333342 Detector SN# :
Matrix Spike ID   : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.30*	15	49	1.60	127.19	124	7	2.08E-03	93.9	
2	0	66.52	28	38	2.25	133.62	131	7	3.93E-03	40.8	
3	0	86.70	38	64	1.42	173.97	169	10	5.22E-03	43.3	
4	0	92.70*	15	94	1.08	185.97	182	10	2.03E-03	148.9	
5	0	185.71*	23	57	1.99	371.96	367	10	3.22E-03	72.7	
6	0	189.64	18	35	0.85	379.83	377	7	2.50E-03	59.4	
7	0	201.84	14	26	1.44	404.22	402	5	1.95E-03	60.8	
8	0	238.42*	42	49	1.52	477.37	471	13	5.76E-03	44.0	
9	0	254.65	10	69	3.14	509.82	499	14	1.46E-03	171.5	
10	0	257.13	9	29	1.07	514.79	512	7	1.30E-03	97.9	
11	0	296.12	13	26	1.10	592.77	589	8	1.86E-03	71.1	
12	3	338.70*	21	33	1.79	677.90	673	27	2.91E-03	61.2	3.14E+00
13	3	342.19	19	33	1.80	684.89	673	27	2.70E-03	61.3	
14	0	569.37*	2	14	0.72	1139.21	1134	10	2.83E-04	427.7	
15	0	607.60	50	47	10.23	1215.66	1202	27	6.96E-03	40.7	
16	0	657.48	8	13	0.93	1315.43	1309	10	1.15E-03	87.5	
17	0	684.03	21	23	4.92	1368.53	1359	22	2.90E-03	61.4	
18	0	728.64*	2	12	0.81	1457.75	1452	11	3.37E-04	351.4	
19	0	792.88	12	5	1.54	1586.22	1582	9	1.60E-03	44.4	
20	0	804.17	20	7	0.75	1608.79	1602	13	2.71E-03	35.2	
21	0	896.66	6	10	0.49	1793.78	1785	10	8.85E-04	100.4	
22	0	1045.14	13	7	4.72	2090.77	2081	15	1.78E-03	54.2	
23	0	1460.79*	3	7	1.11	2922.17	2913	14	4.26E-04	228.8	
24	0	1506.06	15	0	1.00	3012.73	3005	14	2.08E-03	25.8	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 1-NOV-2022 07:10:06

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226444.CNF;3		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 31-OCT-2022 00:00:00	Acquisition date	: 1-NOV-2022 05:09:30
Sample ID	: G1205226444	Sample quantity	: 0.77722 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA7	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.48 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	3	10.66*	8.354E-01	1.663E+01	1.663E+01	457.67
CU-67	91.27	15	7.00	3.982E+00	2.529E+01	3.546E+01	297.83
	93.31	15	16.10	3.982E+00	1.099E+01	1.542E+01	297.83
	184.58	23	48.70*	3.941E+00	5.827E+00	8.170E+00	145.39
CD-109	88.03	38	3.70*	3.725E+00	1.316E+02	1.318E+02	86.63
AG-110	657.50	8	4.50*	1.611E+00	5.505E+01	5.524E+01	174.98
IN-114M	190.27	18	15.56*	3.896E+00	1.434E+01	1.459E+01	118.76
SN-126	64.28	15	9.60	2.017E+00	3.733E+01	3.733E+01	187.76
	86.94	38	8.90	3.725E+00	5.470E+01	5.470E+01	86.63
	87.57	38	37.00*	3.725E+00	1.316E+01	1.316E+01	86.63
BI-212	727.33	2	6.67*	1.483E+00	1.186E+01	1.187E+01	702.85
	1620.50	-----	1.47	7.761E-01	-----	Line Not Found	-----
RA-226	186.21	23	3.59*	3.941E+00	7.904E+01	7.904E+01	145.39
TH-230	67.67	28	0.38*	2.311E+00	1.558E+03	1.558E+03	81.56
TH-232	63.81	15	0.26*	2.017E+00	1.378E+03	1.378E+03	187.76
	140.88	-----	0.02	4.402E+00	-----	Line Not Found	-----
TH-234	63.29	15	3.70*	2.017E+00	9.686E+01	9.686E+01	187.76
	92.59	15	4.23	3.982E+00	4.185E+01	4.185E+01	297.83
U-238	63.29	15	3.70*	2.017E+00	9.686E+01	9.686E+01	187.76
	92.59	15	4.23	3.982E+00	4.185E+01	4.185E+01	297.83

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                    *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226444.CNF;3 *
* Acquisition date   : 1-NOV-2022 05:09:30 Sensitivity      : 3.000           *
* Detector ID        : GAM07 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 02:00:00.48 Half life ratio  : *****          *
* Sample date        : 31-OCT-2022 00:00:00 Analyst initials: RXF2         *
* Sample ID          : G1205226444 Sample Quantity : 7.7722E-01 FILTER *
* Batch Number       : 2333342 Wet Weight : 0.00000         *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 18-JUL-2022 10:57:12 Eff. Geometry : JAR           *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM07_JAR.CNF;18         *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
K-40	1.663E+01	7.459E+01	7.734E+01
CU-67	8.170E+00	1.164E+01	8.608E+00
CD-109	1.318E+02	1.119E+02	1.234E+02
AG-110	5.524E+01	9.473E+01	1.488E+02
IN-114M	1.459E+01	1.699E+01	2.443E+01
SN-126	1.316E+01	1.117E+01	1.162E+01
BI-212	1.187E+01	8.178E+01	8.063E+01
RA-226	7.904E+01	1.126E+02	8.373E+01
TH-230	1.558E+03	1.245E+03	1.487E+03
TH-232	1.378E+03	2.536E+03	2.480E+03
TH-234	9.686E+01	1.782E+02	1.783E+02
U-238	9.686E+01	1.782E+02	1.783E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	-1.127E+01	3.081E+01	5.541E+01	NOT IDENT.
NA-22	-1.561E+00	3.619E+00	6.746E+00	NOT IDENT.
NA-24	-7.424E+00	1.671E+01	3.061E+01	NOT IDENT.
AL-26	3.285E-01	4.092E+00	8.680E+00	NOT IDENT.
SC-46	-1.642E+00	4.278E+00	6.761E+00	NOT IDENT.
V-48	-3.141E+00	3.387E+00	5.629E+00	NOT IDENT.
CR-51	4.269E+00	2.183E+01	4.368E+01	NOT IDENT.
MN-52	1.824E+00	4.332E+00	9.900E+00	NOT IDENT.
MN-54	9.878E-01	3.392E+00	6.848E+00	NOT IDENT.
CO-56	-6.013E-01	3.522E+00	6.473E+00	NOT IDENT.
CO-57	3.705E-01	2.020E+00	3.742E+00	NOT IDENT.
NI-57	8.520E+00	6.311E+00	1.827E+01	NOT IDENT.
CO-58	1.136E+00	3.718E+00	7.393E+00	NOT IDENT.
FE-59	7.368E-01	5.579E+00	1.209E+01	NOT IDENT.
CO-60	1.414E-02	2.587E+00	5.813E+00	NOT IDENT.
ZN-65	2.784E+00	5.273E+00	1.287E+01	NOT IDENT.
GE-68	-7.970E-01	1.044E+02	2.161E+02	NOT IDENT.
AS-73	6.545E+01	7.190E+01	1.455E+02	NOT IDENT.

AS-74	-6.146E+00	5.843E+00	9.127E+00	NOT IDENT.
SE-75	-1.331E+00	3.726E+00	6.943E+00	NOT IDENT.
BR-77	3.697E+01	3.187E+01	4.178E+01	FAIL ABUN
SR-82	-1.735E+01	2.128E+01	3.345E+01	NOT IDENT.
RB-83	-1.943E+00	6.094E+00	1.114E+01	NOT IDENT.
RB-84	1.547E+00	5.077E+00	1.083E+01	NOT IDENT.
KR-85	-3.614E+03	1.180E+03	1.448E+03	NOT IDENT.
SR-85	-1.640E+01	5.355E+00	6.571E+00	NOT IDENT.
RB-86	-7.571E+00	4.130E+01	8.221E+01	NOT IDENT.
Y-88	-6.110E-01	4.396E+00	8.687E+00	FAIL ABUN
Y-91	-1.353E+03	1.365E+03	2.084E+03	NOT IDENT.
NB-94	-3.779E-01	3.444E+00	6.387E+00	NOT IDENT.
NB-95	1.032E+00	3.640E+00	7.199E+00	NOT IDENT.
NB-95M	2.799E+00	9.213E+00	1.579E+01	NOT IDENT.
TC-95M	1.218E+00	3.254E+00	5.691E+00	NOT IDENT.
ZR-95	-1.393E+00	6.332E+00	1.122E+01	NOT IDENT.
MO-99	1.252E+01	3.047E+01	6.497E+01	NOT IDENT.
TC-99M	5.290E+01	6.691E+01	1.304E+02	NOT IDENT.
RH-101	-1.592E-01	2.811E+00	5.011E+00	NOT IDENT.
RH-102M	5.148E-02	3.007E+00	5.751E+00	FAIL ABUN
RU-103	5.837E-02	3.590E+00	6.786E+00	NOT IDENT.
RH-106	-2.242E+01	3.827E+01	6.049E+01	NOT IDENT.
RU-106	-2.242E+01	3.827E+01	6.049E+01	NOT IDENT.
AG-108M	-2.090E-01	2.928E+00	5.566E+00	NOT IDENT.
AG-110M	-7.002E-01	4.438E+00	8.870E+00	FAIL ABUN
IN-111	9.399E-01	3.502E+00	6.323E+00	NOT IDENT.
SN-113	1.259E+00	4.059E+00	8.073E+00	NOT IDENT.
CD-115	-1.350E+00	1.538E+01	2.906E+01	NOT IDENT.
SN-117M	-2.814E-01	2.319E+00	4.083E+00	NOT IDENT.
SB-122	-1.679E+00	6.403E+00	1.032E+01	NOT IDENT.
I-123	1.004E+01	1.060E+01	2.110E+01	NOT IDENT.
TE-123M	2.105E+00	2.185E+00	4.354E+00	NOT IDENT.
SB-124	3.294E+00	7.027E+00	1.726E+01	NOT IDENT.
SB-125	-2.708E+00	8.220E+00	1.516E+01	NOT IDENT.
TE-125M	-4.119E+02	7.060E+02	1.194E+03	NOT IDENT.
I-126	2.264E+00	1.118E+01	2.175E+01	NOT IDENT.
SB-126	-1.110E+00	6.430E+00	1.188E+01	NOT IDENT.
SB-127	4.810E+00	1.078E+01	2.213E+01	NOT IDENT.
TE-129	2.398E+00	3.432E+01	6.690E+01	NOT IDENT.
I-131	-3.318E-01	3.066E+00	5.883E+00	NOT IDENT.
I-132	0.000E+00	3.166E+04	0.000E+00	SHORT HLIF
TE-132	-1.918E+00	3.585E+00	5.828E+00	NOT IDENT.
BA-133	-8.088E-01	3.806E+00	7.163E+00	NOT IDENT.
I-133	-4.315E+00	8.397E+00	1.482E+01	NOT IDENT.
CS-134	-3.182E-01	3.781E+00	6.408E+00	FAIL ABUN
I-135	-8.673E+01	2.859E+02	5.553E+02	NOT IDENT.
CS-136	-3.080E+00	5.665E+00	8.634E+00	NOT IDENT.
BA-137M	-6.354E+00	4.670E+00	6.500E+00	NOT IDENT.
CS-137	-6.713E+00	4.933E+00	6.867E+00	NOT IDENT.
LA-138	-2.912E+00	5.697E+00	1.027E+01	NOT IDENT.
CE-139	-3.331E-01	2.379E+00	4.173E+00	NOT IDENT.
BA-140	-2.775E+00	1.629E+01	2.537E+01	NOT IDENT.
LA-140	-1.951E+00	3.853E+00	6.930E+00	NOT IDENT.
CE-141	2.936E+00	4.392E+00	8.326E+00	NOT IDENT.
CE-143	-9.161E+00	1.033E+01	1.538E+01	NOT IDENT.
CE-144	-1.554E+01	1.712E+01	2.741E+01	NOT IDENT.
PM-144	4.010E-01	3.442E+00	6.633E+00	NOT IDENT.
PR-144	3.168E+01	2.561E+02	4.939E+02	NOT IDENT.
PM-146	-1.520E+00	4.166E+00	7.578E+00	NOT IDENT.
ND-147	-6.158E+00	2.154E+01	3.975E+01	NOT IDENT.
PM-147	4.433E+04	6.037E+04	1.187E+05	NOT IDENT.
PM-149	-3.600E+00	1.045E+02	2.019E+02	NOT IDENT.
EU-152	4.848E+00	9.751E+00	1.965E+01	NOT IDENT.
GD-153	-6.055E+00	6.678E+00	9.720E+00	NOT IDENT.
EU-154	-5.683E+00	1.078E+01	1.949E+01	NOT IDENT.
EU-155	1.158E+00	8.790E+00	1.622E+01	FAIL ABUN
TB-160	-4.204E+00	1.241E+01	2.184E+01	FAIL ABUN
HO-166M	-1.462E+00	5.523E+00	1.010E+01	FAIL ABUN
TM-171	8.654E+02	1.596E+03	3.157E+03	FAIL ABUN
LU-176	7.954E-02	2.379E+00	4.630E+00	FAIL ABUN
LU-177	-9.016E+00	2.504E+01	4.196E+01	NOT IDENT.
HF-181	7.841E-01	3.507E+00	6.929E+00	NOT IDENT.
W-181	2.668E+00	1.693E+01	3.200E+01	FAIL ABUN
TA-182	5.389E+00	1.190E+01	2.771E+01	FAIL ABUN
RE-183	9.003E+00	1.560E+01	3.062E+01	FAIL ABUN
RE-184	-2.899E+00	7.156E+00	1.390E+01	FAIL ABUN
RE-188	-3.704E+00	1.260E+01	2.168E+01	FAIL ABUN
W-188	4.670E+02	5.520E+02	1.166E+03	FAIL ABUN

OS-191	-2.189E-01	7.991E+00	1.423E+01	FAIL ABUN
IR-192	-1.474E-01	2.549E+00	4.946E+00	FAIL ABUN
PB-201	-1.534E+01	2.990E+01	5.406E+01	NOT IDENT.
TL-201	3.121E+00	2.429E+01	4.420E+01	NOT IDENT.
TL-202	-2.752E+00	3.423E+00	5.814E+00	NOT IDENT.
HG-203	2.064E+00	3.045E+00	6.212E+00	NOT IDENT.
PB-203	3.054E+00	4.507E+00	9.193E+00	NOT IDENT.
TL-204	2.935E+02	3.794E+02	7.545E+02	NOT IDENT.
BI-207	5.820E+00	5.536E+00	1.284E+01	FAIL ABUN
TL-208	-6.326E+00	4.885E+00	8.289E+00	NOT IDENT.
PB-210	-2.880E+02	3.941E+02	6.487E+02	NOT IDENT.
BI-211	-1.218E+01	2.497E+01	4.069E+01	NOT IDENT.
PB-211	5.978E+01	6.151E+01	1.349E+02	NOT IDENT.
PB-212	1.359E+01	1.172E+01	1.559E+01	FAIL ABUN
BI-213	-3.802E+00	1.087E+01	1.978E+01	NOT IDENT.
BI-214	1.673E+00	9.040E+00	1.594E+01	NOT IDENT.
PB-214	1.901E+00	8.397E+00	1.575E+01	FAIL ABUN
RN-219	-2.294E+01	3.865E+01	6.840E+01	NOT IDENT.
FR-221	-2.157E+01	2.019E+01	3.028E+01	NOT IDENT.
RA-223	-2.543E+01	5.446E+01	9.973E+01	FAIL ABUN
RA-224	8.659E+00	6.700E+01	1.091E+02	NOT IDENT.
AC-225	-2.353E+01	2.203E+01	3.303E+01	NOT IDENT.
AC-227	1.478E+01	2.837E+01	4.383E+01	FAIL ABUN
TH-227	1.478E+01	2.837E+01	4.383E+01	FAIL ABUN
AC-228	-2.336E+00	1.280E+01	2.541E+01	FAIL ABUN
RA-228	-2.336E+00	1.280E+01	2.541E+01	FAIL ABUN
TH-228	1.359E+01	1.172E+01	1.559E+01	FAIL ABUN
TH-229	2.340E+01	4.641E+01	8.240E+01	FAIL ABUN
PA-231	2.082E+01	4.580E+01	9.193E+01	NOT IDENT.
TH-231	1.032E+00	3.658E+01	6.404E+01	NOT IDENT.
PA-233	7.417E-01	6.054E+00	1.184E+01	NOT IDENT.
PA-234	5.861E+00	2.437E+01	5.348E+01	FAIL ABUN
PA-234M	1.373E+02	4.038E+02	8.799E+02	NOT IDENT.
U-234	3.389E+03	6.278E+03	1.229E+04	NOT IDENT.
U-235	-2.034E+01	2.130E+01	3.188E+01	FAIL ABUN
NP-237	7.417E-01	6.054E+00	1.184E+01	NOT IDENT.
NP-238	-1.120E+01	1.870E+01	3.408E+01	NOT IDENT.
NP-239	-2.213E+01	2.325E+01	3.729E+01	NOT IDENT.
AM-241	-5.463E+00	1.553E+01	2.543E+01	NOT IDENT.
AM-242	5.175E+01	4.982E+01	1.017E+02	NOT IDENT.
AM-243	-7.085E+00	5.590E+00	8.978E+00	NOT IDENT.
CM-243	-4.437E+00	9.082E+00	1.560E+01	NOT IDENT.
BK-247	-1.651E+00	7.182E+00	1.358E+01	NOT IDENT.
CM-247	-1.296E+00	3.344E+00	6.126E+00	NOT IDENT.
CF-249	-2.732E+00	3.572E+00	6.172E+00	NOT IDENT.
CF-251	-1.856E+00	1.053E+01	1.842E+01	NOT IDENT.
CF-252	-1.686E+03	1.456E+04	2.621E+04	NOT IDENT.
ANH-511	-1.521E+01	7.052E+00	1.362E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.30	32	49	1.60	127.19	124	7	4.40E-03	41.2	
2	0	66.52	28	38	2.25	133.62	131	7	3.93E-03	40.8	
3	0	86.70	38	64	1.42	173.97	169	10	5.22E-03	43.3	
4	0	92.70	70	94	1.08	185.97	182	10	9.67E-03	29.2	
5	0	185.71	53	57	1.99	371.96	367	10	7.38E-03	30.0	
6	0	189.64	18	35	0.85	379.83	377	7	2.50E-03	59.4	
7	0	201.84	14	26	1.44	404.22	402	5	1.95E-03	60.8	
8	0	238.42	96	49	1.52	477.37	471	13	1.33E-02	18.2	
9	0	254.65	10	69	3.14	509.82	499	14	1.46E-03	171.5	
10	0	257.13	9	29	1.07	514.79	512	7	1.30E-03	97.9	
11	0	296.12	13	26	1.10	592.77	589	8	1.86E-03	71.1	
12	3	338.70	25	33	1.79	677.90	673	27	3.46E-03	49.1	3.14E+00
13	3	342.19	19	33	1.80	684.89	673	27	2.70E-03	61.3	
14	0	510.79	137	39	2.61	1022.06	1014	17	1.90E-02	13.5	
15	0	569.37	12	14	0.72	1139.21	1134	10	1.62E-03	68.2	
16	0	607.60	50	47	10.23	1215.66	1202	27	6.96E-03	40.7	
17	0	657.48	8	13	0.93	1315.43	1309	10	1.15E-03	87.5	
18	0	684.03	21	23	4.92	1368.53	1359	22	2.90E-03	61.4	
19	0	728.64	12	12	0.81	1457.75	1452	11	1.65E-03	66.2	
20	0	792.88	12	5	1.54	1586.22	1582	9	1.60E-03	44.4	
21	0	804.17	20	7	0.75	1608.79	1602	13	2.71E-03	35.2	
22	0	896.66	6	10	0.49	1793.78	1785	10	8.85E-04	100.4	
23	0	1045.14	13	7	4.72	2090.77	2081	15	1.78E-03	54.2	
24	0	1460.79	12	7	1.11	2922.17	2913	14	1.67E-03	55.0	
25	0	1506.06	15	0	1.00	3012.73	3005	14	2.08E-03	25.8	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	3	10.66*	8.354E-01	1.663E+01	1.663E+01	457.67
CU-67	91.27	15	7.00	3.982E+00	2.529E+01	3.546E+01	297.83
	93.31	15	16.10	3.982E+00	1.099E+01	1.542E+01	297.83
	184.58	23	48.70*	3.941E+00	5.827E+00	8.170E+00	145.39
CD-109	88.03	38	3.70*	3.725E+00	1.316E+02	1.318E+02	86.63
AG-110	657.50	8	4.50*	1.611E+00	5.505E+01	5.524E+01	174.98
IN-114M	190.27	18	15.56*	3.896E+00	1.434E+01	1.459E+01	118.76
SN-126	64.28	15	9.60	2.017E+00	3.733E+01	3.733E+01	187.76
	86.94	38	8.90	3.725E+00	5.470E+01	5.470E+01	86.63
	87.57	38	37.00*	3.725E+00	1.316E+01	1.316E+01	86.63
BI-212	727.33	2	6.67*	1.483E+00	1.186E+01	1.187E+01	702.85
	1620.50	-----	1.47	7.761E-01	-----	Line Not Found	-----
RA-226	186.21	23	3.59*	3.941E+00	7.904E+01	7.904E+01	145.39
TH-230	67.67	28	0.38*	2.311E+00	1.558E+03	1.558E+03	81.56
TH-232	63.81	15	0.26*	2.017E+00	1.378E+03	1.378E+03	187.76
	140.88	-----	0.02	4.402E+00	-----	Line Not Found	-----
TH-234	63.29	15	3.70*	2.017E+00	9.686E+01	9.686E+01	187.76
	92.59	15	4.23	3.982E+00	4.185E+01	4.185E+01	297.83
U-238	63.29	15	3.70*	2.017E+00	9.686E+01	9.686E+01	187.76
	92.59	15	4.23	3.982E+00	4.185E+01	4.185E+01	297.83

Flag: "*" = Keyline

Total number of lines in spectrum 24
Number of unidentified lines 6
Number of lines tentatively identified by NID 18 75.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
K-40	1.25E+09Y	1.00	1.663E+01	1.663E+01	7.611E+01	457.67	
CU-67	61.83H	1.40	5.827E+00	8.170E+00	11.88E+00	145.39	
CD-109	461.40D	1.00	1.316E+02	1.318E+02	1.142E+02	86.63	
AG-110	249.76D	1.00	5.505E+01	5.524E+01	9.666E+01	174.98	
IN-114M	49.51D	1.02	1.434E+01	1.459E+01	1.733E+01	118.76	
SN-126	2.30E+05Y	1.00	1.316E+01	1.316E+01	1.140E+01	86.63	
BI-212	1.91Y	1.00	1.186E+01	1.187E+01	8.345E+01	702.85	
RA-226	1600.00Y	1.00	7.904E+01	7.904E+01	11.49E+01	145.39	
TH-230	7.54E+04Y	1.00	1.558E+03	1.558E+03	1.270E+03	81.56	
TH-232	1.41E+10Y	1.00	1.378E+03	1.378E+03	2.588E+03	187.76	
TH-234	4.47E+09Y	1.00	9.686E+01	9.686E+01	18.19E+01	187.76	
U-238	4.47E+09Y	1.00	9.686E+01	9.686E+01	18.19E+01	187.76	
Total Activity :			3.457E+03	3.460E+03			

Grand Total Activity : 3.457E+03 3.460E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	201.84	14	26	1.44	404.22	402	5	1.95E-03	****	3.76E+00	T
0	238.42	42	49	1.52	477.37	471	13	5.76E-03	88.0	3.39E+00	T
0	254.65	10	69	3.14	509.82	499	14	1.46E-03	****	3.24E+00	
0	257.13	9	29	1.07	514.79	512	7	1.30E-03	****	3.22E+00	T
0	296.12	13	26	1.10	592.77	589	8	1.86E-03	****	2.92E+00	T
3	338.70	21	33	1.79	677.90	673	27	2.91E-03	****	2.65E+00	T
3	342.19	19	33	1.80	684.89	673	27	2.70E-03	****	2.63E+00	
0	569.37	2	14	0.72	1139.21	1134	10	2.83E-04	****	1.80E+00	T
0	607.60	50	47	10.23	1215.66	1202	27	6.96E-03	81.4	1.71E+00	
0	684.03	21	23	4.92	1368.53	1359	22	2.90E-03	****	1.56E+00	
0	792.88	12	5	1.54	1586.22	1582	9	1.60E-03	88.9	1.38E+00	T
0	804.17	20	7	0.75	1608.79	1602	13	2.71E-03	70.4	1.37E+00	
0	896.66	6	10	0.49	1793.78	1785	10	8.85E-04	****	1.25E+00	T
0	1045.14	13	7	4.72	2090.77	2081	15	1.78E-03	****	1.10E+00	T
0	1506.06	15	0	1.00	3012.73	3005	14	2.08E-03	51.6	8.17E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226444.CNF;3
* Acquisition date   : 1-NOV-2022 05:09:30 Sensitivity      : 3.000
* Detector ID        : GAM07 Energy tolerance: 1.500
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 02:00:00.48 Half life ratio : *****
* Sample date        : 31-OCT-2022 00:00:00 Nuclide Library : LIQUID
* Sample ID          : G1205226444 Analyst initials: RXF2
* Batch Number       : 2333342 Sample Quantity : 7.7722E-01 FILTER
* Wet wt corr        : 1.00000 Wet Weight : 0.00000
*                                     Dry Weight : 0.00000
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 18-JUL-2022 10:57:12 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM07_JAR.CNF;18
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
K-40	3.134E+01
CU-67	3.830E+00
CD-109	5.705E+01
AG-110	6.537E+01
IN-114M	1.112E+01
SN-126	5.344E+00
BI-212	3.372E+01
RA-226	3.726E+01
TH-230	6.723E+02
TH-232	1.119E+03
TH-234	8.043E+01
U-238	8.043E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	2.463E+01	NOT IDENT.
NA-22	2.670E+00	NOT IDENT.
NA-24	1.231E+01	NOT IDENT.
AL-26	3.439E+00	NOT IDENT.
SC-46	2.856E+00	NOT IDENT.
V-48	2.217E+00	NOT IDENT.
CR-51	1.939E+01	NOT IDENT.
MN-52	4.050E+00	NOT IDENT.
MN-54	2.931E+00	NOT IDENT.
CO-56	2.733E+00	NOT IDENT.
CO-57	1.700E+00	NOT IDENT.
NI-57	7.491E+00	NOT IDENT.
CO-58	3.208E+00	NOT IDENT.
FE-59	4.923E+00	NOT IDENT.
CO-60	2.178E+00	NOT IDENT.
ZN-65	5.188E+00	NOT IDENT.
GE-68	8.903E+01	NOT IDENT.
AS-73	6.694E+01	NOT IDENT.
AS-74	3.897E+00	NOT IDENT.

SE-75	3.119E+00	NOT IDENT.
BR-77	1.969E+01	FAIL ABUN
SR-82	1.354E+01	NOT IDENT.
RB-83	4.813E+00	NOT IDENT.
RB-84	4.646E+00	NOT IDENT.
KR-85	6.462E+02	NOT IDENT.
SR-85	2.933E+00	NOT IDENT.
RB-86	3.371E+01	NOT IDENT.
Y-88	3.422E+00	FAIL ABUN
Y-91	7.803E+02	NOT IDENT.
NB-94	2.766E+00	NOT IDENT.
NB-95	3.135E+00	NOT IDENT.
NB-95M	7.113E+00	NOT IDENT.
TC-95M	2.566E+00	NOT IDENT.
ZR-95	4.762E+00	NOT IDENT.
MO-99	2.745E+01	NOT IDENT.
TC-99M	5.986E+01	NOT IDENT.
RH-101	2.291E+00	NOT IDENT.
RH-102M	2.544E+00	FAIL ABUN
RU-103	3.027E+00	NOT IDENT.
RH-106	2.633E+01	NOT IDENT.
RU-106	2.633E+01	NOT IDENT.
AG-108M	2.458E+00	NOT IDENT.
AG-110M	3.722E+00	FAIL ABUN
IN-111	2.877E+00	NOT IDENT.
SN-113	3.613E+00	NOT IDENT.
CD-115	1.269E+01	NOT IDENT.
SN-117M	1.852E+00	NOT IDENT.
SB-122	4.461E+00	NOT IDENT.
I-123	9.657E+00	NOT IDENT.
TE-123M	1.993E+00	NOT IDENT.
SB-124	6.788E+00	NOT IDENT.
SB-125	6.602E+00	NOT IDENT.
TE-125M	5.413E+02	NOT IDENT.
I-126	9.545E+00	NOT IDENT.
SB-126	5.071E+00	NOT IDENT.
SB-127	9.641E+00	NOT IDENT.
TE-129	2.935E+01	NOT IDENT.
I-131	2.587E+00	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	2.635E+00	NOT IDENT.
BA-133	3.171E+00	NOT IDENT.
I-133	6.336E+00	NOT IDENT.
CS-134	2.650E+00	FAIL ABUN
I-135	2.196E+02	NOT IDENT.
CS-136	3.520E+00	NOT IDENT.
BA-137M	2.798E+00	NOT IDENT.
CS-137	2.955E+00	NOT IDENT.
LA-138	3.958E+00	NOT IDENT.
CE-139	1.890E+00	NOT IDENT.
BA-140	1.117E+01	NOT IDENT.
LA-140	2.530E+00	NOT IDENT.
CE-141	3.847E+00	NOT IDENT.
CE-143	6.715E+00	NOT IDENT.
CE-144	1.238E+01	NOT IDENT.
PM-144	2.890E+00	NOT IDENT.
PR-144	2.152E+02	NOT IDENT.
PM-146	3.320E+00	NOT IDENT.
ND-147	1.704E+01	NOT IDENT.
PM-147	5.423E+04	NOT IDENT.
PM-149	9.052E+01	NOT IDENT.
EU-152	8.892E+00	NOT IDENT.
GD-153	4.315E+00	NOT IDENT.
EU-154	7.738E+00	NOT IDENT.
EU-155	7.395E+00	FAIL ABUN
TB-160	9.193E+00	FAIL ABUN
HO-166M	4.250E+00	FAIL ABUN
TM-171	1.441E+03	FAIL ABUN
LU-176	2.071E+00	FAIL ABUN
LU-177	1.904E+01	NOT IDENT.
HF-181	3.061E+00	NOT IDENT.
W-181	1.461E+01	FAIL ABUN
TA-182	1.132E+01	FAIL ABUN
RE-183	1.405E+01	FAIL ABUN
RE-184	5.535E+00	FAIL ABUN
RE-188	9.853E+00	FAIL ABUN
W-188	5.276E+02	FAIL ABUN
OS-191	6.533E+00	FAIL ABUN

IR-192	2.187E+00	FAIL ABUN
PB-201	2.408E+01	NOT IDENT.
TL-201	2.001E+01	NOT IDENT.
TL-202	2.558E+00	NOT IDENT.
HG-203	2.839E+00	NOT IDENT.
PB-203	4.201E+00	NOT IDENT.
TL-204	3.465E+02	NOT IDENT.
BI-207	5.610E+00	FAIL ABUN
TL-208	3.711E+00	NOT IDENT.
PB-210	2.967E+02	NOT IDENT.
BI-211	1.839E+01	NOT IDENT.
PB-211	6.008E+01	NOT IDENT.
PB-212	7.357E+00	FAIL ABUN
BI-213	8.740E+00	NOT IDENT.
BI-214	7.132E+00	NOT IDENT.
PB-214	7.167E+00	FAIL ABUN
RN-219	2.998E+01	NOT IDENT.
FR-221	1.355E+01	NOT IDENT.
RA-223	4.390E+01	FAIL ABUN
RA-224	4.982E+01	NOT IDENT.
AC-225	1.478E+01	NOT IDENT.
AC-227	1.979E+01	FAIL ABUN
TH-227	1.979E+01	FAIL ABUN
AC-228	1.065E+01	FAIL ABUN
RA-228	1.065E+01	FAIL ABUN
TH-228	7.357E+00	FAIL ABUN
TH-229	3.737E+01	FAIL ABUN
PA-231	4.175E+01	NOT IDENT.
TH-231	2.928E+01	NOT IDENT.
PA-233	5.321E+00	NOT IDENT.
PA-234	2.218E+01	FAIL ABUN
PA-234M	3.717E+02	NOT IDENT.
U-234	5.642E+03	NOT IDENT.
U-235	1.459E+01	FAIL ABUN
NP-237	5.321E+00	NOT IDENT.
NP-238	1.365E+01	NOT IDENT.
NP-239	1.680E+01	NOT IDENT.
AM-241	1.163E+01	NOT IDENT.
AM-242	4.656E+01	NOT IDENT.
AM-243	4.165E+00	NOT IDENT.
CM-243	7.072E+00	NOT IDENT.
BK-247	6.103E+00	NOT IDENT.
CM-247	2.676E+00	NOT IDENT.
CF-249	2.675E+00	NOT IDENT.
CF-251	8.275E+00	NOT IDENT.
CF-252	1.191E+04	NOT IDENT.
ANH-511	6.482E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226444.CNF;3
Acquisition date : 1-NOV-2022 05:09:30 Sensitivity : 3.000
Detector ID : GAM07 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.48 Half life ratio : *****
Sample date : 31-OCT-2022 00:00:00 Nuclide Library : LIQUID
Sample ID : G1205226444 Analyst initials: RXF2
Batch Number : 2333342 Sample Quantity : 7.7722E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 18-JUL-2022 10:57:12 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM07_JAR.CNF;18

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
K-40	1.663E+01	7.460E+01	7.460E+01
CU-67	8.170E+00	1.166E+01	1.166E+01
CD-109	1.318E+02	1.126E+02	1.127E+02
AG-110	5.524E+01	9.485E+01	9.485E+01
IN-114M	1.459E+01	1.702E+01	1.703E+01
SN-126	1.316E+01	1.122E+01	1.122E+01
BI-212	1.187E+01	8.179E+01	8.179E+01
RA-226	7.904E+01	1.128E+02	1.128E+02
TH-230	1.558E+03	1.274E+03	1.274E+03
TH-232	1.378E+03	2.542E+03	2.543E+03
TH-234	9.686E+01	1.796E+02	1.796E+02
U-238	9.686E+01	1.796E+02	1.796E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	-1.127E+01	3.082E+01	3.124E+01	NOT IDENT.
NA-22	-1.561E+00	3.622E+00	3.690E+00	NOT IDENT.
NA-24	-7.424E+00	1.673E+01	1.706E+01	NOT IDENT.
AL-26	3.285E-01	4.092E+00	4.094E+00	NOT IDENT.
SC-46	-1.642E+00	4.281E+00	4.344E+00	NOT IDENT.
V-48	-3.141E+00	3.399E+00	3.683E+00	NOT IDENT.
CR-51	4.269E+00	2.183E+01	2.192E+01	NOT IDENT.
MN-52	1.824E+00	4.335E+00	4.412E+00	NOT IDENT.
MN-54	9.878E-01	3.393E+00	3.422E+00	NOT IDENT.
CO-56	-6.013E-01	3.523E+00	3.533E+00	NOT IDENT.
CO-57	3.705E-01	2.020E+00	2.027E+00	NOT IDENT.
NI-57	8.520E+00	6.372E+00	7.442E+00	NOT IDENT.
CO-58	1.136E+00	3.719E+00	3.754E+00	NOT IDENT.
FE-59	7.368E-01	5.580E+00	5.590E+00	NOT IDENT.
CO-60	1.414E-02	2.587E+00	2.587E+00	NOT IDENT.
ZN-65	2.784E+00	5.278E+00	5.426E+00	NOT IDENT.
GE-68	-7.970E-01	1.044E+02	1.044E+02	NOT IDENT.
AS-73	6.545E+01	7.320E+01	7.893E+01	NOT IDENT.

AS-74	-6.146E+00	5.881E+00	6.502E+00	NOT IDENT.
SE-75	-1.331E+00	3.727E+00	3.775E+00	NOT IDENT.
BR-77	3.697E+01	3.200E+01	3.608E+01	FAIL ABUN
SR-82	-1.735E+01	2.134E+01	2.273E+01	NOT IDENT.
RB-83	-1.943E+00	6.101E+00	6.164E+00	NOT IDENT.
RB-84	1.547E+00	5.079E+00	5.127E+00	NOT IDENT.
KR-85	-3.614E+03	1.220E+03	2.037E+03	NOT IDENT.
SR-85	-1.640E+01	5.539E+00	9.244E+00	NOT IDENT.
RB-86	-7.571E+00	4.131E+01	4.145E+01	NOT IDENT.
Y-88	-6.110E-01	4.396E+00	4.405E+00	FAIL ABUN
Y-91	-1.353E+03	1.370E+03	1.500E+03	NOT IDENT.
NB-94	-3.779E-01	3.444E+00	3.448E+00	NOT IDENT.
NB-95	1.032E+00	3.642E+00	3.671E+00	NOT IDENT.
NB-95M	2.799E+00	9.218E+00	9.304E+00	NOT IDENT.
TC-95M	1.218E+00	3.256E+00	3.302E+00	NOT IDENT.
ZR-95	-1.393E+00	6.333E+00	6.364E+00	NOT IDENT.
MO-99	1.252E+01	3.049E+01	3.101E+01	NOT IDENT.
TC-99M	5.290E+01	6.717E+01	7.129E+01	NOT IDENT.
RH-101	-1.592E-01	2.811E+00	2.812E+00	NOT IDENT.
RH-102M	5.148E-02	3.007E+00	3.007E+00	FAIL ABUN
RU-103	5.837E-02	3.590E+00	3.590E+00	NOT IDENT.
RH-106	-2.242E+01	3.833E+01	3.964E+01	NOT IDENT.
RU-106	-2.242E+01	3.833E+01	3.964E+01	NOT IDENT.
AG-108M	-2.090E-01	2.928E+00	2.929E+00	NOT IDENT.
AG-110M	-7.002E-01	4.438E+00	4.450E+00	FAIL ABUN
IN-111	9.399E-01	3.503E+00	3.528E+00	NOT IDENT.
SN-113	1.259E+00	4.061E+00	4.100E+00	NOT IDENT.
CD-115	-1.350E+00	1.538E+01	1.540E+01	NOT IDENT.
SN-117M	-2.814E-01	2.320E+00	2.323E+00	NOT IDENT.
SB-122	-1.679E+00	6.404E+00	6.449E+00	NOT IDENT.
I-123	1.004E+01	1.063E+01	1.155E+01	NOT IDENT.
TE-123M	2.105E+00	2.190E+00	2.387E+00	NOT IDENT.
SB-124	3.294E+00	7.032E+00	7.188E+00	NOT IDENT.
SB-125	-2.708E+00	8.223E+00	8.314E+00	NOT IDENT.
TE-125M	-4.119E+02	7.067E+02	7.307E+02	NOT IDENT.
I-126	2.264E+00	1.118E+01	1.123E+01	NOT IDENT.
SB-126	-1.110E+00	6.431E+00	6.451E+00	NOT IDENT.
SB-127	4.810E+00	1.079E+01	1.101E+01	NOT IDENT.
TE-129	2.398E+00	3.432E+01	3.434E+01	NOT IDENT.
I-131	-3.318E-01	3.066E+00	3.070E+00	NOT IDENT.
I-132	-1.650E+04	3.171E+04	3.258E+04	SHORT HLIF
TE-132	-1.918E+00	3.591E+00	3.694E+00	NOT IDENT.
BA-133	-8.088E-01	3.806E+00	3.824E+00	NOT IDENT.
I-133	-4.315E+00	8.408E+00	8.631E+00	NOT IDENT.
CS-134	-3.182E-01	3.781E+00	3.784E+00	FAIL ABUN
I-135	-8.673E+01	2.861E+02	2.888E+02	NOT IDENT.
CS-136	-3.080E+00	5.676E+00	5.844E+00	NOT IDENT.
BA-137M	-6.354E+00	4.701E+00	5.506E+00	NOT IDENT.
CS-137	-6.713E+00	4.966E+00	5.817E+00	NOT IDENT.
LA-138	-2.912E+00	5.702E+00	5.852E+00	NOT IDENT.
CE-139	-3.331E-01	2.380E+00	2.385E+00	NOT IDENT.
BA-140	-2.775E+00	1.629E+01	1.634E+01	NOT IDENT.
LA-140	-1.951E+00	3.856E+00	3.955E+00	NOT IDENT.
CE-141	2.936E+00	4.397E+00	4.592E+00	NOT IDENT.
CE-143	-9.161E+00	1.036E+01	1.115E+01	NOT IDENT.
CE-144	-1.554E+01	1.716E+01	1.854E+01	NOT IDENT.
PM-144	4.010E-01	3.442E+00	3.447E+00	NOT IDENT.
PR-144	3.168E+01	2.561E+02	2.565E+02	NOT IDENT.
PM-146	-1.520E+00	4.169E+00	4.225E+00	NOT IDENT.
ND-147	-6.158E+00	2.155E+01	2.173E+01	NOT IDENT.
PM-147	4.433E+04	6.045E+04	6.367E+04	NOT IDENT.
PM-149	-3.600E+00	1.045E+02	1.045E+02	NOT IDENT.
EU-152	4.848E+00	9.760E+00	1.000E+01	NOT IDENT.
GD-153	-6.055E+00	6.694E+00	7.230E+00	NOT IDENT.
EU-154	-5.683E+00	1.079E+01	1.109E+01	NOT IDENT.
EU-155	1.158E+00	8.791E+00	8.806E+00	FAIL ABUN
TB-160	-4.204E+00	1.242E+01	1.256E+01	FAIL ABUN
HO-166M	-1.462E+00	5.524E+00	5.564E+00	FAIL ABUN
TM-171	8.654E+02	1.598E+03	1.645E+03	FAIL ABUN
LU-176	7.954E-02	2.379E+00	2.380E+00	FAIL ABUN
LU-177	-9.016E+00	2.505E+01	2.538E+01	NOT IDENT.
HF-181	7.841E-01	3.507E+00	3.525E+00	NOT IDENT.
W-181	2.668E+00	1.694E+01	1.699E+01	FAIL ABUN
TA-182	5.389E+00	1.191E+01	1.216E+01	FAIL ABUN
RE-183	9.003E+00	1.563E+01	1.615E+01	FAIL ABUN
RE-184	-2.899E+00	7.163E+00	7.282E+00	FAIL ABUN
RE-188	-3.704E+00	1.260E+01	1.271E+01	FAIL ABUN
W-188	4.670E+02	5.553E+02	5.940E+02	FAIL ABUN

OS-191	-2.189E-01	7.991E+00	7.992E+00	FAIL ABUN
IR-192	-1.474E-01	2.549E+00	2.550E+00	FAIL ABUN
PB-201	-1.534E+01	3.002E+01	3.081E+01	NOT IDENT.
TL-201	3.121E+00	2.429E+01	2.433E+01	NOT IDENT.
TL-202	-2.752E+00	3.431E+00	3.649E+00	NOT IDENT.
HG-203	2.064E+00	3.050E+00	3.189E+00	NOT IDENT.
PB-203	3.054E+00	4.513E+00	4.719E+00	NOT IDENT.
TL-204	2.935E+02	3.805E+02	4.029E+02	NOT IDENT.
BI-207	5.820E+00	5.560E+00	6.149E+00	FAIL ABUN
TL-208	-6.326E+00	4.915E+00	5.684E+00	NOT IDENT.
PB-210	-2.880E+02	3.951E+02	4.159E+02	NOT IDENT.
BI-211	-1.218E+01	2.499E+01	2.559E+01	NOT IDENT.
PB-211	5.978E+01	6.174E+01	6.737E+01	NOT IDENT.
PB-212	1.359E+01	1.177E+01	1.327E+01	FAIL ABUN
BI-213	-3.802E+00	1.087E+01	1.101E+01	NOT IDENT.
BI-214	1.673E+00	9.042E+00	9.073E+00	NOT IDENT.
PB-214	1.901E+00	8.398E+00	8.442E+00	FAIL ABUN
RN-219	-2.294E+01	3.879E+01	4.015E+01	NOT IDENT.
FR-221	-2.157E+01	2.029E+01	2.250E+01	NOT IDENT.
RA-223	-2.543E+01	5.451E+01	5.571E+01	FAIL ABUN
RA-224	8.659E+00	6.700E+01	6.712E+01	NOT IDENT.
AC-225	-2.353E+01	2.214E+01	2.455E+01	NOT IDENT.
AC-227	1.478E+01	2.845E+01	2.922E+01	FAIL ABUN
TH-227	1.478E+01	2.845E+01	2.922E+01	FAIL ABUN
AC-228	-2.336E+00	1.280E+01	1.284E+01	FAIL ABUN
RA-228	-2.336E+00	1.280E+01	1.284E+01	FAIL ABUN
TH-228	1.359E+01	1.177E+01	1.327E+01	FAIL ABUN
TH-229	2.340E+01	4.645E+01	4.763E+01	FAIL ABUN
PA-231	2.082E+01	4.604E+01	4.699E+01	NOT IDENT.
TH-231	1.032E+00	3.658E+01	3.659E+01	NOT IDENT.
PA-233	7.417E-01	6.055E+00	6.064E+00	NOT IDENT.
PA-234	5.861E+00	2.528E+01	2.542E+01	FAIL ABUN
PA-234M	1.373E+02	4.040E+02	4.088E+02	NOT IDENT.
U-234	3.389E+03	6.286E+03	6.469E+03	NOT IDENT.
U-235	-2.034E+01	2.136E+01	2.325E+01	FAIL ABUN
NP-237	7.417E-01	6.055E+00	6.064E+00	NOT IDENT.
NP-238	-1.120E+01	1.873E+01	1.940E+01	NOT IDENT.
NP-239	-2.213E+01	2.331E+01	2.535E+01	NOT IDENT.
AM-241	-5.463E+00	1.553E+01	1.573E+01	NOT IDENT.
AM-242	5.175E+01	5.068E+01	5.580E+01	NOT IDENT.
AM-243	-7.085E+00	5.617E+00	6.463E+00	NOT IDENT.
CM-243	-4.437E+00	9.094E+00	9.312E+00	NOT IDENT.
BK-247	-1.651E+00	7.190E+00	7.229E+00	NOT IDENT.
CM-247	-1.296E+00	3.353E+00	3.403E+00	NOT IDENT.
CF-249	-2.732E+00	3.585E+00	3.791E+00	NOT IDENT.
CF-251	-1.856E+00	1.054E+01	1.057E+01	NOT IDENT.
CF-252	-1.686E+03	1.464E+04	1.466E+04	NOT IDENT.
ANH-511	-1.521E+01	7.173E+00	9.926E+00	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	39.6982	81.00	42.3906	120.90	31.3435
45.60	30.6495	81.07	42.3964	121.12	25.9481
46.54	33.5251	82.35	33.7326	121.22	25.9519
49.72	32.8813	82.47	41.8382	121.78	31.3849
51.35	38.6866	167.43	41.8385	122.06	30.3155
52.39	28.3849	82.47	41.8385	123.07	46.6261
53.20	33.1855	83.79	21.6493	265.00	34.7300
53.44	29.4112	84.00	18.9508	127.16	39.2719
56.28	47.7810	84.21	18.9585	127.23	39.2756
57.36	33.5365	84.86	32.5408	129.43	42.6842
57.53	34.5092	85.43	43.7742	131.20	36.2091
57.53	34.5094	86.55	43.8671	133.02	27.5021
57.98	31.6684	86.79	43.8868	133.52	45.1353
59.32	34.6602	86.94	43.8996	135.34	35.3176
59.54	44.9538	87.09	43.9117	136.00	36.4548
61.49	37.4212	87.57	43.9514	57.53	28.7331
63.00	28.4890	88.03	50.4681	136.47	25.4244
63.29	28.5083	88.34	50.4975	140.51	28.9005
63.58	28.5273	88.47	38.9060	140.88	28.9152
63.81	28.5425	91.11	50.7561	143.76	45.7747
64.28	23.3782	91.27	50.7707	144.24	39.1010
64.99	23.4163	92.59	45.3904	145.44	36.9256
65.08	23.4210	93.31	45.4495	152.32	29.3555
66.73	31.3445	94.56	26.2265	152.43	35.0056
66.98	31.3621	94.65	26.2305	153.25	31.6512
67.24	31.3801	94.67	26.2315	323.87	36.2173
67.67	30.1014	97.43	36.0708	155.04	38.5213
67.75	30.1068	98.43	26.0578	156.02	24.9568
68.89	39.3686	98.44	26.0582	158.56	34.1409
68.89	39.3689	99.53	22.9745	158.97	23.9108
69.67	28.9198	100.11	35.5414	159.00	23.9118
70.82	29.6505	100.20	35.5468	162.33	29.7273
70.82	29.6507	102.03	32.5113	162.66	19.4448
70.83	29.6512	103.18	39.9300	163.33	24.0400
72.81	48.6355	103.37	39.9427	165.86	33.3007
72.87	48.6419	105.31	33.7449	167.43	28.7617
74.66	61.7782	106.12	39.0697	171.28	32.3618
74.82	61.7985	106.47	32.7530	176.31	36.0410
74.97	63.8120	109.28	41.3944	176.60	39.5418
77.11	59.0864	111.00	35.1229	177.52	29.1061
79.69	39.2607	111.76	35.1655	181.07	28.0558
79.82	39.2711	112.95	43.7730	184.41	21.9038
80.02	32.2351	116.24	38.6331	184.58	21.9080
80.03	32.2354	116.30	38.6367	185.72	21.9360
80.12	32.2415	116.74	44.0326	186.21	21.9479
80.19	32.2458	117.23	33.3183	190.27	34.6453
80.22	32.2480	119.76	45.3159	193.51	23.7057
80.57	39.3294	99.53	32.4067	197.03	29.7447

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
198.01	30.9670	256.23	30.6157	492.35	20.7471
201.83	27.5052	304.85	33.2492	497.08	22.7815
204.12	22.3769	306.78	23.6602	511.00	27.9413
205.31	27.6059	308.46	25.4458	514.00	85.9545
208.37	38.5303	311.90	24.6339	520.40	17.0484
210.85	38.6284	316.51	20.3061	520.69	16.0482
215.65	30.3257	319.41	20.3510	522.65	0.0000
218.12	42.5612	320.08	18.5908	527.90	17.1148
222.11	36.6257	321.04	16.8322	529.59	17.1300
227.09	29.4434	323.87	23.9705	529.87	17.1321
227.38	42.9500	325.23	14.2191	531.02	15.1257
228.16	39.2983	328.76	25.8399	537.26	18.2087
228.18	39.2993	331.15	29.4557	546.56	12.1963
116.74	39.2993	333.37	22.5299	552.55	9.1747
235.69	23.0895	334.37	26.8414	563.25	13.3227
235.96	26.3945	338.28	23.3287	564.24	16.9183
238.63	34.7300	338.32	23.3292	569.33	10.2787
238.98	34.7411	311.90	23.3657	946.00	10.2799
240.99	34.8065	340.55	23.3668	569.70	10.2808
242.00	31.5209	344.28	23.4292	582.08	15.5133
244.70	39.9150	345.93	23.4572	583.19	20.6958
245.35	29.9542	351.06	27.1643	595.83	23.9434
250.62	33.8604	351.93	19.5702	427.87	26.6050
252.40	33.9148	356.01	22.7158	604.72	16.7253
252.80	33.9267	361.25	22.7982	609.32	16.7611
256.23	5.0416	364.49	19.1932	610.33	16.7689
260.90	27.8431	366.42	18.3032	614.28	17.3245
264.66	31.3211	356.01	18.5185	618.01	21.0352
265.00	29.6366	388.16	23.2132	621.93	18.9653
269.46	28.9006	388.63	20.4339	630.19	0.0000
271.23	39.1597	391.70	20.4751	631.29	14.8135
273.65	30.7097	264.66	21.5293	155.04	9.5303
276.40	37.6218	401.32	29.0297	633.25	12.7085
277.37	33.3736	401.81	24.3554	634.78	13.7771
277.60	33.3799	402.40	20.6160	635.95	20.1458
278.00	32.5349	404.85	11.2625	636.99	15.9125
278.43	29.9770	410.95	18.8432	657.50	17.6622
279.20	27.4251	414.70	20.7758	657.76	17.6642
279.54	26.5757	423.72	20.8918	661.66	19.3030
280.46	35.1760	427.09	19.0316	664.57	15.0322
283.69	21.5062	427.87	19.0405	666.33	15.0436
284.31	32.7057	433.94	20.0660	666.50	16.1194
285.41	30.1508	439.51	28.7610	667.71	0.0000
285.90	25.8539	440.45	23.9807	677.62	8.0981
287.50	19.8475	453.88	21.2700	685.70	10.8346
290.67	19.0334	459.60	16.4902	692.65	15.6469
293.27	28.6105	463.37	17.4979	695.00	14.1399
351.93	16.9324	468.07	15.5954	696.49	14.1484
295.96	24.3280	473.00	18.5713	696.51	14.1484
879.38	26.1200	475.06	19.5711	697.00	15.2402
299.98	33.9933	476.78	18.6107	697.49	13.0654
300.09	33.9965	477.60	26.4589	702.65	15.2760
300.13	33.9980	477.99	28.4247	706.68	17.4870
301.36	26.1774	482.18	16.7015	711.68	12.0469
302.85	26.2085	487.02	14.7763	720.70	13.1904

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
721.93	14.2970	935.54	5.3485	1368.63	9.0560
722.78	13.2017	937.49	4.4600	1377.63	0.0000
722.91	13.2021	944.13	4.4698	1384.29	2.0200
723.31	11.5540	945.96	6.2613	1408.01	3.0472
724.19	11.5579	946.00	6.2615	1434.09	4.0876
727.33	8.8171	949.00	8.0582	1435.80	7.1564
733.00	3.3140	667.71	0.0000	1457.56	3.2879
735.93	11.0596	962.31	7.1938	1460.82	6.1692
739.50	6.6450	964.08	10.7966	1489.16	5.1743
744.23	12.2054	966.17	14.4053	1596.21	5.2963
747.24	13.3311	968.97	11.7146	1620.50	8.5176
752.31	17.8099	983.53	11.7690	1678.03	6.4644
753.82	8.9102	984.45	9.9614	1690.97	2.1604
756.73	10.0353	996.26	7.2715	1757.55	4.3782
763.94	12.2998	1001.03	7.2822	1764.49	0.0000
765.80	12.3088	1274.44	9.1135	1063.66	6.5837
766.42	16.7883	1025.87	2.7519	1771.35	2.1949
766.84	16.7914	1028.54	6.4262	1791.20	3.3051
772.60	0.0000	1037.84	4.4188	1808.65	4.4216
776.52	13.4829	1038.76	10.3141	1836.06	5.5557
739.50	8.9935	475.06	5.9074		
778.90	6.7476	1048.07	11.8203		
783.70	10.1400	1050.41	6.1609		
788.74	8.4659	1063.66	6.4941		
792.07	13.5625	1077.00	8.3826		
795.86	8.4888	1077.34	7.4521		
802.10	5.1050	459.60	6.5330		
810.29	12.5169	1085.87	8.4045		
344.28	9.1038	1099.25	5.6246		
810.76	11.3810	1111.64	9.4080		
815.77	6.8413	1112.07	8.4683		
1048.07	9.1309	1112.84	7.5288		
832.01	8.0288	1115.54	2.8255		
834.85	9.1852	1120.29	5.6587		
835.15	9.1862	1120.55	4.7159		
836.80	9.1914	1221.41	3.7734		
846.77	11.5304	1129.67	2.8369		
856.80	15.0429	1131.51	7.5688		
860.56	10.4282	1173.23	7.6567		
871.09	6.9778	1177.95	6.7086		
873.19	8.1467	1189.05	8.6512		
875.33	8.1527	1204.77	5.7920		
879.38	12.8293	1221.41	3.8784		
880.51	11.3758	1231.02	5.8323		
881.60	9.6294	1235.36	5.8389		
883.24	8.7589	1238.28	3.8955		
884.68	10.5157	1260.41	6.8564		
889.28	9.8304	1271.87	3.9297		
894.76	9.6730	1274.44	8.8473		
898.04	5.6342	1274.54	7.8647		
903.28	7.9371	1291.59	2.9619		
907.67	9.7153	1298.22	3.9558		
911.20	10.6110	1312.11	5.9546		
923.98	7.9923	1332.49	2.9923		
926.36	5.3324	1365.19	7.0380		

VAX/VMS Nuclide Identification Report Generated 31-OCT-2022 12:38:28.05

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226445.CNF;1
Background file  : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM18.CNF;800
Background date  : 30-OCT-2022 11:28:53
Sample date     : 26-SEP-2022 08:18:00 Acquisition date : 31-OCT-2022 10:42:37
Sample ID      : G1205226445 Sample quantity : 7.37270E-01 FILTER
Detector name   : GAM18 Detector geometry: JAR
Elapsed live time: 0 01:55:26.36 Elapsed real time: 0 01:55:27.18 0.0%
Energy tolerance: 1.50000 keV Analyst Initials : RXF2
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2333342 Detector SN# :
Matrix Spike ID : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	8	92.43*	13	110	1.33	185.07	181	13	1.83E-03	171.0	2.06E+00
2	8	95.12	15	84	1.52	190.44	181	13	2.23E-03	105.6	
3	0	141.95*	52	101	4.44	284.03	277	13	7.44E-03	44.5	
4	0	163.38	41	64	1.83	326.88	324	8	5.92E-03	37.2	
5	0	185.20*	17	126	1.15	370.49	363	14	2.39E-03	160.3	
6	0	198.12*	4	61	0.91	396.31	393	6	5.56E-04	375.2	
7	0	216.79*	81	98	4.53	433.63	422	19	1.17E-02	32.4	
8	0	239.27*	28	127	1.31	478.55	473	13	4.07E-03	91.9	
9	0	283.04	26	77	0.54	566.04	559	12	3.74E-03	70.8	
10	0	306.55	23	94	3.25	613.02	604	14	3.28E-03	93.2	
11	0	355.92	20	52	2.39	711.71	707	9	2.88E-03	68.9	
12	0	458.91	37	20	3.31	917.59	913	10	5.28E-03	29.1	
13	0	478.14	60	69	1.62	956.04	948	17	8.65E-03	34.8	
14	0	510.79*	61	61	2.58	1021.31	1011	22	8.76E-03	46.5	
15	0	532.70	20	32	3.40	1065.11	1058	13	2.88E-03	63.0	
16	0	547.41	28	27	2.60	1094.50	1087	14	4.10E-03	47.0	
17	0	583.07*	15	24	1.56	1165.80	1159	11	2.10E-03	87.2	
18	0	662.52	9	47	1.08	1324.64	1317	12	1.36E-03	146.4	
19	0	722.89	37	28	6.14	1445.35	1434	19	5.29E-03	38.6	
20	0	772.24	14	9	1.23	1544.03	1539	10	2.02E-03	49.5	
21	0	785.75	12	23	4.41	1571.04	1559	15	1.66E-03	94.6	
22	0	912.55*	4	15	2.80	1824.58	1816	12	5.14E-04	266.0	
23	0	1014.50	8	7	1.07	2028.47	2024	9	1.13E-03	70.4	
24	0	1042.44	19	4	6.46	2084.34	2077	15	2.77E-03	31.8	
25	0	1120.18*	23	13	3.05	2239.82	2229	17	3.26E-03	45.1	
26	0	1157.49	6	22	3.61	2314.45	2301	21	7.94E-04	213.0	
27	0	1173.52	28	13	1.86	2346.51	2338	14	3.98E-03	34.4	
28	0	1253.18	11	9	1.47	2505.83	2501	11	1.64E-03	57.6	
29	0	1265.96	17	3	0.73	2531.40	2524	14	2.41E-03	34.1	
30	0	1423.09	15	4	5.15	2845.71	2838	16	2.10E-03	40.6	
31	0	1460.50*	28	9	2.63	2920.55	2912	17	4.00E-03	36.5	
32	0	1480.26	14	11	2.72	2960.07	2952	15	2.06E-03	57.3	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 31-OCT-2022 12:38:29

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226445.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 26-SEP-2022 08:18:00	Acquisition date	: 31-OCT-2022 10:42:37
Sample ID	: G1205226445	Sample quantity	: 0.73727 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA18	Detector geometry	: JAR
Elapsed live time	: 0 01:55:26.36	Elapsed real time	: 0 01:55:27.18 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	60	10.44*	3.326E+00	9.137E+01	1.444E+02	69.68
K-40	1460.82	28	10.66*	1.441E+00	9.545E+01	9.545E+01	73.04
TE-129	250.62	-----	0.38	4.676E+00	-----	Line Not Found	-----
	278.43	-----	0.57	4.443E+00	-----	Line Not Found	-----
	459.60	37	7.70*	3.407E+00	7.385E+01	1.525E+02	58.14
	802.10	-----	0.19	2.326E+00	-----	Line Not Found	-----
	1083.85	-----	0.49	1.814E+00	-----	Line Not Found	-----
	1111.64	-----	0.19	1.776E+00	-----	Line Not Found	-----
BA-137M	661.66	9	89.90*	2.688E+00	2.067E+00	2.072E+00	292.88
CS-137	661.66	9	85.10*	2.688E+00	2.184E+00	2.189E+00	292.88
TL-208	277.37	-----	6.60	4.452E+00	-----	Line Not Found	-----
	583.19	15	85.00*	2.936E+00	3.091E+00	3.201E+00	174.38
	860.56	-----	12.50	2.198E+00	-----	Line Not Found	-----
FR-221	218.12	81	11.40*	4.998E+00	7.533E+01	7.533E+01	64.84
AC-225	218.12	81	11.40*	4.998E+00	7.533E+01	8.606E+02	64.84
RA-226	186.21	17	3.59*	5.325E+00	4.579E+01	4.579E+01	320.61
U-235	143.76	-----	10.96*	5.658E+00	-----	Line Not Found	-----
	163.33	41	5.08	5.534E+00	7.718E+01	7.718E+01	74.46
	185.72	17	57.20	5.325E+00	2.874E+00	2.874E+00	320.61
	205.31	-----	5.01	5.116E+00	-----	Line Not Found	-----
ANH-511	511.00	61	100.00*	3.195E+00	1.005E+01	1.005E+01	93.08

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226445.CNF;1 *
* Acquisition date   : 31-OCT-2022 10:42:37 Sensitivity      : 3.000          *
* Detector ID       : GAM18 Energy tolerance: 1.500          *
* Elapsed live time : 0 01:55:26.36 Abundance limit : 75.000      *
* Elapsed real time : 0 01:55:27.18 Half life ratio : *****          *
* Sample date       : 26-SEP-2022 08:18:00 Analyst initials: RXF2          *
* Sample ID        : G1205226445 Sample Quantity : 7.3727E-01 FILTER *
* Batch Number     : 2333342 Wet Weight : 0.00000          *
* Wet wt corr      : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library   : LIQUID.NLB;26                                         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date    : 8-JUN-2022 11:06:14 Eff. Geometry    : JAR          *
* Eff. File         : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.444E+02	9.860E+01	7.300E+01
K-40	9.545E+01	6.833E+01	6.807E+01
TE-129	1.525E+02	8.688E+01	1.238E+02
BA-137M	2.072E+00	5.946E+00	6.861E+00
CS-137	2.189E+00	6.282E+00	7.248E+00
TL-208	3.201E+00	5.470E+00	6.515E+00
FR-221	7.533E+01	4.787E+01	3.312E+01
AC-225	8.606E+02	5.469E+02	3.783E+02
RA-226	4.579E+01	1.439E+02	9.719E+01
U-235	5.683E+00	2.301E+01	3.603E+01
ANH-511	1.005E+01	9.172E+00	4.565E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-1.828E-01		3.465E+00	6.552E+00	NOT IDENT.
NA-24	0.000E+00		3.088E+17	0.000E+00	SHORT HLIF
AL-26	-2.385E+00		2.937E+00	4.699E+00	NOT IDENT.
SC-46	-8.538E-02		4.192E+00	8.013E+00	FAIL ABUN
V-48	-1.084E+01		1.528E+01	2.616E+01	NOT IDENT.
CR-51	6.429E+00		5.875E+01	1.064E+02	NOT IDENT.
MN-52	-3.761E+01		3.055E+02	5.844E+02	NOT IDENT.
MN-54	-1.589E+00		4.306E+00	7.776E+00	NOT IDENT.
CO-56	-5.252E-01		4.748E+00	8.895E+00	NOT IDENT.
CO-57	-1.540E+00		2.842E+00	4.650E+00	NOT IDENT.
NI-57	0.000E+00		6.327E+07	0.000E+00	SHORT HLIF
CO-58	1.498E-01		4.220E+00	8.164E+00	NOT IDENT.
FE-59	1.412E+00		9.799E+00	1.921E+01	NOT IDENT.
CO-60	5.530E+00		4.364E+00	9.649E+00	FAIL ABUN
ZN-65	3.472E-01		8.349E+00	1.391E+01	NOT IDENT.
CU-67	0.000E+00		1.354E+05	0.000E+00	SHORT HLIF
GE-68	3.144E+00		1.180E+02	2.247E+02	NOT IDENT.
AS-73	2.425E+01		1.745E+02	3.211E+02	NOT IDENT.
AS-74	-1.442E+01		2.236E+01	3.811E+01	NOT IDENT.

SE-75	-2.382E+00	4.898E+00	8.474E+00	NOT IDENT.
BR-77	0.000E+00	6.876E+05	0.000E+00	SHORT HLIF
SR-82	2.788E+01	6.758E+01	9.165E+01	NOT IDENT.
RB-83	-5.203E-01	7.193E+00	1.342E+01	NOT IDENT.
RB-84	5.933E+00	1.016E+01	2.064E+01	NOT IDENT.
KR-85	0.000E+00	7.961E+02	1.741E+03	NOT IDENT.
SR-85	0.000E+00	5.159E+00	1.128E+01	NOT IDENT.
RB-86	-3.666E+01	1.500E+02	2.742E+02	NOT IDENT.
Y-88	2.956E+00	4.125E+00	9.372E+00	NOT IDENT.
Y-91	1.144E+02	2.176E+03	4.130E+03	NOT IDENT.
NB-94	2.373E+00	3.362E+00	6.572E+00	NOT IDENT.
NB-95	3.314E+00	5.374E+00	9.777E+00	NOT IDENT.
NB-95M	4.726E+00	1.515E+01	2.557E+01	NOT IDENT.
TC-95M	-3.600E+00	4.945E+00	8.567E+00	FAIL ABUN
ZR-95	-1.314E+00	8.919E+00	1.587E+01	FAIL ABUN
MO-99	0.000E+00	1.878E+05	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	8.729E+40	0.000E+00	SHORT HLIF
RH-101	-1.759E+00	3.378E+00	5.516E+00	FAIL ABUN
RH-102M	-5.194E-01	3.677E+00	5.894E+00	NOT IDENT.
RU-103	8.729E-02	5.520E+00	1.032E+01	NOT IDENT.
RH-106	-2.058E+01	2.920E+01	4.924E+01	NOT IDENT.
RU-106	-2.058E+01	2.920E+01	4.924E+01	NOT IDENT.
AG-108M	6.787E-02	2.411E+00	4.619E+00	FAIL ABUN
CD-109	-2.263E+01	7.231E+01	1.247E+02	NOT IDENT.
AG-110	1.332E+01	7.864E+01	1.308E+02	NOT IDENT.
AG-110M	1.126E-01	4.958E+00	9.483E+00	NOT IDENT.
IN-111	0.000E+00	1.600E+04	0.000E+00	SHORT HLIF
SN-113	1.145E+00	4.227E+00	7.827E+00	NOT IDENT.
IN-114M	-6.013E+00	2.367E+01	3.838E+01	NOT IDENT.
CD-115	0.000E+00	5.032E+05	0.000E+00	SHORT HLIF
SN-117M	7.293E+00	1.441E+01	2.785E+01	NOT IDENT.
SB-122	0.000E+00	3.137E+04	0.000E+00	SHORT HLIF
I-123	0.000E+00	4.091E+19	0.000E+00	SHORT HLIF
TE-123M	3.201E+00	3.107E+00	6.009E+00	NOT IDENT.
SB-124	-9.680E+00	1.072E+01	1.710E+01	FAIL ABUN
SB-125	7.892E+00	7.955E+00	1.654E+01	NOT IDENT.
TE-125M	2.832E+02	1.248E+03	2.219E+03	NOT IDENT.
I-126	6.238E+01	7.809E+01	1.378E+02	NOT IDENT.
SB-126	3.441E+01	4.239E+01	8.463E+01	NOT IDENT.
SN-126	-2.448E+00	6.877E+00	1.182E+01	NOT IDENT.
SB-127	7.456E+02	4.551E+03	8.516E+03	NOT IDENT.
I-131	7.034E+00	6.395E+01	1.149E+02	FAIL ABUN
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	5.345E+03	0.000E+00	SHORT HLIF
BA-133	4.364E+00	5.892E+00	8.428E+00	FAIL ABUN
I-133	0.000E+00	5.087E+12	0.000E+00	SHORT HLIF
CS-134	-2.316E+00	3.992E+00	6.357E+00	NOT IDENT.
I-135	0.000E+00	6.073E+39	0.000E+00	SHORT HLIF
CS-136	-1.284E+01	2.605E+01	3.830E+01	NOT IDENT.
LA-138	6.593E+00	5.623E+00	1.289E+01	NOT IDENT.
CE-139	-1.905E+00	3.154E+00	4.980E+00	NOT IDENT.
BA-140	3.166E+01	7.764E+01	1.364E+02	FAIL ABUN
LA-140	1.362E+01	2.074E+01	4.762E+01	NOT IDENT.
CE-141	-4.161E+00	9.194E+00	1.360E+01	NOT IDENT.
CE-143	0.000E+00	2.964E+08	0.000E+00	SHORT HLIF
CE-144	1.413E+01	2.012E+01	3.689E+01	NOT IDENT.
PM-144	1.244E-01	3.692E+00	6.708E+00	FAIL ABUN
PR-144	7.414E+00	2.790E+02	5.065E+02	NOT IDENT.
PM-146	2.228E+00	4.509E+00	7.962E+00	NOT IDENT.
ND-147	9.149E+01	1.762E+02	3.492E+02	FAIL ABUN
PM-147	2.560E+03	7.509E+04	1.304E+05	NOT IDENT.
PM-149	0.000E+00	4.625E+06	0.000E+00	SHORT HLIF
EU-152	-4.948E-01	9.966E+00	1.759E+01	NOT IDENT.
GD-153	-9.634E+00	1.022E+01	1.422E+01	NOT IDENT.
EU-154	2.548E-01	9.863E+00	1.887E+01	FAIL ABUN
EU-155	6.116E-01	1.006E+01	1.778E+01	NOT IDENT.
TB-160	1.317E+01	1.547E+01	3.228E+01	FAIL ABUN
HO-166M	5.207E+00	5.747E+00	1.161E+01	FAIL ABUN
TM-171	1.935E+03	3.313E+03	6.289E+03	NOT IDENT.
LU-176	3.033E+00	5.538E+00	5.021E+00	FAIL ABUN
LU-177	3.544E+02	9.946E+02	1.636E+03	NOT IDENT.
HF-181	5.183E-01	5.557E+00	9.452E+00	NOT IDENT.
W-181	-1.051E+01	3.141E+01	5.575E+01	NOT IDENT.
TA-182	-1.012E+01	1.661E+01	2.815E+01	FAIL ABUN
RE-183	-3.147E+01	3.346E+01	5.603E+01	FAIL ABUN
RE-184	2.687E+00	1.458E+01	2.848E+01	NOT IDENT.
RE-188	-5.649E+00	1.768E+01	3.241E+01	FAIL ABUN
W-188	-2.869E+02	8.453E+02	1.473E+03	NOT IDENT.

OS-191	2.254E+01	3.982E+01	7.183E+01	NOT IDENT.
IR-192	-2.737E+00	4.041E+00	6.738E+00	NOT IDENT.
PB-201	0.000E+00	5.124E+27	0.000E+00	SHORT HLIF
TL-201	0.000E+00	6.364E+04	0.000E+00	SHORT HLIF
TL-202	1.107E+01	1.975E+01	3.919E+01	NOT IDENT.
HG-203	3.025E-01	5.501E+00	8.927E+00	NOT IDENT.
PB-203	0.000E+00	2.551E+05	0.000E+00	SHORT HLIF
TL-204	-3.954E+02	6.798E+02	1.077E+03	NOT IDENT.
BI-207	6.831E-01	5.159E+00	9.840E+00	NOT IDENT.
PB-210	3.074E+02	7.110E+02	1.352E+03	NOT IDENT.
BI-211	-1.334E+01	2.494E+01	3.866E+01	NOT IDENT.
PB-211	-4.469E+01	7.689E+01	1.261E+02	NOT IDENT.
BI-212	-1.387E+00	5.229E+01	8.339E+01	NOT IDENT.
PB-212	7.415E+00	1.336E+01	1.403E+01	FAIL ABUN
BI-213	1.041E+01	9.533E+00	1.979E+01	NOT IDENT.
BI-214	-8.690E+00	1.029E+01	1.667E+01	FAIL ABUN
PB-214	-2.876E+00	8.794E+00	1.404E+01	NOT IDENT.
RN-219	-3.425E+00	4.103E+01	7.148E+01	NOT IDENT.
RA-223	-3.604E+01	6.628E+01	1.117E+02	FAIL ABUN
RA-224	2.274E+01	6.201E+01	1.155E+02	NOT IDENT.
AC-227	1.070E+01	2.436E+01	4.587E+01	NOT IDENT.
TH-227	1.070E+01	2.436E+01	4.587E+01	NOT IDENT.
AC-228	3.524E+00	1.837E+01	2.804E+01	FAIL ABUN
RA-228	3.524E+00	1.837E+01	2.804E+01	FAIL ABUN
TH-228	7.415E+00	1.336E+01	1.403E+01	FAIL ABUN
TH-229	-8.782E+00	5.208E+01	9.041E+01	NOT IDENT.
TH-230	-1.941E+03	1.291E+03	2.020E+03	NOT IDENT.
PA-231	4.886E+00	4.966E+01	8.072E+01	FAIL ABUN
TH-231	2.796E+00	5.048E+01	8.237E+01	NOT IDENT.
TH-232	-3.448E+03	2.763E+03	4.367E+03	FAIL ABUN
PA-233	-2.818E+00	6.587E+00	1.129E+01	FAIL ABUN
PA-234	-7.342E+00	2.430E+01	4.489E+01	FAIL ABUN
PA-234M	1.038E+02	4.888E+02	9.264E+02	NOT IDENT.
TH-234	-3.204E+01	1.904E+02	3.273E+02	FAIL ABUN
U-234	1.815E+03	1.135E+04	2.092E+04	NOT IDENT.
NP-237	-2.818E+00	6.587E+00	1.129E+01	FAIL ABUN
NP-238	0.000E+00	1.275E+06	0.000E+00	SHORT HLIF
U-238	-3.204E+01	1.904E+02	3.273E+02	FAIL ABUN
NP-239	2.975E+00	2.627E+01	4.613E+01	NOT IDENT.
AM-241	3.602E-01	2.238E+01	3.884E+01	NOT IDENT.
AM-242	-2.354E+01	7.358E+01	1.186E+02	NOT IDENT.
AM-243	3.456E+00	5.657E+00	1.057E+01	NOT IDENT.
CM-243	-4.744E+00	1.091E+01	1.832E+01	NOT IDENT.
BK-247	-3.870E+00	7.776E+00	1.344E+01	NOT IDENT.
CM-247	-1.585E-01	3.821E+00	6.678E+00	NOT IDENT.
CF-249	8.887E-01	3.711E+00	6.770E+00	NOT IDENT.
CF-251	4.549E+00	1.186E+01	2.267E+01	NOT IDENT.
CF-252	1.598E+04	1.849E+04	3.480E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	8	92.43	91	110	1.33	185.07	181	13	1.31E-02	22.1	2.06E+00
2	8	95.12	15	84	1.52	190.44	181	13	2.23E-03	105.6	
3	0	141.95	66	101	4.44	284.03	277	13	9.51E-03	33.8	
4	0	163.38	41	64	1.83	326.88	324	8	5.92E-03	37.2	
5	0	185.20	92	126	1.15	370.49	363	14	1.33E-02	27.9	
6	0	198.12	25	61	0.91	396.31	393	6	3.61E-03	53.4	
7	0	216.79	90	98	4.53	433.63	422	19	1.29E-02	28.7	
8	0	239.27	71	127	1.31	478.55	473	13	1.02E-02	35.1	
9	0	283.04	26	77	0.54	566.04	559	12	3.74E-03	70.8	
10	0	306.55	23	94	3.25	613.02	604	14	3.28E-03	93.2	
11	0	355.92	20	52	2.39	711.71	707	9	2.88E-03	68.9	
12	0	458.91	37	20	3.31	917.59	913	10	5.28E-03	29.1	
13	0	478.14	60	69	1.62	956.04	948	17	8.65E-03	34.8	
14	0	510.79	301	61	2.58	1021.31	1011	22	4.34E-02	8.8	
15	0	532.70	20	32	3.40	1065.11	1058	13	2.88E-03	63.0	
16	0	547.41	28	27	2.60	1094.50	1087	14	4.10E-03	47.0	
17	0	583.07	43	24	1.56	1165.80	1159	11	6.27E-03	26.8	
18	0	662.52	9	47	1.08	1324.64	1317	12	1.36E-03	146.4	
19	0	722.89	37	28	6.14	1445.35	1434	19	5.29E-03	38.6	
20	0	772.24	14	9	1.23	1544.03	1539	10	2.02E-03	49.5	
21	0	785.75	12	23	4.41	1571.04	1559	15	1.66E-03	94.6	
22	0	912.55	17	15	2.80	1824.58	1816	12	2.42E-03	52.3	
23	0	1014.50	8	7	1.07	2028.47	2024	9	1.13E-03	70.4	
24	0	1042.44	19	4	6.46	2084.34	2077	15	2.77E-03	31.8	
25	0	1120.18	27	13	3.05	2239.82	2229	17	3.90E-03	36.0	
26	0	1157.49	6	22	3.61	2314.45	2301	21	7.94E-04	213.0	
27	0	1173.52	28	13	1.86	2346.51	2338	14	3.98E-03	34.4	
28	0	1253.18	11	9	1.47	2505.83	2501	11	1.64E-03	57.6	
29	0	1265.96	17	3	0.73	2531.40	2524	14	2.41E-03	34.1	
30	0	1423.09	15	4	5.15	2845.71	2838	16	2.10E-03	40.6	
31	0	1460.50	44	9	2.63	2920.55	2912	17	6.28E-03	21.6	
32	0	1480.26	14	11	2.72	2960.07	2952	15	2.06E-03	57.3	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	60	10.44*	3.326E+00	9.137E+01	1.444E+02	69.68
K-40	1460.82	28	10.66*	1.441E+00	9.545E+01	9.545E+01	73.04
TE-129	250.62	-----	0.38	4.676E+00	-----	Line Not Found	-----
	278.43	-----	0.57	4.443E+00	-----	Line Not Found	-----
	459.60	37	7.70*	3.407E+00	7.385E+01	1.525E+02	58.14
	802.10	-----	0.19	2.326E+00	-----	Line Not Found	-----
	1083.85	-----	0.49	1.814E+00	-----	Line Not Found	-----
	1111.64	-----	0.19	1.776E+00	-----	Line Not Found	-----
BA-137M	661.66	9	89.90*	2.688E+00	2.067E+00	2.072E+00	292.88
CS-137	661.66	9	85.10*	2.688E+00	2.184E+00	2.189E+00	292.88
TL-208	277.37	-----	6.60	4.452E+00	-----	Line Not Found	-----
	583.19	15	85.00*	2.936E+00	3.091E+00	3.201E+00	174.38
	860.56	-----	12.50	2.198E+00	-----	Line Not Found	-----
FR-221	218.12	81	11.40*	4.998E+00	7.533E+01	7.533E+01	64.84
AC-225	218.12	81	11.40*	4.998E+00	7.533E+01	8.606E+02	64.84
RA-226	186.21	17	3.59*	5.325E+00	4.579E+01	4.579E+01	320.61
U-235	143.76	-----	10.96*	5.658E+00	-----	Line Not Found	-----
	163.33	41	5.08	5.534E+00	7.718E+01	7.718E+01	74.46
	185.72	17	57.20	5.325E+00	2.874E+00	2.874E+00	320.61
	205.31	-----	5.01	5.116E+00	-----	Line Not Found	-----
ANH-511	511.00	61	100.00*	3.195E+00	1.005E+01	1.005E+01	93.08

Flag: "*" = Keyline

Total number of lines in spectrum 32
Number of unidentified lines 9
Number of lines tentatively identified by NID 23 71.88%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.58	9.137E+01	1.444E+02	1.006E+02	69.68	
K-40	1.25E+09Y	1.00	9.545E+01	9.545E+01	6.972E+01	73.04	
TE-129	33.60D	2.06	7.385E+01	1.525E+02	0.887E+02	58.14	
BA-137M	30.08Y	1.00	2.067E+00	2.072E+00	6.068E+00	292.88	
CS-137	30.08Y	1.00	2.184E+00	2.189E+00	6.410E+00	292.88	
TL-208	1.91Y	1.04	3.091E+00	3.201E+00	5.581E+00	174.38	
FR-221	7340.00Y	1.00	7.533E+01	7.533E+01	4.885E+01	64.84	
AC-225	10.00D	11.4	7.533E+01	8.606E+02	5.580E+02	64.84	
RA-226	1600.00Y	1.00	4.579E+01	4.579E+01	14.68E+01	320.61	
U-235	7.04E+08Y	1.00	2.874E+00	2.874E+00	9.213E+00	320.61	K
ANH-511	1.00E+09Y	1.00	1.005E+01	1.005E+01	0.936E+01	93.08	
Total Activity :			4.774E+02	1.394E+03			

Grand Total Activity : 4.774E+02 1.394E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
8	92.43	13	110	1.33	185.07	181	13	1.83E-03	****	4.65E+00	T
8	95.12	15	84	1.52	190.44	181	13	2.23E-03	****	4.80E+00	T
0	141.95	52	101	4.44	284.03	277	13	7.44E-03	89.1	5.66E+00	T
0	198.12	4	61	0.91	396.31	393	6	5.56E-04	****	5.19E+00	T
0	239.27	28	127	1.31	478.55	473	13	4.07E-03	****	4.78E+00	T
0	283.04	26	77	0.54	566.04	559	12	3.74E-03	****	4.41E+00	T
0	306.55	23	94	3.25	613.02	604	14	3.28E-03	****	4.23E+00	T
0	355.92	20	52	2.39	711.71	707	9	2.88E-03	****	3.92E+00	T
0	532.70	20	32	3.40	1065.11	1058	13	2.88E-03	****	3.11E+00	
0	547.41	28	27	2.60	1094.50	1087	14	4.10E-03	93.9	3.06E+00	T
0	722.89	37	28	6.14	1445.35	1434	19	5.29E-03	77.3	2.52E+00	T
0	772.24	14	9	1.23	1544.03	1539	10	2.02E-03	99.0	2.40E+00	T
0	785.75	12	23	4.41	1571.04	1559	15	1.66E-03	****	2.36E+00	
0	912.55	4	15	2.80	1824.58	1816	12	5.14E-04	****	2.09E+00	T
0	1014.50	8	7	1.07	2028.47	2024	9	1.13E-03	****	1.92E+00	
0	1042.44	19	4	6.46	2084.34	2077	15	2.77E-03	63.5	1.87E+00	
0	1120.18	23	13	3.05	2239.82	2229	17	3.26E-03	90.1	1.76E+00	T
0	1157.49	6	22	3.61	2314.45	2301	21	7.94E-04	****	1.72E+00	
0	1173.52	28	13	1.86	2346.51	2338	14	3.98E-03	68.8	1.70E+00	T
0	1253.18	11	9	1.47	2505.83	2501	11	1.64E-03	****	1.61E+00	
0	1265.96	17	3	0.73	2531.40	2524	14	2.41E-03	68.1	1.60E+00	
0	1423.09	15	4	5.15	2845.71	2838	16	2.10E-03	81.2	1.47E+00	
0	1480.26	14	11	2.72	2960.07	2952	15	2.06E-03	****	1.43E+00	

Flags: "T" = Tentatively associated


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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226445.CNF;1 *
* Acquisition date   : 31-OCT-2022 10:42:37 Sensitivity      : 3.000          *
* Detector ID        : GAM18 Energy tolerance: 1.500          *
* Elapsed live time  : 0 01:55:26.36 Abundance limit : 75.000          *
* Elapsed real time  : 0 01:55:27.18 Half life ratio  : *****          *
* Sample date        : 26-SEP-2022 08:18:00 Nuclide Library : LIQUID          *
* Sample ID          : G1205226445 Analyst initials: RXF2          *
* Batch Number       : 2333342 Sample Quantity : 7.3727E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 8-JUN-2022 11:06:14 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19          *
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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.326E+01
K-40	2.938E+01
TE-129	5.627E+01
BA-137M	3.135E+00
CS-137	3.312E+00
TL-208	2.961E+00
FR-221	1.531E+01
AC-225	1.749E+02
RA-226	4.486E+01
U-235	1.687E+01
ANH-511	2.059E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	2.815E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	1.798E+00	NOT IDENT.
SC-46	3.560E+00	FAIL ABUN
V-48	1.141E+01	NOT IDENT.
CR-51	4.902E+01	NOT IDENT.
MN-52	2.540E+02	NOT IDENT.
MN-54	3.546E+00	NOT IDENT.
CO-56	4.008E+00	NOT IDENT.
CO-57	2.163E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.643E+00	NOT IDENT.
FE-59	8.384E+00	NOT IDENT.
CO-60	4.354E+00	FAIL ABUN
ZN-65	6.074E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	9.903E+01	NOT IDENT.
AS-73	1.501E+02	NOT IDENT.
AS-74	1.741E+01	NOT IDENT.
SE-75	3.912E+00	NOT IDENT.

BR-77	0.000E+00	SHORT HLIF
SR-82	4.064E+01	NOT IDENT.
RB-83	6.046E+00	NOT IDENT.
RB-84	9.309E+00	NOT IDENT.
KR-85	8.181E+02	NOT IDENT.
SR-85	5.302E+00	NOT IDENT.
RB-86	1.204E+02	NOT IDENT.
Y-88	3.988E+00	NOT IDENT.
Y-91	1.814E+03	NOT IDENT.
NB-94	3.009E+00	NOT IDENT.
NB-95	4.455E+00	NOT IDENT.
NB-95M	1.191E+01	NOT IDENT.
TC-95M	3.956E+00	FAIL ABUN
ZR-95	7.146E+00	FAIL ABUN
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.569E+00	FAIL ABUN
RH-102M	2.719E+00	NOT IDENT.
RU-103	4.710E+00	NOT IDENT.
RH-106	2.189E+01	NOT IDENT.
RU-106	2.189E+01	NOT IDENT.
AG-108M	2.085E+00	FAIL ABUN
CD-109	5.771E+01	NOT IDENT.
AG-110	5.895E+01	NOT IDENT.
AG-110M	4.238E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	3.550E+00	NOT IDENT.
IN-114M	1.777E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	1.304E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.818E+00	NOT IDENT.
SB-124	6.855E+00	FAIL ABUN
SB-125	7.581E+00	NOT IDENT.
TE-125M	1.034E+03	NOT IDENT.
I-126	6.356E+01	NOT IDENT.
SB-126	3.855E+01	NOT IDENT.
SN-126	5.464E+00	NOT IDENT.
SB-127	3.845E+03	NOT IDENT.
I-131	5.278E+01	FAIL ABUN
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	3.919E+00	FAIL ABUN
I-133	0.000E+00	SHORT HLIF
CS-134	2.810E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.610E+01	NOT IDENT.
LA-138	5.697E+00	NOT IDENT.
CE-139	2.297E+00	NOT IDENT.
BA-140	6.182E+01	FAIL ABUN
LA-140	2.011E+01	NOT IDENT.
CE-141	6.249E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.721E+01	NOT IDENT.
PM-144	3.058E+00	FAIL ABUN
PR-144	2.309E+02	NOT IDENT.
PM-146	3.657E+00	NOT IDENT.
ND-147	1.586E+02	FAIL ABUN
PM-147	6.062E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.120E+00	NOT IDENT.
GD-153	6.556E+00	NOT IDENT.
EU-154	8.142E+00	FAIL ABUN
EU-155	8.236E+00	NOT IDENT.
TB-160	1.460E+01	FAIL ABUN
HO-166M	5.291E+00	FAIL ABUN
TM-171	2.950E+03	NOT IDENT.
LU-176	2.331E+00	FAIL ABUN
LU-177	7.653E+02	NOT IDENT.
HF-181	4.250E+00	NOT IDENT.
W-181	2.579E+01	NOT IDENT.
TA-182	1.208E+01	FAIL ABUN
RE-183	2.584E+01	FAIL ABUN
RE-184	1.247E+01	NOT IDENT.
RE-188	1.505E+01	FAIL ABUN
W-188	6.785E+02	NOT IDENT.
OS-191	3.361E+01	NOT IDENT.

IR-192	3.081E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF
TL-202	1.798E+01	NOT IDENT.
HG-203	4.132E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	5.058E+02	NOT IDENT.
BI-207	4.400E+00	NOT IDENT.
PB-210	6.312E+02	NOT IDENT.
BI-211	1.793E+01	NOT IDENT.
PB-211	5.786E+01	NOT IDENT.
BI-212	3.728E+01	NOT IDENT.
PB-212	6.665E+00	FAIL ABUN
BI-213	9.109E+00	NOT IDENT.
BI-214	7.787E+00	FAIL ABUN
PB-214	6.511E+00	NOT IDENT.
RN-219	3.279E+01	NOT IDENT.
RA-223	5.152E+01	FAIL ABUN
RA-224	5.400E+01	NOT IDENT.
AC-227	2.131E+01	NOT IDENT.
TH-227	2.131E+01	NOT IDENT.
AC-228	1.268E+01	FAIL ABUN
RA-228	1.268E+01	FAIL ABUN
TH-228	6.665E+00	FAIL ABUN
TH-229	4.212E+01	NOT IDENT.
TH-230	9.332E+02	NOT IDENT.
PA-231	3.724E+01	FAIL ABUN
TH-231	3.854E+01	NOT IDENT.
TH-232	2.047E+03	FAIL ABUN
PA-233	5.203E+00	FAIL ABUN
PA-234	1.952E+01	FAIL ABUN
PA-234M	4.194E+02	NOT IDENT.
TH-234	1.537E+02	FAIL ABUN
U-234	9.782E+03	NOT IDENT.
NP-237	5.203E+00	FAIL ABUN
NP-238	0.000E+00	SHORT HLIF
U-238	1.537E+02	FAIL ABUN
NP-239	2.144E+01	NOT IDENT.
AM-241	1.811E+01	NOT IDENT.
AM-242	5.534E+01	NOT IDENT.
AM-243	4.955E+00	NOT IDENT.
CM-243	8.503E+00	NOT IDENT.
BK-247	6.199E+00	NOT IDENT.
CM-247	3.069E+00	NOT IDENT.
CF-249	3.096E+00	NOT IDENT.
CF-251	1.058E+01	NOT IDENT.
CF-252	1.629E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226445.CNF;1
Acquisition date : 31-OCT-2022 10:42:37 Sensitivity : 3.000
Detector ID : GAM18 Energy tolerance: 1.500
Elapsed live time: 0 01:55:26.36 Abundance limit : 75.000
Elapsed real time: 0 01:55:27.18 Half life ratio : *****
Sample date : 26-SEP-2022 08:18:00 Nuclide Library : LIQUID
Sample ID : G1205226445 Analyst initials: RXF2
Batch Number : 2333342 Sample Quantity : 7.3727E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 8-JUN-2022 11:06:14 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.444E+02	9.935E+01	9.939E+01
K-40	9.545E+01	6.890E+01	6.893E+01
TE-129	1.525E+02	9.084E+01	9.089E+01
BA-137M	2.072E+00	5.949E+00	5.949E+00
CS-137	2.189E+00	6.284E+00	6.285E+00
TL-208	3.201E+00	5.476E+00	5.477E+00
FR-221	7.533E+01	4.839E+01	4.841E+01
AC-225	8.606E+02	5.543E+02	5.546E+02
RA-226	4.579E+01	1.439E+02	1.439E+02
U-235	5.683E+00	2.301E+01	2.301E+01
ANH-511	1.005E+01	9.211E+00	9.213E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-1.828E-01	3.465E+00	3.466E+00	NOT IDENT.
NA-24	-1.553E+16	3.088E+17	0.000E+00	SHORT HLIF
AL-26	-2.385E+00	2.942E+00	3.133E+00	NOT IDENT.
SC-46	-8.538E-02	4.192E+00	4.192E+00	FAIL ABUN
V-48	-1.084E+01	1.532E+01	1.608E+01	NOT IDENT.
CR-51	6.429E+00	5.875E+01	5.882E+01	NOT IDENT.
MN-52	-3.761E+01	3.055E+02	3.060E+02	NOT IDENT.
MN-54	-1.589E+00	4.309E+00	4.369E+00	NOT IDENT.
CO-56	-5.252E-01	4.748E+00	4.754E+00	NOT IDENT.
CO-57	-1.540E+00	2.845E+00	2.928E+00	NOT IDENT.
NI-57	-1.267E+07	6.329E+07	6.354E+07	SHORT HLIF
CO-58	1.498E-01	4.220E+00	4.220E+00	NOT IDENT.
FE-59	1.412E+00	9.801E+00	9.821E+00	NOT IDENT.
CO-60	5.530E+00	4.391E+00	5.051E+00	FAIL ABUN
ZN-65	3.472E-01	8.349E+00	8.350E+00	NOT IDENT.
CU-67	4.309E+04	1.354E+05	1.368E+05	SHORT HLIF
GE-68	3.144E+00	1.180E+02	1.180E+02	NOT IDENT.
AS-73	2.425E+01	1.746E+02	1.749E+02	NOT IDENT.
AS-74	-1.442E+01	2.242E+01	2.334E+01	NOT IDENT.

SE-75	-2.382E+00	4.902E+00	5.018E+00	NOT IDENT.
BR-77	3.817E+05	6.884E+05	7.097E+05	SHORT HLIF
SR-82	2.788E+01	6.763E+01	6.879E+01	NOT IDENT.
RB-83	-5.203E-01	7.193E+00	7.197E+00	NOT IDENT.
RB-84	5.933E+00	1.018E+01	1.052E+01	NOT IDENT.
KR-85	2.066E+03	8.147E+02	1.238E+03	NOT IDENT.
SR-85	1.339E+01	5.280E+00	8.024E+00	NOT IDENT.
RB-86	-3.666E+01	1.501E+02	1.510E+02	NOT IDENT.
Y-88	2.956E+00	4.131E+00	4.341E+00	NOT IDENT.
Y-91	1.144E+02	2.176E+03	2.177E+03	NOT IDENT.
NB-94	2.373E+00	3.369E+00	3.535E+00	NOT IDENT.
NB-95	3.314E+00	5.383E+00	5.587E+00	NOT IDENT.
NB-95M	4.726E+00	1.516E+01	1.531E+01	NOT IDENT.
TC-95M	-3.600E+00	4.954E+00	5.214E+00	FAIL ABUN
ZR-95	-1.314E+00	8.920E+00	8.939E+00	FAIL ABUN
MO-99	-1.218E+05	1.882E+05	1.961E+05	SHORT HLIF
TC-99M	1.000E+41	8.804E+40	0.000E+00	SHORT HLIF
RH-101	-1.759E+00	3.394E+00	3.486E+00	FAIL ABUN
RH-102M	-5.194E-01	3.678E+00	3.685E+00	NOT IDENT.
RU-103	8.729E-02	5.520E+00	5.520E+00	NOT IDENT.
RH-106	-2.058E+01	2.926E+01	3.070E+01	NOT IDENT.
RU-106	-2.058E+01	2.926E+01	3.070E+01	NOT IDENT.
AG-108M	6.787E-02	2.411E+00	2.411E+00	FAIL ABUN
CD-109	-2.263E+01	7.235E+01	7.307E+01	NOT IDENT.
AG-110	1.332E+01	7.865E+01	7.888E+01	NOT IDENT.
AG-110M	1.126E-01	4.958E+00	4.958E+00	NOT IDENT.
IN-111	9.351E+03	1.601E+04	1.656E+04	SHORT HLIF
SN-113	1.145E+00	4.228E+00	4.260E+00	NOT IDENT.
IN-114M	-6.013E+00	2.367E+01	2.382E+01	NOT IDENT.
CD-115	2.913E+05	5.040E+05	5.209E+05	SHORT HLIF
SN-117M	7.293E+00	1.442E+01	1.479E+01	NOT IDENT.
SB-122	-4.132E+03	3.137E+04	3.142E+04	SHORT HLIF
I-123	4.264E+19	4.103E+19	0.000E+00	SHORT HLIF
TE-123M	3.201E+00	3.116E+00	3.434E+00	NOT IDENT.
SB-124	-9.680E+00	1.075E+01	1.160E+01	FAIL ABUN
SB-125	7.892E+00	7.982E+00	8.740E+00	NOT IDENT.
TE-125M	2.832E+02	1.248E+03	1.255E+03	NOT IDENT.
I-126	6.238E+01	7.831E+01	8.322E+01	NOT IDENT.
SB-126	3.441E+01	4.261E+01	4.535E+01	NOT IDENT.
SN-126	-2.448E+00	6.881E+00	6.969E+00	NOT IDENT.
SB-127	7.456E+02	4.553E+03	4.566E+03	NOT IDENT.
I-131	7.034E+00	6.395E+01	6.403E+01	FAIL ABUN
I-132	-1.000E+41	2.670E+42	0.000E+00	SHORT HLIF
TE-132	-2.676E+03	5.354E+03	5.488E+03	SHORT HLIF
BA-133	4.364E+00	5.903E+00	6.223E+00	FAIL ABUN
I-133	6.716E+11	5.089E+12	5.098E+12	SHORT HLIF
CS-134	-2.316E+00	3.998E+00	4.132E+00	NOT IDENT.
I-135	-3.123E+38	6.078E+39	0.000E+00	SHORT HLIF
CS-136	-1.284E+01	2.610E+01	2.674E+01	NOT IDENT.
LA-138	6.593E+00	5.652E+00	6.387E+00	NOT IDENT.
CE-139	-1.905E+00	3.180E+00	3.294E+00	NOT IDENT.
BA-140	3.166E+01	7.768E+01	7.899E+01	FAIL ABUN
LA-140	1.362E+01	2.077E+01	2.166E+01	NOT IDENT.
CE-141	-4.161E+00	9.199E+00	9.389E+00	NOT IDENT.
CE-143	2.233E+08	2.970E+08	3.136E+08	SHORT HLIF
CE-144	1.413E+01	2.015E+01	2.113E+01	NOT IDENT.
PM-144	1.244E-01	3.692E+00	3.692E+00	FAIL ABUN
PR-144	7.414E+00	2.790E+02	2.790E+02	NOT IDENT.
PM-146	2.228E+00	4.515E+00	4.625E+00	NOT IDENT.
ND-147	9.149E+01	1.764E+02	1.811E+02	FAIL ABUN
PM-147	2.560E+03	7.509E+04	7.510E+04	NOT IDENT.
PM-149	2.188E+06	4.637E+06	4.741E+06	SHORT HLIF
EU-152	-4.948E-01	9.966E+00	9.968E+00	NOT IDENT.
GD-153	-9.634E+00	1.025E+01	1.113E+01	NOT IDENT.
EU-154	2.548E-01	9.863E+00	9.863E+00	FAIL ABUN
EU-155	6.116E-01	1.006E+01	1.007E+01	NOT IDENT.
TB-160	1.317E+01	1.553E+01	1.663E+01	FAIL ABUN
HO-166M	5.207E+00	5.767E+00	6.227E+00	FAIL ABUN
TM-171	1.935E+03	3.322E+03	3.434E+03	NOT IDENT.
LU-176	3.033E+00	5.544E+00	5.710E+00	FAIL ABUN
LU-177	3.544E+02	9.950E+02	1.008E+03	NOT IDENT.
HF-181	5.183E-01	5.557E+00	5.562E+00	NOT IDENT.
W-181	-1.051E+01	3.154E+01	3.189E+01	NOT IDENT.
TA-182	-1.012E+01	1.664E+01	1.725E+01	FAIL ABUN
RE-183	-3.147E+01	3.372E+01	3.659E+01	FAIL ABUN
RE-184	2.687E+00	1.458E+01	1.463E+01	NOT IDENT.
RE-188	-5.649E+00	1.768E+01	1.786E+01	FAIL ABUN
W-188	-2.869E+02	8.462E+02	8.560E+02	NOT IDENT.

OS-191	2.254E+01	3.985E+01	4.113E+01	NOT IDENT.
IR-192	-2.737E+00	4.048E+00	4.232E+00	NOT IDENT.
PB-201	3.815E+27	5.382E+27	0.000E+00	SHORT HLIF
TL-201	3.369E+04	6.369E+04	6.548E+04	SHORT HLIF
TL-202	1.107E+01	1.978E+01	2.040E+01	NOT IDENT.
HG-203	3.025E-01	5.501E+00	5.503E+00	NOT IDENT.
PB-203	1.403E+04	2.551E+05	2.552E+05	SHORT HLIF
TL-204	-3.954E+02	6.812E+02	7.041E+02	NOT IDENT.
BI-207	6.831E-01	5.159E+00	5.168E+00	NOT IDENT.
PB-210	3.074E+02	7.118E+02	7.251E+02	NOT IDENT.
BI-211	-1.334E+01	2.497E+01	2.569E+01	NOT IDENT.
PB-211	-4.469E+01	7.699E+01	7.959E+01	NOT IDENT.
BI-212	-1.387E+00	5.229E+01	5.229E+01	NOT IDENT.
PB-212	7.415E+00	1.337E+01	1.378E+01	FAIL ABUN
BI-213	1.041E+01	9.573E+00	1.066E+01	NOT IDENT.
BI-214	-8.690E+00	1.031E+01	1.103E+01	FAIL ABUN
PB-214	-2.876E+00	8.797E+00	8.892E+00	NOT IDENT.
RN-219	-3.425E+00	4.103E+01	4.106E+01	NOT IDENT.
RA-223	-3.604E+01	6.637E+01	6.833E+01	FAIL ABUN
RA-224	2.274E+01	6.204E+01	6.288E+01	NOT IDENT.
AC-227	1.070E+01	2.441E+01	2.488E+01	NOT IDENT.
TH-227	1.070E+01	2.441E+01	2.488E+01	NOT IDENT.
AC-228	3.524E+00	1.838E+01	1.844E+01	FAIL ABUN
RA-228	3.524E+00	1.838E+01	1.844E+01	FAIL ABUN
TH-228	7.415E+00	1.337E+01	1.378E+01	FAIL ABUN
TH-229	-8.782E+00	5.209E+01	5.224E+01	NOT IDENT.
TH-230	-1.941E+03	1.338E+03	1.599E+03	NOT IDENT.
PA-231	4.886E+00	4.967E+01	4.972E+01	FAIL ABUN
TH-231	2.796E+00	5.048E+01	5.049E+01	NOT IDENT.
TH-232	-3.448E+03	2.804E+03	3.206E+03	FAIL ABUN
PA-233	-2.818E+00	6.592E+00	6.713E+00	FAIL ABUN
PA-234	-7.342E+00	2.572E+01	2.593E+01	FAIL ABUN
PA-234M	1.038E+02	4.889E+02	4.911E+02	NOT IDENT.
TH-234	-3.204E+01	1.906E+02	1.911E+02	FAIL ABUN
U-234	1.815E+03	1.135E+04	1.138E+04	NOT IDENT.
NP-237	-2.818E+00	6.592E+00	6.713E+00	FAIL ABUN
NP-238	-8.096E+05	1.278E+06	1.329E+06	SHORT HLIF
U-238	-3.204E+01	1.906E+02	1.911E+02	FAIL ABUN
NP-239	2.975E+00	2.627E+01	2.631E+01	NOT IDENT.
AM-241	3.602E-01	2.238E+01	2.238E+01	NOT IDENT.
AM-242	-2.354E+01	7.370E+01	7.446E+01	NOT IDENT.
AM-243	3.456E+00	5.665E+00	5.876E+00	NOT IDENT.
CM-243	-4.744E+00	1.092E+01	1.113E+01	NOT IDENT.
BK-247	-3.870E+00	7.819E+00	8.012E+00	NOT IDENT.
CM-247	-1.585E-01	3.821E+00	3.822E+00	NOT IDENT.
CF-249	8.887E-01	3.713E+00	3.734E+00	NOT IDENT.
CF-251	4.549E+00	1.187E+01	1.205E+01	NOT IDENT.
CF-252	1.598E+04	2.350E+04	2.458E+04	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	62.1778	133.52	60.8050	116.30	0.0000
879.38	63.7579	364.49	57.6734	116.74	55.8882
46.54	56.7400	80.22	0.0000	117.23	50.1275
228.16	0.0000	711.68	57.7464	119.76	59.8244
52.39	71.1874	356.01	54.6743	120.54	58.7624
53.20	66.1275	323.87	54.6870	120.90	56.4613
53.44	66.1996	82.35	0.0000	264.66	57.6682
57.53	60.3353	82.47	64.4472	121.22	57.6821
293.27	0.0000	82.47	0.0000	344.28	67.1900
57.53	57.7732	83.79	57.2963	122.06	71.9535
482.18	57.7737	265.00	57.3350	1274.44	56.7561
57.98	66.5671	84.21	57.3738	123.68	53.2863
59.32	50.4512	84.86	0.0000	1377.63	0.0000
59.54	50.4976	193.51	59.7307	127.23	74.0306
155.04	78.3157	105.31	63.1534	129.43	57.6064
63.00	51.2168	86.79	62.1295	131.20	78.3241
129.43	52.2620	86.94	62.1591	133.02	52.0270
63.29	52.2620	87.09	55.7550	133.52	49.6628
290.67	52.3225	87.57	57.9864	135.34	0.0000
63.81	76.0852	88.03	58.0692	136.00	58.4626
87.57	76.2265	306.78	68.8887	136.28	58.4985
64.99	67.5051	88.47	68.9165	136.47	60.1491
65.08	67.5284	531.02	59.3425	739.50	0.0000
66.73	53.9691	184.58	0.0000	140.51	0.0000
66.98	54.0206	92.59	52.3378	140.88	59.0852
67.24	84.1154	93.31	0.0000	143.76	51.1911
67.67	83.2501	94.56	52.6436	144.24	46.2839
1221.41	83.2748	311.90	52.6575	145.44	53.0293
439.51	65.4959	946.00	52.6604	152.32	50.4205
70.82	65.4959	97.43	54.5579	152.43	56.3152
167.43	0.0000	98.43	81.3312	1048.07	61.4593
97.43	63.6662	98.44	81.3335	154.21	59.8904
70.82	0.0000	99.53	57.8510	155.04	63.3690
70.82	86.2626	103.37	57.8510	158.56	70.2643
279.20	0.0000	116.74	57.8510	158.97	0.0000
1063.66	86.8871	100.11	52.3737	159.00	53.1343
72.87	0.0000	100.20	52.3870	162.33	65.5593
351.06	86.9059	102.03	77.3018	537.26	64.3143
74.66	60.7074	103.18	61.8125	163.33	57.5277
238.63	60.7416	103.37	65.2181	165.86	60.8226
351.93	60.7416	105.31	51.9978	167.43	0.0000
238.63	60.7416	106.12	57.7754	245.35	0.0000
74.97	60.7735	106.47	48.7585	427.87	78.2661
77.11	61.2268	109.28	58.2614	176.60	66.8688
256.23	58.6237	111.00	65.4079	177.52	56.4030
79.82	0.0000	111.76	0.0000	181.07	0.0000
80.02	58.6887	208.37	68.0432	184.41	48.1668
80.03	58.6895	116.24	66.2846	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	48.2750	300.09	50.3096	477.60	35.2574
186.21	48.3157	300.13	50.3115	477.99	35.2678
190.27	58.1087	301.36	45.6594	482.18	25.3257
193.51	66.3032	302.85	52.0459	487.02	23.3635
197.03	61.4953	304.50	47.4033	492.35	0.0000
198.01	64.7872	304.85	47.4216	497.08	36.7238
201.83	57.2908	306.78	47.5259	511.00	28.5400
204.12	63.5820	308.46	46.0285	514.00	28.6020
205.31	62.7781	311.90	55.2341	520.40	28.7338
208.37	54.2677	316.51	51.2461	520.69	0.0000
210.85	61.4608	319.41	46.0532	667.71	0.0000
215.65	49.7182	320.08	43.9429	527.90	0.0000
218.12	49.9037	321.04	42.9167	529.59	26.2230
222.11	41.2025	323.87	58.1144	529.87	0.0000
227.09	57.2467	325.23	51.7334	531.02	25.0915
227.38	62.9982	1596.21	57.3379	537.26	24.8133
228.16	0.0000	331.15	0.0000	1260.41	0.0000
228.18	65.9376	333.37	56.5301	552.55	26.6430
235.69	55.0564	334.37	57.6787	795.86	36.5043
235.96	55.0773	338.28	46.9866	564.24	0.0000
238.63	60.1331	911.20	46.9884	569.33	31.6992
238.98	0.0000	340.48	56.9501	569.50	32.6938
240.99	60.3299	340.55	56.9543	569.70	32.6979
242.00	67.2347	344.28	49.4769	582.08	25.9714
244.70	45.4783	345.93	41.8509	583.19	33.5877
245.35	0.0000	351.06	36.5335	595.83	49.3813
459.60	53.2375	351.93	31.5789	600.60	46.4984
685.70	51.3875	356.01	50.0656	604.72	52.6998
388.16	52.4032	361.25	0.0000	609.32	60.9814
256.23	48.6680	364.49	40.3879	610.33	42.7139
527.90	0.0000	366.42	0.0000	614.28	43.8385
264.66	58.2390	383.85	38.8539	618.01	35.7648
265.00	57.2598	388.16	34.4202	621.93	31.7540
269.46	62.6357	666.33	42.4696	630.19	0.0000
401.81	49.6121	391.70	27.6255	631.29	33.9950
273.65	57.8860	400.66	33.6534	632.98	35.0615
276.40	53.8033	401.32	0.0000	633.25	34.0353
583.19	45.9100	401.81	42.9815	634.78	30.9705
277.60	45.9229	402.40	44.1663	635.95	26.8593
402.40	42.8827	404.85	53.5815	636.99	25.8430
278.43	42.9049	410.95	37.7680	657.50	25.1118
279.20	0.0000	720.70	33.4866	884.68	21.7667
279.54	56.7726	423.72	42.6292	661.66	37.7589
280.46	62.9814	427.09	32.9548	664.57	0.0000
301.36	50.3767	427.87	24.9550	666.33	31.9716
284.31	47.8415	433.94	28.6665	666.50	33.6572
285.41	43.2689	439.51	32.3998	667.71	0.0000
285.90	0.0000	440.45	27.0209	677.62	23.2870
287.50	44.9266	453.88	33.5112	685.70	26.5831
290.67	52.8708	459.60	33.6656	692.65	0.0000
293.27	0.0000	463.37	27.8942	695.00	30.9975
295.22	53.1541	468.07	38.6809	696.49	35.3022
316.51	59.4585	473.00	34.0227	696.51	35.3022
298.58	44.9903	475.06	50.3750	697.00	40.6626
299.98	50.3027	696.49	35.2354	697.49	39.6027

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	27.9083	903.28	14.7387	1291.59	16.4209
706.68	34.4248	907.67	0.0000	1298.22	0.0000
711.68	21.5741	911.20	17.1141	1312.11	11.9368
720.70	22.7637	984.45	0.0000	1332.49	12.9370
721.93	0.0000	926.36	21.0547	1365.19	14.0002
1690.97	22.7893	935.54	24.0204	1368.63	0.0000
722.91	22.7906	937.49	22.1167	1377.63	0.0000
723.31	22.7957	983.53	16.3932	1384.29	19.7131
756.73	22.8066	945.96	0.0000	1408.01	11.3442
727.33	24.3674	946.00	18.3362	1434.09	16.1934
733.00	27.2781	949.00	18.3594	1435.80	7.6243
735.93	30.5985	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	28.1787	1460.82	13.4383
1434.09	21.9519	964.08	25.2821	1489.16	17.4163
747.24	25.2840	966.17	22.3846	1596.21	4.9801
752.31	28.6573	968.97	20.4617	1620.50	11.0255
753.82	19.8550	983.53	24.5050	1678.03	0.0000
756.73	29.8275	984.45	0.0000	1690.97	13.2650
763.94	29.9383	996.26	23.6461	1757.55	0.0000
765.80	25.1569	1001.03	16.7813	1764.49	6.2329
1001.03	33.7500	1004.73	29.6580	1770.23	12.4829
766.84	35.5342	1025.87	0.0000	1771.35	15.6079
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	13.3909	1037.84	23.3698	1808.65	9.4475
777.92	0.0000	1038.76	0.0000	1836.06	5.2820
778.90	14.3008	1046.59	16.7497		
783.70	21.2787	1048.07	15.0828		
1435.80	19.7603	1050.41	16.3547		
903.28	24.7406	1063.66	22.2535		
795.86	21.6322	1077.00	20.3330		
801.95	20.7932	1077.34	18.3015		
802.10	20.7949	1083.85	14.2693		
810.29	20.8774	1085.87	20.4004		
810.45	20.8791	1099.25	14.3514		
810.76	22.6984	1111.64	13.7298		
815.77	16.3824	1112.07	17.1647		
818.51	17.3152	1112.84	10.3018		
832.01	29.3508	1115.54	15.4680		
834.85	42.2479	1120.29	12.3961		
835.15	42.2546	1120.55	13.7747		
836.80	0.0000	1121.30	13.7780		
846.77	29.5547	1808.65	11.4012		
856.80	25.9807	1131.51	0.0000		
860.56	26.9553	1332.49	19.9982		
871.09	23.3490	1177.95	8.7854		
873.19	19.6321	1189.05	13.7579		
875.33	0.0000	1204.77	17.0242		
879.38	18.7495	1221.41	19.2595		
880.51	18.7588	1231.02	23.6146		
881.60	20.6449	1235.36	18.2742		
883.24	27.2342	1238.28	17.2156		
884.68	23.4924	1260.41	0.0000		
889.28	21.6580	1271.87	7.2523		
894.76	23.5986	1274.44	13.0652		
1836.06	20.7969	1274.54	13.0652		

VAX/VMS Nuclide Identification Report Generated 31-OCT-2022 10:59:39.26

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226446.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM03.CNF;650
Background date    : 30-OCT-2022 10:39:18
Sample date       : 31-OCT-2022 00:00:00 Acquisition date : 31-OCT-2022 10:43:43
Sample ID        : G1205226446 Sample quantity : 7.77220E-01 FILTER
Detector name    : GAM03 Detector geometry: JAR
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.59 0.2%
Energy tolerance : 1.50000 keV Analyst Initials : RXF2
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID         : 2333342 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	40.54	81	919	0.57	80.60	78	5	8.95E-02	57.5	
2	0	46.55	1738	1795	1.38	92.61	88	9	1.93E+00	5.0	
3	0	59.54	8026	2018	1.33	118.58	112	13	8.92E+00	1.6	
4	0	67.49	42	425	1.30	134.49	131	7	4.69E-02	82.3	
5	0	107.89	29	287	1.24	215.27	213	5	3.18E-02	90.8	
6	0	196.75	75	390	2.04	392.97	390	8	8.32E-02	47.1	
7	0	277.01	40	514	4.02	553.47	548	13	4.47E-02	117.6	
8	0	308.89	49	613	4.64	617.22	611	17	5.43E-02	116.9	
9	0	477.23	82	210	1.78	953.91	951	8	9.14E-02	32.6	
10	0	516.27	59	164	4.01	1031.98	1027	11	6.51E-02	44.4	
11	0	661.98	7769	180	1.83	1323.44	1316	16	8.63E+00	1.2	
12	0	870.30	20	139	4.89	1740.17	1727	16	2.23E-02	133.5	
13	0	884.87	21	148	3.51	1769.33	1754	17	2.33E-02	135.1	
14	0	1148.72	20	43	1.82	2297.19	2290	11	2.18E-02	71.8	
15	0	1173.75	2170	88	2.33	2347.27	2335	23	2.41E+00	2.4	
16	0	1209.04	20	21	3.55	2417.89	2408	17	2.18E-02	58.4	
17	0	1333.01	1906	12	2.28	2665.96	2654	20	2.12E+00	2.3	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 31-OCT-2022 10:59:44

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226446.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 31-OCT-2022 00:00:00	Acquisition date	: 31-OCT-2022 10:43:43
Sample ID	: G1205226446	Sample quantity	: 0.77722 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA3	Detector geometry	: JAR
Elapsed live time	: 0 00:15:00.00	Elapsed real time	: 0 00:15:01.59 0.2%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	82	10.44*	2.037E+00	1.494E+03	1.503E+03	65.26
CO-60	1173.23	2170	99.85	9.770E-01	8.595E+03	8.597E+03	4.84
	1332.49	1906	99.98*	8.774E-01	8.395E+03	8.397E+03	4.65
TE-125M	109.28	29	0.27*	3.960E+00	1.034E+04	1.039E+04	181.51
BA-137M	661.66	7769	89.90*	1.589E+00	2.102E+04	2.102E+04	2.40
CS-137	661.66	7769	85.10*	1.589E+00	2.220E+04	2.220E+04	2.40
PB-210	46.54	1738	4.25*	2.521E-01	6.268E+05	6.269E+05	10.02
TH-230	67.67	42	0.38*	1.727E+00	2.485E+04	2.485E+04	164.68
AM-241	59.54	8026	35.90*	1.064E+00	8.120E+04	8.120E+04	3.24

Flag: "*" = Keyline

```

*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                       *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226446.CNF;1 *
* Acquisition date   : 31-OCT-2022 10:43:43 Sensitivity      : 3.000          *
* Detector ID        : GAM03 Energy tolerance: 1.500         *
* Elapsed live time  : 0 00:15:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 00:15:01.59 Half life ratio : *****         *
* Sample date        : 31-OCT-2022 00:00:00 Analyst initials: RXF2         *
* Sample ID          : G1205226446 Sample Quantity : 7.7722E-01 FILTER *
* Batch Number       : 2333342 Wet Weight : 0.00000         *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                       *
* Eff. Cal. date     : 20-APR-2022 11:51:08 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16          *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.503E+03	9.610E+02	1.326E+03
CO-60	8.397E+03	3.830E+02	7.146E+01
TE-125M	1.039E+04	1.849E+04	3.042E+04
BA-137M	2.102E+04	4.937E+02	1.330E+02
CS-137	2.220E+04	5.215E+02	1.405E+02
PB-210	6.269E+05	6.156E+04	5.124E+04
TH-230	2.485E+04	4.011E+04	4.748E+04
AM-241	8.120E+04	2.578E+03	1.351E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	6.349E+01		4.359E+01	1.029E+02	NOT IDENT.
NA-24	3.011E+01		3.536E+01	9.739E+01	NOT IDENT.
AL-26	8.205E+00		2.033E+01	5.519E+01	NOT IDENT.
K-40	1.295E+02		2.684E+02	6.519E+02	NOT IDENT.
SC-46	5.654E+01		8.164E+01	1.472E+02	NOT IDENT.
V-48	5.074E+01		8.872E+01	1.623E+02	NOT IDENT.
CR-51	-4.109E+01		5.891E+02	1.011E+03	NOT IDENT.
MN-52	3.262E+01		3.118E+01	8.044E+01	NOT IDENT.
MN-54	9.075E+00		7.602E+01	1.361E+02	NOT IDENT.
CO-56	8.413E+00		7.919E+01	1.413E+02	NOT IDENT.
CO-57	-1.432E+01		5.099E+01	9.065E+01	NOT IDENT.
NI-57	5.061E+00		4.236E+01	9.301E+01	NOT IDENT.
CO-58	3.199E+01		7.518E+01	1.377E+02	NOT IDENT.
FE-59	-9.887E+01		1.648E+02	2.734E+02	NOT IDENT.
ZN-65	2.508E+01		1.898E+02	3.337E+02	NOT IDENT.
CU-67	-6.552E+01		1.145E+02	1.992E+02	NOT IDENT.
GE-68	1.650E+03		2.763E+03	5.065E+03	NOT IDENT.
AS-73	-7.454E+03		5.641E+03	9.014E+03	NOT IDENT.
AS-74	-1.084E+01		1.080E+02	1.940E+02	NOT IDENT.
SE-75	5.740E+01		9.627E+01	1.710E+02	NOT IDENT.
BR-77	7.527E+01		2.753E+02	4.861E+02	NOT IDENT.
SR-82	-9.320E+01		4.187E+02	7.402E+02	NOT IDENT.

RB-83	-1.008E+02	1.656E+02	2.528E+02	NOT IDENT.
RB-84	2.544E+01	1.146E+02	2.061E+02	NOT IDENT.
KR-85	-1.609E+04	1.736E+04	2.586E+04	NOT IDENT.
SR-85	-7.240E+01	7.812E+01	1.164E+02	NOT IDENT.
RB-86	3.315E+02	1.062E+03	1.902E+03	NOT IDENT.
Y-88	-4.814E-01	2.219E+01	5.143E+01	NOT IDENT.
Y-91	-1.451E+04	2.284E+04	3.377E+04	NOT IDENT.
NB-94	4.453E+00	5.525E+01	1.010E+02	FAIL ABUN
NB-95	1.440E+01	6.335E+01	1.159E+02	NOT IDENT.
NB-95M	-1.914E+02	2.219E+02	3.735E+02	NOT IDENT.
TC-95M	-2.087E+01	8.081E+01	1.405E+02	NOT IDENT.
ZR-95	3.631E+01	1.036E+02	1.934E+02	NOT IDENT.
MO-99	2.829E+02	5.371E+02	1.012E+03	NOT IDENT.
TC-99M	1.993E+01	1.686E+02	3.022E+02	NOT IDENT.
RH-101	-2.010E+01	6.392E+01	1.133E+02	FAIL ABUN
RH-102M	5.880E+01	1.016E+02	1.564E+02	NOT IDENT.
RU-103	-1.740E+01	7.878E+01	1.407E+02	NOT IDENT.
RH-106	2.711E+02	6.407E+02	1.186E+03	NOT IDENT.
RU-106	2.711E+02	6.407E+02	1.186E+03	NOT IDENT.
AG-108M	2.870E+01	8.727E+01	1.493E+02	NOT IDENT.
CD-109	3.183E+02	1.703E+03	2.817E+03	NOT IDENT.
AG-110	2.198E+02	1.776E+03	2.830E+03	NOT IDENT.
AG-110M	8.925E+01	2.363E+02	1.889E+02	FAIL ABUN
IN-111	3.890E+01	6.383E+01	1.139E+02	NOT IDENT.
SN-113	-5.501E+01	1.070E+02	1.773E+02	NOT IDENT.
IN-114M	-1.755E+02	3.336E+02	5.752E+02	NOT IDENT.
CD-115	-1.734E+02	2.674E+02	4.672E+02	NOT IDENT.
SN-117M	2.971E+01	5.226E+01	9.475E+01	NOT IDENT.
SB-122	1.987E+01	9.953E+01	1.821E+02	NOT IDENT.
I-123	8.476E+01	9.340E+01	1.713E+02	NOT IDENT.
TE-123M	4.757E+01	5.257E+01	9.642E+01	NOT IDENT.
SB-124	4.257E+01	6.854E+01	1.651E+02	NOT IDENT.
SB-125	1.297E+02	2.650E+02	4.568E+02	NOT IDENT.
I-126	2.236E+01	2.107E+02	3.387E+02	NOT IDENT.
SB-126	-2.215E+01	1.135E+02	2.020E+02	NOT IDENT.
SN-126	-1.227E+02	1.759E+02	2.797E+02	NOT IDENT.
SB-127	1.795E+02	1.728E+02	3.359E+02	NOT IDENT.
TE-129	4.307E+02	1.156E+03	1.968E+03	FAIL ABUN
I-131	-8.977E+01	8.245E+01	1.332E+02	NOT IDENT.
I-132	1.616E+02	1.680E+03	2.712E+03	NOT IDENT.
TE-132	-5.078E+01	6.696E+01	1.134E+02	NOT IDENT.
BA-133	-2.018E+01	1.056E+02	1.789E+02	FAIL ABUN
I-133	1.055E+01	1.036E+02	1.886E+02	NOT IDENT.
CS-134	-3.907E+01	8.378E+01	1.444E+02	NOT IDENT.
I-135	4.371E+01	4.572E+02	9.200E+02	NOT IDENT.
CS-136	2.398E+01	1.120E+02	1.997E+02	NOT IDENT.
LA-138	-1.922E+01	4.924E+01	9.351E+01	NOT IDENT.
CE-139	-9.134E+00	5.543E+01	9.768E+01	NOT IDENT.
BA-140	1.446E+01	2.654E+02	4.820E+02	NOT IDENT.
LA-140	3.473E+00	2.731E+01	6.272E+01	NOT IDENT.
CE-141	-3.468E+00	8.970E+01	1.599E+02	NOT IDENT.
CE-143	4.696E+01	1.708E+02	2.985E+02	NOT IDENT.
CE-144	4.522E+01	3.735E+02	6.719E+02	NOT IDENT.
PM-144	1.745E+01	5.941E+01	1.098E+02	FAIL ABUN
PR-144	1.296E+03	4.412E+03	8.152E+03	NOT IDENT.
PM-146	-9.026E+00	1.348E+02	2.253E+02	NOT IDENT.
ND-147	7.138E+01	5.004E+02	9.126E+02	NOT IDENT.
PM-147	-6.377E+05	1.557E+06	2.756E+06	NOT IDENT.
PM-149	2.356E+02	2.196E+03	3.810E+03	NOT IDENT.
EU-152	9.505E+01	2.394E+02	4.174E+02	NOT IDENT.
GD-153	-4.433E-01	1.922E+02	3.143E+02	NOT IDENT.
EU-154	1.822E+02	1.246E+02	2.943E+02	NOT IDENT.
EU-155	-1.498E+02	2.496E+02	3.953E+02	NOT IDENT.
TB-160	1.320E+01	2.567E+02	4.568E+02	FAIL ABUN
HO-166M	-3.806E+01	1.056E+02	1.859E+02	NOT IDENT.
TM-171	-2.200E+05	1.353E+05	2.147E+05	FAIL ABUN
LU-176	4.957E+01	6.963E+01	1.118E+02	NOT IDENT.
LU-177	3.079E+02	5.339E+02	9.541E+02	NOT IDENT.
HF-181	7.196E+01	1.140E+02	1.768E+02	NOT IDENT.
W-181	0.000E+00	1.377E+03	2.714E+03	FAIL ABUN
TA-182	-9.537E+01	1.822E+02	3.287E+02	FAIL ABUN
RE-183	0.000E+00	1.452E+03	3.035E+03	FAIL ABUN
RE-184	6.938E+01	2.233E+02	4.019E+02	NOT IDENT.
RE-188	-7.245E+01	2.789E+02	4.913E+02	FAIL ABUN
W-188	1.847E+02	1.433E+04	2.478E+04	NOT IDENT.
OS-191	3.901E+01	1.646E+02	2.972E+02	NOT IDENT.
IR-192	2.778E+01	8.066E+01	1.265E+02	FAIL ABUN
PB-201	-4.154E+01	1.844E+02	3.129E+02	NOT IDENT.

TL-201	2.073E+02	4.836E+02	8.714E+02	FAIL ABUN
TL-202	-1.361E+00	9.380E+01	1.575E+02	FAIL ABUN
HG-203	1.925E+01	7.561E+01	1.189E+02	NOT IDENT.
PB-203	2.228E+01	8.752E+01	1.376E+02	NOT IDENT.
TL-204	7.636E+02	1.335E+04	2.043E+04	FAIL ABUN
BI-207	-1.394E+01	1.239E+02	2.145E+02	NOT IDENT.
TL-208	1.057E+00	7.402E+01	1.343E+02	FAIL ABUN
BI-211	-8.555E+01	4.966E+02	8.440E+02	NOT IDENT.
PB-211	2.762E+02	1.932E+03	3.295E+03	NOT IDENT.
BI-212	1.104E+02	8.606E+02	1.575E+03	NOT IDENT.
PB-212	8.583E+00	1.267E+02	2.220E+02	NOT IDENT.
BI-213	-3.250E+02	3.231E+02	5.177E+02	NOT IDENT.
BI-214	-8.168E+00	1.388E+02	2.504E+02	NOT IDENT.
PB-214	1.380E+01	1.809E+02	3.110E+02	NOT IDENT.
RN-219	-7.315E+02	1.113E+03	1.826E+03	NOT IDENT.
FR-221	-1.239E+02	4.659E+02	8.063E+02	NOT IDENT.
RA-223	2.275E+02	1.470E+03	2.548E+03	NOT IDENT.
RA-224	1.433E+02	1.345E+03	2.351E+03	NOT IDENT.
AC-225	-1.279E+02	4.808E+02	8.319E+02	NOT IDENT.
RA-226	8.312E+02	1.408E+03	2.547E+03	NOT IDENT.
AC-227	-6.348E+02	5.842E+02	9.683E+02	NOT IDENT.
TH-227	-6.348E+02	5.842E+02	9.683E+02	NOT IDENT.
AC-228	1.307E+02	3.334E+02	6.045E+02	NOT IDENT.
RA-228	1.307E+02	3.334E+02	6.045E+02	NOT IDENT.
TH-228	8.583E+00	1.267E+02	2.220E+02	NOT IDENT.
TH-229	2.729E+02	1.274E+03	2.029E+03	NOT IDENT.
PA-231	-6.244E+02	1.092E+03	1.834E+03	NOT IDENT.
TH-231	4.970E+02	9.727E+02	1.640E+03	NOT IDENT.
TH-232	9.005E+04	6.197E+04	9.215E+04	NOT IDENT.
PA-233	7.023E+01	1.585E+02	2.781E+02	NOT IDENT.
PA-234	-2.083E+02	7.860E+02	1.350E+03	NOT IDENT.
PA-234M	4.191E+03	1.105E+04	1.989E+04	NOT IDENT.
TH-234	-3.287E+01	4.212E+03	6.475E+03	NOT IDENT.
U-234	-6.084E+05	4.880E+05	7.813E+05	NOT IDENT.
U-235	-2.675E+02	3.818E+02	6.649E+02	NOT IDENT.
NP-237	7.023E+01	1.585E+02	2.781E+02	NOT IDENT.
NP-238	3.591E+01	4.068E+02	7.182E+02	NOT IDENT.
U-238	-3.287E+01	4.212E+03	6.475E+03	NOT IDENT.
NP-239	-2.895E+02	5.584E+02	9.860E+02	FAIL ABUN
AM-242	2.829E+02	1.309E+03	2.390E+03	NOT IDENT.
AM-243	-6.913E+01	1.286E+02	2.077E+02	NOT IDENT.
CM-243	3.076E+02	2.229E+02	4.210E+02	FAIL ABUN
BK-247	1.352E+02	1.897E+02	3.384E+02	FAIL ABUN
CM-247	-1.931E+01	9.987E+01	1.677E+02	FAIL ABUN
CF-249	-5.957E+01	1.045E+02	1.727E+02	NOT IDENT.
CF-251	-4.127E+01	2.641E+02	4.641E+02	NOT IDENT.
CF-252	-2.197E+04	3.623E+05	6.543E+05	NOT IDENT.
ANH-511	-1.041E+01	7.763E+01	1.263E+02	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	40.54	81	919	0.57	80.60	78	5	8.95E-02	57.5	
2	0	46.55	1738	1795	1.38	92.61	88	9	1.93E+00	5.0	
3	0	59.54	8026	2018	1.33	118.58	112	13	8.92E+00	1.6	
4	0	67.49	42	425	1.30	134.49	131	7	4.69E-02	82.3	
5	0	107.89	29	287	1.24	215.27	213	5	3.18E-02	90.8	
6	0	196.75	75	390	2.04	392.97	390	8	8.32E-02	47.1	
7	0	277.01	40	514	4.02	553.47	548	13	4.47E-02	117.6	
8	0	308.89	49	613	4.64	617.22	611	17	5.43E-02	116.9	
9	0	477.23	82	210	1.78	953.91	951	8	9.14E-02	32.6	
10	0	516.27	59	164	4.01	1031.98	1027	11	6.51E-02	44.4	
11	0	661.98	7769	180	1.83	1323.44	1316	16	8.63E+00	1.2	
12	0	870.30	20	139	4.89	1740.17	1727	16	2.23E-02	133.5	
13	0	884.87	21	148	3.51	1769.33	1754	17	2.33E-02	135.1	
14	0	1148.72	20	43	1.82	2297.19	2290	11	2.18E-02	71.8	
15	0	1173.75	2170	88	2.33	2347.27	2335	23	2.41E+00	2.4	
16	0	1209.04	20	21	3.55	2417.89	2408	17	2.18E-02	58.4	
17	0	1333.01	1906	12	2.28	2665.96	2654	20	2.12E+00	2.3	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	82	10.44*	2.037E+00	1.494E+03	1.503E+03	65.26
CO-60	1173.23	2170	99.85	9.770E-01	8.595E+03	8.597E+03	4.84
	1332.49	1906	99.98*	8.774E-01	8.395E+03	8.397E+03	4.65
TE-125M	109.28	29	0.27*	3.960E+00	1.034E+04	1.039E+04	181.51
BA-137M	661.66	7769	89.90*	1.589E+00	2.102E+04	2.102E+04	2.40
CS-137	661.66	7769	85.10*	1.589E+00	2.220E+04	2.220E+04	2.40
PB-210	46.54	1738	4.25*	2.521E-01	6.268E+05	6.269E+05	10.02
TH-230	67.67	42	0.38*	1.727E+00	2.485E+04	2.485E+04	164.68
AM-241	59.54	8026	35.90*	1.064E+00	8.120E+04	8.120E+04	3.24

Flag: "*" = Keyline

Total number of lines in spectrum 17
Number of unidentified lines 4
Number of lines tentatively identified by NID 13 76.47%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.01	1.494E+03	1.503E+03	0.981E+03	65.26	
CO-60	1925.28D	1.00	8.395E+03	8.397E+03	0.391E+03	4.65	
TE-125M	57.40D	1.01	1.034E+04	1.039E+04	1.887E+04	181.51	
BA-137M	30.08Y	1.00	2.102E+04	2.102E+04	0.050E+04	2.40	
CS-137	30.08Y	1.00	2.220E+04	2.220E+04	0.053E+04	2.40	
PB-210	22.20Y	1.00	6.268E+05	6.269E+05	0.628E+05	10.02	
TH-230	7.54E+04Y	1.00	2.485E+04	2.485E+04	4.093E+04	164.68	
AM-241	432.60Y	1.00	8.120E+04	8.120E+04	0.263E+04	3.24	
Total Activity :			7.963E+05	7.964E+05			

Grand Total Activity : 7.963E+05 7.964E+05

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	40.54	81	919	0.57	80.60	78	5	8.95E-02	****	7.84E-02	
0	196.75	75	390	2.04	392.97	390	8	8.32E-02	94.1	3.70E+00	T
0	277.01	40	514	4.02	553.47	548	13	4.47E-02	****	2.99E+00	T
0	308.89	49	613	4.64	617.22	611	17	5.43E-02	****	2.77E+00	T
0	516.27	59	164	4.01	1031.98	1027	11	6.51E-02	88.9	1.92E+00	
0	870.30	20	139	4.89	1740.17	1727	16	2.23E-02	****	1.27E+00	T
0	884.87	21	148	3.51	1769.33	1754	17	2.33E-02	****	1.25E+00	T
0	1148.72	20	43	1.82	2297.19	2290	11	2.18E-02	****	9.95E-01	
0	1209.04	20	21	3.55	2417.89	2408	17	2.18E-02	****	9.52E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226446.CNF;1 *
* Acquisition date   : 31-OCT-2022 10:43:43 Sensitivity      : 3.000          *
* Detector ID        : GAM03 Energy tolerance: 1.500          *
* Elapsed live time  : 0 00:15:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 00:15:01.59 Half life ratio  : *****          *
* Sample date        : 31-OCT-2022 00:00:00 Nuclide Library : LIQUID          *
* Sample ID          : G1205226446 Analyst initials:  RXF2          *
* Batch Number       : 2333342 Sample Quantity  : 7.7722E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight       : 0.00000          *
*                                     Dry Weight      : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 20-APR-2022 11:51:08 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	6.387E+02
CO-60	2.978E+01
TE-125M	1.473E+04
BA-137M	6.287E+01
CS-137	6.642E+01
PB-210	2.515E+04
TH-230	2.296E+04
AM-241	6.624E+02

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	4.573E+01	NOT IDENT.
NA-24	3.865E+01	NOT IDENT.
AL-26	2.022E+01	NOT IDENT.
K-40	2.659E+02	NOT IDENT.
SC-46	6.940E+01	NOT IDENT.
V-48	7.651E+01	NOT IDENT.
CR-51	4.863E+02	NOT IDENT.
MN-52	3.355E+01	NOT IDENT.
MN-54	6.411E+01	NOT IDENT.
CO-56	6.664E+01	NOT IDENT.
CO-57	4.388E+01	NOT IDENT.
NI-57	3.726E+01	NOT IDENT.
CO-58	6.494E+01	NOT IDENT.
FE-59	1.277E+02	NOT IDENT.
ZN-65	1.568E+02	NOT IDENT.
CU-67	9.647E+01	NOT IDENT.
GE-68	2.379E+03	NOT IDENT.
AS-73	4.427E+03	NOT IDENT.
AS-74	9.184E+01	NOT IDENT.
SE-75	8.266E+01	NOT IDENT.
BR-77	2.353E+02	NOT IDENT.
SR-82	3.451E+02	NOT IDENT.
RB-83	1.204E+02	NOT IDENT.

RB-84	9.700E+01	NOT IDENT.
KR-85	1.231E+04	NOT IDENT.
SR-85	5.539E+01	NOT IDENT.
RB-86	8.932E+02	NOT IDENT.
Y-88	1.822E+01	NOT IDENT.
Y-91	1.477E+04	NOT IDENT.
NB-94	4.708E+01	FAIL ABUN
NB-95	5.427E+01	NOT IDENT.
NB-95M	1.805E+02	NOT IDENT.
TC-95M	6.798E+01	NOT IDENT.
ZR-95	8.997E+01	NOT IDENT.
MO-99	4.730E+02	NOT IDENT.
TC-99M	1.463E+02	NOT IDENT.
RH-101	5.483E+01	FAIL ABUN
RH-102M	7.555E+01	NOT IDENT.
RU-103	6.748E+01	NOT IDENT.
RH-106	5.616E+02	NOT IDENT.
RU-106	5.616E+02	NOT IDENT.
AG-108M	7.203E+01	NOT IDENT.
CD-109	1.365E+03	NOT IDENT.
AG-110	1.343E+03	NOT IDENT.
AG-110M	8.872E+01	FAIL ABUN
IN-111	5.504E+01	NOT IDENT.
SN-113	8.526E+01	NOT IDENT.
IN-114M	2.788E+02	NOT IDENT.
CD-115	2.222E+02	NOT IDENT.
SN-117M	4.588E+01	NOT IDENT.
SB-122	8.648E+01	NOT IDENT.
I-123	8.299E+01	NOT IDENT.
TE-123M	4.670E+01	NOT IDENT.
SB-124	6.760E+01	NOT IDENT.
SB-125	2.205E+02	NOT IDENT.
I-126	1.591E+02	NOT IDENT.
SB-126	9.431E+01	NOT IDENT.
SN-126	1.355E+02	NOT IDENT.
SB-127	1.580E+02	NOT IDENT.
TE-129	9.515E+02	FAIL ABUN
I-131	6.392E+01	NOT IDENT.
I-132	1.268E+03	NOT IDENT.
TE-132	5.478E+01	NOT IDENT.
BA-133	8.612E+01	FAIL ABUN
I-133	8.979E+01	NOT IDENT.
CS-134	6.773E+01	NOT IDENT.
I-135	3.980E+02	NOT IDENT.
CS-136	9.368E+01	NOT IDENT.
LA-138	3.711E+01	NOT IDENT.
CE-139	4.723E+01	NOT IDENT.
BA-140	2.293E+02	NOT IDENT.
LA-140	2.403E+01	NOT IDENT.
CE-141	7.739E+01	NOT IDENT.
CE-143	1.440E+02	NOT IDENT.
CE-144	3.249E+02	NOT IDENT.
PM-144	5.146E+01	FAIL ABUN
PR-144	3.822E+03	NOT IDENT.
PM-146	1.089E+02	NOT IDENT.
ND-147	4.347E+02	NOT IDENT.
PM-147	1.334E+06	NOT IDENT.
PM-149	1.840E+03	NOT IDENT.
EU-152	2.012E+02	NOT IDENT.
GD-153	1.523E+02	NOT IDENT.
EU-154	1.308E+02	NOT IDENT.
EU-155	1.914E+02	NOT IDENT.
TB-160	2.146E+02	FAIL ABUN
HO-166M	8.653E+01	NOT IDENT.
TM-171	1.054E+05	FAIL ABUN
LU-176	5.391E+01	NOT IDENT.
LU-177	4.625E+02	NOT IDENT.
HF-181	8.520E+01	NOT IDENT.
W-181	1.340E+03	FAIL ABUN
TA-182	1.439E+02	FAIL ABUN
RE-183	1.502E+03	FAIL ABUN
RE-184	1.898E+02	NOT IDENT.
RE-188	2.376E+02	FAIL ABUN
W-188	1.194E+04	NOT IDENT.
OS-191	1.439E+02	NOT IDENT.
IR-192	6.097E+01	FAIL ABUN
PB-201	1.508E+02	NOT IDENT.
TL-201	4.214E+02	FAIL ABUN

TL-202	7.609E+01	FAIL ABUN
HG-203	5.730E+01	NOT IDENT.
PB-203	6.633E+01	NOT IDENT.
TL-204	9.889E+03	FAIL ABUN
BI-207	1.007E+02	NOT IDENT.
TL-208	6.369E+01	FAIL ABUN
BI-211	4.063E+02	NOT IDENT.
PB-211	1.588E+03	NOT IDENT.
BI-212	7.344E+02	NOT IDENT.
PB-212	1.074E+02	NOT IDENT.
BI-213	2.497E+02	NOT IDENT.
BI-214	1.185E+02	NOT IDENT.
PB-214	1.498E+02	NOT IDENT.
RN-219	8.790E+02	NOT IDENT.
FR-221	3.902E+02	NOT IDENT.
RA-223	1.226E+03	NOT IDENT.
RA-224	1.137E+03	NOT IDENT.
AC-225	4.026E+02	NOT IDENT.
RA-226	1.236E+03	NOT IDENT.
AC-227	4.669E+02	NOT IDENT.
TH-227	4.669E+02	NOT IDENT.
AC-228	2.858E+02	NOT IDENT.
RA-228	2.858E+02	NOT IDENT.
TH-228	1.074E+02	NOT IDENT.
TH-229	9.835E+02	NOT IDENT.
PA-231	8.828E+02	NOT IDENT.
TH-231	7.940E+02	NOT IDENT.
TH-232	4.468E+04	NOT IDENT.
PA-233	1.342E+02	NOT IDENT.
PA-234	6.385E+02	NOT IDENT.
PA-234M	9.394E+03	NOT IDENT.
TH-234	3.136E+03	NOT IDENT.
U-234	3.836E+05	NOT IDENT.
U-235	3.212E+02	NOT IDENT.
NP-237	1.342E+02	NOT IDENT.
NP-238	3.381E+02	NOT IDENT.
U-238	3.136E+03	NOT IDENT.
NP-239	4.773E+02	FAIL ABUN
AM-242	1.157E+03	NOT IDENT.
AM-243	1.005E+02	NOT IDENT.
CM-243	2.041E+02	FAIL ABUN
BK-247	1.636E+02	FAIL ABUN
CM-247	8.076E+01	FAIL ABUN
CF-249	8.303E+01	NOT IDENT.
CF-251	2.244E+02	NOT IDENT.
CF-252	3.166E+05	NOT IDENT.
ANH-511	6.050E+01	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226446.CNF;1
* Acquisition date   : 31-OCT-2022 10:43:43 Sensitivity      : 3.000
* Detector ID        : GAM03 Energy tolerance: 1.500
* Elapsed live time  : 0 00:15:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 00:15:01.59 Half life ratio  : *****
* Sample date        : 31-OCT-2022 00:00:00 Nuclide Library : LIQUID
* Sample ID          : G1205226446 Analyst initials: RXF2
* Batch Number       : 2333342 Sample Quantity  : 7.7722E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 20-APR-2022 11:51:08 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.503E+03	9.694E+02	9.698E+02
CO-60	8.397E+03	8.929E+02	9.079E+02
TE-125M	1.039E+04	1.850E+04	1.851E+04
BA-137M	2.102E+04	1.773E+03	1.820E+03
CS-137	2.220E+04	1.871E+03	1.921E+03
PB-210	6.269E+05	9.226E+04	9.307E+04
TH-230	2.485E+04	4.035E+04	4.035E+04
AM-241	8.120E+04	7.761E+03	7.923E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	6.349E+01	4.397E+01	5.248E+01	NOT IDENT.
NA-24	3.011E+01	3.548E+01	3.799E+01	NOT IDENT.
AL-26	8.205E+00	2.034E+01	2.067E+01	NOT IDENT.
K-40	1.295E+02	2.687E+02	2.750E+02	NOT IDENT.
SC-46	5.654E+01	8.181E+01	8.570E+01	NOT IDENT.
V-48	5.074E+01	8.884E+01	9.175E+01	NOT IDENT.
CR-51	-4.109E+01	5.891E+02	5.894E+02	NOT IDENT.
MN-52	3.262E+01	3.133E+01	3.462E+01	NOT IDENT.
MN-54	9.075E+00	7.602E+01	7.613E+01	NOT IDENT.
CO-56	8.413E+00	7.920E+01	7.929E+01	NOT IDENT.
CO-57	-1.432E+01	5.100E+01	5.141E+01	NOT IDENT.
NI-57	5.061E+00	4.236E+01	4.242E+01	NOT IDENT.
CO-58	3.199E+01	7.524E+01	7.661E+01	NOT IDENT.
FE-59	-9.887E+01	1.652E+02	1.711E+02	NOT IDENT.
ZN-65	2.508E+01	1.898E+02	1.901E+02	NOT IDENT.
CU-67	-6.552E+01	1.146E+02	1.184E+02	NOT IDENT.
GE-68	1.650E+03	2.767E+03	2.866E+03	NOT IDENT.
AS-73	-7.454E+03	5.864E+03	6.760E+03	NOT IDENT.
AS-74	-1.084E+01	1.080E+02	1.081E+02	NOT IDENT.
SE-75	5.740E+01	9.639E+01	9.980E+01	NOT IDENT.
BR-77	7.527E+01	2.754E+02	2.775E+02	NOT IDENT.
SR-82	-9.320E+01	4.188E+02	4.209E+02	NOT IDENT.

RB-83	-1.008E+02	1.664E+02	1.725E+02	NOT IDENT.
RB-84	2.544E+01	1.146E+02	1.152E+02	NOT IDENT.
KR-85	-1.609E+04	1.741E+04	1.886E+04	NOT IDENT.
SR-85	-7.240E+01	7.835E+01	8.489E+01	NOT IDENT.
RB-86	3.315E+02	1.062E+03	1.073E+03	NOT IDENT.
Y-88	-4.814E-01	2.219E+01	2.219E+01	NOT IDENT.
Y-91	-1.451E+04	2.287E+04	2.379E+04	NOT IDENT.
NB-94	4.453E+00	5.526E+01	5.529E+01	FAIL ABUN
NB-95	1.440E+01	6.336E+01	6.369E+01	NOT IDENT.
NB-95M	-1.914E+02	2.228E+02	2.389E+02	NOT IDENT.
TC-95M	-2.087E+01	8.083E+01	8.138E+01	NOT IDENT.
ZR-95	3.631E+01	1.036E+02	1.049E+02	NOT IDENT.
MO-99	2.829E+02	5.377E+02	5.527E+02	NOT IDENT.
TC-99M	1.993E+01	1.686E+02	1.688E+02	NOT IDENT.
RH-101	-2.010E+01	6.403E+01	6.467E+01	FAIL ABUN
RH-102M	5.880E+01	1.018E+02	1.052E+02	NOT IDENT.
RU-103	-1.740E+01	7.879E+01	7.918E+01	NOT IDENT.
RH-106	2.711E+02	6.412E+02	6.527E+02	NOT IDENT.
RU-106	2.711E+02	6.412E+02	6.527E+02	NOT IDENT.
AG-108M	2.870E+01	8.730E+01	8.825E+01	NOT IDENT.
CD-109	3.183E+02	1.703E+03	1.709E+03	NOT IDENT.
AG-110	2.198E+02	1.776E+03	1.779E+03	NOT IDENT.
AG-110M	8.925E+01	2.365E+02	2.399E+02	FAIL ABUN
IN-111	3.890E+01	6.391E+01	6.628E+01	NOT IDENT.
SN-113	-5.501E+01	1.071E+02	1.100E+02	NOT IDENT.
IN-114M	-1.755E+02	3.339E+02	3.431E+02	NOT IDENT.
CD-115	-1.734E+02	2.679E+02	2.791E+02	NOT IDENT.
SN-117M	2.971E+01	5.230E+01	5.399E+01	NOT IDENT.
SB-122	1.987E+01	9.954E+01	9.995E+01	NOT IDENT.
I-123	8.476E+01	9.361E+01	1.011E+02	NOT IDENT.
TE-123M	4.757E+01	5.268E+01	5.689E+01	NOT IDENT.
SB-124	4.257E+01	6.863E+01	7.127E+01	NOT IDENT.
SB-125	1.297E+02	2.652E+02	2.715E+02	NOT IDENT.
I-126	2.236E+01	2.107E+02	2.109E+02	NOT IDENT.
SB-126	-2.215E+01	1.135E+02	1.139E+02	NOT IDENT.
SN-126	-1.227E+02	1.762E+02	1.847E+02	NOT IDENT.
SB-127	1.795E+02	1.735E+02	1.915E+02	NOT IDENT.
TE-129	4.307E+02	1.158E+03	1.175E+03	FAIL ABUN
I-131	-8.977E+01	8.280E+01	9.217E+01	NOT IDENT.
I-132	1.616E+02	1.680E+03	1.681E+03	NOT IDENT.
TE-132	-5.078E+01	6.716E+01	7.096E+01	NOT IDENT.
BA-133	-2.018E+01	1.057E+02	1.060E+02	FAIL ABUN
I-133	1.055E+01	1.036E+02	1.037E+02	NOT IDENT.
CS-134	-3.907E+01	8.385E+01	8.569E+01	NOT IDENT.
I-135	4.371E+01	4.572E+02	4.576E+02	NOT IDENT.
CS-136	2.398E+01	1.121E+02	1.126E+02	NOT IDENT.
LA-138	-1.922E+01	4.927E+01	5.003E+01	NOT IDENT.
CE-139	-9.134E+00	5.546E+01	5.561E+01	NOT IDENT.
BA-140	1.446E+01	2.654E+02	2.655E+02	NOT IDENT.
LA-140	3.473E+00	2.731E+01	2.736E+01	NOT IDENT.
CE-141	-3.468E+00	8.970E+01	8.971E+01	NOT IDENT.
CE-143	4.696E+01	1.708E+02	1.721E+02	NOT IDENT.
CE-144	4.522E+01	3.735E+02	3.741E+02	NOT IDENT.
PM-144	1.745E+01	5.943E+01	5.994E+01	FAIL ABUN
PR-144	1.296E+03	4.413E+03	4.452E+03	NOT IDENT.
PM-146	-9.026E+00	1.348E+02	1.349E+02	NOT IDENT.
ND-147	7.138E+01	5.004E+02	5.014E+02	NOT IDENT.
PM-147	-6.377E+05	1.558E+06	1.584E+06	NOT IDENT.
PM-149	2.356E+02	2.196E+03	2.199E+03	NOT IDENT.
EU-152	9.505E+01	2.395E+02	2.433E+02	NOT IDENT.
GD-153	-4.433E-01	1.922E+02	1.922E+02	NOT IDENT.
EU-154	1.822E+02	1.257E+02	1.502E+02	NOT IDENT.
EU-155	-1.498E+02	2.499E+02	2.589E+02	NOT IDENT.
TB-160	1.320E+01	2.567E+02	2.568E+02	FAIL ABUN
HO-166M	-3.806E+01	1.057E+02	1.070E+02	NOT IDENT.
TM-171	-2.200E+05	1.375E+05	1.696E+05	FAIL ABUN
LU-176	4.957E+01	6.975E+01	7.325E+01	NOT IDENT.
LU-177	3.079E+02	5.344E+02	5.521E+02	NOT IDENT.
HF-181	7.196E+01	1.142E+02	1.187E+02	NOT IDENT.
W-181	1.434E+04	3.993E+03	7.602E+03	FAIL ABUN
TA-182	-9.537E+01	1.824E+02	1.874E+02	FAIL ABUN
RE-183	2.522E+04	3.289E+03	1.185E+04	FAIL ABUN
RE-184	6.938E+01	2.234E+02	2.256E+02	NOT IDENT.
RE-188	-7.245E+01	2.790E+02	2.809E+02	FAIL ABUN
W-188	1.847E+02	1.433E+04	1.433E+04	NOT IDENT.
OS-191	3.901E+01	1.646E+02	1.655E+02	NOT IDENT.
IR-192	2.778E+01	8.069E+01	8.166E+01	FAIL ABUN
PB-201	-4.154E+01	1.845E+02	1.855E+02	NOT IDENT.

TL-201	2.073E+02	4.838E+02	4.928E+02	FAIL ABUN
TL-202	-1.361E+00	9.380E+01	9.380E+01	FAIL ABUN
HG-203	1.925E+01	7.563E+01	7.612E+01	NOT IDENT.
PB-203	2.228E+01	8.754E+01	8.812E+01	NOT IDENT.
TL-204	7.636E+02	1.336E+04	1.336E+04	FAIL ABUN
BI-207	-1.394E+01	1.239E+02	1.241E+02	NOT IDENT.
TL-208	1.057E+00	7.402E+01	7.402E+01	FAIL ABUN
BI-211	-8.555E+01	4.967E+02	4.982E+02	NOT IDENT.
PB-211	2.762E+02	1.932E+03	1.936E+03	NOT IDENT.
BI-212	1.104E+02	8.606E+02	8.621E+02	NOT IDENT.
PB-212	8.583E+00	1.267E+02	1.267E+02	NOT IDENT.
BI-213	-3.250E+02	3.243E+02	3.559E+02	NOT IDENT.
BI-214	-8.168E+00	1.388E+02	1.389E+02	NOT IDENT.
PB-214	1.380E+01	1.809E+02	1.810E+02	NOT IDENT.
RN-219	-7.315E+02	1.118E+03	1.165E+03	NOT IDENT.
FR-221	-1.239E+02	4.661E+02	4.694E+02	NOT IDENT.
RA-223	2.275E+02	1.470E+03	1.474E+03	NOT IDENT.
RA-224	1.433E+02	1.345E+03	1.347E+03	NOT IDENT.
AC-225	-1.279E+02	4.809E+02	4.844E+02	NOT IDENT.
RA-226	8.312E+02	1.410E+03	1.459E+03	NOT IDENT.
AC-227	-6.348E+02	5.917E+02	6.574E+02	NOT IDENT.
TH-227	-6.348E+02	5.917E+02	6.574E+02	NOT IDENT.
AC-228	1.307E+02	3.336E+02	3.388E+02	NOT IDENT.
RA-228	1.307E+02	3.336E+02	3.388E+02	NOT IDENT.
TH-228	8.583E+00	1.267E+02	1.267E+02	NOT IDENT.
TH-229	2.729E+02	1.274E+03	1.280E+03	NOT IDENT.
PA-231	-6.244E+02	1.101E+03	1.136E+03	NOT IDENT.
TH-231	4.970E+02	9.754E+02	1.001E+03	NOT IDENT.
TH-232	9.005E+04	6.306E+04	7.501E+04	NOT IDENT.
PA-233	7.023E+01	1.586E+02	1.618E+02	NOT IDENT.
PA-234	-2.083E+02	8.216E+02	8.269E+02	NOT IDENT.
PA-234M	4.191E+03	1.106E+04	1.122E+04	NOT IDENT.
TH-234	-3.287E+01	4.213E+03	4.213E+03	NOT IDENT.
U-234	-6.084E+05	4.923E+05	5.637E+05	NOT IDENT.
U-235	-2.675E+02	3.824E+02	4.010E+02	NOT IDENT.
NP-237	7.023E+01	1.586E+02	1.618E+02	NOT IDENT.
NP-238	3.591E+01	4.068E+02	4.072E+02	NOT IDENT.
U-238	-3.287E+01	4.213E+03	4.213E+03	NOT IDENT.
NP-239	-2.895E+02	5.588E+02	5.739E+02	FAIL ABUN
AM-242	2.829E+02	1.310E+03	1.316E+03	NOT IDENT.
AM-243	-6.913E+01	1.288E+02	1.325E+02	NOT IDENT.
CM-243	3.076E+02	2.252E+02	2.645E+02	FAIL ABUN
BK-247	1.352E+02	1.918E+02	2.013E+02	FAIL ABUN
CM-247	-1.931E+01	9.993E+01	1.003E+02	FAIL ABUN
CF-249	-5.957E+01	1.047E+02	1.081E+02	NOT IDENT.
CF-251	-4.127E+01	2.642E+02	2.648E+02	NOT IDENT.
CF-252	-2.197E+04	3.628E+05	3.630E+05	NOT IDENT.
ANH-511	-1.041E+01	7.764E+01	7.778E+01	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	929.4565	133.52	291.9591	116.30	320.8926
879.38	892.1932	364.49	291.9977	116.74	324.5381
46.54	894.4645	80.22	305.3447	117.23	298.1378
228.16	886.8773	711.68	300.6947	119.76	293.2095
52.39	895.5073	356.01	319.1427	120.54	309.0820
53.20	1065.4126	323.87	319.1849	120.90	318.7441
53.44	1096.9287	82.35	312.6521	264.66	318.8455
57.53	1199.3304	82.47	312.7227	121.22	327.5345
293.27	788.6453	82.47	312.7246	344.28	322.6091
57.53	788.9606	83.79	276.8953	122.06	314.0875
482.18	788.9658	265.00	277.0026	1274.44	306.7431
57.98	789.7943	84.21	277.1100	123.68	296.6025
59.32	792.2590	84.86	301.8849	1377.63	309.3945
59.54	792.6603	193.51	313.2090	127.23	316.3944
155.04	335.7279	105.31	300.3620	129.43	292.8856
63.00	308.7919	86.79	309.0764	131.20	290.0930
129.43	308.9903	86.94	309.1610	133.02	290.8136
63.29	308.9903	87.09	309.2437	133.52	276.9420
290.67	295.1342	87.57	353.7268	135.34	305.8241
63.81	243.7262	88.03	315.9128	136.00	294.6284
87.57	300.2813	306.78	319.7771	136.28	293.8546
64.99	307.0121	88.47	319.8505	136.47	308.0519
65.08	307.0730	531.02	359.6583	739.50	296.3883
66.73	285.3699	184.58	388.1927	140.51	296.3883
66.98	285.5213	92.59	322.1713	140.88	284.1016
67.24	285.6801	93.31	336.2172	143.76	295.8564
67.67	285.9404	94.56	345.6420	144.24	288.9053
1221.41	285.9884	311.90	345.6951	145.44	292.9225
439.51	312.7386	946.00	345.7057	152.32	287.3544
70.82	312.7386	97.43	318.5846	152.43	282.8887
167.43	312.7407	98.43	306.1843	1048.07	293.0964
97.43	300.5937	98.44	306.1899	154.21	291.6345
70.82	299.7210	99.53	285.8471	155.04	295.5487
70.82	299.7230	103.37	285.8471	158.56	304.9503
279.20	299.7287	116.74	285.8471	158.97	270.6203
1063.66	317.6609	100.11	296.9962	159.00	270.6294
72.87	317.6995	100.20	297.0395	162.33	292.6761
351.06	317.6995	102.03	331.4952	537.26	283.6692
74.66	329.6299	103.18	289.2317	163.33	286.6323
238.63	339.3271	103.37	269.1357	165.86	290.2286
351.93	339.3271	105.31	337.8852	167.43	265.9956
238.63	339.3271	106.12	337.0500	245.35	286.5196
74.97	339.4286	106.47	337.2367	427.87	290.9317
77.11	328.8156	109.28	308.1590	176.60	291.9511
256.23	328.0338	111.00	330.6809	177.52	290.3936
79.82	291.7936	111.76	322.1175	181.07	269.1824
80.02	291.9040	208.37	303.9185	184.41	344.0117
80.03	291.9058	116.24	321.7220	184.58	329.1156

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	324.8395	300.09	242.8169	477.60	225.4610
186.21	311.8996	300.13	242.8217	477.99	204.0038
190.27	352.7603	301.36	244.0889	482.18	204.4644
193.51	312.9057	302.85	209.6349	487.02	213.7569
197.03	304.1082	304.50	220.2049	492.35	182.7332
198.01	295.8801	304.85	221.8230	497.08	187.5938
201.83	286.7565	306.78	211.1971	511.00	157.5504
204.12	308.2241	308.46	230.7838	514.00	163.4805
205.31	329.6107	311.90	231.3773	520.40	154.0318
208.37	303.7852	316.51	215.8812	520.69	154.0529
210.85	331.4322	319.41	211.6037	667.71	138.7037
215.65	304.0347	320.08	208.5461	527.90	144.9487
218.12	310.5638	321.04	228.7215	529.59	131.6396
222.11	321.4610	323.87	207.0099	529.87	127.1794
227.09	273.2097	325.23	199.8127	531.02	129.9416
227.38	273.2837	1596.21	235.2969	537.26	126.7485
228.16	307.6685	331.15	242.0691	1260.41	112.8807
228.18	307.6749	333.37	229.6890	552.55	105.9634
235.69	311.7760	334.37	227.7233	795.86	95.5856
235.96	311.8502	338.28	212.3444	564.24	112.9351
238.63	285.9821	911.20	212.3485	569.33	98.6001
238.98	286.0706	340.48	216.9430	569.50	89.4794
240.99	283.6221	340.55	216.9554	569.70	90.4016
242.00	274.9769	344.28	217.5171	582.08	105.6226
244.70	257.7915	345.93	204.8921	583.19	109.3509
245.35	250.9951	351.06	224.9922	595.83	107.2172
459.60	255.1484	351.93	220.8154	600.60	98.1878
685.70	257.5407	356.01	231.1454	604.72	89.0918
388.16	261.6242	361.25	217.8686	609.32	103.2258
256.23	290.4395	364.49	234.6328	610.33	95.8301
527.90	265.4556	366.42	213.1787	614.28	119.2969
264.66	250.1544	383.85	232.1034	618.01	112.0276
265.00	250.2251	388.16	231.6357	621.93	95.3884
269.46	237.9930	666.33	228.3940	630.19	90.1055
401.81	259.2297	391.70	229.9417	631.29	109.8696
273.65	246.9402	400.66	210.1064	632.98	106.1892
276.40	242.4015	401.32	229.0970	633.25	106.2030
583.19	242.5952	401.81	250.3052	634.78	115.6766
277.60	242.6388	402.40	230.3650	635.95	106.3272
402.40	242.7162	404.85	228.4812	636.99	108.2582
278.43	242.8034	410.95	243.8751	657.50	110.9222
279.20	223.5580	720.70	223.1260	884.68	110.9365
279.54	258.8431	423.72	249.1286	661.66	99.8923
280.46	243.7114	427.09	271.0889	664.57	74.6771
301.36	234.6048	427.87	237.3096	666.33	77.7825
284.31	224.4714	433.94	235.8874	666.50	77.7875
285.41	245.1850	439.51	267.3680	667.71	67.1451
285.90	254.5189	440.45	289.1400	677.62	55.5468
287.50	258.9521	453.88	279.8862	685.70	60.5371
290.67	235.9047	459.60	268.1216	692.65	68.4172
293.27	234.3154	463.37	279.0641	695.00	79.0922
295.22	245.0090	468.07	311.0039	696.49	68.5234
316.51	237.9081	473.00	288.6560	696.51	68.5234
298.58	236.3171	475.06	236.7549	697.00	68.5386
299.98	239.6804	696.49	261.3739	697.49	66.6205

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	60.9543	903.28	87.4120	1291.59	8.3654
706.68	70.7433	907.67	102.1272	1298.22	8.3791
711.68	68.9438	911.20	87.6401	1312.11	9.3418
720.70	71.1376	984.45	102.6715	1332.49	8.4494
721.93	80.9230	926.36	94.3643	1365.19	1.8923
1690.97	60.4674	935.54	99.8996	1368.63	0.9469
722.91	60.4712	937.49	113.6426	1377.63	4.7446
723.31	69.2601	983.53	107.5563	1384.29	4.7520
756.73	76.1147	945.96	108.6737	1408.01	6.6893
727.33	61.5542	946.00	108.6737	1434.09	1.9227
733.00	53.8553	949.00	114.0579	1435.80	7.6937
735.93	58.8190	954.55	111.0851	1457.56	4.8320
739.50	56.9362	962.31	104.9941	1460.82	2.9014
1434.09	61.9579	964.08	100.8070	1489.16	1.9464
747.24	64.9828	966.17	77.5135	1596.21	2.9870
752.31	56.2311	968.97	77.5803	1620.50	5.0034
753.82	71.0684	983.53	75.7950	1678.03	2.0247
756.73	52.3724	984.45	84.3594	1690.97	3.0448
763.94	48.5514	996.26	88.9525	1757.55	3.0845
765.80	66.4336	1001.03	85.8618	1764.49	3.0886
1001.03	64.4644	1004.73	109.5952	1770.23	7.2146
766.84	75.3877	1025.87	81.0986	1771.35	8.2469
772.60	74.5560	1028.54	84.4080	1791.20	2.0695
776.52	68.6905	1037.84	66.1938	1808.65	1.0381
777.92	69.7223	1038.76	73.8105	1836.06	2.0869
778.90	66.7587	1046.59	76.1566		
783.70	53.9011	1048.07	71.8370		
1435.80	79.0024	1050.41	89.3121		
903.28	71.0888	1063.66	82.0038		
795.86	89.2336	1077.00	71.3397		
801.95	85.4124	1077.34	65.8594		
802.10	90.4422	1083.85	81.3801		
810.29	74.5826	1085.87	72.6226		
810.45	74.5872	1099.25	82.8369		
810.76	81.6526	1111.64	76.4753		
815.77	94.9266	1112.07	75.3752		
818.51	75.8125	1112.84	75.3918		
832.01	80.2392	1115.54	77.6691		
834.85	84.3855	1120.29	65.5504		
835.15	84.3957	1120.55	65.5540		
836.80	88.5134	1121.30	71.1250		
846.77	88.8214	1808.65	47.8973		
856.80	69.6643	1131.51	43.4632		
860.56	78.7805	1332.49	37.8718		
871.09	102.1244	1177.95	39.1227		
873.19	80.3566	1189.05	29.8821		
875.33	82.4780	1204.77	25.7615		
879.38	79.4932	1221.41	22.8296		
880.51	79.5237	1231.02	21.9703		
881.60	79.5519	1235.36	14.6633		
883.24	79.5966	1238.28	17.4256		
884.68	86.0463	1260.41	12.9124		
889.28	73.3936	1271.87	20.3489		
894.76	96.5051	1274.44	6.4788		
1836.06	94.5325	1274.54	6.4791		

Continuing Calibration Data

Review of Gamma Spectrometer QA results (Daily calibration & background checks)
31-OCT-2022 08:57:39

Run Date	Detector	Parameter	Flag	Status	Comments
31-OCT-22	GAM01	All Parameters Passed			
31-OCT-22	GAM02	Cal Check PSFWHM-59	Investigate		
31-OCT-22	GAM03	Cal Check NLACTVTY-1332	Investigate		
31-OCT-22	GAM04	Cal Check PSFWHM-1332	Investigate		
31-OCT-22	GAM05	Cal Check PSFWHM-59	Action	Lockout	Detector locked out.
31-OCT-22	GAM05	Cal Check PSFWHM-662	Investigate		
31-OCT-22	GAM05	Cal Check PSFWHM-1332	Action	Lockout	Detector locked out.
31-OCT-22	GAM06	Cal Check PSFWHM-59	Action	Approved	Low FWHM, approved for use.
31-OCT-22	GAM06	Cal Check NLACTVTY-59	Investigate		
31-OCT-22	GAM07	Cal Check PSFWHM-1332	Action	Approved	Low FWHM, approved for use.
31-OCT-22	GAM08	All Parameters Passed			
31-OCT-22	GAM09	Cal Check NLACTVTY-1332	Investigate		
31-OCT-22	GAM10	Cal Check PSFWHM-59	Action	Approved	Low FWHM, approved for use.
31-OCT-22	GAM10	Bkg Check BACKRATE	Above		Spectrum good approved for use
31-OCT-22	GAM11	Cal Check NLACTVTY-662	Investigate		
31-OCT-22	GAM12	All Parameters Passed			
31-OCT-22	GAM14	Cal Check NLACTVTY-1332	Investigate		
31-OCT-22	GAM16	All Parameters Passed			
31-OCT-22	GAM18	Cal Check PSFWHM-59	Investigate		
31-OCT-22	GAM19	All Parameters Passed			
31-OCT-22	GAM20	All Parameters Passed			
	GAM21	Cal Check may not have run since 31-OCT-2022			Detector locked out.
	GAM21	Bkg Check may not have run since 31-OCT-2022			Detector locked out.
	GAM22	Cal Check may not have run since 31-OCT-2022			Detector locked out.
05-APR-20	GAM22	Bkg Check may not have run since 31-OCT-2022			Detector locked out.
31-OCT-22	GAM23	All Parameters Passed			
31-OCT-22	GAM24	Cal Check PSFWHM-1332	Investigate		
31-OCT-22	GAM24	Cal Check NLACTVTY-662	Investigate		
31-OCT-22	GAM26	Bkg Check BACKRATE	Above		Spectrum good approved for use
31-OCT-22	GAM27	All Parameters Passed			
31-OCT-22	GAM28	All Parameters Passed			
31-OCT-22	GAM29	All Parameters Passed			
31-OCT-22	GAM30	All Parameters Passed			
31-OCT-22	GAM31	Cal Check PSFWHM-662	Investigate		
31-OCT-22	GAM32	Cal Check NLACTVTY-1332	Investigate		
31-OCT-22	GAM33	All Parameters Passed			
31-OCT-22	GAM34	All Parameters Passed			
31-OCT-22	GAM36	Cal Check PSFWHM-59	Investigate		
31-OCT-22	GAM38	Cal Check PSFWHM-662	Investigate		
31-OCT-22	GAM38	Cal Check PSFWHM-1332	Investigate		
31-OCT-22	GAM40	Cal Check NLACTVTY-662	Investigate		
30-OCT-22	GAM41	Cal Check may not have run since 31-OCT-2022			Detector locked out.
31-OCT-22	GAM43	All Parameters Passed			
31-OCT-22	GAM44	All Parameters Passed			Detector locked out.
31-OCT-22	GAM45	All Parameters Passed			
31-OCT-22	GAM46	Cal Check NLACTVTY-59	Investigate		

31-OCT-22	GAM47	All Parameters Passed			
31-OCT-22	XRAY1	All Parameters Passed			
31-OCT-22	XRAY2	All Parameters Passed			
31-OCT-22	XRAY3	Cal Check PSFWHM-30	Action	Approved	Low FWHM, approved for use.
31-OCT-22	XRAY3	Cal Check PSFWHM-40	Action	Approved	Low FWHM, approved for use.
31-OCT-22	XRAY4	All Parameters Passed			
31-OCT-22	XRAY6	All Parameters Passed			
31-OCT-22	XRAY7	Cal Check PSFWHM-30	Investigate		
31-OCT-22	XRAY7	Cal Check PSFWHM-34	Investigate		
31-OCT-22	XRAY7	Cal Check NLACTIONTY-30	Investigate		

APPROVAL DATE: 31-OCT-2022

APPROVAL TIME: 09:47:37

APPROVED BY: Rebekah Futch

PROCEDURE # GL-RAD-I-001

The Investigate flag does not indicate a lockout and is approved for use. Action flags that have not been approved are locked out of service.

Review of Gamma Spectrometer QA results (Daily calibration & background checks)
01-NOV-2022 12:46:11

Run Date	Detector	Parameter	Flag	Status	Comments
01-NOV-22	GAM01	All Parameters Passed			
01-NOV-22	GAM02	Cal Check PSFWHM-59	Action	Approved	Low FWHM, approved for use.
01-NOV-22	GAM03	All Parameters Passed			
01-NOV-22	GAM04	Cal Check PSFWHM-662	Action	Approved	Low FWHM, approved for use.
01-NOV-22	GAM04	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	GAM05	Cal Check PSFWHM-59	Action	Lockout	Detector locked out.
01-NOV-22	GAM05	Cal Check PSFWHM-662	Action	Lockout	Detector locked out.
01-NOV-22	GAM05	Cal Check NLACTVTY-1332	Action	Lockout	Detector locked out.
01-NOV-22	GAM05	Bkg Check BACKRATE	Investigate		
01-NOV-22	GAM06	Cal Check PSFWHM-59	Investigate		
01-NOV-22	GAM06	Cal Check PSFWHM-662	Investigate		
01-NOV-22	GAM06	Cal Check NLACTVTY-662	Investigate		
01-NOV-22	GAM06	Cal Check NLACTVTY-1332	Investigate		
01-NOV-22	GAM07	All Parameters Passed			
01-NOV-22	GAM08	All Parameters Passed			
01-NOV-22	GAM09	All Parameters Passed			
01-NOV-22	GAM10	Cal Check PSFWHM-59	Investigate		
01-NOV-22	GAM10	Cal Check PSFWHM-1332	Investigate		
01-NOV-22	GAM10	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	GAM11	All Parameters Passed			
01-NOV-22	GAM12	Cal Check NLACTVTY-662	Investigate		
01-NOV-22	GAM12	Cal Check NLACTVTY-1332	Investigate		
01-NOV-22	GAM14	All Parameters Passed			
01-NOV-22	GAM16	All Parameters Passed			
01-NOV-22	GAM18	All Parameters Passed			
01-NOV-22	GAM19	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	GAM20	Cal Check PSFWHM-662	Investigate		
01-NOV-22	GAM20	Cal Check PSFWHM-1332	Investigate		
	GAM21	Cal Check may not have run since 1-NOV-2022			Detector locked out.
	GAM21	Bkg Check may not have run since 1-NOV-2022			Detector locked out.
	GAM22	Cal Check may not have run since 1-NOV-2022			Detector locked out.
05-APR-20	GAM22	Bkg Check may not have run since 1-NOV-2022			Detector locked out.
01-NOV-22	GAM23	Cal Check PSFWHM-662	Investigate		
01-NOV-22	GAM24	Cal Check PSFWHM-662	Investigate		
01-NOV-22	GAM26	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	GAM27	Bkg Check BACKRATE	Action	Approved	
01-NOV-22	GAM28	All Parameters Passed			
01-NOV-22	GAM29	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	GAM30	All Parameters Passed			
01-NOV-22	GAM31	All Parameters Passed			
01-NOV-22	GAM32	All Parameters Passed			
01-NOV-22	GAM33	All Parameters Passed			
01-NOV-22	GAM34	All Parameters Passed			
01-NOV-22	GAM36	All Parameters Passed			
01-NOV-22	GAM38	Cal Check PSFWHM-1332	Investigate		
01-NOV-22	GAM38	Bkg Check BACKRATE	Above		Spectrum good approved for use

01-NOV-22	GAM40	Cal Check NLACTVTY-59	Investigate		
01-NOV-22	GAM40	Bkg Check BACKRATE	Above		Spectrum good approved for use
30-OCT-22	GAM41	Cal Check may not have run since 1-NOV-2022			
01-NOV-22	GAM41	Bkg Check BACKRATE	Action	Lockout	Detector locked out.
01-NOV-22	GAM43	All Parameters Passed			
01-NOV-22	GAM44	Cal Check NLACTVTY-1332	Investigate		
01-NOV-22	GAM45	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	GAM46	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	GAM47	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	XRAY1	Cal Check NLACTVTY-30	Investigate		
01-NOV-22	XRAY1	Cal Check NLACTVTY-40	Investigate		
01-NOV-22	XRAY1	Bkg Check BACKRATE	Action	Approved	
01-NOV-22	XRAY2	Cal Check NLACTVTY-34	Investigate		
01-NOV-22	XRAY3	All Parameters Passed			
01-NOV-22	XRAY4	Cal Check PSFWHM-34	Investigate		
01-NOV-22	XRAY4	Bkg Check BACKRATE	Investigate		
01-NOV-22	XRAY6	Cal Check PSFWHM-30	Investigate		
01-NOV-22	XRAY6	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	XRAY7	Cal Check PSFWHM-30	Investigate		
01-NOV-22	XRAY7	Cal Check PSFWHM-34	Action	Approved	Low FWHM, approved for use.
01-NOV-22	XRAY7	Cal Check NLACTVTY-30	Investigate		
01-NOV-22	XRAY7	Bkg Check BACKRATE	Above		Spectrum good approved for use

APPROVAL DATE: 01-NOV-2022

APPROVAL TIME: 12:58:05

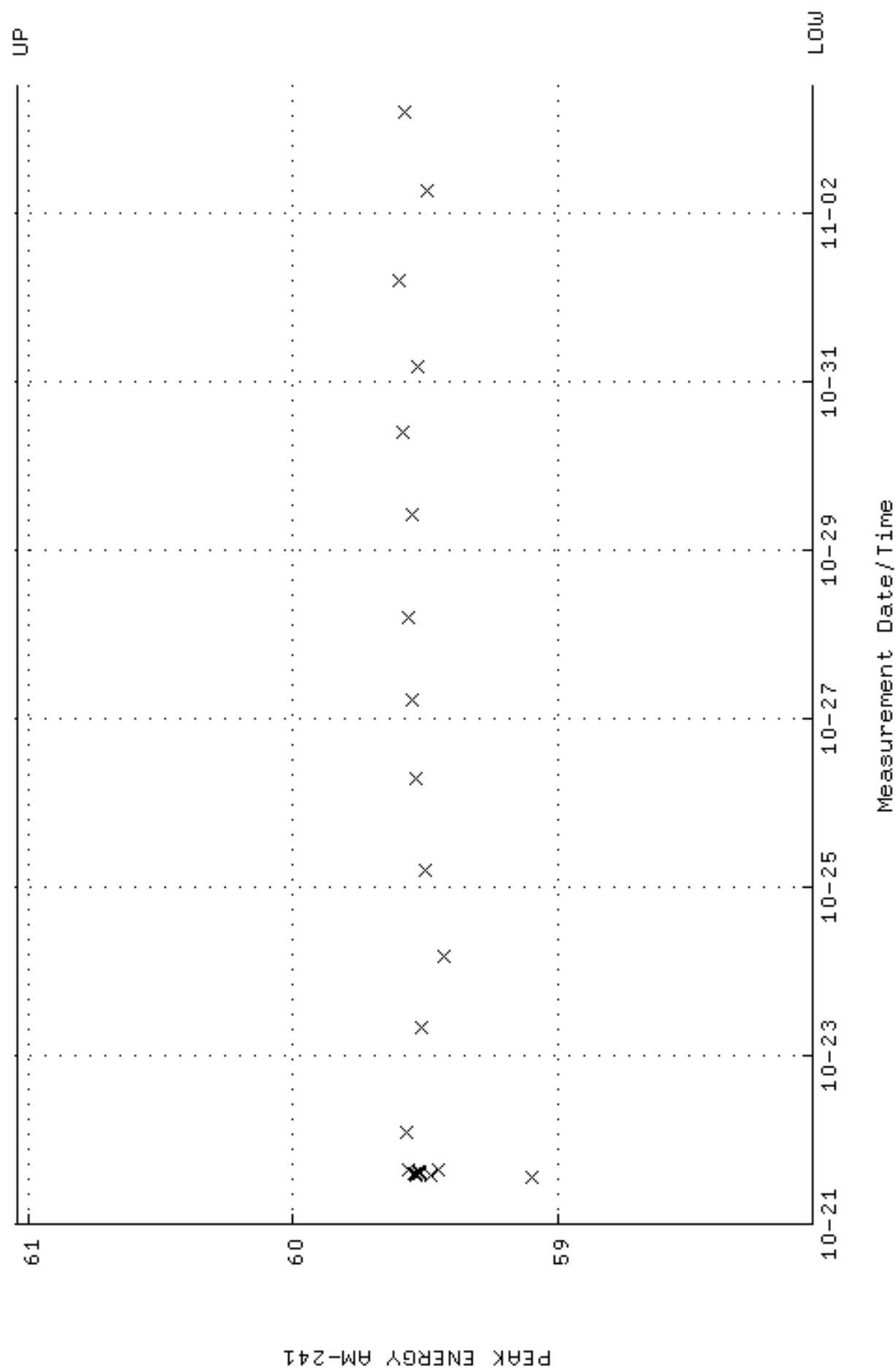
APPROVED BY: Rebekah Futch

PROCEDURE # GL-RAD-I-001

The Investigate flag does not indicate a lockout and is approved for use. Action flags that have not been approved are locked out of service.

Background and Efficiency Data

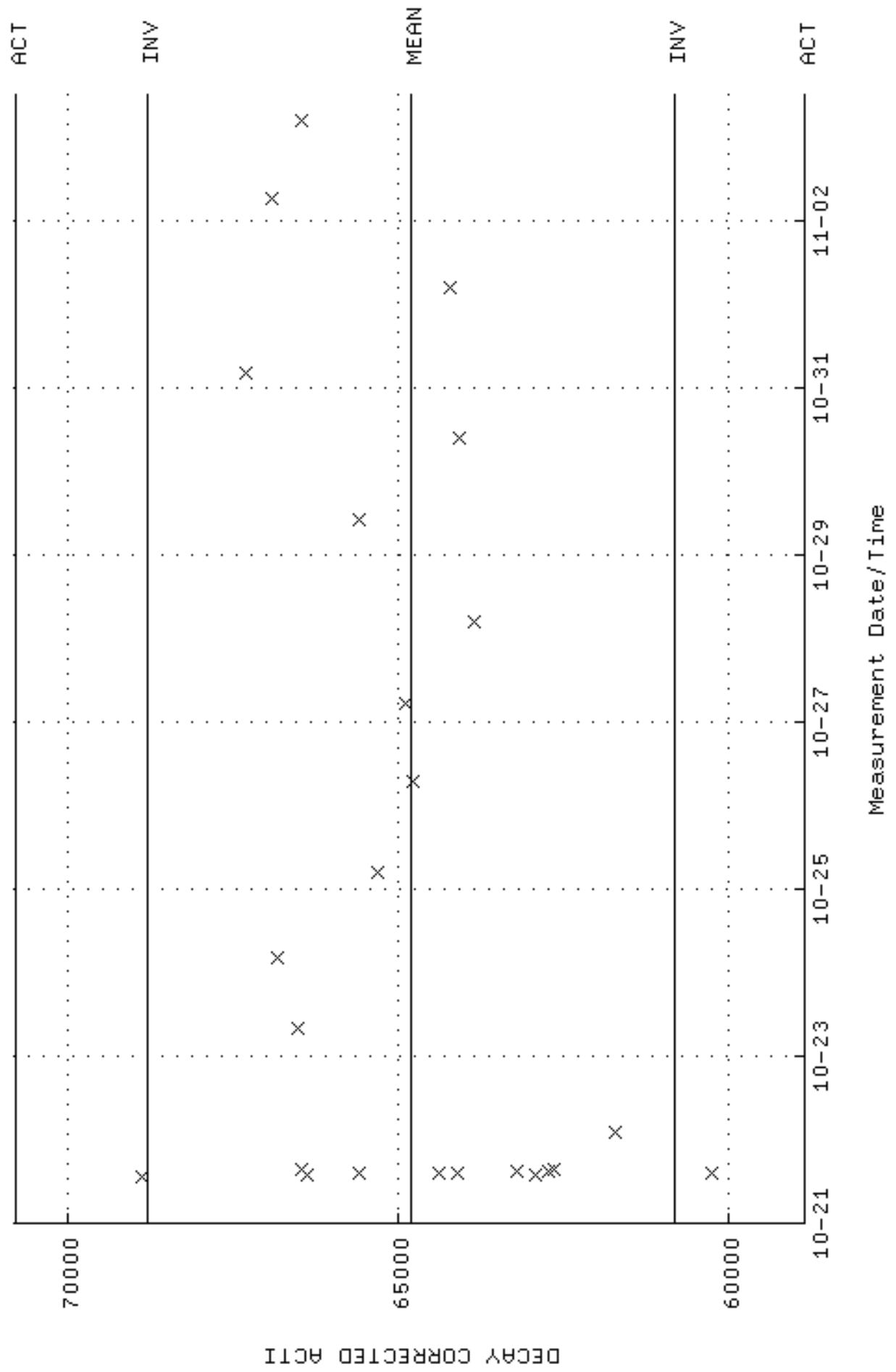
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM03_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 21-OCT-2022 13:14:47 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



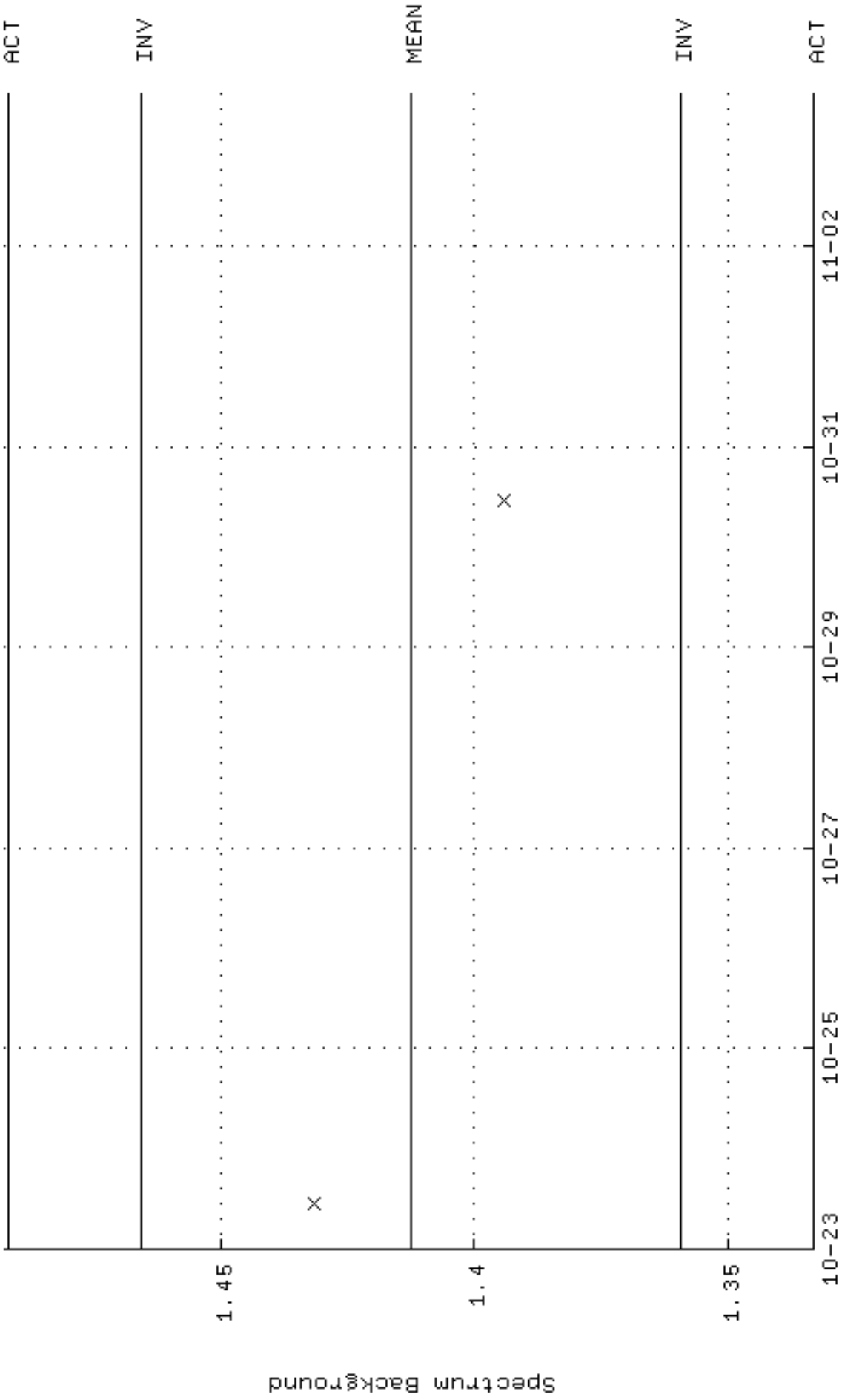

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QA filename      : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM03_CAN.QAF;1
Parameter Name   : NLACTIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates  : 21-OCT-2022 13:14:47 through 3-NOV-2022 12:00:00
Mean +- Std Dev : 64822.1 +- 1989.62 (3.07 %)

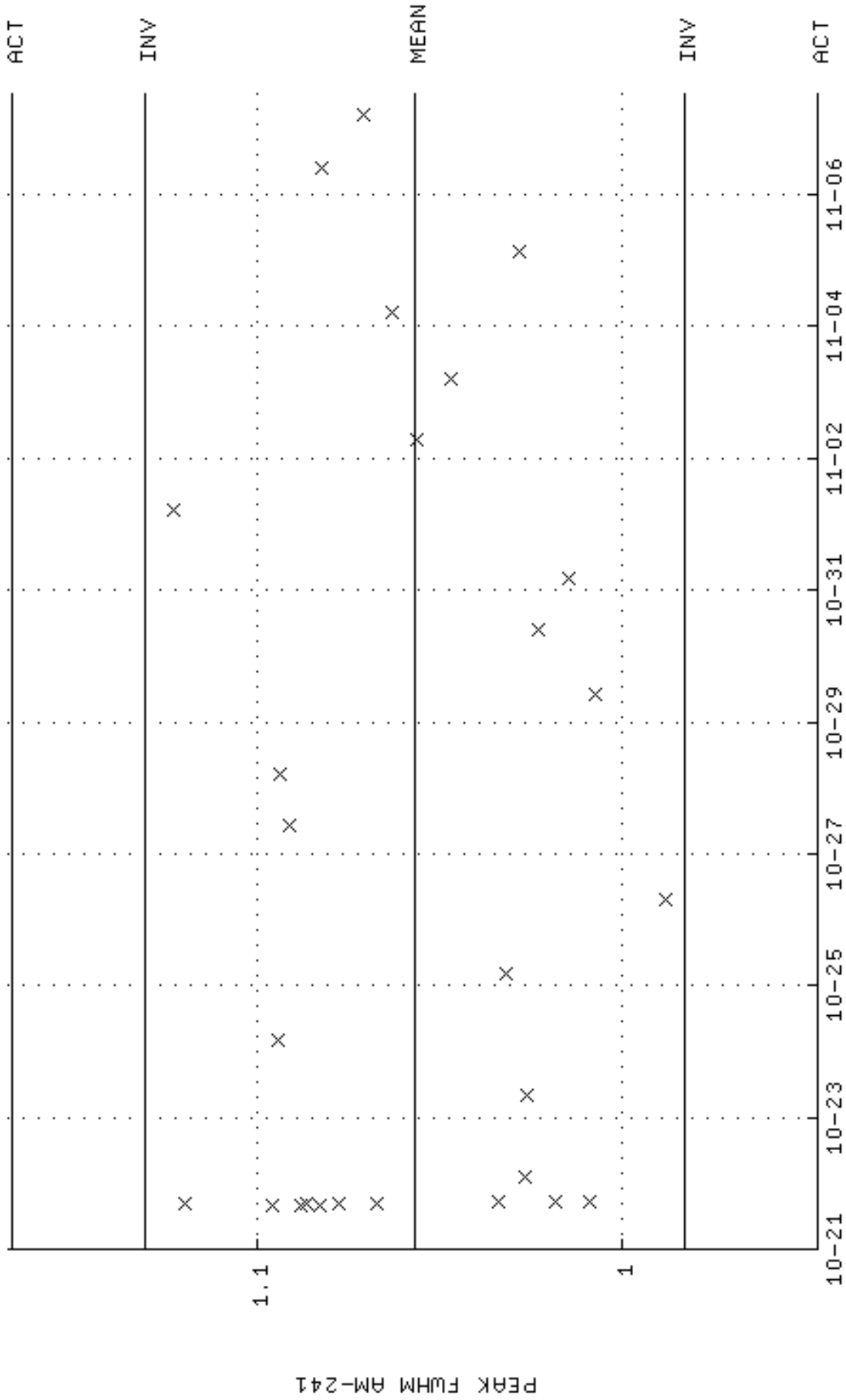
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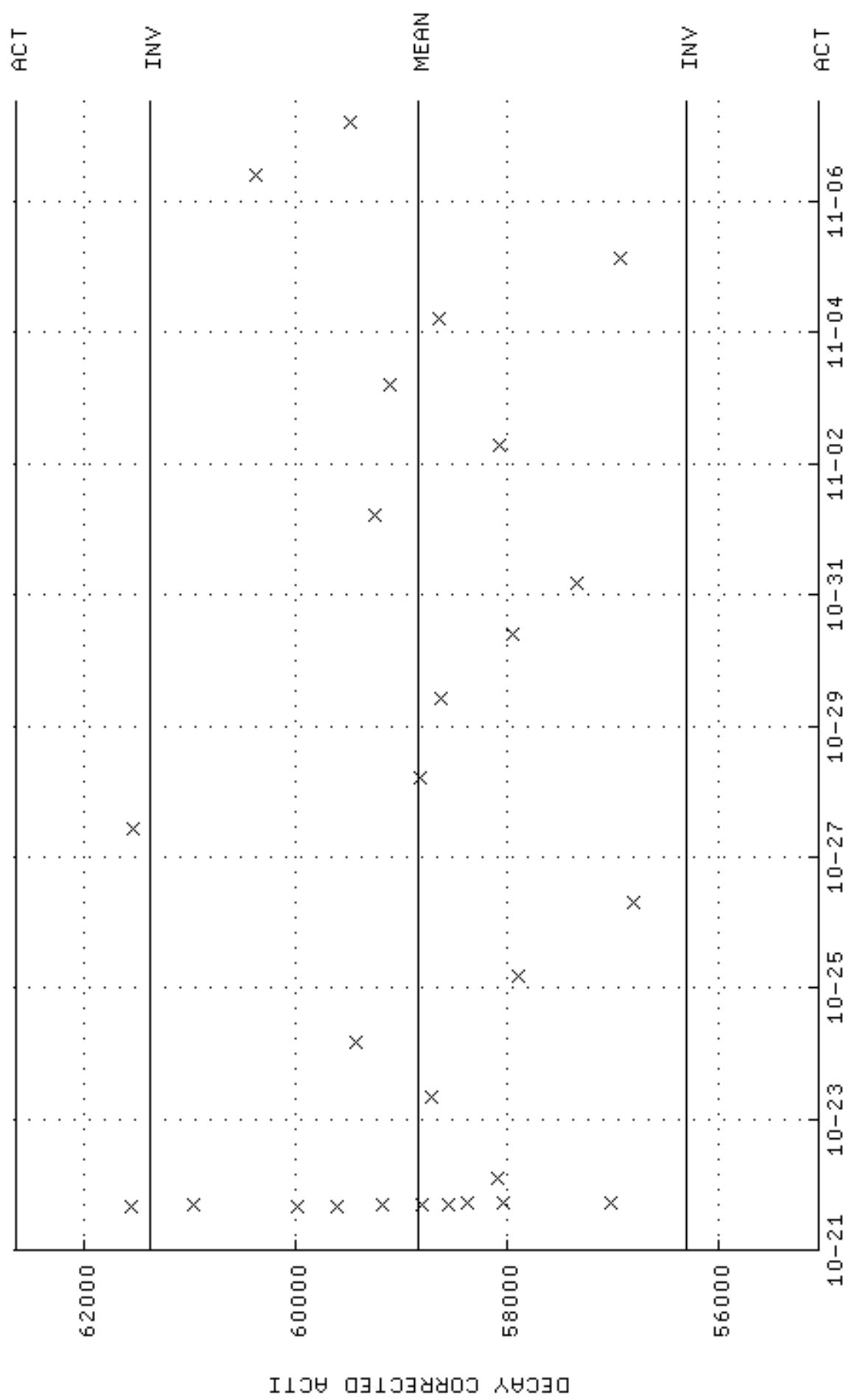
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM03.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 23-OCT-2022 11:00:41 through 3-NOV-2022 12:00:00
Mean +- Std Dev : 1.41258 +- 2.651652E-02 (1.88 %)



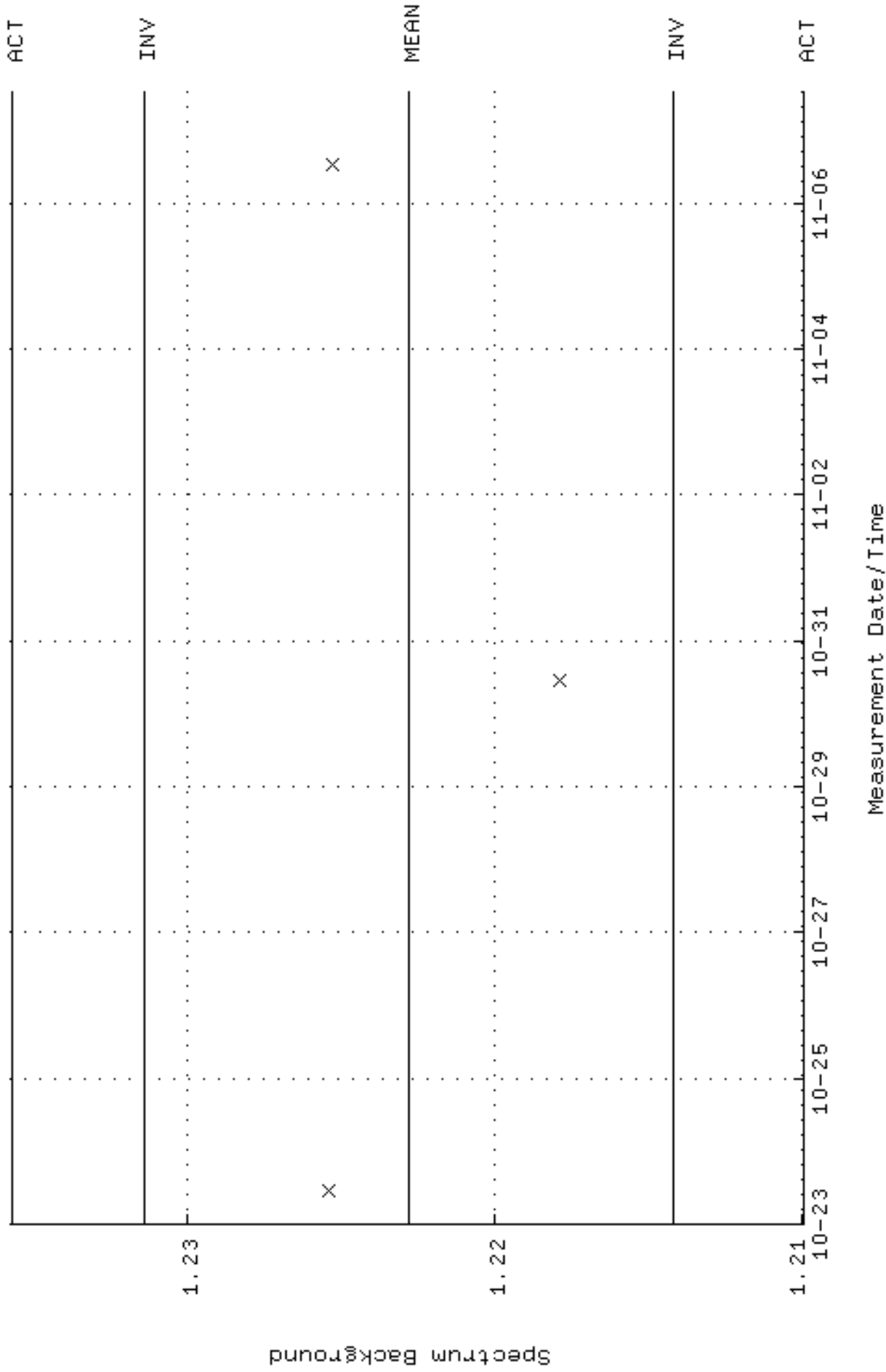
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC_GAM07_JAR.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 21-OCT-2022 15:42:57 through 7-NOV-2022 12:00:00
 Mean +- Std Dev : 1.05685 +- 3.694007E-02 (3.50 %)



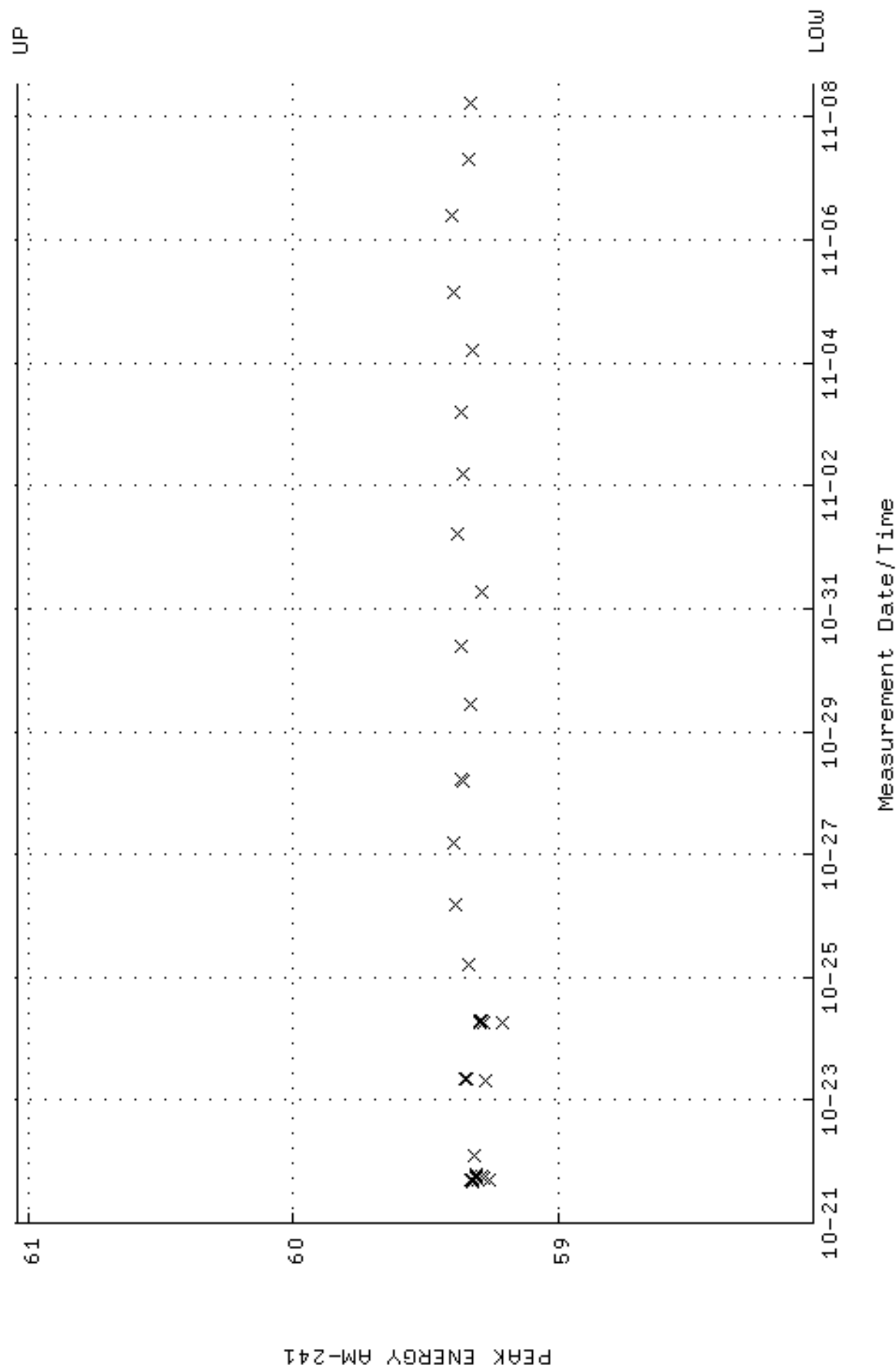
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM07_JAR.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 21-OCT-2022 15:42:57 through 7-NOV-2022 12:00:00
 Mean +- Std Dev : 58849.6 +- 1265.35 (2.15 %)



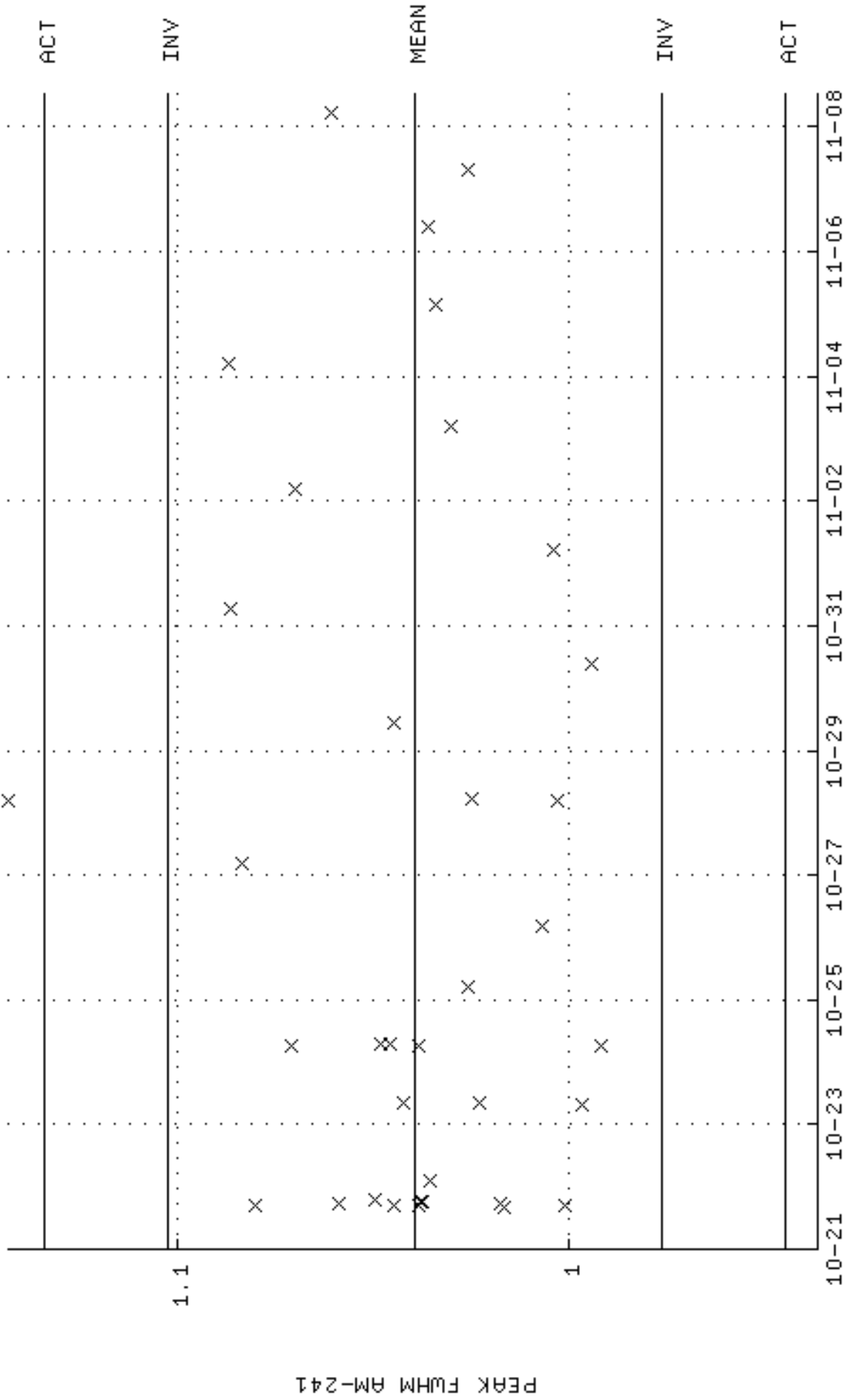
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM07.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 23-OCT-2022 11:00:58 through 7-NOV-2022 12:00:00
Mean +- Std Dev : 1.22281 +- 4.282790E-03 (0.35 %)



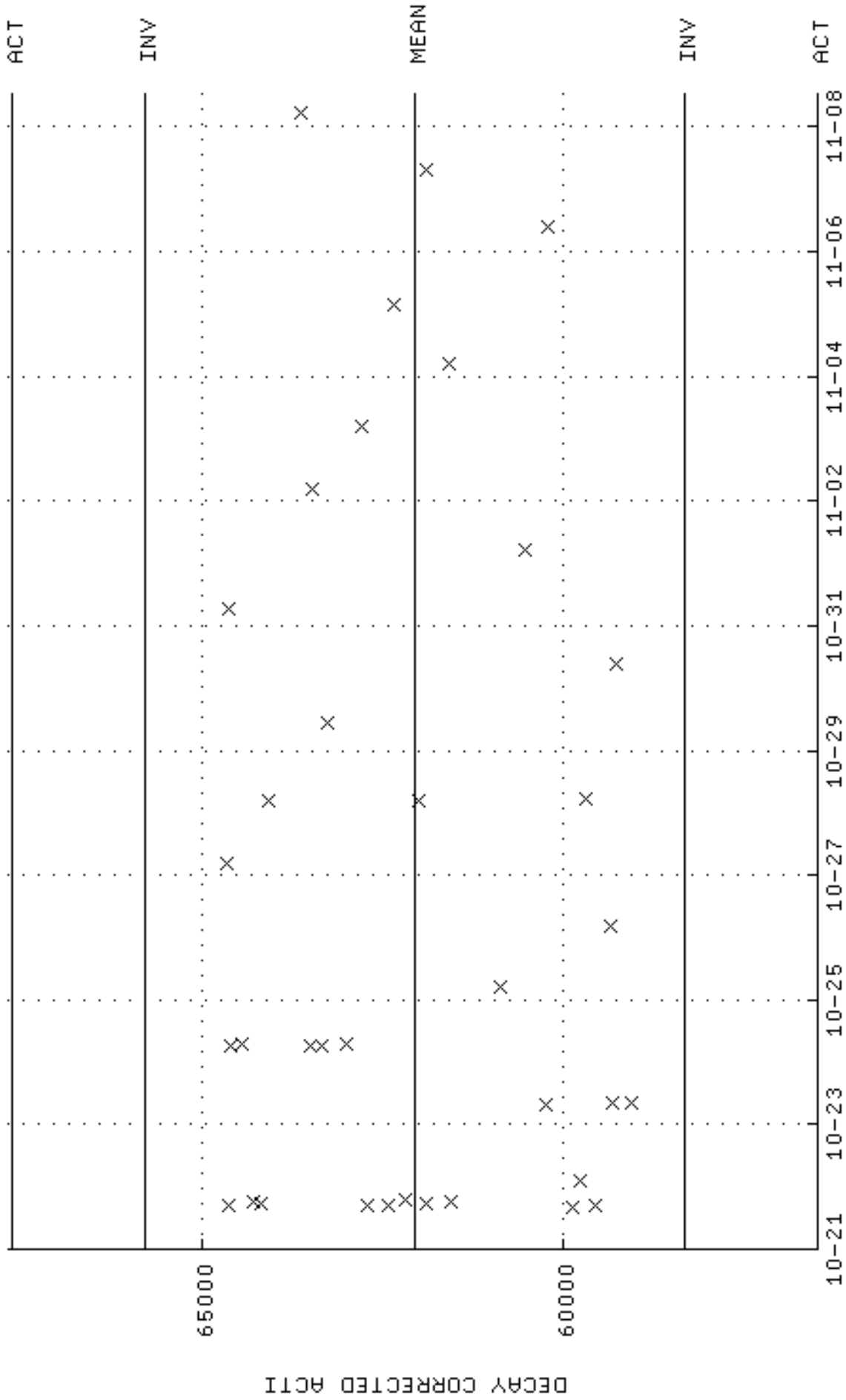
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM18_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 21-OCT-2022 16:24:35 through 8-NOV-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



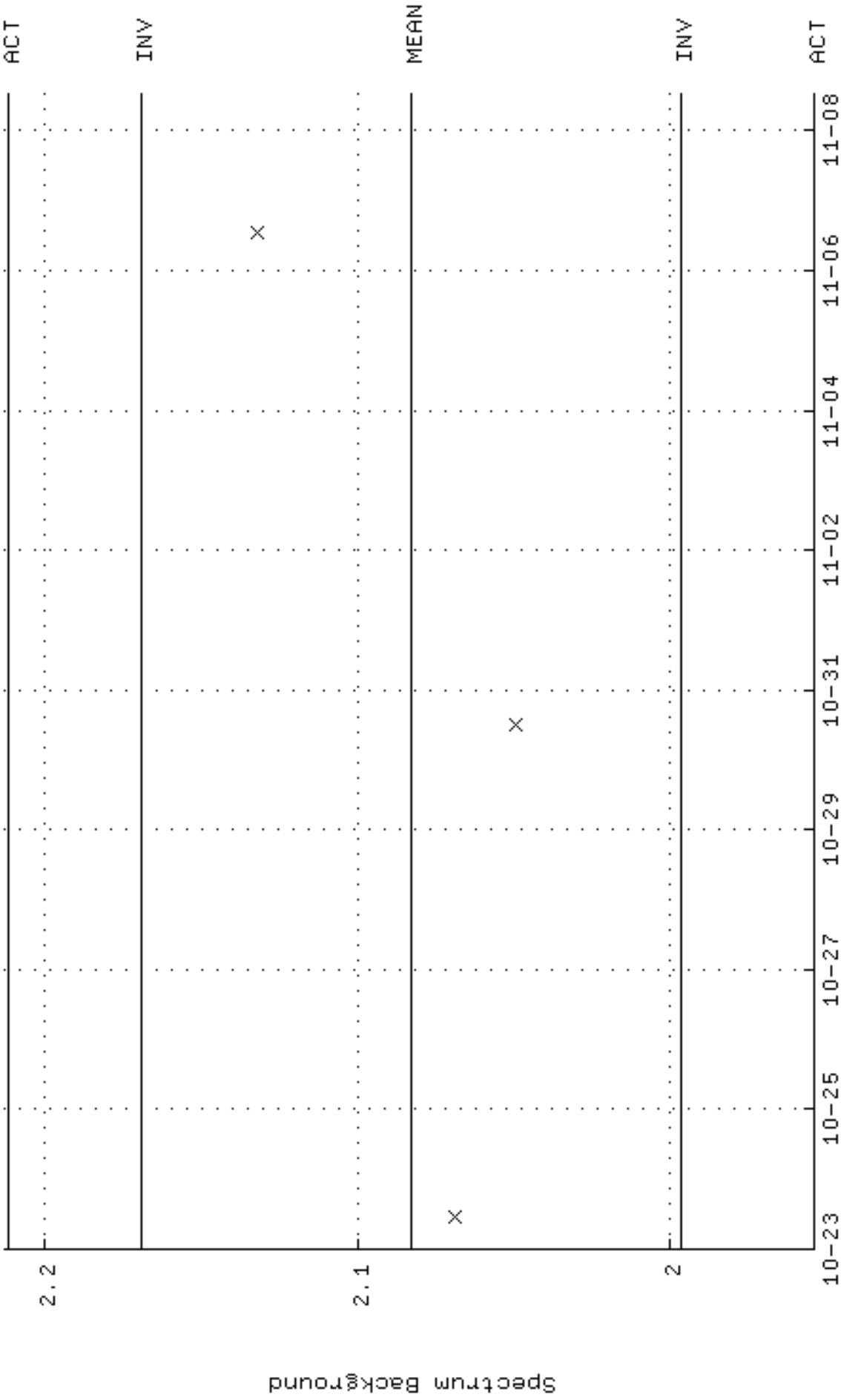
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC_GAM18_CAN_QAF;1
Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
Start/End Dates : 21-OCT-2022 16:24:35 through 8-NOV-2022 12:00:00
Mean +- Std Dev : 1.03944 +- 3.165008E-02 (3.04 %)



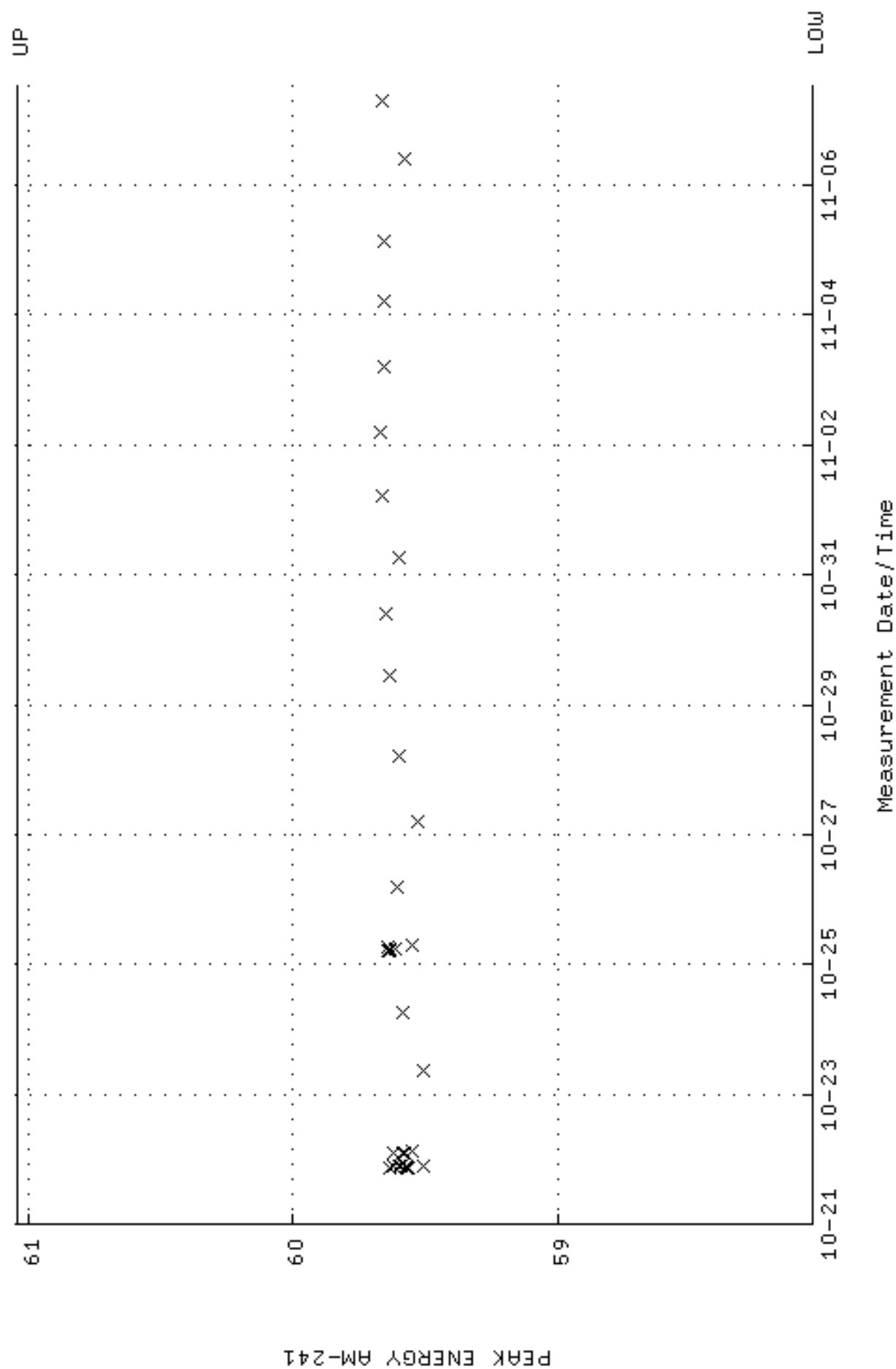
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM18_CAN.QAF;1
Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 21-OCT-2022 16:24:35 through 8-NOV-2022 12:00:00
Mean +- Std Dev : 62072.8 +- 1861.17 (3.00 %)



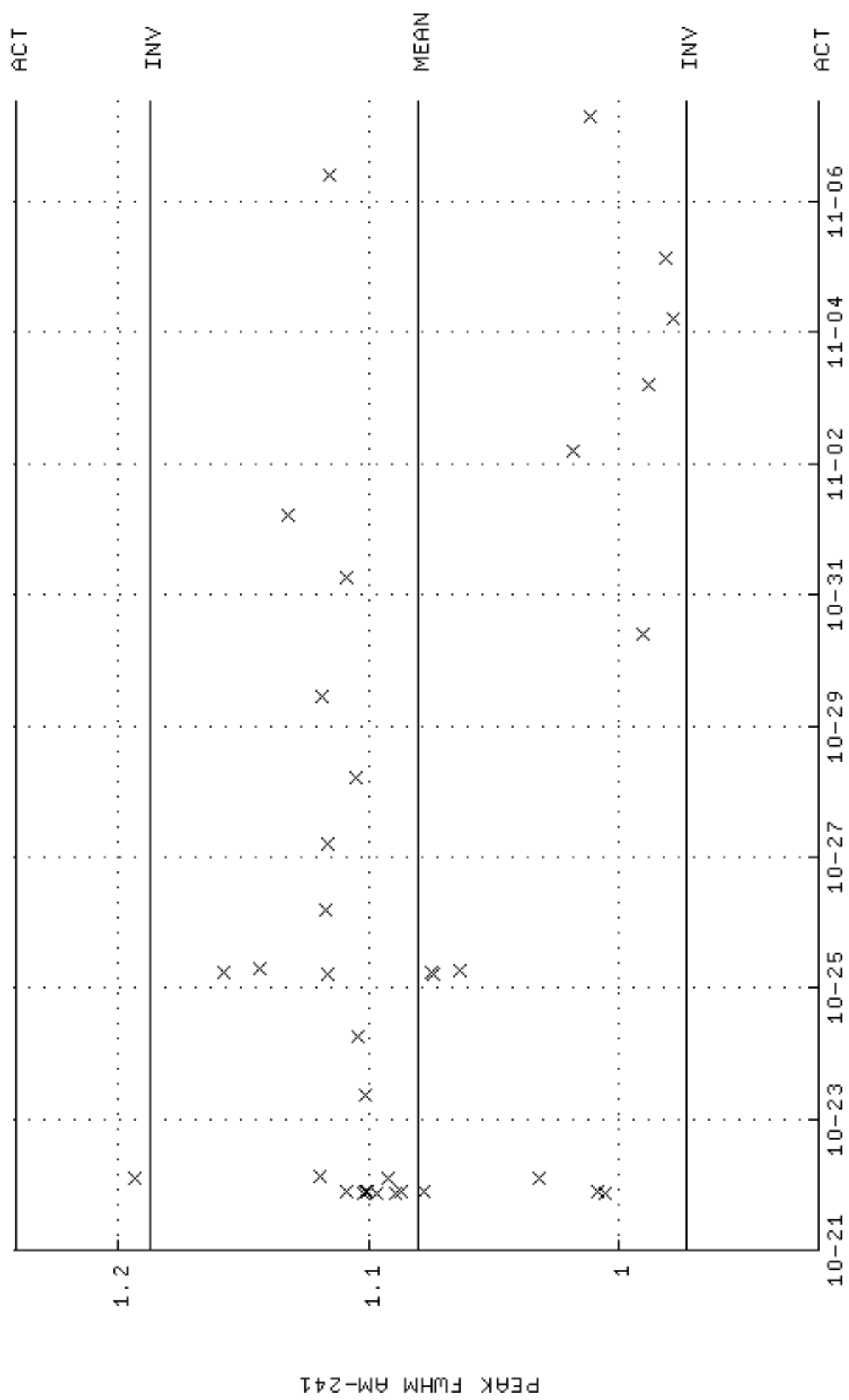
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM18.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 23-OCT-2022 11:05:04 through 8-NOV-2022 12:00:00
Mean +- Std Dev : 2.08306 +- 4.305913E-02 (2.07 %)



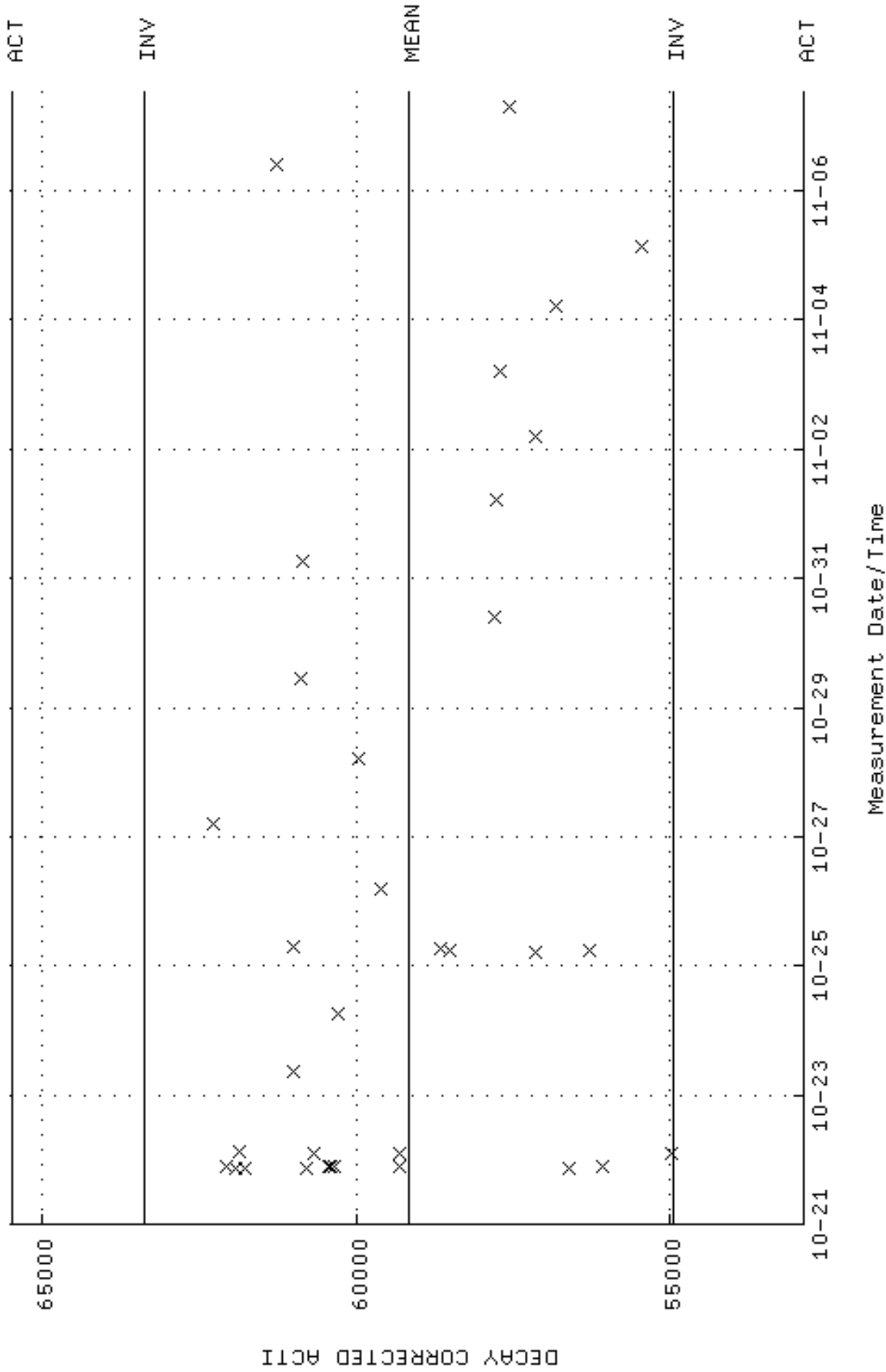
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM20_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 21-OCT-2022 20:36:56 through 7-NOV-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



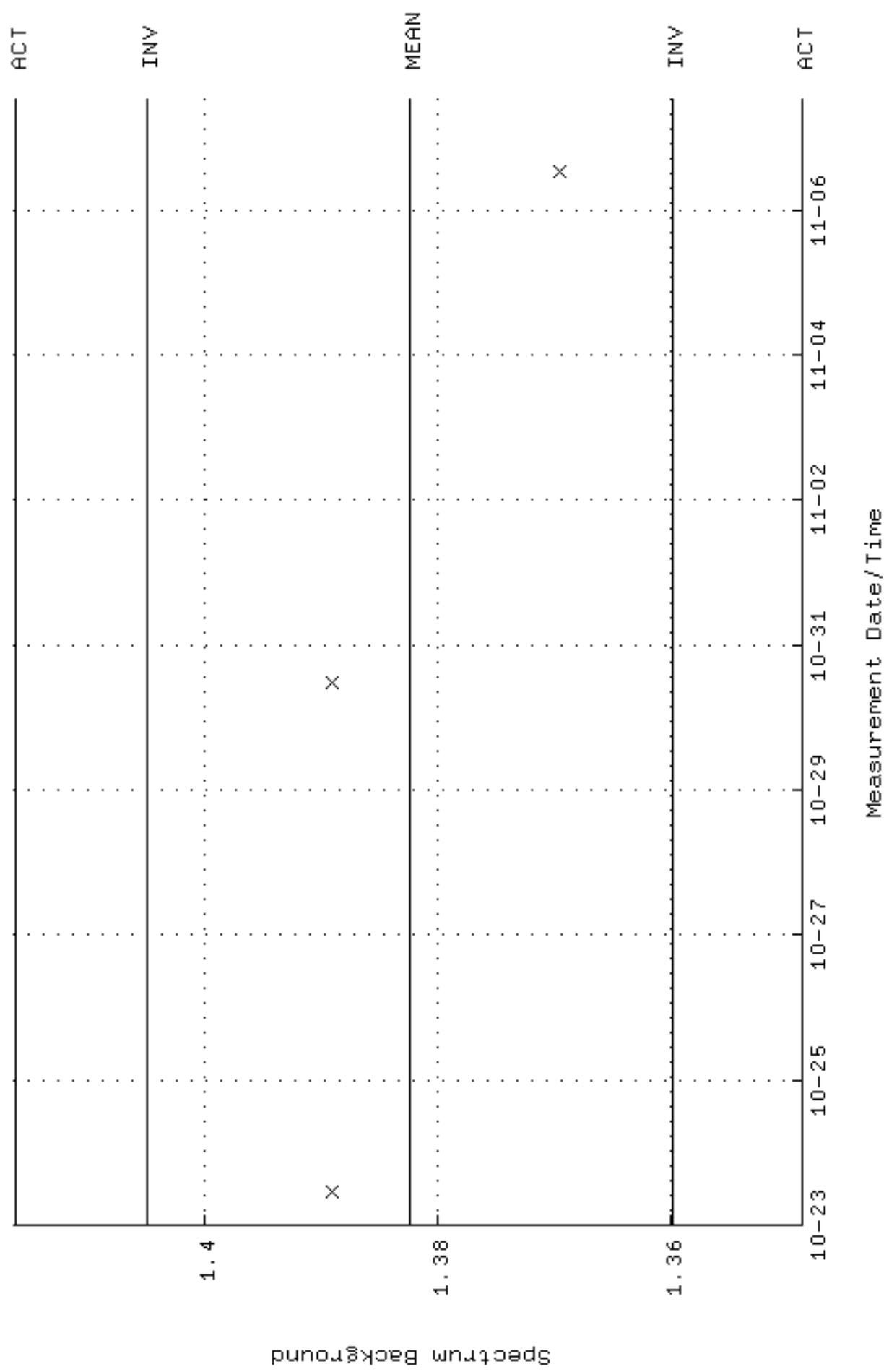
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC_GAM20_CAN.QAF;1
Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
Start/End Dates : 21-OCT-2022 20:36:56 through 7-NOV-2022 12:00:00
Mean +- Std Dev : 1.08043 +- 5.344304E-02 (4.95 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM20_CAN.QAF;1
Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 21-OCT-2022 20:36:56 through 7-NOV-2022 12:00:00
Mean +- Std Dev : 59174.5 +- 2097.83 (3.55 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM20.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 23-OCT-2022 11:05:17 through 7-NOV-2022 12:00:00
Mean +- Std Dev : 1.38253 +- 1.124404E-02 (0.81 %)



RAD Standards Traceability

1298

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

78962-278
200 mL Solid in 250 mL PP MRP Jar

Customer: GEL Laboratories, LLC

P.O. No.: 88007 RD, Item 1

Calibration Date: 01-Jan-2009

12:00 EST

Grams of Master Source: 0.0068241

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* yps/gram	This Source yps	Uncertainty, %			Calibration Method
					Type	u _A	u _F	U
Pb-210	46.5	8145.1	—	1.305E+03	0.30	1.50	3.06	4π LS
Am-241	59.5	157860	—	7.746E+02	0.3	1.5	3.1	4π LS
Cd-109	88.0	462.60	1.694E+05	1.156E+03	0.6	1.7	3.6	HPGe
Co-57	122.1	271.79	8.597E+04	5.867E+02	0.7	1.3	3.0	HPGe
Ce-139	165.9	137.6	1.217E+05	8.305E+02	0.5	1.1	2.4	HPGe
Hg-203	279.2	46.61	2.692E+05	1.837E+03	0.5	1.1	2.4	HPGe
Sn-113	391.7	115.1	1.709E+05	1.166E+03	0.6	1.1	2.5	HPGe
Cs-137	661.7	10983	1.071E+05	7.309E+02	0.7	1.2	2.8	HPGe
Y-88	898.0	106.6	4.084E+05	2.787E+03	0.7	1.1	2.6	HPGe
Co-60	1173.2	1925.4	2.084E+05	1.422E+03	0.8	1.1	2.7	HPGe
Co-60	1332.5	1925.4	2.086E+05	1.424E+03	1.0	1.1	3.0	HPGe
Y-88	1836.1	106.6	4.320E+05	2.948E+03	0.8	1.1	2.7	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

This standard will expire one year after the calibration date.

Source Prepared by: W. Mao

W. Mao, Radiochemist

QA Approved: D. M. Montgomery

D. M. Montgomery, QA Manager

Date: 2-10-09

End of Certificate

RC-S-051-017

Standard Logbook

Serial ID: 1298 Open/Reference Date: 01-JAN-09 Aliquot : 1 mL
Name: Mixed Gamma LCS JAR Received: 12-FEB-09 Density : Hand Calculated
Type: Source Material Expires: 01-JAN-35 Lot Number : 78962-278
Employee: Maggie Stamps Verified: 07-NOV-11
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

Verification for Mixed Gamma Standard

1298

JAR

M. Stamps 11/7/2011	Isotope Am-241	Result pCi/L	Isotopic Abundance: Certificate Value (dps):
	Mixed Gamma N1	60560	0.359
	Mixed Gamma N2	56920	774.6
	Mixed Gamma N3	59450	

Mean Value (Counting) =	58976.67	pCi/L	101.1344	Pass
Stdev =	1865.592	pCi/L		Rule 3 (Pass/Fail)
Certificate Value =	58315.1	pCi/L		
Lower Limit =	55245.48276	pCi/L		
Upper Limit =	62707.85057	pCi/L		
Rule 1 Pass/Fail	Pass			
Two sigma =	3731.183905			
10 % of Mean =	5897.666667			
Rule 2 (Pass/Fail)	Pass			

Stamp
11/7/11
Rec'd
11/18/11

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard 1298 JAR

M. Stamps 11/7/2011	Isotope Cs-137	Result pCi/L	Isotopic Abundance: Certificate Value (dps):	0.851 730.9
	Mixed Gamma N1	24390		
	Mixed Gamma N2	24610		
	Mixed Gamma N3	24450		
Mean Value (Counting) =	24483.33	pCi/L	105.4736	
Stdev =	113.725	pCi/L		
			Fail	
			Rule 3 (Pass/Fail)	

*Exception taken due to the high uncertainty of the certified value

Certificate Value =
 Lower Limit =
 Upper Limit =
 Rule 1 Pass/Fail
 Two sigma =
 10 % of Mean =
 Rule 2 (Pass/Fail)

*exception taken due to full recovery of standard

Handwritten signature
11/7/11

Handwritten signature
11/8/11

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard

1298

JAR

M. Stamps
11/7/2011

Isotope
Co-60 (1332.50)
Mixed Gamma N1
Mixed Gamma N2
Mixed Gamma N3

Result
pCi/L
41290
40800
41060

Isotopic Abundance:
Certificate Value (dps):
0.9998
1424

Mean Value (Counting) =
Stdev =

41050.00
245.153

pCi/L
pCi/L

Fail
Rule 3 (Pass/Fail)

*Exception taken due to the high uncertainty of the certified value

Certificate Value =
Lower Limit =
Upper Limit =
Rule 1 Pass/Fail
Two sigma =
10 % of Mean =
Rule 2 (Pass/Fail)

38494.2
40559.69397
41540.30603
Fail
490.3060269
4105
Pass

pCi/L
pCi/L
pCi/L

*exception taken due to full recovery of standard

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

J. Stamps
11/7/11

R. Fatch
11/8/11

Standard Logbook

Serial ID: 1298 **Open/Reference Date:** 01 JAN 2009 **Aliquot :** 1 mL
Name: Mixed Gamma LCS JAR **Received:** 12 FEB 2009 **Density :** Hand Calculated
Type: Source Material **Expires:** 01 JAN 2035 **Lot Number :** 78962-278
Employee: Maggie Stamps **Verified:** 07 NOV 2011
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

Runlogs

Instrument Run Log

Instrument Type: GAMMA SPECTROMETER

Batch ID: 2333342

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
597531001	SAMPLE	RXF2	GAM03	OCT-31-22 08:15:23	DONE JAR		20-APR-22 00:00
597531002	SAMPLE	RXF2	GAM18	OCT-31-22 08:15:48	DONE JAR		08-JUN-22 00:00
597531003	SAMPLE	RXF2	GAM20	OCT-31-22 08:16:13	DONE JAR		18-APR-22 00:00
597533001	SAMPLE	RXF2	GAM23	OCT-31-22 08:16:43	DONE JAR		03-MAY-22 00:00
597533002	SAMPLE	RXF2	GAM30	OCT-31-22 08:17:22	DONE JAR		04-OCT-22 00:00
597533003	SAMPLE	RXF2	GAM33	OCT-31-22 08:18:19	DONE JAR		02-AUG-22 00:00
597533004	SAMPLE	RXF2	GAM46	OCT-31-22 08:19:03	DONE JAR		23-SEP-22 00:00
597533005	SAMPLE	RXF2	GAM45	OCT-31-22 08:19:32	DONE JAR		28-FEB-22 00:00
1205226445	DUP	RXF2	GAM18	OCT-31-22 10:42:37	DONE JAR		08-JUN-22 00:00
1205226446	LCS	RXF2	GAM03	OCT-31-22 10:43:43	DONE JAR		20-APR-22 00:00
1205226444	MB	RXF2	GAM07	NOV-01-22 05:09:30	DONE JAR		18-JUL-22 00:00

Gas Flow Raw Data

Batch 2333238 Check-list

This check-list was completed on 03-NOV-22 by Kenshalla Oston

This batch was reviewed by Nat Long on 02-NOV-22 and Kenshalla Oston on 03-NOV-22.

Batch ID:
2333238

Product:
GFC90SRF

Description: Gas Flow Strontium 90
GL-RAD-A-004

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
8	Are there any equilibrium assumptions?		No	
Quality Control (QC) Information				
9	Was the method blank (MB) within the acceptance criteria?	Yes		
10	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
11	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Strontium-90 in Filter

Batch ID: 2333238
Analyst: Jennie Kill-Bowden (JXK3)
Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified
Lab SOP: GL-RAD-A-004 REV# 22
Instrument: GFC-C045440487

Due Dates for Lab: 01-NOV-2022			Package: 03-NOV-2022	SDG: 03-NOV-2022		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205226268	Strontium-90 SPIKE		1943-D	.1	mL
LCSD	1205226269	Strontium-90 SPIKE		1943-D	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Initial Wt (g)	Final Wt (g)	Net Weight (mg)	Sr Separation (date)	Strontium Carrier Yield (percent)
1	597531001	28-OCT-2022	3	30	0.11059	0.0343	0.0383	4	11/01/22 15:45	89
2	597531002	28-OCT-2022	3	30	0.11123	0.0344	0.0388	4.4	11/01/22 15:45	98
3	597531003	28-OCT-2022	3	30	0.11337	0.0362	0.0389	2.7	11/01/22 15:45	60
4	597533001	28-OCT-2022	3	30	0.11658	0.0341	0.0381	4	11/01/22 15:45	89
5	597533002	28-OCT-2022	3	30	0.11583	0.0362	0.0403	4.1	11/01/22 15:45	91
6	597533003	28-OCT-2022	3	30	0.11367	0.0346	0.0388	4.2	11/01/22 15:45	93
7	597533004	28-OCT-2022	3	30	0.11425	0.0343	0.0384	4.1	11/01/22 15:45	91
8	597533005	28-OCT-2022	3	30	0.11358	0.0343	0.0384	4.1	11/01/22 15:45	91
9	1205226267 MB	28-OCT-2022	3		0.11658	0.0363	0.04	3.7	11/01/22 15:45	82
10	1205226268 LCS	28-OCT-2022	3		0.11658	0.0344	0.0364	2	11/01/22 15:45	44
11	1205226269 LCSD	28-OCT-2022	3		0.11658	0.0344	0.0381	3.7	11/01/22 15:45	82

Reagent/Solvent Lot ID	Description	Amount	Comments:
CARR 3482192	Strontium Carrier 0.5mL=4.5 mg/mL	.5 mL	Spike Pipet ID: RAD-GFC-1795419 Carrier Pipet ID: RAD-GFC-2154115 Data Entry Date2: 28-OCT-2022 00:00
REGNT 3424102.2	Phenolphthalein	2 mL	
REGNT 3432260	RGF-0.05M Nitric Acid	15 mL	
REGNT 3460243.3	Thymol Blue Indicator0.0.04%	1 mL	
REGNT 3487134	80% ethanol	3 mL	
REGNT 3495604	0.75M Sodium Carbonate	13 mL	
REGNT 3501767	8M HNO3	40 mL	
REGNT 3517710	3M HNO3 0.05M Oxalic	10 mL	
REGNT 3520138	RGF-6M Sodium Hydroxide	10 mL	
REGNT SR0066	2283064	2 g	

Strontium-90 Filter

Filename : SR90.XLS
 File type : Excel
 Version # : 1.3.10

Carrier S/N : 3482192
 Carrier Exp Date : 9/2/2023
 Carrier Volume Added: 0.50
 Carrier Weight (mg/ml): 9.00
 Carrier Weight StDev.: 0.08

Batch : 2333238
 Analyst : JEN02186
 Prep Date : 10/28/2022
 Method Uncertainty : 0.1315

Procedure Code : GFC90SRF
 Parmname : Strontium-90
 Required MDA : 3 pCi/F
 Sr-90 Abundance : 1.00
 Halflife of Sr-90 : 28.90 years
 Halflife of Y-90 : 64.053 hours

Geometry: Tuffryn Filter

Sample Characteristics					Carrier Calculations				
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Carrier Weight (mg) (Standard)	Net Weight (mg) (Sample)	Net Weight StDev. (mg)	Carrier Aliquot (mL)	Carrier Aliquot StDev. (mL)
1	597531001.1	0.1106	1.2001E-05	9/26/2022 8:18	9.00	4.00	0.024522	0.5	0.001000
2	597531002.1	0.1112	1.2038E-05	9/26/2022 8:25	9.00	4.40	0.026241	0.5	0.001000
3	597531003.1	0.1134	1.2160E-05	9/26/2022 9:00	9.00	2.70	0.018935	0.5	0.001000
4	597533001.1	0.1166	1.2341E-05	9/30/2022 7:45	9.00	4.00	0.024522	0.5	0.001000
5	597533002.1	0.1158	1.2299E-05	9/30/2022 7:51	9.00	4.10	0.024952	0.5	0.001000
6	597533003.1	0.1137	1.2177E-05	9/30/2022 7:58	9.00	4.20	0.025382	0.5	0.001000
7	597533004.1	0.1143	1.2210E-05	9/30/2022 8:05	9.00	4.10	0.024952	0.5	0.001000
8	597533005.1	0.1136	1.2172E-05	9/30/2022 9:00	9.00	4.10	0.024952	0.5	0.001000
9	1205226267.1	0.1166	1.2341E-05	10/28/2022 0:00	9.00	3.70	0.023233	0.5	0.001000
10	1205226268.1	0.1166	1.2341E-05	10/28/2022 0:00	9.00	2.00	0.015926	0.5	0.001000
11	1205226269.1	0.1166	1.2341E-05	10/28/2022 0:00	9.00	3.70	0.023233	0.5	0.001000

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
Pipet, 0.5 ml Stdev : +/- 0.001000 ml
Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-004
Instrument SOP: GL-RAD-I-016

Count Raw Data											
	Detector	Counting	Gross Counts		Gross Beta	Count	Strontium			Calculated	
Pos.	ID	Time (min.)	Alpha	Beta	CPM	Start Date/Time	Separation Date/Time	Yttrium Ingrowth	Sr-90 Decay	Sample Recovery %	Sample Recovery Error %
1	8A	150	13	134	0.889	11/2/2022 9:11	11/1/2022 15:45	0.183	0.998	88.9%	1.26%
2	5A	500	36	521	1.040	11/1/2022 19:09	11/1/2022 15:45	0.079	0.998	97.8%	1.24%
3	10D	240	8	97	0.401	11/2/2022 9:11	11/1/2022 15:45	0.190	0.998	60.0%	1.35%
4	9D	130	7	106	0.812	11/2/2022 9:11	11/1/2022 15:45	0.182	0.998	88.9%	1.26%
5	5D	500	23	499	0.996	11/1/2022 19:09	11/1/2022 15:45	0.079	0.998	91.1%	1.25%
6	9C	130	5	89	0.682	11/2/2022 9:11	11/1/2022 15:45	0.182	0.998	93.3%	1.25%
7	6C	500	30	743	1.482	11/1/2022 19:10	11/1/2022 15:45	0.079	0.998	91.1%	1.25%
8	7A	500	26	244	0.485	11/1/2022 19:10	11/1/2022 15:45	0.079	0.998	91.1%	1.25%
9	7B	500	34	306	0.608	11/1/2022 19:09	11/1/2022 15:45	0.079	1.000	82.2%	1.27%
10	2A	60	8	750	12.493	11/2/2022 6:22	11/1/2022 15:45	0.151	1.000	44.4%	1.45%
11	2B	60	6	1460	24.326	11/2/2022 6:22	11/1/2022 15:45	0.151	1.000	82.2%	1.27%

Calibration Data										
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)		Detector Efficiency Error (cpm/dpm)	Alpha X-Talk	Weekly Bkg CPM	Weekly Bkg Count Start Date/Time	Weekly Bkg Count Time (min.)
1	PIC	4/1/2021	3/31/2023	0.3565	0.5214	0.01579	0.04467	0.758	10/29/2022 8:05	500
2	PIC	4/1/2021	3/31/2023	0.3620	0.5227	0.00851	0.03268	1.014	10/29/2022 8:05	500
3	PIC	4/1/2021	3/31/2023	0.3437	0.5093	0.00557	0.08028	0.486	10/29/2022 8:06	500
4	PIC	4/1/2021	3/31/2023	0.3549	0.5102	0.02610	0.05749	0.714	10/29/2022 8:06	500
5	PIC	4/1/2021	3/31/2023	0.3664	0.5237	0.00925	0.04017	1.092	10/29/2022 8:05	500
6	PIC	4/1/2021	3/31/2023	0.3441	0.5099	0.00584	0.05868	0.730	10/29/2022 8:06	500
7	PIC	4/1/2021	3/31/2023	0.3528	0.4867	0.01970	0.07026	1.556	10/29/2022 8:05	500
8	PIC	4/1/2021	3/31/2023	0.3485	0.5013	0.00594	0.06067	0.590	10/29/2022 8:05	500
9	PIC	4/1/2021	3/31/2023	0.3503	0.5082	0.00627	0.05218	0.600	10/29/2022 8:05	500
10	PIC	4/1/2021	3/31/2023	0.3523	0.5073	0.01914	0.05433	1.108	10/29/2022 8:04	500
11	PIC	4/1/2021	3/31/2023	0.3571	0.5059	0.02111	0.06868	1.568	10/29/2022 8:04	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1943-D
LCS Exp Date : 6/4/2023
LCS Activity (dpm/ml): 514.93
LCS Volume Added: 0.10

Results																	Scanned Detector
Pos.	Decision Level pCi/F	Critical Level pCi/F	Required MDA pCi/F	MDA pCi/F	Sample Act. Conc. pCi/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/F	2 SIGMA Total Prop. Uncertainty pCi/F	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery	
1	1.9192	1.3549	3	2.9131	1.3360	65.67%	0.1315	0.0863	1.7187	1.7542		SAMPLE					
2	1.5283	1.0790	3	2.2197	0.2641	249.89%	0.0256	0.0641	1.2937	1.2955		SAMPLE					
3	1.9227	1.3574	3	2.9033	-1.2738	60.87%	-0.0845	0.0514	1.5194	1.5195		SAMPLE					
4	1.8864	1.3318	3	2.8882	0.9566	89.19%	0.0983	0.0876	1.6713	1.6909		SAMPLE					
5	1.6156	1.1407	3	2.3443	-1.0056	67.44%	-0.0958	0.0646	1.3289	1.3289		SAMPLE					
6	1.9093	1.3480	3	2.9208	-0.4641	171.93%	-0.0476	0.0819	1.5640	1.5641		SAMPLE					
7	2.0381	1.4389	3	2.9444	-0.8229	105.05%	-0.0742	0.0779	1.6939	1.6939		SAMPLE					
8	1.2724	0.8984	3	1.8642	-1.1821	44.11%	-0.1052	0.0464	1.0216	1.0216		SAMPLE					
9	1.3747	0.9706	3	2.0134	0.1018	581.66%	0.0085	0.0492	1.1605	1.1608		MB					
10	6.7938	4.7965	3	10.6066	230.8209	4.69%	11.3848	0.4587	18.2289	63.7532		LCS			198.9594	116.0%	
11	4.3227	3.0518	3	6.6459	246.7919	3.74%	22.7585	0.6392	13.5857	66.9096		LCSD	6.7%		198.9594	124.0%	

Results (DPM)															
Decision Level DPM/F	Critical Level DPM/F	Required MDA DPM/F	MDA DPM/F	Sample Act. Conc. DPM/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	1 SIGMA Counting Uncertainty DPM/F	1 SIGMA Total Prop. Uncertainty DPM/F	Sample QC	Sample Type	RPD	RER	Nominal DPM/F	Recovery
4.2605	3.0080	6.66	6.4671	2.9658	65.67%	0.1315	0.0863	3.8155	3.8942		SAMPLE				
3.3928	2.3953	6.66	4.9278	0.5864	249.89%	0.0256	0.0641	2.8720	2.8760		SAMPLE				
4.2684	3.0135	6.66	6.4453	-2.8279	60.87%	-0.0845	0.0514	3.3731	3.3733		SAMPLE				
4.1878	2.9566	6.66	6.4118	2.1236	89.19%	0.0983	0.0876	3.7102	3.7539		SAMPLE				
3.5867	2.5322	6.66	5.2042	-2.2324	67.44%	-0.0958	0.0646	2.9502	2.9502		SAMPLE				
4.2387	2.9926	6.66	6.4843	-1.0304	171.93%	-0.0476	0.0819	3.4721	3.4723		SAMPLE				
4.5246	3.1944	6.66	6.5365	-1.8268	105.05%	-0.0742	0.0779	3.7604	3.7605		SAMPLE				
2.8248	1.9943	6.66	4.1384	-2.6243	44.11%	-0.1052	0.0464	2.2679	2.2679		SAMPLE				
3.0519	2.1547	6.66	4.4698	0.2260	581.66%	0.0085	0.0492	2.5763	2.5770		MB				
15.0822	10.6481	6.66	23.5468	512.4225	4.69%	11.3848	0.4587	40.4681	141.5322		LCS			441.69	116.0%
9.5963	6.7751	6.66	14.7538	547.8780	3.74%	22.7585	0.6392	30.1602	148.5393		LCSD	6.7%		441.69	124.0%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
597531001	8A	150	13	134	11/2/2022 9:11	11/2/2022 11:41	PIC	2333238
597531002	5A	500	36	521	11/1/2022 19:09	11/2/2022 3:29	PIC	2333238
597531003	10D	240	8	97	11/2/2022 9:11	11/2/2022 13:11	PIC	2333238
597533001	9D	130	7	106	11/2/2022 9:11	11/2/2022 11:21	PIC	2333238
597533002	5D	500	23	499	11/1/2022 19:09	11/2/2022 3:29	PIC	2333238
597533003	9C	130	5	89	11/2/2022 9:11	11/2/2022 11:21	PIC	2333238
597533004	6C	500	30	743	11/1/2022 19:10	11/2/2022 3:30	PIC	2333238
597533005	7A	500	26	244	11/1/2022 19:10	11/2/2022 3:30	PIC	2333238
1205226267	7B	500	34	306	11/1/2022 19:09	11/2/2022 3:29	PIC	2333238
1205226268	2A	60	8	750	11/2/2022 6:22	11/2/2022 7:22	PIC	2333238
1205226269	2B	60	6	1460	11/2/2022 6:22	11/2/2022 7:22	PIC	2333238

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 01-Nov-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	need 2nd	Alpha bkg	01-Nov 05:14	60	0.017	-3.73E-2	0.175	-1.48
LB4100A2	Above	Beta bkg	01-Nov 05:14	60	2.083	1.377	2.444	+0.97
LB4100E2	Above	Beta bkg	01-Nov 04:54	60	2.433	1.385	3.072	+0.73
LB4100E4	Above	Beta bkg	01-Nov 04:54	60	3.733	0.976	2.268	+9.81
LB4100F2	need 2nd	Alpha eff	01-Nov 06:04	5	6564	6533	7372	-2.78
LB4100F2	need 2nd	Alpha XTalk	01-Nov 06:04	5	0.363	0.318	0.366	+2.62
LB4100F2	Above	Beta bkg	01-Nov 04:54	60	36.217	1.173	1.833	+315.58
LB4100F3	Above	Alpha bkg	01-Nov 04:54	60	0.367	0.119	0.404	+2.22
LB4100F3	Above	Alpha eff	01-Nov 06:04	5	16073	11460	15350	+4.11
LB4100F3	Below	Alpha XTalk	01-Nov 06:04	5	0.315	0.328	0.439	-3.69
LB4100F4	Below	Alpha eff	01-Nov 06:04	5	11546	12140	14390	-4.58
LB4100F4	Above	Alpha XTalk	01-Nov 06:04	5	0.368	0.287	0.347	+5.13
LB4100G1	Above	Alpha XTalk	01-Nov 05:56	5	1.033	0.088	0.447	+12.81
LB4100G1	Above	Beta bkg	01-Nov 04:55	60	6840	0.380	1.675	+31,690.40
LB4100G1	Above	Beta eff	01-Nov 06:04	5	21573	12880	18320	+6.59
LB4100G3	Above	Beta bkg	01-Nov 04:55	60	2.333	0.810	1.674	+7.58
LB4100H1	Above	Beta bkg	01-Nov 04:54	60	2.567	0.216	2.462	+3.28
PIC4D	Above	Alpha bkg	01-Nov 05:27	60	0.567	-4.40E-2	0.433	+4.69
PIC4D	Above	Beta bkg	01-Nov 05:27	60	3.533	0.100	2.482	+5.65
PIC8B	Above	Alpha bkg	01-Nov 05:39	60	0.750	-1.16E-1	0.388	+7.32
PIC8B	Above	Beta bkg	01-Nov 05:39	60	3.283	-1.80E-1	2.341	+5.24
PIC8B	Above	Beta XTalk	01-Nov 05:32	5	0.002	2.00E-4	9.31E-4	+8.44
PIC8D	Above	Beta bkg	01-Nov 05:39	60	2.733	-1.07E-1	2.328	+4.00
PIC10B	Above	Beta bkg	01-Nov 05:46	60	2.267	-1.04E-1	2.645	+2.17
PIC12B	Above	Beta bkg	01-Nov 05:52	60	2.200	0.269	2.358	+2.55

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 11/11/22

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 02-Nov-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stddev
LB4100A2	need 2nd	Beta bkg	02-Nov 05:12	60	1.817	1.377	2.444	-0.53
LB4100A3	Above	Beta eff	02-Nov 06:29	5	24294	18490	23930	+3.40
LB4100E2	Above	Beta bkg	02-Nov 04:36	60	2.350	1.385	3.072	+0.43
LB4100E4	Above	Beta bkg	02-Nov 04:36	60	3.150	0.976	2.268	+7.10
LB4100E4	Below	Beta eff	02-Nov 05:38	5	15953	16060	18510	-3.26
LB4100F2	Below	Alpha eff	02-Nov 05:46	5	6508	6533	7372	-3.18
LB4100F2	Above	Alpha XTalk	02-Nov 05:46	5	0.367	0.318	0.366	+3.16
LB4100F2	Above	Beta bkg	02-Nov 04:36	60	34.483	1.173	1.833	+299.82
LB4100F3	need 2nd	Alpha bkg	02-Nov 04:36	60	0.267	0.119	0.404	+0.11
LB4100F3	Above	Alpha eff	02-Nov 05:46	5	15814	11460	15350	+3.72
LB4100F3	Below	Alpha XTalk	02-Nov 05:46	5	0.322	0.328	0.439	-3.32
LB4100F4	Below	Alpha eff	02-Nov 05:46	5	11162	12140	14390	-5.61
LB4100F4	Above	Alpha XTalk	02-Nov 05:46	5	0.381	0.287	0.347	+6.41
LB4100G1	Above	Alpha XTalk	02-Nov 05:38	5	0.778	0.088	0.447	+8.55
LB4100G1	Above	Beta bkg	02-Nov 04:36	60	4996	0.380	1.675	+23,148.23
LB4100G1	Above	Beta eff	02-Nov 05:46	5	19491	12880	18320	+4.29
LB4100G3	Above	Beta bkg	02-Nov 04:36	60	2.233	0.810	1.674	+6.88
LB4100H1	Above	Beta bkg	02-Nov 04:36	60	2.850	0.216	2.462	+4.04
PIC2C	Below	Alpha eff	02-Nov 15:09	5	19251	19380	21750	-3.33
PIC2C	Above	Alpha XTalk	02-Nov 15:09	5	0.277	0.238	0.276	+3.19
PIC4D	Above	Alpha bkg	02-Nov 05:09	60	0.600	-4.40E-2	0.433	+5.11
PIC4D	Above	Beta bkg	02-Nov 05:09	60	3.233	0.100	2.482	+4.89
PIC8B	Above	Alpha bkg	02-Nov 05:20	60	0.717	-1.16E-1	0.388	+6.93
PIC8B	Above	Beta bkg	02-Nov 05:20	60	3.450	-1.80E-1	2.341	+5.64
PIC8B	Above	Beta XTalk	02-Nov 05:13	5	0.001	2.00E-4	9.31E-4	+7.54
PIC8D	Above	Beta bkg	02-Nov 05:20	60	2.800	-1.07E-1	2.328	+4.16
PIC10B	Above	Beta bkg	02-Nov 05:28	60	2.667	-1.04E-1	2.645	+3.05
PIC11B	Above	Alpha bkg	02-Nov 12:10	60	0.333	-1.80E-1	0.522	+1.39
PIC12B	Above	Beta bkg	02-Nov 05:33	60	2.383	0.269	2.358	+3.07

PIC14B	Above	Alpha bkg	02-Nov 05:39	60	0.450	-1.04E-1	0.352	+4.28
PIC14B	Above	Beta bkg	02-Nov 05:39	60	2.783	-2.13E-1	2.672	+3.23

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

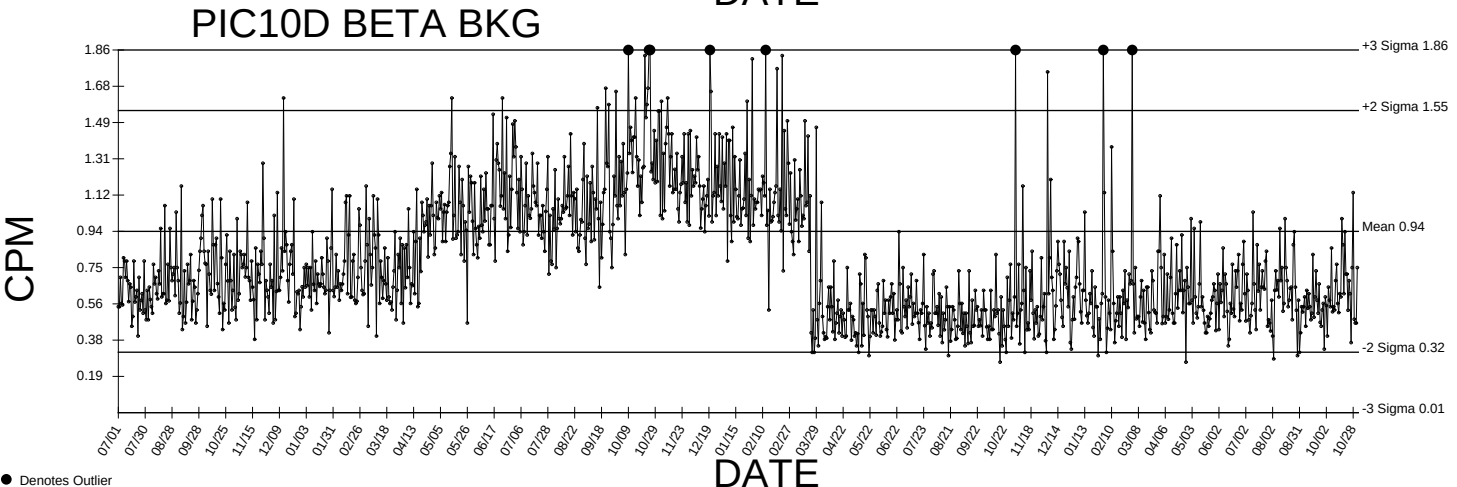
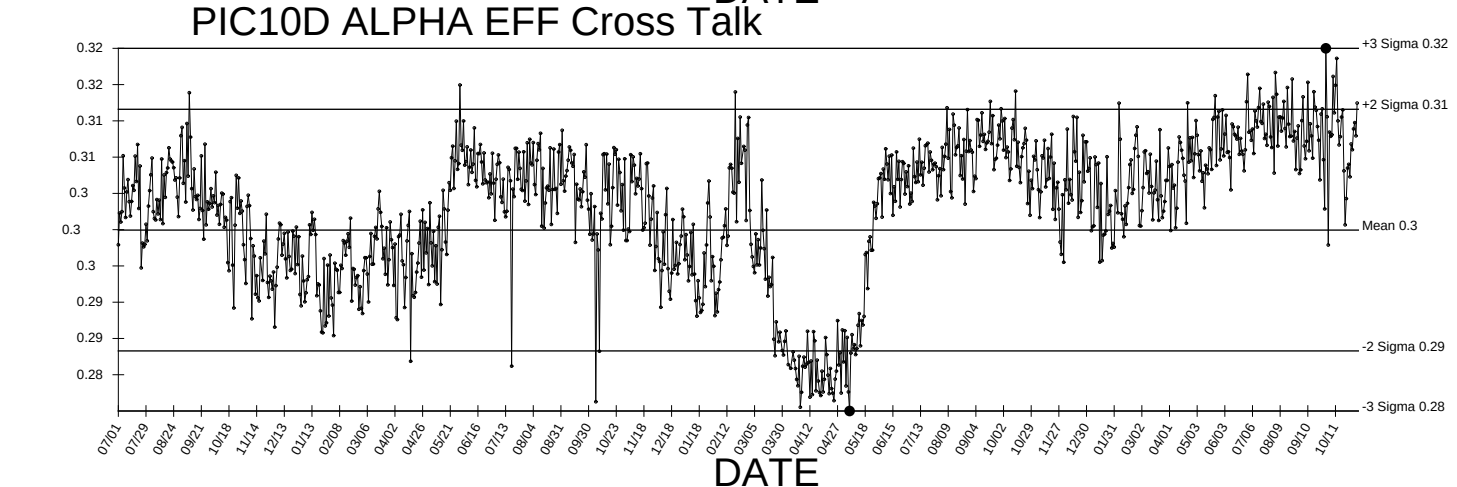
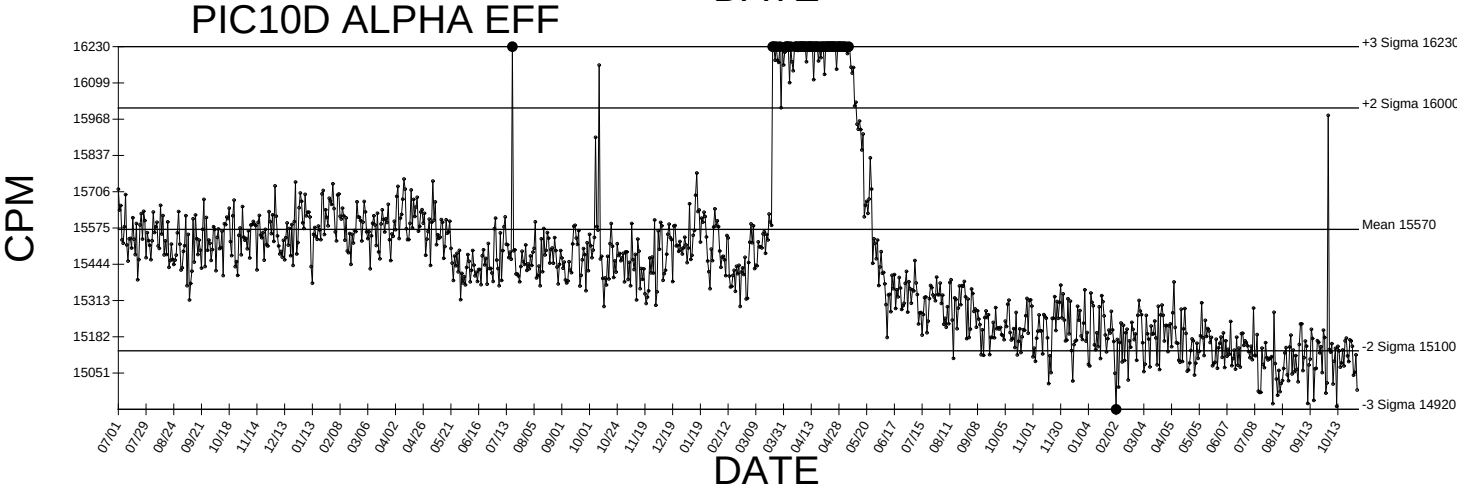
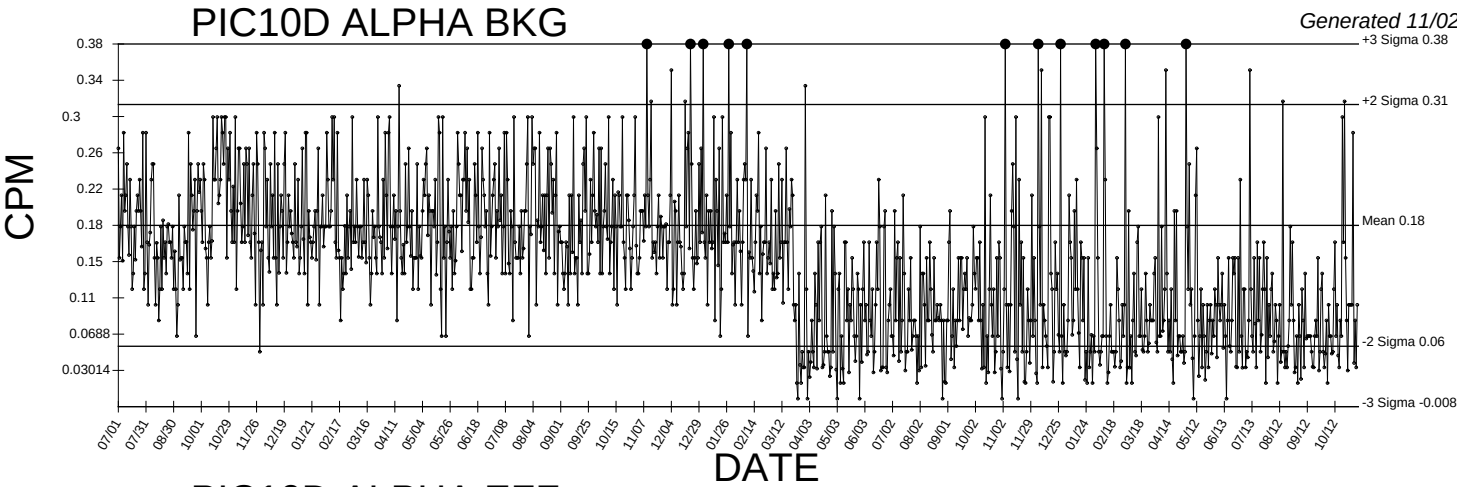
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by  _____

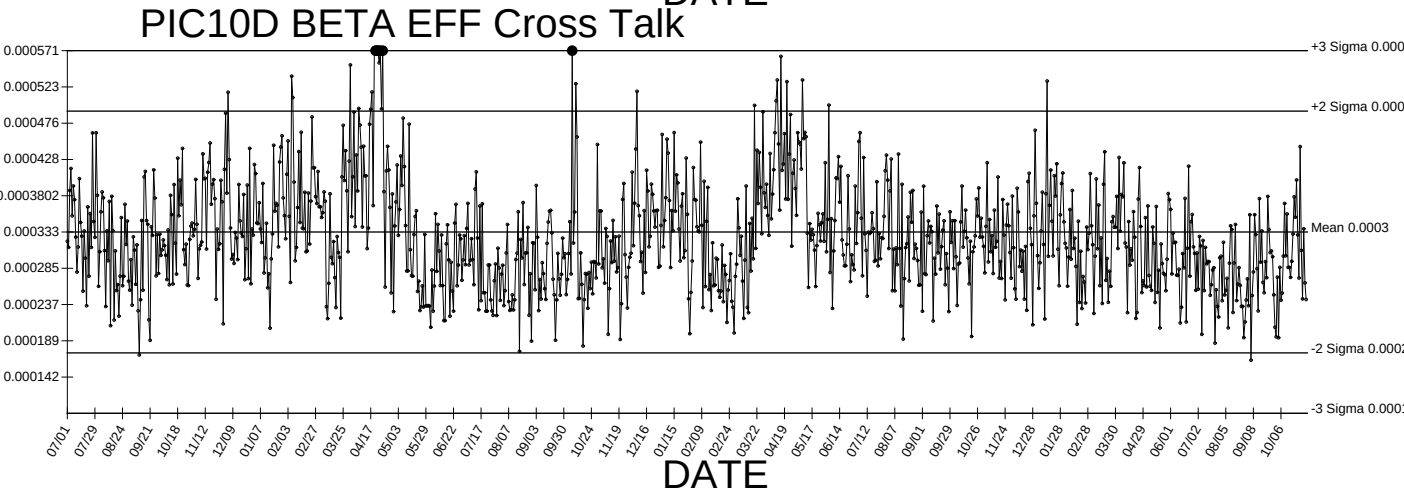
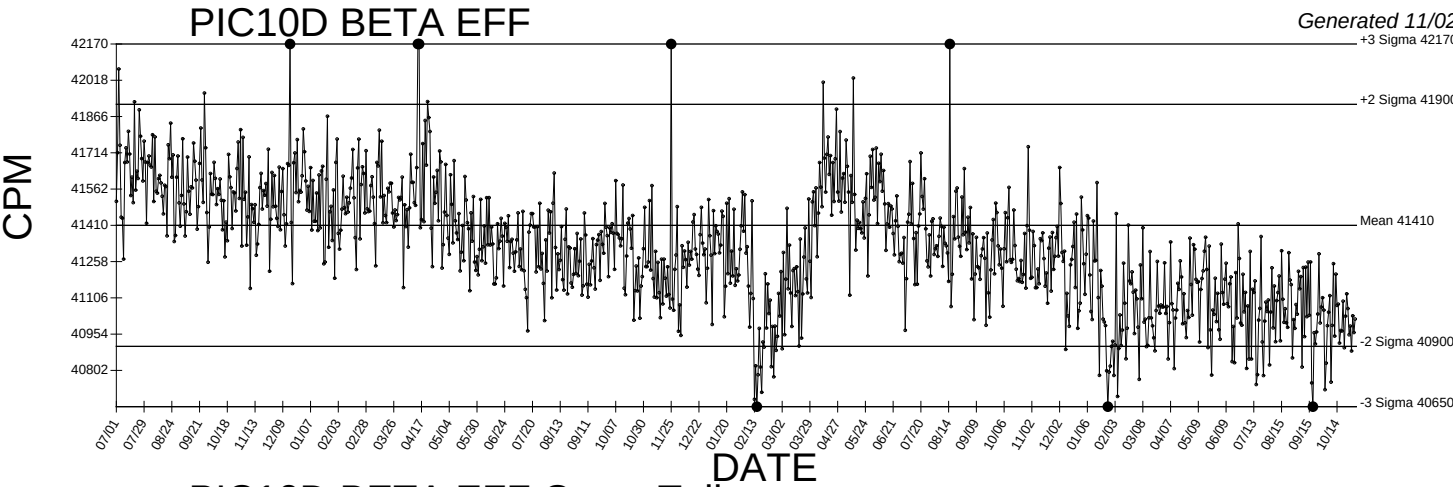
Date 11/21/22

GEL Laboratories LLC

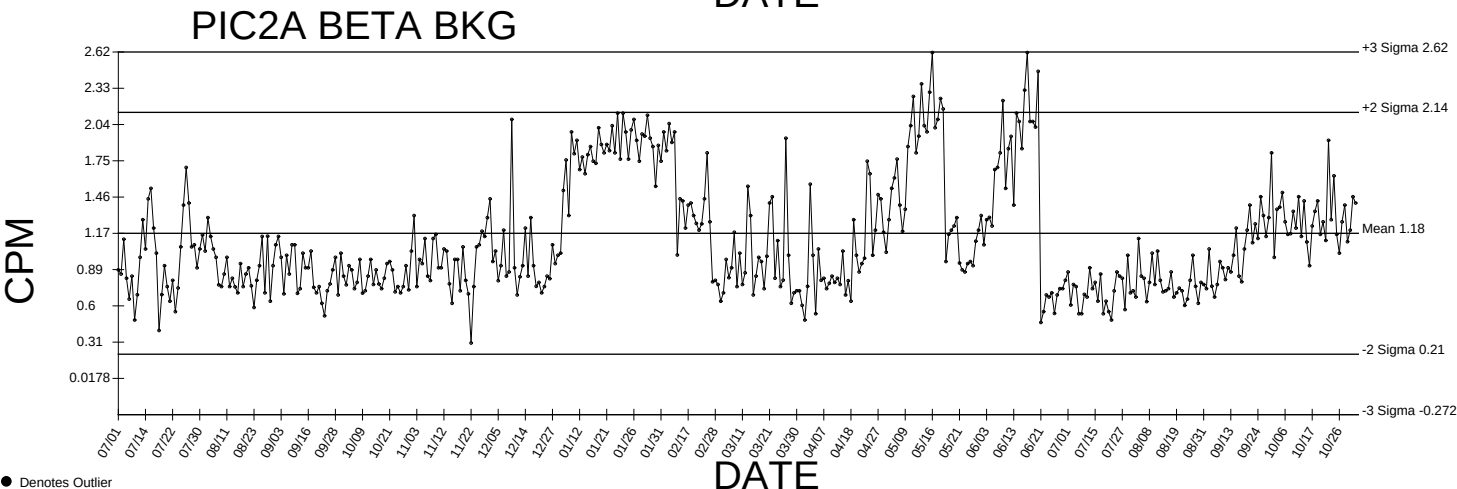
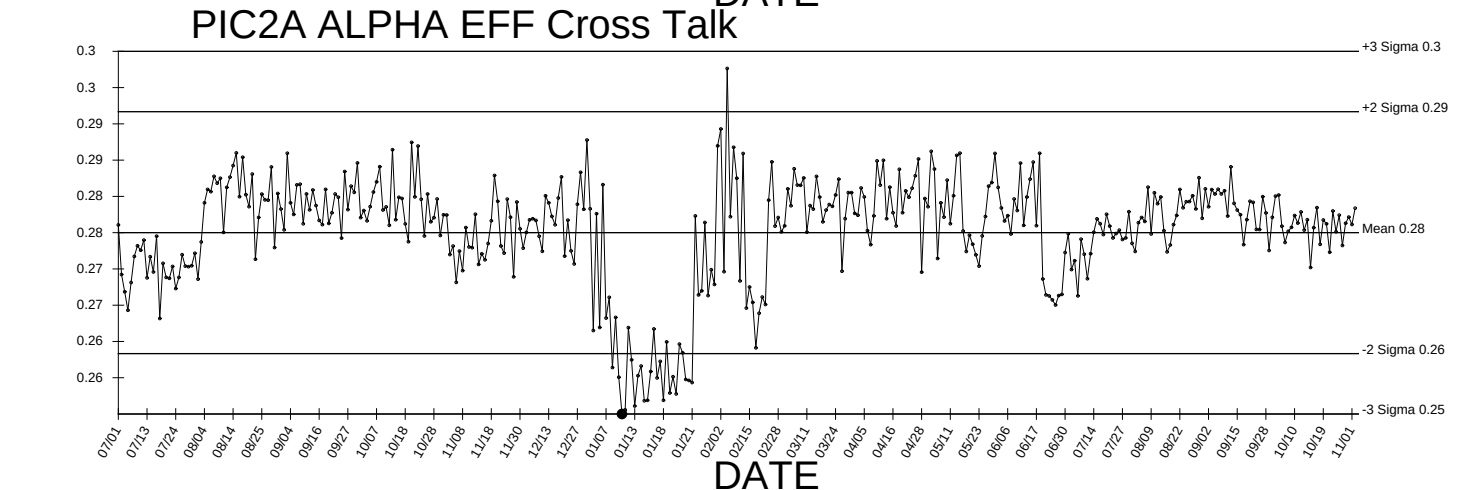
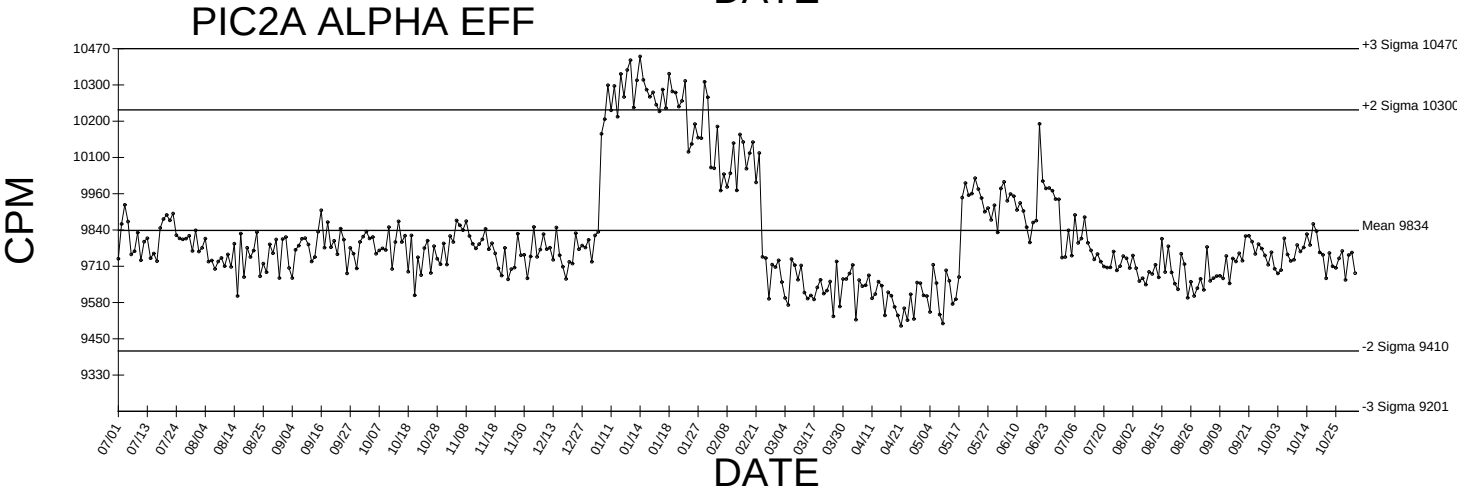
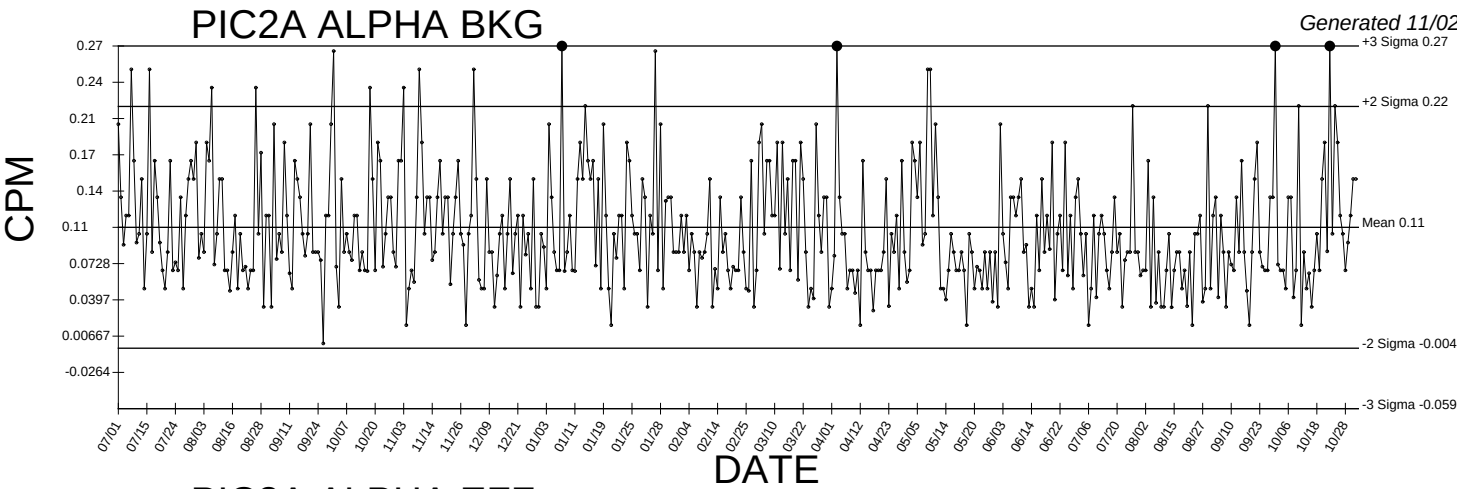
Background and Efficiency Data



● Denotes Outlier



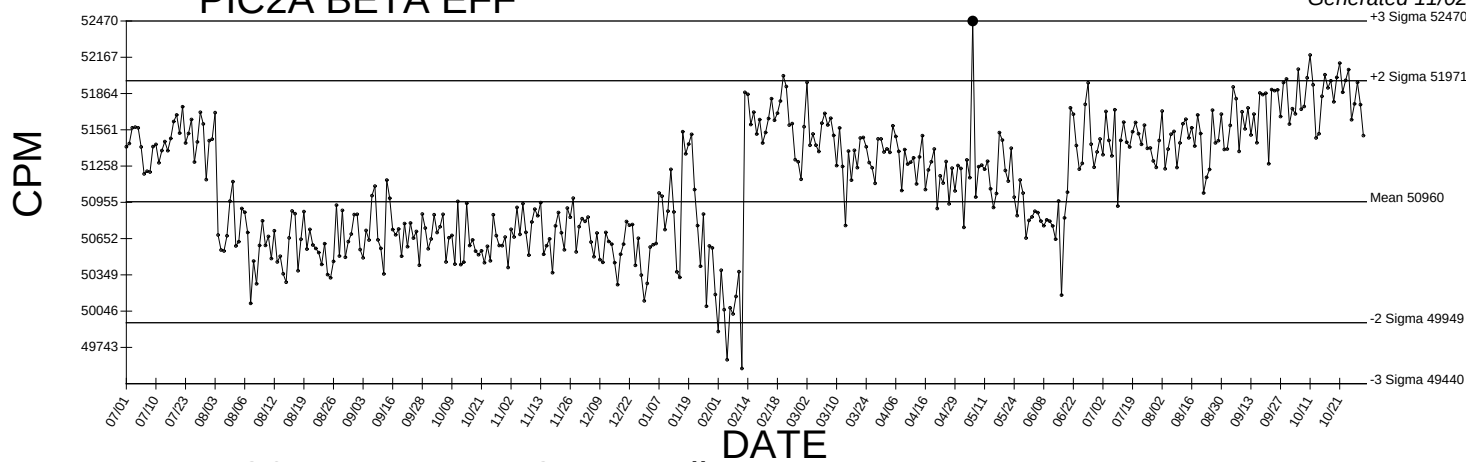
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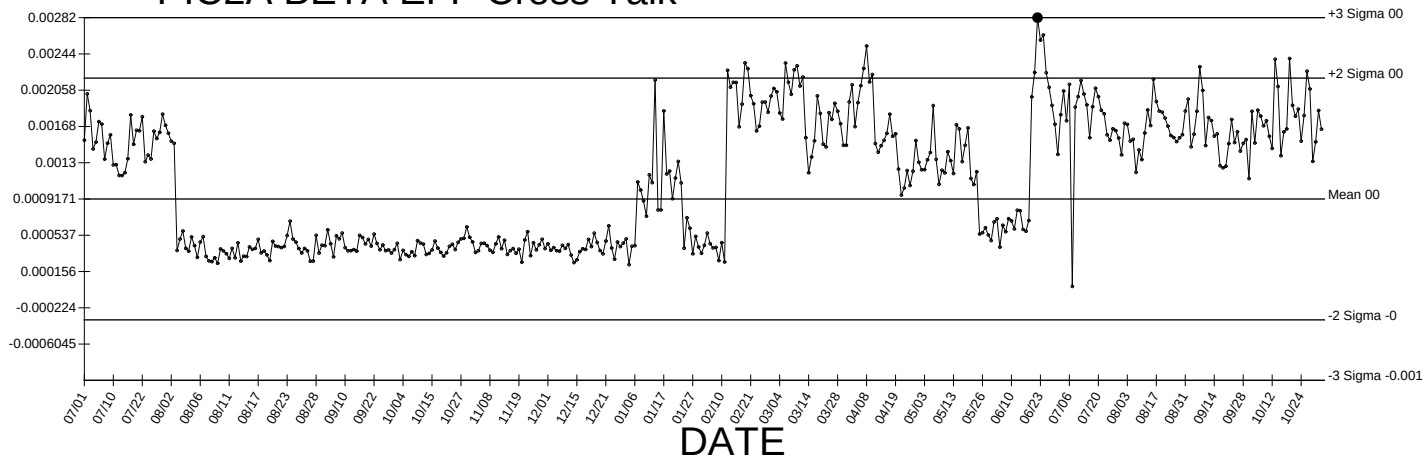
● Denotes Outlier

PIC2A BETA EFF

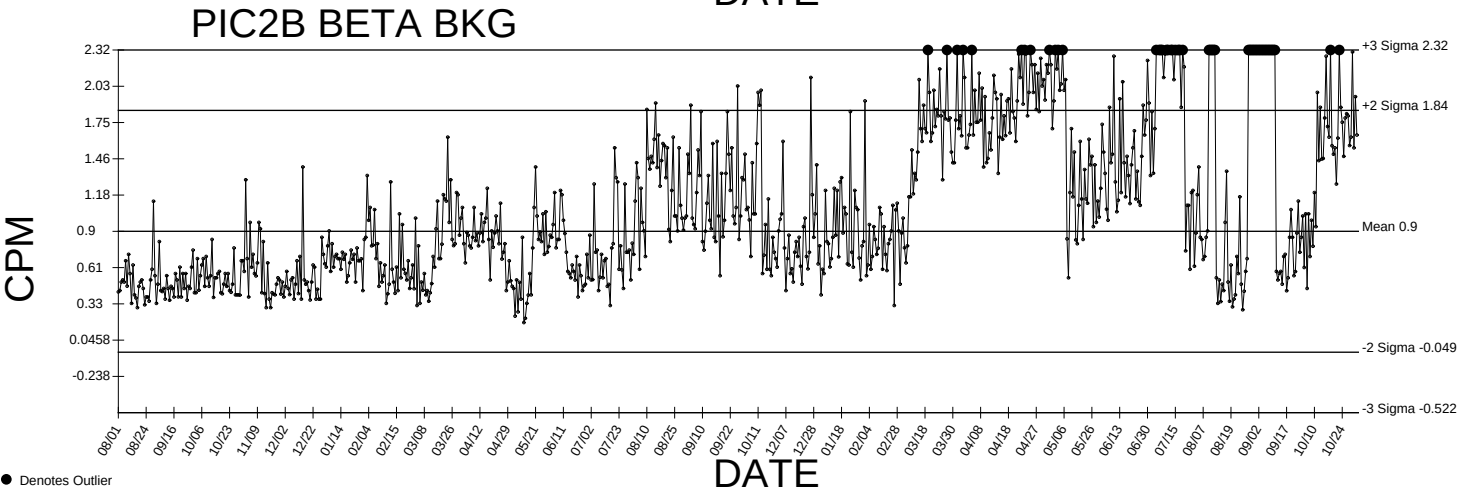
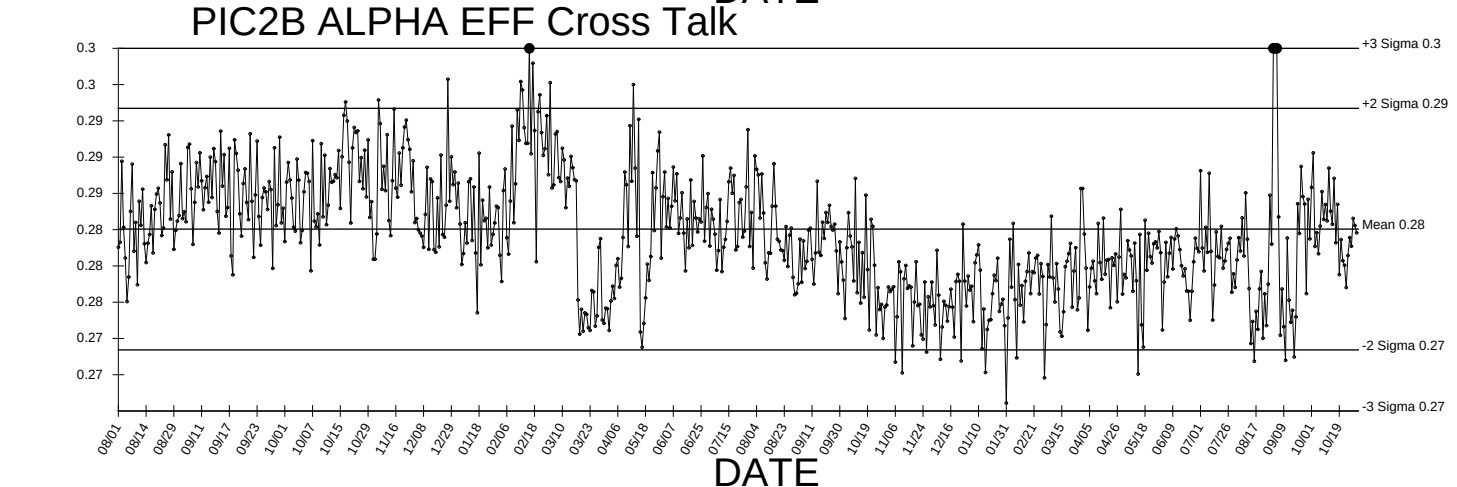
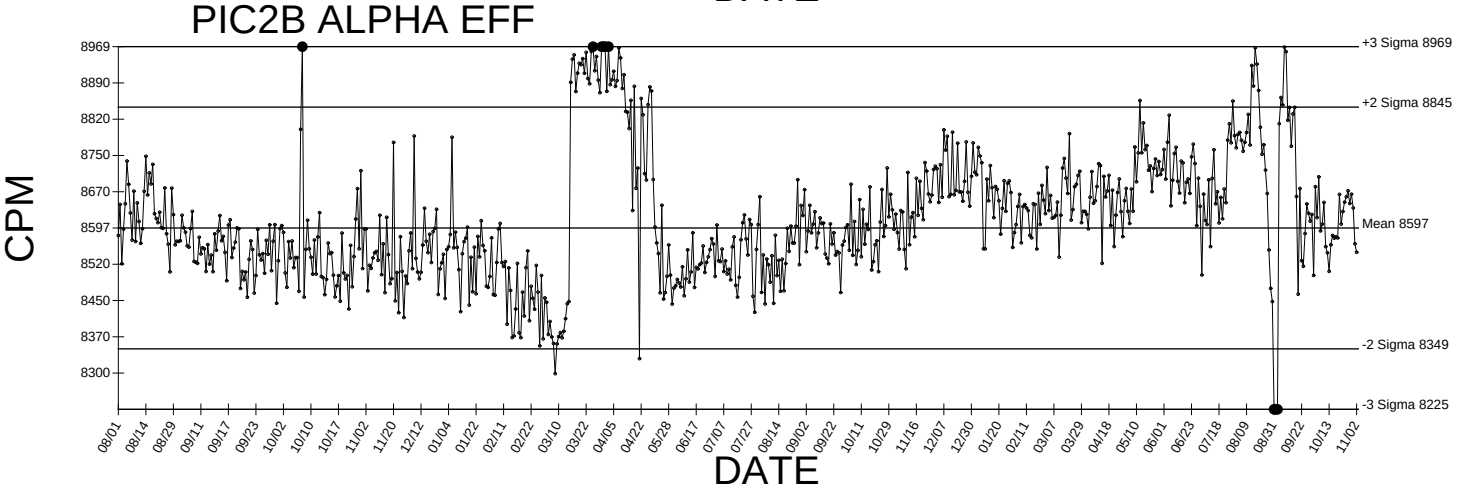
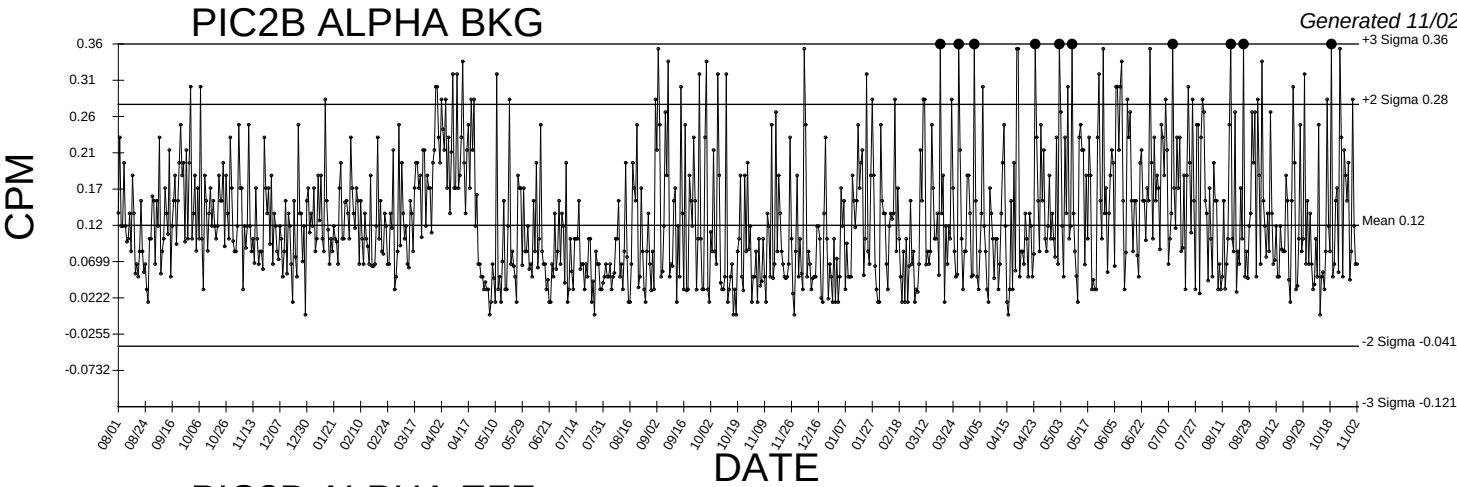
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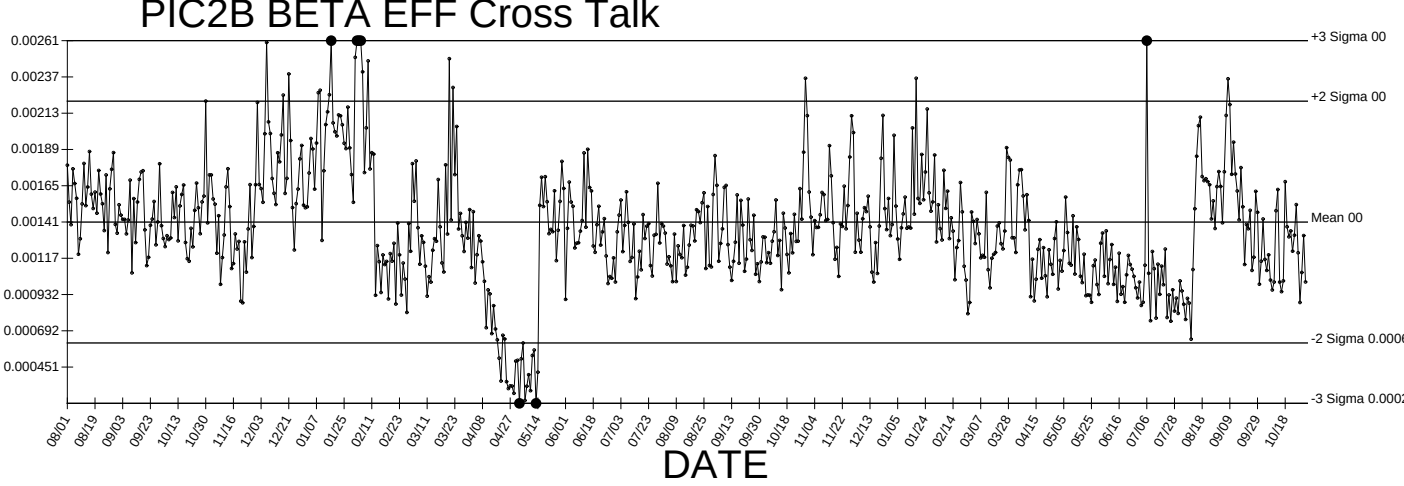
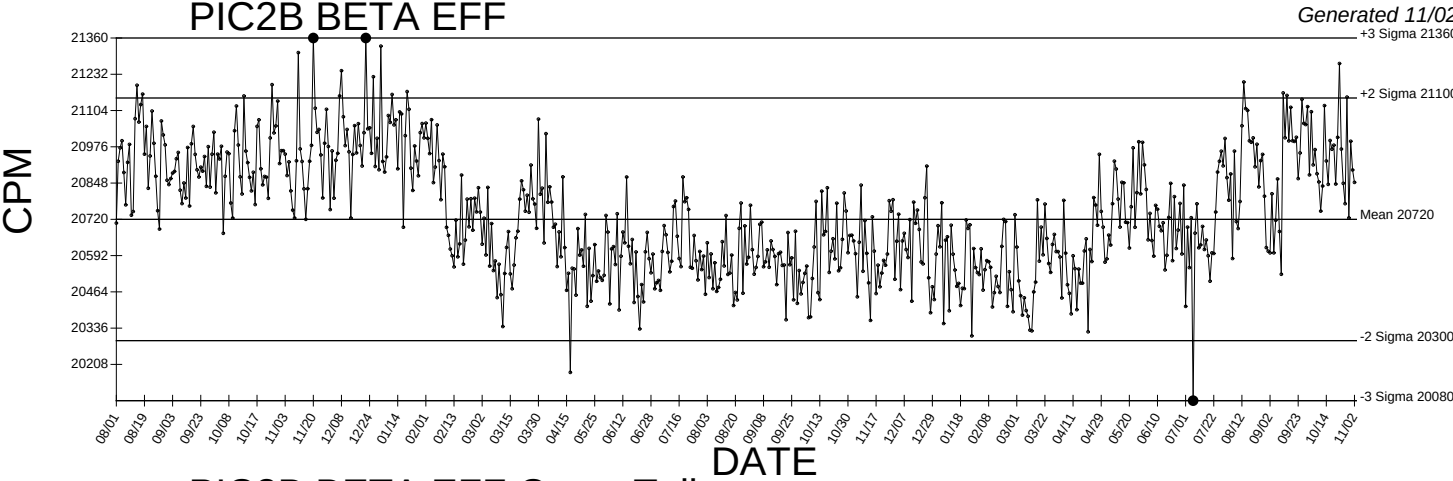
PIC2A BETA EFF Cross Talk



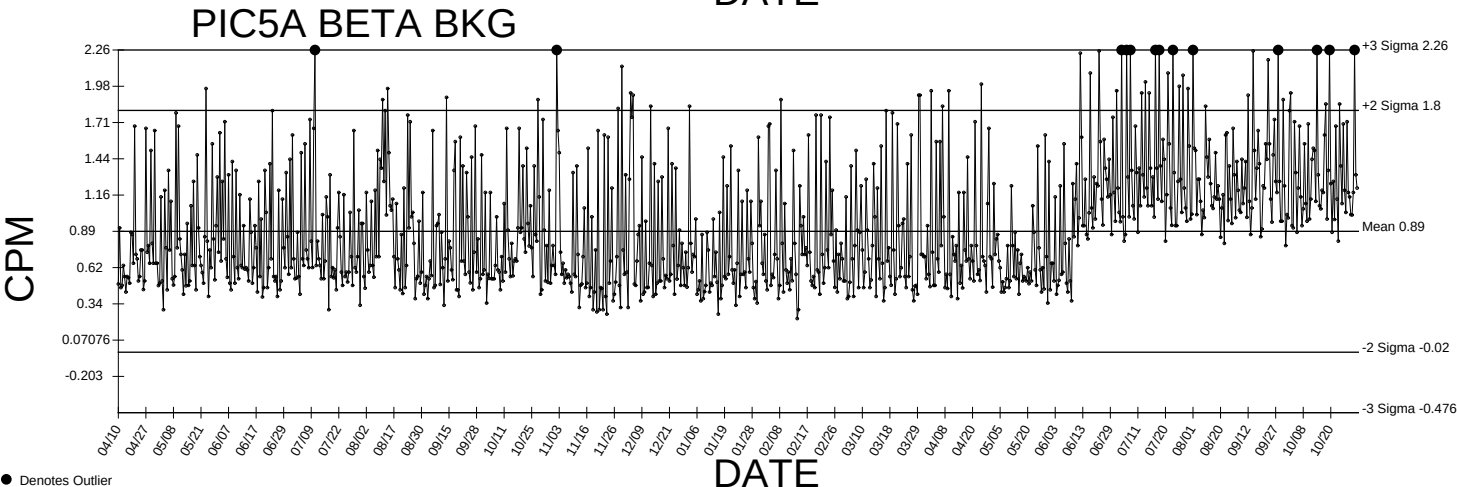
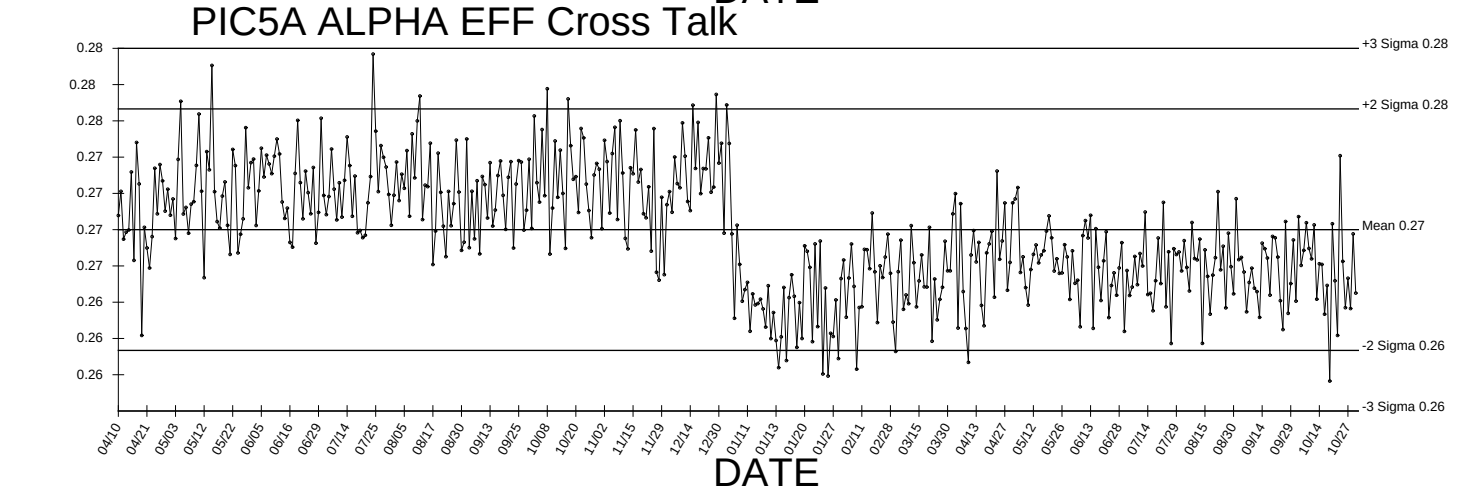
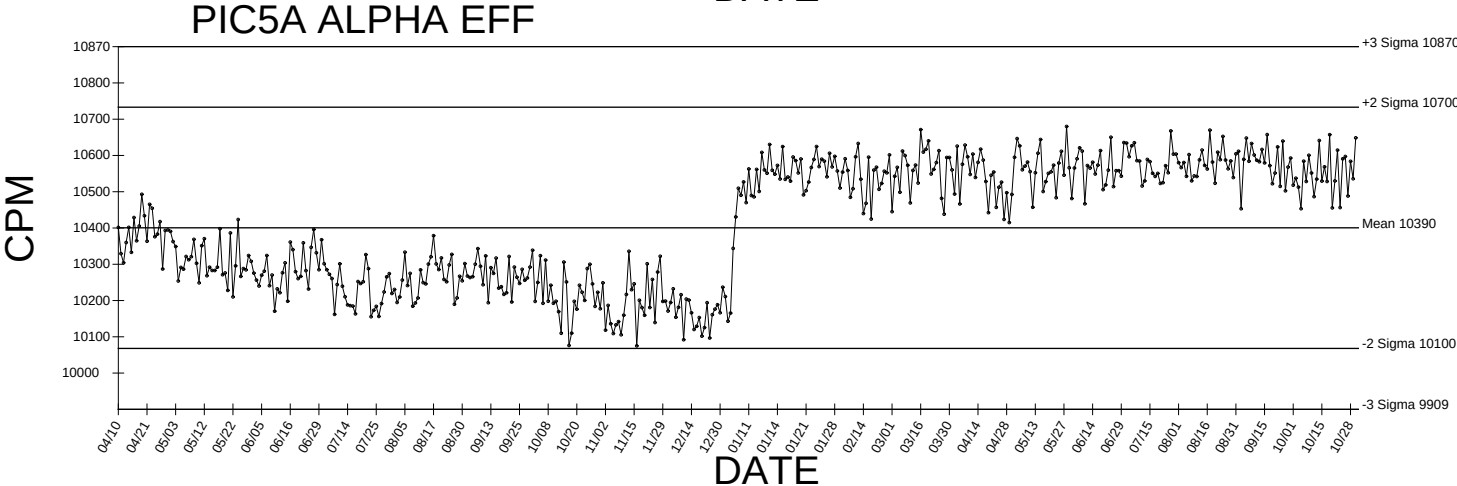
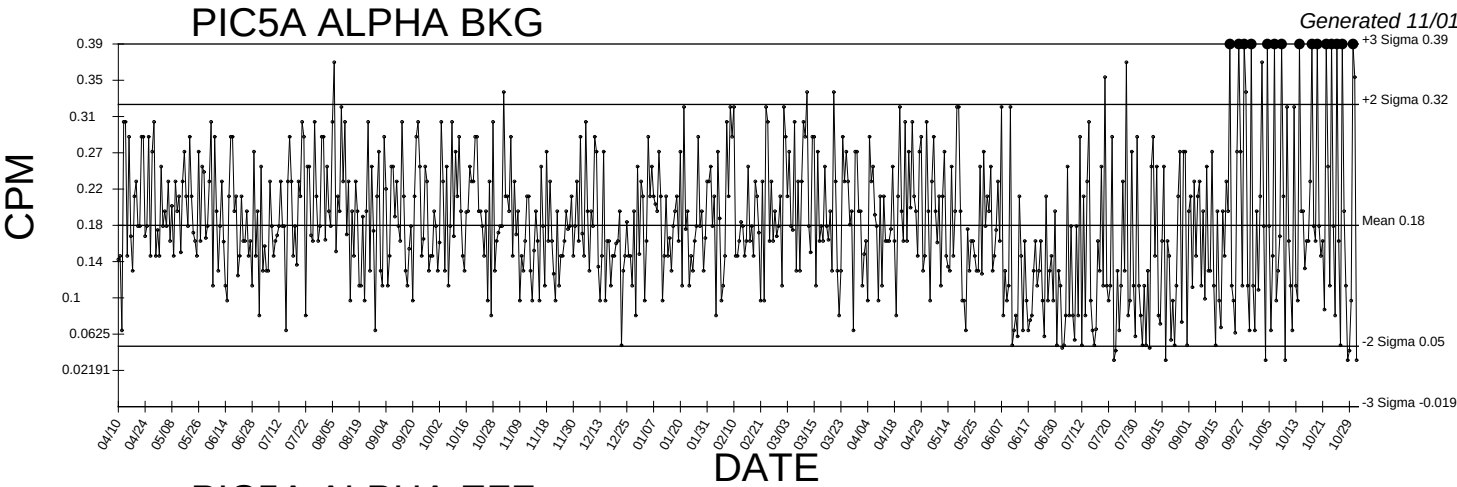
● Denotes Outlier



● Denotes Outlier



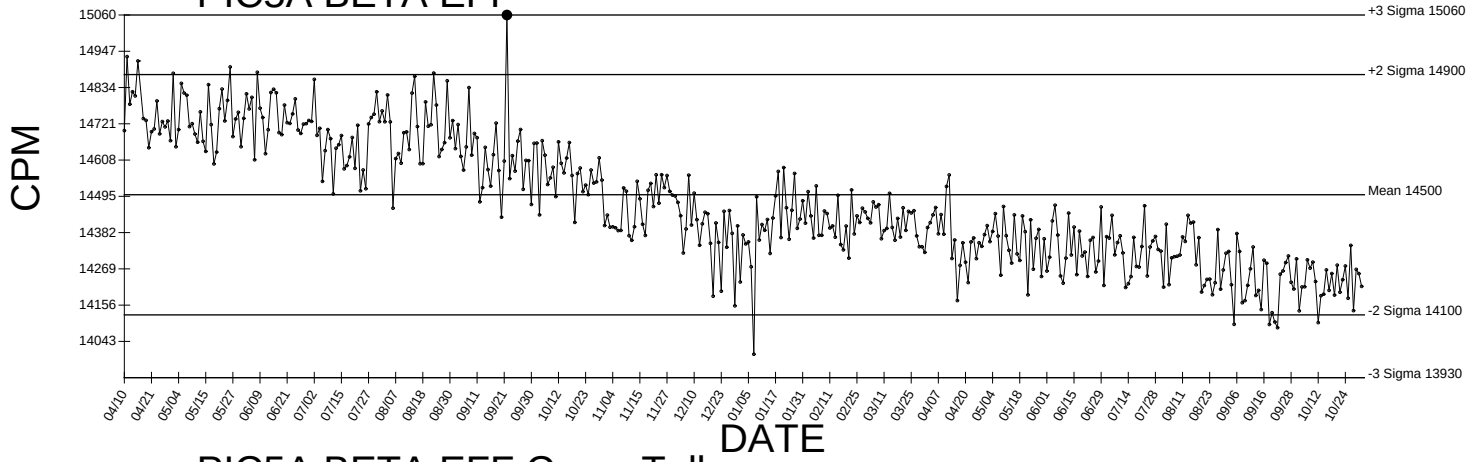
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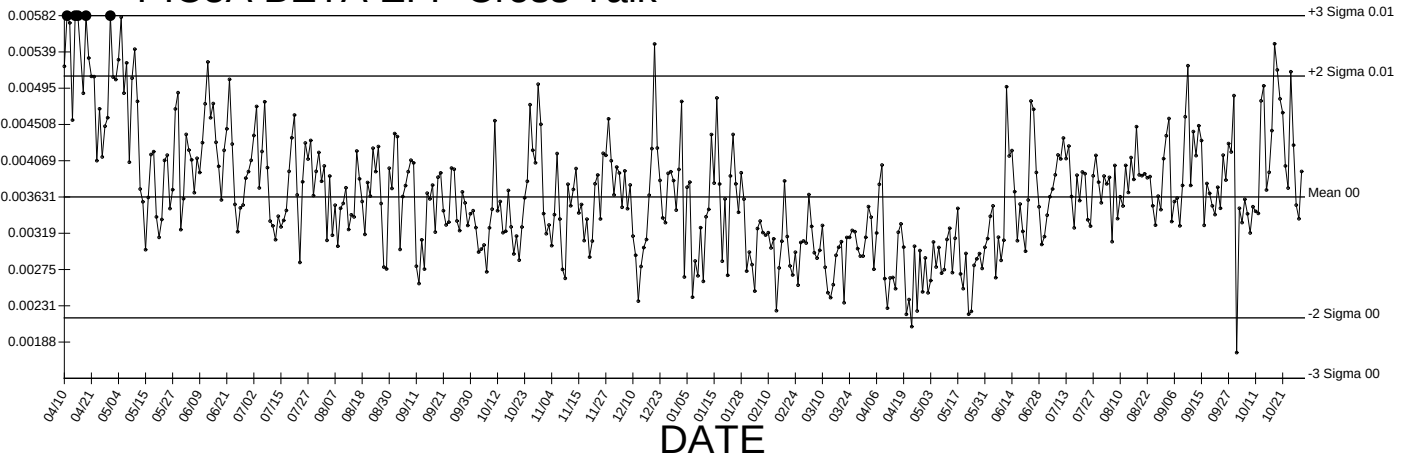
● Denotes Outlier

PIC5A BETA EFF

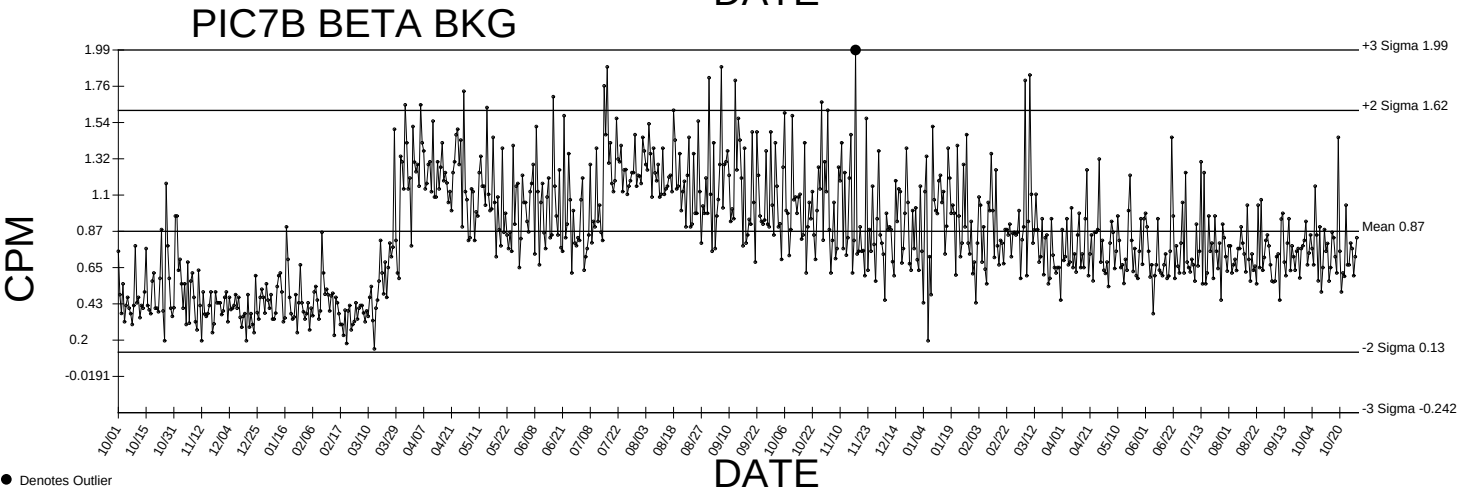
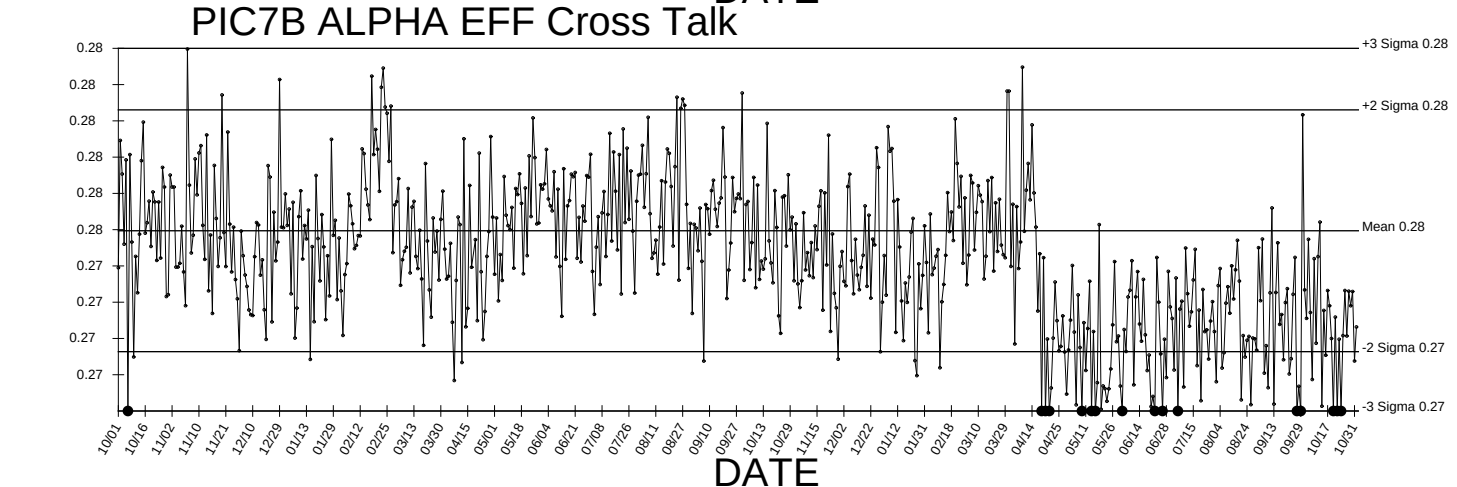
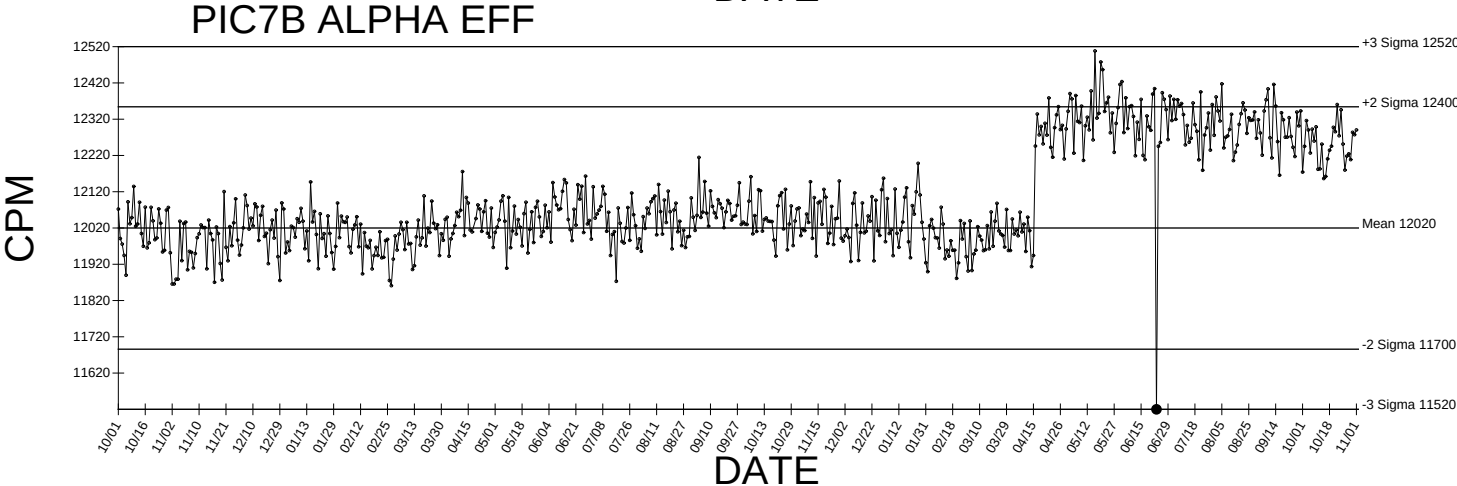
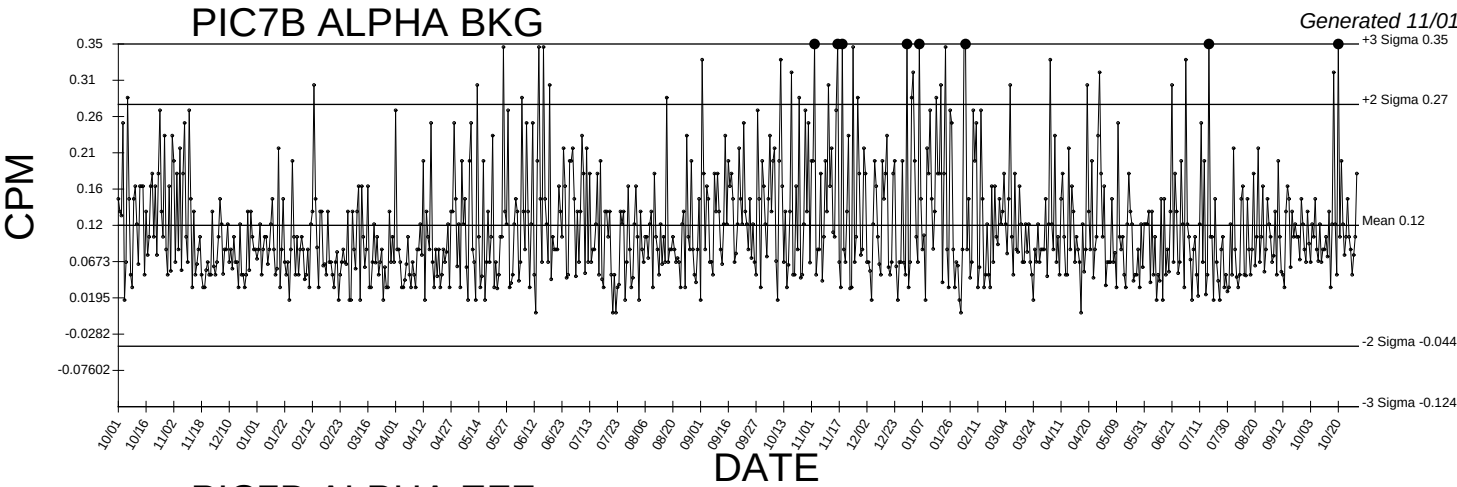
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+3 Sigma 15060



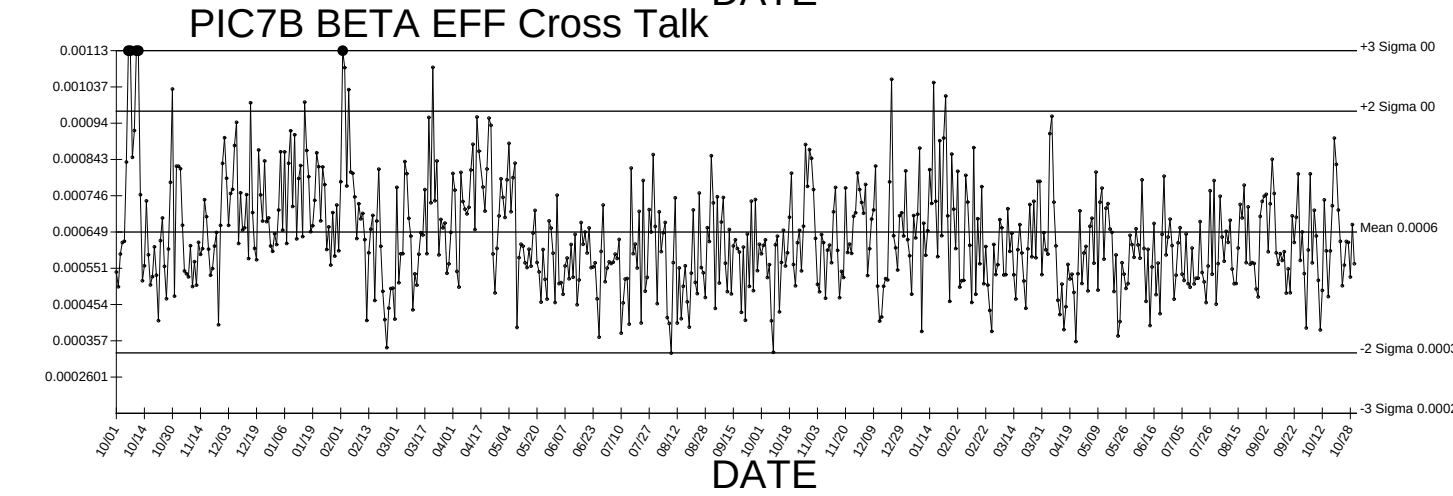
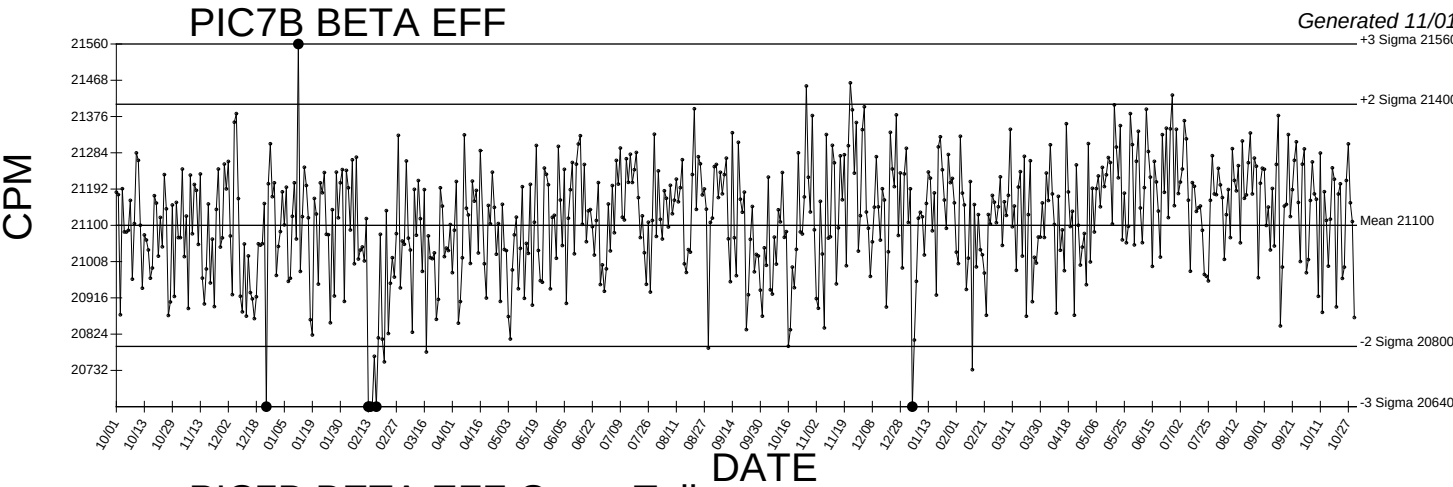
PIC5A BETA EFF Cross Talk



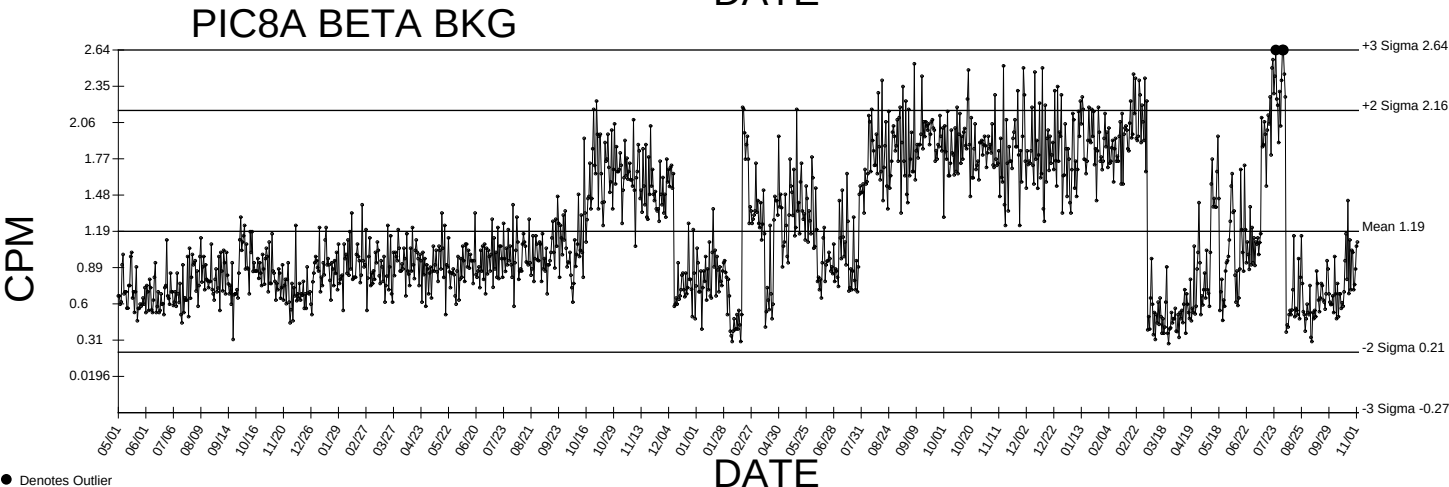
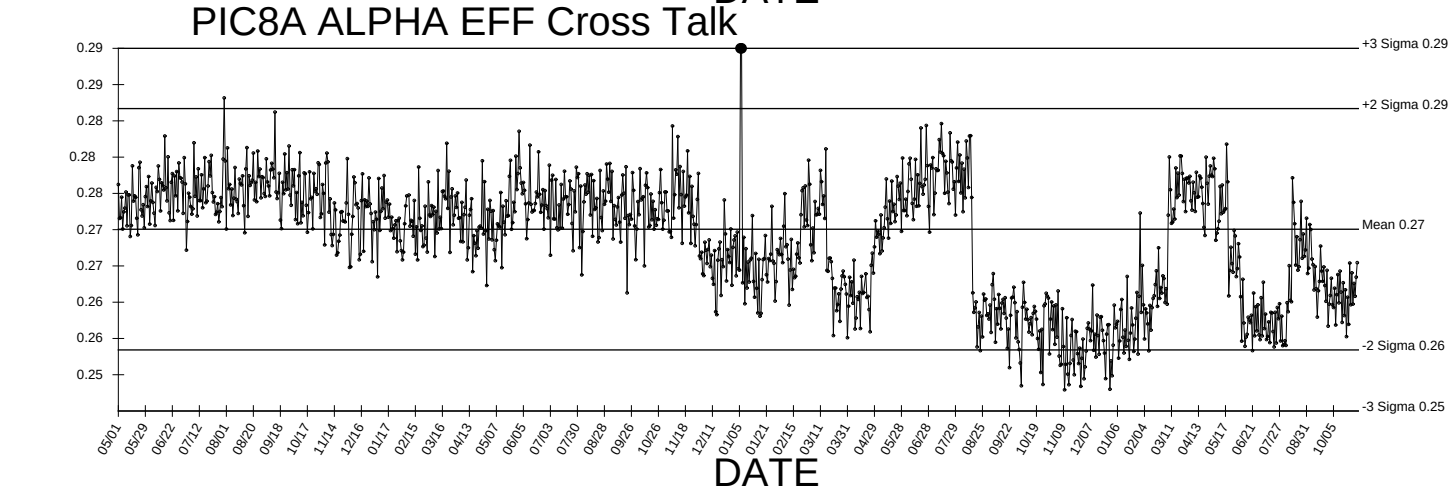
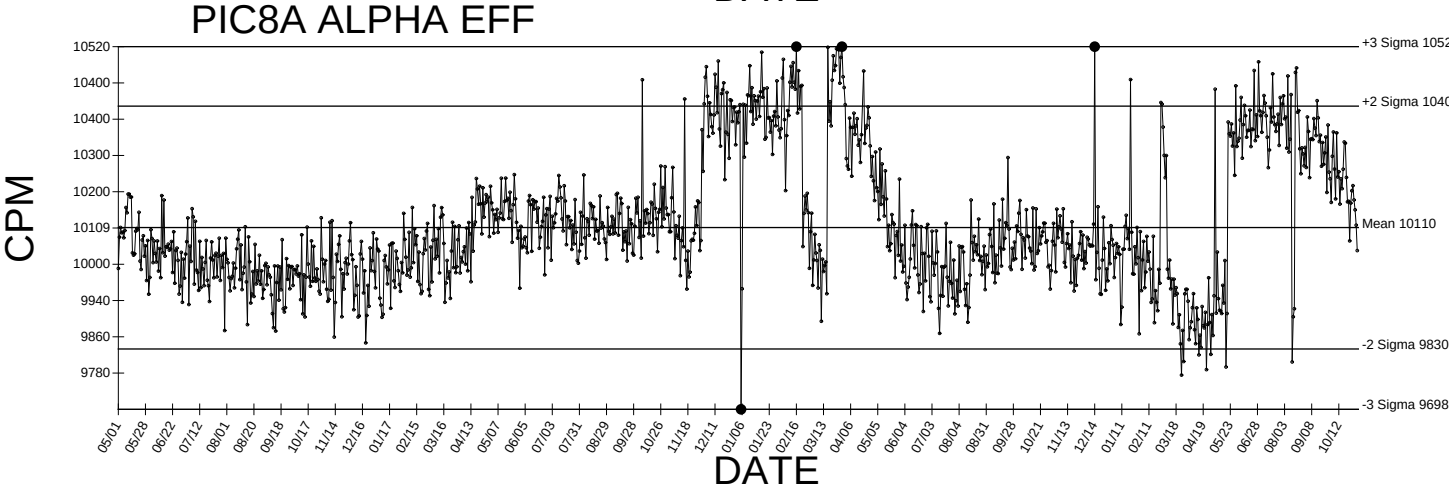
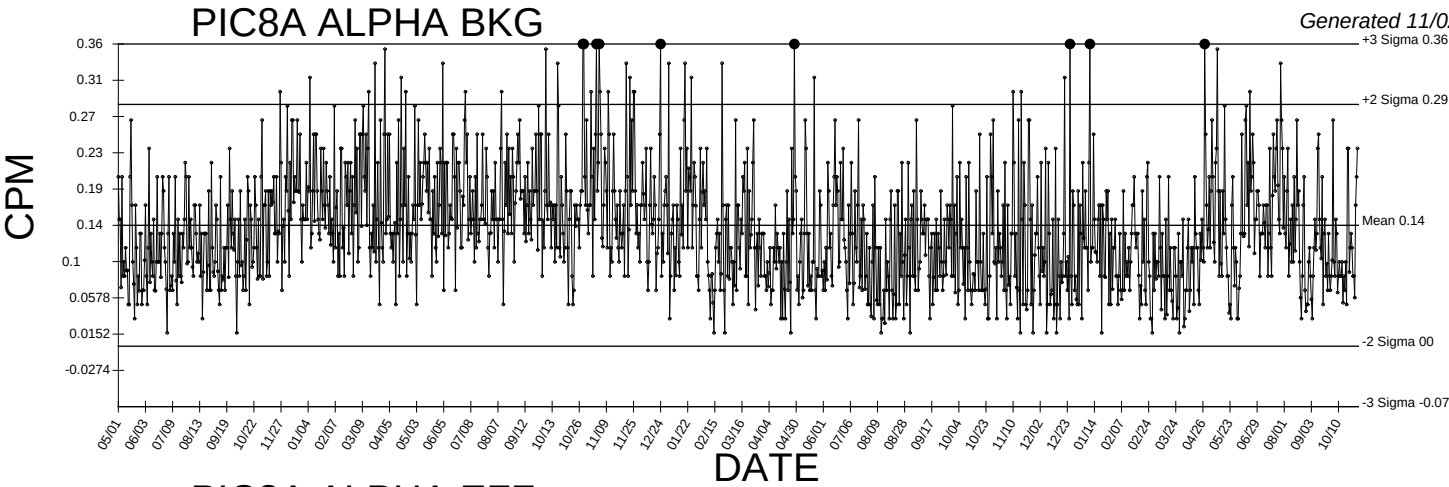
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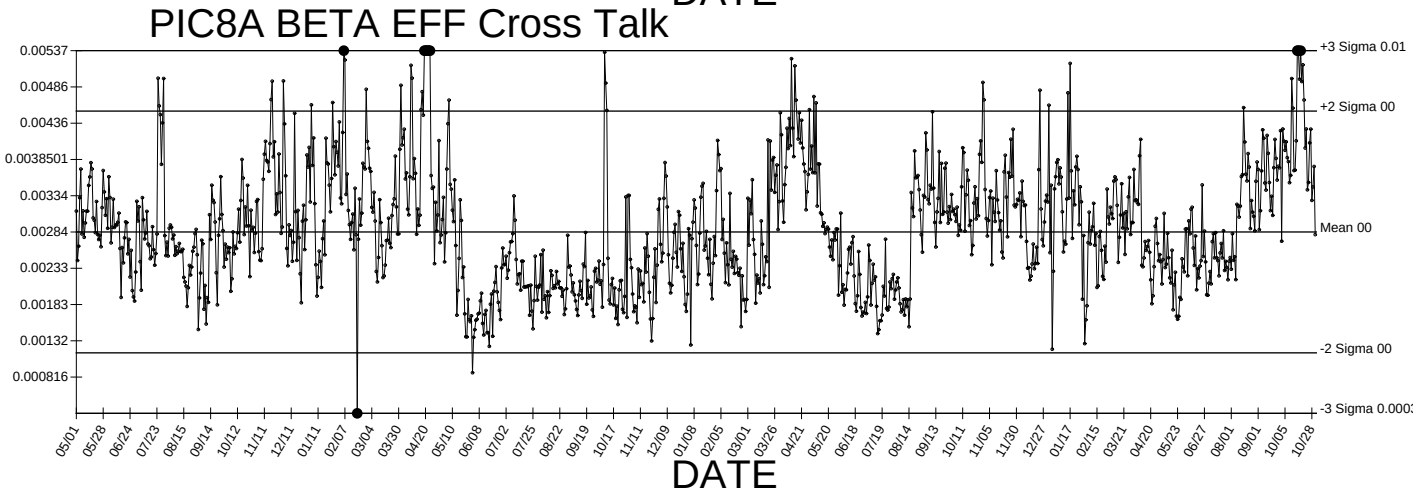
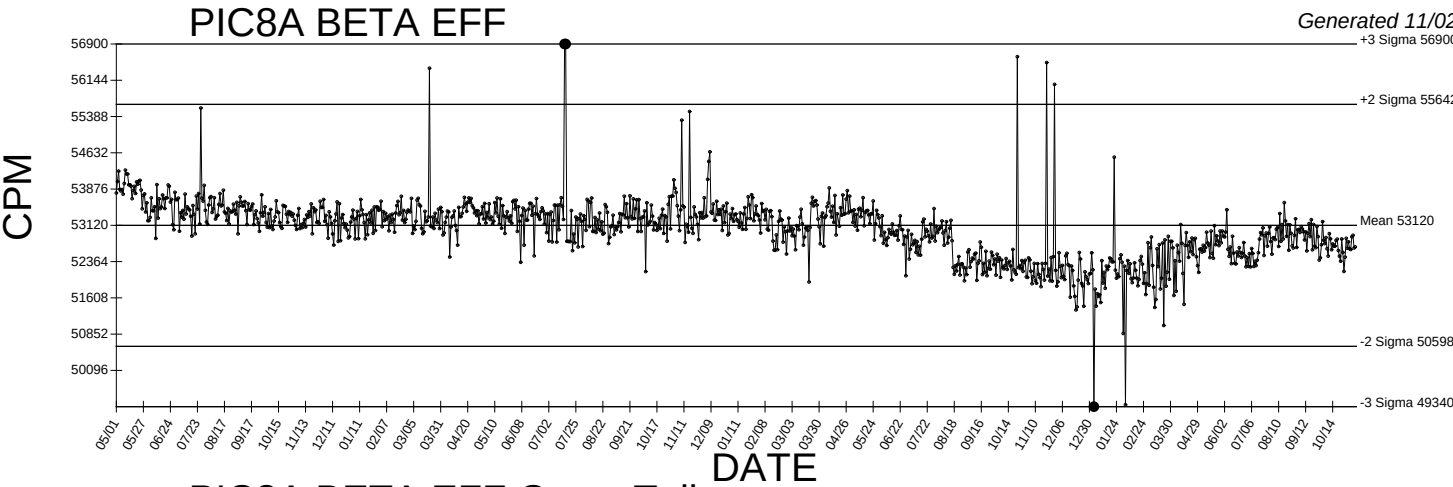


● Denotes Outlier



● Denotes Outlier





● Denotes Outlier

RAD Standards Traceability

Standardization of Strontium Carrier 3482192

v1.2.1

Analyst	KH1
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Standard Information	
Isotope	Strontium
Serial Number	3482192
Amount of Std. (mL)	1.0
Standard Prepared	9/2/2022

Parent Information	
Parent Serial #	3268476.2
Parent Exp. Date	4/7/2024

Std #	Weight of carrier added (g)	Weight of crucible or filter (g)	Weight of crucible or filter + ppt. (g)	Weight of ppt. (g)	mg Strontium/mL	mg Strontium/g
1	1.0214	0.0366	0.0457	0.0091	9.10	8.91
2	1.0138	0.0356	0.0446	0.0090	9.00	8.88
3	1.0213	0.0360	0.0449	0.0089	8.90	8.71
4	1.0206	0.0352	0.0442	0.0090	9.00	8.82

Mean Value (mg/mL) = 9.00
 Stdev (mg/mL) = ± 0.08
 1.0% of Mean Value = 0.090000
 Pass
 Expiration Date 9/2/2023
 Mean Value (mg/1.0mL) = 9.00

Standardization Rule

A satisfactory standardization is obtained when results give a standard deviation of less than 1.0% of the mean value.

Handwritten signature and date 9/2/22

CERTIFICATE OF CALIBRATION

Standard Reference Source

1943

SRS Number: 115036

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8090-5FSA-37kBq

Customer: GEL Laboratories LLC

P.O. Number: GEL1924879, Item 4

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 23-January-2020 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Sr-90	1.052E+04	3.705E+04	0.1	1.0	2.1	4π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

GL-CED-297-236a

SRS Number: 115036

Comments:

5.00204 g of 0.1 M HCl solution with approximately 30 µg/g each Sr and Y carriers.

Impurities:

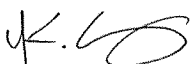
γ-impurities < 0.1%

Note:

This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total activity for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Eardley, Radiochemist

QC Approved by:


A. Chen, Spectroscopist

Date: 16 Jan 20

Standard Logbook

Serial ID: 1943 **Open/Reference Date:** 23 JAN 2020 **Aliquot :** 5.00204 g
Name: Strontium-90 **Received:** 23 JAN 2020 **Density :** Hand Calculated
Type: Source Material **Expires:** 23 JAN 2035 **Logbook Num :** GL-CED-297-236
Employee: Tim Chandler **Lot Number :** 115036
Supplier: Eckert & Zeigler **Solvent :** 0.1M HCl
Uncertainty : 1.05 percent
Description: Strontium-90
Comments: None

Analyte	Concentration	Analyte	Concentration
Strontium-90	37050 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1943
Prepared By:	Tim Chandler
Carrier Conc:	0.1M HCl
Reference Date:	01/23/2020
Ampoule Mass (g):	5.00204 g
Uncertainty:	+/- 1.05 %
LogBook No:	GL-CED-297-236
Supplier:	Eckert & Zeigler

A Solution Material Info			
Isotope:	Strontium-90		
Prepared By:	Jennie Kill-Bowden		
Prep Date:	08/13/2020		
Verification Date:	01/04/2022		
Expiration Date:	01/04/2023		
Primary Code:	1943-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9536 g		
Density(g/mL):	0.9995	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22014.7236 \text{ dpm/mL}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (0.9995 \text{ g/mL}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22025.6704 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/16/2021	Bethany Fiem	24.8842	1000	1943-B	548.091187 dpm/mL	02/16/2021	02/16/2022
01/04/2022	Jennie Kill-Bowden	25.0633	1000	1943-C	552.035985 dpm/ml	01/04/2022	01/04/2023
06/06/2022	Jennie Kill-Bowden	24.9802	1000	1943-D	550.2057 dpm/ml	06/03/2022	06/03/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Sr-90 Standard 1943-D

v1.0.2

Instrument	BROWN
Analyst	JXK3
Verification Prep Date	6/3/2022

Standard Information	
Isotope	Sr-90
Serial Number	1943-D
Isotope Half-life	28.9000 Y
Reference Date	1/23/2020
Ref. Act. (DPM/mL)	550.2057
Amount of Std. (mL)	1.0
Standard Prep Date	6/3/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	6/4/2022	92.40	1086.20	47.20
2	6/4/2022	91.60	1093.60	47.20
3	6/4/2022	91.70	1107.60	47.20

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	1039.00	2.018286	514.79	514.79
2	1046.40	2.018286	518.46	518.46
3	1060.40	2.018286	525.40	525.40

dpm/mL
519.55
5.384916401

Mean Value =
Stdev =

Certificate Value* = 519.9
Two sigma = 10.770
10 % of Mean = 51.955
Rule A (Pass/Fail) Pass
% Recovery 99.93%
Rule B (Pass/Fail) Pass
Expiration Date 6/3/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Sr-90 source 1943-D by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCBROWN for Sr-90 source standard verification. The Sr-90 efficiency calibration which was used for verification calculations was performed on 6/3/2022 using Sr-90 source 1689-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

A = Ver. source cpm,
B = BKG cpm,
C = System efficiency (cpm/dpm), and
D = volume used for standard verification.

RAD-M-001

Handwritten: 6/16/22
6/16/22
Luo B. B. B.

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2333238

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205226267	MB	JXK3	PIC7B	NOV-01-22 19:09:29	DONE	Tuffryn Filter	01-APR-21 00:00
597531002	SAMPLE	JXK3	PIC5A	NOV-01-22 19:09:43	DONE	Tuffryn Filter	01-APR-21 00:00
597533002	SAMPLE	JXK3	PIC5D	NOV-01-22 19:09:56	DONE	Tuffryn Filter	01-APR-21 00:00
597533004	SAMPLE	JXK3	PIC6C	NOV-01-22 19:10:04	DONE	Tuffryn Filter	01-APR-21 00:00
597533005	SAMPLE	JXK3	PIC7A	NOV-01-22 19:10:18	DONE	Tuffryn Filter	01-APR-21 00:00
1205226268	LCS	JXK3	PIC2A	NOV-02-22 06:22:37	DONE	Tuffryn Filter	01-APR-21 00:00
1205226269	LCSD	JXK3	PIC2B	NOV-02-22 06:22:41	DONE	Tuffryn Filter	01-APR-21 00:00
597531001	SAMPLE	JXK3	PIC8A	NOV-02-22 09:11:37	DONE	Tuffryn Filter	01-APR-21 00:00
597531003	SAMPLE	JXK3	PIC10D	NOV-02-22 09:11:48	DONE	Tuffryn Filter	01-APR-21 00:00
597533001	SAMPLE	JXK3	PIC9D	NOV-02-22 09:11:55	DONE	Tuffryn Filter	01-APR-21 00:00
597533003	SAMPLE	JXK3	PIC9C	NOV-02-22 09:11:59	DONE	Tuffryn Filter	01-APR-21 00:00

Liquid Scintillation Raw Data

Batch 2333140 Check-list

This check-list was completed on 06-NOV-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 06-NOV-22 and Jessica Davis on 07-NOV-22.

Batch ID: 2333140

Product: LSC41PUF

Description: LSC Plutonium Filter

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have client special requirements have been reviewed and met?	Yes		
4	Have samples been blank corrected?		No	
5	Has a hit notification been completed?		No	
6	Has an Aliquot Correction been completed for this batch?	Yes		
7	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
8	Were all the samples prepared/analyzed within the required holding time period?	Yes		
9	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
10	Was the method blank (MB) within the acceptance criteria?	Yes		
11	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
12	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
13	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
14	Has the method required detection limit been met?		No	
Miscellaneous Information				
15	Were manual integrations performed on any sample or QC data files in this batch?		No	
16	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium-241 in Filter per Liter

Batch ID: 2333140
Analyst: Brendon Viquez (BV1)
Method: DOE EML HASL-300, Pu-11-RC
 Modified
Lab SOP: GL-RAD-A-035 REV# 23
Instrument: GFC-B742840386

Due Dates for Lab: 02-NOV-2022			Package: 03-NOV-2022	SDG: 03-NOV-2022		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205226002	Plutonium-241 AS SPIKE		1714-B	.1	mL
LCSD	1205226003	Plutonium-241 AS SPIKE		1714-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	597531001	01-NOV-2022	5	30.16	0.11118
2	597531002	01-NOV-2022	5	30.21	0.11201
3	597531003	01-NOV-2022	5	30.02	0.11345
4	597533001	01-NOV-2022	5	30.04	0.11674
5	597533002	01-NOV-2022	5	30.05	0.11602
6	597533003	01-NOV-2022	5	30.23	0.11454
7	597533004	01-NOV-2022	5	30.15	0.11482
8	597533005	01-NOV-2022	5	30.3	0.11471
9	1205226001 MB	01-NOV-2022	5		0.11674
10	1205226002 LCS	01-NOV-2022	5		0.11674
11	1205226003 LCSD	01-NOV-2022	5		0.11674

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2022-A	Plutonium-242 AS TRACER	.1 mL	Pipet ID: RAD-ASP-184002Z

Plutonium-241 Filter

Filename : PU241.XLS
File type : Excel
Version # : 1.3.4

Tracer S/N : 2022-A
Tracer Exp Date : 7/18/2023
Tracer Volume Added: 0.10
Tracer Error: 0.37%

Batch : 2333140
Analyst : BRE02408
Prep Date : 11/1/2022
Method Uncertainty : 0.0935

Procedure Code : LSC41PUF
Parmname : Plutonium-241
Required MDA : 5 pCi/F
Halflife of Pu-241 : 14.290 years
Pu-241 Abundance : 1.00
Tracer Abundance : 1.00
Halflife of Tracer : 373500.000 years

Geometry:

2mL DI/1 drop HNO3/13mL Ecoscint Ultra

Sample Characteristics					Tracer Calculations									
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Tracer Concentration DPM	Tracer Counts	Tracer Bkg Counts	Tracer Net CPM	Tracer Count Start Date/Time	Tracer Count Time (sec.)	Tracer Decay	Detector Serial #	Detector Efficiency (cpm/dpm)	Detector Efficiency StDev. (cpm/dpm)
1	597531001.1	0.1112	1.2035E-05	9/26/2022 8:18	4.2365	309	4.560	1.269	11/3/2022 10:26	14400	1.000	79988	0.309886	0.005992
2	597531002.1	0.1120	1.2082E-05	9/26/2022 8:25	4.2365	318	2.640	1.314	11/3/2022 10:26	14400	1.000	158119	0.351247	0.006772
3	597531003.1	0.1134	1.2165E-05	9/26/2022 9:00	4.2365	304	4.800	1.247	11/3/2022 10:26	14400	1.000	158160	0.339981	0.006559
4	597533001.1	0.1167	1.2350E-05	9/30/2022 7:45	4.2365	325	0.240	1.353	11/3/2022 10:26	14400	1.000	155764	0.334274	0.006452
5	597533002.1	0.1160	1.2310E-05	9/30/2022 7:51	4.2365	216	2.400	0.890	11/3/2022 10:26	14400	1.000	140239	0.316063	0.006108
6	597533003.1	0.1145	1.2226E-05	9/30/2022 7:58	4.2365	315	2.880	1.301	11/3/2022 10:26	14400	1.000	80016	0.334897	0.006463
7	597533004.1	0.1148	1.2242E-05	9/30/2022 8:05	4.2365	231	3.840	0.947	11/3/2022 10:26	14400	1.000	83288	0.361216	0.006960
8	597533005.1	0.1147	1.2236E-05	9/30/2022 9:00	4.2365	235	3.600	0.964	11/3/2022 10:26	14400	1.000	158118	0.365015	0.007032
9	1205226001.1	0.1167	1.2350E-05	11/1/2022 0:00	4.2365	276	6.480	1.123	11/3/2022 10:26	14400	1.000	158120	0.356810	0.006877
10	1205226002.1	0.1167	1.2350E-05	11/1/2022 0:00	4.2365	225	1.680	0.931	11/3/2022 10:12	14400	1.000	155839	0.272396	0.005285
11	1205226003.1	0.1167	1.2350E-05	11/1/2022 0:00	4.2365	252	2.400	1.040	11/3/2022 10:13	14400	1.000	155841	0.261786	0.005084

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-035
 Instrument SOP: GL-RAD-I-004

Count raw Data													Calibration Data							
Pos.	Rack Position #	Counting Time (min.)	Quench#	Gross cpm	Bkg cpm	Bkg Count Time (min.)	Bkg Quench#	Corrected Bkg cpm	Count Start Date/Time	Sample Decay	Calculated Sample Recovery %	Sample Recovery Error %	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Background Rack Position #	Background Count Start Date/Time	
1	20-2	60	149.5	6.87	7.33	60	148.6	7.3118	11/5/2022 12:22	0.995	96.6%	6.12%	LSCPURPLE	2/1/2022	1/31/2023	0.2178	0.00792	20-1	11/5/2022 11:20	
2	20-3	60	150.9	7.9	7.33	60	148.6	7.2834	11/5/2022 13:24	0.995	88.3%	6.00%	LSCPURPLE	2/1/2022	1/31/2023	0.2153	0.00792	20-1	11/5/2022 11:20	
3	20-4	60	154.5	7.78	7.33	60	148.6	7.2121	11/5/2022 14:26	0.995	86.6%	6.17%	LSCPURPLE	2/1/2022	1/31/2023	0.2090	0.00792	20-1	11/5/2022 11:20	
4	20-5	60	148.5	7.72	7.33	60	148.6	7.3320	11/5/2022 15:28	0.995	95.6%	5.90%	LSCPURPLE	2/1/2022	1/31/2023	0.2196	0.00792	20-1	11/5/2022 11:20	
5	20-6	60	155.8	7.82	7.33	60	148.6	7.1875	11/5/2022 16:29	0.995	66.5%	7.18%	LSCPURPLE	2/1/2022	1/31/2023	0.2067	0.00792	20-1	11/5/2022 11:20	
6	20-7	60	149.4	7.3	7.33	60	148.6	7.3138	11/5/2022 17:31	0.995	91.7%	6.03%	LSCPURPLE	2/1/2022	1/31/2023	0.2180	0.00792	20-1	11/5/2022 11:20	
7	20-8	60	153.4	7.82	7.33	60	148.6	7.2335	11/5/2022 18:33	0.995	61.9%	7.00%	LSCPURPLE	2/1/2022	1/31/2023	0.2109	0.00792	20-1	11/5/2022 11:20	
8	20-9	60	154.4	8.37	7.33	60	148.6	7.2140	11/5/2022 19:35	0.995	62.3%	6.94%	LSCPURPLE	2/1/2022	1/31/2023	0.2091	0.00792	20-1	11/5/2022 11:20	
9	20-10	60	155.6	7.6	7.33	60	148.6	7.1912	11/5/2022 20:37	0.999	74.3%	6.50%	LSCPURPLE	2/1/2022	1/31/2023	0.2070	0.00792	20-1	11/5/2022 11:20	
10	20-11	60	153.9	30.98	7.33	60	148.6	7.2237	11/5/2022 21:39	0.999	80.6%	7.02%	LSCPURPLE	2/1/2022	1/31/2023	0.2100	0.00792	20-1	11/5/2022 11:20	
11	20-12	60	163.4	33.68	7.33	60	148.6	7.0679	11/5/2022 22:40	0.999	93.8%	6.68%	LSCPURPLE	2/1/2022	1/31/2023	0.1937	0.00792	20-1	11/5/2022 11:20	

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

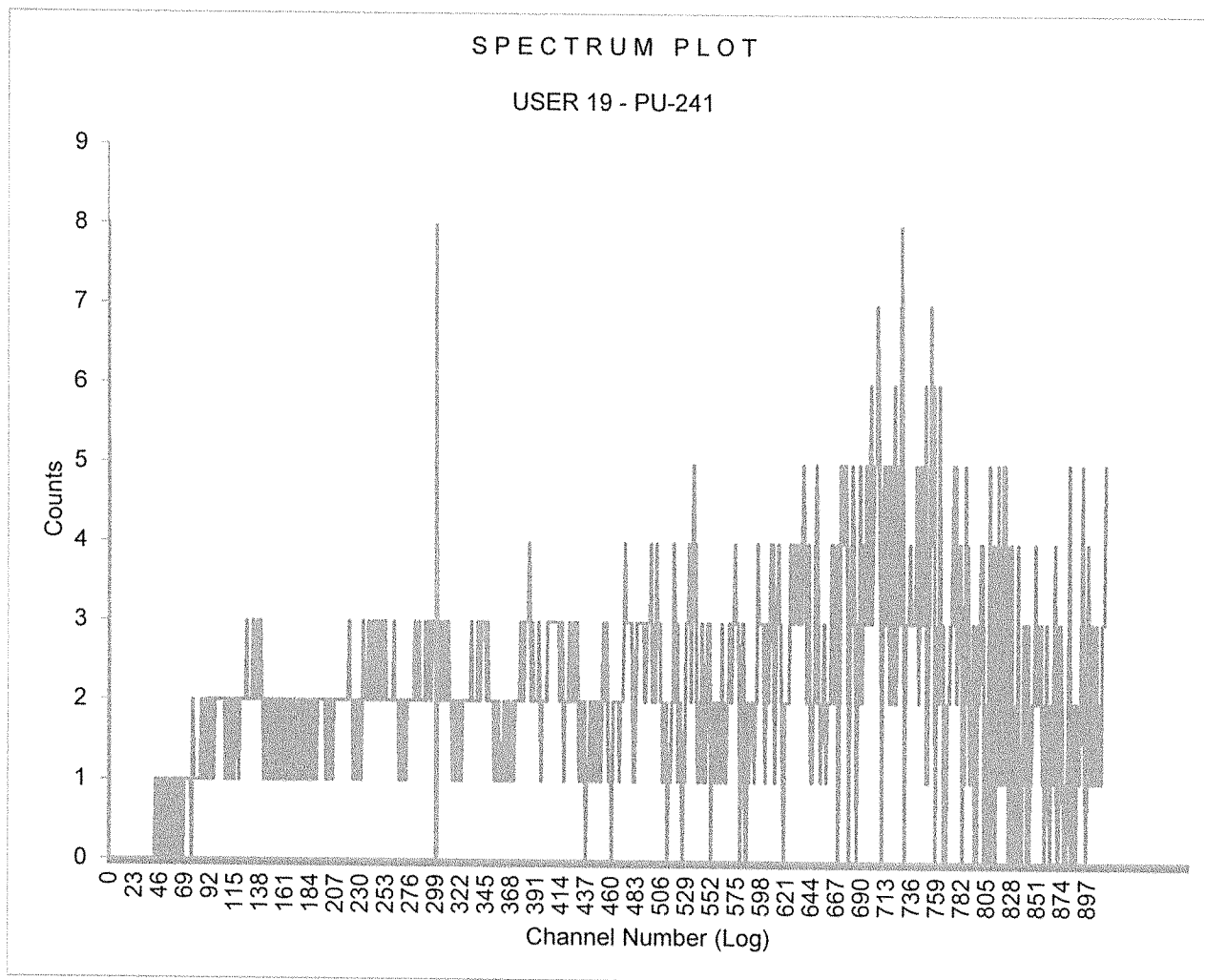
Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1714-B
LCS Exp Date : 1/19/2023
LCS Activity (dpm/ml): 1588.35
LCS Volume Added: 0.10

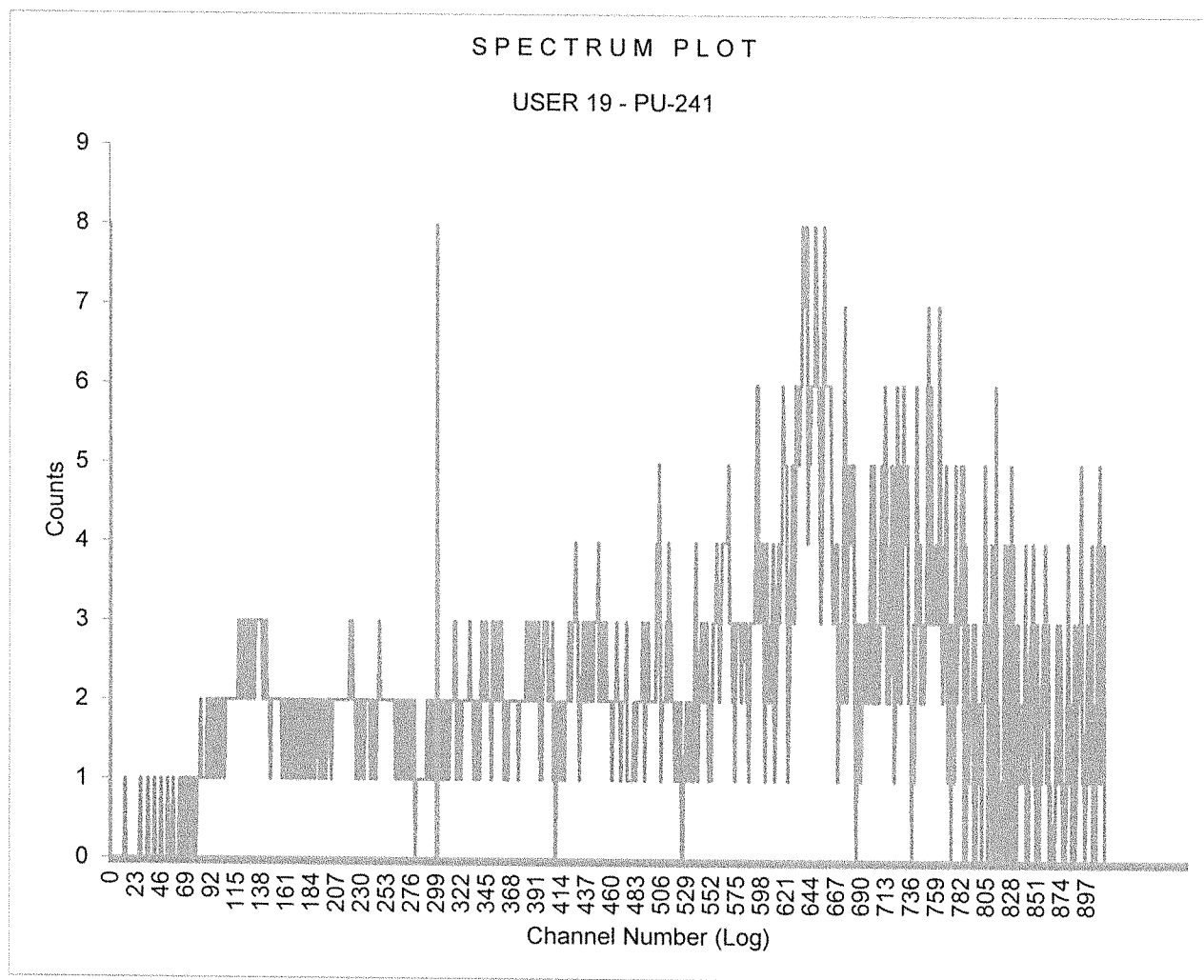
Results																
	Decision Level	Critical Level	Required MDA	MDA	Sample Act. Conc.	Sample Act. Error	Net Count Rate	Net Count Rate Error	2 SIGMA Counting Uncertainty	2 SIGMA Total Prop. Uncertainty	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery
Pos.	pCi/F	pCi/F	pCi/F	pCi/F	pCi/F	%	CPM	CPM	pCi/F	pCi/F						
1	22.2663	15.7202	5	32.4083	-8.5517	110.22%	-0.4418	0.4862	18.4454	18.4455		SAMPLE				
2	24.4164	17.2382	5	35.5398	13.1127	81.81%	0.6166	0.5030	20.9693	21.1638		SAMPLE				
3	25.2137	17.8011	5	36.7058	12.5334	88.24%	0.5679	0.4999	21.6233	21.7986		SAMPLE				
4	21.2881	15.0296	5	30.9832	7.1703	129.23%	0.3880	0.5009	18.1429	18.2097		SAMPLE				
5	32.3842	22.8636	5	47.1469	17.9604	79.40%	0.6325	0.5001	27.8346	28.1436		SAMPLE				
6	22.7565	16.0663	5	33.1217	-0.2731	3574.04%	-0.0138	0.4935	19.1338	19.1339		SAMPLE				
7	34.5775	24.4120	5	50.3351	17.7246	85.70%	0.5865	0.5009	29.6703	29.9478		SAMPLE				
8	34.5749	24.4102	5	50.3334	34.9798	44.64%	1.1560	0.5096	30.2271	31.2678		SAMPLE				
9	28.6358	20.2171	5	41.6893	10.2611	121.64%	0.4088	0.4965	24.4284	24.5360		MB				
10	26.0701	18.4057	5	37.9516	541.6829	7.82%	23.7563	0.7980	35.6616	129.4424		LCS			612.8891	88.4%
11	24.0422	16.9740	5	35.0110	565.7367	7.41%	26.6121	0.8241	34.3374	132.2562		LCSD	4.3%		612.8891	92.3%

SampleID	Rack	Time (min.)	H#	CPM Iso1	CPM Iso2	LumEx	Count Start Time	Count End Time	Machine
	20-1	60	148.6	7.33	31.05	3.82	11/5/2022 11:20	11/5/2022 12:20	PURPLE
	20-2	60	149.5	6.87	32.68	3.62	11/5/2022 12:22	11/5/2022 13:22	PURPLE
	20-3	60	150.9	7.90	33.13	3.67	11/5/2022 13:24	11/5/2022 14:24	PURPLE
	20-4	60	154.5	7.78	34.28	3.65	11/5/2022 14:26	11/5/2022 15:26	PURPLE
	20-5	60	148.5	7.72	34.07	3.69	11/5/2022 15:28	11/5/2022 16:28	PURPLE
	20-6	60	155.8	7.82	33.92	3.88	11/5/2022 16:29	11/5/2022 17:29	PURPLE
	20-7	60	149.4	7.30	33.48	3.78	11/5/2022 17:31	11/5/2022 18:31	PURPLE
	20-8	60	153.4	7.82	32.68	3.91	11/5/2022 18:33	11/5/2022 19:33	PURPLE
	20-9	60	154.4	8.37	34.97	3.68	11/5/2022 19:35	11/5/2022 20:35	PURPLE
	20-10	60	155.6	7.60	33.38	3.76	11/5/2022 20:37	11/5/2022 21:37	PURPLE
	20-11	60	153.9	30.98	57.73	2.26	11/5/2022 21:39	11/5/2022 22:39	PURPLE
	20-12	60	163.4	33.68	60.25	2.16	11/5/2022 22:40	11/5/2022 23:40	PURPLE

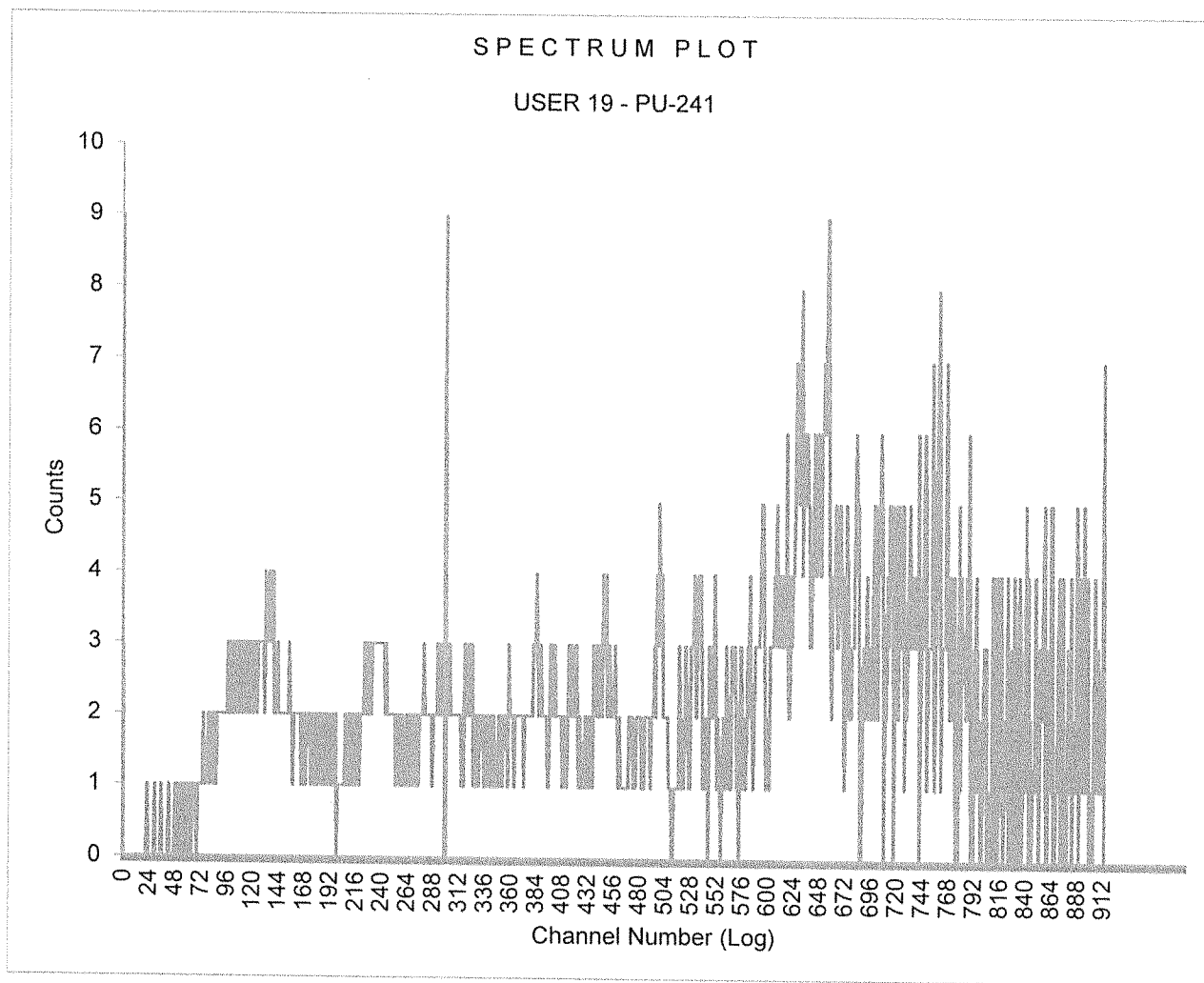
Sample Count Start Time:	5 Nov 2022 11:20:53		
Data Capture Date	05 Nov 2022 12:21:17		
User Filename	S19110520-1A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	1	20-1	60.00
H#, Total Counts:	148.6	1895	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



Sample Count Start Time:	5 Nov 2022 12:22:46		
Data Capture Date	05 Nov 2022 13:23:09		
User Filename	S19110520-2A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	2	20-2	60.00
H#, Total Counts:	149.5	1993	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



Sample Count Start Time:	5 Nov 2022 13:24:32		
Data Capture Date	05 Nov 2022 14:24:55		
User Filename	S19110520-3A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	3	20-3	60.00
H#, Total Counts:	150.9	2014	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



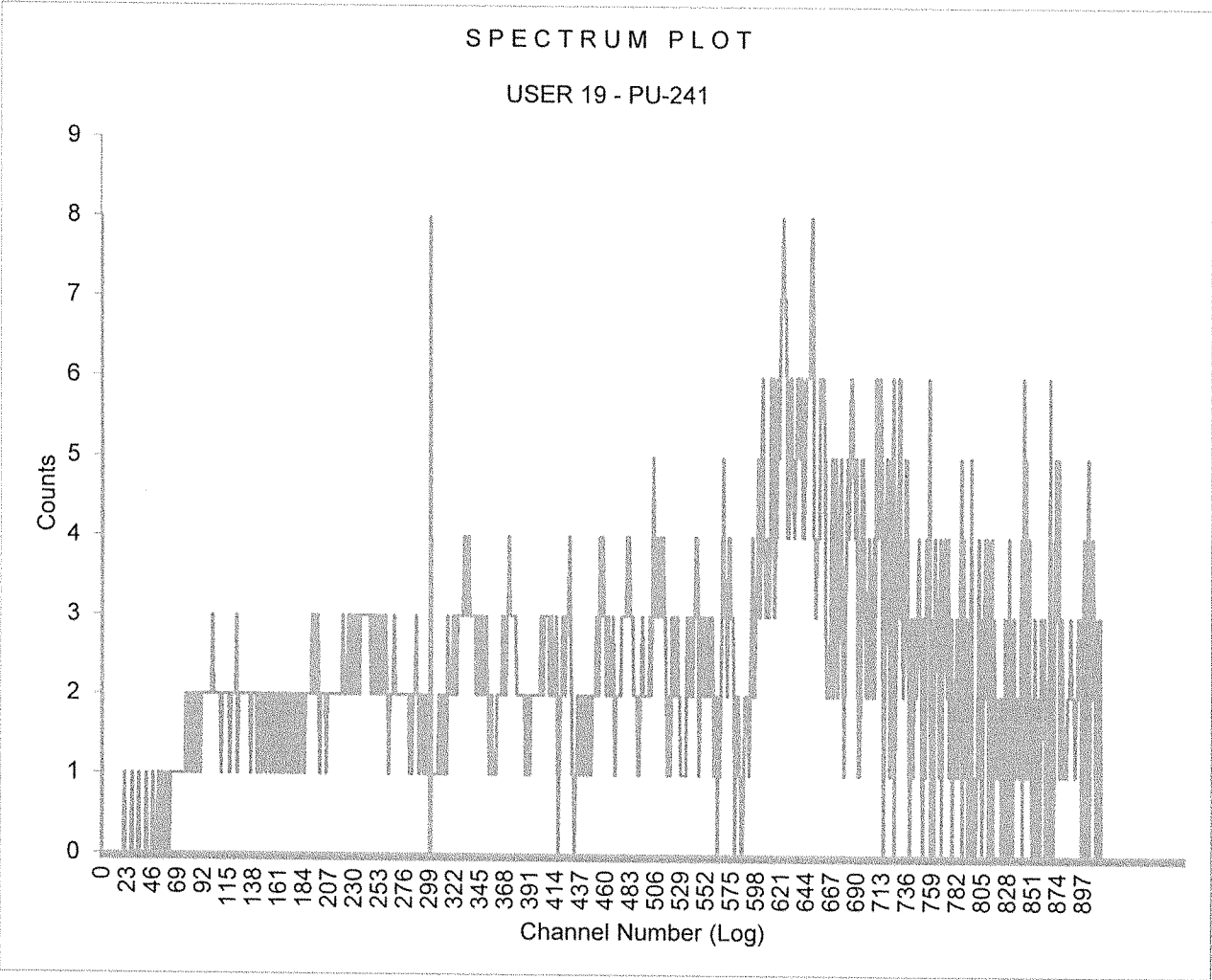
Sample Count Start Time:
Data Capture Date
User Filename

Spectrum Type
User Number
User Id
User Comment
Scintillator
Sample, Rack-Pos, Time:
H#, Total Counts:
Win1: Pu-241 - Start, End:
Win2: - Start, End:

5 Nov 2022 14:26:19
05 Nov 2022 15:26:41
S19110520-4A.XLS
U19110520-1A.XLS

Log Counts
19
PU-241
LSCPURPLE
LIQUID

420-460.00
154.52086
0300
0990



Sample Count Start Time:
Data Capture Date
User Filename

5 Nov 2022 15:28:04
05 Nov 2022 16:28:28
S19110520-5A.XLS
U19110520-1A.XLS

Spectrum Type
User Number
User Id
User Comment
Scintillator

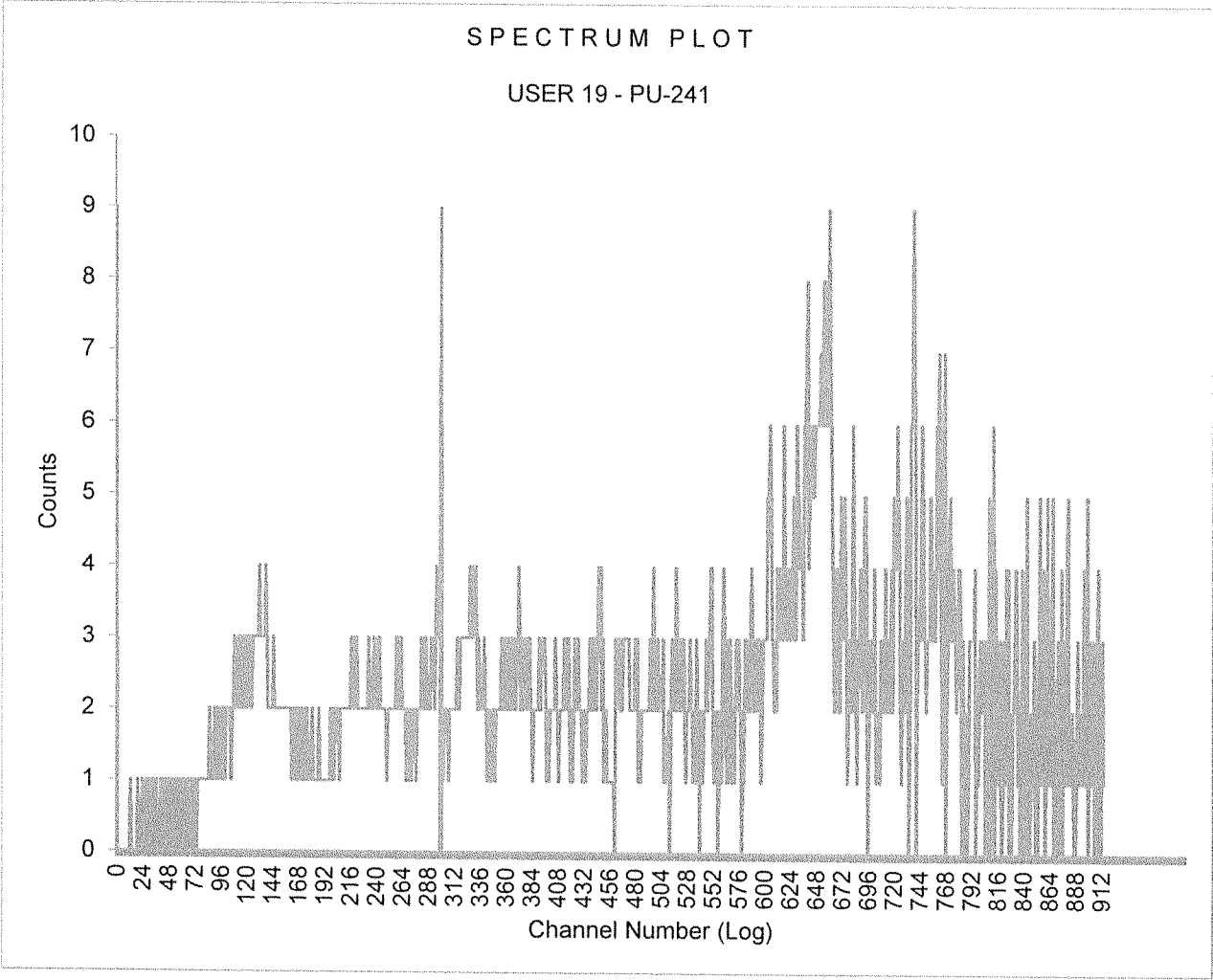
Log Counts
19
PU-241
LSCPURPLE
LIQUID

Sample, Rack-Pos, Time:
H#, Total Counts:
Win1: Pu-241 - Start, End:
Win2: - Start, End:

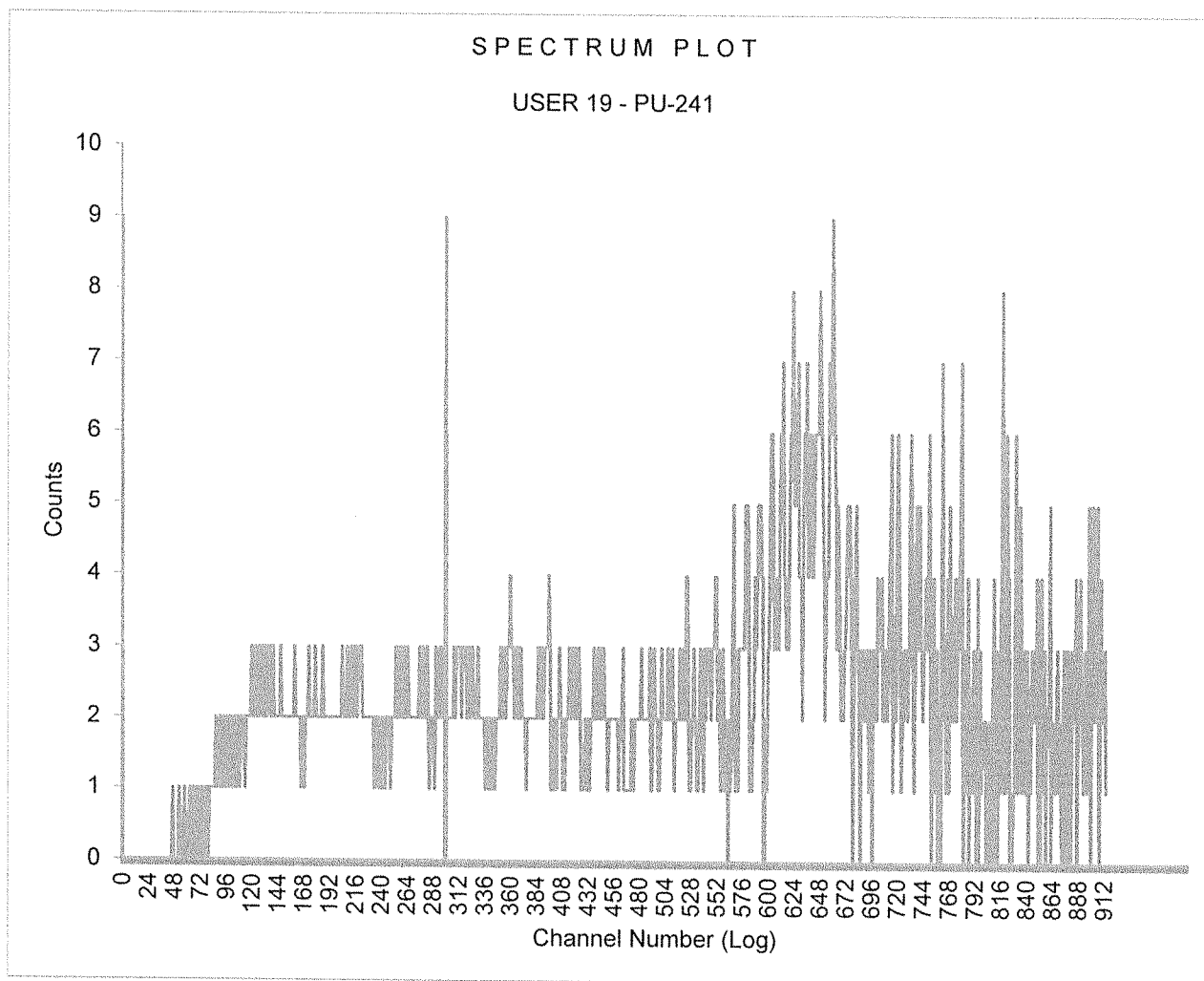
5
148.5
0
0

20-5
2076
300
990

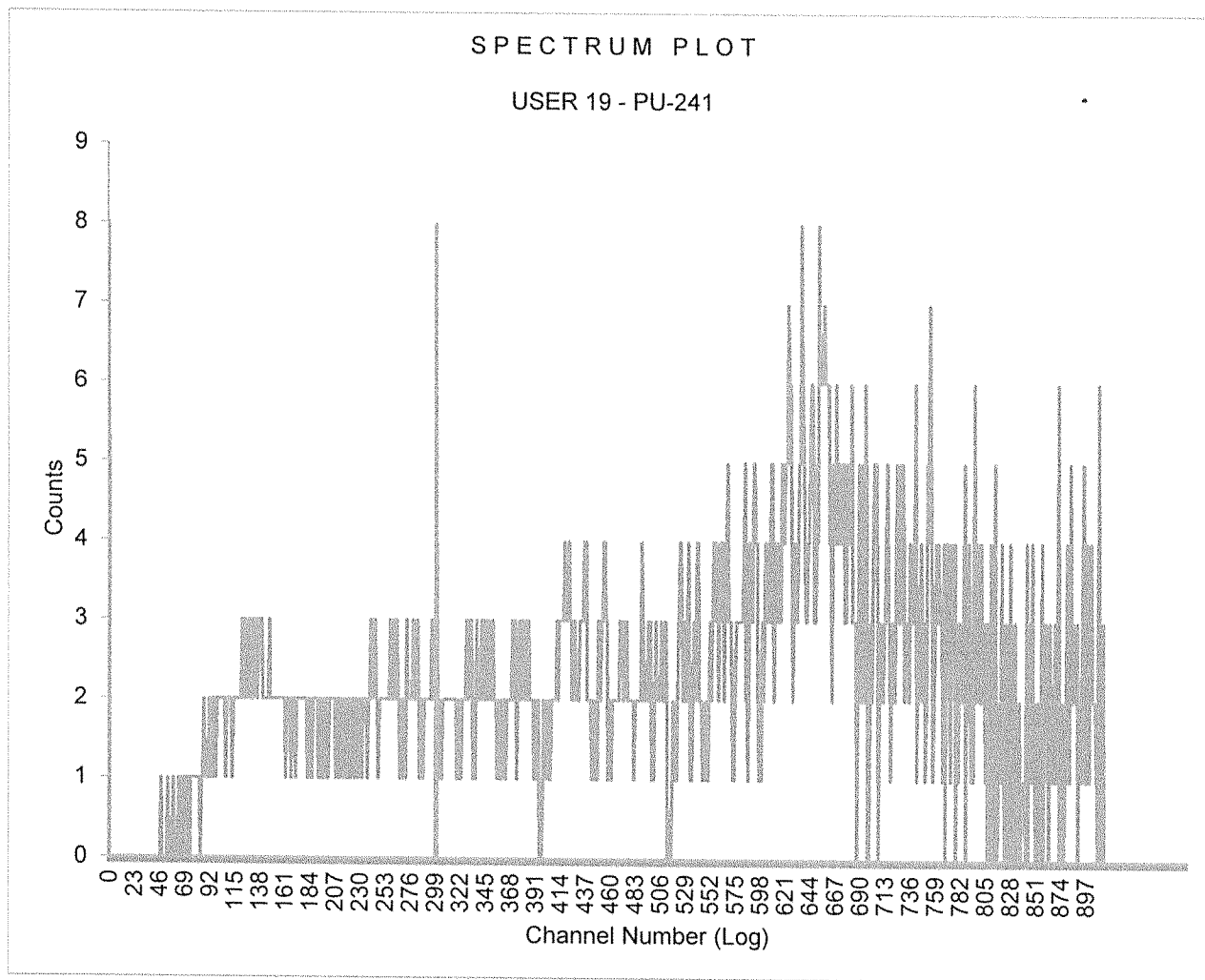
60.00



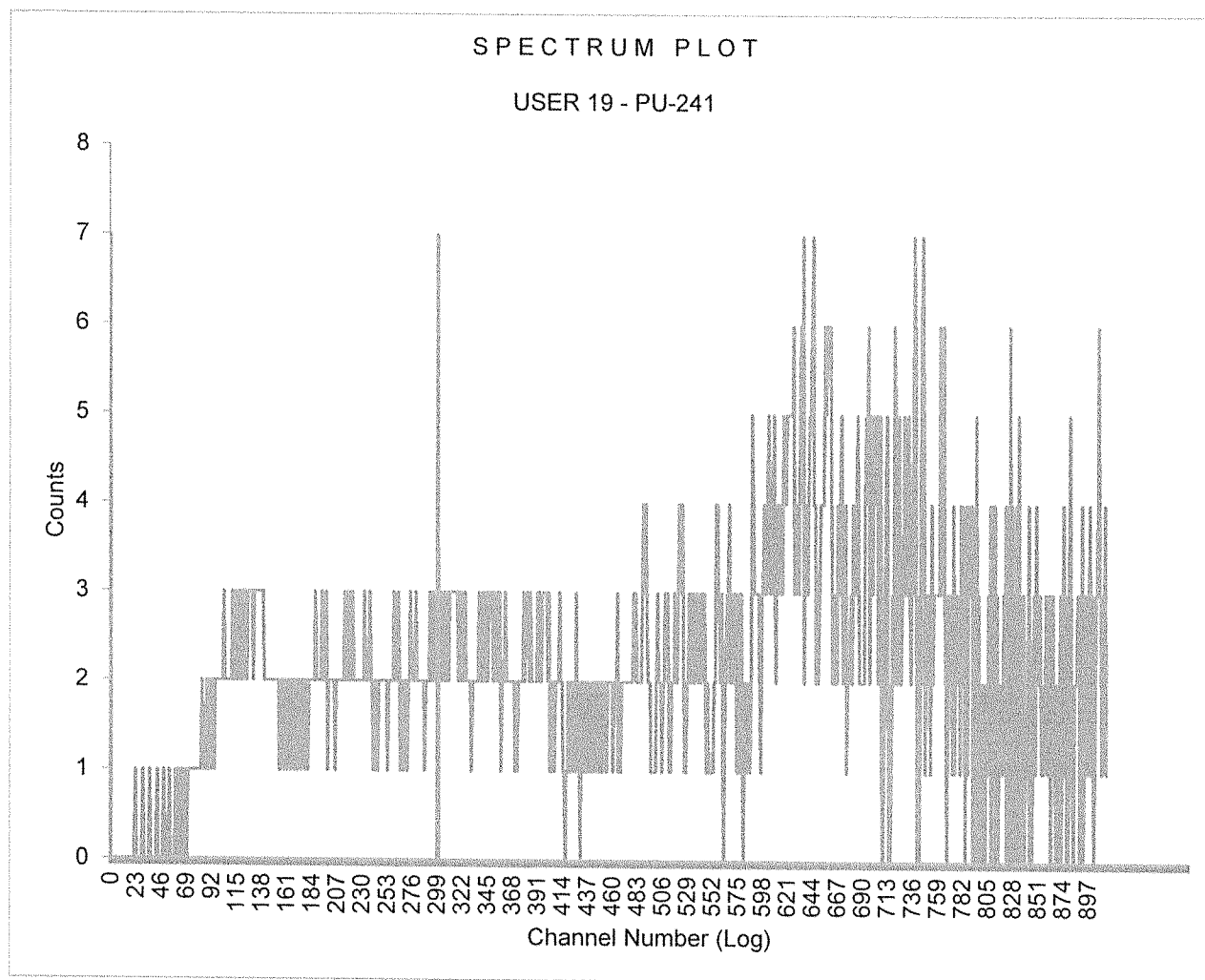
Sample Count Start Time:	5 Nov 2022 16:29:51		
Data Capture Date	05 Nov 2022 17:30:15		
User Filename	S19110520-6A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	6	20-6	60.00
H#, Total Counts:	155.8	2072	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



Sample Count Start Time:	5 Nov 2022 17:31:39		
Data Capture Date	05 Nov 2022 18:32:02		
User Filename	S19110520-7A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	7	20-7	60.00
H#, Total Counts:	149.4	2038	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



Sample Count Start Time:	5 Nov 2022 18:33:32		
Data Capture Date	05 Nov 2022 19:33:56		
User Filename	S19110520-8A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	8	20-8	60.00
H#, Total Counts:	153.4	1996	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



Sample Count Start Time:

Data Capture Date

User Filename

Spectrum Type

User Number

User Id

User Comment

Scintillator

Sample, Rack-Pos, Time:

H#, Total Counts:

Win1: Pu-241 - Start, End:

Win2: - Start, End:

5 Nov 2022 19:35:26

05 Nov 2022 20:35:50

S19110520-9A.XLS

U19110520-1A.XLS

Log Counts

19

PU-241

LSCPURPLE

LIQUID

920-96060.00

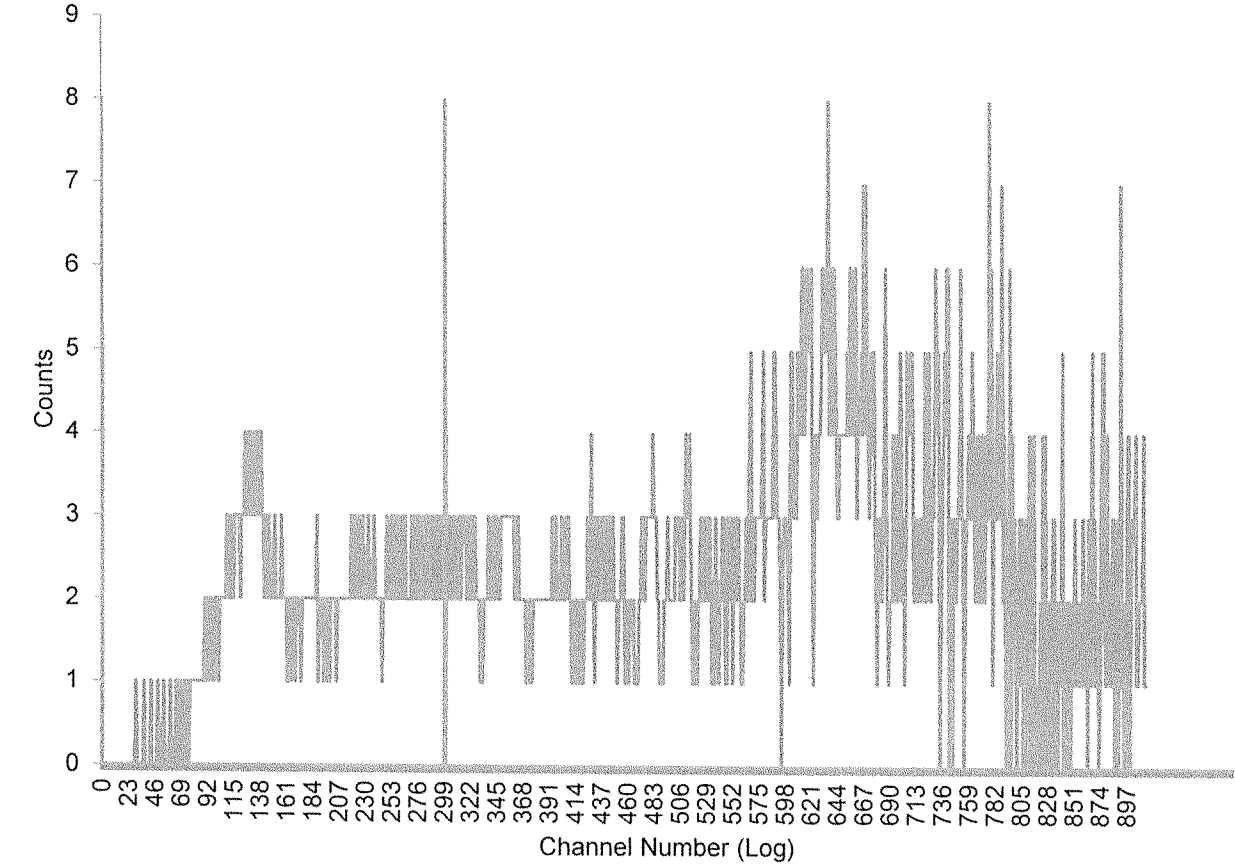
154.42129

0300

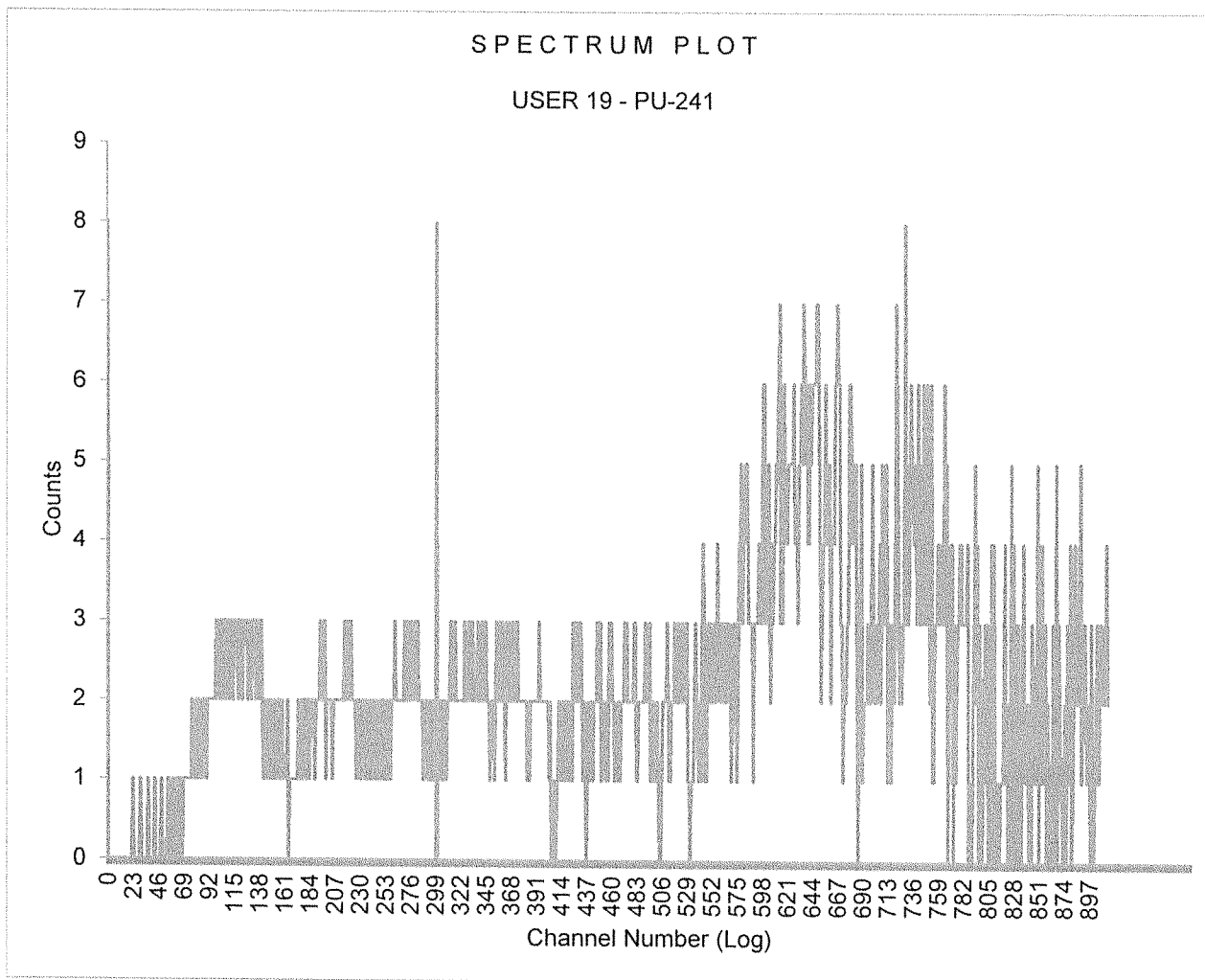
0990

SPECTRUM PLOT

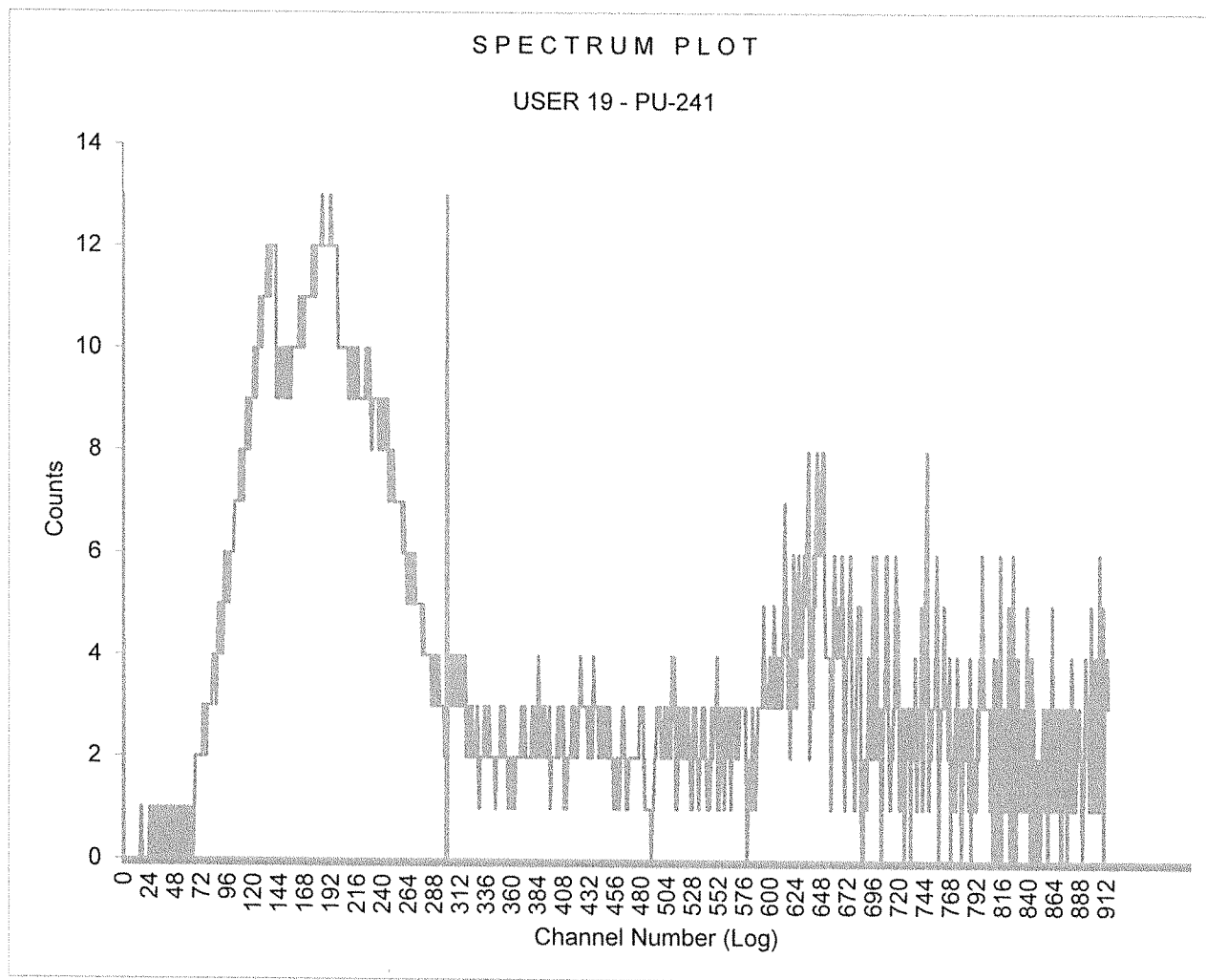
USER 19 - PU-241



Sample Count Start Time:	5 Nov 2022 20:37:19		
Data Capture Date	05 Nov 2022 21:37:42		
User Filename	S19110520-10A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	10	20-10	60.00
H#, Total Counts:	155.6	2033	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



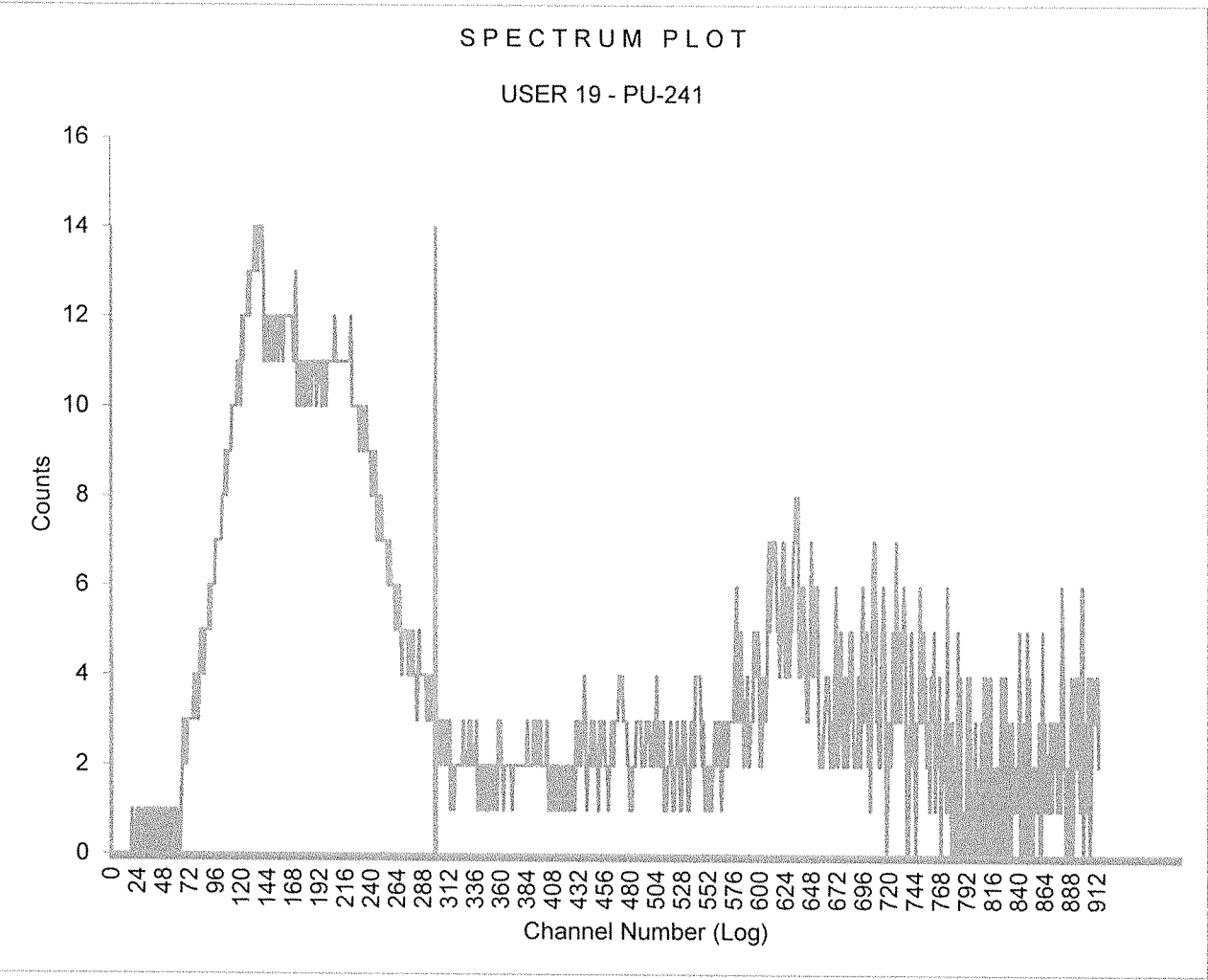
Sample Count Start Time:	5 Nov 2022 21:39:05		
Data Capture Date	05 Nov 2022 22:39:29		
User Filename	S19110520-11A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	11	20-11	60.00
H#, Total Counts:	153.9	3504	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



Sample Count Start Time:	5 Nov 2022 22:40:52		
Data Capture Date	05 Nov 2022 23:41:16		
User Filename	S19110520-12A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	12	20-12	60.00
H#, Total Counts:	163.4	3653	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	

SPECTRUM PLOT

USER 19 - PU-241



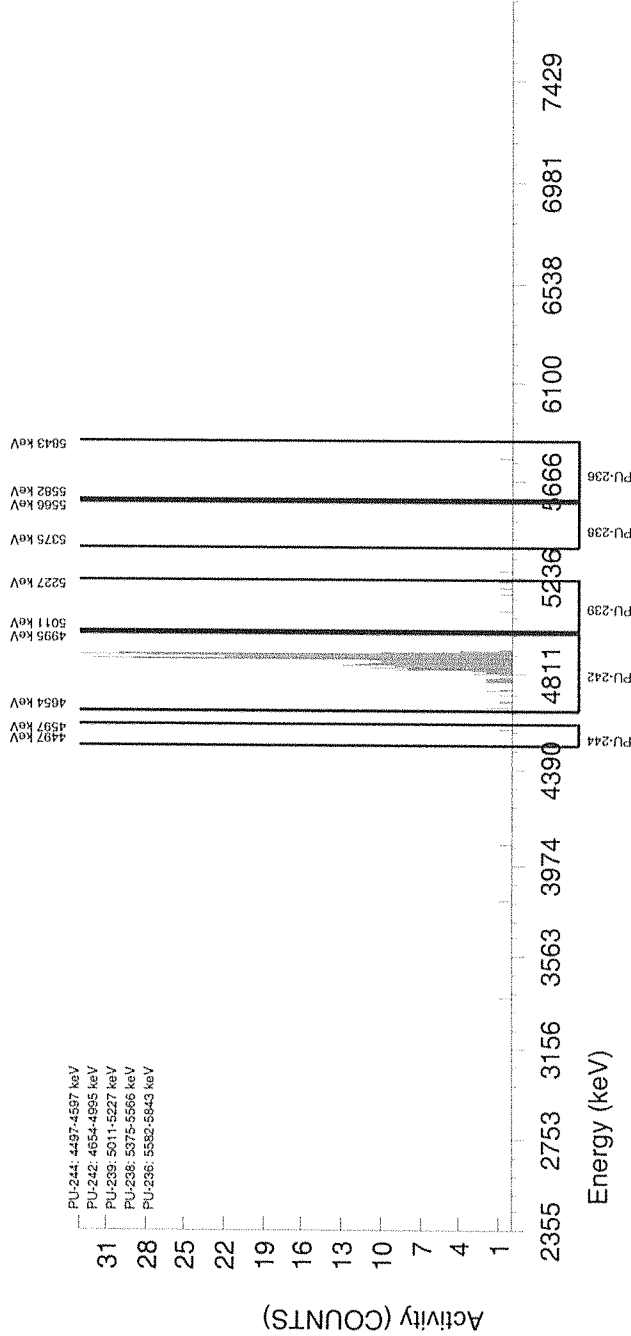
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2333140		CHAMBER : 089		LIB FILE : PU	
SAMPLE ID : R0597531001_PU		DETECTOR S/N : 79988		BKG FILE : B089.CNF:2092	
SAMPLE QTY : 0.111 F +/-0.899 %		AVERAGE %EFFICIENCY : 30.9886		BKG DATE : 28-Oct-2022	
SAMPLE DATE : 26-Sep-2022 08:18:00		AVERAGE %EFF ERROR : 0.5992		BKG LIVE TIME(SEC) : 60000.00	
ANALYST : BV1		COUNT DATE : 03-Nov-2022 10:26:51		EFF FILE : W089.CNF:548	
% YIELD : 96.6 +/-6.120 %		ELAPSED LIVE TIME(SEC) : 14400.00		CAL DATE : 13-Oct-2022	

TRACER	ID : 2022-A
NUCLIDE	PU-242
NOMINAL	4.2365E+00 dpm
RESULTS	4.0934E+00 dpm

NUCLIDE ACTIVITY SUMMARY									
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F
PU-236	5749.00	5762.89	4.947	1.000	0.520	0.480	0.6928	100.000	3.01E-02
PU-238	5486.00	5470.34	0.000	0.000	-0.960	0.960	0.9798	99.900	-5.42E-02
PU-239	5155.00	5167.95	123.678	4.000	2.080	1.920	1.3856	99.900	1.17E-01
PU-242	4870.00	4872.32	31.510	309.000	304.440	4.560	2.1354	100.000	1.72E+01
PU-244	4589.00	4568.51	4.947	1.000	0.280	0.720	0.8485	99.900	1.58E-02
									1.96-sigma
									TPU pCi/F
									1.67E-01
									1.26E-01
									2.60E-01
									2.92E+00
									1.65E-01
									MDA pCi/F
									3.20E-01
									3.72E-01
									4.56E-01
									6.10E-01
									3.45E-01
									Lc pCi/F
									7.34E-02
									1.01E-01
									1.43E-01
									2.21E-01
									8.77E-02
									1.96-sigma
									cnt Unc pCi/F
									1.67E-01
									1.26E-01
									2.60E-01
									1.95E+00
									1.65E-01



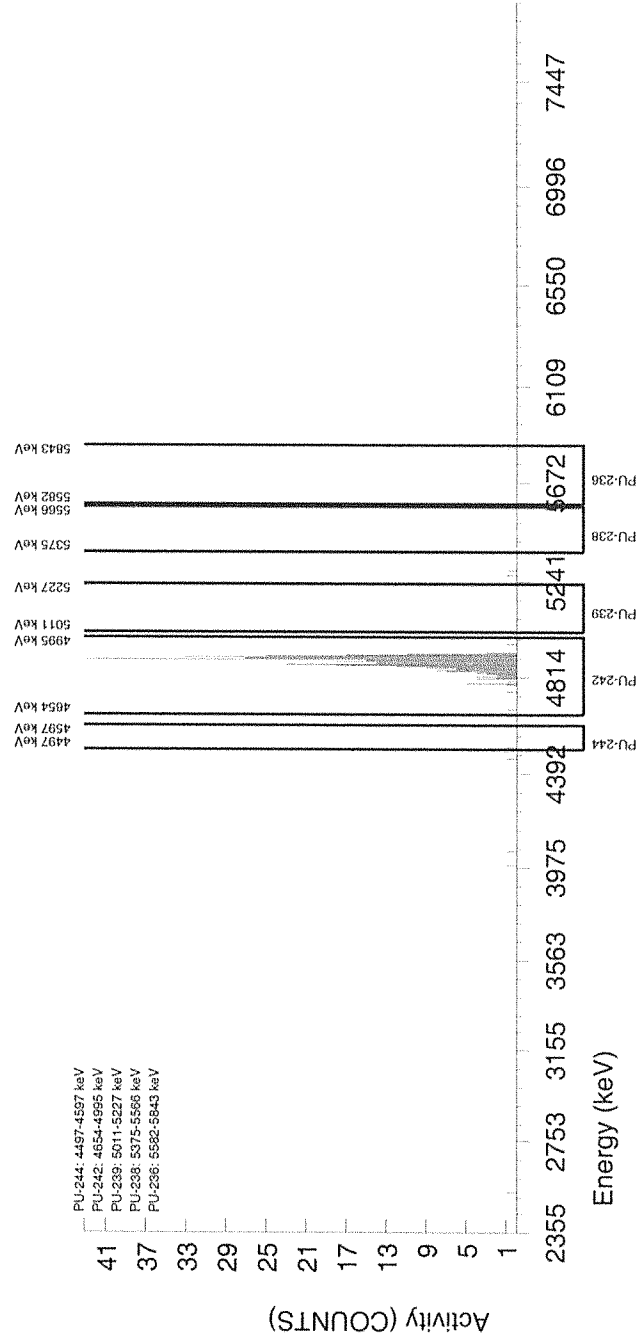
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2333140 SAMPLE ID : R0597531002_PU SAMPLE QTY : 0.112 F +/-0.893 % SAMPLE DATE : 26-Sep-2022 08:25:00 ANALYST : BV1 % YIELD : 88.3 +/-6.000 %		CHAMBER : 090 DETECTOR S/N : 158119 AVERAGE %EFFICIENCY : 35.1247 AVERAGE %EFF ERROR : 0.6772 COUNT DATE : 03-Nov-2022 10:26:51 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B090.CNF:2093 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W090.CNF:540 CAL DATE : 13-Oct-2022
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TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.7410E+00 dpm	
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NUCLIDE ACTIVITY SUMMARY									
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F
PU-236	5749.00	5829.79	4.940	1.000	-0.200	1.200	1.0954	100.000	-1.11E-02
PU-238	5486.00	5470.33	0.000	0.000	-0.960	0.960	0.9798	99.900	-5.20E-02
PU-239	5155.00	5118.67	0.000	0.000	-2.880	2.880	1.6971	99.900	-1.56E-01
PU-242	4870.00	4881.01	38.223	318.000	315.360	2.640	1.6248	100.000	1.70E+01
PU-244	4589.00	4552.13	0.000	2.000	2.000	0.000	1.0000	99.900	1.08E-01
1.96-sigma TPU pCi/F									1.66E-01
1.96-sigma MDA pCi/F									3.89E-01
1.96-sigma Lc pCi/F									1.11E-01
1.96-sigma cnt Unc pCi/F									1.20E-01
1.96-sigma MDA pCi/F									4.98E-01
1.96-sigma Lc pCi/F									1.61E-01
1.96-sigma cnt Unc pCi/F									1.85E-01



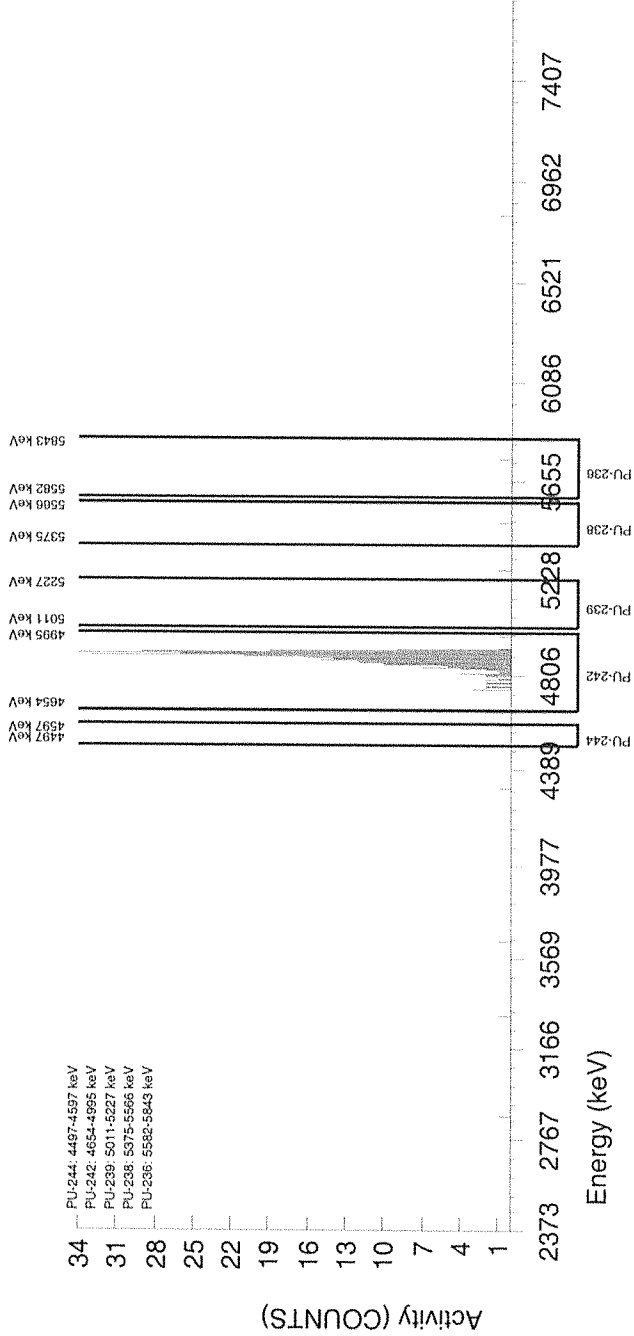
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2333140		CHAMBER : 092		LIB FILE : PU	
SAMPLE ID : R0597531003_PU		DETECTOR S/N : 158160		BKG FILE : B092.CNF:2101	
SAMPLE QTY : 0.113 F		AVERAGE %EFFICIENCY : 33.9981		BKG DATE : 28-Oct-2022	
SAMPLE DATE : 26-Sep-2022 09:00:00		AVERAGE %EFF ERROR : 0.6559		BKG LIVE TIME(SEC) : 60000.00	
ANALYST : BV1		COUNT DATE : 03-Nov-2022 10:26:51		EFF FILE : W092.CNF:586	
% YIELD : 86.6		ELAPSED LIVE TIME(SEC) : 14400.00		CAL DATE : 13-Oct-2022	

TRACER	
ID : 2022-A	
NUCLIDE : PU-242	
NOMINAL : 4.2365E+00 dpm	
RESULTS : 3.6669E+00 dpm	

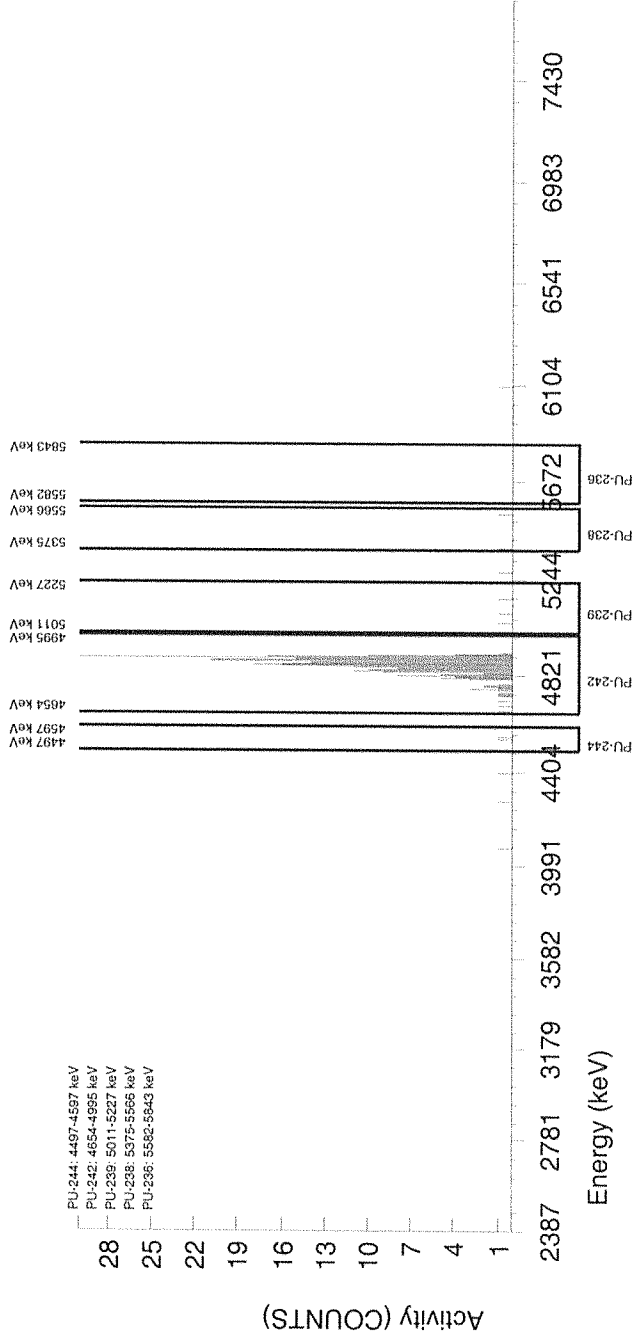
NUCLIDE ACTIVITY SUMMARY									
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F
PU-236	5749.00	5751.15	4.894	1.000	-0.920	1.920	1.3856	100.000	-5.30E-02
PU-238	5486.00	5472.79	4.894	1.000	-1.160	2.160	1.4697	99.900	-6.53E-02
PU-239	5155.00	5118.68	0.000	0.000	-3.840	3.840	1.9596	99.900	-2.16E-01
PU-242	4870.00	4876.87	29.364	304.000	299.200	4.800	2.1909	100.000	1.68E+01
PU-244	4589.00	4586.89	4.894	1.000	0.280	0.720	0.8485	99.900	1.58E-02
									1.96-sigma
									TPU pCi/F
									1.80E-01
									1.77E-01
									1.55E-01
									2.89E+00
									1.65E-01
									MDA pCi/F
									4.66E-01
									4.72E-01
									5.73E-01
									6.20E-01
									3.44E-01
									Lc pCi/F
									1.46E-01
									1.52E-01
									2.02E-01
									2.26E-01
									8.75E-02
									1.96-sigma
									cnt Unc pCi/F
									1.79E-01
									1.77E-01
									1.55E-01
									1.93E+00
									1.65E-01



BATCH NUMBER : 2333140		CHAMBER : 099		LIB FILE : PU	
SAMPLE ID : R1205226001_PU		DETECTOR S/N : 158120		BKG FILE : B099.CNF:2050	
SAMPLE QTY : 0.117 F		AVERAGE %EFFICIENCY : 35.6810		BKG DATE : 28-Oct-2022	
SAMPLE DATE : 01-Nov-2022 00:00:00		AVERAGE %EFF ERROR : 0.6877		BKG LIVE TIME(SEC) : 60000.00	
ANALYST : BV1		COUNT DATE : 03-Nov-2022 10:26:52		EFF FILE : W099.CNF:551	
% YIELD : 74.3 +/-6.497 %		ELAPSED LIVE TIME(SEC) : 14399.99		CAL DATE : 13-Oct-2022	

TRACER	
ID : 2022-A	
NUCLIDE : PU-242	
NOMINAL : 4.2365E+00 dpm	
RESULTS : 3.1473E+00 dpm	

NUCLIDE ACTIVITY SUMMARY										
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F
PU-236	5749.00	5712.23	0.000	0.000	-2.640	2.640	1.6248	100.000	-1.60E-01	1.55E-01
PU-238	5486.00	5457.20	141.784	2.000	0.800	1.200	1.0954	99.900	4.86E-02	2.18E-01
PU-239	5155.00	5102.63	102.671	3.000	0.840	2.160	1.4697	99.900	5.10E-02	2.55E-01
PU-242	4870.00	4865.60	41.487	276.000	269.520	6.480	2.5456	100.000	1.63E+01	2.95E+00
PU-244	4589.00	4549.27	14.667	2.000	1.520	0.480	0.6928	99.900	9.23E-02	2.12E-01
									MDA pCi/F	1.96-sigma cnt Unc pCi/F
									5.44E-01	1.55E-01
									4.26E-01	2.18E-01
									5.09E-01	2.56E-01
									7.48E-01	1.98E+00
									3.36E-01	2.12E-01

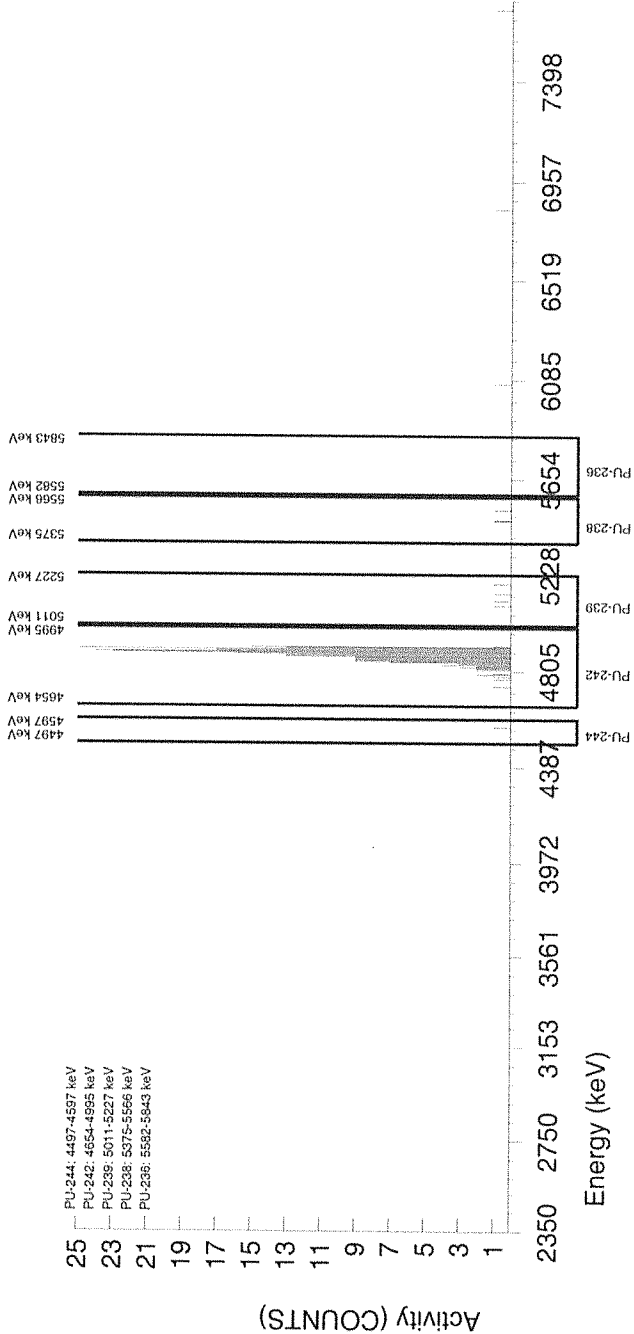


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER : 2333140		CHAMBER : 215		LIB FILE : PU	
SAMPLE ID : R1205226002_PU		DETECTOR S/N : 155839		BKG FILE : B215.CNF:985	
SAMPLE QTY : 0.117 F		AVERAGE %EFFICIENCY : 27.2396		BKG DATE : 28-Oct-2022	
SAMPLE DATE : 01-Nov-2022 00:00:00		AVERAGE %EFF ERROR : 0.5285		BKG LIVE TIME(SEC) : 60000.00	
ANALYST : BV1		COUNT DATE : 03-Nov-2022 10:12:58		EFF FILE : W215.CNF:79	
% YIELD : 80.6		ELAPSED LIVE TIME(SEC) : 14400.00		CAL DATE : 20-Oct-2022	

TRACER		LCS	
ID : 2022-A		ID	
NUCLIDE : PU-242		NUCLIDE	
NOMINAL : 4.2365E+00 dpm		NOMINAL (pCi/F)	
RESULTS : 3.4160E+00 dpm		% RECOVERY	

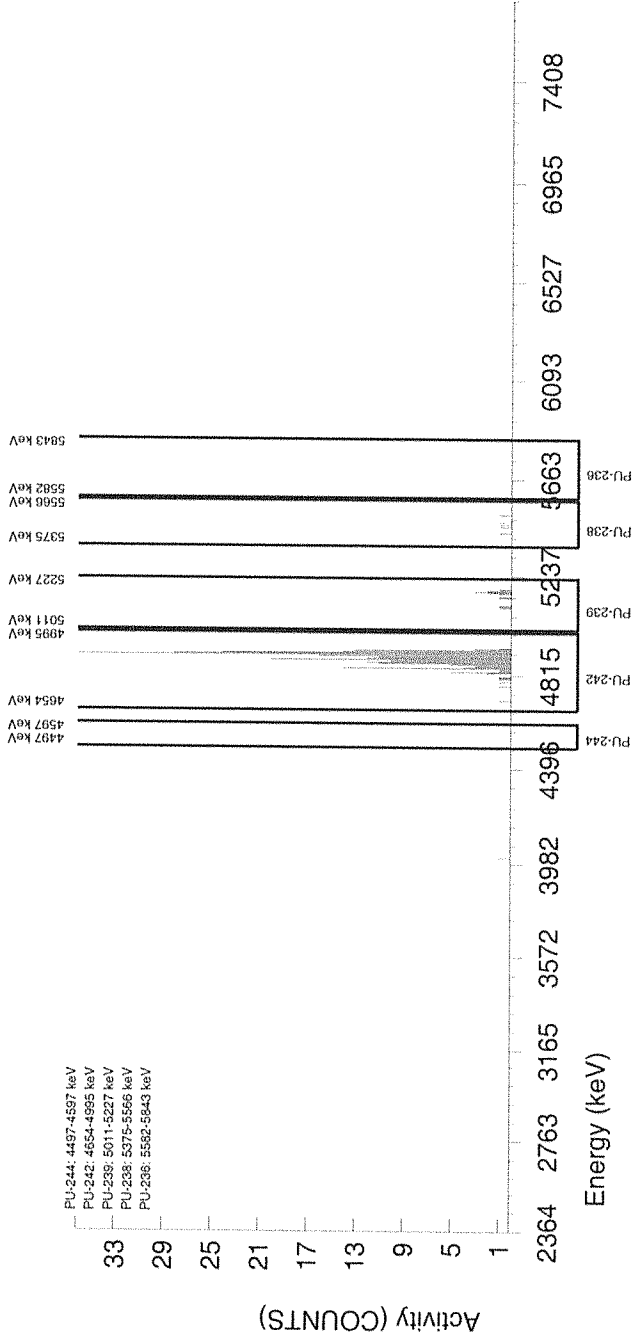
NUCLIDE ACTIVITY SUMMARY									
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F
PU-236	5749.00	5712.28	0.000	0.000	-1.200	1.200	1.0954	100.000	-8.80E-02
PU-238	5486.00	5485.09	49.701	3.000	1.800	1.200	1.0954	99.900	1.32E-01
PU-239	5155.00	5137.81	94.431	4.000	2.800	1.200	1.0954	99.900	2.05E-01
PU-242	4870.00	4880.87	41.269	225.000	223.320	1.680	1.2961	100.000	1.63E+01
PU-244	4589.00	4564.11	4.970	1.000	1.000	0.000	1.0000	99.900	7.33E-02
1.96-sigma									TPU pCi/F
									1.67E-01
									3.00E-01
									3.33E-01
									3.19E+00
									2.06E-01
1.96-sigma									Lc pCi/F
									1.47E-01
									1.47E-01
									1.47E-01
									5.67E-01
									2.20E-01
									1.67E-01
									2.99E-01
									3.32E-01
									2.16E+00
									2.06E-01



BATCH NUMBER : 2333140		CHAMBER : 217		LIB FILE : PU	
SAMPLE ID : R1205226003_PU		DETECTOR S/N : 155841		BKG FILE : B217.CNF;1120	
SAMPLE QTY : 0.117 F		AVERAGE %EFFICIENCY : 26.1786		BKG DATE : 28-Oct-2022	
SAMPLE DATE : 01-Nov-2022 00:00:00		AVERAGE %EFF ERROR : 0.5084		BKG LIVE TIME(SEC) : 60000.00	
ANALYST : BV1		COUNT DATE : 03-Nov-2022 10:13:00		EFF FILE : W217.CNF;75	
% YIELD : 93.8		ELAPSED LIVE TIME(SEC) : 14400.00		CAL DATE : 20-Oct-2022	

TRACER		LCSD	
ID : 2022-A		ID	
NUCLIDE : PU-242		NUCLIDE	
NOMINAL : 4.2365E+00 dpm		NOMINAL (pCi/F)	
RESULTS : 3.9727E+00 dpm		% RECOVERY	

NUCLIDE ACTIVITY SUMMARY									
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F
PU-236	5749.00	5712.27	0.000	0.000	-1.200	1.200	1.0954	100.000	-7.87E-02
PU-238	5486.00	5466.62	79.303	5.000	3.320	1.680	1.2961	99.900	2.18E-01
PU-239	5155.00	5161.01	14.869	15.000	14.520	0.480	0.6928	99.900	9.52E-01
PU-242	4870.00	4884.40	33.704	252.000	249.600	2.400	1.5492	100.000	1.63E+01
PU-244	4589.00	4546.97	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00
									1.96-sigma
									TPU pCi/F
									1.49E-01
									3.28E-01
									5.33E-01
									3.04E+00
									1.32E-01
									MDA pCi/F
									4.60E-01
									5.08E-01
									3.63E-01
									5.68E-01
									1.97E-01
									Lc pCi/F
									1.32E-01
									1.56E-01
									8.32E-02
									1.86E-01
									1.20E-01
									1.96-sigma
									cnt Unc pCi/F
									1.49E-01
									3.27E-01
									5.17E-01
									2.04E+00
									1.32E-01



Continuing Calibration Data



Liquid Scintillation Counter Checks for 05-NOV-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LSCGOLD	Carbon-14	08:02	1.3		124059	-0.15		
	Carbon-14	08:04	1.3		124247	0.52		
	Tritium	08:06	1.15		153668	-1.1		
	Tritium	08:07	1.15		152988	-2.5		
	BKG	08:10	30		27	-0.12		
	BKG	08:41	30		27	-0.02		
LSCJADE	Carbon-14	02:32	1.31		123884	0.28		
	Carbon-14	02:35	1.32		123476	-1.08		
	Tritium	02:37	1.05		163263	-0.86		
	Tritium	02:39	1.04		163412	-0.48		
	BKG	02:44	30		4.86	-0.23		
	BKG	03:17	30		4.8	-0.32		
LSCMOCHA	Carbon-14	06:22	1.35		121688	0.44		
	Carbon-14	06:24	1.35		121677	0.41		
	Tritium	06:26	1.3		138370	-1.55		
	Tritium	06:27	1.3		138683	-1.08		
	BKG	06:29	30		18	-1.69		
	BKG	07:00	30		18	-1.18		
LSCNAVY	Carbon-14	02:33	1.32		124519	-2.11		
	Carbon-14	02:35	1.3		125441	0.75		
	Tritium	02:36	1.1		169859	-2.22		
	Tritium	02:38	1.1		169824	-2.27		
	BKG	02:40	30		20	-0.09		
	BKG	03:10	30		18	-1.79		
LSCPINK	Carbon-14	01:35	1.012433		124059	0.42		
	Tritium	01:39	1.012433		136908	-2.24		
	BKG	02:11	30.01243		8.63	1.85		
	Carbon-14	02:13	1.012433		123670	-0.61		
	Tritium	02:14	1.012417		136693	-2.64		
	BKG	02:44	30.01243		8.03	0.82		

LSCPURPLE	Carbon-14	04:30	.4	124062	0.8
	Carbon-14	04:30	.45	122888	-1.8
	Tritium	04:31	.4	152745	-2.17
	Tritium	04:32	.4	152214	-2.76
	BKG	04:33	30	21	-1.68
	BKG	05:04	30	23	0.27

Reviewed by:



Gregory Ramsay

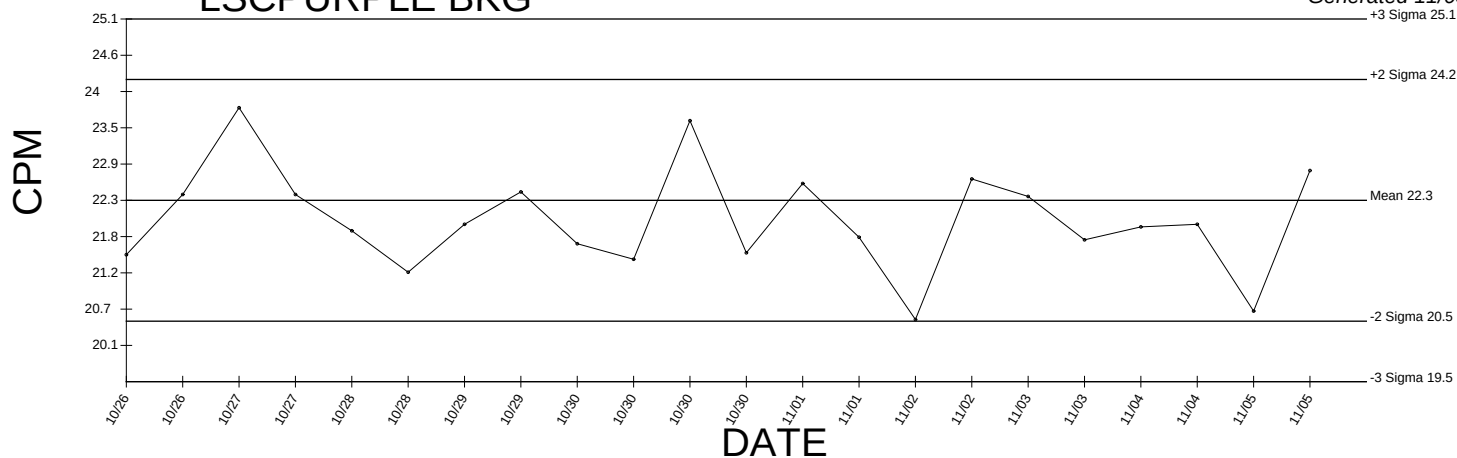
Date: 05-NOV-22

GEL Laboratories LLC

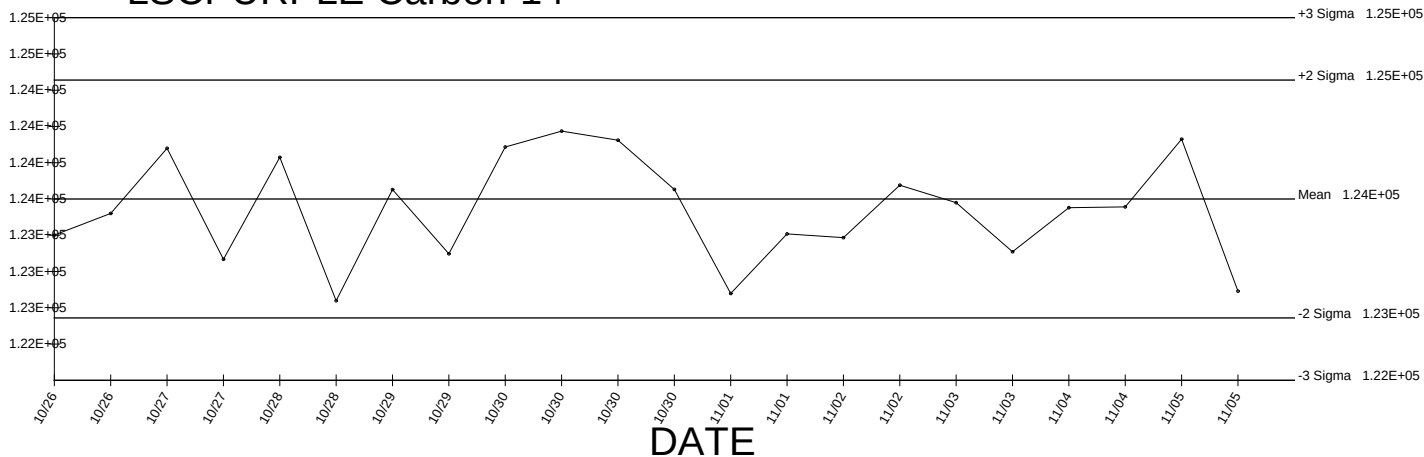
Background and Efficiency Data

LSCPURPLE BKG

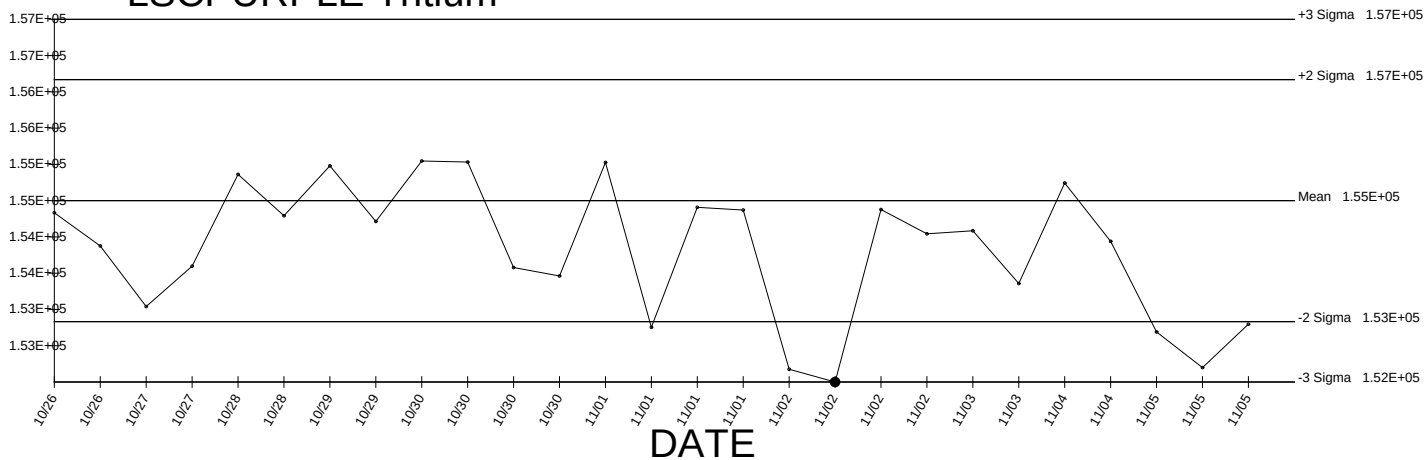
Generated 11/05/2022



LSCPURPLE Carbon-14



LSCPURPLE Tritium



RAD Standards Traceability



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

1714

98366

Pu-241 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL 1408580, Item 6 **Product Code:** 8341

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)	
			Type	u _A	u _B		U
Pu-241	5.232E+03	4.016E+04		0.2	1.7	3.5	09/09/2014

*Uncertainty: U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: α -impurities < 0.08%, γ -impurities (other than decay products) < 0.1%.
5.46647 g 3M HNO₃ solution. Carrier free.

Source Prepared by:

R. Ormsby
R. Ormsby, Radiochemist

QC Approved:

J. S. Lahr
J. S. Lahr, Spectroscopist

Date: 9/5/14



Standard Logbook

Serial ID: 1714 **Open/Reference Date:** 09 SEP 2014 **Aliquot :** 5.46647 g
Name: Plutonium-241 **Received:** 10 SEP 2014 **Density :** Hand Calculated
Type: Source Material **Expires:** 11 SEP 2075 **Logbook Num :** GL-CED-297-007
Employee: Gregory Ramsay **Lot Number :** 98366
Supplier: Eckert & Ziegler **Solvent :** 3M HNO3
Uncertainty : 1.75 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-241	40160 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1714
Prepared By:	Gregory Ramsay
Carrier Conc:	3M HNO ₃
Reference Date:	09/09/2014
Ampoule Mass (g):	5.46647 g
Uncertainty:	+/- 1.75 %
LogBook No:	GL-CED-297-007
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Plutonium-241		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2019		
Verification Date:	01/25/2021		
Expiration Date:	01/25/2023		
Primary Code:	1714-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.4425 g		
Density(g/mL):	1.0331	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23990.3411 \text{ dpm/mL}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0331 \text{ g/mL}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23220.6511 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
07/22/2019	Tim Chandler	50.7721	500	1714-B	2357.9224 dpm/mL	01/19/2022	01/19/2023
07/18/2022	Matelon DeFreese	25.0261	250	1714-C	2324.48935 dpm/mL	10/28/2022	10/28/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-241 Standard 1714-B

1/19/2022	Isotope	Detector CPM	BKG CPM	NET CPM	Detector Eff Mass. Used (mL)	Source DPM/mL
Matelon DeFreese	1714-B	418.9300	10.5300	408.4000	0.2541	1607.241244
	1714-B	423.9300	10.5300	413.4000	0.2551	1620.540964
	1714-B	413.8700	10.5300	403.3400	0.253	1594.229249
Mean Value (Counting) =	1607.337152	dpm/mL	97.4108307	Pass	Average =	1607.337152
Stdev =	13.15611985	dpm/mL	0.00818504	Rule B (Pass/Fail)		
Certificate Value =	1650.06	dpm/mL				
Two sigma =	26.31223971					
10 % of Mean =	160.7337152					
Rule A (Pass/Fail)	Pass					

Verification Rules

- Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule B = The determined mean value shall be within 5% of the certificate value.

The analyst prepared three standard verification sources for Pu-241 source 1714-B by transferring 1 mL portions of the standard into plastic liquid scintillation vials. Thirteen mL of Ecoscint Ultra liquid scintillation cocktail and 2 mL of DI water were added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion. The standard verification vials and Background source were dark adapted for two hours and counted on LSC Brown for Pu-241 source standard verification. The Pu-241 efficiency calibration which was used for verification calculations was created during instrument calibrations. Each verification source calculation was performed as follows:

$$\text{Source dpm/g} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency, (cpm/dpm), and
- D = mass used for standard verification.

Reference RAD SOP M-001

8/24/22



National Institute of Standards & Technology

Certificate

2022

Standard Reference Material[®] 4334j

Plutonium-242 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}.$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterwieser, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

Steven J. Choquette, Director
Office of Reference Materials

GL-CE0-797-314a

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq·g^{-1(a)}
Relative expanded uncertainty ($k = 2$)	0.51 % ^(b)

^(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

^(b) The uncertainties on certified values are expanded uncertainties, $U = k u_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

GL-CED-297.3146

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ⁻¹ (a,b,c,d)
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ⁻¹ (a,d)
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π α liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

^(a) The stated uncertainty is two times the standard uncertainty [5].

^(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

^(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,

0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and

0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

^(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclidic impurities follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ⁻⁶ ⁽³⁾	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ⁻⁵ ⁽³⁾	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

^(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,

5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and

3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

^(f) The stated uncertainty is the standard uncertainty. See reference 6.

GL-CEB-297-314c

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ^{242}Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	^{242}Pu decay corrections for half-life uncertainty of 0.22 %.	B	$< 10^{-10}$
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty ($k = 2$)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

GL-CE0-297-314d

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

GL-CEB-297-314e

Standard Logbook

Serial ID: 2022 **Open/Reference Date:** 09 AUG 2017 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 18 JAN 2022 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18 JAN 2050 **Logbook Num :** GL-CED-297-314
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
Uncertainty : .255 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2022
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO3
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-314
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	07/18/2022		
Verification Date:	07/21/2022		
Expiration Date:	07/21/2023		
Primary Code:	2022-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.4148 g		
Density(g/mL):	1.0405	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.4148 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 42.3654 \text{ dpm/mL}$
$(5.4148 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0405 \text{ g/mL}) / (200 \text{ mL}) = 40.7183 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
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GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2022-A

v1.2

Analyst	MXS2
Verification Prep Date	7/21/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.2
Expiration Date	8/17/2022

Standard Information	
Isotope	Pu-242
Serial Number	2022-A
Isotope Half-life	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	42.3654
Amount of Std. (mL)	0.2
Standard Prep Date	7/18/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	7/21/2022	3.800	42.18
2	7/21/2022	3.760	41.74
3	7/21/2022	3.730	41.40

Mean Value = 3.763 41.773
Stdev = 0.035118846 0.389819189

Certificate Value* = 3.8167 pCi
Two sigma = 0.0702
10 % of Mean = 0.3763
Rule A (Pass/Fail) Pass
% Recovery 98.60%
Rule B (Pass/Fail) Pass
Expiration Date 7/21/2023

dpm/mL
42.3650
0.7796
4.1773
Pass
98.60%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2022-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. Added 0.1 mL of neodymium carrier and 3-4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

8/25/22

Runlogs

Instrument Run Log

Instrument Type: LSC

Batch ID: 2333140

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
597531001	SAMPLE	BV1	LSCPURPLE	NOV-05-22 12:22:46	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
597531002	SAMPLE	BV1	LSCPURPLE	NOV-05-22 13:24:32	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
597531003	SAMPLE	BV1	LSCPURPLE	NOV-05-22 14:26:19	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
597533001	SAMPLE	BV1	LSCPURPLE	NOV-05-22 15:28:04	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
597533002	SAMPLE	BV1	LSCPURPLE	NOV-05-22 16:29:51	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
597533003	SAMPLE	BV1	LSCPURPLE	NOV-05-22 17:31:39	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
597533004	SAMPLE	BV1	LSCPURPLE	NOV-05-22 18:33:32	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
597533005	SAMPLE	BV1	LSCPURPLE	NOV-05-22 19:35:26	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
1205226001	MB	BV1	LSCPURPLE	NOV-05-22 20:37:19	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
1205226002	LCS	BV1	LSCPURPLE	NOV-05-22 21:39:05	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
1205226003	LCSD	BV1	LSCPURPLE	NOV-05-22 22:40:52	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00

November 07, 2022

Ms. Candace Christensen
Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607

Re: Project # 080153.007 Air Monitoring at SSFL
Work Order: 597533

Dear Ms. Christensen:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on October 20, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4422.

Sincerely,



Jake Crook
Project Manager

Purchase Order: 8-00000942
Chain of Custody: 10182022-2
Enclosures

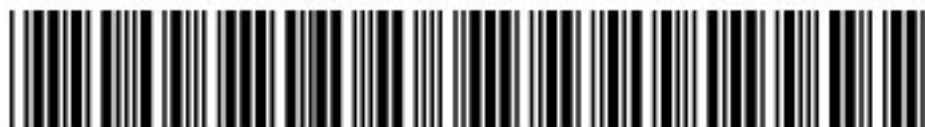


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Case Narrative

**Receipt Narrative
for
North Wind Solutions
SDG: 597533**

November 07, 2022

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on October 20, 2022 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

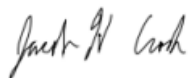
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
597533001	DOE-1_Qtr 18_S
597533002	DOE-2_Qtr 18_S
597533003	DOE-3_Qtr 18_S
597533004	DOE-4_Qtr 18_S
597533005	BLANK_Qtr 18_S

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink, appearing to read "Jake H. Crook". The signature is written in a cursive, slightly slanted style.

Jake Crook
Project Manager

Chain of Custody and Supporting Documentation

Page: 1 of 1

Project # 080153.018.15

Quote #: GEL19-1151

CO Number (0): 10182022-2

PO Number: 8-00000942

GEL

Laboratories LLC

Chemistry | Radiochemistry | Radiobiology | Specialty Analytics

Chain of Custody and Analytical Request

GEL Work Order Number: 697533

GEL Laboratories, LLC

2040 Savage Road

Charleston, SC 29407

Phone: (843) 556-8171

Fax: (843) 766-1178

Client Name: North Wind Portage, Inc.

Project/Site Name: Baseline Air Monitoring / DOE SSFL- ETEC

Address: 5800 Woolsey Canyon Rd Canoga Park, CA 91304

Collected By: Lucas Ray

Send Results To: cchristensen@northwindgrp.com, lucas.ray@envirochem.com

Phone # 805-587-0691

Fax # N/A

Sample ID

DOE-1_Qtr 18_S (7/1/22 1225-9/30/22 0745)

DOE-2_Qtr 18_S (7/1/22 1233-9/30/22 0751)

DOE-3_Qtr 18_S (7/1/22 1309-9/30/22 0758)

DOE-4_Qtr 18_S (7/1/22 1315-9/30/22 0805)

BLANK_Qtr 18_S (7/1/22 0900-9/30/22 0900)

Should this sample be considered:

Radioactive (if isotopic info yes, please supply (7) Known or possible Hazards

Gamma Spec (GA-01-R)

Sr-90 (SR-03-RC)

Iso-Po-210 (Alpha Spec)(A-01-R)

Iso-Th (Alpha Spec)(A-01-R)

Iso-U (Alpha Spec)(A-01-R)

Iso-Am-241 (Alpha Spec)(A-01-R)

Iso-Pu (Alpha Spec)(A-01-R)

Pu-241 (STL-RC-0245)

Ra-226 (Ra-02-RC Modified)

Ra-228 (Ra-02-RC Modified)

Comments

Note: extra sample is required for sample specific QC

Gamma Spec to include: Be-7, K-40, Co-60, Cs-137, Ac-228

Chain of Custody Signatures

Relinquished By (Signed) Date Time

Received by (signed) Date Time

1 10-18-2022 10:10 10/20/2022 09:45

2 10/20/2022 09:45

3 10/20/2022 09:45

TAT Requested: Normal: X Rush: Specify: (Subject to Surcharge)

Fax Results: [] Yes [x] No

Select Deliverable: [] C of A [] QC Summary [] Level 1 [] Level 2 [] Level 3 [] Level 4

Additional Remarks:

For Lab Receiving Use Only: Custody Seal Intact? [] Yes [] No Cooler Temp: °C

Sample Collection Time Zone: [] Eastern [x] Pacific [] Central [] Mountain [] Other:

1.) Chain of Custody Number = Client Determined

2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite

3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.

4.) Matrix Codes: DW=Drinking Water, GW=Groundwater, SW=Surface Water, WW=Waste Water, W=Water, ML=Misc Liquid, SO=Soil, SD=Sediment, SL=Sludge, SS=Solid Waste, O=Oil, F=Filter, P=Wipe, U=Urine, F=Fecal, N=Nasal

5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).

6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate, If no preservative is added = leave field blank

7.) KNOWN OR POSSIBLE HAZARDS

RCRA Metals As = Arsenic Hg= Mercury Ba = Barium Se= Selenium Cd = Cadmium Ag= Silver Cr = Chromium MR= Misc. RCRA metals Pb = Lead

Characteristic Hazards FL = Flammable/Ignitable CO = Corrosive RE = Reactive

Listed Waste LW= Listed Waste (F,K,P and U-listed wastes.) Waste code(s):

Other OT= Other / Unknown (i.e., High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.) Description:

Please provide any additional details below regarding handling and/or disposal concerns. (i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)



Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: <u>NORW</u>		SDG/AR/COC/Work Order: <u>597531, 597533</u>	
Received By: <u>[Signature]</u>		Date Received: <u>10/20/22</u>	
Carrier and Tracking Number		Circle Applicable: ☒ FedEx Express ☐ FedEx Ground ☐ UPS ☐ Field Services ☐ Courier ☐ Other	
		<u>770236265623</u>	
Suspected Hazard Information		Yes	No
			*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		☒	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		☒	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		☒	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM/mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		☒	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		☒	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____
Sample Receipt Criteria		Yes	NA
1 Shipping containers received intact and sealed?		☒	☒
2 Chain of custody documents included with shipment?		☒	☒
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		☒	☒
4 Daily check performed and passed on IR temperature gun?		☒	☒
5 Sample containers intact and sealed?		☒	☒
6 Samples requiring chemical preservation at proper pH?		☒	☒
7 Do any samples require Volatile Analysis?		☒	☒
8 Samples received within holding time?		☒	☒
9 Sample ID's on COC match ID's on bottles?		☒	☒
10 Date & time on COC match date & time on bottles?		☒	☒
11 Number of containers received match number indicated on COC?		☒	☒
12 Are sample containers identifiable as GEL provided by use of GEL labels?		☒	☒
13 COC form is properly signed in relinquished/received sections?		☒	☒
Comments (Use Continuation Form if needed):			

Laboratory Certifications

List of current GEL Certifications as of 07 November 2022

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-3
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
North Wind Solutions
SDG #: 597533**

Product: Alphaspec Am241, Filter

Analytical Method: DOE EML HASL-300, Am-05-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2333132

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597533001	DOE-1_Qtr 18_S
597533002	DOE-2_Qtr 18_S
597533003	DOE-3_Qtr 18_S
597533004	DOE-4_Qtr 18_S
597533005	BLANK_Qtr 18_S
1205225991	Method Blank (MB)
1205225992	Laboratory Control Sample (LCS)
1205225993	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec Pu, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2333138

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597533001	DOE-1_Qtr 18_S

597533002	DOE-2_Qtr 18_S
597533003	DOE-3_Qtr 18_S
597533004	DOE-4_Qtr 18_S
597533005	BLANK_Qtr 18_S
1205225998	Method Blank (MB)
1205225999	Laboratory Control Sample (LCS)
1205226000	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Laboratory Control Sample (LCS) Recovery

The Laboratory Control Sample (See Below) does not meet the recovery requirement, however, all sample results are less than the MDC. Since the sample results are non-detects, the implied high bias does not carry over to the associated samples.

Sample	Analyte	Value
1205225999 (LCS)	Plutonium-239/240	126* (75%-125%)

Duplication Criteria between LCS and LCSD

The Laboratory Control Sample and Laboratory Control Sample Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below and the spike recovery limit.

Sample	Analyte	Value
1205225999 (LCS) and 1205226000 (LCSD)	Plutonium-239/240	RPD 24.1* (0%-20%) RER 1.8 (0-3)

Product: Alphaspec U, Filter

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2333141

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
------------------------------	--

597533001	DOE-1_Qtr 18_S
597533002	DOE-2_Qtr 18_S
597533003	DOE-3_Qtr 18_S
597533004	DOE-4_Qtr 18_S
597533005	BLANK_Qtr 18_S
1205226004	Method Blank (MB)
1205226005	Laboratory Control Sample (LCS)
1205226006	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec Th, Filter

Analytical Method: DOE EML HASL-300, Th-01-RC Modified

Analytical Procedure: GL-RAD-A-038 REV# 18

Analytical Batch: 2333142

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597533001	DOE-1_Qtr 18_S
597533002	DOE-2_Qtr 18_S
597533003	DOE-3_Qtr 18_S
597533004	DOE-4_Qtr 18_S
597533005	BLANK_Qtr 18_S
1205226007	Method Blank (MB)
1205226008	Laboratory Control Sample (LCS)
1205226009	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Samples 597533003 (DOE-3_Qtr 18_S) and 597533005 (BLANK_Qtr 18_S) were recounted due to high MDCs. The recounts are reported.

Product: Alphaspec Po210, Filter

Analytical Method: DOE EML HASL-300, Po-01-RC Modified

Analytical Procedure: GL-RAD-A-016 REV# 19

Analytical Batch: 2333147

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597533001	DOE-1_Qtr 18_S
597533002	DOE-2_Qtr 18_S
597533003	DOE-3_Qtr 18_S
597533004	DOE-4_Qtr 18_S
597533005	BLANK_Qtr 18_S
1205226018	Method Blank (MB)
1205226019	Laboratory Control Sample (LCS)
1205226020	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The tracer peak centroid for samples 597533001 (DOE-1_Qtr 18_S) and 597533002 (DOE-2_Qtr 18_S) are greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peaks are within the tracer region of interest.

Product: Gammaspec, Gamma, Filter

Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R

Analytical Procedure: GL-RAD-A-013 REV# 27

Analytical Batch: 2333342

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597533001	DOE-1_Qtr 18_S
597533002	DOE-2_Qtr 18_S
597533003	DOE-3_Qtr 18_S
597533004	DOE-4_Qtr 18_S
597533005	BLANK_Qtr 18_S
1205226444	Method Blank (MB)
1205226445	597531001(A-3-RMHF-2022-Qtr3) Sample Duplicate (DUP)
1205226446	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Qualifier Information

Qualifier	Reason	Analyte	Sample	Client Sample
UI	Results are considered a false positive due to high peak-width.	Cesium-137	597533005	BLANK_Qtr 18_S
UI	Results are considered a false positive due to no valid peak.	Potassium-40	597533004	DOE-4_Qtr 18_S

Product: GFPC, Sr90, Filter

Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified

Analytical Procedure: GL-RAD-A-004 REV# 22

Analytical Batch: 2333238

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597533001	DOE-1_Qtr 18_S
597533002	DOE-2_Qtr 18_S
597533003	DOE-3_Qtr 18_S
597533004	DOE-4_Qtr 18_S
597533005	BLANK_Qtr 18_S
1205226267	Method Blank (MB)
1205226268	Laboratory Control Sample (LCS)
1205226269	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Samples 597533001 (DOE-1_Qtr 18_S) and 597533003 (DOE-3_Qtr 18_S) were recounted due to a suspected false positive. The recounts are reported.

Product: GFPC Total Alpha Radium, Filter

Analytical Method: EPA 900.1 Mod/ EPA 903.0 Mod

Analytical Procedure: GL-RAD-A-010 REV# 21

Analytical Batch: 2333240

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597533001	DOE-1_Qtr 18_S
597533002	DOE-2_Qtr 18_S
597533003	DOE-3_Qtr 18_S
597533004	DOE-4_Qtr 18_S
597533005	BLANK_Qtr 18_S
1205226270	Method Blank (MB)
1205226271	Laboratory Control Sample (LCS)
1205226272	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205226270 (MB)	Total Radium	Result 0.807 < MDA 2.95 > RDL 1 pCi/Sample

Samples (See Below) did not meet the detection limits due to limited sample volume. Samples were counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
597533001 (DOE-1_Qtr 18_S)	Total Radium	Result 0.536 < MDA 2.74 > RDL 1 pCi/Sample
597533003 (DOE-3_Qtr 18_S)	Total Radium	Result 2.77 < MDA 3.48 > RDL 1 pCi/Sample

Product: GFPC Ra228, Filter

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2333242

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597533001	DOE-1_Qtr 18_S
597533002	DOE-2_Qtr 18_S
597533003	DOE-3_Qtr 18_S
597533004	DOE-4_Qtr 18_S
597533005	BLANK_Qtr 18_S
1205226273	Method Blank (MB)
1205226274	Laboratory Control Sample (LCS)
1205226275	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205226273 (MB)	Radium-228	Result 3.22 < MDA 3.97 > RDL 1 pCi/Sample

Samples did not meet the detection limits due to limited sample volume.

Sample	Analyte	Value
597533002 (DOE-2_Qtr 18_S)	Radium-228	Result 1.69 < MDA 3.53 > RDL 1 pCi/Sample
597533004 (DOE-4_Qtr 18_S)	Radium-228	Result 0.842 < MDA 3.94 > RDL 1 pCi/Sample

Product: Liquid Scint Pu241, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-035 REV# 23

Analytical Batch: 2333140

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2333105

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
597533001	DOE-1_Qtr 18_S
597533002	DOE-2_Qtr 18_S
597533003	DOE-3_Qtr 18_S
597533004	DOE-4_Qtr 18_S
597533005	BLANK_Qtr 18_S
1205226001	Method Blank (MB)
1205226002	Laboratory Control Sample (LCS)
1205226003	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
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1205226001 (MB)	Plutonium-241	Result 10.3 < MDA 41.7 > RDL 5 pCi/Sample
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Samples did not meet the detection limits due to limited sample volume.

Sample	Analyte	Value
597533001 (DOE-1_Qtr 18_S)	Plutonium-241	Result 7.17 < MDA 31 > RDL 5 pCi/Sample
597533002 (DOE-2_Qtr 18_S)	Plutonium-241	Result 18 < MDA 47.1 > RDL 5 pCi/Sample
597533003 (DOE-3_Qtr 18_S)	Plutonium-241	Result -0.273 < MDA 33.1 > RDL 5 pCi/Sample
597533004 (DOE-4_Qtr 18_S)	Plutonium-241	Result 17.7 < MDA 50.3 > RDL 5 pCi/Sample
597533005 (BLANK_Qtr 18_S)	Plutonium-241	Result 35 < MDA 50.3 > RDL 5 pCi/Sample

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Prep Logbook

The Preparation of Special Matrices for the Determination of Radionuclides

Batch ID: 2333105

Analyst: Christine Carter (CXC1)

Method: Filter Prep

Lab SOP: GL-RAD-A-026 REV# 18

Instrument: NONE

SP-15750050

Due Dates for Lab: 01-NOV-2022

Package: 03-NOV-2022

SDG: 03-NOV-2022

Type

Sample Id

Description

Serial Number

Spike Amount

Spike Units

#	Sample ID	Prep Date	Min RDL ()	Number of Filters	Container Wt (g)	Weight of total filter with container (g)	Weight of filter Diluted with container (g)	Not Saved Final Volume of filter diluted to in Liters (mL)	Total Filter Weight (g)	Weight of Filter Diluted (g)
1	597531001	26-OCT-2022		1	81.196	83.434	82.846	200	2.238	1.65
2	597531002	26-OCT-2022		1	81.429	83.669	83.09	200	2.24	1.661
3	597531003	26-OCT-2022		1	81.37	83.561	83.026	200	2.191	1.656
4	597533001	26-OCT-2022		1	80.907	84.664	83.827	200	3.757	2.92
5	597533002	26-OCT-2022		1	81.441	85.19	84.336	200	3.749	2.895
6	597533003	26-OCT-2022		1	81.445	85.21	84.298	200	3.765	2.853
7	597533004	26-OCT-2022		1	81.356	85.103	84.21	200	3.747	2.854
8	597533005	26-OCT-2022		1	81.877	85.538	84.649	200	3.661	2.772
9	597649003	26-OCT-2022		1	81.683	83.363	83.363	200	1.68	1.68
10	597649004	26-OCT-2022		1	81.899	82.158	82.158	200	0.259	0.259
11	597649005	26-OCT-2022		1	81.824	83.503	83.503	200	1.679	1.679
12	1205225940 MFB	26-OCT-2022		1	0	1	1	200	1	1

Reagent/Solvent Lot ID	Description	Amount	Comments:
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GEL LABORATORIES LLC

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Qualifier Definition Report for

NORW002 North Wind Solutions

Client SDG: 597533 GEL Work Order: 597533

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- UI Gamma Spectroscopy--Uncertain identification

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kenshalla Oston

Date: 08 NOV 2022

Title: Analyst I

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 8, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-1_Qtr 18_S
Sample ID: 597533001
Matrix: Filter
Collect Date: 30-SEP-22 07:45
Receive Date: 20-OCT-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	-0.216	+/-0.337	0.912	1.00	pCi/Sample			BV1	11/03/22	1013	2333132	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		8.85	+/-1.50	0.632	0.500	pCi/Sample			BV1	11/04/22	0835	2333147	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.101	+/-0.173	0.151	1.00	pCi/Sample			BV1	11/03/22	1026	2333138	3
Plutonium-239/240	U	0.0262	+/-0.146	0.279	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.764	+/-0.839	1.23	1.00	pCi/Sample			MP2	11/03/22	1202	2333142	4
Thorium-230	U	0.115	+/-0.515	1.02	1.00	pCi/Sample							
Thorium-232	U	0.0277	+/-0.368	0.781	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.495	+/-0.401	0.527	1.00	pCi/Sample			BV1	11/03/22	0850	2333141	5
Uranium-235/236	U	0.0343	+/-0.191	0.365	1.00	pCi/Sample							
Uranium-238		0.736	+/-0.423	0.374	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	7.17	+/-18.1	31.0	5.00	pCi/Sample			BV1	11/05/22	1528	2333140	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-1.35	+/-19.5	33.6		pCi/Sample			RXF2	10/31/22	0816	2333342	7
Beryllium-7		119	+/-64.7	74.9		pCi/Sample							
Cesium-137	U	-0.359	+/-4.11	7.60	20.0	pCi/Sample							
Cobalt-60	U	-2.80	+/-5.75	10.0		pCi/Sample							
Potassium-40	U	53.0	+/-81.6	166		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228		9.14	+/-3.98	6.12	1.00	pCi/Sample			JE1	11/04/22	1139	2333242	8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium	U	0.536	+/-1.53	2.74	1.00	pCi/Sample			JXK3	11/03/22	1851	2333240	9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	0.957	+/-1.67	2.89	3.00	pCi/Sample			JXK3	11/02/22	0911	2333238	10
The following Prep Methods were performed:													
Method	Description			Analyst	Date	Time	Prep Batch						
Filter Prep	Filter Prep			CXC1	10/26/22	0716	2333105						

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: November 8, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-1_Qtr 18_S
Sample ID: 597533001
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			75	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			66.7	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			95.6	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			37.4	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			87.8	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			95.6	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			66.6	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			97.9	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			88.9	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: November 8, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-2_Qtr 18_S
Sample ID: 597533002
Matrix: Filter
Collect Date: 30-SEP-22 07:51
Receive Date: 20-OCT-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	-0.171	+/-0.295	0.837	1.00	pCi/Sample			BV1	11/03/22	1013	2333132	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		9.30	+/-1.25	0.428	0.500	pCi/Sample			BV1	11/04/22	0835	2333147	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.0432	+/-0.279	0.571	1.00	pCi/Sample			BV1	11/03/22	1026	2333138	3
Plutonium-239/240	U	-0.0524	+/-0.237	0.597	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.202	+/-0.698	1.34	1.00	pCi/Sample			MP2	11/03/22	1202	2333142	4
Thorium-230	U	0.222	+/-0.662	1.24	1.00	pCi/Sample							
Thorium-232		0.822	+/-0.753	0.713	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.0781	+/-0.359	0.712	1.00	pCi/Sample			BV1	11/03/22	0935	2333141	5
Uranium-235/236	U	0.0821	+/-0.308	0.518	1.00	pCi/Sample							
Uranium-238		0.549	+/-0.491	0.534	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	18.0	+/-27.8	47.1	5.00	pCi/Sample			BV1	11/05/22	1629	2333140	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	18.2	+/-14.2	31.9		pCi/Sample			RXF2	10/31/22	0817	2333342	7
Beryllium-7		132	+/-64.8	61.3		pCi/Sample							
Cesium-137	U	-1.88	+/-2.94	4.65	20.0	pCi/Sample							
Cobalt-60	U	-2.11	+/-3.63	6.50		pCi/Sample							
Potassium-40		103	+/-67.0	59.8		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228	U	1.69	+/-2.09	3.53	1.00	pCi/Sample			JE1	11/04/22	1139	2333242	8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium		3.40	+/-1.85	2.78	1.00	pCi/Sample			JXK3	11/03/22	1851	2333240	9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	-1.01	+/-1.33	2.34	3.00	pCi/Sample			JXK3	11/01/22	1909	2333238	10
The following Prep Methods were performed:													
Method	Description			Analyst	Date	Time	Prep Batch						
Filter Prep	Filter Prep			CXC1	10/26/22	0716	2333105						

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: November 8, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-2_Qtr 18_S
Sample ID: 597533002
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			71.6	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			63	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			66.5	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			31.7	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			70.8	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			66.5	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			72.4	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			103	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			91.1	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: November 8, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-3_Qtr 18_S
Sample ID: 597533003
Matrix: Filter
Collect Date: 30-SEP-22 07:58
Receive Date: 20-OCT-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	-0.0184	+/-0.277	0.647	1.00	pCi/Sample			BV1	11/03/22	1013	2333132	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		10.4	+/-1.25	0.469	0.500	pCi/Sample			BV1	11/04/22	0835	2333147	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	-0.0492	+/-0.166	0.432	1.00	pCi/Sample			BV1	11/03/22	1026	2333138	3
Plutonium-239/240	U	0.0577	+/-0.223	0.432	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.310	+/-0.305	0.431	1.00	pCi/Sample			MP2	11/05/22	1519	2333142	4
Thorium-230	U	0.111	+/-0.562	1.01	1.00	pCi/Sample							
Thorium-232	U	0.443	+/-0.389	0.578	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.418	+/-0.485	0.743	1.00	pCi/Sample			BV1	11/03/22	0850	2333141	5
Uranium-235/236	U	0.00355	+/-0.263	0.585	1.00	pCi/Sample							
Uranium-238		0.686	+/-0.496	0.531	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	-0.273	+/-19.1	33.1	5.00	pCi/Sample			BV1	11/05/22	1731	2333140	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	15.5	+/-38.0	39.8		pCi/Sample			RXF2	10/31/22	0818	2333342	7
Beryllium-7	U	115	+/-52.8	120		pCi/Sample							
Cesium-137	U	3.72	+/-3.95	8.56	20.0	pCi/Sample							
Cobalt-60	U	-0.647	+/-3.85	7.68		pCi/Sample							
Potassium-40	U	38.6	+/-94.4	83.3		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228		9.74	+/-2.53	3.16	1.00	pCi/Sample			JE1	11/04/22	1139	2333242	8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium	U	2.77	+/-2.15	3.48	1.00	pCi/Sample			JXK3	11/03/22	1851	2333240	9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	-0.464	+/-1.56	2.92	3.00	pCi/Sample			JXK3	11/02/22	0911	2333238	10
The following Prep Methods were performed:													
Method	Description			Analyst	Date	Time	Prep Batch						
Filter Prep	Filter Prep			CXC1	10/26/22	0716	2333105						

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 8, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-3_Qtr 18_S
Sample ID: 597533003
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			68.6	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			71.9	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			91.7	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			32.6	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			72.8	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			91.7	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			81.6	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			113	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			93.3	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 8, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-4_Qtr 18_S
Sample ID: 597533004
Matrix: Filter
Collect Date: 30-SEP-22 08:05
Receive Date: 20-OCT-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0106	+/-0.379	0.818	1.00	pCi/Sample			BV1	11/03/22	1013	2333132	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		9.68	+/-1.23	0.434	0.500	pCi/Sample			BV1	11/04/22	0835	2333147	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	-0.0528	+/-0.159	0.448	1.00	pCi/Sample			BV1	11/03/22	1026	2333138	3
Plutonium-239/240	U	0.0615	+/-0.307	0.614	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.605	+/-0.709	0.984	1.00	pCi/Sample			MP2	11/03/22	1202	2333142	4
Thorium-230	U	0.343	+/-0.638	1.08	1.00	pCi/Sample							
Thorium-232		0.798	+/-0.722	0.797	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.423	+/-0.425	0.568	1.00	pCi/Sample			BV1	11/03/22	0850	2333141	5
Uranium-235/236	U	-0.0210	+/-0.181	0.420	1.00	pCi/Sample							
Uranium-238		0.888	+/-0.523	0.393	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	17.7	+/-29.7	50.3	5.00	pCi/Sample			BV1	11/05/22	1833	2333140	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-14.0	+/-16.7	26.2		pCi/Sample			RXF2	10/31/22	0819	2333342	7
Beryllium-7		186	+/-63.6	59.5		pCi/Sample							
Cesium-137	U	0.685	+/-2.23	4.83	20.0	pCi/Sample							
Cobalt-60	U	-0.375	+/-3.07	6.28		pCi/Sample							
Potassium-40	UI	76.0	+/-69.7	71.6		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228	U	0.842	+/-2.25	3.94	1.00	pCi/Sample			JE1	11/04/22	1139	2333242	8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium		2.68	+/-1.62	2.47	1.00	pCi/Sample			JXK3	11/03/22	1851	2333240	9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	-0.823	+/-1.69	2.94	3.00	pCi/Sample			JXK3	11/01/22	1910	2333238	10
The following Prep Methods were performed:													
Method	Description			Analyst	Date	Time	Prep Batch						
Filter Prep	Filter Prep			CXC1	10/26/22	0716	2333105						

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 8, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-4_Qtr 18_S
Sample ID: 597533004

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			76.4	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			68.9	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			61.9	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			35.7	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			69.7	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			61.9	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			79.6	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			109	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			91.1	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: November 8, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: BLANK_Qtr 18_S
Sample ID: 597533005
Matrix: Filter
Collect Date: 30-SEP-22 09:00
Receive Date: 20-OCT-22
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	-0.0764	+/-0.258	0.671	1.00	pCi/Sample			BV1	11/03/22	1013	2333132	1
Alphaspec Po210, Filter "As Received"													
Polonium-210		0.754	+/-0.471	0.565	0.500	pCi/Sample			BV1	11/04/22	0841	2333147	2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	-0.0490	+/-0.221	0.558	1.00	pCi/Sample			BV1	11/03/22	1026	2333138	3
Plutonium-239/240	U	-0.118	+/-0.231	0.644	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.844	+/-0.656	0.850	1.00	pCi/Sample			MP2	11/05/22	1519	2333142	4
Thorium-230	U	0.256	+/-0.756	1.36	1.00	pCi/Sample							
Thorium-232		0.732	+/-0.543	0.575	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		1.49	+/-0.620	0.432	1.00	pCi/Sample			BV1	11/03/22	0850	2333141	5
Uranium-235/236	U	0.0210	+/-0.219	0.458	1.00	pCi/Sample							
Uranium-238		0.808	+/-0.482	0.470	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	35.0	+/-30.2	50.3	5.00	pCi/Sample			BV1	11/05/22	1935	2333140	6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	3.58	+/-30.9	25.2		pCi/Sample			RXF2	10/31/22	0819	2333342	7
Beryllium-7	U	1.36	+/-35.6	70.2		pCi/Sample							
Cesium-137	UI	7.99	+/-7.91	5.74	20.0	pCi/Sample							
Cobalt-60	U	0.995	+/-3.81	7.87		pCi/Sample							
Potassium-40		99.3	+/-64.8	48.7		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228		5.73	+/-2.49	3.68	1.00	pCi/Sample			JE1	11/04/22	1139	2333242	8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium		2.76	+/-1.56	2.31	1.00	pCi/Sample			JXK3	11/03/22	1851	2333240	9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	-1.18	+/-1.02	1.86	3.00	pCi/Sample			JXK3	11/01/22	1910	2333238	10
The following Prep Methods were performed:													
Method	Description			Analyst	Date	Time	Prep Batch						
Filter Prep	Filter Prep			CXC1	10/26/22	0716	2333105						

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 8, 2022

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: BLANK_Qtr 18_S
Sample ID: 597533005
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			75.1	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			78.5	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			62.3	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			16.5	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			78	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			62.3	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			77.7	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			111	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			91.1	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: November 8, 2022

Page 1 of 6

Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina
Ms. Candace Christensen

Contact:
Workorder: 597533

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2333132										
QC1205225992	LCS										
Americium-241	17.0			15.1 pCi/Sample			89.3	(75%-125%)	BV1	11/03/22	10:20
	Uncertainty			+/-1.94							
QC1205225993	LCSD										
Americium-241	17.0			13.4 pCi/Sample	12.6		78.8	(0%-20%)		11/03/22	10:20
	Uncertainty			+/-1.67							
QC1205225991	MB										
Americium-241			U	0.140 pCi/Sample						11/03/22	10:13
	Uncertainty			+/-0.407							
Batch	2333138										
QC1205225999	LCS										
Plutonium-238			U	0.158 pCi/Sample					BV1	11/03/22	10:26
	Uncertainty			+/-0.307							
Plutonium-239/240	17.6			22.3 pCi/Sample			126 *	(75%-125%)			
	Uncertainty			+/-2.29							
QC1205226000	LCSD										
Plutonium-238			U	-0.181 pCi/Sample	0					11/03/22	10:12
	Uncertainty			+/-0.280							
Plutonium-239/240	17.6			17.5 pCi/Sample	24.1 *		99.2	(0%-20%)			
	Uncertainty			+/-2.41							
QC1205225998	MB										
Plutonium-238			U	0.0486 pCi/Sample						11/03/22	10:26
	Uncertainty			+/-0.218							
Plutonium-239/240			U	0.0510 pCi/Sample							
	Uncertainty			+/-0.255							
Batch	2333140										
QC1205226002	LCS										
Plutonium-241	613			542 pCi/Sample			88.4	(75%-125%)	BV1	11/05/22	21:39
	Uncertainty			+/-35.7							
QC1205226003	LCSD										
Plutonium-241	613			566 pCi/Sample	4.34		92.3	(0%-20%)		11/05/22	22:40
	Uncertainty			+/-34.3							

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QC Summary

Workorder: 597533

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2333140										
QC1205226001	MB										
Plutonium-241			U	10.3 pCi/Sample					BV1	11/05/22	20:37
	Uncertainty			+/-24.4							
Batch	2333141										
QC1205226005	LCS										
Uranium-233/234				20.6 pCi/Sample					BV1	11/03/22	08:50
	Uncertainty			+/-2.33							
Uranium-235/236				0.969 pCi/Sample							
	Uncertainty			+/-0.624							
Uranium-238	24.1			22.8 pCi/Sample			94.5	(75%-125%)			
	Uncertainty			+/-2.45							
QC1205226006	LCSD										
Uranium-233/234				24.0 pCi/Sample		15				11/03/22	08:50
	Uncertainty			+/-2.54							
Uranium-235/236				2.07 pCi/Sample		72.5					
	Uncertainty			+/-0.856							
Uranium-238	24.1			24.4 pCi/Sample		6.97	101	(0%-20%)			
	Uncertainty			+/-2.55							
QC1205226004	MB										
Uranium-233/234			U	-0.0379 pCi/Sample						11/03/22	08:50
	Uncertainty			+/-0.227							
Uranium-235/236			U	0.0586 pCi/Sample							
	Uncertainty			+/-0.220							
Uranium-238			U	-0.0424 pCi/Sample							
	Uncertainty			+/-0.192							
Batch	2333142										
QC1205226008	LCS										
Thorium-228				17.1 pCi/Sample					MP2	11/03/22	12:02
	Uncertainty			+/-1.86							
Thorium-230				2.84 pCi/Sample				(75%-125%)			
	Uncertainty			+/-0.788							
Thorium-232	16.9			17.2 pCi/Sample			101	(75%-125%)			
	Uncertainty			+/-1.86							

GEL LABORATORIES LLC

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QC Summary

Workorder: 597533

Page 3 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2333142										
QC1205226009	LCSD										
Thorium-228				15.2 pCi/Sample		11.8			MP2	11/03/22	12:02
	Uncertainty			+/-1.82							
Thorium-230				1.93 pCi/Sample		37.9*		(0%-20%)			
	Uncertainty			+/-0.713							
Thorium-232	16.9			18.0 pCi/Sample		4.58	106	(0%-20%)			
	Uncertainty			+/-1.96							
QC1205226007	MB										
Thorium-228			U	0.0320 pCi/Sample						11/03/22	12:02
	Uncertainty			+/-0.390							
Thorium-230			U	0.677 pCi/Sample							
	Uncertainty			+/-0.639							
Thorium-232			U	-0.00382 pCi/Sample							
	Uncertainty			+/-0.271							
Batch	2333147										
QC1205226019	LCS										
Polonium-210	10.2			11.3 pCi/Sample			112	(75%-125%)	BV1	11/04/22	08:41
	Uncertainty			+/-1.48							
QC1205226020	LCSD										
Polonium-210	10.2			11.2 pCi/Sample		1.31	110	(0%-20%)		11/04/22	08:41
	Uncertainty			+/-1.68							
QC1205226018	MB										
Polonium-210			U	0.00452 pCi/Sample						11/04/22	08:41
	Uncertainty			+/-0.208							
Rad Gamma Spec											
Batch	2333342										
QC1205226445	597531001	DUP									
Actinium-228	U	-6.69	U	3.52 pCi/Sample		N/A			N/A	RXF2	10/31/22 10:42
	Uncertainty	+/-17.8		+/-18.4							
Beryllium-7	U	38.0		144 pCi/Sample		25.5		(0% - 100%)			
	Uncertainty	+/-57.5		+/-98.6							
Cesium-137	U	2.19	U	2.19 pCi/Sample		N/A			N/A		
	Uncertainty	+/-4.85		+/-6.28							

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QC Summary

Workorder: 597533

Page 4 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	2333342										
Cobalt-60	U	0.395	U	5.53 pCi/Sample		N/A		N/A	RXF2	10/31/22	10:42
	Uncertainty	+/-5.24		+/-4.36							
Potassium-40	U	53.2		95.5 pCi/Sample		23.1		(0% - 100%)			
	Uncertainty	+/-71.7		+/-68.3							
QC1205226446	LCS										
Americium-241	73400			81200 pCi/Sample			111	(75%-125%)		10/31/22	10:43
	Uncertainty			+/-2580							
Actinium-228			U	131 pCi/Sample							
	Uncertainty			+/-333							
Beryllium-7				1500 pCi/Sample							
	Uncertainty			+/-961							
Cesium-137	21700			22200 pCi/Sample			102	(75%-125%)			
	Uncertainty			+/-522							
Cobalt-60	8040			8400 pCi/Sample			104	(75%-125%)			
	Uncertainty			+/-383							
Potassium-40			U	130 pCi/Sample							
	Uncertainty			+/-268							
QC1205226444	MB										
Actinium-228			U	-2.34 pCi/Sample						11/01/22	05:09
	Uncertainty			+/-12.8							
Beryllium-7			U	-11.3 pCi/Sample							
	Uncertainty			+/-30.8							
Cesium-137			U	-6.71 pCi/Sample							
	Uncertainty			+/-4.93							
Cobalt-60			U	0.0141 pCi/Sample							
	Uncertainty			+/-2.59							
Potassium-40			U	16.6 pCi/Sample							
	Uncertainty			+/-74.6							
Rad Gas Flow											
Batch	2333238										
QC1205226268	LCS										
Strontium-90	199			231 pCi/Sample			116	(75%-125%)	JXK3	11/02/22	06:22
	Uncertainty			+/-18.2							

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QC Summary

Workorder: 597533

Page 5 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2333238										
QC1205226269	LCSD										
Strontium-90	199			247 pCi/Sample		6.69	124	(0%-20%)	JXK3	11/02/22	06:22
	Uncertainty			+/-13.6							
QC1205226267	MB										
Strontium-90			U	0.102 pCi/Sample						11/01/22	19:09
	Uncertainty			+/-1.16							
Batch	2333240										
QC1205226271	LCS										
Total Radium	5570			4200 pCi/Sample			75.4	(75%-125%)	JXK3	11/03/22	06:36
	Uncertainty			+/-142							
QC1205226272	LCSD										
Total Radium	5570			4190 pCi/Sample		0.328	75.2	(0%-20%)		11/03/22	06:36
	Uncertainty			+/-138							
QC1205226270	MB										
Total Radium			U	0.807 pCi/Sample						11/03/22	18:50
	Uncertainty			+/-1.71							
Batch	2333242										
QC1205226274	LCS										
Radium-228	171			161 pCi/Sample			93.9	(75%-125%)	JE1	11/04/22	11:39
	Uncertainty			+/-10.6							
QC1205226275	LCSD										
Radium-228	171			166 pCi/Sample		3.01	96.8	(0%-20%)		11/04/22	11:39
	Uncertainty			+/-10.9							
QC1205226273	MB										
Radium-228			U	3.22 pCi/Sample						11/04/22	11:38
	Uncertainty			+/-2.45							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- ** Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded

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QC Summary

Workorder: 597533

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J	See case narrative for an explanation										
J	Value is estimated										
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.										
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.										
M	M if above MDC and less than LLD										
M	REMP Result > MDC/CL and < RDL										
N/A	RPD or %Recovery limits do not apply.										
N1	See case narrative										
ND	Analyte concentration is not detected above the detection limit										
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.										
R	Sample results are rejected										
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.										
UI	Gamma Spectroscopy--Uncertain identification										
UJ	Gamma Spectroscopy--Uncertain identification										
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.										
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.										
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.										
h	Preparation or preservation holding time was exceeded										

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where the duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Alpha Spectroscopy Raw Data

Batch 2333141 Check-list

This check-list was completed on 03-NOV-22 by Melanie Aycok

This batch was reviewed by Jessica Davis on 03-NOV-22 and Melanie Aycok on 03-NOV-22.

Batch ID:
2333141

Product:
ASP__UUF

Description: Alpha Spec Uranium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Uranium

Batch ID: 2333141

Analyst: Brendon Viquez (BV1)

Method: DOE EML HASL-300, U-02-RC
Modified

Lab SOP: GL-RAD-A-011 REV# 28

Instrument: GFC-B742840386

Due Dates for Lab: 02-NOV-2022

Package: 03-NOV-2022

SDG: 03-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205226005	Uranium-238 AS SPIKE	1600-O	.1	mL
LCSD	1205226006	Uranium-238 AS SPIKE	1600-O	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	597531001	01-NOV-2022	1	30.16	0.11118
2	597531002	01-NOV-2022	1	30.21	0.11201
3	597531003	01-NOV-2022	1	30.02	0.11345
4	597533001	01-NOV-2022	1	30.04	0.11674
5	597533002	01-NOV-2022	1	30.05	0.11602
6	597533003	01-NOV-2022	1	30.23	0.11454
7	597533004	01-NOV-2022	1	30.15	0.11482
8	597533005	01-NOV-2022	1	30.3	0.11471
9	1205226004 MB	01-NOV-2022	1		0.11674
10	1205226005 LCS	01-NOV-2022	1		0.11674
11	1205226006 LCSD	01-NOV-2022	1		0.11674

Reagent/Solvent Lot ID	Description	Amount
WORK 1564-EE	Uranium-232 AS TRACER	.1 ml

Comments:

Pipet ID: R2-428724
Pu-236 Tracer Used: No
Analyzed With: N/A
Data Entry Date2: 01-NOV-2022 00:00

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ALPHA SPECTROSCOPY REPORT

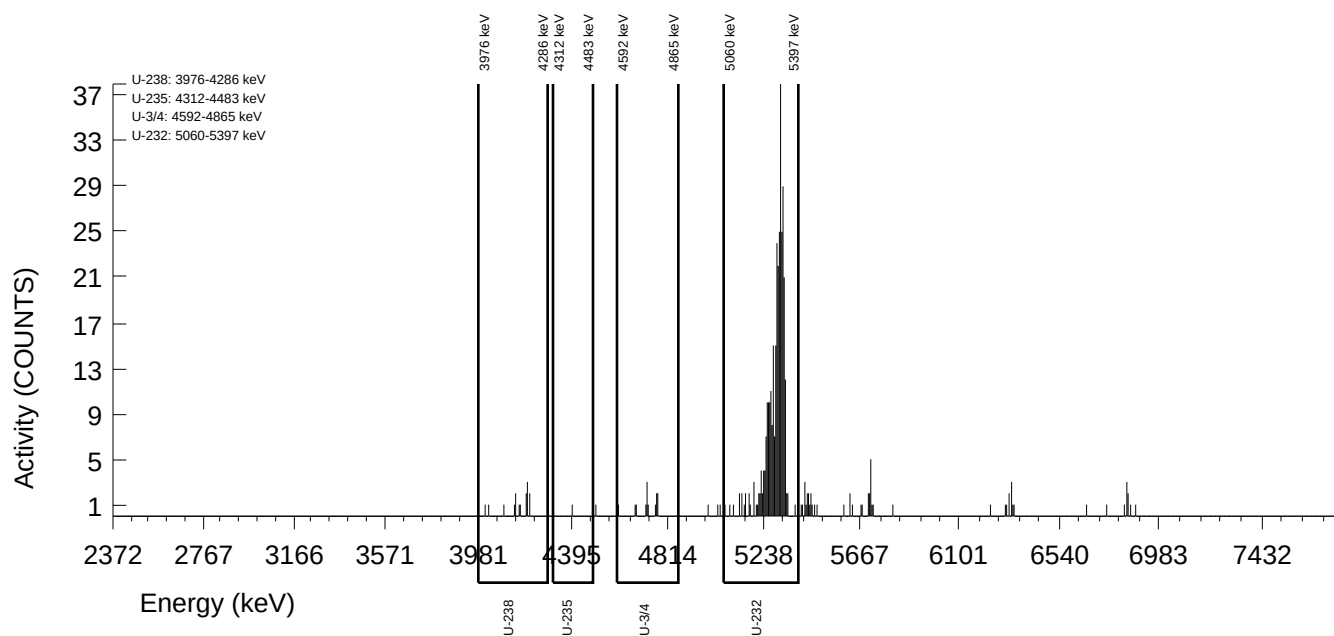
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333141 SAMPLE ID : S0597533001_UU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 87.8 +/-6.453 %	CHAMBER : 005 DETECTOR S/N : 101453 AVERAGE %EFFICIENCY : 34.3123 AVERAGE %EFF ERROR : 0.6619 COUNT DATE : 03-Nov-2022 08:50:14 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B005.CNF;2481 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W005.CNF;784 CAL DATE : 02-Nov-2022
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4755E+00 dpm RESULTS : 3.9294E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5290.08	33.255	330.000	323.280	6.720	2.5923	100.000	1.73E+01	2.99E+00	6.68E-01	2.54E-01	1.91E+00
U-3/4	4763.02	4724.05	49.065	13.000	9.275	2.640	1.6248	100.000	4.95E-01	4.08E-01	5.27E-01	1.83E-01	4.01E-01
U-235	4391.00	4395.10	4.906	1.000	0.520	0.480	0.6928	80.900	3.43E-02	1.91E-01	3.65E-01	8.37E-02	1.91E-01
U-238	4184.73	4152.43	62.558	15.000	13.800	1.200	1.0954	100.000	7.36E-01	4.34E-01	3.74E-01	1.07E-01	4.23E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (1.085 +/-0.033)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

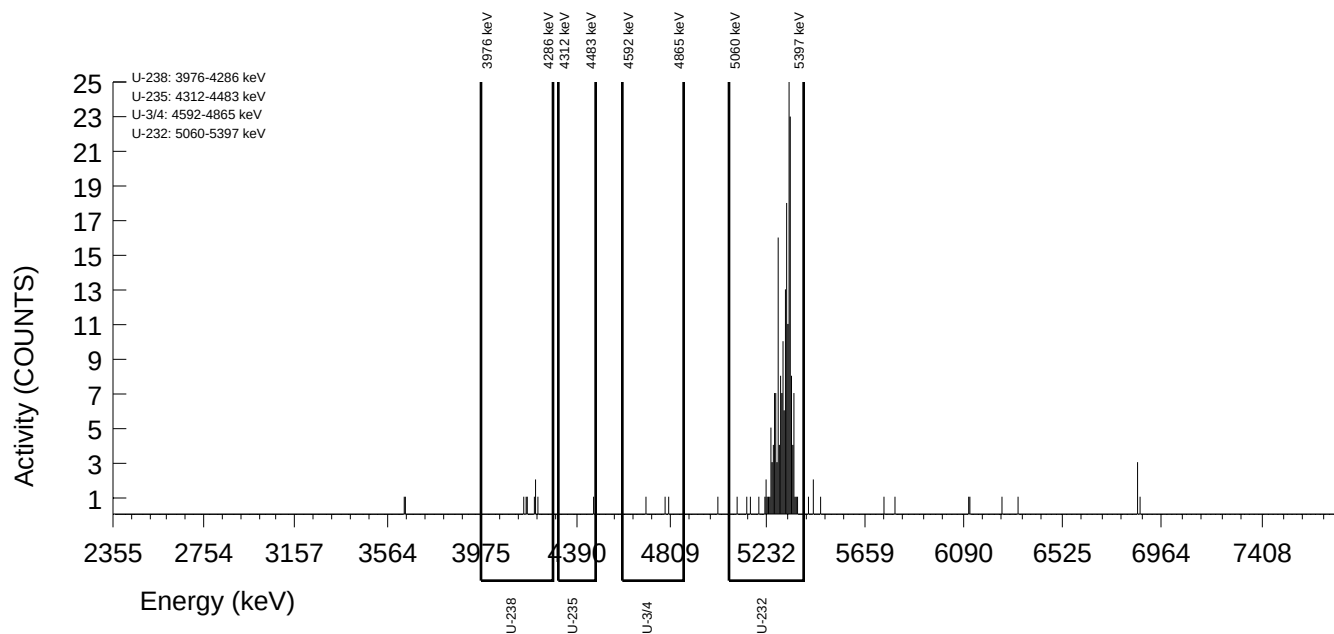
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333141 SAMPLE ID : S0597533002_UU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 70.8 +/-7.844 %	CHAMBER : 113 DETECTOR S/N : 67598 AVERAGE %EFFICIENCY : 26.1344 AVERAGE %EFF ERROR : 0.5076 COUNT DATE : 03-Nov-2022 09:35:17 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B113.CNF;1813 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W113.CNF;482 CAL DATE : 14-Oct-2022
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4755E+00 dpm RESULTS : 3.1700E+00 dpm		

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
U-232	5302.10	5302.71	54.396	202.000	198.640	3.360	1.8330	100.000	1.74E+01	3.69E+00	8.50E-01	2.94E-01	2.45E+00	
U-3/4	4763.02	4759.62	99.180	3.000	0.893	1.440	1.2000	100.000	7.81E-02	3.60E-01	7.12E-01	2.25E-01	3.59E-01	
U-235	4391.00	4467.96	4.959	1.000	0.760	0.240	0.4899	80.900	8.21E-02	3.08E-01	5.18E-01	9.69E-02	3.08E-01	
U-238	4184.73	4195.06	7.438	7.000	6.280	0.720	0.8485	100.000	5.49E-01	4.99E-01	5.34E-01	1.36E-01	4.91E-01	

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.667 +/-0.020)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

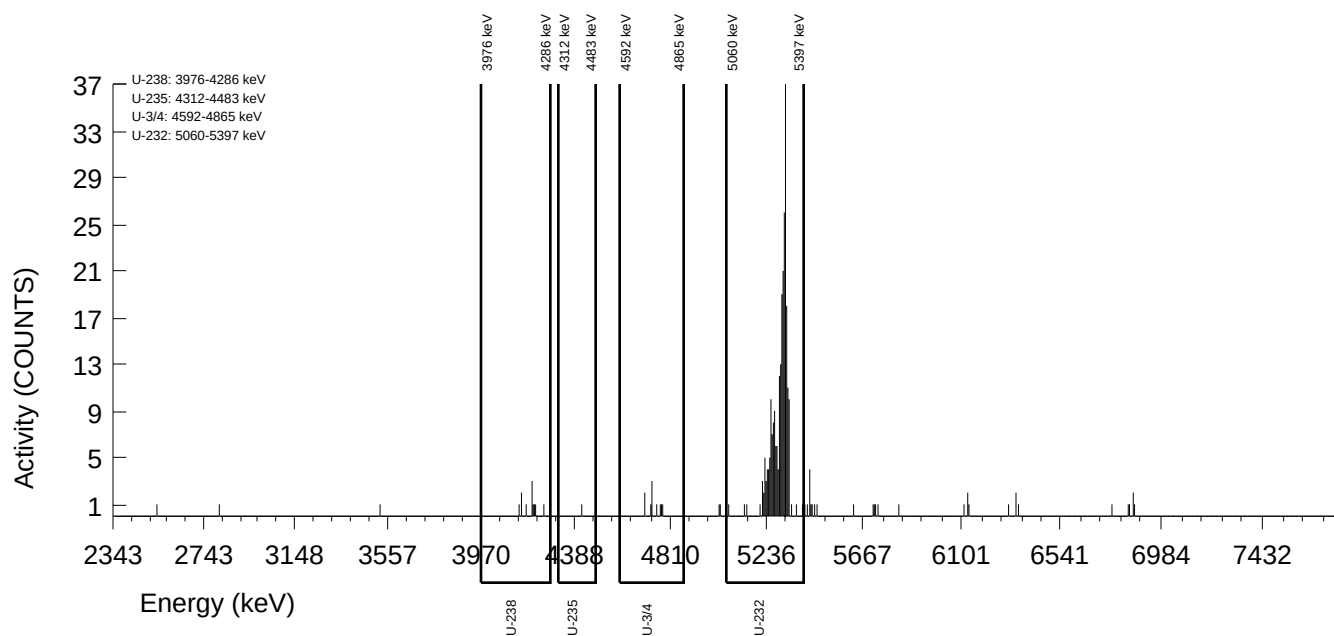
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333141 SAMPLE ID : S0597533003_UU SAMPLE QTY : 0.115 F +/-0.873 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 72.8 +/-7.202 %	CHAMBER : 007 DETECTOR S/N : 149004 AVERAGE %EFFICIENCY : 31.3388 AVERAGE %EFF ERROR : 0.6059 COUNT DATE : 03-Nov-2022 08:50:15 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B007.CNF;2499 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W007.CNF;682 CAL DATE : 02-Nov-2022
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4755E+00 dpm RESULTS : 3.2600E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5296.95	20.184	250.000	244.960	5.040	2.2450	100.000	1.76E+01	3.42E+00	8.07E-01	2.95E-01	2.24E+00
U-3/4	4763.02	4738.10	33.581	10.000	5.818	3.360	1.8330	100.000	4.18E-01	4.90E-01	7.43E-01	2.64E-01	4.85E-01
U-235	4391.00	4419.16	4.975	1.000	0.040	0.960	0.9798	80.900	3.55E-03	2.63E-01	5.85E-01	1.59E-01	2.63E-01
U-238	4184.73	4190.66	49.750	11.000	9.560	1.440	1.2000	100.000	6.86E-01	5.06E-01	5.31E-01	1.58E-01	4.96E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.822 +/-0.025)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

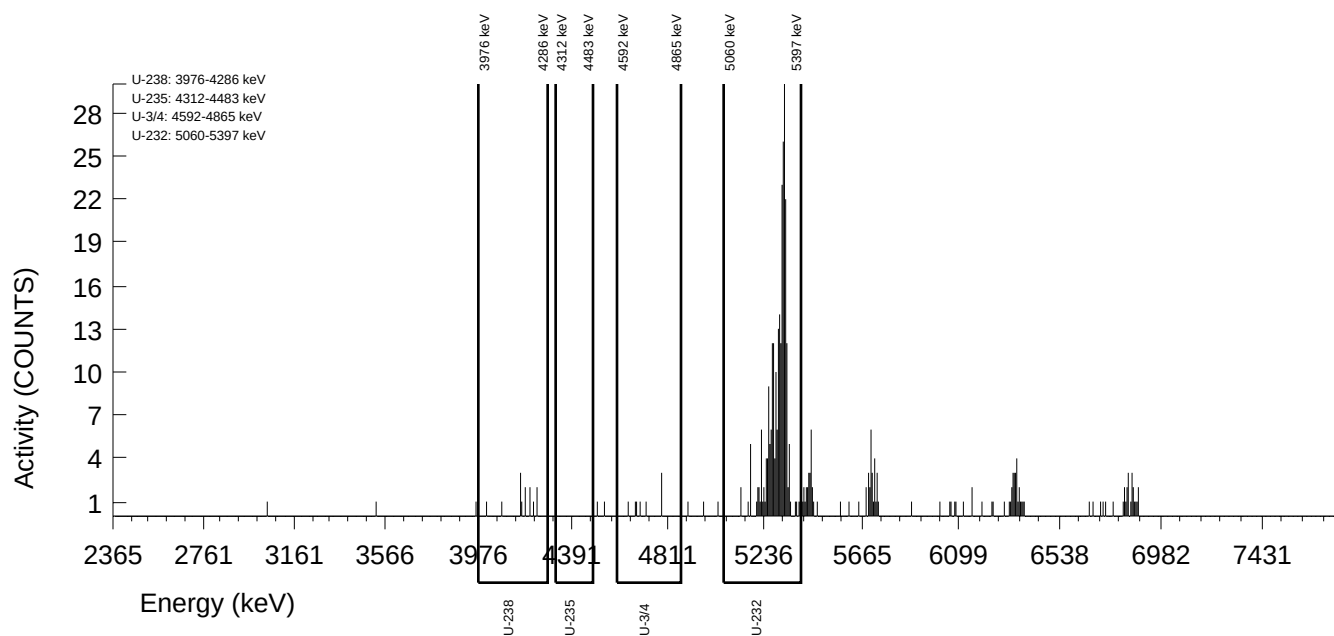
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333141 SAMPLE ID : S0597533004_UU SAMPLE QTY : 0.115 F +/-0.871 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 69.7 +/-7.281 %	CHAMBER : 008 DETECTOR S/N : 78788 AVERAGE %EFFICIENCY : 33.0737 AVERAGE %EFF ERROR : 0.6385 COUNT DATE : 03-Nov-2022 08:50:15 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B008.CNF;2508 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W008.CNF;672 CAL DATE : 02-Nov-2022
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4755E+00 dpm RESULTS : 3.1182E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5298.05	21.761	260.000	247.280	12.720	3.5665	100.000	1.76E+01	3.45E+00	1.14E+00	4.64E-01	2.26E+00
U-3/4	4763.02	4717.61	4.915	8.000	5.970	1.200	1.0954	100.000	4.23E-01	4.31E-01	5.68E-01	1.78E-01	4.25E-01
U-235	4391.00	4397.17	0.000	0.000	-0.240	0.240	0.4899	80.900	-2.10E-02	1.82E-01	4.20E-01	7.87E-02	1.81E-01
U-238	4184.73	4170.18	72.500	13.000	12.520	0.480	0.6928	100.000	8.88E-01	5.40E-01	3.93E-01	9.00E-02	5.23E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.830 +/-0.025)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

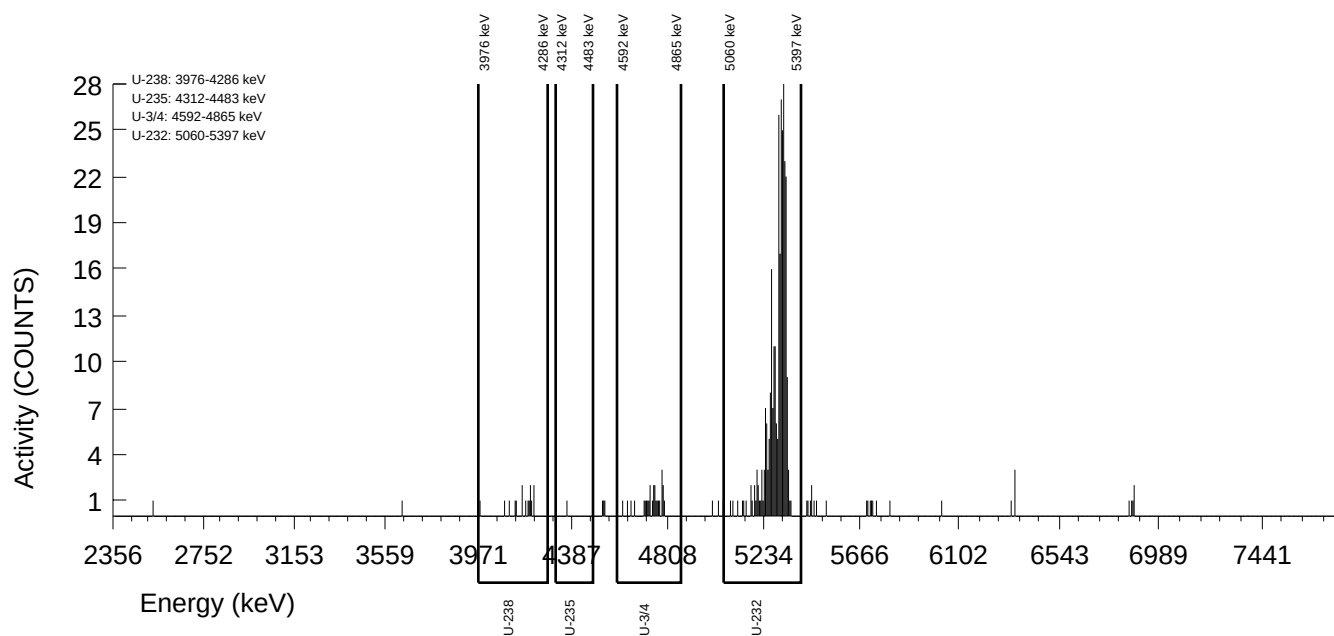
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333141 SAMPLE ID : S0597533005_UU SAMPLE QTY : 0.115 F +/-0.872 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 78.0 +/-6.720 %	CHAMBER : 009 DETECTOR S/N : 149015 AVERAGE %EFFICIENCY : 34.5998 AVERAGE %EFF ERROR : 0.6673 COUNT DATE : 03-Nov-2022 08:50:15 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B009.CNF;2492 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W009.CNF;673 CAL DATE : 02-Nov-2022
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4755E+00 dpm RESULTS : 3.4889E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5295.76	63.302	294.000	289.440	4.560	2.1354	100.000	1.76E+01	3.18E+00	6.57E-01	2.38E-01	2.05E+00
U-3/4	4763.02	4738.10	59.044	26.000	24.549	0.480	0.6928	100.000	1.49E+00	6.56E-01	4.32E-01	1.25E-01	6.20E-01
U-235	4391.00	4365.95	4.920	1.000	0.280	0.720	0.8485	80.900	2.10E-02	2.20E-01	4.58E-01	1.17E-01	2.19E-01
U-238	4184.73	4161.85	54.124	15.000	13.320	1.680	1.2961	100.000	8.08E-01	4.95E-01	4.70E-01	1.44E-01	4.82E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.971 +/-0.029)



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ALPHA SPECTROSCOPY REPORT

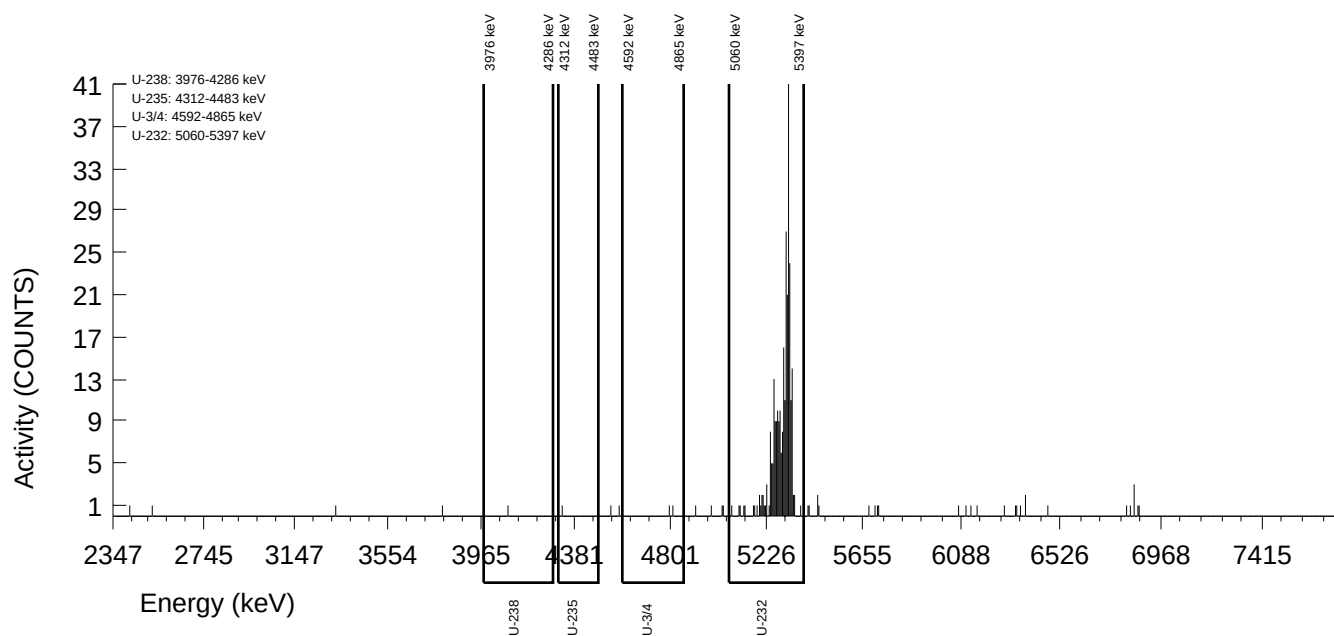
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333141 SAMPLE ID : S1205226004_UU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 78.4 +/-6.863 %	CHAMBER : 010 DETECTOR S/N : 149014 AVERAGE %EFFICIENCY : 32.9129 AVERAGE %EFF ERROR : 0.6355 COUNT DATE : 03-Nov-2022 08:50:15 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B010.CNF;2541 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W010.CNF;682 CAL DATE : 02-Nov-2022
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4715E+00 dpm RESULTS : 3.5039E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5298.52	18.182	283.000	276.760	6.240	2.4980	100.000	1.73E+01	3.19E+00	7.58E-01	2.85E-01	2.06E+00
U-3/4	4763.02	4808.99	19.787	2.000	-0.609	1.680	1.2961	100.000	-3.79E-02	2.27E-01	5.43E-01	1.78E-01	2.27E-01
U-235	4391.00	4328.72	4.947	1.000	0.760	0.240	0.4899	80.900	5.86E-02	2.20E-01	3.69E-01	6.91E-02	2.20E-01
U-238	4184.73	4089.47	4.947	1.000	-0.680	1.680	1.2961	100.000	-4.24E-02	1.92E-01	4.83E-01	1.48E-01	1.92E-01

NOTES:

* Correction made to the following net area
due to tracer impurity:
U-3/4 (0.929 +/-0.028)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

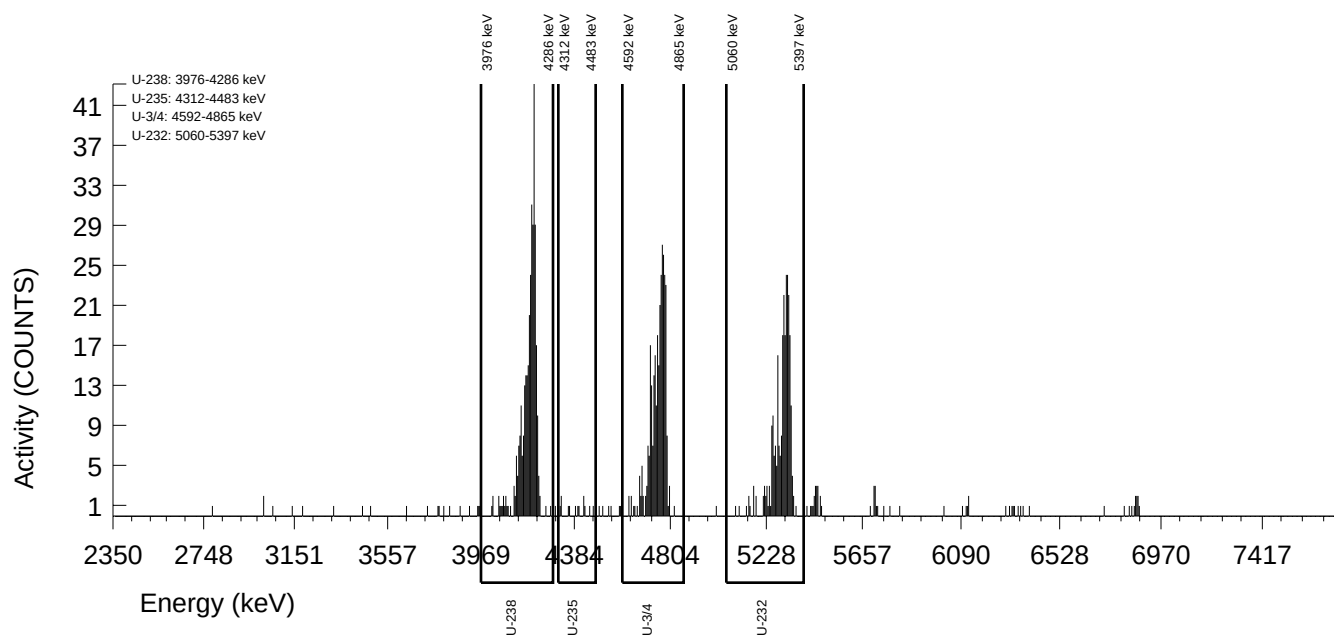
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333141 SAMPLE ID : S1205226005_UU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 76.0 +/-7.151 %	CHAMBER : 011 DETECTOR S/N : 72531 AVERAGE %EFFICIENCY : 31.1898 AVERAGE %EFF ERROR : 0.6030 COUNT DATE : 03-Nov-2022 08:50:15 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B011.CNF;2514 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W011.CNF;688 CAL DATE : 02-Nov-2022
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4715E+00 dpm RESULTS : 3.3988E+00 dpm	LCS ID 1600-O NUCLIDE U-238 NOMINAL (pCi/F) 2.4083E+01 % RECOVERY 94.506	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5297.21	55.496	264.000	254.400	9.600	3.0984	100.000	1.73E+01	3.33E+00	9.73E-01	3.85E-01	2.17E+00
U-3/4	4763.02	4752.02	69.002	307.000	304.466	1.680	1.2961	100.000	2.06E+01	3.82E+00	5.86E-01	1.91E-01	2.33E+00
U-235	4391.00	4391.75	103.863	13.000	11.560	1.440	1.2000	80.900	9.69E-01	6.39E-01	6.20E-01	1.84E-01	6.24E-01
U-238	4184.73	4182.82	25.966	338.000	335.600	2.400	1.5492	100.000	2.28E+01	4.13E+00	5.88E-01	1.92E-01	2.45E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.854 +/-0.026)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

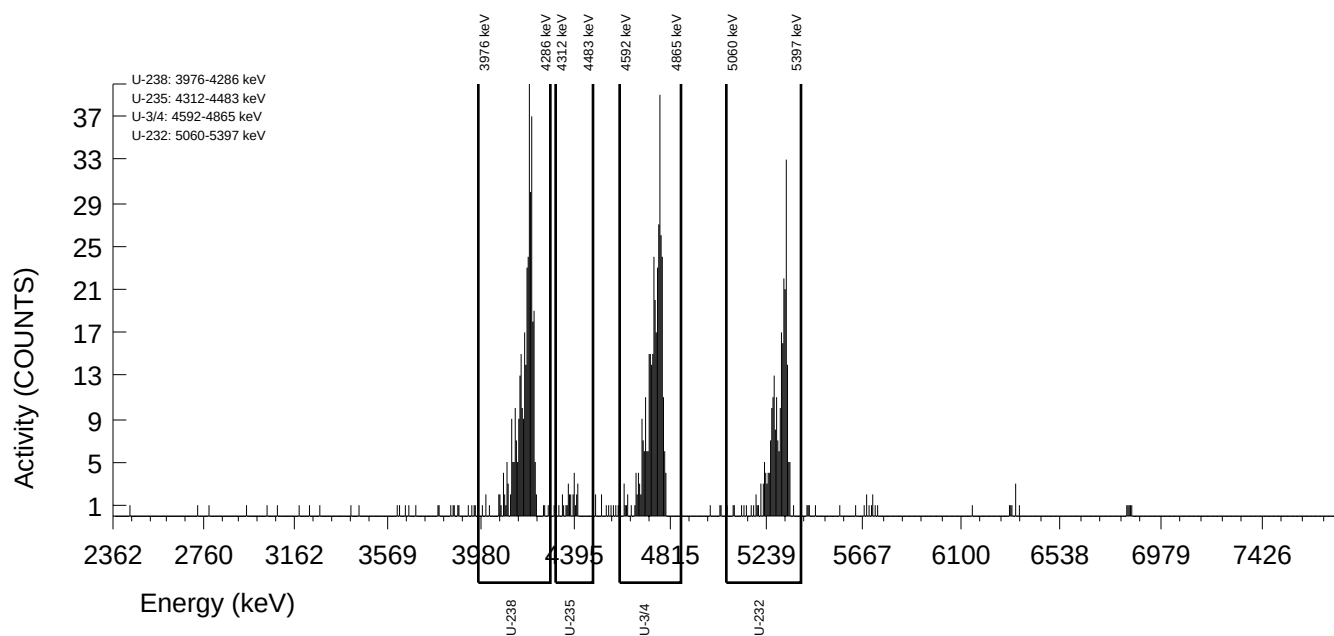
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333141 SAMPLE ID : S1205226006_UU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 74.8 +/-7.142 %	CHAMBER : 012 DETECTOR S/N : 158176 AVERAGE %EFFICIENCY : 31.1442 AVERAGE %EFF ERROR : 0.6021 COUNT DATE : 03-Nov-2022 08:50:15 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B012.CNF;2513 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W012.CNF;660 CAL DATE : 02-Nov-2022
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4715E+00 dpm RESULTS : 3.3444E+00 dpm	LCSD ID 1600-O NUCLIDE U-238 NOMINAL (pCi/F) 2.4083E+01 % RECOVERY 101.332	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5293.24	24.414	255.000	249.960	5.040	2.2450	100.000	1.73E+01	3.32E+00	7.75E-01	2.84E-01	2.17E+00
U-3/4	4763.02	4745.84	38.777	351.000	347.521	2.640	1.6248	100.000	2.40E+01	4.33E+00	6.68E-01	2.30E-01	2.54E+00
U-235	4391.00	4379.84	43.656	25.000	24.280	0.720	0.8485	80.900	2.07E+00	9.08E-01	5.21E-01	1.33E-01	8.56E-01
U-238	4184.73	4176.79	25.838	355.000	353.560	1.440	1.2000	100.000	2.44E+01	4.38E+00	5.11E-01	1.52E-01	2.55E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.839 +/-0.025)



Batch 2333142 Check-list

This check-list was completed on 07-NOV-22 by Melanie Aycok

This batch was reviewed by Jessica Davis on 07-NOV-22 and Melanie Aycok on 07-NOV-22.

Batch ID:
2333142

Product:
ASP_THF

Description: Alpha Spec Thorium
GL-RAD-A-038

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Thorium

Batch ID: 2333142

Analyst: Brendon Viquez (BV1)

Prep: Brendon Viquez (BV1)

Michael Potts (MP2)

Method: DOE EML HASL-300, Th-01-RC
Modified

Lab SOP: GL-RAD-A-038 REV# 18

Instrument: GFC-B742840386

Due Dates for Lab: 02-NOV-2022

Package: 03-NOV-2022

SDG: 03-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205226008	Thorium-232 AS SPIKE	1513-C	.1	mL
LCSD	1205226009	Thorium-232 AS SPIKE	1513-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	597531001	01-NOV-2022	1	30.16	0.11118
2	597531002	01-NOV-2022	1	30.23	0.11208
3	597531003	01-NOV-2022	1	30.16	0.11398
4	597533001	01-NOV-2022	1	30.18	0.11728
5	597533002	01-NOV-2022	1	30.01	0.11587
6	597533003	01-NOV-2022	1	30.25	0.11461
7	597533004	01-NOV-2022	1	30.05	0.11444
8	597533005	01-NOV-2022	1	30.04	0.11373
9	1205226007 MB	01-NOV-2022	1		0.11728
10	1205226008 LCS	01-NOV-2022	1		0.11728
11	1205226009 LCSD	01-NOV-2022	1		0.11728

Reagent/Solvent Lot ID	Description	Amount
WORK 1845-G	Thorium-229 AS TRACER, RASP	.1 mL

Comments:

Pipet ID: RAD-ASP-184002Z
Data Entry Date2: 01-NOV-2022 00:00

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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

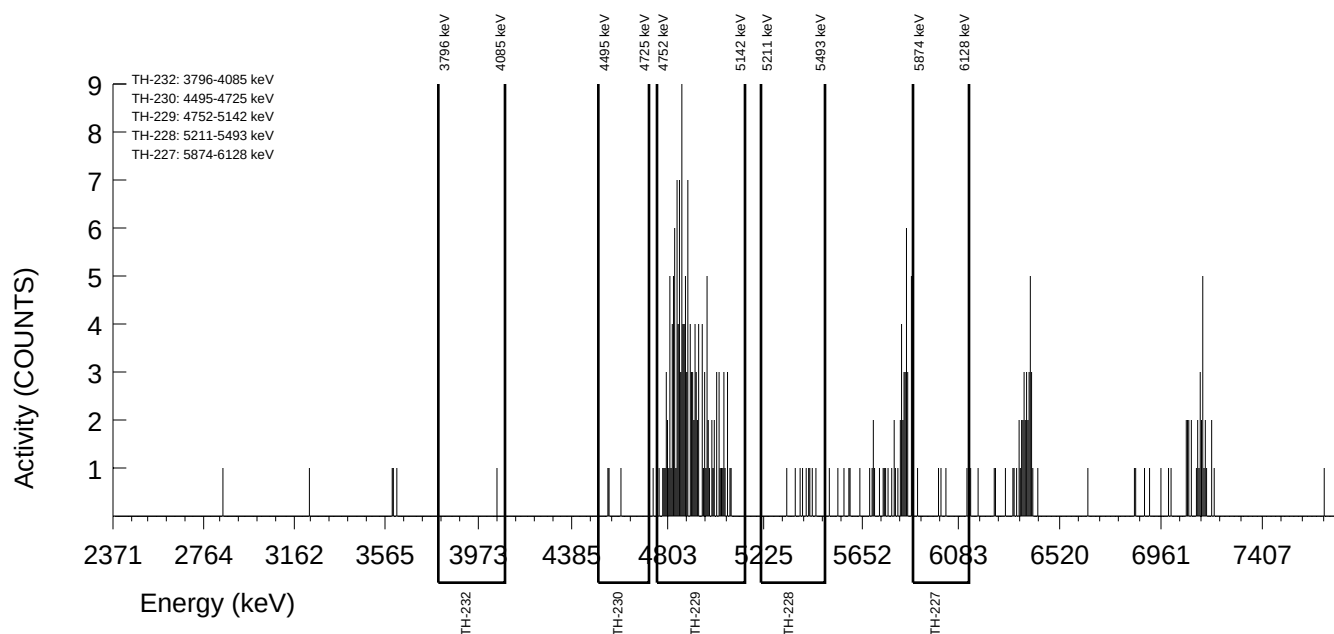
BATCH NUMBER : 2333142 SAMPLE ID : S0597533001_TH SAMPLE QTY : 0.117 F +/-0.853 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : MP2 % YIELD : 37.4 +/-8.723 %	CHAMBER : 040 DETECTOR S/N : 78773 AVERAGE %EFFICIENCY : 34.0043 AVERAGE %EFF ERROR : 0.6561 COUNT DATE : 03-Nov-2022 12:02:40 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH BKG FILE : B040.CNF;2475 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W040.CNF;652 CAL DATE : 03-Nov-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8636E+00 dpm RESULTS : 1.8208E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5933.60	0.000	11.000	7.640	3.360	1.8330	57.440	6.03E+00	5.65E+00	7.66E+00	2.65E+00	5.55E+00
TH-228	5363.00	5401.99	122.161	9.000	5.872	3.120	1.7664	99.940	7.64E-01	8.49E-01	1.23E+00	4.22E-01	8.39E-01
TH-229	4900.00	4901.54	152.905	151.000	147.880	3.120	1.7664	99.520	1.87E+01	4.49E+00	1.20E+00	4.09E-01	3.06E+00
TH-230	4671.39	4562.06	58.637	3.000	0.910	1.200	1.0954	99.700	1.15E-01	5.17E-01	1.02E+00	3.20E-01	5.15E-01
TH-232	3972.00	4054.88	4.886	1.000	0.221	0.720	0.8485	100.000	2.77E-02	3.69E-01	7.81E-01	2.02E-01	3.68E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.008 +/-0.000)
TH-230 (0.890 +/-0.014)
TH-232 (0.059 +/-0.001)



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ALPHA SPECTROSCOPY REPORT

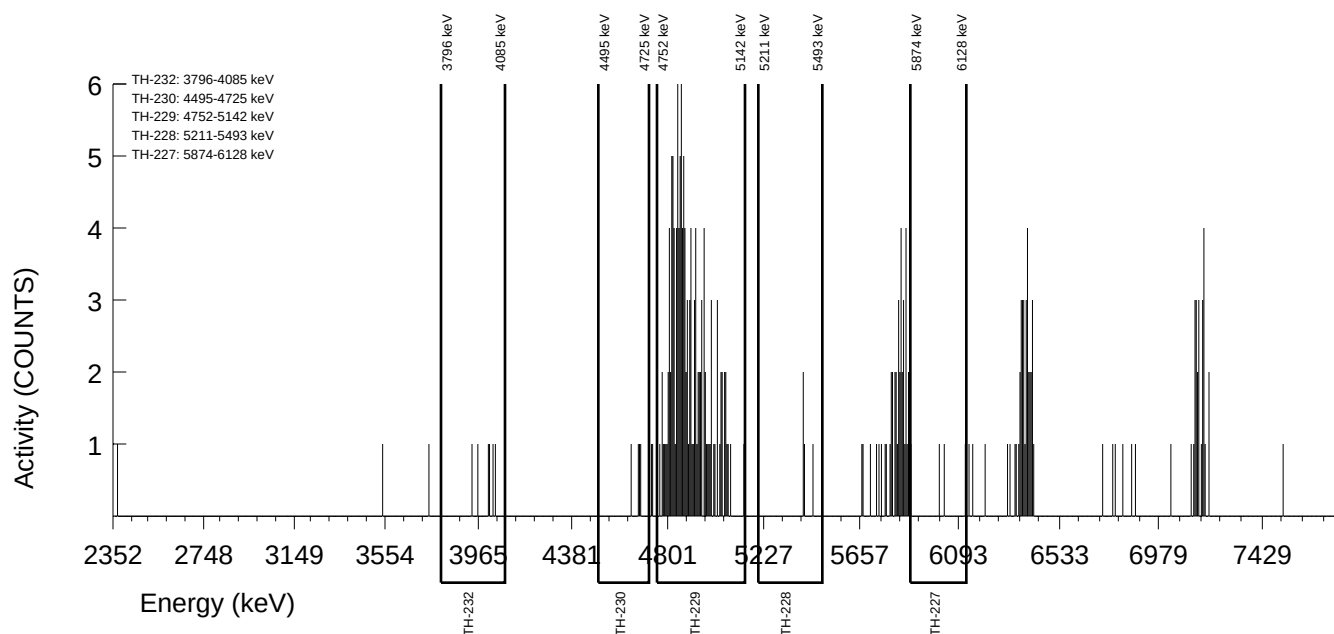
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2333142 SAMPLE ID : S0597533002_TH SAMPLE QTY : 0.116 F +/-0.863 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : MP2 % YIELD : 31.7 +/-9.227 %	CHAMBER : 041 DETECTOR S/N : 158121 AVERAGE %EFFICIENCY : 35.4173 AVERAGE %EFF ERROR : 0.6827 COUNT DATE : 03-Nov-2022 12:02:40 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH BKG FILE : B041.CNF;2484 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W041.CNF;700 CAL DATE : 03-Nov-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8636E+00 dpm RESULTS : 1.5439E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5986.50	0.000	7.000	3.880	3.120	1.7664	57.440	3.51E+00	5.30E+00	8.56E+00	2.93E+00	5.26E+00
TH-228	5363.00	5415.81	7.372	4.000	1.353	2.640	1.6248	99.940	2.02E-01	6.99E-01	1.34E+00	4.45E-01	6.98E-01
TH-229	4900.00	4900.37	147.443	133.000	130.600	2.400	1.5492	99.520	1.89E+01	4.81E+00	1.26E+00	4.11E-01	3.29E+00
TH-230	4671.39	4670.54	44.233	4.000	1.534	1.680	1.2961	99.700	2.22E-01	6.65E-01	1.24E+00	4.03E-01	6.62E-01
TH-232	3972.00	4001.18	103.210	6.000	5.707	0.240	0.4899	100.000	8.22E-01	7.69E-01	7.13E-01	1.40E-01	7.53E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.007 +/-0.000)
TH-230 (0.786 +/-0.012)
TH-232 (0.053 +/-0.001)



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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

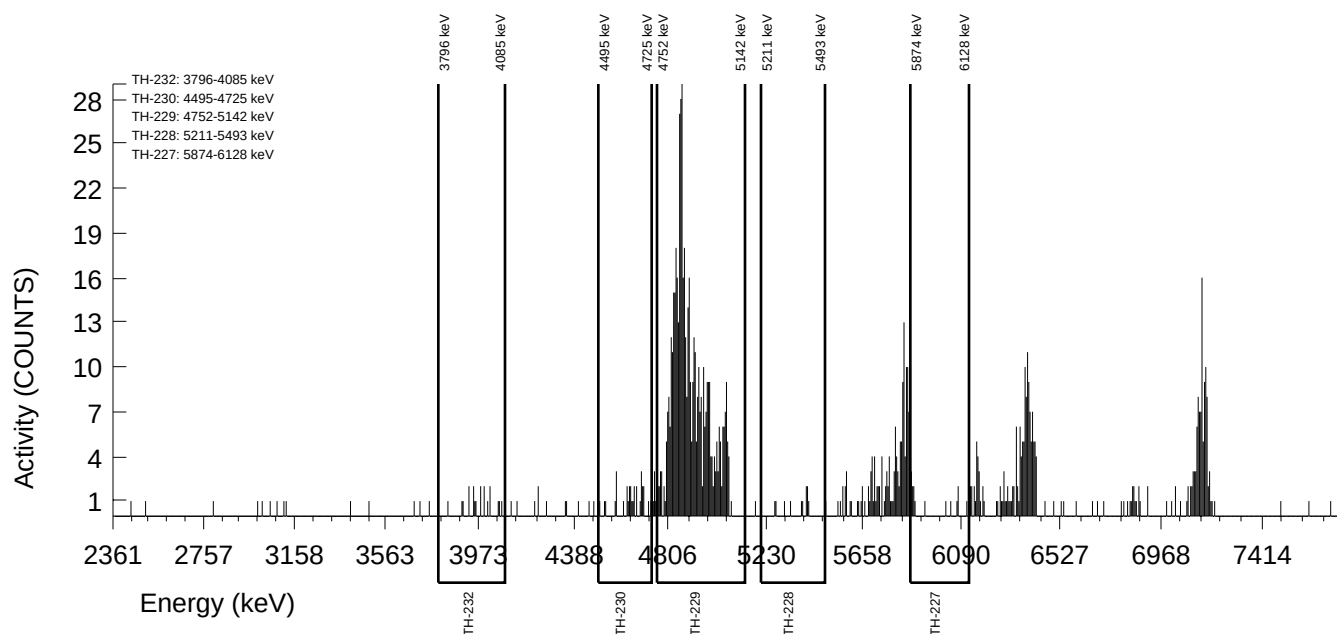
BATCH NUMBER : 2333142 SAMPLE ID : S0597533003_TH SAMPLE QTY : 0.115 F +/-0.873 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : MP2 % YIELD : 32.6 +/-5.207 %	CHAMBER : 031 DETECTOR S/N : 155850 AVERAGE %EFFICIENCY : 32.1021 AVERAGE %EFF ERROR : 0.6202 COUNT DATE : 05-Nov-2022 15:19:43 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : TH BKG FILE : B031.CNF;2501 BKG DATE : 04-Nov-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W031.CNF;694 CAL DATE : 03-Nov-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8636E+00 dpm RESULTS : 1.5870E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5969.56	0.000	16.000	0.000	16.000	4.0000	57.440	-6.86E-07	2.94E+00	5.56E+00	2.39E+00	2.94E+00
TH-228	5363.00	5369.70	12.309	11.000	7.972	3.000	1.7321	99.940	3.10E-01	3.07E-01	4.31E-01	1.57E-01	3.05E-01
TH-229	4900.00	4900.23	65.679	521.000	507.000	14.000	3.7417	99.520	1.91E+01	2.71E+00	7.69E-01	3.28E-01	1.71E+00
TH-230	4671.39	4637.26	118.170	31.000	2.950	25.000	5.0000	99.700	1.11E-01	5.62E-01	1.01E+00	4.51E-01	5.62E-01
TH-232	3972.00	3972.14	93.551	19.000	11.796	7.000	2.6458	100.000	4.43E-01	3.92E-01	5.78E-01	2.33E-01	3.89E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.028 +/-0.000)
TH-230 (3.050 +/-0.047)
TH-232 (0.204 +/-0.003)



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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

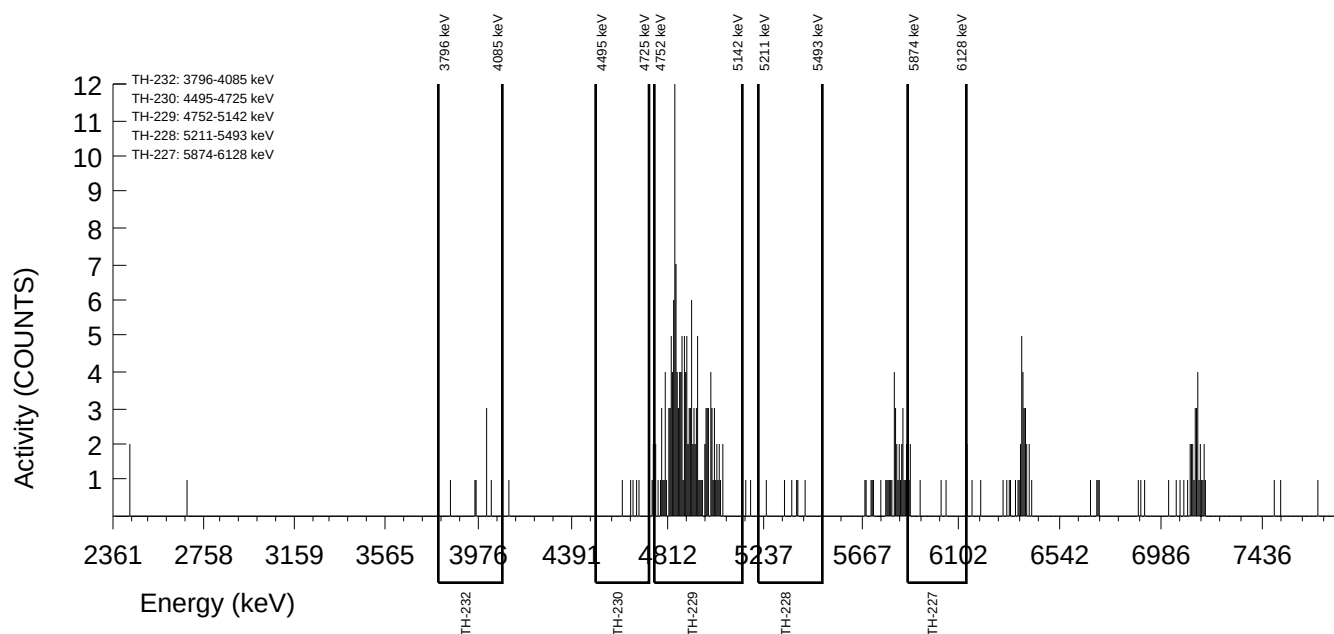
BATCH NUMBER : 2333142 SAMPLE ID : S0597533004_TH SAMPLE QTY : 0.114 F +/-0.874 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : MP2 % YIELD : 35.7 +/-8.753 %	CHAMBER : 043 DETECTOR S/N : 155792 AVERAGE %EFFICIENCY : 35.7629 AVERAGE %EFF ERROR : 0.6892 COUNT DATE : 03-Nov-2022 12:02:41 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : TH BKG FILE : B043.CNF;2503 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W043.CNF;700 CAL DATE : 03-Nov-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8636E+00 dpm RESULTS : 1.7378E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5929.86	7.385	7.000	3.880	3.120	1.7664	57.440	3.12E+00	4.72E+00	7.63E+00	2.61E+00	4.68E+00
TH-228	5363.00	5353.98	162.469	6.000	4.552	1.440	1.2000	99.940	6.05E-01	7.17E-01	9.84E-01	2.93E-01	7.09E-01
TH-229	4900.00	4895.96	11.488	153.000	148.440	4.560	2.1354	99.520	1.91E+01	4.62E+00	1.40E+00	5.04E-01	3.15E+00
TH-230	4671.39	4655.69	73.850	5.000	2.667	1.440	1.2000	99.700	3.43E-01	6.44E-01	1.08E+00	3.47E-01	6.38E-01
TH-232	3972.00	3977.96	4.923	7.000	6.220	0.720	0.8485	100.000	7.98E-01	7.36E-01	7.97E-01	2.06E-01	7.22E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.008 +/-0.000)
TH-230 (0.893 +/-0.014)
TH-232 (0.060 +/-0.001)



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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

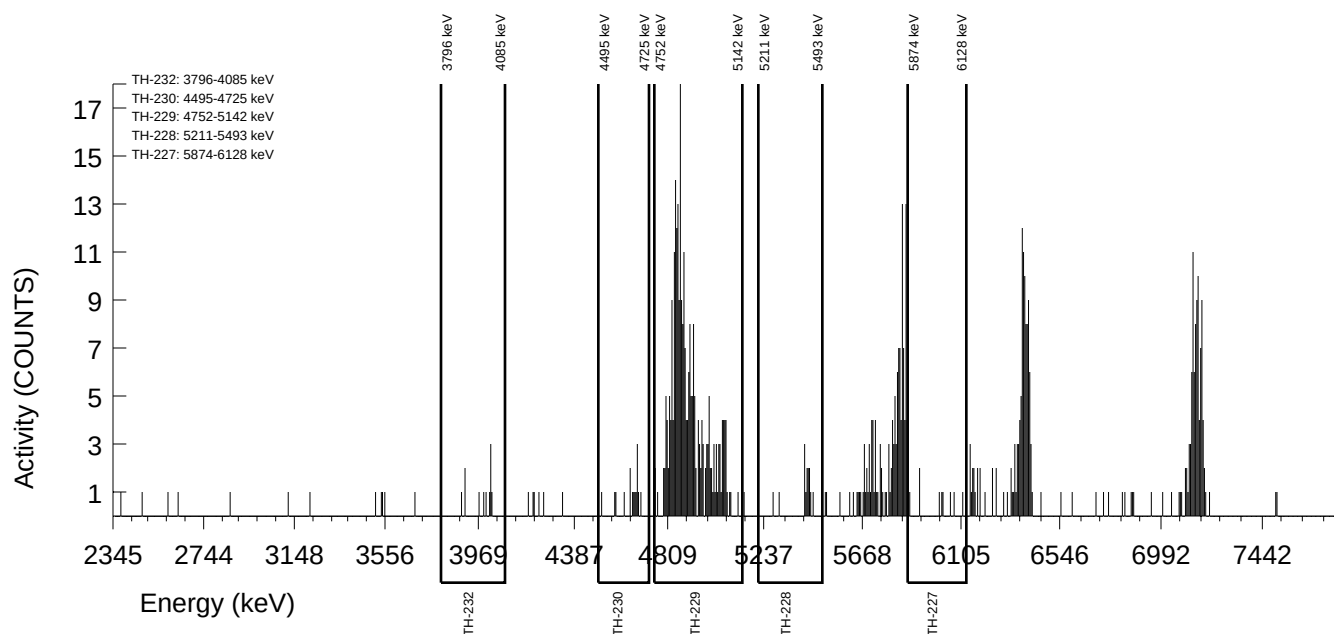
BATCH NUMBER : 2333142 SAMPLE ID : S0597533005_TH SAMPLE QTY : 0.114 F +/-0.879 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : MP2 % YIELD : 16.5 +/-6.914 %	CHAMBER : 033 DETECTOR S/N : 149006 AVERAGE %EFFICIENCY : 32.3492 AVERAGE %EFF ERROR : 0.6248 COUNT DATE : 05-Nov-2022 15:19:43 ELAPSED LIVE TIME(SEC) : 60000.00	LIB FILE : TH BKG FILE : B033.CNF;2490 BKG DATE : 04-Nov-2022 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W033.CNF;740 CAL DATE : 03-Nov-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8636E+00 dpm RESULTS : 8.0451E-01 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	6004.93	4.958	9.000	-3.000	12.000	3.4641	57.440	-1.52E+00	4.77E+00	9.71E+00	4.09E+00	4.77E+00
TH-228	5363.00	5407.92	24.789	14.000	10.986	3.000	1.7321	99.940	8.44E-01	6.67E-01	8.50E-01	3.10E-01	6.56E-01
TH-229	4900.00	4899.00	43.557	268.000	259.000	9.000	3.0000	99.520	1.93E+01	3.66E+00	1.26E+00	5.19E-01	2.43E+00
TH-230	4671.39	4637.83	34.704	15.000	3.442	10.000	3.1623	99.700	2.56E-01	7.58E-01	1.36E+00	5.67E-01	7.56E-01
TH-232	3972.00	3979.25	114.027	11.000	9.896	1.000	1.0000	100.000	7.32E-01	5.53E-01	5.75E-01	1.77E-01	5.43E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.014 +/-0.000)
 TH-230 (1.558 +/-0.024)
 TH-232 (0.104 +/-0.002)



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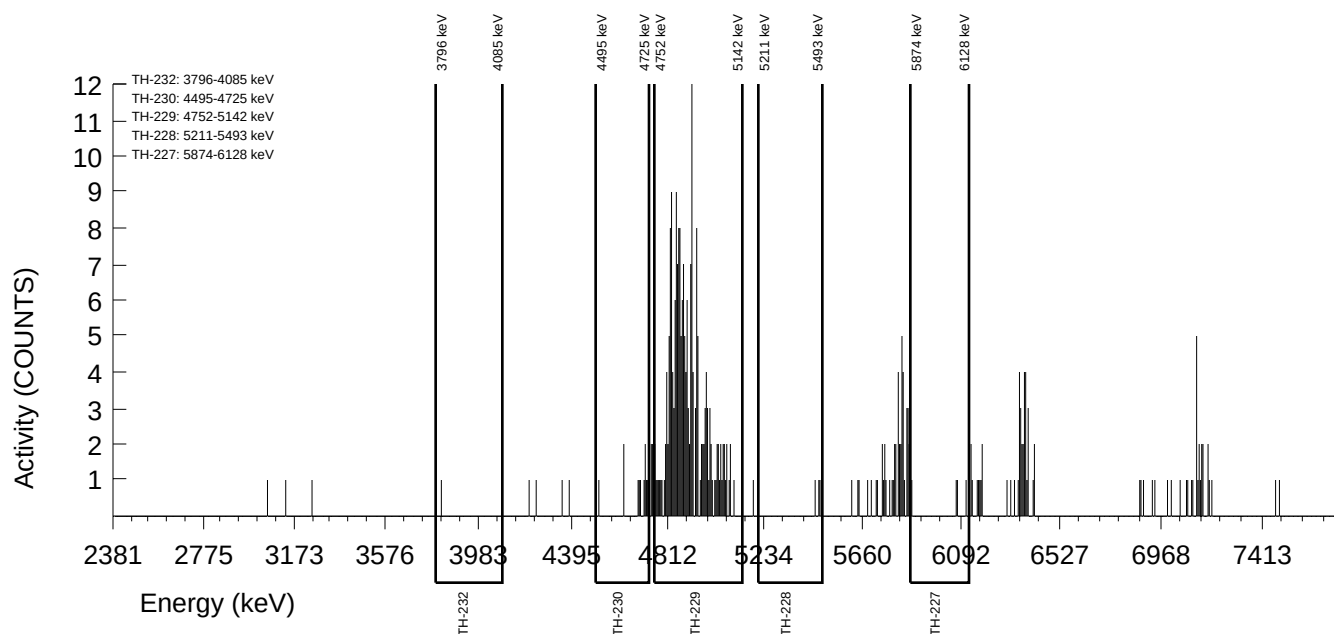
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2333142 SAMPLE ID : S1205226007_TH SAMPLE QTY : 0.117 F +/-0.853 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : MP2 % YIELD : 52.2 +/-7.540 %	CHAMBER : 045 DETECTOR S/N : 78783 AVERAGE %EFFICIENCY : 33.5256 AVERAGE %EFF ERROR : 0.6472 COUNT DATE : 03-Nov-2022 12:02:41 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : TH BKG FILE : B045.CNF;2487 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W045.CNF;658 CAL DATE : 03-Nov-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8635E+00 dpm RESULTS : 2.5371E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	6038.74	219.944	4.000	-0.800	4.800	2.1909	57.440	-1.40E-01	8.57E-01	1.93E+00	7.04E-01	8.56E-01
TH-228	5363.00	5469.77	24.438	3.000	0.349	2.640	1.6248	99.940	3.20E-02	3.90E-01	8.23E-01	2.74E-01	3.90E-01
TH-229	4900.00	4898.64	114.045	207.000	203.160	3.840	1.9596	99.520	1.87E+01	3.87E+00	9.36E-01	3.30E-01	2.61E+00
TH-230	4671.39	4671.15	95.309	11.000	7.378	2.400	1.5492	99.700	6.77E-01	6.51E-01	8.94E-01	3.09E-01	6.39E-01
TH-232	3972.00	3819.60	4.888	1.000	-0.042	0.960	0.9798	100.000	-3.82E-03	2.72E-01	6.14E-01	1.70E-01	2.71E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.011 +/-0.000)
TH-230 (1.222 +/-0.019)
TH-232 (0.082 +/-0.001)



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ALPHA SPECTROSCOPY REPORT

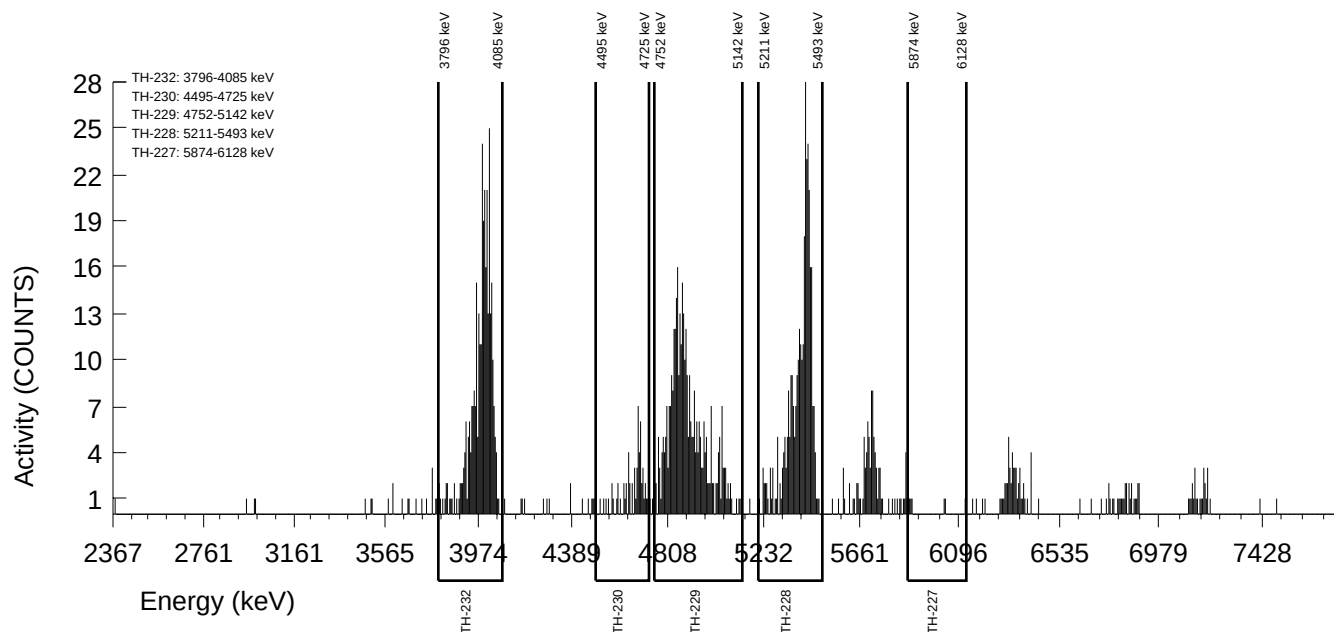
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2333142 SAMPLE ID : S1205226008_TH SAMPLE QTY : 0.117 F +/-0.853 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : MP2 % YIELD : 86.9 +/-5.868 %	CHAMBER : 047 DETECTOR S/N : 80064 AVERAGE %EFFICIENCY : 35.4142 AVERAGE %EFF ERROR : 0.6826 COUNT DATE : 03-Nov-2022 12:02:41 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : TH BKG FILE : B047.CNF;2493 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W047.CNF;664 CAL DATE : 03-Nov-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8635E+00 dpm RESULTS : 4.2243E+00 dpm	LCS ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.6933E+01 % RECOVERY 101.360	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma	MDA pCi/F	Lc pCi/F	1.96-sigma
										TPU pCi/F			cnt Unc pCi/F
TH-227	5994.04	5958.59	0.000	7.000	3.880	3.120	1.7664	57.440	3.87E-01	5.82E-01	9.44E-01	3.23E-01	5.80E-01
TH-228	5363.00	5393.79	33.287	330.000	327.820	2.160	1.4697	99.940	1.71E+01	2.80E+00	4.39E-01	1.41E-01	1.86E+00
TH-229	4900.00	4899.66	77.578	359.000	357.320	1.680	1.2961	99.520	1.87E+01	3.00E+00	4.05E-01	1.24E-01	1.95E+00
TH-230	4671.39	4654.17	52.672	58.000	54.410	1.440	1.2000	99.700	2.84E+00	8.67E-01	4.97E-01	1.70E-01	7.88E-01
TH-232	3972.00	3987.80	67.677	331.000	329.896	0.960	0.9798	100.000	1.72E+01	2.80E+00	3.54E-01	9.89E-02	1.86E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.020 +/-0.000)
 TH-230 (2.150 +/-0.033)
 TH-232 (0.144 +/-0.002)



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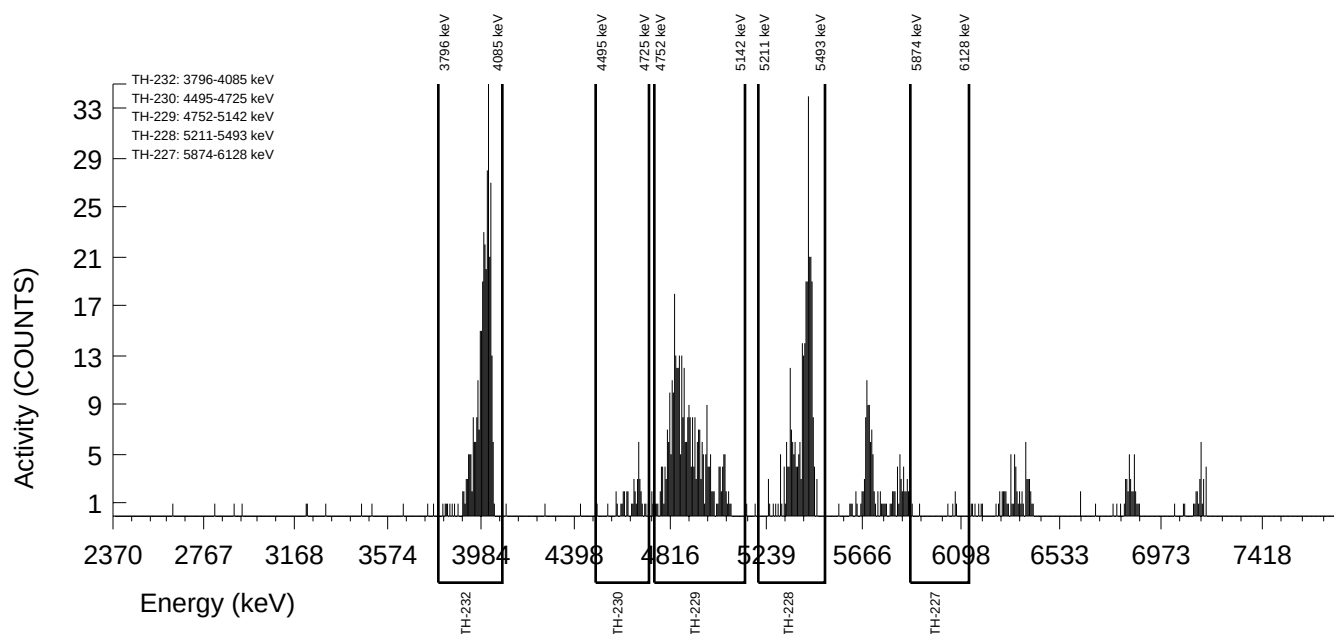
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2333142 SAMPLE ID : S1205226009_TH SAMPLE QTY : 0.117 F +/-0.853 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : MP2 % YIELD : 90.4 +/-6.044 %	CHAMBER : 048 DETECTOR S/N : 140242 AVERAGE %EFFICIENCY : 32.0519 AVERAGE %EFF ERROR : 0.6192 COUNT DATE : 03-Nov-2022 12:02:41 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : TH BKG FILE : B048.CNF;2503 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W048.CNF;743 CAL DATE : 03-Nov-2022
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8635E+00 dpm RESULTS : 4.3947E+00 dpm	LCSD ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.6933E+01 % RECOVERY 106.113	

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
TH-227	5994.04	6015.54	7.399	7.000	4.840	2.160	1.4697	57.440	5.12E-01	6.11E-01	8.88E-01	2.85E-01	6.08E-01
TH-228	5363.00	5399.09	27.535	279.000	274.181	4.800	2.1909	99.940	1.52E+01	2.64E+00	6.12E-01	2.23E-01	1.82E+00
TH-229	4900.00	4897.21	62.895	341.000	336.440	4.560	2.1354	99.520	1.87E+01	3.09E+00	6.01E-01	2.17E-01	2.02E+00
TH-230	4671.39	4649.28	9.866	41.000	34.896	4.080	2.0199	99.700	1.93E+00	7.57E-01	6.52E-01	2.43E-01	7.13E-01
TH-232	3972.00	3994.54	39.728	327.000	325.185	1.680	1.2961	100.000	1.80E+01	2.99E+00	4.37E-01	1.35E-01	1.96E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.019 +/-0.000)
 TH-230 (2.024 +/-0.031)
 TH-232 (0.135 +/-0.002)



Batch 2333138 Check-list

This check-list was completed on 03-NOV-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 03-NOV-22 and Jessica Davis on 03-NOV-22.

Batch ID:
2333138

Product:
ASP_PUF

Description: Alpha Spec Plutonium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?		No	
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?		No	
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium

Batch ID: 2333138

Analyst: Brendon Viquez (BV1)

Method: DOE EML HASL-300, Pu-11-RC
Modified

Lab SOP: GL-RAD-A-011 REV# 28

Instrument: GFC-B742840386

Due Dates for Lab: 02-NOV-2022

Package: 03-NOV-2022

SDG: 03-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205225999	Plutonium-239 AS SPIKE	1472-C	.1	mL
LCSD	1205226000	Plutonium-239 AS SPIKE	1472-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	597531001	01-NOV-2022	1	30.16	0.11118
2	597531002	01-NOV-2022	1	30.21	0.11201
3	597531003	01-NOV-2022	1	30.02	0.11345
4	597533001	01-NOV-2022	1	30.04	0.11674
5	597533002	01-NOV-2022	1	30.05	0.11602
6	597533003	01-NOV-2022	1	30.23	0.11454
7	597533004	01-NOV-2022	1	30.15	0.11482
8	597533005	01-NOV-2022	1	30.3	0.11471
9	1205225998 MB	01-NOV-2022	1		0.11674
10	1205225999 LCS	01-NOV-2022	1		0.11674
11	1205226000 LCSD	01-NOV-2022	1		0.11674

Reagent/Solvent Lot ID	Description	Amount
WORK 2022-A	Plutonium-242 AS TRACER	.1 ml

Comments:

Pipet ID: RAD-ASP-184002Z
Analyzed With: Am , U
Data Entry Date2: 01-NOV-2022 00:00

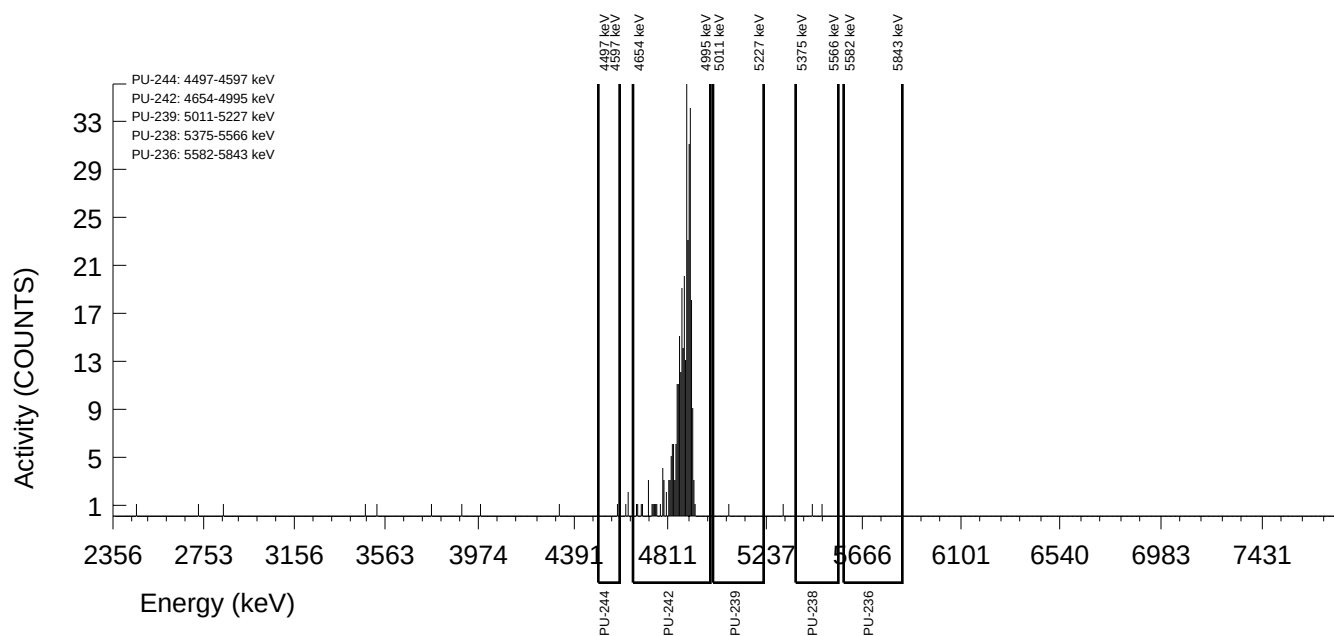
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333138 SAMPLE ID : S0597533001_PU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 30-Sep-2022 07:45:00 ANALYST : BV1 % YIELD : 95.6 +/-5.898 %	CHAMBER : 093 DETECTOR S/N : 155764 AVERAGE %EFFICIENCY : 33.4274 AVERAGE %EFF ERROR : 0.6452 COUNT DATE : 03-Nov-2022 10:26:51 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B093.CNF;2086 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W093.CNF;542 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 4.0481E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.25	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.04E-01	1.54E-01	9.43E-02	1.04E-01
PU-238	5486.00	5466.98	44.497	2.000	2.000	0.000	1.0000	99.900	1.01E-01	1.73E-01	1.51E-01	9.24E-02	1.73E-01
PU-239	5155.00	5076.52	4.944	1.000	0.520	0.480	0.6928	99.900	2.62E-02	1.46E-01	2.79E-01	6.39E-02	1.46E-01
PU-242	4870.00	4871.79	40.259	325.000	324.760	0.240	0.4899	100.000	1.63E+01	2.68E+00	2.41E-01	4.52E-02	1.78E+00
PU-244	4589.00	4584.59	4.944	1.000	1.000	0.000	1.0000	99.900	5.04E-02	1.42E-01	1.51E-01	9.23E-02	1.42E-01



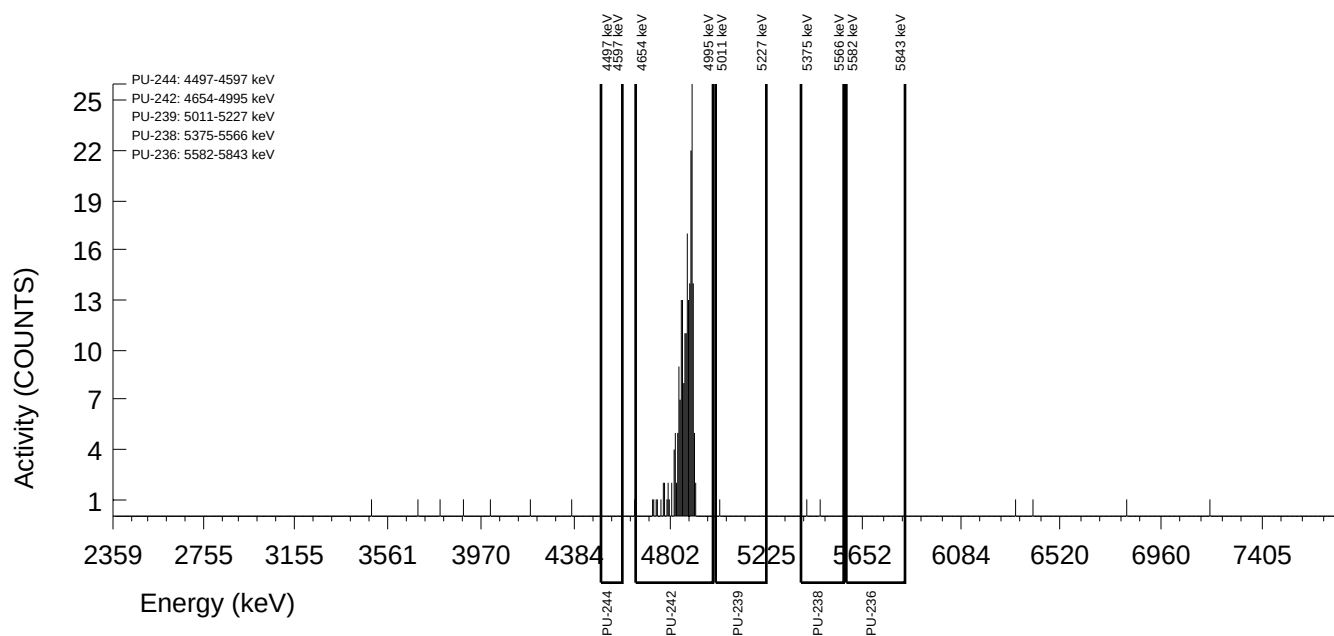
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333138 SAMPLE ID : S0597533002_PU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 30-Sep-2022 07:51:00 ANALYST : BV1 % YIELD : 66.5 +/-7.182 %	CHAMBER : 095 DETECTOR S/N : 140239 AVERAGE %EFFICIENCY : 31.6063 AVERAGE %EFF ERROR : 0.6108 COUNT DATE : 03-Nov-2022 10:26:52 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B095.CNF;2052 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W095.CNF;584 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 2.8159E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.25	0.000	0.000	-0.720	0.720	0.8485	100.000	-5.67E-02	1.72E-01	4.81E-01	1.22E-01	1.71E-01
PU-238	5486.00	5435.39	59.099	2.000	0.560	1.440	1.2000	99.900	4.32E-02	2.79E-01	5.71E-01	1.70E-01	2.79E-01
PU-239	5155.00	5023.68	4.925	1.000	-0.680	1.680	1.2961	99.900	-5.24E-02	2.37E-01	5.97E-01	1.83E-01	2.37E-01
PU-242	4870.00	4871.37	28.455	216.000	213.600	2.400	1.5492	100.000	1.64E+01	3.28E+00	6.68E-01	2.19E-01	2.23E+00
PU-244	4589.00	4546.97	0.000	0.000	-0.240	0.240	0.4899	99.900	-1.85E-02	1.60E-01	3.70E-01	6.92E-02	1.60E-01

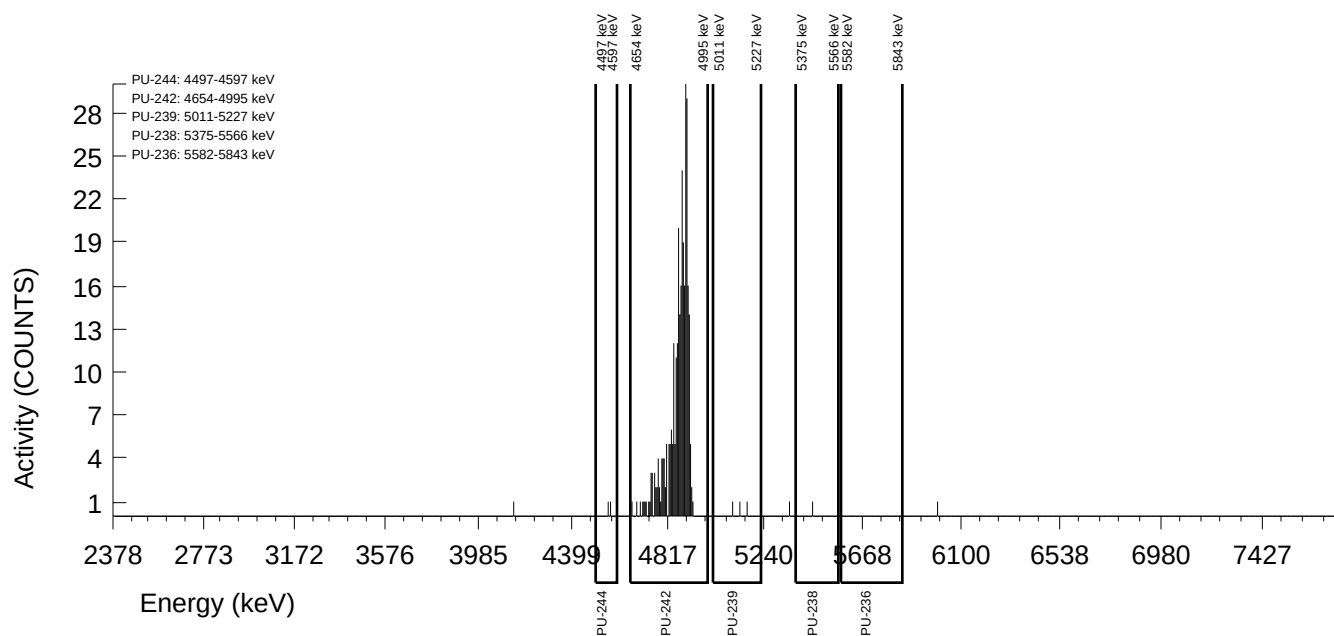


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333138 SAMPLE ID : S0597533003_PU SAMPLE QTY : 0.115 F +/-0.873 % SAMPLE DATE : 30-Sep-2022 07:58:00 ANALYST : BV1 % YIELD : 91.7 +/-6.031 %	CHAMBER : 096 DETECTOR S/N : 80016 AVERAGE %EFFICIENCY : 33.4897 AVERAGE %EFF ERROR : 0.6463 COUNT DATE : 03-Nov-2022 10:26:52 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B096.CNF;2044 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W096.CNF;514 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.8833E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.23	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.31E-02	1.13E-01	2.62E-01	4.90E-02	1.13E-01
PU-238	5486.00	5453.32	4.901	1.000	-0.920	1.920	1.3856	99.900	-4.92E-02	1.66E-01	4.32E-01	1.36E-01	1.66E-01
PU-239	5155.00	5133.76	63.708	3.000	1.080	1.920	1.3856	99.900	5.77E-02	2.23E-01	4.32E-01	1.36E-01	2.23E-01
PU-242	4870.00	4862.25	44.718	315.000	312.120	2.880	1.6971	100.000	1.67E+01	2.80E+00	4.92E-01	1.66E-01	1.86E+00
PU-244	4589.00	4560.08	14.702	2.000	1.760	0.240	0.4899	99.900	9.40E-02	1.85E-01	2.56E-01	4.80E-02	1.85E-01

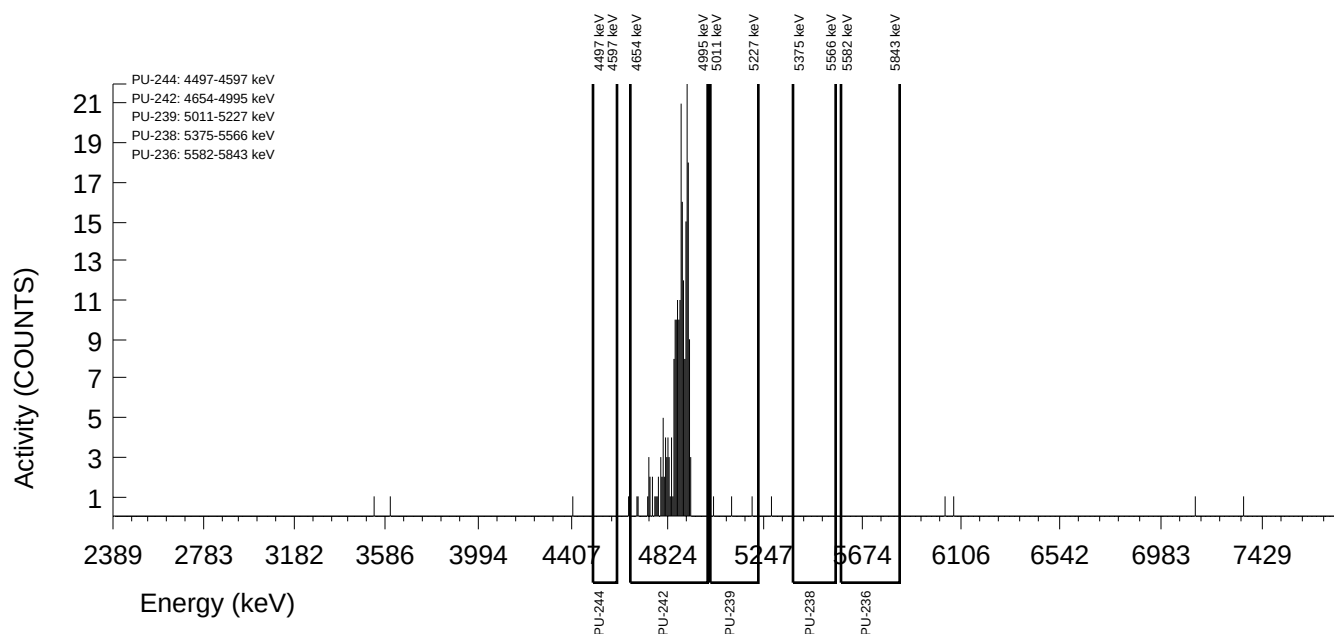


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333138 SAMPLE ID : S0597533004_PU SAMPLE QTY : 0.115 F +/-0.871 % SAMPLE DATE : 30-Sep-2022 08:05:00 ANALYST : BV1 % YIELD : 61.9 +/-7.000 %	CHAMBER : 097 DETECTOR S/N : 83288 AVERAGE %EFFICIENCY : 36.1216 AVERAGE %EFF ERROR : 0.6960 COUNT DATE : 03-Nov-2022 10:26:52 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B097.CNF;2041 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W097.CNF;538 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 2.6203E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.24	0.000	0.000	-0.960	0.960	0.9798	100.000	-7.18E-02	1.67E-01	4.93E-01	1.34E-01	1.66E-01
PU-238	5486.00	5470.34	0.000	0.000	-0.720	0.720	0.8485	99.900	-5.28E-02	1.60E-01	4.48E-01	1.14E-01	1.59E-01
PU-239	5155.00	5107.29	161.586	3.000	0.840	2.160	1.4697	99.900	6.15E-02	3.07E-01	6.14E-01	1.97E-01	3.07E-01
PU-242	4870.00	4869.72	38.084	231.000	227.160	3.840	1.9596	100.000	1.66E+01	3.23E+00	7.45E-01	2.63E-01	2.19E+00
PU-244	4589.00	4547.28	0.000	2.000	1.760	0.240	0.4899	99.900	1.29E-01	2.54E-01	3.51E-01	6.57E-02	2.53E-01

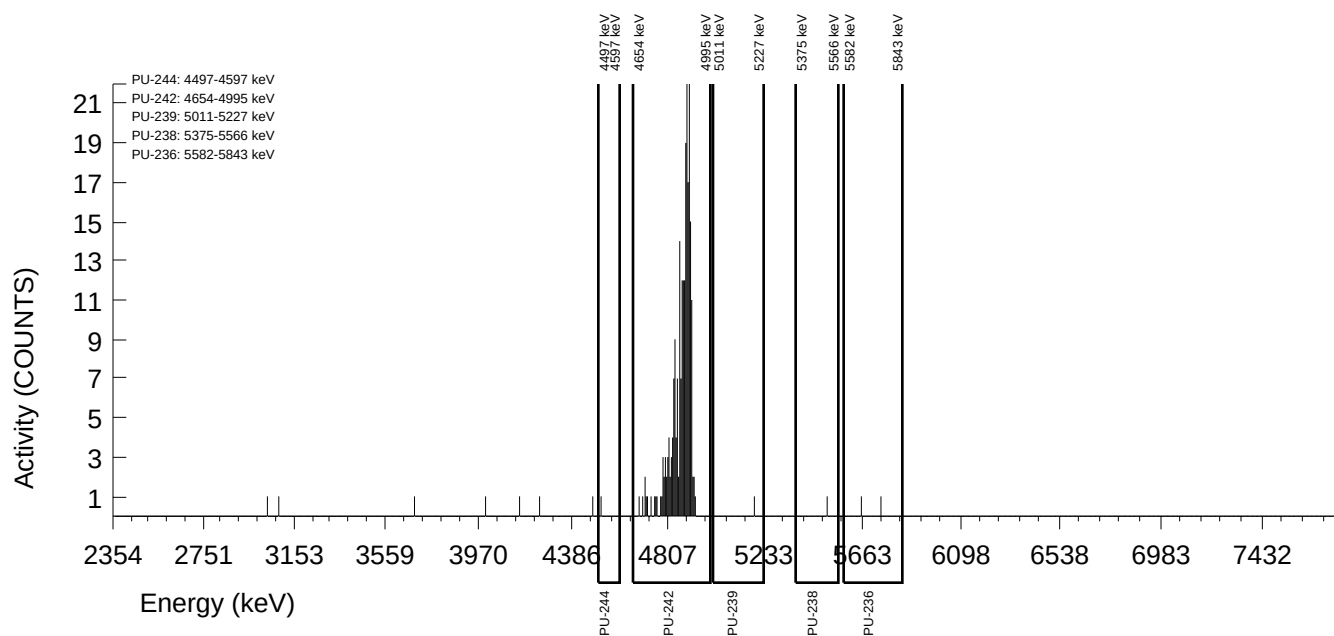


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333138 SAMPLE ID : S0597533005_PU SAMPLE QTY : 0.115 F +/-0.872 % SAMPLE DATE : 30-Sep-2022 09:00:00 ANALYST : BV1 % YIELD : 62.3 +/-6.935 %	CHAMBER : 098 DETECTOR S/N : 158118 AVERAGE %EFFICIENCY : 36.5015 AVERAGE %EFF ERROR : 0.7032 COUNT DATE : 03-Nov-2022 10:26:52 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B098.CNF;2069 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W098.CNF;588 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 2.6414E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5706.49	83.828	2.000	-0.400	2.400	1.5492	100.000	-2.94E-02	2.75E-01	6.38E-01	2.09E-01	2.75E-01
PU-238	5486.00	5512.03	4.931	1.000	-0.680	1.680	1.2961	99.900	-4.90E-02	2.22E-01	5.58E-01	1.71E-01	2.21E-01
PU-239	5155.00	5190.07	4.931	1.000	-1.640	2.640	1.6248	99.900	-1.18E-01	2.32E-01	6.44E-01	2.14E-01	2.31E-01
PU-242	4870.00	4866.88	50.543	235.000	231.400	3.600	1.8974	100.000	1.66E+01	3.21E+00	7.15E-01	2.50E-01	2.17E+00
PU-244	4589.00	4512.21	4.931	1.000	0.520	0.480	0.6928	99.900	3.74E-02	2.08E-01	3.99E-01	9.13E-02	2.08E-01



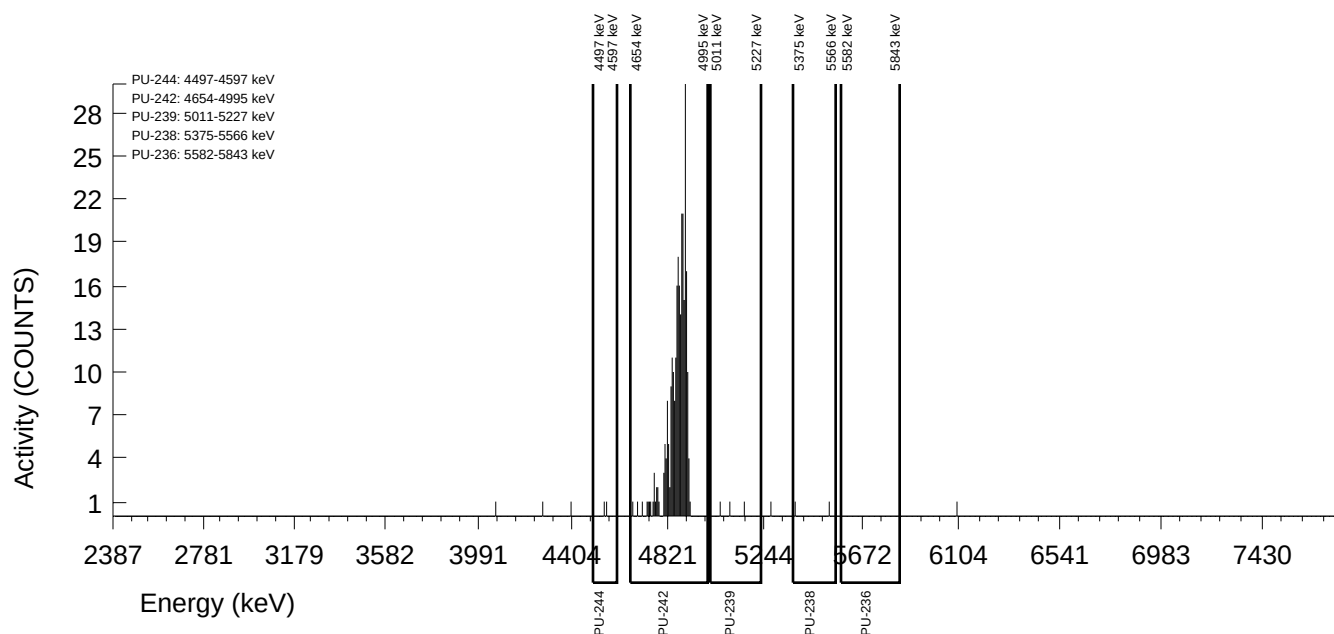
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333138 SAMPLE ID : S1205225998_PU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 74.3 +/-6.497 %	CHAMBER : 099 DETECTOR S/N : 158120 AVERAGE %EFFICIENCY : 35.6810 AVERAGE %EFF ERROR : 0.6877 COUNT DATE : 03-Nov-2022 10:26:52 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B099.CNF;2050 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W099.CNF;551 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.1473E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.23	0.000	0.000	-2.640	2.640	1.6248	100.000	-1.60E-01	1.55E-01	5.44E-01	1.81E-01	1.55E-01
PU-238	5486.00	5457.20	141.784	2.000	0.800	1.200	1.0954	99.900	4.86E-02	2.18E-01	4.26E-01	1.22E-01	2.18E-01
PU-239	5155.00	5102.63	102.671	3.000	0.840	2.160	1.4697	99.900	5.10E-02	2.55E-01	5.09E-01	1.63E-01	2.55E-01
PU-242	4870.00	4865.60	41.487	276.000	269.520	6.480	2.5456	100.000	1.63E+01	2.95E+00	7.48E-01	2.83E-01	1.98E+00
PU-244	4589.00	4549.27	14.667	2.000	1.520	0.480	0.6928	99.900	9.23E-02	2.12E-01	3.36E-01	7.71E-02	2.12E-01

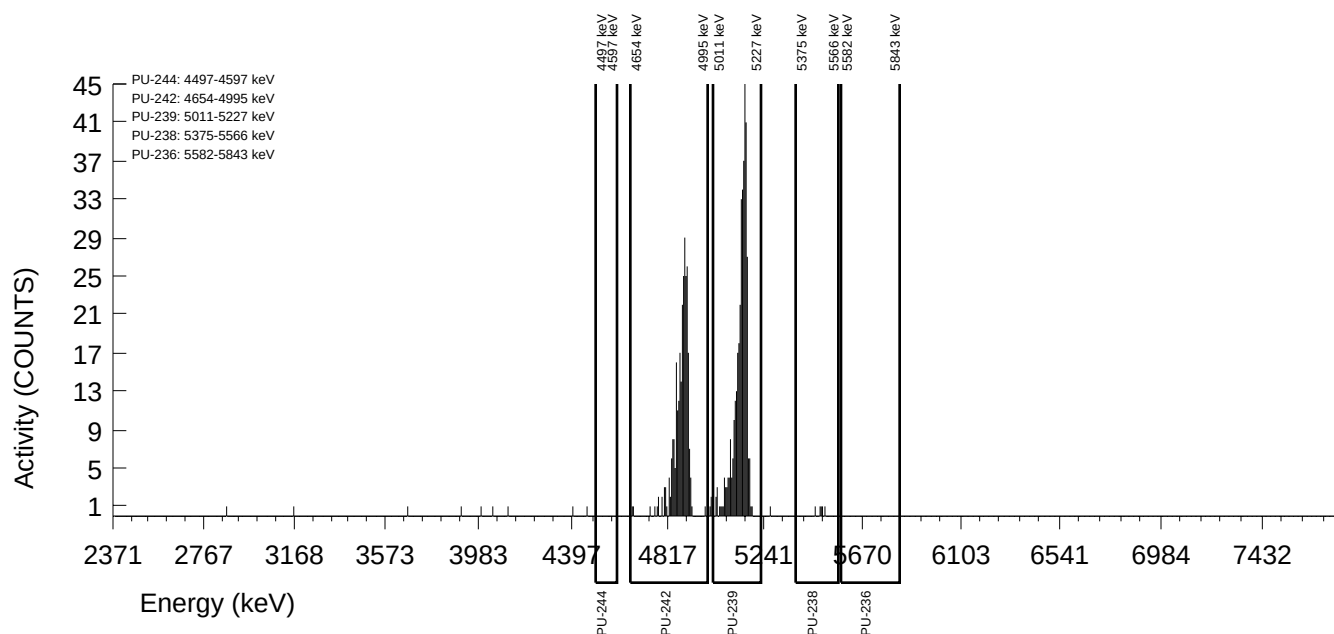


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333138 SAMPLE ID : S1205225999_PU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 79.1 +/-6.527 %	CHAMBER : 100 DETECTOR S/N : 155848 AVERAGE %EFFICIENCY : 33.4290 AVERAGE %EFF ERROR : 0.6452 COUNT DATE : 03-Nov-2022 10:26:52 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B100.CNF;2050 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W100.CNF;624 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.3509E+00 dpm	LCS ID 1472-C NUCLIDE PU-239 NOMINAL (pCi/F) 1.7633E+01 % RECOVERY 126.365	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.24	0.000	0.000	-3.360	3.360	1.8330	100.000	-2.05E-01	1.63E-01	5.92E-01	2.05E-01	1.63E-01
PU-238	5486.00	5489.97	44.252	5.000	2.600	2.400	1.5492	99.900	1.58E-01	3.08E-01	5.28E-01	1.73E-01	3.07E-01
PU-239	5155.00	5137.13	30.332	368.000	366.080	1.920	1.3856	99.900	2.23E+01	3.77E+00	4.92E-01	1.54E-01	2.29E+00
PU-242	4870.00	4873.55	51.069	277.000	268.840	8.160	2.8566	100.000	1.63E+01	2.97E+00	8.19E-01	3.18E-01	1.99E+00
PU-244	4589.00	4546.97	0.000	0.000	-0.240	0.240	0.4899	99.900	-1.46E-02	1.26E-01	2.92E-01	5.46E-02	1.26E-01

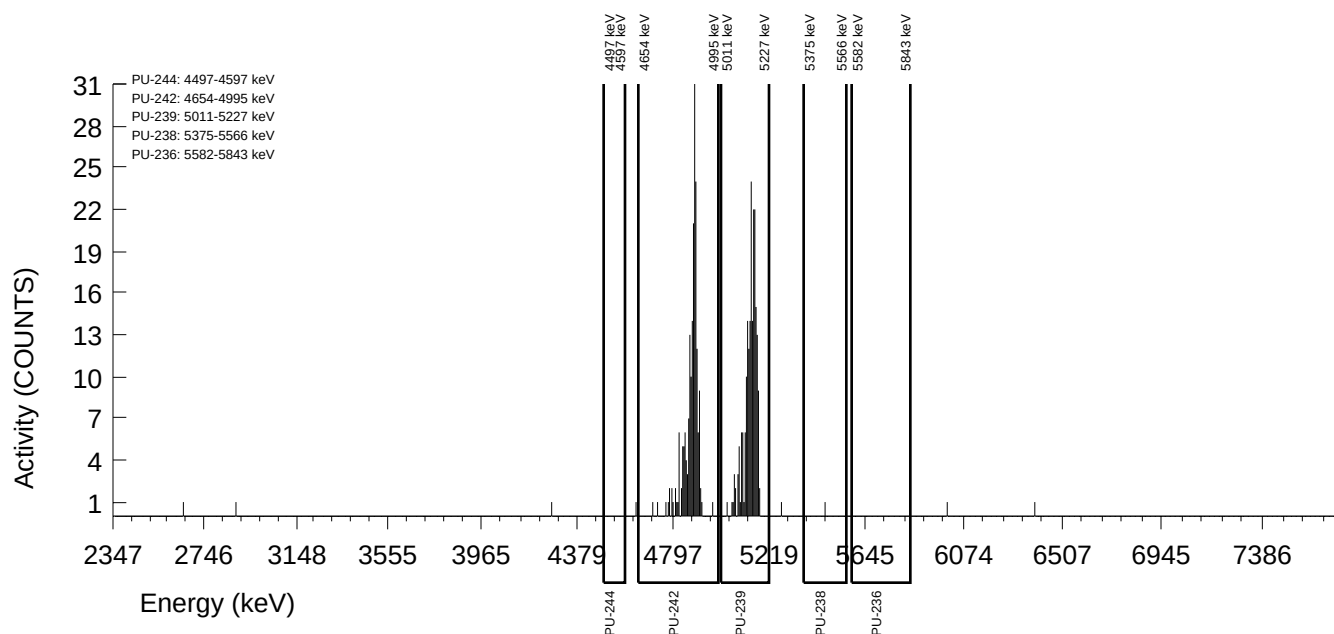


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333138 SAMPLE ID : S1205226000_PU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 72.1 +/-7.564 %			CHAMBER : 213 DETECTOR S/N : 155838 AVERAGE %EFFICIENCY : 26.2169 AVERAGE %EFF ERROR : 0.5092 COUNT DATE : 03-Nov-2022 10:12:56 ELAPSED LIVE TIME(SEC) : 14400.00			LIB FILE : PU BKG FILE : B213.CNF;1105 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W213.CNF;333 CAL DATE : 20-Oct-2022		
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.0534E+00 dpm			LCSD ID 1472-C NUCLIDE PU-239 NOMINAL (pCi/F) 1.7633E+01 % RECOVERY 99.175					

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.27	0.000	0.000	-0.960	0.960	0.9798	100.000	-8.18E-02	1.90E-01	5.62E-01	1.53E-01	1.90E-01
PU-238	5486.00	5468.54	4.960	1.000	-2.120	3.120	1.7664	99.900	-1.81E-01	2.80E-01	8.07E-01	2.76E-01	2.80E-01
PU-239	5155.00	5141.25	43.400	207.000	205.320	1.680	1.2961	99.900	1.75E+01	3.61E+00	6.60E-01	2.02E-01	2.41E+00
PU-242	4870.00	4880.94	17.331	195.000	192.120	2.880	1.6971	100.000	1.63E+01	3.44E+00	7.84E-01	2.65E-01	2.34E+00
PU-244	4589.00	4546.97	0.000	0.000	-0.720	0.720	0.8485	99.900	-6.13E-02	1.86E-01	5.20E-01	1.32E-01	1.85E-01



Batch 2333147 Check-list

This check-list was completed on 07-NOV-22 by Melanie Aycock

This batch was reviewed by Jessica Davis on 07-NOV-22 and Melanie Aycock on 07-NOV-22.

Batch ID: 2333147

Product: ASP10POF

Description: Alpha Spec Polonium

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Polonium

Batch ID: 2333147

Analyst: Brendon Viquez (BV1)

Method: DOE EML HASL-300, Po-01-RC
Modified

Lab SOP: GL-RAD-A-016 REV# 19

Instrument: BAL-18550299

Due Dates for Lab: 02-NOV-2022

Package: 03-NOV-2022

SDG: 03-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205226019	Polonium-210 AS SPIKE	2012-A	.1	mL
LCSD	1205226020	Polonium-210 AS SPIKE	2012-A	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (g)	Aliquot (Filter)
1	597531001	31-OCT-2022	.5	0.452	0.20197
2	597531002	31-OCT-2022	.5	0.453	0.20223
3	597531003	31-OCT-2022	.5	0.456	0.20812
4	597533001	31-OCT-2022	.5	0.767	0.20415
5	597533002	31-OCT-2022	.5	0.761	0.20299
6	597533003	31-OCT-2022	.5	0.764	0.20292
7	597533004	31-OCT-2022	.5	0.769	0.20523
8	597533005	31-OCT-2022	.5	0.763	0.20841
9	1205226018 MB	31-OCT-2022	.5		0.20841
10	1205226019 LCS	31-OCT-2022	.5		0.20841
11	1205226020 LCSD	31-OCT-2022	.5		0.20841

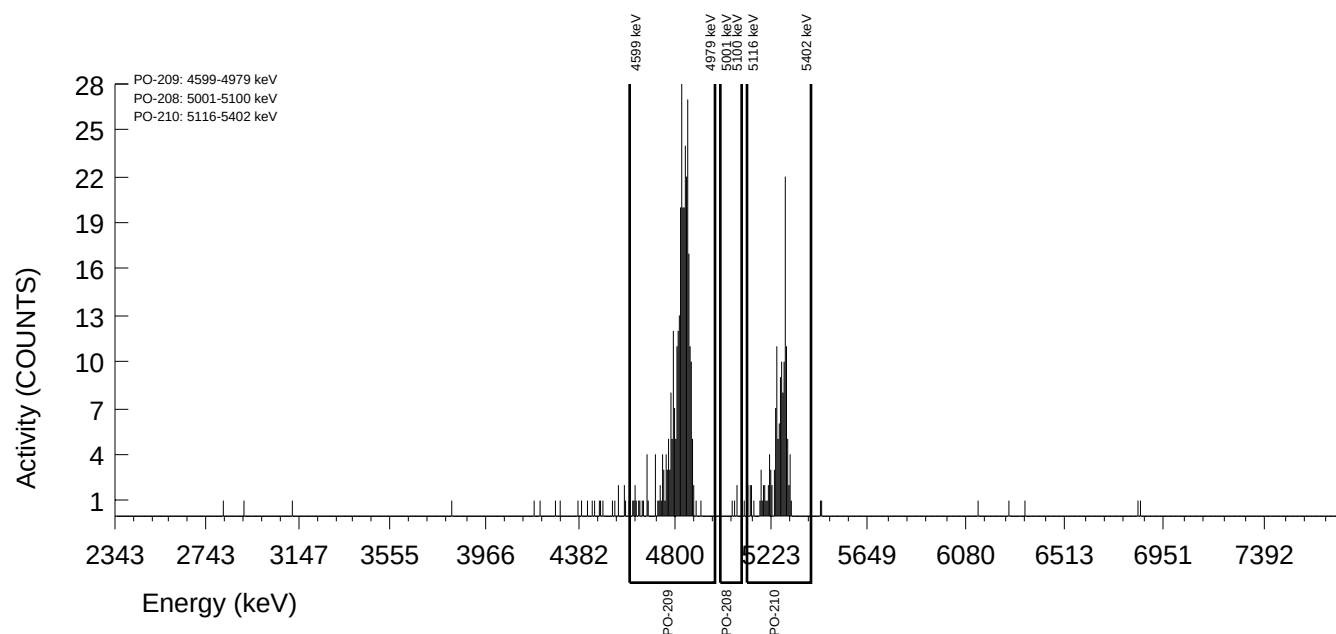
Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1720-D	Polonium-209 AS TRACER	.1 ml	Data Entry Date2: 31-OCT-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2333147 SAMPLE ID : S0597533001_PO SAMPLE QTY : 0.204 F +/-0.490 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 66.7 +/-6.047 %	CHAMBER : 124 DETECTOR S/N : 155771 AVERAGE %EFFICIENCY : 25.9309 AVERAGE %EFF ERROR : 0.5038 COUNT DATE : 04-Nov-2022 08:35:07 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B124.CNF;1807 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W124.CNF;466 CAL DATE : 14-Oct-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8680E+00 dpm RESULTS : 5.2490E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5066.79	4.979	4.000	3.520	0.480	0.6928	100.000	1.91E-01	2.44E-01	3.01E-01	6.90E-02	2.42E-01
PO-209	4882.00	4820.46	41.611	329.000	325.640	3.360	1.8330	99.740	1.74E+01	2.88E+00	5.18E-01	1.79E-01	1.90E+00
PO-210	5304.38	5256.89	9.543	143.000	139.400	3.600	1.8974	100.000	8.85E+00	1.86E+00	6.32E-01	2.21E-01	1.50E+00

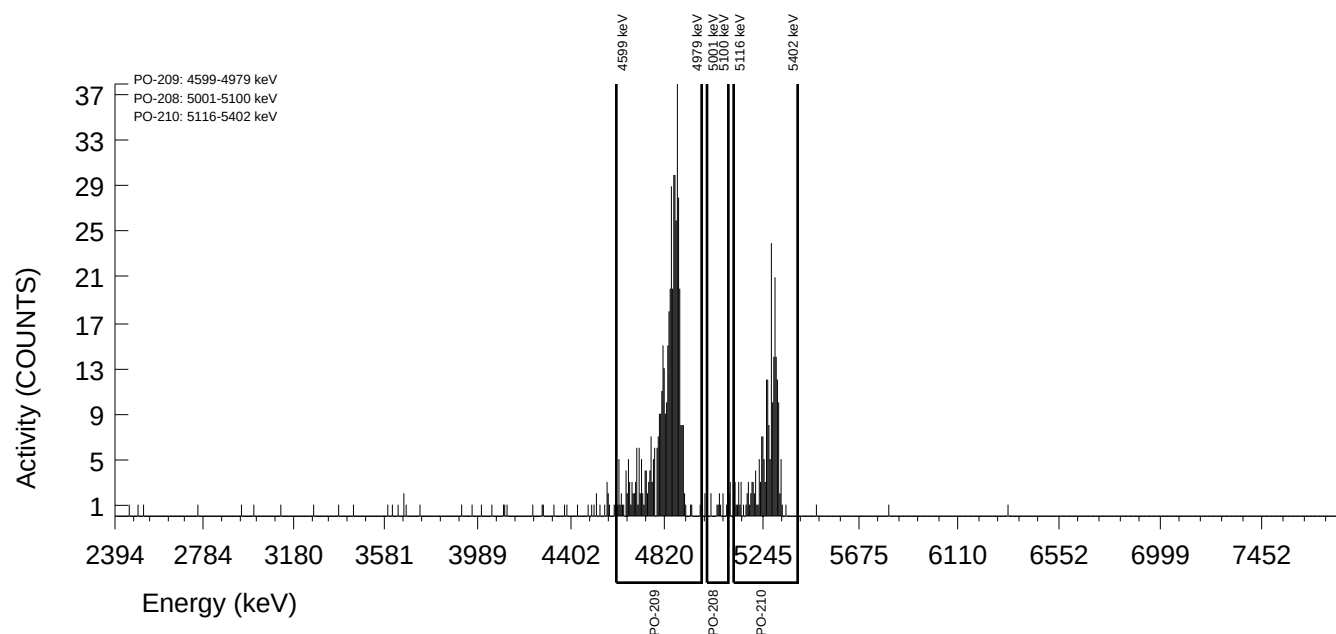


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2333147 SAMPLE ID : S0597533002_PO SAMPLE QTY : 0.203 F +/-0.493 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 63.0 +/-5.141 %	CHAMBER : 139 DETECTOR S/N : 76231 AVERAGE %EFFICIENCY : 40.7854 AVERAGE %EFF ERROR : 0.7839 COUNT DATE : 04-Nov-2022 08:35:11 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B139.CNF;1768 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W139.CNF;504 CAL DATE : 17-Oct-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8680E+00 dpm RESULTS : 4.9585E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5068.11	0.000	14.000	13.520	0.480	0.6928	100.000	4.98E-01	2.86E-01	2.04E-01	4.67E-02	2.81E-01
PO-209	4882.00	4820.85	41.545	492.000	483.840	8.160	2.8566	99.740	1.75E+01	2.46E+00	4.86E-01	1.89E-01	1.57E+00
PO-210	5304.38	5268.15	27.258	220.000	216.400	3.600	1.8974	100.000	9.30E+00	1.61E+00	4.28E-01	1.49E-01	1.25E+00



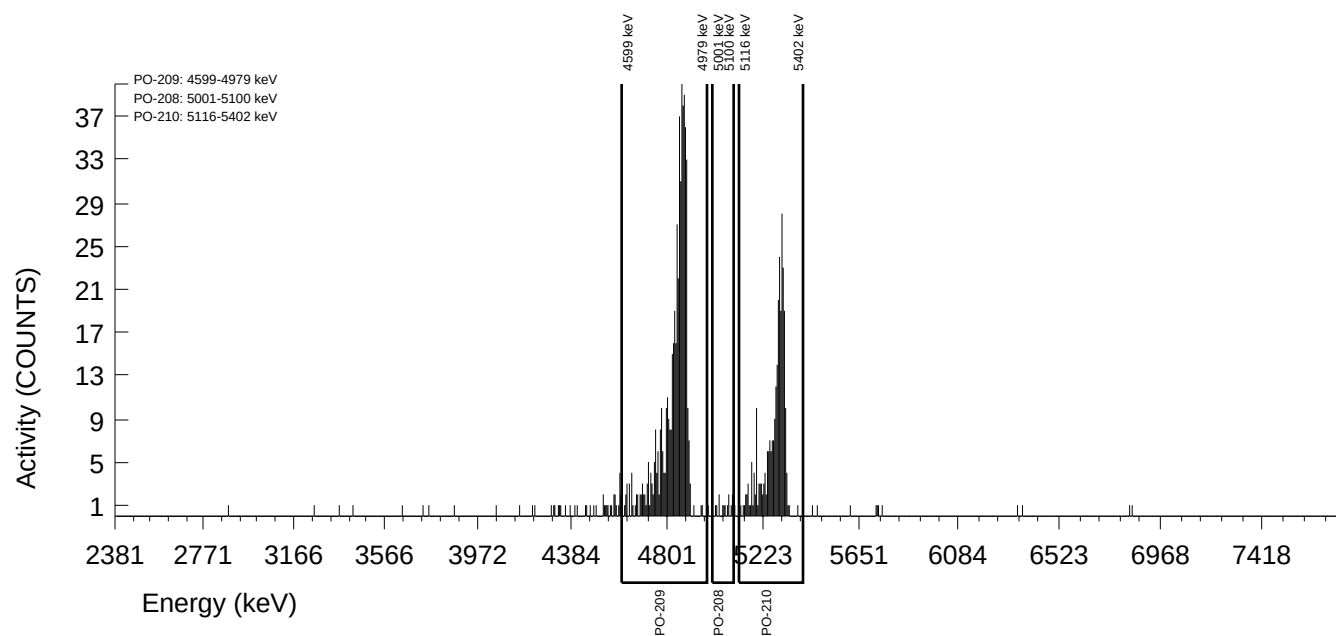
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2333147 SAMPLE ID : S0597533003_PO SAMPLE QTY : 0.203 F +/-0.493 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 71.9 +/-4.879 %	CHAMBER : 140 DETECTOR S/N : 155855 AVERAGE %EFFICIENCY : 40.3896 AVERAGE %EFF ERROR : 0.7765 COUNT DATE : 04-Nov-2022 08:35:20 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B140.CNF;1750 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W140.CNF;452 CAL DATE : 17-Oct-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8680E+00 dpm RESULTS : 5.6549E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5061.23	65.263	17.000	16.520	0.480	0.6928	100.000	5.39E-01	2.78E-01	1.81E-01	4.14E-02	2.72E-01
PO-209	4882.00	4832.60	44.483	551.000	546.440	4.560	2.1354	99.740	1.75E+01	2.33E+00	3.46E-01	1.25E-01	1.47E+00
PO-210	5304.38	5275.39	31.691	279.000	272.520	6.480	2.5456	100.000	1.04E+01	1.65E+00	4.69E-01	1.77E-01	1.25E+00



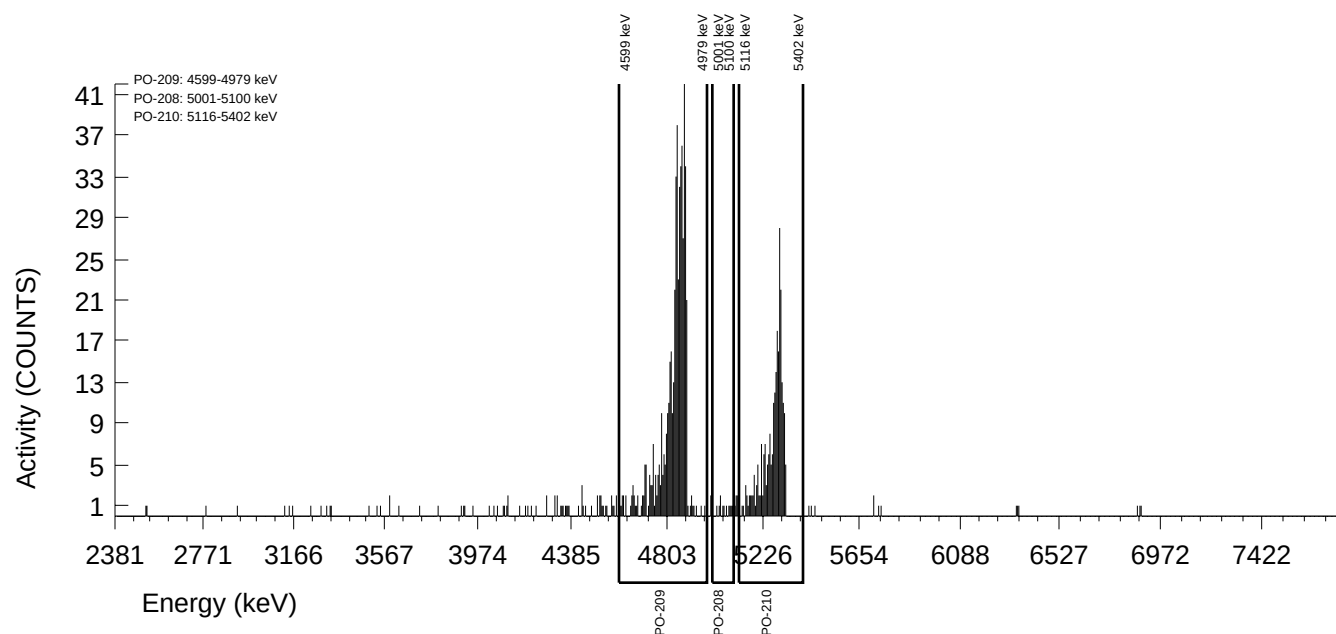
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2333147 SAMPLE ID : S0597533004_PO SAMPLE QTY : 0.205 F +/-0.487 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 68.9 +/-4.982 %	CHAMBER : 141 DETECTOR S/N : 155856 AVERAGE %EFFICIENCY : 40.2988 AVERAGE %EFF ERROR : 0.7747 COUNT DATE : 04-Nov-2022 08:35:15 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B141.CNF;1785 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W141.CNF;77 CAL DATE : 17-Oct-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8680E+00 dpm RESULTS : 5.4229E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5054.50	7.260	12.000	12.000	0.000	1.0000	100.000	4.04E-01	2.42E-01	1.01E-01	6.17E-02	2.39E-01
PO-209	4882.00	4835.33	48.939	531.000	522.840	8.160	2.8566	99.740	1.73E+01	2.35E+00	4.45E-01	1.73E-01	1.50E+00
PO-210	5304.38	5269.34	23.663	251.000	246.200	4.800	2.1909	100.000	9.68E+00	1.59E+00	4.34E-01	1.58E-01	1.23E+00

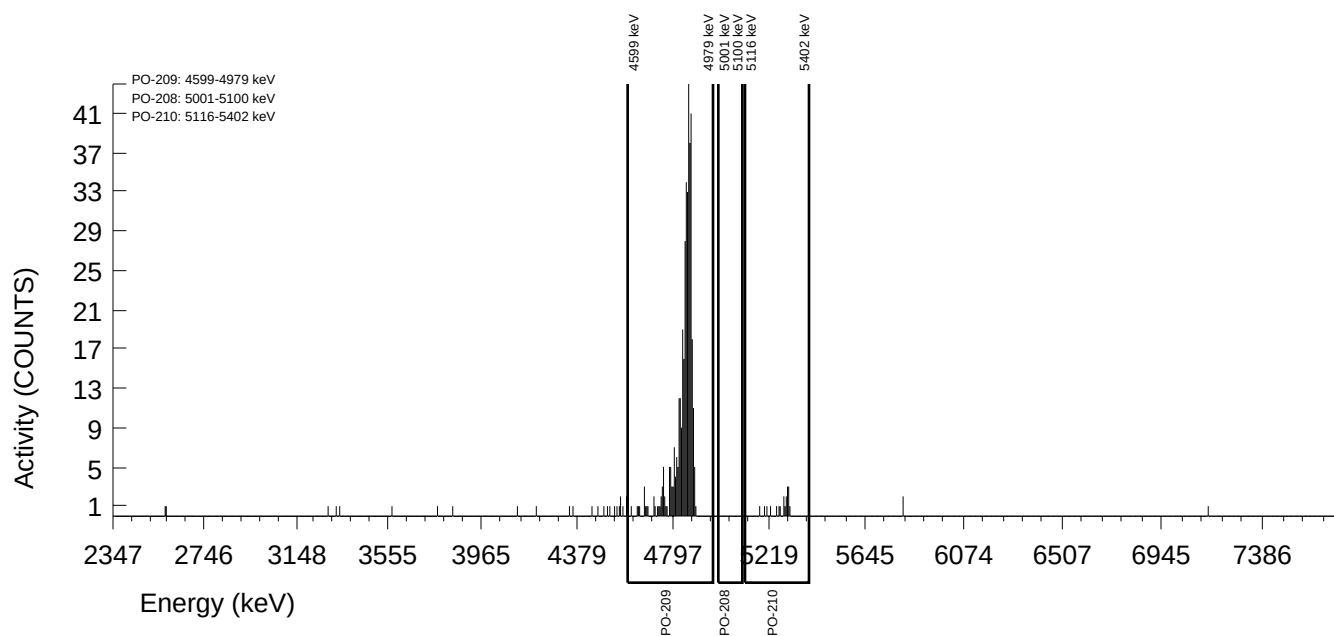


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2333147 SAMPLE ID : S0597533005_PO SAMPLE QTY : 0.208 F +/-0.480 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 78.5 +/-5.613 %	CHAMBER : 213 DETECTOR S/N : 155838 AVERAGE %EFFICIENCY : 26.2169 AVERAGE %EFF ERROR : 0.5092 COUNT DATE : 04-Nov-2022 08:41:19 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B213.CNF;1105 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W213.CNF;333 CAL DATE : 20-Oct-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8680E+00 dpm RESULTS : 6.1802E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5050.47	0.000	0.000	-0.720	0.720	0.8485	100.000	-3.22E-02	9.74E-02	2.73E-01	6.96E-02	9.73E-02
PO-209	4882.00	4847.16	31.378	391.000	387.640	3.360	1.8330	99.740	1.70E+01	2.62E+00	4.26E-01	1.47E-01	1.70E+00
PO-210	5304.38	5275.83	24.800	19.000	14.440	4.560	2.1354	100.000	7.54E-01	4.79E-01	5.65E-01	2.04E-01	4.71E-01

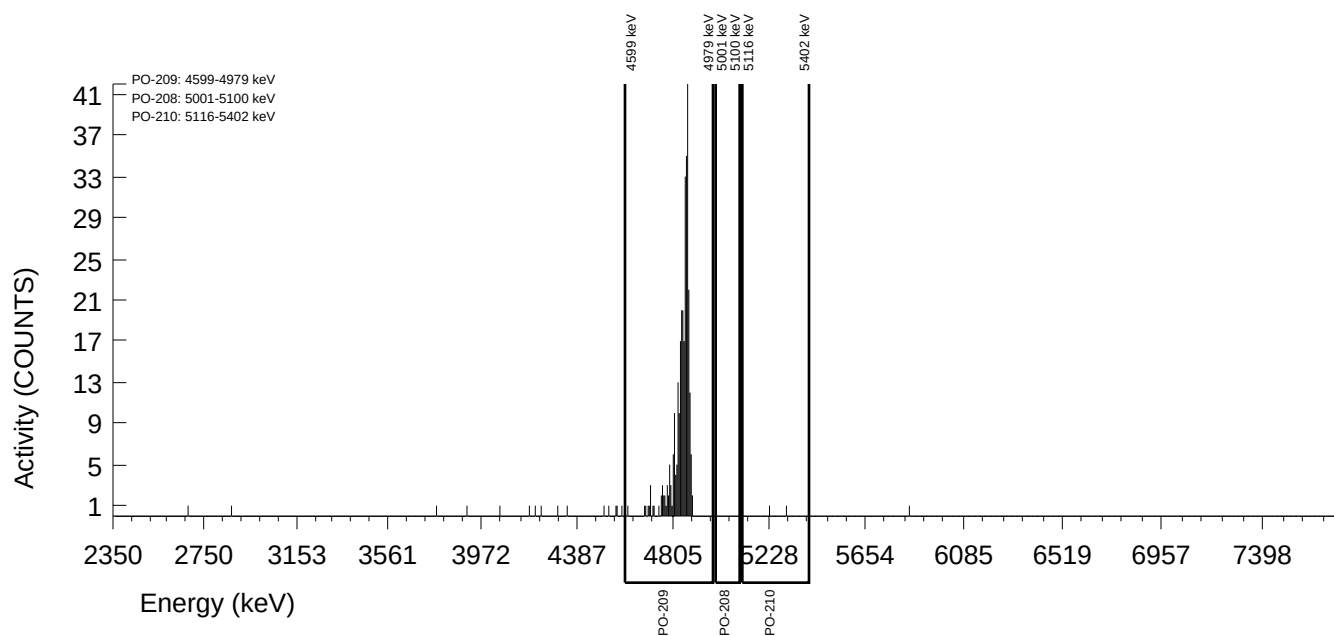


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2333147 SAMPLE ID : S1205226018_PO SAMPLE QTY : 0.208 F +/-0.480 % SAMPLE DATE : 31-Oct-2022 00:00:00 ANALYST : BV1 % YIELD : 59.9 +/-6.187 %	CHAMBER : 215 DETECTOR S/N : 155839 AVERAGE %EFFICIENCY : 27.2396 AVERAGE %EFF ERROR : 0.5285 COUNT DATE : 04-Nov-2022 08:41:21 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B215.CNF;985 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W215.CNF;79 CAL DATE : 20-Oct-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8643E+00 dpm RESULTS : 4.7098E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5050.47	0.000	0.000	-0.480	0.480	0.6928	100.000	-2.66E-02	1.18E-01	3.07E-01	7.03E-02	1.18E-01
PO-209	4882.00	4846.86	19.135	309.000	307.080	1.920	1.3856	99.740	1.70E+01	2.89E+00	4.47E-01	1.40E-01	1.91E+00
PO-210	5304.38	5270.39	74.551	2.000	0.080	1.920	1.3856	100.000	4.52E-03	2.08E-01	4.56E-01	1.43E-01	2.08E-01

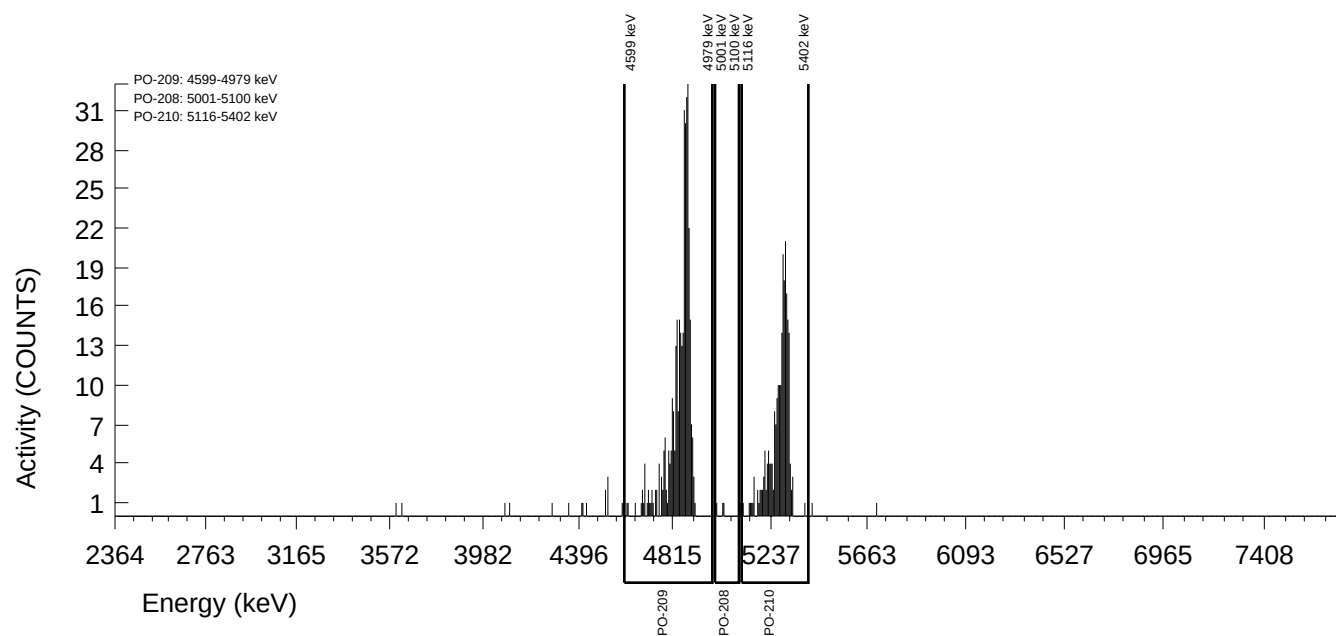


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2333147 SAMPLE ID : S1205226019_PO SAMPLE QTY : 0.208 F +/-0.480 % SAMPLE DATE : 31-Oct-2022 00:00:00 ANALYST : BV1 % YIELD : 71.5 +/-5.839 %	CHAMBER : 217 DETECTOR S/N : 155841 AVERAGE %EFFICIENCY : 26.1786 AVERAGE %EFF ERROR : 0.5084 COUNT DATE : 04-Nov-2022 08:41:24 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B217.CNF;1120 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W217.CNF;75 CAL DATE : 20-Oct-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8643E+00 dpm RESULTS : 5.6233E+00 dpm	LCS ID 2012-A NUCLIDE PO-210 NOMINAL (pCi/F) 1.0151E+01 % RECOVERY 111.636	

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F	
PO-208	5080.00	5023.57	34.695	3.000	2.760	0.240	0.4899	100.000	1.33E-01	1.93E-01	2.31E-01	4.33E-02	1.92E-01	
PO-209	4882.00	4840.65	27.947	355.000	352.360	2.640	1.6248	99.740	1.70E+01	2.72E+00	4.32E-01	1.44E-01	1.79E+00	
PO-210	5304.38	5279.24	35.810	233.000	230.360	2.640	1.6248	100.000	1.13E+01	2.02E+00	4.40E-01	1.46E-01	1.48E+00	

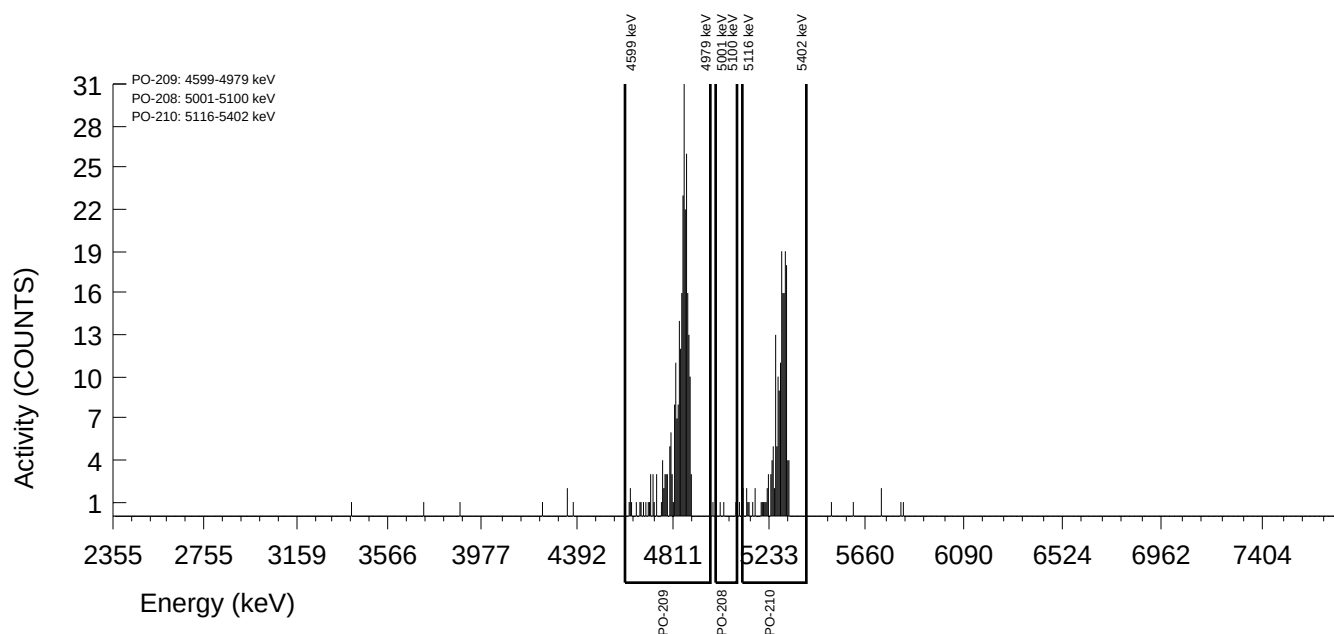


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2333147 SAMPLE ID : S1205226020_PO SAMPLE QTY : 0.208 F +/-0.480 % SAMPLE DATE : 31-Oct-2022 00:00:00 ANALYST : BV1 % YIELD : 56.7 +/-6.553 %	CHAMBER : 218 DETECTOR S/N : 155842 AVERAGE %EFFICIENCY : 25.2650 AVERAGE %EFF ERROR : 0.4912 COUNT DATE : 04-Nov-2022 08:41:25 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B218.CNF;1122 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W218.CNF;81 CAL DATE : 20-Oct-2022
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8643E+00 dpm RESULTS : 4.4621E+00 dpm	LCSD ID 2012-A NUCLIDE PO-210 NOMINAL (pCi/F) 1.0151E+01 % RECOVERY 110.186	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
PO-208	5080.00	5049.83	69.608	3.000	2.280	0.720	0.8485	100.000	1.44E-01	2.55E-01	3.85E-01	9.79E-02	2.54E-01
PO-209	4882.00	4839.70	26.310	272.000	269.840	2.160	1.4697	99.740	1.70E+01	3.06E+00	5.28E-01	1.70E-01	2.04E+00
PO-210	5304.38	5279.65	49.349	177.000	174.120	2.880	1.6971	100.000	1.12E+01	2.26E+00	5.92E-01	2.00E-01	1.68E+00



Batch 2333132 Check-list

This check-list was completed on 07-NOV-22 by Melanie Aycok

This batch was reviewed by Jessica Davis on 07-NOV-22 and Melanie Aycok on 07-NOV-22.

Batch ID:
2333132

Product:
ASPAMCMF

Description: Alpha Spec Am241Curium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Americium/Curium

Batch ID: 2333132
Analyst: Brendon Viquez (BV1)
Method: DOE EML HASL-300, Am-05-RC
 Modified
Lab SOP: GL-RAD-A-011 REV# 28
Instrument: GFC-B742840386

Due Dates for Lab: 02-NOV-2022			Package: 03-NOV-2022	SDG: 03-NOV-2022		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205225992	Americium-241 SPIKE		0533-JJ	.1	mL
LCSD	1205225993	Americium-241 SPIKE		0533-JJ	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	597531001	01-NOV-2022	1	30.16	0.11118
2	597531002	01-NOV-2022	1	30.21	0.11201
3	597531003	01-NOV-2022	1	30.02	0.11345
4	597533001	01-NOV-2022	1	30.04	0.11674
5	597533002	01-NOV-2022	1	30.05	0.11602
6	597533003	01-NOV-2022	1	30.23	0.11454
7	597533004	01-NOV-2022	1	30.15	0.11482
8	597533005	01-NOV-2022	1	30.3	0.11471
9	1205225991 MB	01-NOV-2022	1		0.11674
10	1205225992 LCS	01-NOV-2022	1		0.11674
11	1205225993 LCSD	01-NOV-2022	1		0.11674

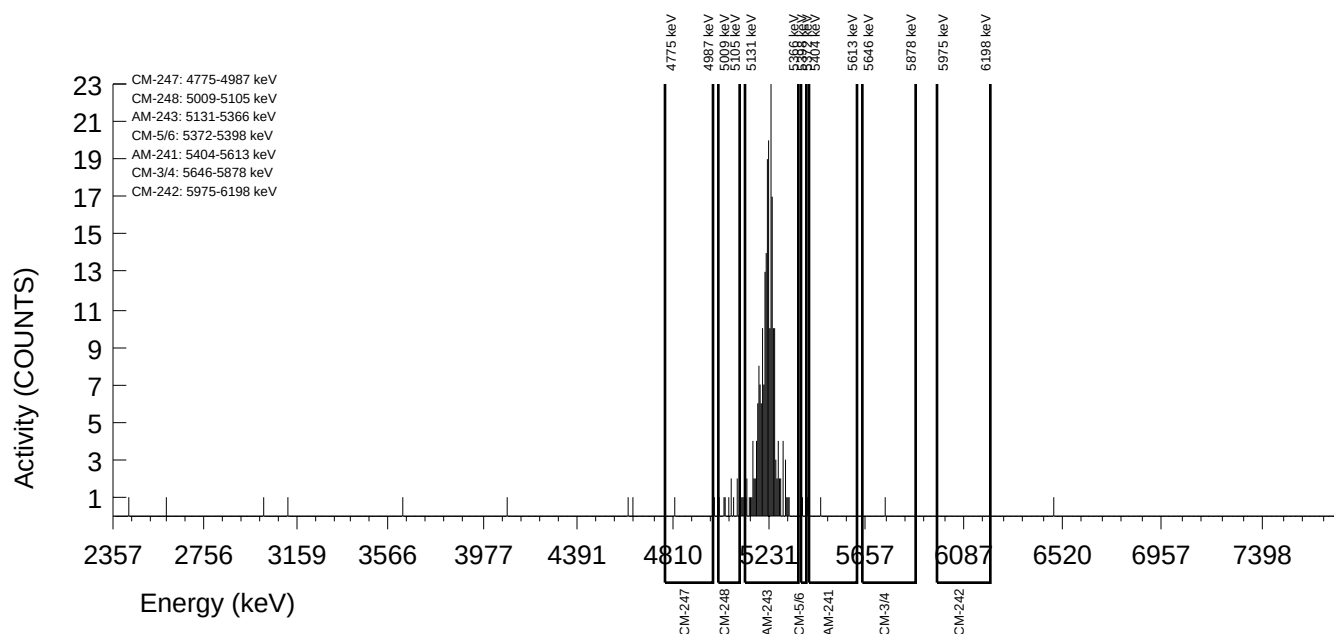
Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1752-J	Americium-243 AS TRACER	.1 ml	Pipet ID: R2-428724 Analyzed With: Pu , U Data Entry Date2: 01-NOV-2022 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333132 SAMPLE ID : S0597533001_AM SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 75.0 +/-7.427 %	CHAMBER : 222 DETECTOR S/N : 126127 AVERAGE %EFFICIENCY : 25.8222 AVERAGE %EFF ERROR : 0.5017 COUNT DATE : 03-Nov-2022 10:13:09 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B222.CNF;975 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W222.CNF;75 CAL DATE : 20-Oct-2022
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6468E+00 dpm RESULTS : 3.4855E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5430.56	0.000	2.000	-2.560	4.560	2.1354	98.525	-2.16E-01	3.37E-01	9.12E-01	3.30E-01	3.37E-01
AM-243	5269.50	5227.45	34.958	221.000	215.960	5.040	2.2450	99.980	1.79E+01	3.64E+00	9.32E-01	3.41E-01	2.43E+00
CM-242	6102.00	6086.59	0.000	0.000	-0.480	0.480	0.6928	100.000	-4.61E-02	2.05E-01	5.32E-01	1.22E-01	2.04E-01
CM-3/4	5795.02	5742.78	4.969	1.000	0.280	0.720	0.8485	100.000	2.33E-02	2.44E-01	5.09E-01	1.29E-01	2.44E-01
CM-5/6	5386.00	5380.05	4.969	1.000	0.520	0.480	0.6928	86.090	5.01E-02	2.79E-01	5.34E-01	1.22E-01	2.79E-01
CM-247	4946.00	4820.03	4.969	1.000	-1.160	2.160	1.4697	79.300	-1.21E-01	3.30E-01	8.78E-01	2.82E-01	3.29E-01
CM-248	5078.60	5065.41	29.812	10.000	8.320	1.680	1.2961	91.000	7.59E-01	6.16E-01	7.07E-01	2.17E-01	6.05E-01

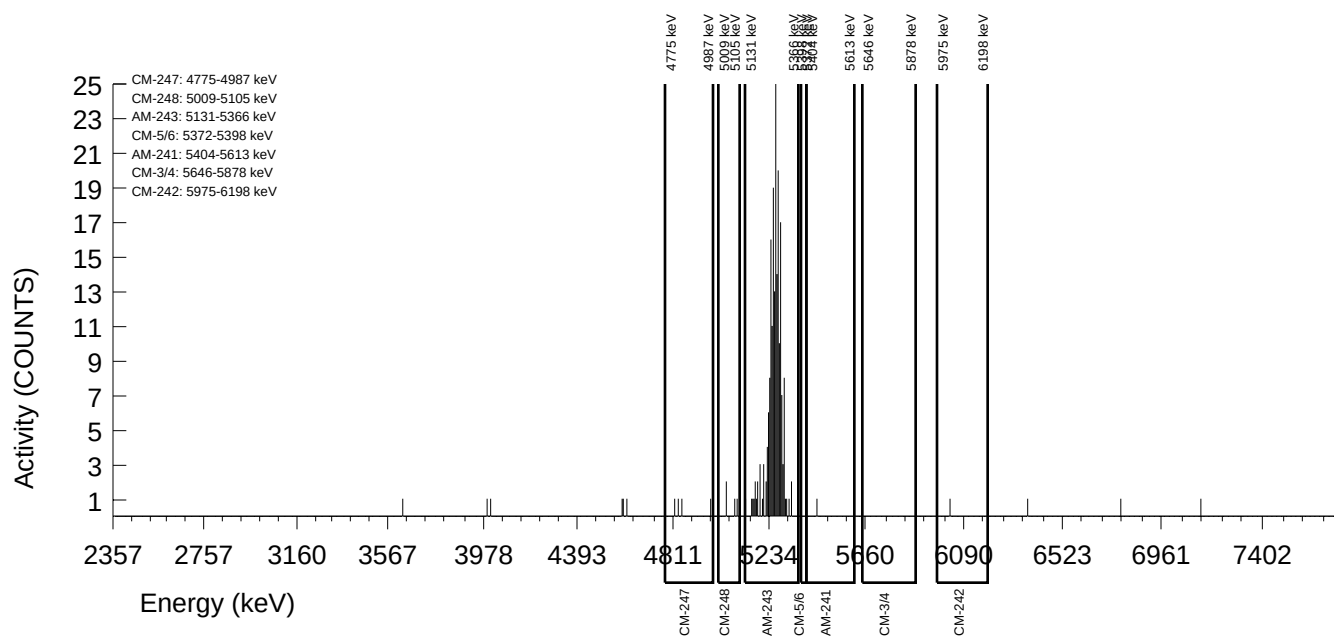


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333132 SAMPLE ID : S0597533002_AM SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 71.6 +/-7.608 %	CHAMBER : 223 DETECTOR S/N : 126130 AVERAGE %EFFICIENCY : 25.2616 AVERAGE %EFF ERROR : 0.4911 COUNT DATE : 03-Nov-2022 10:13:10 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B223.CNF;1120 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W223.CNF;64 CAL DATE : 20-Oct-2022
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6468E+00 dpm RESULTS : 3.3259E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5446.36	4.972	1.000	-1.880	2.880	1.6971	98.525	-1.71E-01	2.95E-01	8.37E-01	2.82E-01	2.95E-01
AM-243	5269.50	5260.55	44.185	204.000	201.600	2.400	1.5492	99.980	1.80E+01	3.76E+00	7.76E-01	2.54E-01	2.52E+00
CM-242	6102.00	6030.38	4.972	1.000	0.520	0.480	0.6928	100.000	5.39E-02	3.00E-01	5.74E-01	1.31E-01	2.99E-01
CM-3/4	5795.02	5761.62	0.000	0.000	-2.400	2.400	1.5492	100.000	-2.16E-01	2.25E-01	7.79E-01	2.55E-01	2.25E-01
CM-5/6	5386.00	5385.09	0.000	0.000	-0.240	0.240	0.4899	86.090	-2.49E-02	2.16E-01	4.98E-01	9.33E-02	2.15E-01
CM-247	4946.00	4873.29	154.120	4.000	1.840	2.160	1.4697	79.300	2.08E-01	5.23E-01	9.46E-01	3.04E-01	5.22E-01
CM-248	5078.60	5082.04	0.000	6.000	5.280	0.720	0.8485	91.000	5.19E-01	5.24E-01	6.01E-01	1.53E-01	5.18E-01

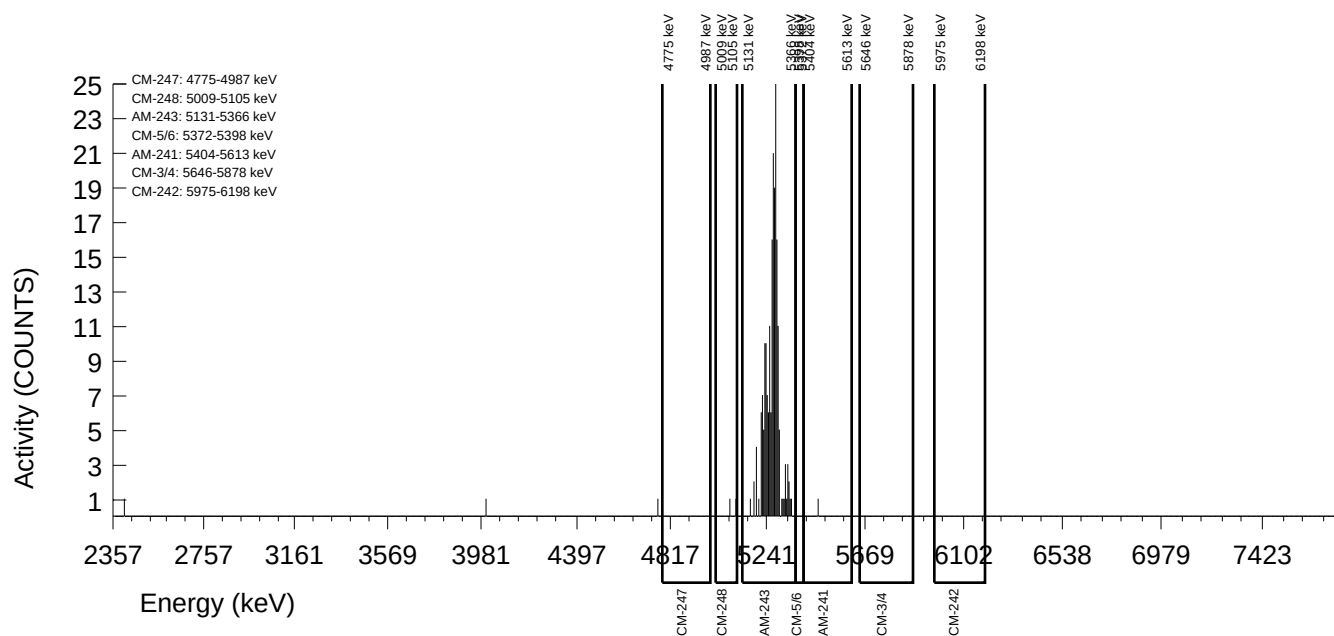


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333132 SAMPLE ID : S0597533003_AM SAMPLE QTY : 0.115 F +/-0.873 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 68.6 +/-7.607 %	CHAMBER : 225 DETECTOR S/N : 155847 AVERAGE %EFFICIENCY : 26.2833 AVERAGE %EFF ERROR : 0.5105 COUNT DATE : 03-Nov-2022 10:13:14 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B225.CNF;1126 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W225.CNF;66 CAL DATE : 20-Oct-2022
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6468E+00 dpm RESULTS : 3.1884E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5465.41	4.970	1.000	-0.200	1.200	1.0954	98.525	-1.84E-02	2.77E-01	6.47E-01	1.85E-01	2.77E-01
AM-243	5269.50	5262.73	25.100	203.000	201.080	1.920	1.3856	99.980	1.83E+01	3.81E+00	7.34E-01	2.31E-01	2.55E+00
CM-242	6102.00	6086.58	0.000	0.000	-0.240	0.240	0.4899	100.000	-2.53E-02	2.18E-01	5.05E-01	9.44E-02	2.18E-01
CM-3/4	5795.02	5761.61	0.000	0.000	-2.400	2.400	1.5492	100.000	-2.19E-01	2.29E-01	7.91E-01	2.59E-01	2.28E-01
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	2.13E-01	3.17E-01	1.93E-01	2.13E-01
CM-247	4946.00	4881.19	0.000	0.000	-0.720	0.720	0.8485	79.300	-8.25E-02	2.50E-01	7.00E-01	1.78E-01	2.49E-01
CM-248	5078.60	5089.48	0.000	2.000	0.800	1.200	1.0954	91.000	7.99E-02	3.58E-01	7.00E-01	2.00E-01	3.58E-01



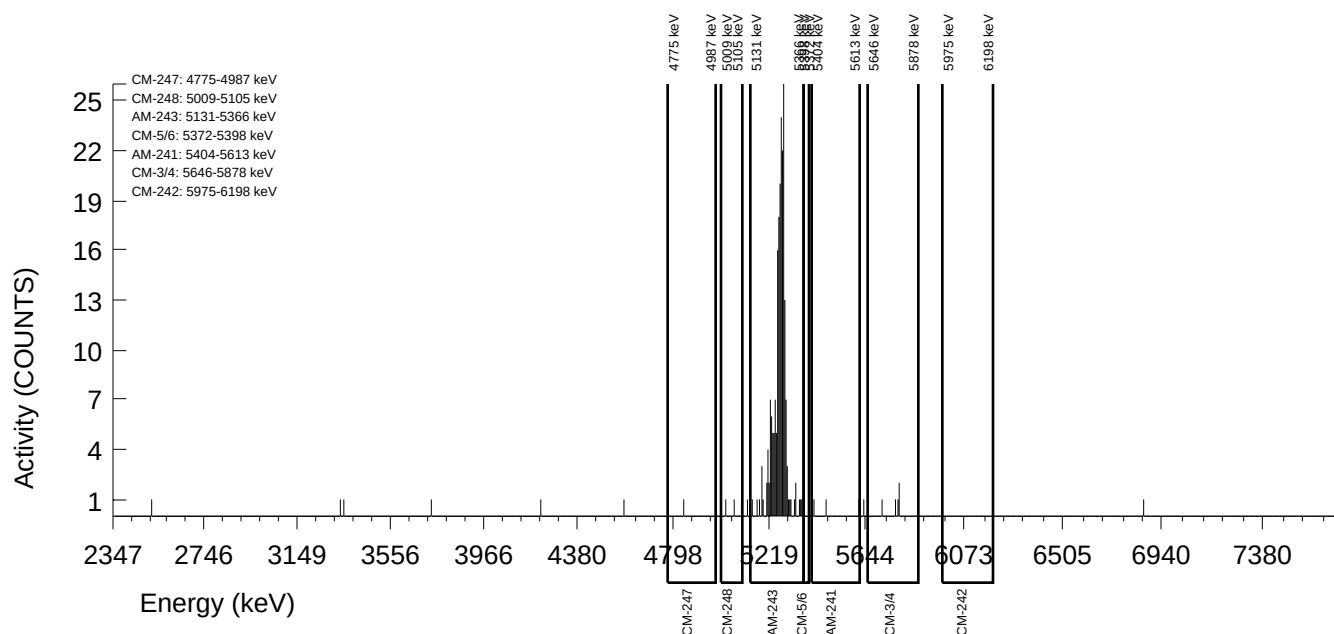
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333132 SAMPLE ID : S0597533004_AM SAMPLE QTY : 0.115 F +/-0.871 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 76.4 +/-7.459 %	CHAMBER : 226 DETECTOR S/N : 158113 AVERAGE %EFFICIENCY : 24.4766 AVERAGE %EFF ERROR : 0.4764 COUNT DATE : 03-Nov-2022 10:13:16 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B226.CNF;1123 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W226.CNF;62 CAL DATE : 20-Oct-2022
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6468E+00 dpm RESULTS : 3.5504E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5498.48	0.000	3.000	0.120	2.880	1.6971	98.525	1.06E-02	3.79E-01	8.18E-01	2.76E-01	3.79E-01
AM-243	5269.50	5264.16	31.173	209.000	208.520	0.480	0.6928	99.980	1.82E+01	3.72E+00	4.84E-01	1.11E-01	2.48E+00
CM-242	6102.00	6086.59	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	2.05E-01	3.04E-01	1.85E-01	2.04E-01
CM-3/4	5795.02	5768.99	7.454	5.000	-1.240	6.240	2.4980	100.000	-1.09E-01	4.73E-01	1.07E+00	4.01E-01	4.73E-01
CM-5/6	5386.00	5385.09	0.000	0.000	-0.480	0.480	0.6928	86.090	-4.87E-02	2.16E-01	5.62E-01	1.29E-01	2.16E-01
CM-247	4946.00	4845.21	4.970	1.000	0.040	0.960	0.9798	79.300	4.41E-03	3.27E-01	7.26E-01	1.98E-01	3.27E-01
CM-248	5078.60	5064.35	69.575	3.000	2.520	0.480	0.6928	91.000	2.42E-01	3.86E-01	5.32E-01	1.22E-01	3.85E-01

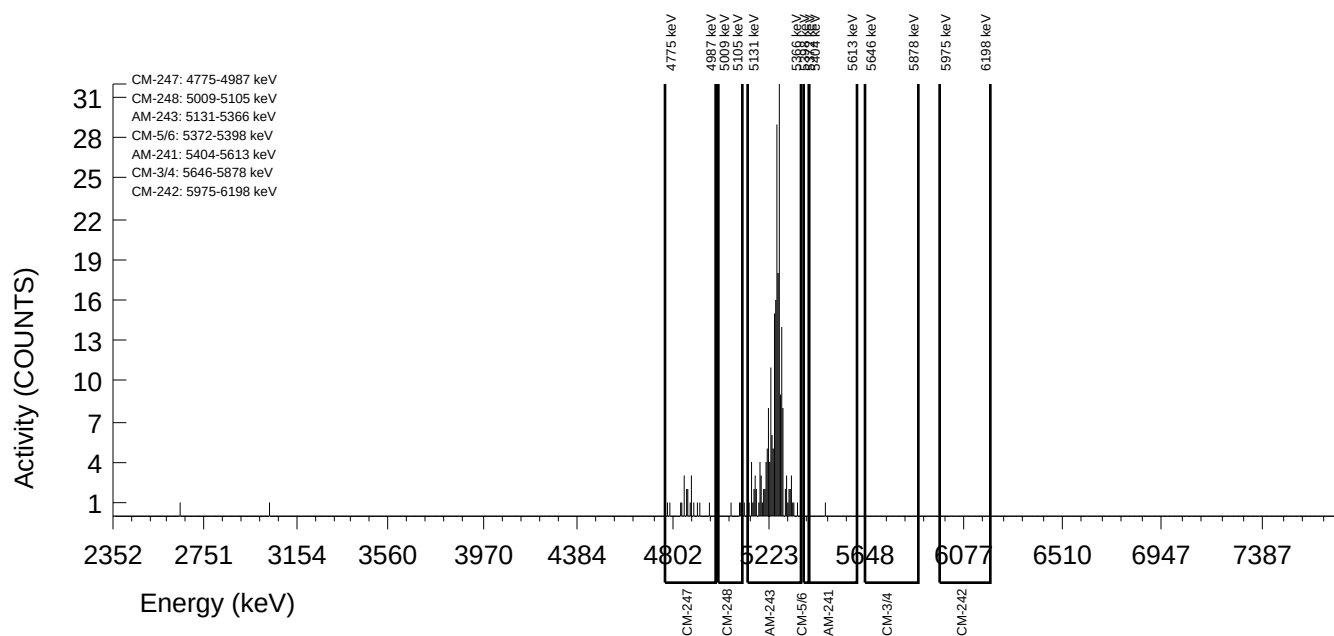


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333132 SAMPLE ID : S0597533005_AM SAMPLE QTY : 0.115 F +/-0.872 % SAMPLE DATE : 30-Sep-2022 00:00:00 ANALYST : BV1 % YIELD : 75.1 +/-7.290 %	CHAMBER : 229 DETECTOR S/N : 155832 AVERAGE %EFFICIENCY : 26.6160 AVERAGE %EFF ERROR : 0.5167 COUNT DATE : 03-Nov-2022 10:13:18 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B229.CNF;1134 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W229.CNF;63 CAL DATE : 20-Oct-2022
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6468E+00 dpm RESULTS : 3.4899E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5472.53	4.960	1.000	-0.920	1.920	1.3856	98.525	-7.64E-02	2.59E-01	6.71E-01	2.11E-01	2.58E-01
AM-243	5269.50	5252.26	18.329	226.000	222.880	3.120	1.7664	99.980	1.82E+01	3.64E+00	7.75E-01	2.65E-01	2.42E+00
CM-242	6102.00	6086.59	0.000	0.000	-0.240	0.240	0.4899	100.000	-2.28E-02	1.97E-01	4.55E-01	8.51E-02	1.96E-01
CM-3/4	5795.02	5761.62	0.000	0.000	-2.400	2.400	1.5492	100.000	-1.97E-01	2.06E-01	7.13E-01	2.33E-01	2.06E-01
CM-5/6	5386.00	5385.09	0.000	0.000	-0.240	0.240	0.4899	86.090	-2.28E-02	1.97E-01	4.56E-01	8.53E-02	1.97E-01
CM-247	4946.00	4869.35	34.718	19.000	15.160	3.840	1.9596	79.300	1.56E+00	9.55E-01	1.05E+00	3.71E-01	9.27E-01
CM-248	5078.60	5094.19	0.000	5.000	3.560	1.440	1.2000	91.000	3.20E-01	4.49E-01	6.65E-01	1.98E-01	4.46E-01

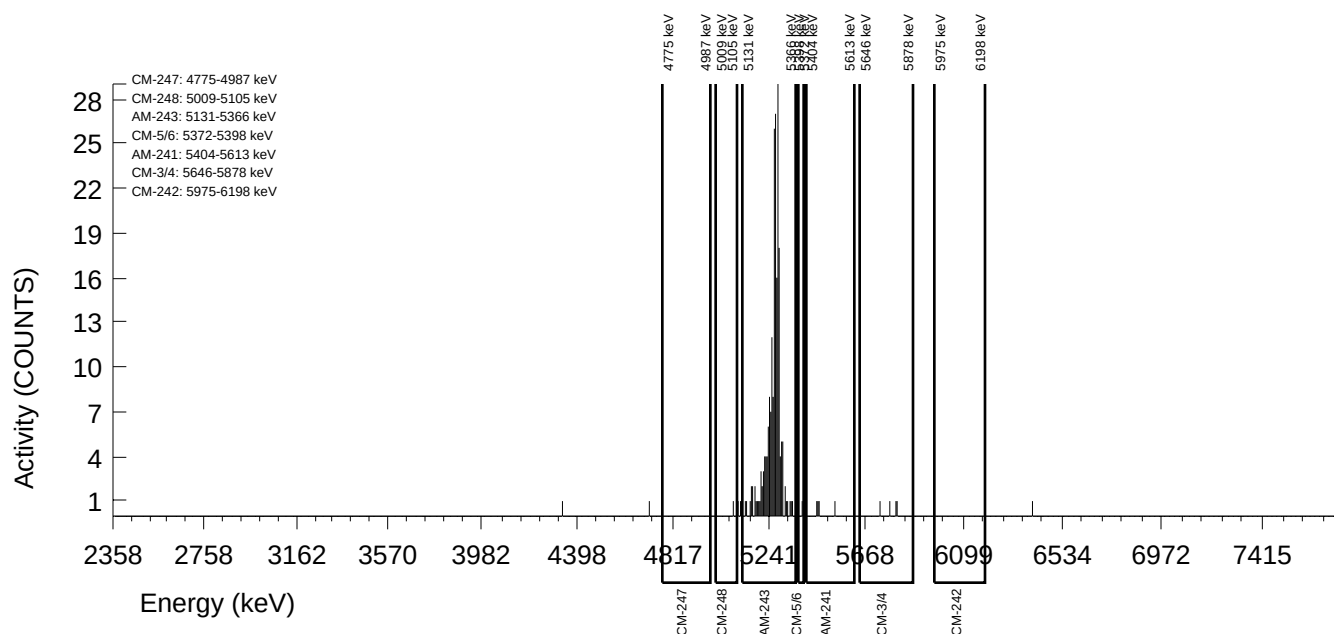


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333132 SAMPLE ID : S1205225991_AM SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 73.9 +/-7.511 %	CHAMBER : 230 DETECTOR S/N : 155830 AVERAGE %EFFICIENCY : 25.2588 AVERAGE %EFF ERROR : 0.4911 COUNT DATE : 03-Nov-2022 10:13:19 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B230.CNF;1121 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W230.CNF;65 CAL DATE : 20-Oct-2022
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6467E+00 dpm RESULTS : 3.4338E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5477.87	79.685	4.000	1.600	2.400	1.5492	98.525	1.40E-01	4.07E-01	7.58E-01	2.48E-01	4.07E-01
AM-243	5269.50	5264.23	24.348	211.000	208.120	2.880	1.6971	99.980	1.79E+01	3.69E+00	7.94E-01	2.68E-01	2.46E+00
CM-242	6102.00	6086.59	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.76E-01	2.61E-01	1.59E-01	1.75E-01
CM-3/4	5795.02	5779.34	74.705	4.000	-2.480	6.480	2.5456	100.000	-2.14E-01	4.34E-01	1.06E+00	4.02E-01	4.34E-01
CM-5/6	5386.00	5389.80	4.980	1.000	0.520	0.480	0.6928	86.090	5.20E-02	2.89E-01	5.54E-01	1.27E-01	2.89E-01
CM-247	4946.00	4881.20	0.000	0.000	-1.440	1.440	1.2000	79.300	-1.56E-01	2.53E-01	8.03E-01	2.39E-01	2.52E-01
CM-248	5078.60	5086.81	4.980	1.000	1.000	0.000	1.0000	91.000	9.47E-02	2.67E-01	2.84E-01	1.73E-01	2.66E-01

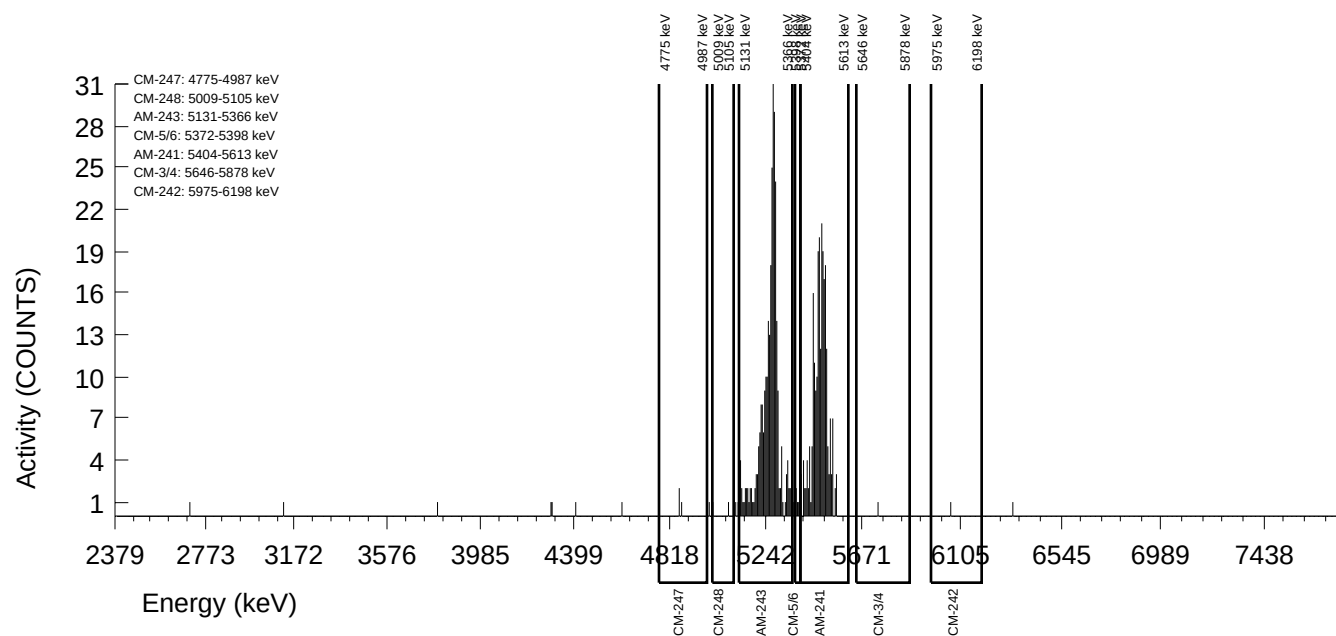


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333132 SAMPLE ID : S1205225992_AM SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 67.4 +/-6.564 %	CHAMBER : 234 DETECTOR S/N : 140622 AVERAGE %EFFICIENCY : 38.0969 AVERAGE %EFF ERROR : 0.7333 COUNT DATE : 03-Nov-2022 10:20:08 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B234.CNF;1116 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W234.CNF;71 CAL DATE : 21-Oct-2022
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6467E+00 dpm RESULTS : 3.1339E+00 dpm	LCS ID : 0533-JJ NUCLIDE : AM-241 NOMINAL (pCi/F) : 1.6950E+01 % RECOVERY : 89.328	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5486.53	57.278	242.000	238.400	3.600	1.8974	98.525	1.51E+01	2.82E+00	6.32E-01	2.21E-01	1.94E+00
AM-243	5269.50	5264.00	26.159	292.000	286.480	5.520	2.3495	99.980	1.79E+01	3.21E+00	7.26E-01	2.69E-01	2.10E+00
CM-242	6102.00	6061.70	4.890	1.000	1.000	0.000	1.0000	100.000	6.32E-02	1.78E-01	1.90E-01	1.16E-01	1.78E-01
CM-3/4	5795.02	5741.35	4.890	1.000	-10.760	11.760	3.4293	100.000	-6.73E-01	2.71E-01	9.74E-01	3.93E-01	2.71E-01
CM-5/6	5386.00	5383.20	9.779	7.000	6.520	0.480	0.6928	86.090	4.74E-01	4.12E-01	4.03E-01	9.22E-02	4.07E-01
CM-247	4946.00	4868.86	4.890	3.000	-1.080	4.080	2.0199	79.300	-8.52E-02	3.47E-01	8.21E-01	2.92E-01	3.47E-01
CM-248	5078.60	5047.86	68.454	2.000	1.280	0.720	0.8485	91.000	8.80E-02	2.43E-01	4.20E-01	1.07E-01	2.42E-01

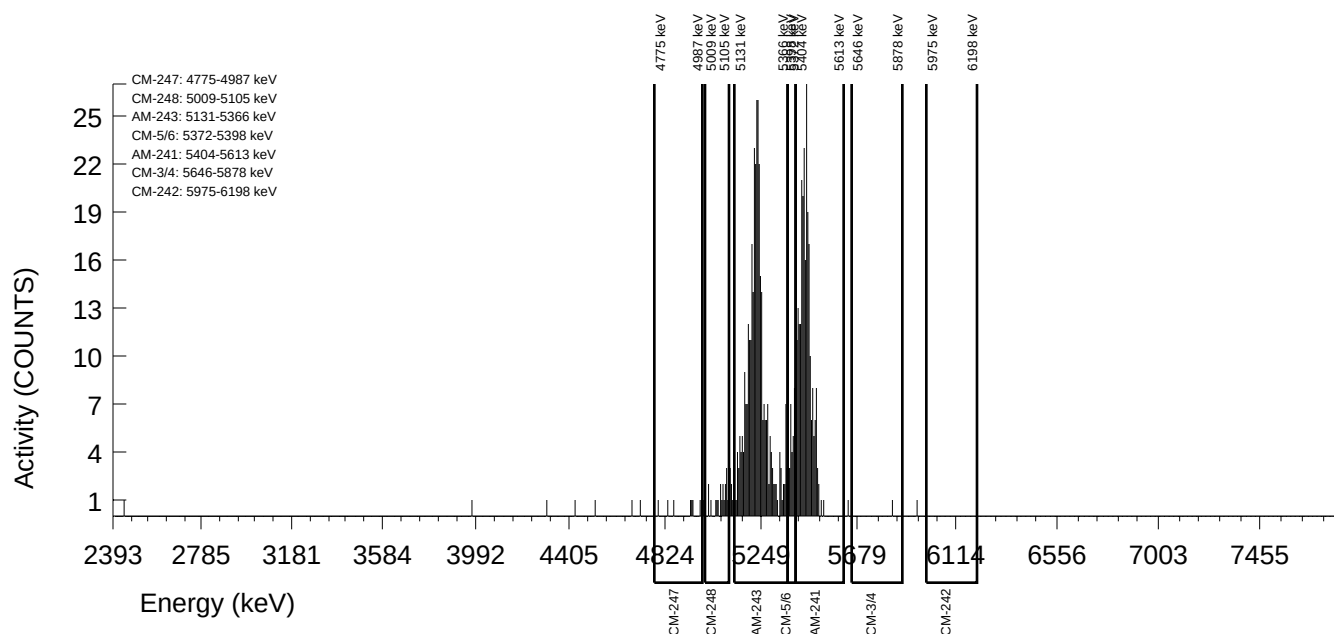


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2333132 SAMPLE ID : S1205225993_AM SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 76.3 +/-6.103 %			CHAMBER : 239 DETECTOR S/N : 158110 AVERAGE %EFFICIENCY : 39.7652 AVERAGE %EFF ERROR : 0.7647 COUNT DATE : 03-Nov-2022 10:20:05 ELAPSED LIVE TIME(SEC) : 14400.00			LIB FILE : AM BKG FILE : B239.CNF;1114 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W239.CNF;87 CAL DATE : 21-Oct-2022		
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6467E+00 dpm RESULTS : 3.5465E+00 dpm			LCSD ID : 0533-JJ NUCLIDE : AM-241 NOMINAL (pCi/F) : 1.6950E+01 % RECOVERY : 78.769					

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5447.06	35.598	250.000	248.320	1.680	1.2961	98.525	1.34E+01	2.38E+00	4.17E-01	1.28E-01	1.67E+00
AM-243	5269.50	5234.45	42.677	342.000	338.400	3.600	1.8974	99.980	1.79E+01	2.98E+00	5.27E-01	1.84E-01	1.93E+00
CM-242	6102.00	6086.53	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.29E-02	1.11E-01	2.57E-01	4.80E-02	1.11E-01
CM-3/4	5795.02	5830.63	4.854	1.000	-6.200	7.200	2.6833	100.000	-3.29E-01	2.02E-01	6.80E-01	2.60E-01	2.02E-01
CM-5/6	5386.00	5388.19	0.000	29.000	29.000	0.000	1.0000	86.090	1.78E+00	6.99E-01	1.85E-01	1.13E-01	6.61E-01
CM-247	4946.00	4903.25	174.754	7.000	5.800	1.200	1.0954	79.300	3.87E-01	3.81E-01	4.69E-01	1.34E-01	3.78E-01
CM-248	5078.60	5072.83	77.669	18.000	18.000	0.000	1.0000	91.000	1.05E+00	5.15E-01	1.75E-01	1.07E-01	4.98E-01



Continuing Calibration Data

Review of Alpha Spectrometer QA results (Daily checks) 3-NOV-2022 12:10:43.87

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
3-NOV-2022	6	PSENERGY-5000	Above
3-NOV-2022	23	PSFWHM-5000	Above
3-NOV-2022	46	PSFWHM-5000	Below
3-NOV-2022	46	PSCTSS-5000	Below
3-NOV-2022	73	PSENERGY-5000	Above
3-NOV-2022	91	PSFWHM-5000	Below
3-NOV-2022	91	PSCTSS-5000	Below
3-NOV-2022	94	PSFWHM-5000	Below
3-NOV-2022	94	PSCTSS-5000	Below
3-NOV-2022	101	PSFWHM-5000	Below
3-NOV-2022	101	PSCTSS-5000	Below
21-SEP-2022	115	PSCTSS-5000	Below
3-NOV-2022	118	PSENERGY-5000	Below
3-NOV-2022	143	PSFWHM-5000	Below
3-NOV-2022	143	PSCENTRD-5000	Below
3-NOV-2022	143	PSCTSS-5000	Below
3-NOV-2022	149	PSENERGY-5000	Above
3-NOV-2022	156	PSENERGY-5000	Above
3-NOV-2022	161	PSFWHM-5000	Above
3-NOV-2022	167	PSFWHM-5000	Above
3-NOV-2022	171	PSENERGY-5000	Above
3-NOV-2022	171	PSCENTRD-5000	Above
3-NOV-2022	173	PSCTSS-5000	Below
3-NOV-2022	177	PSCTSS-5000	Below
3-NOV-2022	186	PSENERGY-5000	Below
3-NOV-2022	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below

24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

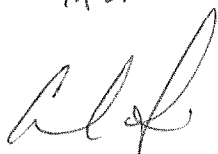
The following detectors that may not have properly transfered to the QA file

115	may not have run since 3-NOV-2022
116	may not have run since 3-NOV-2022
119	may not have run since 3-NOV-2022
120	may not have run since 3-NOV-2022
137	may not have run since 3-NOV-2022
145	may not have run since 3-NOV-2022
146	may not have run since 3-NOV-2022
147	may not have run since 3-NOV-2022
148	may not have run since 3-NOV-2022
163	may not have run since 3-NOV-2022
164	may not have run since 3-NOV-2022
183	may not have run since 3-NOV-2022
184	may not have run since 3-NOV-2022
198	may not have run since 3-NOV-2022
221	may not have run since 3-NOV-2022
227	may not have run since 3-NOV-2022
228	may not have run since 3-NOV-2022
241	may not have run since 3-NOV-2022
242	may not have run since 3-NOV-2022
247	may not have run since 3-NOV-2022
248	may not have run since 3-NOV-2022

APPROVAL DATE: 11/3/22

APPROVAL TIME: 1215

APPROVED BY:



PROCEDURE # GL-RAD-I-009

Report completed at 3-NOV-2022 12:13:34.86

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag

4-NOV-2022	23	PSFWHM-5000	Above
4-NOV-2022	46	PSFWHM-5000	Below
4-NOV-2022	46	PSCTSS-5000	Below
4-NOV-2022	73	PSENERGY-5000	Above
4-NOV-2022	91	PSFWHM-5000	Below
4-NOV-2022	91	PSCTSS-5000	Below
4-NOV-2022	94	PSFWHM-5000	Below
4-NOV-2022	94	PSCTSS-5000	Below
4-NOV-2022	101	PSFWHM-5000	Below
4-NOV-2022	101	PSCTSS-5000	Below
21-SEP-2022	115	PSCTSS-5000	Below
4-NOV-2022	118	PSENERGY-5000	Below
4-NOV-2022	143	PSFWHM-5000	Below
4-NOV-2022	143	PSCENTRD-5000	Below
4-NOV-2022	143	PSCTSS-5000	Below
4-NOV-2022	149	PSENERGY-5000	Above
4-NOV-2022	161	PSFWHM-5000	Above
4-NOV-2022	167	PSFWHM-5000	Above
4-NOV-2022	171	PSENERGY-5000	Above
4-NOV-2022	171	PSCENTRD-5000	Above
4-NOV-2022	173	PSCTSS-5000	Below
4-NOV-2022	177	PSCTSS-5000	Below
4-NOV-2022	186	PSENERGY-5000	Below
4-NOV-2022	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below

15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

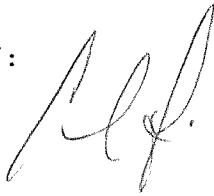
The following detectors that may not have properly transfered to the QA file

115	may not have run since 4-NOV-2022
116	may not have run since 4-NOV-2022
119	may not have run since 4-NOV-2022
120	may not have run since 4-NOV-2022
137	may not have run since 4-NOV-2022
147	may not have run since 4-NOV-2022
148	may not have run since 4-NOV-2022
163	may not have run since 4-NOV-2022
164	may not have run since 4-NOV-2022
183	may not have run since 4-NOV-2022
184	may not have run since 4-NOV-2022
198	may not have run since 4-NOV-2022
221	may not have run since 4-NOV-2022
227	may not have run since 4-NOV-2022
228	may not have run since 4-NOV-2022
241	may not have run since 4-NOV-2022
242	may not have run since 4-NOV-2022
247	may not have run since 4-NOV-2022
248	may not have run since 4-NOV-2022

APPROVAL DATE: 11/4/22

APPROVAL TIME: 1131

APPROVED BY:



PROCEDURE # GL-RAD-I-009

Report completed at 4-NOV-2022 11:30:44.47

Review of Alpha Spectrometer QA results (Daily checks) 5-NOV-2022 09:21:02.00

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
5-NOV-2022	23	PSFWHM-5000	Above
5-NOV-2022	46	PSFWHM-5000	Below
5-NOV-2022	46	PSCTSS-5000	Below
5-NOV-2022	73	PSENERGY-5000	Above
5-NOV-2022	91	PSFWHM-5000	Below
5-NOV-2022	91	PSCTSS-5000	Below
5-NOV-2022	94	PSFWHM-5000	Below
5-NOV-2022	94	PSCTSS-5000	Below
5-NOV-2022	101	PSFWHM-5000	Below
5-NOV-2022	101	PSCTSS-5000	Below
21-SEP-2022	115	PSCTSS-5000	Below
5-NOV-2022	118	PSENERGY-5000	Below
5-NOV-2022	143	PSFWHM-5000	Below
5-NOV-2022	143	PSCENTRD-5000	Below
5-NOV-2022	143	PSCTSS-5000	Below
5-NOV-2022	149	PSENERGY-5000	Above
5-NOV-2022	161	PSFWHM-5000	Above
5-NOV-2022	162	PSFWHM-5000	Above
5-NOV-2022	171	PSENERGY-5000	Above
5-NOV-2022	171	PSCENTRD-5000	Above
5-NOV-2022	173	PSCTSS-5000	Below
5-NOV-2022	177	PSCTSS-5000	Below
5-NOV-2022	186	PSENERGY-5000	Below
5-NOV-2022	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below

15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transfered to the QA file

115	may not have run since 5-NOV-2022
116	may not have run since 5-NOV-2022
119	may not have run since 5-NOV-2022
120	may not have run since 5-NOV-2022
137	may not have run since 5-NOV-2022
147	may not have run since 5-NOV-2022
148	may not have run since 5-NOV-2022
163	may not have run since 5-NOV-2022
164	may not have run since 5-NOV-2022
183	may not have run since 5-NOV-2022
184	may not have run since 5-NOV-2022
198	may not have run since 5-NOV-2022
221	may not have run since 5-NOV-2022
227	may not have run since 5-NOV-2022
228	may not have run since 5-NOV-2022
241	may not have run since 5-NOV-2022
242	may not have run since 5-NOV-2022
247	may not have run since 5-NOV-2022
248	may not have run since 5-NOV-2022

APPROVAL DATE: 11/5/22

APPROVAL TIME: 1000

APPROVED BY:

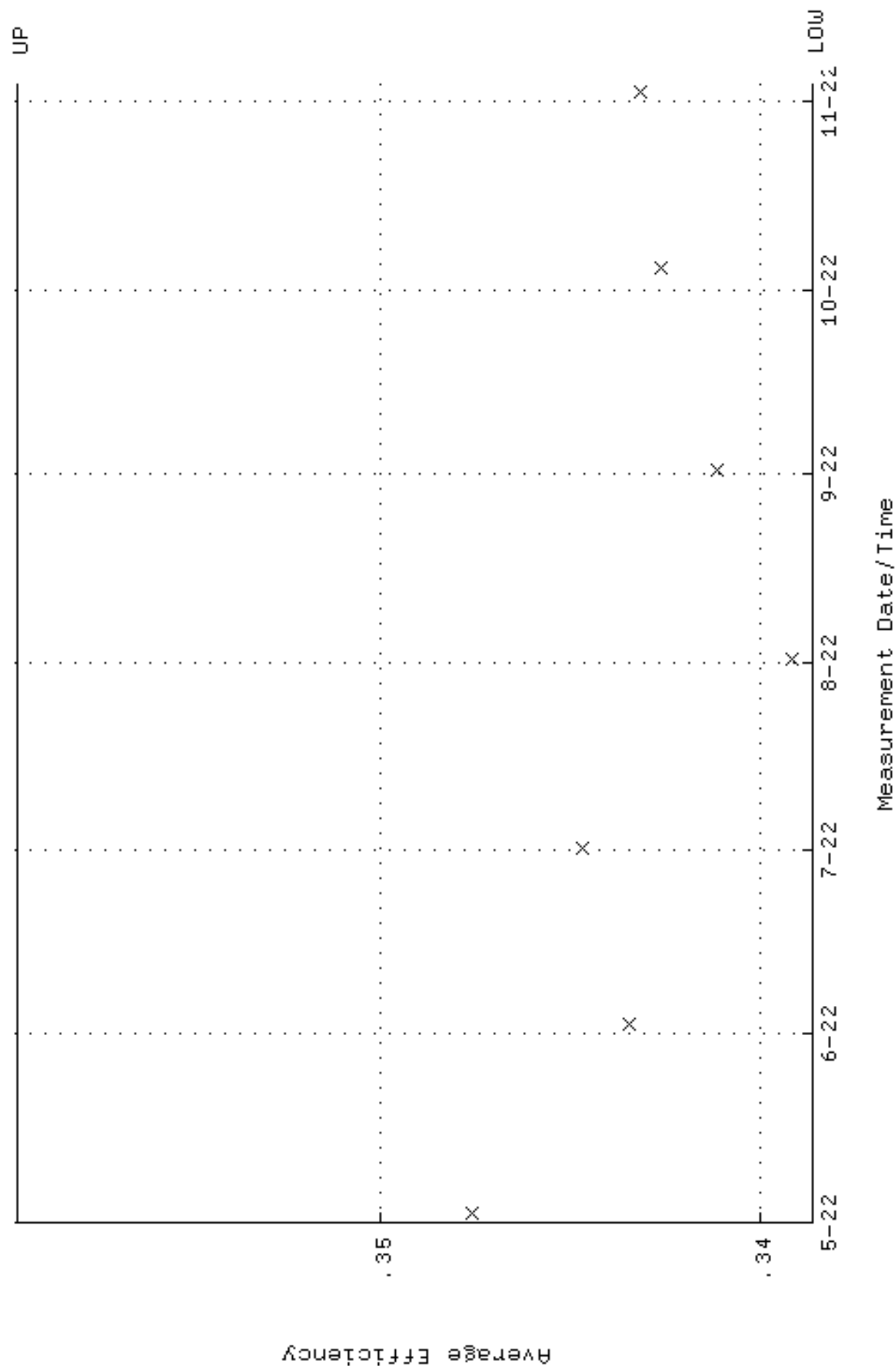


PROCEDURE # GL-RAD-I-009

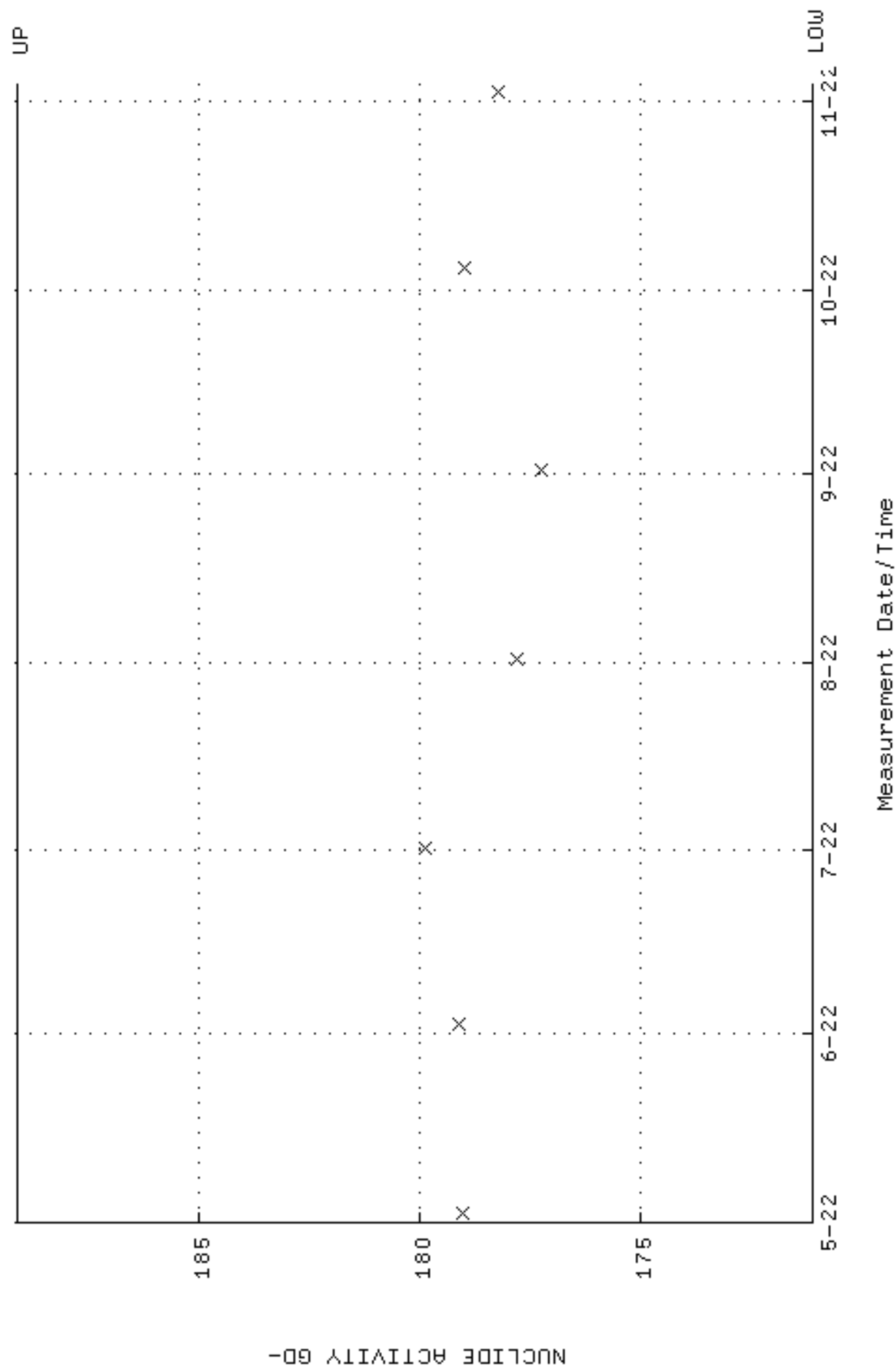
Report completed at 5-NOV-2022 09:24:09.98

Background and Efficiency Data

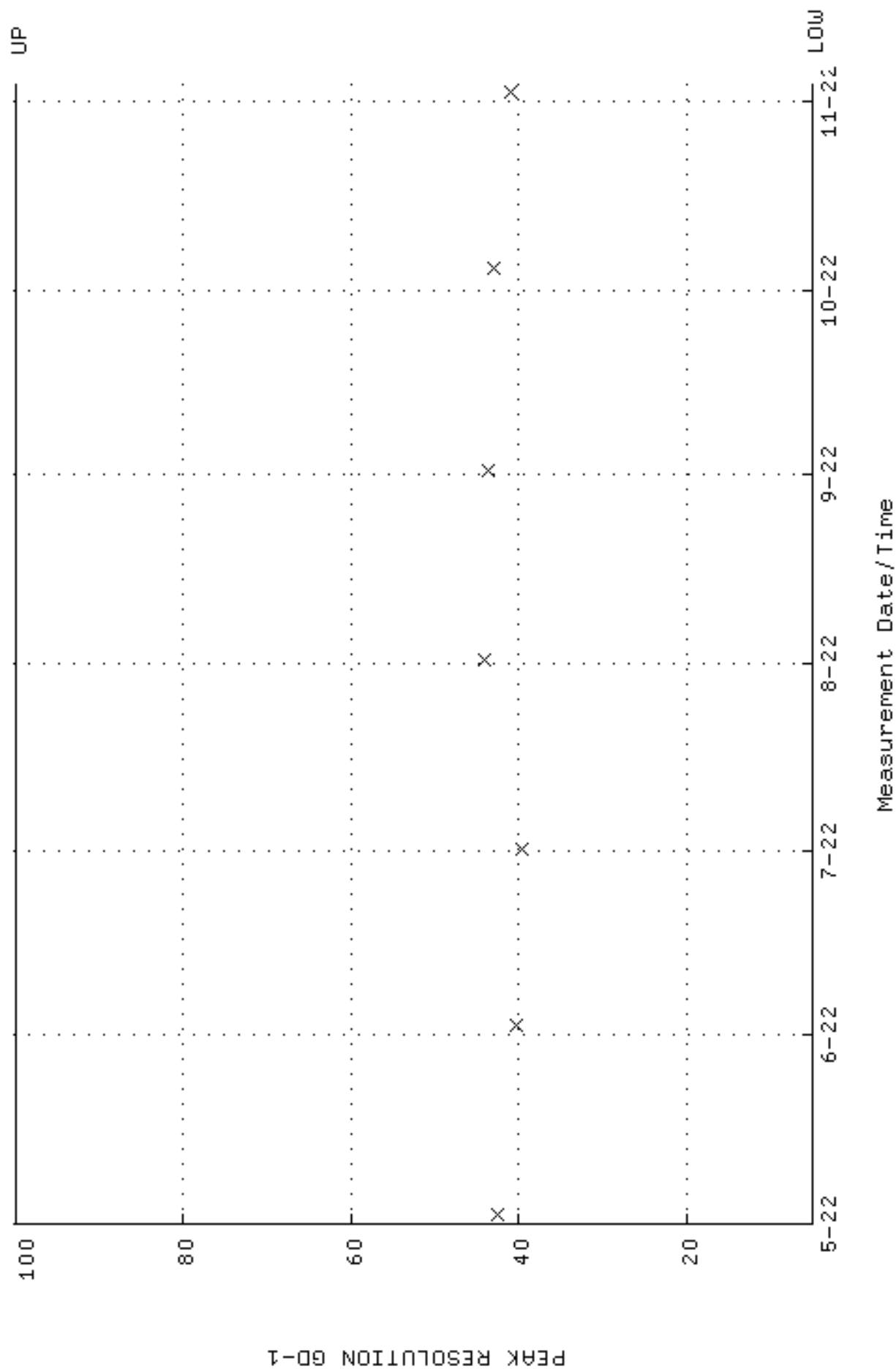
QA filename : DKA100:[ENV_ALPHA.QA.W]W005.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.338600 through 0.359540



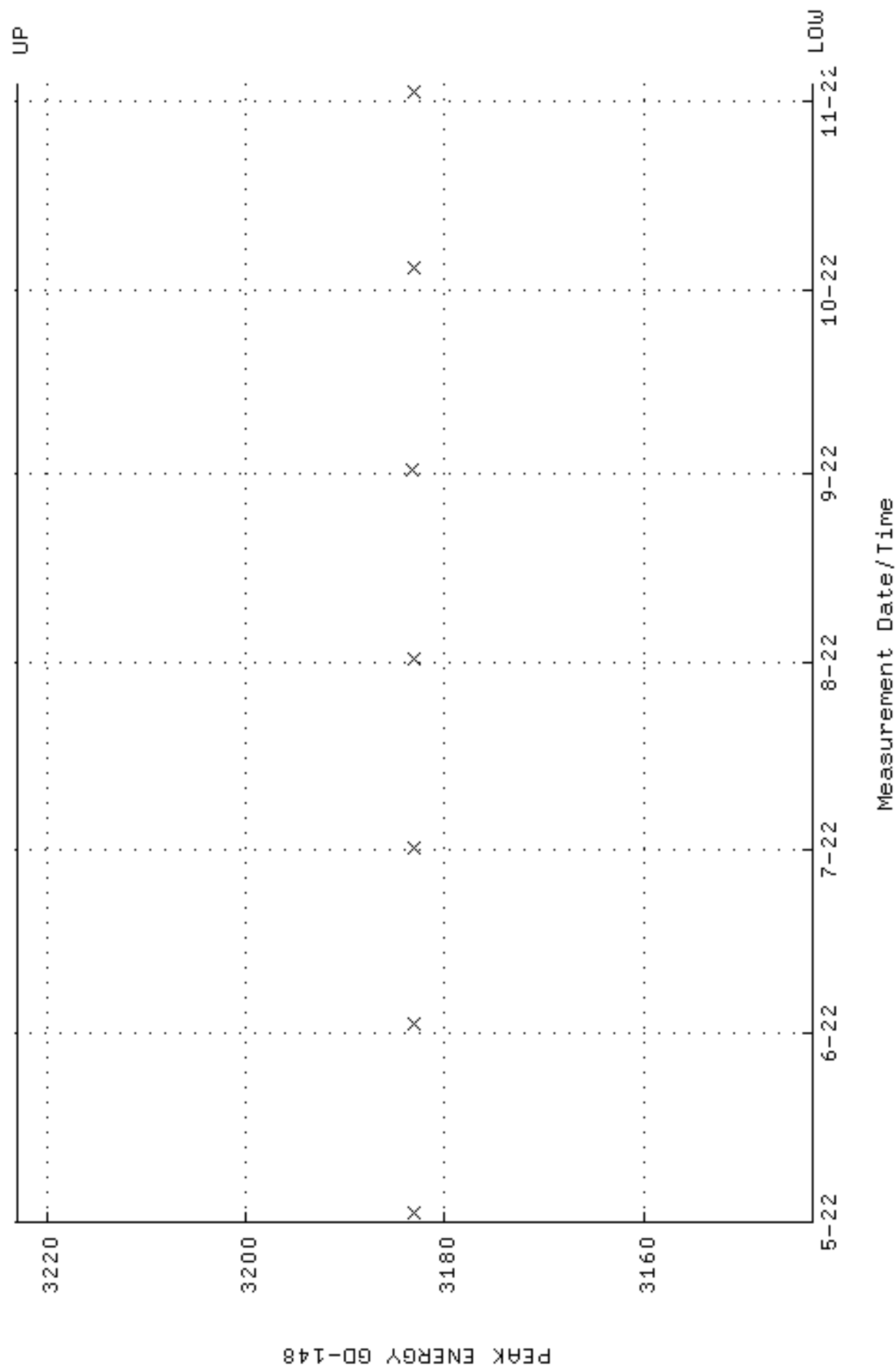
QA filename : DKA100:[ENV_ALPHA.QA.W]W005.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



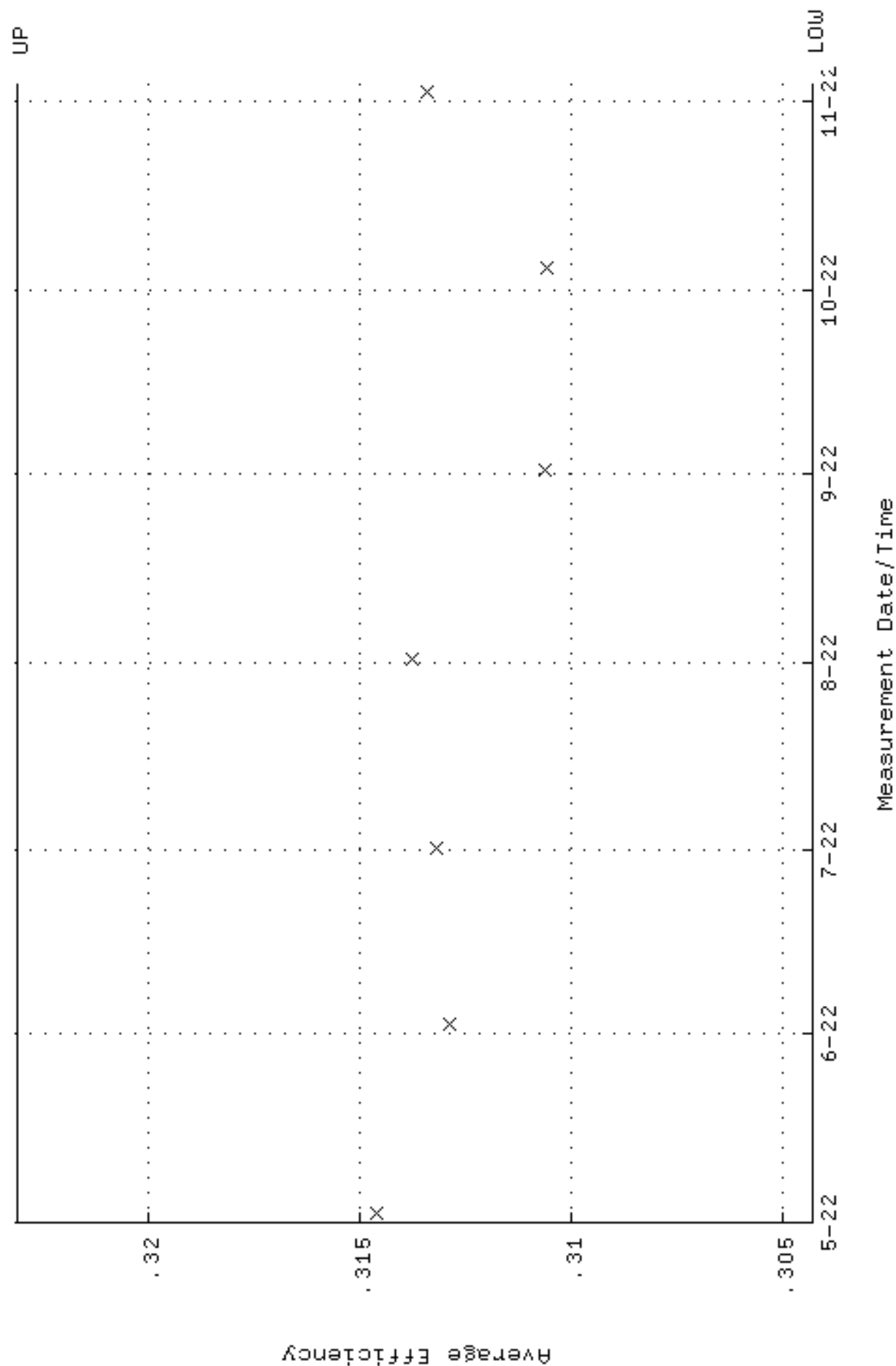
QA filename : DKA100:[ENV_ALPHA.QA.W]W005.QAF;11
Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



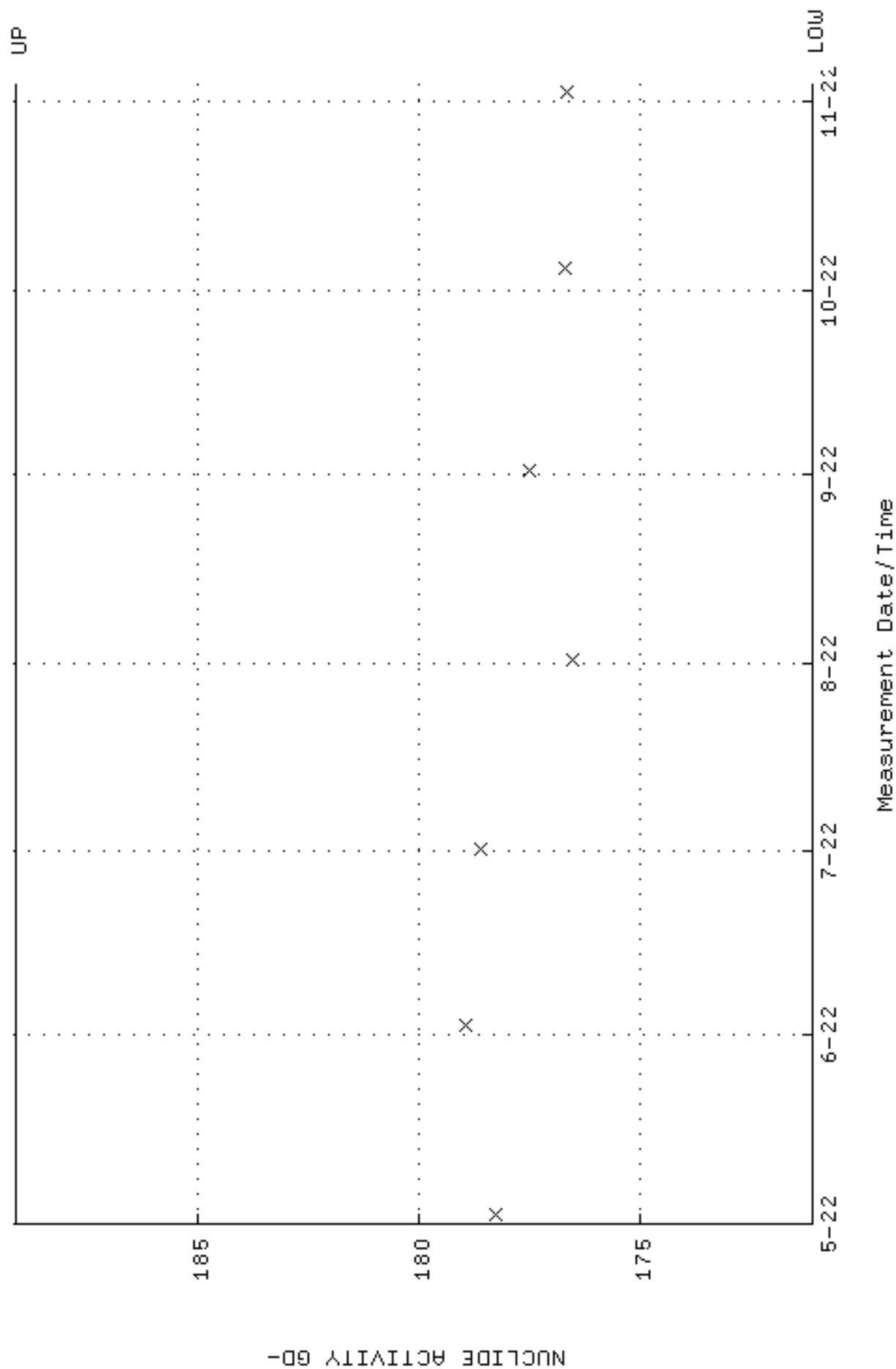
QA filename : DKA100:[ENV_ALPHA.QA.W]W005.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-MAY-2022 09:43:37 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



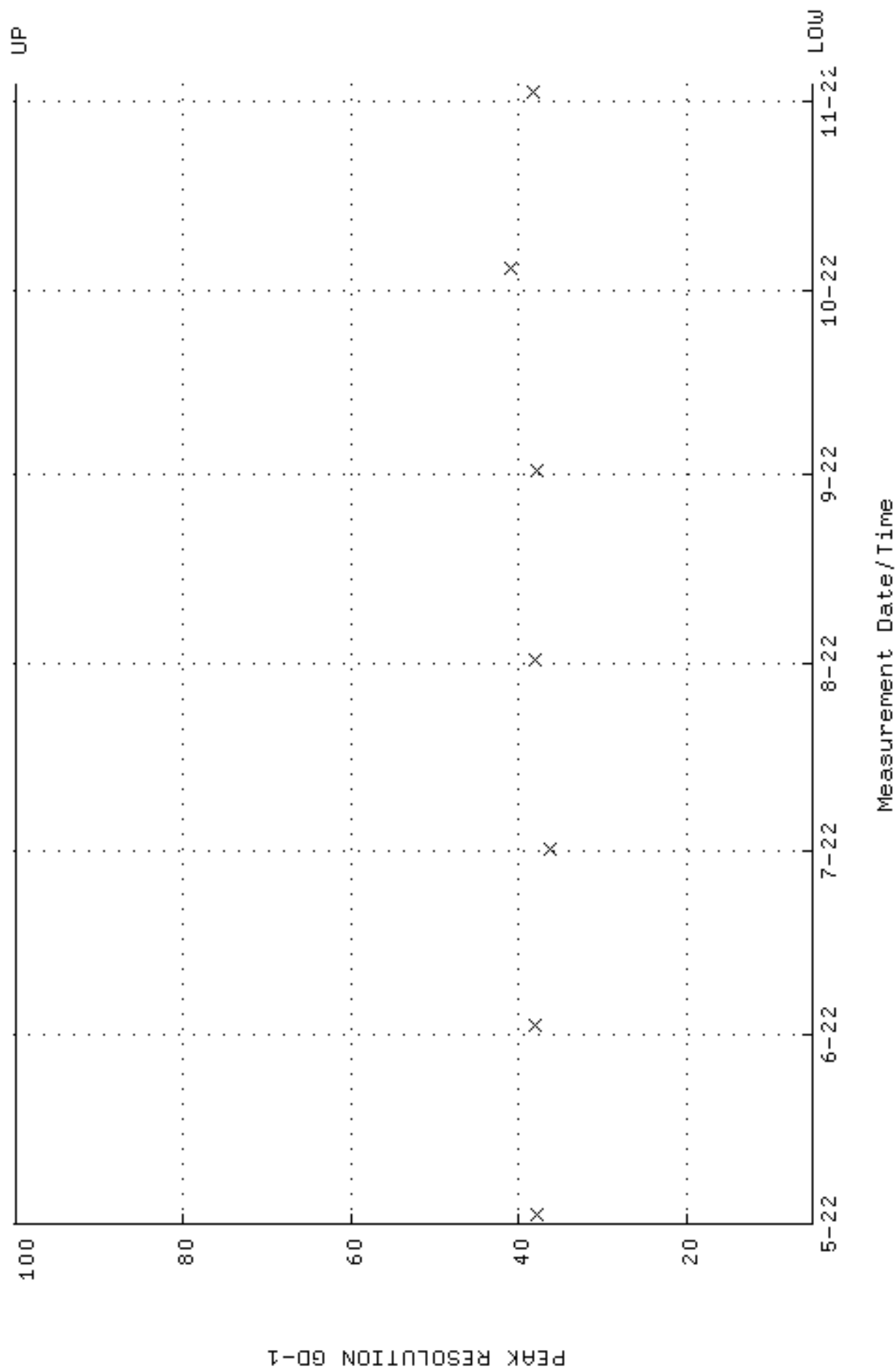
QA filename : DKA100:[ENV_ALPHA.QA.W]W007.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.304289 through 0.323111



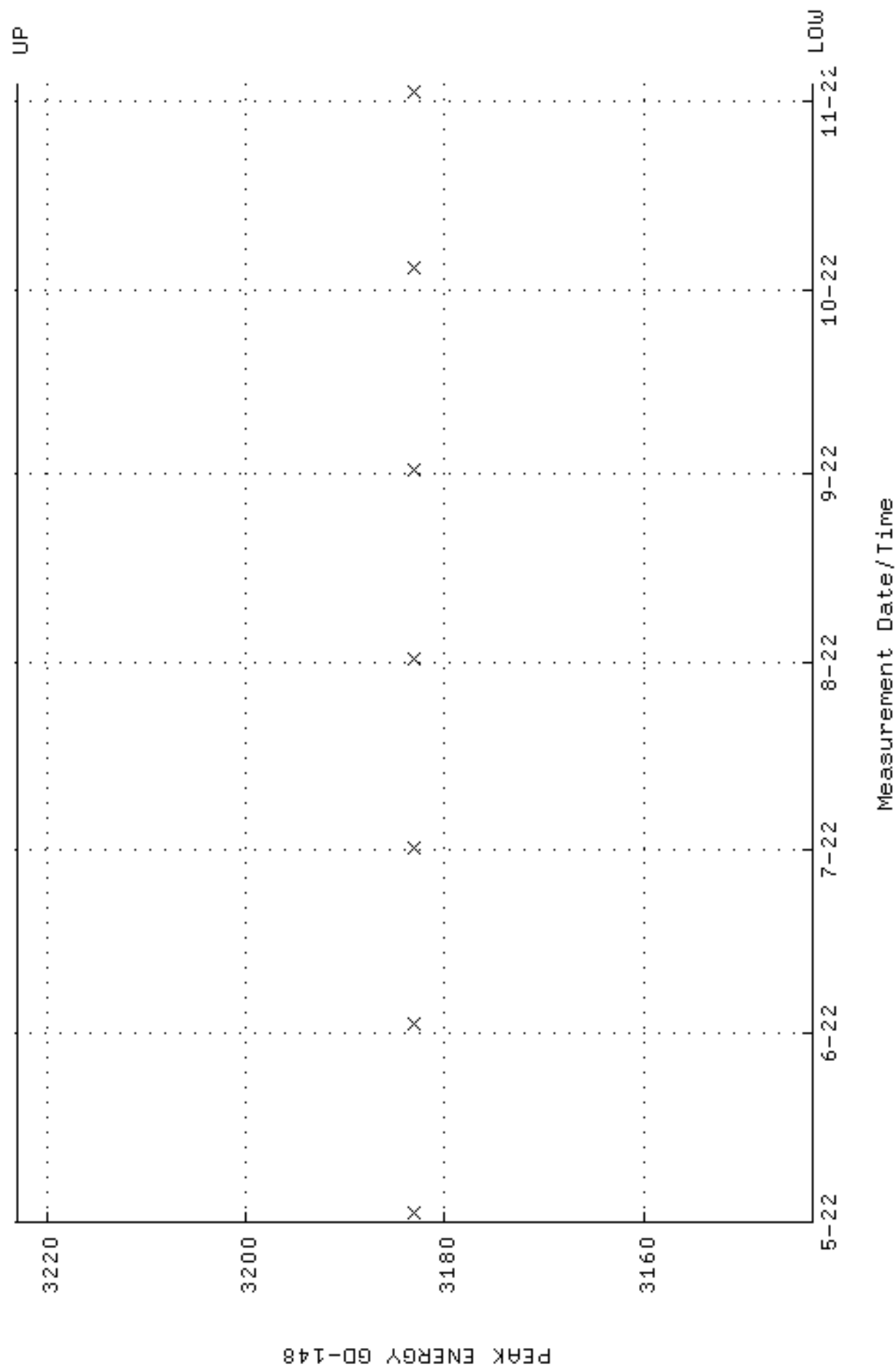
QA filename : DKA100:[ENV_ALPHA.QA.W]W007.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



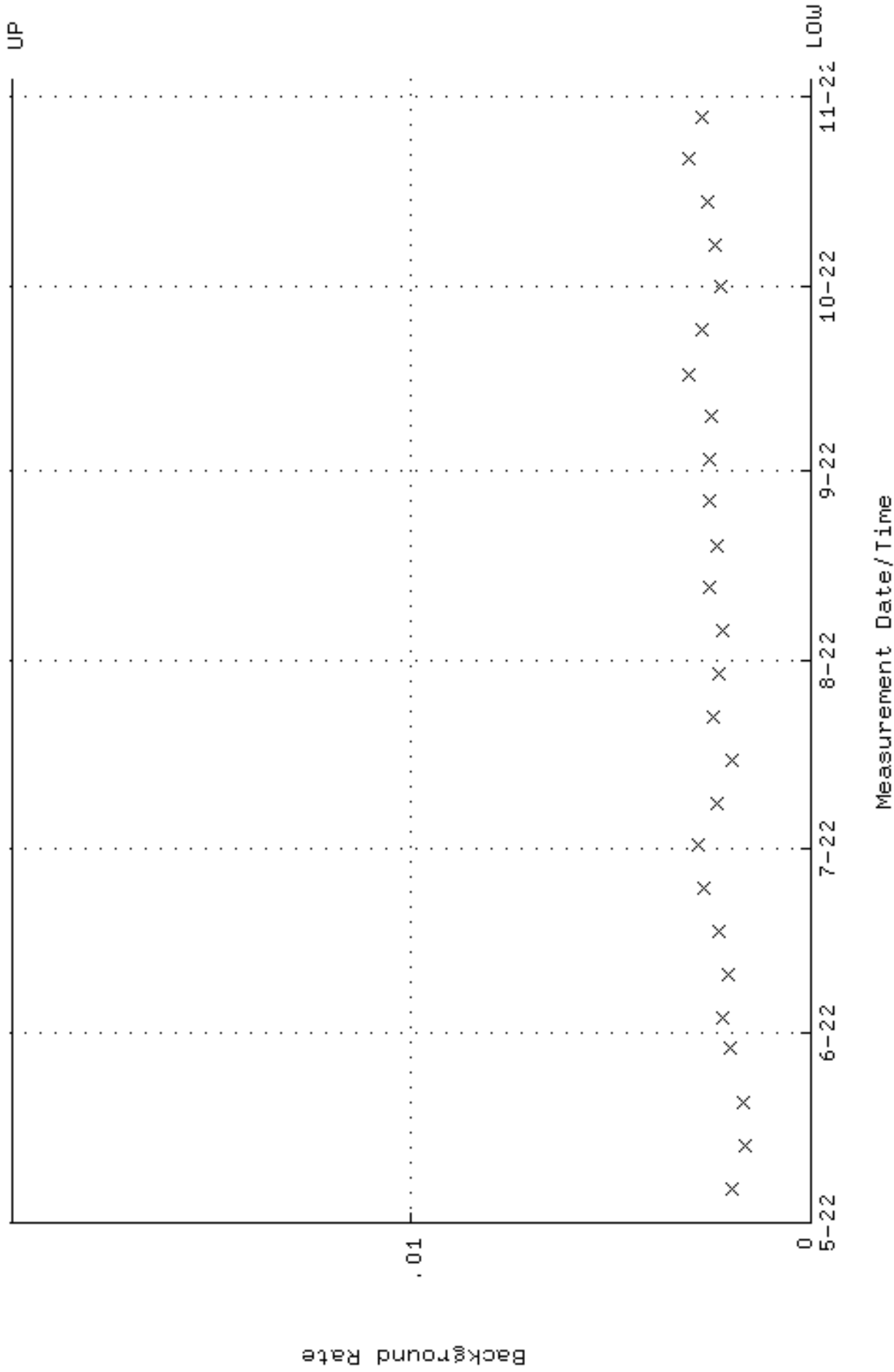
QA filename : DKA100:[ENV_ALPHA.QA.W]W007.QAF;7
Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



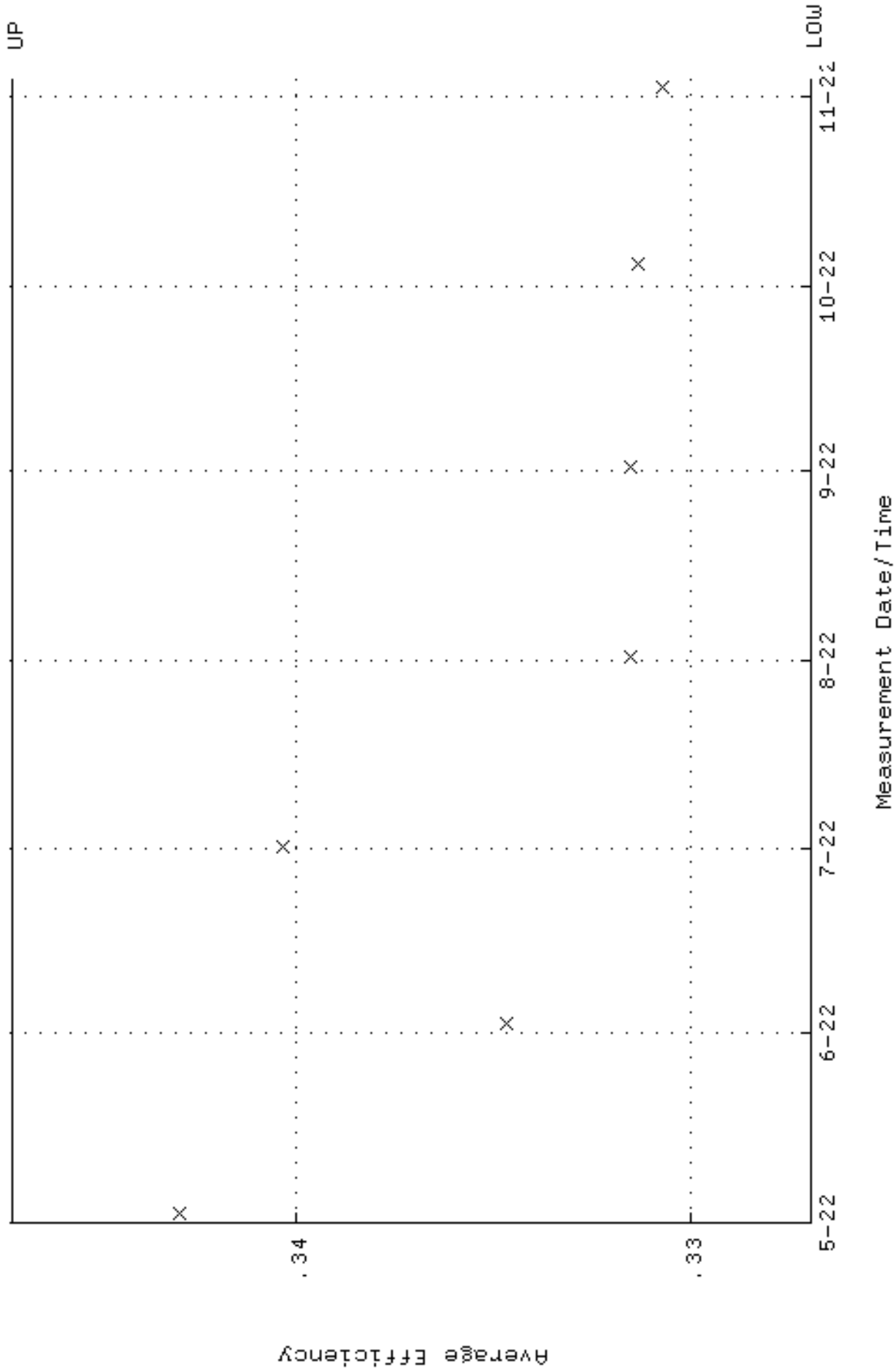
QA filename : DKA100:[ENV_ALPHA.QA.W]W007.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



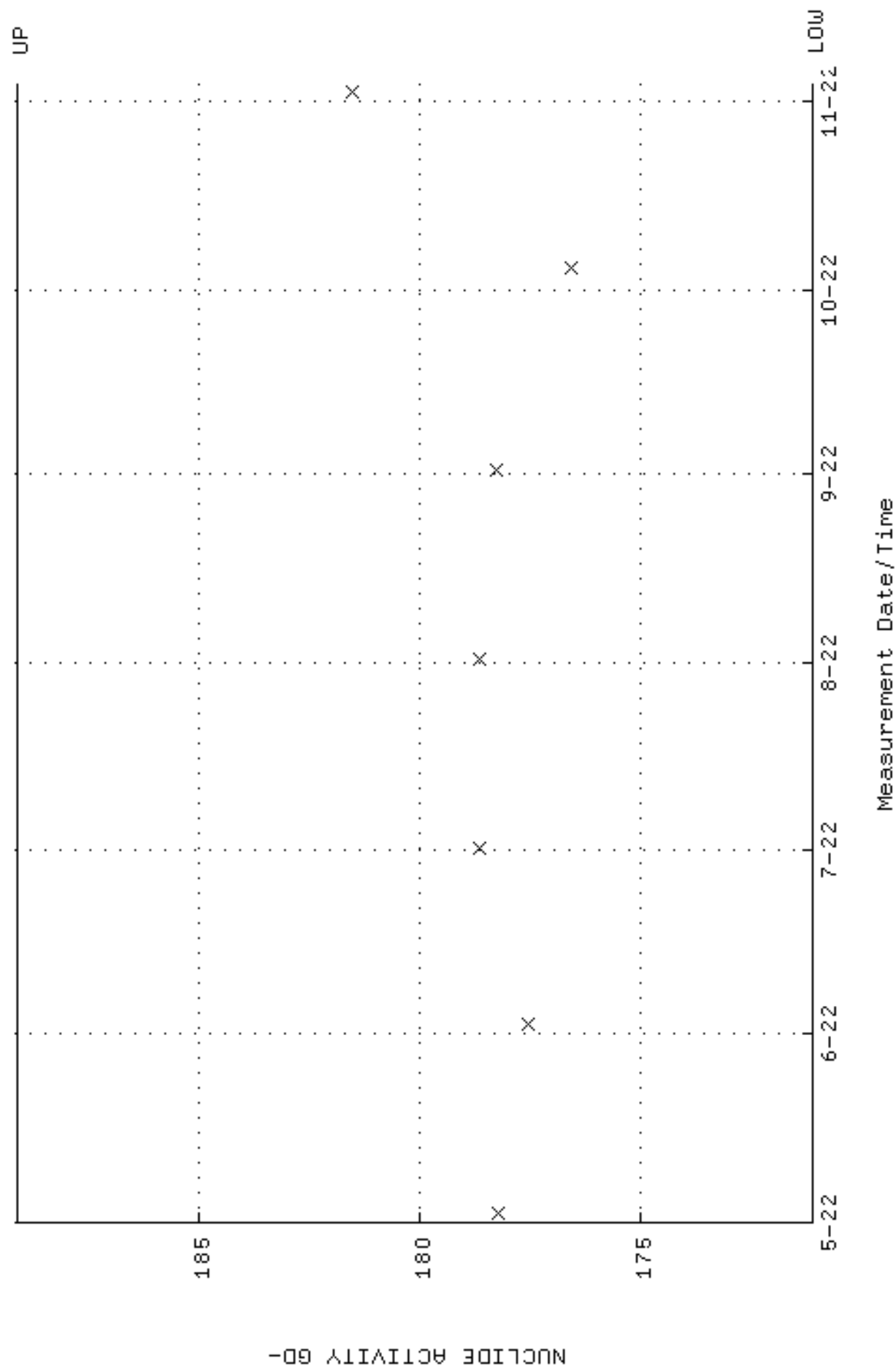
QA filename : DKA100:[ENV_ALPHA.QA.B]B007.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-MAY-2022 14:17:29 through 3-NOV-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



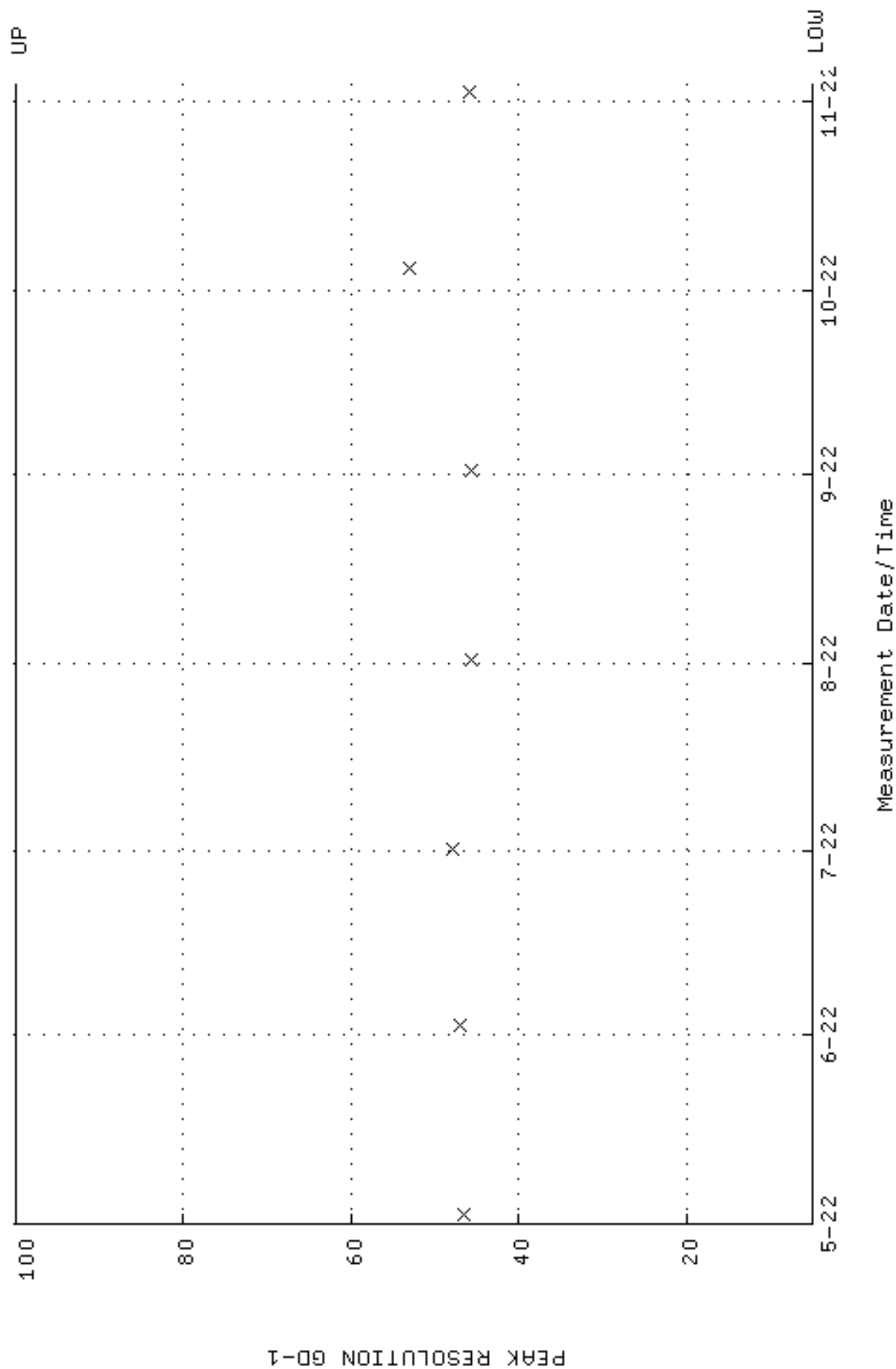
QA filename : DKA100:[ENV_ALPHA.QA.W]W008.QAF;6
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
Lower/Upper Lmts: 0.326971 through 0.347195



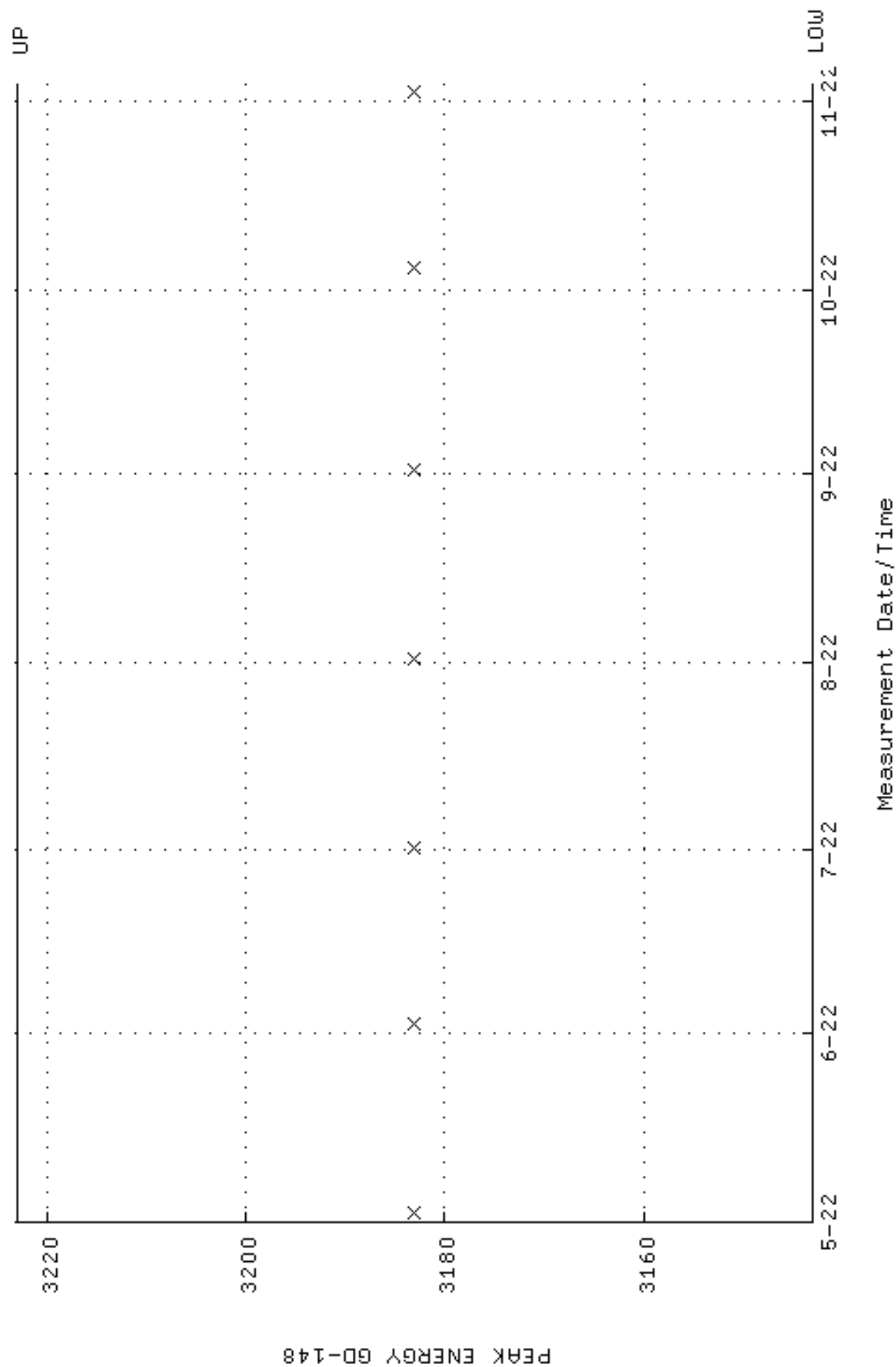
QA filename : DKA100:[ENV_ALPHA.QA.W]W008.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



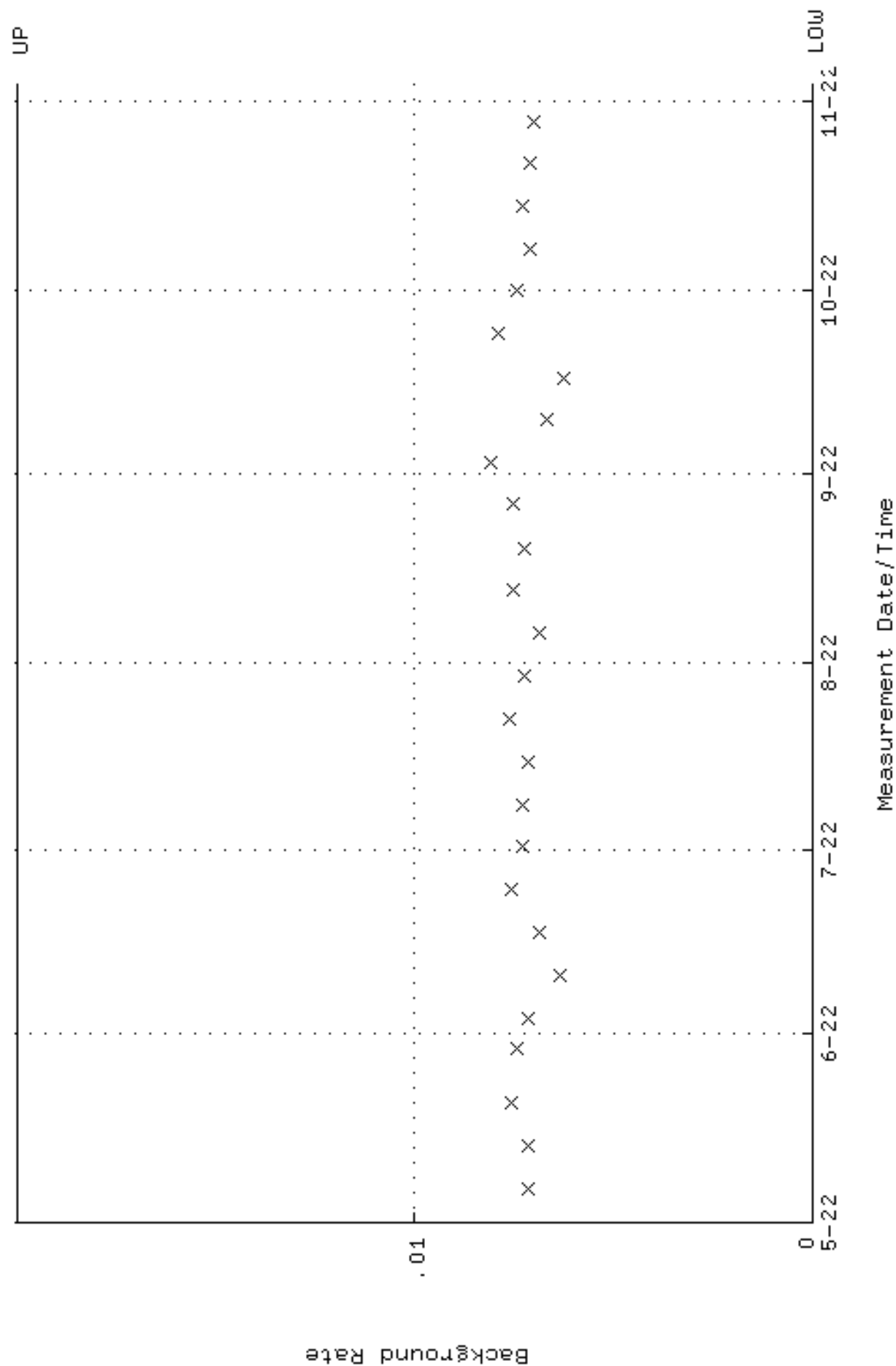
QA filename : DKA100:[ENV_ALPHA.QA.W]W008.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



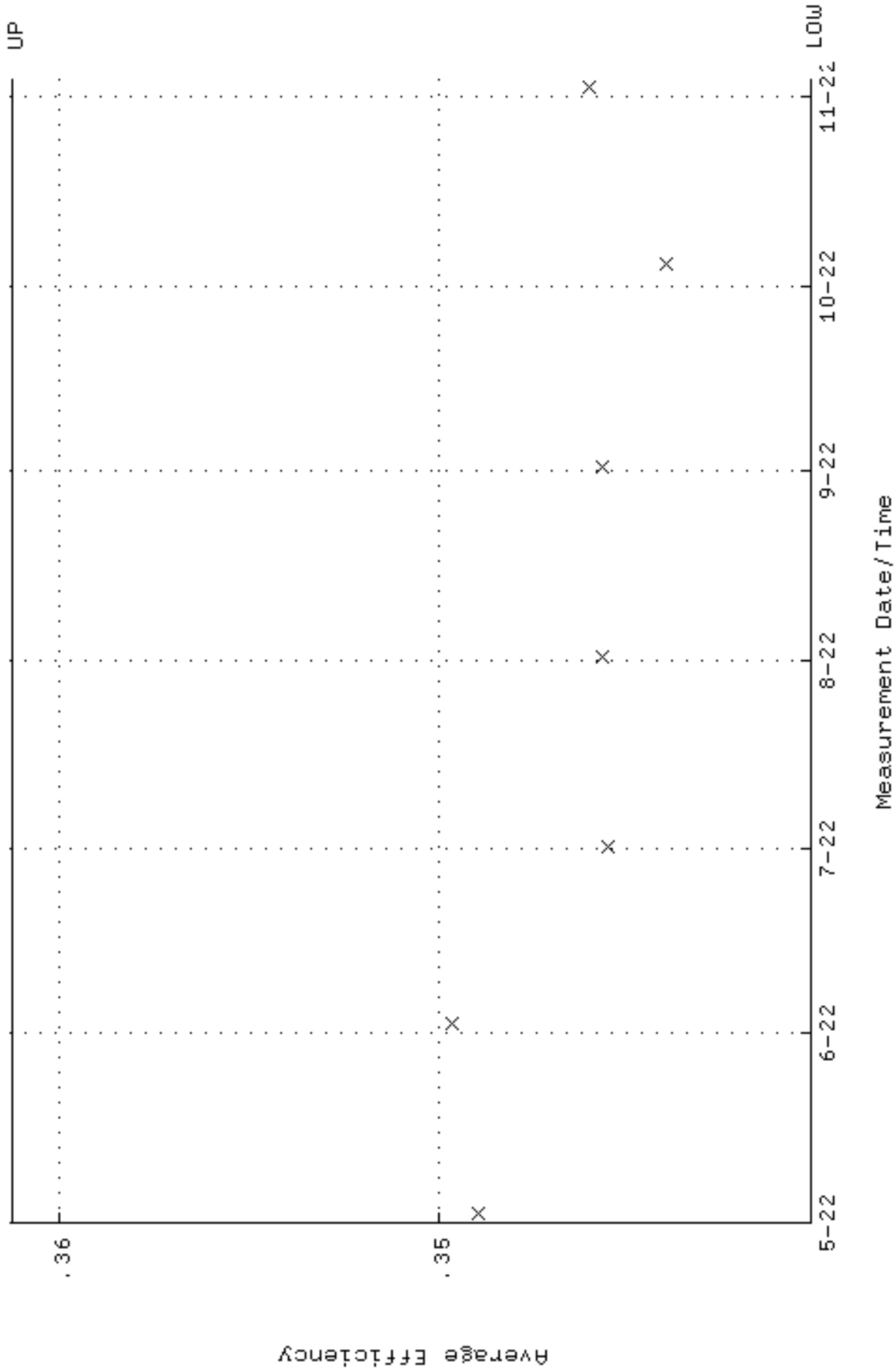
QA filename : DKA100:[ENV_ALPHA.QA.W]W008.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



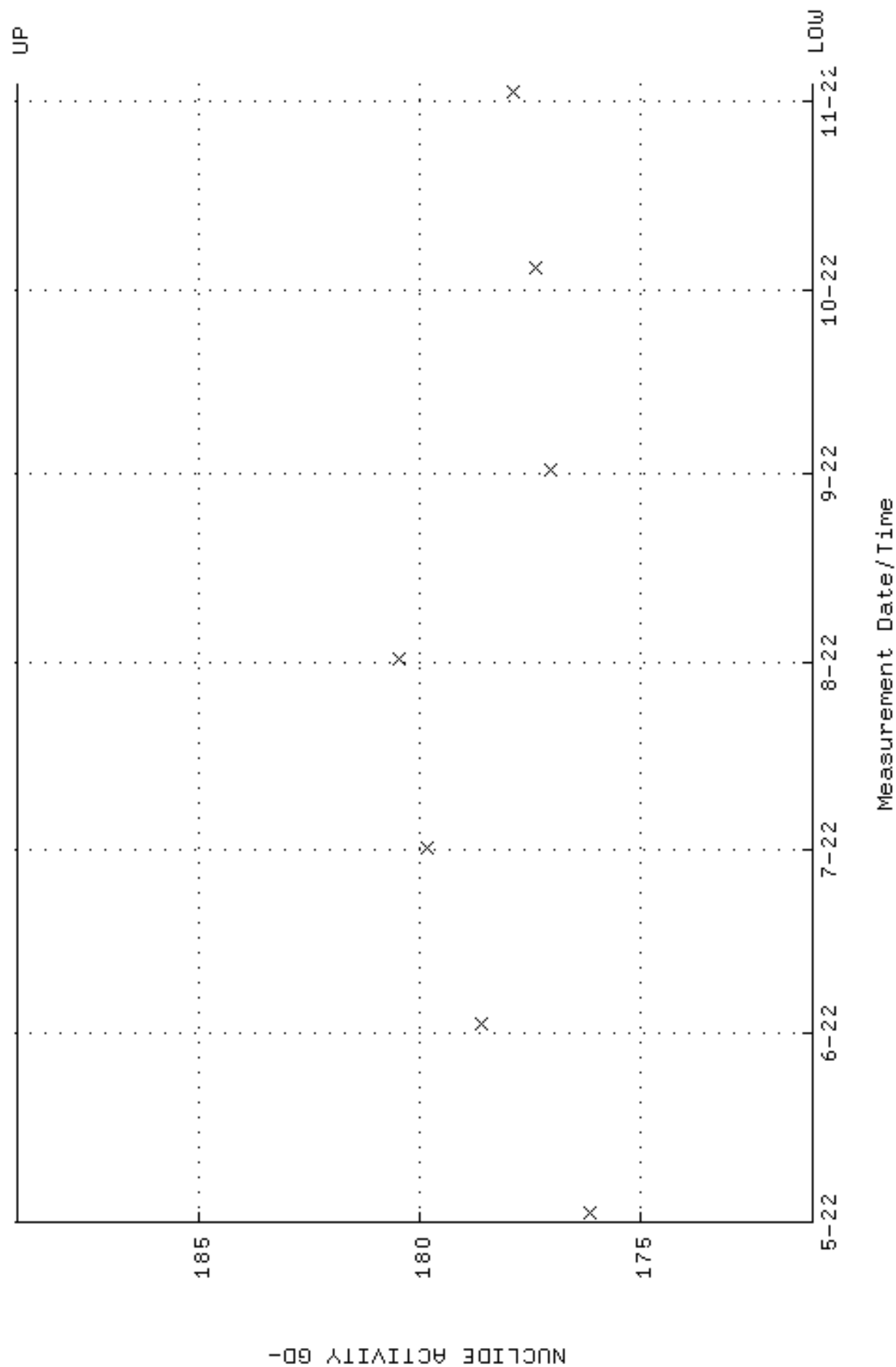
QA filename : DKA100:[ENV_ALPHA.QA.B]B008.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-MAY-2022 14:17:29 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



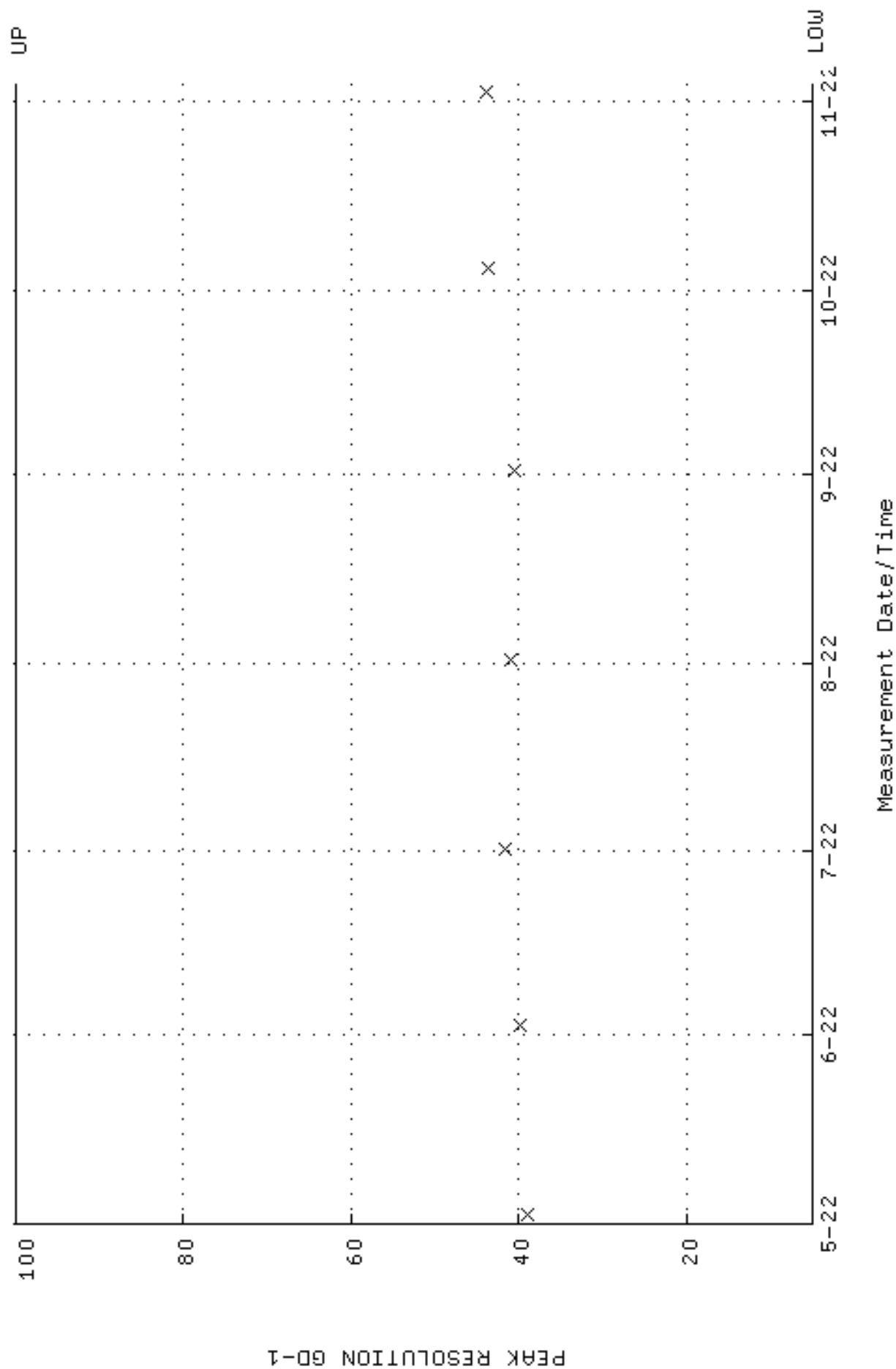
QA filename : DKA100:[ENV_ALPHA.QA.W]W009.QAF;7
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
Lower/Upper Lmts: 0.340180 through 0.361220



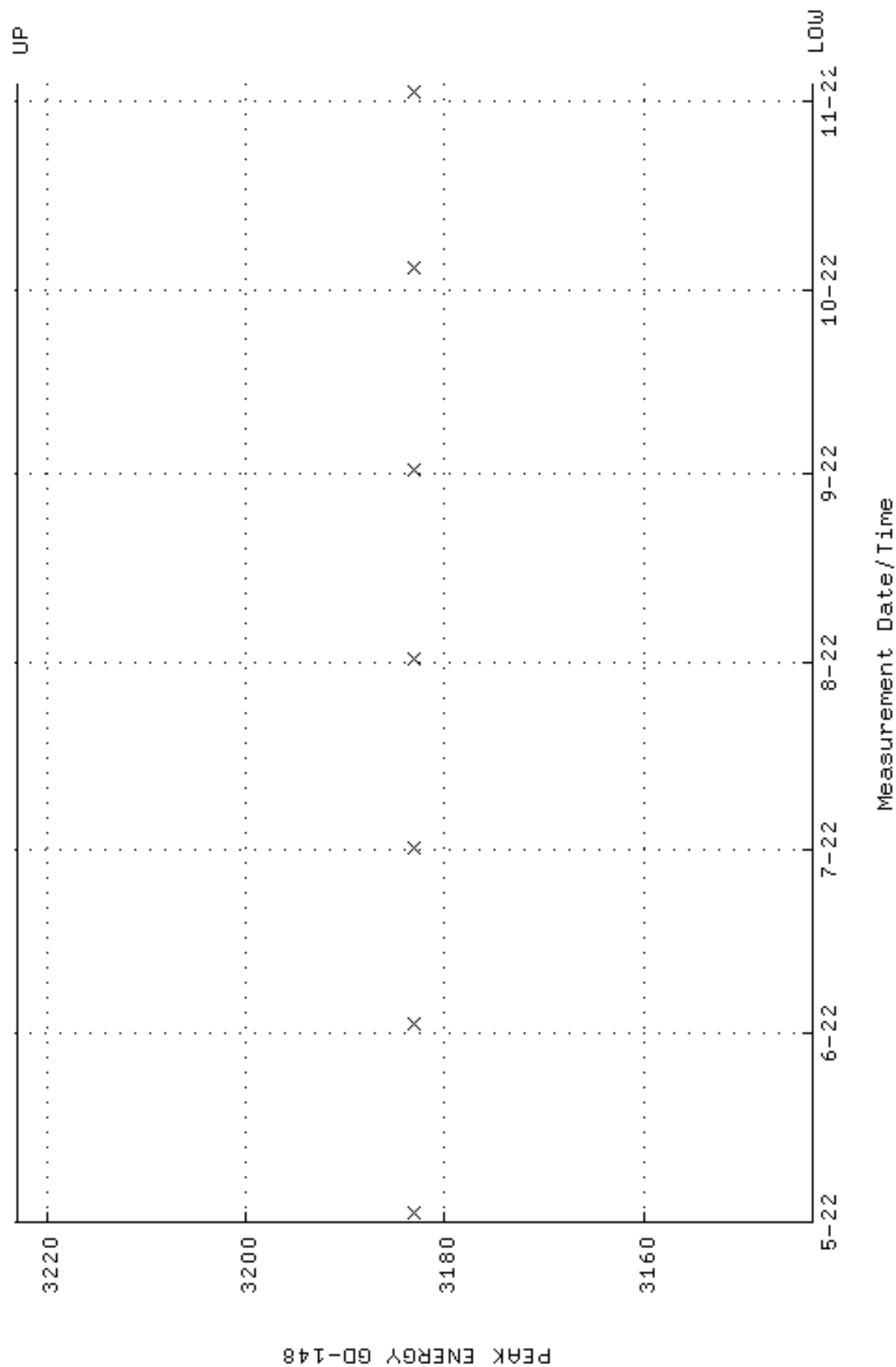
QA filename : DKA100:[ENV_ALPHA.QA.W]W009.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



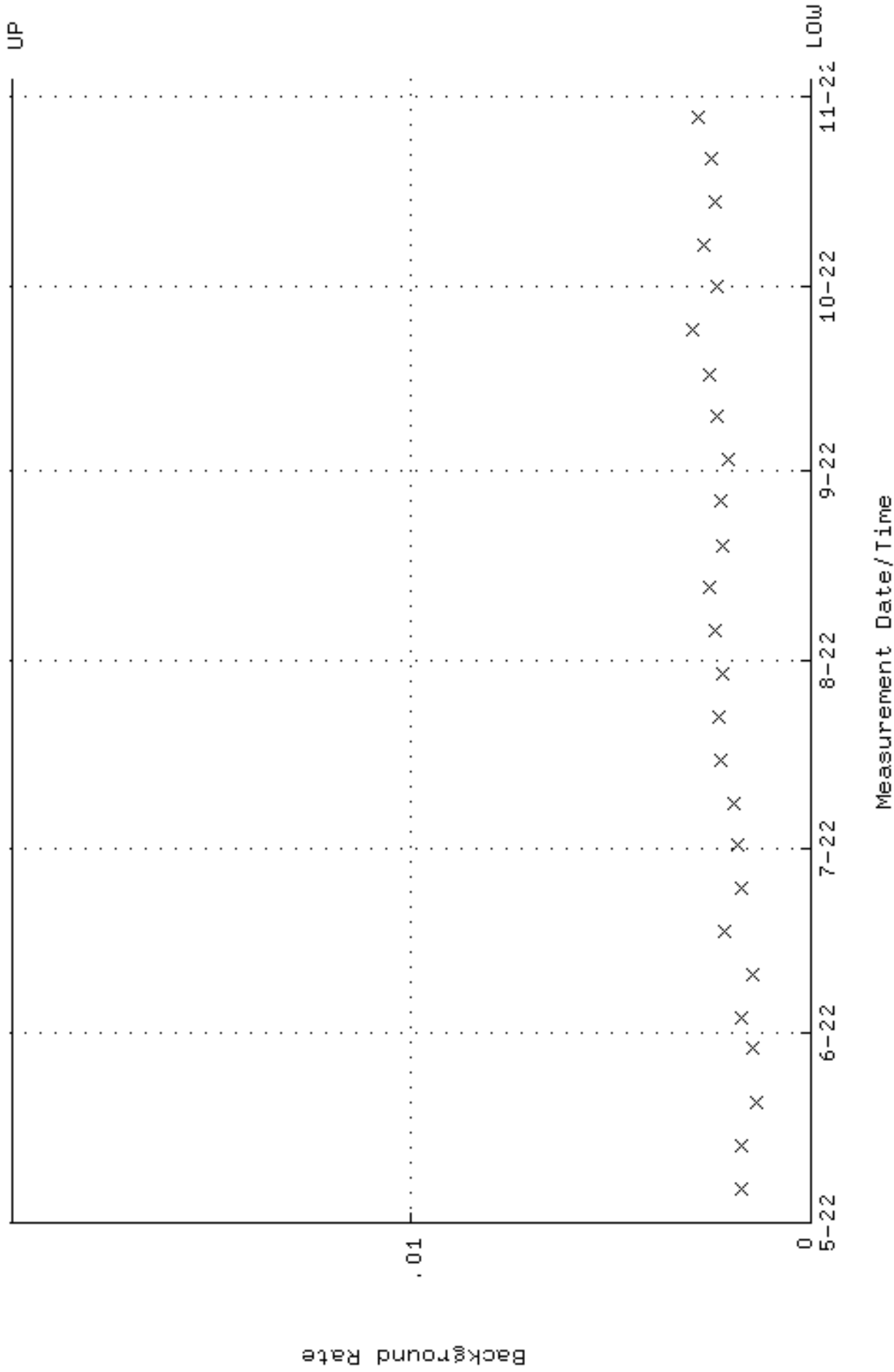
QA filename : DKA100:[ENV_ALPHA.QA.W]W009.QAF;7
Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



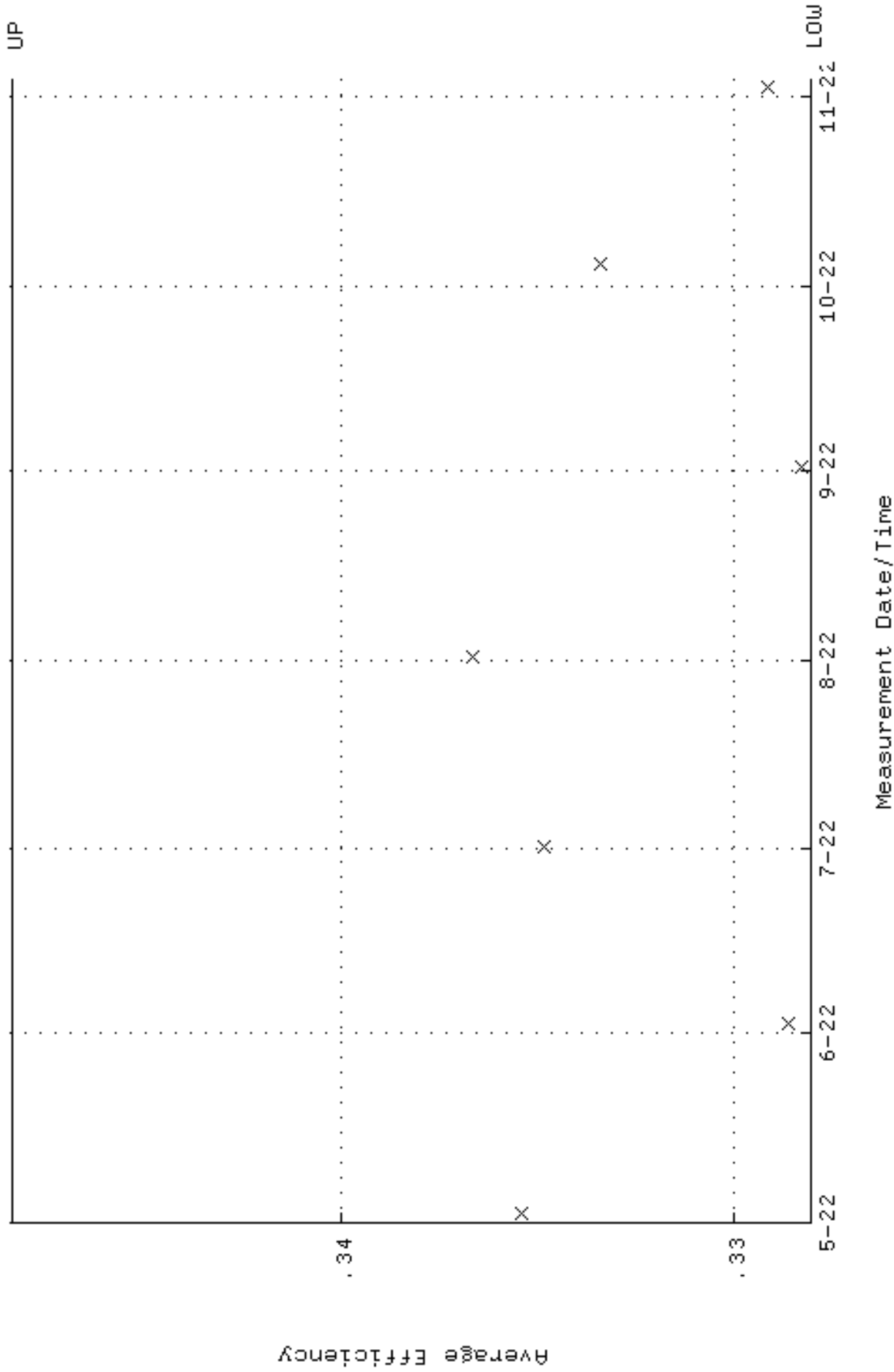
QA filename : DKA100:[ENV_ALPHA.QA.W]W009.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



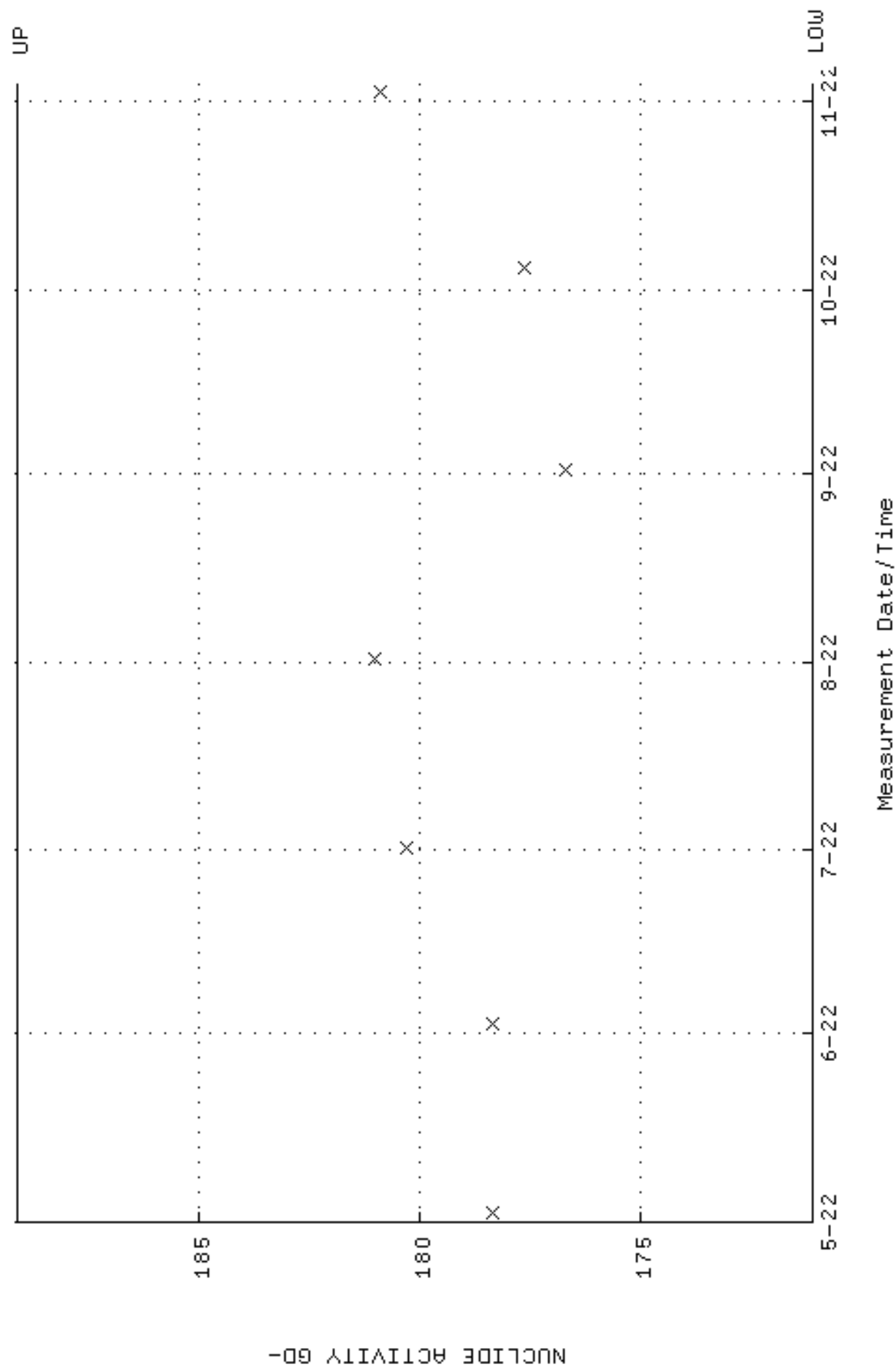
QA filename : DKA100:[ENV_ALPHA.QA.B]B009.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-MAY-2022 14:17:29 through 3-NOV-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



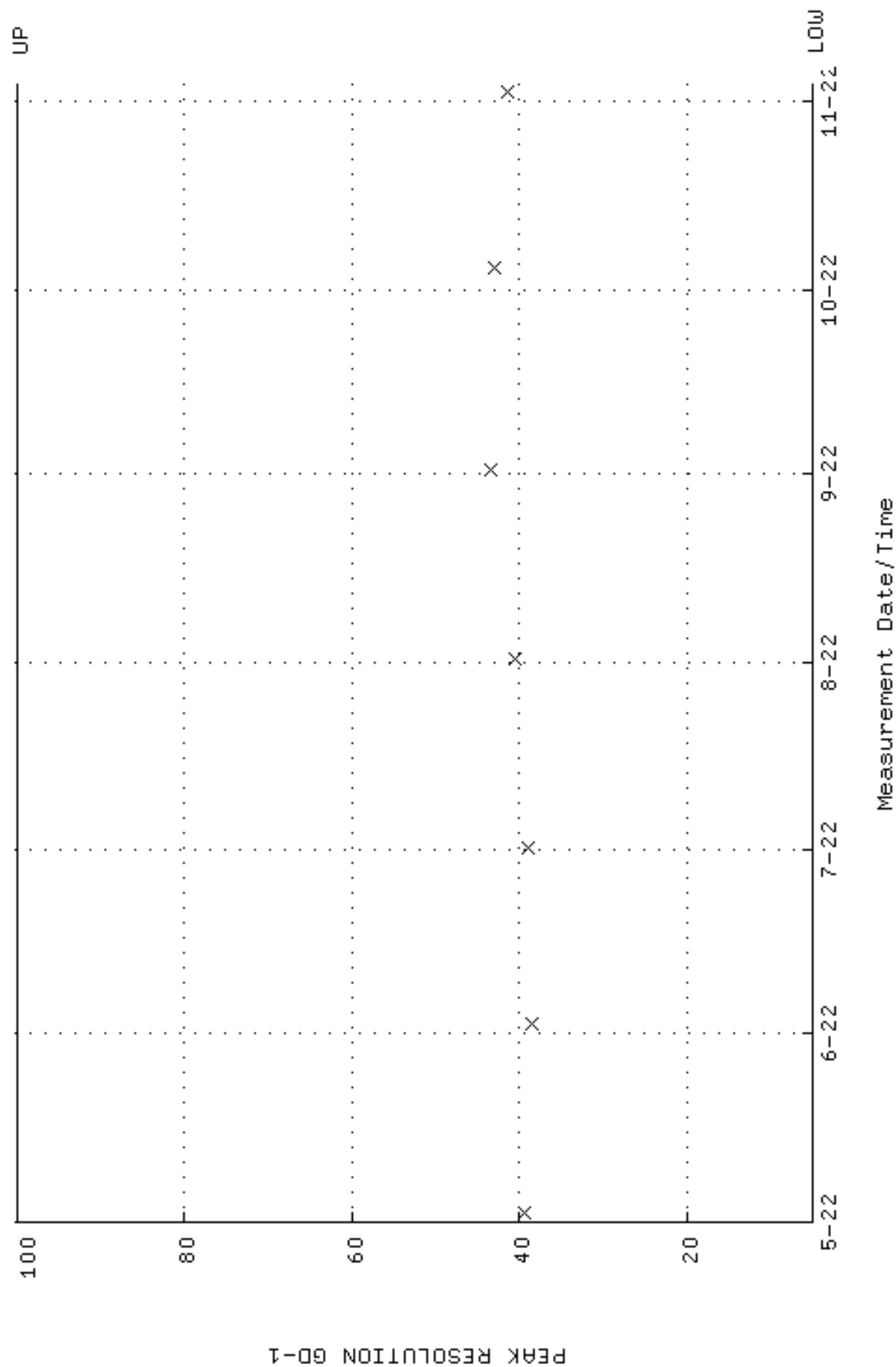
QA filename : DKA100:[ENV_ALPHA.QA.W]W010.QAF;8
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
Lower/Upper Lmts: 0.328050 through 0.348350



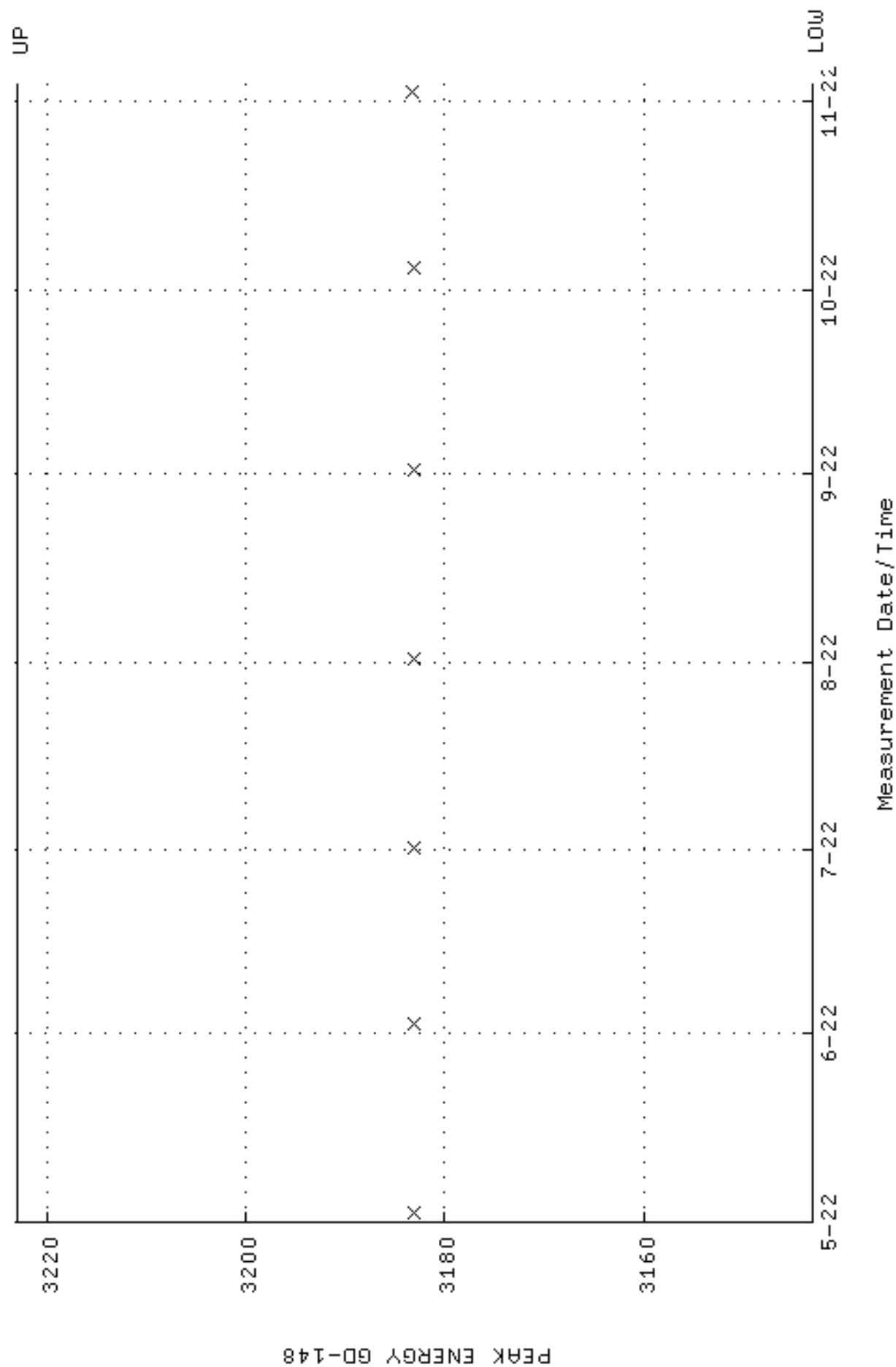
QA filename : DKA100:[ENV_ALPHA.QA.W]W010.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



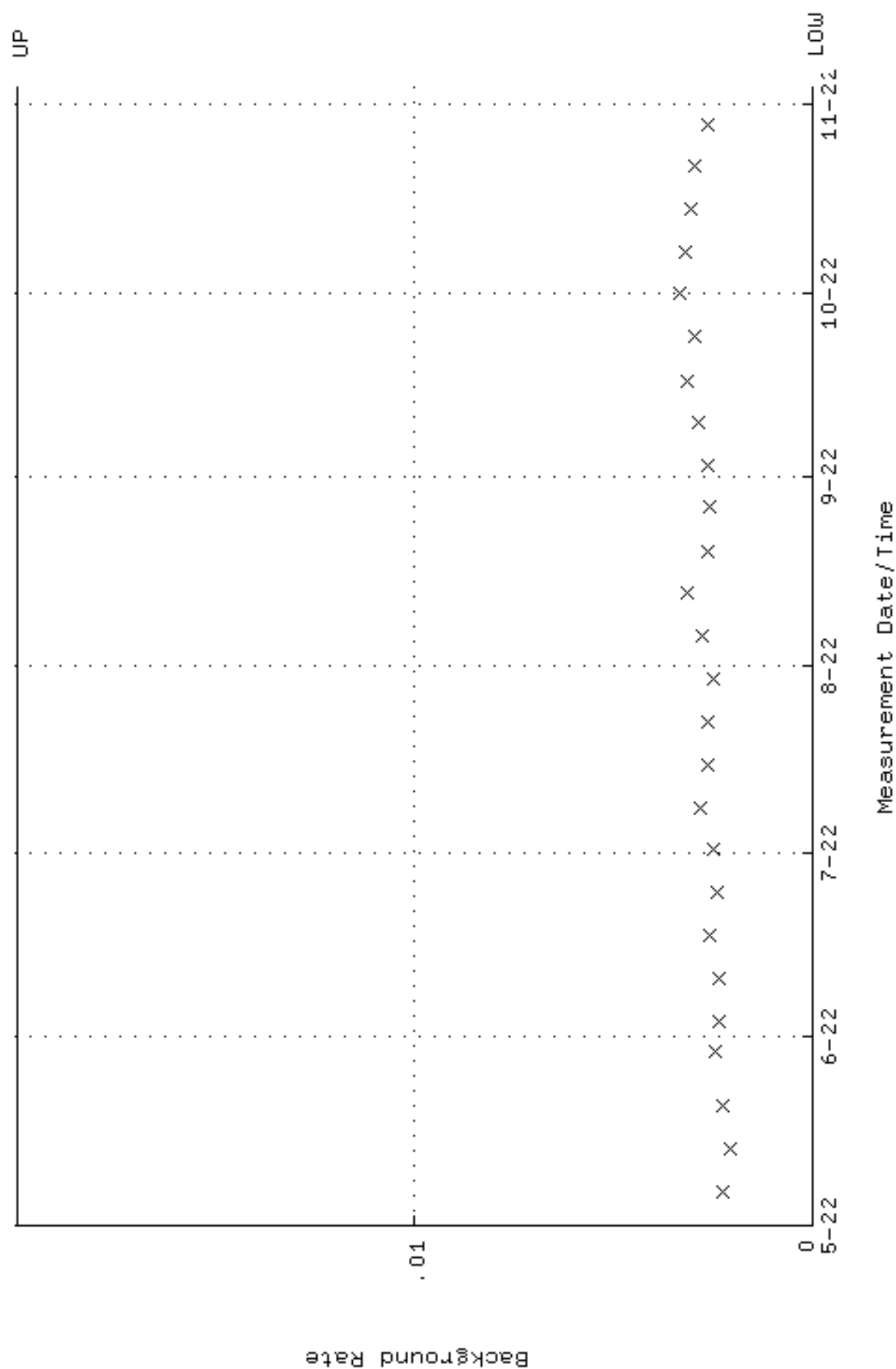
QA filename : DKA100:[ENV_ALPHA.QA.W]W010.QAF;8
Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



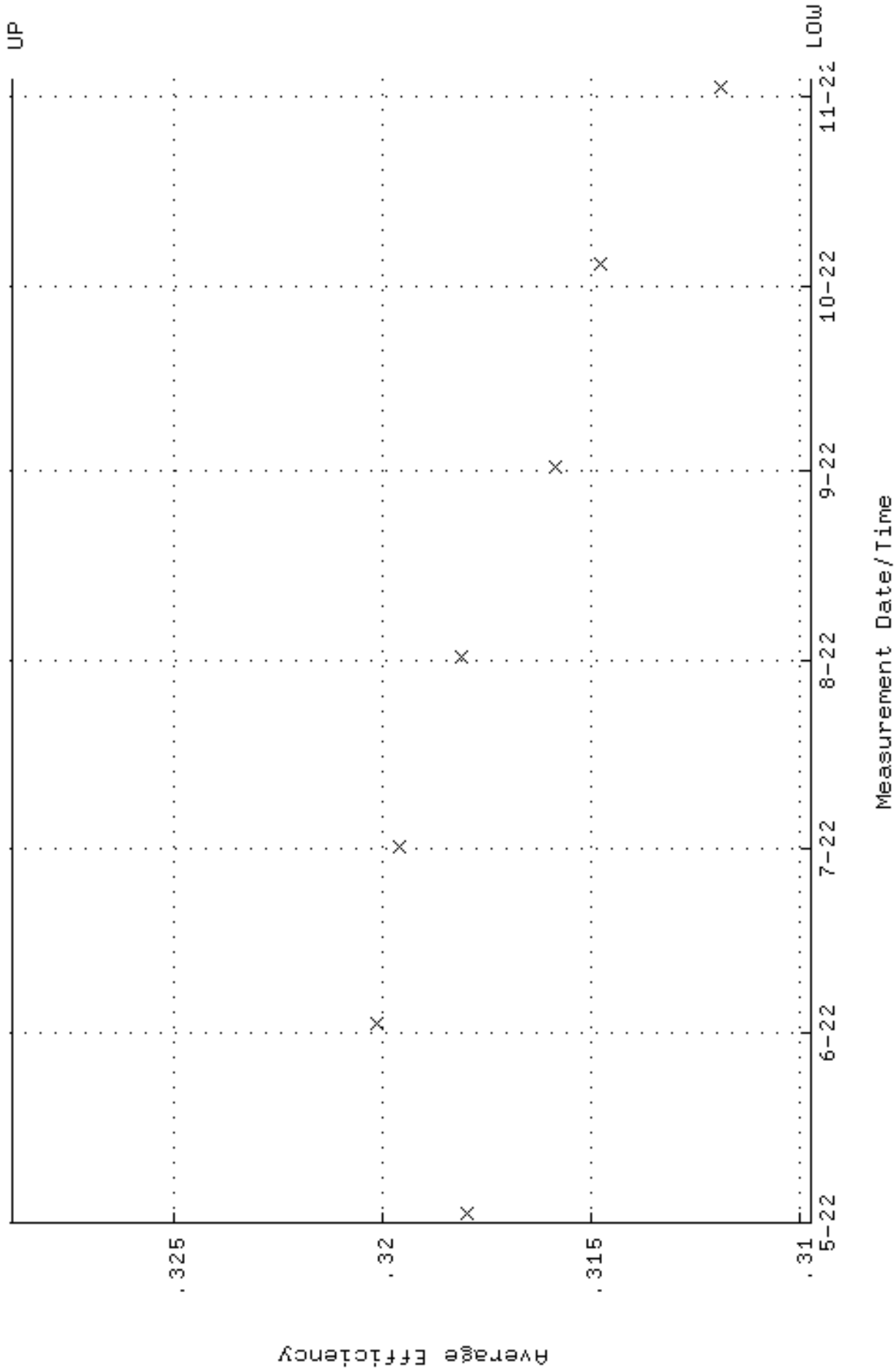
QA filename : DKA100:[ENV_ALPHA.QA.W]W010.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



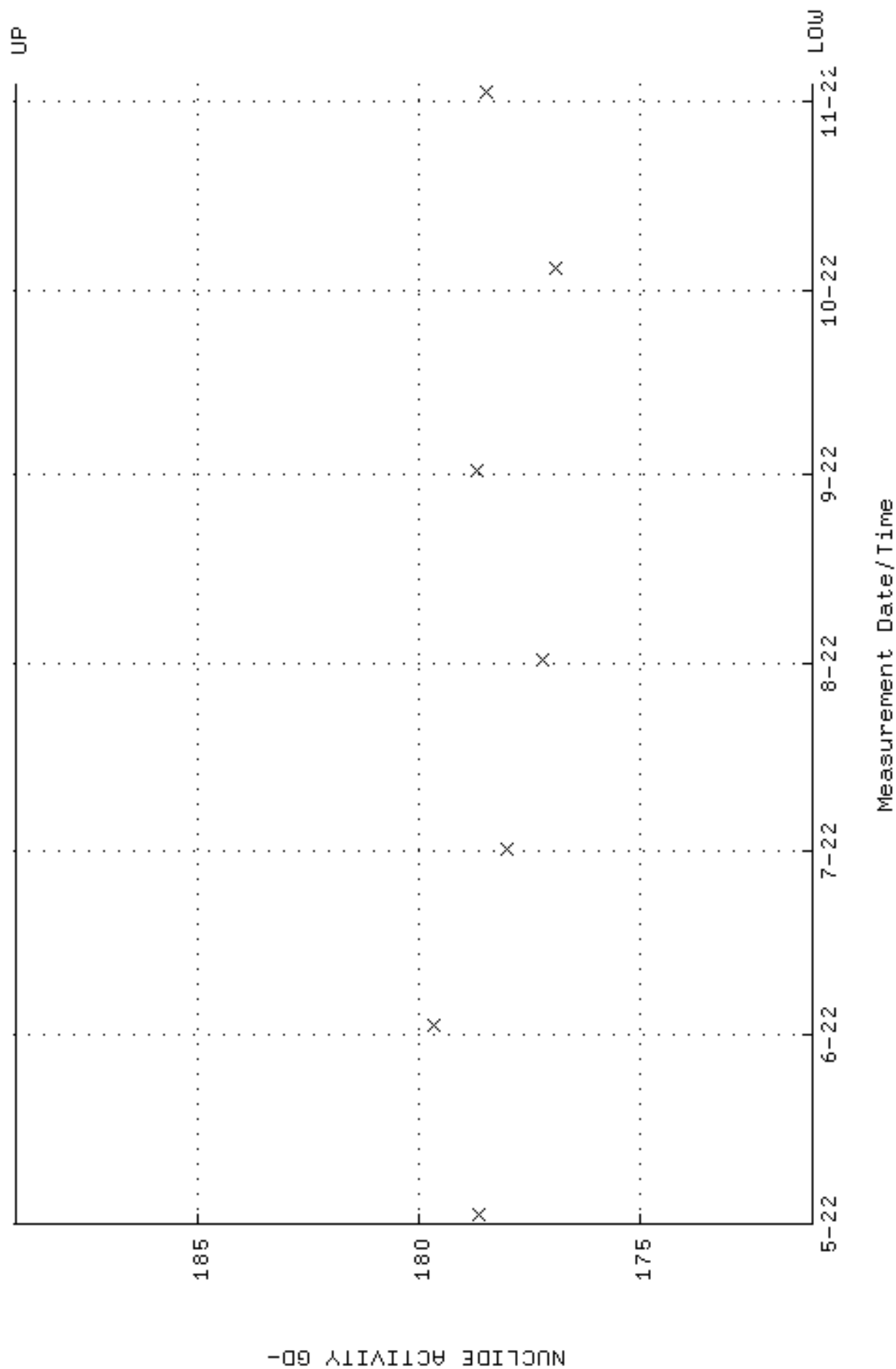
QQA filename : DKA100:[ENV_ALPHA.QA.B]B010.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-MAY-2022 14:17:29 through 3-NOV-
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



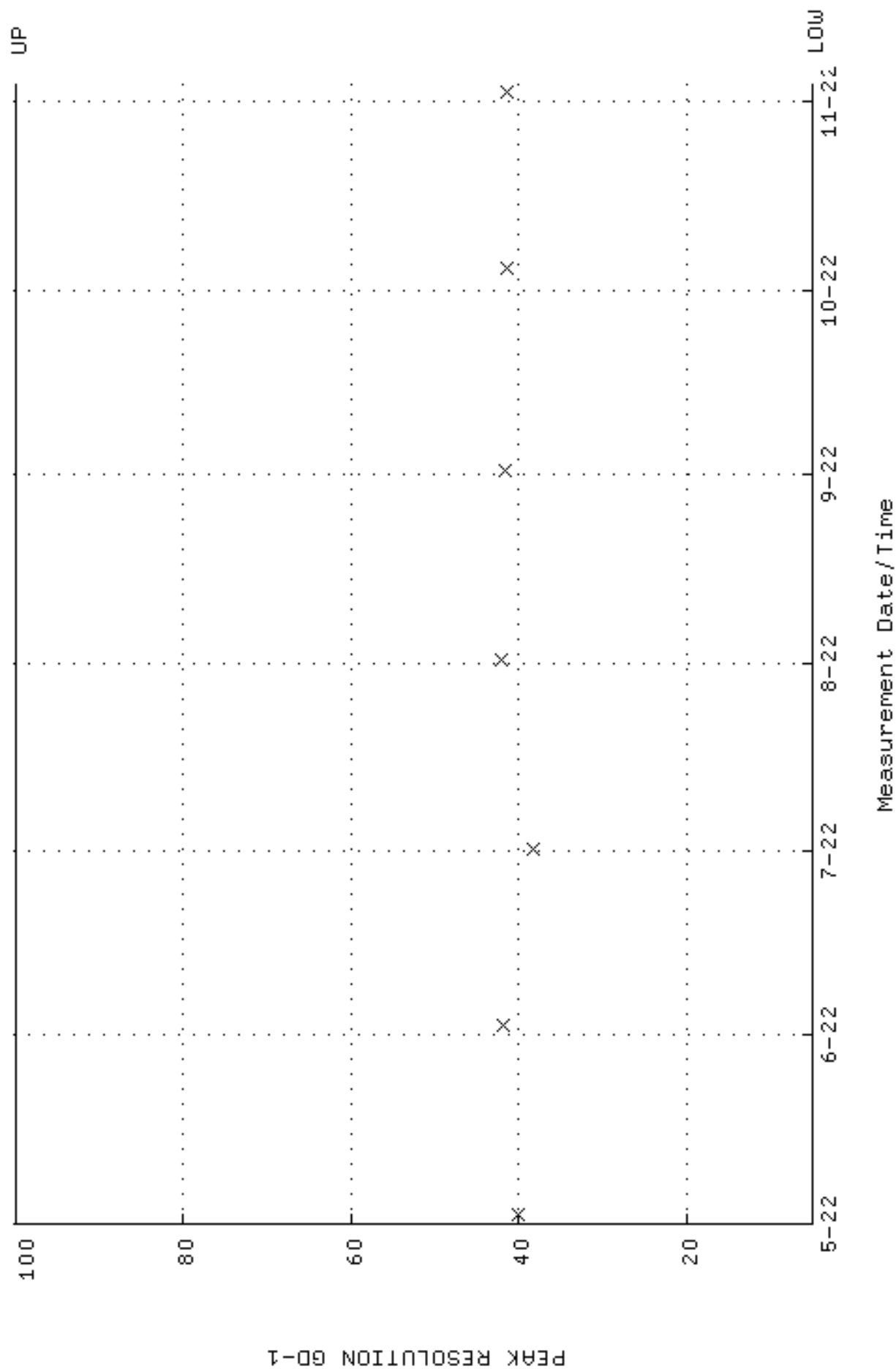
QA filename : DKA100:[ENV_ALPHA.QA.W]W011.QAF;8
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
Lower/Upper Lmts: 0.309718 through 0.328876



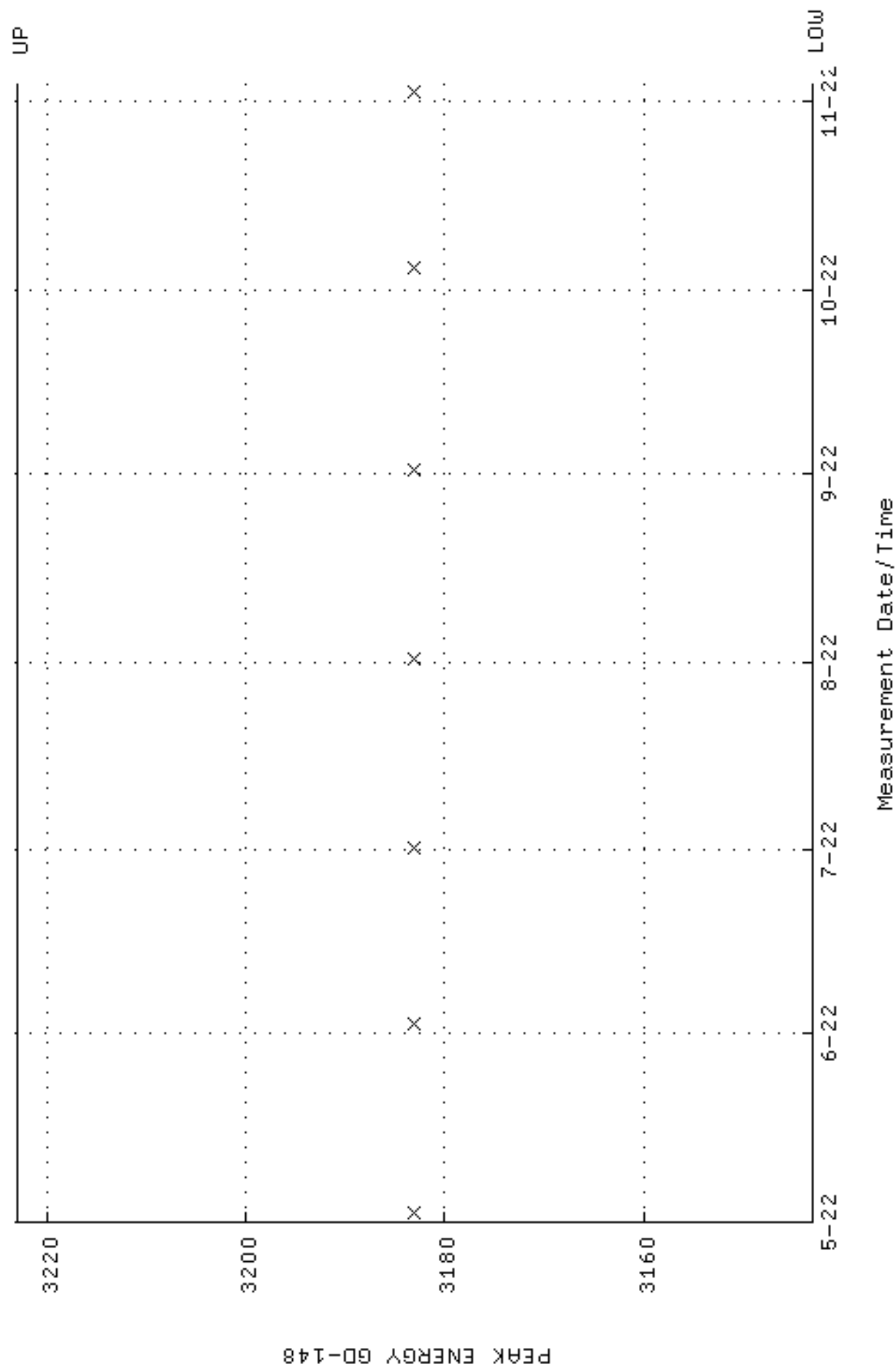
QA filename : DKA100:[ENV_ALPHA.QA.W]W011.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



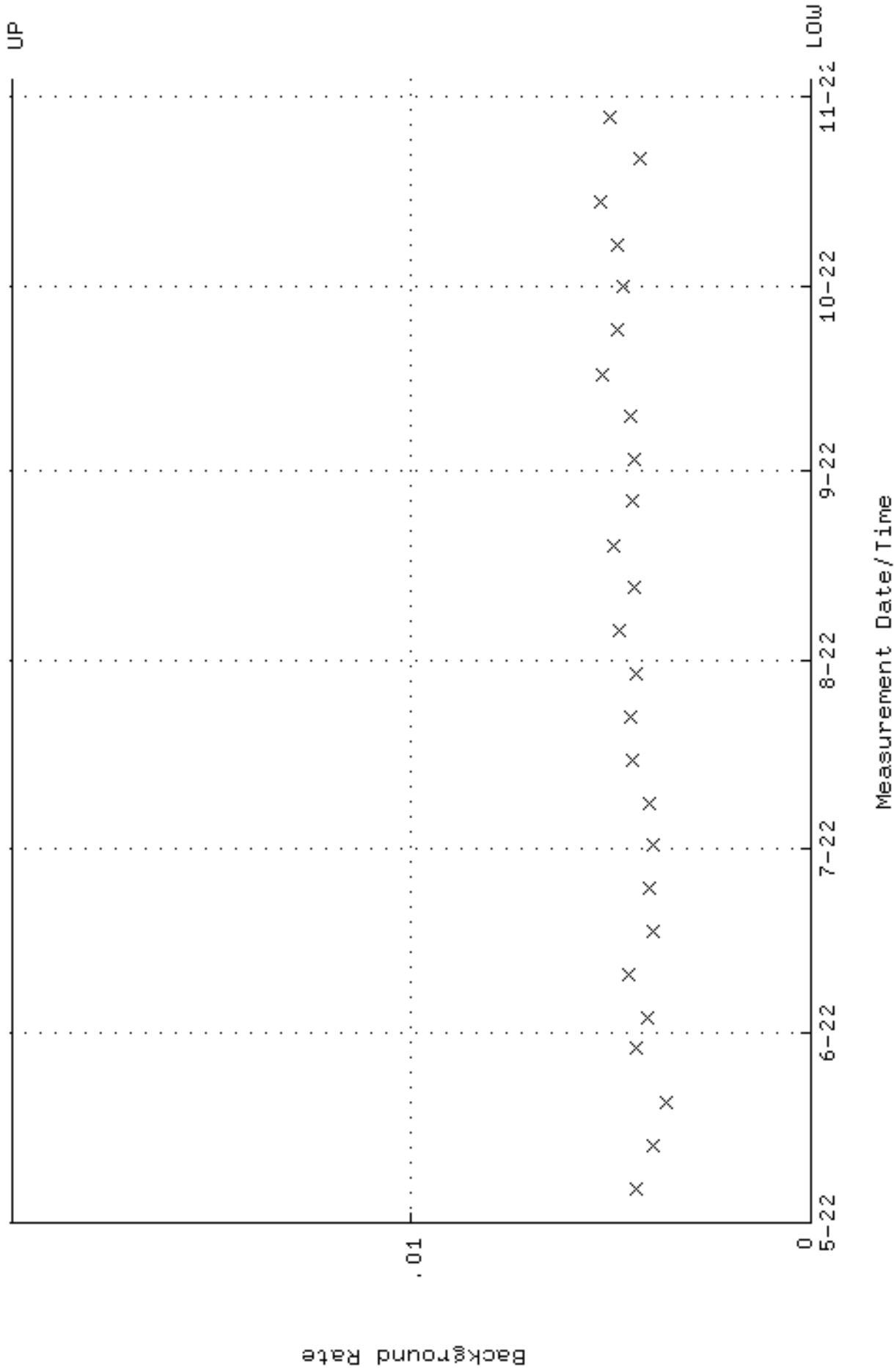
QA filename : DKA100:[ENV_ALPHA.QA.W]W011.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



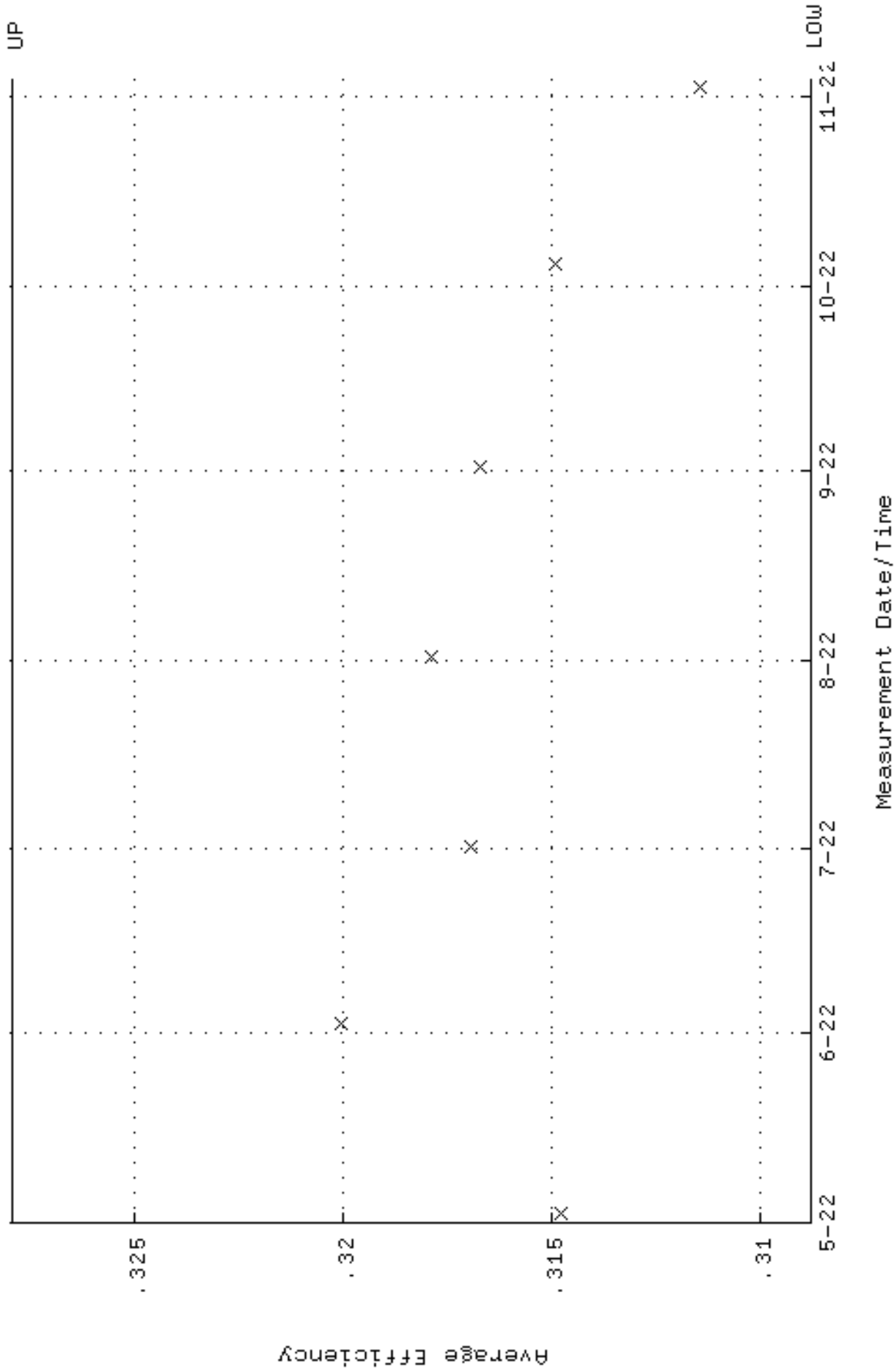
QA filename : DKA100:[ENV_ALPHA.QA.W]W011.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



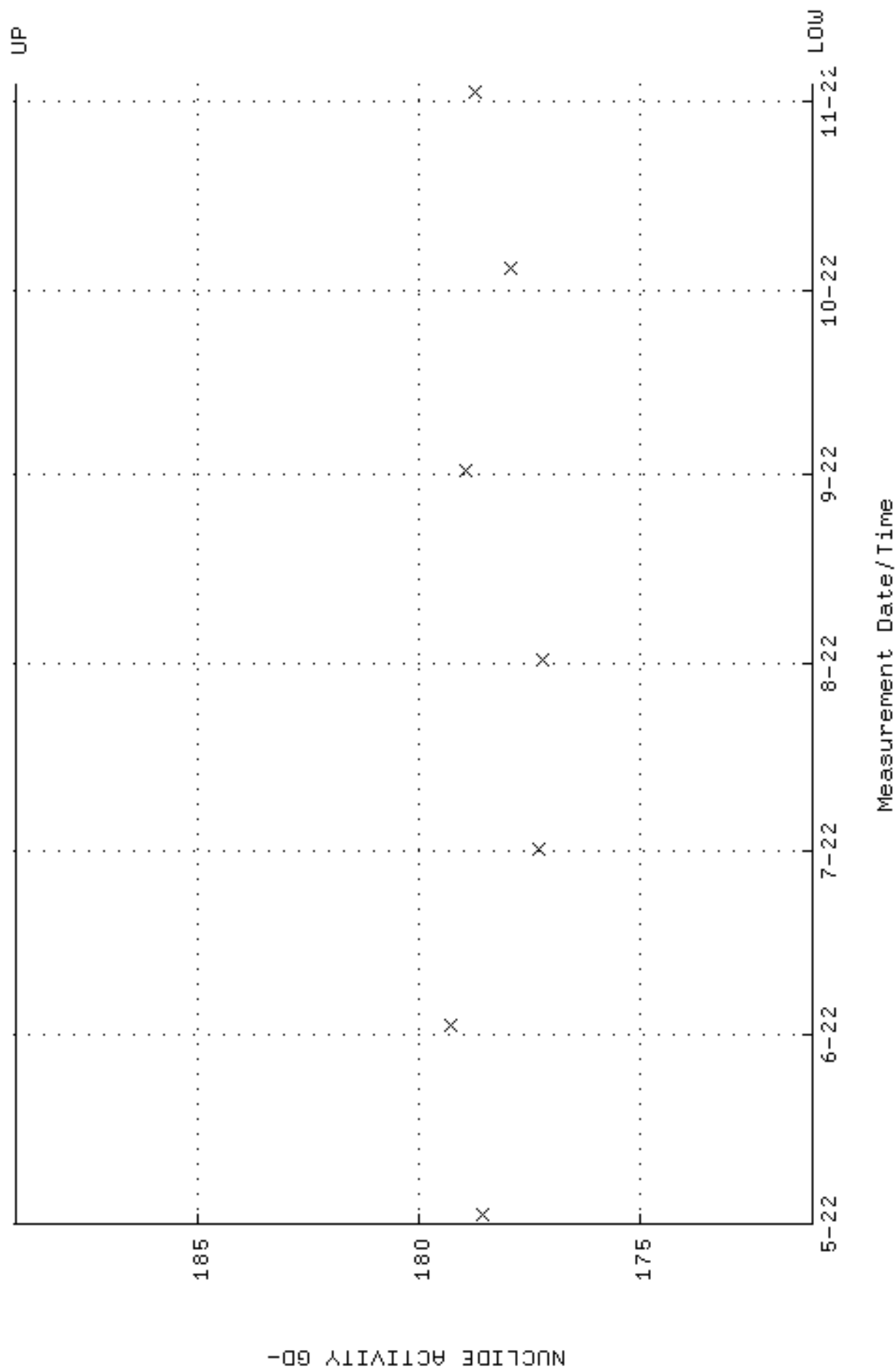
QA filename : DKA100:[ENV_ALPHA.QA.B]B011.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-MAY-2022 14:17:29 through 3-NOV-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



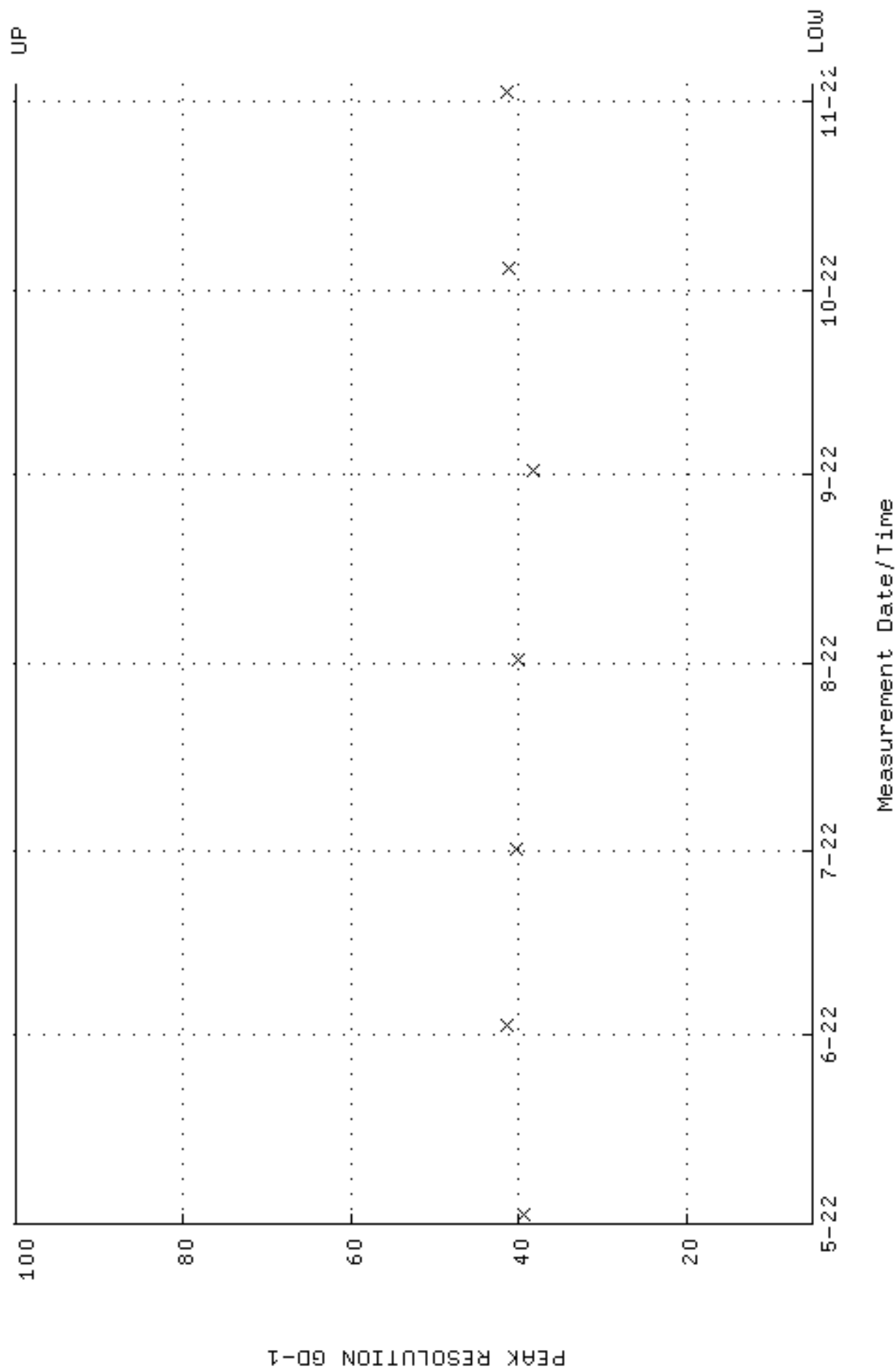
QA filename : DKA100:[ENV_ALPHA.QA.W]W012.QAF;7
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
Lower/Upper Lmts: 0.308796 through 0.327900



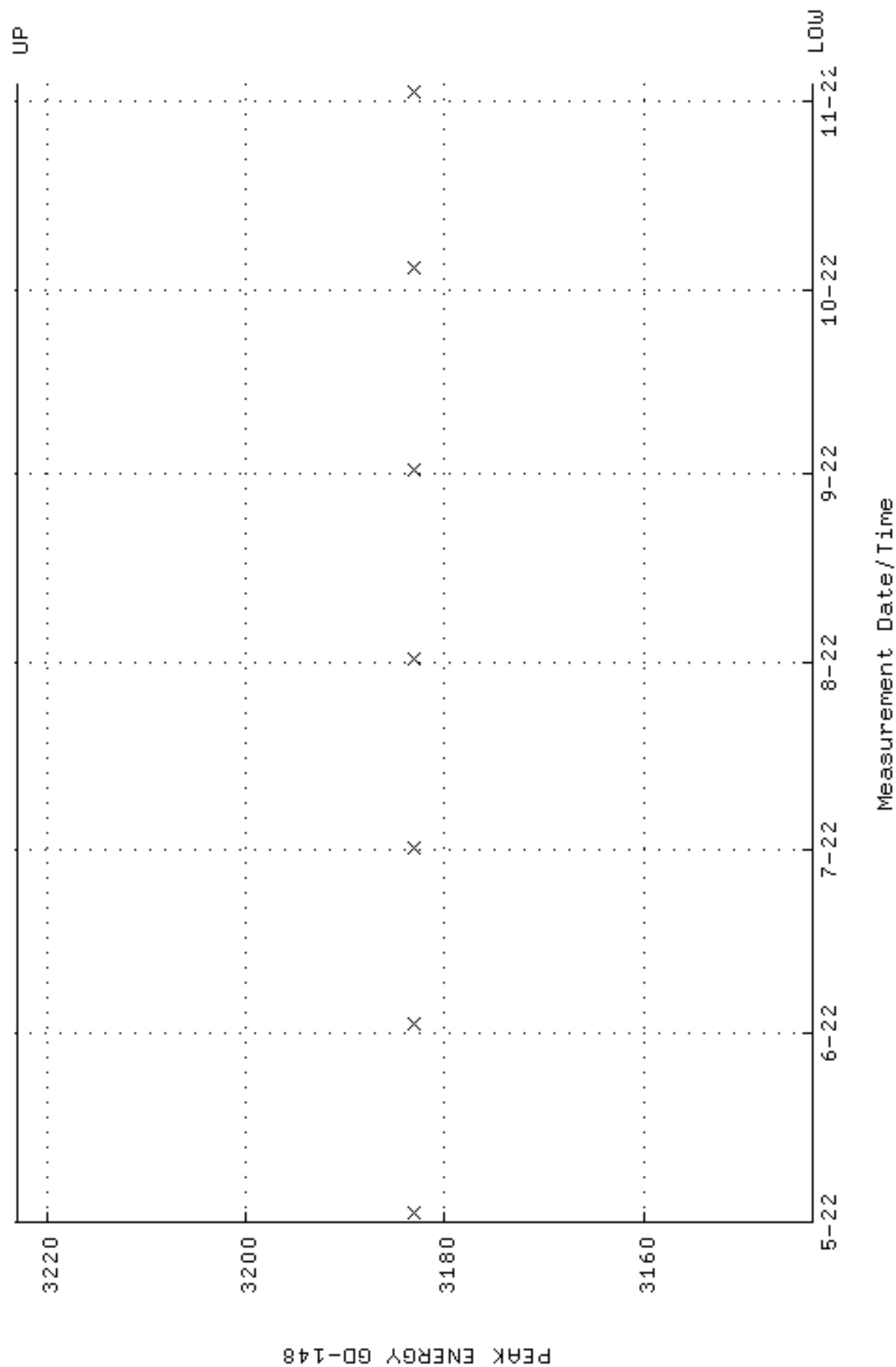
QA filename : DKA100:[ENV_ALPHA.QA.W]W012.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



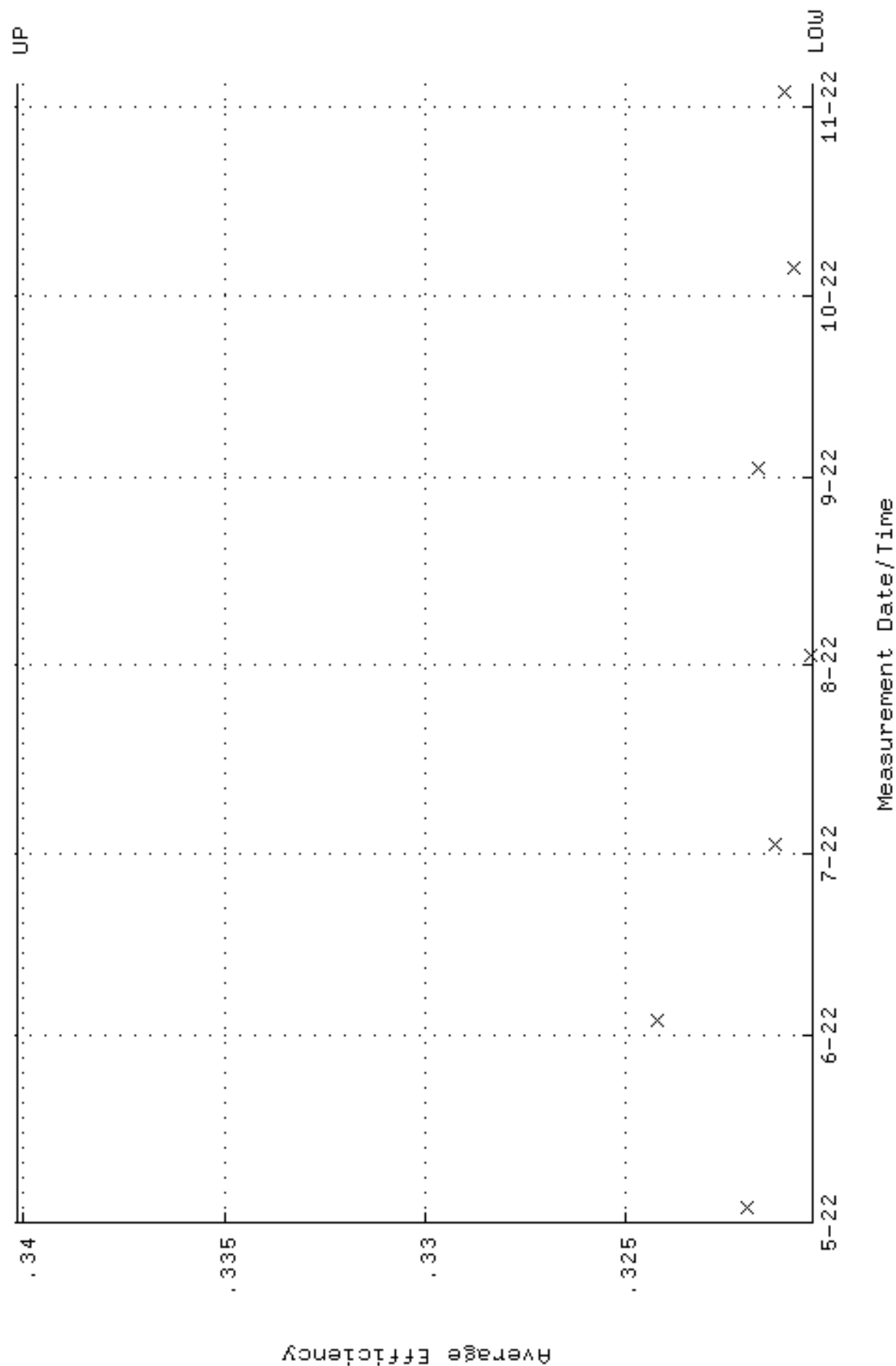
QA filename : DKA100:[ENV_ALPHA.QA.W]W012.QAF;7
Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



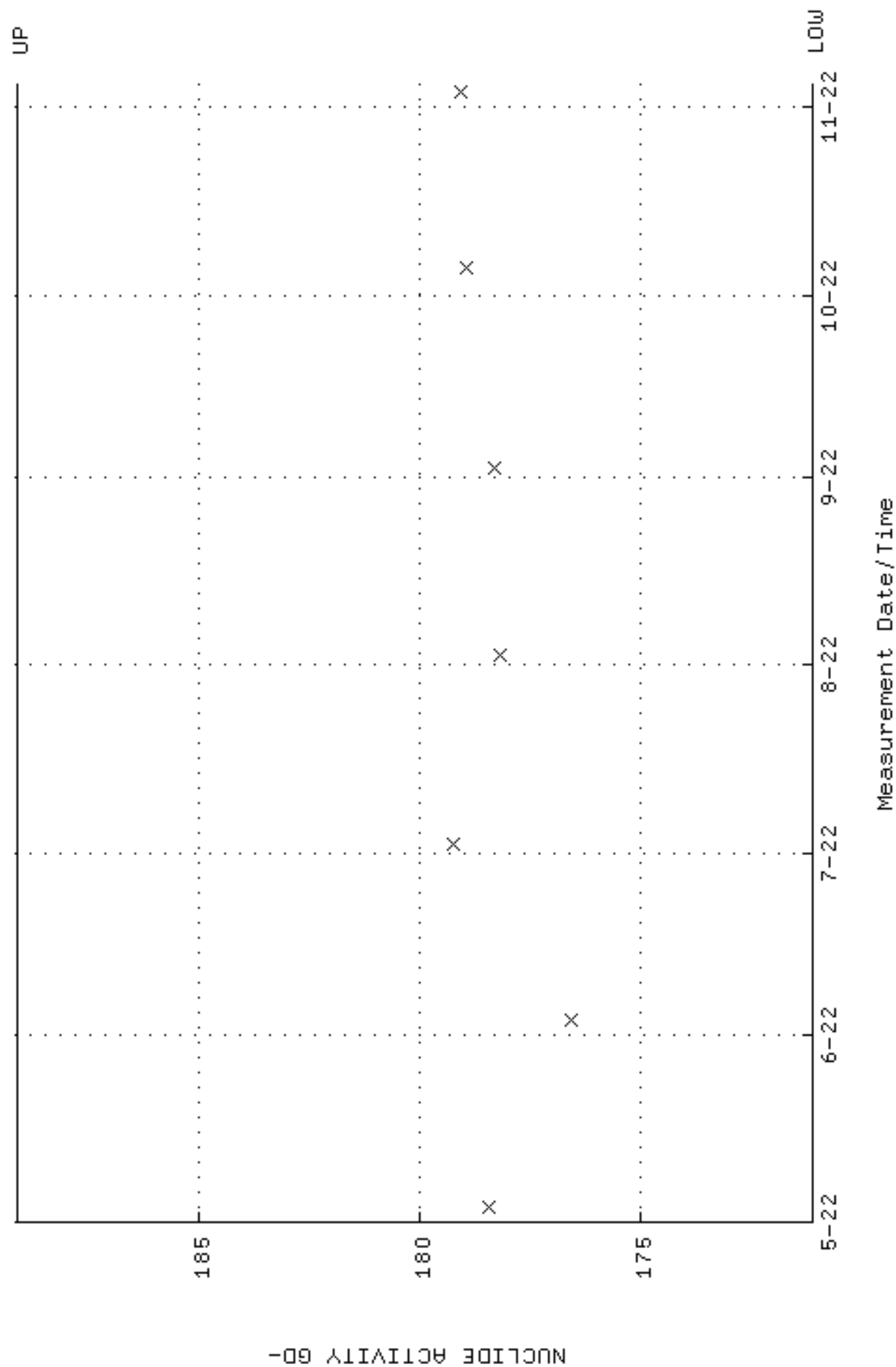
QA filename : DKA100:[ENV_ALPHA.QA.W]W012.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-MAY-2022 09:46:43 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



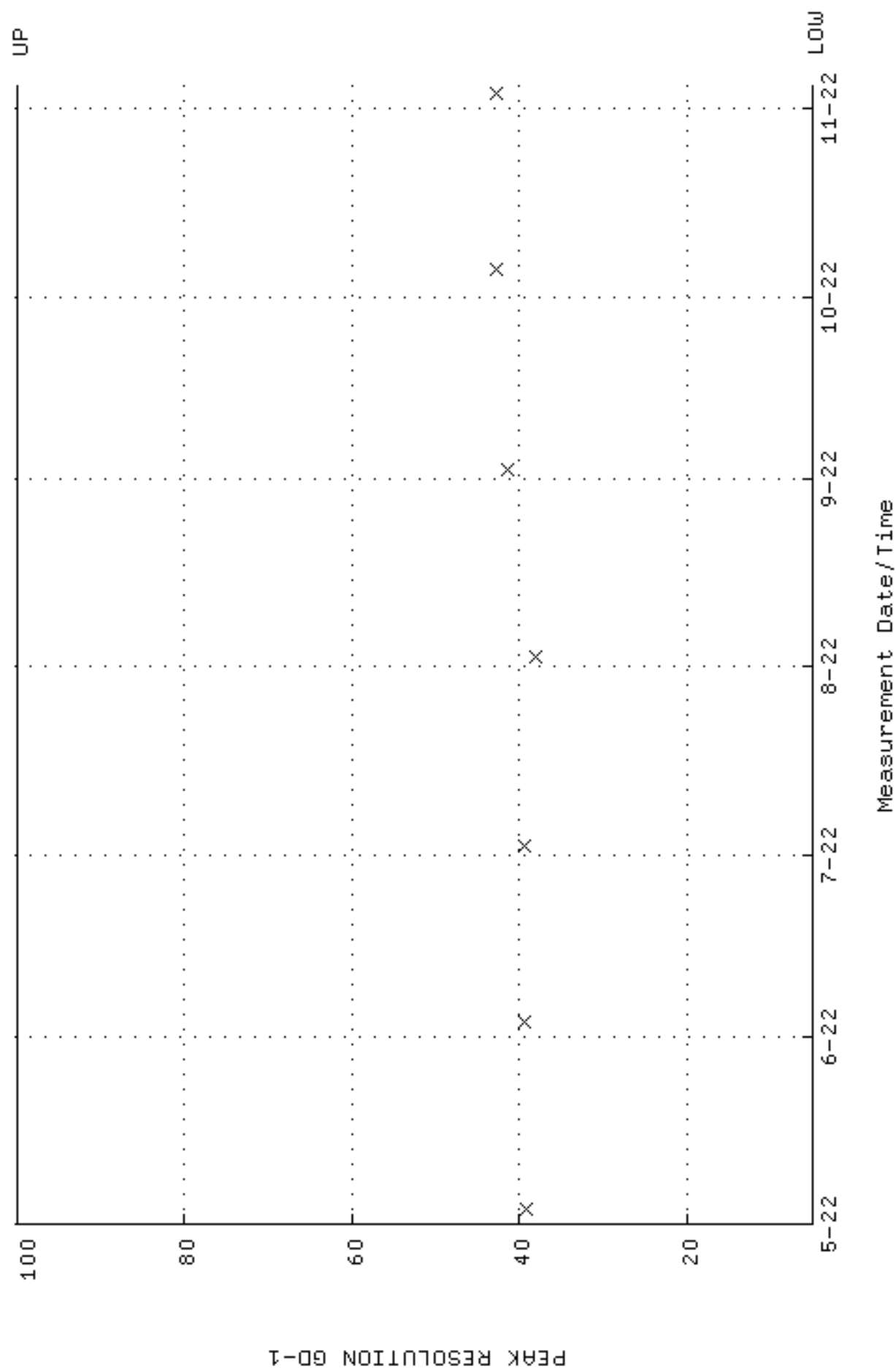
QA filename : DKA100:[ENV_ALPHA.QA.W]W031.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-MAY-2022 09:52:21 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.320340 through 0.340160



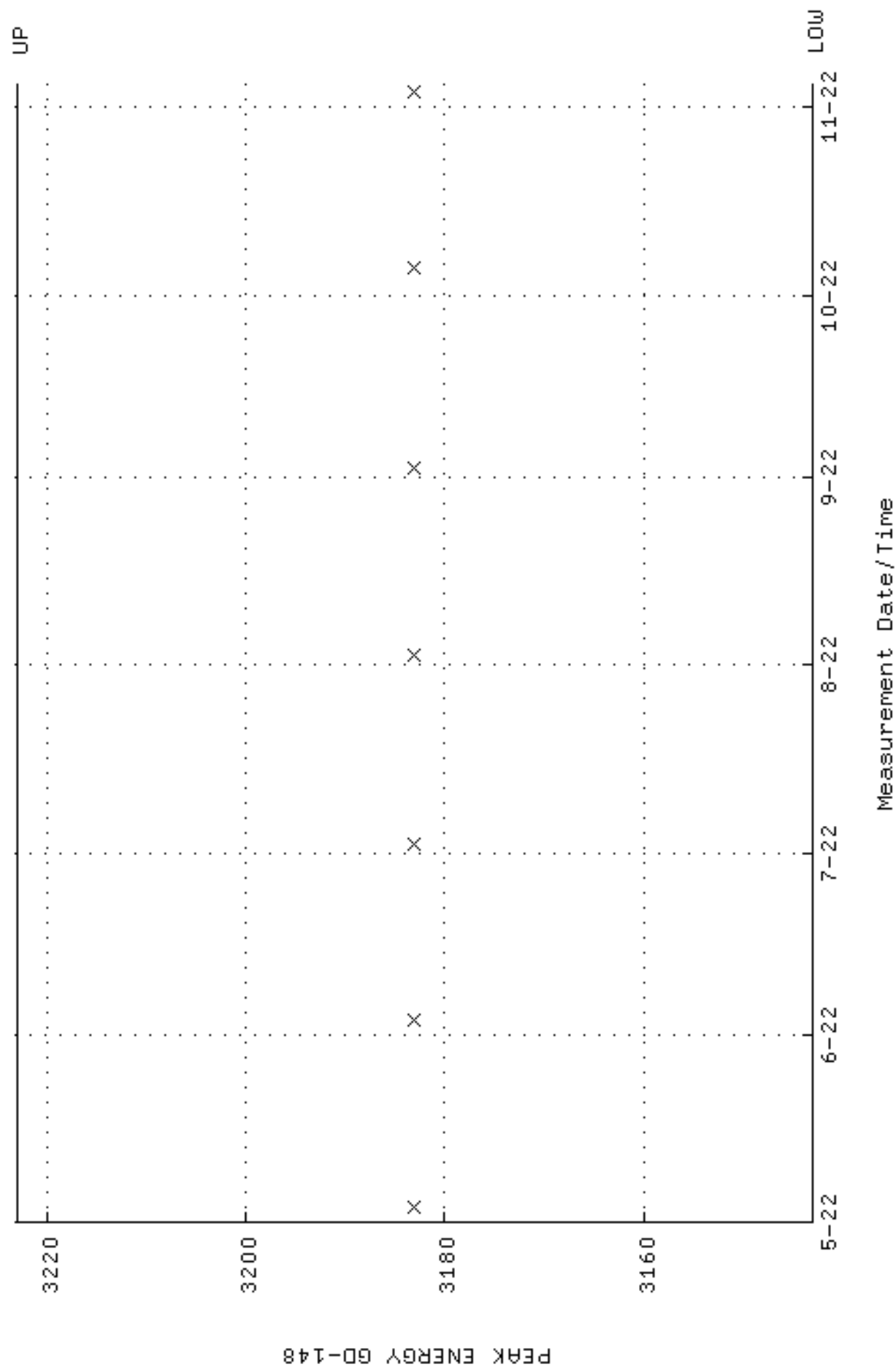
QA filename : DKA100:[ENV_ALPHA.QA.W]W031.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-MAY-2022 09:52:21 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



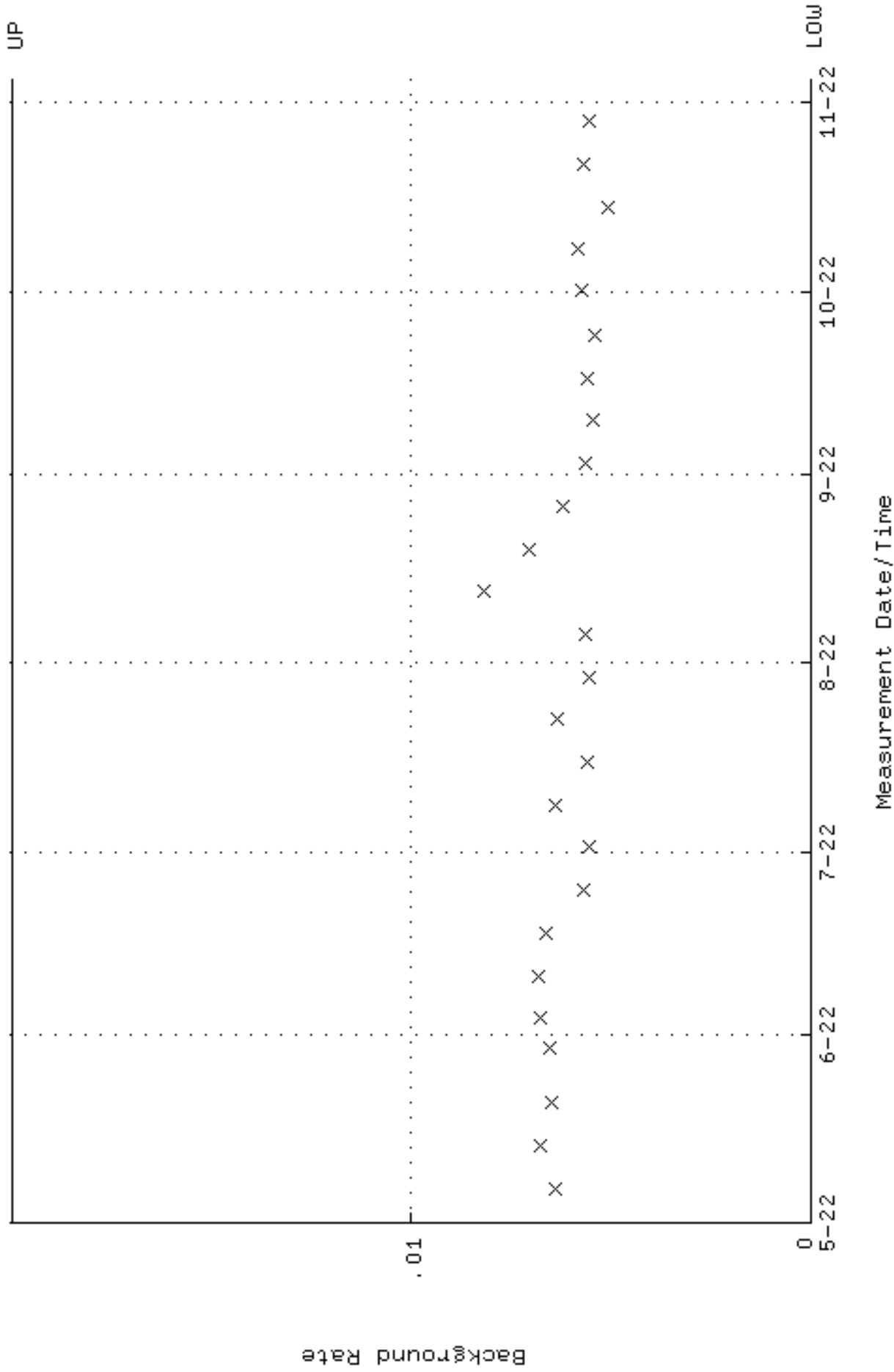
QA filename : DKA100:[ENV_ALPHA.QA.W]W031.QAF;8
Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 3-MAY-2022 09:52:21 through 4-NOV-2022 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



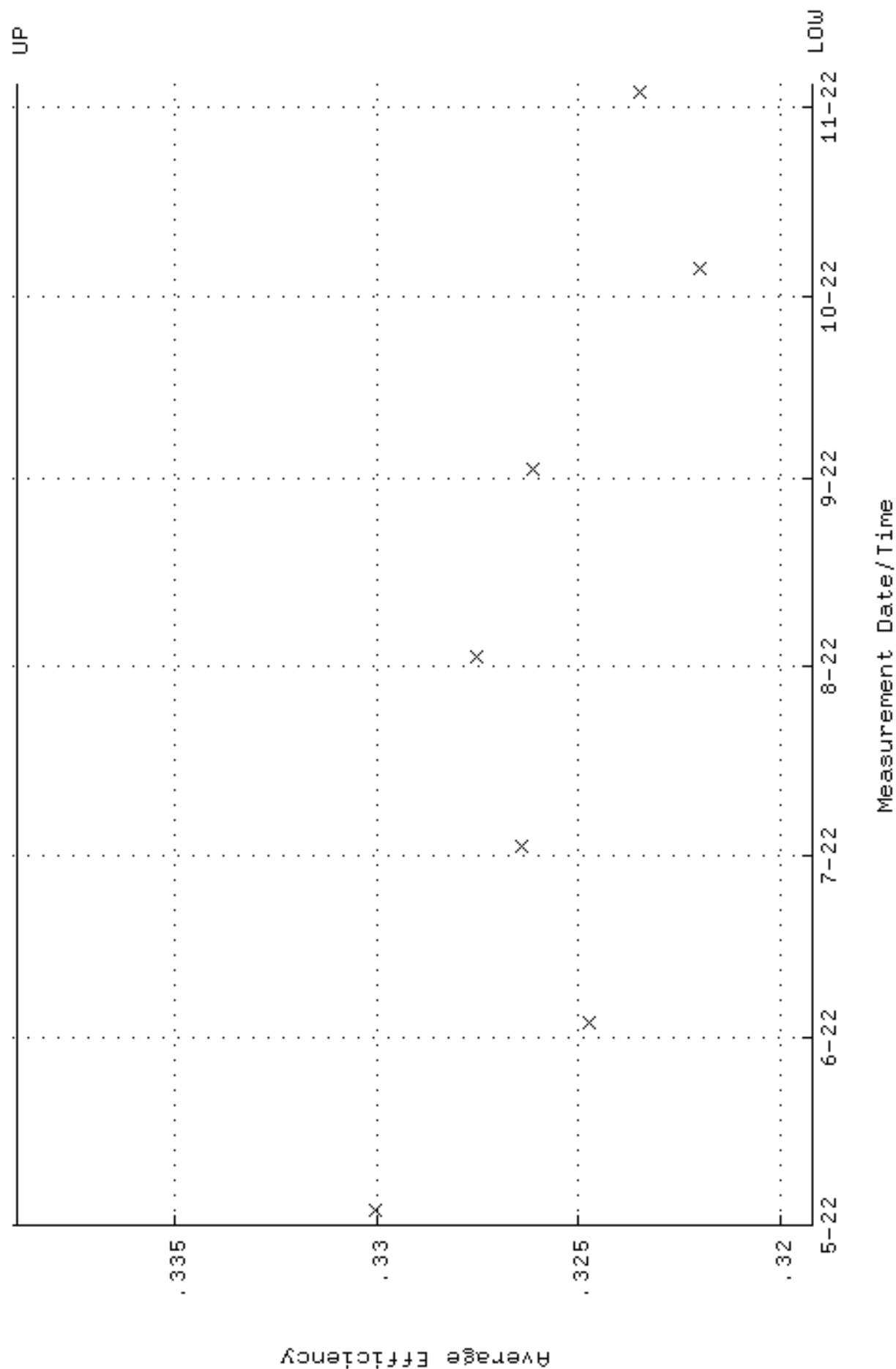
QA filename : DKA100:[ENV_ALPHA.QA.W]W031.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-MAY-2022 09:52:21 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



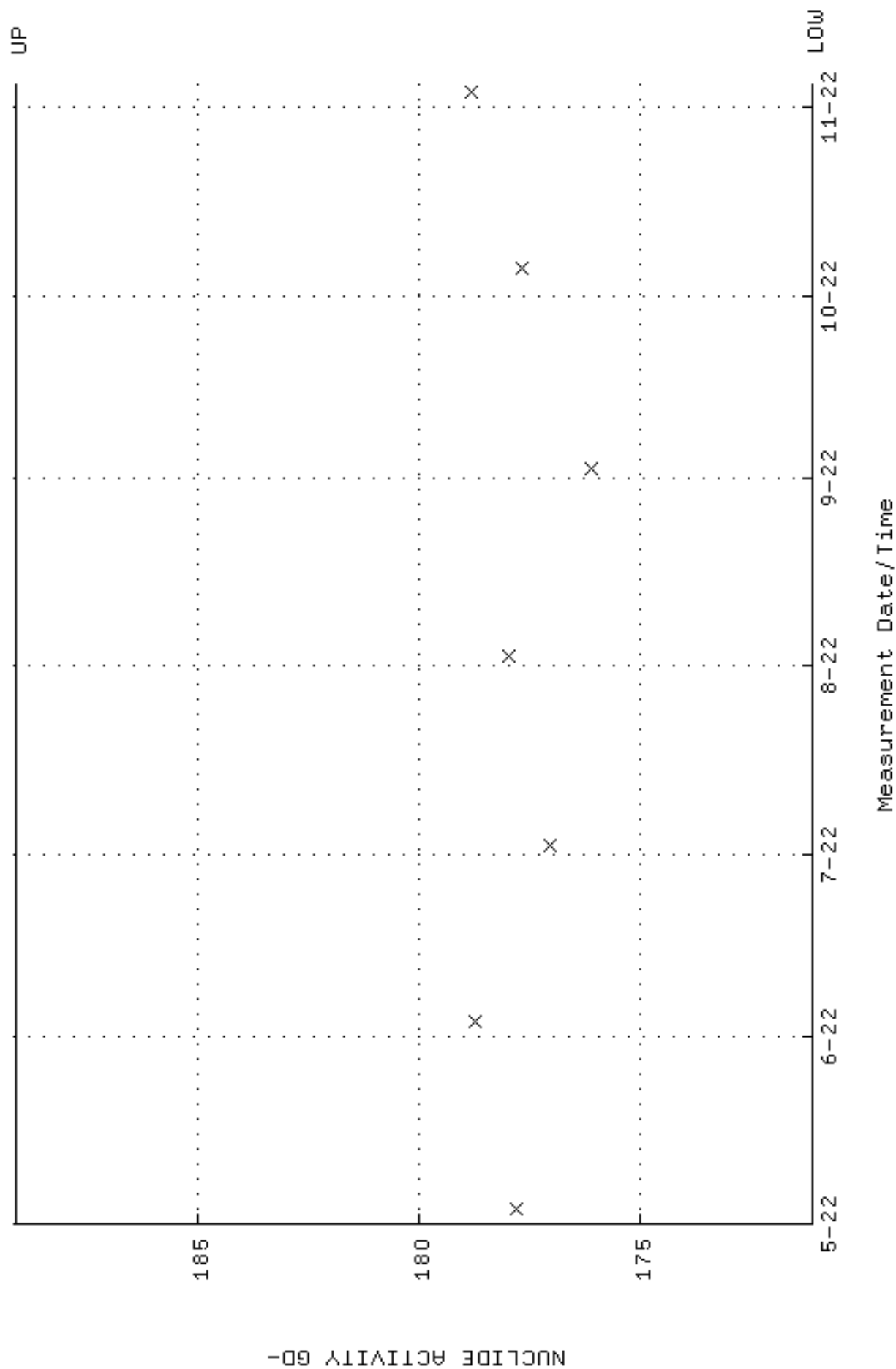
QA filename : DKA100:[ENV_ALPHA.QA.B]B031.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-MAY-2022 12:58:09 through 4-NOV-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



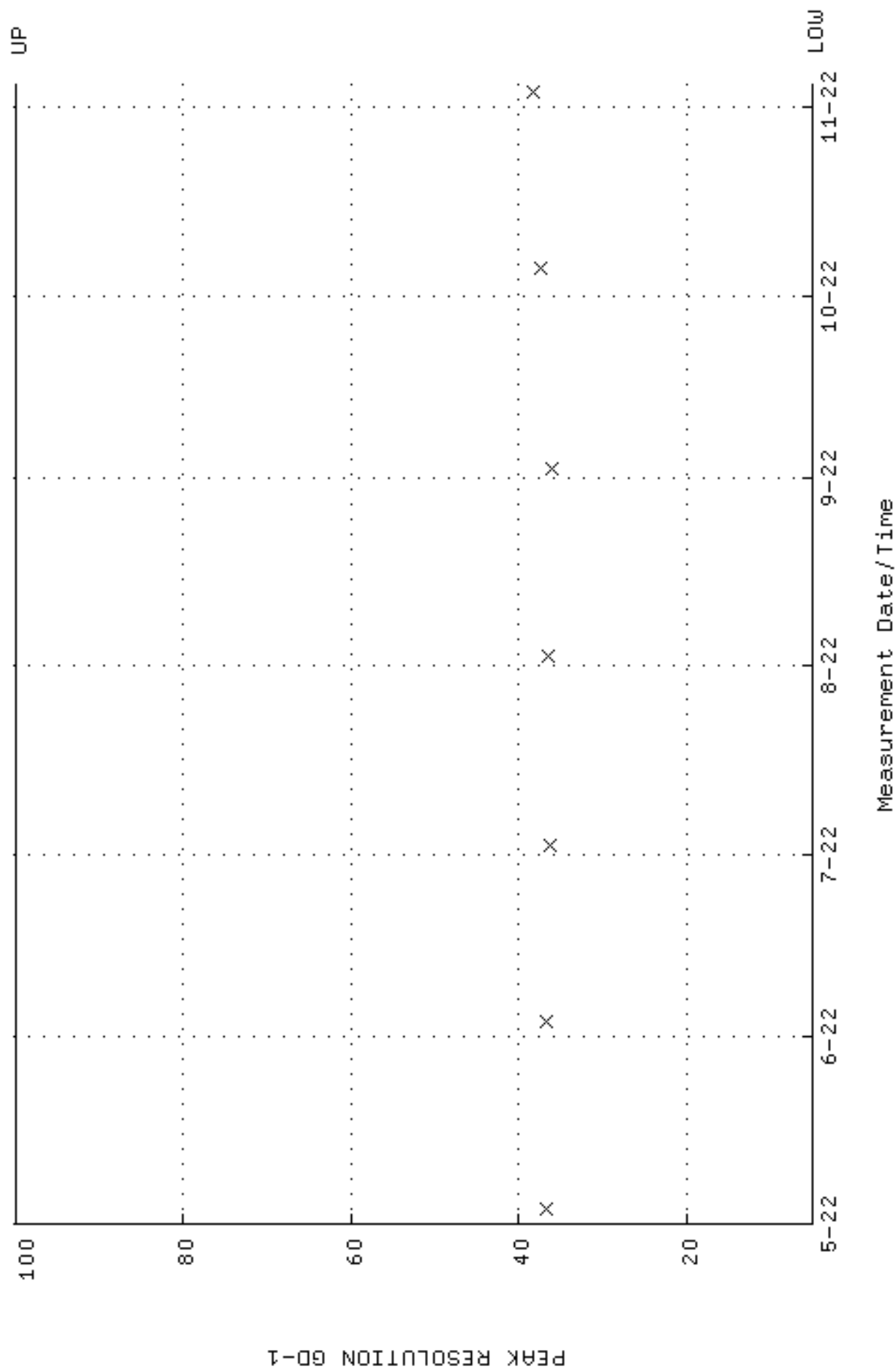
QA filename : DKA100:[ENV_ALPHA.QA.W]W033.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-MAY-2022 09:52:21 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.319214 through 0.338960



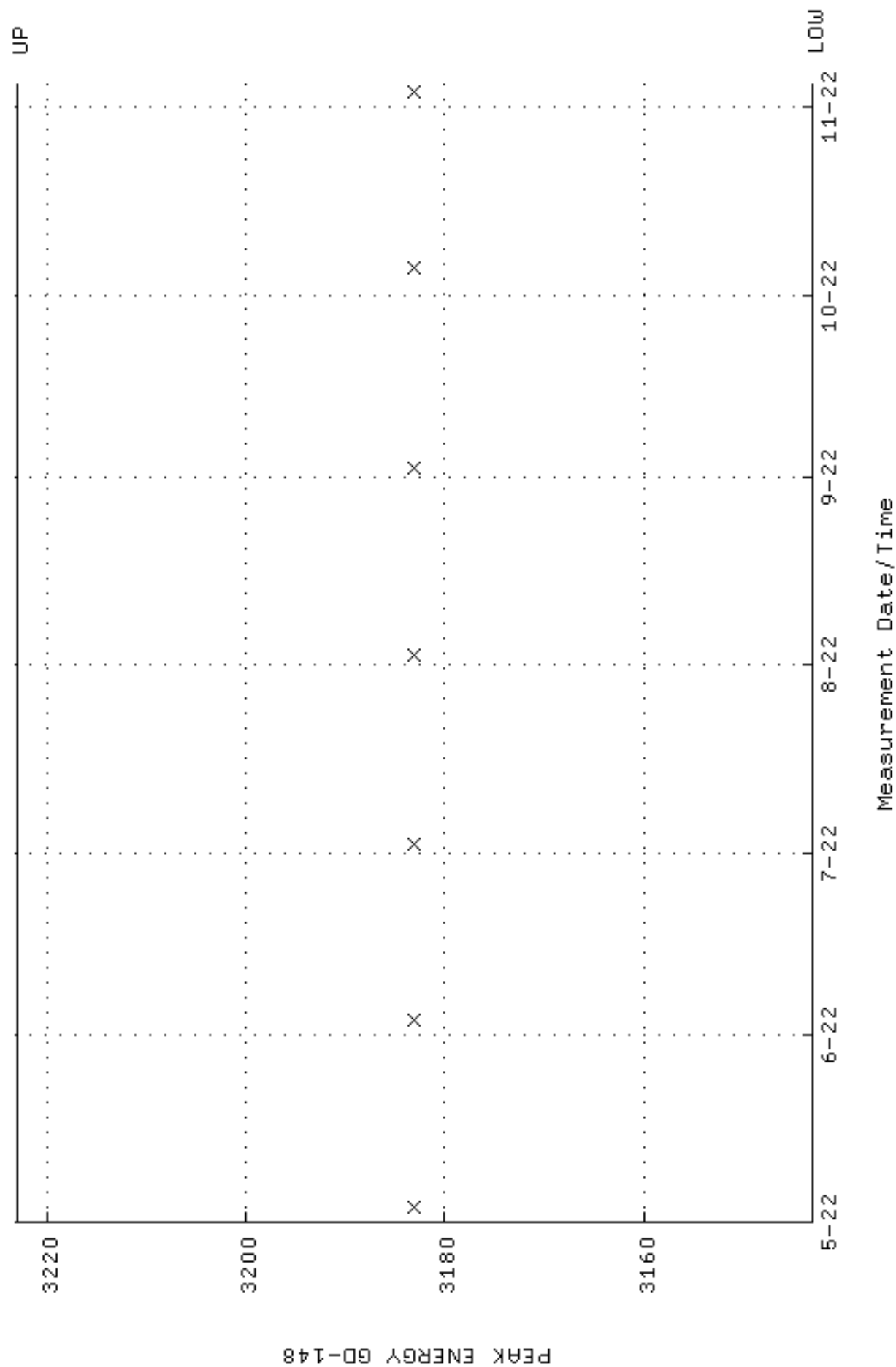
QA filename : DKA100:[ENV_ALPHA.QA.W]W033.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-MAY-2022 09:52:21 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



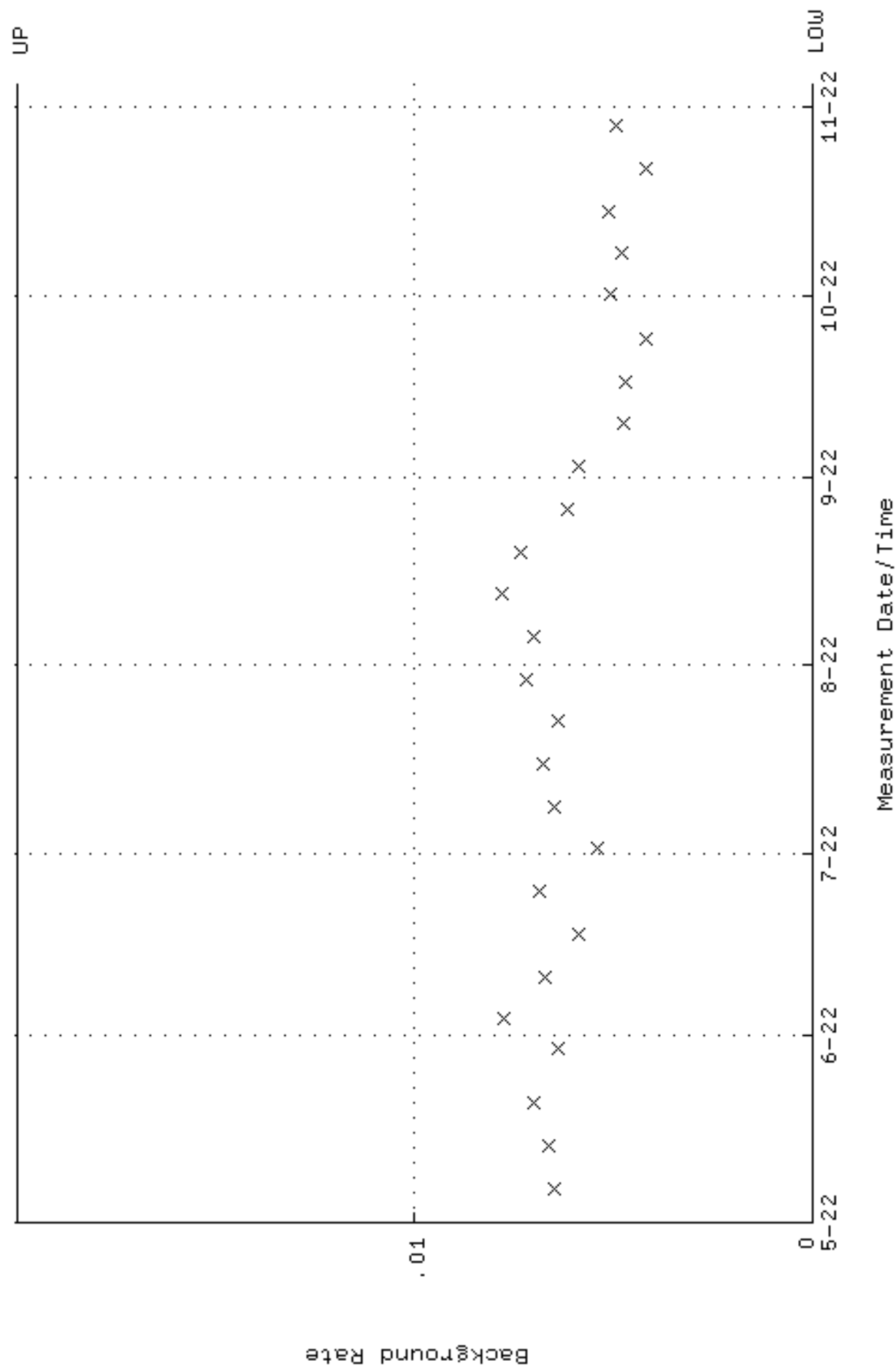
QA filename : DKA100:[ENV_ALPHA.QA.W]W033.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-MAY-2022 09:52:21 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



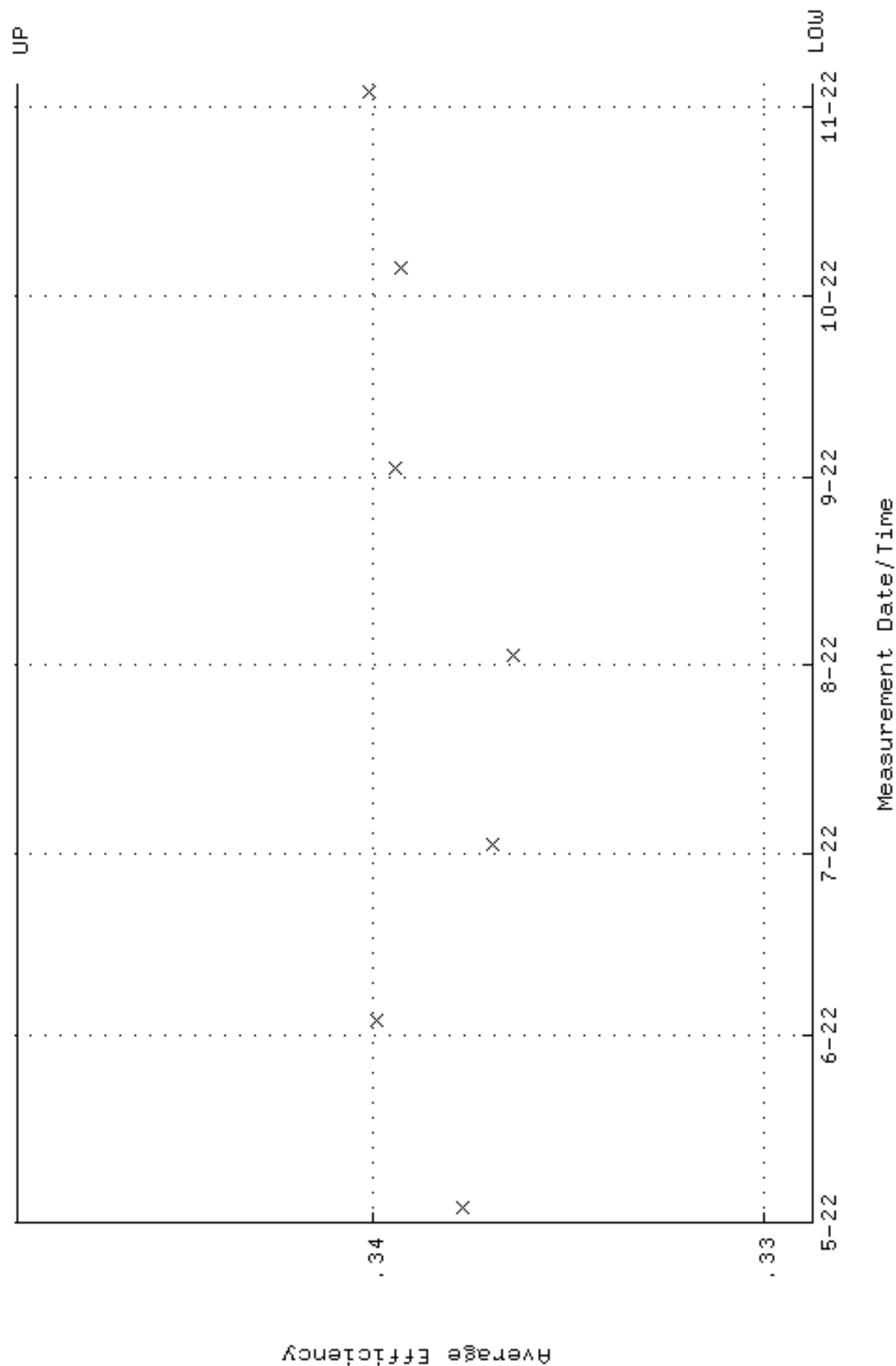
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-MAY-2022 09:52:21 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



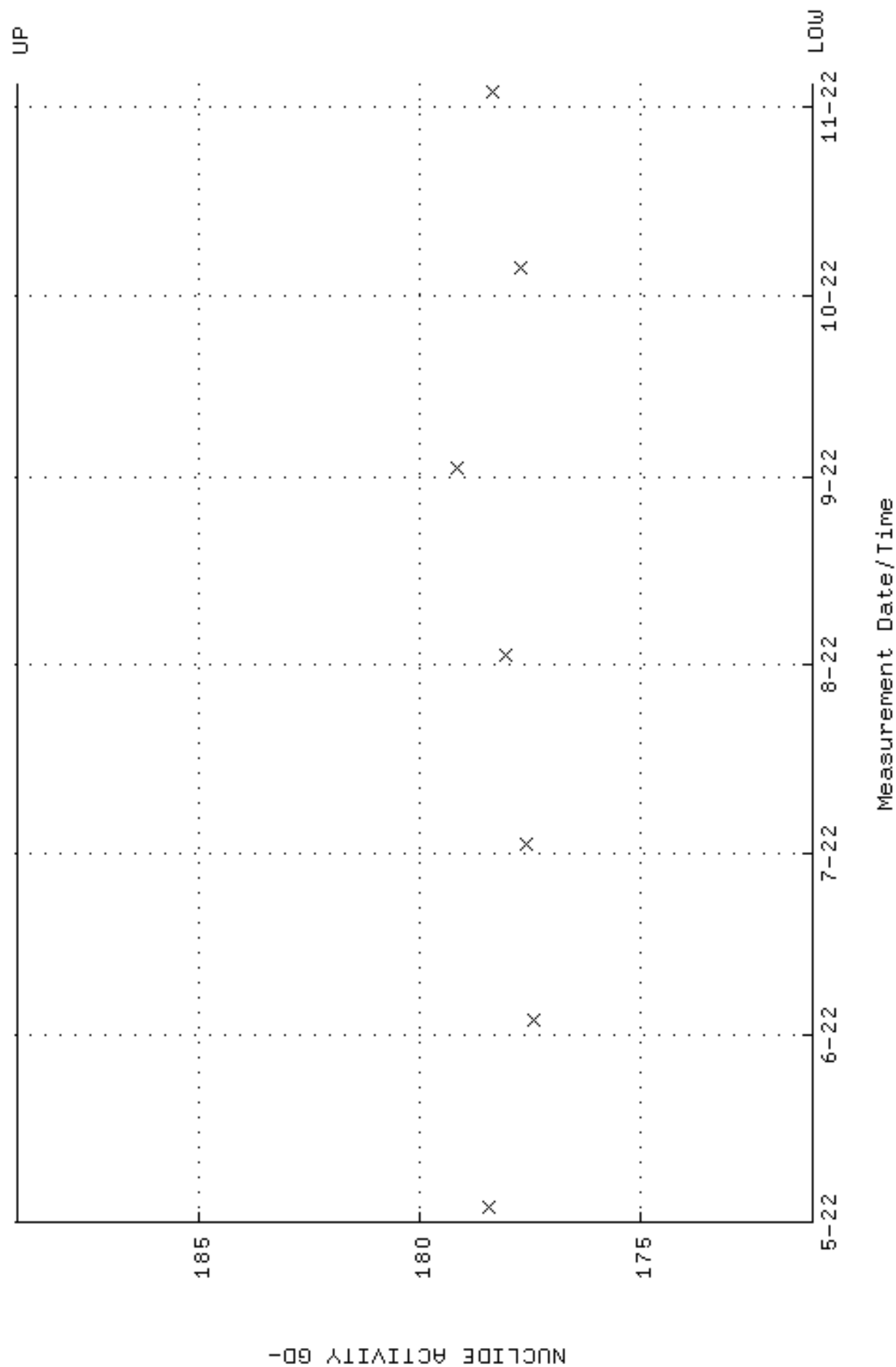
QA filename : DKA100:[ENV_ALPHA.QA.B]B033.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-MAY-2022 12:58:09 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



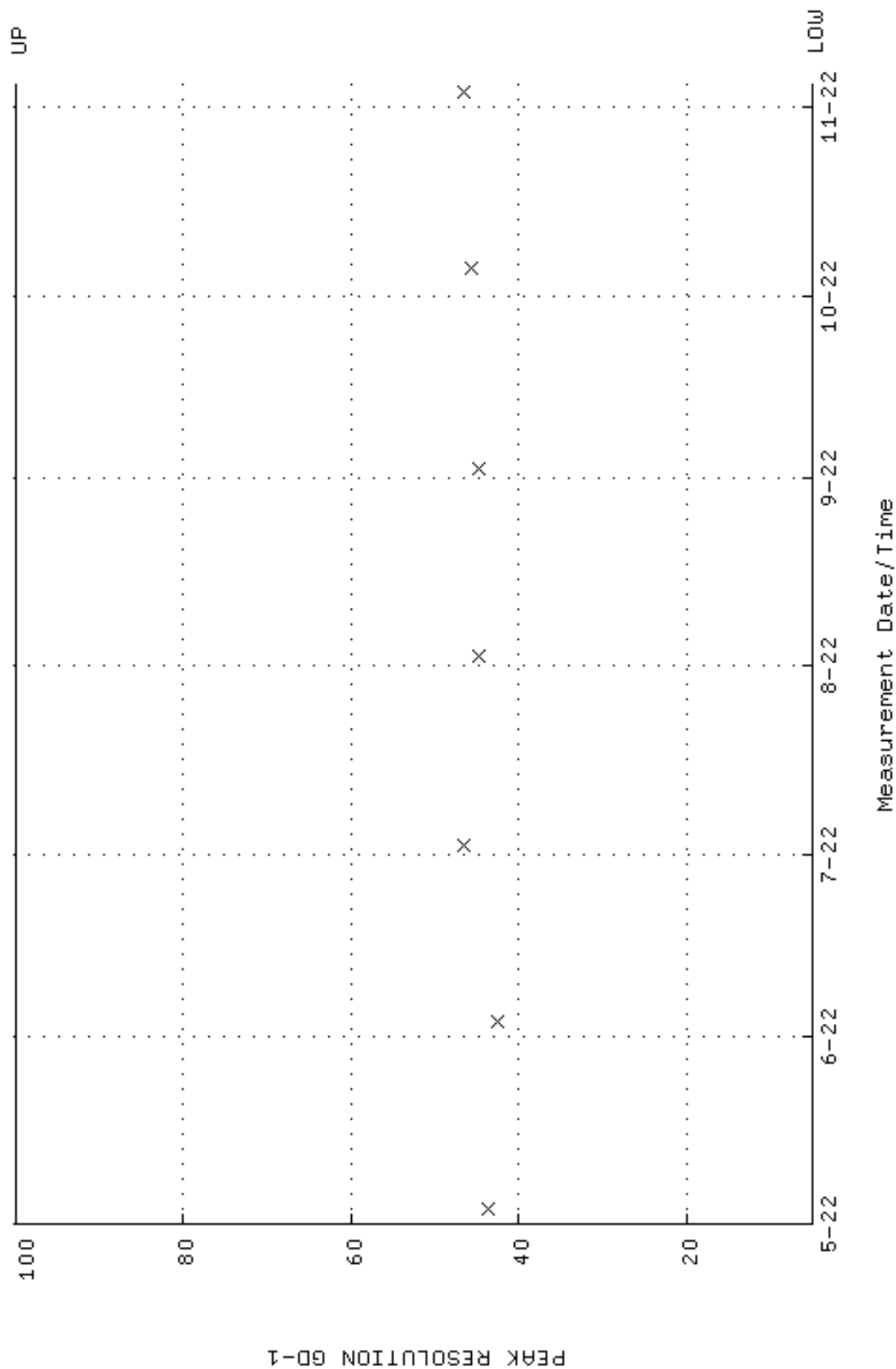
QA filename : DKA100:[ENV_ALPHA.QA.W]W040.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.328745 through 0.349079



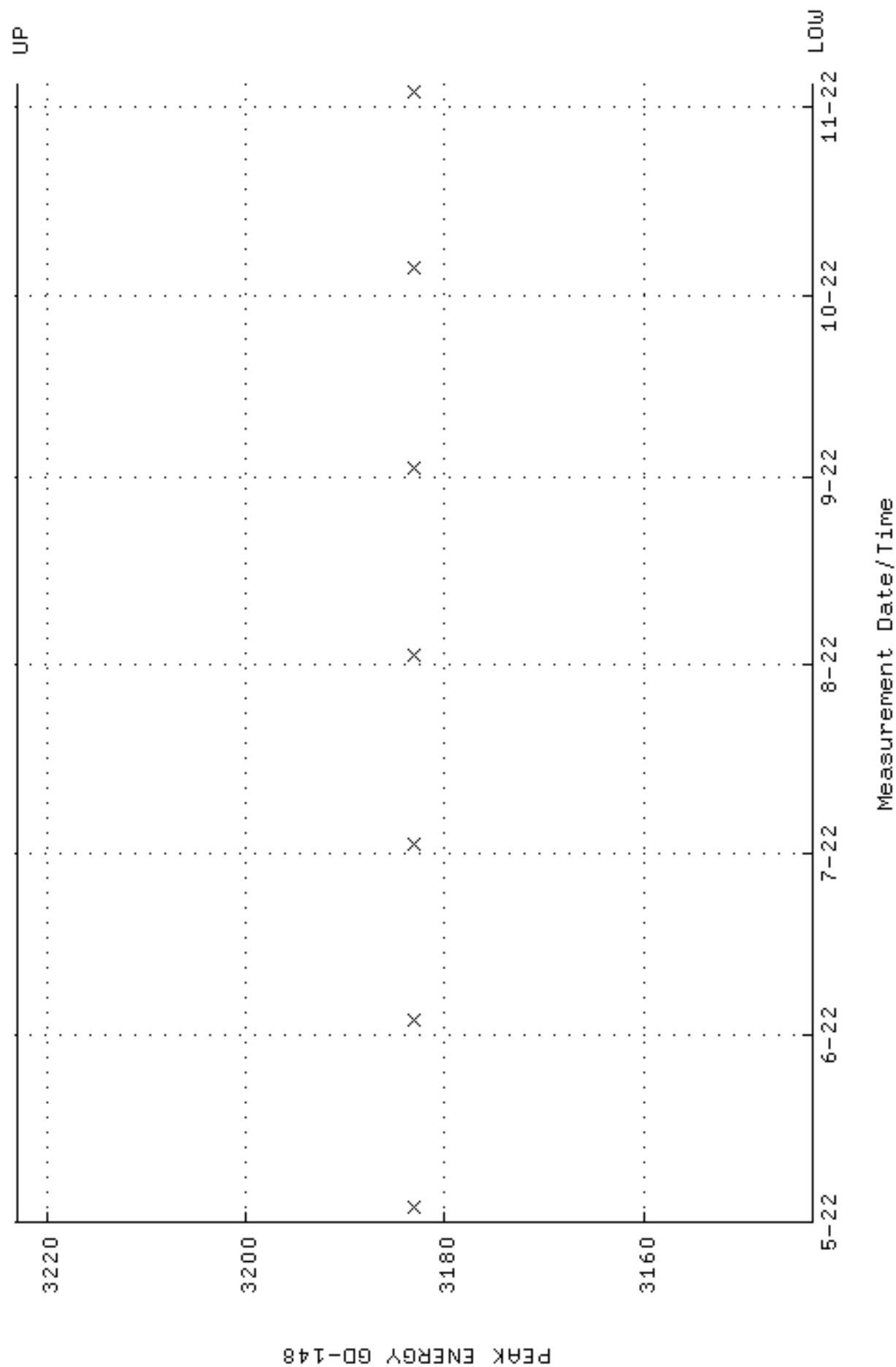
QA filename : DKA100:[ENV_ALPHA.QA.W]W040.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



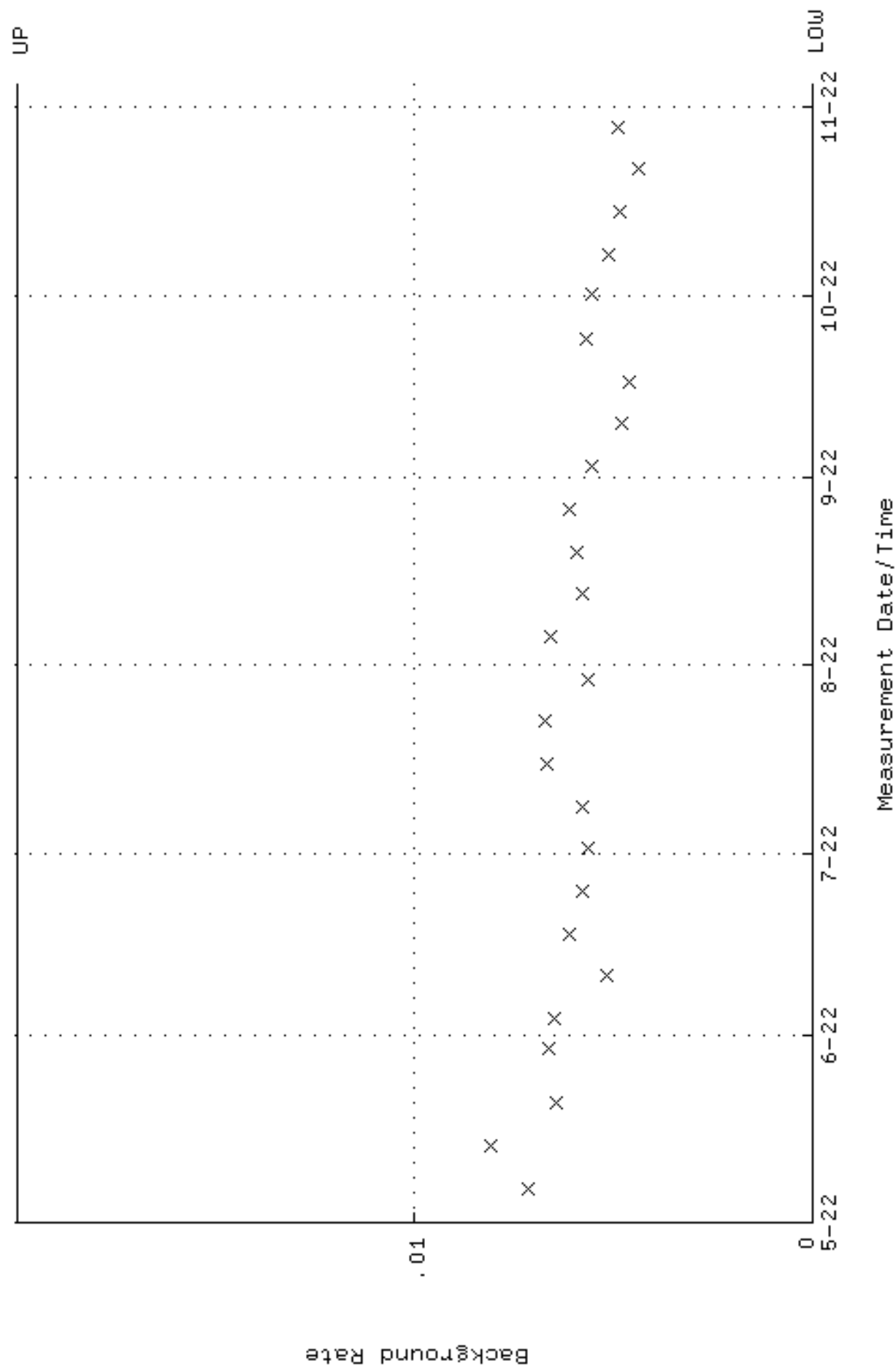
QA filename : DKA100:[ENV_ALPHA.QA.W]W040.QAF;6
Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



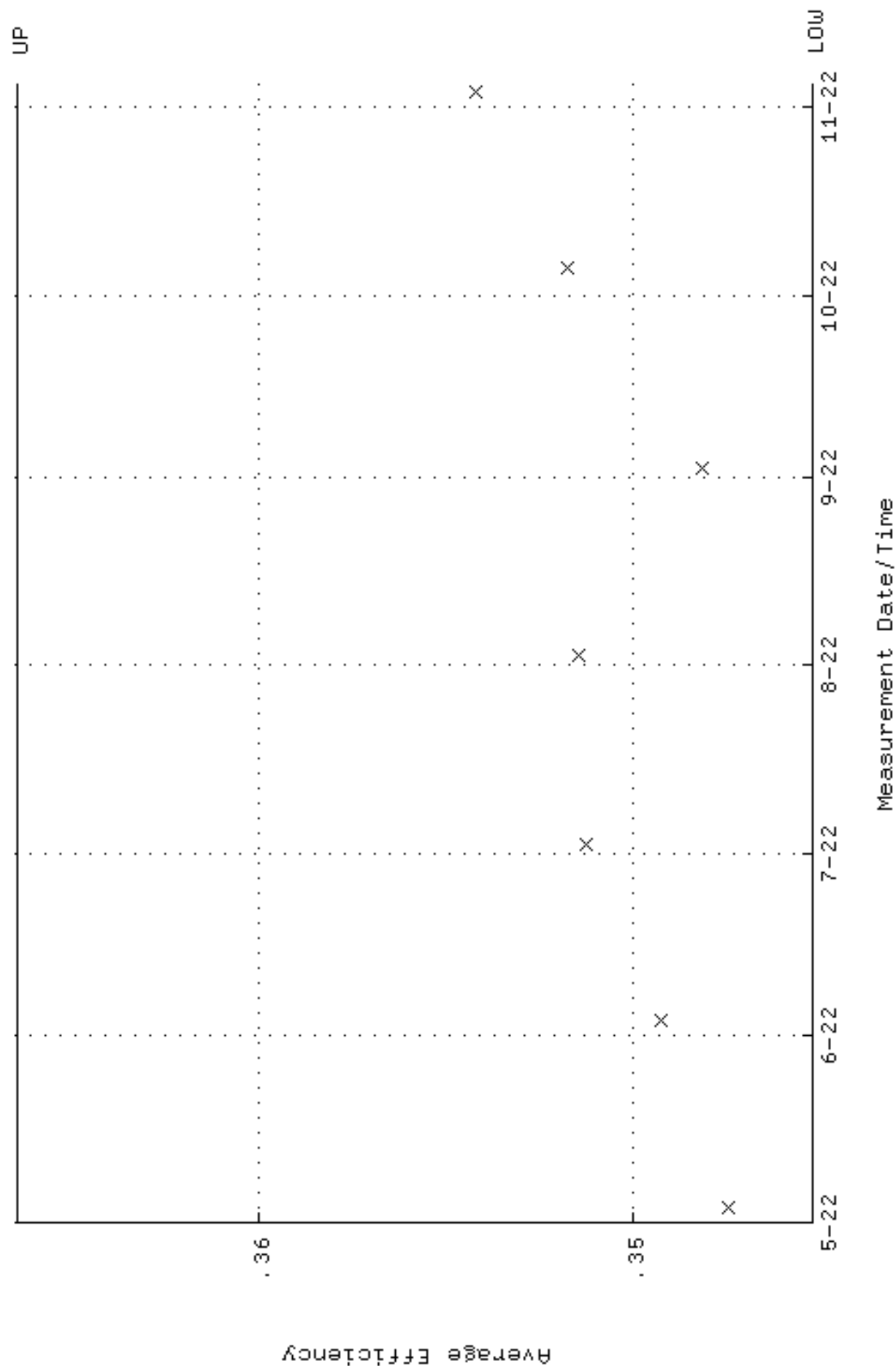
QA filename : DKA100:[ENV_ALPHA.QA.W]W040.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



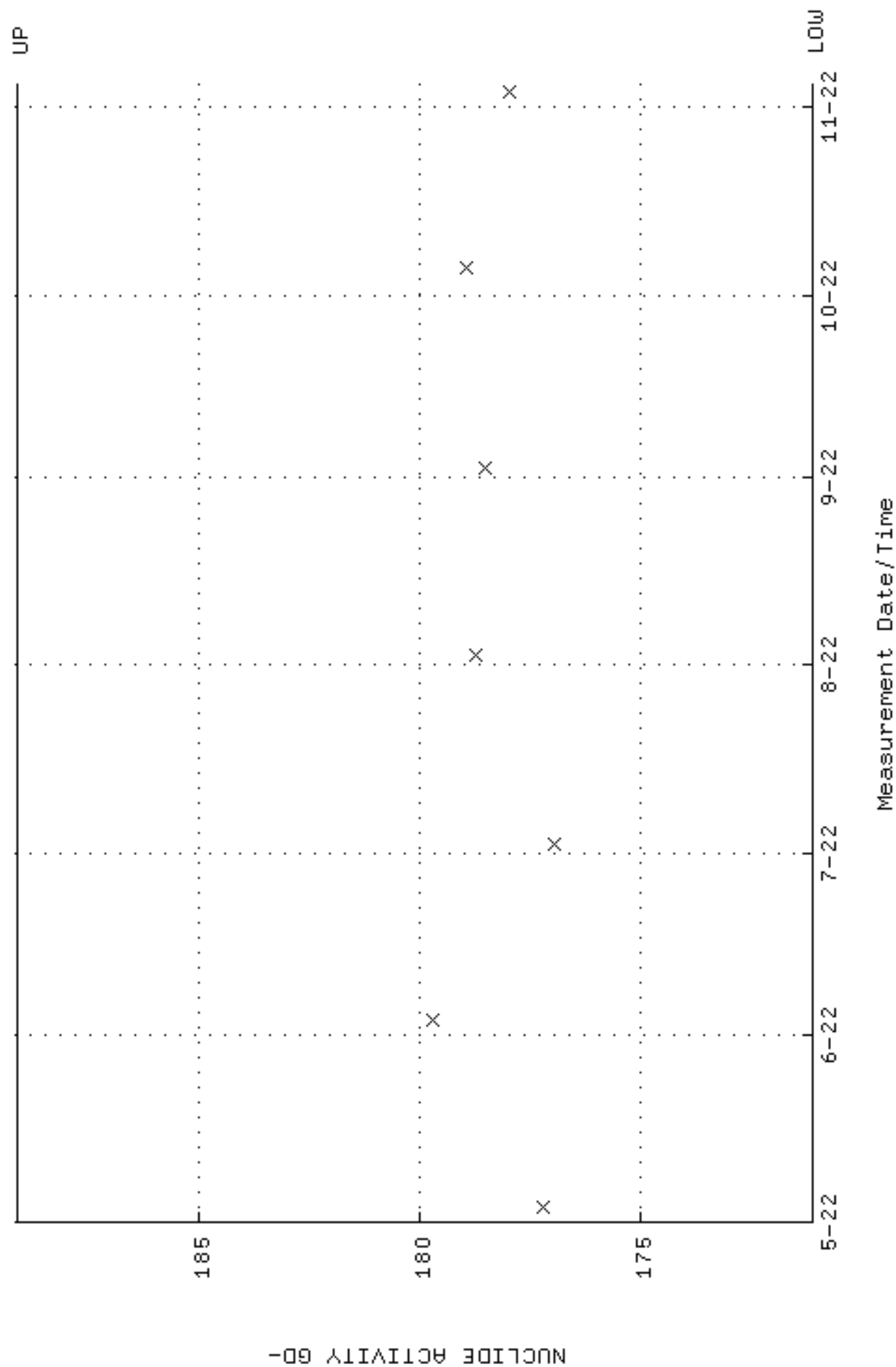
QA filename : DKA100:[ENV_ALPHA.QA.B]B040.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-MAY-2022 13:56:32 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



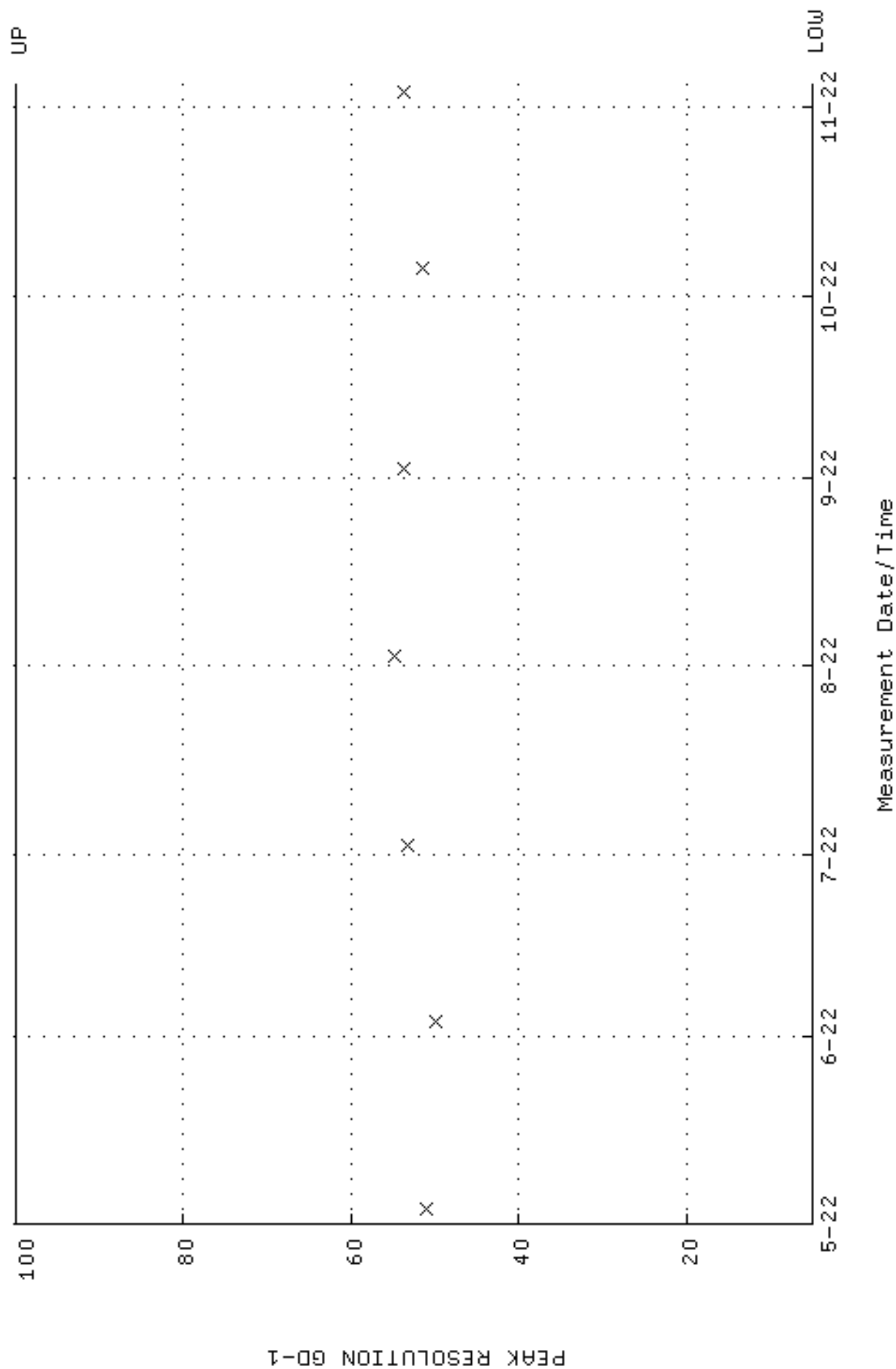
QA filename : DKA100:[ENV_ALPHA.QA.W]W041.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.345155 through 0.366505



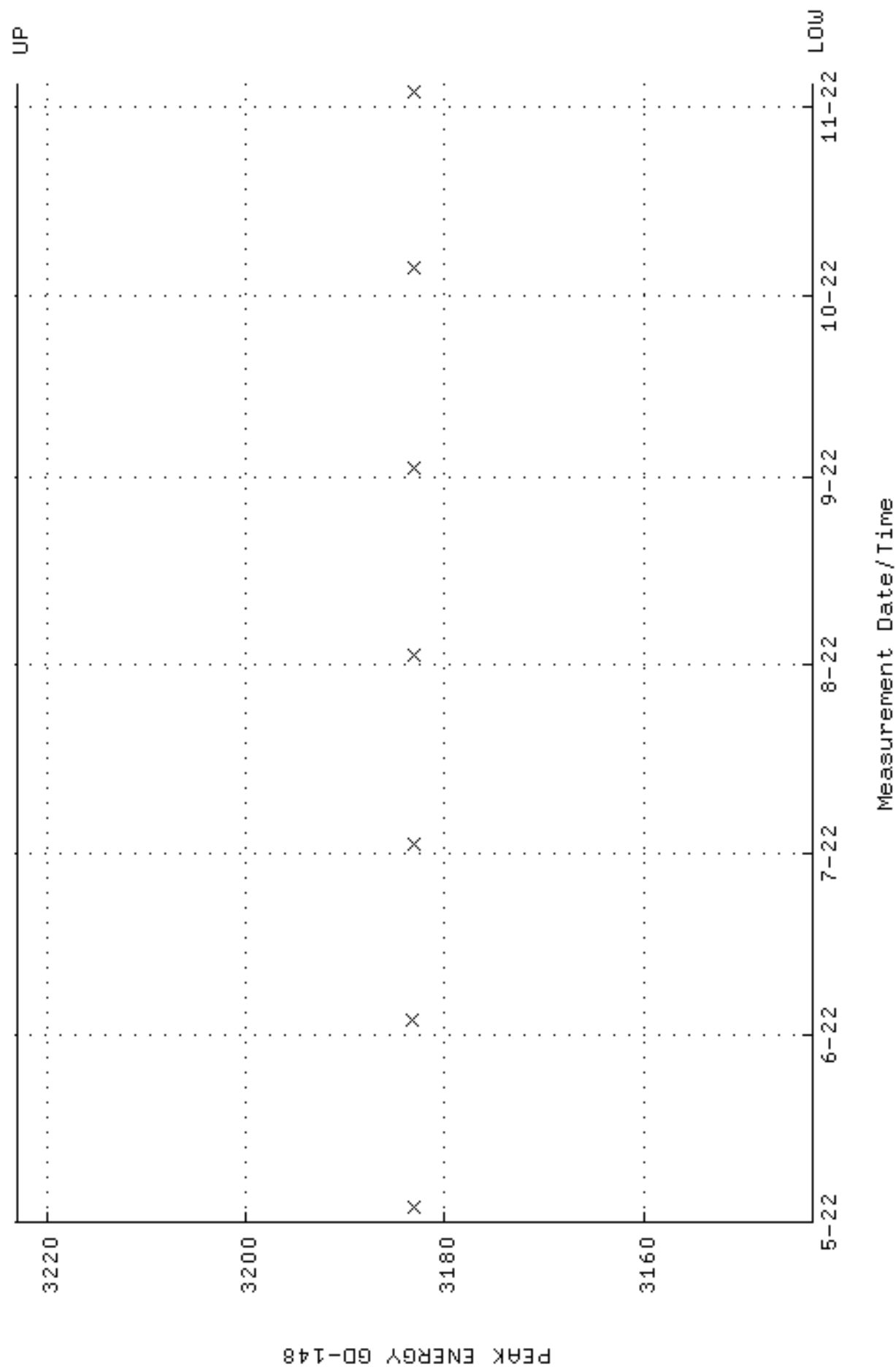
QA filename : DKA100:[ENV_ALPHA.QA.W]W041.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



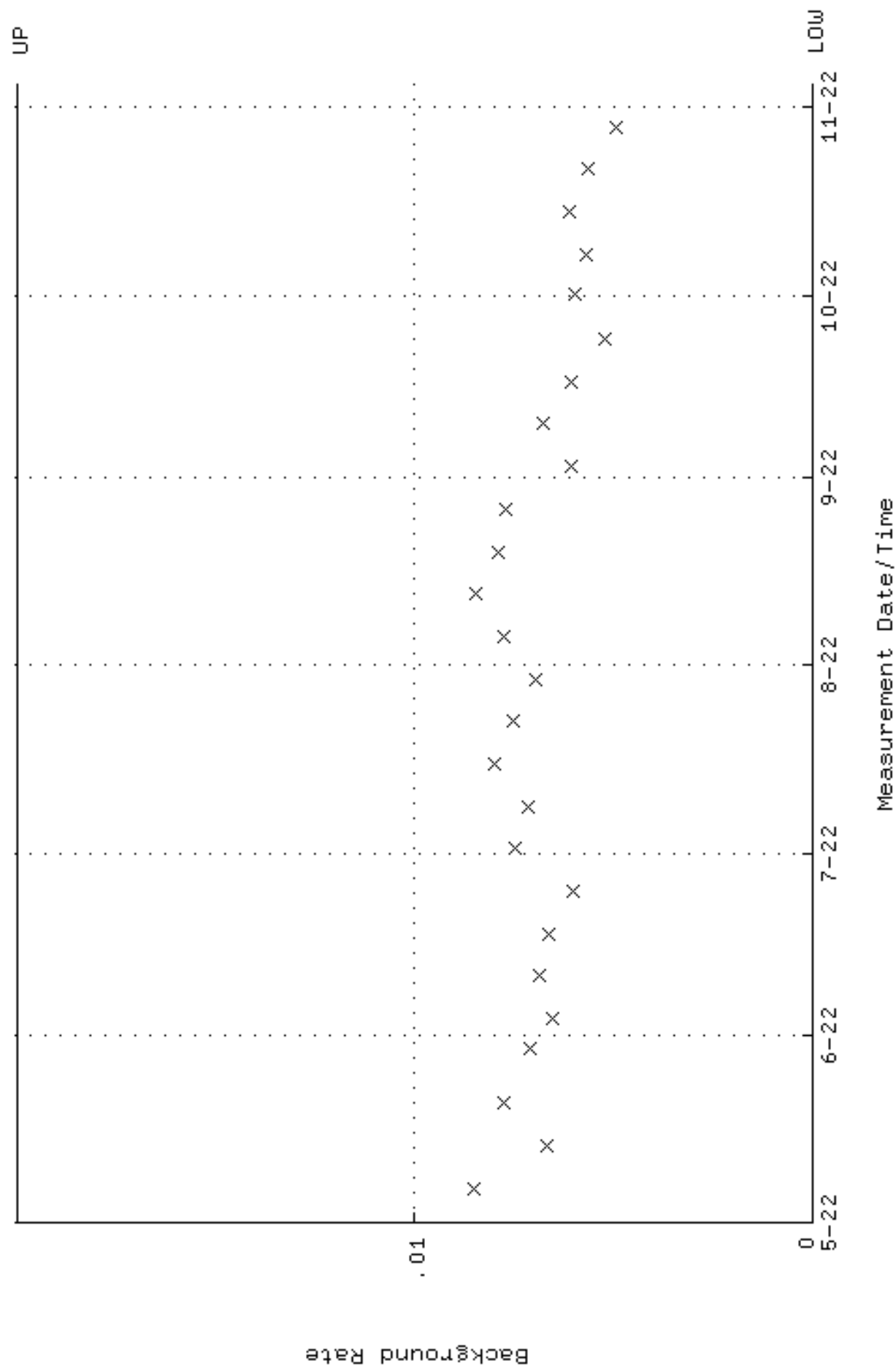
QA filename : DKA100:[ENV_ALPHA.QA.W]W041.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



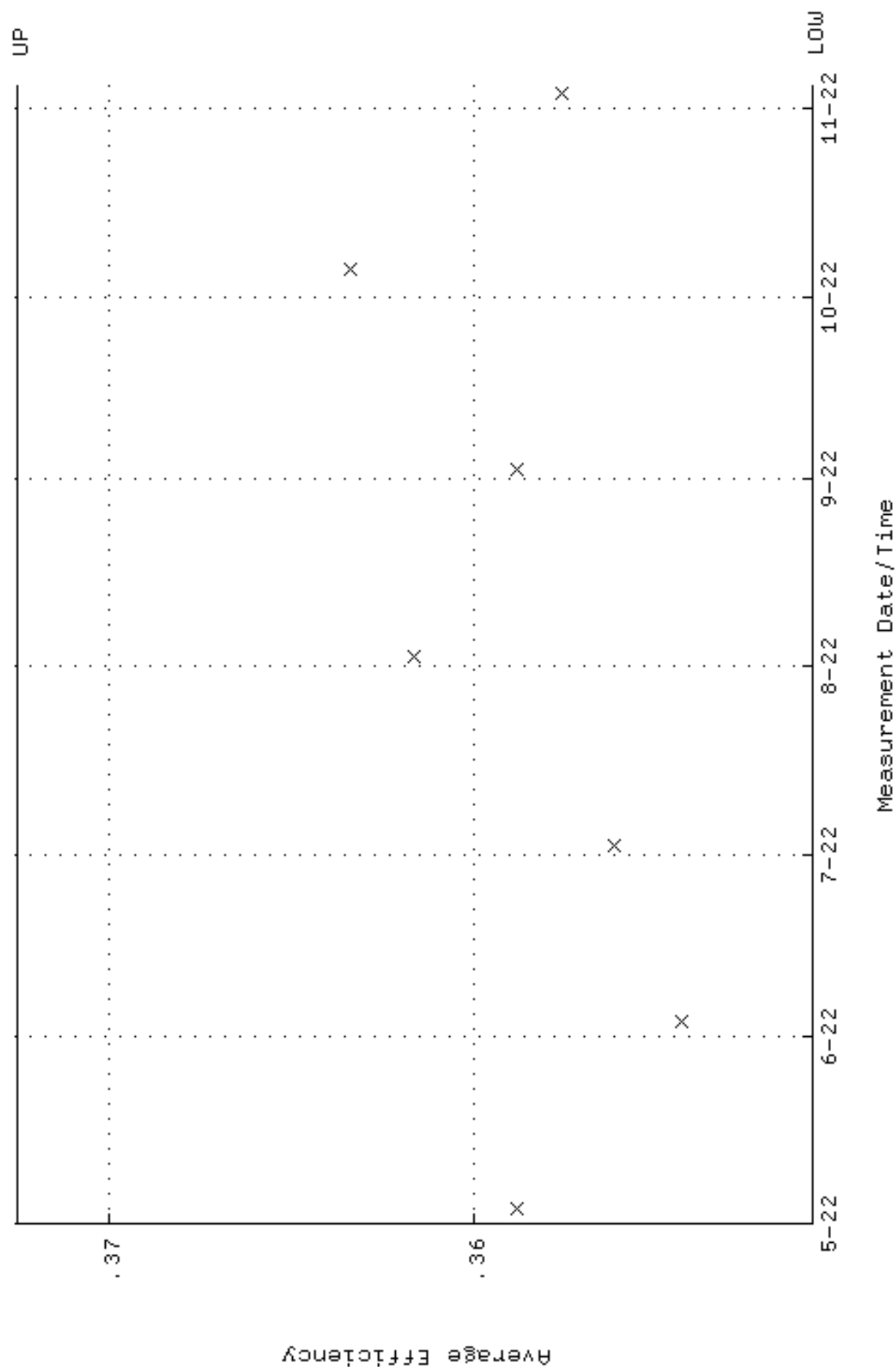
QA filename : DKA100:[ENV_ALPHA.QA.W]W041.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:48 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



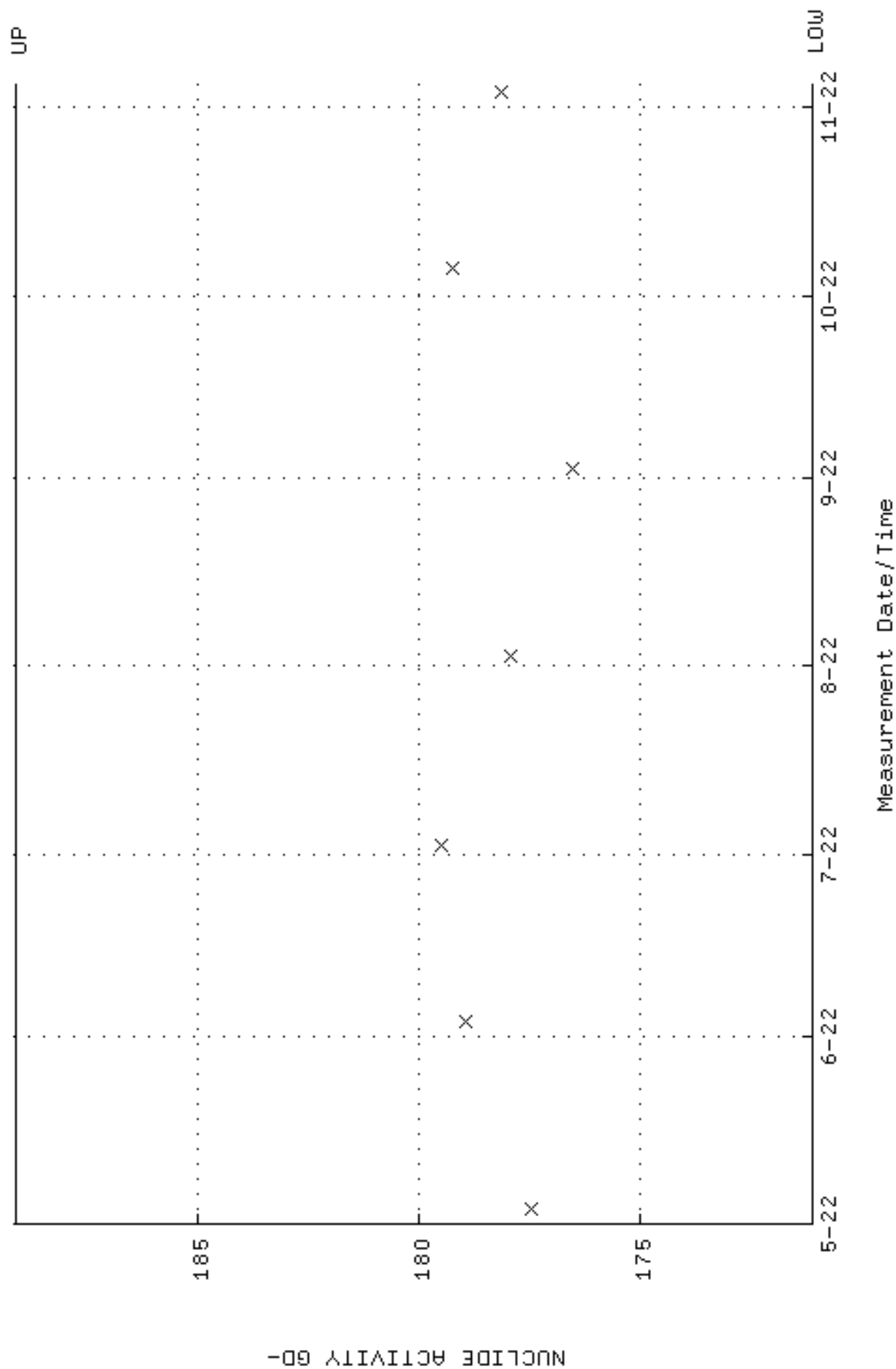
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 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-MAY-2022 13:56:32 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



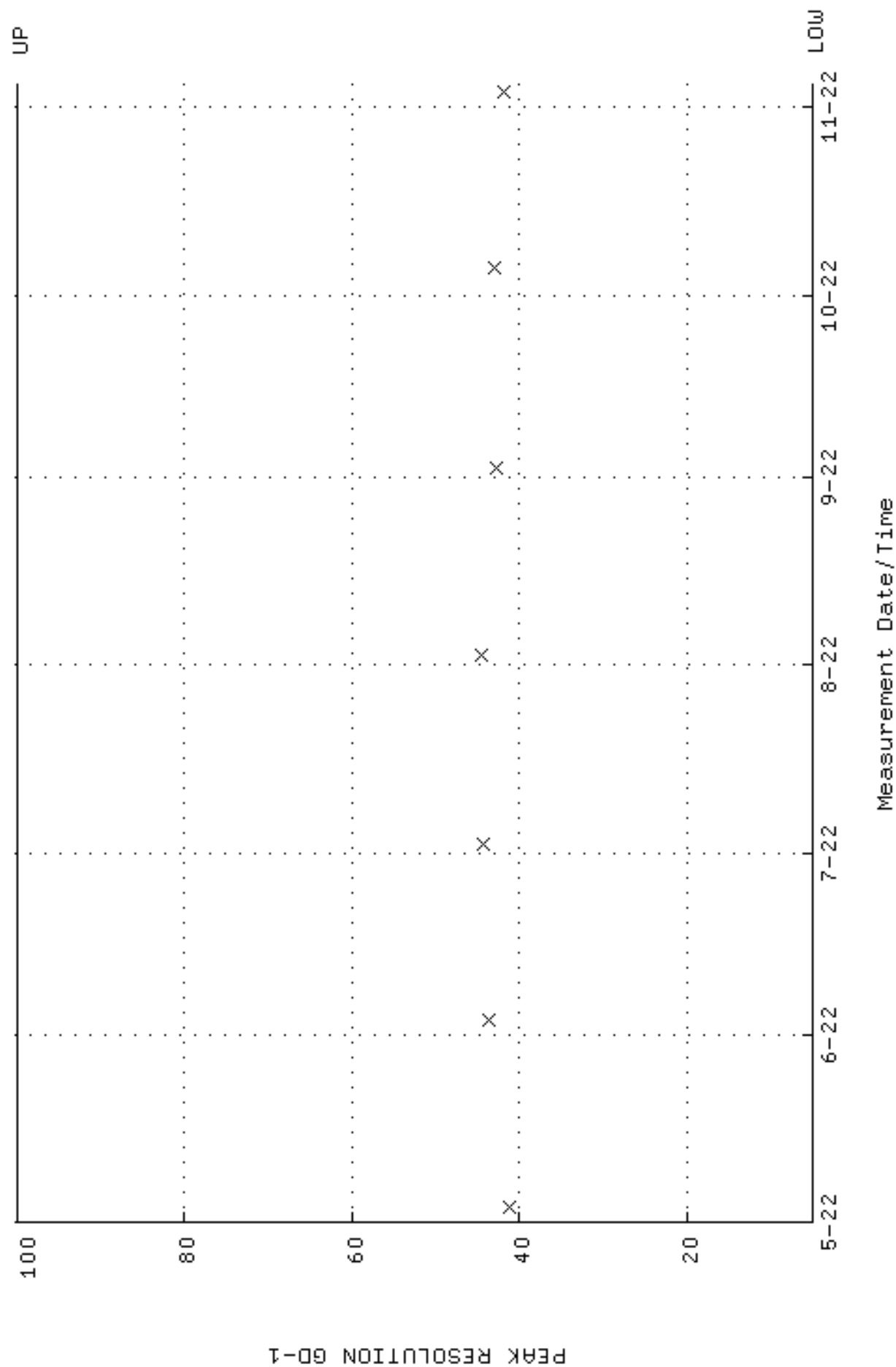
QA filename : DKA100:[ENV_ALPHA.QA.W]W043.QAF;109
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.350783 through 0.372480



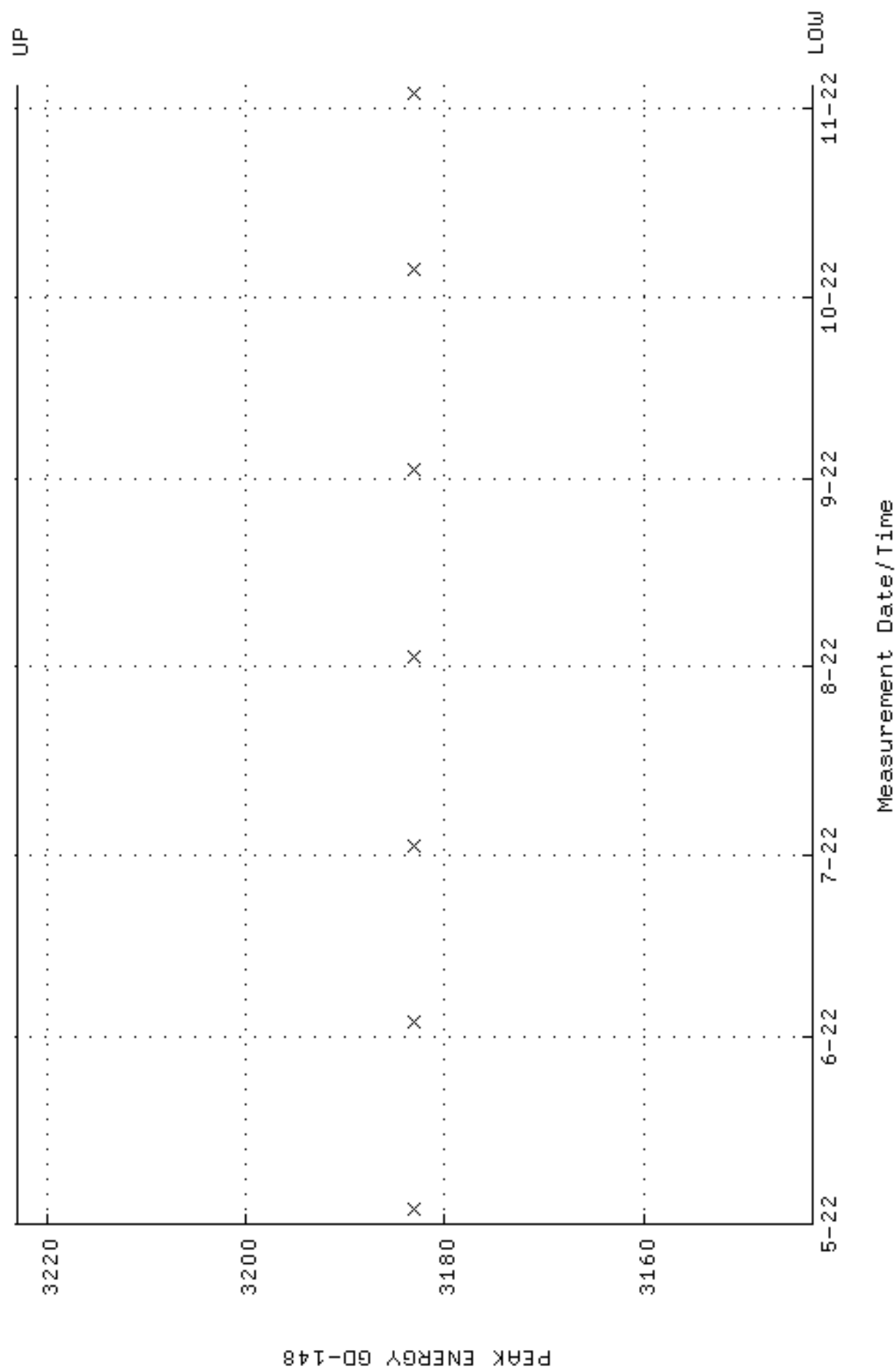
QA filename : DKA100:[ENV_ALPHA.QA.W]W043.QAF;109
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



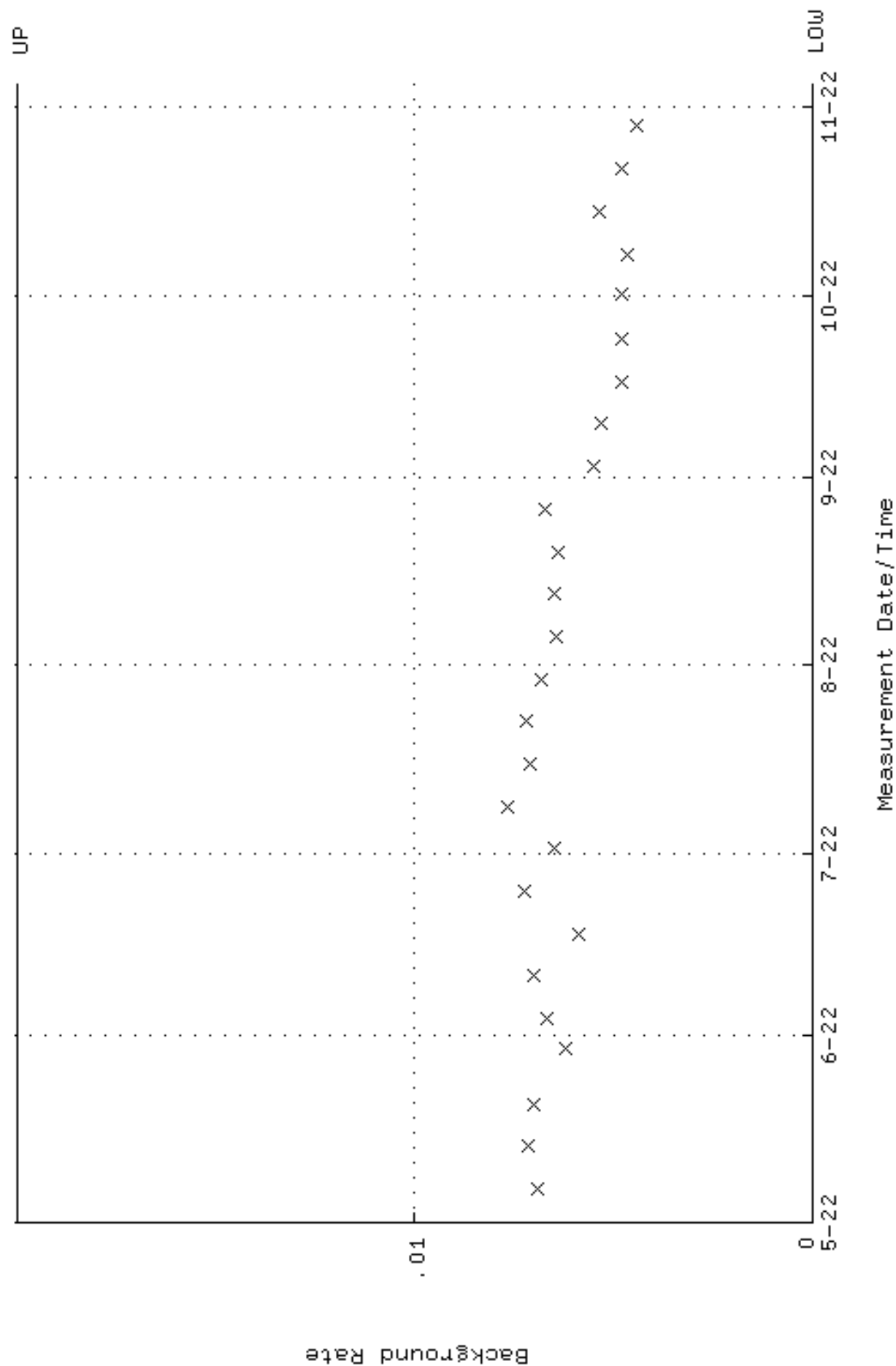
QA filename : DKA100:[ENV_ALPHA.QA.W]W043.QAF;109
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



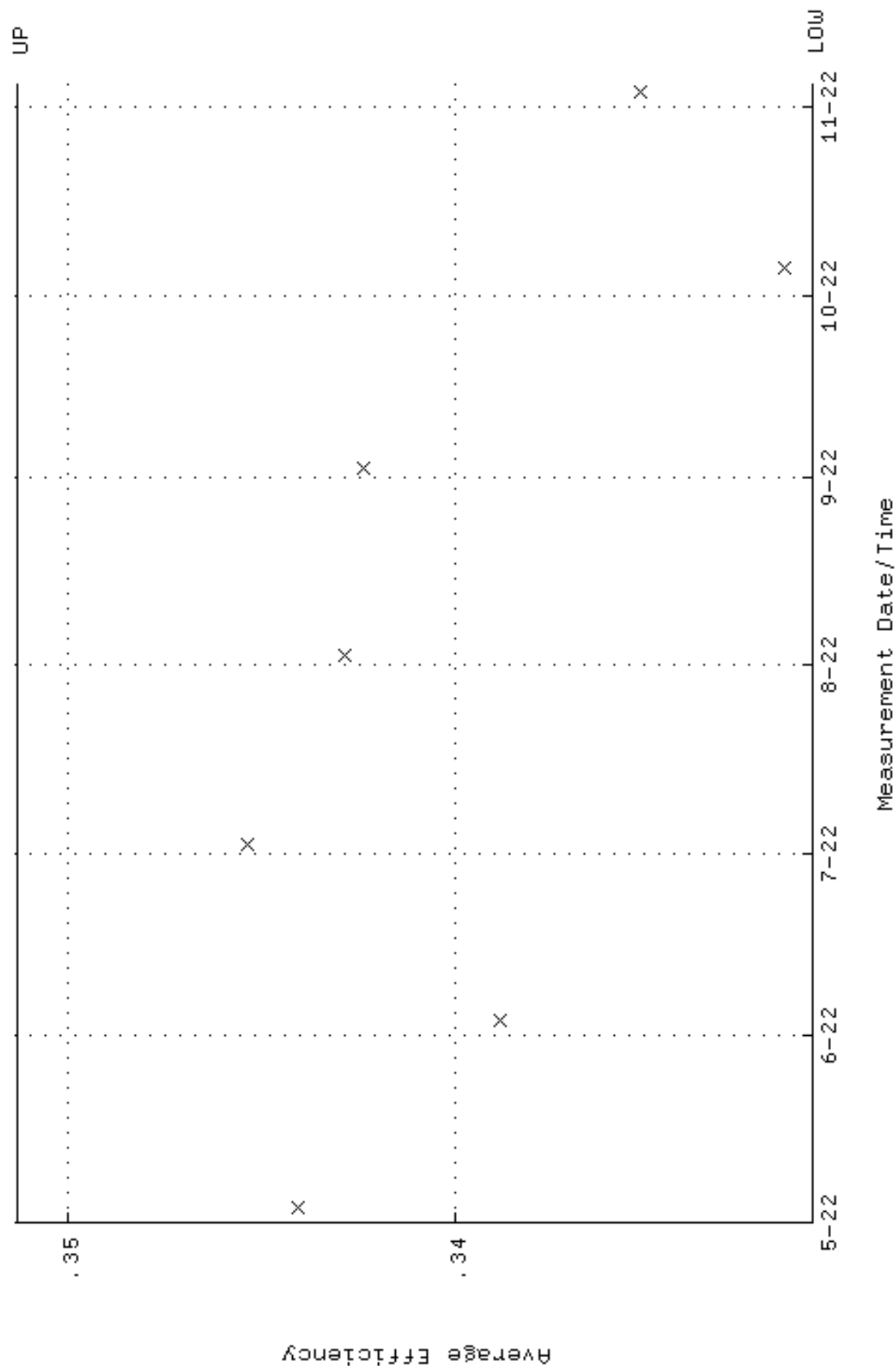
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



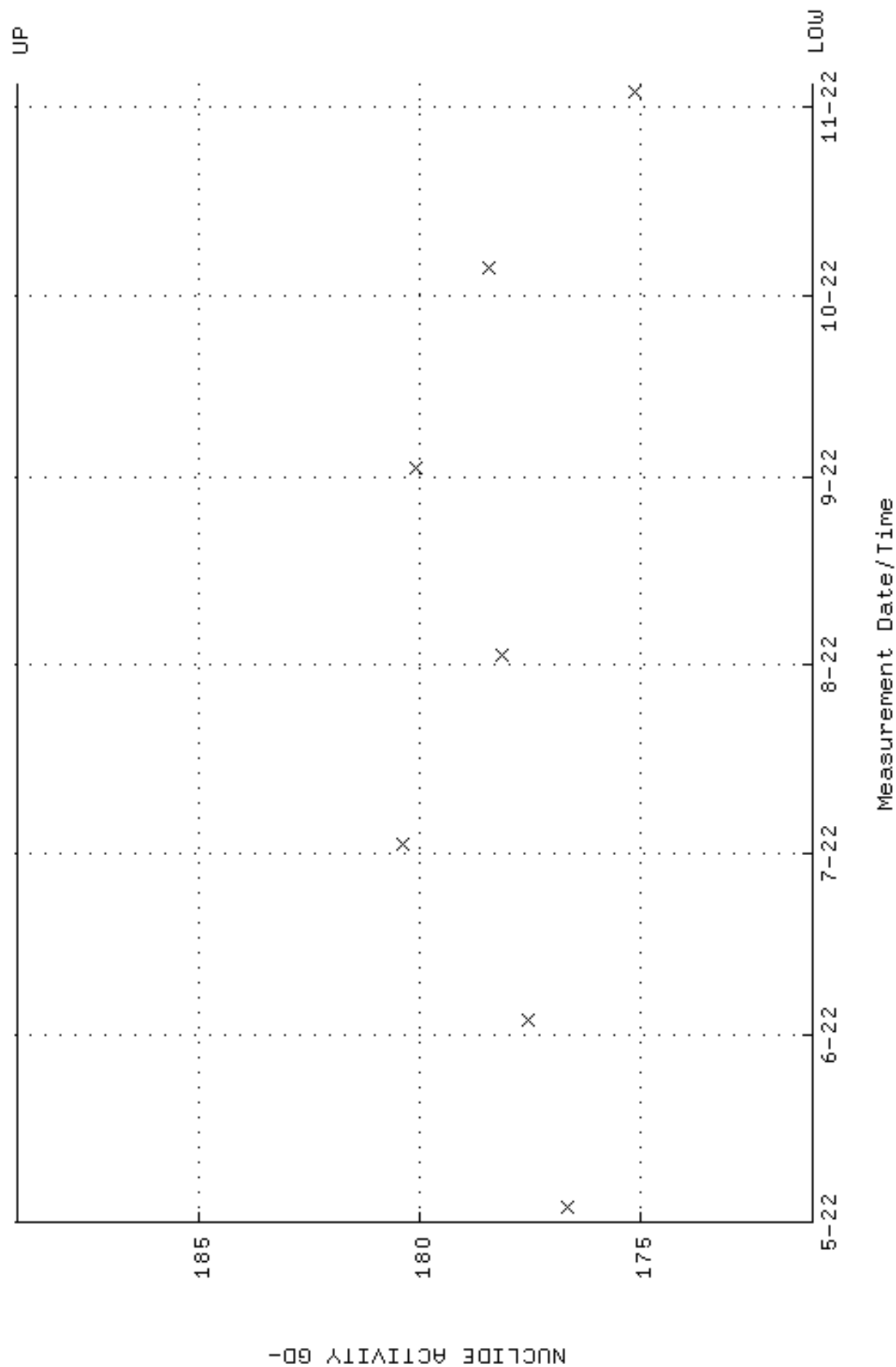
QA filename : DKA100:[ENV_ALPHA.QA.B]B043.QAF;6
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-MAY-2022 11:08:56 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



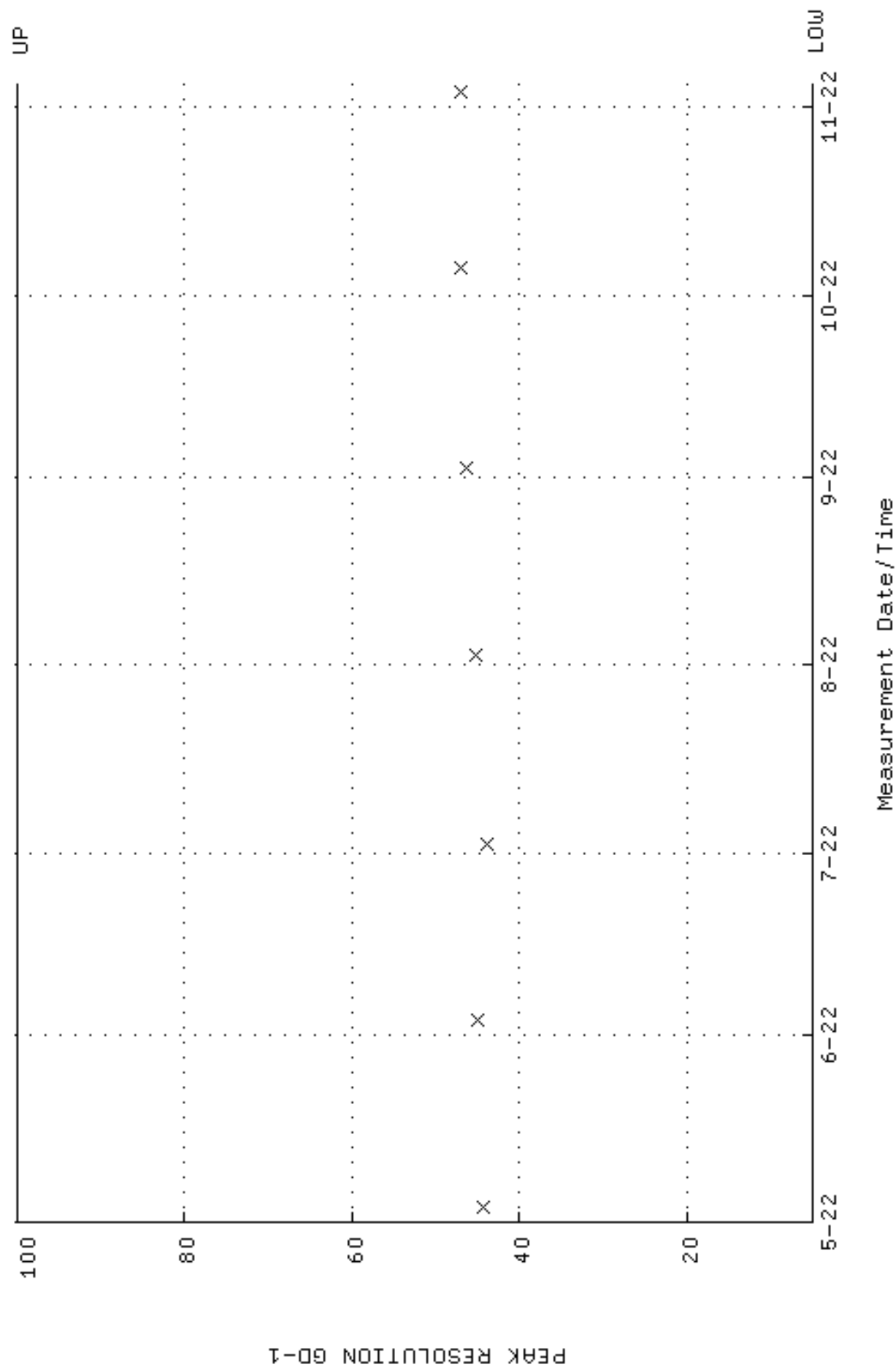
QA filename : DKA100:[ENV_ALPHA.QA.W]W045.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.330826 through 0.351290



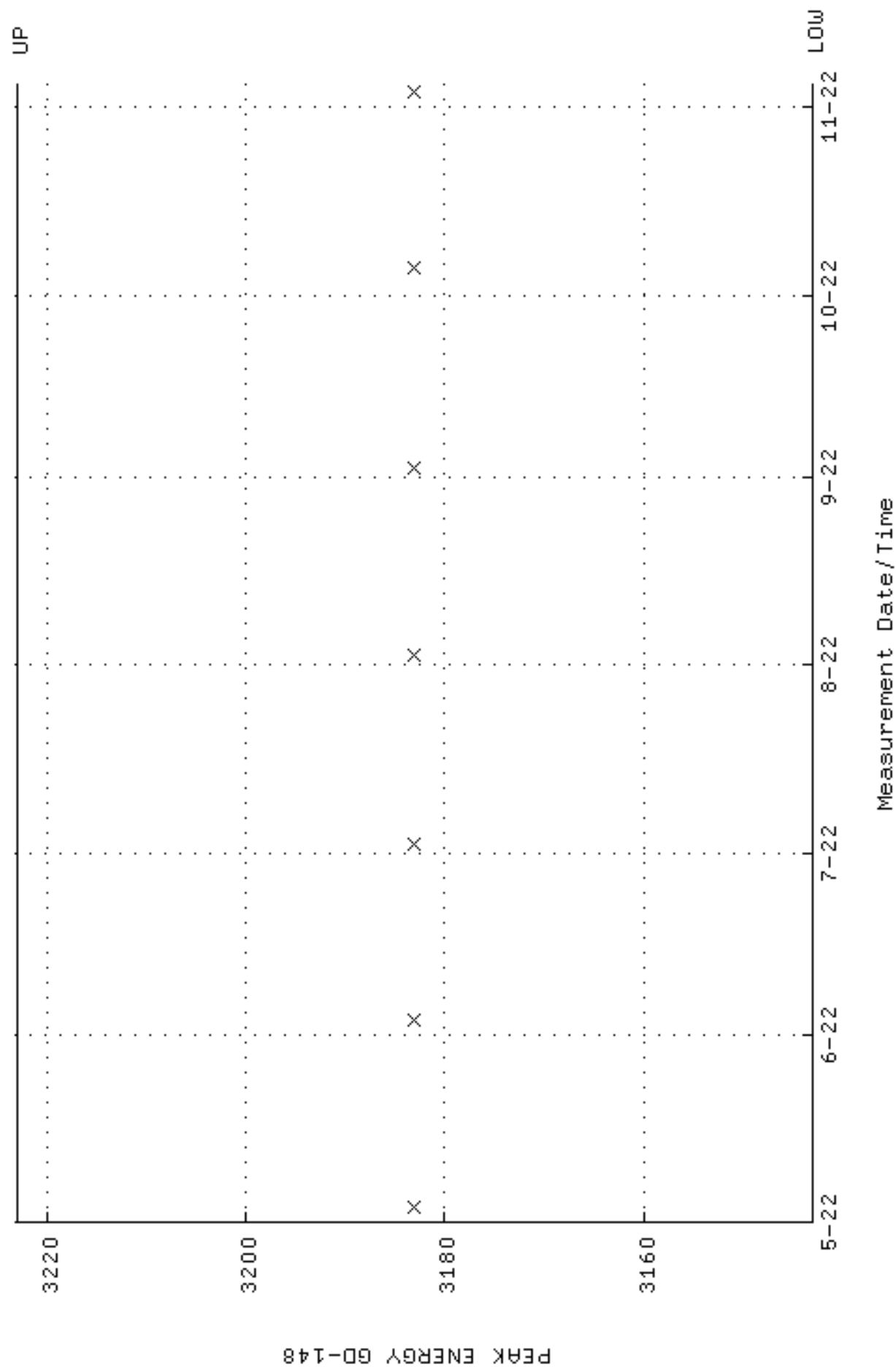
QA filename : DKA100:[ENV_ALPHA.QA.W]W045.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



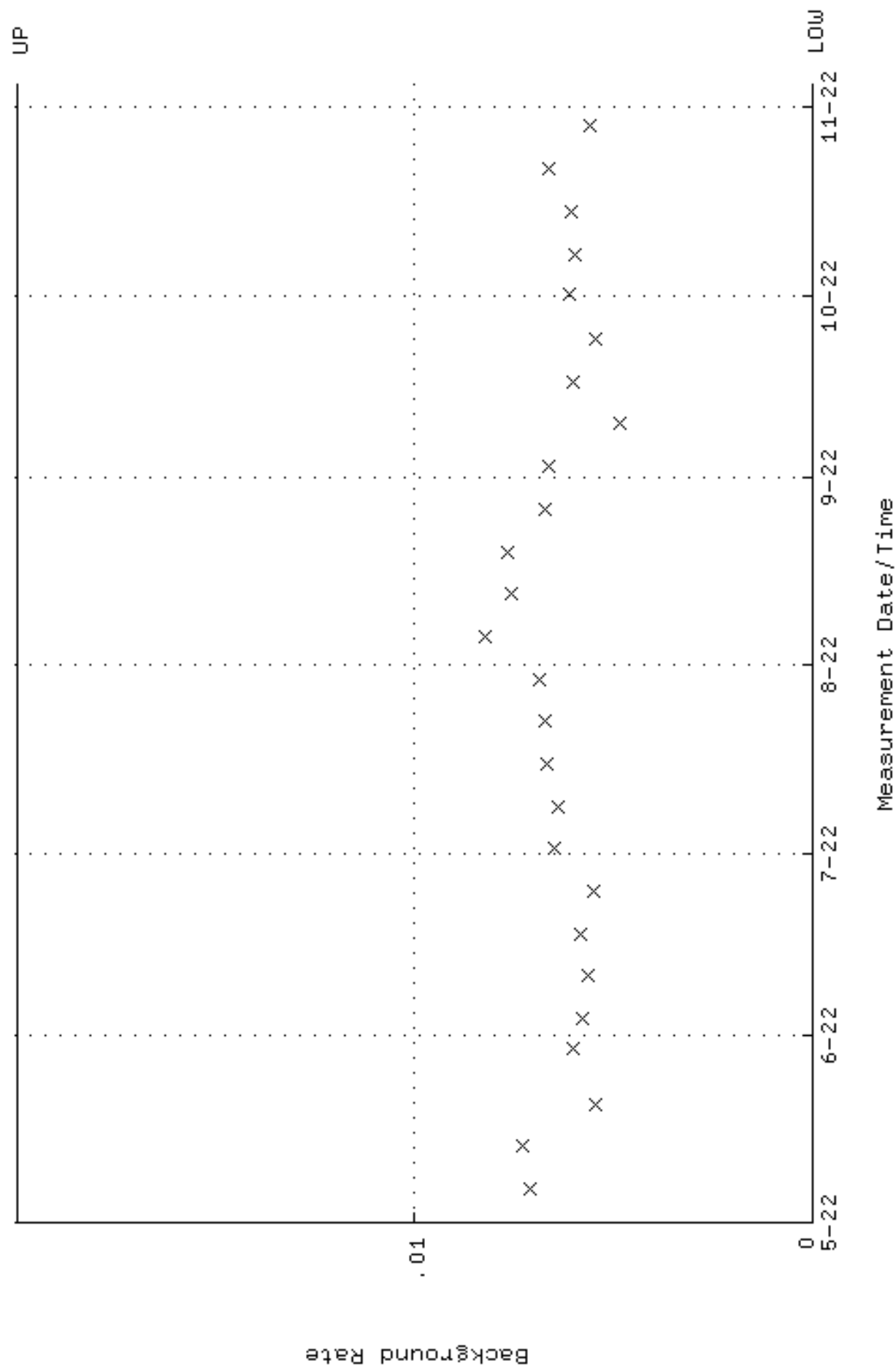
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



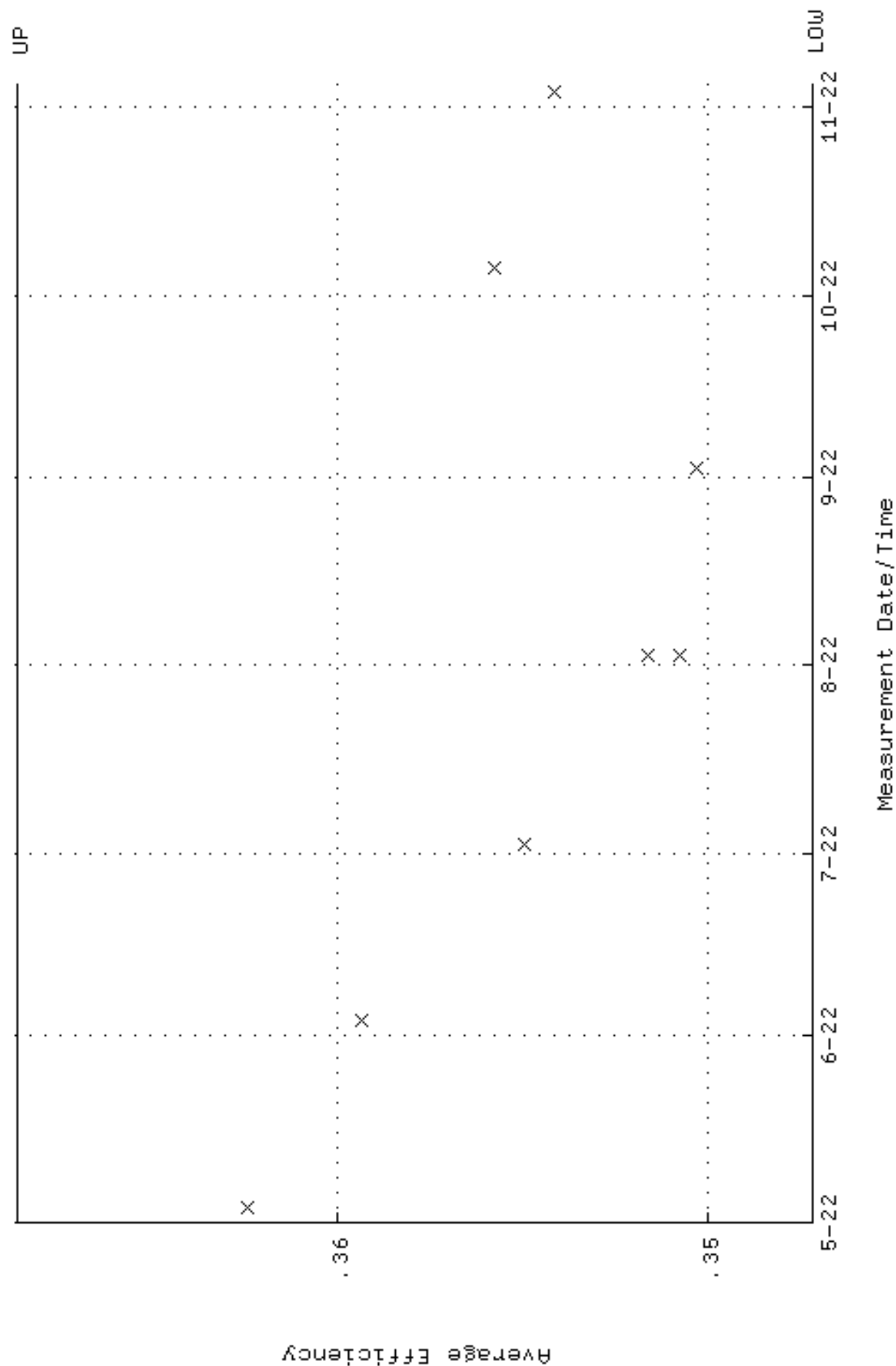
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



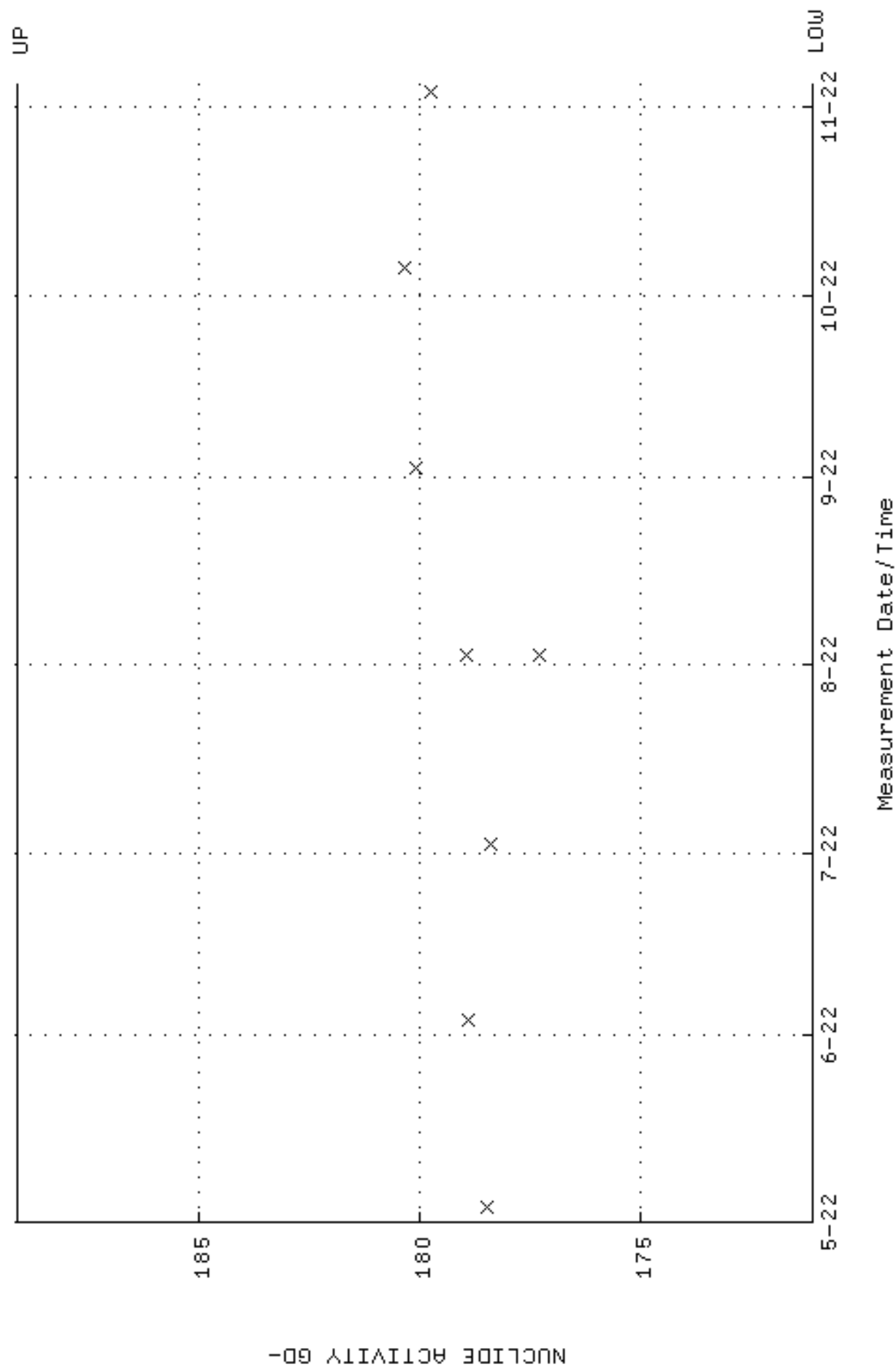
QA filename : DKA100:[ENV_ALPHA.QA.B]B045.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-MAY-2022 11:08:56 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



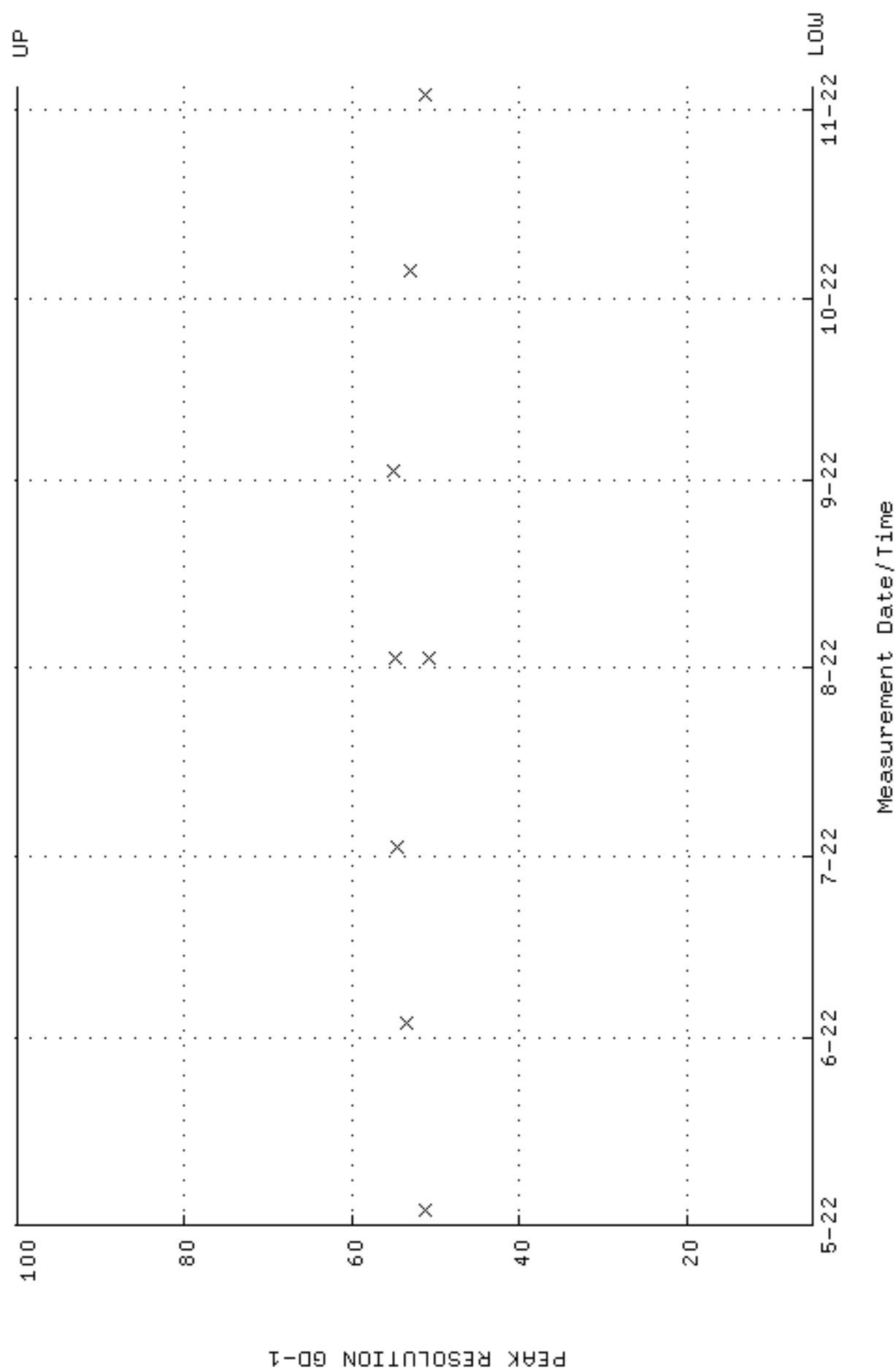
QA filename : DKA100:[ENV_ALPHA.QA.W]W047.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.347176 through 0.368651



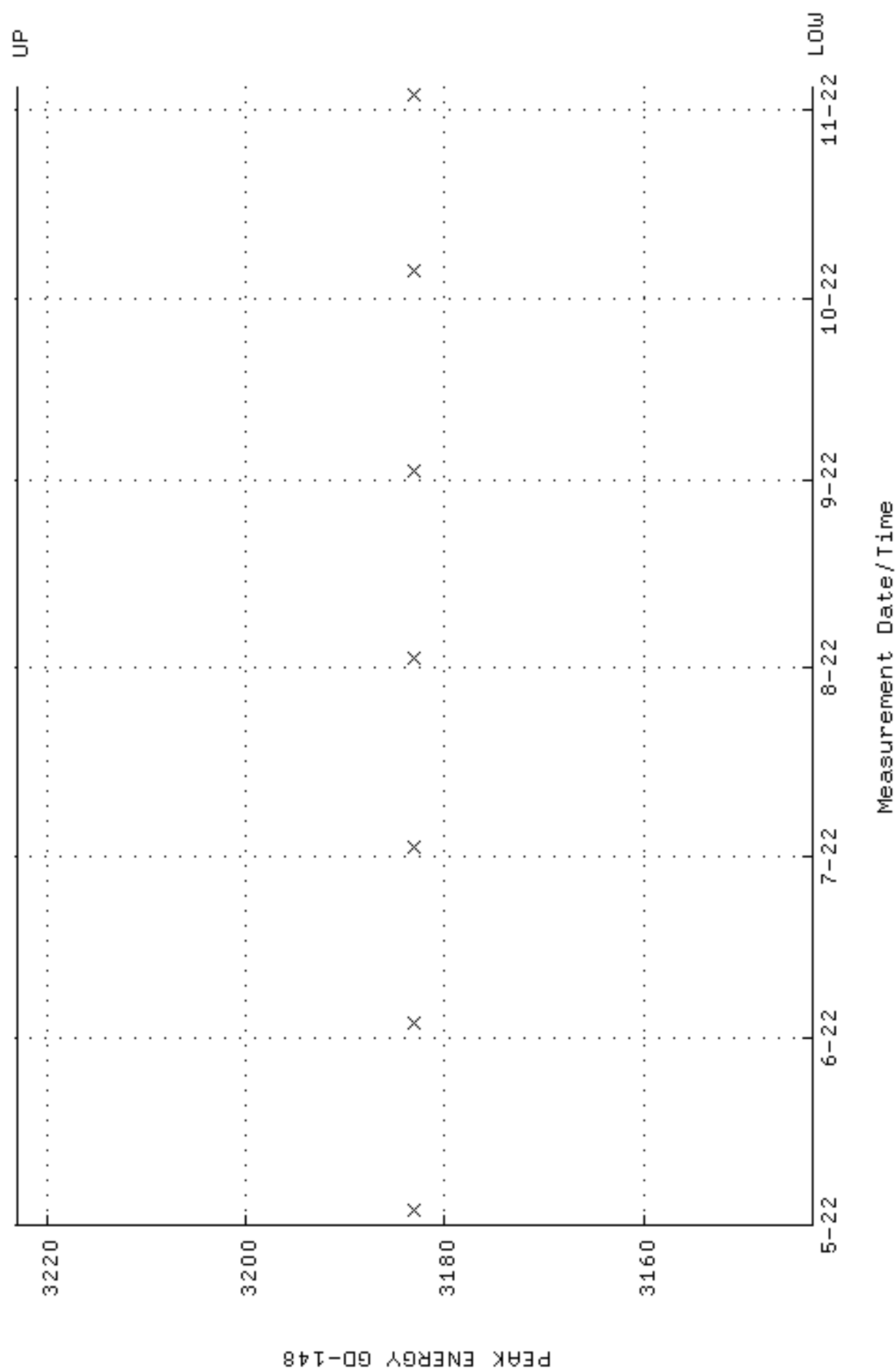
QA filename : DKA100:[ENV_ALPHA.QA.W]W047.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



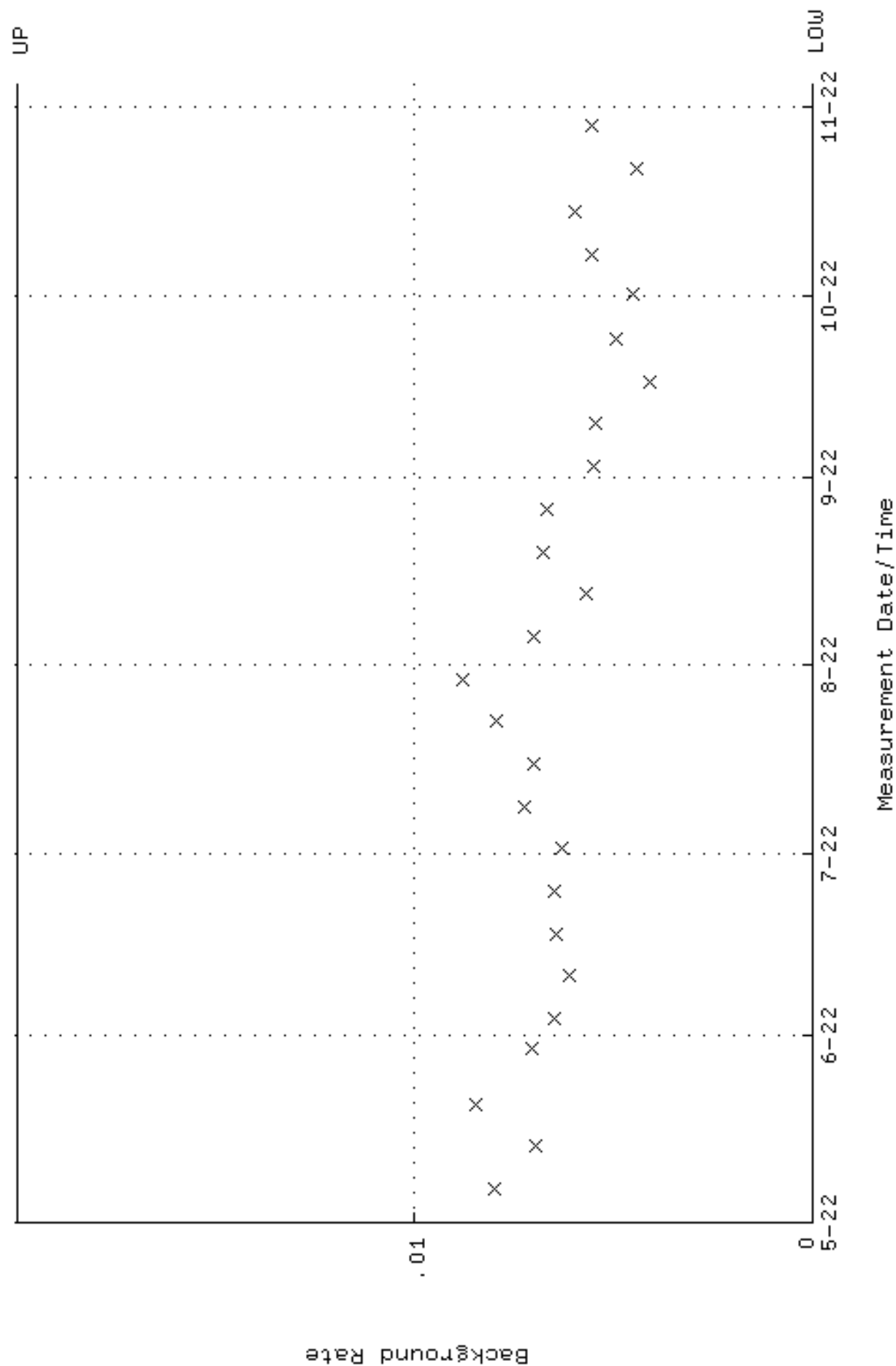
QA filename : DKA100:[ENV_ALPHA.QA.W]W047.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



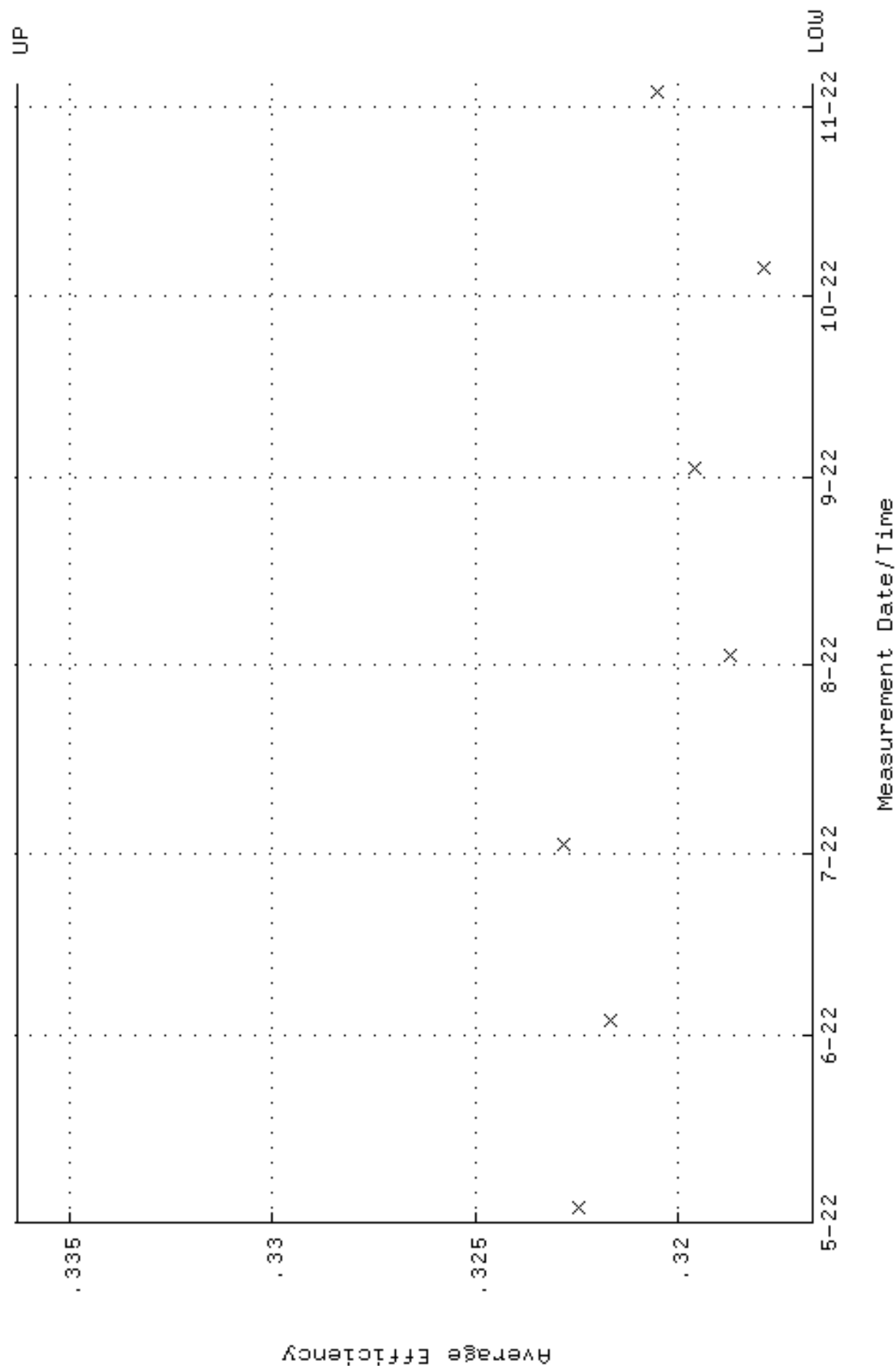
QA filename : DKA100:[ENV_ALPHA.QA.W]W047.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



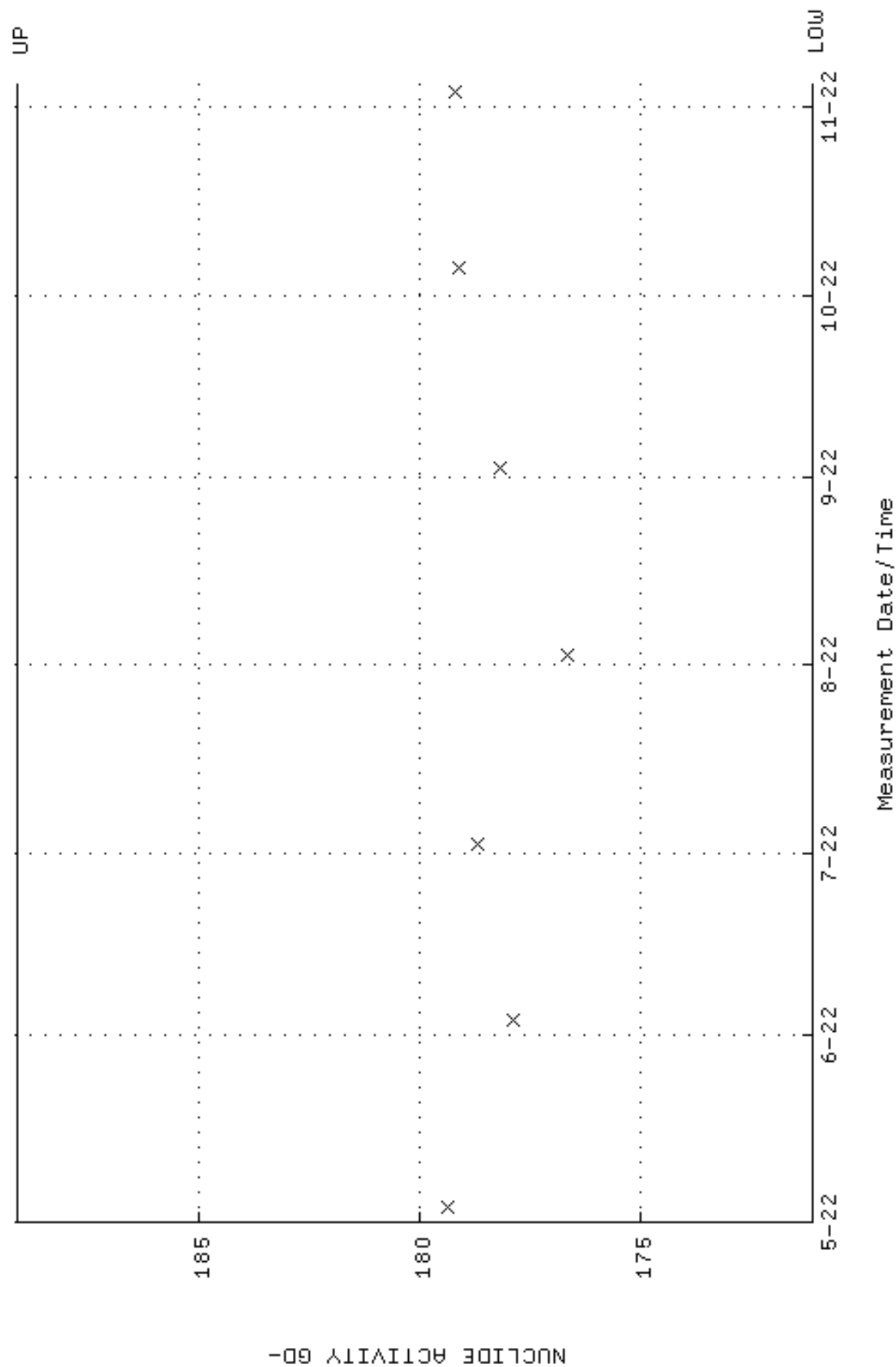
QA filename : DKA100:[ENV_ALPHA.QA.B]B047.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 6-MAY-2022 11:08:56 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



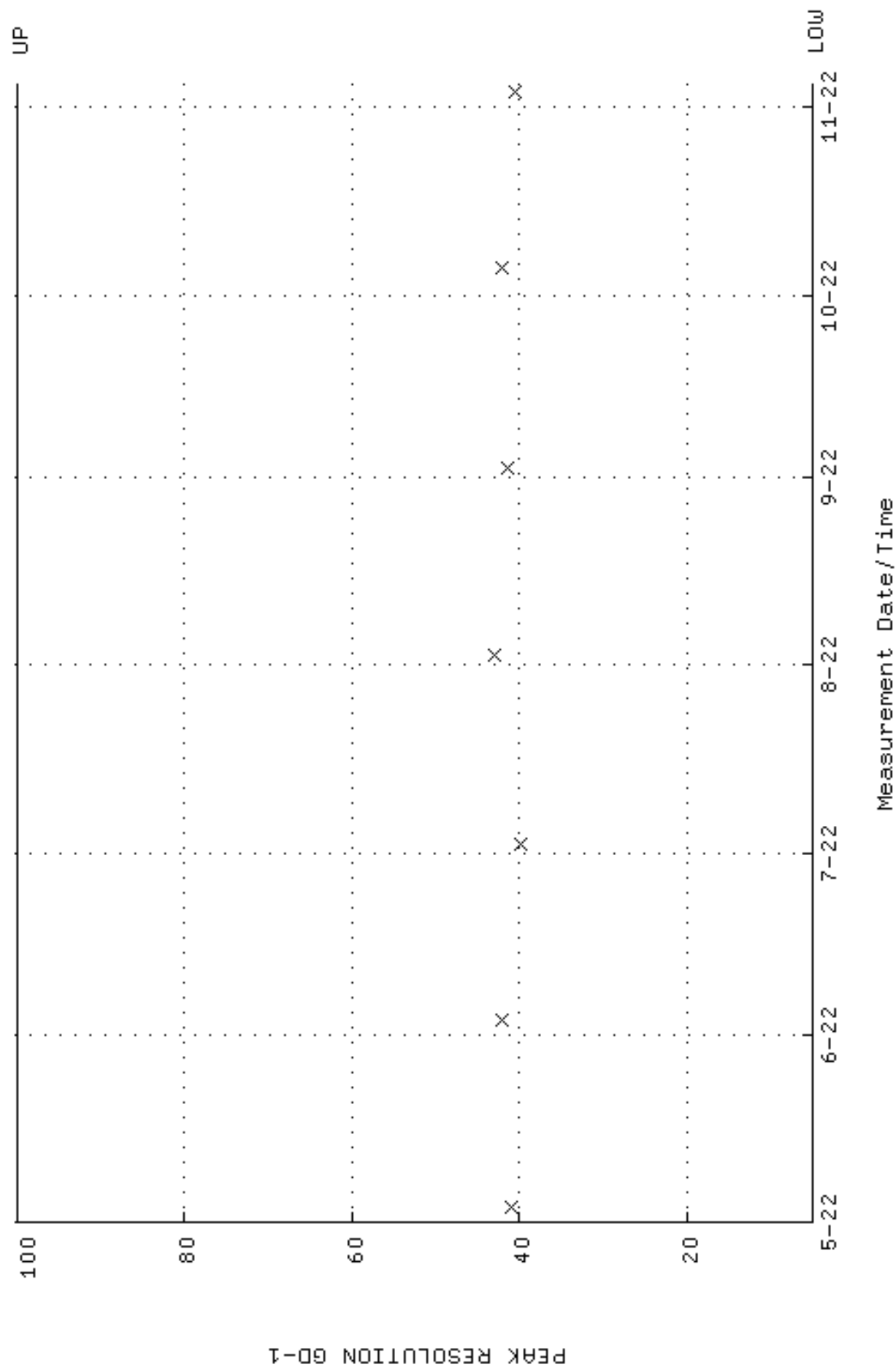
QA filename : DKA100:[ENV_ALPHA.QA.W]W048.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 0.316695 through 0.336285



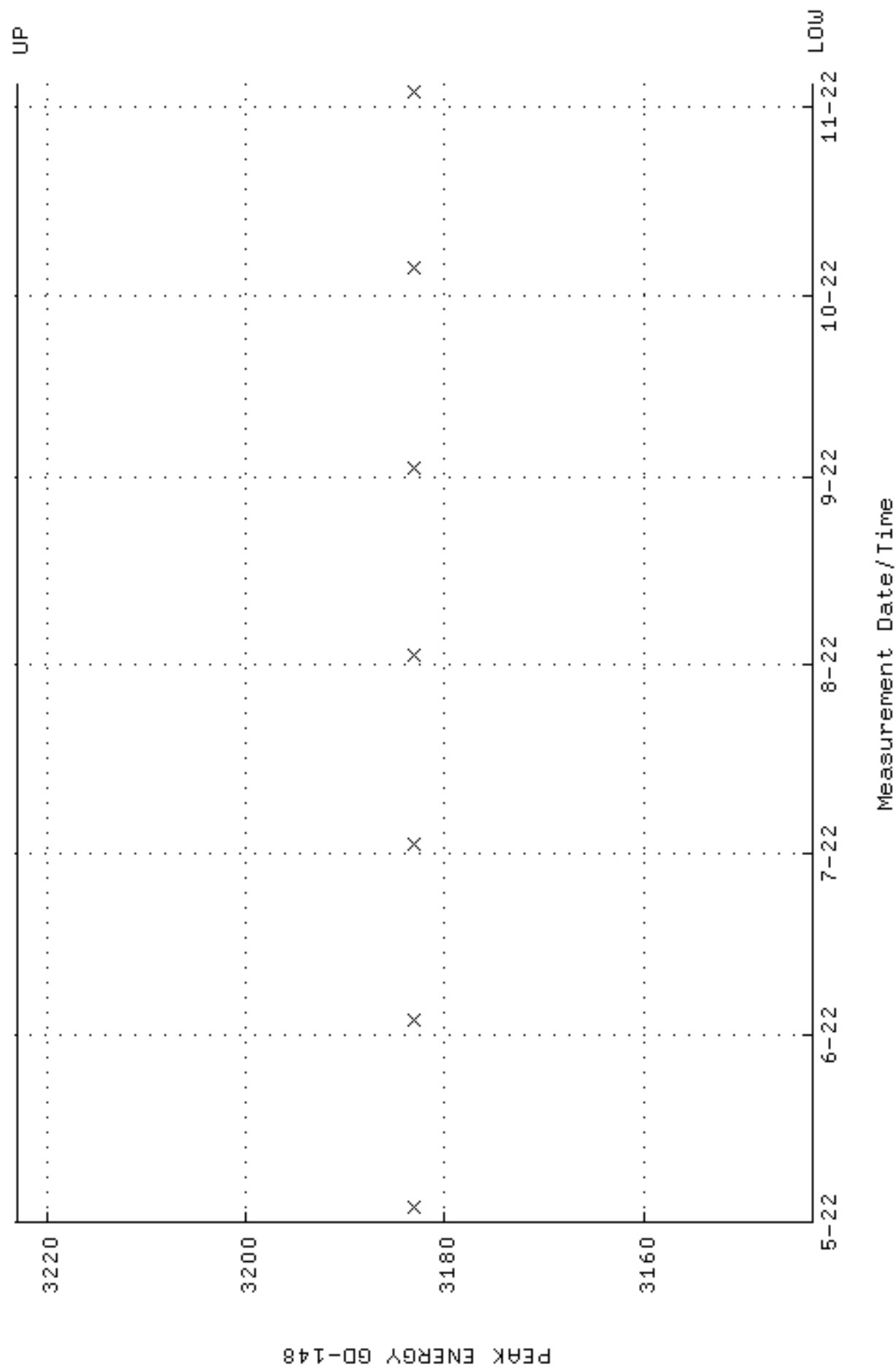
QA filename : DKA100:[ENV_ALPHA.QA.W]W048.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



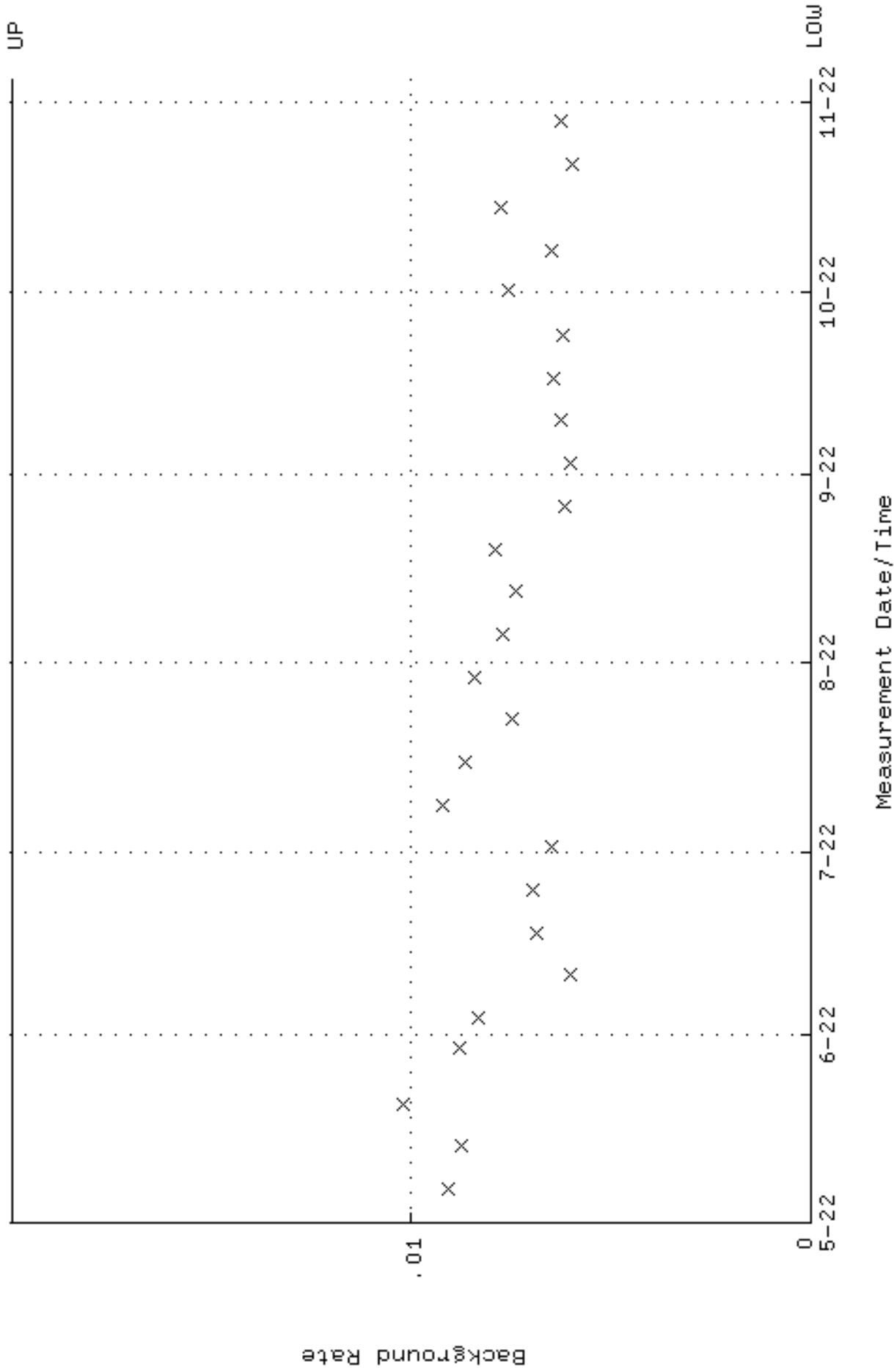
QA filename : DKA100:[ENV_ALPHA.QA.W]W048.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



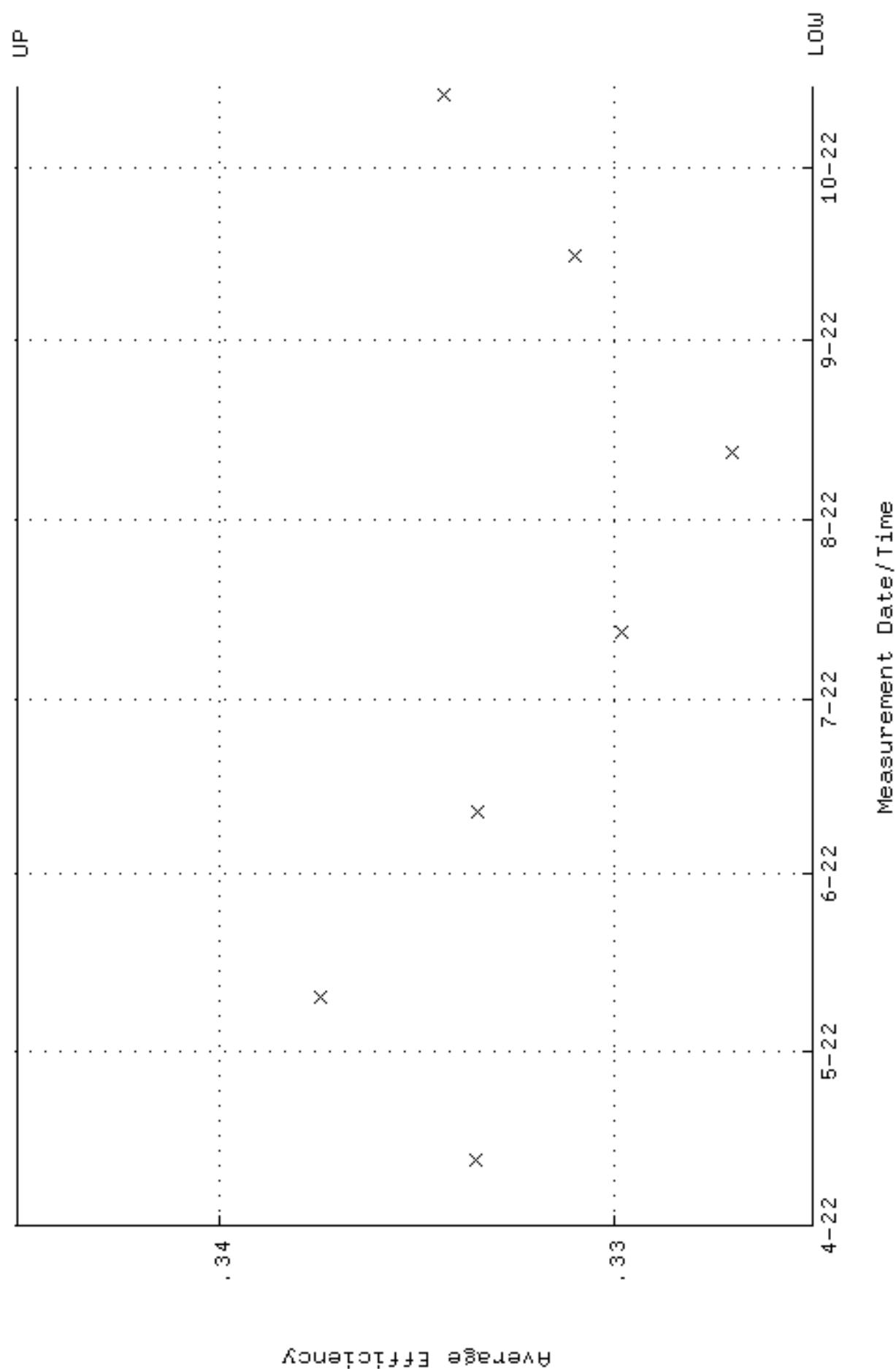
QA filename : DKA100:[ENV_ALPHA.QA.W]W048.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 3-MAY-2022 09:43:25 through 4-NOV-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



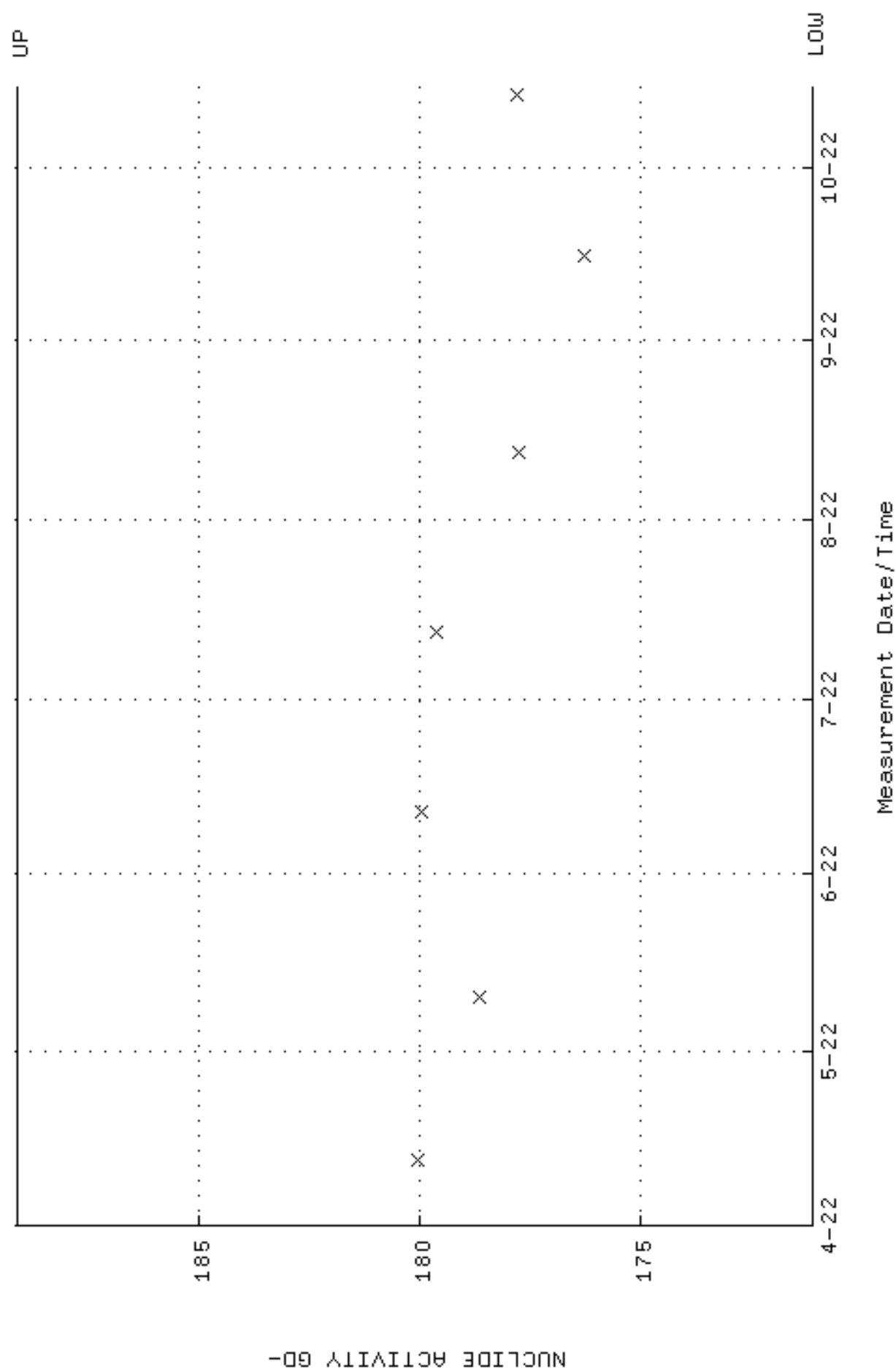
QA filename : DKA100:[ENV_ALPHA.QA.B]B048.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 6-MAY-2022 11:08:56 through 4-NOV-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



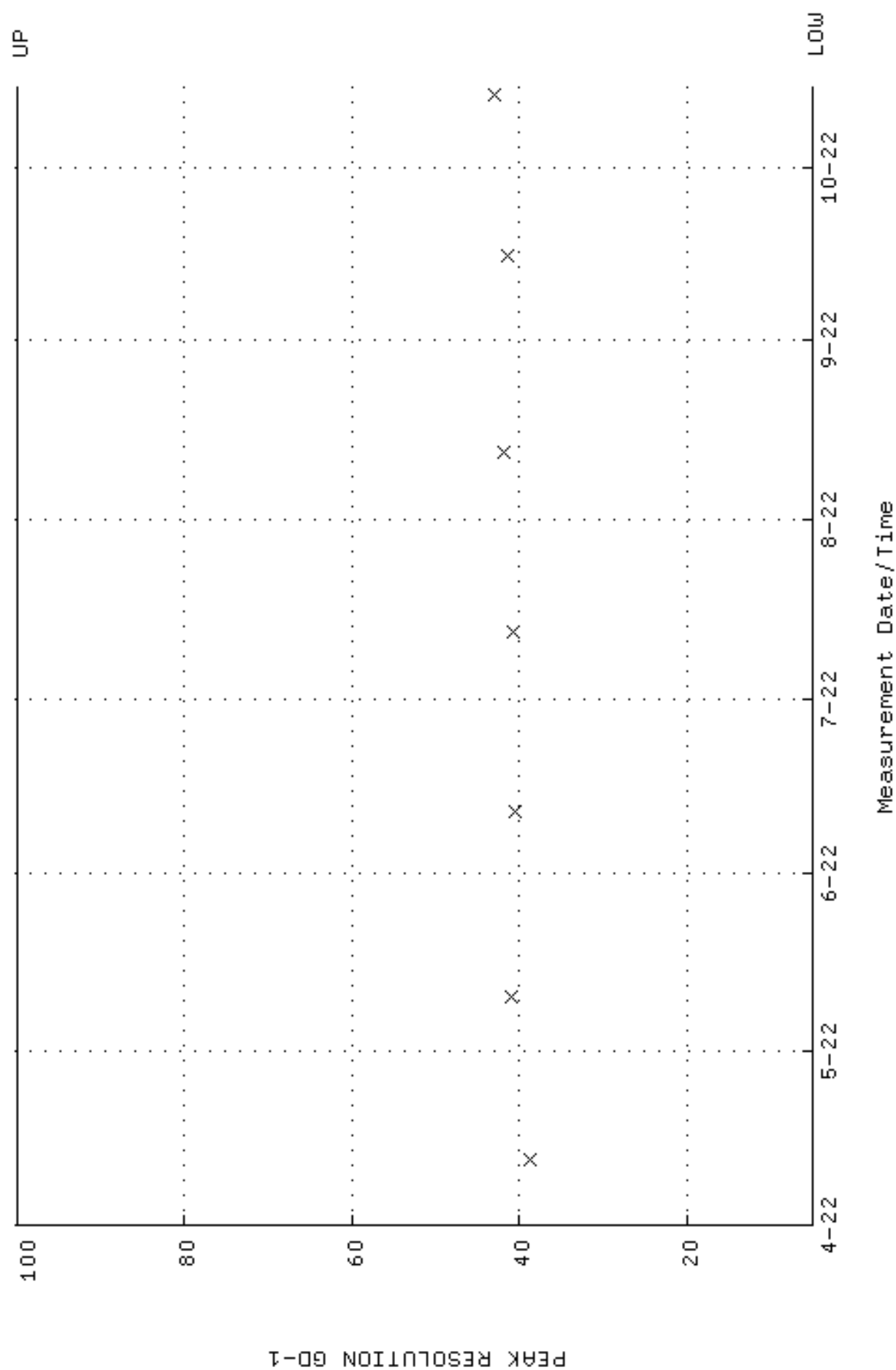
QA filename : DKA100:[ENV_ALPHA.QA.W]W093.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 12-APR-2022 08:47:14 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.325000 through 0.345100



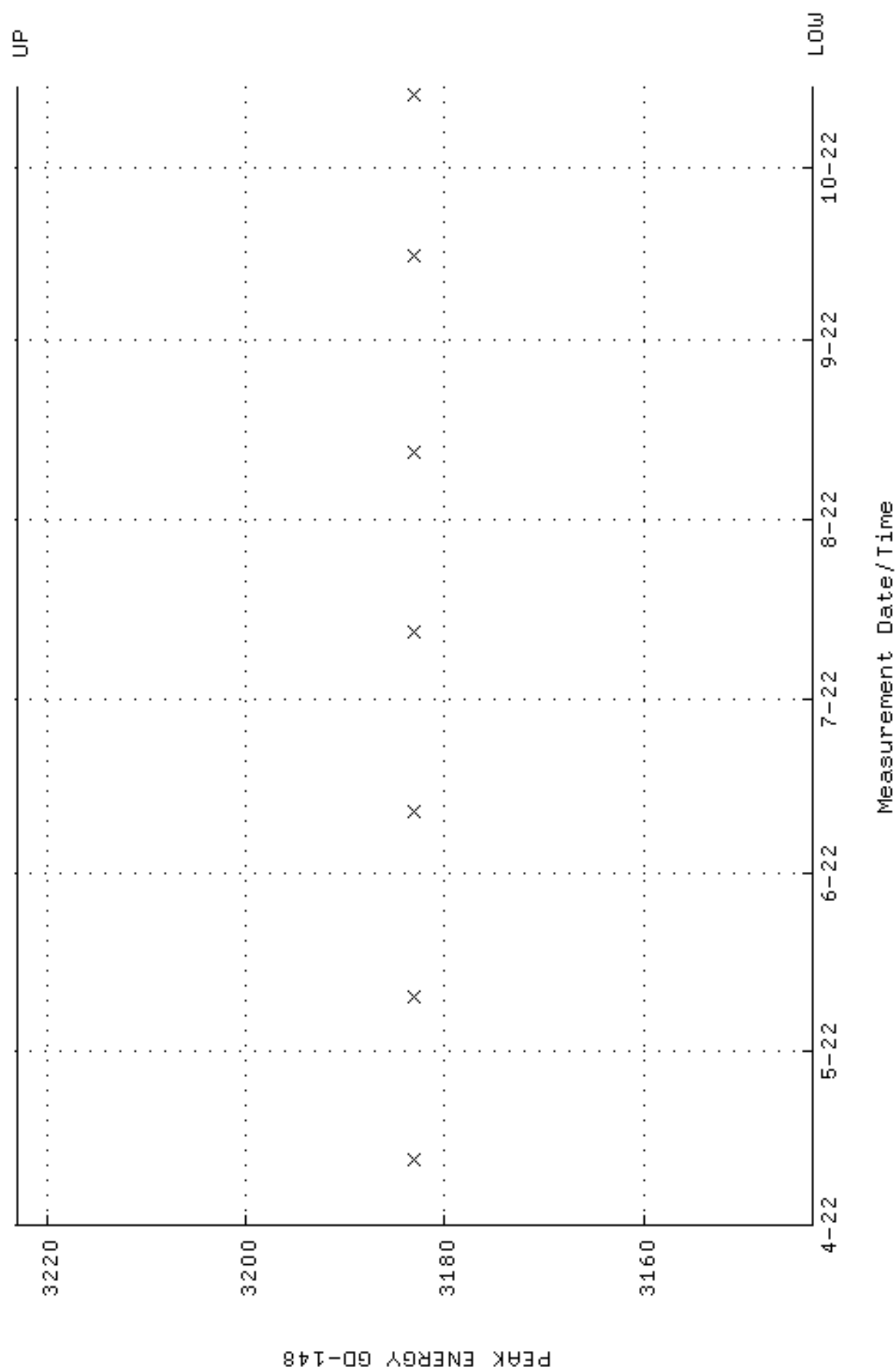
QA filename : DKA100:[ENV_ALPHA.QA.W]W093.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-APR-2022 08:47:14 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



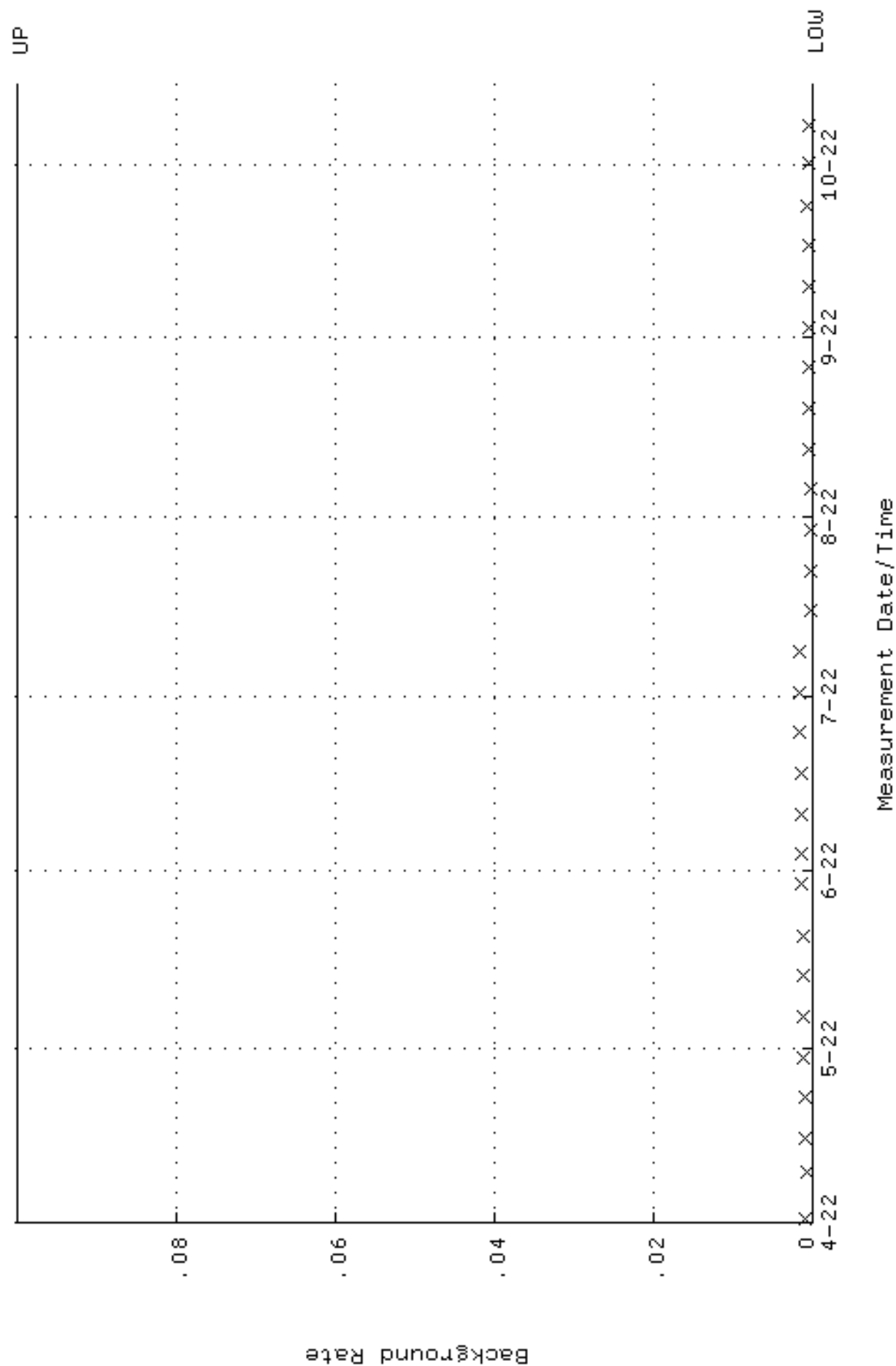
QA filename : DKA100:[ENV_ALPHA.QA.W]W093.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 12-APR-2022 08:47:14 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



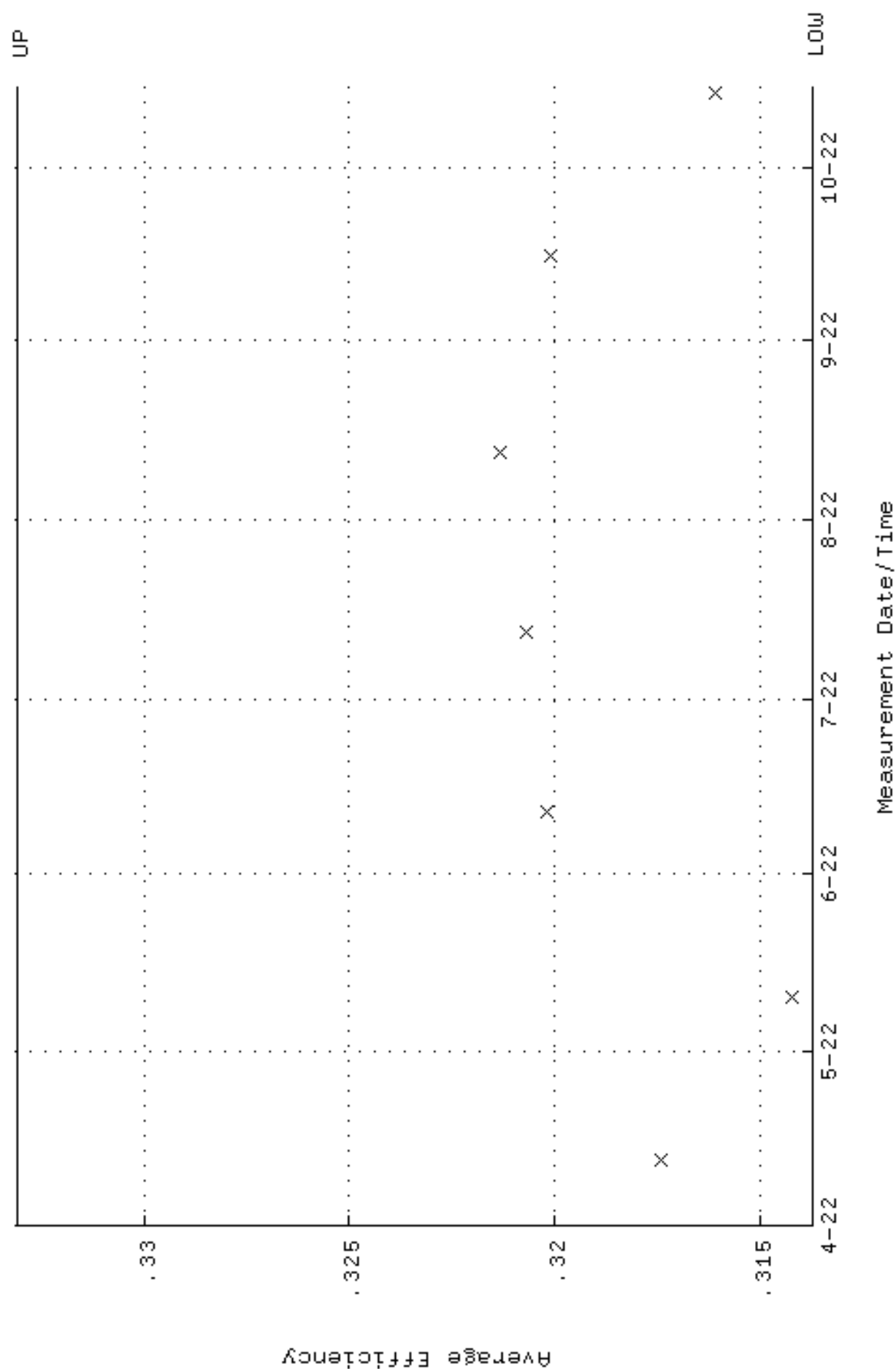
QA filename : DKA100:[ENV_ALPHA.QA.W]W093.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 12-APR-2022 08:47:14 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



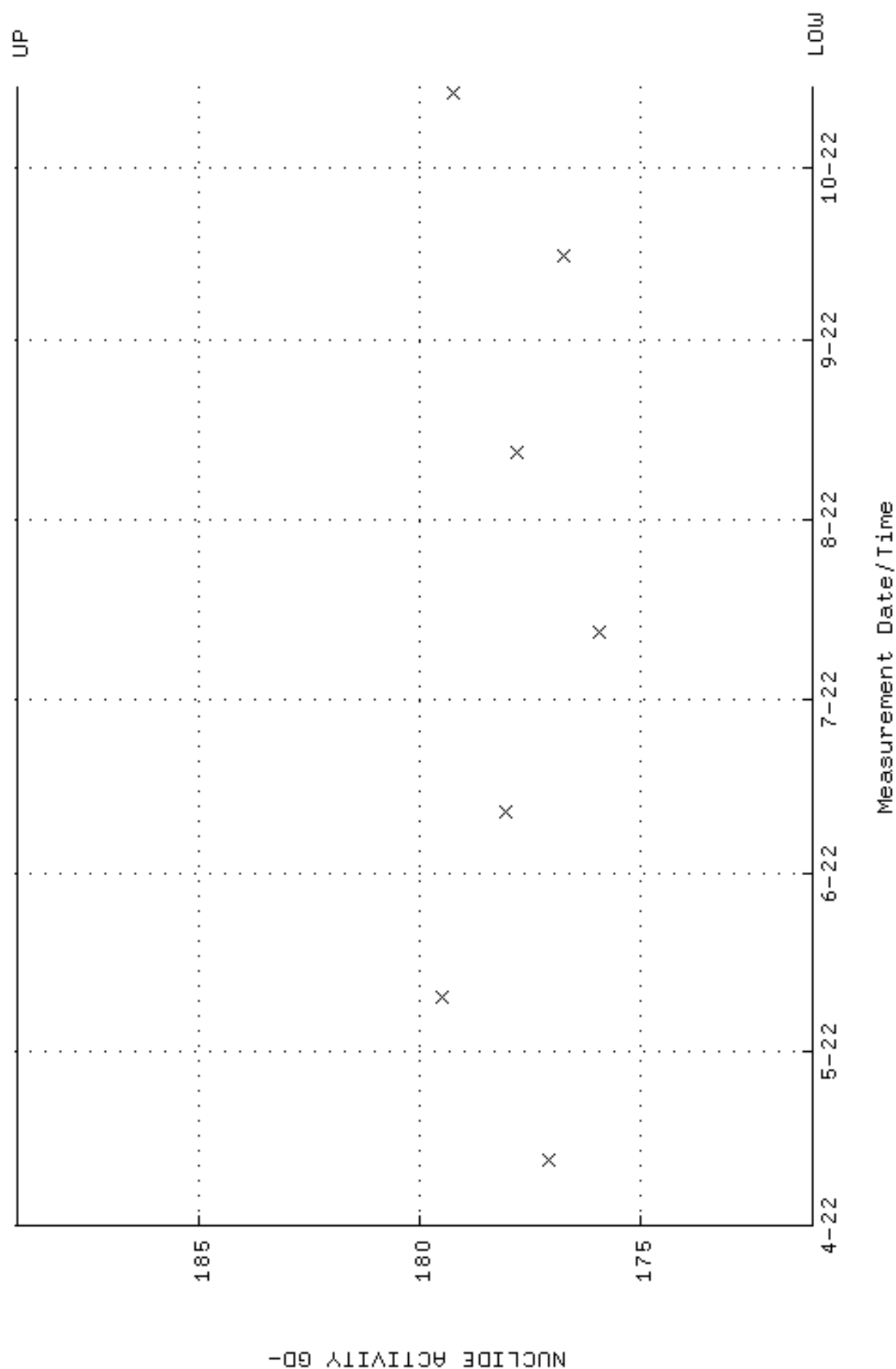
QA filename : DKA100:[ENV_ALPHA.QA.B]B093.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 12:51:53 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



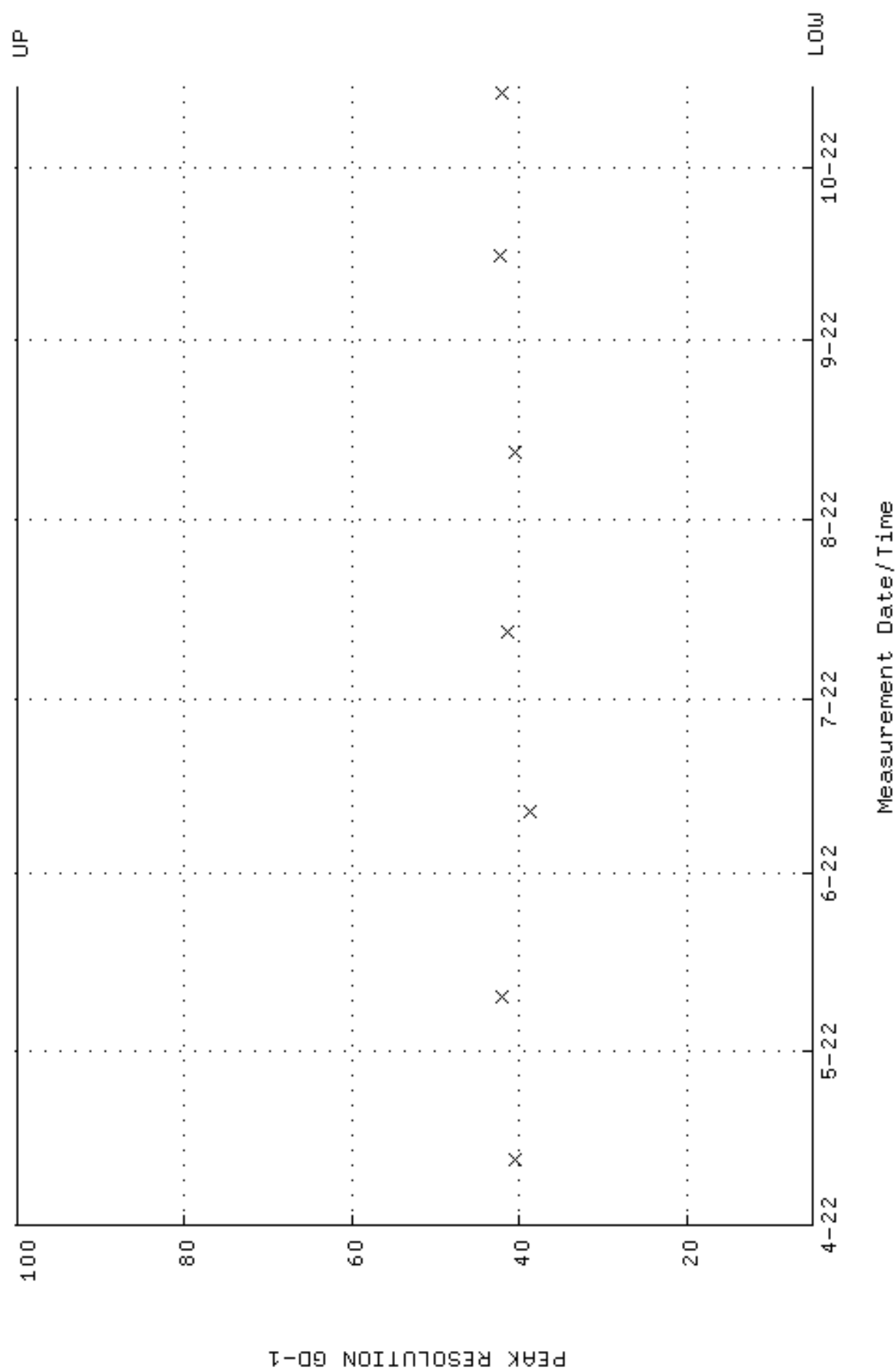
QA filename : DKA100:[ENV_ALPHA.QA.W]W095.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.313700 through 0.333100



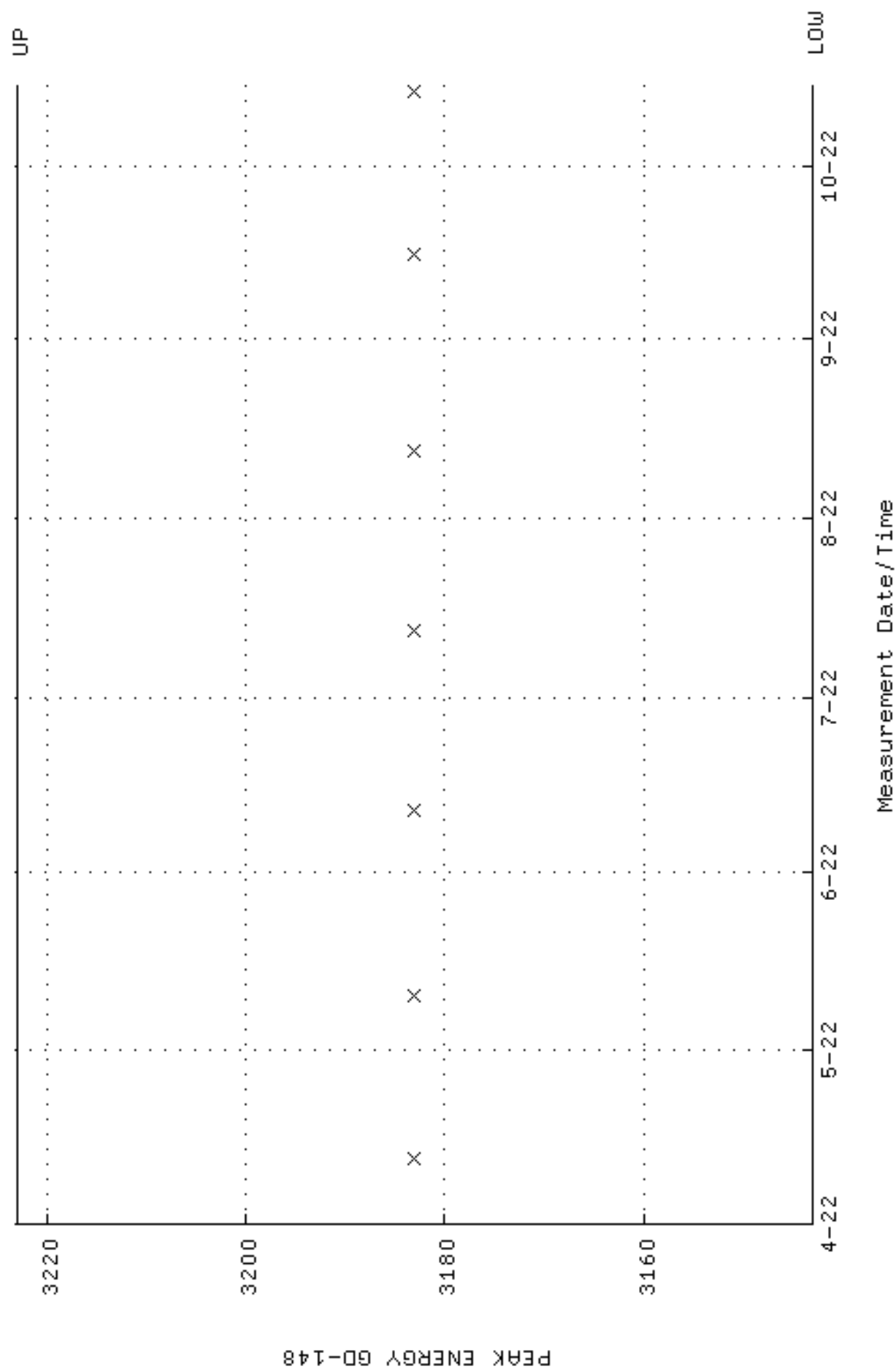
QA filename : DKA100:[ENV_ALPHA.QA.W]W095.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



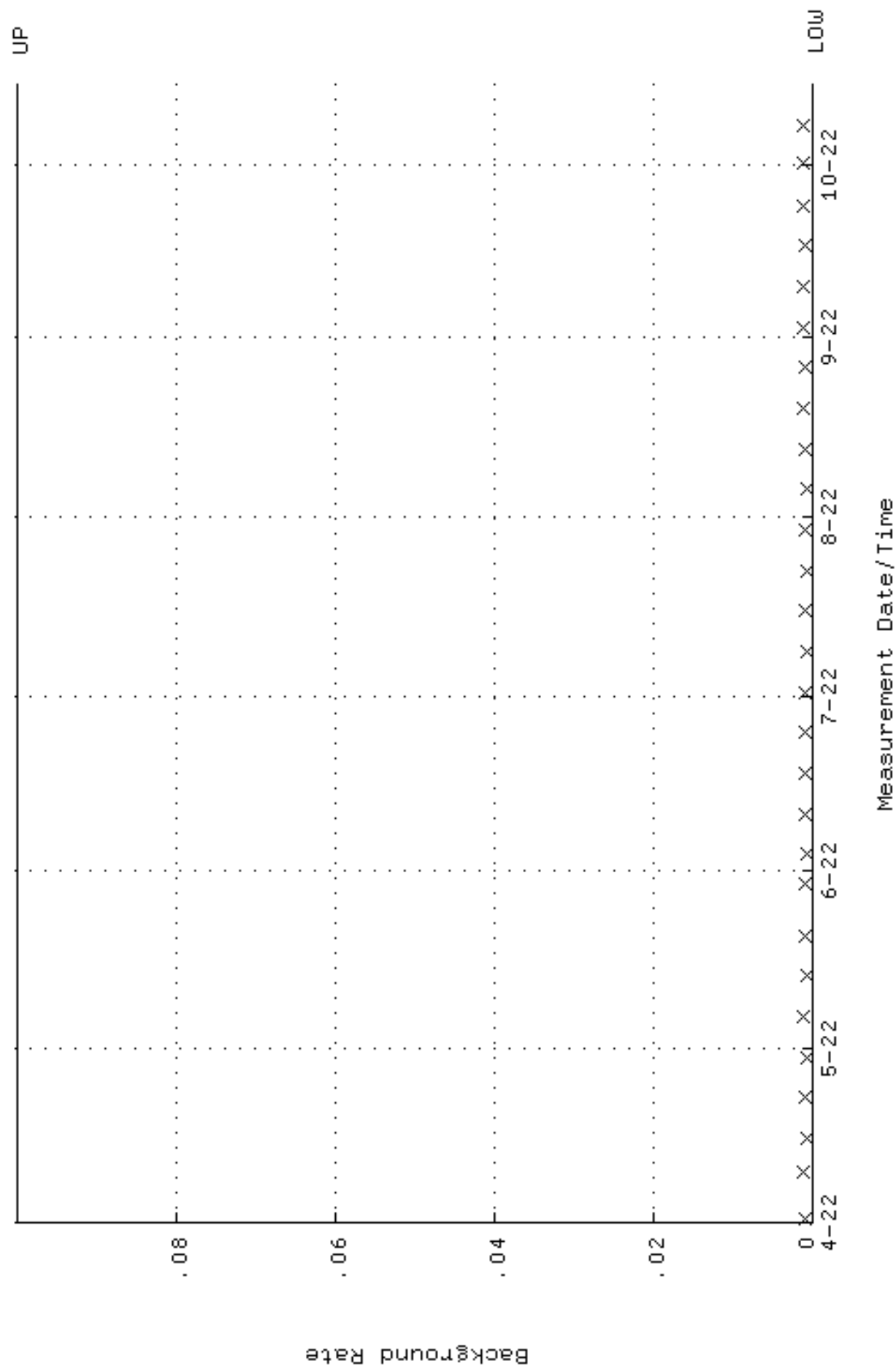
QA filename : DKA100:[ENV_ALPHA.QA.W]W095.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



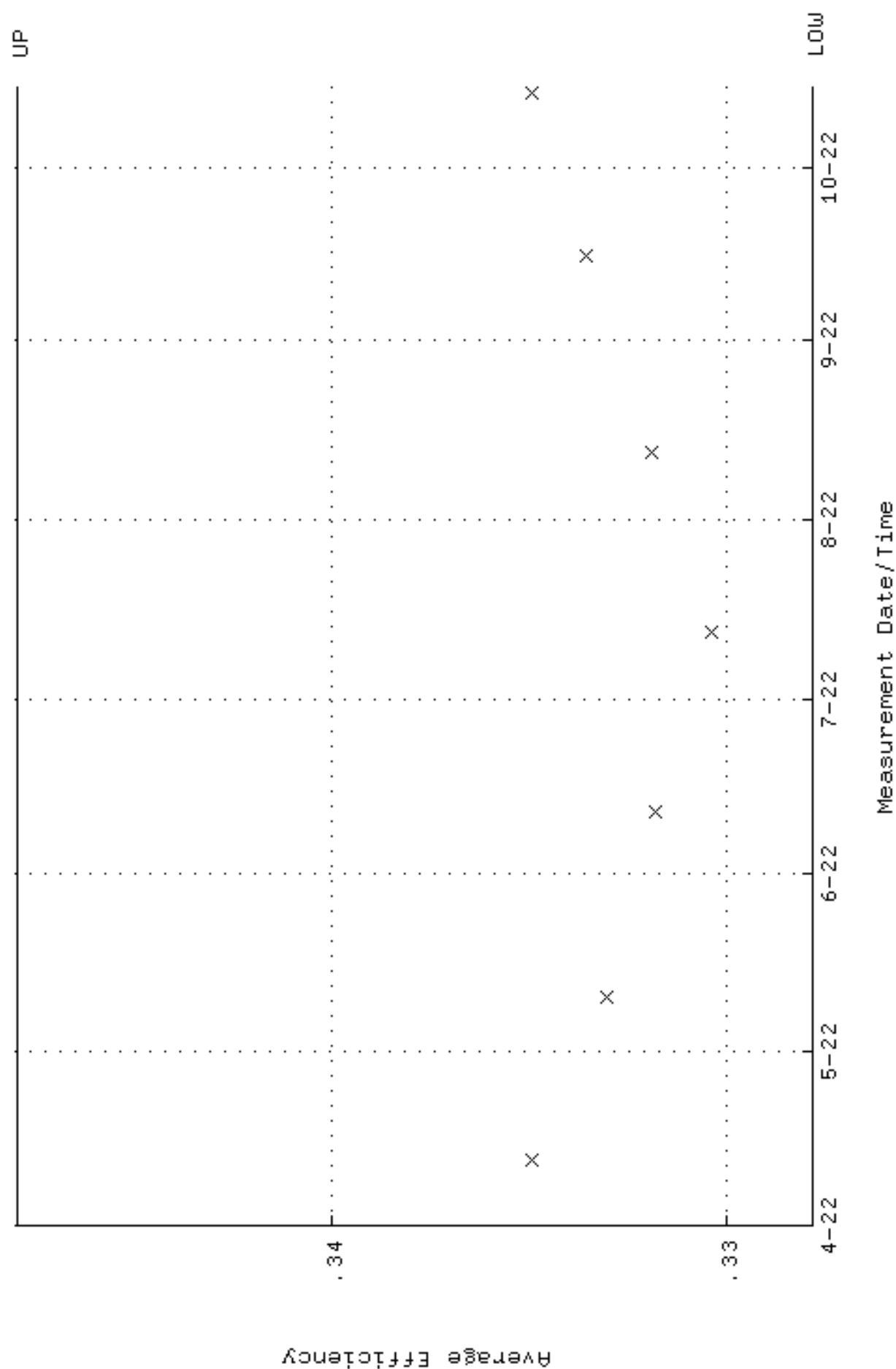
QA filename : DKA100:[ENV_ALPHA.QA.W]W095.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



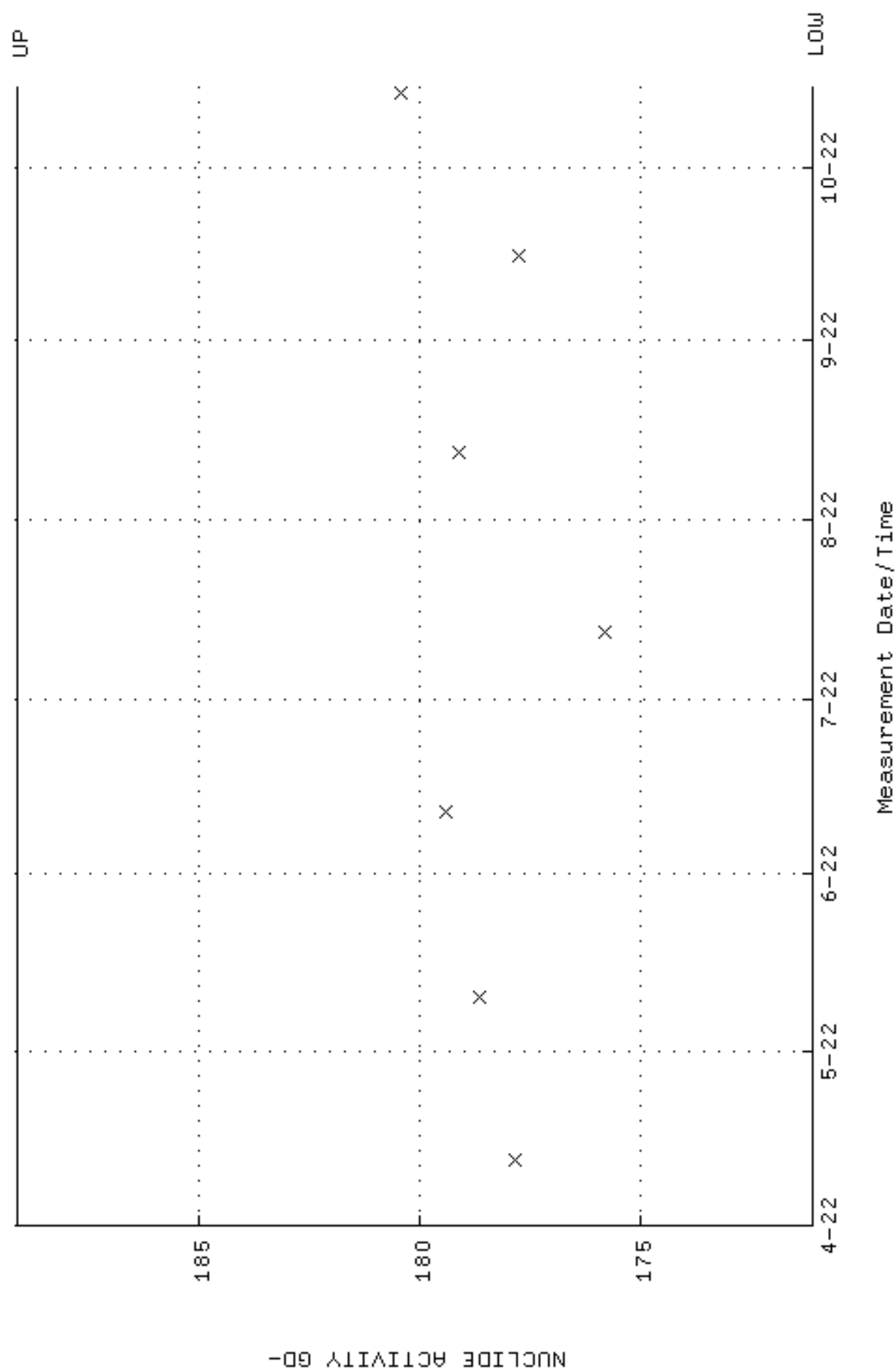
QA filename : DKA100:[ENV_ALPHA.QA.B]B095.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 12:51:54 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



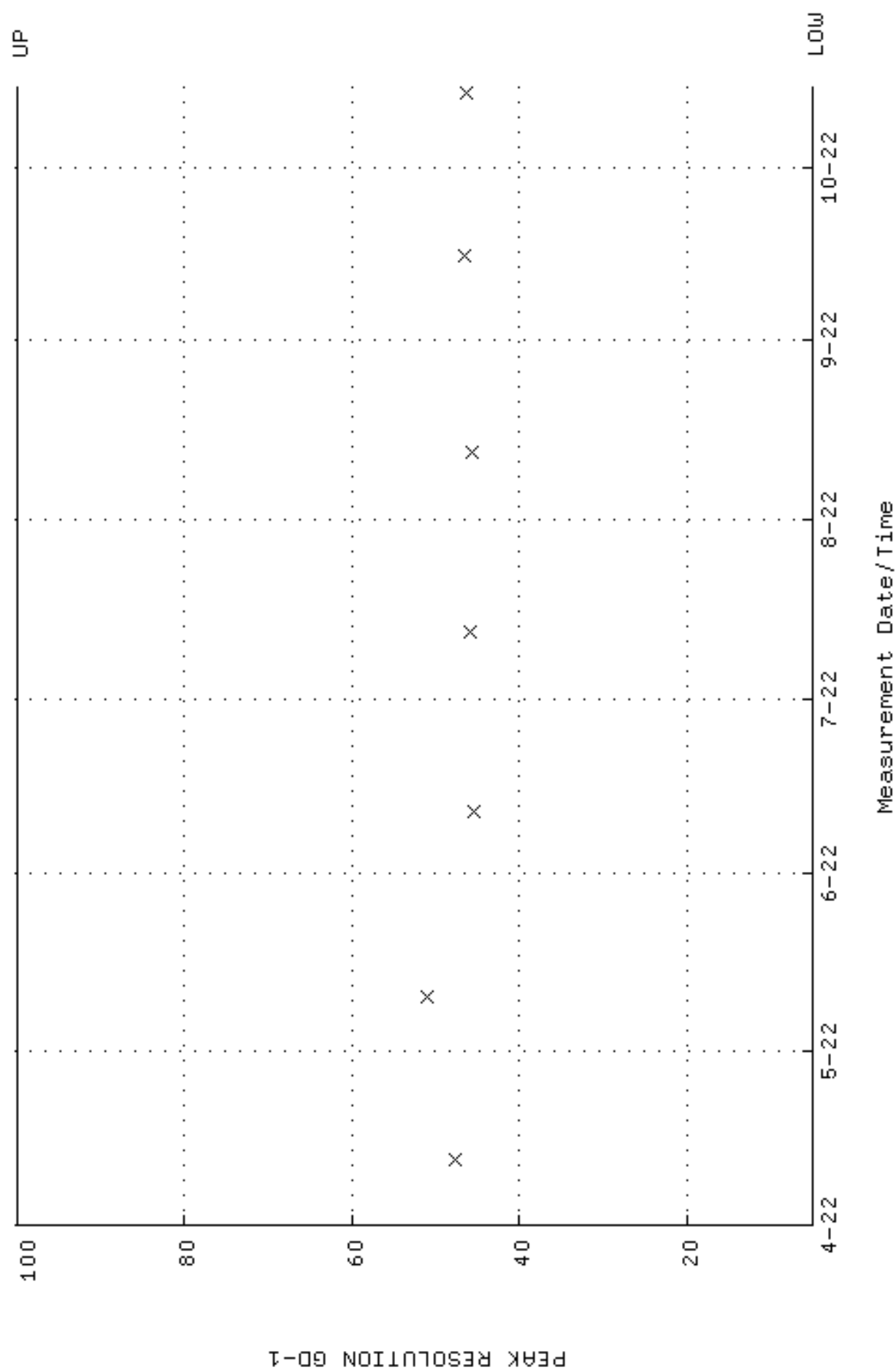
QA filename : DKA100:[ENV_ALPHA.QA.W]W096.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.327800 through 0.348000



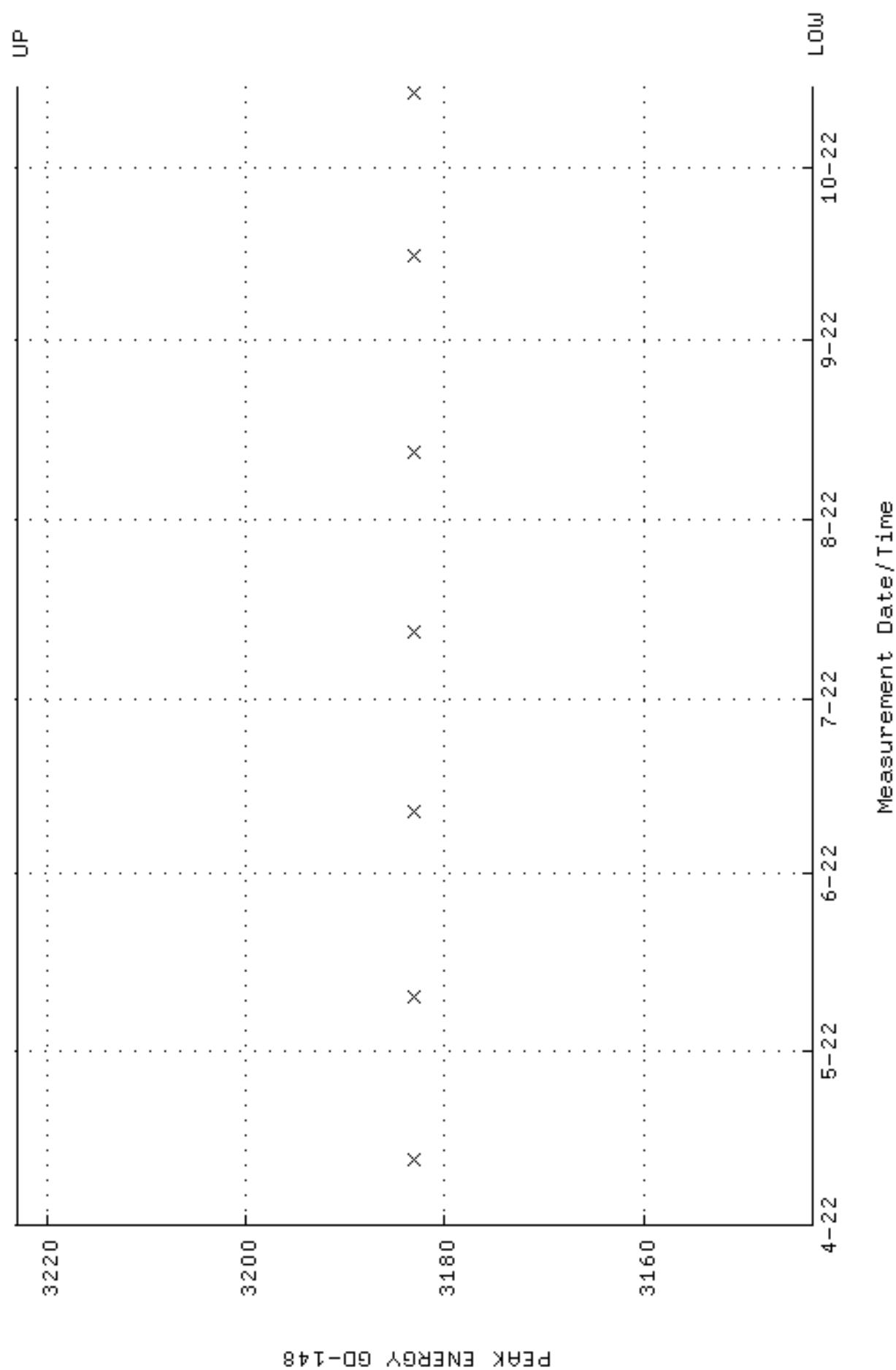
QA filename : DKA100:[ENV_ALPHA.QA.W]W096.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



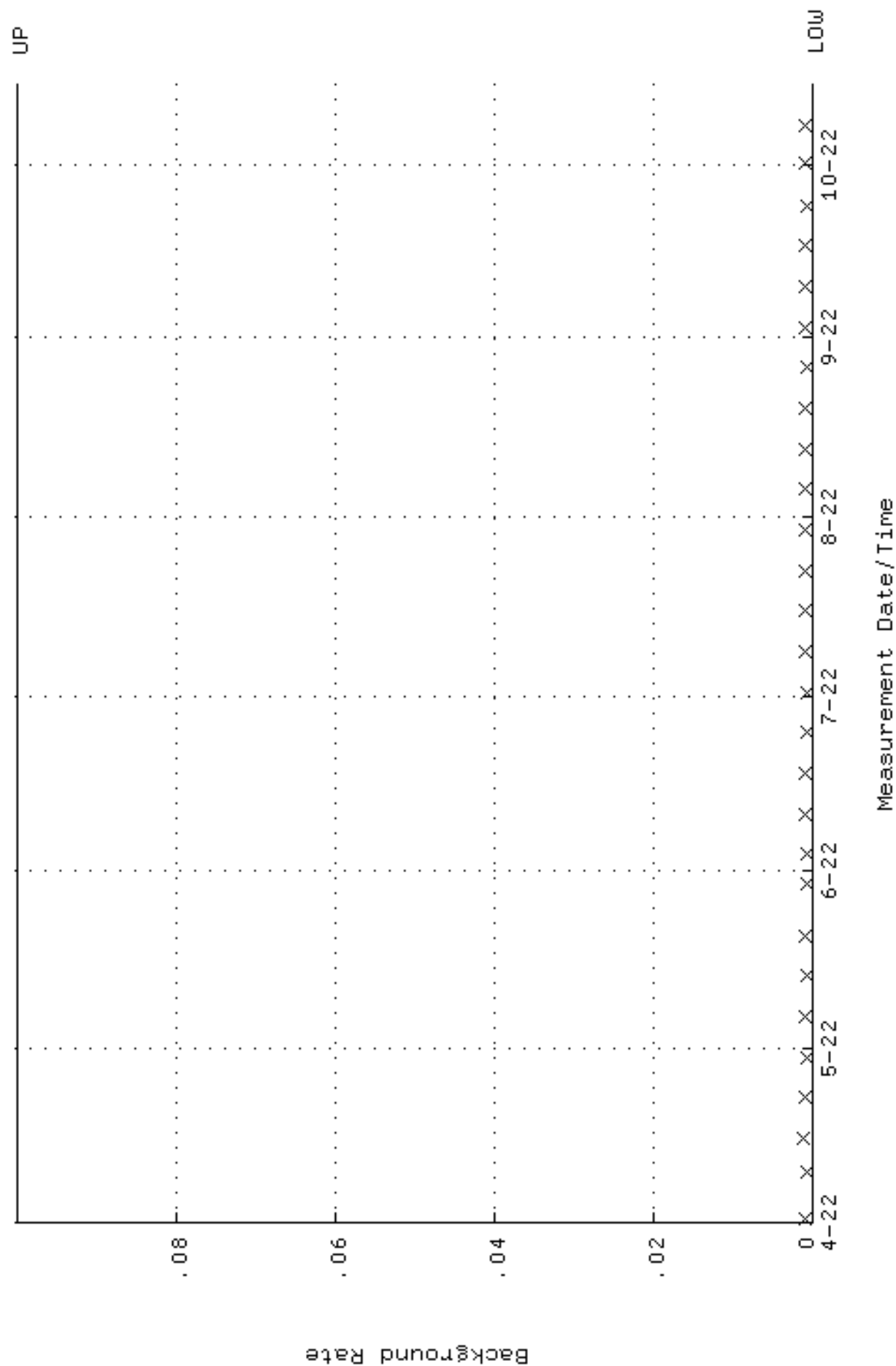
QA filename : DKA100:[ENV_ALPHA.QA.W]W096.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



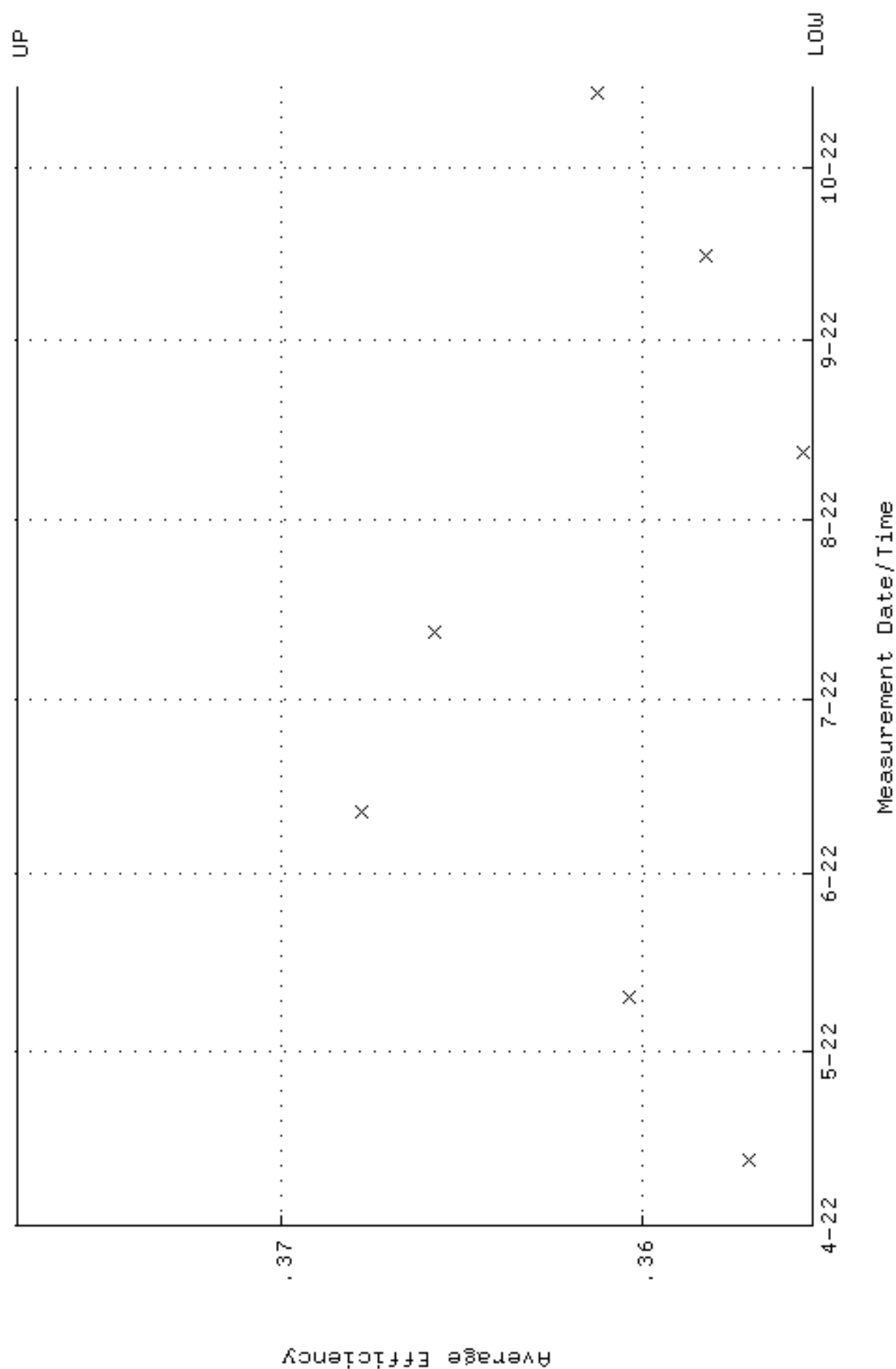
QA filename : DKA100:[ENV_ALPHA.QA.W]W096.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



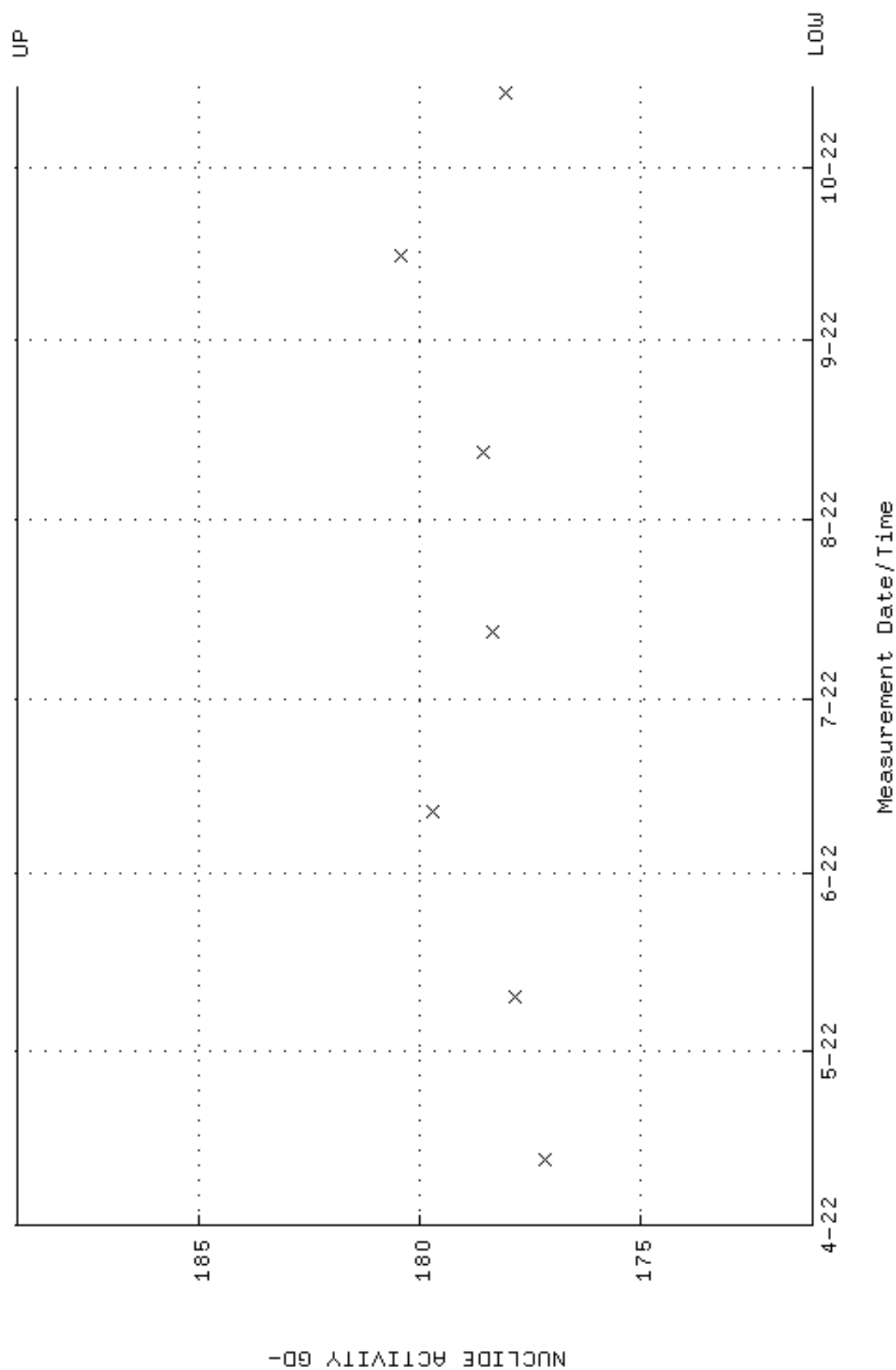
QA filename : DKA100:[ENV_ALPHA.QA.B]B096.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 12:51:54 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



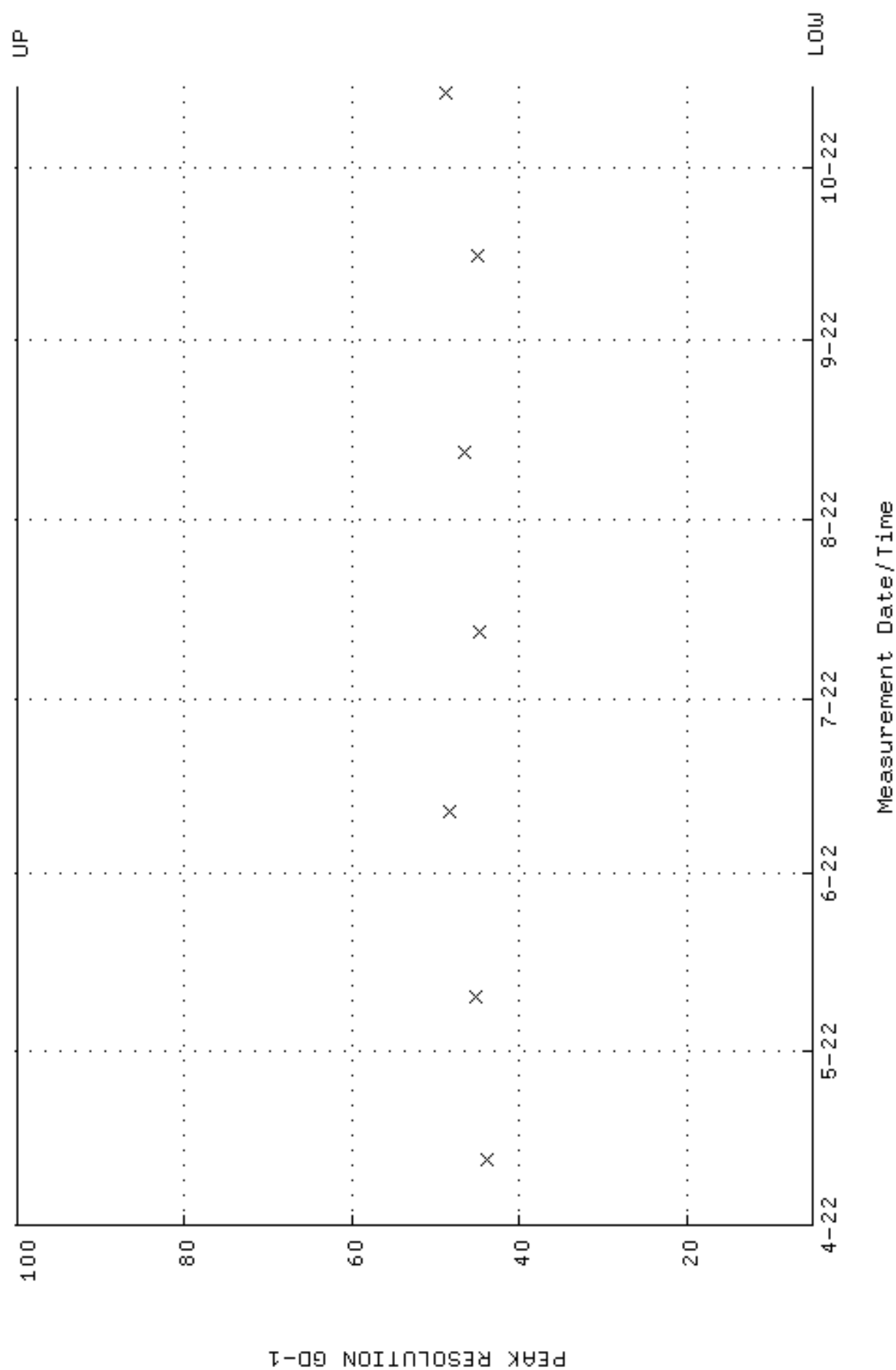
QA filename : DKA100:[ENV_ALPHA.QA.W]W097.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.355300 through 0.377300



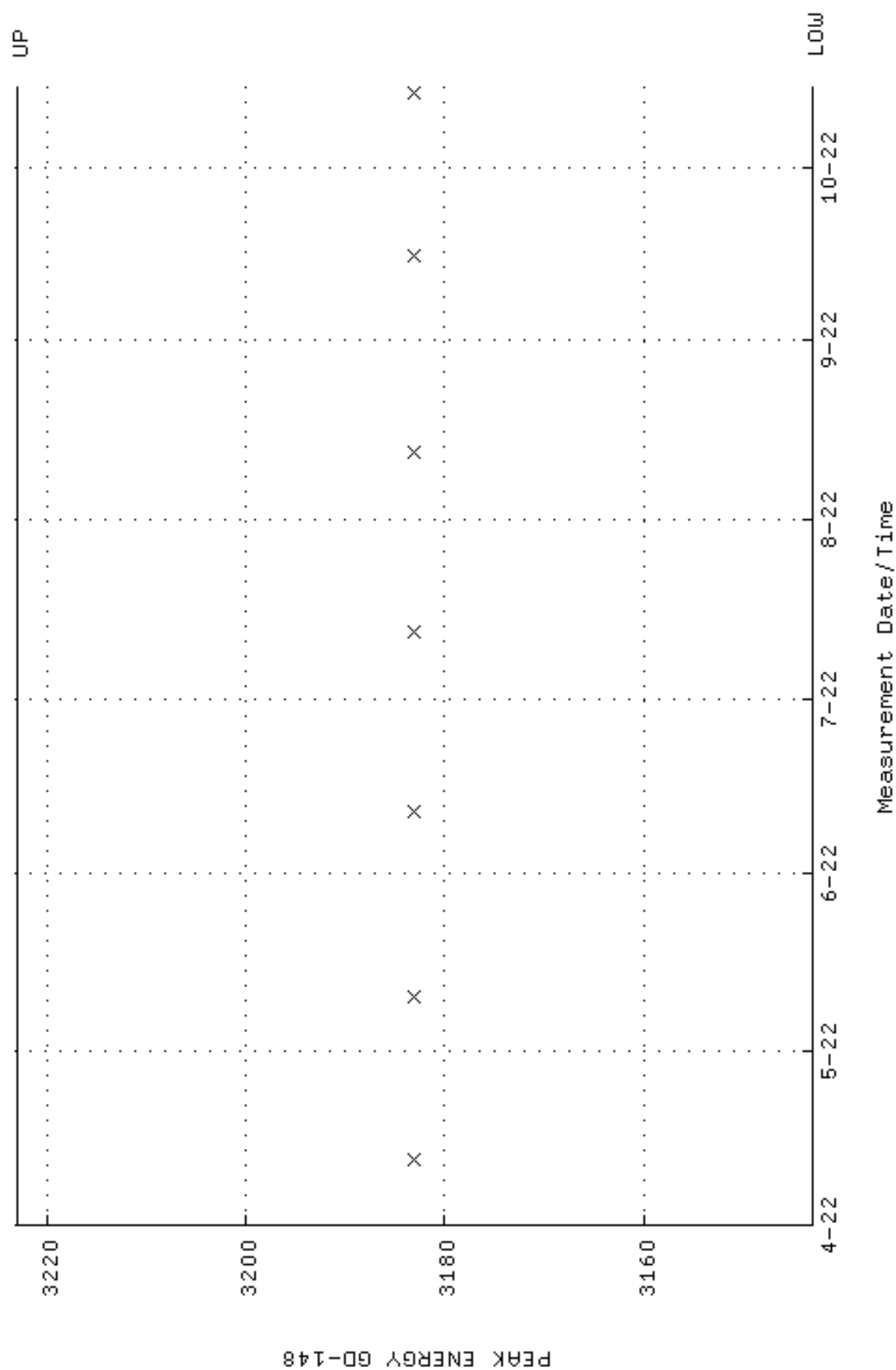
QA filename : DKA100:[ENV_ALPHA.QA.W]W097.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



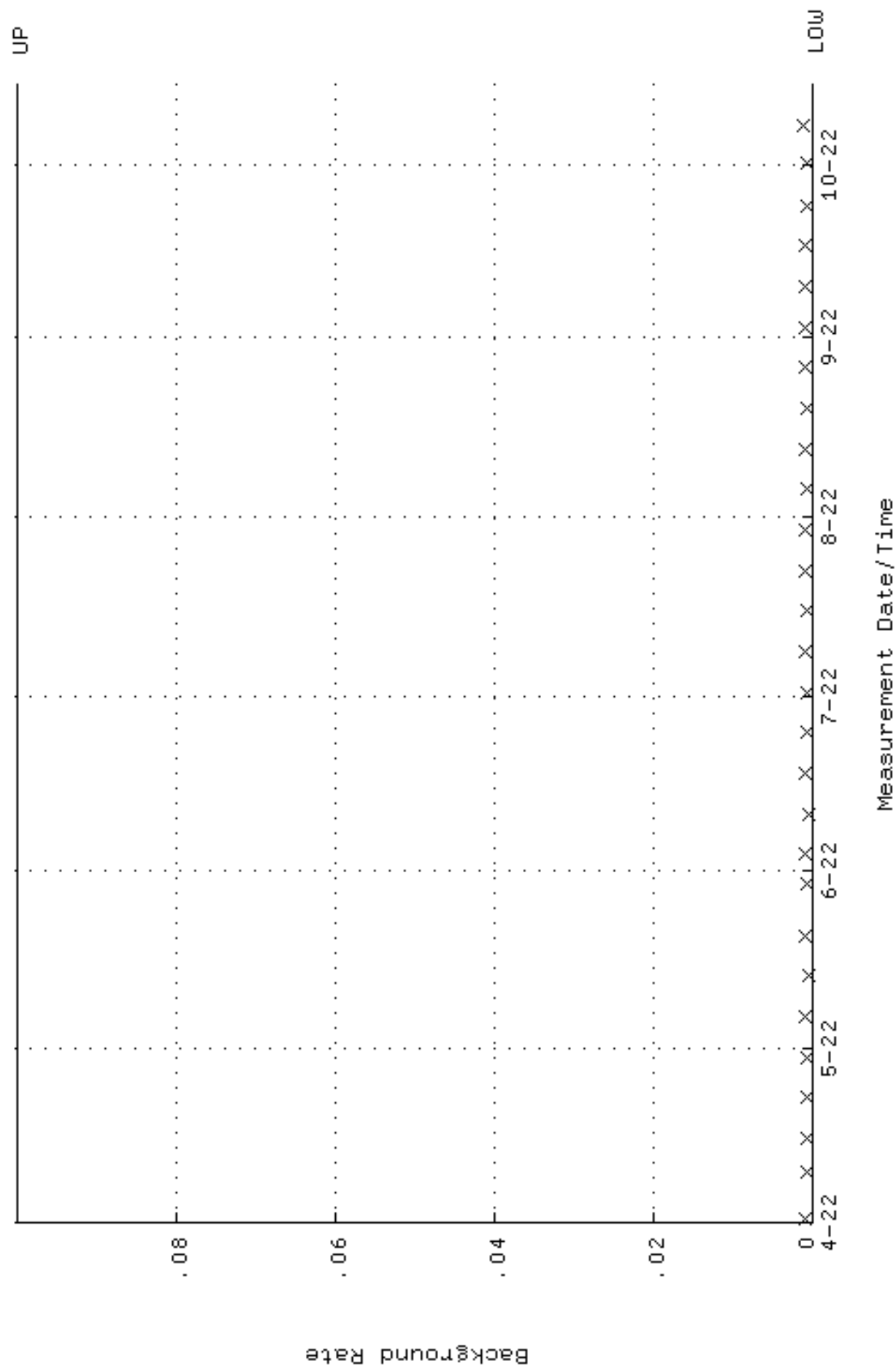
QA filename : DKA100:[ENV_ALPHA.QA.W]W097.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



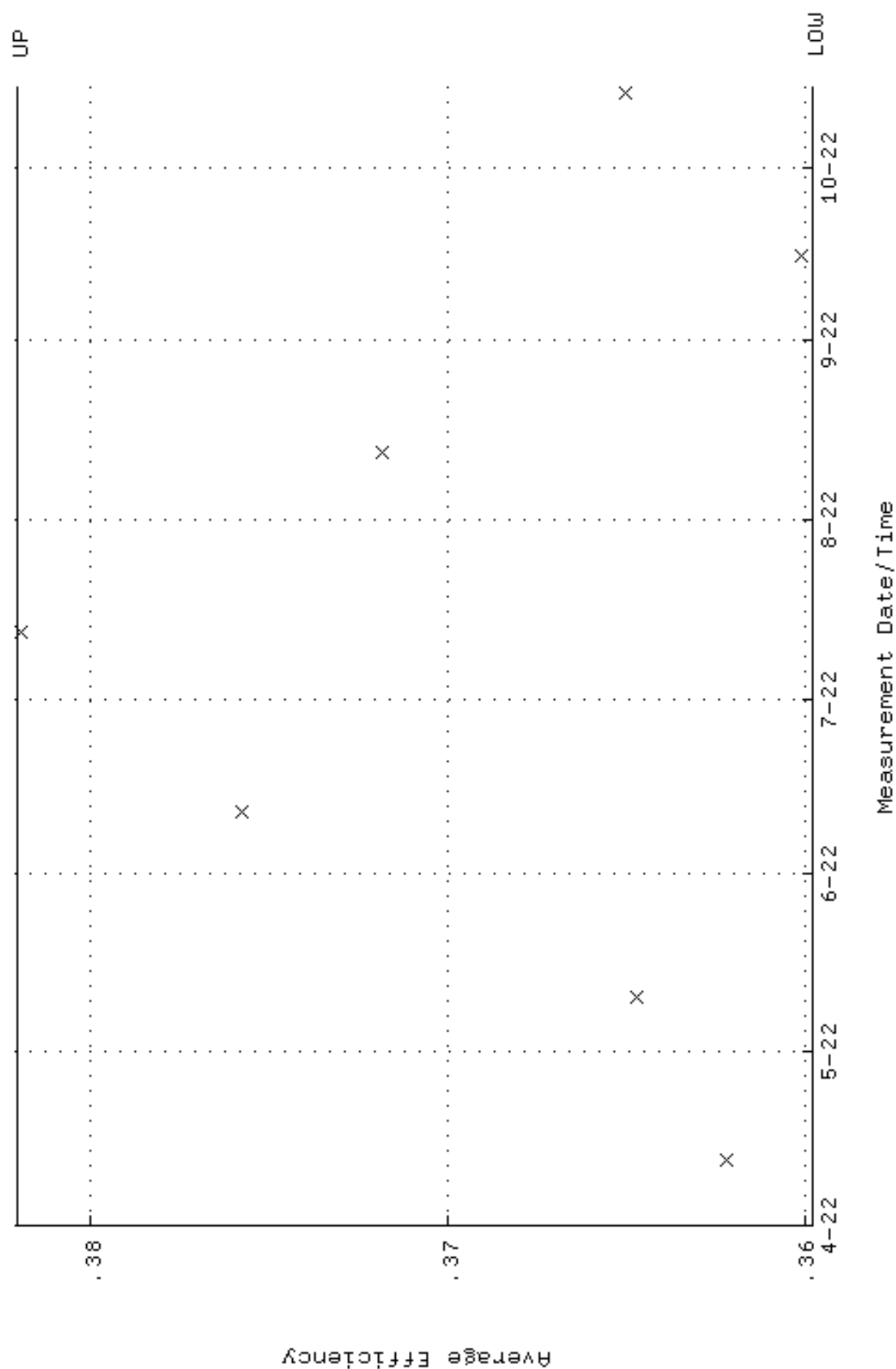
QA filename : DKA100:[ENV_ALPHA.QA.W]W097.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



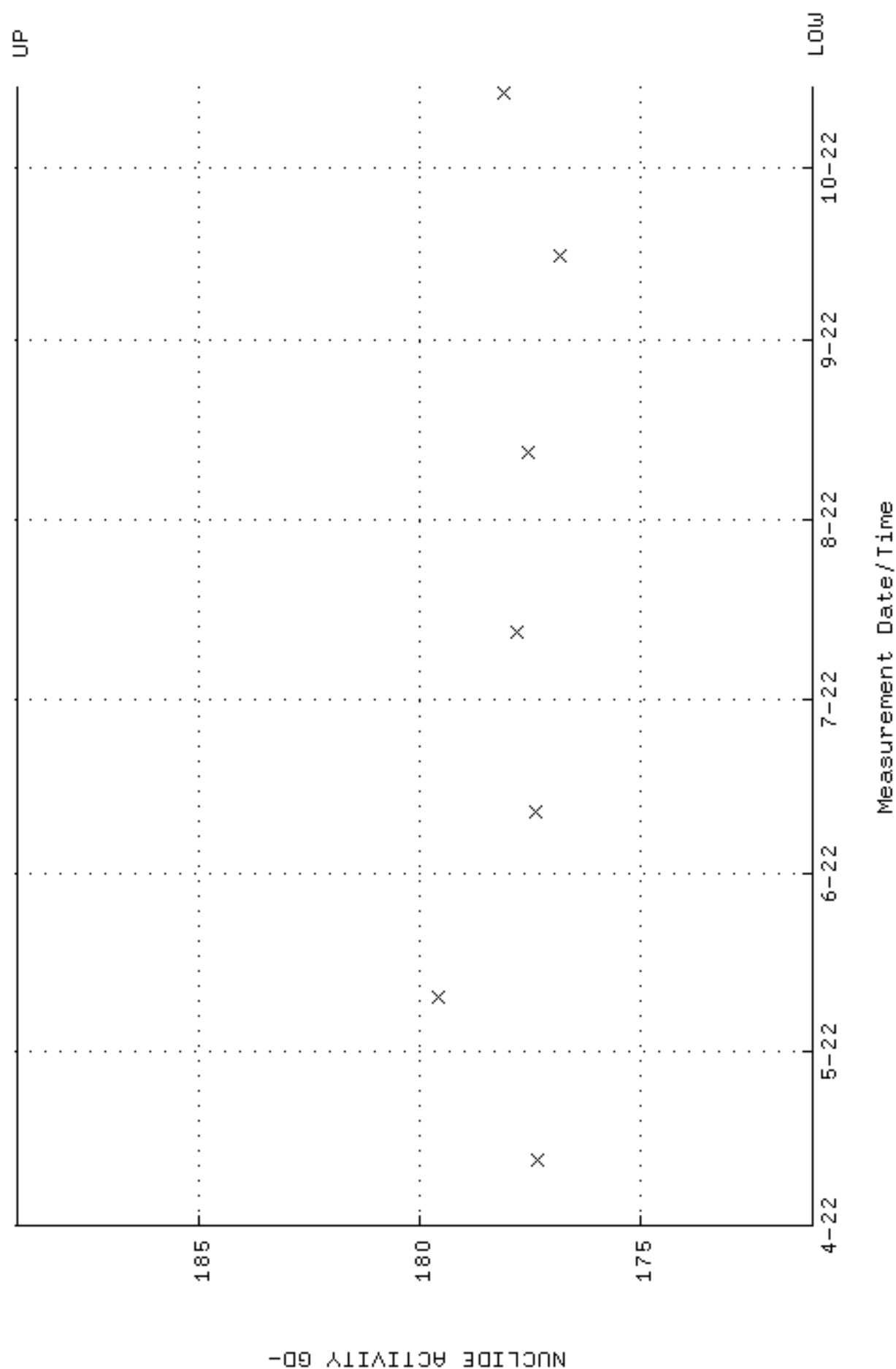
QA filename : DKA100:[ENV_ALPHA.QA.B]B097.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 12:51:54 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



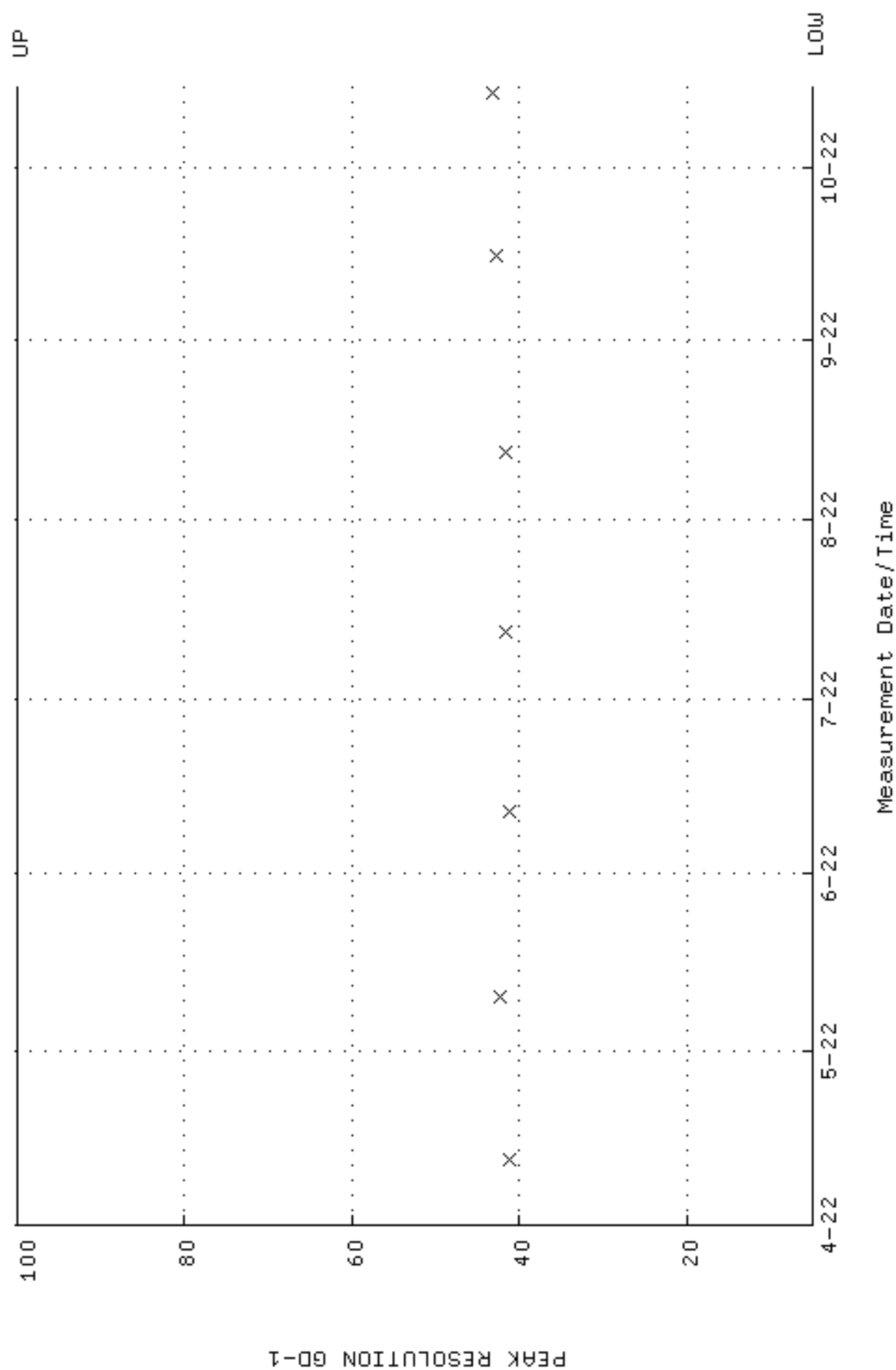
QA filename : DKA100:[ENV_ALPHA.QA.W]W098.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.359797 through 0.382053



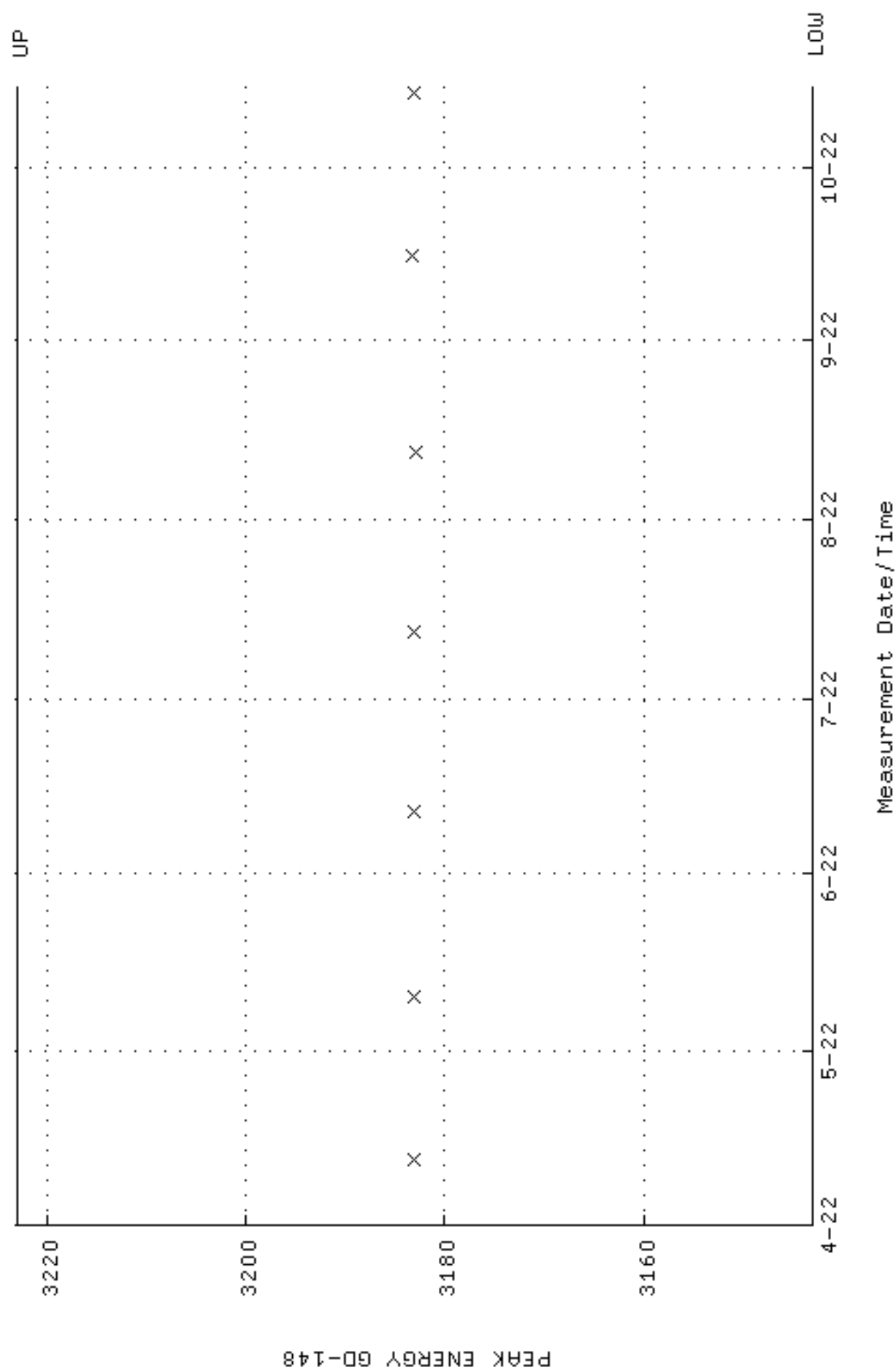
QA filename : DKA100:[ENV_ALPHA.QA.W]W098.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



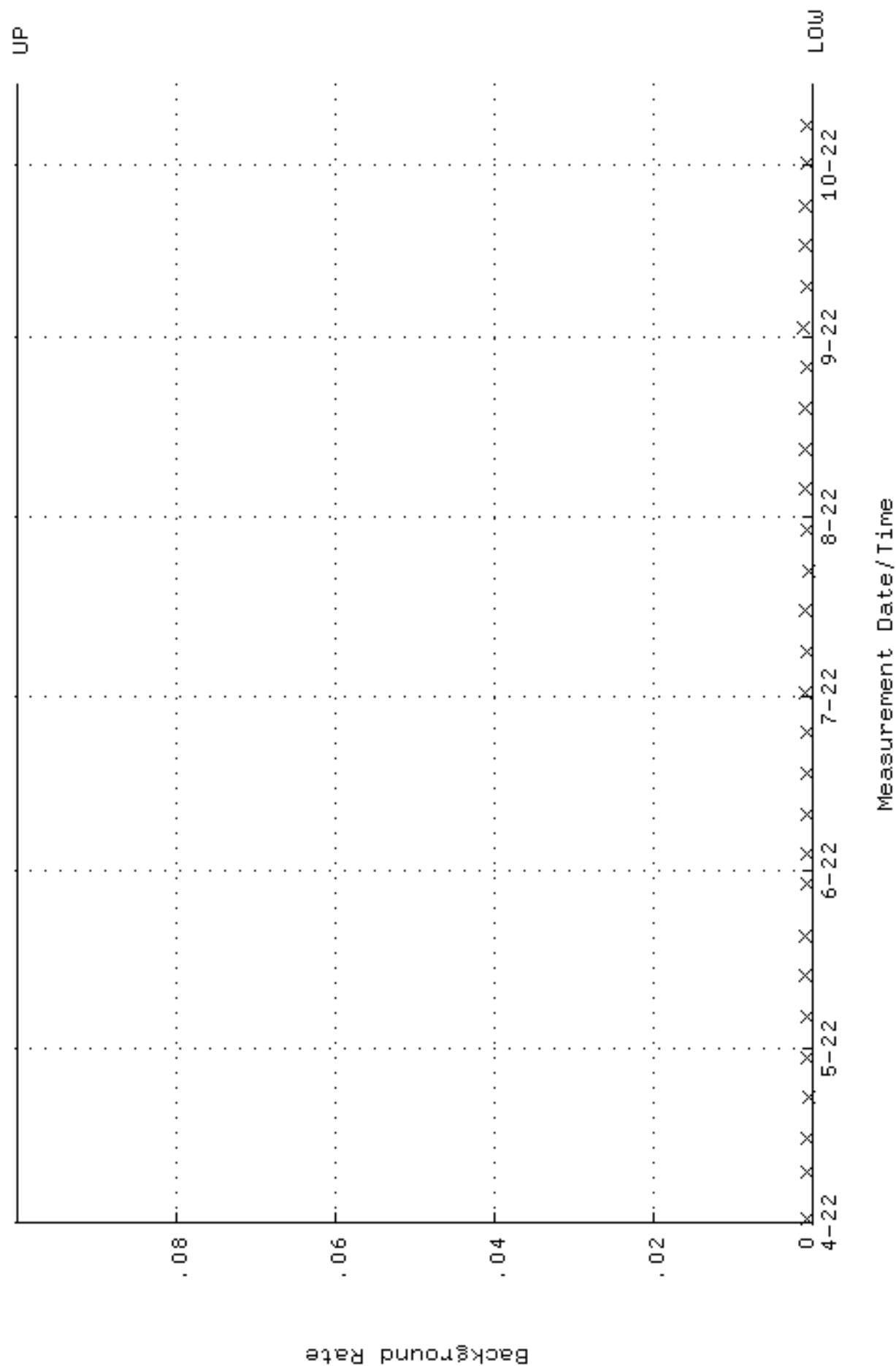
QA filename : DKA100:[ENV_ALPHA.QA.W]W098.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



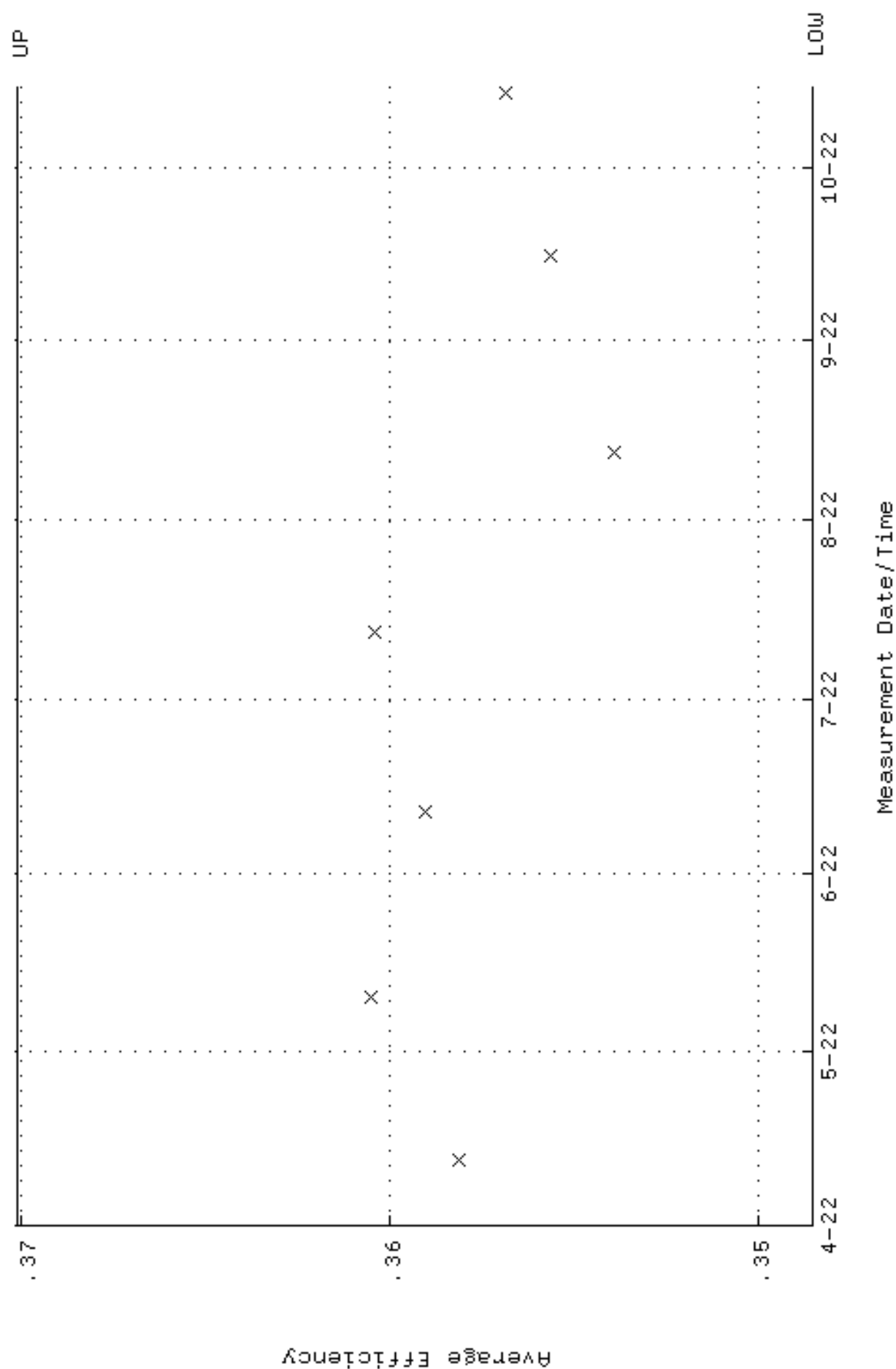
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



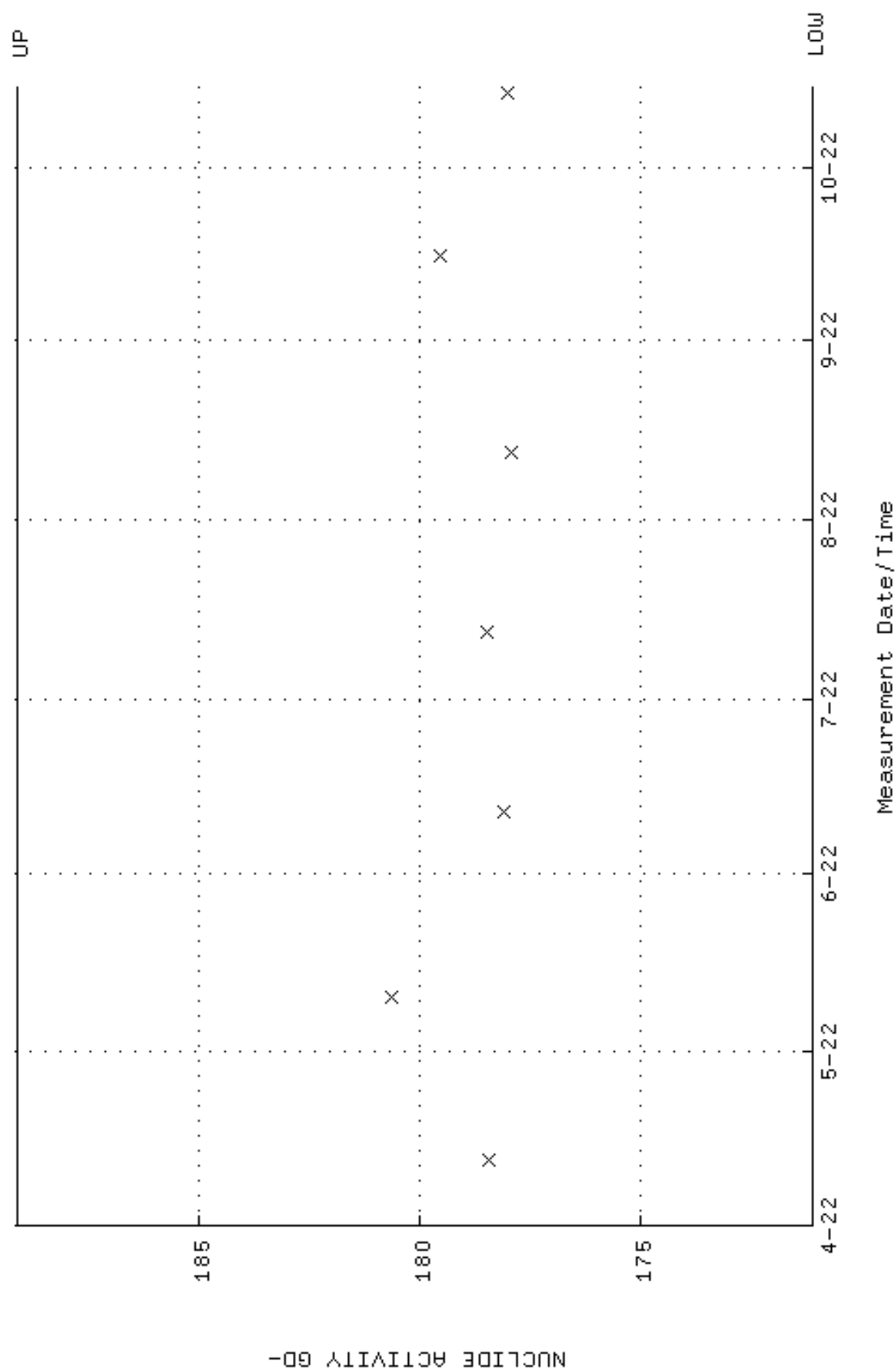
QA filename : DKA100:[ENV_ALPHA.QA.B]B098.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 12:51:54 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



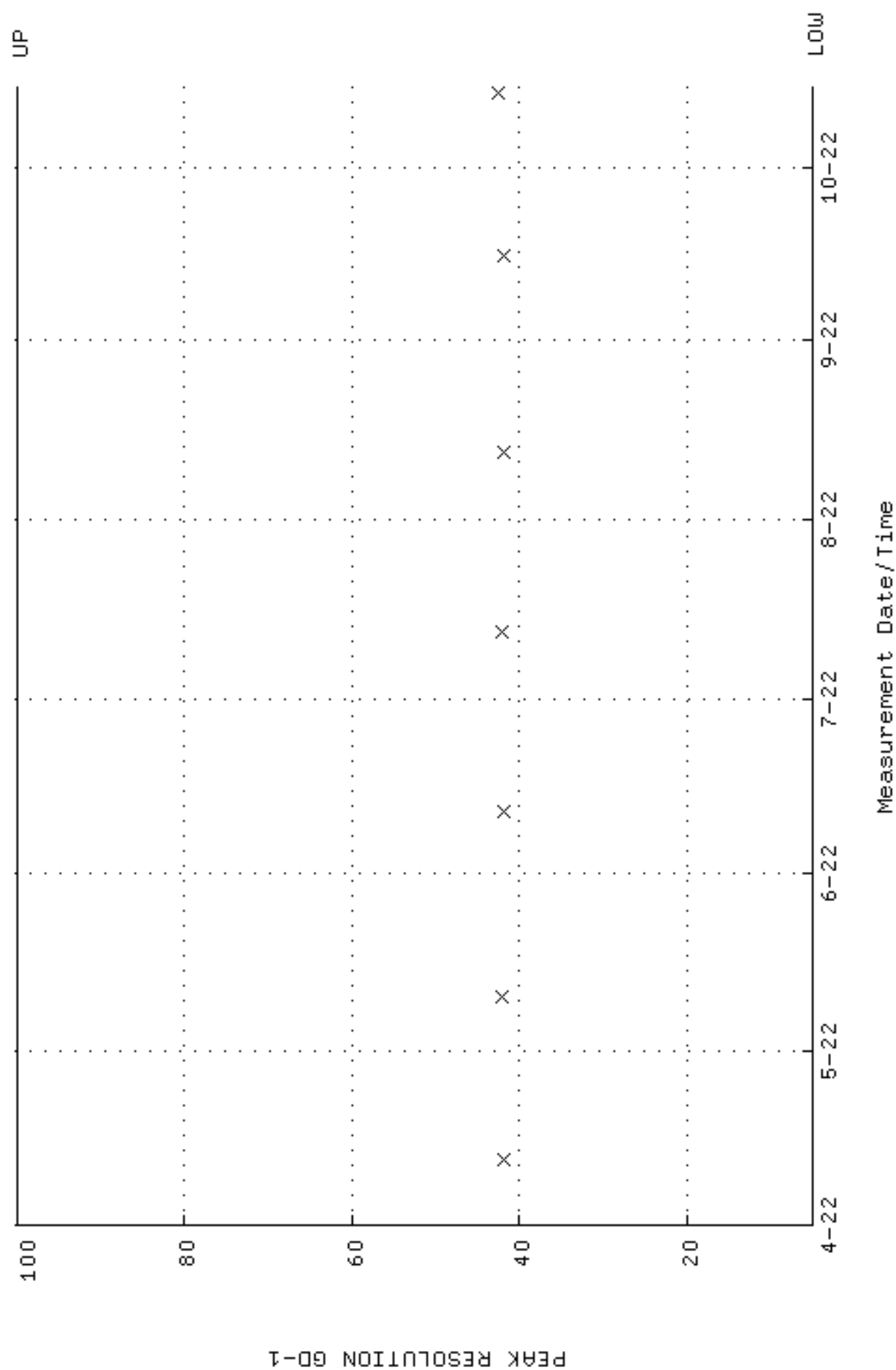
QA filename : DKA100:[ENV_ALPHA.QA.W]W099.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.348530 through 0.370089



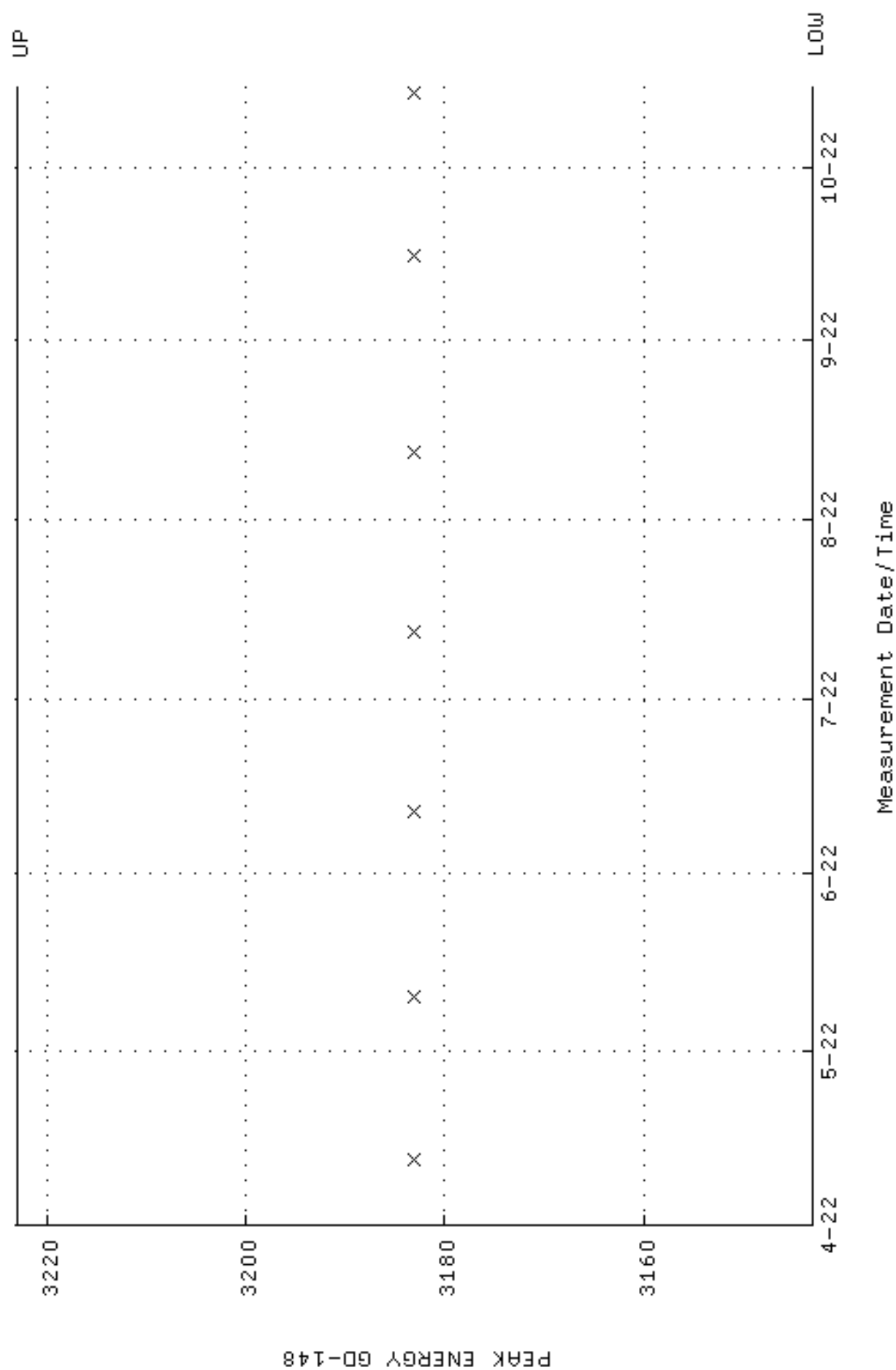
QA filename : DKA100:[ENV_ALPHA.QA.W]W099.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



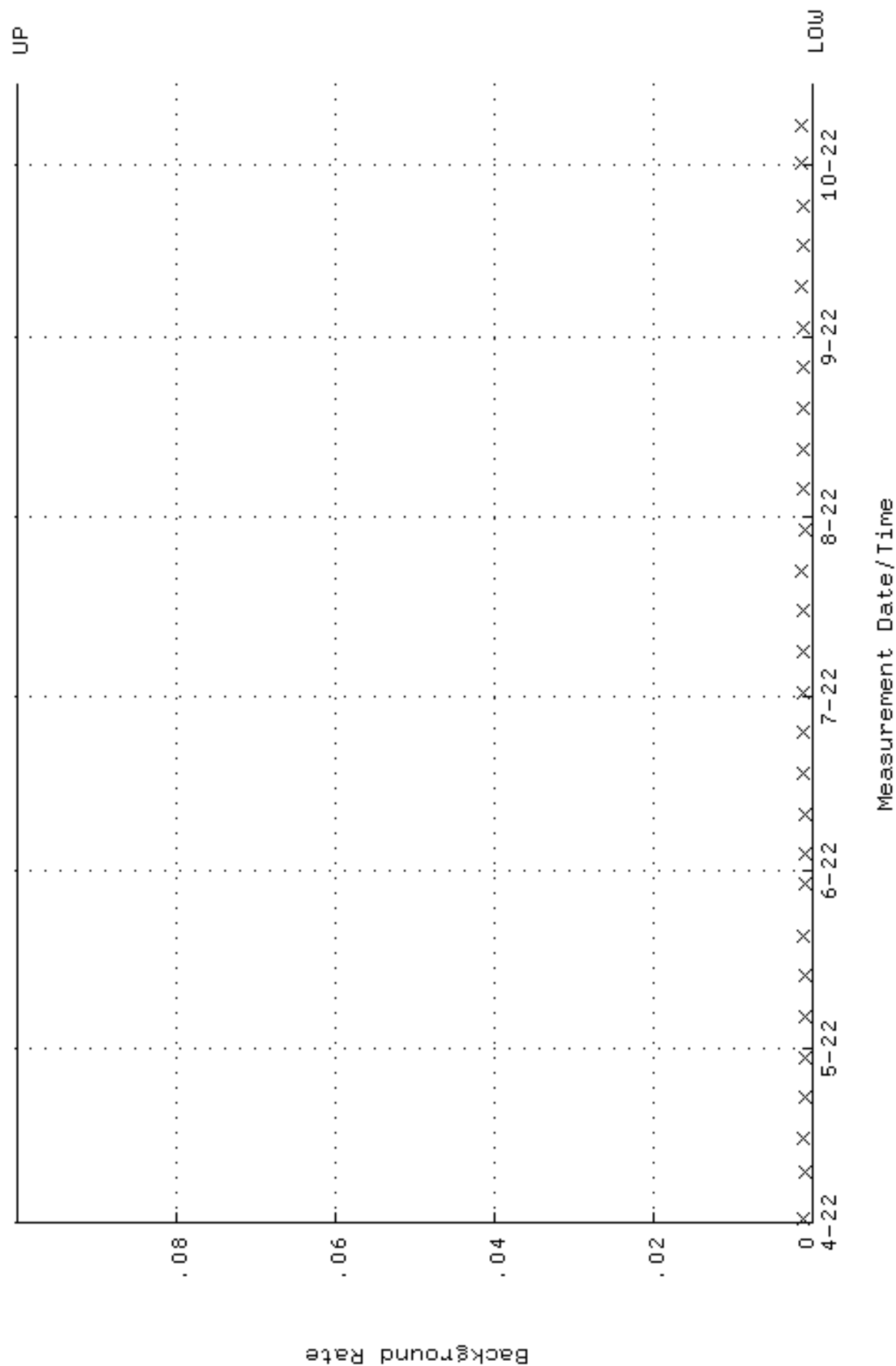
QA filename : DKA100:[ENV_ALPHA.QA.W]W099.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



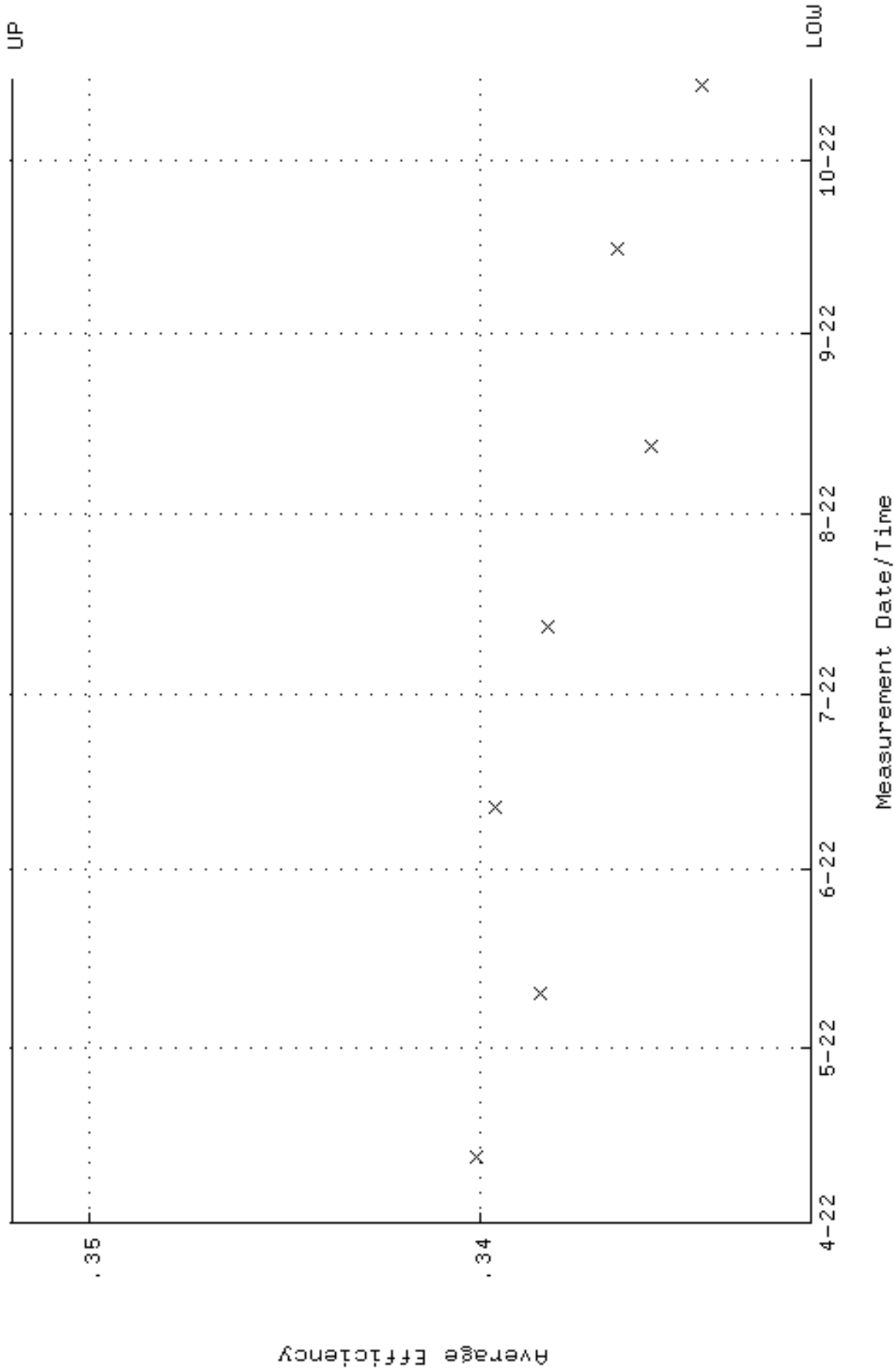
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



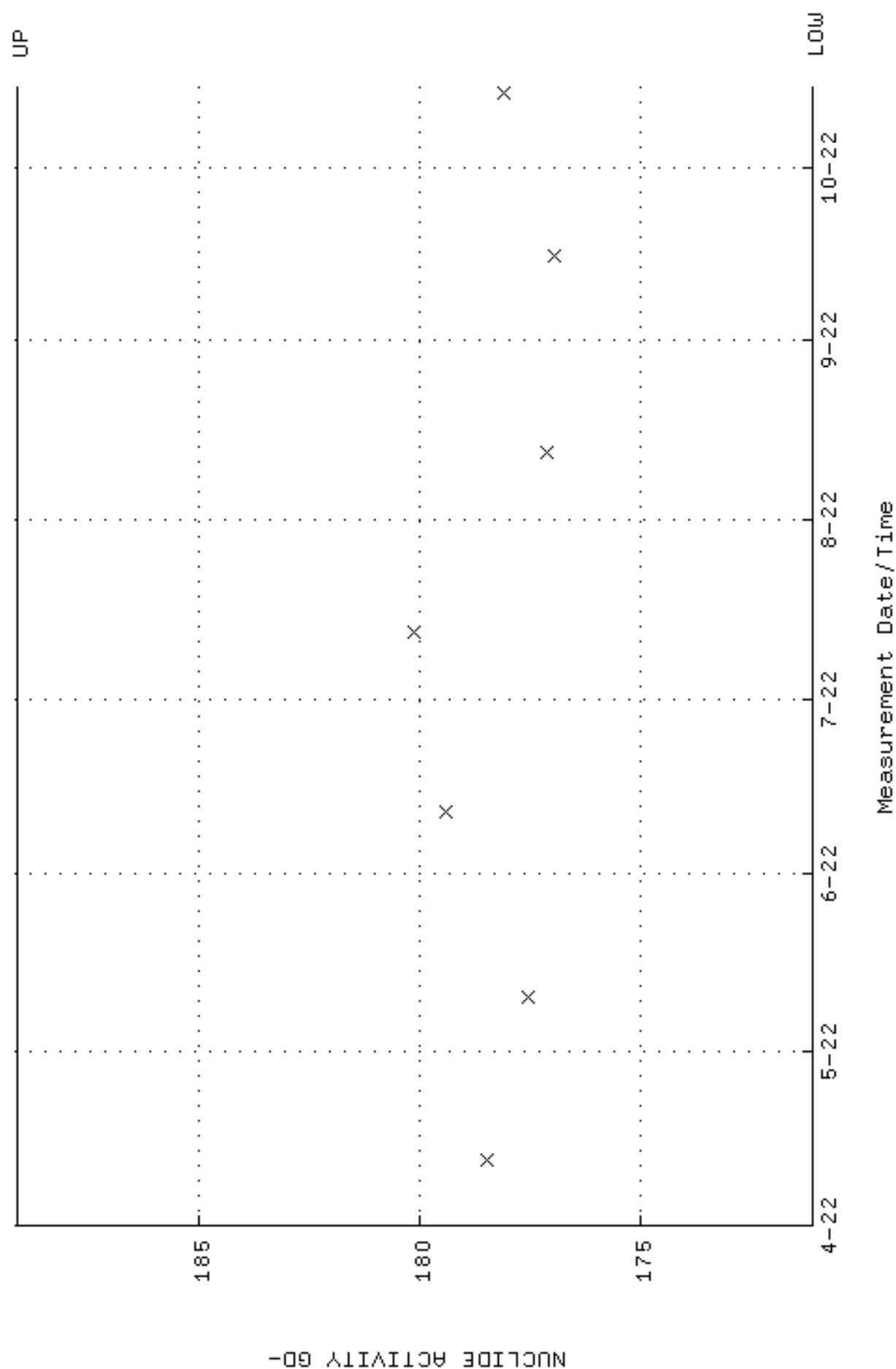
QA filename : DKA100:[ENV_ALPHA.QA.B]B099.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 12:51:54 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



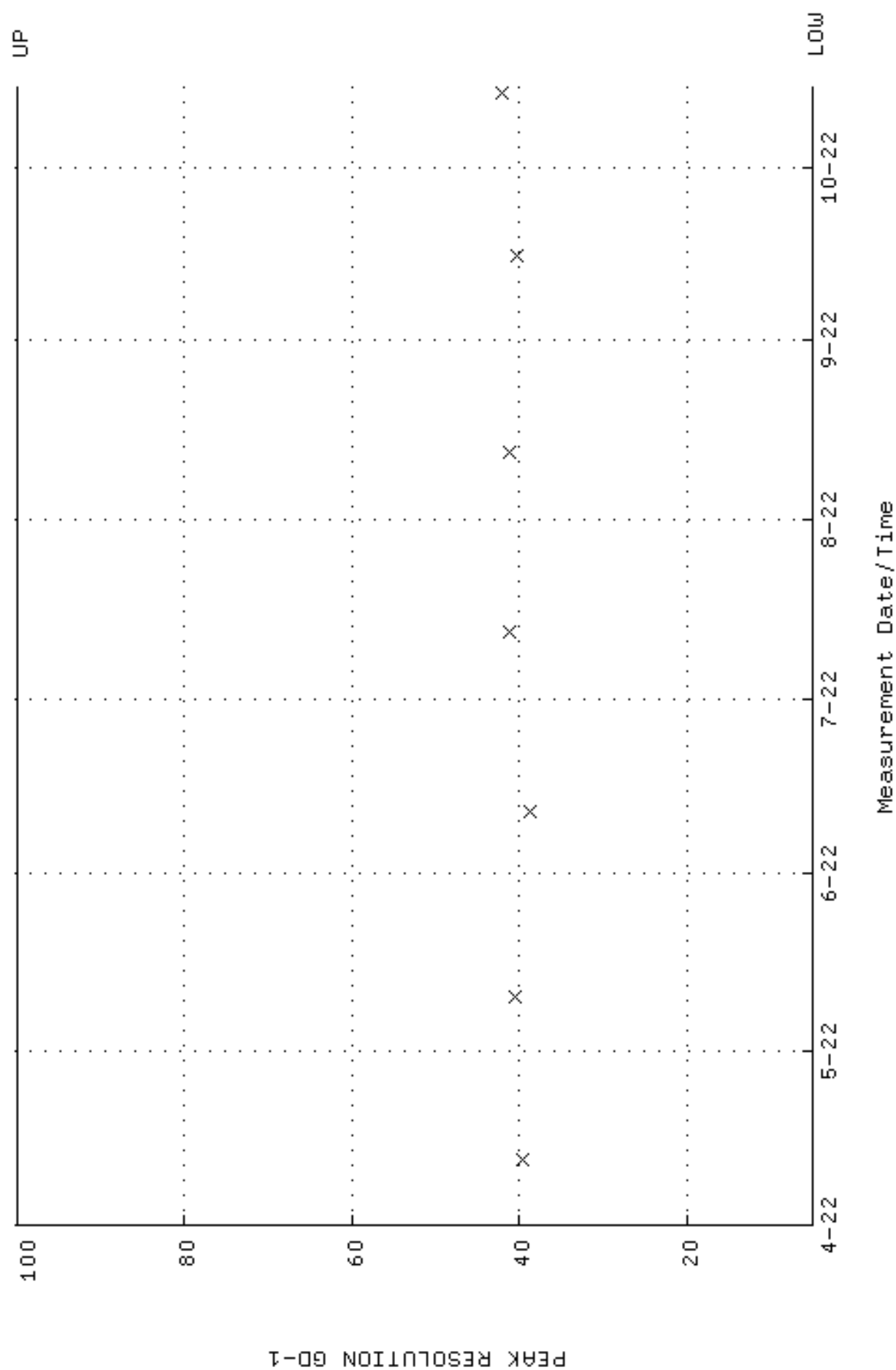
QA filename : DKA100:[ENV_ALPHA.QA.W]W100.QAF;12
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
Lower/Upper Lmts: 0.331500 through 0.352000



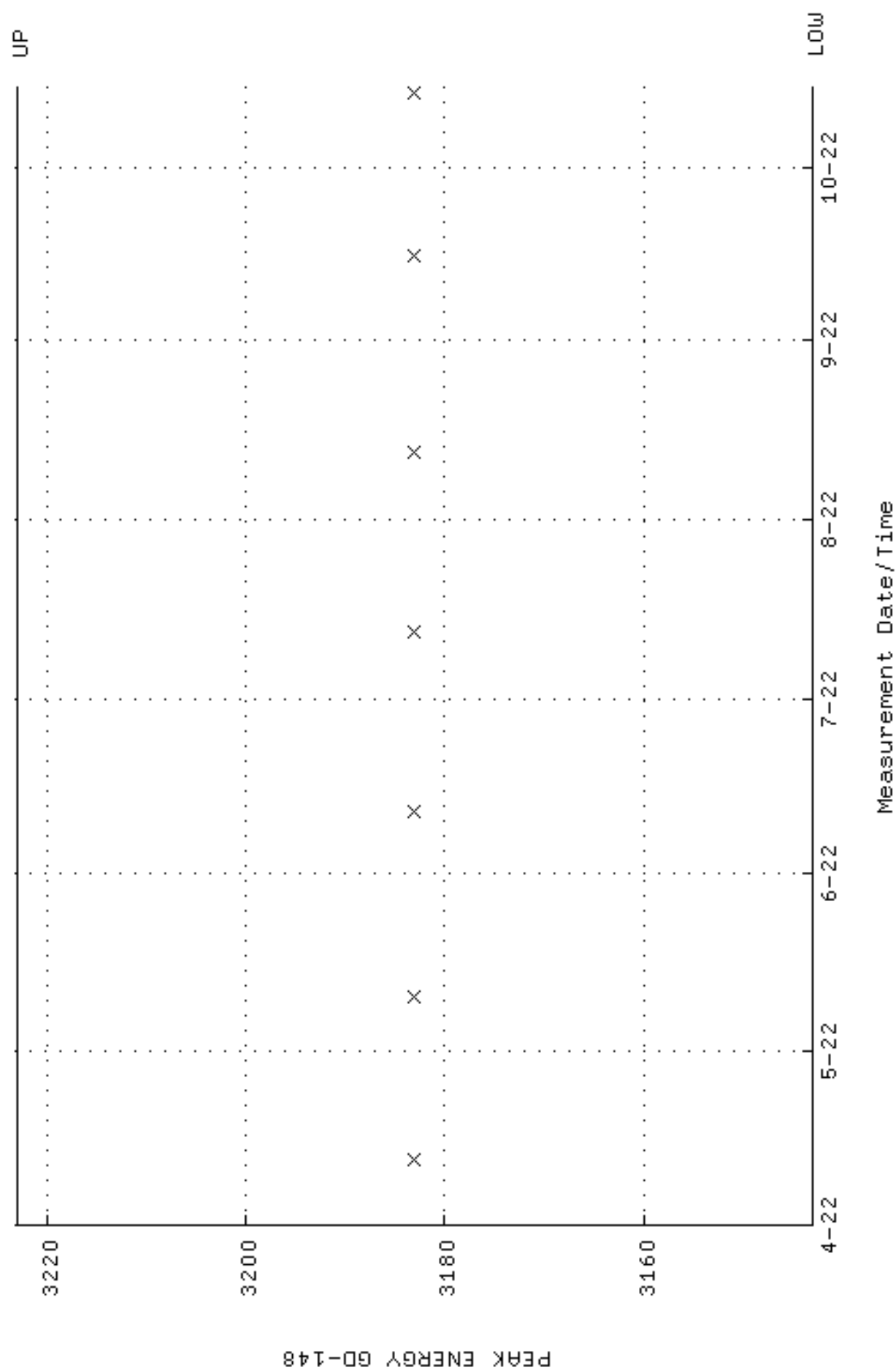
QA filename : DKA100:[ENV_ALPHA.QA.W]W100.QAF;12
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



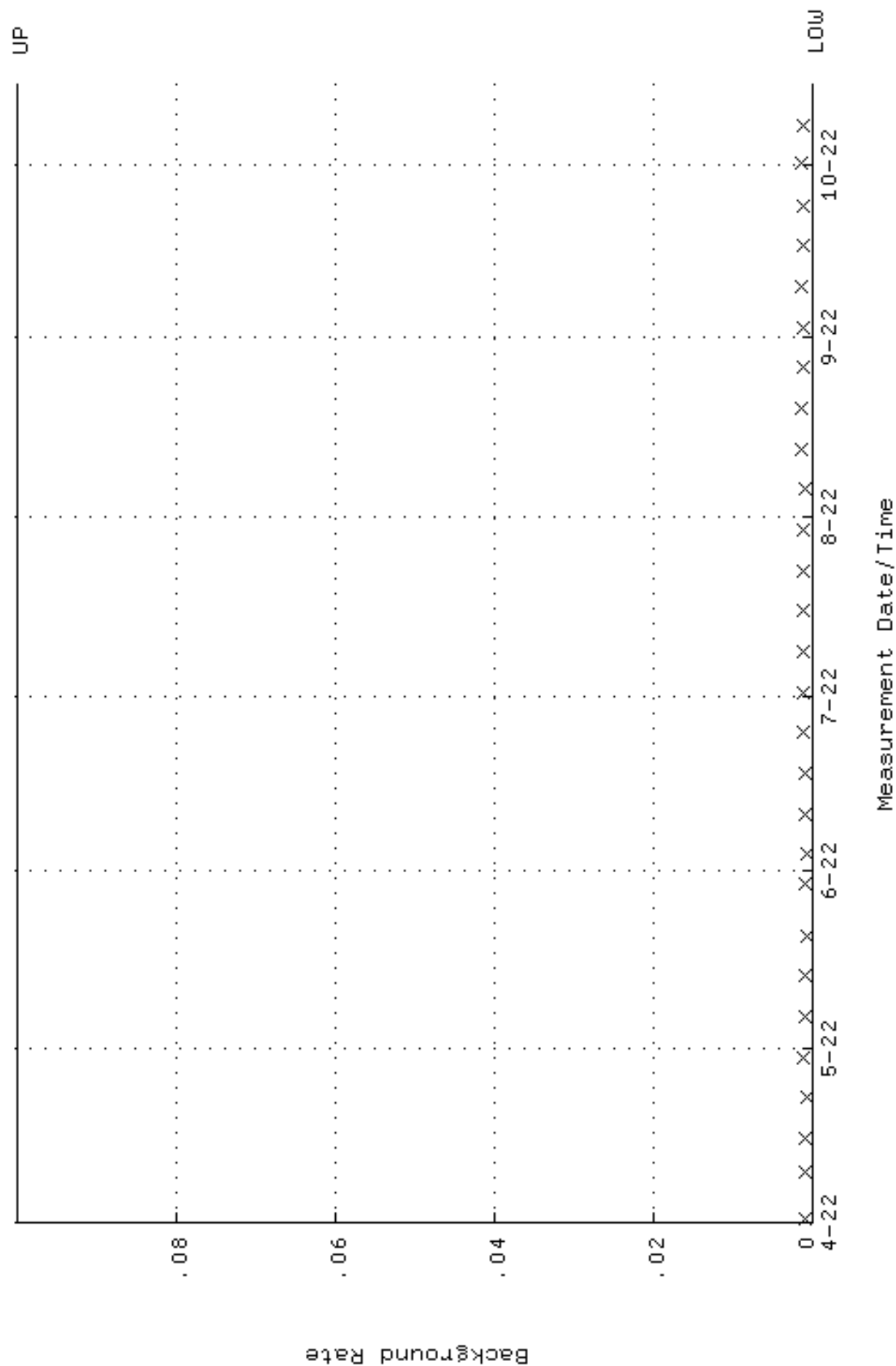
QA filename : DKA100:[ENV_ALPHA.QA.W]W100.QAF;12
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



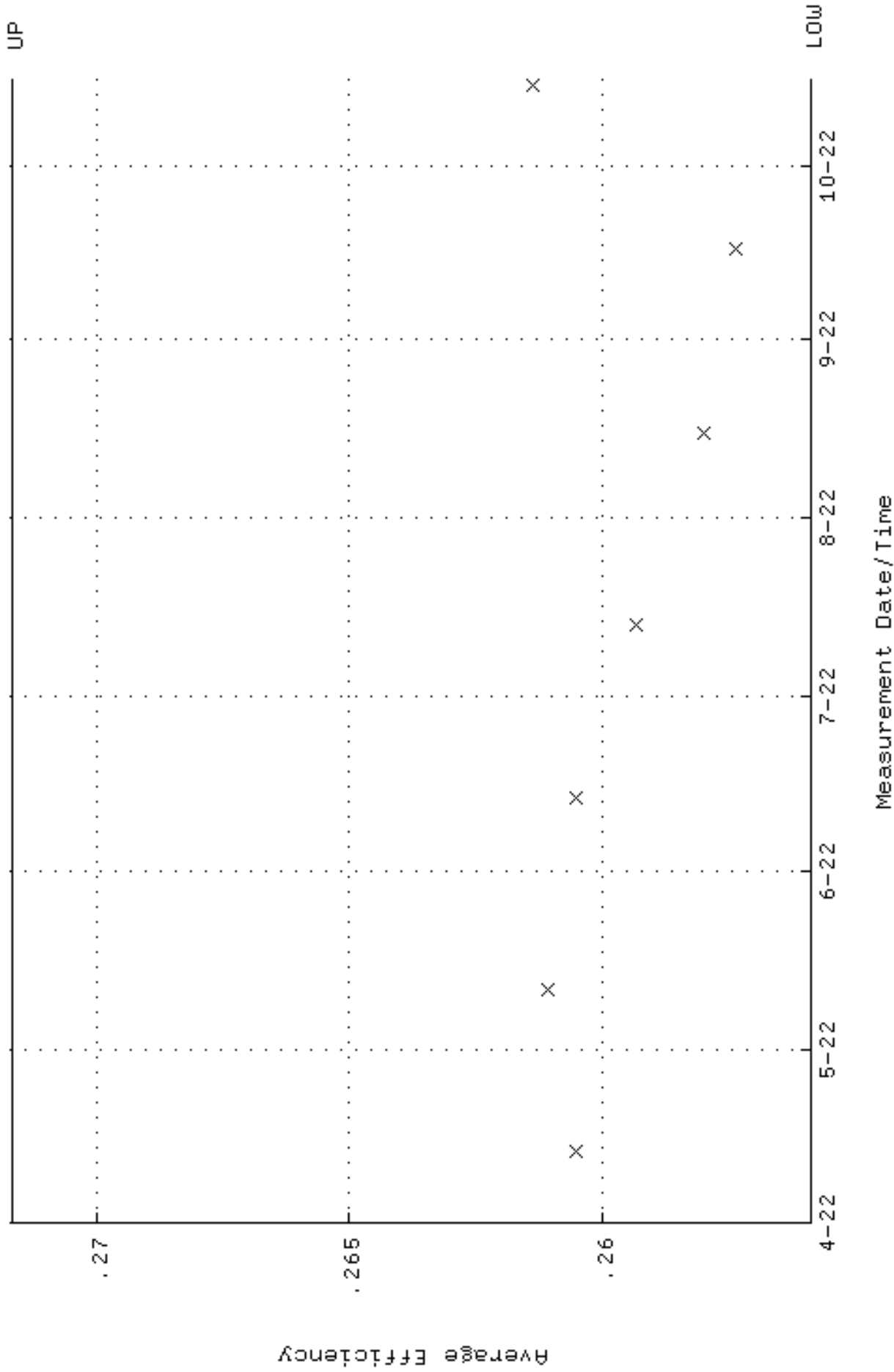
QA filename : DKA100:[ENV_ALPHA.QA.W]W100.QAF;12
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 12-APR-2022 08:54:18 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



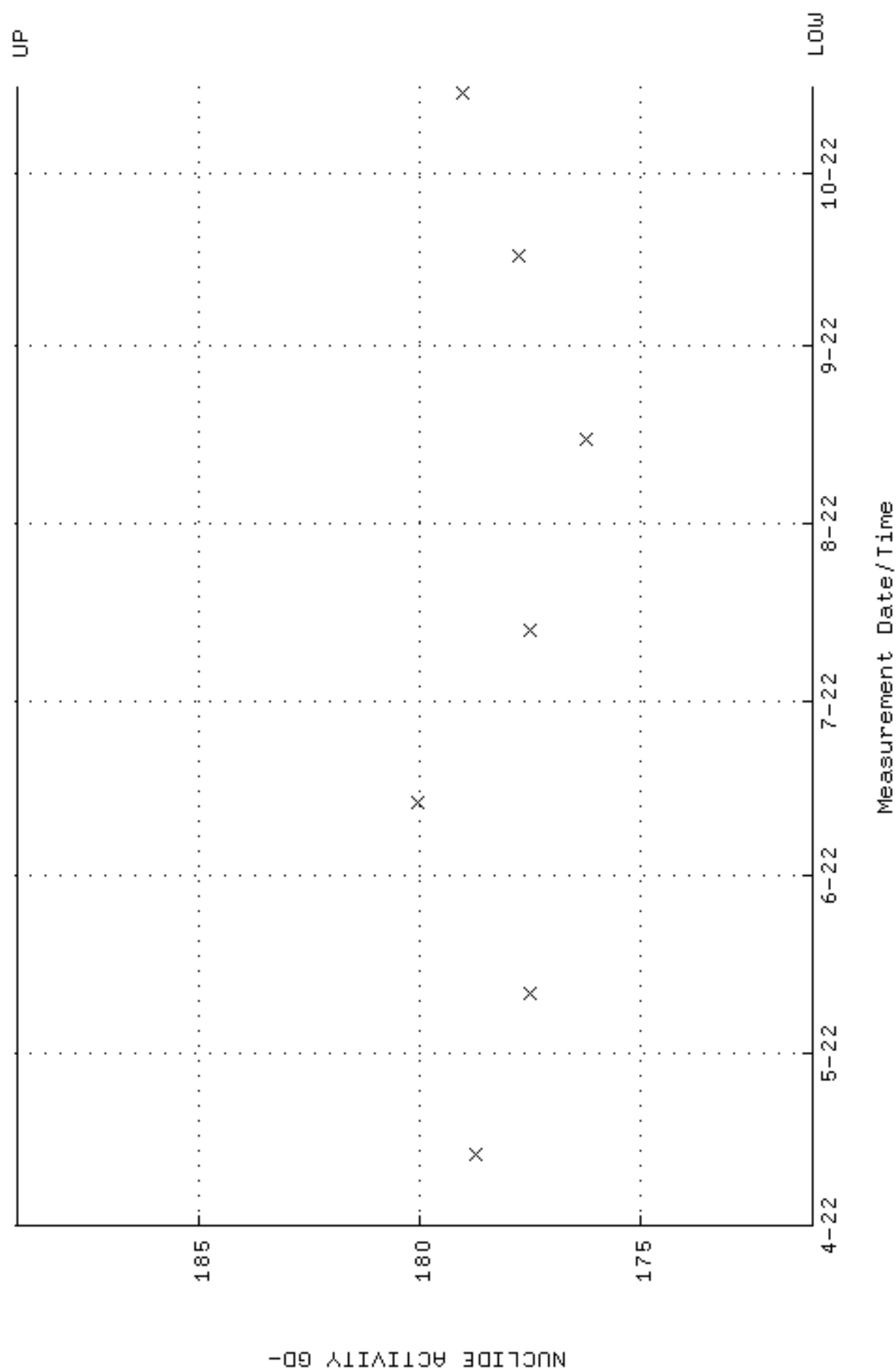
QA filename : DKA100:[ENV_ALPHA.QA.B]B100.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 12:51:54 through 14-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



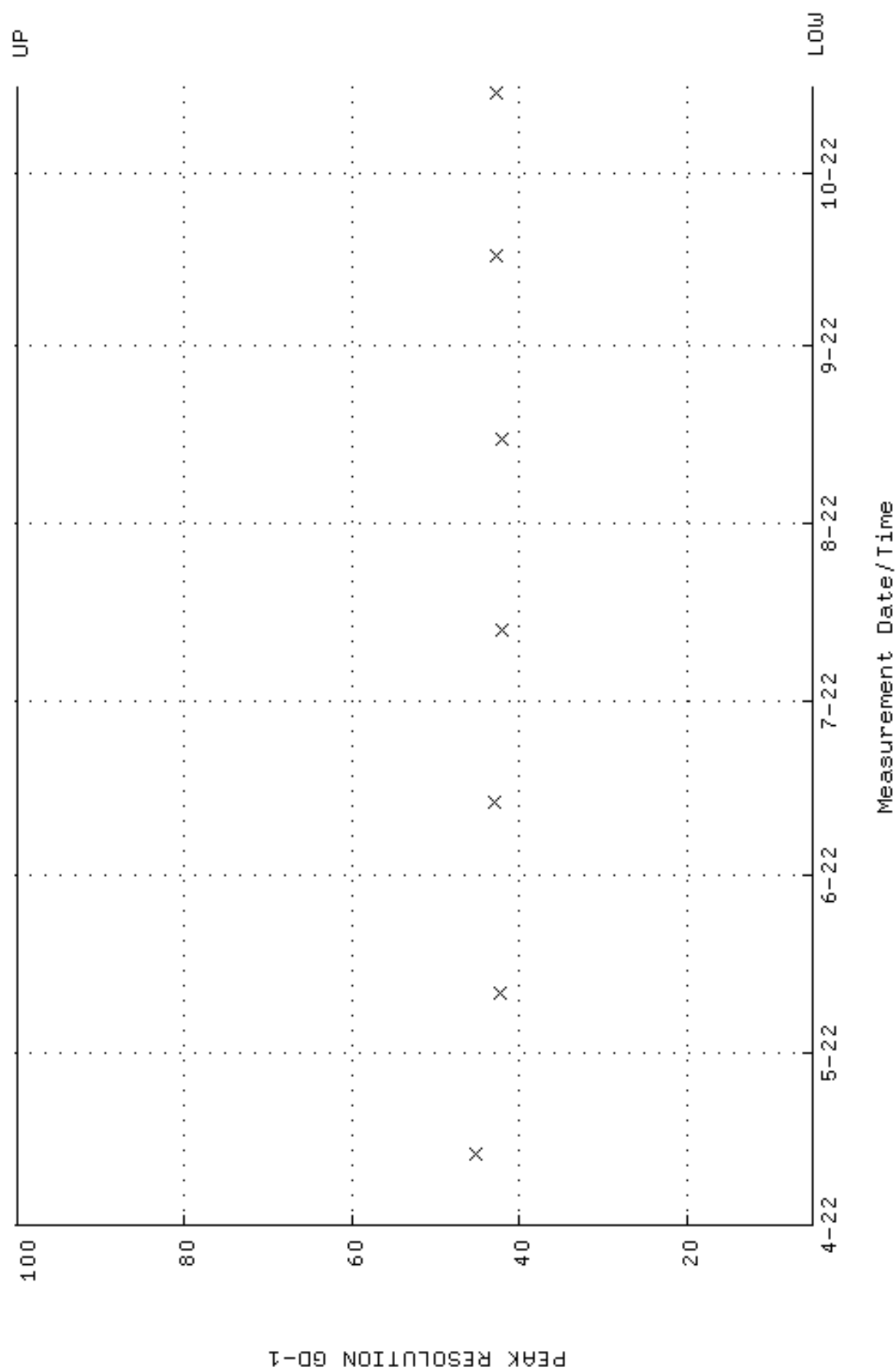
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 13-APR-2022 10:17:52 through 15-OCT-2022 12:00:00
Lower/Upper Lmts: 0.255850 through 0.271680



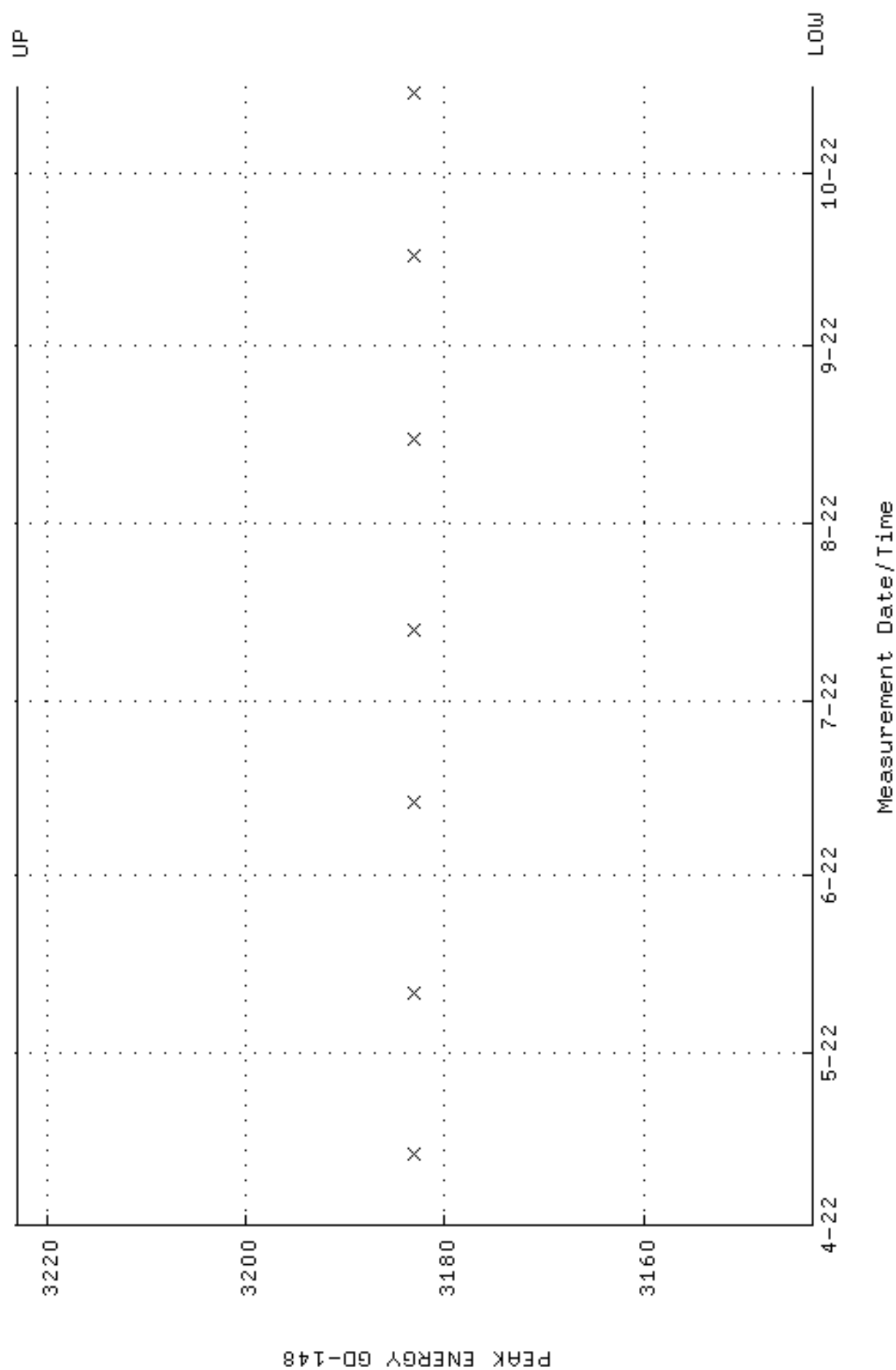
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-APR-2022 10:17:52 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



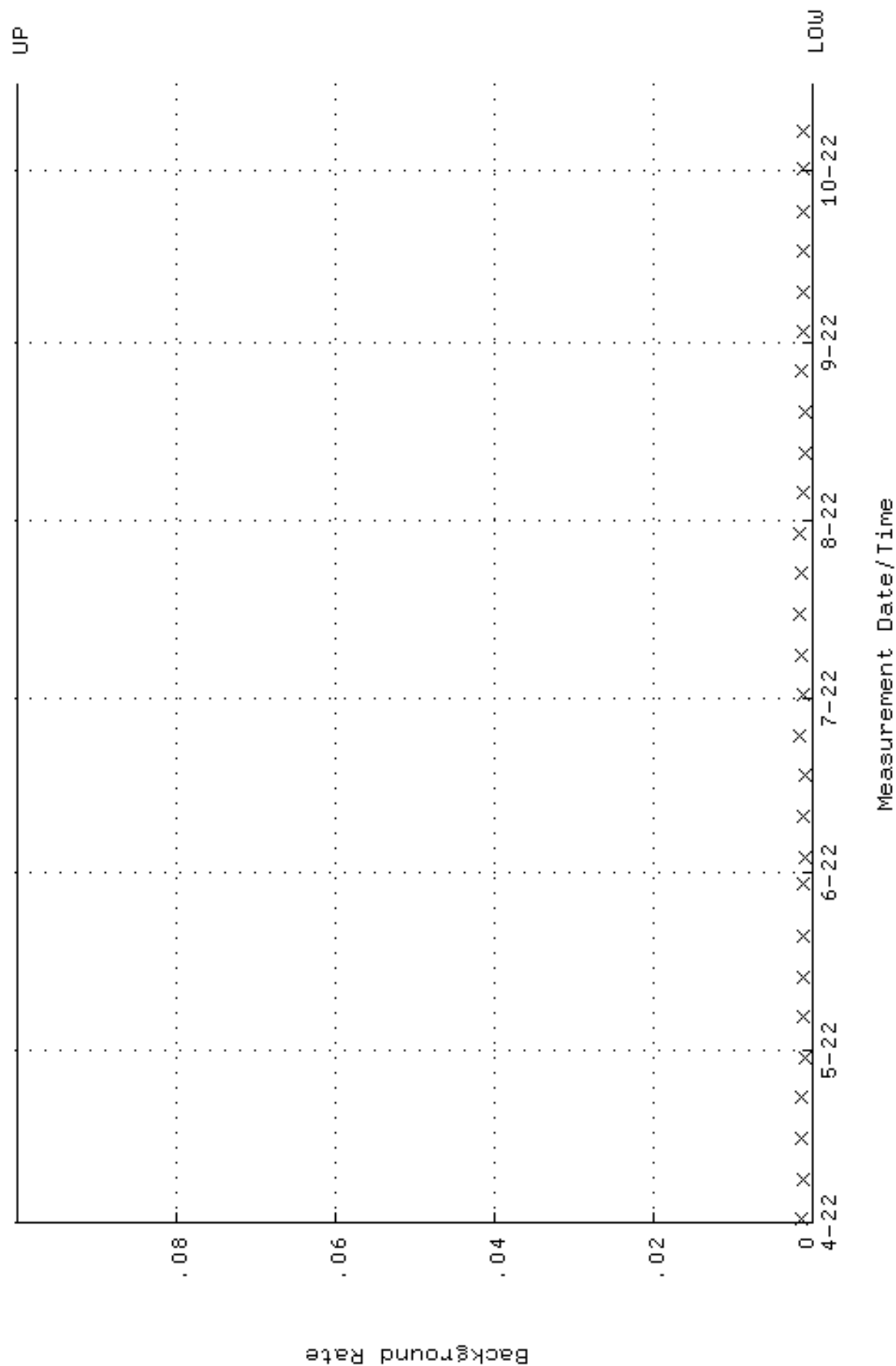
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-APR-2022 10:17:52 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



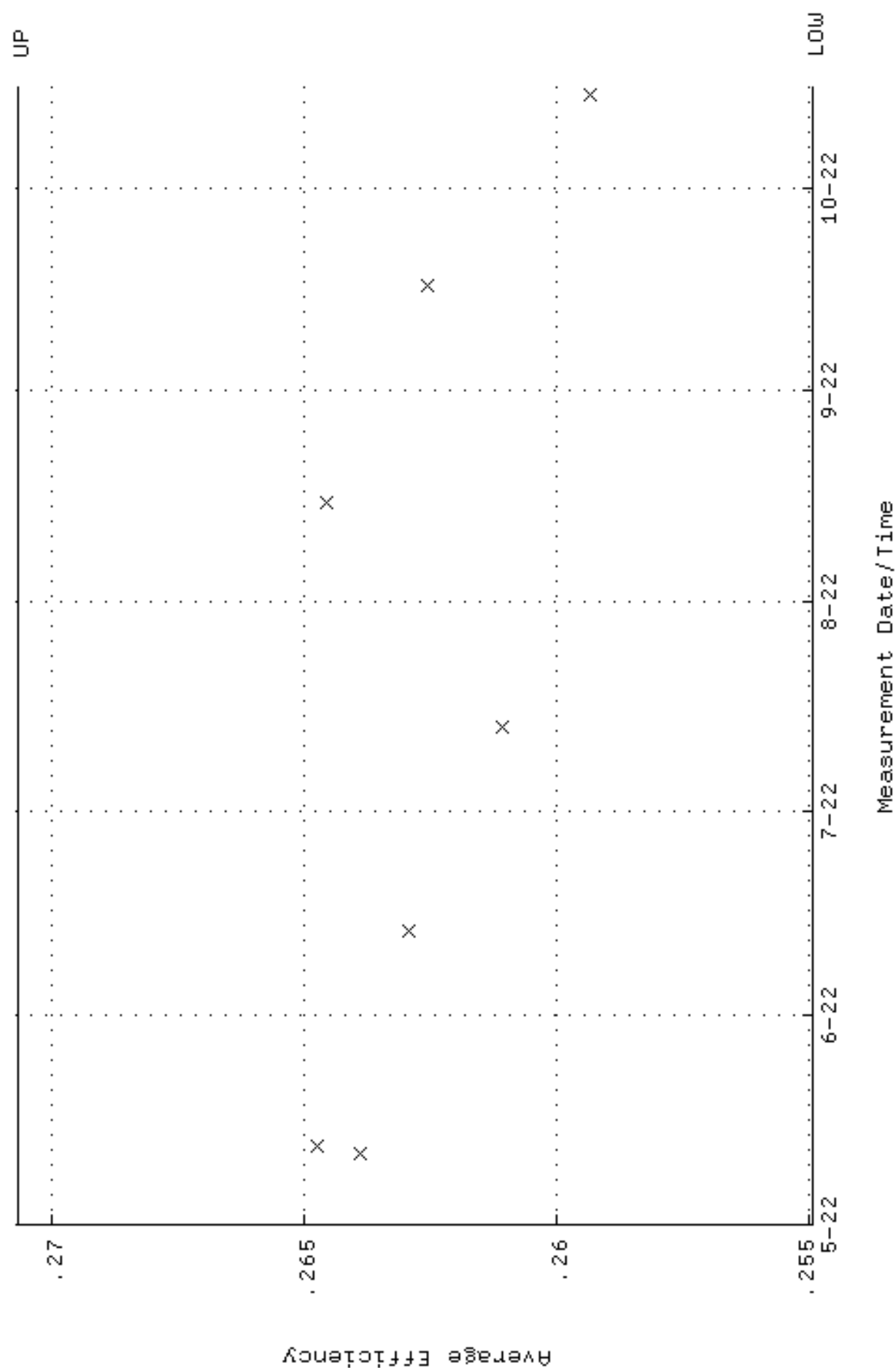
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-APR-2022 10:17:52 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



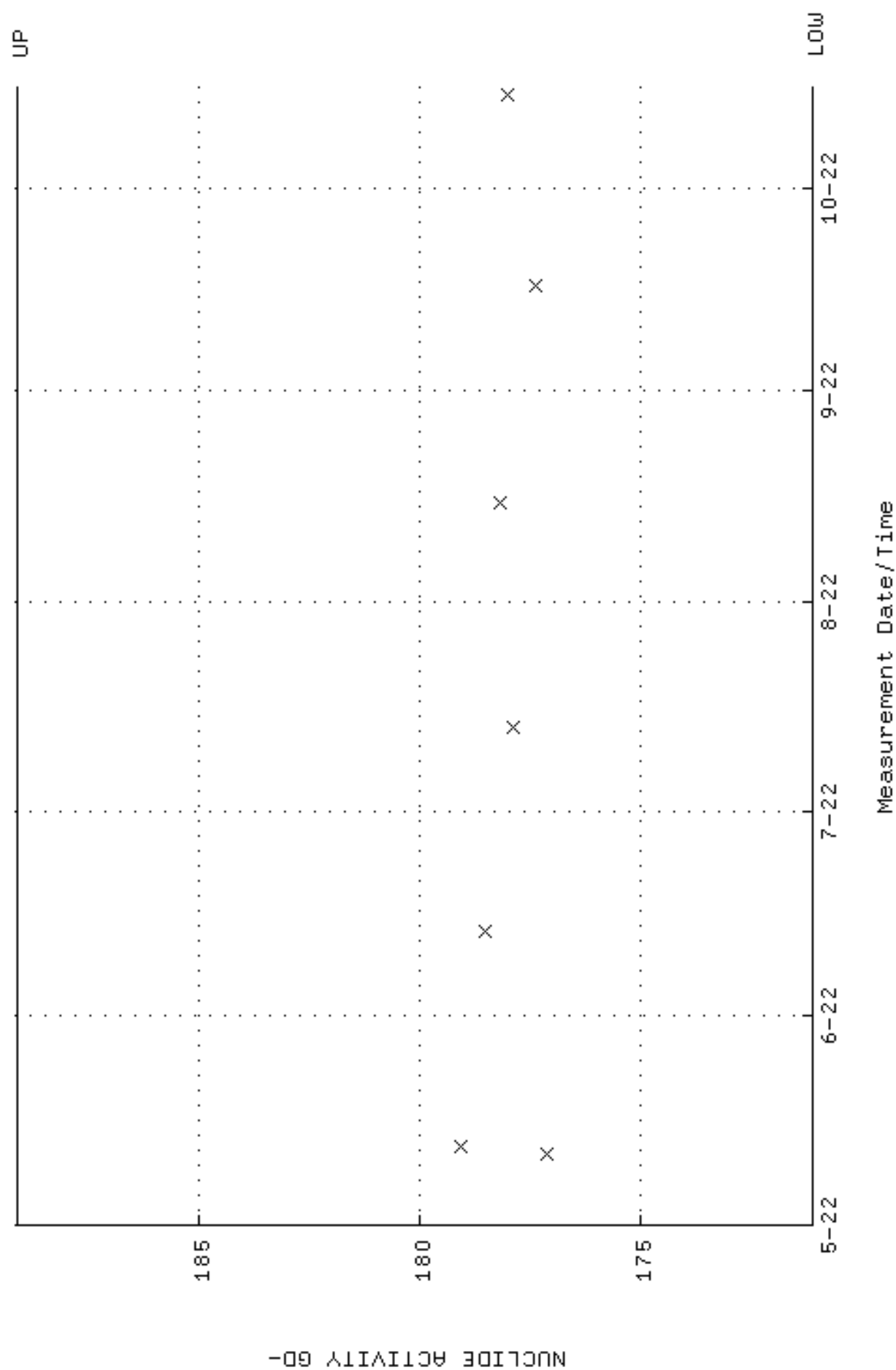
QA filename : DKA100:[ENV_ALPHA.QA.B]B113.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:16:23 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



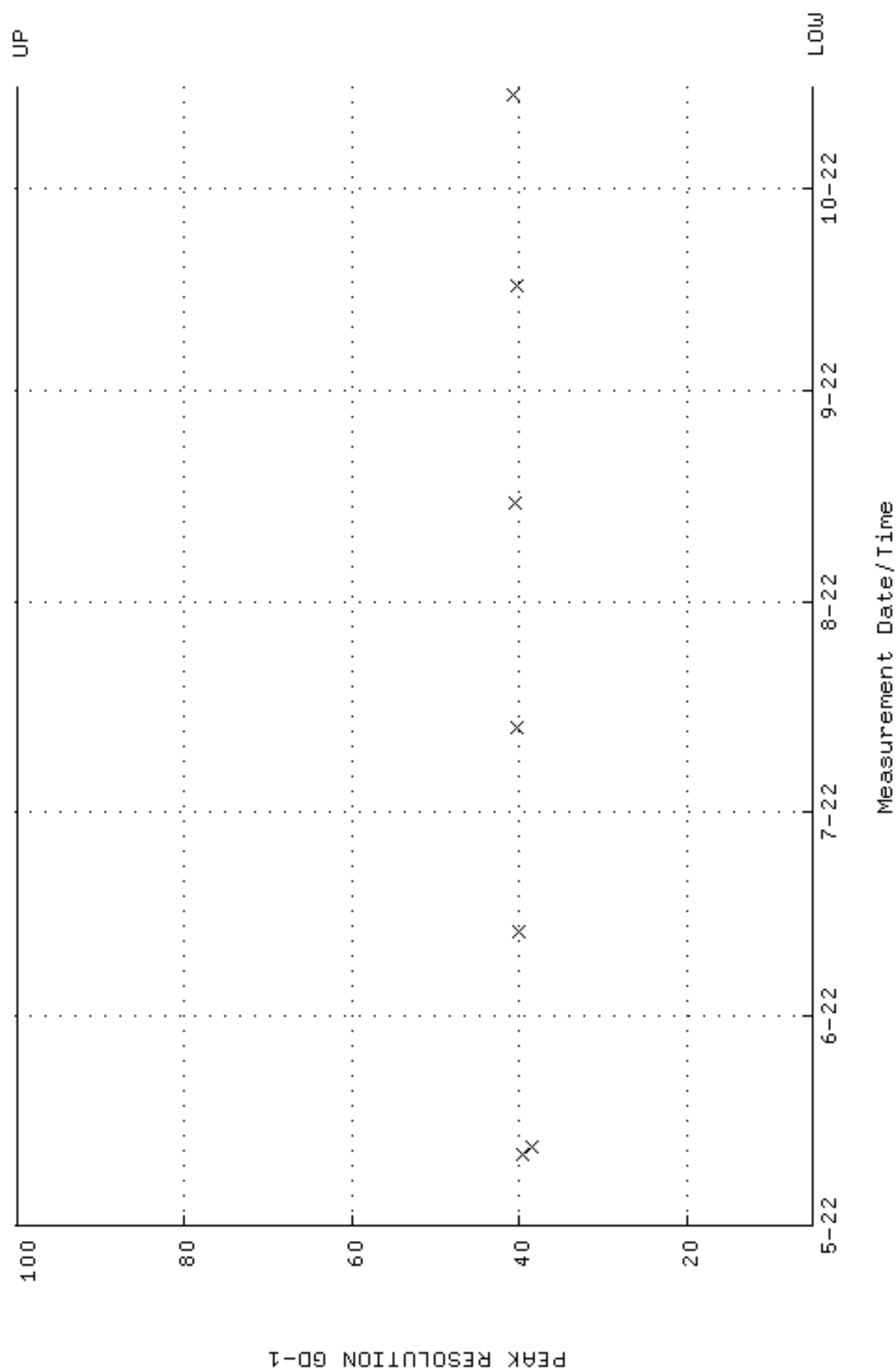
QA filename : DKA100:[ENV_ALPHA.QA.W]W124.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-MAY-2022 09:33:46 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.254910 through 0.270680



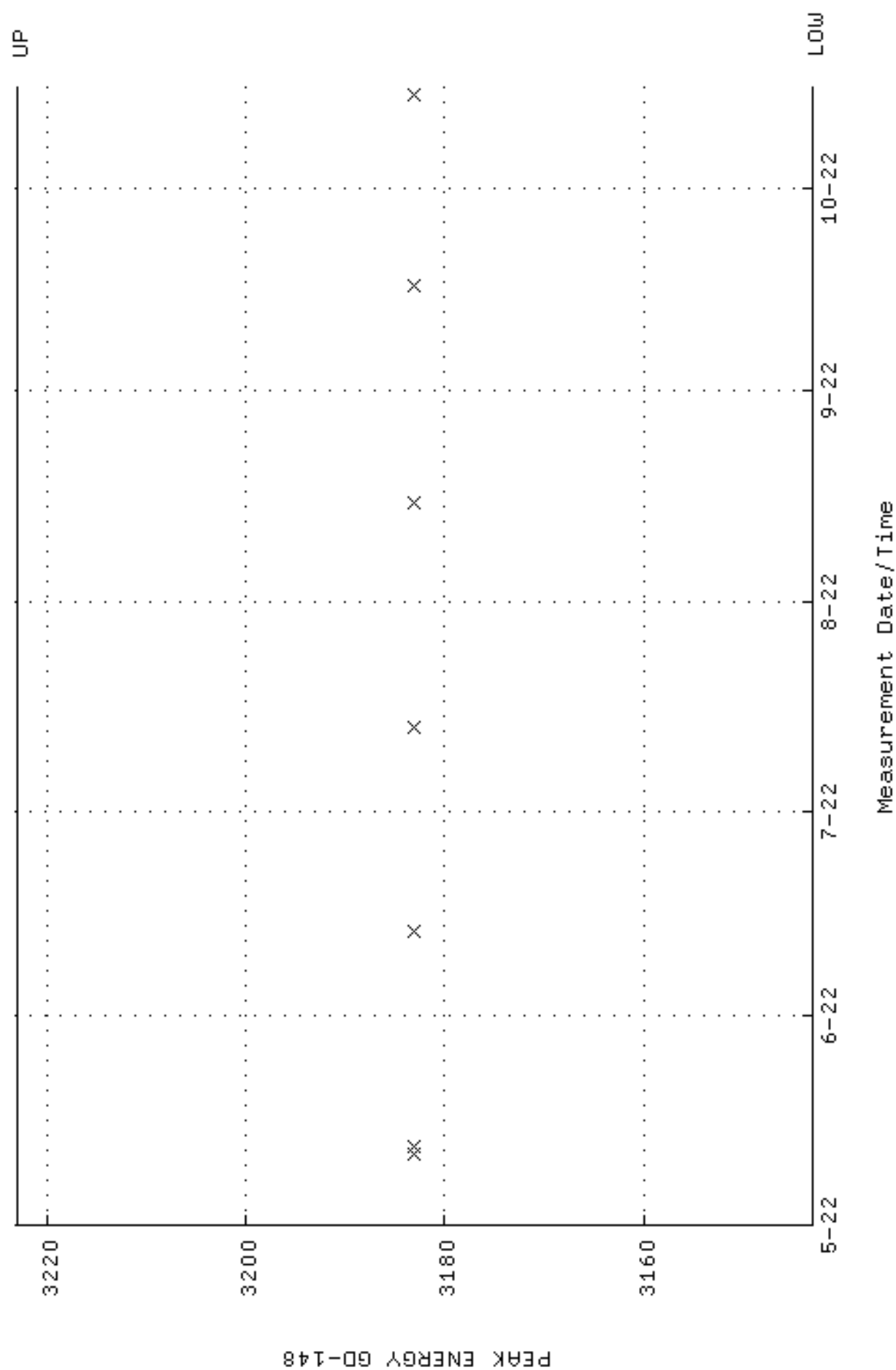
QA filename : DKA100:[ENV_ALPHA.QA.W]W124.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-MAY-2022 09:33:46 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



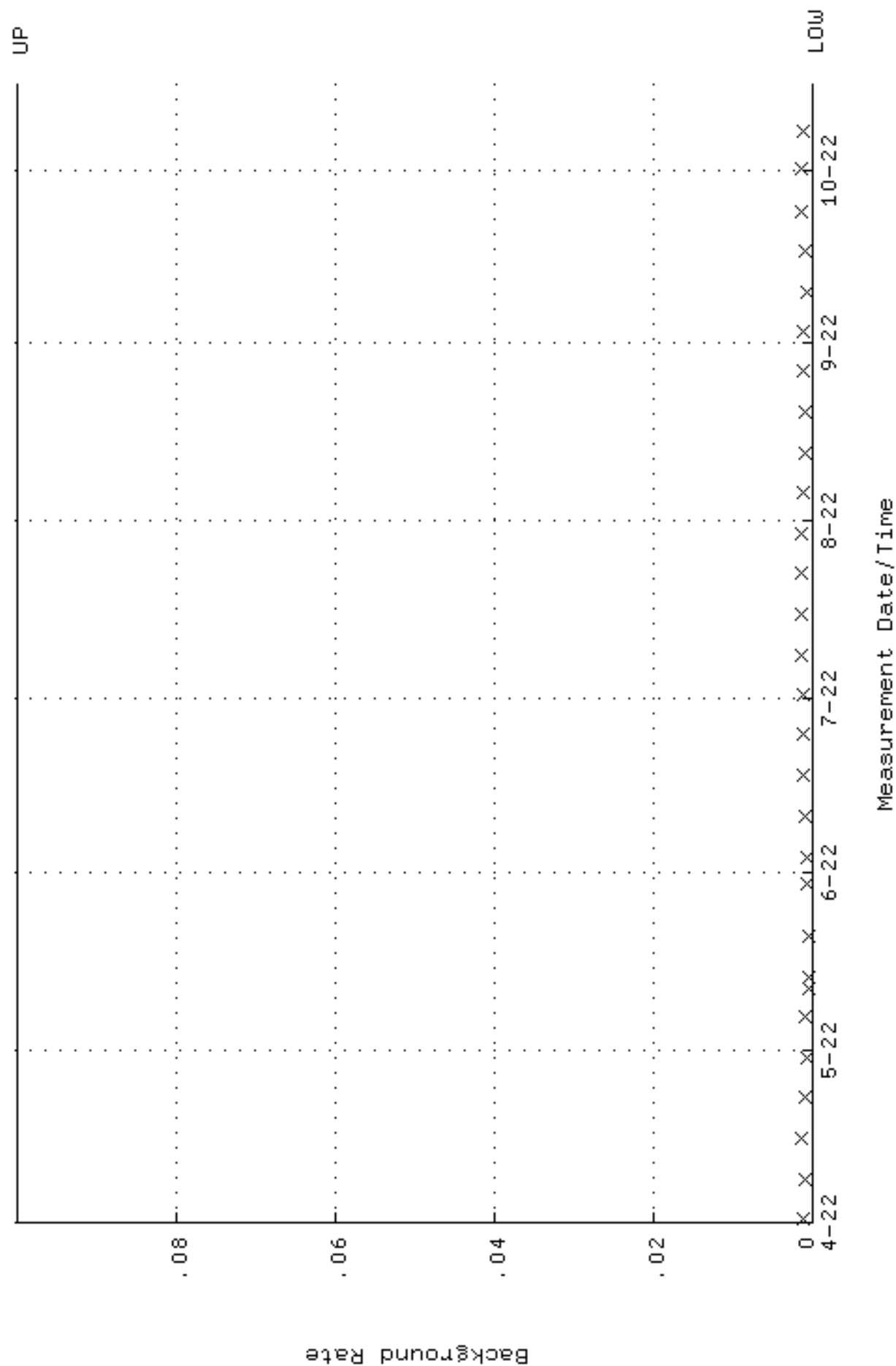
QA filename : DKA100:[ENV_ALPHA.QA.W]W124.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-MAY-2022 09:33:46 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



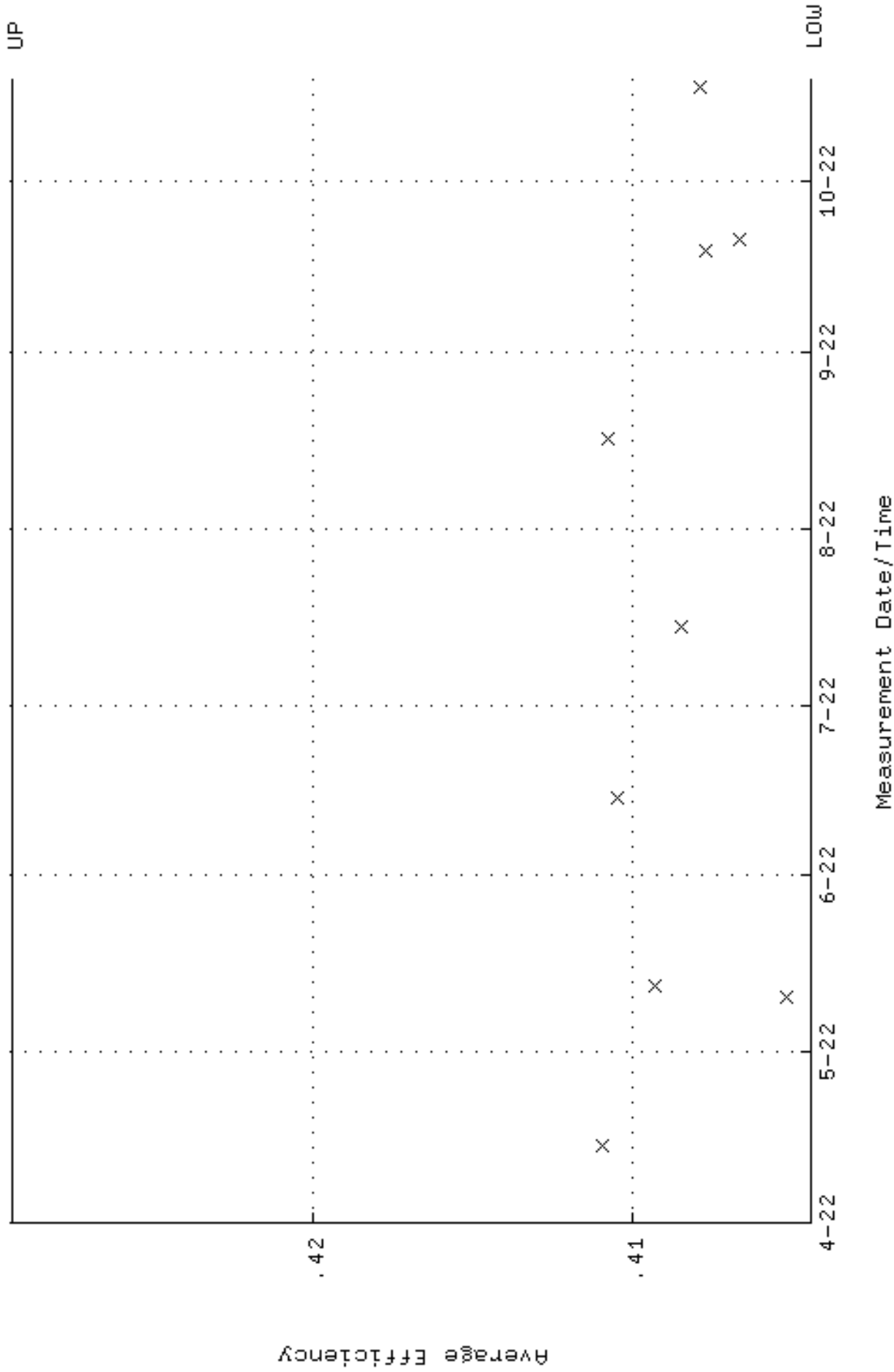
QA filename : DKA100:[ENV_ALPHA.QA.W]W124.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-MAY-2022 09:33:46 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



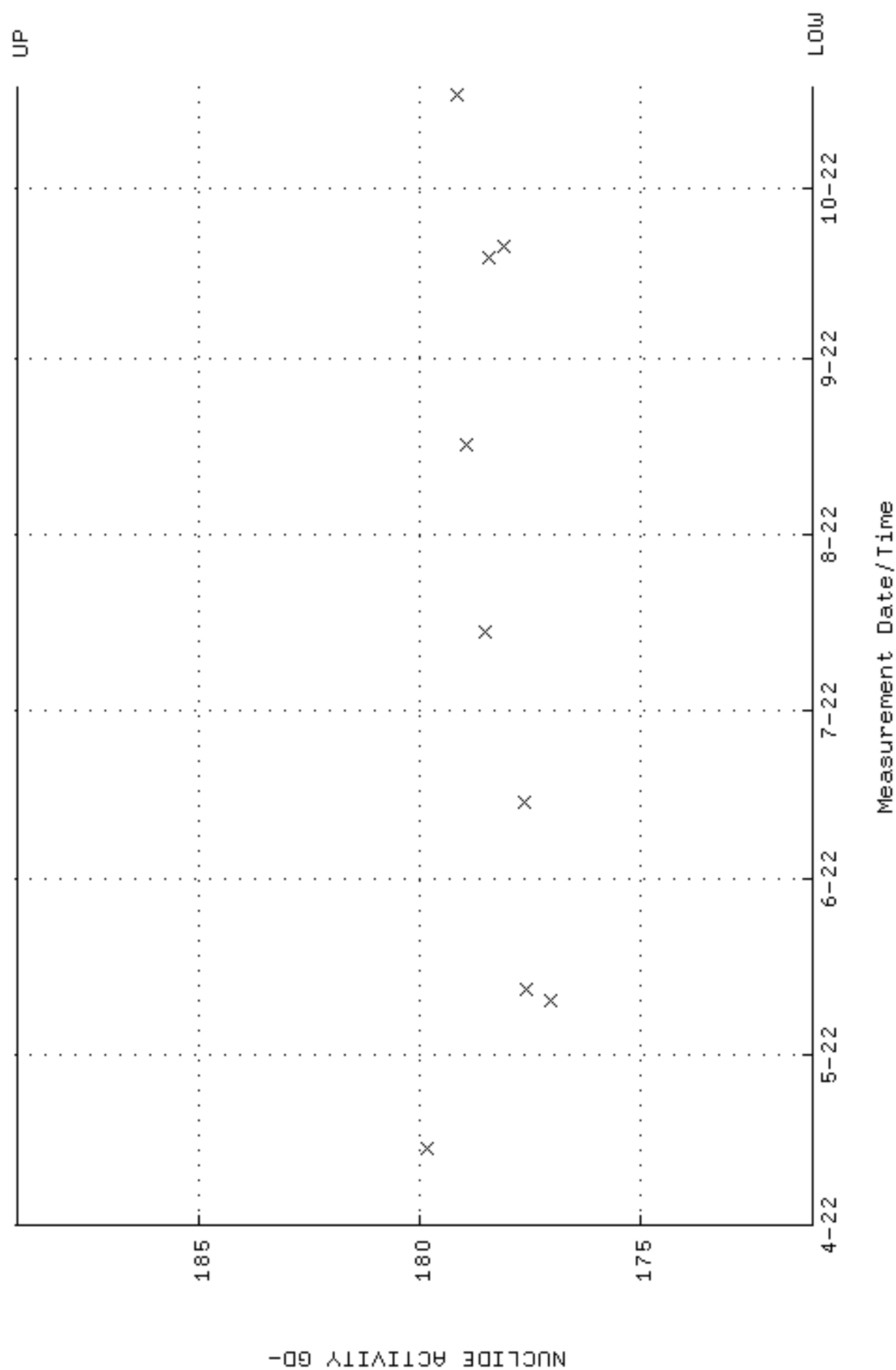
QA filename : DKA100:[ENV_ALPHA.QA.B]B124.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:16:49 through 15-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



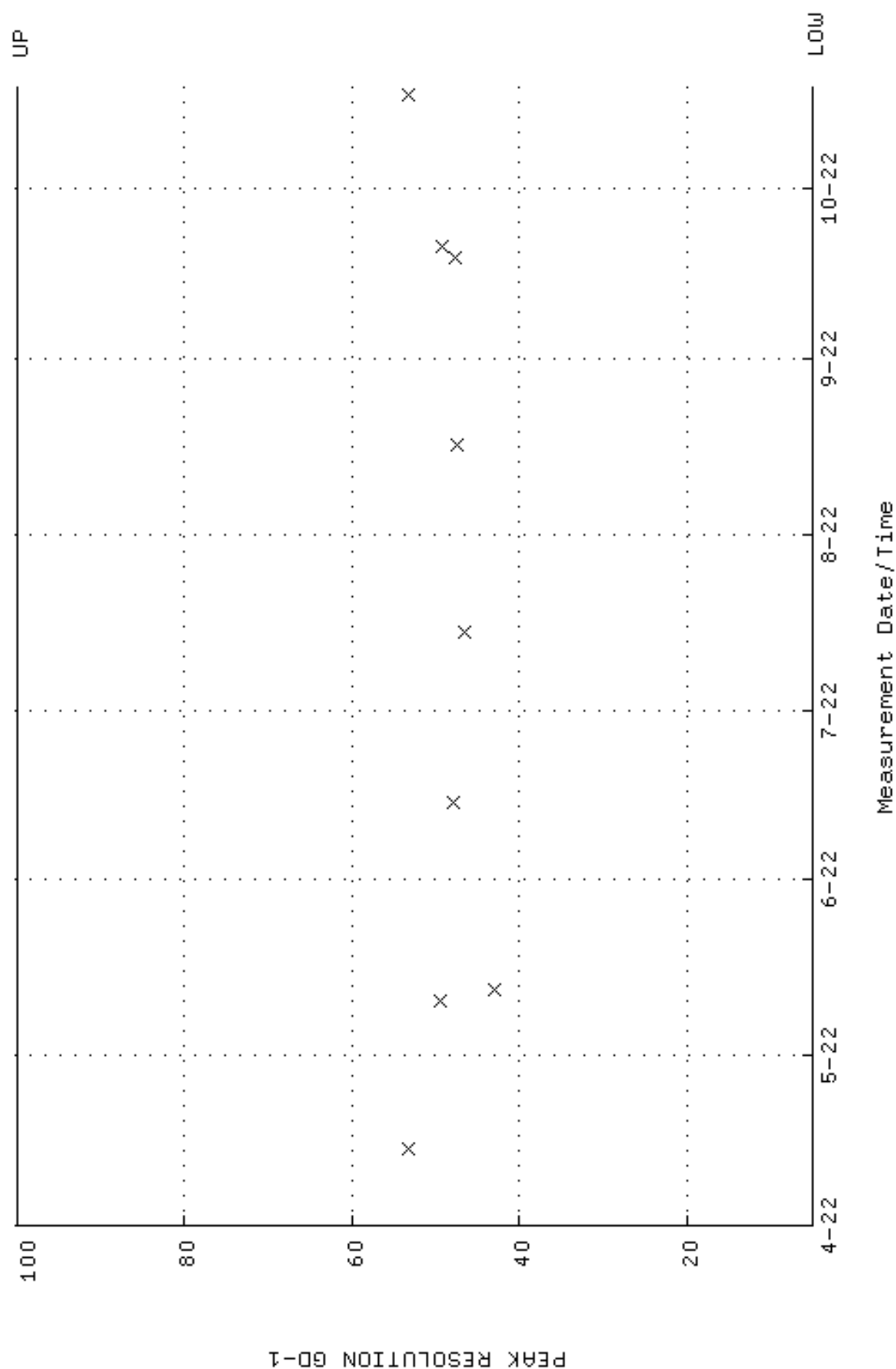
QA filename : DKA100:[ENV_ALPHA.QA.W]W139.QAF;6
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 14-APR-2022 09:45:56 through 18-OCT-2022 12:00:00
Lower/Upper Lmts: 0.404411 through 0.429430



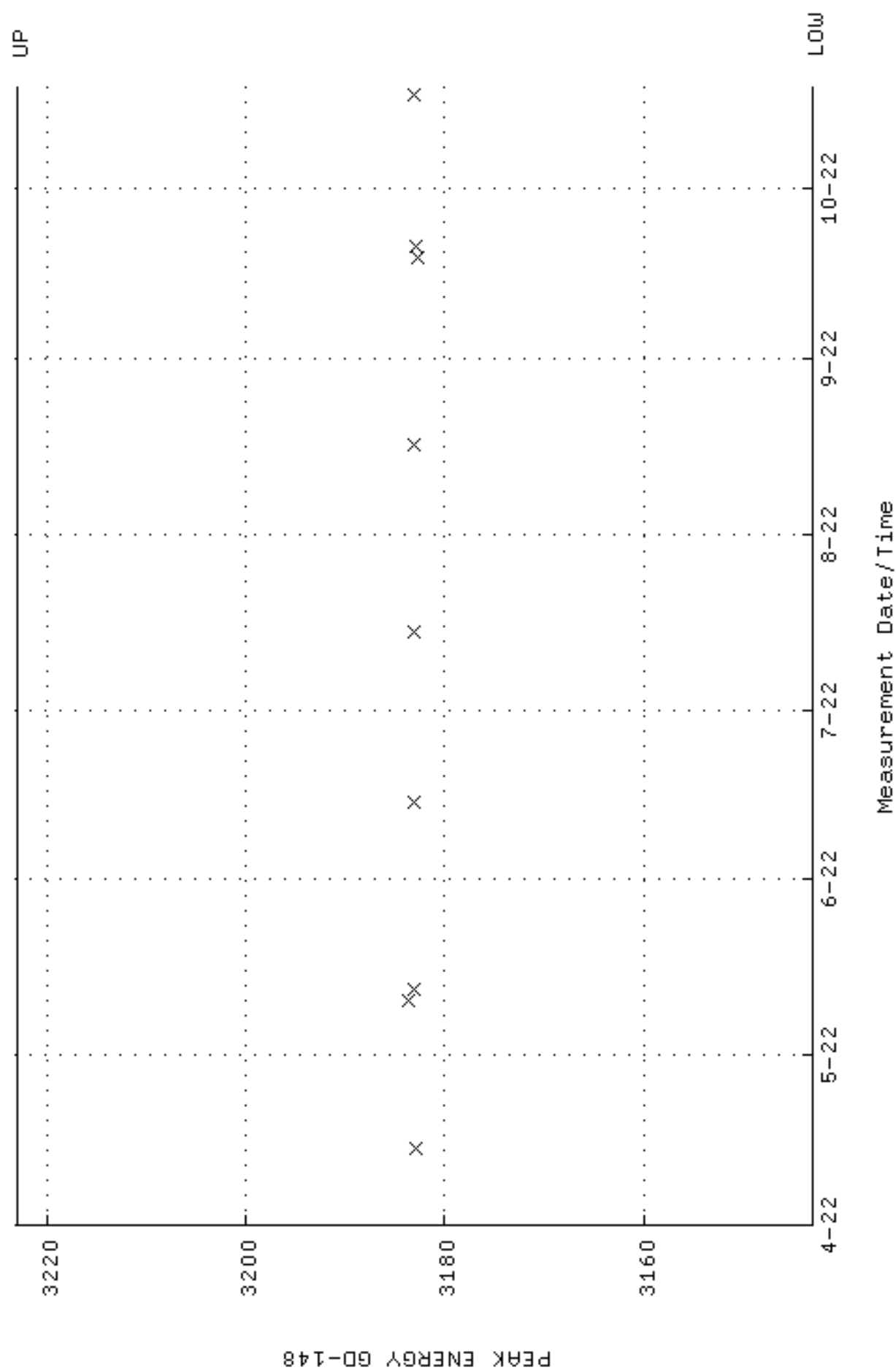
QA filename : DKA100:[ENV_ALPHA.QA.W]W139.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 14-APR-2022 09:45:56 through 18-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



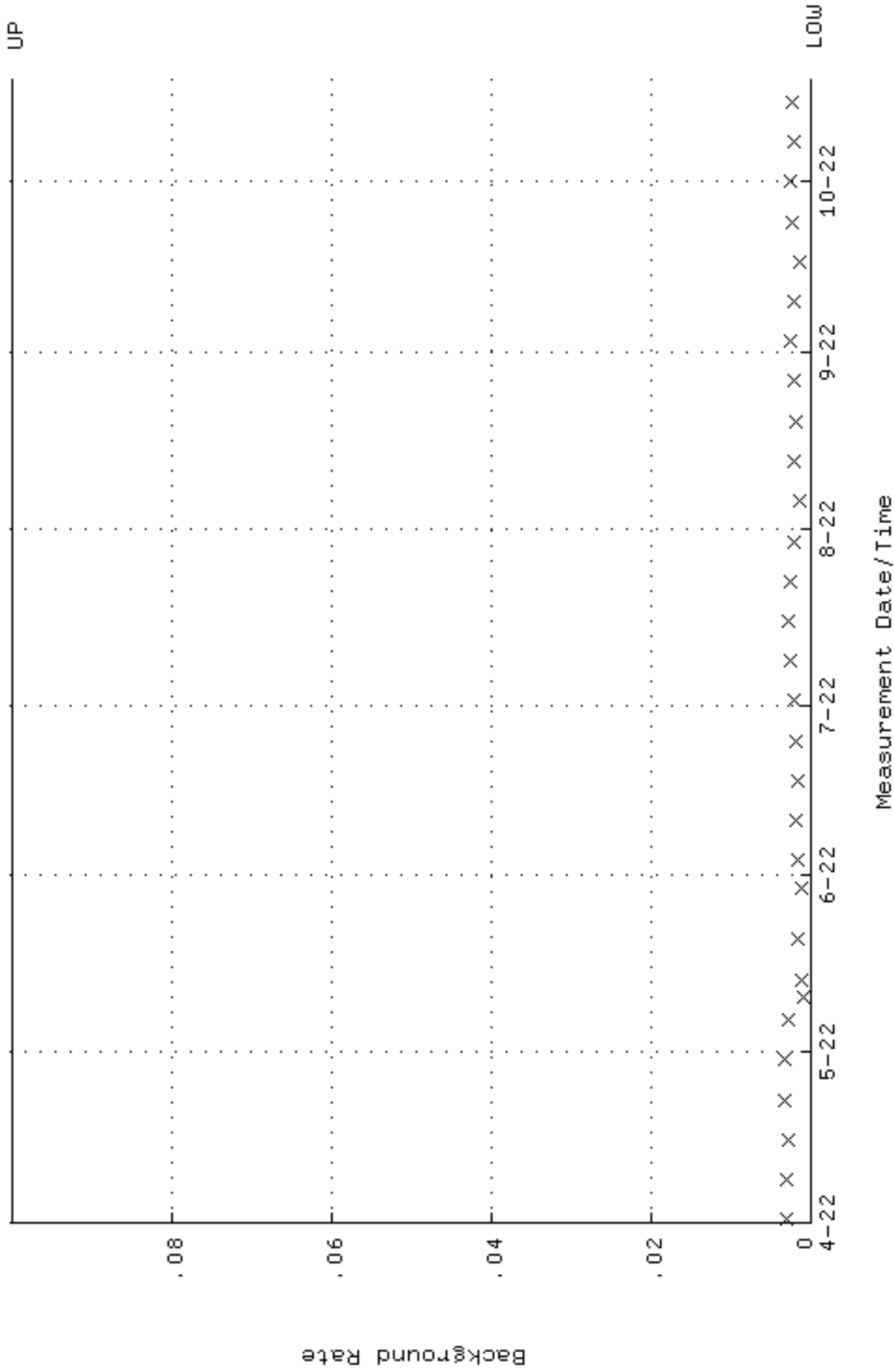
QA filename : DKA100:[ENV_ALPHA.QA.W]W139.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 14-APR-2022 09:45:56 through 18-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



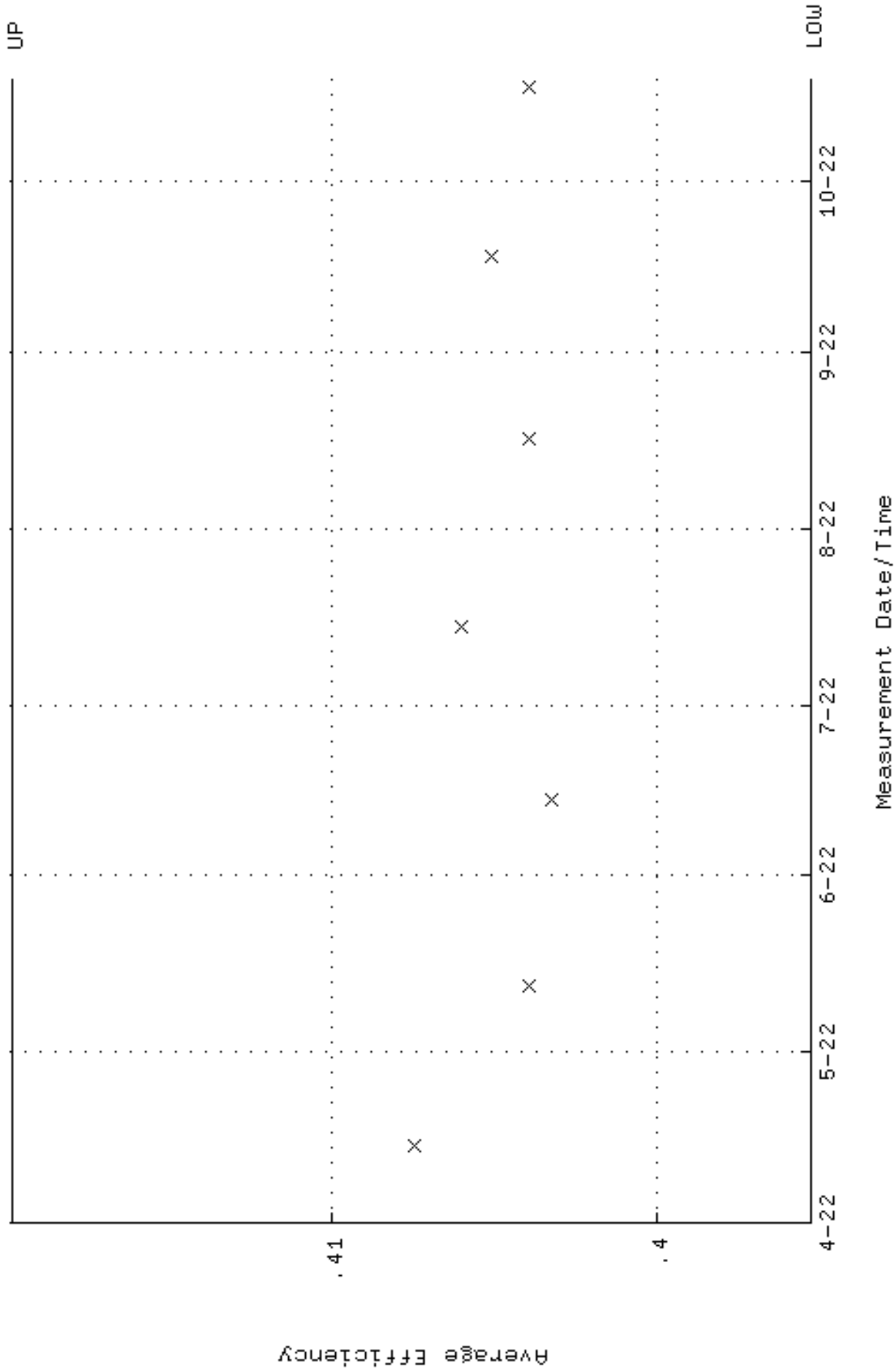
QA filename : DKA100:[ENV_ALPHA.QA.W]W139.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 14-APR-2022 09:45:56 through 18-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



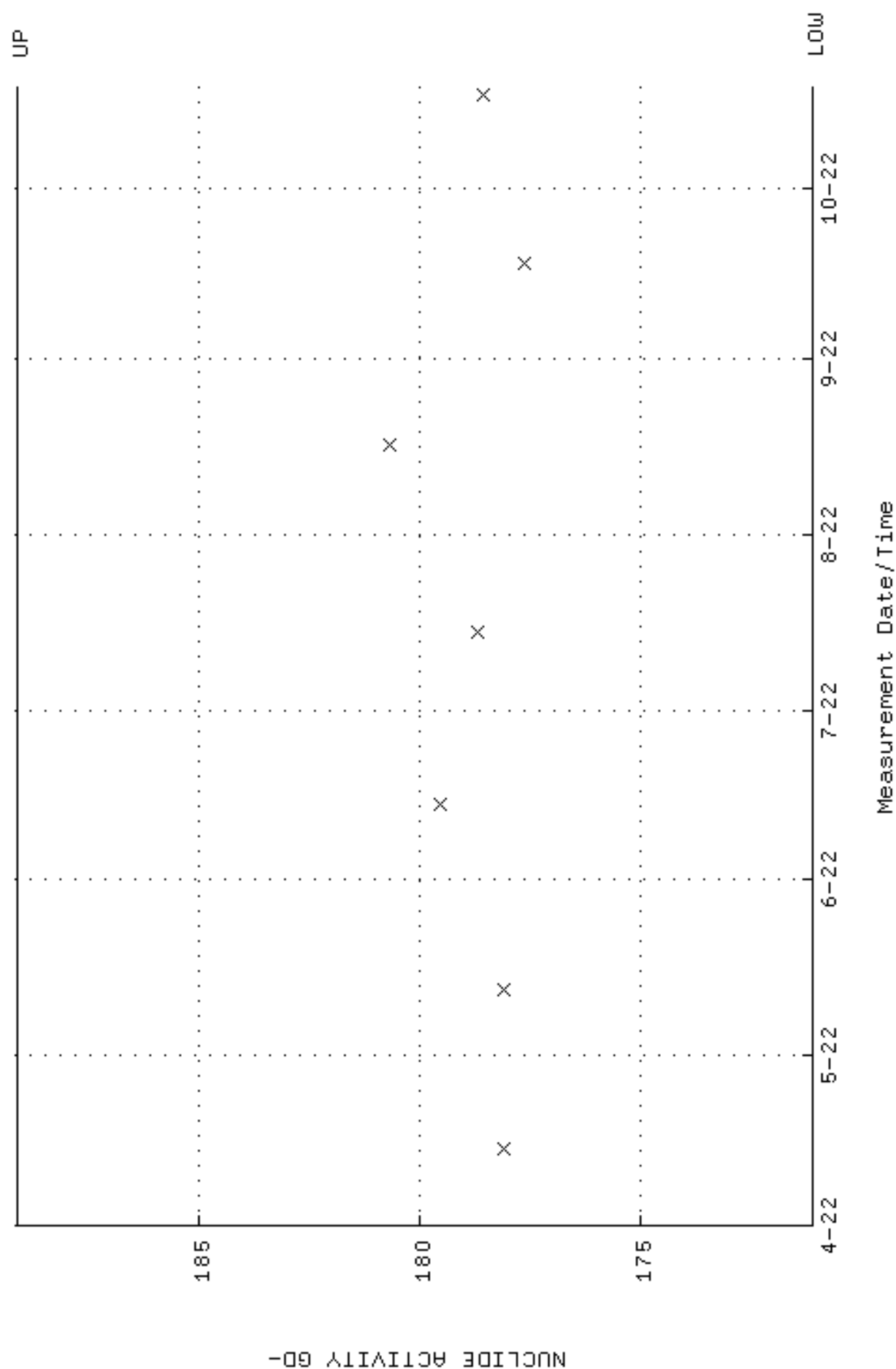
QA filename : DKA100:[ENV_ALPHA.QA.B]B139.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-APR-2022 13:19:17 through 18-OCT-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 0.100000



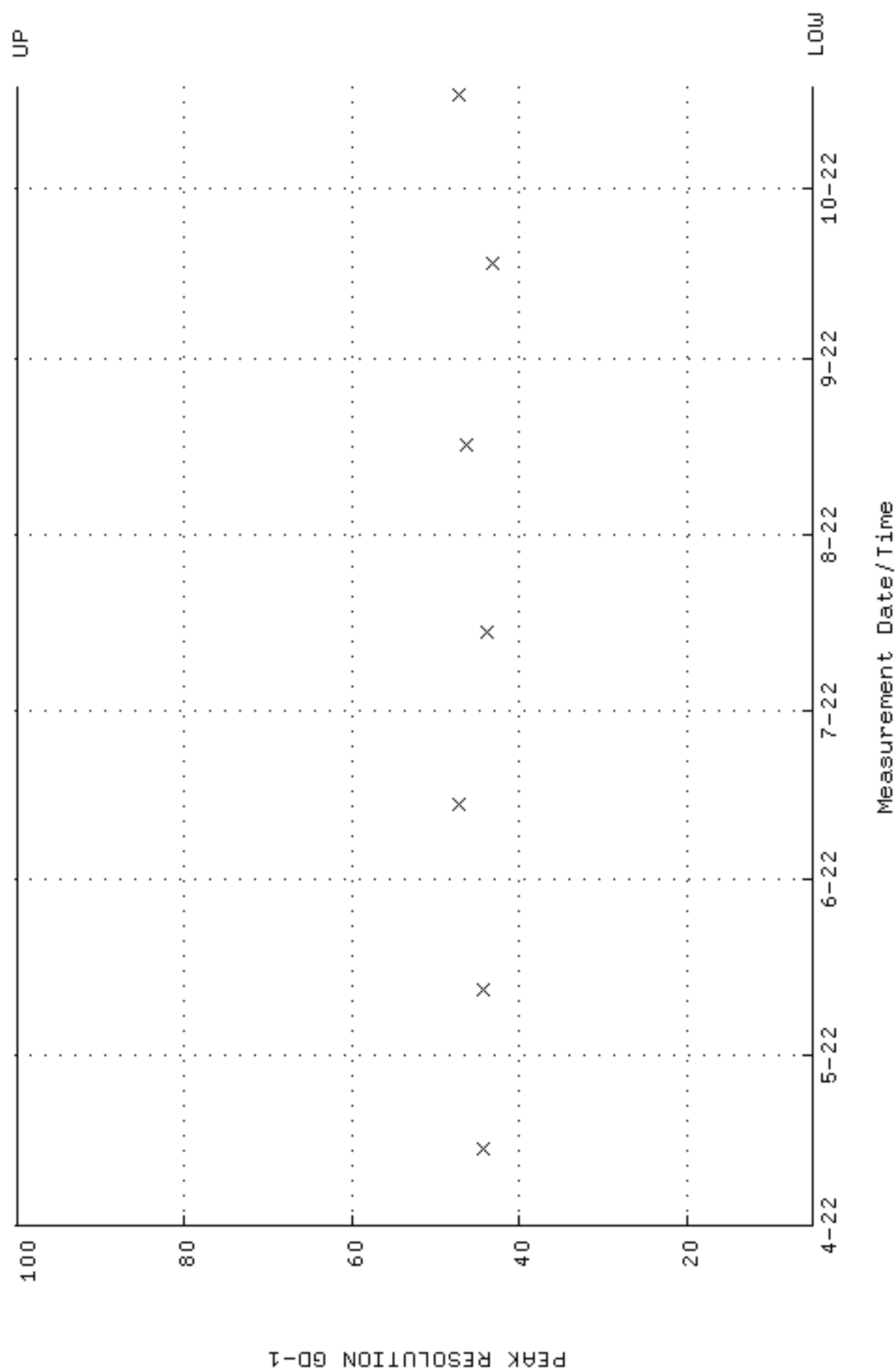
QA filename : DKA100:[ENV_ALPHA.QA.W]W140.QAF;3
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 14-APR-2022 09:46:00 through 18-OCT-2022 12:00:00
Lower/Upper Lmts: 0.395310 through 0.419760



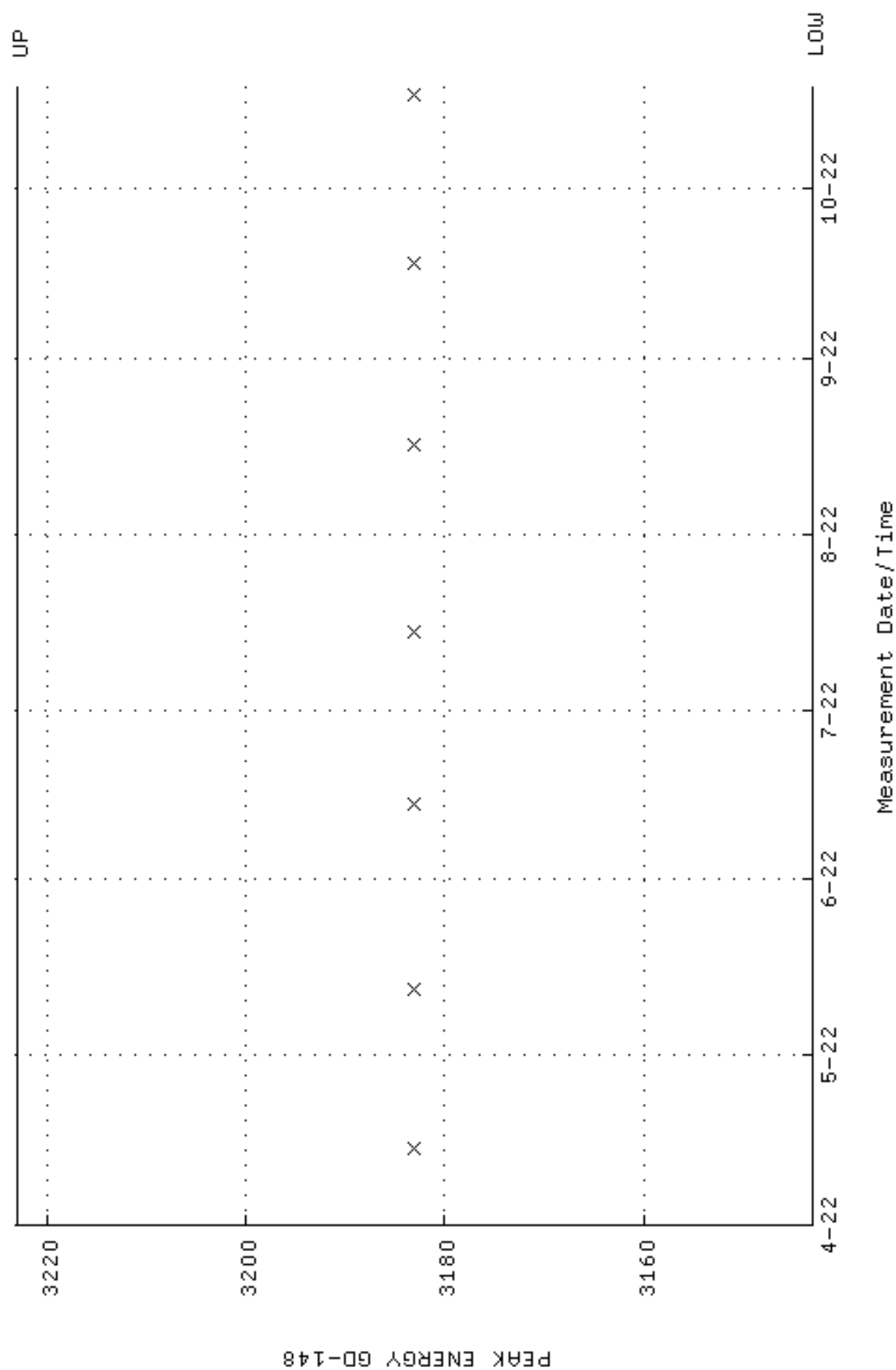
QA filename : DKA100:[ENV_ALPHA.QA.W]W140.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 14-APR-2022 09:46:00 through 18-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



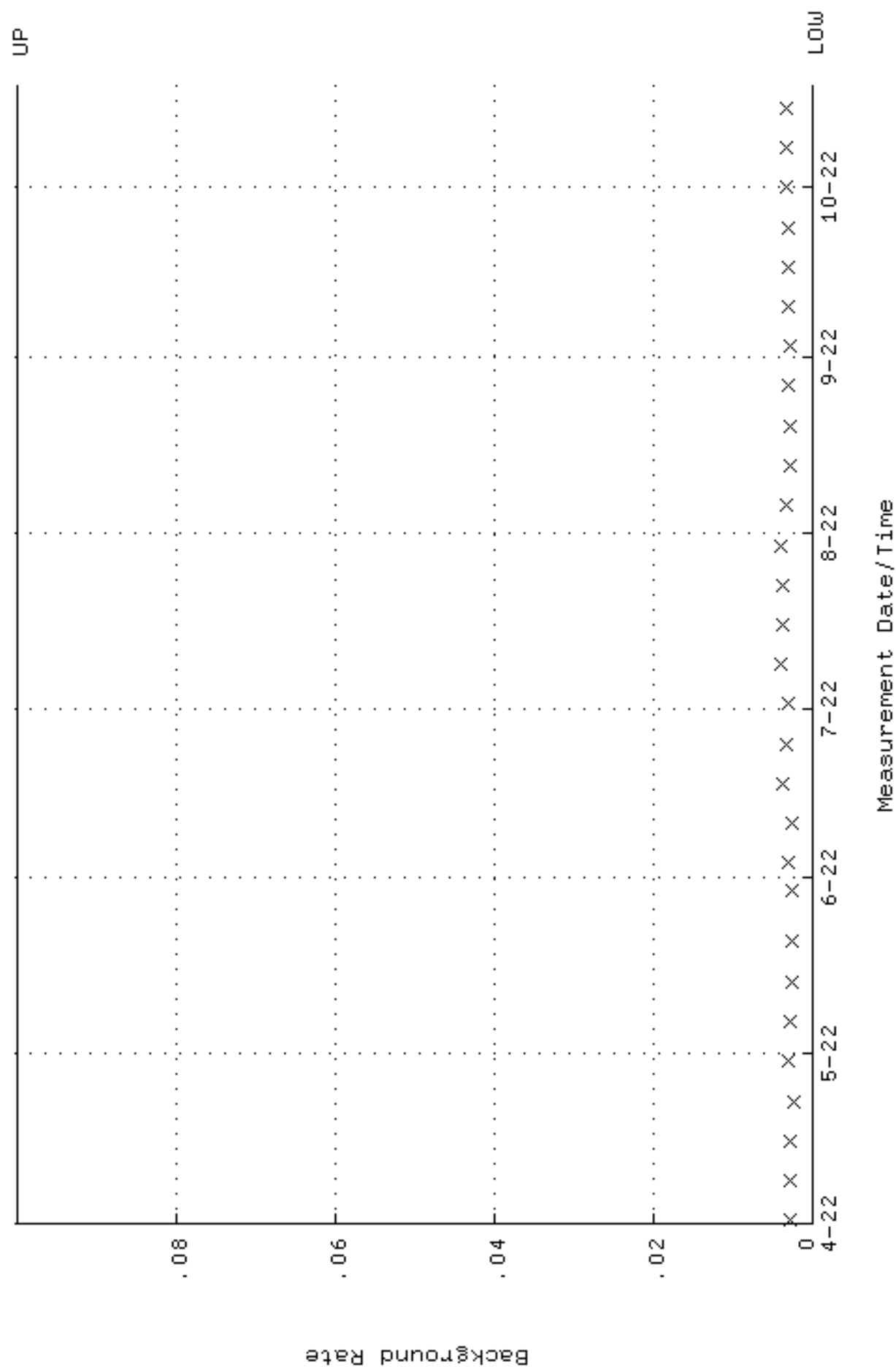
QA filename : DKA100:[ENV_ALPHA.QA.W]W140.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 14-APR-2022 09:46:00 through 18-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



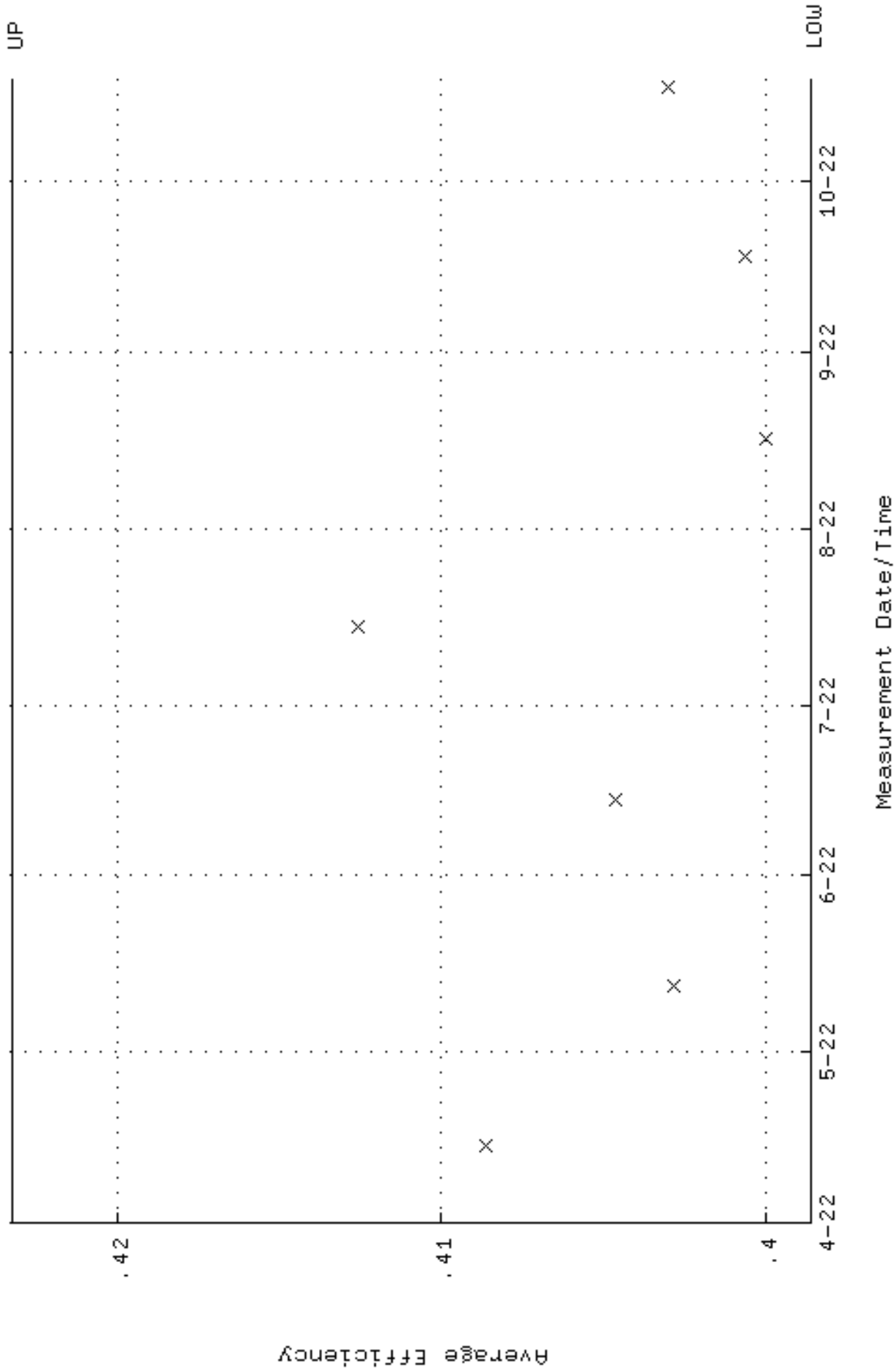
QA filename : DKA100:[ENV_ALPHA.QA.W]W140.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 14-APR-2022 09:46:00 through 18-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



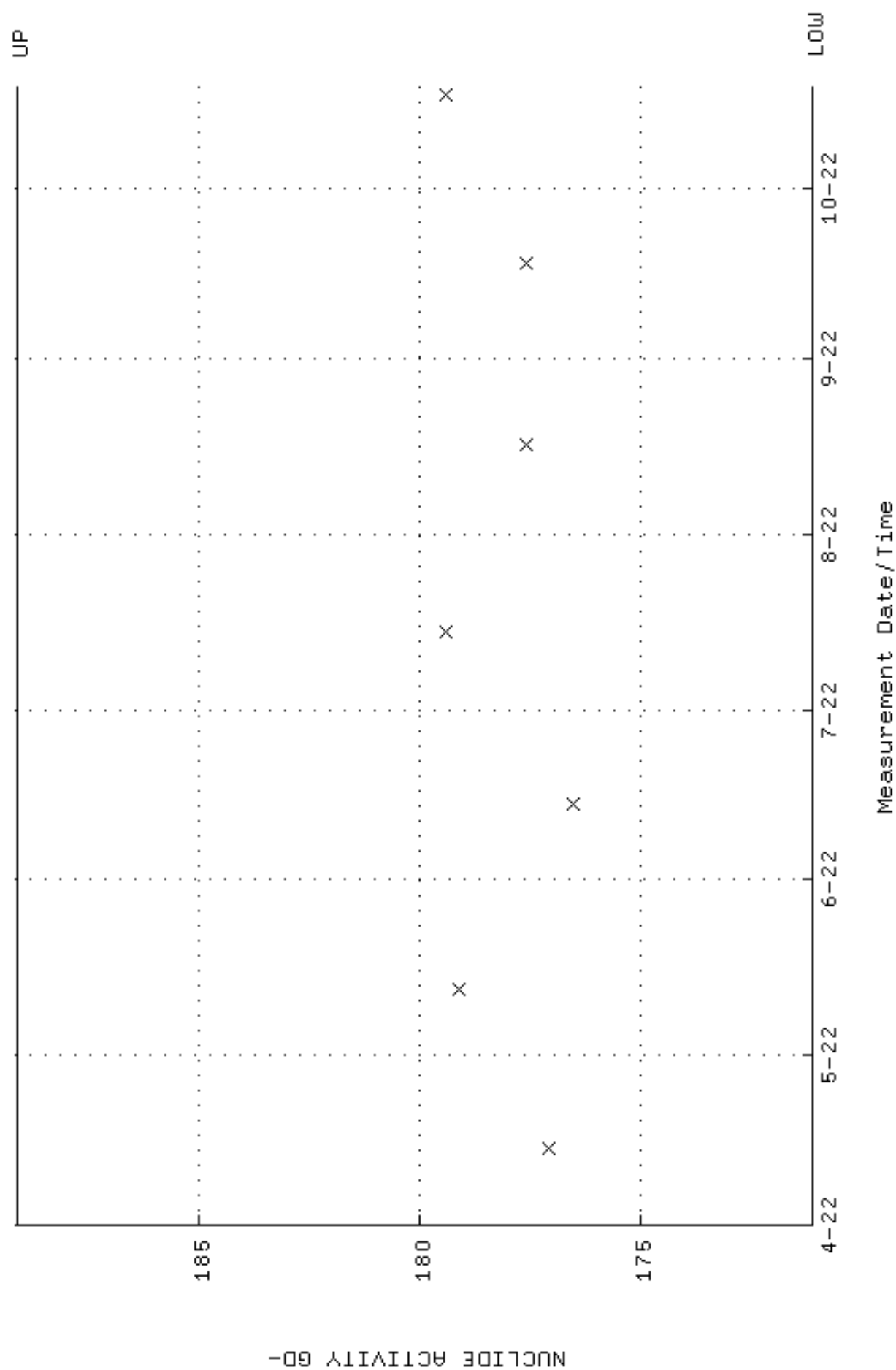
QA filename : DKA100:[ENV_ALPHA.QA.B]B140.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:19:21 through 18-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



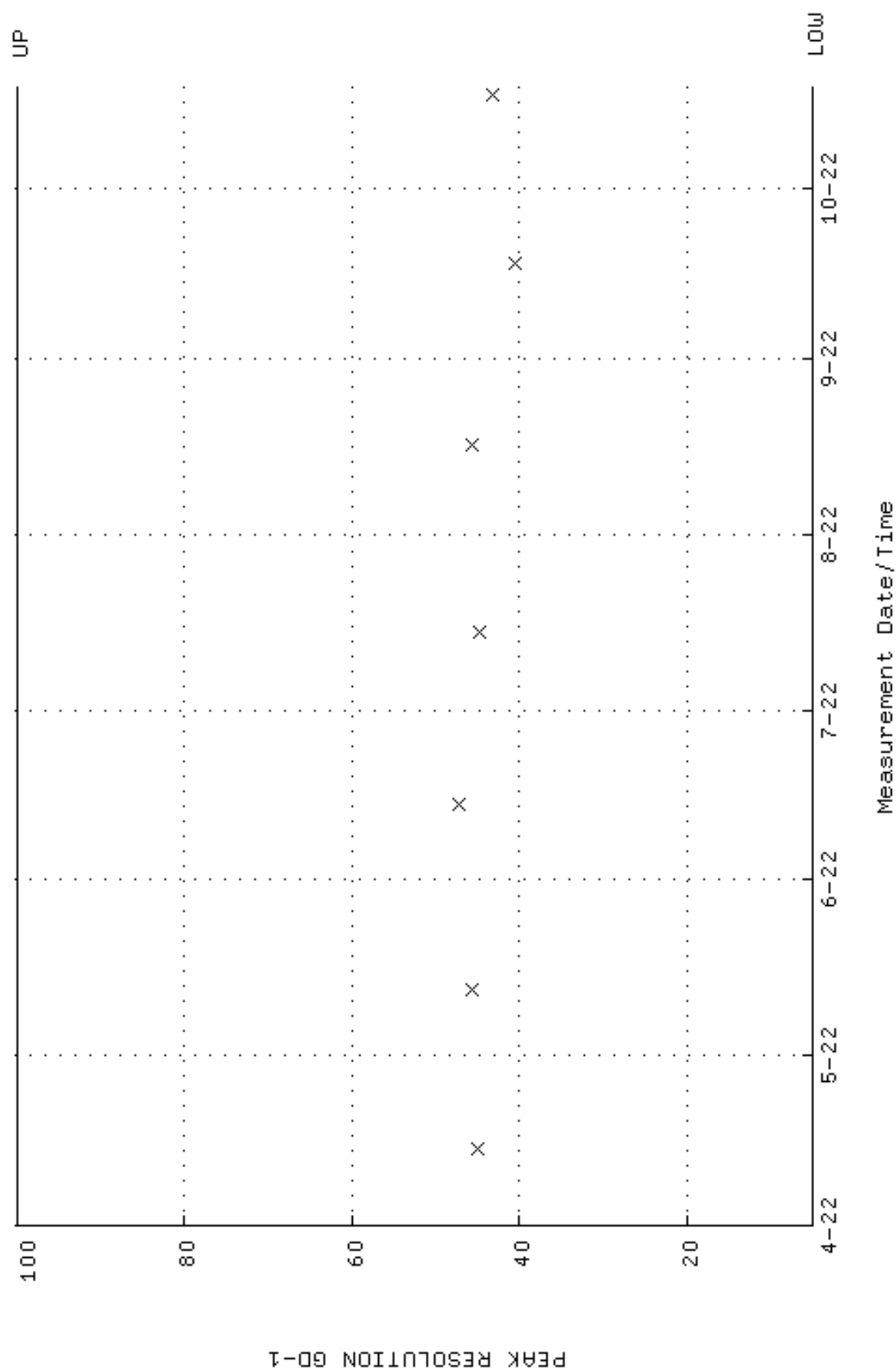
QA filename : DKA100:[ENV_ALPHA.QA.W]W141.QAF;4
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 14-APR-2022 09:46:04 through 18-OCT-2022 12:00:00
Lower/Upper Lmts: 0.398600 through 0.423250



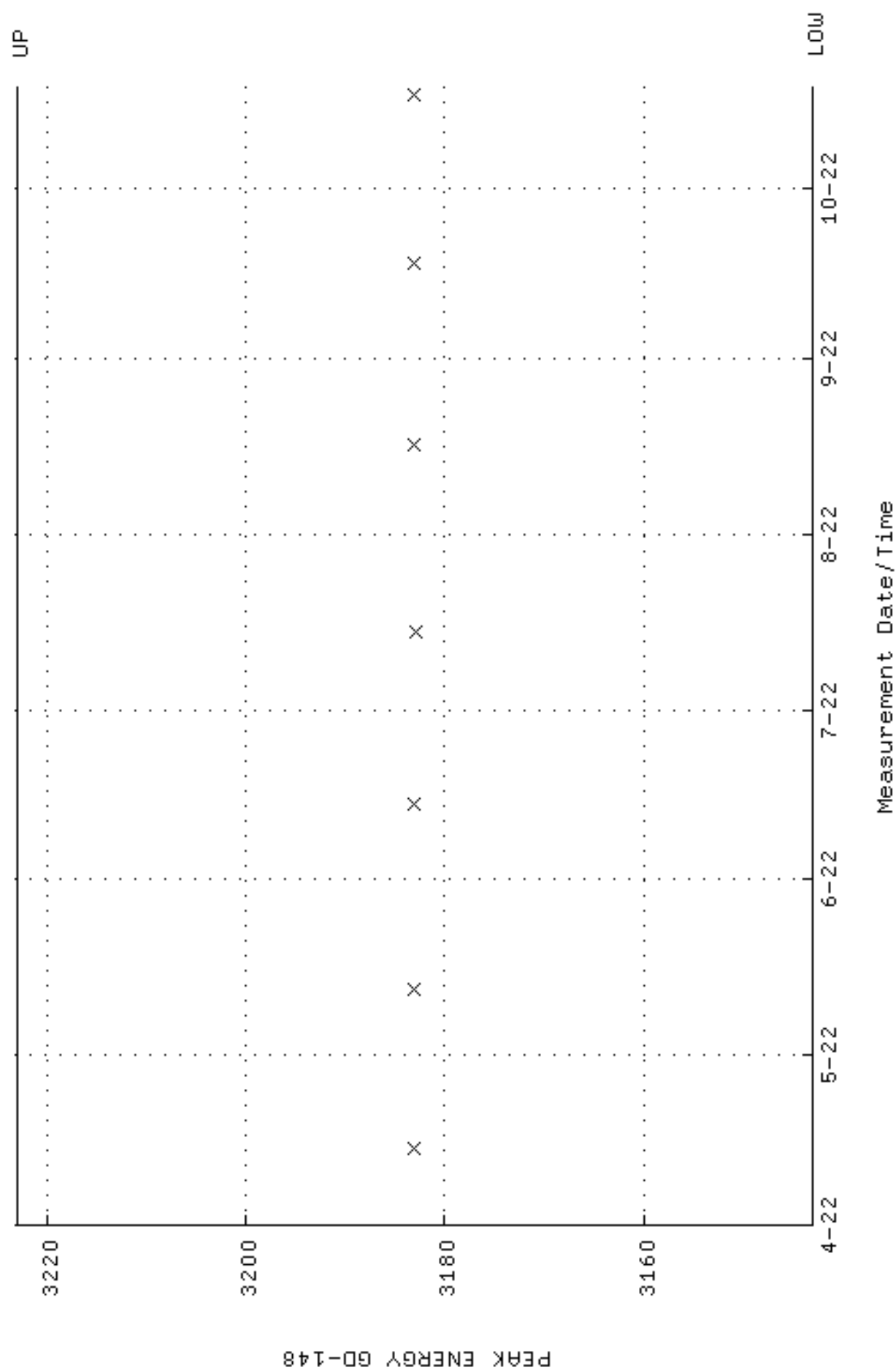
QA filename : DKA100:[ENV_ALPHA.QA.W]W141.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 14-APR-2022 09:46:04 through 18-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



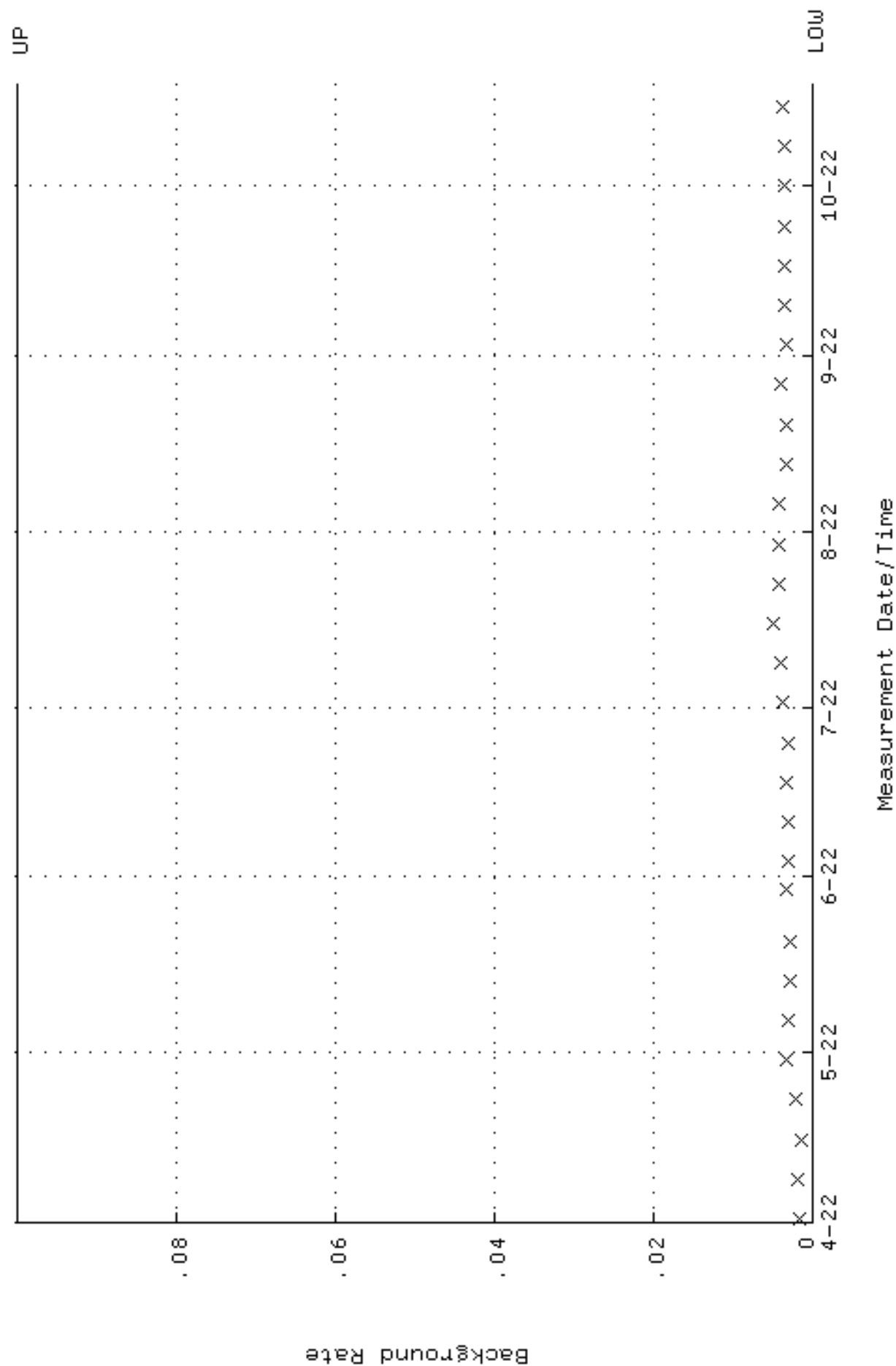
QA filename : DKA100:[ENV_ALPHA.QA.W]W141.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 14-APR-2022 09:46:04 through 18-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



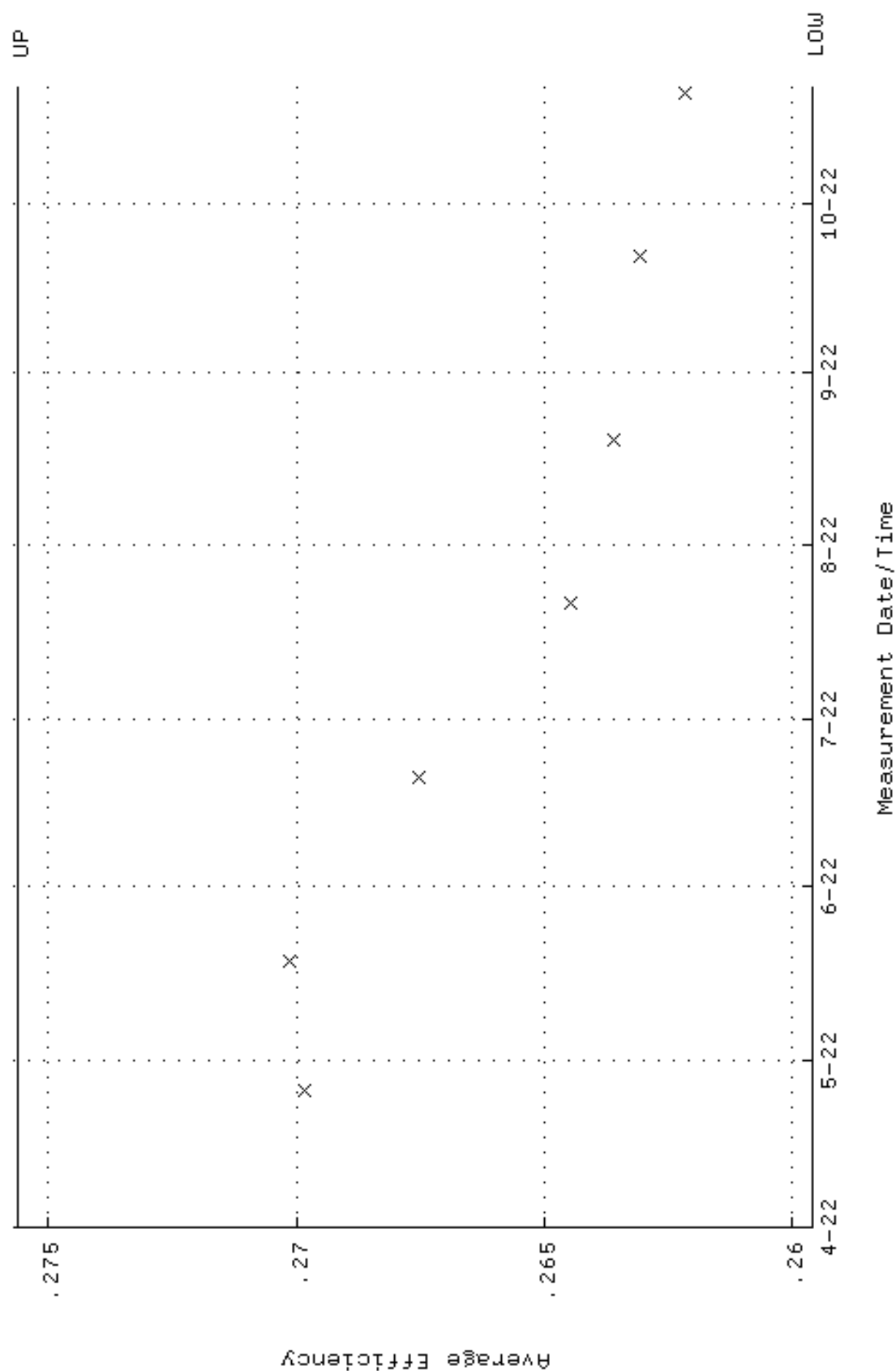
QA filename : DKA100:[ENV_ALPHA.QA.W]W141.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 14-APR-2022 09:46:04 through 18-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



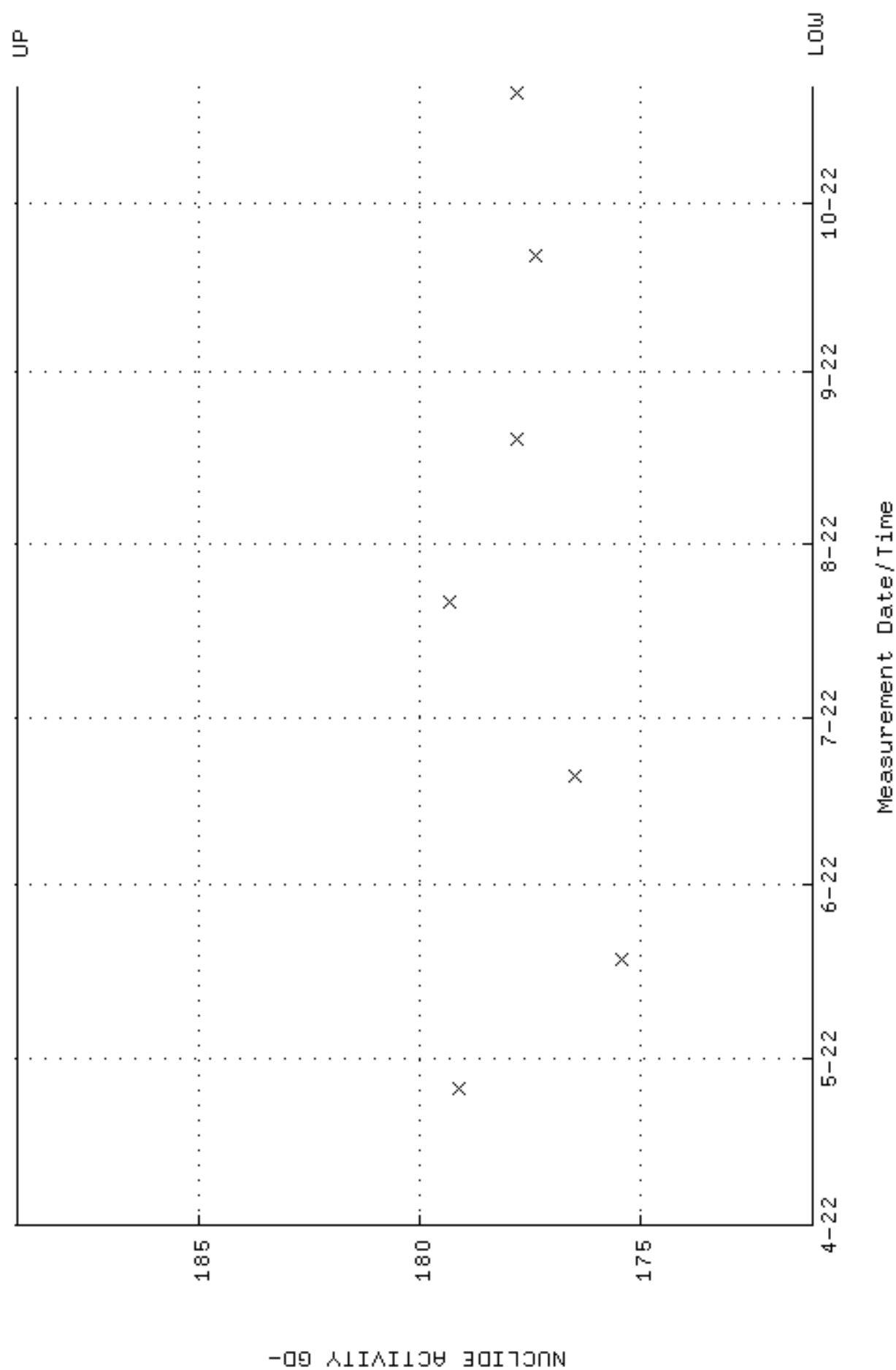
QA filename : DKA100:[ENV_ALPHA.QA.B]B141.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:19:25 through 18-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



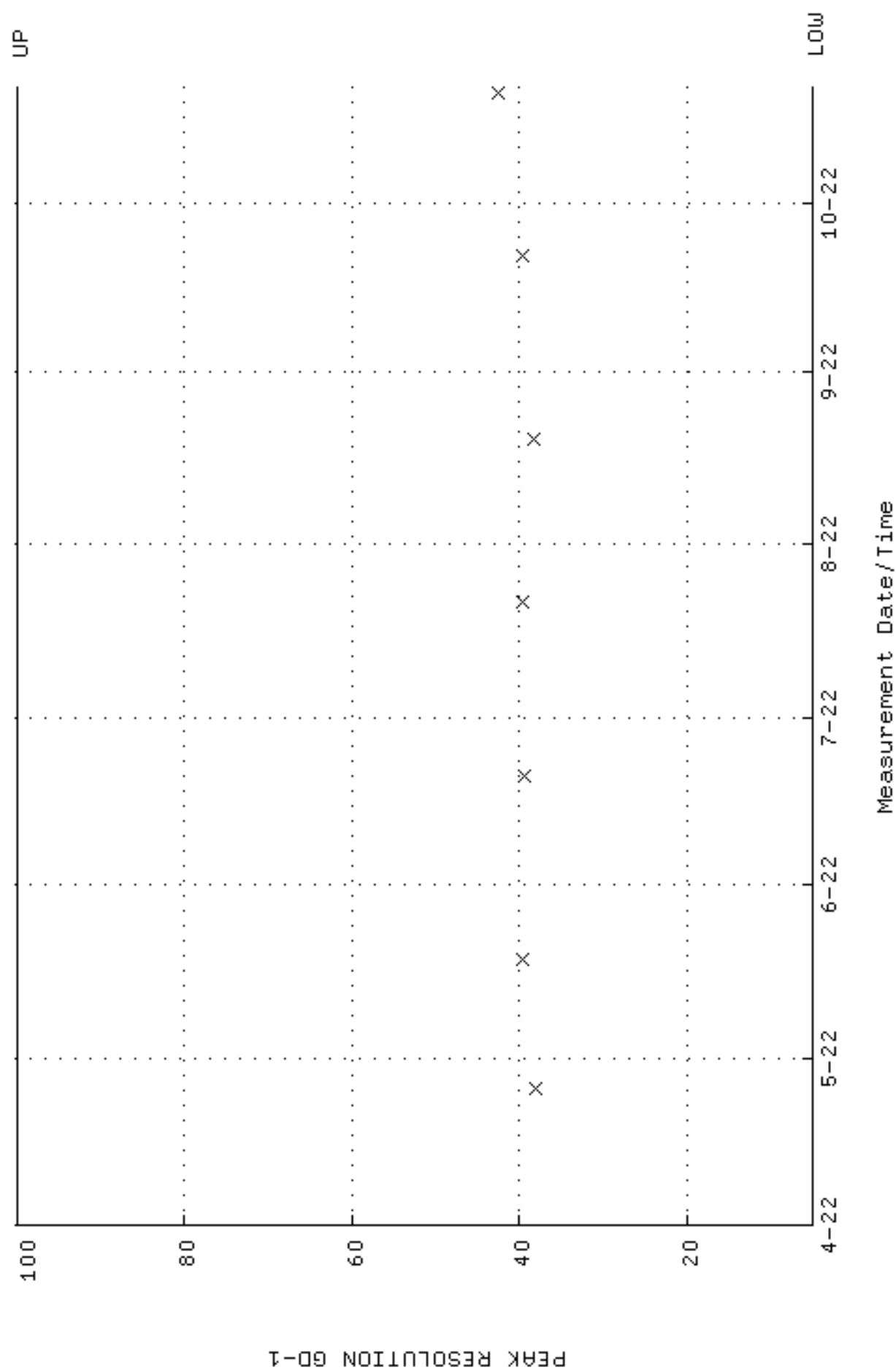
QA filename : DKA100:[ENV_ALPHA.QA.W]W213.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 25-APR-2022 10:44:57 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.259600 through 0.275660



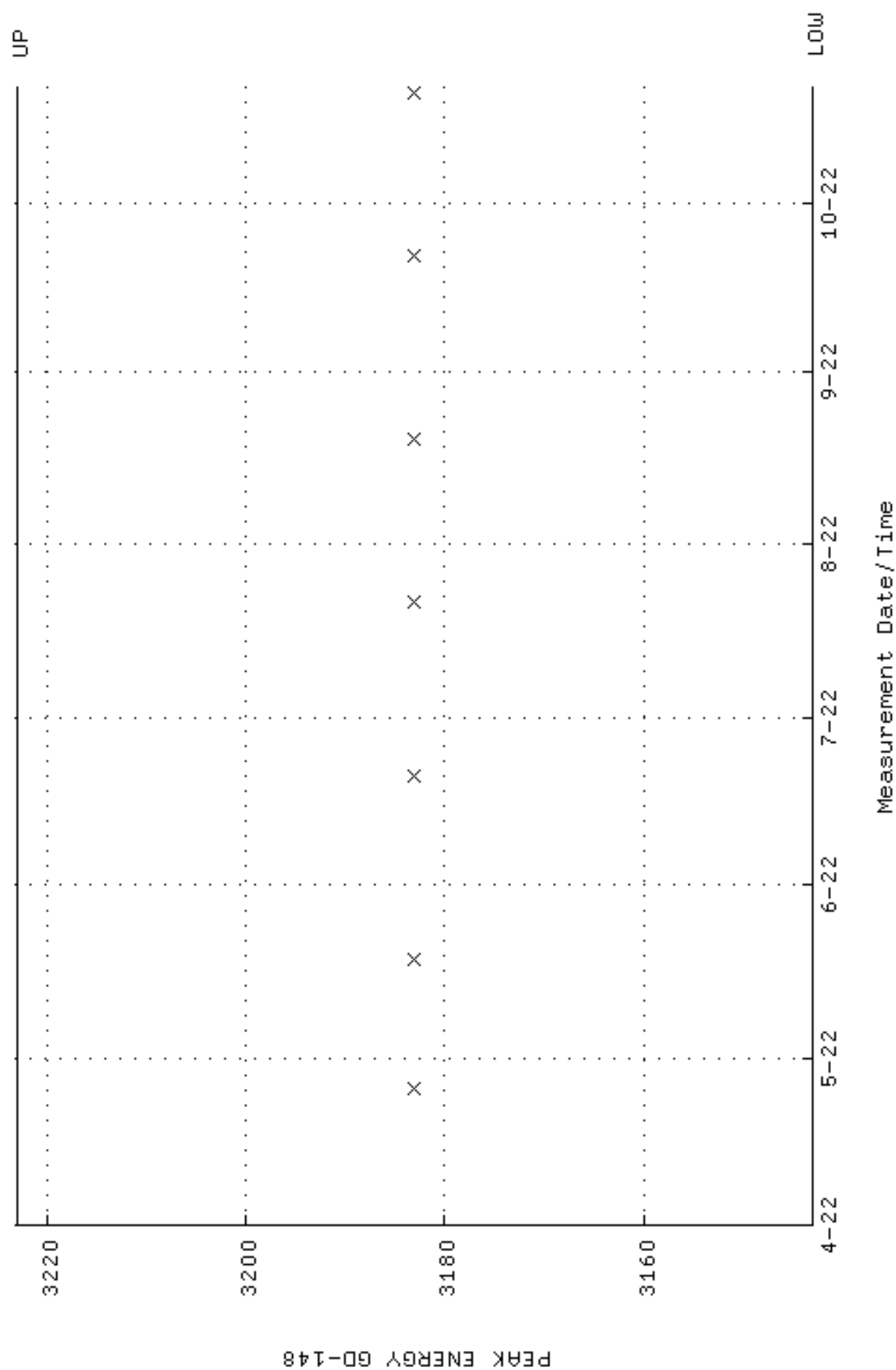
QA filename : DKA100:[ENV_ALPHA.QA.W]W213.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 10:44:57 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



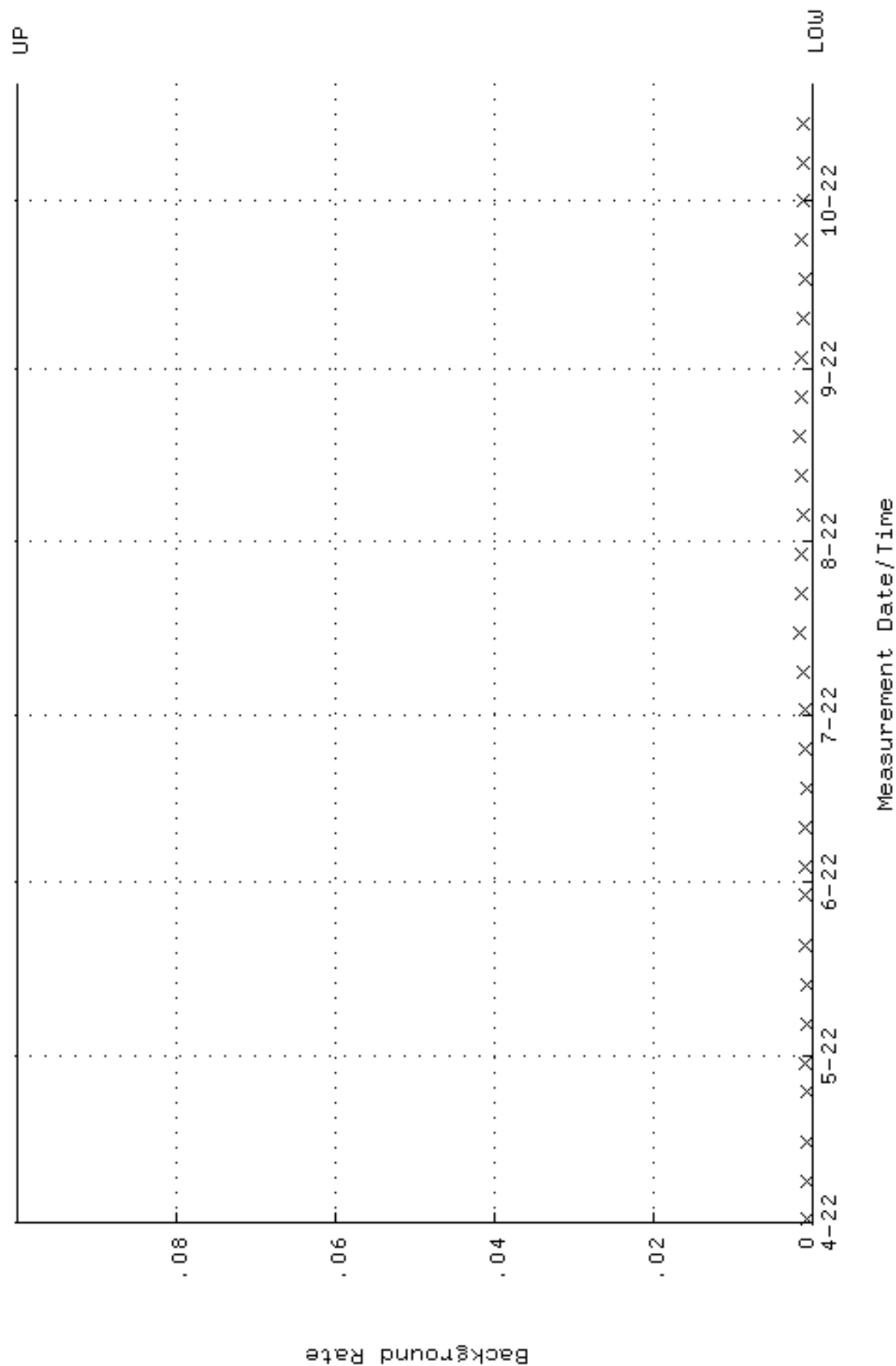
QA filename : DKA100:[ENV_ALPHA.QA.W]W213.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 10:44:57 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



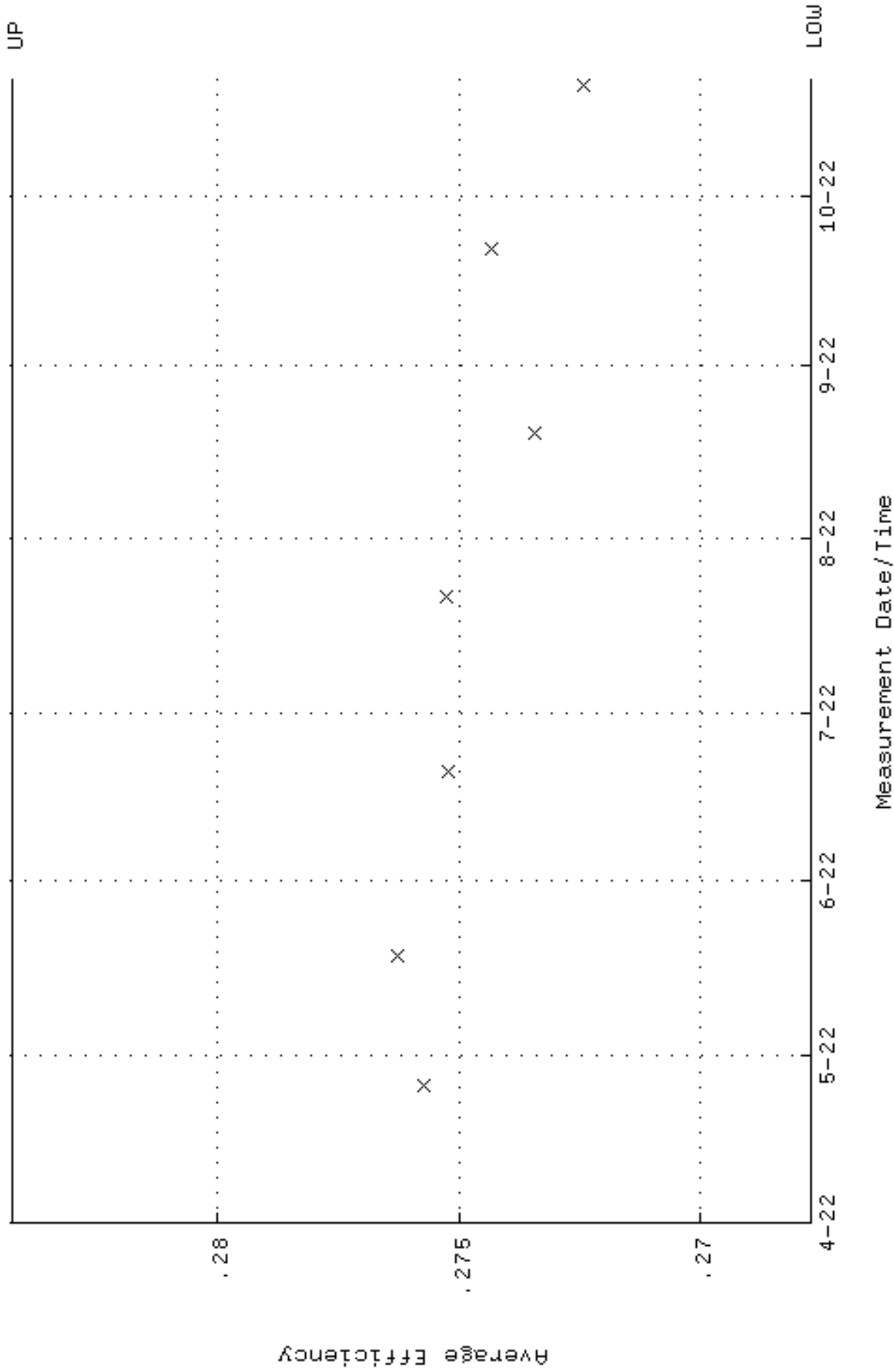
QA filename : DKA100:[ENV_ALPHA.QA.W]W213.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 10:44:57 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



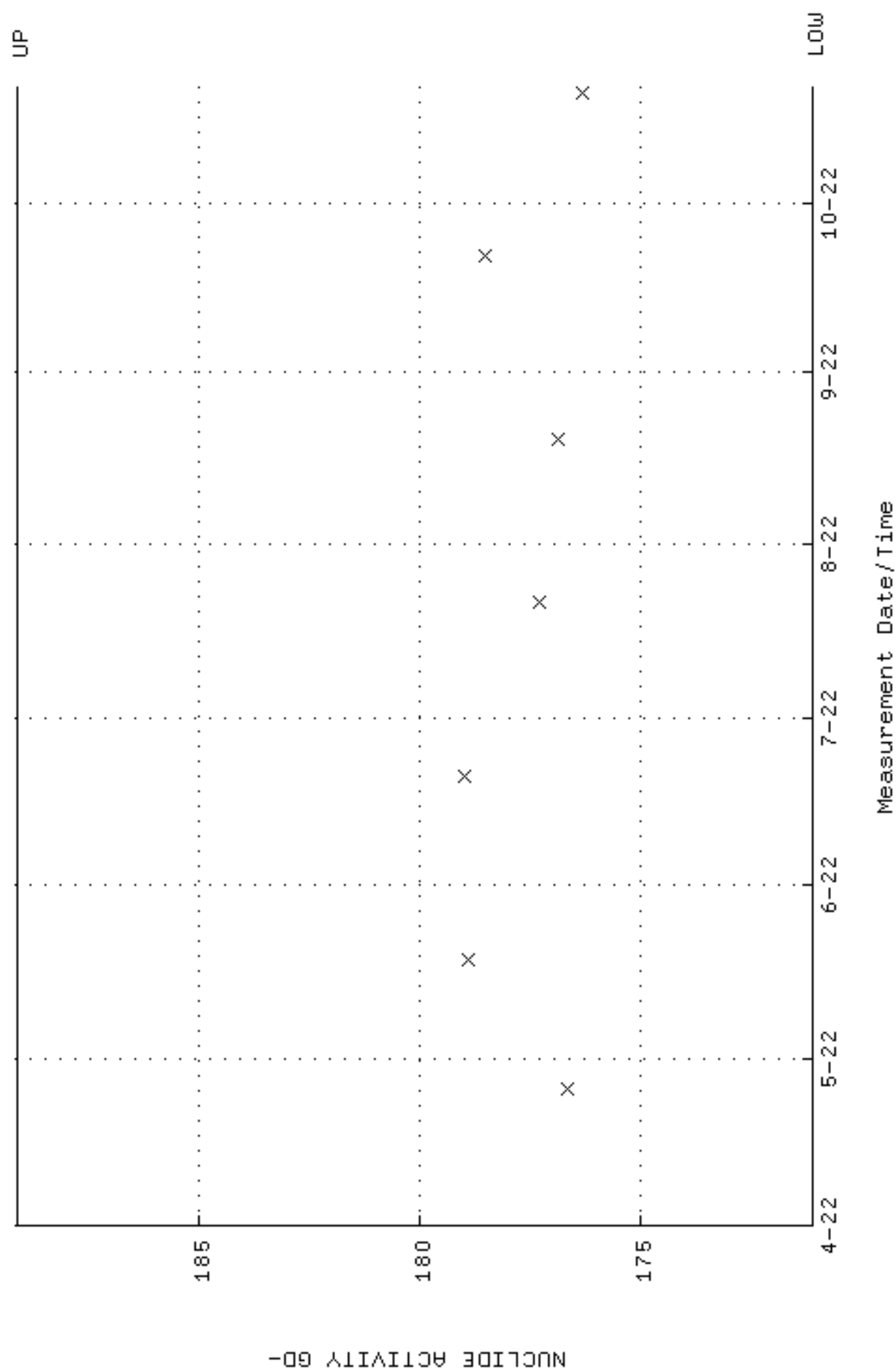
QA filename : DKA100:[ENV_ALPHA.QA.B]B213.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:11:53 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



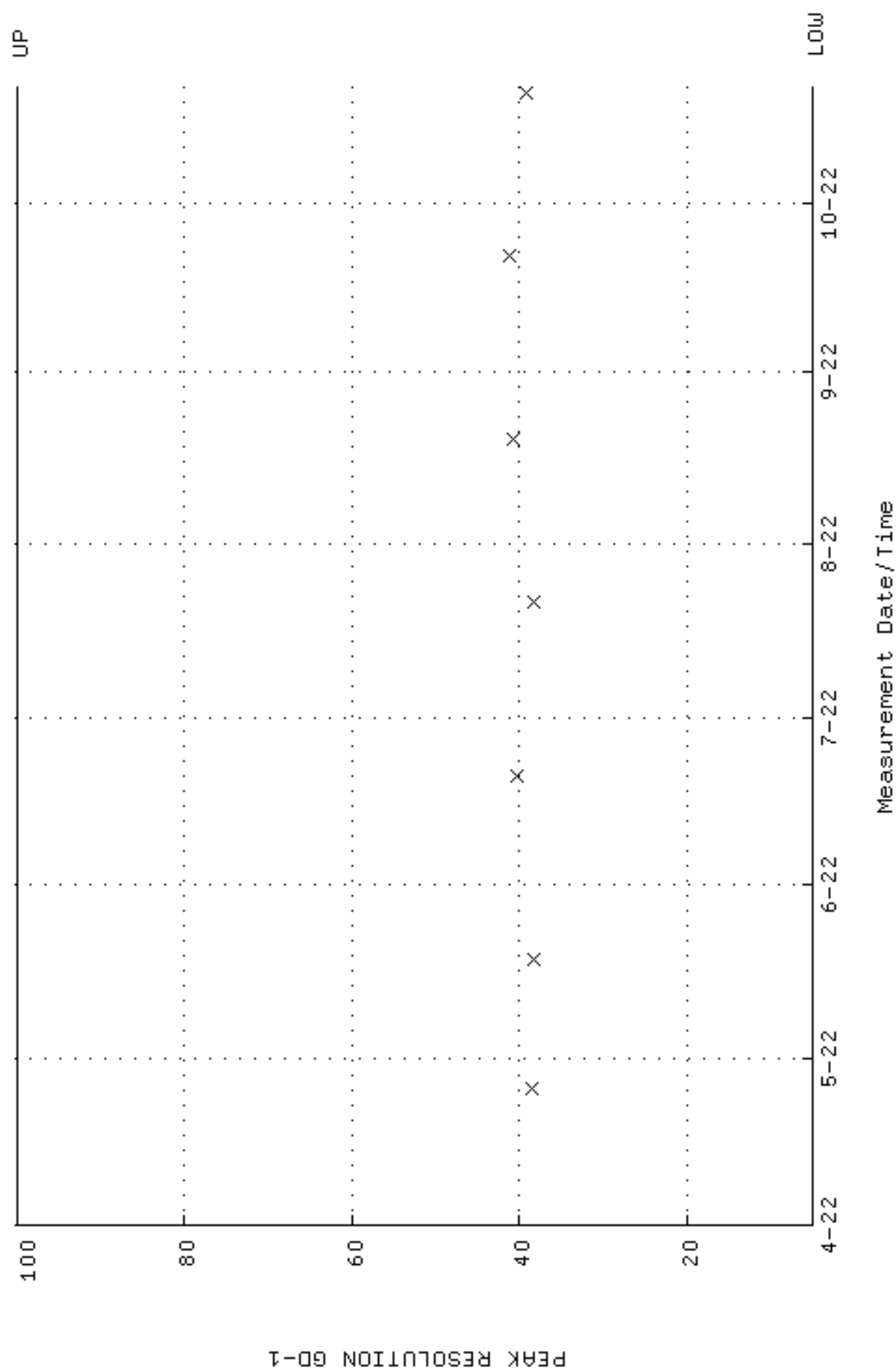
QA filename : DKA100:[ENV_ALPHA.QA.W]W215.QAF;3
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 25-APR-2022 10:45:05 through 21-OCT-2022 12:00:00
Lower/Upper Lmts: 0.267700 through 0.284260



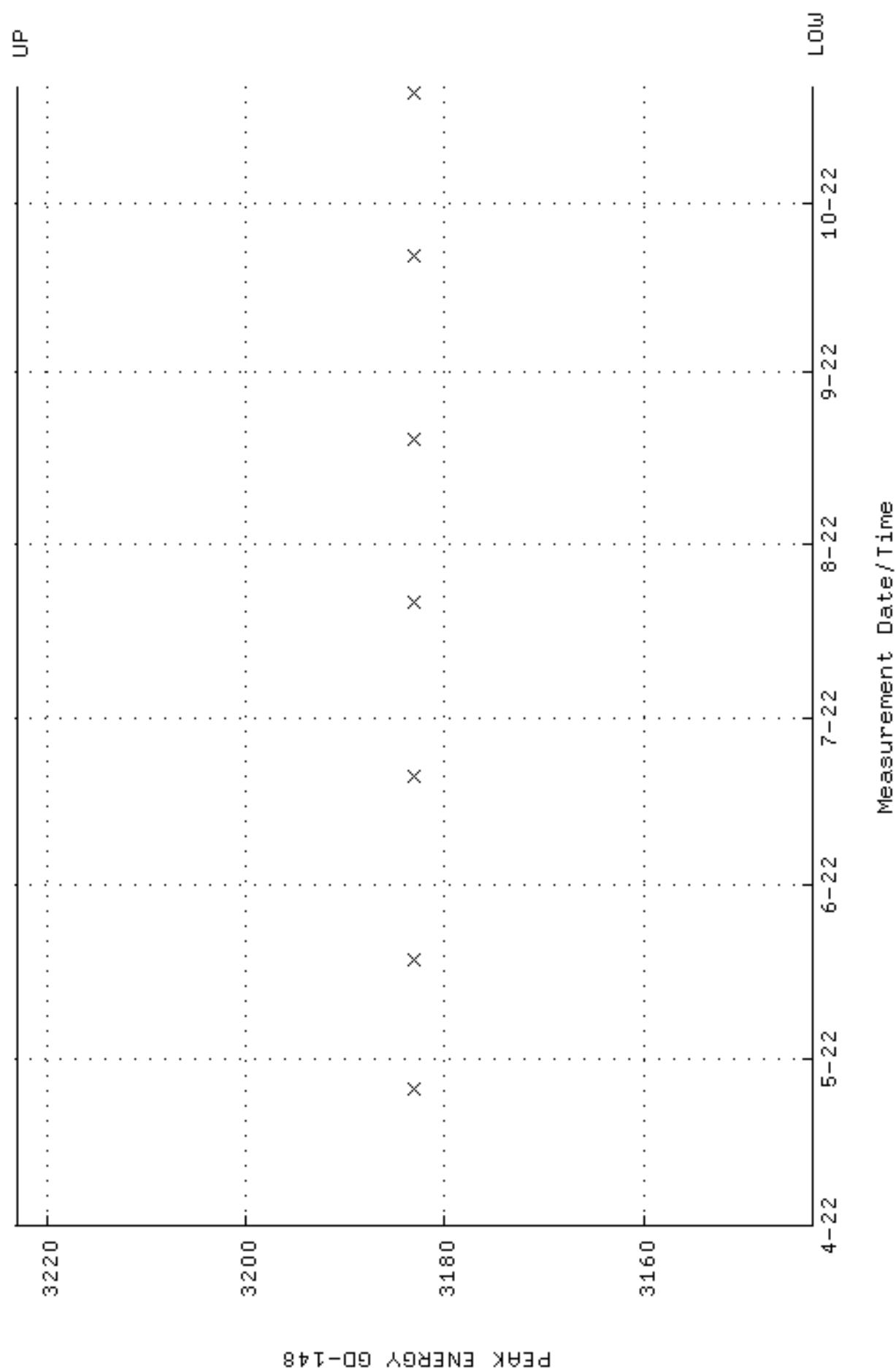
QA filename : DKA100:[ENV_ALPHA.QA.W]W215.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 10:45:05 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



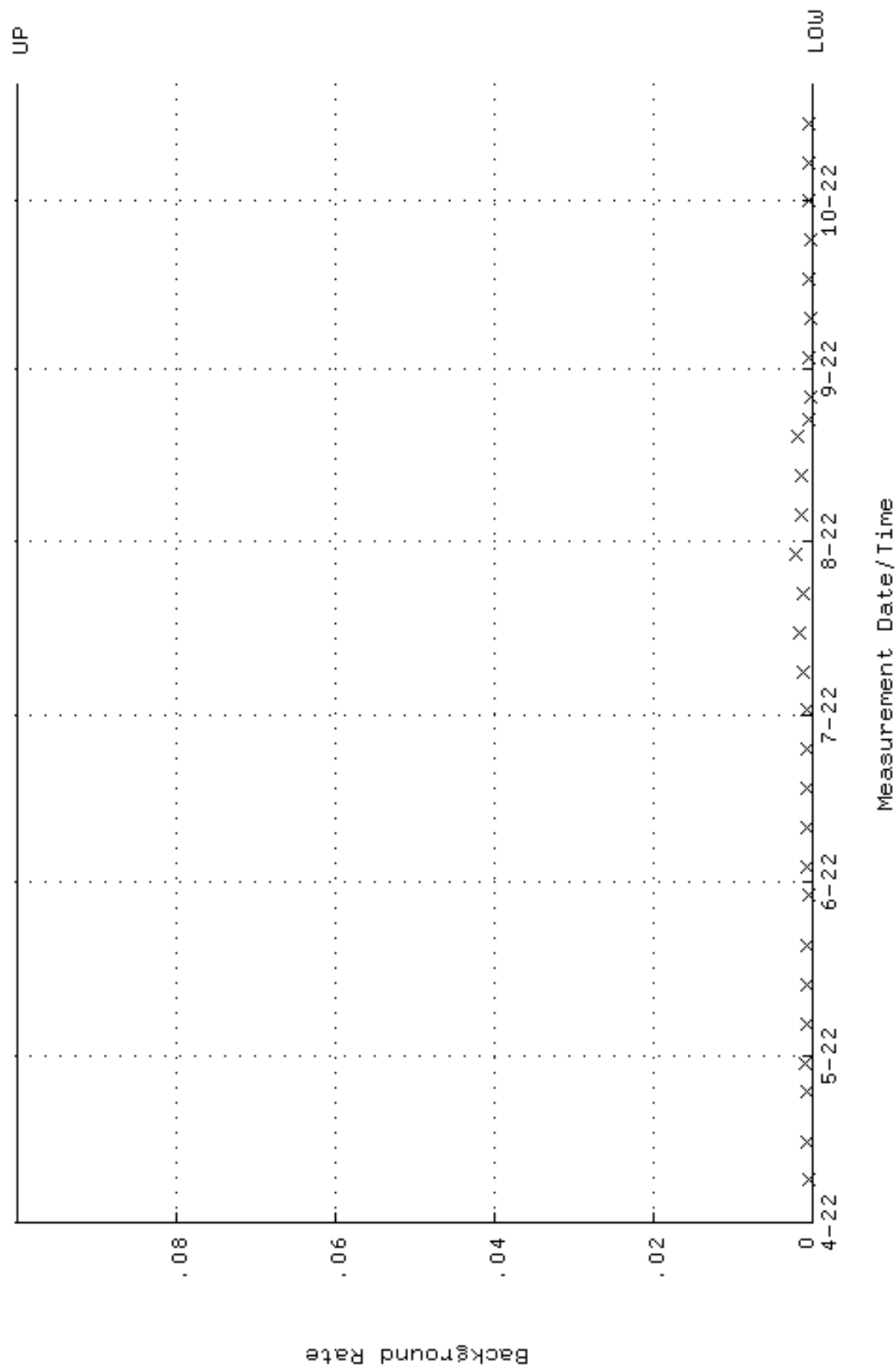
QA filename : DKA100:[ENV_ALPHA.QA.W]W215.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 10:45:05 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



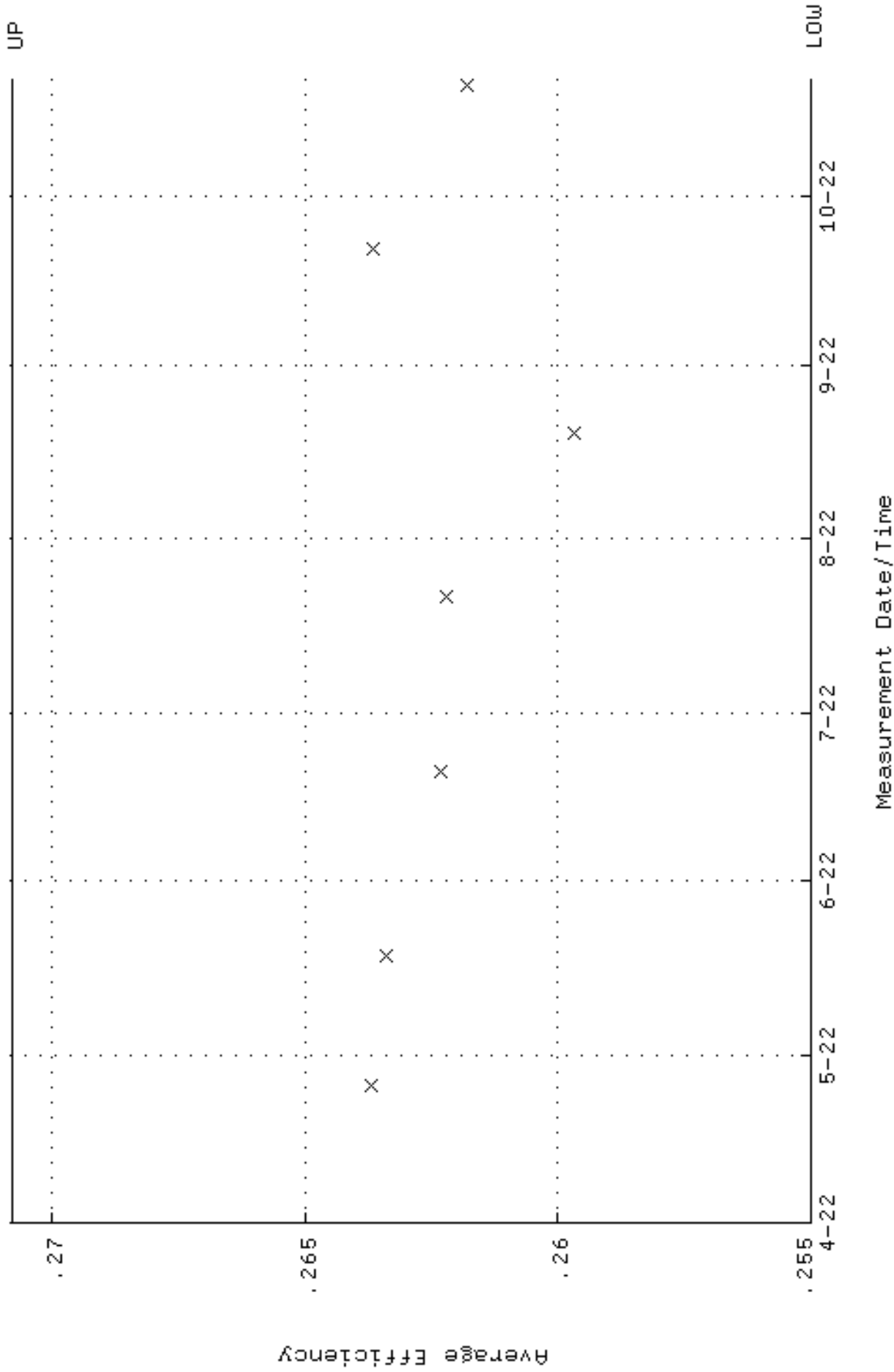
QA filename : DKA100:[ENV_ALPHA.QA.W]W215.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 10:45:05 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



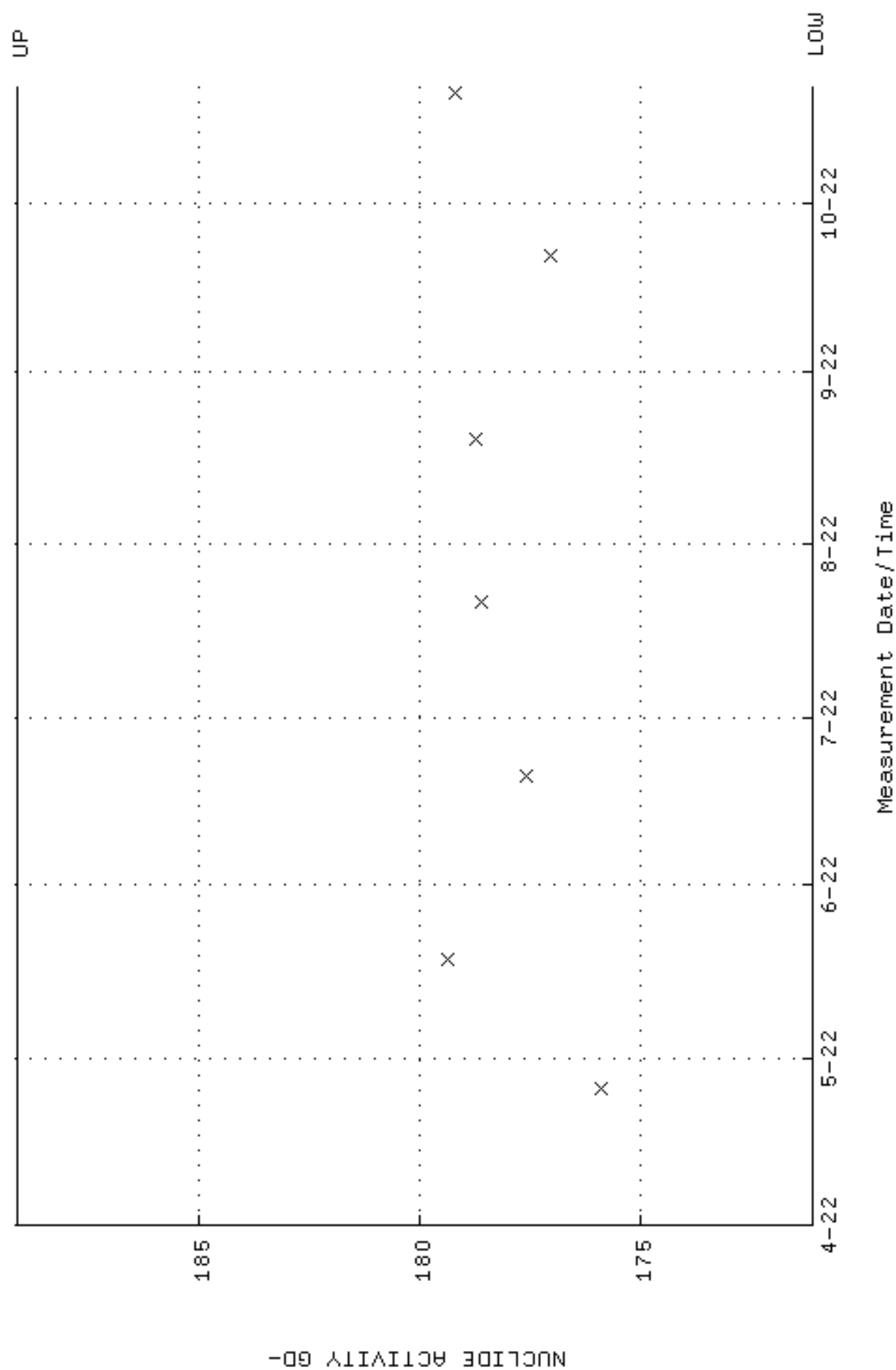
QA filename : DKA100:[ENV_ALPHA.QA.B]B215.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 8-APR-2022 12:46:30 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



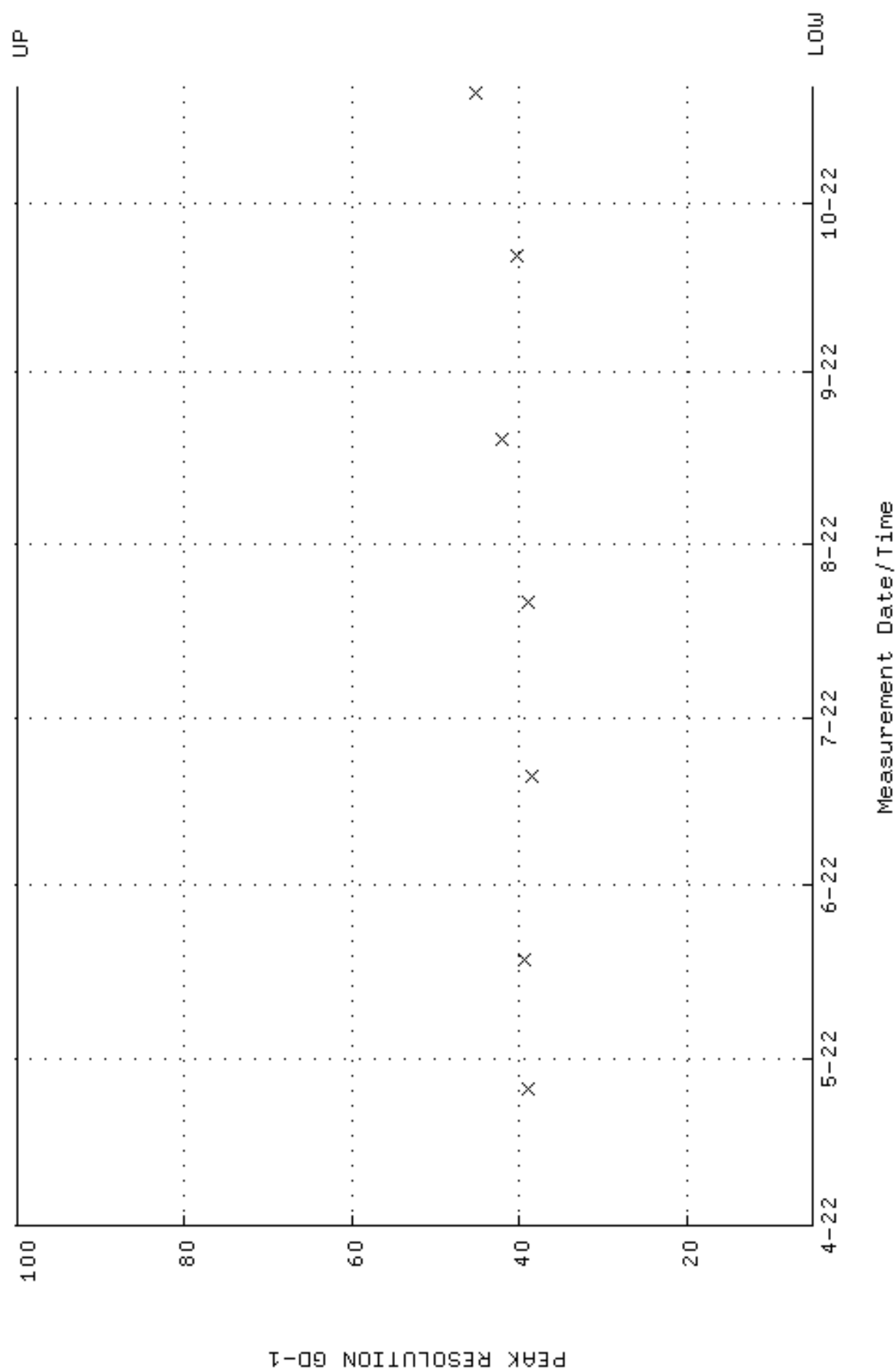
QA filename : DKA100:[ENV_ALPHA.QA.W]W217.QAF;3
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 25-APR-2022 11:23:42 through 21-OCT-2022 12:00:00
Lower/Upper Lmts: 0.255000 through 0.270770



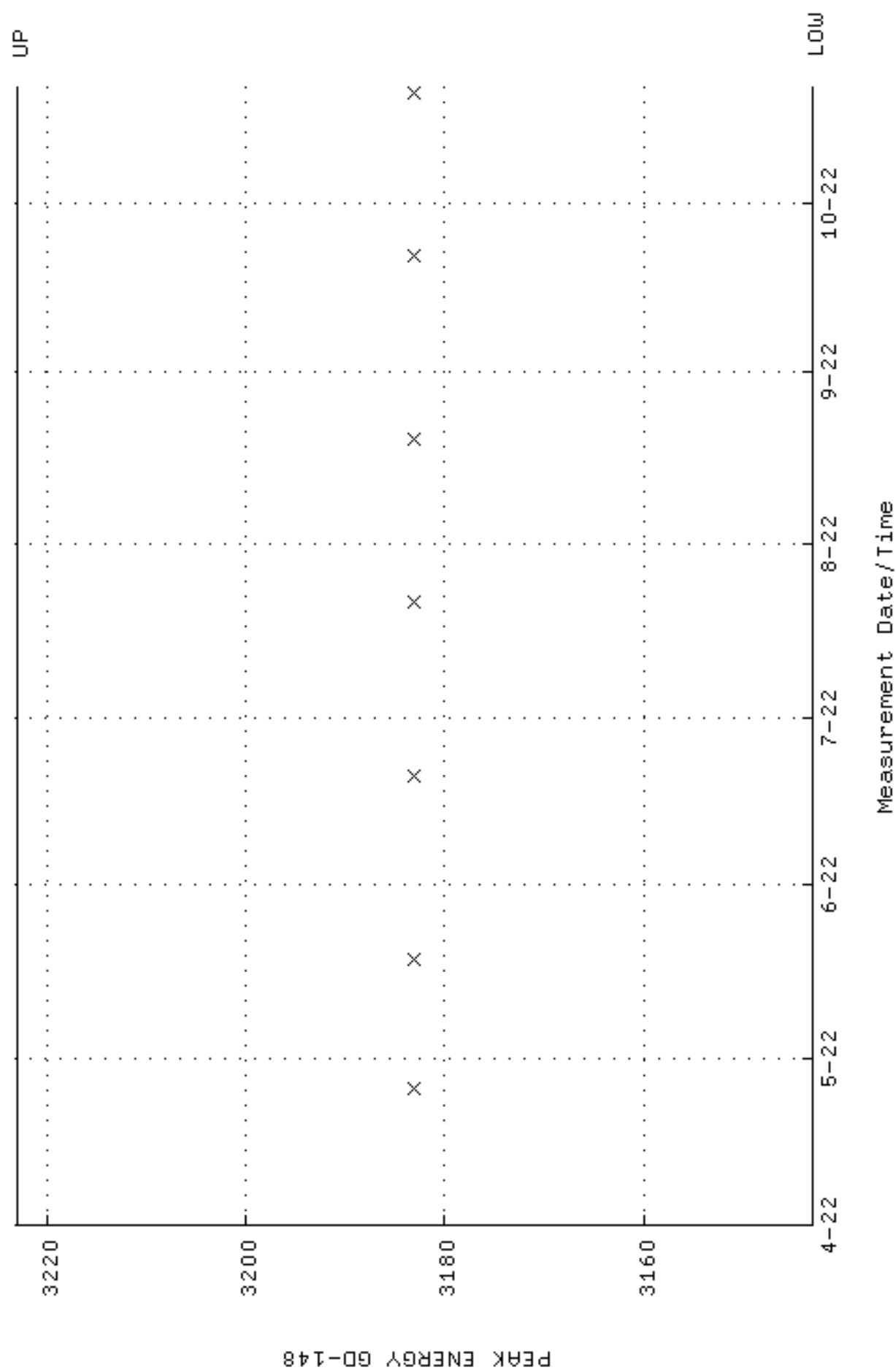
QA filename : DKA100:[ENV_ALPHA.QA.W]W217.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 11:23:42 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



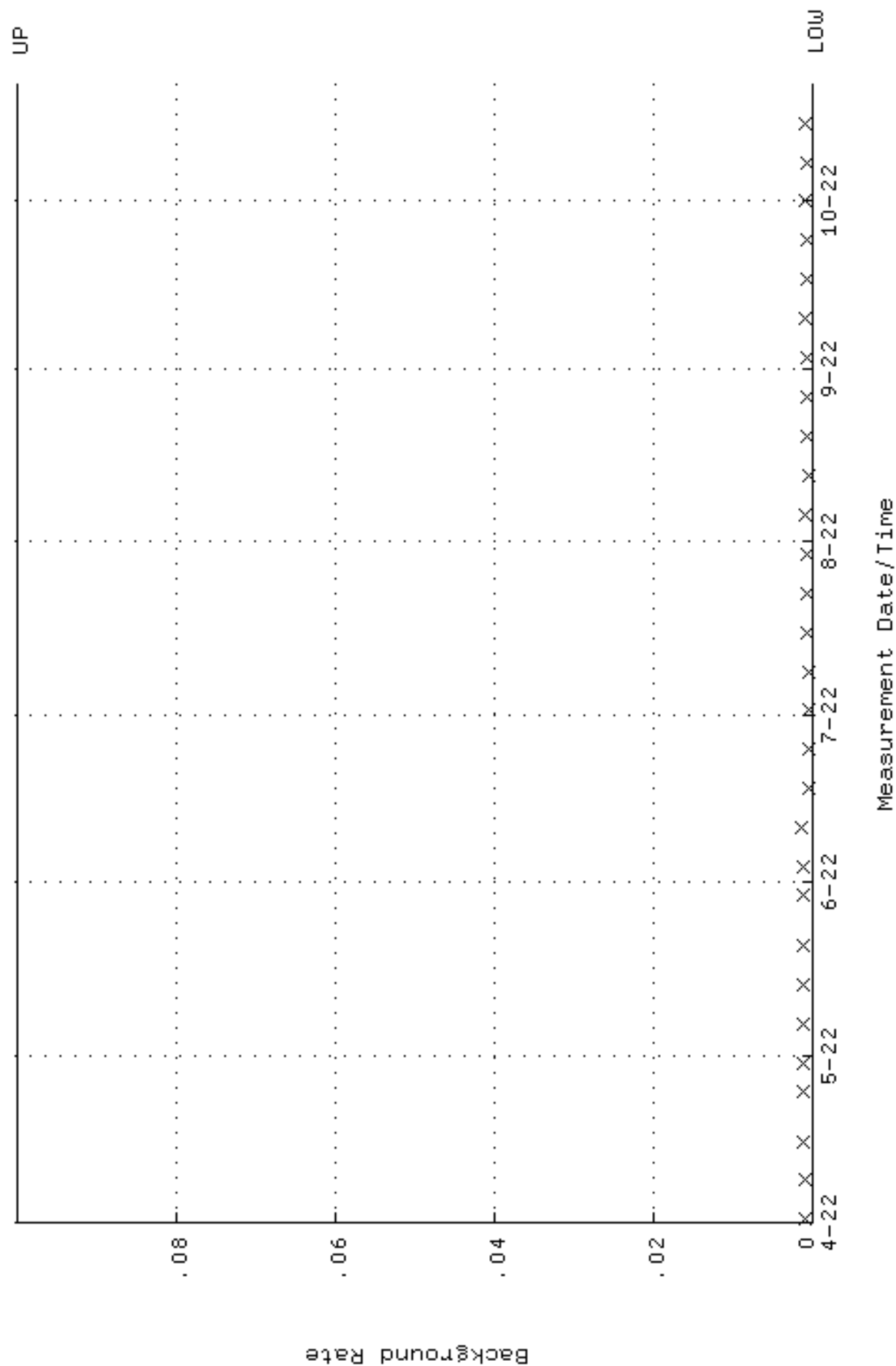
QA filename : DKA100:[ENV_ALPHA.QA.W]W217.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 11:23:42 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



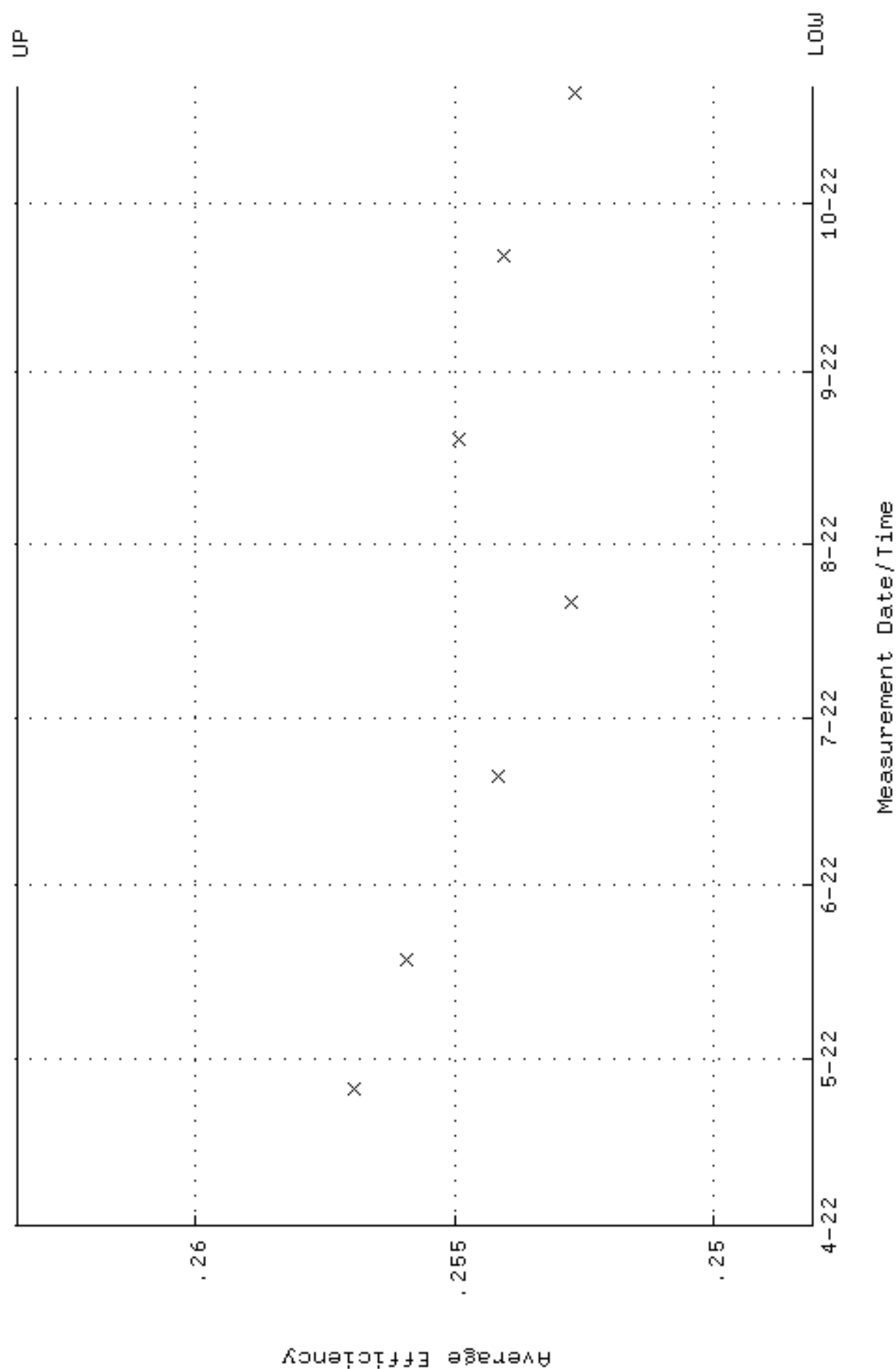
QA filename : DKA100:[ENV_ALPHA.QA.W]W217.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 11:23:42 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



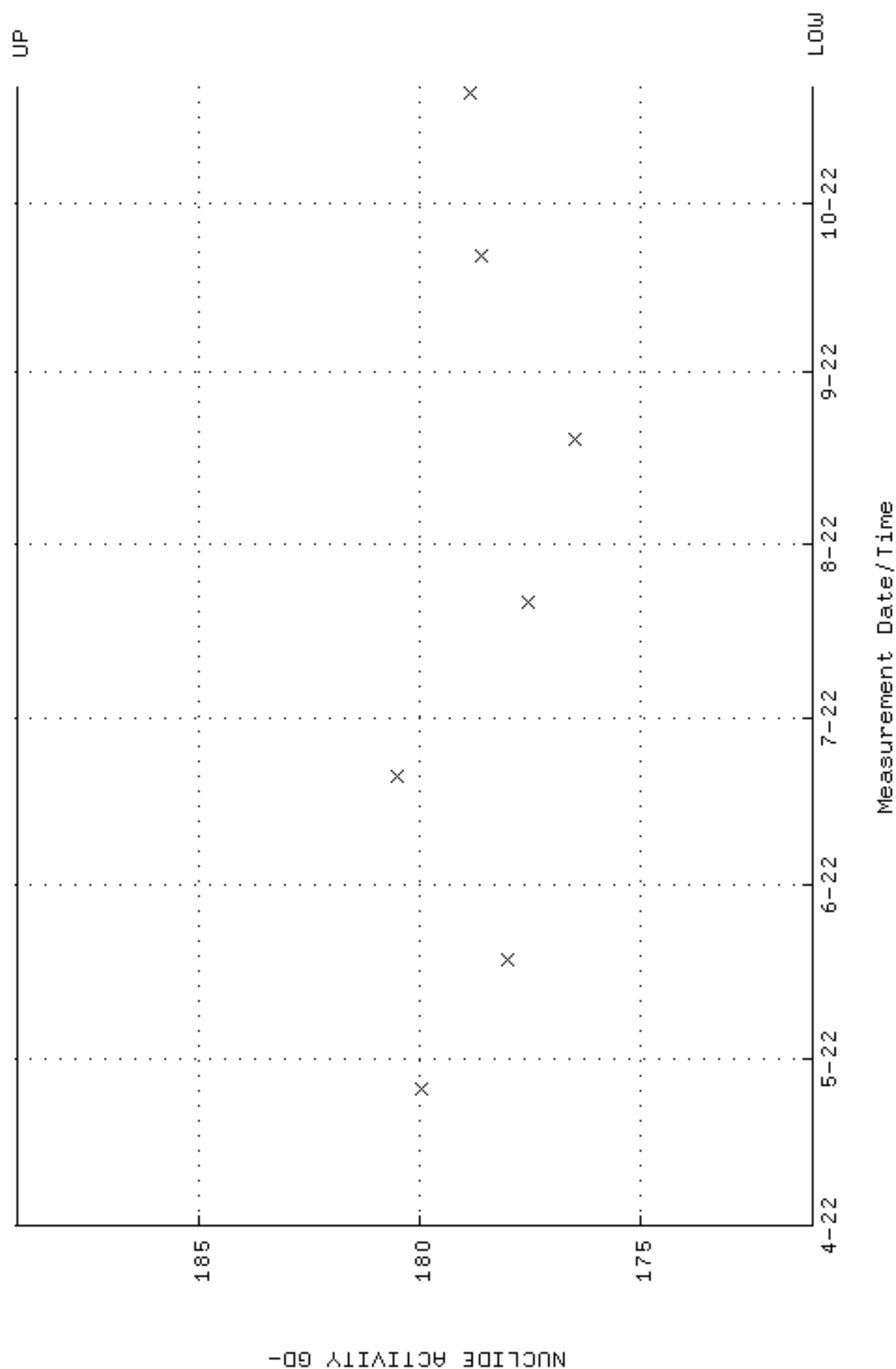
QA filename : DKA100:[ENV_ALPHA.QA.B]B217.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:12:01 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



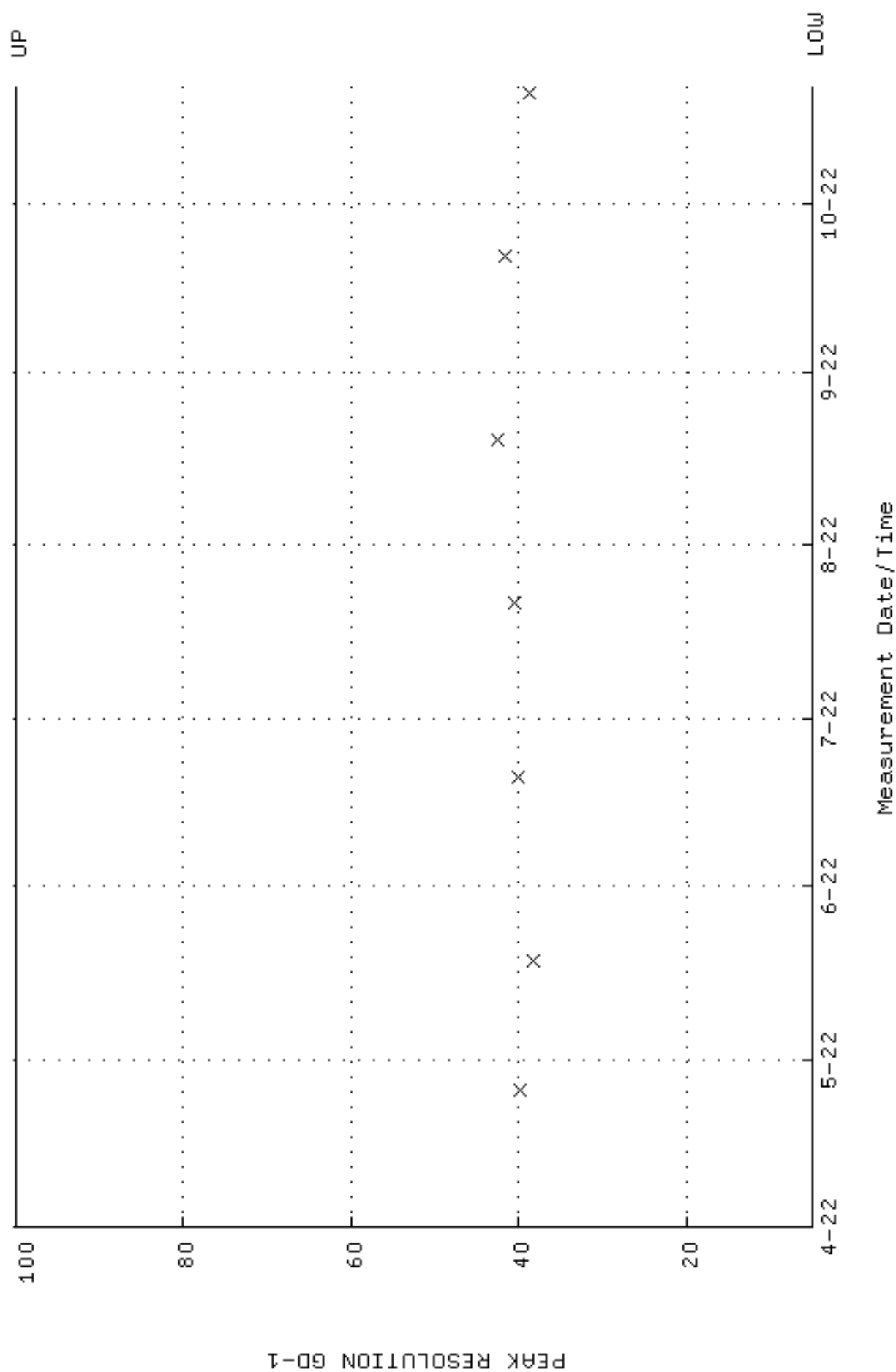
QA filename : DKA100:[ENV_ALPHA.QA.W]W218.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 25-APR-2022 10:45:16 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.248090 through 0.263440



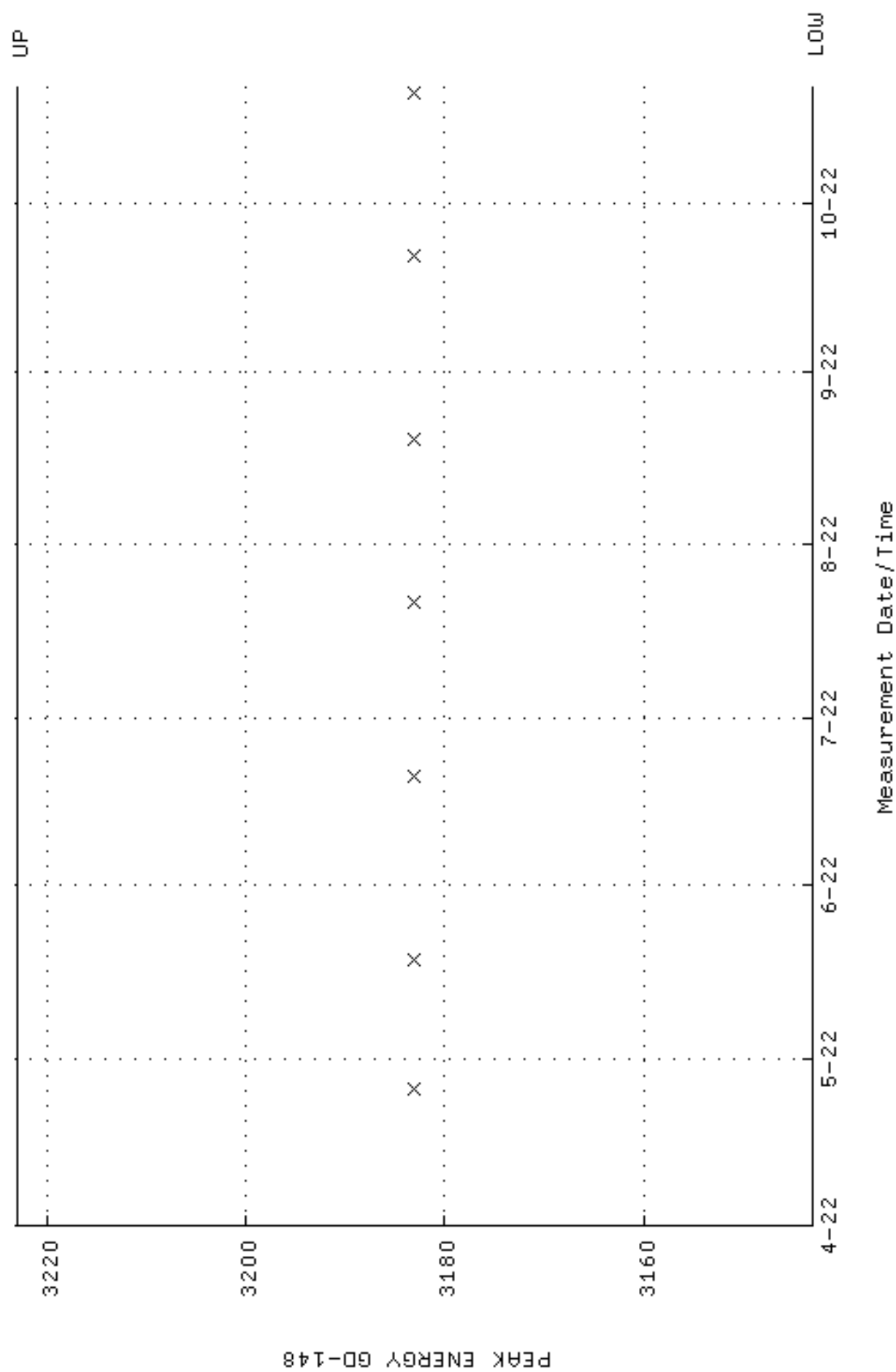
QA filename : DKA100:[ENV_ALPHA.QA.W]W218.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 10:45:16 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



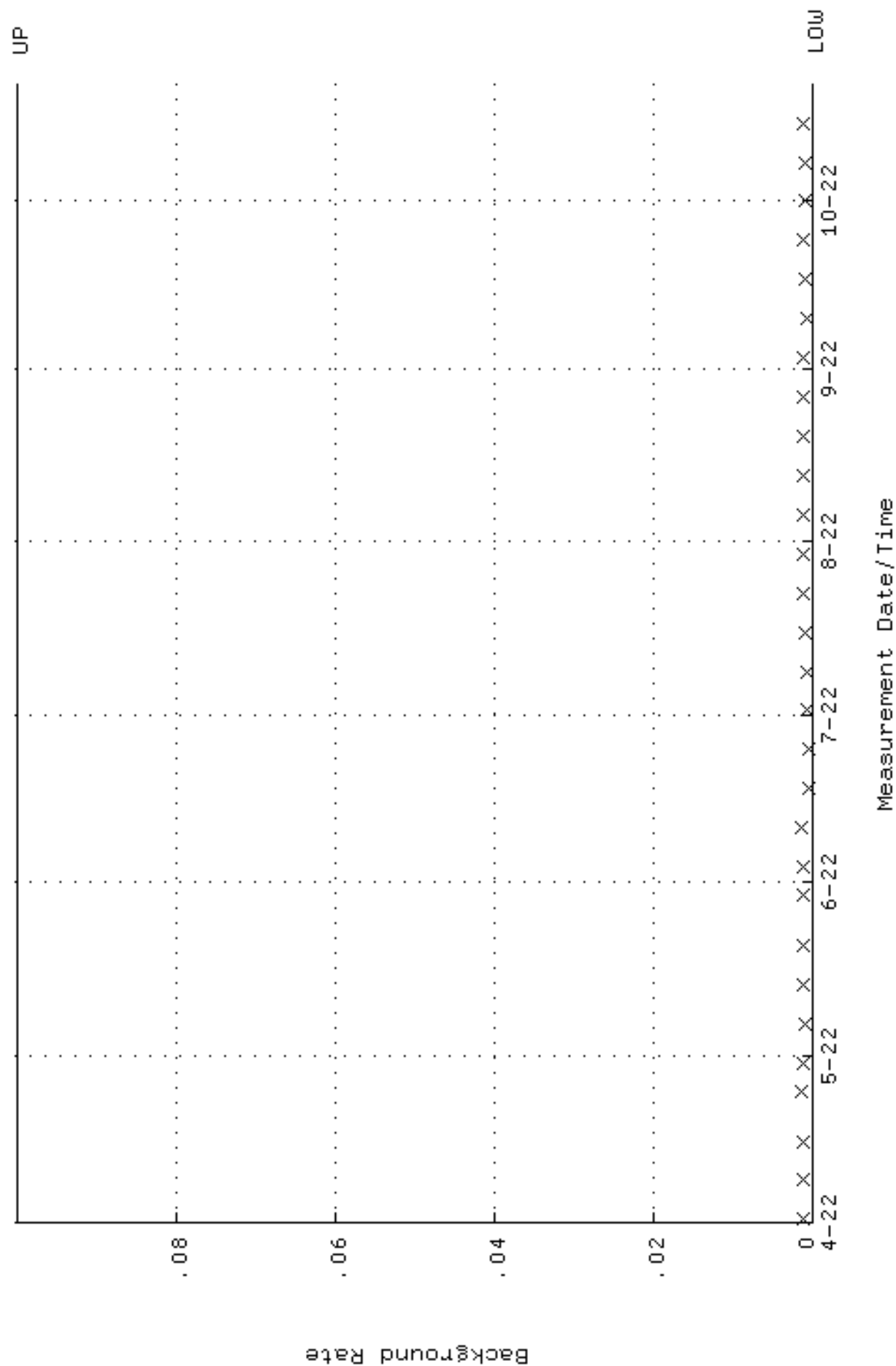
QA filename : DKA100:[ENV_ALPHA.QA.W]W218.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 10:45:16 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



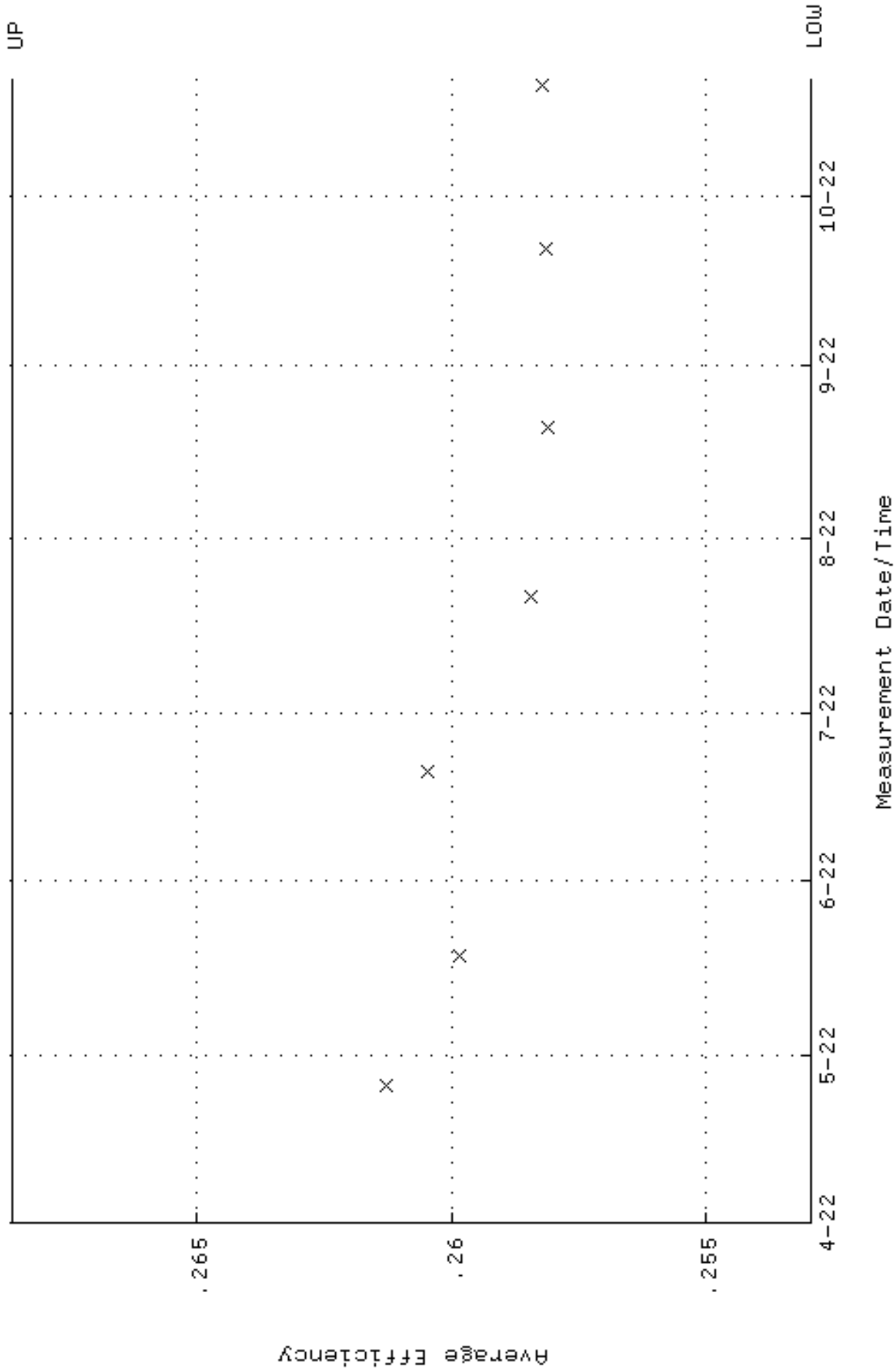
QA filename : DKA100:[ENV_ALPHA.QA.W]W218.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 10:45:16 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



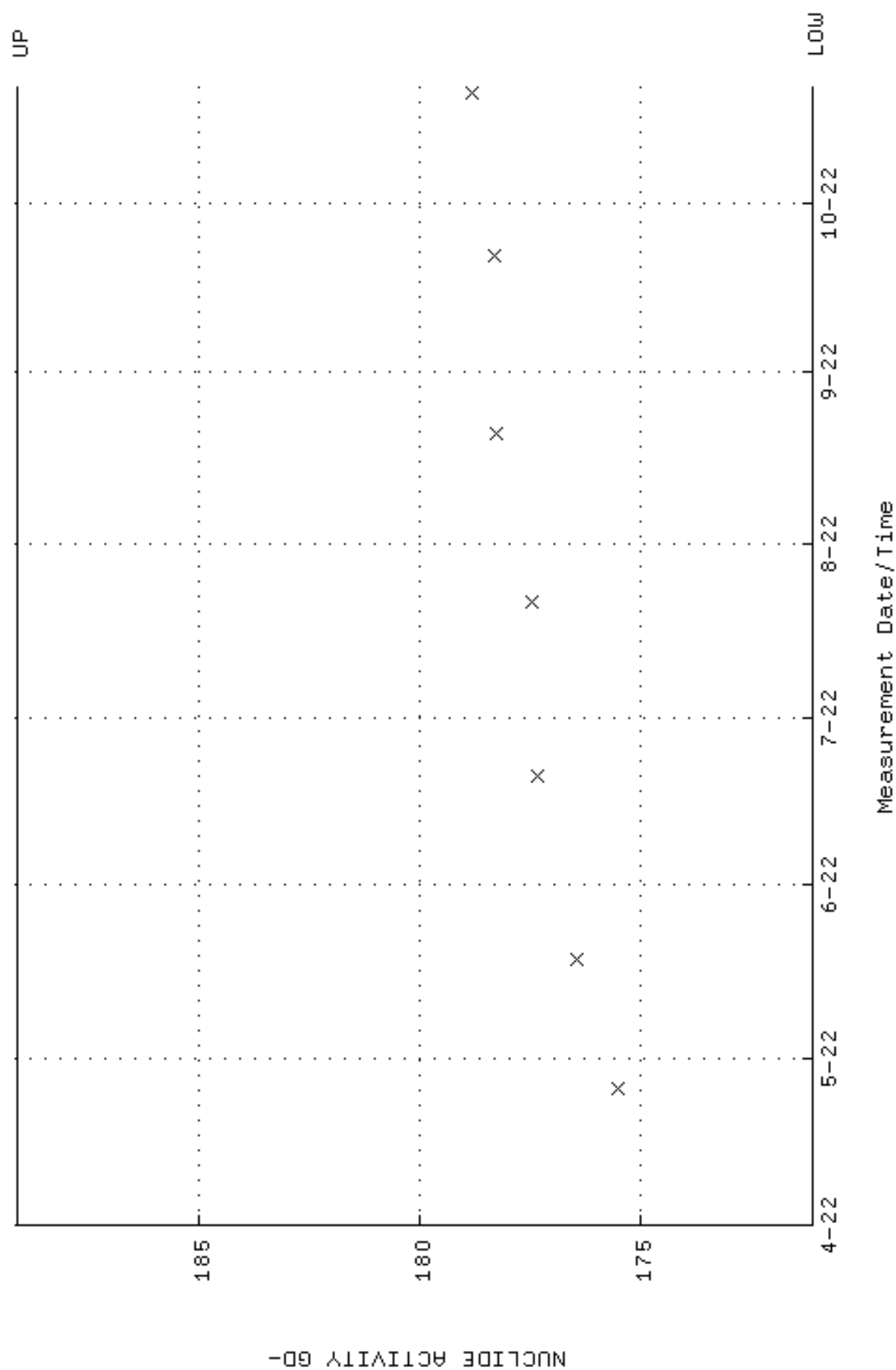
QA filename : DKA100:[ENV_ALPHA.QA.B]B218.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:12:04 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



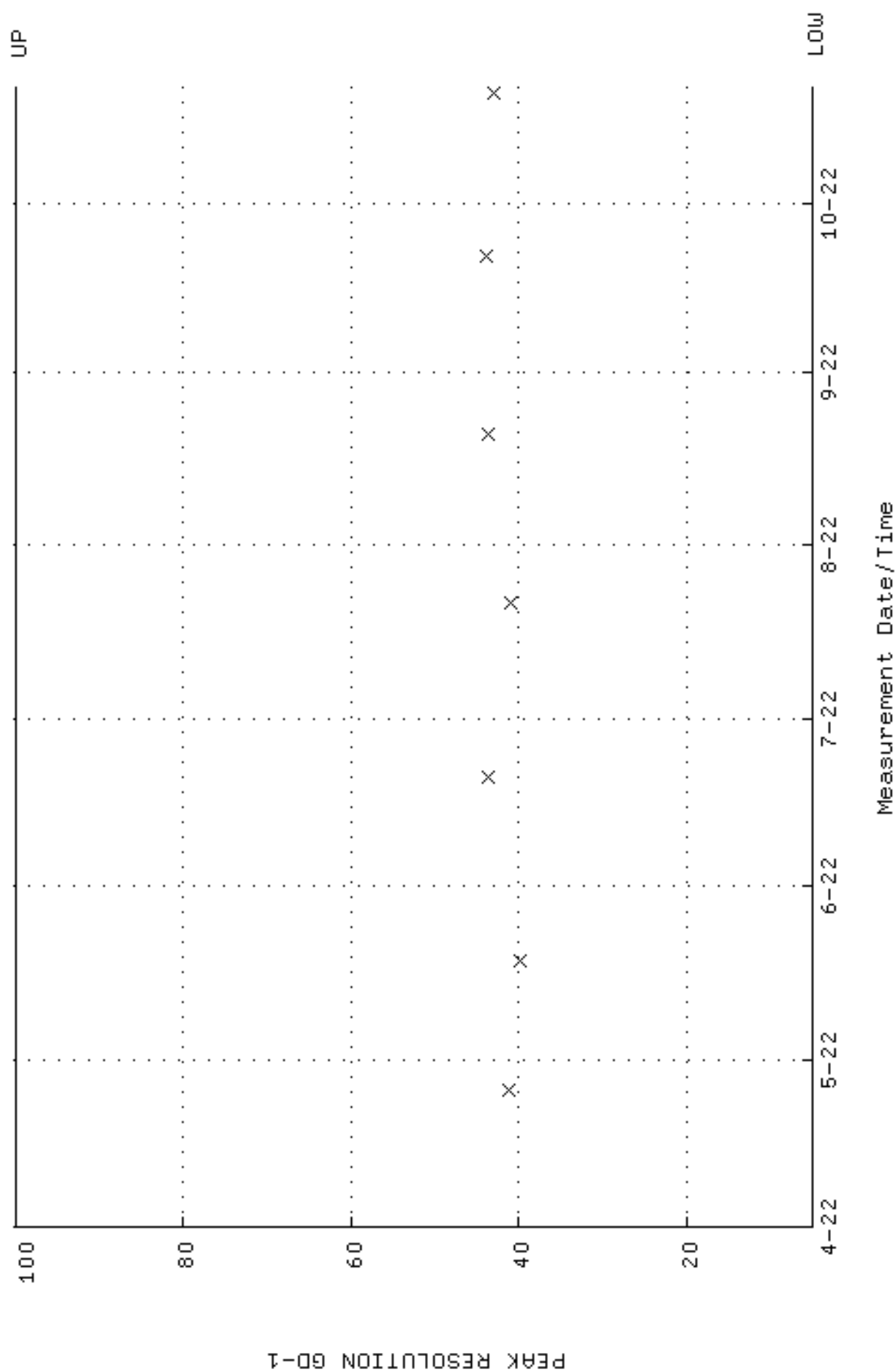
QA filename : DKA100:[ENV_ALPHA.QA.W]W222.QAF;3
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 25-APR-2022 10:46:55 through 21-OCT-2022 12:00:00
Lower/Upper Lmts: 0.252952 through 0.268598



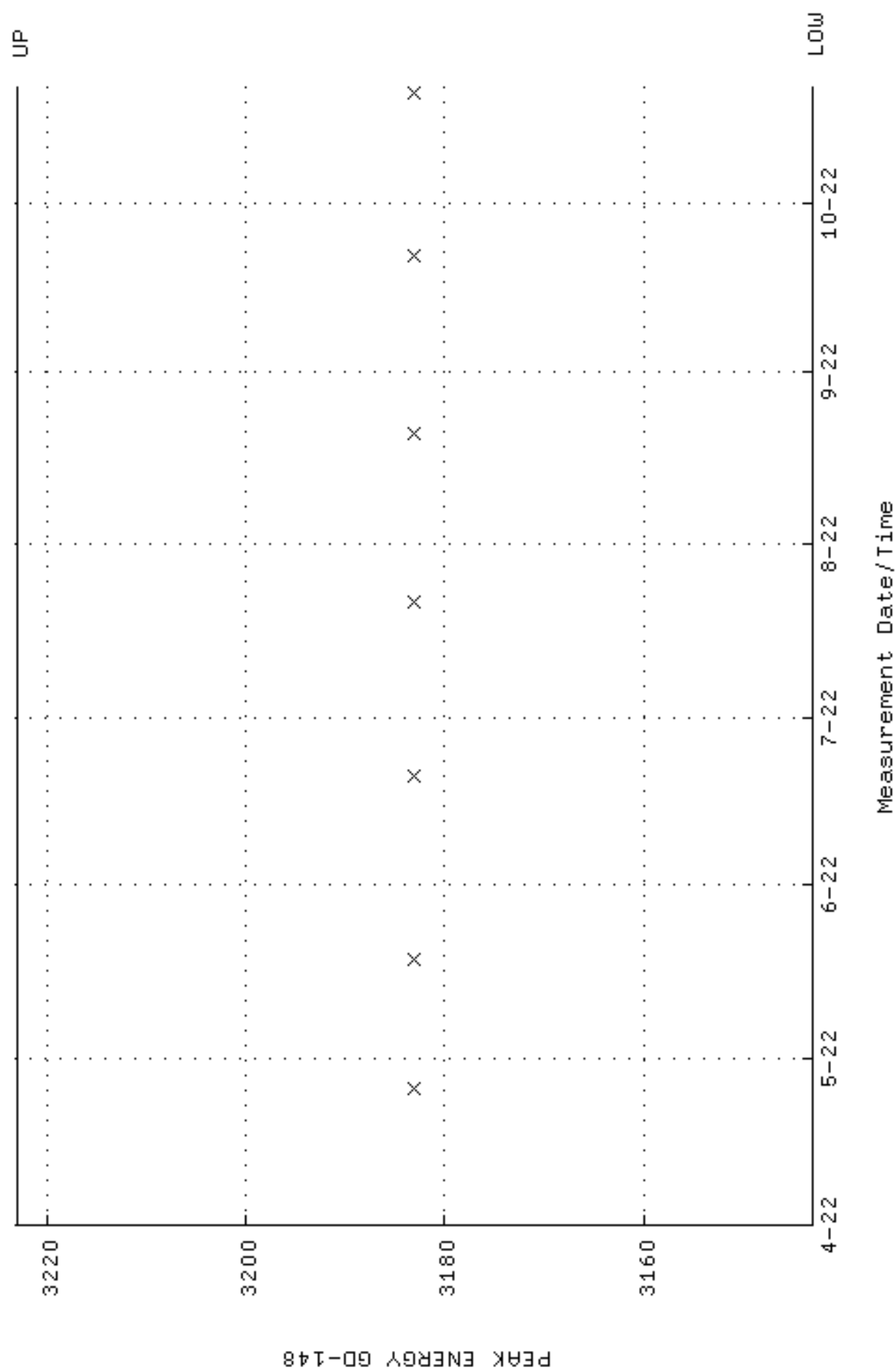
QA filename : DKA100:[ENV_ALPHA.QA.W]W222.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 10:46:55 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



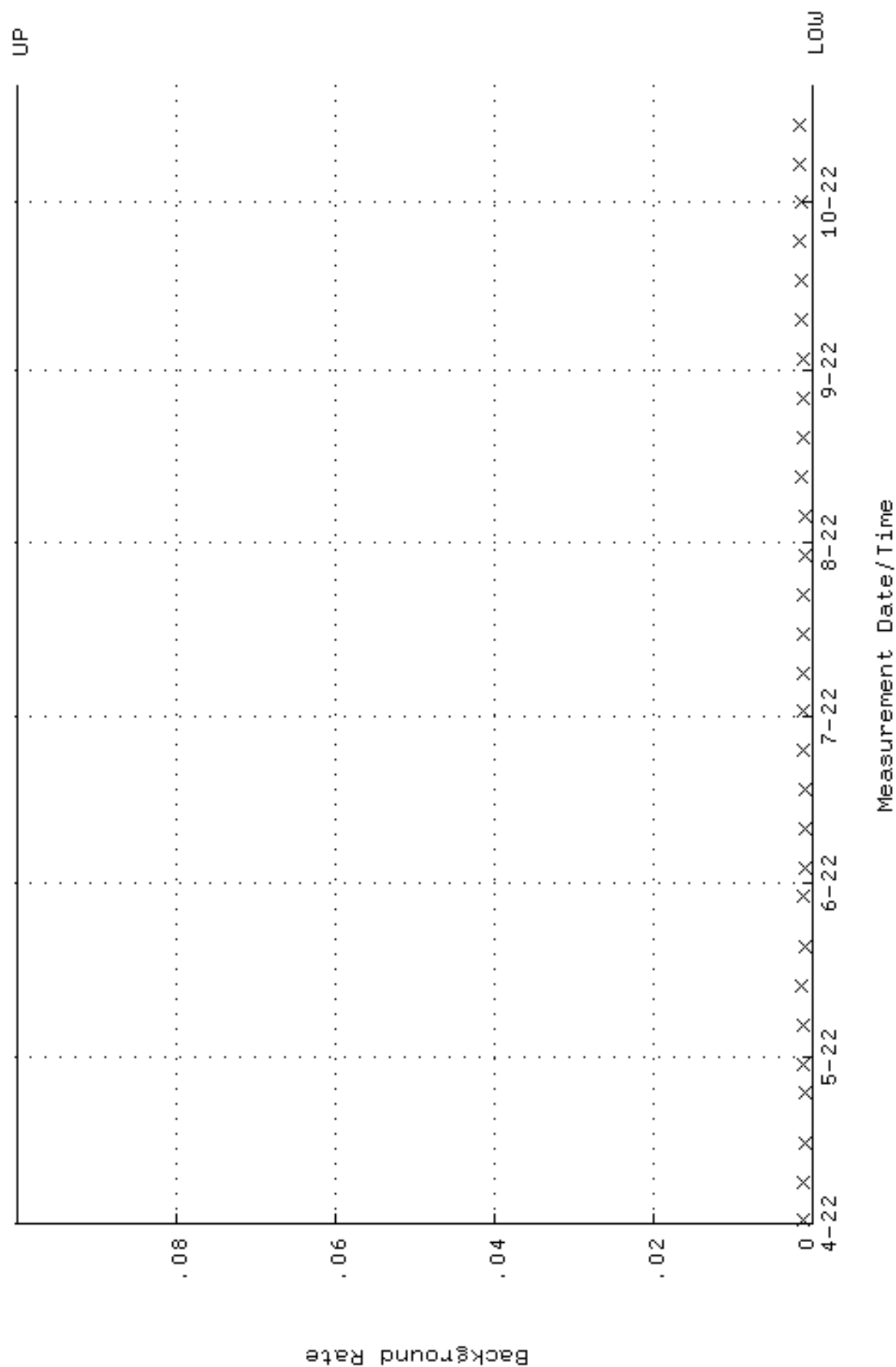
QA filename : DKA100:[ENV_ALPHA.QA.W]W222.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 10:46:55 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



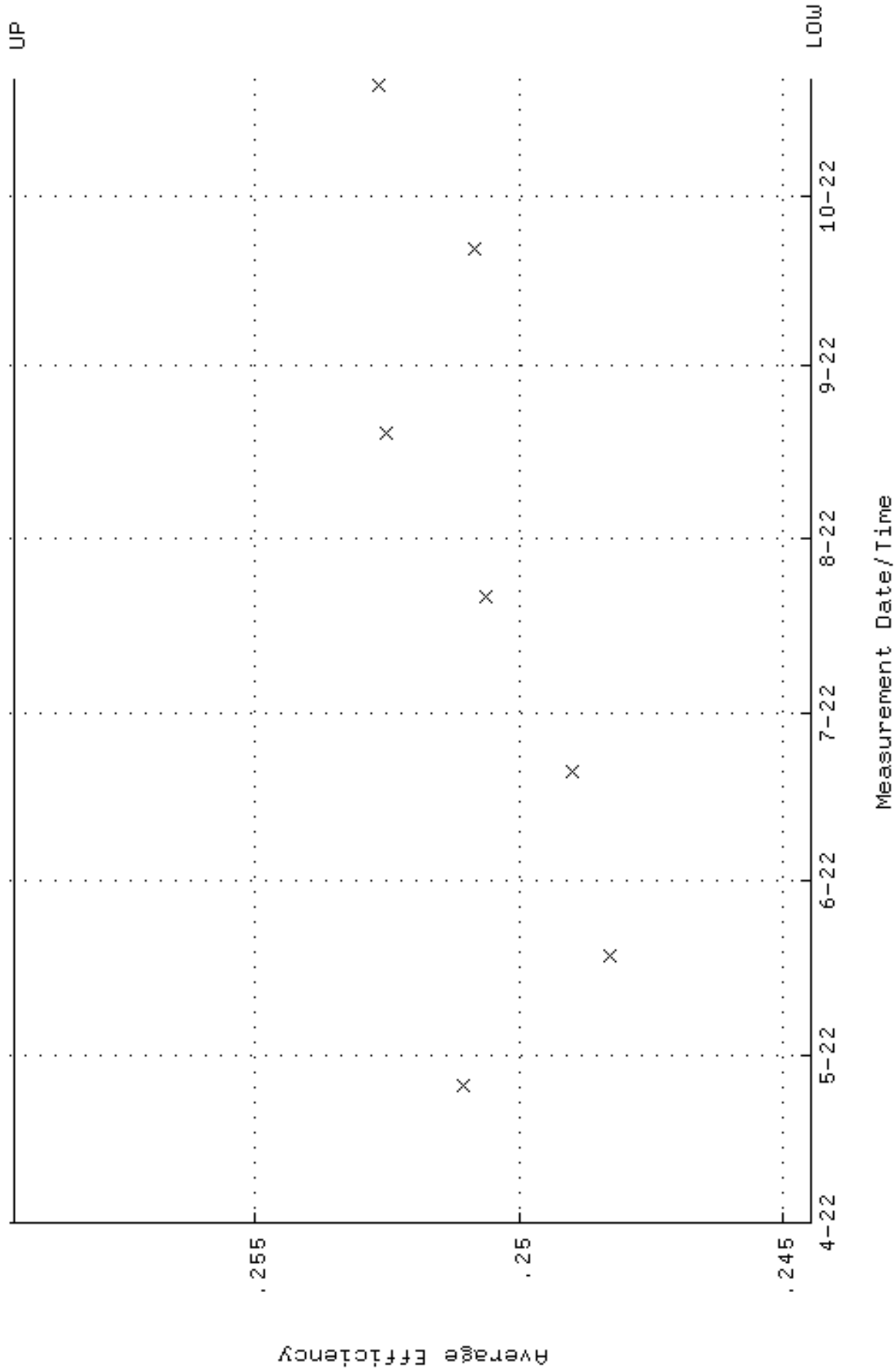
QA filename : DKA100:[ENV_ALPHA.QA.W]W222.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 10:46:55 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



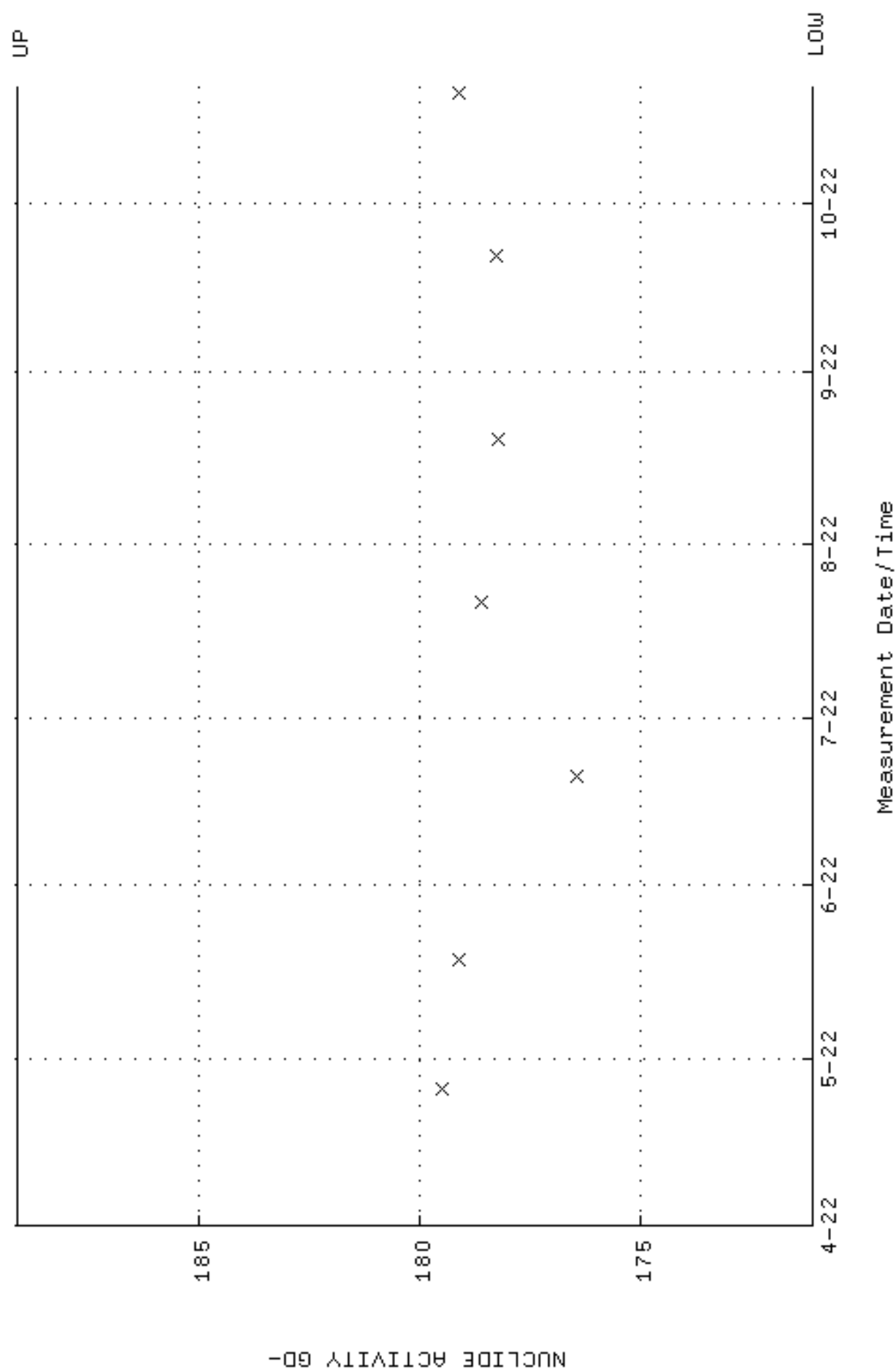
QA filename : DKA100:[ENV_ALPHA.QA.B]B222.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:12:15 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



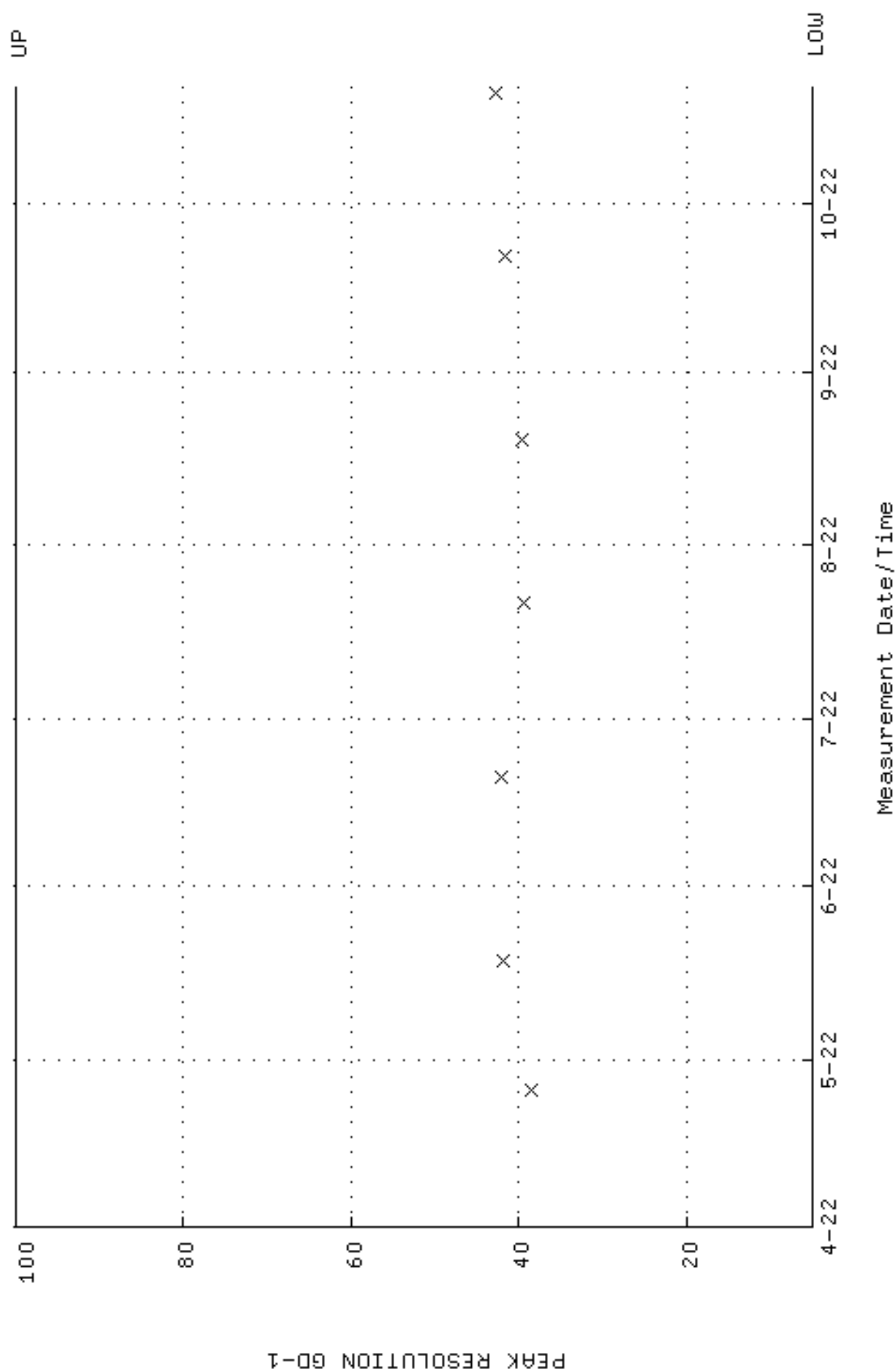
QA filename : DKA100:[ENV_ALPHA.QA.W]W223.QAF;3
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 25-APR-2022 10:46:59 through 21-OCT-2022 12:00:00
Lower/Upper Lmts: 0.244470 through 0.259590



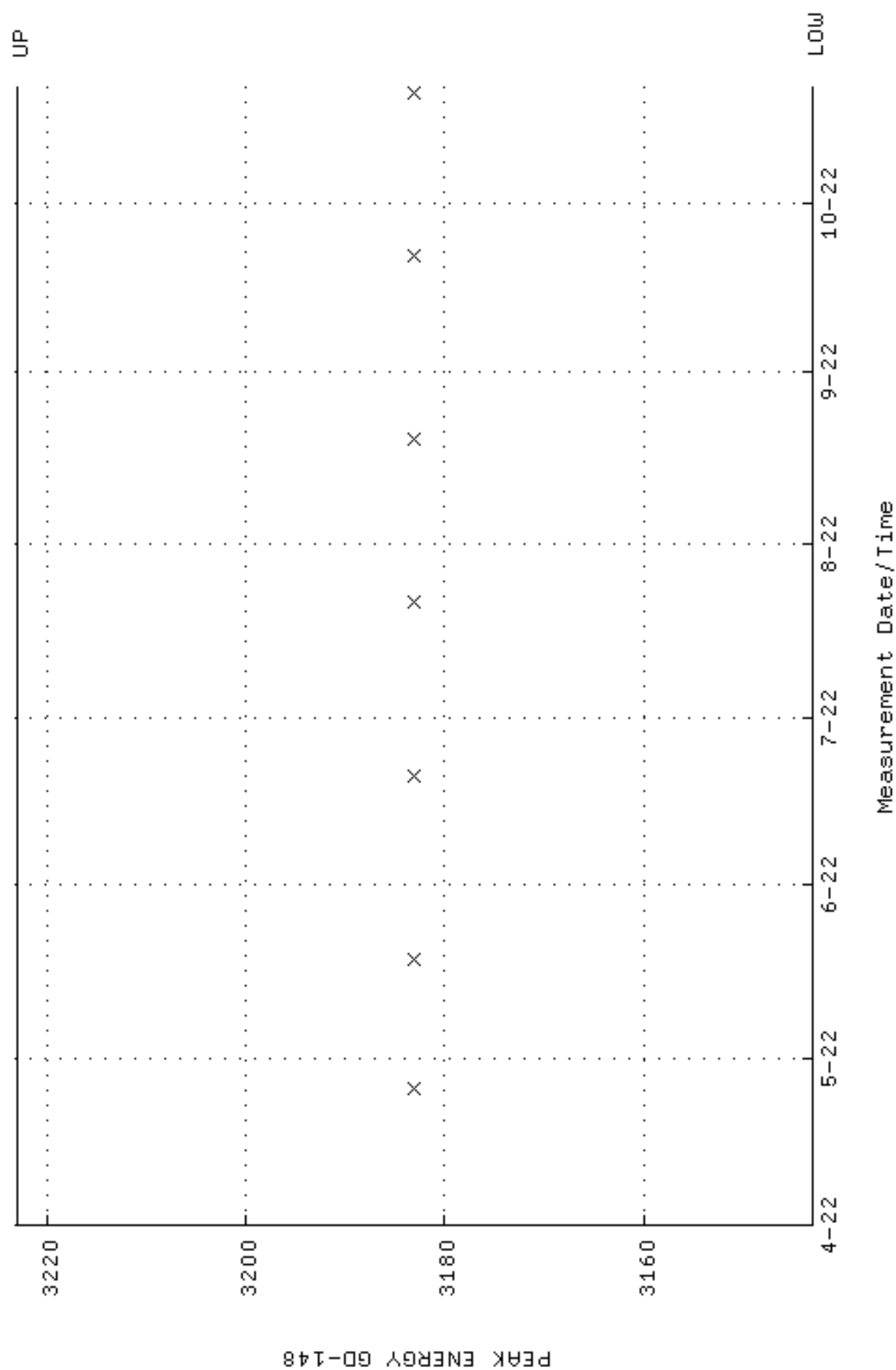
QA filename : DKA100:[ENV_ALPHA.QA.W]W223.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 10:46:59 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



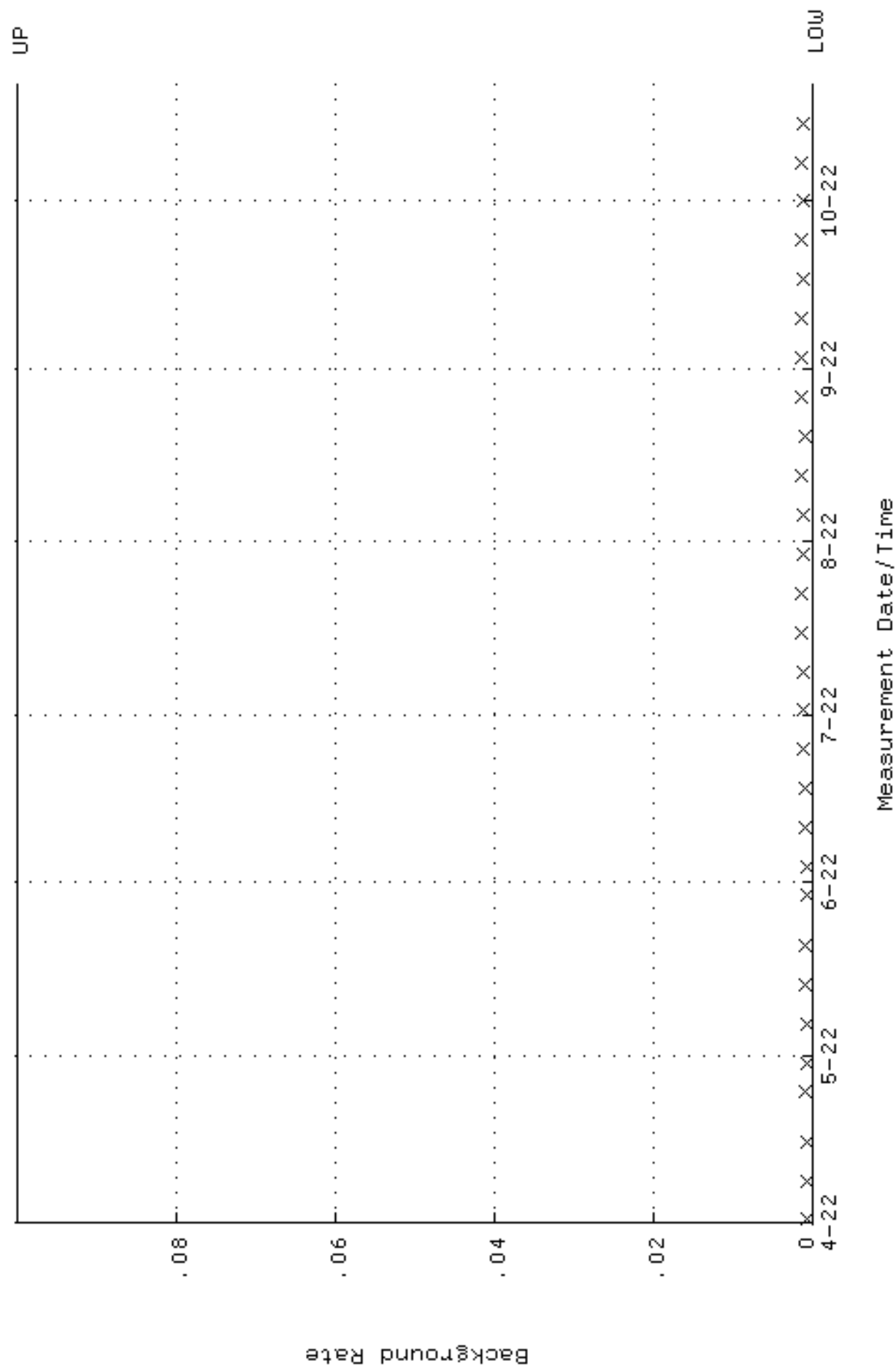
QA filename : DKA100:[ENV_ALPHA.QA.W]W223.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 10:46:59 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



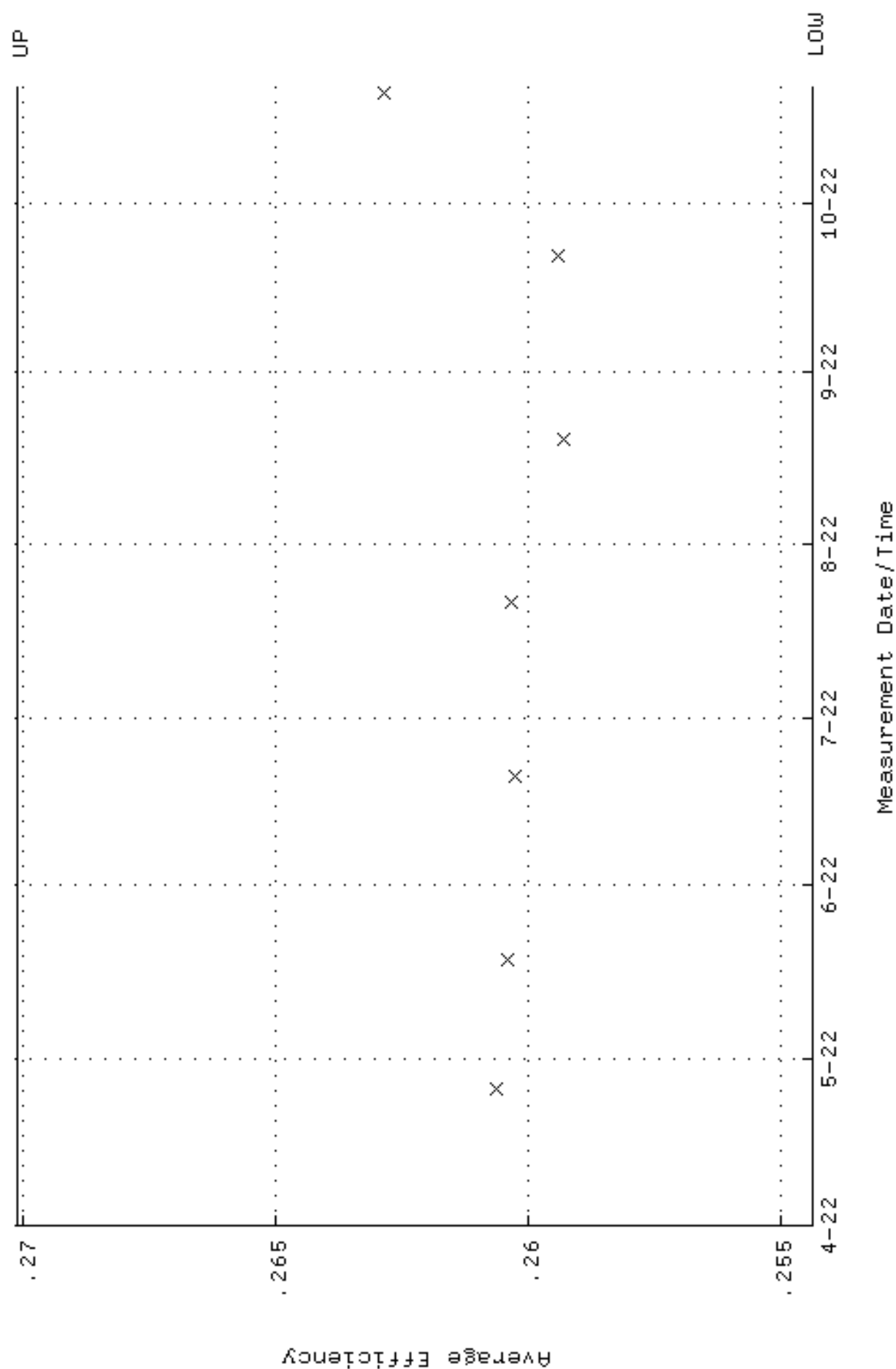
QA filename : DKA100:[ENV_ALPHA.QA.W]W223.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 10:46:59 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



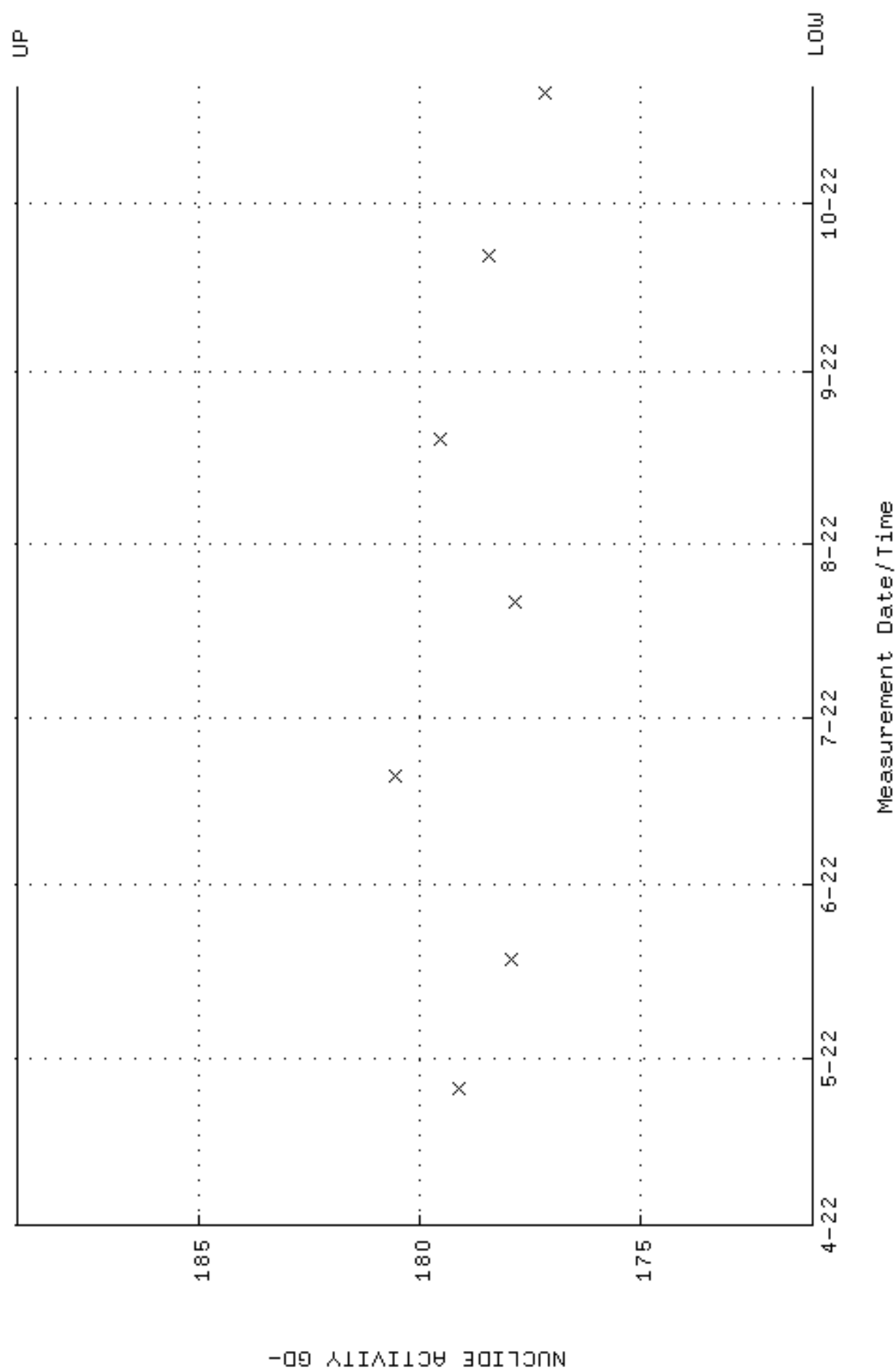
QA filename : DKA100:[ENV_ALPHA.QA.B]B223.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:12:19 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



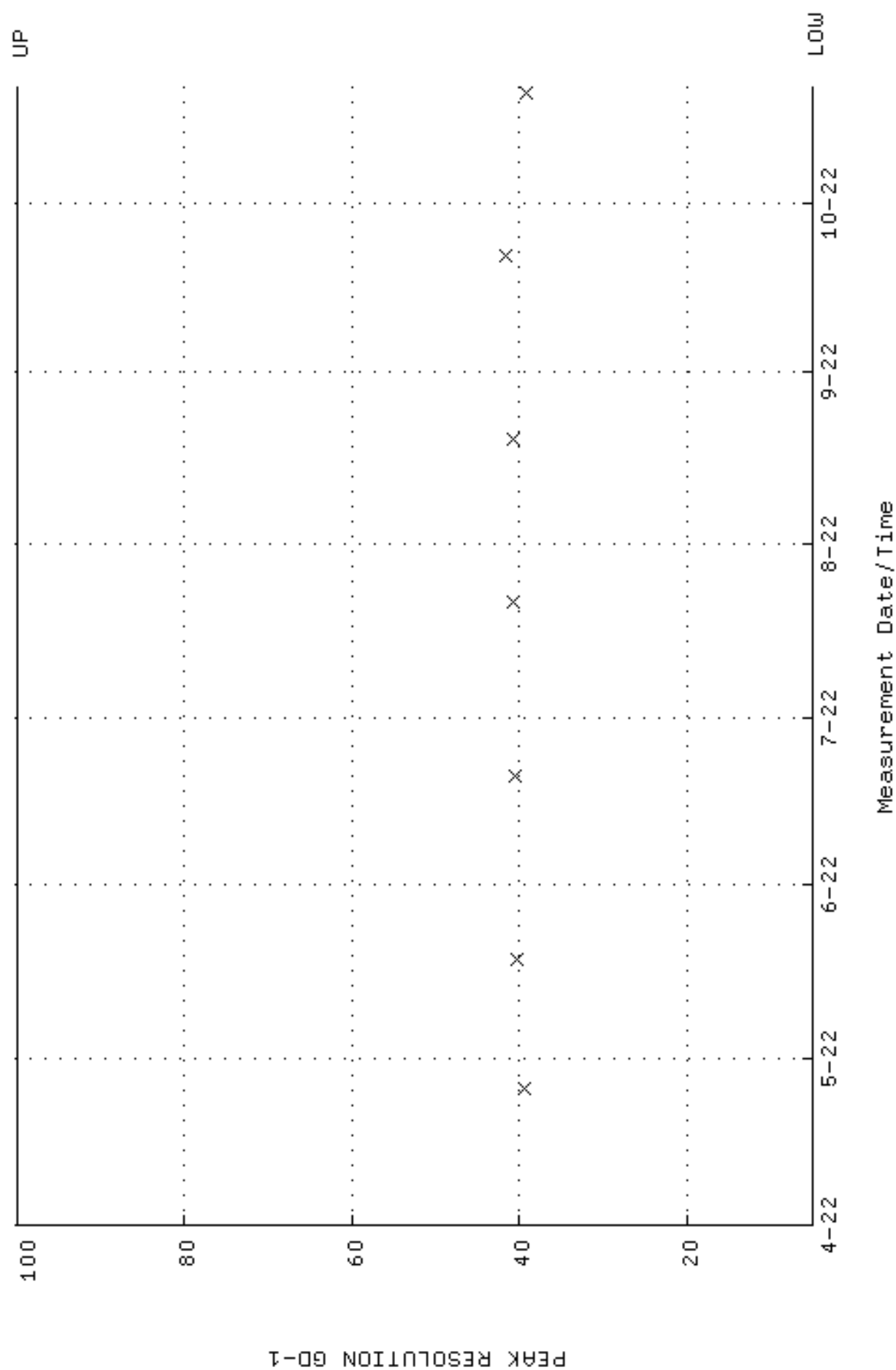
QA filename : DKA100:[ENV_ALPHA.QA.W]W225.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 25-APR-2022 10:47:06 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.254370 through 0.270110



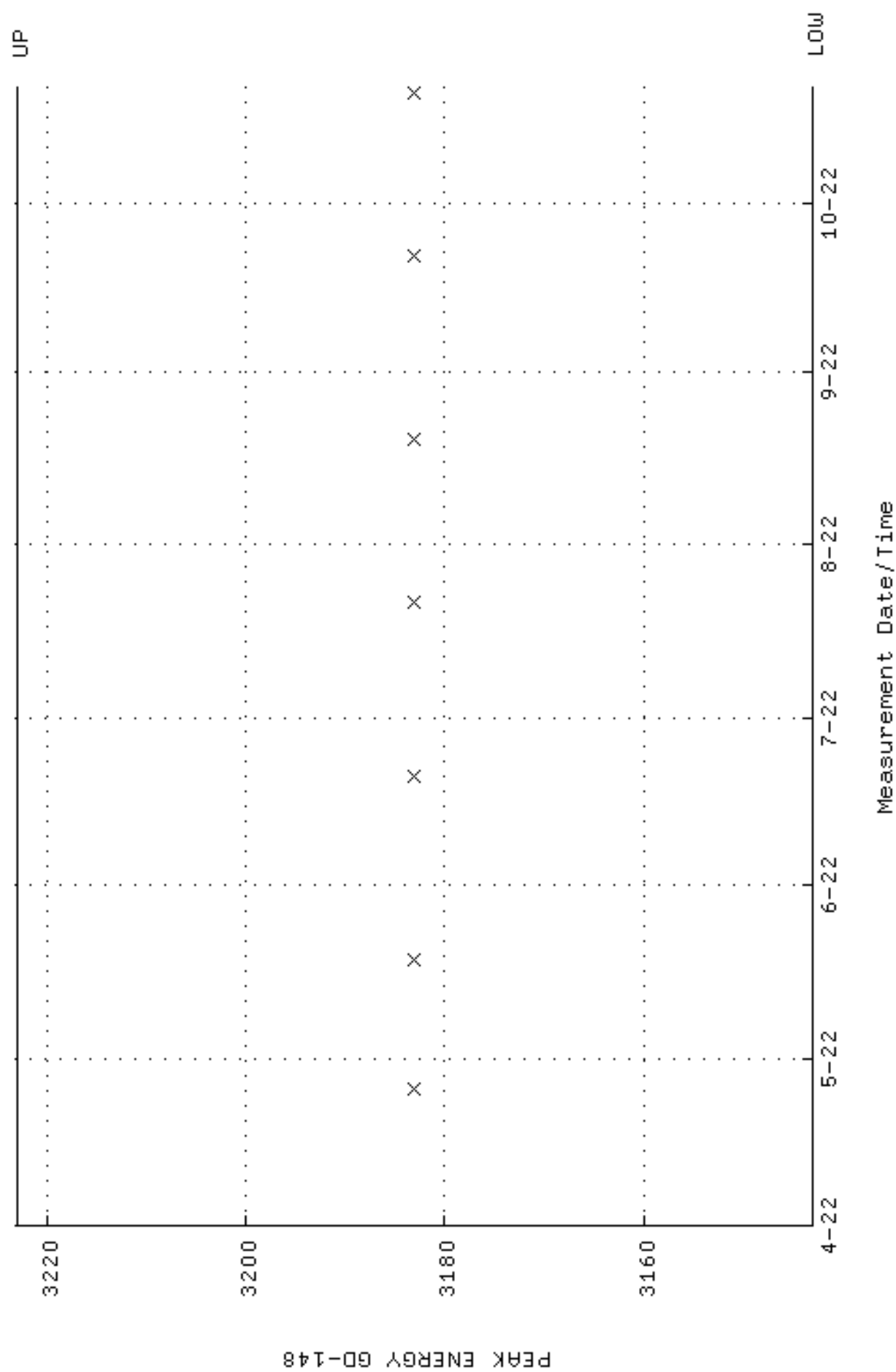
QA filename : DKA100:[ENV_ALPHA.QA.W]W225.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 10:47:06 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



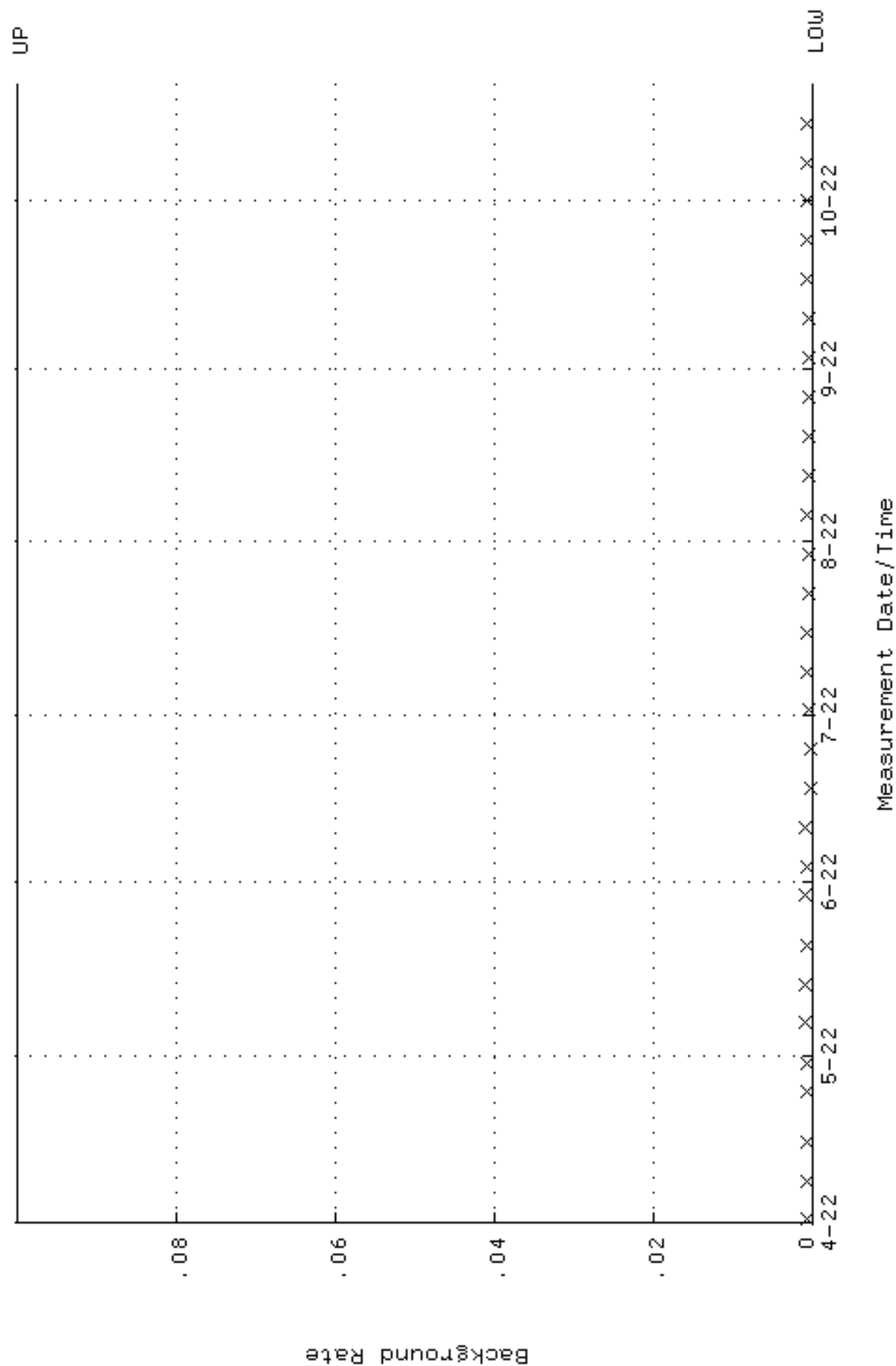
QA filename : DKA100:[ENV_ALPHA.QA.W]W225.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 10:47:06 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



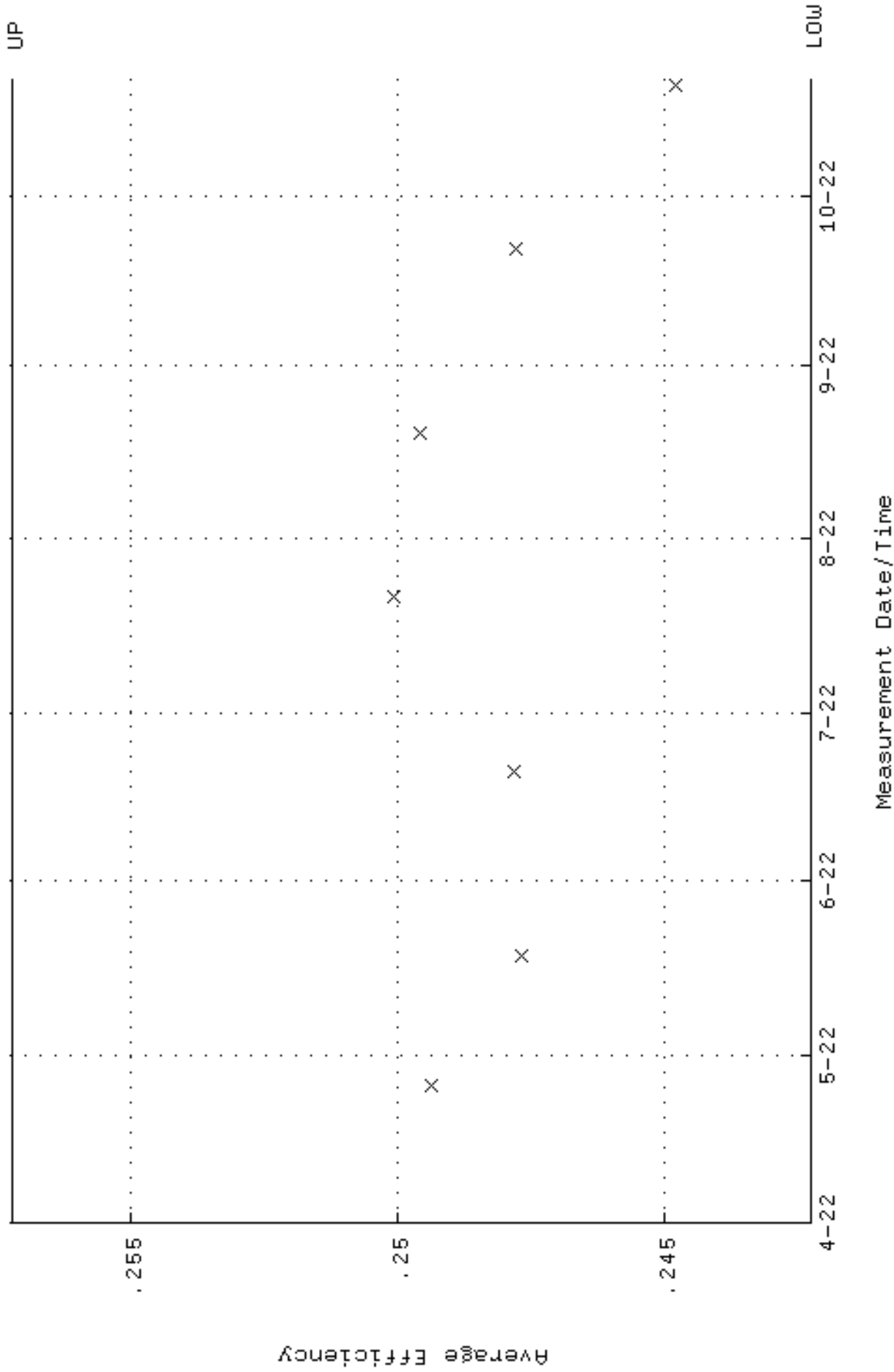
QA filename : DKA100:[ENV_ALPHA.QA.W]W225.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 10:47:06 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



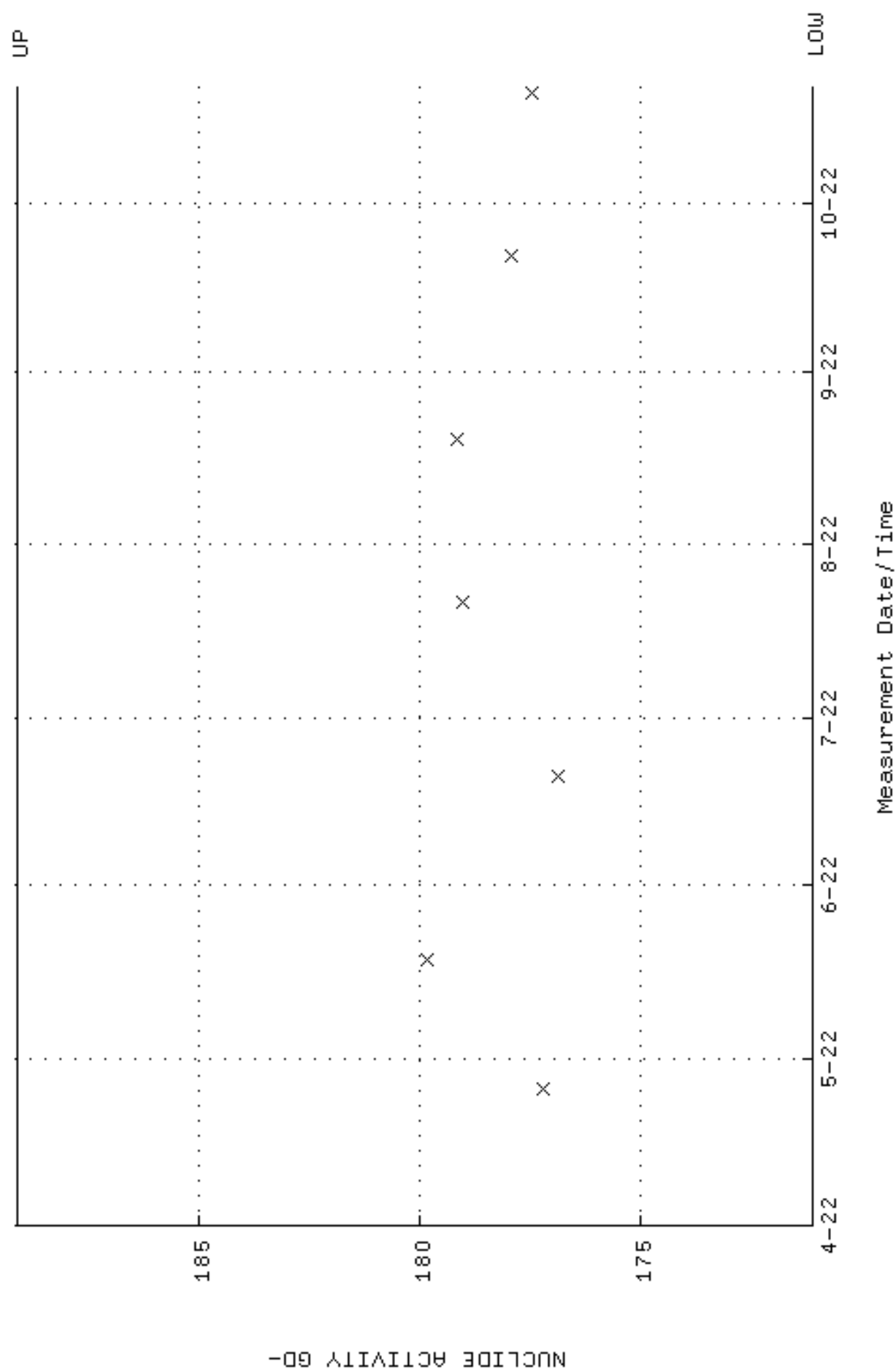
QA filename : DKA100:[ENV_ALPHA.QA.B]B225.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:12:26 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



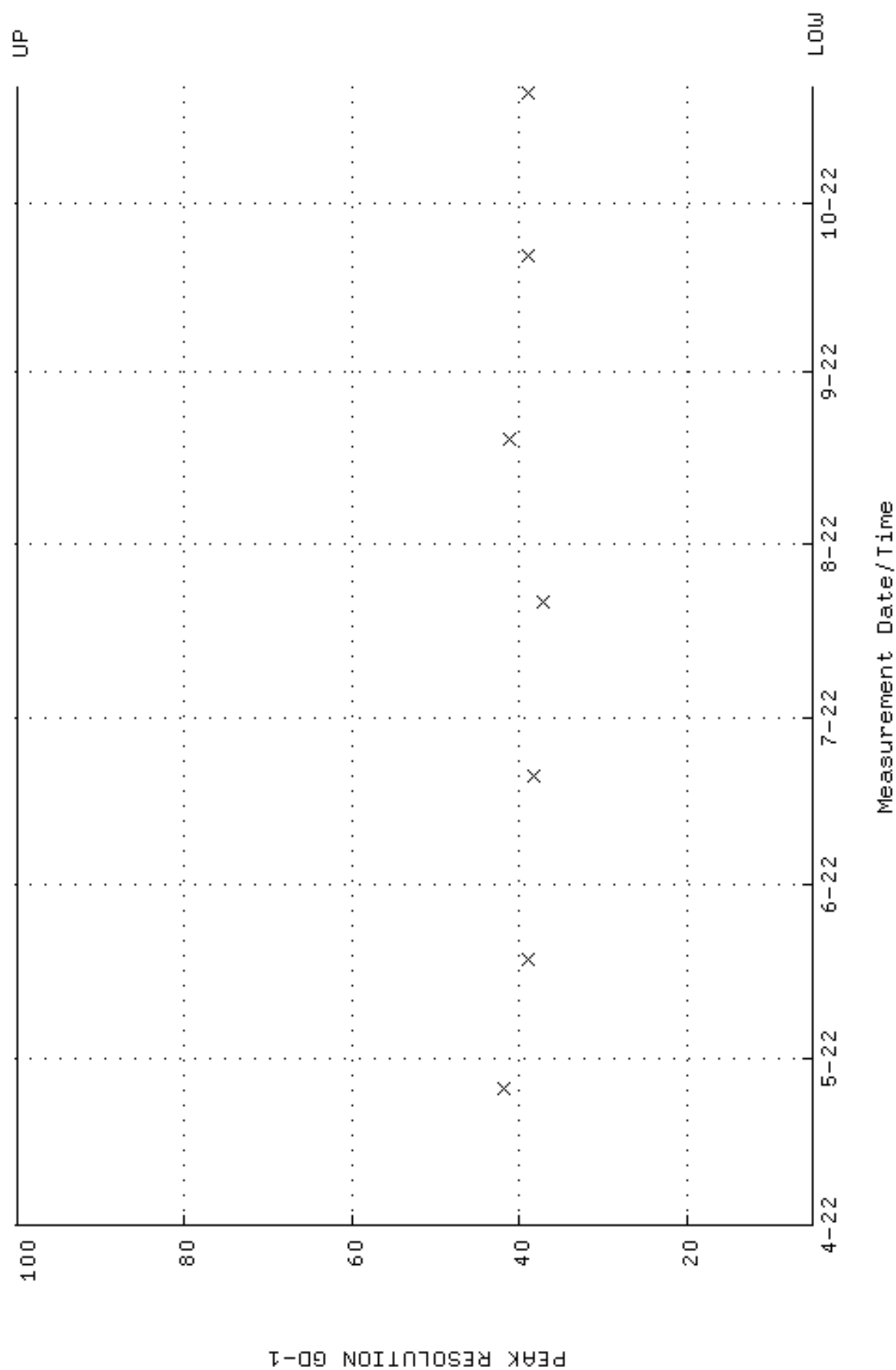
QA filename : DKA100:[ENV_ALPHA.QA.W]W226.QAF;3
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 25-APR-2022 11:30:05 through 21-OCT-2022 12:00:00
Lower/Upper Lmts: 0.242240 through 0.257220



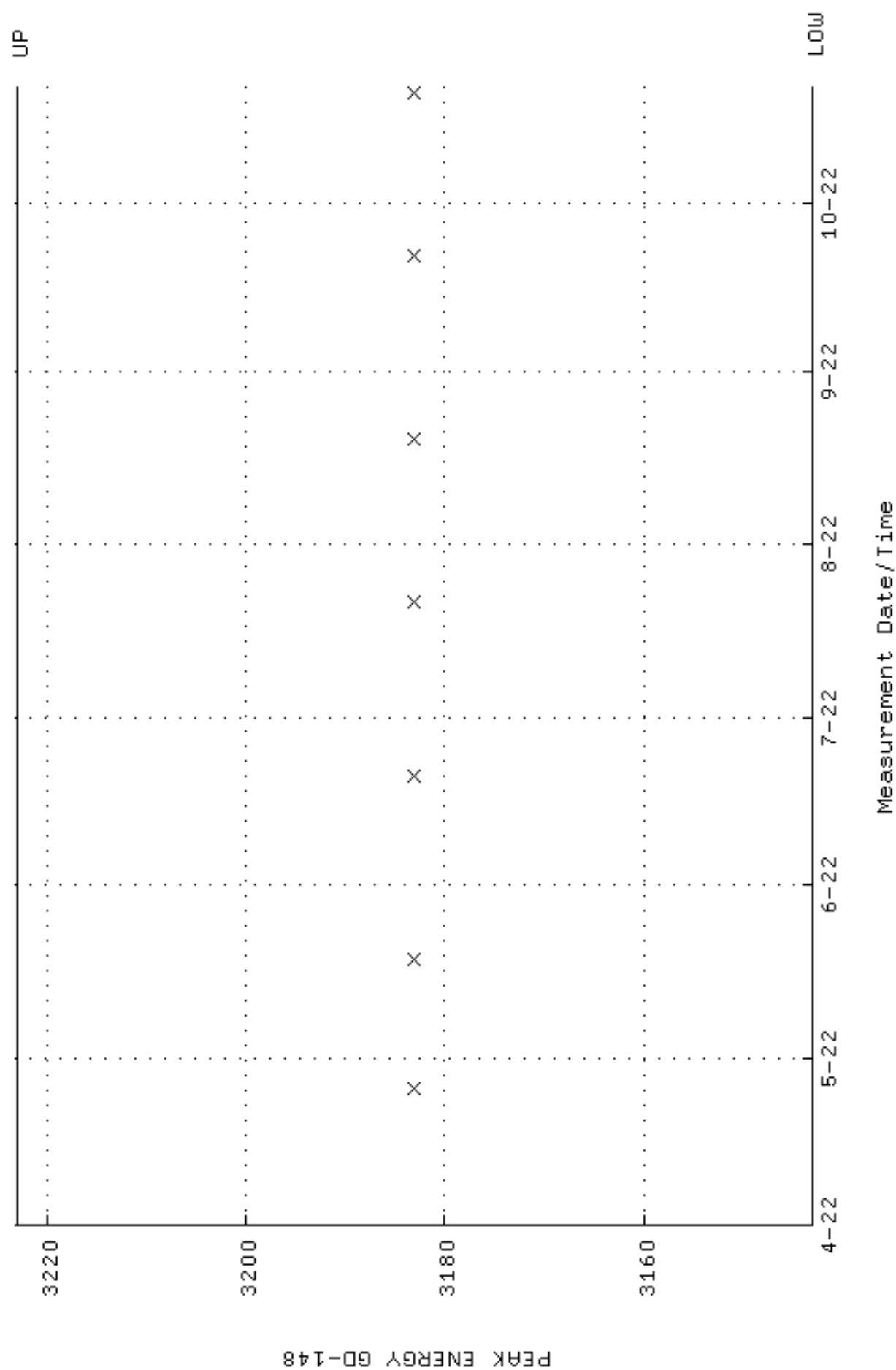
QA filename : DKA100:[ENV_ALPHA.QA.W]W226.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 11:30:05 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



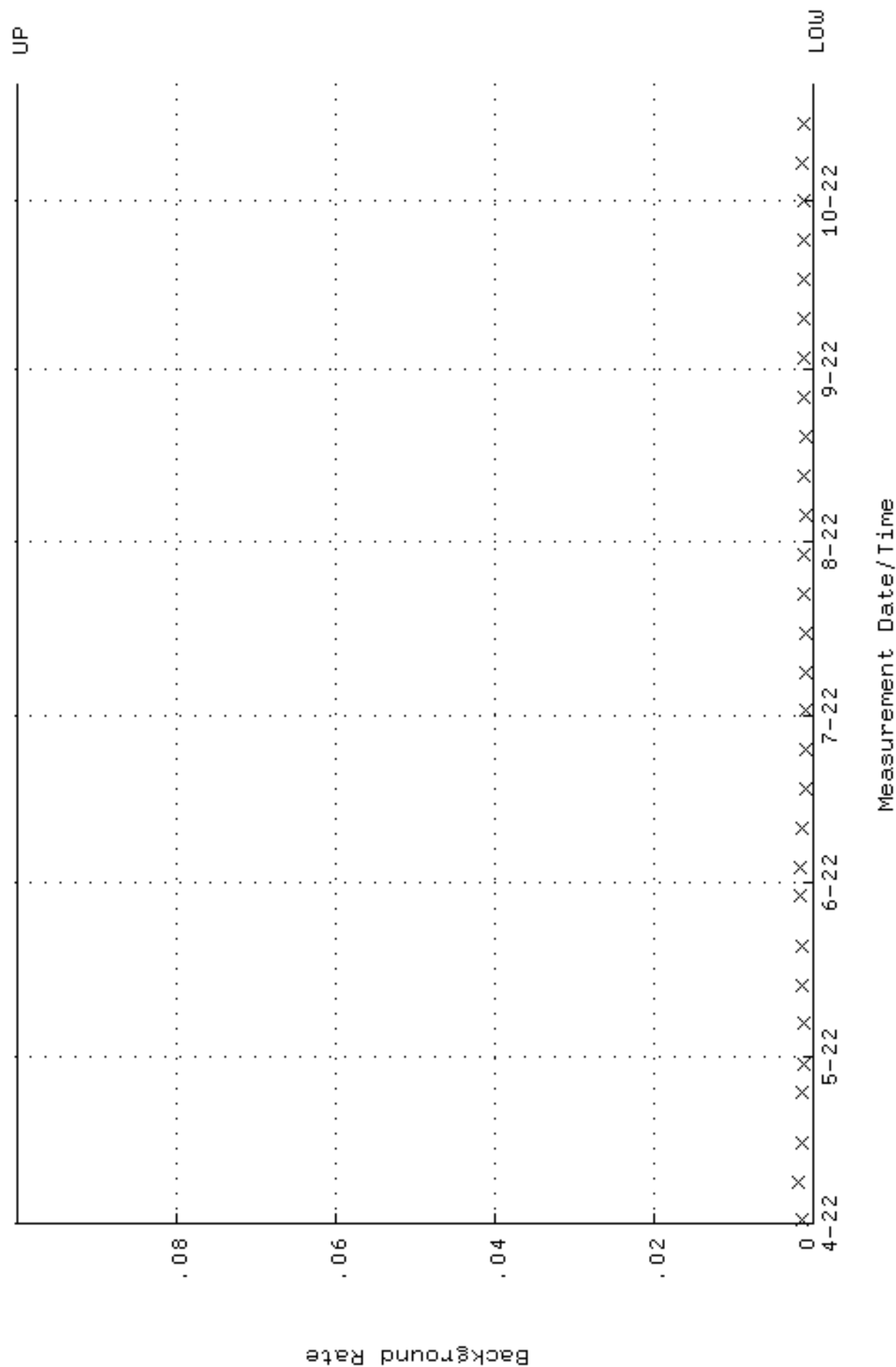
QA filename : DKA100:[ENV_ALPHA.QA.W]W226.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 11:30:05 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



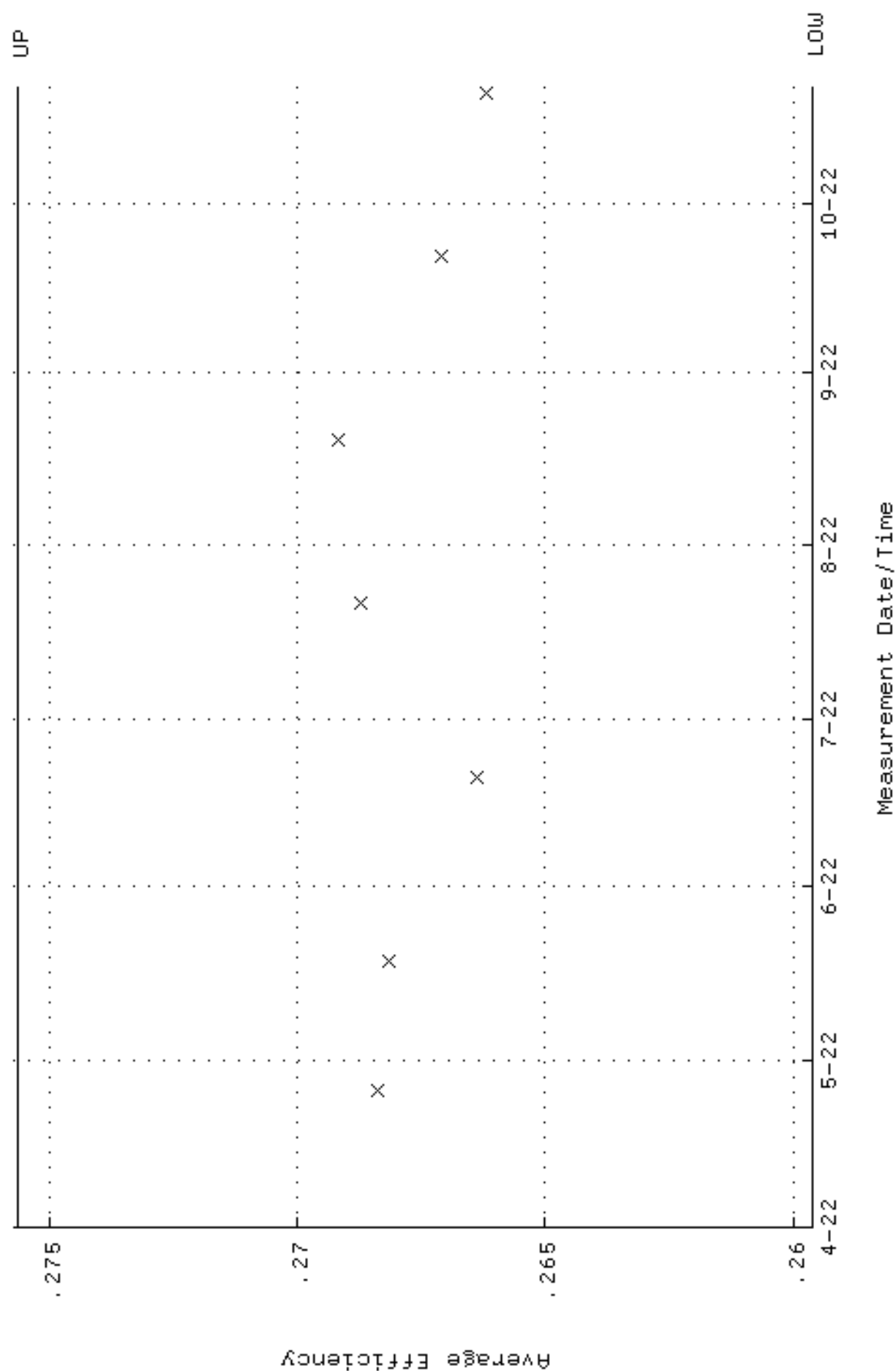
QA filename : DKA100:[ENV_ALPHA.QA.W]W226.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 11:30:05 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



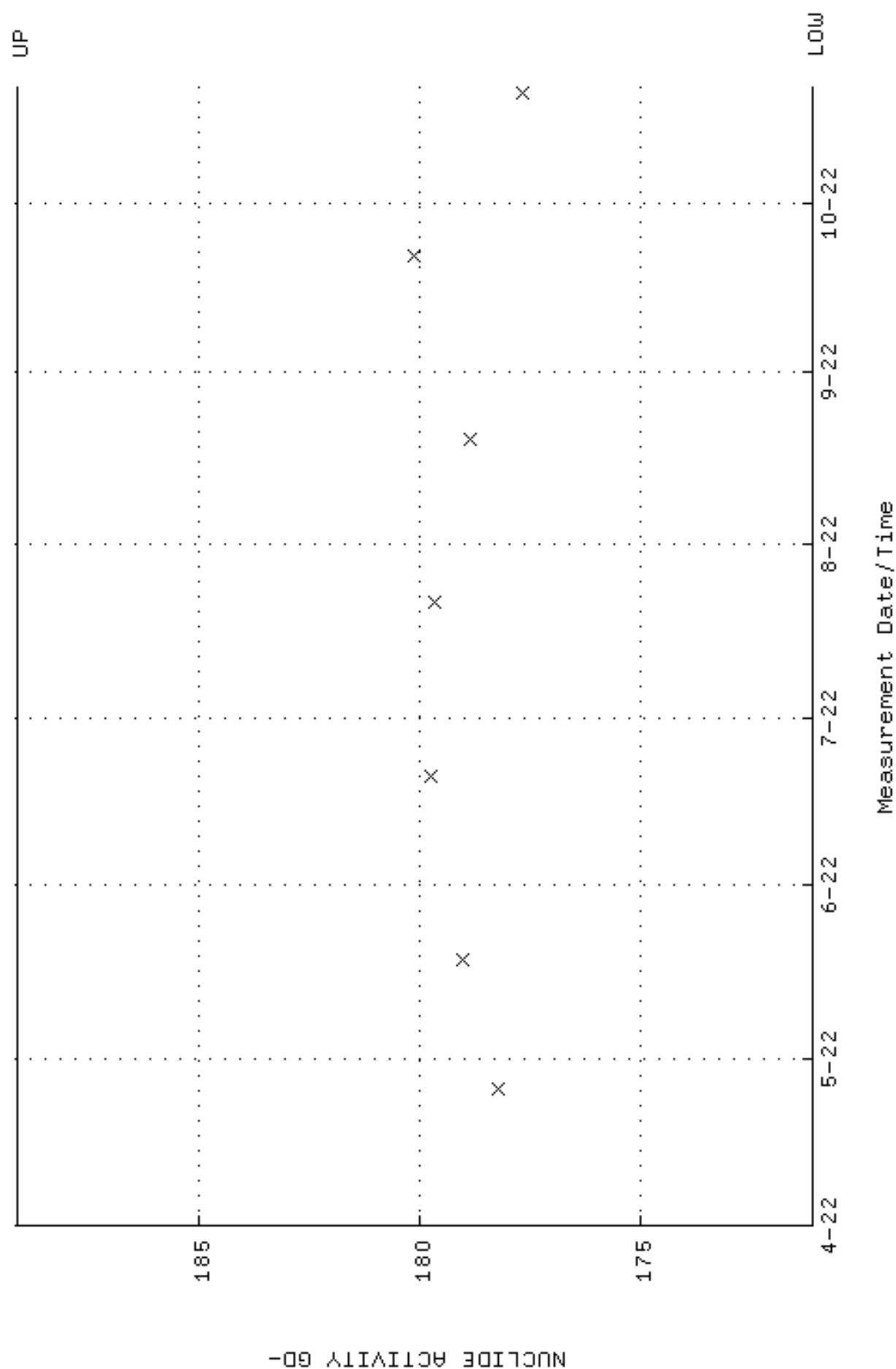
QA filename : DKA100:[ENV_ALPHA.QA.B]B226.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:12:29 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



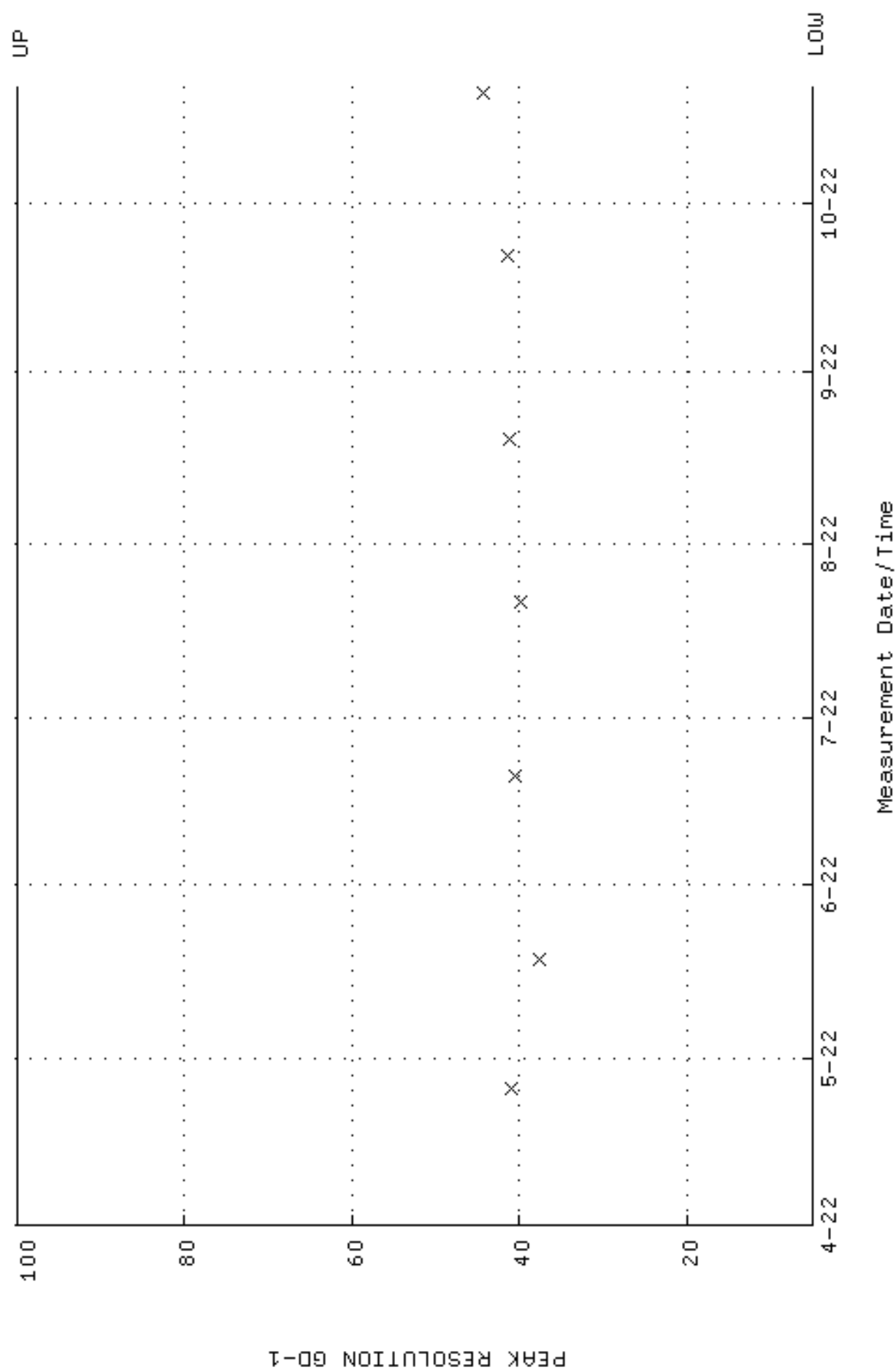
QA filename : DKA100:[ENV_ALPHA.QA.W]W229.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 25-APR-2022 10:47:15 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.259610 through 0.275670



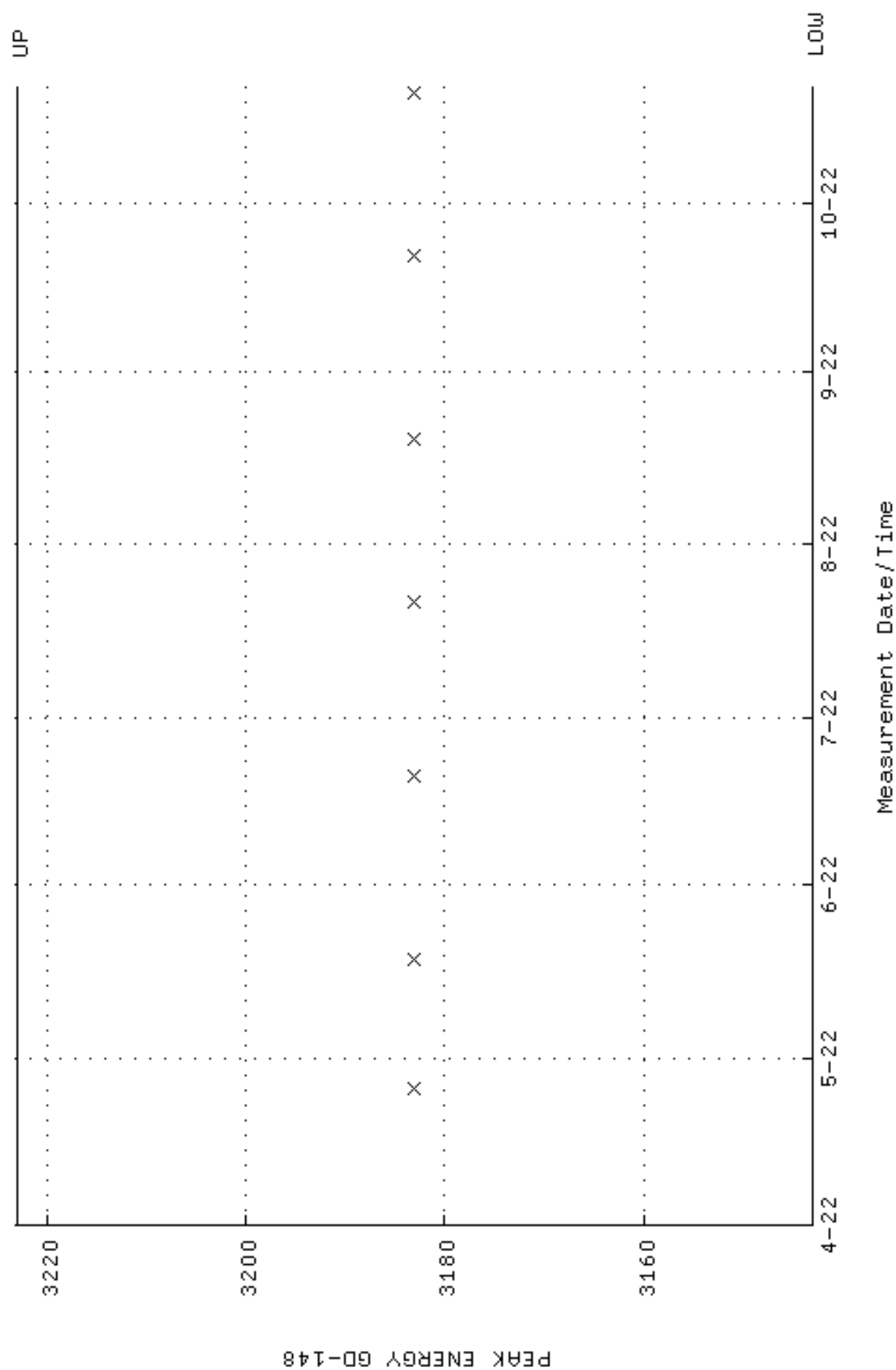
QA filename : DKA100:[ENV_ALPHA.QA.W]W229.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 10:47:15 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



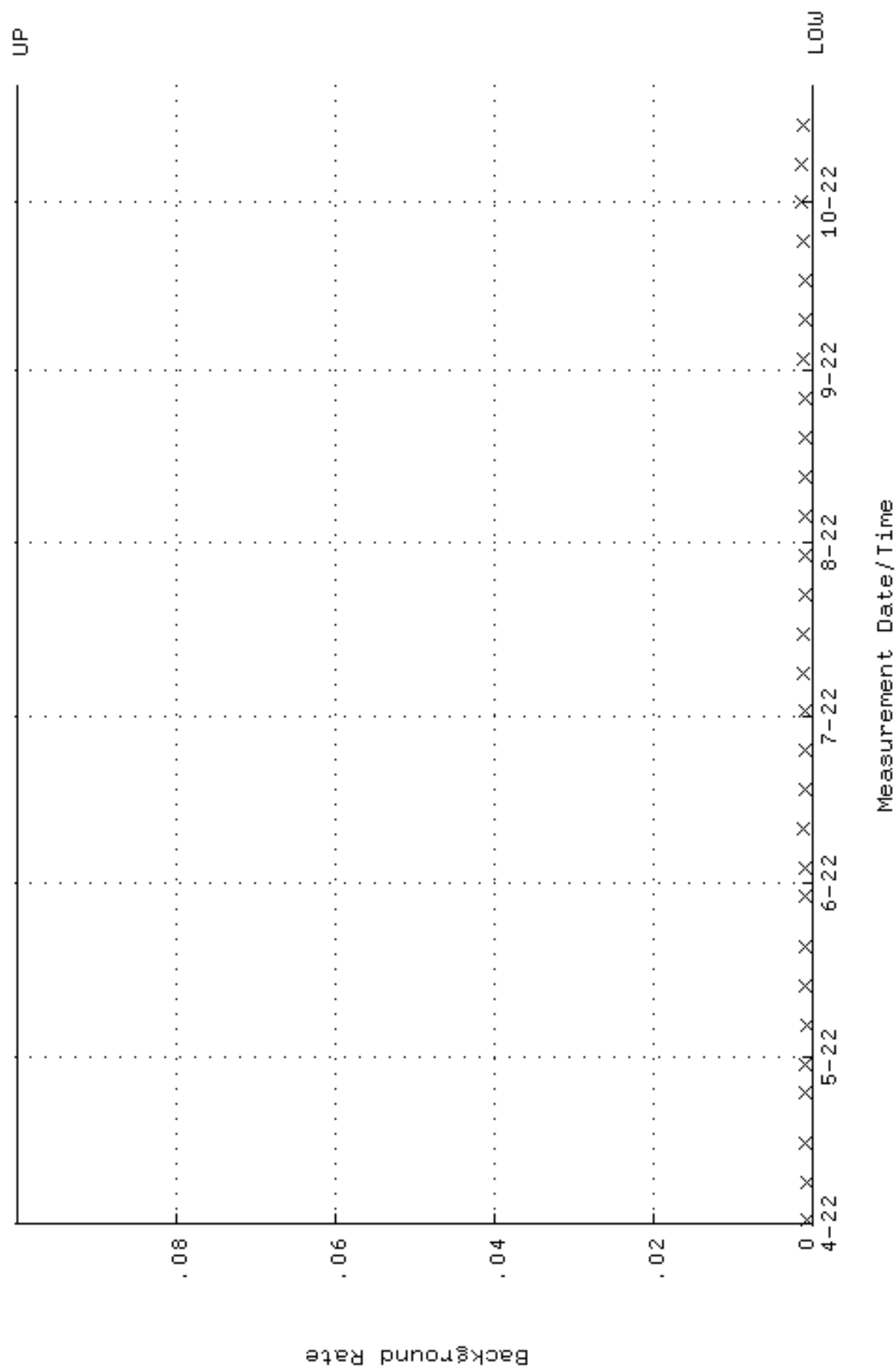
QA filename : DKA100:[ENV_ALPHA.QA.W]W229.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 10:47:15 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



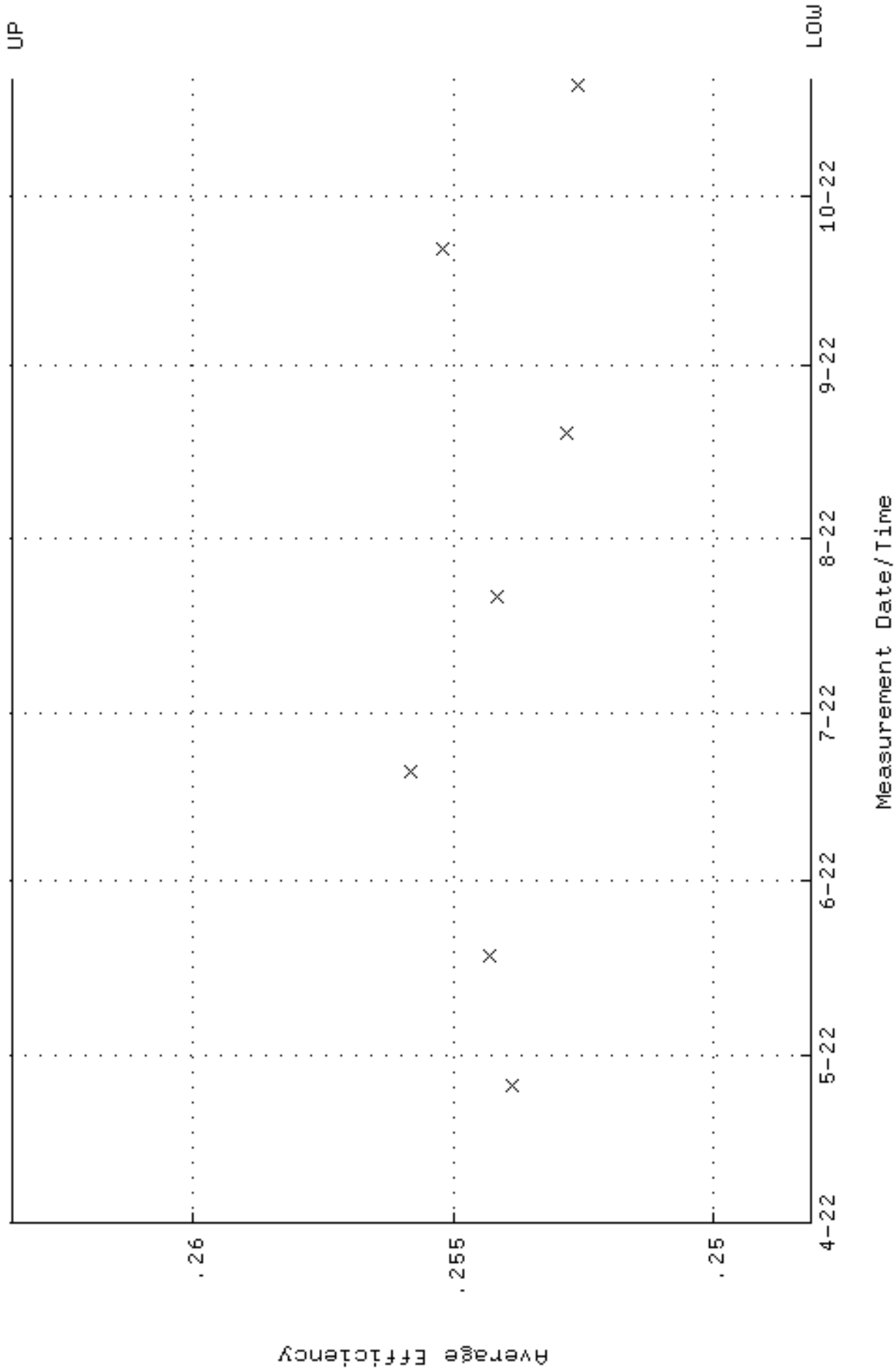
QA filename : DKA100:[ENV_ALPHA.QA.W]W229.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 10:47:15 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



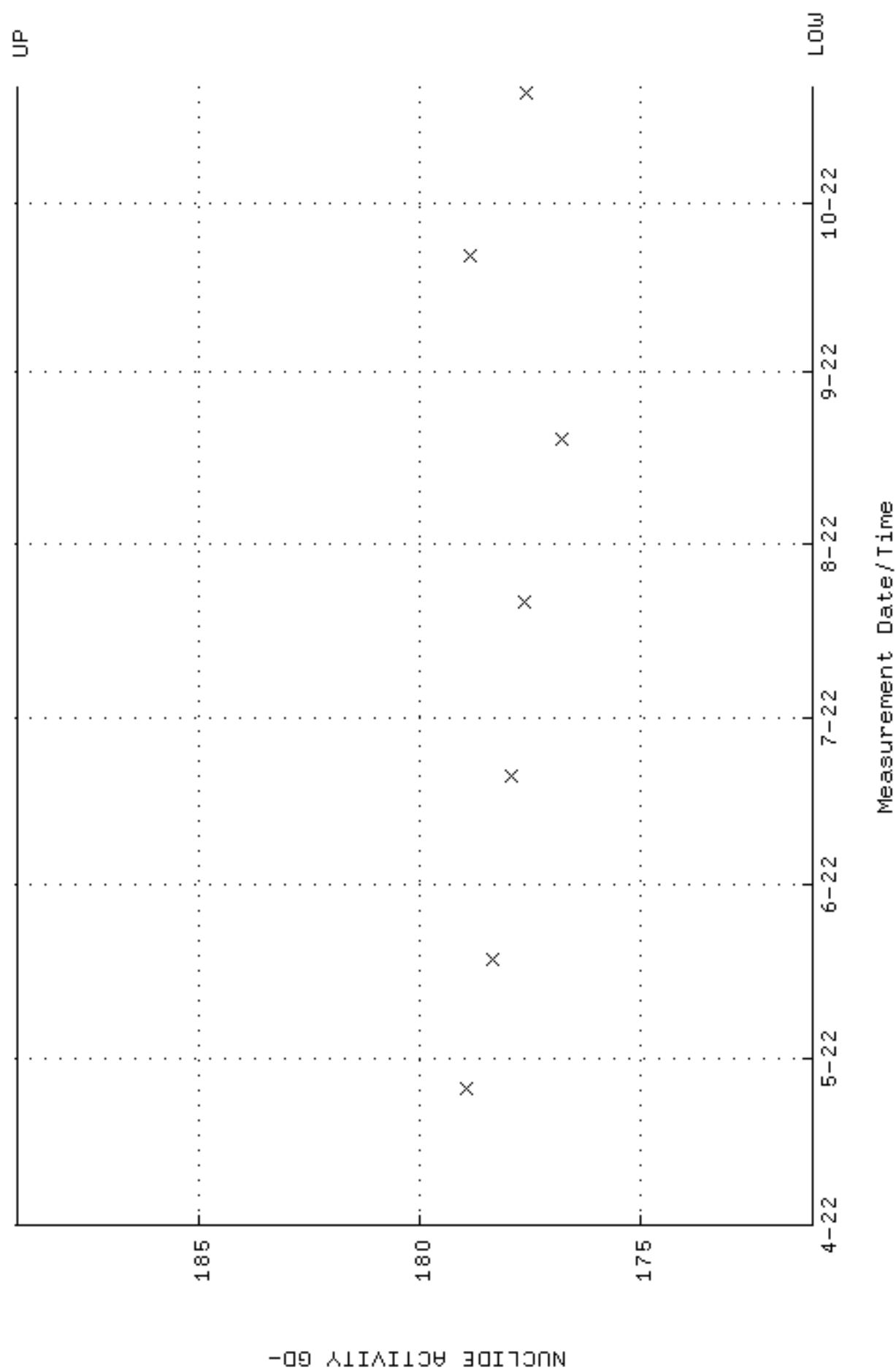
QQA filename : DKA100:[ENV_ALPHA.QA.BJB229.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-APR-2022 13:12:33 through 21-OCT-
Lower/Upper Lmts: 0.000000E+00 through 0.100000



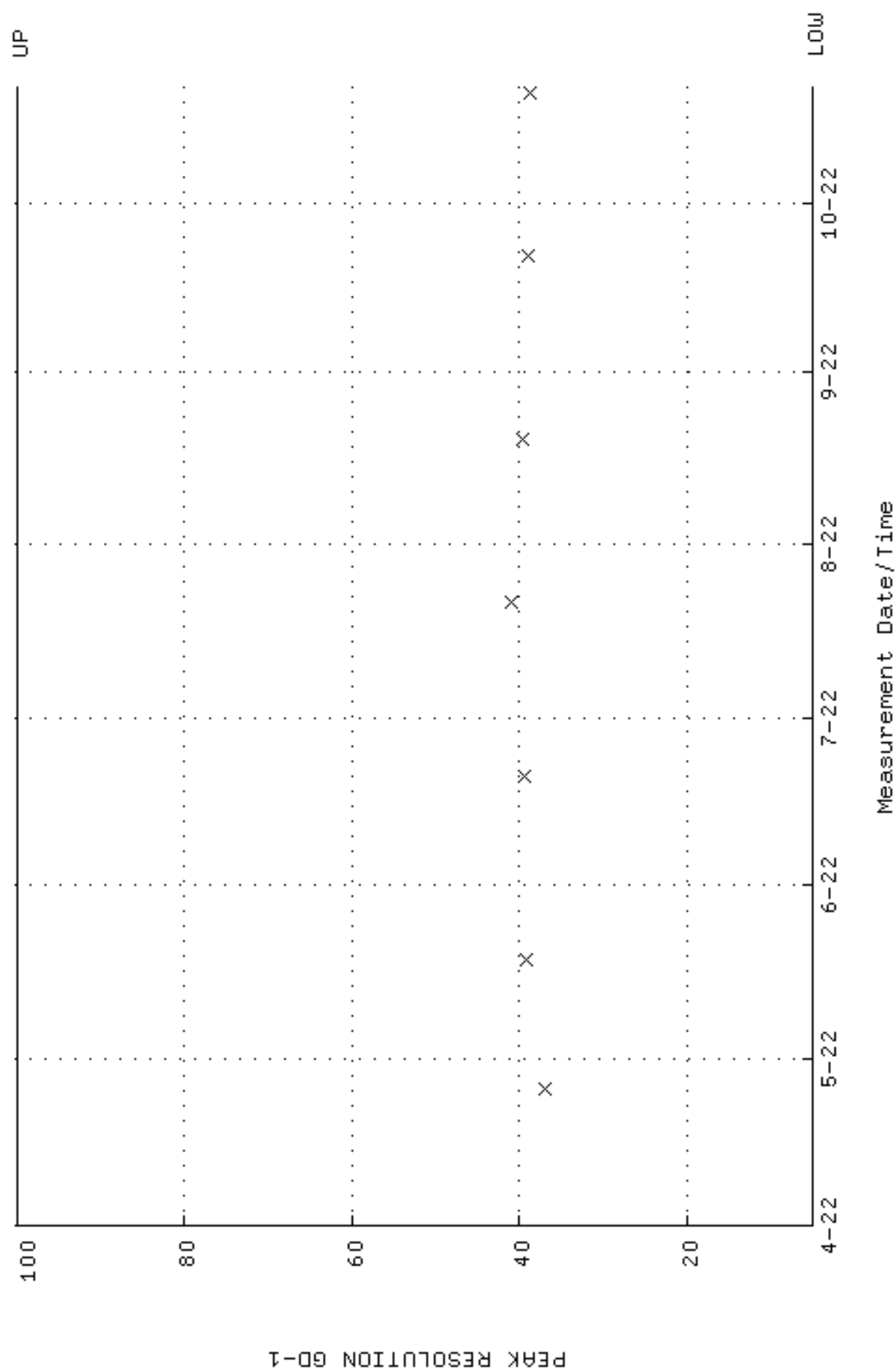
QA filename : DKA100:[ENV_ALPHA.QA.W]W230.QAF;3
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 25-APR-2022 10:47:19 through 21-OCT-2022 12:00:00
Lower/Upper Lmts: 0.248130 through 0.263470



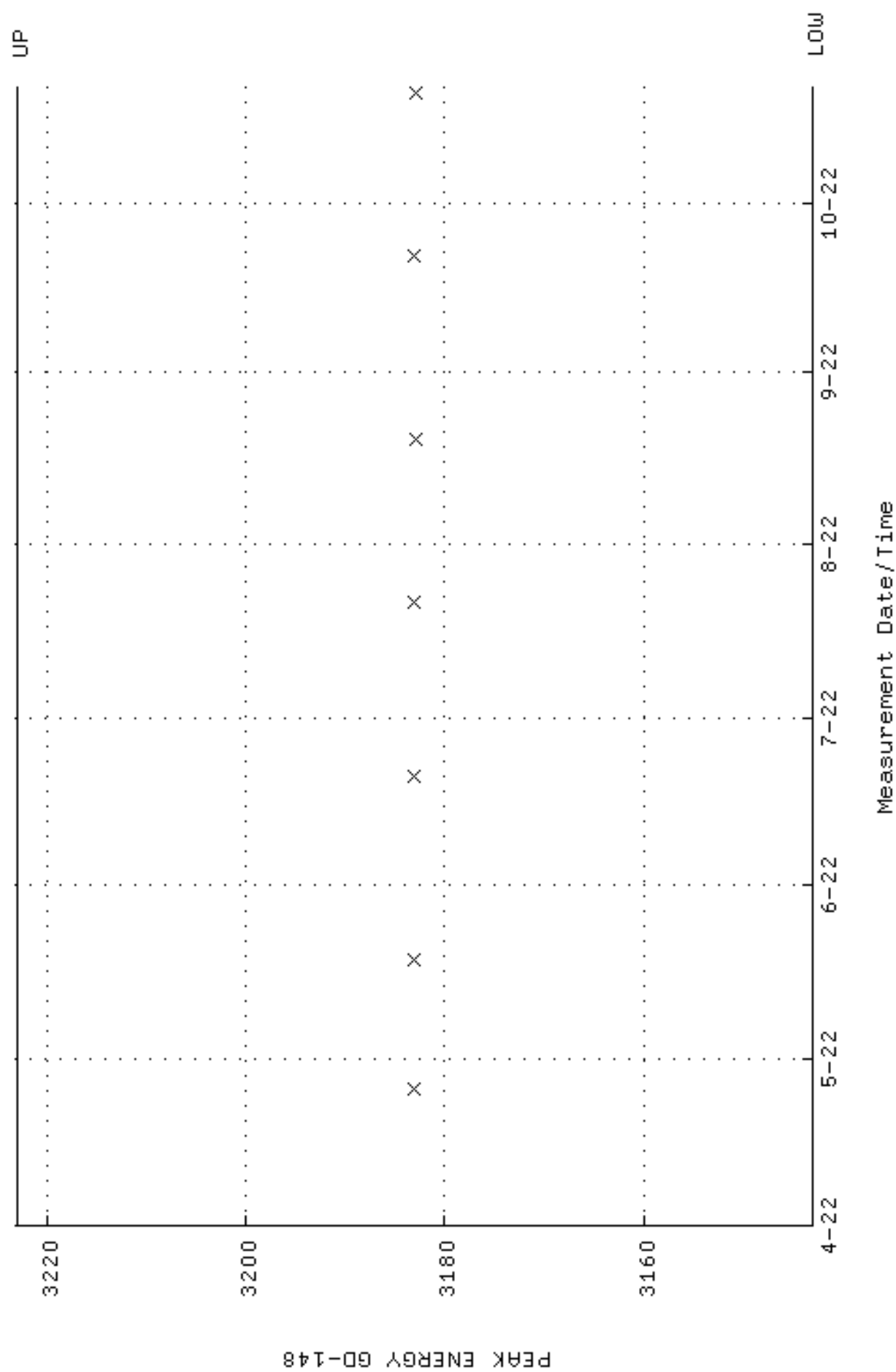
QA filename : DKA100:[ENV_ALPHA.QA.W]W230.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 25-APR-2022 10:47:19 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



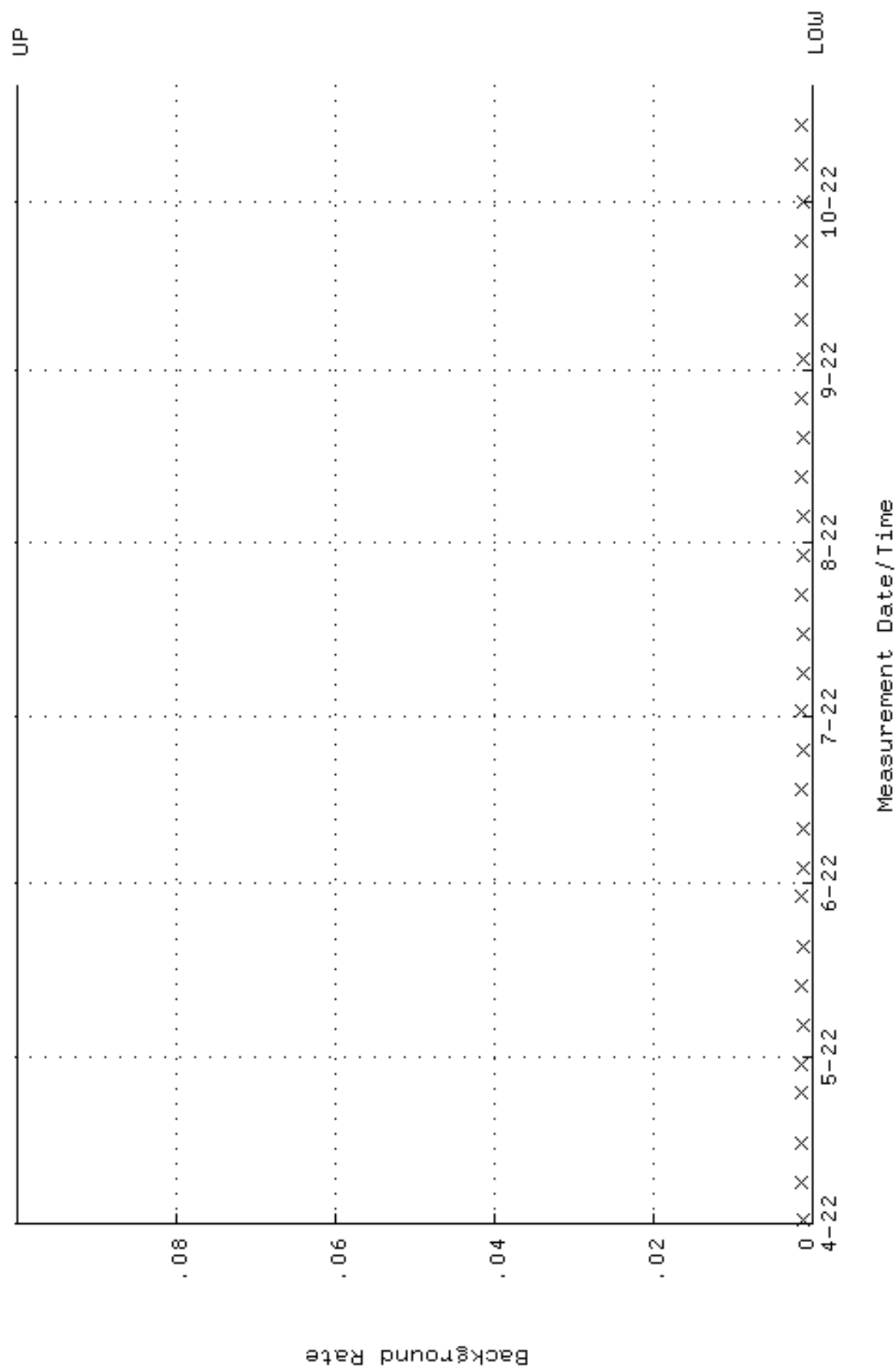
QA filename : DKA100:[ENV_ALPHA.QA.W]W230.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 25-APR-2022 10:47:19 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



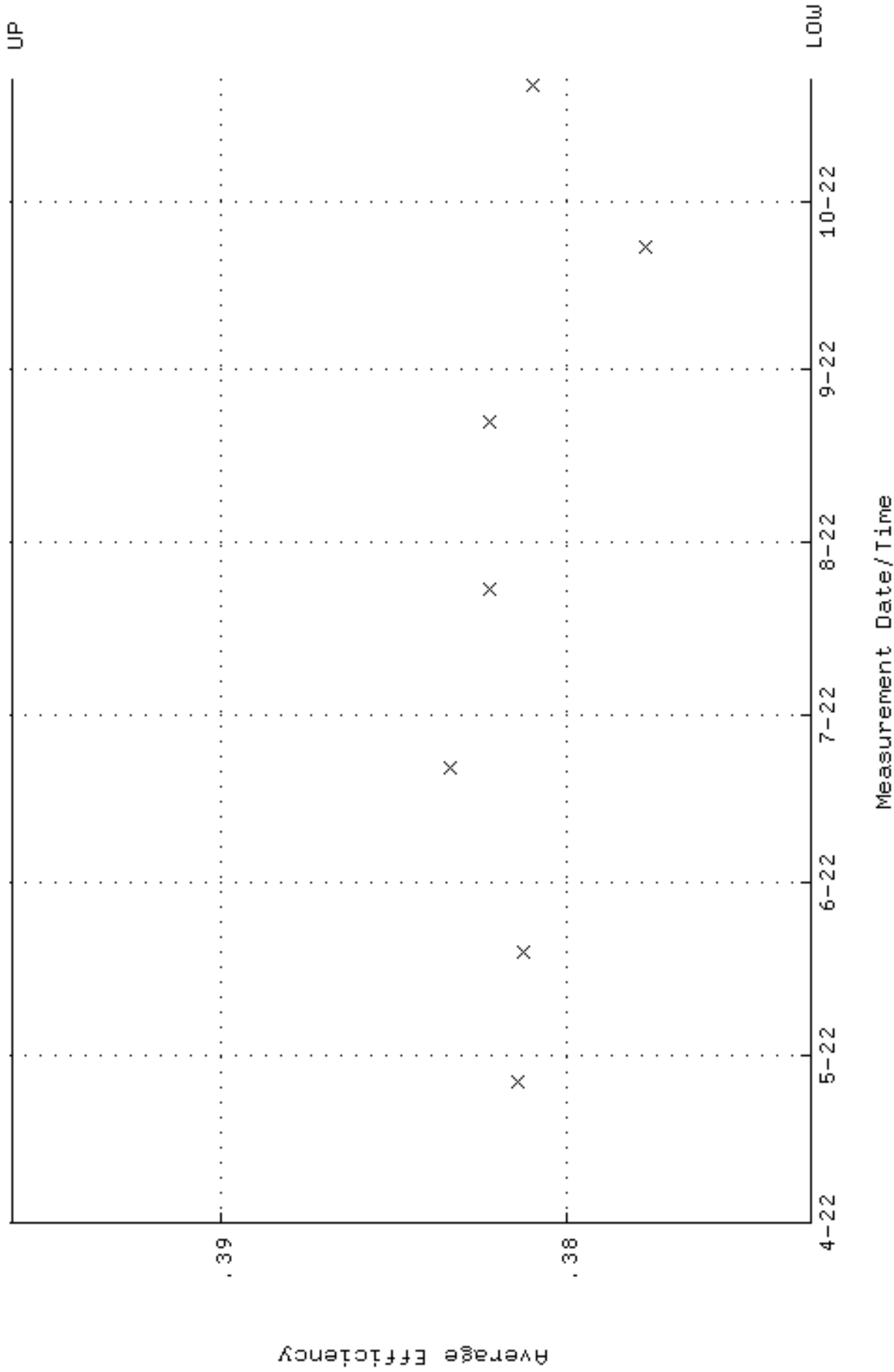
QA filename : DKA100:[ENV_ALPHA.QA.W]W230.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 25-APR-2022 10:47:19 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



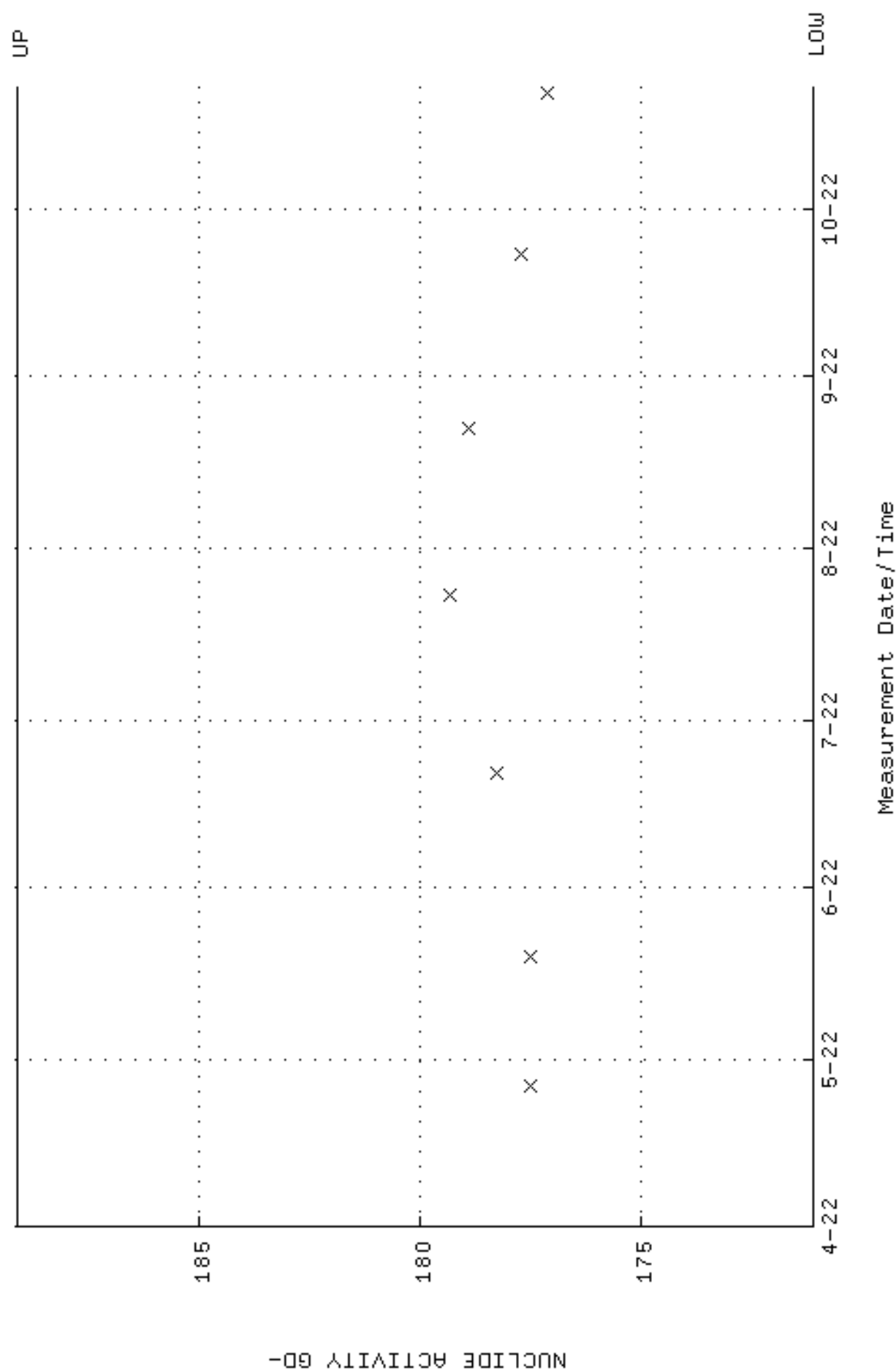
QA filename : DKA100:[ENV_ALPHA.QA.B]B230.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:12:37 through 21-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



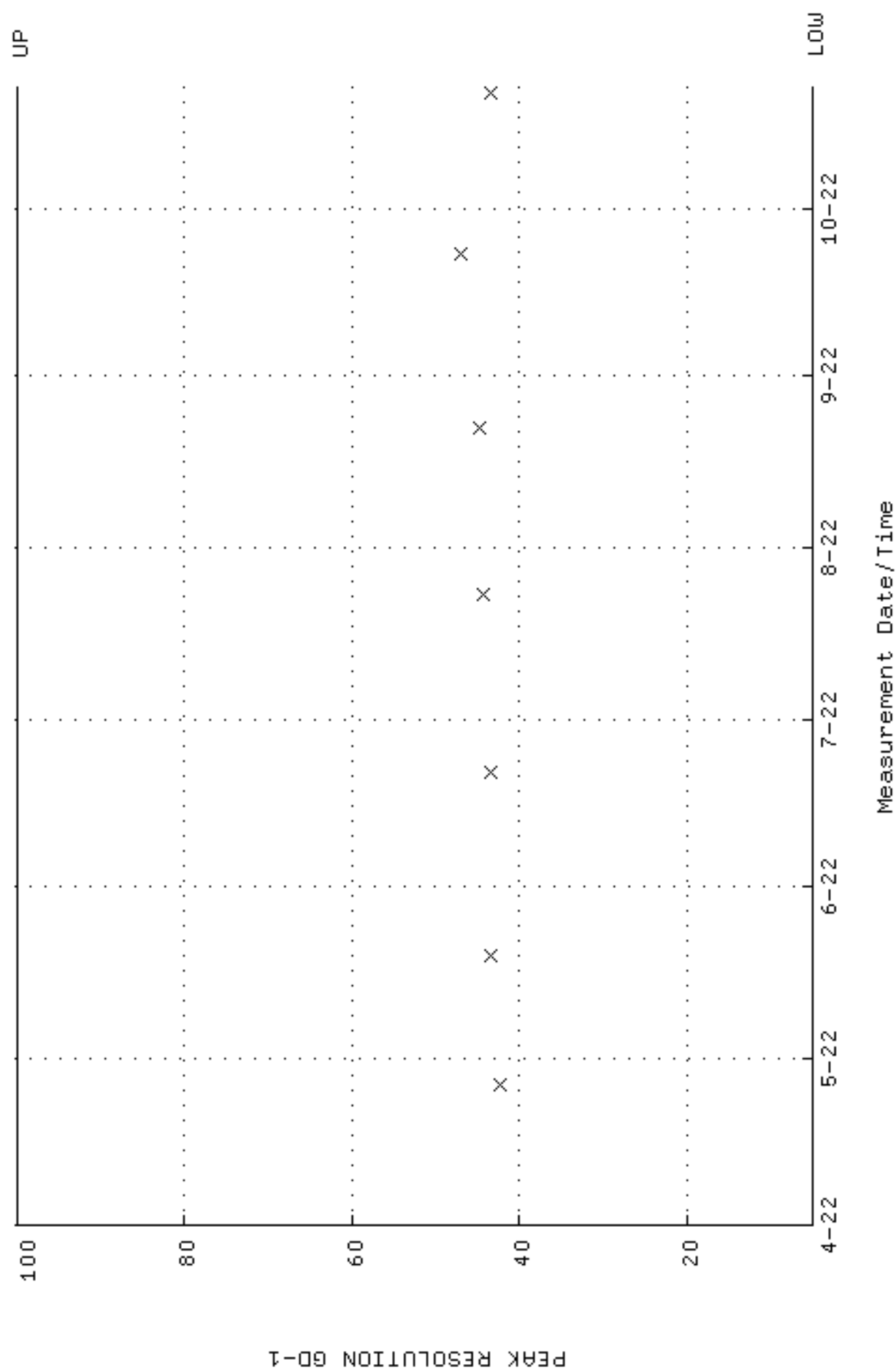
QA filename : DKA100:[ENV_ALPHA.QA.W]W234.QAF;3
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 26-APR-2022 09:27:31 through 22-OCT-2022 12:00:00
Lower/Upper Lmts: 0.372940 through 0.396010



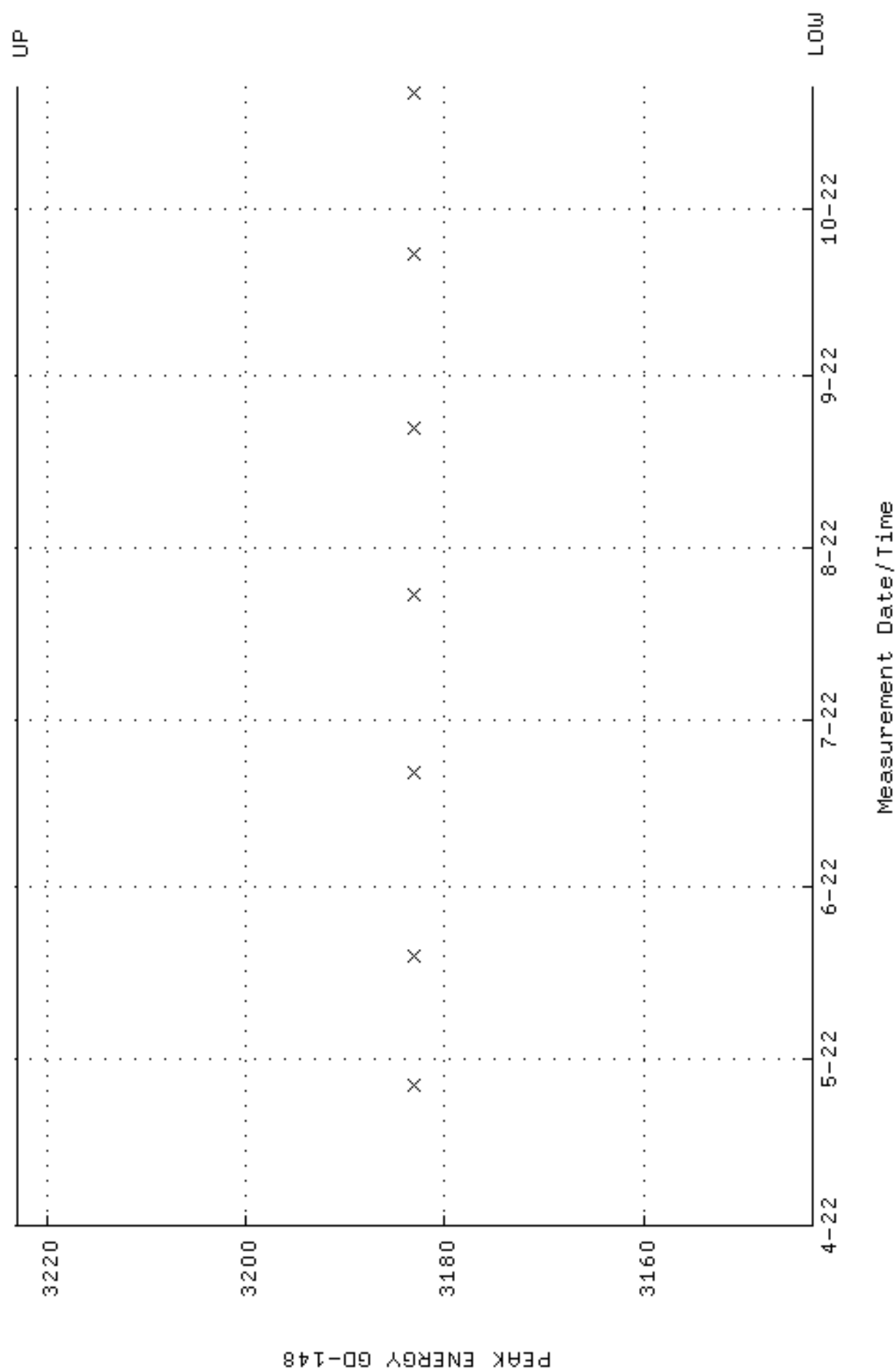
QA filename : DKA100:[ENV_ALPHA.QA.W]W234.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 26-APR-2022 09:27:31 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



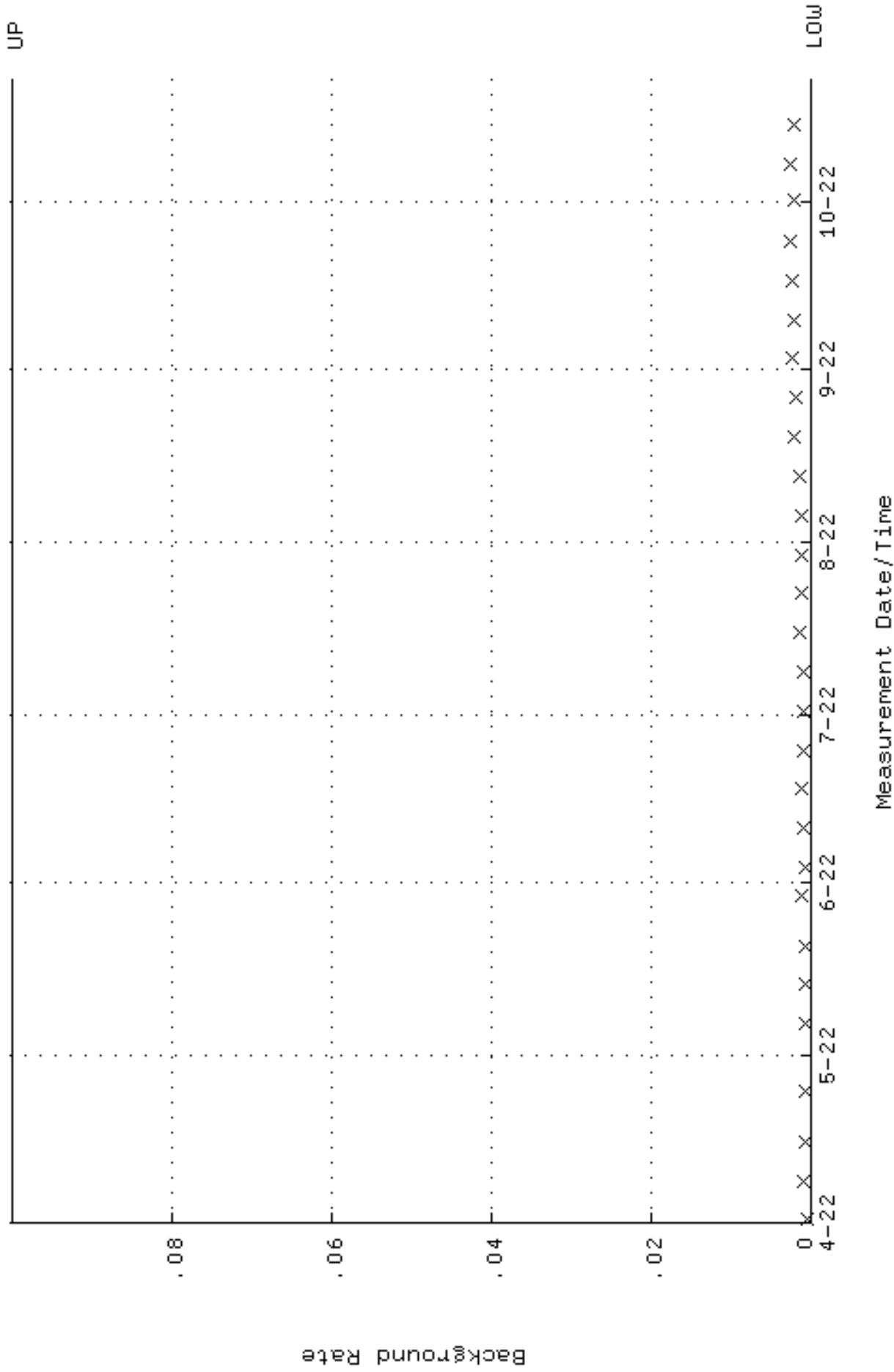
QA filename : DKA100:[ENV_ALPHA.QA.W]W234.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 26-APR-2022 09:27:31 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



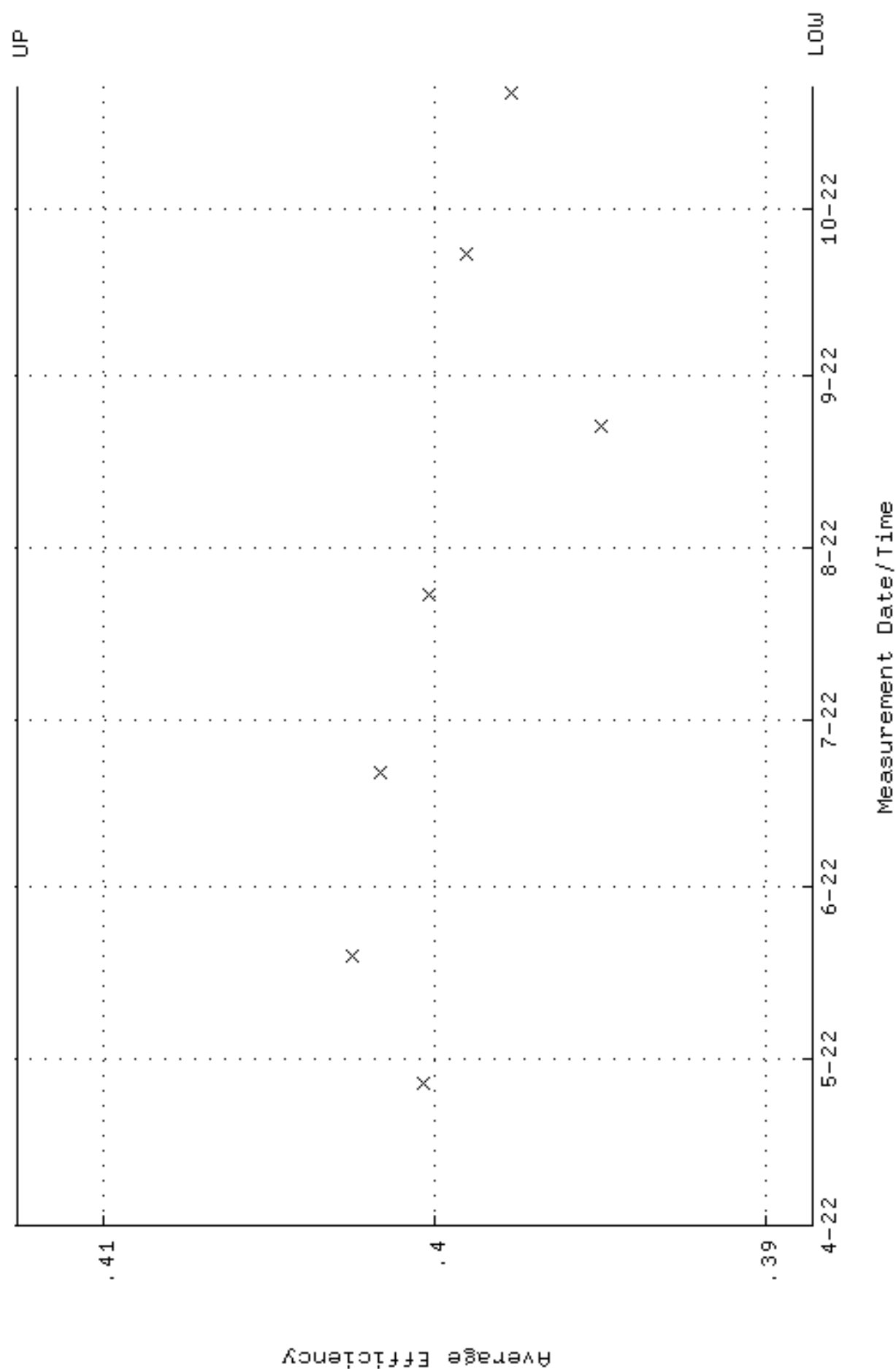
QA filename : DKA100:[ENV_ALPHA.QA.W]W234.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 26-APR-2022 09:27:31 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



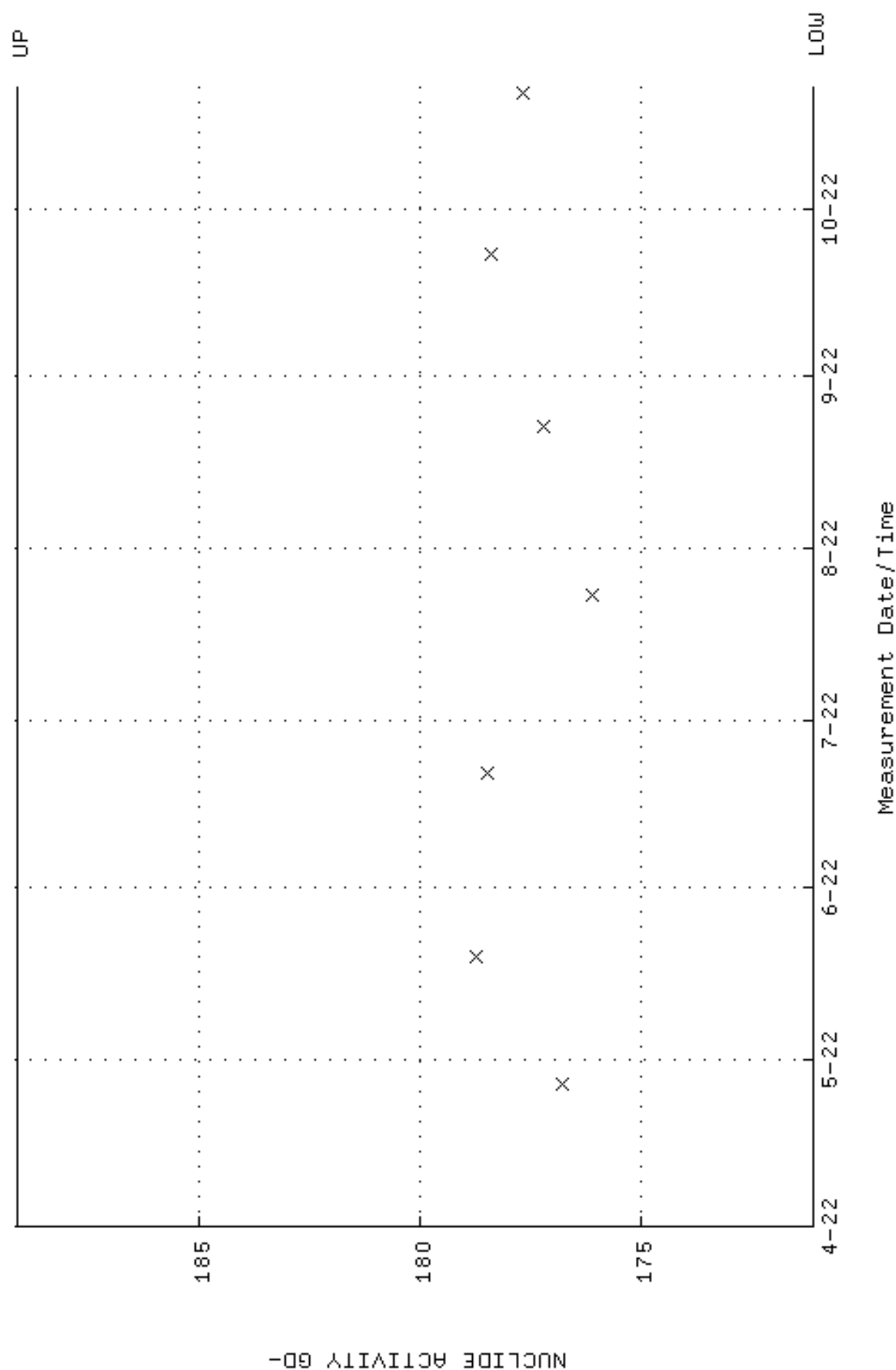
QA filename : DKA100:[ENV_ALPHA.QA.B]B234.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-APR-2022 13:36:21 through 22-OCT-2022 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 0.100000



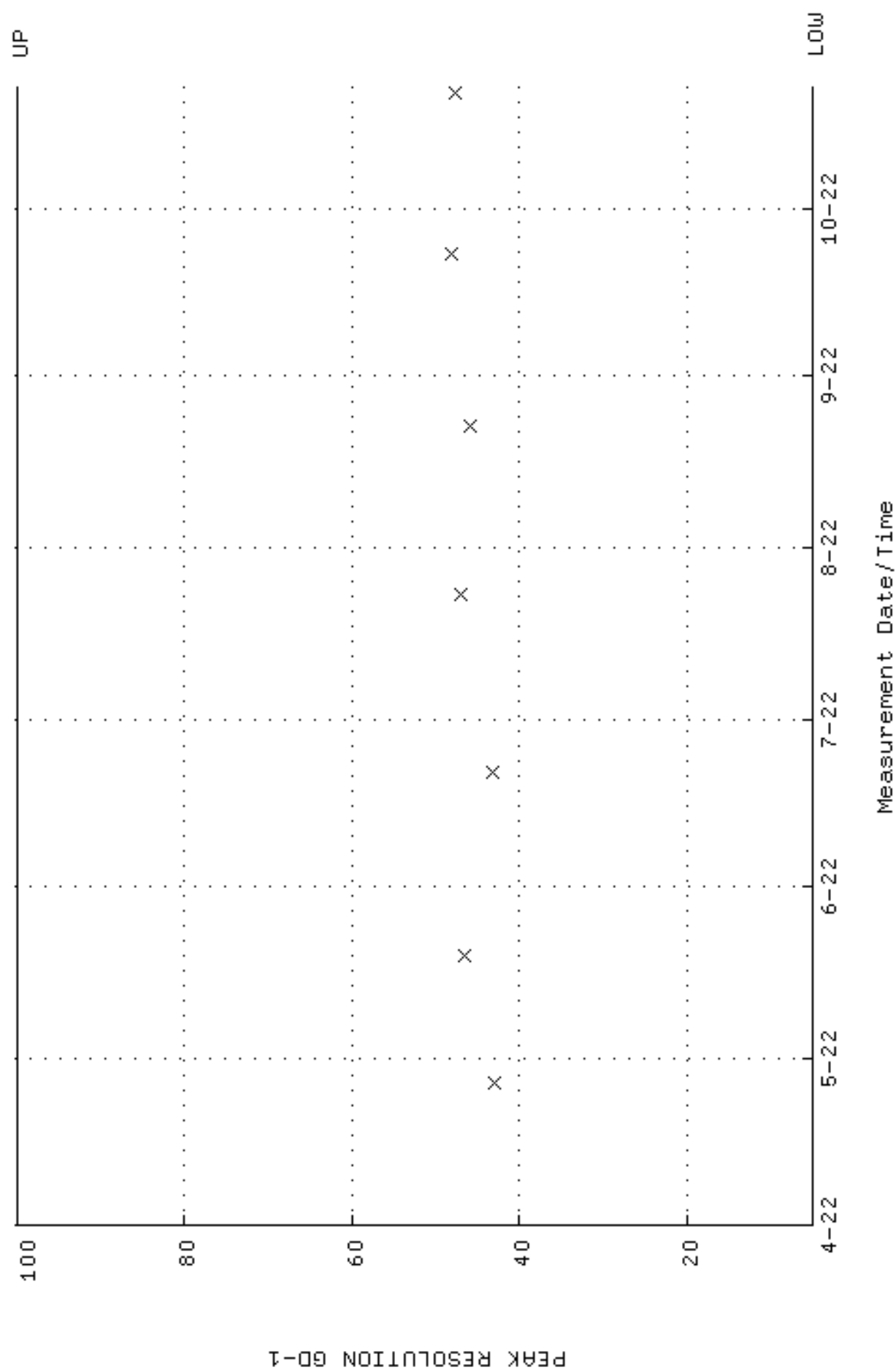
QA filename : DKA100:[ENV_ALPHA.QA.W]W239.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 26-APR-2022 09:27:54 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.388590 through 0.412630



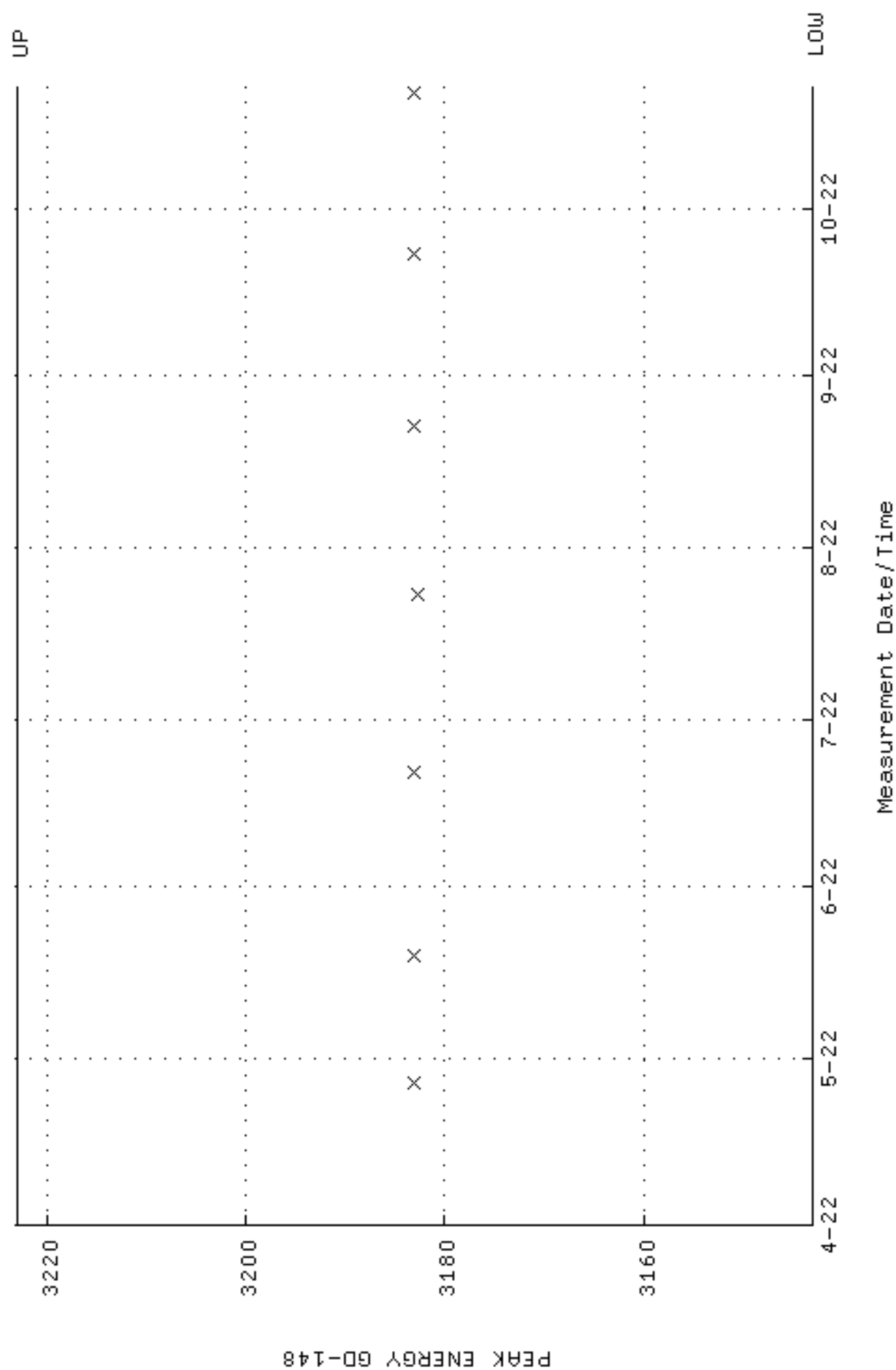
QA filename : DKA100:[ENV_ALPHA.QA.W]W239.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 26-APR-2022 09:27:54 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



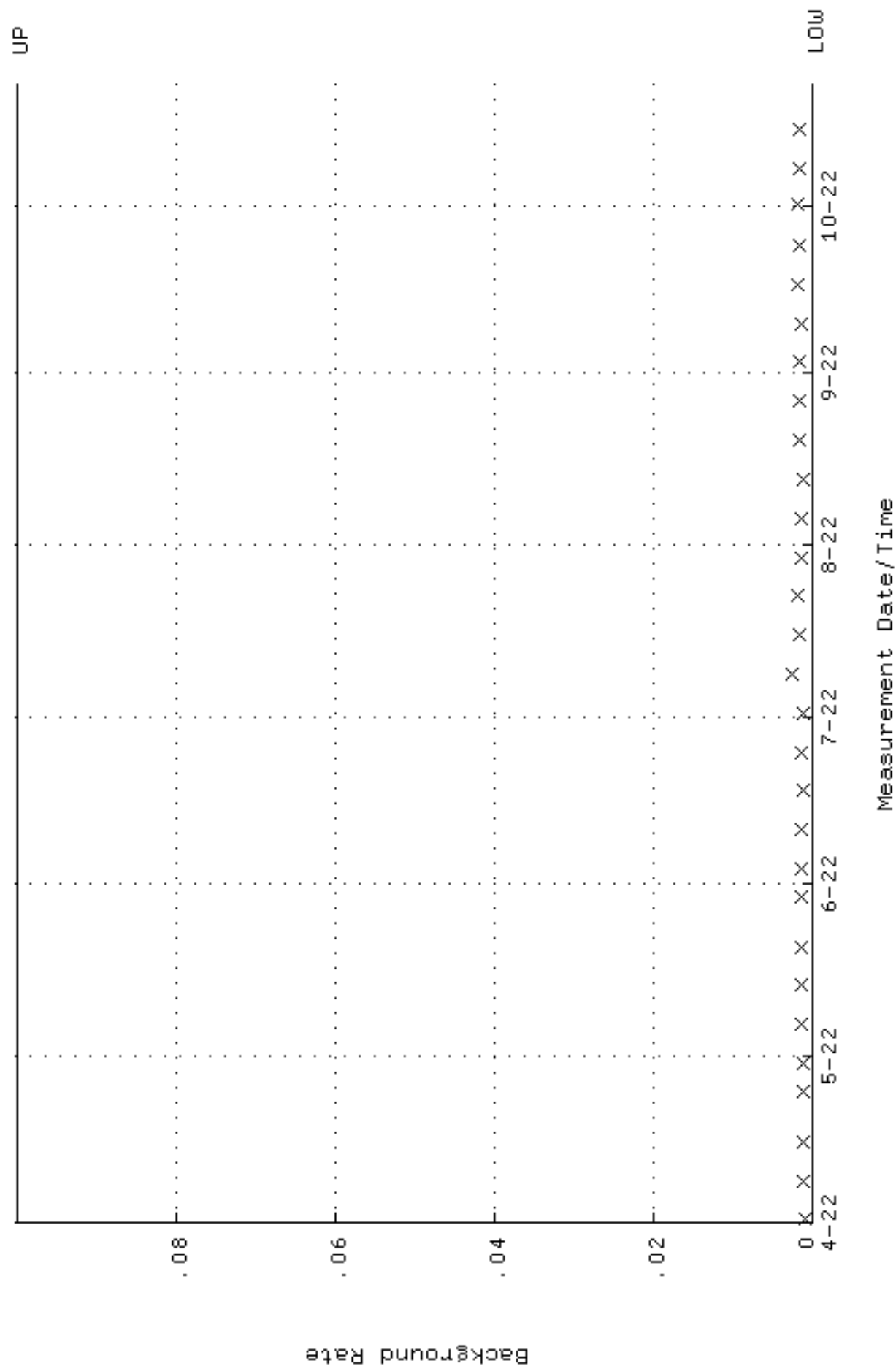
QA filename : DKA100:[ENV_ALPHA.QA.W]W239.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 26-APR-2022 09:27:54 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



QA filename : DKA100:[ENV_ALPHA.QA.W]W239.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 26-APR-2022 09:27:54 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



QA filename : DKA100:[ENV_ALPHA.QA.B]B239.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2022 13:13:35 through 22-OCT-2022 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



RAD Standards Traceability

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

65338-278

Am-241 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Am-241
ACTIVITY (dps):	3.920 E4
HALF-LIFE:	4.322 E2 years
CALIBRATION DATE:	January 15, 2003 12:00 EST
TOTAL UNCERTAINTY*:	3.2%
SYSTEMATIC:	2.2%
RANDOM:	1.0%

*99% confidence level.

5.10649 grams 1M HCl solution.

Impurities: γ -impurities <0.1%
 α -impurities <0.1%

P O NUMBER 3213 RD, Item 1

SOURCE PREPARED BY: M. Taskaeva
M. Taskaeva, Radiochemist

Q A APPROVED:

UM [Signature] 1-16-03

RC-S-035-046a

Standard Logbook

Serial ID: 0533 **Open/Reference Date:** 15 JAN 2003 **Aliquot :** 5.10649 g
Name: Americium-241 **Received:** 27 JAN 2003 **Density :** Hand Calculated
Type: Source Material **Expires:** 05 FEB 2020 **Logbook Num :** RC S 035 048
Employee: Angela Johnson **Lot Number :** 65338-278
Supplier: Analytics **Solvent :** 1 M HCL
Uncertainty : 1.25 percent
Description: 65338-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	39200 dps		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	0533
Prepared By:	Angela Johnson
Carrier Conc:	1 M HCL
Reference Date:	01/15/2003
Ampoule Mass (g):	5.10649 g
Uncertainty:	+/- 1.25 %
LogBook No:	RC S 035 048
Supplier:	Analytics

A Solution Material Info		
Isotope:	Americium-241	
Prepared By:	Angela Johnson	
Prep Date:	02/05/2003	
Verification Date:	07/08/2022	
Expiration Date:	07/08/2023	
Primary Code:	0533-A	
Dilution(mL):	100 mL	
Mass of Parent(g):	4.8225 g	
Density(g/mL):	1.0139	Balance ID:

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (5.10649 \text{ g} * 100 \text{ mL}) = 22211.9695 \text{ dpm/mL}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (1.0139 \text{ g/mL}) / (5.10649 \text{ g} * 100 \text{ mL}) = 21907.2185 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/20/2003	Angela Johnson	1.0151	100	0533-B	222.38 dpm/mL	03/01/2006	03/01/2007
01/16/2015	Christina Kimball	.005081	500	0533-BB	.22263 dpm/mL	01/14/2016	01/14/2017
02/20/2003	Angela Johnson	.6819	250	0533-C	59.754 dpm/mL	02/20/2004	02/20/2005
05/04/2015	Tim Chandler	1.02	500	0533-CC	44.6907 dpm/mL	04/17/2017	04/17/2018
05/07/2003	Tim Chandler	.1245	100	0533-D	27.2745 dpm/mL	05/03/2004	05/03/2005
01/22/2016	Christina Kimball	.103	500	0533-DD	4.51289 dpm/mL	01/05/2022	01/05/2023
09/10/2004	Amanda Fehr	.6933	250	0533-E	60.753 dpm/mL	09/10/2005	09/10/2006
10/31/2016	Christina Kimball	.00508	500	0533-EE	.22259 dpm/mL	10/30/2017	10/30/2018

12/17/2004	Brenda Burke	.0093	100	0533-F	2.0374 dpm/mL	12/20/2004	12/20/2005
10/13/2017	Tim Chandler	1.0219	500	0533-FF	44.774 dpm/mL	10/01/2019	10/01/2020
12/21/2004	Brenda Burke	.009273	100	0533-G	2.0315 dpm/mL	12/07/2005	12/07/2006
11/13/2017	Christina Kimball	.00507	500	0533-GG	.2222 dpm/mL	11/09/2018	11/09/2019
04/28/2005	Brenda Burke	.1347	100	0533-H	29.4598 dpm/mL	04/27/2006	04/27/2007
01/23/2018	Tim Chandler	1.2536	100	0533-HH	274.6289 dpm/mL	01/23/2018	01/23/2019
10/19/2005	Mary Aders	.6948	250	0533-I	60.7831 dpm/mL	10/18/2006	10/18/2007
01/30/2020	Tim Chandler	1.0284	500	0533-II	45.0588 dpm/mL	01/18/2022	01/18/2023
05/08/2006	Julie Strock	.0711	100	0533-J	15.576 dpm/mL	05/10/2008	05/10/2009
07/08/2022	Matelon DeFreese	1.0349	500	0533-JJ	45.3435609 dpm/mL	07/18/2022	07/18/2023
05/11/2006	Brenda Burke	.00092601	100	0533-K	.20286 dpm/mL	08/02/2007	07/28/2007
11/15/2006	Tara Sides	.132	1000	0533-L	2.88586 dpm/mL	09/15/2015	09/15/2016
06/12/2007	Julie Strock	.000979	100	0533-M	.21448 dpm/mL	05/20/2009	05/20/2010
08/03/2007	Daniel Roy	.7042	250	0533-N	61.7083 dpm/ml	08/02/2008	08/02/2009
09/25/2008	Daniel Roy	1.4561	500	0533-O	63.7982 dpm/ml	09/07/2010	09/07/2011
09/29/2008	Tara Sides	.1004	100	0533-P	21.9948 dpm/mL	09/07/2010	09/07/2011
06/03/2009	Julie Strock	.0009751	100	0533-Q	.2136 dpm/mL	06/01/2010	06/01/2011
11/08/2010	Ashley Drochter	1.4675	500	0533-R	64.2977 dpm/mL	11/08/2010	11/08/2011
11/09/2010	Ashley Drochter	.7295	500	0533-S	31.9626 dpm/mL	10/31/2011	10/31/2012
01/03/2011	Christina Kimball	.097	100	0533-T	21.25 dpm/mL	01/03/2011	01/03/2012
01/05/2011	Christina Kimball	.1009	100	0533-U	22.10438 dpm/mL	12/18/2013	12/18/2014
05/23/2011	Christina Kimball	.001008999	100	0533-V	.2210438 dpm/mL	05/11/2012	05/11/2013
05/11/2012	Christina Kimball	.001016	100	0533-W	.222676 dpm/mL	05/01/2014	05/01/2015

06/13/2012	Ashley Drochter	.728	500	0533-X	31.8969 dpm/mL	06/02/2014	06/02/2015
01/23/2013	Salina Pizarro	2	500	1641	.1498555 dpm/mL	12/19/2013	12/01/2038
07/16/2013	Julie Strock	1	500	1641-A	.07492775 dpm/mL	07/16/2038	07/16/2039
03/17/2014	Christina Kimball	.1013	100	0533-Y	22.19201 dpm/mL	02/26/2019	02/26/2020
05/05/2014	Christina Kimball	.00101595	100	0533-Z	.222567 dpm/mL	05/05/2014	05/05/2015

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Am-243 Standard 0533-JJ

v1.2

Analyst	MXS2
Verification Prep Date	7/18/2022

Tracer Information	
Isotope	Cm-244
Serial Number	1216-N2
Amount of Std. (mL)	0.2
Expiration Date	4/7/2023

Standard Information	
Isotope	Am-243
Serial Number	0533-JJ
Isotope Half-life	7.3700E+03 Y
Reference Date	1/15/2003
Ref. Act. (dpm/mL)	45.3435609
Amount of Std. (mL)	0.2
Standard Prep Date	7/8/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	7/21/2022	3.880	43.07
2	7/23/2022	3.980	44.18
3	7/21/2022	3.790	42.07

Mean Value = 3.883 43.105
Stdev = 0.09504385 1.05498673

Certificate Value* = 4.0775 dpm/mL
Two sigma = 0.1901
10 % of Mean = 0.3883
Rule A (Pass/Fail) Pass
% Recovery 95.24%
Rule B (Pass/Fail) Pass
Expiration Date 7/18/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Am-243 standard 0533-JJ using 0.2 mL for each source. Each standard was combined with 0.2 mL of Cm-244 standard 1216-N2 and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. 0.1mL of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-243 were calculated by comparison to Cm-244 certified values.

7/25/22

CERTIFICATE OF CALIBRATION
Standard Reference Source

1752

101294

Am-243 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL1511998, Item 1 **Product Code:** 8243



This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
Am-243	2.692E+06	3.809E+04	0.5	1.8	3.7	09/01/2015

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities (other than decay products) < 0.1%.
5.10528 g 1M HCl solution, carrier free.

Source Prepared by:


Z. Dimitrova, Radiochemist

QC Approved:


J. S. Lehr, Spectroscopist

Date: 28 AUG 15

Standard Logbook

Serial ID: 1752 **Open/Reference Date:** 01 SEP 2015 **Aliquot :** 5.10528 g
Name: Americium-243 **Received:** 01 SEP 2015 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18 SEP 2025 **Logbook Num :** GL-CED-297-045
Employee: Gregory Ramsay **Lot Number :** 101294
Supplier: Eckert & Ziegler **Solvent :** 1M HCl
Uncertainty : 1.85 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-243	38090 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1752
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HCl
Reference Date:	09/01/2015
Ampoule Mass (g):	5.10528 g
Uncertainty:	+/- 1.85 %
LogBook No:	GL-CED-297-045
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Americium-243		
Prepared By:	Tim Chandler		
Prep Date:	11/23/2015		
Verification Date:	01/06/2017		
Expiration Date:	01/20/2022		
Primary Code:	1752-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0826 g		
Density(g/mL):	1.0282	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22752.4720 \text{ dpm/mL}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0282 \text{ g/mL}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22128.4498 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/23/2015	Tim Chandler	1.0432	500	1752-B	46.1688 dpm/mL	11/24/2015	11/23/2016
05/26/2016	Tim Chandler	1.072	500	1752-C	47.4434 dpm/mL	05/26/2016	05/26/2017
01/06/2017	Tim Chandler	2.1043	1000	1752-D	46.5649 dpm/mL	12/20/2017	12/20/2018
05/30/2018	Tim Chandler	2.3853	1000	1752-E	52.783 dpm/mL	05/21/2019	05/21/2020
08/05/2019	Tim Chandler	2.2432	1000	1752-F	49.6385 dpm/mL	08/03/2020	08/03/2021
08/12/2020	Tim Chandler	2.2247	1000	1752-G	49.2292 dpm/mL	08/12/2020	08/12/2021
06/18/2021	Tim Chandler	2.2608	1000	1752-H	50.028 dpm/mL	06/18/2021	06/18/2022
01/20/2022	Matelon DeFreese	2.0841	1000	1752-I	46.1179022 dpm/mL	01/21/2022	01/21/2023
09/06/2022	Matelon DeFreese	2.1013	1000	1752-J	46.4985116 dpm/mL	09/06/2022	09/06/2023

Verification for Am-243 Standard 1752-J

v1.2

Analyst	MXS2
Verification Prep Date	9/6/2022

Tracer Information	
Isotope	Am-241
Serial Number	0533-JJ
Amount of Std. (mL)	0.2
Expiration Date	7/18/2023

Standard Information	
Isotope	Am-243
Serial Number	1752-J
Isotope Half-life	7.3700E+03 Y
Reference Date	9/1/2015
Ref. Act. (dpm/mL)	46.4985116
Amount of Std. (mL)	0.2
Standard Prep Date	9/6/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	9/7/2022	4.280	47.51
2	9/8/2022	4.310	47.84
3	9/8/2022	4.200	46.62

Mean Value = 4.263 47.323
Stdev = 0.056862407 0.631172718

Certificate Value* = 4.1863 pCi
Two sigma = 0.1137
10 % of Mean = 0.4263
Rule A (Pass/Fail) Pass
% Recovery 101.84%
Rule B (Pass/Fail) Pass
Expiration Date 9/6/2023

dpm/mL
46.4678
1.2623
4.7323
Pass
101.84%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Am-243 standard 1752-J using 0.2 mL for each source. Each standard was combined with 0.2 mL of Am-241 standard 0533-JJ and was diluted in a centrifuge tube containing 20 mL 3M HCl, diluted to 40 mL with DI water. 0.1 mL of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-243 were calculated by comparison to Am-241 certified values.

8-21/22



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010

Fax 661•257•8303

1521

CERTIFICATE OF CALIBRATION GAMMA STANDARD SOLUTION

Radionuclide:	Pb-210	Customer:	GENERAL ENGINEERING LABS.		
Half-life:	22.3 ± 0.2 years	P.O. No.:	936803 RD		
Catalog No.:	7210	Reference Date:	15-Feb-11	12:00	PST
Source No.:	1476-99	Contained Radioactivity:	4.973	μCi	184.0 kBq

Physical Description:

A. Mass of solution:	5.21292 g in 5 mL flame-sealed ampoule
B. Chemical form:	Pb(NO ₃) ₂ in 1M HNO ₃
C. Carrier content:	10 μg Pb/mL of solution
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.9540 μCi/g, 35.30 kBq/g

Method of Calibration:

This source was prepared from a weighed aliquot of solution whose activity in μCi/g was determined using gamma ray spectrometry.

Peak energy used for integration:	46.5 keV
Branching ratio used:	0.0418 gammas per decay

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5 %
B. Type B (systematic) uncertainty:	± 7.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 7.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.



Quality Control

11-Jan-11
Date

EZIP Ref. No.: 1476-99

ISO 9001 CERTIFIED

Medical Imaging Laboratory

Industrial Gauging Laboratory

Standard Logbook

Serial ID: 1521 **Open/Reference Date:** 15 FEB 2011 **Aliquot :** 5.21292 g
Name: Lead-210 **Received:** 14 JAN 2011 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 02 MAR 2013 **Logbook Num :** RC-S-060-066
Employee: Gregory Ramsay **Lot Number :** 1426-99
Supplier: Eckert & Ziegler **Solvent :** 1M HNO₃
Uncertainty : 7 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Lead-210	35.3 kBq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1521
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	02/15/2011
Ampoule Mass (g):	5.21292 g
Uncertainty:	+/- 7 %
LogBook No:	RC-S-060-066
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Lead-210		
Prepared By:	Bethany Fiem		
Prep Date:	03/22/2011		
Verification Date:	12/03/2020		
Expiration Date:	12/23/2021		
Primary Code:	1521-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0705 g		
Density(g/mL):	1.0272	Balance ID:	1113021018

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 107393.1900 \text{ dpm/mL}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0272 \text{ g/mL}) / (100 \text{ mL}) = 104549.4451 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/07/2013	Ashley Drochter	.5177	100	1521-B	541.2525 dpm/mL	10/29/2013	10/29/2014
10/29/2013	Tim Chandler	5.1002	100	1521-C	5332.2308 dpm/mL	08/09/2018	08/09/2019
02/01/2019	Bethany Fiem	5.0359	100	1521-D	5265.0055 dpm/mL	11/30/2021	11/30/2022
06/05/2018	Tim Chandler	.6059	200	1867-A		06/06/2018	06/05/2019
06/14/2018	Tim Chandler	.6646	200	1867-B		06/15/2018	06/14/2019
06/14/2018	Tim Chandler	.6646	200	1868-A		06/14/2018	06/14/2019
06/13/2019	Tim Chandler	.6984	200	1907-A		06/15/2021	06/15/2022
06/13/2019	Tim Chandler	.6984	200	1907-A1		06/15/2021	06/15/2022
11/06/2019	Tim Chandler	15.0553	100	1920-A		11/07/2019	11/07/2020
12/14/2021	Matelon DeFreese	.6276	200	2012-A		12/15/2021	12/15/2022

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

82308-278

Pu-239 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: 7340 RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u_A	u_B	U	
Pu-239	8.803E+06	3.758E+04	0.1	0.9	1.8	05/07/2010

***Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities < 0.1 %, α -impurities < 0.1 %, Am-241 330.1 Bq. 5.56111 g 3M HNO₃ solution, carrier free.

Source Prepared by: _____

W. Mao, Radiochemist

QA Approved: _____

J. D. McCorvey, QA Manager Alternate

Date: _____

5/10/10



Standard Logbook

Serial ID: 1472 **Open/Reference Date:** 07 MAY 2010 **Aliquot :** 5.56111 g
Name: Plutonium-239 **Received:** 12 MAY 2010 **Density :** Hand Calculated
Type: Source Material **Expires:** 03 JUN 2030 **Logbook Num :** RC-S-060-019
Employee: Ashley Drochter **Lot Number :** 82308-278
Supplier: Eckert & Zeigler Analytics **Solvent :** 3M HNO3
Uncertainty : .9 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-239	37580 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1472
Prepared By:	Ashley Drochter
Carrier Conc:	3M HNO3
Reference Date:	05/07/2010
Ampoule Mass (g):	5.56111 g
Uncertainty:	+/- .9 %
LogBook No:	RC-S-060-019
Supplier:	Eckert & Zeigler Analytics

A Solution Material Info			
Isotope:	Plutonium-239		
Prepared By:	Julie Strock		
Prep Date:	10/20/2020		
Verification Date:	08/17/2021		
Expiration Date:	08/17/2022		
Primary Code:	1472-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.5071 g		
Density(g/mL):	1.1056	Balance ID:	BIOFA-B952846238

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.56111 \text{ g} * 100 \text{ mL}) = 22329.0118 \text{ dpm/mL}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.1056 \text{ g/mL}) / (5.56111 \text{ g} * 100 \text{ mL}) = 20195.4985 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
10/20/2020	Julie Strock	.0117	1000	1472-B	.2363 dpm/mL	10/14/2021	10/14/2022
08/17/2021	Tim Chandler	1.1318	500	1472-C	45.7145 dpm/mL	08/11/2022	08/11/2023
04/07/2022	Christina Kimball	.01	1000	1472-D	.20195 dpm/mL	04/07/2022	04/07/2023
04/15/2022	Christina Kimball	.011283	1000	1472-E	.2279 dpm/mL	04/15/2022	04/15/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-239 Standard 1472-C

v1.2

Analyst	MXS2
Verification Prep Date	8/11/2022

Tracer Information	
Isotope	Pu-242
Serial Number	2021-A
Amount of Std. (mL)	0.2
Expiration Date	7/19/2023

Standard Information	
Isotope	Pu-239
Serial Number	1472-C
Isotope Half-life	2.4131E+04 Y
Reference Date	5/7/2010
Ref. Act. (dpm/mL)	45.7145
Amount of Std. (mL)	0.2
Standard Prep Date	8/17/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	8/11/2022	3.960	43.96
2	8/11/2022	4.190	46.51
3	8/15/2022	4.220	46.84

Certificate Value* = 4.1170 pCi
 Two sigma = 0.2845
 10 % of Mean = 0.4123
 Rule A (Pass/Fail) Pass
 % Recovery 100.15%
 Rule B (Pass/Fail) Pass
 Expiration Date 8/11/2023

Mean Value = 4.123 45.769
 Stdev = 0.142243922 1.578907534

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-239 standard 1472-C using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-242 standard 2021-A and was diluted in a centrifuge tube containing 20 mL of 0.1M HCl, diluted to 40 mL with DI water. 0.1 mL of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-239 were calculated by comparison to Pu-242 certified values.

8/16/22



National Institute of Standards & Technology

Certificate

2022

Standard Reference Material[®] 4334j

Plutonium-242 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}.$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterwieser, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

Steven J. Choquette, Director
Office of Reference Materials

GL-CE0-797-314a

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq·g^{-1(a)}
Relative expanded uncertainty ($k = 2$)	0.51 % ^(b)

^(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

^(b) The uncertainties on certified values are expanded uncertainties, $U = k u_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ⁻¹ (a,b,c,d)
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ⁻¹ (a,d)
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π α liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

^(a) The stated uncertainty is two times the standard uncertainty [5].

^(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

^(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,

0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and

0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

^(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclidic impurities follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ⁻⁶ ⁽³⁾	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ⁻⁵ ⁽³⁾	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

^(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,

5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and

3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

^(f) The stated uncertainty is the standard uncertainty. See reference 6.

GL-CEB-297-314c

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ^{242}Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	^{242}Pu decay corrections for half-life uncertainty of 0.22 %.	B	$< 10^{-10}$
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty ($k = 2$)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

GL-CE0-297-314d

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

GL-CE0-297-314e

Standard Logbook

Serial ID: 2022 **Open/Reference Date:** 09 AUG 2017 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 18 JAN 2022 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18 JAN 2050 **Logbook Num :** GL-CED-297-314
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
Uncertainty : .255 PERCENT

Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2022
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO3
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-314
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	07/18/2022		
Verification Date:	07/21/2022		
Expiration Date:	07/21/2023		
Primary Code:	2022-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.4148 g		
Density(g/mL):	1.0405	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.4148 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 42.3654 \text{ dpm/mL}$
$(5.4148 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0405 \text{ g/mL}) / (200 \text{ mL}) = 40.7183 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
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GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2022-A

v1.2

Analyst	MXS2
Verification Prep Date	7/21/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.2
Expiration Date	8/17/2022

Standard Information	
Isotope	Pu-242
Serial Number	2022-A
Isotope Half-life	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	42.3654
Amount of Std. (mL)	0.2
Standard Prep Date	7/18/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	7/21/2022	3.800	42.18
2	7/21/2022	3.760	41.74
3	7/21/2022	3.730	41.40

Mean Value = 3.763 41.773
Stdev = 0.035118846 0.389819189

Certificate Value* = 3.8167 pCi
Two sigma = 0.0702
10 % of Mean = 0.3763
Rule A (Pass/Fail) Pass
% Recovery 98.60%
Rule B (Pass/Fail) Pass
Expiration Date 7/21/2023

dpm/mL
42.3650
0.7796
4.1773
Pass
98.60%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2022-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. Added 0.1 mL of neodymium carrier and 3-4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

8/25/22



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661-309-1010

Fax 661-257-8303

1720

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Po-209	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	102 ± 5 years	P.O. No.:	GEL1408569	
Catalog No.:	7209	Reference Date:	1-Oct-14	12:00 PST
Source No.:	1760-53-1	Contained Radioactivity:	0.05281 µCi	1.954 kBq

Physical Description:

A. Mass of solution:	5.21650 g in 5 mL flame-sealed ampoule
B. Chemical form:	Po(NO ₃) ₄ in 1M HNO ₃
C. Carrier content:	None
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.01012 µCi/g, 0.3744 kBq/g

Method of Calibration:

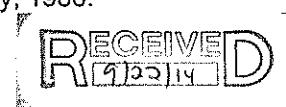
This source was prepared from a weighed aliquot of solution whose activity in µCi/g was determined using a liquid scintillation counter.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.4 %
D. Total uncertainty at the 99% confidence level:	± 3.1 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.



Daniel James Van Dorem
Quality Control

11-Sep-14
Date

EZIP Ref. No.: 1760-53

ISO 9001 CERTIFIED

GEL-CEP-297-013

Standard Logbook

Serial ID: 1720 **Open/Reference Date:** 01 OCT 2014 **Aliquot :** 5.2165 g
Name: Polonium-209 **Received:** 22 SEP 2014 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 22 SEP 2035 **Logbook Num :** GL-CED-297-013
Employee: Gregory Ramsay **Lot Number :** 1760-53-1
Supplier: Eckert & Ziegler **Solvent :** 1M HNO3
Uncertainty : 1.211 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Polonium-209	1.954 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1720
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	10/01/2014
Ampoule Mass (g):	5.2165 g
Uncertainty:	+/- 1.211 %
LogBook No:	GL-CED-297-013
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Polonium-209		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2016		
Verification Date:	07/12/2017		
Expiration Date:	12/06/2019		
Primary Code:	1720-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1896 g		
Density(g/mL):	1.0290	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1166.3543 \text{ dpm/mL}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0290 \text{ g/mL}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1133.4833 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
12/06/2018	Tim Chandler	14.42	200	1720-B	81.7241 dpm/mL	12/07/2018	12/07/2019
11/26/2019	Tim Chandler	14.5183	200	1720-C	82.2813 dpm/mL	11/11/2021	11/11/2022
11/26/2019	Tim Chandler	14.5183	200	1720-C1	82.2813 dpm/mL	11/11/2021	11/11/2022
02/21/2022	Matelon DeFreese	14.5109	200	1720-D	82.239314 dpm/mL	03/07/2022	03/07/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Po-209 Standard 1720-D

v1.2

Analyst	MXS2
Verification Prep Date	3/7/2022

Tracer Information	
Isotope	Po-210
Serial Number	2012-A
Amount of Std. (mL)	0.2
Expiration Date	12/15/2022

Standard Information	
Isotope	Po-209
Serial Number	1720-D
Isotope Half-life	125.3000 Y
Reference Date	10/1/2014
Ref. Act. (dpm/mL)	82.239314
Amount of Std. (mL)	0.2
Standard Prep Date	2/21/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	3/7/2022	7.180	79.70
2	3/7/2022	7.480	83.03
3	3/7/2022	7.700	85.47

Mean Value = 7.453 82.732
Stdev = 0.261023626 2.897362249

Certificate Value* = 7.1106 pCi
Two sigma = 0.5220
10 % of Mean = 0.7453
Rule A (Pass/Fail) Pass
% Recovery 104.82%
Rule B (Pass/Fail) Pass
Expiration Date 3/7/2023

dpm/mL
78.9274
5.7947
8.2732
Pass
104.82%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-209 standard 1720-D using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-210 standard 2012-A and was diluted in a centrifuge tube containing 15mL of 0.05M HNO3. Precipitated by adding 0.1mL of 30% H2O2, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-209 were calculated by comparison to Po-210 certified values.

3/15/22



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1521
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	02/15/2011
Ampoule Mass (g):	5.21292 g
Uncertainty:	+/- 7 %
LogBook No:	RC-S-060-066
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Lead-210		
Prepared By:	Bethany Fiem		
Prep Date:	03/22/2011		
Verification Date:	12/03/2020		
Expiration Date:	12/23/2021		
Primary Code:	1521-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0705 g		
Density(g/mL):	1.0272	Balance ID:	1113021018

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 107393.1900 \text{ dpm/mL}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0272 \text{ g/mL}) / (100 \text{ mL}) = 104549.4451 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/07/2013	Ashley Drochter	.5177	100	1521-B	541.2525 dpm/mL	10/29/2013	10/29/2014
10/29/2013	Tim Chandler	5.1002	100	1521-C	5332.2308 dpm/mL	08/09/2018	08/09/2019
02/01/2019	Bethany Fiem	5.0359	100	1521-D	5265.0055 dpm/mL	11/30/2021	11/30/2022
06/05/2018	Tim Chandler	.6059	200	1867-A		06/06/2018	06/05/2019
06/14/2018	Tim Chandler	.6646	200	1867-B		06/15/2018	06/14/2019
06/14/2018	Tim Chandler	.6646	200	1868-A		06/14/2018	06/14/2019
06/13/2019	Tim Chandler	.6984	200	1907-A		06/15/2021	06/15/2022
06/13/2019	Tim Chandler	.6984	200	1907-A1		06/15/2021	06/15/2022
11/06/2019	Tim Chandler	15.0553	100	1920-A		11/07/2019	11/07/2020
12/14/2021	Matelon DeFreese	.6276	200	2012-A		12/15/2021	12/15/2022

Verification for Po-210 Standard 2012-A

v1.2

Analyst	MXS2
Verification Prep Date	12/15/2021

Tracer Information	
Isotope	Po-209
Serial Number	1720-C
Amount of Std. (mL)	0.2
Expiration Date	11/11/2022

Standard Information	
Isotope	Po-210
Serial Number	2012-A
Isotope Half-life	138.3800 D
Reference Date	12/14/2021
Ref. Act. (dpm/mL)	233.932217
Amount of Std. (mL)	0.2
Standard Prep Date	12/14/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	12/16/2021	20.500	227.55
2	12/16/2021	19.700	218.67
3	12/16/2021	20.000	222.00

Mean Value = 20.067 222.740
 Stdev = 0.404145188 4.486011592

pCi
 Certificate Value* = 20.9697 232.7634
 Two sigma = 0.8083 8.9720
 10 % of Mean = 2.0067 22.2740
 Rule A (Pass/Fail) Pass
 % Recovery 95.69%
 Rule B (Pass/Fail) Pass
 Expiration Date 12/15/2022

dpm/mL
 232.7634
 8.9720
 22.2740
 Pass
 95.69%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-210 standard 2012-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-209 standard 1720-C and was diluted in a centrifuge tube containing 15 mL of 0.05M HNO₃. Precipitated by adding 0.1mL of 30% H₂O₂, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-210 were calculated by comparison to Po-209 certified values.

12/15/2021



Eckert & Ziegler

Analytics

1845

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION

Standard Reference Source

Received: 12-1-17 12:00

SRS Number: 108018

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8229

Customer: GEL Laboratories LLC

P.O. Number: GEL1718798, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 29-November-2017 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Th-229	2.897E+06	1.999E+04	0.5	1.5	3.1	4π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 108018

Comments:

5.21561 g of 0.5 M HNO₃ solution, carrier free.

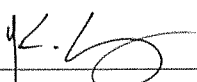
Impurities:

γ-impurities (other than decay products) < 0.1%

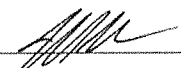
α-impurities: Th-228 6.6E+00 Bq, Th-230 1.2E+02 Bq, Th-232 8.0E+00 Bq

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Hardley, Radiochemist

QC Approved by:


J. Lahr, Spectroscopist

Date: 27-Nov-17

Standard Logbook

Serial ID: 1845 **Open/Reference Date:** 29 NOV 2017 **Aliquot :** 5.21561 g
Name: Thorium-229 **Received:** 01 DEC 2017 **Density :** Hand Calculated
Type: Source Material **Expires:** 01 DEC 2018 **Logbook Num :** GL-CED-297-138
Employee: Tim Chandler **Lot Number :** 108018
Supplier: Eckert & Ziegler **Solvent :** 0.5M HNO₃
Uncertainty : 1.55 percent
Description: 1 ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-229	19990 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1845
Prepared By:	Tim Chandler
Carrier Conc:	0.5M HNO3
Reference Date:	11/29/2017
Ampoule Mass (g):	5.21561 g
Uncertainty:	+/- 1.55 %
LogBook No:	GL-CED-297-138
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-229		
Prepared By:	Tim Chandler		
Prep Date:	06/08/2018		
Verification Date:	07/07/2020		
Expiration Date:	11/10/2022		
Primary Code:	1845-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1906 g		
Density(g/mL):	1.0291	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11936.4861 \text{ dpm/mL}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0291 \text{ g/mL}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11598.7987 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/08/2018	Tim Chandler	2.0385	1000	1845-B	23.6442 dpm/mL	06/01/2020	06/01/2021
07/10/2019	Tim Chandler	4.0198	1000	1845-C	46.62485 dpm/mL	07/07/2020	07/07/2021
10/26/2020	Tim Chandler	4.0184	1000	1845-D	46.6086 dpm/mL	10/27/2020	10/27/2021
04/23/2021	Tim Chandler	4.2911	1000	1845-E	49.7716 dpm/mL	04/26/2021	04/26/2022
11/10/2021	Matelon DeFreese	4.211	1000	1845-F	48.8425 dpm/mL	11/10/2021	11/10/2022
05/11/2022	Matelon DeFreese	4.1951	1000	1845-G	48.6581 dpm/mL	05/12/2022	05/11/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Th-229 Standard 1845-G

v1.2

Analyst	MXS2
Verification Prep Date	5/12/2022

Tracer Information	
Isotope	Th-232
Serial Number	1513-C
Amount of Std. (mL)	0.1
Expiration Date	12/22/2022

Standard Information	
Isotope	Th-229
Serial Number	1845-G
Isotope Half-life	7.3400E+03 Y
Reference Date	11/29/2017
Ref. Act. (dpm/mL)	48.6581
Amount of Std. (mL)	0.1
Standard Prep Date	5/11/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	5/12/2022	2.190	48.62
2	5/12/2022	2.070	45.95
3	5/12/2022	2.120	47.06

Mean Value = 2.127 47.212
Stdev = 0.060277138 1.338152458

Certificate Value* = 2.1909 pCi
Two sigma = 0.1206
10 % of Mean = 0.2127
Rule A (Pass/Fail) Pass
% Recovery 97.07%
Rule B (Pass/Fail) Pass
Expiration Date 5/12/2023
dpm/mL
48.6377
2.6763
4.7212
Pass
97.07%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-229 standard 1845-G using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-232 standard 1513-C and was diluted in a centrifuge tube containing 10 mL 8M HNO₃. The standard was isolated following the standard operating procedure for the separation of thorium (GL-RAD-A-038). After dissolving the sources in 5 mL of 2M HCl, the sources were diluted to 40 mL with deionized water. 100 micrograms of neodymium carrier and five mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-229 were calculated by comparison to Th-232 certified values.

5/16/22

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Th-232	Customer:	GEL LABORATORIES, LLC		
Half-life:	(1.405 ± 0.006)E+10 years	P.O. No.:	7347RD		
Catalog No.:	7232	Reference Date:	1-Nov-10	12:00	PST
Source No.:	1451-62	Contained Radioactivity:	50.26	nCi	1860 Bq
		(Th-232 only)			

Physical Description:

A. Mass of solution:	5.73256 g in 5 mL flame-sealed ampoule
B. Chemical form:	Th(NO ₃) ₄ in H ₂ O
C. Carrier content:	None
D. Density:	1.15 g/mL @ 20°C

Radioimpurities:

Not determined

Radionuclide Concentration: 8.767 nCi/g, 324.4 Bq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.


Quality Control

15-OCT-10
Date

EZIP Ref. No.: 1451-62

RC-S-060-058

ISO 9001 CERTIFIED

Standard Logbook

Serial ID: 1513 **Open/Reference Date:** 01 NOV 2010 **Aliquot :** 5.73256 g
Name: Thorium-232 **Received:** 21 OCT 2010 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 30 NOV 2011 **Logbook Num :** RC-S-060-058
Employee: Gregory Ramsay **Verified:** 28 APR 2011 **Lot Number :** 1451-62
Supplier: Eckert & Ziegler **Solvent :** DI water
Uncertainty : 1.172 PERCENT

Description: in water
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-232	324.4 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1513
Prepared By:	Gregory Ramsay
Carrier Conc:	DI water
Reference Date:	11/01/2010
Ampoule Mass (g):	5.73256 g
Uncertainty:	+/- 1.172 %
LogBook No:	RC-S-060-058
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-232		
Prepared By:	Christina Kimball		
Prep Date:	04/19/2011		
Verification Date:	02/21/2020		
Expiration Date:	02/21/2021		
Primary Code:	1513-A		
Dilution(mL):	250 mL		
Mass of Parent(g):	5.672 g		
Density(g/mL):	1.0020	Balance ID:	60108592

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (250 \text{ mL}) = 441.5992 \text{ dpm/mL}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0020 \text{ g/mL}) / (250 \text{ mL}) = 440.7354 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
04/19/2011	Christina Kimball	5.0665	100	1513-B	22.3299 dpm/mL	04/11/2013	04/11/2014
02/26/2014	Matelon DeFreese	100.0316	1000	1513-C	44.08747 dpm/mL	12/22/2021	12/22/2022
04/18/2014	Christina Kimball	5.0477	100	1513-D	22.247 dpm/mL	06/28/2022	06/28/2023
01/04/2016	Christina Kimball	.2487	100	1513-E	1.096117 dpm/mL	02/11/2020	02/11/2021
08/01/2016	Christina Kimball	2.053	250	1513-F	3.61932 dpm/mL	07/21/2022	07/21/2023
02/21/2020	Christina Kimball	.248	100	1513-G	1.093 dpm/mL	02/23/2022	02/23/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Th-232 Standard 1513-C

v1.2

Analyst	MXS2
Verification Prep Date	12/22/2021

Tracer Information	
Isotope	Th-229
Serial Number	1845-F
Amount of Std. (mL)	0.1
Expiration Date	11/10/2022

Standard Information	
Isotope	Th-232
Serial Number	1513-C
Isotope Half-life	1.4050E+10 Y
Reference Date	11/1/2010
Ref. Act. (dpm/mL)	44.08747
Amount of Std. (mL)	0.1
Standard Prep Date	2/26/2014

Std #	Count Date	Activity pCi	Standard dpm/mL
1	12/22/2021	1.970	43.73
2	12/22/2021	2.070	45.95
3	12/22/2021	1.920	42.62

Mean Value = 1.987 44.104

Stdev = 0.076376262 1.695553007

Certificate Value* = 1.9859 pCi
 Two sigma = 0.1528
 10 % of Mean = 0.1987
 Rule A (Pass/Fail) Pass
 % Recovery 100.04%
 Rule B (Pass/Fail) Pass
 Expiration Date 12/22/2022

dpm/mL
 44.0875
 3.3911
 4.4104
 Pass
 100.04%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-232 standard 1513-C using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-229 standard 1845-F and was diluted in a centrifuge tube containing 10 mL of 8M HNO₃, then poured onto AG columns following SOP 038. 0.1 mL of neodymium carrier and 2 mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-232 were calculated by comparison to Th-229 certified values.

2/14/22



Eckert & Ziegler

Analytics

1564

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

85621-278

5 mL Liquid in Flame Sealed Vial

Customer: General Engineering Labs/Charleston, SC
P.O. No.: 936814RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
U-232	2.517E+04	3.393E+04	0.5	2.4	4.9	09/12/2011

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities (other than decay products) < 0.1 %, U-233 < 1.20E2 Bq, Am-241 < 5.8E1 Bq. 5.06048 grams 2M HNO₃ solution.

Source Prepared by: M. I. Taskaeva
M. I. Taskaeva, Radiochemist

QA Approved: J. D. McCorvey
J. D. McCorvey, QA Manager Alternate

Date: 9/12/11

RECEIVED
9/14/11
AM



Standard Logbook

Serial ID: 1564 **Open/Reference Date:** 12 SEP 2011 **Aliquot :** 5.06048 g
Name: Uranium-232 **Received:** 14 SEP 2011 **Density :** Hand Calculated
Type: Source Material **Expires:** 26 SEP 2014 **Logbook Num :** RC-S-060-109
Employee: Ashley Drochter **Lot Number :** 85621-278
Supplier: Eckert & Ziegler **Solvent :** 2M HNO3
Uncertainty : 2.45 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-232	33930 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1564
Prepared By:	Ashley Drochter
Carrier Conc:	2M HNO3
Reference Date:	09/12/2011
Ampoule Mass (g):	5.06048 g
Uncertainty:	+/- 2.45 %
LogBook No:	RC-S-060-109
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-232		
Prepared By:	Ashley Drochter		
Prep Date:	11/15/2012		
Verification Date:	09/21/2022		
Expiration Date:	09/21/2023		
Primary Code:	1564-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9067 g		
Density(g/mL):	1.0615	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.06048 \text{ g} * 100 \text{ mL}) = 19739.3525 \text{ dpm/mL}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0615 \text{ g/mL}) / (5.06048 \text{ g} * 100 \text{ mL}) = 18595.7160 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/16/2012	Ashley Drochter	2.6179	1000	1564-B	48.6817 dpm/mL	11/13/2013	11/13/2014
07/26/2021	Christina Kimball	.635	500	1564-BB	23.6166 dpm/mL	07/21/2022	07/21/2023
07/26/2021	Christina Kimball	.635	500	1564-BB Spike	23.6166 dpm/mL	07/21/2022	07/21/2023
01/15/2013	Christina Kimball	.265	250	1564-C	19.7115 dpm/mL	01/13/2014	01/13/2015
12/14/2021	Tim Chandler	2.6412	1000	1564-CC	49.115 dpm/mL	12/15/2021	12/15/2022
02/18/2013	Christina Kimball	.116	500	1564-D	4.31421 dpm/mL	02/16/2015	02/13/2016
04/13/2022	Matelon DeFreese	2.7103	1000	1564-DD	50.4 dpm/mL	04/13/2022	04/13/2023
01/02/2014	Gregory Ramsay	2.6936	1000	1564-E	50.08942 dpm/mL	12/10/2014	12/10/2015

09/21/2022	Tim Chandler	2.6897	1000	1564-EE	50.0169 dpm/mL	09/21/2022	09/21/2023
03/17/2014	Christina Kimball	.266	250	1564-F	19.78584 dpm/mL	03/25/2015	03/25/2016
12/10/2014	Tim Chandler	2.6312	1000	1564-G	48.929 dpm/mL	12/10/2014	12/10/2015
07/20/2015	Christina Kimball	.266	250	1564-H	19.78584 dpm/mL	07/25/2016	07/25/2017
11/23/2015	Tim Chandler	2.6117	1000	1564-I	48.5664 dpm/mL	11/23/2015	11/23/2016
01/05/2016	Christina Kimball	.119	500	1564-J	4.4258 dpm/mL	12/27/2017	12/27/2018
01/05/2016	Christina Kimball	.119	500	1564-J Spike	4.4258 dpm/mL	12/27/2017	12/27/2018
09/20/2016	Tim Chandler	2.6389	1000	1564-K	49.0722 dpm/mL	09/18/2017	09/18/2018
12/20/2016	Christina Kimball	.276	250	1564-L	20.52974 dpm/mL	12/21/2017	12/21/2018
06/20/2017	Tim Chandler	2.6611	1000	1564-M	49.4851 dpm/mL	06/19/2018	06/19/2019
01/18/2018	Tim Chandler	2.6367	1000	1564-N	49.0313 dpm/mL	04/25/2018	04/25/2019
04/25/2018	Tim Chandler	2.6505	1000	1564-O	49.2879 dpm/mL	04/25/2018	04/25/2019
08/06/2018	Christina Kimball	.106	500	1564-P	3.9423 dpm/mL	12/19/2019	12/19/2020
08/06/2018	Christina Kimball	.106	500	1564-P Spike	3.9423 dpm/mL	12/19/2019	12/19/2020
12/13/2018	Tim Chandler	2.6502	1000	1564-Q	49.2824 dpm/mL	12/13/2018	12/13/2019
01/08/2019	Christina Kimball	.29	250	1564-R	21.571 dpm/mL	01/08/2019	01/08/2020
01/08/2019	Christina Kimball	.29	250	1564-R Spike	21.571 dpm/mL	01/08/2019	01/08/2020
10/01/2019	Tim Chandler	2.6957	1000	1564-S	50.1285 dpm/mL	10/01/2019	10/01/2020
12/18/2019	Christina Kimball	.307	250	1564-T	22.83554 dpm/mL	12/19/2019	12/19/2020
12/18/2019	Christina Kimball	.307	250	1564-T Spike	22.83554 dpm/mL	12/19/2019	12/19/2020
03/31/2020	Tim Chandler	2.6645	1000	1564-U	49.5483 dpm/mL	03/31/2020	03/31/2021
08/14/2020	Christina Kimball	.111	500	1564-V	4.1282 dpm/mL	08/14/2020	08/14/2021

08/14/2020	Christina Kimball	.111	500	1564-V Spike	4.1282 dpm/mL	08/14/2020	08/14/2021
10/13/2020	Tim Chandler	2.6983	1000	1564-W	50.1768 dpm/mL	10/13/2020	10/13/2021
11/04/2020	Christina Kimball	.315	250	1564-X	23.4306 dpm/mL	11/04/2020	11/04/2021
11/04/2020	Christina Kimball	.315	250	1564-X Spike	23.4306 dpm/mL	11/04/2020	11/04/2021
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Y	51.32232 dpm/mL	03/19/2021	03/19/2022
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Z	51.32232 dpm/mL	03/20/2021	03/20/2022

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-232 Standard 1564-EE

v1.2

Analyst	MXS2
Verification Prep Date	9/21/2022

Tracer Information	
Isotope	U-238
Serial Number	1600-M
Amount of Std. (mL)	0.2
Expiration Date	1/21/2023

Standard Information	
Isotope	U-232
Serial Number	1564-EE
Isotope Halflife	68.9000 Y
Reference Date	9/12/2011
Ref. Act. (dpm/mL)	50.0169
Amount of Std. (mL)	0.2
Standard Prep Date	9/21/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	9/22/2022	4.030	44.73
2	9/22/2022	3.960	43.96
3	9/22/2022	3.920	43.51

Mean Value = 3.970 44.067
Stdev = 0.055677644 0.618021844

Certificate Value* = 4.0330 pCi
Two sigma = 0.1114
10 % of Mean = 0.3970
Rule A (Pass/Fail) Pass
% Recovery 98.44%
Rule B (Pass/Fail) Pass
Expiration Date 9/21/2023

dpm/mL
44.7658
1.2360
4.4067
Pass
98.44%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-232 standard 1564-EE using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-238 standard 1600-M and was diluted in a centrifuge tube containing 20 mL of 0.1M HCL diluted to 40 mL with DI water. 0.1 mL of neodymium carrier, 0.5 mL of titanium (III) chloride, and 5 mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-232 were calculated by comparison to U-238 certified values.

9/20/22

15 Apr 3/24/12
1600

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide: U-238 (Nat)
Half-life: (4.468 ± 0.005)E+09 years
Catalog No.: 7338
Source No.: 1577-71-2

Customer: GENERAL ENGINEERING LABS.
P.O. No.: 936823 RD
Reference Date: 15-Apr-12 12:00 PST
Contained Radioactivity: 1.023 µCi 37.85 kBq
(Total Uranium)

Physical Description:

A. Mass of solution: 7.05210 g in 10 mL flame-sealed ampoule
B. Chemical form: $\text{UO}_2(\text{NO}_3)_2$ in dilute HNO_3
C. Carrier content: None
D. Density: Approximately 1.41 g/mL @ 20°C

Radioimpurities:

See Technical Data Sheet

Radionuclide Concentration: 0.1451 µCi/g, 5.369 kBq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.


Quality Control

21-Mar-12
Date

EZIP Ref. No.: 1577-71

RC-S-065-030a

ISO 9001 CERTIFIED

Medical Imaging Laboratory

24937 Avenue Tibbitts Valencia, California 91355

Industrial Gauging Laboratory

1800 North Keystone Street Burbank, California 91504

U-238 Natural Technical Data

The U-238 Natural used to prepare your order was taken from Eckert & Ziegler Isotope Products Lot #4550102. It had the following composition as of 9 Feb 10:

<u>Nuclide</u>	<u>Atom %</u>	<u>Activity %</u>
U-234	0.0055	49.086
U-235	0.7200	2.241
U-238	99.274	48.673

Isotopic composition provided by New Brunswick Laboratory.

If you have any question, please contact Eckert & Ziegler Isotope Products Technical Service: (661) 309-1010

Standard Logbook

Serial ID: 1600 **Open/Reference Date:** 15 APR 2012 **Aliquot :** 7.0521 g
Name: Uranium-238 **Received:** 24 MAR 2012 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 26 MAR 2015 **Logbook Num :** RC-S-065-030
Employee: Ashley Drochter **Lot Number :** 4550102
Supplier: Eckert & Ziegler **Solvent :** UO₂(NO₃)₂ in dilute HNO₃
Uncertainty : 1.17 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-238	18.42 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1600
Prepared By:	Ashley Drochter
Carrier Conc:	UO ₂ (NO ₃) ₂ in dilute HNO ₃
Reference Date:	04/15/2012
Ampoule Mass (g):	7.0521 g
Uncertainty:	+/- 1.17 %
LogBook No:	RC-S-065-030
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-238		
Prepared By:	Ashley Drochter		
Prep Date:	09/04/2012		
Verification Date:	05/20/2022		
Expiration Date:	05/20/2023		
Primary Code:	1600-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	6.8204 g		
Density(g/mL):	1.0789	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (7.0521 \text{ g} * 100 \text{ mL}) = 10688.8814 \text{ dpm/mL}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0789 \text{ g/mL}) / (7.0521 \text{ g} * 100 \text{ mL}) = 9907.0626 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
09/04/2012	Ashley Drochter	1.4579	500	1600-B	28.8913 dpm/mL	09/04/2012	09/04/2013
09/11/2012	Ashley Drochter	3.0288	500	1600-C	60.0219 dpm/mL	09/04/2013	09/04/2014
03/27/2014	Tim Chandler	3.0445	500	1600-D	60.3241 dpm/mL	03/18/2015	03/18/2016
07/24/2015	Tim Chandler	3.0177	500	1600-E	59.7931 dpm/mL	07/10/2017	07/10/2018
02/16/2017	Tim Chandler	3.0261	500	1600-F	59.9595 dpm/mL	02/06/2018	02/06/2019
10/10/2017	Christina Kimball	.539	250	1600-G	21.3596 dpm/mL	07/21/2022	07/21/2023

04/02/2018	Tim Chandler	3.0544	500	1600-H	60.5203 dpm/mL	03/29/2019	03/29/2020
06/21/2019	Tim Chandler	3.0536	500	1600-I	60.5044 dpm/mL	06/21/2019	06/21/2020
01/30/2020	Tim Chandler	3.0563	500	1600-J	60.5579 dpm/mL	01/26/2021	01/26/2022
03/13/2020	Christina Kimball	.01222	500	1600-K	.24207 dpm/mL	03/15/2022	03/15/2023
04/23/2021	Tim Chandler	3.0507	500	1600-L	60.4469 dpm/mL	04/26/2021	04/26/2022
01/21/2022	Matelon DeFreese	3.1075	500	1600-M	61.5723941 dpm/mL	01/21/2022	01/21/2023
05/19/2022	Christina Kimball	.01275	500	1600-N	.2527 dpm/mL	05/20/2022	05/20/2023
09/06/2022	Matelon DeFreese	3.1499	500	1600-O	62.412513 dpm/mL	09/06/2022	09/06/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-238 Standard 1600-O

v1.2

Analyst	MXS2
Verification Prep Date	9/6/2022

Tracer Information	
Isotope	U-232
Serial Number	1564-DD
Amount of Std. (mL)	0.2
Expiration Date	4/13/2023

Standard Information	
Isotope	U-238
Serial Number	1600-O
Isotope Half-life	4.4680E+09 Y
Reference Date	4/15/2012
Ref. Act. (dpm/mL)	62.412513
Amount of Std. (mL)	0.2
Standard Prep Date	9/6/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	9/6/2022	5.560	61.72
2	9/6/2022	5.840	64.82
3	9/6/2022	5.440	60.38

Mean Value = 5.613 62.308
Stdev = 0.205264058 2.278431039

Certificate Value* = pCi 5.6227
Two sigma = 0.4105
10 % of Mean = 0.5613
Rule A (Pass/Fail) Pass
% Recovery 99.83%
Rule B (Pass/Fail) Pass
Expiration Date 9/6/2023

dpm/mL
62.4125
4.5569
6.2308
Pass
99.83%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-238 standard 1600-O using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-232 standard 1564-DD and was diluted in a centrifuge tube containing 15 mL of 0.1M HCl, diluted to 40 mL with DI water. 0.1 mL of neodymium carrier, 0.5 mL of titanium (III) chloride, and 5 mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-238 were calculated by comparison to U-232 certified values.

for 9/7/22

Runlogs

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2333132

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
597531002	SAMPLE	BV1	1219	NOV-03-22 10:13:05	DONE		20-OCT-22 11:20
597531003	SAMPLE	BV1	1220	NOV-03-22 10:13:07	DONE		20-OCT-22 11:20
597533001	SAMPLE	BV1	1222	NOV-03-22 10:13:09	DONE		20-OCT-22 12:25
597533002	SAMPLE	BV1	1223	NOV-03-22 10:13:10	DONE		20-OCT-22 11:33
597533003	SAMPLE	BV1	1225	NOV-03-22 10:13:14	DONE		20-OCT-22 11:41
597533004	SAMPLE	BV1	1226	NOV-03-22 10:13:16	DONE		20-OCT-22 12:25
597533005	SAMPLE	BV1	1229	NOV-03-22 10:13:18	DONE		20-OCT-22 12:25
1205225991	MB	BV1	1230	NOV-03-22 10:13:19	DONE		20-OCT-22 12:27
1205225993	LCSD	BV1	1239	NOV-03-22 10:20:05	DONE		21-OCT-22 12:36
1205225992	LCS	BV1	1234	NOV-03-22 10:20:08	DONE		21-OCT-22 12:09
597531001	SAMPLE	BV1	1215	NOV-05-22 14:56:48	DONE		20-OCT-22 12:24

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2333138

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205226000	LCSD	BV1	1213	NOV-03-22 10:12:56	DONE		20-OCT-22 11:24
597531001	SAMPLE	BV1	1089	NOV-03-22 10:26:51	DONE		13-OCT-22 14:30
597531002	SAMPLE	BV1	1090	NOV-03-22 10:26:51	DONE		13-OCT-22 14:30
597531003	SAMPLE	BV1	1092	NOV-03-22 10:26:51	DONE		13-OCT-22 11:06
597533001	SAMPLE	BV1	1093	NOV-03-22 10:26:51	DONE		13-OCT-22 11:06
597533002	SAMPLE	BV1	1095	NOV-03-22 10:26:52	DONE		13-OCT-22 11:14
597533003	SAMPLE	BV1	1096	NOV-03-22 10:26:52	DONE		13-OCT-22 11:14
597533004	SAMPLE	BV1	1097	NOV-03-22 10:26:52	DONE		13-OCT-22 11:15
597533005	SAMPLE	BV1	1098	NOV-03-22 10:26:52	DONE		13-OCT-22 11:15
1205225998	MB	BV1	1099	NOV-03-22 10:26:52	DONE		13-OCT-22 11:15
1205225999	LCS	BV1	1100	NOV-03-22 10:26:52	DONE		13-OCT-22 11:15

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2333141

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
597531001	SAMPLE	BV1	1002	NOV-03-22 08:50:14	DONE		02-NOV-22 12:09
597531002	SAMPLE	BV1	1003	NOV-03-22 08:50:14	DONE		02-NOV-22 12:09
597531003	SAMPLE	BV1	1004	NOV-03-22 08:50:14	DONE		02-NOV-22 12:09
597533001	SAMPLE	BV1	1005	NOV-03-22 08:50:14	DONE		02-NOV-22 12:09
597533003	SAMPLE	BV1	1007	NOV-03-22 08:50:15	DONE		02-NOV-22 12:10
597533004	SAMPLE	BV1	1008	NOV-03-22 08:50:15	DONE		02-NOV-22 12:10
597533005	SAMPLE	BV1	1009	NOV-03-22 08:50:15	DONE		02-NOV-22 12:10
1205226004	MB	BV1	1010	NOV-03-22 08:50:15	DONE		02-NOV-22 12:10
1205226005	LCS	BV1	1011	NOV-03-22 08:50:15	DONE		02-NOV-22 12:10
1205226006	LCSD	BV1	1012	NOV-03-22 08:50:15	DONE		02-NOV-22 12:11
597533002	SAMPLE	BV1	1113	NOV-03-22 09:35:17	DONE		14-OCT-22 11:26

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2333142

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
597531001	SAMPLE	MP2	1037	NOV-03-22 12:02:40	DONE		03-NOV-22 11:32
597531002	SAMPLE	MP2	1038	NOV-03-22 12:02:40	DONE		03-NOV-22 11:32
597531003	SAMPLE	MP2	1039	NOV-03-22 12:02:40	DONE		03-NOV-22 11:32
597533001	SAMPLE	MP2	1040	NOV-03-22 12:02:40	DONE		03-NOV-22 11:32
597533002	SAMPLE	MP2	1041	NOV-03-22 12:02:40	DONE		03-NOV-22 11:32
597533004	SAMPLE	MP2	1043	NOV-03-22 12:02:41	DONE		03-NOV-22 11:33
1205226007	MB	MP2	1045	NOV-03-22 12:02:41	DONE		03-NOV-22 11:33
1205226008	LCS	MP2	1047	NOV-03-22 12:02:41	DONE		03-NOV-22 11:33
1205226009	LCSD	MP2	1048	NOV-03-22 12:02:41	DONE		03-NOV-22 11:33
597533003	SAMPLE	MP2	1031	NOV-05-22 15:19:43	DONE		03-NOV-22 11:31
597533005	SAMPLE	MP2	1033	NOV-05-22 15:19:43	DONE		03-NOV-22 11:31

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2333147

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
597531001	SAMPLE	BV1	1121	NOV-04-22 08:35:00	DONE		14-OCT-22 11:59
597531002	SAMPLE	BV1	1122	NOV-04-22 08:35:02	DONE		14-OCT-22 11:27
597533001	SAMPLE	BV1	1124	NOV-04-22 08:35:07	DONE		14-OCT-22 12:26
597533002	SAMPLE	BV1	1139	NOV-04-22 08:35:11	DONE		17-OCT-22 09:40
597533004	SAMPLE	BV1	1141	NOV-04-22 08:35:15	DONE		17-OCT-22 09:40
597533003	SAMPLE	BV1	1140	NOV-04-22 08:35:20	DONE		17-OCT-22 09:40
597533005	SAMPLE	BV1	1213	NOV-04-22 08:41:19	DONE		20-OCT-22 11:24
1205226018	MB	BV1	1215	NOV-04-22 08:41:21	DONE		20-OCT-22 12:24
1205226019	LCS	BV1	1217	NOV-04-22 08:41:24	DONE		20-OCT-22 12:26
1205226020	LCSD	BV1	1218	NOV-04-22 08:41:25	DONE		20-OCT-22 12:24
597531003	SAMPLE	BV1	1213	NOV-05-22 10:14:25	DONE		20-OCT-22 11:24

Gamma Spectroscopy Raw Data

Batch 2333342 Check-list

This check-list was completed on 01-NOV-22 by Tim Winters

This batch was reviewed by Spencer Collins on 01-NOV-22 and Tim Winters on 01-NOV-22.

Batch ID: 2333342

Product: GSCGAMMF

Description: Gamma Spec Filter RAD A-013

#	Criteria	Yes	No	Comments
Preparation Information				
1	Did any sample(s) require dilution?		No	
2	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
3	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
4	Are instrument source checks within limits?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were any additional radionuclides added that were not requested by the client?		No	
7	Were all the samples prepared/analyzed within the required holding time period?	Yes		
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Gamma Spectroscopy

Batch ID: 2333342
Analyst: Rebekah Futch (RXF2)
Method: DOE HASL 300, 4.5.2.3/Ga-01-R
Lab SOP: GL-RAD-A-013 REV# 27
Instrument: No instrument-manual method

Due Dates for Lab: 02-NOV-2022 **Package:** 03-NOV-2022 **SDG:** 03-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205226446	78962-278	1298	1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	597531001	31-OCT-2022	20	200	0.73727
2	597531002	31-OCT-2022	20	200	0.74152
3	597531003	31-OCT-2022	20	200	0.75582
4	597533001	31-OCT-2022	20	200	0.77722
5	597533002	31-OCT-2022	20	200	0.77221
6	597533003	31-OCT-2022	20	200	0.75777
7	597533004	31-OCT-2022	20	200	0.76168
8	597533005	31-OCT-2022	20	200	0.75717
9	1205226444 MB	31-OCT-2022	20		0.77722
10	1205226445 DUP (597531001)	31-OCT-2022	20	200	0.73727
11	1205226446 LCS	31-OCT-2022	20		0.77722

Reagent/Solvent Lot ID	Description	Amount	Comments:
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VAX/VMS Nuclide Identification Report Generated 31-OCT-2022 10:16:13.79

```
*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531001.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM03.CNF;650
Background date    : 30-OCT-2022 10:39:18
Sample date       : 26-SEP-2022 08:18:00 Acquisition date : 31-OCT-2022 08:15:23
Sample ID        : G597531001 Sample quantity : 7.37270E-01 FILTER
Detector name     : GAM03 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:00.47 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : RXF2
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2333342 Detector SN# :
Matrix Spike ID   : LCS ID :
*****
```

BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	110.54	21	120	1.37	220.57	214	12	2.92E-03	106.6	
2	2	128.75	36	47	1.39	256.97	251	24	5.05E-03	35.7	1.57E+00
3	2	131.53	32	52	1.59	262.55	251	24	4.44E-03	48.4	
4	2	134.75	26	45	1.60	268.97	251	24	3.58E-03	59.7	
5	0	139.46	22	34	1.40	278.40	275	7	3.06E-03	48.5	
6	0	143.65*	22	63	1.64	286.78	282	10	3.00E-03	80.3	
7	0	185.75*	1	72	1.09	370.97	366	9	1.89E-04	*****	
8	1	238.92*	12	50	1.63	477.30	473	15	1.64E-03	135.2	7.97E-01
9	1	241.77	26	61	1.48	483.00	473	15	3.58E-03	58.0	
10	0	300.50	14	28	0.93	600.45	597	6	1.91E-03	66.8	
11	0	353.42*	12	48	3.51	706.29	696	15	1.73E-03	133.6	
12	0	369.12	24	39	4.37	737.68	730	14	3.38E-03	57.8	
13	0	511.17*	5	53	1.58	1021.79	1014	17	6.31E-04	474.0	
14	0	531.16	10	15	2.84	1061.77	1054	10	1.43E-03	76.9	
15	0	749.23	11	3	1.73	1497.97	1494	7	1.48E-03	42.2	
16	0	795.18	16	2	0.83	1589.90	1585	10	2.18E-03	31.3	
17	0	804.28	9	12	0.88	1608.09	1601	11	1.26E-03	84.5	
18	0	809.30	18	7	2.21	1618.14	1612	13	2.43E-03	38.4	
19	0	883.12	10	9	3.33	1765.82	1756	14	1.37E-03	75.9	
20	0	969.86	20	5	1.74	1939.34	1933	12	2.72E-03	33.5	
21	0	1002.52*	1	12	0.86	2004.68	1995	12	1.80E-04	636.2	
22	0	1075.91	12	7	5.06	2151.52	2146	13	1.65E-03	53.3	
23	0	1121.27	18	9	2.34	2242.29	2233	17	2.43E-03	45.0	
24	0	1148.16	6	3	0.67	2296.08	2291	8	7.72E-04	74.2	
25	0	1353.19	9	7	0.50	2706.33	2697	14	1.25E-03	70.7	
26	0	1461.82*	9	4	2.98	2923.71	2913	15	1.26E-03	68.8	
27	0	1526.74	4	5	0.59	3053.63	3046	10	5.56E-04	115.9	
28	0	1554.53	8	0	1.38	3109.25	3105	8	1.11E-03	35.4	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 31-OCT-2022 10:16:18

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531001.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 26-SEP-2022 08:18:00	Acquisition date	: 31-OCT-2022 08:15:23
Sample ID	: G597531001	Sample quantity	: 0.73727 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA3	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.47 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	9	10.66*	8.156E-01	5.318E+01	5.318E+01	137.58
CO-58	810.76	18	99.45*	1.348E+00	6.647E+00	9.364E+00	76.77
GE-68	1077.34	12	3.22*	1.054E+00	1.785E+02	1.952E+02	106.51
RB-86	1077.00	12	8.64*	1.054E+00	6.651E+01	2.448E+02	106.51
TE-125M	109.28	21	0.27*	4.014E+00	9.865E+02	1.506E+03	213.17
CE-144	80.12	-----	1.36	2.720E+00	-----	Line Not Found	-----
	133.52	26	11.09*	4.196E+00	2.818E+01	3.069E+01	119.35
RA-224	240.99	26	4.10*	3.270E+00	9.779E+01	1.013E+02	115.91
RA-226	186.21	1	3.59*	3.813E+00	5.054E+00	5.054E+00	2881.34
PA-231	283.69	-----	1.70	2.940E+00	-----	Line Not Found	-----
	301.36	14	5.35*	2.826E+00	4.638E+01	4.638E+01	133.67
U-235	143.76	22	10.96*	4.171E+00	2.405E+01	2.405E+01	160.58
	163.33	-----	5.08	4.031E+00	-----	Line Not Found	-----
	185.72	1	57.20	3.813E+00	3.172E-01	3.172E-01	2881.34
	205.31	-----	5.01	3.614E+00	-----	Line Not Found	-----
ANH-511	511.00	5	100.00*	1.937E+00	1.194E+00	1.194E+00	948.09

Flag: "*" = Keyline


```

*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                     *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531001.CNF;1  *
* Acquisition date   : 31-OCT-2022 08:15:23 Sensitivity      : 3.000          *
* Detector ID        : GAM03 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 02:00:00.47 Half life ratio : *****          *
* Sample date        : 26-SEP-2022 08:18:00 Analyst initials: RXF2       *
* Sample ID          : G597531001 Sample Quantity : 7.3727E-01 FILTER *
* Batch Number       : 2333342 Wet Weight : 0.00000         *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                     *
* Eff. Cal. date     : 20-APR-2022 11:51:08 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
K-40	5.318E+01	7.170E+01	7.572E+01
CO-58	9.364E+00	7.045E+00	1.095E+01
GE-68	1.952E+02	2.038E+02	3.124E+02
RB-86	2.448E+02	2.555E+02	3.568E+02
TE-125M	1.506E+03	3.147E+03	2.530E+03
CE-144	3.069E+01	3.589E+01	3.807E+01
RA-224	1.013E+02	1.150E+02	1.310E+02
RA-226	5.054E+00	1.427E+02	1.349E+02
PA-231	4.638E+01	6.076E+01	1.182E+02
U-235	2.405E+01	3.784E+01	3.690E+01
ANH-511	1.194E+00	1.110E+01	5.458E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	3.797E+01		5.754E+01	1.117E+02	NOT IDENT.
NA-22	-2.392E+00		3.876E+00	7.000E+00	NOT IDENT.
NA-24	0.000E+00		2.549E+17	0.000E+00	SHORT HLIF
AL-26	-4.645E+00		4.553E+00	6.474E+00	NOT IDENT.
SC-46	-1.524E-01		4.367E+00	8.681E+00	FAIL ABUN
V-48	-4.516E+00		1.786E+01	3.320E+01	NOT IDENT.
CR-51	1.171E+00		7.905E+01	1.435E+02	NOT IDENT.
MN-52	9.329E+01		3.619E+02	7.787E+02	NOT IDENT.
MN-54	1.280E+00		4.479E+00	9.000E+00	NOT IDENT.
CO-56	-1.580E+00		6.348E+00	1.160E+01	NOT IDENT.
CO-57	1.954E-01		3.291E+00	5.806E+00	NOT IDENT.
NI-57	0.000E+00		7.314E+07	0.000E+00	SHORT HLIF
FE-59	3.569E+00		1.191E+01	2.505E+01	NOT IDENT.
CO-60	3.954E-01		5.239E+00	1.065E+01	NOT IDENT.
ZN-65	2.727E-02		9.478E+00	1.646E+01	NOT IDENT.
CU-67	0.000E+00		1.307E+05	0.000E+00	SHORT HLIF
AS-73	1.131E+02		2.108E+02	3.910E+02	NOT IDENT.
AS-74	-8.839E-01		2.653E+01	5.048E+01	NOT IDENT.
SE-75	-1.638E+00		5.724E+00	1.019E+01	FAIL ABUN

BR-77	0.000E+00	5.753E+05	0.000E+00	SHORT HLIF
SR-82	-6.599E+00	6.854E+01	1.302E+02	NOT IDENT.
RB-83	8.241E+00	9.415E+00	2.028E+01	NOT IDENT.
RB-84	2.021E+00	1.205E+01	2.407E+01	NOT IDENT.
KR-85	2.123E+03	1.100E+03	2.283E+03	NOT IDENT.
SR-85	1.375E+01	7.122E+00	1.478E+01	NOT IDENT.
Y-88	-1.511E+00	2.894E+00	5.274E+00	NOT IDENT.
Y-91	1.534E+03	2.246E+03	5.288E+03	NOT IDENT.
NB-94	1.253E+00	4.267E+00	8.435E+00	NOT IDENT.
NB-95	2.347E+00	5.491E+00	1.136E+01	NOT IDENT.
NB-95M	-5.682E+00	1.700E+01	2.676E+01	NOT IDENT.
TC-95M	-4.507E+00	6.799E+00	1.071E+01	NOT IDENT.
ZR-95	1.074E+00	1.006E+01	1.986E+01	NOT IDENT.
MO-99	0.000E+00	1.927E+05	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	9.509E+40	0.000E+00	SHORT HLIF
RH-101	1.766E+00	3.579E+00	6.427E+00	NOT IDENT.
RH-102M	-3.649E+00	4.020E+00	6.271E+00	NOT IDENT.
RU-103	1.836E+00	6.088E+00	1.241E+01	NOT IDENT.
RH-106	-4.448E+01	3.618E+01	5.668E+01	NOT IDENT.
RU-106	-4.448E+01	3.618E+01	5.668E+01	NOT IDENT.
AG-108M	-2.674E+00	3.746E+00	6.093E+00	NOT IDENT.
CD-109	7.578E+01	8.922E+01	1.677E+02	NOT IDENT.
AG-110	-5.351E+01	9.380E+01	1.661E+02	NOT IDENT.
AG-110M	2.072E+00	5.539E+00	1.075E+01	NOT IDENT.
IN-111	0.000E+00	1.812E+04	0.000E+00	SHORT HLIF
SN-113	2.083E+00	5.396E+00	1.048E+01	NOT IDENT.
IN-114M	-3.160E+00	2.829E+01	4.928E+01	NOT IDENT.
CD-115	0.000E+00	6.066E+05	0.000E+00	SHORT HLIF
SN-117M	-8.428E+00	1.742E+01	2.841E+01	NOT IDENT.
SB-122	0.000E+00	3.568E+04	0.000E+00	SHORT HLIF
I-123	0.000E+00	4.243E+19	0.000E+00	SHORT HLIF
TE-123M	-2.392E+00	3.660E+00	5.853E+00	NOT IDENT.
SB-124	-3.674E-01	1.205E+01	2.581E+01	NOT IDENT.
SB-125	-1.694E+01	1.345E+01	1.868E+01	NOT IDENT.
I-126	1.000E+01	7.821E+01	1.527E+02	NOT IDENT.
SB-126	-1.138E+01	4.752E+01	8.905E+01	NOT IDENT.
SN-126	6.627E+00	8.582E+00	1.601E+01	NOT IDENT.
SB-127	9.954E+02	4.965E+03	1.005E+04	NOT IDENT.
TE-129	-4.370E+01	1.009E+02	1.704E+02	NOT IDENT.
I-131	-5.922E+00	8.106E+01	1.309E+02	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	5.956E+03	0.000E+00	SHORT HLIF
BA-133	-9.648E-01	5.680E+00	8.957E+00	NOT IDENT.
I-133	0.000E+00	7.138E+12	0.000E+00	SHORT HLIF
CS-134	7.071E+00	4.341E+00	9.658E+00	FAIL ABUN
I-135	0.000E+00	4.244E+39	0.000E+00	SHORT HLIF
CS-136	-6.381E+00	2.973E+01	5.610E+01	NOT IDENT.
BA-137M	2.073E+00	4.586E+00	9.243E+00	NOT IDENT.
CS-137	2.190E+00	4.845E+00	9.764E+00	NOT IDENT.
LA-138	-4.865E+00	8.105E+00	1.438E+01	NOT IDENT.
CE-139	-2.749E-01	3.845E+00	7.063E+00	NOT IDENT.
BA-140	8.615E+01	1.049E+02	2.185E+02	NOT IDENT.
LA-140	-9.267E+00	2.590E+01	5.043E+01	NOT IDENT.
CE-141	-7.509E+00	1.280E+01	1.914E+01	NOT IDENT.
CE-143	0.000E+00	3.339E+08	0.000E+00	SHORT HLIF
PM-144	-1.835E-01	4.513E+00	8.564E+00	NOT IDENT.
PR-144	-1.388E+01	3.413E+02	6.476E+02	NOT IDENT.
PM-146	-2.228E+00	5.605E+00	9.543E+00	NOT IDENT.
ND-147	1.939E+02	2.922E+02	4.613E+02	FAIL ABUN
PM-147	-9.626E+03	9.141E+04	1.589E+05	NOT IDENT.
PM-149	0.000E+00	5.477E+06	0.000E+00	SHORT HLIF
EU-152	-1.920E+00	1.089E+01	1.952E+01	FAIL ABUN
GD-153	-3.820E+00	1.336E+01	2.140E+01	NOT IDENT.
EU-154	-6.970E+00	1.080E+01	1.933E+01	NOT IDENT.
EU-155	-5.049E+00	1.404E+01	2.158E+01	NOT IDENT.
TB-160	-2.945E+00	1.992E+01	3.282E+01	NOT IDENT.
HO-166M	2.236E+00	6.105E+00	1.272E+01	FAIL ABUN
TM-171	5.731E+01	3.848E+03	6.801E+03	NOT IDENT.
LU-176	1.988E+00	3.246E+00	6.301E+00	NOT IDENT.
LU-177	-3.063E+02	1.033E+03	1.845E+03	NOT IDENT.
HF-181	4.578E-01	8.691E+00	1.562E+01	FAIL ABUN
W-181	4.554E-01	4.246E+01	7.450E+01	NOT IDENT.
TA-182	3.085E+00	1.889E+01	4.028E+01	FAIL ABUN
RE-183	5.780E+00	4.474E+01	7.935E+01	NOT IDENT.
RE-184	-7.240E-01	1.837E+01	3.608E+01	NOT IDENT.
RE-188	2.272E+01	2.239E+01	4.482E+01	NOT IDENT.
W-188	-1.880E+02	1.133E+03	2.021E+03	NOT IDENT.
OS-191	8.071E+01	5.653E+01	9.006E+01	FAIL ABUN

IR-192	-6.274E-01	5.344E+00	9.580E+00	NOT IDENT.
PB-201	0.000E+00	5.401E+27	0.000E+00	SHORT HLIF
TL-201	0.000E+00	7.320E+04	0.000E+00	SHORT HLIF
TL-202	5.363E+00	2.604E+01	4.860E+01	NOT IDENT.
HG-203	4.208E+00	5.787E+00	1.142E+01	NOT IDENT.
PB-203	0.000E+00	2.603E+05	0.000E+00	SHORT HLIF
TL-204	3.269E+02	6.858E+02	1.244E+03	NOT IDENT.
BI-207	2.630E+00	5.648E+00	1.198E+01	NOT IDENT.
TL-208	2.797E+00	5.362E+00	1.075E+01	NOT IDENT.
PB-210	6.217E+02	9.312E+02	1.754E+03	NOT IDENT.
BI-211	1.123E+01	2.949E+01	5.319E+01	NOT IDENT.
PB-211	-1.556E+01	9.016E+01	1.595E+02	NOT IDENT.
BI-212	5.916E+01	5.606E+01	1.256E+02	NOT IDENT.
PB-212	4.341E+00	1.151E+01	1.686E+01	FAIL ABUN
BI-213	-9.925E-01	1.320E+01	2.364E+01	NOT IDENT.
BI-214	8.481E-01	1.241E+01	2.065E+01	FAIL ABUN
PB-214	7.068E+00	1.850E+01	1.893E+01	FAIL ABUN
RN-219	3.395E+00	5.084E+01	9.286E+01	NOT IDENT.
FR-221	4.111E+00	2.366E+01	4.419E+01	NOT IDENT.
RA-223	1.238E+01	8.842E+01	1.614E+02	FAIL ABUN
AC-225	4.663E+01	2.685E+02	5.013E+02	NOT IDENT.
AC-227	1.289E+01	3.099E+01	5.884E+01	FAIL ABUN
TH-227	1.289E+01	3.099E+01	5.884E+01	FAIL ABUN
AC-228	-6.689E+00	1.784E+01	3.431E+01	FAIL ABUN
RA-228	-6.689E+00	1.784E+01	3.431E+01	FAIL ABUN
TH-228	4.341E+00	1.151E+01	1.686E+01	FAIL ABUN
TH-229	-9.573E+00	5.994E+01	1.088E+02	NOT IDENT.
TH-230	3.619E+02	1.621E+03	2.873E+03	NOT IDENT.
TH-231	4.966E+01	5.981E+01	1.061E+02	NOT IDENT.
TH-232	5.840E+01	3.827E+03	6.035E+03	FAIL ABUN
PA-233	9.542E-01	7.535E+00	1.400E+01	FAIL ABUN
PA-234	1.559E+01	3.284E+01	6.955E+01	FAIL ABUN
PA-234M	7.023E+01	8.758E+02	1.243E+03	FAIL ABUN
TH-234	-1.909E+02	2.815E+02	4.164E+02	NOT IDENT.
U-234	7.331E+03	1.337E+04	2.490E+04	NOT IDENT.
NP-237	9.542E-01	7.535E+00	1.400E+01	FAIL ABUN
NP-238	0.000E+00	1.319E+06	0.000E+00	SHORT HLIF
U-238	-1.909E+02	2.815E+02	4.164E+02	NOT IDENT.
NP-239	-1.913E+01	2.601E+01	4.607E+01	NOT IDENT.
AM-241	1.189E+01	2.569E+01	4.724E+01	NOT IDENT.
AM-242	-1.145E+02	8.858E+01	1.410E+02	NOT IDENT.
AM-243	-4.716E-01	8.206E+00	1.341E+01	NOT IDENT.
CM-243	-3.739E+00	1.201E+01	2.216E+01	NOT IDENT.
BK-247	-3.382E+00	9.099E+00	1.604E+01	NOT IDENT.
CM-247	2.396E+00	4.455E+00	8.658E+00	NOT IDENT.
CF-249	-3.765E+00	4.362E+00	6.965E+00	NOT IDENT.
CF-251	-4.734E+00	1.306E+01	2.351E+01	NOT IDENT.
CF-252	-1.321E+04	2.147E+04	3.858E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.98	37	87	0.96	127.47	121	10	5.07E-03	50.7	
2	0	93.01	156	120	1.34	185.52	179	13	2.17E-02	16.5	
3	0	110.54	21	120	1.37	220.57	214	12	2.92E-03	106.6	
4	2	128.75	36	47	1.39	256.97	251	24	5.05E-03	35.7	1.57E+00
5	2	131.53	32	52	1.59	262.55	251	24	4.44E-03	48.4	
6	2	134.75	26	45	1.60	268.97	251	24	3.58E-03	59.7	
7	0	139.46	22	34	1.40	278.40	275	7	3.06E-03	48.5	
8	0	143.65	42	63	1.64	286.78	282	10	5.84E-03	38.4	
9	0	185.75	99	72	1.09	370.97	366	9	1.37E-02	18.4	
10	1	238.92	58	50	1.63	477.30	473	15	8.04E-03	24.7	7.97E-01
11	1	241.77	26	61	1.48	483.00	473	15	3.58E-03	58.0	
12	0	300.50	14	28	0.93	600.45	597	6	1.91E-03	66.8	
13	0	353.42	26	48	3.51	706.29	696	15	3.64E-03	61.2	
14	0	369.12	24	39	4.37	737.68	730	14	3.38E-03	57.8	
15	0	511.17	146	53	1.58	1021.79	1014	17	2.03E-02	13.9	
16	0	531.16	10	15	2.84	1061.77	1054	10	1.43E-03	76.9	
17	0	749.23	11	3	1.73	1497.97	1494	7	1.48E-03	42.2	
18	0	795.18	16	2	0.83	1589.90	1585	10	2.18E-03	31.3	
19	0	804.28	9	12	0.88	1608.09	1601	11	1.26E-03	84.5	
20	0	809.30	18	7	2.21	1618.14	1612	13	2.43E-03	38.4	
21	0	883.12	10	9	3.33	1765.82	1756	14	1.37E-03	75.9	
22	0	969.86	20	5	1.74	1939.34	1933	12	2.72E-03	33.5	
23	0	1002.52	9	12	0.86	2004.68	1995	12	1.32E-03	79.7	
24	0	1075.91	12	7	5.06	2151.52	2146	13	1.65E-03	53.3	
25	0	1121.27	18	9	2.34	2242.29	2233	17	2.43E-03	45.0	
26	0	1148.16	6	3	0.67	2296.08	2291	8	7.72E-04	74.2	
27	0	1353.19	9	7	0.50	2706.33	2697	14	1.25E-03	70.7	
28	0	1461.82	16	4	2.98	2923.71	2913	15	2.16E-03	37.6	
29	0	1526.74	4	5	0.59	3053.63	3046	10	5.56E-04	115.9	
30	0	1554.53	8	0	1.38	3109.25	3105	8	1.11E-03	35.4	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	9	10.66*	8.156E-01	5.318E+01	5.318E+01	137.58
CO-58	810.76	18	99.45*	1.348E+00	6.647E+00	9.364E+00	76.77
GE-68	1077.34	12	3.22*	1.054E+00	1.785E+02	1.952E+02	106.51
RB-86	1077.00	12	8.64*	1.054E+00	6.651E+01	2.448E+02	106.51
TE-125M	109.28	21	0.27*	4.014E+00	9.865E+02	1.506E+03	213.17
CE-144	80.12	-----	1.36	2.720E+00	-----	Line Not Found	-----
	133.52	26	11.09*	4.196E+00	2.818E+01	3.069E+01	119.35
RA-224	240.99	26	4.10*	3.270E+00	9.779E+01	1.013E+02	115.91
RA-226	186.21	1	3.59*	3.813E+00	5.054E+00	5.054E+00	2881.34
PA-231	283.69	-----	1.70	2.940E+00	-----	Line Not Found	-----
	301.36	14	5.35*	2.826E+00	4.638E+01	4.638E+01	133.67
U-235	143.76	22	10.96*	4.171E+00	2.405E+01	2.405E+01	160.58
	163.33	-----	5.08	4.031E+00	-----	Line Not Found	-----
	185.72	1	57.20	3.813E+00	3.172E-01	3.172E-01	2881.34
	205.31	-----	5.01	3.614E+00	-----	Line Not Found	-----
ANH-511	511.00	5	100.00*	1.937E+00	1.194E+00	1.194E+00	948.09

Flag: "*" = Keyline

Total number of lines in spectrum 28
Number of unidentified lines 7
Number of lines tentatively identified by NID 21 75.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
K-40	1.25E+09Y	1.00	5.318E+01	5.318E+01	7.316E+01	137.58	
CO-58	70.86D	1.41	6.647E+00	9.364E+00	7.189E+00	76.77	
GE-68	270.95D	1.09	1.785E+02	1.952E+02	2.079E+02	106.51	
RB-86	18.64D	3.68	6.651E+01	2.448E+02	2.607E+02	106.51	
TE-125M	57.40D	1.53	9.865E+02	1.506E+03	3.211E+03	213.17	
CE-144	284.91D	1.09	2.818E+01	3.069E+01	3.662E+01	119.35	
RA-224	1.91Y	1.04	9.779E+01	1.013E+02	1.174E+02	115.91	
RA-226	1600.00Y	1.00	5.054E+00	5.054E+00	145.6E+00	2881.34	
PA-231	3.28E+04Y	1.00	4.638E+01	4.638E+01	6.200E+01	133.67	
U-235	7.04E+08Y	1.00	2.405E+01	2.405E+01	3.862E+01	160.58	
ANH-511	1.00E+09Y	1.00	1.194E+00	1.194E+00	11.32E+00	948.09	
Total Activity :			1.494E+03	2.217E+03			

Grand Total Activity : 1.494E+03 2.217E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
2	128.75	36	47	1.39	256.97	251	24	5.05E-03	71.5	4.19E+00	T
2	131.53	32	52	1.59	262.55	251	24	4.44E-03	96.9	4.20E+00	T
0	139.46	22	34	1.40	278.40	275	7	3.06E-03	97.0	4.19E+00	T
1	238.92	12	50	1.63	477.30	473	15	1.64E-03	****	3.29E+00	T
0	353.42	12	48	3.51	706.29	696	15	1.73E-03	****	2.52E+00	T
0	369.12	24	39	4.37	737.68	730	14	3.38E-03	****	2.45E+00	
0	531.16	10	15	2.84	1061.77	1054	10	1.43E-03	****	1.88E+00	T
0	749.23	11	3	1.73	1497.97	1494	7	1.48E-03	84.3	1.44E+00	
0	795.18	16	2	0.83	1589.90	1585	10	2.18E-03	62.6	1.37E+00	T
0	804.28	9	12	0.88	1608.09	1601	11	1.26E-03	****	1.35E+00	
0	883.12	10	9	3.33	1765.82	1756	14	1.37E-03	****	1.25E+00	T
0	969.86	20	5	1.74	1939.34	1933	12	2.72E-03	67.0	1.15E+00	T
0	1002.52	1	12	0.86	2004.68	1995	12	1.80E-04	****	1.12E+00	T
0	1121.27	18	9	2.34	2242.29	2233	17	2.43E-03	90.1	1.02E+00	T
0	1148.16	6	3	0.67	2296.08	2291	8	7.72E-04	****	9.96E-01	
0	1353.19	9	7	0.50	2706.33	2697	14	1.25E-03	****	8.67E-01	
0	1526.74	4	5	0.59	3053.63	3046	10	5.56E-04	****	7.90E-01	
0	1554.53	8	0	1.38	3109.25	3105	8	1.11E-03	70.7	7.80E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531001.CNF;1  *
* Acquisition date   : 31-OCT-2022 08:15:23 Sensitivity      : 3.000          *
* Detector ID        : GAM03 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 02:00:00.47 Half life ratio  : *****          *
* Sample date        : 26-SEP-2022 08:18:00 Nuclide Library : LIQUID         *
* Sample ID          : G597531001 Analyst initials:  RXF2           *
* Batch Number       : 2333342 Sample Quantity  : 7.3727E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight       : 0.00000         *
*                                     Dry Weight    : 0.00000         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 20-APR-2022 11:51:08 Eff. Geometry   : JAR           *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16          *
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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
K-40	2.994E+01
CO-58	4.750E+00
GE-68	1.340E+02
RB-86	1.506E+02
TE-125M	1.168E+03
CE-144	1.743E+01
RA-224	6.020E+01
RA-226	6.246E+01
PA-231	5.455E+01
U-235	1.695E+01
ANH-511	2.374E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	5.074E+01	NOT IDENT.
NA-22	2.724E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.265E+00	NOT IDENT.
SC-46	3.601E+00	FAIL ABUN
V-48	1.384E+01	NOT IDENT.
CR-51	6.559E+01	NOT IDENT.
MN-52	3.253E+02	NOT IDENT.
MN-54	3.934E+00	NOT IDENT.
CO-56	5.077E+00	NOT IDENT.
CO-57	2.693E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
FE-59	1.050E+01	NOT IDENT.
CO-60	4.534E+00	NOT IDENT.
ZN-65	6.760E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
AS-73	1.810E+02	NOT IDENT.
AS-74	2.260E+01	NOT IDENT.
SE-75	4.631E+00	FAIL ABUN
BR-77	0.000E+00	SHORT HLIF

SR-82	5.661E+01	NOT IDENT.
RB-83	9.084E+00	NOT IDENT.
RB-84	1.037E+01	NOT IDENT.
KR-85	1.059E+03	NOT IDENT.
SR-85	6.853E+00	NOT IDENT.
Y-88	1.400E+00	NOT IDENT.
Y-91	2.225E+03	NOT IDENT.
NB-94	3.763E+00	NOT IDENT.
NB-95	4.966E+00	NOT IDENT.
NB-95M	1.216E+01	NOT IDENT.
TC-95M	4.912E+00	NOT IDENT.
ZR-95	8.634E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.968E+00	NOT IDENT.
RH-102M	2.776E+00	NOT IDENT.
RU-103	5.496E+00	NOT IDENT.
RH-106	2.391E+01	NOT IDENT.
RU-106	2.391E+01	NOT IDENT.
AG-108M	2.699E+00	NOT IDENT.
CD-109	7.779E+01	NOT IDENT.
AG-110	7.250E+01	NOT IDENT.
AG-110M	4.538E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	4.682E+00	NOT IDENT.
IN-114M	2.273E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	1.304E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.680E+00	NOT IDENT.
SB-124	9.967E+00	NOT IDENT.
SB-125	8.269E+00	NOT IDENT.
I-126	6.769E+01	NOT IDENT.
SB-126	3.837E+01	NOT IDENT.
SN-126	7.423E+00	NOT IDENT.
SB-127	4.360E+03	NOT IDENT.
TE-129	7.644E+01	NOT IDENT.
I-131	5.845E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	4.036E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	4.222E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	2.300E+01	NOT IDENT.
BA-137M	4.140E+00	NOT IDENT.
CS-137	4.373E+00	NOT IDENT.
LA-138	5.920E+00	NOT IDENT.
CE-139	3.277E+00	NOT IDENT.
BA-140	9.911E+01	NOT IDENT.
LA-140	1.888E+01	NOT IDENT.
CE-141	8.853E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
PM-144	3.798E+00	NOT IDENT.
PR-144	2.872E+02	NOT IDENT.
PM-146	4.266E+00	NOT IDENT.
ND-147	2.052E+02	FAIL ABUN
PM-147	7.352E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.751E+00	FAIL ABUN
GD-153	9.985E+00	NOT IDENT.
EU-154	7.489E+00	NOT IDENT.
EU-155	9.943E+00	NOT IDENT.
TB-160	1.386E+01	NOT IDENT.
HO-166M	5.512E+00	FAIL ABUN
TM-171	3.127E+03	NOT IDENT.
LU-176	2.888E+00	NOT IDENT.
LU-177	8.514E+02	NOT IDENT.
HF-181	7.063E+00	FAIL ABUN
W-181	3.437E+01	NOT IDENT.
TA-182	1.680E+01	FAIL ABUN
RE-183	3.667E+01	NOT IDENT.
RE-184	1.512E+01	NOT IDENT.
RE-188	2.090E+01	NOT IDENT.
W-188	9.271E+02	NOT IDENT.
OS-191	4.205E+01	FAIL ABUN
IR-192	4.367E+00	NOT IDENT.

PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF
TL-202	2.180E+01	NOT IDENT.
HG-203	5.236E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	5.780E+02	NOT IDENT.
BI-207	5.123E+00	NOT IDENT.
TL-208	4.898E+00	NOT IDENT.
PB-210	8.126E+02	NOT IDENT.
BI-211	2.450E+01	NOT IDENT.
PB-211	7.179E+01	NOT IDENT.
BI-212	5.558E+01	NOT IDENT.
PB-212	7.939E+00	FAIL ABUN
BI-213	1.059E+01	NOT IDENT.
BI-214	9.438E+00	FAIL ABUN
PB-214	8.704E+00	FAIL ABUN
RN-219	4.191E+01	NOT IDENT.
FR-221	2.037E+01	NOT IDENT.
RA-223	7.430E+01	FAIL ABUN
AC-225	2.311E+02	NOT IDENT.
AC-227	2.712E+01	FAIL ABUN
TH-227	2.712E+01	FAIL ABUN
AC-228	1.494E+01	FAIL ABUN
RA-228	1.494E+01	FAIL ABUN
TH-228	7.939E+00	FAIL ABUN
TH-229	5.026E+01	NOT IDENT.
TH-230	1.333E+03	NOT IDENT.
TH-231	4.957E+01	NOT IDENT.
TH-232	2.832E+03	FAIL ABUN
PA-233	6.352E+00	FAIL ABUN
PA-234	2.992E+01	FAIL ABUN
PA-234M	5.488E+02	FAIL ABUN
TH-234	1.947E+02	NOT IDENT.
U-234	1.150E+04	NOT IDENT.
NP-237	6.352E+00	FAIL ABUN
NP-238	0.000E+00	SHORT HLIF
U-238	1.947E+02	NOT IDENT.
NP-239	2.093E+01	NOT IDENT.
AM-241	2.183E+01	NOT IDENT.
AM-242	6.540E+01	NOT IDENT.
AM-243	6.266E+00	NOT IDENT.
CM-243	1.023E+01	NOT IDENT.
BK-247	7.279E+00	NOT IDENT.
CM-247	3.916E+00	NOT IDENT.
CF-249	3.042E+00	NOT IDENT.
CF-251	1.074E+01	NOT IDENT.
CF-252	1.785E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597531001.CNF;1
Acquisition date : 31-OCT-2022 08:15:23 Sensitivity : 3.000
Detector ID : GAM03 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.47 Half life ratio : *****
Sample date : 26-SEP-2022 08:18:00 Nuclide Library : LIQUID
Sample ID : G597531001 Analyst initials: RXF2
Batch Number : 2333342 Sample Quantity : 7.3727E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 20-APR-2022 11:51:08 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
K-40	5.318E+01	7.189E+01	7.190E+01
CO-58	9.364E+00	7.096E+00	7.099E+00
GE-68	1.952E+02	2.045E+02	2.045E+02
RB-86	2.448E+02	2.564E+02	2.565E+02
TE-125M	1.506E+03	3.149E+03	3.149E+03
CE-144	3.069E+01	3.597E+01	3.598E+01
RA-224	1.013E+02	1.153E+02	1.153E+02
RA-226	5.054E+00	1.427E+02	1.427E+02
PA-231	4.638E+01	6.164E+01	6.165E+01
U-235	2.405E+01	3.789E+01	3.789E+01
ANH-511	1.194E+00	1.110E+01	1.110E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	3.797E+01	5.763E+01	6.012E+01	NOT IDENT.
NA-22	-2.392E+00	3.882E+00	4.029E+00	NOT IDENT.
NA-24	-3.260E+16	2.549E+17	0.000E+00	SHORT HLIF
AL-26	-4.645E+00	4.567E+00	5.025E+00	NOT IDENT.
SC-46	-1.524E-01	4.367E+00	4.368E+00	FAIL ABUN
V-48	-4.516E+00	1.786E+01	1.798E+01	NOT IDENT.
CR-51	1.171E+00	7.905E+01	7.905E+01	NOT IDENT.
MN-52	9.329E+01	3.620E+02	3.645E+02	NOT IDENT.
MN-54	1.280E+00	4.481E+00	4.518E+00	NOT IDENT.
CO-56	-1.580E+00	6.350E+00	6.390E+00	NOT IDENT.
CO-57	1.954E-01	3.291E+00	3.292E+00	NOT IDENT.
NI-57	8.457E+06	7.315E+07	7.325E+07	SHORT HLIF
FE-59	3.569E+00	1.191E+01	1.202E+01	NOT IDENT.
CO-60	3.954E-01	5.239E+00	5.242E+00	NOT IDENT.
ZN-65	2.727E-02	9.478E+00	9.478E+00	NOT IDENT.
CU-67	4.630E+03	1.307E+05	1.307E+05	SHORT HLIF
AS-73	1.131E+02	2.122E+02	2.183E+02	NOT IDENT.
AS-74	-8.839E-01	2.653E+01	2.653E+01	NOT IDENT.
SE-75	-1.638E+00	5.726E+00	5.773E+00	FAIL ABUN

BR-77	2.170E+05	5.756E+05	5.839E+05	SHORT HLIF
SR-82	-6.599E+00	6.854E+01	6.861E+01	NOT IDENT.
RB-83	8.241E+00	9.502E+00	1.020E+01	NOT IDENT.
RB-84	2.021E+00	1.205E+01	1.208E+01	NOT IDENT.
KR-85	2.123E+03	1.114E+03	1.470E+03	NOT IDENT.
SR-85	1.375E+01	7.215E+00	9.515E+00	NOT IDENT.
Y-88	-1.511E+00	2.896E+00	2.976E+00	NOT IDENT.
Y-91	1.534E+03	2.249E+03	2.353E+03	NOT IDENT.
NB-94	1.253E+00	4.269E+00	4.306E+00	NOT IDENT.
NB-95	2.347E+00	5.495E+00	5.596E+00	NOT IDENT.
NB-95M	-5.682E+00	1.701E+01	1.720E+01	NOT IDENT.
TC-95M	-4.507E+00	6.810E+00	7.107E+00	NOT IDENT.
ZR-95	1.074E+00	1.006E+01	1.008E+01	NOT IDENT.
MO-99	-9.754E+04	1.929E+05	1.979E+05	SHORT HLIF
TC-99M	1.000E+41	9.576E+40	0.000E+00	SHORT HLIF
RH-101	1.766E+00	3.594E+00	3.682E+00	NOT IDENT.
RH-102M	-3.649E+00	4.043E+00	4.365E+00	NOT IDENT.
RU-103	1.836E+00	6.090E+00	6.146E+00	NOT IDENT.
RH-106	-4.448E+01	3.643E+01	4.159E+01	NOT IDENT.
RU-106	-4.448E+01	3.643E+01	4.159E+01	NOT IDENT.
AG-108M	-2.674E+00	3.753E+00	3.942E+00	NOT IDENT.
CD-109	7.578E+01	8.953E+01	9.584E+01	NOT IDENT.
AG-110	-5.351E+01	9.390E+01	9.695E+01	NOT IDENT.
AG-110M	2.072E+00	5.543E+00	5.621E+00	NOT IDENT.
IN-111	1.141E+04	1.814E+04	1.886E+04	SHORT HLIF
SN-113	2.083E+00	5.399E+00	5.480E+00	NOT IDENT.
IN-114M	-3.160E+00	2.829E+01	2.833E+01	NOT IDENT.
CD-115	-5.354E+04	6.066E+05	6.071E+05	SHORT HLIF
SN-117M	-8.428E+00	1.744E+01	1.785E+01	NOT IDENT.
SB-122	-2.201E+04	3.573E+04	3.708E+04	SHORT HLIF
I-123	-2.772E+19	4.248E+19	0.000E+00	SHORT HLIF
TE-123M	-2.392E+00	3.664E+00	3.820E+00	NOT IDENT.
SB-124	-3.674E-01	1.205E+01	1.205E+01	NOT IDENT.
SB-125	-1.694E+01	1.352E+01	1.554E+01	NOT IDENT.
I-126	1.000E+01	7.822E+01	7.835E+01	NOT IDENT.
SB-126	-1.138E+01	4.754E+01	4.781E+01	NOT IDENT.
SN-126	6.627E+00	8.599E+00	9.104E+00	NOT IDENT.
SB-127	9.954E+02	4.968E+03	4.988E+03	NOT IDENT.
TE-129	-4.370E+01	1.012E+02	1.031E+02	NOT IDENT.
I-131	-5.922E+00	8.106E+01	8.110E+01	NOT IDENT.
I-132	-1.000E+41	3.243E+41	0.000E+00	SHORT HLIF
TE-132	-1.943E+03	5.960E+03	6.025E+03	SHORT HLIF
BA-133	-9.648E-01	5.681E+00	5.697E+00	NOT IDENT.
I-133	4.735E+12	7.223E+12	7.532E+12	SHORT HLIF
CS-134	7.071E+00	4.387E+00	5.425E+00	FAIL ABUN
I-135	-1.965E+39	4.525E+39	0.000E+00	SHORT HLIF
CS-136	-6.381E+00	2.974E+01	2.988E+01	NOT IDENT.
BA-137M	2.073E+00	4.589E+00	4.684E+00	NOT IDENT.
CS-137	2.190E+00	4.848E+00	4.948E+00	NOT IDENT.
LA-138	-4.865E+00	8.118E+00	8.410E+00	NOT IDENT.
CE-139	-2.749E-01	3.846E+00	3.848E+00	NOT IDENT.
BA-140	8.615E+01	1.052E+02	1.121E+02	NOT IDENT.
LA-140	-9.267E+00	2.591E+01	2.625E+01	NOT IDENT.
CE-141	-7.509E+00	1.281E+01	1.325E+01	NOT IDENT.
CE-143	-1.473E+08	3.342E+08	3.407E+08	SHORT HLIF
PM-144	-1.835E-01	4.513E+00	4.514E+00	NOT IDENT.
PR-144	-1.388E+01	3.413E+02	3.414E+02	NOT IDENT.
PM-146	-2.228E+00	5.610E+00	5.699E+00	NOT IDENT.
ND-147	1.939E+02	2.927E+02	3.055E+02	FAIL ABUN
PM-147	-9.626E+03	9.141E+04	9.151E+04	NOT IDENT.
PM-149	-2.440E+06	5.489E+06	5.598E+06	SHORT HLIF
EU-152	-1.920E+00	1.089E+01	1.092E+01	FAIL ABUN
GD-153	-3.820E+00	1.336E+01	1.347E+01	NOT IDENT.
EU-154	-6.970E+00	1.082E+01	1.126E+01	NOT IDENT.
EU-155	-5.049E+00	1.404E+01	1.423E+01	NOT IDENT.
TB-160	-2.945E+00	1.993E+01	1.997E+01	NOT IDENT.
HO-166M	2.236E+00	6.108E+00	6.191E+00	FAIL ABUN
TM-171	5.731E+01	3.848E+03	3.848E+03	NOT IDENT.
LU-176	1.988E+00	3.250E+00	3.372E+00	NOT IDENT.
LU-177	-3.063E+02	1.033E+03	1.043E+03	NOT IDENT.
HF-181	4.578E-01	8.691E+00	8.693E+00	FAIL ABUN
W-181	4.554E-01	4.246E+01	4.246E+01	NOT IDENT.
TA-182	3.085E+00	1.889E+01	1.894E+01	FAIL ABUN
RE-183	5.780E+00	4.474E+01	4.482E+01	NOT IDENT.
RE-184	-7.240E-01	1.837E+01	1.837E+01	NOT IDENT.
RE-188	2.272E+01	2.245E+01	2.468E+01	NOT IDENT.
W-188	-1.880E+02	1.134E+03	1.137E+03	NOT IDENT.
OS-191	8.071E+01	5.685E+01	6.751E+01	FAIL ABUN

IR-192	-6.274E-01	5.344E+00	5.352E+00	NOT IDENT.
PB-201	3.762E+25	5.401E+27	0.000E+00	SHORT HLIF
TL-201	-2.573E+04	7.322E+04	7.414E+04	SHORT HLIF
TL-202	5.363E+00	2.604E+01	2.616E+01	NOT IDENT.
HG-203	4.208E+00	5.797E+00	6.100E+00	NOT IDENT.
PB-203	1.893E+05	2.607E+05	2.744E+05	SHORT HLIF
TL-204	3.269E+02	6.866E+02	7.022E+02	NOT IDENT.
BI-207	2.630E+00	5.653E+00	5.776E+00	NOT IDENT.
TL-208	2.797E+00	5.368E+00	5.514E+00	NOT IDENT.
PB-210	6.217E+02	9.337E+02	9.749E+02	NOT IDENT.
BI-211	1.123E+01	2.951E+01	2.994E+01	NOT IDENT.
PB-211	-1.556E+01	9.017E+01	9.045E+01	NOT IDENT.
BI-212	5.916E+01	5.631E+01	6.232E+01	NOT IDENT.
PB-212	4.341E+00	1.151E+01	1.168E+01	FAIL ABUN
BI-213	-9.925E-01	1.320E+01	1.321E+01	NOT IDENT.
BI-214	8.481E-01	1.241E+01	1.241E+01	FAIL ABUN
PB-214	7.068E+00	1.851E+01	1.878E+01	FAIL ABUN
RN-219	3.395E+00	5.084E+01	5.087E+01	NOT IDENT.
FR-221	4.111E+00	2.367E+01	2.374E+01	NOT IDENT.
RA-223	1.238E+01	8.842E+01	8.860E+01	FAIL ABUN
AC-225	4.663E+01	2.685E+02	2.693E+02	NOT IDENT.
AC-227	1.289E+01	3.105E+01	3.159E+01	FAIL ABUN
TH-227	1.289E+01	3.105E+01	3.159E+01	FAIL ABUN
AC-228	-6.689E+00	1.785E+01	1.811E+01	FAIL ABUN
RA-228	-6.689E+00	1.785E+01	1.811E+01	FAIL ABUN
TH-228	4.341E+00	1.151E+01	1.168E+01	FAIL ABUN
TH-229	-9.573E+00	5.995E+01	6.010E+01	NOT IDENT.
TH-230	3.619E+02	1.622E+03	1.630E+03	NOT IDENT.
TH-231	4.966E+01	6.024E+01	6.427E+01	NOT IDENT.
TH-232	5.840E+01	3.827E+03	3.827E+03	FAIL ABUN
PA-233	9.542E-01	7.536E+00	7.548E+00	FAIL ABUN
PA-234	1.559E+01	3.739E+01	3.805E+01	FAIL ABUN
PA-234M	7.023E+01	8.759E+02	8.764E+02	FAIL ABUN
TH-234	-1.909E+02	2.849E+02	2.976E+02	NOT IDENT.
U-234	7.331E+03	1.339E+04	1.379E+04	NOT IDENT.
NP-237	9.542E-01	7.536E+00	7.548E+00	FAIL ABUN
NP-238	8.477E+05	1.321E+06	1.375E+06	SHORT HLIF
U-238	-1.909E+02	2.849E+02	2.976E+02	NOT IDENT.
NP-239	-1.913E+01	2.605E+01	2.744E+01	NOT IDENT.
AM-241	1.189E+01	2.571E+01	2.627E+01	NOT IDENT.
AM-242	-1.145E+02	9.093E+01	1.046E+02	NOT IDENT.
AM-243	-4.716E-01	8.206E+00	8.209E+00	NOT IDENT.
CM-243	-3.739E+00	1.202E+01	1.214E+01	NOT IDENT.
BK-247	-3.382E+00	9.127E+00	9.254E+00	NOT IDENT.
CM-247	2.396E+00	4.477E+00	4.605E+00	NOT IDENT.
CF-249	-3.765E+00	4.381E+00	4.698E+00	NOT IDENT.
CF-251	-4.734E+00	1.307E+01	1.325E+01	NOT IDENT.
CF-252	-1.321E+04	2.459E+04	2.530E+04	NOT IDENT.

* GEL Laboratories LLC *
* 2040 Savage Road *
* Charleston, SC 29407 *
* GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	50.1505	81.00	63.1005	120.90	49.2369
45.60	47.0755	81.07	63.1088	121.12	49.2525
46.54	40.4532	82.35	0.0000	121.22	48.3956
49.72	0.0000	82.47	55.9737	121.78	48.4346
51.35	54.6180	167.43	0.0000	122.06	48.4543
52.39	43.3523	82.47	55.9741	123.07	55.1098
53.20	38.8670	83.79	37.8139	265.00	55.9382
53.44	41.1777	84.00	37.8286	127.16	0.0000
56.28	48.3725	84.21	37.8432	127.23	39.2225
57.36	0.0000	84.86	0.0000	129.43	39.3428
57.53	47.3607	85.43	68.5145	131.20	39.4386
57.53	47.3610	86.55	60.0724	133.02	39.5366
57.98	47.4108	86.79	56.4187	133.52	39.5631
59.32	44.0788	86.94	56.4342	135.34	0.0000
59.54	40.6195	87.09	56.4492	136.00	39.6954
61.49	75.7719	87.57	39.3030	57.53	21.1787
63.00	51.4653	88.03	38.1062	136.47	21.1841
63.29	47.9871	88.34	51.6563	140.51	0.0000
63.58	38.6485	88.47	51.6682	140.88	29.2980
63.81	36.3246	91.11	150.7846	143.76	42.7744
64.28	46.9189	91.27	0.0000	144.24	42.8008
64.99	71.6623	92.59	64.4343	145.44	44.2063
65.08	71.6765	93.31	0.0000	152.32	55.8494
66.73	53.0647	94.56	144.2247	152.43	58.5598
66.98	54.2726	94.65	144.2469	153.25	56.8156
67.24	44.8589	94.67	144.2513	323.87	49.6591
67.67	50.8076	97.43	54.9715	155.04	43.3833
67.75	57.9067	98.43	50.0574	156.02	49.7693
68.89	58.0462	98.44	50.0583	158.56	43.5688
68.89	0.0000	99.53	67.7006	158.97	0.0000
69.67	62.8874	100.11	63.5823	159.00	44.4995
70.82	0.0000	100.20	63.5916	162.33	50.1470
70.82	47.5751	102.03	45.3183	162.66	50.1666
70.83	0.0000	103.18	47.0842	163.33	45.6421
72.81	66.8760	103.37	53.8271	165.86	56.7640
72.87	0.0000	105.31	49.3540	167.43	0.0000
74.66	61.1314	106.12	41.8145	171.28	0.0000
74.82	65.9470	106.47	38.0342	176.31	48.1798
74.97	65.9667	109.28	48.3886	176.60	50.0488
77.11	67.4493	111.00	48.5169	177.52	43.6054
79.69	67.7856	111.76	0.0000	181.07	0.0000
79.82	0.0000	112.95	46.1000	184.41	53.2844
80.02	43.6039	116.24	42.8963	184.58	0.0000
80.03	43.6042	116.30	0.0000	185.72	53.3598
80.12	43.6122	116.74	45.5040	186.21	51.9833
80.19	43.6179	117.23	44.6777	190.27	49.6687
80.22	0.0000	119.76	34.4952	193.51	51.9150
80.57	40.0118	99.53	40.5778	197.03	47.3689

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
198.01	50.2617	256.23	36.2323	492.35	0.0000
201.83	39.9860	304.85	35.4084	497.08	16.7337
204.12	43.8957	306.78	30.2455	511.00	15.0808
205.31	49.6805	308.46	36.5495	514.00	19.9020
208.37	53.6655	311.90	30.3617	520.40	14.2622
210.85	55.7190	316.51	37.8186	520.69	0.0000
215.65	48.2595	319.41	46.3212	522.65	0.0000
218.12	43.5370	320.08	37.9175	527.90	0.0000
222.11	50.5014	321.04	31.6205	529.59	20.5967
227.09	41.9572	323.87	42.2469	529.87	0.0000
227.38	41.9686	325.23	40.1740	531.02	20.0737
228.16	0.0000	328.76	33.9167	537.26	20.6753
228.18	43.9536	331.15	0.0000	546.56	0.0000
116.74	43.9536	333.37	26.5844	552.55	15.3964
235.69	39.8326	334.37	24.4749	563.25	20.0275
235.96	39.8421	338.28	27.7435	564.24	0.0000
238.63	43.3904	338.32	27.7440	569.33	19.1722
238.98	0.0000	311.90	33.1292	946.00	19.1742
240.99	43.4821	340.55	33.1311	569.70	17.3498
242.00	43.5215	344.28	27.8593	582.08	20.2061
244.70	40.1560	345.93	28.9638	583.19	13.7837
245.35	0.0000	351.06	24.7599	595.83	24.9557
250.62	34.8836	351.93	24.7744	427.87	27.7890
252.40	30.9448	356.01	30.7834	604.72	28.7692
252.80	31.9541	361.25	0.0000	609.32	22.3191
256.23	39.0591	364.49	24.4409	610.33	17.6774
260.90	0.0000	366.42	0.0000	614.28	23.3002
264.66	38.3301	356.01	36.3005	618.01	14.9370
265.00	38.3409	388.16	27.5757	621.93	23.3795
269.46	38.4840	388.63	29.7905	630.19	0.0000
271.23	22.3124	391.70	18.7933	631.29	19.7202
273.65	38.6162	264.66	31.1269	155.04	15.0356
276.40	25.4623	401.32	0.0000	633.25	13.1579
277.37	36.6951	401.81	27.8117	634.78	13.1664
277.60	34.6627	402.40	22.2575	635.95	14.1142
278.00	33.6539	404.85	30.0927	636.99	16.0034
278.43	30.6055	410.95	23.4926	657.50	22.7922
279.20	0.0000	414.70	25.7884	657.76	21.8454
279.54	30.6323	423.72	25.9274	661.66	19.0271
280.46	37.8085	427.09	28.2384	664.57	0.0000
283.69	20.4895	427.87	38.4215	666.33	19.0643
284.31	27.6746	433.94	30.6200	666.50	17.1590
285.41	43.0869	439.51	22.7547	667.71	0.0000
285.90	0.0000	440.45	26.1820	677.62	13.4078
287.50	43.1587	453.88	29.8239	685.70	12.4918
290.67	44.2965	459.60	32.2206	692.65	0.0000
293.27	0.0000	463.37	25.3695	695.00	11.5745
351.93	40.3179	468.07	16.1861	696.49	21.2326
295.96	37.2378	473.00	19.7074	696.51	21.2326
879.38	41.9774	475.06	33.6563	697.00	19.3066
299.98	39.4279	476.78	16.2633	697.49	16.4138
300.09	38.3941	477.60	23.2434	702.65	19.3506
300.13	38.3949	477.99	23.2483	706.68	16.4745
301.36	48.2984	482.18	29.1260	711.68	10.6814
302.85	42.1142	487.02	23.6534	720.70	15.5918

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
721.93	0.0000	935.54	9.4642	1368.63	0.0000
722.78	16.5798	937.49	15.7837	1377.63	0.0000
722.91	16.5808	944.13	14.7626	1384.29	9.5039
723.31	23.4119	945.96	0.0000	1408.01	7.6449
724.19	16.5891	946.00	8.4407	1434.09	6.7293
727.33	8.7935	949.00	11.6170	1435.80	12.5023
733.00	10.7711	667.71	0.0000	1457.56	0.0000
735.93	9.8032	962.31	12.7266	1460.82	4.8357
739.50	0.0000	964.08	20.3736	1489.16	2.9196
744.23	12.5883	966.17	13.5914	1596.21	4.9783
747.24	15.7534	968.97	9.5647	1620.50	8.0055
752.31	11.0489	983.53	10.6754	1678.03	0.0000
753.82	10.5286	984.45	0.0000	1690.97	4.0598
756.73	13.8342	996.26	12.0032	1757.55	0.0000
763.94	22.7894	1001.03	15.0258	1764.49	7.2068
765.80	11.8986	1274.44	17.1914	1063.66	5.1533
766.42	10.9094	1025.87	0.0000	1771.35	4.1234
766.84	8.9275	1028.54	0.0000	1791.20	0.0000
772.60	0.0000	1037.84	7.5960	1808.65	8.3051
776.52	15.9282	1038.76	0.0000	1836.06	2.0869
739.50	0.0000	475.06	5.4398		
778.90	14.9460	1048.07	8.7075		
783.70	16.9689	1050.41	11.9809		
788.74	11.4289	1063.66	7.6537		
792.07	12.8160	1077.00	9.8778		
795.86	11.2294	1077.34	12.2937		
802.10	12.8629	459.60	9.8976		
810.29	11.2882	1085.87	12.1038		
344.28	11.2889	1099.25	6.6270		
810.76	14.5160	1111.64	6.6500		
815.77	16.1577	1112.07	6.6508		
1048.07	9.0975	1112.84	7.3914		
832.01	20.3137	1115.54	7.1012		
834.85	13.2170	1120.29	11.1102		
835.15	7.1177	1120.55	11.1108		
836.80	0.0000	1221.41	11.1133		
846.77	19.3978	1129.67	8.9111		
856.80	14.3427	1131.51	0.0000		
860.56	12.3094	1173.23	9.9188		
871.09	15.4422	1177.95	6.3198		
873.19	12.3625	1189.05	9.0552		
875.33	0.0000	1204.77	4.5461		
879.38	11.5626	1221.41	7.3055		
880.51	11.3605	1231.02	7.3234		
881.60	11.3646	1235.36	14.6633		
883.24	11.5777	1238.28	11.0057		
884.68	6.6189	1260.41	0.0000		
889.28	8.2864	1271.87	6.4747		
894.76	8.3015	1274.44	8.3298		
898.04	15.5823	1274.54	8.3303		
903.28	9.3656	1291.59	6.5064		
907.67	0.0000	1298.22	0.0000		
911.20	7.3033	1312.11	4.6709		
923.98	0.0000	1332.49	10.3270		
926.36	11.5334	1365.19	3.7846		

VAX/VMS Nuclide Identification Report Generated 31-OCT-2022 10:19:01.05

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533001.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM23.CNF;813
Background date    : 30-OCT-2022 11:30:08
Sample date       : 30-SEP-2022 07:45:00 Acquisition date : 31-OCT-2022 08:16:43
Sample ID        : G597533001 Sample quantity : 7.77220E-01 FILTER
Detector name    : GAM23 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:01.53 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : RXF2
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID         : 2333342 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.03*	32	61	1.13	125.65	121	9	4.38E-03	52.9	
2	0	150.89	26	54	2.67	301.23	297	10	3.57E-03	56.5	
3	0	262.29	28	42	1.27	523.87	519	10	3.95E-03	46.7	
4	0	306.80	19	18	1.97	612.81	609	7	2.57E-03	44.1	
5	6	475.06	17	5	1.94	949.11	946	13	2.34E-03	33.9	2.36E+00
6	6	477.51	32	15	1.52	954.00	946	13	4.46E-03	27.8	
7	0	552.78	7	15	0.56	1104.43	1100	9	1.03E-03	97.7	
8	0	583.58*	9	11	0.81	1165.98	1160	11	1.27E-03	110.7	
9	0	668.68	19	5	3.91	1336.08	1330	11	2.60E-03	33.4	
10	0	678.35	17	2	1.08	1355.41	1350	10	2.31E-03	30.2	
11	0	728.00	8	3	1.23	1454.64	1451	7	1.12E-03	51.1	
12	0	766.71	10	0	1.74	1532.00	1529	7	1.39E-03	31.6	
13	0	770.27	4	3	1.13	1539.13	1535	6	5.56E-04	84.8	
14	0	857.14	7	1	0.63	1712.75	1709	6	9.37E-04	47.4	
15	0	862.15	9	13	4.55	1722.75	1715	12	1.31E-03	80.6	
16	0	889.04	16	6	4.02	1776.51	1769	13	2.18E-03	41.8	
17	0	925.11	12	9	0.77	1848.61	1842	12	1.70E-03	56.6	
18	0	929.44	10	4	1.11	1857.26	1854	7	1.32E-03	46.0	
19	0	939.32	13	4	0.86	1877.01	1871	14	1.83E-03	41.1	
20	0	968.06	6	12	3.03	1934.45	1928	12	8.49E-04	120.2	
21	0	982.51	8	3	3.25	1963.33	1957	11	1.15E-03	52.1	
22	0	1462.86	7	13	1.37	2923.50	2918	9	9.24E-04	117.0	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 31-OCT-2022 10:19:02

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533001.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 30-SEP-2022 07:45:00	Acquisition date	: 31-OCT-2022 08:16:43
Sample ID	: G597533001	Sample quantity	: 0.77722 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA23	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:01.53 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	32	10.44*	1.870E+00	7.939E+01	1.190E+02	55.52
NB-95	765.80	10	99.81*	1.281E+00	3.779E+00	5.289E+00	63.25
TL-208	277.37	-----	6.60	2.772E+00	-----	Line Not Found	-----
	583.19	9	85.00*	1.604E+00	3.238E+00	3.340E+00	221.47
	860.56	-----	12.50	1.157E+00	-----	Line Not Found	-----
BI-212	727.33	8	6.67*	1.339E+00	4.377E+01	4.514E+01	102.29
	1620.50	-----	1.47	6.671E-01	-----	Line Not Found	-----
TH-232	63.81	32	0.26*	1.460E+00	4.011E+03	4.011E+03	105.81
	140.88	-----	0.02	4.072E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                           *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533001.CNF;1      *
* Acquisition date   : 31-OCT-2022 08:16:43 Sensitivity      : 3.000                *
* Detector ID        : GAM23 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:01.53 Half life ratio : *****      *
* Sample date        : 30-SEP-2022 07:45:00 Analyst initials: RXF2        *
* Sample ID          : G597533001 Sample Quantity : 7.7722E-01 FILTER *
* Batch Number       : 2333342 Wet Weight      : 0.00000        *
* Wet wt corr        : 1.00000 Dry Weight       : 0.00000        *
* Nuclide Library    : LIQUID.NLB;26
*****
*                                     CALIBRATION INFORMATION                       *
*
* Eff. Cal. date     : 3-MAY-2022 06:48:20 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM23_JAR.CNF;20
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.190E+02	6.474E+01	7.487E+01
NB-95	5.289E+00	3.278E+00	8.063E+00
TL-208	3.340E+00	7.248E+00	7.132E+00
BI-212	4.514E+01	4.525E+01	9.991E+01
TH-232	4.011E+03	4.159E+03	3.290E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	1.267E+00		4.845E+00	1.009E+01	NOT IDENT.
NA-24	0.000E+00		4.282E+15	0.000E+00	SHORT HLIF
AL-26	1.518E+00		3.070E+00	8.343E+00	NOT IDENT.
K-40	5.299E+01		8.157E+01	1.656E+02	NOT IDENT.
SC-46	8.744E+00		7.156E+00	1.169E+01	FAIL ABUN
V-48	1.500E+01		1.531E+01	2.903E+01	FAIL ABUN
CR-51	-2.622E+01		6.198E+01	1.137E+02	NOT IDENT.
MN-52	-2.938E+01		2.100E+02	4.281E+02	NOT IDENT.
MN-54	2.035E-01		3.319E+00	6.911E+00	NOT IDENT.
CO-56	2.404E+00		5.102E+00	1.091E+01	NOT IDENT.
CO-57	1.545E+00		2.110E+00	4.312E+00	NOT IDENT.
NI-57	0.000E+00		9.340E+06	0.000E+00	SHORT HLIF
CO-58	2.469E+00		5.220E+00	1.112E+01	NOT IDENT.
FE-59	1.645E+00		1.185E+01	2.437E+01	NOT IDENT.
CO-60	-2.803E+00		5.745E+00	1.002E+01	NOT IDENT.
ZN-65	-4.056E+00		8.995E+00	1.611E+01	NOT IDENT.
CU-67	0.000E+00		2.474E+04	0.000E+00	SHORT HLIF
GE-68	-8.446E+01		1.617E+02	2.831E+02	NOT IDENT.
AS-73	1.093E+01		1.740E+02	2.785E+02	NOT IDENT.
AS-74	1.440E+01		2.176E+01	4.414E+01	NOT IDENT.
SE-75	-5.398E-01		5.125E+00	8.262E+00	NOT IDENT.
BR-77	0.000E+00		1.174E+05	0.000E+00	SHORT HLIF
SR-82	3.114E+01		5.534E+01	1.204E+02	NOT IDENT.
RB-83	-5.358E+00		8.943E+00	1.531E+01	FAIL ABUN
RB-84	5.948E+00		9.566E+00	2.089E+01	NOT IDENT.

KR-85	-3.656E+03	1.337E+03	1.711E+03	NOT IDENT.
SR-85	-2.270E+01	8.301E+00	1.062E+01	NOT IDENT.
RB-86	-1.279E+02	1.776E+02	2.963E+02	NOT IDENT.
Y-88	2.791E+00	5.053E+00	1.260E+01	NOT IDENT.
Y-91	-3.027E+01	1.864E+03	3.893E+03	NOT IDENT.
NB-94	1.803E-01	2.974E+00	6.159E+00	NOT IDENT.
NB-95M	-1.264E+01	1.326E+01	2.043E+01	NOT IDENT.
TC-95M	-7.963E-01	5.671E+00	9.524E+00	FAIL ABUN
ZR-95	-1.624E+00	8.208E+00	1.613E+01	NOT IDENT.
MO-99	0.000E+00	7.084E+04	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	4.369E+37	0.000E+00	SHORT HLIF
RH-101	1.882E+00	3.146E+00	6.127E+00	NOT IDENT.
RH-102M	4.628E+00	3.074E+00	6.595E+00	FAIL ABUN
RU-103	4.771E+00	6.787E+00	1.380E+01	NOT IDENT.
RH-106	-1.419E+01	3.260E+01	5.688E+01	NOT IDENT.
RU-106	-1.419E+01	3.260E+01	5.688E+01	NOT IDENT.
AG-108M	3.736E-01	3.368E+00	6.501E+00	NOT IDENT.
CD-109	3.748E+01	6.568E+01	1.320E+02	NOT IDENT.
AG-110	2.523E+01	6.171E+01	1.328E+02	NOT IDENT.
AG-110M	-1.937E-01	4.937E+00	8.971E+00	FAIL ABUN
IN-111	0.000E+00	5.707E+03	0.000E+00	SHORT HLIF
SN-113	1.580E+00	5.260E+00	1.046E+01	NOT IDENT.
IN-114M	-1.562E+01	2.101E+01	3.449E+01	NOT IDENT.
CD-115	0.000E+00	1.841E+05	0.000E+00	SHORT HLIF
SN-117M	-3.932E+00	1.151E+01	2.027E+01	NOT IDENT.
SB-122	0.000E+00	1.418E+04	0.000E+00	SHORT HLIF
I-123	0.000E+00	2.376E+17	0.000E+00	SHORT HLIF
TE-123M	-3.790E-01	2.988E+00	5.381E+00	NOT IDENT.
SB-124	1.343E+01	1.074E+01	3.155E+01	NOT IDENT.
SB-125	2.399E-01	9.152E+00	1.775E+01	NOT IDENT.
TE-125M	-9.615E+01	9.550E+02	1.794E+03	NOT IDENT.
I-126	-4.471E+01	6.944E+01	9.629E+01	NOT IDENT.
SB-126	-1.853E+01	3.873E+01	7.156E+01	FAIL ABUN
SN-126	1.506E+00	6.283E+00	1.228E+01	FAIL ABUN
SB-127	1.085E+03	2.546E+03	5.154E+03	NOT IDENT.
TE-129	-4.601E+00	7.174E+01	1.360E+02	NOT IDENT.
I-131	-1.375E+01	5.290E+01	9.803E+01	NOT IDENT.
I-132	0.000E+00	6.553E+40	0.000E+00	SHORT HLIF
TE-132	-8.603E+02	2.674E+03	4.538E+03	NOT IDENT.
BA-133	1.961E+00	4.709E+00	9.420E+00	NOT IDENT.
I-133	0.000E+00	2.362E+11	0.000E+00	SHORT HLIF
CS-134	1.011E+00	4.286E+00	8.929E+00	NOT IDENT.
I-135	0.000E+00	1.611E+35	0.000E+00	SHORT HLIF
CS-136	-4.193E+00	2.640E+01	5.088E+01	NOT IDENT.
BA-137M	-3.401E-01	3.890E+00	7.190E+00	NOT IDENT.
CS-137	-3.593E-01	4.109E+00	7.595E+00	NOT IDENT.
LA-138	-1.811E+00	6.572E+00	1.303E+01	NOT IDENT.
CE-139	-1.174E+00	3.110E+00	5.426E+00	NOT IDENT.
BA-140	-2.161E+01	6.377E+01	1.151E+02	NOT IDENT.
LA-140	8.343E+00	2.506E+01	5.732E+01	NOT IDENT.
CE-141	-4.426E+00	7.087E+00	1.219E+01	NOT IDENT.
CE-143	0.000E+00	4.195E+07	0.000E+00	SHORT HLIF
CE-144	-3.103E+00	1.850E+01	3.373E+01	NOT IDENT.
PM-144	-6.941E-02	3.830E+00	7.618E+00	FAIL ABUN
PR-144	-4.118E+00	2.892E+02	5.755E+02	NOT IDENT.
PM-146	-1.257E-01	4.099E+00	7.903E+00	NOT IDENT.
ND-147	6.561E+01	1.854E+02	3.658E+02	NOT IDENT.
PM-147	-1.955E+04	6.367E+04	1.157E+05	NOT IDENT.
PM-149	0.000E+00	1.371E+06	0.000E+00	SHORT HLIF
EU-152	2.953E+00	9.033E+00	1.838E+01	NOT IDENT.
GD-153	-9.794E+00	9.290E+00	1.343E+01	NOT IDENT.
EU-154	4.293E+00	1.379E+01	2.892E+01	NOT IDENT.
EU-155	-2.534E+00	9.274E+00	1.705E+01	NOT IDENT.
TB-160	9.970E-01	1.645E+01	3.338E+01	NOT IDENT.
HO-166M	-5.507E+00	8.808E+00	1.235E+01	NOT IDENT.
TM-171	-2.205E+03	3.442E+03	4.931E+03	NOT IDENT.
LU-176	3.701E+00	3.200E+00	5.676E+00	FAIL ABUN
LU-177	-2.174E+02	5.585E+02	9.550E+02	NOT IDENT.
HF-181	-1.360E+00	6.624E+00	1.086E+01	NOT IDENT.
W-181	-9.015E+00	2.563E+01	4.902E+01	FAIL ABUN
TA-182	2.585E-01	2.174E+01	4.265E+01	NOT IDENT.
RE-183	-4.957E+00	2.688E+01	5.214E+01	NOT IDENT.
RE-184	9.917E-01	1.999E+01	3.978E+01	NOT IDENT.
RE-188	-1.053E+00	1.933E+01	3.251E+01	FAIL ABUN
W-188	-8.876E+01	7.449E+02	1.447E+03	FAIL ABUN
OS-191	-4.803E+01	3.418E+01	5.046E+01	FAIL ABUN
IR-192	1.302E+00	4.412E+00	8.760E+00	NOT IDENT.
PB-201	0.000E+00	3.531E+24	0.000E+00	SHORT HLIF

TL-201	0.000E+00	2.415E+04	0.000E+00	SHORT HLIF
TL-202	-3.526E+00	1.805E+01	3.362E+01	NOT IDENT.
HG-203	-8.158E+00	6.350E+00	9.196E+00	NOT IDENT.
PB-203	0.000E+00	8.475E+04	0.000E+00	SHORT HLIF
TL-204	2.261E+02	4.881E+02	9.762E+02	NOT IDENT.
BI-207	2.044E+00	5.290E+00	1.146E+01	NOT IDENT.
PB-210	-2.049E+02	7.866E+02	1.211E+03	NOT IDENT.
BI-211	-1.213E+01	2.155E+01	3.864E+01	NOT IDENT.
PB-211	2.772E+01	7.316E+01	1.477E+02	NOT IDENT.
PB-212	2.414E+00	6.781E+00	1.248E+01	NOT IDENT.
BI-213	-4.657E+00	1.157E+01	2.081E+01	NOT IDENT.
BI-214	-1.761E+00	1.059E+01	1.863E+01	NOT IDENT.
PB-214	1.206E+00	9.754E+00	1.652E+01	NOT IDENT.
RN-219	1.019E+01	4.887E+01	8.968E+01	NOT IDENT.
FR-221	1.011E+01	2.251E+01	4.200E+01	NOT IDENT.
RA-223	-3.240E+01	6.938E+01	1.267E+02	NOT IDENT.
RA-224	3.743E+00	6.654E+01	1.185E+02	NOT IDENT.
AC-225	8.703E+01	1.938E+02	3.617E+02	NOT IDENT.
RA-226	-2.731E+01	8.614E+01	1.623E+02	NOT IDENT.
AC-227	3.760E+00	2.985E+01	5.319E+01	NOT IDENT.
TH-227	3.760E+00	2.985E+01	5.319E+01	NOT IDENT.
AC-228	-1.353E+00	1.952E+01	3.355E+01	FAIL ABUN
RA-228	-1.353E+00	1.952E+01	3.355E+01	FAIL ABUN
TH-228	2.414E+00	6.781E+00	1.248E+01	NOT IDENT.
TH-229	-5.529E+00	5.066E+01	9.024E+01	NOT IDENT.
TH-230	-5.113E+02	9.933E+02	1.845E+03	NOT IDENT.
PA-231	-1.341E+01	4.464E+01	8.417E+01	NOT IDENT.
TH-231	-3.600E+01	4.399E+01	7.042E+01	NOT IDENT.
PA-233	3.279E+00	6.823E+00	1.386E+01	NOT IDENT.
PA-234	-3.715E+01	4.416E+01	5.902E+01	FAIL ABUN
PA-234M	1.686E+02	5.638E+02	1.151E+03	FAIL ABUN
TH-234	2.818E+02	2.923E+02	3.402E+02	FAIL ABUN
U-234	-1.504E+02	1.162E+04	1.840E+04	NOT IDENT.
U-235	-1.130E+01	2.130E+01	3.408E+01	NOT IDENT.
NP-237	3.279E+00	6.823E+00	1.386E+01	NOT IDENT.
NP-238	0.000E+00	4.339E+05	0.000E+00	SHORT HLIF
U-238	2.818E+02	2.923E+02	3.402E+02	FAIL ABUN
NP-239	1.091E+01	2.317E+01	4.565E+01	NOT IDENT.
AM-241	7.375E+00	1.772E+01	3.423E+01	NOT IDENT.
AM-242	-7.417E+00	6.547E+01	1.057E+02	NOT IDENT.
AM-243	1.608E+00	4.471E+00	8.945E+00	NOT IDENT.
CM-243	8.534E-01	8.731E+00	1.681E+01	NOT IDENT.
BK-247	-3.039E+00	8.752E+00	1.340E+01	NOT IDENT.
CM-247	1.098E+00	4.336E+00	8.004E+00	NOT IDENT.
CF-249	-2.694E+00	4.474E+00	7.119E+00	NOT IDENT.
CF-251	-2.217E+00	1.192E+01	2.123E+01	NOT IDENT.
CF-252	-4.948E+03	1.523E+04	2.800E+04	NOT IDENT.
ANH-511	-1.113E+01	7.931E+00	1.505E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.03	52	61	1.13	125.65	121	9	7.24E-03	30.3	
2	0	92.77	65	87	1.55	185.09	180	10	8.98E-03	29.8	
3	0	150.89	26	54	2.67	301.23	297	10	3.57E-03	56.5	
4	0	186.06	27	95	0.93	371.51	366	10	3.70E-03	71.2	
5	0	262.29	28	42	1.27	523.87	519	10	3.95E-03	46.7	
6	0	306.80	19	18	1.97	612.81	609	7	2.57E-03	44.1	
7	6	475.06	17	5	1.94	949.11	946	13	2.34E-03	33.9	2.36E+00
8	6	477.51	32	15	1.52	954.00	946	13	4.46E-03	27.8	
9	0	511.05	128	44	1.39	1021.02	1015	14	1.78E-02	14.2	
10	0	552.78	7	15	0.56	1104.43	1100	9	1.03E-03	97.7	
11	0	583.58	28	11	0.81	1165.98	1160	11	3.92E-03	29.5	
12	0	668.68	19	5	3.91	1336.08	1330	11	2.60E-03	33.4	
13	0	678.35	17	2	1.08	1355.41	1350	10	2.31E-03	30.2	
14	0	728.00	8	3	1.23	1454.64	1451	7	1.12E-03	51.1	
15	0	766.71	10	0	1.74	1532.00	1529	7	1.39E-03	31.6	
16	0	770.27	4	3	1.13	1539.13	1535	6	5.56E-04	84.8	
17	0	857.14	7	1	0.63	1712.75	1709	6	9.37E-04	47.4	
18	0	862.15	9	13	4.55	1722.75	1715	12	1.31E-03	80.6	
19	0	889.04	16	6	4.02	1776.51	1769	13	2.18E-03	41.8	
20	0	925.11	12	9	0.77	1848.61	1842	12	1.70E-03	56.6	
21	0	929.44	10	4	1.11	1857.26	1854	7	1.32E-03	46.0	
22	0	939.32	13	4	0.86	1877.01	1871	14	1.83E-03	41.1	
23	0	968.06	6	12	3.03	1934.45	1928	12	8.49E-04	120.2	
24	0	982.51	8	3	3.25	1963.33	1957	11	1.15E-03	52.1	
25	0	1462.86	7	13	1.37	2923.50	2918	9	9.24E-04	117.0	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	32	10.44*	1.870E+00	7.939E+01	1.190E+02	55.52
NB-95	765.80	10	99.81*	1.281E+00	3.779E+00	5.289E+00	63.25
TL-208	277.37	-----	6.60	2.772E+00	-----	Line Not Found	-----
	583.19	9	85.00*	1.604E+00	3.238E+00	3.340E+00	221.47
	860.56	-----	12.50	1.157E+00	-----	Line Not Found	-----
BI-212	727.33	8	6.67*	1.339E+00	4.377E+01	4.514E+01	102.29
	1620.50	-----	1.47	6.671E-01	-----	Line Not Found	-----
TH-232	63.81	32	0.26*	1.460E+00	4.011E+03	4.011E+03	105.81
	140.88	-----	0.02	4.072E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

Total number of lines in spectrum 22
Number of unidentified lines 5
Number of lines tentatively identified by NID 17 77.27%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.50	7.939E+01	1.190E+02	0.661E+02	55.52	
NB-95	64.03D	1.40	3.779E+00	5.289E+00	3.345E+00	63.25	
TL-208	1.91Y	1.03	3.238E+00	3.340E+00	7.396E+00	221.47	
BI-212	1.91Y	1.03	4.377E+01	4.514E+01	4.617E+01	102.29	
TH-232	1.41E+10Y	1.00	4.011E+03	4.011E+03	4.244E+03	105.81	

Total Activity : 4.141E+03 4.183E+03

Grand Total Activity : 4.141E+03 4.183E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	150.89	26	54	2.67	301.23	297	10	3.57E-03	****	3.99E+00	T
0	262.29	28	42	1.27	523.87	519	10	3.95E-03	93.4	2.88E+00	T
0	306.80	19	18	1.97	612.81	609	7	2.57E-03	88.2	2.58E+00	T
6	475.06	17	5	1.94	949.11	946	13	2.34E-03	67.8	1.88E+00	T
0	552.78	7	15	0.56	1104.43	1100	9	1.03E-03	****	1.67E+00	T
0	668.68	19	5	3.91	1336.08	1330	11	2.60E-03	66.9	1.44E+00	T
0	678.35	17	2	1.08	1355.41	1350	10	2.31E-03	60.3	1.42E+00	T
0	770.27	4	3	1.13	1539.13	1535	6	5.56E-04	****	1.28E+00	
0	857.14	7	1	0.63	1712.75	1709	6	9.37E-04	94.9	1.16E+00	T
0	862.15	9	13	4.55	1722.75	1715	12	1.31E-03	****	1.15E+00	
0	889.04	16	6	4.02	1776.51	1769	13	2.18E-03	83.5	1.12E+00	T
0	925.11	12	9	0.77	1848.61	1842	12	1.70E-03	****	1.08E+00	T
0	929.44	10	4	1.11	1857.26	1854	7	1.32E-03	92.1	1.08E+00	
0	939.32	13	4	0.86	1877.01	1871	14	1.83E-03	82.3	1.07E+00	
0	968.06	6	12	3.03	1934.45	1928	12	8.49E-04	****	1.04E+00	T
0	982.51	8	3	3.25	1963.33	1957	11	1.15E-03	****	1.03E+00	T
0	1462.86	7	13	1.37	2923.50	2918	9	9.24E-04	****	7.20E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533001.CNF;1  *
* Acquisition date   : 31-OCT-2022 08:16:43 Sensitivity      : 3.000          *
* Detector ID        : GAM23 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 02:00:01.53 Half life ratio  : *****          *
* Sample date        : 30-SEP-2022 07:45:00 Nuclide Library : LIQUID         *
* Sample ID          : G597533001 Analyst initials:  RXF2           *
* Batch Number       : 2333342 Sample Quantity  : 7.7722E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight       : 0.00000         *
*                                     Dry Weight    : 0.00000         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 3-MAY-2022 06:48:20 Eff. Geometry    : JAR           *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM23_JAR.CNF;20          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.243E+01
NB-95	3.317E+00
TL-208	3.073E+00
BI-212	4.243E+01
TH-232	1.481E+03

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	4.219E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	3.123E+00	NOT IDENT.
K-40	7.434E+01	NOT IDENT.
SC-46	5.096E+00	FAIL ABUN
V-48	1.206E+01	FAIL ABUN
CR-51	5.112E+01	NOT IDENT.
MN-52	1.720E+02	NOT IDENT.
MN-54	2.867E+00	NOT IDENT.
CO-56	4.720E+00	NOT IDENT.
CO-57	1.956E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	4.833E+00	NOT IDENT.
FE-59	1.016E+01	NOT IDENT.
CO-60	4.160E+00	NOT IDENT.
ZN-65	6.510E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	1.182E+02	NOT IDENT.
AS-73	1.270E+02	NOT IDENT.
AS-74	1.972E+01	NOT IDENT.
SE-75	3.669E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	5.224E+01	NOT IDENT.
RB-83	6.596E+00	FAIL ABUN
RB-84	8.833E+00	NOT IDENT.
KR-85	7.694E+02	NOT IDENT.

SR-85	4.777E+00	NOT IDENT.
RB-86	1.227E+02	NOT IDENT.
Y-88	4.999E+00	NOT IDENT.
Y-91	1.520E+03	NOT IDENT.
NB-94	2.605E+00	NOT IDENT.
NB-95M	9.033E+00	NOT IDENT.
TC-95M	4.333E+00	FAIL ABUN
ZR-95	6.767E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.827E+00	NOT IDENT.
RH-102M	2.927E+00	FAIL ABUN
RU-103	6.218E+00	NOT IDENT.
RH-106	2.388E+01	NOT IDENT.
RU-106	2.388E+01	NOT IDENT.
AG-108M	2.892E+00	NOT IDENT.
CD-109	6.047E+01	NOT IDENT.
AG-110	5.557E+01	NOT IDENT.
AG-110M	3.618E+00	FAIL ABUN
IN-111	0.000E+00	SHORT HLIF
SN-113	4.673E+00	NOT IDENT.
IN-114M	1.543E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	9.197E+00	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.454E+00	NOT IDENT.
SB-124	1.275E+01	NOT IDENT.
SB-125	7.775E+00	NOT IDENT.
TE-125M	8.093E+02	NOT IDENT.
I-126	4.087E+01	NOT IDENT.
SB-126	3.065E+01	FAIL ABUN
SN-126	5.607E+00	FAIL ABUN
SB-127	2.239E+03	NOT IDENT.
TE-129	5.965E+01	NOT IDENT.
I-131	4.389E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	2.074E+03	NOT IDENT.
BA-133	4.255E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.831E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	2.111E+01	NOT IDENT.
BA-137M	3.094E+00	NOT IDENT.
CS-137	3.268E+00	NOT IDENT.
LA-138	5.149E+00	NOT IDENT.
CE-139	2.465E+00	NOT IDENT.
BA-140	4.909E+01	NOT IDENT.
LA-140	2.316E+01	NOT IDENT.
CE-141	5.445E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.533E+01	NOT IDENT.
PM-144	3.308E+00	FAIL ABUN
PR-144	2.500E+02	NOT IDENT.
PM-146	3.430E+00	NOT IDENT.
ND-147	1.624E+02	NOT IDENT.
PM-147	5.218E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.154E+00	NOT IDENT.
GD-153	6.057E+00	NOT IDENT.
EU-154	1.214E+01	NOT IDENT.
EU-155	7.732E+00	NOT IDENT.
TB-160	1.412E+01	NOT IDENT.
HO-166M	5.293E+00	NOT IDENT.
TM-171	2.230E+03	NOT IDENT.
LU-176	2.568E+00	FAIL ABUN
LU-177	4.301E+02	NOT IDENT.
HF-181	4.706E+00	NOT IDENT.
W-181	2.206E+01	FAIL ABUN
TA-182	1.785E+01	NOT IDENT.
RE-183	2.356E+01	NOT IDENT.
RE-184	1.705E+01	NOT IDENT.
RE-188	1.482E+01	FAIL ABUN
W-188	6.412E+02	FAIL ABUN
OS-191	2.282E+01	FAIL ABUN
IR-192	3.963E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF

TL-202	1.475E+01	NOT IDENT.
HG-203	4.139E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	4.490E+02	NOT IDENT.
BI-207	4.813E+00	NOT IDENT.
PB-210	5.502E+02	NOT IDENT.
BI-211	1.716E+01	NOT IDENT.
PB-211	6.567E+01	NOT IDENT.
PB-212	5.740E+00	NOT IDENT.
BI-213	9.141E+00	NOT IDENT.
BI-214	8.394E+00	NOT IDENT.
PB-214	7.477E+00	NOT IDENT.
RN-219	4.018E+01	NOT IDENT.
FR-221	1.926E+01	NOT IDENT.
RA-223	5.673E+01	NOT IDENT.
RA-224	5.388E+01	NOT IDENT.
AC-225	1.659E+02	NOT IDENT.
RA-226	7.616E+01	NOT IDENT.
AC-227	2.425E+01	NOT IDENT.
TH-227	2.425E+01	NOT IDENT.
AC-228	1.445E+01	FAIL ABUN
RA-228	1.445E+01	FAIL ABUN
TH-228	5.740E+00	NOT IDENT.
TH-229	4.094E+01	NOT IDENT.
TH-230	8.306E+02	NOT IDENT.
PA-231	3.742E+01	NOT IDENT.
TH-231	3.205E+01	NOT IDENT.
PA-233	6.265E+00	NOT IDENT.
PA-234	2.439E+01	FAIL ABUN
PA-234M	4.985E+02	FAIL ABUN
TH-234	1.583E+02	FAIL ABUN
U-234	8.377E+03	NOT IDENT.
U-235	1.558E+01	NOT IDENT.
NP-237	6.265E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.583E+02	FAIL ABUN
NP-239	2.082E+01	NOT IDENT.
AM-241	1.555E+01	NOT IDENT.
AM-242	4.808E+01	NOT IDENT.
AM-243	4.078E+00	NOT IDENT.
CM-243	7.606E+00	NOT IDENT.
BK-247	5.944E+00	NOT IDENT.
CM-247	3.576E+00	NOT IDENT.
CF-249	3.106E+00	NOT IDENT.
CF-251	9.603E+00	NOT IDENT.
CF-252	1.266E+04	NOT IDENT.
ANH-511	7.162E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533001.CNF;1
* Acquisition date   : 31-OCT-2022 08:16:43 Sensitivity      : 3.000
* Detector ID        : GAM23 Energy tolerance: 1.500
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 02:00:01.53 Half life ratio  : *****
* Sample date        : 30-SEP-2022 07:45:00 Nuclide Library : LIQUID
* Sample ID          : G597533001 Analyst initials: RXF2
* Batch Number       : 2333342 Sample Quantity : 7.7722E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 3-MAY-2022 06:48:20 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM23_JAR.CNF;20

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.190E+02	6.553E+01	6.557E+01
NB-95	5.289E+00	3.313E+00	3.314E+00
TL-208	3.340E+00	7.254E+00	7.254E+00
BI-212	4.514E+01	4.544E+01	4.545E+01
TH-232	4.011E+03	4.196E+03	4.196E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	1.267E+00	4.846E+00	4.880E+00	NOT IDENT.
NA-24	1.999E+15	4.289E+15	4.383E+15	SHORT HLIF
AL-26	1.518E+00	3.073E+00	3.148E+00	NOT IDENT.
K-40	5.299E+01	8.179E+01	8.521E+01	NOT IDENT.
SC-46	8.744E+00	7.206E+00	8.215E+00	FAIL ABUN
V-48	1.500E+01	1.538E+01	1.680E+01	FAIL ABUN
CR-51	-2.622E+01	6.203E+01	6.315E+01	NOT IDENT.
MN-52	-2.938E+01	2.101E+02	2.105E+02	NOT IDENT.
MN-54	2.035E-01	3.319E+00	3.320E+00	NOT IDENT.
CO-56	2.404E+00	5.107E+00	5.221E+00	NOT IDENT.
CO-57	1.545E+00	2.114E+00	2.226E+00	NOT IDENT.
NI-57	-2.462E+06	9.346E+06	9.412E+06	SHORT HLIF
CO-58	2.469E+00	5.225E+00	5.343E+00	NOT IDENT.
FE-59	1.645E+00	1.185E+01	1.188E+01	NOT IDENT.
CO-60	-2.803E+00	5.753E+00	5.890E+00	NOT IDENT.
ZN-65	-4.056E+00	9.001E+00	9.186E+00	NOT IDENT.
CU-67	-4.915E+04	2.508E+04	3.348E+04	SHORT HLIF
GE-68	-8.446E+01	1.619E+02	1.663E+02	NOT IDENT.
AS-73	1.093E+01	1.741E+02	1.741E+02	NOT IDENT.
AS-74	1.440E+01	2.181E+01	2.276E+01	NOT IDENT.
SE-75	-5.398E-01	5.125E+00	5.131E+00	NOT IDENT.
BR-77	-5.123E+04	1.175E+05	1.198E+05	SHORT HLIF
SR-82	3.114E+01	5.541E+01	5.717E+01	NOT IDENT.
RB-83	-5.358E+00	8.982E+00	9.302E+00	FAIL ABUN
RB-84	5.948E+00	9.583E+00	9.952E+00	NOT IDENT.

KR-85	-3.656E+03	1.373E+03	2.146E+03	NOT IDENT.
SR-85	-2.270E+01	8.524E+00	1.333E+01	NOT IDENT.
RB-86	-1.279E+02	1.779E+02	1.871E+02	NOT IDENT.
Y-88	2.791E+00	5.057E+00	5.212E+00	NOT IDENT.
Y-91	-3.027E+01	1.864E+03	1.864E+03	NOT IDENT.
NB-94	1.803E-01	2.974E+00	2.975E+00	NOT IDENT.
NB-95M	-1.264E+01	1.333E+01	1.450E+01	NOT IDENT.
TC-95M	-7.963E-01	5.671E+00	5.683E+00	FAIL ABUN
ZR-95	-1.624E+00	8.210E+00	8.242E+00	NOT IDENT.
MO-99	2.076E+03	7.084E+04	7.085E+04	SHORT HLIF
TC-99M	7.333E+36	4.370E+37	0.000E+00	SHORT HLIF
RH-101	1.882E+00	3.167E+00	3.279E+00	NOT IDENT.
RH-102M	4.628E+00	3.123E+00	3.757E+00	FAIL ABUN
RU-103	4.771E+00	6.800E+00	7.133E+00	NOT IDENT.
RH-106	-1.419E+01	3.263E+01	3.325E+01	NOT IDENT.
RU-106	-1.419E+01	3.263E+01	3.325E+01	NOT IDENT.
AG-108M	3.736E-01	3.368E+00	3.373E+00	NOT IDENT.
CD-109	3.748E+01	6.579E+01	6.793E+01	NOT IDENT.
AG-110	2.523E+01	6.175E+01	6.279E+01	NOT IDENT.
AG-110M	-1.937E-01	4.937E+00	4.938E+00	FAIL ABUN
IN-111	-1.317E+03	5.708E+03	5.739E+03	SHORT HLIF
SN-113	1.580E+00	5.262E+00	5.310E+00	NOT IDENT.
IN-114M	-1.562E+01	2.104E+01	2.219E+01	NOT IDENT.
CD-115	2.475E+03	1.841E+05	1.841E+05	SHORT HLIF
SN-117M	-3.932E+00	1.151E+01	1.165E+01	NOT IDENT.
SB-122	9.547E+03	1.421E+04	1.485E+04	SHORT HLIF
I-123	-3.355E+16	2.377E+17	0.000E+00	SHORT HLIF
TE-123M	-3.790E-01	2.988E+00	2.993E+00	NOT IDENT.
SB-124	1.343E+01	1.081E+01	1.239E+01	NOT IDENT.
SB-125	2.399E-01	9.152E+00	9.152E+00	NOT IDENT.
TE-125M	-9.615E+01	9.550E+02	9.560E+02	NOT IDENT.
I-126	-4.471E+01	6.957E+01	7.244E+01	NOT IDENT.
SB-126	-1.853E+01	3.879E+01	3.968E+01	FAIL ABUN
SN-126	1.506E+00	6.284E+00	6.321E+00	FAIL ABUN
SB-127	1.085E+03	2.552E+03	2.599E+03	NOT IDENT.
TE-129	-4.601E+00	7.175E+01	7.178E+01	NOT IDENT.
I-131	-1.375E+01	5.292E+01	5.328E+01	NOT IDENT.
I-132	1.000E+41	2.025E+41	0.000E+00	SHORT HLIF
TE-132	-8.603E+02	2.675E+03	2.704E+03	NOT IDENT.
BA-133	1.961E+00	4.713E+00	4.795E+00	NOT IDENT.
I-133	9.410E+09	2.362E+11	2.362E+11	SHORT HLIF
CS-134	1.011E+00	4.287E+00	4.311E+00	NOT IDENT.
I-135	6.980E+34	1.685E+35	0.000E+00	SHORT HLIF
CS-136	-4.193E+00	2.640E+01	2.647E+01	NOT IDENT.
BA-137M	-3.401E-01	3.890E+00	3.893E+00	NOT IDENT.
CS-137	-3.593E-01	4.109E+00	4.113E+00	NOT IDENT.
LA-138	-1.811E+00	6.575E+00	6.626E+00	NOT IDENT.
CE-139	-1.174E+00	3.120E+00	3.165E+00	NOT IDENT.
BA-140	-2.161E+01	6.379E+01	6.454E+01	NOT IDENT.
LA-140	8.343E+00	2.508E+01	2.536E+01	NOT IDENT.
CE-141	-4.426E+00	7.096E+00	7.372E+00	NOT IDENT.
CE-143	-6.080E+07	4.237E+07	5.048E+07	SHORT HLIF
CE-144	-3.103E+00	1.850E+01	1.855E+01	NOT IDENT.
PM-144	-6.941E-02	3.830E+00	3.830E+00	FAIL ABUN
PR-144	-4.118E+00	2.892E+02	2.892E+02	NOT IDENT.
PM-146	-1.257E-01	4.099E+00	4.099E+00	NOT IDENT.
ND-147	6.561E+01	1.855E+02	1.879E+02	NOT IDENT.
PM-147	-1.955E+04	6.369E+04	6.430E+04	NOT IDENT.
PM-149	4.173E+05	1.372E+06	1.385E+06	SHORT HLIF
EU-152	2.953E+00	9.038E+00	9.135E+00	NOT IDENT.
GD-153	-9.794E+00	9.323E+00	1.032E+01	NOT IDENT.
EU-154	4.293E+00	1.380E+01	1.393E+01	NOT IDENT.
EU-155	-2.534E+00	9.277E+00	9.347E+00	NOT IDENT.
TB-160	9.970E-01	1.645E+01	1.646E+01	NOT IDENT.
HO-166M	-5.507E+00	8.822E+00	9.166E+00	NOT IDENT.
TM-171	-2.205E+03	3.453E+03	3.594E+03	NOT IDENT.
LU-176	3.701E+00	3.220E+00	3.627E+00	FAIL ABUN
LU-177	-2.174E+02	5.588E+02	5.673E+02	NOT IDENT.
HF-181	-1.360E+00	6.625E+00	6.654E+00	NOT IDENT.
W-181	-9.015E+00	2.575E+01	2.607E+01	FAIL ABUN
TA-182	2.585E-01	2.174E+01	2.174E+01	NOT IDENT.
RE-183	-4.957E+00	2.688E+01	2.698E+01	NOT IDENT.
RE-184	9.917E-01	1.999E+01	1.999E+01	NOT IDENT.
RE-188	-1.053E+00	1.933E+01	1.934E+01	FAIL ABUN
W-188	-8.876E+01	7.450E+02	7.461E+02	FAIL ABUN
OS-191	-4.803E+01	3.442E+01	4.068E+01	FAIL ABUN
IR-192	1.302E+00	4.414E+00	4.453E+00	NOT IDENT.
PB-201	-4.141E+23	3.534E+24	0.000E+00	SHORT HLIF

TL-201	4.333E+03	2.415E+04	2.423E+04	SHORT HLIF
TL-202	-3.526E+00	1.805E+01	1.812E+01	NOT IDENT.
HG-203	-8.158E+00	6.399E+00	7.382E+00	NOT IDENT.
PB-203	-1.089E+05	8.541E+04	9.853E+04	SHORT HLIF
TL-204	2.261E+02	4.887E+02	4.992E+02	NOT IDENT.
BI-207	2.044E+00	5.294E+00	5.373E+00	NOT IDENT.
PB-210	-2.049E+02	7.870E+02	7.924E+02	NOT IDENT.
BI-211	-1.213E+01	2.158E+01	2.226E+01	NOT IDENT.
PB-211	2.772E+01	7.320E+01	7.426E+01	NOT IDENT.
PB-212	2.414E+00	6.785E+00	6.872E+00	NOT IDENT.
BI-213	-4.657E+00	1.158E+01	1.176E+01	NOT IDENT.
BI-214	-1.761E+00	1.059E+01	1.062E+01	NOT IDENT.
PB-214	1.206E+00	9.755E+00	9.770E+00	NOT IDENT.
RN-219	1.019E+01	4.889E+01	4.911E+01	NOT IDENT.
FR-221	1.011E+01	2.253E+01	2.298E+01	NOT IDENT.
RA-223	-3.240E+01	6.946E+01	7.099E+01	NOT IDENT.
RA-224	3.743E+00	6.654E+01	6.656E+01	NOT IDENT.
AC-225	8.703E+01	1.940E+02	1.980E+02	NOT IDENT.
RA-226	-2.731E+01	8.617E+01	8.704E+01	NOT IDENT.
AC-227	3.760E+00	2.986E+01	2.991E+01	NOT IDENT.
TH-227	3.760E+00	2.986E+01	2.991E+01	NOT IDENT.
AC-228	-1.353E+00	1.952E+01	1.953E+01	FAIL ABUN
RA-228	-1.353E+00	1.952E+01	1.953E+01	FAIL ABUN
TH-228	2.414E+00	6.785E+00	6.872E+00	NOT IDENT.
TH-229	-5.529E+00	5.066E+01	5.072E+01	NOT IDENT.
TH-230	-5.113E+02	9.975E+02	1.024E+03	NOT IDENT.
PA-231	-1.341E+01	4.475E+01	4.515E+01	NOT IDENT.
TH-231	-3.600E+01	4.429E+01	4.718E+01	NOT IDENT.
PA-233	3.279E+00	6.830E+00	6.988E+00	NOT IDENT.
PA-234	-3.715E+01	6.138E+01	6.362E+01	FAIL ABUN
PA-234M	1.686E+02	5.641E+02	5.692E+02	FAIL ABUN
TH-234	2.818E+02	2.995E+02	3.254E+02	FAIL ABUN
U-234	-1.504E+02	1.162E+04	1.162E+04	NOT IDENT.
U-235	-1.130E+01	2.132E+01	2.192E+01	NOT IDENT.
NP-237	3.279E+00	6.830E+00	6.988E+00	NOT IDENT.
NP-238	0.000E+00	4.339E+05	0.000E+00	SHORT HLIF
U-238	2.818E+02	2.995E+02	3.254E+02	FAIL ABUN
NP-239	1.091E+01	2.319E+01	2.370E+01	NOT IDENT.
AM-241	7.375E+00	1.774E+01	1.805E+01	NOT IDENT.
AM-242	-7.417E+00	6.549E+01	6.557E+01	NOT IDENT.
AM-243	1.608E+00	4.473E+00	4.531E+00	NOT IDENT.
CM-243	8.534E-01	8.731E+00	8.740E+00	NOT IDENT.
BK-247	-3.039E+00	8.777E+00	8.883E+00	NOT IDENT.
CM-247	1.098E+00	4.340E+00	4.369E+00	NOT IDENT.
CF-249	-2.694E+00	4.483E+00	4.645E+00	NOT IDENT.
CF-251	-2.217E+00	1.192E+01	1.196E+01	NOT IDENT.
CF-252	-4.948E+03	1.588E+04	1.603E+04	NOT IDENT.
ANH-511	-1.113E+01	7.988E+00	9.434E+00	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	31.3002	133.52	35.0805	116.30	24.2256
879.38	23.0250	364.49	35.0892	116.74	28.9178
46.54	26.0344	80.22	0.0000	117.23	33.6248
228.16	30.8803	711.68	38.4823	119.76	31.0246
52.39	29.6512	356.01	45.2428	120.54	27.3183
53.20	23.9365	323.87	45.2539	120.90	26.4005
53.44	23.9641	82.35	0.0000	264.66	33.0189
57.53	25.8051	82.47	35.3686	121.22	33.0275
293.27	0.0000	82.47	0.0000	344.28	31.1842
57.53	32.0601	83.79	32.1451	122.06	21.7499
482.18	32.0603	265.00	36.4007	1274.44	38.8698
57.98	32.1255	84.21	36.4266	123.68	38.9292
59.32	26.6759	84.86	0.0000	1377.63	0.0000
59.54	26.7019	193.51	32.3234	127.23	37.3552
155.04	27.1897	105.31	39.2744	129.43	50.0735
63.00	27.3660	86.79	40.1601	131.20	32.8789
129.43	27.3996	86.94	35.0508	133.02	37.8765
63.29	27.3996	87.09	35.0680	133.52	35.9764
290.67	27.4331	87.57	33.4100	135.34	0.0000
63.81	27.4597	88.03	30.8867	136.00	34.2283
87.57	24.1074	306.78	32.6357	136.28	35.2293
64.99	29.4349	88.47	32.6493	136.47	35.2447
65.08	29.4458	531.02	63.2568	739.50	0.0000
66.73	29.6455	184.58	0.0000	140.51	0.0000
66.98	29.4107	92.59	36.5648	140.88	34.6107
67.24	28.6458	93.31	0.0000	143.76	35.8281
67.67	35.0722	94.56	66.5725	144.24	38.8548
1221.41	35.0833	311.90	67.4672	145.44	32.9637
439.51	35.2431	946.00	67.4713	152.32	25.3437
70.82	35.2431	97.43	37.9977	152.43	25.3494
167.43	0.0000	98.43	31.0213	1048.07	36.5663
97.43	31.3346	98.44	31.0223	154.21	44.7815
70.82	0.0000	99.53	25.7879	155.04	36.7031
70.82	36.3177	103.37	25.7879	158.56	29.6261
279.20	0.0000	116.74	25.7879	158.97	0.0000
1063.66	38.2223	100.11	34.7397	159.00	38.0303
72.87	0.0000	100.20	34.7490	162.33	33.1123
351.06	38.2309	102.03	28.6653	537.26	26.9216
74.66	30.2996	103.18	28.7607	163.33	35.2519
238.63	32.7759	103.37	28.7766	165.86	39.5963
351.93	32.7759	105.31	36.1707	167.43	0.0000
238.63	32.7759	106.12	19.9395	245.35	0.0000
74.97	32.7942	106.47	21.7736	427.87	30.8282
77.11	34.7053	109.28	30.1739	176.60	32.9720
256.23	35.0273	111.00	29.3975	177.52	33.0283
79.82	0.0000	111.76	31.2991	181.07	0.0000
80.02	35.0680	208.37	32.3233	184.41	61.4984
80.03	35.0687	116.24	24.2219	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	35.6879	300.09	28.0714	477.60	14.1353
186.21	37.8839	300.13	28.0727	477.99	14.1396
190.27	35.9762	301.36	25.5579	482.18	16.7199
193.51	33.9867	302.85	25.6030	487.02	17.2923
197.03	38.6038	304.50	23.0878	492.35	0.0000
198.01	32.0396	304.85	23.0971	497.08	18.4526
201.83	30.0219	306.78	25.7214	511.00	31.0806
204.12	30.1360	308.46	28.3493	514.00	84.1072
205.31	24.6036	311.90	23.2872	520.40	19.8226
208.37	33.7184	316.51	26.0120	520.69	0.0000
210.85	32.7250	319.41	34.7965	667.71	0.0000
215.65	31.8388	320.08	33.0815	527.90	0.0000
218.12	33.1038	321.04	27.8887	529.59	16.8053
222.11	28.7148	323.87	31.4744	529.87	0.0000
227.09	32.4053	325.23	36.7756	531.02	16.8229
227.38	37.0513	1596.21	21.9757	537.26	14.7861
228.16	44.0500	331.15	0.0000	1260.41	0.0000
228.18	44.0511	333.37	18.5532	552.55	10.6767
235.69	33.9946	334.37	22.1110	795.86	15.0584
235.96	35.1805	338.28	23.9810	564.24	0.0000
238.63	21.1904	911.20	23.9815	569.33	18.3613
238.98	0.0000	340.48	23.1473	569.50	16.2030
240.99	33.0753	340.55	24.9295	569.70	16.2054
242.00	29.5742	344.28	16.9837	582.08	13.0728
244.70	36.8134	345.93	24.1765	583.19	13.0825
245.35	0.0000	351.06	28.8079	595.83	15.3911
459.60	21.5538	351.93	19.8234	600.60	24.2612
685.70	27.6087	356.01	23.5265	604.72	23.2200
388.16	27.6241	361.25	0.0000	609.32	23.2892
256.23	33.7877	364.49	28.2943	610.33	23.3037
527.90	0.0000	366.42	0.0000	614.28	27.8127
264.66	22.7819	383.85	14.8844	618.01	14.4970
265.00	26.0482	388.16	17.7483	621.93	13.4150
269.46	35.6172	666.33	15.8873	630.19	0.0000
401.81	25.8514	391.70	19.6828	631.29	15.7426
273.65	43.2202	400.66	20.7937	632.98	7.8796
276.40	34.6984	401.32	0.0000	633.25	9.0068
583.19	34.7419	401.81	18.9237	634.78	13.5229
277.60	35.9933	402.40	17.0405	635.95	13.5327
402.40	18.6264	404.85	17.0790	636.99	11.2846
278.43	26.0917	410.95	24.8077	657.50	5.7129
279.20	0.0000	720.70	22.0197	884.68	7.9995
279.54	42.3029	423.72	14.4766	661.66	13.7451
280.46	27.4040	427.09	23.2314	664.57	0.0000
301.36	35.8535	427.87	16.4667	666.33	18.9519
284.31	34.2125	433.94	20.4493	666.50	18.9539
285.41	30.9169	439.51	19.5687	667.71	0.0000
285.90	0.0000	440.45	22.5222	677.62	6.9375
287.50	26.8086	453.88	14.8557	685.70	10.4553
290.67	21.8666	459.60	17.9114	692.65	0.0000
293.27	0.0000	463.37	16.9685	695.00	18.3942
295.22	28.7539	468.07	27.0533	696.49	14.9035
316.51	23.7008	473.00	21.1252	696.51	14.9035
298.58	31.4175	475.06	14.1068	697.00	19.2923
299.98	28.0680	696.49	14.1262	697.49	18.4205

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	9.6770	903.28	11.6770	1291.59	8.1215
706.68	13.2257	907.67	0.0000	1298.22	0.0000
711.68	15.0312	911.20	12.6953	1312.11	5.4501
720.70	16.8842	984.45	0.0000	1332.49	6.3998
721.93	0.0000	926.36	3.9325	1365.19	8.3127
1690.97	13.0482	935.54	15.7935	1368.63	0.0000
722.91	13.0491	937.49	9.4843	1377.63	0.0000
723.31	11.3910	983.53	9.5115	1384.29	2.7872
756.73	12.8210	945.96	0.0000	1408.01	5.6145
727.33	10.7025	946.00	17.4518	1434.09	6.6011
733.00	8.1797	949.00	7.9429	1435.80	6.6045
735.93	12.5448	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	11.1836	1460.82	9.5044
1434.09	11.7011	964.08	9.5930	1489.16	8.6238
747.24	11.7198	966.17	11.2017	1596.21	3.9477
752.31	11.7515	968.97	9.6129	1620.50	2.9798
753.82	9.9516	983.53	9.6718	1678.03	0.0000
756.73	10.8730	984.45	0.0000	1690.97	0.0000
763.94	8.7313	996.26	12.1538	1757.55	0.0000
765.80	7.2832	1001.03	11.1628	1764.49	3.0904
1001.03	4.3714	1004.73	10.1633	1770.23	8.2523
766.84	4.3723	1025.87	0.0000	1771.35	3.0955
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	9.1550	1037.84	8.2397	1808.65	1.0411
777.92	0.0000	1038.76	0.0000	1836.06	2.0958
778.90	12.8328	1046.59	7.2346		
783.70	12.8644	1048.07	9.3071		
1435.80	17.5034	1050.41	7.2457		
903.28	9.2279	1063.66	6.2428		
795.86	10.1702	1077.00	14.6417		
801.95	11.1288	1077.34	13.5975		
802.10	11.1295	1083.85	6.2915		
810.29	11.1753	1085.87	7.3456		
810.45	12.1074	1099.25	7.3828		
810.76	10.2464	1111.64	7.4170		
815.77	14.0071	1112.07	6.3585		
818.51	13.0908	1112.84	4.2402		
832.01	8.4713	1115.54	9.5504		
834.85	7.5403	1120.29	4.2520		
835.15	10.3696	1120.55	6.3787		
836.80	0.0000	1121.30	7.4439		
846.77	9.4794	1808.65	8.5337		
856.80	15.2397	1131.51	0.0000		
860.56	10.6866	1332.49	7.5849		
871.09	11.5063	1177.95	5.4269		
873.19	6.7187	1189.05	6.5380		
875.33	0.0000	1204.77	4.3826		
879.38	9.6255	1221.41	8.8154		
880.51	8.6674	1231.02	9.9498		
881.60	5.1388	1235.36	5.5356		
883.24	12.3426	1238.28	7.7575		
884.68	6.1754	1260.41	0.0000		
889.28	4.8347	1271.87	3.3622		
894.76	9.0474	1274.44	6.7299		
1836.06	9.7079	1274.54	6.7302		

VAX/VMS Nuclide Identification Report Generated 31-OCT-2022 10:19:35.24

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                   *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533002.CNF;1
Background file  : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM30.CNF;636
Background date  : 30-OCT-2022 10:46:12
Sample date      : 30-SEP-2022 07:51:00 Acquisition date : 31-OCT-2022 08:17:22
Sample ID        : G597533002 Sample quantity : 7.72210E-01 FILTER
Detector name     : GAM30 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:02.03 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : RXF2
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2333342 Detector SN# :
Matrix Spike ID   : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.60*	57	101	2.05	127.74	120	15	7.97E-03	43.1	
2	0	76.83	57	125	4.07	154.23	147	16	7.86E-03	46.0	
3	0	92.73*	16	70	0.94	186.07	182	8	2.24E-03	113.8	
4	0	116.36	45	45	1.70	233.36	229	9	6.21E-03	30.9	
5	2	137.42	35	58	1.31	275.53	272	12	4.86E-03	41.5	2.35E+00
6	2	139.53*	10	64	1.35	279.76	272	12	1.41E-03	150.5	
7	0	144.06*	5	47	0.59	288.83	285	6	7.20E-04	248.3	
8	0	148.31	20	36	1.40	297.33	295	5	2.74E-03	52.5	
9	0	186.51*	10	116	1.10	373.80	367	13	1.45E-03	232.7	
10	0	192.76	18	51	1.40	386.32	383	7	2.50E-03	69.8	
11	0	198.19*	8	52	0.71	397.20	393	7	1.09E-03	180.8	
12	0	209.05	21	34	0.70	418.93	416	6	2.96E-03	48.0	
13	0	238.41*	36	63	1.21	477.71	471	12	5.03E-03	51.1	
14	0	477.97	46	26	1.10	957.31	953	10	6.41E-03	25.1	
15	0	511.05*	24	43	2.70	1023.54	1014	19	3.31E-03	92.6	
16	0	654.27	21	35	7.08	1310.28	1300	20	2.98E-03	70.7	
17	0	779.50	8	13	3.79	1560.99	1553	11	1.12E-03	95.0	
18	0	789.96	13	13	0.71	1581.94	1575	13	1.82E-03	63.0	
19	0	806.79	8	7	1.41	1615.63	1610	10	1.08E-03	74.5	
20	0	970.72	17	5	0.73	1943.82	1939	10	2.36E-03	34.6	
21	0	1103.59	10	9	3.12	2209.87	2203	12	1.37E-03	68.9	
22	0	1109.65	10	2	1.48	2221.99	2217	8	1.37E-03	40.7	
23	0	1162.04	5	4	0.50	2326.89	2321	7	6.25E-04	83.5	
24	0	1375.69	5	4	1.06	2754.67	2750	7	6.25E-04	83.5	
25	0	1460.39*	23	4	1.68	2924.26	2917	15	3.13E-03	33.1	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 31-OCT-2022 10:19:36

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533002.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 30-SEP-2022 07:51:00	Acquisition date	: 31-OCT-2022 08:17:22
Sample ID	: G597533002	Sample quantity	: 0.77221 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA30	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:02.03 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	46	10.44*	2.448E+00	8.780E+01	1.316E+02	50.24
K-40	1460.82	23	10.66*	9.946E-01	1.032E+02	1.032E+02	66.30
CE-141	145.44	5	48.29*	5.046E+00	1.034E+00	2.005E+00	496.65
PB-212	74.82	-----	10.28	3.705E+00	-----	Line Not Found	-----
	77.11	57	17.10	3.859E+00	4.168E+01	4.299E+01	92.05
	238.63	36	43.60*	3.946E+00	1.022E+01	1.054E+01	102.21
	300.09	-----	3.30	3.398E+00	-----	Line Not Found	-----
RA-226	186.21	10	3.59*	4.545E+00	3.103E+01	3.103E+01	465.44
TH-228	74.82	-----	10.28	3.705E+00	-----	Line Not Found	-----
	77.11	57	17.10	3.859E+00	4.168E+01	4.299E+01	92.05
	238.63	36	43.60*	3.946E+00	1.022E+01	1.054E+01	102.21
	300.09	-----	3.30	3.398E+00	-----	Line Not Found	-----
TH-232	63.81	57	0.26*	2.658E+00	4.034E+03	4.034E+03	86.22
	140.88	10	0.02	5.085E+00	4.835E+03	4.835E+03	301.05
TH-234	63.29	57	3.70*	2.658E+00	2.835E+02	2.835E+02	86.22
	92.59	16	4.23	4.725E+00	3.931E+01	3.931E+01	227.61
U-235	143.76	5	10.96*	5.046E+00	4.555E+00	4.555E+00	496.65
	163.33	-----	5.08	4.834E+00	-----	Line Not Found	-----
	185.72	10	57.20	4.545E+00	1.948E+00	1.948E+00	465.44
	205.31	-----	5.01	4.315E+00	-----	Line Not Found	-----
U-238	63.29	57	3.70*	2.658E+00	2.835E+02	2.835E+02	86.22
	92.59	16	4.23	4.725E+00	3.931E+01	3.931E+01	227.61
ANH-511	511.00	24	100.00*	2.330E+00	4.973E+00	4.973E+00	185.16

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                           *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533002.CNF;1      *
* Acquisition date   : 31-OCT-2022 08:17:22 Sensitivity      : 3.000                *
* Detector ID        : GAM30 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:02.03 Half life ratio : *****      *
* Sample date        : 30-SEP-2022 07:51:00 Analyst initials: RXF2      *
* Sample ID          : G597533002 Sample Quantity : 7.7221E-01 FILTER *
* Batch Number       : 2333342 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000           *
* Nuclide Library    : LIQUID.NLB;26
*****
*                                     CALIBRATION INFORMATION                       *
*
* Eff. Cal. date     : 4-OCT-2022 11:04:16 Eff. Geometry    : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM30_JAR.CNF;12      *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.316E+02	6.478E+01	6.130E+01
K-40	1.032E+02	6.702E+01	5.984E+01
CE-141	2.005E+00	9.757E+00	1.253E+01
PB-212	1.054E+01	1.056E+01	8.172E+00
RA-226	3.103E+01	1.415E+02	9.940E+01
TH-228	1.054E+01	1.056E+01	8.172E+00
TH-232	4.034E+03	3.409E+03	1.929E+03
TH-234	2.835E+02	2.395E+02	1.383E+02
U-235	4.555E+00	2.217E+01	3.109E+01
U-238	2.835E+02	2.395E+02	1.383E+02
ANH-511	4.973E+00	9.023E+00	4.639E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-1.211E+00		2.558E+00	4.851E+00	NOT IDENT.
NA-24	0.000E+00		2.304E+15	0.000E+00	SHORT HLIF
AL-26	-2.401E+00		2.817E+00	4.115E+00	NOT IDENT.
SC-46	8.132E-01		3.349E+00	6.927E+00	NOT IDENT.
V-48	4.171E+00		1.078E+01	2.384E+01	NOT IDENT.
CR-51	2.469E+00		4.841E+01	9.322E+01	NOT IDENT.
MN-52	-9.131E+01		1.513E+02	2.683E+02	NOT IDENT.
MN-54	1.461E+00		3.572E+00	7.176E+00	NOT IDENT.
CO-56	1.783E-01		3.978E+00	7.665E+00	NOT IDENT.
CO-57	-2.309E-01		2.205E+00	3.897E+00	FAIL ABUN
NI-57	0.000E+00		6.079E+06	0.000E+00	SHORT HLIF
CO-58	-2.925E-01		4.081E+00	6.910E+00	NOT IDENT.
FE-59	8.835E-01		8.491E+00	1.638E+01	NOT IDENT.
CO-60	-2.108E+00		3.634E+00	6.504E+00	NOT IDENT.
ZN-65	-3.417E+00		6.488E+00	1.201E+01	NOT IDENT.
CU-67	0.000E+00		2.282E+04	0.000E+00	SHORT HLIF
GE-68	-6.057E+01		1.058E+02	1.934E+02	NOT IDENT.
AS-73	-9.699E+00		7.344E+01	1.234E+02	NOT IDENT.
AS-74	1.117E+01		1.595E+01	3.316E+01	NOT IDENT.

SE-75	-2.900E+00	3.750E+00	6.667E+00	FAIL ABUN
BR-77	0.000E+00	1.661E+05	0.000E+00	SHORT HLIF
SR-82	2.687E+00	4.905E+01	8.494E+01	NOT IDENT.
RB-83	7.043E+00	6.604E+00	1.465E+01	NOT IDENT.
RB-84	2.550E+00	6.836E+00	1.469E+01	NOT IDENT.
KR-85	6.441E+02	6.661E+02	1.397E+03	NOT IDENT.
SR-85	3.999E+00	4.136E+00	8.676E+00	NOT IDENT.
RB-86	-6.335E+01	1.162E+02	2.137E+02	NOT IDENT.
Y-88	-1.489E+00	4.940E+00	9.296E+00	NOT IDENT.
Y-91	-6.414E+02	1.789E+03	3.419E+03	NOT IDENT.
NB-94	9.579E-01	3.359E+00	6.526E+00	NOT IDENT.
NB-95	6.972E-01	3.718E+00	7.448E+00	NOT IDENT.
NB-95M	4.364E+00	1.211E+01	2.066E+01	NOT IDENT.
TC-95M	-1.073E+00	4.715E+00	8.016E+00	NOT IDENT.
ZR-95	3.595E+00	5.777E+00	1.292E+01	NOT IDENT.
MO-99	0.000E+00	5.693E+04	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	6.031E+37	0.000E+00	SHORT HLIF
RH-101	7.897E-01	2.393E+00	4.458E+00	FAIL ABUN
RH-102M	-8.543E-01	2.787E+00	4.522E+00	NOT IDENT.
RU-103	1.973E+00	5.238E+00	1.035E+01	NOT IDENT.
RH-106	7.867E+00	2.789E+01	5.581E+01	NOT IDENT.
RU-106	7.867E+00	2.789E+01	5.581E+01	NOT IDENT.
AG-108M	-1.758E+00	2.613E+00	4.558E+00	NOT IDENT.
CD-109	-2.618E+01	5.996E+01	1.034E+02	NOT IDENT.
AG-110	2.130E+01	6.772E+01	1.252E+02	NOT IDENT.
AG-110M	-1.619E+00	3.184E+00	5.524E+00	NOT IDENT.
IN-111	0.000E+00	4.966E+03	0.000E+00	SHORT HLIF
SN-113	3.894E+00	4.226E+00	8.944E+00	NOT IDENT.
IN-114M	-7.369E+00	2.524E+01	3.367E+01	NOT IDENT.
CD-115	0.000E+00	1.411E+05	0.000E+00	SHORT HLIF
SN-117M	-2.439E+00	1.048E+01	1.804E+01	NOT IDENT.
SB-122	0.000E+00	9.153E+03	0.000E+00	SHORT HLIF
I-123	0.000E+00	2.115E+17	0.000E+00	SHORT HLIF
TE-123M	-4.937E-01	2.668E+00	4.615E+00	NOT IDENT.
SB-124	-5.995E+00	1.150E+01	2.048E+01	NOT IDENT.
SB-125	-8.527E+00	7.870E+00	1.283E+01	NOT IDENT.
TE-125M	8.219E+02	9.276E+02	1.815E+03	NOT IDENT.
I-126	-2.726E+01	4.746E+01	8.051E+01	NOT IDENT.
SB-126	3.376E+00	2.748E+01	5.435E+01	NOT IDENT.
SN-126	-6.521E+00	6.009E+00	9.671E+00	FAIL ABUN
SB-127	2.673E+02	1.885E+03	3.726E+03	NOT IDENT.
TE-129	-1.975E+01	5.657E+01	1.036E+02	NOT IDENT.
I-131	-2.551E+01	3.359E+01	5.863E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	-7.226E+02	2.259E+03	3.763E+03	FAIL ABUN
BA-133	-2.101E+00	3.788E+00	6.785E+00	NOT IDENT.
I-133	0.000E+00	1.743E+11	0.000E+00	SHORT HLIF
CS-134	-9.427E-01	3.034E+00	5.231E+00	NOT IDENT.
I-135	0.000E+00	1.525E+35	0.000E+00	SHORT HLIF
CS-136	-3.151E+01	2.142E+01	3.085E+01	NOT IDENT.
BA-137M	-1.777E+00	2.779E+00	4.402E+00	NOT IDENT.
CS-137	-1.877E+00	2.936E+00	4.650E+00	NOT IDENT.
LA-138	1.523E+00	4.538E+00	1.039E+01	FAIL ABUN
CE-139	-1.120E-01	2.689E+00	4.727E+00	NOT IDENT.
BA-140	2.649E+01	5.891E+01	1.188E+02	NOT IDENT.
LA-140	1.395E+01	1.717E+01	4.363E+01	NOT IDENT.
CE-143	0.000E+00	3.002E+07	0.000E+00	SHORT HLIF
CE-144	4.023E+00	1.803E+01	3.054E+01	NOT IDENT.
PM-144	7.642E-01	3.205E+00	6.286E+00	FAIL ABUN
PR-144	5.425E+01	2.413E+02	4.725E+02	NOT IDENT.
PM-146	1.752E-01	3.913E+00	7.493E+00	NOT IDENT.
ND-147	-1.160E+01	1.449E+02	2.724E+02	NOT IDENT.
PM-147	-6.333E+03	6.094E+04	1.079E+05	NOT IDENT.
PM-149	0.000E+00	1.122E+06	0.000E+00	SHORT HLIF
EU-152	6.228E+00	8.299E+00	1.718E+01	FAIL ABUN
GD-153	-6.647E+00	7.496E+00	1.145E+01	NOT IDENT.
EU-154	-3.403E+00	7.190E+00	1.363E+01	NOT IDENT.
EU-155	6.100E+00	8.397E+00	1.620E+01	NOT IDENT.
TB-160	-1.526E+00	1.208E+01	2.287E+01	FAIL ABUN
HO-166M	-1.558E+00	6.439E+00	1.156E+01	NOT IDENT.
TM-171	4.115E+01	1.421E+03	2.437E+03	NOT IDENT.
LU-176	1.405E-02	2.159E+00	4.170E+00	NOT IDENT.
LU-177	5.963E+02	5.607E+02	9.543E+02	FAIL ABUN
HF-181	1.314E-01	5.292E+00	9.186E+00	NOT IDENT.
W-181	1.344E+01	1.413E+01	2.771E+01	FAIL ABUN
TA-182	-1.904E+00	1.368E+01	2.766E+01	NOT IDENT.
RE-183	-1.660E+00	1.551E+01	2.638E+01	NOT IDENT.
RE-184	-9.474E+00	1.506E+01	2.486E+01	NOT IDENT.

RE-188	-5.776E+00	1.604E+01	2.723E+01	FAIL ABUN
W-188	5.218E+01	6.713E+02	1.307E+03	FAIL ABUN
OS-191	5.913E+00	2.781E+01	5.045E+01	FAIL ABUN
IR-192	-6.195E-02	3.452E+00	6.619E+00	NOT IDENT.
PB-201	0.000E+00	3.681E+24	0.000E+00	SHORT HLIF
TL-201	0.000E+00	2.053E+04	0.000E+00	SHORT HLIF
TL-202	-3.429E+00	1.506E+01	2.798E+01	NOT IDENT.
HG-203	-1.868E+00	4.326E+00	7.613E+00	NOT IDENT.
PB-203	0.000E+00	5.767E+04	0.000E+00	SHORT HLIF
TL-204	-4.741E+00	3.438E+02	5.928E+02	NOT IDENT.
BI-207	-1.263E+00	4.421E+00	8.549E+00	NOT IDENT.
TL-208	-2.308E+00	3.611E+00	6.456E+00	NOT IDENT.
PB-210	-6.795E+01	2.575E+02	4.287E+02	NOT IDENT.
BI-211	-5.787E+00	2.068E+01	3.735E+01	NOT IDENT.
PB-211	3.928E+01	5.285E+01	1.130E+02	NOT IDENT.
BI-212	-2.301E+01	4.233E+01	7.290E+01	NOT IDENT.
BI-213	5.116E+00	8.952E+00	1.841E+01	NOT IDENT.
BI-214	-6.256E+00	8.932E+00	1.413E+01	NOT IDENT.
PB-214	2.621E+00	7.858E+00	1.500E+01	FAIL ABUN
RN-219	-1.773E+01	3.351E+01	6.008E+01	NOT IDENT.
FR-221	-3.959E+00	1.726E+01	2.941E+01	NOT IDENT.
RA-223	3.354E+00	5.094E+01	9.916E+01	FAIL ABUN
RA-224	-1.434E+01	5.991E+01	9.224E+01	NOT IDENT.
AC-225	-3.409E+01	1.486E+02	2.532E+02	NOT IDENT.
AC-227	1.655E+01	2.214E+01	4.522E+01	NOT IDENT.
TH-227	1.655E+01	2.214E+01	4.522E+01	NOT IDENT.
AC-228	1.819E+01	1.423E+01	3.189E+01	NOT IDENT.
RA-228	1.819E+01	1.423E+01	3.189E+01	NOT IDENT.
TH-229	4.440E+01	6.075E+01	8.392E+01	FAIL ABUN
TH-230	-4.299E+02	8.400E+02	1.281E+03	NOT IDENT.
PA-231	-5.536E+00	4.101E+01	7.745E+01	NOT IDENT.
TH-231	-5.112E+00	3.323E+01	5.905E+01	NOT IDENT.
PA-233	-1.488E+00	5.017E+00	9.399E+00	NOT IDENT.
PA-234	2.090E+01	2.329E+01	5.365E+01	NOT IDENT.
PA-234M	1.364E+02	3.733E+02	8.061E+02	NOT IDENT.
U-234	-9.051E+02	4.876E+03	8.138E+03	NOT IDENT.
NP-237	-1.488E+00	5.017E+00	9.399E+00	NOT IDENT.
NP-238	0.000E+00	3.015E+05	0.000E+00	SHORT HLIF
NP-239	0.000E+00	3.219E+01	4.353E+01	FAIL ABUN
AM-241	-5.045E+00	1.004E+01	1.607E+01	NOT IDENT.
AM-242	5.264E+00	5.589E+01	9.562E+01	FAIL ABUN
AM-243	4.300E+00	3.587E+00	7.250E+00	NOT IDENT.
CM-243	-2.998E+00	8.104E+00	1.405E+01	NOT IDENT.
BK-247	-4.164E+00	6.239E+00	1.123E+01	NOT IDENT.
CM-247	-1.545E+00	3.079E+00	5.541E+00	NOT IDENT.
CF-249	-1.383E+00	3.221E+00	5.877E+00	NOT IDENT.
CF-251	-6.329E+00	1.201E+01	1.981E+01	NOT IDENT.
CF-252	9.995E+03	1.377E+04	2.668E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.60	90	101	2.05	127.74	120	15	1.25E-02	26.6	
2	0	76.83	57	125	4.07	154.23	147	16	7.86E-03	46.0	
3	0	92.73	79	70	0.94	186.07	182	8	1.10E-02	21.5	
4	0	116.36	45	45	1.70	233.36	229	9	6.21E-03	30.9	
5	2	137.42	35	58	1.31	275.53	272	12	4.86E-03	41.5	2.35E+00
6	2	139.53	18	64	1.35	279.76	272	12	2.54E-03	79.6	
7	0	144.06	20	47	0.59	288.83	285	6	2.74E-03	60.3	
8	0	148.31	20	36	1.40	297.33	295	5	2.74E-03	52.5	
9	0	186.51	50	116	1.10	373.80	367	13	7.00E-03	46.3	
10	0	192.76	18	51	1.40	386.32	383	7	2.50E-03	69.8	
11	0	198.19	25	52	0.71	397.20	393	7	3.52E-03	51.3	
12	0	209.05	21	34	0.70	418.93	416	6	2.96E-03	48.0	
13	0	238.41	68	63	1.21	477.71	471	12	9.44E-03	26.3	
14	0	477.97	46	26	1.10	957.31	953	10	6.41E-03	25.1	
15	0	511.05	177	43	2.70	1023.54	1014	19	2.46E-02	11.6	
16	0	654.27	21	35	7.08	1310.28	1300	20	2.98E-03	70.7	
17	0	779.50	8	13	3.79	1560.99	1553	11	1.12E-03	95.0	
18	0	789.96	13	13	0.71	1581.94	1575	13	1.82E-03	63.0	
19	0	806.79	8	7	1.41	1615.63	1610	10	1.08E-03	74.5	
20	0	970.72	17	5	0.73	1943.82	1939	10	2.36E-03	34.6	
21	0	1103.59	10	9	3.12	2209.87	2203	12	1.37E-03	68.9	
22	0	1109.65	10	2	1.48	2221.99	2217	8	1.37E-03	40.7	
23	0	1162.04	5	4	0.50	2326.89	2321	7	6.25E-04	83.5	
24	0	1375.69	5	4	1.06	2754.67	2750	7	6.25E-04	83.5	
25	0	1460.39	32	4	1.68	2924.26	2917	15	4.47E-03	22.0	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	46	10.44*	2.448E+00	8.780E+01	1.316E+02	50.24
K-40	1460.82	23	10.66*	9.946E-01	1.032E+02	1.032E+02	66.30
CE-141	145.44	5	48.29*	5.046E+00	1.034E+00	2.005E+00	496.65
PB-212	74.82	-----	10.28	3.705E+00	-----	Line Not Found	-----
	77.11	57	17.10	3.859E+00	4.168E+01	4.299E+01	92.05
	238.63	36	43.60*	3.946E+00	1.022E+01	1.054E+01	102.21
	300.09	-----	3.30	3.398E+00	-----	Line Not Found	-----
RA-226	186.21	10	3.59*	4.545E+00	3.103E+01	3.103E+01	465.44
TH-228	74.82	-----	10.28	3.705E+00	-----	Line Not Found	-----
	77.11	57	17.10	3.859E+00	4.168E+01	4.299E+01	92.05
	238.63	36	43.60*	3.946E+00	1.022E+01	1.054E+01	102.21
	300.09	-----	3.30	3.398E+00	-----	Line Not Found	-----
TH-232	63.81	57	0.26*	2.658E+00	4.034E+03	4.034E+03	86.22
	140.88	10	0.02	5.085E+00	4.835E+03	4.835E+03	301.05
TH-234	63.29	57	3.70*	2.658E+00	2.835E+02	2.835E+02	86.22
	92.59	16	4.23	4.725E+00	3.931E+01	3.931E+01	227.61
U-235	143.76	5	10.96*	5.046E+00	4.555E+00	4.555E+00	496.65
	163.33	-----	5.08	4.834E+00	-----	Line Not Found	-----
	185.72	10	57.20	4.545E+00	1.948E+00	1.948E+00	465.44
	205.31	-----	5.01	4.315E+00	-----	Line Not Found	-----
U-238	63.29	57	3.70*	2.658E+00	2.835E+02	2.835E+02	86.22
	92.59	16	4.23	4.725E+00	3.931E+01	3.931E+01	227.61
ANH-511	511.00	24	100.00*	2.330E+00	4.973E+00	4.973E+00	185.16

Flag: "*" = Keyline

Total number of lines in spectrum 25
Number of unidentified lines 8
Number of lines tentatively identified by NID 17 68.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.50	8.780E+01	1.316E+02	0.661E+02	50.24	
K-40	1.25E+09Y	1.00	1.032E+02	1.032E+02	0.684E+02	66.30	
CE-141	32.51D	1.94	1.034E+00	2.005E+00	9.956E+00	496.65	
PB-212	1.91Y	1.03	1.022E+01	1.054E+01	1.078E+01	102.21	
RA-226	1600.00Y	1.00	3.103E+01	3.103E+01	14.44E+01	465.44	
TH-228	1.91Y	1.03	1.022E+01	1.054E+01	1.078E+01	102.21	
TH-232	1.41E+10Y	1.00	4.034E+03	4.034E+03	3.478E+03	86.22	
TH-234	4.47E+09Y	1.00	2.835E+02	2.835E+02	2.444E+02	86.22	
U-235	7.04E+08Y	1.00	4.555E+00	4.555E+00	22.62E+00	496.65	
U-238	4.47E+09Y	1.00	2.835E+02	2.835E+02	2.444E+02	86.22	
ANH-511	1.00E+09Y	1.00	4.973E+00	4.973E+00	9.207E+00	185.16	
Total Activity :			4.854E+03	4.899E+03			

Grand Total Activity : 4.854E+03 4.899E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	116.36	45	45	1.70	233.36	229	9	6.21E-03	61.8	5.15E+00	T
2	137.42	35	58	1.31	275.53	272	12	4.86E-03	83.0	5.10E+00	T
0	148.31	20	36	1.40	297.33	295	5	2.74E-03	****	5.00E+00	
0	192.76	18	51	1.40	386.32	383	7	2.50E-03	****	4.47E+00	T
0	198.19	8	52	0.71	397.20	393	7	1.09E-03	****	4.40E+00	T
0	209.05	21	34	0.70	418.93	416	6	2.96E-03	95.9	4.27E+00	T
0	654.27	21	35	7.08	1310.28	1300	20	2.98E-03	****	1.92E+00	
0	779.50	8	13	3.79	1560.99	1553	11	1.12E-03	****	1.67E+00	T
0	789.96	13	13	0.71	1581.94	1575	13	1.82E-03	****	1.65E+00	T
0	806.79	8	7	1.41	1615.63	1610	10	1.08E-03	****	1.62E+00	
0	970.72	17	5	0.73	1943.82	1939	10	2.36E-03	69.1	1.39E+00	
0	1103.59	10	9	3.12	2209.87	2203	12	1.37E-03	****	1.24E+00	
0	1109.65	10	2	1.48	2221.99	2217	8	1.37E-03	81.4	1.24E+00	
0	1162.04	5	4	0.50	2326.89	2321	7	6.25E-04	****	1.19E+00	
0	1375.69	5	4	1.06	2754.67	2750	7	6.25E-04	****	1.04E+00	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533002.CNF;1  *
* Acquisition date   : 31-OCT-2022 08:17:22 Sensitivity      : 3.000          *
* Detector ID        : GAM30 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 02:00:02.03 Half life ratio  : *****         *
* Sample date        : 30-SEP-2022 07:51:00 Nuclide Library : LIQUID         *
* Sample ID          : G597533002 Analyst initials:  RXF2           *
* Batch Number       : 2333342 Sample Quantity  : 7.7221E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight       : 0.00000         *
*                                     Dry Weight    : 0.00000         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 4-OCT-2022 11:04:16 Eff. Geometry    : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM30_JAR.CNF;12          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	2.681E+01
K-40	2.372E+01
CE-141	5.743E+00
PB-212	3.693E+00
RA-226	4.570E+01
TH-228	3.693E+00
TH-232	8.704E+02
TH-234	6.241E+01
U-235	1.437E+01
U-238	6.241E+01
ANH-511	2.038E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	1.816E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	1.301E+00	NOT IDENT.
SC-46	2.895E+00	NOT IDENT.
V-48	1.008E+01	NOT IDENT.
CR-51	4.219E+01	NOT IDENT.
MN-52	1.035E+02	NOT IDENT.
MN-54	3.142E+00	NOT IDENT.
CO-56	3.275E+00	NOT IDENT.
CO-57	1.788E+00	FAIL ABUN
NI-57	0.000E+00	SHORT HLIF
CO-58	2.901E+00	NOT IDENT.
FE-59	6.680E+00	NOT IDENT.
CO-60	2.629E+00	NOT IDENT.
ZN-65	4.852E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	7.931E+01	NOT IDENT.
AS-73	5.630E+01	NOT IDENT.
AS-74	1.478E+01	NOT IDENT.
SE-75	2.973E+00	FAIL ABUN

BR-77	0.000E+00	SHORT HLIF
SR-82	3.639E+01	NOT IDENT.
RB-83	6.510E+00	NOT IDENT.
RB-84	6.122E+00	NOT IDENT.
KR-85	6.326E+02	NOT IDENT.
SR-85	3.928E+00	NOT IDENT.
RB-86	8.784E+01	NOT IDENT.
Y-88	3.711E+00	NOT IDENT.
Y-91	1.394E+03	NOT IDENT.
NB-94	2.902E+00	NOT IDENT.
NB-95	3.180E+00	NOT IDENT.
NB-95M	9.398E+00	NOT IDENT.
TC-95M	3.668E+00	NOT IDENT.
ZR-95	5.473E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.039E+00	FAIL ABUN
RH-102M	1.976E+00	NOT IDENT.
RU-103	4.652E+00	NOT IDENT.
RH-106	2.441E+01	NOT IDENT.
RU-106	2.441E+01	NOT IDENT.
AG-108M	2.003E+00	NOT IDENT.
CD-109	4.761E+01	NOT IDENT.
AG-110	5.430E+01	NOT IDENT.
AG-110M	2.105E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	4.042E+00	NOT IDENT.
IN-114M	1.539E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	8.263E+00	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.116E+00	NOT IDENT.
SB-124	8.055E+00	NOT IDENT.
SB-125	5.570E+00	NOT IDENT.
TE-125M	8.385E+02	NOT IDENT.
I-126	3.470E+01	NOT IDENT.
SB-126	2.326E+01	NOT IDENT.
SN-126	4.443E+00	FAIL ABUN
SB-127	1.605E+03	NOT IDENT.
TE-129	4.538E+01	NOT IDENT.
I-131	2.536E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	1.728E+03	FAIL ABUN
BA-133	3.041E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	2.133E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.218E+01	NOT IDENT.
BA-137M	1.817E+00	NOT IDENT.
CS-137	1.919E+00	NOT IDENT.
LA-138	4.200E+00	FAIL ABUN
CE-139	2.164E+00	NOT IDENT.
BA-140	5.289E+01	NOT IDENT.
LA-140	1.783E+01	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.403E+01	NOT IDENT.
PM-144	2.761E+00	FAIL ABUN
PR-144	2.074E+02	NOT IDENT.
PM-146	3.346E+00	NOT IDENT.
ND-147	1.205E+02	NOT IDENT.
PM-147	4.941E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	7.793E+00	FAIL ABUN
GD-153	5.217E+00	NOT IDENT.
EU-154	5.103E+00	NOT IDENT.
EU-155	7.479E+00	NOT IDENT.
TB-160	9.489E+00	FAIL ABUN
HO-166M	5.106E+00	NOT IDENT.
TM-171	1.118E+03	NOT IDENT.
LU-176	1.876E+00	NOT IDENT.
LU-177	4.396E+02	FAIL ABUN
HF-181	4.036E+00	NOT IDENT.
W-181	1.263E+01	FAIL ABUN
TA-182	1.126E+01	NOT IDENT.
RE-183	1.192E+01	NOT IDENT.
RE-184	1.028E+01	NOT IDENT.
RE-188	1.246E+01	FAIL ABUN

W-188	5.897E+02	FAIL ABUN
OS-191	2.329E+01	FAIL ABUN
IR-192	2.986E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF
TL-202	1.241E+01	NOT IDENT.
HG-203	3.449E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	2.714E+02	NOT IDENT.
BI-207	3.587E+00	NOT IDENT.
TL-208	2.850E+00	NOT IDENT.
PB-210	1.960E+02	NOT IDENT.
BI-211	1.701E+01	NOT IDENT.
PB-211	5.021E+01	NOT IDENT.
BI-212	3.070E+01	NOT IDENT.
BI-213	8.232E+00	NOT IDENT.
BI-214	6.360E+00	NOT IDENT.
PB-214	6.895E+00	FAIL ABUN
RN-219	2.645E+01	NOT IDENT.
FR-221	1.333E+01	NOT IDENT.
RA-223	4.447E+01	FAIL ABUN
RA-224	4.192E+01	NOT IDENT.
AC-225	1.147E+02	NOT IDENT.
AC-227	2.078E+01	NOT IDENT.
TH-227	2.078E+01	NOT IDENT.
AC-228	1.419E+01	NOT IDENT.
RA-228	1.419E+01	NOT IDENT.
TH-229	3.863E+01	FAIL ABUN
TH-230	5.846E+02	NOT IDENT.
PA-231	3.511E+01	NOT IDENT.
TH-231	2.724E+01	NOT IDENT.
PA-233	4.185E+00	NOT IDENT.
PA-234	2.297E+01	NOT IDENT.
PA-234M	3.452E+02	NOT IDENT.
U-234	3.709E+03	NOT IDENT.
NP-237	4.185E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
NP-239	2.017E+01	FAIL ABUN
AM-241	7.214E+00	NOT IDENT.
AM-242	4.412E+01	FAIL ABUN
AM-243	3.361E+00	NOT IDENT.
CM-243	6.400E+00	NOT IDENT.
BK-247	5.025E+00	NOT IDENT.
CM-247	2.442E+00	NOT IDENT.
CF-249	2.589E+00	NOT IDENT.
CF-251	9.094E+00	NOT IDENT.
CF-252	1.230E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533002.CNF;1
Acquisition date : 31-OCT-2022 08:17:22 Sensitivity : 3.000
Detector ID : GAM30 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:02.03 Half life ratio : *****
Sample date : 30-SEP-2022 07:51:00 Nuclide Library : LIQUID
Sample ID : G597533002 Analyst initials: RXF2
Batch Number : 2333342 Sample Quantity : 7.7221E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 4-OCT-2022 11:04:16 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM30_JAR.CNF;12

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.316E+02	6.575E+01	6.580E+01
K-40	1.032E+02	6.773E+01	6.776E+01
CE-141	2.005E+00	9.758E+00	9.758E+00
PB-212	1.054E+01	1.061E+01	1.061E+01
RA-226	3.103E+01	1.416E+02	1.416E+02
TH-228	1.054E+01	1.061E+01	1.061E+01
TH-232	4.034E+03	3.446E+03	3.447E+03
TH-234	2.835E+02	2.480E+02	2.480E+02
U-235	4.555E+00	2.217E+01	2.217E+01
U-238	2.835E+02	2.480E+02	2.480E+02
ANH-511	4.973E+00	9.033E+00	9.034E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-1.211E+00	2.560E+00	2.618E+00	NOT IDENT.
NA-24	8.257E+14	2.306E+15	2.336E+15	SHORT HLIF
AL-26	-2.401E+00	2.822E+00	3.023E+00	NOT IDENT.
SC-46	8.132E-01	3.350E+00	3.370E+00	NOT IDENT.
V-48	4.171E+00	1.078E+01	1.095E+01	NOT IDENT.
CR-51	2.469E+00	4.842E+01	4.843E+01	NOT IDENT.
MN-52	-9.131E+01	1.516E+02	1.571E+02	NOT IDENT.
MN-54	1.461E+00	3.574E+00	3.634E+00	NOT IDENT.
CO-56	1.783E-01	3.979E+00	3.979E+00	NOT IDENT.
CO-57	-2.309E-01	2.205E+00	2.208E+00	FAIL ABUN
NI-57	3.784E+06	6.095E+06	6.330E+06	SHORT HLIF
CO-58	-2.925E-01	4.081E+00	4.083E+00	NOT IDENT.
FE-59	8.835E-01	8.492E+00	8.501E+00	NOT IDENT.
CO-60	-2.108E+00	3.639E+00	3.761E+00	NOT IDENT.
ZN-65	-3.417E+00	6.494E+00	6.675E+00	NOT IDENT.
CU-67	-1.788E+04	2.287E+04	2.425E+04	SHORT HLIF
GE-68	-6.057E+01	1.059E+02	1.094E+02	NOT IDENT.
AS-73	-9.699E+00	7.347E+01	7.360E+01	NOT IDENT.
AS-74	1.117E+01	1.600E+01	1.677E+01	NOT IDENT.

SE-75	-2.900E+00	3.760E+00	3.981E+00	FAIL ABUN
BR-77	1.658E+05	1.668E+05	1.828E+05	SHORT HLIF
SR-82	2.687E+00	4.905E+01	4.907E+01	NOT IDENT.
RB-83	7.043E+00	6.695E+00	7.411E+00	NOT IDENT.
RB-84	2.550E+00	6.840E+00	6.936E+00	NOT IDENT.
KR-85	6.441E+02	6.684E+02	7.289E+02	NOT IDENT.
SR-85	3.999E+00	4.150E+00	4.526E+00	NOT IDENT.
RB-86	-6.335E+01	1.163E+02	1.198E+02	NOT IDENT.
Y-88	-1.489E+00	4.941E+00	4.986E+00	NOT IDENT.
Y-91	-6.414E+02	1.790E+03	1.813E+03	NOT IDENT.
NB-94	9.579E-01	3.360E+00	3.388E+00	NOT IDENT.
NB-95	6.972E-01	3.719E+00	3.732E+00	NOT IDENT.
NB-95M	4.364E+00	1.212E+01	1.228E+01	NOT IDENT.
TC-95M	-1.073E+00	4.716E+00	4.741E+00	NOT IDENT.
ZR-95	3.595E+00	5.786E+00	6.009E+00	NOT IDENT.
MO-99	1.464E+04	5.695E+04	5.733E+04	SHORT HLIF
TC-99M	2.044E+37	6.035E+37	0.000E+00	SHORT HLIF
RH-101	7.897E-01	2.397E+00	2.423E+00	FAIL ABUN
RH-102M	-8.543E-01	2.789E+00	2.816E+00	NOT IDENT.
RU-103	1.973E+00	5.240E+00	5.316E+00	NOT IDENT.
RH-106	7.867E+00	2.790E+01	2.813E+01	NOT IDENT.
RU-106	7.867E+00	2.790E+01	2.813E+01	NOT IDENT.
AG-108M	-1.758E+00	2.617E+00	2.735E+00	NOT IDENT.
CD-109	-2.618E+01	6.002E+01	6.117E+01	NOT IDENT.
AG-110	2.130E+01	6.774E+01	6.842E+01	NOT IDENT.
AG-110M	-1.619E+00	3.189E+00	3.271E+00	NOT IDENT.
IN-111	3.400E+03	4.976E+03	5.207E+03	SHORT HLIF
SN-113	3.894E+00	4.238E+00	4.588E+00	NOT IDENT.
IN-114M	-7.369E+00	2.525E+01	2.547E+01	NOT IDENT.
CD-115	-9.916E+03	1.411E+05	1.411E+05	SHORT HLIF
SN-117M	-2.439E+00	1.048E+01	1.054E+01	NOT IDENT.
SB-122	-1.288E+03	9.154E+03	9.172E+03	SHORT HLIF
I-123	-3.982E+16	2.115E+17	0.000E+00	SHORT HLIF
TE-123M	-4.937E-01	2.669E+00	2.678E+00	NOT IDENT.
SB-124	-5.995E+00	1.152E+01	1.183E+01	NOT IDENT.
SB-125	-8.527E+00	7.903E+00	8.790E+00	NOT IDENT.
TE-125M	8.219E+02	9.297E+02	1.001E+03	NOT IDENT.
I-126	-2.726E+01	4.753E+01	4.910E+01	NOT IDENT.
SB-126	3.376E+00	2.748E+01	2.752E+01	NOT IDENT.
SN-126	-6.521E+00	6.034E+00	6.713E+00	FAIL ABUN
SB-127	2.673E+02	1.886E+03	1.889E+03	NOT IDENT.
TE-129	-1.975E+01	5.667E+01	5.737E+01	NOT IDENT.
I-131	-2.551E+01	3.366E+01	3.558E+01	NOT IDENT.
I-132	-1.000E+41	6.372E+41	0.000E+00	SHORT HLIF
TE-132	-7.226E+02	2.261E+03	2.284E+03	FAIL ABUN
BA-133	-2.101E+00	3.793E+00	3.909E+00	NOT IDENT.
I-133	1.656E+11	1.778E+11	1.929E+11	SHORT HLIF
CS-134	-9.427E-01	3.035E+00	3.065E+00	NOT IDENT.
I-135	1.025E+35	1.690E+35	0.000E+00	SHORT HLIF
CS-136	-3.151E+01	2.174E+01	2.597E+01	NOT IDENT.
BA-137M	-1.777E+00	2.783E+00	2.896E+00	NOT IDENT.
CS-137	-1.877E+00	2.940E+00	3.060E+00	NOT IDENT.
LA-138	1.523E+00	4.540E+00	4.591E+00	FAIL ABUN
CE-139	-1.120E-01	2.689E+00	2.689E+00	NOT IDENT.
BA-140	2.649E+01	5.895E+01	6.015E+01	NOT IDENT.
LA-140	1.395E+01	1.721E+01	1.832E+01	NOT IDENT.
CE-143	-5.514E+06	3.002E+07	3.012E+07	SHORT HLIF
CE-144	4.023E+00	1.803E+01	1.812E+01	NOT IDENT.
PM-144	7.642E-01	3.206E+00	3.224E+00	FAIL ABUN
PR-144	5.425E+01	2.413E+02	2.426E+02	NOT IDENT.
PM-146	1.752E-01	3.913E+00	3.914E+00	NOT IDENT.
ND-147	-1.160E+01	1.449E+02	1.450E+02	NOT IDENT.
PM-147	-6.333E+03	6.094E+04	6.101E+04	NOT IDENT.
PM-149	-2.045E+05	1.123E+06	1.127E+06	SHORT HLIF
EU-152	6.228E+00	8.321E+00	8.783E+00	FAIL ABUN
GD-153	-6.647E+00	7.513E+00	8.090E+00	NOT IDENT.
EU-154	-3.403E+00	7.196E+00	7.358E+00	NOT IDENT.
EU-155	6.100E+00	8.413E+00	8.852E+00	NOT IDENT.
TB-160	-1.526E+00	1.208E+01	1.210E+01	FAIL ABUN
HO-166M	-1.558E+00	6.440E+00	6.479E+00	NOT IDENT.
TM-171	4.115E+01	1.421E+03	1.421E+03	NOT IDENT.
LU-176	1.405E-02	2.159E+00	2.159E+00	NOT IDENT.
LU-177	5.963E+02	5.628E+02	6.238E+02	FAIL ABUN
HF-181	1.314E-01	5.292E+00	5.292E+00	NOT IDENT.
W-181	1.344E+01	1.456E+01	1.577E+01	FAIL ABUN
TA-182	-1.904E+00	1.369E+01	1.371E+01	NOT IDENT.
RE-183	-1.660E+00	1.551E+01	1.553E+01	NOT IDENT.
RE-184	-9.474E+00	1.510E+01	1.569E+01	NOT IDENT.

RE-188	-5.776E+00	1.604E+01	1.625E+01	FAIL ABUN
W-188	5.218E+01	6.713E+02	6.717E+02	FAIL ABUN
OS-191	5.913E+00	2.781E+01	2.794E+01	FAIL ABUN
IR-192	-6.195E-02	3.452E+00	3.452E+00	NOT IDENT.
PB-201	3.518E+24	3.930E+24	0.000E+00	SHORT HLIF
TL-201	-5.493E+03	2.053E+04	2.068E+04	SHORT HLIF
TL-202	-3.429E+00	1.507E+01	1.515E+01	NOT IDENT.
HG-203	-1.868E+00	4.330E+00	4.411E+00	NOT IDENT.
PB-203	-2.490E+04	5.772E+04	5.880E+04	SHORT HLIF
TL-204	-4.741E+00	3.438E+02	3.438E+02	NOT IDENT.
BI-207	-1.263E+00	4.423E+00	4.459E+00	NOT IDENT.
TL-208	-2.308E+00	3.616E+00	3.763E+00	NOT IDENT.
PB-210	-6.795E+01	2.575E+02	2.594E+02	NOT IDENT.
BI-211	-5.787E+00	2.068E+01	2.085E+01	NOT IDENT.
PB-211	3.928E+01	5.297E+01	5.585E+01	NOT IDENT.
BI-212	-2.301E+01	4.238E+01	4.363E+01	NOT IDENT.
BI-213	5.116E+00	8.962E+00	9.255E+00	NOT IDENT.
BI-214	-6.256E+00	8.948E+00	9.383E+00	NOT IDENT.
PB-214	2.621E+00	7.861E+00	7.950E+00	FAIL ABUN
RN-219	-1.773E+01	3.360E+01	3.454E+01	NOT IDENT.
FR-221	-3.959E+00	1.726E+01	1.735E+01	NOT IDENT.
RA-223	3.354E+00	5.094E+01	5.097E+01	FAIL ABUN
RA-224	-1.434E+01	5.993E+01	6.027E+01	NOT IDENT.
AC-225	-3.409E+01	1.486E+02	1.494E+02	NOT IDENT.
AC-227	1.655E+01	2.229E+01	2.351E+01	NOT IDENT.
TH-227	1.655E+01	2.229E+01	2.351E+01	NOT IDENT.
AC-228	1.819E+01	1.435E+01	1.653E+01	NOT IDENT.
RA-228	1.819E+01	1.435E+01	1.653E+01	NOT IDENT.
TH-229	4.440E+01	6.086E+01	6.407E+01	FAIL ABUN
TH-230	-4.299E+02	8.433E+02	8.653E+02	NOT IDENT.
PA-231	-5.536E+00	4.103E+01	4.110E+01	NOT IDENT.
TH-231	-5.112E+00	3.324E+01	3.332E+01	NOT IDENT.
PA-233	-1.488E+00	5.019E+00	5.064E+00	NOT IDENT.
PA-234	2.090E+01	3.342E+01	3.472E+01	NOT IDENT.
PA-234M	1.364E+02	3.735E+02	3.786E+02	NOT IDENT.
U-234	-9.051E+02	4.876E+03	4.893E+03	NOT IDENT.
NP-237	-1.488E+00	5.019E+00	5.064E+00	NOT IDENT.
NP-238	5.646E+04	3.015E+05	3.026E+05	SHORT HLIF
NP-239	5.311E+01	3.243E+01	4.032E+01	FAIL ABUN
AM-241	-5.045E+00	1.005E+01	1.031E+01	NOT IDENT.
AM-242	5.264E+00	5.589E+01	5.594E+01	FAIL ABUN
AM-243	4.300E+00	3.603E+00	4.092E+00	NOT IDENT.
CM-243	-2.998E+00	8.111E+00	8.223E+00	NOT IDENT.
BK-247	-4.164E+00	6.304E+00	6.579E+00	NOT IDENT.
CM-247	-1.545E+00	3.092E+00	3.170E+00	NOT IDENT.
CF-249	-1.383E+00	3.225E+00	3.285E+00	NOT IDENT.
CF-251	-6.329E+00	1.204E+01	1.237E+01	NOT IDENT.
CF-252	9.995E+03	1.649E+04	1.710E+04	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	40.7209	133.52	36.8531	116.30	34.6702
879.38	39.0342	364.49	36.8575	116.74	34.6914
46.54	32.4465	80.22	0.0000	117.23	34.7151
228.16	36.5477	711.68	39.6145	119.76	29.0302
52.39	36.6896	356.01	45.1128	120.54	45.7712
53.20	33.9390	323.87	45.1185	120.90	39.2517
53.44	33.9578	82.35	0.0000	264.66	41.4448
57.53	35.1530	82.47	41.1176	121.22	41.4503
293.27	0.0000	82.47	0.0000	344.28	42.5735
57.53	20.8890	83.79	46.3637	122.06	43.6816
482.18	20.8891	265.00	50.5032	1274.44	31.7123
57.98	31.3644	84.21	50.5212	123.68	37.2103
59.32	32.7662	84.86	0.0000	1377.63	0.0000
59.54	34.0930	193.51	51.6602	127.23	32.9874
155.04	28.6386	105.31	43.4772	129.43	44.1101
63.00	28.7290	86.79	43.4948	131.20	49.7379
129.43	28.7463	86.94	53.8646	133.02	40.9910
63.29	28.7463	87.09	56.9865	133.52	38.4303
290.67	28.7635	87.57	65.3283	135.34	0.0000
63.81	28.7771	88.03	53.9634	136.00	38.5509
87.57	28.8049	306.78	53.9912	136.28	38.5647
64.99	28.8467	88.47	48.4643	136.47	38.5737
65.08	28.8518	531.02	59.8021	739.50	0.0000
66.73	34.6045	184.58	0.0000	140.51	0.0000
66.98	38.6165	92.59	43.9143	140.88	49.2274
67.24	38.6366	93.31	0.0000	143.76	49.4006
67.67	40.0027	94.56	30.7676	144.24	43.4380
1221.41	40.0092	311.90	30.7719	145.44	40.5005
439.51	36.0893	946.00	30.7730	152.32	39.6970
70.82	36.0893	97.43	46.3613	152.43	39.7024
167.43	0.0000	98.43	30.6041	1048.07	31.7922
97.43	42.1685	98.44	30.6045	154.21	35.2373
70.82	0.0000	99.53	39.1132	155.04	45.5115
70.82	33.2059	103.37	39.1132	158.56	35.3111
279.20	0.0000	116.74	39.1132	158.97	0.0000
1063.66	37.7093	100.11	33.8579	159.00	44.5742
72.87	0.0000	100.20	33.8628	162.33	47.0359
351.06	37.7136	102.03	36.0799	537.26	47.0528
74.66	32.4346	103.18	41.4580	163.33	42.4939
238.63	32.4441	103.37	41.4699	165.86	40.3096
351.93	32.4441	105.31	35.1919	167.43	0.0000
238.63	32.4441	106.12	35.2345	245.35	0.0000
74.97	32.4531	106.47	38.4574	427.87	40.7652
77.11	32.5813	109.28	33.2528	176.60	33.7875
256.23	32.7332	111.00	46.2396	177.52	52.4789
79.82	0.0000	111.76	45.2136	181.07	0.0000
80.02	36.8465	208.37	35.9449	184.41	43.4582
80.03	36.8468	116.24	34.6672	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	43.5163	300.09	31.1169	477.60	16.3678
186.21	43.5383	300.13	31.1184	477.99	16.3712
190.27	44.8983	301.36	33.7418	482.18	17.3716
193.51	42.6720	302.85	24.2505	487.02	22.2518
197.03	42.8203	304.50	32.0837	492.35	0.0000
198.01	39.2892	304.85	30.3573	497.08	21.3926
201.83	33.4598	306.78	26.9251	511.00	17.6246
204.12	43.1136	308.46	23.4789	514.00	17.6506
205.31	20.7820	311.90	26.1511	520.40	9.8364
208.37	32.0646	316.51	28.8596	520.69	0.0000
210.85	35.3530	319.41	24.5365	667.71	0.0000
215.65	26.6326	320.08	29.8081	527.90	0.0000
218.12	35.1858	321.04	32.4593	529.59	11.8560
222.11	35.3132	323.87	24.6117	529.87	0.0000
227.09	29.3544	325.23	26.3947	531.02	20.7616
227.38	25.6918	1596.21	43.2149	537.26	16.8575
228.16	48.9703	331.15	0.0000	1260.41	0.0000
228.18	48.9716	333.37	37.1567	552.55	12.9831
235.69	27.9325	334.37	33.6412	795.86	13.0471
235.96	27.9390	338.28	24.8526	564.24	0.0000
238.63	29.6503	911.20	24.8538	569.33	16.1029
238.98	0.0000	340.48	22.2224	569.50	18.1165
240.99	37.9627	340.55	23.1123	569.70	18.1187
242.00	39.6470	344.28	21.3872	582.08	12.1460
244.70	38.4955	345.93	27.6548	583.19	13.1650
245.35	0.0000	351.06	27.7475	595.83	14.2569
459.60	29.9502	351.93	25.9721	600.60	25.5117
685.70	27.4946	356.01	33.2241	604.72	21.4683
388.16	33.3378	361.25	0.0000	609.32	25.6073
256.23	30.9237	364.49	22.5698	610.33	24.5938
527.90	0.0000	366.42	0.0000	614.28	22.5828
264.66	33.6580	383.85	26.4966	618.01	14.3936
265.00	33.6670	388.16	23.8175	621.93	13.3877
269.46	40.5430	666.33	26.5733	630.19	0.0000
401.81	27.9116	391.70	17.4418	631.29	13.4406
273.65	36.4387	400.66	21.2265	632.98	11.3809
276.40	32.2697	401.32	0.0000	633.25	11.3822
583.19	31.4438	401.81	24.9346	634.78	14.4956
277.60	28.8999	402.40	24.9434	635.95	9.3230
402.40	27.2083	404.85	12.9521	636.99	10.3634
278.43	23.8147	410.95	29.7103	657.50	10.9738
279.20	0.0000	720.70	23.2610	884.68	10.9747
279.54	30.6453	423.72	14.9635	661.66	13.8188
280.46	37.4813	427.09	21.5513	664.57	0.0000
301.36	25.6183	427.87	28.1226	666.33	14.6836
284.31	26.4842	433.94	26.3366	666.50	12.5869
285.41	32.4916	439.51	23.5870	667.71	0.0000
285.90	0.0000	440.45	16.9915	677.62	5.2679
287.50	35.9681	453.88	22.8208	685.70	11.6262
290.67	27.4694	459.60	20.9831	692.65	0.0000
293.27	0.0000	463.37	20.0695	695.00	11.6687
295.22	26.7005	468.07	24.9093	696.49	14.8596
316.51	32.7475	473.00	20.7475	696.51	14.8596
298.58	31.0833	475.06	20.1925	697.00	18.0473
299.98	31.9790	696.49	20.2104	697.49	21.2362

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	18.0867	903.28	13.6919	1291.59	6.6612
706.68	23.4430	907.67	0.0000	1298.22	0.0000
711.68	22.4202	911.20	8.0069	1312.11	2.8687
720.70	10.7129	984.45	0.0000	1332.49	10.5690
721.93	0.0000	926.36	10.3436	1365.19	6.7766
1690.97	10.7210	935.54	5.7627	1368.63	0.0000
722.91	10.7218	937.49	10.3792	1377.63	0.0000
723.31	8.5788	983.53	10.4004	1384.29	4.8615
756.73	4.2907	945.96	0.0000	1408.01	5.8649
727.33	15.0351	946.00	4.6250	1434.09	7.8647
733.00	15.0670	949.00	13.8877	1435.80	3.9338
735.93	7.5417	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	5.8099	1460.82	4.9442
1434.09	9.7266	964.08	18.6016	1489.16	4.9741
747.24	10.8191	966.17	8.7250	1596.21	2.0341
752.31	15.1752	968.97	10.4788	1620.50	4.0879
753.82	9.7606	983.53	7.0164	1678.03	0.0000
756.73	5.4285	984.45	0.0000	1690.97	8.2886
763.94	8.7080	996.26	7.9231	1757.55	0.0000
765.80	9.8031	1001.03	8.8156	1764.49	4.2019
1001.03	10.8948	1004.73	7.9426	1770.23	5.2582
766.84	11.9860	1025.87	0.0000	1771.35	4.2073
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	11.4810	1037.84	13.3640	1808.65	5.2951
777.92	0.0000	1038.76	0.0000	1836.06	7.4499
778.90	12.0380	1046.59	5.3591		
783.70	10.9623	1048.07	17.8711		
1435.80	6.5891	1050.41	8.9410		
903.28	11.5446	1063.66	11.6670		
795.86	9.2480	1077.00	11.7098		
801.95	13.2393	1077.34	11.7114		
802.10	9.9302	1083.85	7.2197		
810.29	6.6389	1085.87	7.2236		
810.45	4.9794	1099.25	5.8000		
810.76	9.9598	1111.64	4.3646		
815.77	12.1942	1112.07	4.3652		
818.51	11.0958	1112.84	5.8215		
832.01	12.2618	1115.54	10.0131		
834.85	12.2734	1120.29	6.3801		
835.15	12.2747	1120.55	6.3805		
836.80	0.0000	1121.30	8.2051		
846.77	11.2024	1808.65	3.6548		
856.80	12.3638	1131.51	0.0000		
860.56	9.0029	1332.49	8.3172		
871.09	9.0339	1177.95	7.4023		
873.19	10.1700	1189.05	9.2792		
875.33	0.0000	1204.77	9.3158		
879.38	9.0583	1221.41	7.4839		
880.51	2.2654	1231.02	1.8755		
881.60	5.6655	1235.36	13.1421		
883.24	7.9360	1238.28	7.5151		
884.68	6.8054	1260.41	0.0000		
889.28	6.8154	1271.87	3.7886		
894.76	13.6548	1274.44	5.6865		
1836.06	13.6689	1274.54	5.6865		

VAX/VMS Nuclide Identification Report Generated 31-OCT-2022 10:20:09.73

```
*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533003.CNF:1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM33.CNF:549
Background date    : 30-OCT-2022 10:46:28
Sample date       : 30-SEP-2022 07:58:00 Acquisition date : 31-OCT-2022 08:18:19
Sample ID        : G597533003 Sample quantity : 7.57770E-01 FILTER
Detector name    : GAM33 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:01.51 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : RXF2
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID        : 2333342 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.62*	14	101	1.02	126.81	122	10	1.88E-03	158.5	
2	1	90.29	22	39	1.24	180.22	178	11	3.05E-03	44.6	4.11E+00
3	8	143.51*	51	70	1.60	286.80	282	13	7.11E-03	36.1	3.15E+00
4	8	145.85	15	49	1.78	291.48	282	13	2.03E-03	86.7	
5	4	188.82	20	50	1.52	377.53	364	18	2.72E-03	71.1	1.31E+00
6	0	205.04*	21	54	0.96	410.00	407	9	2.96E-03	70.6	
7	3	238.56*	18	51	1.74	477.14	469	34	2.52E-03	90.1	1.30E+00
8	3	244.46	27	43	1.75	488.96	469	34	3.81E-03	53.5	
9	0	275.71	29	33	1.50	551.53	547	8	3.98E-03	39.8	
10	0	287.86	15	61	2.14	575.85	567	11	2.04E-03	107.7	
11	0	302.61	43	62	6.08	605.41	595	19	6.03E-03	46.0	
12	0	353.71	17	46	2.83	707.73	702	12	2.39E-03	83.7	
13	0	396.01	23	48	4.86	792.44	781	19	3.12E-03	76.4	
14	0	434.66	14	6	1.64	869.83	867	7	1.94E-03	40.6	
15	0	479.42	61	33	6.10	959.48	949	23	8.48E-03	28.0	
16	0	729.04	15	15	0.89	1459.40	1450	15	2.08E-03	61.9	
17	0	795.00	8	12	0.62	1591.50	1584	12	1.11E-03	93.5	
18	0	803.02*	16	11	2.56	1607.56	1599	18	2.28E-03	65.2	
19	0	839.40	7	10	1.30	1680.42	1672	10	9.56E-04	94.2	
20	0	868.49	16	0	2.91	1738.69	1734	9	2.22E-03	25.0	
21	0	911.48*	10	20	2.03	1824.80	1815	20	1.38E-03	124.8	
22	0	929.37	13	2	1.34	1860.62	1855	9	1.84E-03	33.8	
23	0	982.48	7	0	1.49	1967.00	1964	6	9.72E-04	37.8	
24	0	1035.60	8	2	3.23	2073.39	2068	9	1.11E-03	48.5	
25	0	1115.48	8	2	2.94	2233.40	2228	9	1.08E-03	49.8	
26	0	1119.93*	6	5	1.79	2242.30	2238	9	7.68E-04	103.5	
27	0	1153.25*	4	2	1.57	2309.04	2305	8	6.15E-04	98.3	
28	0	1437.43	11	3	1.41	2878.28	2872	13	1.58E-03	43.6	
29	0	1461.31*	7	10	0.70	2926.12	2918	15	9.71E-04	124.8	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 31-OCT-2022 10:20:10

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533003.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 30-SEP-2022 07:58:00	Acquisition date	: 31-OCT-2022 08:18:19
Sample ID	: G597533003	Sample quantity	: 0.75777 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA33	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:01.51 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	7	10.66*	8.418E-01	3.859E+01	3.859E+01	249.61
ZN-65	1115.54	8	50.60*	1.046E+00	7.298E+00	7.971E+00	99.51
IN-114M	190.27	20	15.56*	3.695E+00	1.688E+01	2.608E+01	142.27
CE-141	145.44	15	48.29*	4.093E+00	3.666E+00	7.108E+00	173.36
PA-231	283.69	-----	1.70	2.881E+00	-----	Line Not Found	-----
	301.36	43	5.35*	2.761E+00	1.456E+02	1.456E+02	91.92
TH-232	63.81	14	0.26*	1.486E+00	1.740E+03	1.740E+03	317.09
	140.88	-----	0.02	4.121E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533003.CNF;1  *
* Acquisition date   : 31-OCT-2022 08:18:19 Sensitivity      : 3.000          *
* Detector ID        : GAM33 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 02:00:01.51 Half life ratio : *****          *
* Sample date        : 30-SEP-2022 07:58:00 Analyst initials: RXF2          *
* Sample ID          : G597533003 Sample Quantity : 7.5777E-01 FILTER      *
* Batch Number       : 2333342 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 2-AUG-2022 03:50:17 Eff. Geometry   : JAR            *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM33_JAR.CNF;13          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
K-40	3.859E+01	9.440E+01	8.332E+01
ZN-65	7.971E+00	7.774E+00	1.198E+01
IN-114M	2.608E+01	3.636E+01	3.778E+01
CE-141	7.108E+00	1.208E+01	1.719E+01
PA-231	1.456E+02	1.312E+02	8.192E+01
TH-232	1.740E+03	5.407E+03	4.583E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	1.147E+02	5.277E+01	1.198E+02	NOT IDENT.
NA-22	2.463E+00	4.258E+00	9.586E+00	NOT IDENT.
NA-24	0.000E+00	3.284E+15	0.000E+00	SHORT HLIF
AL-26	5.623E-01	3.043E+00	7.232E+00	NOT IDENT.
SC-46	-1.876E+00	4.188E+00	7.916E+00	FAIL ABUN
V-48	1.146E+01	8.487E+00	2.629E+01	FAIL ABUN
CR-51	-3.478E+01	5.154E+01	9.037E+01	NOT IDENT.
MN-52	2.668E+02	2.283E+02	5.316E+02	NOT IDENT.
MN-54	-2.986E-01	5.325E+00	8.610E+00	NOT IDENT.
CO-56	1.414E+00	4.657E+00	9.385E+00	NOT IDENT.
CO-57	-1.838E+00	2.777E+00	4.499E+00	NOT IDENT.
NI-57	0.000E+00	8.109E+06	0.000E+00	SHORT HLIF
CO-58	3.956E+00	4.620E+00	1.020E+01	NOT IDENT.
FE-59	-1.172E+01	1.071E+01	1.666E+01	NOT IDENT.
CO-60	-6.465E-01	3.853E+00	7.683E+00	NOT IDENT.
CU-67	0.000E+00	3.133E+04	0.000E+00	SHORT HLIF
GE-68	-1.436E+01	1.181E+02	2.378E+02	NOT IDENT.
AS-73	4.093E+01	1.644E+02	3.050E+02	NOT IDENT.
AS-74	-7.317E+00	1.823E+01	3.223E+01	NOT IDENT.
SE-75	1.895E+00	5.531E+00	1.078E+01	NOT IDENT.
BR-77	0.000E+00	1.827E+05	0.000E+00	SHORT HLIF
SR-82	-1.884E+00	4.924E+01	9.392E+01	NOT IDENT.
RB-83	-3.627E+00	8.278E+00	1.468E+01	NOT IDENT.
RB-84	-3.298E+00	1.030E+01	1.971E+01	NOT IDENT.

KR-85	-3.366E+03	1.236E+03	1.587E+03	NOT IDENT.
SR-85	-2.090E+01	7.671E+00	9.853E+00	NOT IDENT.
RB-86	-1.568E+01	1.290E+02	2.597E+02	NOT IDENT.
Y-88	-1.127E+00	4.531E+00	8.950E+00	NOT IDENT.
Y-91	5.382E+02	1.998E+03	4.375E+03	NOT IDENT.
NB-94	1.026E+00	3.673E+00	7.189E+00	NOT IDENT.
NB-95	3.569E+00	5.125E+00	1.076E+01	NOT IDENT.
NB-95M	8.964E+00	1.387E+01	2.795E+01	NOT IDENT.
TC-95M	6.740E+00	9.326E+00	1.169E+01	FAIL ABUN
ZR-95	-1.253E+01	1.024E+01	1.457E+01	NOT IDENT.
MO-99	0.000E+00	6.517E+04	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	5.000E+37	0.000E+00	SHORT HLIF
RH-101	6.242E-01	3.390E+00	6.049E+00	NOT IDENT.
RH-102M	1.065E+00	2.991E+00	5.567E+00	NOT IDENT.
RU-103	-1.525E+00	5.265E+00	9.623E+00	NOT IDENT.
RH-106	4.218E+01	3.444E+01	7.712E+01	NOT IDENT.
RU-106	4.218E+01	3.444E+01	7.712E+01	NOT IDENT.
AG-108M	3.538E+00	2.813E+00	5.875E+00	FAIL ABUN
CD-109	3.312E+01	9.083E+01	1.563E+02	NOT IDENT.
AG-110	-2.834E+00	8.470E+01	1.584E+02	NOT IDENT.
AG-110M	2.763E+00	5.862E+00	1.250E+01	NOT IDENT.
IN-111	0.000E+00	1.043E+04	0.000E+00	SHORT HLIF
SN-113	1.105E+00	4.712E+00	9.332E+00	NOT IDENT.
CD-115	0.000E+00	1.988E+05	0.000E+00	SHORT HLIF
SN-117M	-5.261E+00	1.462E+01	2.244E+01	NOT IDENT.
SB-122	0.000E+00	1.109E+04	0.000E+00	SHORT HLIF
I-123	0.000E+00	2.994E+17	0.000E+00	SHORT HLIF
TE-123M	-7.589E-01	3.800E+00	5.969E+00	NOT IDENT.
SB-124	1.127E+01	1.077E+01	2.896E+01	NOT IDENT.
SB-125	-3.481E-01	9.682E+00	1.832E+01	NOT IDENT.
TE-125M	9.179E+02	1.332E+03	2.493E+03	NOT IDENT.
I-126	-2.786E+01	5.634E+01	9.703E+01	NOT IDENT.
SB-126	1.135E+01	3.225E+01	6.627E+01	NOT IDENT.
SN-126	5.988E+00	8.424E+00	1.514E+01	FAIL ABUN
SB-127	8.304E+02	1.623E+03	3.665E+03	NOT IDENT.
TE-129	-7.193E+01	7.413E+01	1.203E+02	FAIL ABUN
I-131	-5.172E+00	5.158E+01	9.634E+01	NOT IDENT.
I-132	0.000E+00	1.785E+41	0.000E+00	SHORT HLIF
TE-132	-5.395E+02	2.310E+03	4.297E+03	NOT IDENT.
BA-133	-3.183E+00	5.147E+00	7.846E+00	FAIL ABUN
I-133	0.000E+00	2.221E+11	0.000E+00	SHORT HLIF
CS-134	3.434E+00	6.297E+00	8.510E+00	FAIL ABUN
I-135	0.000E+00	1.640E+35	0.000E+00	SHORT HLIF
CS-136	-1.863E+00	2.452E+01	4.909E+01	NOT IDENT.
BA-137M	3.526E+00	3.740E+00	8.099E+00	NOT IDENT.
CS-137	3.724E+00	3.951E+00	8.555E+00	NOT IDENT.
LA-138	-2.379E+00	8.268E+00	1.331E+01	NOT IDENT.
CE-139	7.669E-01	3.905E+00	6.836E+00	NOT IDENT.
BA-140	-1.072E+01	7.695E+01	1.411E+02	NOT IDENT.
LA-140	-2.900E+01	3.579E+01	5.001E+01	NOT IDENT.
CE-143	0.000E+00	3.883E+07	0.000E+00	SHORT HLIF
CE-144	-3.478E+01	2.220E+01	3.129E+01	NOT IDENT.
PM-144	-4.717E-01	3.455E+00	6.416E+00	NOT IDENT.
PR-144	-3.559E+01	2.608E+02	4.842E+02	NOT IDENT.
PM-146	-9.090E-01	5.337E+00	9.750E+00	NOT IDENT.
ND-147	3.393E+01	1.522E+02	3.021E+02	FAIL ABUN
PM-147	3.608E+04	8.002E+04	1.473E+05	NOT IDENT.
PM-149	0.000E+00	1.569E+06	0.000E+00	SHORT HLIF
EU-152	5.308E+00	9.947E+00	2.012E+01	FAIL ABUN
GD-153	-6.902E-01	8.808E+00	1.553E+01	NOT IDENT.
EU-154	6.617E+00	1.189E+01	2.672E+01	NOT IDENT.
EU-155	1.165E+01	1.118E+01	2.188E+01	NOT IDENT.
TB-160	-4.989E+00	1.465E+01	2.826E+01	NOT IDENT.
HO-166M	-3.103E-02	6.267E+00	1.186E+01	NOT IDENT.
TM-171	3.527E+02	3.250E+03	5.936E+03	NOT IDENT.
LU-176	-1.226E+00	3.293E+00	5.290E+00	NOT IDENT.
LU-177	-9.515E+01	6.595E+02	1.111E+03	NOT IDENT.
HF-181	4.054E+00	5.830E+00	1.221E+01	NOT IDENT.
W-181	2.708E+01	3.542E+01	6.830E+01	FAIL ABUN
TA-182	9.390E+00	1.648E+01	3.791E+01	FAIL ABUN
RE-183	1.812E+01	3.620E+01	6.820E+01	NOT IDENT.
RE-184	-9.113E+00	1.489E+01	2.437E+01	NOT IDENT.
RE-188	-9.603E+00	2.259E+01	3.715E+01	FAIL ABUN
W-188	-1.987E+02	9.521E+02	1.579E+03	FAIL ABUN
OS-191	1.483E-01	3.495E+01	6.107E+01	FAIL ABUN
IR-192	5.512E+00	4.377E+00	9.364E+00	NOT IDENT.
PB-201	0.000E+00	3.496E+24	0.000E+00	SHORT HLIF
TL-201	0.000E+00	3.471E+04	0.000E+00	SHORT HLIF

TL-202	1.257E+01	1.754E+01	3.657E+01	NOT IDENT.
HG-203	2.589E+00	6.385E+00	1.130E+01	NOT IDENT.
PB-203	0.000E+00	8.500E+04	0.000E+00	SHORT HLIF
TL-204	-4.665E+02	6.434E+02	1.059E+03	NOT IDENT.
BI-207	3.330E+00	4.810E+00	1.108E+01	NOT IDENT.
TL-208	-8.139E-01	5.306E+00	9.635E+00	NOT IDENT.
PB-210	4.824E+02	7.883E+02	1.505E+03	NOT IDENT.
BI-211	-2.063E+01	3.011E+01	4.689E+01	NOT IDENT.
PB-211	-1.945E+01	7.884E+01	1.443E+02	NOT IDENT.
BI-212	2.789E+00	5.184E+01	9.943E+01	NOT IDENT.
PB-212	6.591E+00	1.164E+01	1.673E+01	FAIL ABUN
BI-213	-3.390E+00	1.041E+01	1.896E+01	NOT IDENT.
BI-214	1.609E+00	1.043E+01	1.820E+01	FAIL ABUN
PB-214	-5.537E+00	1.092E+01	1.744E+01	NOT IDENT.
RN-219	-1.728E+01	4.812E+01	7.658E+01	NOT IDENT.
FR-221	-1.159E+01	2.176E+01	3.931E+01	NOT IDENT.
RA-223	7.457E+00	6.981E+01	1.336E+02	FAIL ABUN
RA-224	1.178E+01	5.935E+01	1.156E+02	NOT IDENT.
AC-225	-9.975E+01	1.873E+02	3.383E+02	NOT IDENT.
RA-226	-1.001E+02	1.041E+02	1.961E+02	NOT IDENT.
AC-227	-1.581E+01	2.597E+01	4.632E+01	NOT IDENT.
TH-227	-1.581E+01	2.597E+01	4.632E+01	NOT IDENT.
AC-228	1.552E+01	3.796E+01	3.984E+01	FAIL ABUN
RA-228	1.552E+01	3.796E+01	3.984E+01	FAIL ABUN
TH-228	6.591E+00	1.164E+01	1.673E+01	FAIL ABUN
TH-229	-3.332E+01	5.281E+01	9.016E+01	NOT IDENT.
TH-230	1.406E+02	1.588E+03	2.561E+03	NOT IDENT.
TH-231	1.910E+01	5.585E+01	9.264E+01	NOT IDENT.
PA-233	-7.581E+00	6.898E+00	1.139E+01	NOT IDENT.
PA-234	-6.614E+00	2.611E+01	5.162E+01	NOT IDENT.
PA-234M	-3.826E+02	5.431E+02	9.777E+02	NOT IDENT.
TH-234	1.223E+02	3.800E+02	4.482E+02	FAIL ABUN
U-234	4.926E+03	1.115E+04	2.106E+04	NOT IDENT.
U-235	0.000E+00	3.980E+01	4.845E+01	FAIL ABUN
NP-237	-7.581E+00	6.898E+00	1.139E+01	NOT IDENT.
NP-238	0.000E+00	3.711E+05	0.000E+00	SHORT HLIF
U-238	1.223E+02	3.800E+02	4.482E+02	FAIL ABUN
NP-239	6.888E+00	2.634E+01	4.801E+01	NOT IDENT.
AM-241	-1.260E+01	2.493E+01	3.863E+01	NOT IDENT.
AM-242	4.076E+01	6.494E+01	1.231E+02	NOT IDENT.
AM-243	-4.740E-01	7.357E+00	1.217E+01	NOT IDENT.
CM-243	-8.351E-02	1.116E+01	1.972E+01	NOT IDENT.
BK-247	7.786E-01	8.585E+00	1.644E+01	NOT IDENT.
CM-247	2.432E-01	4.125E+00	7.532E+00	FAIL ABUN
CF-249	-6.411E-01	4.647E+00	7.731E+00	NOT IDENT.
CF-251	-5.832E+00	1.440E+01	2.366E+01	NOT IDENT.
CF-252	-5.115E+03	1.971E+04	3.379E+04	NOT IDENT.
ANH-511	-1.885E+01	7.571E+00	1.448E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.62	63	101	1.02	126.81	122	10	8.81E-03	32.1	
2	1	90.29	22	39	1.24	180.22	178	11	3.05E-03	44.6	4.11E+00
3	1	92.70	152	47	1.24	185.05	178	11	2.11E-02	11.5	
4	8	143.51	68	70	1.60	286.80	282	13	9.41E-03	25.9	3.15E+00
5	8	145.85	15	49	1.78	291.48	282	13	2.03E-03	86.7	
6	4	185.53	92	61	1.83	370.94	364	18	1.27E-02	20.3	1.31E+00
7	4	188.82	20	50	1.52	377.53	364	18	2.72E-03	71.1	
8	0	205.04	28	54	0.96	410.00	407	9	3.89E-03	50.9	
9	3	238.56	56	51	1.74	477.14	469	34	7.71E-03	27.6	1.30E+00
10	3	244.46	27	43	1.75	488.96	469	34	3.81E-03	53.5	
11	0	275.71	29	33	1.50	551.53	547	8	3.98E-03	39.8	
12	0	287.86	15	61	2.14	575.85	567	11	2.04E-03	107.7	
13	0	302.61	43	62	6.08	605.41	595	19	6.03E-03	46.0	
14	0	353.71	17	46	2.83	707.73	702	12	2.39E-03	83.7	
15	0	396.01	23	48	4.86	792.44	781	19	3.12E-03	76.4	
16	0	434.66	14	6	1.64	869.83	867	7	1.94E-03	40.6	
17	0	479.42	61	33	6.10	959.48	949	23	8.48E-03	28.0	
18	0	511.19	105	68	2.26	1023.10	1018	13	1.46E-02	19.7	
19	0	729.04	15	15	0.89	1459.40	1450	15	2.08E-03	61.9	
20	0	795.00	8	12	0.62	1591.50	1584	12	1.11E-03	93.5	
21	0	803.02	28	11	2.56	1607.56	1599	18	3.88E-03	35.7	
22	0	839.40	7	10	1.30	1680.42	1672	10	9.56E-04	94.2	
23	0	868.49	16	0	2.91	1738.69	1734	9	2.22E-03	25.0	
24	0	911.48	20	20	2.03	1824.80	1815	20	2.78E-03	59.2	
25	0	929.37	13	2	1.34	1860.62	1855	9	1.84E-03	33.8	
26	0	982.48	7	0	1.49	1967.00	1964	6	9.72E-04	37.8	
27	0	1035.60	8	2	3.23	2073.39	2068	9	1.11E-03	48.5	
28	0	1115.48	8	2	2.94	2233.40	2228	9	1.08E-03	49.8	
29	0	1119.93	14	5	1.79	2242.30	2238	9	1.87E-03	39.3	
30	0	1153.25	9	2	1.57	2309.04	2305	8	1.28E-03	42.2	
31	0	1437.43	11	3	1.41	2878.28	2872	13	1.58E-03	43.6	
32	0	1461.31	20	10	0.70	2926.12	2918	15	2.79E-03	42.3	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	7	10.66*	8.418E-01	3.859E+01	3.859E+01	249.61
ZN-65	1115.54	8	50.60*	1.046E+00	7.298E+00	7.971E+00	99.51
IN-114M	190.27	20	15.56*	3.695E+00	1.688E+01	2.608E+01	142.27
CE-141	145.44	15	48.29*	4.093E+00	3.666E+00	7.108E+00	173.36
PA-231	283.69	-----	1.70	2.881E+00	-----	Line Not Found	-----
	301.36	43	5.35*	2.761E+00	1.456E+02	1.456E+02	91.92
TH-232	63.81	14	0.26*	1.486E+00	1.740E+03	1.740E+03	317.09
	140.88	-----	0.02	4.121E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

Total number of lines in spectrum 29
Number of unidentified lines 9
Number of lines tentatively identified by NID 20 68.97%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
K-40	1.25E+09Y	1.00	3.859E+01	3.859E+01	9.633E+01	249.61	
ZN-65	244.06D	1.09	7.298E+00	7.971E+00	7.933E+00	99.51	
IN-114M	49.51D	1.54	1.688E+01	2.608E+01	3.710E+01	142.27	
CE-141	32.51D	1.94	3.666E+00	7.108E+00	12.32E+00	173.36	
PA-231	3.28E+04Y	1.00	1.456E+02	1.456E+02	1.339E+02	91.92	
TH-232	1.41E+10Y	1.00	1.740E+03	1.740E+03	5.518E+03	317.09	
Total Activity :			1.952E+03	1.965E+03			

Grand Total Activity : 1.952E+03 1.965E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
1	90.29	22	39	1.24	180.22	178	11	3.05E-03	89.3	3.40E+00	T
8	143.51	51	70	1.60	286.80	282	13	7.11E-03	72.1	4.11E+00	T
0	205.04	21	54	0.96	410.00	407	9	2.96E-03	****	3.53E+00	T
3	238.56	18	51	1.74	477.14	469	34	2.52E-03	****	3.22E+00	T
3	244.46	27	43	1.75	488.96	469	34	3.81E-03	****	3.17E+00	T
0	275.71	29	33	1.50	551.53	547	8	3.98E-03	79.6	2.94E+00	T
0	287.86	15	61	2.14	575.85	567	11	2.04E-03	****	2.85E+00	T
0	353.71	17	46	2.83	707.73	702	12	2.39E-03	****	2.49E+00	
0	396.01	23	48	4.86	792.44	781	19	3.12E-03	****	2.31E+00	
0	434.66	14	6	1.64	869.83	867	7	1.94E-03	81.1	2.17E+00	T
0	479.42	61	33	6.10	959.48	949	23	8.48E-03	56.0	2.03E+00	T
0	729.04	15	15	0.89	1459.40	1450	15	2.08E-03	****	1.49E+00	
0	795.00	8	12	0.62	1591.50	1584	12	1.11E-03	****	1.39E+00	T
0	803.02	16	11	2.56	1607.56	1599	18	2.28E-03	****	1.38E+00	T
0	839.40	7	10	1.30	1680.42	1672	10	9.56E-04	****	1.33E+00	
0	868.49	16	0	2.91	1738.69	1734	9	2.22E-03	50.0	1.29E+00	
0	911.48	10	20	2.03	1824.80	1815	20	1.38E-03	****	1.24E+00	T
0	929.37	13	2	1.34	1860.62	1855	9	1.84E-03	67.7	1.22E+00	
0	982.48	7	0	1.49	1967.00	1964	6	9.72E-04	75.6	1.17E+00	T
0	1035.60	8	2	3.23	2073.39	2068	9	1.11E-03	97.0	1.11E+00	
0	1119.93	6	5	1.79	2242.30	2238	9	7.68E-04	****	1.04E+00	T
0	1153.25	4	2	1.57	2309.04	2305	8	6.15E-04	****	1.02E+00	
0	1437.43	11	3	1.41	2878.28	2872	13	1.58E-03	87.3	8.52E-01	

Flags: "T" = Tentatively associated


```

*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533003.CNF;1  *
* Acquisition date   : 31-OCT-2022 08:18:19 Sensitivity      : 3.000          *
* Detector ID        : GAM33 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:01.51 Half life ratio : *****      *
* Sample date        : 30-SEP-2022 07:58:00 Nuclide Library : LIQUID      *
* Sample ID          : G597533003 Analyst initials: RXF2        *
* Batch Number       : 2333342 Sample Quantity : 7.5777E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 2-AUG-2022 03:50:17 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM33_JAR.CNF;13          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
K-40	3.420E+01
ZN-65	4.606E+00
IN-114M	1.709E+01
CE-141	7.942E+00
PA-231	3.645E+01
TH-232	2.121E+03

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	5.518E+01	NOT IDENT.
NA-22	4.062E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.707E+00	NOT IDENT.
SC-46	3.275E+00	FAIL ABUN
V-48	1.093E+01	FAIL ABUN
CR-51	3.967E+01	NOT IDENT.
MN-52	2.289E+02	NOT IDENT.
MN-54	3.768E+00	NOT IDENT.
CO-56	4.022E+00	NOT IDENT.
CO-57	2.045E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	4.433E+00	NOT IDENT.
FE-59	6.516E+00	NOT IDENT.
CO-60	3.092E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	9.803E+01	NOT IDENT.
AS-73	1.399E+02	NOT IDENT.
AS-74	1.392E+01	NOT IDENT.
SE-75	4.939E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	3.963E+01	NOT IDENT.
RB-83	6.342E+00	NOT IDENT.
RB-84	8.390E+00	NOT IDENT.
KR-85	7.125E+02	NOT IDENT.

SR-85	4.424E+00	NOT IDENT.
RB-86	1.071E+02	NOT IDENT.
Y-88	3.349E+00	NOT IDENT.
Y-91	1.808E+03	NOT IDENT.
NB-94	3.157E+00	NOT IDENT.
NB-95	4.727E+00	NOT IDENT.
NB-95M	1.282E+01	NOT IDENT.
TC-95M	5.420E+00	FAIL ABUN
ZR-95	6.096E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.784E+00	NOT IDENT.
RH-102M	2.433E+00	NOT IDENT.
RU-103	4.168E+00	NOT IDENT.
RH-106	3.432E+01	NOT IDENT.
RU-106	3.432E+01	NOT IDENT.
AG-108M	2.597E+00	FAIL ABUN
CD-109	7.240E+01	NOT IDENT.
AG-110	6.914E+01	NOT IDENT.
AG-110M	5.462E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	4.133E+00	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	1.028E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.746E+00	NOT IDENT.
SB-124	1.185E+01	NOT IDENT.
SB-125	8.114E+00	NOT IDENT.
TE-125M	1.156E+03	NOT IDENT.
I-126	4.178E+01	NOT IDENT.
SB-126	2.841E+01	NOT IDENT.
SN-126	7.015E+00	FAIL ABUN
SB-127	1.520E+03	NOT IDENT.
TE-129	5.226E+01	FAIL ABUN
I-131	4.327E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	1.958E+03	NOT IDENT.
BA-133	3.486E+00	FAIL ABUN
I-133	0.000E+00	SHORT HLIF
CS-134	3.675E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	2.066E+01	NOT IDENT.
BA-137M	3.585E+00	NOT IDENT.
CS-137	3.787E+00	NOT IDENT.
LA-138	5.458E+00	NOT IDENT.
CE-139	3.170E+00	NOT IDENT.
BA-140	6.263E+01	NOT IDENT.
LA-140	2.021E+01	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.408E+01	NOT IDENT.
PM-144	2.745E+00	NOT IDENT.
PR-144	2.072E+02	NOT IDENT.
PM-146	4.381E+00	NOT IDENT.
ND-147	1.318E+02	FAIL ABUN
PM-147	6.787E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	9.063E+00	FAIL ABUN
GD-153	7.082E+00	NOT IDENT.
EU-154	1.130E+01	NOT IDENT.
EU-155	1.012E+01	NOT IDENT.
TB-160	1.179E+01	NOT IDENT.
HO-166M	5.116E+00	NOT IDENT.
TM-171	2.725E+03	NOT IDENT.
LU-176	2.384E+00	NOT IDENT.
LU-177	5.086E+02	NOT IDENT.
HF-181	5.422E+00	NOT IDENT.
W-181	3.161E+01	FAIL ABUN
TA-182	1.587E+01	FAIL ABUN
RE-183	3.149E+01	NOT IDENT.
RE-184	9.603E+00	NOT IDENT.
RE-188	1.713E+01	FAIL ABUN
W-188	7.099E+02	FAIL ABUN
OS-191	2.808E+01	FAIL ABUN
IR-192	4.279E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF
TL-202	1.633E+01	NOT IDENT.

HG-203	5.205E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	4.888E+02	NOT IDENT.
BI-207	4.713E+00	NOT IDENT.
TL-208	4.358E+00	NOT IDENT.
PB-210	6.963E+02	NOT IDENT.
BI-211	2.137E+01	NOT IDENT.
PB-211	6.434E+01	NOT IDENT.
BI-212	4.278E+01	NOT IDENT.
PB-212	7.877E+00	FAIL ABUN
BI-213	8.278E+00	NOT IDENT.
BI-214	8.241E+00	FAIL ABUN
PB-214	7.972E+00	NOT IDENT.
RN-219	3.385E+01	NOT IDENT.
FR-221	1.794E+01	NOT IDENT.
RA-223	6.044E+01	FAIL ABUN
RA-224	5.255E+01	NOT IDENT.
AC-225	1.544E+02	NOT IDENT.
RA-226	9.310E+01	NOT IDENT.
AC-227	2.087E+01	NOT IDENT.
TH-227	2.087E+01	NOT IDENT.
AC-228	1.781E+01	FAIL ABUN
RA-228	1.781E+01	FAIL ABUN
TH-228	7.877E+00	FAIL ABUN
TH-229	4.093E+01	NOT IDENT.
TH-230	1.185E+03	NOT IDENT.
TH-231	4.303E+01	NOT IDENT.
PA-233	5.055E+00	NOT IDENT.
PA-234	2.117E+01	NOT IDENT.
PA-234M	4.194E+02	NOT IDENT.
TH-234	2.118E+02	FAIL ABUN
U-234	9.683E+03	NOT IDENT.
U-235	2.275E+01	FAIL ABUN
NP-237	5.055E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	2.118E+02	FAIL ABUN
NP-239	2.195E+01	NOT IDENT.
AM-241	1.768E+01	NOT IDENT.
AM-242	5.663E+01	NOT IDENT.
AM-243	5.672E+00	NOT IDENT.
CM-243	9.031E+00	NOT IDENT.
BK-247	7.481E+00	NOT IDENT.
CM-247	3.359E+00	FAIL ABUN
CF-249	3.433E+00	NOT IDENT.
CF-251	1.082E+01	NOT IDENT.
CF-252	1.551E+04	NOT IDENT.
ANH-511	6.898E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533003.CNF;1
* Acquisition date   : 31-OCT-2022 08:18:19 Sensitivity      : 3.000
* Detector ID        : GAM33 Energy tolerance: 1.500
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 02:00:01.51 Half life ratio  : *****
* Sample date        : 30-SEP-2022 07:58:00 Nuclide Library : LIQUID
* Sample ID          : G597533003 Analyst initials: RXF2
* Batch Number       : 2333342 Sample Quantity  : 7.5777E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 2-AUG-2022 03:50:17 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM33_JAR.CNF;13

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
K-40	3.859E+01	9.449E+01	9.449E+01
ZN-65	7.971E+00	7.804E+00	7.806E+00
IN-114M	2.608E+01	3.642E+01	3.642E+01
CE-141	7.108E+00	1.209E+01	1.209E+01
PA-231	1.456E+02	1.353E+02	1.353E+02
TH-232	1.740E+03	5.413E+03	5.413E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	1.147E+02	5.364E+01	7.454E+01	NOT IDENT.
NA-22	2.463E+00	4.264E+00	4.406E+00	NOT IDENT.
NA-24	-1.532E+15	3.289E+15	3.361E+15	SHORT HLIF
AL-26	5.623E-01	3.043E+00	3.054E+00	NOT IDENT.
SC-46	-1.876E+00	4.192E+00	4.276E+00	FAIL ABUN
V-48	1.146E+01	8.555E+00	9.995E+00	FAIL ABUN
CR-51	-3.478E+01	5.163E+01	5.396E+01	NOT IDENT.
MN-52	2.668E+02	2.298E+02	2.594E+02	NOT IDENT.
MN-54	-2.986E-01	5.325E+00	5.327E+00	NOT IDENT.
CO-56	1.414E+00	4.658E+00	4.702E+00	NOT IDENT.
CO-57	-1.838E+00	2.780E+00	2.902E+00	NOT IDENT.
NI-57	4.131E+06	8.126E+06	8.337E+06	SHORT HLIF
CO-58	3.956E+00	4.634E+00	4.966E+00	NOT IDENT.
FE-59	-1.172E+01	1.078E+01	1.201E+01	NOT IDENT.
CO-60	-6.465E-01	3.853E+00	3.864E+00	NOT IDENT.
CU-67	-4.812E+04	3.158E+04	3.832E+04	SHORT HLIF
GE-68	-1.436E+01	1.181E+02	1.183E+02	NOT IDENT.
AS-73	4.093E+01	1.646E+02	1.656E+02	NOT IDENT.
AS-74	-7.317E+00	1.824E+01	1.854E+01	NOT IDENT.
SE-75	1.895E+00	5.534E+00	5.599E+00	NOT IDENT.
BR-77	1.035E+05	1.830E+05	1.889E+05	SHORT HLIF
SR-82	-1.884E+00	4.924E+01	4.925E+01	NOT IDENT.
RB-83	-3.627E+00	8.297E+00	8.457E+00	NOT IDENT.
RB-84	-3.298E+00	1.030E+01	1.041E+01	NOT IDENT.

KR-85	-3.366E+03	1.267E+03	1.978E+03	NOT IDENT.
SR-85	-2.090E+01	7.869E+00	1.228E+01	NOT IDENT.
RB-86	-1.568E+01	1.290E+02	1.292E+02	NOT IDENT.
Y-88	-1.127E+00	4.532E+00	4.560E+00	NOT IDENT.
Y-91	5.382E+02	1.998E+03	2.013E+03	NOT IDENT.
NB-94	1.026E+00	3.674E+00	3.703E+00	NOT IDENT.
NB-95	3.569E+00	5.135E+00	5.381E+00	NOT IDENT.
NB-95M	8.964E+00	1.390E+01	1.448E+01	NOT IDENT.
TC-95M	6.740E+00	9.344E+00	9.826E+00	FAIL ABUN
ZR-95	-1.253E+01	1.030E+01	1.175E+01	NOT IDENT.
MO-99	-8.949E+03	6.518E+04	6.530E+04	SHORT HLIF
TC-99M	1.950E+37	5.006E+37	0.000E+00	SHORT HLIF
RH-101	6.242E-01	3.392E+00	3.404E+00	NOT IDENT.
RH-102M	1.065E+00	2.993E+00	3.031E+00	NOT IDENT.
RU-103	-1.525E+00	5.267E+00	5.312E+00	NOT IDENT.
RH-106	4.218E+01	3.467E+01	3.955E+01	NOT IDENT.
RU-106	4.218E+01	3.467E+01	3.955E+01	NOT IDENT.
AG-108M	3.538E+00	2.828E+00	3.248E+00	FAIL ABUN
CD-109	3.312E+01	9.089E+01	9.211E+01	NOT IDENT.
AG-110	-2.834E+00	8.470E+01	8.471E+01	NOT IDENT.
AG-110M	2.763E+00	5.869E+00	6.000E+00	NOT IDENT.
IN-111	9.937E+03	1.047E+04	1.139E+04	SHORT HLIF
SN-113	1.105E+00	4.713E+00	4.739E+00	NOT IDENT.
CD-115	-3.572E+04	1.988E+05	1.995E+05	SHORT HLIF
SN-117M	-5.261E+00	1.463E+01	1.482E+01	NOT IDENT.
SB-122	-4.083E+03	1.110E+04	1.125E+04	SHORT HLIF
I-123	-6.405E+16	2.994E+17	0.000E+00	SHORT HLIF
TE-123M	-7.589E-01	3.801E+00	3.816E+00	NOT IDENT.
SB-124	1.127E+01	1.082E+01	1.195E+01	NOT IDENT.
SB-125	-3.481E-01	9.682E+00	9.683E+00	NOT IDENT.
TE-125M	9.179E+02	1.334E+03	1.396E+03	NOT IDENT.
I-126	-2.786E+01	5.640E+01	5.779E+01	NOT IDENT.
SB-126	1.135E+01	3.228E+01	3.269E+01	NOT IDENT.
SN-126	5.988E+00	8.441E+00	8.862E+00	FAIL ABUN
SB-127	8.304E+02	1.628E+03	1.671E+03	NOT IDENT.
TE-129	-7.193E+01	7.518E+01	8.188E+01	FAIL ABUN
I-131	-5.172E+00	5.159E+01	5.164E+01	NOT IDENT.
I-132	1.000E+41	2.618E+41	0.000E+00	SHORT HLIF
TE-132	-5.395E+02	2.310E+03	2.323E+03	NOT IDENT.
BA-133	-3.183E+00	5.154E+00	5.350E+00	FAIL ABUN
I-133	-4.161E+10	2.222E+11	2.230E+11	SHORT HLIF
CS-134	3.434E+00	6.304E+00	6.492E+00	FAIL ABUN
I-135	-6.608E+32	1.640E+35	0.000E+00	SHORT HLIF
CS-136	-1.863E+00	2.452E+01	2.453E+01	NOT IDENT.
BA-137M	3.526E+00	3.751E+00	4.074E+00	NOT IDENT.
CS-137	3.724E+00	3.962E+00	4.304E+00	NOT IDENT.
LA-138	-2.379E+00	8.271E+00	8.341E+00	NOT IDENT.
CE-139	7.669E-01	3.908E+00	3.923E+00	NOT IDENT.
BA-140	-1.072E+01	7.696E+01	7.711E+01	NOT IDENT.
LA-140	-2.900E+01	3.589E+01	3.820E+01	NOT IDENT.
CE-143	5.643E+05	3.883E+07	3.883E+07	SHORT HLIF
CE-144	-3.478E+01	2.238E+01	2.734E+01	NOT IDENT.
PM-144	-4.717E-01	3.456E+00	3.462E+00	NOT IDENT.
PR-144	-3.559E+01	2.608E+02	2.613E+02	NOT IDENT.
PM-146	-9.090E-01	5.338E+00	5.354E+00	NOT IDENT.
ND-147	3.393E+01	1.522E+02	1.530E+02	FAIL ABUN
PM-147	3.608E+04	8.007E+04	8.171E+04	NOT IDENT.
PM-149	1.147E+06	1.579E+06	1.662E+06	SHORT HLIF
EU-152	5.308E+00	9.960E+00	1.024E+01	FAIL ABUN
GD-153	-6.902E-01	8.808E+00	8.813E+00	NOT IDENT.
EU-154	6.617E+00	1.191E+01	1.228E+01	NOT IDENT.
EU-155	1.165E+01	1.123E+01	1.240E+01	NOT IDENT.
TB-160	-4.989E+00	1.466E+01	1.483E+01	NOT IDENT.
HO-166M	-3.103E-02	6.267E+00	6.267E+00	NOT IDENT.
TM-171	3.527E+02	3.250E+03	3.254E+03	NOT IDENT.
LU-176	-1.226E+00	3.295E+00	3.341E+00	NOT IDENT.
LU-177	-9.515E+01	6.595E+02	6.609E+02	NOT IDENT.
HF-181	4.054E+00	5.840E+00	6.119E+00	NOT IDENT.
W-181	2.708E+01	3.616E+01	3.817E+01	FAIL ABUN
TA-182	9.390E+00	1.650E+01	1.704E+01	FAIL ABUN
RE-183	1.812E+01	3.628E+01	3.719E+01	NOT IDENT.
RE-184	-9.113E+00	1.493E+01	1.548E+01	NOT IDENT.
RE-188	-9.603E+00	2.260E+01	2.301E+01	FAIL ABUN
W-188	-1.987E+02	9.525E+02	9.567E+02	FAIL ABUN
OS-191	1.483E-01	3.495E+01	3.495E+01	FAIL ABUN
IR-192	5.512E+00	4.403E+00	5.057E+00	NOT IDENT.
PB-201	-2.901E+24	3.675E+24	0.000E+00	SHORT HLIF
TL-201	-8.268E+03	3.472E+04	3.492E+04	SHORT HLIF

TL-202	1.257E+01	1.757E+01	1.846E+01	NOT IDENT.
HG-203	2.589E+00	6.389E+00	6.495E+00	NOT IDENT.
PB-203	3.448E+04	8.506E+04	8.647E+04	SHORT HLIF
TL-204	-4.665E+02	6.454E+02	6.788E+02	NOT IDENT.
BI-207	3.330E+00	4.819E+00	5.048E+00	NOT IDENT.
TL-208	-8.139E-01	5.307E+00	5.319E+00	NOT IDENT.
PB-210	4.824E+02	7.900E+02	8.194E+02	NOT IDENT.
BI-211	-2.063E+01	3.017E+01	3.157E+01	NOT IDENT.
PB-211	-1.945E+01	7.886E+01	7.935E+01	NOT IDENT.
BI-212	2.789E+00	5.184E+01	5.186E+01	NOT IDENT.
PB-212	6.591E+00	1.165E+01	1.202E+01	FAIL ABUN
BI-213	-3.390E+00	1.041E+01	1.052E+01	NOT IDENT.
BI-214	1.609E+00	1.043E+01	1.046E+01	FAIL ABUN
PB-214	-5.537E+00	1.093E+01	1.122E+01	NOT IDENT.
RN-219	-1.728E+01	4.819E+01	4.882E+01	NOT IDENT.
FR-221	-1.159E+01	2.179E+01	2.241E+01	NOT IDENT.
RA-223	7.457E+00	6.981E+01	6.990E+01	FAIL ABUN
RA-224	1.178E+01	5.936E+01	5.960E+01	NOT IDENT.
AC-225	-9.975E+01	1.876E+02	1.929E+02	NOT IDENT.
RA-226	-1.001E+02	1.044E+02	1.138E+02	NOT IDENT.
AC-227	-1.581E+01	2.608E+01	2.704E+01	NOT IDENT.
TH-227	-1.581E+01	2.608E+01	2.704E+01	NOT IDENT.
AC-228	1.552E+01	3.799E+01	3.863E+01	FAIL ABUN
RA-228	1.552E+01	3.799E+01	3.863E+01	FAIL ABUN
TH-228	6.591E+00	1.165E+01	1.202E+01	FAIL ABUN
TH-229	-3.332E+01	5.288E+01	5.497E+01	NOT IDENT.
TH-230	1.406E+02	1.589E+03	1.590E+03	NOT IDENT.
TH-231	1.910E+01	5.593E+01	5.659E+01	NOT IDENT.
PA-233	-7.581E+00	6.931E+00	7.729E+00	NOT IDENT.
PA-234	-6.614E+00	2.719E+01	2.735E+01	NOT IDENT.
PA-234M	-3.826E+02	5.443E+02	5.711E+02	NOT IDENT.
TH-234	1.223E+02	3.811E+02	3.850E+02	FAIL ABUN
U-234	4.926E+03	1.116E+04	1.138E+04	NOT IDENT.
U-235	5.632E+01	4.004E+01	4.742E+01	FAIL ABUN
NP-237	-7.581E+00	6.931E+00	7.729E+00	NOT IDENT.
NP-238	-1.003E+05	3.712E+05	3.739E+05	SHORT HLIF
U-238	1.223E+02	3.811E+02	3.850E+02	FAIL ABUN
NP-239	6.888E+00	2.634E+01	2.653E+01	NOT IDENT.
AM-241	-1.260E+01	2.497E+01	2.561E+01	NOT IDENT.
AM-242	4.076E+01	6.537E+01	6.790E+01	NOT IDENT.
AM-243	-4.740E-01	7.357E+00	7.360E+00	NOT IDENT.
CM-243	-8.351E-02	1.116E+01	1.116E+01	NOT IDENT.
BK-247	7.786E-01	8.586E+00	8.593E+00	NOT IDENT.
CM-247	2.432E-01	4.125E+00	4.127E+00	FAIL ABUN
CF-249	-6.411E-01	4.648E+00	4.657E+00	NOT IDENT.
CF-251	-5.832E+00	1.442E+01	1.466E+01	NOT IDENT.
CF-252	-5.115E+03	2.025E+04	2.038E+04	NOT IDENT.
ANH-511	-1.885E+01	7.734E+00	1.150E+01	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	43.4024	81.00	48.7927	120.90	30.4632
45.60	37.3775	81.07	44.3619	121.12	32.8155
46.54	39.5368	82.35	0.0000	121.22	37.5078
49.72	33.5248	82.47	60.0200	121.78	45.7439
51.35	33.6401	167.43	0.0000	122.06	45.7594
52.39	40.0339	82.47	60.0202	123.07	35.2425
53.20	35.8795	83.79	36.7539	265.00	35.2685
53.44	36.9528	84.00	38.9939	127.16	0.0000
56.28	50.9674	84.21	40.1212	127.23	41.3208
57.36	0.0000	84.86	0.0000	129.43	43.7952
57.53	37.2549	85.43	64.7606	131.20	34.3968
57.53	36.1906	86.55	48.0935	133.02	51.1091
57.98	39.4182	86.79	48.1109	133.52	57.0842
59.32	41.3002	86.94	49.2412	135.34	0.0000
59.54	49.8660	87.09	32.8348	136.00	34.5862
61.49	34.3199	87.57	29.8714	57.53	31.0178
63.00	51.6244	88.03	35.8704	136.47	31.0246
63.29	51.6519	88.34	40.3728	140.51	0.0000
63.58	51.6794	88.47	40.3805	140.88	38.3726
63.81	51.7011	91.11	41.6642	143.76	49.3206
64.28	51.7455	91.27	0.0000	144.24	49.3463
64.99	59.0083	92.59	41.7543	145.44	49.4107
65.08	59.0179	93.31	0.0000	152.32	46.1322
66.73	44.7552	94.56	42.2498	152.43	46.1374
66.98	50.5525	94.65	42.2552	153.25	55.8983
67.24	50.5760	94.67	42.2566	323.87	53.5216
67.67	41.9377	97.43	37.4979	155.04	56.0028
67.75	41.9433	98.43	47.7912	156.02	37.7794
68.89	57.6064	98.44	47.7919	158.56	40.3215
68.89	0.0000	99.53	33.0491	158.97	0.0000
69.67	50.0661	100.11	46.7622	159.00	41.5620
70.82	0.0000	100.20	46.7678	162.33	34.3433
70.82	63.2516	102.03	45.7416	162.66	39.2627
70.83	0.0000	103.18	43.5223	163.33	46.6558
72.81	61.2773	103.37	40.0968	165.86	50.4661
72.87	0.0000	105.31	32.1609	167.43	0.0000
74.66	59.2718	106.12	44.8438	171.28	0.0000
74.82	59.2874	106.47	48.3158	176.31	27.3557
74.97	61.4982	109.28	41.5668	176.60	42.2888
77.11	52.8981	111.00	56.7034	177.52	46.0603
79.69	47.5850	111.76	50.9670	181.07	0.0000
79.82	0.0000	112.95	40.6036	184.41	39.2582
80.02	50.9316	116.24	45.4327	184.58	0.0000
80.03	50.9319	116.30	45.4359	185.72	39.3058
80.12	50.9397	116.74	33.8043	186.21	39.3235
80.19	50.9453	117.23	29.1594	190.27	30.2318
80.22	0.0000	119.76	31.5908	193.51	43.4588
80.57	44.3268	99.53	32.7922	197.03	51.5364

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
198.01	53.2722	256.23	21.9937	492.35	0.0000
201.83	45.8146	304.85	21.9990	497.08	17.3054
204.12	44.6307	306.78	34.4162	511.00	38.9297
205.31	35.7413	308.46	22.0508	514.00	82.0703
208.37	42.2339	311.90	36.8327	520.40	18.5186
210.85	47.8800	316.51	19.3944	520.69	0.0000
215.65	47.2147	319.41	29.6081	522.65	0.0000
218.12	45.5911	320.08	25.9179	527.90	0.0000
222.11	37.1102	321.04	17.5980	529.59	19.6270
227.09	41.5923	323.87	28.7635	529.87	0.0000
227.38	41.6021	325.23	27.8595	531.02	13.4375
228.16	39.0262	328.76	22.3369	537.26	22.8030
228.18	39.0271	331.15	0.0000	546.56	0.0000
116.74	39.0271	333.37	20.5337	552.55	14.6073
235.69	30.5353	334.37	23.3480	563.25	15.7214
235.96	30.5417	338.28	30.8932	564.24	0.0000
238.63	30.6051	338.32	30.8939	569.33	11.5586
238.98	0.0000	311.90	29.0600	946.00	14.7121
240.99	30.6613	340.55	24.3739	569.70	14.7132
242.00	30.6848	344.28	20.6707	582.08	20.0708
244.70	30.7485	345.93	22.5718	583.19	17.9663
245.35	0.0000	351.06	33.9617	595.83	18.0590
250.62	31.7688	351.93	32.5634	427.87	27.6726
252.40	30.4858	356.01	31.2222	604.72	20.2555
252.80	23.8656	361.25	0.0000	609.32	18.1566
256.23	37.2189	364.49	27.5740	610.33	22.4381
260.90	0.0000	366.42	0.0000	614.28	16.0522
264.66	34.7740	356.01	20.1874	618.01	21.4347
265.00	32.9990	388.16	23.1265	621.93	8.5869
269.46	33.9991	388.63	17.3496	630.19	0.0000
271.23	28.2194	391.70	17.3789	631.29	14.0050
273.65	34.9978	264.66	24.7405	155.04	10.7800
276.40	43.1582	401.32	0.0000	633.25	10.7813
277.37	36.4395	401.81	24.7555	634.78	12.9448
277.60	36.4452	402.40	22.1413	635.95	9.7130
278.00	36.4551	404.85	26.2546	636.99	7.5577
278.43	41.8682	410.95	15.6090	657.50	16.3220
279.20	0.0000	414.70	18.5725	657.76	18.4997
279.54	40.5496	423.72	11.7854	661.66	9.8082
280.46	32.4602	427.09	23.6118	664.57	0.0000
283.69	42.0214	427.87	20.6685	666.33	18.5592
284.31	44.7516	433.94	22.2139	666.50	18.5605
285.41	31.6668	439.51	14.8511	667.71	0.0000
285.90	0.0000	440.45	19.8108	677.62	15.3478
287.50	20.3860	453.88	28.9192	685.70	4.3981
290.67	29.9640	459.60	27.0000	692.65	0.0000
293.27	0.0000	463.37	15.0278	695.00	12.1355
351.93	25.9574	468.07	18.0743	696.49	13.2461
295.96	30.0707	473.00	18.1172	696.51	13.2461
879.38	21.9082	475.06	12.0901	697.00	16.5607
299.98	21.9282	476.78	13.1082	697.49	18.7715
300.09	21.9302	477.60	13.1135	702.65	14.3817
300.13	21.9307	477.99	13.1158	706.68	19.9417
301.36	21.9482	482.18	13.1420	711.68	13.3179
302.85	21.9697	487.02	18.2380	720.70	8.9069

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
721.93	0.0000	935.54	7.1506	1368.63	0.0000
722.78	11.6989	937.49	8.9432	1377.63	0.0000
722.91	11.6993	944.13	9.8563	1384.29	2.9938
723.31	8.3578	945.96	0.0000	1408.01	5.0143
724.19	11.7044	946.00	8.9651	1434.09	3.2266
727.33	12.2752	949.00	7.1782	1435.80	9.6832
733.00	11.7403	667.71	0.0000	1457.56	0.0000
735.93	10.0734	962.31	13.5100	1460.82	7.0970
739.50	0.0000	964.08	10.8135	1489.16	2.0393
744.23	13.4697	966.17	10.8197	1596.21	9.3697
747.24	11.2362	968.97	9.9258	1620.50	4.1833
752.31	11.2557	983.53	10.1473	1678.03	0.0000
753.82	10.1353	984.45	0.0000	1690.97	1.0594
756.73	18.0358	996.26	10.0010	1757.55	0.0000
763.94	16.9501	1001.03	11.8348	1764.49	9.6603
765.80	10.1763	1274.44	10.9354	1063.66	6.4464
766.42	14.7022	1025.87	0.0000	1771.35	4.2986
766.84	13.5732	1028.54	0.0000	1791.20	0.0000
772.60	0.0000	1037.84	10.2977	1808.65	2.1631
776.52	10.2129	1038.76	0.0000	1836.06	4.3464
739.50	0.0000	475.06	11.9804		
778.90	5.6783	1048.07	10.1413		
783.70	13.6494	1050.41	8.3024		
788.74	13.6719	1063.66	5.5543		
792.07	8.5544	1077.00	8.3600		
795.86	13.7036	1077.34	8.3611		
802.10	9.1543	459.60	7.4443		
810.29	8.2605	1085.87	7.4482		
344.28	8.2611	1099.25	13.0789		
810.76	6.8850	1111.64	7.4971		
815.77	10.3440	1112.07	8.9977		
1048.07	10.3531	1112.84	11.9992		
832.01	12.4770	1115.54	3.7522		
834.85	17.3444	1120.29	9.0158		
835.15	17.3462	1120.55	9.0164		
836.80	0.0000	1221.41	6.0121		
846.77	9.2848	1129.67	5.6481		
856.80	10.4777	1131.51	0.0000		
860.56	8.1587	1173.23	4.7574		
871.09	7.0159	1177.95	7.6201		
873.19	8.1903	1189.05	5.7305		
875.33	0.0000	1204.77	5.7521		
879.38	11.4294	1221.41	4.8120		
880.51	14.9513	1231.02	7.7163		
881.60	14.0762	1235.36	10.6207		
883.24	11.4424	1238.28	8.6957		
884.68	11.4476	1260.41	0.0000		
889.28	11.4631	1271.87	5.8418		
894.76	12.3654	1274.44	5.8451		
898.04	10.6091	1274.54	5.8455		
903.28	9.4450	1291.59	3.9119		
907.67	0.0000	1298.22	0.0000		
911.20	11.5381	1312.11	4.9121		
923.98	0.0000	1332.49	6.9077		
926.36	5.7053	1365.19	2.9815		

VAX/VMS Nuclide Identification Report Generated 31-OCT-2022 10:20:43.92

```
*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533004.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM46.CNF;76
Background date    : 30-OCT-2022 10:50:26
Sample date       : 30-SEP-2022 08:05:00 Acquisition date : 31-OCT-2022 08:19:03
Sample ID        : G597533004 Sample quantity : 7.61680E-01 FILTER
Detector name     : GAM46 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:02.19 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : RXF2
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2333342 Detector SN# :
Matrix Spike ID   : LCS ID :
*****
```

BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	9.97	204	422	2.65	19.97	18	6	2.84E-02	17.5	
2	0	29.59	29	65	0.95	59.20	57	6	4.00E-03	48.8	
3	0	47.26*	63	157	2.90	94.53	87	19	8.76E-03	50.4	
4	0	64.02*	54	129	1.73	128.03	121	17	7.45E-03	51.9	
5	0	130.10	21	44	1.32	260.13	257	8	2.86E-03	61.6	
6	0	154.48	57	57	4.20	308.86	303	13	7.95E-03	30.4	
7	0	185.99*	35	58	1.31	371.86	368	10	4.81E-03	50.9	
8	0	239.19*	7	92	1.28	478.22	472	11	9.91E-04	293.5	
9	0	315.09	8	26	0.73	629.96	626	6	1.11E-03	106.1	
10	0	333.59	22	38	2.23	666.94	659	11	3.03E-03	59.1	
11	0	359.41	69	106	14.84	718.55	698	36	9.57E-03	50.9	
12	0	477.76	65	16	1.74	955.18	949	11	8.97E-03	17.4	
13	0	558.63*	15	7	1.94	1116.87	1113	10	2.07E-03	52.8	
14	0	574.94	18	17	0.52	1149.48	1144	10	2.47E-03	49.8	
15	0	583.50*	3	15	1.27	1166.58	1162	10	3.76E-04	339.1	
16	0	694.55	8	14	1.87	1388.62	1382	9	1.17E-03	85.6	
17	0	714.63	12	15	1.42	1428.78	1423	12	1.63E-03	72.4	
18	0	880.36	7	2	1.22	1760.17	1757	7	9.80E-04	49.2	
19	0	1077.03	7	12	2.39	2153.45	2143	12	9.72E-04	105.9	
20	0	1235.01	6	7	0.95	2469.37	2461	10	8.28E-04	94.5	
21	0	1250.23	11	0	0.63	2499.82	2495	9	1.53E-03	30.2	
22	0	1341.45	6	4	0.73	2682.24	2678	6	7.71E-04	73.7	
23	0	1461.58*	16	6	1.76	2922.51	2917	11	2.22E-03	46.8	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 31-OCT-2022 10:20:44

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533004.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 30-SEP-2022 08:05:00	Acquisition date	: 31-OCT-2022 08:19:03
Sample ID	: G597533004	Sample quantity	: 0.76168 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA46	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:02.19 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	65	10.44*	2.452E+00	1.243E+02	1.863E+02	34.81
K-40	1460.82	16	10.66*	9.730E-01	7.598E+01	7.598E+01	93.55
GE-68	1077.34	7	3.22*	1.246E+00	8.602E+01	9.313E+01	211.89
RB-84	881.60	7	68.90*	1.469E+00	3.436E+00	6.620E+00	98.45
RB-86	1077.00	7	8.64*	1.246E+00	3.206E+01	1.017E+02	211.89
RE-188	61.49	-----	1.39	6.494E+00	-----	Line Not Found	-----
	63.00	54	2.38	6.470E+00	1.717E+02	2.338E+02	103.89
	155.04	57	15.61*	5.291E+00	3.417E+01	4.652E+01	60.90
	477.99	65	1.08	2.452E+00	1.202E+03	1.636E+03	34.81
	632.98	-----	1.37	1.935E+00	-----	Line Not Found	-----
OS-191	63.29	54	15.70	6.470E+00	2.603E+01	1.053E+02	103.89
	64.99	54	26.70	6.470E+00	1.531E+01	6.193E+01	103.89
	129.43	21	26.50*	5.659E+00	6.770E+00	2.739E+01	123.19
TL-208	277.37	-----	6.60	3.760E+00	-----	Line Not Found	-----
	583.19	3	85.00*	2.073E+00	7.578E-01	7.816E-01	678.18
	860.56	-----	12.50	1.497E+00	-----	Line Not Found	-----
PB-210	46.54	63	4.25*	6.684E+00	1.094E+02	1.097E+02	100.88
RA-226	186.21	35	3.59*	4.834E+00	9.827E+01	9.828E+01	101.77
TH-232	63.81	54	0.26*	6.470E+00	1.572E+03	1.572E+03	103.89
	140.88	-----	0.02	5.496E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                          *
*****
*                                     DETECTOR AND SAMPLE DATA                      *
*                                     *                                             *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533004.CNF;1      *
* Acquisition date   : 31-OCT-2022 08:19:03 Sensitivity      : 3.000                *
* Detector ID        : GAM46 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:02.19 Half life ratio : *****      *
* Sample date        : 30-SEP-2022 08:05:00 Analyst initials: RXF2        *
* Sample ID          : G597533004 Sample Quantity : 7.6168E-01 FILTER *
* Batch Number       : 2333342 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000           *
* Nuclide Library    : LIQUID.NLB;26                                           *
*****
*                                     CALIBRATION INFORMATION                      *
*                                     *                                             *
* Eff. Cal. date     : 23-SEP-2022 04:01:30 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM46_JAR.CNF;4          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.863E+02	6.356E+01	5.950E+01
K-40	7.598E+01	6.965E+01	7.155E+01
GE-68	9.313E+01	1.934E+02	2.200E+02
RB-84	6.620E+00	6.387E+00	1.666E+01
RB-86	1.017E+02	2.112E+02	2.403E+02
RE-188	4.652E+01	2.777E+01	2.148E+01
OS-191	2.739E+01	3.307E+01	4.096E+01
TL-208	7.816E-01	5.195E+00	5.519E+00
PB-210	1.097E+02	1.084E+02	5.170E+01
RA-226	9.828E+01	9.802E+01	9.025E+01
TH-232	1.572E+03	1.600E+03	8.992E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	5.691E-01		3.470E+00	7.360E+00	NOT IDENT.
NA-24	0.000E+00		3.378E+15	0.000E+00	SHORT HLIF
AL-26	-9.511E-02		2.470E+00	5.626E+00	NOT IDENT.
SC-46	2.540E+00		4.149E+00	8.783E+00	NOT IDENT.
V-48	9.579E-01		1.048E+01	2.227E+01	NOT IDENT.
CR-51	2.235E+01		4.800E+01	9.551E+01	NOT IDENT.
MN-52	-7.067E+01		1.218E+02	2.177E+02	NOT IDENT.
MN-54	-1.654E+00		3.173E+00	5.391E+00	NOT IDENT.
CO-56	1.137E+00		3.981E+00	8.033E+00	NOT IDENT.
CO-57	-3.935E-01		1.846E+00	3.208E+00	NOT IDENT.
NI-57	0.000E+00		7.344E+06	0.000E+00	SHORT HLIF
CO-58	6.244E-02		4.329E+00	8.210E+00	NOT IDENT.
FE-59	3.026E+00		7.071E+00	1.664E+01	NOT IDENT.
CO-60	-3.752E-01		3.071E+00	6.277E+00	NOT IDENT.
ZN-65	-1.162E+00		6.220E+00	1.249E+01	NOT IDENT.
CU-67	0.000E+00		3.070E+04	0.000E+00	SHORT HLIF
AS-73	8.215E+00		1.583E+01	2.897E+01	NOT IDENT.
AS-74	1.311E+01		1.601E+01	3.381E+01	NOT IDENT.
SE-75	-2.583E+00		3.801E+00	6.765E+00	NOT IDENT.

BR-77	0.000E+00	1.803E+05	0.000E+00	SHORT HLIF
SR-82	-5.256E+00	3.618E+01	6.920E+01	NOT IDENT.
RB-83	6.320E+00	6.677E+00	1.460E+01	NOT IDENT.
KR-85	-3.579E+03	1.129E+03	1.412E+03	NOT IDENT.
SR-85	-2.222E+01	7.007E+00	8.766E+00	NOT IDENT.
Y-88	-1.890E+00	4.920E+00	9.070E+00	NOT IDENT.
Y-91	2.534E+02	1.517E+03	3.350E+03	NOT IDENT.
NB-94	-1.991E+00	3.181E+00	5.335E+00	NOT IDENT.
NB-95	-3.226E+00	4.848E+00	7.997E+00	NOT IDENT.
NB-95M	-3.276E+00	1.256E+01	2.087E+01	NOT IDENT.
TC-95M	2.911E+00	4.422E+00	8.242E+00	FAIL ABUN
ZR-95	-6.539E+00	6.998E+00	1.065E+01	NOT IDENT.
MO-99	0.000E+00	5.131E+04	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	4.026E+37	0.000E+00	SHORT HLIF
RH-101	9.613E-02	2.496E+00	4.100E+00	NOT IDENT.
RH-102M	6.291E-01	2.990E+00	5.269E+00	NOT IDENT.
RU-103	-2.645E+00	4.191E+00	7.245E+00	NOT IDENT.
RH-106	1.177E+01	3.098E+01	6.180E+01	NOT IDENT.
RU-106	1.177E+01	3.098E+01	6.180E+01	NOT IDENT.
AG-108M	-7.553E-01	2.833E+00	5.171E+00	NOT IDENT.
CD-109	-8.495E+00	4.178E+01	7.321E+01	NOT IDENT.
AG-110	-2.610E+00	5.203E+01	1.019E+02	NOT IDENT.
AG-110M	2.090E+00	4.254E+00	8.556E+00	NOT IDENT.
IN-111	0.000E+00	4.624E+03	0.000E+00	SHORT HLIF
SN-113	2.455E+00	3.691E+00	7.757E+00	NOT IDENT.
IN-114M	1.200E+01	1.849E+01	3.270E+01	NOT IDENT.
CD-115	0.000E+00	1.133E+05	0.000E+00	SHORT HLIF
SN-117M	1.295E+00	8.813E+00	1.480E+01	NOT IDENT.
SB-122	0.000E+00	1.035E+04	0.000E+00	SHORT HLIF
I-123	0.000E+00	1.865E+17	0.000E+00	SHORT HLIF
TE-123M	7.552E-01	2.345E+00	4.016E+00	NOT IDENT.
SB-124	-3.657E+00	7.040E+00	1.278E+01	NOT IDENT.
SB-125	-3.034E+00	6.673E+00	1.206E+01	NOT IDENT.
TE-125M	-4.527E+02	7.550E+02	1.255E+03	NOT IDENT.
I-126	-1.366E+01	4.436E+01	7.998E+01	NOT IDENT.
SB-126	-7.601E+00	3.098E+01	5.628E+01	FAIL ABUN
SN-126	-5.049E-01	3.812E+00	6.752E+00	FAIL ABUN
SB-127	1.860E+02	1.793E+03	3.553E+03	NOT IDENT.
TE-129	2.723E+01	6.275E+01	1.252E+02	NOT IDENT.
I-131	6.698E+00	3.811E+01	7.442E+01	NOT IDENT.
I-132	0.000E+00	1.564E+41	0.000E+00	SHORT HLIF
TE-132	-3.494E+02	1.704E+03	3.208E+03	NOT IDENT.
BA-133	-1.159E+00	3.108E+00	5.709E+00	NOT IDENT.
I-133	0.000E+00	1.826E+11	0.000E+00	SHORT HLIF
CS-134	1.422E+00	3.495E+00	7.201E+00	NOT IDENT.
I-135	0.000E+00	1.515E+35	0.000E+00	SHORT HLIF
CS-136	5.314E+00	1.729E+01	3.860E+01	FAIL ABUN
BA-137M	6.485E-01	2.109E+00	4.569E+00	NOT IDENT.
CS-137	6.851E-01	2.228E+00	4.826E+00	NOT IDENT.
LA-138	-3.391E+00	3.535E+00	4.734E+00	NOT IDENT.
CE-139	2.278E-01	2.428E+00	4.319E+00	NOT IDENT.
BA-140	-1.006E+01	5.357E+01	9.969E+01	NOT IDENT.
LA-140	8.628E+00	1.603E+01	4.003E+01	NOT IDENT.
CE-141	-2.937E+00	6.311E+00	1.053E+01	NOT IDENT.
CE-143	0.000E+00	2.938E+07	0.000E+00	SHORT HLIF
CE-144	8.350E+00	1.602E+01	2.808E+01	NOT IDENT.
PM-144	-5.188E-01	3.705E+00	6.023E+00	FAIL ABUN
PR-144	-4.271E+01	2.791E+02	4.523E+02	NOT IDENT.
PM-146	-2.180E-02	3.739E+00	7.112E+00	NOT IDENT.
ND-147	-1.961E+02	1.552E+02	2.201E+02	NOT IDENT.
PM-147	-7.972E+03	5.501E+04	9.605E+04	NOT IDENT.
PM-149	0.000E+00	9.959E+05	0.000E+00	SHORT HLIF
EU-152	2.373E+00	8.337E+00	1.635E+01	NOT IDENT.
GD-153	-3.182E+00	5.522E+00	9.246E+00	NOT IDENT.
EU-154	1.599E+00	9.752E+00	2.069E+01	NOT IDENT.
EU-155	4.031E+00	6.601E+00	1.265E+01	NOT IDENT.
TB-160	1.059E+01	1.022E+01	2.402E+01	FAIL ABUN
HO-166M	1.843E+00	4.145E+00	8.441E+00	NOT IDENT.
TM-171	8.056E+01	2.774E+02	4.926E+02	NOT IDENT.
LU-176	-1.833E+00	2.174E+00	3.756E+00	NOT IDENT.
LU-177	8.833E+00	4.801E+02	8.344E+02	NOT IDENT.
HF-181	6.029E+00	4.431E+00	9.907E+00	NOT IDENT.
W-181	2.154E+00	4.741E+00	9.081E+00	FAIL ABUN
TA-182	1.172E+00	1.419E+01	2.988E+01	NOT IDENT.
RE-183	5.400E+00	4.901E+00	1.000E+01	NOT IDENT.
RE-184	1.673E+01	1.616E+01	3.708E+01	NOT IDENT.
W-188	2.460E+02	6.604E+02	1.314E+03	FAIL ABUN
IR-192	1.867E+00	3.881E+00	6.271E+00	FAIL ABUN

PB-201	0.000E+00	2.981E+24	0.000E+00	SHORT HLIF
TL-201	0.000E+00	2.020E+04	0.000E+00	SHORT HLIF
TL-202	-1.161E+01	1.493E+01	2.534E+01	NOT IDENT.
HG-203	-9.901E-01	3.457E+00	6.458E+00	NOT IDENT.
PB-203	0.000E+00	4.596E+04	0.000E+00	SHORT HLIF
TL-204	-7.613E-01	1.753E+02	3.172E+02	NOT IDENT.
BI-207	1.647E+00	3.814E+00	8.613E+00	NOT IDENT.
BI-211	1.770E+01	2.082E+01	3.989E+01	NOT IDENT.
PB-211	-3.146E+01	6.138E+01	1.091E+02	NOT IDENT.
BI-212	-2.099E+01	4.929E+01	8.585E+01	NOT IDENT.
PB-212	1.999E+00	1.150E+01	1.432E+01	FAIL ABUN
BI-213	-6.388E+00	8.652E+00	1.478E+01	NOT IDENT.
BI-214	-5.266E+00	8.245E+00	1.328E+01	NOT IDENT.
PB-214	6.433E+00	7.554E+00	1.447E+01	NOT IDENT.
RN-219	4.673E+01	3.640E+01	7.876E+01	NOT IDENT.
FR-221	1.054E+00	1.718E+01	3.112E+01	NOT IDENT.
RA-223	2.205E+01	5.339E+01	1.062E+02	FAIL ABUN
RA-224	-2.099E+01	5.659E+01	9.219E+01	NOT IDENT.
AC-225	9.066E+00	1.478E+02	2.678E+02	NOT IDENT.
AC-227	-1.621E+01	2.184E+01	3.561E+01	FAIL ABUN
TH-227	-1.621E+01	2.184E+01	3.561E+01	FAIL ABUN
AC-228	-1.402E+01	1.671E+01	2.621E+01	NOT IDENT.
RA-228	-1.402E+01	1.671E+01	2.621E+01	NOT IDENT.
TH-228	1.999E+00	1.150E+01	1.432E+01	FAIL ABUN
TH-229	-1.826E+01	4.732E+01	7.811E+01	NOT IDENT.
TH-230	1.311E+02	3.556E+02	6.691E+02	NOT IDENT.
PA-231	-1.091E+01	3.783E+01	7.001E+01	NOT IDENT.
TH-231	-2.031E+00	2.417E+01	4.270E+01	NOT IDENT.
PA-233	-3.423E+00	5.658E+00	8.810E+00	NOT IDENT.
PA-234	8.939E+00	2.473E+01	5.379E+01	FAIL ABUN
PA-234M	4.130E+02	3.851E+02	9.120E+02	NOT IDENT.
TH-234	0.000E+00	1.125E+02	8.968E+01	FAIL ABUN
U-234	5.067E+02	1.057E+03	1.921E+03	NOT IDENT.
U-235	-2.416E+00	1.736E+01	2.862E+01	FAIL ABUN
NP-237	-3.423E+00	5.658E+00	8.810E+00	NOT IDENT.
NP-238	0.000E+00	2.438E+05	0.000E+00	SHORT HLIF
U-238	0.000E+00	1.125E+02	8.968E+01	FAIL ABUN
NP-239	-9.761E+00	1.934E+01	3.239E+01	NOT IDENT.
AM-241	-6.857E-01	3.937E+00	6.489E+00	NOT IDENT.
AM-242	1.983E+01	3.894E+01	7.368E+01	NOT IDENT.
AM-243	9.530E-01	2.299E+00	4.272E+00	NOT IDENT.
CM-243	-1.515E+00	6.754E+00	1.179E+01	NOT IDENT.
BK-247	-4.531E+00	6.205E+00	1.098E+01	NOT IDENT.
CM-247	2.458E+00	3.329E+00	6.841E+00	NOT IDENT.
CF-249	1.797E+00	3.184E+00	6.544E+00	FAIL ABUN
CF-251	-4.811E+00	1.072E+01	1.769E+01	NOT IDENT.
CF-252	3.880E+02	1.144E+04	2.052E+04	NOT IDENT.
ANH-511	-1.290E+01	6.555E+00	1.255E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	9.97	204	422	2.65	19.97	18	6	2.84E-02	17.5	
2	0	29.59	29	65	0.95	59.20	57	6	4.00E-03	48.8	
3	0	47.26	82	157	2.90	94.53	87	19	1.13E-02	38.4	
4	0	64.02	79	129	1.73	128.03	121	17	1.10E-02	34.6	
5	0	93.12	64	100	1.03	186.21	181	10	8.86E-03	32.6	
6	0	130.10	21	44	1.32	260.13	257	8	2.86E-03	61.6	
7	0	154.48	57	57	4.20	308.86	303	13	7.95E-03	30.4	
8	0	185.99	72	58	1.31	371.86	368	10	1.00E-02	23.0	
9	0	239.19	60	92	1.28	478.22	472	11	8.34E-03	33.7	
10	0	315.09	8	26	0.73	629.96	626	6	1.11E-03	106.1	
11	0	333.59	22	38	2.23	666.94	659	11	3.03E-03	59.1	
12	0	359.41	69	106	14.84	718.55	698	36	9.57E-03	50.9	
13	0	477.76	65	16	1.74	955.18	949	11	8.97E-03	17.4	
14	0	511.20	157	60	1.72	1022.04	1012	20	2.19E-02	14.4	
15	0	558.63	25	7	1.94	1116.87	1113	10	3.49E-03	28.3	
16	0	574.94	18	17	0.52	1149.48	1144	10	2.47E-03	49.8	
17	0	583.50	18	15	1.27	1166.58	1162	10	2.50E-03	46.6	
18	0	694.55	8	14	1.87	1388.62	1382	9	1.17E-03	85.6	
19	0	714.63	12	15	1.42	1428.78	1423	12	1.63E-03	72.4	
20	0	880.36	7	2	1.22	1760.17	1757	7	9.80E-04	49.2	
21	0	1077.03	7	12	2.39	2153.45	2143	12	9.72E-04	105.9	
22	0	1235.01	6	7	0.95	2469.37	2461	10	8.28E-04	94.5	
23	0	1250.23	11	0	0.63	2499.82	2495	9	1.53E-03	30.2	
24	0	1341.45	6	4	0.73	2682.24	2678	6	7.71E-04	73.7	
25	0	1461.58	31	6	1.76	2922.51	2917	11	4.24E-03	23.4	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	65	10.44*	2.452E+00	1.243E+02	1.863E+02	34.81
K-40	1460.82	16	10.66*	9.730E-01	7.598E+01	7.598E+01	93.55
GE-68	1077.34	7	3.22*	1.246E+00	8.602E+01	9.313E+01	211.89
RB-84	881.60	7	68.90*	1.469E+00	3.436E+00	6.620E+00	98.45
RB-86	1077.00	7	8.64*	1.246E+00	3.206E+01	1.017E+02	211.89
RE-188	61.49	-----	1.39	6.494E+00	-----	Line Not Found	-----
	63.00	54	2.38	6.470E+00	1.717E+02	2.338E+02	103.89
	155.04	57	15.61*	5.291E+00	3.417E+01	4.652E+01	60.90
	477.99	65	1.08	2.452E+00	1.202E+03	1.636E+03	34.81
	632.98	-----	1.37	1.935E+00	-----	Line Not Found	-----
OS-191	63.29	54	15.70	6.470E+00	2.603E+01	1.053E+02	103.89
	64.99	54	26.70	6.470E+00	1.531E+01	6.193E+01	103.89
	129.43	21	26.50*	5.659E+00	6.770E+00	2.739E+01	123.19
TL-208	277.37	-----	6.60	3.760E+00	-----	Line Not Found	-----
	583.19	3	85.00*	2.073E+00	7.578E-01	7.816E-01	678.18
	860.56	-----	12.50	1.497E+00	-----	Line Not Found	-----
PB-210	46.54	63	4.25*	6.684E+00	1.094E+02	1.097E+02	100.88
RA-226	186.21	35	3.59*	4.834E+00	9.827E+01	9.828E+01	101.77
TH-232	63.81	54	0.26*	6.470E+00	1.572E+03	1.572E+03	103.89
	140.88	-----	0.02	5.496E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

Total number of lines in spectrum 23
Number of unidentified lines 8
Number of lines tentatively identified by NID 15 65.22%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.50	1.243E+02	1.863E+02	0.649E+02	34.81	
K-40	1.25E+09Y	1.00	7.598E+01	7.598E+01	7.108E+01	93.55	
GE-68	270.95D	1.08	8.602E+01	9.313E+01	19.73E+01	211.89	
RB-84	32.82D	1.93	3.436E+00	6.620E+00	6.517E+00	98.45	
RB-86	18.64D	3.17	3.206E+01	1.017E+02	2.155E+02	211.89	
RE-188	69.78D	1.36	3.417E+01	4.652E+01	2.833E+01	60.90	
OS-191	15.40D	4.05	6.770E+00	2.739E+01	3.374E+01	123.19	
TL-208	1.91Y	1.03	7.578E-01	7.816E-01	53.01E-01	678.18	
PB-210	22.20Y	1.00	1.094E+02	1.097E+02	1.107E+02	100.88	
RA-226	1600.00Y	1.00	9.827E+01	9.828E+01	10.00E+01	101.77	
TH-232	1.41E+10Y	1.00	1.572E+03	1.572E+03	1.633E+03	103.89	
Total Activity :			2.143E+03	2.318E+03			

Grand Total Activity : 2.143E+03 2.318E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	9.97	204	422	2.65	19.97	18	6	2.84E-02	34.9	1.00E+02	
0	29.59	29	65	0.95	59.20	57	6	4.00E-03	97.7	7.87E+00	
0	239.19	7	92	1.28	478.22	472	11	9.91E-04	****	4.16E+00	T
0	315.09	8	26	0.73	629.96	626	6	1.11E-03	****	3.42E+00	T
0	333.59	22	38	2.23	666.94	659	11	3.03E-03	****	3.28E+00	T
0	359.41	69	106	14.84	718.55	698	36	9.57E-03	****	3.09E+00	
0	558.63	15	7	1.94	1116.87	1113	10	2.07E-03	****	2.15E+00	
0	574.94	18	17	0.52	1149.48	1144	10	2.47E-03	99.6	2.10E+00	
0	694.55	8	14	1.87	1388.62	1382	9	1.17E-03	****	1.79E+00	T
0	714.63	12	15	1.42	1428.78	1423	12	1.63E-03	****	1.75E+00	
0	1235.01	6	7	0.95	2469.37	2461	10	8.28E-04	****	1.12E+00	T
0	1250.23	11	0	0.63	2499.82	2495	9	1.53E-03	60.3	1.10E+00	
0	1341.45	6	4	0.73	2682.24	2678	6	7.71E-04	****	1.04E+00	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533004.CNF;1  *
* Acquisition date   : 31-OCT-2022 08:19:03 Sensitivity      : 3.000          *
* Detector ID       : GAM46 Energy tolerance: 1.500          *
* Elapsed live time : 0 02:00:00.00 Abundance limit : 75.000      *
* Elapsed real time : 0 02:00:02.19 Half life ratio : *****          *
* Sample date       : 30-SEP-2022 08:05:00 Nuclide Library : LIQUID        *
* Sample ID         : G597533004 Analyst initials: RXF2          *
* Batch Number      : 2333342 Sample Quantity : 7.6168E-01 FILTER *
* Wet wt corr       : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date    : 23-SEP-2022 04:01:30 Eff. Geometry   : JAR          *
* Eff. File         : DKA100:[CANBERRA.GAMMA]EFF_GAM46_JAR.CNF;4          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	2.586E+01
K-40	2.936E+01
GE-68	9.205E+01
RB-84	7.061E+00
RB-86	1.005E+02
RE-188	9.645E+00
OS-191	1.869E+01
TL-208	2.370E+00
PB-210	2.351E+01
RA-226	4.130E+01
TH-232	4.102E+02

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	3.053E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	1.993E+00	NOT IDENT.
SC-46	3.801E+00	NOT IDENT.
V-48	9.223E+00	NOT IDENT.
CR-51	4.345E+01	NOT IDENT.
MN-52	7.713E+01	NOT IDENT.
MN-54	2.231E+00	NOT IDENT.
CO-56	3.437E+00	NOT IDENT.
CO-57	1.459E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.529E+00	NOT IDENT.
FE-59	6.757E+00	NOT IDENT.
CO-60	2.496E+00	NOT IDENT.
ZN-65	5.057E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
AS-73	1.321E+01	NOT IDENT.
AS-74	1.505E+01	NOT IDENT.
SE-75	3.035E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF

SR-82	2.827E+01	NOT IDENT.
RB-83	6.467E+00	NOT IDENT.
KR-85	6.386E+02	NOT IDENT.
SR-85	3.965E+00	NOT IDENT.
Y-88	3.514E+00	NOT IDENT.
Y-91	1.350E+03	NOT IDENT.
NB-94	2.291E+00	NOT IDENT.
NB-95	3.433E+00	NOT IDENT.
NB-95M	9.544E+00	NOT IDENT.
TC-95M	3.796E+00	FAIL ABUN
ZR-95	4.296E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	1.876E+00	NOT IDENT.
RH-102M	2.346E+00	NOT IDENT.
RU-103	3.089E+00	NOT IDENT.
RH-106	2.729E+01	NOT IDENT.
RU-106	2.729E+01	NOT IDENT.
AG-108M	2.309E+00	NOT IDENT.
CD-109	3.359E+01	NOT IDENT.
AG-110	4.235E+01	NOT IDENT.
AG-110M	3.596E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	3.451E+00	NOT IDENT.
IN-114M	1.497E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	6.685E+00	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	1.827E+00	NOT IDENT.
SB-124	4.065E+00	NOT IDENT.
SB-125	5.182E+00	NOT IDENT.
TE-125M	5.675E+02	NOT IDENT.
I-126	3.423E+01	NOT IDENT.
SB-126	2.407E+01	FAIL ABUN
SN-126	3.089E+00	FAIL ABUN
SB-127	1.509E+03	NOT IDENT.
TE-129	5.612E+01	NOT IDENT.
I-131	3.332E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	1.457E+03	NOT IDENT.
BA-133	2.508E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.099E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.595E+01	FAIL ABUN
BA-137M	1.886E+00	NOT IDENT.
CS-137	1.993E+00	NOT IDENT.
LA-138	1.335E+00	NOT IDENT.
CE-139	1.970E+00	NOT IDENT.
BA-140	4.321E+01	NOT IDENT.
LA-140	1.584E+01	NOT IDENT.
CE-141	4.771E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.289E+01	NOT IDENT.
PM-144	2.614E+00	FAIL ABUN
PR-144	1.962E+02	NOT IDENT.
PM-146	3.152E+00	NOT IDENT.
ND-147	9.397E+01	NOT IDENT.
PM-147	4.391E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	7.389E+00	NOT IDENT.
GD-153	4.214E+00	NOT IDENT.
EU-154	8.581E+00	NOT IDENT.
EU-155	5.798E+00	NOT IDENT.
TB-160	9.982E+00	FAIL ABUN
HO-166M	3.519E+00	NOT IDENT.
TM-171	2.242E+02	NOT IDENT.
LU-176	1.675E+00	NOT IDENT.
LU-177	3.813E+02	NOT IDENT.
HF-181	4.390E+00	NOT IDENT.
W-181	4.161E+00	FAIL ABUN
TA-182	1.230E+01	NOT IDENT.
RE-183	4.599E+00	NOT IDENT.
RE-184	1.631E+01	NOT IDENT.
W-188	5.953E+02	FAIL ABUN
IR-192	2.820E+00	FAIL ABUN
PB-201	0.000E+00	SHORT HLIF

TL-201	0.000E+00	SHORT HLIF
TL-202	1.108E+01	NOT IDENT.
HG-203	2.884E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	1.453E+02	NOT IDENT.
BI-207	3.596E+00	NOT IDENT.
BI-211	1.831E+01	NOT IDENT.
PB-211	4.828E+01	NOT IDENT.
BI-212	3.695E+01	NOT IDENT.
PB-212	6.787E+00	FAIL ABUN
BI-213	6.415E+00	NOT IDENT.
BI-214	5.906E+00	NOT IDENT.
PB-214	6.644E+00	NOT IDENT.
RN-219	3.582E+01	NOT IDENT.
FR-221	1.424E+01	NOT IDENT.
RA-223	4.812E+01	FAIL ABUN
RA-224	4.206E+01	NOT IDENT.
AC-225	1.225E+02	NOT IDENT.
AC-227	1.604E+01	FAIL ABUN
TH-227	1.604E+01	FAIL ABUN
AC-228	1.128E+01	NOT IDENT.
RA-228	1.128E+01	NOT IDENT.
TH-228	6.787E+00	FAIL ABUN
TH-229	3.588E+01	NOT IDENT.
TH-230	3.074E+02	NOT IDENT.
PA-231	3.150E+01	NOT IDENT.
TH-231	1.975E+01	NOT IDENT.
PA-233	3.905E+00	NOT IDENT.
PA-234	2.289E+01	FAIL ABUN
PA-234M	3.961E+02	NOT IDENT.
TH-234	4.208E+01	FAIL ABUN
U-234	8.764E+02	NOT IDENT.
U-235	1.320E+01	FAIL ABUN
NP-237	3.905E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	4.208E+01	FAIL ABUN
NP-239	1.477E+01	NOT IDENT.
AM-241	2.961E+00	NOT IDENT.
AM-242	3.381E+01	NOT IDENT.
AM-243	1.981E+00	NOT IDENT.
CM-243	5.369E+00	NOT IDENT.
BK-247	4.918E+00	NOT IDENT.
CM-247	3.094E+00	NOT IDENT.
CF-249	2.926E+00	FAIL ABUN
CF-251	8.069E+00	NOT IDENT.
CF-252	9.402E+03	NOT IDENT.
ANH-511	5.993E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533004.CNF;1
Acquisition date : 31-OCT-2022 08:19:03 Sensitivity : 3.000
Detector ID : GAM46 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:02.19 Half life ratio : *****
Sample date : 30-SEP-2022 08:05:00 Nuclide Library : LIQUID
Sample ID : G597533004 Analyst initials: RXF2
Batch Number : 2333342 Sample Quantity : 7.6168E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 23-SEP-2022 04:01:30 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM46_JAR.CNF;4

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.863E+02	6.578E+01	6.588E+01
K-40	7.598E+01	6.997E+01	6.998E+01
GE-68	9.313E+01	1.936E+02	1.936E+02
RB-84	6.620E+00	6.425E+00	6.426E+00
RB-86	1.017E+02	2.114E+02	2.114E+02
RE-188	4.652E+01	2.845E+01	2.847E+01
OS-191	2.739E+01	3.322E+01	3.322E+01
TL-208	7.816E-01	5.195E+00	5.195E+00
PB-210	1.097E+02	1.090E+02	1.090E+02
RA-226	9.828E+01	9.892E+01	9.893E+01
TH-232	1.572E+03	1.616E+03	1.616E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	5.691E-01	3.470E+00	3.480E+00	NOT IDENT.
NA-24	-8.231E+14	3.379E+15	3.400E+15	SHORT HLIF
AL-26	-9.511E-02	2.470E+00	2.470E+00	NOT IDENT.
SC-46	2.540E+00	4.158E+00	4.313E+00	NOT IDENT.
V-48	9.579E-01	1.048E+01	1.049E+01	NOT IDENT.
CR-51	2.235E+01	4.804E+01	4.908E+01	NOT IDENT.
MN-52	-7.067E+01	1.220E+02	1.261E+02	NOT IDENT.
MN-54	-1.654E+00	3.178E+00	3.264E+00	NOT IDENT.
CO-56	1.137E+00	3.983E+00	4.016E+00	NOT IDENT.
CO-57	-3.935E-01	1.847E+00	1.855E+00	NOT IDENT.
NI-57	7.196E+06	7.386E+06	8.068E+06	SHORT HLIF
CO-58	6.244E-02	4.329E+00	4.329E+00	NOT IDENT.
FE-59	3.026E+00	7.078E+00	7.209E+00	NOT IDENT.
CO-60	-3.752E-01	3.071E+00	3.076E+00	NOT IDENT.
ZN-65	-1.162E+00	6.221E+00	6.243E+00	NOT IDENT.
CU-67	3.078E+04	3.099E+04	3.396E+04	SHORT HLIF
AS-73	8.215E+00	1.593E+01	1.635E+01	NOT IDENT.
AS-74	1.311E+01	1.609E+01	1.714E+01	NOT IDENT.
SE-75	-2.583E+00	3.809E+00	3.983E+00	NOT IDENT.

BR-77	3.135E+04	1.804E+05	1.809E+05	SHORT HLIF
SR-82	-5.256E+00	3.618E+01	3.626E+01	NOT IDENT.
RB-83	6.320E+00	6.755E+00	7.332E+00	NOT IDENT.
KR-85	-3.579E+03	1.178E+03	1.999E+03	NOT IDENT.
SR-85	-2.222E+01	7.316E+00	1.241E+01	NOT IDENT.
Y-88	-1.890E+00	4.922E+00	4.995E+00	NOT IDENT.
Y-91	2.534E+02	1.517E+03	1.521E+03	NOT IDENT.
NB-94	-1.991E+00	3.188E+00	3.312E+00	NOT IDENT.
NB-95	-3.226E+00	4.860E+00	5.074E+00	NOT IDENT.
NB-95M	-3.276E+00	1.256E+01	1.265E+01	NOT IDENT.
TC-95M	2.911E+00	4.438E+00	4.629E+00	FAIL ABUN
ZR-95	-6.539E+00	7.034E+00	7.628E+00	NOT IDENT.
MO-99	-4.133E+04	5.152E+04	5.480E+04	SHORT HLIF
TC-99M	-1.672E+37	4.034E+37	0.000E+00	SHORT HLIF
RH-101	9.613E-02	2.496E+00	2.496E+00	NOT IDENT.
RH-102M	6.291E-01	2.991E+00	3.004E+00	NOT IDENT.
RU-103	-2.645E+00	4.198E+00	4.365E+00	NOT IDENT.
RH-106	1.177E+01	3.101E+01	3.146E+01	NOT IDENT.
RU-106	1.177E+01	3.101E+01	3.146E+01	NOT IDENT.
AG-108M	-7.553E-01	2.834E+00	2.854E+00	NOT IDENT.
CD-109	-8.495E+00	4.179E+01	4.196E+01	NOT IDENT.
AG-110	-2.610E+00	5.203E+01	5.205E+01	NOT IDENT.
AG-110M	2.090E+00	4.260E+00	4.363E+00	NOT IDENT.
IN-111	4.302E+02	4.624E+03	4.628E+03	SHORT HLIF
SN-113	2.455E+00	3.697E+00	3.859E+00	NOT IDENT.
IN-114M	1.200E+01	1.855E+01	1.933E+01	NOT IDENT.
CD-115	1.245E+04	1.133E+05	1.135E+05	SHORT HLIF
SN-117M	1.295E+00	8.815E+00	8.834E+00	NOT IDENT.
SB-122	3.991E+03	1.036E+04	1.052E+04	SHORT HLIF
I-123	3.973E+16	1.866E+17	0.000E+00	SHORT HLIF
TE-123M	7.552E-01	2.347E+00	2.371E+00	NOT IDENT.
SB-124	-3.657E+00	7.046E+00	7.237E+00	NOT IDENT.
SB-125	-3.034E+00	6.678E+00	6.816E+00	NOT IDENT.
TE-125M	-4.527E+02	7.566E+02	7.837E+02	NOT IDENT.
I-126	-1.366E+01	4.439E+01	4.481E+01	NOT IDENT.
SB-126	-7.601E+00	3.099E+01	3.118E+01	FAIL ABUN
SN-126	-5.049E-01	3.812E+00	3.819E+00	FAIL ABUN
SB-127	1.860E+02	1.793E+03	1.795E+03	NOT IDENT.
TE-129	2.723E+01	6.293E+01	6.412E+01	NOT IDENT.
I-131	6.698E+00	3.812E+01	3.824E+01	NOT IDENT.
I-132	1.000E+41	2.474E+41	0.000E+00	SHORT HLIF
TE-132	-3.494E+02	1.705E+03	1.712E+03	NOT IDENT.
BA-133	-1.159E+00	3.109E+00	3.153E+00	NOT IDENT.
I-133	-2.108E+11	1.883E+11	2.109E+11	SHORT HLIF
CS-134	1.422E+00	3.498E+00	3.557E+00	NOT IDENT.
I-135	5.076E+34	1.557E+35	0.000E+00	SHORT HLIF
CS-136	5.314E+00	1.731E+01	1.747E+01	FAIL ABUN
BA-137M	6.485E-01	2.111E+00	2.131E+00	NOT IDENT.
CS-137	6.851E-01	2.230E+00	2.251E+00	NOT IDENT.
LA-138	-3.391E+00	3.545E+00	3.861E+00	NOT IDENT.
CE-139	2.278E-01	2.429E+00	2.431E+00	NOT IDENT.
BA-140	-1.006E+01	5.358E+01	5.377E+01	NOT IDENT.
LA-140	8.628E+00	1.604E+01	1.651E+01	NOT IDENT.
CE-141	-2.937E+00	6.322E+00	6.460E+00	NOT IDENT.
CE-143	-7.615E+06	2.939E+07	2.959E+07	SHORT HLIF
CE-144	8.350E+00	1.606E+01	1.649E+01	NOT IDENT.
PM-144	-5.188E-01	3.706E+00	3.713E+00	FAIL ABUN
PR-144	-4.271E+01	2.791E+02	2.798E+02	NOT IDENT.
PM-146	-2.180E-02	3.739E+00	3.739E+00	NOT IDENT.
ND-147	-1.961E+02	1.564E+02	1.797E+02	NOT IDENT.
PM-147	-7.972E+03	5.502E+04	5.514E+04	NOT IDENT.
PM-149	1.004E+06	1.008E+06	1.105E+06	SHORT HLIF
EU-152	2.373E+00	8.340E+00	8.408E+00	NOT IDENT.
GD-153	-3.182E+00	5.532E+00	5.716E+00	NOT IDENT.
EU-154	1.599E+00	9.752E+00	9.779E+00	NOT IDENT.
EU-155	4.031E+00	6.618E+00	6.863E+00	NOT IDENT.
TB-160	1.059E+01	1.029E+01	1.134E+01	FAIL ABUN
HO-166M	1.843E+00	4.150E+00	4.233E+00	NOT IDENT.
TM-171	8.056E+01	2.776E+02	2.800E+02	NOT IDENT.
LU-176	-1.833E+00	2.179E+00	2.331E+00	NOT IDENT.
LU-177	8.833E+00	4.801E+02	4.801E+02	NOT IDENT.
HF-181	6.029E+00	4.465E+00	5.229E+00	NOT IDENT.
W-181	2.154E+00	4.775E+00	4.873E+00	FAIL ABUN
TA-182	1.172E+00	1.419E+01	1.420E+01	NOT IDENT.
RE-183	5.400E+00	4.948E+00	5.516E+00	NOT IDENT.
RE-184	1.673E+01	1.630E+01	1.796E+01	NOT IDENT.
W-188	2.460E+02	6.612E+02	6.704E+02	FAIL ABUN
IR-192	1.867E+00	3.884E+00	3.974E+00	FAIL ABUN

PB-201	6.399E+23	2.991E+24	0.000E+00	SHORT HLIF
TL-201	-7.062E+03	2.022E+04	2.047E+04	SHORT HLIF
TL-202	-1.161E+01	1.496E+01	1.585E+01	NOT IDENT.
HG-203	-9.901E-01	3.458E+00	3.486E+00	NOT IDENT.
PB-203	-1.316E+04	4.597E+04	4.635E+04	SHORT HLIF
TL-204	-7.613E-01	1.753E+02	1.753E+02	NOT IDENT.
BI-207	1.647E+00	3.817E+00	3.889E+00	NOT IDENT.
BI-211	1.770E+01	2.087E+01	2.235E+01	NOT IDENT.
PB-211	-3.146E+01	6.144E+01	6.306E+01	NOT IDENT.
BI-212	-2.099E+01	4.934E+01	5.024E+01	NOT IDENT.
PB-212	1.999E+00	1.150E+01	1.154E+01	FAIL ABUN
BI-213	-6.388E+00	8.670E+00	9.137E+00	NOT IDENT.
BI-214	-5.266E+00	8.263E+00	8.598E+00	NOT IDENT.
PB-214	6.433E+00	7.573E+00	8.110E+00	NOT IDENT.
RN-219	4.673E+01	3.701E+01	4.260E+01	NOT IDENT.
FR-221	1.054E+00	1.718E+01	1.719E+01	NOT IDENT.
RA-223	2.205E+01	5.344E+01	5.435E+01	FAIL ABUN
RA-224	-2.099E+01	5.664E+01	5.743E+01	NOT IDENT.
AC-225	9.066E+00	1.478E+02	1.479E+02	NOT IDENT.
AC-227	-1.621E+01	2.199E+01	2.318E+01	FAIL ABUN
TH-227	-1.621E+01	2.199E+01	2.318E+01	FAIL ABUN
AC-228	-1.402E+01	1.678E+01	1.793E+01	NOT IDENT.
RA-228	-1.402E+01	1.678E+01	1.793E+01	NOT IDENT.
TH-228	1.999E+00	1.150E+01	1.154E+01	FAIL ABUN
TH-229	-1.826E+01	4.738E+01	4.809E+01	NOT IDENT.
TH-230	1.311E+02	3.565E+02	3.613E+02	NOT IDENT.
PA-231	-1.091E+01	3.790E+01	3.822E+01	NOT IDENT.
TH-231	-2.031E+00	2.417E+01	2.419E+01	NOT IDENT.
PA-233	-3.423E+00	5.665E+00	5.872E+00	NOT IDENT.
PA-234	8.939E+00	2.677E+01	2.707E+01	FAIL ABUN
PA-234M	4.130E+02	3.872E+02	4.298E+02	NOT IDENT.
TH-234	1.105E+02	1.154E+02	1.257E+02	FAIL ABUN
U-234	5.067E+02	1.059E+03	1.083E+03	NOT IDENT.
U-235	-2.416E+00	1.737E+01	1.740E+01	FAIL ABUN
NP-237	-3.423E+00	5.665E+00	5.872E+00	NOT IDENT.
NP-238	3.054E+04	2.438E+05	2.442E+05	SHORT HLIF
U-238	1.105E+02	1.154E+02	1.257E+02	FAIL ABUN
NP-239	-9.761E+00	1.937E+01	1.986E+01	NOT IDENT.
AM-241	-6.857E-01	3.938E+00	3.950E+00	NOT IDENT.
AM-242	1.983E+01	3.913E+01	4.014E+01	NOT IDENT.
AM-243	9.530E-01	2.301E+00	2.341E+00	NOT IDENT.
CM-243	-1.515E+00	6.757E+00	6.792E+00	NOT IDENT.
BK-247	-4.531E+00	6.282E+00	6.607E+00	NOT IDENT.
CM-247	2.458E+00	3.359E+00	3.538E+00	NOT IDENT.
CF-249	1.797E+00	3.190E+00	3.291E+00	FAIL ABUN
CF-251	-4.811E+00	1.075E+01	1.097E+01	NOT IDENT.
CF-252	3.880E+02	1.144E+04	1.144E+04	NOT IDENT.
ANH-511	-1.290E+01	6.667E+00	8.851E+00	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	46.2165	133.52	58.6721	116.30	41.6727
879.38	33.8432	364.49	58.6788	116.74	45.0778
46.54	33.9196	80.22	0.0000	117.23	49.6182
228.16	34.1726	711.68	66.1896	119.76	27.1549
52.39	34.2992	356.01	59.8277	120.54	38.5089
53.20	28.3627	323.87	59.8350	120.90	39.6599
53.44	27.0264	82.35	0.0000	264.66	41.9383
57.53	35.6900	82.47	47.1236	121.22	40.8101
293.27	0.0000	82.47	0.0000	344.28	38.5709
57.53	32.7169	83.79	47.2270	122.06	37.4500
482.18	32.7170	265.00	56.9069	1274.44	42.0445
57.98	25.5841	84.21	52.6304	123.68	37.5283
59.32	39.6800	84.86	0.0000	1377.63	0.0000
59.54	39.6979	193.51	50.5833	127.23	38.0789
155.04	36.0759	105.31	42.0499	129.43	36.6567
63.00	36.1847	86.79	39.9087	131.20	45.9216
129.43	36.2054	86.94	38.8397	133.02	44.4906
63.29	36.2054	87.09	38.8490	133.52	32.2370
290.67	36.2260	87.57	41.0389	135.34	0.0000
63.81	36.2424	88.03	45.3924	136.00	36.9531
87.57	36.2758	306.78	47.5775	136.28	34.6550
64.99	36.3260	88.47	47.5872	136.47	42.7513
65.08	36.3322	531.02	98.8307	739.50	0.0000
66.73	36.4478	184.58	0.0000	140.51	0.0000
66.98	36.4652	92.59	50.0739	140.88	46.4606
67.24	36.4831	93.31	0.0000	143.76	38.4594
67.67	36.5130	94.56	98.2679	144.24	39.6471
1221.41	37.5617	311.90	98.2816	145.44	39.7021
439.51	43.2191	946.00	98.2844	152.32	34.5214
70.82	43.2191	97.43	46.0583	152.43	34.5254
167.43	0.0000	98.43	40.6359	1048.07	25.9179
97.43	43.2822	98.44	40.6364	154.21	25.9454
70.82	0.0000	99.53	33.0018	155.04	25.9692
70.82	39.8761	103.37	33.0018	158.56	25.9974
279.20	0.0000	116.74	33.0018	158.97	0.0000
1063.66	53.7124	100.11	34.1309	159.00	28.4531
72.87	0.0000	100.20	39.6414	162.33	34.5048
351.06	53.7182	102.03	36.4354	537.26	41.6581
74.66	46.4942	103.18	38.7080	163.33	44.0702
238.63	58.1341	103.37	38.7186	165.86	34.6344
351.93	58.1341	105.31	29.9519	167.43	0.0000
238.63	58.1341	106.12	36.6502	245.35	0.0000
74.97	58.1496	106.47	35.5571	427.87	39.8396
77.11	61.5524	109.28	40.1600	176.60	37.4359
256.23	47.9691	111.00	42.4923	177.52	44.7234
79.82	0.0000	111.76	36.9397	181.07	0.0000
80.02	58.6620	208.37	44.8483	184.41	34.0776
80.03	58.6624	116.24	41.6693	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	38.9956	300.09	30.3414	477.60	14.8572
186.21	39.0146	300.13	30.3421	477.99	14.8599
190.27	27.7440	301.36	31.2616	482.18	5.9564
193.51	50.3397	302.85	29.5061	487.02	9.9512
197.03	50.5074	304.50	22.3785	492.35	0.0000
198.01	50.5543	304.85	19.6980	497.08	18.0004
201.83	45.7842	306.78	34.9661	511.00	38.2559
204.12	33.4806	308.46	26.0305	514.00	101.8261
205.31	37.2411	311.90	29.6901	520.40	10.1123
208.37	37.3448	316.51	32.4910	520.69	0.0000
210.85	37.4281	319.41	28.0326	667.71	0.0000
215.65	42.6001	320.08	27.1405	527.90	0.0000
218.12	28.4616	321.04	28.0635	529.59	14.2176
222.11	28.5606	323.87	25.3955	529.87	0.0000
227.09	37.9628	325.23	30.8651	531.02	19.3085
227.38	34.5967	1596.21	21.8379	537.26	16.3066
228.16	36.3084	331.15	0.0000	1260.41	0.0000
228.18	36.3092	333.37	24.6412	552.55	15.3937
235.69	43.3368	334.37	16.4381	795.86	20.1070
235.96	43.3462	338.28	20.1420	564.24	0.0000
238.63	37.4795	911.20	20.1425	569.33	21.0915
238.98	0.0000	340.48	23.8376	569.50	20.1625
240.99	34.5649	340.55	22.0049	569.70	17.0626
242.00	29.4684	344.28	25.7339	582.08	14.0356
244.70	38.5213	345.93	25.7607	583.19	12.4819
245.35	0.0000	351.06	22.1519	595.83	12.5498
459.60	36.1241	351.93	22.1641	600.60	19.9100
685.70	31.0074	356.01	22.2202	604.72	23.0939
388.16	26.7094	361.25	0.0000	609.32	22.0869
256.23	32.8287	364.49	22.3364	610.33	13.6787
527.90	0.0000	366.42	0.0000	614.28	15.8087
264.66	35.6523	383.85	16.0056	618.01	15.8331
265.00	35.6615	388.16	16.9900	621.93	14.8015
269.46	30.5460	666.33	16.0506	630.19	0.0000
401.81	37.5786	391.70	14.1873	631.29	11.6741
273.65	37.6469	400.66	28.5211	632.98	8.4961
276.40	31.5828	401.32	0.0000	633.25	10.6213
583.19	29.8496	401.81	16.1723	634.78	11.6906
277.60	36.0010	402.40	19.9844	635.95	10.6331
402.40	32.4985	404.85	26.6829	636.99	11.7014
278.43	31.6304	410.95	21.0372	657.50	8.5798
279.20	0.0000	720.70	13.4152	884.68	7.5081
279.54	28.1387	423.72	16.3709	661.66	5.3711
280.46	27.2776	427.09	15.4362	664.57	0.0000
301.36	36.1628	427.87	17.3730	666.33	15.0664
284.31	33.5314	433.94	27.1136	666.50	15.0675
285.41	18.5455	439.51	26.2233	667.71	0.0000
285.90	0.0000	440.45	23.3208	677.62	7.5662
287.50	26.5332	453.88	20.5501	685.70	9.7581
290.67	25.7078	459.60	19.6297	692.65	0.0000
293.27	0.0000	463.37	10.8172	695.00	19.5857
295.22	35.5737	468.07	14.7861	696.49	16.3306
316.51	31.1434	473.00	22.2345	696.51	16.3306
298.58	29.4182	475.06	19.2897	697.00	17.9670
299.98	29.4470	696.49	14.8511	697.49	13.0693

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	19.6421	903.28	7.8841	1291.59	4.8575
706.68	8.7428	907.67	0.0000	1298.22	0.0000
711.68	4.9270	911.20	13.1717	1312.11	11.7136
720.70	14.2812	984.45	0.0000	1332.49	5.8843
721.93	0.0000	926.36	6.1753	1365.19	3.9517
1690.97	10.9937	935.54	7.0771	1368.63	0.0000
722.91	10.9941	937.49	13.2770	1377.63	0.0000
723.31	9.8961	983.53	9.7559	1384.29	2.9762
756.73	12.0993	945.96	0.0000	1408.01	6.9808
727.33	17.6191	946.00	7.9865	1434.09	5.0143
733.00	17.6556	949.00	9.7700	1435.80	5.0162
735.93	11.0465	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	8.9169	1460.82	7.0598
1434.09	7.7557	964.08	9.8137	1489.16	3.0436
747.24	13.3096	966.17	12.4978	1596.21	2.0734
752.31	18.8891	968.97	6.2540	1620.50	6.2498
753.82	7.7821	983.53	7.1777	1678.03	0.0000
756.73	14.4674	984.45	0.0000	1690.97	3.1670
763.94	14.5044	996.26	6.3034	1757.55	0.0000
765.80	20.0962	1001.03	5.4102	1764.49	4.2800
1001.03	15.6338	1004.73	11.7344	1770.23	4.2844
766.84	13.4023	1025.87	0.0000	1771.35	7.4995
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	7.8442	1037.84	11.8439	1808.65	2.1570
777.92	0.0000	1038.76	0.0000	1836.06	6.5024
778.90	10.0939	1046.59	7.3062		
783.70	7.8639	1048.07	5.4818		
1435.80	7.8773	1050.41	4.5712		
903.28	11.2663	1063.66	5.5052		
795.86	9.0247	1077.00	8.8400		
801.95	10.1737	1077.34	8.8412		
802.10	10.1741	1083.85	7.3804		
810.29	12.4694	1085.87	10.1534		
810.45	13.6040	1099.25	3.7053		
810.76	12.4717	1111.64	5.5759		
815.77	6.8140	1112.07	5.5767		
818.51	13.6406	1112.84	4.6481		
832.01	4.5672	1115.54	7.4424		
834.85	12.5715	1120.29	7.4517		
835.15	12.5728	1120.55	7.4521		
836.80	0.0000	1121.30	6.5219		
846.77	9.1784	1808.65	6.5360		
856.80	9.2083	1131.51	0.0000		
860.56	13.8291	1332.49	3.7766		
871.09	6.9377	1177.95	8.5073		
873.19	10.4136	1189.05	4.7394		
875.33	0.0000	1204.77	4.7577		
879.38	10.4341	1221.41	6.6881		
880.51	5.7987	1231.02	9.1939		
881.60	10.4414	1235.36	7.6694		
883.24	8.7054	1238.28	4.6049		
884.68	5.2256	1260.41	0.0000		
889.28	8.1405	1271.87	7.7363		
894.76	10.4843	1274.44	6.7736		
1836.06	9.3288	1274.54	6.7736		

VAX/VMS Nuclide Identification Report Generated 31-OCT-2022 10:21:18.01

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533005.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM45.CNF;70
Background date    : 30-OCT-2022 10:50:20
Sample date       : 30-SEP-2022 09:00:00 Acquisition date : 31-OCT-2022 08:19:32
Sample ID        : G597533005 Sample quantity : 7.57170E-01 FILTER
Detector name     : GAM45 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:00.60 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : RXF2
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2333342 Detector SN# :
Matrix Spike ID   : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	10.46	101	446	0.95	21.23	20	6	1.41E-02	35.4	
2	0	63.77*	46	95	1.59	127.83	123	10	6.34E-03	45.5	
3	0	92.69*	7	102	0.96	185.67	182	8	9.74E-04	293.4	
4	0	140.22*	23	71	0.72	280.71	277	6	3.23E-03	66.5	
5	0	153.90	18	70	0.70	308.06	304	7	2.50E-03	80.6	
6	0	171.13	22	69	1.96	342.52	338	8	3.02E-03	69.3	
7	0	180.68	30	45	1.91	361.61	359	6	4.10E-03	40.4	
8	0	185.46*	3	93	1.63	371.17	366	10	3.49E-04	824.1	
9	0	231.61	22	107	3.18	463.47	459	12	3.01E-03	97.1	
10	0	302.77	13	56	1.54	605.77	601	9	1.84E-03	105.7	
11	0	352.41*	5	76	1.67	705.04	698	12	6.44E-04	401.5	
12	0	376.29	15	18	1.15	752.80	751	5	2.03E-03	51.3	
13	0	452.24	22	14	1.82	904.67	901	8	3.03E-03	36.6	
14	0	489.65	20	22	1.71	979.50	976	8	2.74E-03	47.1	
15	0	582.73*	18	23	2.08	1165.64	1161	11	2.52E-03	65.7	
16	0	595.74	28	27	1.66	1191.66	1186	11	3.87E-03	41.0	
17	0	609.80*	2	23	1.22	1219.78	1216	9	3.29E-04	478.4	
18	0	662.42	26	27	5.86	1325.01	1314	18	3.63E-03	50.5	
19	0	683.16	16	18	0.51	1366.48	1360	11	2.20E-03	59.0	
20	0	802.75*	4	14	3.53	1605.66	1599	12	5.60E-04	226.7	
21	0	808.35*	4	10	3.24	1616.86	1611	10	6.19E-04	158.5	
22	0	859.50	18	17	1.52	1719.17	1713	13	2.52E-03	51.6	
23	0	912.27*	3	22	0.67	1824.71	1816	13	3.73E-04	440.0	
24	0	968.06*	18	6	1.35	1936.28	1930	13	2.54E-03	42.0	
25	0	1000.32*	13	0	1.42	2000.79	1997	8	1.85E-03	37.3	
26	0	1021.68	6	2	1.45	2043.52	2040	7	8.59E-04	53.8	
27	0	1075.06	14	0	2.18	2150.29	2146	8	1.94E-03	26.7	
28	0	1120.26*	11	10	1.70	2240.68	2236	10	1.50E-03	73.9	
29	0	1176.80	7	4	0.59	2353.77	2350	6	9.60E-04	61.0	
30	0	1354.24	12	0	0.55	2708.67	2704	8	1.67E-03	28.9	
31	0	1367.26	8	3	4.25	2734.70	2727	11	1.10E-03	54.2	
32	0	1411.11	10	0	0.73	2822.40	2816	11	1.39E-03	31.6	
33	0	1444.32	6	0	1.37	2888.83	2886	6	8.33E-04	40.8	
34	0	1460.69*	21	0	2.25	2921.57	2916	11	2.92E-03	33.3	

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
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Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 31-OCT-2022 10:21:19

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533005.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 30-SEP-2022 09:00:00	Acquisition date	: 31-OCT-2022 08:19:32
Sample ID	: G597533005	Sample quantity	: 0.75717 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA45	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.60 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	21	10.66*	9.849E-01	9.925E+01	9.925E+01	66.59
AS-74	595.83	28	59.00*	2.088E+00	1.122E+01	3.760E+01	82.01
	634.78	-----	15.40	1.981E+00	-----	Line Not Found	-----
BA-137M	661.66	26	89.90*	1.911E+00	7.551E+00	7.566E+00	100.95
CS-137	661.66	26	85.10*	1.911E+00	7.977E+00	7.993E+00	100.95
RE-188	61.49	-----	1.39	6.722E+00	-----	Line Not Found	-----
	63.00	46	2.38	6.728E+00	1.413E+02	1.922E+02	91.08
	155.04	18	15.61*	5.357E+00	1.067E+01	1.452E+01	161.21
	477.99	-----	1.08	2.501E+00	-----	Line Not Found	-----
	632.98	-----	1.37	1.985E+00	-----	Line Not Found	-----
TL-208	277.37	-----	6.60	3.771E+00	-----	Line Not Found	-----
	583.19	18	85.00*	2.127E+00	4.978E+00	5.134E+00	131.42
	860.56	18	12.50	1.534E+00	4.699E+01	4.846E+01	103.14
BI-211	72.87	-----	1.23	6.695E+00	-----	Line Not Found	-----
	351.06	5	12.92*	3.172E+00	5.608E+00	5.623E+00	802.94
BI-214	609.32	2	45.49*	2.048E+00	1.262E+00	1.262E+00	956.83
	1120.29	11	14.92	1.226E+00	2.936E+01	2.936E+01	147.90
	1764.49	-----	15.30	8.477E-01	-----	Line Not Found	-----
RA-226	186.21	3	3.59*	4.858E+00	7.149E+00	7.149E+00	1648.16
AC-228	338.32	-----	11.27	3.270E+00	-----	Line Not Found	-----
	911.20	3	25.80*	1.458E+00	3.541E+00	3.578E+00	880.00
	968.97	18	15.80	1.387E+00	4.131E+01	4.173E+01	83.97
RA-228	338.32	-----	11.27	3.270E+00	-----	Line Not Found	-----
	911.20	3	25.80*	1.458E+00	3.541E+00	3.578E+00	880.00
	968.97	18	15.80	1.387E+00	4.131E+01	4.173E+01	83.97
PA-231	283.69	-----	1.70	3.712E+00	-----	Line Not Found	-----
	301.36	13	5.35*	3.545E+00	3.458E+01	3.458E+01	211.37
TH-232	63.81	46	0.26*	6.728E+00	1.293E+03	1.293E+03	91.08
	140.88	23	0.02	5.594E+00	1.029E+04	1.029E+04	132.95
TH-234	63.29	46	3.70*	6.728E+00	9.086E+01	9.086E+01	91.08
	92.59	7	4.23	6.446E+00	1.275E+01	1.275E+01	586.83
U-238	63.29	46	3.70*	6.728E+00	9.086E+01	9.086E+01	91.08
	92.59	7	4.23	6.446E+00	1.275E+01	1.275E+01	586.83

Flag: "*" = Keyline


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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533005.CNF;1  *
* Acquisition date   : 31-OCT-2022 08:19:32 Sensitivity      : 3.000          *
* Detector ID        : GAM45 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 02:00:00.60 Half life ratio : *****          *
* Sample date        : 30-SEP-2022 09:00:00 Analyst initials: RXF2       *
* Sample ID          : G597533005 Sample Quantity : 7.5717E-01 FILTER *
* Batch Number       : 2333342 Wet Weight : 0.00000         *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 28-FEB-2022 05:30:22 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM45_JAR.CNF;1          *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
K-40	9.925E+01	6.476E+01	4.865E+01
AS-74	3.760E+01	3.022E+01	3.151E+01
BA-137M	7.566E+00	7.486E+00	5.436E+00
CS-137	7.993E+00	7.908E+00	5.743E+00
RE-188	1.452E+01	2.294E+01	2.786E+01
TL-208	5.134E+00	6.612E+00	6.320E+00
BI-211	5.623E+00	4.424E+01	3.598E+01
BI-214	1.262E+00	1.184E+01	1.270E+01
RA-226	7.149E+00	1.155E+02	9.034E+01
AC-228	3.578E+00	3.086E+01	2.521E+01
RA-228	3.578E+00	3.086E+01	2.521E+01
PA-231	3.458E+01	7.164E+01	8.299E+01
TH-232	1.293E+03	1.154E+03	8.448E+02
TH-234	9.086E+01	8.110E+01	5.934E+01
U-238	9.086E+01	8.110E+01	5.934E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	1.362E+00		3.559E+01	7.022E+01	NOT IDENT.
NA-22	1.600E+00		3.272E+00	7.309E+00	NOT IDENT.
NA-24	0.000E+00		3.488E+15	0.000E+00	SHORT HLIF
AL-26	-1.090E+00		2.786E+00	5.549E+00	NOT IDENT.
SC-46	4.497E-01		3.291E+00	6.861E+00	FAIL ABUN
V-48	-5.251E+00		1.209E+01	2.172E+01	NOT IDENT.
CR-51	6.759E+00		5.425E+01	9.805E+01	NOT IDENT.
MN-52	2.894E+01		1.406E+02	3.196E+02	NOT IDENT.
MN-54	-1.676E+00		3.413E+00	6.098E+00	NOT IDENT.
CO-56	2.423E-01		4.401E+00	8.611E+00	NOT IDENT.
CO-57	-3.901E-01		1.935E+00	3.531E+00	NOT IDENT.
NI-57	0.000E+00		8.570E+06	0.000E+00	SHORT HLIF
CO-58	-5.241E-01		4.333E+00	7.455E+00	NOT IDENT.
FE-59	1.592E+00		9.253E+00	1.897E+01	NOT IDENT.
CO-60	9.950E-01		3.808E+00	7.869E+00	NOT IDENT.

ZN-65	1.868E-01	8.663E+00	1.512E+01	NOT IDENT.
CU-67	0.000E+00	3.580E+04	0.000E+00	SHORT HLIF
GE-68	-1.287E+01	1.153E+02	1.982E+02	NOT IDENT.
AS-73	5.935E+00	1.814E+01	3.290E+01	NOT IDENT.
SE-75	-3.977E+00	4.472E+00	7.205E+00	NOT IDENT.
BR-77	0.000E+00	1.065E+05	0.000E+00	SHORT HLIF
SR-82	-7.452E+00	3.959E+01	7.661E+01	NOT IDENT.
RB-83	1.769E+00	5.592E+00	1.190E+01	NOT IDENT.
RB-84	-2.775E+00	8.721E+00	1.612E+01	NOT IDENT.
KR-85	-1.546E+03	8.379E+02	1.302E+03	NOT IDENT.
SR-85	-9.596E+00	5.200E+00	8.079E+00	NOT IDENT.
RB-86	5.438E+00	1.299E+02	2.324E+02	NOT IDENT.
Y-88	7.389E-01	2.473E+00	6.850E+00	NOT IDENT.
Y-91	1.364E+02	1.641E+03	3.394E+03	NOT IDENT.
NB-94	1.092E+00	3.628E+00	7.168E+00	NOT IDENT.
NB-95	-3.417E+00	4.088E+00	6.858E+00	NOT IDENT.
NB-95M	-9.456E+00	1.509E+01	2.298E+01	NOT IDENT.
TC-95M	2.183E+00	4.357E+00	8.309E+00	FAIL ABUN
ZR-95	6.162E+00	7.877E+00	1.708E+01	NOT IDENT.
MO-99	0.000E+00	4.933E+04	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	4.985E+37	0.000E+00	SHORT HLIF
RH-101	3.829E-01	2.287E+00	4.314E+00	NOT IDENT.
RH-102M	-3.113E+00	2.596E+00	4.330E+00	NOT IDENT.
RU-103	-3.065E+00	5.063E+00	9.181E+00	FAIL ABUN
RH-106	2.023E+01	2.907E+01	6.226E+01	NOT IDENT.
RU-106	2.023E+01	2.907E+01	6.226E+01	NOT IDENT.
AG-108M	-5.656E-01	3.089E+00	5.315E+00	NOT IDENT.
CD-109	-3.134E+01	4.756E+01	7.987E+01	NOT IDENT.
AG-110	-2.487E+01	7.709E+01	1.271E+02	NOT IDENT.
AG-110M	4.277E-01	4.396E+00	8.666E+00	NOT IDENT.
IN-111	0.000E+00	4.971E+03	0.000E+00	SHORT HLIF
SN-113	2.194E+00	4.319E+00	8.326E+00	NOT IDENT.
IN-114M	1.038E+01	1.967E+01	3.741E+01	NOT IDENT.
CD-115	0.000E+00	1.141E+05	0.000E+00	SHORT HLIF
SN-117M	-7.121E-01	1.118E+01	1.893E+01	NOT IDENT.
SB-122	0.000E+00	9.663E+03	0.000E+00	SHORT HLIF
I-123	0.000E+00	2.051E+17	0.000E+00	SHORT HLIF
TE-123M	2.856E-01	2.739E+00	4.704E+00	NOT IDENT.
SB-124	-4.123E-01	8.986E+00	2.041E+01	NOT IDENT.
SB-125	-1.782E+00	8.774E+00	1.515E+01	NOT IDENT.
TE-125M	-5.168E+02	9.082E+02	1.472E+03	NOT IDENT.
I-126	1.181E+01	3.607E+01	7.203E+01	NOT IDENT.
SB-126	-5.164E+00	2.944E+01	5.642E+01	NOT IDENT.
SN-126	-6.676E-02	4.466E+00	7.906E+00	FAIL ABUN
SB-127	-4.941E+02	1.865E+03	3.161E+03	NOT IDENT.
TE-129	-6.907E+01	5.183E+01	8.377E+01	FAIL ABUN
I-131	5.823E+00	4.378E+01	7.951E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	-1.728E+03	2.319E+03	3.493E+03	NOT IDENT.
BA-133	3.045E+00	4.580E+00	8.199E+00	FAIL ABUN
I-133	0.000E+00	1.705E+11	0.000E+00	SHORT HLIF
CS-134	-9.059E-01	3.537E+00	6.655E+00	FAIL ABUN
I-135	0.000E+00	1.487E+35	0.000E+00	SHORT HLIF
CS-136	-1.802E+01	2.088E+01	3.306E+01	FAIL ABUN
LA-138	-4.995E+00	4.709E+00	7.333E+00	NOT IDENT.
CE-139	1.303E+00	2.708E+00	5.154E+00	NOT IDENT.
BA-140	-4.389E+00	5.963E+01	1.155E+02	NOT IDENT.
LA-140	-4.929E+00	1.958E+01	3.944E+01	NOT IDENT.
CE-141	-3.274E+00	6.930E+00	1.219E+01	NOT IDENT.
CE-143	0.000E+00	3.497E+07	0.000E+00	SHORT HLIF
CE-144	-1.295E+01	1.557E+01	2.655E+01	NOT IDENT.
PM-144	-5.229E-01	3.409E+00	6.454E+00	NOT IDENT.
PR-144	-3.946E+01	2.572E+02	4.871E+02	NOT IDENT.
PM-146	1.571E+00	4.079E+00	7.240E+00	NOT IDENT.
ND-147	-1.573E+01	1.490E+02	2.867E+02	NOT IDENT.
PM-147	-3.164E+04	5.535E+04	9.746E+04	NOT IDENT.
PM-149	0.000E+00	1.301E+06	0.000E+00	SHORT HLIF
EU-152	-8.396E+00	9.558E+00	1.504E+01	NOT IDENT.
GD-153	-3.309E-01	5.178E+00	9.681E+00	NOT IDENT.
EU-154	7.360E+00	8.229E+00	2.049E+01	NOT IDENT.
EU-155	7.296E-02	7.198E+00	1.344E+01	NOT IDENT.
TB-160	1.073E+01	1.476E+01	2.996E+01	FAIL ABUN
HO-166M	-1.590E-02	5.404E+00	1.057E+01	FAIL ABUN
TM-171	-1.180E+02	3.062E+02	5.197E+02	NOT IDENT.
LU-176	-3.258E+00	2.548E+00	3.808E+00	NOT IDENT.
LU-177	2.370E+02	5.096E+02	9.607E+02	NOT IDENT.
HF-181	-2.494E+00	4.843E+00	8.951E+00	NOT IDENT.
W-181	-2.441E-01	4.861E+00	9.269E+00	FAIL ABUN

TA-182	1.993E+00	1.484E+01	3.036E+01	FAIL ABUN
RE-183	1.005E-02	5.050E+00	9.686E+00	NOT IDENT.
RE-184	6.989E+00	1.516E+01	3.208E+01	NOT IDENT.
W-188	-1.910E+02	7.599E+02	1.324E+03	FAIL ABUN
OS-191	4.014E+00	2.727E+01	4.695E+01	FAIL ABUN
IR-192	1.655E+00	3.630E+00	6.892E+00	NOT IDENT.
PB-201	0.000E+00	3.183E+24	0.000E+00	SHORT HLIF
TL-201	0.000E+00	2.398E+04	0.000E+00	SHORT HLIF
TL-202	8.035E+00	1.537E+01	2.973E+01	NOT IDENT.
HG-203	1.093E+00	4.186E+00	7.774E+00	NOT IDENT.
PB-203	0.000E+00	5.502E+04	0.000E+00	SHORT HLIF
TL-204	-1.896E+02	1.902E+02	3.303E+02	NOT IDENT.
BI-207	4.700E+00	4.810E+00	1.091E+01	NOT IDENT.
PB-210	-3.794E+01	4.125E+01	6.574E+01	NOT IDENT.
PB-211	-5.742E+01	6.324E+01	9.649E+01	NOT IDENT.
BI-212	-2.755E+01	5.674E+01	9.706E+01	NOT IDENT.
PB-212	-5.650E+00	6.875E+00	1.284E+01	NOT IDENT.
BI-213	-5.757E+00	1.071E+01	1.742E+01	NOT IDENT.
PB-214	2.035E+00	1.601E+01	1.622E+01	FAIL ABUN
RN-219	-1.594E+00	3.539E+01	6.320E+01	NOT IDENT.
FR-221	-1.467E+01	1.970E+01	3.285E+01	NOT IDENT.
RA-223	-2.752E+01	5.982E+01	1.007E+02	FAIL ABUN
RA-224	-3.025E+01	6.149E+01	1.045E+02	NOT IDENT.
AC-225	-1.259E+02	1.691E+02	2.819E+02	NOT IDENT.
AC-227	1.415E+01	2.178E+01	4.219E+01	NOT IDENT.
TH-227	1.415E+01	2.178E+01	4.219E+01	NOT IDENT.
TH-228	-5.650E+00	6.875E+00	1.284E+01	NOT IDENT.
TH-229	-1.985E+01	4.548E+01	7.900E+01	NOT IDENT.
TH-230	-6.312E+02	4.235E+02	5.851E+02	NOT IDENT.
TH-231	-1.323E+01	2.764E+01	4.167E+01	NOT IDENT.
PA-233	-1.027E+00	6.376E+00	1.115E+01	NOT IDENT.
PA-234	-7.600E+00	2.836E+01	5.251E+01	NOT IDENT.
PA-234M	5.817E+02	4.248E+02	9.438E+02	FAIL ABUN
U-234	-4.950E+02	1.230E+03	2.099E+03	NOT IDENT.
U-235	-1.341E+01	2.006E+01	3.129E+01	FAIL ABUN
NP-237	-1.027E+00	6.376E+00	1.115E+01	NOT IDENT.
NP-238	0.000E+00	3.199E+05	0.000E+00	SHORT HLIF
NP-239	-6.907E+00	1.909E+01	3.437E+01	NOT IDENT.
AM-241	1.416E+00	3.609E+00	6.748E+00	NOT IDENT.
AM-242	-3.840E+00	3.990E+01	7.411E+01	NOT IDENT.
AM-243	-3.865E-03	2.186E+00	4.112E+00	NOT IDENT.
CM-243	-5.812E+00	7.061E+00	1.223E+01	NOT IDENT.
BK-247	-6.064E+00	7.071E+00	1.143E+01	NOT IDENT.
CM-247	3.648E+00	2.947E+00	6.352E+00	NOT IDENT.
CF-249	3.522E+00	3.554E+00	7.243E+00	NOT IDENT.
CF-251	4.788E+00	1.169E+01	2.064E+01	NOT IDENT.
CF-252	-2.420E+03	1.161E+04	2.132E+04	NOT IDENT.
ANH-511	-1.307E+01	6.270E+00	1.218E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	10.46	101	446	0.95	21.23	20	6	1.41E-02	35.4	
2	0	63.77	76	95	1.59	127.83	123	10	1.05E-02	26.6	
3	0	87.23	11	96	1.22	174.74	171	7	1.46E-03	157.4	
4	0	92.69	60	102	0.96	185.67	182	8	8.37E-03	31.8	
5	0	140.22	29	71	0.72	280.71	277	6	4.08E-03	49.4	
6	0	153.90	18	70	0.70	308.06	304	7	2.50E-03	80.6	
7	0	171.13	22	69	1.96	342.52	338	8	3.02E-03	69.3	
8	0	180.68	30	45	1.91	361.61	359	6	4.10E-03	40.4	
9	0	185.46	55	93	1.63	371.17	366	10	7.68E-03	35.2	
10	0	231.61	22	107	3.18	463.47	459	12	3.01E-03	97.1	
11	0	238.41	50	55	0.74	477.06	474	6	6.94E-03	27.5	
12	0	302.77	13	56	1.54	605.77	601	9	1.84E-03	105.7	
13	0	352.41	23	76	1.67	705.04	698	12	3.15E-03	79.4	
14	0	376.29	15	18	1.15	752.80	751	5	2.03E-03	51.3	
15	0	452.24	22	14	1.82	904.67	901	8	3.03E-03	36.6	
16	0	489.65	20	22	1.71	979.50	976	8	2.74E-03	47.1	
17	0	510.74	126	79	1.13	1021.66	1016	13	1.76E-02	17.1	
18	0	582.73	40	23	2.08	1165.64	1161	11	5.61E-03	27.5	
19	0	595.74	28	27	1.66	1191.66	1186	11	3.87E-03	41.0	
20	0	609.80	23	23	1.22	1219.78	1216	9	3.13E-03	44.8	
21	0	662.42	26	27	5.86	1325.01	1314	18	3.63E-03	50.5	
22	0	683.16	16	18	0.51	1366.48	1360	11	2.20E-03	59.0	
23	0	802.75	15	14	3.53	1605.66	1599	12	2.15E-03	55.7	
24	0	808.35	10	10	3.24	1616.86	1611	10	1.36E-03	68.5	
25	0	859.50	18	17	1.52	1719.17	1713	13	2.52E-03	51.6	
26	0	912.27	18	22	0.67	1824.71	1816	13	2.50E-03	62.0	
27	0	968.06	24	6	1.35	1936.28	1930	13	3.37E-03	29.4	
28	0	1000.32	19	0	1.42	2000.79	1997	8	2.64E-03	22.9	
29	0	1021.68	6	2	1.45	2043.52	2040	7	8.59E-04	53.8	
30	0	1075.06	14	0	2.18	2150.29	2146	8	1.94E-03	26.7	
31	0	1120.26	22	10	1.70	2240.68	2236	10	3.06E-03	34.3	
32	0	1176.80	7	4	0.59	2353.77	2350	6	9.60E-04	61.0	
33	0	1354.24	12	0	0.55	2708.67	2704	8	1.67E-03	28.9	
34	0	1367.26	8	3	4.25	2734.70	2727	11	1.10E-03	54.2	
35	0	1411.11	10	0	0.73	2822.40	2816	11	1.39E-03	31.6	
36	0	1444.32	6	0	1.37	2888.83	2886	6	8.33E-04	40.8	
37	0	1460.69	40	0	2.25	2921.57	2916	11	5.56E-03	15.8	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	21	10.66*	9.849E-01	9.925E+01	9.925E+01	66.59
AS-74	595.83	28	59.00*	2.088E+00	1.122E+01	3.760E+01	82.01
	634.78	-----	15.40	1.981E+00	-----	Line Not Found	-----
BA-137M	661.66	26	89.90*	1.911E+00	7.551E+00	7.566E+00	100.95
CS-137	661.66	26	85.10*	1.911E+00	7.977E+00	7.993E+00	100.95
RE-188	61.49	-----	1.39	6.722E+00	-----	Line Not Found	-----
	63.00	46	2.38	6.728E+00	1.413E+02	1.922E+02	91.08
	155.04	18	15.61*	5.357E+00	1.067E+01	1.452E+01	161.21
	477.99	-----	1.08	2.501E+00	-----	Line Not Found	-----
	632.98	-----	1.37	1.985E+00	-----	Line Not Found	-----
TL-208	277.37	-----	6.60	3.771E+00	-----	Line Not Found	-----
	583.19	18	85.00*	2.127E+00	4.978E+00	5.134E+00	131.42
	860.56	18	12.50	1.534E+00	4.699E+01	4.846E+01	103.14
BI-211	72.87	-----	1.23	6.695E+00	-----	Line Not Found	-----
	351.06	5	12.92*	3.172E+00	5.608E+00	5.623E+00	802.94
BI-214	609.32	2	45.49*	2.048E+00	1.262E+00	1.262E+00	956.83
	1120.29	11	14.92	1.226E+00	2.936E+01	2.936E+01	147.90
	1764.49	-----	15.30	8.477E-01	-----	Line Not Found	-----
RA-226	186.21	3	3.59*	4.858E+00	7.149E+00	7.149E+00	1648.16
AC-228	338.32	-----	11.27	3.270E+00	-----	Line Not Found	-----
	911.20	3	25.80*	1.458E+00	3.541E+00	3.578E+00	880.00
	968.97	18	15.80	1.387E+00	4.131E+01	4.173E+01	83.97
RA-228	338.32	-----	11.27	3.270E+00	-----	Line Not Found	-----
	911.20	3	25.80*	1.458E+00	3.541E+00	3.578E+00	880.00
	968.97	18	15.80	1.387E+00	4.131E+01	4.173E+01	83.97
PA-231	283.69	-----	1.70	3.712E+00	-----	Line Not Found	-----
	301.36	13	5.35*	3.545E+00	3.458E+01	3.458E+01	211.37
TH-232	63.81	46	0.26*	6.728E+00	1.293E+03	1.293E+03	91.08
	140.88	23	0.02	5.594E+00	1.029E+04	1.029E+04	132.95
TH-234	63.29	46	3.70*	6.728E+00	9.086E+01	9.086E+01	91.08
	92.59	7	4.23	6.446E+00	1.275E+01	1.275E+01	586.83
U-238	63.29	46	3.70*	6.728E+00	9.086E+01	9.086E+01	91.08
	92.59	7	4.23	6.446E+00	1.275E+01	1.275E+01	586.83

Flag: "*" = Keyline

Total number of lines in spectrum 34
Number of unidentified lines 12
Number of lines tentatively identified by NID 22 64.71%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
K-40	1.25E+09Y	1.00	9.925E+01	9.925E+01	6.608E+01	66.59	
AS-74	17.77D	3.35	1.122E+01	3.760E+01	3.084E+01	82.01	
BA-137M	30.08Y	1.00	7.551E+00	7.566E+00	7.638E+00	100.95	
CS-137	30.08Y	1.00	7.977E+00	7.993E+00	8.069E+00	100.95	
RE-188	69.78D	1.36	1.067E+01	1.452E+01	2.341E+01	161.21	
TL-208	1.91Y	1.03	4.978E+00	5.134E+00	6.747E+00	131.42	
BI-211	21.77Y	1.00	5.608E+00	5.623E+00	45.15E+00	802.94	
BI-214	1600.00Y	1.00	1.262E+00	1.262E+00	12.08E+00	956.83	
RA-226	1600.00Y	1.00	7.149E+00	7.149E+00	117.8E+00	1648.16	
AC-228	5.75Y	1.01	3.541E+00	3.578E+00	31.49E+00	880.00	
RA-228	5.75Y	1.01	3.541E+00	3.578E+00	31.49E+00	880.00	
PA-231	3.28E+04Y	1.00	3.458E+01	3.458E+01	7.310E+01	211.37	
TH-232	1.41E+10Y	1.00	1.293E+03	1.293E+03	1.178E+03	91.08	
TH-234	4.47E+09Y	1.00	9.086E+01	9.086E+01	8.276E+01	91.08	
U-238	4.47E+09Y	1.00	9.086E+01	9.086E+01	8.276E+01	91.08	
Total Activity :			1.672E+03	1.703E+03			

Grand Total Activity : 1.672E+03 1.703E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	10.46	101	446	0.95	21.23	20	6	1.41E-02	70.8	1.32E+00	
0	171.13	22	69	1.96	342.52	338	8	3.02E-03	****	5.08E+00	T
0	180.68	30	45	1.91	361.61	359	6	4.10E-03	80.9	4.93E+00	T
0	231.61	22	107	3.18	463.47	459	12	3.01E-03	****	4.25E+00	
0	376.29	15	18	1.15	752.80	751	5	2.03E-03	****	3.02E+00	
0	452.24	22	14	1.82	904.67	901	8	3.03E-03	73.2	2.61E+00	
0	489.65	20	22	1.71	979.50	976	8	2.74E-03	94.1	2.45E+00	
0	683.16	16	18	0.51	1366.48	1360	11	2.20E-03	****	1.86E+00	
0	802.75	4	14	3.53	1605.66	1599	12	5.60E-04	****	1.63E+00	T
0	808.35	4	10	3.24	1616.86	1611	10	6.19E-04	****	1.62E+00	
0	1000.32	13	0	1.42	2000.79	1997	8	1.85E-03	74.5	1.35E+00	T
0	1021.68	6	2	1.45	2043.52	2040	7	8.59E-04	****	1.32E+00	
0	1075.06	14	0	2.18	2150.29	2146	8	1.94E-03	53.5	1.27E+00	
0	1176.80	7	4	0.59	2353.77	2350	6	9.60E-04	****	1.18E+00	T
0	1354.24	12	0	0.55	2708.67	2704	8	1.67E-03	57.7	1.05E+00	
0	1367.26	8	3	4.25	2734.70	2727	11	1.10E-03	****	1.04E+00	T
0	1411.11	10	0	0.73	2822.40	2816	11	1.39E-03	63.2	1.01E+00	
0	1444.32	6	0	1.37	2888.83	2886	6	8.33E-04	81.6	9.94E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533005.CNF;1  *
* Acquisition date   : 31-OCT-2022 08:19:32 Sensitivity      : 3.000          *
* Detector ID        : GAM45 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000      *
* Elapsed real time  : 0 02:00:00.60 Half life ratio : *****      *
* Sample date        : 30-SEP-2022 09:00:00 Nuclide Library : LIQUID      *
* Sample ID          : G597533005 Analyst initials: RXF2          *
* Batch Number       : 2333342 Sample Quantity : 7.5717E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 28-FEB-2022 05:30:22 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM45_JAR.CNF;1          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
K-40	1.794E+01
AS-74	1.393E+01
BA-137M	2.328E+00
CS-137	2.459E+00
RE-188	1.284E+01
TL-208	2.778E+00
BI-211	1.636E+01
BI-214	5.634E+00
RA-226	4.134E+01
AC-228	1.081E+01
RA-228	1.081E+01
PA-231	3.799E+01
TH-232	3.842E+02
TH-234	2.699E+01
U-238	2.699E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	3.128E+01	NOT IDENT.
NA-22	3.032E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	1.966E+00	NOT IDENT.
SC-46	2.850E+00	FAIL ABUN
V-48	8.980E+00	NOT IDENT.
CR-51	4.473E+01	NOT IDENT.
MN-52	1.285E+02	NOT IDENT.
MN-54	2.593E+00	NOT IDENT.
CO-56	3.736E+00	NOT IDENT.
CO-57	1.623E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.162E+00	NOT IDENT.
FE-59	7.945E+00	NOT IDENT.
CO-60	3.297E+00	NOT IDENT.
ZN-65	6.388E+00	NOT IDENT.

CU-67	0.000E+00	SHORT HLIF
GE-68	8.132E+01	NOT IDENT.
AS-73	1.517E+01	NOT IDENT.
SE-75	3.254E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	3.210E+01	NOT IDENT.
RB-83	5.132E+00	NOT IDENT.
RB-84	6.815E+00	NOT IDENT.
KR-85	5.846E+02	NOT IDENT.
SR-85	3.628E+00	NOT IDENT.
RB-86	9.683E+01	NOT IDENT.
Y-88	2.419E+00	NOT IDENT.
Y-91	1.374E+03	NOT IDENT.
NB-94	3.216E+00	NOT IDENT.
NB-95	2.874E+00	NOT IDENT.
NB-95M	1.060E+01	NOT IDENT.
TC-95M	3.828E+00	FAIL ABUN
ZR-95	7.535E+00	NOT IDENT.
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	1.986E+00	NOT IDENT.
RH-102M	1.880E+00	NOT IDENT.
RU-103	4.066E+00	FAIL ABUN
RH-106	2.759E+01	NOT IDENT.
RU-106	2.759E+01	NOT IDENT.
AG-108M	2.384E+00	NOT IDENT.
CD-109	3.704E+01	NOT IDENT.
AG-110	5.513E+01	NOT IDENT.
AG-110M	3.662E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	3.740E+00	NOT IDENT.
IN-114M	1.732E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	8.756E+00	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.171E+00	NOT IDENT.
SB-124	7.908E+00	NOT IDENT.
SB-125	6.737E+00	NOT IDENT.
TE-125M	6.776E+02	NOT IDENT.
I-126	3.037E+01	NOT IDENT.
SB-126	2.423E+01	NOT IDENT.
SN-126	3.677E+00	FAIL ABUN
SB-127	1.320E+03	NOT IDENT.
TE-129	3.550E+01	FAIL ABUN
I-131	3.590E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	1.600E+03	NOT IDENT.
BA-133	3.756E+00	FAIL ABUN
I-133	0.000E+00	SHORT HLIF
CS-134	2.835E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	1.322E+01	FAIL ABUN
LA-138	2.641E+00	NOT IDENT.
CE-139	2.388E+00	NOT IDENT.
BA-140	5.124E+01	NOT IDENT.
LA-140	1.559E+01	NOT IDENT.
CE-141	5.608E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.214E+01	NOT IDENT.
PM-144	2.838E+00	NOT IDENT.
PR-144	2.142E+02	NOT IDENT.
PM-146	3.221E+00	NOT IDENT.
ND-147	1.276E+02	NOT IDENT.
PM-147	4.470E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	6.740E+00	NOT IDENT.
GD-153	4.445E+00	NOT IDENT.
EU-154	8.493E+00	NOT IDENT.
EU-155	6.205E+00	NOT IDENT.
TB-160	1.299E+01	FAIL ABUN
HO-166M	4.599E+00	FAIL ABUN
TM-171	2.377E+02	NOT IDENT.
LU-176	1.701E+00	NOT IDENT.
LU-177	4.444E+02	NOT IDENT.
HF-181	3.920E+00	NOT IDENT.
W-181	4.263E+00	FAIL ABUN
TA-182	1.256E+01	FAIL ABUN

RE-183	4.448E+00	NOT IDENT.
RE-184	1.385E+01	NOT IDENT.
W-188	6.000E+02	FAIL ABUN
OS-191	2.172E+01	FAIL ABUN
IR-192	3.131E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF
TL-202	1.330E+01	NOT IDENT.
HG-203	3.541E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	1.524E+02	NOT IDENT.
BI-207	4.753E+00	NOT IDENT.
PB-210	3.043E+01	NOT IDENT.
PB-211	4.202E+01	NOT IDENT.
BI-212	4.268E+01	NOT IDENT.
PB-212	6.044E+00	NOT IDENT.
BI-213	7.745E+00	NOT IDENT.
PB-214	7.520E+00	FAIL ABUN
RN-219	2.806E+01	NOT IDENT.
FR-221	1.510E+01	NOT IDENT.
RA-223	4.538E+01	FAIL ABUN
RA-224	4.822E+01	NOT IDENT.
AC-225	1.296E+02	NOT IDENT.
AC-227	1.933E+01	NOT IDENT.
TH-227	1.933E+01	NOT IDENT.
TH-228	6.044E+00	NOT IDENT.
TH-229	3.631E+01	NOT IDENT.
TH-230	2.664E+02	NOT IDENT.
TH-231	1.930E+01	NOT IDENT.
PA-233	5.076E+00	NOT IDENT.
PA-234	2.231E+01	NOT IDENT.
PA-234M	4.128E+02	FAIL ABUN
U-234	9.657E+02	NOT IDENT.
U-235	1.455E+01	FAIL ABUN
NP-237	5.076E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
NP-239	1.579E+01	NOT IDENT.
AM-241	3.097E+00	NOT IDENT.
AM-242	3.413E+01	NOT IDENT.
AM-243	1.908E+00	NOT IDENT.
CM-243	5.603E+00	NOT IDENT.
BK-247	5.144E+00	NOT IDENT.
CM-247	2.852E+00	NOT IDENT.
CF-249	3.278E+00	NOT IDENT.
CF-251	9.548E+00	NOT IDENT.
CF-252	9.831E+03	NOT IDENT.
ANH-511	5.810E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G597533005.CNF;1
Acquisition date : 31-OCT-2022 08:19:32 Sensitivity : 3.000
Detector ID : GAM45 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.60 Half life ratio : *****
Sample date : 30-SEP-2022 09:00:00 Nuclide Library : LIQUID
Sample ID : G597533005 Analyst initials: RXF2
Batch Number : 2333342 Sample Quantity : 7.5717E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 28-FEB-2022 05:30:22 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM45_JAR.CNF;1

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
K-40	9.925E+01	6.535E+01	6.538E+01
AS-74	3.760E+01	3.052E+01	3.053E+01
BA-137M	7.566E+00	7.519E+00	7.520E+00
CS-137	7.993E+00	7.943E+00	7.944E+00
RE-188	1.452E+01	2.302E+01	2.302E+01
TL-208	5.134E+00	6.629E+00	6.630E+00
BI-211	5.623E+00	4.425E+01	4.425E+01
BI-214	1.262E+00	1.184E+01	1.184E+01
RA-226	7.149E+00	1.155E+02	1.155E+02
AC-228	3.578E+00	3.086E+01	3.086E+01
RA-228	3.578E+00	3.086E+01	3.086E+01
PA-231	3.458E+01	7.206E+01	7.207E+01
TH-232	1.293E+03	1.168E+03	1.168E+03
TH-234	9.086E+01	8.385E+01	8.387E+01
U-238	9.086E+01	8.385E+01	8.387E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	1.362E+00	3.559E+01	3.560E+01	NOT IDENT.
NA-22	1.600E+00	3.275E+00	3.353E+00	NOT IDENT.
NA-24	3.286E+15	3.502E+15	3.803E+15	SHORT HLIF
AL-26	-1.090E+00	2.787E+00	2.830E+00	NOT IDENT.
SC-46	4.497E-01	3.291E+00	3.297E+00	FAIL ABUN
V-48	-5.251E+00	1.210E+01	1.233E+01	NOT IDENT.
CR-51	6.759E+00	5.426E+01	5.434E+01	NOT IDENT.
MN-52	2.894E+01	1.406E+02	1.413E+02	NOT IDENT.
MN-54	-1.676E+00	3.417E+00	3.499E+00	NOT IDENT.
CO-56	2.423E-01	4.401E+00	4.402E+00	NOT IDENT.
CO-57	-3.901E-01	1.935E+00	1.943E+00	NOT IDENT.
NI-57	-3.678E+06	8.580E+06	8.739E+06	SHORT HLIF
CO-58	-5.241E-01	4.333E+00	4.340E+00	NOT IDENT.
FE-59	1.592E+00	9.254E+00	9.282E+00	NOT IDENT.
CO-60	9.950E-01	3.809E+00	3.835E+00	NOT IDENT.

ZN-65	1.868E-01	8.663E+00	8.663E+00	NOT IDENT.
CU-67	2.217E+03	3.580E+04	3.582E+04	SHORT HLIF
GE-68	-1.287E+01	1.153E+02	1.154E+02	NOT IDENT.
AS-73	5.935E+00	1.818E+01	1.838E+01	NOT IDENT.
SE-75	-3.977E+00	4.488E+00	4.834E+00	NOT IDENT.
BR-77	-1.101E+05	1.073E+05	1.183E+05	SHORT HLIF
SR-82	-7.452E+00	3.959E+01	3.974E+01	NOT IDENT.
RB-83	1.769E+00	5.599E+00	5.656E+00	NOT IDENT.
RB-84	-2.775E+00	8.724E+00	8.814E+00	NOT IDENT.
KR-85	-1.546E+03	8.492E+02	1.099E+03	NOT IDENT.
SR-85	-9.596E+00	5.270E+00	6.821E+00	NOT IDENT.
RB-86	5.438E+00	1.299E+02	1.299E+02	NOT IDENT.
Y-88	7.389E-01	2.474E+00	2.496E+00	NOT IDENT.
Y-91	1.364E+02	1.641E+03	1.642E+03	NOT IDENT.
NB-94	1.092E+00	3.629E+00	3.662E+00	NOT IDENT.
NB-95	-3.417E+00	4.101E+00	4.381E+00	NOT IDENT.
NB-95M	-9.456E+00	1.514E+01	1.573E+01	NOT IDENT.
TC-95M	2.183E+00	4.366E+00	4.476E+00	FAIL ABUN
ZR-95	6.162E+00	7.898E+00	8.373E+00	NOT IDENT.
MO-99	-1.235E+04	4.935E+04	4.966E+04	SHORT HLIF
TC-99M	3.826E+37	5.015E+37	0.000E+00	SHORT HLIF
RH-101	3.829E-01	2.289E+00	2.295E+00	NOT IDENT.
RH-102M	-3.113E+00	2.623E+00	2.976E+00	NOT IDENT.
RU-103	-3.065E+00	5.071E+00	5.256E+00	FAIL ABUN
RH-106	2.023E+01	2.915E+01	3.054E+01	NOT IDENT.
RU-106	2.023E+01	2.915E+01	3.054E+01	NOT IDENT.
AG-108M	-5.656E-01	3.090E+00	3.100E+00	NOT IDENT.
CD-109	-3.134E+01	4.772E+01	4.977E+01	NOT IDENT.
AG-110	-2.487E+01	7.712E+01	7.793E+01	NOT IDENT.
AG-110M	4.277E-01	4.397E+00	4.401E+00	NOT IDENT.
IN-111	2.265E+03	4.977E+03	5.081E+03	SHORT HLIF
SN-113	2.194E+00	4.322E+00	4.434E+00	NOT IDENT.
IN-114M	1.038E+01	1.972E+01	2.027E+01	NOT IDENT.
CD-115	-1.489E+04	1.141E+05	1.143E+05	SHORT HLIF
SN-117M	-7.121E-01	1.118E+01	1.118E+01	NOT IDENT.
SB-122	-8.106E+03	9.691E+03	1.036E+04	SHORT HLIF
I-123	2.376E+16	2.051E+17	0.000E+00	SHORT HLIF
TE-123M	2.856E-01	2.739E+00	2.742E+00	NOT IDENT.
SB-124	-4.123E-01	8.986E+00	8.988E+00	NOT IDENT.
SB-125	-1.782E+00	8.775E+00	8.812E+00	NOT IDENT.
TE-125M	-5.168E+02	9.098E+02	9.392E+02	NOT IDENT.
I-126	1.181E+01	3.609E+01	3.648E+01	NOT IDENT.
SB-126	-5.164E+00	2.944E+01	2.954E+01	NOT IDENT.
SN-126	-6.676E-02	4.466E+00	4.466E+00	FAIL ABUN
SB-127	-4.941E+02	1.867E+03	1.881E+03	NOT IDENT.
TE-129	-6.907E+01	5.323E+01	6.168E+01	FAIL ABUN
I-131	5.823E+00	4.378E+01	4.386E+01	NOT IDENT.
I-132	1.000E+41	3.168E+41	0.000E+00	SHORT HLIF
TE-132	-1.728E+03	2.332E+03	2.459E+03	NOT IDENT.
BA-133	3.045E+00	4.587E+00	4.788E+00	FAIL ABUN
I-133	-5.972E+09	1.705E+11	1.705E+11	SHORT HLIF
CS-134	-9.059E-01	3.538E+00	3.561E+00	FAIL ABUN
I-135	3.497E+34	1.508E+35	0.000E+00	SHORT HLIF
CS-136	-1.802E+01	2.098E+01	2.250E+01	FAIL ABUN
LA-138	-4.995E+00	4.726E+00	5.236E+00	NOT IDENT.
CE-139	1.303E+00	2.726E+00	2.789E+00	NOT IDENT.
BA-140	-4.389E+00	5.963E+01	5.967E+01	NOT IDENT.
LA-140	-4.929E+00	1.959E+01	1.971E+01	NOT IDENT.
CE-141	-3.274E+00	6.941E+00	7.096E+00	NOT IDENT.
CE-143	-1.739E+07	3.501E+07	3.588E+07	SHORT HLIF
CE-144	-1.295E+01	1.564E+01	1.669E+01	NOT IDENT.
PM-144	-5.229E-01	3.409E+00	3.417E+00	NOT IDENT.
PR-144	-3.946E+01	2.573E+02	2.579E+02	NOT IDENT.
PM-146	1.571E+00	4.083E+00	4.144E+00	NOT IDENT.
ND-147	-1.573E+01	1.490E+02	1.491E+02	NOT IDENT.
PM-147	-3.164E+04	5.543E+04	5.724E+04	NOT IDENT.
PM-149	5.116E+04	1.301E+06	1.302E+06	SHORT HLIF
EU-152	-8.396E+00	9.590E+00	1.031E+01	NOT IDENT.
GD-153	-3.309E-01	5.178E+00	5.180E+00	NOT IDENT.
EU-154	7.360E+00	8.252E+00	8.895E+00	NOT IDENT.
EU-155	7.296E-02	7.198E+00	7.198E+00	NOT IDENT.
TB-160	1.073E+01	1.480E+01	1.557E+01	FAIL ABUN
HO-166M	-1.590E-02	5.404E+00	5.404E+00	FAIL ABUN
TM-171	-1.180E+02	3.064E+02	3.110E+02	NOT IDENT.
LU-176	-3.258E+00	2.564E+00	2.955E+00	NOT IDENT.
LU-177	2.370E+02	5.104E+02	5.215E+02	NOT IDENT.
HF-181	-2.494E+00	4.848E+00	4.977E+00	NOT IDENT.
W-181	-2.441E-01	4.862E+00	4.863E+00	FAIL ABUN

TA-182	1.993E+00	1.484E+01	1.487E+01	FAIL ABUN
RE-183	1.005E-02	5.050E+00	5.050E+00	NOT IDENT.
RE-184	6.989E+00	1.518E+01	1.551E+01	NOT IDENT.
W-188	-1.910E+02	7.603E+02	7.652E+02	FAIL ABUN
OS-191	4.014E+00	2.727E+01	2.733E+01	FAIL ABUN
IR-192	1.655E+00	3.633E+00	3.709E+00	NOT IDENT.
PB-201	2.740E+24	3.357E+24	0.000E+00	SHORT HLIF
TL-201	-6.340E+03	2.399E+04	2.416E+04	SHORT HLIF
TL-202	8.035E+00	1.539E+01	1.581E+01	NOT IDENT.
HG-203	1.093E+00	4.187E+00	4.216E+00	NOT IDENT.
PB-203	1.436E+04	5.503E+04	5.541E+04	SHORT HLIF
TL-204	-1.896E+02	1.915E+02	2.098E+02	NOT IDENT.
BI-207	4.700E+00	4.827E+00	5.273E+00	NOT IDENT.
PB-210	-3.794E+01	4.142E+01	4.482E+01	NOT IDENT.
PB-211	-5.742E+01	6.344E+01	6.853E+01	NOT IDENT.
BI-212	-2.755E+01	5.681E+01	5.815E+01	NOT IDENT.
PB-212	-5.650E+00	6.906E+00	7.361E+00	NOT IDENT.
BI-213	-5.757E+00	1.073E+01	1.104E+01	NOT IDENT.
PB-214	2.035E+00	1.602E+01	1.604E+01	FAIL ABUN
RN-219	-1.594E+00	3.539E+01	3.540E+01	NOT IDENT.
FR-221	-1.467E+01	1.980E+01	2.088E+01	NOT IDENT.
RA-223	-2.752E+01	5.988E+01	6.115E+01	FAIL ABUN
RA-224	-3.025E+01	6.158E+01	6.308E+01	NOT IDENT.
AC-225	-1.259E+02	1.700E+02	1.792E+02	NOT IDENT.
AC-227	1.415E+01	2.190E+01	2.281E+01	NOT IDENT.
TH-227	1.415E+01	2.190E+01	2.281E+01	NOT IDENT.
TH-228	-5.650E+00	6.906E+00	7.361E+00	NOT IDENT.
TH-229	-1.985E+01	4.556E+01	4.643E+01	NOT IDENT.
TH-230	-6.312E+02	4.393E+02	5.236E+02	NOT IDENT.
TH-231	-1.323E+01	2.772E+01	2.836E+01	NOT IDENT.
PA-233	-1.027E+00	6.377E+00	6.394E+00	NOT IDENT.
PA-234	-7.600E+00	2.967E+01	2.987E+01	NOT IDENT.
PA-234M	5.817E+02	4.281E+02	5.022E+02	FAIL ABUN
U-234	-4.950E+02	1.231E+03	1.251E+03	NOT IDENT.
U-235	-1.341E+01	2.012E+01	2.101E+01	FAIL ABUN
NP-237	-1.027E+00	6.377E+00	6.394E+00	NOT IDENT.
NP-238	-2.006E+05	3.204E+05	3.330E+05	SHORT HLIF
NP-239	-6.907E+00	1.910E+01	1.936E+01	NOT IDENT.
AM-241	1.416E+00	3.612E+00	3.668E+00	NOT IDENT.
AM-242	-3.840E+00	3.990E+01	3.994E+01	NOT IDENT.
AM-243	-3.865E-03	2.186E+00	2.186E+00	NOT IDENT.
CM-243	-5.812E+00	7.101E+00	7.569E+00	NOT IDENT.
BK-247	-6.064E+00	7.194E+00	7.696E+00	NOT IDENT.
CM-247	3.648E+00	3.021E+00	3.441E+00	NOT IDENT.
CF-249	3.522E+00	3.574E+00	3.911E+00	NOT IDENT.
CF-251	4.788E+00	1.172E+01	1.191E+01	NOT IDENT.
CF-252	-2.420E+03	1.182E+04	1.187E+04	NOT IDENT.
ANH-511	-1.307E+01	6.378E+00	8.685E+00	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	43.1599	81.00	43.0065	120.90	41.5245
45.60	45.0068	81.07	43.0126	121.12	47.0771
46.54	50.6731	82.35	0.0000	121.22	51.7002
49.72	39.9481	82.47	54.3487	121.78	55.4411
51.35	53.7714	167.43	0.0000	122.06	47.1452
52.39	39.4364	82.47	54.3492	123.07	53.6993
53.20	45.9748	83.79	42.3827	265.00	40.7753
53.44	34.7049	84.00	44.1308	127.16	0.0000
56.28	47.9735	84.21	44.1495	127.23	41.9255
57.36	0.0000	84.86	0.0000	129.43	43.9327
57.53	44.8642	85.43	67.6847	131.20	36.5494
57.53	44.8644	86.55	46.0911	133.02	48.8619
57.98	42.4652	86.79	47.8527	133.52	53.5984
59.32	38.2380	86.94	47.8669	135.34	0.0000
59.54	34.9797	87.09	43.5280	136.00	56.6208
61.49	31.8524	87.57	47.0535	57.53	56.6437
63.00	33.8976	88.03	56.6885	136.47	56.6592
63.29	33.9212	88.34	56.7223	140.51	0.0000
63.58	33.9445	88.47	56.7366	140.88	43.0755
63.81	33.9631	91.11	49.1256	143.76	52.4689
64.28	34.0009	91.27	0.0000	144.24	47.7303
64.99	34.0576	92.59	44.8627	145.44	53.5459
65.08	34.0648	93.31	0.0000	152.32	45.0346
66.73	34.4736	94.56	51.7944	152.43	45.0410
66.98	46.7330	94.65	51.8029	153.25	46.3777
67.24	46.7612	94.67	51.8051	323.87	52.8858
67.67	61.2948	97.43	43.4855	155.04	46.4861
67.75	61.3060	98.43	49.7866	156.02	49.1313
68.89	43.5842	98.44	49.7874	158.56	45.7256
68.89	0.0000	99.53	47.2112	158.97	0.0000
69.67	36.9437	100.11	50.8265	159.00	39.9105
70.82	0.0000	100.20	50.8343	162.33	40.0797
70.82	67.3425	102.03	47.4186	162.66	44.0078
70.83	0.0000	103.18	57.3740	163.33	54.8114
72.81	54.1099	103.37	55.5995	165.86	44.1843
72.87	0.0000	105.31	48.5861	167.43	0.0000
74.66	55.1750	106.12	54.0587	171.28	0.0000
74.82	60.2887	106.47	49.5832	176.31	41.7654
74.97	54.3623	109.28	50.7227	176.60	41.7795
77.11	47.7828	111.00	41.7833	177.52	42.4896
79.69	47.1809	111.76	50.0204	181.07	0.0000
79.82	0.0000	112.95	51.9398	184.41	38.8165
80.02	42.0623	116.24	47.6344	184.58	0.0000
80.03	42.0626	116.30	47.6392	185.72	38.8749
80.12	42.0709	116.74	49.5056	186.21	38.8968
80.19	42.0769	117.23	44.9569	190.27	42.4454
80.22	0.0000	119.76	45.1356	193.51	51.7276
80.57	44.6879	99.53	41.5012	197.03	45.8199

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
198.01	38.7341	256.23	28.5093	492.35	0.0000
201.83	46.0602	304.85	34.5206	497.08	28.1036
204.12	36.9388	306.78	45.0964	511.00	39.4732
205.31	46.2325	308.46	36.1250	514.00	57.5863
208.37	42.2600	311.90	37.3556	520.40	10.3496
210.85	47.5372	316.51	26.1291	520.69	0.0000
215.65	56.0830	319.41	38.7128	522.65	0.0000
218.12	58.3071	320.08	34.1757	527.90	0.0000
222.11	55.4075	321.04	25.0810	529.59	17.3332
227.09	47.6292	323.87	35.4180	529.87	0.0000
227.38	51.8468	325.23	33.1675	531.02	23.4174
228.16	56.0938	328.76	36.6963	537.26	21.7529
228.18	51.8875	331.15	0.0000	546.56	0.0000
116.74	51.8875	333.37	27.6174	552.55	17.5399
235.69	55.0945	334.37	35.6990	563.25	19.3977
235.96	55.1088	338.28	27.7185	564.24	0.0000
238.63	43.5631	338.32	30.0292	569.33	22.9944
238.98	0.0000	311.90	46.2732	946.00	23.8810
240.99	57.5044	340.55	48.5881	569.70	23.8832
242.00	41.5708	344.28	39.4412	582.08	17.7987
244.70	45.9513	345.93	22.0673	583.19	17.8084
245.35	0.0000	351.06	33.8065	595.83	19.7092
250.62	42.9816	351.93	33.8277	427.87	18.3173
252.40	37.6708	356.01	28.0774	604.72	25.1904
252.80	33.3779	361.25	0.0000	609.32	20.7371
256.23	29.1621	364.49	27.0682	610.33	20.7474
260.90	0.0000	366.42	0.0000	614.28	21.6895
264.66	44.6192	356.01	26.2371	618.01	19.0116
265.00	41.3665	388.16	16.7446	621.93	12.6972
269.46	38.2513	388.63	22.7318	630.19	0.0000
271.23	31.7426	391.70	19.1816	631.29	13.6627
273.65	38.3902	264.66	32.5602	155.04	14.5846
276.40	29.6862	401.32	0.0000	633.25	14.5866
277.37	35.2129	401.81	21.7227	634.78	10.9478
277.60	34.1191	402.40	10.8655	635.95	15.5176
278.00	31.9285	404.85	27.8116	636.99	10.9585
278.43	27.5345	410.95	23.0646	657.50	15.2076
279.20	0.0000	414.70	19.4692	657.76	11.0610
279.54	35.2773	423.72	22.0276	661.66	12.0034
280.46	38.6156	427.09	18.3948	664.57	0.0000
283.69	42.0403	427.87	24.5380	666.33	6.9394
284.31	42.0623	433.94	28.3246	666.50	6.9400
285.41	39.8848	439.51	17.2996	667.71	0.0000
285.90	0.0000	440.45	29.6733	677.62	20.9207
287.50	38.8452	453.88	16.6178	685.70	11.1963
290.67	35.6084	459.60	25.0110	692.65	0.0000
293.27	0.0000	463.37	20.8883	695.00	22.4824
351.93	30.1575	468.07	17.5940	696.49	19.6841
295.96	33.5284	473.00	20.1646	696.51	19.6841
879.38	25.3866	475.06	29.4415	697.00	22.5010
299.98	35.8809	476.78	21.0500	697.49	20.6304
300.09	35.8838	477.60	21.9026	702.65	21.6149
300.13	35.8857	477.99	17.6944	706.68	19.7687
301.36	39.2885	482.18	22.8038	711.68	15.0931
302.85	39.3355	487.02	19.0549	720.70	14.2029

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
721.93	0.0000	935.54	14.3520	1368.63	0.0000
722.78	12.3197	937.49	9.2322	1377.63	0.0000
722.91	12.3203	944.13	10.2808	1384.29	3.4910
723.31	13.2703	945.96	0.0000	1408.01	7.0220
724.19	14.2230	946.00	13.3729	1434.09	4.4156
727.33	14.2413	949.00	6.1782	1435.80	8.8348
733.00	9.5162	667.71	0.0000	1457.56	0.0000
735.93	9.5276	962.31	13.9620	1460.82	2.6660
739.50	0.0000	964.08	15.5225	1489.16	6.2613
744.23	12.4271	966.17	13.9796	1596.21	6.4108
747.24	9.5711	968.97	10.3646	1620.50	3.6824
752.31	11.5083	983.53	11.4548	1678.03	0.0000
753.82	16.3138	984.45	0.0000	1690.97	2.8026
756.73	10.5681	996.26	6.2734	1757.55	0.0000
763.94	10.5981	1001.03	10.9952	1764.49	2.8442
765.80	17.3547	1274.44	6.2903	1063.66	1.8983
766.42	17.3591	1025.87	0.0000	1771.35	2.8480
766.84	13.5038	1028.54	0.0000	1791.20	0.0000
772.60	0.0000	1037.84	3.1777	1808.65	3.8250
776.52	10.6504	1038.76	0.0000	1836.06	0.9613
739.50	0.0000	475.06	6.3726		
778.90	15.5059	1048.07	12.7500		
783.70	17.4763	1050.41	8.5065		
788.74	10.7006	1063.66	6.4053		
792.07	11.6880	1077.00	8.0386		
795.86	13.6559	1077.34	8.0396		
802.10	11.7329	459.60	10.7397		
810.29	10.2979	1085.87	12.8955		
344.28	10.2983	1099.25	7.5520		
810.76	11.7710	1111.64	6.4966		
815.77	9.8275	1112.07	7.5805		
1048.07	3.9351	1112.84	10.8317		
832.01	12.8529	1115.54	9.7559		
834.85	15.8353	1120.29	16.2817		
835.15	15.8372	1120.55	16.2830		
836.80	0.0000	1221.41	16.2866		
846.77	13.9163	1129.67	7.6187		
856.80	10.4748	1131.51	0.0000		
860.56	11.9873	1173.23	9.9163		
871.09	6.0161	1177.95	3.3098		
873.19	10.0342	1189.05	4.4268		
875.33	0.0000	1204.77	5.5570		
879.38	4.0225	1221.41	6.6982		
880.51	10.0602	1231.02	5.5965		
881.60	13.0830	1235.36	7.8442		
883.24	11.0770	1238.28	7.8499		
884.68	6.0449	1260.41	0.0000		
889.28	7.0638	1271.87	7.9194		
894.76	10.1103	1274.44	2.2642		
898.04	6.0730	1274.54	4.5286		
903.28	9.1260	1291.59	4.5485		
907.67	0.0000	1298.22	0.0000		
911.20	12.2012	1312.11	8.0015		
923.98	0.0000	1332.49	6.8936		
926.36	14.3076	1365.19	2.3166		

VAX/VMS Nuclide Identification Report Generated 1-NOV-2022 07:10:05.27

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226444.CNF;3
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM07.CNF;789
Background date    : 30-OCT-2022 10:39:38
Sample date       : 31-OCT-2022 00:00:00 Acquisition date : 1-NOV-2022 05:09:30.
Sample ID        : G1205226444 Sample quantity : 7.77220E-01 FILTER
Detector name     : GAM07 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:00.48 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : RXF2
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2333342 Detector SN# :
Matrix Spike ID   : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.30*	15	49	1.60	127.19	124	7	2.08E-03	93.9	
2	0	66.52	28	38	2.25	133.62	131	7	3.93E-03	40.8	
3	0	86.70	38	64	1.42	173.97	169	10	5.22E-03	43.3	
4	0	92.70*	15	94	1.08	185.97	182	10	2.03E-03	148.9	
5	0	185.71*	23	57	1.99	371.96	367	10	3.22E-03	72.7	
6	0	189.64	18	35	0.85	379.83	377	7	2.50E-03	59.4	
7	0	201.84	14	26	1.44	404.22	402	5	1.95E-03	60.8	
8	0	238.42*	42	49	1.52	477.37	471	13	5.76E-03	44.0	
9	0	254.65	10	69	3.14	509.82	499	14	1.46E-03	171.5	
10	0	257.13	9	29	1.07	514.79	512	7	1.30E-03	97.9	
11	0	296.12	13	26	1.10	592.77	589	8	1.86E-03	71.1	
12	3	338.70*	21	33	1.79	677.90	673	27	2.91E-03	61.2	3.14E+00
13	3	342.19	19	33	1.80	684.89	673	27	2.70E-03	61.3	
14	0	569.37*	2	14	0.72	1139.21	1134	10	2.83E-04	427.7	
15	0	607.60	50	47	10.23	1215.66	1202	27	6.96E-03	40.7	
16	0	657.48	8	13	0.93	1315.43	1309	10	1.15E-03	87.5	
17	0	684.03	21	23	4.92	1368.53	1359	22	2.90E-03	61.4	
18	0	728.64*	2	12	0.81	1457.75	1452	11	3.37E-04	351.4	
19	0	792.88	12	5	1.54	1586.22	1582	9	1.60E-03	44.4	
20	0	804.17	20	7	0.75	1608.79	1602	13	2.71E-03	35.2	
21	0	896.66	6	10	0.49	1793.78	1785	10	8.85E-04	100.4	
22	0	1045.14	13	7	4.72	2090.77	2081	15	1.78E-03	54.2	
23	0	1460.79*	3	7	1.11	2922.17	2913	14	4.26E-04	228.8	
24	0	1506.06	15	0	1.00	3012.73	3005	14	2.08E-03	25.8	

Flag: "*" = Peak area was modified by background subtraction

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226444.CNF;3		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 31-OCT-2022 00:00:00	Acquisition date	: 1-NOV-2022 05:09:30
Sample ID	: G1205226444	Sample quantity	: 0.77722 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA7	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.48 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	3	10.66*	8.354E-01	1.663E+01	1.663E+01	457.67
CU-67	91.27	15	7.00	3.982E+00	2.529E+01	3.546E+01	297.83
	93.31	15	16.10	3.982E+00	1.099E+01	1.542E+01	297.83
	184.58	23	48.70*	3.941E+00	5.827E+00	8.170E+00	145.39
CD-109	88.03	38	3.70*	3.725E+00	1.316E+02	1.318E+02	86.63
AG-110	657.50	8	4.50*	1.611E+00	5.505E+01	5.524E+01	174.98
IN-114M	190.27	18	15.56*	3.896E+00	1.434E+01	1.459E+01	118.76
SN-126	64.28	15	9.60	2.017E+00	3.733E+01	3.733E+01	187.76
	86.94	38	8.90	3.725E+00	5.470E+01	5.470E+01	86.63
	87.57	38	37.00*	3.725E+00	1.316E+01	1.316E+01	86.63
BI-212	727.33	2	6.67*	1.483E+00	1.186E+01	1.187E+01	702.85
	1620.50	-----	1.47	7.761E-01	-----	Line Not Found	-----
RA-226	186.21	23	3.59*	3.941E+00	7.904E+01	7.904E+01	145.39
TH-230	67.67	28	0.38*	2.311E+00	1.558E+03	1.558E+03	81.56
TH-232	63.81	15	0.26*	2.017E+00	1.378E+03	1.378E+03	187.76
	140.88	-----	0.02	4.402E+00	-----	Line Not Found	-----
TH-234	63.29	15	3.70*	2.017E+00	9.686E+01	9.686E+01	187.76
	92.59	15	4.23	3.982E+00	4.185E+01	4.185E+01	297.83
U-238	63.29	15	3.70*	2.017E+00	9.686E+01	9.686E+01	187.76
	92.59	15	4.23	3.982E+00	4.185E+01	4.185E+01	297.83

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226444.CNF;3 *
* Acquisition date   : 1-NOV-2022 05:09:30 Sensitivity      : 3.000           *
* Detector ID        : GAM07 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 02:00:00.48 Half life ratio : *****          *
* Sample date        : 31-OCT-2022 00:00:00 Analyst initials: RXF2         *
* Sample ID          : G1205226444 Sample Quantity : 7.7722E-01 FILTER *
* Batch Number       : 2333342 Wet Weight : 0.00000         *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 18-JUL-2022 10:57:12 Eff. Geometry : JAR             *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM07_JAR.CNF;18          *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
K-40	1.663E+01	7.459E+01	7.734E+01
CU-67	8.170E+00	1.164E+01	8.608E+00
CD-109	1.318E+02	1.119E+02	1.234E+02
AG-110	5.524E+01	9.473E+01	1.488E+02
IN-114M	1.459E+01	1.699E+01	2.443E+01
SN-126	1.316E+01	1.117E+01	1.162E+01
BI-212	1.187E+01	8.178E+01	8.063E+01
RA-226	7.904E+01	1.126E+02	8.373E+01
TH-230	1.558E+03	1.245E+03	1.487E+03
TH-232	1.378E+03	2.536E+03	2.480E+03
TH-234	9.686E+01	1.782E+02	1.783E+02
U-238	9.686E+01	1.782E+02	1.783E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	-1.127E+01	3.081E+01	5.541E+01	NOT IDENT.
NA-22	-1.561E+00	3.619E+00	6.746E+00	NOT IDENT.
NA-24	-7.424E+00	1.671E+01	3.061E+01	NOT IDENT.
AL-26	3.285E-01	4.092E+00	8.680E+00	NOT IDENT.
SC-46	-1.642E+00	4.278E+00	6.761E+00	NOT IDENT.
V-48	-3.141E+00	3.387E+00	5.629E+00	NOT IDENT.
CR-51	4.269E+00	2.183E+01	4.368E+01	NOT IDENT.
MN-52	1.824E+00	4.332E+00	9.900E+00	NOT IDENT.
MN-54	9.878E-01	3.392E+00	6.848E+00	NOT IDENT.
CO-56	-6.013E-01	3.522E+00	6.473E+00	NOT IDENT.
CO-57	3.705E-01	2.020E+00	3.742E+00	NOT IDENT.
NI-57	8.520E+00	6.311E+00	1.827E+01	NOT IDENT.
CO-58	1.136E+00	3.718E+00	7.393E+00	NOT IDENT.
FE-59	7.368E-01	5.579E+00	1.209E+01	NOT IDENT.
CO-60	1.414E-02	2.587E+00	5.813E+00	NOT IDENT.
ZN-65	2.784E+00	5.273E+00	1.287E+01	NOT IDENT.
GE-68	-7.970E-01	1.044E+02	2.161E+02	NOT IDENT.
AS-73	6.545E+01	7.190E+01	1.455E+02	NOT IDENT.

AS-74	-6.146E+00	5.843E+00	9.127E+00	NOT IDENT.
SE-75	-1.331E+00	3.726E+00	6.943E+00	NOT IDENT.
BR-77	3.697E+01	3.187E+01	4.178E+01	FAIL ABUN
SR-82	-1.735E+01	2.128E+01	3.345E+01	NOT IDENT.
RB-83	-1.943E+00	6.094E+00	1.114E+01	NOT IDENT.
RB-84	1.547E+00	5.077E+00	1.083E+01	NOT IDENT.
KR-85	-3.614E+03	1.180E+03	1.448E+03	NOT IDENT.
SR-85	-1.640E+01	5.355E+00	6.571E+00	NOT IDENT.
RB-86	-7.571E+00	4.130E+01	8.221E+01	NOT IDENT.
Y-88	-6.110E-01	4.396E+00	8.687E+00	FAIL ABUN
Y-91	-1.353E+03	1.365E+03	2.084E+03	NOT IDENT.
NB-94	-3.779E-01	3.444E+00	6.387E+00	NOT IDENT.
NB-95	1.032E+00	3.640E+00	7.199E+00	NOT IDENT.
NB-95M	2.799E+00	9.213E+00	1.579E+01	NOT IDENT.
TC-95M	1.218E+00	3.254E+00	5.691E+00	NOT IDENT.
ZR-95	-1.393E+00	6.332E+00	1.122E+01	NOT IDENT.
MO-99	1.252E+01	3.047E+01	6.497E+01	NOT IDENT.
TC-99M	5.290E+01	6.691E+01	1.304E+02	NOT IDENT.
RH-101	-1.592E-01	2.811E+00	5.011E+00	NOT IDENT.
RH-102M	5.148E-02	3.007E+00	5.751E+00	FAIL ABUN
RU-103	5.837E-02	3.590E+00	6.786E+00	NOT IDENT.
RH-106	-2.242E+01	3.827E+01	6.049E+01	NOT IDENT.
RU-106	-2.242E+01	3.827E+01	6.049E+01	NOT IDENT.
AG-108M	-2.090E-01	2.928E+00	5.566E+00	NOT IDENT.
AG-110M	-7.002E-01	4.438E+00	8.870E+00	FAIL ABUN
IN-111	9.399E-01	3.502E+00	6.323E+00	NOT IDENT.
SN-113	1.259E+00	4.059E+00	8.073E+00	NOT IDENT.
CD-115	-1.350E+00	1.538E+01	2.906E+01	NOT IDENT.
SN-117M	-2.814E-01	2.319E+00	4.083E+00	NOT IDENT.
SB-122	-1.679E+00	6.403E+00	1.032E+01	NOT IDENT.
I-123	1.004E+01	1.060E+01	2.110E+01	NOT IDENT.
TE-123M	2.105E+00	2.185E+00	4.354E+00	NOT IDENT.
SB-124	3.294E+00	7.027E+00	1.726E+01	NOT IDENT.
SB-125	-2.708E+00	8.220E+00	1.516E+01	NOT IDENT.
TE-125M	-4.119E+02	7.060E+02	1.194E+03	NOT IDENT.
I-126	2.264E+00	1.118E+01	2.175E+01	NOT IDENT.
SB-126	-1.110E+00	6.430E+00	1.188E+01	NOT IDENT.
SB-127	4.810E+00	1.078E+01	2.213E+01	NOT IDENT.
TE-129	2.398E+00	3.432E+01	6.690E+01	NOT IDENT.
I-131	-3.318E-01	3.066E+00	5.883E+00	NOT IDENT.
I-132	0.000E+00	3.166E+04	0.000E+00	SHORT HLIF
TE-132	-1.918E+00	3.585E+00	5.828E+00	NOT IDENT.
BA-133	-8.088E-01	3.806E+00	7.163E+00	NOT IDENT.
I-133	-4.315E+00	8.397E+00	1.482E+01	NOT IDENT.
CS-134	-3.182E-01	3.781E+00	6.408E+00	FAIL ABUN
I-135	-8.673E+01	2.859E+02	5.553E+02	NOT IDENT.
CS-136	-3.080E+00	5.665E+00	8.634E+00	NOT IDENT.
BA-137M	-6.354E+00	4.670E+00	6.500E+00	NOT IDENT.
CS-137	-6.713E+00	4.933E+00	6.867E+00	NOT IDENT.
LA-138	-2.912E+00	5.697E+00	1.027E+01	NOT IDENT.
CE-139	-3.331E-01	2.379E+00	4.173E+00	NOT IDENT.
BA-140	-2.775E+00	1.629E+01	2.537E+01	NOT IDENT.
LA-140	-1.951E+00	3.853E+00	6.930E+00	NOT IDENT.
CE-141	2.936E+00	4.392E+00	8.326E+00	NOT IDENT.
CE-143	-9.161E+00	1.033E+01	1.538E+01	NOT IDENT.
CE-144	-1.554E+01	1.712E+01	2.741E+01	NOT IDENT.
PM-144	4.010E-01	3.442E+00	6.633E+00	NOT IDENT.
PR-144	3.168E+01	2.561E+02	4.939E+02	NOT IDENT.
PM-146	-1.520E+00	4.166E+00	7.578E+00	NOT IDENT.
ND-147	-6.158E+00	2.154E+01	3.975E+01	NOT IDENT.
PM-147	4.433E+04	6.037E+04	1.187E+05	NOT IDENT.
PM-149	-3.600E+00	1.045E+02	2.019E+02	NOT IDENT.
EU-152	4.848E+00	9.751E+00	1.965E+01	NOT IDENT.
GD-153	-6.055E+00	6.678E+00	9.720E+00	NOT IDENT.
EU-154	-5.683E+00	1.078E+01	1.949E+01	NOT IDENT.
EU-155	1.158E+00	8.790E+00	1.622E+01	FAIL ABUN
TB-160	-4.204E+00	1.241E+01	2.184E+01	FAIL ABUN
HO-166M	-1.462E+00	5.523E+00	1.010E+01	FAIL ABUN
TM-171	8.654E+02	1.596E+03	3.157E+03	FAIL ABUN
LU-176	7.954E-02	2.379E+00	4.630E+00	FAIL ABUN
LU-177	-9.016E+00	2.504E+01	4.196E+01	NOT IDENT.
HF-181	7.841E-01	3.507E+00	6.929E+00	NOT IDENT.
W-181	2.668E+00	1.693E+01	3.200E+01	FAIL ABUN
TA-182	5.389E+00	1.190E+01	2.771E+01	FAIL ABUN
RE-183	9.003E+00	1.560E+01	3.062E+01	FAIL ABUN
RE-184	-2.899E+00	7.156E+00	1.390E+01	FAIL ABUN
RE-188	-3.704E+00	1.260E+01	2.168E+01	FAIL ABUN
W-188	4.670E+02	5.520E+02	1.166E+03	FAIL ABUN

OS-191	-2.189E-01	7.991E+00	1.423E+01	FAIL ABUN
IR-192	-1.474E-01	2.549E+00	4.946E+00	FAIL ABUN
PB-201	-1.534E+01	2.990E+01	5.406E+01	NOT IDENT.
TL-201	3.121E+00	2.429E+01	4.420E+01	NOT IDENT.
TL-202	-2.752E+00	3.423E+00	5.814E+00	NOT IDENT.
HG-203	2.064E+00	3.045E+00	6.212E+00	NOT IDENT.
PB-203	3.054E+00	4.507E+00	9.193E+00	NOT IDENT.
TL-204	2.935E+02	3.794E+02	7.545E+02	NOT IDENT.
BI-207	5.820E+00	5.536E+00	1.284E+01	FAIL ABUN
TL-208	-6.326E+00	4.885E+00	8.289E+00	NOT IDENT.
PB-210	-2.880E+02	3.941E+02	6.487E+02	NOT IDENT.
BI-211	-1.218E+01	2.497E+01	4.069E+01	NOT IDENT.
PB-211	5.978E+01	6.151E+01	1.349E+02	NOT IDENT.
PB-212	1.359E+01	1.172E+01	1.559E+01	FAIL ABUN
BI-213	-3.802E+00	1.087E+01	1.978E+01	NOT IDENT.
BI-214	1.673E+00	9.040E+00	1.594E+01	NOT IDENT.
PB-214	1.901E+00	8.397E+00	1.575E+01	FAIL ABUN
RN-219	-2.294E+01	3.865E+01	6.840E+01	NOT IDENT.
FR-221	-2.157E+01	2.019E+01	3.028E+01	NOT IDENT.
RA-223	-2.543E+01	5.446E+01	9.973E+01	FAIL ABUN
RA-224	8.659E+00	6.700E+01	1.091E+02	NOT IDENT.
AC-225	-2.353E+01	2.203E+01	3.303E+01	NOT IDENT.
AC-227	1.478E+01	2.837E+01	4.383E+01	FAIL ABUN
TH-227	1.478E+01	2.837E+01	4.383E+01	FAIL ABUN
AC-228	-2.336E+00	1.280E+01	2.541E+01	FAIL ABUN
RA-228	-2.336E+00	1.280E+01	2.541E+01	FAIL ABUN
TH-228	1.359E+01	1.172E+01	1.559E+01	FAIL ABUN
TH-229	2.340E+01	4.641E+01	8.240E+01	FAIL ABUN
PA-231	2.082E+01	4.580E+01	9.193E+01	NOT IDENT.
TH-231	1.032E+00	3.658E+01	6.404E+01	NOT IDENT.
PA-233	7.417E-01	6.054E+00	1.184E+01	NOT IDENT.
PA-234	5.861E+00	2.437E+01	5.348E+01	FAIL ABUN
PA-234M	1.373E+02	4.038E+02	8.799E+02	NOT IDENT.
U-234	3.389E+03	6.278E+03	1.229E+04	NOT IDENT.
U-235	-2.034E+01	2.130E+01	3.188E+01	FAIL ABUN
NP-237	7.417E-01	6.054E+00	1.184E+01	NOT IDENT.
NP-238	-1.120E+01	1.870E+01	3.408E+01	NOT IDENT.
NP-239	-2.213E+01	2.325E+01	3.729E+01	NOT IDENT.
AM-241	-5.463E+00	1.553E+01	2.543E+01	NOT IDENT.
AM-242	5.175E+01	4.982E+01	1.017E+02	NOT IDENT.
AM-243	-7.085E+00	5.590E+00	8.978E+00	NOT IDENT.
CM-243	-4.437E+00	9.082E+00	1.560E+01	NOT IDENT.
BK-247	-1.651E+00	7.182E+00	1.358E+01	NOT IDENT.
CM-247	-1.296E+00	3.344E+00	6.126E+00	NOT IDENT.
CF-249	-2.732E+00	3.572E+00	6.172E+00	NOT IDENT.
CF-251	-1.856E+00	1.053E+01	1.842E+01	NOT IDENT.
CF-252	-1.686E+03	1.456E+04	2.621E+04	NOT IDENT.
ANH-511	-1.521E+01	7.052E+00	1.362E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.30	32	49	1.60	127.19	124	7	4.40E-03	41.2	
2	0	66.52	28	38	2.25	133.62	131	7	3.93E-03	40.8	
3	0	86.70	38	64	1.42	173.97	169	10	5.22E-03	43.3	
4	0	92.70	70	94	1.08	185.97	182	10	9.67E-03	29.2	
5	0	185.71	53	57	1.99	371.96	367	10	7.38E-03	30.0	
6	0	189.64	18	35	0.85	379.83	377	7	2.50E-03	59.4	
7	0	201.84	14	26	1.44	404.22	402	5	1.95E-03	60.8	
8	0	238.42	96	49	1.52	477.37	471	13	1.33E-02	18.2	
9	0	254.65	10	69	3.14	509.82	499	14	1.46E-03	171.5	
10	0	257.13	9	29	1.07	514.79	512	7	1.30E-03	97.9	
11	0	296.12	13	26	1.10	592.77	589	8	1.86E-03	71.1	
12	3	338.70	25	33	1.79	677.90	673	27	3.46E-03	49.1	3.14E+00
13	3	342.19	19	33	1.80	684.89	673	27	2.70E-03	61.3	
14	0	510.79	137	39	2.61	1022.06	1014	17	1.90E-02	13.5	
15	0	569.37	12	14	0.72	1139.21	1134	10	1.62E-03	68.2	
16	0	607.60	50	47	10.23	1215.66	1202	27	6.96E-03	40.7	
17	0	657.48	8	13	0.93	1315.43	1309	10	1.15E-03	87.5	
18	0	684.03	21	23	4.92	1368.53	1359	22	2.90E-03	61.4	
19	0	728.64	12	12	0.81	1457.75	1452	11	1.65E-03	66.2	
20	0	792.88	12	5	1.54	1586.22	1582	9	1.60E-03	44.4	
21	0	804.17	20	7	0.75	1608.79	1602	13	2.71E-03	35.2	
22	0	896.66	6	10	0.49	1793.78	1785	10	8.85E-04	100.4	
23	0	1045.14	13	7	4.72	2090.77	2081	15	1.78E-03	54.2	
24	0	1460.79	12	7	1.11	2922.17	2913	14	1.67E-03	55.0	
25	0	1506.06	15	0	1.00	3012.73	3005	14	2.08E-03	25.8	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	3	10.66*	8.354E-01	1.663E+01	1.663E+01	457.67
CU-67	91.27	15	7.00	3.982E+00	2.529E+01	3.546E+01	297.83
	93.31	15	16.10	3.982E+00	1.099E+01	1.542E+01	297.83
	184.58	23	48.70*	3.941E+00	5.827E+00	8.170E+00	145.39
CD-109	88.03	38	3.70*	3.725E+00	1.316E+02	1.318E+02	86.63
AG-110	657.50	8	4.50*	1.611E+00	5.505E+01	5.524E+01	174.98
IN-114M	190.27	18	15.56*	3.896E+00	1.434E+01	1.459E+01	118.76
SN-126	64.28	15	9.60	2.017E+00	3.733E+01	3.733E+01	187.76
	86.94	38	8.90	3.725E+00	5.470E+01	5.470E+01	86.63
	87.57	38	37.00*	3.725E+00	1.316E+01	1.316E+01	86.63
BI-212	727.33	2	6.67*	1.483E+00	1.186E+01	1.187E+01	702.85
	1620.50	-----	1.47	7.761E-01	-----	Line Not Found	-----
RA-226	186.21	23	3.59*	3.941E+00	7.904E+01	7.904E+01	145.39
TH-230	67.67	28	0.38*	2.311E+00	1.558E+03	1.558E+03	81.56
TH-232	63.81	15	0.26*	2.017E+00	1.378E+03	1.378E+03	187.76
	140.88	-----	0.02	4.402E+00	-----	Line Not Found	-----
TH-234	63.29	15	3.70*	2.017E+00	9.686E+01	9.686E+01	187.76
	92.59	15	4.23	3.982E+00	4.185E+01	4.185E+01	297.83
U-238	63.29	15	3.70*	2.017E+00	9.686E+01	9.686E+01	187.76
	92.59	15	4.23	3.982E+00	4.185E+01	4.185E+01	297.83

Flag: "*" = Keyline

Total number of lines in spectrum 24
Number of unidentified lines 6
Number of lines tentatively identified by NID 18 75.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
K-40	1.25E+09Y	1.00	1.663E+01	1.663E+01	7.611E+01	457.67	
CU-67	61.83H	1.40	5.827E+00	8.170E+00	11.88E+00	145.39	
CD-109	461.40D	1.00	1.316E+02	1.318E+02	1.142E+02	86.63	
AG-110	249.76D	1.00	5.505E+01	5.524E+01	9.666E+01	174.98	
IN-114M	49.51D	1.02	1.434E+01	1.459E+01	1.733E+01	118.76	
SN-126	2.30E+05Y	1.00	1.316E+01	1.316E+01	1.140E+01	86.63	
BI-212	1.91Y	1.00	1.186E+01	1.187E+01	8.345E+01	702.85	
RA-226	1600.00Y	1.00	7.904E+01	7.904E+01	11.49E+01	145.39	
TH-230	7.54E+04Y	1.00	1.558E+03	1.558E+03	1.270E+03	81.56	
TH-232	1.41E+10Y	1.00	1.378E+03	1.378E+03	2.588E+03	187.76	
TH-234	4.47E+09Y	1.00	9.686E+01	9.686E+01	18.19E+01	187.76	
U-238	4.47E+09Y	1.00	9.686E+01	9.686E+01	18.19E+01	187.76	

Total Activity : 3.457E+03 3.460E+03

Grand Total Activity : 3.457E+03 3.460E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	201.84	14	26	1.44	404.22	402	5	1.95E-03	****	3.76E+00	T
0	238.42	42	49	1.52	477.37	471	13	5.76E-03	88.0	3.39E+00	T
0	254.65	10	69	3.14	509.82	499	14	1.46E-03	****	3.24E+00	
0	257.13	9	29	1.07	514.79	512	7	1.30E-03	****	3.22E+00	T
0	296.12	13	26	1.10	592.77	589	8	1.86E-03	****	2.92E+00	T
3	338.70	21	33	1.79	677.90	673	27	2.91E-03	****	2.65E+00	T
3	342.19	19	33	1.80	684.89	673	27	2.70E-03	****	2.63E+00	
0	569.37	2	14	0.72	1139.21	1134	10	2.83E-04	****	1.80E+00	T
0	607.60	50	47	10.23	1215.66	1202	27	6.96E-03	81.4	1.71E+00	
0	684.03	21	23	4.92	1368.53	1359	22	2.90E-03	****	1.56E+00	
0	792.88	12	5	1.54	1586.22	1582	9	1.60E-03	88.9	1.38E+00	T
0	804.17	20	7	0.75	1608.79	1602	13	2.71E-03	70.4	1.37E+00	
0	896.66	6	10	0.49	1793.78	1785	10	8.85E-04	****	1.25E+00	T
0	1045.14	13	7	4.72	2090.77	2081	15	1.78E-03	****	1.10E+00	T
0	1506.06	15	0	1.00	3012.73	3005	14	2.08E-03	51.6	8.17E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226444.CNF;3  *
* Acquisition date   : 1-NOV-2022 05:09:30 Sensitivity      : 3.000          *
* Detector ID        : GAM07 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000      *
* Elapsed real time  : 0 02:00:00.48 Half life ratio  : *****          *
* Sample date        : 31-OCT-2022 00:00:00 Nuclide Library : LIQUID      *
* Sample ID          : G1205226444 Analyst initials:  RXF2          *
* Batch Number       : 2333342 Sample Quantity  : 7.7722E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000        *
*                                     Dry Weight    : 0.00000        *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 18-JUL-2022 10:57:12 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM07_JAR.CNF;18          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
K-40	3.134E+01
CU-67	3.830E+00
CD-109	5.705E+01
AG-110	6.537E+01
IN-114M	1.112E+01
SN-126	5.344E+00
BI-212	3.372E+01
RA-226	3.726E+01
TH-230	6.723E+02
TH-232	1.119E+03
TH-234	8.043E+01
U-238	8.043E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	2.463E+01	NOT IDENT.
NA-22	2.670E+00	NOT IDENT.
NA-24	1.231E+01	NOT IDENT.
AL-26	3.439E+00	NOT IDENT.
SC-46	2.856E+00	NOT IDENT.
V-48	2.217E+00	NOT IDENT.
CR-51	1.939E+01	NOT IDENT.
MN-52	4.050E+00	NOT IDENT.
MN-54	2.931E+00	NOT IDENT.
CO-56	2.733E+00	NOT IDENT.
CO-57	1.700E+00	NOT IDENT.
NI-57	7.491E+00	NOT IDENT.
CO-58	3.208E+00	NOT IDENT.
FE-59	4.923E+00	NOT IDENT.
CO-60	2.178E+00	NOT IDENT.
ZN-65	5.188E+00	NOT IDENT.
GE-68	8.903E+01	NOT IDENT.
AS-73	6.694E+01	NOT IDENT.
AS-74	3.897E+00	NOT IDENT.

SE-75	3.119E+00	NOT IDENT.
BR-77	1.969E+01	FAIL ABUN
SR-82	1.354E+01	NOT IDENT.
RB-83	4.813E+00	NOT IDENT.
RB-84	4.646E+00	NOT IDENT.
KR-85	6.462E+02	NOT IDENT.
SR-85	2.933E+00	NOT IDENT.
RB-86	3.371E+01	NOT IDENT.
Y-88	3.422E+00	FAIL ABUN
Y-91	7.803E+02	NOT IDENT.
NB-94	2.766E+00	NOT IDENT.
NB-95	3.135E+00	NOT IDENT.
NB-95M	7.113E+00	NOT IDENT.
TC-95M	2.566E+00	NOT IDENT.
ZR-95	4.762E+00	NOT IDENT.
MO-99	2.745E+01	NOT IDENT.
TC-99M	5.986E+01	NOT IDENT.
RH-101	2.291E+00	NOT IDENT.
RH-102M	2.544E+00	FAIL ABUN
RU-103	3.027E+00	NOT IDENT.
RH-106	2.633E+01	NOT IDENT.
RU-106	2.633E+01	NOT IDENT.
AG-108M	2.458E+00	NOT IDENT.
AG-110M	3.722E+00	FAIL ABUN
IN-111	2.877E+00	NOT IDENT.
SN-113	3.613E+00	NOT IDENT.
CD-115	1.269E+01	NOT IDENT.
SN-117M	1.852E+00	NOT IDENT.
SB-122	4.461E+00	NOT IDENT.
I-123	9.657E+00	NOT IDENT.
TE-123M	1.993E+00	NOT IDENT.
SB-124	6.788E+00	NOT IDENT.
SB-125	6.602E+00	NOT IDENT.
TE-125M	5.413E+02	NOT IDENT.
I-126	9.545E+00	NOT IDENT.
SB-126	5.071E+00	NOT IDENT.
SB-127	9.641E+00	NOT IDENT.
TE-129	2.935E+01	NOT IDENT.
I-131	2.587E+00	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	2.635E+00	NOT IDENT.
BA-133	3.171E+00	NOT IDENT.
I-133	6.336E+00	NOT IDENT.
CS-134	2.650E+00	FAIL ABUN
I-135	2.196E+02	NOT IDENT.
CS-136	3.520E+00	NOT IDENT.
BA-137M	2.798E+00	NOT IDENT.
CS-137	2.955E+00	NOT IDENT.
LA-138	3.958E+00	NOT IDENT.
CE-139	1.890E+00	NOT IDENT.
BA-140	1.117E+01	NOT IDENT.
LA-140	2.530E+00	NOT IDENT.
CE-141	3.847E+00	NOT IDENT.
CE-143	6.715E+00	NOT IDENT.
CE-144	1.238E+01	NOT IDENT.
PM-144	2.890E+00	NOT IDENT.
PR-144	2.152E+02	NOT IDENT.
PM-146	3.320E+00	NOT IDENT.
ND-147	1.704E+01	NOT IDENT.
PM-147	5.423E+04	NOT IDENT.
PM-149	9.052E+01	NOT IDENT.
EU-152	8.892E+00	NOT IDENT.
GD-153	4.315E+00	NOT IDENT.
EU-154	7.738E+00	NOT IDENT.
EU-155	7.395E+00	FAIL ABUN
TB-160	9.193E+00	FAIL ABUN
HO-166M	4.250E+00	FAIL ABUN
TM-171	1.441E+03	FAIL ABUN
LU-176	2.071E+00	FAIL ABUN
LU-177	1.904E+01	NOT IDENT.
HF-181	3.061E+00	NOT IDENT.
W-181	1.461E+01	FAIL ABUN
TA-182	1.132E+01	FAIL ABUN
RE-183	1.405E+01	FAIL ABUN
RE-184	5.535E+00	FAIL ABUN
RE-188	9.853E+00	FAIL ABUN
W-188	5.276E+02	FAIL ABUN
OS-191	6.533E+00	FAIL ABUN

IR-192	2.187E+00	FAIL ABUN
PB-201	2.408E+01	NOT IDENT.
TL-201	2.001E+01	NOT IDENT.
TL-202	2.558E+00	NOT IDENT.
HG-203	2.839E+00	NOT IDENT.
PB-203	4.201E+00	NOT IDENT.
TL-204	3.465E+02	NOT IDENT.
BI-207	5.610E+00	FAIL ABUN
TL-208	3.711E+00	NOT IDENT.
PB-210	2.967E+02	NOT IDENT.
BI-211	1.839E+01	NOT IDENT.
PB-211	6.008E+01	NOT IDENT.
PB-212	7.357E+00	FAIL ABUN
BI-213	8.740E+00	NOT IDENT.
BI-214	7.132E+00	NOT IDENT.
PB-214	7.167E+00	FAIL ABUN
RN-219	2.998E+01	NOT IDENT.
FR-221	1.355E+01	NOT IDENT.
RA-223	4.390E+01	FAIL ABUN
RA-224	4.982E+01	NOT IDENT.
AC-225	1.478E+01	NOT IDENT.
AC-227	1.979E+01	FAIL ABUN
TH-227	1.979E+01	FAIL ABUN
AC-228	1.065E+01	FAIL ABUN
RA-228	1.065E+01	FAIL ABUN
TH-228	7.357E+00	FAIL ABUN
TH-229	3.737E+01	FAIL ABUN
PA-231	4.175E+01	NOT IDENT.
TH-231	2.928E+01	NOT IDENT.
PA-233	5.321E+00	NOT IDENT.
PA-234	2.218E+01	FAIL ABUN
PA-234M	3.717E+02	NOT IDENT.
U-234	5.642E+03	NOT IDENT.
U-235	1.459E+01	FAIL ABUN
NP-237	5.321E+00	NOT IDENT.
NP-238	1.365E+01	NOT IDENT.
NP-239	1.680E+01	NOT IDENT.
AM-241	1.163E+01	NOT IDENT.
AM-242	4.656E+01	NOT IDENT.
AM-243	4.165E+00	NOT IDENT.
CM-243	7.072E+00	NOT IDENT.
BK-247	6.103E+00	NOT IDENT.
CM-247	2.676E+00	NOT IDENT.
CF-249	2.675E+00	NOT IDENT.
CF-251	8.275E+00	NOT IDENT.
CF-252	1.191E+04	NOT IDENT.
ANH-511	6.482E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226444.CNF;3
Acquisition date : 1-NOV-2022 05:09:30 Sensitivity : 3.000
Detector ID : GAM07 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.48 Half life ratio : *****
Sample date : 31-OCT-2022 00:00:00 Nuclide Library : LIQUID
Sample ID : G1205226444 Analyst initials: RXF2
Batch Number : 2333342 Sample Quantity : 7.7722E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 18-JUL-2022 10:57:12 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM07_JAR.CNF;18

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
K-40	1.663E+01	7.460E+01	7.460E+01
CU-67	8.170E+00	1.166E+01	1.166E+01
CD-109	1.318E+02	1.126E+02	1.127E+02
AG-110	5.524E+01	9.485E+01	9.485E+01
IN-114M	1.459E+01	1.702E+01	1.703E+01
SN-126	1.316E+01	1.122E+01	1.122E+01
BI-212	1.187E+01	8.179E+01	8.179E+01
RA-226	7.904E+01	1.128E+02	1.128E+02
TH-230	1.558E+03	1.274E+03	1.274E+03
TH-232	1.378E+03	2.542E+03	2.543E+03
TH-234	9.686E+01	1.796E+02	1.796E+02
U-238	9.686E+01	1.796E+02	1.796E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	-1.127E+01	3.082E+01	3.124E+01	NOT IDENT.
NA-22	-1.561E+00	3.622E+00	3.690E+00	NOT IDENT.
NA-24	-7.424E+00	1.673E+01	1.706E+01	NOT IDENT.
AL-26	3.285E-01	4.092E+00	4.094E+00	NOT IDENT.
SC-46	-1.642E+00	4.281E+00	4.344E+00	NOT IDENT.
V-48	-3.141E+00	3.399E+00	3.683E+00	NOT IDENT.
CR-51	4.269E+00	2.183E+01	2.192E+01	NOT IDENT.
MN-52	1.824E+00	4.335E+00	4.412E+00	NOT IDENT.
MN-54	9.878E-01	3.393E+00	3.422E+00	NOT IDENT.
CO-56	-6.013E-01	3.523E+00	3.533E+00	NOT IDENT.
CO-57	3.705E-01	2.020E+00	2.027E+00	NOT IDENT.
NI-57	8.520E+00	6.372E+00	7.442E+00	NOT IDENT.
CO-58	1.136E+00	3.719E+00	3.754E+00	NOT IDENT.
FE-59	7.368E-01	5.580E+00	5.590E+00	NOT IDENT.
CO-60	1.414E-02	2.587E+00	2.587E+00	NOT IDENT.
ZN-65	2.784E+00	5.278E+00	5.426E+00	NOT IDENT.
GE-68	-7.970E-01	1.044E+02	1.044E+02	NOT IDENT.
AS-73	6.545E+01	7.320E+01	7.893E+01	NOT IDENT.

AS-74	-6.146E+00	5.881E+00	6.502E+00	NOT IDENT.
SE-75	-1.331E+00	3.727E+00	3.775E+00	NOT IDENT.
BR-77	3.697E+01	3.200E+01	3.608E+01	FAIL ABUN
SR-82	-1.735E+01	2.134E+01	2.273E+01	NOT IDENT.
RB-83	-1.943E+00	6.101E+00	6.164E+00	NOT IDENT.
RB-84	1.547E+00	5.079E+00	5.127E+00	NOT IDENT.
KR-85	-3.614E+03	1.220E+03	2.037E+03	NOT IDENT.
SR-85	-1.640E+01	5.539E+00	9.244E+00	NOT IDENT.
RB-86	-7.571E+00	4.131E+01	4.145E+01	NOT IDENT.
Y-88	-6.110E-01	4.396E+00	4.405E+00	FAIL ABUN
Y-91	-1.353E+03	1.370E+03	1.500E+03	NOT IDENT.
NB-94	-3.779E-01	3.444E+00	3.448E+00	NOT IDENT.
NB-95	1.032E+00	3.642E+00	3.671E+00	NOT IDENT.
NB-95M	2.799E+00	9.218E+00	9.304E+00	NOT IDENT.
TC-95M	1.218E+00	3.256E+00	3.302E+00	NOT IDENT.
ZR-95	-1.393E+00	6.333E+00	6.364E+00	NOT IDENT.
MO-99	1.252E+01	3.049E+01	3.101E+01	NOT IDENT.
TC-99M	5.290E+01	6.717E+01	7.129E+01	NOT IDENT.
RH-101	-1.592E-01	2.811E+00	2.812E+00	NOT IDENT.
RH-102M	5.148E-02	3.007E+00	3.007E+00	FAIL ABUN
RU-103	5.837E-02	3.590E+00	3.590E+00	NOT IDENT.
RH-106	-2.242E+01	3.833E+01	3.964E+01	NOT IDENT.
RU-106	-2.242E+01	3.833E+01	3.964E+01	NOT IDENT.
AG-108M	-2.090E-01	2.928E+00	2.929E+00	NOT IDENT.
AG-110M	-7.002E-01	4.438E+00	4.450E+00	FAIL ABUN
IN-111	9.399E-01	3.503E+00	3.528E+00	NOT IDENT.
SN-113	1.259E+00	4.061E+00	4.100E+00	NOT IDENT.
CD-115	-1.350E+00	1.538E+01	1.540E+01	NOT IDENT.
SN-117M	-2.814E-01	2.320E+00	2.323E+00	NOT IDENT.
SB-122	-1.679E+00	6.404E+00	6.449E+00	NOT IDENT.
I-123	1.004E+01	1.063E+01	1.155E+01	NOT IDENT.
TE-123M	2.105E+00	2.190E+00	2.387E+00	NOT IDENT.
SB-124	3.294E+00	7.032E+00	7.188E+00	NOT IDENT.
SB-125	-2.708E+00	8.223E+00	8.314E+00	NOT IDENT.
TE-125M	-4.119E+02	7.067E+02	7.307E+02	NOT IDENT.
I-126	2.264E+00	1.118E+01	1.123E+01	NOT IDENT.
SB-126	-1.110E+00	6.431E+00	6.451E+00	NOT IDENT.
SB-127	4.810E+00	1.079E+01	1.101E+01	NOT IDENT.
TE-129	2.398E+00	3.432E+01	3.434E+01	NOT IDENT.
I-131	-3.318E-01	3.066E+00	3.070E+00	NOT IDENT.
I-132	-1.650E+04	3.171E+04	3.258E+04	SHORT HLIF
TE-132	-1.918E+00	3.591E+00	3.694E+00	NOT IDENT.
BA-133	-8.088E-01	3.806E+00	3.824E+00	NOT IDENT.
I-133	-4.315E+00	8.408E+00	8.631E+00	NOT IDENT.
CS-134	-3.182E-01	3.781E+00	3.784E+00	FAIL ABUN
I-135	-8.673E+01	2.861E+02	2.888E+02	NOT IDENT.
CS-136	-3.080E+00	5.676E+00	5.844E+00	NOT IDENT.
BA-137M	-6.354E+00	4.701E+00	5.506E+00	NOT IDENT.
CS-137	-6.713E+00	4.966E+00	5.817E+00	NOT IDENT.
LA-138	-2.912E+00	5.702E+00	5.852E+00	NOT IDENT.
CE-139	-3.331E-01	2.380E+00	2.385E+00	NOT IDENT.
BA-140	-2.775E+00	1.629E+01	1.634E+01	NOT IDENT.
LA-140	-1.951E+00	3.856E+00	3.955E+00	NOT IDENT.
CE-141	2.936E+00	4.397E+00	4.592E+00	NOT IDENT.
CE-143	-9.161E+00	1.036E+01	1.115E+01	NOT IDENT.
CE-144	-1.554E+01	1.716E+01	1.854E+01	NOT IDENT.
PM-144	4.010E-01	3.442E+00	3.447E+00	NOT IDENT.
PR-144	3.168E+01	2.561E+02	2.565E+02	NOT IDENT.
PM-146	-1.520E+00	4.169E+00	4.225E+00	NOT IDENT.
ND-147	-6.158E+00	2.155E+01	2.173E+01	NOT IDENT.
PM-147	4.433E+04	6.045E+04	6.367E+04	NOT IDENT.
PM-149	-3.600E+00	1.045E+02	1.045E+02	NOT IDENT.
EU-152	4.848E+00	9.760E+00	1.000E+01	NOT IDENT.
GD-153	-6.055E+00	6.694E+00	7.230E+00	NOT IDENT.
EU-154	-5.683E+00	1.079E+01	1.109E+01	NOT IDENT.
EU-155	1.158E+00	8.791E+00	8.806E+00	FAIL ABUN
TB-160	-4.204E+00	1.242E+01	1.256E+01	FAIL ABUN
HO-166M	-1.462E+00	5.524E+00	5.564E+00	FAIL ABUN
TM-171	8.654E+02	1.598E+03	1.645E+03	FAIL ABUN
LU-176	7.954E-02	2.379E+00	2.380E+00	FAIL ABUN
LU-177	-9.016E+00	2.505E+01	2.538E+01	NOT IDENT.
HF-181	7.841E-01	3.507E+00	3.525E+00	NOT IDENT.
W-181	2.668E+00	1.694E+01	1.699E+01	FAIL ABUN
TA-182	5.389E+00	1.191E+01	1.216E+01	FAIL ABUN
RE-183	9.003E+00	1.563E+01	1.615E+01	FAIL ABUN
RE-184	-2.899E+00	7.163E+00	7.282E+00	FAIL ABUN
RE-188	-3.704E+00	1.260E+01	1.271E+01	FAIL ABUN
W-188	4.670E+02	5.553E+02	5.940E+02	FAIL ABUN

OS-191	-2.189E-01	7.991E+00	7.992E+00	FAIL ABUN
IR-192	-1.474E-01	2.549E+00	2.550E+00	FAIL ABUN
PB-201	-1.534E+01	3.002E+01	3.081E+01	NOT IDENT.
TL-201	3.121E+00	2.429E+01	2.433E+01	NOT IDENT.
TL-202	-2.752E+00	3.431E+00	3.649E+00	NOT IDENT.
HG-203	2.064E+00	3.050E+00	3.189E+00	NOT IDENT.
PB-203	3.054E+00	4.513E+00	4.719E+00	NOT IDENT.
TL-204	2.935E+02	3.805E+02	4.029E+02	NOT IDENT.
BI-207	5.820E+00	5.560E+00	6.149E+00	FAIL ABUN
TL-208	-6.326E+00	4.915E+00	5.684E+00	NOT IDENT.
PB-210	-2.880E+02	3.951E+02	4.159E+02	NOT IDENT.
BI-211	-1.218E+01	2.499E+01	2.559E+01	NOT IDENT.
PB-211	5.978E+01	6.174E+01	6.737E+01	NOT IDENT.
PB-212	1.359E+01	1.177E+01	1.327E+01	FAIL ABUN
BI-213	-3.802E+00	1.087E+01	1.101E+01	NOT IDENT.
BI-214	1.673E+00	9.042E+00	9.073E+00	NOT IDENT.
PB-214	1.901E+00	8.398E+00	8.442E+00	FAIL ABUN
RN-219	-2.294E+01	3.879E+01	4.015E+01	NOT IDENT.
FR-221	-2.157E+01	2.029E+01	2.250E+01	NOT IDENT.
RA-223	-2.543E+01	5.451E+01	5.571E+01	FAIL ABUN
RA-224	8.659E+00	6.700E+01	6.712E+01	NOT IDENT.
AC-225	-2.353E+01	2.214E+01	2.455E+01	NOT IDENT.
AC-227	1.478E+01	2.845E+01	2.922E+01	FAIL ABUN
TH-227	1.478E+01	2.845E+01	2.922E+01	FAIL ABUN
AC-228	-2.336E+00	1.280E+01	1.284E+01	FAIL ABUN
RA-228	-2.336E+00	1.280E+01	1.284E+01	FAIL ABUN
TH-228	1.359E+01	1.177E+01	1.327E+01	FAIL ABUN
TH-229	2.340E+01	4.645E+01	4.763E+01	FAIL ABUN
PA-231	2.082E+01	4.604E+01	4.699E+01	NOT IDENT.
TH-231	1.032E+00	3.658E+01	3.659E+01	NOT IDENT.
PA-233	7.417E-01	6.055E+00	6.064E+00	NOT IDENT.
PA-234	5.861E+00	2.528E+01	2.542E+01	FAIL ABUN
PA-234M	1.373E+02	4.040E+02	4.088E+02	NOT IDENT.
U-234	3.389E+03	6.286E+03	6.469E+03	NOT IDENT.
U-235	-2.034E+01	2.136E+01	2.325E+01	FAIL ABUN
NP-237	7.417E-01	6.055E+00	6.064E+00	NOT IDENT.
NP-238	-1.120E+01	1.873E+01	1.940E+01	NOT IDENT.
NP-239	-2.213E+01	2.331E+01	2.535E+01	NOT IDENT.
AM-241	-5.463E+00	1.553E+01	1.573E+01	NOT IDENT.
AM-242	5.175E+01	5.068E+01	5.580E+01	NOT IDENT.
AM-243	-7.085E+00	5.617E+00	6.463E+00	NOT IDENT.
CM-243	-4.437E+00	9.094E+00	9.312E+00	NOT IDENT.
BK-247	-1.651E+00	7.190E+00	7.229E+00	NOT IDENT.
CM-247	-1.296E+00	3.353E+00	3.403E+00	NOT IDENT.
CF-249	-2.732E+00	3.585E+00	3.791E+00	NOT IDENT.
CF-251	-1.856E+00	1.054E+01	1.057E+01	NOT IDENT.
CF-252	-1.686E+03	1.464E+04	1.466E+04	NOT IDENT.
ANH-511	-1.521E+01	7.173E+00	9.926E+00	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	39.6982	81.00	42.3906	120.90	31.3435
45.60	30.6495	81.07	42.3964	121.12	25.9481
46.54	33.5251	82.35	33.7326	121.22	25.9519
49.72	32.8813	82.47	41.8382	121.78	31.3849
51.35	38.6866	167.43	41.8385	122.06	30.3155
52.39	28.3849	82.47	41.8385	123.07	46.6261
53.20	33.1855	83.79	21.6493	265.00	34.7300
53.44	29.4112	84.00	18.9508	127.16	39.2719
56.28	47.7810	84.21	18.9585	127.23	39.2756
57.36	33.5365	84.86	32.5408	129.43	42.6842
57.53	34.5092	85.43	43.7742	131.20	36.2091
57.53	34.5094	86.55	43.8671	133.02	27.5021
57.98	31.6684	86.79	43.8868	133.52	45.1353
59.32	34.6602	86.94	43.8996	135.34	35.3176
59.54	44.9538	87.09	43.9117	136.00	36.4548
61.49	37.4212	87.57	43.9514	57.53	28.7331
63.00	28.4890	88.03	50.4681	136.47	25.4244
63.29	28.5083	88.34	50.4975	140.51	28.9005
63.58	28.5273	88.47	38.9060	140.88	28.9152
63.81	28.5425	91.11	50.7561	143.76	45.7747
64.28	23.3782	91.27	50.7707	144.24	39.1010
64.99	23.4163	92.59	45.3904	145.44	36.9256
65.08	23.4210	93.31	45.4495	152.32	29.3555
66.73	31.3445	94.56	26.2265	152.43	35.0056
66.98	31.3621	94.65	26.2305	153.25	31.6512
67.24	31.3801	94.67	26.2315	323.87	36.2173
67.67	30.1014	97.43	36.0708	155.04	38.5213
67.75	30.1068	98.43	26.0578	156.02	24.9568
68.89	39.3686	98.44	26.0582	158.56	34.1409
68.89	39.3689	99.53	22.9745	158.97	23.9108
69.67	28.9198	100.11	35.5414	159.00	23.9118
70.82	29.6505	100.20	35.5468	162.33	29.7273
70.82	29.6507	102.03	32.5113	162.66	19.4448
70.83	29.6512	103.18	39.9300	163.33	24.0400
72.81	48.6355	103.37	39.9427	165.86	33.3007
72.87	48.6419	105.31	33.7449	167.43	28.7617
74.66	61.7782	106.12	39.0697	171.28	32.3618
74.82	61.7985	106.47	32.7530	176.31	36.0410
74.97	63.8120	109.28	41.3944	176.60	39.5418
77.11	59.0864	111.00	35.1229	177.52	29.1061
79.69	39.2607	111.76	35.1655	181.07	28.0558
79.82	39.2711	112.95	43.7730	184.41	21.9038
80.02	32.2351	116.24	38.6331	184.58	21.9080
80.03	32.2354	116.30	38.6367	185.72	21.9360
80.12	32.2415	116.74	44.0326	186.21	21.9479
80.19	32.2458	117.23	33.3183	190.27	34.6453
80.22	32.2480	119.76	45.3159	193.51	23.7057
80.57	39.3294	99.53	32.4067	197.03	29.7447

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
198.01	30.9670	256.23	30.6157	492.35	20.7471
201.83	27.5052	304.85	33.2492	497.08	22.7815
204.12	22.3769	306.78	23.6602	511.00	27.9413
205.31	27.6059	308.46	25.4458	514.00	85.9545
208.37	38.5303	311.90	24.6339	520.40	17.0484
210.85	38.6284	316.51	20.3061	520.69	16.0482
215.65	30.3257	319.41	20.3510	522.65	0.0000
218.12	42.5612	320.08	18.5908	527.90	17.1148
222.11	36.6257	321.04	16.8322	529.59	17.1300
227.09	29.4434	323.87	23.9705	529.87	17.1321
227.38	42.9500	325.23	14.2191	531.02	15.1257
228.16	39.2983	328.76	25.8399	537.26	18.2087
228.18	39.2993	331.15	29.4557	546.56	12.1963
116.74	39.2993	333.37	22.5299	552.55	9.1747
235.69	23.0895	334.37	26.8414	563.25	13.3227
235.96	26.3945	338.28	23.3287	564.24	16.9183
238.63	34.7300	338.32	23.3292	569.33	10.2787
238.98	34.7411	311.90	23.3657	946.00	10.2799
240.99	34.8065	340.55	23.3668	569.70	10.2808
242.00	31.5209	344.28	23.4292	582.08	15.5133
244.70	39.9150	345.93	23.4572	583.19	20.6958
245.35	29.9542	351.06	27.1643	595.83	23.9434
250.62	33.8604	351.93	19.5702	427.87	26.6050
252.40	33.9148	356.01	22.7158	604.72	16.7253
252.80	33.9267	361.25	22.7982	609.32	16.7611
256.23	5.0416	364.49	19.1932	610.33	16.7689
260.90	27.8431	366.42	18.3032	614.28	17.3245
264.66	31.3211	356.01	18.5185	618.01	21.0352
265.00	29.6366	388.16	23.2132	621.93	18.9653
269.46	28.9006	388.63	20.4339	630.19	0.0000
271.23	39.1597	391.70	20.4751	631.29	14.8135
273.65	30.7097	264.66	21.5293	155.04	9.5303
276.40	37.6218	401.32	29.0297	633.25	12.7085
277.37	33.3736	401.81	24.3554	634.78	13.7771
277.60	33.3799	402.40	20.6160	635.95	20.1458
278.00	32.5349	404.85	11.2625	636.99	15.9125
278.43	29.9770	410.95	18.8432	657.50	17.6622
279.20	27.4251	414.70	20.7758	657.76	17.6642
279.54	26.5757	423.72	20.8918	661.66	19.3030
280.46	35.1760	427.09	19.0316	664.57	15.0322
283.69	21.5062	427.87	19.0405	666.33	15.0436
284.31	32.7057	433.94	20.0660	666.50	16.1194
285.41	30.1508	439.51	28.7610	667.71	0.0000
285.90	25.8539	440.45	23.9807	677.62	8.0981
287.50	19.8475	453.88	21.2700	685.70	10.8346
290.67	19.0334	459.60	16.4902	692.65	15.6469
293.27	28.6105	463.37	17.4979	695.00	14.1399
351.93	16.9324	468.07	15.5954	696.49	14.1484
295.96	24.3280	473.00	18.5713	696.51	14.1484
879.38	26.1200	475.06	19.5711	697.00	15.2402
299.98	33.9933	476.78	18.6107	697.49	13.0654
300.09	33.9965	477.60	26.4589	702.65	15.2760
300.13	33.9980	477.99	28.4247	706.68	17.4870
301.36	26.1774	482.18	16.7015	711.68	12.0469
302.85	26.2085	487.02	14.7763	720.70	13.1904

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
721.93	14.2970	935.54	5.3485	1368.63	9.0560
722.78	13.2017	937.49	4.4600	1377.63	0.0000
722.91	13.2021	944.13	4.4698	1384.29	2.0200
723.31	11.5540	945.96	6.2613	1408.01	3.0472
724.19	11.5579	946.00	6.2615	1434.09	4.0876
727.33	8.8171	949.00	8.0582	1435.80	7.1564
733.00	3.3140	667.71	0.0000	1457.56	3.2879
735.93	11.0596	962.31	7.1938	1460.82	6.1692
739.50	6.6450	964.08	10.7966	1489.16	5.1743
744.23	12.2054	966.17	14.4053	1596.21	5.2963
747.24	13.3311	968.97	11.7146	1620.50	8.5176
752.31	17.8099	983.53	11.7690	1678.03	6.4644
753.82	8.9102	984.45	9.9614	1690.97	2.1604
756.73	10.0353	996.26	7.2715	1757.55	4.3782
763.94	12.2998	1001.03	7.2822	1764.49	0.0000
765.80	12.3088	1274.44	9.1135	1063.66	6.5837
766.42	16.7883	1025.87	2.7519	1771.35	2.1949
766.84	16.7914	1028.54	6.4262	1791.20	3.3051
772.60	0.0000	1037.84	4.4188	1808.65	4.4216
776.52	13.4829	1038.76	10.3141	1836.06	5.5557
739.50	8.9935	475.06	5.9074		
778.90	6.7476	1048.07	11.8203		
783.70	10.1400	1050.41	6.1609		
788.74	8.4659	1063.66	6.4941		
792.07	13.5625	1077.00	8.3826		
795.86	8.4888	1077.34	7.4521		
802.10	5.1050	459.60	6.5330		
810.29	12.5169	1085.87	8.4045		
344.28	9.1038	1099.25	5.6246		
810.76	11.3810	1111.64	9.4080		
815.77	6.8413	1112.07	8.4683		
1048.07	9.1309	1112.84	7.5288		
832.01	8.0288	1115.54	2.8255		
834.85	9.1852	1120.29	5.6587		
835.15	9.1862	1120.55	4.7159		
836.80	9.1914	1221.41	3.7734		
846.77	11.5304	1129.67	2.8369		
856.80	15.0429	1131.51	7.5688		
860.56	10.4282	1173.23	7.6567		
871.09	6.9778	1177.95	6.7086		
873.19	8.1467	1189.05	8.6512		
875.33	8.1527	1204.77	5.7920		
879.38	12.8293	1221.41	3.8784		
880.51	11.3758	1231.02	5.8323		
881.60	9.6294	1235.36	5.8389		
883.24	8.7589	1238.28	3.8955		
884.68	10.5157	1260.41	6.8564		
889.28	9.8304	1271.87	3.9297		
894.76	9.6730	1274.44	8.8473		
898.04	5.6342	1274.54	7.8647		
903.28	7.9371	1291.59	2.9619		
907.67	9.7153	1298.22	3.9558		
911.20	10.6110	1312.11	5.9546		
923.98	7.9923	1332.49	2.9923		
926.36	5.3324	1365.19	7.0380		

VAX/VMS Nuclide Identification Report Generated 31-OCT-2022 12:38:28.05

```
*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226445.CNF;1
Background file : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM18.CNF;800
Background date : 30-OCT-2022 11:28:53
Sample date : 26-SEP-2022 08:18:00 Acquisition date : 31-OCT-2022 10:42:37
Sample ID : G1205226445 Sample quantity : 7.37270E-01 FILTER
Detector name : GAM18 Detector geometry: JAR
Elapsed live time: 0 01:55:26.36 Elapsed real time: 0 01:55:27.18 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : RXF2
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID : 2333342 Detector SN# :
Matrix Spike ID : LCS ID :
*****
```

BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	8	92.43*	13	110	1.33	185.07	181	13	1.83E-03	171.0	2.06E+00
2	8	95.12	15	84	1.52	190.44	181	13	2.23E-03	105.6	
3	0	141.95*	52	101	4.44	284.03	277	13	7.44E-03	44.5	
4	0	163.38	41	64	1.83	326.88	324	8	5.92E-03	37.2	
5	0	185.20*	17	126	1.15	370.49	363	14	2.39E-03	160.3	
6	0	198.12*	4	61	0.91	396.31	393	6	5.56E-04	375.2	
7	0	216.79*	81	98	4.53	433.63	422	19	1.17E-02	32.4	
8	0	239.27*	28	127	1.31	478.55	473	13	4.07E-03	91.9	
9	0	283.04	26	77	0.54	566.04	559	12	3.74E-03	70.8	
10	0	306.55	23	94	3.25	613.02	604	14	3.28E-03	93.2	
11	0	355.92	20	52	2.39	711.71	707	9	2.88E-03	68.9	
12	0	458.91	37	20	3.31	917.59	913	10	5.28E-03	29.1	
13	0	478.14	60	69	1.62	956.04	948	17	8.65E-03	34.8	
14	0	510.79*	61	61	2.58	1021.31	1011	22	8.76E-03	46.5	
15	0	532.70	20	32	3.40	1065.11	1058	13	2.88E-03	63.0	
16	0	547.41	28	27	2.60	1094.50	1087	14	4.10E-03	47.0	
17	0	583.07*	15	24	1.56	1165.80	1159	11	2.10E-03	87.2	
18	0	662.52	9	47	1.08	1324.64	1317	12	1.36E-03	146.4	
19	0	722.89	37	28	6.14	1445.35	1434	19	5.29E-03	38.6	
20	0	772.24	14	9	1.23	1544.03	1539	10	2.02E-03	49.5	
21	0	785.75	12	23	4.41	1571.04	1559	15	1.66E-03	94.6	
22	0	912.55*	4	15	2.80	1824.58	1816	12	5.14E-04	266.0	
23	0	1014.50	8	7	1.07	2028.47	2024	9	1.13E-03	70.4	
24	0	1042.44	19	4	6.46	2084.34	2077	15	2.77E-03	31.8	
25	0	1120.18*	23	13	3.05	2239.82	2229	17	3.26E-03	45.1	
26	0	1157.49	6	22	3.61	2314.45	2301	21	7.94E-04	213.0	
27	0	1173.52	28	13	1.86	2346.51	2338	14	3.98E-03	34.4	
28	0	1253.18	11	9	1.47	2505.83	2501	11	1.64E-03	57.6	
29	0	1265.96	17	3	0.73	2531.40	2524	14	2.41E-03	34.1	
30	0	1423.09	15	4	5.15	2845.71	2838	16	2.10E-03	40.6	
31	0	1460.50*	28	9	2.63	2920.55	2912	17	4.00E-03	36.5	
32	0	1480.26	14	11	2.72	2960.07	2952	15	2.06E-03	57.3	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 31-OCT-2022 12:38:29

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226445.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 26-SEP-2022 08:18:00	Acquisition date	: 31-OCT-2022 10:42:37
Sample ID	: G1205226445	Sample quantity	: 0.73727 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA18	Detector geometry	: JAR
Elapsed live time	: 0 01:55:26.36	Elapsed real time	: 0 01:55:27.18 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	60	10.44*	3.326E+00	9.137E+01	1.444E+02	69.68
K-40	1460.82	28	10.66*	1.441E+00	9.545E+01	9.545E+01	73.04
TE-129	250.62	-----	0.38	4.676E+00	-----	Line Not Found	-----
	278.43	-----	0.57	4.443E+00	-----	Line Not Found	-----
	459.60	37	7.70*	3.407E+00	7.385E+01	1.525E+02	58.14
	802.10	-----	0.19	2.326E+00	-----	Line Not Found	-----
	1083.85	-----	0.49	1.814E+00	-----	Line Not Found	-----
	1111.64	-----	0.19	1.776E+00	-----	Line Not Found	-----
BA-137M	661.66	9	89.90*	2.688E+00	2.067E+00	2.072E+00	292.88
CS-137	661.66	9	85.10*	2.688E+00	2.184E+00	2.189E+00	292.88
TL-208	277.37	-----	6.60	4.452E+00	-----	Line Not Found	-----
	583.19	15	85.00*	2.936E+00	3.091E+00	3.201E+00	174.38
	860.56	-----	12.50	2.198E+00	-----	Line Not Found	-----
FR-221	218.12	81	11.40*	4.998E+00	7.533E+01	7.533E+01	64.84
AC-225	218.12	81	11.40*	4.998E+00	7.533E+01	8.606E+02	64.84
RA-226	186.21	17	3.59*	5.325E+00	4.579E+01	4.579E+01	320.61
U-235	143.76	-----	10.96*	5.658E+00	-----	Line Not Found	-----
	163.33	41	5.08	5.534E+00	7.718E+01	7.718E+01	74.46
	185.72	17	57.20	5.325E+00	2.874E+00	2.874E+00	320.61
	205.31	-----	5.01	5.116E+00	-----	Line Not Found	-----
ANH-511	511.00	61	100.00*	3.195E+00	1.005E+01	1.005E+01	93.08

Flag: "*" = Keyline

```

*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226445.CNF;1 *
* Acquisition date   : 31-OCT-2022 10:42:37 Sensitivity      : 3.000          *
* Detector ID        : GAM18 Energy tolerance: 1.500          *
* Elapsed live time  : 0 01:55:26.36 Abundance limit : 75.000          *
* Elapsed real time  : 0 01:55:27.18 Half life ratio : *****          *
* Sample date        : 26-SEP-2022 08:18:00 Analyst initials: RXF2          *
* Sample ID          : G1205226445 Sample Quantity : 7.3727E-01 FILTER *
* Batch Number       : 2333342 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;26                                         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 8-JUN-2022 11:06:14 Eff. Geometry   : JAR            *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.444E+02	9.860E+01	7.300E+01
K-40	9.545E+01	6.833E+01	6.807E+01
TE-129	1.525E+02	8.688E+01	1.238E+02
BA-137M	2.072E+00	5.946E+00	6.861E+00
CS-137	2.189E+00	6.282E+00	7.248E+00
TL-208	3.201E+00	5.470E+00	6.515E+00
FR-221	7.533E+01	4.787E+01	3.312E+01
AC-225	8.606E+02	5.469E+02	3.783E+02
RA-226	4.579E+01	1.439E+02	9.719E+01
U-235	5.683E+00	2.301E+01	3.603E+01
ANH-511	1.005E+01	9.172E+00	4.565E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-1.828E-01		3.465E+00	6.552E+00	NOT IDENT.
NA-24	0.000E+00		3.088E+17	0.000E+00	SHORT HLIF
AL-26	-2.385E+00		2.937E+00	4.699E+00	NOT IDENT.
SC-46	-8.538E-02		4.192E+00	8.013E+00	FAIL ABUN
V-48	-1.084E+01		1.528E+01	2.616E+01	NOT IDENT.
CR-51	6.429E+00		5.875E+01	1.064E+02	NOT IDENT.
MN-52	-3.761E+01		3.055E+02	5.844E+02	NOT IDENT.
MN-54	-1.589E+00		4.306E+00	7.776E+00	NOT IDENT.
CO-56	-5.252E-01		4.748E+00	8.895E+00	NOT IDENT.
CO-57	-1.540E+00		2.842E+00	4.650E+00	NOT IDENT.
NI-57	0.000E+00		6.327E+07	0.000E+00	SHORT HLIF
CO-58	1.498E-01		4.220E+00	8.164E+00	NOT IDENT.
FE-59	1.412E+00		9.799E+00	1.921E+01	NOT IDENT.
CO-60	5.530E+00		4.364E+00	9.649E+00	FAIL ABUN
ZN-65	3.472E-01		8.349E+00	1.391E+01	NOT IDENT.
CU-67	0.000E+00		1.354E+05	0.000E+00	SHORT HLIF
GE-68	3.144E+00		1.180E+02	2.247E+02	NOT IDENT.
AS-73	2.425E+01		1.745E+02	3.211E+02	NOT IDENT.
AS-74	-1.442E+01		2.236E+01	3.811E+01	NOT IDENT.

SE-75	-2.382E+00	4.898E+00	8.474E+00	NOT IDENT.
BR-77	0.000E+00	6.876E+05	0.000E+00	SHORT HLIF
SR-82	2.788E+01	6.758E+01	9.165E+01	NOT IDENT.
RB-83	-5.203E-01	7.193E+00	1.342E+01	NOT IDENT.
RB-84	5.933E+00	1.016E+01	2.064E+01	NOT IDENT.
KR-85	0.000E+00	7.961E+02	1.741E+03	NOT IDENT.
SR-85	0.000E+00	5.159E+00	1.128E+01	NOT IDENT.
RB-86	-3.666E+01	1.500E+02	2.742E+02	NOT IDENT.
Y-88	2.956E+00	4.125E+00	9.372E+00	NOT IDENT.
Y-91	1.144E+02	2.176E+03	4.130E+03	NOT IDENT.
NB-94	2.373E+00	3.362E+00	6.572E+00	NOT IDENT.
NB-95	3.314E+00	5.374E+00	9.777E+00	NOT IDENT.
NB-95M	4.726E+00	1.515E+01	2.557E+01	NOT IDENT.
TC-95M	-3.600E+00	4.945E+00	8.567E+00	FAIL ABUN
ZR-95	-1.314E+00	8.919E+00	1.587E+01	FAIL ABUN
MO-99	0.000E+00	1.878E+05	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	8.729E+40	0.000E+00	SHORT HLIF
RH-101	-1.759E+00	3.378E+00	5.516E+00	FAIL ABUN
RH-102M	-5.194E-01	3.677E+00	5.894E+00	NOT IDENT.
RU-103	8.729E-02	5.520E+00	1.032E+01	NOT IDENT.
RH-106	-2.058E+01	2.920E+01	4.924E+01	NOT IDENT.
RU-106	-2.058E+01	2.920E+01	4.924E+01	NOT IDENT.
AG-108M	6.787E-02	2.411E+00	4.619E+00	FAIL ABUN
CD-109	-2.263E+01	7.231E+01	1.247E+02	NOT IDENT.
AG-110	1.332E+01	7.864E+01	1.308E+02	NOT IDENT.
AG-110M	1.126E-01	4.958E+00	9.483E+00	NOT IDENT.
IN-111	0.000E+00	1.600E+04	0.000E+00	SHORT HLIF
SN-113	1.145E+00	4.227E+00	7.827E+00	NOT IDENT.
IN-114M	-6.013E+00	2.367E+01	3.838E+01	NOT IDENT.
CD-115	0.000E+00	5.032E+05	0.000E+00	SHORT HLIF
SN-117M	7.293E+00	1.441E+01	2.785E+01	NOT IDENT.
SB-122	0.000E+00	3.137E+04	0.000E+00	SHORT HLIF
I-123	0.000E+00	4.091E+19	0.000E+00	SHORT HLIF
TE-123M	3.201E+00	3.107E+00	6.009E+00	NOT IDENT.
SB-124	-9.680E+00	1.072E+01	1.710E+01	FAIL ABUN
SB-125	7.892E+00	7.955E+00	1.654E+01	NOT IDENT.
TE-125M	2.832E+02	1.248E+03	2.219E+03	NOT IDENT.
I-126	6.238E+01	7.809E+01	1.378E+02	NOT IDENT.
SB-126	3.441E+01	4.239E+01	8.463E+01	NOT IDENT.
SN-126	-2.448E+00	6.877E+00	1.182E+01	NOT IDENT.
SB-127	7.456E+02	4.551E+03	8.516E+03	NOT IDENT.
I-131	7.034E+00	6.395E+01	1.149E+02	FAIL ABUN
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	0.000E+00	5.345E+03	0.000E+00	SHORT HLIF
BA-133	4.364E+00	5.892E+00	8.428E+00	FAIL ABUN
I-133	0.000E+00	5.087E+12	0.000E+00	SHORT HLIF
CS-134	-2.316E+00	3.992E+00	6.357E+00	NOT IDENT.
I-135	0.000E+00	6.073E+39	0.000E+00	SHORT HLIF
CS-136	-1.284E+01	2.605E+01	3.830E+01	NOT IDENT.
LA-138	6.593E+00	5.623E+00	1.289E+01	NOT IDENT.
CE-139	-1.905E+00	3.154E+00	4.980E+00	NOT IDENT.
BA-140	3.166E+01	7.764E+01	1.364E+02	FAIL ABUN
LA-140	1.362E+01	2.074E+01	4.762E+01	NOT IDENT.
CE-141	-4.161E+00	9.194E+00	1.360E+01	NOT IDENT.
CE-143	0.000E+00	2.964E+08	0.000E+00	SHORT HLIF
CE-144	1.413E+01	2.012E+01	3.689E+01	NOT IDENT.
PM-144	1.244E-01	3.692E+00	6.708E+00	FAIL ABUN
PR-144	7.414E+00	2.790E+02	5.065E+02	NOT IDENT.
PM-146	2.228E+00	4.509E+00	7.962E+00	NOT IDENT.
ND-147	9.149E+01	1.762E+02	3.492E+02	FAIL ABUN
PM-147	2.560E+03	7.509E+04	1.304E+05	NOT IDENT.
PM-149	0.000E+00	4.625E+06	0.000E+00	SHORT HLIF
EU-152	-4.948E-01	9.966E+00	1.759E+01	NOT IDENT.
GD-153	-9.634E+00	1.022E+01	1.422E+01	NOT IDENT.
EU-154	2.548E-01	9.863E+00	1.887E+01	FAIL ABUN
EU-155	6.116E-01	1.006E+01	1.778E+01	NOT IDENT.
TB-160	1.317E+01	1.547E+01	3.228E+01	FAIL ABUN
HO-166M	5.207E+00	5.747E+00	1.161E+01	FAIL ABUN
TM-171	1.935E+03	3.313E+03	6.289E+03	NOT IDENT.
LU-176	3.033E+00	5.538E+00	5.021E+00	FAIL ABUN
LU-177	3.544E+02	9.946E+02	1.636E+03	NOT IDENT.
HF-181	5.183E-01	5.557E+00	9.452E+00	NOT IDENT.
W-181	-1.051E+01	3.141E+01	5.575E+01	NOT IDENT.
TA-182	-1.012E+01	1.661E+01	2.815E+01	FAIL ABUN
RE-183	-3.147E+01	3.346E+01	5.603E+01	FAIL ABUN
RE-184	2.687E+00	1.458E+01	2.848E+01	NOT IDENT.
RE-188	-5.649E+00	1.768E+01	3.241E+01	FAIL ABUN
W-188	-2.869E+02	8.453E+02	1.473E+03	NOT IDENT.

OS-191	2.254E+01	3.982E+01	7.183E+01	NOT IDENT.
IR-192	-2.737E+00	4.041E+00	6.738E+00	NOT IDENT.
PB-201	0.000E+00	5.124E+27	0.000E+00	SHORT HLIF
TL-201	0.000E+00	6.364E+04	0.000E+00	SHORT HLIF
TL-202	1.107E+01	1.975E+01	3.919E+01	NOT IDENT.
HG-203	3.025E-01	5.501E+00	8.927E+00	NOT IDENT.
PB-203	0.000E+00	2.551E+05	0.000E+00	SHORT HLIF
TL-204	-3.954E+02	6.798E+02	1.077E+03	NOT IDENT.
BI-207	6.831E-01	5.159E+00	9.840E+00	NOT IDENT.
PB-210	3.074E+02	7.110E+02	1.352E+03	NOT IDENT.
BI-211	-1.334E+01	2.494E+01	3.866E+01	NOT IDENT.
PB-211	-4.469E+01	7.689E+01	1.261E+02	NOT IDENT.
BI-212	-1.387E+00	5.229E+01	8.339E+01	NOT IDENT.
PB-212	7.415E+00	1.336E+01	1.403E+01	FAIL ABUN
BI-213	1.041E+01	9.533E+00	1.979E+01	NOT IDENT.
BI-214	-8.690E+00	1.029E+01	1.667E+01	FAIL ABUN
PB-214	-2.876E+00	8.794E+00	1.404E+01	NOT IDENT.
RN-219	-3.425E+00	4.103E+01	7.148E+01	NOT IDENT.
RA-223	-3.604E+01	6.628E+01	1.117E+02	FAIL ABUN
RA-224	2.274E+01	6.201E+01	1.155E+02	NOT IDENT.
AC-227	1.070E+01	2.436E+01	4.587E+01	NOT IDENT.
TH-227	1.070E+01	2.436E+01	4.587E+01	NOT IDENT.
AC-228	3.524E+00	1.837E+01	2.804E+01	FAIL ABUN
RA-228	3.524E+00	1.837E+01	2.804E+01	FAIL ABUN
TH-228	7.415E+00	1.336E+01	1.403E+01	FAIL ABUN
TH-229	-8.782E+00	5.208E+01	9.041E+01	NOT IDENT.
TH-230	-1.941E+03	1.291E+03	2.020E+03	NOT IDENT.
PA-231	4.886E+00	4.966E+01	8.072E+01	FAIL ABUN
TH-231	2.796E+00	5.048E+01	8.237E+01	NOT IDENT.
TH-232	-3.448E+03	2.763E+03	4.367E+03	FAIL ABUN
PA-233	-2.818E+00	6.587E+00	1.129E+01	FAIL ABUN
PA-234	-7.342E+00	2.430E+01	4.489E+01	FAIL ABUN
PA-234M	1.038E+02	4.888E+02	9.264E+02	NOT IDENT.
TH-234	-3.204E+01	1.904E+02	3.273E+02	FAIL ABUN
U-234	1.815E+03	1.135E+04	2.092E+04	NOT IDENT.
NP-237	-2.818E+00	6.587E+00	1.129E+01	FAIL ABUN
NP-238	0.000E+00	1.275E+06	0.000E+00	SHORT HLIF
U-238	-3.204E+01	1.904E+02	3.273E+02	FAIL ABUN
NP-239	2.975E+00	2.627E+01	4.613E+01	NOT IDENT.
AM-241	3.602E-01	2.238E+01	3.884E+01	NOT IDENT.
AM-242	-2.354E+01	7.358E+01	1.186E+02	NOT IDENT.
AM-243	3.456E+00	5.657E+00	1.057E+01	NOT IDENT.
CM-243	-4.744E+00	1.091E+01	1.832E+01	NOT IDENT.
BK-247	-3.870E+00	7.776E+00	1.344E+01	NOT IDENT.
CM-247	-1.585E-01	3.821E+00	6.678E+00	NOT IDENT.
CF-249	8.887E-01	3.711E+00	6.770E+00	NOT IDENT.
CF-251	4.549E+00	1.186E+01	2.267E+01	NOT IDENT.
CF-252	1.598E+04	1.849E+04	3.480E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	8	92.43	91	110	1.33	185.07	181	13	1.31E-02	22.1	2.06E+00
2	8	95.12	15	84	1.52	190.44	181	13	2.23E-03	105.6	
3	0	141.95	66	101	4.44	284.03	277	13	9.51E-03	33.8	
4	0	163.38	41	64	1.83	326.88	324	8	5.92E-03	37.2	
5	0	185.20	92	126	1.15	370.49	363	14	1.33E-02	27.9	
6	0	198.12	25	61	0.91	396.31	393	6	3.61E-03	53.4	
7	0	216.79	90	98	4.53	433.63	422	19	1.29E-02	28.7	
8	0	239.27	71	127	1.31	478.55	473	13	1.02E-02	35.1	
9	0	283.04	26	77	0.54	566.04	559	12	3.74E-03	70.8	
10	0	306.55	23	94	3.25	613.02	604	14	3.28E-03	93.2	
11	0	355.92	20	52	2.39	711.71	707	9	2.88E-03	68.9	
12	0	458.91	37	20	3.31	917.59	913	10	5.28E-03	29.1	
13	0	478.14	60	69	1.62	956.04	948	17	8.65E-03	34.8	
14	0	510.79	301	61	2.58	1021.31	1011	22	4.34E-02	8.8	
15	0	532.70	20	32	3.40	1065.11	1058	13	2.88E-03	63.0	
16	0	547.41	28	27	2.60	1094.50	1087	14	4.10E-03	47.0	
17	0	583.07	43	24	1.56	1165.80	1159	11	6.27E-03	26.8	
18	0	662.52	9	47	1.08	1324.64	1317	12	1.36E-03	146.4	
19	0	722.89	37	28	6.14	1445.35	1434	19	5.29E-03	38.6	
20	0	772.24	14	9	1.23	1544.03	1539	10	2.02E-03	49.5	
21	0	785.75	12	23	4.41	1571.04	1559	15	1.66E-03	94.6	
22	0	912.55	17	15	2.80	1824.58	1816	12	2.42E-03	52.3	
23	0	1014.50	8	7	1.07	2028.47	2024	9	1.13E-03	70.4	
24	0	1042.44	19	4	6.46	2084.34	2077	15	2.77E-03	31.8	
25	0	1120.18	27	13	3.05	2239.82	2229	17	3.90E-03	36.0	
26	0	1157.49	6	22	3.61	2314.45	2301	21	7.94E-04	213.0	
27	0	1173.52	28	13	1.86	2346.51	2338	14	3.98E-03	34.4	
28	0	1253.18	11	9	1.47	2505.83	2501	11	1.64E-03	57.6	
29	0	1265.96	17	3	0.73	2531.40	2524	14	2.41E-03	34.1	
30	0	1423.09	15	4	5.15	2845.71	2838	16	2.10E-03	40.6	
31	0	1460.50	44	9	2.63	2920.55	2912	17	6.28E-03	21.6	
32	0	1480.26	14	11	2.72	2960.07	2952	15	2.06E-03	57.3	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	60	10.44*	3.326E+00	9.137E+01	1.444E+02	69.68
K-40	1460.82	28	10.66*	1.441E+00	9.545E+01	9.545E+01	73.04
TE-129	250.62	-----	0.38	4.676E+00	-----	Line Not Found	-----
	278.43	-----	0.57	4.443E+00	-----	Line Not Found	-----
	459.60	37	7.70*	3.407E+00	7.385E+01	1.525E+02	58.14
	802.10	-----	0.19	2.326E+00	-----	Line Not Found	-----
	1083.85	-----	0.49	1.814E+00	-----	Line Not Found	-----
	1111.64	-----	0.19	1.776E+00	-----	Line Not Found	-----
BA-137M	661.66	9	89.90*	2.688E+00	2.067E+00	2.072E+00	292.88
CS-137	661.66	9	85.10*	2.688E+00	2.184E+00	2.189E+00	292.88
TL-208	277.37	-----	6.60	4.452E+00	-----	Line Not Found	-----
	583.19	15	85.00*	2.936E+00	3.091E+00	3.201E+00	174.38
	860.56	-----	12.50	2.198E+00	-----	Line Not Found	-----
FR-221	218.12	81	11.40*	4.998E+00	7.533E+01	7.533E+01	64.84
AC-225	218.12	81	11.40*	4.998E+00	7.533E+01	8.606E+02	64.84
RA-226	186.21	17	3.59*	5.325E+00	4.579E+01	4.579E+01	320.61
U-235	143.76	-----	10.96*	5.658E+00	-----	Line Not Found	-----
	163.33	41	5.08	5.534E+00	7.718E+01	7.718E+01	74.46
	185.72	17	57.20	5.325E+00	2.874E+00	2.874E+00	320.61
	205.31	-----	5.01	5.116E+00	-----	Line Not Found	-----
ANH-511	511.00	61	100.00*	3.195E+00	1.005E+01	1.005E+01	93.08

Flag: "*" = Keyline

Total number of lines in spectrum 32
Number of unidentified lines 9
Number of lines tentatively identified by NID 23 71.88%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.58	9.137E+01	1.444E+02	1.006E+02	69.68	
K-40	1.25E+09Y	1.00	9.545E+01	9.545E+01	6.972E+01	73.04	
TE-129	33.60D	2.06	7.385E+01	1.525E+02	0.887E+02	58.14	
BA-137M	30.08Y	1.00	2.067E+00	2.072E+00	6.068E+00	292.88	
CS-137	30.08Y	1.00	2.184E+00	2.189E+00	6.410E+00	292.88	
TL-208	1.91Y	1.04	3.091E+00	3.201E+00	5.581E+00	174.38	
FR-221	7340.00Y	1.00	7.533E+01	7.533E+01	4.885E+01	64.84	
AC-225	10.00D	11.4	7.533E+01	8.606E+02	5.580E+02	64.84	
RA-226	1600.00Y	1.00	4.579E+01	4.579E+01	14.68E+01	320.61	
U-235	7.04E+08Y	1.00	2.874E+00	2.874E+00	9.213E+00	320.61	K
ANH-511	1.00E+09Y	1.00	1.005E+01	1.005E+01	0.936E+01	93.08	
Total Activity :			4.774E+02	1.394E+03			

Grand Total Activity : 4.774E+02 1.394E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
8	92.43	13	110	1.33	185.07	181	13	1.83E-03	****	4.65E+00	T
8	95.12	15	84	1.52	190.44	181	13	2.23E-03	****	4.80E+00	T
0	141.95	52	101	4.44	284.03	277	13	7.44E-03	89.1	5.66E+00	T
0	198.12	4	61	0.91	396.31	393	6	5.56E-04	****	5.19E+00	T
0	239.27	28	127	1.31	478.55	473	13	4.07E-03	****	4.78E+00	T
0	283.04	26	77	0.54	566.04	559	12	3.74E-03	****	4.41E+00	T
0	306.55	23	94	3.25	613.02	604	14	3.28E-03	****	4.23E+00	T
0	355.92	20	52	2.39	711.71	707	9	2.88E-03	****	3.92E+00	T
0	532.70	20	32	3.40	1065.11	1058	13	2.88E-03	****	3.11E+00	
0	547.41	28	27	2.60	1094.50	1087	14	4.10E-03	93.9	3.06E+00	T
0	722.89	37	28	6.14	1445.35	1434	19	5.29E-03	77.3	2.52E+00	T
0	772.24	14	9	1.23	1544.03	1539	10	2.02E-03	99.0	2.40E+00	T
0	785.75	12	23	4.41	1571.04	1559	15	1.66E-03	****	2.36E+00	
0	912.55	4	15	2.80	1824.58	1816	12	5.14E-04	****	2.09E+00	T
0	1014.50	8	7	1.07	2028.47	2024	9	1.13E-03	****	1.92E+00	
0	1042.44	19	4	6.46	2084.34	2077	15	2.77E-03	63.5	1.87E+00	
0	1120.18	23	13	3.05	2239.82	2229	17	3.26E-03	90.1	1.76E+00	T
0	1157.49	6	22	3.61	2314.45	2301	21	7.94E-04	****	1.72E+00	
0	1173.52	28	13	1.86	2346.51	2338	14	3.98E-03	68.8	1.70E+00	T
0	1253.18	11	9	1.47	2505.83	2501	11	1.64E-03	****	1.61E+00	
0	1265.96	17	3	0.73	2531.40	2524	14	2.41E-03	68.1	1.60E+00	
0	1423.09	15	4	5.15	2845.71	2838	16	2.10E-03	81.2	1.47E+00	
0	1480.26	14	11	2.72	2960.07	2952	15	2.06E-03	****	1.43E+00	

Flags: "T" = Tentatively associated

```

*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                       *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226445.CNF;1 *
* Acquisition date   : 31-OCT-2022 10:42:37 Sensitivity      : 3.000          *
* Detector ID        : GAM18 Energy tolerance: 1.500          *
* Elapsed live time  : 0 01:55:26.36 Abundance limit : 75.000          *
* Elapsed real time  : 0 01:55:27.18 Half life ratio : *****          *
* Sample date        : 26-SEP-2022 08:18:00 Nuclide Library : LIQUID          *
* Sample ID          : G1205226445 Analyst initials: RXF2          *
* Batch Number       : 2333342 Sample Quantity : 7.3727E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                       *
* Eff. Cal. date     : 8-JUN-2022 11:06:14 Eff. Geometry    : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.326E+01
K-40	2.938E+01
TE-129	5.627E+01
BA-137M	3.135E+00
CS-137	3.312E+00
TL-208	2.961E+00
FR-221	1.531E+01
AC-225	1.749E+02
RA-226	4.486E+01
U-235	1.687E+01
ANH-511	2.059E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	2.815E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	1.798E+00	NOT IDENT.
SC-46	3.560E+00	FAIL ABUN
V-48	1.141E+01	NOT IDENT.
CR-51	4.902E+01	NOT IDENT.
MN-52	2.540E+02	NOT IDENT.
MN-54	3.546E+00	NOT IDENT.
CO-56	4.008E+00	NOT IDENT.
CO-57	2.163E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.643E+00	NOT IDENT.
FE-59	8.384E+00	NOT IDENT.
CO-60	4.354E+00	FAIL ABUN
ZN-65	6.074E+00	NOT IDENT.
CU-67	0.000E+00	SHORT HLIF
GE-68	9.903E+01	NOT IDENT.
AS-73	1.501E+02	NOT IDENT.
AS-74	1.741E+01	NOT IDENT.
SE-75	3.912E+00	NOT IDENT.

BR-77	0.000E+00	SHORT HLIF
SR-82	4.064E+01	NOT IDENT.
RB-83	6.046E+00	NOT IDENT.
RB-84	9.309E+00	NOT IDENT.
KR-85	8.181E+02	NOT IDENT.
SR-85	5.302E+00	NOT IDENT.
RB-86	1.204E+02	NOT IDENT.
Y-88	3.988E+00	NOT IDENT.
Y-91	1.814E+03	NOT IDENT.
NB-94	3.009E+00	NOT IDENT.
NB-95	4.455E+00	NOT IDENT.
NB-95M	1.191E+01	NOT IDENT.
TC-95M	3.956E+00	FAIL ABUN
ZR-95	7.146E+00	FAIL ABUN
MO-99	0.000E+00	SHORT HLIF
TC-99M	0.000E+00	SHORT HLIF
RH-101	2.569E+00	FAIL ABUN
RH-102M	2.719E+00	NOT IDENT.
RU-103	4.710E+00	NOT IDENT.
RH-106	2.189E+01	NOT IDENT.
RU-106	2.189E+01	NOT IDENT.
AG-108M	2.085E+00	FAIL ABUN
CD-109	5.771E+01	NOT IDENT.
AG-110	5.895E+01	NOT IDENT.
AG-110M	4.238E+00	NOT IDENT.
IN-111	0.000E+00	SHORT HLIF
SN-113	3.550E+00	NOT IDENT.
IN-114M	1.777E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	1.304E+01	NOT IDENT.
SB-122	0.000E+00	SHORT HLIF
I-123	0.000E+00	SHORT HLIF
TE-123M	2.818E+00	NOT IDENT.
SB-124	6.855E+00	FAIL ABUN
SB-125	7.581E+00	NOT IDENT.
TE-125M	1.034E+03	NOT IDENT.
I-126	6.356E+01	NOT IDENT.
SB-126	3.855E+01	NOT IDENT.
SN-126	5.464E+00	NOT IDENT.
SB-127	3.845E+03	NOT IDENT.
I-131	5.278E+01	FAIL ABUN
I-132	0.000E+00	SHORT HLIF
TE-132	0.000E+00	SHORT HLIF
BA-133	3.919E+00	FAIL ABUN
I-133	0.000E+00	SHORT HLIF
CS-134	2.810E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.610E+01	NOT IDENT.
LA-138	5.697E+00	NOT IDENT.
CE-139	2.297E+00	NOT IDENT.
BA-140	6.182E+01	FAIL ABUN
LA-140	2.011E+01	NOT IDENT.
CE-141	6.249E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.721E+01	NOT IDENT.
PM-144	3.058E+00	FAIL ABUN
PR-144	2.309E+02	NOT IDENT.
PM-146	3.657E+00	NOT IDENT.
ND-147	1.586E+02	FAIL ABUN
PM-147	6.062E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.120E+00	NOT IDENT.
GD-153	6.556E+00	NOT IDENT.
EU-154	8.142E+00	FAIL ABUN
EU-155	8.236E+00	NOT IDENT.
TB-160	1.460E+01	FAIL ABUN
HO-166M	5.291E+00	FAIL ABUN
TM-171	2.950E+03	NOT IDENT.
LU-176	2.331E+00	FAIL ABUN
LU-177	7.653E+02	NOT IDENT.
HF-181	4.250E+00	NOT IDENT.
W-181	2.579E+01	NOT IDENT.
TA-182	1.208E+01	FAIL ABUN
RE-183	2.584E+01	FAIL ABUN
RE-184	1.247E+01	NOT IDENT.
RE-188	1.505E+01	FAIL ABUN
W-188	6.785E+02	NOT IDENT.
OS-191	3.361E+01	NOT IDENT.

IR-192	3.081E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	0.000E+00	SHORT HLIF
TL-202	1.798E+01	NOT IDENT.
HG-203	4.132E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	5.058E+02	NOT IDENT.
BI-207	4.400E+00	NOT IDENT.
PB-210	6.312E+02	NOT IDENT.
BI-211	1.793E+01	NOT IDENT.
PB-211	5.786E+01	NOT IDENT.
BI-212	3.728E+01	NOT IDENT.
PB-212	6.665E+00	FAIL ABUN
BI-213	9.109E+00	NOT IDENT.
BI-214	7.787E+00	FAIL ABUN
PB-214	6.511E+00	NOT IDENT.
RN-219	3.279E+01	NOT IDENT.
RA-223	5.152E+01	FAIL ABUN
RA-224	5.400E+01	NOT IDENT.
AC-227	2.131E+01	NOT IDENT.
TH-227	2.131E+01	NOT IDENT.
AC-228	1.268E+01	FAIL ABUN
RA-228	1.268E+01	FAIL ABUN
TH-228	6.665E+00	FAIL ABUN
TH-229	4.212E+01	NOT IDENT.
TH-230	9.332E+02	NOT IDENT.
PA-231	3.724E+01	FAIL ABUN
TH-231	3.854E+01	NOT IDENT.
TH-232	2.047E+03	FAIL ABUN
PA-233	5.203E+00	FAIL ABUN
PA-234	1.952E+01	FAIL ABUN
PA-234M	4.194E+02	NOT IDENT.
TH-234	1.537E+02	FAIL ABUN
U-234	9.782E+03	NOT IDENT.
NP-237	5.203E+00	FAIL ABUN
NP-238	0.000E+00	SHORT HLIF
U-238	1.537E+02	FAIL ABUN
NP-239	2.144E+01	NOT IDENT.
AM-241	1.811E+01	NOT IDENT.
AM-242	5.534E+01	NOT IDENT.
AM-243	4.955E+00	NOT IDENT.
CM-243	8.503E+00	NOT IDENT.
BK-247	6.199E+00	NOT IDENT.
CM-247	3.069E+00	NOT IDENT.
CF-249	3.096E+00	NOT IDENT.
CF-251	1.058E+01	NOT IDENT.
CF-252	1.629E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226445.CNF;1
Acquisition date : 31-OCT-2022 10:42:37 Sensitivity : 3.000
Detector ID : GAM18 Energy tolerance: 1.500
Elapsed live time: 0 01:55:26.36 Abundance limit : 75.000
Elapsed real time: 0 01:55:27.18 Half life ratio : *****
Sample date : 26-SEP-2022 08:18:00 Nuclide Library : LIQUID
Sample ID : G1205226445 Analyst initials: RXF2
Batch Number : 2333342 Sample Quantity : 7.3727E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 8-JUN-2022 11:06:14 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.444E+02	9.935E+01	9.939E+01
K-40	9.545E+01	6.890E+01	6.893E+01
TE-129	1.525E+02	9.084E+01	9.089E+01
BA-137M	2.072E+00	5.949E+00	5.949E+00
CS-137	2.189E+00	6.284E+00	6.285E+00
TL-208	3.201E+00	5.476E+00	5.477E+00
FR-221	7.533E+01	4.839E+01	4.841E+01
AC-225	8.606E+02	5.543E+02	5.546E+02
RA-226	4.579E+01	1.439E+02	1.439E+02
U-235	5.683E+00	2.301E+01	2.301E+01
ANH-511	1.005E+01	9.211E+00	9.213E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-1.828E-01	3.465E+00	3.466E+00	NOT IDENT.
NA-24	-1.553E+16	3.088E+17	0.000E+00	SHORT HLIF
AL-26	-2.385E+00	2.942E+00	3.133E+00	NOT IDENT.
SC-46	-8.538E-02	4.192E+00	4.192E+00	FAIL ABUN
V-48	-1.084E+01	1.532E+01	1.608E+01	NOT IDENT.
CR-51	6.429E+00	5.875E+01	5.882E+01	NOT IDENT.
MN-52	-3.761E+01	3.055E+02	3.060E+02	NOT IDENT.
MN-54	-1.589E+00	4.309E+00	4.369E+00	NOT IDENT.
CO-56	-5.252E-01	4.748E+00	4.754E+00	NOT IDENT.
CO-57	-1.540E+00	2.845E+00	2.928E+00	NOT IDENT.
NI-57	-1.267E+07	6.329E+07	6.354E+07	SHORT HLIF
CO-58	1.498E-01	4.220E+00	4.220E+00	NOT IDENT.
FE-59	1.412E+00	9.801E+00	9.821E+00	NOT IDENT.
CO-60	5.530E+00	4.391E+00	5.051E+00	FAIL ABUN
ZN-65	3.472E-01	8.349E+00	8.350E+00	NOT IDENT.
CU-67	4.309E+04	1.354E+05	1.368E+05	SHORT HLIF
GE-68	3.144E+00	1.180E+02	1.180E+02	NOT IDENT.
AS-73	2.425E+01	1.746E+02	1.749E+02	NOT IDENT.
AS-74	-1.442E+01	2.242E+01	2.334E+01	NOT IDENT.

SE-75	-2.382E+00	4.902E+00	5.018E+00	NOT IDENT.
BR-77	3.817E+05	6.884E+05	7.097E+05	SHORT HLIF
SR-82	2.788E+01	6.763E+01	6.879E+01	NOT IDENT.
RB-83	-5.203E-01	7.193E+00	7.197E+00	NOT IDENT.
RB-84	5.933E+00	1.018E+01	1.052E+01	NOT IDENT.
KR-85	2.066E+03	8.147E+02	1.238E+03	NOT IDENT.
SR-85	1.339E+01	5.280E+00	8.024E+00	NOT IDENT.
RB-86	-3.666E+01	1.501E+02	1.510E+02	NOT IDENT.
Y-88	2.956E+00	4.131E+00	4.341E+00	NOT IDENT.
Y-91	1.144E+02	2.176E+03	2.177E+03	NOT IDENT.
NB-94	2.373E+00	3.369E+00	3.535E+00	NOT IDENT.
NB-95	3.314E+00	5.383E+00	5.587E+00	NOT IDENT.
NB-95M	4.726E+00	1.516E+01	1.531E+01	NOT IDENT.
TC-95M	-3.600E+00	4.954E+00	5.214E+00	FAIL ABUN
ZR-95	-1.314E+00	8.920E+00	8.939E+00	FAIL ABUN
MO-99	-1.218E+05	1.882E+05	1.961E+05	SHORT HLIF
TC-99M	1.000E+41	8.804E+40	0.000E+00	SHORT HLIF
RH-101	-1.759E+00	3.394E+00	3.486E+00	FAIL ABUN
RH-102M	-5.194E-01	3.678E+00	3.685E+00	NOT IDENT.
RU-103	8.729E-02	5.520E+00	5.520E+00	NOT IDENT.
RH-106	-2.058E+01	2.926E+01	3.070E+01	NOT IDENT.
RU-106	-2.058E+01	2.926E+01	3.070E+01	NOT IDENT.
AG-108M	6.787E-02	2.411E+00	2.411E+00	FAIL ABUN
CD-109	-2.263E+01	7.235E+01	7.307E+01	NOT IDENT.
AG-110	1.332E+01	7.865E+01	7.888E+01	NOT IDENT.
AG-110M	1.126E-01	4.958E+00	4.958E+00	NOT IDENT.
IN-111	9.351E+03	1.601E+04	1.656E+04	SHORT HLIF
SN-113	1.145E+00	4.228E+00	4.260E+00	NOT IDENT.
IN-114M	-6.013E+00	2.367E+01	2.382E+01	NOT IDENT.
CD-115	2.913E+05	5.040E+05	5.209E+05	SHORT HLIF
SN-117M	7.293E+00	1.442E+01	1.479E+01	NOT IDENT.
SB-122	-4.132E+03	3.137E+04	3.142E+04	SHORT HLIF
I-123	4.264E+19	4.103E+19	0.000E+00	SHORT HLIF
TE-123M	3.201E+00	3.116E+00	3.434E+00	NOT IDENT.
SB-124	-9.680E+00	1.075E+01	1.160E+01	FAIL ABUN
SB-125	7.892E+00	7.982E+00	8.740E+00	NOT IDENT.
TE-125M	2.832E+02	1.248E+03	1.255E+03	NOT IDENT.
I-126	6.238E+01	7.831E+01	8.322E+01	NOT IDENT.
SB-126	3.441E+01	4.261E+01	4.535E+01	NOT IDENT.
SN-126	-2.448E+00	6.881E+00	6.969E+00	NOT IDENT.
SB-127	7.456E+02	4.553E+03	4.566E+03	NOT IDENT.
I-131	7.034E+00	6.395E+01	6.403E+01	FAIL ABUN
I-132	-1.000E+41	2.670E+42	0.000E+00	SHORT HLIF
TE-132	-2.676E+03	5.354E+03	5.488E+03	SHORT HLIF
BA-133	4.364E+00	5.903E+00	6.223E+00	FAIL ABUN
I-133	6.716E+11	5.089E+12	5.098E+12	SHORT HLIF
CS-134	-2.316E+00	3.998E+00	4.132E+00	NOT IDENT.
I-135	-3.123E+38	6.078E+39	0.000E+00	SHORT HLIF
CS-136	-1.284E+01	2.610E+01	2.674E+01	NOT IDENT.
LA-138	6.593E+00	5.652E+00	6.387E+00	NOT IDENT.
CE-139	-1.905E+00	3.180E+00	3.294E+00	NOT IDENT.
BA-140	3.166E+01	7.768E+01	7.899E+01	FAIL ABUN
LA-140	1.362E+01	2.077E+01	2.166E+01	NOT IDENT.
CE-141	-4.161E+00	9.199E+00	9.389E+00	NOT IDENT.
CE-143	2.233E+08	2.970E+08	3.136E+08	SHORT HLIF
CE-144	1.413E+01	2.015E+01	2.113E+01	NOT IDENT.
PM-144	1.244E-01	3.692E+00	3.692E+00	FAIL ABUN
PR-144	7.414E+00	2.790E+02	2.790E+02	NOT IDENT.
PM-146	2.228E+00	4.515E+00	4.625E+00	NOT IDENT.
ND-147	9.149E+01	1.764E+02	1.811E+02	FAIL ABUN
PM-147	2.560E+03	7.509E+04	7.510E+04	NOT IDENT.
PM-149	2.188E+06	4.637E+06	4.741E+06	SHORT HLIF
EU-152	-4.948E-01	9.966E+00	9.968E+00	NOT IDENT.
GD-153	-9.634E+00	1.025E+01	1.113E+01	NOT IDENT.
EU-154	2.548E-01	9.863E+00	9.863E+00	FAIL ABUN
EU-155	6.116E-01	1.006E+01	1.007E+01	NOT IDENT.
TB-160	1.317E+01	1.553E+01	1.663E+01	FAIL ABUN
HO-166M	5.207E+00	5.767E+00	6.227E+00	FAIL ABUN
TM-171	1.935E+03	3.322E+03	3.434E+03	NOT IDENT.
LU-176	3.033E+00	5.544E+00	5.710E+00	FAIL ABUN
LU-177	3.544E+02	9.950E+02	1.008E+03	NOT IDENT.
HF-181	5.183E-01	5.557E+00	5.562E+00	NOT IDENT.
W-181	-1.051E+01	3.154E+01	3.189E+01	NOT IDENT.
TA-182	-1.012E+01	1.664E+01	1.725E+01	FAIL ABUN
RE-183	-3.147E+01	3.372E+01	3.659E+01	FAIL ABUN
RE-184	2.687E+00	1.458E+01	1.463E+01	NOT IDENT.
RE-188	-5.649E+00	1.768E+01	1.786E+01	FAIL ABUN
W-188	-2.869E+02	8.462E+02	8.560E+02	NOT IDENT.

OS-191	2.254E+01	3.985E+01	4.113E+01	NOT IDENT.
IR-192	-2.737E+00	4.048E+00	4.232E+00	NOT IDENT.
PB-201	3.815E+27	5.382E+27	0.000E+00	SHORT HLIF
TL-201	3.369E+04	6.369E+04	6.548E+04	SHORT HLIF
TL-202	1.107E+01	1.978E+01	2.040E+01	NOT IDENT.
HG-203	3.025E-01	5.501E+00	5.503E+00	NOT IDENT.
PB-203	1.403E+04	2.551E+05	2.552E+05	SHORT HLIF
TL-204	-3.954E+02	6.812E+02	7.041E+02	NOT IDENT.
BI-207	6.831E-01	5.159E+00	5.168E+00	NOT IDENT.
PB-210	3.074E+02	7.118E+02	7.251E+02	NOT IDENT.
BI-211	-1.334E+01	2.497E+01	2.569E+01	NOT IDENT.
PB-211	-4.469E+01	7.699E+01	7.959E+01	NOT IDENT.
BI-212	-1.387E+00	5.229E+01	5.229E+01	NOT IDENT.
PB-212	7.415E+00	1.337E+01	1.378E+01	FAIL ABUN
BI-213	1.041E+01	9.573E+00	1.066E+01	NOT IDENT.
BI-214	-8.690E+00	1.031E+01	1.103E+01	FAIL ABUN
PB-214	-2.876E+00	8.797E+00	8.892E+00	NOT IDENT.
RN-219	-3.425E+00	4.103E+01	4.106E+01	NOT IDENT.
RA-223	-3.604E+01	6.637E+01	6.833E+01	FAIL ABUN
RA-224	2.274E+01	6.204E+01	6.288E+01	NOT IDENT.
AC-227	1.070E+01	2.441E+01	2.488E+01	NOT IDENT.
TH-227	1.070E+01	2.441E+01	2.488E+01	NOT IDENT.
AC-228	3.524E+00	1.838E+01	1.844E+01	FAIL ABUN
RA-228	3.524E+00	1.838E+01	1.844E+01	FAIL ABUN
TH-228	7.415E+00	1.337E+01	1.378E+01	FAIL ABUN
TH-229	-8.782E+00	5.209E+01	5.224E+01	NOT IDENT.
TH-230	-1.941E+03	1.338E+03	1.599E+03	NOT IDENT.
PA-231	4.886E+00	4.967E+01	4.972E+01	FAIL ABUN
TH-231	2.796E+00	5.048E+01	5.049E+01	NOT IDENT.
TH-232	-3.448E+03	2.804E+03	3.206E+03	FAIL ABUN
PA-233	-2.818E+00	6.592E+00	6.713E+00	FAIL ABUN
PA-234	-7.342E+00	2.572E+01	2.593E+01	FAIL ABUN
PA-234M	1.038E+02	4.889E+02	4.911E+02	NOT IDENT.
TH-234	-3.204E+01	1.906E+02	1.911E+02	FAIL ABUN
U-234	1.815E+03	1.135E+04	1.138E+04	NOT IDENT.
NP-237	-2.818E+00	6.592E+00	6.713E+00	FAIL ABUN
NP-238	-8.096E+05	1.278E+06	1.329E+06	SHORT HLIF
U-238	-3.204E+01	1.906E+02	1.911E+02	FAIL ABUN
NP-239	2.975E+00	2.627E+01	2.631E+01	NOT IDENT.
AM-241	3.602E-01	2.238E+01	2.238E+01	NOT IDENT.
AM-242	-2.354E+01	7.370E+01	7.446E+01	NOT IDENT.
AM-243	3.456E+00	5.665E+00	5.876E+00	NOT IDENT.
CM-243	-4.744E+00	1.092E+01	1.113E+01	NOT IDENT.
BK-247	-3.870E+00	7.819E+00	8.012E+00	NOT IDENT.
CM-247	-1.585E-01	3.821E+00	3.822E+00	NOT IDENT.
CF-249	8.887E-01	3.713E+00	3.734E+00	NOT IDENT.
CF-251	4.549E+00	1.187E+01	1.205E+01	NOT IDENT.
CF-252	1.598E+04	2.350E+04	2.458E+04	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	62.1778	133.52	60.8050	116.30	0.0000
879.38	63.7579	364.49	57.6734	116.74	55.8882
46.54	56.7400	80.22	0.0000	117.23	50.1275
228.16	0.0000	711.68	57.7464	119.76	59.8244
52.39	71.1874	356.01	54.6743	120.54	58.7624
53.20	66.1275	323.87	54.6870	120.90	56.4613
53.44	66.1996	82.35	0.0000	264.66	57.6682
57.53	60.3353	82.47	64.4472	121.22	57.6821
293.27	0.0000	82.47	0.0000	344.28	67.1900
57.53	57.7732	83.79	57.2963	122.06	71.9535
482.18	57.7737	265.00	57.3350	1274.44	56.7561
57.98	66.5671	84.21	57.3738	123.68	53.2863
59.32	50.4512	84.86	0.0000	1377.63	0.0000
59.54	50.4976	193.51	59.7307	127.23	74.0306
155.04	78.3157	105.31	63.1534	129.43	57.6064
63.00	51.2168	86.79	62.1295	131.20	78.3241
129.43	52.2620	86.94	62.1591	133.02	52.0270
63.29	52.2620	87.09	55.7550	133.52	49.6628
290.67	52.3225	87.57	57.9864	135.34	0.0000
63.81	76.0852	88.03	58.0692	136.00	58.4626
87.57	76.2265	306.78	68.8887	136.28	58.4985
64.99	67.5051	88.47	68.9165	136.47	60.1491
65.08	67.5284	531.02	59.3425	739.50	0.0000
66.73	53.9691	184.58	0.0000	140.51	0.0000
66.98	54.0206	92.59	52.3378	140.88	59.0852
67.24	84.1154	93.31	0.0000	143.76	51.1911
67.67	83.2501	94.56	52.6436	144.24	46.2839
1221.41	83.2748	311.90	52.6575	145.44	53.0293
439.51	65.4959	946.00	52.6604	152.32	50.4205
70.82	65.4959	97.43	54.5579	152.43	56.3152
167.43	0.0000	98.43	81.3312	1048.07	61.4593
97.43	63.6662	98.44	81.3335	154.21	59.8904
70.82	0.0000	99.53	57.8510	155.04	63.3690
70.82	86.2626	103.37	57.8510	158.56	70.2643
279.20	0.0000	116.74	57.8510	158.97	0.0000
1063.66	86.8871	100.11	52.3737	159.00	53.1343
72.87	0.0000	100.20	52.3870	162.33	65.5593
351.06	86.9059	102.03	77.3018	537.26	64.3143
74.66	60.7074	103.18	61.8125	163.33	57.5277
238.63	60.7416	103.37	65.2181	165.86	60.8226
351.93	60.7416	105.31	51.9978	167.43	0.0000
238.63	60.7416	106.12	57.7754	245.35	0.0000
74.97	60.7735	106.47	48.7585	427.87	78.2661
77.11	61.2268	109.28	58.2614	176.60	66.8688
256.23	58.6237	111.00	65.4079	177.52	56.4030
79.82	0.0000	111.76	0.0000	181.07	0.0000
80.02	58.6887	208.37	68.0432	184.41	48.1668
80.03	58.6895	116.24	66.2846	184.58	0.0000

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	48.2750	300.09	50.3096	477.60	35.2574
186.21	48.3157	300.13	50.3115	477.99	35.2678
190.27	58.1087	301.36	45.6594	482.18	25.3257
193.51	66.3032	302.85	52.0459	487.02	23.3635
197.03	61.4953	304.50	47.4033	492.35	0.0000
198.01	64.7872	304.85	47.4216	497.08	36.7238
201.83	57.2908	306.78	47.5259	511.00	28.5400
204.12	63.5820	308.46	46.0285	514.00	28.6020
205.31	62.7781	311.90	55.2341	520.40	28.7338
208.37	54.2677	316.51	51.2461	520.69	0.0000
210.85	61.4608	319.41	46.0532	667.71	0.0000
215.65	49.7182	320.08	43.9429	527.90	0.0000
218.12	49.9037	321.04	42.9167	529.59	26.2230
222.11	41.2025	323.87	58.1144	529.87	0.0000
227.09	57.2467	325.23	51.7334	531.02	25.0915
227.38	62.9982	1596.21	57.3379	537.26	24.8133
228.16	0.0000	331.15	0.0000	1260.41	0.0000
228.18	65.9376	333.37	56.5301	552.55	26.6430
235.69	55.0564	334.37	57.6787	795.86	36.5043
235.96	55.0773	338.28	46.9866	564.24	0.0000
238.63	60.1331	911.20	46.9884	569.33	31.6992
238.98	0.0000	340.48	56.9501	569.50	32.6938
240.99	60.3299	340.55	56.9543	569.70	32.6979
242.00	67.2347	344.28	49.4769	582.08	25.9714
244.70	45.4783	345.93	41.8509	583.19	33.5877
245.35	0.0000	351.06	36.5335	595.83	49.3813
459.60	53.2375	351.93	31.5789	600.60	46.4984
685.70	51.3875	356.01	50.0656	604.72	52.6998
388.16	52.4032	361.25	0.0000	609.32	60.9814
256.23	48.6680	364.49	40.3879	610.33	42.7139
527.90	0.0000	366.42	0.0000	614.28	43.8385
264.66	58.2390	383.85	38.8539	618.01	35.7648
265.00	57.2598	388.16	34.4202	621.93	31.7540
269.46	62.6357	666.33	42.4696	630.19	0.0000
401.81	49.6121	391.70	27.6255	631.29	33.9950
273.65	57.8860	400.66	33.6534	632.98	35.0615
276.40	53.8033	401.32	0.0000	633.25	34.0353
583.19	45.9100	401.81	42.9815	634.78	30.9705
277.60	45.9229	402.40	44.1663	635.95	26.8593
402.40	42.8827	404.85	53.5815	636.99	25.8430
278.43	42.9049	410.95	37.7680	657.50	25.1118
279.20	0.0000	720.70	33.4866	884.68	21.7667
279.54	56.7726	423.72	42.6292	661.66	37.7589
280.46	62.9814	427.09	32.9548	664.57	0.0000
301.36	50.3767	427.87	24.9550	666.33	31.9716
284.31	47.8415	433.94	28.6665	666.50	33.6572
285.41	43.2689	439.51	32.3998	667.71	0.0000
285.90	0.0000	440.45	27.0209	677.62	23.2870
287.50	44.9266	453.88	33.5112	685.70	26.5831
290.67	52.8708	459.60	33.6656	692.65	0.0000
293.27	0.0000	463.37	27.8942	695.00	30.9975
295.22	53.1541	468.07	38.6809	696.49	35.3022
316.51	59.4585	473.00	34.0227	696.51	35.3022
298.58	44.9903	475.06	50.3750	697.00	40.6626
299.98	50.3027	696.49	35.2354	697.49	39.6027

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	27.9083	903.28	14.7387	1291.59	16.4209
706.68	34.4248	907.67	0.0000	1298.22	0.0000
711.68	21.5741	911.20	17.1141	1312.11	11.9368
720.70	22.7637	984.45	0.0000	1332.49	12.9370
721.93	0.0000	926.36	21.0547	1365.19	14.0002
1690.97	22.7893	935.54	24.0204	1368.63	0.0000
722.91	22.7906	937.49	22.1167	1377.63	0.0000
723.31	22.7957	983.53	16.3932	1384.29	19.7131
756.73	22.8066	945.96	0.0000	1408.01	11.3442
727.33	24.3674	946.00	18.3362	1434.09	16.1934
733.00	27.2781	949.00	18.3594	1435.80	7.6243
735.93	30.5985	954.55	0.0000	1457.56	0.0000
739.50	0.0000	962.31	28.1787	1460.82	13.4383
1434.09	21.9519	964.08	25.2821	1489.16	17.4163
747.24	25.2840	966.17	22.3846	1596.21	4.9801
752.31	28.6573	968.97	20.4617	1620.50	11.0255
753.82	19.8550	983.53	24.5050	1678.03	0.0000
756.73	29.8275	984.45	0.0000	1690.97	13.2650
763.94	29.9383	996.26	23.6461	1757.55	0.0000
765.80	25.1569	1001.03	16.7813	1764.49	6.2329
1001.03	33.7500	1004.73	29.6580	1770.23	12.4829
766.84	35.5342	1025.87	0.0000	1771.35	15.6079
772.60	0.0000	1028.54	0.0000	1791.20	0.0000
776.52	13.3909	1037.84	23.3698	1808.65	9.4475
777.92	0.0000	1038.76	0.0000	1836.06	5.2820
778.90	14.3008	1046.59	16.7497		
783.70	21.2787	1048.07	15.0828		
1435.80	19.7603	1050.41	16.3547		
903.28	24.7406	1063.66	22.2535		
795.86	21.6322	1077.00	20.3330		
801.95	20.7932	1077.34	18.3015		
802.10	20.7949	1083.85	14.2693		
810.29	20.8774	1085.87	20.4004		
810.45	20.8791	1099.25	14.3514		
810.76	22.6984	1111.64	13.7298		
815.77	16.3824	1112.07	17.1647		
818.51	17.3152	1112.84	10.3018		
832.01	29.3508	1115.54	15.4680		
834.85	42.2479	1120.29	12.3961		
835.15	42.2546	1120.55	13.7747		
836.80	0.0000	1121.30	13.7780		
846.77	29.5547	1808.65	11.4012		
856.80	25.9807	1131.51	0.0000		
860.56	26.9553	1332.49	19.9982		
871.09	23.3490	1177.95	8.7854		
873.19	19.6321	1189.05	13.7579		
875.33	0.0000	1204.77	17.0242		
879.38	18.7495	1221.41	19.2595		
880.51	18.7588	1231.02	23.6146		
881.60	20.6449	1235.36	18.2742		
883.24	27.2342	1238.28	17.2156		
884.68	23.4924	1260.41	0.0000		
889.28	21.6580	1271.87	7.2523		
894.76	23.5986	1274.44	13.0652		
1836.06	20.7969	1274.54	13.0652		

VAX/VMS Nuclide Identification Report Generated 31-OCT-2022 10:59:39.26

```
*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                    *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226446.CNF;1
Background file : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM03.CNF;650
Background date : 30-OCT-2022 10:39:18
Sample date     : 31-OCT-2022 00:00:00 Acquisition date : 31-OCT-2022 10:43:43
Sample ID      : G1205226446 Sample quantity : 7.77220E-01 FILTER
Detector name   : GAM03 Detector geometry: JAR
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.59 0.2%
Energy tolerance: 1.50000 keV Analyst Initials : RXF2
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2333342 Detector SN# :
Matrix Spike ID : LCS ID :
*****
```

BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	40.54	81	919	0.57	80.60	78	5	8.95E-02	57.5	
2	0	46.55	1738	1795	1.38	92.61	88	9	1.93E+00	5.0	
3	0	59.54	8026	2018	1.33	118.58	112	13	8.92E+00	1.6	
4	0	67.49	42	425	1.30	134.49	131	7	4.69E-02	82.3	
5	0	107.89	29	287	1.24	215.27	213	5	3.18E-02	90.8	
6	0	196.75	75	390	2.04	392.97	390	8	8.32E-02	47.1	
7	0	277.01	40	514	4.02	553.47	548	13	4.47E-02	117.6	
8	0	308.89	49	613	4.64	617.22	611	17	5.43E-02	116.9	
9	0	477.23	82	210	1.78	953.91	951	8	9.14E-02	32.6	
10	0	516.27	59	164	4.01	1031.98	1027	11	6.51E-02	44.4	
11	0	661.98	7769	180	1.83	1323.44	1316	16	8.63E+00	1.2	
12	0	870.30	20	139	4.89	1740.17	1727	16	2.23E-02	133.5	
13	0	884.87	21	148	3.51	1769.33	1754	17	2.33E-02	135.1	
14	0	1148.72	20	43	1.82	2297.19	2290	11	2.18E-02	71.8	
15	0	1173.75	2170	88	2.33	2347.27	2335	23	2.41E+00	2.4	
16	0	1209.04	20	21	3.55	2417.89	2408	17	2.18E-02	58.4	
17	0	1333.01	1906	12	2.28	2665.96	2654	20	2.12E+00	2.3	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 31-OCT-2022 10:59:44

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226446.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: RXF2		
Sample date	: 31-OCT-2022 00:00:00	Acquisition date	: 31-OCT-2022 10:43:43
Sample ID	: G1205226446	Sample quantity	: 0.77722 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA3	Detector geometry	: JAR
Elapsed live time	: 0 00:15:00.00	Elapsed real time	: 0 00:15:01.59 0.2%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	82	10.44*	2.037E+00	1.494E+03	1.503E+03	65.26
CO-60	1173.23	2170	99.85	9.770E-01	8.595E+03	8.597E+03	4.84
	1332.49	1906	99.98*	8.774E-01	8.395E+03	8.397E+03	4.65
TE-125M	109.28	29	0.27*	3.960E+00	1.034E+04	1.039E+04	181.51
BA-137M	661.66	7769	89.90*	1.589E+00	2.102E+04	2.102E+04	2.40
CS-137	661.66	7769	85.10*	1.589E+00	2.220E+04	2.220E+04	2.40
PB-210	46.54	1738	4.25*	2.521E-01	6.268E+05	6.269E+05	10.02
TH-230	67.67	42	0.38*	1.727E+00	2.485E+04	2.485E+04	164.68
AM-241	59.54	8026	35.90*	1.064E+00	8.120E+04	8.120E+04	3.24

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226446.CNF;1
Acquisition date : 31-OCT-2022 10:43:43 Sensitivity : 3.000
Detector ID : GAM03 Energy tolerance: 1.500
Elapsed live time: 0 00:15:00.00 Abundance limit : 75.000
Elapsed real time: 0 00:15:01.59 Half life ratio : *****
Sample date : 31-OCT-2022 00:00:00 Analyst initials: RXF2
Sample ID : G1205226446 Sample Quantity : 7.7722E-01 FILTER
Batch Number : 2333342 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;26

CALIBRATION INFORMATION

Eff. Cal. date : 20-APR-2022 11:51:08 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.503E+03	9.610E+02	1.326E+03
CO-60	8.397E+03	3.830E+02	7.146E+01
TE-125M	1.039E+04	1.849E+04	3.042E+04
BA-137M	2.102E+04	4.937E+02	1.330E+02
CS-137	2.220E+04	5.215E+02	1.405E+02
PB-210	6.269E+05	6.156E+04	5.124E+04
TH-230	2.485E+04	4.011E+04	4.748E+04
AM-241	8.120E+04	2.578E+03	1.351E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	6.349E+01	4.359E+01	1.029E+02	NOT IDENT.
NA-24	3.011E+01	3.536E+01	9.739E+01	NOT IDENT.
AL-26	8.205E+00	2.033E+01	5.519E+01	NOT IDENT.
K-40	1.295E+02	2.684E+02	6.519E+02	NOT IDENT.
SC-46	5.654E+01	8.164E+01	1.472E+02	NOT IDENT.
V-48	5.074E+01	8.872E+01	1.623E+02	NOT IDENT.
CR-51	-4.109E+01	5.891E+02	1.011E+03	NOT IDENT.
MN-52	3.262E+01	3.118E+01	8.044E+01	NOT IDENT.
MN-54	9.075E+00	7.602E+01	1.361E+02	NOT IDENT.
CO-56	8.413E+00	7.919E+01	1.413E+02	NOT IDENT.
CO-57	-1.432E+01	5.099E+01	9.065E+01	NOT IDENT.
NI-57	5.061E+00	4.236E+01	9.301E+01	NOT IDENT.
CO-58	3.199E+01	7.518E+01	1.377E+02	NOT IDENT.
FE-59	-9.887E+01	1.648E+02	2.734E+02	NOT IDENT.
ZN-65	2.508E+01	1.898E+02	3.337E+02	NOT IDENT.
CU-67	-6.552E+01	1.145E+02	1.992E+02	NOT IDENT.
GE-68	1.650E+03	2.763E+03	5.065E+03	NOT IDENT.
AS-73	-7.454E+03	5.641E+03	9.014E+03	NOT IDENT.
AS-74	-1.084E+01	1.080E+02	1.940E+02	NOT IDENT.
SE-75	5.740E+01	9.627E+01	1.710E+02	NOT IDENT.
BR-77	7.527E+01	2.753E+02	4.861E+02	NOT IDENT.
SR-82	-9.320E+01	4.187E+02	7.402E+02	NOT IDENT.

RB-83	-1.008E+02	1.656E+02	2.528E+02	NOT IDENT.
RB-84	2.544E+01	1.146E+02	2.061E+02	NOT IDENT.
KR-85	-1.609E+04	1.736E+04	2.586E+04	NOT IDENT.
SR-85	-7.240E+01	7.812E+01	1.164E+02	NOT IDENT.
RB-86	3.315E+02	1.062E+03	1.902E+03	NOT IDENT.
Y-88	-4.814E-01	2.219E+01	5.143E+01	NOT IDENT.
Y-91	-1.451E+04	2.284E+04	3.377E+04	NOT IDENT.
NB-94	4.453E+00	5.525E+01	1.010E+02	FAIL ABUN
NB-95	1.440E+01	6.335E+01	1.159E+02	NOT IDENT.
NB-95M	-1.914E+02	2.219E+02	3.735E+02	NOT IDENT.
TC-95M	-2.087E+01	8.081E+01	1.405E+02	NOT IDENT.
ZR-95	3.631E+01	1.036E+02	1.934E+02	NOT IDENT.
MO-99	2.829E+02	5.371E+02	1.012E+03	NOT IDENT.
TC-99M	1.993E+01	1.686E+02	3.022E+02	NOT IDENT.
RH-101	-2.010E+01	6.392E+01	1.133E+02	FAIL ABUN
RH-102M	5.880E+01	1.016E+02	1.564E+02	NOT IDENT.
RU-103	-1.740E+01	7.878E+01	1.407E+02	NOT IDENT.
RH-106	2.711E+02	6.407E+02	1.186E+03	NOT IDENT.
RU-106	2.711E+02	6.407E+02	1.186E+03	NOT IDENT.
AG-108M	2.870E+01	8.727E+01	1.493E+02	NOT IDENT.
CD-109	3.183E+02	1.703E+03	2.817E+03	NOT IDENT.
AG-110	2.198E+02	1.776E+03	2.830E+03	NOT IDENT.
AG-110M	8.925E+01	2.363E+02	1.889E+02	FAIL ABUN
IN-111	3.890E+01	6.383E+01	1.139E+02	NOT IDENT.
SN-113	-5.501E+01	1.070E+02	1.773E+02	NOT IDENT.
IN-114M	-1.755E+02	3.336E+02	5.752E+02	NOT IDENT.
CD-115	-1.734E+02	2.674E+02	4.672E+02	NOT IDENT.
SN-117M	2.971E+01	5.226E+01	9.475E+01	NOT IDENT.
SB-122	1.987E+01	9.953E+01	1.821E+02	NOT IDENT.
I-123	8.476E+01	9.340E+01	1.713E+02	NOT IDENT.
TE-123M	4.757E+01	5.257E+01	9.642E+01	NOT IDENT.
SB-124	4.257E+01	6.854E+01	1.651E+02	NOT IDENT.
SB-125	1.297E+02	2.650E+02	4.568E+02	NOT IDENT.
I-126	2.236E+01	2.107E+02	3.387E+02	NOT IDENT.
SB-126	-2.215E+01	1.135E+02	2.020E+02	NOT IDENT.
SN-126	-1.227E+02	1.759E+02	2.797E+02	NOT IDENT.
SB-127	1.795E+02	1.728E+02	3.359E+02	NOT IDENT.
TE-129	4.307E+02	1.156E+03	1.968E+03	FAIL ABUN
I-131	-8.977E+01	8.245E+01	1.332E+02	NOT IDENT.
I-132	1.616E+02	1.680E+03	2.712E+03	NOT IDENT.
TE-132	-5.078E+01	6.696E+01	1.134E+02	NOT IDENT.
BA-133	-2.018E+01	1.056E+02	1.789E+02	FAIL ABUN
I-133	1.055E+01	1.036E+02	1.886E+02	NOT IDENT.
CS-134	-3.907E+01	8.378E+01	1.444E+02	NOT IDENT.
I-135	4.371E+01	4.572E+02	9.200E+02	NOT IDENT.
CS-136	2.398E+01	1.120E+02	1.997E+02	NOT IDENT.
LA-138	-1.922E+01	4.924E+01	9.351E+01	NOT IDENT.
CE-139	-9.134E+00	5.543E+01	9.768E+01	NOT IDENT.
BA-140	1.446E+01	2.654E+02	4.820E+02	NOT IDENT.
LA-140	3.473E+00	2.731E+01	6.272E+01	NOT IDENT.
CE-141	-3.468E+00	8.970E+01	1.599E+02	NOT IDENT.
CE-143	4.696E+01	1.708E+02	2.985E+02	NOT IDENT.
CE-144	4.522E+01	3.735E+02	6.719E+02	NOT IDENT.
PM-144	1.745E+01	5.941E+01	1.098E+02	FAIL ABUN
PR-144	1.296E+03	4.412E+03	8.152E+03	NOT IDENT.
PM-146	-9.026E+00	1.348E+02	2.253E+02	NOT IDENT.
ND-147	7.138E+01	5.004E+02	9.126E+02	NOT IDENT.
PM-147	-6.377E+05	1.557E+06	2.756E+06	NOT IDENT.
PM-149	2.356E+02	2.196E+03	3.810E+03	NOT IDENT.
EU-152	9.505E+01	2.394E+02	4.174E+02	NOT IDENT.
GD-153	-4.433E-01	1.922E+02	3.143E+02	NOT IDENT.
EU-154	1.822E+02	1.246E+02	2.943E+02	NOT IDENT.
EU-155	-1.498E+02	2.496E+02	3.953E+02	NOT IDENT.
TB-160	1.320E+01	2.567E+02	4.568E+02	FAIL ABUN
HO-166M	-3.806E+01	1.056E+02	1.859E+02	NOT IDENT.
TM-171	-2.200E+05	1.353E+05	2.147E+05	FAIL ABUN
LU-176	4.957E+01	6.963E+01	1.118E+02	NOT IDENT.
LU-177	3.079E+02	5.339E+02	9.541E+02	NOT IDENT.
HF-181	7.196E+01	1.140E+02	1.768E+02	NOT IDENT.
W-181	0.000E+00	1.377E+03	2.714E+03	FAIL ABUN
TA-182	-9.537E+01	1.822E+02	3.287E+02	FAIL ABUN
RE-183	0.000E+00	1.452E+03	3.035E+03	FAIL ABUN
RE-184	6.938E+01	2.233E+02	4.019E+02	NOT IDENT.
RE-188	-7.245E+01	2.789E+02	4.913E+02	FAIL ABUN
W-188	1.847E+02	1.433E+04	2.478E+04	NOT IDENT.
OS-191	3.901E+01	1.646E+02	2.972E+02	NOT IDENT.
IR-192	2.778E+01	8.066E+01	1.265E+02	FAIL ABUN
PB-201	-4.154E+01	1.844E+02	3.129E+02	NOT IDENT.

TL-201	2.073E+02	4.836E+02	8.714E+02	FAIL ABUN
TL-202	-1.361E+00	9.380E+01	1.575E+02	FAIL ABUN
HG-203	1.925E+01	7.561E+01	1.189E+02	NOT IDENT.
PB-203	2.228E+01	8.752E+01	1.376E+02	NOT IDENT.
TL-204	7.636E+02	1.335E+04	2.043E+04	FAIL ABUN
BI-207	-1.394E+01	1.239E+02	2.145E+02	NOT IDENT.
TL-208	1.057E+00	7.402E+01	1.343E+02	FAIL ABUN
BI-211	-8.555E+01	4.966E+02	8.440E+02	NOT IDENT.
PB-211	2.762E+02	1.932E+03	3.295E+03	NOT IDENT.
BI-212	1.104E+02	8.606E+02	1.575E+03	NOT IDENT.
PB-212	8.583E+00	1.267E+02	2.220E+02	NOT IDENT.
BI-213	-3.250E+02	3.231E+02	5.177E+02	NOT IDENT.
BI-214	-8.168E+00	1.388E+02	2.504E+02	NOT IDENT.
PB-214	1.380E+01	1.809E+02	3.110E+02	NOT IDENT.
RN-219	-7.315E+02	1.113E+03	1.826E+03	NOT IDENT.
FR-221	-1.239E+02	4.659E+02	8.063E+02	NOT IDENT.
RA-223	2.275E+02	1.470E+03	2.548E+03	NOT IDENT.
RA-224	1.433E+02	1.345E+03	2.351E+03	NOT IDENT.
AC-225	-1.279E+02	4.808E+02	8.319E+02	NOT IDENT.
RA-226	8.312E+02	1.408E+03	2.547E+03	NOT IDENT.
AC-227	-6.348E+02	5.842E+02	9.683E+02	NOT IDENT.
TH-227	-6.348E+02	5.842E+02	9.683E+02	NOT IDENT.
AC-228	1.307E+02	3.334E+02	6.045E+02	NOT IDENT.
RA-228	1.307E+02	3.334E+02	6.045E+02	NOT IDENT.
TH-228	8.583E+00	1.267E+02	2.220E+02	NOT IDENT.
TH-229	2.729E+02	1.274E+03	2.029E+03	NOT IDENT.
PA-231	-6.244E+02	1.092E+03	1.834E+03	NOT IDENT.
TH-231	4.970E+02	9.727E+02	1.640E+03	NOT IDENT.
TH-232	9.005E+04	6.197E+04	9.215E+04	NOT IDENT.
PA-233	7.023E+01	1.585E+02	2.781E+02	NOT IDENT.
PA-234	-2.083E+02	7.860E+02	1.350E+03	NOT IDENT.
PA-234M	4.191E+03	1.105E+04	1.989E+04	NOT IDENT.
TH-234	-3.287E+01	4.212E+03	6.475E+03	NOT IDENT.
U-234	-6.084E+05	4.880E+05	7.813E+05	NOT IDENT.
U-235	-2.675E+02	3.818E+02	6.649E+02	NOT IDENT.
NP-237	7.023E+01	1.585E+02	2.781E+02	NOT IDENT.
NP-238	3.591E+01	4.068E+02	7.182E+02	NOT IDENT.
U-238	-3.287E+01	4.212E+03	6.475E+03	NOT IDENT.
NP-239	-2.895E+02	5.584E+02	9.860E+02	FAIL ABUN
AM-242	2.829E+02	1.309E+03	2.390E+03	NOT IDENT.
AM-243	-6.913E+01	1.286E+02	2.077E+02	NOT IDENT.
CM-243	3.076E+02	2.229E+02	4.210E+02	FAIL ABUN
BK-247	1.352E+02	1.897E+02	3.384E+02	FAIL ABUN
CM-247	-1.931E+01	9.987E+01	1.677E+02	FAIL ABUN
CF-249	-5.957E+01	1.045E+02	1.727E+02	NOT IDENT.
CF-251	-4.127E+01	2.641E+02	4.641E+02	NOT IDENT.
CF-252	-2.197E+04	3.623E+05	6.543E+05	NOT IDENT.
ANH-511	-1.041E+01	7.763E+01	1.263E+02	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	40.54	81	919	0.57	80.60	78	5	8.95E-02	57.5	
2	0	46.55	1738	1795	1.38	92.61	88	9	1.93E+00	5.0	
3	0	59.54	8026	2018	1.33	118.58	112	13	8.92E+00	1.6	
4	0	67.49	42	425	1.30	134.49	131	7	4.69E-02	82.3	
5	0	107.89	29	287	1.24	215.27	213	5	3.18E-02	90.8	
6	0	196.75	75	390	2.04	392.97	390	8	8.32E-02	47.1	
7	0	277.01	40	514	4.02	553.47	548	13	4.47E-02	117.6	
8	0	308.89	49	613	4.64	617.22	611	17	5.43E-02	116.9	
9	0	477.23	82	210	1.78	953.91	951	8	9.14E-02	32.6	
10	0	516.27	59	164	4.01	1031.98	1027	11	6.51E-02	44.4	
11	0	661.98	7769	180	1.83	1323.44	1316	16	8.63E+00	1.2	
12	0	870.30	20	139	4.89	1740.17	1727	16	2.23E-02	133.5	
13	0	884.87	21	148	3.51	1769.33	1754	17	2.33E-02	135.1	
14	0	1148.72	20	43	1.82	2297.19	2290	11	2.18E-02	71.8	
15	0	1173.75	2170	88	2.33	2347.27	2335	23	2.41E+00	2.4	
16	0	1209.04	20	21	3.55	2417.89	2408	17	2.18E-02	58.4	
17	0	1333.01	1906	12	2.28	2665.96	2654	20	2.12E+00	2.3	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	82	10.44*	2.037E+00	1.494E+03	1.503E+03	65.26
CO-60	1173.23	2170	99.85	9.770E-01	8.595E+03	8.597E+03	4.84
	1332.49	1906	99.98*	8.774E-01	8.395E+03	8.397E+03	4.65
TE-125M	109.28	29	0.27*	3.960E+00	1.034E+04	1.039E+04	181.51
BA-137M	661.66	7769	89.90*	1.589E+00	2.102E+04	2.102E+04	2.40
CS-137	661.66	7769	85.10*	1.589E+00	2.220E+04	2.220E+04	2.40
PB-210	46.54	1738	4.25*	2.521E-01	6.268E+05	6.269E+05	10.02
TH-230	67.67	42	0.38*	1.727E+00	2.485E+04	2.485E+04	164.68
AM-241	59.54	8026	35.90*	1.064E+00	8.120E+04	8.120E+04	3.24

Flag: "*" = Keyline

Total number of lines in spectrum 17
Number of unidentified lines 4
Number of lines tentatively identified by NID 13 76.47%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.01	1.494E+03	1.503E+03	0.981E+03	65.26	
CO-60	1925.28D	1.00	8.395E+03	8.397E+03	0.391E+03	4.65	
TE-125M	57.40D	1.01	1.034E+04	1.039E+04	1.887E+04	181.51	
BA-137M	30.08Y	1.00	2.102E+04	2.102E+04	0.050E+04	2.40	
CS-137	30.08Y	1.00	2.220E+04	2.220E+04	0.053E+04	2.40	
PB-210	22.20Y	1.00	6.268E+05	6.269E+05	0.628E+05	10.02	
TH-230	7.54E+04Y	1.00	2.485E+04	2.485E+04	4.093E+04	164.68	
AM-241	432.60Y	1.00	8.120E+04	8.120E+04	0.263E+04	3.24	
Total Activity :			7.963E+05	7.964E+05			

Grand Total Activity : 7.963E+05 7.964E+05

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	40.54	81	919	0.57	80.60	78	5	8.95E-02	****	7.84E-02	
0	196.75	75	390	2.04	392.97	390	8	8.32E-02	94.1	3.70E+00	T
0	277.01	40	514	4.02	553.47	548	13	4.47E-02	****	2.99E+00	T
0	308.89	49	613	4.64	617.22	611	17	5.43E-02	****	2.77E+00	T
0	516.27	59	164	4.01	1031.98	1027	11	6.51E-02	88.9	1.92E+00	
0	870.30	20	139	4.89	1740.17	1727	16	2.23E-02	****	1.27E+00	T
0	884.87	21	148	3.51	1769.33	1754	17	2.33E-02	****	1.25E+00	T
0	1148.72	20	43	1.82	2297.19	2290	11	2.18E-02	****	9.95E-01	
0	1209.04	20	21	3.55	2417.89	2408	17	2.18E-02	****	9.52E-01	

Flags: "T" = Tentatively associated


```

*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                       *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226446.CNF;1 *
* Acquisition date   : 31-OCT-2022 10:43:43 Sensitivity      : 3.000          *
* Detector ID        : GAM03 Energy tolerance: 1.500         *
* Elapsed live time  : 0 00:15:00.00 Abundance limit : 75.000      *
* Elapsed real time  : 0 00:15:01.59 Half life ratio  : *****          *
* Sample date        : 31-OCT-2022 00:00:00 Nuclide Library : LIQUID       *
* Sample ID          : G1205226446 Analyst initials:  RXF2         *
* Batch Number       : 2333342 Sample Quantity  : 7.7722E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight       : 0.00000         *
*                                     Dry Weight    : 0.00000         *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                       *
* Eff. Cal. date     : 20-APR-2022 11:51:08 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	6.387E+02
CO-60	2.978E+01
TE-125M	1.473E+04
BA-137M	6.287E+01
CS-137	6.642E+01
PB-210	2.515E+04
TH-230	2.296E+04
AM-241	6.624E+02

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	4.573E+01	NOT IDENT.
NA-24	3.865E+01	NOT IDENT.
AL-26	2.022E+01	NOT IDENT.
K-40	2.659E+02	NOT IDENT.
SC-46	6.940E+01	NOT IDENT.
V-48	7.651E+01	NOT IDENT.
CR-51	4.863E+02	NOT IDENT.
MN-52	3.355E+01	NOT IDENT.
MN-54	6.411E+01	NOT IDENT.
CO-56	6.664E+01	NOT IDENT.
CO-57	4.388E+01	NOT IDENT.
NI-57	3.726E+01	NOT IDENT.
CO-58	6.494E+01	NOT IDENT.
FE-59	1.277E+02	NOT IDENT.
ZN-65	1.568E+02	NOT IDENT.
CU-67	9.647E+01	NOT IDENT.
GE-68	2.379E+03	NOT IDENT.
AS-73	4.427E+03	NOT IDENT.
AS-74	9.184E+01	NOT IDENT.
SE-75	8.266E+01	NOT IDENT.
BR-77	2.353E+02	NOT IDENT.
SR-82	3.451E+02	NOT IDENT.
RB-83	1.204E+02	NOT IDENT.

RB-84	9.700E+01	NOT IDENT.
KR-85	1.231E+04	NOT IDENT.
SR-85	5.539E+01	NOT IDENT.
RB-86	8.932E+02	NOT IDENT.
Y-88	1.822E+01	NOT IDENT.
Y-91	1.477E+04	NOT IDENT.
NB-94	4.708E+01	FAIL ABUN
NB-95	5.427E+01	NOT IDENT.
NB-95M	1.805E+02	NOT IDENT.
TC-95M	6.798E+01	NOT IDENT.
ZR-95	8.997E+01	NOT IDENT.
MO-99	4.730E+02	NOT IDENT.
TC-99M	1.463E+02	NOT IDENT.
RH-101	5.483E+01	FAIL ABUN
RH-102M	7.555E+01	NOT IDENT.
RU-103	6.748E+01	NOT IDENT.
RH-106	5.616E+02	NOT IDENT.
RU-106	5.616E+02	NOT IDENT.
AG-108M	7.203E+01	NOT IDENT.
CD-109	1.365E+03	NOT IDENT.
AG-110	1.343E+03	NOT IDENT.
AG-110M	8.872E+01	FAIL ABUN
IN-111	5.504E+01	NOT IDENT.
SN-113	8.526E+01	NOT IDENT.
IN-114M	2.788E+02	NOT IDENT.
CD-115	2.222E+02	NOT IDENT.
SN-117M	4.588E+01	NOT IDENT.
SB-122	8.648E+01	NOT IDENT.
I-123	8.299E+01	NOT IDENT.
TE-123M	4.670E+01	NOT IDENT.
SB-124	6.760E+01	NOT IDENT.
SB-125	2.205E+02	NOT IDENT.
I-126	1.591E+02	NOT IDENT.
SB-126	9.431E+01	NOT IDENT.
SN-126	1.355E+02	NOT IDENT.
SB-127	1.580E+02	NOT IDENT.
TE-129	9.515E+02	FAIL ABUN
I-131	6.392E+01	NOT IDENT.
I-132	1.268E+03	NOT IDENT.
TE-132	5.478E+01	NOT IDENT.
BA-133	8.612E+01	FAIL ABUN
I-133	8.979E+01	NOT IDENT.
CS-134	6.773E+01	NOT IDENT.
I-135	3.980E+02	NOT IDENT.
CS-136	9.368E+01	NOT IDENT.
LA-138	3.711E+01	NOT IDENT.
CE-139	4.723E+01	NOT IDENT.
BA-140	2.293E+02	NOT IDENT.
LA-140	2.403E+01	NOT IDENT.
CE-141	7.739E+01	NOT IDENT.
CE-143	1.440E+02	NOT IDENT.
CE-144	3.249E+02	NOT IDENT.
PM-144	5.146E+01	FAIL ABUN
PR-144	3.822E+03	NOT IDENT.
PM-146	1.089E+02	NOT IDENT.
ND-147	4.347E+02	NOT IDENT.
PM-147	1.334E+06	NOT IDENT.
PM-149	1.840E+03	NOT IDENT.
EU-152	2.012E+02	NOT IDENT.
GD-153	1.523E+02	NOT IDENT.
EU-154	1.308E+02	NOT IDENT.
EU-155	1.914E+02	NOT IDENT.
TB-160	2.146E+02	FAIL ABUN
HO-166M	8.653E+01	NOT IDENT.
TM-171	1.054E+05	FAIL ABUN
LU-176	5.391E+01	NOT IDENT.
LU-177	4.625E+02	NOT IDENT.
HF-181	8.520E+01	NOT IDENT.
W-181	1.340E+03	FAIL ABUN
TA-182	1.439E+02	FAIL ABUN
RE-183	1.502E+03	FAIL ABUN
RE-184	1.898E+02	NOT IDENT.
RE-188	2.376E+02	FAIL ABUN
W-188	1.194E+04	NOT IDENT.
OS-191	1.439E+02	NOT IDENT.
IR-192	6.097E+01	FAIL ABUN
PB-201	1.508E+02	NOT IDENT.
TL-201	4.214E+02	FAIL ABUN

TL-202	7.609E+01	FAIL ABUN
HG-203	5.730E+01	NOT IDENT.
PB-203	6.633E+01	NOT IDENT.
TL-204	9.889E+03	FAIL ABUN
BI-207	1.007E+02	NOT IDENT.
TL-208	6.369E+01	FAIL ABUN
BI-211	4.063E+02	NOT IDENT.
PB-211	1.588E+03	NOT IDENT.
BI-212	7.344E+02	NOT IDENT.
PB-212	1.074E+02	NOT IDENT.
BI-213	2.497E+02	NOT IDENT.
BI-214	1.185E+02	NOT IDENT.
PB-214	1.498E+02	NOT IDENT.
RN-219	8.790E+02	NOT IDENT.
FR-221	3.902E+02	NOT IDENT.
RA-223	1.226E+03	NOT IDENT.
RA-224	1.137E+03	NOT IDENT.
AC-225	4.026E+02	NOT IDENT.
RA-226	1.236E+03	NOT IDENT.
AC-227	4.669E+02	NOT IDENT.
TH-227	4.669E+02	NOT IDENT.
AC-228	2.858E+02	NOT IDENT.
RA-228	2.858E+02	NOT IDENT.
TH-228	1.074E+02	NOT IDENT.
TH-229	9.835E+02	NOT IDENT.
PA-231	8.828E+02	NOT IDENT.
TH-231	7.940E+02	NOT IDENT.
TH-232	4.468E+04	NOT IDENT.
PA-233	1.342E+02	NOT IDENT.
PA-234	6.385E+02	NOT IDENT.
PA-234M	9.394E+03	NOT IDENT.
TH-234	3.136E+03	NOT IDENT.
U-234	3.836E+05	NOT IDENT.
U-235	3.212E+02	NOT IDENT.
NP-237	1.342E+02	NOT IDENT.
NP-238	3.381E+02	NOT IDENT.
U-238	3.136E+03	NOT IDENT.
NP-239	4.773E+02	FAIL ABUN
AM-242	1.157E+03	NOT IDENT.
AM-243	1.005E+02	NOT IDENT.
CM-243	2.041E+02	FAIL ABUN
BK-247	1.636E+02	FAIL ABUN
CM-247	8.076E+01	FAIL ABUN
CF-249	8.303E+01	NOT IDENT.
CF-251	2.244E+02	NOT IDENT.
CF-252	3.166E+05	NOT IDENT.
ANH-511	6.050E+01	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205226446.CNF;1
* Acquisition date   : 31-OCT-2022 10:43:43 Sensitivity      : 3.000
* Detector ID        : GAM03 Energy tolerance: 1.500
* Elapsed live time   : 0 00:15:00.00 Abundance limit : 75.000
* Elapsed real time   : 0 00:15:01.59 Half life ratio  : *****
* Sample date         : 31-OCT-2022 00:00:00 Nuclide Library : LIQUID
* Sample ID           : G1205226446 Analyst initials: RXF2
* Batch Number        : 2333342 Sample Quantity  : 7.7722E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr         : 1.00000 Wet Weight      : 0.00000
*                               Dry Weight       : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 20-APR-2022 11:51:08 Eff. Geometry   : JAR
* Eff. File           : DKA100:[CANBERRA.GAMMA]EFF_GAM03_JAR.CNF;16

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.503E+03	9.694E+02	9.698E+02
CO-60	8.397E+03	8.929E+02	9.079E+02
TE-125M	1.039E+04	1.850E+04	1.851E+04
BA-137M	2.102E+04	1.773E+03	1.820E+03
CS-137	2.220E+04	1.871E+03	1.921E+03
PB-210	6.269E+05	9.226E+04	9.307E+04
TH-230	2.485E+04	4.035E+04	4.035E+04
AM-241	8.120E+04	7.761E+03	7.923E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	6.349E+01	4.397E+01	5.248E+01	NOT IDENT.
NA-24	3.011E+01	3.548E+01	3.799E+01	NOT IDENT.
AL-26	8.205E+00	2.034E+01	2.067E+01	NOT IDENT.
K-40	1.295E+02	2.687E+02	2.750E+02	NOT IDENT.
SC-46	5.654E+01	8.181E+01	8.570E+01	NOT IDENT.
V-48	5.074E+01	8.884E+01	9.175E+01	NOT IDENT.
CR-51	-4.109E+01	5.891E+02	5.894E+02	NOT IDENT.
MN-52	3.262E+01	3.133E+01	3.462E+01	NOT IDENT.
MN-54	9.075E+00	7.602E+01	7.613E+01	NOT IDENT.
CO-56	8.413E+00	7.920E+01	7.929E+01	NOT IDENT.
CO-57	-1.432E+01	5.100E+01	5.141E+01	NOT IDENT.
NI-57	5.061E+00	4.236E+01	4.242E+01	NOT IDENT.
CO-58	3.199E+01	7.524E+01	7.661E+01	NOT IDENT.
FE-59	-9.887E+01	1.652E+02	1.711E+02	NOT IDENT.
ZN-65	2.508E+01	1.898E+02	1.901E+02	NOT IDENT.
CU-67	-6.552E+01	1.146E+02	1.184E+02	NOT IDENT.
GE-68	1.650E+03	2.767E+03	2.866E+03	NOT IDENT.
AS-73	-7.454E+03	5.864E+03	6.760E+03	NOT IDENT.
AS-74	-1.084E+01	1.080E+02	1.081E+02	NOT IDENT.
SE-75	5.740E+01	9.639E+01	9.980E+01	NOT IDENT.
BR-77	7.527E+01	2.754E+02	2.775E+02	NOT IDENT.
SR-82	-9.320E+01	4.188E+02	4.209E+02	NOT IDENT.

RB-83	-1.008E+02	1.664E+02	1.725E+02	NOT IDENT.
RB-84	2.544E+01	1.146E+02	1.152E+02	NOT IDENT.
KR-85	-1.609E+04	1.741E+04	1.886E+04	NOT IDENT.
SR-85	-7.240E+01	7.835E+01	8.489E+01	NOT IDENT.
RB-86	3.315E+02	1.062E+03	1.073E+03	NOT IDENT.
Y-88	-4.814E-01	2.219E+01	2.219E+01	NOT IDENT.
Y-91	-1.451E+04	2.287E+04	2.379E+04	NOT IDENT.
NB-94	4.453E+00	5.526E+01	5.529E+01	FAIL ABUN
NB-95	1.440E+01	6.336E+01	6.369E+01	NOT IDENT.
NB-95M	-1.914E+02	2.228E+02	2.389E+02	NOT IDENT.
TC-95M	-2.087E+01	8.083E+01	8.138E+01	NOT IDENT.
ZR-95	3.631E+01	1.036E+02	1.049E+02	NOT IDENT.
MO-99	2.829E+02	5.377E+02	5.527E+02	NOT IDENT.
TC-99M	1.993E+01	1.686E+02	1.688E+02	NOT IDENT.
RH-101	-2.010E+01	6.403E+01	6.467E+01	FAIL ABUN
RH-102M	5.880E+01	1.018E+02	1.052E+02	NOT IDENT.
RU-103	-1.740E+01	7.879E+01	7.918E+01	NOT IDENT.
RH-106	2.711E+02	6.412E+02	6.527E+02	NOT IDENT.
RU-106	2.711E+02	6.412E+02	6.527E+02	NOT IDENT.
AG-108M	2.870E+01	8.730E+01	8.825E+01	NOT IDENT.
CD-109	3.183E+02	1.703E+03	1.709E+03	NOT IDENT.
AG-110	2.198E+02	1.776E+03	1.779E+03	NOT IDENT.
AG-110M	8.925E+01	2.365E+02	2.399E+02	FAIL ABUN
IN-111	3.890E+01	6.391E+01	6.628E+01	NOT IDENT.
SN-113	-5.501E+01	1.071E+02	1.100E+02	NOT IDENT.
IN-114M	-1.755E+02	3.339E+02	3.431E+02	NOT IDENT.
CD-115	-1.734E+02	2.679E+02	2.791E+02	NOT IDENT.
SN-117M	2.971E+01	5.230E+01	5.399E+01	NOT IDENT.
SB-122	1.987E+01	9.954E+01	9.995E+01	NOT IDENT.
I-123	8.476E+01	9.361E+01	1.011E+02	NOT IDENT.
TE-123M	4.757E+01	5.268E+01	5.689E+01	NOT IDENT.
SB-124	4.257E+01	6.863E+01	7.127E+01	NOT IDENT.
SB-125	1.297E+02	2.652E+02	2.715E+02	NOT IDENT.
I-126	2.236E+01	2.107E+02	2.109E+02	NOT IDENT.
SB-126	-2.215E+01	1.135E+02	1.139E+02	NOT IDENT.
SN-126	-1.227E+02	1.762E+02	1.847E+02	NOT IDENT.
SB-127	1.795E+02	1.735E+02	1.915E+02	NOT IDENT.
TE-129	4.307E+02	1.158E+03	1.175E+03	FAIL ABUN
I-131	-8.977E+01	8.280E+01	9.217E+01	NOT IDENT.
I-132	1.616E+02	1.680E+03	1.681E+03	NOT IDENT.
TE-132	-5.078E+01	6.716E+01	7.096E+01	NOT IDENT.
BA-133	-2.018E+01	1.057E+02	1.060E+02	FAIL ABUN
I-133	1.055E+01	1.036E+02	1.037E+02	NOT IDENT.
CS-134	-3.907E+01	8.385E+01	8.569E+01	NOT IDENT.
I-135	4.371E+01	4.572E+02	4.576E+02	NOT IDENT.
CS-136	2.398E+01	1.121E+02	1.126E+02	NOT IDENT.
LA-138	-1.922E+01	4.927E+01	5.003E+01	NOT IDENT.
CE-139	-9.134E+00	5.546E+01	5.561E+01	NOT IDENT.
BA-140	1.446E+01	2.654E+02	2.655E+02	NOT IDENT.
LA-140	3.473E+00	2.731E+01	2.736E+01	NOT IDENT.
CE-141	-3.468E+00	8.970E+01	8.971E+01	NOT IDENT.
CE-143	4.696E+01	1.708E+02	1.721E+02	NOT IDENT.
CE-144	4.522E+01	3.735E+02	3.741E+02	NOT IDENT.
PM-144	1.745E+01	5.943E+01	5.994E+01	FAIL ABUN
PR-144	1.296E+03	4.413E+03	4.452E+03	NOT IDENT.
PM-146	-9.026E+00	1.348E+02	1.349E+02	NOT IDENT.
ND-147	7.138E+01	5.004E+02	5.014E+02	NOT IDENT.
PM-147	-6.377E+05	1.558E+06	1.584E+06	NOT IDENT.
PM-149	2.356E+02	2.196E+03	2.199E+03	NOT IDENT.
EU-152	9.505E+01	2.395E+02	2.433E+02	NOT IDENT.
GD-153	-4.433E-01	1.922E+02	1.922E+02	NOT IDENT.
EU-154	1.822E+02	1.257E+02	1.502E+02	NOT IDENT.
EU-155	-1.498E+02	2.499E+02	2.589E+02	NOT IDENT.
TB-160	1.320E+01	2.567E+02	2.568E+02	FAIL ABUN
HO-166M	-3.806E+01	1.057E+02	1.070E+02	NOT IDENT.
TM-171	-2.200E+05	1.375E+05	1.696E+05	FAIL ABUN
LU-176	4.957E+01	6.975E+01	7.325E+01	NOT IDENT.
LU-177	3.079E+02	5.344E+02	5.521E+02	NOT IDENT.
HF-181	7.196E+01	1.142E+02	1.187E+02	NOT IDENT.
W-181	1.434E+04	3.993E+03	7.602E+03	FAIL ABUN
TA-182	-9.537E+01	1.824E+02	1.874E+02	FAIL ABUN
RE-183	2.522E+04	3.289E+03	1.185E+04	FAIL ABUN
RE-184	6.938E+01	2.234E+02	2.256E+02	NOT IDENT.
RE-188	-7.245E+01	2.790E+02	2.809E+02	FAIL ABUN
W-188	1.847E+02	1.433E+04	1.433E+04	NOT IDENT.
OS-191	3.901E+01	1.646E+02	1.655E+02	NOT IDENT.
IR-192	2.778E+01	8.069E+01	8.166E+01	FAIL ABUN
PB-201	-4.154E+01	1.845E+02	1.855E+02	NOT IDENT.

TL-201	2.073E+02	4.838E+02	4.928E+02	FAIL ABUN
TL-202	-1.361E+00	9.380E+01	9.380E+01	FAIL ABUN
HG-203	1.925E+01	7.563E+01	7.612E+01	NOT IDENT.
PB-203	2.228E+01	8.754E+01	8.812E+01	NOT IDENT.
TL-204	7.636E+02	1.336E+04	1.336E+04	FAIL ABUN
BI-207	-1.394E+01	1.239E+02	1.241E+02	NOT IDENT.
TL-208	1.057E+00	7.402E+01	7.402E+01	FAIL ABUN
BI-211	-8.555E+01	4.967E+02	4.982E+02	NOT IDENT.
PB-211	2.762E+02	1.932E+03	1.936E+03	NOT IDENT.
BI-212	1.104E+02	8.606E+02	8.621E+02	NOT IDENT.
PB-212	8.583E+00	1.267E+02	1.267E+02	NOT IDENT.
BI-213	-3.250E+02	3.243E+02	3.559E+02	NOT IDENT.
BI-214	-8.168E+00	1.388E+02	1.389E+02	NOT IDENT.
PB-214	1.380E+01	1.809E+02	1.810E+02	NOT IDENT.
RN-219	-7.315E+02	1.118E+03	1.165E+03	NOT IDENT.
FR-221	-1.239E+02	4.661E+02	4.694E+02	NOT IDENT.
RA-223	2.275E+02	1.470E+03	1.474E+03	NOT IDENT.
RA-224	1.433E+02	1.345E+03	1.347E+03	NOT IDENT.
AC-225	-1.279E+02	4.809E+02	4.844E+02	NOT IDENT.
RA-226	8.312E+02	1.410E+03	1.459E+03	NOT IDENT.
AC-227	-6.348E+02	5.917E+02	6.574E+02	NOT IDENT.
TH-227	-6.348E+02	5.917E+02	6.574E+02	NOT IDENT.
AC-228	1.307E+02	3.336E+02	3.388E+02	NOT IDENT.
RA-228	1.307E+02	3.336E+02	3.388E+02	NOT IDENT.
TH-228	8.583E+00	1.267E+02	1.267E+02	NOT IDENT.
TH-229	2.729E+02	1.274E+03	1.280E+03	NOT IDENT.
PA-231	-6.244E+02	1.101E+03	1.136E+03	NOT IDENT.
TH-231	4.970E+02	9.754E+02	1.001E+03	NOT IDENT.
TH-232	9.005E+04	6.306E+04	7.501E+04	NOT IDENT.
PA-233	7.023E+01	1.586E+02	1.618E+02	NOT IDENT.
PA-234	-2.083E+02	8.216E+02	8.269E+02	NOT IDENT.
PA-234M	4.191E+03	1.106E+04	1.122E+04	NOT IDENT.
TH-234	-3.287E+01	4.213E+03	4.213E+03	NOT IDENT.
U-234	-6.084E+05	4.923E+05	5.637E+05	NOT IDENT.
U-235	-2.675E+02	3.824E+02	4.010E+02	NOT IDENT.
NP-237	7.023E+01	1.586E+02	1.618E+02	NOT IDENT.
NP-238	3.591E+01	4.068E+02	4.072E+02	NOT IDENT.
U-238	-3.287E+01	4.213E+03	4.213E+03	NOT IDENT.
NP-239	-2.895E+02	5.588E+02	5.739E+02	FAIL ABUN
AM-242	2.829E+02	1.310E+03	1.316E+03	NOT IDENT.
AM-243	-6.913E+01	1.288E+02	1.325E+02	NOT IDENT.
CM-243	3.076E+02	2.252E+02	2.645E+02	FAIL ABUN
BK-247	1.352E+02	1.918E+02	2.013E+02	FAIL ABUN
CM-247	-1.931E+01	9.993E+01	1.003E+02	FAIL ABUN
CF-249	-5.957E+01	1.047E+02	1.081E+02	NOT IDENT.
CF-251	-4.127E+01	2.642E+02	2.648E+02	NOT IDENT.
CF-252	-2.197E+04	3.628E+05	3.630E+05	NOT IDENT.
ANH-511	-1.041E+01	7.764E+01	7.778E+01	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	929.4565	133.52	291.9591	116.30	320.8926
879.38	892.1932	364.49	291.9977	116.74	324.5381
46.54	894.4645	80.22	305.3447	117.23	298.1378
228.16	886.8773	711.68	300.6947	119.76	293.2095
52.39	895.5073	356.01	319.1427	120.54	309.0820
53.20	1065.4126	323.87	319.1849	120.90	318.7441
53.44	1096.9287	82.35	312.6521	264.66	318.8455
57.53	1199.3304	82.47	312.7227	121.22	327.5345
293.27	788.6453	82.47	312.7246	344.28	322.6091
57.53	788.9606	83.79	276.8953	122.06	314.0875
482.18	788.9658	265.00	277.0026	1274.44	306.7431
57.98	789.7943	84.21	277.1100	123.68	296.6025
59.32	792.2590	84.86	301.8849	1377.63	309.3945
59.54	792.6603	193.51	313.2090	127.23	316.3944
155.04	335.7279	105.31	300.3620	129.43	292.8856
63.00	308.7919	86.79	309.0764	131.20	290.0930
129.43	308.9903	86.94	309.1610	133.02	290.8136
63.29	308.9903	87.09	309.2437	133.52	276.9420
290.67	295.1342	87.57	353.7268	135.34	305.8241
63.81	243.7262	88.03	315.9128	136.00	294.6284
87.57	300.2813	306.78	319.7771	136.28	293.8546
64.99	307.0121	88.47	319.8505	136.47	308.0519
65.08	307.0730	531.02	359.6583	739.50	296.3883
66.73	285.3699	184.58	388.1927	140.51	296.3883
66.98	285.5213	92.59	322.1713	140.88	284.1016
67.24	285.6801	93.31	336.2172	143.76	295.8564
67.67	285.9404	94.56	345.6420	144.24	288.9053
1221.41	285.9884	311.90	345.6951	145.44	292.9225
439.51	312.7386	946.00	345.7057	152.32	287.3544
70.82	312.7386	97.43	318.5846	152.43	282.8887
167.43	312.7407	98.43	306.1843	1048.07	293.0964
97.43	300.5937	98.44	306.1899	154.21	291.6345
70.82	299.7210	99.53	285.8471	155.04	295.5487
70.82	299.7230	103.37	285.8471	158.56	304.9503
279.20	299.7287	116.74	285.8471	158.97	270.6203
1063.66	317.6609	100.11	296.9962	159.00	270.6294
72.87	317.6995	100.20	297.0395	162.33	292.6761
351.06	317.6995	102.03	331.4952	537.26	283.6692
74.66	329.6299	103.18	289.2317	163.33	286.6323
238.63	339.3271	103.37	269.1357	165.86	290.2286
351.93	339.3271	105.31	337.8852	167.43	265.9956
238.63	339.3271	106.12	337.0500	245.35	286.5196
74.97	339.4286	106.47	337.2367	427.87	290.9317
77.11	328.8156	109.28	308.1590	176.60	291.9511
256.23	328.0338	111.00	330.6809	177.52	290.3936
79.82	291.7936	111.76	322.1175	181.07	269.1824
80.02	291.9040	208.37	303.9185	184.41	344.0117
80.03	291.9058	116.24	321.7220	184.58	329.1156

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	324.8395	300.09	242.8169	477.60	225.4610
186.21	311.8996	300.13	242.8217	477.99	204.0038
190.27	352.7603	301.36	244.0889	482.18	204.4644
193.51	312.9057	302.85	209.6349	487.02	213.7569
197.03	304.1082	304.50	220.2049	492.35	182.7332
198.01	295.8801	304.85	221.8230	497.08	187.5938
201.83	286.7565	306.78	211.1971	511.00	157.5504
204.12	308.2241	308.46	230.7838	514.00	163.4805
205.31	329.6107	311.90	231.3773	520.40	154.0318
208.37	303.7852	316.51	215.8812	520.69	154.0529
210.85	331.4322	319.41	211.6037	667.71	138.7037
215.65	304.0347	320.08	208.5461	527.90	144.9487
218.12	310.5638	321.04	228.7215	529.59	131.6396
222.11	321.4610	323.87	207.0099	529.87	127.1794
227.09	273.2097	325.23	199.8127	531.02	129.9416
227.38	273.2837	1596.21	235.2969	537.26	126.7485
228.16	307.6685	331.15	242.0691	1260.41	112.8807
228.18	307.6749	333.37	229.6890	552.55	105.9634
235.69	311.7760	334.37	227.7233	795.86	95.5856
235.96	311.8502	338.28	212.3444	564.24	112.9351
238.63	285.9821	911.20	212.3485	569.33	98.6001
238.98	286.0706	340.48	216.9430	569.50	89.4794
240.99	283.6221	340.55	216.9554	569.70	90.4016
242.00	274.9769	344.28	217.5171	582.08	105.6226
244.70	257.7915	345.93	204.8921	583.19	109.3509
245.35	250.9951	351.06	224.9922	595.83	107.2172
459.60	255.1484	351.93	220.8154	600.60	98.1878
685.70	257.5407	356.01	231.1454	604.72	89.0918
388.16	261.6242	361.25	217.8686	609.32	103.2258
256.23	290.4395	364.49	234.6328	610.33	95.8301
527.90	265.4556	366.42	213.1787	614.28	119.2969
264.66	250.1544	383.85	232.1034	618.01	112.0276
265.00	250.2251	388.16	231.6357	621.93	95.3884
269.46	237.9930	666.33	228.3940	630.19	90.1055
401.81	259.2297	391.70	229.9417	631.29	109.8696
273.65	246.9402	400.66	210.1064	632.98	106.1892
276.40	242.4015	401.32	229.0970	633.25	106.2030
583.19	242.5952	401.81	250.3052	634.78	115.6766
277.60	242.6388	402.40	230.3650	635.95	106.3272
402.40	242.7162	404.85	228.4812	636.99	108.2582
278.43	242.8034	410.95	243.8751	657.50	110.9222
279.20	223.5580	720.70	223.1260	884.68	110.9365
279.54	258.8431	423.72	249.1286	661.66	99.8923
280.46	243.7114	427.09	271.0889	664.57	74.6771
301.36	234.6048	427.87	237.3096	666.33	77.7825
284.31	224.4714	433.94	235.8874	666.50	77.7875
285.41	245.1850	439.51	267.3680	667.71	67.1451
285.90	254.5189	440.45	289.1400	677.62	55.5468
287.50	258.9521	453.88	279.8862	685.70	60.5371
290.67	235.9047	459.60	268.1216	692.65	68.4172
293.27	234.3154	463.37	279.0641	695.00	79.0922
295.22	245.0090	468.07	311.0039	696.49	68.5234
316.51	237.9081	473.00	288.6560	696.51	68.5234
298.58	236.3171	475.06	236.7549	697.00	68.5386
299.98	239.6804	696.49	261.3739	697.49	66.6205

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
702.65	60.9543	903.28	87.4120	1291.59	8.3654
706.68	70.7433	907.67	102.1272	1298.22	8.3791
711.68	68.9438	911.20	87.6401	1312.11	9.3418
720.70	71.1376	984.45	102.6715	1332.49	8.4494
721.93	80.9230	926.36	94.3643	1365.19	1.8923
1690.97	60.4674	935.54	99.8996	1368.63	0.9469
722.91	60.4712	937.49	113.6426	1377.63	4.7446
723.31	69.2601	983.53	107.5563	1384.29	4.7520
756.73	76.1147	945.96	108.6737	1408.01	6.6893
727.33	61.5542	946.00	108.6737	1434.09	1.9227
733.00	53.8553	949.00	114.0579	1435.80	7.6937
735.93	58.8190	954.55	111.0851	1457.56	4.8320
739.50	56.9362	962.31	104.9941	1460.82	2.9014
1434.09	61.9579	964.08	100.8070	1489.16	1.9464
747.24	64.9828	966.17	77.5135	1596.21	2.9870
752.31	56.2311	968.97	77.5803	1620.50	5.0034
753.82	71.0684	983.53	75.7950	1678.03	2.0247
756.73	52.3724	984.45	84.3594	1690.97	3.0448
763.94	48.5514	996.26	88.9525	1757.55	3.0845
765.80	66.4336	1001.03	85.8618	1764.49	3.0886
1001.03	64.4644	1004.73	109.5952	1770.23	7.2146
766.84	75.3877	1025.87	81.0986	1771.35	8.2469
772.60	74.5560	1028.54	84.4080	1791.20	2.0695
776.52	68.6905	1037.84	66.1938	1808.65	1.0381
777.92	69.7223	1038.76	73.8105	1836.06	2.0869
778.90	66.7587	1046.59	76.1566		
783.70	53.9011	1048.07	71.8370		
1435.80	79.0024	1050.41	89.3121		
903.28	71.0888	1063.66	82.0038		
795.86	89.2336	1077.00	71.3397		
801.95	85.4124	1077.34	65.8594		
802.10	90.4422	1083.85	81.3801		
810.29	74.5826	1085.87	72.6226		
810.45	74.5872	1099.25	82.8369		
810.76	81.6526	1111.64	76.4753		
815.77	94.9266	1112.07	75.3752		
818.51	75.8125	1112.84	75.3918		
832.01	80.2392	1115.54	77.6691		
834.85	84.3855	1120.29	65.5504		
835.15	84.3957	1120.55	65.5540		
836.80	88.5134	1121.30	71.1250		
846.77	88.8214	1808.65	47.8973		
856.80	69.6643	1131.51	43.4632		
860.56	78.7805	1332.49	37.8718		
871.09	102.1244	1177.95	39.1227		
873.19	80.3566	1189.05	29.8821		
875.33	82.4780	1204.77	25.7615		
879.38	79.4932	1221.41	22.8296		
880.51	79.5237	1231.02	21.9703		
881.60	79.5519	1235.36	14.6633		
883.24	79.5966	1238.28	17.4256		
884.68	86.0463	1260.41	12.9124		
889.28	73.3936	1271.87	20.3489		
894.76	96.5051	1274.44	6.4788		
1836.06	94.5325	1274.54	6.4791		

Continuing Calibration Data

Review of Gamma Spectrometer QA results (Daily calibration & background checks)
31-OCT-2022 08:57:39

Run Date	Detector	Parameter	Flag	Status	Comments
31-OCT-22	GAM01	All Parameters Passed			
31-OCT-22	GAM02	Cal Check PSFWHM-59	Investigate		
31-OCT-22	GAM03	Cal Check NLACTVTY-1332	Investigate		
31-OCT-22	GAM04	Cal Check PSFWHM-1332	Investigate		
31-OCT-22	GAM05	Cal Check PSFWHM-59	Action	Lockout	Detector locked out.
31-OCT-22	GAM05	Cal Check PSFWHM-662	Investigate		
31-OCT-22	GAM05	Cal Check PSFWHM-1332	Action	Lockout	Detector locked out.
31-OCT-22	GAM06	Cal Check PSFWHM-59	Action	Approved	Low FWHM, approved for use.
31-OCT-22	GAM06	Cal Check NLACTVTY-59	Investigate		
31-OCT-22	GAM07	Cal Check PSFWHM-1332	Action	Approved	Low FWHM, approved for use.
31-OCT-22	GAM08	All Parameters Passed			
31-OCT-22	GAM09	Cal Check NLACTVTY-1332	Investigate		
31-OCT-22	GAM10	Cal Check PSFWHM-59	Action	Approved	Low FWHM, approved for use.
31-OCT-22	GAM10	Bkg Check BACKRATE	Above		Spectrum good approved for use
31-OCT-22	GAM11	Cal Check NLACTVTY-662	Investigate		
31-OCT-22	GAM12	All Parameters Passed			
31-OCT-22	GAM14	Cal Check NLACTVTY-1332	Investigate		
31-OCT-22	GAM16	All Parameters Passed			
31-OCT-22	GAM18	Cal Check PSFWHM-59	Investigate		
31-OCT-22	GAM19	All Parameters Passed			
31-OCT-22	GAM20	All Parameters Passed			
	GAM21	Cal Check may not have run since 31-OCT-2022			Detector locked out.
	GAM21	Bkg Check may not have run since 31-OCT-2022			Detector locked out.
	GAM22	Cal Check may not have run since 31-OCT-2022			Detector locked out.
05-APR-20	GAM22	Bkg Check may not have run since 31-OCT-2022			Detector locked out.
31-OCT-22	GAM23	All Parameters Passed			
31-OCT-22	GAM24	Cal Check PSFWHM-1332	Investigate		
31-OCT-22	GAM24	Cal Check NLACTVTY-662	Investigate		
31-OCT-22	GAM26	Bkg Check BACKRATE	Above		Spectrum good approved for use
31-OCT-22	GAM27	All Parameters Passed			
31-OCT-22	GAM28	All Parameters Passed			
31-OCT-22	GAM29	All Parameters Passed			
31-OCT-22	GAM30	All Parameters Passed			
31-OCT-22	GAM31	Cal Check PSFWHM-662	Investigate		
31-OCT-22	GAM32	Cal Check NLACTVTY-1332	Investigate		
31-OCT-22	GAM33	All Parameters Passed			
31-OCT-22	GAM34	All Parameters Passed			
31-OCT-22	GAM36	Cal Check PSFWHM-59	Investigate		
31-OCT-22	GAM38	Cal Check PSFWHM-662	Investigate		
31-OCT-22	GAM38	Cal Check PSFWHM-1332	Investigate		
31-OCT-22	GAM40	Cal Check NLACTVTY-662	Investigate		
30-OCT-22	GAM41	Cal Check may not have run since 31-OCT-2022			Detector locked out.
31-OCT-22	GAM43	All Parameters Passed			
31-OCT-22	GAM44	All Parameters Passed			Detector locked out.
31-OCT-22	GAM45	All Parameters Passed			
31-OCT-22	GAM46	Cal Check NLACTVTY-59	Investigate		

31-OCT-22	GAM47	All Parameters Passed			
31-OCT-22	XRAY1	All Parameters Passed			
31-OCT-22	XRAY2	All Parameters Passed			
31-OCT-22	XRAY3	Cal Check PSFWHM-30	Action	Approved	Low FWHM, approved for use.
31-OCT-22	XRAY3	Cal Check PSFWHM-40	Action	Approved	Low FWHM, approved for use.
31-OCT-22	XRAY4	All Parameters Passed			
31-OCT-22	XRAY6	All Parameters Passed			
31-OCT-22	XRAY7	Cal Check PSFWHM-30	Investigate		
31-OCT-22	XRAY7	Cal Check PSFWHM-34	Investigate		
31-OCT-22	XRAY7	Cal Check NLACTIONTY-30	Investigate		

APPROVAL DATE: 31-OCT-2022

APPROVAL TIME: 09:47:37

APPROVED BY: Rebekah Futch

PROCEDURE # GL-RAD-I-001

The Investigate flag does not indicate a lockout and is approved for use. Action flags that have not been approved are locked out of service.

Review of Gamma Spectrometer QA results (Daily calibration & background checks)
01-NOV-2022 12:46:11

Run Date	Detector	Parameter	Flag	Status	Comments
01-NOV-22	GAM01	All Parameters Passed			
01-NOV-22	GAM02	Cal Check PSFWHM-59	Action	Approved	Low FWHM, approved for use.
01-NOV-22	GAM03	All Parameters Passed			
01-NOV-22	GAM04	Cal Check PSFWHM-662	Action	Approved	Low FWHM, approved for use.
01-NOV-22	GAM04	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	GAM05	Cal Check PSFWHM-59	Action	Lockout	Detector locked out.
01-NOV-22	GAM05	Cal Check PSFWHM-662	Action	Lockout	Detector locked out.
01-NOV-22	GAM05	Cal Check NLACTVTY-1332	Action	Lockout	Detector locked out.
01-NOV-22	GAM05	Bkg Check BACKRATE	Investigate		
01-NOV-22	GAM06	Cal Check PSFWHM-59	Investigate		
01-NOV-22	GAM06	Cal Check PSFWHM-662	Investigate		
01-NOV-22	GAM06	Cal Check NLACTVTY-662	Investigate		
01-NOV-22	GAM06	Cal Check NLACTVTY-1332	Investigate		
01-NOV-22	GAM07	All Parameters Passed			
01-NOV-22	GAM08	All Parameters Passed			
01-NOV-22	GAM09	All Parameters Passed			
01-NOV-22	GAM10	Cal Check PSFWHM-59	Investigate		
01-NOV-22	GAM10	Cal Check PSFWHM-1332	Investigate		
01-NOV-22	GAM10	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	GAM11	All Parameters Passed			
01-NOV-22	GAM12	Cal Check NLACTVTY-662	Investigate		
01-NOV-22	GAM12	Cal Check NLACTVTY-1332	Investigate		
01-NOV-22	GAM14	All Parameters Passed			
01-NOV-22	GAM16	All Parameters Passed			
01-NOV-22	GAM18	All Parameters Passed			
01-NOV-22	GAM19	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	GAM20	Cal Check PSFWHM-662	Investigate		
01-NOV-22	GAM20	Cal Check PSFWHM-1332	Investigate		
	GAM21	Cal Check may not have run since 1-NOV-2022			Detector locked out.
	GAM21	Bkg Check may not have run since 1-NOV-2022			Detector locked out.
	GAM22	Cal Check may not have run since 1-NOV-2022			Detector locked out.
05-APR-20	GAM22	Bkg Check may not have run since 1-NOV-2022			Detector locked out.
01-NOV-22	GAM23	Cal Check PSFWHM-662	Investigate		
01-NOV-22	GAM24	Cal Check PSFWHM-662	Investigate		
01-NOV-22	GAM26	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	GAM27	Bkg Check BACKRATE	Action	Approved	
01-NOV-22	GAM28	All Parameters Passed			
01-NOV-22	GAM29	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	GAM30	All Parameters Passed			
01-NOV-22	GAM31	All Parameters Passed			
01-NOV-22	GAM32	All Parameters Passed			
01-NOV-22	GAM33	All Parameters Passed			
01-NOV-22	GAM34	All Parameters Passed			
01-NOV-22	GAM36	All Parameters Passed			
01-NOV-22	GAM38	Cal Check PSFWHM-1332	Investigate		
01-NOV-22	GAM38	Bkg Check BACKRATE	Above		Spectrum good approved for use

01-NOV-22	GAM40	Cal Check NLACTVTY-59	Investigate		
01-NOV-22	GAM40	Bkg Check BACKRATE	Above		Spectrum good approved for use
30-OCT-22	GAM41	Cal Check may not have run since 1-NOV-2022			
01-NOV-22	GAM41	Bkg Check BACKRATE	Action	Lockout	Detector locked out.
01-NOV-22	GAM43	All Parameters Passed			
01-NOV-22	GAM44	Cal Check NLACTVTY-1332	Investigate		
01-NOV-22	GAM45	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	GAM46	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	GAM47	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	XRAY1	Cal Check NLACTVTY-30	Investigate		
01-NOV-22	XRAY1	Cal Check NLACTVTY-40	Investigate		
01-NOV-22	XRAY1	Bkg Check BACKRATE	Action	Approved	
01-NOV-22	XRAY2	Cal Check NLACTVTY-34	Investigate		
01-NOV-22	XRAY3	All Parameters Passed			
01-NOV-22	XRAY4	Cal Check PSFWHM-34	Investigate		
01-NOV-22	XRAY4	Bkg Check BACKRATE	Investigate		
01-NOV-22	XRAY6	Cal Check PSFWHM-30	Investigate		
01-NOV-22	XRAY6	Bkg Check BACKRATE	Above		Spectrum good approved for use
01-NOV-22	XRAY7	Cal Check PSFWHM-30	Investigate		
01-NOV-22	XRAY7	Cal Check PSFWHM-34	Action	Approved	Low FWHM, approved for use.
01-NOV-22	XRAY7	Cal Check NLACTVTY-30	Investigate		
01-NOV-22	XRAY7	Bkg Check BACKRATE	Above		Spectrum good approved for use

APPROVAL DATE: 01-NOV-2022

APPROVAL TIME: 12:58:05

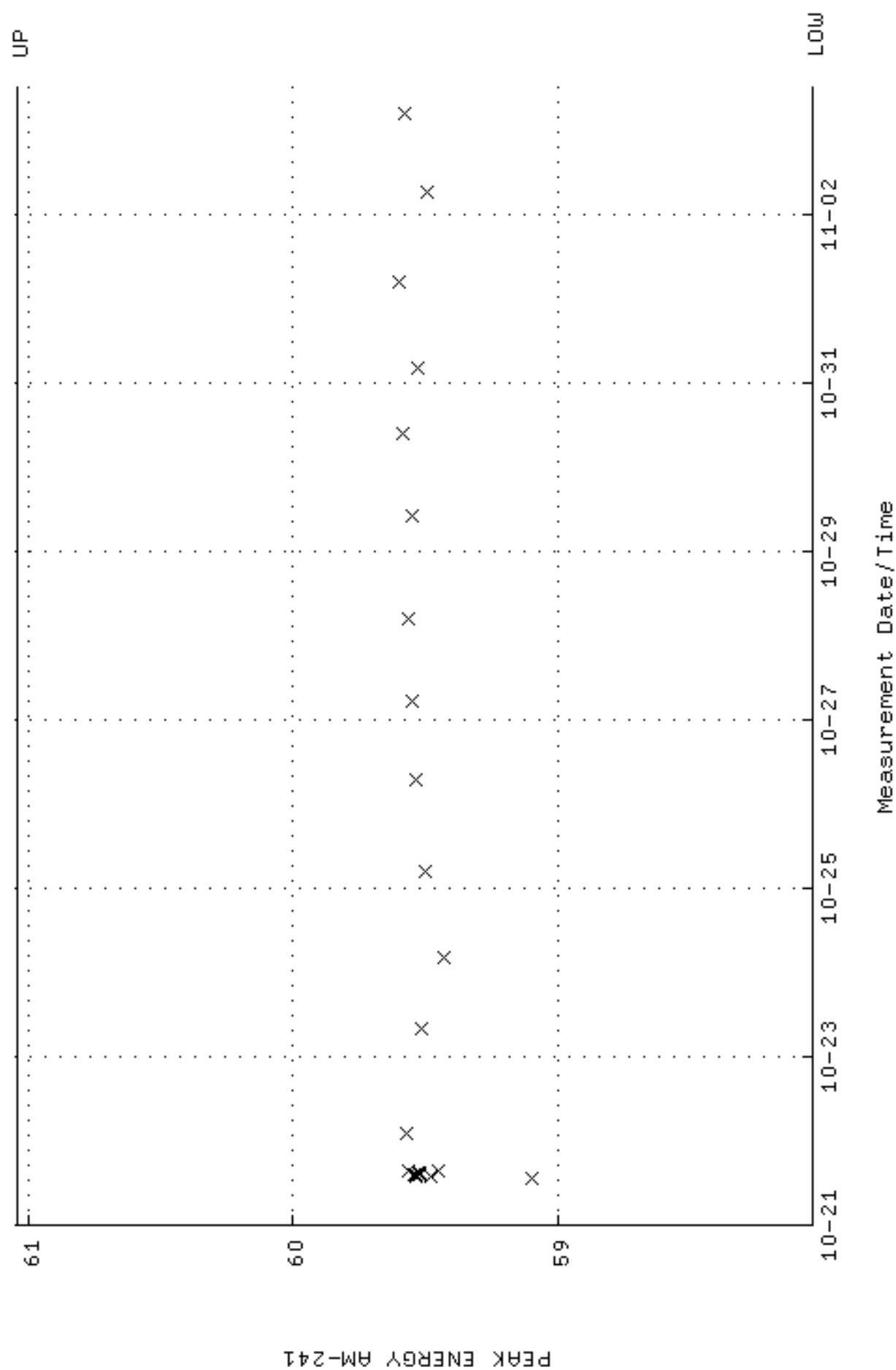
APPROVED BY: Rebekah Futch

PROCEDURE # GL-RAD-I-001

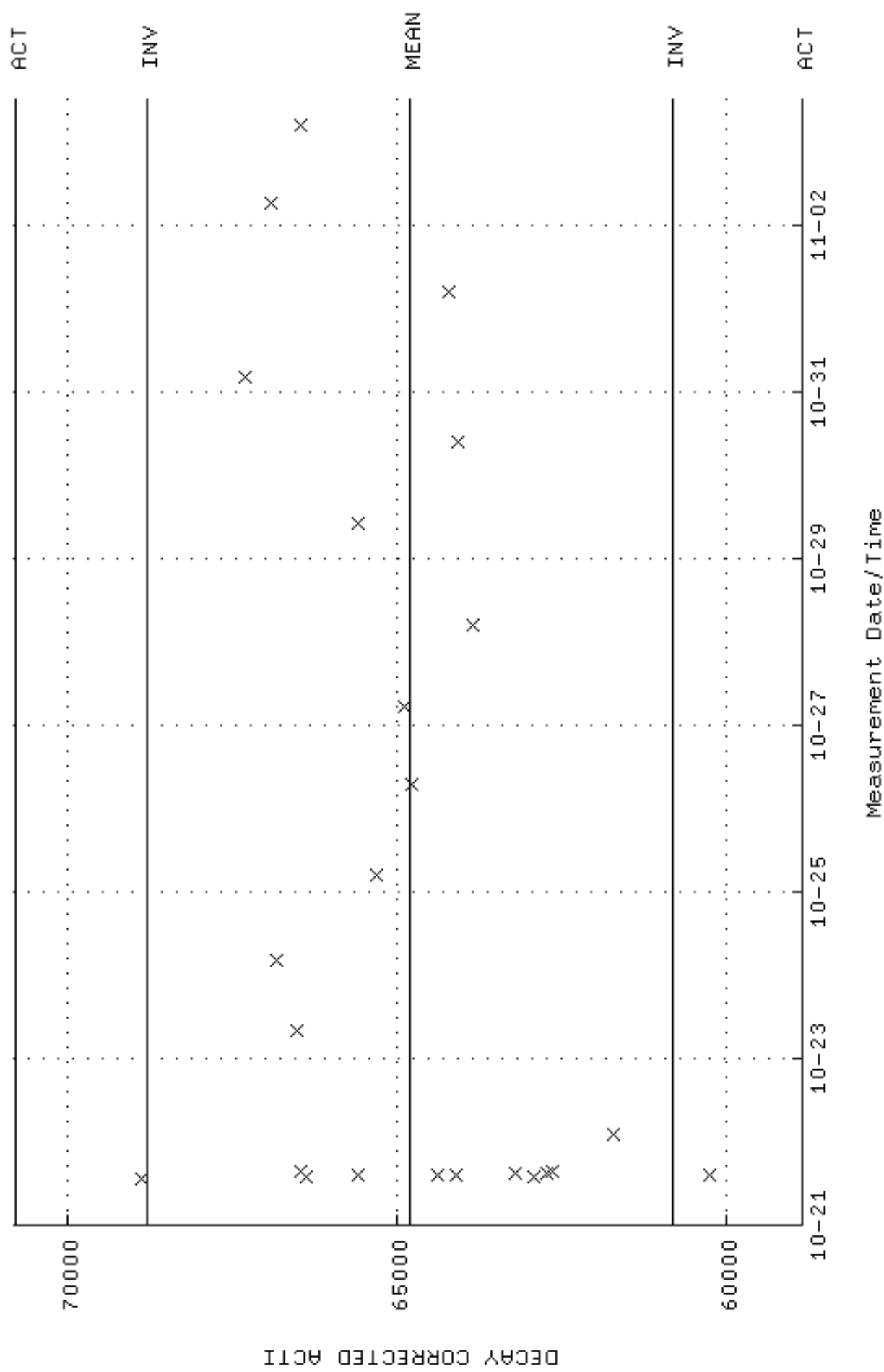
The Investigate flag does not indicate a lockout and is approved for use. Action flags that have not been approved are locked out of service.

Background and Efficiency Data

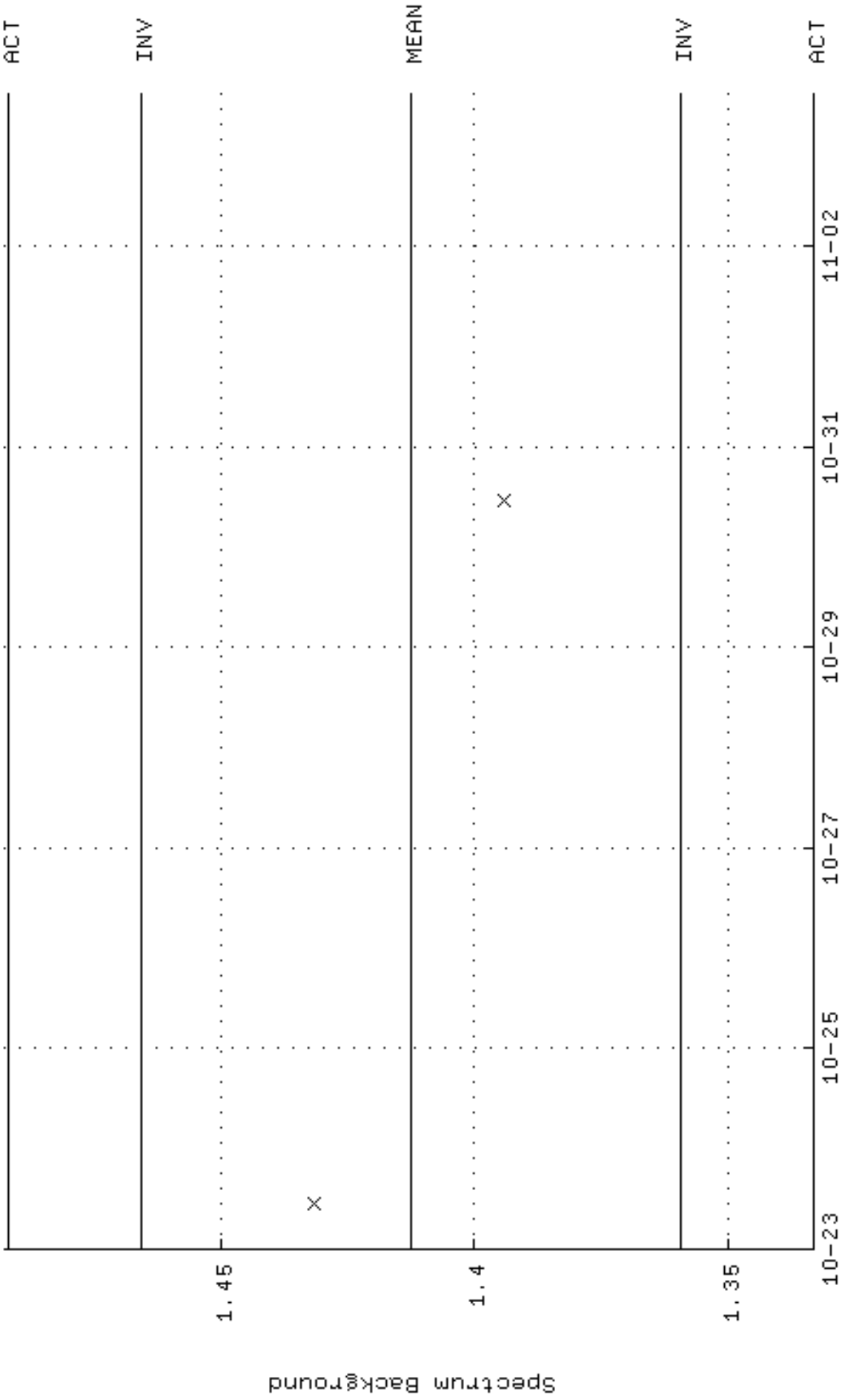
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM03_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 21-OCT-2022 13:14:47 through 3-NOV-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



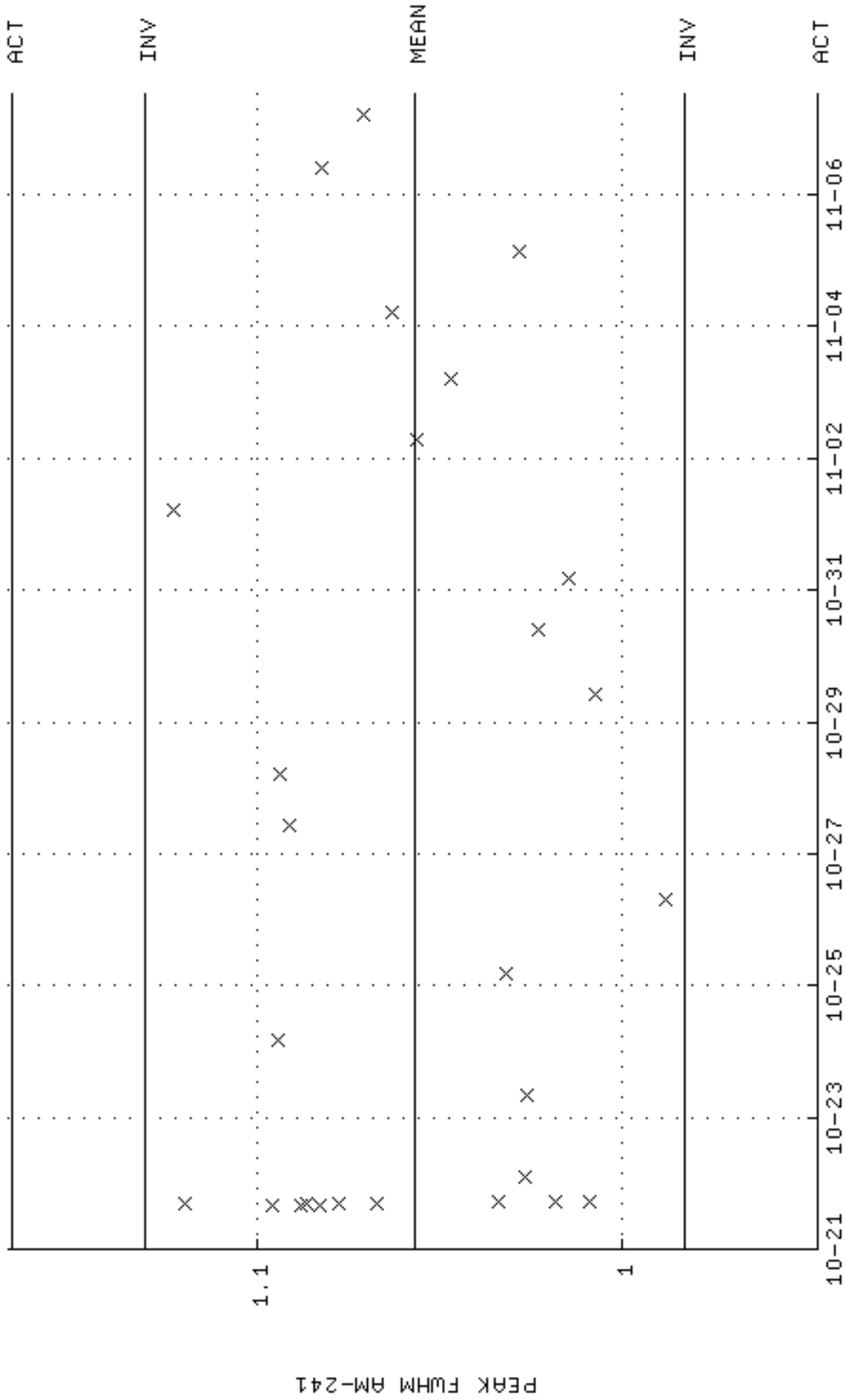
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM03_CAN.QAF;1
Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 21-OCT-2022 13:14:47 through 3-NOV-2022 12:00:00
Mean +- Std Dev : 64822.1 +- 1989.62 (3.07 %)



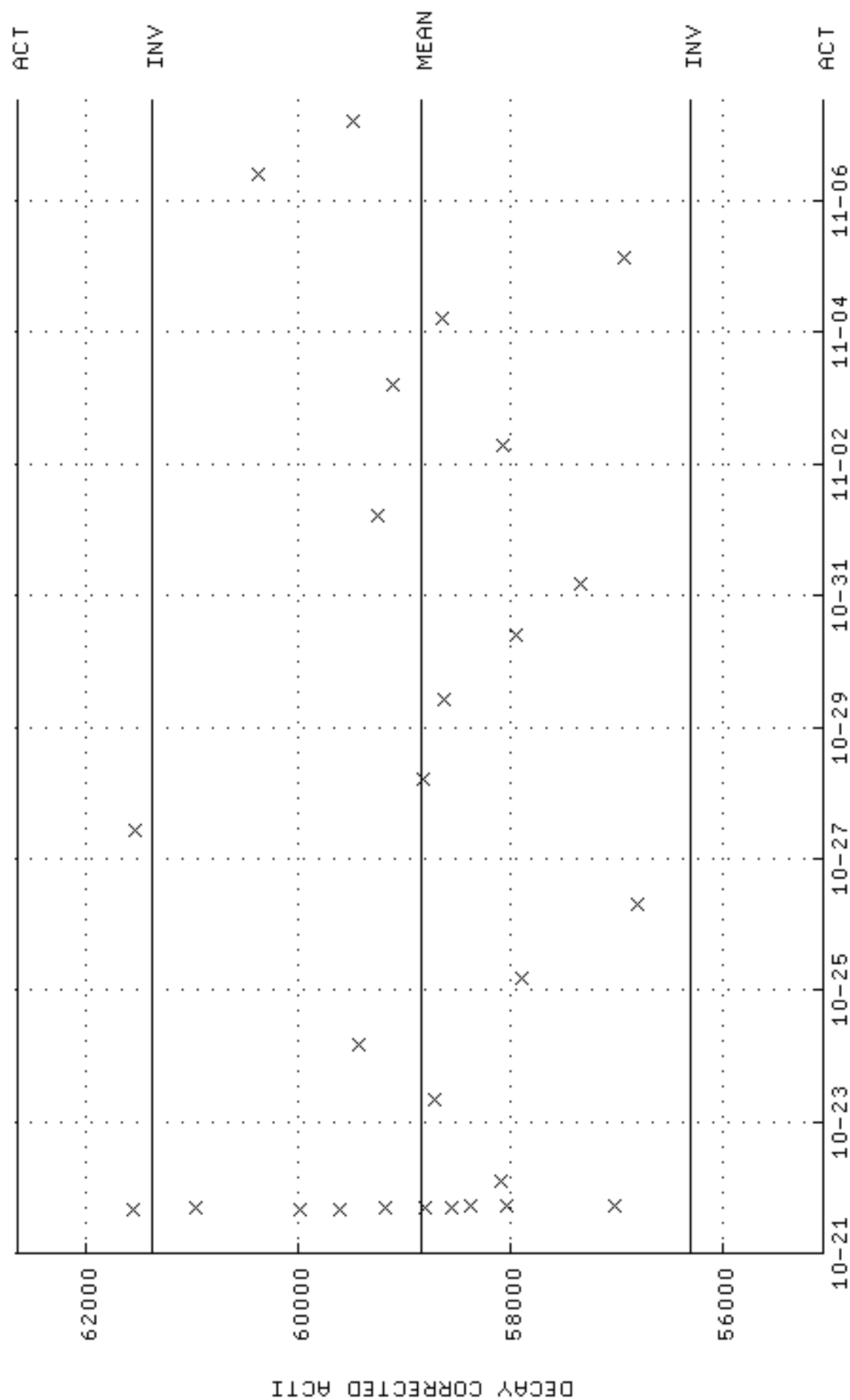
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM03.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 23-OCT-2022 11:00:41 through 3-NOV-2022 12:00:00
Mean +- Std Dev : 1.41258 +- 2.651652E-02 (1.88 %)



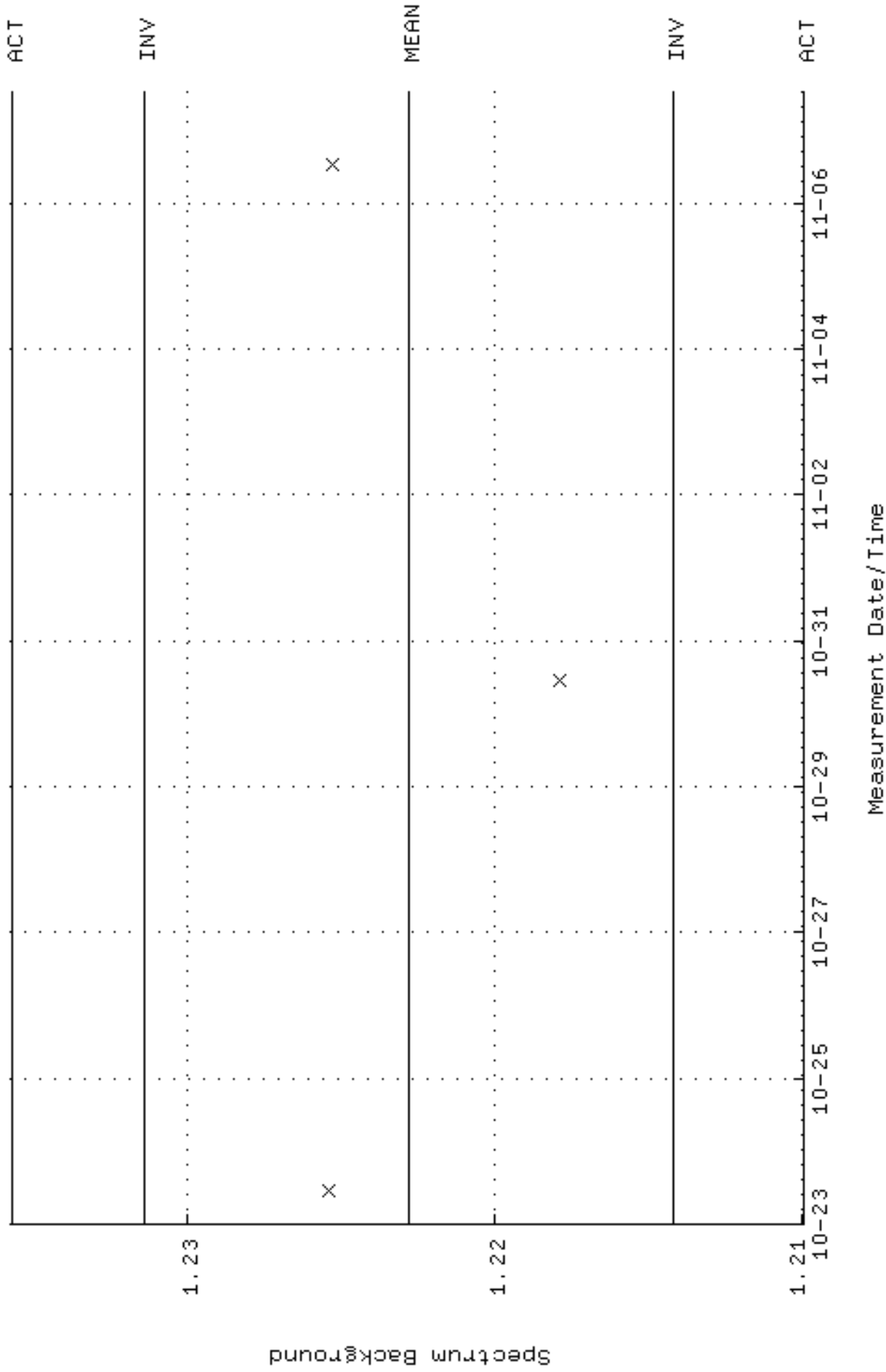
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC_GAM07_JAR.QAF;1
Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
Start/End Dates : 21-OCT-2022 15:42:57 through 7-NOV-2022 12:00:00
Mean +- Std Dev : 1.05685 +- 3.694007E-02 (3.50 %)



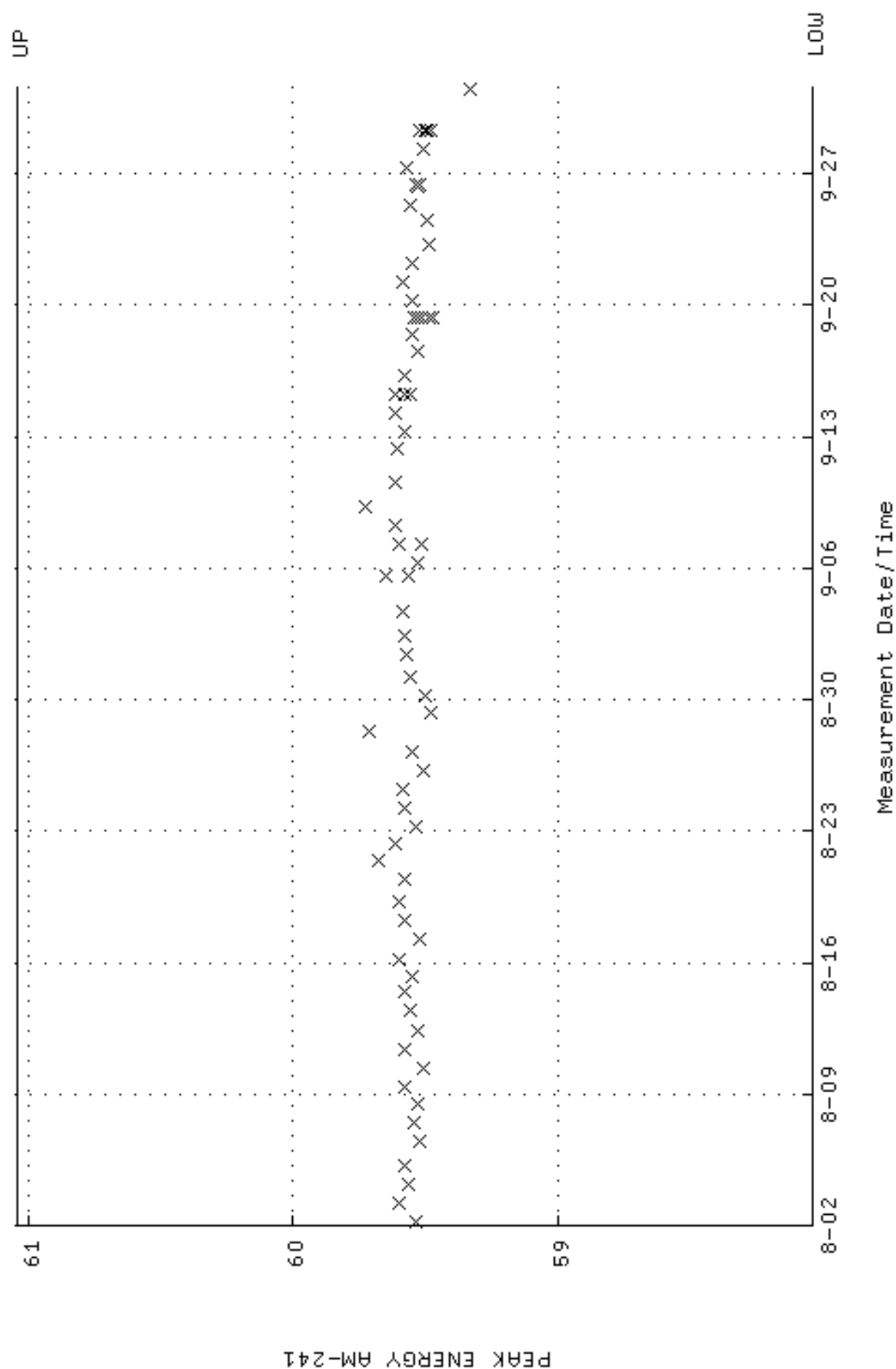
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM07_JAR.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 21-OCT-2022 15:42:57 through 7-NOV-2022 12:00:00
 Mean +- Std Dev : 58849.6 +- 1265.35 (2.15 %)



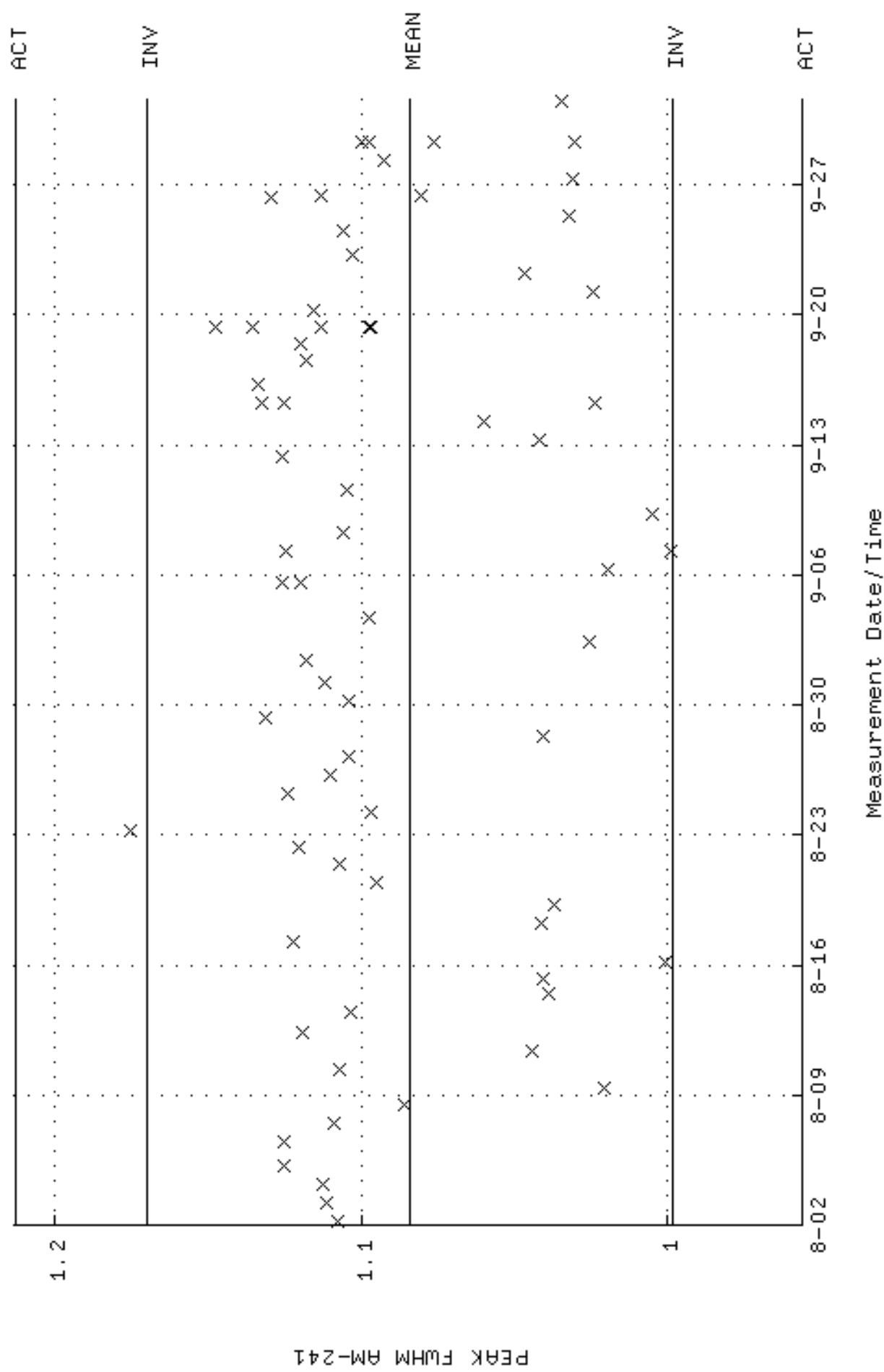
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM07.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 23-OCT-2022 11:00:58 through 7-NOV-2022 12:00:00
Mean +- Std Dev : 1.22281 +- 4.282790E-03 (0.35 %)



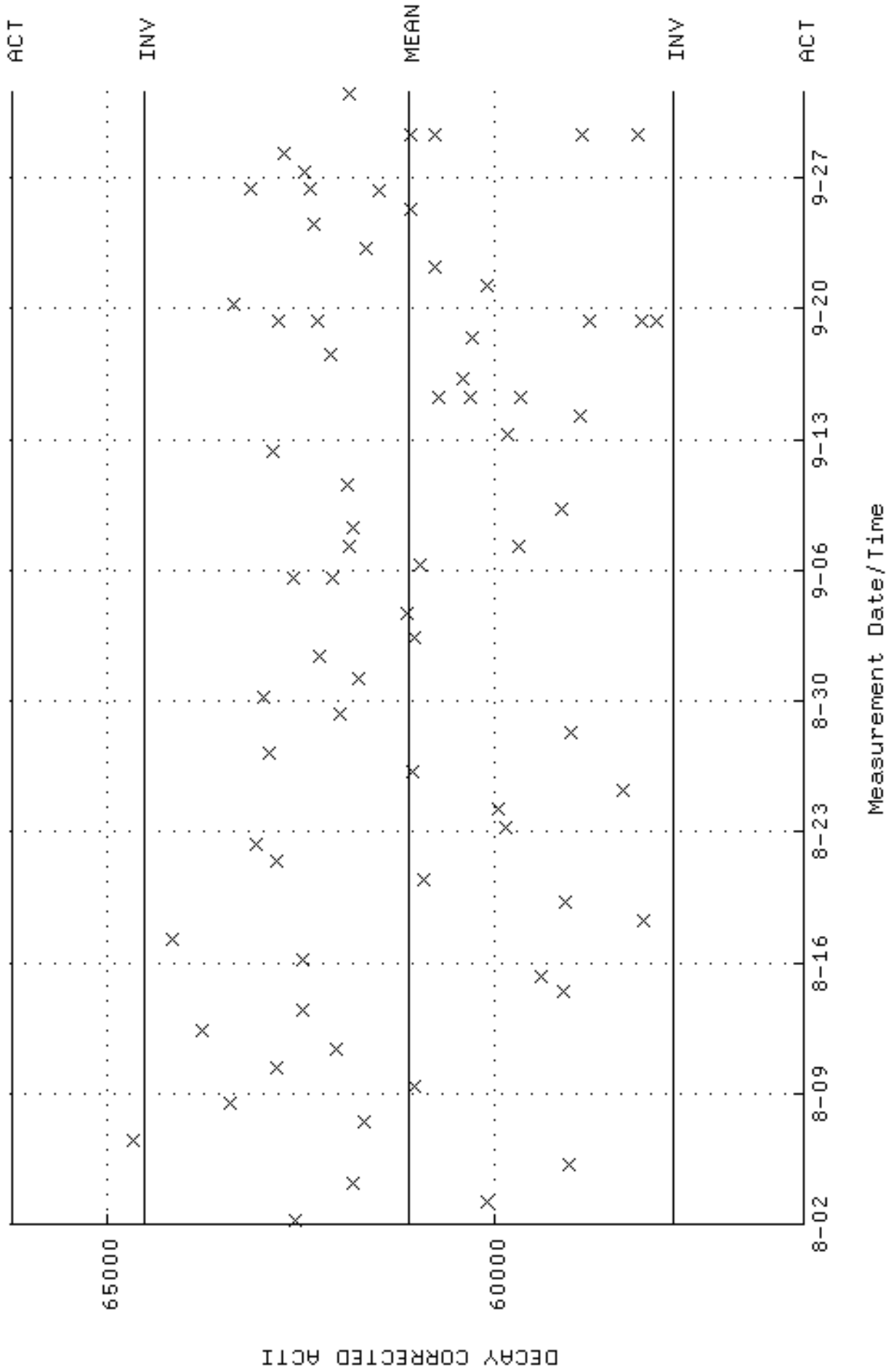
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM18_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-AUG-2022 04:18:17 through 1-OCT-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



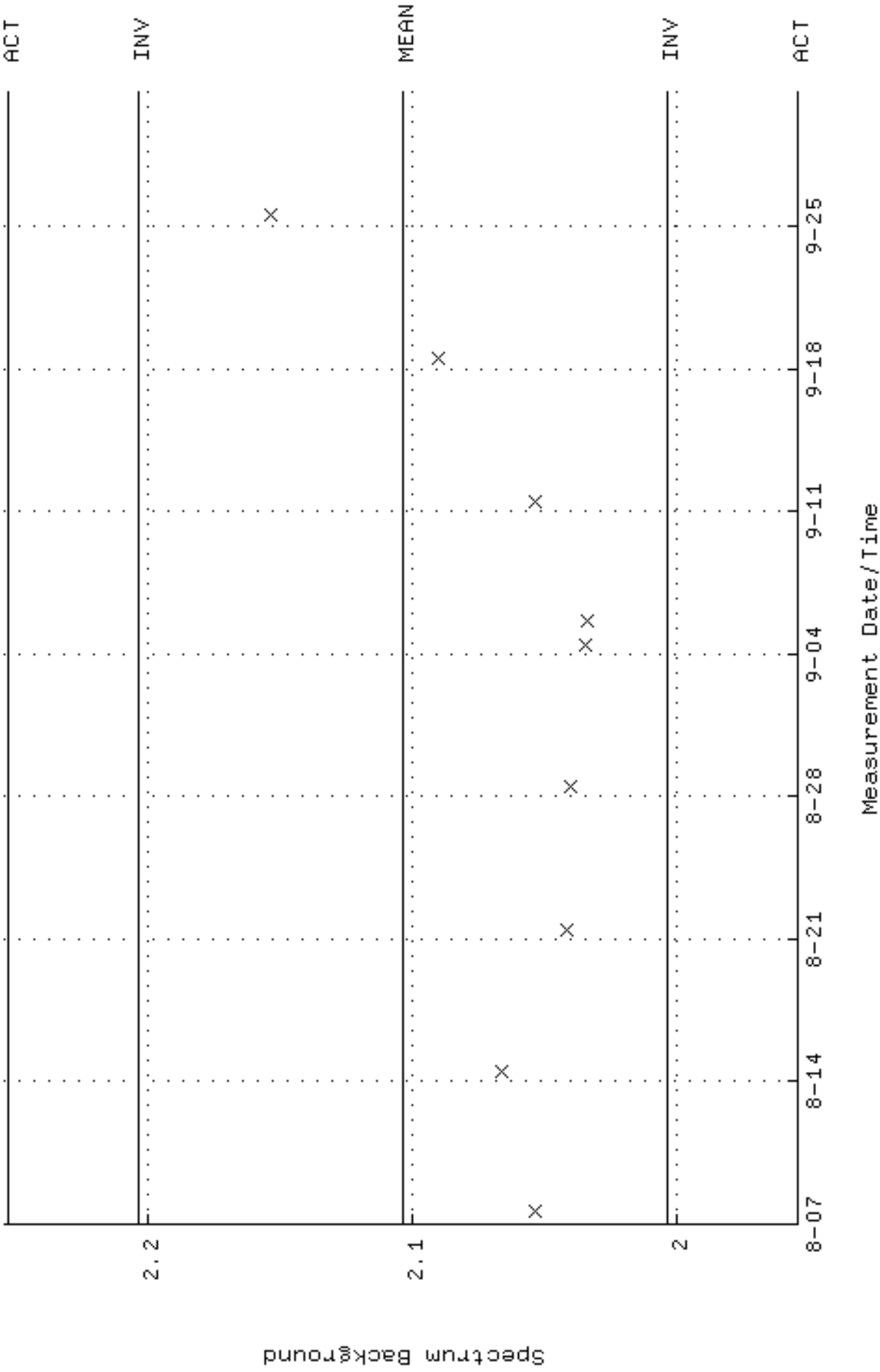
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM18_CAN.QAF;1
Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
Start/End Dates : 2-AUG-2022 04:18:17 through 1-OCT-2022 12:00:00
Mean +- Std Dev : 1.08450 +- 4.277769E-02 (3.94 %)



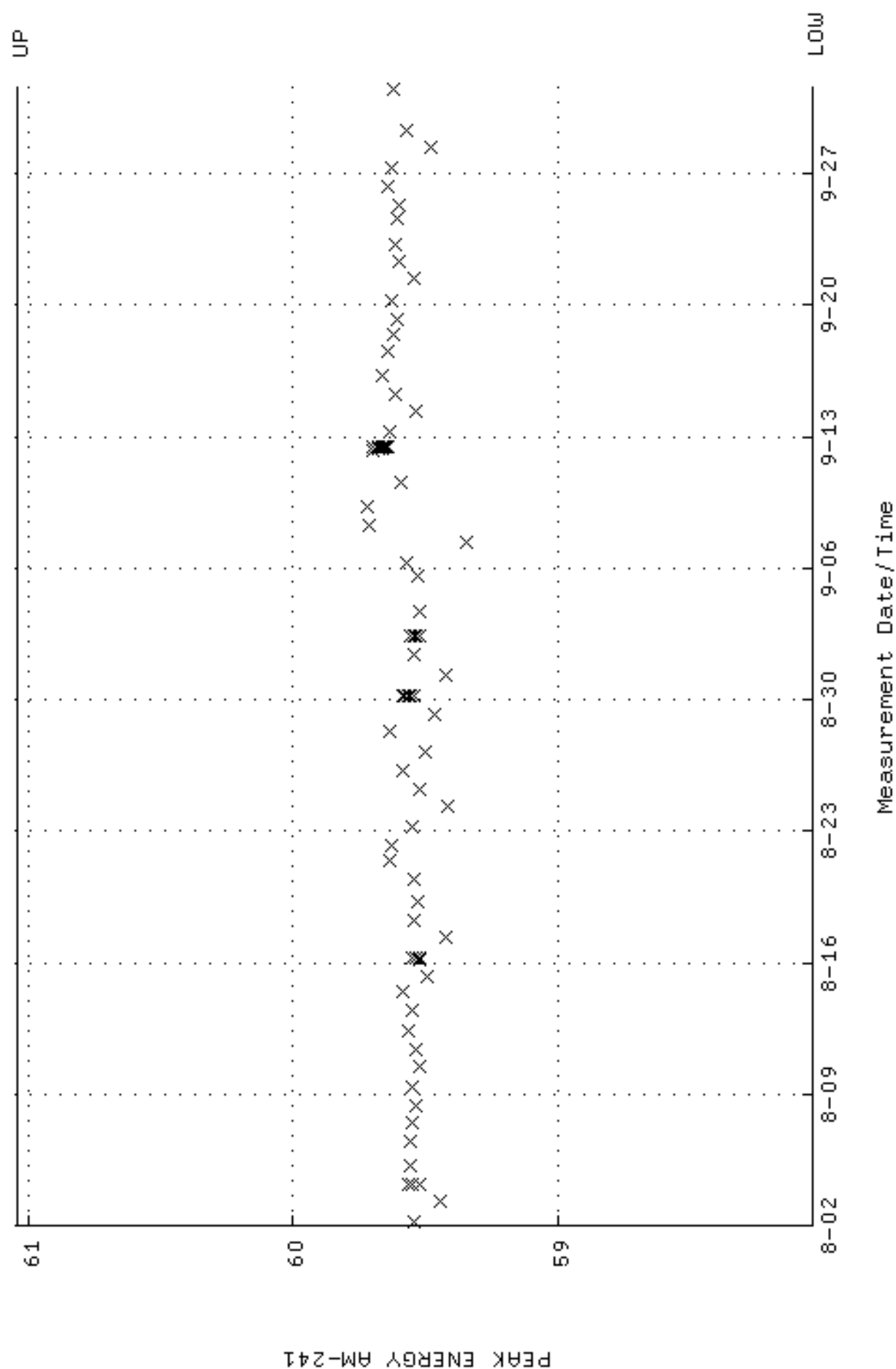
QA filename : DKA100:[CANSBERRA.GAMMA.SCUSR.QA]QCC-GAM18-CAN.QAF;1
Parameter Name : NLAOTVY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-AUG-2022 04:18:17 through 1-OCT-2022 12:00:00
Mean +- Std Dev : 61108.2 +- 1703.28 (2.79 %)



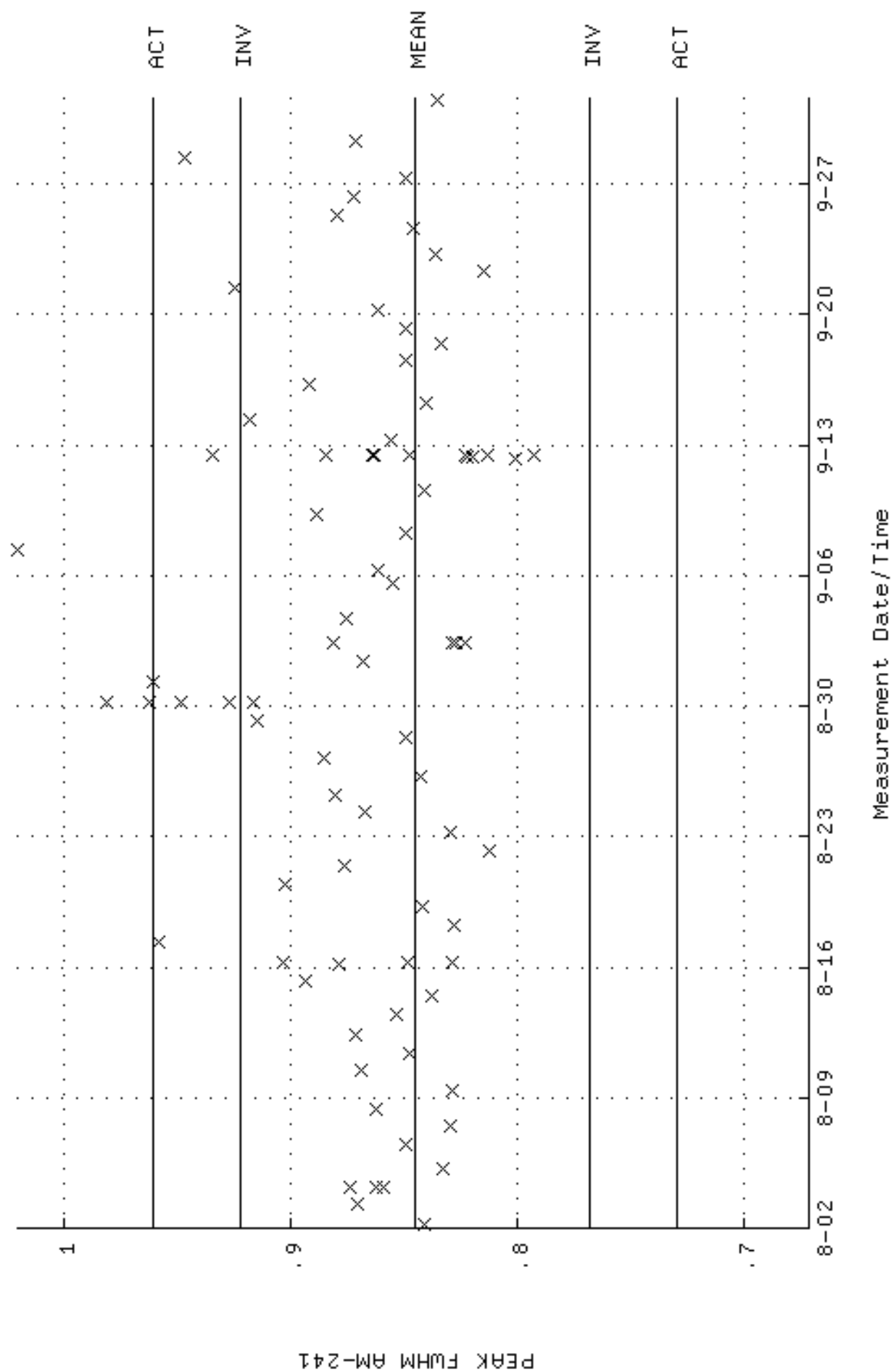
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM18.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 7-AUG-2022 15:23:00 through 1-OCT-2022 12:00:00
Mean +- Std Dev : 2.10393 +- 4.992997E-02 (2.37 %)



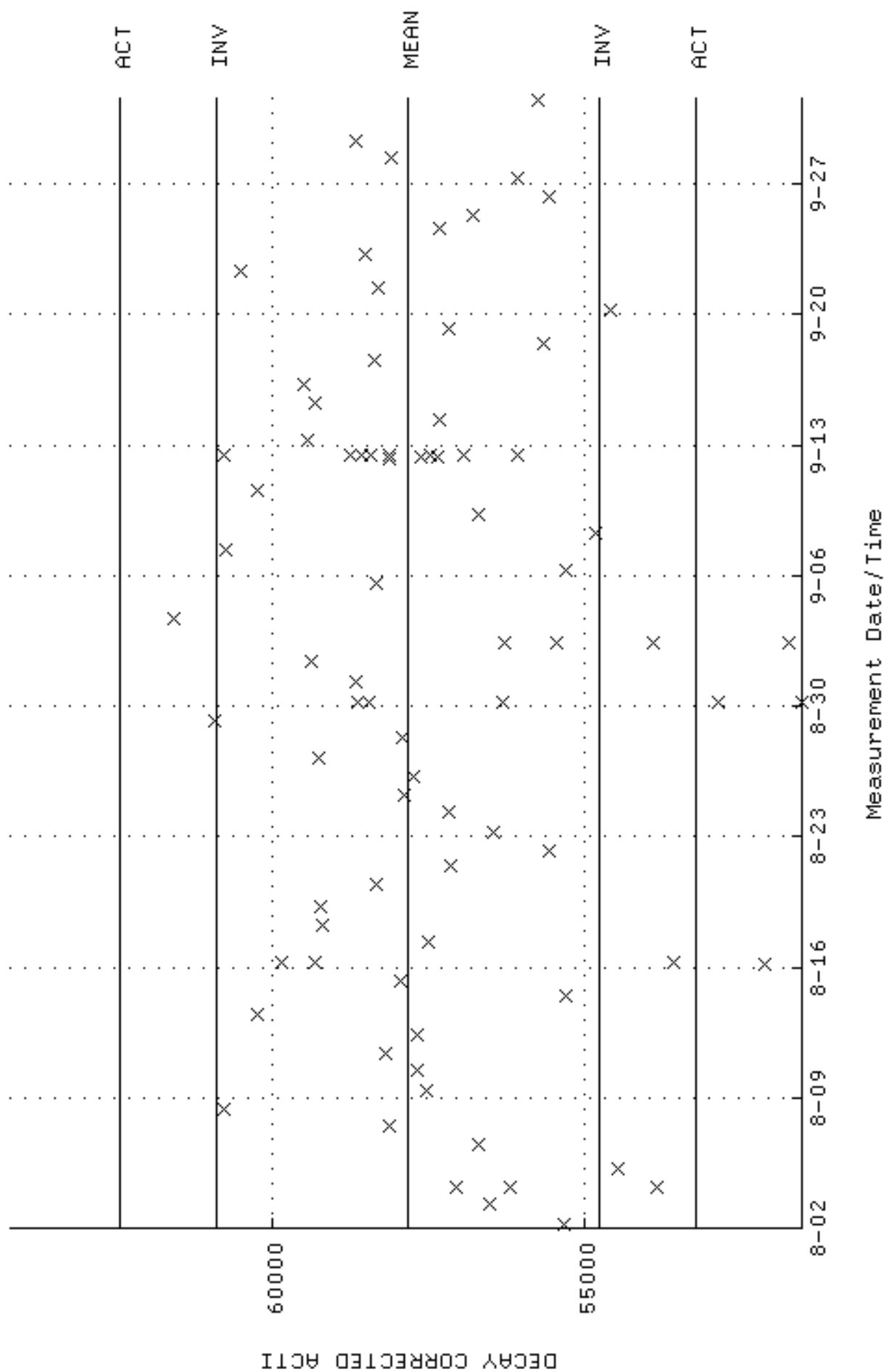
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM23_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-AUG-2022 04:18:28 through 1-OCT-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



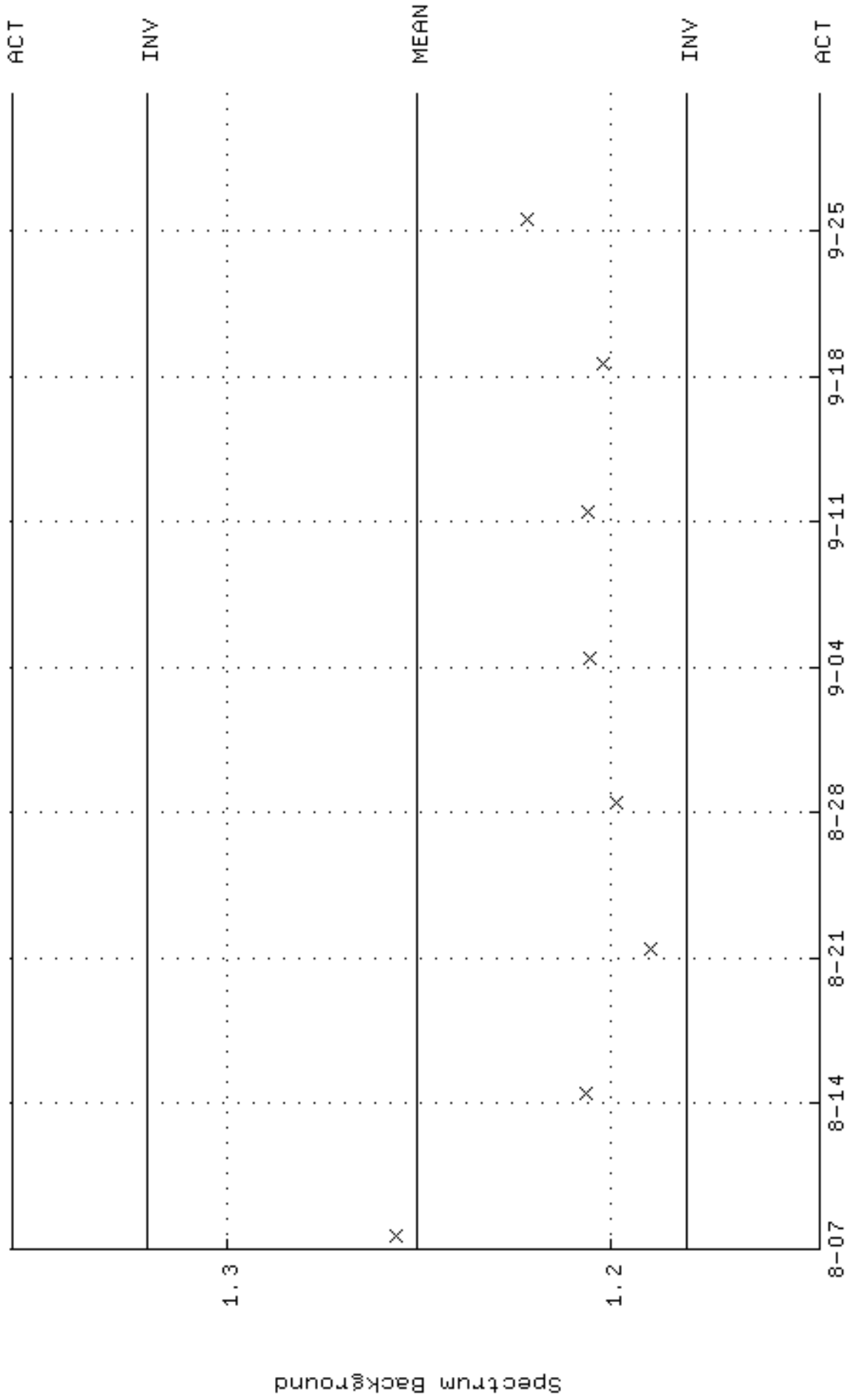
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC_GAM23_CAN.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-AUG-2022 04:18:28 through 1-OCT-2022 12:00:00
 Mean +- Std Dev : 0.845412 +- 3.858073E-02 (4.56 %)



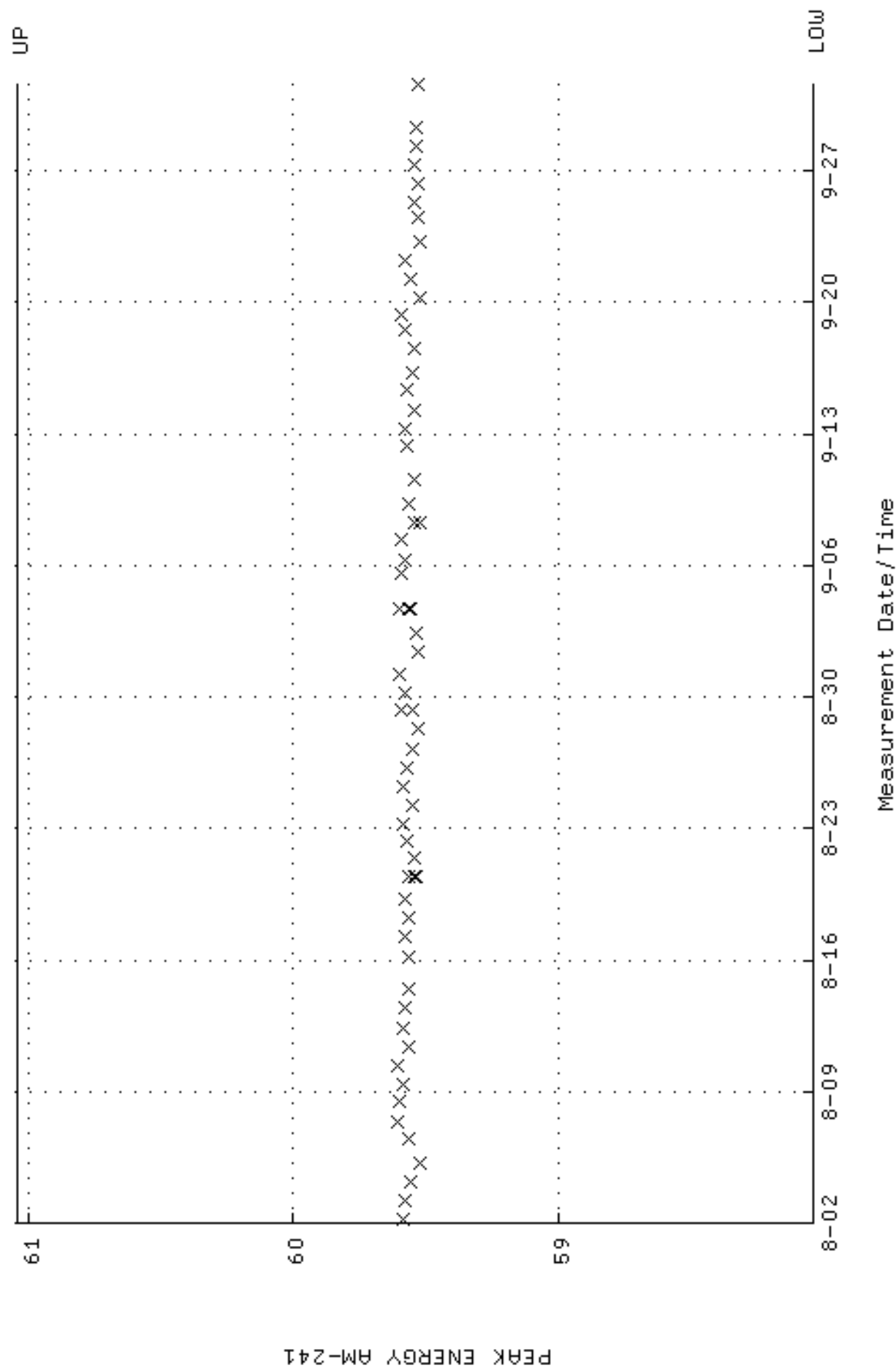
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM23_CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-AUG-2022 04:18:28 through 1-OCT-2022 12:00:00
 Mean +- Std Dev : 57829.3 +- 1540.23 (2.66 %)



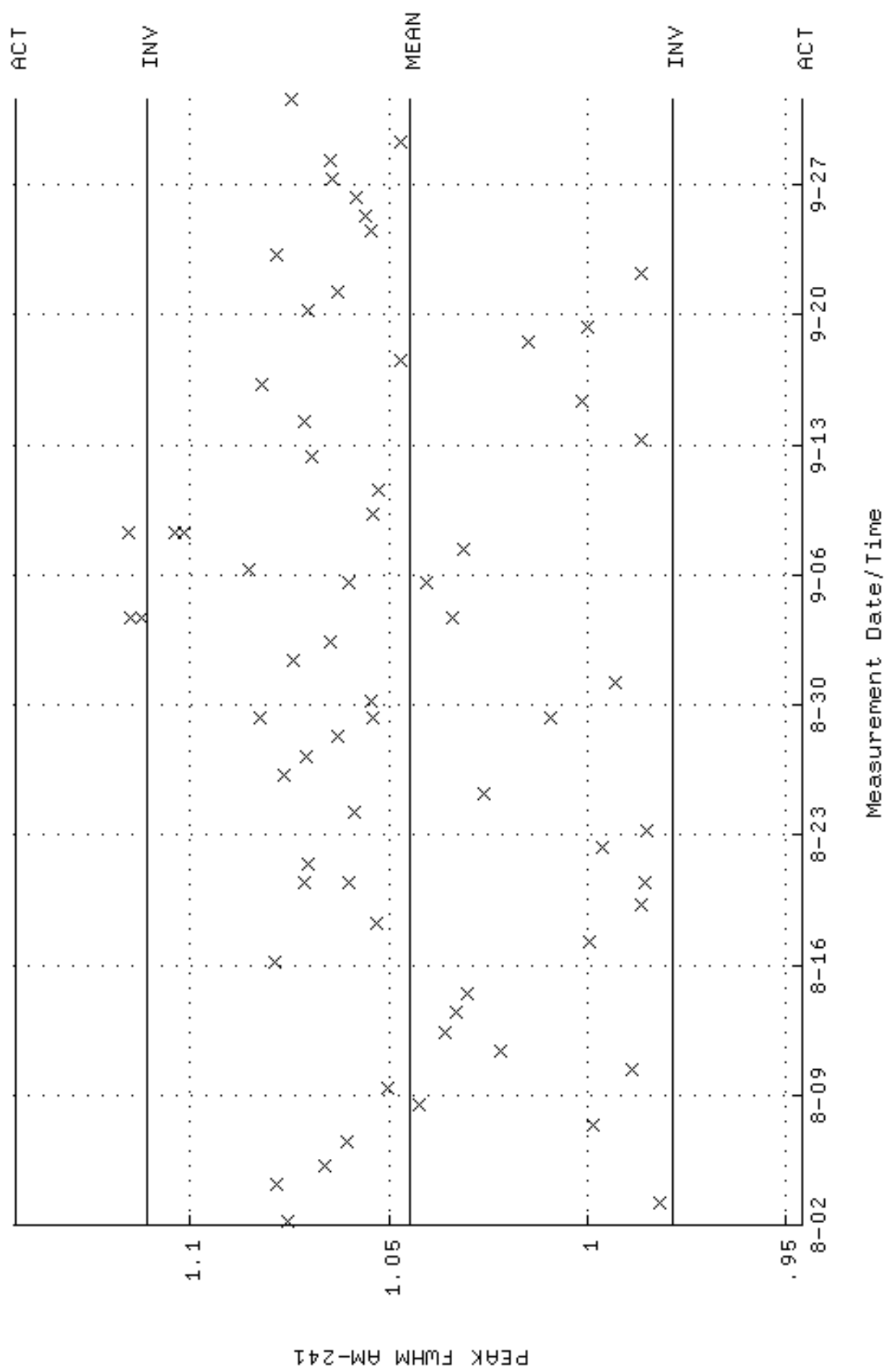
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM23.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 7-AUG-2022 15:23:14 through 1-OCT-2022 12:00:00
Mean +- Std Dev : 1.25081 +- 3.508674E-02 (2.81 %)



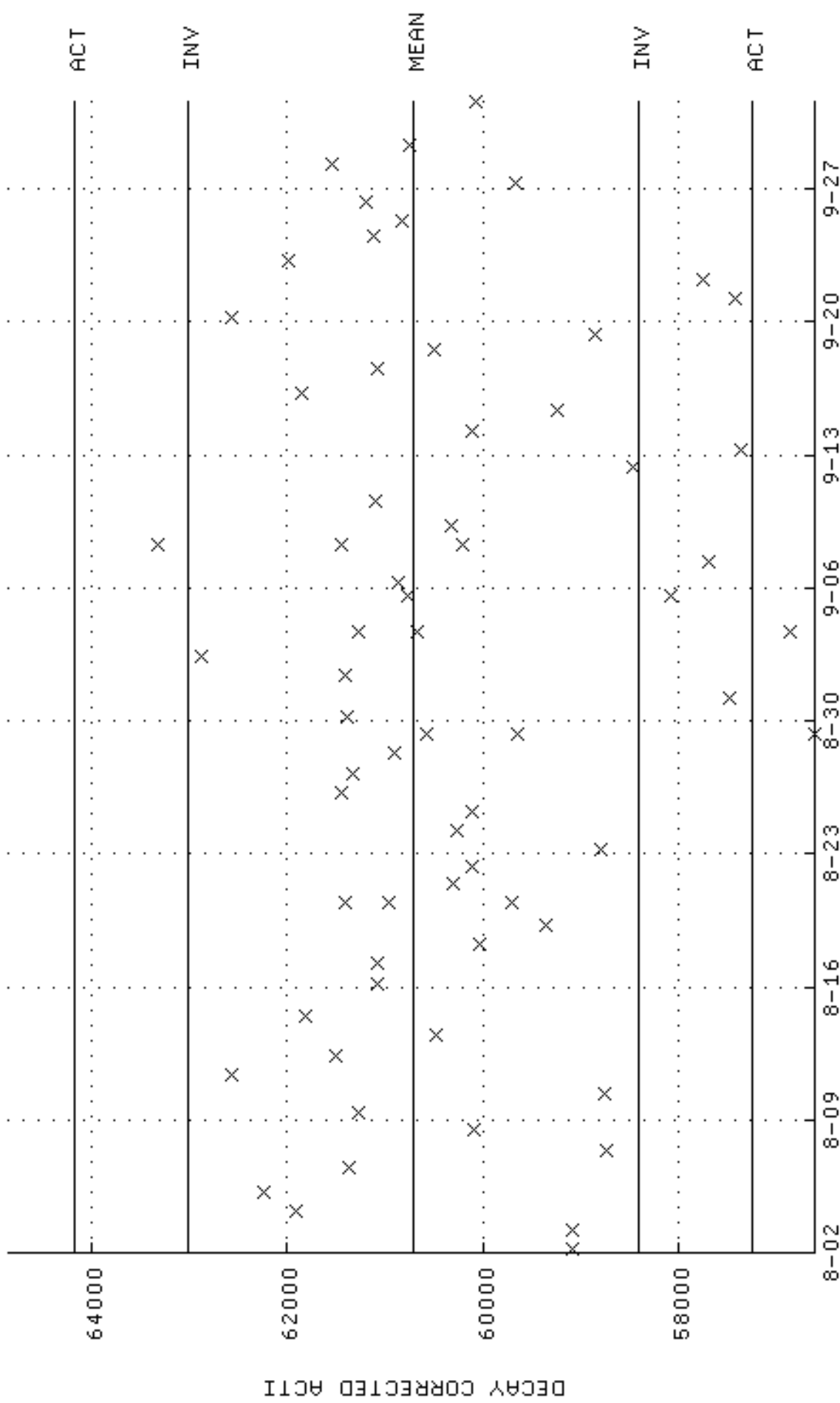
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM30_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-AUG-2022 04:18:38 through 1-OCT-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM30_CAN.QAF;1
Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
Start/End Dates : 2-AUG-2022 04:18:38 through 1-OCT-2022 12:00:00
Mean +- Std Dev : 1.04491 +- 3.300933E-02 (3.16 %)

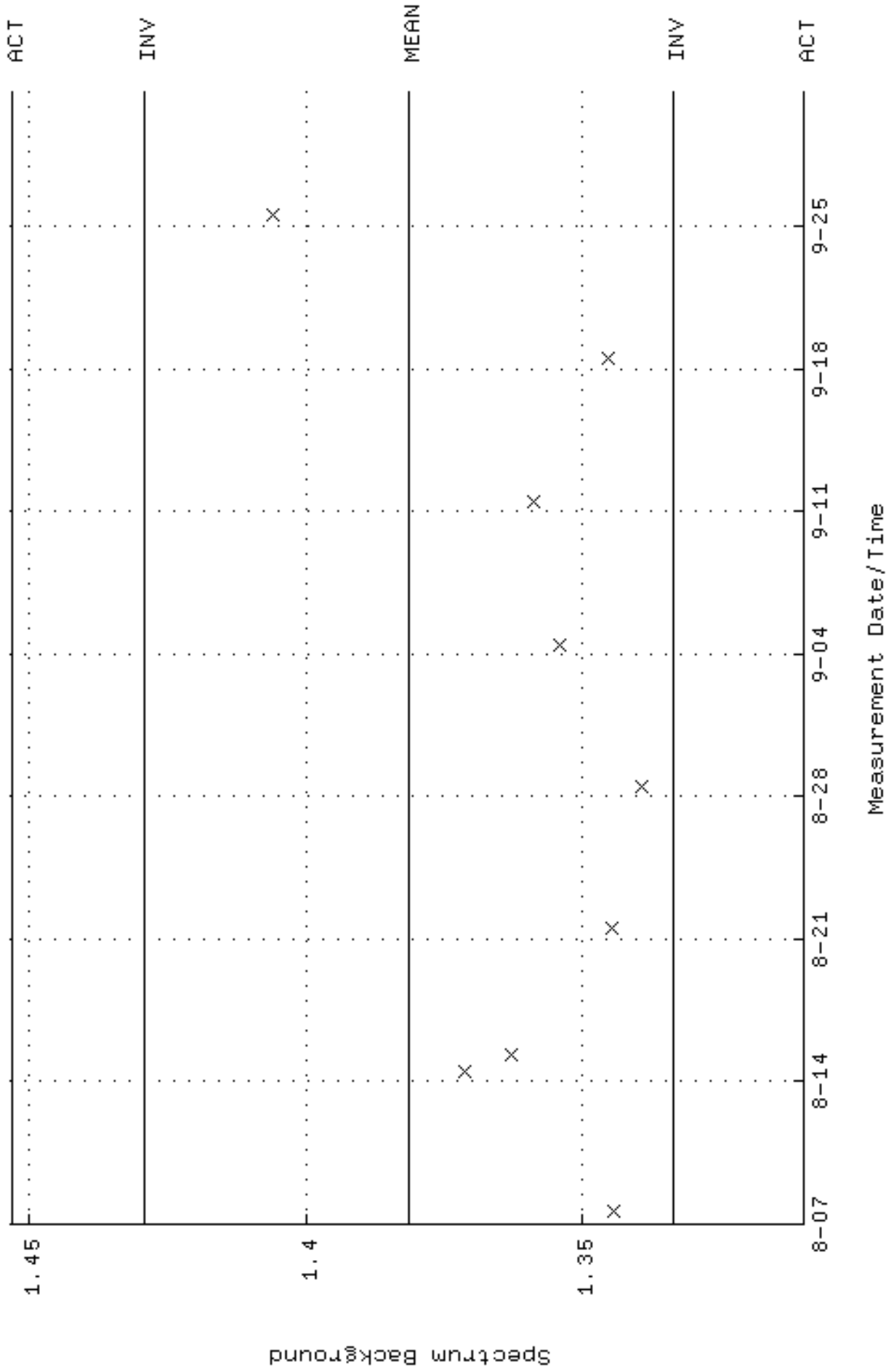


QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM30-CAN.QAF;1
Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
Start/End Dates : 2-AUG-2022 04:18:38 through 1-OCT-2022 12:00:00
Mean +- Std Dev : 60719.9 +- 1157.24 (1.91 %)

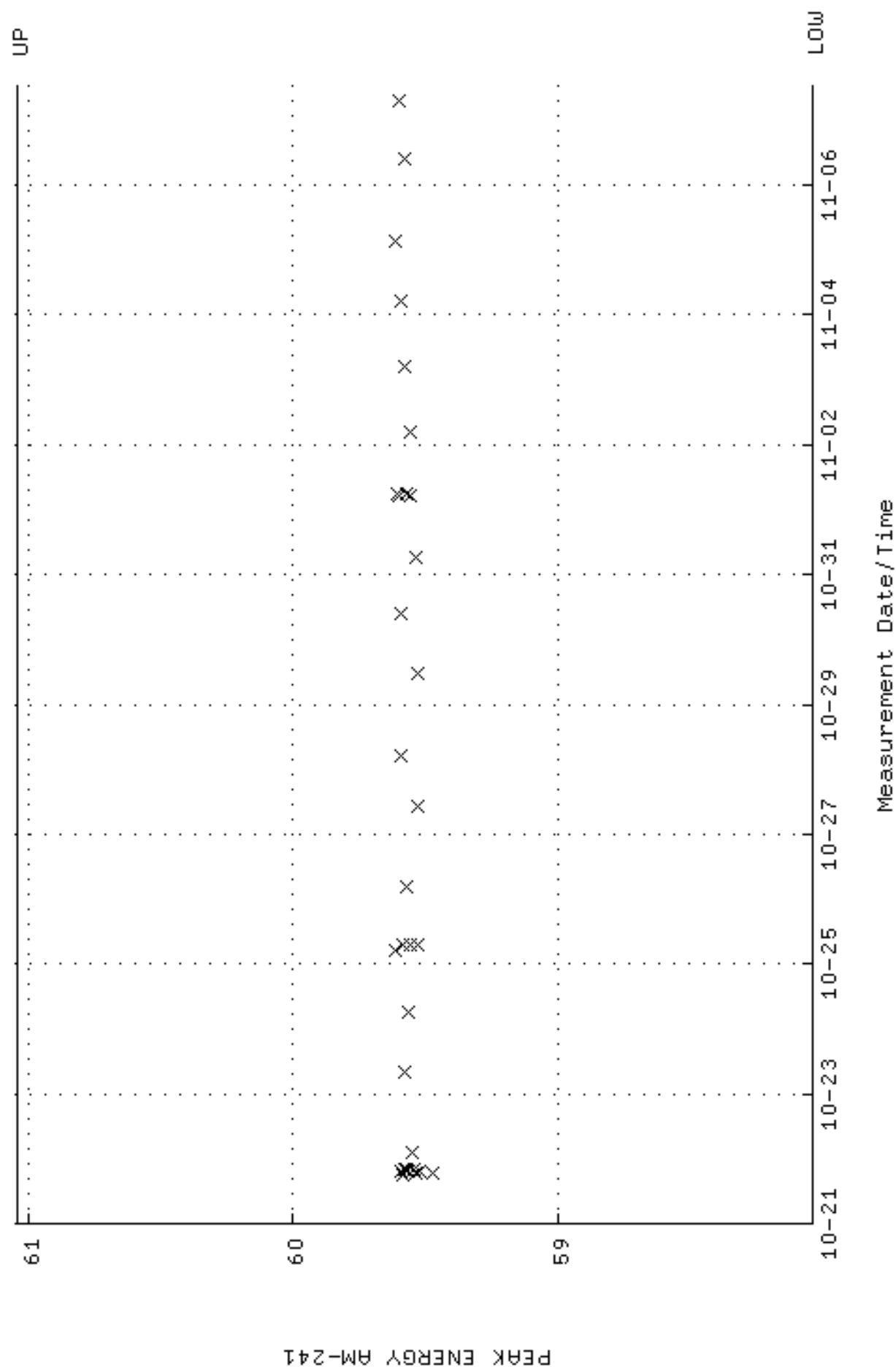


Measurement Date/Time

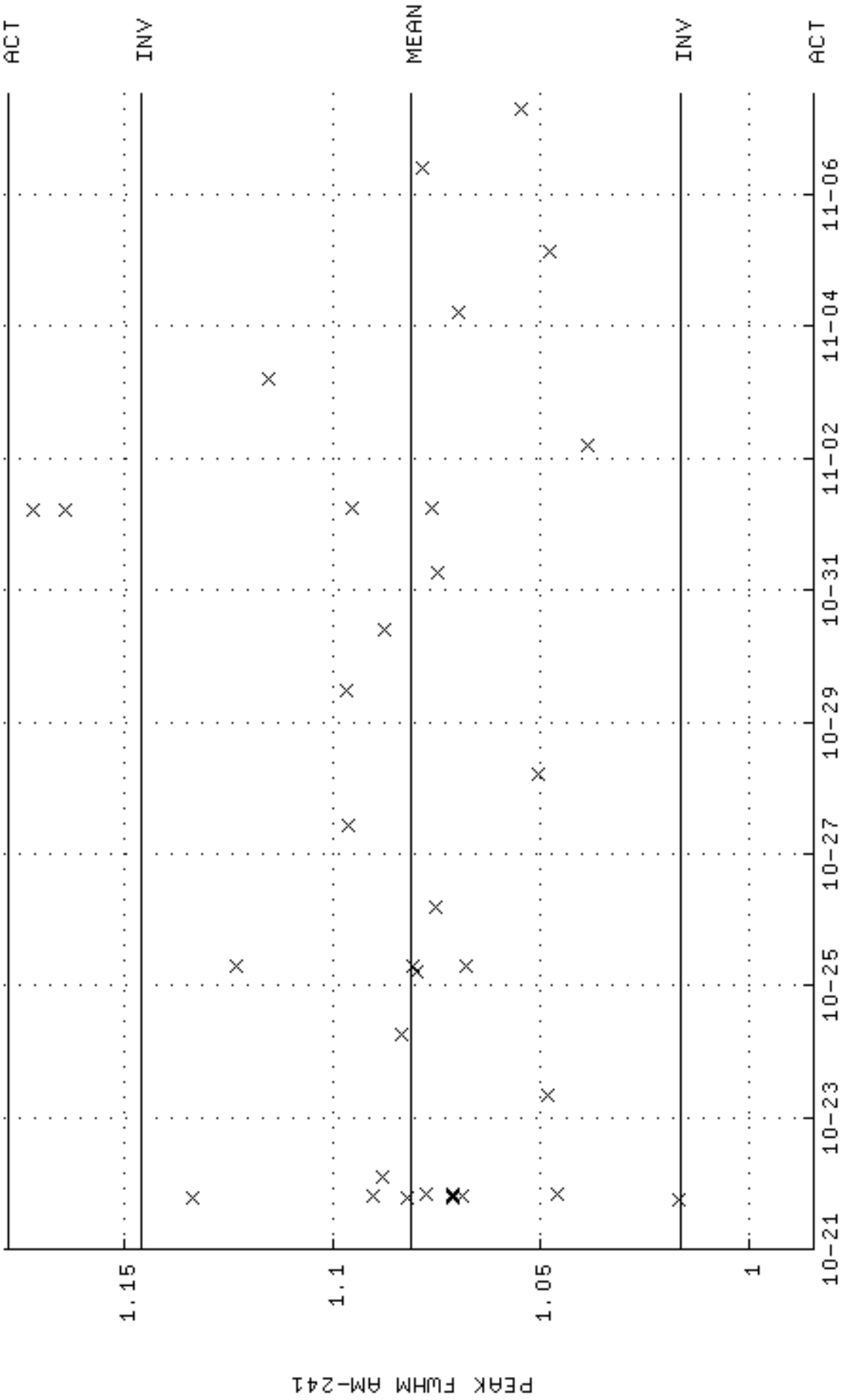
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM30.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 7-AUG-2022 15:24:07 through 1-OCT-2022 12:00:00
Mean +- Std Dev : 1.38155 +- 2.378993E-02 (1.72 %)



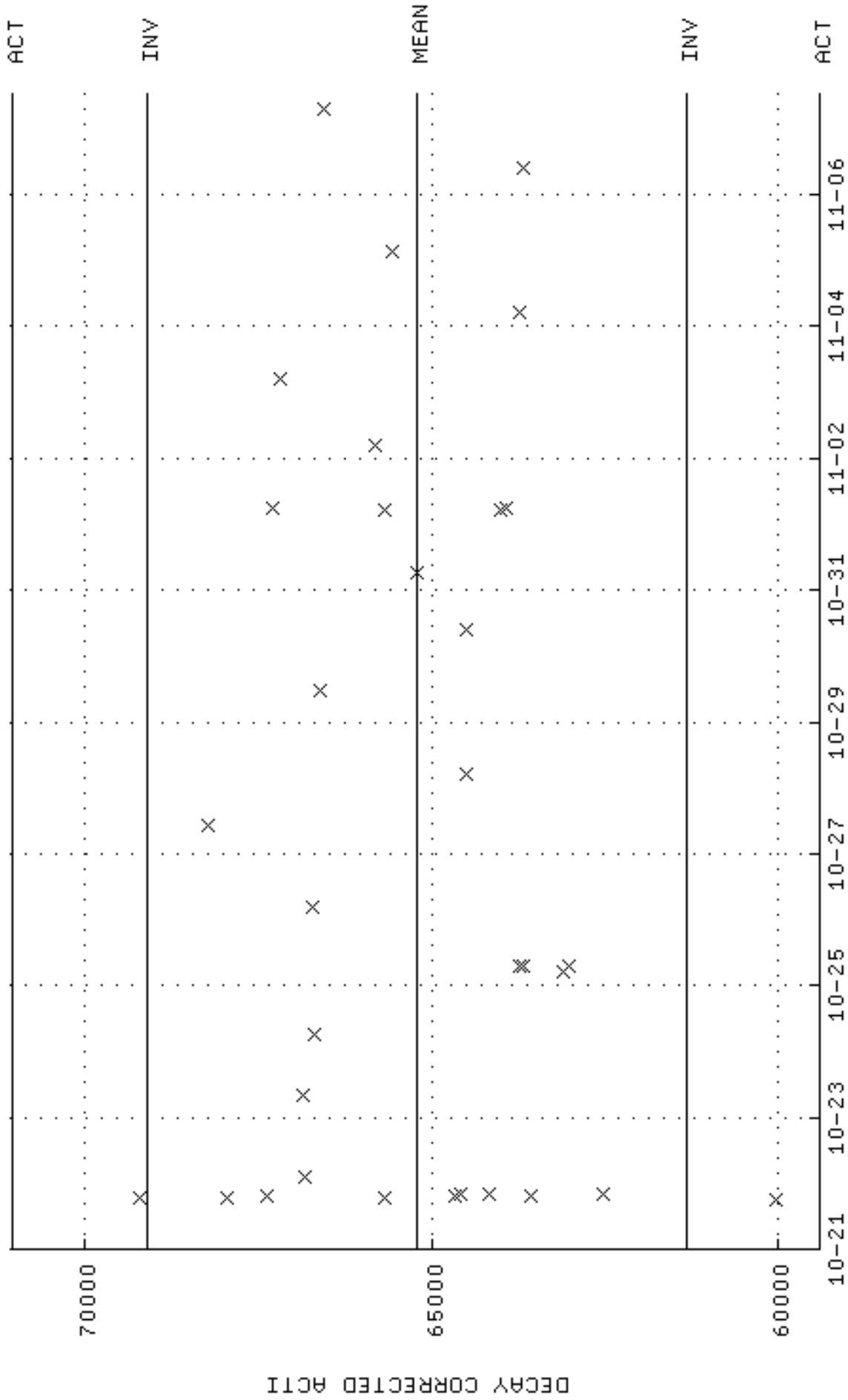
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM33_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 21-OCT-2022 18:06:17 through 7-NOV-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM33_CAN.QAF;1
Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
Start/End Dates : 21-OCT-2022 18:06:17 through 7-NOV-2022 12:00:00
Mean +- Std Dev : 1.08139 +- 3.231825E-02 (2.99 %)

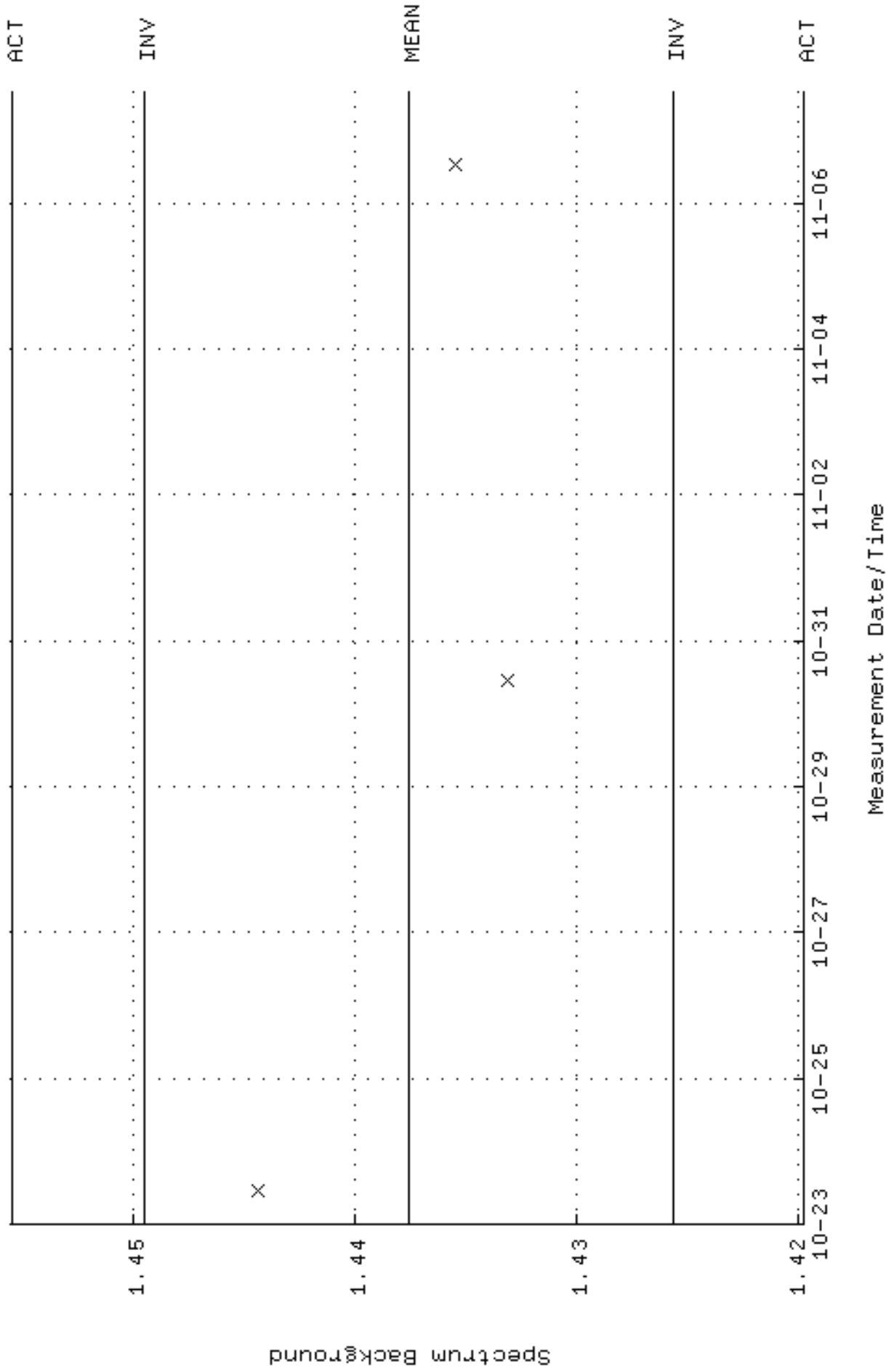


QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM33_CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 21-OCT-2022 18:06:17 through 7-NOV-2022 12:00:00
 Mean +- Std Dev : 65220.0 +- 1945.81 (2.98 %)

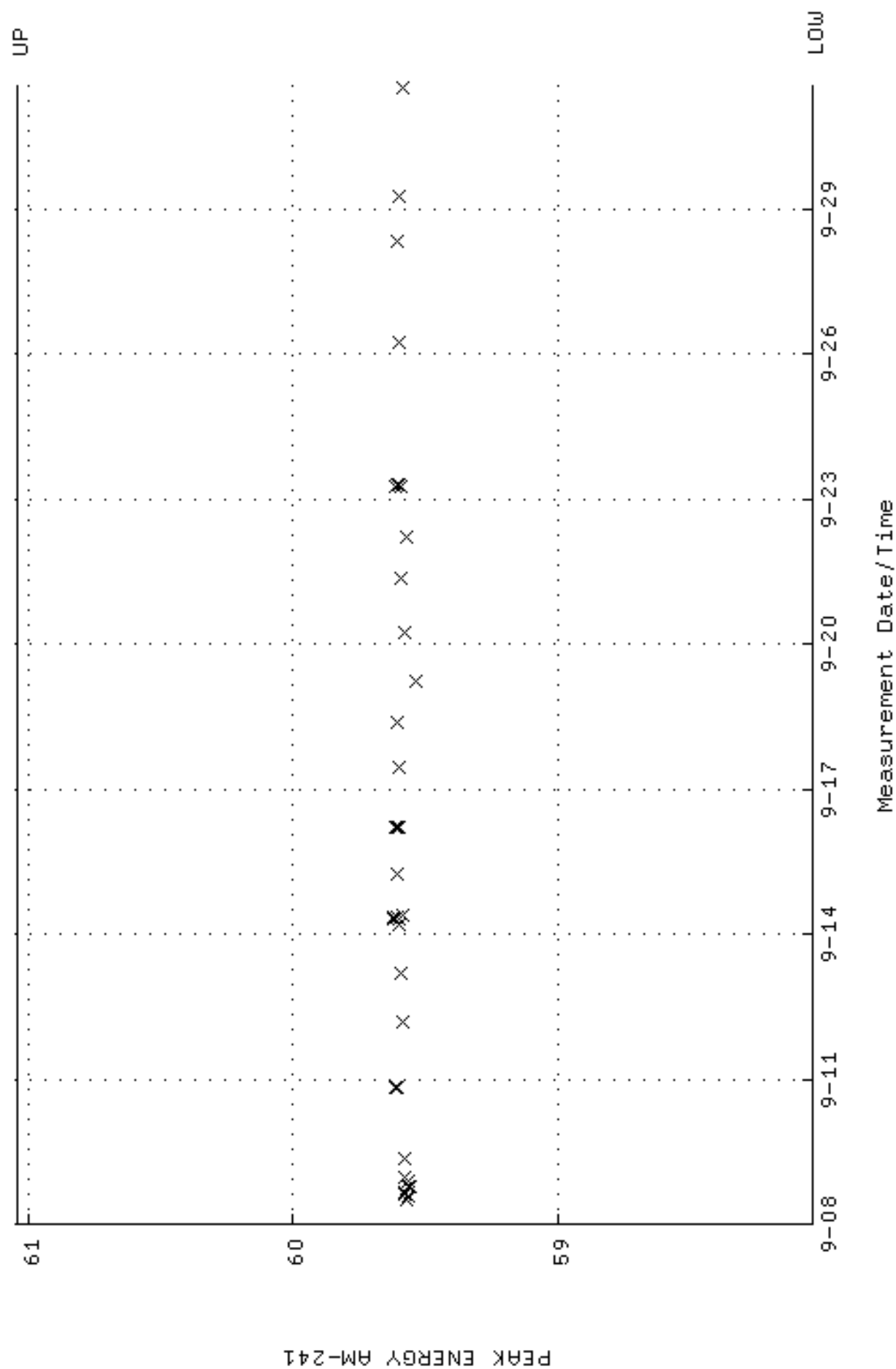


Measurement Date/Time

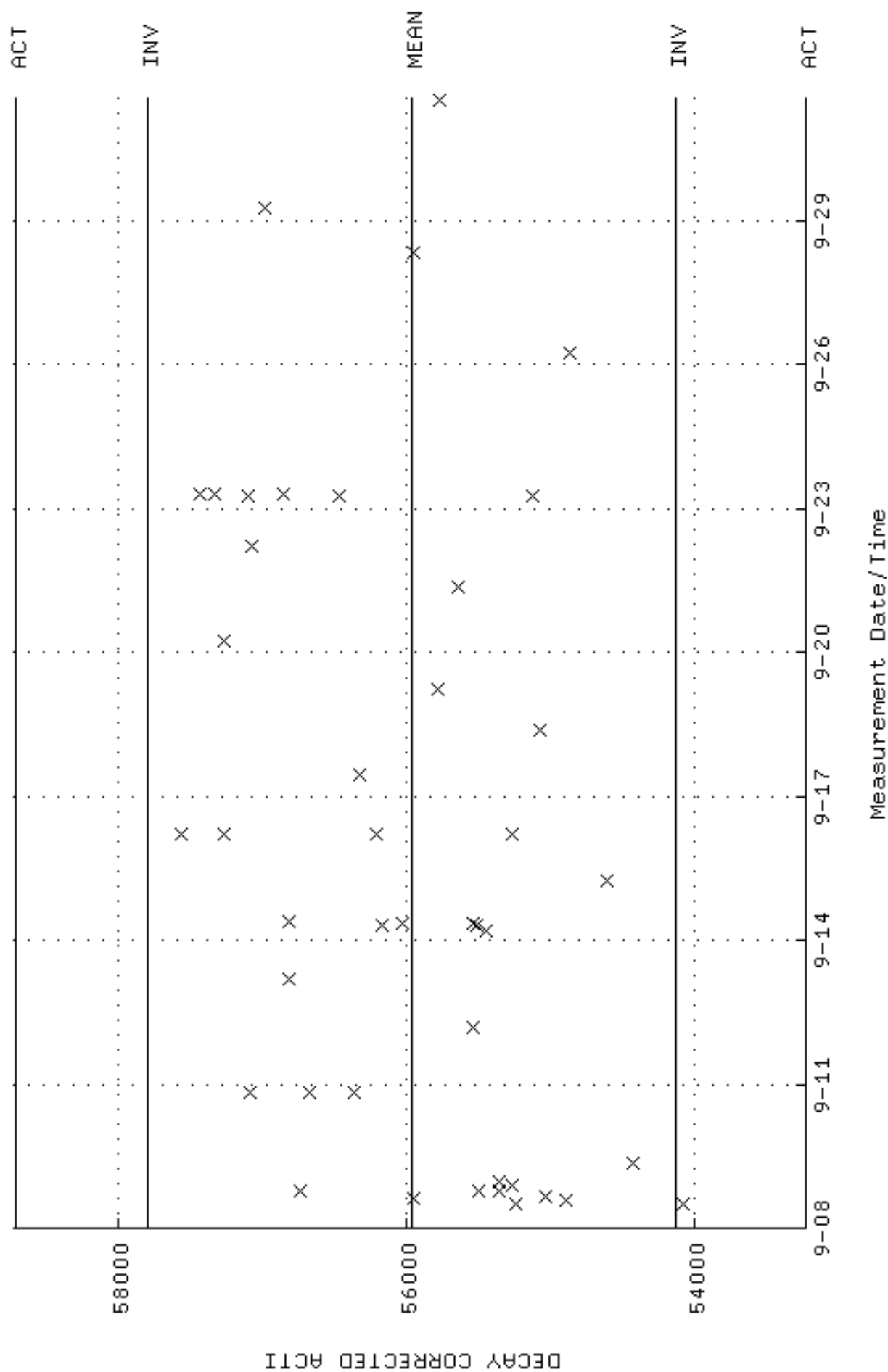
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM33.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 23-OCT-2022 11:12:10 through 7-NOV-2022 12:00:00
Mean +- Std Dev : 1.43758 +- 5.953132E-03 (0.41 %)



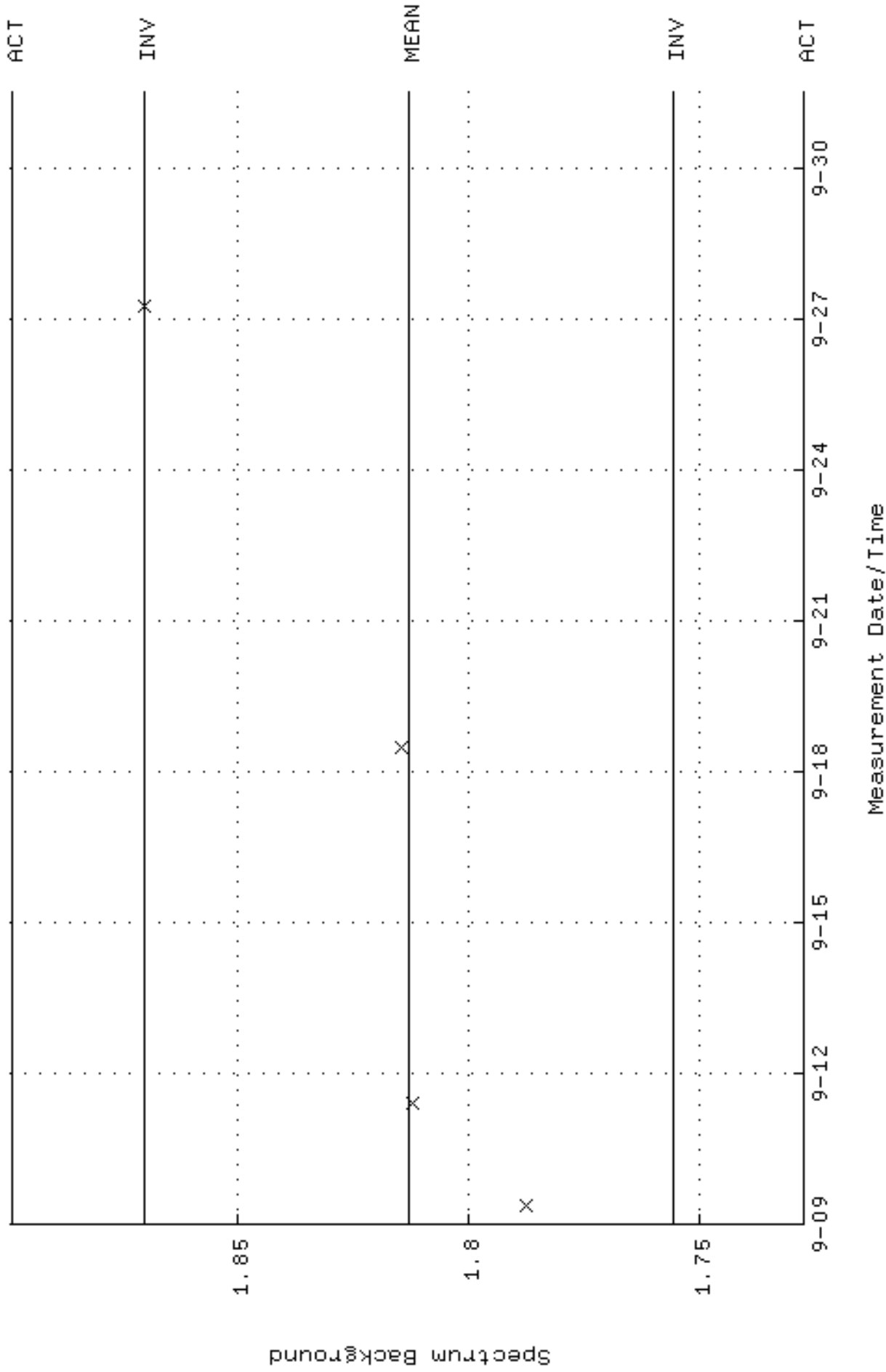
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM45_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 8-SEP-2022 12:07:08 through 1-OCT-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



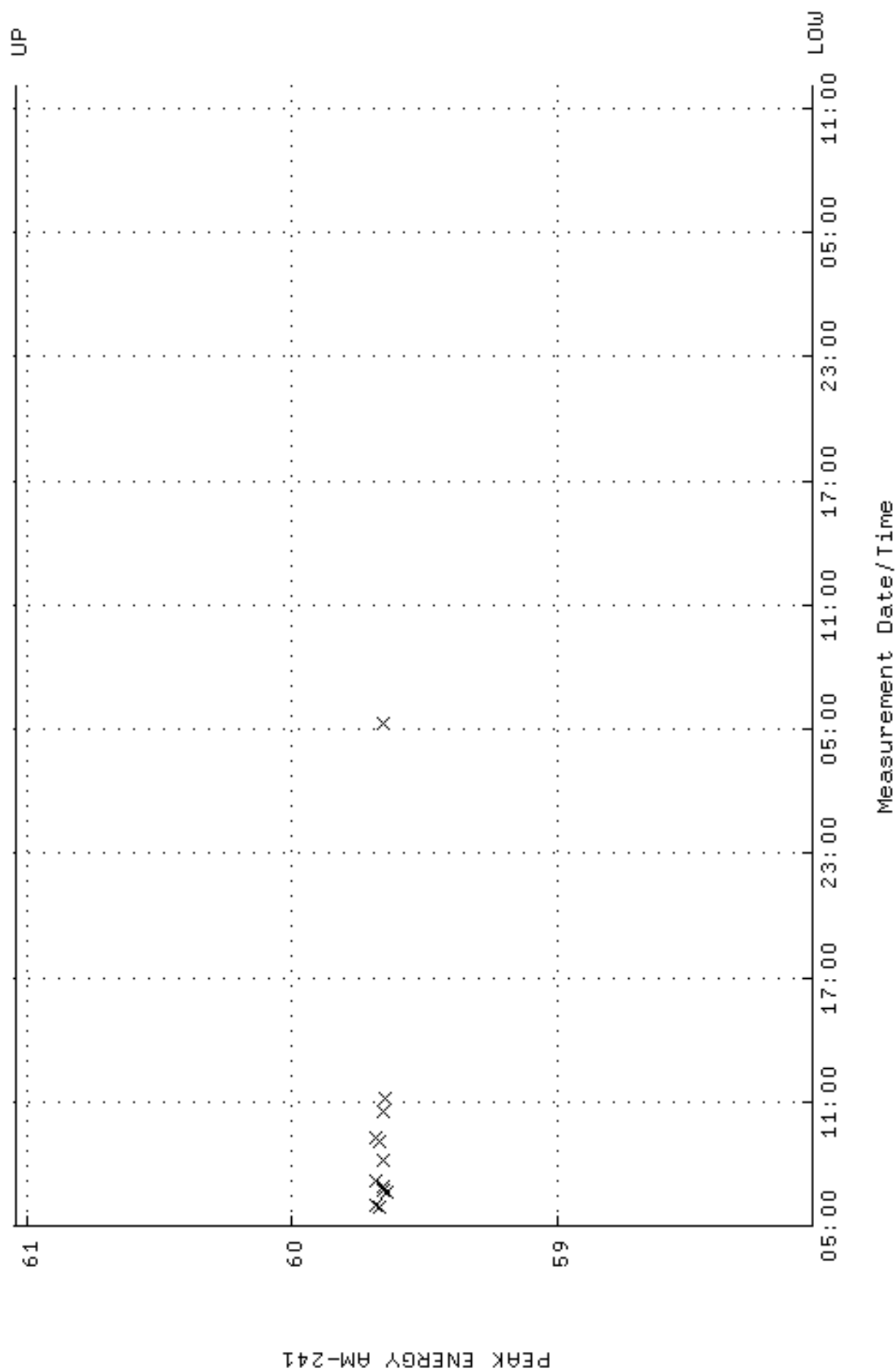
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM45_CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 8-SEP-2022 12:07:08 through 1-OCT-2022 12:00:00
 Mean +- Std Dev : 55971.5 +- 913.292 (1.63 %)



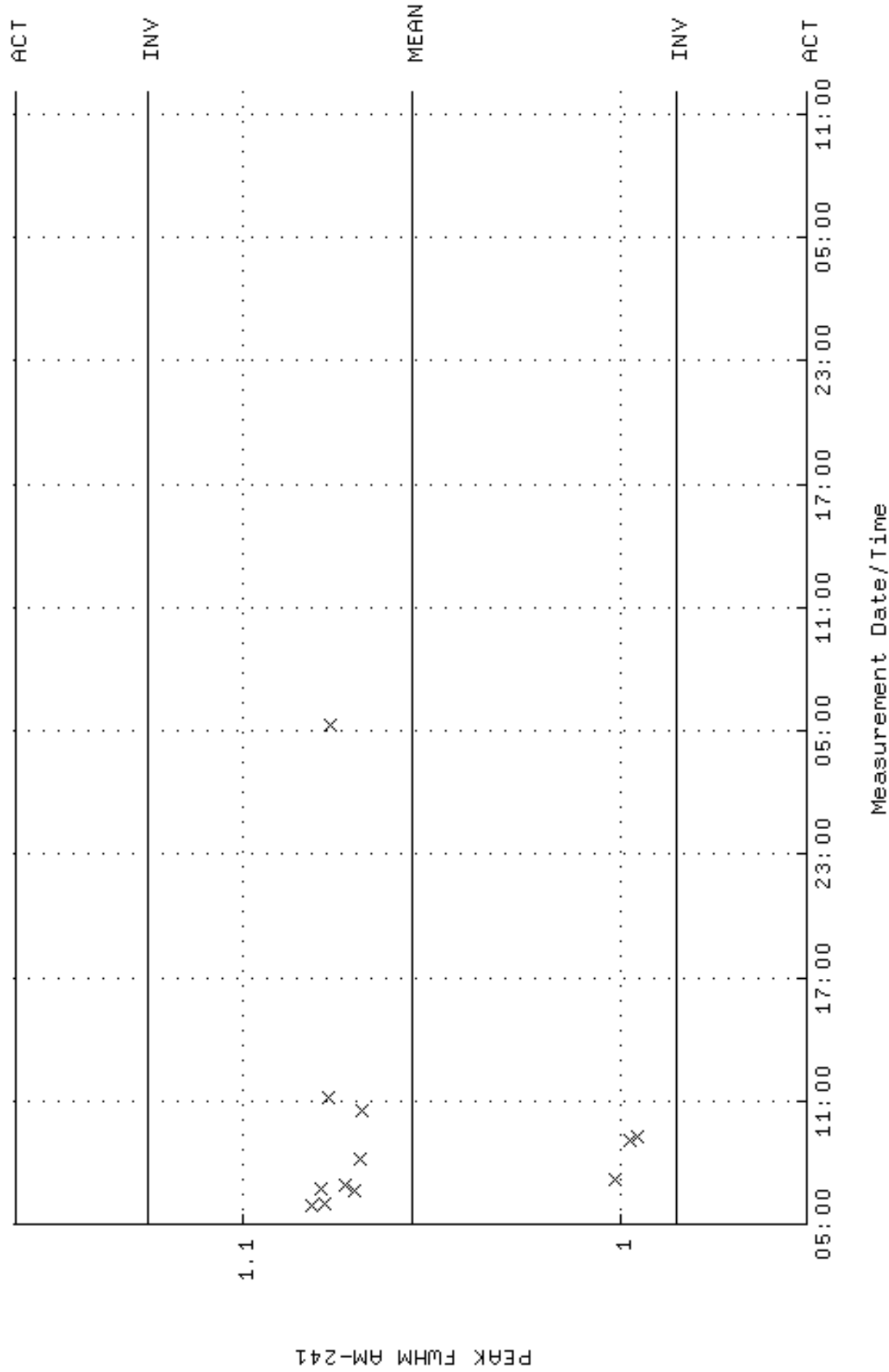
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM45.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 9-SEP-2022 08:50:38 through 1-OCT-2022 12:00:00
Mean +- Std Dev : 1.81323 +- 2.857933E-02 (1.58 %)



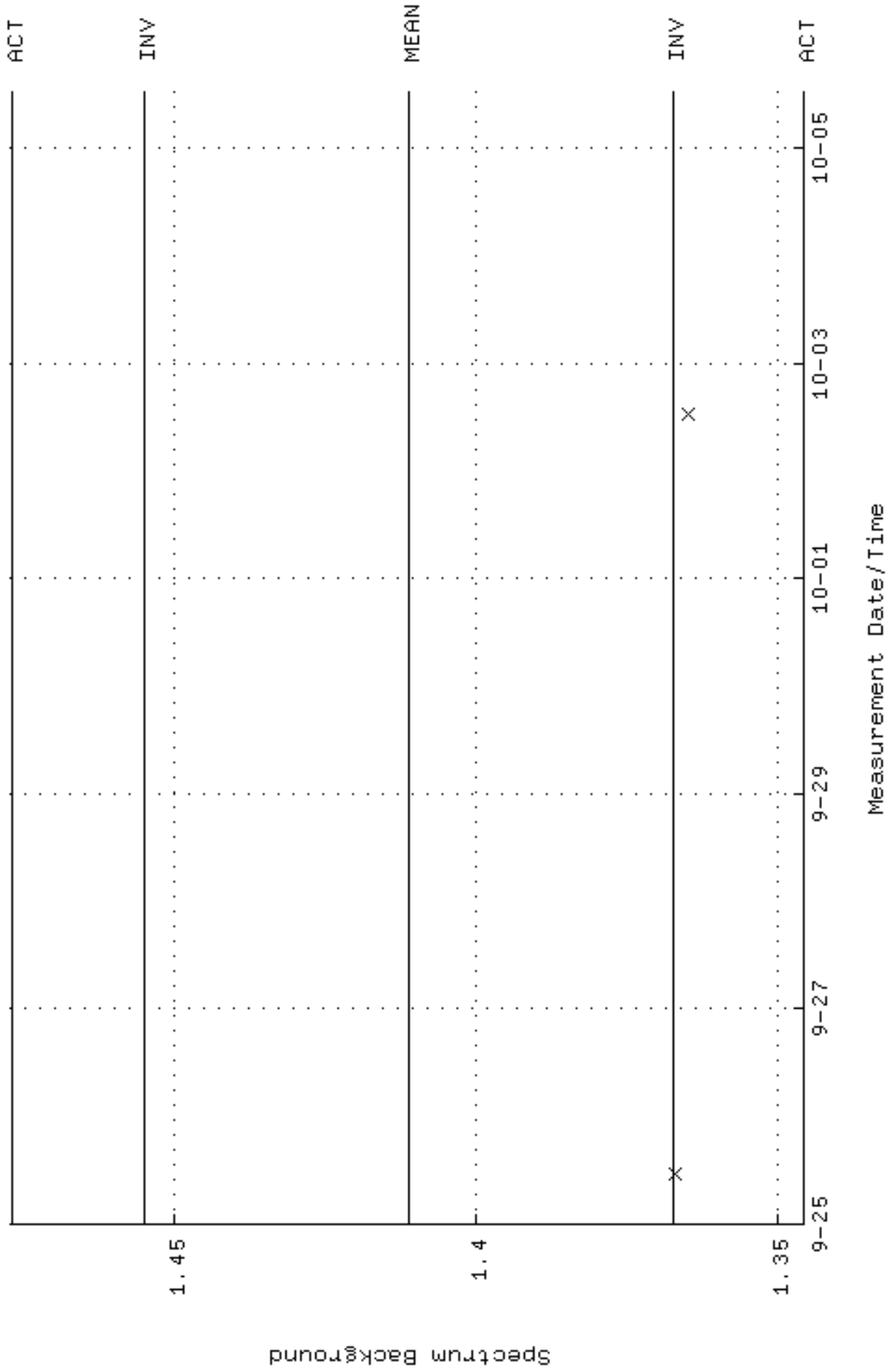
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM46_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 3-OCT-2022 05:52:42 through 5-OCT-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM46_CAN.QAF;1
Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
Start/End Dates : 3-OCT-2022 05:52:42 through 5-OCT-2022 12:00:00
Mean +- Std Dev : 1.05536 +- 3.497341E-02 (3.31 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM46.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 25-SEP-2022 11:17:44 through 5-OCT-2022 12:00:00
Mean +- Std Dev : 1.41124 +- 2.182219E-02 (1.55 %)



RAD Standards Traceability

1298

CERTIFICATE OF CALIBRATION
 Standard Radionuclide Source

78962-278

200 mL Solid in 250 mL PP MRP Jar

Customer: GEL Laboratories, LLC

P.O. No.: 88007 RD, Item 1

Calibration Date: 01-Jan-2009

12:00 EST

Grams of Master Source: 0.0068241

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* yps/gram	This Source yps	Uncertainty, %			Calibration Method
					Type	u _A	u _F	U
Pb-210	46.5	8145.1	—	1.305E+03	0.30	1.50	3.06	4π LS
Am-241	59.5	157860	—	7.746E+02	0.3	1.5	3.1	4π LS
Cd-109	88.0	462.60	1.694E+05	1.156E+03	0.6	1.7	3.6	HPGe
Co-57	122.1	271.79	8.597E+04	5.867E+02	0.7	1.3	3.0	HPGe
Ce-139	165.9	137.6	1.217E+05	8.305E+02	0.5	1.1	2.4	HPGe
Hg-203	279.2	46.61	2.692E+05	1.837E+03	0.5	1.1	2.4	HPGe
Sn-113	391.7	115.1	1.709E+05	1.166E+03	0.6	1.1	2.5	HPGe
Cs-137	661.7	10983	1.071E+05	7.309E+02	0.7	1.2	2.8	HPGe
Y-88	898.0	106.6	4.084E+05	2.787E+03	0.7	1.1	2.6	HPGe
Co-60	1173.2	1925.4	2.084E+05	1.422E+03	0.8	1.1	2.7	HPGe
Co-60	1332.5	1925.4	2.086E+05	1.424E+03	1.0	1.1	3.0	HPGe
Y-88	1836.1	106.6	4.320E+05	2.948E+03	0.8	1.1	2.7	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

This standard will expire one year after the calibration date.

Source Prepared by:

W. Mao, Radiochemist

QA Approved:

D. M. Montgomery, QA Manager

Date:

2-10-07

End of Certificate

RC-S-051-017

Standard Logbook

Serial ID: 1298 Open/Reference Date: 01-JAN-09 Aliquot : 1 mL
Name: Mixed Gamma LCS JAR Received: 12-FEB-09 Density : Hand Calculated
Type: Source Material Expires: 01-JAN-35 Lot Number : 78962-278
Employee: Maggie Stamps Verified: 07-NOV-11
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

JAR

1298

Verification for Mixed Gamma Standard

M. Stamps 11/7/2011	Isotope Am-241	Result pCi/L	Isotopic Abundance: Certificate Value (dps):
	Mixed Gamma N1	60560	0.359
	Mixed Gamma N2	56920	774.6
	Mixed Gamma N3	59450	

Mean Value (Counting) = 101.1344
Stdev = 1865.592

Pass
Rule 3 (Pass/Fail)

Certificate Value = 58315.1
Lower Limit = 55245.48276
Upper Limit = 62707.85057
Rule 1 Pass/Fail Pass
Two sigma = 3731.183905
10 % of Mean = 5897.666667
Rule 2 (Pass/Fail) Pass

Stamp
11/7/11
R. E. Smith
11/18/11

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard 1298 JAR

M. Stamps 11/7/2011	Isotope Cs-137	Result pCi/L	Isotopic Abundance: Certificate Value (dps):	0.851 730.9
	Mixed Gamma N1	24390		
	Mixed Gamma N2	24610		
	Mixed Gamma N3	24450		
Mean Value (Counting) =	24483.33	pCi/L	105.4736	
Stdev =	113.725	pCi/L		
			Fail	
			Rule 3 (Pass/Fail)	

*Exception taken due to the high uncertainty of the certified value

Certificate Value =
 Lower Limit =
 Upper Limit =
 Rule 1 Pass/Fail
 Two sigma =
 10 % of Mean =
 Rule 2 (Pass/Fail)

*exception taken due to full recovery of standard

Handwritten signature
11/7/11

Handwritten signature
11/8/11

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

JAR

Standard Logbook

Serial ID: 1298 **Open/Reference Date:** 01 JAN 2009 **Aliquot :** 1 mL
Name: Mixed Gamma LCS JAR **Received:** 12 FEB 2009 **Density :** Hand Calculated
Type: Source Material **Expires:** 01 JAN 2035 **Lot Number :** 78962-278
Employee: Maggie Stamps **Verified:** 07 NOV 2011
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

Runlogs

Instrument Run Log

Instrument Type: GAMMA SPECTROMETER

Batch ID: 2333342

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
597531001	SAMPLE	RXF2	GAM03	OCT-31-22 08:15:23	DONE JAR		20-APR-22 00:00
597531002	SAMPLE	RXF2	GAM18	OCT-31-22 08:15:48	DONE JAR		08-JUN-22 00:00
597531003	SAMPLE	RXF2	GAM20	OCT-31-22 08:16:13	DONE JAR		18-APR-22 00:00
597533001	SAMPLE	RXF2	GAM23	OCT-31-22 08:16:43	DONE JAR		03-MAY-22 00:00
597533002	SAMPLE	RXF2	GAM30	OCT-31-22 08:17:22	DONE JAR		04-OCT-22 00:00
597533003	SAMPLE	RXF2	GAM33	OCT-31-22 08:18:19	DONE JAR		02-AUG-22 00:00
597533004	SAMPLE	RXF2	GAM46	OCT-31-22 08:19:03	DONE JAR		23-SEP-22 00:00
597533005	SAMPLE	RXF2	GAM45	OCT-31-22 08:19:32	DONE JAR		28-FEB-22 00:00
1205226445	DUP	RXF2	GAM18	OCT-31-22 10:42:37	DONE JAR		08-JUN-22 00:00
1205226446	LCS	RXF2	GAM03	OCT-31-22 10:43:43	DONE JAR		20-APR-22 00:00
1205226444	MB	RXF2	GAM07	NOV-01-22 05:09:30	DONE JAR		18-JUL-22 00:00

Gas Flow Raw Data

Batch 2333240 Check-list

This check-list was completed on 04-NOV-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 04-NOV-22 and Nat Long on 04-NOV-22.

Batch ID:
2333240

Product:
GFCTORAF

Description: Gas Flow Total Radium
GL-RAD-A-010

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?		No	
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Total Radium in Filter

Batch ID: 2333240

Analyst: Jennie Kill-Bowden (JXK3)

Method: EPA 900.1 Mod/ EPA 903.0 Mod

Lab SOP: GL-RAD-A-010 REV# 21

Instrument: GFC-C045440487

Due Dates for Lab: 01-NOV-2022

Package: 03-NOV-2022

SDG: 03-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205226271		1926-C	.1	mL
LCSD	1205226272		1926-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Precipitation (date)	Initial Weight (g)	Final Weight (g)	Net Weight (mg)	Barium Carrier Yield (percent)
1	597533001	02-NOV-2022	1	5	0.01943	11/02/22 11:30	0.0738	0.099	25.2	98
2	597533002	02-NOV-2022	1	5	0.01931	11/02/22 11:30	0.0739	0.1003	26.4	103
3	597533003	02-NOV-2022	1	5	0.01894	11/02/22 11:30	0.0733	0.1024	29.1	113
4	597533004	02-NOV-2022	1	5	0.01904	11/02/22 11:30	0.0733	0.1013	28	109
5	597533005	02-NOV-2022	1	5	0.01893	11/02/22 11:30	0.0727	0.1013	28.6	111
6	1205226270 MB	02-NOV-2022	1		0.01943	11/02/22 11:30	0.0733	0.0964	23.1	90
7	1205226271 LCS	02-NOV-2022	1		0.01943	11/02/22 11:30	0.0729	0.0939	21	82
8	1205226272 LCSD	02-NOV-2022	1		0.01943	11/02/22 11:30	0.0733	0.0931	19.8	77

Reagent/Solvent Lot ID	Description	Amount	Comments:
CARR 3492426	Barium Carrier TR 1ml=25.75	1 mL	Pipet ID: RAD-GFC-1795419
REGNT 3491695	1:1 Sulfuric Acid	10 mL	Pipet ID: RAD-GFC-1608405
			Data Entry Date2: 02-NOV-2022 00:00

Total Radium Filter

Filename : TOTRA.XLS
File type : Excel
Version # : 1.3.9

Carrier S/N : 3492426
Carrier Exp Date : 9/28/2023
Carrier Volume Added: 1.00
Carrier Weight (mg/ml): 25.75
Carrier Weight StDev.: 0.19

Batch : 2333240
Analyst : JEN02186
Prep Date : 11/2/2022
Method Uncertainty: 0.0802

Procedure Code : GFCTORAF
Parmname : Total Radium
Required MDA : 1 pCi/F
Halflife of Rn-222 : 3.8235 days

Geometry: 47mm Filter

Sample Characteristics					Carrier Calculations				
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Carrier Weight (mg) (Standard)	Residue Weight (mg) (Sample)	Residue Weight StDev. (mg)	Carrier Aliquot (mL)	Carrier Aliquot StDev. (mL)
1	597533001.1	0.0194	5.1548E-06	9/30/2022 7:45	25.75	25.20	0.115640	1.0	0.002000
2	597533002.1	0.0193	5.1429E-06	9/30/2022 7:51	25.75	26.40	0.120797	1.0	0.002000
3	597533003.1	0.0189	5.1087E-06	9/30/2022 7:58	25.75	29.10	0.132402	1.0	0.002000
4	597533004.1	0.0190	5.1179E-06	9/30/2022 8:05	25.75	28.00	0.127674	1.0	0.002000
5	597533005.1	0.0189	5.1072E-06	9/30/2022 9:00	25.75	28.60	0.130253	1.0	0.002000
6	1205226270.1	0.0194	5.1548E-06	11/2/2022 0:00	25.75	23.10	0.106614	1.0	0.002000
7	1205226271.1	0.0194	5.1548E-06	11/2/2022 0:00	25.75	21.00	0.097588	1.0	0.002000
8	1205226272.1	0.0194	5.1548E-06	11/2/2022 0:00	25.75	19.80	0.092430	1.0	0.002000

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml
 Pipet, 5 ml Stdev : +/- 0.010000 ml

Analytical SOP: GL-RAD-A-010
 Instrument SOP: GL-RAD-I-016

Count Raw Data										
Pos.	Detector ID	Counting	Gross Counts		Gross Alpha	Count	Precipitation Date/Time	Ingrowth factor	Calculated	Sample
		Time (min.)	Alpha	Beta	CPM	Start Date/Time			Recovery %	Recovery Error %
1	7A	500	40	384	0.080	11/3/2022 18:51	11/2/2022 11:30	1.706	97.9%	1.00%
2	7B	500	77	545	0.154	11/3/2022 18:51	11/2/2022 11:30	1.706	103%	1.00%
3	7C	500	101	792	0.202	11/3/2022 18:51	11/2/2022 11:30	1.706	113%	1.00%
4	7D	500	61	467	0.122	11/3/2022 18:51	11/2/2022 11:30	1.706	109%	1.00%
5	8A	500	64	475	0.128	11/3/2022 18:51	11/2/2022 11:30	1.706	111%	1.00%
6	8C	500	47	478	0.094	11/3/2022 18:50	11/2/2022 11:30	1.706	89.7%	1.01%
7	1B	60	3384	4446	56.400	11/3/2022 6:36	11/2/2022 11:30	1.413	81.6%	1.01%
8	1C	60	3569	4274	59.483	11/3/2022 6:36	11/2/2022 11:30	1.413	76.9%	1.01%

Calibration Data								
Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Beta X-Talk	Weekly Bkg Count Start Date/Time	Weekly Bkg Count Time (min.)	
PIC	6/1/2022	5/31/2023	0.3053	0.00525	0.00028	0.068	10/29/2022 8:05	500
PIC	6/1/2022	5/31/2023	0.3036	0.00479	0.00063	0.076	10/29/2022 8:05	500
PIC	6/1/2022	5/31/2023	0.2928	0.00790	0.00014	0.136	10/29/2022 8:05	500
PIC	6/1/2022	5/31/2023	0.2941	0.00619	0.00031	0.060	10/29/2022 8:05	500
PIC	6/1/2022	5/31/2023	0.3045	0.01473	0.00325	0.058	10/29/2022 8:05	500
PIC	6/1/2022	5/31/2023	0.3138	0.01321	0.00761	0.070	10/29/2022 8:05	500
PIC	6/1/2022	5/31/2023	0.2693	0.01356	0.00057	0.100	10/29/2022 8:04	500
PIC	6/1/2022	5/31/2023	0.3017	0.00967	0.00320	0.034	10/29/2022 8:04	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1926-C
LCS Exp Date : 9/9/2023
LCS Activity (dpm/ml): 2403.54
LCS Volume Added: 0.10

Results																
	Decision	Critical	Required		Sample Act.	Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA						
Pos.	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.	Sample	Sample			Nominal	
	pCi/F	pCi/F	pCi/F	pCi/F	pCi/F	%	CPM	CPM	Uncertainty	Uncertainty	QC	Type			pCi/F	Recovery
1	1.7480	1.2341	1	2.7411	0.5360	143.38%	0.0120	0.0172	1.5339	1.5364		SAMPLE				
2	1.7854	1.2605	1	2.7846	3.3979	27.52%	0.0780	0.0214	1.8474	1.9259		SAMPLE				
3	2.2890	1.6161	1	3.4849	2.7705	39.41%	0.0660	0.0260	2.1465	2.1916		SAMPLE				
4	1.5649	1.1048	1	2.4697	2.6754	30.79%	0.0620	0.0191	1.6211	1.6764		SAMPLE				
5	1.4639	1.0335	1	2.3145	2.7599	27.61%	0.0700	0.0193	1.5593	1.6271		SAMPLE				
6	1.8822	1.3289	1	2.9474	0.8074	75.48%	0.0240	0.0181	1.7137	1.7238		MB				
7	7.5194	5.3088	1	14.3523	4202.1886	2.41%	56.3000	0.9696	141.9582	690.3148		LCS			5572.0665	75.4%
8	4.1515	2.9310	1	9.3982	4188.4489	2.18%	59.4493	0.9957	138.0279	684.9461		LCSD	0.3%		5572.0665	75.2%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
597533001	7A	500	40	384	11/3/2022 18:51	11/4/2022 3:11	PIC	2333240
597533002	7B	500	77	545	11/3/2022 18:51	11/4/2022 3:11	PIC	2333240
597533003	7C	500	101	792	11/3/2022 18:51	11/4/2022 3:11	PIC	2333240
597533004	7D	500	61	467	11/3/2022 18:51	11/4/2022 3:11	PIC	2333240
597533005	8A	500	64	475	11/3/2022 18:51	11/4/2022 3:11	PIC	2333240
1205226270	8C	500	47	478	11/3/2022 18:50	11/4/2022 3:10	PIC	2333240
1205226271	1B	60	3384	4446	11/3/2022 6:36	11/3/2022 7:36	PIC	2333240
1205226272	1C	60	3569	4274	11/3/2022 6:36	11/3/2022 7:36	PIC	2333240

Batch 2333238 Check-list

This check-list was completed on 03-NOV-22 by Kenshalla Oston

This batch was reviewed by Nat Long on 02-NOV-22 and Kenshalla Oston on 03-NOV-22.

Batch ID:
2333238

Product:
GFC90SRF

Description: Gas Flow Strontium 90
GL-RAD-A-004

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
8	Are there any equilibrium assumptions?		No	
Quality Control (QC) Information				
9	Was the method blank (MB) within the acceptance criteria?	Yes		
10	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
11	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Strontium-90 in Filter

Batch ID: 2333238

Analyst: Jennie Kill-Bowden (JXK3)

Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified

Lab SOP: GL-RAD-A-004 REV# 22

Instrument: GFC-C045440487

Due Dates for Lab: 01-NOV-2022

Package: 03-NOV-2022

SDG: 03-NOV-2022

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205226268	Strontium-90 SPIKE	1943-D	.1	mL
LCSD	1205226269	Strontium-90 SPIKE	1943-D	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Initial Wt (g)	Final Wt (g)	Net Weight (mg)	Sr Separation (date)	Strontium Carrier Yield (percent)
1	597531001	28-OCT-2022	3	30	0.11059	0.0343	0.0383	4	11/01/22 15:45	89
2	597531002	28-OCT-2022	3	30	0.11123	0.0344	0.0388	4.4	11/01/22 15:45	98
3	597531003	28-OCT-2022	3	30	0.11337	0.0362	0.0389	2.7	11/01/22 15:45	60
4	597533001	28-OCT-2022	3	30	0.11658	0.0341	0.0381	4	11/01/22 15:45	89
5	597533002	28-OCT-2022	3	30	0.11583	0.0362	0.0403	4.1	11/01/22 15:45	91
6	597533003	28-OCT-2022	3	30	0.11367	0.0346	0.0388	4.2	11/01/22 15:45	93
7	597533004	28-OCT-2022	3	30	0.11425	0.0343	0.0384	4.1	11/01/22 15:45	91
8	597533005	28-OCT-2022	3	30	0.11358	0.0343	0.0384	4.1	11/01/22 15:45	91
9	1205226267 MB	28-OCT-2022	3		0.11658	0.0363	0.04	3.7	11/01/22 15:45	82
10	1205226268 LCS	28-OCT-2022	3		0.11658	0.0344	0.0364	2	11/01/22 15:45	44
11	1205226269 LCSD	28-OCT-2022	3		0.11658	0.0344	0.0381	3.7	11/01/22 15:45	82

Reagent/Solvent Lot ID	Description	Amount	Comments:
CARR 3482192	Strontium Carrier 0.5mL=4.5 mg/mL	.5 mL	Spike Pipet ID: RAD-GFC-1795419
REGNT 3424102.2	Phenolphthalein	2 mL	Carrier Pipet ID: RAD-GFC-2154115
REGNT 3432260	RGF-0.05M Nitric Acid	15 mL	Data Entry Date2: 28-OCT-2022 00:00
REGNT 3460243.3	Thymol Blue Indicator0.0.04%	1 mL	
REGNT 3487134	80% ethanol	3 mL	
REGNT 3495604	0.75M Sodium Carbonate	13 mL	
REGNT 3501767	8M HNO3	40 mL	
REGNT 3517710	3M HNO3 0.05M Oxalic	10 mL	
REGNT 3520138	RGF-6M Sodium Hydroxide	10 mL	
REGNT SR0066	2283064	2 g	

Strontium-90 Filter

Filename : SR90.XLS
 File type : Excel
 Version # : 1.3.10

Carrier S/N : 3482192
 Carrier Exp Date : 9/2/2023
 Carrier Volume Added: 0.50
 Carrier Weight (mg/ml): 9.00
 Carrier Weight StDev.: 0.08

Batch : 2333238
 Analyst : JEN02186
 Prep Date : 10/28/2022
 Method Uncertainty : 0.1315

Procedure Code : GFC90SRF
 Parmname : Strontium-90
 Required MDA : 3 pCi/F
 Sr-90 Abundance : 1.00
 Halflife of Sr-90 : 28.90 years
 Halflife of Y-90 : 64.053 hours

Geometry: Tuffryn Filter

Sample Characteristics					Carrier Calculations				
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Carrier Weight (mg) (Standard)	Net Weight (mg) (Sample)	Net Weight StDev. (mg)	Carrier Aliquot (mL)	Carrier Aliquot StDev. (mL)
1	597531001.1	0.1106	1.2001E-05	9/26/2022 8:18	9.00	4.00	0.024522	0.5	0.001000
2	597531002.1	0.1112	1.2038E-05	9/26/2022 8:25	9.00	4.40	0.026241	0.5	0.001000
3	597531003.1	0.1134	1.2160E-05	9/26/2022 9:00	9.00	2.70	0.018935	0.5	0.001000
4	597533001.1	0.1166	1.2341E-05	9/30/2022 7:45	9.00	4.00	0.024522	0.5	0.001000
5	597533002.1	0.1158	1.2299E-05	9/30/2022 7:51	9.00	4.10	0.024952	0.5	0.001000
6	597533003.1	0.1137	1.2177E-05	9/30/2022 7:58	9.00	4.20	0.025382	0.5	0.001000
7	597533004.1	0.1143	1.2210E-05	9/30/2022 8:05	9.00	4.10	0.024952	0.5	0.001000
8	597533005.1	0.1136	1.2172E-05	9/30/2022 9:00	9.00	4.10	0.024952	0.5	0.001000
9	1205226267.1	0.1166	1.2341E-05	10/28/2022 0:00	9.00	3.70	0.023233	0.5	0.001000
10	1205226268.1	0.1166	1.2341E-05	10/28/2022 0:00	9.00	2.00	0.015926	0.5	0.001000
11	1205226269.1	0.1166	1.2341E-05	10/28/2022 0:00	9.00	3.70	0.023233	0.5	0.001000

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-004
 Instrument SOP: GL-RAD-I-016

Count Raw Data											
	Counting					Count	Strontium			Calculated	
	Detector	Time	Gross Counts		Gross Beta	Start	Separation	Yttrium	Sr-90	Sample	Sample
Pos.	ID	(min.)	Alpha	Beta	CPM	Date/Time	Date/Time	Ingrowth	Decay	Recovery %	Recovery Error %
1	8A	150	13	134	0.889	11/2/2022 9:11	11/1/2022 15:45	0.183	0.998	88.9%	1.26%
2	5A	500	36	521	1.040	11/1/2022 19:09	11/1/2022 15:45	0.079	0.998	97.8%	1.24%
3	10D	240	8	97	0.401	11/2/2022 9:11	11/1/2022 15:45	0.190	0.998	60.0%	1.35%
4	9D	130	7	106	0.812	11/2/2022 9:11	11/1/2022 15:45	0.182	0.998	88.9%	1.26%
5	5D	500	23	499	0.996	11/1/2022 19:09	11/1/2022 15:45	0.079	0.998	91.1%	1.25%
6	9C	130	5	89	0.682	11/2/2022 9:11	11/1/2022 15:45	0.182	0.998	93.3%	1.25%
7	6C	500	30	743	1.482	11/1/2022 19:10	11/1/2022 15:45	0.079	0.998	91.1%	1.25%
8	7A	500	26	244	0.485	11/1/2022 19:10	11/1/2022 15:45	0.079	0.998	91.1%	1.25%
9	7B	500	34	306	0.608	11/1/2022 19:09	11/1/2022 15:45	0.079	1.000	82.2%	1.27%
10	2A	60	8	750	12.493	11/2/2022 6:22	11/1/2022 15:45	0.151	1.000	44.4%	1.45%
11	2B	60	6	1460	24.326	11/2/2022 6:22	11/1/2022 15:45	0.151	1.000	82.2%	1.27%

Calibration Data										
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)		Detector Efficiency Error (cpm/dpm)	Alpha X-Talk	Weekly Bkg CPM	Weekly Bkg Count Start Date/Time	Weekly Bkg Count Time (min.)
1	PIC	4/1/2021	3/31/2023	0.3565	0.5214	0.01579	0.04467	0.758	10/29/2022 8:05	500
2	PIC	4/1/2021	3/31/2023	0.3620	0.5227	0.00851	0.03268	1.014	10/29/2022 8:05	500
3	PIC	4/1/2021	3/31/2023	0.3437	0.5093	0.00557	0.08028	0.486	10/29/2022 8:06	500
4	PIC	4/1/2021	3/31/2023	0.3549	0.5102	0.02610	0.05749	0.714	10/29/2022 8:06	500
5	PIC	4/1/2021	3/31/2023	0.3664	0.5237	0.00925	0.04017	1.092	10/29/2022 8:05	500
6	PIC	4/1/2021	3/31/2023	0.3441	0.5099	0.00584	0.05868	0.730	10/29/2022 8:06	500
7	PIC	4/1/2021	3/31/2023	0.3528	0.4867	0.01970	0.07026	1.556	10/29/2022 8:05	500
8	PIC	4/1/2021	3/31/2023	0.3485	0.5013	0.00594	0.06067	0.590	10/29/2022 8:05	500
9	PIC	4/1/2021	3/31/2023	0.3503	0.5082	0.00627	0.05218	0.600	10/29/2022 8:05	500
10	PIC	4/1/2021	3/31/2023	0.3523	0.5073	0.01914	0.05433	1.108	10/29/2022 8:04	500
11	PIC	4/1/2021	3/31/2023	0.3571	0.5059	0.02111	0.06868	1.568	10/29/2022 8:04	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1943-D
LCS Exp Date : 6/4/2023
LCS Activity (dpm/ml): 514.93
LCS Volume Added: 0.10

Results																	Scanned Detector
Pos.	Decision Level	Critical Level	Required MDA	MDA	Sample Act. Conc.	Sample Act. Error	Net Count Rate	Net Count Rate Error	2 SIGMA Counting Uncertainty	2 SIGMA Total Prop. Uncertainty	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery	
	pCi/F	pCi/F	pCi/F	pCi/F	pCi/F	%	CPM	CPM	pCi/F	pCi/F							
1	1.9192	1.3549	3	2.9131	1.3360	65.67%	0.1315	0.0863	1.7187	1.7542		SAMPLE					
2	1.5283	1.0790	3	2.2197	0.2641	249.89%	0.0256	0.0641	1.2937	1.2955		SAMPLE					
3	1.9227	1.3574	3	2.9033	-1.2738	60.87%	-0.0845	0.0514	1.5194	1.5195		SAMPLE					
4	1.8864	1.3318	3	2.8882	0.9566	89.19%	0.0983	0.0876	1.6713	1.6909		SAMPLE					
5	1.6156	1.1407	3	2.3443	-1.0056	67.44%	-0.0958	0.0646	1.3289	1.3289		SAMPLE					
6	1.9093	1.3480	3	2.9208	-0.4641	171.93%	-0.0476	0.0819	1.5640	1.5641		SAMPLE					
7	2.0381	1.4389	3	2.9444	-0.8229	105.05%	-0.0742	0.0779	1.6939	1.6939		SAMPLE					
8	1.2724	0.8984	3	1.8642	-1.1821	44.11%	-0.1052	0.0464	1.0216	1.0216		SAMPLE					
9	1.3747	0.9706	3	2.0134	0.1018	581.66%	0.0085	0.0492	1.1605	1.1608		MB					
10	6.7938	4.7965	3	10.6066	230.8209	4.69%	11.3848	0.4587	18.2289	63.7532		LCS			198.9594	116.0%	
11	4.3227	3.0518	3	6.6459	246.7919	3.74%	22.7585	0.6392	13.5857	66.9096		LCSD	6.7%		198.9594	124.0%	

Results (DPM)															
Decision Level DPM/F	Critical Level DPM/F	Required MDA DPM/F	MDA DPM/F	Sample Act. Conc. DPM/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	1 SIGMA Counting Uncertainty DPM/F	1 SIGMA Total Prop. Uncertainty DPM/F	Sample QC	Sample Type	RPD	RER	Nominal DPM/F	Recovery
4.2605	3.0080	6.66	6.4671	2.9658	65.67%	0.1315	0.0863	3.8155	3.8942		SAMPLE				
3.3928	2.3953	6.66	4.9278	0.5864	249.89%	0.0256	0.0641	2.8720	2.8760		SAMPLE				
4.2684	3.0135	6.66	6.4453	-2.8279	60.87%	-0.0845	0.0514	3.3731	3.3733		SAMPLE				
4.1878	2.9566	6.66	6.4118	2.1236	89.19%	0.0983	0.0876	3.7102	3.7539		SAMPLE				
3.5867	2.5322	6.66	5.2042	-2.2324	67.44%	-0.0958	0.0646	2.9502	2.9502		SAMPLE				
4.2387	2.9926	6.66	6.4843	-1.0304	171.93%	-0.0476	0.0819	3.4721	3.4723		SAMPLE				
4.5246	3.1944	6.66	6.5365	-1.8268	105.05%	-0.0742	0.0779	3.7604	3.7605		SAMPLE				
2.8248	1.9943	6.66	4.1384	-2.6243	44.11%	-0.1052	0.0464	2.2679	2.2679		SAMPLE				
3.0519	2.1547	6.66	4.4698	0.2260	581.66%	0.0085	0.0492	2.5763	2.5770		MB				
15.0822	10.6481	6.66	23.5468	512.4225	4.69%	11.3848	0.4587	40.4681	141.5322		LCS			441.69	116.0%
9.5963	6.7751	6.66	14.7538	547.8780	3.74%	22.7585	0.6392	30.1602	148.5393		LCSD	6.7%		441.69	124.0%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
597531001	8A	150	13	134	11/2/2022 9:11	11/2/2022 11:41	PIC	2333238
597531002	5A	500	36	521	11/1/2022 19:09	11/2/2022 3:29	PIC	2333238
597531003	10D	240	8	97	11/2/2022 9:11	11/2/2022 13:11	PIC	2333238
597533001	9D	130	7	106	11/2/2022 9:11	11/2/2022 11:21	PIC	2333238
597533002	5D	500	23	499	11/1/2022 19:09	11/2/2022 3:29	PIC	2333238
597533003	9C	130	5	89	11/2/2022 9:11	11/2/2022 11:21	PIC	2333238
597533004	6C	500	30	743	11/1/2022 19:10	11/2/2022 3:30	PIC	2333238
597533005	7A	500	26	244	11/1/2022 19:10	11/2/2022 3:30	PIC	2333238
1205226267	7B	500	34	306	11/1/2022 19:09	11/2/2022 3:29	PIC	2333238
1205226268	2A	60	8	750	11/2/2022 6:22	11/2/2022 7:22	PIC	2333238
1205226269	2B	60	6	1460	11/2/2022 6:22	11/2/2022 7:22	PIC	2333238

Batch 2333242 Check-list

This check-list was completed on 07-NOV-22 by Nat Long

This batch was reviewed by Kenshalla Oston on 07-NOV-22 and Nat Long on 07-NOV-22.

Batch ID:
2333242

Product:
GFC28RAF

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
11	Has the method required detection limit been met?		No	
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Filter

Batch ID: 2333242
Analyst: Jacqueline Emond (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: No instrument-manual method

Due Dates for Lab: 01-NOV-2022			Package: 03-NOV-2022	SDG: 03-NOV-2022		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205226274	228 DW spike	1952-B	.1	mL	
LCSD	1205226275	228 DW spike	1952-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	597533001	01-NOV-2022	1	30	0.11658	11/02/22 15:15	11/04/22 09:28
2	597533002	01-NOV-2022	1	30	0.11583	11/02/22 15:15	11/04/22 09:28
3	597533003	01-NOV-2022	1	30	0.11367	11/02/22 15:15	11/04/22 09:28
4	597533004	01-NOV-2022	1	30	0.11425	11/02/22 15:15	11/04/22 09:28
5	597533005	01-NOV-2022	1	30	0.11358	11/02/22 15:15	11/04/22 09:28
6	1205226273 MB	01-NOV-2022	1		0.11658	11/02/22 15:15	11/04/22 09:28
7	1205226274 LCS	01-NOV-2022	1		0.11658	11/02/22 15:15	11/04/22 09:28
8	1205226275 LCSD	01-NOV-2022	1		0.11658	11/02/22 15:15	11/04/22 09:28

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 01-NOV-2022 00:00
REGNT 3418276.6	29M HF (48-50%)	4 mL	
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3466687	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3481329	RGF-1M Citric Acid	5 mL	
REGNT 3485721.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3517376	2M HCl	20 mL	
REGNT 3521298	RGF-Neodymium Substrate	5 mL	
REGNT 3523298	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3523926	RGF-50% Potassium Carbonate	2 mL	
REGNT 3526650	RGF-7M Nitric Acid	25 mL	
REGNT DGA0038	2327498	2 g	

Radium-228 Filter

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.2

Tracer S/N : 1951-D
 Tracer Exp Date : 6/2/2023
 Tracer Volume Added: 0.10

Batch : 2333242
 Analyst : JAC02417
 Prep Date : 11/1/2022
 Ra-228 Method Uncertainty : 0

Procedure Code : GFC28RAF
 Parmname : Radium-228
 Required MDA : 1 pCi/F
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations					
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	597533001.1	0.1166	1.2341E-05	9/30/2022 7:45	1304.4	1.60%	868.1	1.96%	0.1	0.000200
2	597533002.1	0.1158	1.2299E-05	9/30/2022 7:51	1304.4	1.60%	944.1	1.88%	0.1	0.000200
3	597533003.1	0.1137	1.2177E-05	9/30/2022 7:58	1304.4	1.60%	1064.8	1.77%	0.1	0.000200
4	597533004.1	0.1143	1.2210E-05	9/30/2022 8:05	1304.4	1.60%	1038.9	1.79%	0.1	0.000200
5	597533005.1	0.1136	1.2172E-05	9/30/2022 9:00	1304.4	1.60%	1013.5	1.81%	0.1	0.000200
6	1205226273.1	0.1166	1.2341E-05	11/1/2022 0:00	1304.4	1.60%	1001.7	1.82%	0.1	0.000200
7	1205226274.1	0.1166	1.2341E-05	11/1/2022 0:00	1304.4	1.60%	1066.8	1.77%	0.1	0.000200
8	1205226275.1	0.1166	1.2341E-05	11/1/2022 0:00	1304.4	1.60%	1034.6	1.79%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data														Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Alpha	Counts Beta	Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction			
1	6C	120	14	266	2.217	11/4/2022 11:39	11/2/2022 15:15	11/4/2022 9:28	0.988	0.781	0.991	1.117	66.6%	1.30%	
2	7A	120	37	87	0.725	11/4/2022 11:39	11/2/2022 15:15	11/4/2022 9:28	0.988	0.781	0.991	1.117	72.4%	1.27%	
3	7B	120	22	177	1.475	11/4/2022 11:39	11/2/2022 15:15	11/4/2022 9:28	0.988	0.781	0.991	1.117	81.6%	1.23%	
4	7C	120	37	122	1.017	11/4/2022 11:39	11/2/2022 15:15	11/4/2022 9:28	0.988	0.781	0.991	1.117	79.6%	1.23%	
5	8A	120	30	150	1.250	11/4/2022 11:39	11/2/2022 15:15	11/4/2022 9:28	0.988	0.781	0.991	1.117	77.7%	1.24%	
6	8C	120	30	143	1.192	11/4/2022 11:38	11/2/2022 15:15	11/4/2022 9:28	0.999	0.782	0.991	1.117	76.8%	1.24%	
7	9A	60	19	1005	16.750	11/4/2022 11:39	11/2/2022 15:15	11/4/2022 9:28	0.999	0.782	0.991	1.057	81.8%	1.23%	
8	9B	60	25	996	16.600	11/4/2022 11:39	11/2/2022 15:15	11/4/2022 9:28	0.999	0.782	0.991	1.057	79.3%	1.23%	

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6123	0.01970	1.556	10/29/2022 8:05	500
2	PIC	6/1/2022	5/31/2023	0.6257	0.00594	0.590	10/29/2022 8:05	500
3	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.600	10/29/2022 8:05	500
4	PIC	6/1/2022	5/31/2023	0.6407	0.00790	0.942	10/29/2022 8:05	500
5	PIC	6/1/2022	5/31/2023	0.6398	0.01579	0.758	10/29/2022 8:05	500
6	PIC	6/1/2022	5/31/2023	0.6294	0.01955	0.912	10/29/2022 8:05	500
7	PIC	6/1/2022	5/31/2023	0.6336	0.00758	0.948	10/29/2022 8:06	500
8	PIC	6/1/2022	5/31/2023	0.6318	0.00754	0.854	10/29/2022 8:06	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1952-B
LCS Exp Date : 8/9/2023
LCS Activity (dpm/ml): 443.39
LCS Volume Added: 0.10

Results																
	Decision	Critical	Required		Sample Act.	Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA						
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
Pos.	pCi/F	pCi/F	pCi/F	pCi/F	pCi/F	%	CPM	CPM	Uncertainty	Uncertainty	Sample	Sample	RPD	RER	Nominal	Recovery
									pCi/F	pCi/F	QC	Type			pCi/F	
1	4.0867	2.8852	1	6.1163	9.1385	22.36%	0.6607	0.1469	3.9831	4.0054		SAMPLE				
2	2.2797	1.6095	1	3.5322	1.6916	62.96%	0.1350	0.0850	2.0871	2.0876		SAMPLE				
3	2.0422	1.4418	1	3.1619	9.7398	13.35%	0.8750	0.1162	2.5342	2.5478		SAMPLE				
4	2.5928	1.8306	1	3.9431	0.8422	136.30%	0.0747	0.1018	2.2497	2.2499		SAMPLE				
5	2.4024	1.6961	1	3.6835	5.7319	22.29%	0.4920	0.1092	2.4944	2.5045		SAMPLE				
6	2.6082	1.8414	1	3.9711	3.2249	38.84%	0.2797	0.1084	2.4504	2.4547		MB				
7	3.1570	2.2289	1	4.9670	160.9508	3.65%	15.8020	0.5302	10.5837	11.5195		LCS			171.3165	93.9%
8	3.0991	2.1880	1	4.9027	165.8760	3.65%	15.7460	0.5276	10.8939	11.8641		LCSD	3.0%		171.3165	96.8%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
597533001	6C	120	14	266	11/4/2022 11:39	11/4/2022 13:39	PIC	2333242
597533002	7A	120	37	87	11/4/2022 11:39	11/4/2022 13:39	PIC	2333242
597533003	7B	120	22	177	11/4/2022 11:39	11/4/2022 13:39	PIC	2333242
597533004	7C	120	37	122	11/4/2022 11:39	11/4/2022 13:39	PIC	2333242
597533005	8A	120	30	150	11/4/2022 11:39	11/4/2022 13:39	PIC	2333242
1205226273	8C	120	30	143	11/4/2022 11:38	11/4/2022 13:38	PIC	2333242
1205226274	9A	60	19	1005	11/4/2022 11:39	11/4/2022 12:39	PIC	2333242
1205226275	9B	60	25	996	11/4/2022 11:39	11/4/2022 12:39	PIC	2333242

ASSAY 4-Nov-22 10:13:25
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 11/4/2022
 Run id. 5773

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF	1	87	1	180	3914	1304.44	1.6		10:13:25
597533001	2	87	2	180	2604.85	868.14	1.96	66.55	10:16:39
597533002	3	87	3	180	2833	944.08	1.88	72.37	10:19:53
597533003	4	87	4	180	3195	1064.82	1.77	81.63	10:23:07
597533004	5	87	5	180	3117.28	1038.9	1.79	79.64	10:26:20
597533005	1	14	1	180	3040.85	1013.51	1.81	77.70	10:29:57
1205226273	2	14	2	180	3005.28	1001.66	1.82	76.79	10:33:11
1205226274	3	14	3	180	3201	1066.81	1.77	81.78	10:36:25
1205226275	4	14	4	180	3104.28	1034.58	1.79	79.31	10:39:38

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 01-Nov-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	need 2nd	Alpha bkg	01-Nov 05:14	60	0.017	-3.73E-2	0.175	-1.48
LB4100A2	Above	Beta bkg	01-Nov 05:14	60	2.083	1.377	2.444	+0.97
LB4100E2	Above	Beta bkg	01-Nov 04:54	60	2.433	1.385	3.072	+0.73
LB4100E4	Above	Beta bkg	01-Nov 04:54	60	3.733	0.976	2.268	+9.81
LB4100F2	need 2nd	Alpha eff	01-Nov 06:04	5	6564	6533	7372	-2.78
LB4100F2	need 2nd	Alpha XTalk	01-Nov 06:04	5	0.363	0.318	0.366	+2.62
LB4100F2	Above	Beta bkg	01-Nov 04:54	60	36.217	1.173	1.833	+315.58
LB4100F3	Above	Alpha bkg	01-Nov 04:54	60	0.367	0.119	0.404	+2.22
LB4100F3	Above	Alpha eff	01-Nov 06:04	5	16073	11460	15350	+4.11
LB4100F3	Below	Alpha XTalk	01-Nov 06:04	5	0.315	0.328	0.439	-3.69
LB4100F4	Below	Alpha eff	01-Nov 06:04	5	11546	12140	14390	-4.58
LB4100F4	Above	Alpha XTalk	01-Nov 06:04	5	0.368	0.287	0.347	+5.13
LB4100G1	Above	Alpha XTalk	01-Nov 05:56	5	1.033	0.088	0.447	+12.81
LB4100G1	Above	Beta bkg	01-Nov 04:55	60	6840	0.380	1.675	+31,690.40
LB4100G1	Above	Beta eff	01-Nov 06:04	5	21573	12880	18320	+6.59
LB4100G3	Above	Beta bkg	01-Nov 04:55	60	2.333	0.810	1.674	+7.58
LB4100H1	Above	Beta bkg	01-Nov 04:54	60	2.567	0.216	2.462	+3.28
PIC4D	Above	Alpha bkg	01-Nov 05:27	60	0.567	-4.40E-2	0.433	+4.69
PIC4D	Above	Beta bkg	01-Nov 05:27	60	3.533	0.100	2.482	+5.65
PIC8B	Above	Alpha bkg	01-Nov 05:39	60	0.750	-1.16E-1	0.388	+7.32
PIC8B	Above	Beta bkg	01-Nov 05:39	60	3.283	-1.80E-1	2.341	+5.24
PIC8B	Above	Beta XTalk	01-Nov 05:32	5	0.002	2.00E-4	9.31E-4	+8.44
PIC8D	Above	Beta bkg	01-Nov 05:39	60	2.733	-1.07E-1	2.328	+4.00
PIC10B	Above	Beta bkg	01-Nov 05:46	60	2.267	-1.04E-1	2.645	+2.17
PIC12B	Above	Beta bkg	01-Nov 05:52	60	2.200	0.269	2.358	+2.55

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 11/11/22

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 02-Nov-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stddev
LB4100A2	need 2nd	Beta bkg	02-Nov 05:12	60	1.817	1.377	2.444	-0.53
LB4100A3	Above	Beta eff	02-Nov 06:29	5	24294	18490	23930	+3.40
LB4100E2	Above	Beta bkg	02-Nov 04:36	60	2.350	1.385	3.072	+0.43
LB4100E4	Above	Beta bkg	02-Nov 04:36	60	3.150	0.976	2.268	+7.10
LB4100E4	Below	Beta eff	02-Nov 05:38	5	15953	16060	18510	-3.26
LB4100F2	Below	Alpha eff	02-Nov 05:46	5	6508	6533	7372	-3.18
LB4100F2	Above	Alpha XTalk	02-Nov 05:46	5	0.367	0.318	0.366	+3.16
LB4100F2	Above	Beta bkg	02-Nov 04:36	60	34.483	1.173	1.833	+299.82
LB4100F3	need 2nd	Alpha bkg	02-Nov 04:36	60	0.267	0.119	0.404	+0.11
LB4100F3	Above	Alpha eff	02-Nov 05:46	5	15814	11460	15350	+3.72
LB4100F3	Below	Alpha XTalk	02-Nov 05:46	5	0.322	0.328	0.439	-3.32
LB4100F4	Below	Alpha eff	02-Nov 05:46	5	11162	12140	14390	-5.61
LB4100F4	Above	Alpha XTalk	02-Nov 05:46	5	0.381	0.287	0.347	+6.41
LB4100G1	Above	Alpha XTalk	02-Nov 05:38	5	0.778	0.088	0.447	+8.55
LB4100G1	Above	Beta bkg	02-Nov 04:36	60	4996	0.380	1.675	+23,148.23
LB4100G1	Above	Beta eff	02-Nov 05:46	5	19491	12880	18320	+4.29
LB4100G3	Above	Beta bkg	02-Nov 04:36	60	2.233	0.810	1.674	+6.88
LB4100H1	Above	Beta bkg	02-Nov 04:36	60	2.850	0.216	2.462	+4.04
PIC2C	Below	Alpha eff	02-Nov 15:09	5	19251	19380	21750	-3.33
PIC2C	Above	Alpha XTalk	02-Nov 15:09	5	0.277	0.238	0.276	+3.19
PIC4D	Above	Alpha bkg	02-Nov 05:09	60	0.600	-4.40E-2	0.433	+5.11
PIC4D	Above	Beta bkg	02-Nov 05:09	60	3.233	0.100	2.482	+4.89
PIC8B	Above	Alpha bkg	02-Nov 05:20	60	0.717	-1.16E-1	0.388	+6.93
PIC8B	Above	Beta bkg	02-Nov 05:20	60	3.450	-1.80E-1	2.341	+5.64
PIC8B	Above	Beta XTalk	02-Nov 05:13	5	0.001	2.00E-4	9.31E-4	+7.54
PIC8D	Above	Beta bkg	02-Nov 05:20	60	2.800	-1.07E-1	2.328	+4.16
PIC10B	Above	Beta bkg	02-Nov 05:28	60	2.667	-1.04E-1	2.645	+3.05
PIC11B	Above	Alpha bkg	02-Nov 12:10	60	0.333	-1.80E-1	0.522	+1.39
PIC12B	Above	Beta bkg	02-Nov 05:33	60	2.383	0.269	2.358	+3.07

PIC14B	Above	Alpha bkg	02-Nov 05:39	60	0.450	-1.04E-1	0.352	+4.28
PIC14B	Above	Beta bkg	02-Nov 05:39	60	2.783	-2.13E-1	2.672	+3.23

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 11/21/22

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 03-Nov-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
G5400W1X	Below	Beta eff	03-Nov 09:51	5	14161	14210	14820	-3.48
LB4100A2	Above	Beta bkg	03-Nov 05:08	60	2.017	1.377	2.444	+0.60
LB4100A3	Above	Beta eff	03-Nov 06:22	5	24175	18490	23930	+3.27
LB4100E2	Above	Alpha bkg	03-Nov 04:48	60	0.383	-1.63E-1	0.406	+2.76
LB4100E2	Above	Beta bkg	03-Nov 04:48	60	2.833	1.385	3.072	+2.15
LB4100E4	Above	Beta bkg	03-Nov 04:48	60	3.467	0.976	2.268	+8.57
LB4100E4	need 2nd	Beta eff	03-Nov 06:09	5	17012	16060	18510	-0.67
LB4100F2	Below	Alpha eff	03-Nov 06:00	5	6344	6533	7372	-4.35
LB4100F2	Above	Alpha XTalk	03-Nov 06:00	5	0.374	0.318	0.366	+4.05
LB4100F2	Above	Beta bkg	03-Nov 04:48	60	33.700	1.173	1.833	+292.70
LB4100F3	Above	Alpha bkg	03-Nov 04:48	60	0.333	0.119	0.404	+1.51
LB4100F3	Above	Alpha eff	03-Nov 06:00	5	15665	11460	15350	+3.49
LB4100F3	need 2nd	Alpha XTalk	03-Nov 06:00	5	0.329	0.328	0.439	-2.95
LB4100F4	Below	Alpha eff	03-Nov 06:00	5	10953	12140	14390	-6.16
LB4100F4	Above	Alpha XTalk	03-Nov 06:00	5	0.390	0.287	0.347	+7.29
LB4100G1	Above	Alpha XTalk	03-Nov 05:54	5	0.858	0.088	0.447	+9.88
LB4100G1	Above	Beta bkg	03-Nov 04:48	60	8234	0.380	1.675	+38,152.71
LB4100G1	need 2nd	Beta eff	03-Nov 06:02	5	14138	12880	18320	-1.61
LB4100G3	Above	Beta bkg	03-Nov 04:48	60	1.883	0.810	1.674	+4.45
LB4100G3	Below	Beta eff	03-Nov 06:02	5	20320	21640	22870	-9.44
LB4100G4	Below	Beta eff	03-Nov 06:02	5	15653	16330	19880	-4.14
LB4100H1	Above	Beta bkg	03-Nov 04:48	60	2.683	0.216	2.462	+3.59
PIC2C	Below	Alpha eff	03-Nov 06:43	5	19289	19380	21750	-3.23
PIC4A	Above	Beta bkg	03-Nov 12:40	60	5.567	0.076	1.446	+21.05
PIC4D	need 2nd	Alpha bkg	03-Nov 05:36	60	0.233	-4.40E-2	0.433	+0.49
PIC4D	Above	Beta bkg	03-Nov 05:36	60	2.883	0.100	2.482	+4.01
PIC6A	Above	Beta bkg	03-Nov 12:40	60	10.967	0.669	2.752	+26.66
PIC8B	Above	Alpha bkg	03-Nov 05:48	60	0.750	-1.16E-1	0.388	+7.32
PIC8B	Above	Beta bkg	03-Nov 05:48	60	4.317	-1.80E-1	2.341	+7.70

PIC8B	Above	Beta XTalk	03-Nov 05:41	5	0.001	2.00E-4	9.31E-4	+7.03
PIC8D	Above	Beta bkg	03-Nov 05:48	60	2.200	-1.07E-1	2.328	+2.68
PIC10B	Above	Beta bkg	03-Nov 05:55	60	2.800	-1.04E-1	2.645	+3.34
PIC12B	Above	Beta bkg	03-Nov 05:59	60	2.333	0.269	2.358	+2.93
PIC14B	Above	Alpha bkg	03-Nov 06:05	60	0.317	-1.04E-1	0.352	+2.53
PIC14B	Above	Beta bkg	03-Nov 06:05	60	2.333	-2.13E-1	2.672	+2.30

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by A. Deil - Hansen

Date 11-4-22

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 04-Nov-2022

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100A2	Above	Beta bkg	04-Nov 04:47	60	2.150	1.377	2.444	+1.35
LB4100A3	Above	Beta eff	04-Nov 06:07	5	24684	18490	23930	+3.83
LB4100E2	need 2nd	Alpha bkg	04-Nov 04:11	60	0.267	-1.63E-1	0.406	+1.53
LB4100E2	Above	Beta bkg	04-Nov 04:11	60	2.483	1.385	3.072	+0.91
LB4100E3	Above	Alpha bkg	04-Nov 05:39	60	0.283	-4.71E-2	0.174	+5.98
LB4100E3	Above	Beta bkg	04-Nov 05:39	60	3.500	0.282	3.189	+3.64
LB4100E4	Above	Beta bkg	04-Nov 04:11	60	2.250	0.976	2.268	+2.92
LB4100F2	Below	Alpha eff	04-Nov 05:29	5	6353	6533	7372	-4.29
LB4100F2	Above	Alpha XTalk	04-Nov 05:29	5	0.379	0.318	0.366	+4.70
LB4100F2	Above	Beta bkg	04-Nov 04:12	60	32.283	1.173	1.833	+279.82
LB4100F3	need 2nd	Alpha bkg	04-Nov 04:12	60	0.300	0.119	0.404	+0.81
LB4100F3	Above	Alpha eff	04-Nov 05:53	5	16039	11460	15350	+4.06
LB4100F3	Below	Alpha XTalk	04-Nov 05:53	5	0.314	0.328	0.439	-3.73
LB4100F4	Below	Alpha eff	04-Nov 05:53	5	10635	12140	14390	-7.01
LB4100F4	Above	Alpha XTalk	04-Nov 05:53	5	0.398	0.287	0.347	+8.10
LB4100G1	Above	Alpha XTalk	04-Nov 05:14	5	1.087	0.088	0.447	+13.72
LB4100G1	Above	Beta bkg	04-Nov 04:12	60	7653	0.380	1.875	+35,457.55
LB4100G1	Above	Beta eff	04-Nov 05:28	5	21199	12880	18320	+6.18
LB4100G3	Above	Beta bkg	04-Nov 04:11	60	1.867	0.810	1.674	+4.34
LB4100G3	need 2nd	Beta eff	04-Nov 05:28	5	21950	21640	22870	-1.49
LB4100H1	Above	Beta bkg	04-Nov 04:11	60	3.067	0.216	2.462	+4.61
LB4100H4	Above	Beta bkg	04-Nov 04:11	60	5.367	0.674	1.825	+21.46
PIC2C	Below	Alpha eff	04-Nov 10:08	5	19257	19380	21750	-3.31
PIC4A	Below	Beta bkg	04-Nov 14:45	60	0.00E+0	0.076	1.446	-3.33
PIC8B	Above	Alpha bkg	04-Nov 14:45	60	0.333	-1.16E-1	0.388	+2.35
PIC8B	Above	Beta bkg	04-Nov 14:45	60	2.350	-1.80E-1	2.341	+3.02
PIC8B	Above	Beta XTalk	04-Nov 04:50	5	0.002	2.00E-4	9.31E-4	+9.31
PIC12B	Below	Beta bkg	04-Nov 14:44	60	0.217	0.269	2.358	-3.15

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

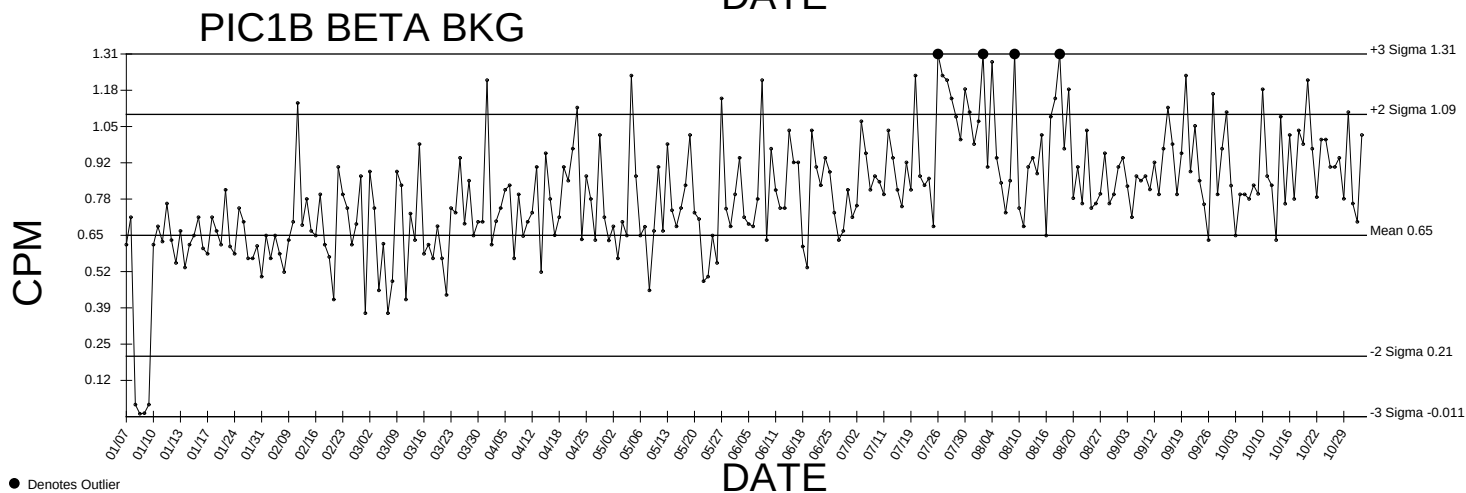
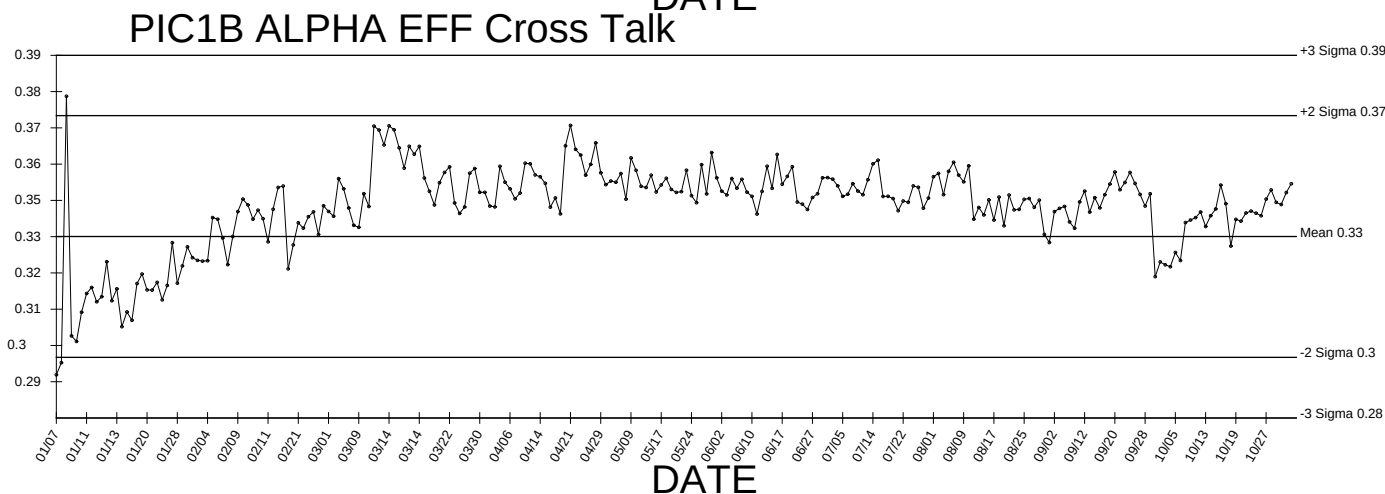
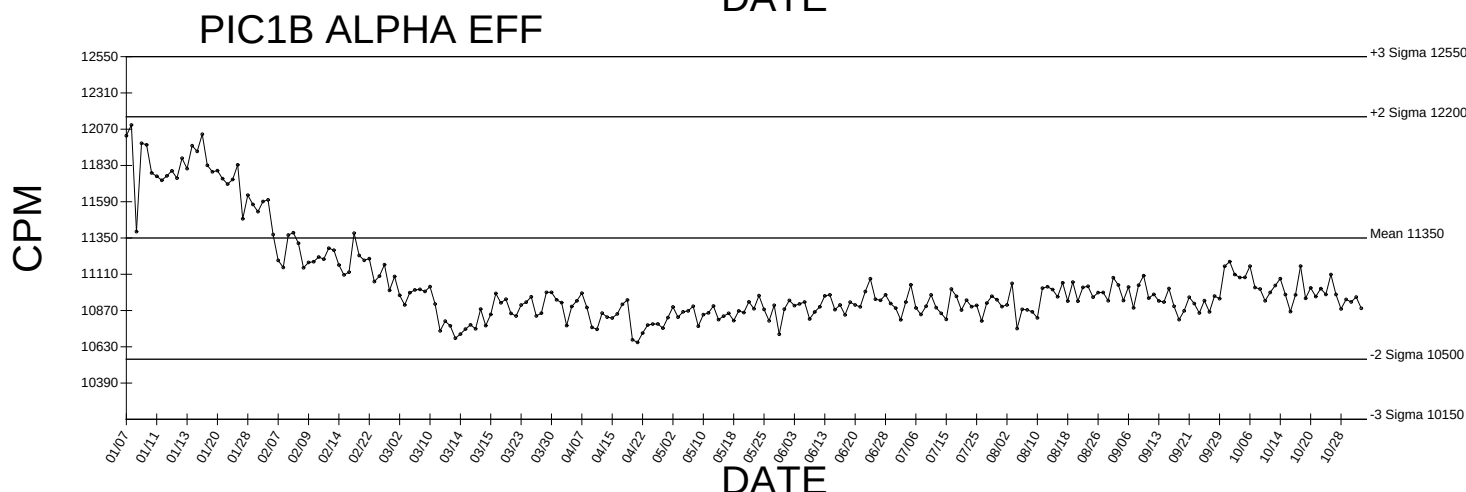
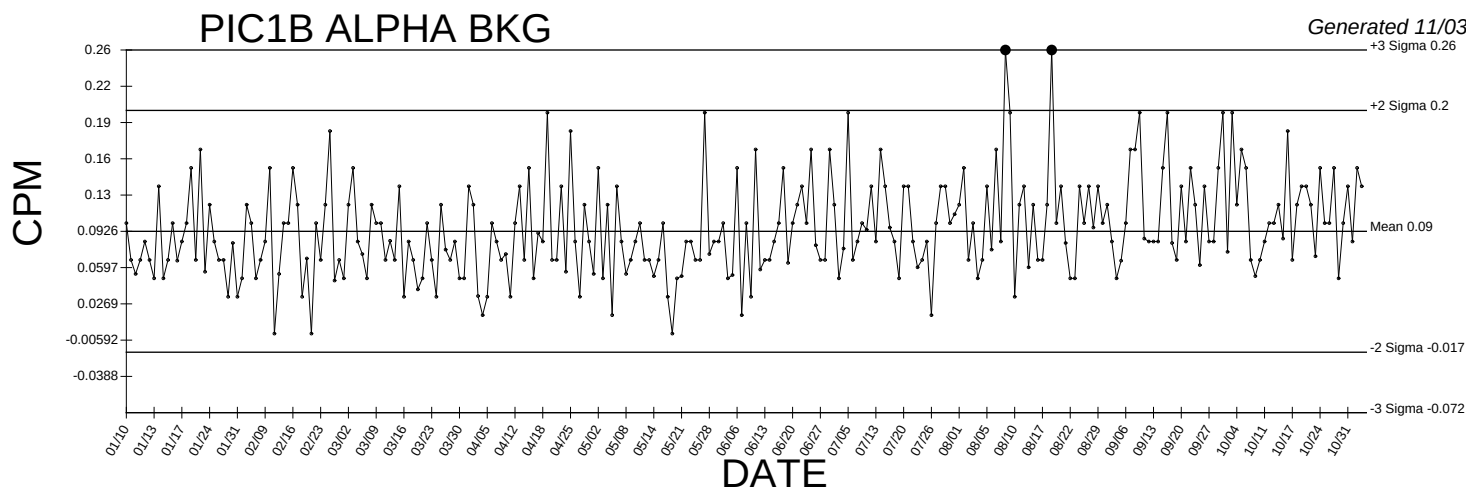
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LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by R. D. H. - Hareman

Date 11-7-22

GEL Laboratories LLC

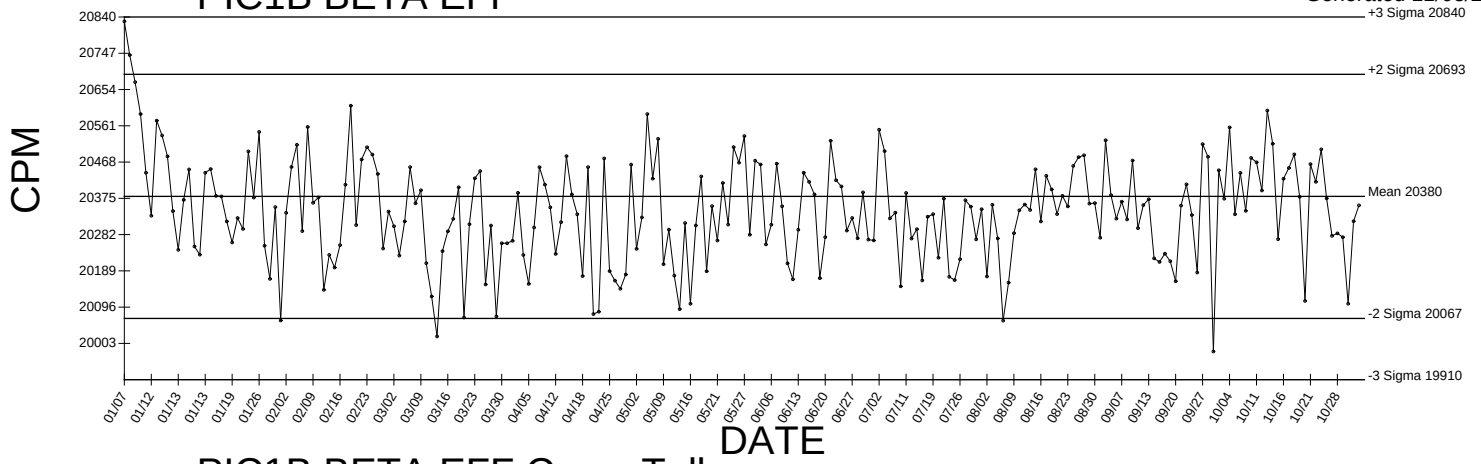
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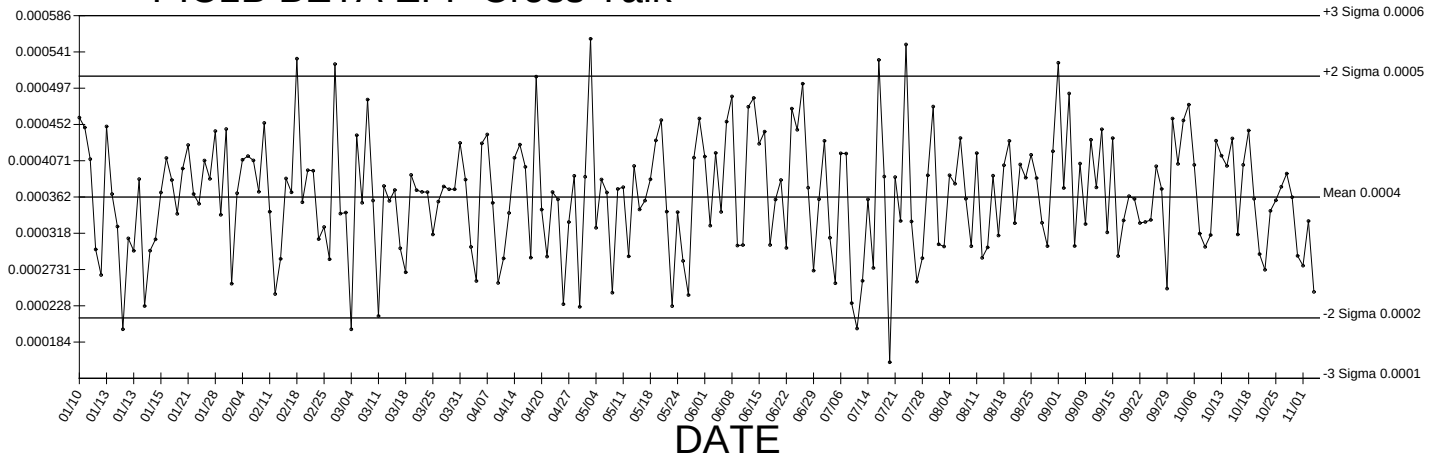
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PIC1B BETA EFF

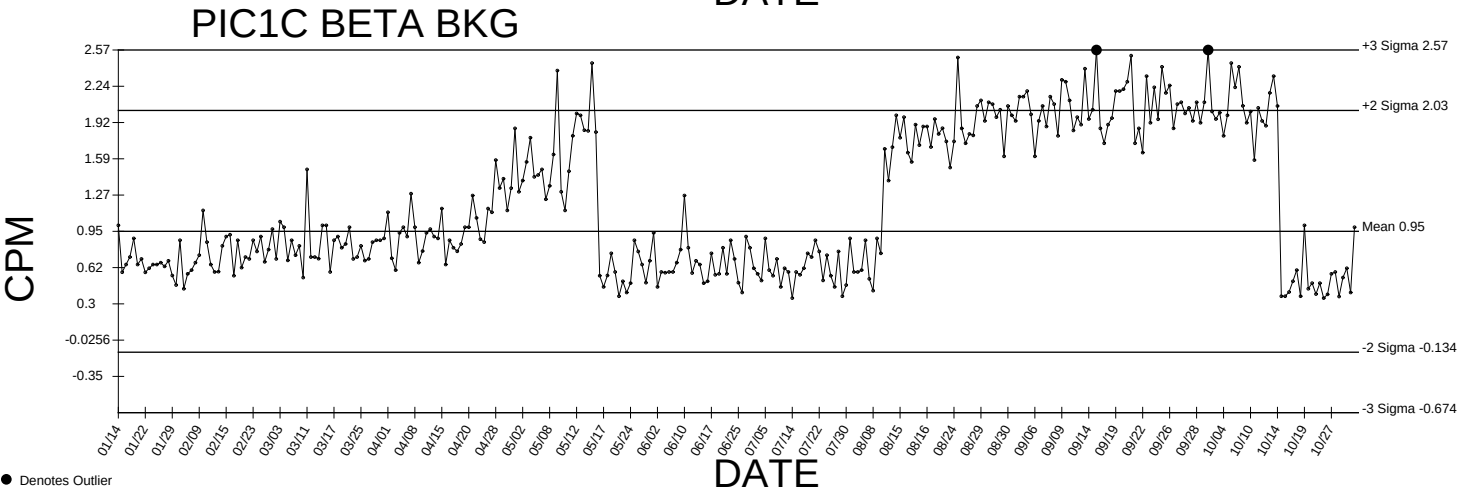
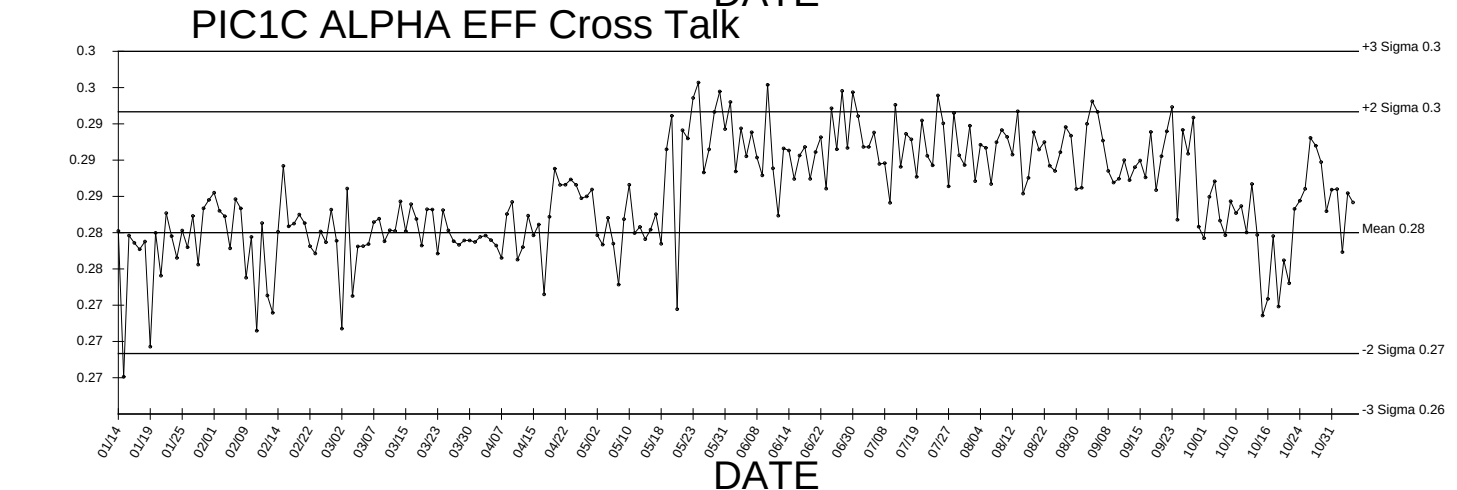
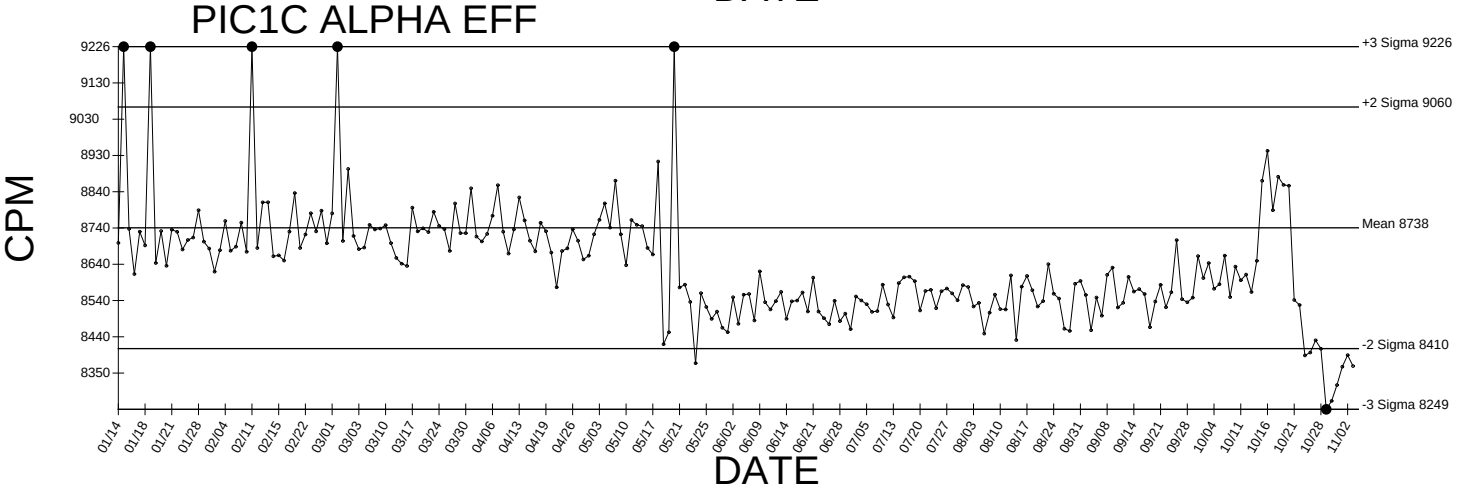
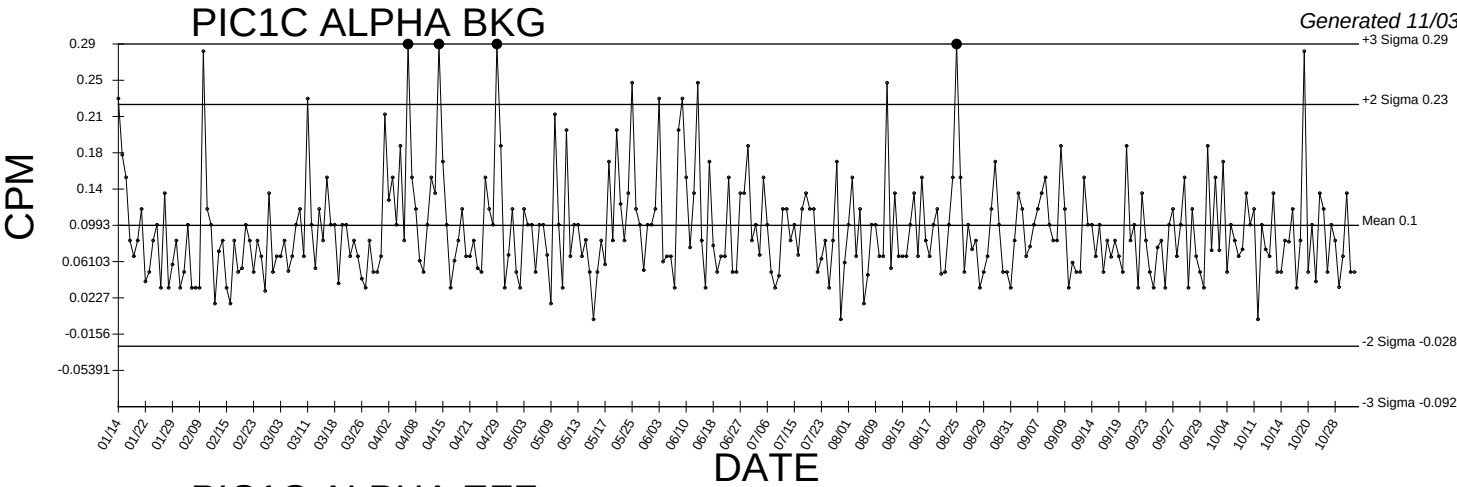
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PIC1B BETA EFF Cross Talk



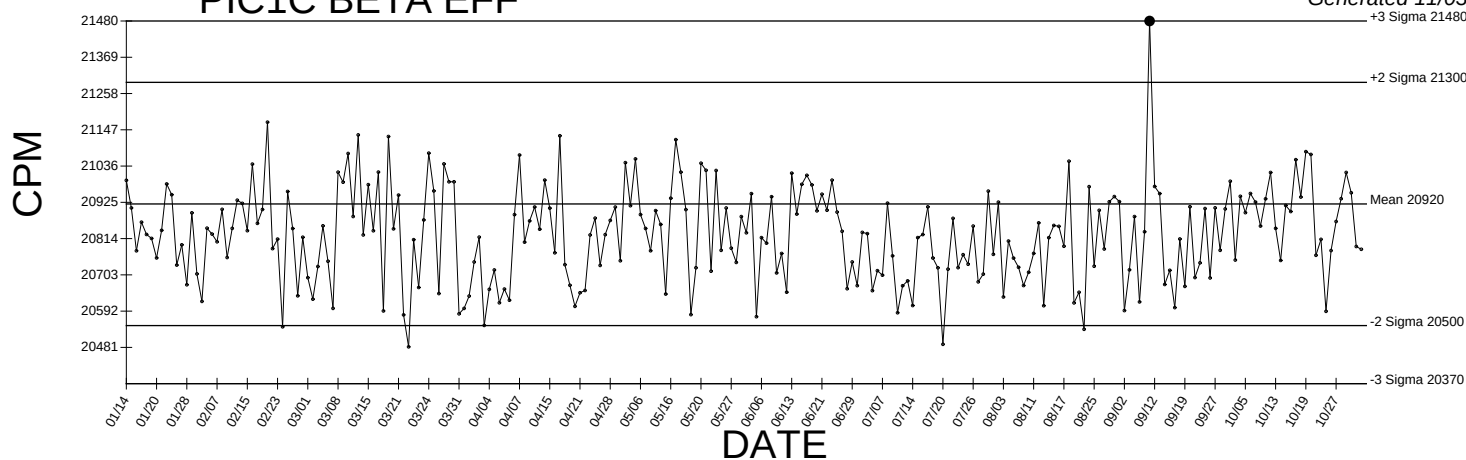
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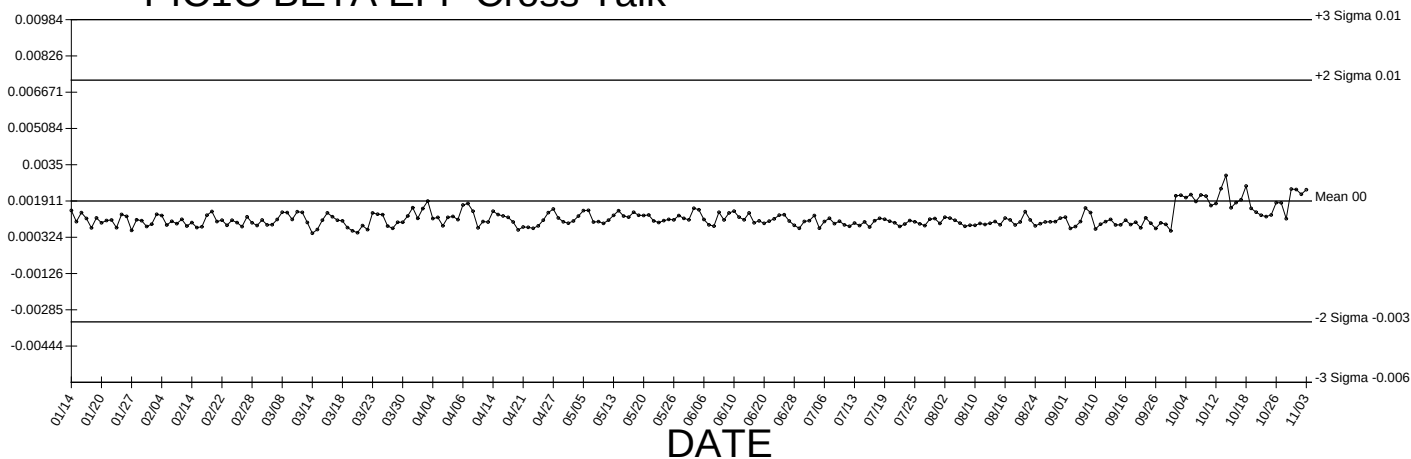
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PIC1C BETA EFF

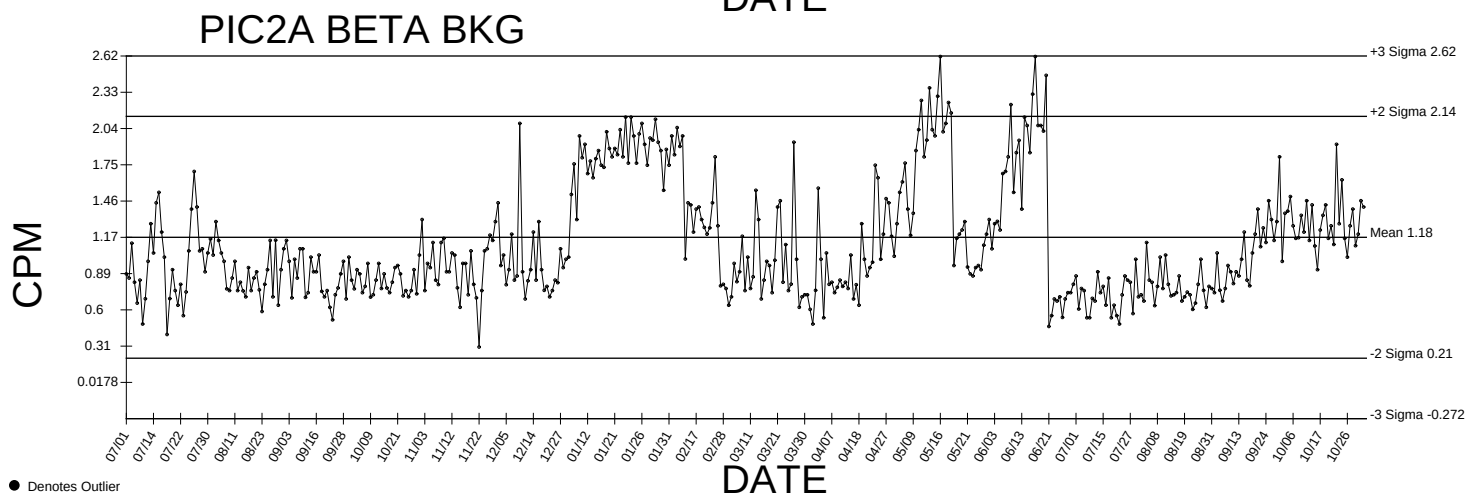
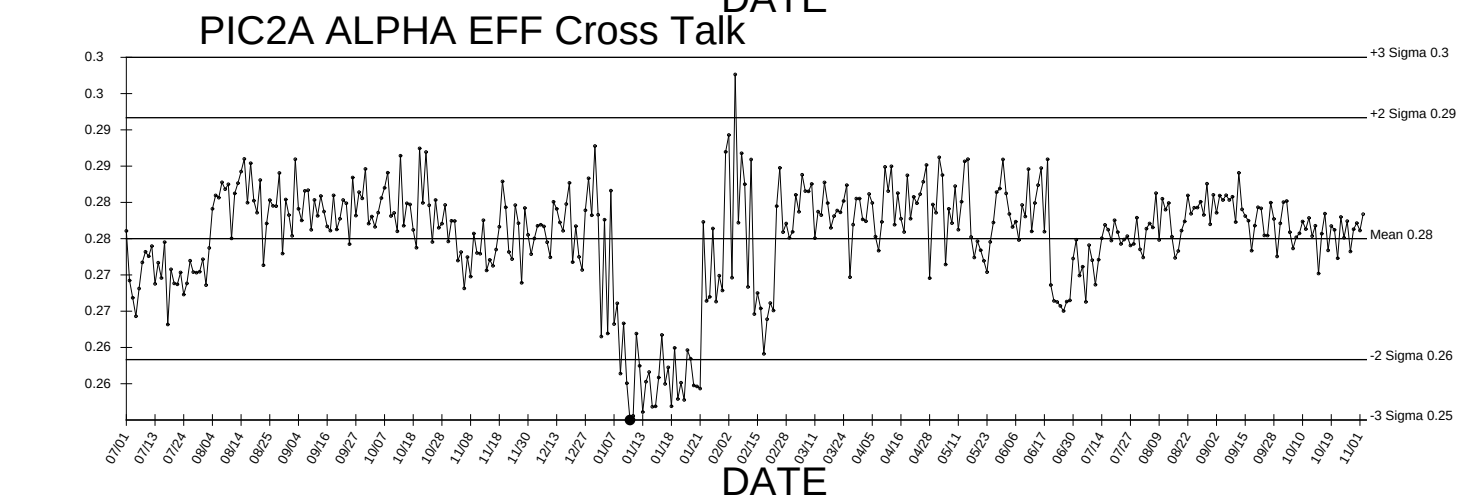
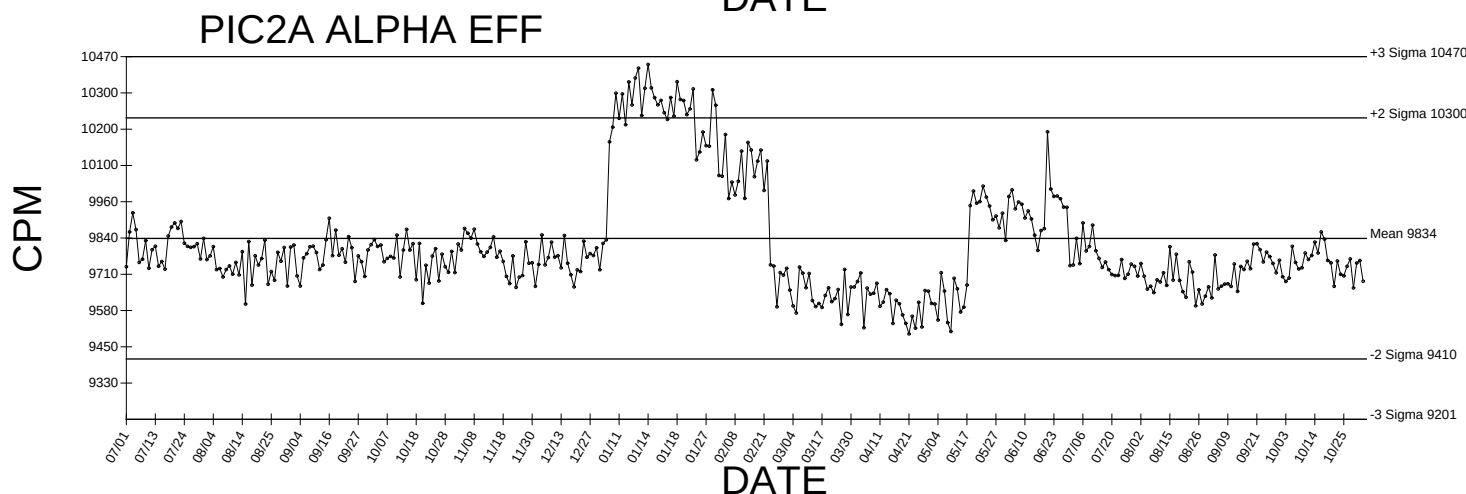
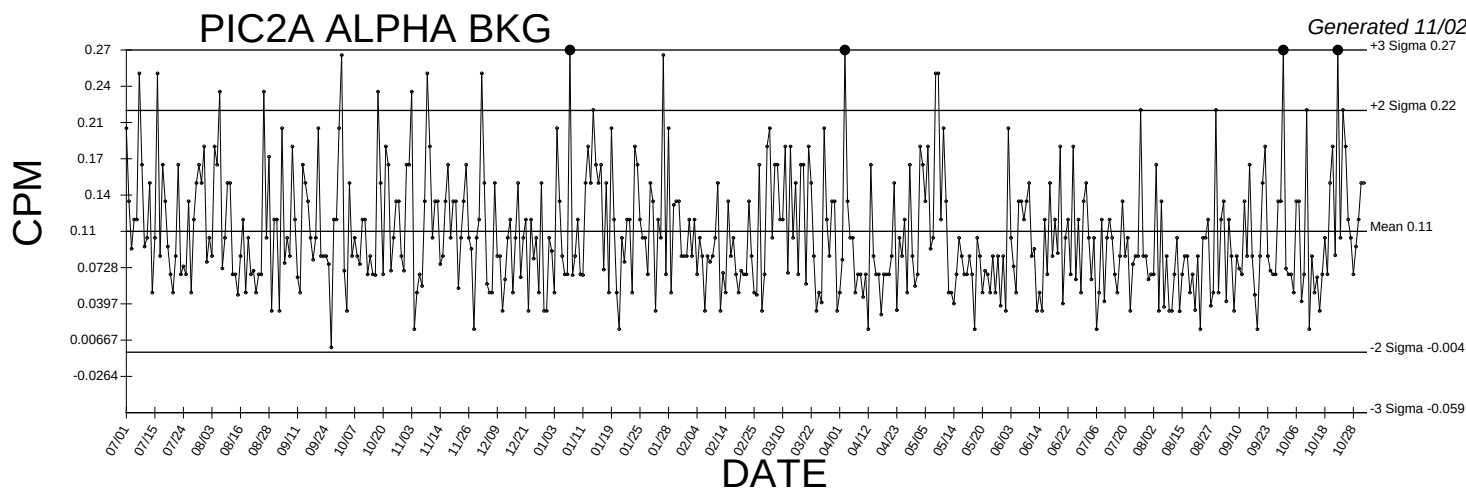
Generated 11/03/2022



PIC1C BETA EFF Cross Talk



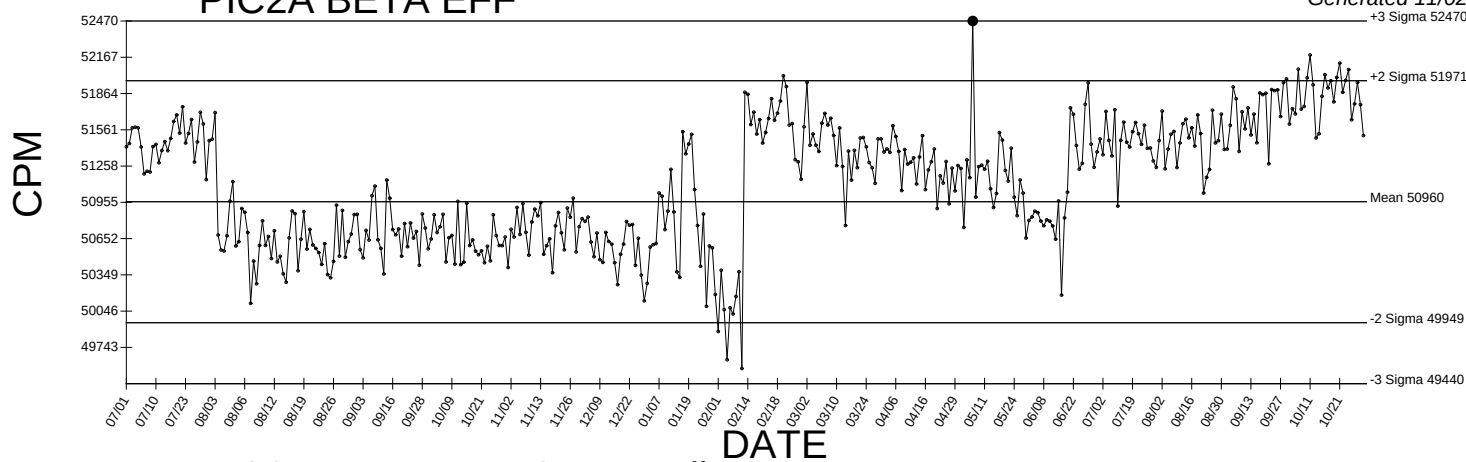
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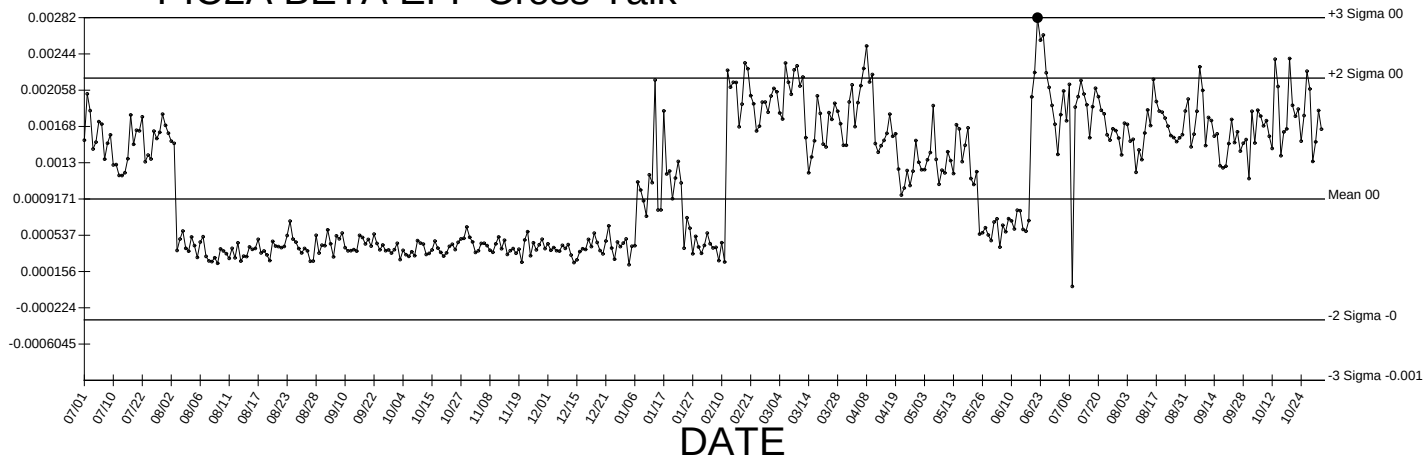
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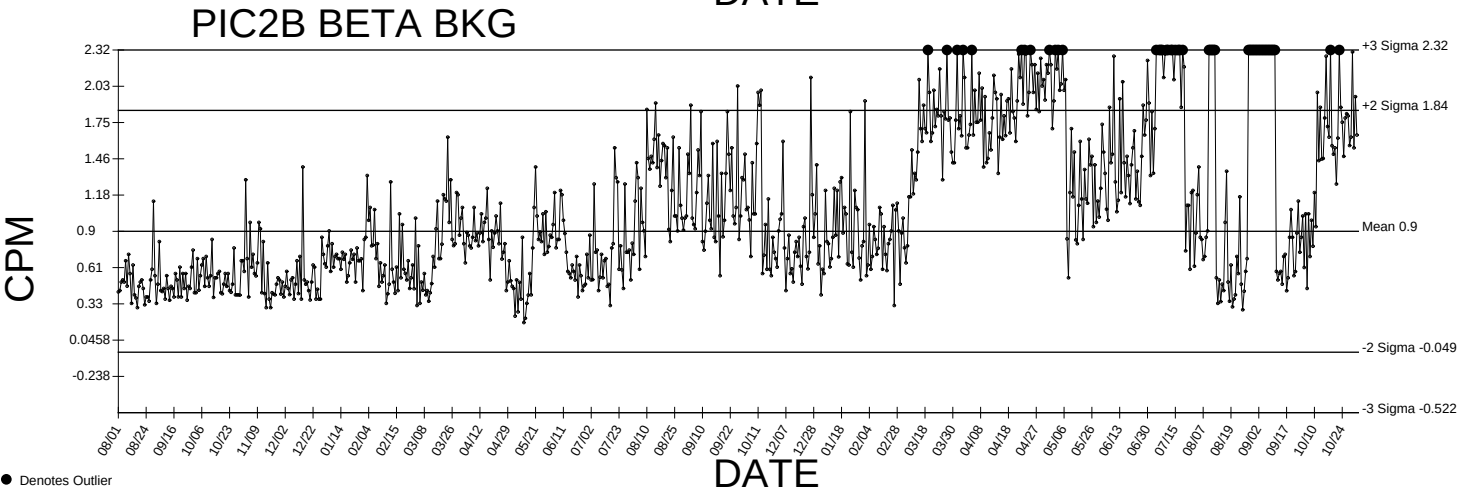
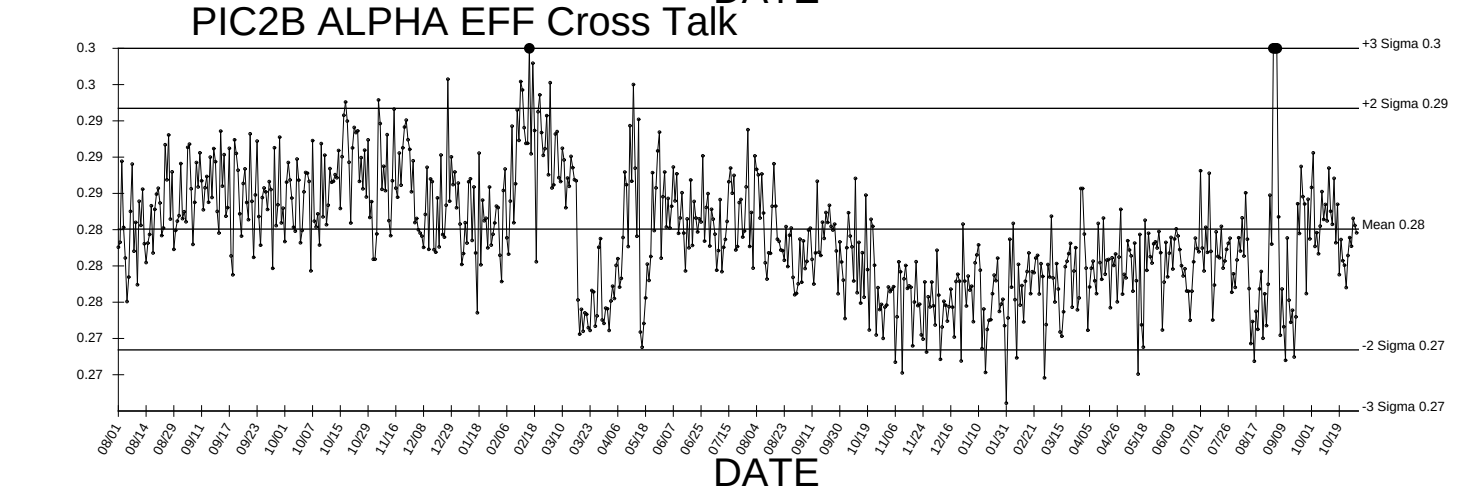
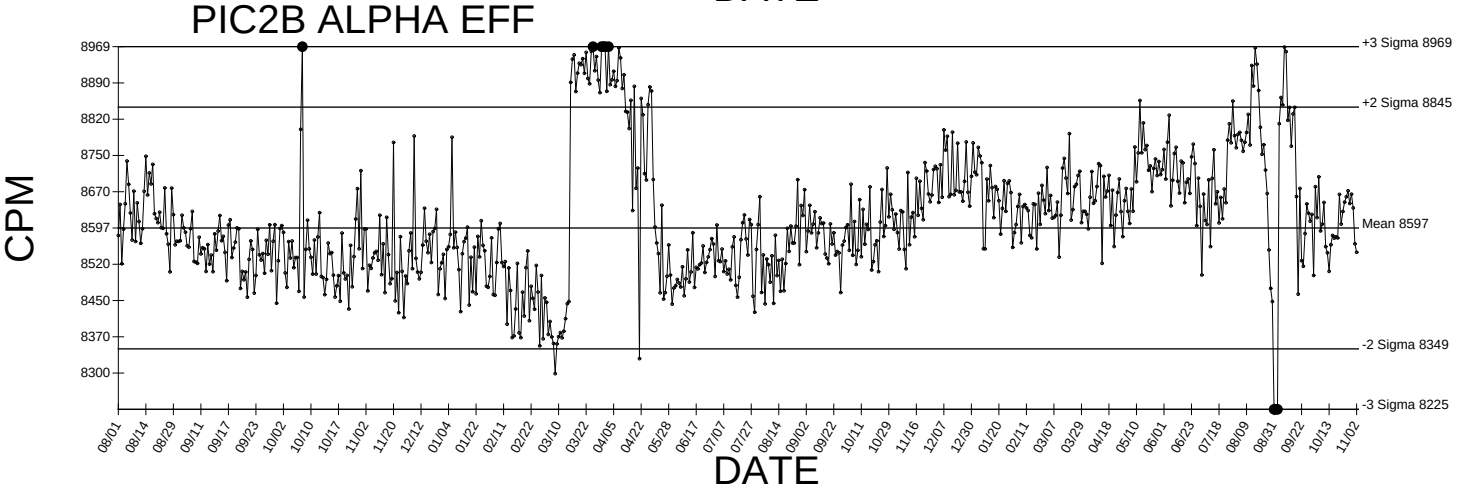
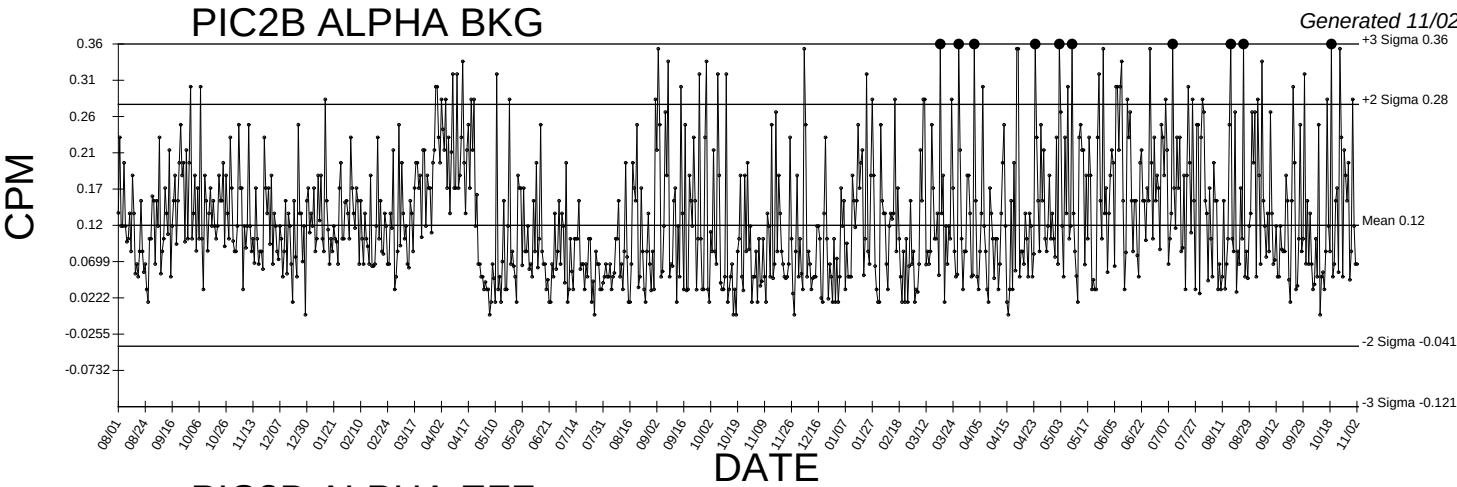
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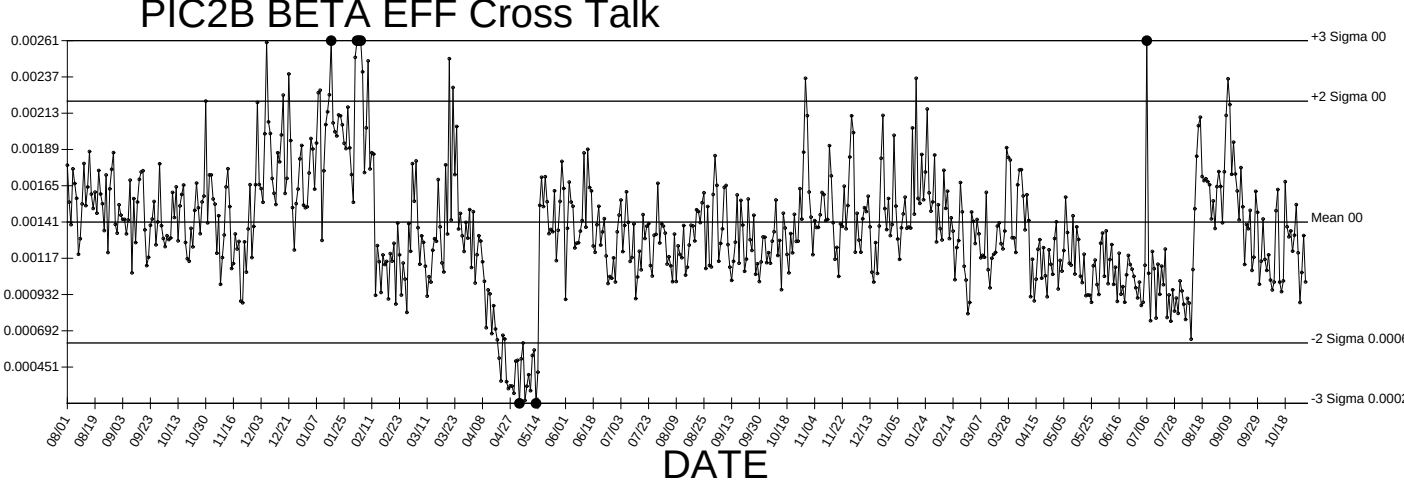
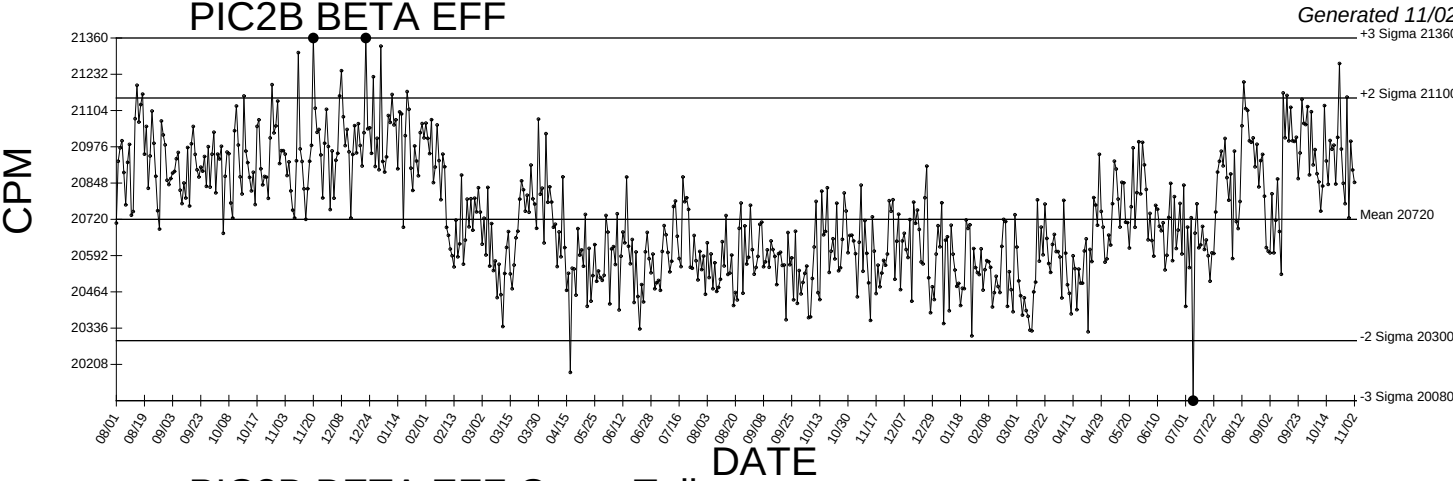
PIC2A BETA EFF Cross Talk



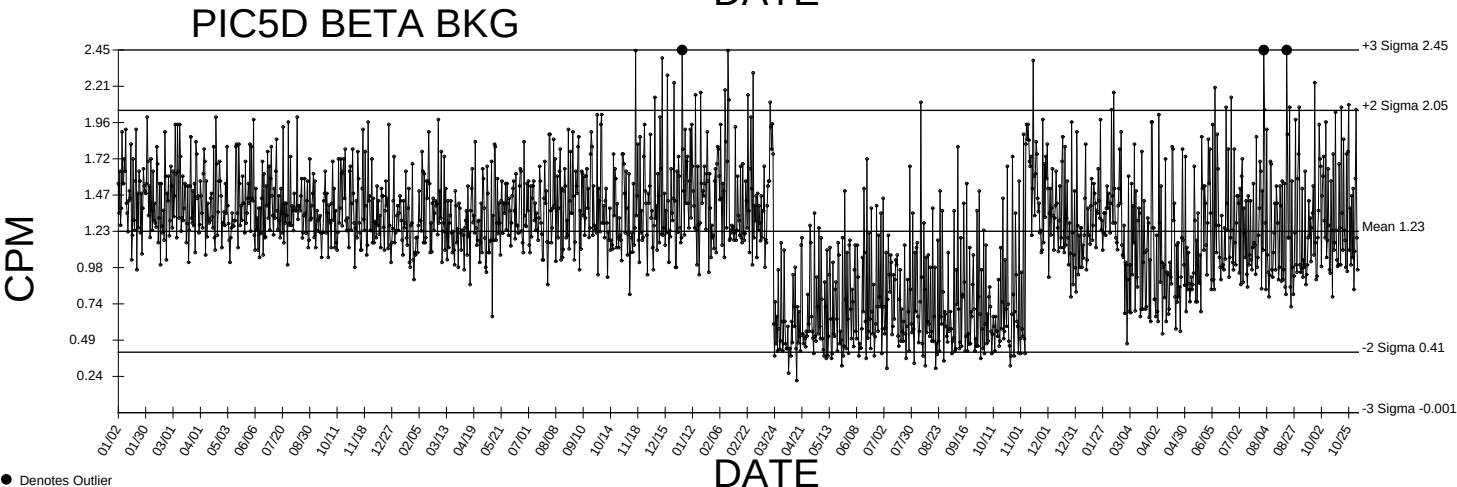
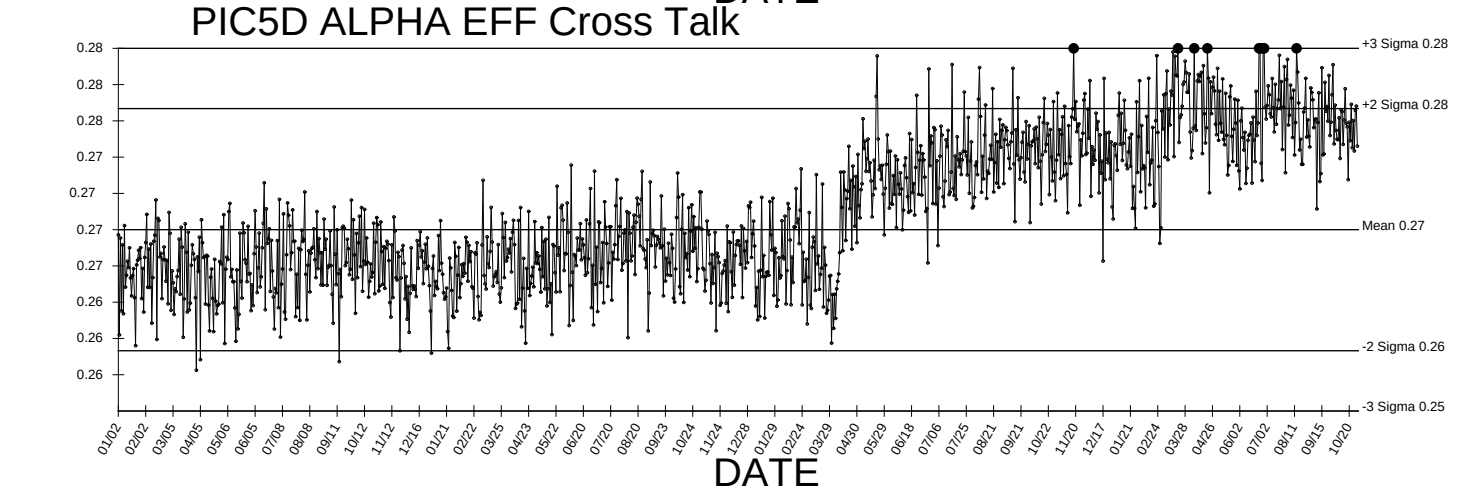
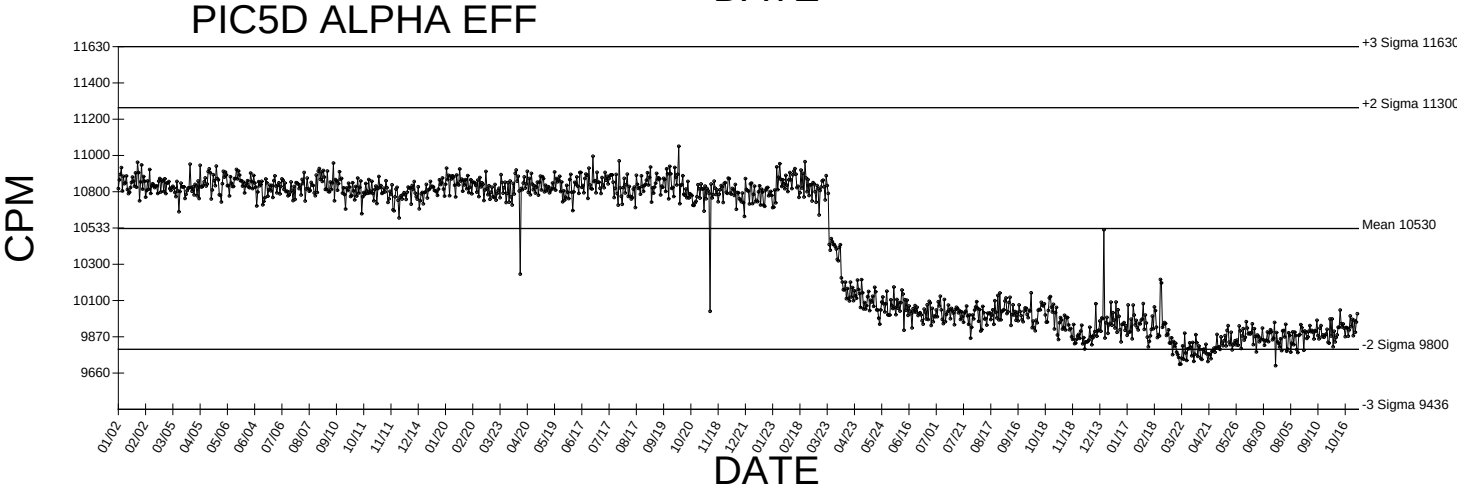
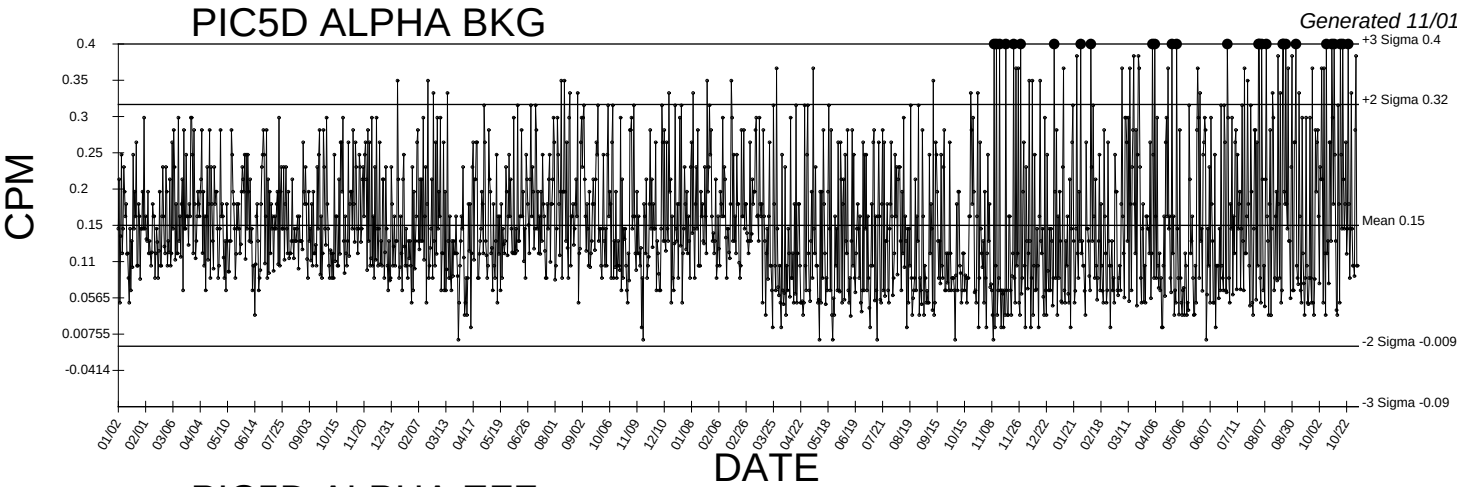
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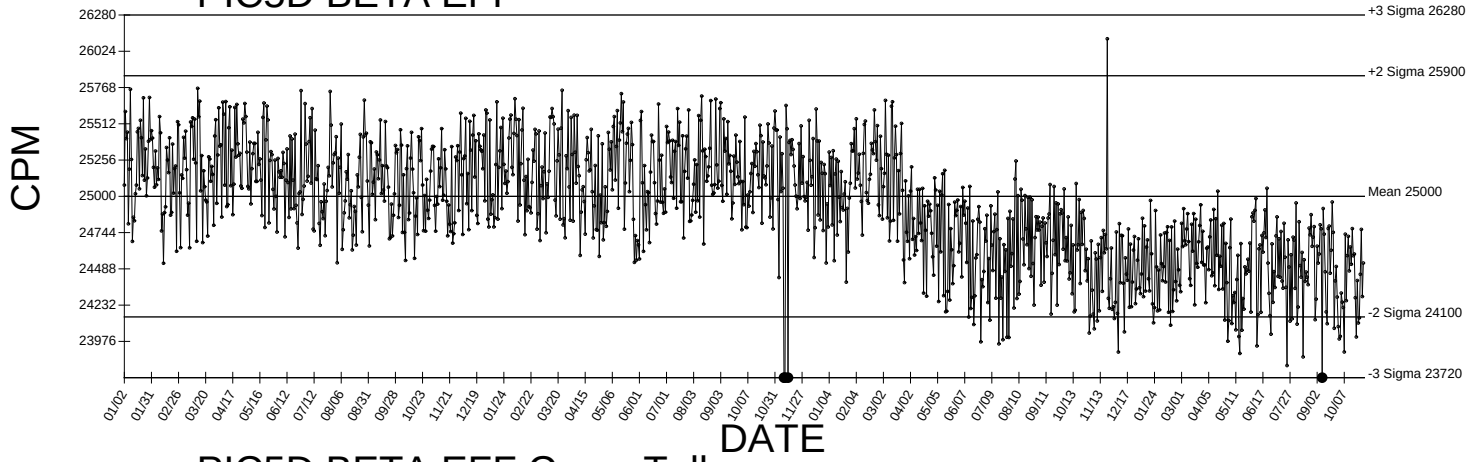
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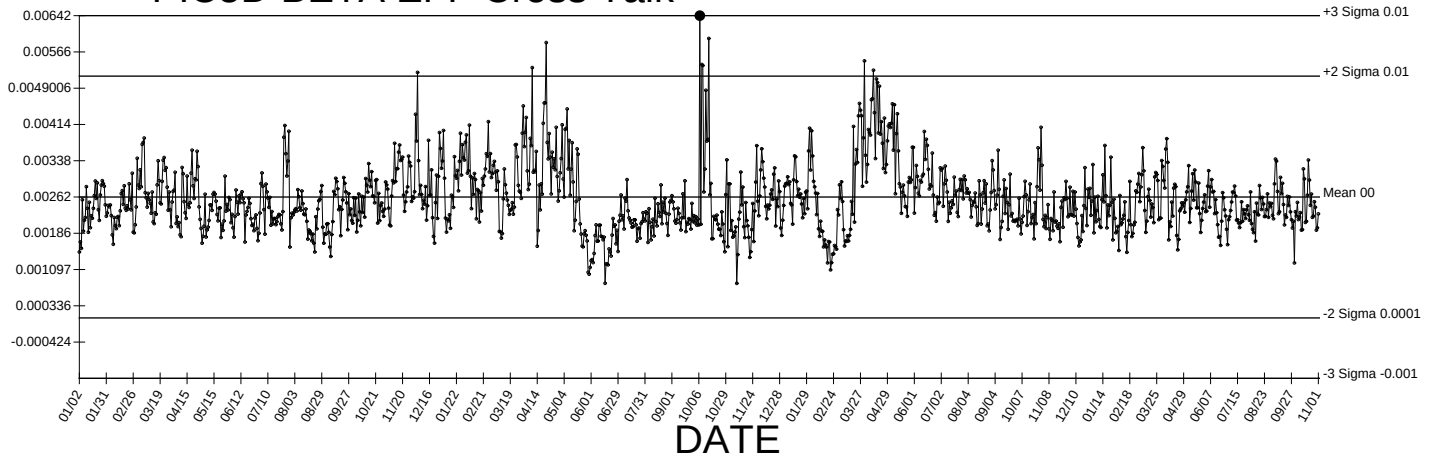
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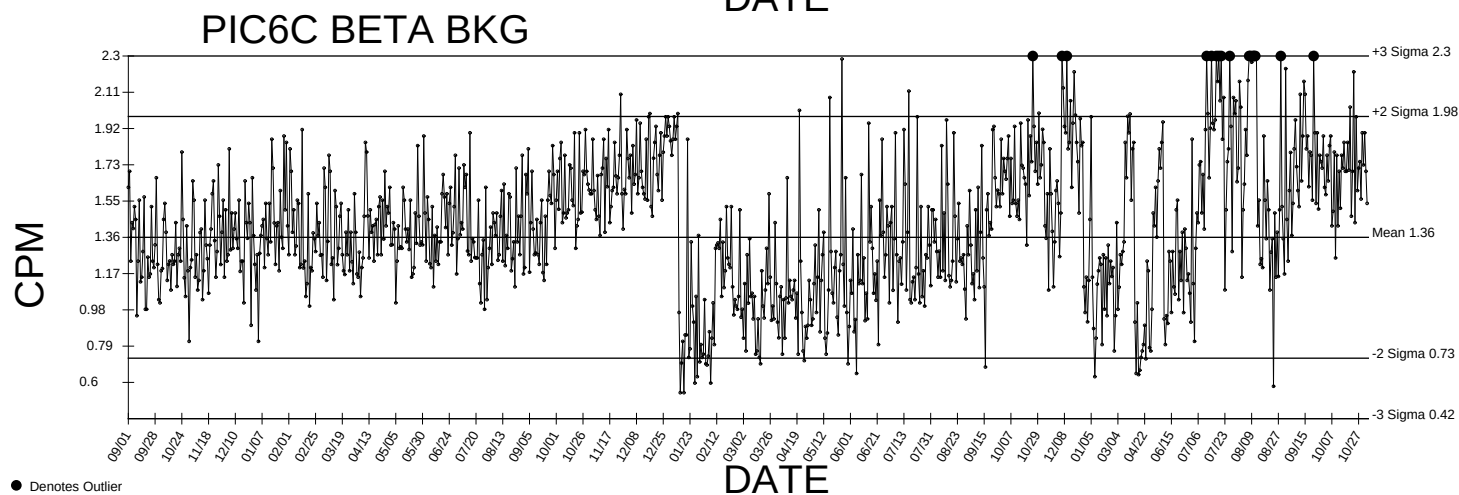
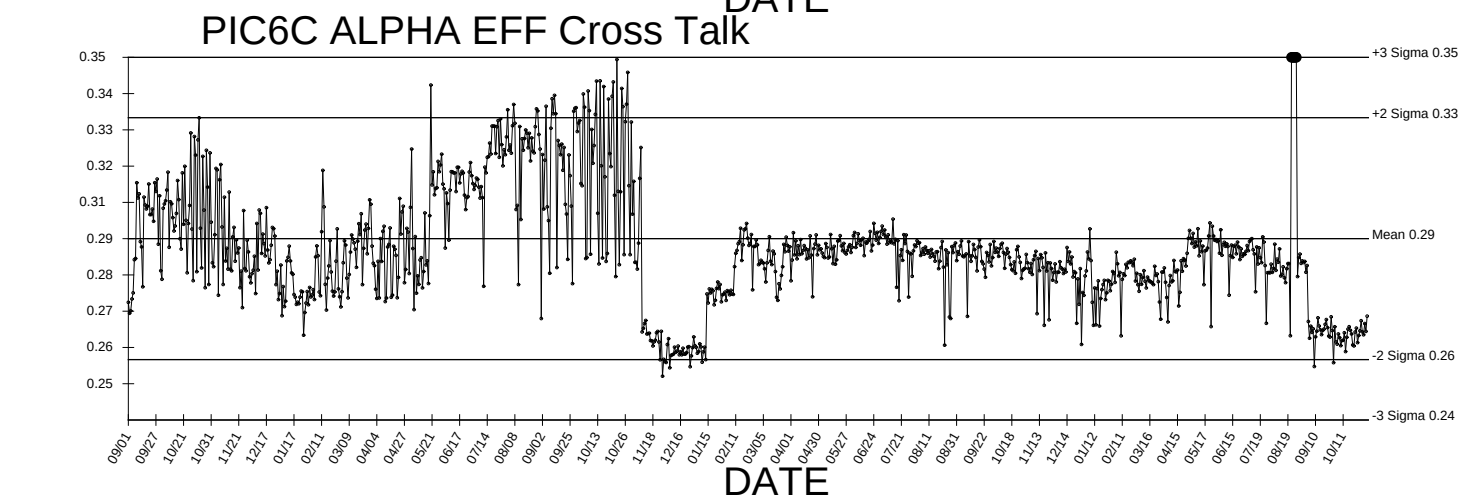
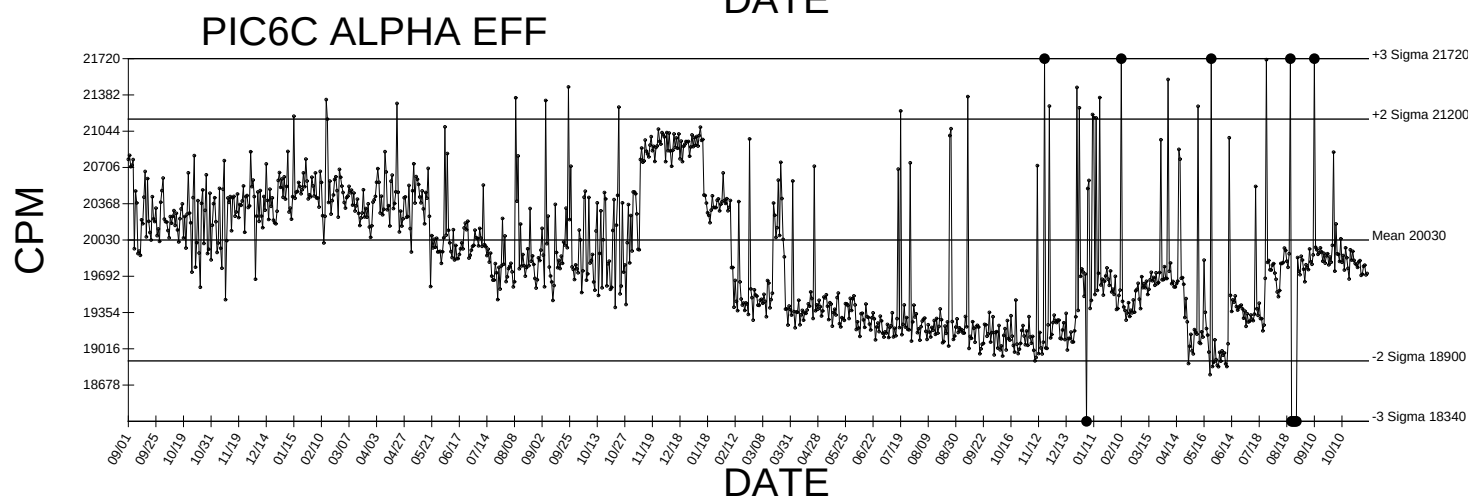
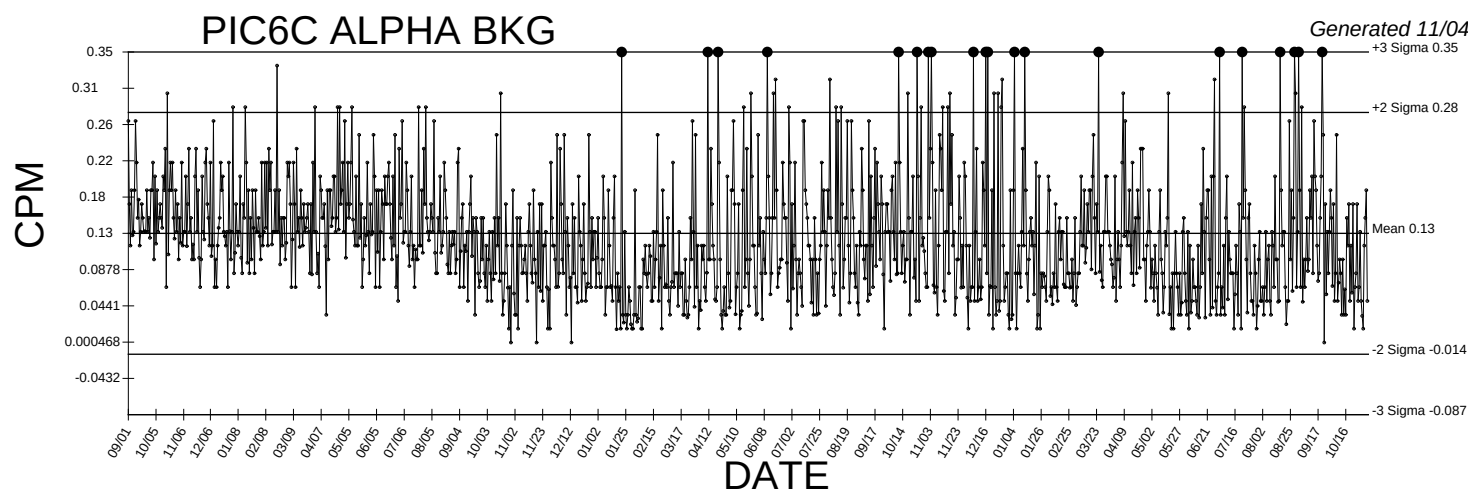
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PIC5D BETA EFF Cross Talk



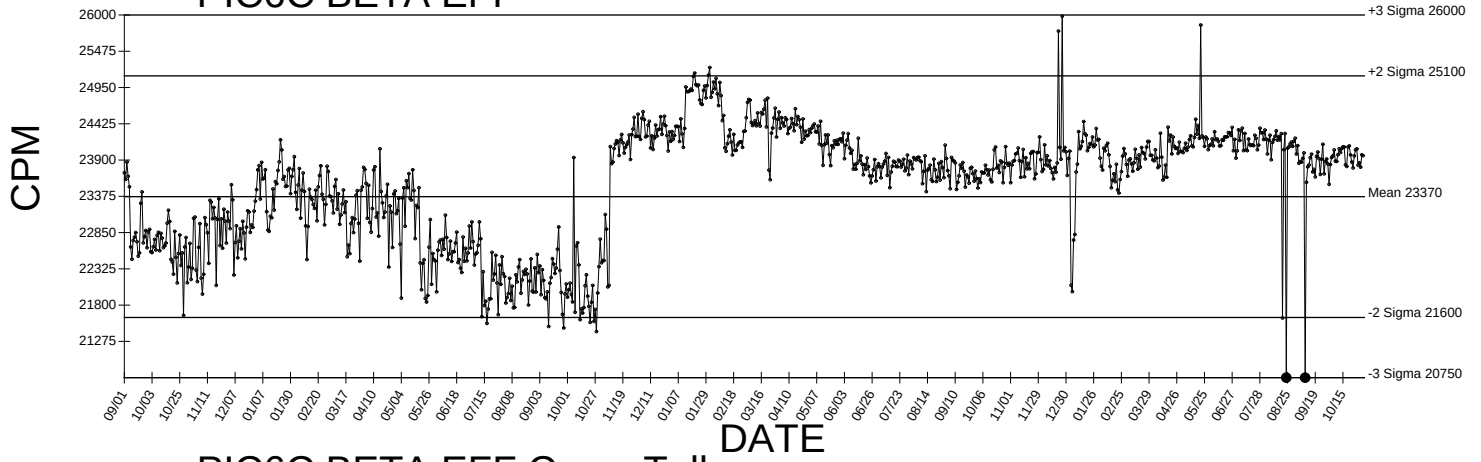
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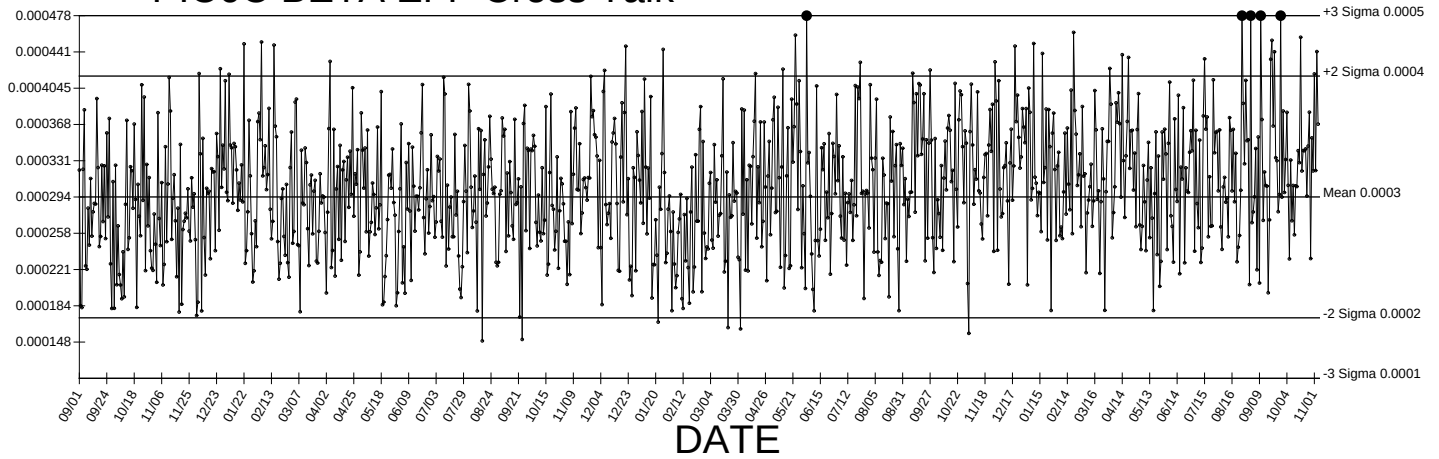
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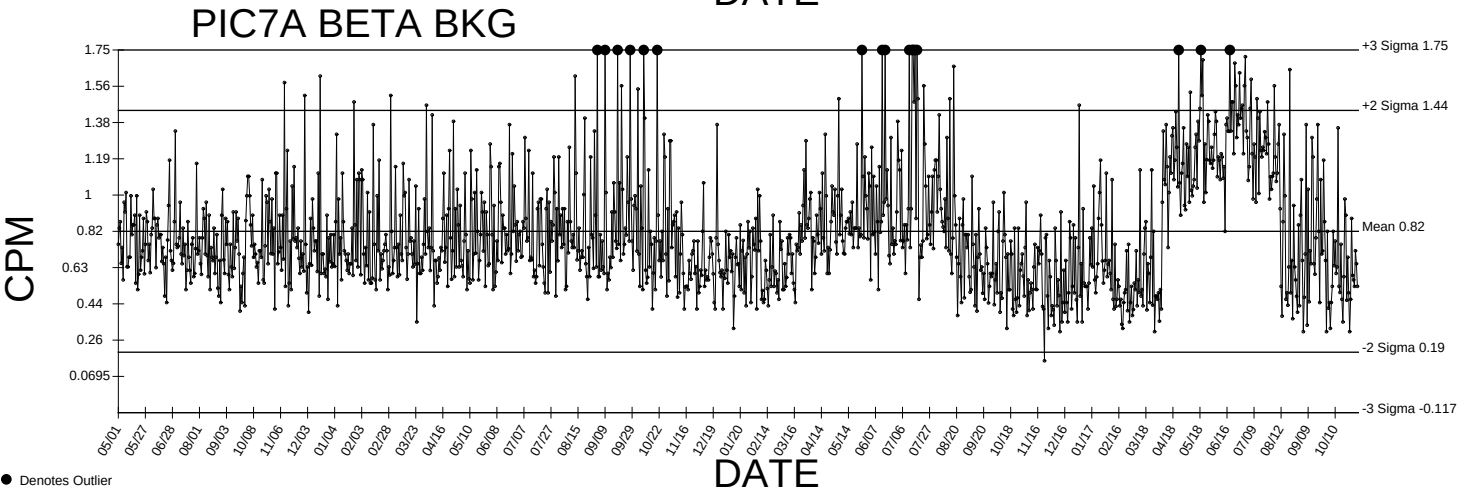
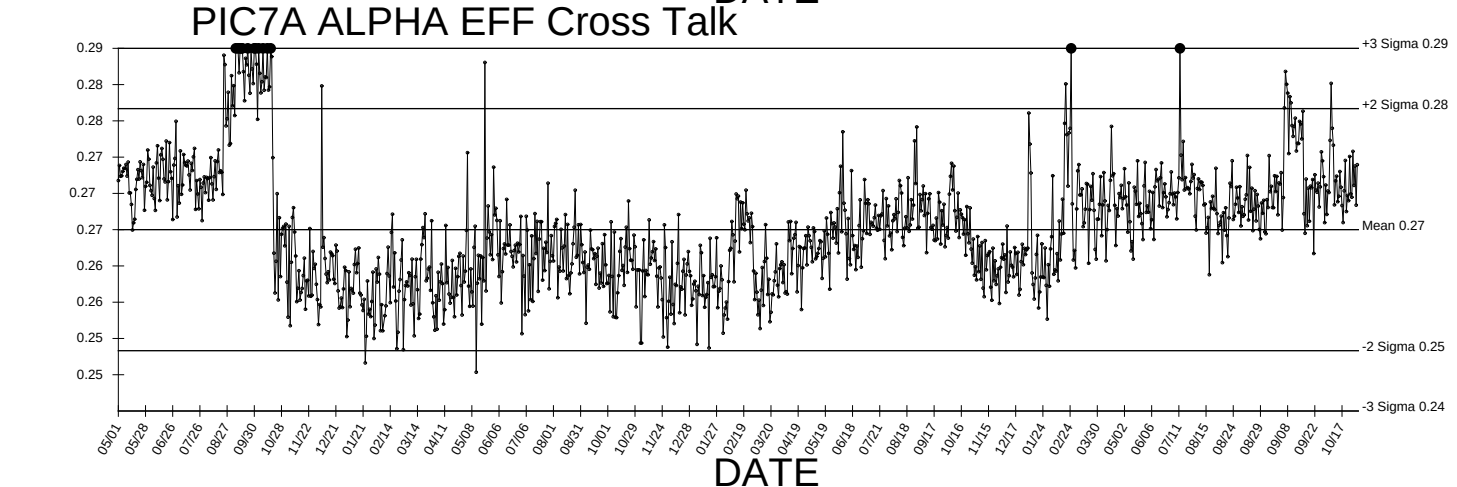
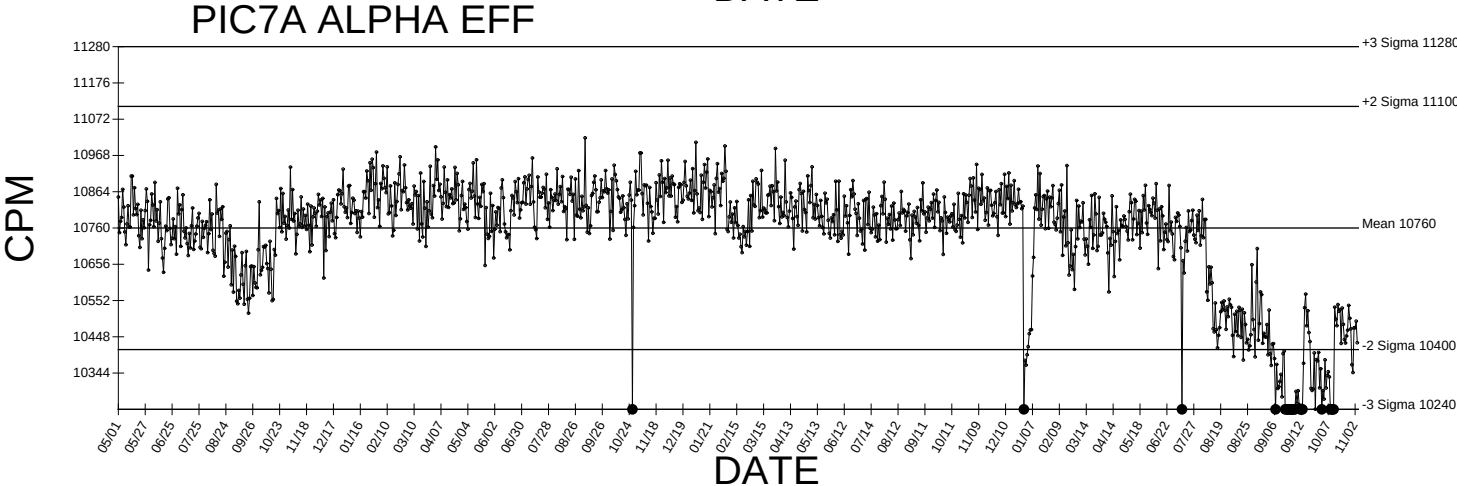
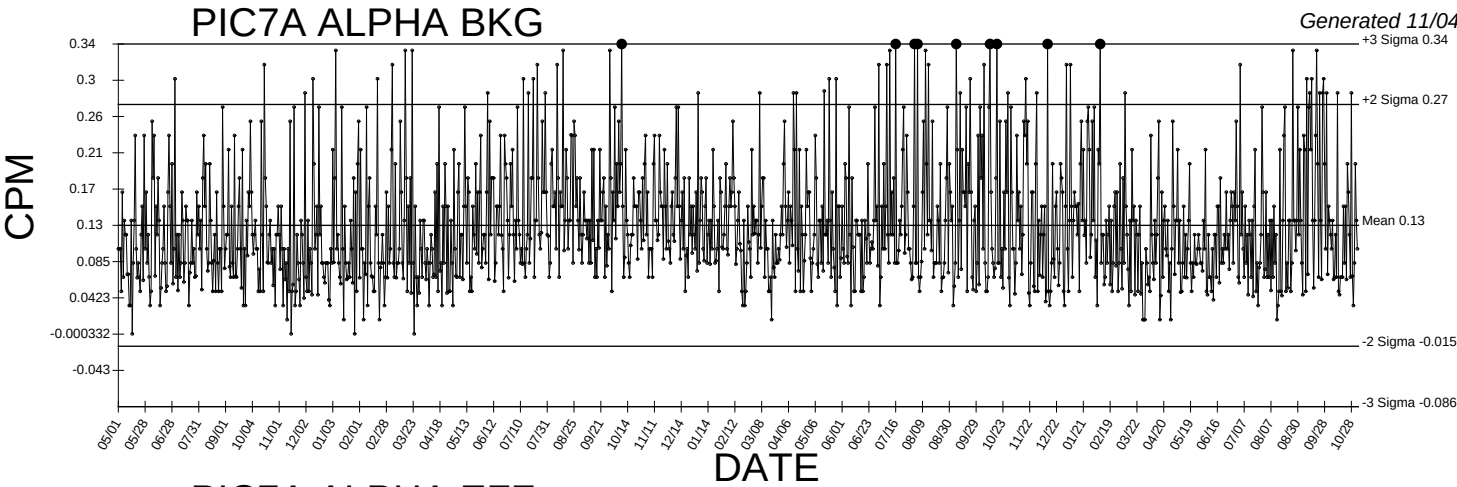
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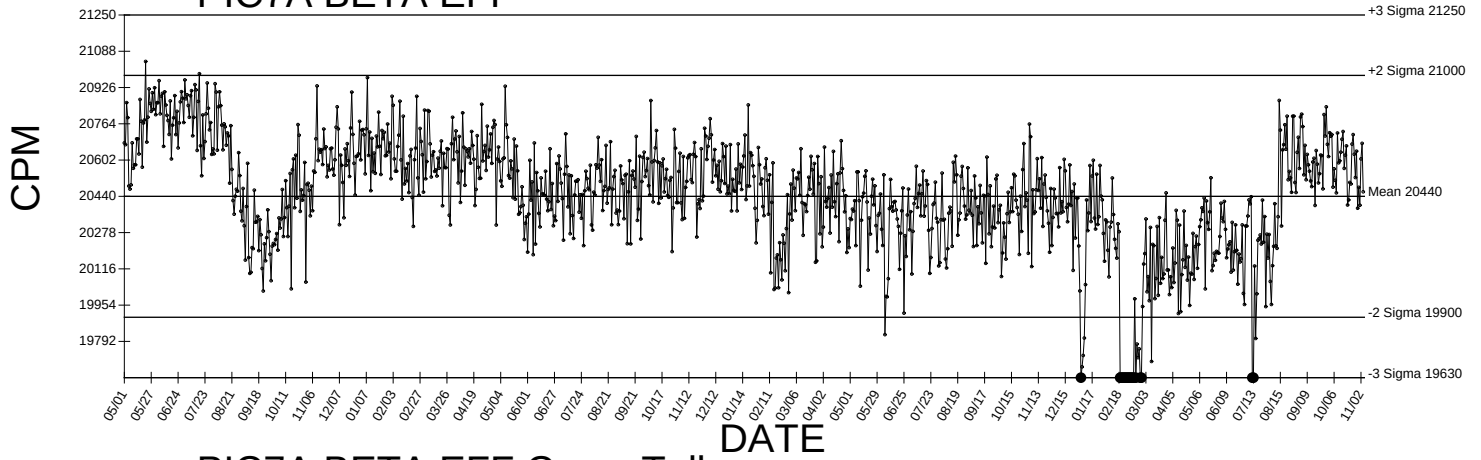
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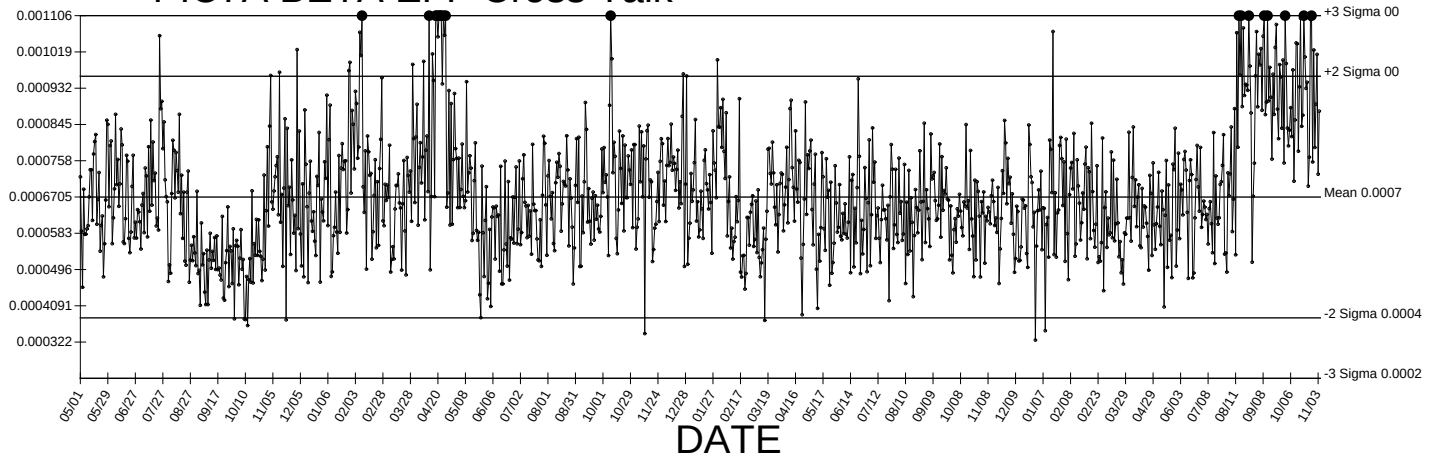
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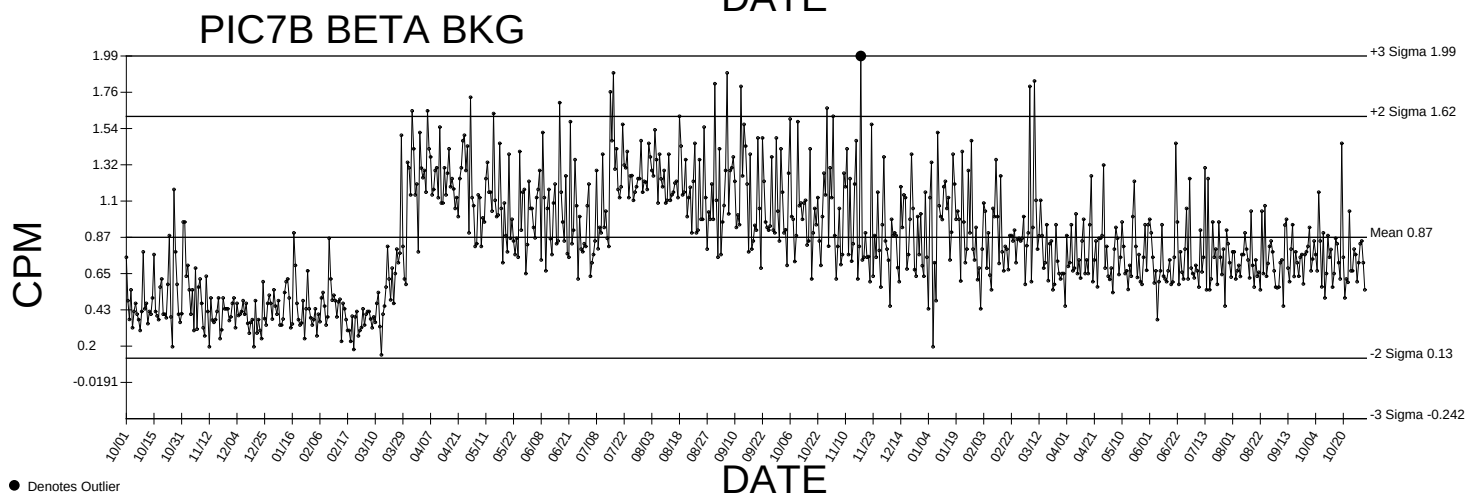
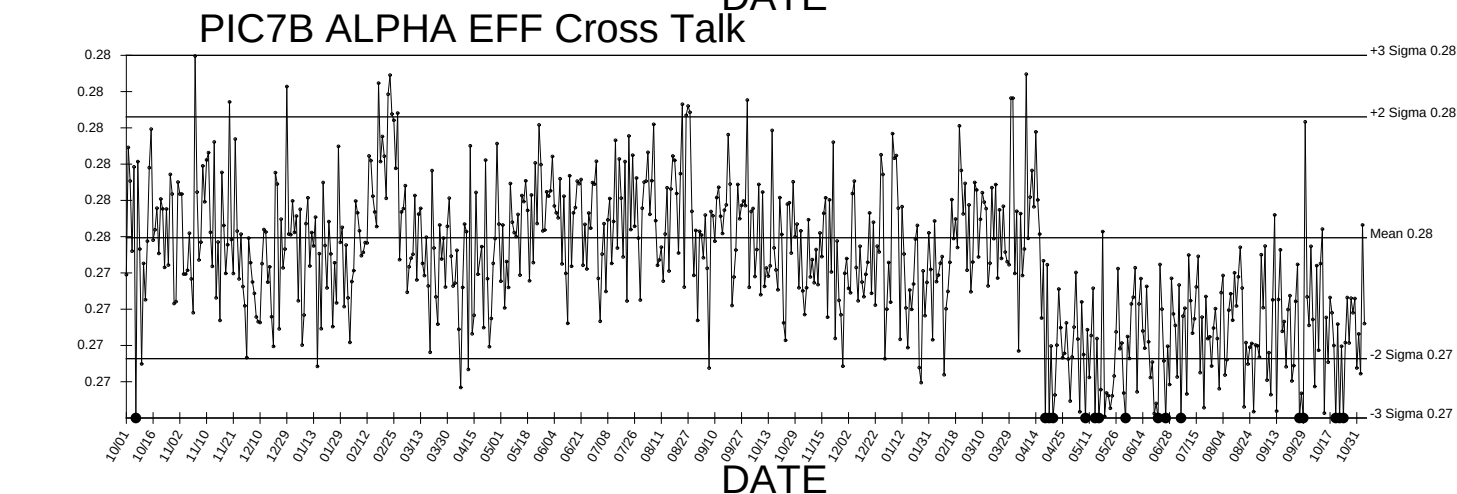
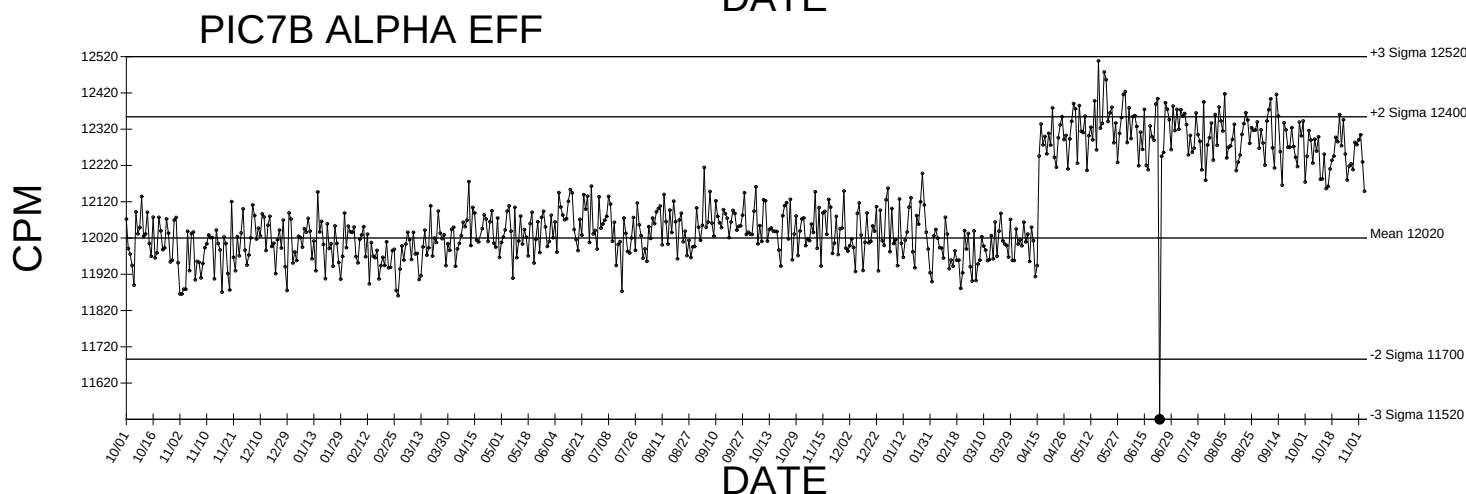
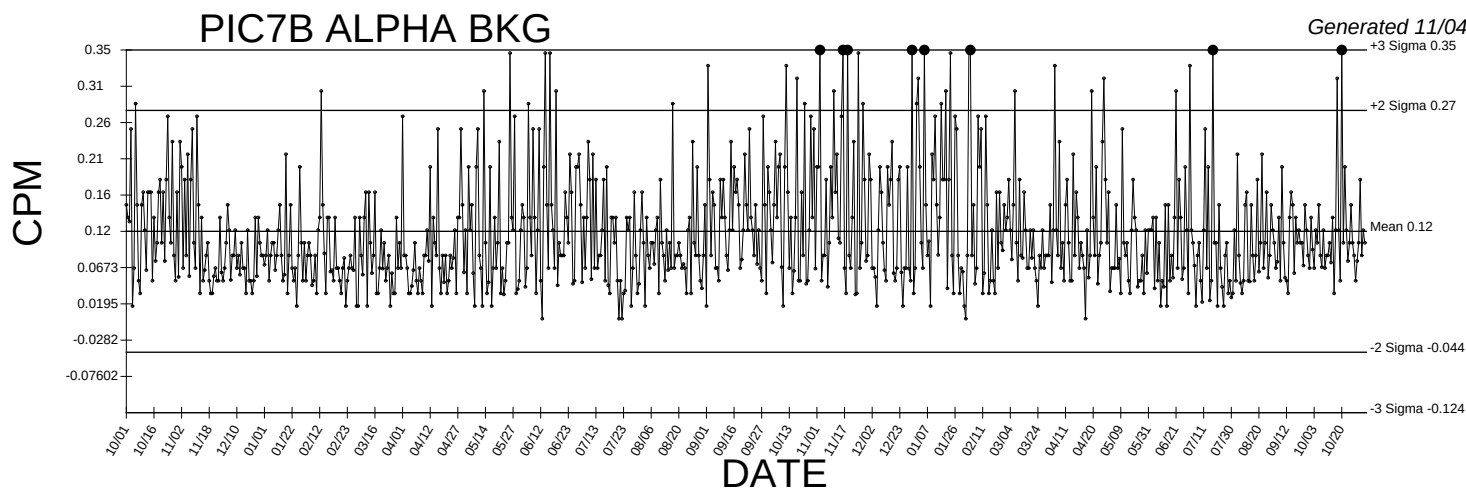
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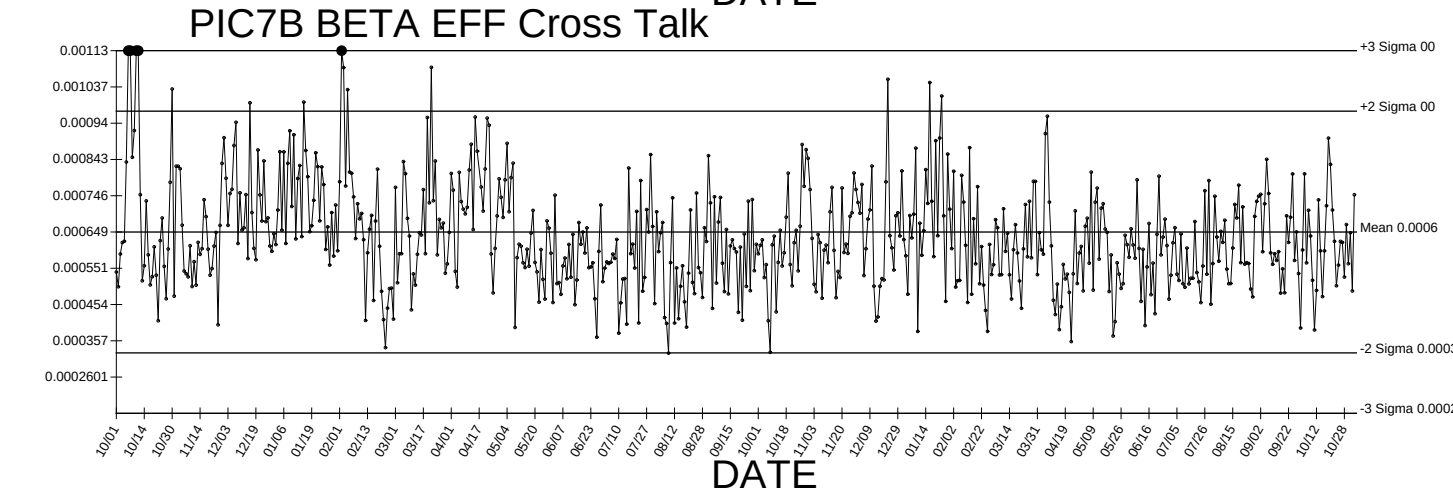
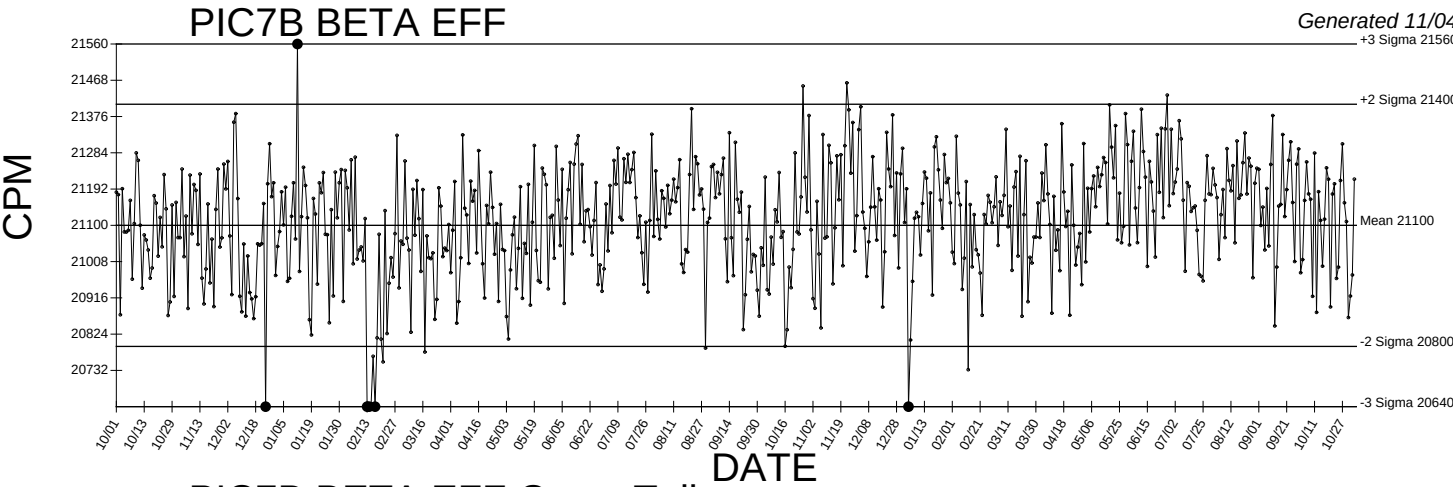
PIC7A BETA EFF Cross Talk



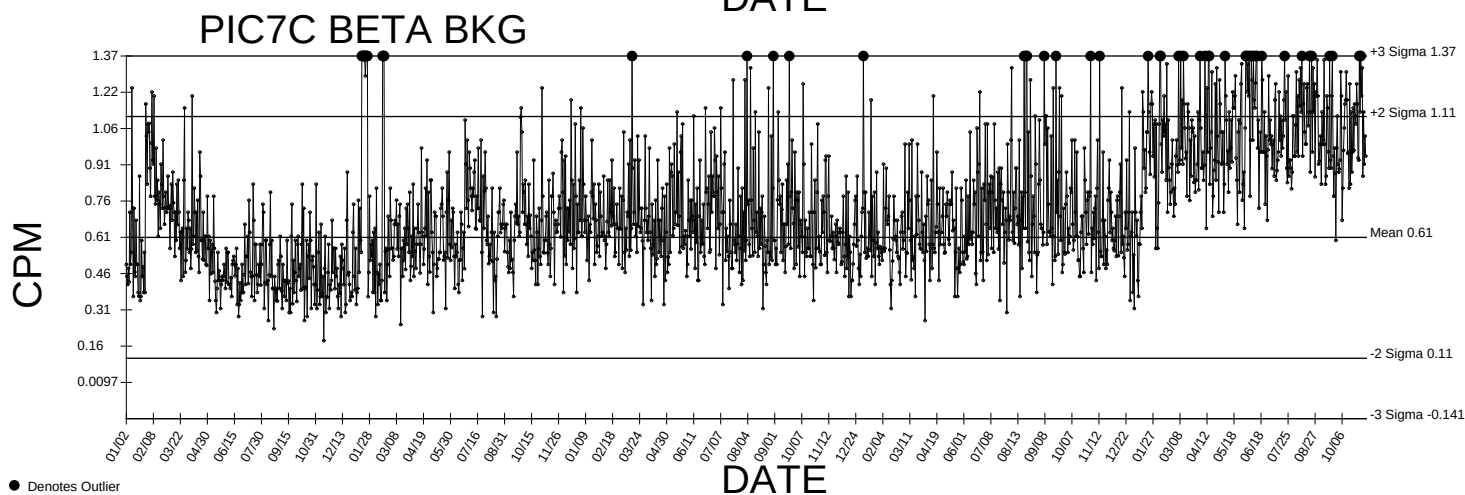
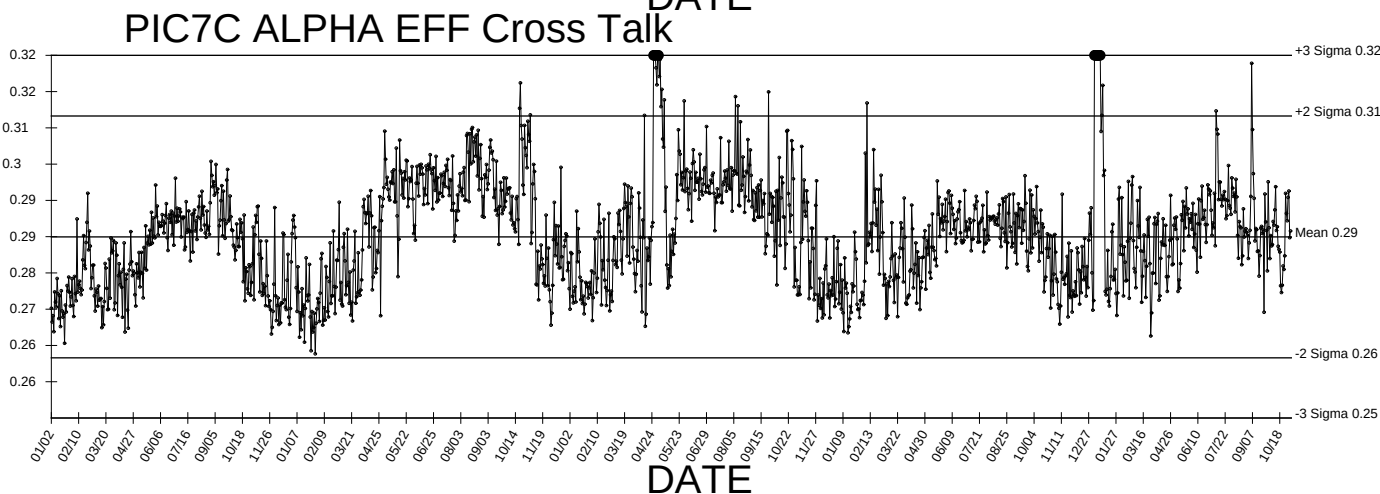
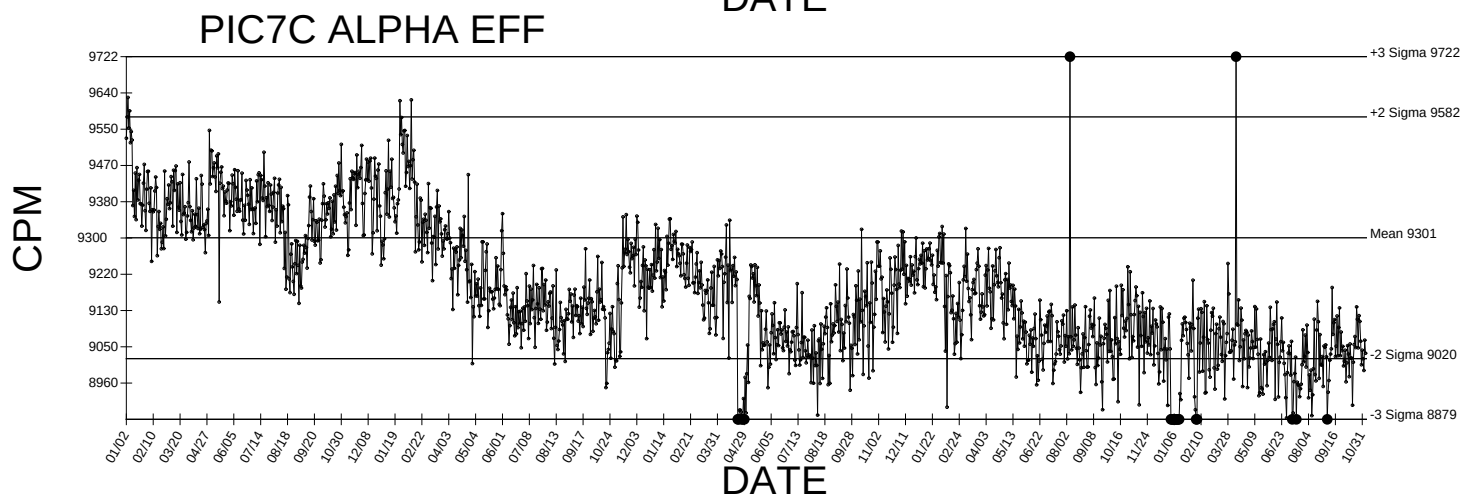
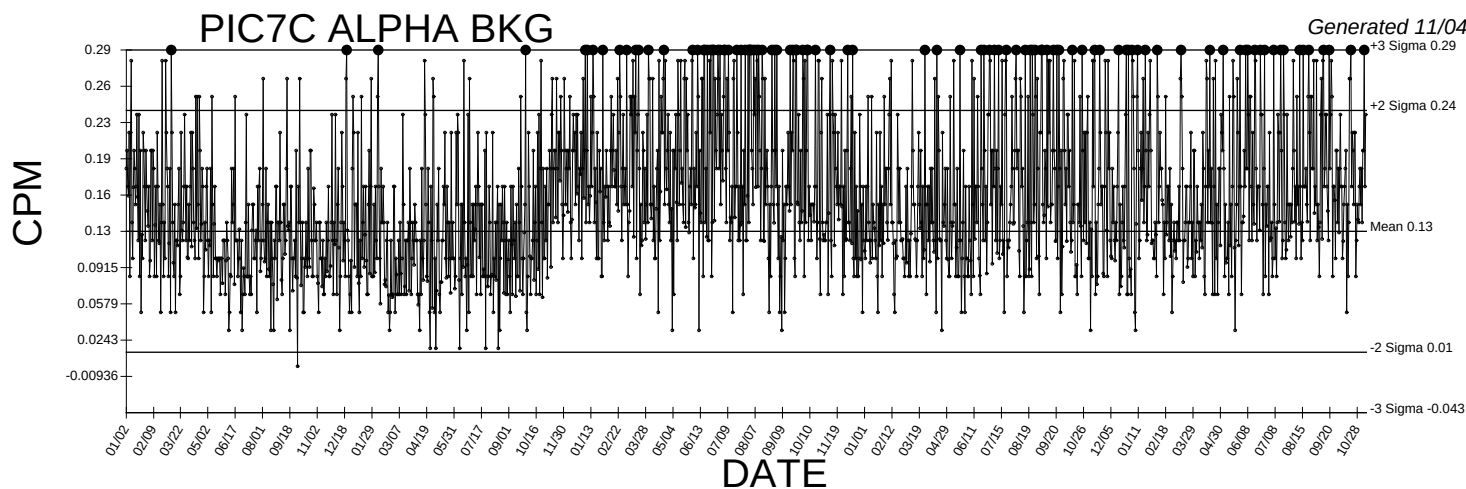
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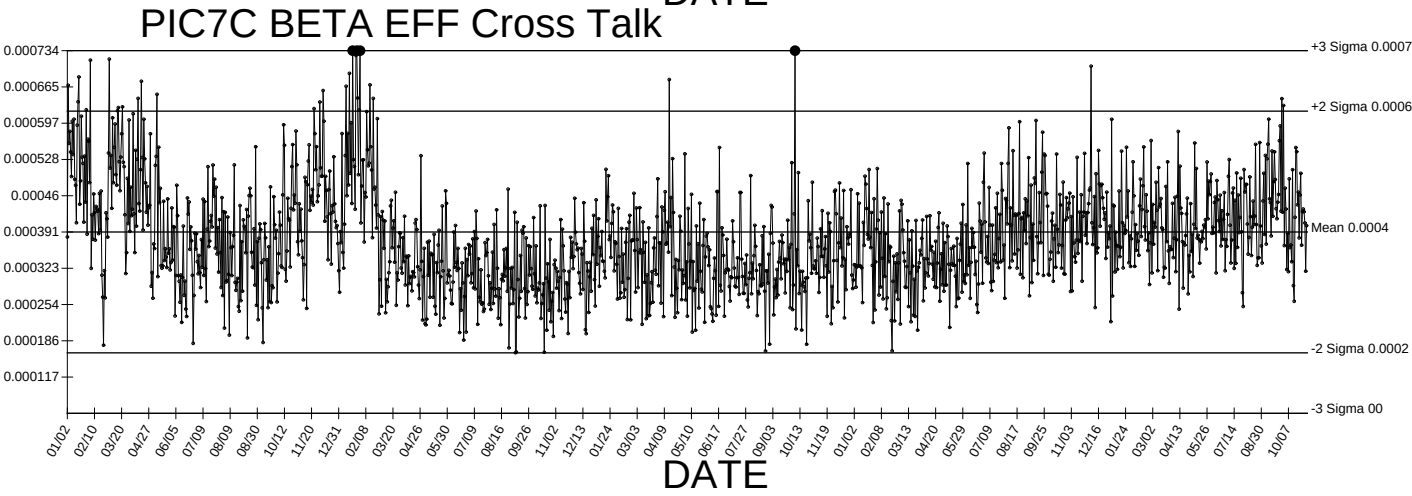
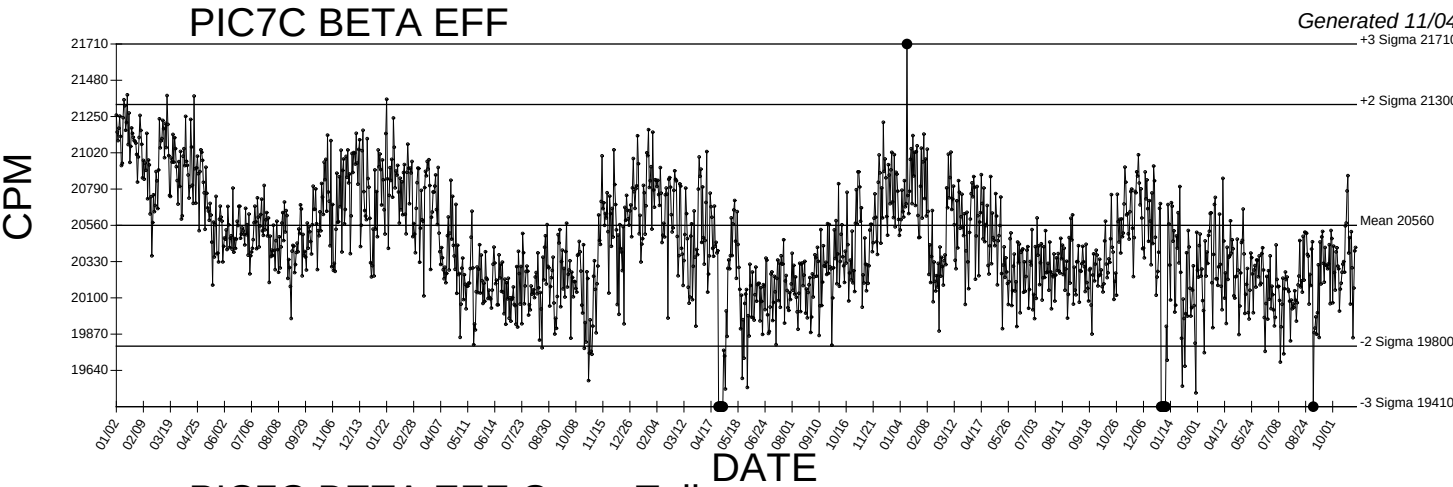
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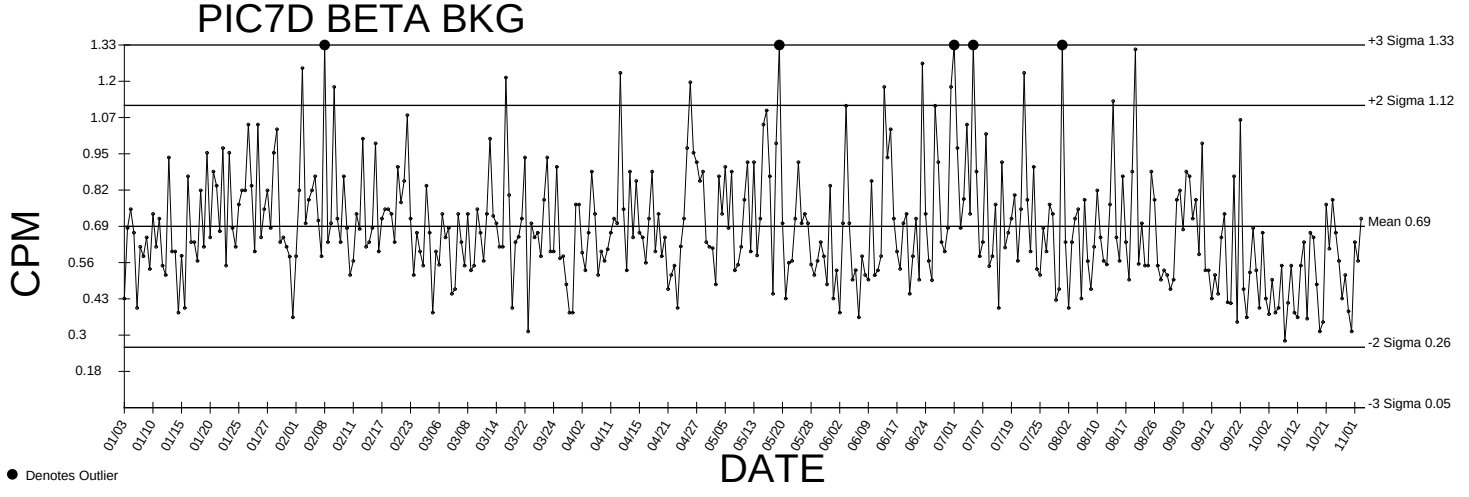
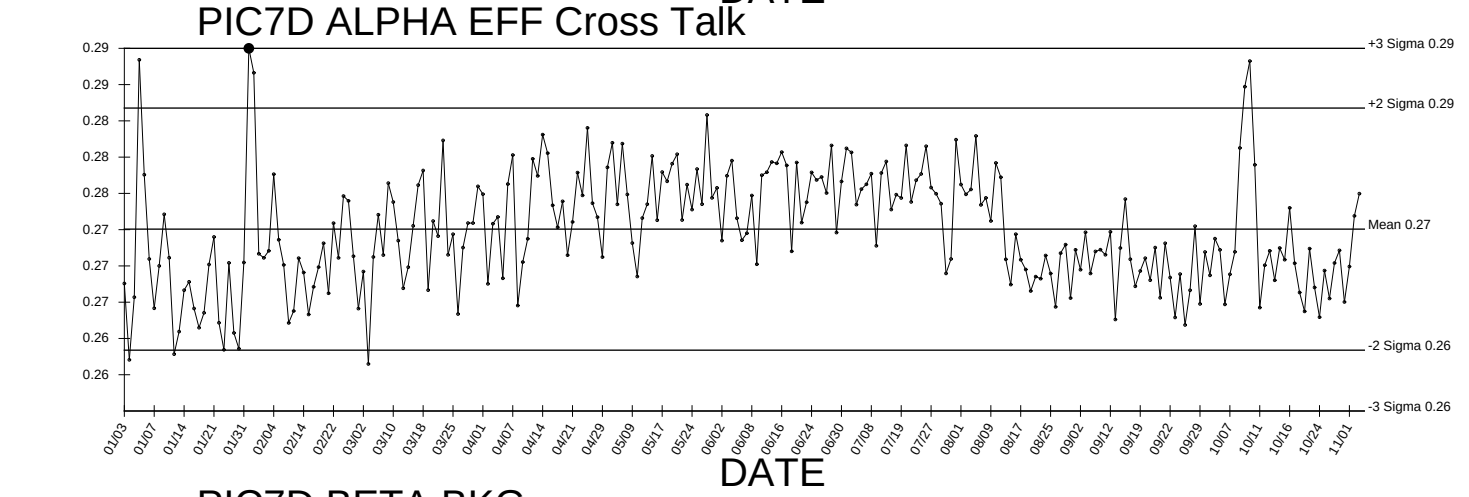
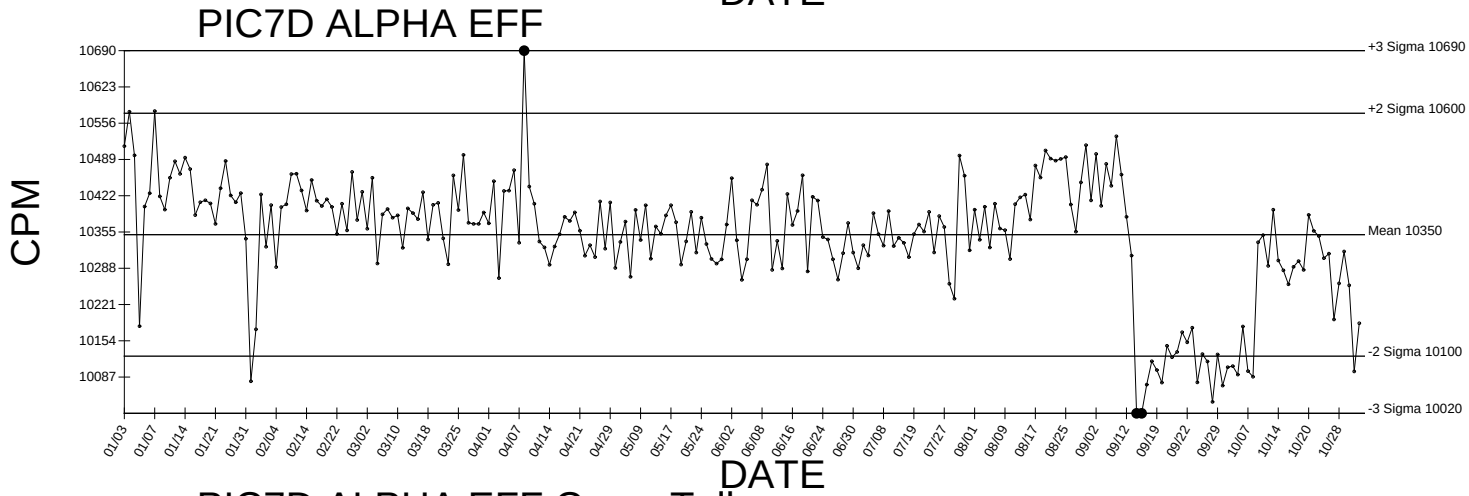
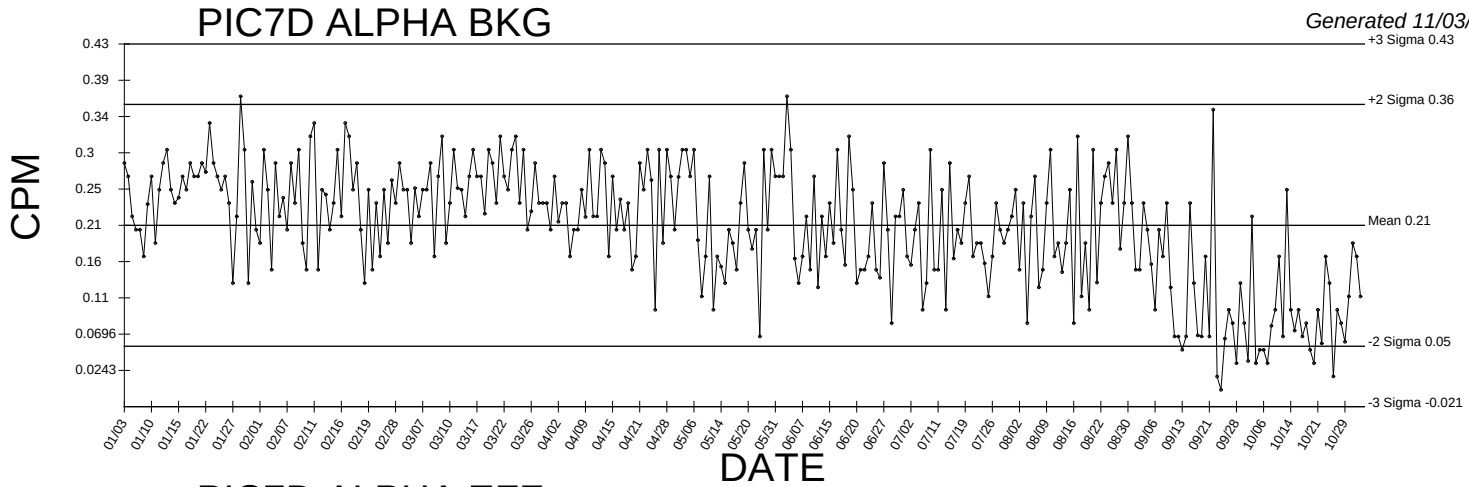
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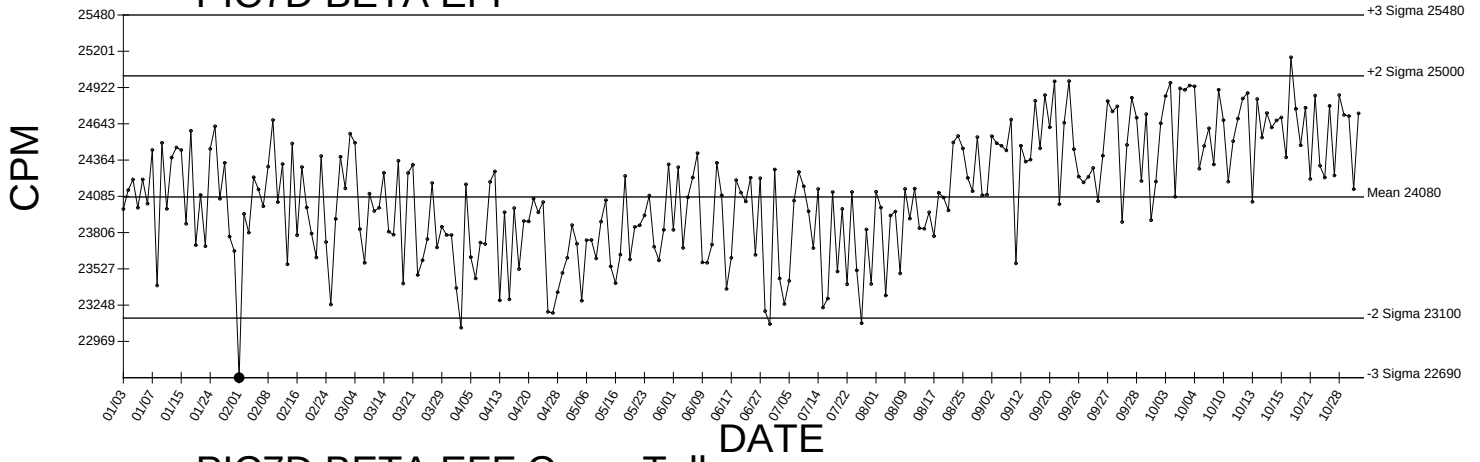
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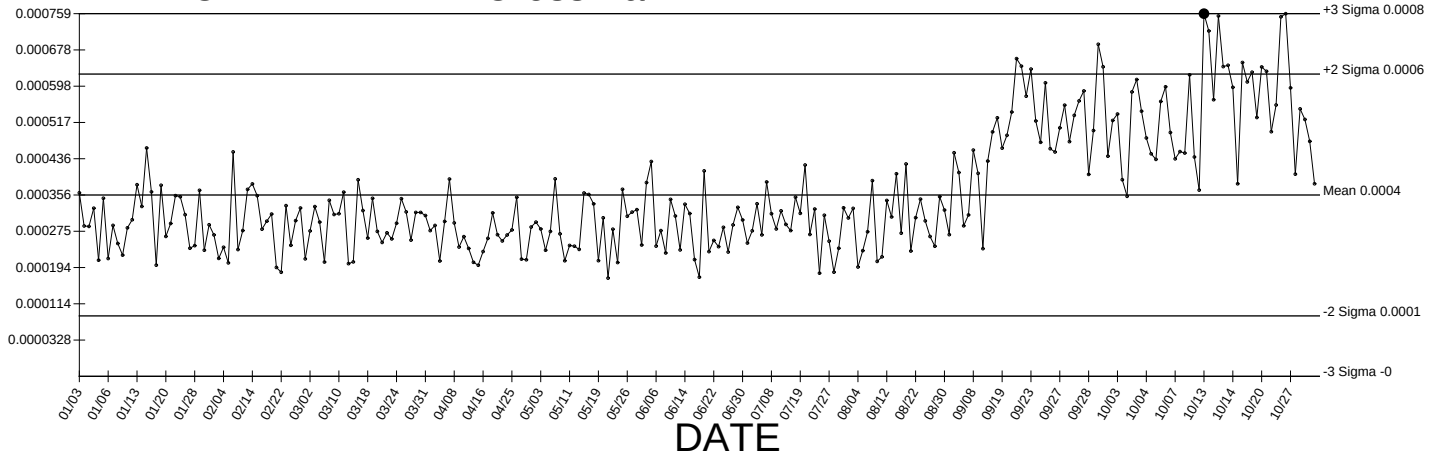
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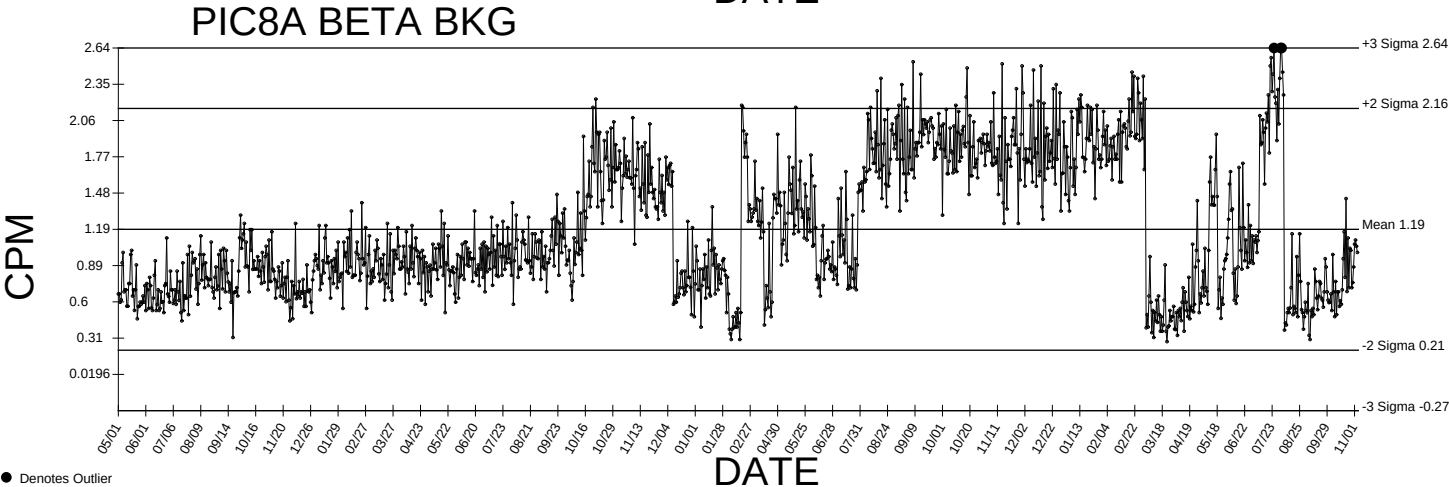
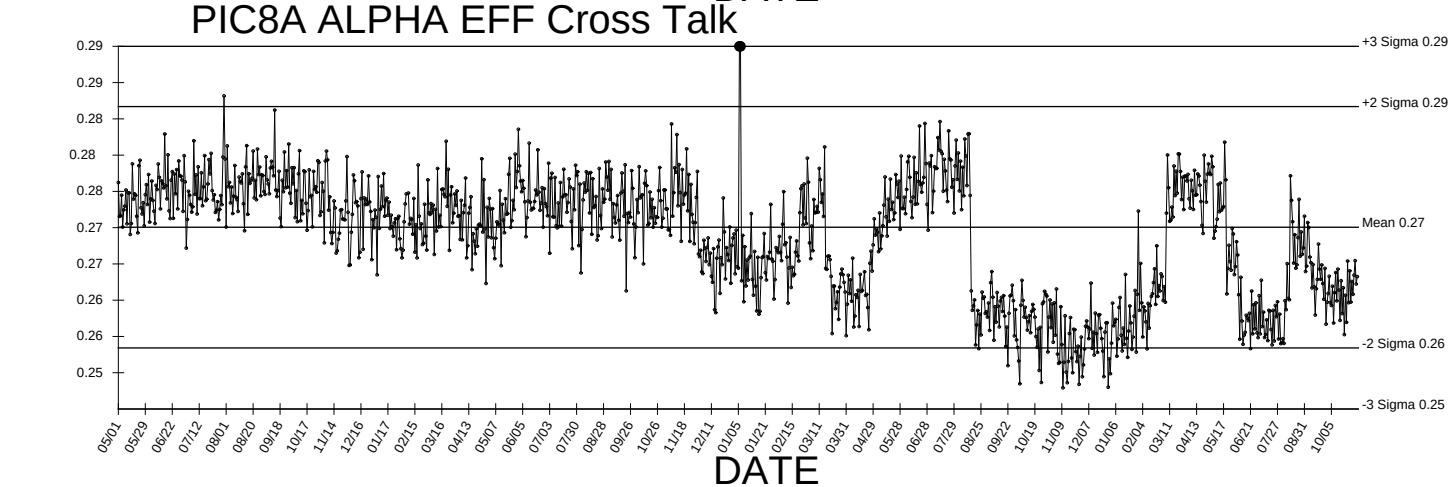
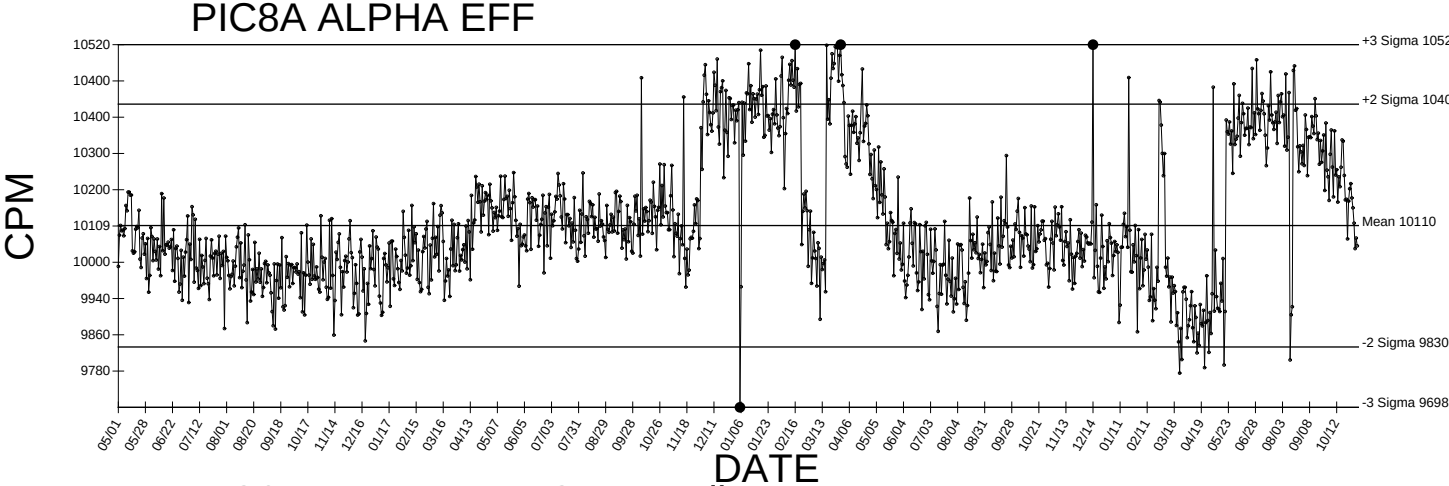
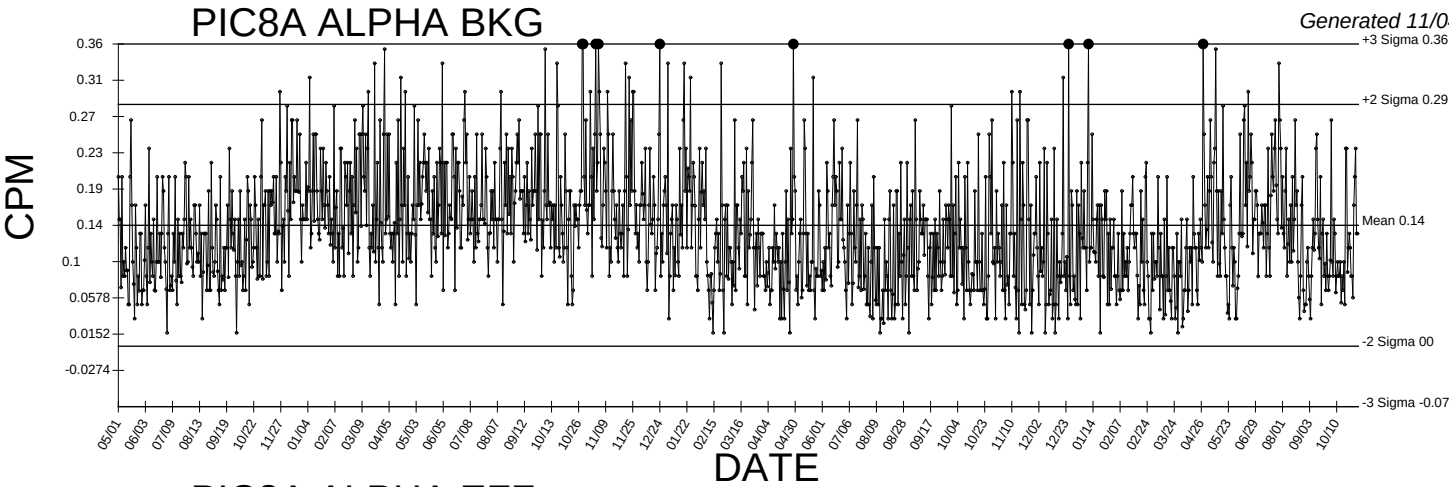
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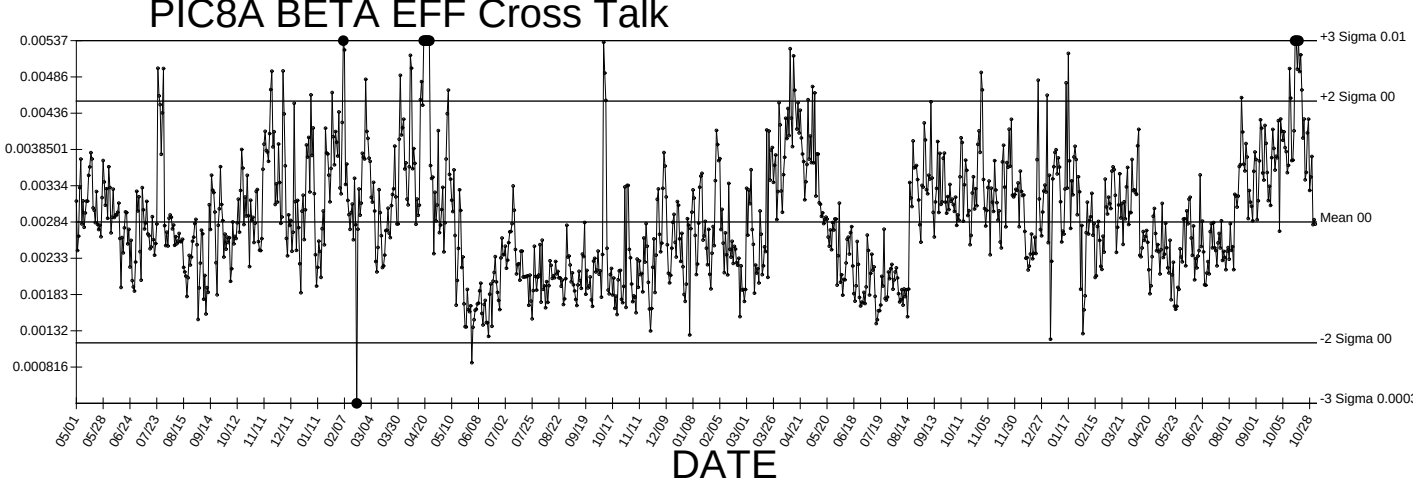
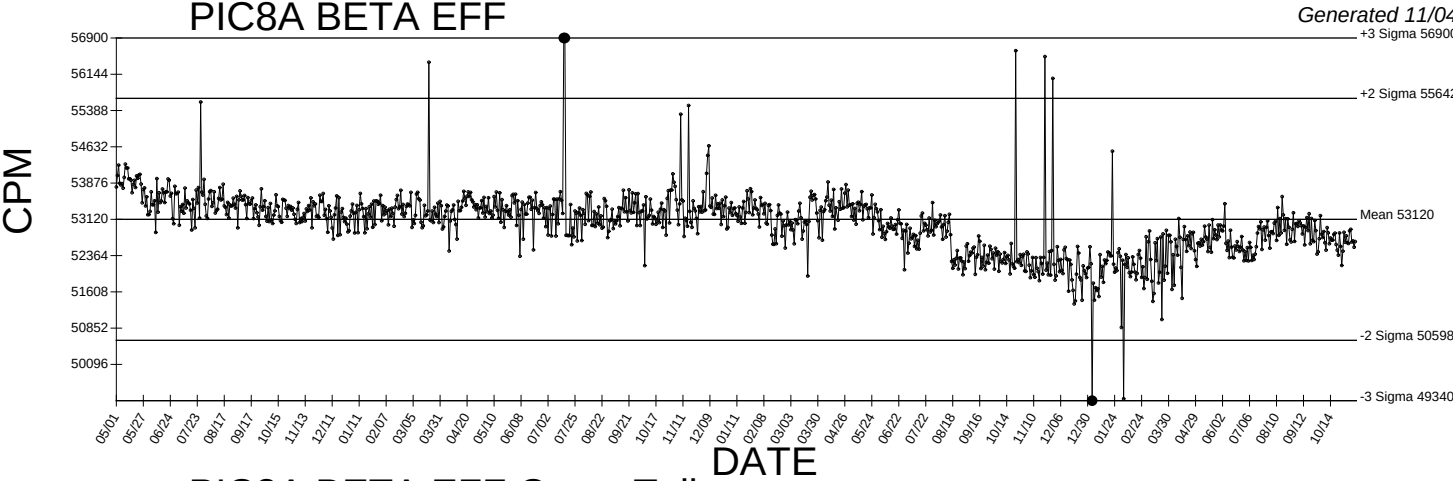


PIC7D BETA EFF Cross Talk

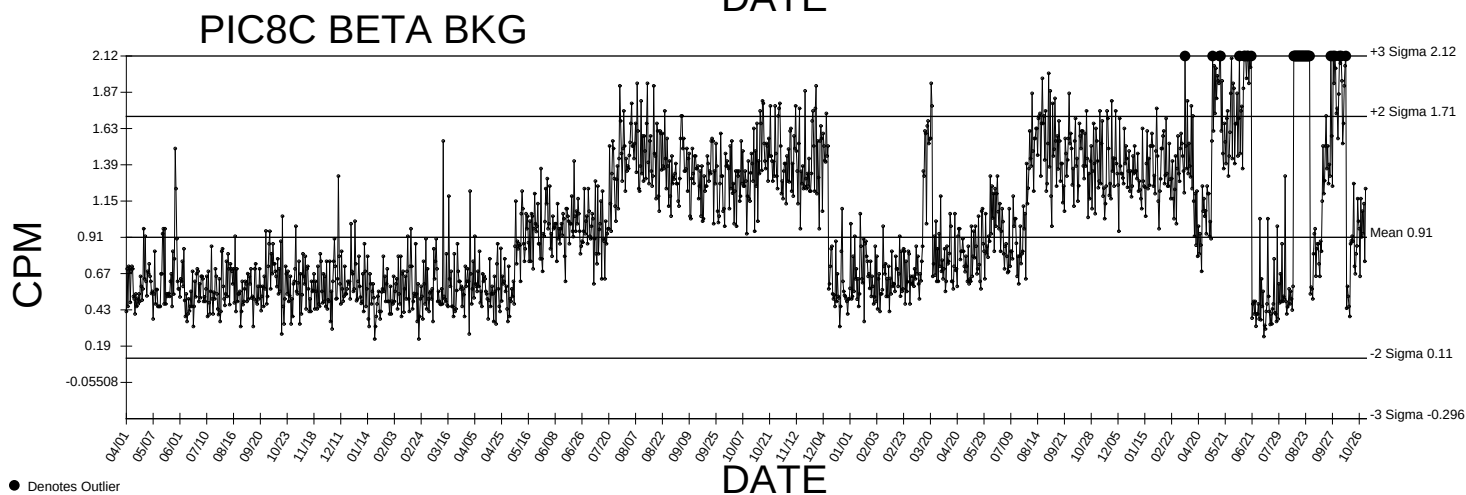
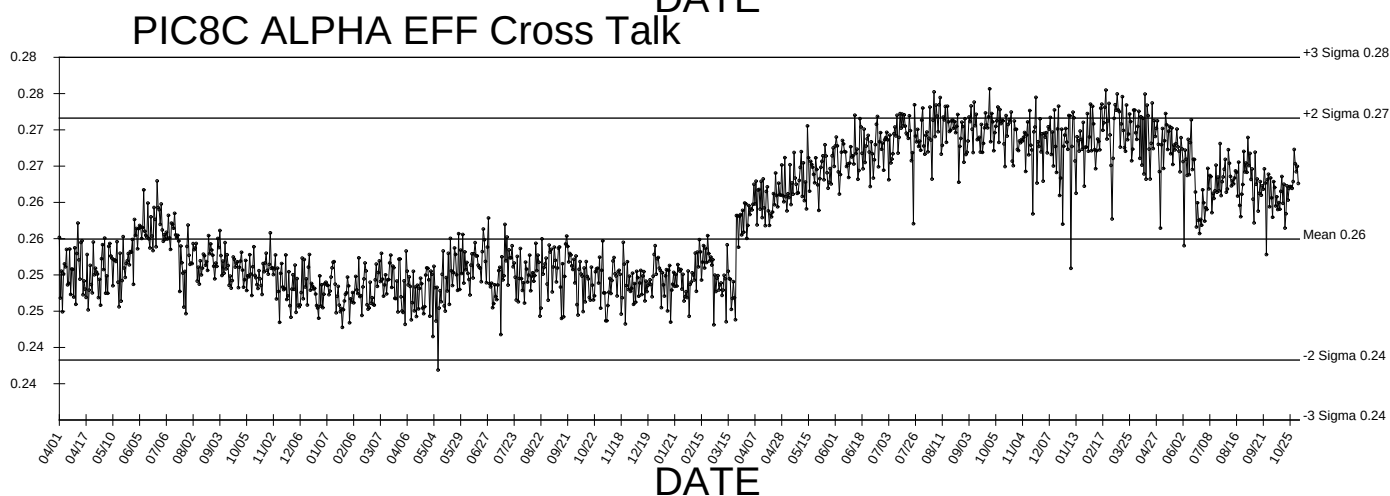
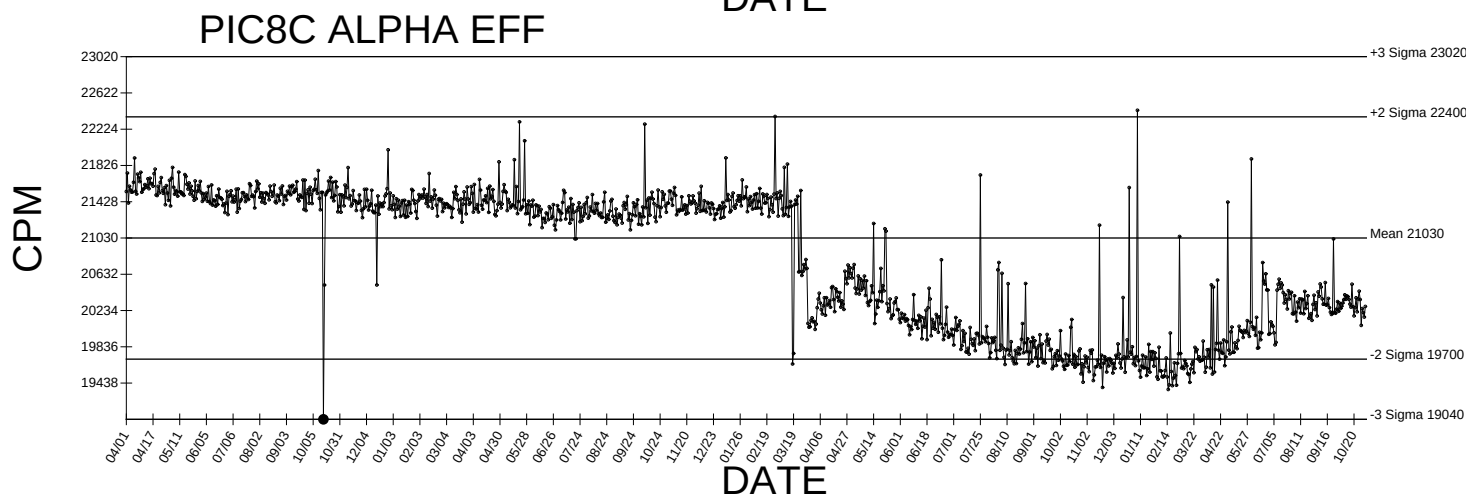
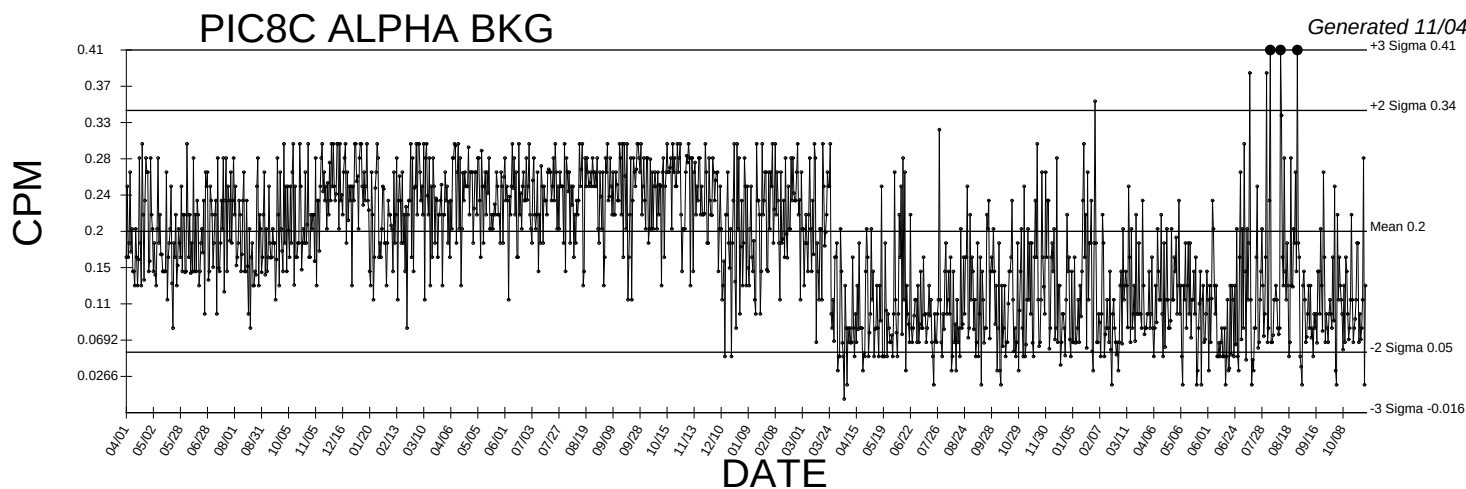


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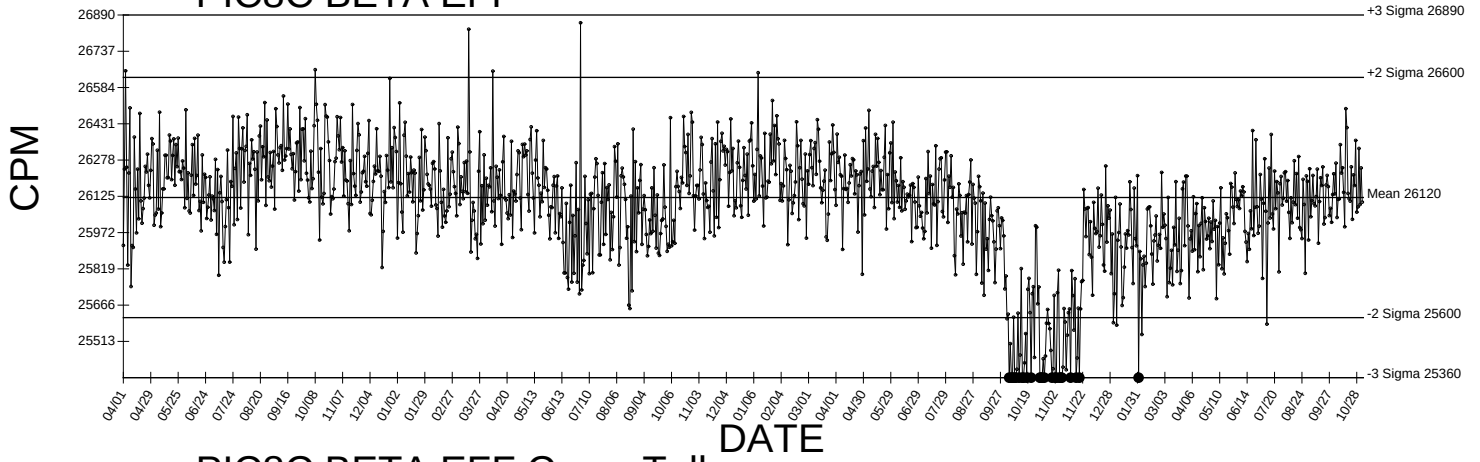
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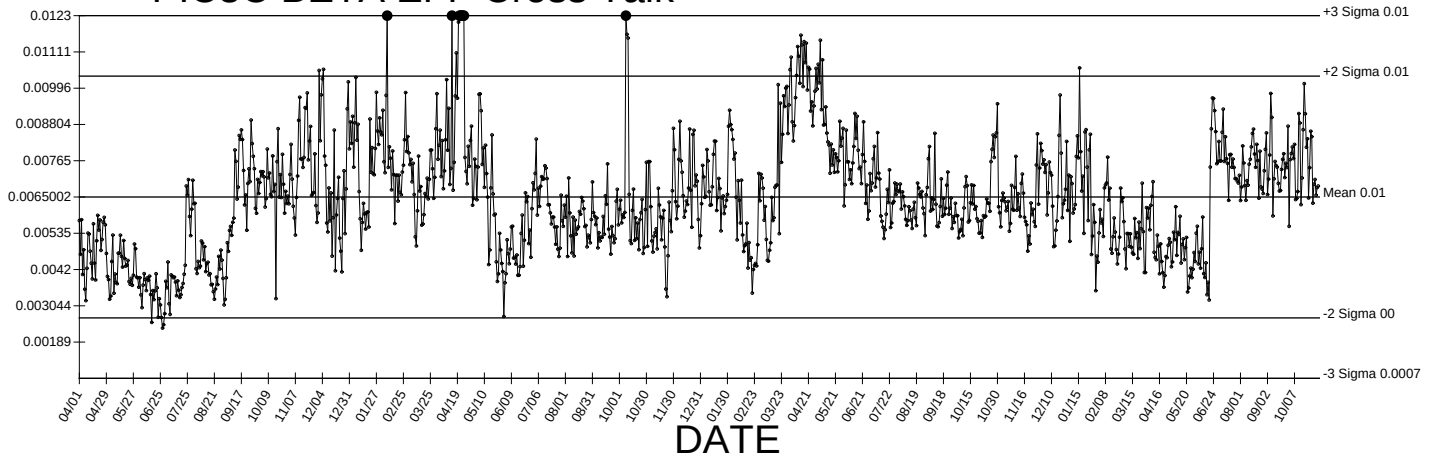
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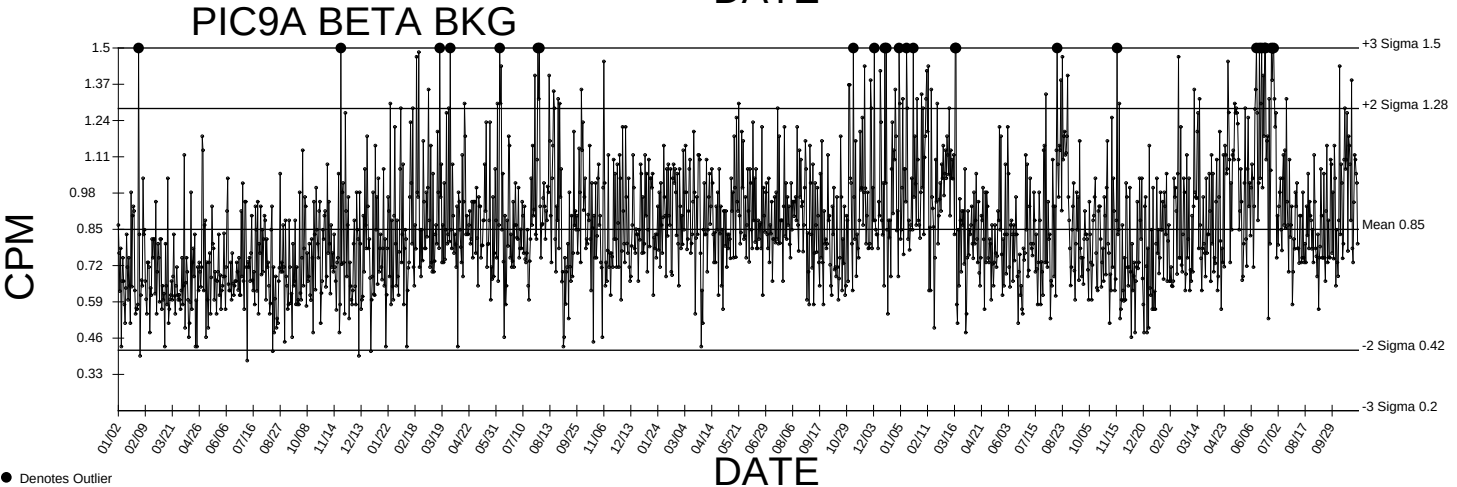
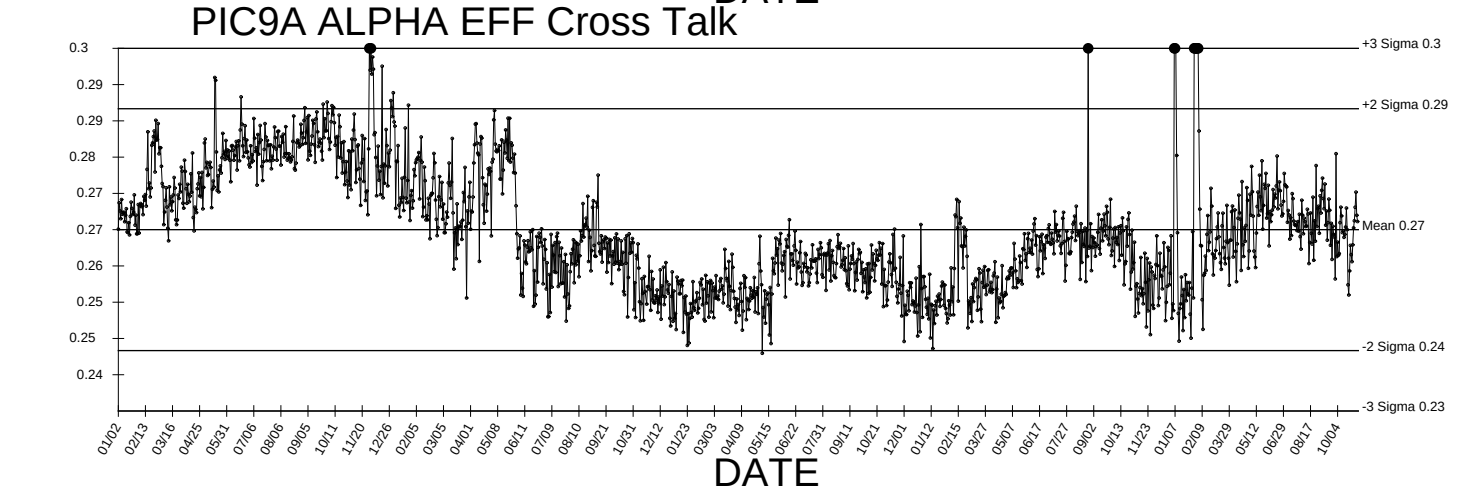
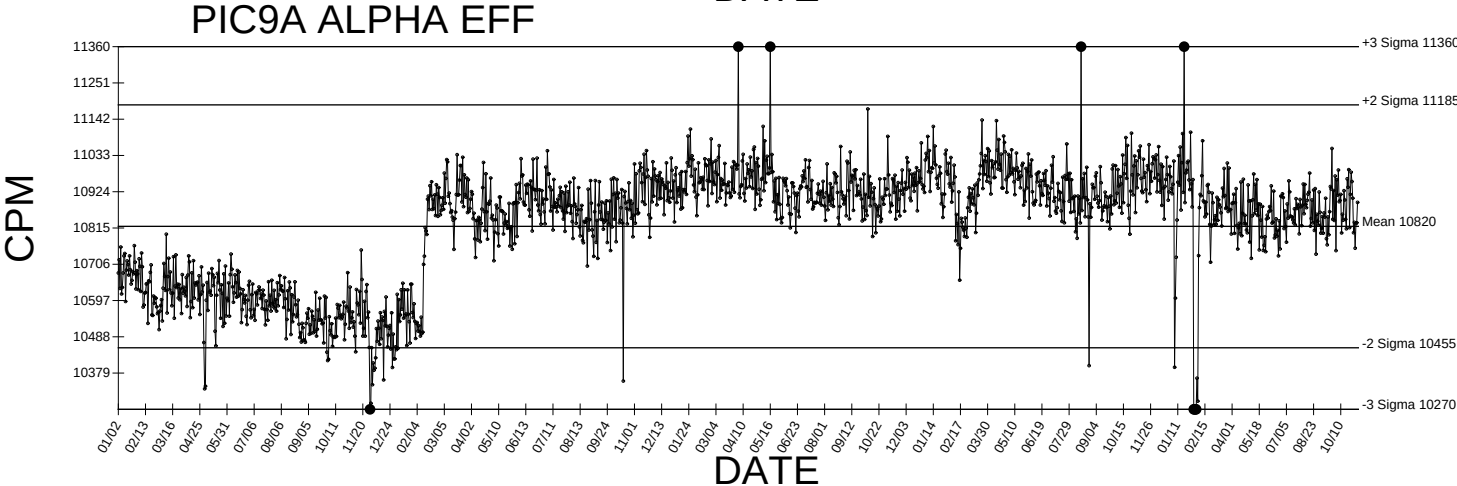
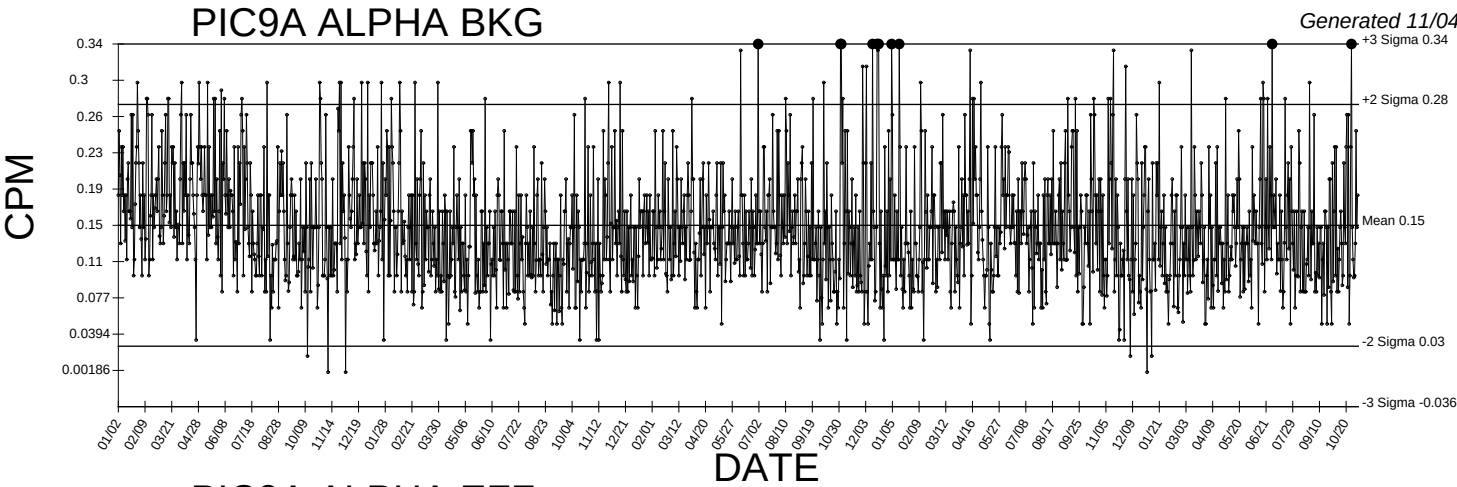
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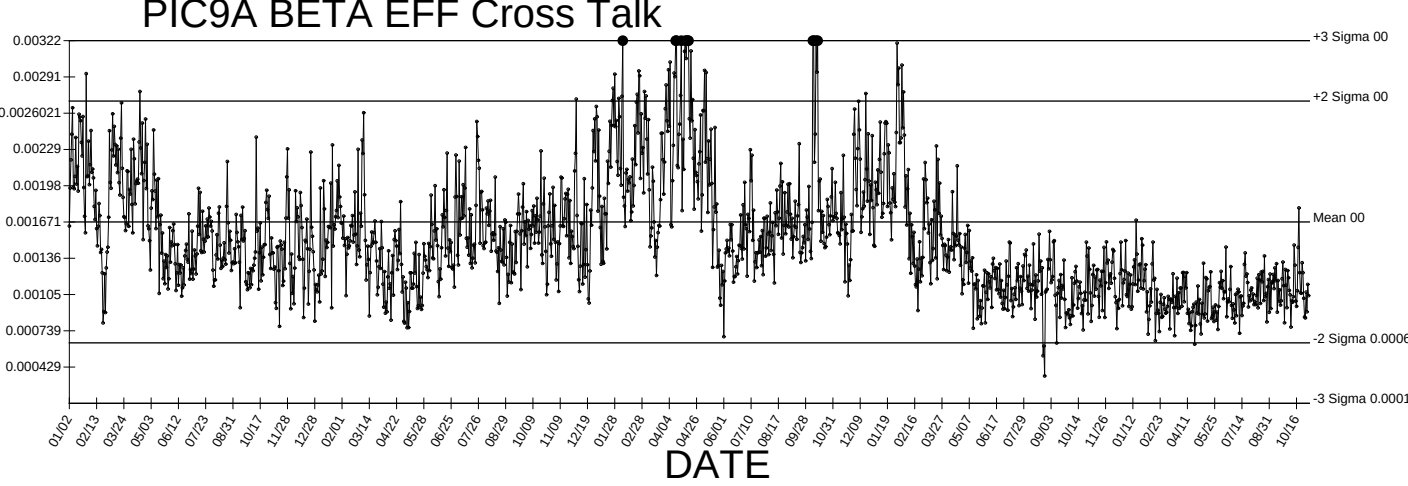
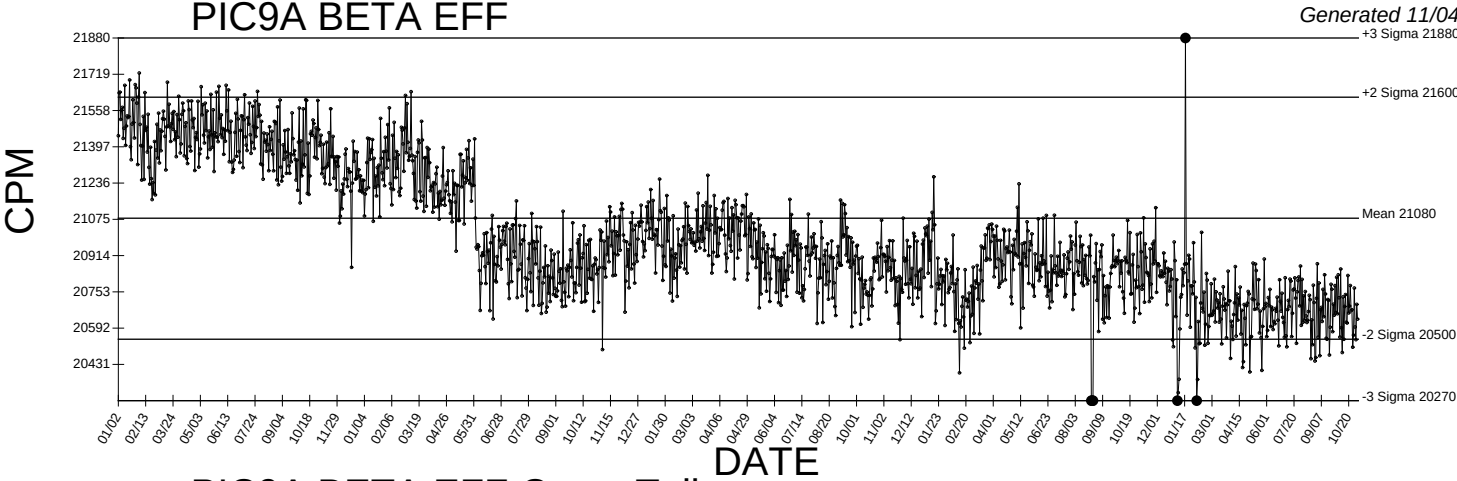
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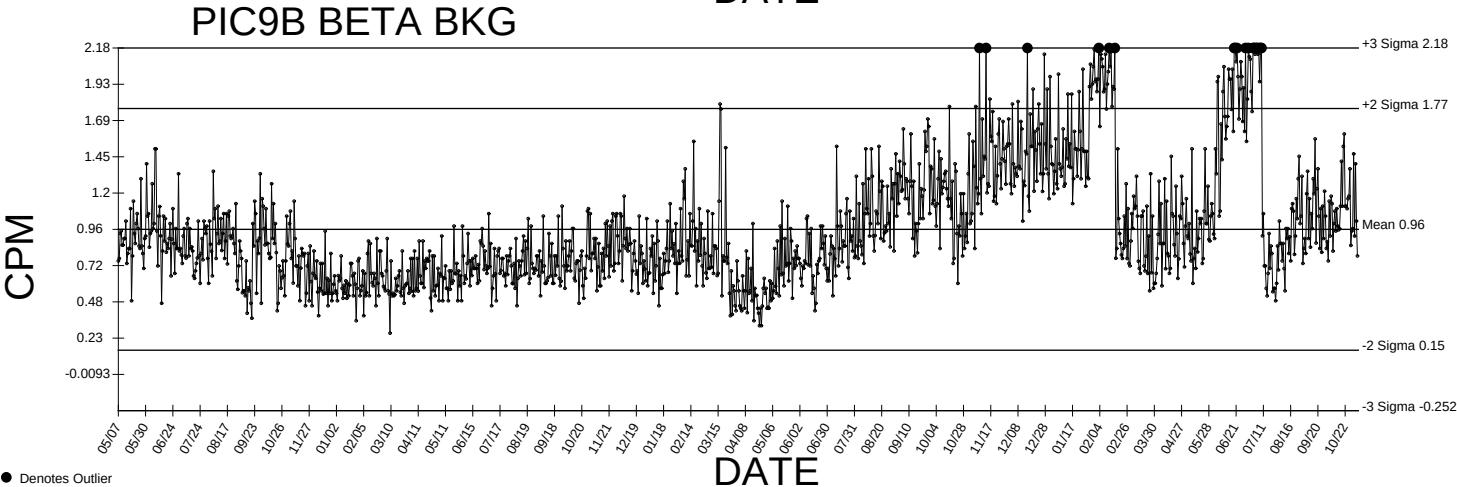
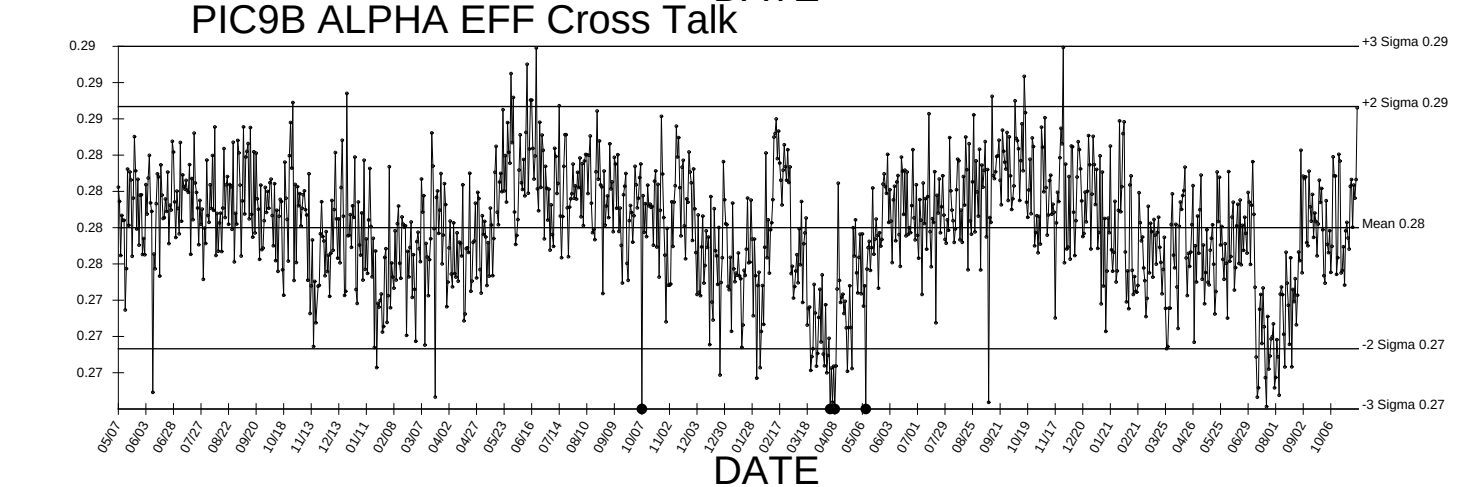
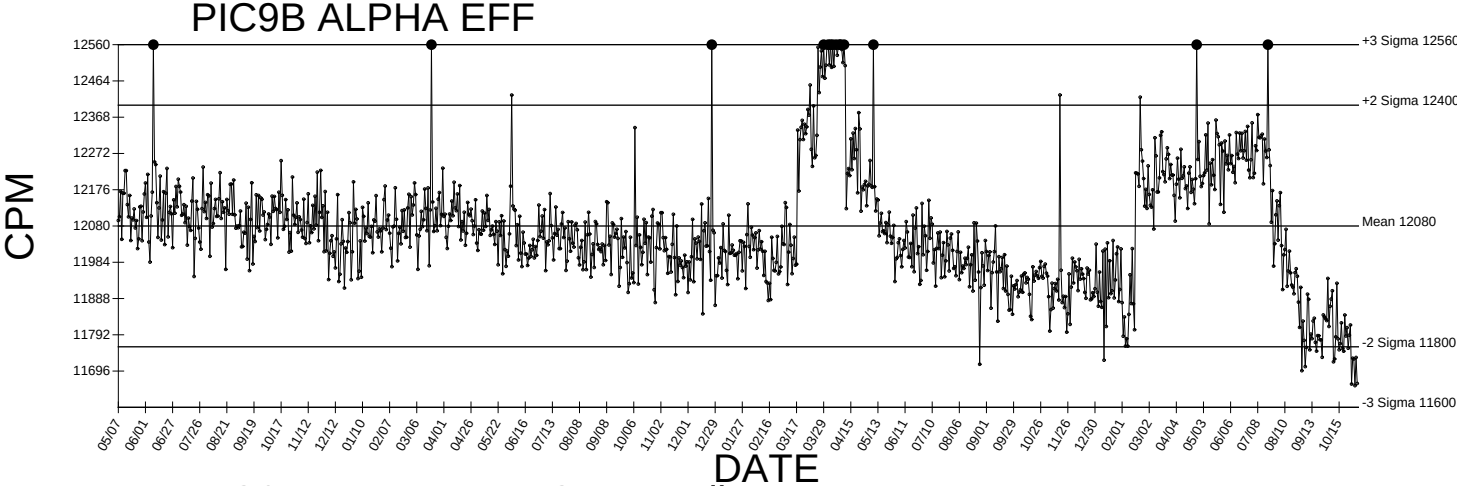
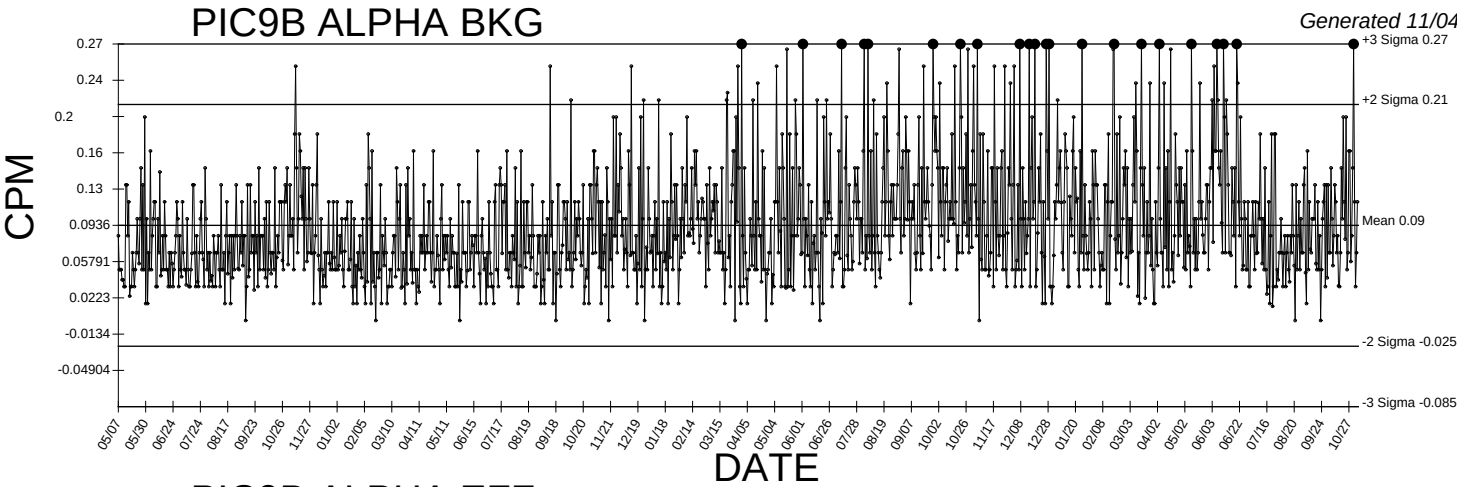
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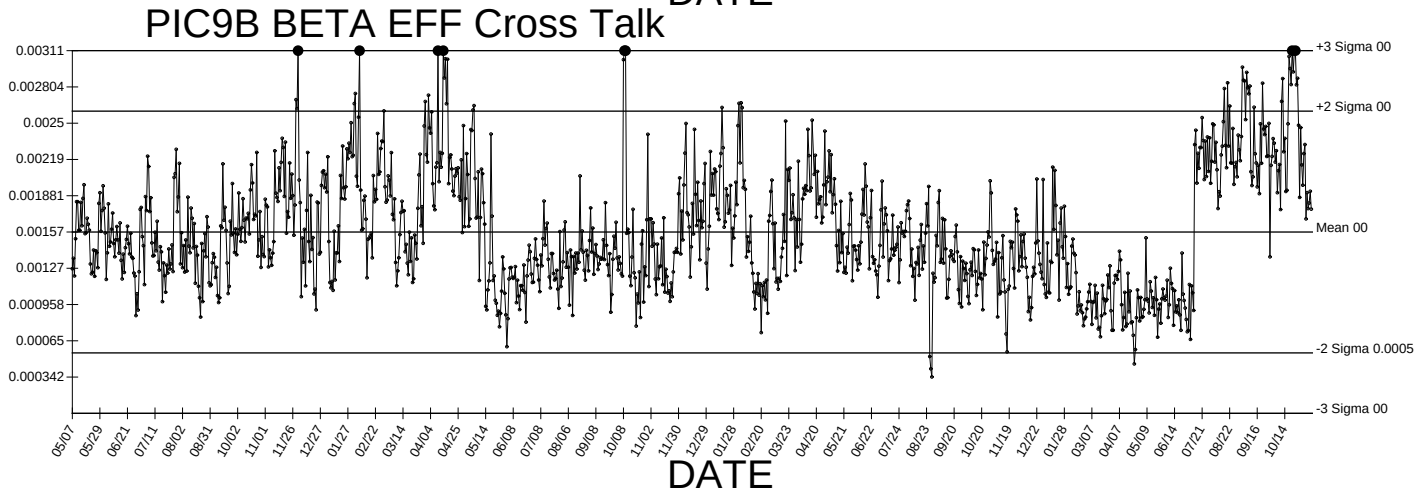
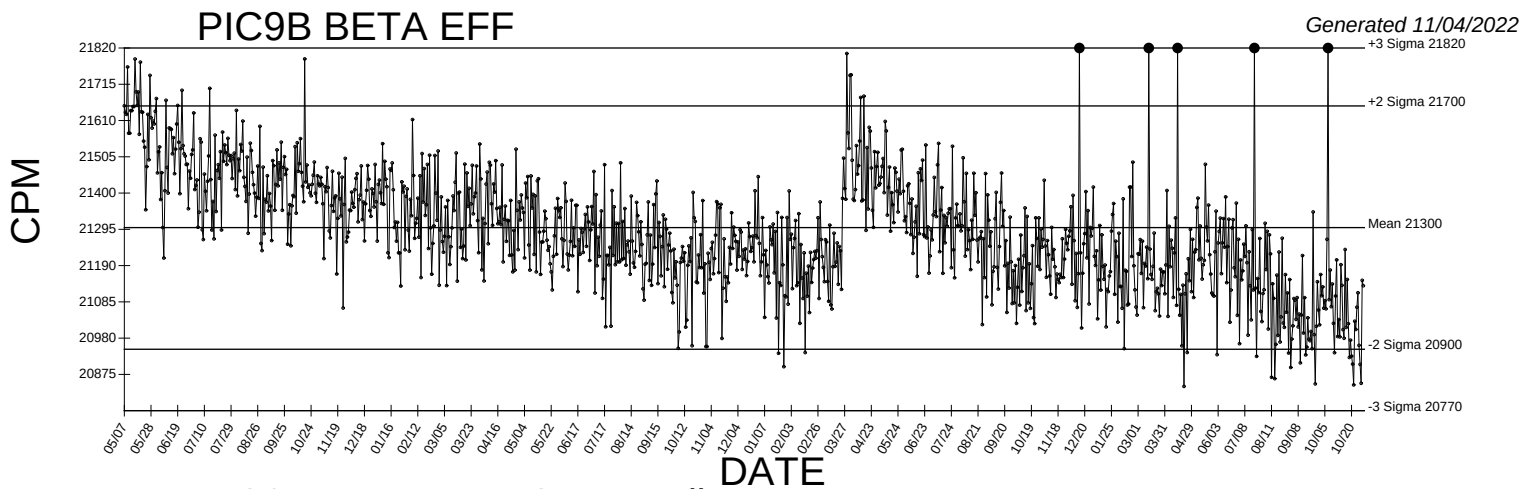
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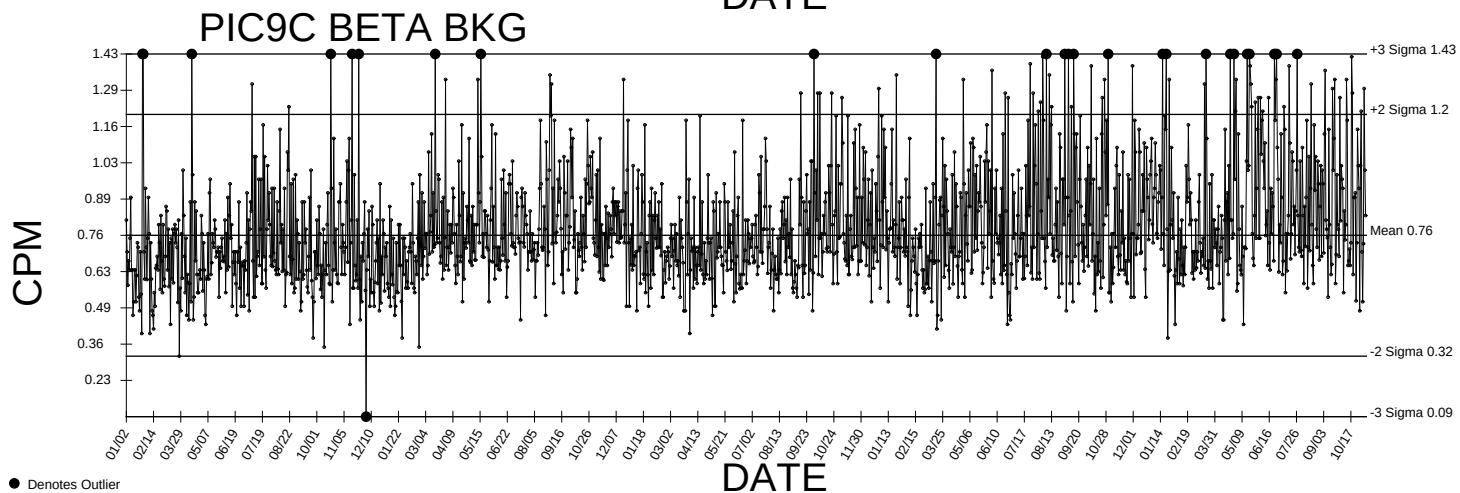
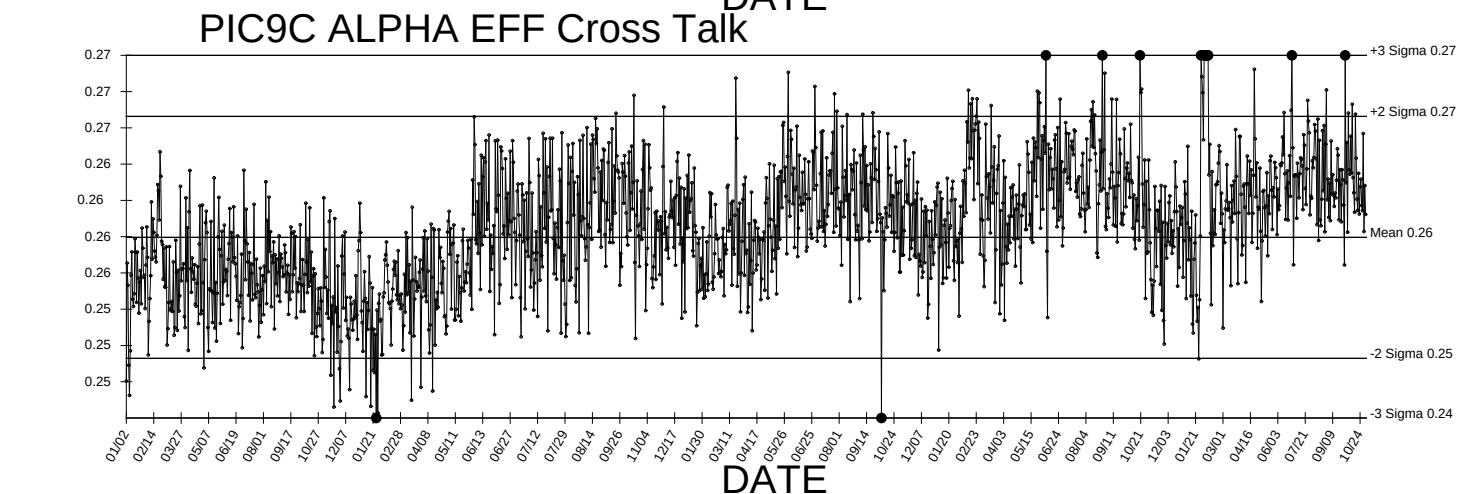
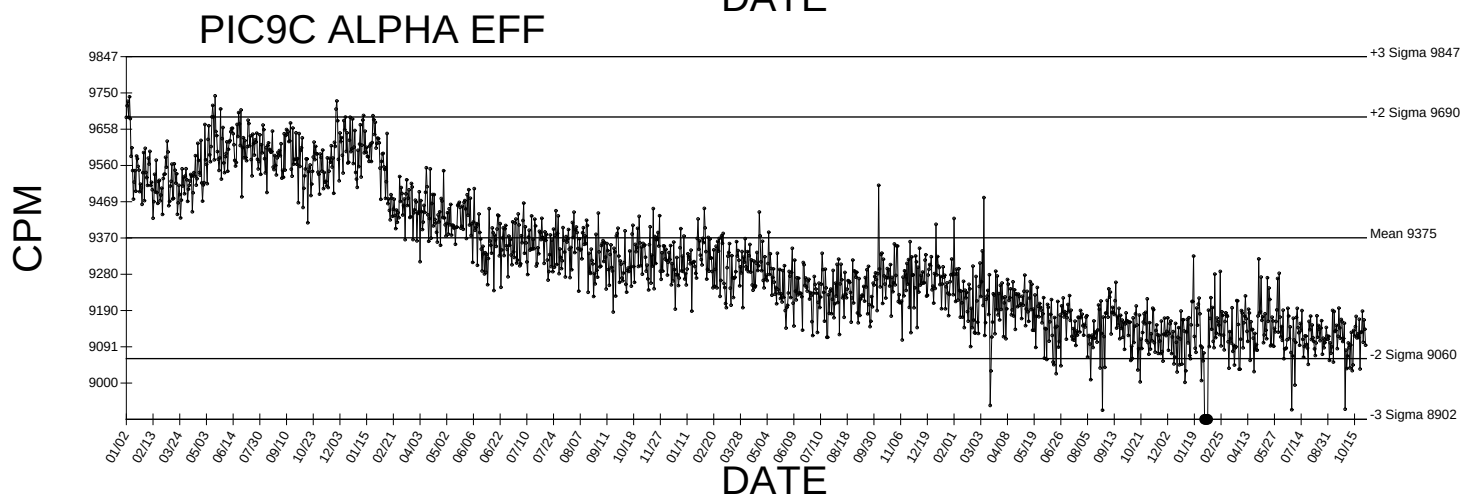
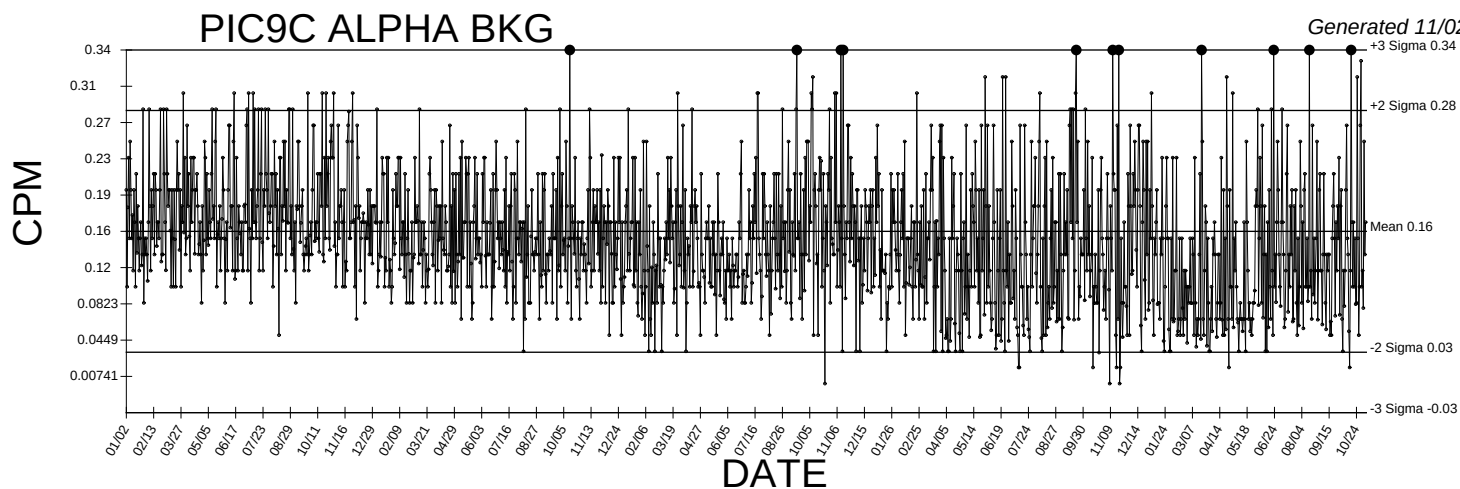
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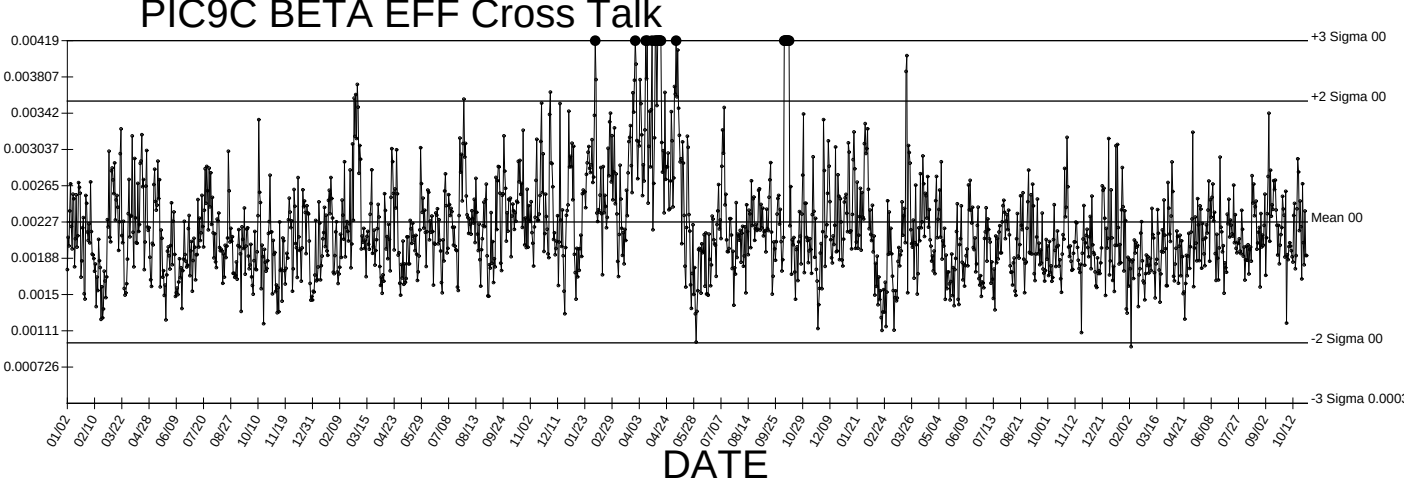
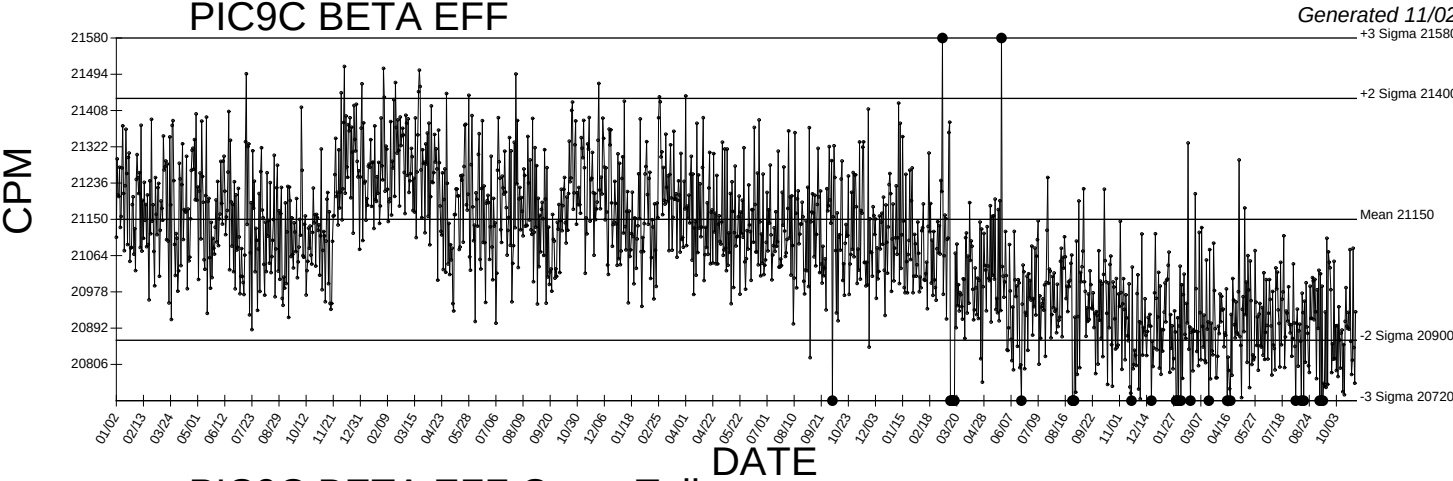


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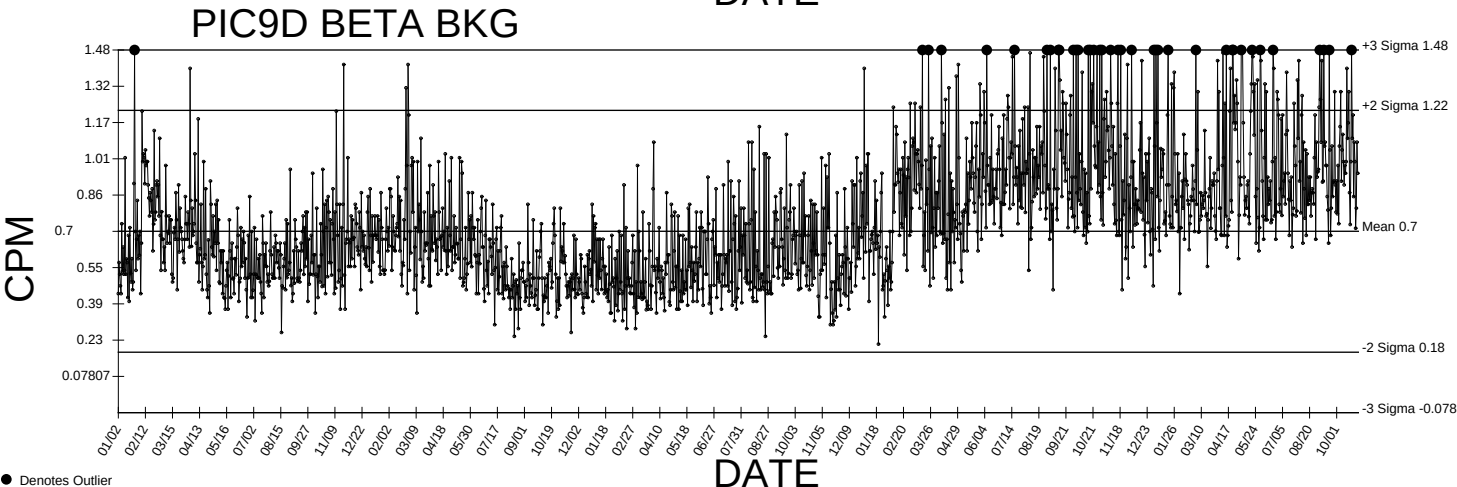
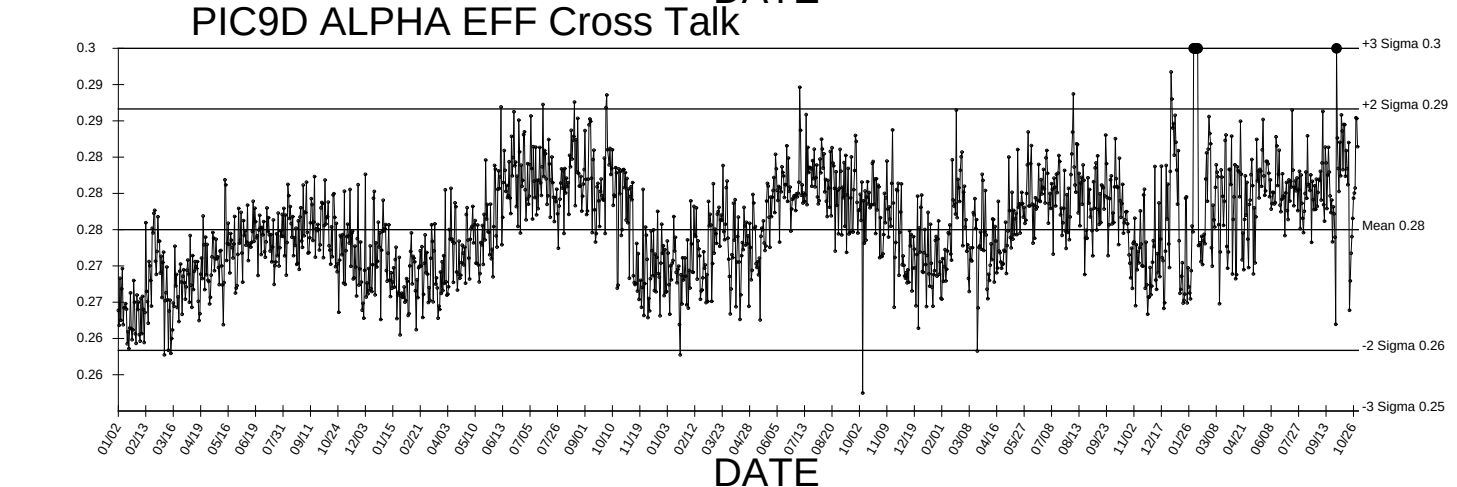
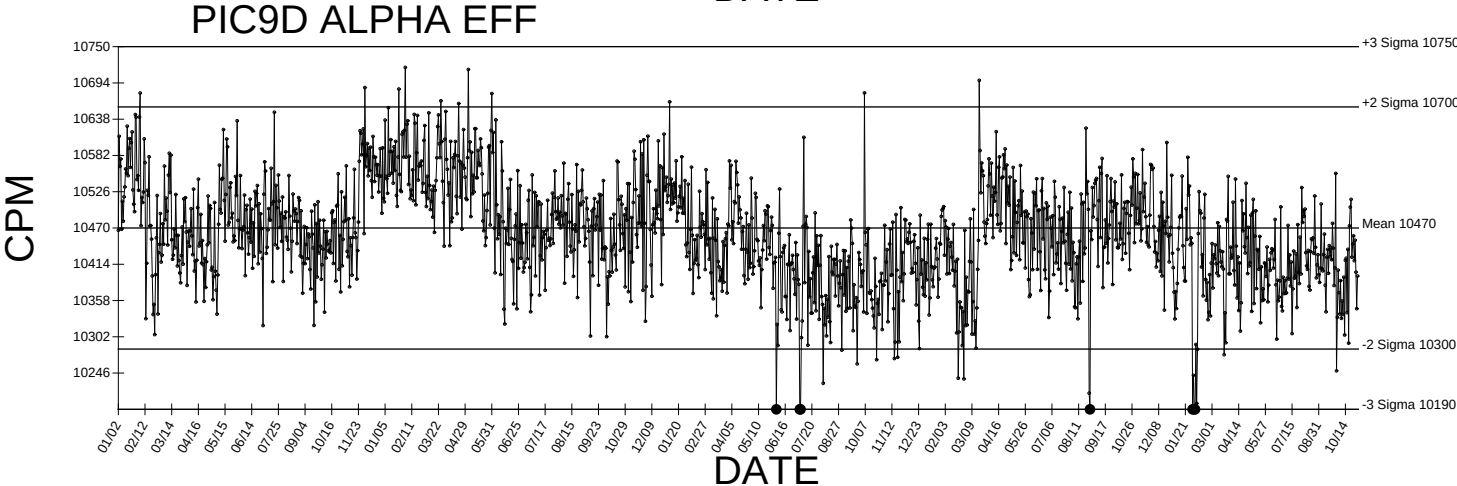
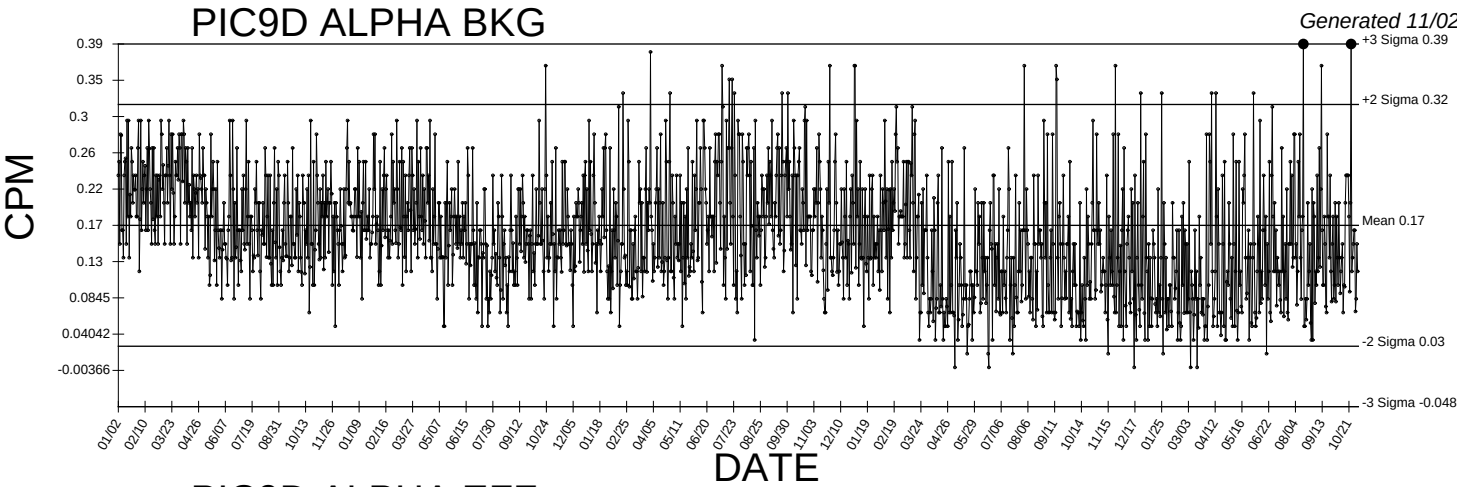


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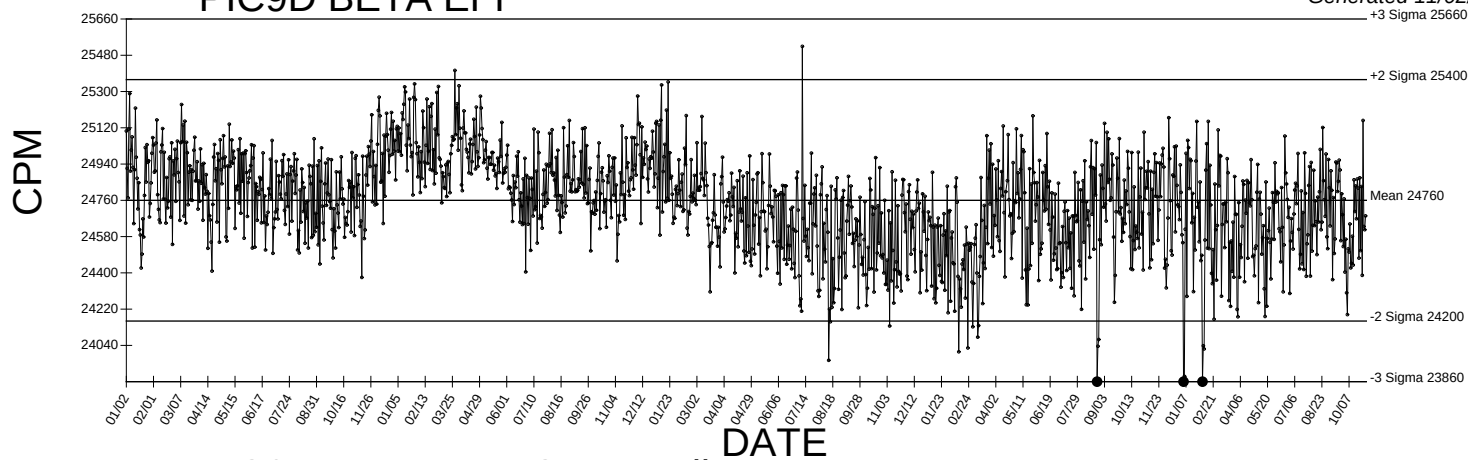
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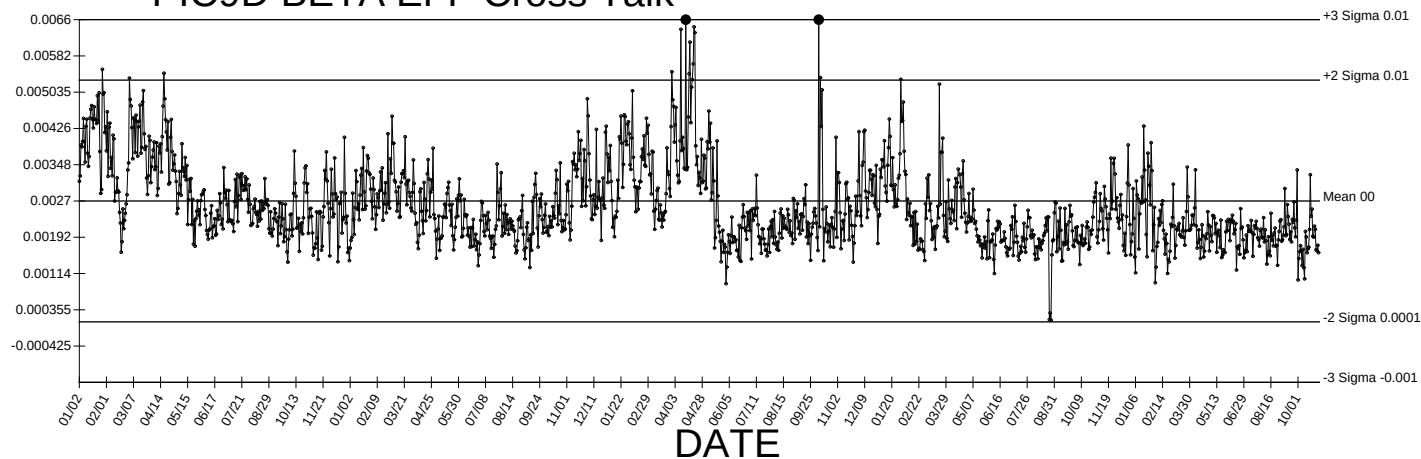
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PIC9D BETA EFF

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PIC9D BETA EFF Cross Talk



● Denotes Outlier

RAD Standards Traceability



National Institute of Standards & Technology

Certificate

1951

Standard Reference Material® 4251d

Received
3-31-20

Barium-133 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive Barium-133 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4251d consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Barium-133** massic activity, at a **Reference Time of 1200 EST, 13 July 2018**, is:

$(382.6 \pm 4.6) \text{ kBq} \cdot \text{g}^{-1}$.

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4251d** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Use and Handling"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared by the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of B.E. Zimmerman, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Fitzgerald, R. Collé and L. Laureano-Pérez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida of the NIST Radiation Physics Division, Radioactivity Group.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

James M. Adams, Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 17 October 2019

Steven J. Choquette, Director
Office of Reference Materials

Table 1. Certified Massic Activity of SRM 4251d

Radionuclide	Barium-133
Reference time	1200 EST, 13 July 2018
Massic activity of the solution	382.6 kBq•g ⁻¹
Relative expanded uncertainty ($k = 2$)	1.2 % ^(a)

^(a) The uncertainties on certified values are expanded uncertainties, $U = ku_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO and NIST Guides [4, 5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

Table 2. Uncertified Information of SRM 4251d

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	88 µg•g ⁻¹ Ba ⁺² in 0.98 mol•L ⁻¹ HCl
Solution density	(1.015 ± 0.002) g•mL ⁻¹ at 22.6 °C ^(a)
Solution mass	(5.063 ± 0.003) g ^(a)
Photon-emitting impurities	None detected ^(b)
Half-lives used [6]	¹³³ Ba: (10.539 ± 0.006) a ^(c)
Calibration methods (and instruments)	The certified massic activity for ¹³³ Ba was obtained by 4π (e, X) - γ(NaI) live-timed anti-coincidence (LTAC) counting. Confirmatory measurements were performed by five other methods: (i) 4παβ liquid scintillation (LS) spectrometry (with ³ H standard efficiency tracing for β efficiencies) and two counters; (ii) 4παβ liquid scintillation (LS) spectrometry (with ⁵⁵ Fe standard efficiency tracing for β efficiencies) and two counters; (iii) an LS-based 4παβ triple-to-double coincidence ratio (TDCR) method; (iv) 4πγ ionization chamber measurements using NIST chamber "A"; and (v) HPGe γ-ray spectrometry. ^(d)

^(a) The stated uncertainty is two times the standard uncertainty [5].

^(b) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

336 s⁻¹•g⁻¹ for energies between 15 keV and 95 keV,

150 s⁻¹•g⁻¹ for energies between 100 keV and 280 keV,

276 s⁻¹•g⁻¹ for energies between 285 keV and 370 keV,

142 s⁻¹•g⁻¹ for energies between 380 keV and 400 keV,

16 s⁻¹•g⁻¹ for energies between 410 keV and 1430 keV,

24 s⁻¹•g⁻¹ for energies between 1440 keV and 1480 keV, and

13 s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ¹³³Ba.

^(c) The stated uncertainty is the standard uncertainty. See reference 6.

^(d) The expanded ($k = 2$) uncertainties for the five confirmatory methods were: (i) 2.4 %; (ii) 2.4 %; (iii) 1.2 %; (iv) 1.6 %; and (v) 1.7 %, respectively. All of the confirmatory measurements agreed with the certified value within their respective measurement uncertainties. The results for methods (iii) and (iv) agreed with the certified anti-coincidence value to better than 0.2 %.

Table 2. Uncertainty evaluation for the massic activity of SRM 4251d

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ¹³³ Ba (%)
1	Measurement repeatability; standard deviation of the distribution for 6 samples, each measured once	A	0.35
2	Background; estimated by half the difference of using the middle background measurement rather than the background measurement closest in time to each sample measurement	A	0.06
3	Extrapolation fit; median uncertainty on least-squares intercept value for a single set of γ -ray gates	A	0.05
4	Analysis model, standard deviation between extrapolation intercept for two gate settings	A	0.46
5	Dead time; from previous systematic studies	B	0.1
6	Gravimetric (mass) measurements; includes uncertainty on average sample mass and dilution to SRM solution. From previous systematic studies.	B	0.05
7	¹³³ Ba decay corrections; from DDEP half-life of ¹³³ Ba of (10.539 $\pm$ 0.006) a	B	0.00004
8	Impurity limit, from limit (no impurities seen) from γ -ray spectrometry	A	0.04
Relative combined standard uncertainty			0.60
Relative expanded uncertainty ($k = 2$)			1.2

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4251d should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to the SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed Oct 2019). Note: This SRM is contained in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM); BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed Oct 2019).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed Oct 2019).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Oct 2019).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Oct 2019).
- [6] Chechev, V.P. and N.K. Kuzmenko ; *LNE-LNHB/CEA Table of Radionuclides*, ¹³³Ba; (October 2016); available at www.lnhb.fr/nuclides/Ba-133_tables.pdf (accessed Oct 2019).

Users of this SRM should ensure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

Standard Logbook

Serial ID: 1951 **Open/Reference Date:** 13 JUL 2018 **Aliquot :** 5.063 g
Name: Barium-133 **Received:** 31 MAR 2020 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 31 MAR 2035 **Logbook Num :** GL-CED-297-244
Employee: Tim Chandler **Lot Number :** 4251d
Supplier: NIST **Solvent :** 0.98M HCl
Uncertainty : .6 percent

Description: Barium-133
Comments: None

Analyte	Concentration	Analyte	Concentration
Barium-133	382.6 kBq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1951
Prepared By:	Tim Chandler
Carrier Conc:	0.98M HCl
Reference Date:	07/13/2018
Ampoule Mass (g):	5.063 g
Uncertainty:	+/- .6 %
LogBook No:	GL-CED-297-244
Supplier:	NIST

A Solution Material Info			
Isotope:	Barium-133		
Prepared By:	Bethany Fiem		
Prep Date:	09/23/2020		
Verification Date:	09/16/2021		
Expiration Date:	09/16/2022		
Primary Code:	1951-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.034 g		
Density(g/mL):	1.0167	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.034 \text{ g}) * (382.6 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 1155605.0400 \text{ dpm/mL}$
$(5.034 \text{ g}) * (382.6 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0167 \text{ g/mL}) / (100 \text{ mL}) = 1136603.3060 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
09/23/2020	Bethany Fiem	19.301	1000	1951-B	21937.5804 dpm/mL	09/16/2021	09/16/2022
09/16/2021	Bethany Fiem	19.02	1000	1951-C	21618.1948 dpm/mL	09/16/2021	09/16/2022
06/02/2022	Jennie Kill-Bowden	19.0813	1000	1951-D	21687.8687 dpm/mL	06/03/2022	06/02/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ba-133 Standard 1951-D

v1.0.2

Instrument	Purple
Analyst	JXK3
Verification Prep Date	6/2/2022

Standard Information	
Isotope	Ba-133
Serial Number	1951-D
Isotope Half-life	3.8410E+03 D
Reference Date	7/13/2018
Ref. Act. (DPM/mL)	21687.8687
Amount of Std. (mL)	1.0
Standard Prep Date	6/2/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	6/3/2022	104.40	13752.00	42.40
2	6/3/2022	104.90	13833.33	42.40
3	6/3/2022	104.10	13909.33	42.40

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	13709.60	0.826295	16591.66	16591.66
2	13790.93	0.826295	16690.09	16690.09
3	13866.93	0.826295	16782.07	16782.07

dpm/mL
16687.94
95.22033877

Mean Value =
Stddev =

Certificate Value* = 16782.2
Two sigma = 190.441
10 % of Mean = 1668.794
Rule A (Pass/Fail) Pass
% Recovery 99.44%
Rule B (Pass/Fail) Pass
Expiration Date 6/2/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Ba-133 source 1951-D by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCPurple for Ba-133 source standard verification. The Ba-133 efficiency calibration which was used for verification calculations was performed on 6/2/2022 using Ba-133 source 1601-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

A = Ver. source cpm,

B = BKG cpm,

C = System efficiency (cpm/dpm), and

D = volume used for standard verification.

RAD-M-001

Standardization of Barium Carrier 3492426

v1.2.1

Analyst	JXK3
---------	------

Standard Information	
Isotope	Barium
Serial Number	3492426
Amount of Std. (mL)	1.0
Standard Prepared	9/28/2022

Parent Information	
Parent Serial #	3268059.1
Parent Exp. Date	1/18/2024

Standardization Rule

A satisfactory standardization is obtained when results give a standard deviation of less than 1.0% of the mean value.

Std #	Weight of carrier added (g)	Weight of crucible or filter (g)	Weight of crucible or filter + ppt. (g)	Weight of ppt. (g)	mg Barium/mL	mg Barium/g
1	1.0258	0.0765	0.1021	0.0256	25.60	24.96
2	1.0274	0.0764	0.1024	0.0260	26.00	25.31
3	1.0239	0.0766	0.1024	0.0258	25.80	25.20
4	1.0278	0.0763	0.1019	0.0256	25.60	24.91

Mean Value (mg/mL) = 25.75
 Stdev (mg/mL) = ± 0.19
 1.0% of Mean Value = 0.257500
 Pass
 Expiration Date 9/28/2023
 Mean Value (mg/1.0mL) = 25.75

22/82/6

Standardization of Strontium Carrier 3482192

v1.2.1

Analyst	KH1
---------	-----

Standard Information	
Isotope	Strontium
Serial Number	3482192
Amount of Std. (mL)	1.0
Standard Prepared	9/2/2022

Parent Information	
Parent Serial #	3268476.2
Parent Exp. Date	4/7/2024

Std #	Weight of carrier added (g)	Weight of crucible or filter (g)	Weight of crucible or filter + ppt. (g)	Weight of ppt. (g)	mg Strontium/mL	mg Strontium/g
1	1.0214	0.0366	0.0457	0.0091	9.10	8.91
2	1.0138	0.0356	0.0446	0.0090	9.00	8.88
3	1.0213	0.0360	0.0449	0.0089	8.90	8.71
4	1.0206	0.0352	0.0442	0.0090	9.00	8.82

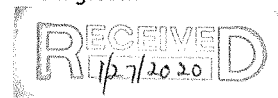
Mean Value (mg/mL) = 9.00
 Stdev (mg/mL) = ± 0.08
 1.0% of Mean Value = 0.090000
 Pass
 Expiration Date 9/2/2023
 Mean Value (mg/1.0mL) = 9.00

Standardization Rule

A satisfactory standardization is obtained when results give a standard deviation of less than 1.0% of the mean value.

Handwritten signature and date 9/2/22

CERTIFICATE OF CALIBRATION
Standard Reference Source



1926

SRS Number: 115032

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8226

Customer: GEL Laboratories LLC

P.O. Number: GEL1924879, Item 8

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated using a germanium gamma-ray spectrometer system. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 23-January-2020

12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Ra-226	5.844E+05	3.733E+04	1.0	2.1	4.7	HPGe

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4 π LS - 4 π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 115032

Comments:

5.00345 g of 0.1 M HCl solution with approximately 30 µg/g Ba carrier.

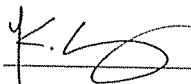
Impurities:

α-impurities (other than decay products) < 0.1%

γ-impurities (other than decay products) < 0.1%

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Eardley, Radiochemist

QC Approved by:


A. Chen, Spectroscopist

Date: 16 Jan 20

Standard Logbook

Serial ID: 1926 **Open/Reference Date:** 23 JAN 2020 **Aliquot :** 5.00345 g
Name: Radium-226 **Received:** 27 JAN 2020 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 26 JAN 2030 **Logbook Num :** GL-CED-297-219
Employee: Gregory Ramsay **Lot Number :** 115032
Supplier: Eckert and Ziegler **Solvent :** 0.1M HCl
Uncertainty : 4.7 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Radium-226	37330 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1926
Prepared By:	Gregory Ramsay
Carrier Conc:	0.1M HCl
Reference Date:	01/23/2020
Ampoule Mass (g):	5.00345 g
Uncertainty:	+/- 4.7 %
LogBook No:	GL-CED-297-219
Supplier:	Eckert and Ziegler

A Solution Material Info			
Isotope:	Radium-226		
Prepared By:	Bethany Fiem		
Prep Date:	03/10/2020		
Verification Date:	09/15/2021		
Expiration Date:	09/15/2022		
Primary Code:	1926-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9415 g		
Density(g/mL):	0.9974	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9415 \text{ g}) * (37330 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00345 \text{ g} * 100 \text{ mL}) = 22120.6801 \text{ dpm/mL}$
$(4.9415 \text{ g}) * (37330 \text{ Bq}) * (60 \text{ dpm/Bq}) / (0.9974 \text{ g/mL}) / (5.00345 \text{ g} * 100 \text{ mL}) = 22178.3439 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
03/10/2020	Bethany Fiem	11.4143	100	1926-B	2531.50269 dpm/mL	04/06/2021	04/06/2022
09/14/2021	Gregory Ramsay	27.1259	250	1926-C	2406.4301 dpm/mL	09/09/2022	09/09/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-226 Standard 1926-C

v1.0.2

Instrument	BLUE
Analyst	GXR1
Verification Prep Date	9/9/2022

Standard Information	
Isotope	Ra-226
Serial Number	1926-C
Isotope Half-life	1,600E+03 Y
Reference Date	1/23/2020
Ref. Act. (DPM/mL)	2406.4301
Amount of Std. (mL)	1.0
Standard Prep Date	9/14/2021

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	9/13/2022	63.80	5530.81	10.00
2	9/13/2022	65.10	5297.37	10.00
3	9/13/2022	66.30	5358.95	10.00

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	5520.81	2.327410	2372.08	2372.08
2	5287.37	2.327410	2271.78	2271.78
3	5348.95	2.327410	2298.24	2298.24

Mean Value = 2314.04
 Stdev = 51.98208109
 Certificate Value* = 2403.7
 Two sigma = 103.964
 10 % of Mean = 231.404
 Rule A (Pass/Fail) Pass
 % Recovery 96.27%
 Rule B (Pass/Fail) Pass
 Expiration Date 9/9/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Ra-226 source 1926-C by transferring 1 mL portions of the standard into glass liquid scintillation vials. 15 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 15 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCBLUE for Ra-226 source standard verification. The Ra-226 efficiency calibration which was used for verification calculations was performed on 9/9/2022 using Ra-226 source 1715-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

A = Ver. source cpm,

B = BKG cpm,

C = System efficiency (cpm/dpm), and

D = volume used for standard verification.

RAD-M-001

[Handwritten signature]
 9/13/22

1952

akkreditiert durch die / *accredited by the*

Deutsche Akkreditierungsstelle GmbH

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst

DKD



Deutsche
Akkreditierungsstelle
D-K-19023-01-00

Kalibrierschein
Calibration certificate

Kalibrierzeichen
Calibration mark

001391
D-K- 19023-01-00
2020-05

Gegenstand
Object **5 mL Liquid in Flame Sealed Ampoule**

Hersteller
Manufacturer **Eckert & Ziegler Analytics, Inc.**

Typ
Type **8328-5FSA-3700BQ-D**

Fabrikat/Serien-Nr.
Serial number **114436**

Auftraggeber
Customer **GEL Laboratories LLC**

Auftragsnummer
Order No. **CO-046016**

Anzahl der Seiten des Kalibrierscheines
Number of pages of the certificate **2**

Datum der Kalibrierung
Date of calibration **01-May-2020 1200 EST
(1700 UTC)**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).

Die DAkkS ist Unterzeichner des multilateralen Übereinkommens der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.

Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

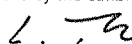
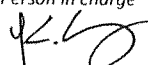
This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).

The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.

The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung sowohl der Deutschen Akkreditierungsstelle GmbH als auch des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine ohne Unterschrift haben keine Gültigkeit.

This calibration certificate may not be reproduced other than in full except with the permission of both the Deutsche Akkreditierungsstelle GmbH and the issuing laboratory. Calibration certificates without signature are not valid.

Datum <i>Date</i>	Leiter des Kalibrierlaboratoriums <i>Head of the calibration laboratory</i>	Bearbeiter <i>Person in charge</i>
22-Apr-20	 Levan Tkavadze	 Karlee Eardley

001391
D-K- 19023-01-00
2020-05

- **Customer Purchase Order No.:**
GEL2025843, Item 1

- **Calibration Results:**

Nuclide	Half-Life *, d	Activity, Bq	Uncertainty, %	Calibration Method
Ra-228	2.100E+03	3.319E+03	4.9	HPGe

- **Calibration Method(s):**

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics using a germanium gamma-ray spectrometer system (HPGe).

- **Uncertainty:**

The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k = 2$. It has been determined in accordance with EA-4/02 M. The value of the measurand lies within the assigned range of values with a probability of approximately 95%. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

- **Traceability:**

Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

- **Impurities:**

γ -impurities (other than decay products) < 0.1 %

- **Expiration Date:**

No expiration date has been given for this source.

- **Wipe Test *:**

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

- **Additional Information:**

- 5.00384 g of 0.1 M HCl solution with approximately 30 $\mu\text{g/g}$ Ba carrier.
- Separation date: 01-March-2018
- *Values not calibrated by EZA (i.e. published nuclear data, uncertified values, etc.)
- Date of Calibration corresponds to Reference Date for this source.
- Expiration Date refers to useful life of this source.

End of Certificate

Standard Logbook

Serial ID: 1952 **Open/Reference Date:** 01 MAY 2020 **Aliquot :** 5.00384 g
Name: Radium-228 **Received:** 01 MAY 2020 **Density :** Hand Calculated
Type: Source Material **Expires:** 01 MAY 2035 **Logbook Num :** GL-CED-297-245
Employee: Tim Chandler **Lot Number :** 114436
Supplier: Eckert & Zeigler **Solvent :** 0.1M HCl
Uncertainty : 2.45 percent
Description: Radium-228
Comments: None

Analyte	Concentration	Analyte	Concentration
Radium-228	3319 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1952
Prepared By:	Tim Chandler
Carrier Conc:	0.1M HCl
Reference Date:	05/01/2020
Ampoule Mass (g):	5.00384 g
Uncertainty:	+/- 2.45 %
LogBook No:	GL-CED-297-245
Supplier:	Eckert & Zeigler

A Solution Material Info			
Isotope:	Radium-228		
Prepared By:	Jennie Kill-Bowden		
Prep Date:	05/27/2020		
Verification Date:	08/05/2022		
Expiration Date:	08/04/2023		
Primary Code:	1952-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.958 g		
Density(g/mL):	1.0281	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.958 \text{ g}) * (3319 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00384 \text{ g} * 100 \text{ mL}) = 1973.1569 \text{ dpm/mL}$
$(4.958 \text{ g}) * (3319 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0281 \text{ g/mL}) / (5.00384 \text{ g} * 100 \text{ mL}) = 1919.2771 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
08/10/2022	Jennie Kill-Bowden	31.236	100	1952-B	599.5054 dpm/mL	08/10/2022	08/09/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-228 Standard 1952-B

v1.0.2

Instrument	BROWN
Analyst	JXK3
Verification Prep Date	8/9/2022

Standard Information	
Isotope	Ra-228
Serial Number	1952-B
Isotope Halflife	5.7500 Y
Reference Date	5/1/2020
Ref. Act. (DPM/mL)	599.5054
Amount of Std. (mL)	1.0
Standard Prep Date	8/9/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	8/10/2022	96.80	3714.81	41.20
2	8/10/2022	98.80	3700.36	41.20
3	8/10/2022	98.60	3773.96	41.20

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	3673.61	8.004187	458.96	458.96
2	3659.16	8.004187	457.16	457.16
3	3732.76	8.004187	466.35	466.35

Mean Value = 460.82 dpm/mL
 Stdev = 4.872045215
 Certificate Value* = 455.7
 Two sigma = 9.744
 10 % of Mean = 46.082
 Rule A (Pass/Fail) Pass
 % Recovery 101.12%
 Rule B (Pass/Fail) Pass
 Expiration Date 8/9/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Ra-228 source 1952-B by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCBROWN for Ra-228 source standard verification. The Ra-228 efficiency calibration which was used for verification calculations was performed on 8/9/2022 using Ra-228 source 1965-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency (cpm/dpm), and
- D = volume used for standard verification.

RAD-M-001

Lois Brink 8/10/22
John 9/10/2022



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

1943

SRS Number: 115036

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8090-5FSA-37kBq

Customer: GEL Laboratories LLC

P.O. Number: GEL1924879, Item 4

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 23-January-2020 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Sr-90	1.052E+04	3.705E+04	0.1	1.0	2.1	4 π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4 π LS - 4 π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

GL-CED-297-236a

EZA Certificate Program Rev. 1, 01-FEB-2019

Dec
4-8-20

Page 1 of 2

SRS Number: 115036

Comments:

5.00204 g of 0.1 M HCl solution with approximately 30 µg/g each Sr and Y carriers.

Impurities:

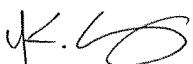
γ-impurities < 0.1%

Note:

This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total activity for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Eardley, Radiochemist

QC Approved by:


A. Chen, Spectroscopist

Date: 16 Jan 20

Standard Logbook

Serial ID: 1943 **Open/Reference Date:** 23 JAN 2020 **Aliquot :** 5.00204 g
Name: Strontium-90 **Received:** 23 JAN 2020 **Density :** Hand Calculated
Type: Source Material **Expires:** 23 JAN 2035 **Logbook Num :** GL-CED-297-236
Employee: Tim Chandler **Lot Number :** 115036
Supplier: Eckert & Zeigler **Solvent :** 0.1M HCl
Uncertainty : 1.05 percent
Description: Strontium-90
Comments: None

Analyte	Concentration	Analyte	Concentration
Strontium-90	37050 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1943
Prepared By:	Tim Chandler
Carrier Conc:	0.1M HCl
Reference Date:	01/23/2020
Ampoule Mass (g):	5.00204 g
Uncertainty:	+/- 1.05 %
LogBook No:	GL-CED-297-236
Supplier:	Eckert & Zeigler

A Solution Material Info			
Isotope:	Strontium-90		
Prepared By:	Jennie Kill-Bowden		
Prep Date:	08/13/2020		
Verification Date:	01/04/2022		
Expiration Date:	01/04/2023		
Primary Code:	1943-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9536 g		
Density(g/mL):	0.9995	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22014.7236 \text{ dpm/mL}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (0.9995 \text{ g/mL}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22025.6704 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/16/2021	Bethany Fiem	24.8842	1000	1943-B	548.091187 dpm/mL	02/16/2021	02/16/2022
01/04/2022	Jennie Kill-Bowden	25.0633	1000	1943-C	552.035985 dpm/ml	01/04/2022	01/04/2023
06/06/2022	Jennie Kill-Bowden	24.9802	1000	1943-D	550.2057 dpm/ml	06/03/2022	06/03/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Sr-90 Standard 1943-D

v1.0.2

Instrument	BROWN
Analyst	JXK3
Verification Prep Date	6/3/2022

Standard Information	
Isotope	Sr-90
Serial Number	1943-D
Isotope Half-life	28.9000 Y
Reference Date	1/23/2020
Ref. Act. (DPM/mL)	550.2057
Amount of Std. (mL)	1.0
Standard Prep Date	6/3/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	6/4/2022	92.40	1086.20	47.20
2	6/4/2022	91.60	1093.60	47.20
3	6/4/2022	91.70	1107.60	47.20

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	1039.00	2.018286	514.79	514.79
2	1046.40	2.018286	518.46	518.46
3	1060.40	2.018286	525.40	525.40

dpm/mL
519.55
5.384916401

Mean Value =
Stdev =

Certificate Value* = 519.9
Two sigma = 10.770
10 % of Mean = 51.955
Rule A (Pass/Fail) Pass
% Recovery 99.93%
Rule B (Pass/Fail) Pass
Expiration Date 6/3/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Sr-90 source 1943-D by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCBROWN for Sr-90 source standard verification. The Sr-90 efficiency calibration which was used for verification calculations was performed on 6/3/2022 using Sr-90 source 1689-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

A = Ver. source cpm,
B = BKG cpm,
C = System efficiency (cpm/dpm), and
D = volume used for standard verification.

RAD-M-001

Handwritten: 6/16/22
6/16/22
Low Bkg

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2333238

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205226267	MB	JXK3	PIC7B	NOV-01-22 19:09:29	DONE	Tuffryn Filter	01-APR-21 00:00
597531002	SAMPLE	JXK3	PIC5A	NOV-01-22 19:09:43	DONE	Tuffryn Filter	01-APR-21 00:00
597533002	SAMPLE	JXK3	PIC5D	NOV-01-22 19:09:56	DONE	Tuffryn Filter	01-APR-21 00:00
597533004	SAMPLE	JXK3	PIC6C	NOV-01-22 19:10:04	DONE	Tuffryn Filter	01-APR-21 00:00
597533005	SAMPLE	JXK3	PIC7A	NOV-01-22 19:10:18	DONE	Tuffryn Filter	01-APR-21 00:00
1205226268	LCS	JXK3	PIC2A	NOV-02-22 06:22:37	DONE	Tuffryn Filter	01-APR-21 00:00
1205226269	LCSD	JXK3	PIC2B	NOV-02-22 06:22:41	DONE	Tuffryn Filter	01-APR-21 00:00
597531001	SAMPLE	JXK3	PIC8A	NOV-02-22 09:11:37	DONE	Tuffryn Filter	01-APR-21 00:00
597531003	SAMPLE	JXK3	PIC10D	NOV-02-22 09:11:48	DONE	Tuffryn Filter	01-APR-21 00:00
597533001	SAMPLE	JXK3	PIC9D	NOV-02-22 09:11:55	DONE	Tuffryn Filter	01-APR-21 00:00
597533003	SAMPLE	JXK3	PIC9C	NOV-02-22 09:11:59	DONE	Tuffryn Filter	01-APR-21 00:00

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2333240

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205226271	LCS	JXK3	PIC1B	NOV-03-22 06:36:52	DONE	47mm Filter	01-JUN-22 00:00
1205226272	LCSD	JXK3	PIC1C	NOV-03-22 06:36:57	DONE	47mm Filter	01-JUN-22 00:00
1205226270	MB	JXK3	PIC8C	NOV-03-22 18:50:57	DONE	47mm Filter	01-JUN-22 00:00
597533001	SAMPLE	JXK3	PIC7A	NOV-03-22 18:51:02	DONE	47mm Filter	01-JUN-22 00:00
597533002	SAMPLE	JXK3	PIC7B	NOV-03-22 18:51:08	DONE	47mm Filter	01-JUN-22 00:00
597533003	SAMPLE	JXK3	PIC7C	NOV-03-22 18:51:10	DONE	47mm Filter	01-JUN-22 00:00
597533004	SAMPLE	JXK3	PIC7D	NOV-03-22 18:51:15	DONE	47mm Filter	01-JUN-22 00:00
597533005	SAMPLE	JXK3	PIC8A	NOV-03-22 18:51:18	DONE	47mm Filter	01-JUN-22 00:00

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2333242

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205226273	MB	JE1	PIC8C	NOV-04-22 11:38:56	DONE	25mm Filter	01-JUN-22 00:00
1205226274	LCS	JE1	PIC9A	NOV-04-22 11:39:05	DONE	25mm Filter	01-JUN-22 00:00
1205226275	LCSD	JE1	PIC9B	NOV-04-22 11:39:11	DONE	25mm Filter	01-JUN-22 00:00
597533001	SAMPLE	JE1	PIC6C	NOV-04-22 11:39:23	DONE	25mm Filter	01-JUN-22 00:00
597533002	SAMPLE	JE1	PIC7A	NOV-04-22 11:39:32	DONE	25mm Filter	01-JUN-22 00:00
597533003	SAMPLE	JE1	PIC7B	NOV-04-22 11:39:41	DONE	25mm Filter	01-JUN-22 00:00
597533004	SAMPLE	JE1	PIC7C	NOV-04-22 11:39:45	DONE	25mm Filter	01-JUN-22 00:00
597533005	SAMPLE	JE1	PIC8A	NOV-04-22 11:39:54	DONE	25mm Filter	01-JUN-22 00:00

Liquid Scintillation Raw Data

Batch 2333140 Check-list

This check-list was completed on 06-NOV-22 by Jessica Downey

This batch was reviewed by Jessica Downey on 06-NOV-22 and Jessica Davis on 07-NOV-22.

Batch ID: 2333140

Product: LSC41PUF

Description: LSC Plutonium Filter

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have client special requirements have been reviewed and met?	Yes		
4	Have samples been blank corrected?		No	
5	Has a hit notification been completed?		No	
6	Has an Aliquot Correction been completed for this batch?	Yes		
7	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
8	Were all the samples prepared/analyzed within the required holding time period?	Yes		
9	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
10	Was the method blank (MB) within the acceptance criteria?	Yes		
11	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
12	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
13	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
14	Has the method required detection limit been met?		No	
Miscellaneous Information				
15	Were manual integrations performed on any sample or QC data files in this batch?		No	
16	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium-241 in Filter per Liter

Batch ID: 2333140
Analyst: Brendon Viquez (BV1)
Method: DOE EML HASL-300, Pu-11-RC
 Modified
Lab SOP: GL-RAD-A-035 REV# 23
Instrument: GFC-B742840386

Due Dates for Lab: 02-NOV-2022			Package: 03-NOV-2022	SDG: 03-NOV-2022		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205226002	Plutonium-241 AS SPIKE		1714-B	.1	mL
LCSD	1205226003	Plutonium-241 AS SPIKE		1714-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	597531001	01-NOV-2022	5	30.16	0.11118
2	597531002	01-NOV-2022	5	30.21	0.11201
3	597531003	01-NOV-2022	5	30.02	0.11345
4	597533001	01-NOV-2022	5	30.04	0.11674
5	597533002	01-NOV-2022	5	30.05	0.11602
6	597533003	01-NOV-2022	5	30.23	0.11454
7	597533004	01-NOV-2022	5	30.15	0.11482
8	597533005	01-NOV-2022	5	30.3	0.11471
9	1205226001 MB	01-NOV-2022	5		0.11674
10	1205226002 LCS	01-NOV-2022	5		0.11674
11	1205226003 LCSD	01-NOV-2022	5		0.11674

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2022-A	Plutonium-242 AS TRACER	.1 mL	Pipet ID: RAD-ASP-184002Z

Plutonium-241 Filter

Filename : PU241.XLS
 File type : Excel
 Version # : 1.3.4

Tracer S/N : 2022-A
 Tracer Exp Date : 7/18/2023
 Tracer Volume Added: 0.10
 Tracer Error: 0.37%

Batch : 2333140
 Analyst : BRE02408
 Prep Date : 11/1/2022
 Method Uncertainty : 0.0935

Procedure Code : LSC41PUF
 Parmname : Plutonium-241
 Required MDA : 5 pCi/F
 Halflife of Pu-241 : 14.290 years
 Pu-241 Abundance : 1.00
 Tracer Abundance : 1.00
 Halflife of Tracer : 373500.000 years

Geometry:

2mL DI/1 drop HNO3/13mL Ecoscint Ultra

Sample Characteristics					Tracer Calculations									
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Tracer Concentration DPM	Tracer Counts	Tracer Bkg Counts	Tracer Net CPM	Tracer Count Start Date/Time	Tracer Count Time (sec.)	Tracer Decay	Detector Serial #	Detector Efficiency (cpm/dpm)	Detector Efficiency StDev. (cpm/dpm)
1	597531001.1	0.1112	1.2035E-05	9/26/2022 8:18	4.2365	309	4.560	1.269	11/3/2022 10:26	14400	1.000	79988	0.309886	0.005992
2	597531002.1	0.1120	1.2082E-05	9/26/2022 8:25	4.2365	318	2.640	1.314	11/3/2022 10:26	14400	1.000	158119	0.351247	0.006772
3	597531003.1	0.1134	1.2165E-05	9/26/2022 9:00	4.2365	304	4.800	1.247	11/3/2022 10:26	14400	1.000	158160	0.339981	0.006559
4	597533001.1	0.1167	1.2350E-05	9/30/2022 7:45	4.2365	325	0.240	1.353	11/3/2022 10:26	14400	1.000	155764	0.334274	0.006452
5	597533002.1	0.1160	1.2310E-05	9/30/2022 7:51	4.2365	216	2.400	0.890	11/3/2022 10:26	14400	1.000	140239	0.316063	0.006108
6	597533003.1	0.1145	1.2226E-05	9/30/2022 7:58	4.2365	315	2.880	1.301	11/3/2022 10:26	14400	1.000	80016	0.334897	0.006463
7	597533004.1	0.1148	1.2242E-05	9/30/2022 8:05	4.2365	231	3.840	0.947	11/3/2022 10:26	14400	1.000	83288	0.361216	0.006960
8	597533005.1	0.1147	1.2236E-05	9/30/2022 9:00	4.2365	235	3.600	0.964	11/3/2022 10:26	14400	1.000	158118	0.365015	0.007032
9	1205226001.1	0.1167	1.2350E-05	11/1/2022 0:00	4.2365	276	6.480	1.123	11/3/2022 10:26	14400	1.000	158120	0.356810	0.006877
10	1205226002.1	0.1167	1.2350E-05	11/1/2022 0:00	4.2365	225	1.680	0.931	11/3/2022 10:12	14400	1.000	155839	0.272396	0.005285
11	1205226003.1	0.1167	1.2350E-05	11/1/2022 0:00	4.2365	252	2.400	1.040	11/3/2022 10:13	14400	1.000	155841	0.261786	0.005084

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-035
 Instrument SOP: GL-RAD-I-004

Count raw Data													Calibration Data							
Pos.	Rack Position #	Counting Time (min.)	Quench#	Gross cpm	Bkg cpm	Bkg Count Time (min.)	Bkg Quench#	Corrected Bkg cpm	Count Start Date/Time	Sample Decay	Calculated Sample Recovery %	Sample Recovery Error %	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Background Rack Position #	Background Count Start Date/Time	
1	20-2	60	149.5	6.87	7.33	60	148.6	7.3118	11/5/2022 12:22	0.995	96.6%	6.12%	LSCPURPLE	2/1/2022	1/31/2023	0.2178	0.00792	20-1	11/5/2022 11:20	
2	20-3	60	150.9	7.9	7.33	60	148.6	7.2834	11/5/2022 13:24	0.995	88.3%	6.00%	LSCPURPLE	2/1/2022	1/31/2023	0.2153	0.00792	20-1	11/5/2022 11:20	
3	20-4	60	154.5	7.78	7.33	60	148.6	7.2121	11/5/2022 14:26	0.995	86.6%	6.17%	LSCPURPLE	2/1/2022	1/31/2023	0.2090	0.00792	20-1	11/5/2022 11:20	
4	20-5	60	148.5	7.72	7.33	60	148.6	7.3320	11/5/2022 15:28	0.995	95.6%	5.90%	LSCPURPLE	2/1/2022	1/31/2023	0.2196	0.00792	20-1	11/5/2022 11:20	
5	20-6	60	155.8	7.82	7.33	60	148.6	7.1875	11/5/2022 16:29	0.995	66.5%	7.18%	LSCPURPLE	2/1/2022	1/31/2023	0.2067	0.00792	20-1	11/5/2022 11:20	
6	20-7	60	149.4	7.3	7.33	60	148.6	7.3138	11/5/2022 17:31	0.995	91.7%	6.03%	LSCPURPLE	2/1/2022	1/31/2023	0.2180	0.00792	20-1	11/5/2022 11:20	
7	20-8	60	153.4	7.82	7.33	60	148.6	7.2335	11/5/2022 18:33	0.995	61.9%	7.00%	LSCPURPLE	2/1/2022	1/31/2023	0.2109	0.00792	20-1	11/5/2022 11:20	
8	20-9	60	154.4	8.37	7.33	60	148.6	7.2140	11/5/2022 19:35	0.995	62.3%	6.94%	LSCPURPLE	2/1/2022	1/31/2023	0.2091	0.00792	20-1	11/5/2022 11:20	
9	20-10	60	155.6	7.6	7.33	60	148.6	7.1912	11/5/2022 20:37	0.999	74.3%	6.50%	LSCPURPLE	2/1/2022	1/31/2023	0.2070	0.00792	20-1	11/5/2022 11:20	
10	20-11	60	153.9	30.98	7.33	60	148.6	7.2237	11/5/2022 21:39	0.999	80.6%	7.02%	LSCPURPLE	2/1/2022	1/31/2023	0.2100	0.00792	20-1	11/5/2022 11:20	
11	20-12	60	163.4	33.68	7.33	60	148.6	7.0679	11/5/2022 22:40	0.999	93.8%	6.68%	LSCPURPLE	2/1/2022	1/31/2023	0.1937	0.00792	20-1	11/5/2022 11:20	

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

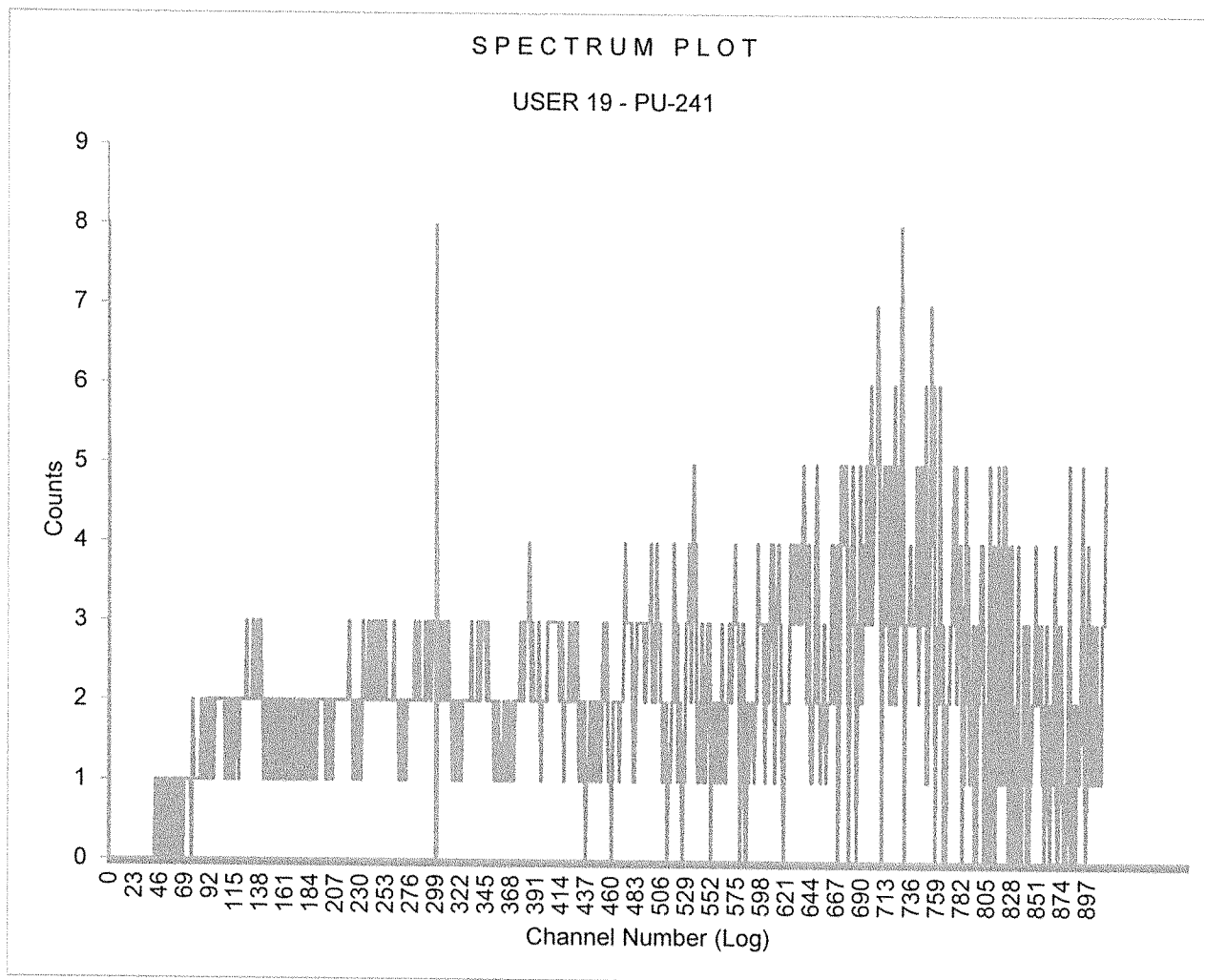
Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1714-B
LCS Exp Date : 1/19/2023
LCS Activity (dpm/ml): 1588.35
LCS Volume Added: 0.10

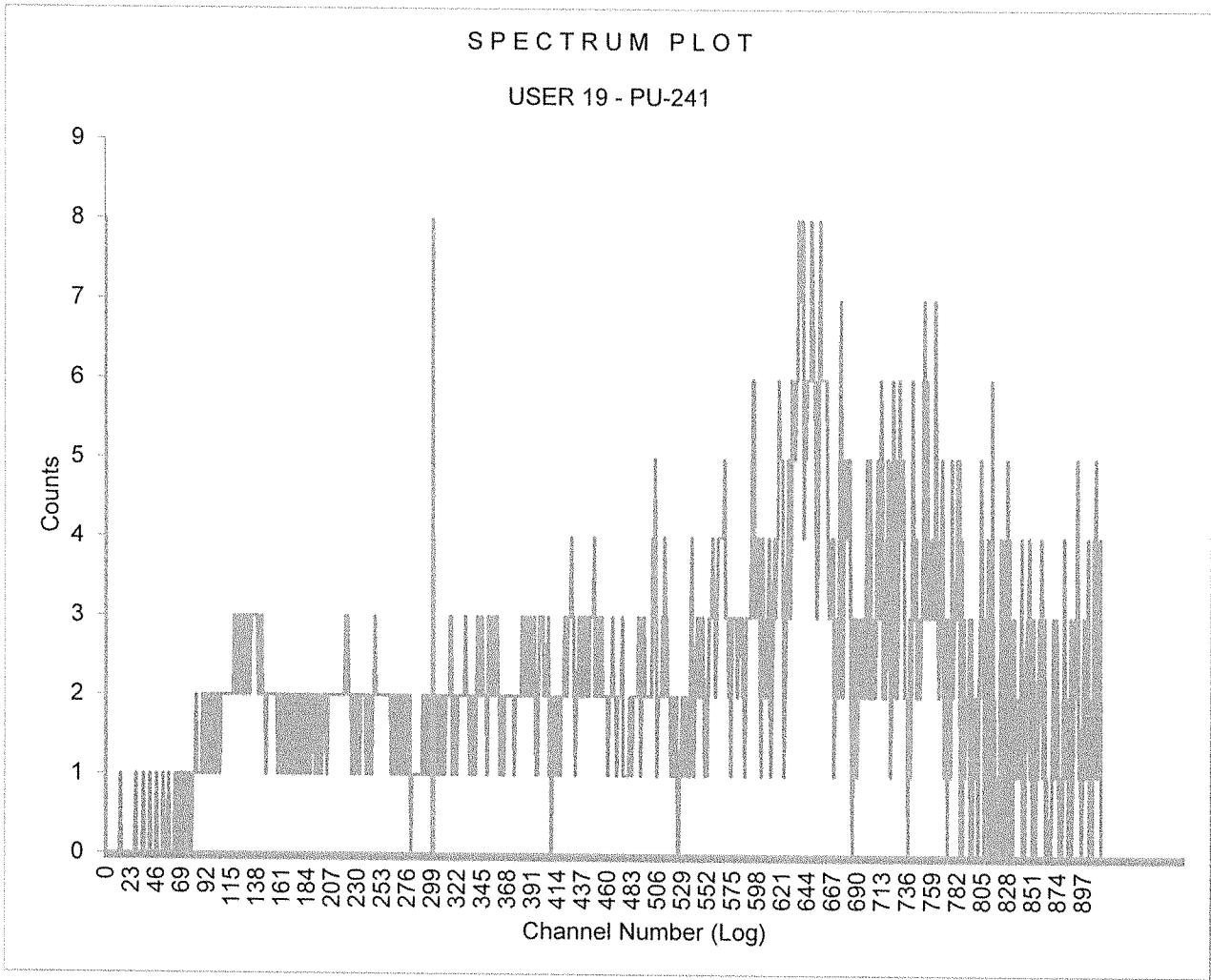
Results																
	Decision Level	Critical Level	Required MDA	MDA	Sample Act. Conc.	Sample Act. Error	Net Count Rate	Net Count Rate Error	2 SIGMA Counting Uncertainty	2 SIGMA Total Prop. Uncertainty	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery
Pos.	pCi/F	pCi/F	pCi/F	pCi/F	pCi/F	%	CPM	CPM	pCi/F	pCi/F						
1	22.2663	15.7202	5	32.4083	-8.5517	110.22%	-0.4418	0.4862	18.4454	18.4455		SAMPLE				
2	24.4164	17.2382	5	35.5398	13.1127	81.81%	0.6166	0.5030	20.9693	21.1638		SAMPLE				
3	25.2137	17.8011	5	36.7058	12.5334	88.24%	0.5679	0.4999	21.6233	21.7986		SAMPLE				
4	21.2881	15.0296	5	30.9832	7.1703	129.23%	0.3880	0.5009	18.1429	18.2097		SAMPLE				
5	32.3842	22.8636	5	47.1469	17.9604	79.40%	0.6325	0.5001	27.8346	28.1436		SAMPLE				
6	22.7565	16.0663	5	33.1217	-0.2731	3574.04%	-0.0138	0.4935	19.1338	19.1339		SAMPLE				
7	34.5775	24.4120	5	50.3351	17.7246	85.70%	0.5865	0.5009	29.6703	29.9478		SAMPLE				
8	34.5749	24.4102	5	50.3334	34.9798	44.64%	1.1560	0.5096	30.2271	31.2678		SAMPLE				
9	28.6358	20.2171	5	41.6893	10.2611	121.64%	0.4088	0.4965	24.4284	24.5360		MB				
10	26.0701	18.4057	5	37.9516	541.6829	7.82%	23.7563	0.7980	35.6616	129.4424		LCS			612.8891	88.4%
11	24.0422	16.9740	5	35.0110	565.7367	7.41%	26.6121	0.8241	34.3374	132.2562		LCSD	4.3%		612.8891	92.3%

SampleID	Rack	Time (min.)	H#	CPM Iso1	CPM Iso2	LumEx	Count Start Time	Count End Time	Machine
20-1		60	148.6	7.33	31.05	3.82	11/5/2022 11:20	11/5/2022 12:20	PURPLE
20-2		60	149.5	6.87	32.68	3.62	11/5/2022 12:22	11/5/2022 13:22	PURPLE
20-3		60	150.9	7.90	33.13	3.67	11/5/2022 13:24	11/5/2022 14:24	PURPLE
20-4		60	154.5	7.78	34.28	3.65	11/5/2022 14:26	11/5/2022 15:26	PURPLE
20-5		60	148.5	7.72	34.07	3.69	11/5/2022 15:28	11/5/2022 16:28	PURPLE
20-6		60	155.8	7.82	33.92	3.88	11/5/2022 16:29	11/5/2022 17:29	PURPLE
20-7		60	149.4	7.30	33.48	3.78	11/5/2022 17:31	11/5/2022 18:31	PURPLE
20-8		60	153.4	7.82	32.68	3.91	11/5/2022 18:33	11/5/2022 19:33	PURPLE
20-9		60	154.4	8.37	34.97	3.68	11/5/2022 19:35	11/5/2022 20:35	PURPLE
20-10		60	155.6	7.60	33.38	3.76	11/5/2022 20:37	11/5/2022 21:37	PURPLE
20-11		60	153.9	30.98	57.73	2.26	11/5/2022 21:39	11/5/2022 22:39	PURPLE
20-12		60	163.4	33.68	60.25	2.16	11/5/2022 22:40	11/5/2022 23:40	PURPLE

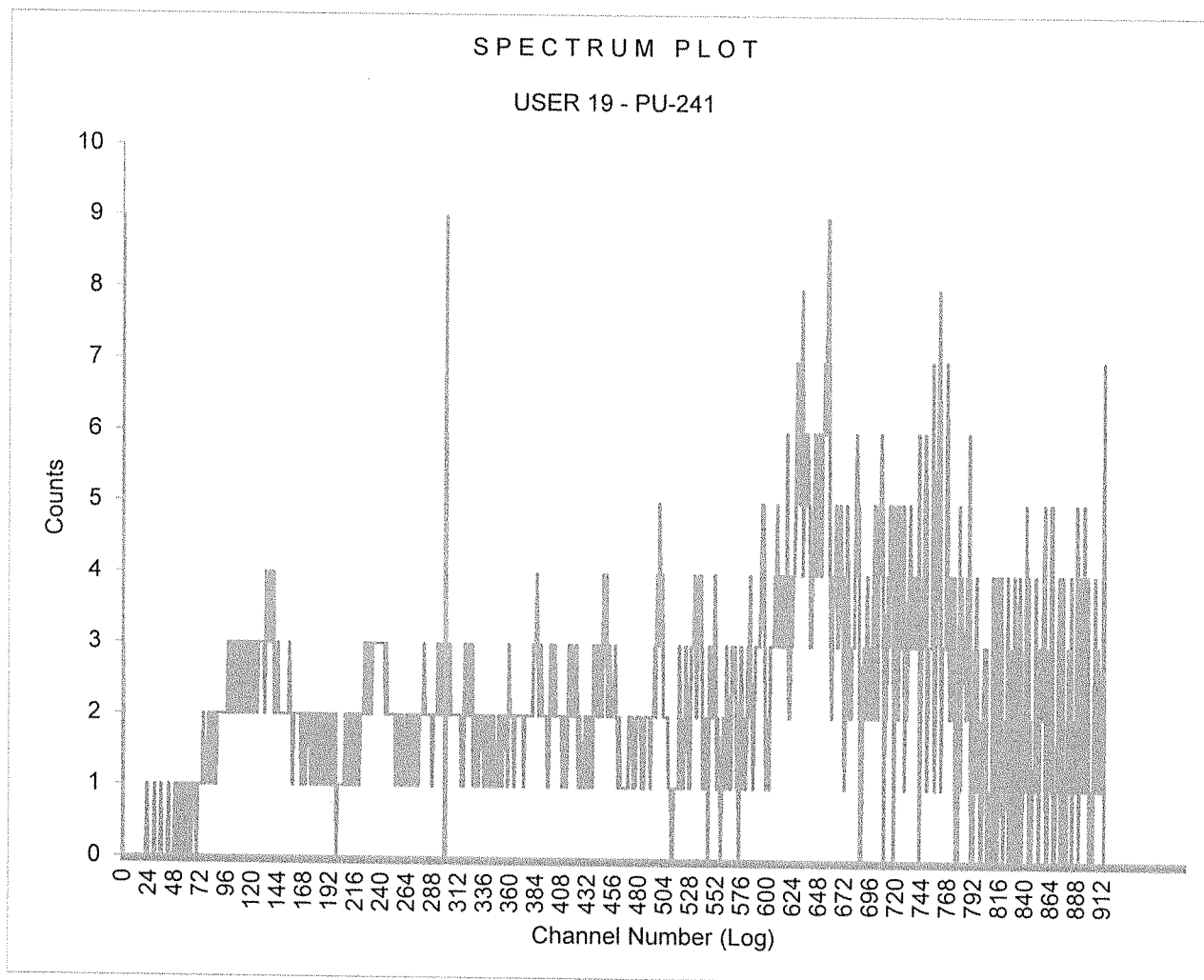
Sample Count Start Time:	5 Nov 2022 11:20:53		
Data Capture Date	05 Nov 2022 12:21:17		
User Filename	S19110520-1A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	1	20-1	60.00
H#, Total Counts:	148.6	1895	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



Sample Count Start Time:	5 Nov 2022 12:22:46		
Data Capture Date	05 Nov 2022 13:23:09		
User Filename	S19110520-2A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	2	20-2	60.00
H#, Total Counts:	149.5	1993	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



Sample Count Start Time:	5 Nov 2022 13:24:32		
Data Capture Date	05 Nov 2022 14:24:55		
User Filename	S19110520-3A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	3	20-3	60.00
H#, Total Counts:	150.9	2014	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



Sample Count Start Time:
Data Capture Date
User Filename

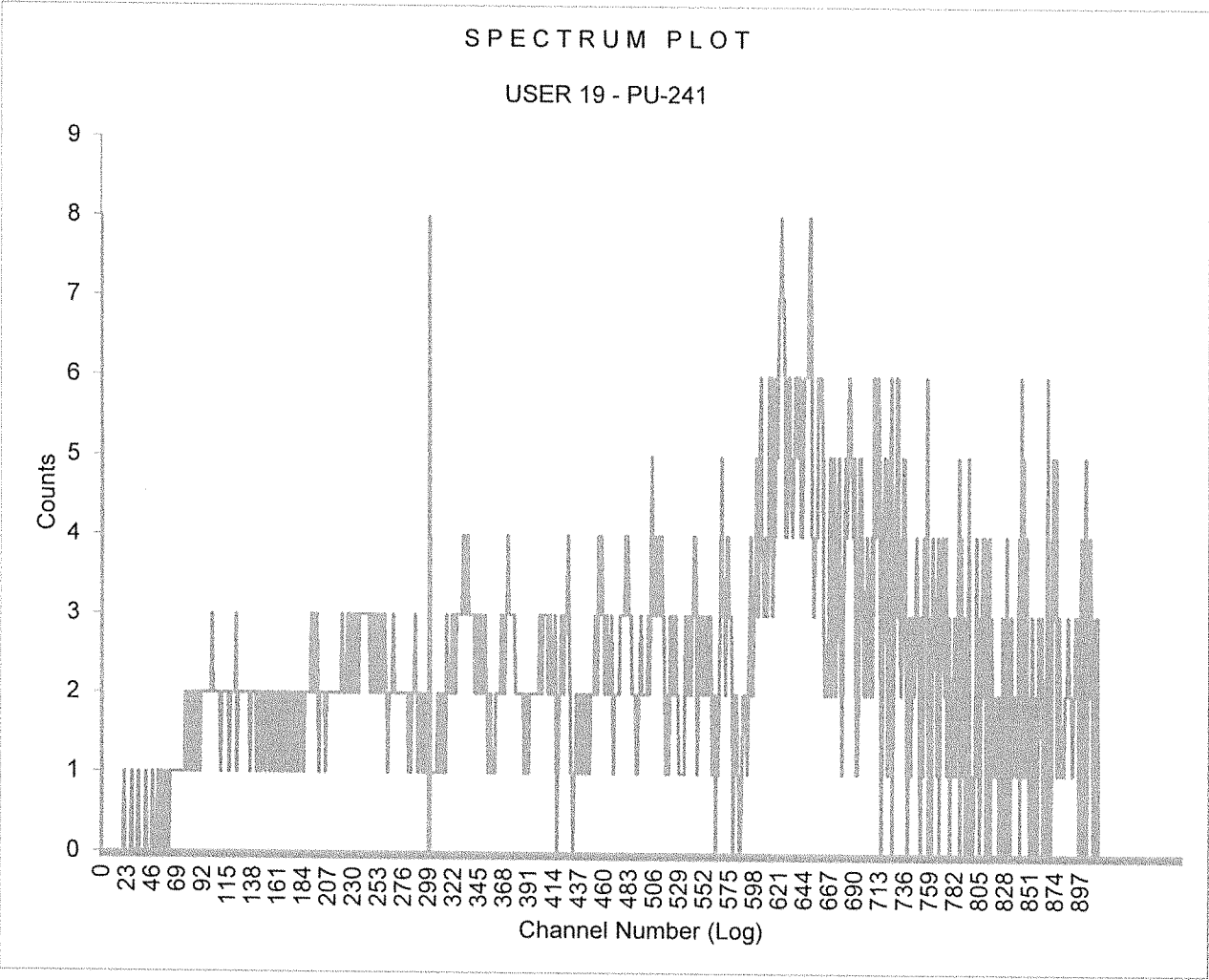
5 Nov 2022 14:26:19
05 Nov 2022 15:26:41
S19110520-4A.XLS
U19110520-1A.XLS

Spectrum Type
User Number
User Id
User Comment
Scintillator

Log Counts
19
PU-241
LSCPURPLE
LIQUID

Sample, Rack-Pos, Time:
H#, Total Counts:
Win1: Pu-241 - Start, End:
Win2: - Start, End:

4 20-4 60.00
154.5 2086
0 300
0 990



Sample Count Start Time:
Data Capture Date
User Filename

5 Nov 2022 15:28:04
05 Nov 2022 16:28:28
S19110520-5A.XLS
U19110520-1A.XLS

Spectrum Type
User Number
User Id
User Comment
Scintillator

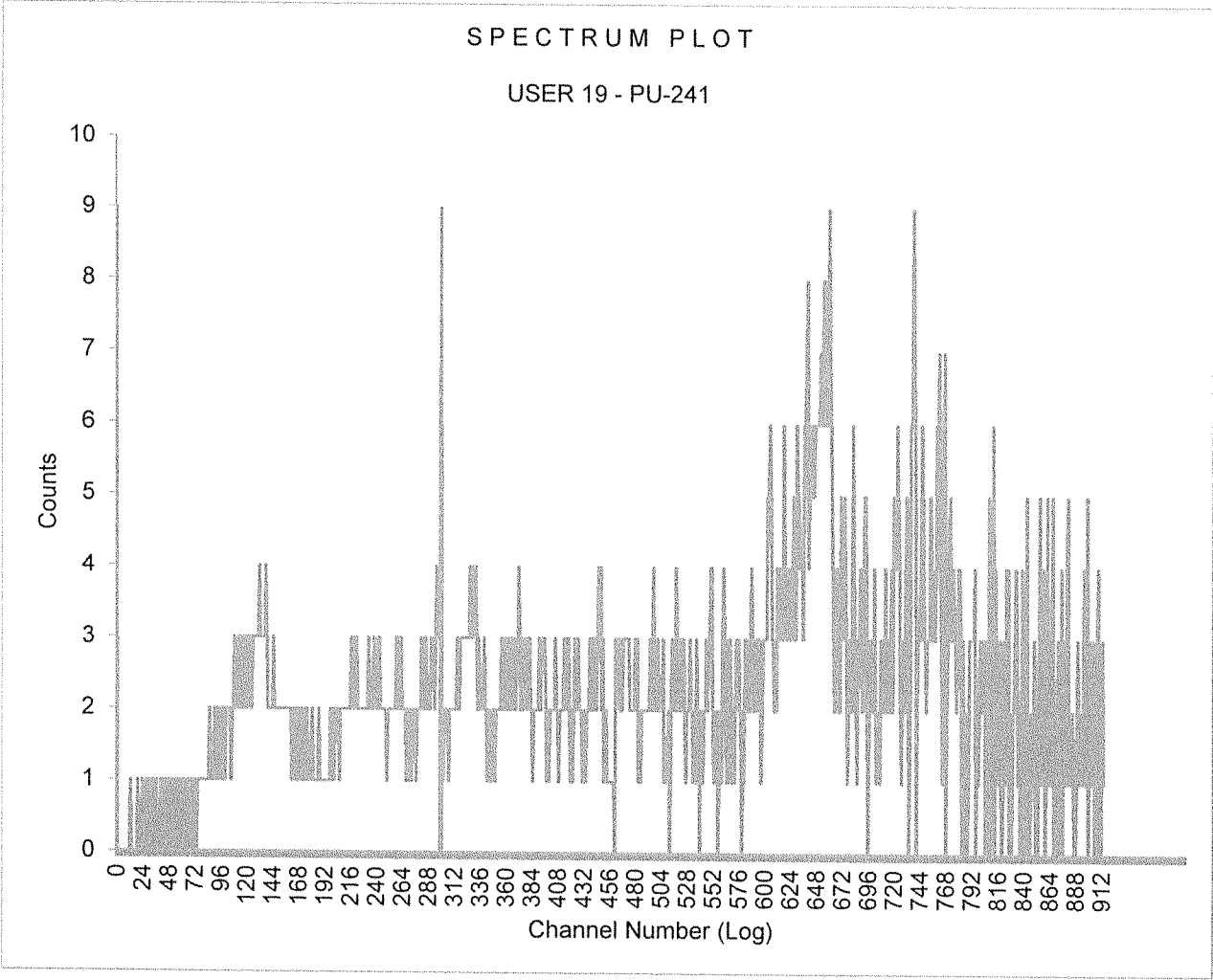
Log Counts
19
PU-241
LSCPURPLE
LIQUID

Sample, Rack-Pos, Time:
H#, Total Counts:
Win1: Pu-241 - Start, End:
Win2: - Start, End:

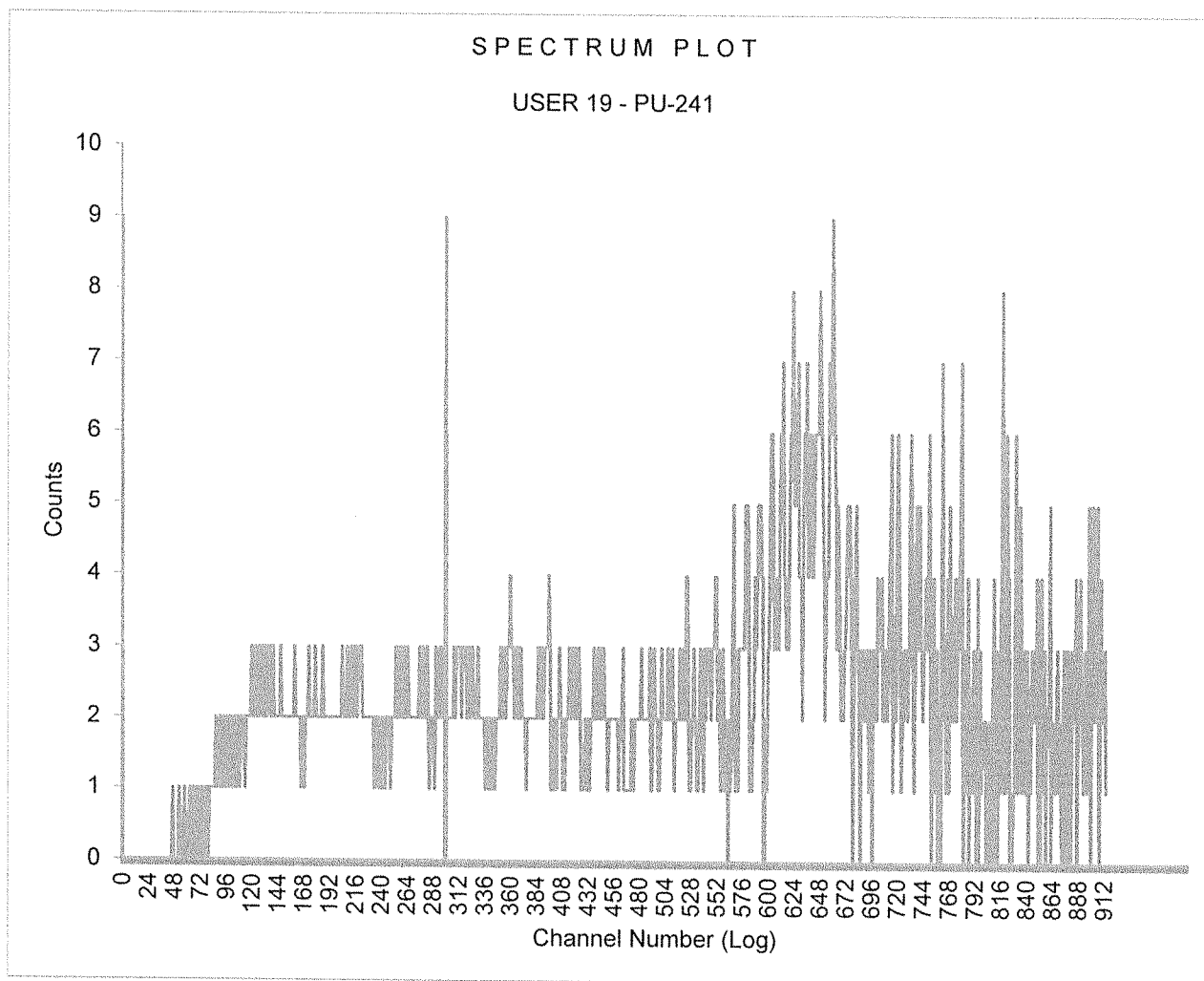
5
148.5
0
0

20-5
2076
300
990

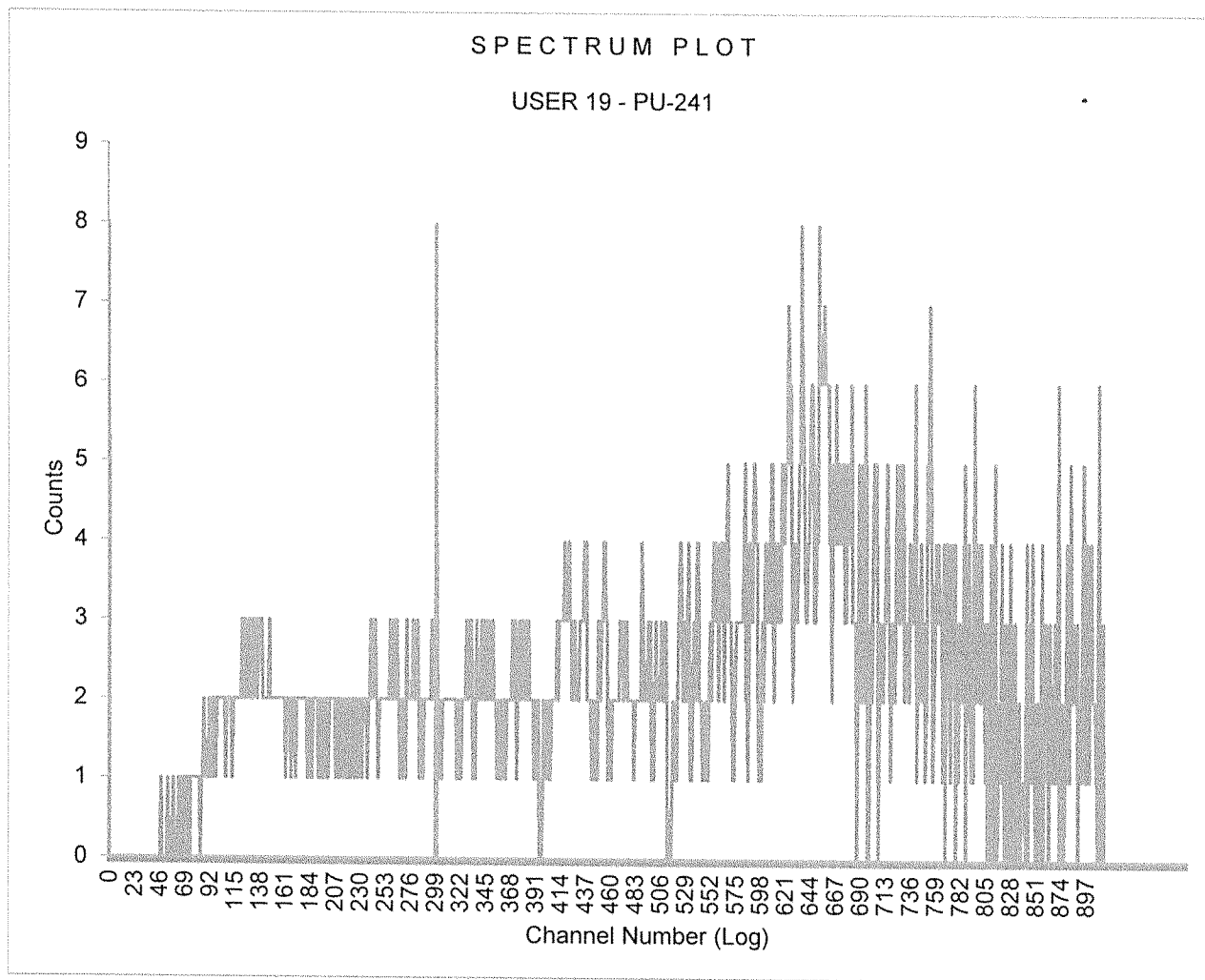
60.00



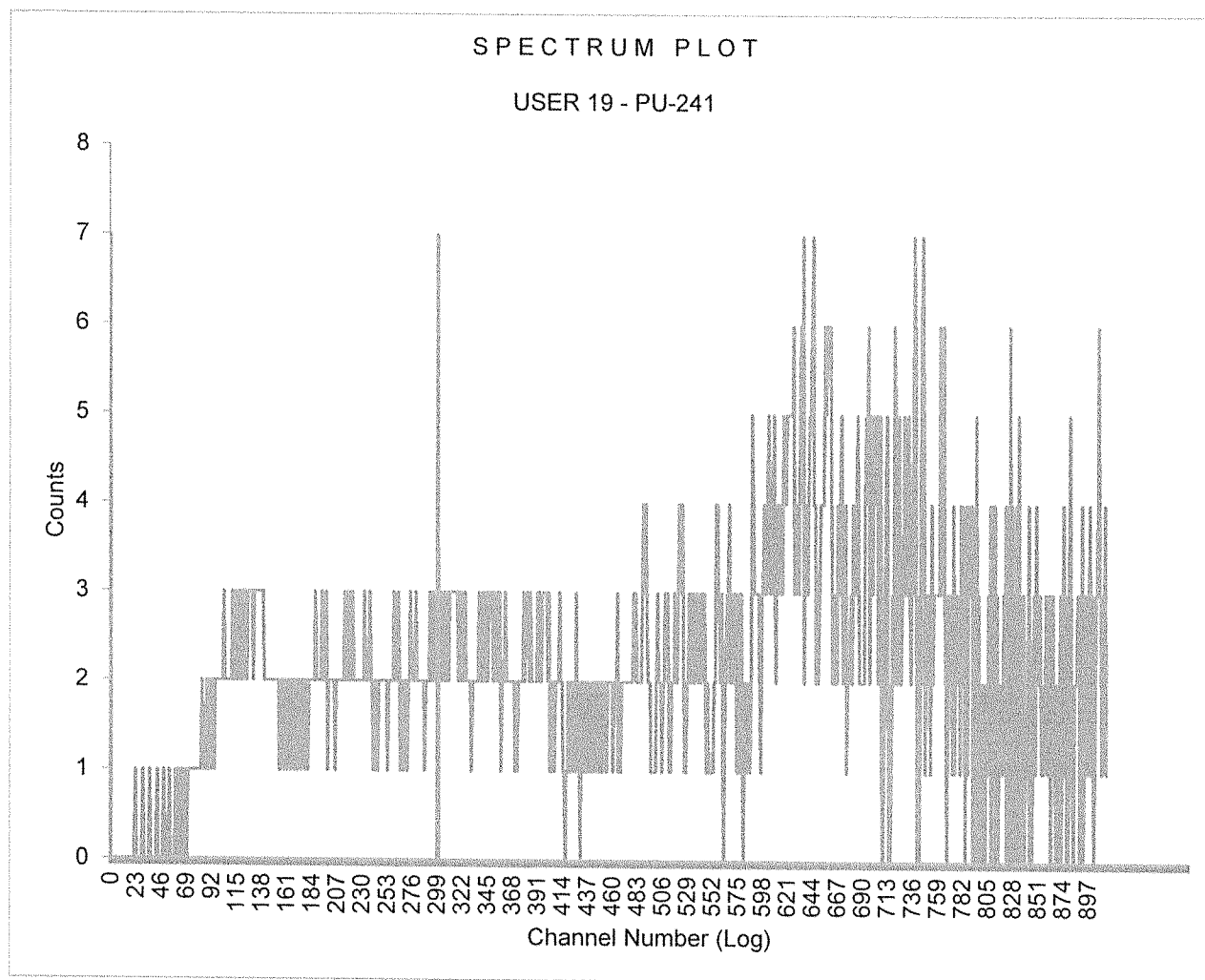
Sample Count Start Time:	5 Nov 2022 16:29:51		
Data Capture Date	05 Nov 2022 17:30:15		
User Filename	S19110520-6A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	6	20-6	60.00
H#, Total Counts:	155.8	2072	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



Sample Count Start Time:	5 Nov 2022 17:31:39		
Data Capture Date	05 Nov 2022 18:32:02		
User Filename	S19110520-7A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	7	20-7	60.00
H#, Total Counts:	149.4	2038	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



Sample Count Start Time:	5 Nov 2022 18:33:32		
Data Capture Date	05 Nov 2022 19:33:56		
User Filename	S19110520-8A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	8	20-8	60.00
H#, Total Counts:	153.4	1996	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



Sample Count Start Time:

Data Capture Date

User Filename

Spectrum Type

User Number

User Id

User Comment

Scintillator

Sample, Rack-Pos, Time:

H#, Total Counts:

Win1: Pu-241 - Start, End:

Win2: - Start, End:

5 Nov 2022 19:35:26

05 Nov 2022 20:35:50

S19110520-9A.XLS

U19110520-1A.XLS

Log Counts

19

PU-241

LSCPURPLE

LIQUID

920-960.00

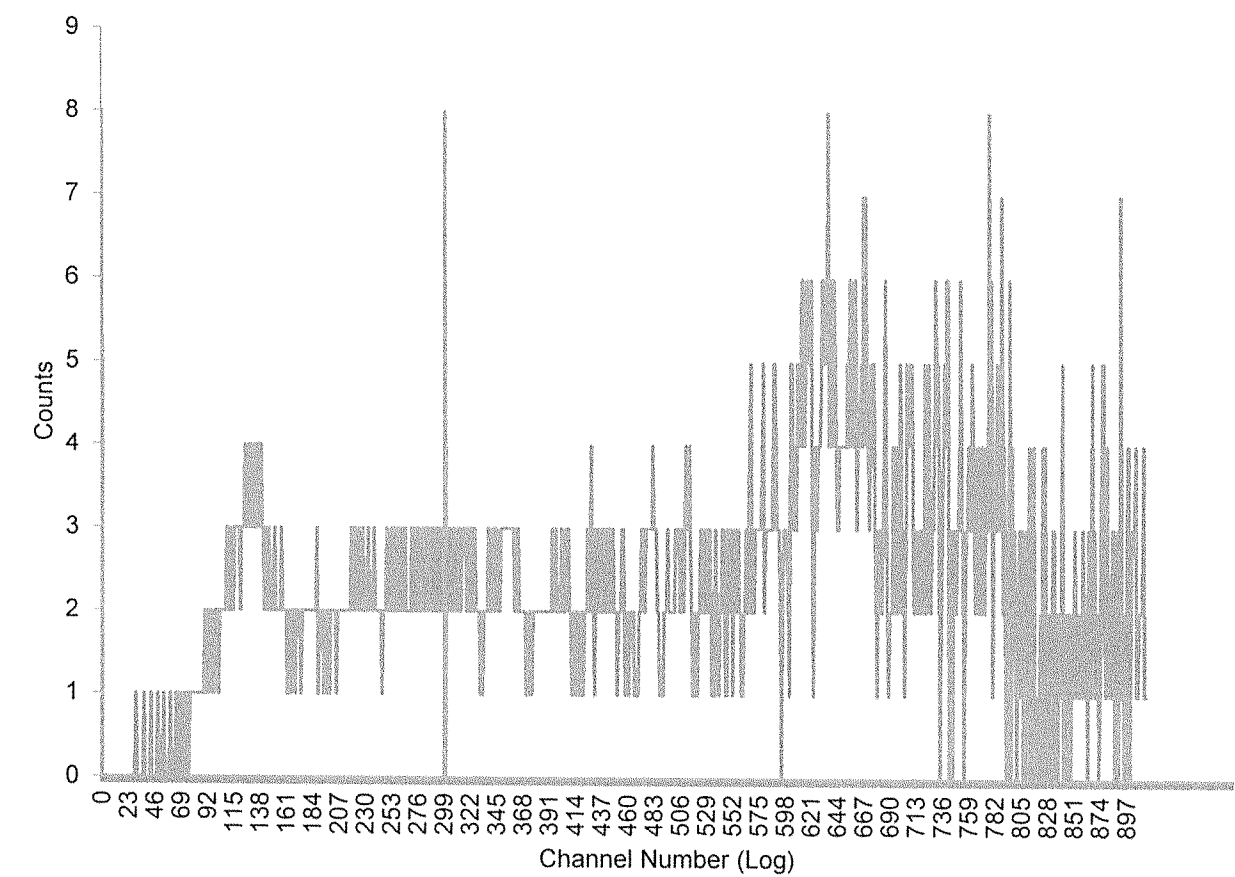
154.42129

0300

0990

SPECTRUM PLOT

USER 19 - PU-241



Sample Count Start Time:

Data Capture Date

User Filename

Spectrum Type

User Number

User Id

User Comment

Scintillator

Sample, Rack-Pos, Time:

H#, Total Counts:

Win1: Pu-241 - Start, End:

Win2: - Start, End:

5 Nov 2022 20:37:19

05 Nov 2022 21:37:42

S19110520-10A.XLS

U19110520-1A.XLS

Log Counts

19

PU-241

LSCPURPLE

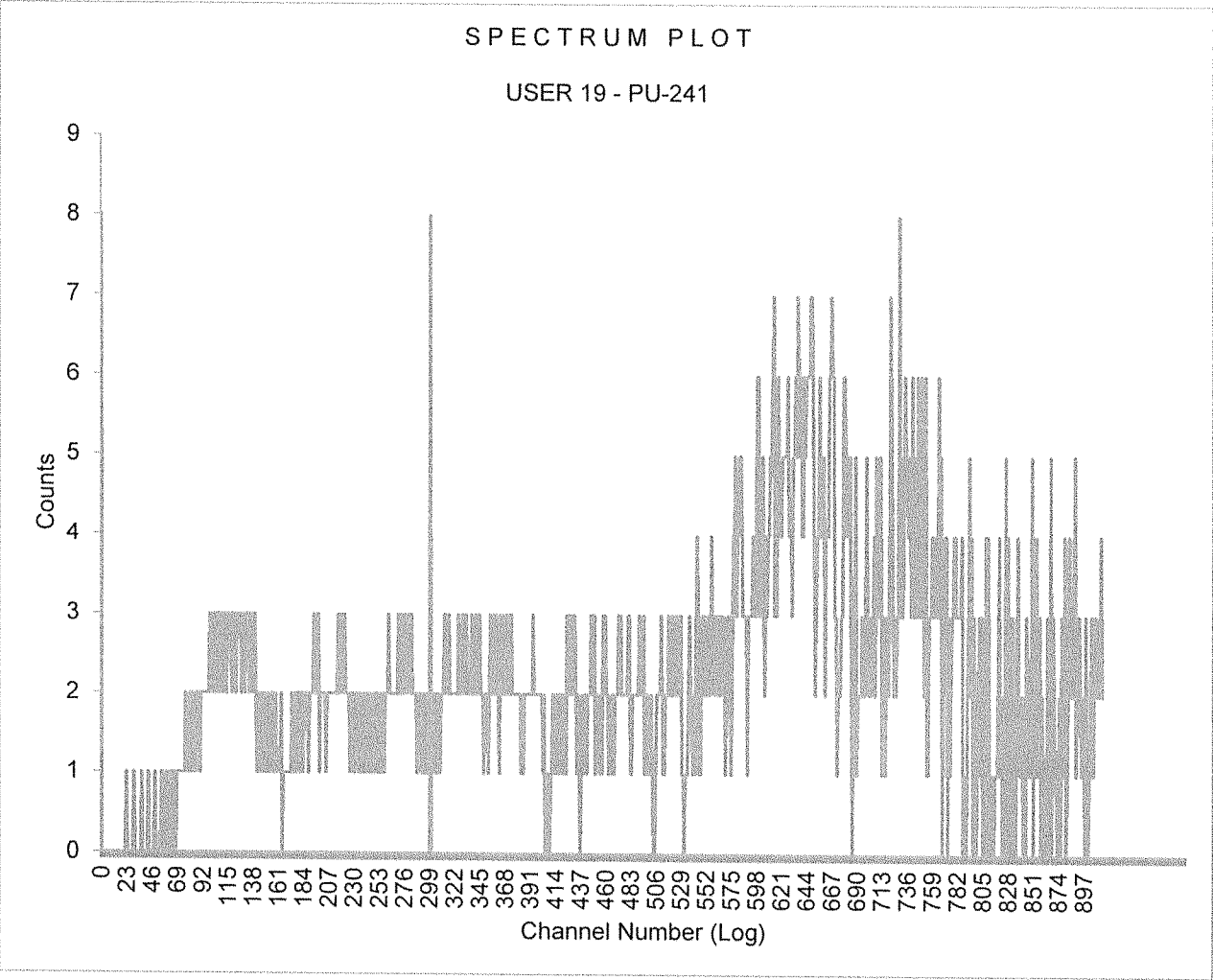
LIQUID

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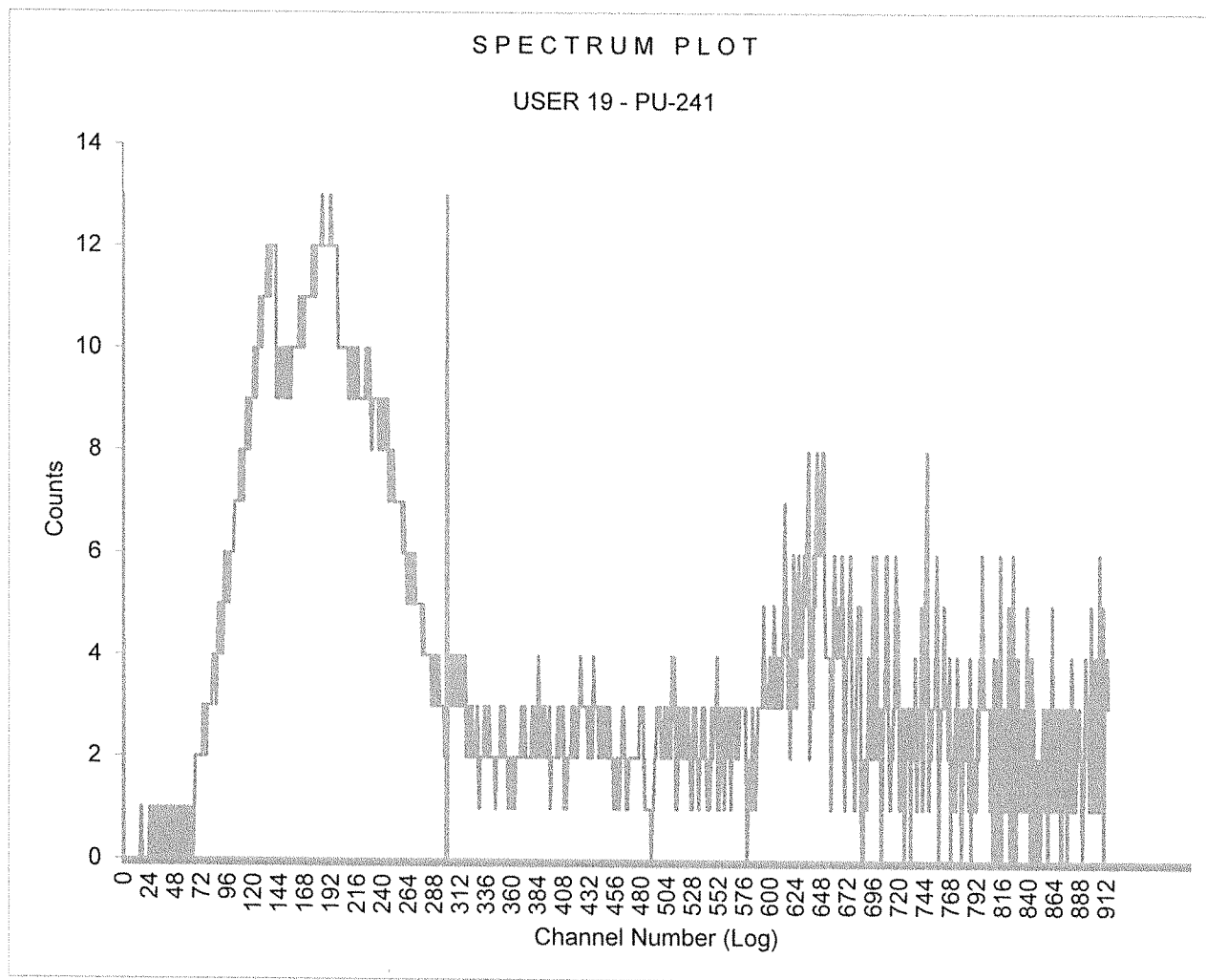
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0300

0990



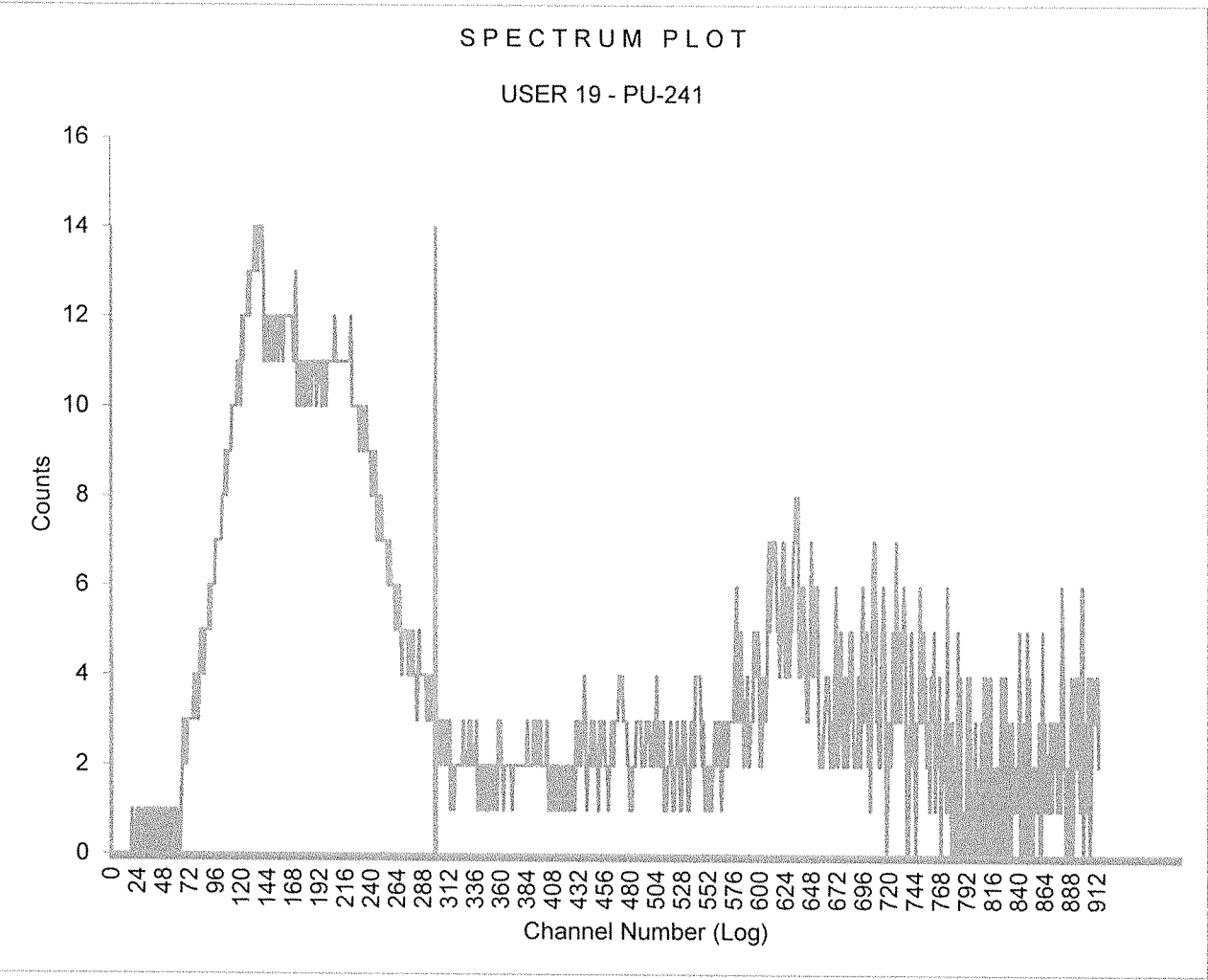
Sample Count Start Time:	5 Nov 2022 21:39:05		
Data Capture Date	05 Nov 2022 22:39:29		
User Filename	S19110520-11A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	11	20-11	60.00
H#, Total Counts:	153.9	3504	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	



Sample Count Start Time:	5 Nov 2022 22:40:52		
Data Capture Date	05 Nov 2022 23:41:16		
User Filename	S19110520-12A.XLS		
	U19110520-1A.XLS		
Spectrum Type	Log Counts		
User Number	19		
User Id	PU-241		
User Comment	LSCPURPLE		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	12	20-12	60.00
H#, Total Counts:	163.4	3653	
Win1: Pu-241 - Start, End:	0	300	
Win2: - Start, End:	0	990	

SPECTRUM PLOT

USER 19 - PU-241



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2333140
SAMPLE ID : R0597531001_PU
SAMPLE QTY : 0.111 F +/-0.899 %
SAMPLE DATE : 26-Sep-2022 08:18:00
ANALYST : BV1
% YIELD : 96.6 +/-6.120 %

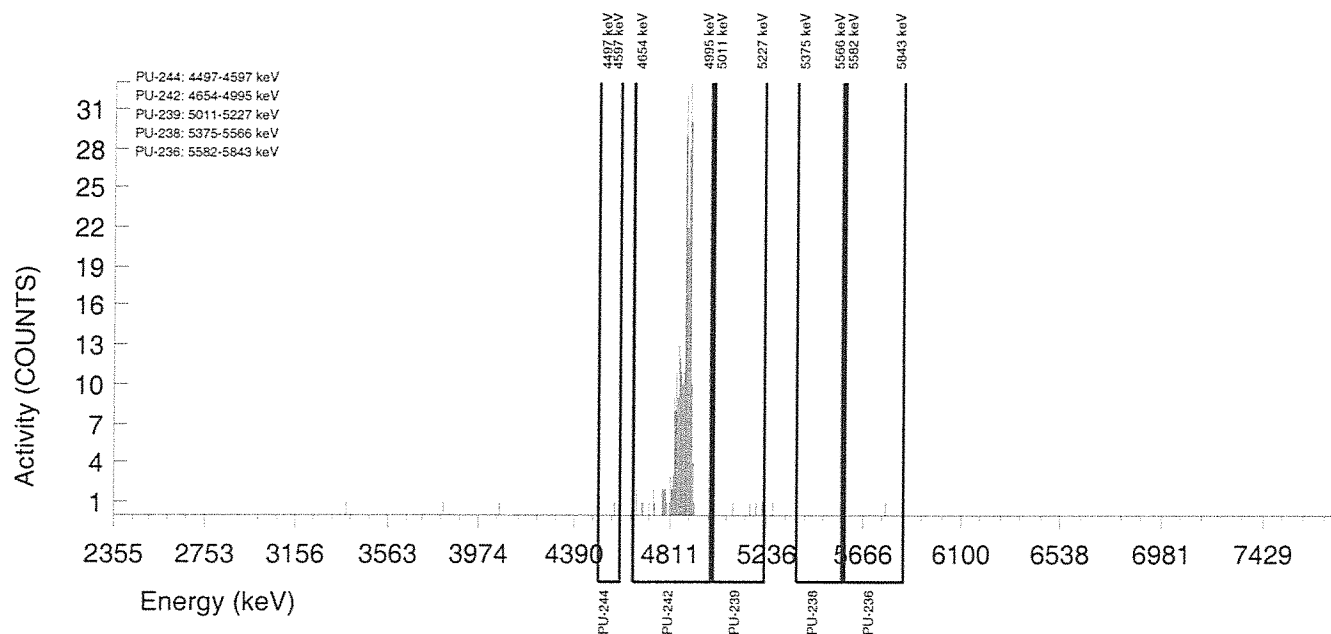
CHAMBER : 089
DETECTOR S/N : 79988
AVERAGE %EFFICIENCY : 30.9886
AVERAGE %EFF ERROR : 0.5992
COUNT DATE : 03-Nov-2022 10:26:51
ELAPSED LIVE TIME(SEC) : 14400.00

LIB FILE : PU
BKG FILE : B089.CNF;2092
BKG DATE : 28-Oct-2022
BKG LIVE TIME(SEC) : 60000.00
EFF FILE : W089.CNF;548
CAL DATE : 13-Oct-2022

TRACER
ID : 2022-A
NUCLIDE : PU-242
NOMINAL : 4.2365E+00 dpm
RESULTS : 4.0934E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5762.89	4.947	1.000	0.520	0.480	0.6928	100.000	3.01E-02	1.67E-01	3.20E-01	7.34E-02	1.67E-01
PU-238	5486.00	5470.34	0.000	0.000	-0.960	0.960	0.9798	99.900	-5.42E-02	1.26E-01	3.72E-01	1.01E-01	1.26E-01
PU-239	5155.00	5167.95	123.678	4.000	2.080	1.920	1.3856	99.900	1.17E-01	2.60E-01	4.56E-01	1.43E-01	2.60E-01
PU-242	4870.00	4872.32	31.510	309.000	304.440	4.560	2.1354	100.000	1.72E+01	2.92E+00	6.10E-01	2.21E-01	1.95E+00
PU-244	4589.00	4568.51	4.947	1.000	0.280	0.720	0.8485	99.900	1.58E-02	1.65E-01	3.45E-01	8.77E-02	1.65E-01

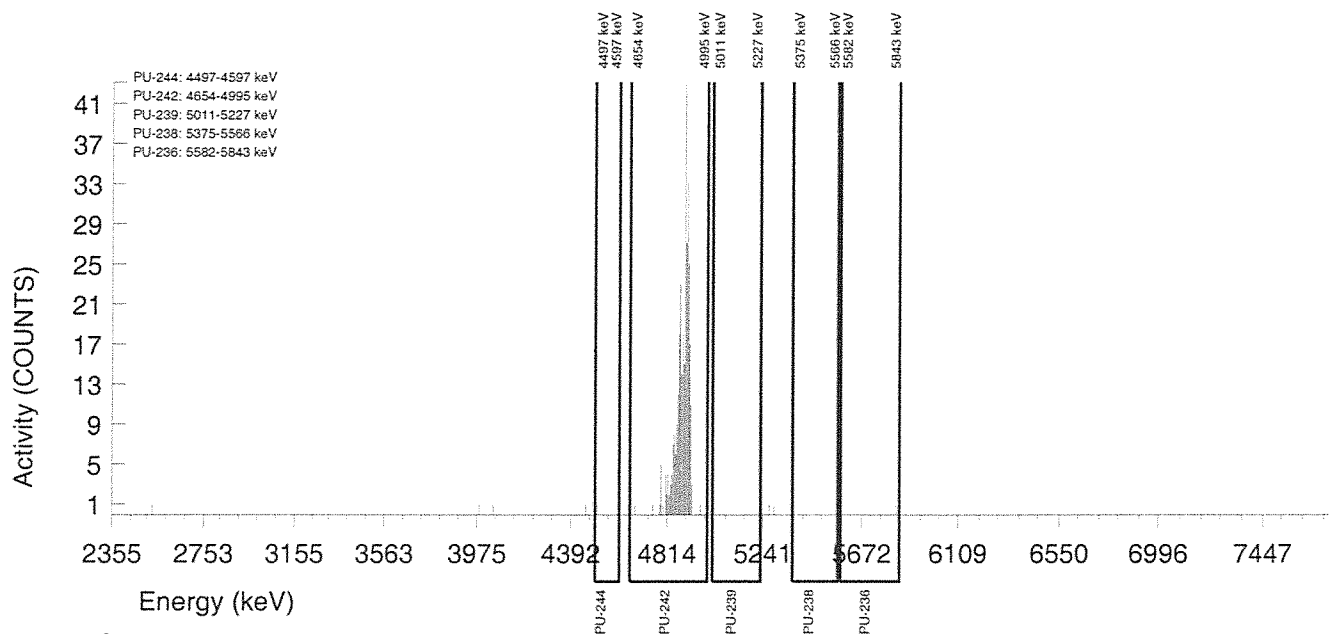


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2333140 SAMPLE ID : R0597531002_PU SAMPLE QTY : 0.112 F +/-0.893 % SAMPLE DATE : 26-Sep-2022 08:25:00 ANALYST : BV1 % YIELD : 88.3 +/-6.000 %	CHAMBER : 090 DETECTOR S/N : 158119 AVERAGE %EFFICIENCY : 35.1247 AVERAGE %EFF ERROR : 0.6772 COUNT DATE : 03-Nov-2022 10:26:51 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B090.CNF;2093 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W090.CNF;540 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.7410E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
PU-236	5749.00	5829.79	4.940	1.000	-0.200	1.200	1.0954	100.000	-1.11E-02	1.66E-01	3.89E-01	1.11E-01	1.66E-01
PU-238	5486.00	5470.33	0.000	0.000	-0.960	0.960	0.9798	99.900	-5.20E-02	1.21E-01	3.57E-01	9.71E-02	1.20E-01
PU-239	5155.00	5118.67	0.000	0.000	-2.880	2.880	1.6971	99.900	-1.56E-01	1.40E-01	4.98E-01	1.68E-01	1.40E-01
PU-242	4870.00	4881.01	38.223	318.000	315.360	2.640	1.6248	100.000	1.70E+01	2.85E+00	4.84E-01	1.61E-01	1.89E+00
PU-244	4589.00	4552.13	0.000	2.000	2.000	0.000	1.0000	99.900	1.08E-01	1.86E-01	1.62E-01	9.91E-02	1.85E-01

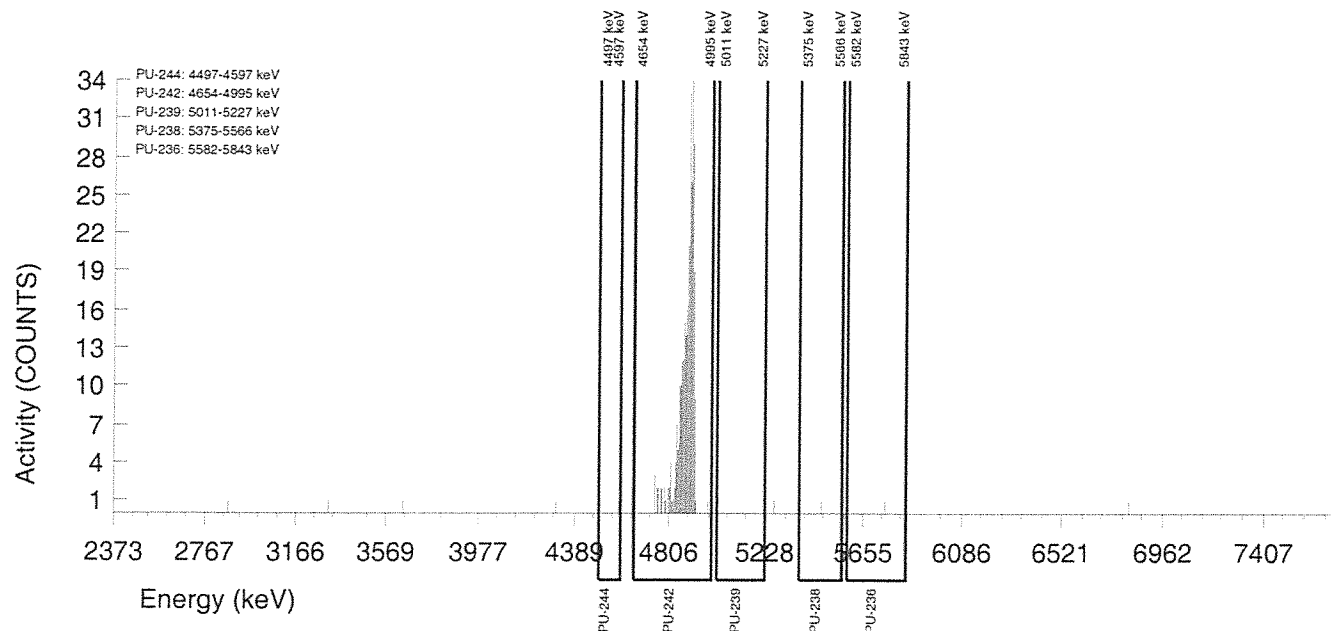


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2333140 SAMPLE ID : R0597531003_PU SAMPLE QTY : 0.113 F +/-0.881 % SAMPLE DATE : 26-Sep-2022 09:00:00 ANALYST : BV1 % YIELD : 86.6 +/-6.170 %	CHAMBER : 092 DETECTOR S/N : 158160 AVERAGE %EFFICIENCY : 33.9981 AVERAGE %EFF ERROR : 0.6559 COUNT DATE : 03-Nov-2022 10:26:51 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B092.CNF;2101 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W092.CNF;586 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.6669E+00 dpm		

NUCLIDE ACTIVITY SUMMARY														
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma	MDA pCi/F	Lc pCi/F	1.96-sigma	
										TPU pCi/F			cnt Unc pCi/F	
PU-236	5749.00	5751.15	4.894	1.000	-0.920	1.920	1.3856	100.000	-5.30E-02	1.80E-01	4.66E-01	1.46E-01	1.79E-01	
PU-238	5486.00	5472.79	4.894	1.000	-1.160	2.160	1.4697	99.900	-6.53E-02	1.77E-01	4.72E-01	1.52E-01	1.77E-01	
PU-239	5155.00	5118.68	0.000	0.000	-3.840	3.840	1.9596	99.900	-2.16E-01	1.55E-01	5.73E-01	2.02E-01	1.55E-01	
PU-242	4870.00	4876.87	29.364	304.000	299.200	4.800	2.1909	100.000	1.68E+01	2.89E+00	6.20E-01	2.26E-01	1.93E+00	
PU-244	4589.00	4586.89	4.894	1.000	0.280	0.720	0.8485	99.900	1.58E-02	1.65E-01	3.44E-01	8.75E-02	1.65E-01	



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2333140
SAMPLE ID : R0597533001_PU
SAMPLE QTY : 0.117 F +/-0.857 %
SAMPLE DATE : 30-Sep-2022 07:45:00
ANALYST : BV1
% YIELD : 95.6 +/-5.898 %

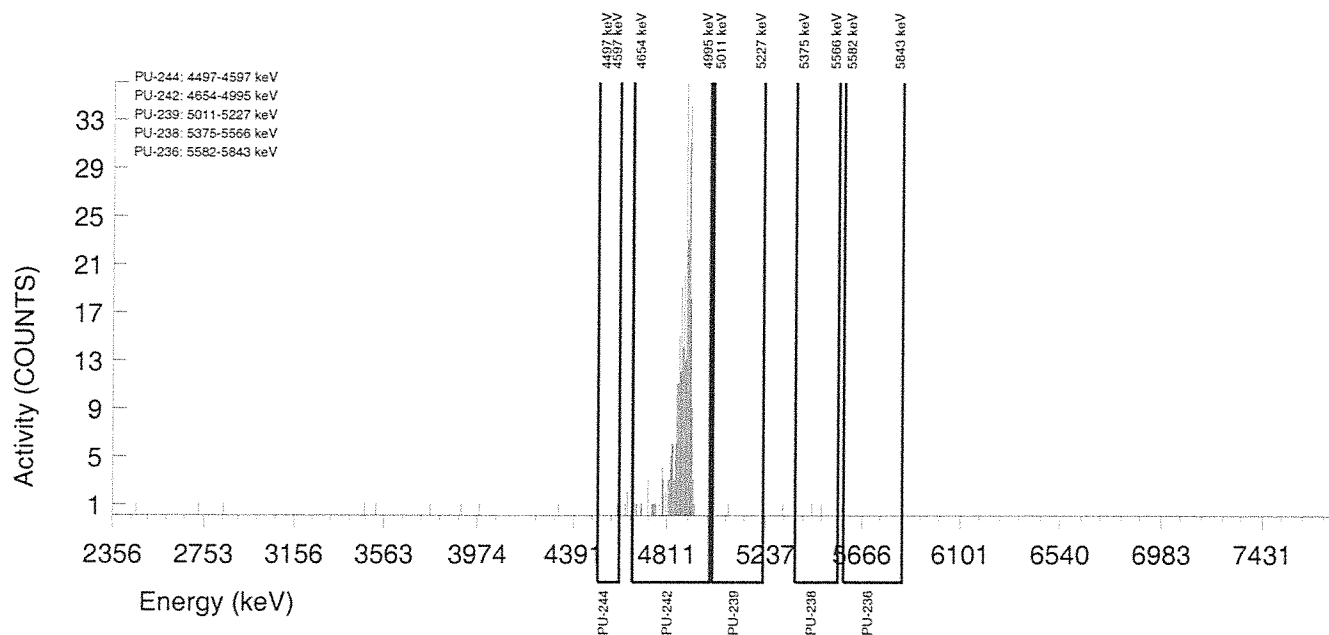
CHAMBER : 093
DETECTOR S/N : 155764
AVERAGE %EFFICIENCY : 33.4274
AVERAGE %EFF ERROR : 0.6452
COUNT DATE : 03-Nov-2022 10:26:51
ELAPSED LIVE TIME(SEC) : 14400.00

LIB FILE : PU
BKG FILE : B093.CNF;2086
BKG DATE : 28-Oct-2022
BKG LIVE TIME(SEC) : 60000.00
EFF FILE : W093.CNF;542
CAL DATE : 13-Oct-2022

TRACER
ID : 2022-A
NUCLIDE : PU-242
NOMINAL : 4.2365E+00 dpm
RESULTS : 4.0481E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.25	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.04E-01	1.54E-01	9.43E-02	1.04E-01
PU-238	5486.00	5466.98	44.497	2.000	2.000	0.000	1.0000	99.900	1.01E-01	1.73E-01	1.51E-01	9.24E-02	1.73E-01
PU-239	5155.00	5076.52	4.944	1.000	0.520	0.480	0.6928	99.900	2.62E-02	1.46E-01	2.79E-01	6.39E-02	1.46E-01
PU-242	4870.00	4871.79	40.259	325.000	324.760	0.240	0.4899	100.000	1.63E+01	2.68E+00	2.41E-01	4.52E-02	1.78E+00
PU-244	4589.00	4584.59	4.944	1.000	1.000	0.000	1.0000	99.900	5.04E-02	1.42E-01	1.51E-01	9.23E-02	1.42E-01

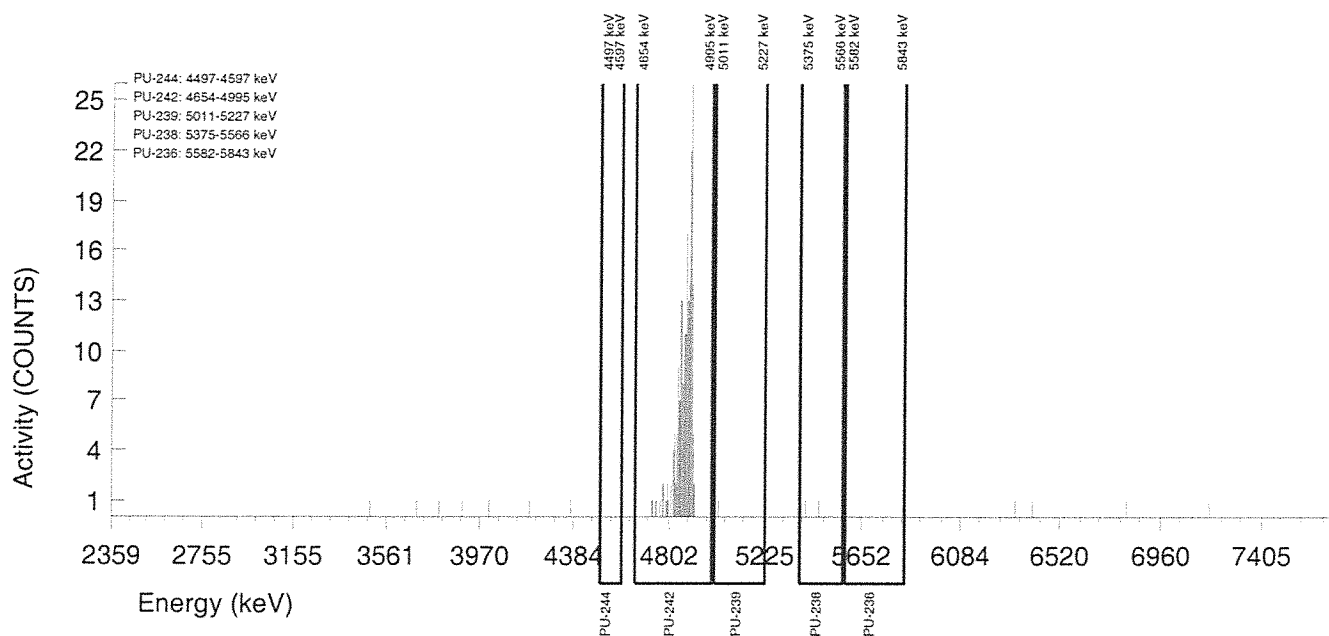


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2333140 SAMPLE ID : R0597533002_PU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 30-Sep-2022 07:51:00 ANALYST : BV1 % YIELD : 66.5 +/-7.182 %	CHAMBER : 095 DETECTOR S/N : 140239 AVERAGE %EFFICIENCY : 31.6063 AVERAGE %EFF ERROR : 0.6108 COUNT DATE : 03-Nov-2022 10:26:52 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B095.CNF;2052 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W095.CNF;584 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 2.8159E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.25	0.000	0.000	-0.720	0.720	0.8485	100.000	-5.67E-02	1.72E-01	4.81E-01	1.22E-01	1.71E-01
PU-238	5486.00	5435.39	59.099	2.000	0.560	1.440	1.2000	99.900	4.32E-02	2.79E-01	5.71E-01	1.70E-01	2.79E-01
PU-239	5155.00	5023.68	4.925	1.000	-0.680	1.680	1.2961	99.900	-5.24E-02	2.37E-01	5.97E-01	1.83E-01	2.37E-01
PU-242	4870.00	4871.37	28.455	216.000	213.600	2.400	1.5492	100.000	1.64E+01	3.28E+00	6.68E-01	2.19E-01	2.23E+00
PU-244	4589.00	4546.97	0.000	0.000	-0.240	0.240	0.4899	99.900	-1.85E-02	1.60E-01	3.70E-01	6.92E-02	1.60E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2333140
SAMPLE ID : R0597533003_PU
SAMPLE QTY : 0.115 F +/-0.873 %
SAMPLE DATE : 30-Sep-2022 07:58:00
ANALYST : BV1
% YIELD : 91.7 +/-6.031 %

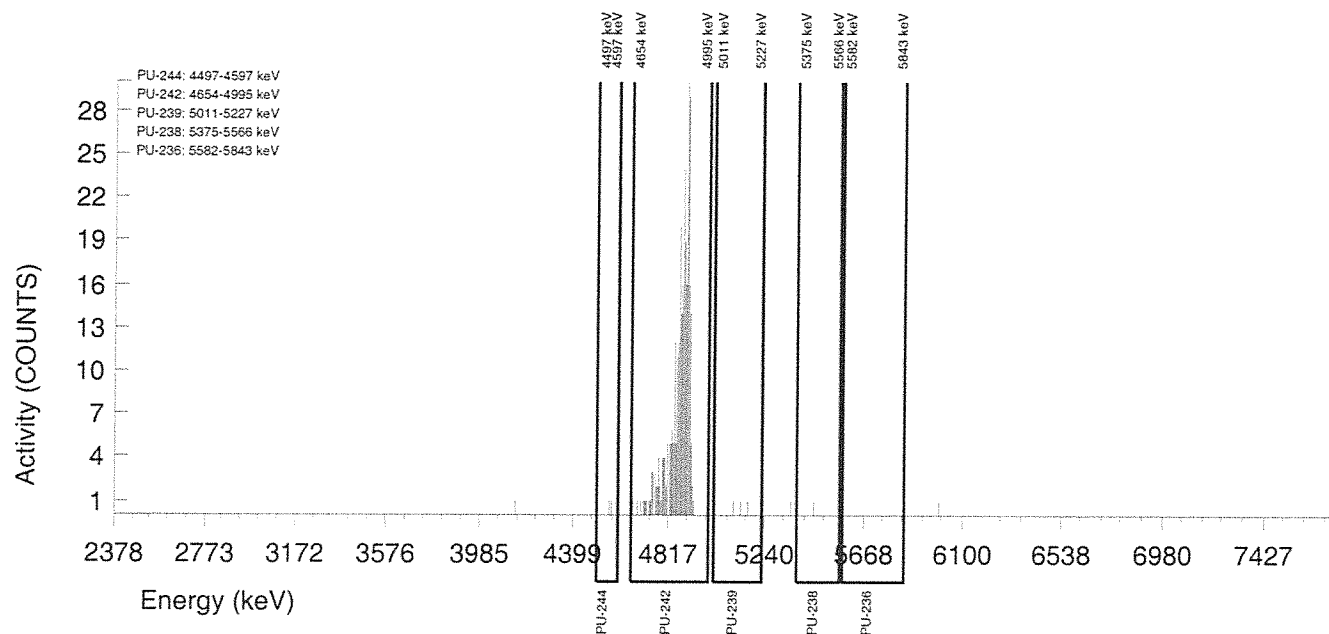
CHAMBER : 096
DETECTOR S/N : 80016
AVERAGE %EFFICIENCY : 33.4897
AVERAGE %EFF ERROR : 0.6463
COUNT DATE : 03-Nov-2022 10:26:52
ELAPSED LIVE TIME(SEC) : 14399.99

LIB FILE : PU
BKG FILE : B096.CNF;2044
BKG DATE : 28-Oct-2022
BKG LIVE TIME(SEC) : 60000.00
EFF FILE : W096.CNF;514
CAL DATE : 13-Oct-2022

TRACER
ID : 2022-A
NUCLIDE : PU-242
NOMINAL : 4.2365E+00 dpm
RESULTS : 3.8833E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.23	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.31E-02	1.13E-01	2.62E-01	4.90E-02	1.13E-01
PU-238	5486.00	5453.32	4.901	1.000	-0.920	1.920	1.3856	99.900	-4.92E-02	1.66E-01	4.32E-01	1.36E-01	1.66E-01
PU-239	5155.00	5133.76	63.708	3.000	1.080	1.920	1.3856	99.900	5.77E-02	2.23E-01	4.32E-01	1.36E-01	2.23E-01
PU-242	4870.00	4862.25	44.718	315.000	312.120	2.880	1.6971	100.000	1.67E+01	2.80E+00	4.92E-01	1.66E-01	1.86E+00
PU-244	4589.00	4560.08	14.702	2.000	1.760	0.240	0.4899	99.900	9.40E-02	1.85E-01	2.56E-01	4.80E-02	1.85E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2333140
SAMPLE ID : R0597533004_PU
SAMPLE QTY : 0.115 F +/-0.871 %
SAMPLE DATE : 30-Sep-2022 08:05:00
ANALYST : BV1
% YIELD : 61.9 +/-7.000 %

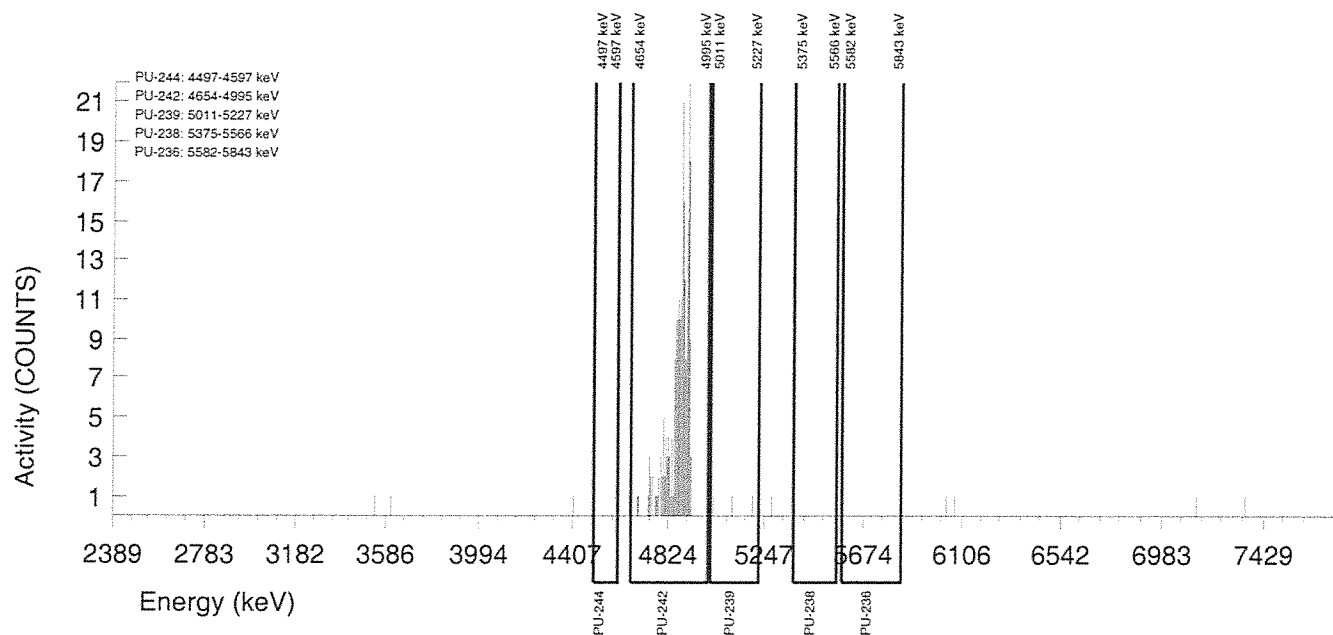
CHAMBER : 097
DETECTOR S/N : 83288
AVERAGE %EFFICIENCY : 36.1216
AVERAGE %EFF ERROR : 0.6960
COUNT DATE : 03-Nov-2022 10:26:52
ELAPSED LIVE TIME(SEC) : 14399.99

LIB FILE : PU
BKG FILE : B097.CNF;2041
BKG DATE : 28-Oct-2022
BKG LIVE TIME(SEC) : 60000.00
EFF FILE : W097.CNF;538
CAL DATE : 13-Oct-2022

TRACER
ID : 2022-A
NUCLIDE : PU-242
NOMINAL : 4.2365E+00 dpm
RESULTS : 2.6203E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.24	0.000	0.000	-0.960	0.960	0.9798	100.000	-7.18E-02	1.67E-01	4.93E-01	1.34E-01	1.66E-01
PU-238	5486.00	5470.34	0.000	0.000	-0.720	0.720	0.8485	99.900	-5.28E-02	1.60E-01	4.48E-01	1.14E-01	1.59E-01
PU-239	5155.00	5107.29	161.586	3.000	0.840	2.160	1.4697	99.900	6.15E-02	3.07E-01	6.14E-01	1.97E-01	3.07E-01
PU-242	4870.00	4869.72	38.084	231.000	227.160	3.840	1.9596	100.000	1.66E+01	3.23E+00	7.45E-01	2.63E-01	2.19E+00
PU-244	4589.00	4547.28	0.000	2.000	1.760	0.240	0.4899	99.900	1.29E-01	2.54E-01	3.51E-01	6.57E-02	2.53E-01

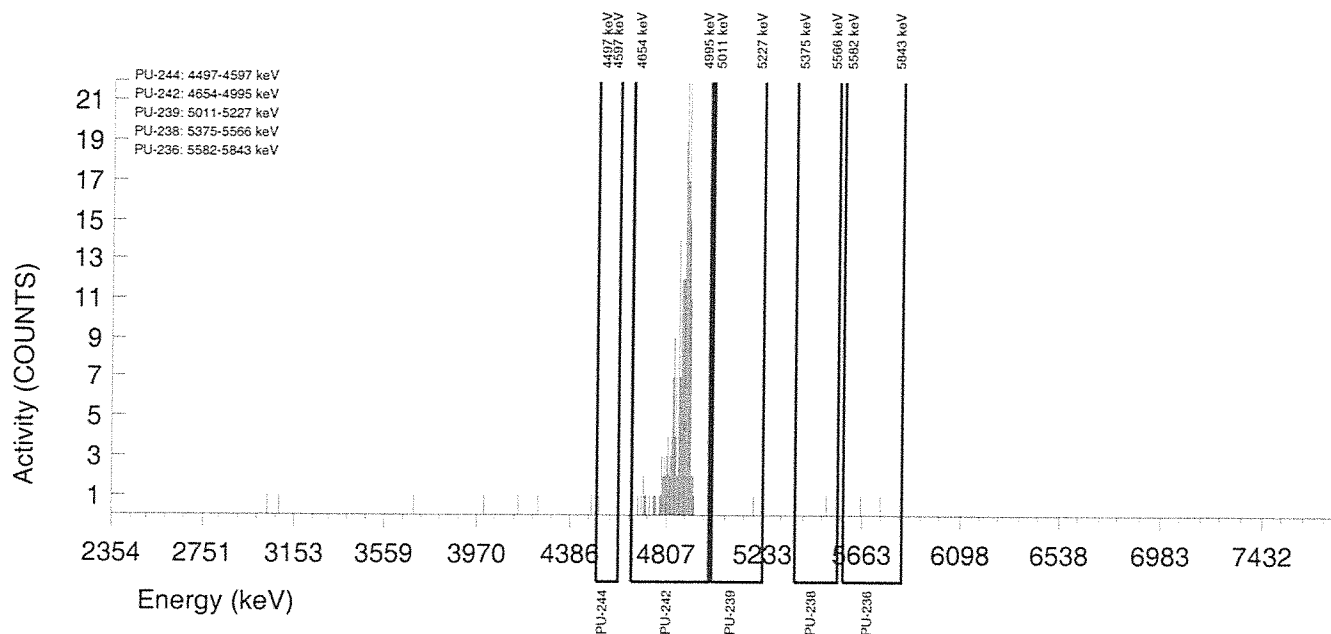


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2333140 SAMPLE ID : R0597533005_PU SAMPLE QTY : 0.115 F +/-0.872 % SAMPLE DATE : 30-Sep-2022 09:00:00 ANALYST : BV1 % YIELD : 62.3 +/-6.935 %	CHAMBER : 098 DETECTOR S/N : 158118 AVERAGE %EFFICIENCY : 36.5015 AVERAGE %EFF ERROR : 0.7032 COUNT DATE : 03-Nov-2022 10:26:52 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B098.CNF;2069 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W098.CNF;588 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 2.6414E+00 dpm		

NUCLIDE ACTIVITY SUMMARY														
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma	MDA pCi/F	Lc pCi/F	1.96-sigma	
										TPU pCi/F			cnt Unc pCi/F	
PU-236	5749.00	5706.49	83.828	2.000	-0.400	2.400	1.5492	100.000	-2.94E-02	2.75E-01	6.38E-01	2.09E-01	2.75E-01	
PU-238	5486.00	5512.03	4.931	1.000	-0.680	1.680	1.2961	99.900	-4.90E-02	2.22E-01	5.58E-01	1.71E-01	2.21E-01	
PU-239	5155.00	5190.07	4.931	1.000	-1.640	2.640	1.6248	99.900	-1.18E-01	2.32E-01	6.44E-01	2.14E-01	2.31E-01	
PU-242	4870.00	4866.88	50.543	235.000	231.400	3.600	1.8974	100.000	1.66E+01	3.21E+00	7.15E-01	2.50E-01	2.17E+00	
PU-244	4589.00	4512.21	4.931	1.000	0.520	0.480	0.6928	99.900	3.74E-02	2.08E-01	3.99E-01	9.13E-02	2.08E-01	

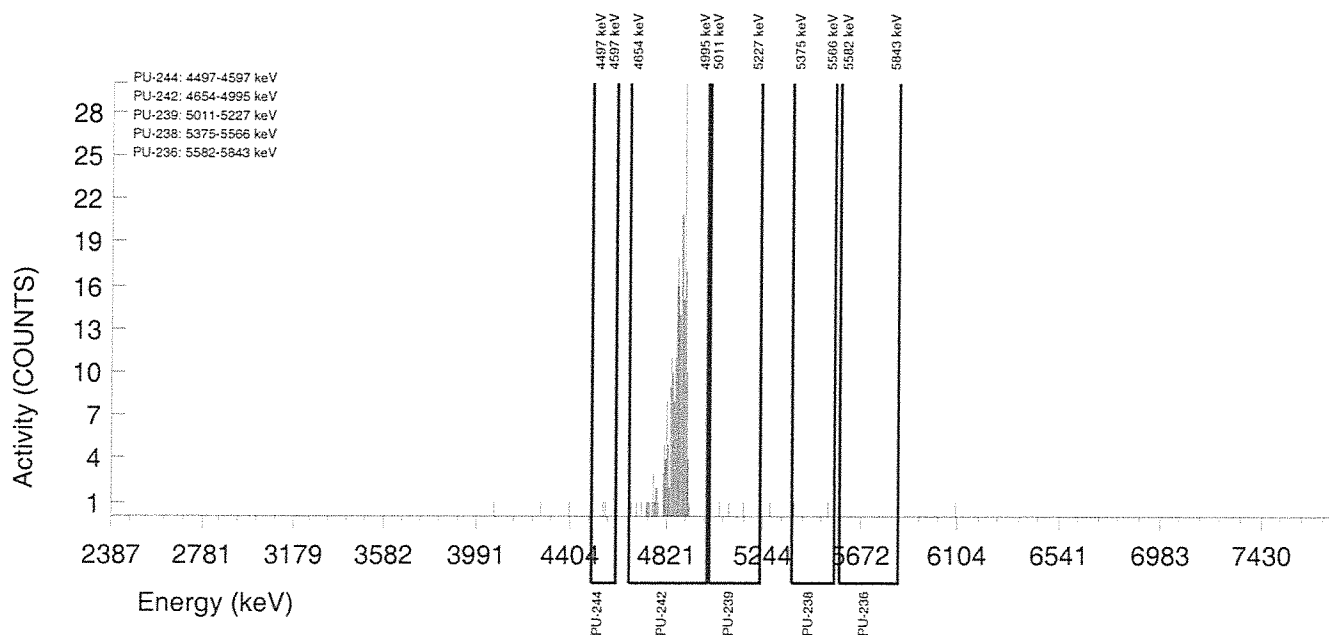


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2333140 SAMPLE ID : R1205226001_PU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 74.3 +/-6.497 %	CHAMBER : 099 DETECTOR S/N : 158120 AVERAGE %EFFICIENCY : 35.6810 AVERAGE %EFF ERROR : 0.6877 COUNT DATE : 03-Nov-2022 10:26:52 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B099.CNF;2050 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W099.CNF;551 CAL DATE : 13-Oct-2022
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.1473E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.23	0.000	0.000	-2.640	2.640	1.6248	100.000	-1.60E-01	1.55E-01	5.44E-01	1.81E-01	1.55E-01
PU-238	5486.00	5457.20	141.784	2.000	0.800	1.200	1.0954	99.900	4.86E-02	2.18E-01	4.26E-01	1.22E-01	2.18E-01
PU-239	5155.00	5102.63	102.671	3.000	0.840	2.160	1.4697	99.900	5.10E-02	2.55E-01	5.09E-01	1.63E-01	2.55E-01
PU-242	4870.00	4865.60	41.487	276.000	269.520	6.480	2.5456	100.000	1.63E+01	2.95E+00	7.48E-01	2.83E-01	1.98E+00
PU-244	4589.00	4549.27	14.667	2.000	1.520	0.480	0.6928	99.900	9.23E-02	2.12E-01	3.36E-01	7.71E-02	2.12E-01

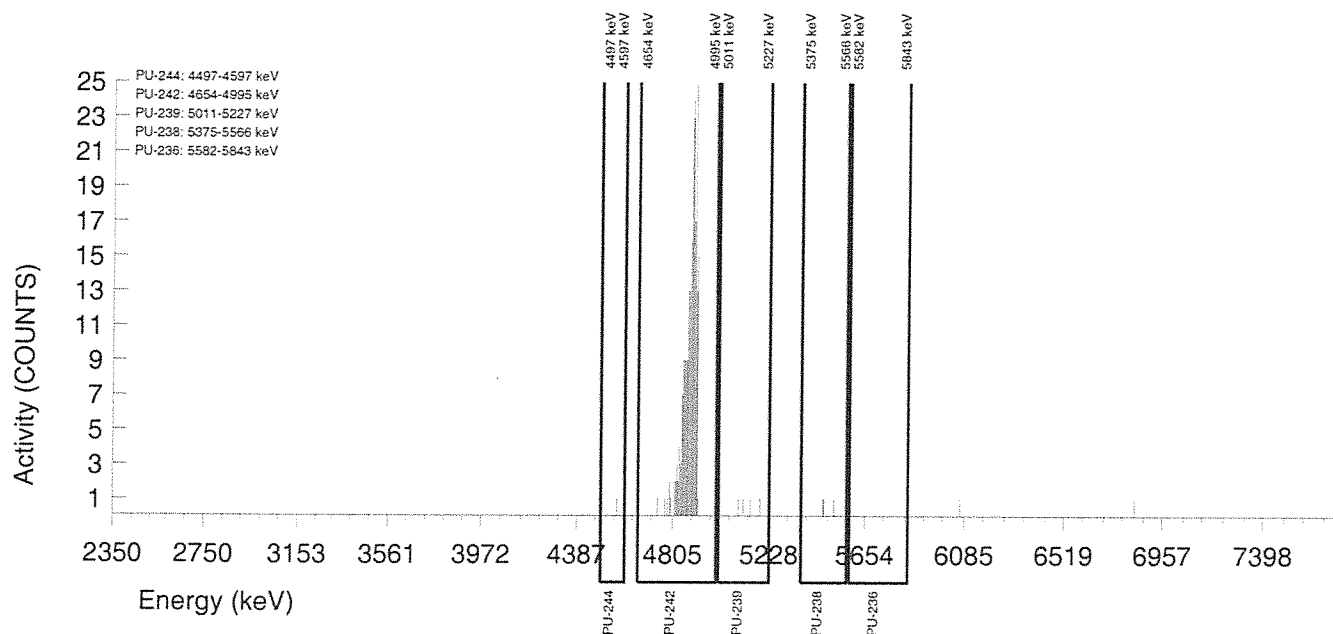


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2333140 SAMPLE ID : R1205226002_PU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 80.6 +/-7.022 %			CHAMBER : 215 DETECTOR S/N : 155839 AVERAGE %EFFICIENCY : 27.2396 AVERAGE %EFF ERROR : 0.5285 COUNT DATE : 03-Nov-2022 10:12:58 ELAPSED LIVE TIME(SEC) : 14400.00			LIB FILE : PU BKG FILE : B215.CNF;985 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W215.CNF;79 CAL DATE : 20-Oct-2022		
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.4160E+00 dpm			LCS ID NUCLIDE NOMINAL (pCi/F) % RECOVERY					

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.28	0.000	0.000	-1.200	1.200	1.0954	100.000	-8.80E-02	1.67E-01	5.14E-01	1.47E-01	1.67E-01
PU-238	5486.00	5485.09	49.701	3.000	1.800	1.200	1.0954	99.900	1.32E-01	3.00E-01	5.14E-01	1.47E-01	2.99E-01
PU-239	5155.00	5137.81	94.431	4.000	2.800	1.200	1.0954	99.900	2.05E-01	3.33E-01	5.14E-01	1.47E-01	3.32E-01
PU-242	4870.00	4880.87	41.269	225.000	223.320	1.680	1.2961	100.000	1.63E+01	3.19E+00	5.67E-01	1.74E-01	2.16E+00
PU-244	4589.00	4564.11	4.970	1.000	1.000	0.000	1.0000	99.900	7.33E-02	2.06E-01	2.20E-01	1.34E-01	2.06E-01

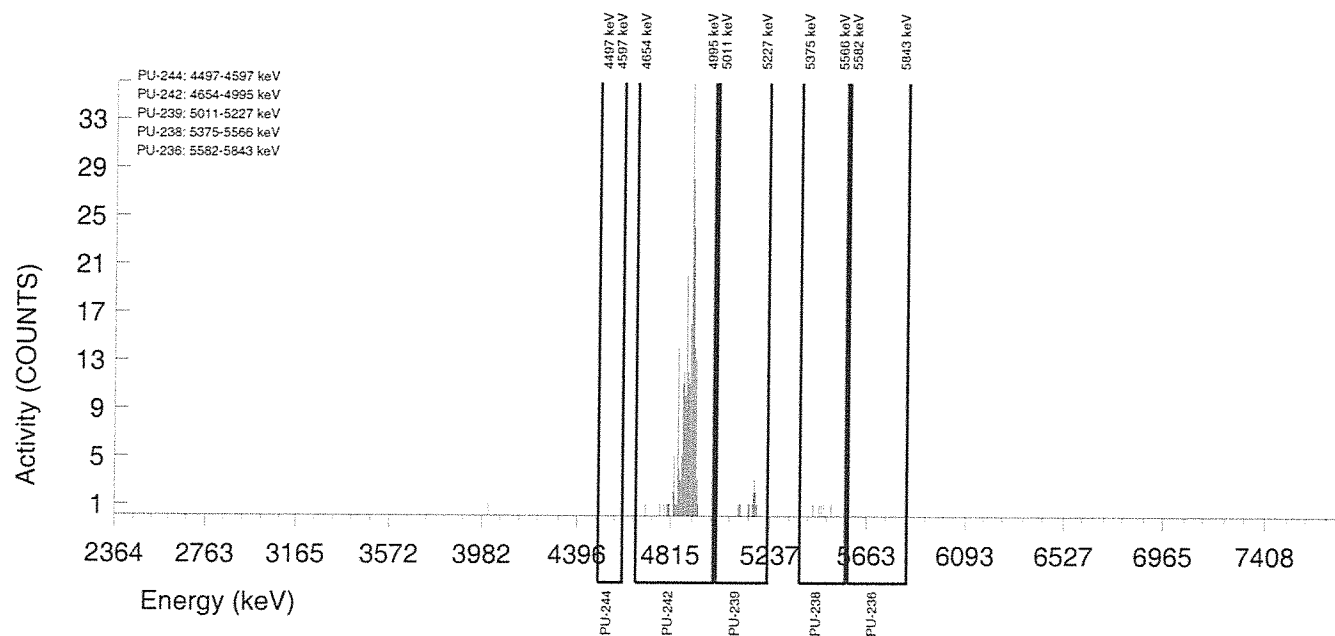


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2333140 SAMPLE ID : R1205226003_PU SAMPLE QTY : 0.117 F +/-0.857 % SAMPLE DATE : 01-Nov-2022 00:00:00 ANALYST : BV1 % YIELD : 93.8 +/-6.680 %		CHAMBER : 217 DETECTOR S/N : 155841 AVERAGE %EFFICIENCY : 26.1786 AVERAGE %EFF ERROR : 0.5084 COUNT DATE : 03-Nov-2022 10:13:00 ELAPSED LIVE TIME(SEC) : 14400.00		LIB FILE : PU BKG FILE : B217.CNF;1120 BKG DATE : 28-Oct-2022 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W217.CNF;75 CAL DATE : 20-Oct-2022	
TRACER ID : 2022-A NUCLIDE : PU-242 NOMINAL : 4.2365E+00 dpm RESULTS : 3.9727E+00 dpm		LCSD ID NUCLIDE NOMINAL (pCi/F) % RECOVERY			

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			1.96-sigma
NUCLIDE	LIBRARY	PEAK	PEAK	GROSS	NET	BKG	BKG	%ABUN	ACTIVITY	TPU	MDA	Lc	cnt Unc
	ENERGY	ENERGY	FWHM	AREA	AREA	AREA	StDev		pCi/F	pCi/F	pCi/F	pCi/F	pCi/F
PU-236	5749.00	5712.27	0.000	0.000	-1.200	1.200	1.0954	100.000	-7.87E-02	1.49E-01	4.60E-01	1.32E-01	1.49E-01
PU-238	5486.00	5466.62	79.303	5.000	3.320	1.680	1.2961	99.900	2.18E-01	3.28E-01	5.08E-01	1.56E-01	3.27E-01
PU-239	5155.00	5161.01	14.869	15.000	14.520	0.480	0.6928	99.900	9.52E-01	5.33E-01	3.63E-01	8.32E-02	5.17E-01
PU-242	4870.00	4884.40	33.704	252.000	249.600	2.400	1.5492	100.000	1.63E+01	3.04E+00	5.68E-01	1.86E-01	2.04E+00
PU-244	4589.00	4546.97	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00	1.32E-01	1.97E-01	1.20E-01	1.32E-01



Continuing Calibration Data



Liquid Scintillation Counter Checks for 05-NOV-2022

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LSCGOLD	Carbon-14	08:02	1.3		124059	-0.15		
	Carbon-14	08:04	1.3		124247	0.52		
	Tritium	08:06	1.15		153668	-1.1		
	Tritium	08:07	1.15		152988	-2.5		
	BKG	08:10	30		27	-0.12		
	BKG	08:41	30		27	-0.02		
LSCJADE	Carbon-14	02:32	1.31		123884	0.28		
	Carbon-14	02:35	1.32		123476	-1.08		
	Tritium	02:37	1.05		163263	-0.86		
	Tritium	02:39	1.04		163412	-0.48		
	BKG	02:44	30		4.86	-0.23		
	BKG	03:17	30		4.8	-0.32		
LSCMOCHA	Carbon-14	06:22	1.35		121688	0.44		
	Carbon-14	06:24	1.35		121677	0.41		
	Tritium	06:26	1.3		138370	-1.55		
	Tritium	06:27	1.3		138683	-1.08		
	BKG	06:29	30		18	-1.69		
	BKG	07:00	30		18	-1.18		
LSCNAVY	Carbon-14	02:33	1.32		124519	-2.11		
	Carbon-14	02:35	1.3		125441	0.75		
	Tritium	02:36	1.1		169859	-2.22		
	Tritium	02:38	1.1		169824	-2.27		
	BKG	02:40	30		20	-0.09		
	BKG	03:10	30		18	-1.79		
LSCPINK	Carbon-14	01:35	1.012433		124059	0.42		
	Tritium	01:39	1.012433		136908	-2.24		
	BKG	02:11	30.01243		8.63	1.85		
	Carbon-14	02:13	1.012433		123670	-0.61		
	Tritium	02:14	1.012417		136693	-2.64		
	BKG	02:44	30.01243		8.03	0.82		

LSCPURPLE	Carbon-14	04:30	.4	124062	0.8
	Carbon-14	04:30	.45	122888	-1.8
	Tritium	04:31	.4	152745	-2.17
	Tritium	04:32	.4	152214	-2.76
	BKG	04:33	30	21	-1.68
	BKG	05:04	30	23	0.27

Reviewed by:



Gregory Ramsay

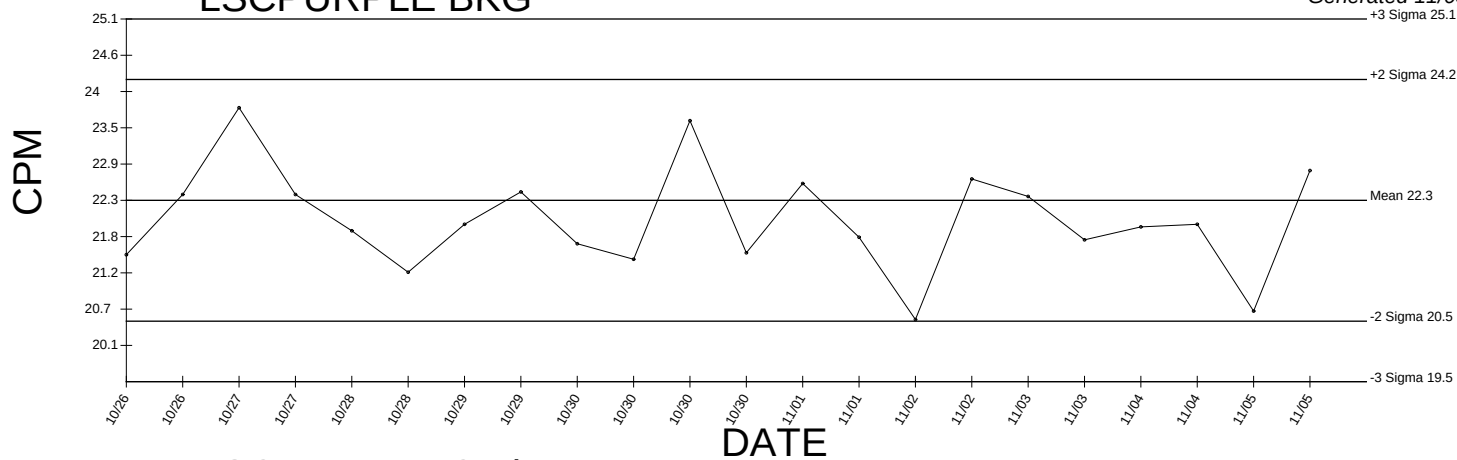
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GEL Laboratories LLC

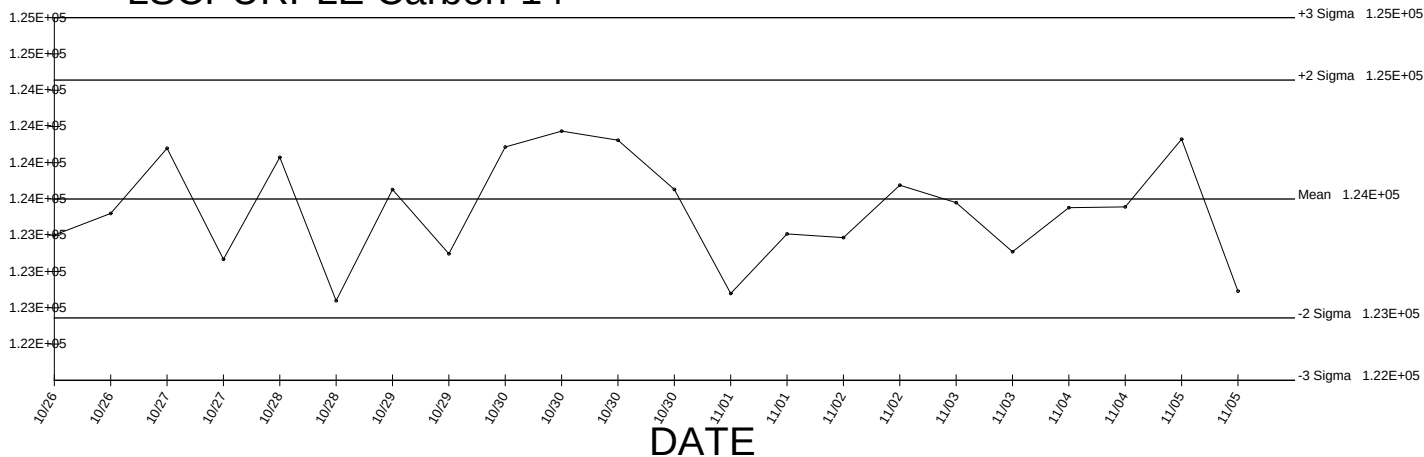
Background and Efficiency Data

LSCPURPLE BKG

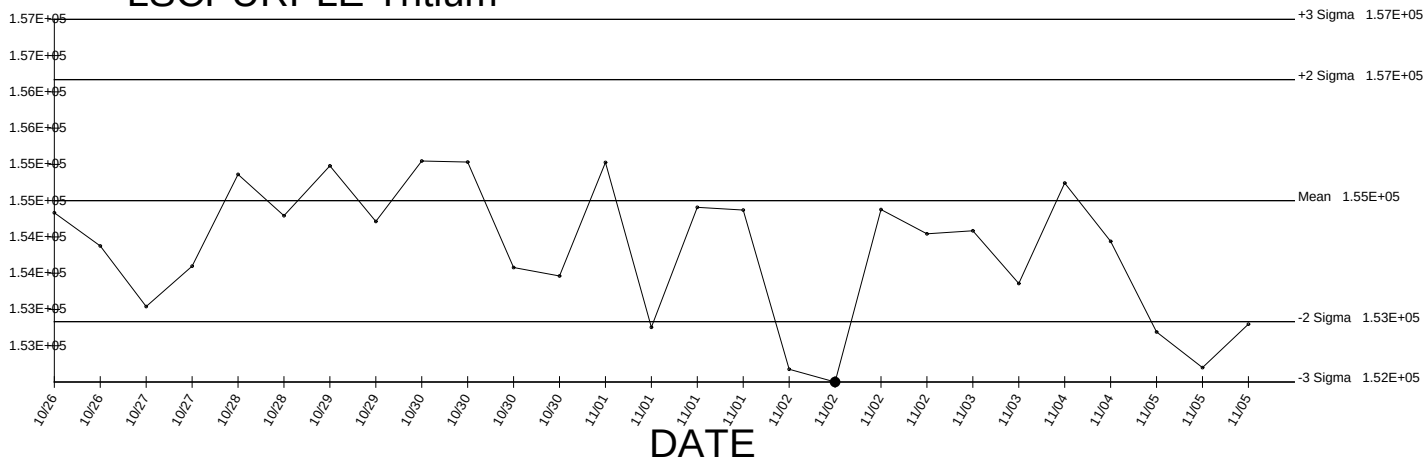
Generated 11/05/2022



LSCPURPLE Carbon-14



LSCPURPLE Tritium



RAD Standards Traceability



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

1714

98366

Pu-241 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL 1408580, Item 6 **Product Code:** 8341

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u_A	u_B	U	
Pu-241	5.232E+03	4.016E+04	0.2	1.7	3.5	09/09/2014

*Uncertainty: U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: α -impurities < 0.08%, γ -impurities (other than decay products) < 0.1%.
5.46647 g 3M HNO₃ solution. Carrier free.

Source Prepared by:

R. Ormsby, Radiochemist

QC Approved:

J. S. Lahr, Spectroscopist

Date: 9/5/14



Standard Logbook

Serial ID: 1714 **Open/Reference Date:** 09 SEP 2014 **Aliquot :** 5.46647 g
Name: Plutonium-241 **Received:** 10 SEP 2014 **Density :** Hand Calculated
Type: Source Material **Expires:** 11 SEP 2075 **Logbook Num :** GL-CED-297-007
Employee: Gregory Ramsay **Lot Number :** 98366
Supplier: Eckert & Ziegler **Solvent :** 3M HNO3
Uncertainty : 1.75 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-241	40160 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1714
Prepared By:	Gregory Ramsay
Carrier Conc:	3M HNO3
Reference Date:	09/09/2014
Ampoule Mass (g):	5.46647 g
Uncertainty:	+/- 1.75 %
LogBook No:	GL-CED-297-007
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Plutonium-241		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2019		
Verification Date:	01/25/2021		
Expiration Date:	01/25/2023		
Primary Code:	1714-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.4425 g		
Density(g/mL):	1.0331	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23990.3411 \text{ dpm/mL}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0331 \text{ g/mL}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23220.6511 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
07/22/2019	Tim Chandler	50.7721	500	1714-B	2357.9224 dpm/mL	01/19/2022	01/19/2023
07/18/2022	Matelon DeFreese	25.0261	250	1714-C	2324.48935 dpm/mL	10/28/2022	10/28/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-241 Standard 1714-B

1/19/2022	Isotope	Detector CPM	BKG CPM	NET CPM	Detector Eff	Mass. Used (mL)	Source DPM/mL
Matelon DeFreese	1714-B	418.9300	10.5300	408.4000	0.2541	1.0000	1607.241244
	1714-B	423.9300	10.5300	413.4000	0.2551	1.0000	1620.540964
	1714-B	413.8700	10.5300	403.3400	0.253	1.0000	1594.229249
Mean Value (Counting) =	1607.337152	dpm/mL	97.4108307	Pass		Average =	1607.337152
Stdev =	13.15611985	dpm/mL	0.00818504	Rule B (Pass/Fail)			
Certificate Value =	1650.06	dpm/mL					
Two sigma =	26.31223971						
10 % of Mean =	160.7337152						
Rule A (Pass/Fail)	Pass						

Verification Rules

- Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule B = The determined mean value shall be within 5% of the certificate value.

The analyst prepared three standard verification sources for Pu-241 source 1714-B by transferring 1 mL portions of the standard into plastic liquid scintillation vials. Thirteen mL of Ecoscint Ultra liquid scintillation cocktail and 2 mL of DI water were added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion. The standard verification vials and Background source were dark adapted for two hours and counted on LSC Brown for Pu-241 source standard verification. The Pu-241 efficiency calibration which was used for verification calculations was created during instrument calibrations. Each verification source calculation was performed as follows:

Source dpm/g = (A - B)/(C)(D)

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency, (cpm/dpm), and
- D = mass used for standard verification.

Reference RAD SOP M-001

8/24/22



National Institute of Standards & Technology

Certificate

2022

Standard Reference Material[®] 4334j

Plutonium-242 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}.$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterweger, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

Steven J. Choquette, Director
Office of Reference Materials

GL-CE0-797-314a

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq·g^{-1(a)}
Relative expanded uncertainty ($k = 2$)	0.51 %^(b)

^(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

^(b) The uncertainties on certified values are expanded uncertainties, $U = k u_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

GL-CED-297.3146

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ⁻¹ (a,b,c,d)
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ⁻¹ (a,d)
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π α liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

^(a) The stated uncertainty is two times the standard uncertainty [5].

^(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

^(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,

0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and

0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

^(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclidic impurities follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ⁻³ (1,2)	(3.6 ± 1.1) × 10 ⁻³ (1,5)
²⁴⁰ Pu + ²³⁹ Pu	< 10 ⁻⁶ (3)	(2.0 ± 2.1) × 10 ⁻⁵ (1,4)	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ⁻⁵ (3)	(9 ± 16) × 10 ⁻⁶ (1,4)	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

^(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,

5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV

4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV

6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and

3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

^(f) The stated uncertainty is the standard uncertainty. See reference 6.

GL-CEB-297-314c

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ^{242}Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	^{242}Pu decay corrections for half-life uncertainty of 0.22 %.	B	$< 10^{-10}$
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty ($k = 2$)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

GL-CED-297-314d

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

GL-CE0-297-314e

Standard Logbook

Serial ID: 2022 **Open/Reference Date:** 09 AUG 2017 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 18 JAN 2022 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18 JAN 2050 **Logbook Num :** GL-CED-297-314
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
Uncertainty : .255 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2022
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO3
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-314
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	07/18/2022		
Verification Date:	07/21/2022		
Expiration Date:	07/21/2023		
Primary Code:	2022-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.4148 g		
Density(g/mL):	1.0405	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.4148 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 42.3654 \text{ dpm/mL}$
$(5.4148 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0405 \text{ g/mL}) / (200 \text{ mL}) = 40.7183 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
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GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2022-A

v1.2

Analyst	MXS2
Verification Prep Date	7/21/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.2
Expiration Date	8/17/2022

Standard Information	
Isotope	Pu-242
Serial Number	2022-A
Isotope Half-life	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	42.3654
Amount of Std. (mL)	0.2
Standard Prep Date	7/18/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	7/21/2022	3.800	42.18
2	7/21/2022	3.760	41.74
3	7/21/2022	3.730	41.40

Mean Value = 3.763 41.773
Stdev = 0.035118846 0.389819189

Certificate Value* = 3.8167 pCi
Two sigma = 0.0702
10 % of Mean = 0.3763
Rule A (Pass/Fail) Pass
% Recovery 98.60%
Rule B (Pass/Fail) Pass
Expiration Date 7/21/2023

dpm/mL
42.3650
0.7796
4.1773
Pass
98.60%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2022-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. Added 0.1 mL of neodymium carrier and 3-4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

8/25/22

Runlogs

Instrument Run Log

Instrument Type: LSC

Batch ID: 2333140

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
597531001	SAMPLE	BV1	LSCPURPLE	NOV-05-22 12:22:46	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
597531002	SAMPLE	BV1	LSCPURPLE	NOV-05-22 13:24:32	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
597531003	SAMPLE	BV1	LSCPURPLE	NOV-05-22 14:26:19	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
597533001	SAMPLE	BV1	LSCPURPLE	NOV-05-22 15:28:04	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
597533002	SAMPLE	BV1	LSCPURPLE	NOV-05-22 16:29:51	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
597533003	SAMPLE	BV1	LSCPURPLE	NOV-05-22 17:31:39	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
597533004	SAMPLE	BV1	LSCPURPLE	NOV-05-22 18:33:32	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
597533005	SAMPLE	BV1	LSCPURPLE	NOV-05-22 19:35:26	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
1205226001	MB	BV1	LSCPURPLE	NOV-05-22 20:37:19	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
1205226002	LCS	BV1	LSCPURPLE	NOV-05-22 21:39:05	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00
1205226003	LCSD	BV1	LSCPURPLE	NOV-05-22 22:40:52	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	01-FEB-22 00:00



January 30, 2023

Ms. Candace Christensen
Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607

Re: Project # 080153.007 Air Monitoring at SSFL
Work Order: 606487

Dear Ms. Christensen:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on January 10, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4422.

Sincerely,

Jake Crook
Project Manager

Purchase Order: 8-00000942
Chain of Custody: 01092023-1
Enclosures



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Case Narrative

**Receipt Narrative
for
North Wind Solutions
SDG: 606487**

January 30, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on January 10, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
606487001	A-3-RMHF-2022-Qtr-4
606487002	A-2-Area 20-2022-Qtr-4
606487003	Blank-2022-2022-Qtr-4

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Jake Crook
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: <u>NORW</u>		SDG/AR/COC/Work Order: <u>1110/2 gnd 606487/606488</u>	
Received By: <u>gnd</u>		Date Received: <u>1/10/23</u>	
Carrier and Tracking Number		Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other	
Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		☒	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		☒	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		☒	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM/mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		☒	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		☒	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:
Sample Receipt Criteria		Yes	NA
1	Shipping containers received intact and sealed?	☒	☒
2	Chain of custody documents included with shipment?	☒	☒
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	☒	☒
4	Daily check performed and passed on IR temperature gun?	☒	☒
5	Sample containers intact and sealed?	☒	☒
6	Samples requiring chemical preservation at proper pH?	☒	☒
7	Do any samples require Volatile Analysis?	☒	☒
8	Samples received within holding time?	☒	☒
9	Sample ID's on COC match ID's on bottles?	☒	☒
10	Date & time on COC match date & time on bottles?	☒	☒
11	Number of containers received match number indicated on COC?	☒	☒
12	Are sample containers identifiable as GEL provided by use of GEL labels?	☒	☒
13	COC form is properly signed in relinquished/received sections?	☒	☒
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials [Signature] Date 1/13/23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 30 January 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
North Wind Solutions
SDG #: 606487**

Product: Alphaspec Am241, Filter

Analytical Method: DOE EML HASL-300, Am-05-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2368289

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606487001	A-3-RMHF-2022-Qtr4
606487002	A-2-Area 20-2022-Qtr4
606487003	Blank-2022-2022-Qtr4
1205293606	Method Blank (MB)
1205293607	Laboratory Control Sample (LCS)
1205293608	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec Pu, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2368291

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606487001	A-3-RMHF-2022-Qtr4
606487002	A-2-Area 20-2022-Qtr4
606487003	Blank-2022-2022-Qtr4

1205293621	Method Blank (MB)
1205293622	Laboratory Control Sample (LCS)
1205293623	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec U, Filter

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2368293

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606487001	A-3-RMHF-2022-Qtr4
606487002	A-2-Area 20-2022-Qtr4
606487003	Blank-2022-2022-Qtr4
1205293627	Method Blank (MB)
1205293628	Laboratory Control Sample (LCS)
1205293629	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec Th, Filter

Analytical Method: DOE EML HASL-300, Th-01-RC Modified

Analytical Procedure: GL-RAD-A-038 REV# 18

Analytical Batch: 2368294

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606487001	A-3-RMHF-2022-Qtr4
606487002	A-2-Area 20-2022-Qtr4
606487003	Blank-2022-2022-Qtr4
1205293630	Method Blank (MB)
1205293631	Laboratory Control Sample (LCS)
1205293632	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Manual Integration

Manual integration of alpha spectroscopy spectra 1205293630 (MB) was performed to fully separate counts in Regions of Interest which would have been biased.

Product: Alphaspec Po210, Filter

Analytical Method: DOE EML HASL-300, Po-01-RC Modified

Analytical Procedure: GL-RAD-A-016 REV# 19

Analytical Batch: 2368295

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606487001	A-3-RMHF-2022-Qtr4
606487002	A-2-Area 20-2022-Qtr4
606487003	Blank-2022-2022-Qtr4
1205293634	Method Blank (MB)
1205293635	Laboratory Control Sample (LCS)
1205293636	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where

applicable, with the following exceptions.

Miscellaneous Information

Manual Integration

Manual integration of alpha spectroscopy spectra 606487001 (A-3-RMHF-2022-Qtr4) was performed to fully separate counts in Regions of Interest which would have been biased.

Additional Comments

Sample 606487001 (A-3-RMHF-2022-Qtr4) did not meet the resolution requirement of having a full width half maximum of 100 keV or less for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest. The tracer peak centroid for samples 606487001 (A-3-RMHF-2022-Qtr4), 606487002 (A-2-Area 20-2022-Qtr4) and 606487003 (Blank-2022-2022-Qtr4) are greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peaks are within the tracer region of interest.

Product: Gammaspec, Gamma, Filter

Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R

Analytical Procedure: GL-RAD-A-013 REV# 27

Analytical Batch: 2367950

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606487001	A-3-RMHF-2022-Qtr4
606487002	A-2-Area 20-2022-Qtr4
606487003	Blank-2022-2022-Qtr4
1205292906	Method Blank (MB)
1205292907	606487002(A-2-Area 20-2022-Qtr4) Sample Duplicate (DUP)
1205292908	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Qualifier Information

Qualifier	Reason	Analyte	Sample	Client Sample
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UI Results are considered a false
positive due to no valid peak. Cesium-137 606487003 Blank-2022-2022-Qtr4

Product: GFPC, Sr90, Filter

Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified

Analytical Procedure: GL-RAD-A-004 REV# 22

Analytical Batch: 2368082

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606487001	A-3-RMHF-2022-Qtr4
606487002	A-2-Area 20-2022-Qtr4
606487003	Blank-2022-2022-Qtr4
1205293194	Method Blank (MB)
1205293195	Laboratory Control Sample (LCS)
1205293196	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Samples 1205293195 (LCS) and 1205293196 (LCSD) were recounted due to high recovery. The recounts are reported. Samples 606487001 (A-3-RMHF-2022-Qtr4) and 606487002 (A-2-Area 20-2022-Qtr4) were recounted due to a suspected false positive. The recounts are reported.

Product: Liquid Scint Pu241, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-035 REV# 24

Analytical Batch: 2368292

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606487001	A-3-RMHF-2022-Qtr4
606487002	A-2-Area 20-2022-Qtr4
606487003	Blank-2022-2022-Qtr4
1205293624	Method Blank (MB)
1205293625	Laboratory Control Sample (LCS)
1205293626	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205293624 (MB)	Plutonium-241	Result -31.2 < MDA 67.8 > RDL 5 pCi/Sample

Samples (See Below) did not meet the detection limits due to limited sample volume.

Sample	Analyte	Value
606487001 (A-3-RMHF-2022-Qtr4)	Plutonium-241	Result -12.6 < MDA 60.4 > RDL 5 pCi/Sample
606487002 (A-2-Area 20-2022-Qtr4)	Plutonium-241	Result 0.681 < MDA 65.9 > RDL 5 pCi/Sample
606487003 (Blank-2022-2022-Qtr4)	Plutonium-241	Result -12.3 < MDA 68.5 > RDL 5 pCi/Sample

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Prep Logbook

The Preparation of Special Matrices for the Determination of Radionuclides

Batch ID: 2367521

Analyst: Christine Carter (CXC1)

Method: Filter Prep

Lab SOP: GL-RAD-A-026 REV# 18

Instrument: NONE

SP-15750050

Due Dates for Lab: 22-JAN-2023

Package: 24-JAN-2023

SDG: 24-JAN-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
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#	Sample ID	Prep Date	Min RDL ()	Number of Filters	Container Wt (g)	Weight of total filter with container (g)	Weight of filter Diluted with container (g)	Not Saved Final Volume of filter diluted to in Liters (mL)	Total Filter Weight (g)	Weight of Filter Diluted (g)
1	606487001	16-JAN-2023		1	82.818	85.011	84.459	200	2.193	1.641
2	606487002	16-JAN-2023		1	83.452	85.66	85.084	200	2.208	1.632
3	606487003	16-JAN-2023		1	81.587	83.767	83.222	200	2.18	1.635
4	606488001	16-JAN-2023		1	79.891	83.366	82.549	200	3.475	2.658
5	606488002	16-JAN-2023		1	83.433	86.898	86.022	200	3.465	2.589
6	606488003	16-JAN-2023		1	82.547	86.013	85.036	200	3.466	2.489
7	606488004	16-JAN-2023		1	82.118	85.587	84.681	200	3.469	2.563
8	606488005	16-JAN-2023		1	84.439	87.808	86.887	200	3.369	2.448
9	1205292390 MFB	16-JAN-2023		1	0	1	1	200	1	1

Reagent/Solvent Lot ID	Description	Amount	Comments:
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GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

NORW002 North Wind Solutions

Client SDG: 606487 GEL Work Order: 606487

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- * A quality control analyte recovery is outside of specified acceptance criteria
- UI Gamma Spectroscopy--Uncertain identification
- ** Analyte is a Tracer compound

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Kate Gellatly

Date: 06 FEB 2023

Title: Analyst I

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: February 6, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-3-RMHF-2022-Qtr4
Sample ID: 606487001
Matrix: Filter
Collect Date: 26-DEC-22 07:15
Receive Date: 10-JAN-23
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0727	+/-0.200	0.347	1.00	pCi/Sample		EJ1	01/23/23	1136	2368289		1
Alphaspec Po210, Filter "As Received"													
Polonium-210		7.98	+/-1.79	0.570	0.500	pCi/Sample		BV1	01/19/23	1619	2368295		2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	-0.0279	+/-0.242	0.539	1.00	pCi/Sample		EJ1	01/23/23	1136	2368291		3
Plutonium-239/240	U	0.102	+/-0.202	0.328	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.251	+/-0.378	0.590	1.00	pCi/Sample		EJ1	01/22/23	1850	2368294		4
Thorium-230		0.718	+/-0.528	0.605	1.00	pCi/Sample							
Thorium-232		0.583	+/-0.436	0.300	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		0.923	+/-0.566	0.539	1.00	pCi/Sample		EJ1	01/23/23	1019	2368293		5
Uranium-235/236	U	0.252	+/-0.364	0.438	1.00	pCi/Sample							
Uranium-238		0.666	+/-0.460	0.222	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	-12.6	+/-34.8	60.4	5.00	pCi/Sample		EJ1	01/24/23	2026	2368292		6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	34.3	+/-30.5	44.2		pCi/Sample		MXR1	01/19/23	1520	2367950		7
Beryllium-7	U	68.5	+/-80.6	87.0		pCi/Sample							
Cesium-137	U	-2.26	+/-4.13	7.54	20.0	pCi/Sample							
Cobalt-60	U	2.97	+/-5.09	11.2		pCi/Sample							
Potassium-40	U	12.2	+/-69.9	145		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	0.549	+/-1.58	2.88	3.00	pCi/Sample		ST2	01/26/23	0947	2368082		8

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	01/16/23	0741	2367521

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: February 6, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-3-RMHF-2022-Qtr4
Sample ID: 606487001
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			89.3	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			75.9	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			100	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			88.6	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			86.2	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			100	(15%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			65.4	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: February 6, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-2-Area 20-2022-Qtr4
Sample ID: 606487002
Matrix: Filter
Collect Date: 26-DEC-22 07:23
Receive Date: 10-JAN-23
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0588	+/-0.165	0.177	1.00	pCi/Sample		EJ1	01/23/23	1136	2368289		1
Alphaspec Po210, Filter "As Received"													
Polonium-210		12.9	+/-2.39	0.548	0.500	pCi/Sample		BV1	01/19/23	1619	2368295		2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	-0.473	+/-0.310	0.888	1.00	pCi/Sample		EJ1	01/23/23	1136	2368291		3
Plutonium-239/240	U	0.0869	+/-0.229	0.412	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.489	+/-0.457	0.536	1.00	pCi/Sample		EJ1	01/22/23	1850	2368294		4
Thorium-230	U	0.0211	+/-0.273	0.585	1.00	pCi/Sample							
Thorium-232		0.544	+/-0.438	0.318	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.570	+/-0.545	0.730	1.00	pCi/Sample		EJ1	01/23/23	1019	2368293		5
Uranium-235/236	U	0.187	+/-0.368	0.510	1.00	pCi/Sample							
Uranium-238	U	0.368	+/-0.421	0.526	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	0.681	+/-38.3	65.9	5.00	pCi/Sample		EJ1	01/24/23	2057	2368292		6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	1.58	+/-21.4	27.4		pCi/Sample		MXR1	01/19/23	1521	2367950		7
Beryllium-7		156	+/-71.4	67.1		pCi/Sample							
Cesium-137	U	0.276	+/-3.60	6.65	20.0	pCi/Sample							
Cobalt-60	U	-0.923	+/-3.73	7.03		pCi/Sample							
Potassium-40	U	12.2	+/-87.5	70.9		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	1.84	+/-1.77	2.89	3.00	pCi/Sample		ST2	01/28/23	0910	2368082		8

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	01/16/23	0741	2367521

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: February 6, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: A-2-Area 20-2022-Qtr4
Sample ID: 606487002
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			84.5	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			65.9	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			92.6	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			79.6	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			75.2	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			92.6	(15%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			75.8	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: February 6, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: Blank-2022-2022-Qtr4
Sample ID: 606487003
Matrix: Filter
Collect Date: 26-DEC-22 09:00
Receive Date: 10-JAN-23
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.000	+/-0.114	0.169	1.00	pCi/Sample		EJ1	01/23/23	1136	2368289		1
Alphaspec Po210, Filter "As Received"													
Polonium-210		0.438	+/-0.483	0.329	0.500	pCi/Sample		BV1	01/19/23	1619	2368295		2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.257	+/-0.419	0.715	1.00	pCi/Sample		EJ1	01/23/23	1136	2368291		3
Plutonium-239/240	U	0.0194	+/-0.221	0.470	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228		0.683	+/-0.498	0.500	1.00	pCi/Sample		EJ1	01/22/23	1850	2368294		4
Thorium-230	U	0.273	+/-0.389	0.603	1.00	pCi/Sample							
Thorium-232	U	0.380	+/-0.387	0.462	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	-0.0387	+/-0.220	0.547	1.00	pCi/Sample		EJ1	01/23/23	1019	2368293		5
Uranium-235/236	U	0.0930	+/-0.262	0.279	1.00	pCi/Sample							
Uranium-238		0.659	+/-0.469	0.361	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	-12.3	+/-39.5	68.5	5.00	pCi/Sample		EJ1	01/24/23	2128	2368292		6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-24.5	+/-22.7	36.8		pCi/Sample		MXR1	01/19/23	1521	2367950		7
Beryllium-7	U	0.511	+/-44.1	86.4		pCi/Sample							
Cesium-137	UI	16.6	+/-6.84	8.90	20.0	pCi/Sample							
Cobalt-60	U	3.31	+/-4.09	11.0		pCi/Sample							
Potassium-40	U	12.4	+/-81.8	172		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	-0.350	+/-1.27	2.20	3.00	pCi/Sample		ST2	01/25/23	1832	2368082		8

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	01/16/23	0741	2367521

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: February 6, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: Blank-2022-2022-Qtr4
Sample ID: 606487003
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			89.1	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			71.1	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			86	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			84.2	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			82.8	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			86	(15%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			83.7	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: February 6, 2023

Page 1 of 6

Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina
Ms. Candace Christensen

Contact:
Workorder: 606487

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2368289										
QC1205293607	LCS			15.2 pCi/Sample			89	(75%-125%)	EJ1	01/23/23	11:41
Americium-241	17.0			+/-1.80							
	Uncertainty										
QC1205293608	LCSD			15.5 pCi/Sample		2.41	91.2	(0%-20%)		01/23/23	11:41
Americium-241	17.0			+/-1.66							
	Uncertainty										
QC1205293606	MB		U	0.0516 pCi/Sample						01/23/23	11:36
Americium-241				+/-0.145							
	Uncertainty										
Batch	2368291										
QC1205293622	LCS		U	0.148 pCi/Sample					EJ1	01/23/23	11:36
Plutonium-238				+/-0.214							
	Uncertainty										
Plutonium-239/240	17.7			18.1 pCi/Sample			102	(75%-125%)			
	Uncertainty			+/-1.94							
QC1205293623	LCSD		U	0.0424 pCi/Sample		0				01/23/23	11:36
Plutonium-238				+/-0.159							
	Uncertainty										
Plutonium-239/240	17.7			16.8 pCi/Sample		7.25	94.7	(0%-20%)			
	Uncertainty			+/-1.90							
QC1205293621	MB		U	0.0933 pCi/Sample						01/23/23	11:36
Plutonium-238				+/-0.246							
	Uncertainty										
Plutonium-239/240			U	-0.0574 pCi/Sample							
	Uncertainty			+/-0.133							
Batch	2368292										
QC1205293625	LCS			1280 pCi/Sample			106	(75%-125%)	EJ1	01/25/23	01:03
Plutonium-241	1200			+/-62.1							
	Uncertainty										
QC1205293626	LCSD			1240 pCi/Sample		3.31	103	(0%-20%)		01/25/23	01:34
Plutonium-241	1200			+/-61.3							
	Uncertainty										

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QC Summary

Workorder: 606487

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2368292										
QC1205293624	MB										
Plutonium-241			U	-31.2 pCi/Sample					EJ1	01/25/23	00:32
	Uncertainty			+/-38.7							
Batch	2368293										
QC1205293628	LCS										
Uranium-233/234				25.7 pCi/Sample					EJ1	01/23/23	10:21
	Uncertainty			+/-2.69							
Uranium-235/236				1.43 pCi/Sample							
	Uncertainty			+/-0.725							
Uranium-238	24.2			25.8 pCi/Sample			107	(75%-125%)			
	Uncertainty			+/-2.69							
QC1205293629	LCSD										
Uranium-233/234				22.5 pCi/Sample		13.4				01/23/23	10:02
	Uncertainty			+/-2.22							
Uranium-235/236				1.24 pCi/Sample		14.3					
	Uncertainty			+/-0.599							
Uranium-238	24.2			24.5 pCi/Sample		5.16	101	(0%-20%)			
	Uncertainty			+/-2.31							
QC1205293627	MB										
Uranium-233/234			U	0.0664 pCi/Sample						01/23/23	10:21
	Uncertainty			+/-0.313							
Uranium-235/236			U	-0.0201 pCi/Sample							
	Uncertainty			+/-0.173							
Uranium-238			U	0.119 pCi/Sample							
	Uncertainty			+/-0.234							
Batch	2368294										
QC1205293631	LCS										
Thorium-228				19.2 pCi/Sample					EJ1	01/23/23	10:06
	Uncertainty			+/-2.47							
Thorium-230				2.72 pCi/Sample				(75%-125%)			
	Uncertainty			+/-0.964							
Thorium-232	17.1			21.0 pCi/Sample			122	(75%-125%)			
	Uncertainty			+/-2.58							

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QC Summary

Workorder: 606487

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2368294										
QC1205293632	LCSD										
Thorium-228				15.1 pCi/Sample		23.4			EJ1	01/23/23	10:06
	Uncertainty			+/-1.90							
Thorium-230				2.66 pCi/Sample		2.16		(0%-20%)			
	Uncertainty			+/-0.820							
Thorium-232	17.1			17.8 pCi/Sample		16.2	104	(0%-20%)			
	Uncertainty			+/-2.06							
QC1205293630	MB										
Thorium-228			U	-0.0511 pCi/Sample						01/23/23	10:06
	Uncertainty			+/-0.184							
Thorium-230			U	0.187 pCi/Sample							
	Uncertainty			+/-0.390							
Thorium-232			U	0.167 pCi/Sample							
	Uncertainty			+/-0.299							
Batch	2368295										
QC1205293635	LCS										
Polonium-210	13.5			13.2 pCi/Sample			97.9	(75%-125%)	BV1	01/19/23	16:20
	Uncertainty			+/-2.18							
QC1205293636	LCSD										
Polonium-210	13.5			13.3 pCi/Sample		0.297	98.2	(0%-20%)		01/19/23	16:20
	Uncertainty			+/-2.31							
QC1205293634	MB										
Polonium-210			U	0.245 pCi/Sample						01/19/23	16:20
	Uncertainty			+/-0.390							
Rad Gamma Spec											
Batch	2367950										
QC1205292907	606487002	DUP									
Actinium-228	U	1.58	U	-16.2 pCi/Sample		N/A			N/A	MXR1	01/19/23 17:31
	Uncertainty	+/-21.4		+/-24.6							
Beryllium-7		156		156 pCi/Sample		0		(0% - 100%)			
	Uncertainty	+/-71.4		+/-79.9							
Cesium-137	U	0.276	U	1.37 pCi/Sample		N/A			N/A		
	Uncertainty	+/-3.60		+/-7.38							

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QC Summary

Workorder: 606487

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	2367950										
Cobalt-60	U	-0.923	U	-0.118	pCi/Sample	N/A		N/A	MXR1	01/19/23	17:31
	Uncertainty	+/-3.73		+/-3.47							
Potassium-40	U	12.2	U	3.49	pCi/Sample	N/A		N/A			
	Uncertainty	+/-87.5		+/-89.0							
QC1205292908	LCS										
Americium-241	74500			84300	pCi/Sample		113	(75%-125%)		01/19/23	16:21
	Uncertainty			+/-2020							
Actinium-228			U	-29.2	pCi/Sample						
	Uncertainty			+/-278							
Beryllium-7			U	-133	pCi/Sample						
	Uncertainty			+/-679							
Cesium-137	22000			22900	pCi/Sample		104	(75%-125%)			
	Uncertainty			+/-494							
Cobalt-60	7930			8730	pCi/Sample		110	(75%-125%)			
	Uncertainty			+/-368							
Potassium-40			U	82.4	pCi/Sample						
	Uncertainty			+/-249							
QC1205292906	MB										
Actinium-228			U	-11.0	pCi/Sample					01/19/23	16:37
	Uncertainty			+/-20.0							
Beryllium-7			U	17.0	pCi/Sample						
	Uncertainty			+/-25.8							
Cesium-137			U	-0.831	pCi/Sample						
	Uncertainty			+/-4.27							
Cobalt-60			U	1.10	pCi/Sample						
	Uncertainty			+/-4.54							
Potassium-40			U	-39.7	pCi/Sample						
	Uncertainty			+/-57.8							
Rad Gas Flow											
Batch	2368082										
QC1205293195	LCS										
Strontium-90	201			222	pCi/Sample		111	(75%-125%)	ST2	01/26/23	09:47
	Uncertainty			+/-12.2							

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QC Summary

Workorder: 606487

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2368082										
QC1205293196	LCSD										
Strontium-90	201			224 pCi/Sample		0.819	111	(0%-20%)	ST2	01/26/23	09:47
	Uncertainty			+/-13.1							
QC1205293194	MB										
Strontium-90			U	-0.789 pCi/Sample						01/25/23	18:32
	Uncertainty			+/-1.16							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported
- UI Gamma Spectroscopy--Uncertain identification
- BD Results are either below the MDC or tracer recovery is low
- h Preparation or preservation holding time was exceeded
- R Sample results are rejected
- ^ RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
- N/A RPD or %Recovery limits do not apply.
- ND Analyte concentration is not detected above the detection limit
- M M if above MDC and less than LLD
- NJ Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- FA Failed analysis.
- UJ Gamma Spectroscopy--Uncertain identification
- Q One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- UL Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- N1 See case narrative
- Y Other specific qualifiers were required to properly define the results. Consult case narrative.
- ** Analyte is a Tracer compound
- M REMP Result > MDC/CL and < RDL
- J See case narrative for an explanation

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QC Summary

Workorder: 606487

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
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N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Alpha Spectroscopy Raw Data

Batch 2368293 Check-list

This check-list was completed on 23-JAN-23 by Melanie Aycock

This batch was reviewed by Jessica Davis on 23-JAN-23 and Melanie Aycock on 23-JAN-23.

Batch ID:
2368293

Product:
ASP__UUF

Description: Alpha Spec Uranium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Uranium

Batch ID: 2368293

Analyst: Evan Johnson (EJ1)

Method: DOE EML HASL-300, U-02-RC
Modified

Lab SOP: GL-RAD-A-011 REV# 28

Instrument: BAL-C236871727

Due Dates for Lab: 23-JAN-2023

Package: 24-JAN-2023

SDG: 24-JAN-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205293628	Uranium-238 AS SPIKE	1600-O	.1	mL
LCSD	1205293629	Uranium-238 AS SPIKE	1600-O	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	606487001	20-JAN-2023	1	30.3	0.11337
2	606487002	20-JAN-2023	1	30.45	0.11253
3	606487003	20-JAN-2023	1	30.13	0.11299
4	606488001	20-JAN-2023	1	30.35	0.11607
5	606488002	20-JAN-2023	1	30.3	0.1132
6	606488003	20-JAN-2023	1	30.15	0.10826
7	606488004	20-JAN-2023	1	30.41	0.11234
8	606488005	20-JAN-2023	1	30.03	0.1091
9	1205293627 MB	20-JAN-2023	1		0.11607
10	1205293628 LCS	20-JAN-2023	1		0.11607
11	1205293629 LCSD	20-JAN-2023	1		0.11607

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1564-EE	Uranium-232 AS TRACER	.1 ml	Pipet ID: R2-428724 Pu-236 Tracer Used: No Analyzed With: Am , Pu Data Entry Date2: 20-JAN-2023 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

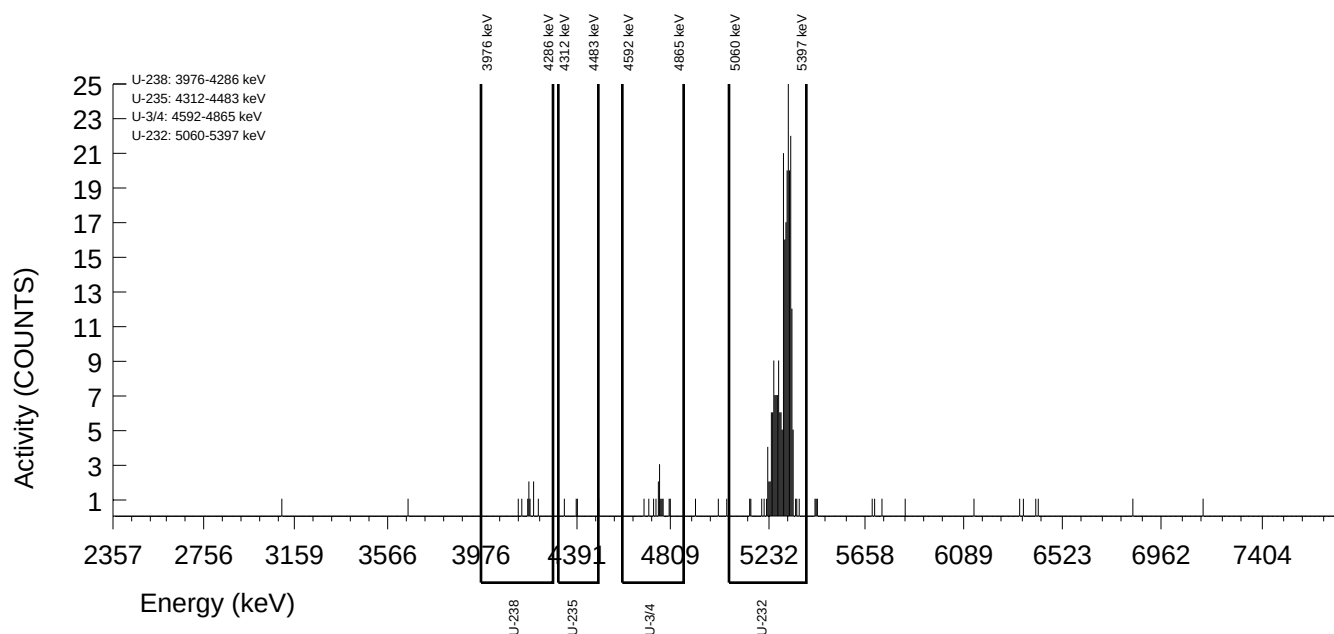
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368293 SAMPLE ID : S0606487001_UU SAMPLE QTY : 0.113 F +/-0.882 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 86.2 +/-7.232 %	CHAMBER : 113 DETECTOR S/N : 67598 AVERAGE %EFFICIENCY : 25.9742 AVERAGE %EFF ERROR : 0.5047 COUNT DATE : 23-Jan-2023 10:19:40 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B113.CNF;1841 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W113.CNF;491 CAL DATE : 12-Jan-2023
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4648E+00 dpm RESULTS : 3.8466E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5301.40	37.102	242.000	239.600	2.400	1.5492	100.000	1.77E+01	3.46E+00	6.42E-01	2.10E-01	2.27E+00
U-3/4	4763.02	4753.58	9.919	14.000	12.474	0.720	0.8485	100.000	9.23E-01	5.84E-01	5.39E-01	1.59E-01	5.66E-01
U-235	4391.00	4375.32	59.513	3.000	2.760	0.240	0.4899	80.900	2.52E-01	3.66E-01	4.38E-01	8.21E-02	3.64E-01
U-238	4184.73	4183.71	27.277	9.000	9.000	0.000	1.0000	100.000	6.66E-01	4.70E-01	2.22E-01	1.36E-01	4.60E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.806 +/-0.024)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

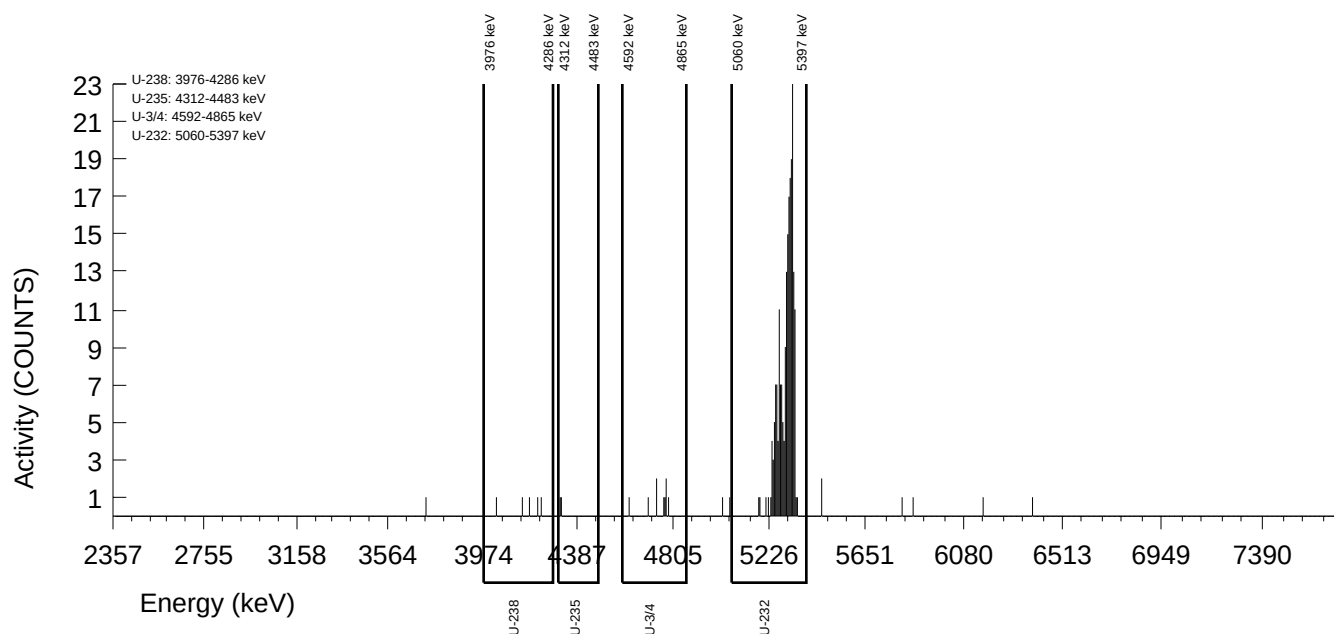
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368293 SAMPLE ID : S0606487002_UU SAMPLE QTY : 0.113 F +/-0.889 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 75.2 +/-7.662 %	CHAMBER : 114 DETECTOR S/N : 155766 AVERAGE %EFFICIENCY : 25.7616 AVERAGE %EFF ERROR : 0.5006 COUNT DATE : 23-Jan-2023 10:19:43 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B114.CNF;1849 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W114.CNF;518 CAL DATE : 12-Jan-2023
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4648E+00 dpm RESULTS : 3.3597E+00 dpm		

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
U-232	5302.10	5304.11	35.325	209.000	207.560	1.440	1.2000	100.000	1.79E+01	3.71E+00	6.37E-01	1.89E-01	2.45E+00	
U-3/4	4763.02	4742.14	44.621	9.000	6.622	1.680	1.2961	100.000	5.70E-01	5.54E-01	7.30E-01	2.36E-01	5.45E-01	
U-235	4391.00	4317.41	9.916	2.000	1.760	0.240	0.4899	80.900	1.87E-01	3.69E-01	5.10E-01	9.54E-02	3.68E-01	
U-238	4184.73	4162.58	193.358	5.000	4.280	0.720	0.8485	100.000	3.68E-01	4.25E-01	5.26E-01	1.34E-01	4.21E-01	

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.698 +/-0.021)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

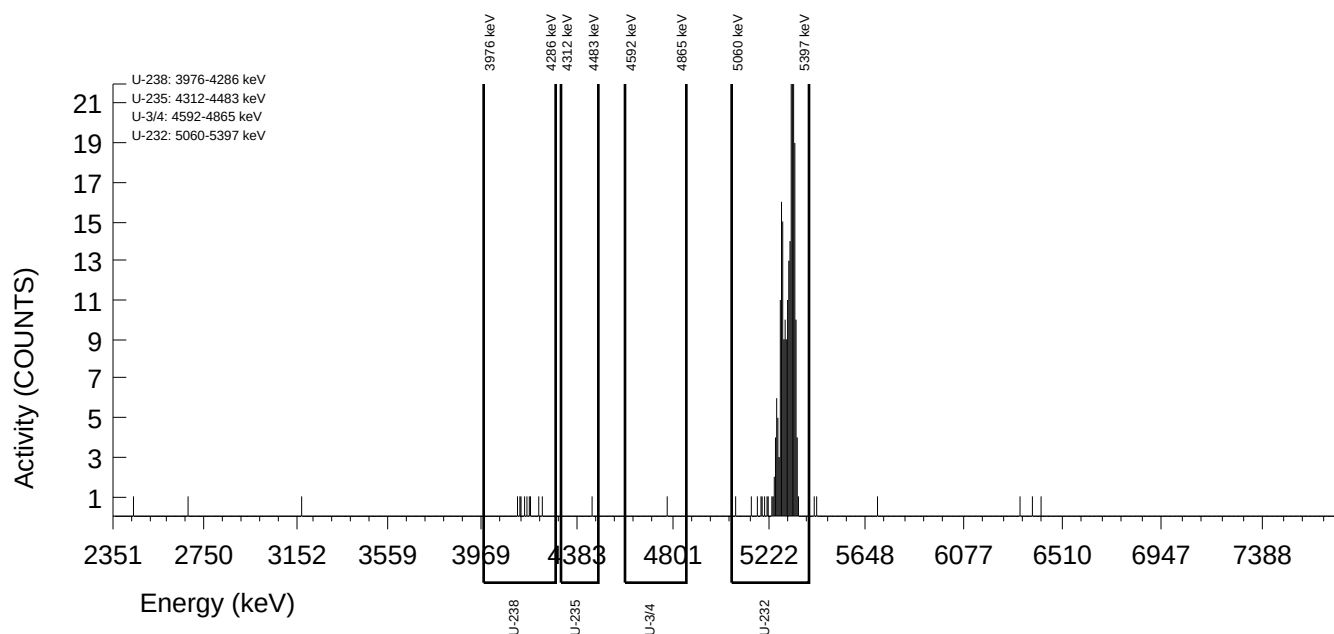
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368293 SAMPLE ID : S0606487003_UU SAMPLE QTY : 0.113 F +/-0.885 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 82.8 +/-7.262 %	CHAMBER : 117 DETECTOR S/N : 80003 AVERAGE %EFFICIENCY : 26.6587 AVERAGE %EFF ERROR : 0.5175 COUNT DATE : 23-Jan-2023 10:19:45 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B117.CNF;1836 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W117.CNF;479 CAL DATE : 12-Jan-2023
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4648E+00 dpm RESULTS : 3.6965E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5304.19	63.900	238.000	236.320	1.680	1.2961	100.000	1.78E+01	3.49E+00	5.84E-01	1.79E-01	2.28E+00
U-3/4	4763.02	4779.59	4.958	1.000	-0.515	0.720	0.8485	100.000	-3.87E-02	2.21E-01	5.47E-01	1.61E-01	2.20E-01
U-235	4391.00	4450.40	4.958	1.000	1.000	0.000	1.0000	80.900	9.30E-02	2.62E-01	2.79E-01	1.70E-01	2.62E-01
U-238	4184.73	4168.98	109.070	9.000	8.760	0.240	0.4899	100.000	6.59E-01	4.79E-01	3.61E-01	6.75E-02	4.69E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.795 +/-0.024)



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ALPHA SPECTROSCOPY REPORT

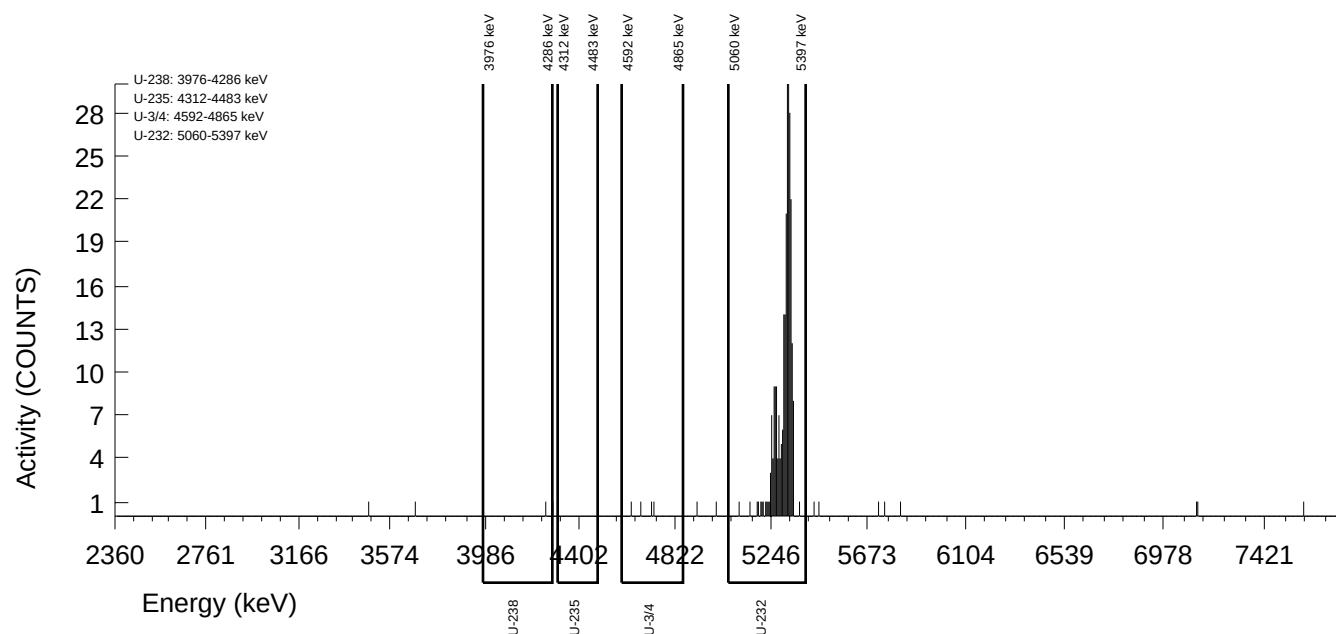
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368293 SAMPLE ID : S1205293627_UU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 93.3 +/-7.043 %	CHAMBER : 130 DETECTOR S/N : 101451 AVERAGE %EFFICIENCY : 25.6000 AVERAGE %EFF ERROR : 0.4976 COUNT DATE : 23-Jan-2023 10:21:26 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B130.CNF;606 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W130.CNF;92 CAL DATE : 12-Jan-2023
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4617E+00 dpm RESULTS : 4.1606E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5305.91	27.706	258.000	255.600	2.400	1.5492	100.000	1.73E+01	3.29E+00	5.88E-01	1.92E-01	2.14E+00
U-3/4	4763.02	4690.58	99.714	4.000	0.980	2.160	1.4697	100.000	6.64E-02	3.14E-01	6.22E-01	2.10E-01	3.13E-01
U-235	4391.00	4397.19	0.000	0.000	-0.240	0.240	0.4899	80.900	-2.01E-02	1.74E-01	4.01E-01	7.51E-02	1.73E-01
U-238	4184.73	4271.98	0.000	2.000	1.760	0.240	0.4899	100.000	1.19E-01	2.35E-01	3.25E-01	6.08E-02	2.34E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.860 +/-0.026)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

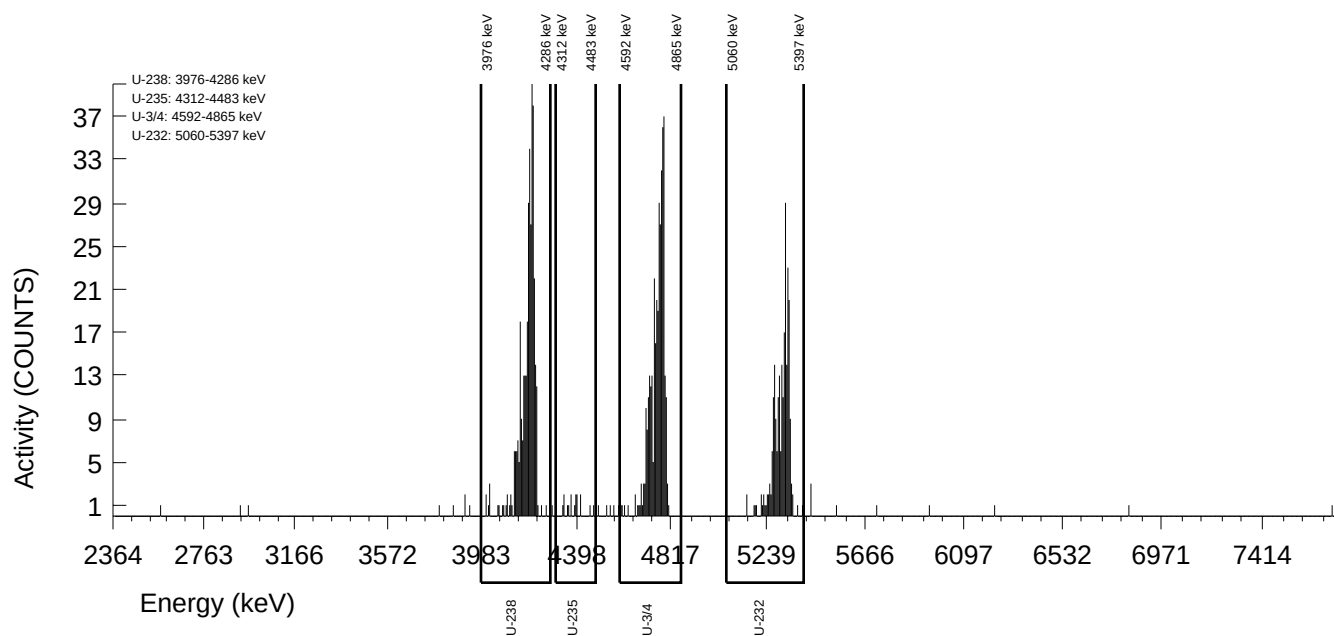
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368293 SAMPLE ID : S1205293628_UU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 85.8 +/-7.231 %	CHAMBER : 136 DETECTOR S/N : 140243 AVERAGE %EFFICIENCY : 26.0206 AVERAGE %EFF ERROR : 0.5055 COUNT DATE : 23-Jan-2023 10:21:30 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B136.CNF;446 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W136.CNF;89 CAL DATE : 12-Jan-2023
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4617E+00 dpm RESULTS : 3.8287E+00 dpm	LCS ID 1600-O NUCLIDE U-238 NOMINAL (pCi/F) 2.4221E+01 % RECOVERY 106.592	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5300.76	24.368	241.000	239.080	1.920	1.3856	100.000	1.73E+01	3.38E+00	5.85E-01	1.84E-01	2.21E+00
U-3/4	4763.02	4755.01	44.491	357.000	355.236	0.960	0.9798	100.000	2.57E+01	4.66E+00	5.54E-01	1.68E-01	2.69E+00
U-235	4391.00	4392.57	76.823	16.000	16.000	0.000	1.0000	80.900	1.43E+00	7.55E-01	2.69E-01	1.64E-01	7.25E-01
U-238	4184.73	4184.19	30.076	357.000	356.520	0.480	0.6928	100.000	2.58E+01	4.67E+00	4.01E-01	9.19E-02	2.69E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.804 +/-0.024)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

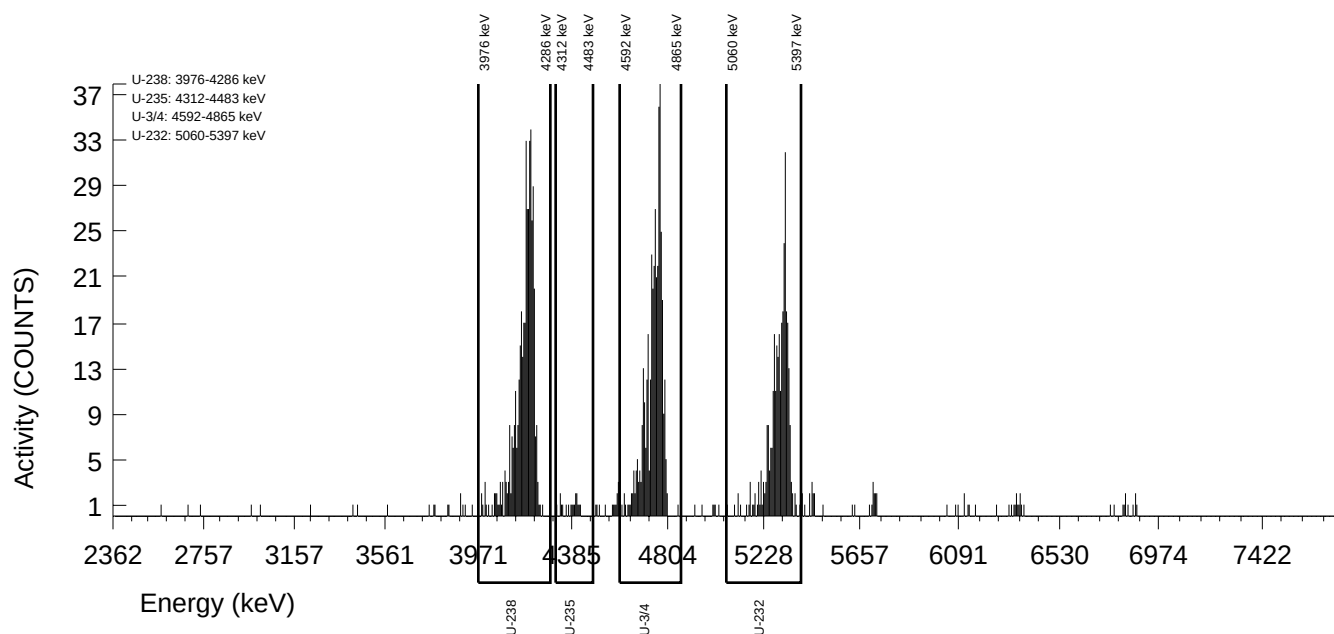
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368293 SAMPLE ID : S1205293629_UU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 91.6 +/-6.603 %	CHAMBER : 024 DETECTOR S/N : 57490 AVERAGE %EFFICIENCY : 31.2491 AVERAGE %EFF ERROR : 0.6042 COUNT DATE : 23-Jan-2023 10:02:48 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B024.CNF;2507 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W024.CNF;693 CAL DATE : 06-Jan-2023
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4617E+00 dpm RESULTS : 4.0848E+00 dpm	LCSD ID 1600-O NUCLIDE U-238 NOMINAL (pCi/F) 2.4221E+01 % RECOVERY 101.228	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5293.88	26.559	314.000	306.320	7.680	2.7713	100.000	1.73E+01	3.07E+00	7.43E-01	2.87E-01	1.97E+00
U-3/4	4763.02	4744.41	45.911	399.000	397.970	0.000	1.0000	100.000	2.25E+01	3.78E+00	3.58E-01	1.40E-01	2.22E+00
U-235	4391.00	4378.20	75.998	18.000	17.760	0.240	0.4899	80.900	1.24E+00	6.22E-01	3.35E-01	6.27E-02	5.99E-01
U-238	4184.73	4173.13	56.700	435.000	433.800	1.200	1.0954	100.000	2.45E+01	4.06E+00	3.96E-01	1.13E-01	2.31E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (1.030 +/-0.031)



Batch 2368294 Check-list

This check-list was completed on 23-JAN-23 by Melanie Aycock

This batch was reviewed by Jessica Davis on 23-JAN-23 and Melanie Aycock on 23-JAN-23.

Batch ID:
2368294

Product:
ASP__THF

Description: Alpha Spec Thorium
GL-RAD-A-038

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?	Yes		
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Thorium

Batch ID: 2368294

Analyst: Evan Johnson (EJ1)

Method: DOE EML HASL-300, Th-01-RC
Modified

Lab SOP: GL-RAD-A-038 REV# 18

Instrument: BAL-C236871727

Due Dates for Lab: 23-JAN-2023

Package: 24-JAN-2023

SDG: 24-JAN-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205293631	Thorium-232 AS SPIKE	1513-C	.1	mL
LCSD	1205293632	Thorium-232 AS SPIKE	1513-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	606487001	20-JAN-2023	1	30.06	0.11247
2	606487002	20-JAN-2023	1	30.18	0.11153
3	606487003	20-JAN-2023	1	30.12	0.11295
4	606488001	20-JAN-2023	1	30.31	0.11592
5	606488002	20-JAN-2023	1	30.19	0.11279
6	606488003	20-JAN-2023	1	30.12	0.10815
7	606488004	20-JAN-2023	1	30.29	0.1119
8	606488005	20-JAN-2023	1	30.24	0.10987
9	1205293630 MB	20-JAN-2023	1		0.11592
10	1205293631 LCS	20-JAN-2023	1		0.11592
11	1205293632 LCSD	20-JAN-2023	1		0.11592

Reagent/Solvent Lot ID

Description

Amount

Comments:

WORK 1845-G

Thorium-229 AS TRACER, RASP

.1 mL

Data Entry Date2: 20-JAN-2023 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

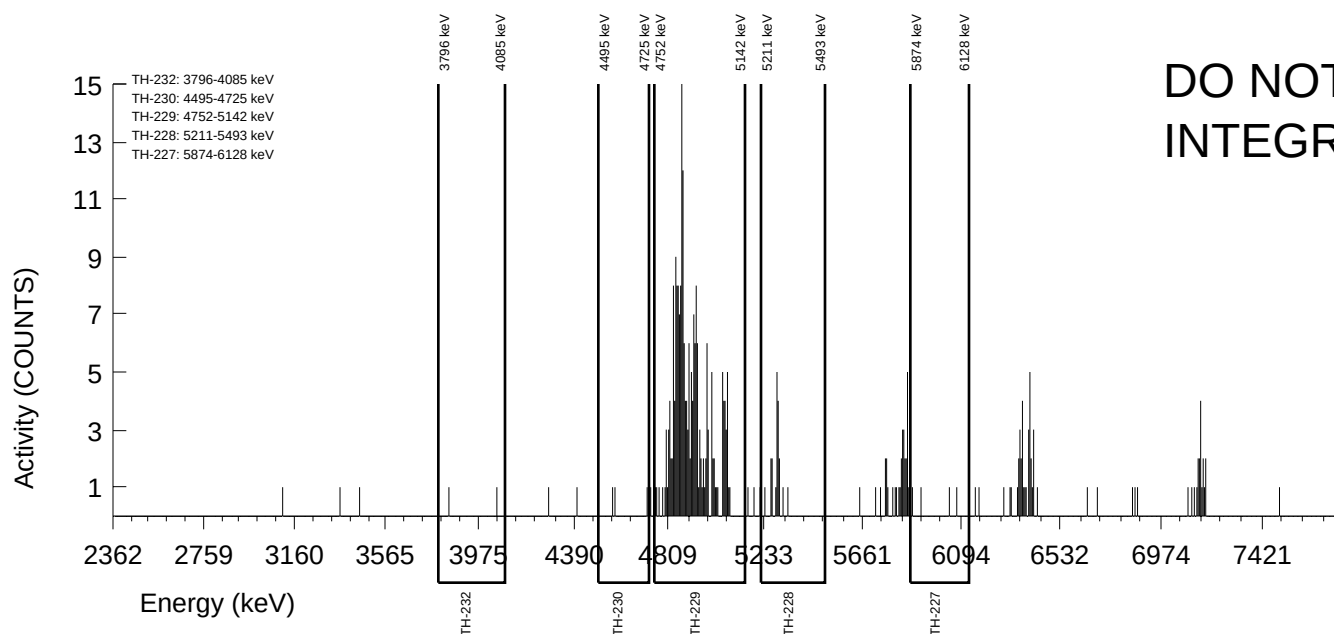
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2368294 SAMPLE ID : S1205293630_TH SAMPLE QTY : 0.116 F +/-0.863 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 68.8 +/-7.292 %	CHAMBER : 027 DETECTOR S/N : 140238 AVERAGE %EFFICIENCY : 33.9490 AVERAGE %EFF ERROR : 0.6551 COUNT DATE : 23-Jan-2023 10:06:21 ELAPSED LIVE TIME(SEC) : 11420.92	LIB FILE : TH BKG FILE : B027.CNF;2533 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W027.CNF;743 CAL DATE : 07-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8634E+00 dpm RESULTS : 3.3439E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5959.59	0.000	5.000	1.574	3.426	1.8510	57.440	2.73E-01	8.79E-01	1.67E+00	5.76E-01	8.78E-01
TH-228	5363.00	5277.60	11.698	21.000	20.228	0.761	0.8726	99.940	1.78E+00	8.53E-01	5.40E-01	1.38E-01	8.11E-01
TH-229	4900.00	4906.16	95.223	216.000	215.048	0.952	0.9756	99.520	1.89E+01	3.79E+00	5.71E-01	1.54E-01	2.54E+00
TH-230	4671.39	4643.49	0.000	4.000	2.135	0.571	0.7557	99.700	1.87E-01	3.93E-01	6.69E-01	2.03E-01	3.90E-01
TH-232	3972.00	3946.86	206.863	2.000	1.913	0.000	1.0000	100.000	1.67E-01	3.00E-01	3.47E-01	1.63E-01	2.99E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.011 +/-0.000)
TH-230 (1.294 +/-0.020)
TH-232 (0.087 +/-0.001)



DO NOT REPORT
INTEGRATED

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

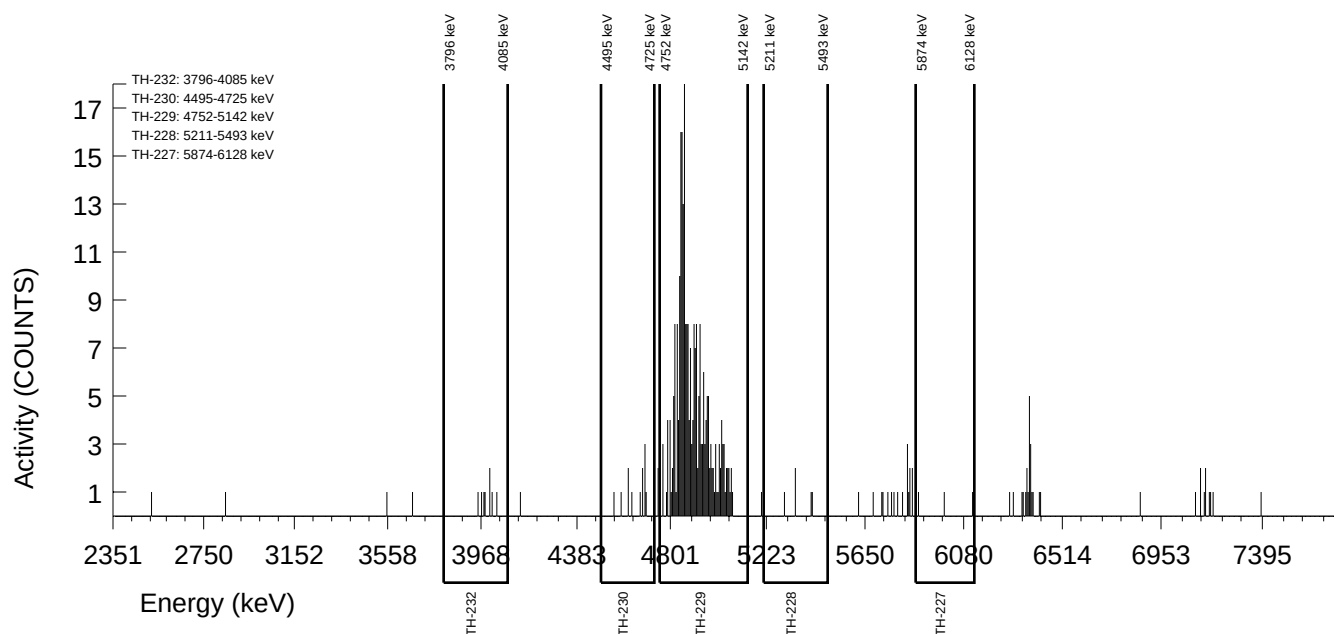
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2368294 SAMPLE ID : S0606487001_TH SAMPLE QTY : 0.112 F +/-0.889 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 88.6 +/-6.691 %	CHAMBER : 194 DETECTOR S/N : 140618 AVERAGE %EFFICIENCY : 25.5079 AVERAGE %EFF ERROR : 0.4959 COUNT DATE : 22-Jan-2023 18:50:42 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH BKG FILE : B194.CNF;1547 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W194.CNF;450 CAL DATE : 18-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8635E+00 dpm RESULTS : 4.3096E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	6002.66	222.875	3.000	2.280	0.720	0.8485	57.440	8.23E-01	1.46E+00	2.21E+00	5.61E-01	1.46E+00
TH-228	5363.00	5364.72	4.953	5.000	3.307	1.680	1.2961	99.940	2.51E-01	3.80E-01	5.90E-01	1.81E-01	3.78E-01
TH-229	4900.00	4893.81	25.094	264.000	262.560	1.440	1.2000	99.520	1.95E+01	3.58E+00	5.49E-01	1.63E-01	2.37E+00
TH-230	4671.39	4645.50	74.292	12.000	9.700	0.720	0.8485	99.700	7.18E-01	5.40E-01	6.05E-01	1.92E-01	5.28E-01
TH-232	3972.00	3992.97	4.953	8.000	7.894	0.000	1.0000	100.000	5.83E-01	4.43E-01	3.00E-01	1.41E-01	4.36E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.013 +/-0.000)
TH-230 (1.580 +/-0.024)
TH-232 (0.106 +/-0.002)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

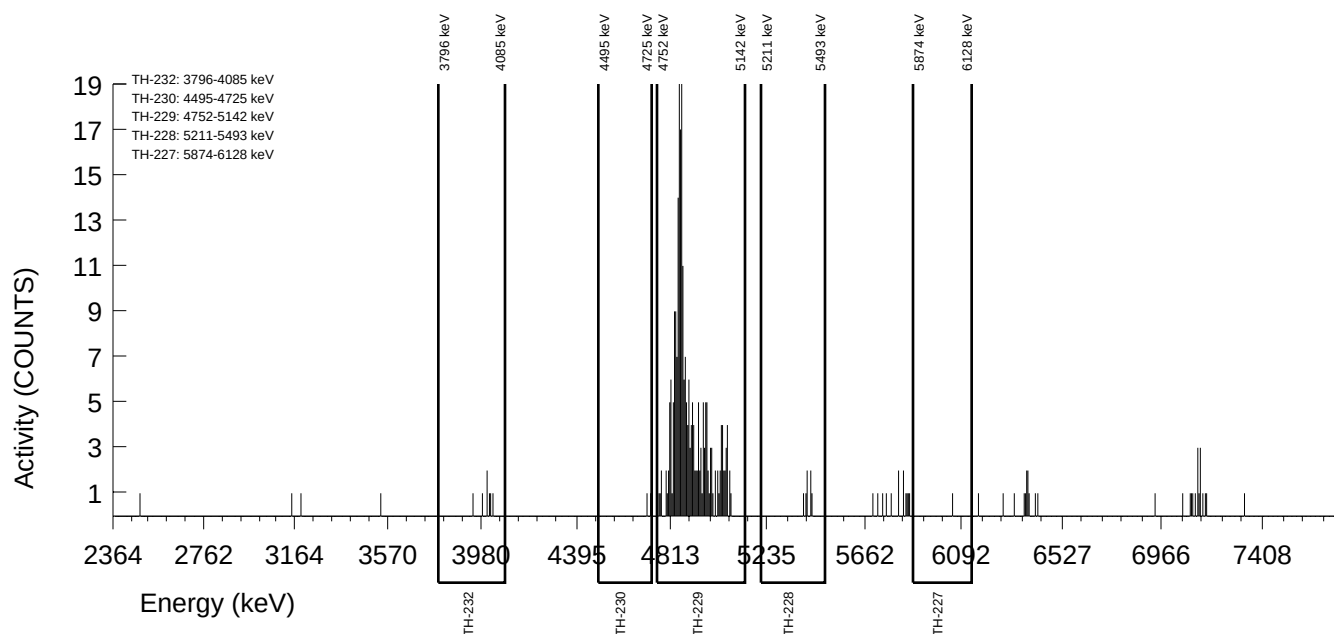
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2368294 SAMPLE ID : S0606487002_TH SAMPLE QTY : 0.112 F +/-0.897 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 79.6 +/-6.865 %	CHAMBER : 195 DETECTOR S/N : 140619 AVERAGE %EFFICIENCY : 26.8283 AVERAGE %EFF ERROR : 0.5208 COUNT DATE : 22-Jan-2023 18:50:44 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH BKG FILE : B195.CNF;1562 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W195.CNF;433 CAL DATE : 18-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8635E+00 dpm RESULTS : 3.8715E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	6049.23	4.951	1.000	1.000	0.000	1.0000	57.440	3.85E-01	1.09E+00	1.16E+00	7.06E-01	1.08E+00
TH-228	5363.00	5415.46	24.753	7.000	6.027	0.960	0.9798	99.940	4.89E-01	4.63E-01	5.36E-01	1.46E-01	4.57E-01
TH-229	4900.00	4893.38	24.470	250.000	248.080	1.920	1.3856	99.520	1.96E+01	3.70E+00	6.39E-01	2.01E-01	2.46E+00
TH-230	4671.39	4715.92	0.000	2.000	0.267	0.240	0.4899	99.700	2.11E-02	2.74E-01	5.85E-01	1.74E-01	2.73E-01
TH-232	3972.00	4001.68	4.951	7.000	6.900	0.000	1.0000	100.000	5.44E-01	4.45E-01	3.18E-01	1.50E-01	4.38E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.013 +/-0.000)
TH-230 (1.493 +/-0.023)
TH-232 (0.100 +/-0.002)



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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

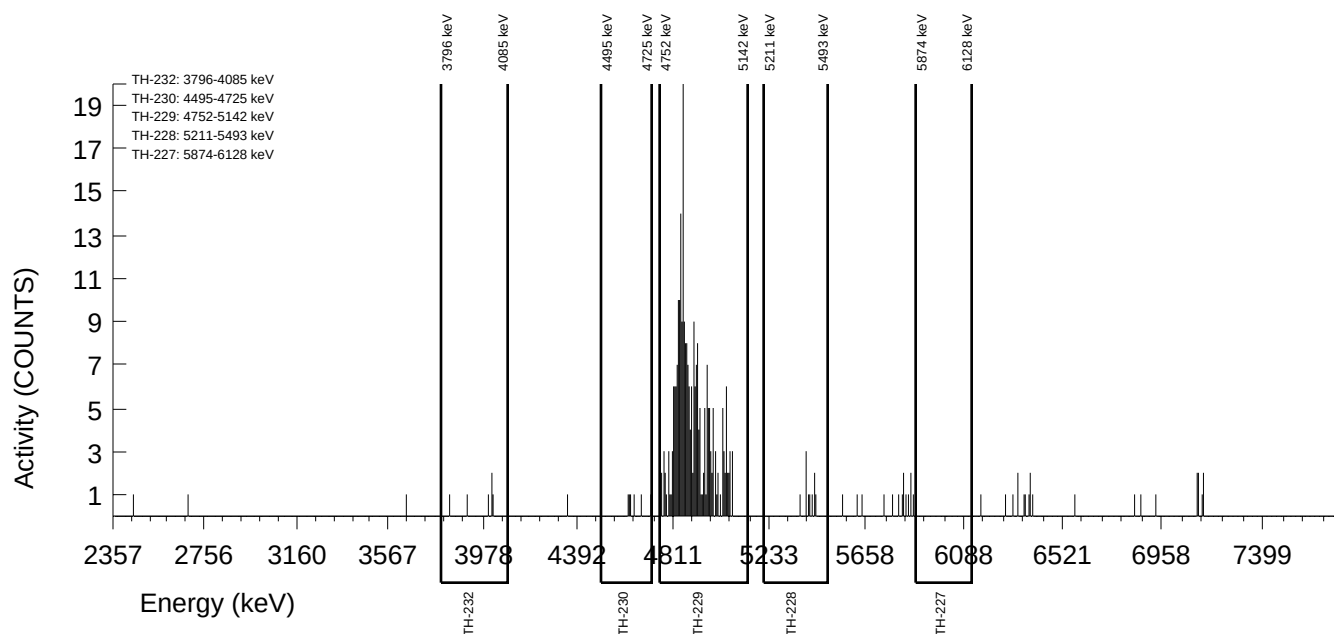
BATCH NUMBER : 2368294 SAMPLE ID : S0606487003_TH SAMPLE QTY : 0.113 F +/-0.885 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 84.2 +/-6.690 %	CHAMBER : 196 DETECTOR S/N : 140620 AVERAGE %EFFICIENCY : 26.8558 AVERAGE %EFF ERROR : 0.5213 COUNT DATE : 22-Jan-2023 18:50:47 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH BKG FILE : B196.CNF;1542 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W196.CNF;439 CAL DATE : 18-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8635E+00 dpm RESULTS : 4.0933E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	6000.77	0.000	0.000	-0.720	0.720	0.8485	57.440	-2.59E-01	7.83E-01	2.20E+00	5.59E-01	7.82E-01
TH-228	5363.00	5411.57	39.764	10.000	9.027	0.960	0.9798	99.940	6.83E-01	5.07E-01	5.00E-01	1.36E-01	4.98E-01
TH-229	4900.00	4898.48	19.430	264.000	262.560	1.440	1.2000	99.520	1.94E+01	3.56E+00	5.46E-01	1.62E-01	2.36E+00
TH-230	4671.39	4649.78	99.409	6.000	3.700	0.720	0.8485	99.700	2.73E-01	3.92E-01	6.03E-01	1.91E-01	3.89E-01
TH-232	3972.00	3968.23	7.456	6.000	5.174	0.720	0.8485	100.000	3.80E-01	3.91E-01	4.62E-01	1.21E-01	3.87E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.013 +/-0.000)
TH-230 (1.580 +/-0.024)
TH-232 (0.106 +/-0.002)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2368294 SAMPLE ID : S1205293630_TH SAMPLE QTY : 0.116 F +/-0.863 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 68.8 +/-7.292 %	CHAMBER : 027 DETECTOR S/N : 140238 AVERAGE %EFFICIENCY : 33.9490 AVERAGE %EFF ERROR : 0.6551 COUNT DATE : 23-Jan-2023 10:06:21 ELAPSED LIVE TIME(SEC) : 11420.92	LIB FILE : TH BKG FILE : B027.CNF;2533 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W027.CNF;743 CAL DATE : 07-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8634E+00 dpm RESULTS : 3.3439E+00 dpm		

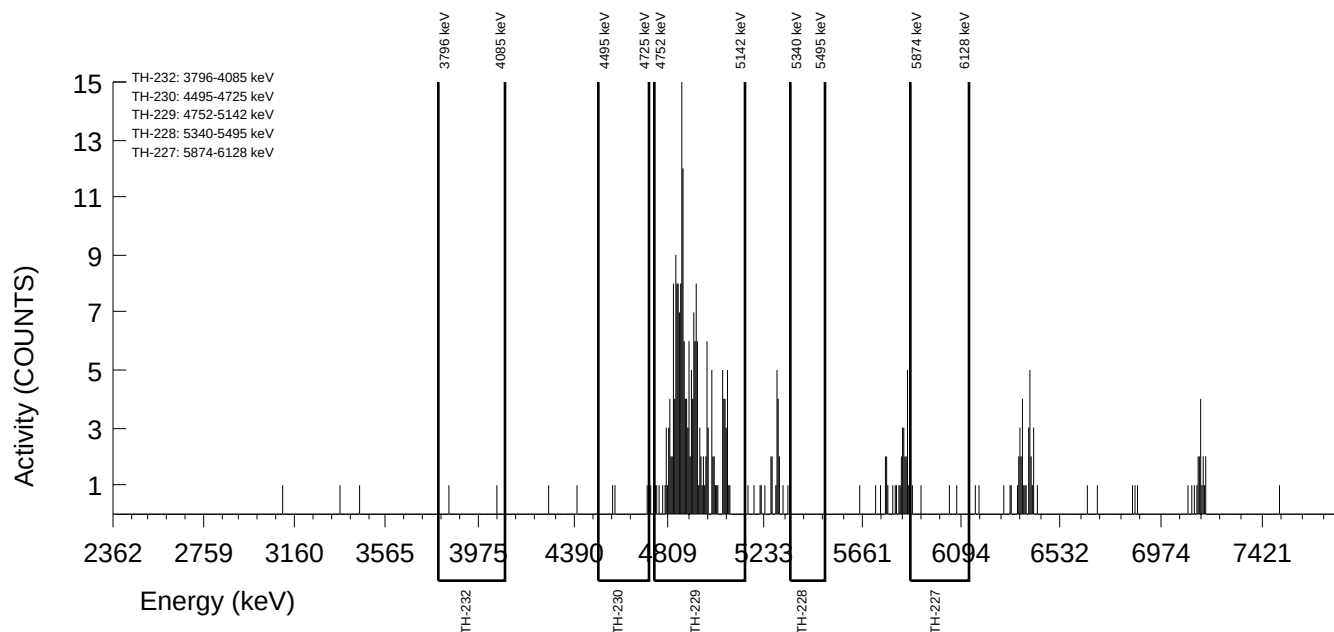
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5959.59	0.000	5.000	1.574	3.426	1.8510	57.440	2.73E-01	8.79E-01	1.67E+00	5.76E-01	8.78E-01
TH-228	5363.00	5417.12	0.000	0.000	-0.582	0.571	0.7557	99.940	-5.11E-02	1.85E-01	5.04E-01	1.20E-01	1.84E-01
TH-229	4900.00	4906.16	95.223	216.000	215.048	0.952	0.9756	99.520	1.89E+01	3.79E+00	5.71E-01	1.54E-01	2.54E+00
TH-230	4671.39	4643.49	0.000	4.000	2.135	0.571	0.7557	99.700	1.87E-01	3.93E-01	6.69E-01	2.03E-01	3.90E-01
TH-232	3972.00	3946.86	206.863	2.000	1.913	0.000	1.0000	100.000	1.67E-01	3.00E-01	3.47E-01	1.63E-01	2.99E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.011 +/-0.000)
TH-230 (1.294 +/-0.020)
TH-232 (0.087 +/-0.001)

* Regions have been manually adjusted



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ALPHA SPECTROSCOPY REPORT

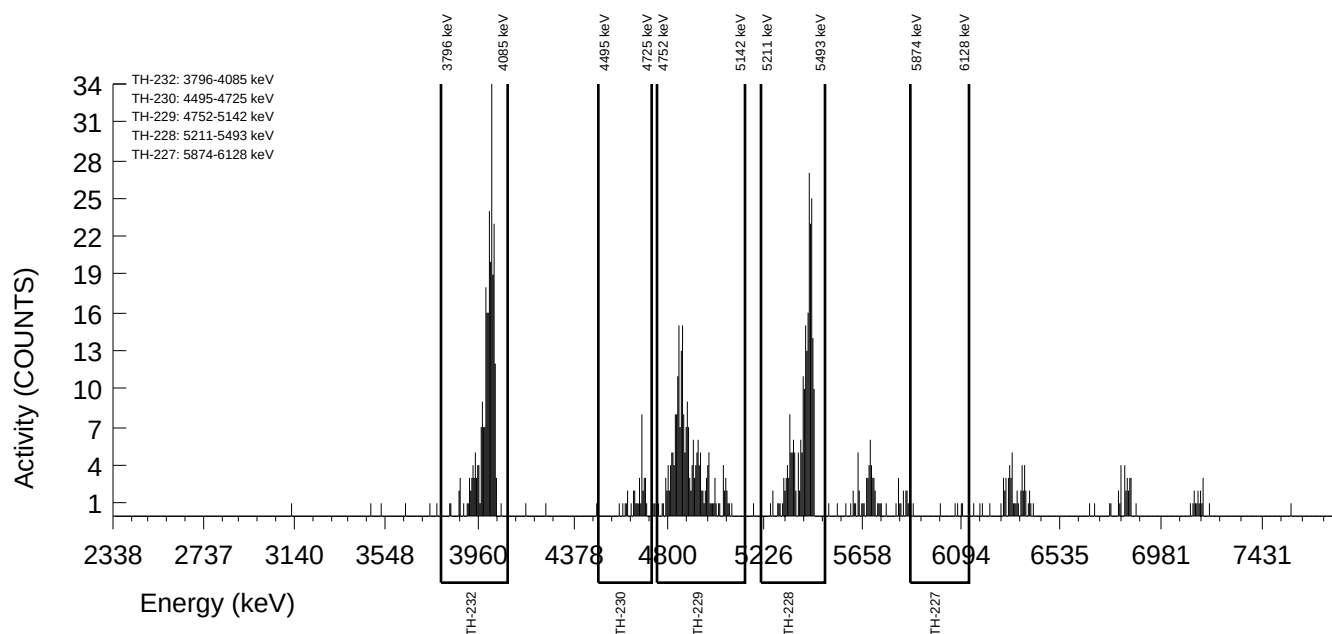
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2368294 SAMPLE ID : S1205293631_TH SAMPLE QTY : 0.116 F +/-0.863 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 78.1 +/-7.081 %	CHAMBER : 028 DETECTOR S/N : 78792 AVERAGE %EFFICIENCY : 32.0261 AVERAGE %EFF ERROR : 0.6188 COUNT DATE : 23-Jan-2023 10:06:21 ELAPSED LIVE TIME(SEC) : 11424.35	LIB FILE : TH BKG FILE : B028.CNF;2515 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W028.CNF;683 CAL DATE : 07-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8634E+00 dpm RESULTS : 3.7978E+00 dpm	LCS ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.7132E+01 % RECOVERY 122.487	

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
TH-227	5994.04	6018.25	0.000	7.000	4.144	2.856	1.6900	57.440	6.70E-01	9.33E-01	1.47E+00	4.90E-01	9.28E-01	9.28E-01
TH-228	5363.00	5400.99	31.802	235.000	233.846	1.142	1.0688	99.940	1.92E+01	3.71E+00	5.62E-01	1.58E-01	2.47E+00	2.47E+00
TH-229	4900.00	4889.31	53.828	232.000	230.477	1.523	1.2342	99.520	1.89E+01	3.68E+00	6.09E-01	1.82E-01	2.45E+00	2.45E+00
TH-230	4671.39	4665.18	6.128	35.000	33.233	0.381	0.6171	99.700	2.72E+00	1.05E+00	6.11E-01	1.83E-01	9.64E-01	9.64E-01
TH-232	3972.00	3995.06	37.798	258.000	257.146	0.762	0.8727	100.000	2.10E+01	3.98E+00	5.13E-01	1.34E-01	2.58E+00	2.58E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.012 +/-0.000)
TH-230 (1.387 +/-0.021)
TH-232 (0.093 +/-0.001)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

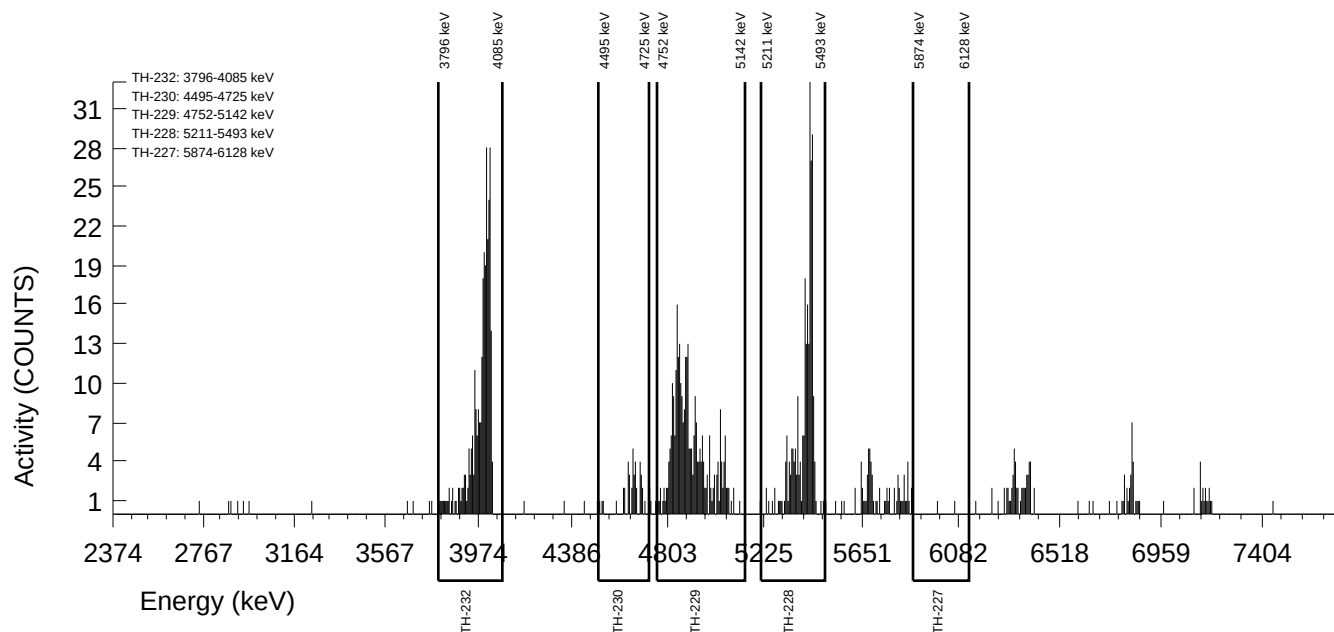
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2368294 SAMPLE ID : S1205293632_TH SAMPLE QTY : 0.116 F +/-0.863 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 94.5 +/-6.257 %	CHAMBER : 029 DETECTOR S/N : 125038 AVERAGE %EFFICIENCY : 35.1133 AVERAGE %EFF ERROR : 0.6771 COUNT DATE : 23-Jan-2023 10:06:21 ELAPSED LIVE TIME(SEC) : 11427.82	LIB FILE : TH BKG FILE : B029.CNF;2529 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W029.CNF;742 CAL DATE : 07-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8634E+00 dpm RESULTS : 4.5954E+00 dpm	LCSD ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.7132E+01 % RECOVERY 104.134	

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F		TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
TH-227	5994.04	5946.89	0.000	4.000	-1.714	5.714	2.3904	57.440	-2.09E-01		5.91E-01	1.41E+00	5.23E-01	5.91E-01
TH-228	5363.00	5400.66	32.954	246.000	245.222	0.762	0.8728	99.940	1.51E+01		2.73E+00	3.80E-01	9.76E-02	1.90E+00
TH-229	4900.00	4902.98	97.641	307.000	305.857	1.143	1.0690	99.520	1.89E+01		3.24E+00	4.22E-01	1.19E-01	2.13E+00
TH-230	4671.39	4645.54	57.975	45.000	43.160	0.000	1.0000	99.700	2.66E+00		8.95E-01	4.60E-01	1.77E-01	8.20E-01
TH-232	3972.00	3984.07	37.429	291.000	290.115	0.762	0.8728	100.000	1.78E+01		3.10E+00	3.90E-01	1.03E-01	2.06E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.016 +/-0.000)
 TH-230 (1.840 +/-0.029)
 TH-232 (0.123 +/-0.002)



Batch 2368291 Check-list

This check-list was completed on 25-JAN-23 by Jessica Downey

This batch was reviewed by Jessica Downey on 24-JAN-23, Jessica Davis on 24-JAN-23 and Jessica Downey on 25-JAN-23.

Batch ID:
2368291

Product:
ASP_PUF

Description: Alpha Spec Plutonium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?	Yes		
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium

Batch ID: 2368291

Analyst: Evan Johnson (EJ1)

Method: DOE EML HASL-300, Pu-11-RC
Modified

Lab SOP: GL-RAD-A-011 REV# 28

Instrument: BAL-C236871727

Due Dates for Lab: 23-JAN-2023

Package: 24-JAN-2023

SDG: 24-JAN-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205293622	Plutonium-239 AS SPIKE	1472-C	.1	mL
LCSD	1205293623	Plutonium-239 AS SPIKE	1472-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	606487001	20-JAN-2023	1	30.3	0.11337
2	606487002	20-JAN-2023	1	30.45	0.11253
3	606487003	20-JAN-2023	1	30.13	0.11299
4	606488001	20-JAN-2023	1	30.35	0.11607
5	606488002	20-JAN-2023	1	30.3	0.1132
6	606488003	20-JAN-2023	1	30.15	0.10826
7	606488004	20-JAN-2023	1	30.41	0.11234
8	606488005	20-JAN-2023	1	30.03	0.1091
9	1205293621 MB	20-JAN-2023	1		0.11607
10	1205293622 LCS	20-JAN-2023	1		0.11607
11	1205293623 LCSD	20-JAN-2023	1		0.11607

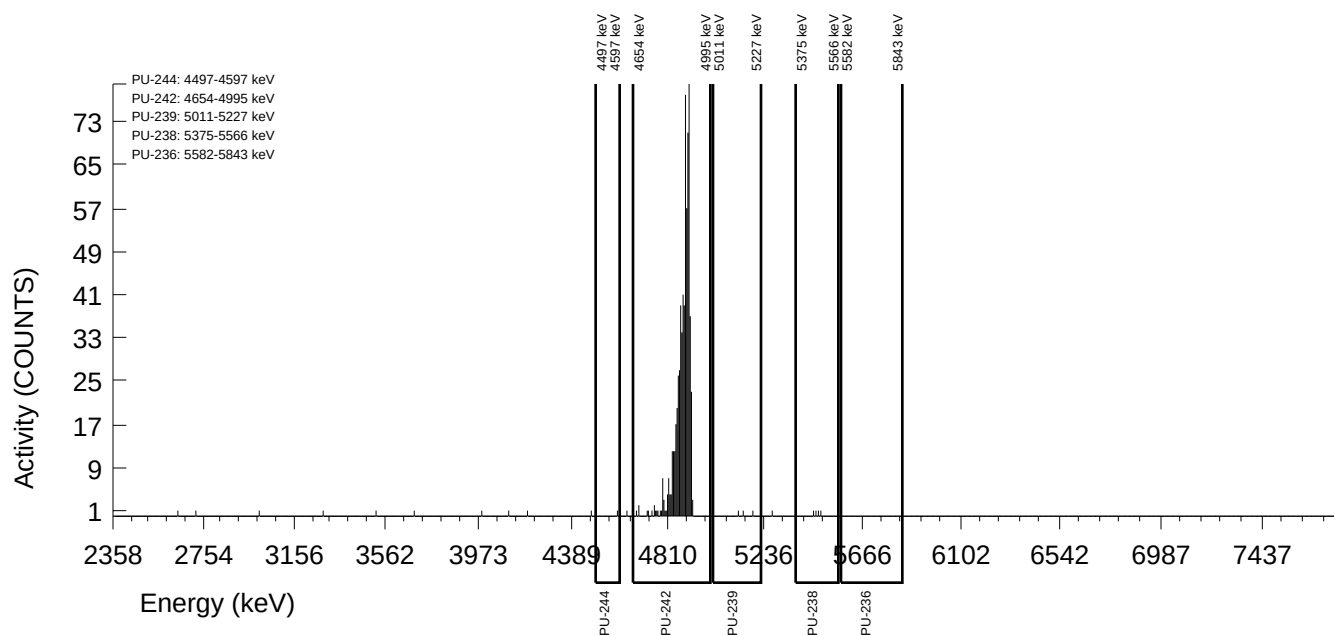
Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2044-A	Plutonium-242 AS TRACER	.2 ml	Pipet ID: RAD-ASP-184002Z Analyzed With: Am , U Data Entry Date2: 20-JAN-2023 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S0606487001_PU SAMPLE QTY : 0.113 F +/-0.882 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 100 +/-4.341 %	CHAMBER : 065 DETECTOR S/N : 148999 AVERAGE %EFFICIENCY : 33.1710 AVERAGE %EFF ERROR : 0.6404 COUNT DATE : 23-Jan-2023 11:36:38 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B065.CNF;3359 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W065.CNF;690 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 8.4296E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.23	0.000	0.000	-0.480	0.480	0.6928	100.000	-2.43E-02	1.08E-01	2.81E-01	6.43E-02	1.08E-01
PU-238	5486.00	5471.88	34.484	4.000	-0.560	4.560	2.1354	99.900	-2.79E-02	2.42E-01	5.39E-01	1.95E-01	2.42E-01
PU-239	5155.00	5151.95	64.042	3.000	2.040	0.960	0.9798	99.900	1.02E-01	2.02E-01	3.28E-01	8.93E-02	2.02E-01
PU-242	4870.00	4877.79	29.918	673.000	671.080	1.920	1.3856	100.000	3.34E+01	4.05E+00	4.01E-01	1.26E-01	2.53E+00
PU-244	4589.00	4588.50	4.926	1.000	1.000	0.000	1.0000	99.900	4.98E-02	1.40E-01	1.49E-01	9.12E-02	1.40E-01

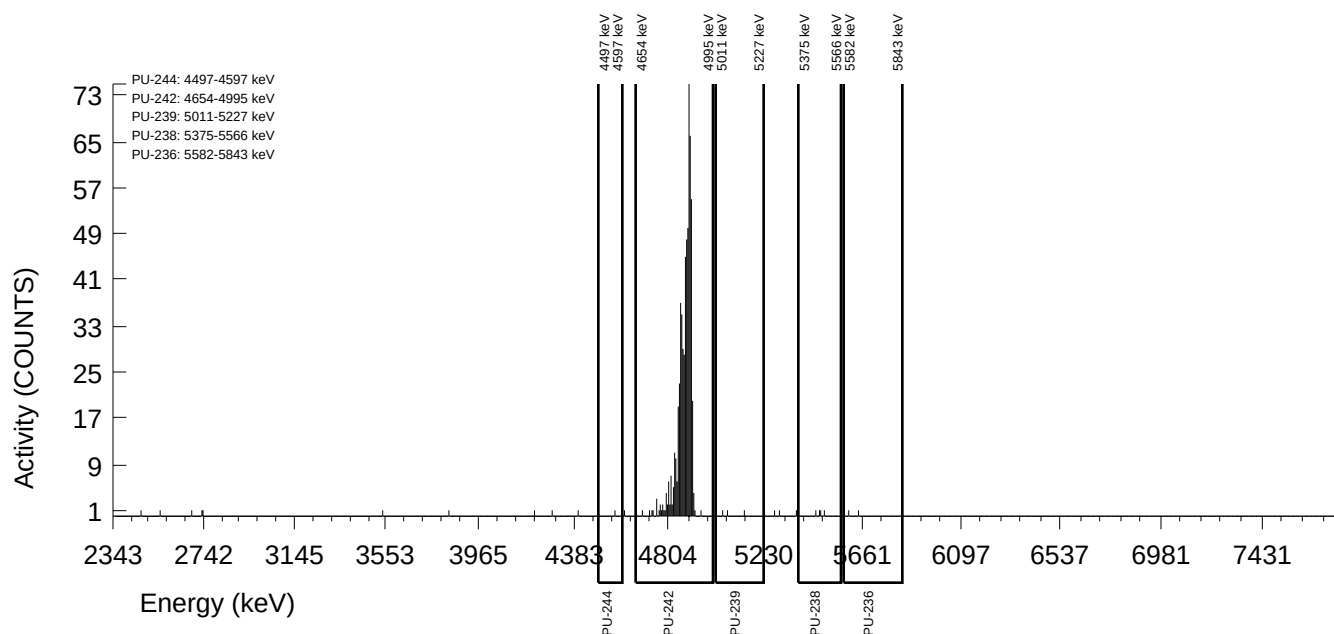


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S0606487002_PU SAMPLE QTY : 0.113 F +/-0.889 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 92.6 +/-4.530 %	CHAMBER : 066 DETECTOR S/N : 101447 AVERAGE %EFFICIENCY : 32.3574 AVERAGE %EFF ERROR : 0.6250 COUNT DATE : 23-Jan-2023 11:36:38 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B066.CNF;2508 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W066.CNF;673 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 7.7788E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5623.39	44.587	2.000	1.280	0.720	0.8485	100.000	7.26E-02	2.00E-01	3.46E-01	8.81E-02	2.00E-01
PU-238	5486.00	5474.91	39.633	4.000	-8.480	12.480	3.5327	99.900	-4.73E-01	3.10E-01	8.88E-01	3.61E-01	3.10E-01
PU-239	5155.00	5082.50	94.128	3.000	1.560	1.440	1.2000	99.900	8.69E-02	2.29E-01	4.12E-01	1.22E-01	2.29E-01
PU-242	4870.00	4874.78	29.433	606.000	604.080	1.920	1.3856	100.000	3.36E+01	4.25E+00	4.49E-01	1.41E-01	2.69E+00
PU-244	4589.00	4582.24	0.000	2.000	0.800	1.200	1.0954	99.900	4.46E-02	2.00E-01	3.91E-01	1.12E-01	2.00E-01

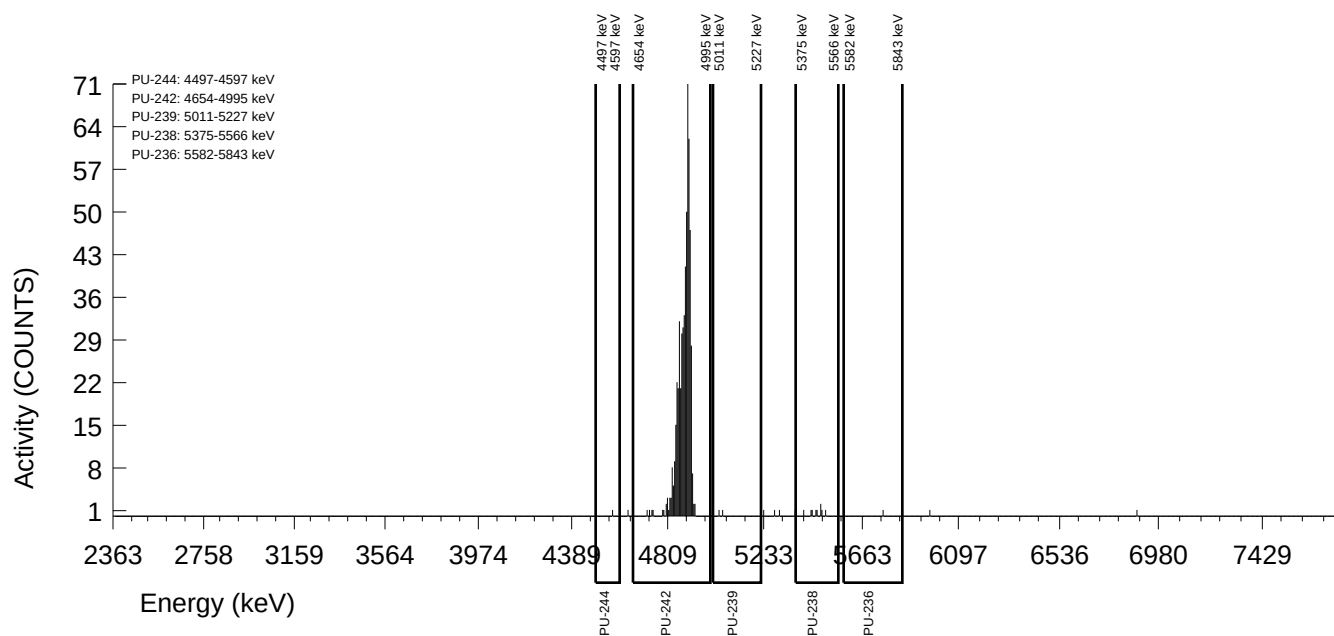


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S0606487003_PU SAMPLE QTY : 0.113 F +/-0.885 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 86.0 +/-4.701 %	CHAMBER : 067 DETECTOR S/N : 149000 AVERAGE %EFFICIENCY : 31.8801 AVERAGE %EFF ERROR : 0.6161 COUNT DATE : 23-Jan-2023 11:36:38 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B067.CNF;2505 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W067.CNF;676 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 7.2224E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
PU-236	5749.00	5760.20	4.913	1.000	1.000	0.000	1.0000	100.000	6.17E-02	1.74E-01	1.85E-01	1.13E-01	1.74E-01
PU-238	5486.00	5457.23	7.370	10.000	4.240	5.760	2.4000	99.900	2.57E-01	4.20E-01	7.15E-01	2.67E-01	4.19E-01
PU-239	5155.00	5044.42	19.654	2.000	0.320	1.680	1.2961	99.900	1.94E-02	2.21E-01	4.70E-01	1.44E-01	2.21E-01
PU-242	4870.00	4882.45	26.006	555.000	552.600	2.400	1.5492	100.000	3.35E+01	4.39E+00	5.25E-01	1.72E-01	2.80E+00
PU-244	4589.00	4566.87	4.913	1.000	0.520	0.480	0.6928	99.900	3.15E-02	1.75E-01	3.36E-01	7.69E-02	1.75E-01

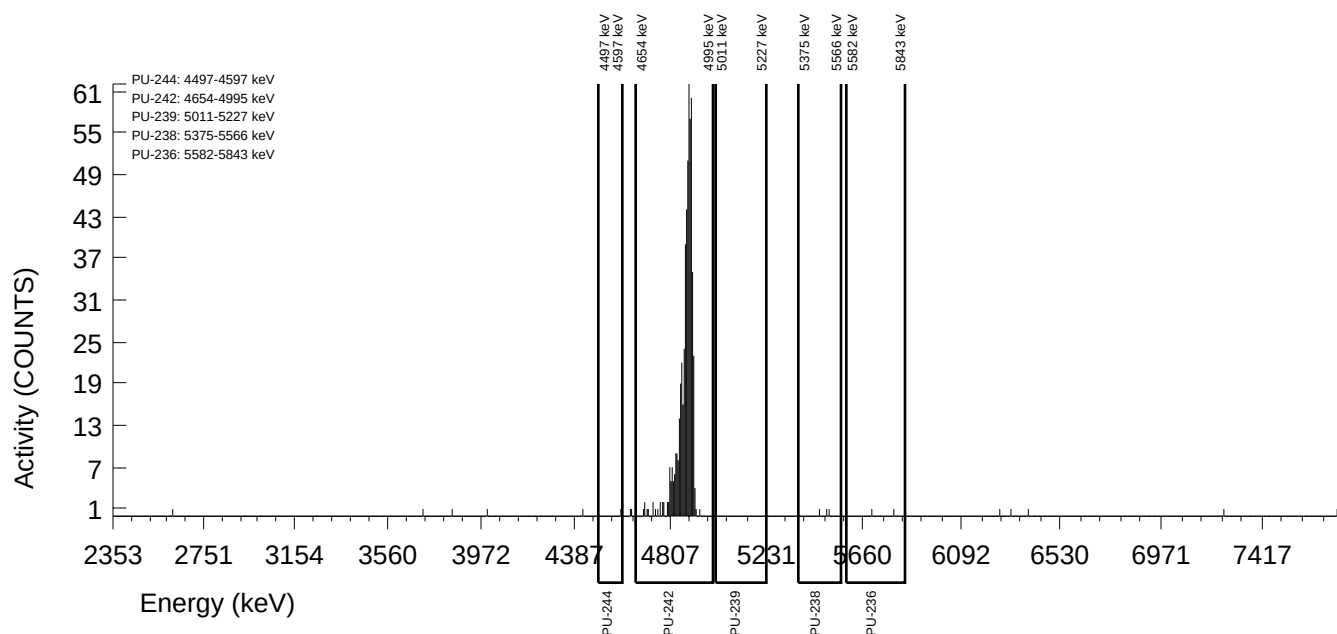


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S1205293621_PU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 83.7 +/-4.724 %	CHAMBER : 074 DETECTOR S/N : 149001 AVERAGE %EFFICIENCY : 32.3334 AVERAGE %EFF ERROR : 0.6246 COUNT DATE : 23-Jan-2023 11:36:39 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B074.CNF;2521 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W074.CNF;697 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 7.0273E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
PU-236	5749.00	5745.88	94.065	2.000	0.800	1.200	1.0954	100.000	4.79E-02	2.15E-01	4.20E-01	1.20E-01	2.15E-01
PU-238	5486.00	5491.34	44.557	3.000	1.560	1.440	1.2000	99.900	9.33E-02	2.46E-01	4.42E-01	1.31E-01	2.46E-01
PU-239	5155.00	5118.69	0.000	0.000	-0.960	0.960	0.9798	99.900	-5.74E-02	1.33E-01	3.94E-01	1.07E-01	1.33E-01
PU-242	4870.00	4876.25	33.995	547.000	545.320	1.680	1.2961	100.000	3.26E+01	4.30E+00	4.63E-01	1.42E-01	2.74E+00
PU-244	4589.00	4591.34	4.951	1.000	1.000	0.000	1.0000	99.900	5.98E-02	1.68E-01	1.79E-01	1.10E-01	1.68E-01

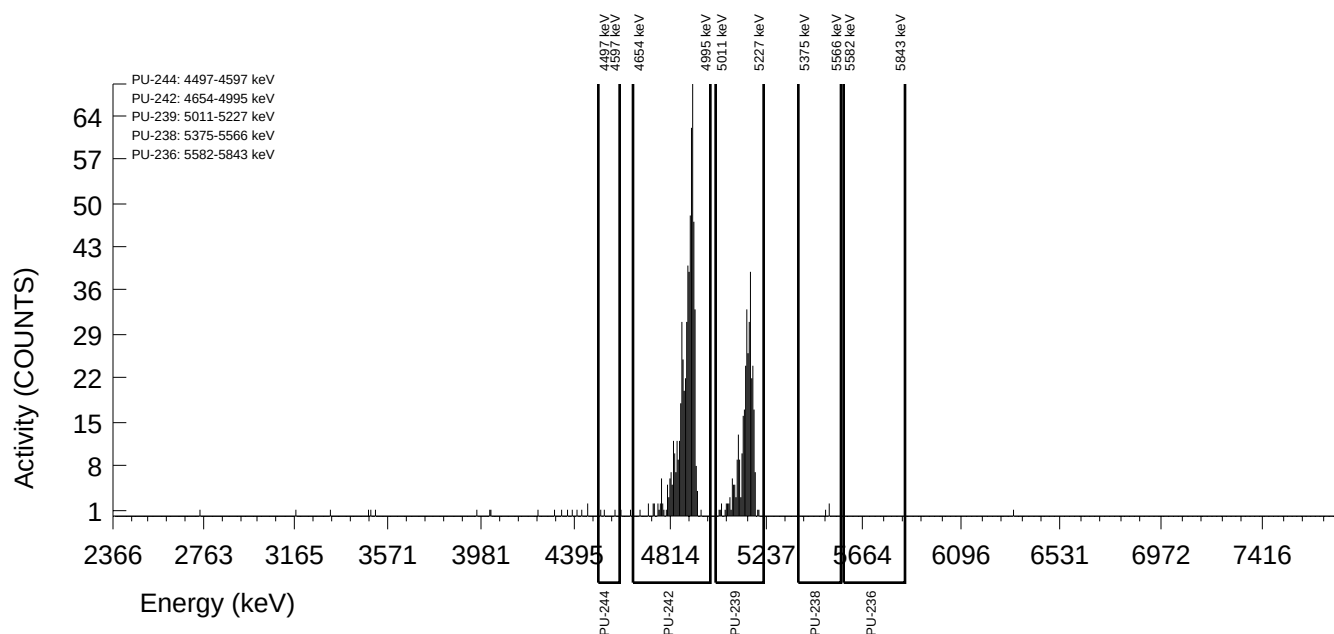


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S1205293622_PU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 96.3 +/-4.523 %			CHAMBER : 075 DETECTOR S/N : 80010 AVERAGE %EFFICIENCY : 31.2381 AVERAGE %EFF ERROR : 0.6039 COUNT DATE : 23-Jan-2023 11:36:39 ELAPSED LIVE TIME(SEC) : 14400.00			LIB FILE : PU BKG FILE : B075.CNF;2494 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W075.CNF;664 CAL DATE : 10-Jan-2023		
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 8.0874E+00 dpm			LCS ID : 1472-C NUCLIDE : PU-239 NOMINAL (pCi/F) : 1.7734E+01 % RECOVERY : 101.782					

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.25	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.29E-02	1.12E-01	2.58E-01	4.83E-02	1.11E-01
PU-238	5486.00	5508.54	4.937	3.000	2.760	0.240	0.4899	99.900	1.48E-01	2.14E-01	2.58E-01	4.83E-02	2.14E-01
PU-239	5155.00	5147.27	35.969	337.000	335.560	1.440	1.2000	99.900	1.81E+01	2.62E+00	3.98E-01	1.18E-01	1.94E+00
PU-242	4870.00	4884.87	32.109	608.000	606.320	1.680	1.2961	100.000	3.26E+01	4.11E+00	4.16E-01	1.28E-01	2.60E+00
PU-244	4589.00	4551.46	0.000	4.000	4.000	0.000	1.0000	99.900	2.15E-01	2.38E-01	1.61E-01	9.85E-02	2.37E-01

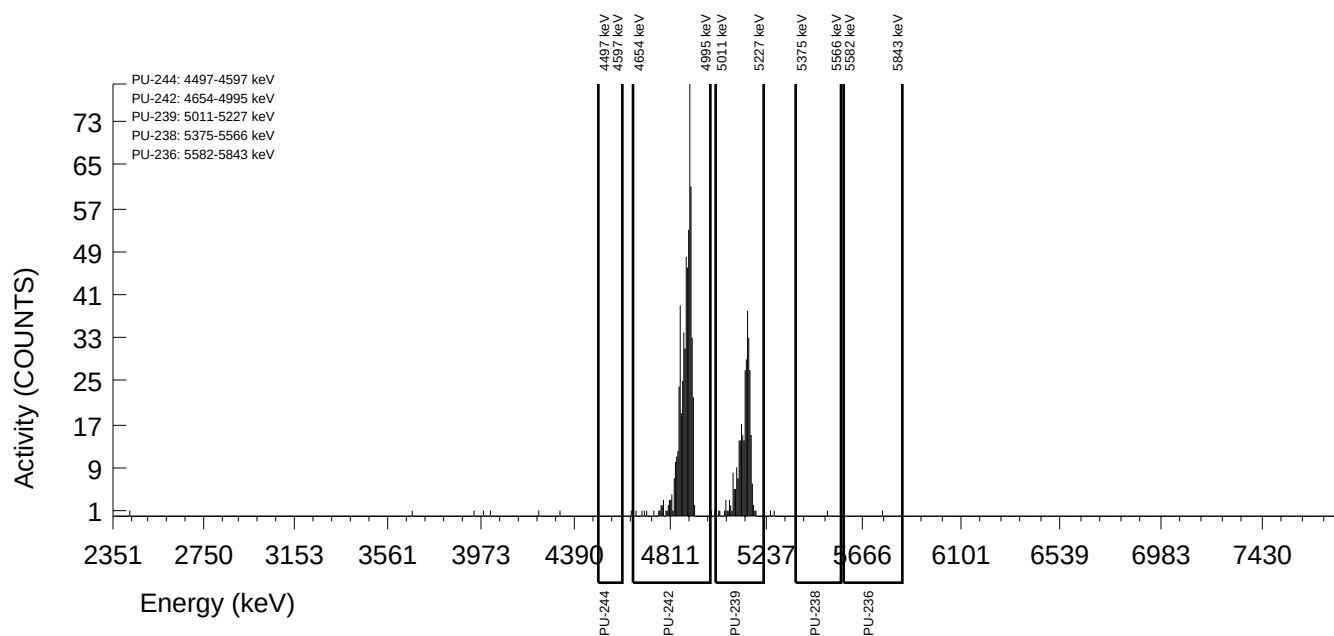


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S1205293623_PU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 88.2 +/-4.587 %	CHAMBER : 076 DETECTOR S/N : 158161 AVERAGE %EFFICIENCY : 32.9212 AVERAGE %EFF ERROR : 0.6357 COUNT DATE : 23-Jan-2023 11:36:39 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B076.CNF;2513 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W076.CNF;639 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 7.4081E+00 dpm	LCSD ID 1472-C NUCLIDE PU-239 NOMINAL (pCi/F) 1.7734E+01 % RECOVERY 94.663	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5752.98	4.960	1.000	0.760	0.240	0.4899	100.000	4.24E-02	1.59E-01	2.68E-01	5.01E-02	1.59E-01
PU-238	5486.00	5510.13	4.960	1.000	0.760	0.240	0.4899	99.900	4.24E-02	1.59E-01	2.67E-01	5.00E-02	1.59E-01
PU-239	5155.00	5140.98	26.198	302.000	301.280	0.720	0.8485	99.900	1.68E+01	2.53E+00	3.40E-01	8.66E-02	1.90E+00
PU-242	4870.00	4880.61	25.893	587.000	585.320	1.680	1.2961	100.000	3.26E+01	4.17E+00	4.31E-01	1.32E-01	2.65E+00
PU-244	4589.00	4546.97	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00	1.12E-01	1.67E-01	1.02E-01	1.12E-01



Batch 2368289 Check-list

This check-list was completed on 24-JAN-23 by Melanie Aycock

This batch was reviewed by Jessica Davis on 24-JAN-23 and Melanie Aycock on 24-JAN-23.

Batch ID:
2368289

Product:
ASPAMCMF

Description: Alpha Spec Am241Curium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Americium/Curium

Batch ID: 2368289
Analyst: Evan Johnson (EJ1)
Method: DOE EML HASL-300, Am-05-RC Modified
Lab SOP: GL-RAD-A-011 REV# 28
Instrument: BAL-C236871727

Due Dates for Lab: 23-JAN-2023			Package: 24-JAN-2023	SDG: 24-JAN-2023		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205293607	Americium-241 SPIKE		0533-JJ	.1	mL
LCSD	1205293608	Americium-241 SPIKE		0533-JJ	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	606487001	20-JAN-2023	1	30.3	0.11337
2	606487002	20-JAN-2023	1	30.45	0.11253
3	606487003	20-JAN-2023	1	30.13	0.11299
4	606488001	20-JAN-2023	1	30.35	0.11607
5	606488002	20-JAN-2023	1	30.3	0.1132
6	606488003	20-JAN-2023	1	30.15	0.10826
7	606488004	20-JAN-2023	1	30.41	0.11234
8	606488005	20-JAN-2023	1	30.03	0.1091
9	1205293606 MB	20-JAN-2023	1		0.11607
10	1205293607 LCS	20-JAN-2023	1		0.11607
11	1205293608 LCSD	20-JAN-2023	1		0.11607

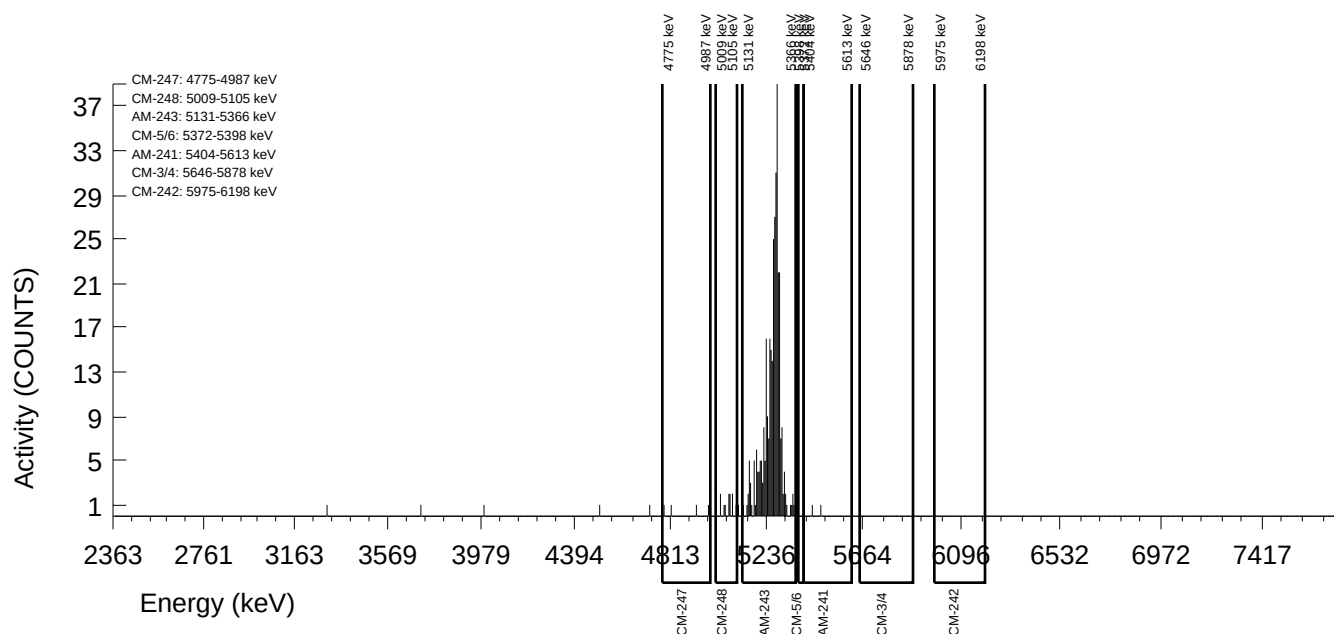
Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1752-J	Americium-243 AS TRACER	.1 ml	Pipet ID: R2-428724 Analyzed With: Pu , U Data Entry Date2: 20-JAN-2023 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368289 SAMPLE ID : S0606487001_AM SAMPLE QTY : 0.113 F +/-0.882 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 89.3 +/-6.148 %	CHAMBER : 079 DETECTOR S/N : 101450 AVERAGE %EFFICIENCY : 33.1128 AVERAGE %EFF ERROR : 0.6393 COUNT DATE : 23-Jan-2023 11:36:40 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : AM BKG FILE : B079.CNF;2440 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W079.CNF;664 CAL DATE : 10-Jan-2023
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6467E+00 dpm RESULTS : 4.1508E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5457.53	39.537	2.000	1.280	0.720	0.8485	98.525	7.27E-02	2.00E-01	3.47E-01	8.83E-02	2.00E-01
AM-243	5269.50	5262.21	28.006	331.000	329.800	1.200	1.0954	99.980	1.85E+01	3.09E+00	3.93E-01	1.12E-01	2.00E+00
CM-242	6102.00	6086.57	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.28E-01	1.90E-01	1.16E-01	1.27E-01
CM-3/4	5795.02	5761.60	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.35E-02	1.16E-01	2.69E-01	5.04E-02	1.16E-01
CM-5/6	5386.00	5374.76	4.942	1.000	1.000	0.000	1.0000	86.090	6.50E-02	1.83E-01	1.95E-01	1.19E-01	1.83E-01
CM-247	4946.00	4878.86	187.802	4.000	4.000	0.000	1.0000	79.300	2.82E-01	3.13E-01	2.12E-01	1.29E-01	3.11E-01
CM-248	5078.60	5068.38	54.364	11.000	11.000	0.000	1.0000	91.000	6.77E-01	4.27E-01	1.85E-01	1.13E-01	4.19E-01

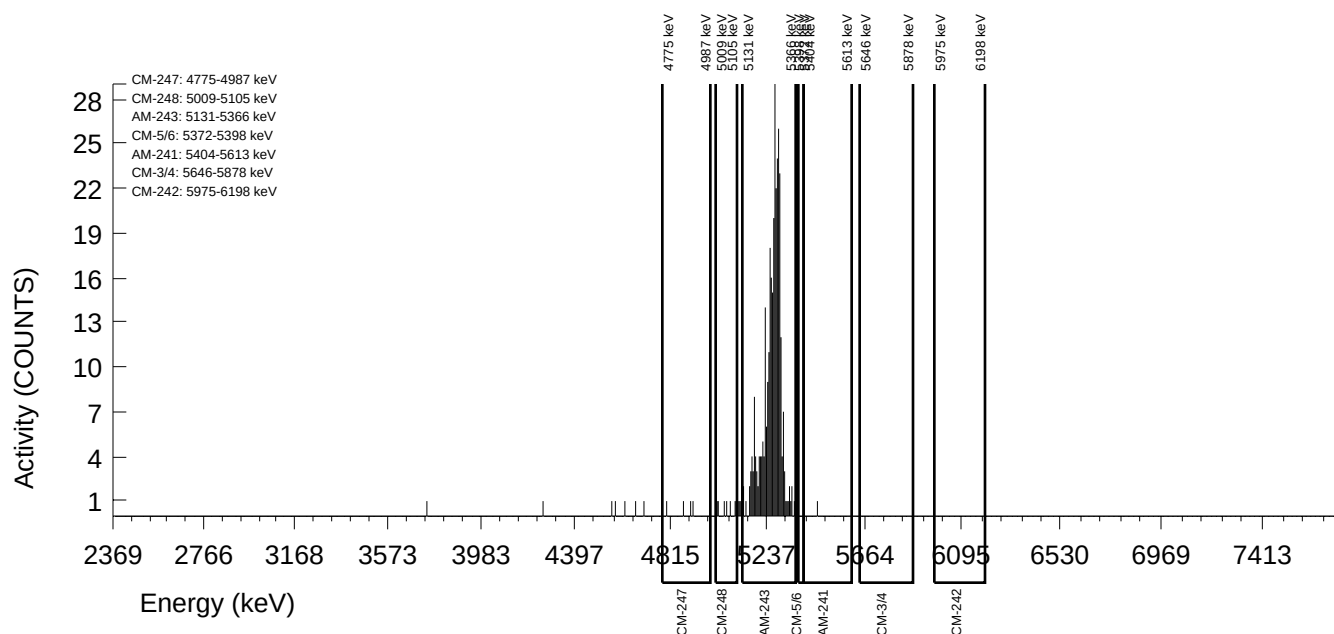


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368289 SAMPLE ID : S0606487002_AM SAMPLE QTY : 0.113 F +/-0.889 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 84.5 +/-6.226 %	CHAMBER : 080 DETECTOR S/N : 79197 AVERAGE %EFFICIENCY : 34.0514 AVERAGE %EFF ERROR : 0.6570 COUNT DATE : 23-Jan-2023 11:36:40 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : AM BKG FILE : B080.CNF;2413 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W080.CNF;616 CAL DATE : 10-Jan-2023
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6467E+00 dpm RESULTS : 3.9267E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5460.90	4.936	1.000	1.000	0.000	1.0000	98.525	5.88E-02	1.66E-01	1.77E-01	1.08E-01	1.65E-01
AM-243	5269.50	5261.63	45.772	323.000	320.840	2.160	1.4697	99.980	1.86E+01	3.15E+00	4.86E-01	1.56E-01	2.05E+00
CM-242	6102.00	6086.57	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.32E-01	1.96E-01	1.20E-01	1.32E-01
CM-3/4	5795.02	5761.60	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.17E-01	1.74E-01	1.06E-01	1.17E-01
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	1.36E-01	2.02E-01	1.23E-01	1.36E-01
CM-247	4946.00	4872.88	113.531	4.000	3.760	0.240	0.4899	79.300	2.75E-01	3.26E-01	3.50E-01	6.56E-02	3.24E-01
CM-248	5078.60	5063.46	0.000	7.000	6.280	0.720	0.8485	91.000	4.00E-01	3.62E-01	3.89E-01	9.90E-02	3.58E-01

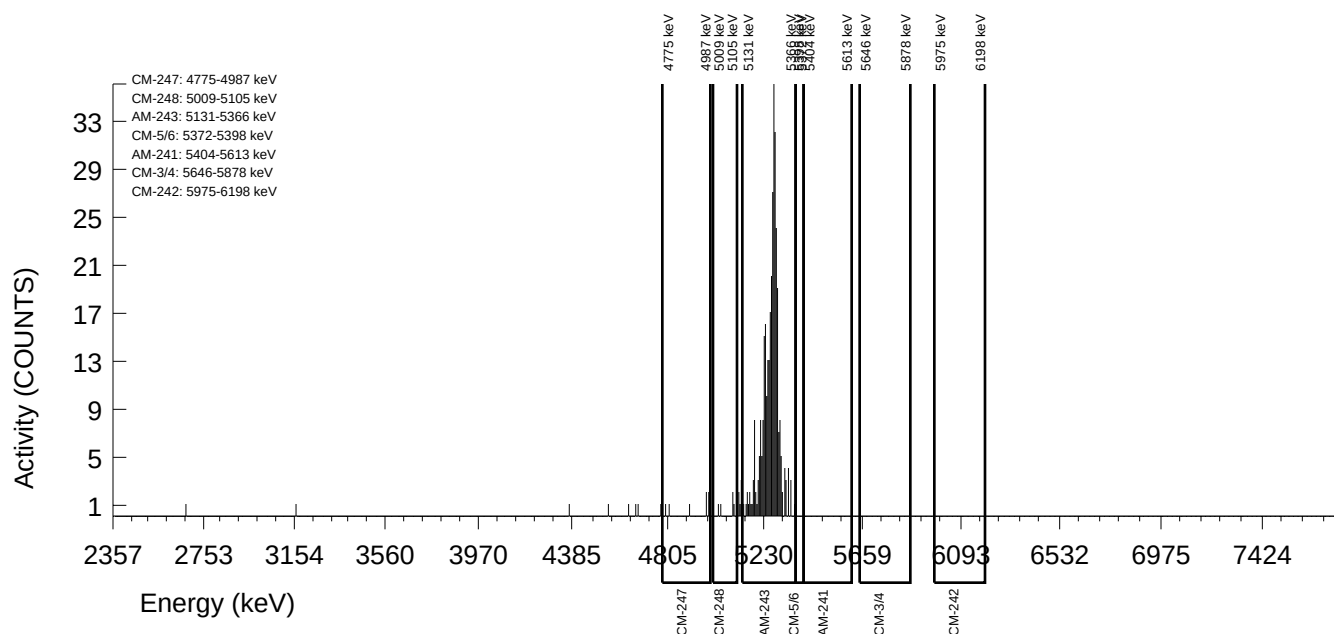


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368289 SAMPLE ID : S0606487003_AM SAMPLE QTY : 0.113 F +/-0.885 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 89.1 +/-6.121 %	CHAMBER : 081 DETECTOR S/N : 148987 AVERAGE %EFFICIENCY : 33.5354 AVERAGE %EFF ERROR : 0.6473 COUNT DATE : 23-Jan-2023 11:36:40 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : AM BKG FILE : B081.CNF;2432 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W081.CNF;626 CAL DATE : 10-Jan-2023
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6467E+00 dpm RESULTS : 4.1388E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5508.47	0.000	0.000	0.000	0.000	1.0000	98.525	0.00E+00	1.14E-01	1.69E-01	1.03E-01	1.14E-01
AM-243	5269.50	5258.01	28.301	334.000	333.040	0.960	0.9798	99.980	1.85E+01	3.09E+00	3.67E-01	9.98E-02	2.00E+00
CM-242	6102.00	6086.56	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.27E-01	1.88E-01	1.15E-01	1.27E-01
CM-3/4	5795.02	5761.58	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.34E-02	1.16E-01	2.67E-01	5.01E-02	1.15E-01
CM-5/6	5386.00	5385.09	0.000	0.000	-0.240	0.240	0.4899	86.090	-1.55E-02	1.34E-01	3.10E-01	5.80E-02	1.34E-01
CM-247	4946.00	4899.71	0.000	8.000	7.760	0.240	0.4899	79.300	5.44E-01	4.21E-01	3.36E-01	6.29E-02	4.15E-01
CM-248	5078.60	5068.99	7.383	5.000	5.000	0.000	1.0000	91.000	3.06E-01	2.97E-01	1.83E-01	1.12E-01	2.95E-01

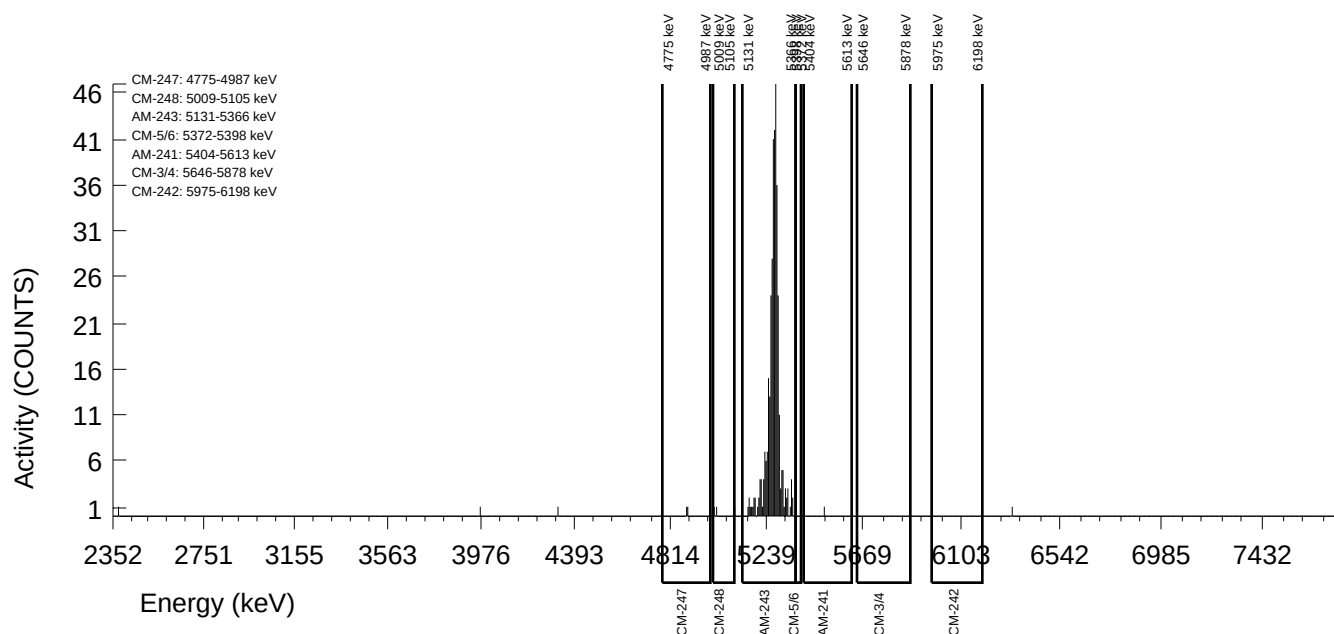


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368289 SAMPLE ID : S1205293606_AM SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 102 +/-5.969 %	CHAMBER : 088 DETECTOR S/N : 83291 AVERAGE %EFFICIENCY : 31.3166 AVERAGE %EFF ERROR : 0.6054 COUNT DATE : 23-Jan-2023 11:36:41 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B088.CNF;2413 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W088.CNF;634 CAL DATE : 10-Jan-2023
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6466E+00 dpm RESULTS : 4.7216E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5496.76	4.967	1.000	1.000	0.000	1.0000	98.525	5.16E-02	1.45E-01	1.55E-01	9.45E-02	1.45E-01
AM-243	5269.50	5272.31	30.218	356.000	354.800	1.200	1.0954	99.980	1.80E+01	2.93E+00	3.56E-01	1.02E-01	1.88E+00
CM-242	6102.00	6086.57	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.04E-01	1.55E-01	9.45E-02	1.04E-01
CM-3/4	5795.02	5761.60	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.22E-02	1.05E-01	2.44E-01	4.56E-02	1.05E-01
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	1.19E-01	1.77E-01	1.08E-01	1.19E-01
CM-247	4946.00	4890.64	9.934	2.000	1.520	0.480	0.6928	79.300	9.74E-02	2.24E-01	3.55E-01	8.13E-02	2.24E-01
CM-248	5078.60	5043.79	0.000	3.000	3.000	0.000	1.0000	91.000	1.68E-01	2.21E-01	1.68E-01	1.02E-01	2.20E-01

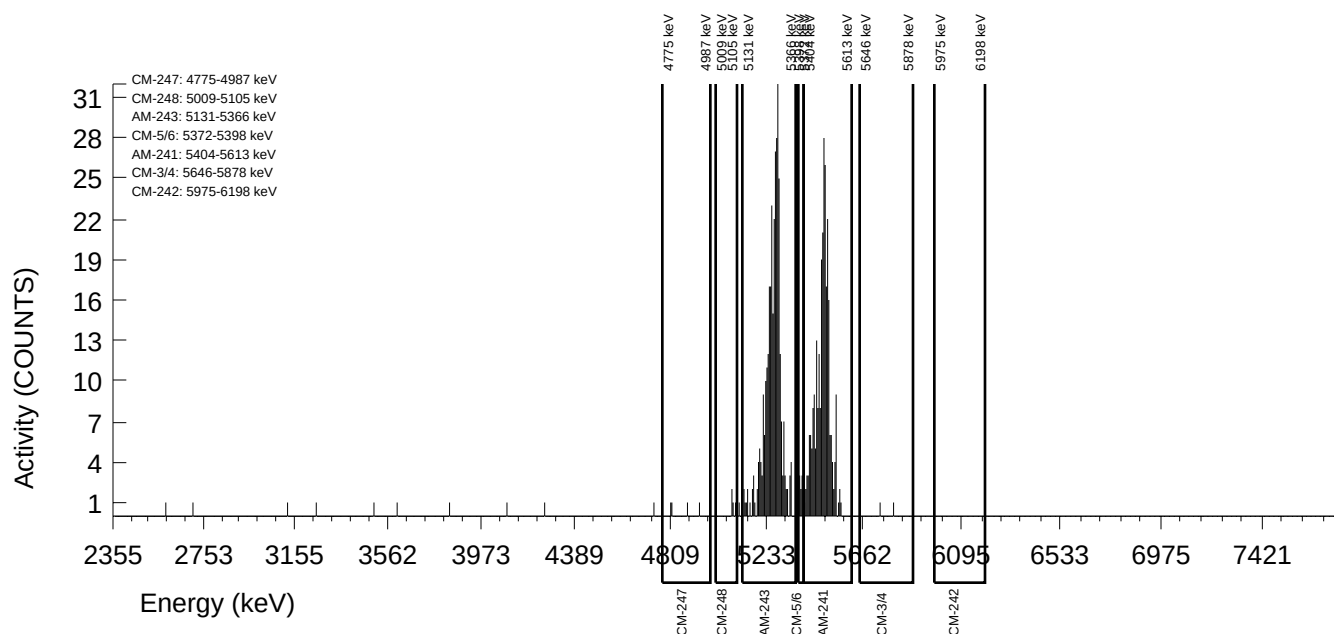


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368289 SAMPLE ID : S1205293607_AM SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 96.5 +/-6.152 %	CHAMBER : 089 DETECTOR S/N : 79988 AVERAGE %EFFICIENCY : 30.5819 AVERAGE %EFF ERROR : 0.5916 COUNT DATE : 23-Jan-2023 11:41:30 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : AM BKG FILE : B089.CNF;2116 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W089.CNF;554 CAL DATE : 11-Jan-2023
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6466E+00 dpm RESULTS : 4.4840E+00 dpm	LCS ID : 0533-JJ NUCLIDE : AM-241 NOMINAL (pCi/F) : 1.7042E+01 % RECOVERY : 89.013	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5484.96	32.927	273.000	272.760	0.240	0.4899	98.525	1.52E+01	2.65E+00	2.67E-01	4.99E-02	1.80E+00
AM-243	5269.50	5265.49	44.000	330.000	329.040	0.960	0.9798	99.980	1.80E+01	3.02E+00	3.61E-01	9.84E-02	1.96E+00
CM-242	6102.00	6086.57	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.12E-01	1.67E-01	1.02E-01	1.12E-01
CM-3/4	5795.02	5767.42	59.377	2.000	1.040	0.960	0.9798	100.000	5.70E-02	1.95E-01	3.61E-01	9.84E-02	1.95E-01
CM-5/6	5386.00	5391.27	0.000	11.000	10.760	0.240	0.4899	86.090	6.85E-01	4.43E-01	3.05E-01	5.71E-02	4.34E-01
CM-247	4946.00	4890.33	0.000	5.000	4.040	0.960	0.9798	79.300	2.79E-01	3.41E-01	4.55E-01	1.24E-01	3.40E-01
CM-248	5078.60	5079.92	7.422	6.000	5.760	0.240	0.4899	91.000	3.47E-01	3.18E-01	2.89E-01	5.40E-02	3.15E-01

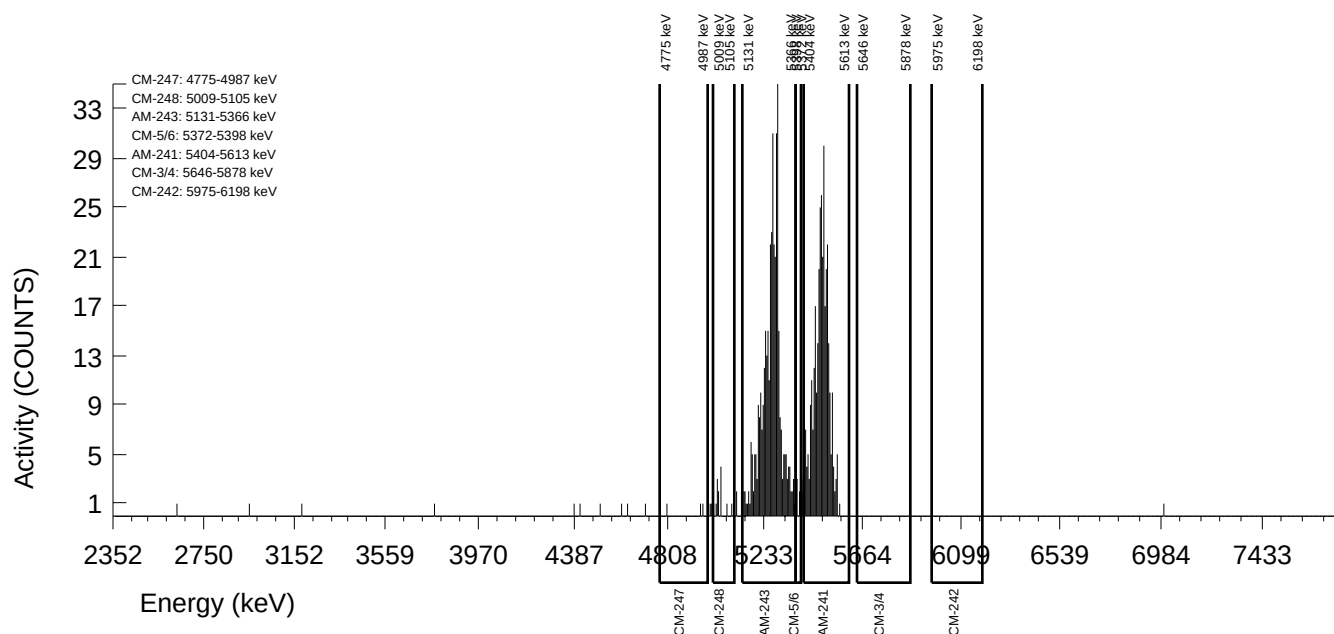


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368289 SAMPLE ID : S1205293608_AM SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 100 +/-5.697 %			CHAMBER : 090 DETECTOR S/N : 158119 AVERAGE %EFFICIENCY : 35.5801 AVERAGE %EFF ERROR : 0.6858 COUNT DATE : 23-Jan-2023 11:41:30 ELAPSED LIVE TIME(SEC) : 14399.99			LIB FILE : AM BKG FILE : B090.CNF;2117 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W090.CNF;546 CAL DATE : 11-Jan-2023		
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6466E+00 dpm RESULTS : 4.6590E+00 dpm			LCSD ID : 0533-JJ NUCLIDE : AM-241 NOMINAL (pCi/F) : 1.7042E+01 % RECOVERY : 91.182					

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5485.46	55.670	338.000	337.760	0.240	0.4899	98.525	1.55E+01	2.49E+00	2.21E-01	4.13E-02	1.66E+00
AM-243	5269.50	5263.26	35.965	398.000	397.760	0.240	0.4899	99.980	1.80E+01	2.79E+00	2.17E-01	4.07E-02	1.78E+00
CM-242	6102.00	6086.56	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	9.29E-02	1.38E-01	8.43E-02	9.28E-02
CM-3/4	5795.02	5761.59	0.000	0.000	-0.720	0.720	0.8485	100.000	-3.26E-02	9.87E-02	2.77E-01	7.05E-02	9.86E-02
CM-5/6	5386.00	5387.16	0.000	12.000	12.000	0.000	1.0000	86.090	6.32E-01	3.80E-01	1.58E-01	9.64E-02	3.73E-01
CM-247	4946.00	4904.83	153.062	3.000	3.000	0.000	1.0000	79.300	1.71E-01	2.27E-01	1.71E-01	1.05E-01	2.26E-01
CM-248	5078.60	5042.02	19.750	14.000	14.000	0.000	1.0000	91.000	6.97E-01	3.88E-01	1.49E-01	9.12E-02	3.79E-01



Batch 2368295 Check-list

This check-list was completed on 20-JAN-23 by Jessica Davis

This batch was reviewed by Jessica Downey on 20-JAN-23 and Jessica Davis on 20-JAN-23.

Batch ID: 2368295

Product: ASP10POF

Description: Alpha Spec Polonium

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?	Yes		
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Polonium

Batch ID: 2368295

Analyst: Brendon Viquez (BV1)

Method: DOE EML HASL-300, Po-01-RC
Modified

Lab SOP: GL-RAD-A-016 REV# 19

Instrument: BAL-18550299

Due Dates for Lab: 23-JAN-2023

Package: 24-JAN-2023

SDG: 24-JAN-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205293635	Polonium-210 AS SPIKE	2012-A	.1	mL
LCSD	1205293636	Polonium-210 AS SPIKE	2012-A	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (g)	Aliquot (Filter)
1	606487001	17-JAN-2023	.5	0.224	0.10214
2	606487002	17-JAN-2023	.5	0.235	0.10643
3	606487003	17-JAN-2023	.5	0.227	0.10413
4	606488001	17-JAN-2023	.5	0.361	0.10388
5	606488002	17-JAN-2023	.5	0.354	0.10216
6	606488003	17-JAN-2023	.5	0.353	0.10185
7	606488004	17-JAN-2023	.5	0.355	0.10234
8	606488005	17-JAN-2023	.5	0.355	0.10537
9	1205293634 MB	17-JAN-2023	.5		0.10643
10	1205293635 LCS	17-JAN-2023	.5		0.10643
11	1205293636 LCSD	17-JAN-2023	.5		0.10643

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1720-D	Polonium-209 AS TRACER	.1 ml	Data Entry Date2: 16-JAN-2023 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2368295
SAMPLE ID : S0606487001_PO
SAMPLE QTY : 0.102 G +/-0.979 %
SAMPLE DATE : 26-Dec-2022 00:00:00
ANALYST : BV1
% YIELD : 57.9 +/-6.338 %

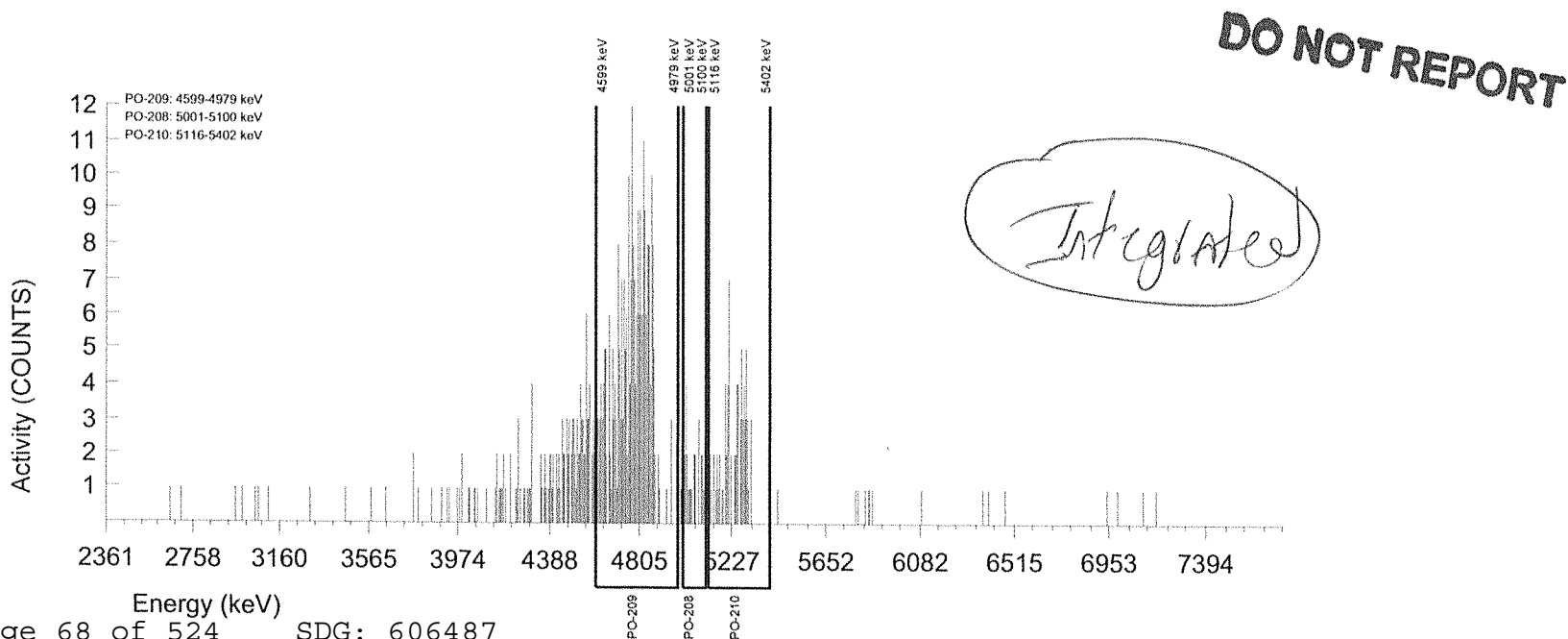
CHAMBER : 179
DETECTOR S/N : 92563
AVERAGE %EFFICIENCY : 26.6326
AVERAGE %EFF ERROR : 0.5171
COUNT DATE : 19-Jan-2023 16:19:46
ELAPSED LIVE TIME(SEC) : 14400.00

LIB FILE : PO
BKG FILE : B179.CNF;1550
BKG DATE : 13-Jan-2023
BKG LIVE TIME(SEC) : 60000.00
EFF FILE : W179.CNF;418
CAL DATE : 17-Jan-2023

TRACER
ID : 1720-D
NUCLIDE : PO-209
NOMINAL : 7.8577E+00 dpm
RESULTS : 4.5474E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/G	1.96-sigma TPU pCi/G	MDA pCi/G	Lc pCi/G	1.96-sigma cnt Unc pCi/G
PO-208	5080.00	5046.40	60.936	29.000	28.760	0.240	0.4899	100.000	3.48E+00	1.38E+00	5.81E-01	1.09E-01	1.30E+00
PO-209	4882.00	4765.82	152.928	291.000	289.800	1.200	1.0954	99.740	3.47E+01	6.06E+00	8.39E-01	2.40E-01	4.01E+00
PO-210	5304.38	5229.04	93.257	78.000	77.520	0.480	0.6928	100.000	1.05E+01	2.73E+00	7.47E-01	1.71E-01	2.35E+00



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

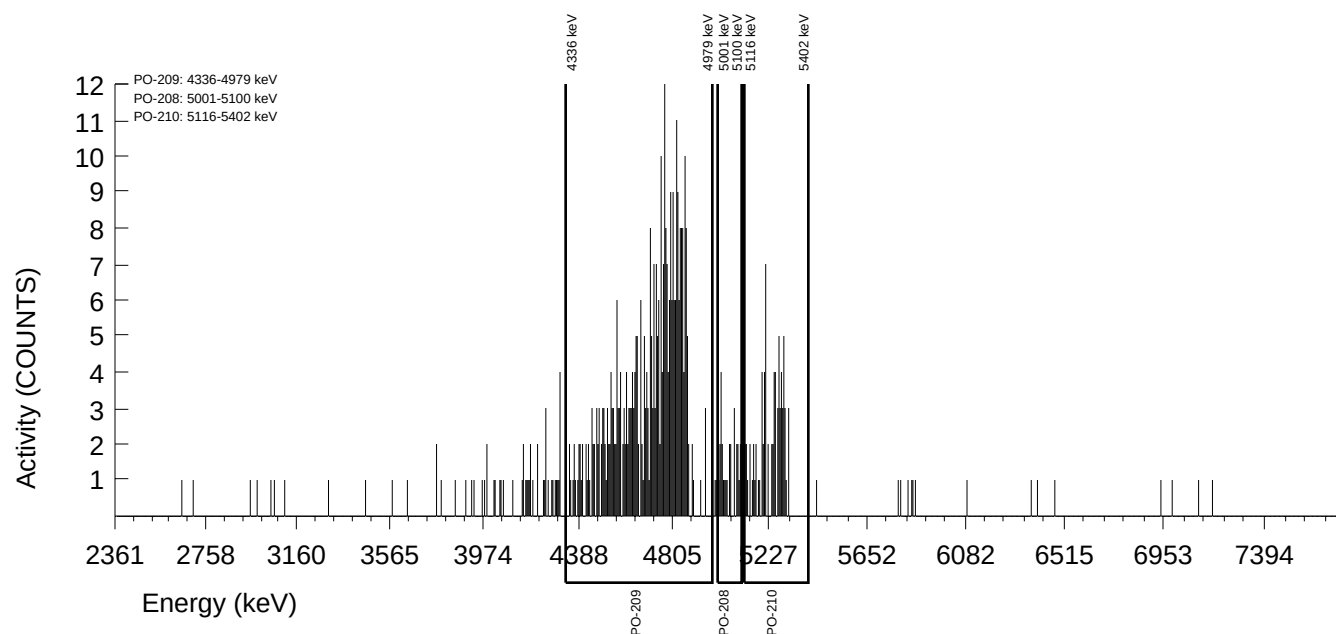
BATCH NUMBER : 2368295 SAMPLE ID : S0606487001_PO SAMPLE QTY : 0.102 F +/-0.979 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : BV1 % YIELD : 75.9 +/-5.649 %	CHAMBER : 179 DETECTOR S/N : 92563 AVERAGE %EFFICIENCY : 26.6326 AVERAGE %EFF ERROR : 0.5171 COUNT DATE : 19-Jan-2023 16:19:46 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B179.CNF;1550 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W179.CNF;418 CAL DATE : 17-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8577E+00 dpm RESULTS : 5.9641E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5046.40	60.936	29.000	28.760	0.240	0.4899	100.000	2.66E+00	1.04E+00	4.43E-01	8.29E-02	9.94E-01
PO-209	4882.00	4701.74	152.928	382.000	380.080	1.920	1.3856	99.740	3.47E+01	5.40E+00	7.36E-01	2.31E-01	3.50E+00
PO-210	5304.38	5229.04	93.257	78.000	77.520	0.480	0.6928	100.000	7.98E+00	2.03E+00	5.70E-01	1.31E-01	1.79E+00

NOTES:

* Regions have been manually adjusted

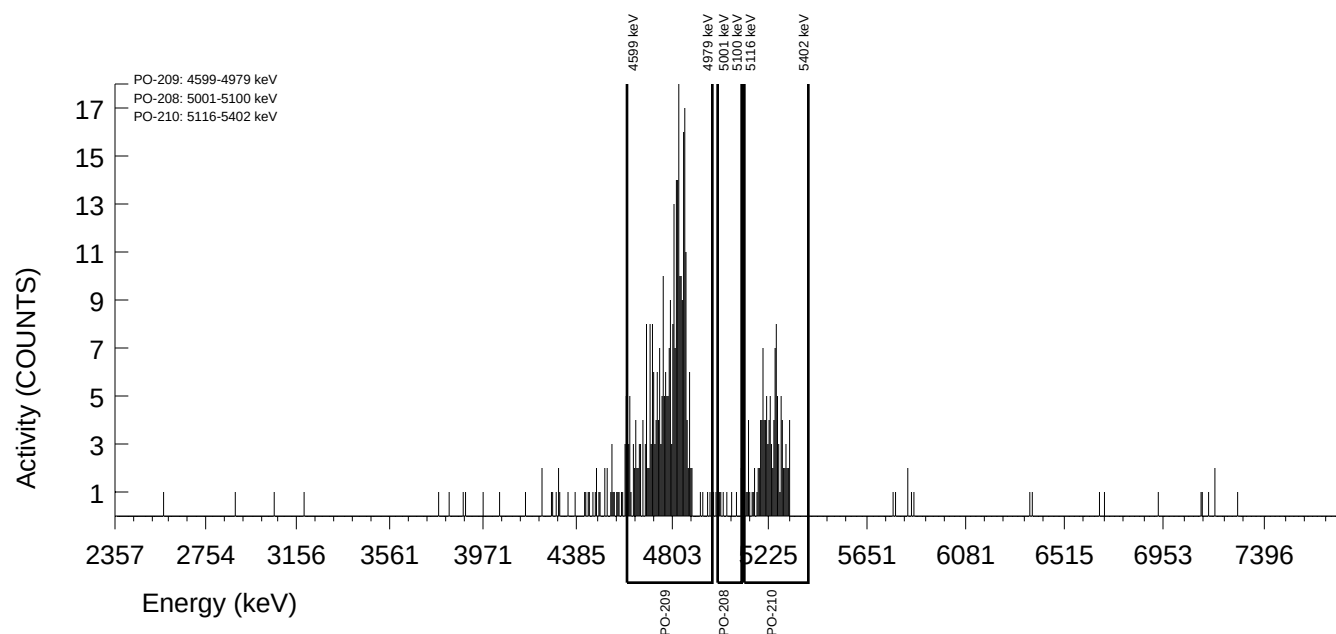


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2368295 SAMPLE ID : S0606487002_PO SAMPLE QTY : 0.106 F +/-0.940 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : BV1 % YIELD : 65.9 +/-6.009 %	CHAMBER : 180 DETECTOR S/N : 158175 AVERAGE %EFFICIENCY : 26.5097 AVERAGE %EFF ERROR : 0.5148 COUNT DATE : 19-Jan-2023 16:19:49 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B180.CNF;1555 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W180.CNF;78 CAL DATE : 17-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8577E+00 dpm RESULTS : 5.1758E+00 dpm		

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
PO-208	5080.00	5054.07	0.000	8.000	8.000	0.000	1.0000	100.000	8.21E-01	6.14E-01	3.08E-01	1.88E-01	6.05E-01	
PO-209	4882.00	4779.29	96.285	330.000	328.320	1.680	1.2961	99.740	3.33E+01	5.51E+00	7.85E-01	2.40E-01	3.61E+00	
PO-210	5304.38	5231.97	84.003	113.000	112.760	0.240	0.4899	100.000	1.29E+01	2.89E+00	5.48E-01	1.03E-01	2.39E+00	

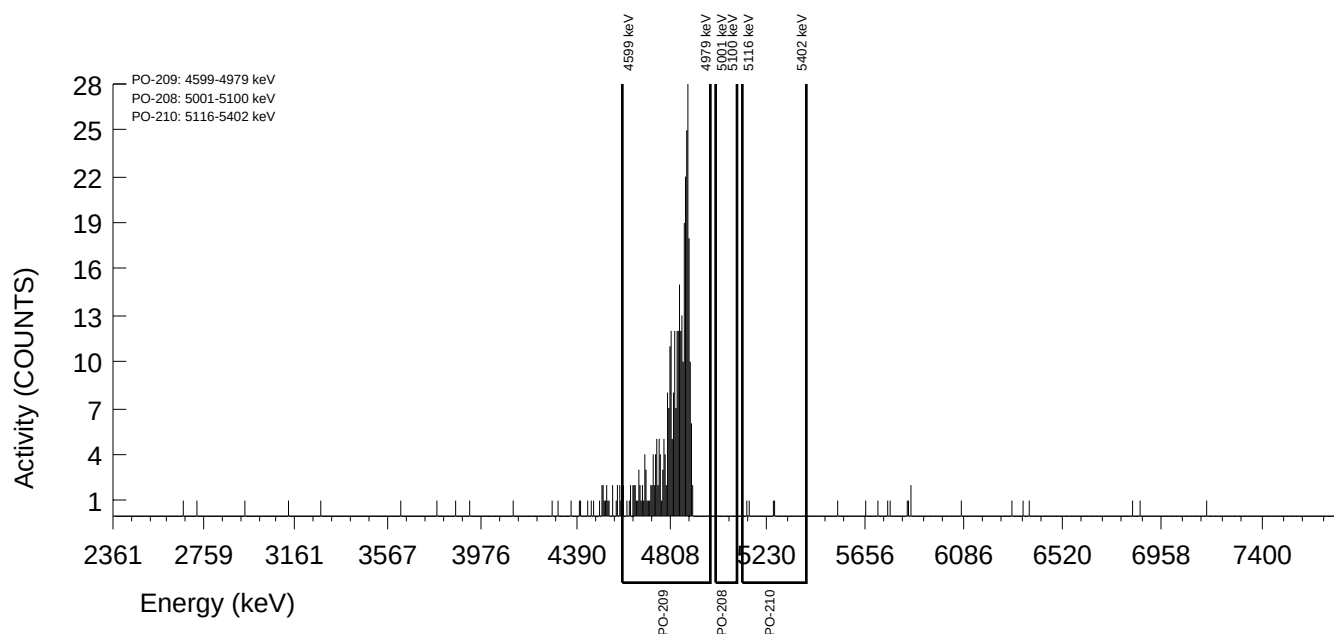


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2368295 SAMPLE ID : S0606487003_PO SAMPLE QTY : 0.104 F +/-0.960 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : BV1 % YIELD : 71.1 +/-5.845 %	CHAMBER : 181 DETECTOR S/N : 92565 AVERAGE %EFFICIENCY : 26.2224 AVERAGE %EFF ERROR : 0.5094 COUNT DATE : 19-Jan-2023 16:19:51 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B181.CNF;994 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W181.CNF;270 CAL DATE : 17-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8577E+00 dpm RESULTS : 5.5831E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5050.47	0.000	0.000	-0.240	0.240	0.4899	100.000	-2.36E-02	2.04E-01	4.71E-01	8.82E-02	2.04E-01
PO-209	4882.00	4822.77	43.692	352.000	350.320	1.680	1.2961	99.740	3.40E+01	5.48E+00	7.52E-01	2.30E-01	3.58E+00
PO-210	5304.38	5202.19	118.711	4.000	4.000	0.000	1.0000	100.000	4.38E-01	4.86E-01	3.29E-01	2.01E-01	4.83E-01

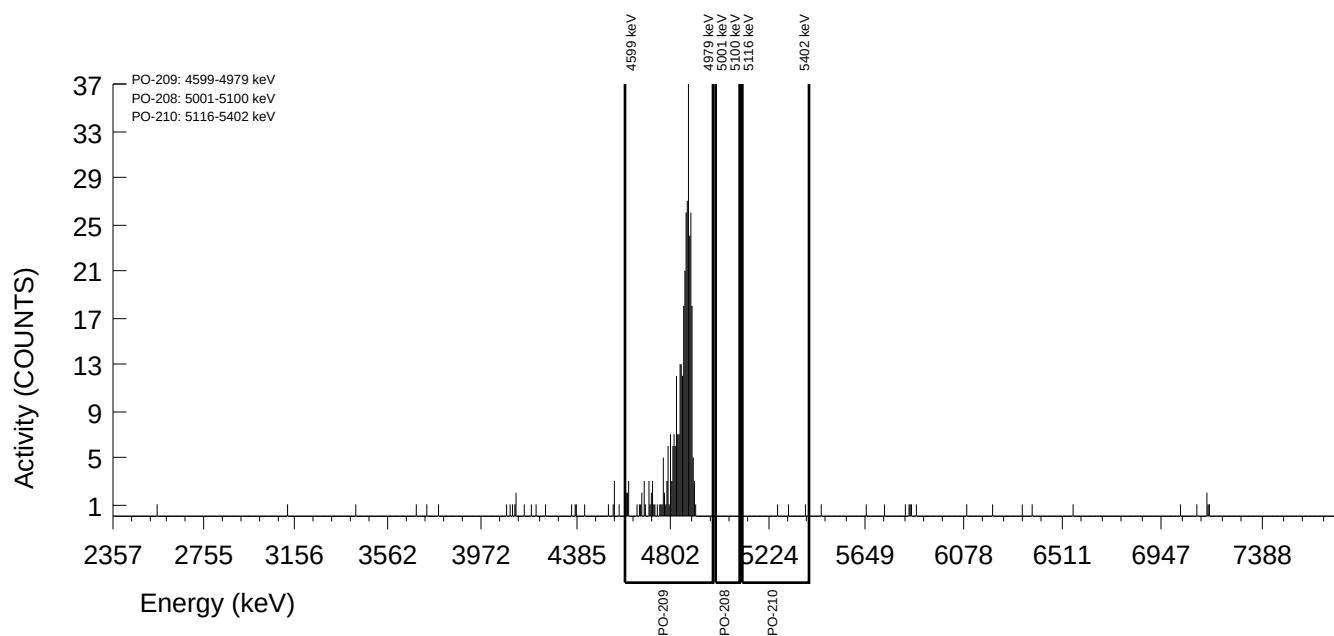


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2368295 SAMPLE ID : S1205293634_PO SAMPLE QTY : 0.106 F +/-0.940 % SAMPLE DATE : 16-Jan-2023 00:00:00 ANALYST : BV1 % YIELD : 67.3 +/-5.861 %	CHAMBER : 191 DETECTOR S/N : 140615 AVERAGE %EFFICIENCY : 27.4228 AVERAGE %EFF ERROR : 0.5320 COUNT DATE : 19-Jan-2023 16:20:04 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B191.CNF;1549 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W191.CNF;464 CAL DATE : 18-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8552E+00 dpm RESULTS : 5.2870E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5050.47	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.93E-01	2.87E-01	1.75E-01	1.93E-01
PO-209	4882.00	4840.28	33.509	348.000	347.040	0.960	0.9798	99.740	3.32E+01	5.37E+00	6.31E-01	1.72E-01	3.51E+00
PO-210	5304.38	5322.53	118.775	3.000	2.520	0.480	0.6928	100.000	2.45E-01	3.91E-01	5.39E-01	1.24E-01	3.90E-01

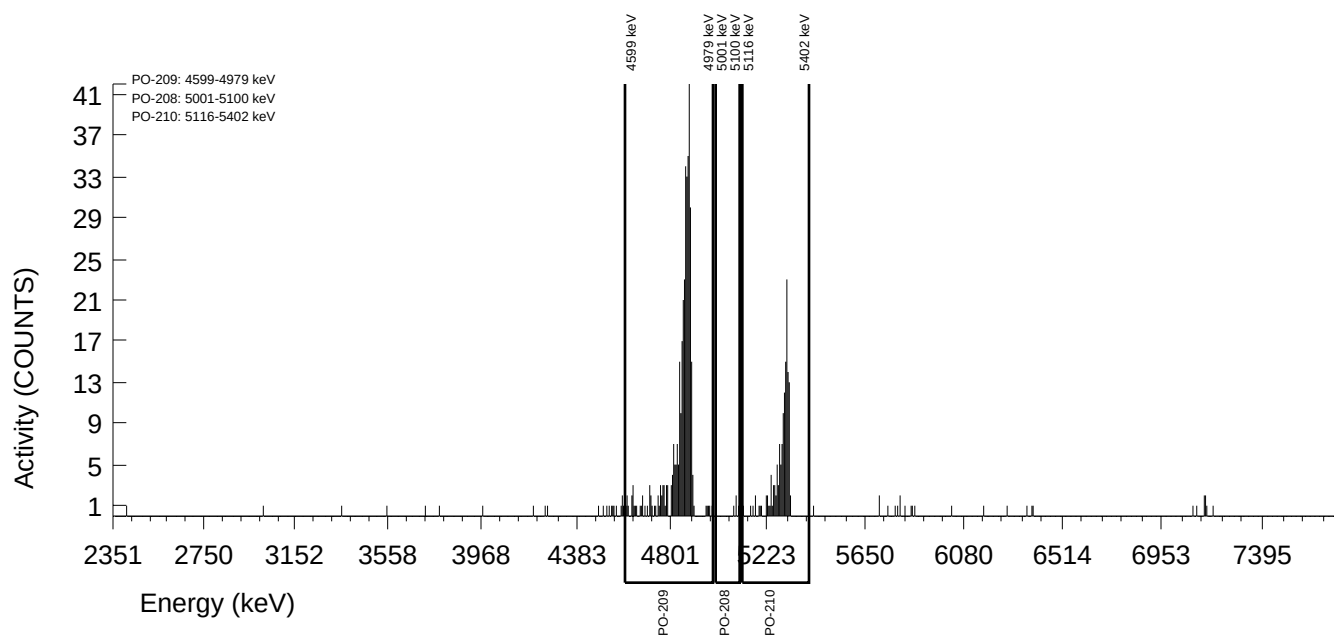


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2368295 SAMPLE ID : S1205293635_PO SAMPLE QTY : 0.106 F +/-0.940 % SAMPLE DATE : 16-Jan-2023 00:00:00 ANALYST : BV1 % YIELD : 76.4 +/-5.736 %	CHAMBER : 194 DETECTOR S/N : 140618 AVERAGE %EFFICIENCY : 25.5079 AVERAGE %EFF ERROR : 0.4959 COUNT DATE : 19-Jan-2023 16:20:07 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B194.CNF;1545 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W194.CNF;450 CAL DATE : 18-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8552E+00 dpm RESULTS : 5.9997E+00 dpm	LCS ID 2012-A NUCLIDE PO-210 NOMINAL (pCi/F) 1.3516E+01 % RECOVERY 97.939	

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
PO-208	5080.00	5085.72	4.953	4.000	3.760	0.240	0.4899	100.000	3.41E-01	4.04E-01	4.35E-01	8.14E-02	4.02E-01	4.02E-01
PO-209	4882.00	4844.60	32.688	368.000	366.320	1.680	1.2961	99.740	3.32E+01	5.26E+00	7.03E-01	2.15E-01	3.42E+00	3.42E+00
PO-210	5304.38	5285.74	21.725	144.000	143.520	0.480	0.6928	100.000	1.32E+01	2.70E+00	5.11E-01	1.17E-01	2.18E+00	2.18E+00

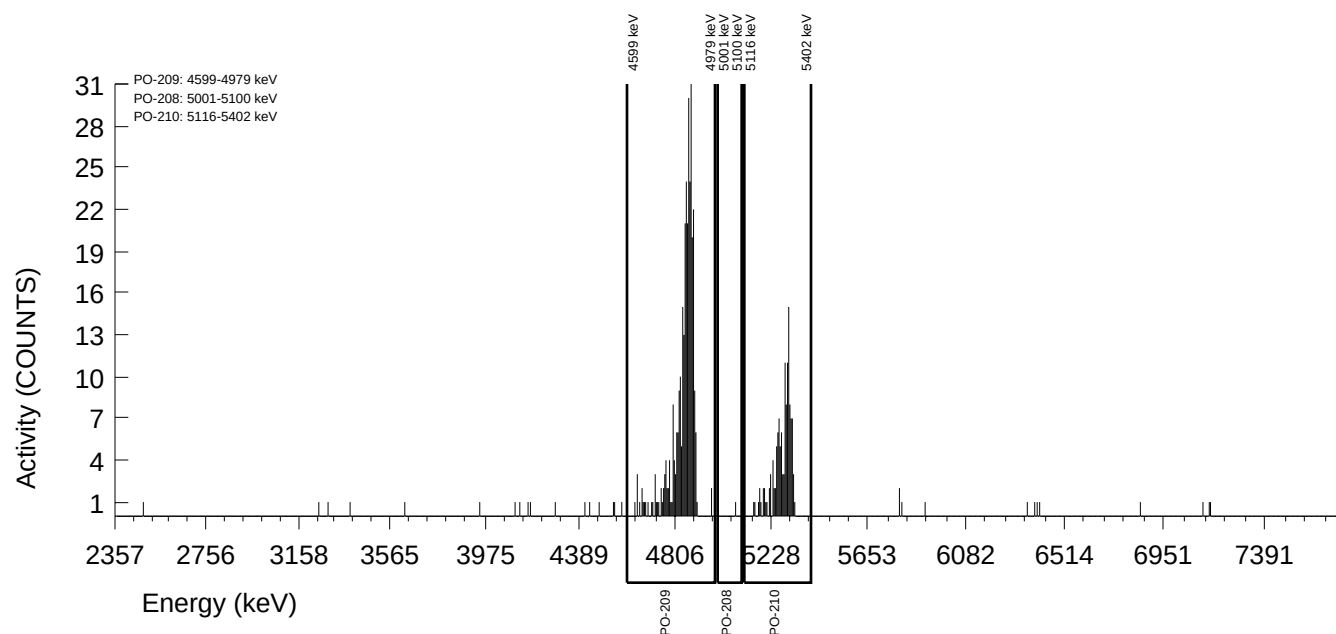


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2368295 SAMPLE ID : S1205293636_PO SAMPLE QTY : 0.106 F +/-0.940 % SAMPLE DATE : 16-Jan-2023 00:00:00 ANALYST : BV1 % YIELD : 64.9 +/-5.993 %	CHAMBER : 192 DETECTOR S/N : 140616 AVERAGE %EFFICIENCY : 27.0513 AVERAGE %EFF ERROR : 0.5250 COUNT DATE : 19-Jan-2023 16:20:09 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B192.CNF;1555 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W192.CNF;484 CAL DATE : 18-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8552E+00 dpm RESULTS : 5.1014E+00 dpm	LCSD ID 2012-A NUCLIDE PO-210 NOMINAL (pCi/F) 1.3516E+01 % RECOVERY 98.230	

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
PO-208	5080.00	5074.53	4.961	1.000	-0.200	1.200	1.0954	100.000	-2.01E-02	3.02E-01	7.06E-01	2.02E-01	3.02E-01	3.02E-01
PO-209	4882.00	4845.70	40.622	332.000	330.320	1.680	1.2961	99.740	3.32E+01	5.50E+00	7.80E-01	2.39E-01	3.60E+00	3.60E+00
PO-210	5304.38	5278.64	24.497	131.000	129.800	1.200	1.0954	100.000	1.33E+01	2.84E+00	7.17E-01	2.05E-01	2.31E+00	2.31E+00



Continuing Calibration Data

Review of Alpha Spectrometer QA results (Daily checks) 19-JAN-2023 10:52:29.41

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
19-JAN-2023	23	PSFWHM-5000	Above
19-JAN-2023	46	PSFWHM-5000	Below
19-JAN-2023	46	PSCTSS-5000	Below
19-JAN-2023	91	PSFWHM-5000	Below
19-JAN-2023	91	PSCTSS-5000	Below
19-JAN-2023	94	PSFWHM-5000	Below
19-JAN-2023	94	PSCTSS-5000	Below
19-JAN-2023	101	PSFWHM-5000	Below
19-JAN-2023	101	PSCTSS-5000	Below
21-SEP-2022	115	PSCTSS-5000	Below
19-JAN-2023	143	PSFWHM-5000	Below
19-JAN-2023	143	PSCENTRD-5000	Below
19-JAN-2023	143	PSCTSS-5000	Below
19-JAN-2023	167	PSENERGY-5000	Above
19-JAN-2023	171	PSENERGY-5000	Above
19-JAN-2023	171	PSCENTRD-5000	Above
19-JAN-2023	171	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
19-JAN-2023	214	PSENERGY-5000	Above
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below
19-JAN-2023	239	PSENERGY-5000	Above
19-JAN-2023	239	PSCENTRD-5000	Above

The following detectors that may not have properly transferred to the QA file

115 may not have run since 19-JAN-2023

116 may not have run since 19-JAN-2023

119 may not have run since 19-JAN-2023
120 may not have run since 19-JAN-2023
137 may not have run since 19-JAN-2023
147 may not have run since 19-JAN-2023
148 may not have run since 19-JAN-2023
163 may not have run since 19-JAN-2023
164 may not have run since 19-JAN-2023
183 may not have run since 19-JAN-2023
184 may not have run since 19-JAN-2023
198 may not have run since 19-JAN-2023
221 may not have run since 19-JAN-2023
227 may not have run since 19-JAN-2023
228 may not have run since 19-JAN-2023
241 may not have run since 19-JAN-2023
242 may not have run since 19-JAN-2023
247 may not have run since 19-JAN-2023
248 may not have run since 19-JAN-2023

APPROVAL DATE: 1/19/23

APPROVAL TIME: 1056

APPROVED BY: 

PROCEDURE # GL-RAD-I-009

Report completed at 19-JAN-2023 10:56:13.02

Review of Alpha Spectrometer QA results (Daily checks) 22-JAN-2023 23:00:00.73

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
22-JAN-2023	46	PSFWHM-5000	Below
22-JAN-2023	46	PSCTSS-5000	Below
22-JAN-2023	70	Second Check Required for D	
22-JAN-2023	91	PSFWHM-5000	Below
22-JAN-2023	91	PSCTSS-5000	Below
22-JAN-2023	94	PSFWHM-5000	Below
22-JAN-2023	94	PSCTSS-5000	Below
22-JAN-2023	101	PSFWHM-5000	Below
22-JAN-2023	101	PSCTSS-5000	Below
21-SEP-2022	115	PSCTSS-5000	Below
22-JAN-2023	143	PSFWHM-5000	Below
22-JAN-2023	143	PSCENTRD-5000	Below
22-JAN-2023	143	PSCTSS-5000	Below
22-JAN-2023	156	PSENERGY-5000	Above
22-JAN-2023	161	PSFWHM-5000	Above
22-JAN-2023	171	PSENERGY-5000	Above
22-JAN-2023	171	PSCENTRD-5000	Above
22-JAN-2023	173	PSCTSS-5000	Below
22-JAN-2023	175	PSFWHM-5000	Below
22-JAN-2023	175	PSCTSS-5000	Below
22-JAN-2023	177	PSCTSS-5000	Below
22-JAN-2023	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
22-JAN-2023	217	PSENERGY-5000	Above
22-JAN-2023	219	PSENERGY-5000	Above
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below

15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transferred to the QA file

115	may not have run since 22-JAN-2023
116	may not have run since 22-JAN-2023
119	may not have run since 22-JAN-2023
120	may not have run since 22-JAN-2023
137	may not have run since 22-JAN-2023
147	may not have run since 22-JAN-2023
148	may not have run since 22-JAN-2023
183	may not have run since 22-JAN-2023
184	may not have run since 22-JAN-2023
198	may not have run since 22-JAN-2023
209	may not have run since 22-JAN-2023
210	may not have run since 22-JAN-2023
211	may not have run since 22-JAN-2023
212	may not have run since 22-JAN-2023
221	may not have run since 22-JAN-2023
227	may not have run since 22-JAN-2023
228	may not have run since 22-JAN-2023
241	may not have run since 22-JAN-2023
242	may not have run since 22-JAN-2023
244	may not have run since 22-JAN-2023
247	may not have run since 22-JAN-2023
248	may not have run since 22-JAN-2023

APPROVAL DATE: ~ 1/22/2023

APPROVAL TIME: 23:10

APPROVED BY: 

PROCEDURE # GL-RAD-I-009

Report completed at 22-JAN-2023 23:02:31.15

Review of Alpha Spectrometer QA results (Daily checks) 23-JAN-2023 23:00:00.71

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
23-JAN-2023	46	PSFWHM-5000	Below
23-JAN-2023	46	PSCTSS-5000	Below
23-JAN-2023	91	PSFWHM-5000	Below
23-JAN-2023	91	PSCTSS-5000	Below
23-JAN-2023	94	PSFWHM-5000	Below
23-JAN-2023	94	PSCTSS-5000	Below
23-JAN-2023	101	PSFWHM-5000	Below
23-JAN-2023	101	PSCTSS-5000	Below
21-SEP-2022	115	PSCTSS-5000	Below
23-JAN-2023	143	PSFWHM-5000	Below
23-JAN-2023	143	PSCENTRD-5000	Below
23-JAN-2023	143	PSCTSS-5000	Below
23-JAN-2023	144	Second Check Required for D	
23-JAN-2023	156	PSENERGY-5000	Above
23-JAN-2023	161	PSFWHM-5000	Above
23-JAN-2023	171	PSENERGY-5000	Above
23-JAN-2023	171	PSCENTRD-5000	Above
23-JAN-2023	173	PSCTSS-5000	Below
23-JAN-2023	175	PSFWHM-5000	Below
23-JAN-2023	175	PSCTSS-5000	Below
23-JAN-2023	177	PSCTSS-5000	Below
23-JAN-2023	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
23-JAN-2023	217	PSENERGY-5000	Above
23-JAN-2023	219	PSENERGY-5000	Above
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below

15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transfered to the QA file

115	may not have run since 23-JAN-2023
116	may not have run since 23-JAN-2023
119	may not have run since 23-JAN-2023
120	may not have run since 23-JAN-2023
137	may not have run since 23-JAN-2023
145	may not have run since 23-JAN-2023
146	may not have run since 23-JAN-2023
147	may not have run since 23-JAN-2023
148	may not have run since 23-JAN-2023
183	may not have run since 23-JAN-2023
184	may not have run since 23-JAN-2023
198	may not have run since 23-JAN-2023
221	may not have run since 23-JAN-2023
227	may not have run since 23-JAN-2023
228	may not have run since 23-JAN-2023
241	may not have run since 23-JAN-2023
242	may not have run since 23-JAN-2023
247	may not have run since 23-JAN-2023
248	may not have run since 23-JAN-2023

APPROVAL DATE: 1/23/23

APPROVAL TIME: 23:30

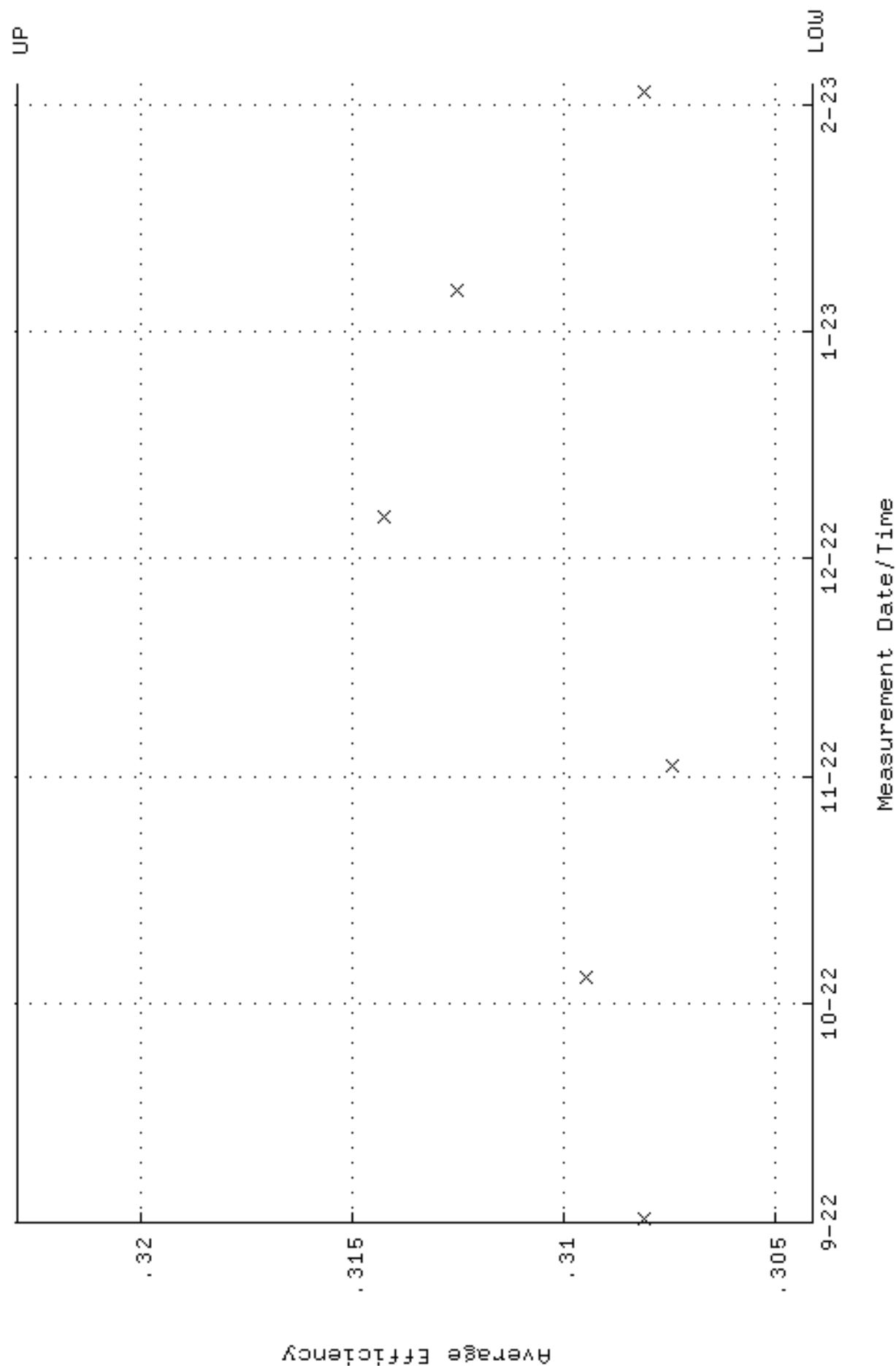
APPROVED BY: 

PROCEDURE # GL-RAD-I-009

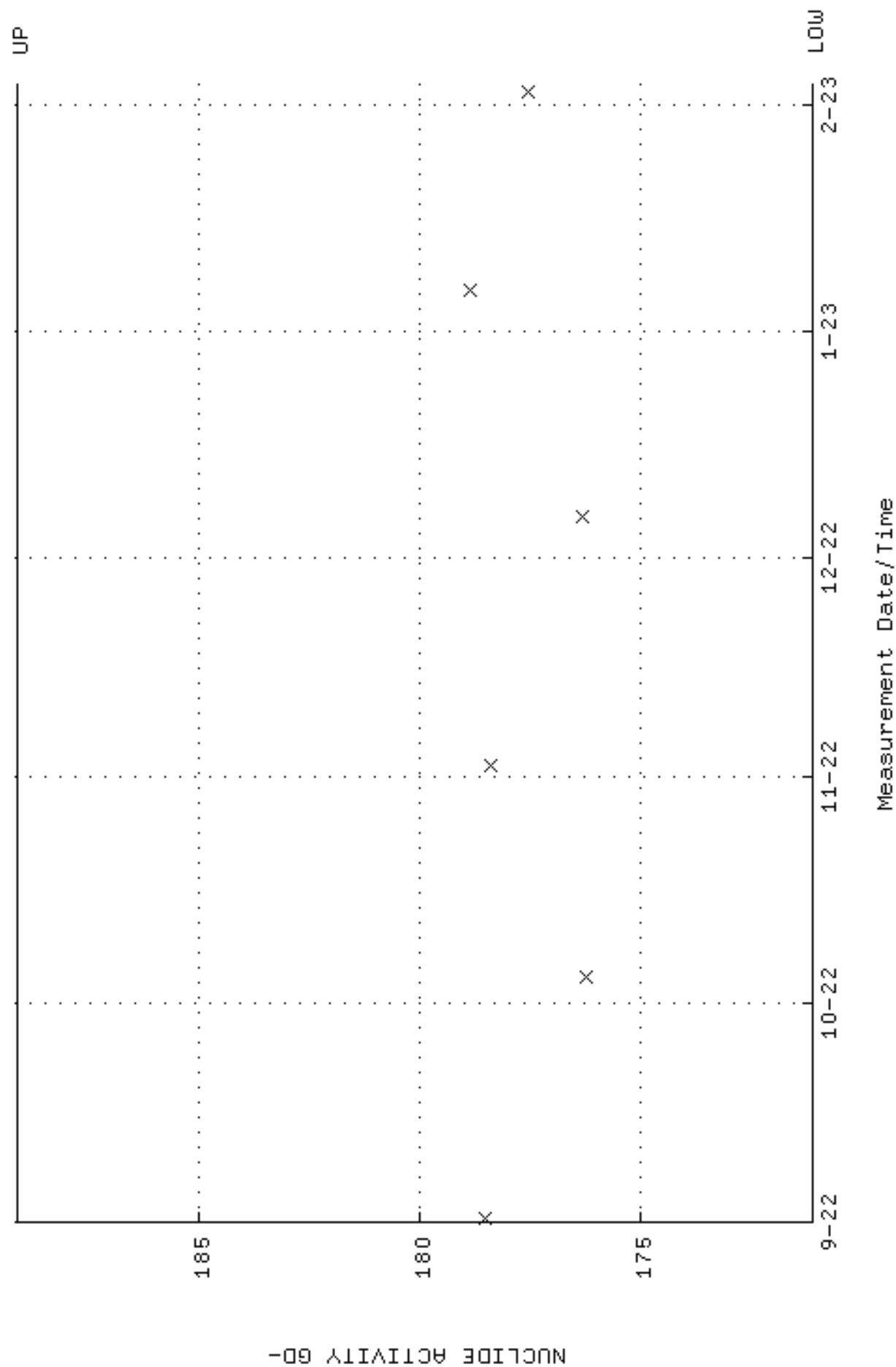
Report completed at 23-JAN-2023 23:02:31.63

Background and Efficiency Data

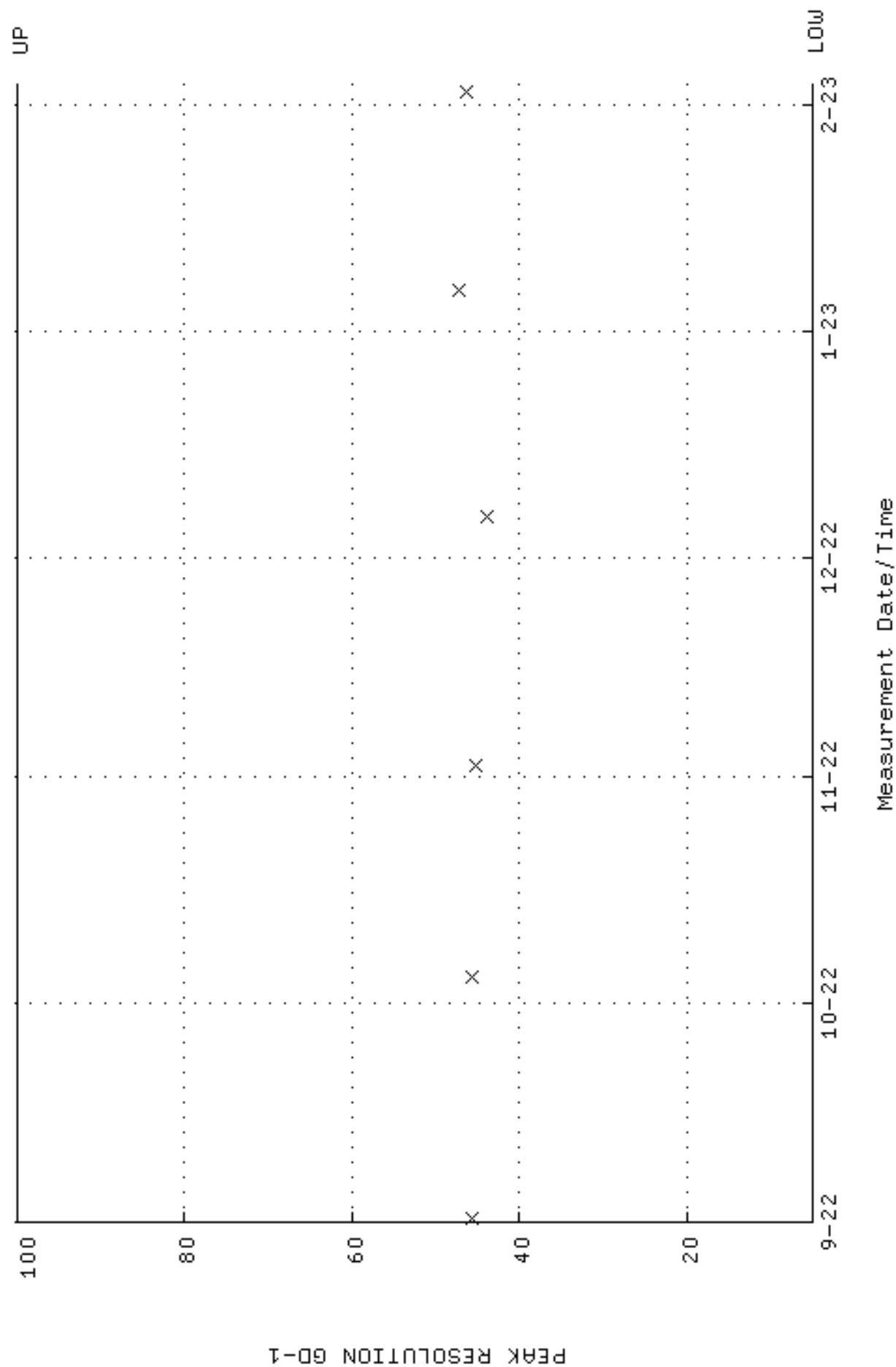
QA filename : DKA100:[ENV_ALPHA.QA.W]W024.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 1-SEP-2022 09:30:17 through 3-FEB-2023 12:00:00
 Lower/Upper Lmts: 0.304118 through 0.322930



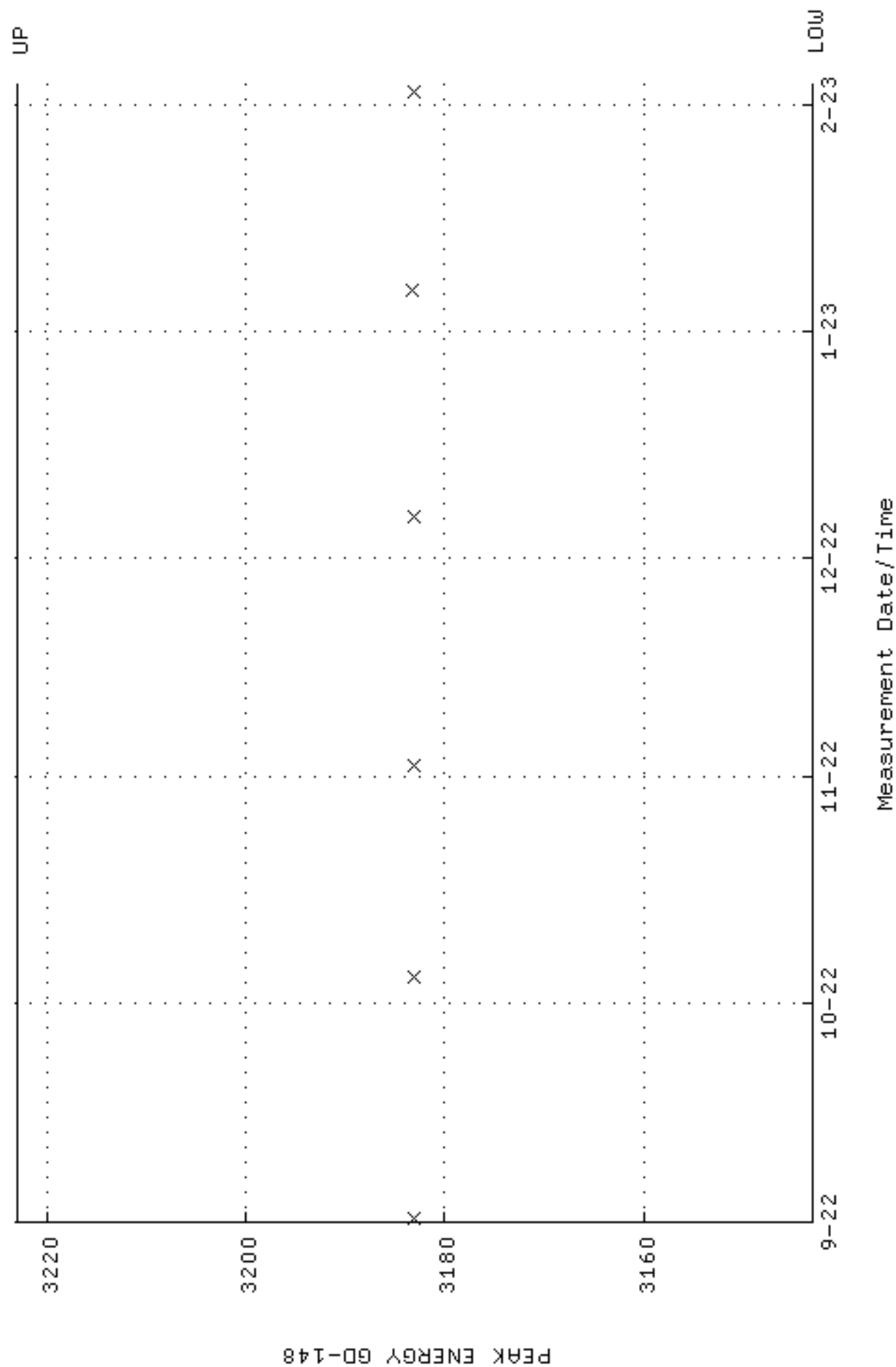
QA filename : DKA100:[ENV_ALPHA.QA.W]W024.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 1-SEP-2022 09:30:17 through 3-FEB-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



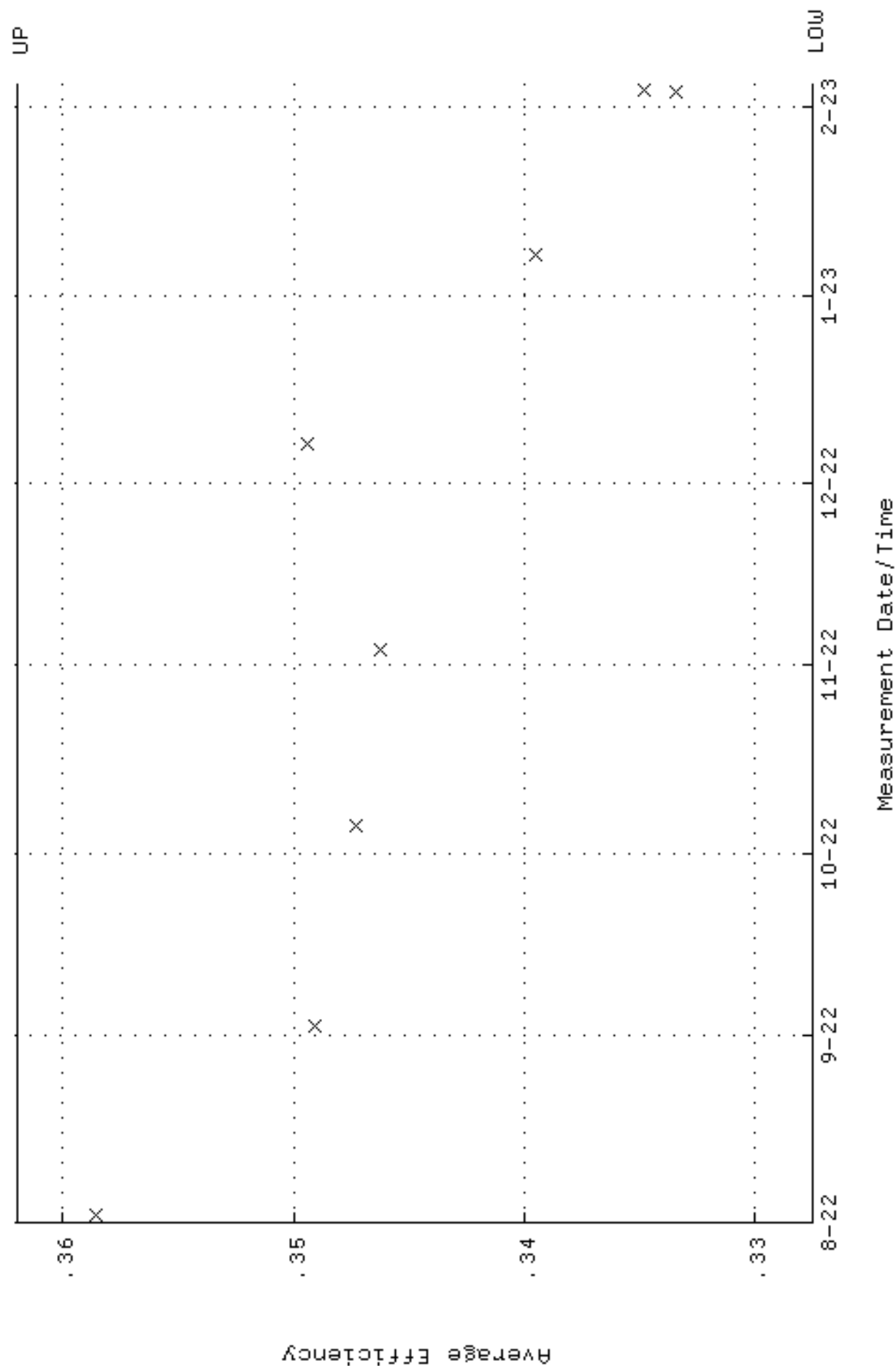
QA filename : DKA100:[ENV_ALPHA.QA.W]W024.QAF;4
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 1-SEP-2022 09:30:17 through 3-FEB-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



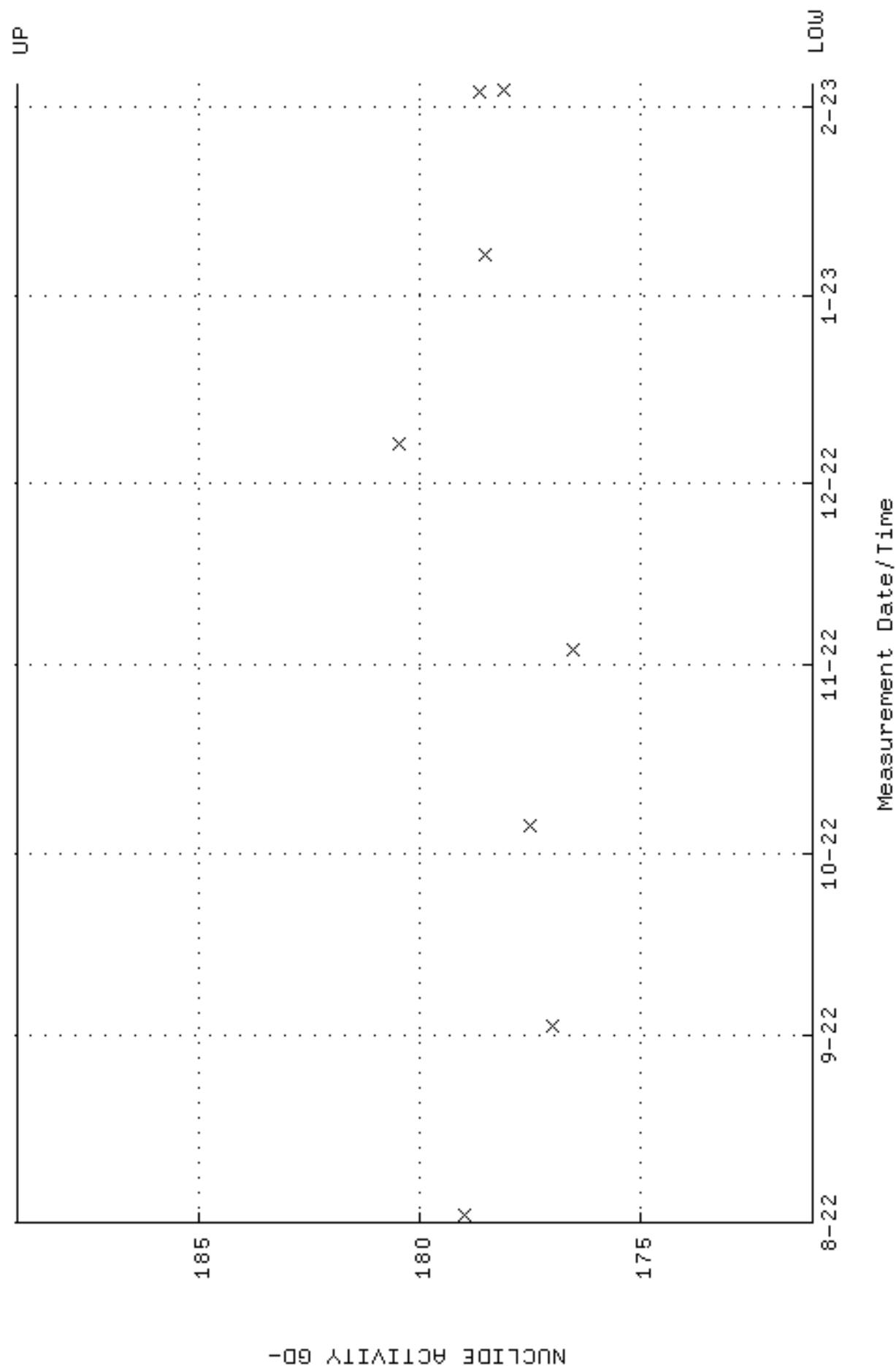
QA filename : DKA100:[ENV_ALPHA.QA.W]W024.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 1-SEP-2022 09:30:17 through 3-FEB-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



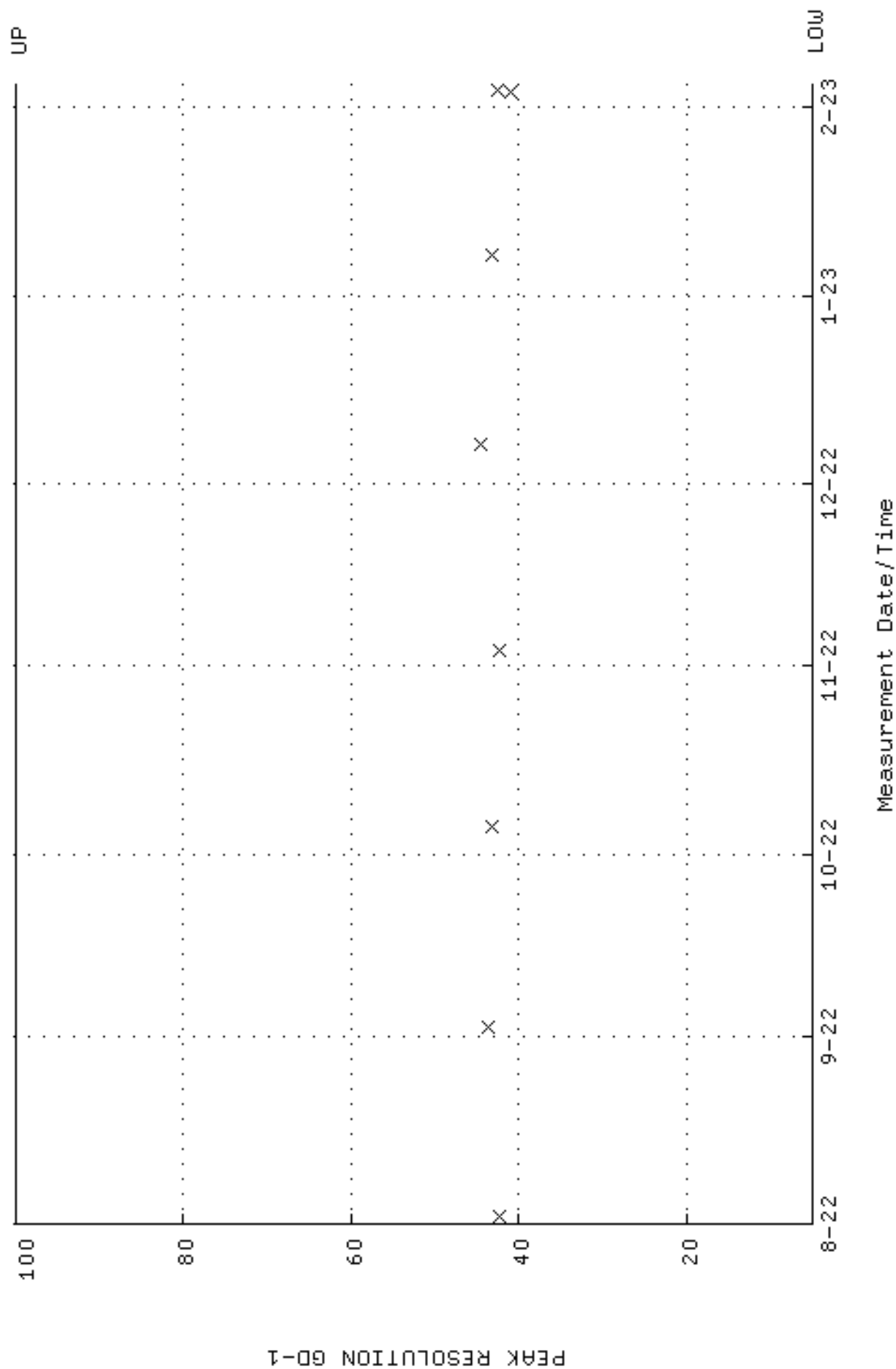
QA filename : DKA100:[ENV_ALPHA.QA.W]W027.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-AUG-2022 09:13:18 through 4-FEB-2023 12:00:00
 Lower/Upper Lmts: 0.327498 through 0.361972



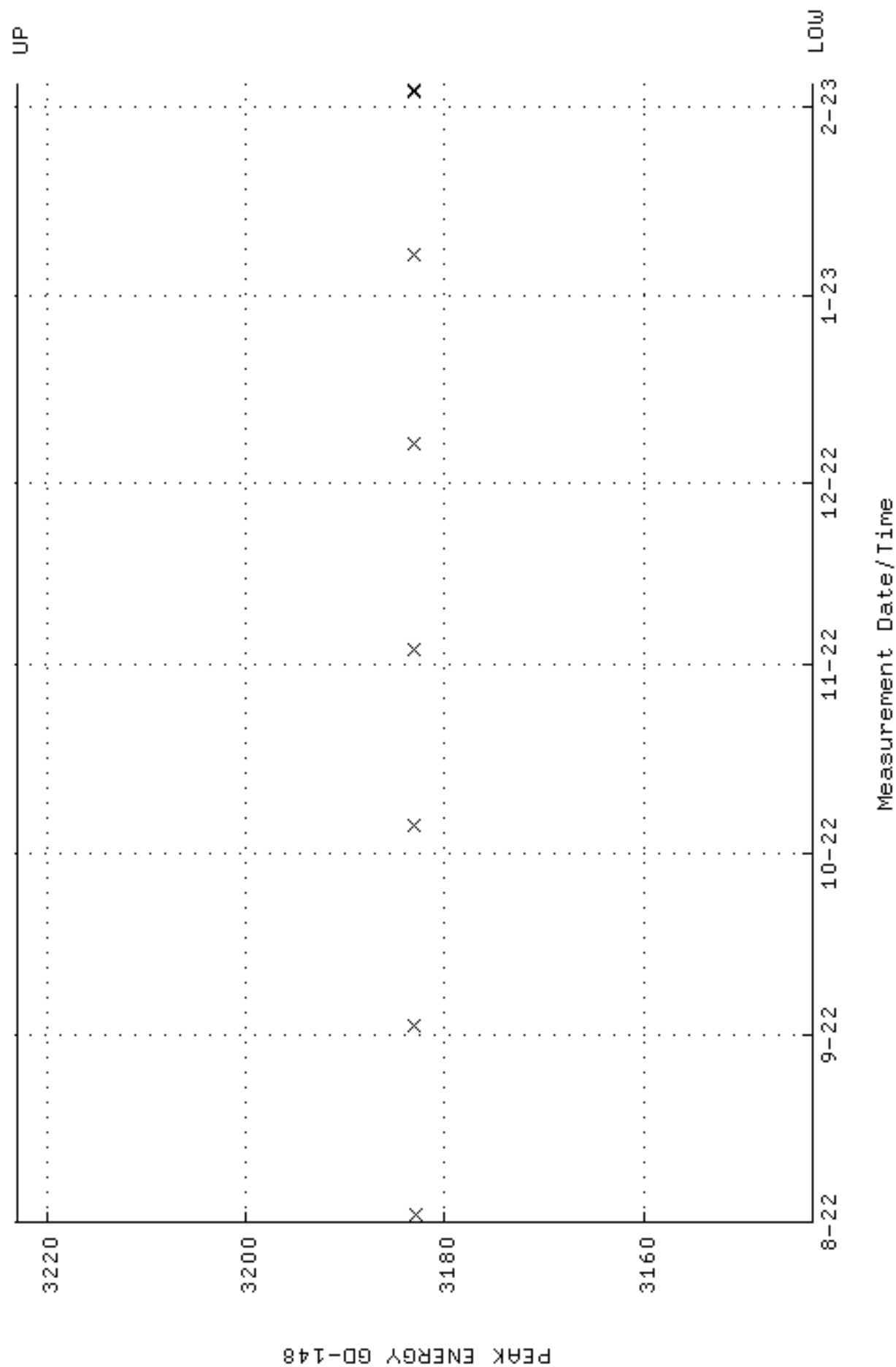
QA filename : DKA100:[ENV_ALPHA.QA.W]W027.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-AUG-2022 09:13:18 through 4-FEB-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



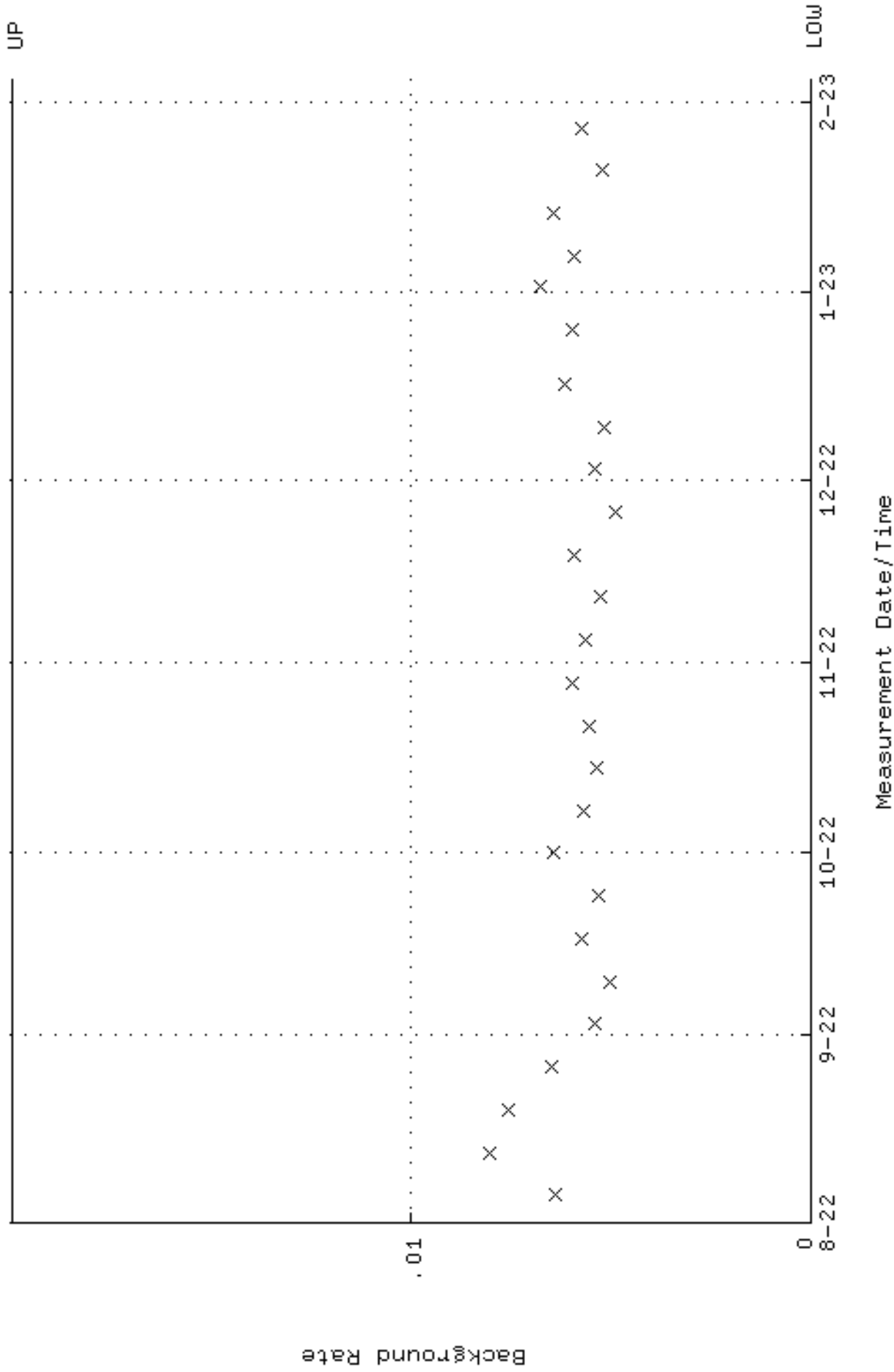
QA filename : DKA100:[ENV_ALPHA.QA.W]W027.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 2-AUG-2022 09:13:18 through 4-FEB-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



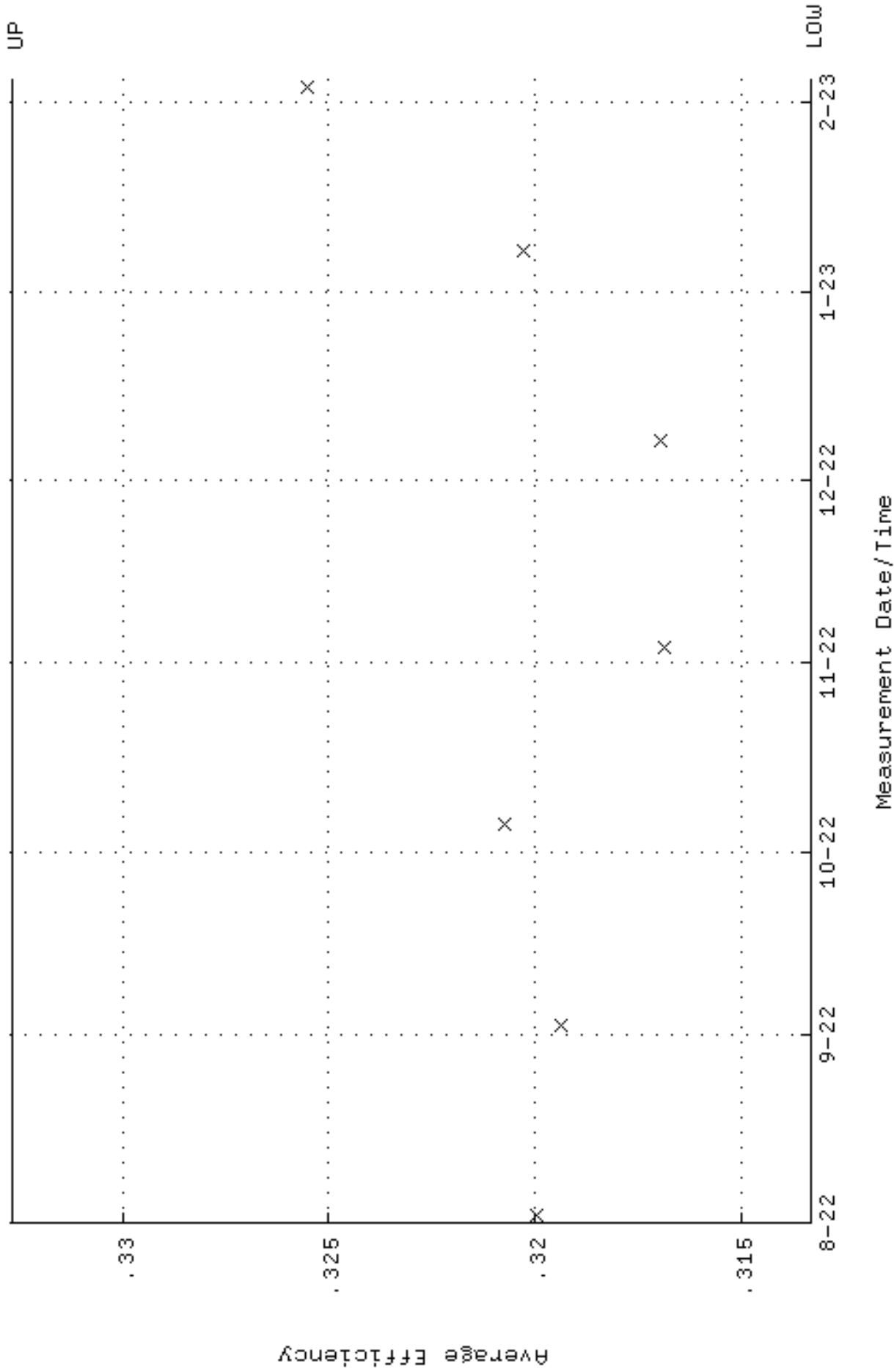
QA filename : DKA100:[ENV_ALPHA.QA.W]W027.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-AUG-2022 09:13:18 through 4-FEB-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



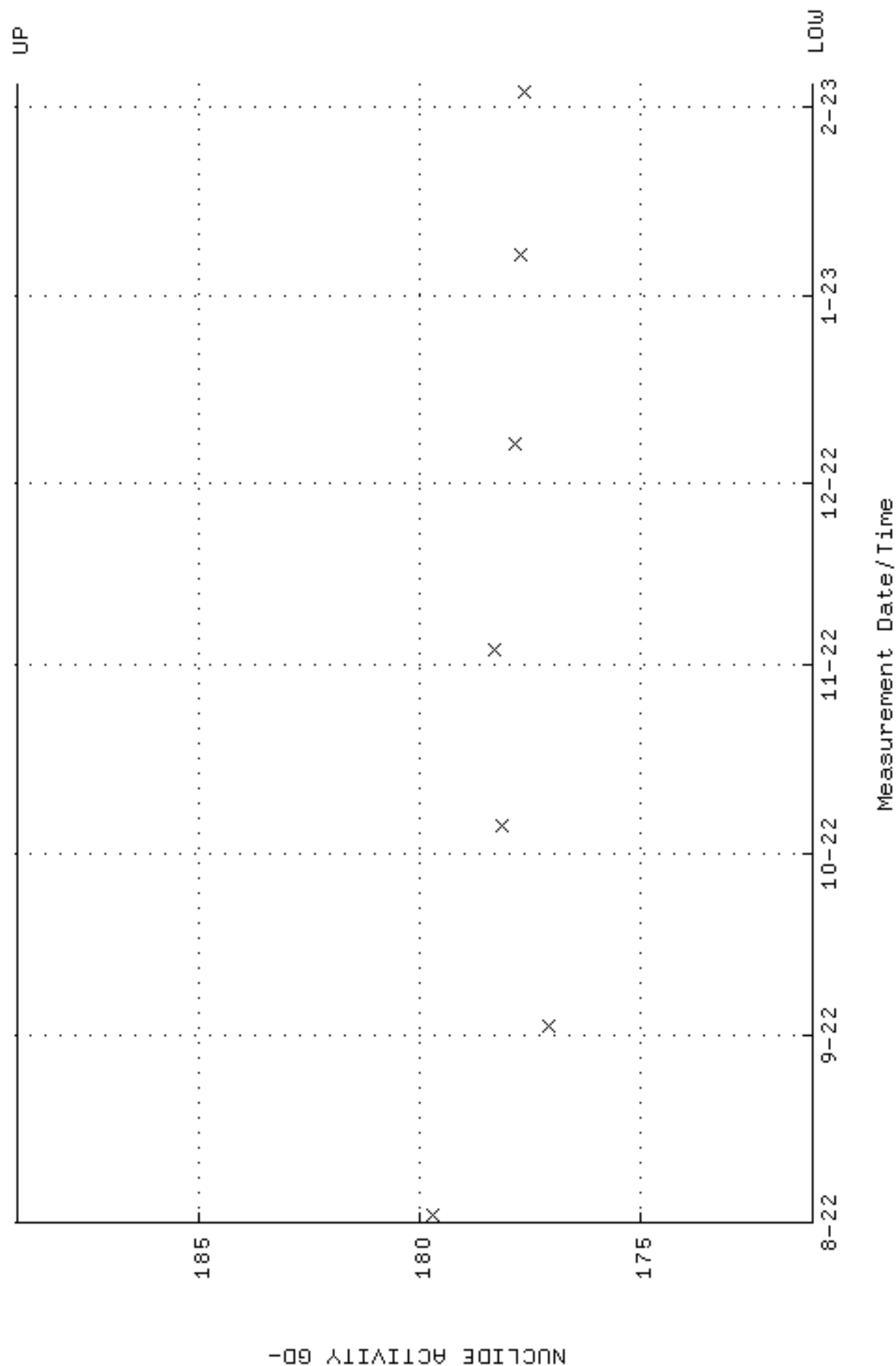
QA filename : DKA100:[ENV_ALPHA.QA.B]B027.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 5-AUG-2022 12:49:07 through 4-FEB-2023 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



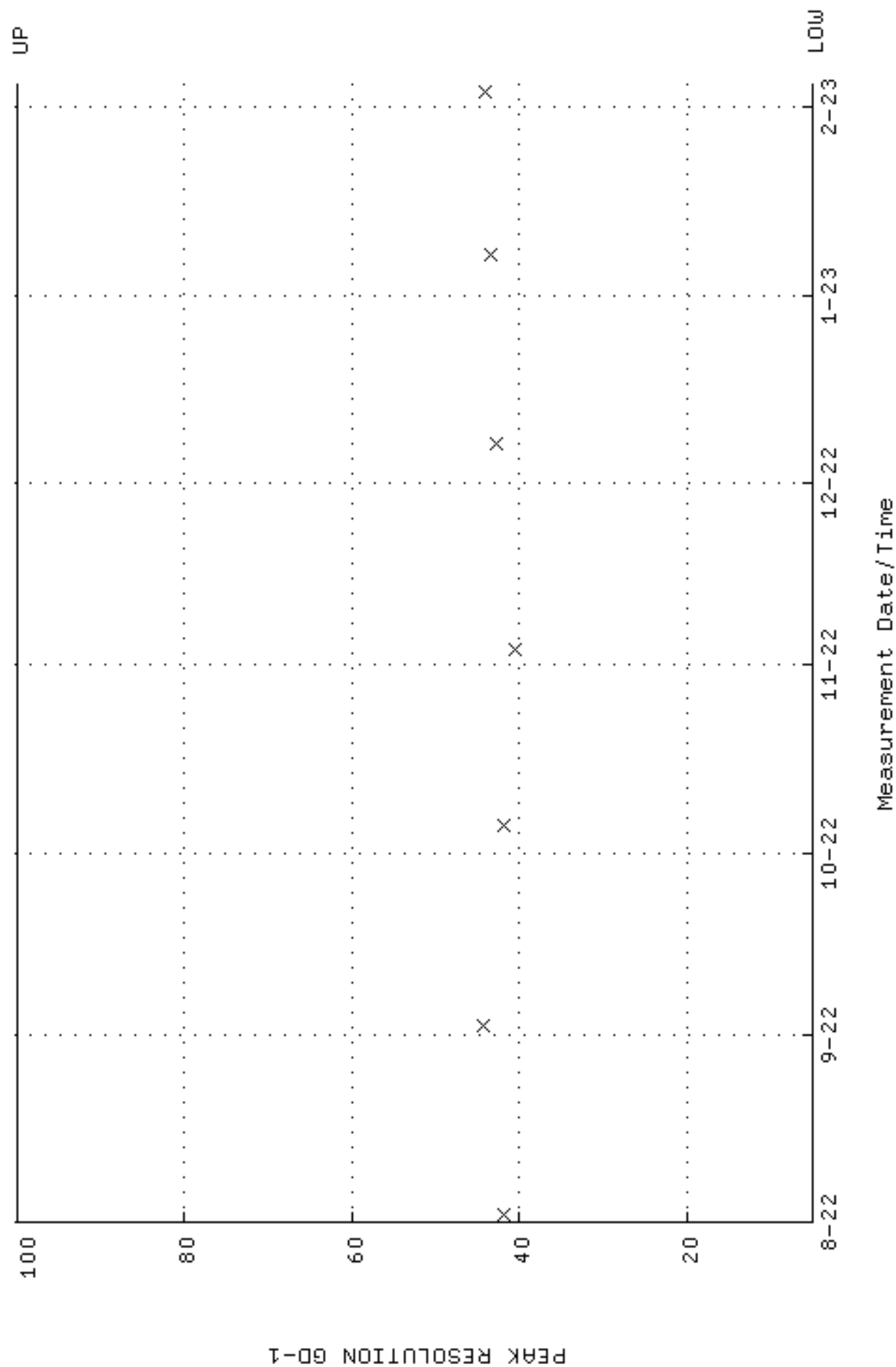
QA filename : DKA100:[ENV_ALPHA.QA.W]W028.QAF;8
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 2-AUG-2022 09:13:18 through 4-FEB-2023 12:00:00
Lower/Upper Lmts: 0.313300 through 0.332680



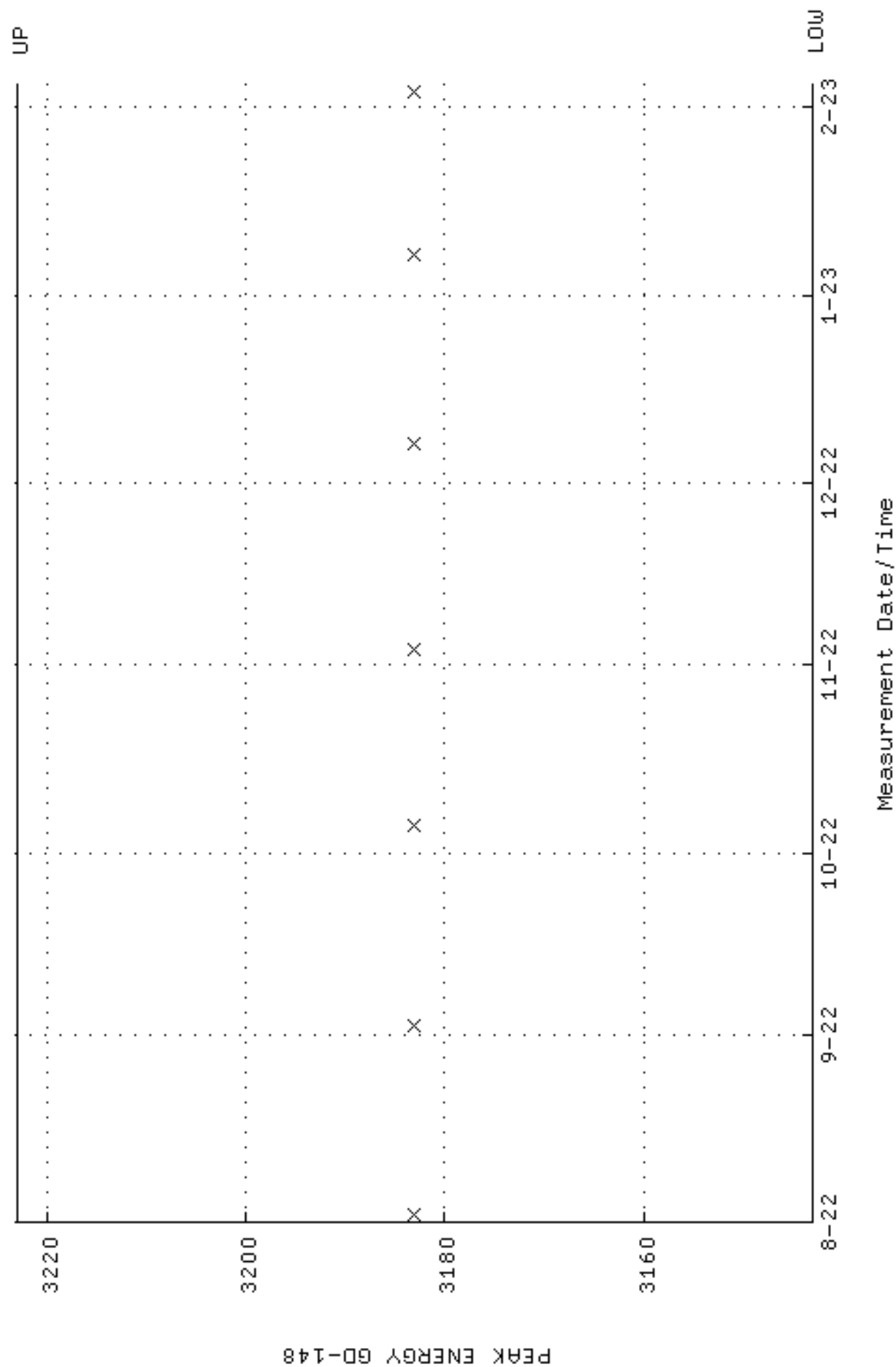
QA filename : DKA100:[ENV_ALPHA.QA.W]W028.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-AUG-2022 09:13:18 through 4-FEB-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



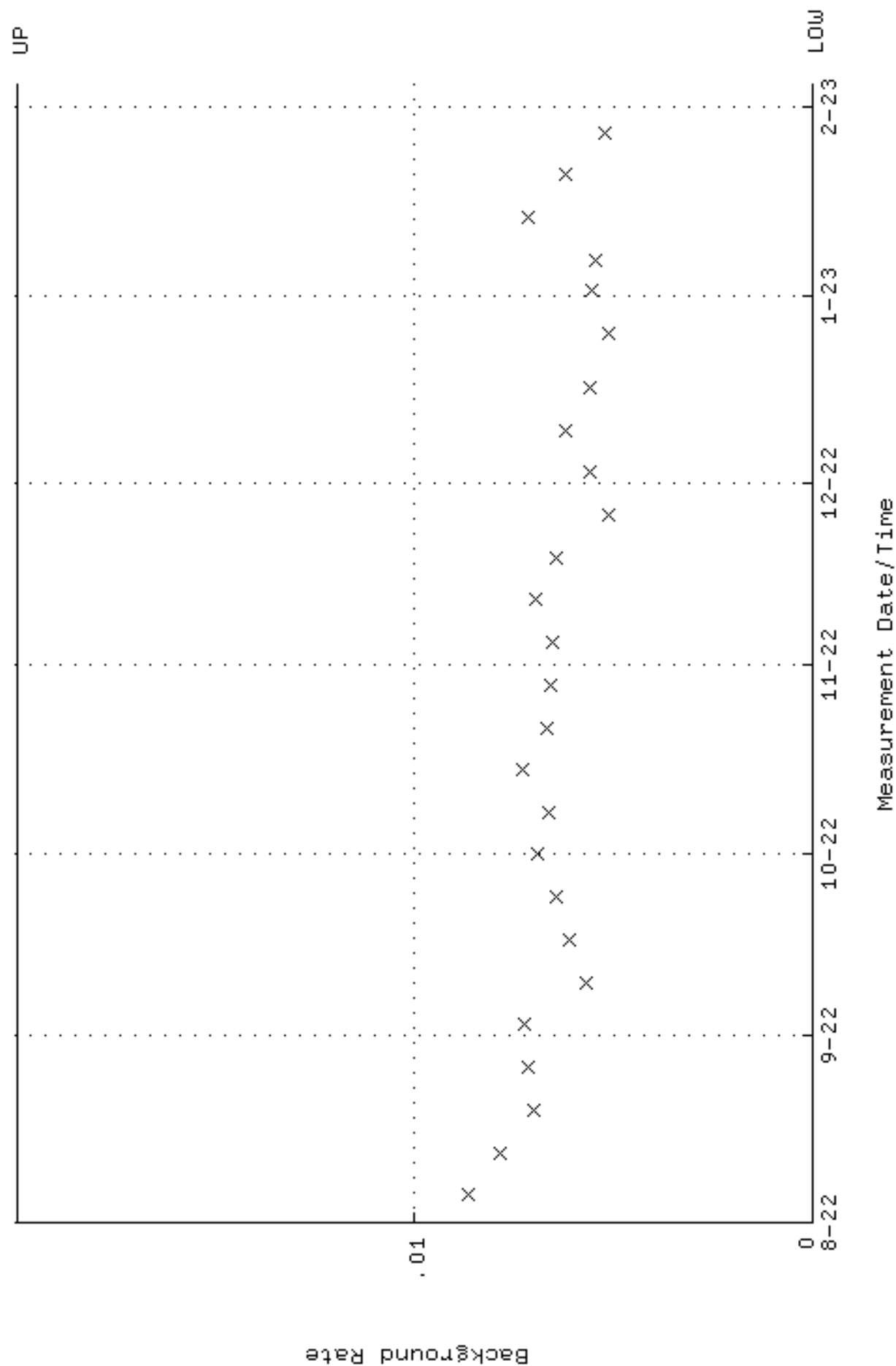
QA filename : DKA100:[ENV_ALPHA.QA.W]W028.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 2-AUG-2022 09:13:18 through 4-FEB-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



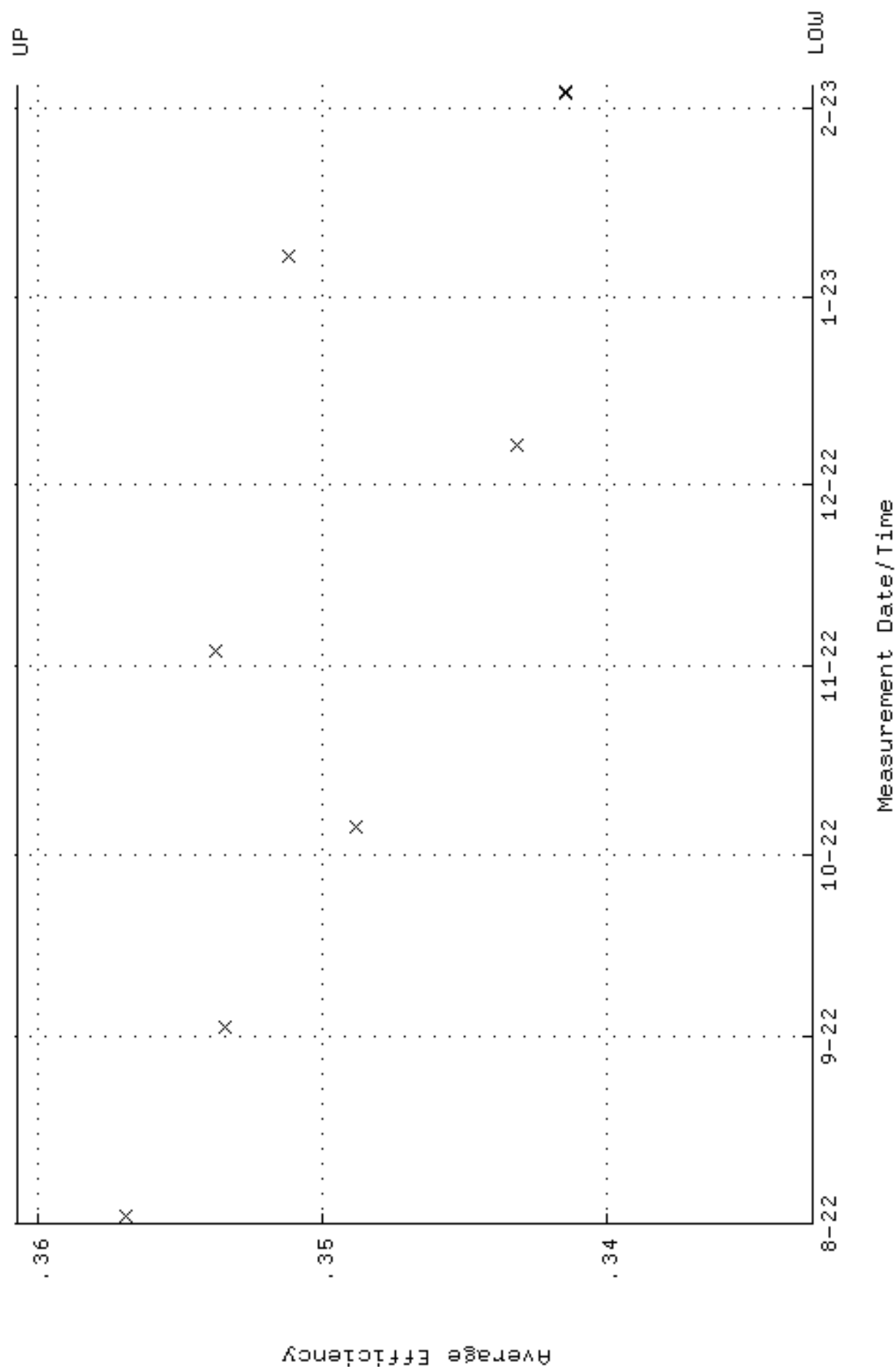
QA filename : DKA100:[ENV_ALPHA.QA.W]W028.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-AUG-2022 09:13:18 through 4-FEB-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



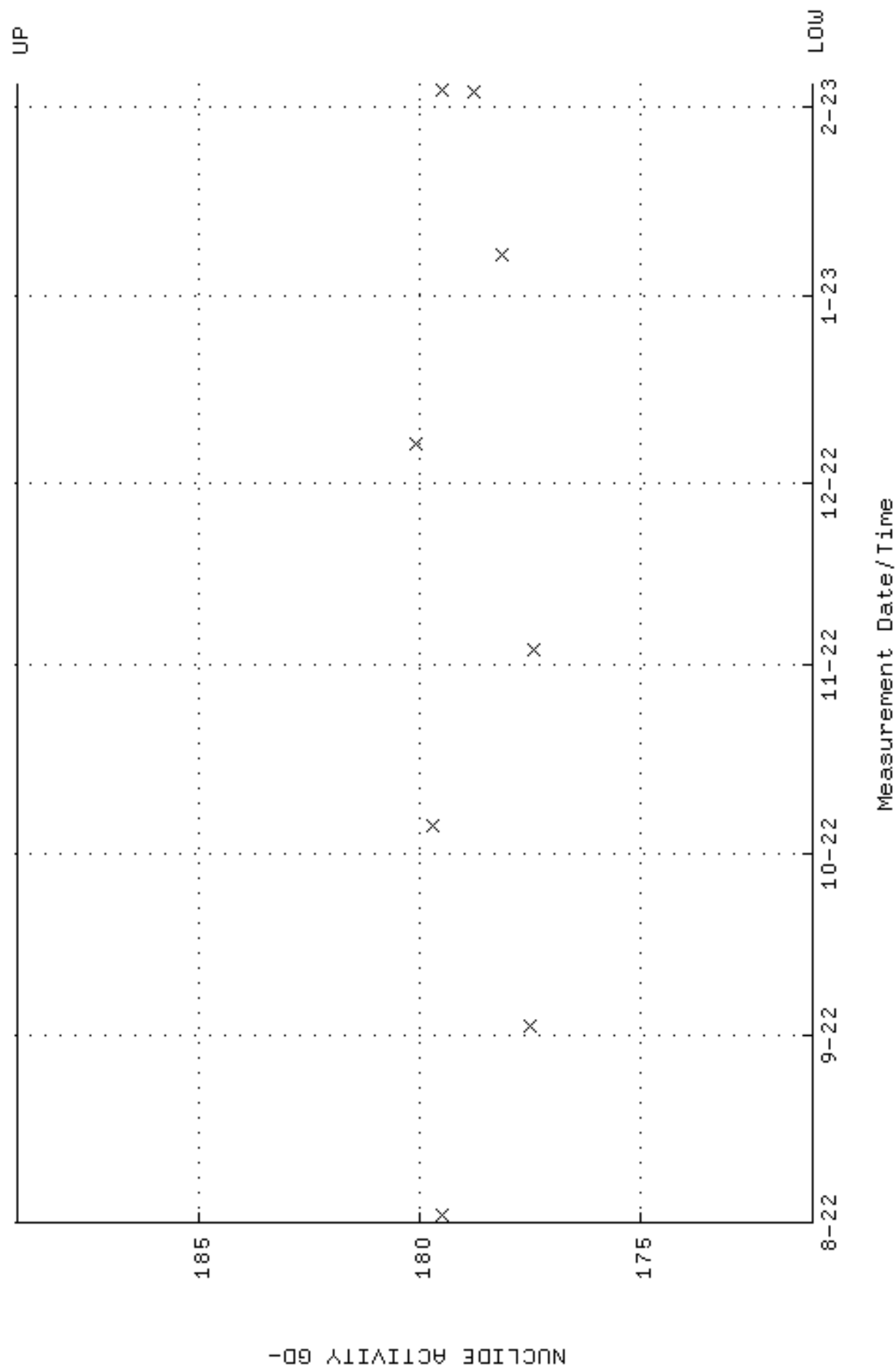
QA filename : DKA100:[ENV_ALPHA.QA.B]B028.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 5-AUG-2022 12:49:07 through 4-FEB-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



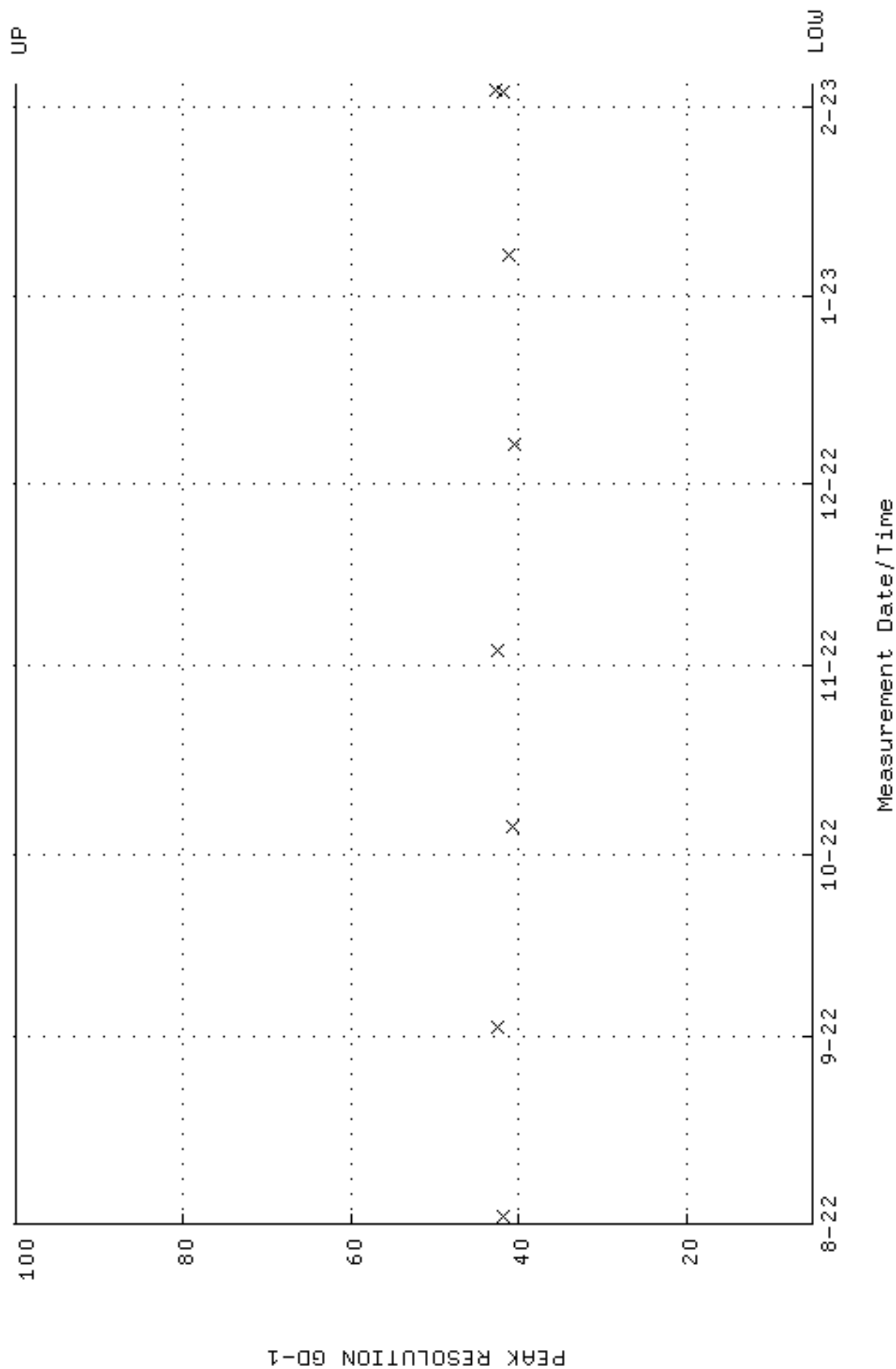
QA filename : DKA100:[ENV_ALPHA.QA.W]W029.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-AUG-2022 09:13:18 through 4-FEB-2023 12:00:00
 Lower/Upper Lmts: 0.332724 through 0.360743



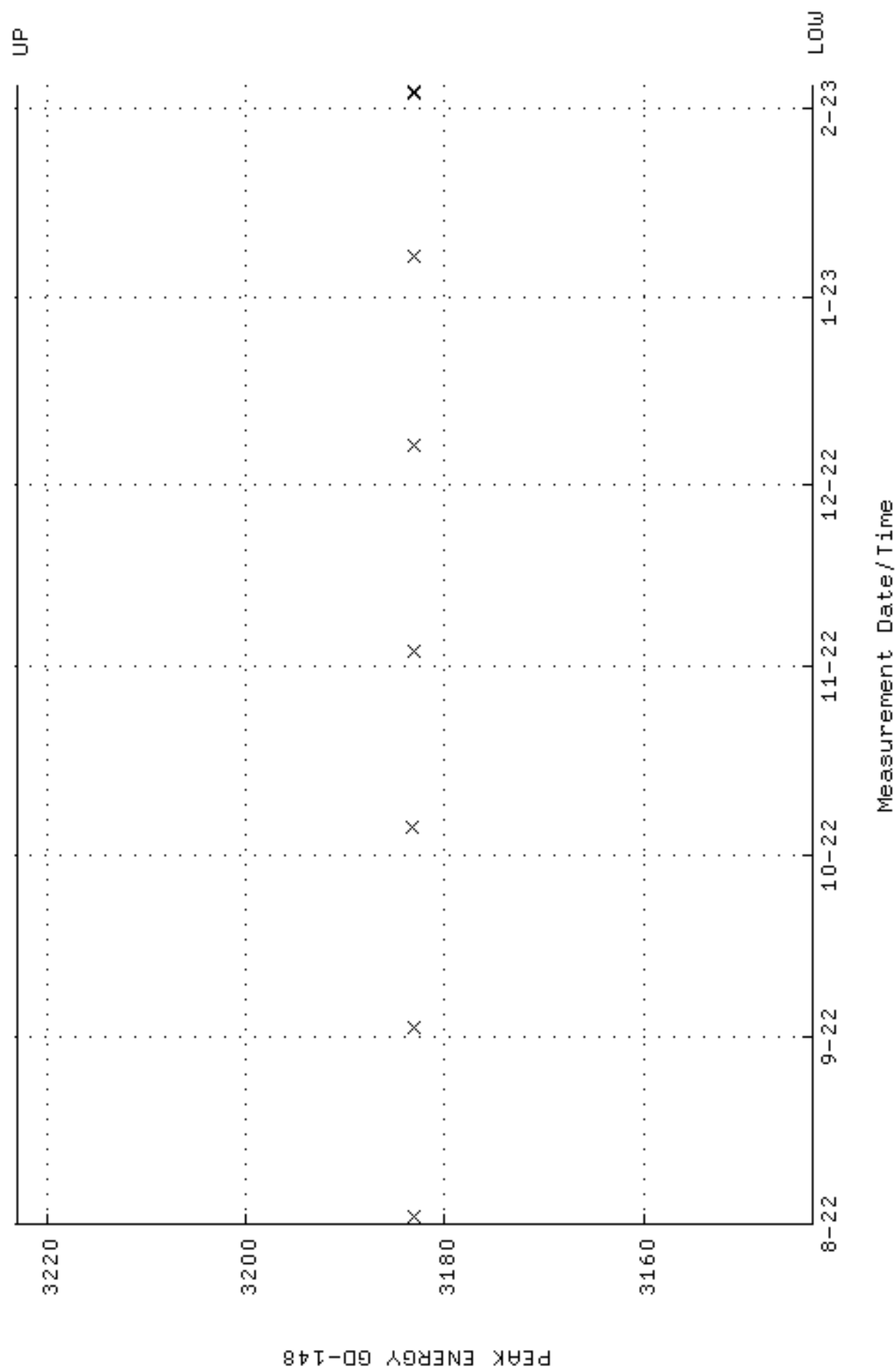
QA filename : DKA100:[ENV_ALPHA.QA.W]W029.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-AUG-2022 09:13:18 through 4-FEB-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



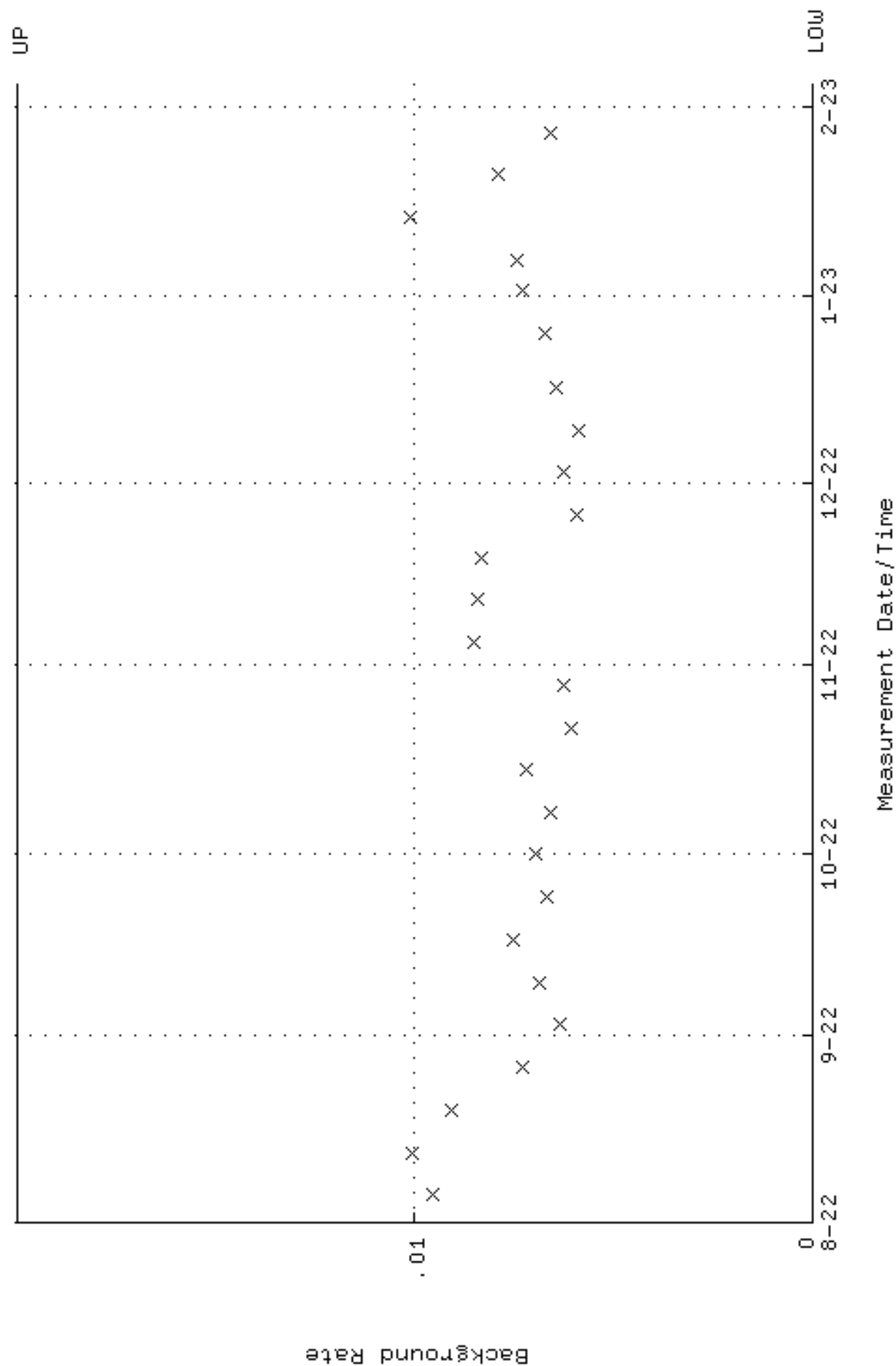
QA filename : DKA100:[ENV_ALPHA.QA.W]W029.QAF;11
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 2-AUG-2022 09:13:18 through 4-FEB-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



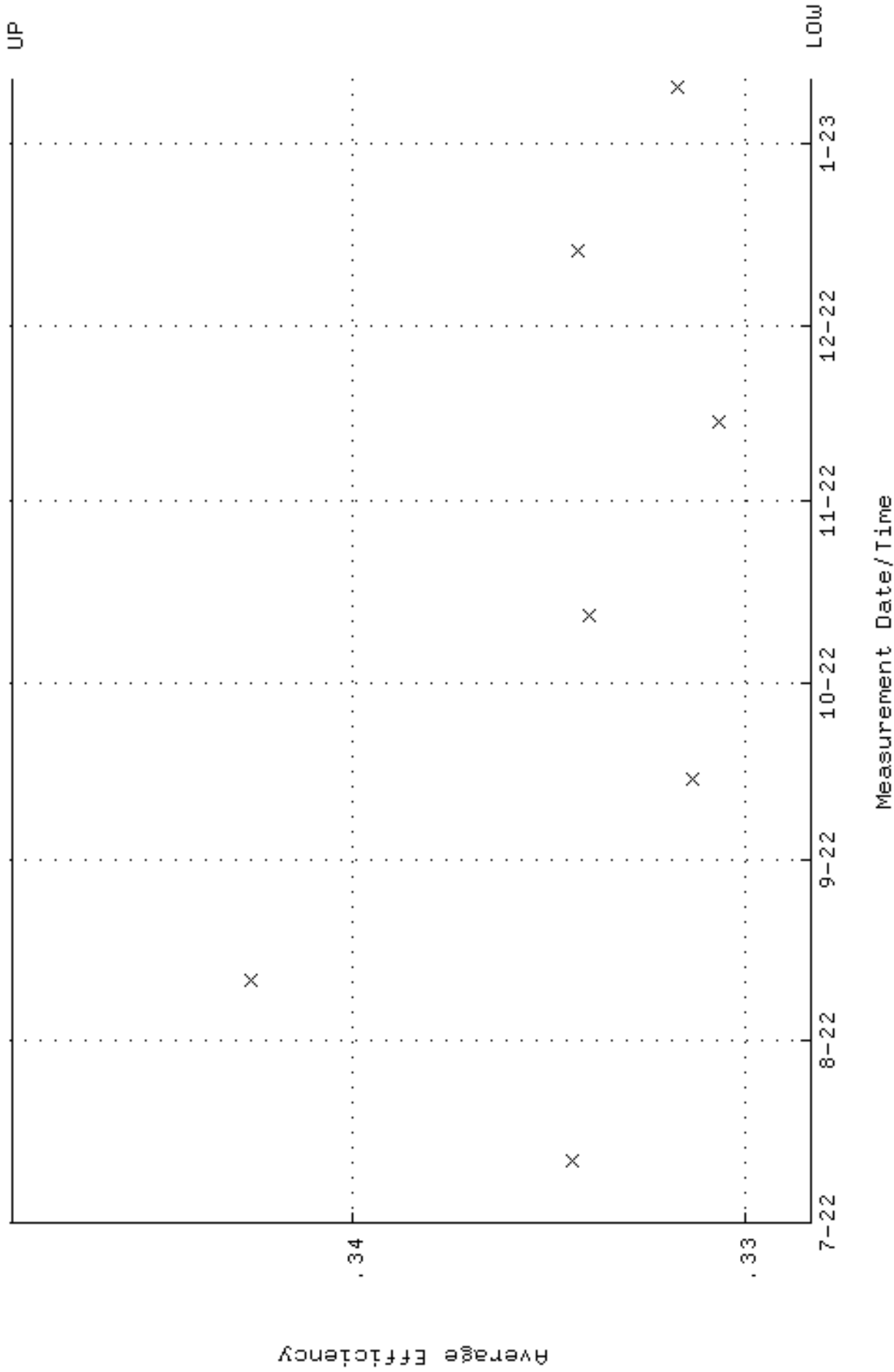
QA filename : DKA100:[ENV_ALPHA.QA.W]W029.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-AUG-2022 09:13:18 through 4-FEB-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



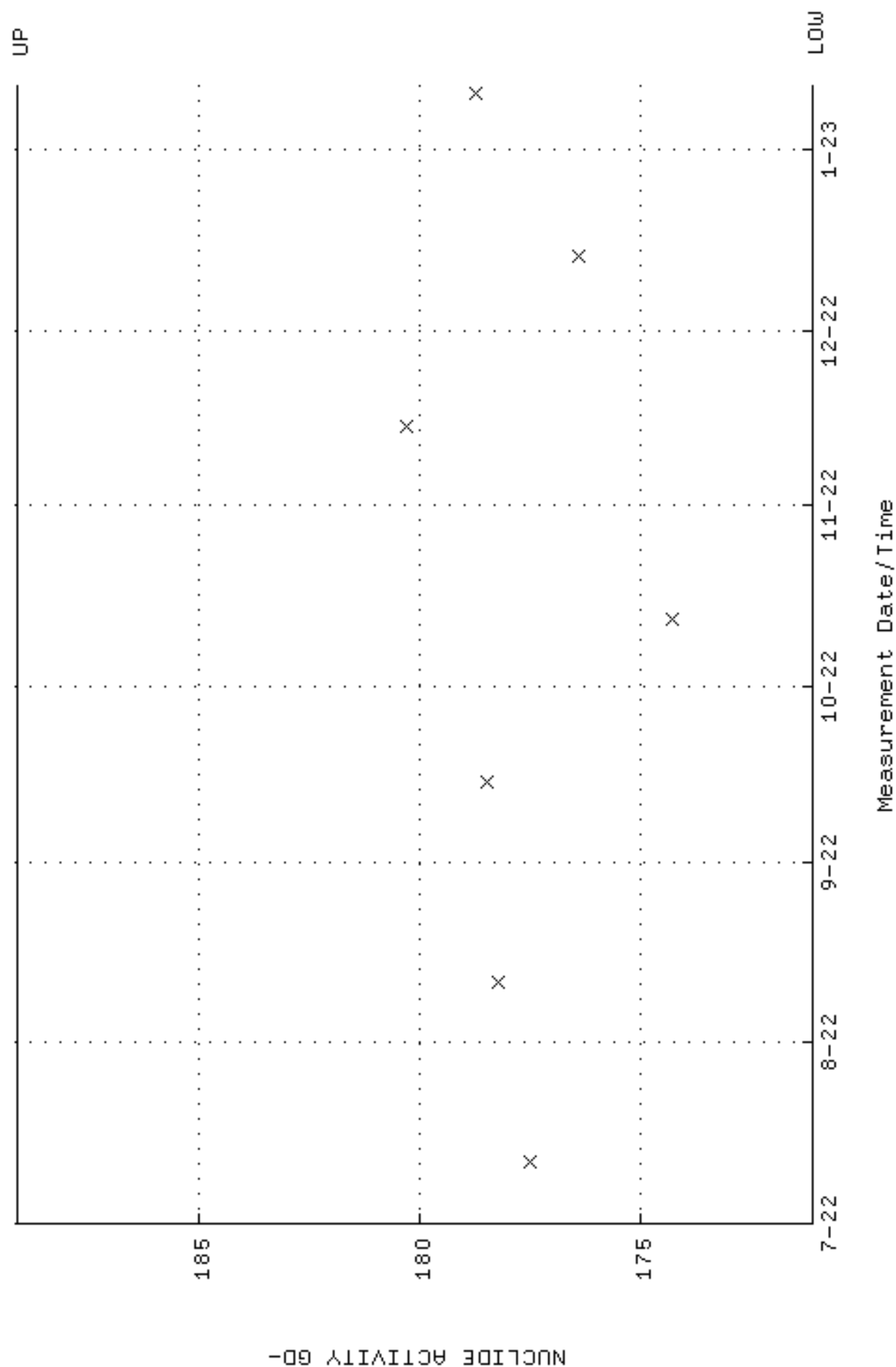
QA filename : DKA100:[ENV_ALPHA.QA.B]B029.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 5-AUG-2022 12:49:07 through 4-FEB-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



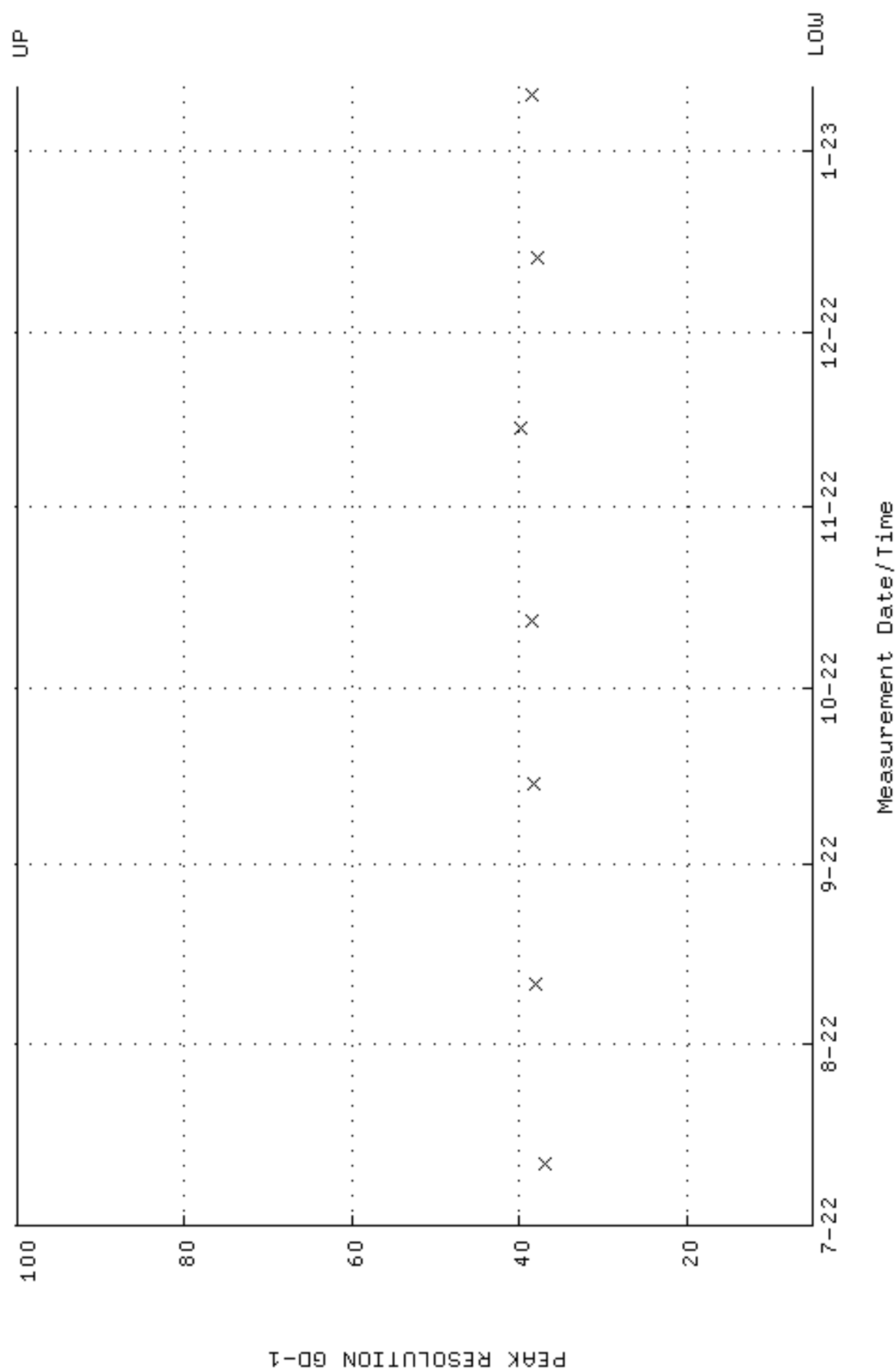
QA filename : DKA100:[ENV_ALPHA.QA.W]W065.QAF;8
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
Lower/Upper Lmts: 0.328347 through 0.348657



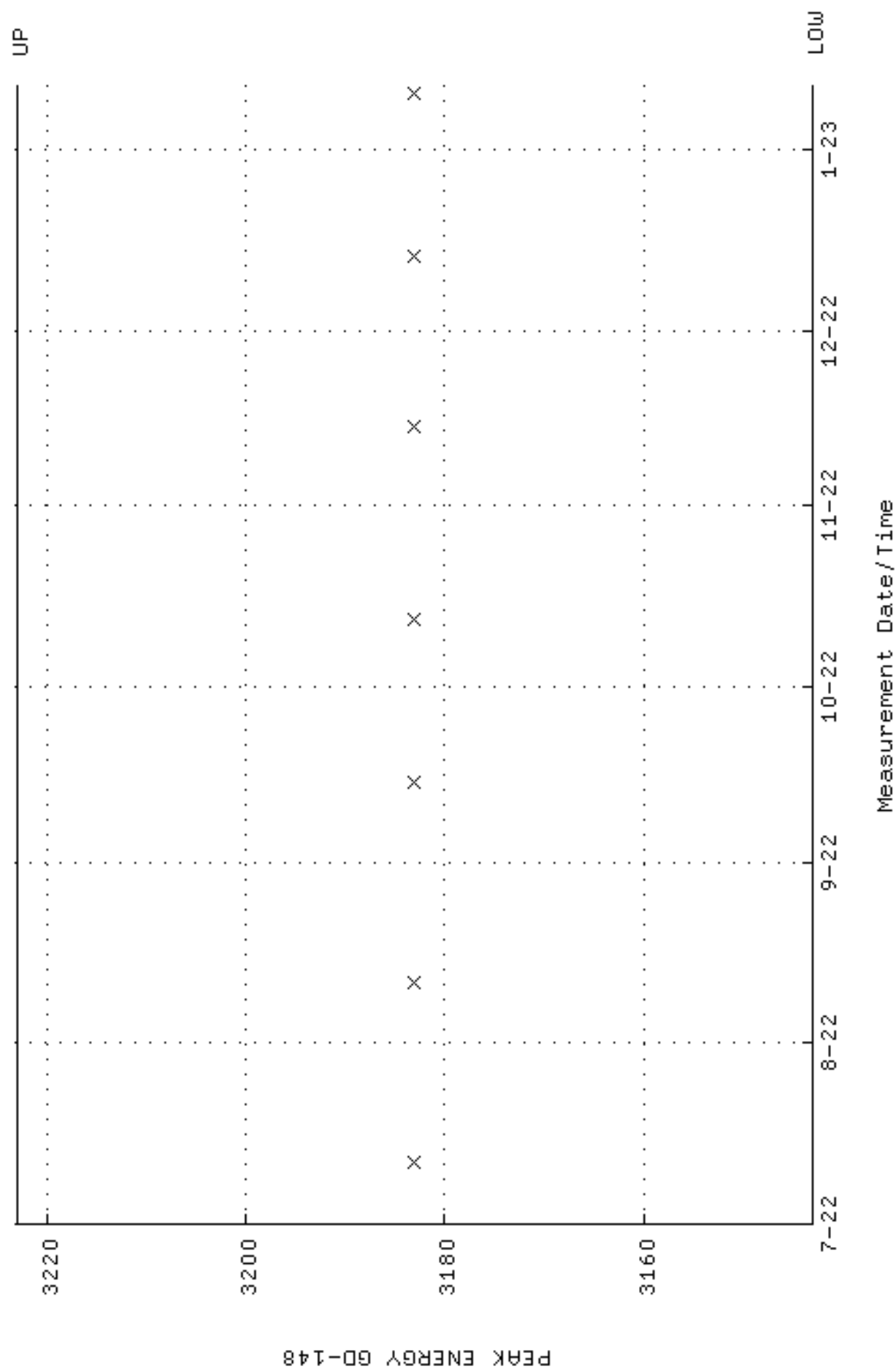
QA filename : DKA100:[ENV_ALPHA.QA.W]W065.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



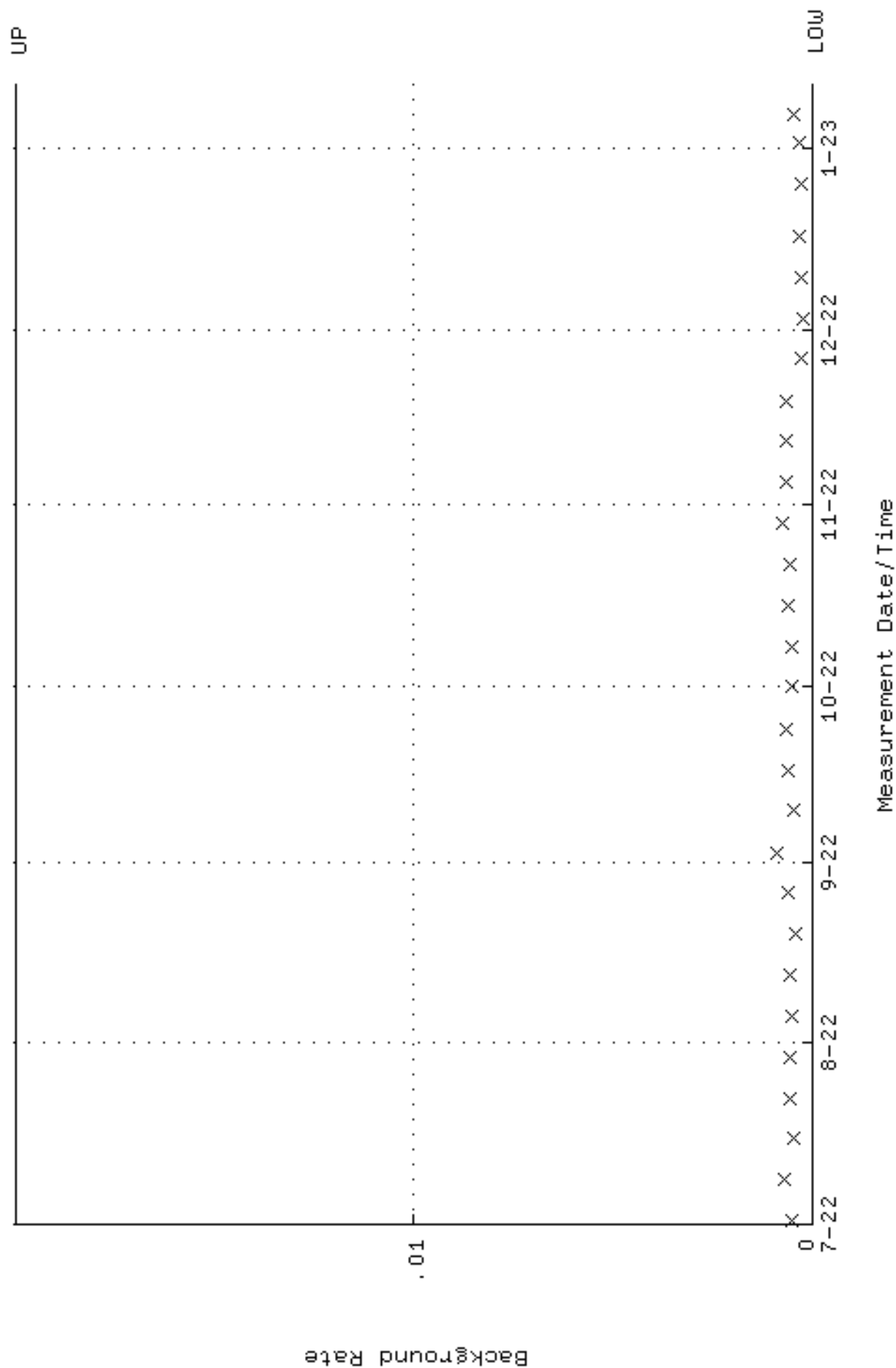
QA filename : DKA100:[ENV_ALPHA.QA.W]W065.QAF;8
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



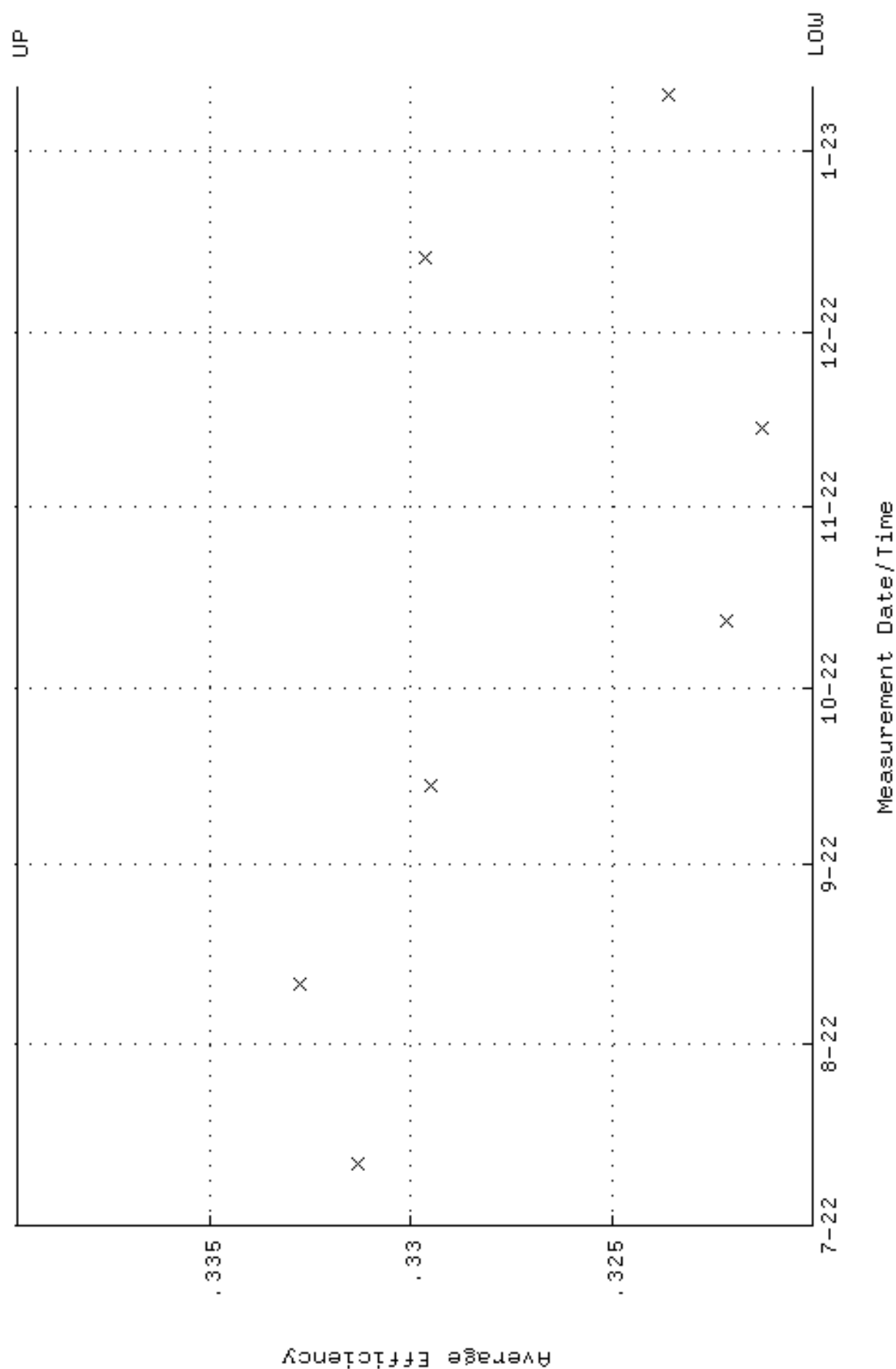
QA filename : DKA100:[ENV_ALPHA.QA.W]W065.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



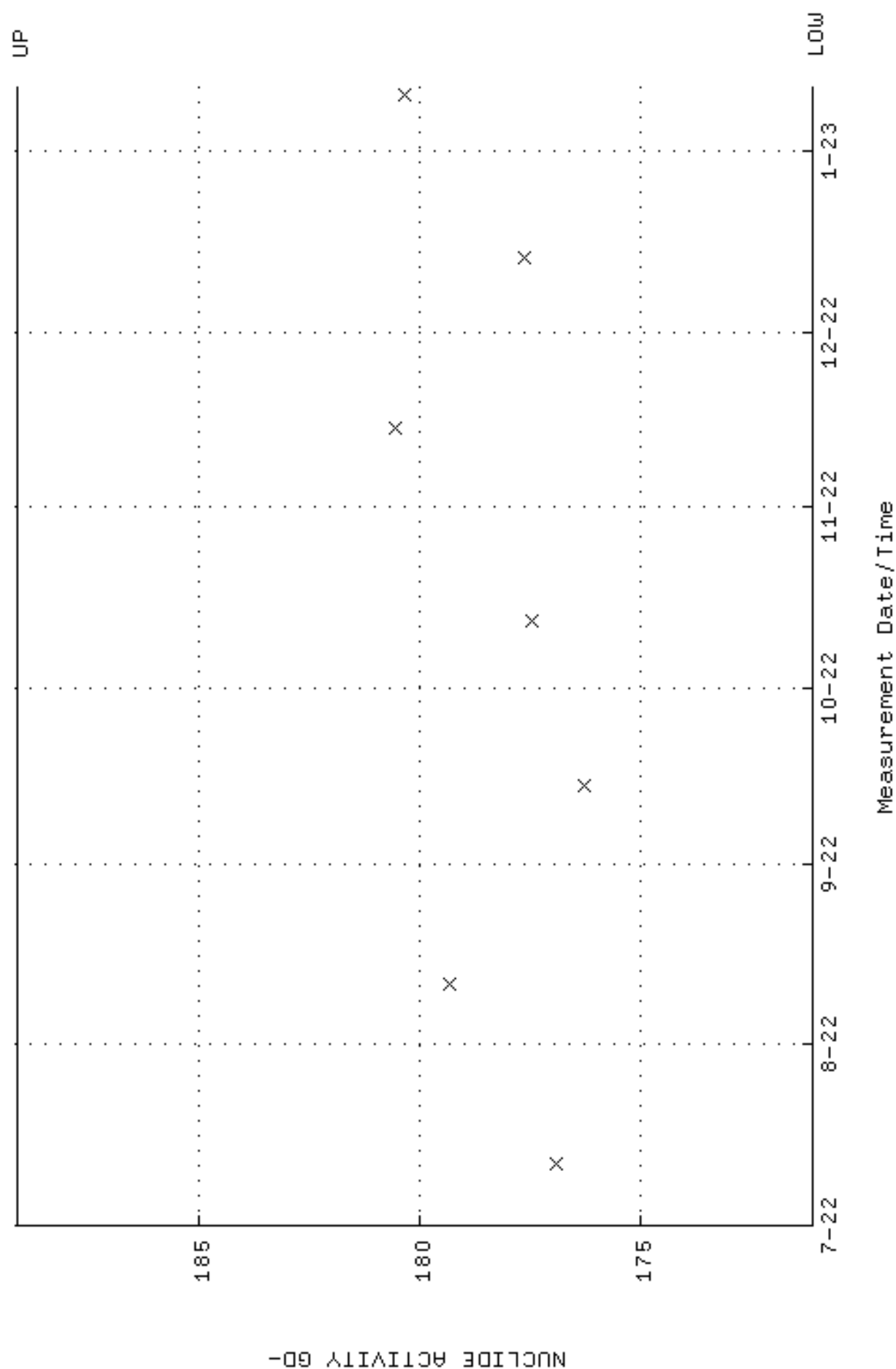
QA filename : DKA100:[ENV_ALPHA.QA.B]B065.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:24:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



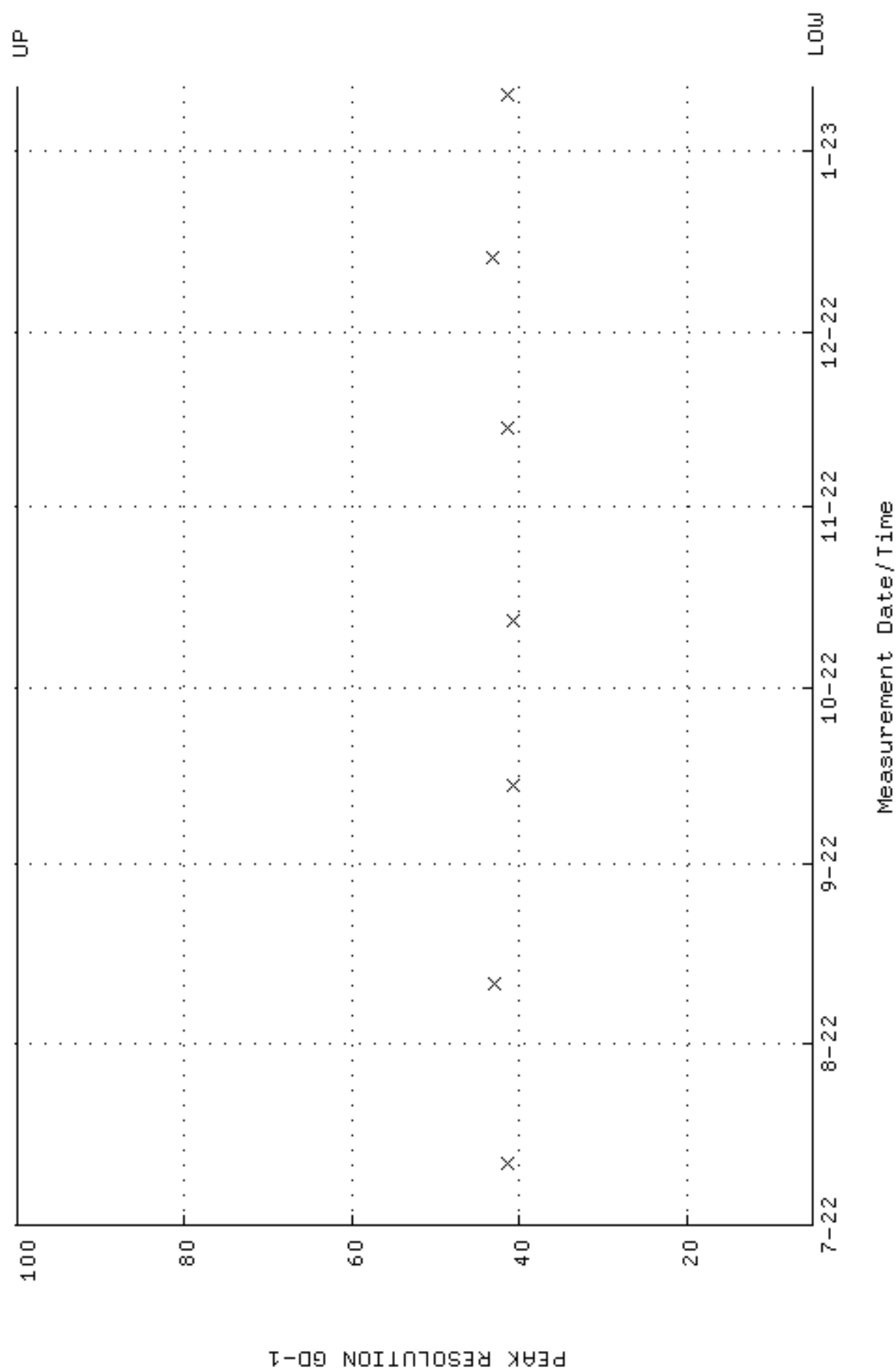
QA filename : DKA100:[ENV_ALPHA.QA.W]W066.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.320010 through 0.339800



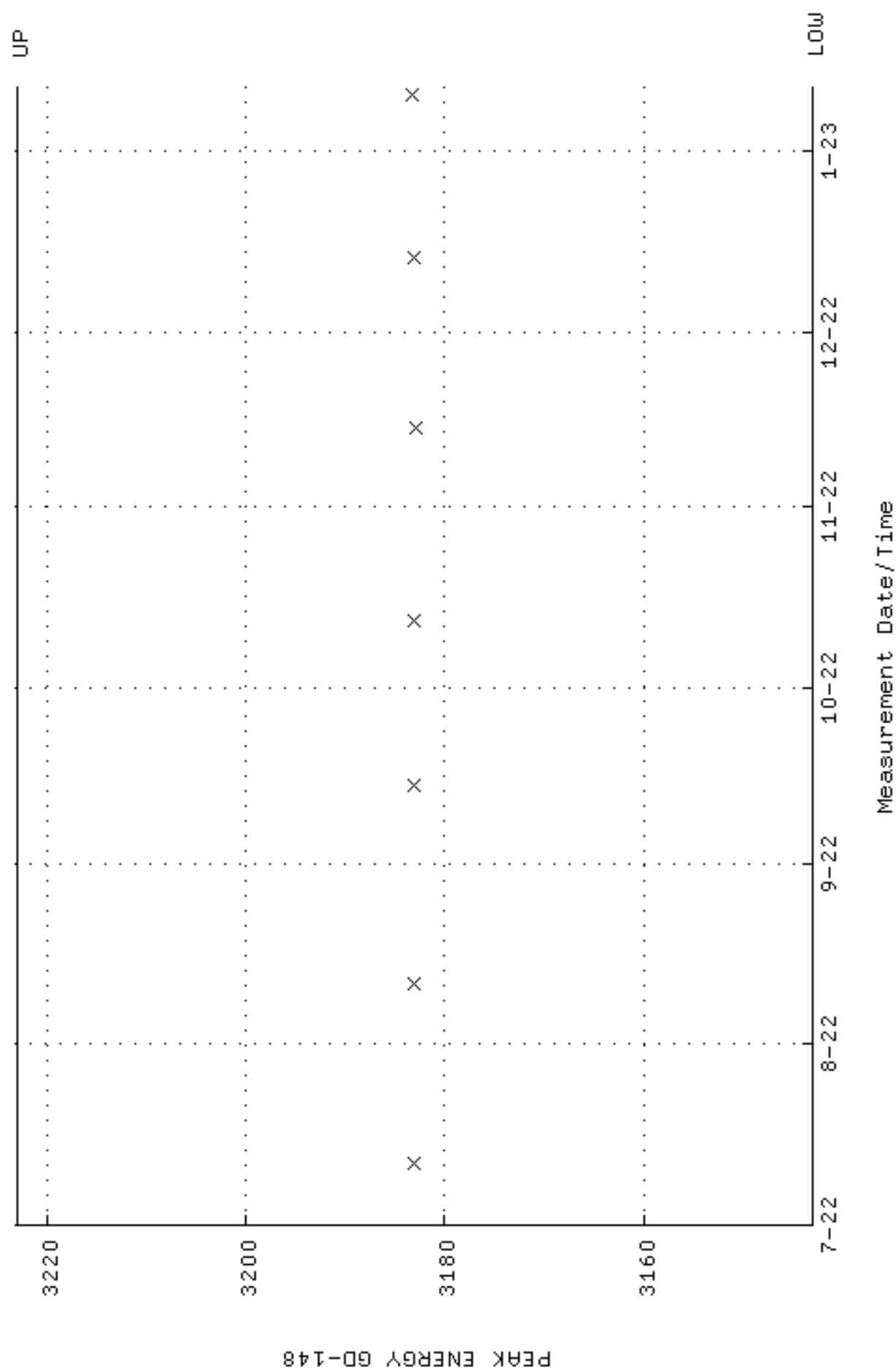
QA filename : DKA100:[ENV_ALPHA.QA.W]W066.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



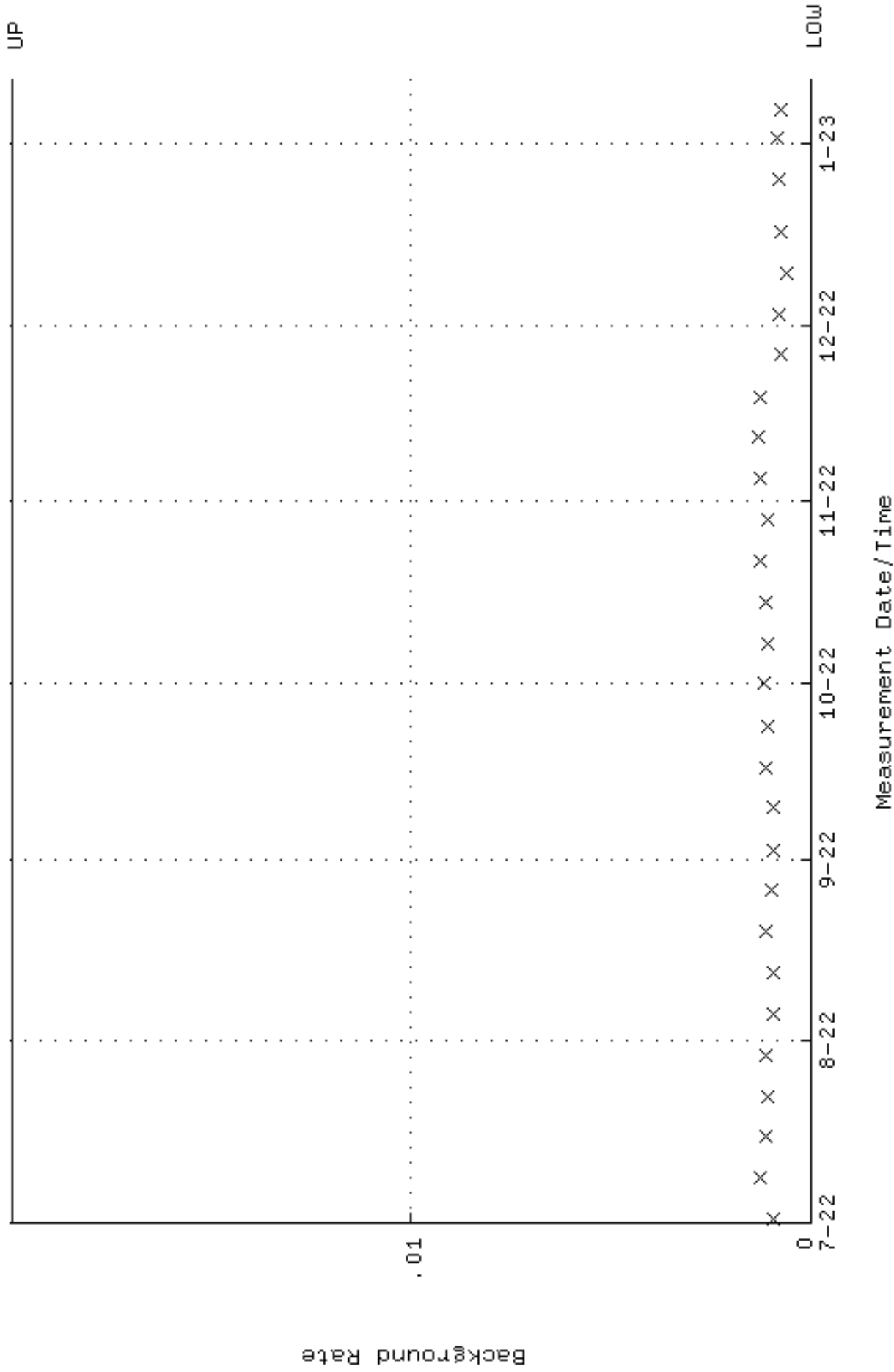
QA filename : DKA100:[ENV_ALPHA.QA.W]W066.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



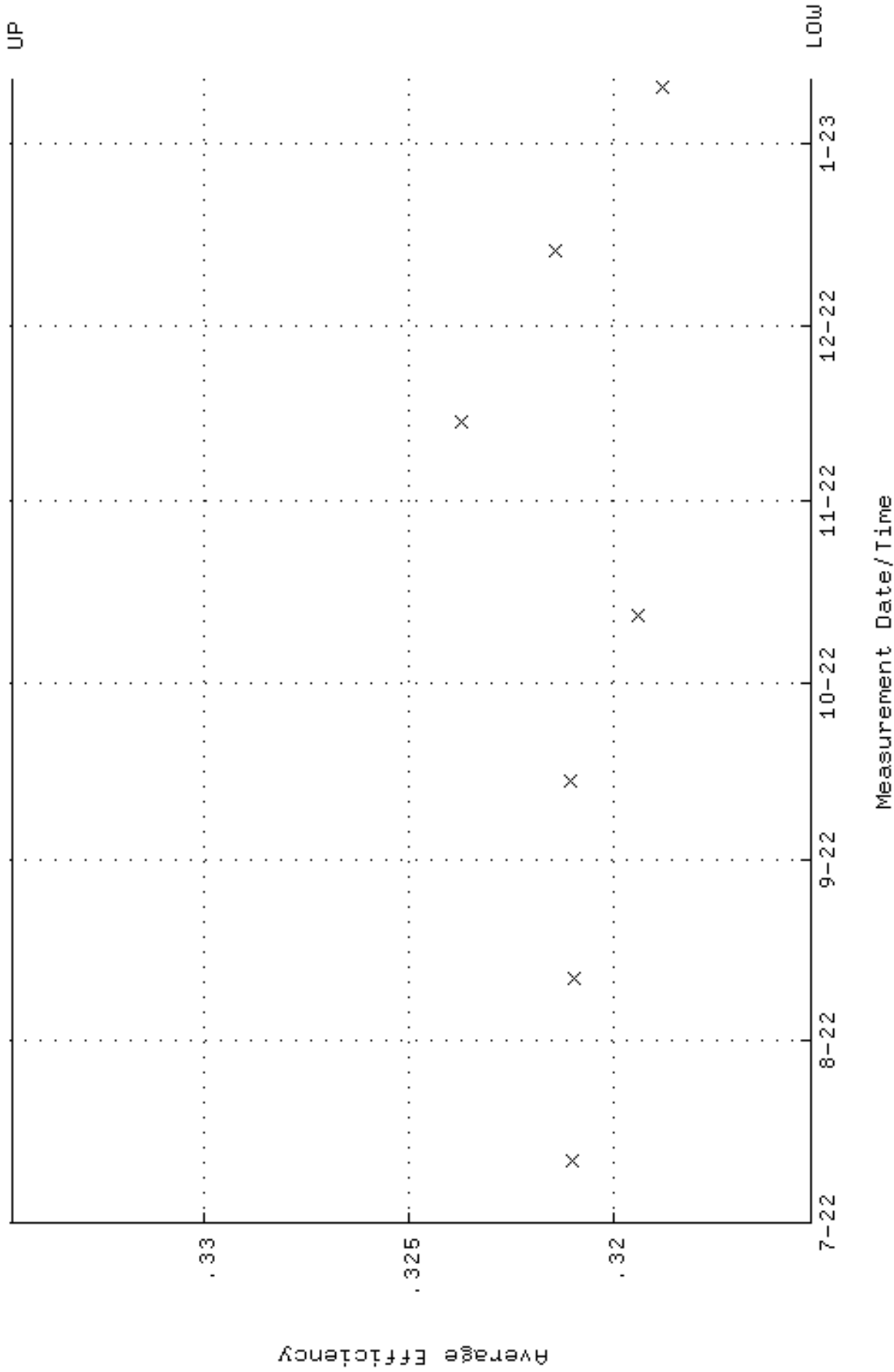
QA filename : DKA100:[ENV_ALPHA.QA.W]W066.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



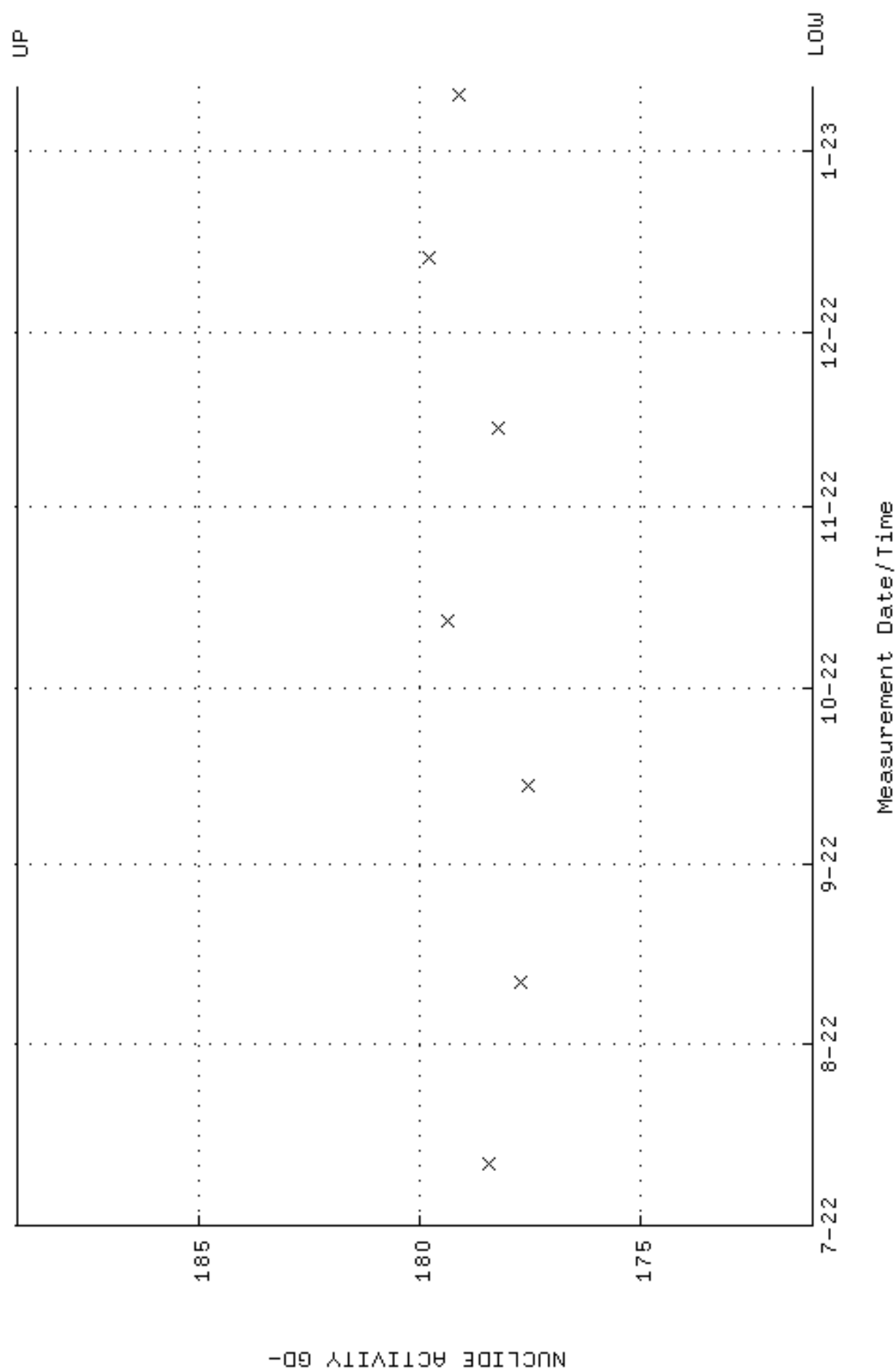
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Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JUL-2022 13:24:38 through 11-JAN-2023 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



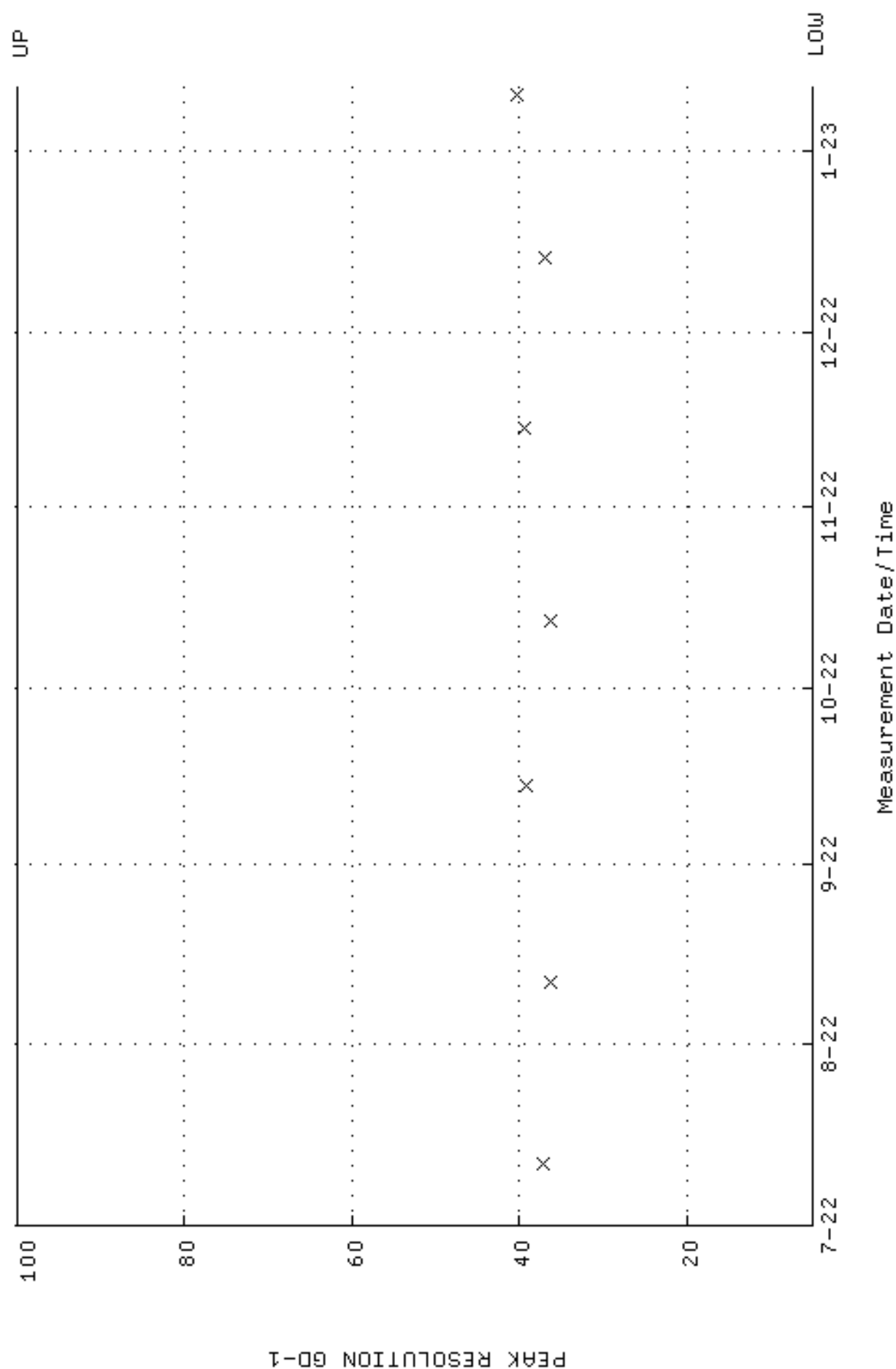
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Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
Lower/Upper Lmts: 0.315200 through 0.334700



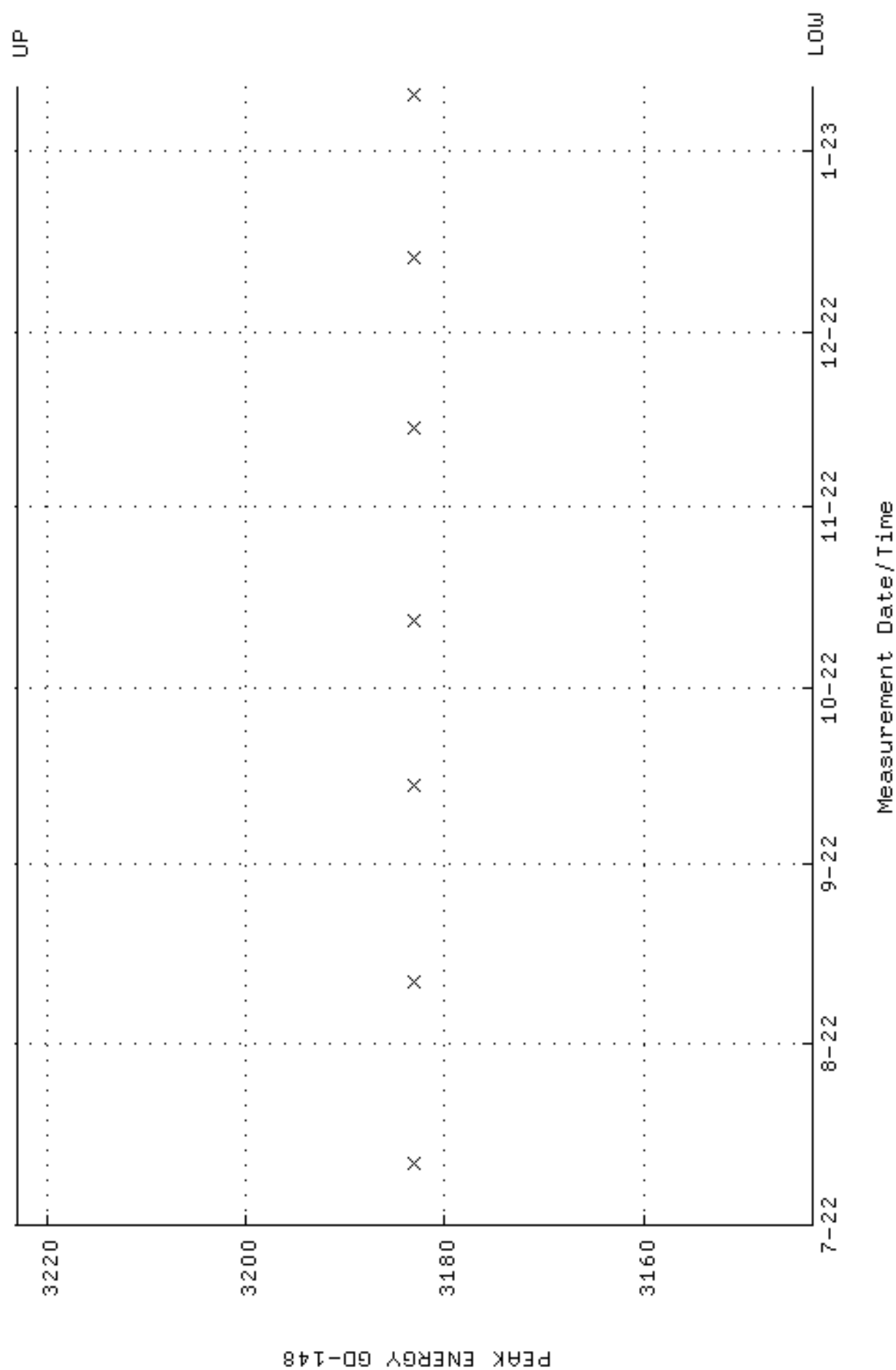
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



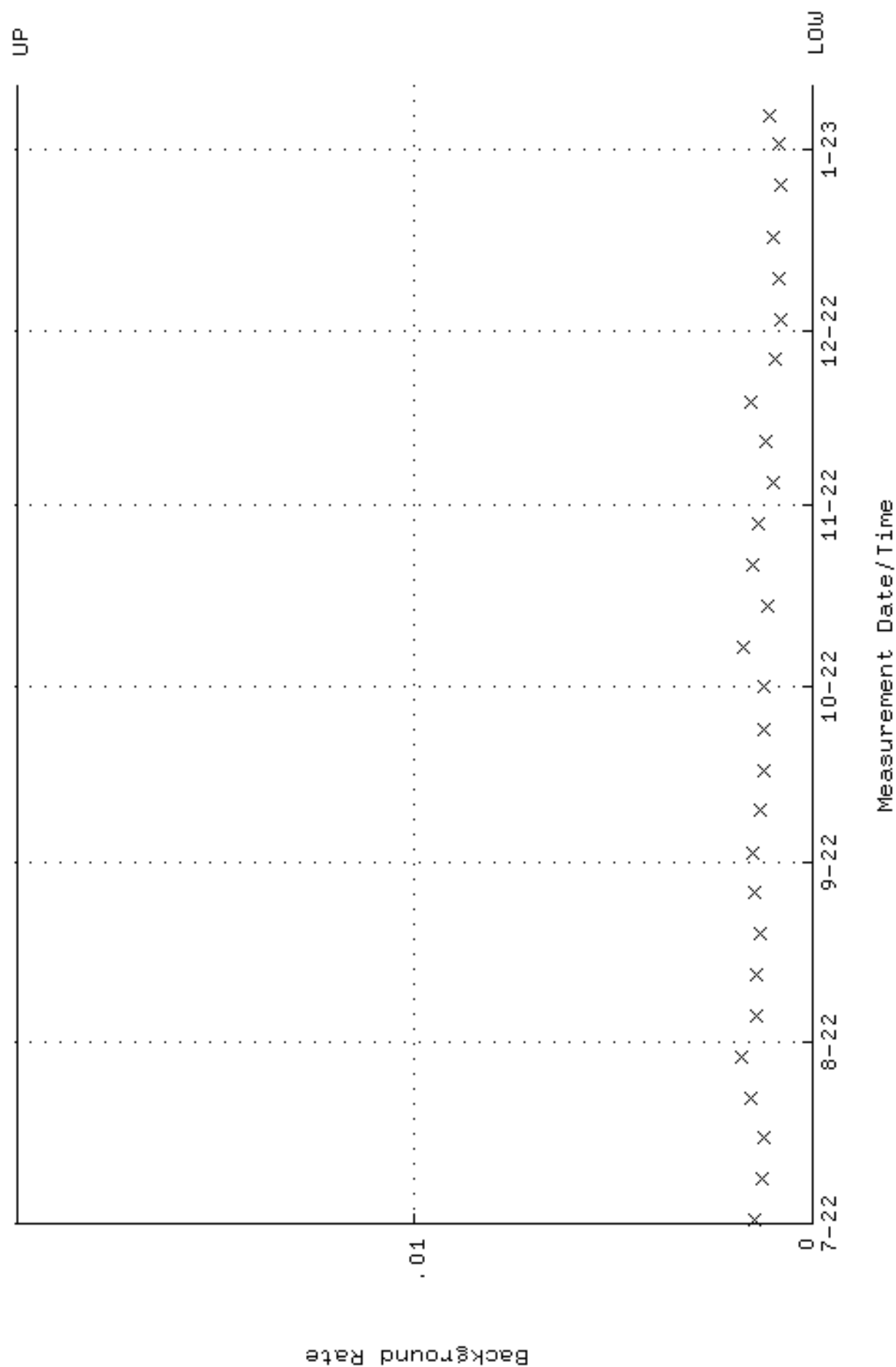
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 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



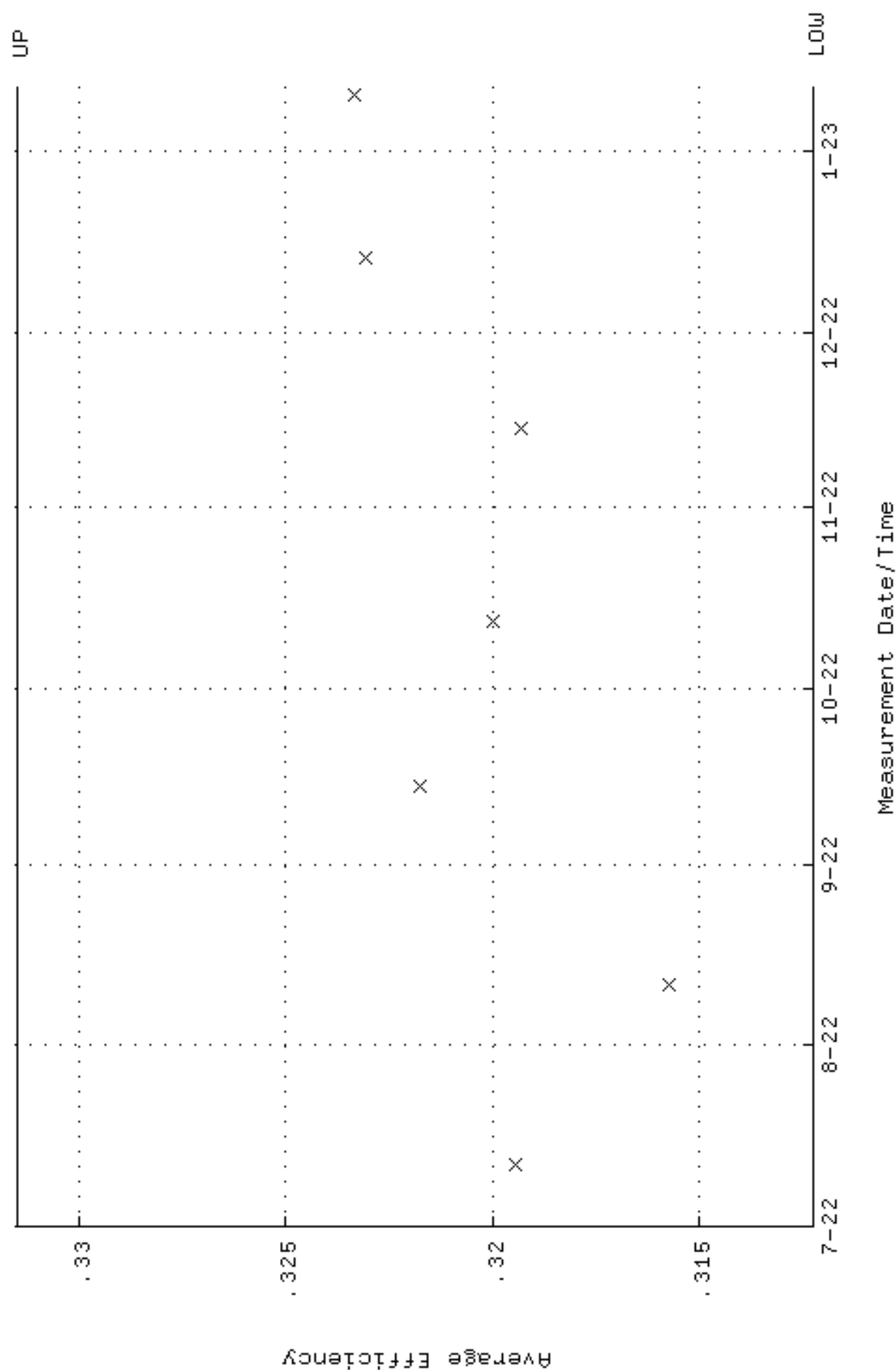
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 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



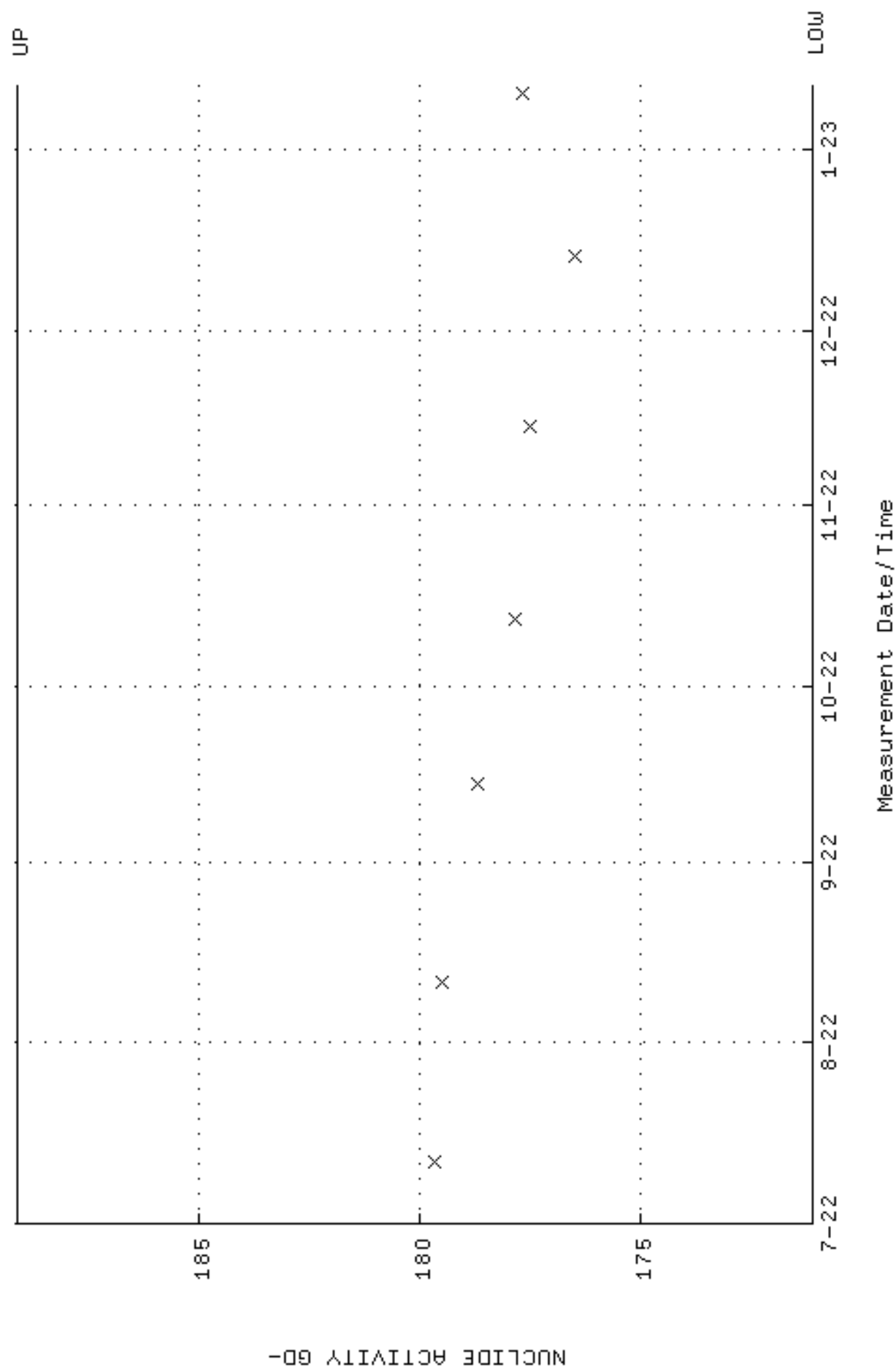
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 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



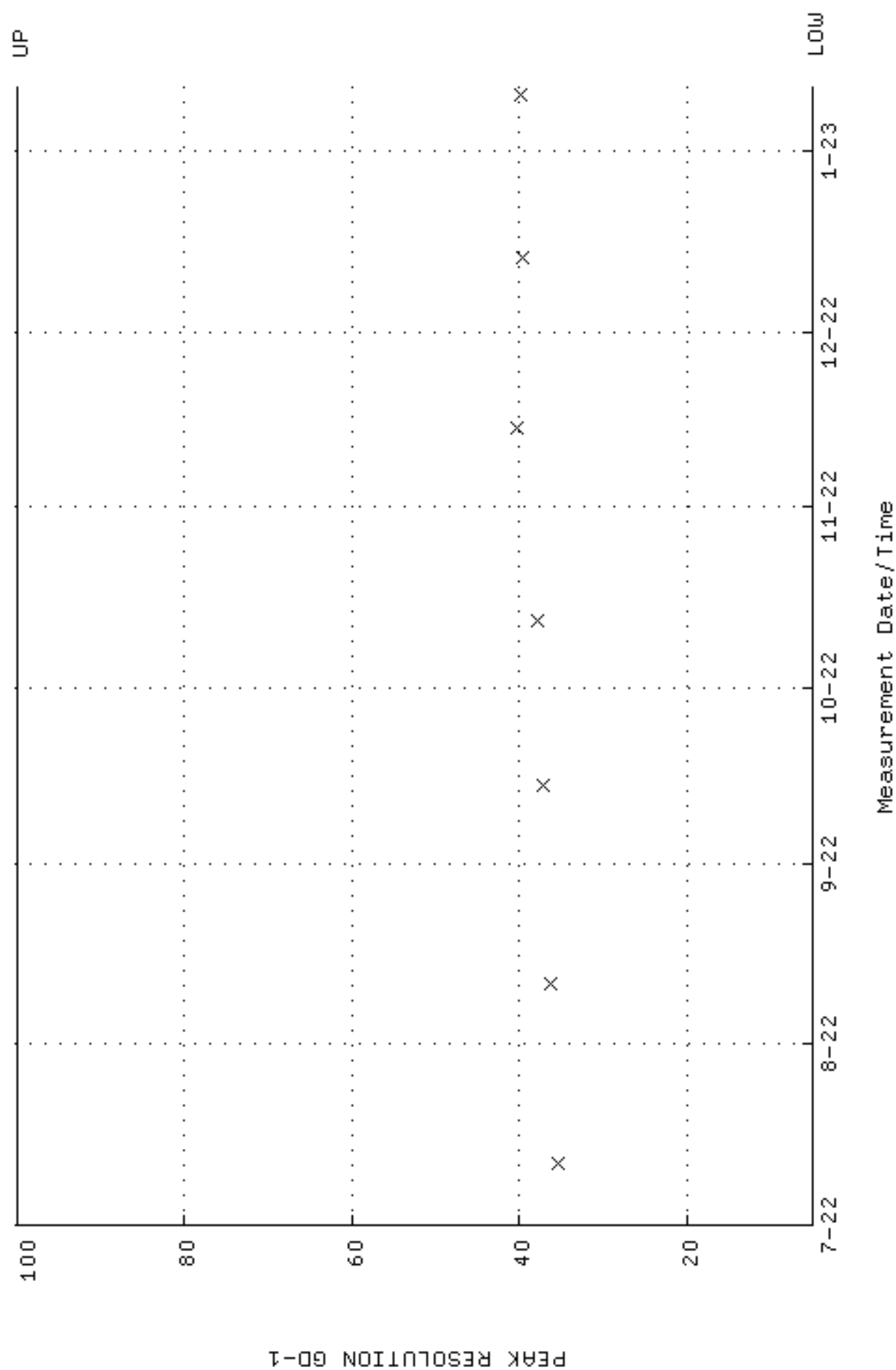
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.312208 through 0.331520



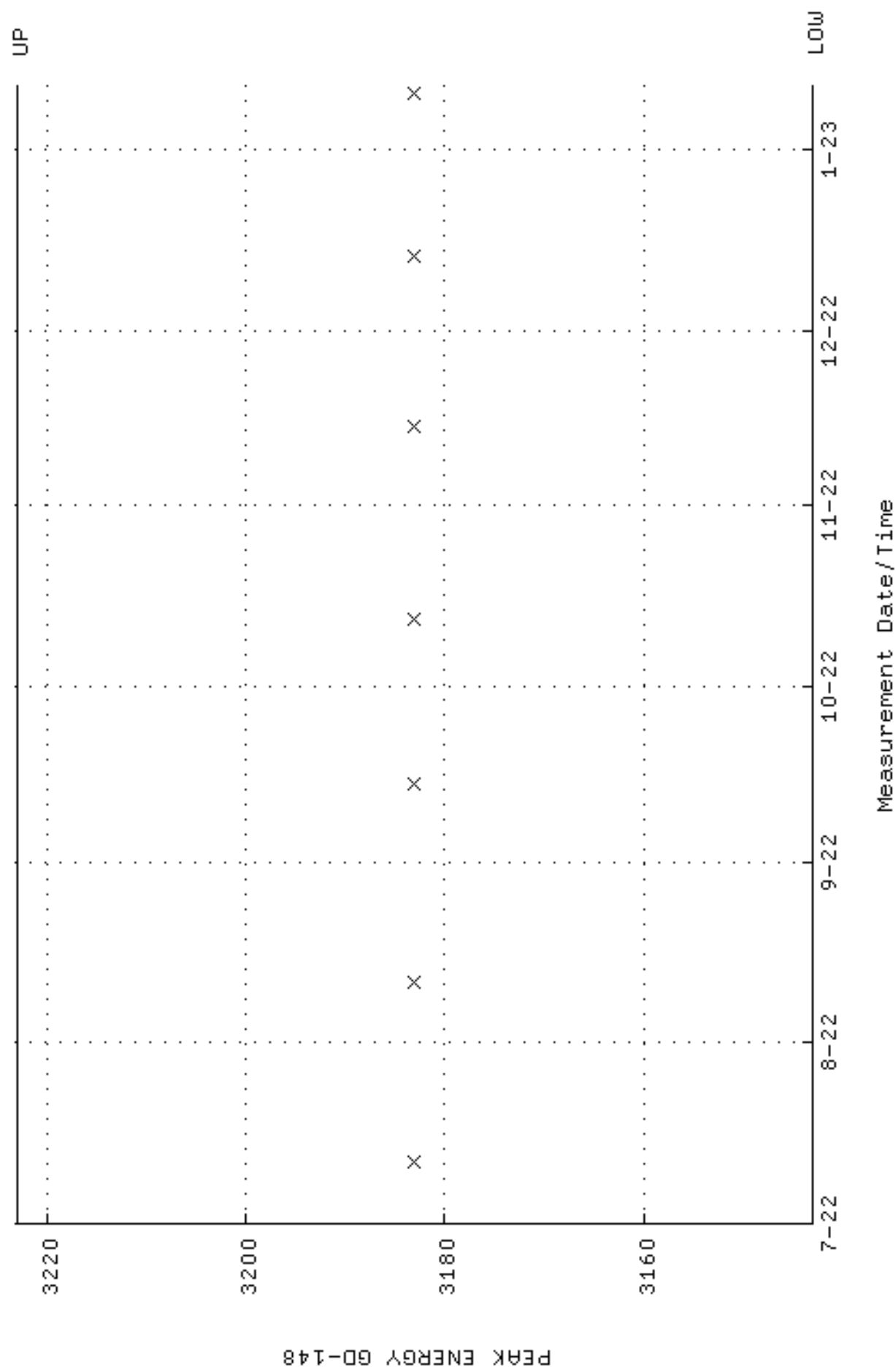
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 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



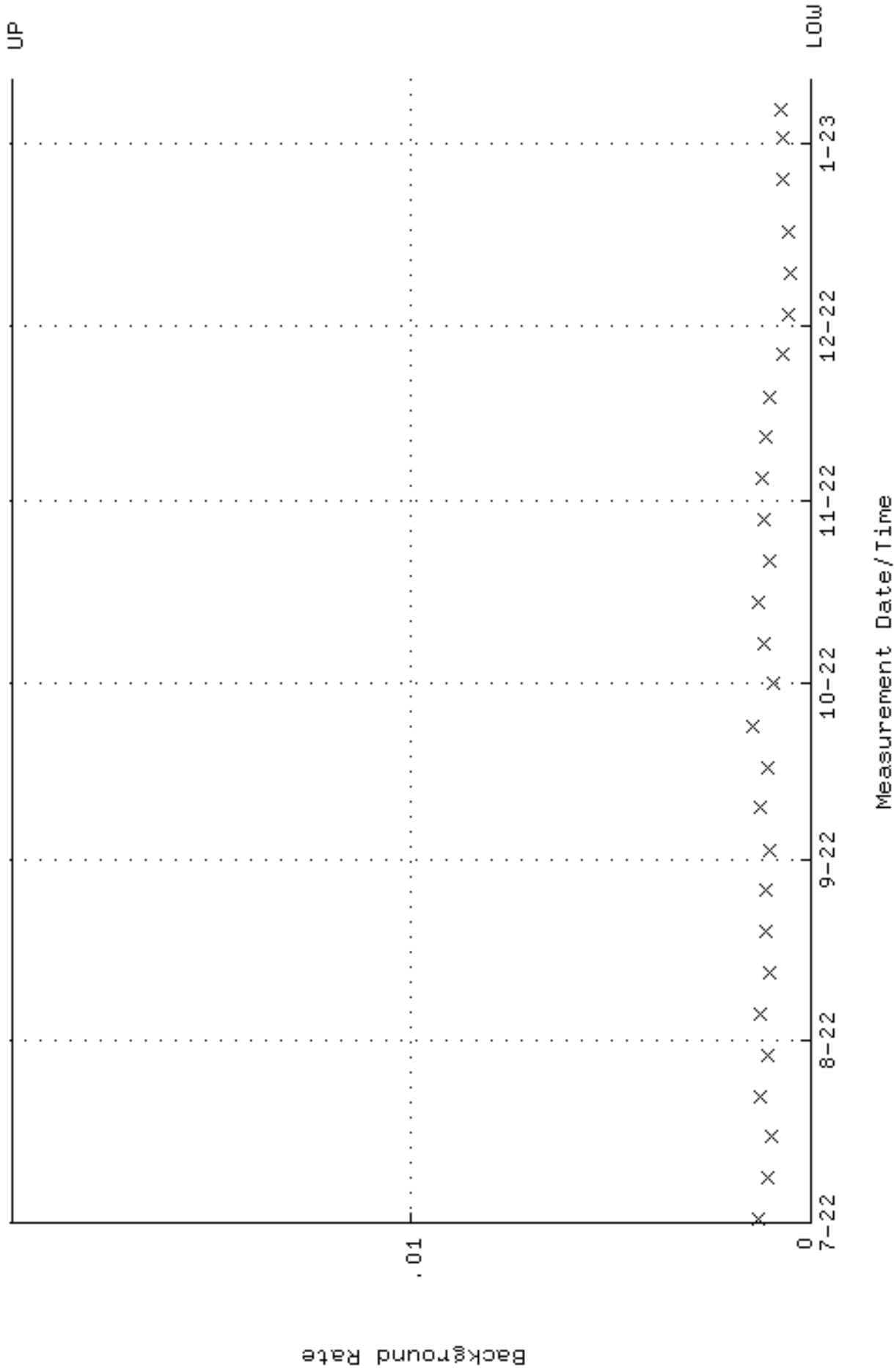
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 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



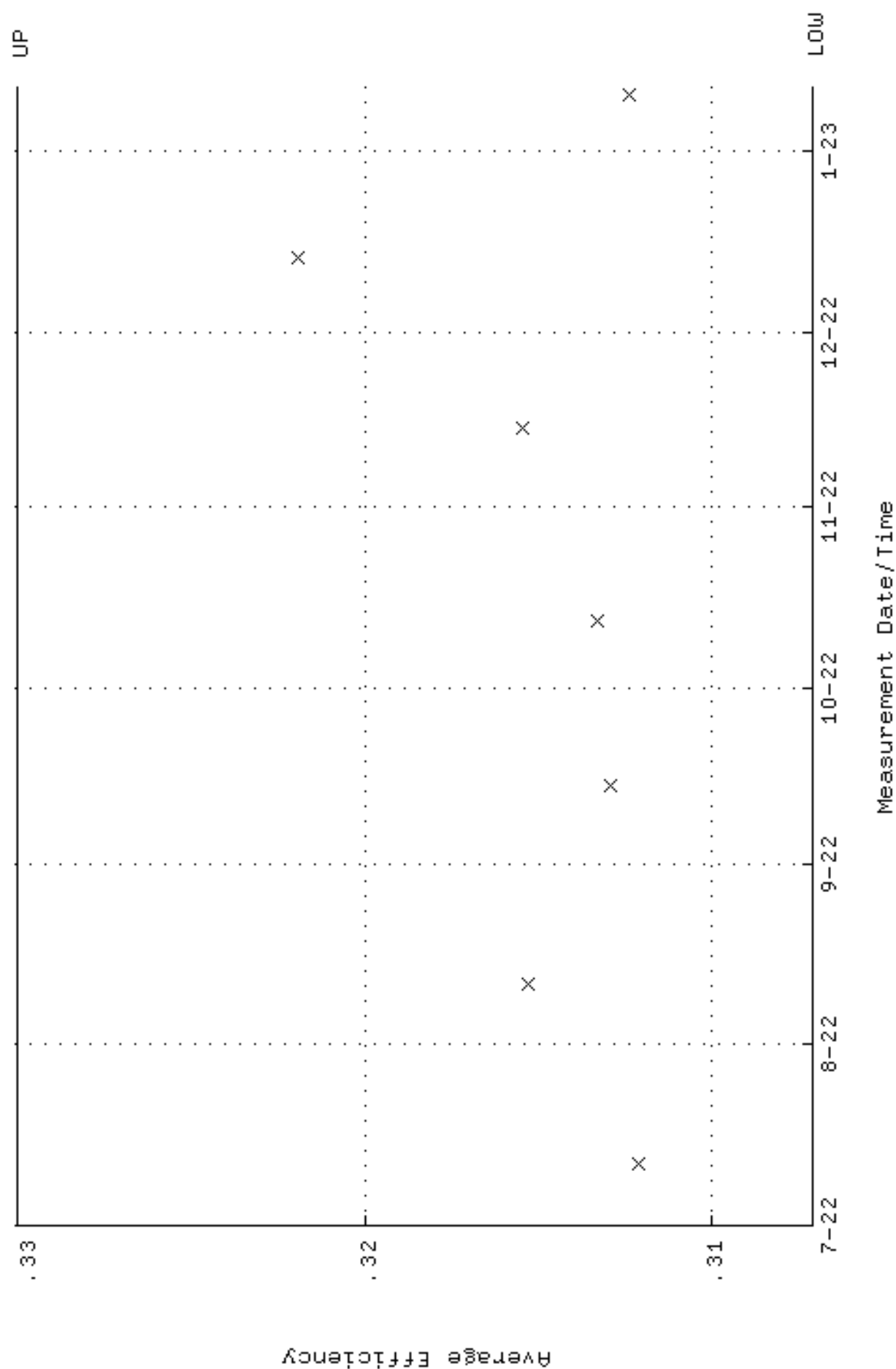
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 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



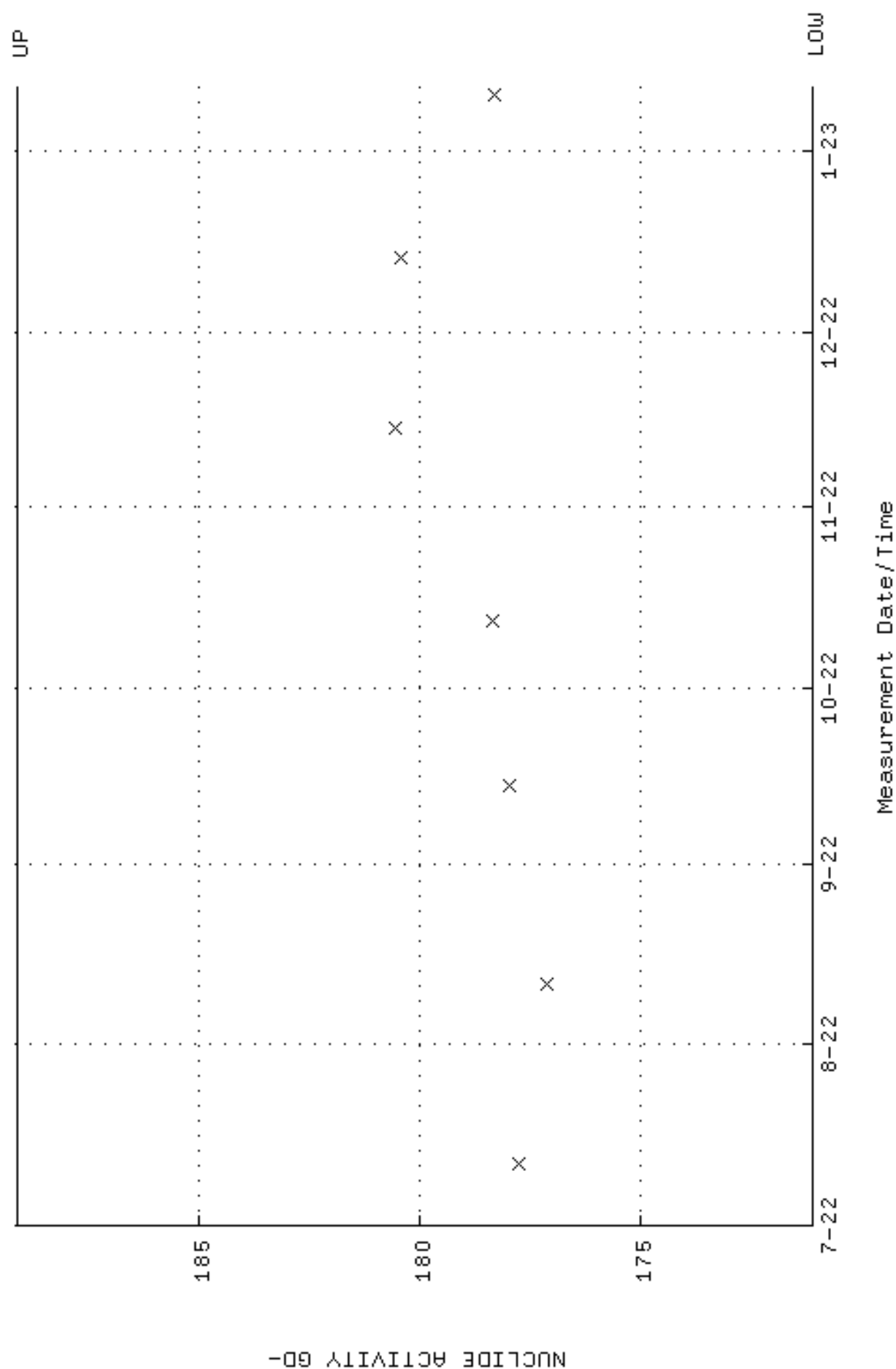
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Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



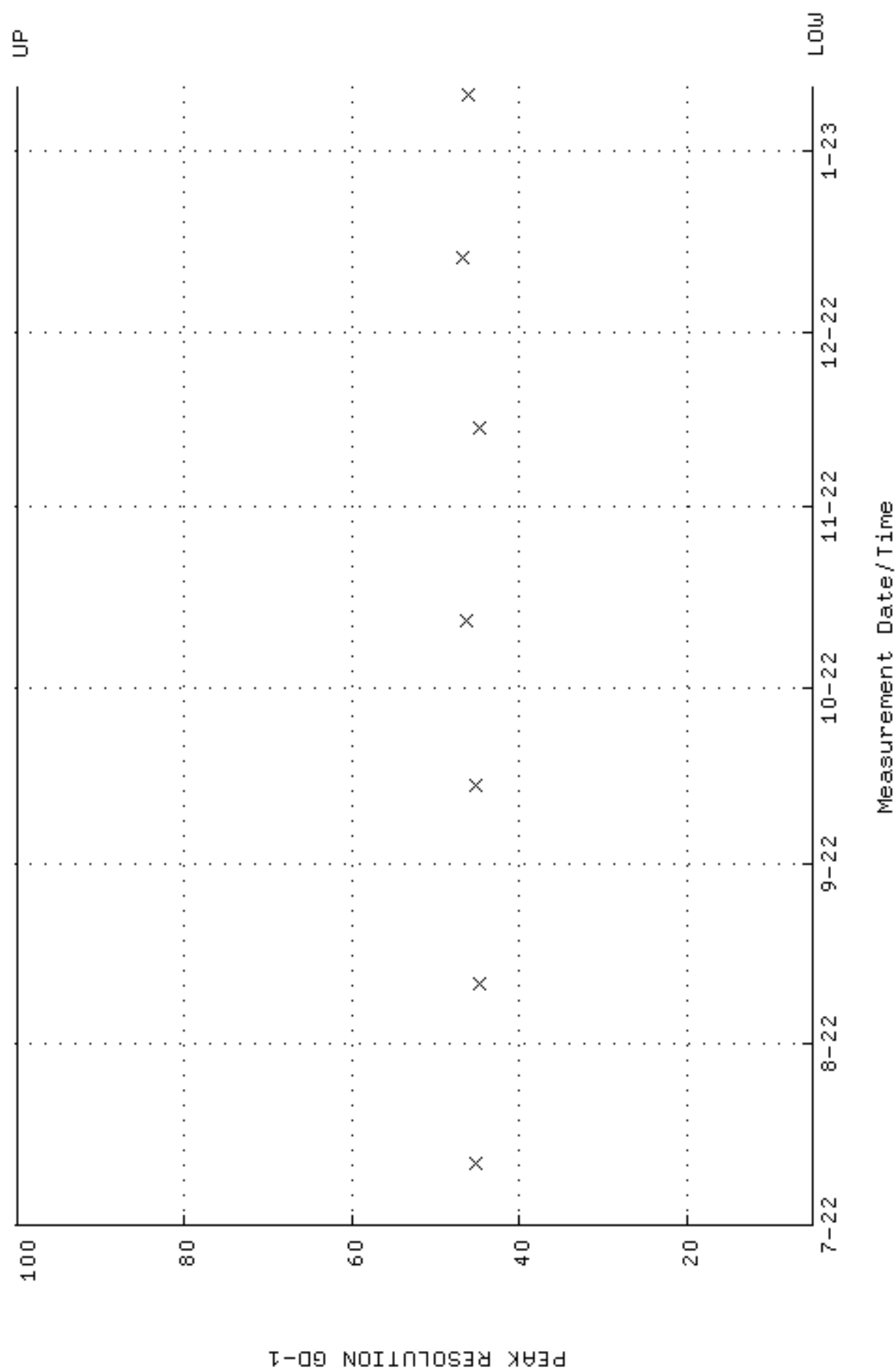
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 Parameter Name : AVRGEFF (Average Efficiency)
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 Lower/Upper Lmts: 0.307100 through 0.330000



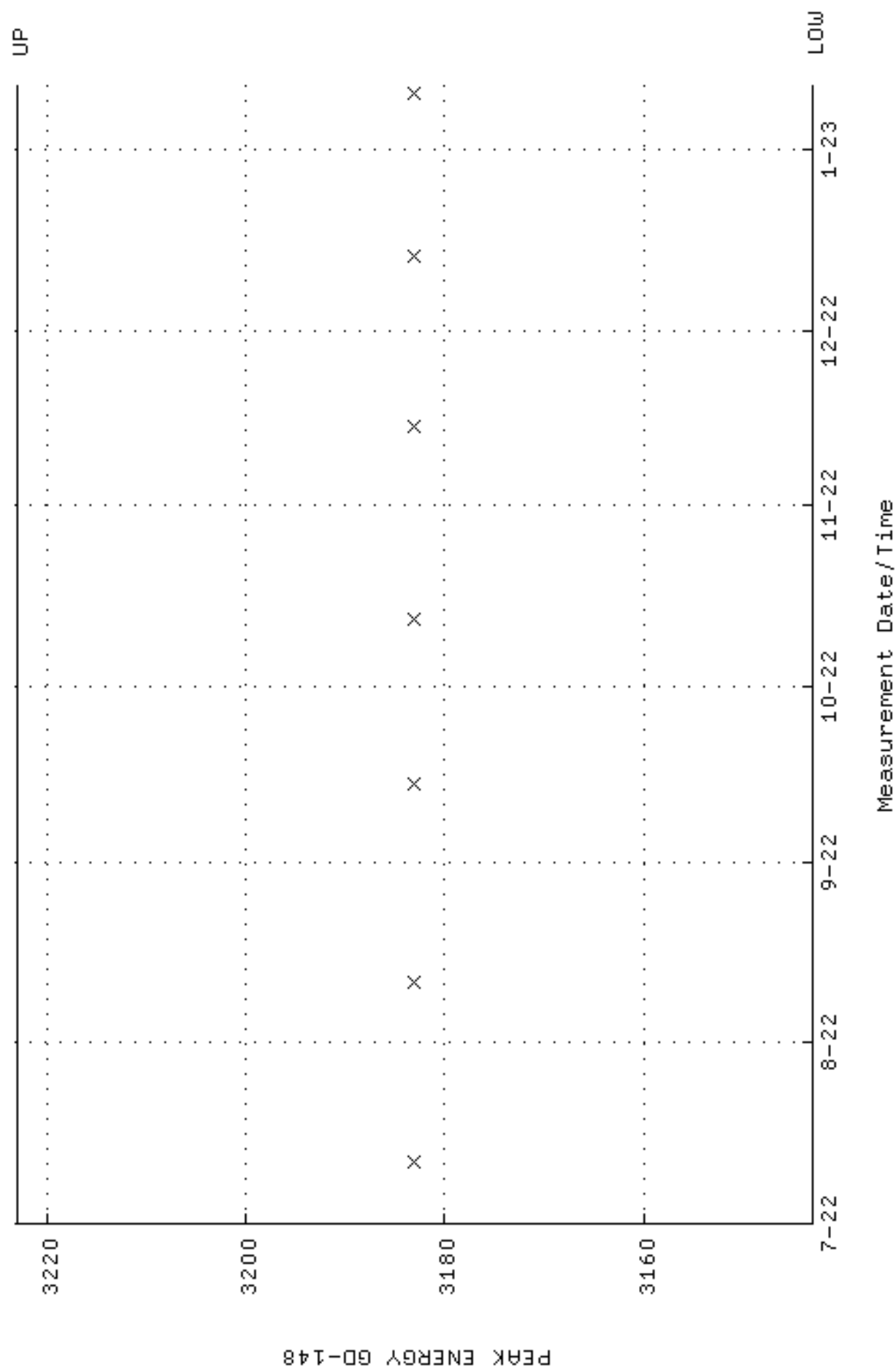
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



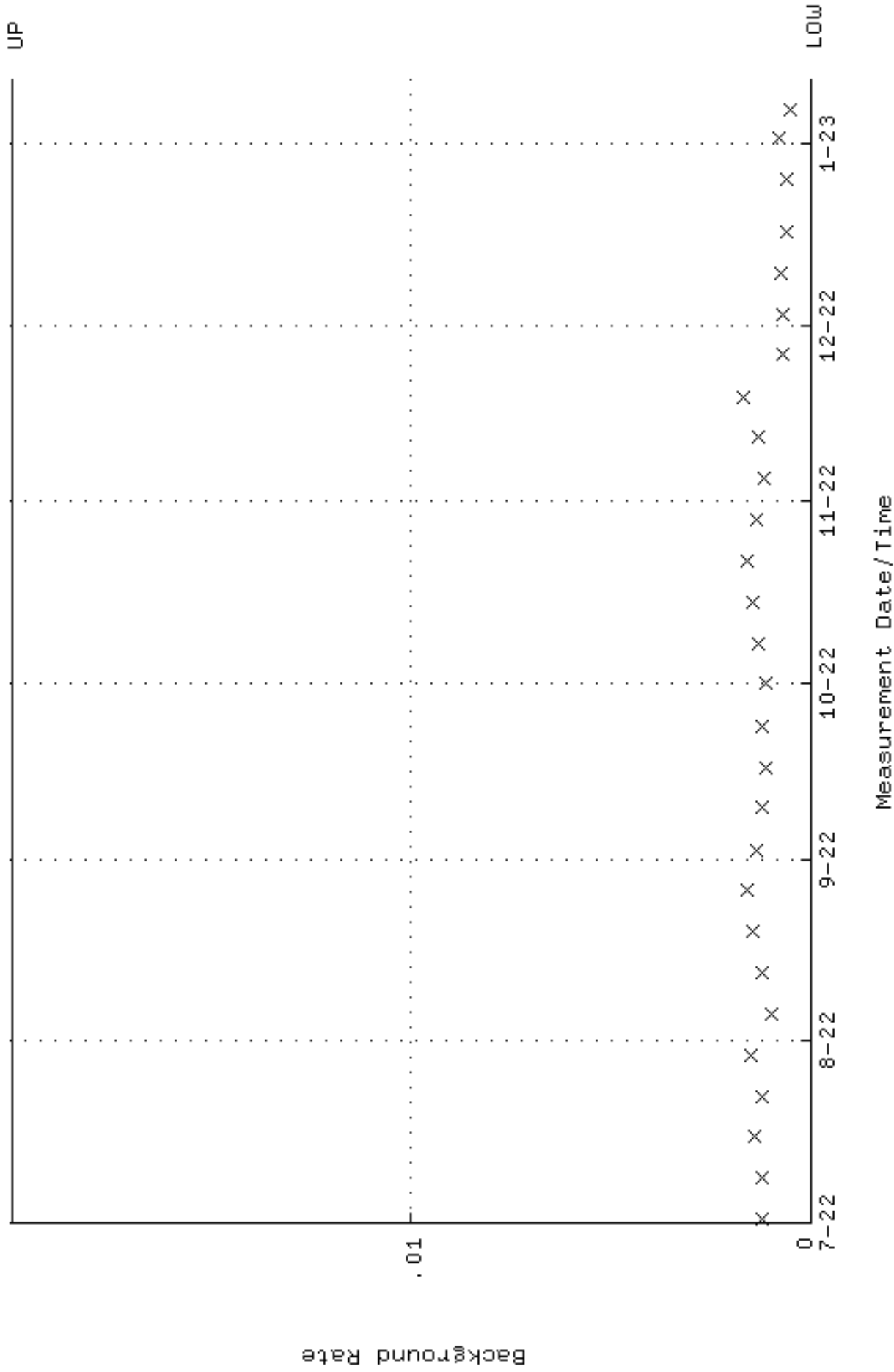
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 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



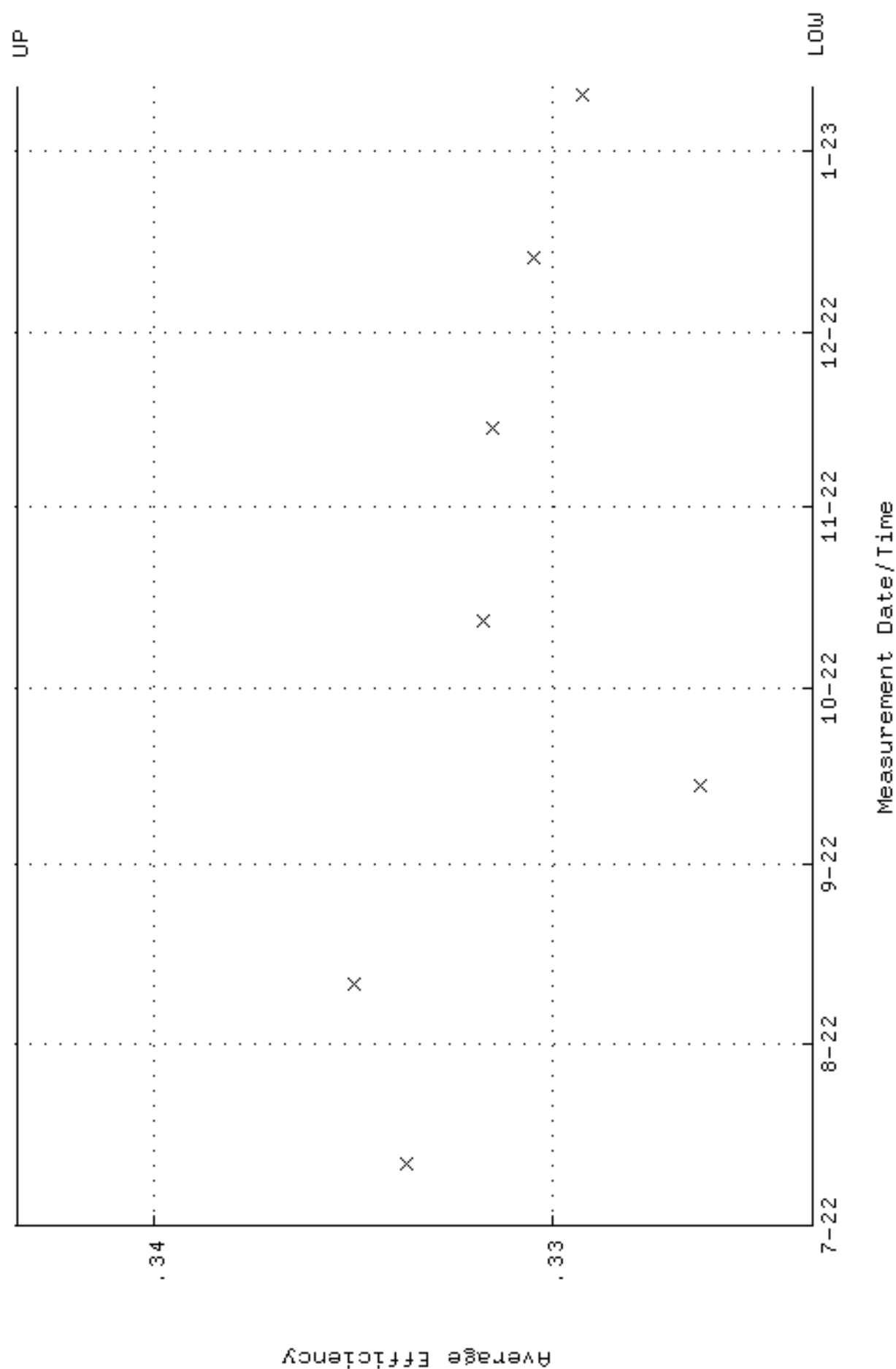
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 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



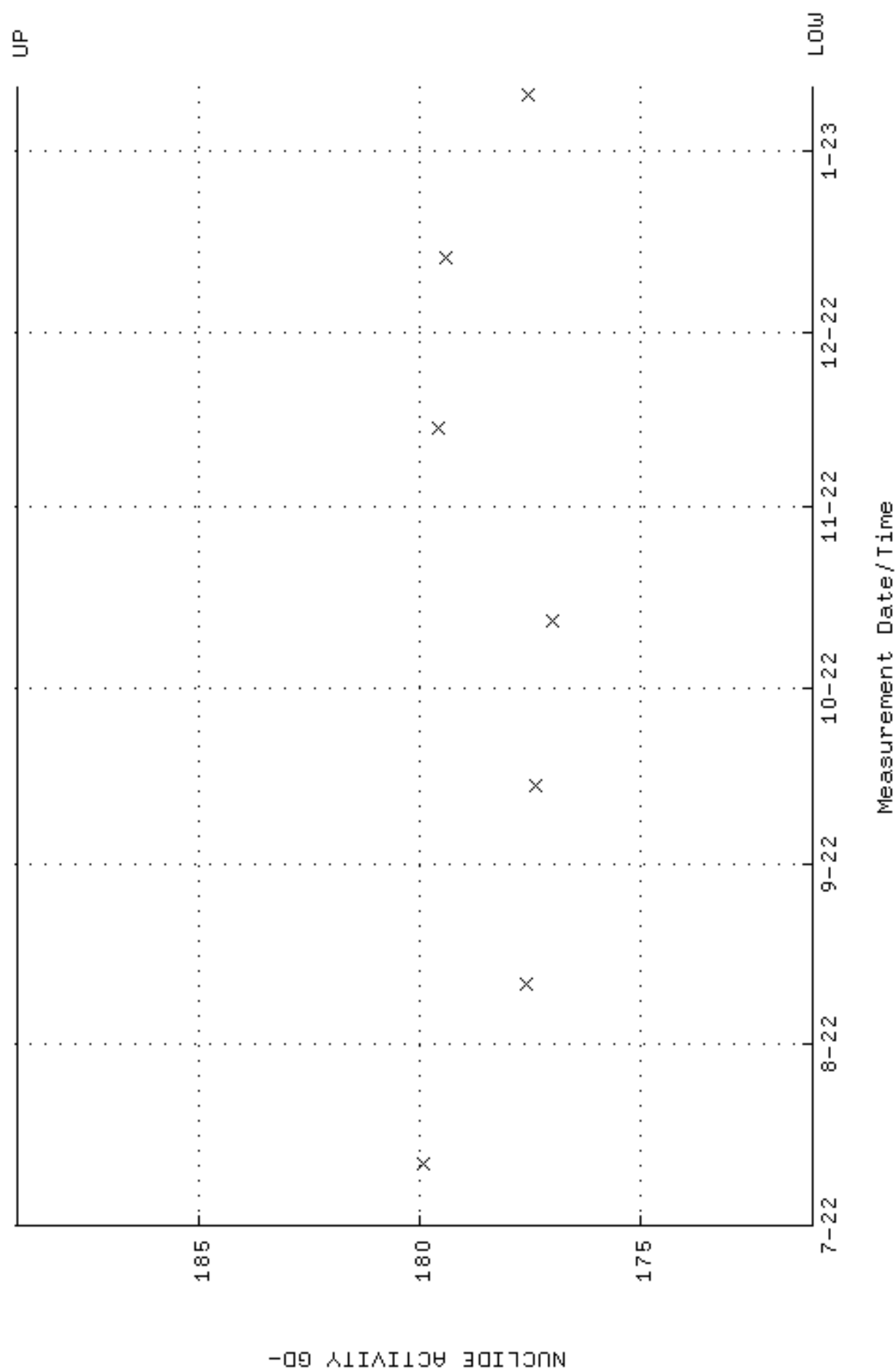
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Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JUL-2022 13:24:38 through 11-JAN-2023 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



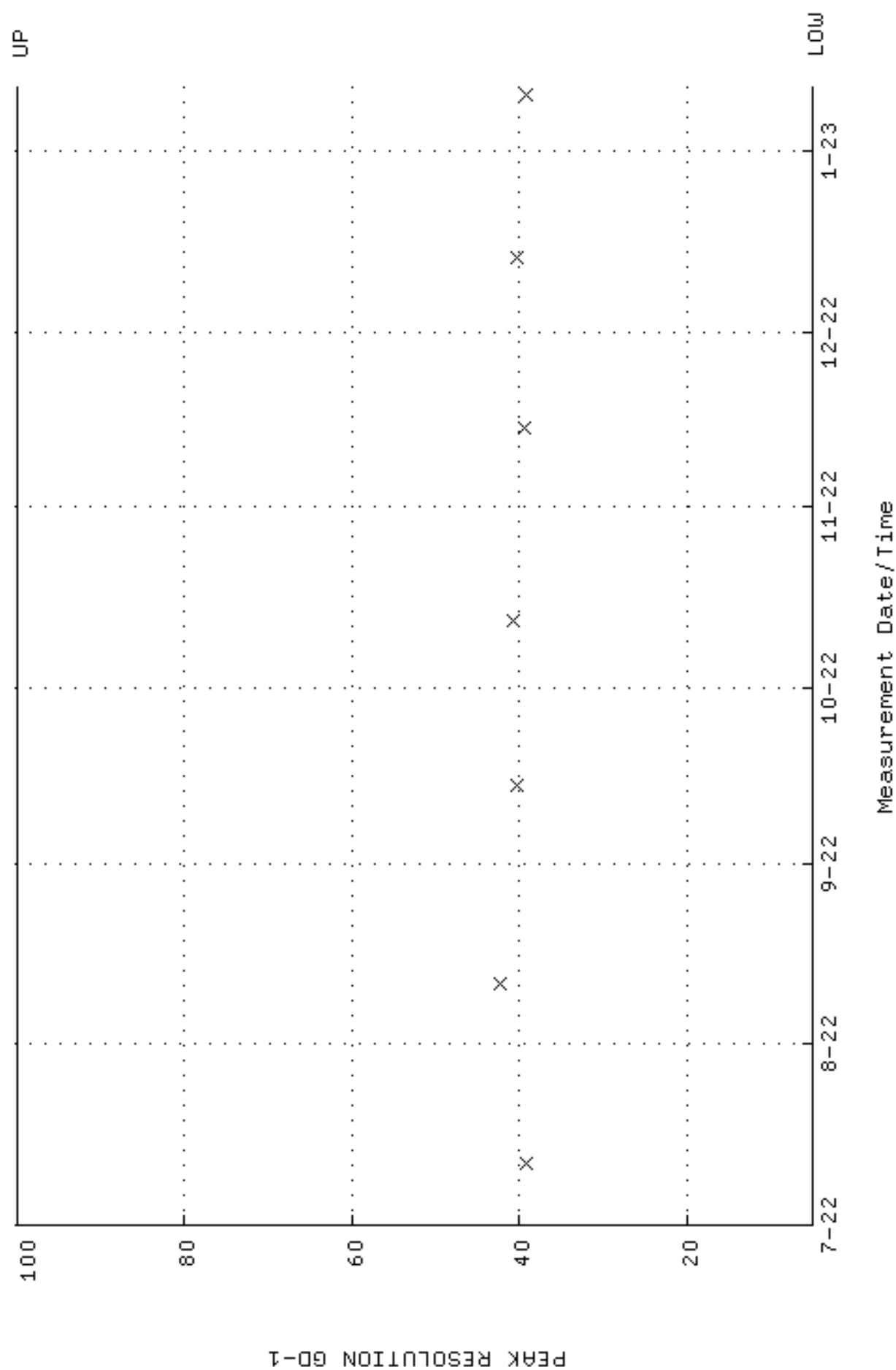
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.323450 through 0.343450



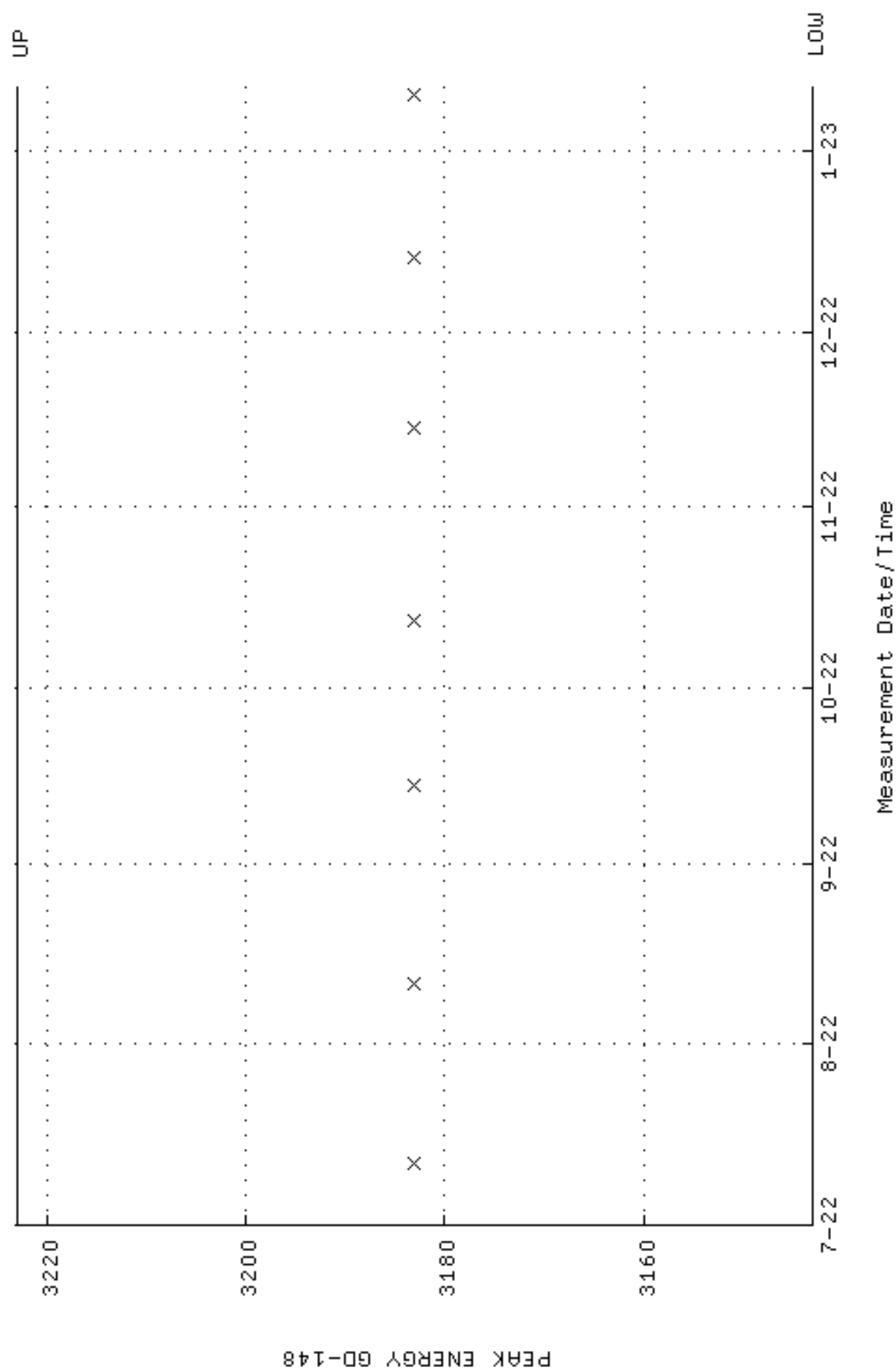
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W076.QAF;10
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



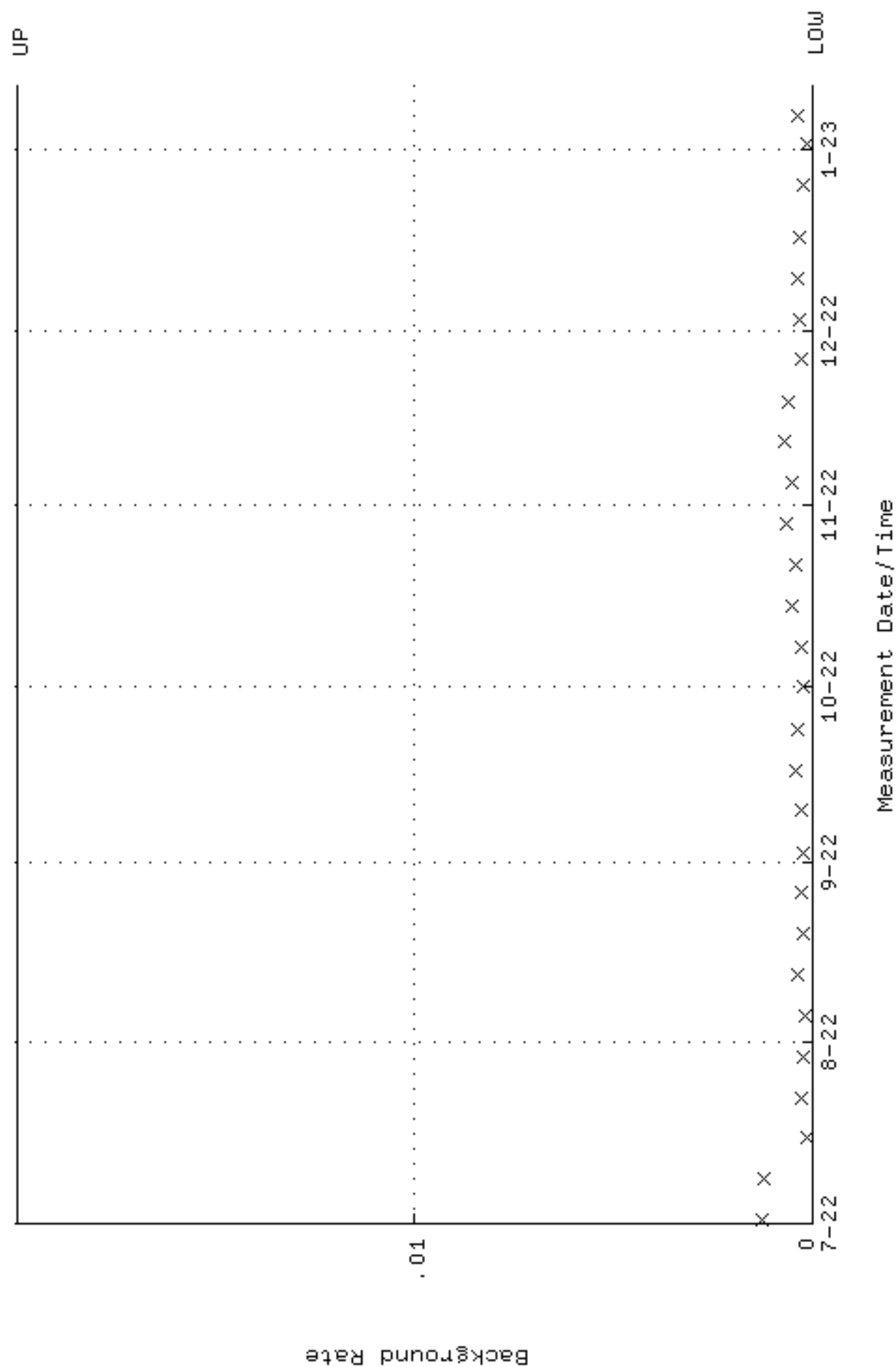
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



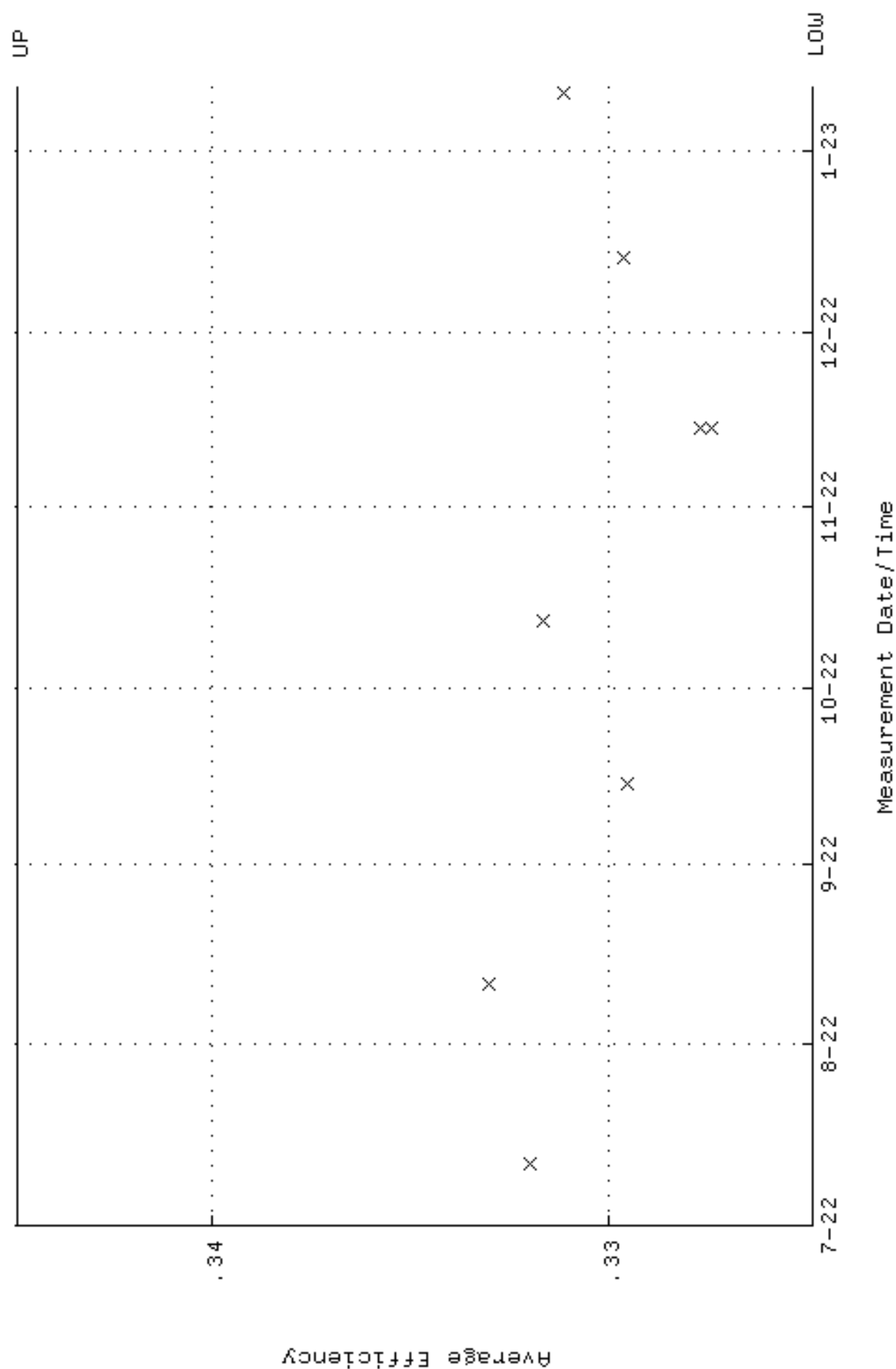
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Start/End Dates  : 1-JUL-2022 13:24:38 through 11-JAN
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02

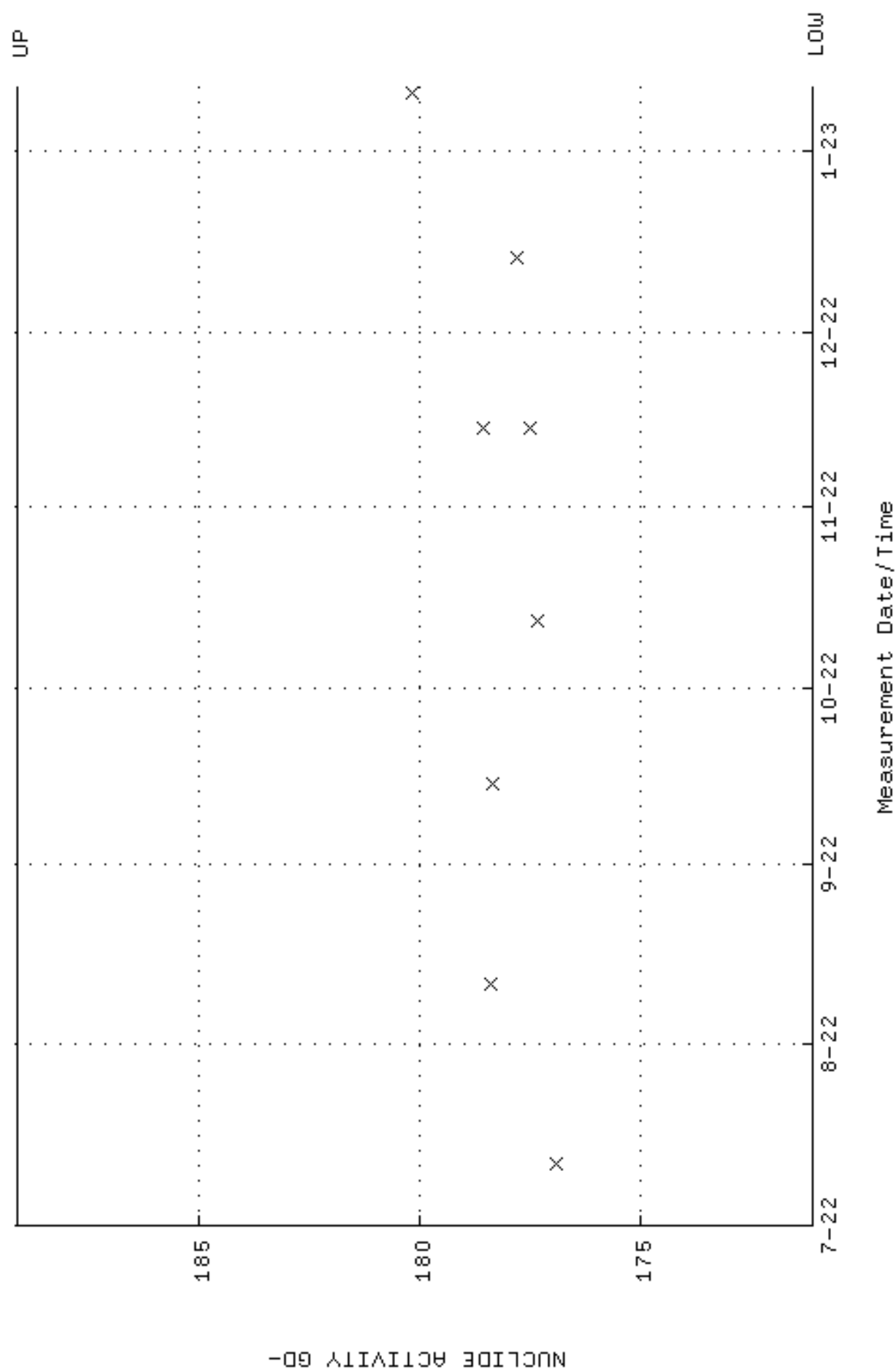
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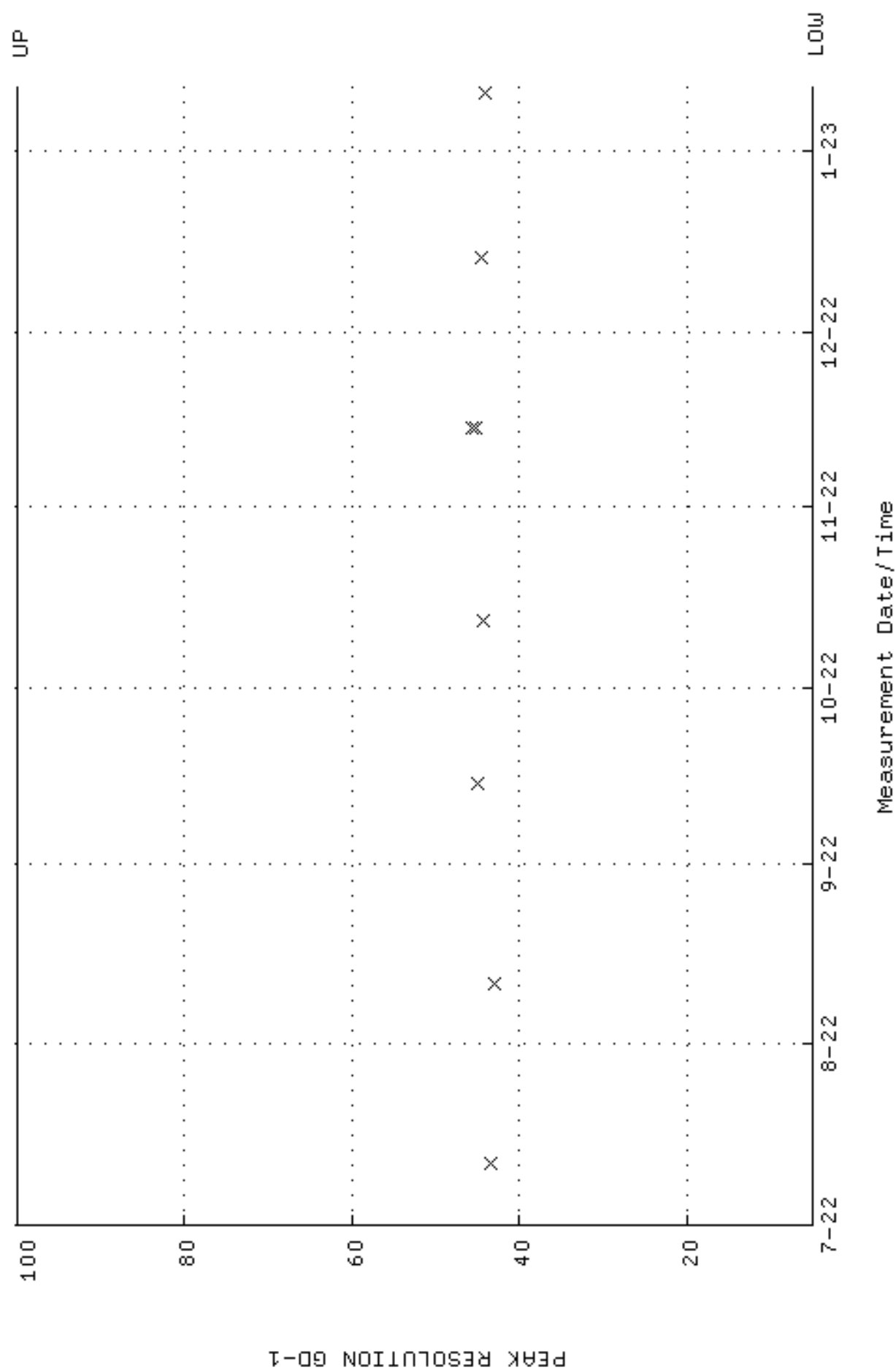
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.324840 through 0.344934



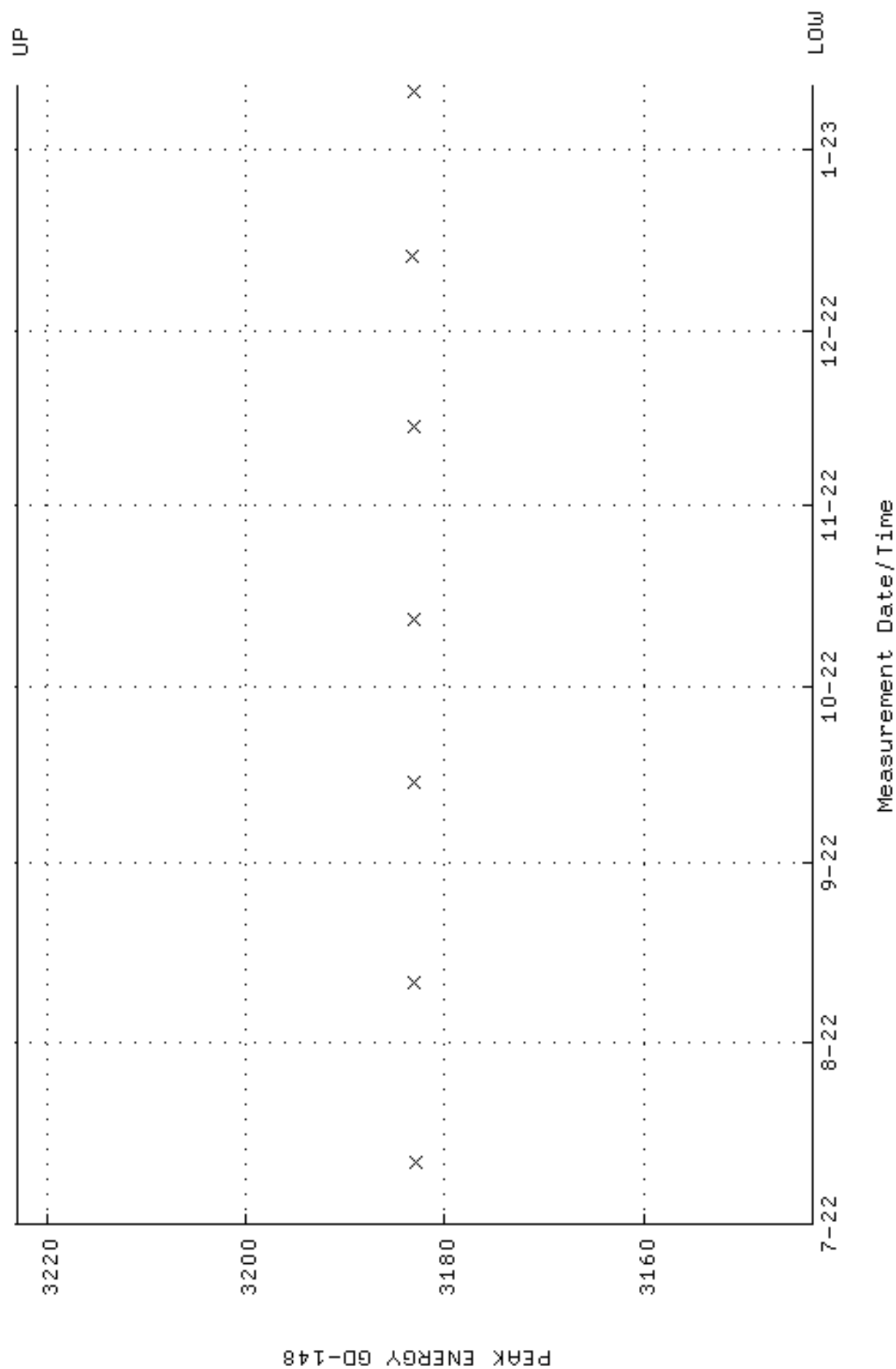
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



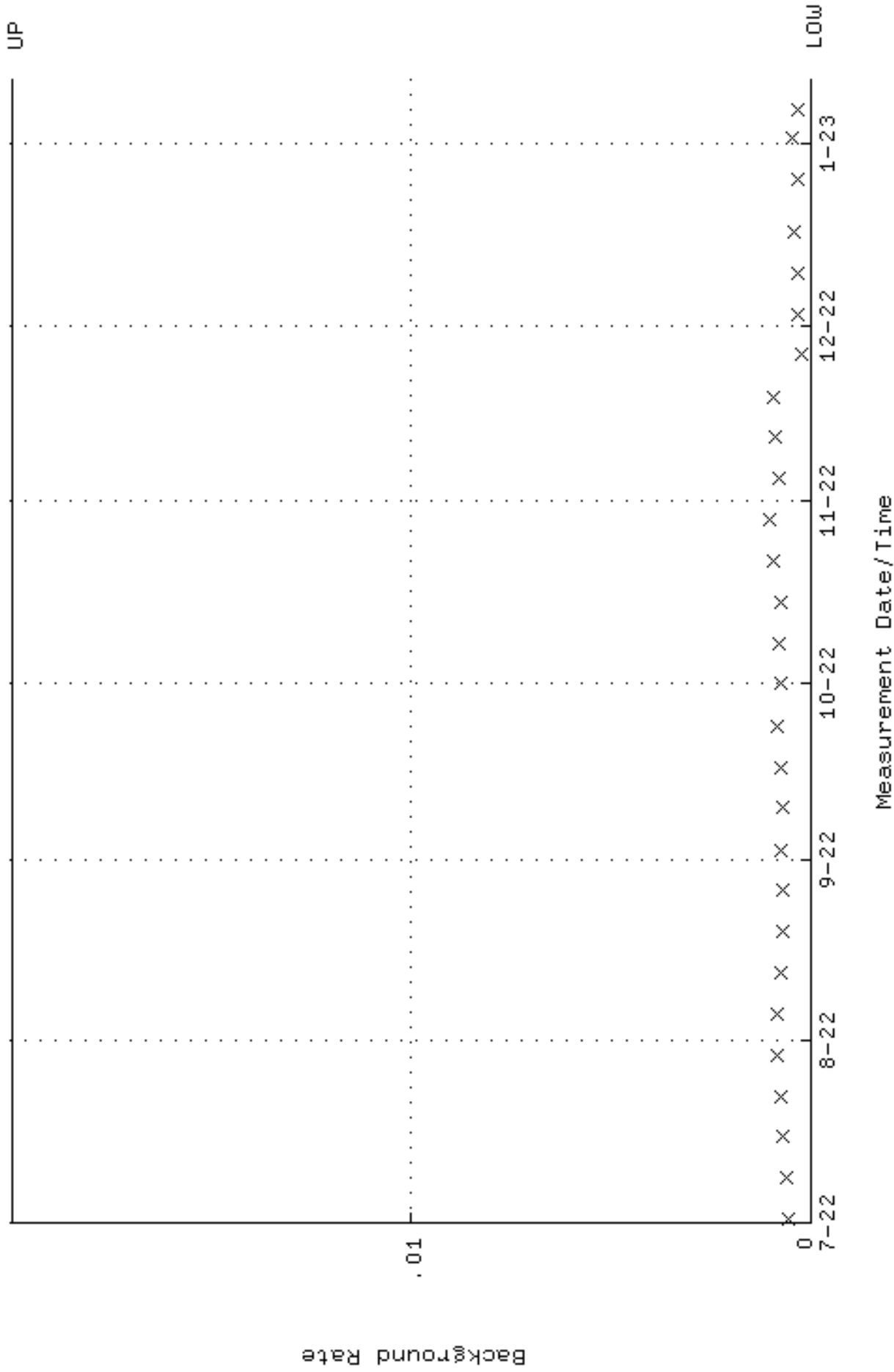
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



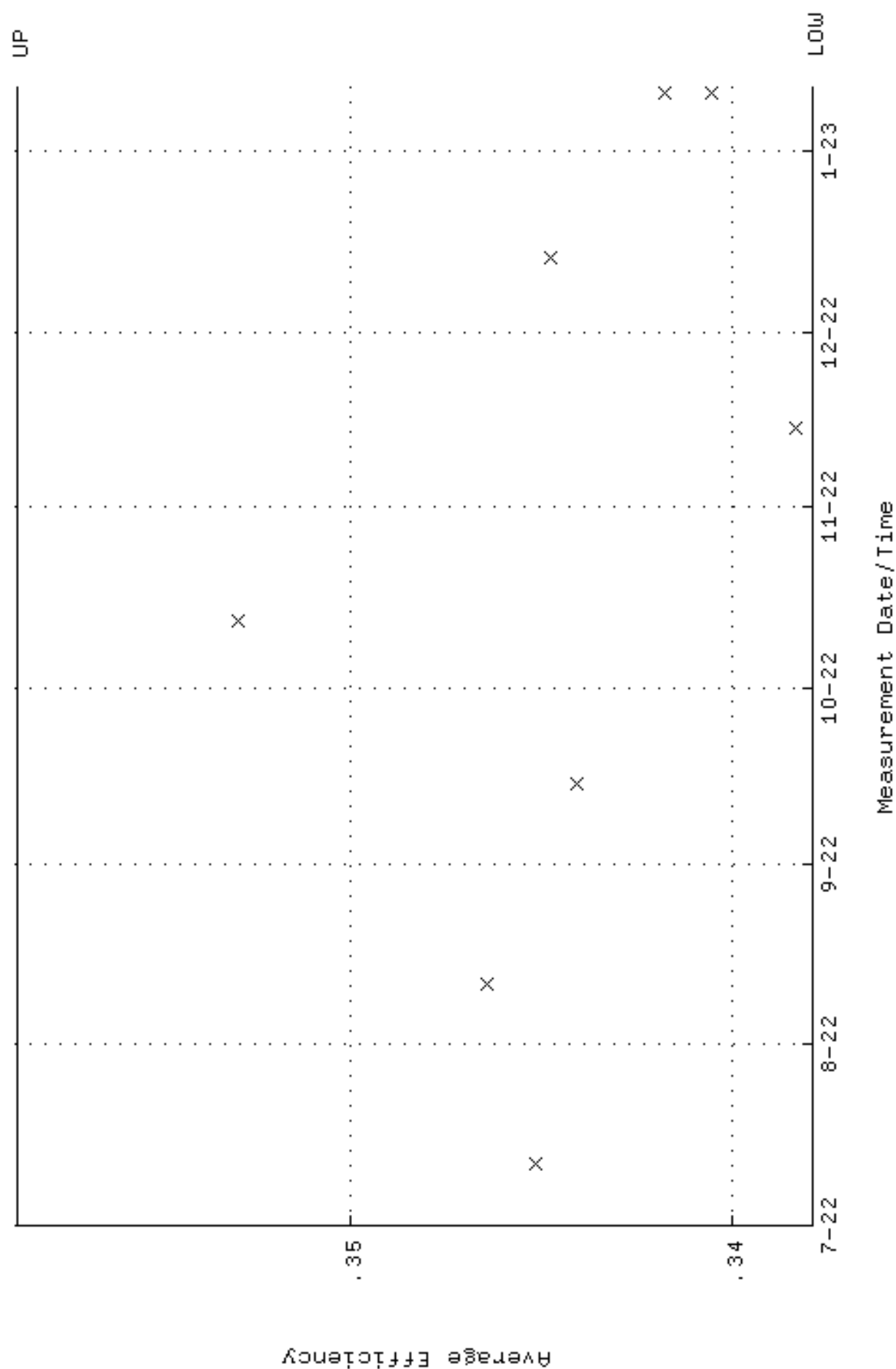
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



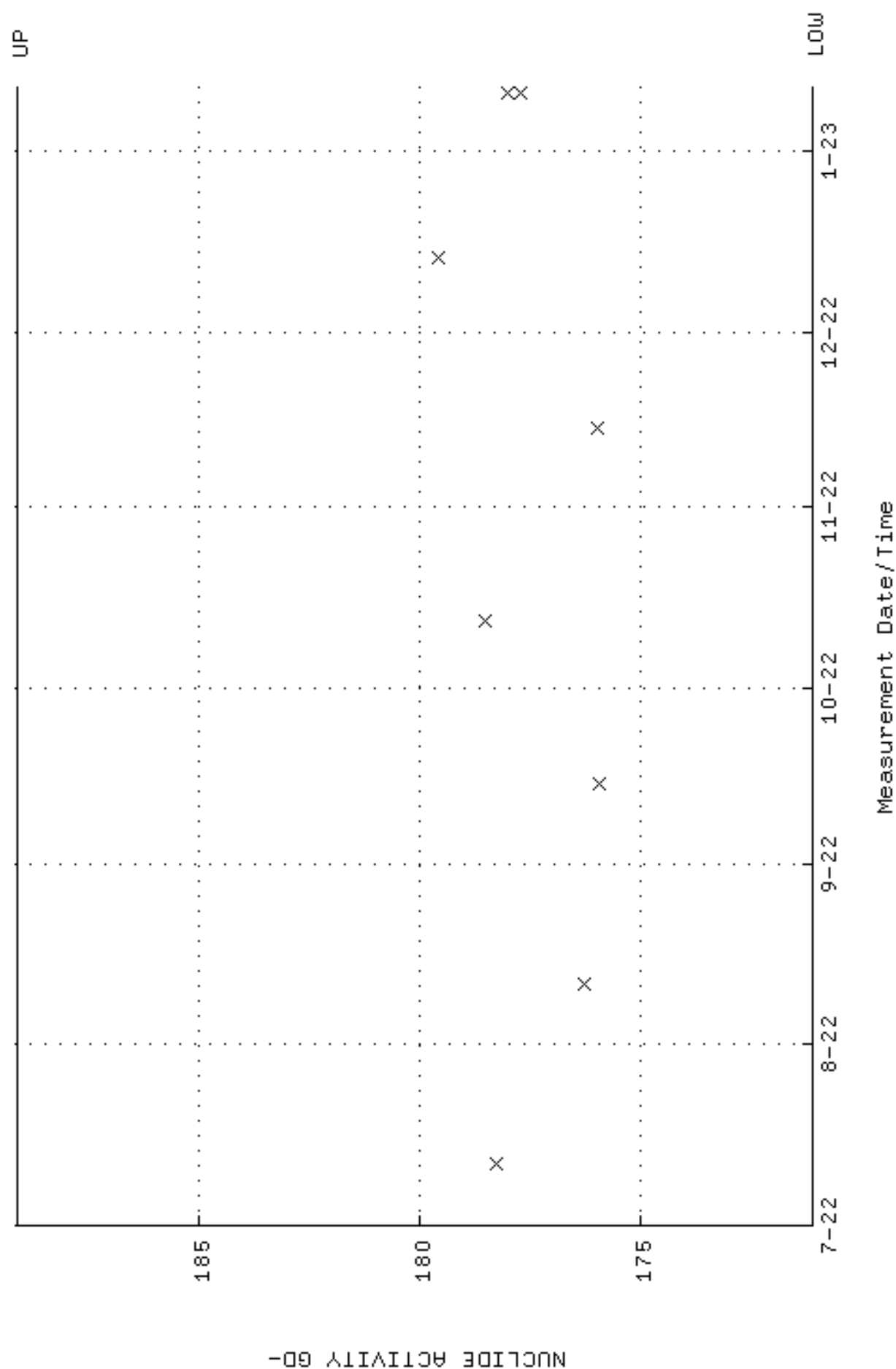
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Parameter Name : BACKRATE (Background Rate)
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Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



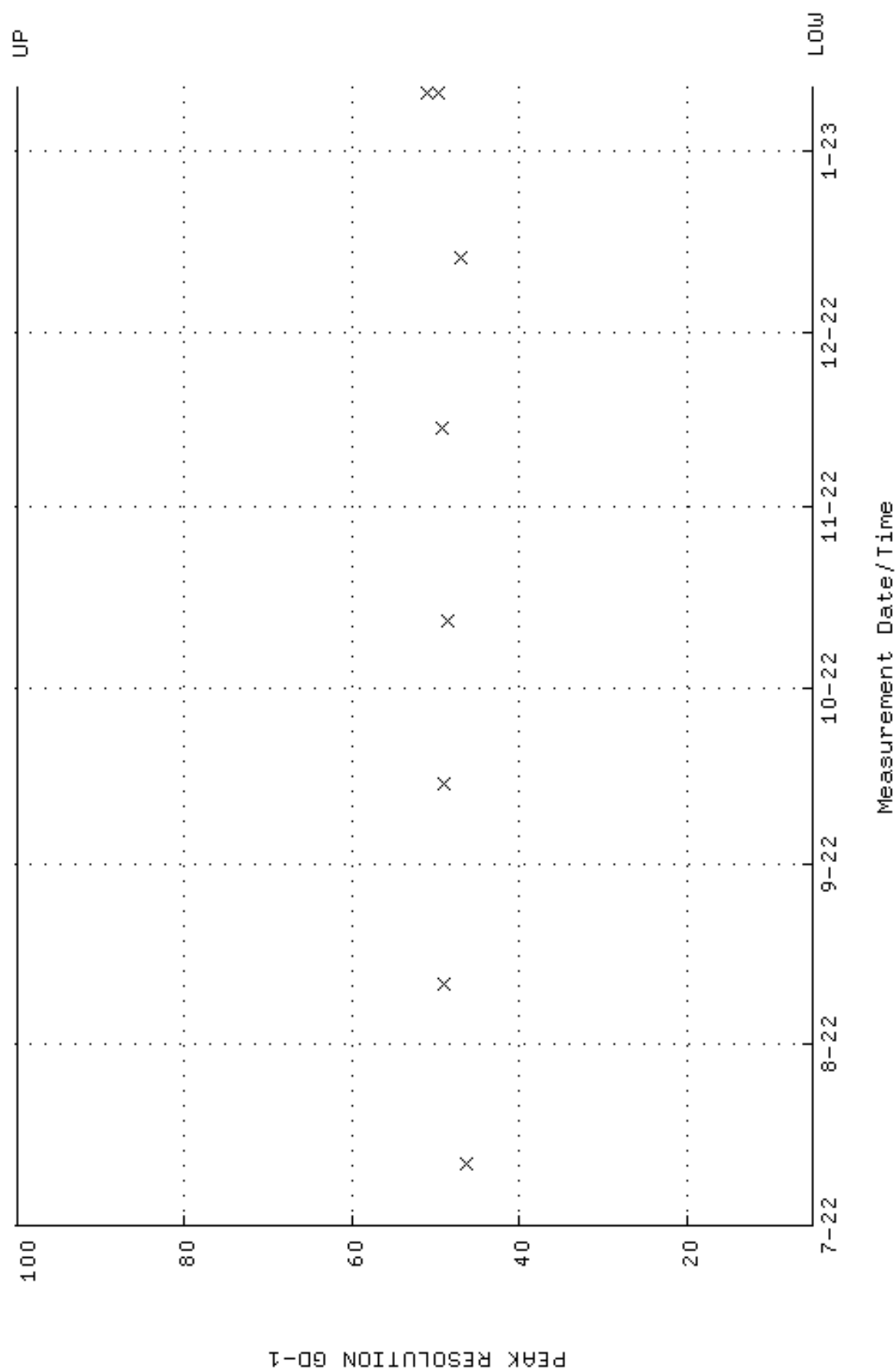
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 Parameter Name : AVRGEFF (Average Efficiency)
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 Lower/Upper Lmts: 0.337870 through 0.358760



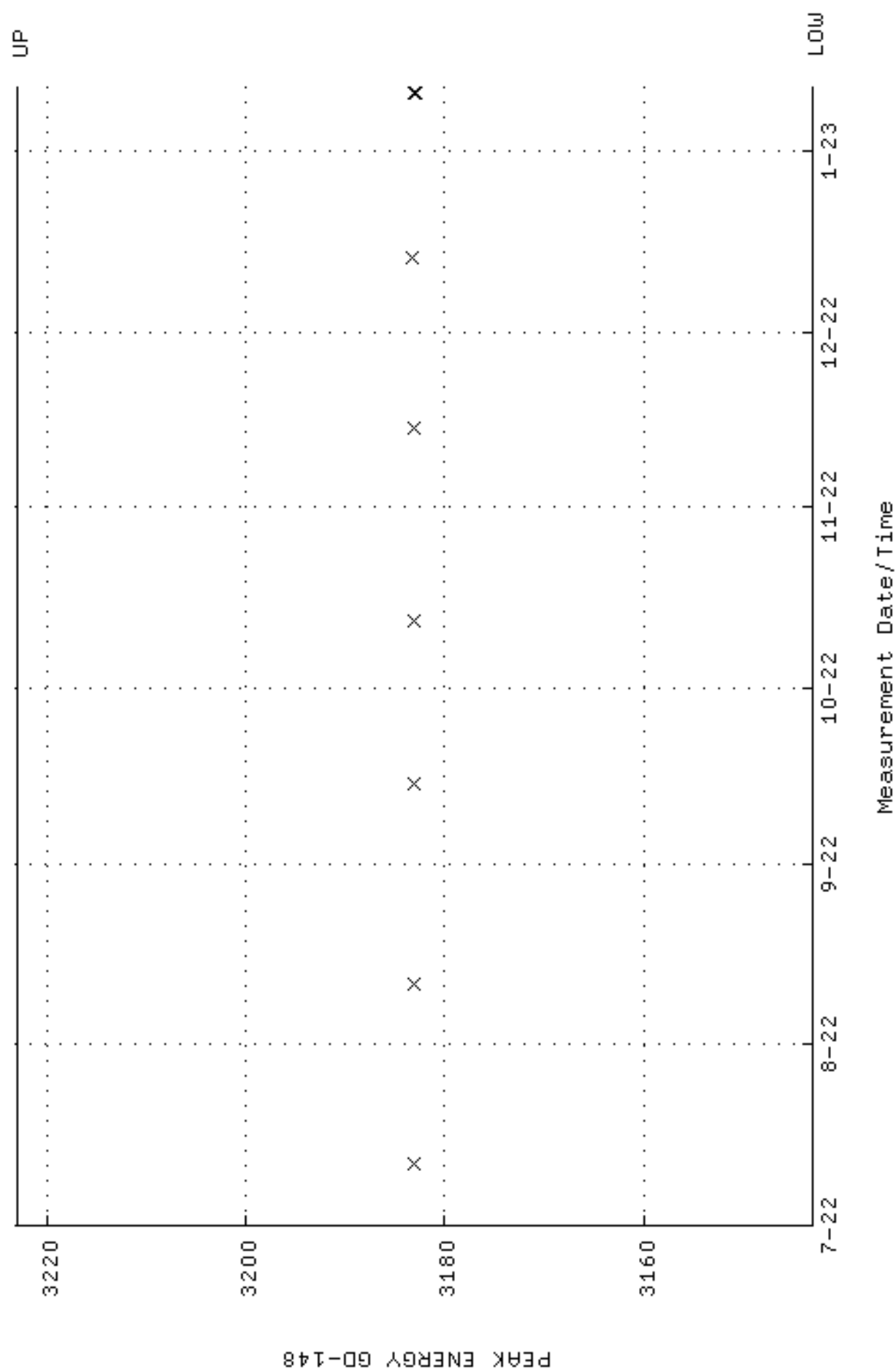
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



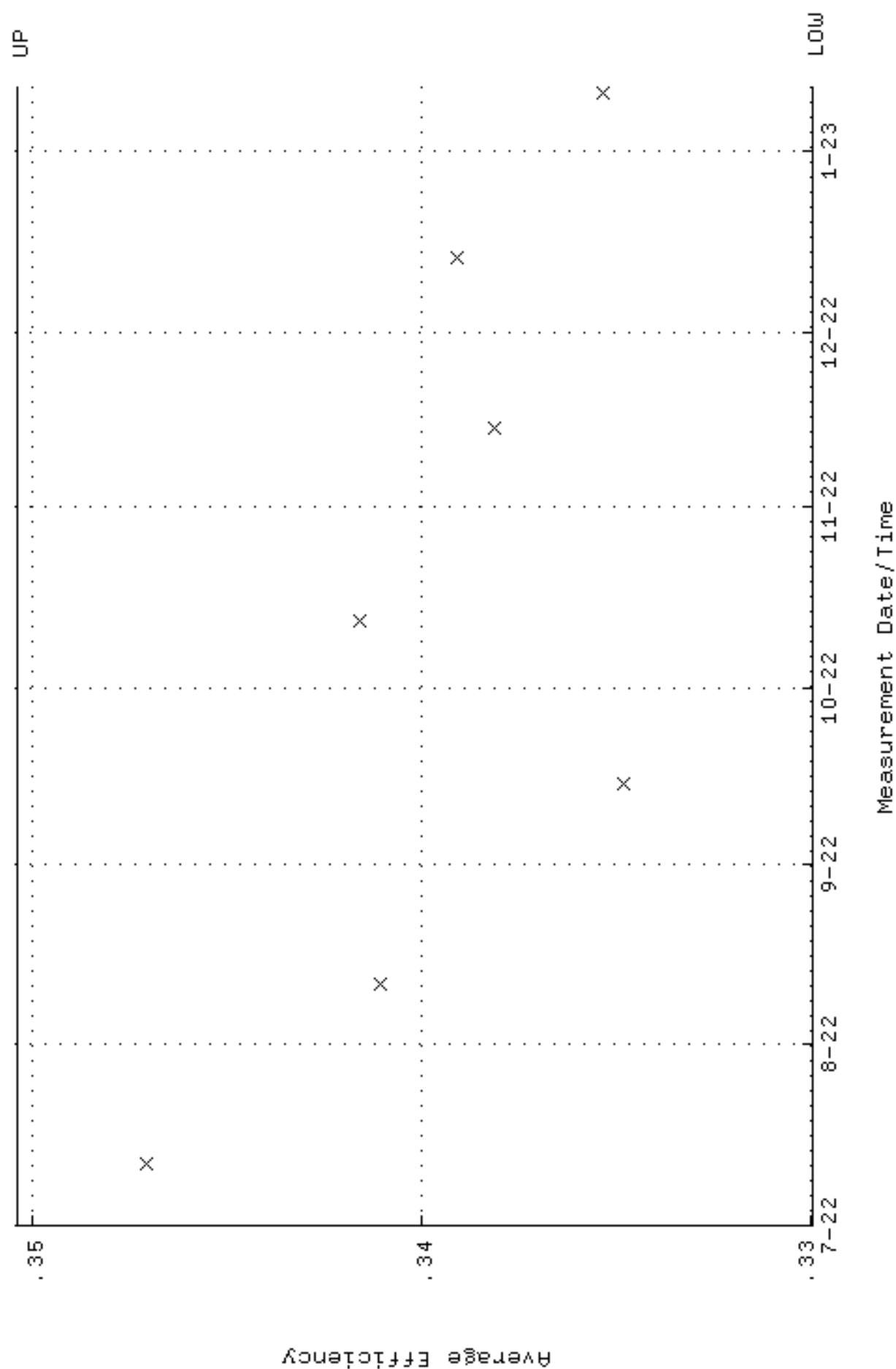
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 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



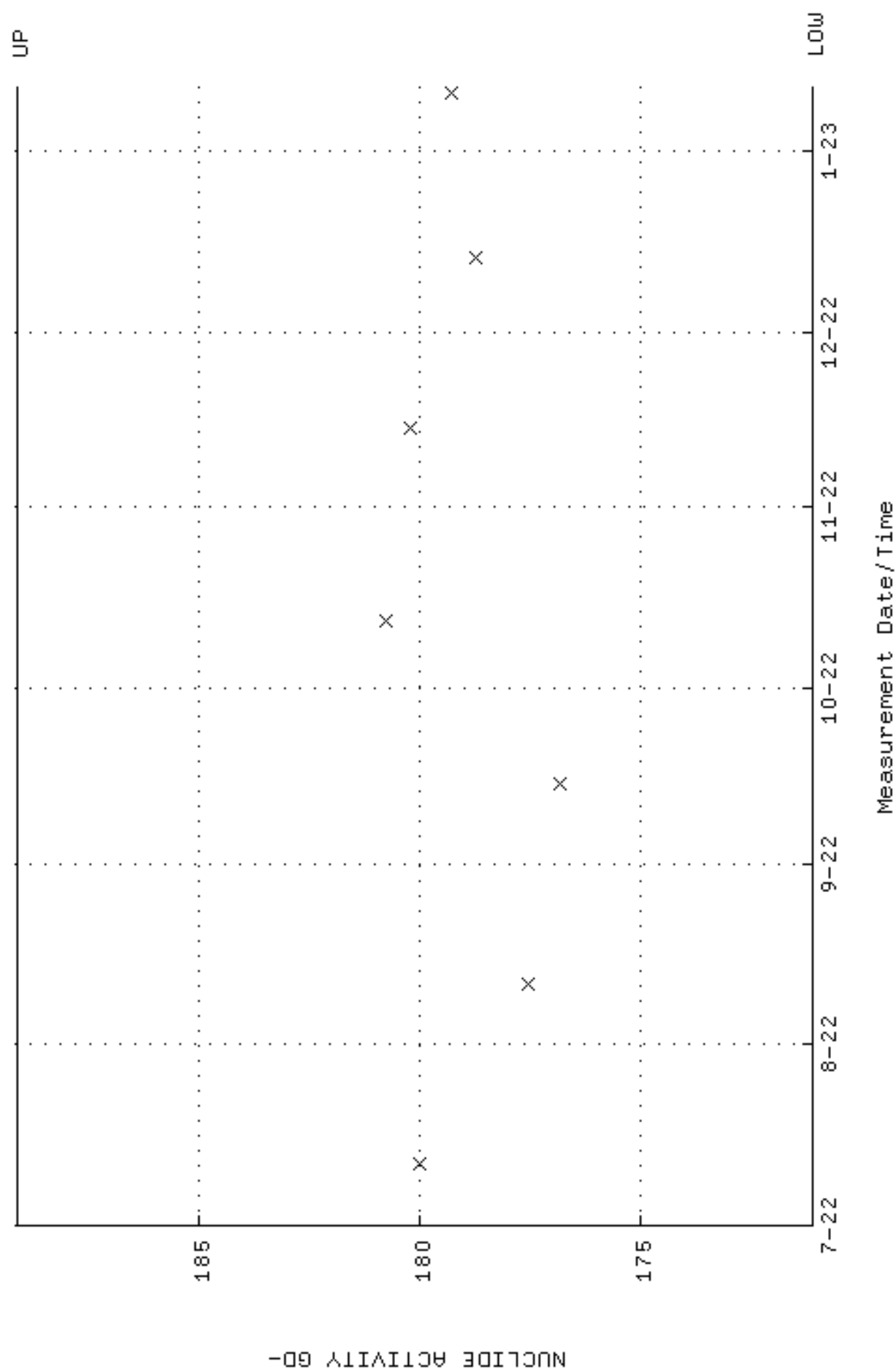
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



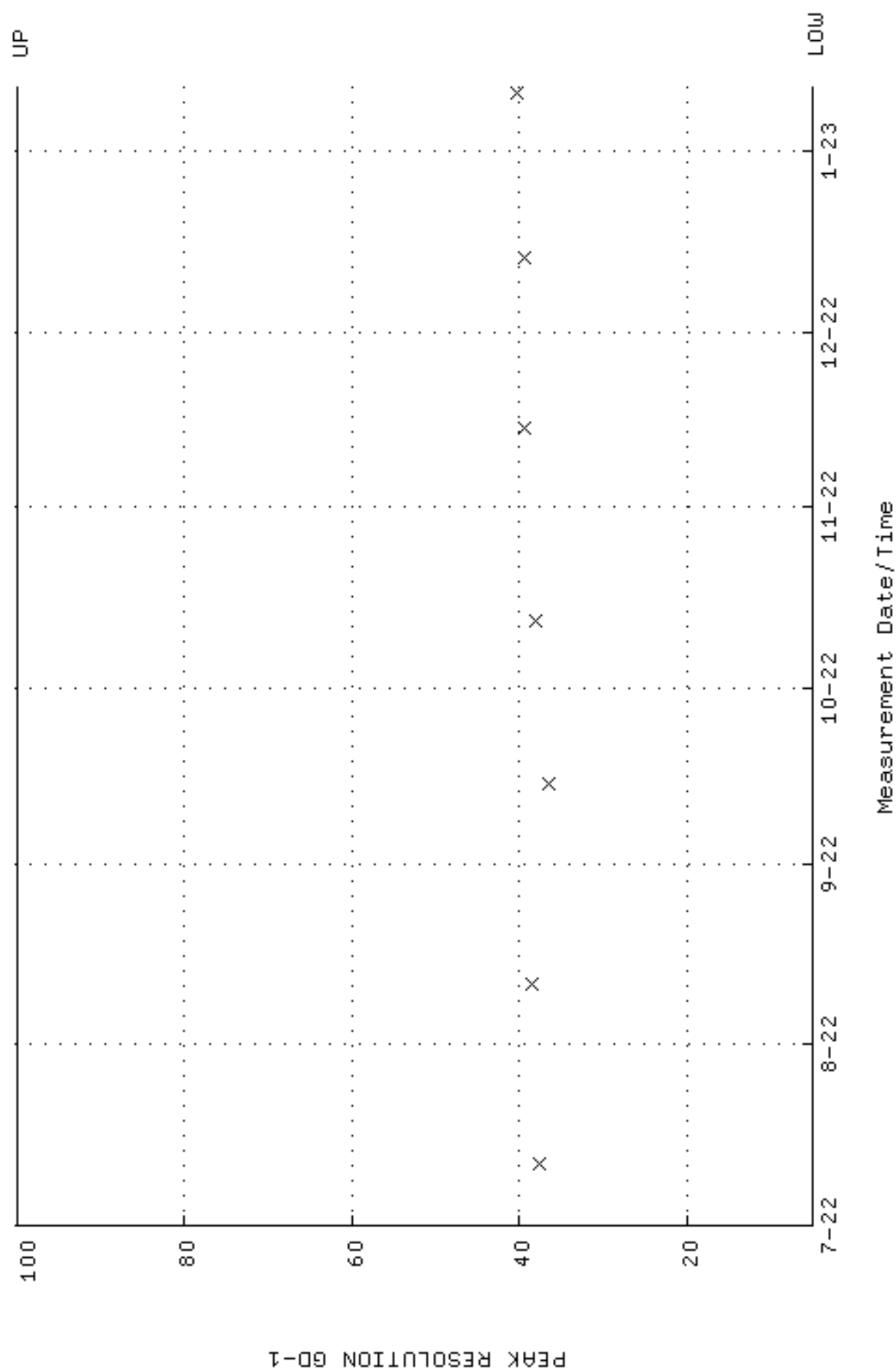
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.329970 through 0.350380



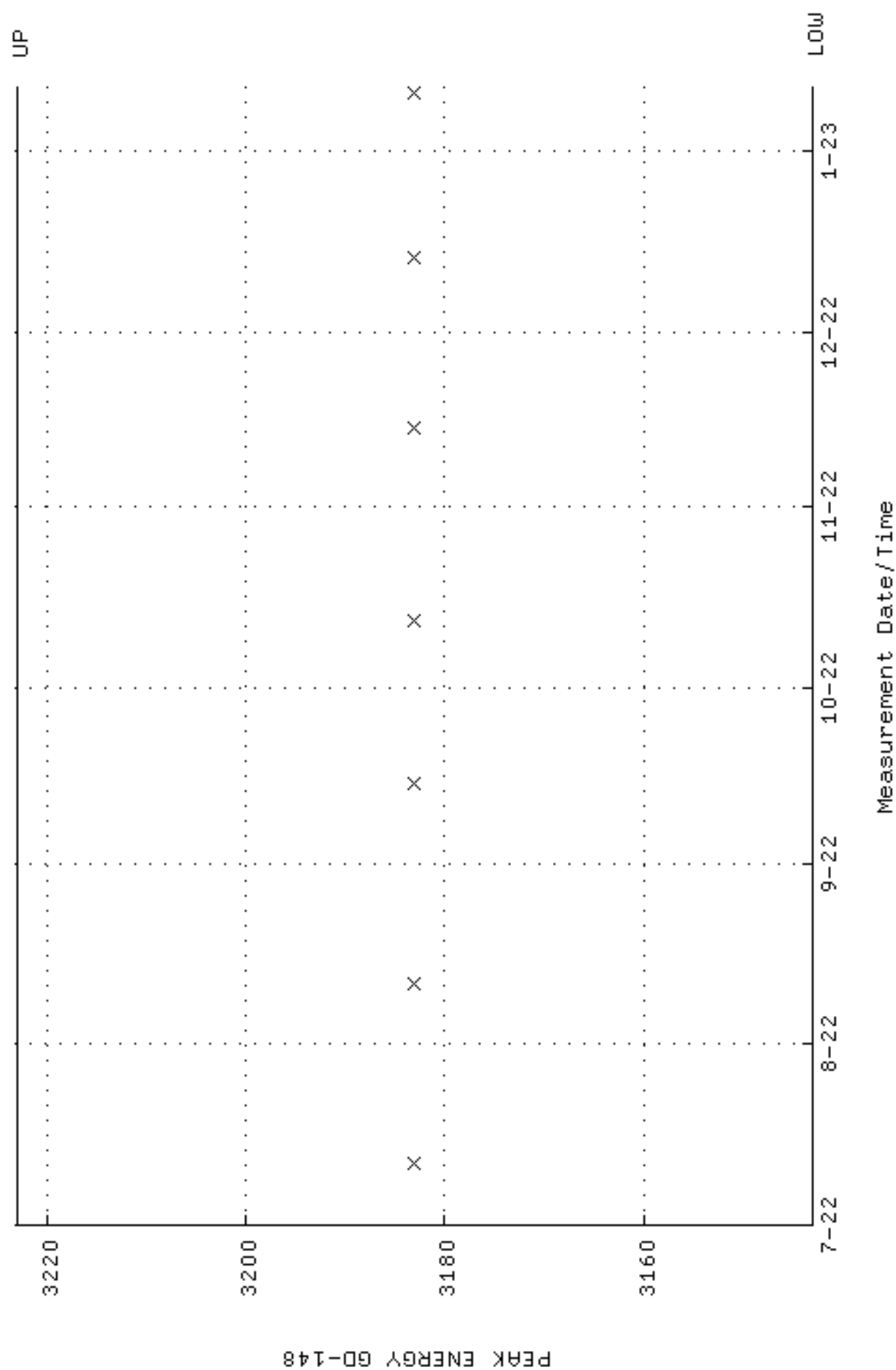
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



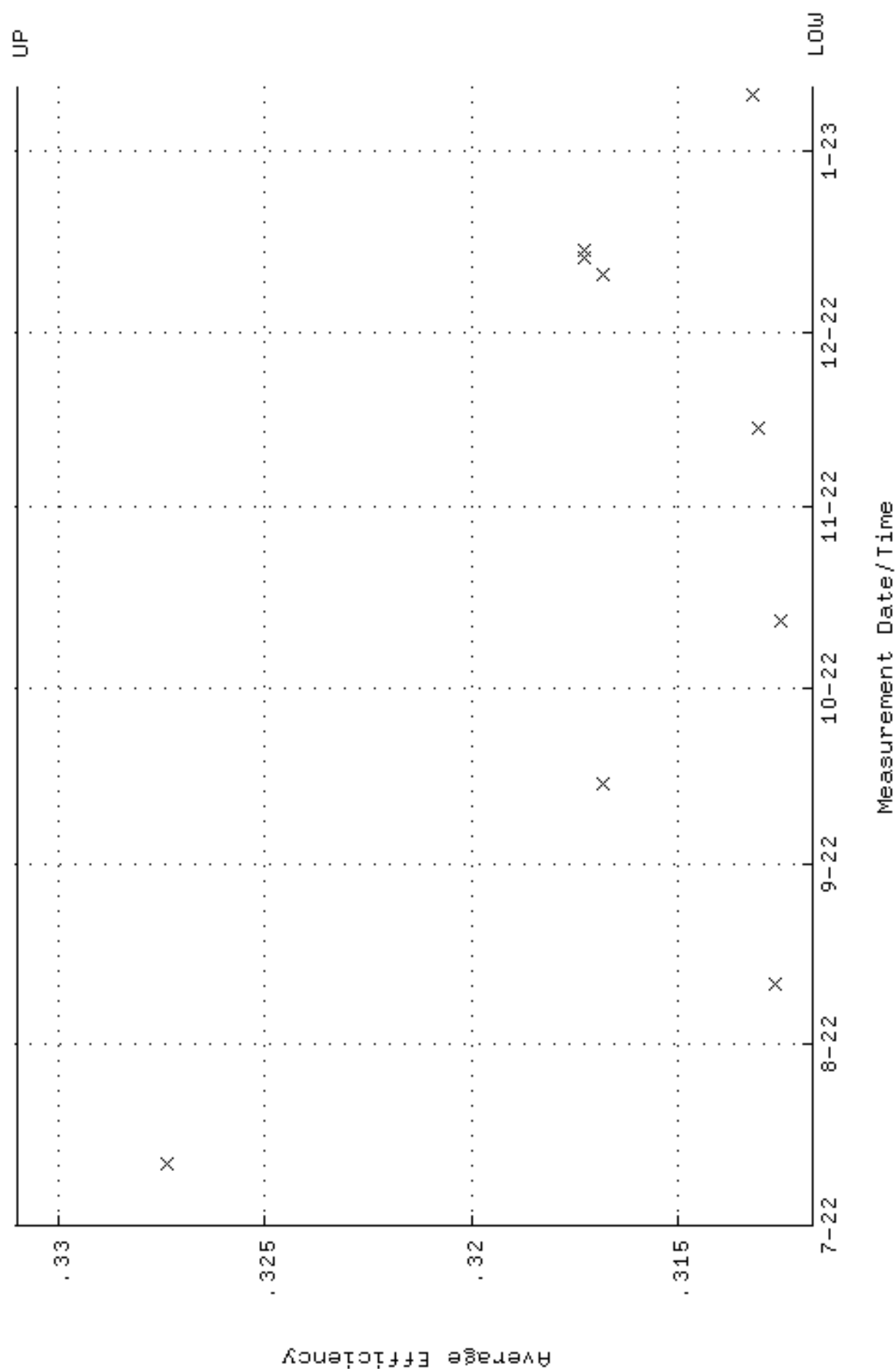
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



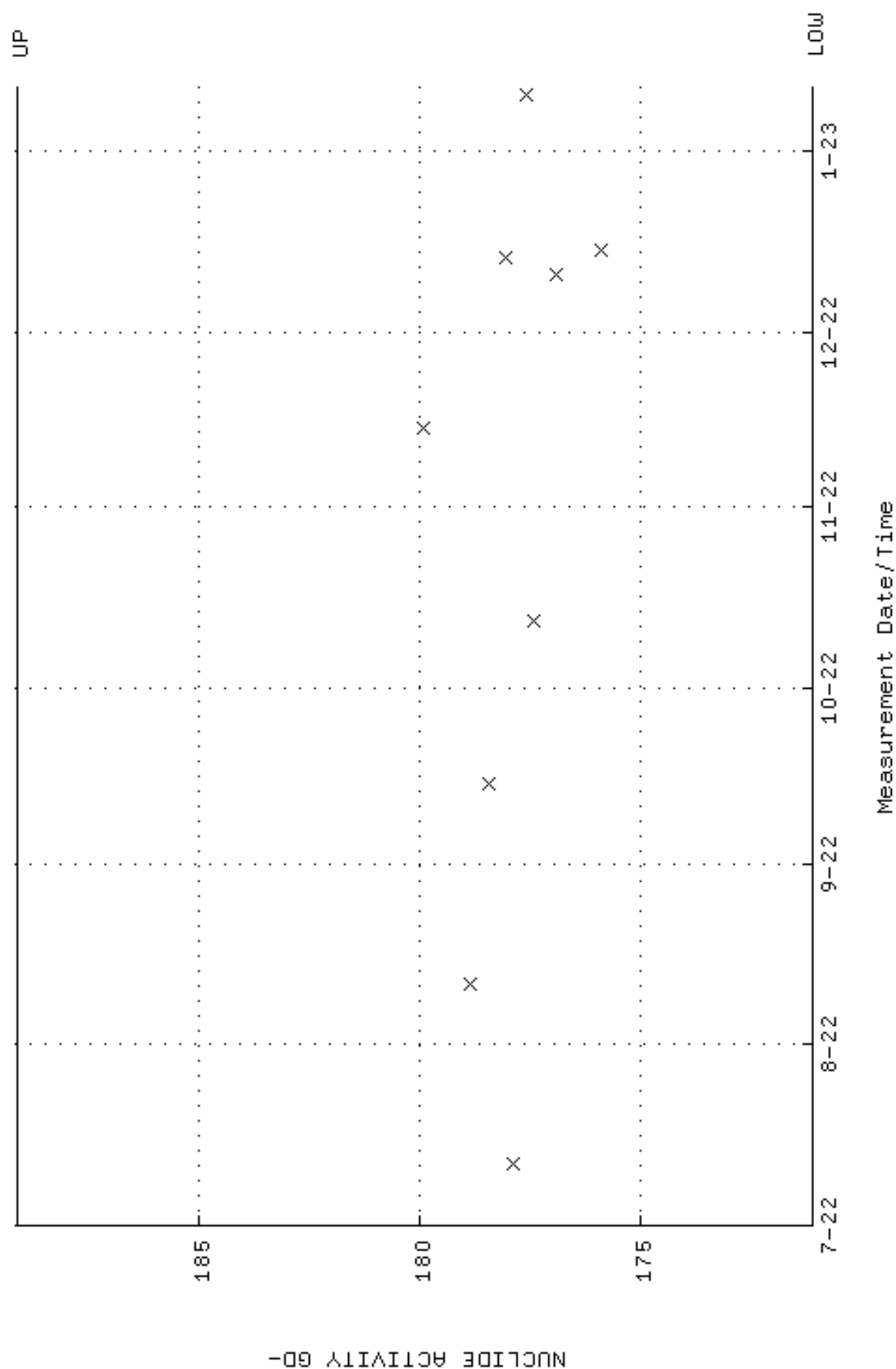
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



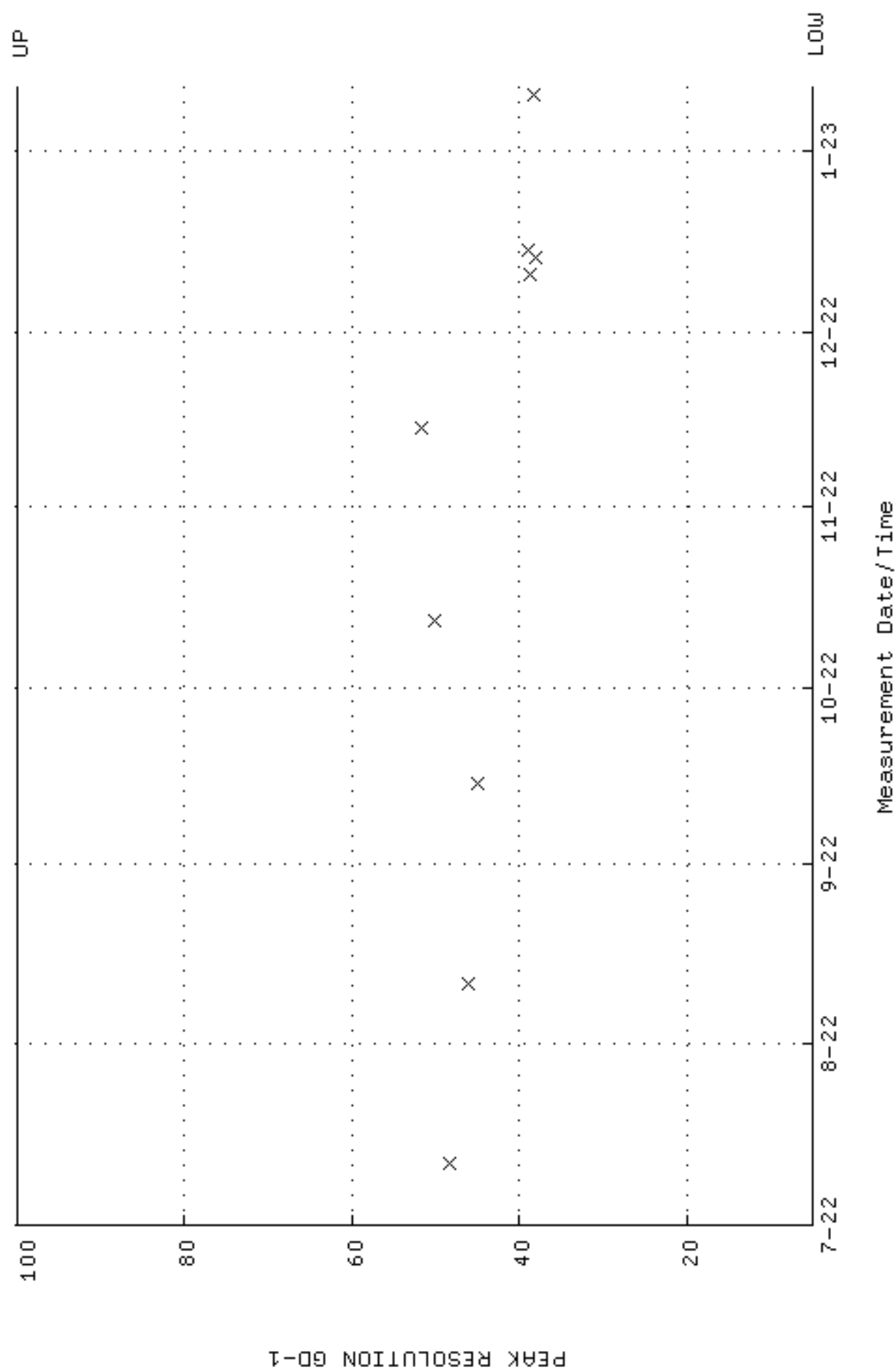
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 Parameter Name : AVRGEFF (Average Efficiency)
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 Lower/Upper Lmts: 0.311720 through 0.331010



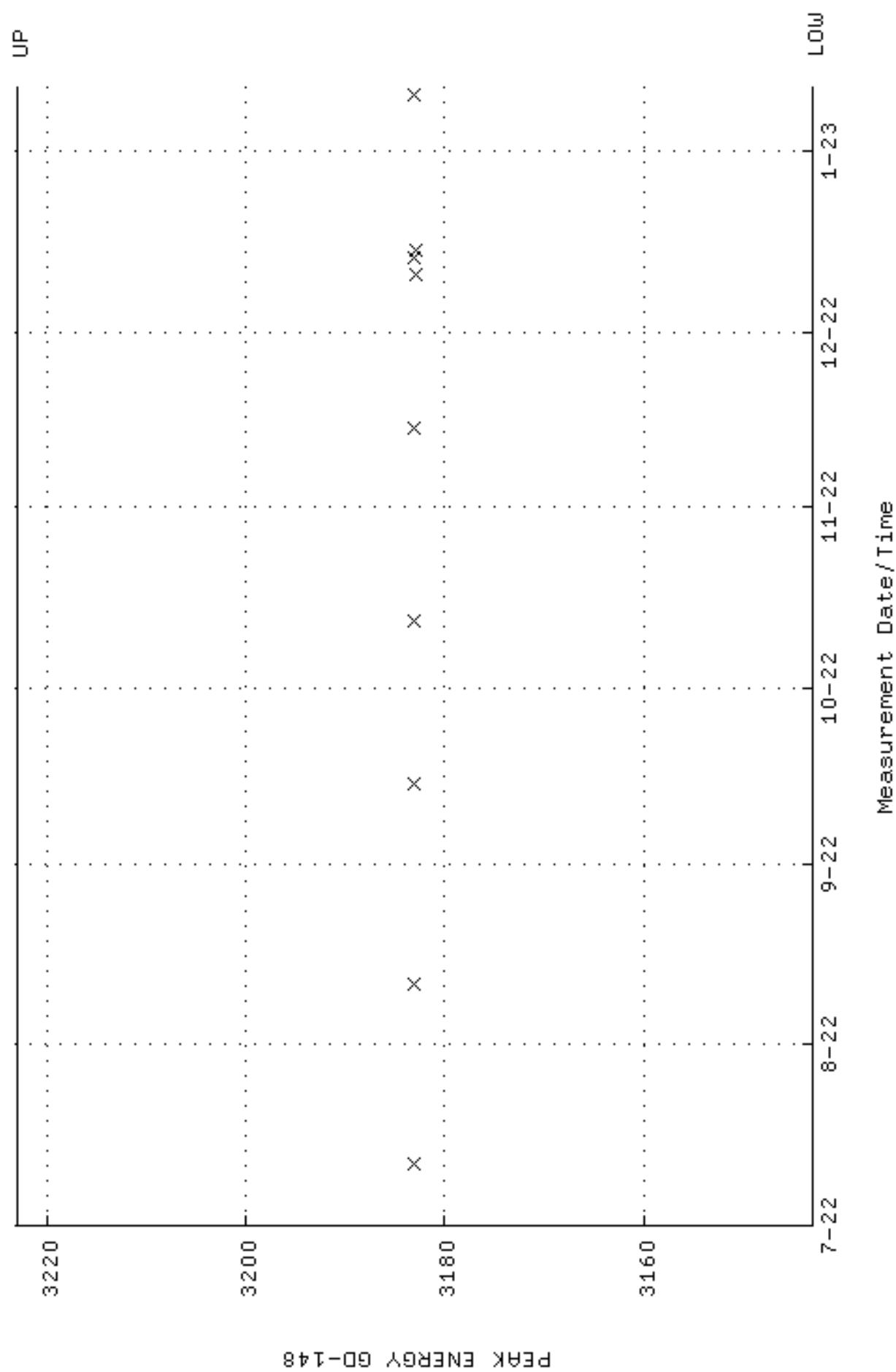
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 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



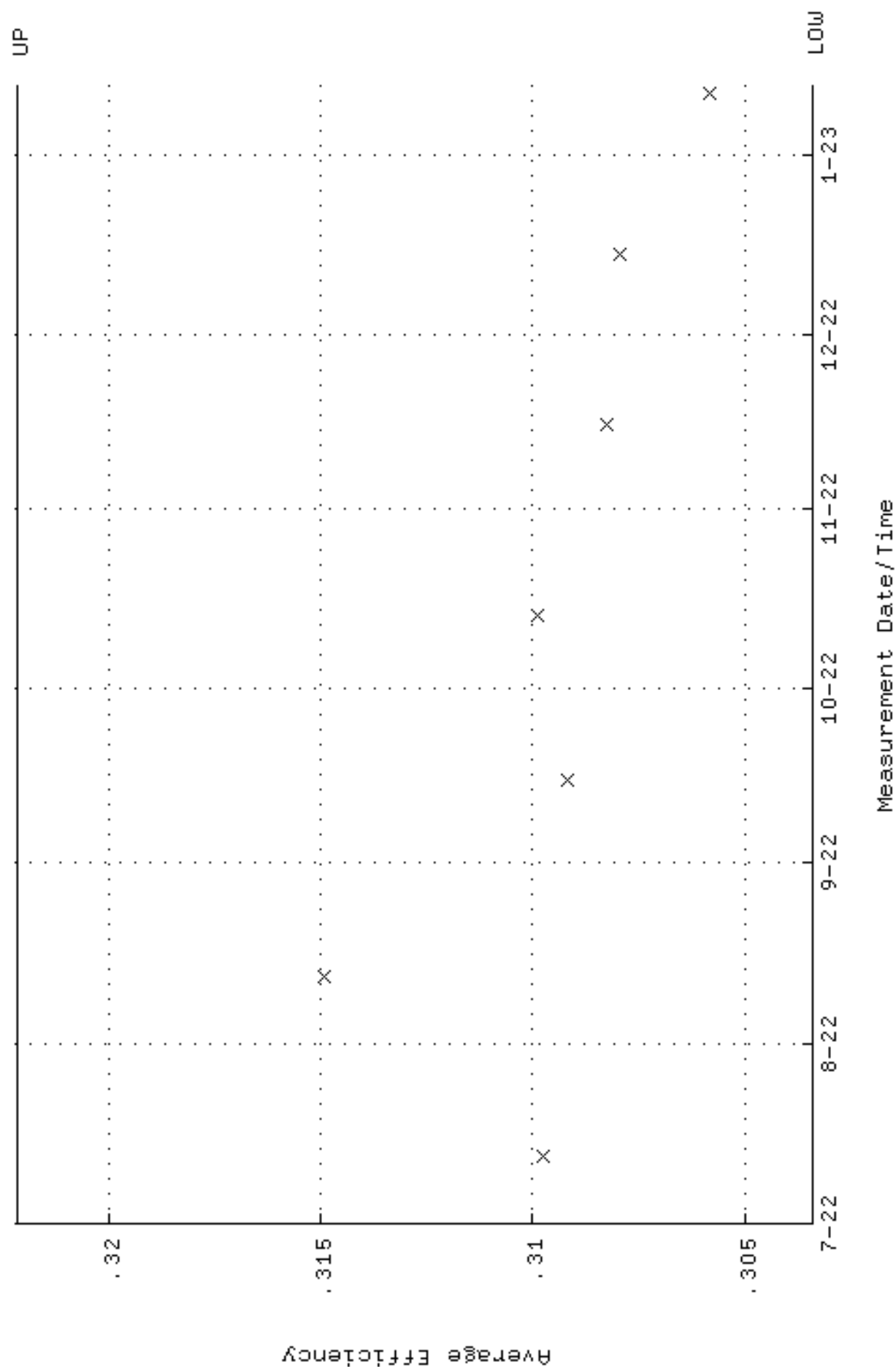
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 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



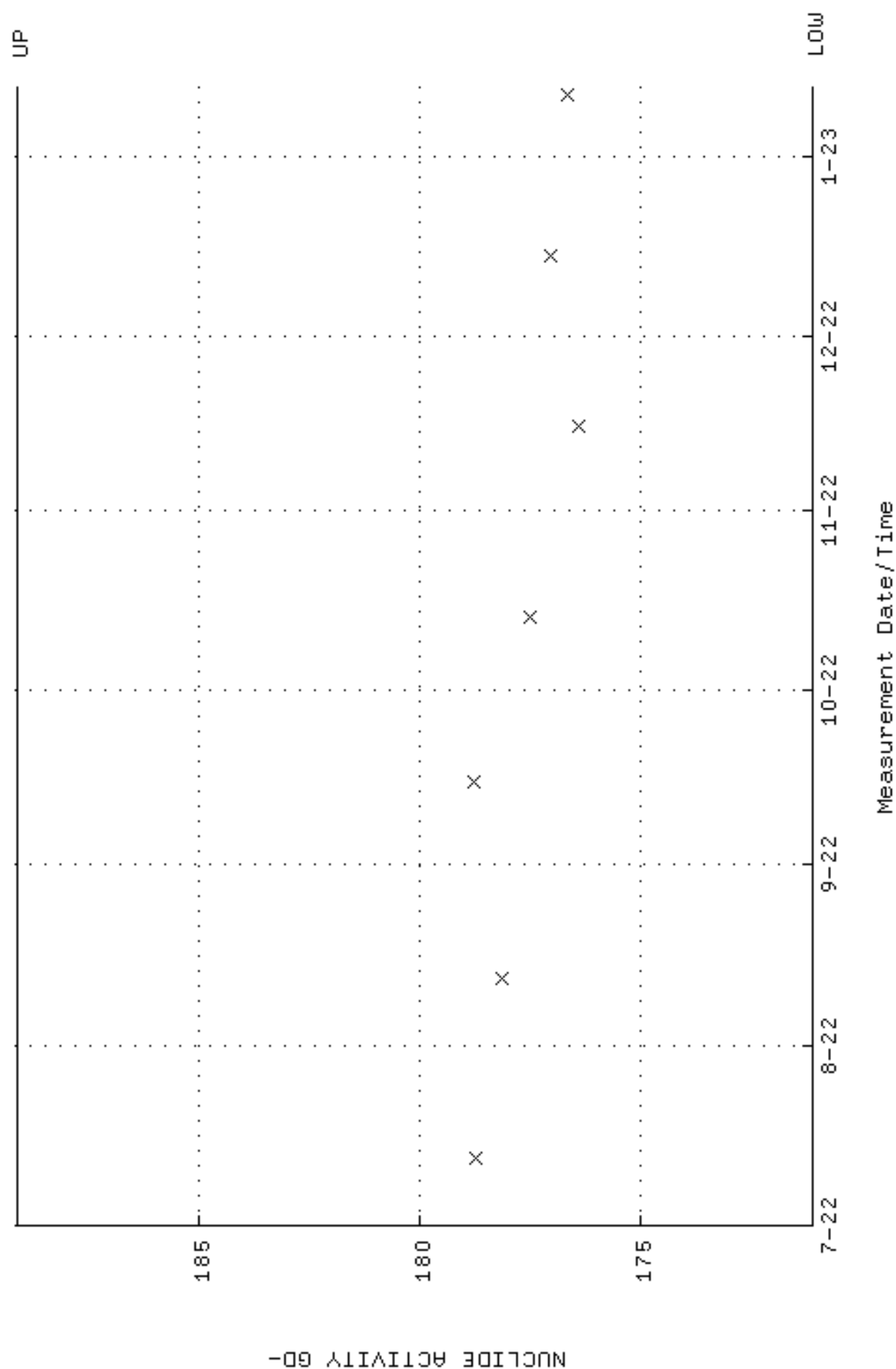
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



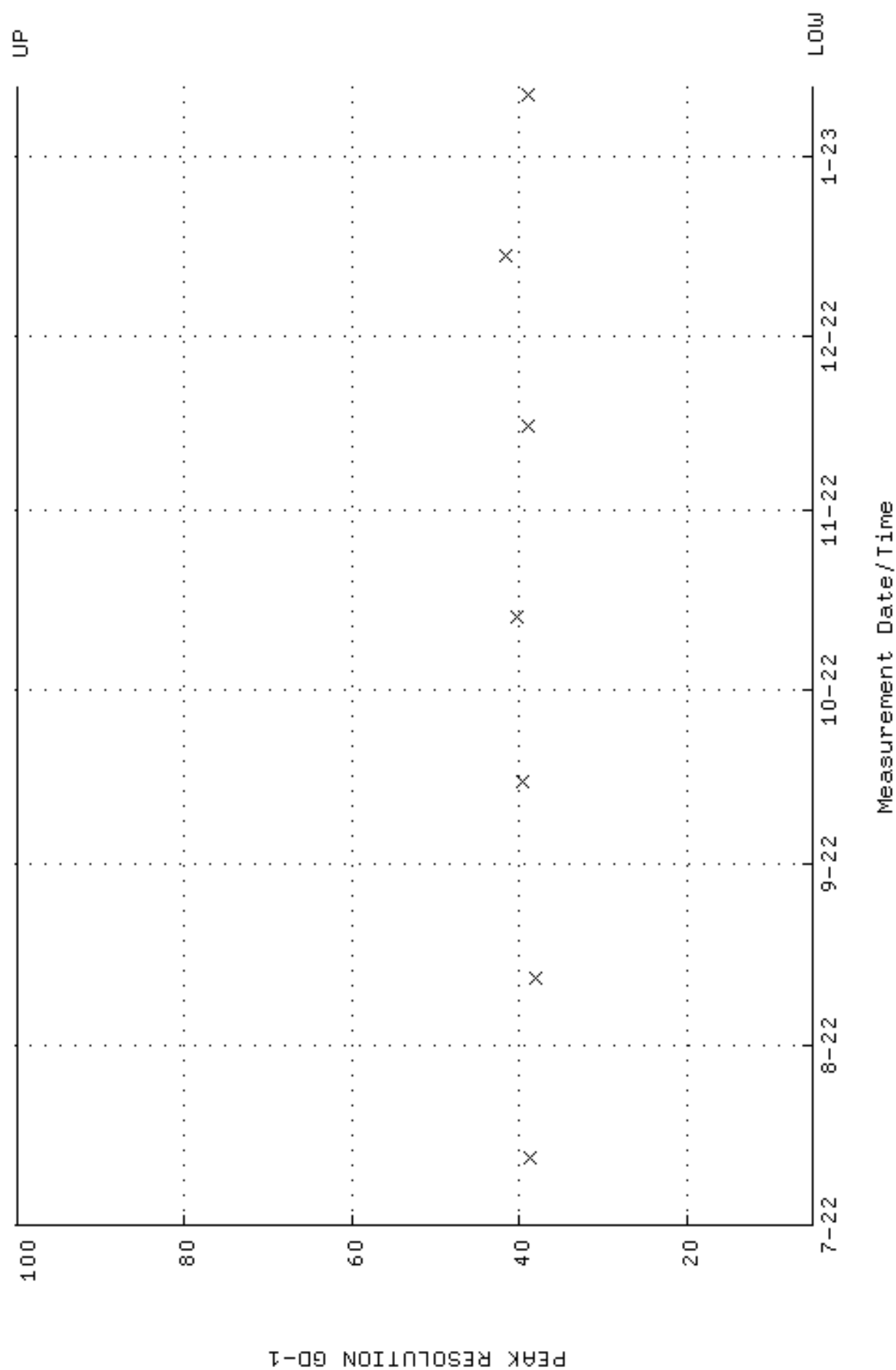
QA filename : DKA100:[ENV_ALPHA.QA.W]W089.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.303389 through 0.322155



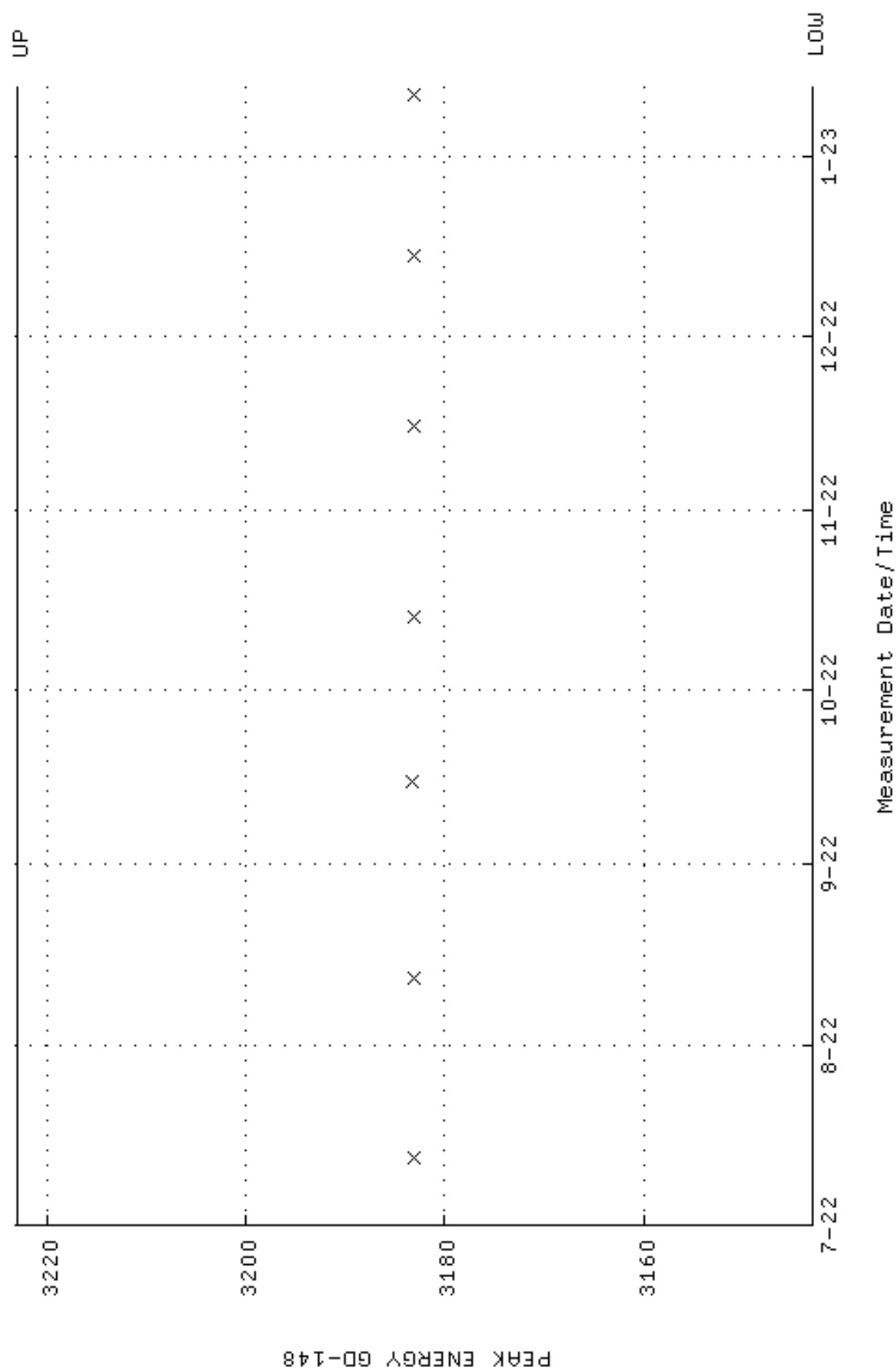
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



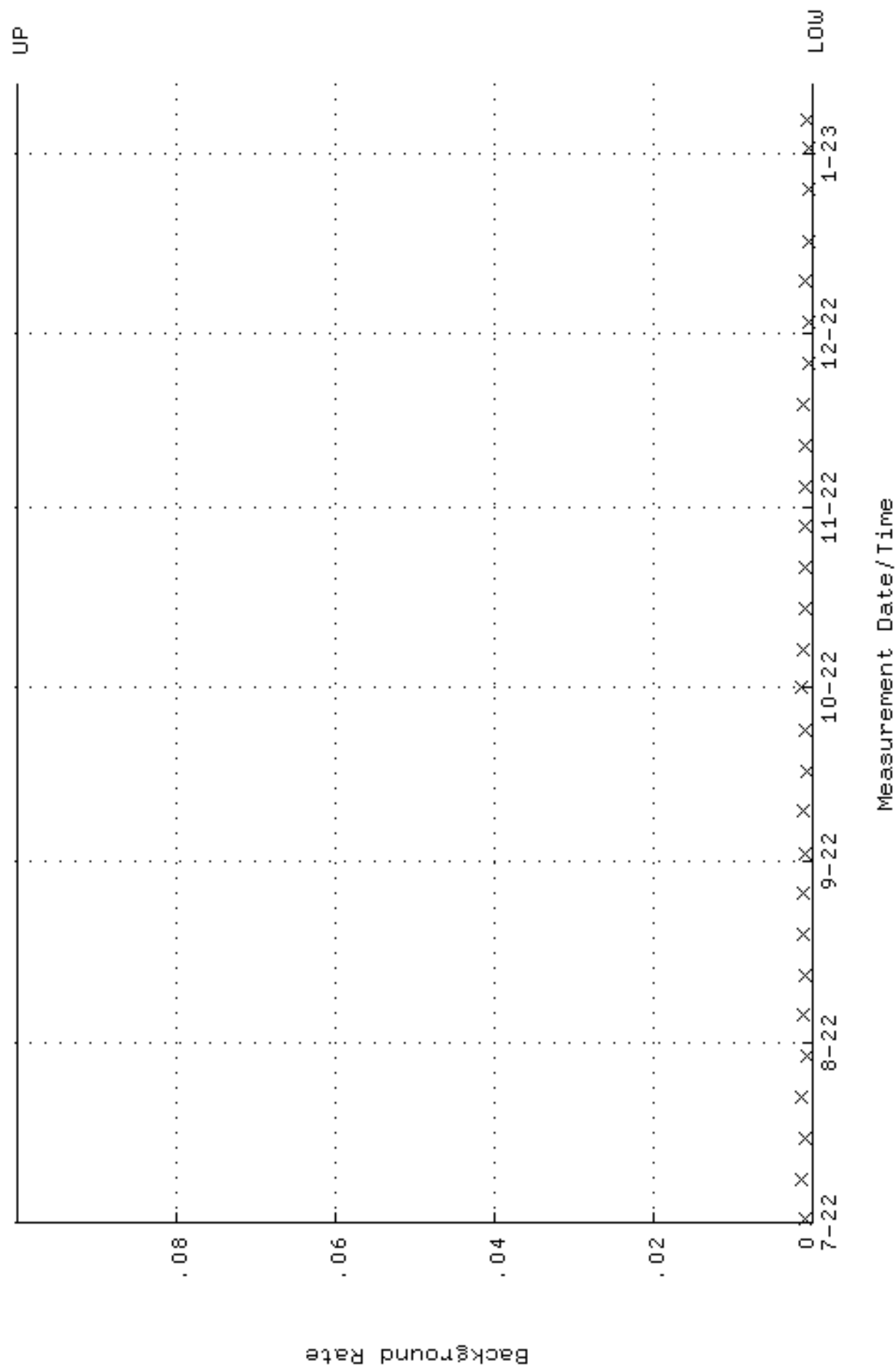
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 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



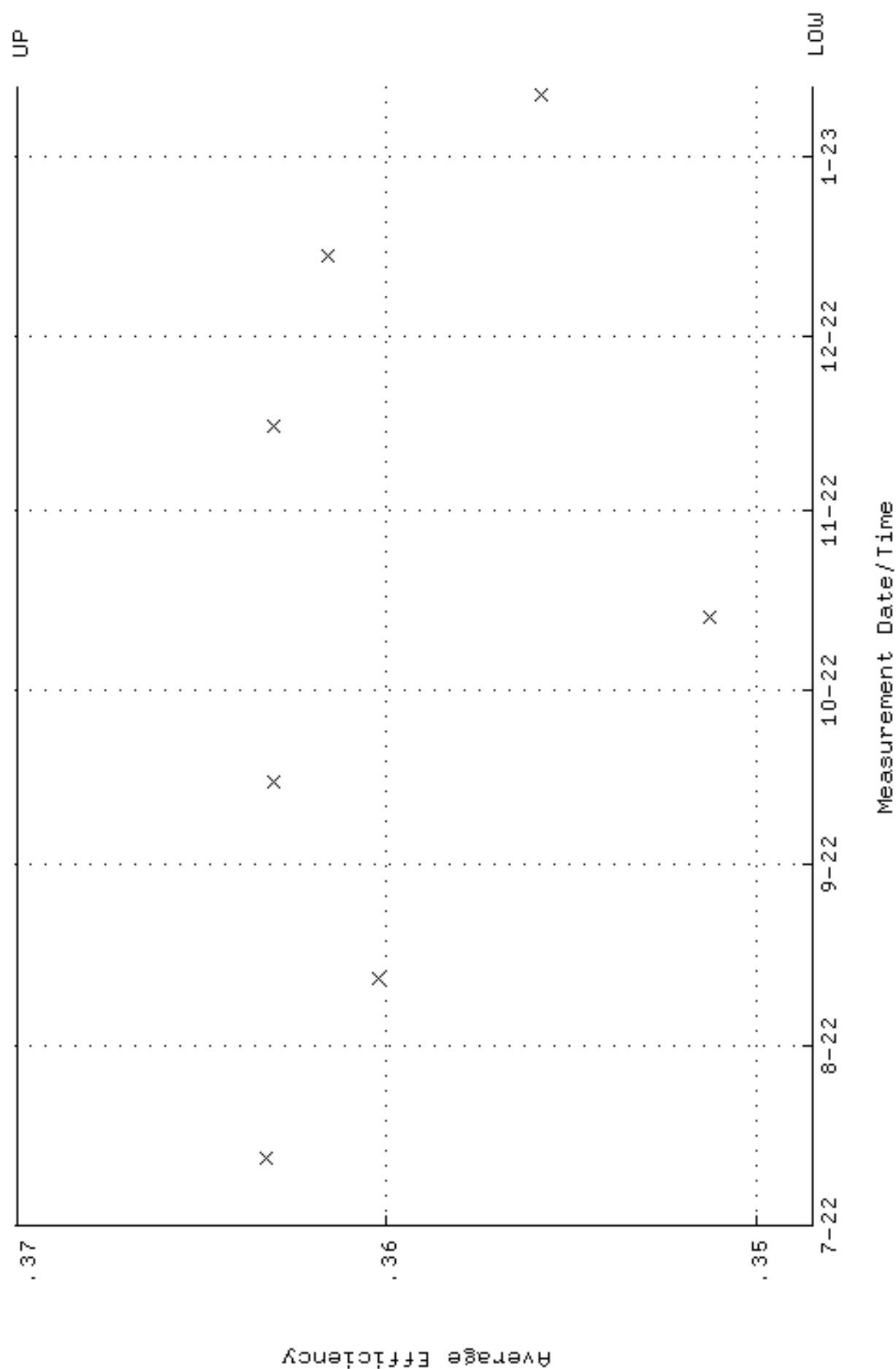
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 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



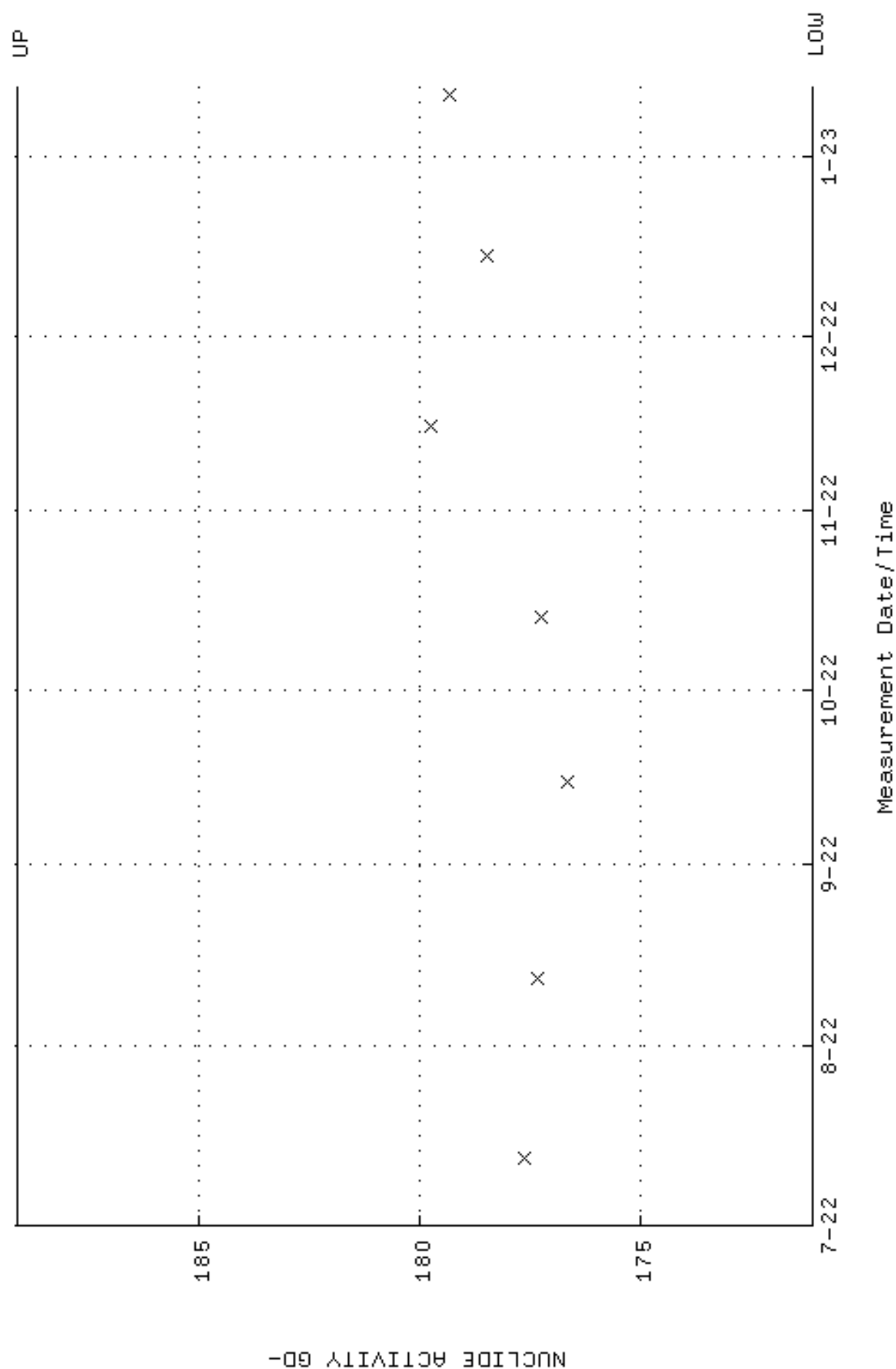
QA filename : DKA100:[ENV_ALPHA.QA.B]B089.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:50:15 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



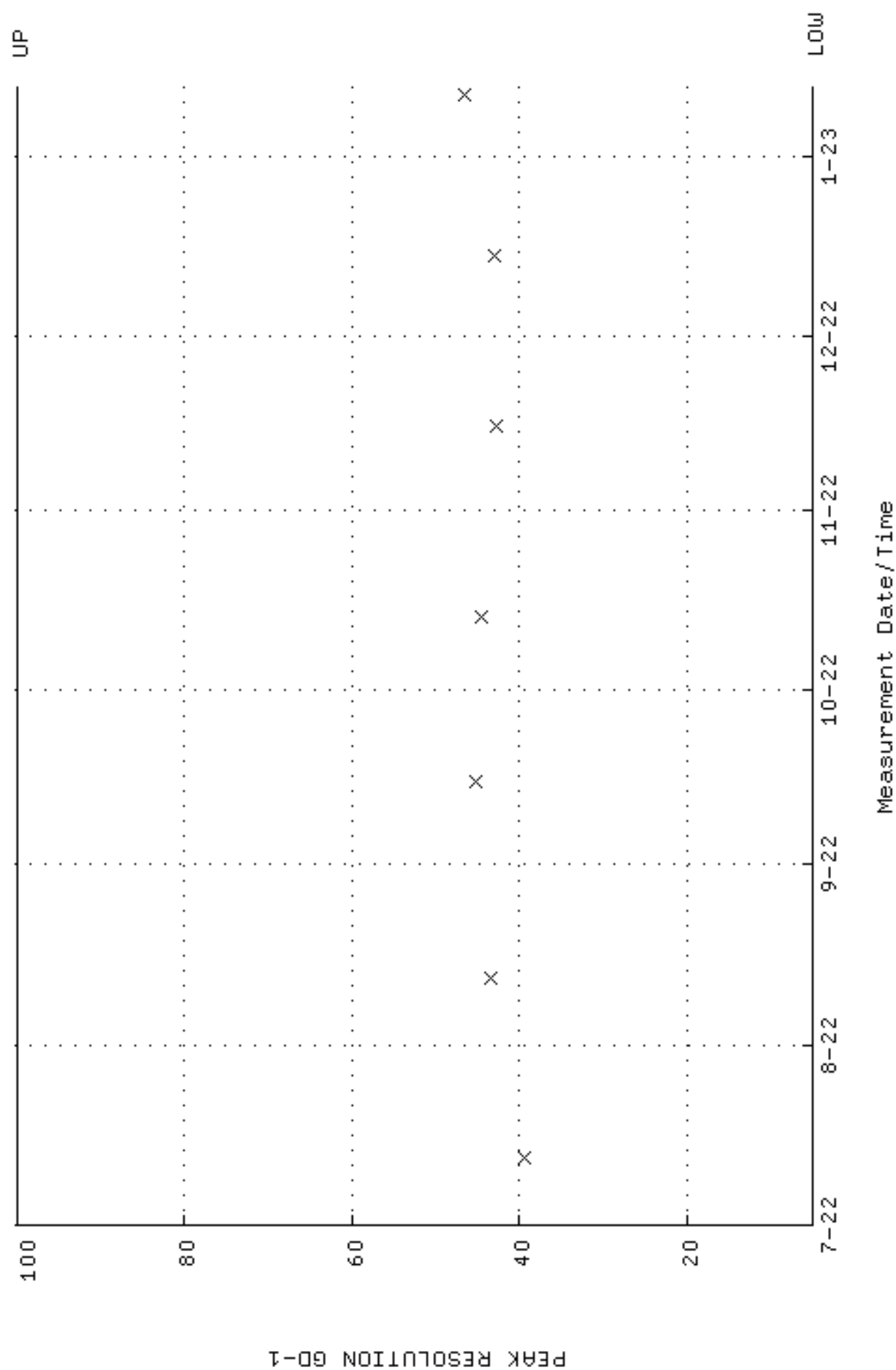
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 Parameter Name : AVRGEFF (Average Efficiency)
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 Lower/Upper Lmts: 0.348461 through 0.370015



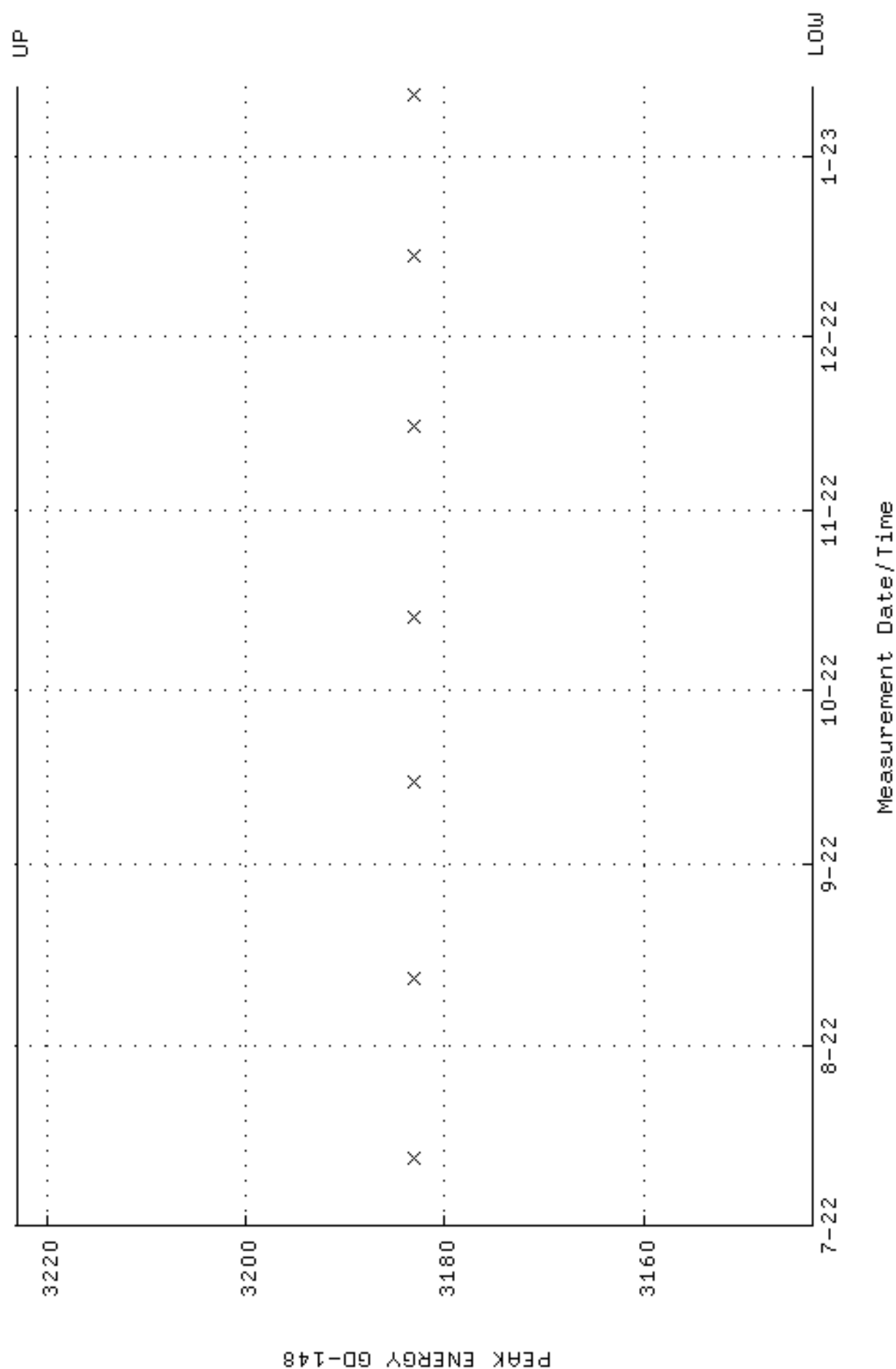
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W090.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000

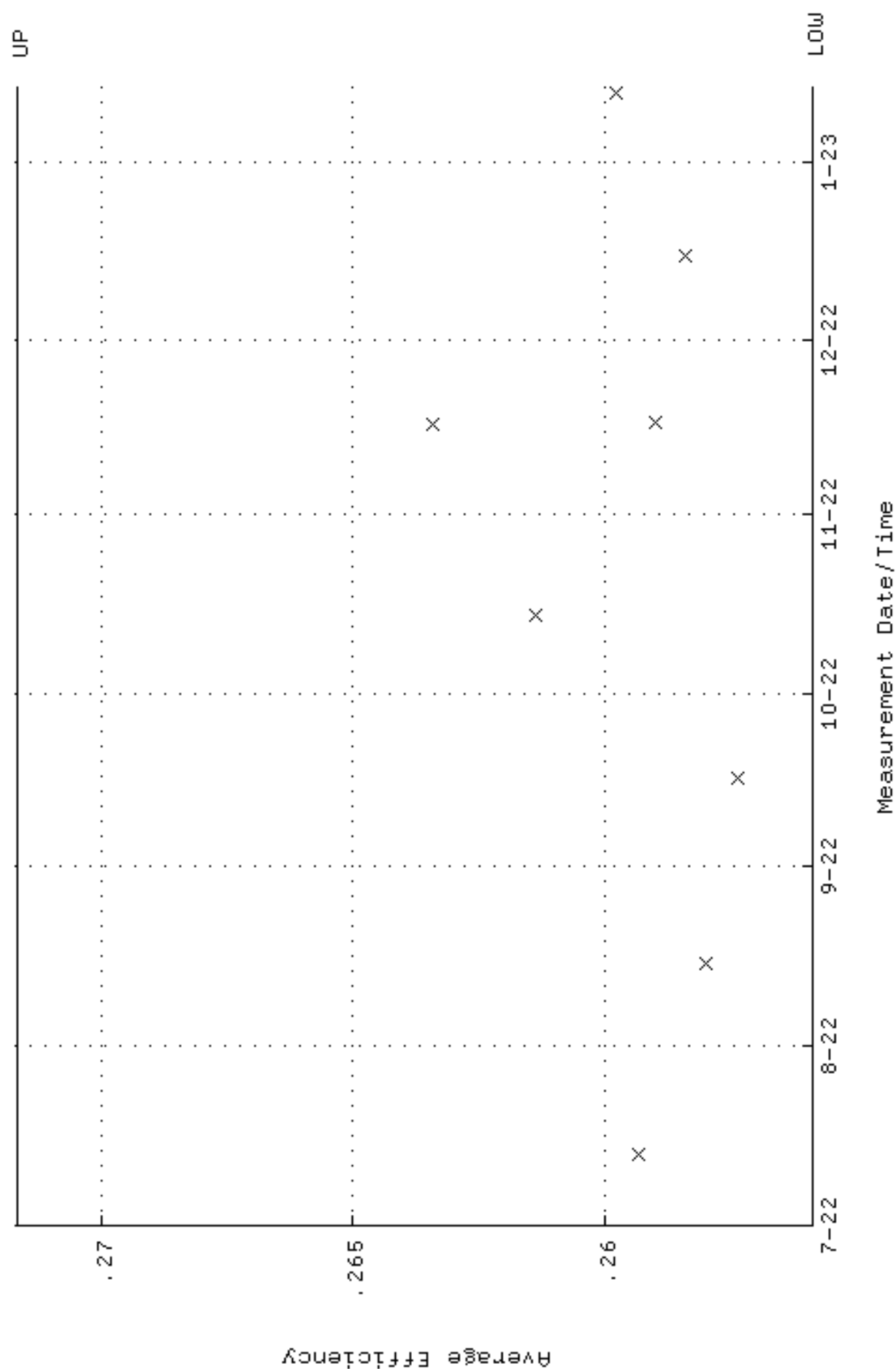


QA filename : DKA100:[ENV_ALPHA.QA.W]W090.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00

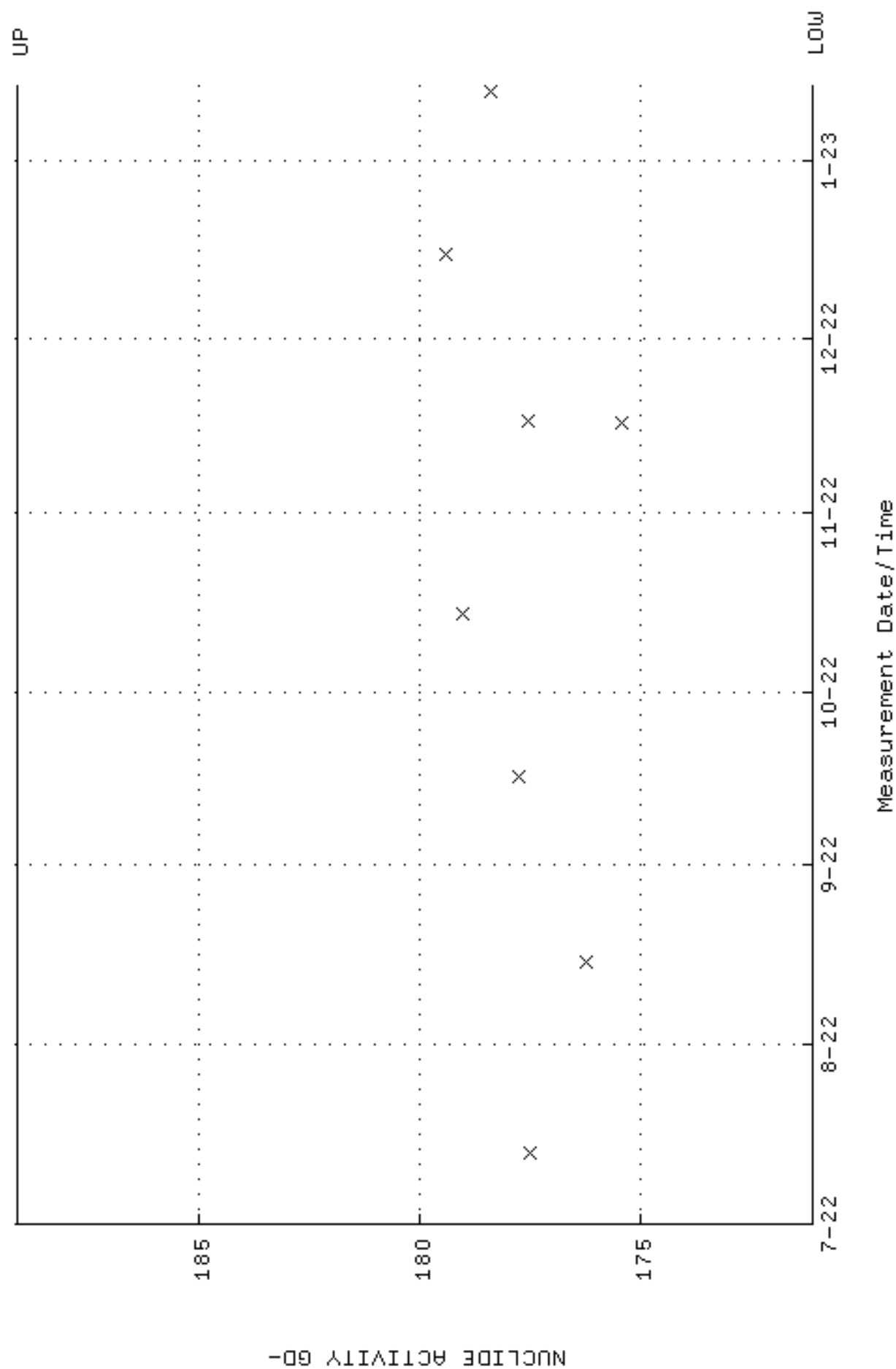


The graph displays the background rate over time. The Y-axis represents the Background Rate, ranging from 0 to 0.08. The X-axis represents the number of days since the last observation, ranging from 7-22 to 1-23. The background rate remains low (near 0) until approximately day 10-22, after which it rises sharply to a peak of about 0.08 around day 11-22, before declining again. The graph is labeled 'UP' and 'LOW' at the top.

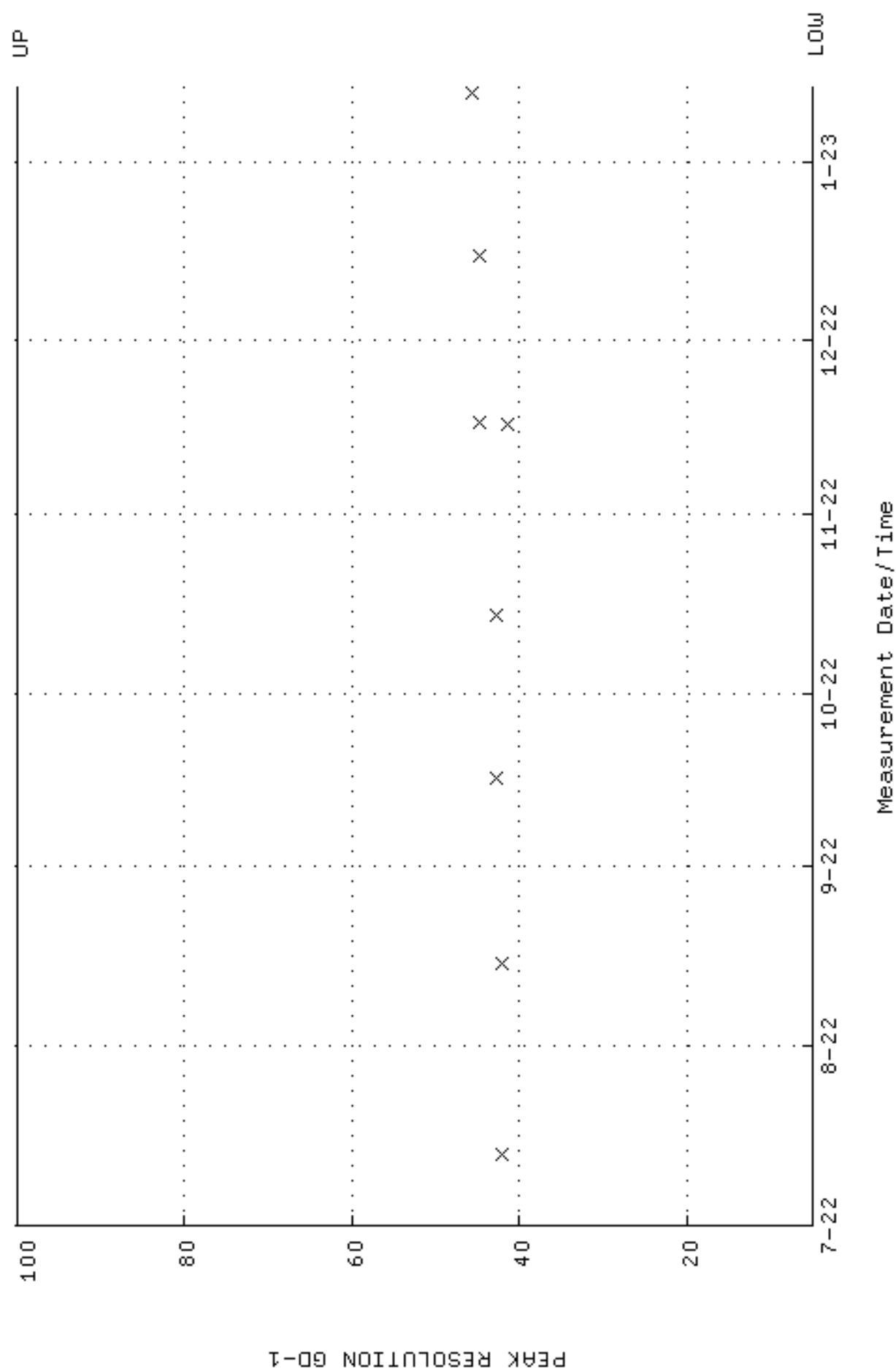
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-JUL-2022 09:43:18 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.255850 through 0.271680



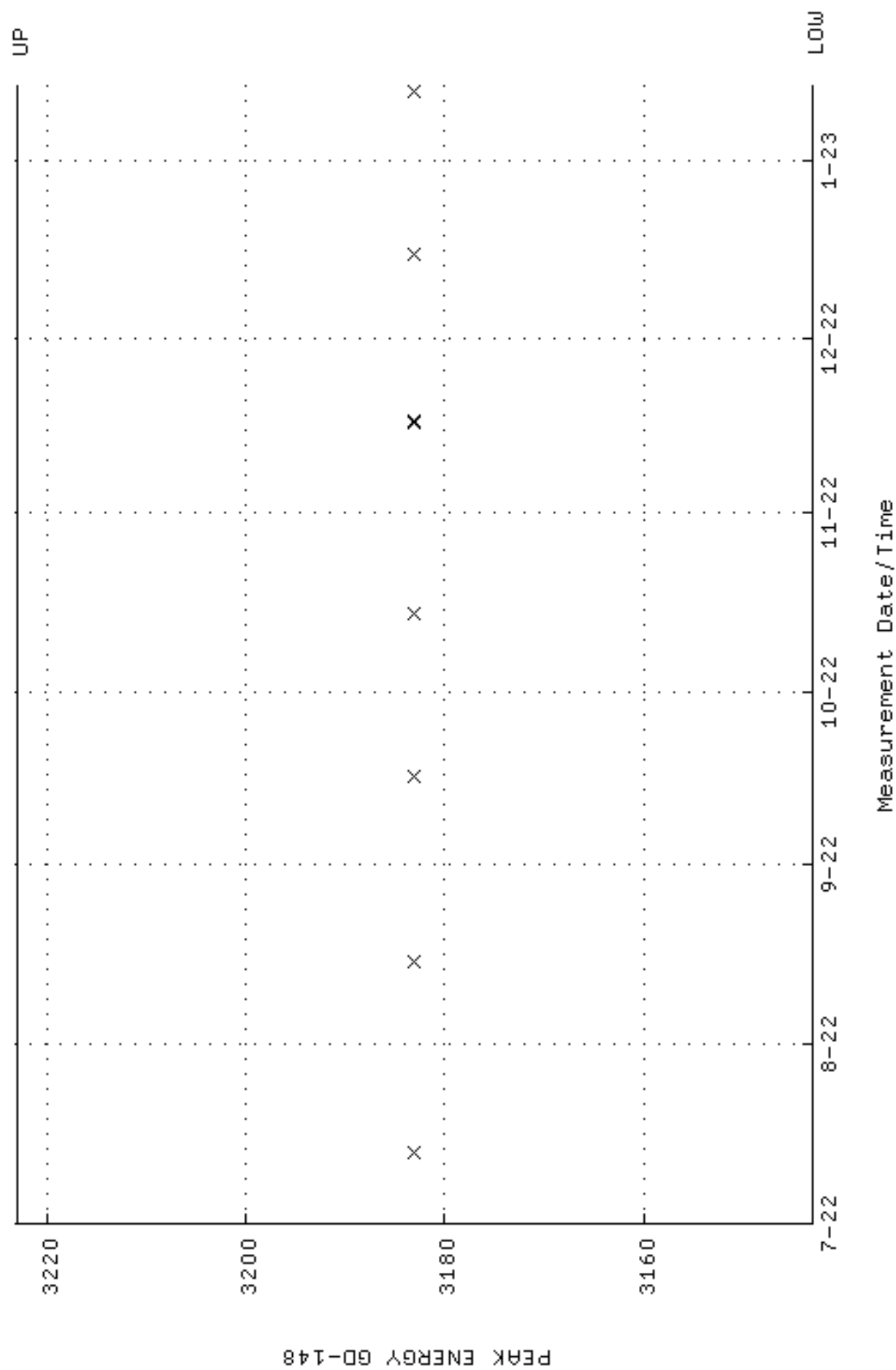
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-JUL-2022 09:43:18 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



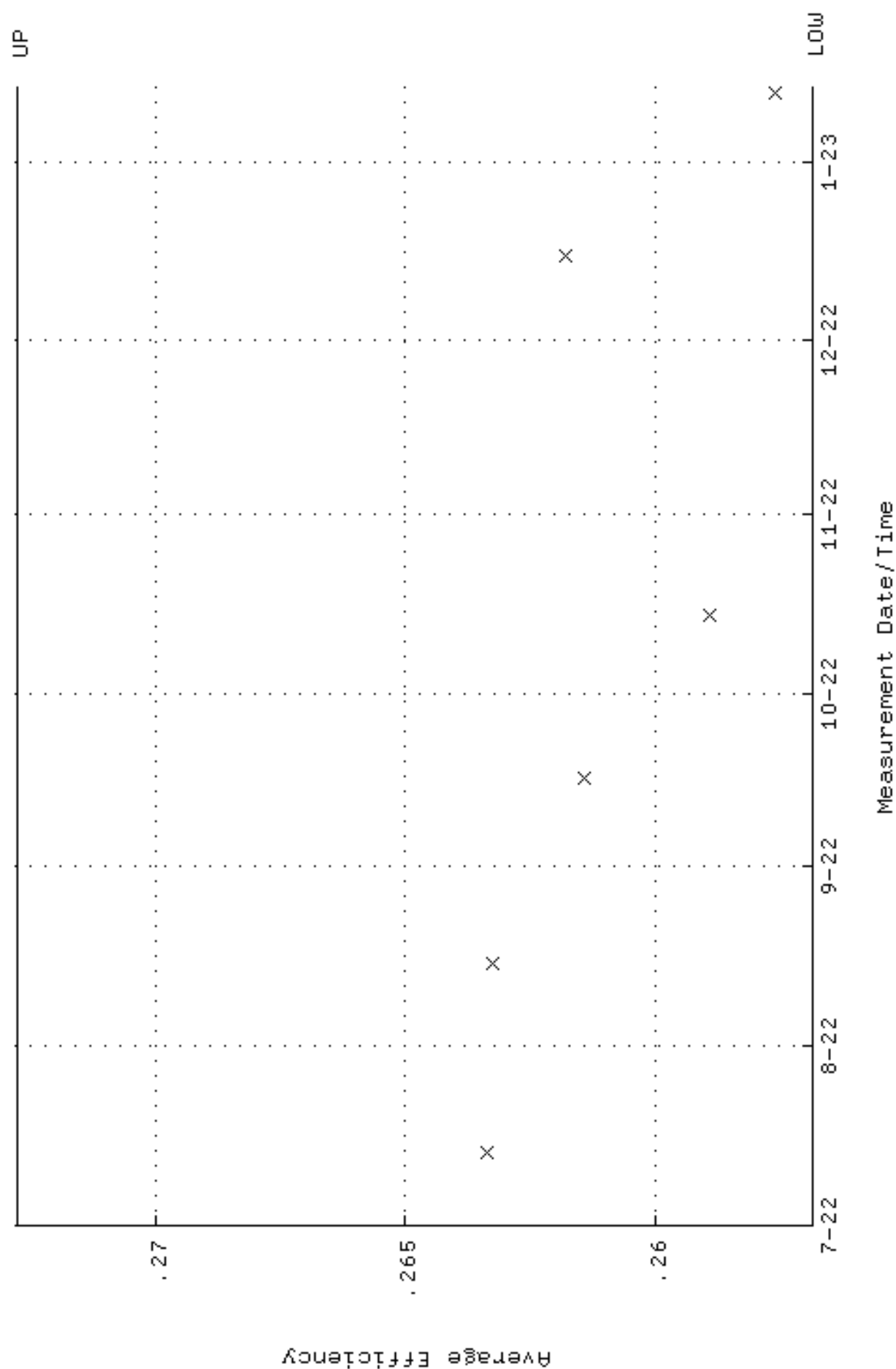
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-JUL-2022 09:43:18 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



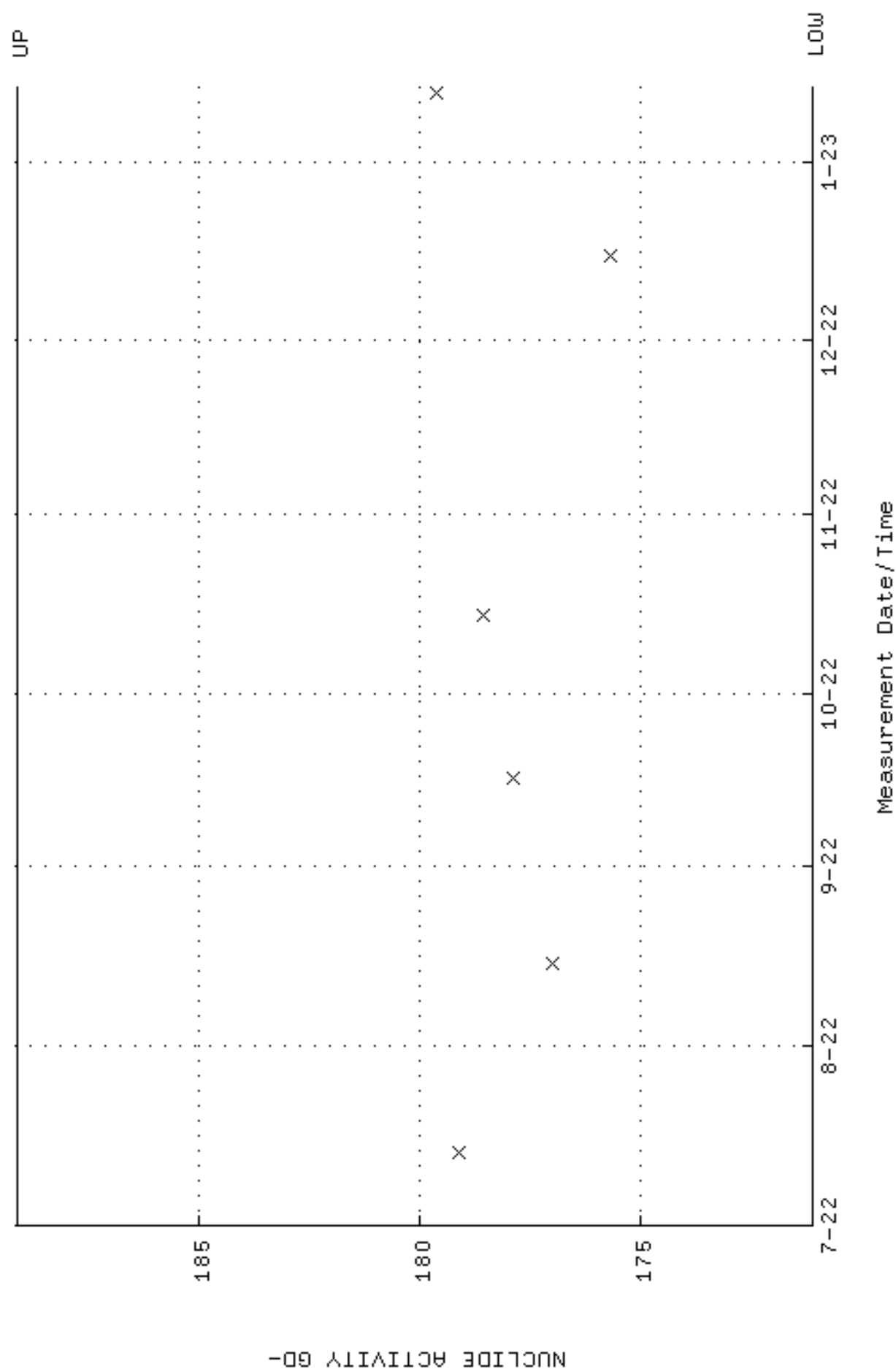
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-JUL-2022 09:43:18 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



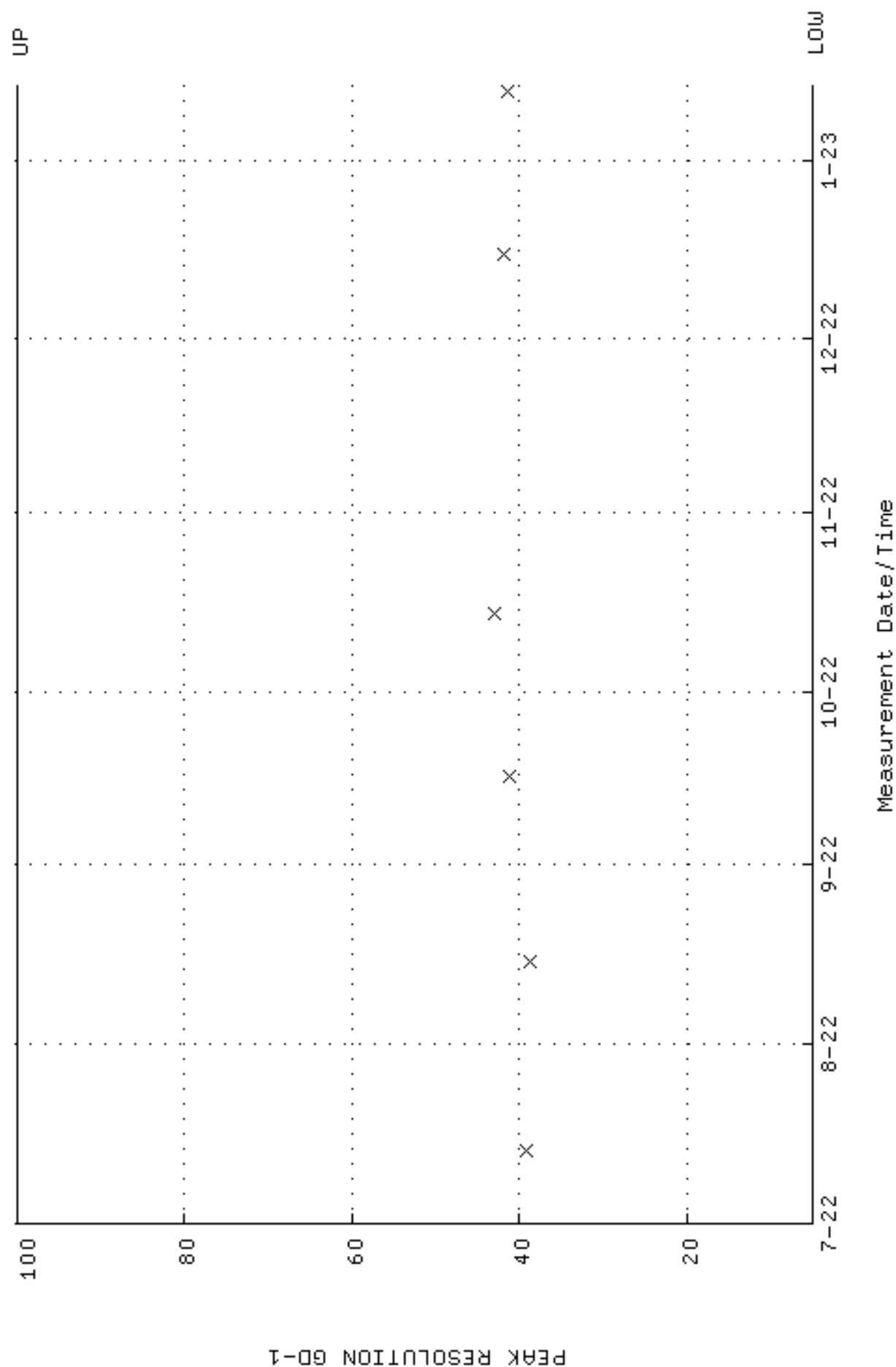
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-JUL-2022 10:43:21 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.256860 through 0.272750



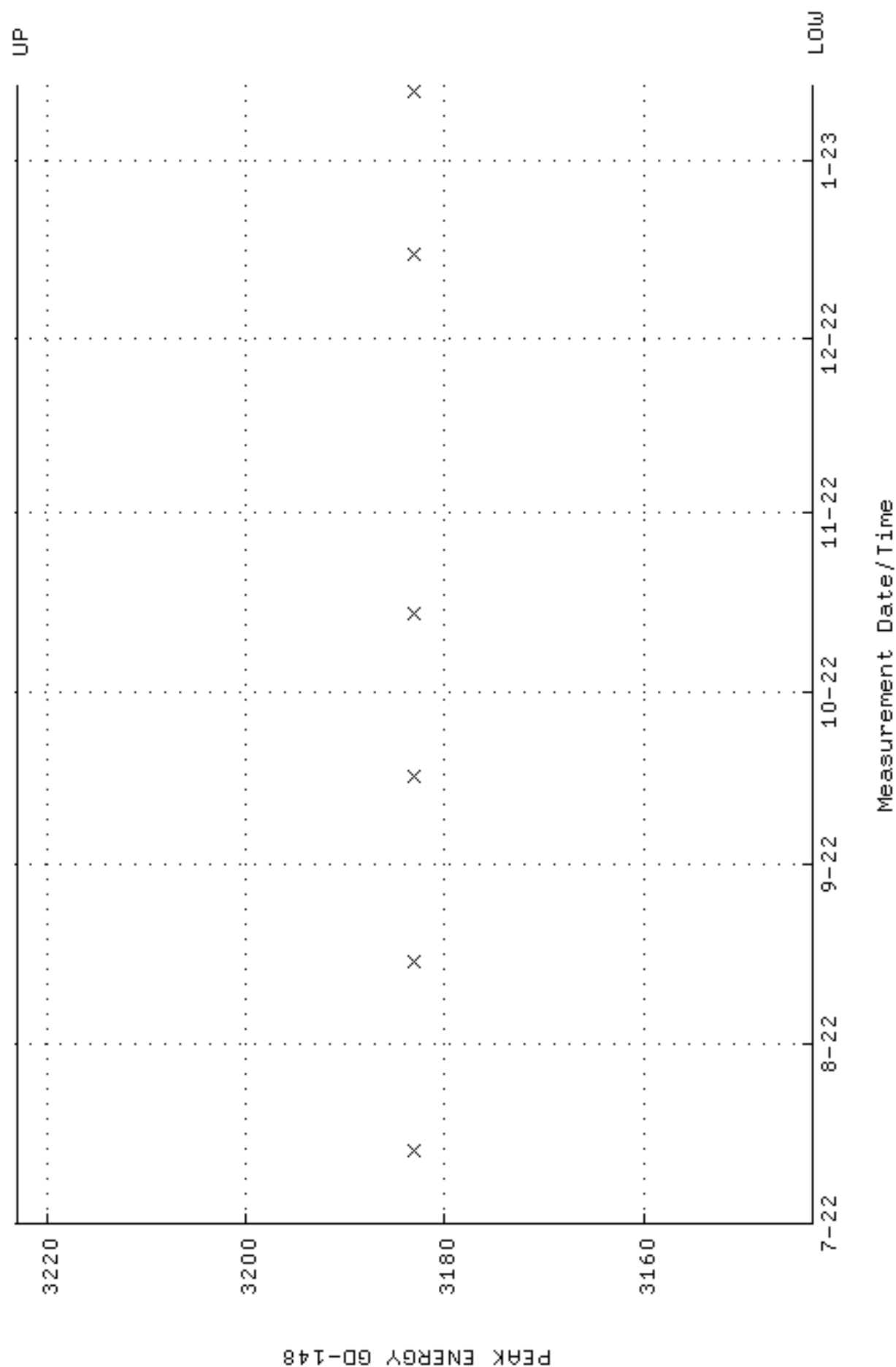
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-JUL-2022 10:43:21 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



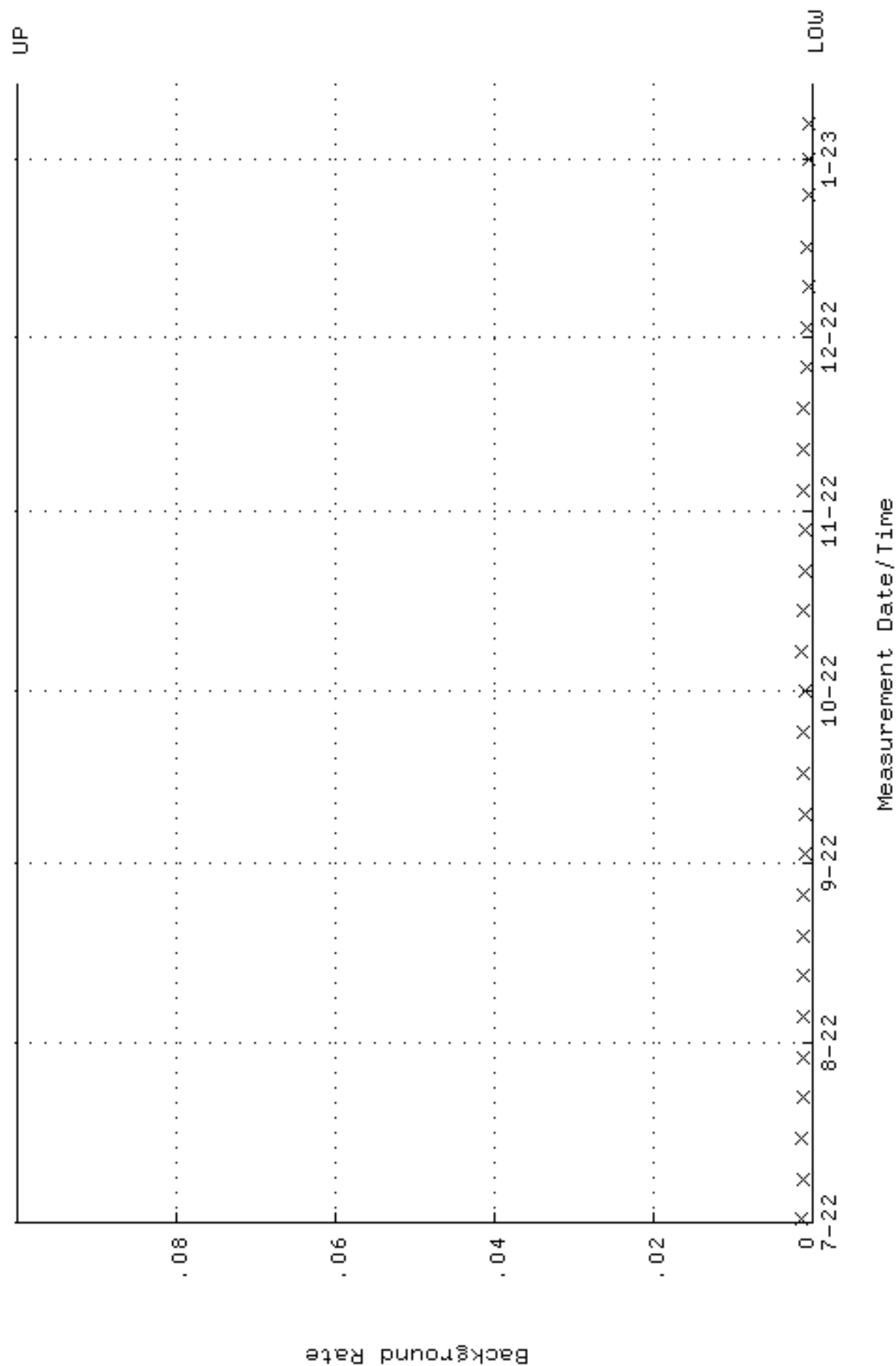
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-JUL-2022 10:43:21 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



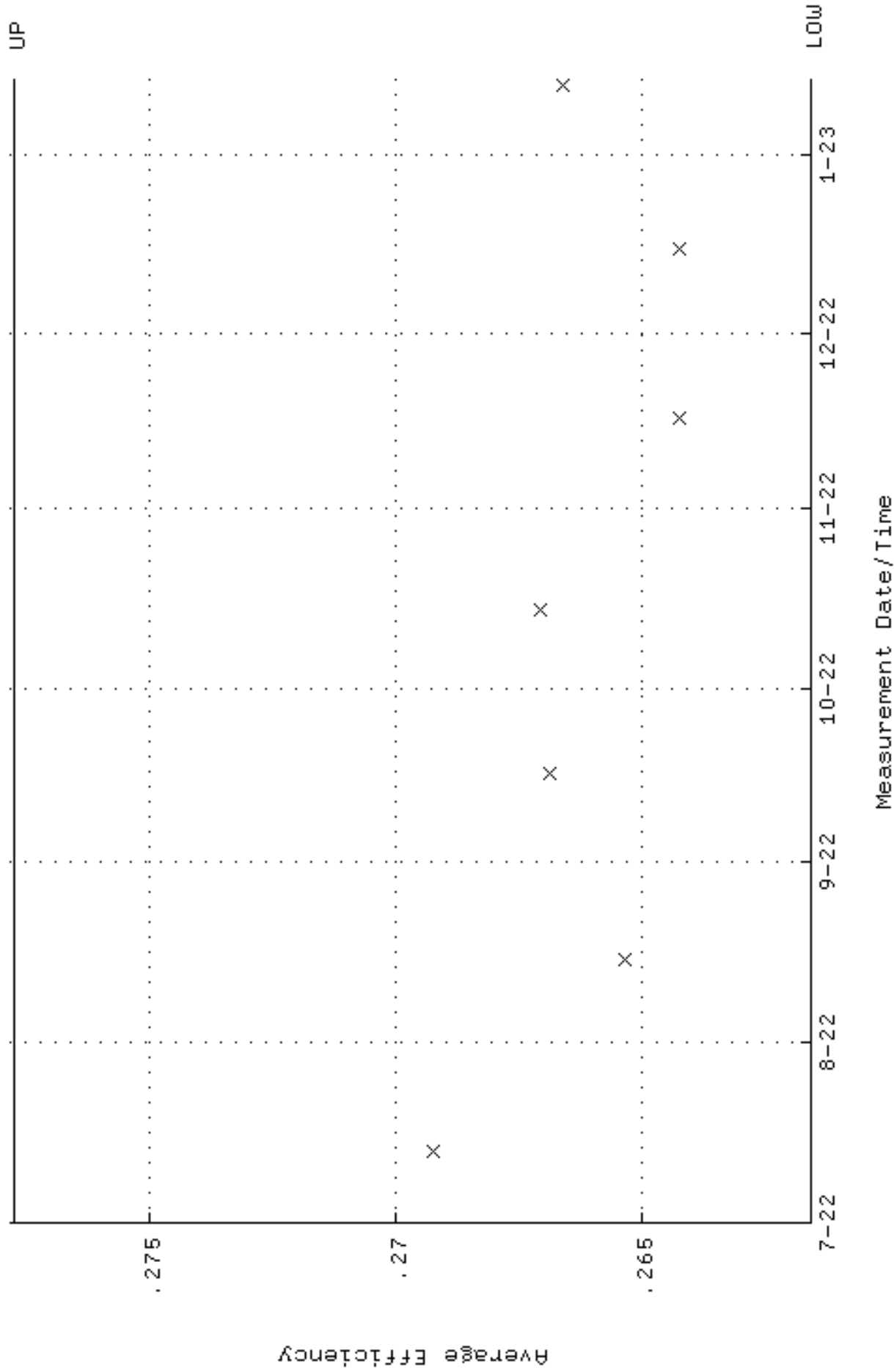
QA filename : DKA100:[ENV_ALPHA.QA.W]W114.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-JUL-2022 10:43:21 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



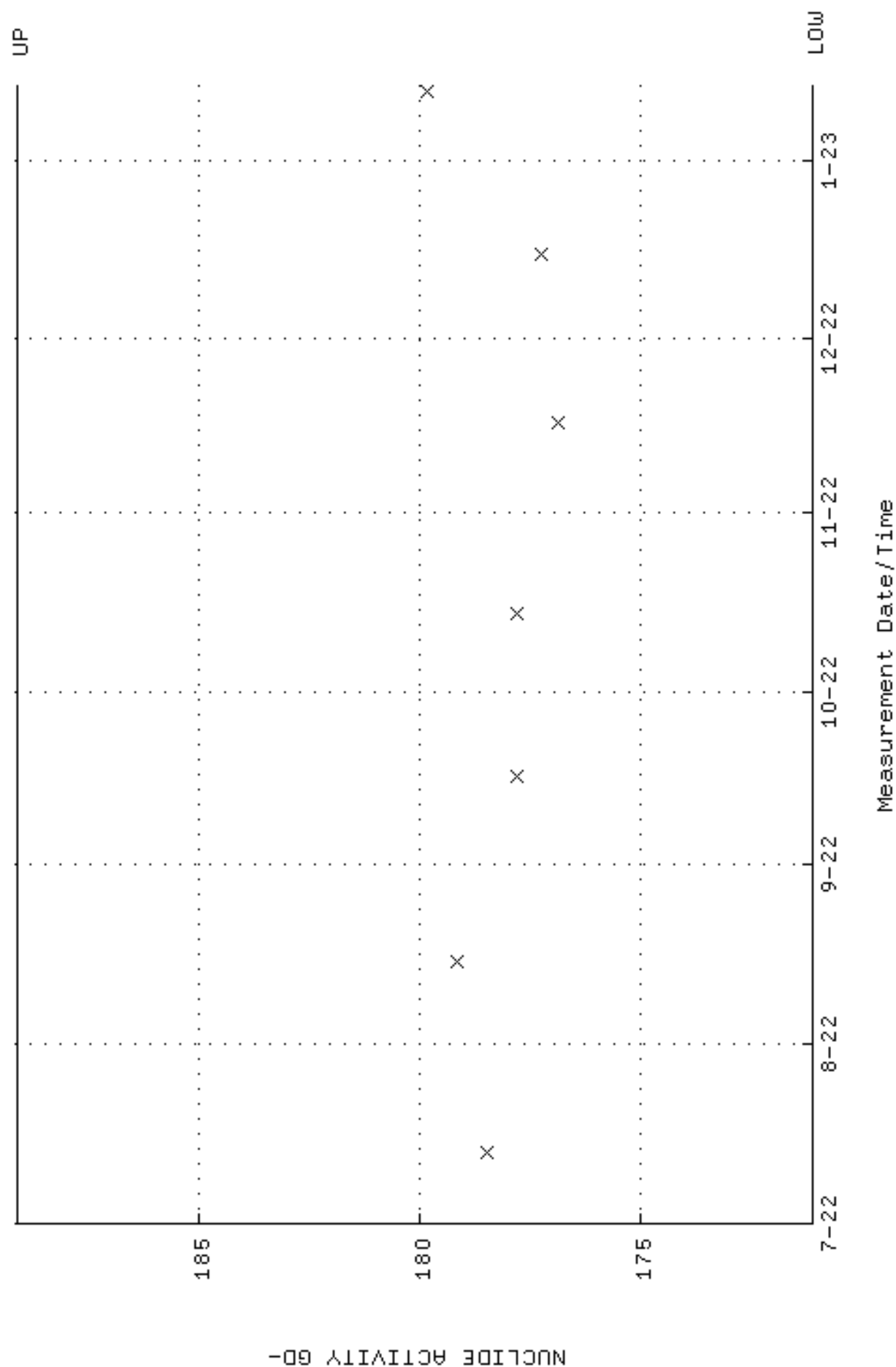
QA filename : DKA100:[ENV_ALPHA.QA.B]B114.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:28:22 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



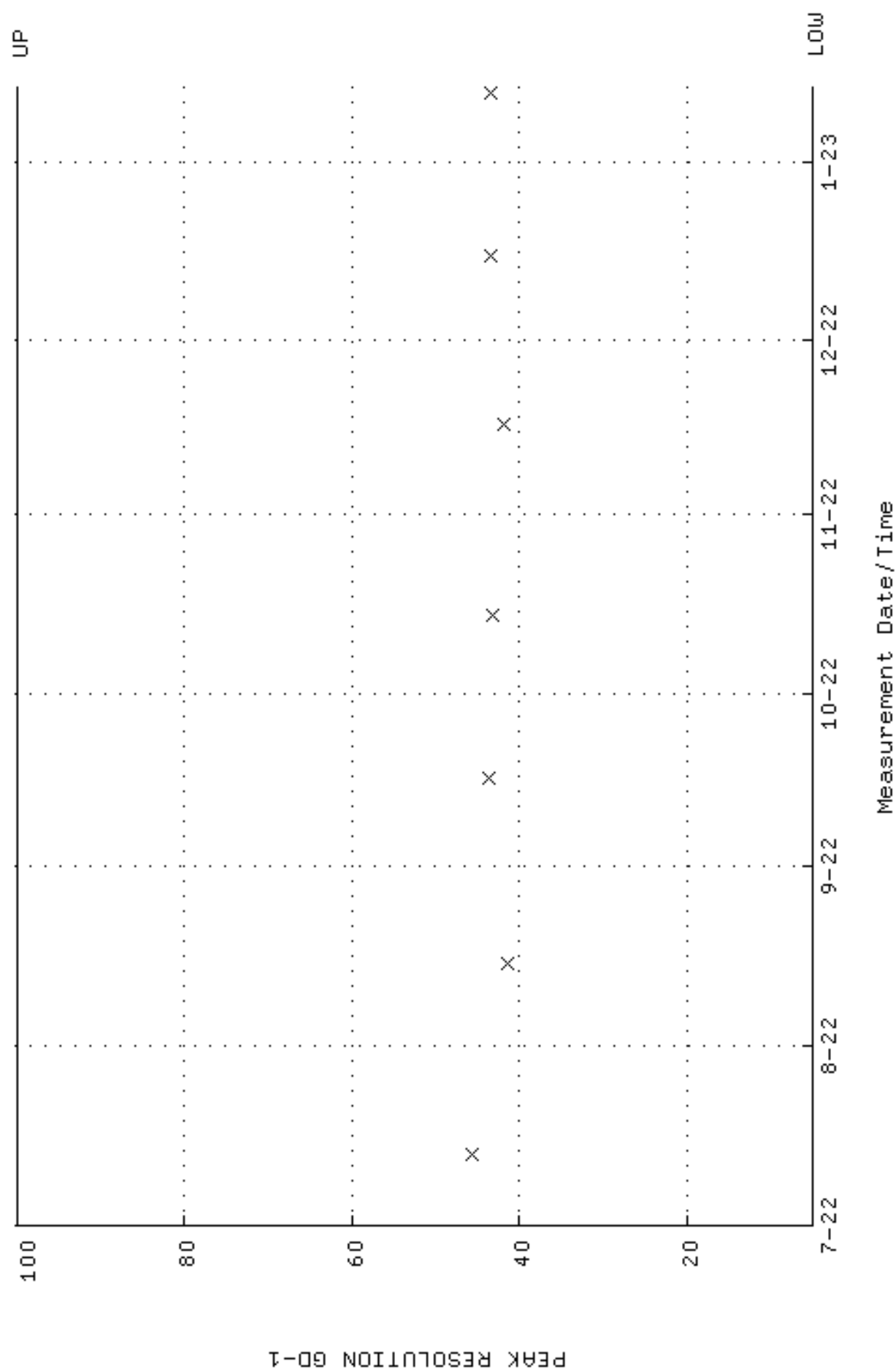
QA filename : DKA100:[ENV_ALPHA.QA.W]W117.QAF;6
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 13-JUL-2022 09:43:31 through 13-JAN-2023 12:00:00
Lower/Upper Lmts: 0.261590 through 0.277777



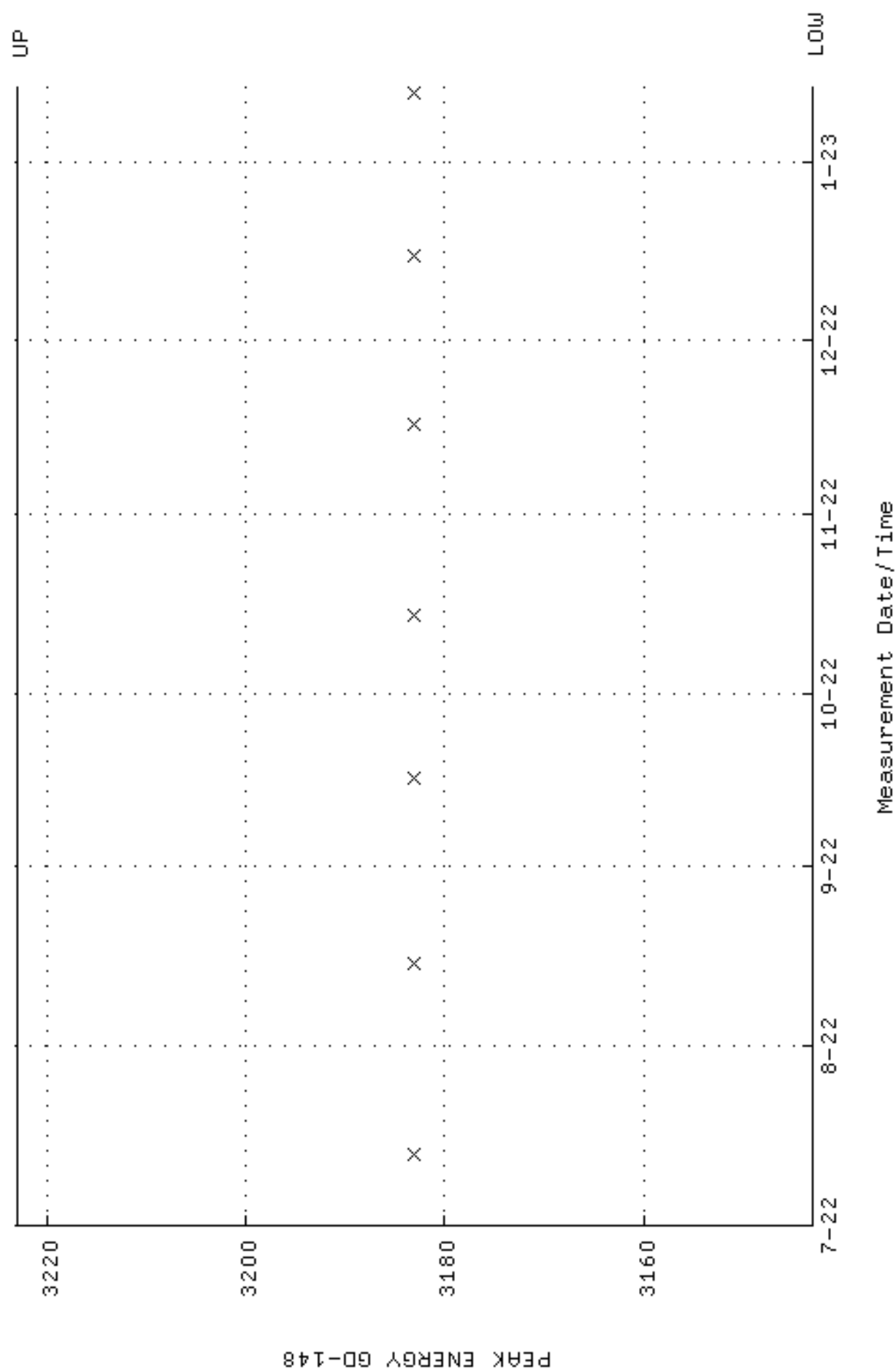
QA filename : DKA100:[ENV_ALPHA.QA.W]W117.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-JUL-2022 09:43:31 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



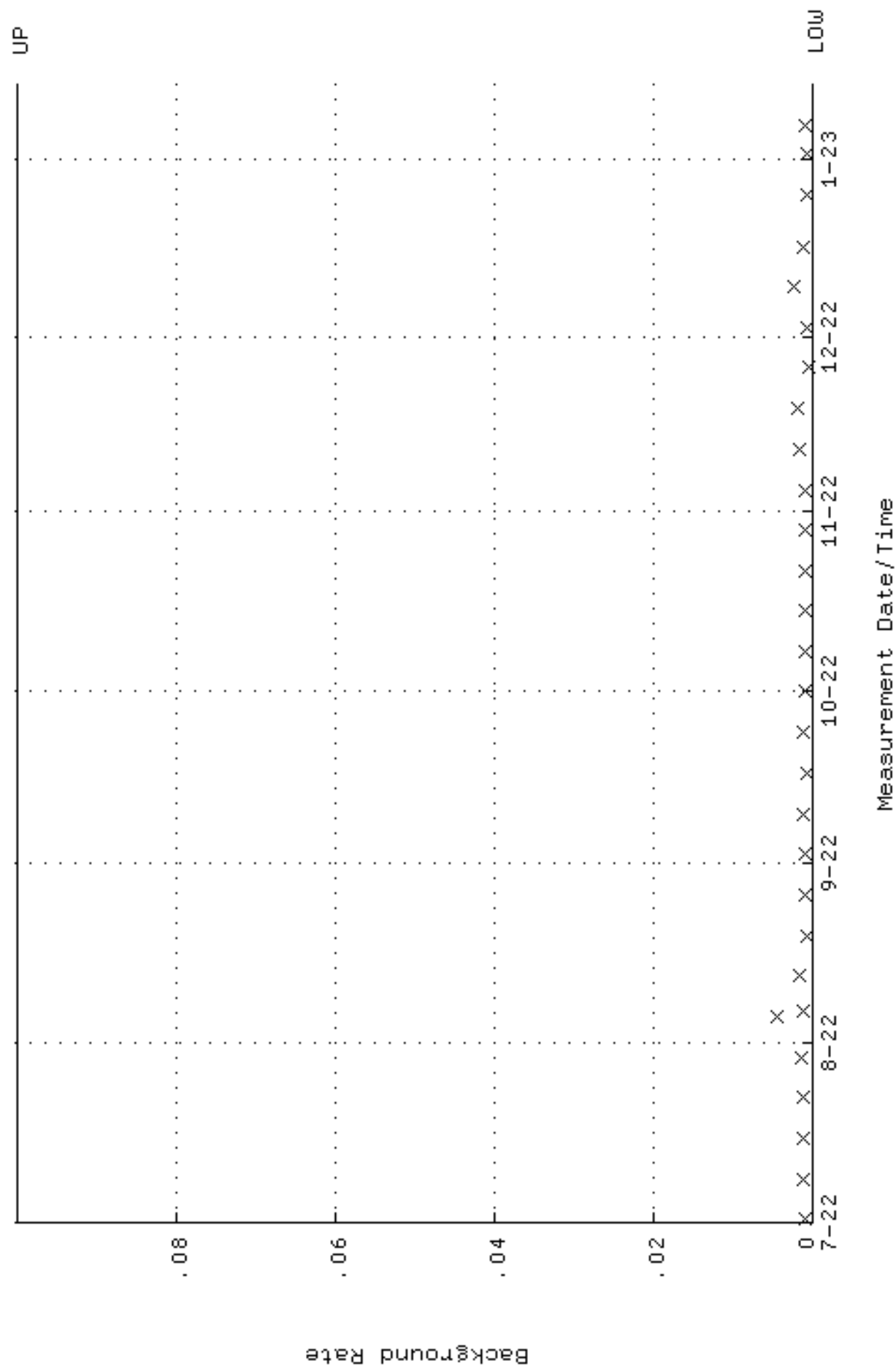
QA filename : DKA100:[ENV_ALPHA.QA.W]W117.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-JUL-2022 09:43:31 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



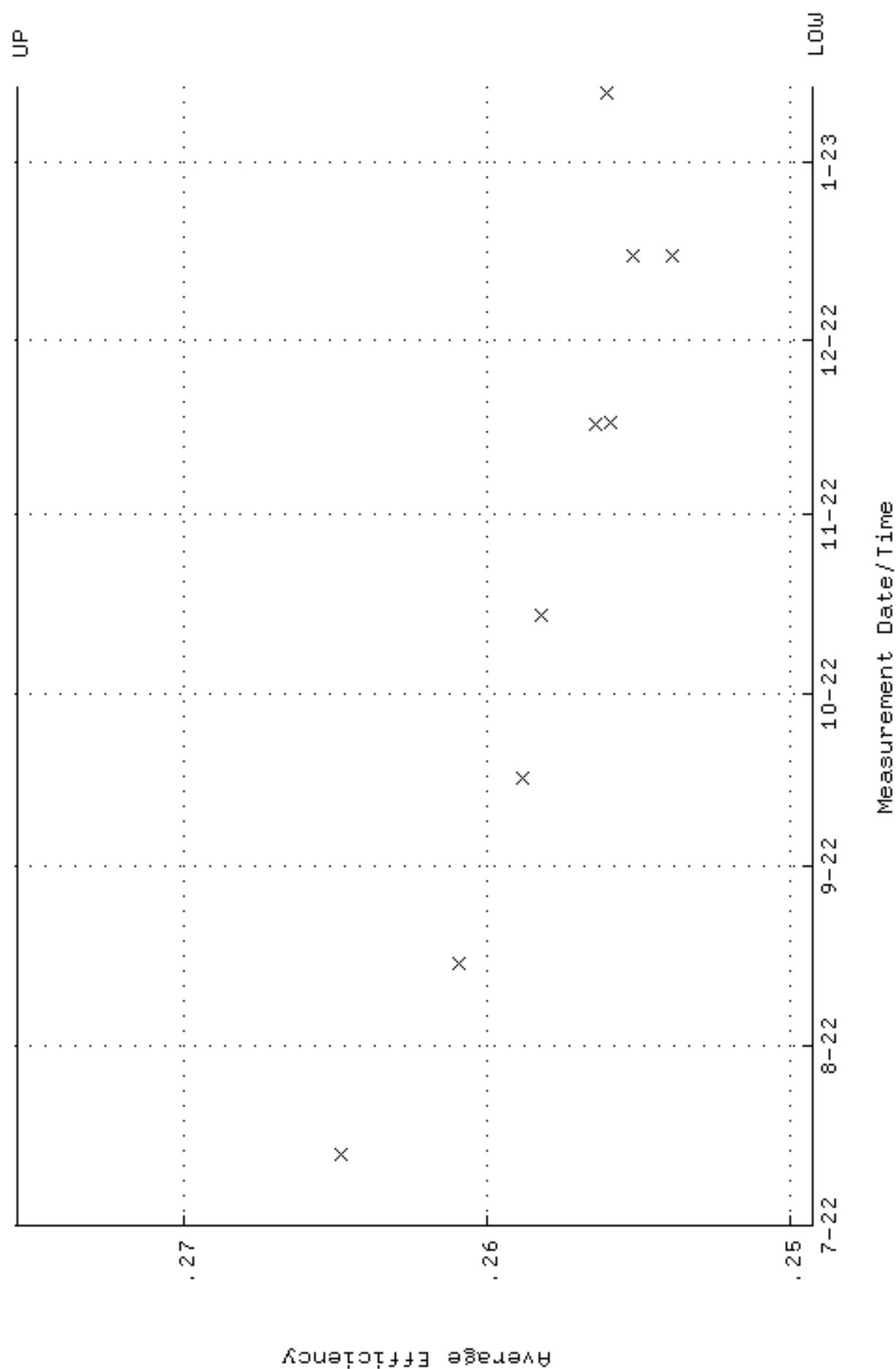
QA filename : DKA100:[ENV_ALPHA.QA.W]W117.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-JUL-2022 09:43:31 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



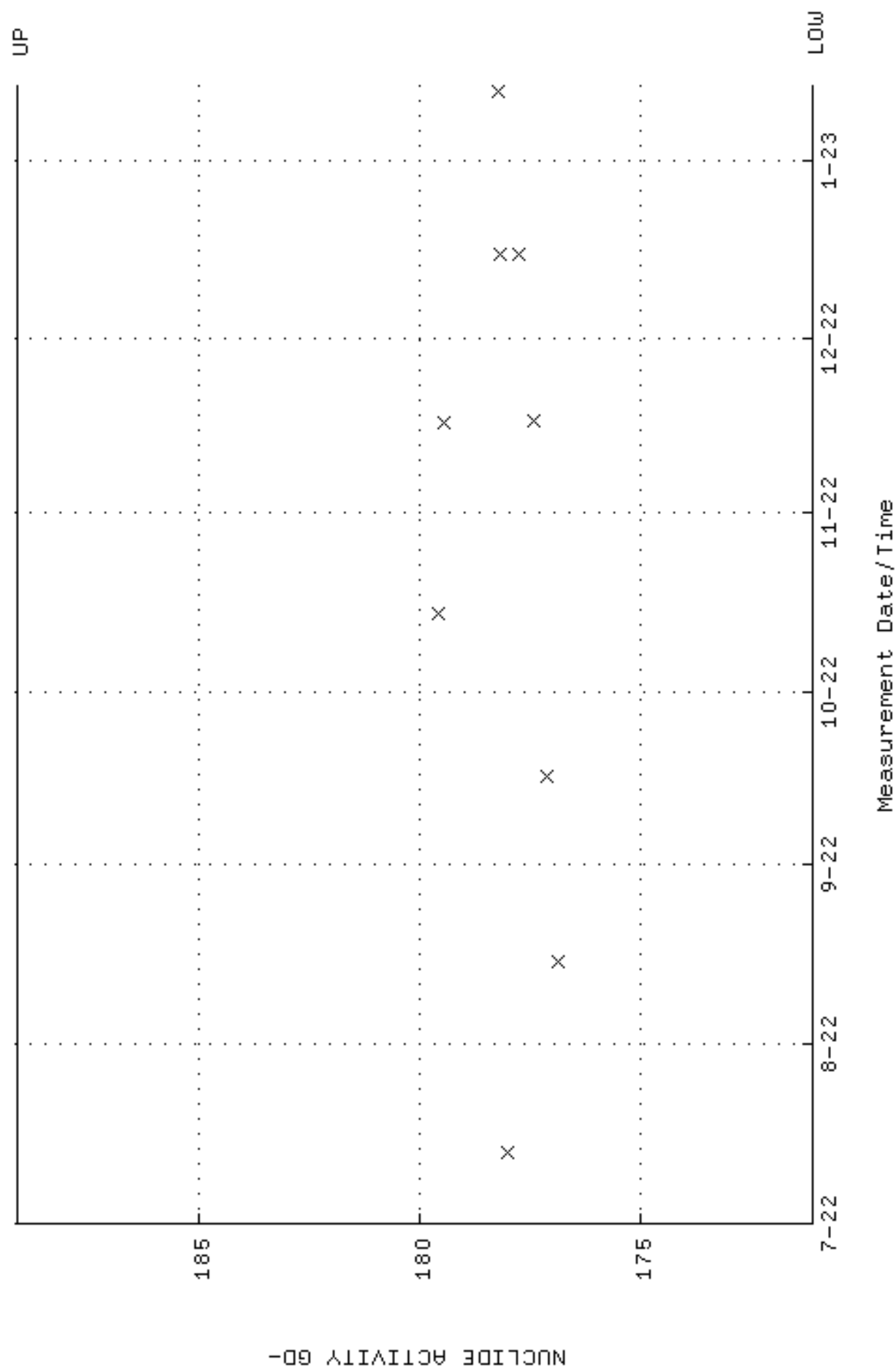
QA filename : DKA100:[ENV_ALPHA.QA.B]B117.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:28:27 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



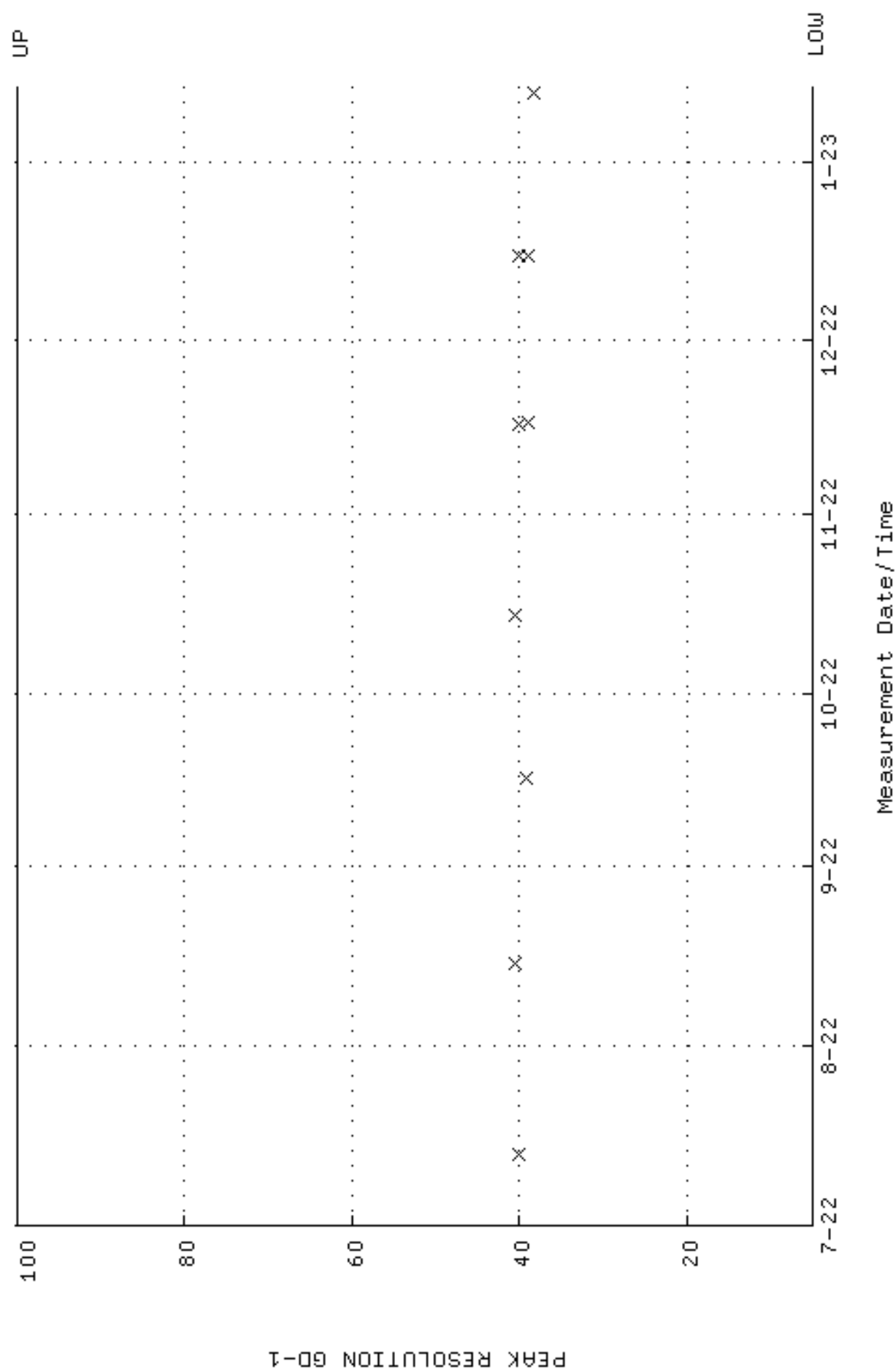
QA filename : DKA100:[ENV_ALPHA.QA.W]W130.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-JUL-2022 09:51:04 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.249246 through 0.275482



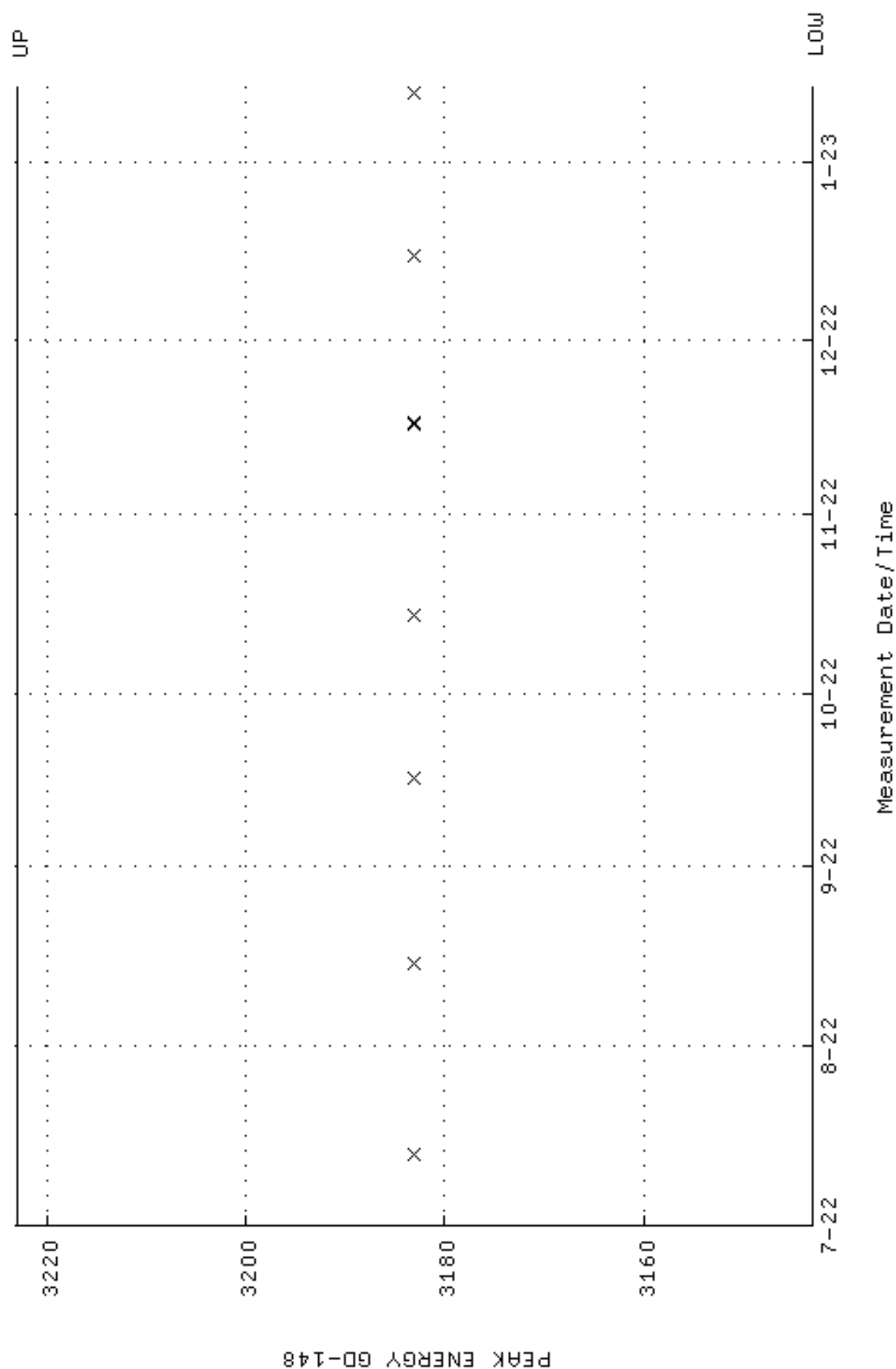
QA filename : DKA100:[ENV_ALPHA.QA.W]W130.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-JUL-2022 09:51:04 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



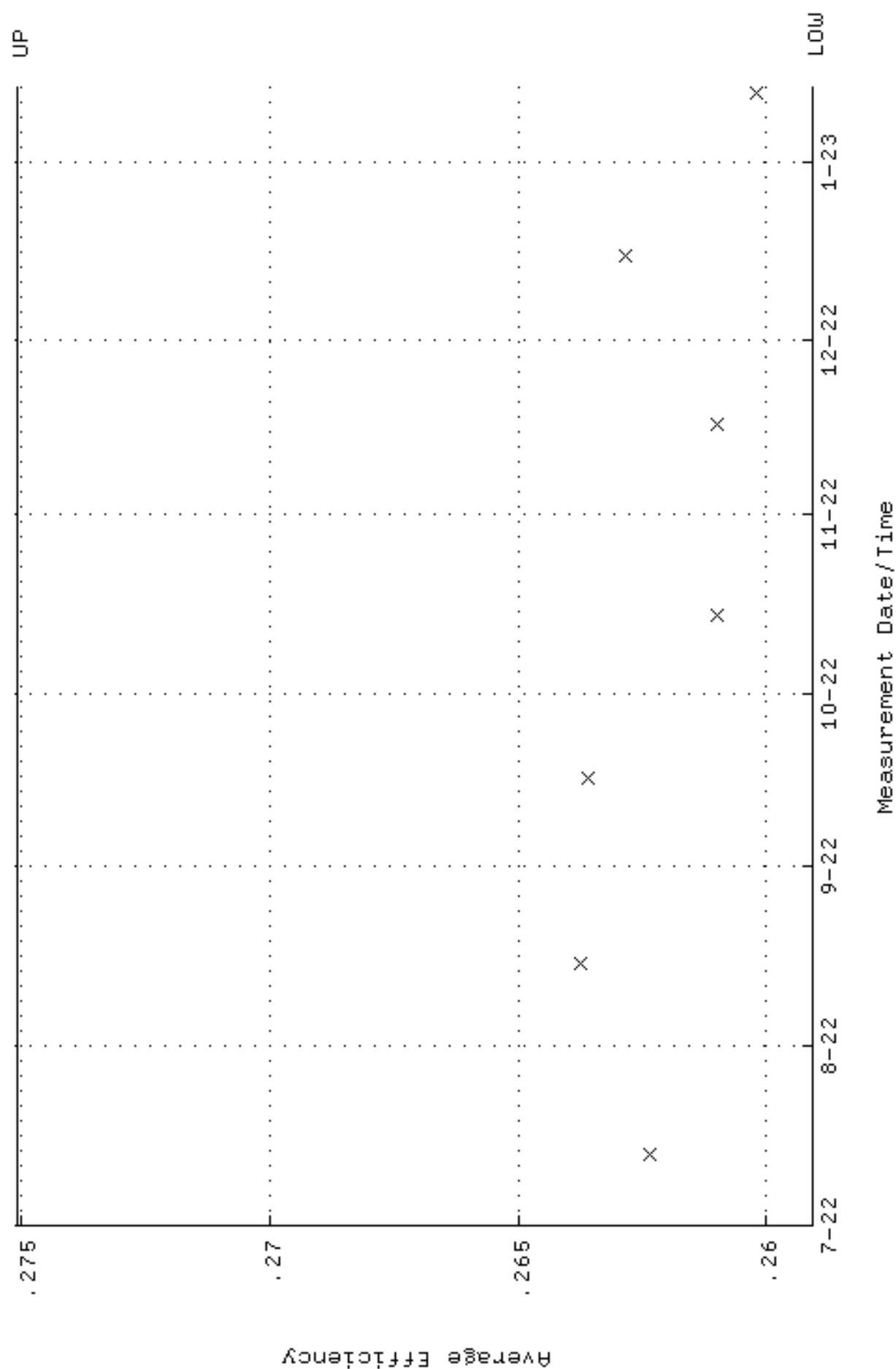
QA filename : DKA100:[ENV_ALPHA.QA.W]W130.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-JUL-2022 09:51:04 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



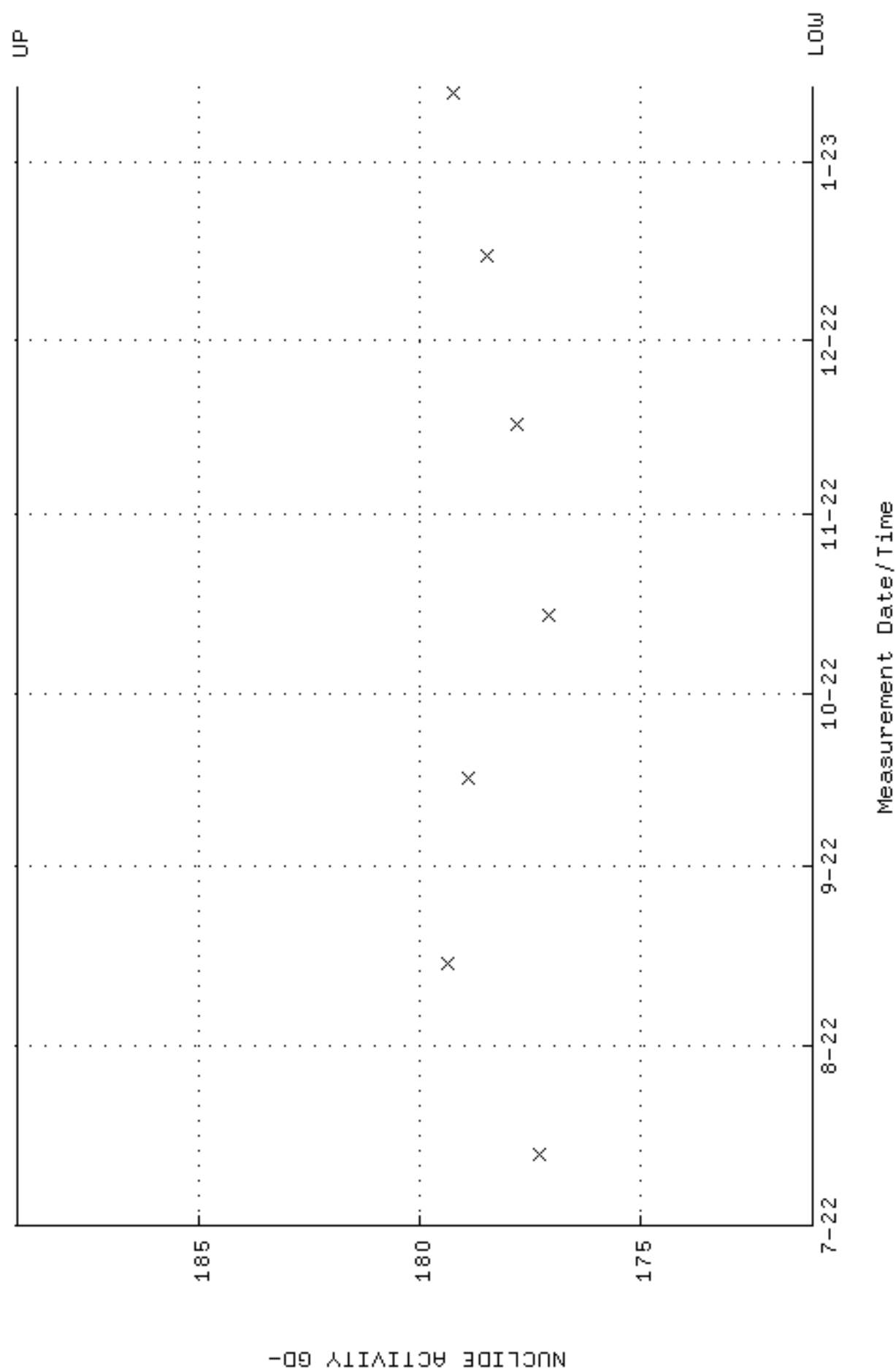
QA filename : DKA100:[ENV_ALPHA.QA.W]W130.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-JUL-2022 09:51:04 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



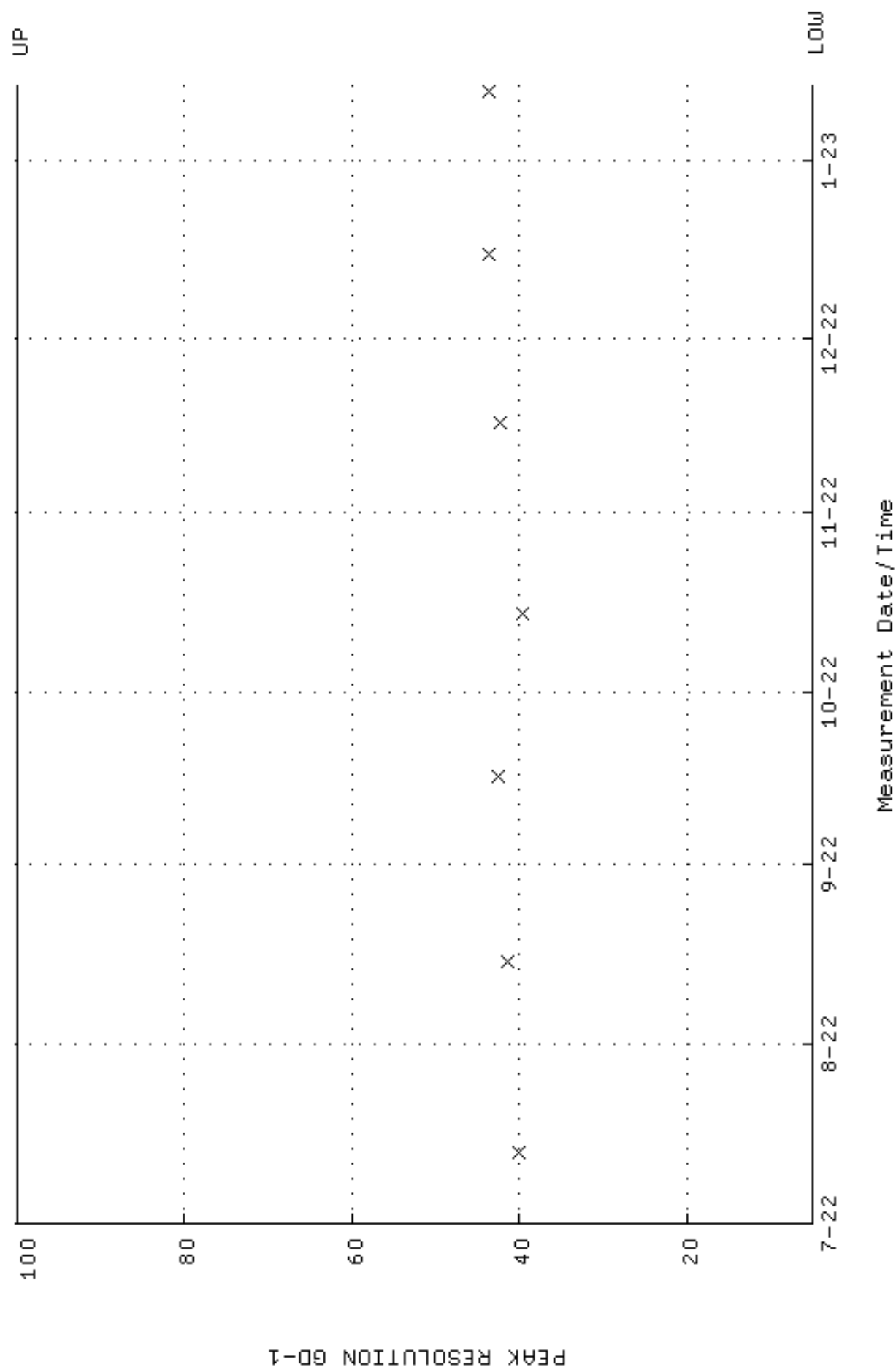
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-JUL-2022 09:51:32 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.259070 through 0.275090



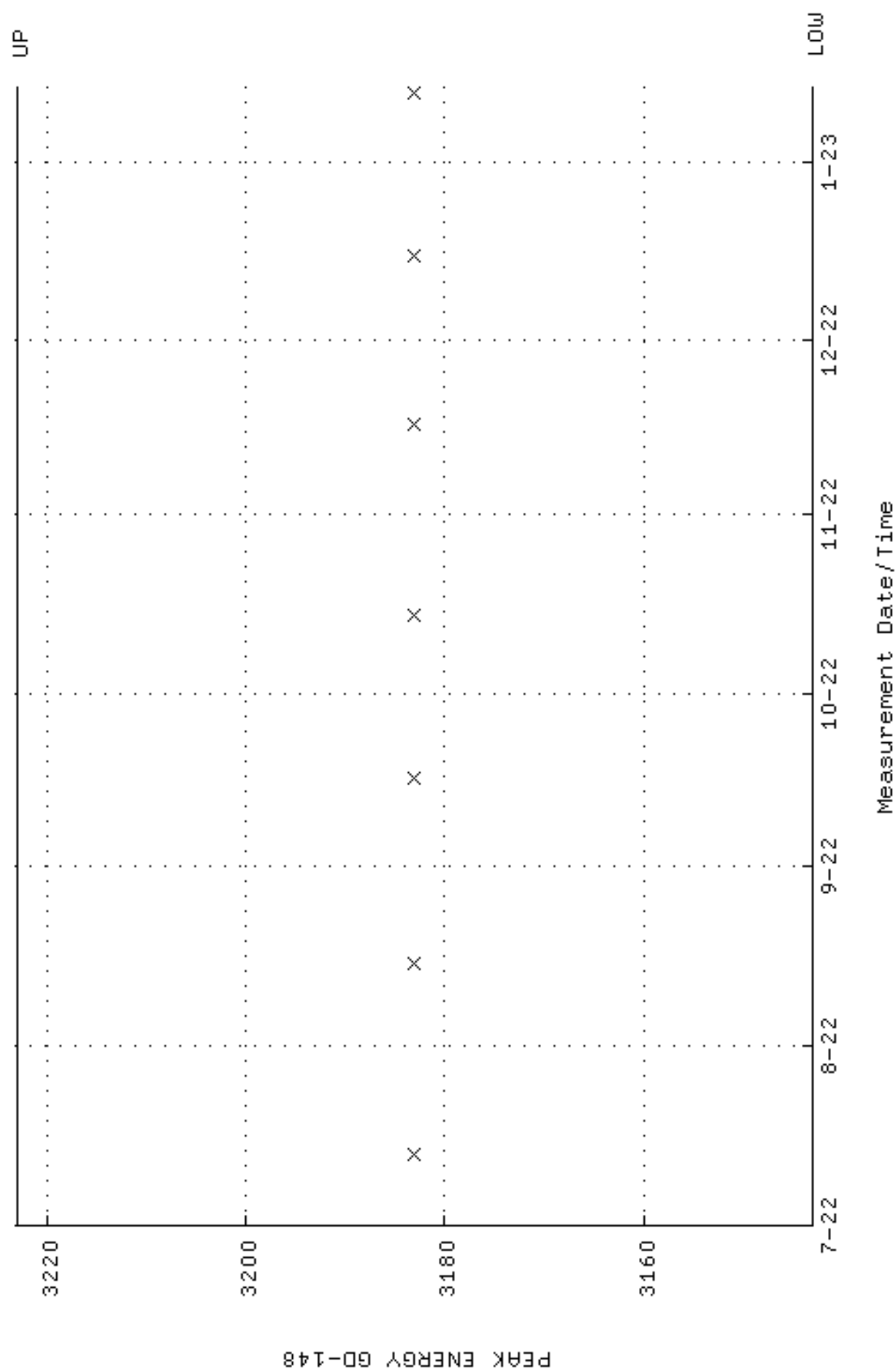
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-JUL-2022 09:51:32 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



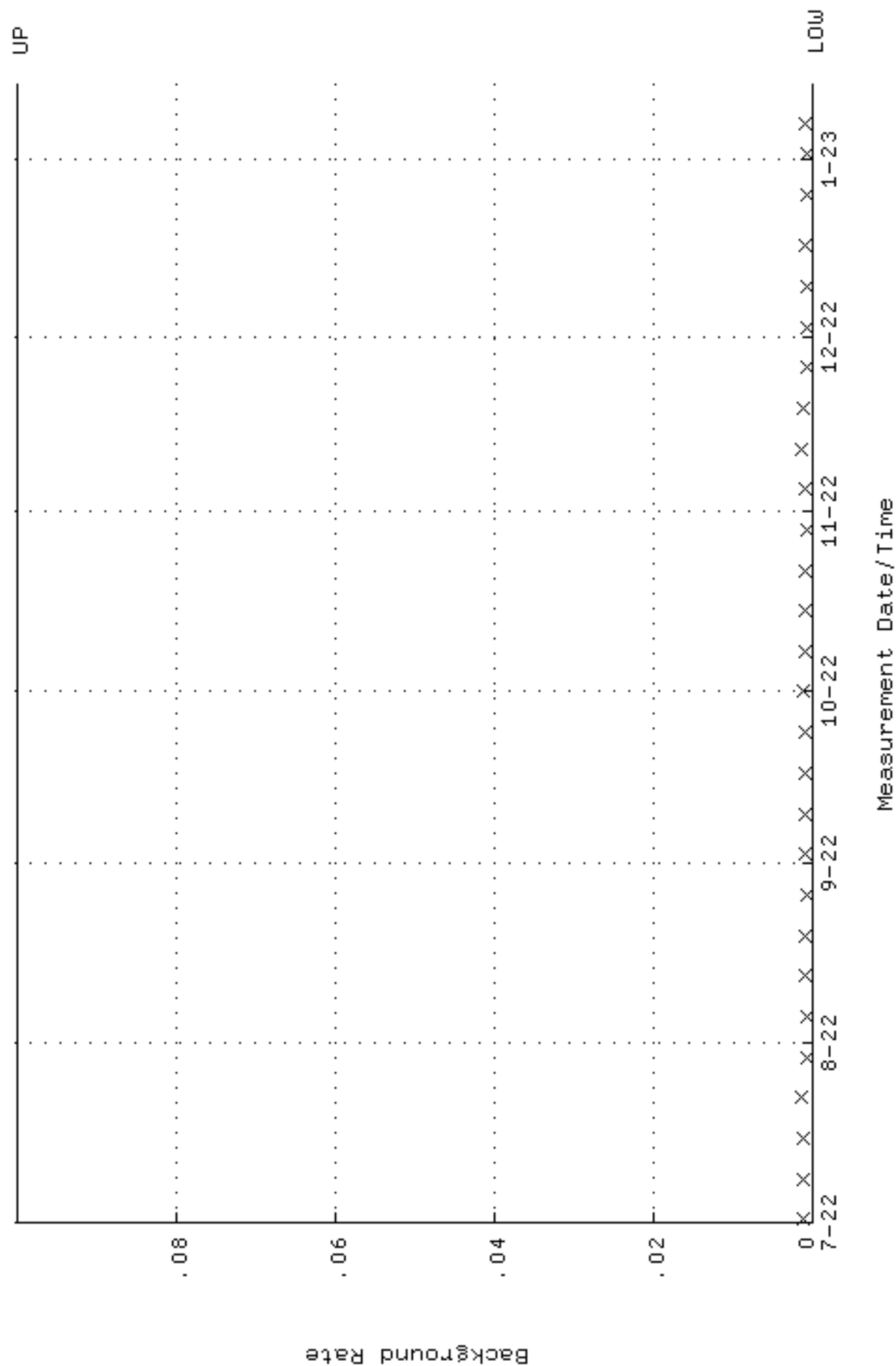
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-JUL-2022 09:51:32 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



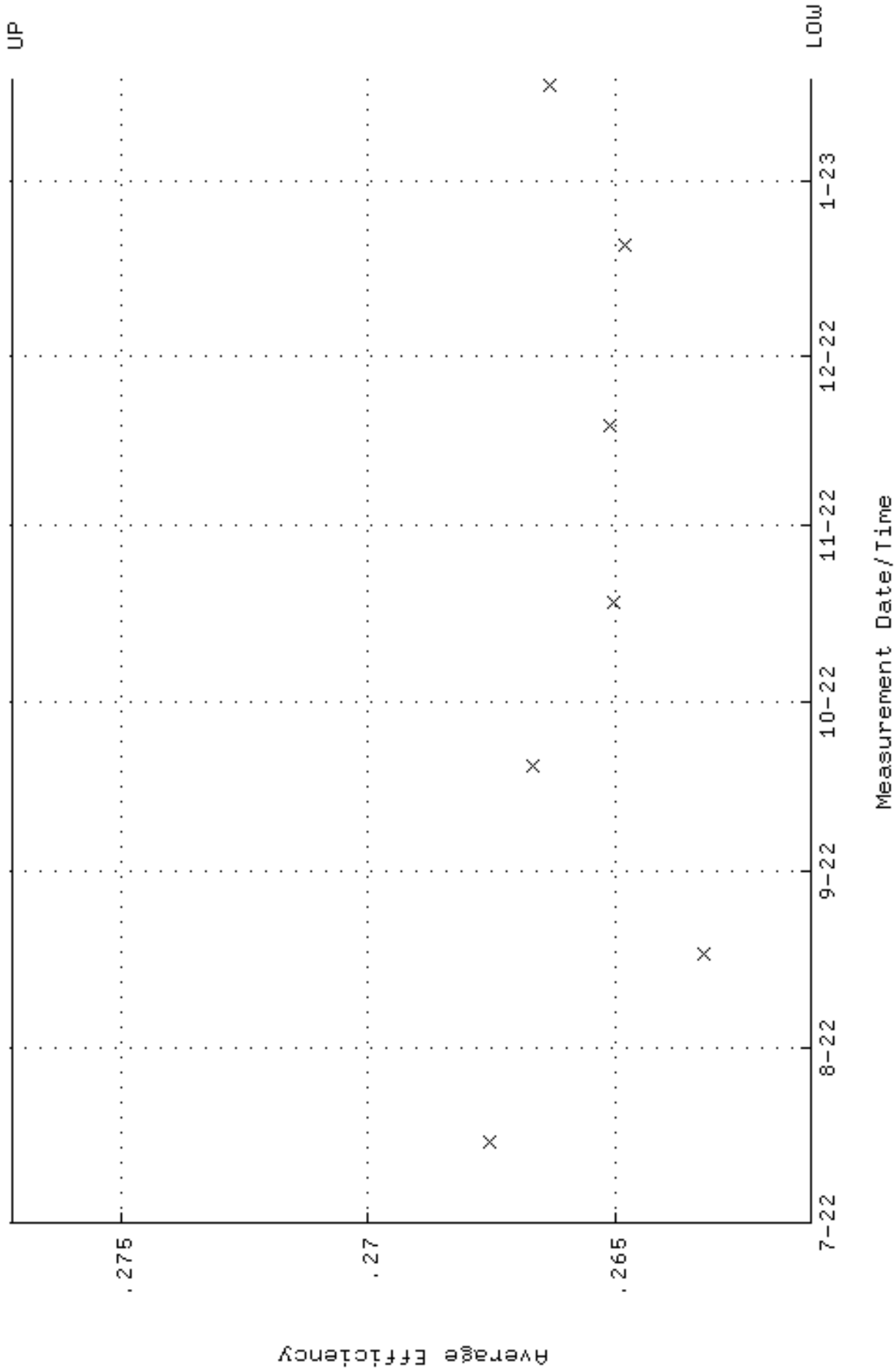
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-JUL-2022 09:51:32 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



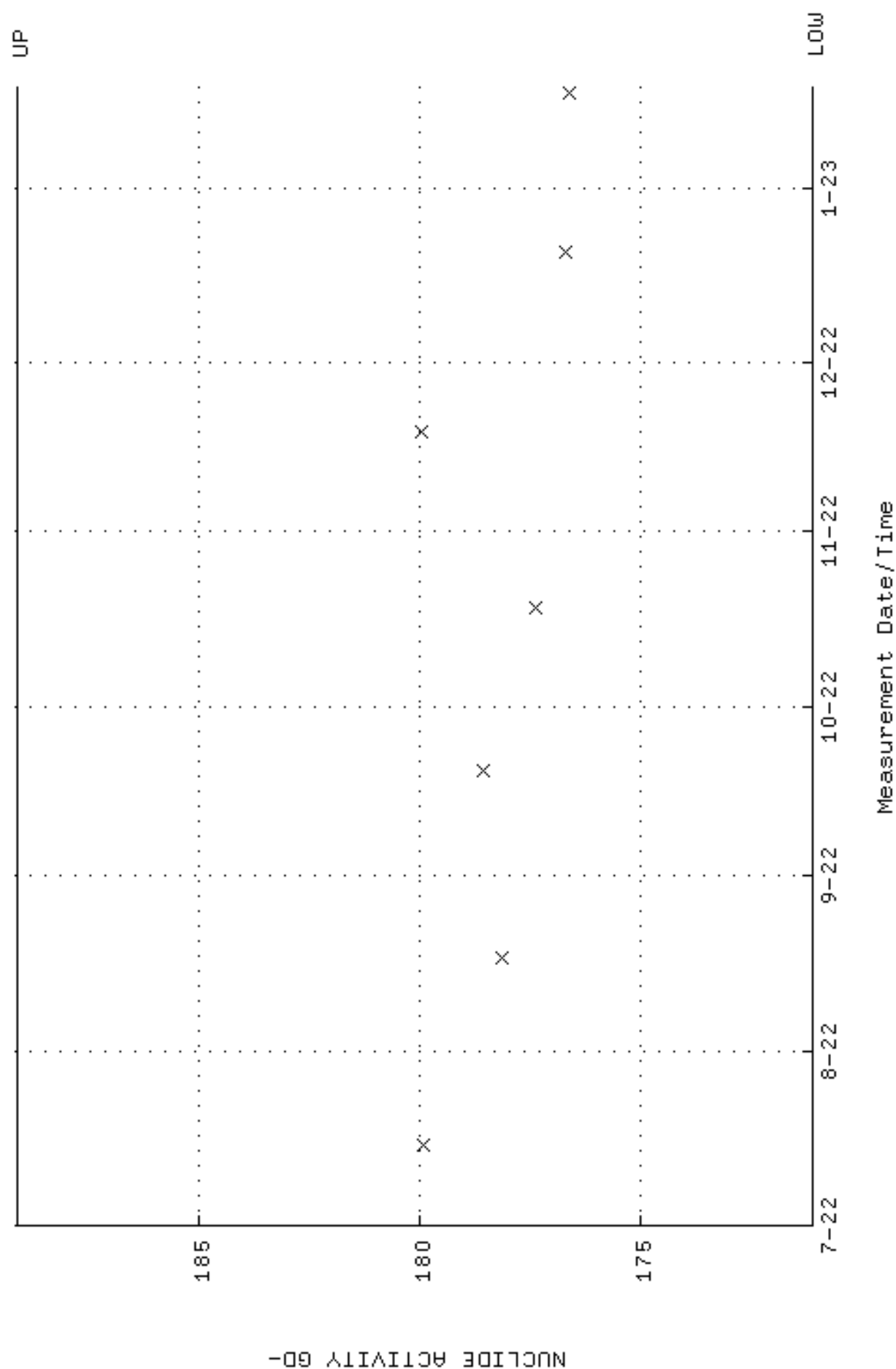
QA filename : DKA100:[ENV_ALPHA.QA.B]B136.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:29:49 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



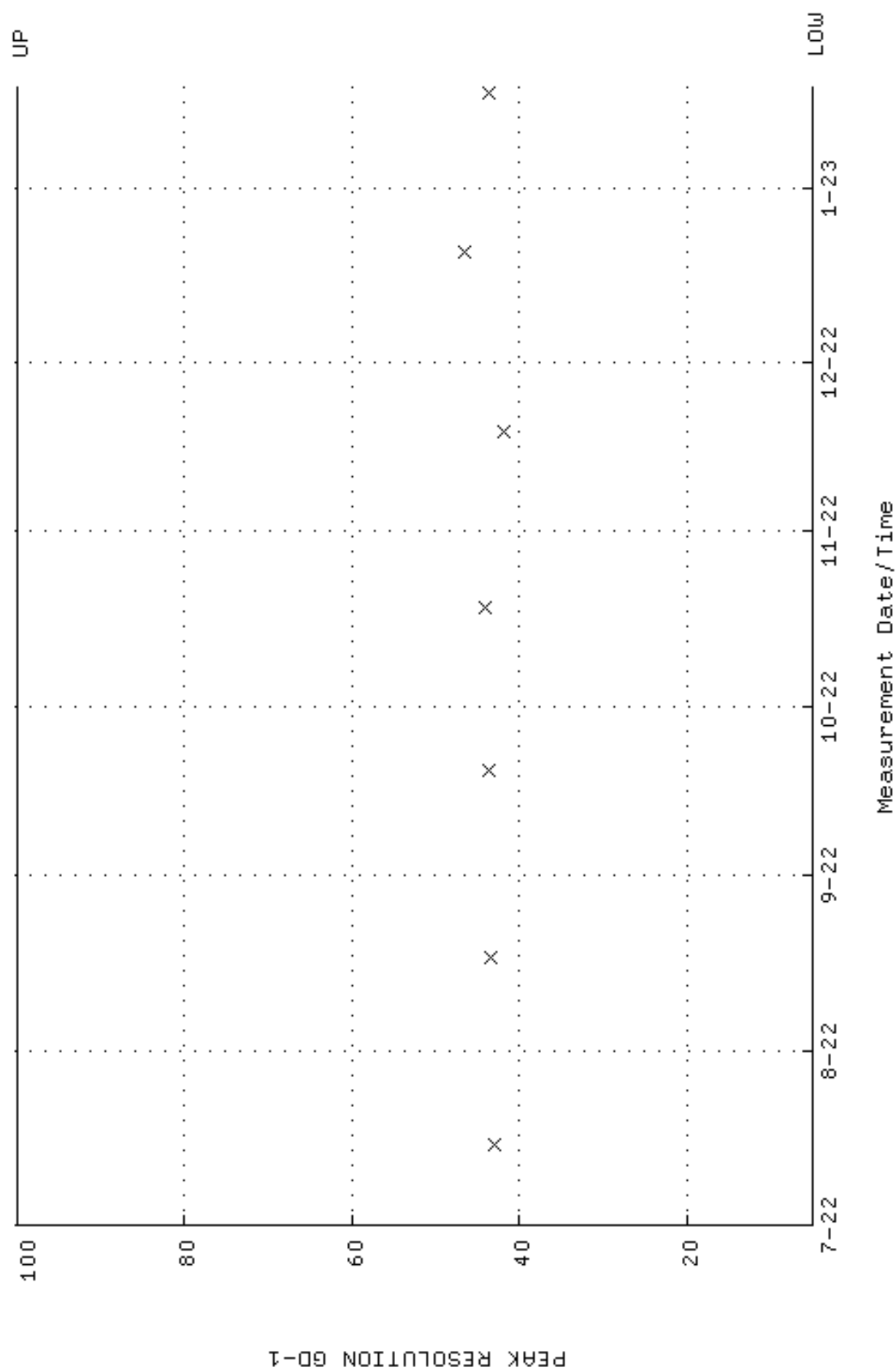
QA filename : DKA100:[ENV_ALPHA.QA.W]W179.QAF;5
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 15-JUL-2022 09:27:24 through 18-JAN-2023 12:00:00
Lower/Upper Lmts: 0.261050 through 0.277200



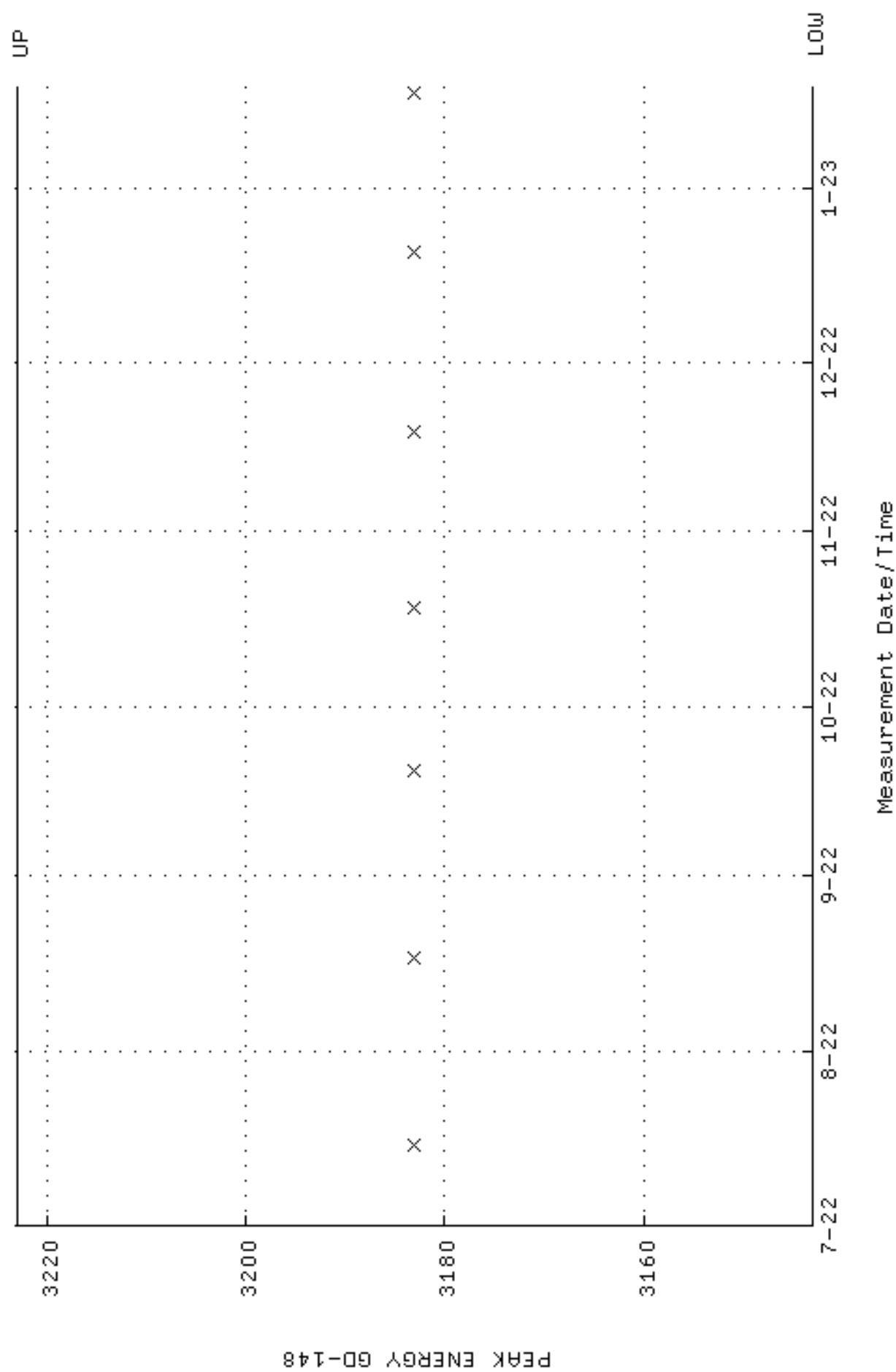
QA filename : DKA100:[ENV_ALPHA.QA.W]W179.QAF;5
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 15-JUL-2022 09:27:24 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



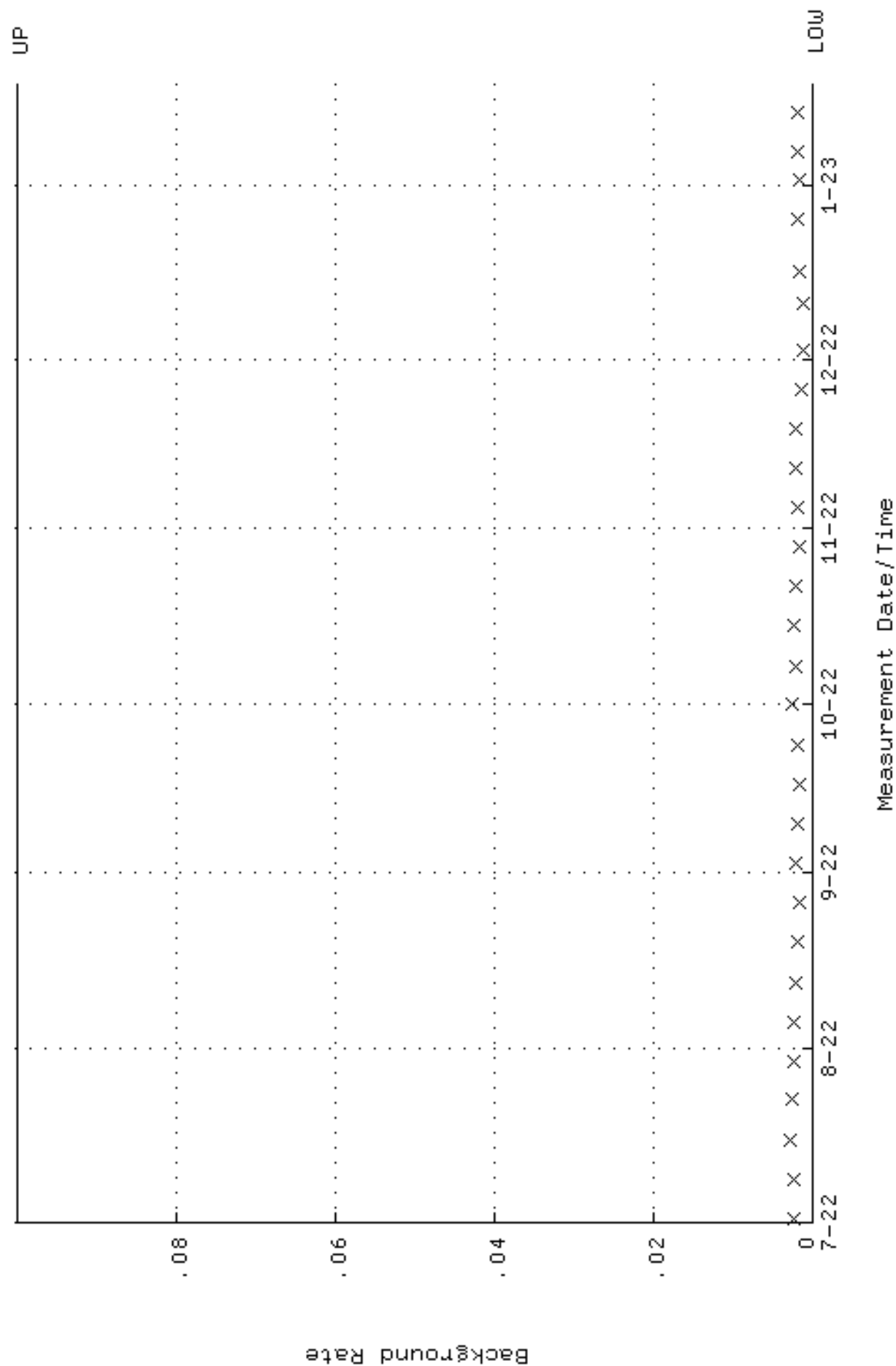
QA filename : DKA100:[ENV_ALPHA.QA.W]W179.QAF;5
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 15-JUL-2022 09:27:24 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



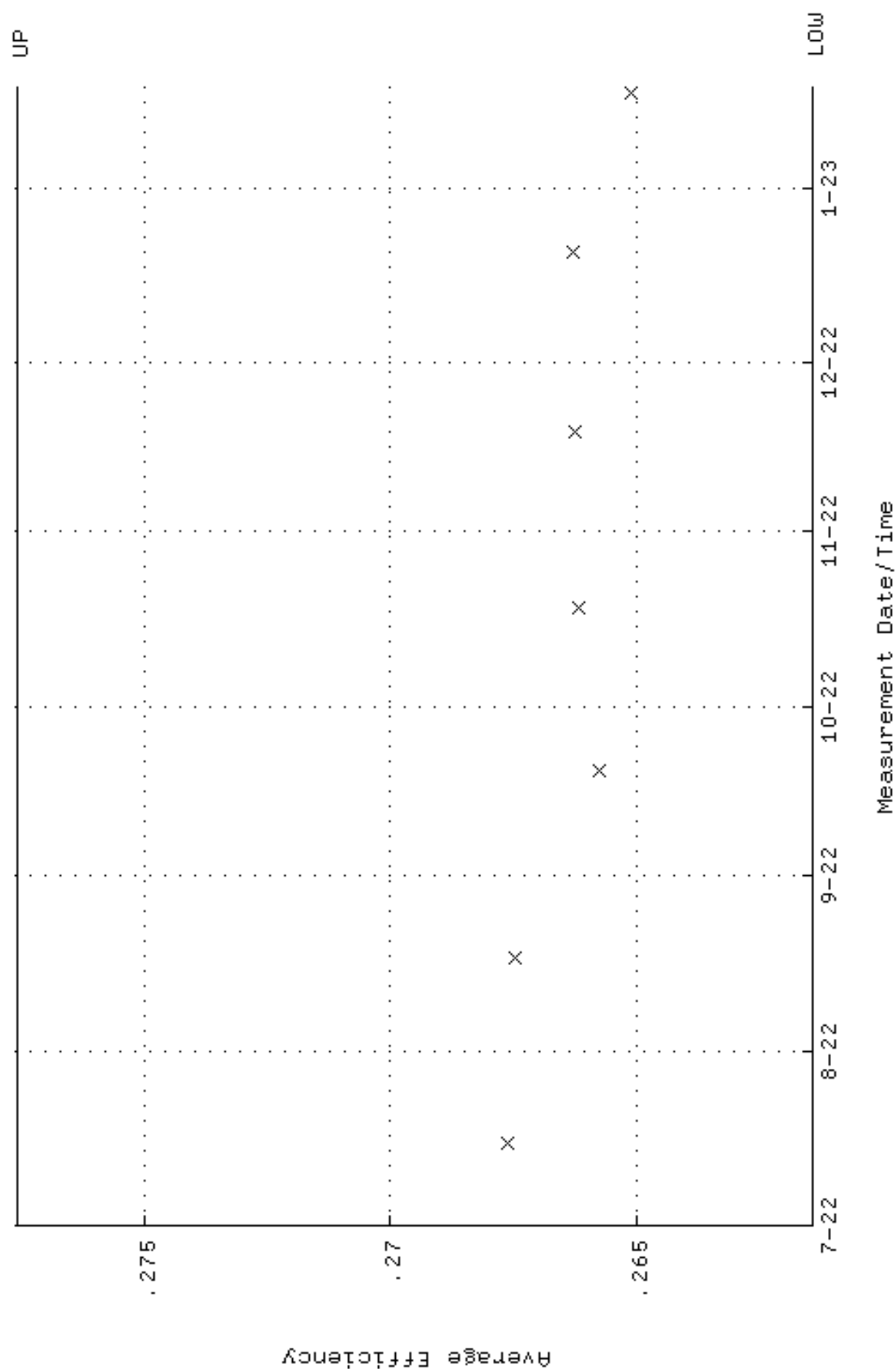
QA filename : DKA100:[ENV_ALPHA.QA.W]W179.QAF;5
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 15-JUL-2022 09:27:24 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



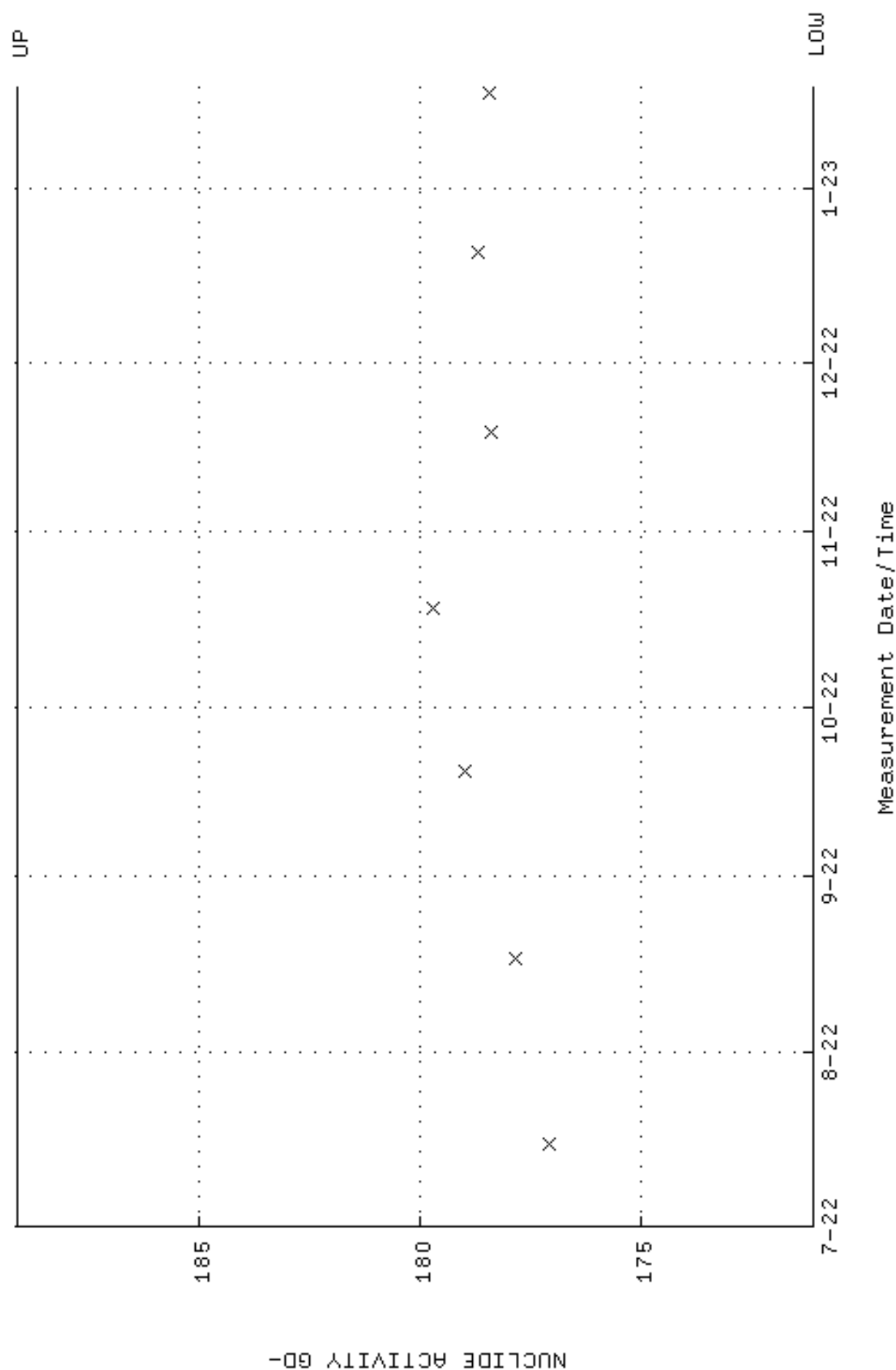
QA filename : DKA100:[ENV_ALPHA.QA.B]B179.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:44:05 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



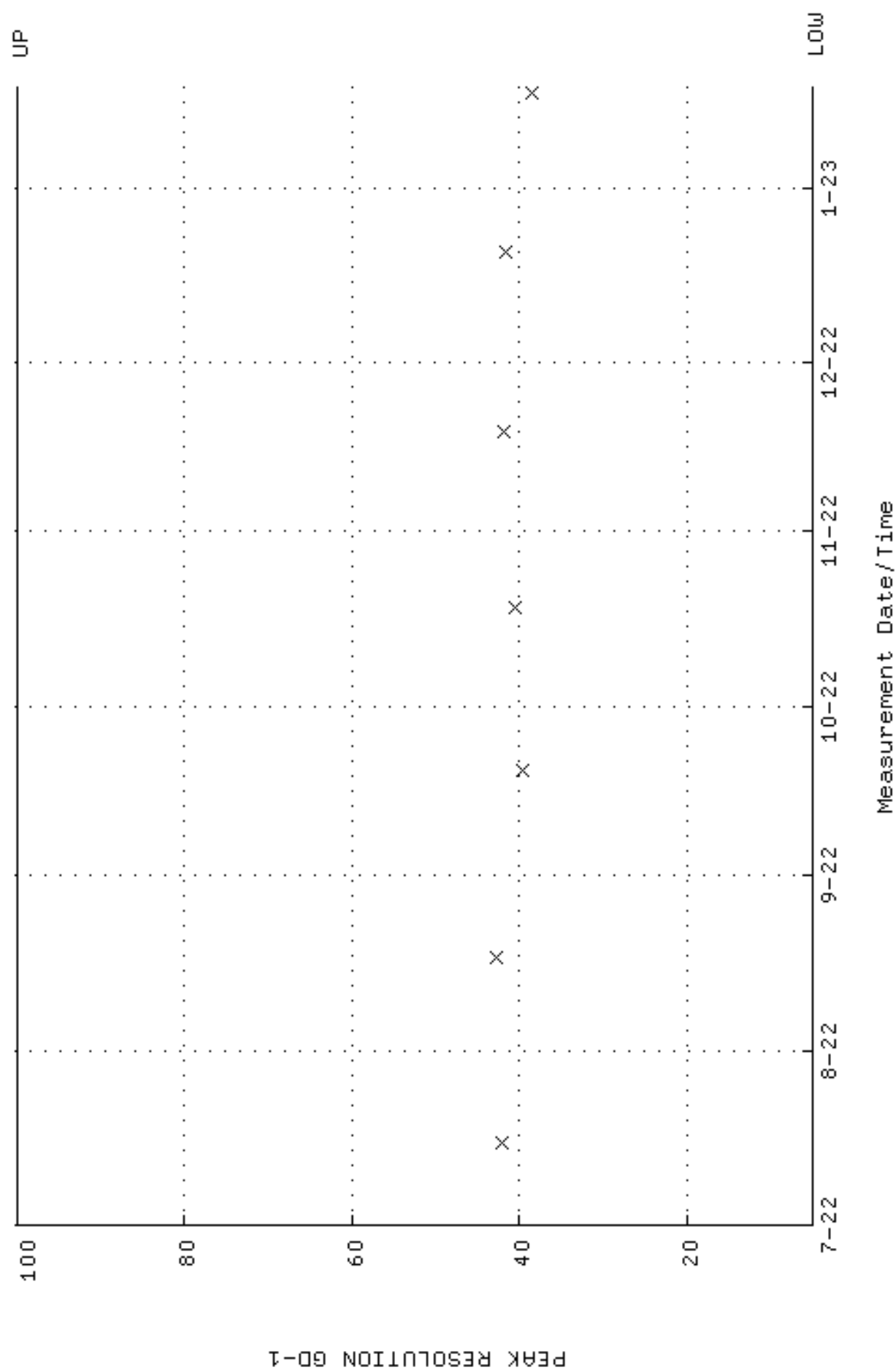
QA filename : DKA100:[ENV_ALPHA.QA.W]W180.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 15-JUL-2022 10:43:17 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.261420 through 0.277590



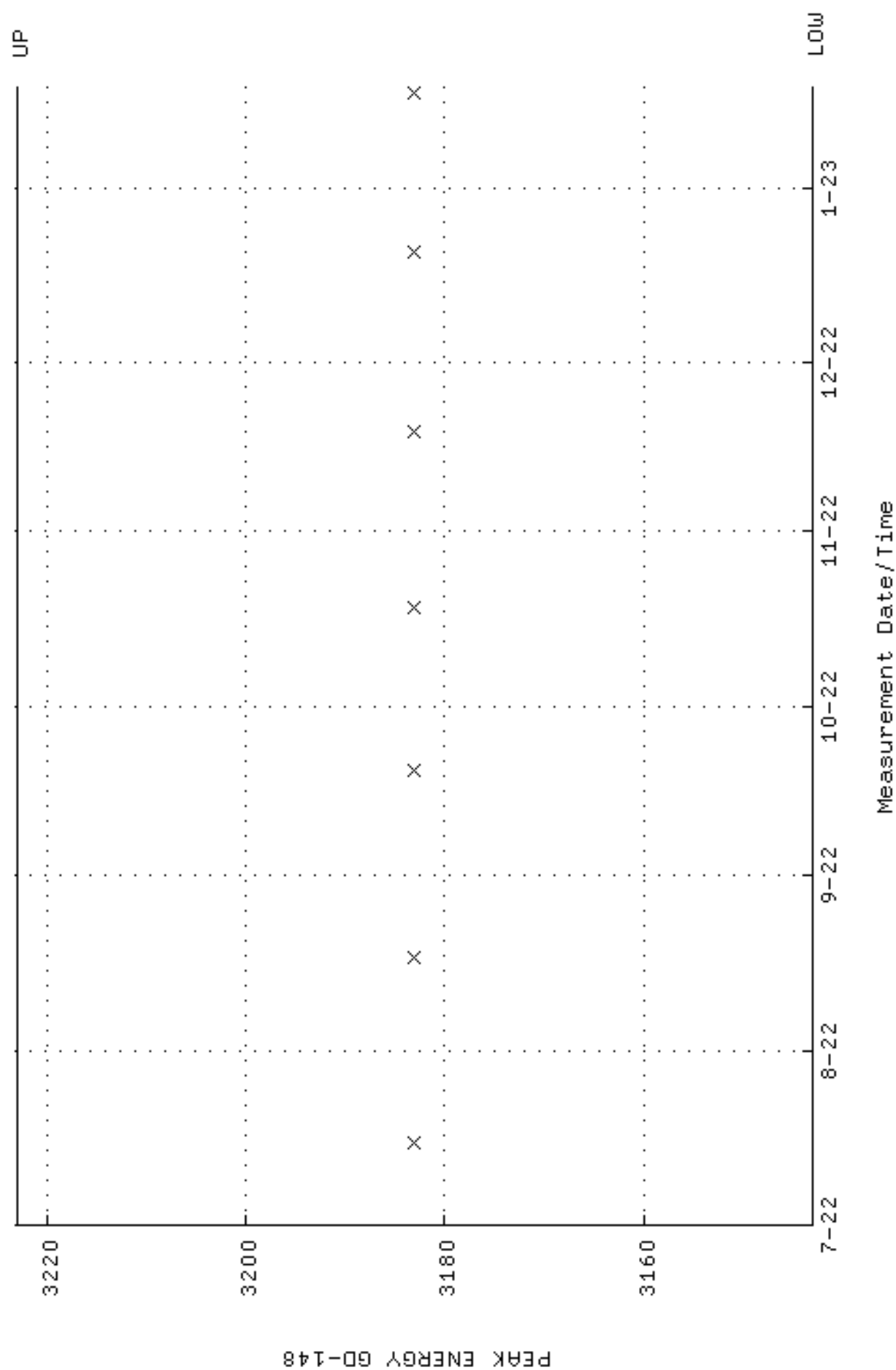
QA filename : DKA100:[ENV_ALPHA.QA.W]W180.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 15-JUL-2022 10:43:17 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



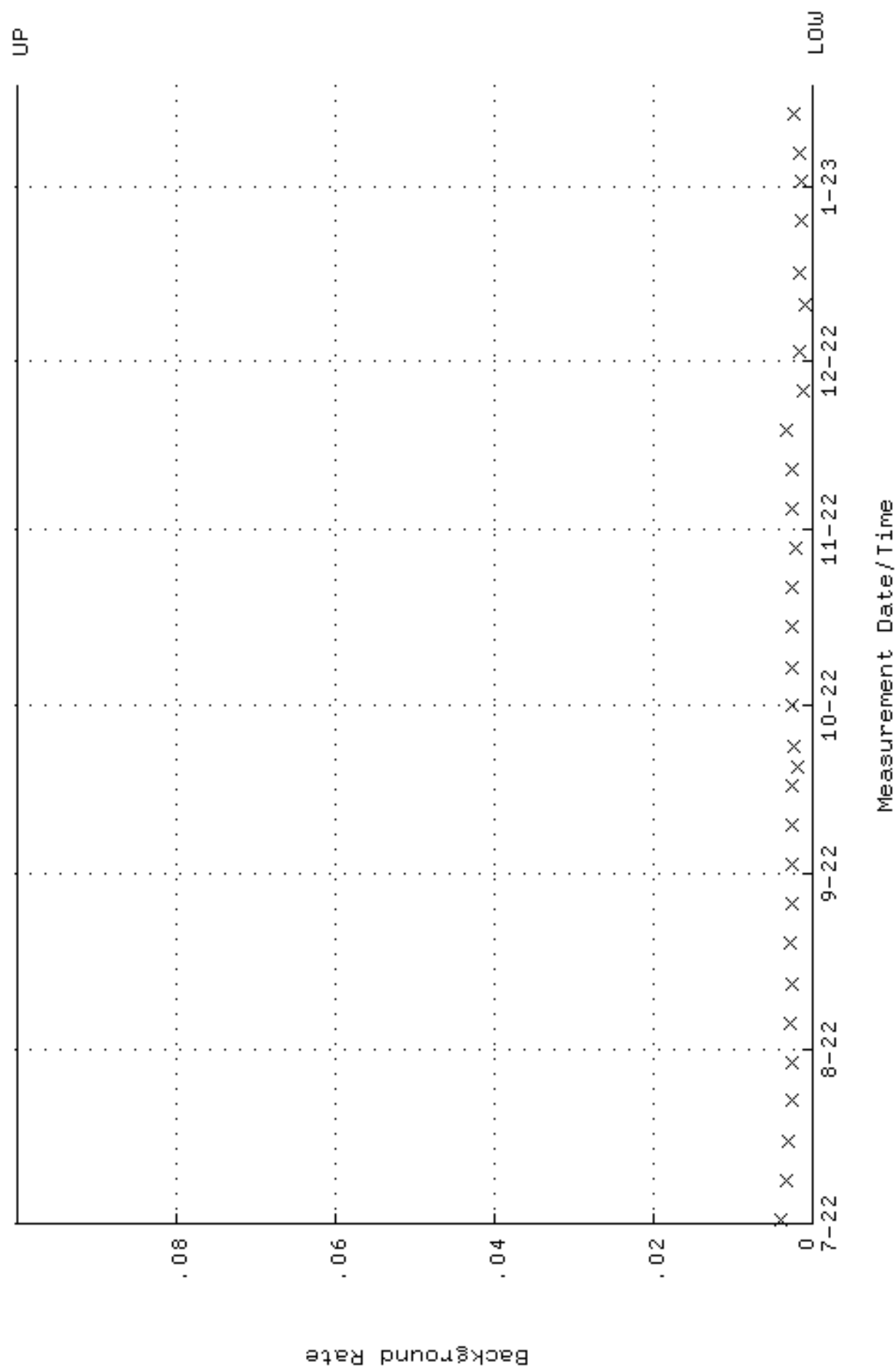
QA filename : DKA100:[ENV_ALPHA.QA.W]W180.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 15-JUL-2022 10:43:17 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



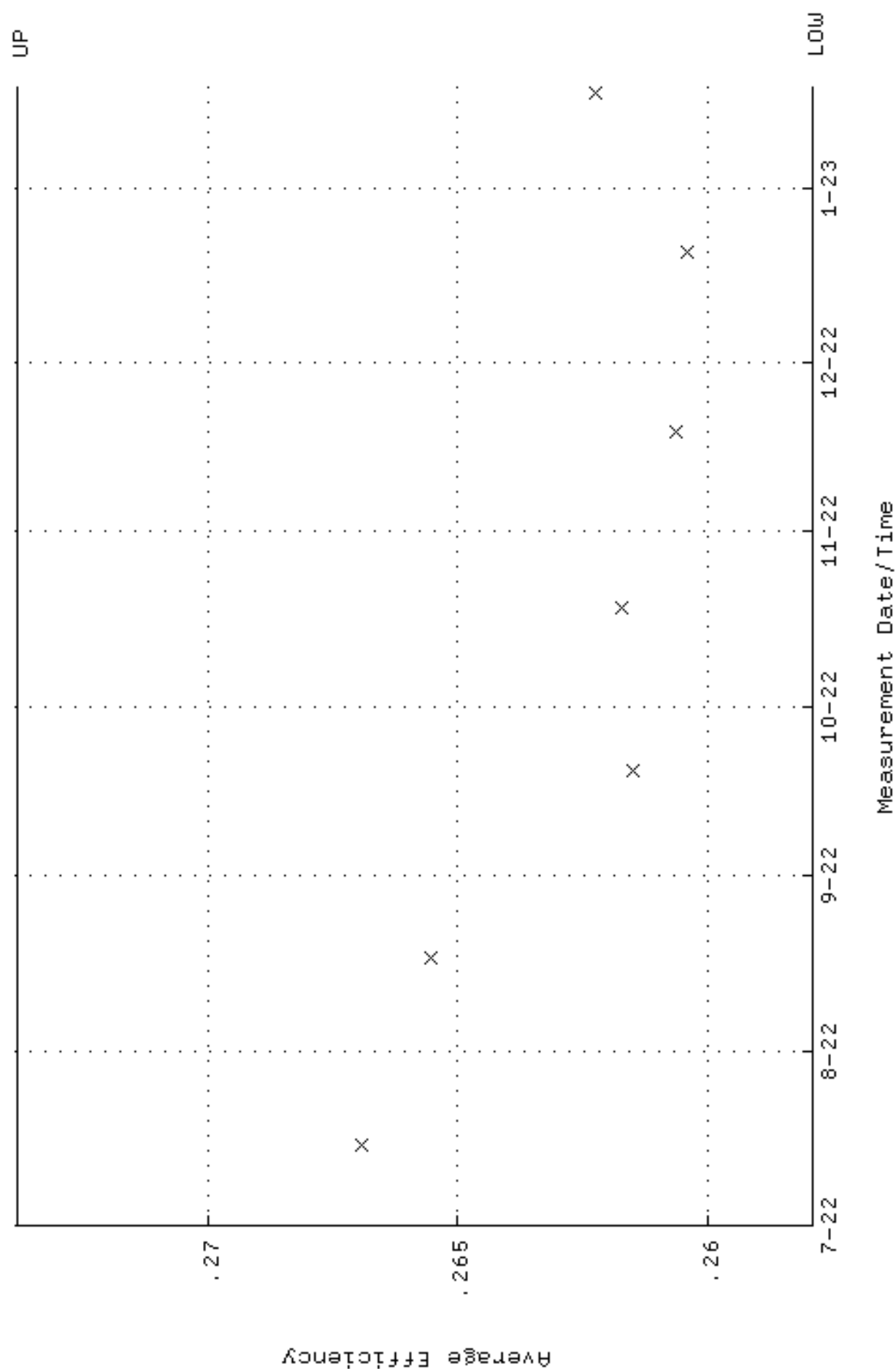
QA filename : DKA100:[ENV_ALPHA.QA.W]W180.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 15-JUL-2022 10:43:17 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



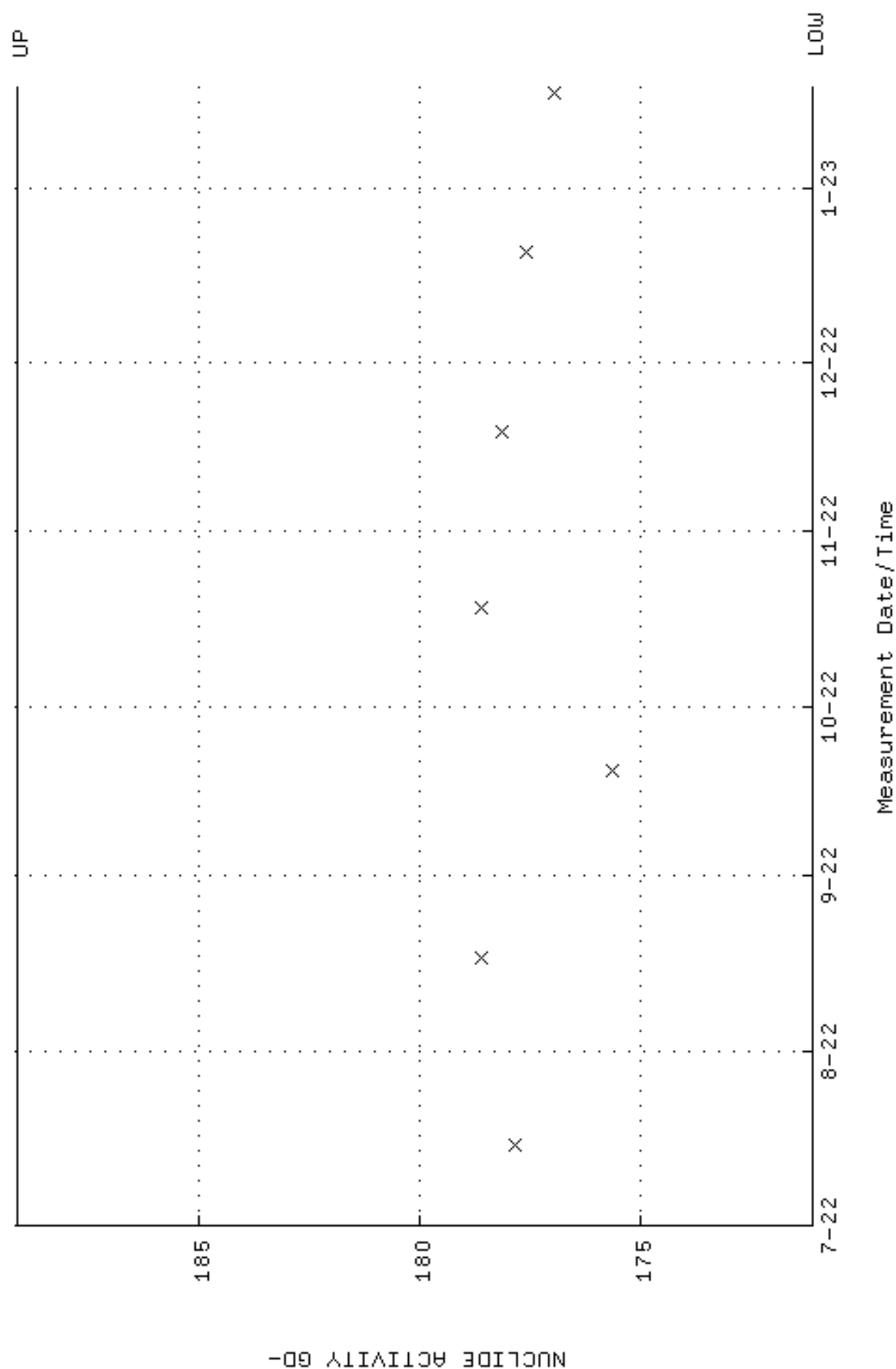
QA filename : DKA100:[ENV_ALPHA.QA.B]B180.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:44:09 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



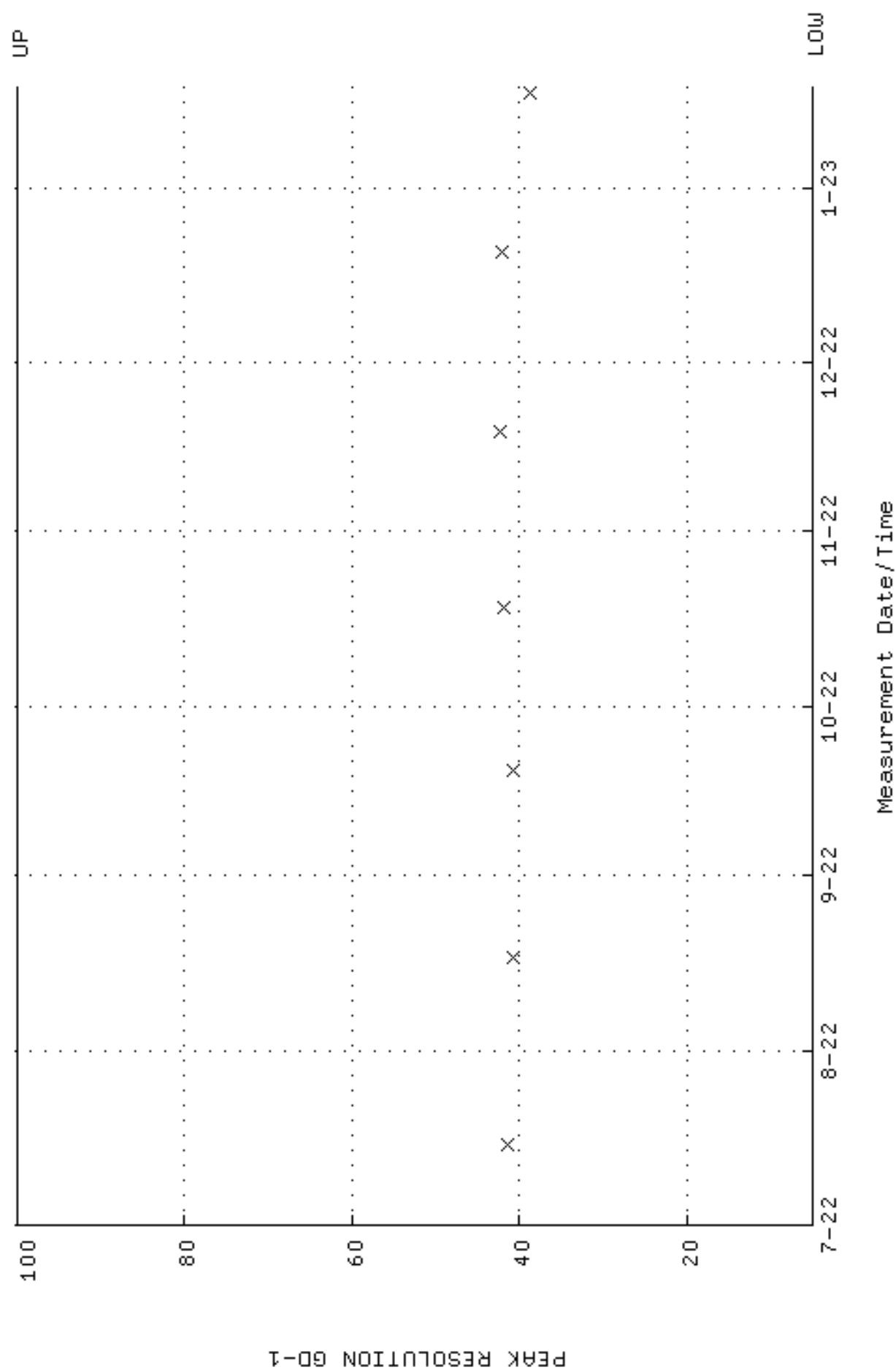
QA filename : DKA100:[ENV_ALPHA.QA.W]W181.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 15-JUL-2022 09:27:33 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.257880 through 0.273830



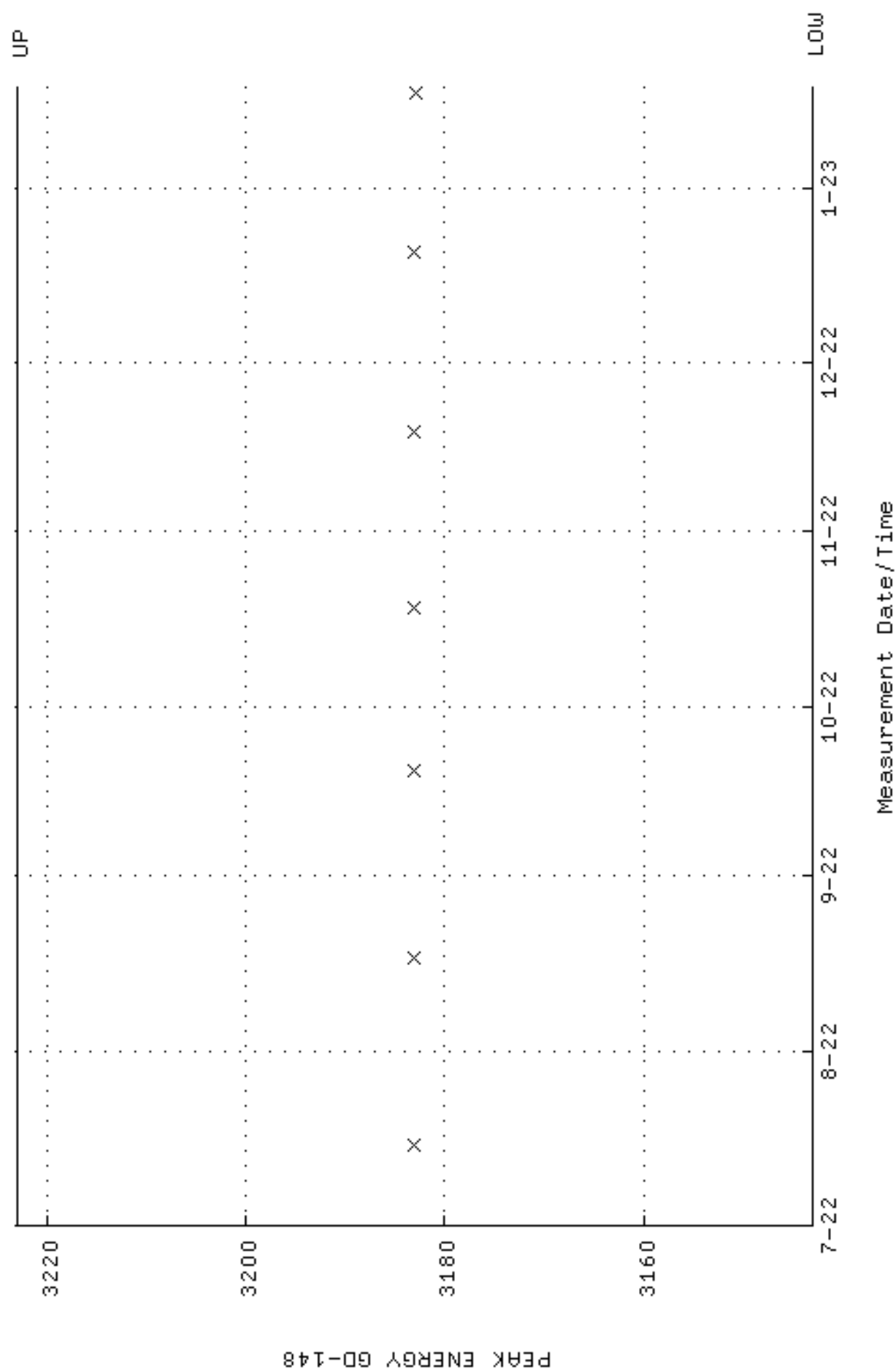
QA filename : DKA100:[ENV_ALPHA.QA.W]W181.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 15-JUL-2022 09:27:33 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



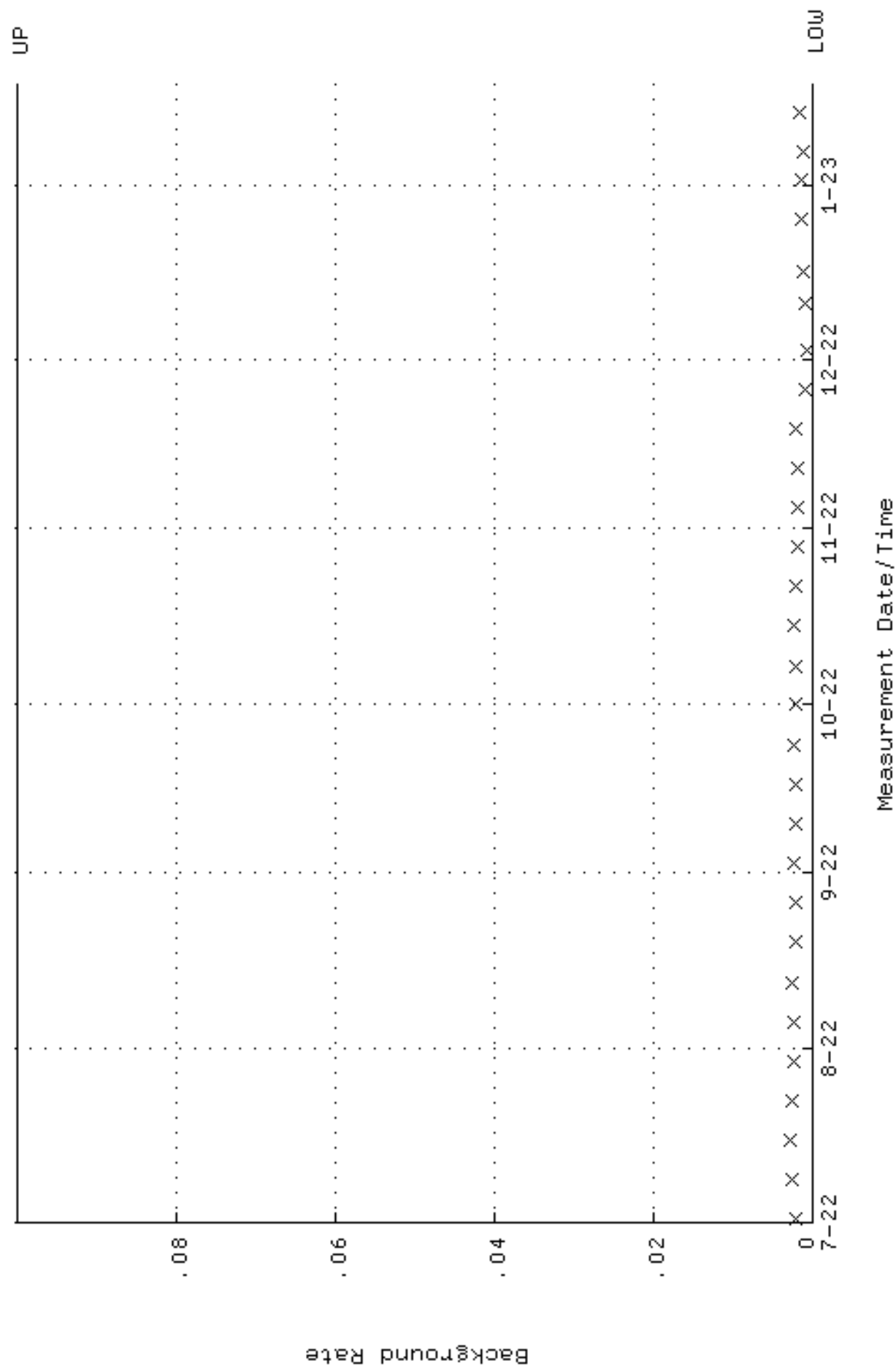
QA filename : DKA100:[ENV_ALPHA.QA.W]W181.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 15-JUL-2022 09:27:33 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



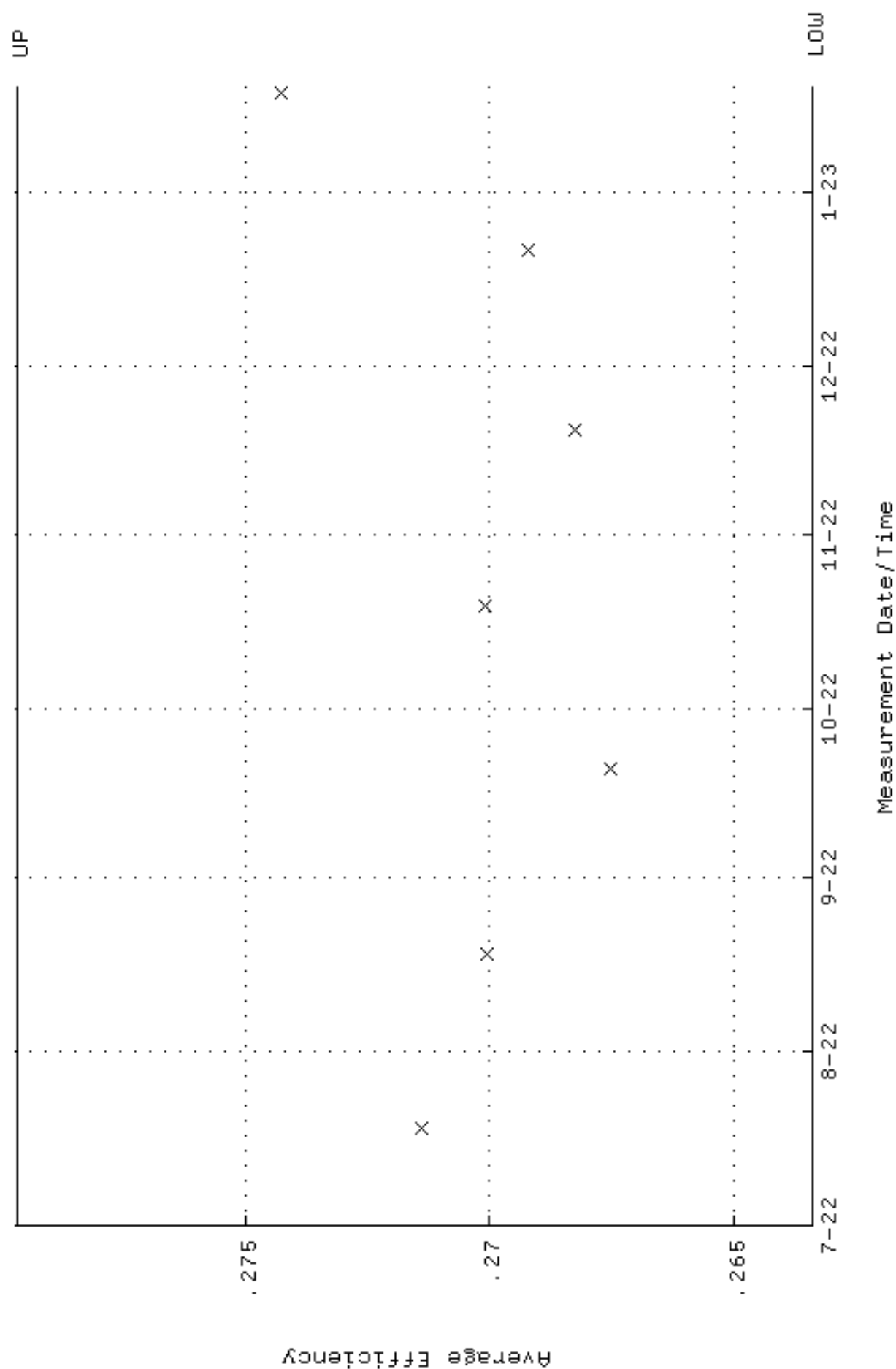
QA filename : DKA100:[ENV_ALPHA.QA.W]W181.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 15-JUL-2022 09:27:33 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



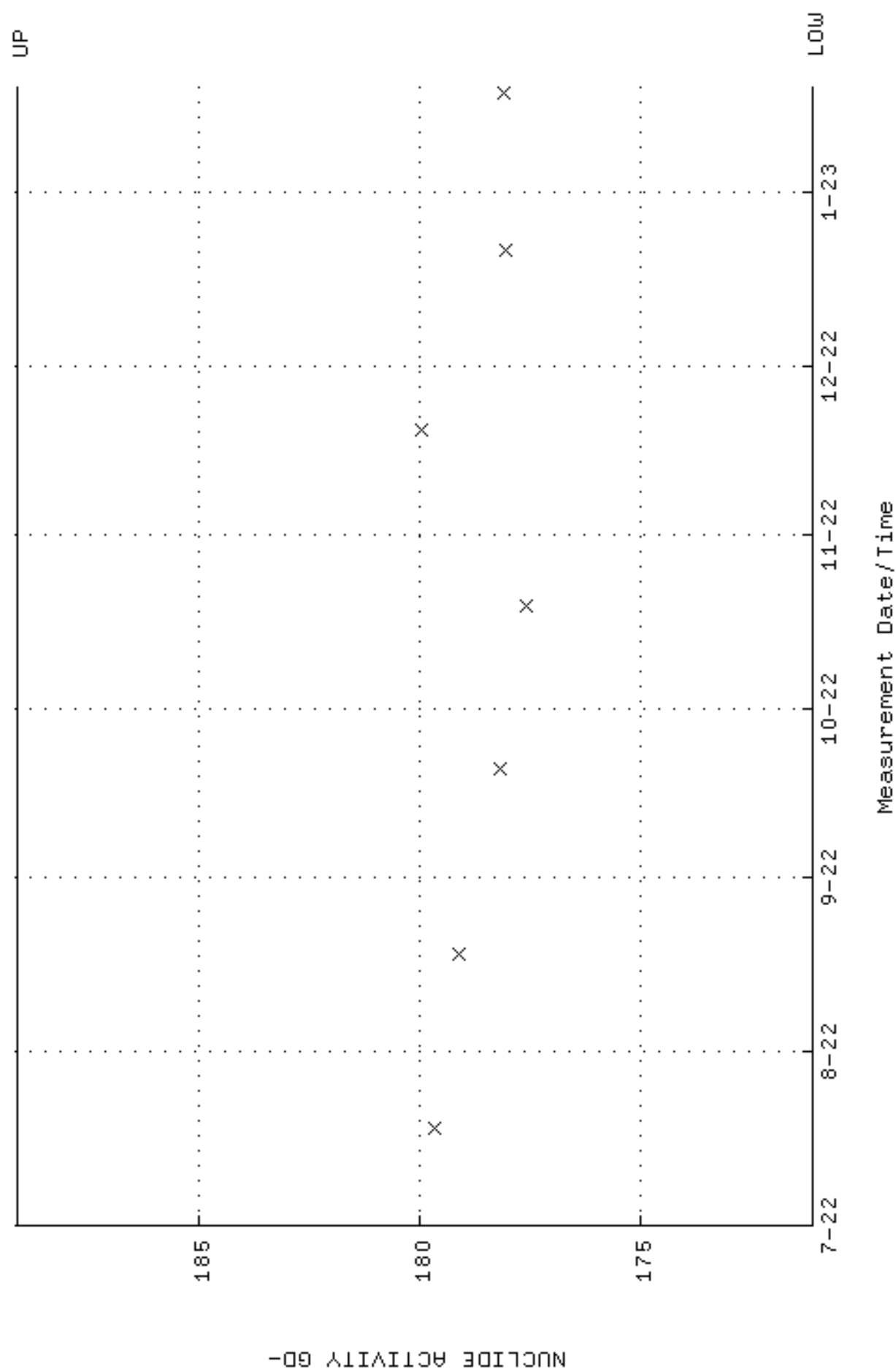
QA filename : DKA100:[ENV_ALPHA.QA.B]B181.QAF;3
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:44:13 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



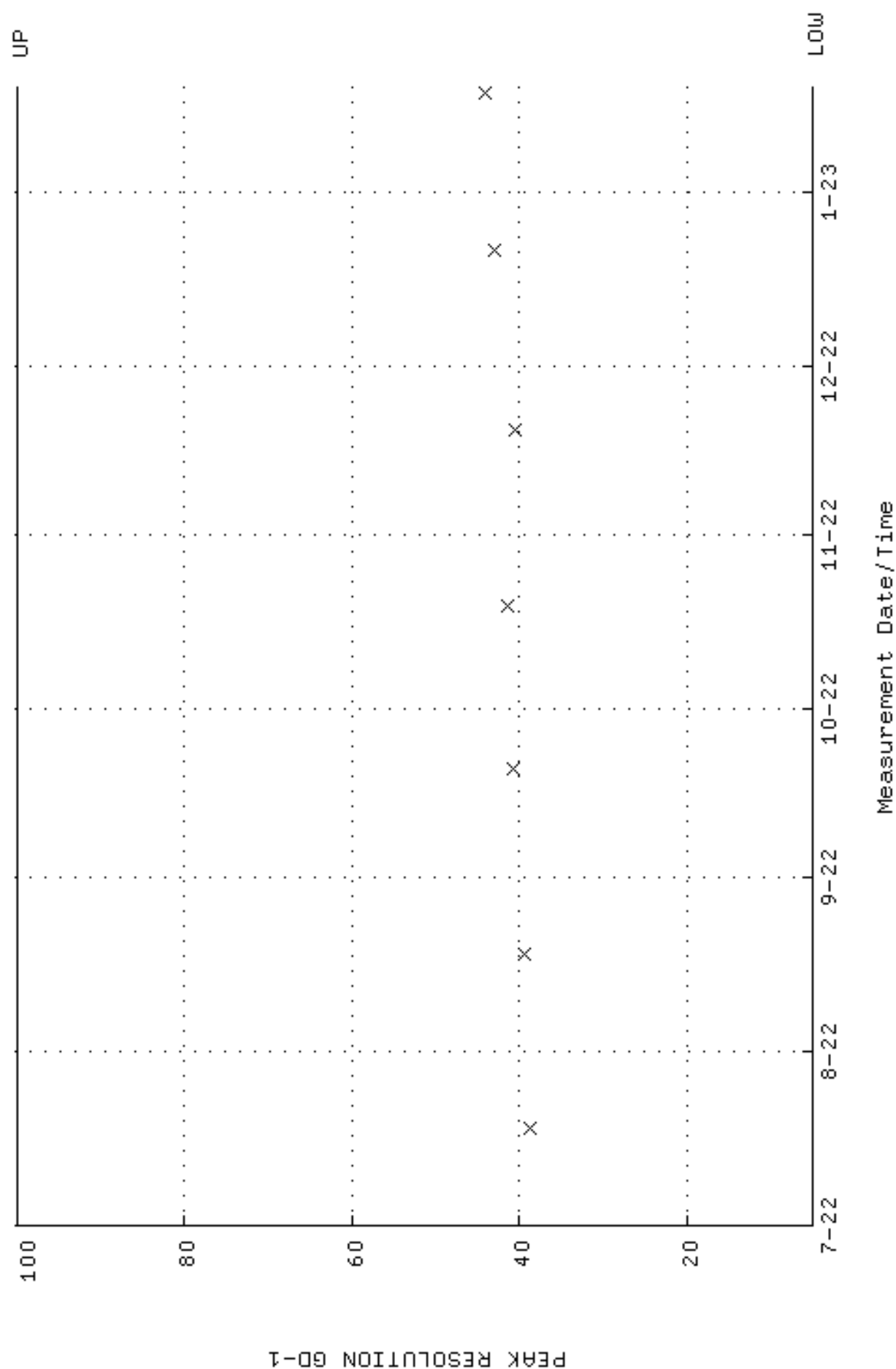
QA filename : DKA100:[ENV_ALPHA.QA.W]W191.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUL-2022 09:36:11 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.263380 through 0.279670



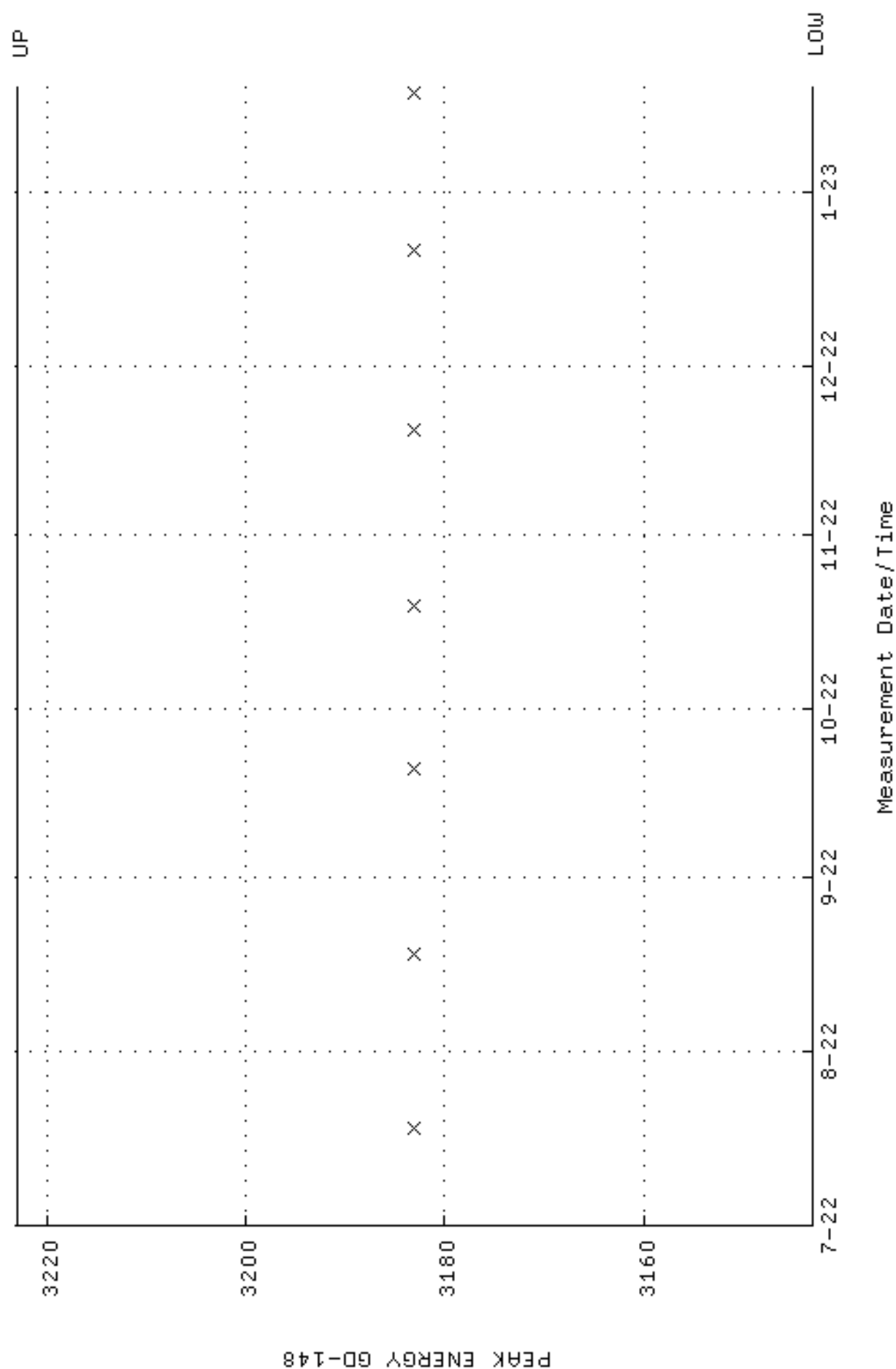
QA filename : DKA100:[ENV_ALPHA.QA.W]W191.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:11 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



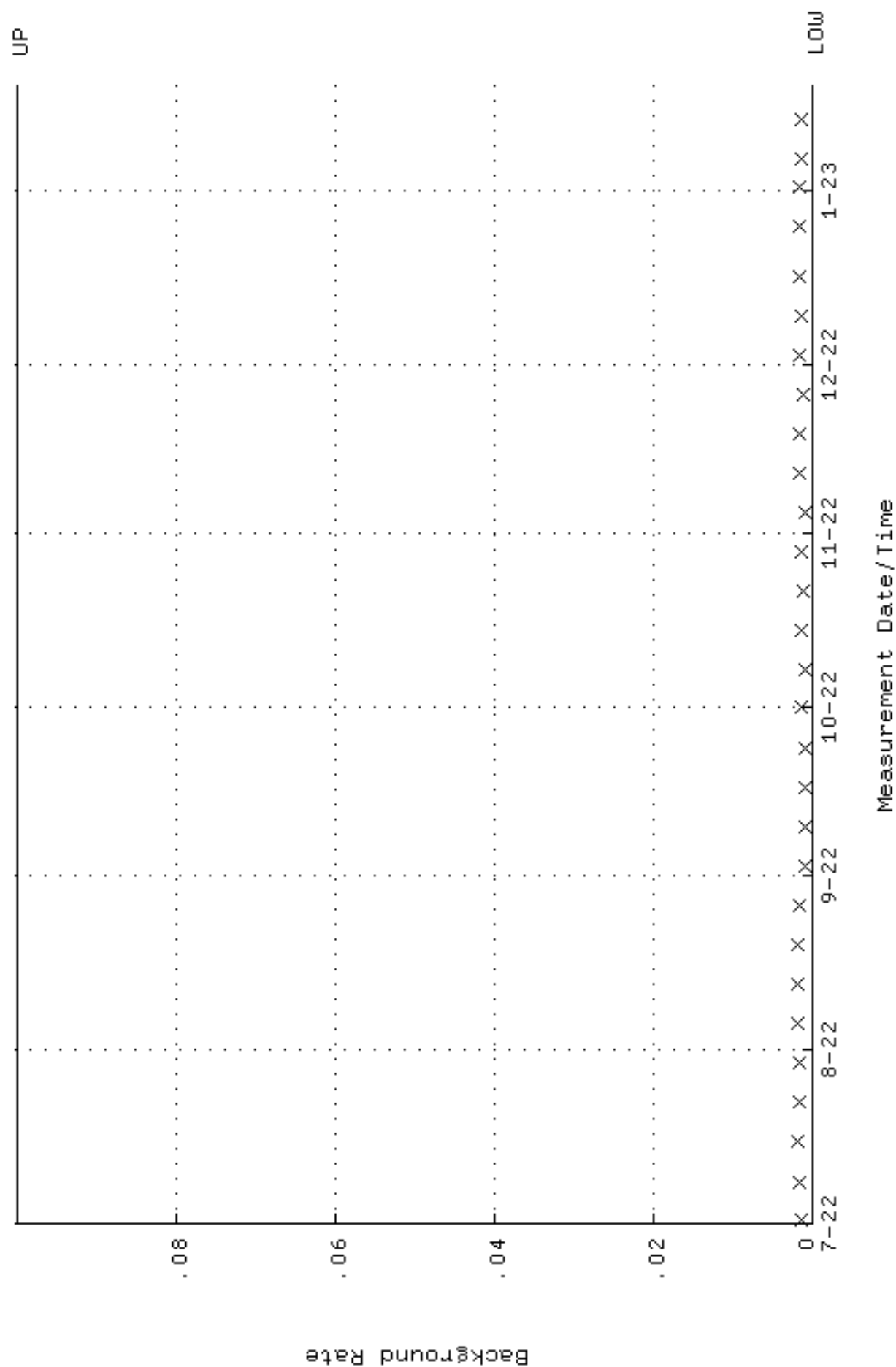
QA filename : DKA100:[ENV_ALPHA.QA.W]W191.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUL-2022 09:36:11 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



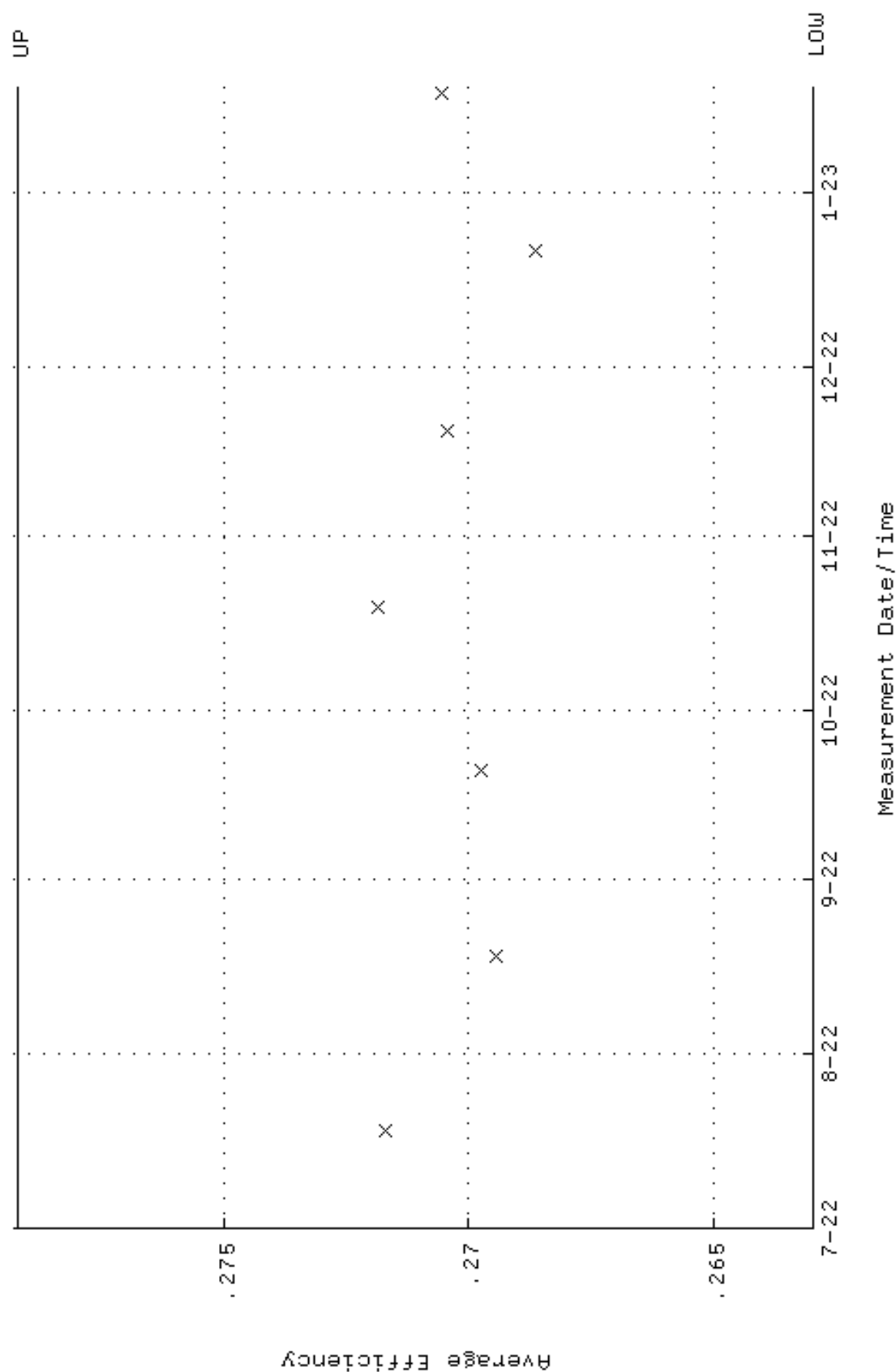
QA filename : DKA100:[ENV_ALPHA.QA.W]W191.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:11 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



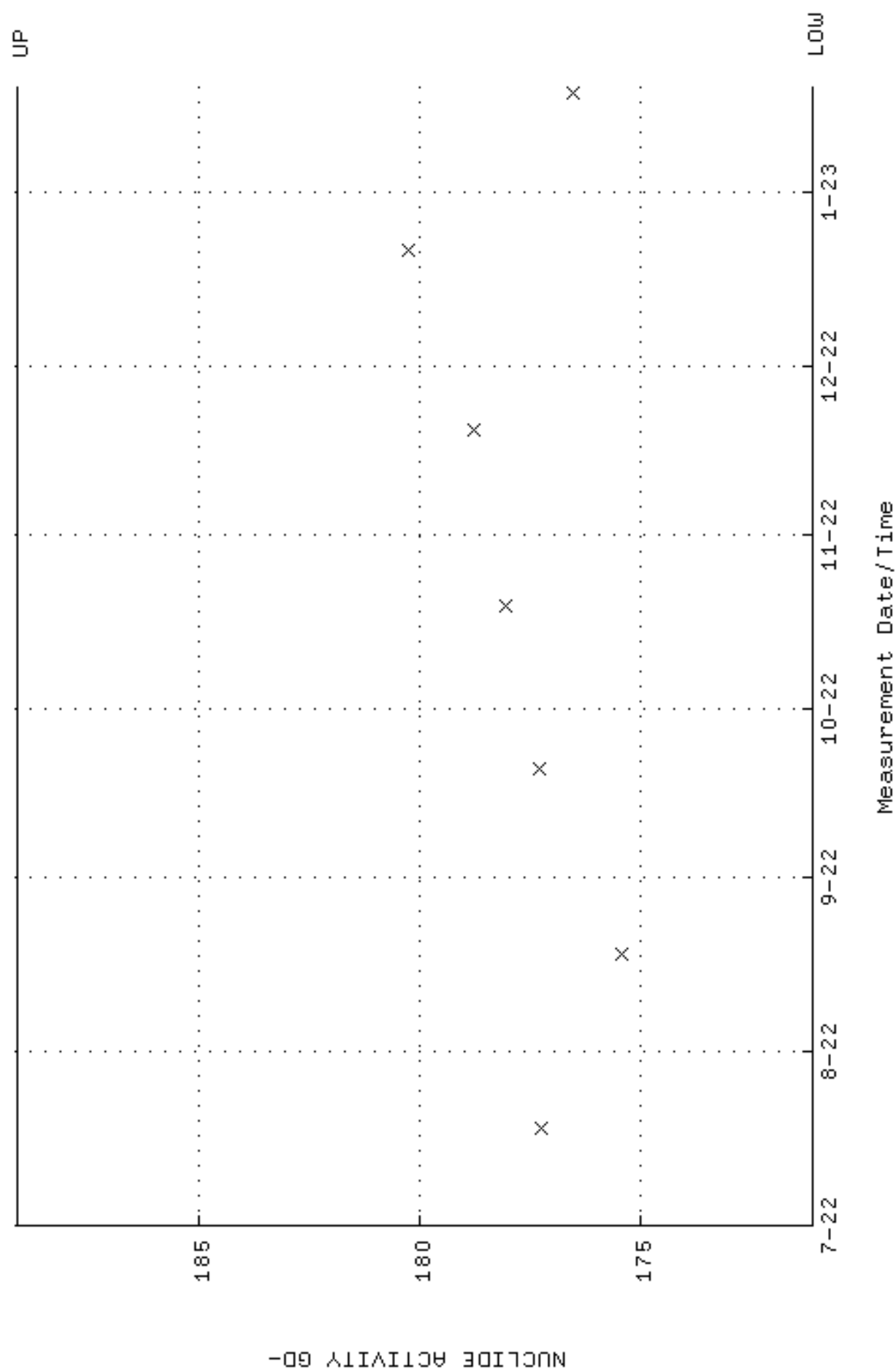
QA filename : DKA100:[ENV_ALPHA.QA.B]B191.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:45:24 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



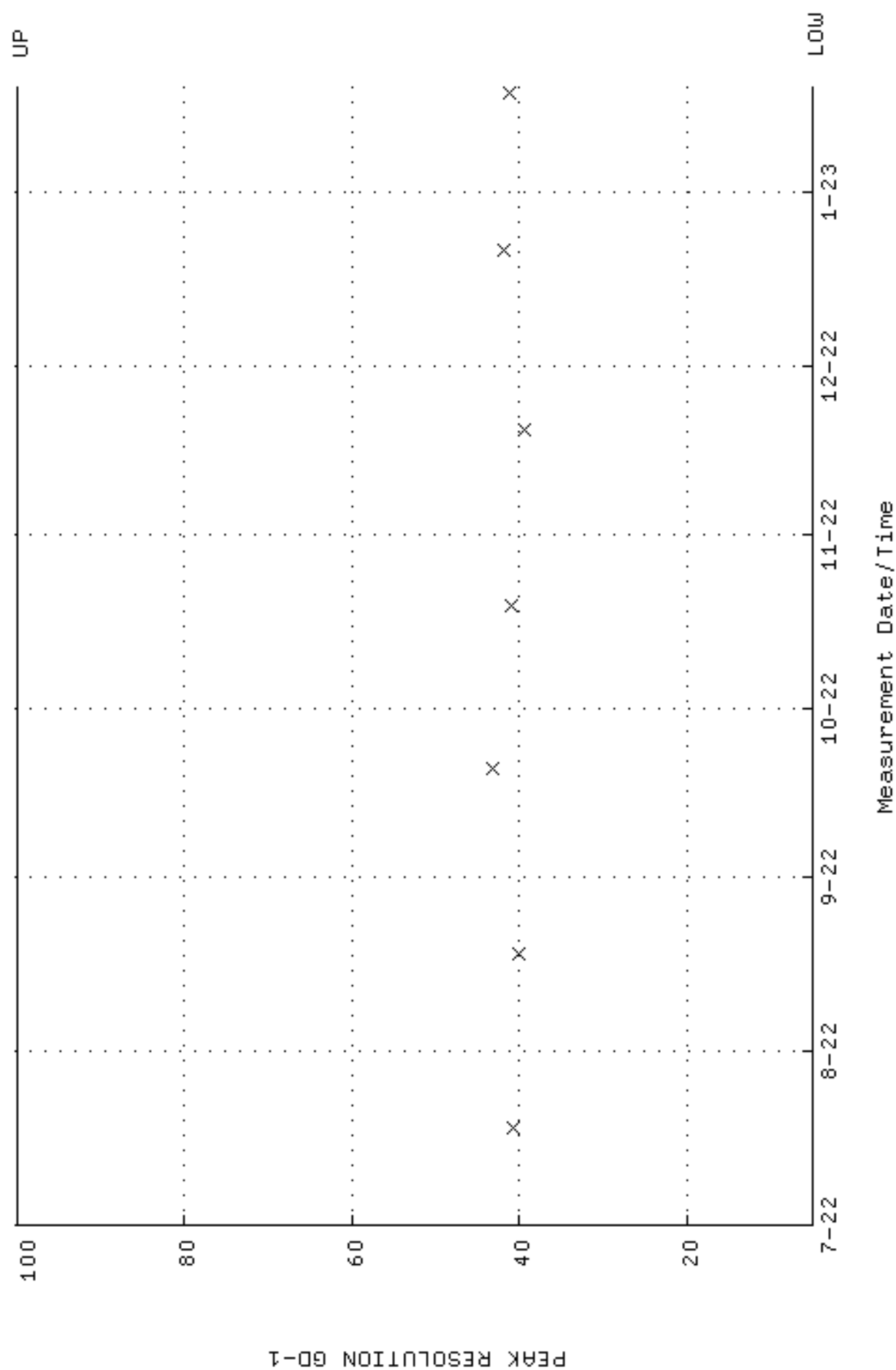
QA filename : DKA100:[ENV_ALPHA.QA.W]W192.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUL-2022 09:36:16 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.262970 through 0.279240



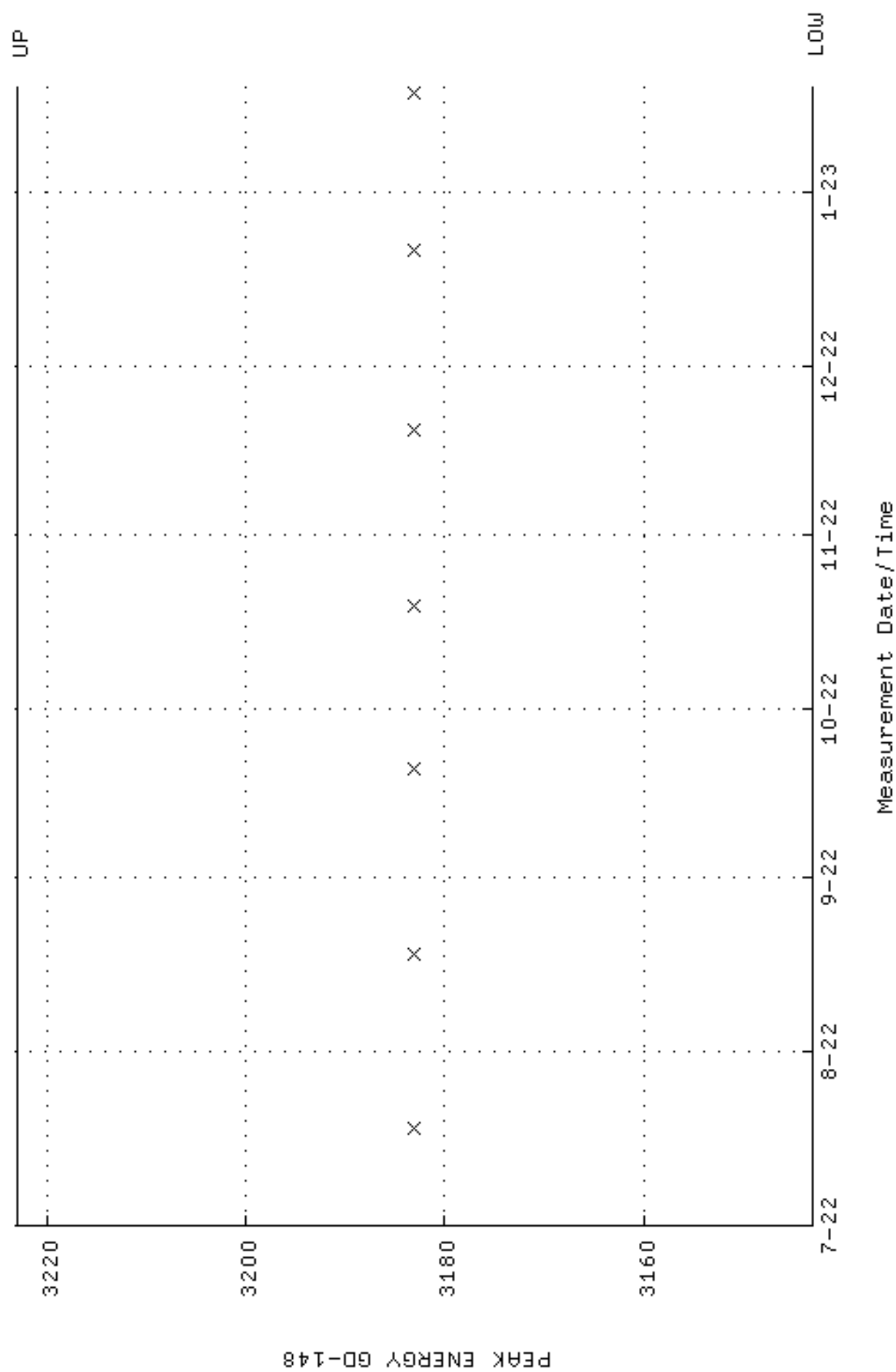
QA filename : DKA100:[ENV_ALPHA.QA.W]W192.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:16 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



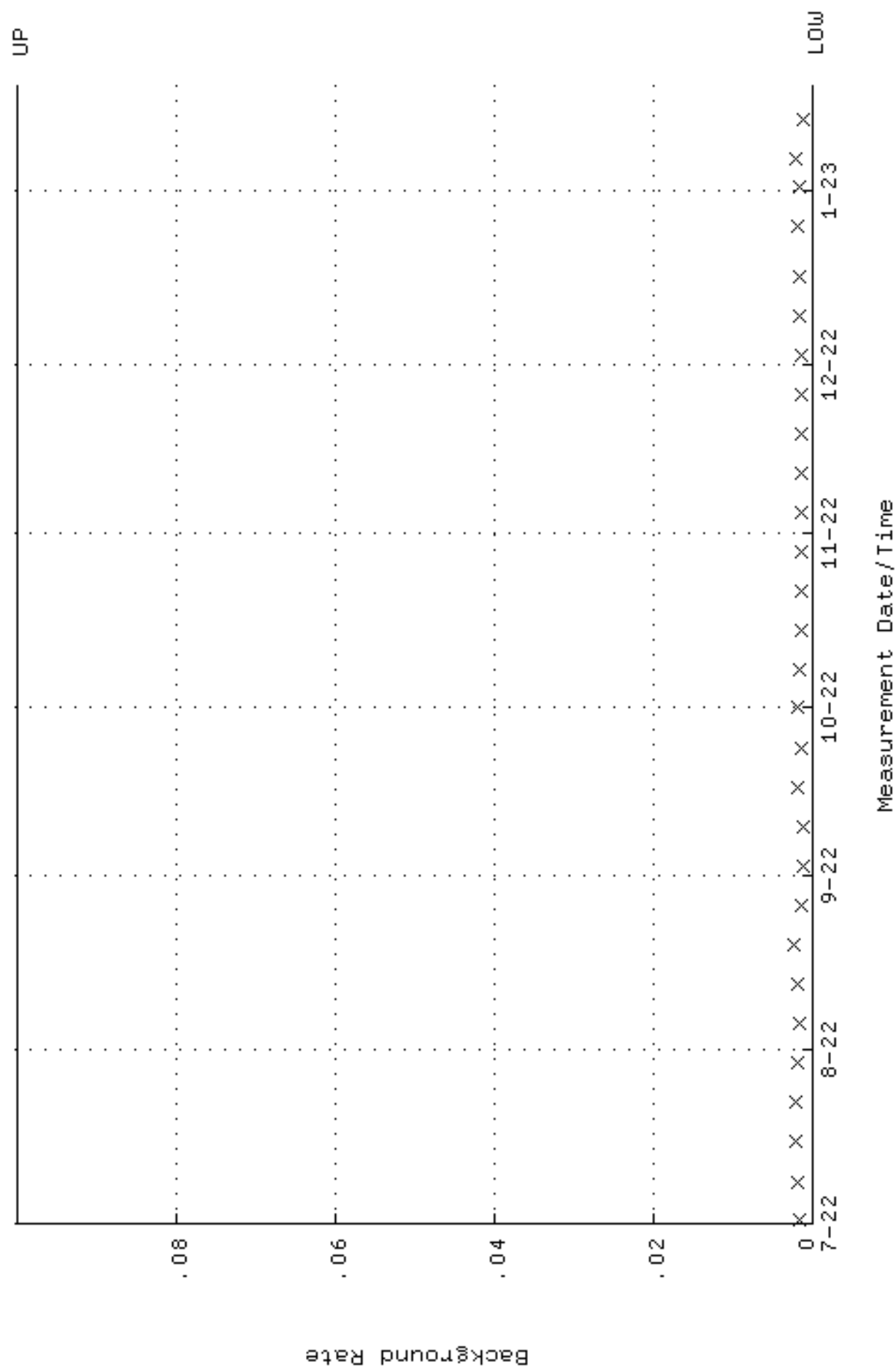
QA filename : DKA100:[ENV_ALPHA.QA.W]W192.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUL-2022 09:36:16 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



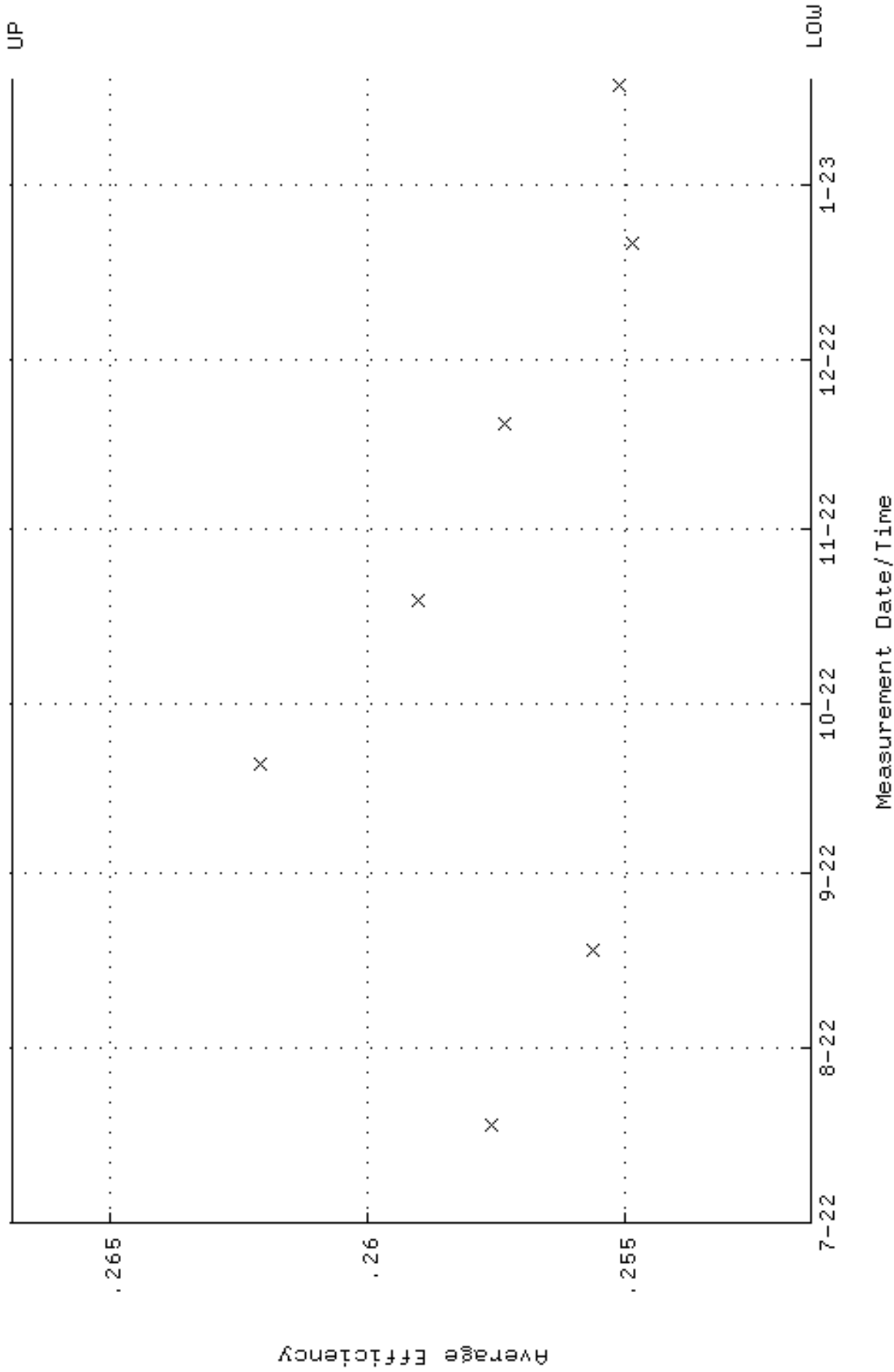
QA filename : DKA100:[ENV_ALPHA.QA.W]W192.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:16 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



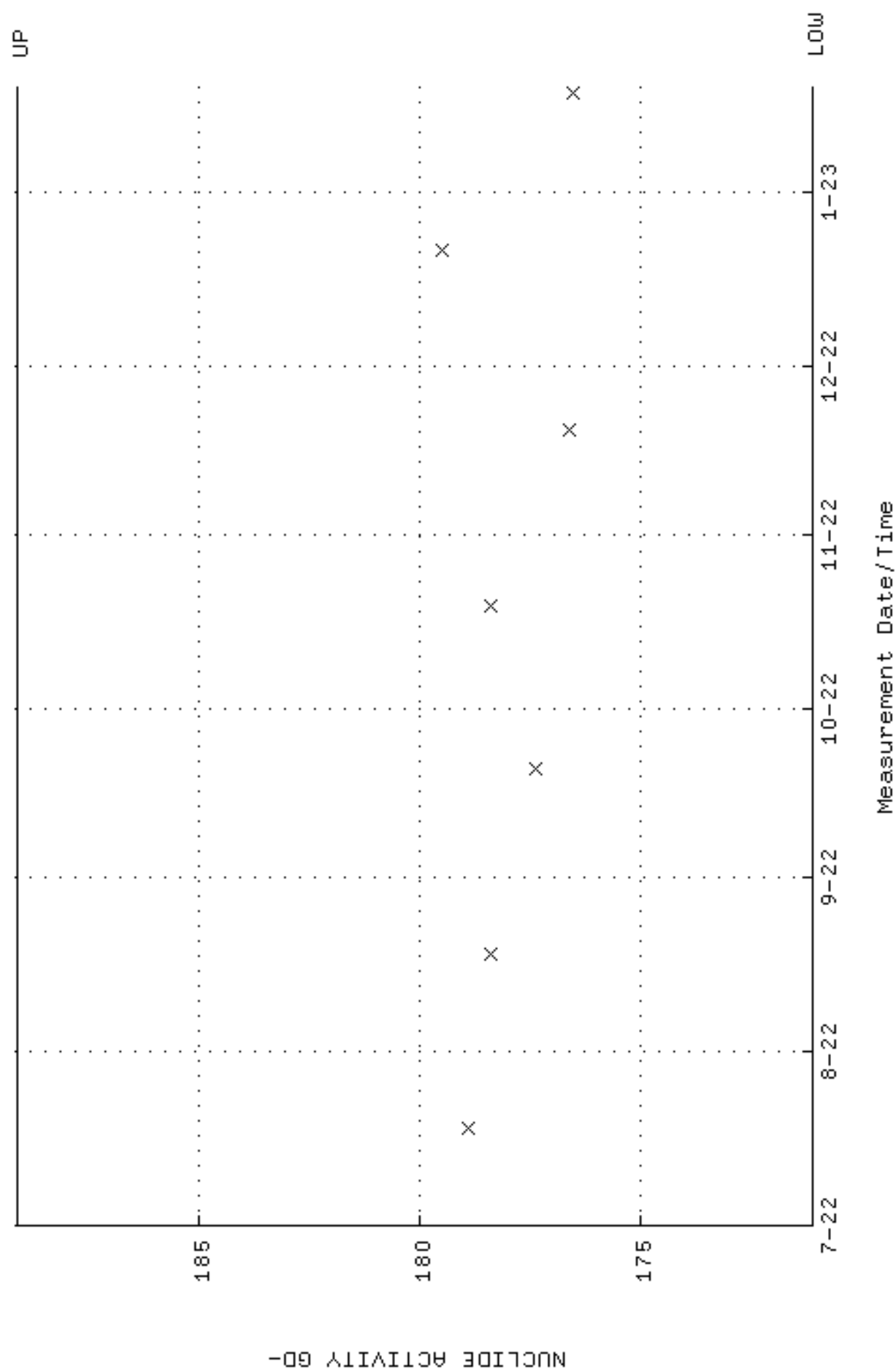
QA filename : DKA100:[ENV_ALPHA.QA.B]B192.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:45:28 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



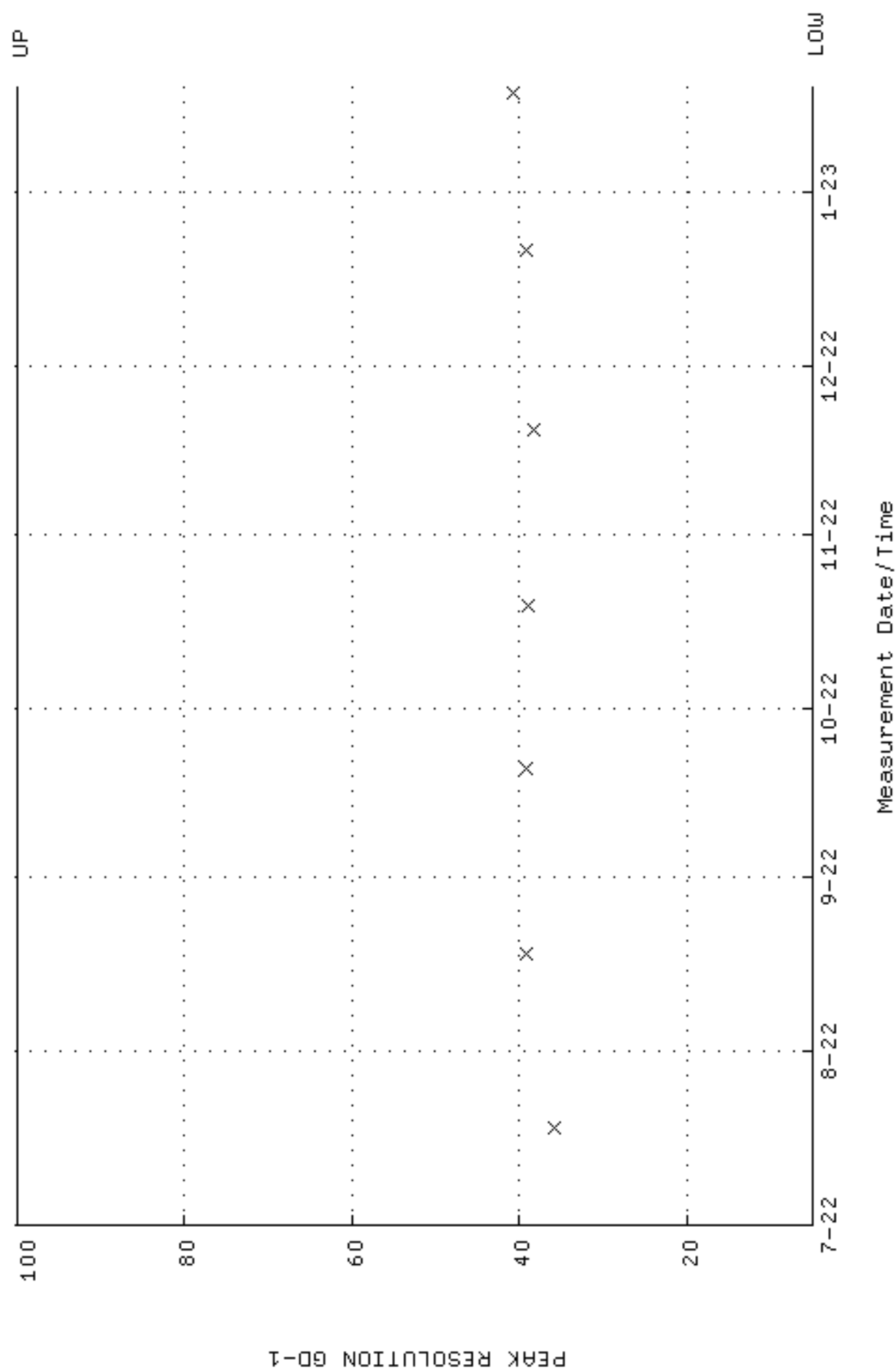
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 18-JUL-2022 09:36:24 through 19-JAN-2023 12:00:00
Lower/Upper Lmts: 0.251370 through 0.266910



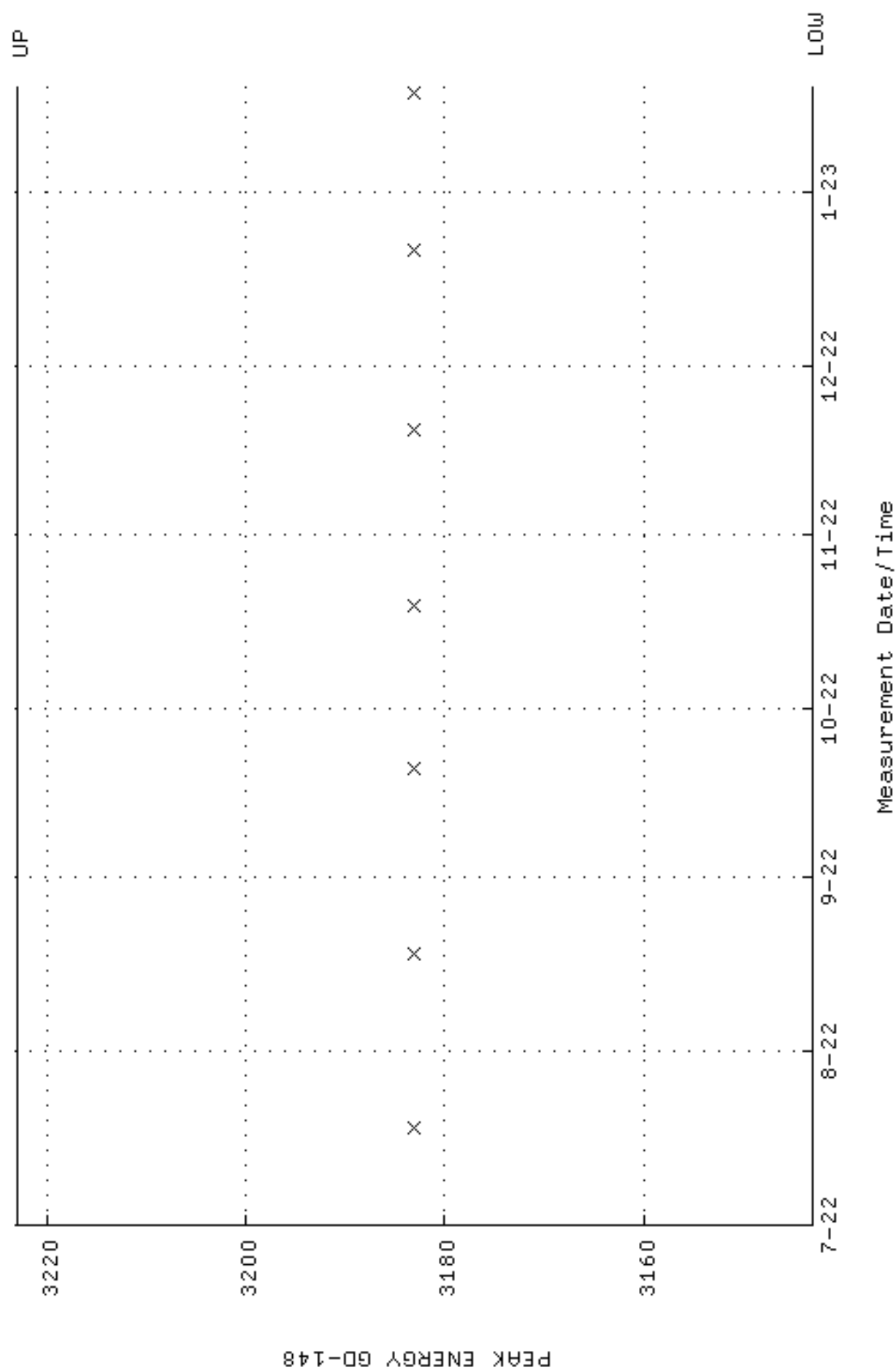
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:24 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



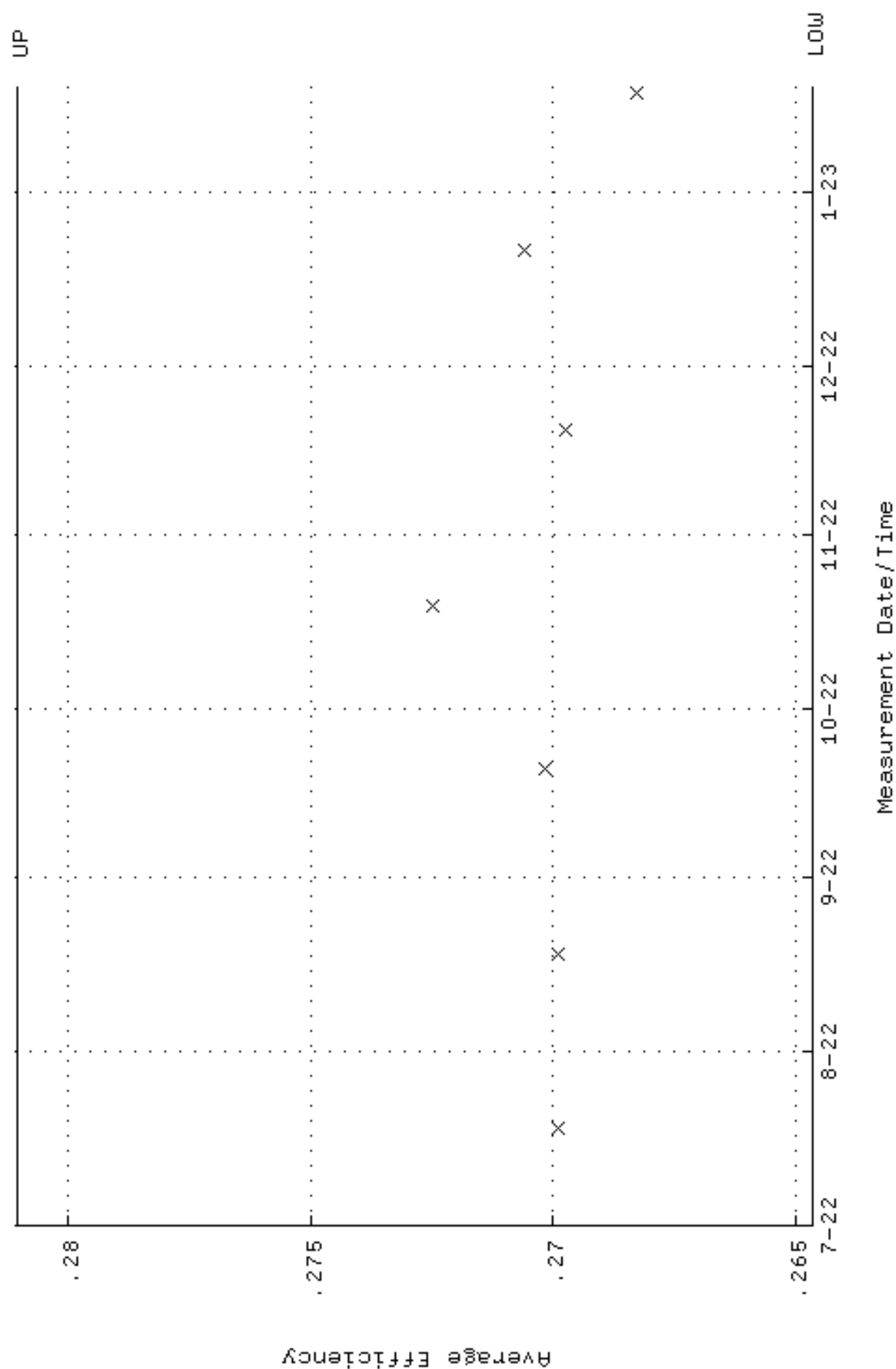
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUL-2022 09:36:24 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



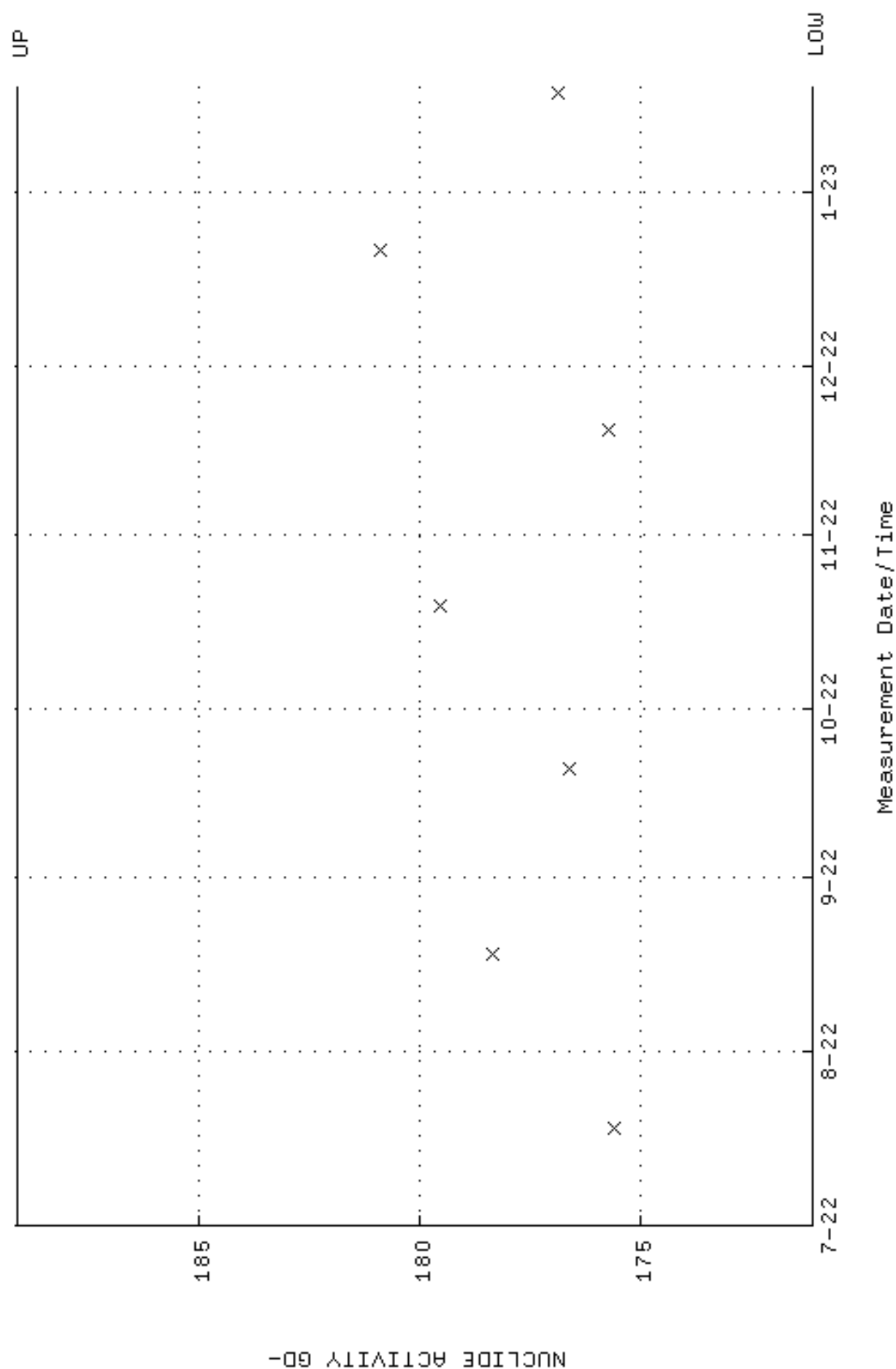
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:24 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



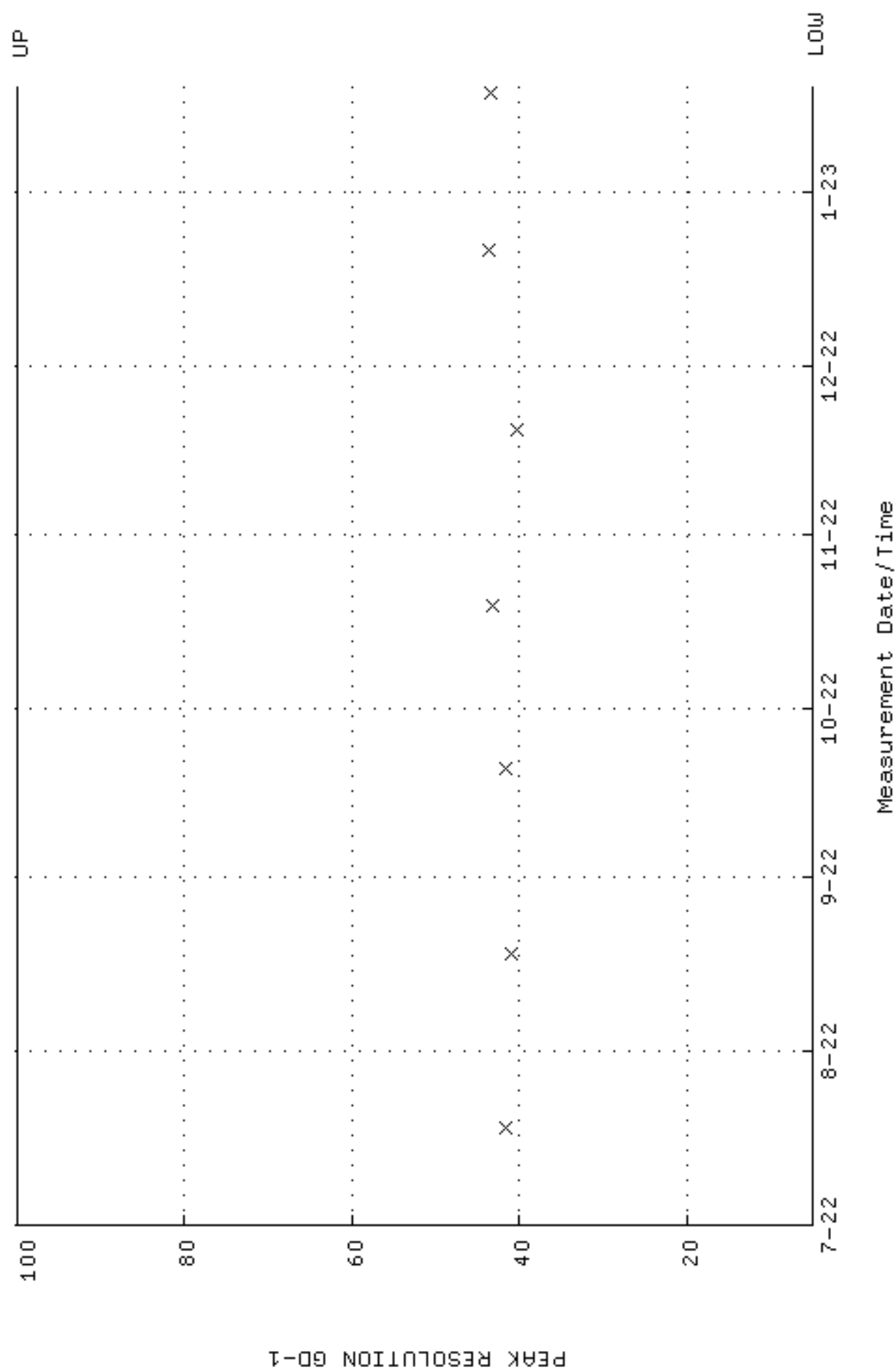
QA filename : DKA100:[ENV_ALPHA.QA.W]W195.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUL-2022 09:36:28 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.264660 through 0.281030



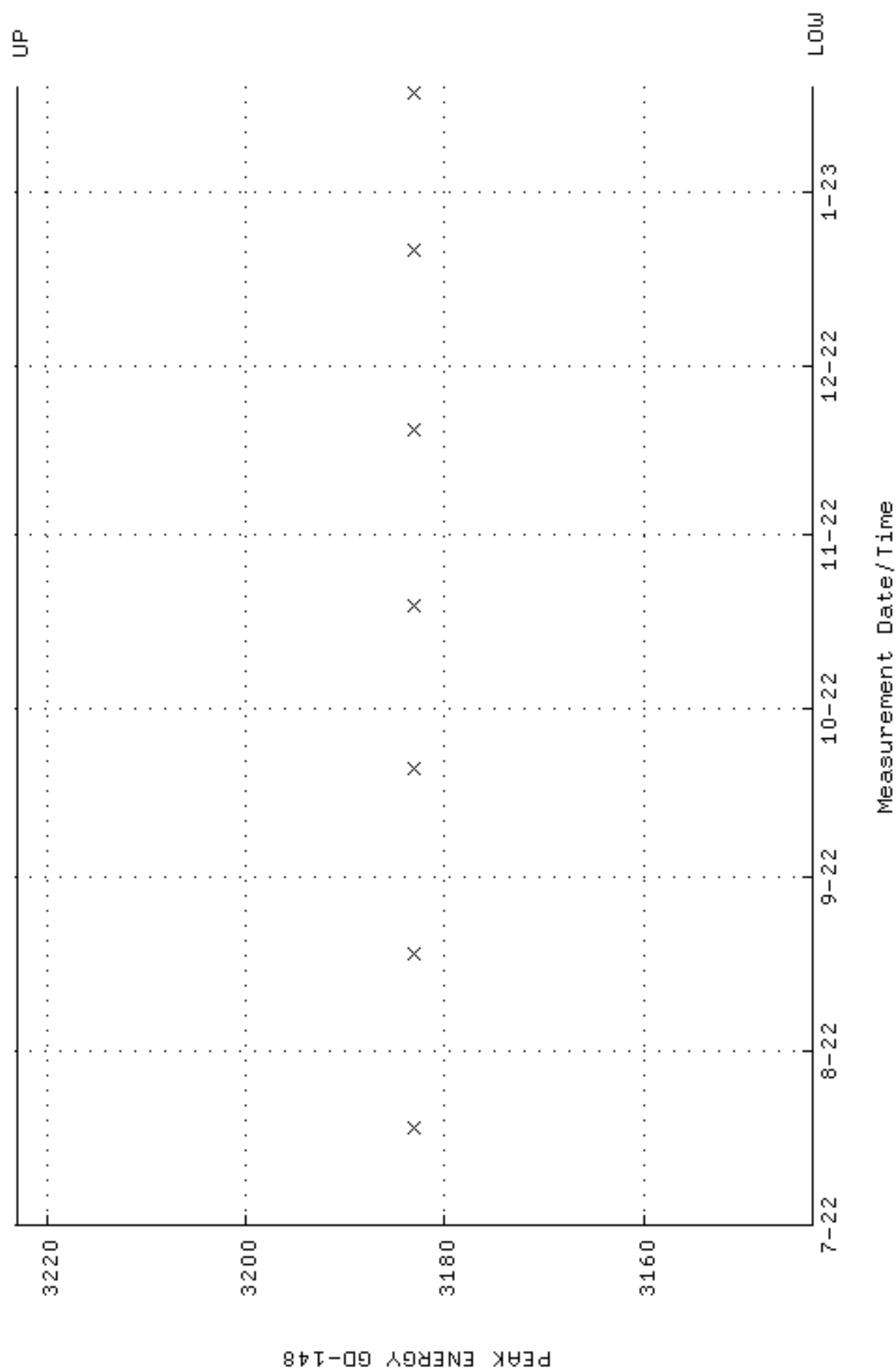
QA filename : DKA100:[ENV_ALPHA.QA.W]W195.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:28 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



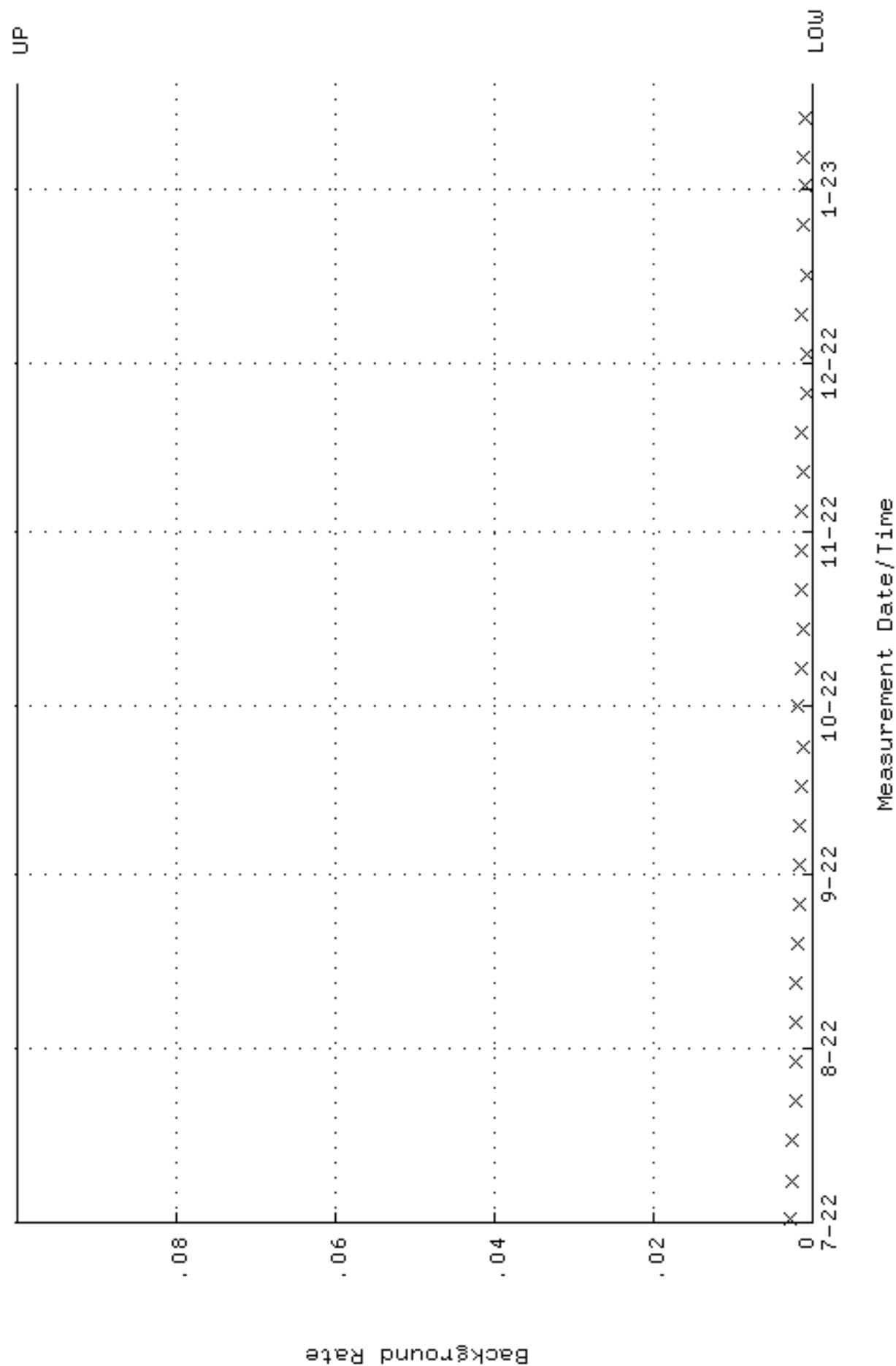
QA filename : DKA100:[ENV_ALPHA.QA.W]W195.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUL-2022 09:36:28 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



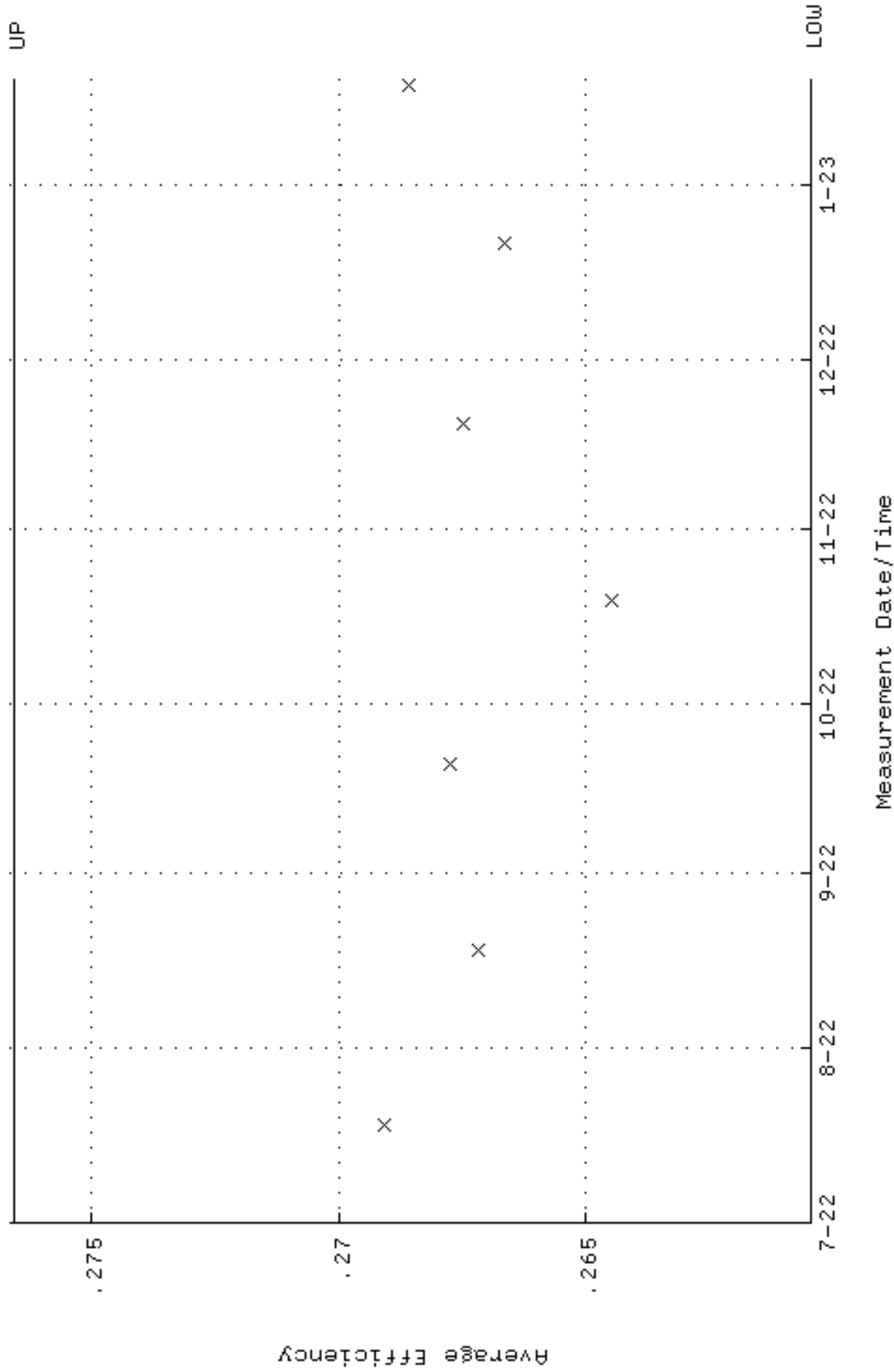
QA filename : DKA100:[ENV_ALPHA.QA.W]W195.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:28 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



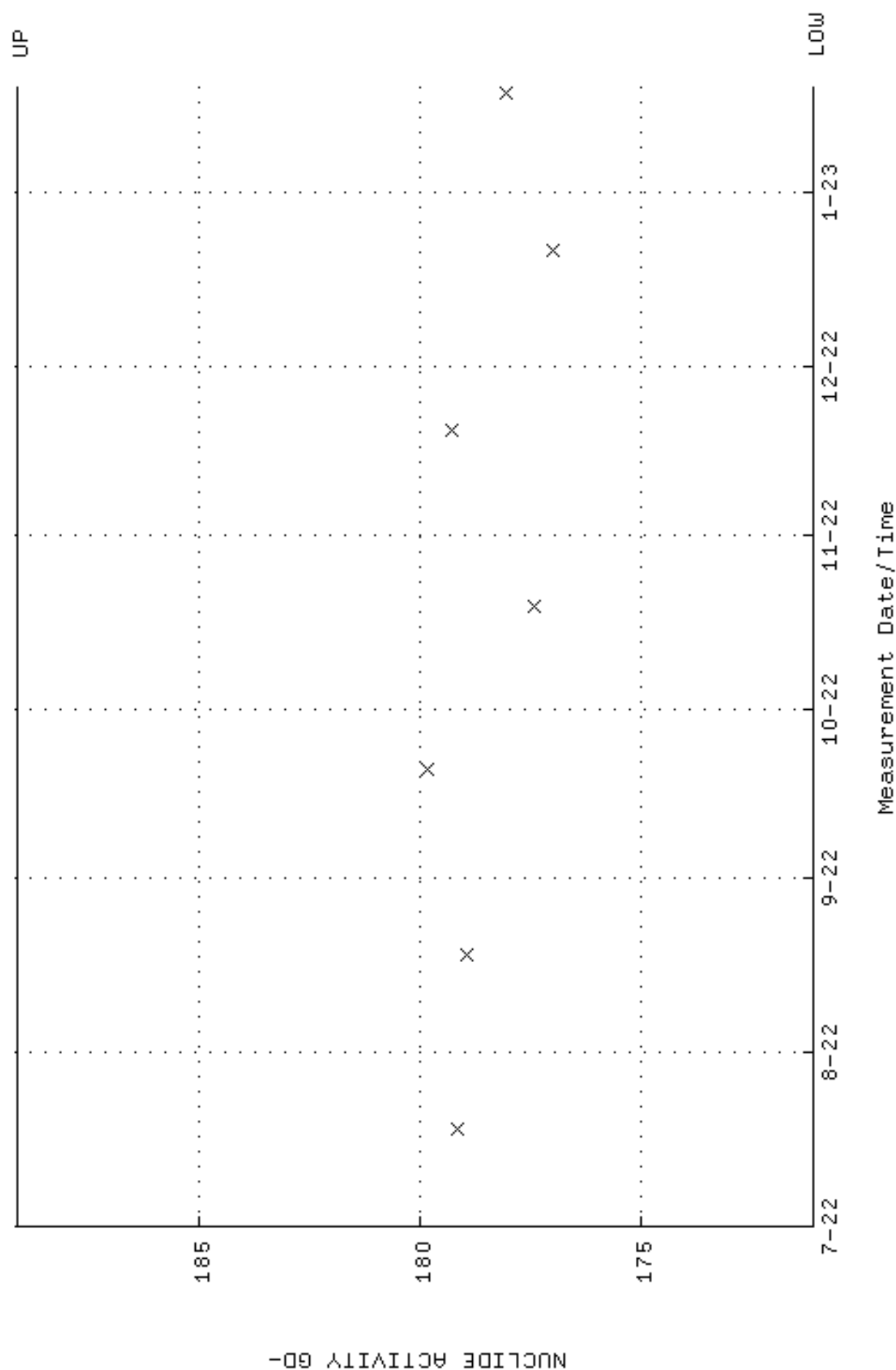
QA filename : DKA100:[ENV_ALPHA.QA.B]B195.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:45:41 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



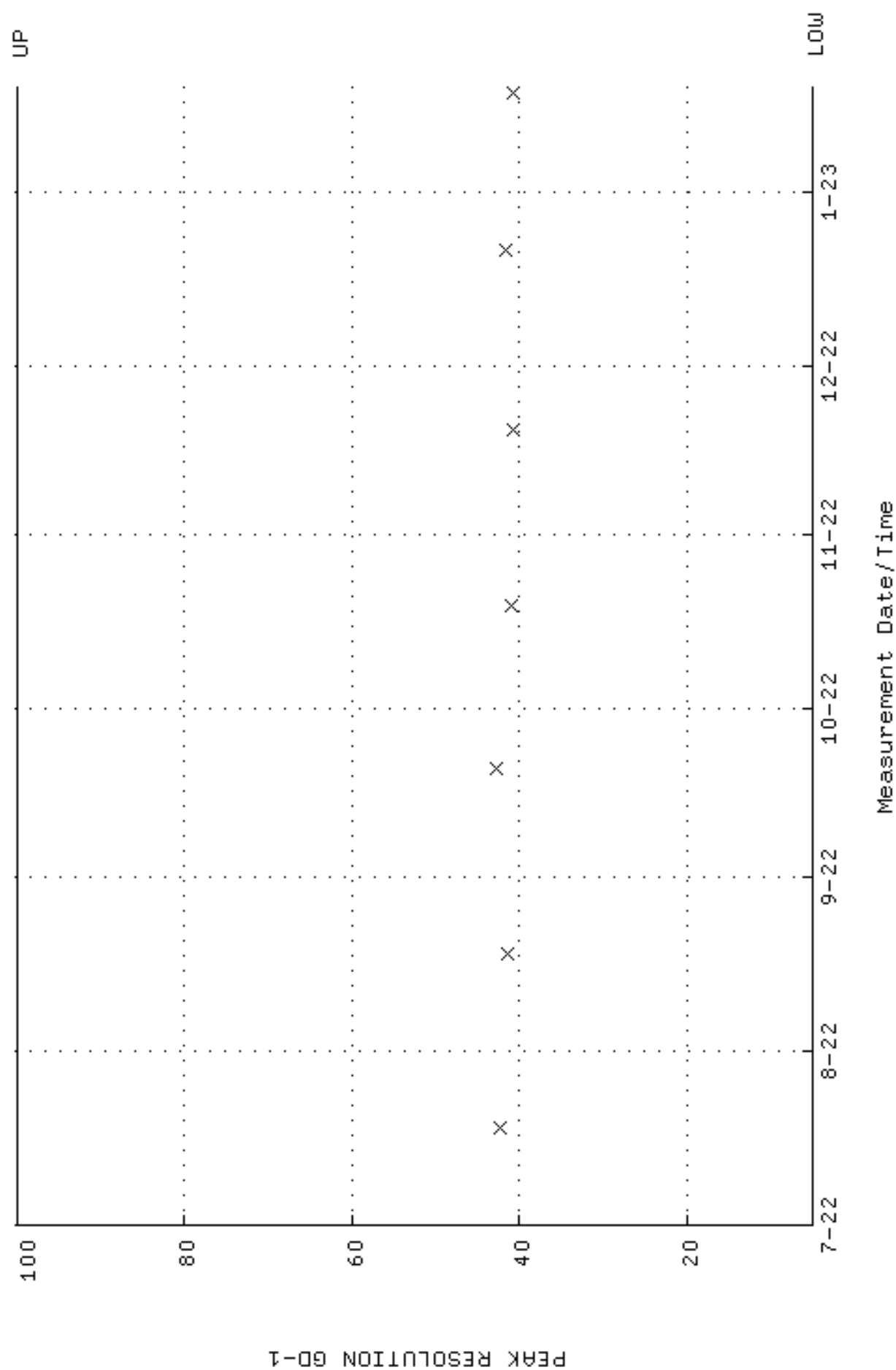
QA filename : DKA100:[ENV_ALPHA.QA.W]W196.QAF;4
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 18-JUL-2022 09:36:32 through 19-JAN-2023 12:00:00
Lower/Upper Lmts: 0.260470 through 0.276580



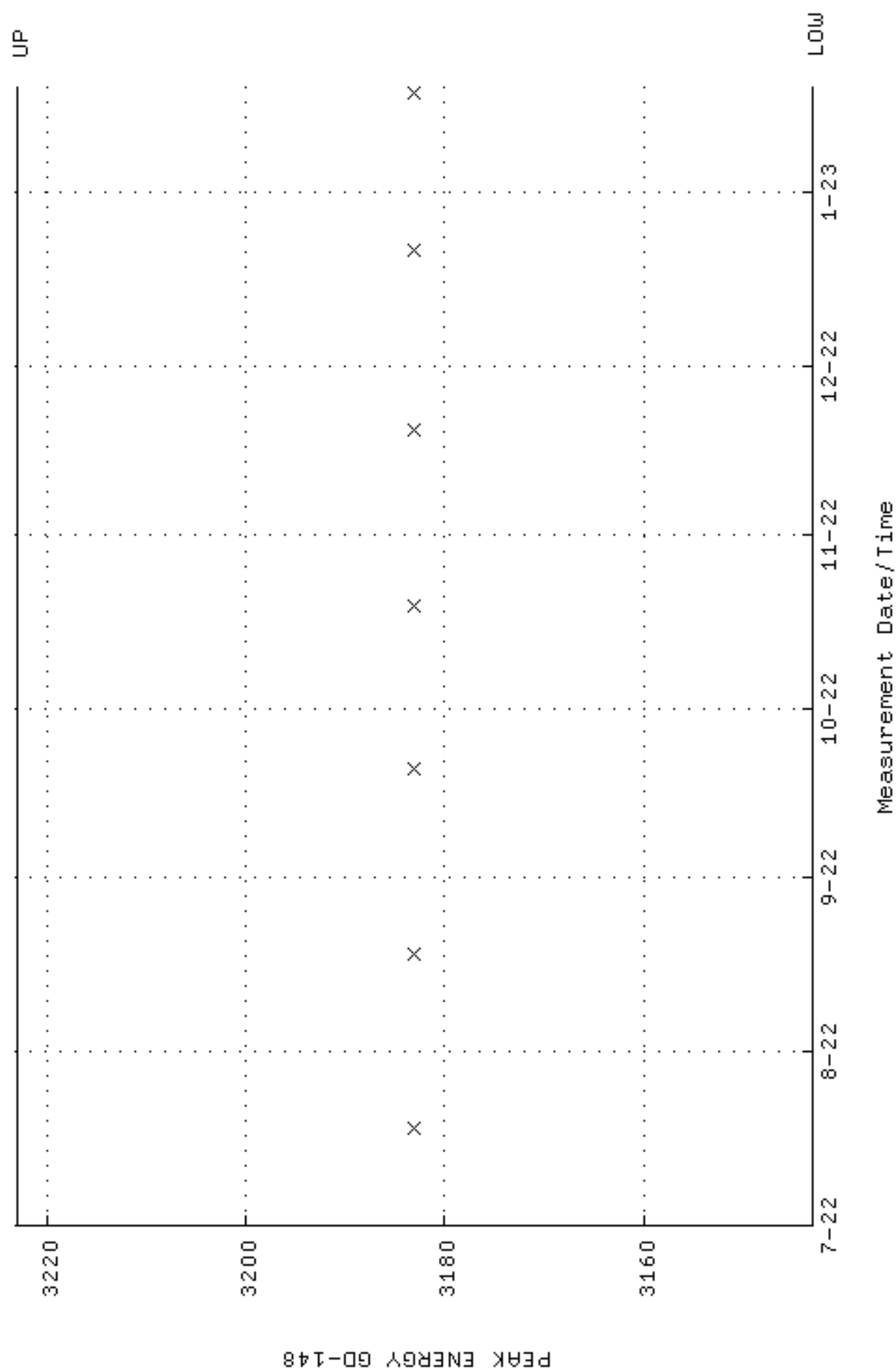
QA filename : DKA100:[ENV_ALPHA.QA.W]W196.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:32 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W196.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUL-2022 09:36:32 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



QA filename : DKA100:[ENV_ALPHA.QA.W]W196.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:32 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



RAD Standards Traceability

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

65338-278

Am-241 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Am-241
ACTIVITY (dps):	3.920 E4
HALF-LIFE:	4.322 E2 years
CALIBRATION DATE:	January 15, 2003 12:00 EST
TOTAL UNCERTAINTY*:	3.2%
SYSTEMATIC:	2.2%
RANDOM:	1.0%

*99% confidence level.

5.10649 grams 1M HCl solution.

Impurities: γ -impurities <0.1%
 α -impurities <0.1%

P O NUMBER 3213 RD, Item 1

SOURCE PREPARED BY: M. Taskaeva
M. Taskaeva, Radiochemist

Q A APPROVED:

UM [Signature] 1-16-03

RC-S-035-046a

Standard Logbook

Serial ID: 0533 **Open/Reference Date:** 15-JAN-03 **Aliquot :** 5.10649 g
Name: Americium-241 **Received:** 27-JAN-03 **Density :** Hand Calculated
Type: Source Material **Expires:** 05-FEB-20 **Logbook Num :** RC S 035 048
Employee: Angela Johnson **Lot Number :** 65338-278
Supplier: Analytics **Solvent :** 1 M HCL
Uncertainty : 1.25 percent
Description: 65338-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	39200 dps		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	0533
Prepared By:	Angela Johnson
Carrier Conc:	1 M HCL
Reference Date:	01/15/2003
Ampoule Mass (g):	5.10649 g
Uncertainty:	+/- 1.25 %
LogBook No:	RC S 035 048
Supplier:	Analytics

A Solution Material Info		
Isotope:	Americium-241	
Prepared By:	Angela Johnson	
Prep Date:	02/05/2003	
Verification Date:	07/08/2022	
Expiration Date:	07/08/2023	
Primary Code:	0533-A	
Dilution(mL):	100 mL	
Mass of Parent(g):	4.8225 g	
Density(g/mL):	1.0139	Balance ID:

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (5.10649 \text{ g} * 100 \text{ mL}) = 22211.9695 \text{ dpm/mL}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (1.0139 \text{ g/mL}) / (5.10649 \text{ g} * 100 \text{ mL}) = 21907.2185 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/20/2003	Angela Johnson	1.0151	100	0533-B	222.38 dpm/mL	03/01/2006	03/01/2007
01/16/2015	Christina Kimball	.005081	500	0533-BB	.22263 dpm/mL	01/14/2016	01/14/2017
02/20/2003	Angela Johnson	.6819	250	0533-C	59.754 dpm/mL	02/20/2004	02/20/2005
05/04/2015	Tim Chandler	1.02	500	0533-CC	44.6907 dpm/mL	04/17/2017	04/17/2018
05/07/2003	Tim Chandler	.1245	100	0533-D	27.2745 dpm/mL	05/03/2004	05/03/2005
01/22/2016	Christina Kimball	.103	500	0533-DD	4.51289 dpm/mL	01/03/2022	01/03/2024
09/10/2004	Amanda Fehr	.6933	250	0533-E	60.753 dpm/mL	09/10/2005	09/10/2006
10/31/2016	Christina Kimball	.00508	500	0533-EE	.22259 dpm/mL	10/30/2017	10/30/2018

12/17/2004	Brenda Burke	.0093	100	0533-F	2.0374 dpm/mL	12/20/2004	12/20/2005
10/13/2017	Tim Chandler	1.0219	500	0533-FF	44.774 dpm/mL	10/01/2019	10/01/2020
12/21/2004	Brenda Burke	.009273	100	0533-G	2.0315 dpm/mL	12/07/2005	12/07/2006
11/13/2017	Christina Kimball	.00507	500	0533-GG	.2222 dpm/mL	11/09/2018	11/09/2019
04/28/2005	Brenda Burke	.1347	100	0533-H	29.4598 dpm/mL	04/27/2006	04/27/2007
01/23/2018	Tim Chandler	1.2536	100	0533-HH	274.6289 dpm/mL	01/23/2018	01/23/2019
10/19/2005	Mary Aders	.6948	250	0533-I	60.7831 dpm/mL	10/18/2006	10/18/2007
01/30/2020	Tim Chandler	1.0284	500	0533-II	45.0588 dpm/mL	01/18/2022	01/18/2023
05/08/2006	Julie Strock	.0711	100	0533-J	15.576 dpm/mL	05/10/2008	05/10/2009
07/08/2022	Matelon DeFreese	1.0349	500	0533-JJ	45.3435609 dpm/mL	07/18/2022	07/18/2023
05/11/2006	Brenda Burke	.00092601	100	0533-K	.20286 dpm/mL	08/02/2007	07/28/2007
11/15/2006	Tara Sides	.132	1000	0533-L	2.88586 dpm/mL	09/15/2015	09/15/2016
06/12/2007	Julie Strock	.000979	100	0533-M	.21448 dpm/mL	05/20/2009	05/20/2010
08/03/2007	Daniel Roy	.7042	250	0533-N	61.7083 dpm/ml	08/02/2008	08/02/2009
09/25/2008	Daniel Roy	1.4561	500	0533-O	63.7982 dpm/ml	09/07/2010	09/07/2011
09/29/2008	Tara Sides	.1004	100	0533-P	21.9948 dpm/mL	09/07/2010	09/07/2011
06/03/2009	Julie Strock	.0009751	100	0533-Q	.2136 dpm/mL	06/01/2010	06/01/2011
11/08/2010	Ashley Drochter	1.4675	500	0533-R	64.2977 dpm/mL	11/08/2010	11/08/2011
11/09/2010	Ashley Drochter	.7295	500	0533-S	31.9626 dpm/mL	10/31/2011	10/31/2012
01/03/2011	Christina Kimball	.097	100	0533-T	21.25 dpm/mL	01/03/2011	01/03/2012
01/05/2011	Christina Kimball	.1009	100	0533-U	22.10438 dpm/mL	12/18/2013	12/18/2014
05/23/2011	Christina Kimball	.001008999	100	0533-V	.2210438 dpm/mL	05/11/2012	05/11/2013
05/11/2012	Christina Kimball	.001016	100	0533-W	.222676 dpm/mL	05/01/2014	05/01/2015

06/13/2012	Ashley Drochter	.728	500	0533-X	31.8969 dpm/mL	06/02/2014	06/02/2015
01/23/2013	Salina Pizarro	2	500	1641	.1498555 dpm/mL	12/19/2013	12/01/2038
07/16/2013	Julie Strock	1	500	1641-A	.07492775 dpm/mL	07/16/2038	07/16/2039
03/17/2014	Christina Kimball	.1013	100	0533-Y	22.19201 dpm/mL	02/26/2019	02/26/2020
05/05/2014	Christina Kimball	.00101595	100	0533-Z	.222567 dpm/mL	05/05/2014	05/05/2015

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Am-243 Standard 0533-JJ

v1.2

Analyst	MXS2
Verification Prep Date	7/18/2022

Tracer Information	
Isotope	Cm-244
Serial Number	1216-N2
Amount of Std. (mL)	0.2
Expiration Date	4/7/2023

Standard Information	
Isotope	Am-243
Serial Number	0533-JJ
Isotope Halflife	7.3700E+03 Y
Reference Date	1/15/2003
Ref. Act. (dpm/mL)	45.3435609
Amount of Std. (mL)	0.2
Standard Prep Date	7/8/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	7/21/2022	3.880	43.07
2	7/23/2022	3.980	44.18
3	7/21/2022	3.790	42.07

Mean Value = 3.883 43.105
Stdev = 0.09504385 1.05498673

	pCi	dpm/mL
Certificate Value* =	4.0775	45.2605
Two sigma =	0.1901	2.1100
10 % of Mean =	0.3883	4.3105
Rule A (Pass/Fail)	Pass	Pass
% Recovery	95.24%	95.24%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	7/18/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Am-243 standard 0533-JJ using 0.2 mL for each source. Each standard was combined with 0.2 mL of Cm-244 standard 1216-N2 and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water 0.1mL of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-243 were calculated by comparison to Cm-244 certified values.

Handwritten signature
7/25/22

CERTIFICATE OF CALIBRATION
Standard Reference Source

1752

101294

Am-243 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL1511998, Item 1 **Product Code:** 8243



This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
Am-243	2.692E+06	3.809E+04	0.5	1.8	3.7	09/01/2015

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

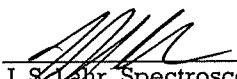
Comments:

Impurities: γ -impurities (other than decay products) < 0.1%.
5.10528 g 1M HCl solution, carrier free.

Source Prepared by:


Z. Dimitrova, Radiochemist

QC Approved:


J. S. Lehr, Spectroscopist

Date: 28 AUG 15

Standard Logbook

Serial ID: 1752 **Open/Reference Date:** 01-SEP-15 **Aliquot :** 5.10528 g
Name: Americium-243 **Received:** 01-SEP-15 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18-SEP-25 **Logbook Num :** GL-CED-297-045
Employee: Gregory Ramsay **Lot Number :** 101294
Supplier: Eckert & Ziegler **Solvent :** 1M HCl
Uncertainty : 1.85 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-243	38090 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1752
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HCl
Reference Date:	09/01/2015
Ampoule Mass (g):	5.10528 g
Uncertainty:	+/- 1.85 %
LogBook No:	GL-CED-297-045
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Americium-243		
Prepared By:	Tim Chandler		
Prep Date:	11/23/2015		
Verification Date:	01/06/2017		
Expiration Date:	01/20/2022		
Primary Code:	1752-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0826 g		
Density(g/mL):	1.0282	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22752.4720 \text{ dpm/mL}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0282 \text{ g/mL}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22128.4498 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/23/2015	Tim Chandler	1.0432	500	1752-B	46.1688 dpm/mL	11/24/2015	11/23/2016
05/26/2016	Tim Chandler	1.072	500	1752-C	47.4434 dpm/mL	05/26/2016	05/26/2017
01/06/2017	Tim Chandler	2.1043	1000	1752-D	46.5649 dpm/mL	12/20/2017	12/20/2018
05/30/2018	Tim Chandler	2.3853	1000	1752-E	52.783 dpm/mL	05/21/2019	05/21/2020
08/05/2019	Tim Chandler	2.2432	1000	1752-F	49.6385 dpm/mL	08/03/2020	08/03/2021
08/12/2020	Tim Chandler	2.2247	1000	1752-G	49.2292 dpm/mL	08/12/2020	08/12/2021
06/18/2021	Tim Chandler	2.2608	1000	1752-H	50.028 dpm/mL	06/18/2021	06/18/2022
01/20/2022	Matelon DeFreese	2.0841	1000	1752-I	46.1179022 dpm/mL	01/21/2022	01/21/2023
09/06/2022	Matelon DeFreese	2.1013	1000	1752-J	46.4985116 dpm/mL	09/06/2022	09/06/2023

Verification for Am-243 Standard 1752-J

v1.2

Analyst	MXS2
Verification Prep Date	9/6/2022

Tracer Information	
Isotope	Am-241
Serial Number	0533-JJ
Amount of Std. (mL)	0.2
Expiration Date	7/18/2023

Standard Information	
Isotope	Am-243
Serial Number	1752-J
Isotope Halflife	7.3700E+03 Y
Reference Date	9/1/2015
Ref. Act. (dpm/mL)	46.4985116
Amount of Std. (mL)	0.2
Standard Prep Date	9/6/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	9/7/2022	4.280	47.51
2	9/8/2022	4.310	47.84
3	9/8/2022	4.200	46.62

Mean Value = 4.263 47.323
Stdev = 0.056862407 0.631172718

	pCi	dpm/mL
Certificate Value* =	4.1863	46.4678
Two sigma =	0.1137	1.2623
10 % of Mean =	0.4263	4.7323
Rule A (Pass/Fail)	Pass	Pass
% Recovery	101.84%	101.84%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	9/6/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Am-243 standard 1752-J using 0.2 mL for each source. Each standard was combined with 0.2 mL of Am-241 standard 0533-JJ and was diluted in a centrifuge tube containing 20 mL 3M HCl, diluted to 40 mL with DI water. 0.1 mL of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-243 were calculated by comparison to Am-241 certified values.

Signature
9/14/22



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010

Fax 661•257•8303

1521

CERTIFICATE OF CALIBRATION GAMMA STANDARD SOLUTION

Radionuclide:	Pb-210	Customer:	GENERAL ENGINEERING LABS.
Half-life:	22.3 ± 0.2 years	P.O. No.:	936803 RD
Catalog No.:	7210	Reference Date:	15-Feb-11 12:00 PST
Source No.:	1476-99	Contained Radioactivity:	4.973 μCi 184.0 kBq

Physical Description:

A. Mass of solution:	5.21292 g in 5 mL flame-sealed ampoule
B. Chemical form:	Pb(NO ₃) ₂ in 1M HNO ₃
C. Carrier content:	10 μg Pb/mL of solution
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.9540 μCi/g, 35.30 kBq/g

Method of Calibration:

This source was prepared from a weighed aliquot of solution whose activity in μCi/g was determined using gamma ray spectrometry.

Peak energy used for integration:	46.5 keV
Branching ratio used:	0.0418 gammas per decay

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5 %
B. Type B (systematic) uncertainty:	± 7.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 7.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.



Daniel James Van Dalsem
Quality Control

11-Jan-11
Date

EZIP Ref. No.: 1476-99

ISO 9001 CERTIFIED

Medical Imaging Laboratory

Industrial Gauging Laboratory

Standard Logbook

Serial ID: 1521 **Open/Reference Date:** 15-FEB-11 **Aliquot :** 5.21292 g
Name: Lead-210 **Received:** 14-JAN-11 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 02-MAR-13 **Logbook Num :** RC-S-060-066
Employee: Gregory Ramsay **Lot Number :** 1426-99
Supplier: Eckert & Ziegler **Solvent :** 1M HNO₃
 Uncertainty : 7 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Lead-210	35.3 kBq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1521
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	02/15/2011
Ampoule Mass (g):	5.21292 g
Uncertainty:	+/- 7 %
LogBook No:	RC-S-060-066
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Lead-210		
Prepared By:	Bethany Fiem		
Prep Date:	03/22/2011		
Verification Date:	12/03/2020		
Expiration Date:	12/23/2021		
Primary Code:	1521-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0705 g		
Density(g/mL):	1.0272	Balance ID:	1113021018

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 107393.1900 \text{ dpm/mL}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0272 \text{ g/mL}) / (100 \text{ mL}) = 104549.4451 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/07/2013	Ashley Drochter	.5177	100	1521-B	541.2525 dpm/mL	10/29/2013	10/29/2014
10/29/2013	Tim Chandler	5.1002	100	1521-C	5332.2308 dpm/mL	08/09/2018	08/09/2019
02/01/2019	Jennie Kill-Bowden	5.0359	100	1521-D	5265.0055 dpm/mL	11/29/2022	11/29/2023
06/05/2018	Tim Chandler	.6059	200	1867-A		06/06/2018	06/05/2019
06/14/2018	Tim Chandler	.6646	200	1867-B		06/15/2018	06/14/2019
06/14/2018	Tim Chandler	.6646	200	1868-A		06/14/2018	06/14/2019
06/13/2019	Tim Chandler	.6984	200	1907-A		06/15/2021	06/15/2022
06/13/2019	Tim Chandler	.6984	200	1907-A1		06/15/2021	06/15/2022
11/06/2019	Tim Chandler	15.0553	100	1920-A		11/07/2019	11/07/2020
12/14/2021	Matelon DeFreese	.6276	200	2012-A		11/23/2022	11/05/2023

Verification for Po-210 Standard 2012-A

v1.2

Analyst	MXS2
Verification Prep Date	11/23/2022

Tracer Information	
Isotope	Po-209
Serial Number	1720-D
Amount of Std. (mL)	0.2
Expiration Date	3/7/2023

Standard Information	
Isotope	Po-210
Serial Number	2012-A
Isotope Halflife	138.3800 D
Reference Date	12/14/2021
Ref. Act. (dpm/mL)	233.932217
Amount of Std. (mL)	0.2
Standard Prep Date	12/14/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	11/27/2022	3.960	43.96
2	11/27/2022	3.910	43.40
3	11/27/2022	3.880	43.07

Mean Value = 3.917 43.475
Stdev = 0.040414519 0.448601159

	pCi	dpm/mL
Certificate Value* =	3.7621	41.7597
Two sigma =	0.0808	0.8972
10 % of Mean =	0.3917	4.3475
Rule A (Pass/Fail)	Pass	Pass
% Recovery	104.11%	104.11%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	11/5/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-210 standard 2012-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-209 standard 1720-D and was diluted in a centrifuge tube containing 15 mL of 0.05M HNO₃. Precipitated by adding 0.1mL of 30% H₂O₂, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-210 were calculated by comparison to Po-209 certified values.



CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

82308-278

Pu-239 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: 7340 RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u_A	u_B	U	
Pu-239	8.803E+06	3.758E+04	0.1	0.9	1.8	05/07/2010

***Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities < 0.1 %, α -impurities < 0.1 %, Am-241 330.1 Bq. 5.56111 g 3M HNO₃ solution, carrier free.

Source Prepared by: W. Mao

W. Mao, Radiochemist

QA Approved: J. D. McCorvey

J. D. McCorvey, QA Manager Alternate

Date: 5/10/10



Standard Logbook

Serial ID: 1472 **Open/Reference Date:** 07-MAY-10 **Aliquot :** 5.56111 g
Name: Plutonium-239 **Received:** 12-MAY-10 **Density :** Hand Calculated
Type: Source Material **Expires:** 03-JUN-30 **Logbook Num :** RC-S-060-019
Employee: Ashley Drochter **Lot Number :** 82308-278
Supplier: Eckert & Zeigler Analytics **Solvent :** 3M HNO₃
 Uncertainty : .9 PERCENT

Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-239	37580 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1472
Prepared By:	Ashley Drochter
Carrier Conc:	3M HNO3
Reference Date:	05/07/2010
Ampoule Mass (g):	5.56111 g
Uncertainty:	+/- .9 %
LogBook No:	RC-S-060-019
Supplier:	Eckert & Zeigler Analytics

A Solution Material Info			
Isotope:	Plutonium-239		
Prepared By:	Julie Strock		
Prep Date:	10/20/2020		
Verification Date:	08/17/2021		
Expiration Date:	08/17/2022		
Primary Code:	1472-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.5071 g		
Density(g/mL):	1.1056	Balance ID:	BIOFA-B952846238

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.56111 \text{ g} * 100 \text{ mL}) = 22329.0118 \text{ dpm/mL}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.1056 \text{ g/mL}) / (5.56111 \text{ g} * 100 \text{ mL}) = 20195.4985 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
10/20/2020	Julie Strock	.0117	1000	1472-B	.2363 dpm/mL	10/14/2021	10/14/2022
08/17/2021	Tim Chandler	1.1318	500	1472-C	45.7145 dpm/mL	08/11/2022	08/11/2023
04/07/2022	Christina Kimball	.01	1000	1472-D	.20195 dpm/mL	04/07/2022	04/07/2023
04/15/2022	Christina Kimball	.011283	1000	1472-E	.2279 dpm/mL	04/15/2022	04/15/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-239 Standard 1472-C

v1.2

Analyst	MXS2
Verification Prep Date	8/11/2022

Tracer Information	
Isotope	Pu-242
Serial Number	2021-A
Amount of Std. (mL)	0.2
Expiration Date	7/19/2023

Standard Information	
Isotope	Pu-239
Serial Number	1472-C
Isotope Halflife	2.4131E+04 Y
Reference Date	5/7/2010
Ref. Act. (dpm/mL)	45.7145
Amount of Std. (mL)	0.2
Standard Prep Date	8/17/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	8/11/2022	3.960	43.96
2	8/11/2022	4.190	46.51
3	8/15/2022	4.220	46.84

Mean Value = 4.123 45.769
Stdev = 0.142243922 1.578907534

	pCi	dpm/mL
Certificate Value* =	4.1170	45.6984
Two sigma =	0.2845	3.1578
10 % of Mean =	0.4123	4.5769
Rule A (Pass/Fail)	Pass	Pass
% Recovery	100.15%	100.15%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	8/11/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-239 standard 1472-C using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-242 standard 2021-A and was diluted in a centrifuge tube containing 20 mL of 0.1M HCl, diluted to 40 mL with DI water. 0.1 mL of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-239 were calculated by comparison to Pu-242 certified values.

Handwritten signature



National Institute of Standards & Technology

Certificate

2044

Standard Reference Material® 4334j

Received
8-18-22

Plutonium-242 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}$.

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterwiesing, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

Steven J. Choquette, Director
Office of Reference Materials

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq•g⁻¹(a)
Relative expanded uncertainty ($k = 2$)	0.51 %^(b)

(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

(b) The uncertainties on certified values are expanded uncertainties, $U = k u_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

GL-CEA-297-3366

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ^{-1(a,b,c,d)}
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ^{-1(a,d)}
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π α liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

(a) The stated uncertainty is two times the standard uncertainty [5].

(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

- 0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,
- 0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and
- 0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclidic impurities follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ^{-6 (3)}	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ^{-5 (3)}	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

- 1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,
- 6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,
- 5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,
- 4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV
- 4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV
- 6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and
- 3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

(f) The stated uncertainty is the standard uncertainty. See reference 6.

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ²⁴² Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	²⁴² Pu decay corrections for half-life uncertainty of 0.22 %.	B	< 10 ⁻¹⁰
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty (k = 2)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utls/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utls/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utls/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

Standard Logbook

Serial ID: 2044 **Open/Reference Date:** 09-AUG-17 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 18-AUG-22 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 22-AUG-35 **Logbook Num :** GL-CED-297-336
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
 Uncertainty : .255 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2044
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO3
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-336
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	10/19/2022		
Verification Date:	10/19/2022		
Expiration Date:	10/19/2023		
Primary Code:	2044-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.3655 g		
Density(g/mL):	1.0314	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.3655 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 41.9797 \text{ dpm/mL}$
$(5.3655 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0314 \text{ g/mL}) / (200 \text{ mL}) = 40.7016 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
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GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2044-A

v1.2

Analyst	MXS2
Verification Prep Date	10/19/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.2
Expiration Date	8/11/2023

Standard Information	
Isotope	Pu-242
Serial Number	2044-A
Isotope Halflife	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	41.9797
Amount of Std. (mL)	0.2
Standard Prep Date	10/19/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	10/23/2022	3.830	42.51
2	10/24/2022	4.020	44.62
3	10/23/2022	3.850	42.74

Mean Value = 3.900 43.290
Stdev = 0.104403065 1.158874022

	pCi	dpm/mL
Certificate Value* =	3.7819	41.9793
Two sigma =	0.2088	2.3177
10 % of Mean =	0.3900	4.3290
Rule A (Pass/Fail)	Pass	Pass
% Recovery	103.12%	103.12%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	10/19/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2044-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. Added 0.1mL of neodymium carrier and 3-4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

10/19/22



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661-309-1010

Fax 661-257-8303

1720

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Po-209	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	102 ± 5 years	P.O. No.:	GEL1408569	
Catalog No.:	7209	Reference Date:	1-Oct-14	12:00 PST
Source No.:	1760-53-1	Contained Radioactivity:	0.05281 µCi	1.954 kBq

Physical Description:

A. Mass of solution:	5.21650 g in 5 mL flame-sealed ampoule
B. Chemical form:	Po(NO ₃) ₄ in 1M HNO ₃
C. Carrier content:	None
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.01012 µCi/g, 0.3744 kBq/g

Method of Calibration:

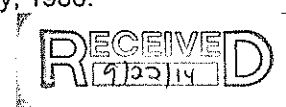
This source was prepared from a weighed aliquot of solution whose activity in µCi/g was determined using a liquid scintillation counter.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.4 %
D. Total uncertainty at the 99% confidence level:	± 3.1 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.



Daniel James Van Dorem
Quality Control

11-Sep-14
Date

EZIP Ref. No.: 1760-53

ISO 9001 CERTIFIED

GL-CED-297-013

Standard Logbook

Serial ID: 1720 **Open/Reference Date:** 01-OCT-14 **Aliquot :** 5.2165 g
Name: Polonium-209 **Received:** 22-SEP-14 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 22-SEP-35 **Logbook Num :** GL-CED-297-013
Employee: Gregory Ramsay **Lot Number :** 1760-53-1
Supplier: Eckert & Ziegler **Solvent :** 1M HNO3
Uncertainty : 1.211 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Polonium-209	1.954 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1720
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	10/01/2014
Ampoule Mass (g):	5.2165 g
Uncertainty:	+/- 1.211 %
LogBook No:	GL-CED-297-013
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Polonium-209		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2016		
Verification Date:	07/12/2017		
Expiration Date:	12/06/2019		
Primary Code:	1720-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1896 g		
Density(g/mL):	1.0290	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1166.3543 \text{ dpm/mL}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0290 \text{ g/mL}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1133.4833 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
12/06/2018	Tim Chandler	14.42	200	1720-B	81.7241 dpm/mL	12/07/2018	12/07/2019
11/26/2019	Tim Chandler	14.5183	200	1720-C	82.2813 dpm/mL	11/11/2021	11/11/2022
11/26/2019	Tim Chandler	14.5183	200	1720-C1	82.2813 dpm/mL	11/11/2021	11/11/2022
02/21/2022	Matelon DeFreese	14.5109	200	1720-D	82.239314 dpm/mL	03/07/2022	03/07/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Po-209 Standard 1720-D

v1.2

Analyst	MXS2
Verification Prep Date	3/7/2022

Tracer Information	
Isotope	Po-210
Serial Number	2012-A
Amount of Std. (mL)	0.2
Expiration Date	12/15/2022

Standard Information	
Isotope	Po-209
Serial Number	1720-D
Isotope Halflife	125.3000 Y
Reference Date	10/1/2014
Ref. Act. (dpm/mL)	82.239314
Amount of Std. (mL)	0.2
Standard Prep Date	2/21/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	3/7/2022	7.180	79.70
2	3/7/2022	7.480	83.03
3	3/7/2022	7.700	85.47

Mean Value = 7.453 82.732
Stdev = 0.261023626 2.897362249

	pCi	dpm/mL
Certificate Value* =	7.1106	78.9274
Two sigma =	0.5220	5.7947
10 % of Mean =	0.7453	8.2732
Rule A (Pass/Fail)	Pass	Pass
% Recovery	104.82%	104.82%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	3/7/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-209 standard 1720-D using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-210 standard 2012-A and was diluted in a centrifuge tube containing 15mL of 0.05M HNO₃. Precipitated by adding 0.1mL of 30% H₂O₂, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-209 were calculated by comparison to Po-210 certified values.

3/15/22



Eckert & Ziegler

Analytics

1845

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION

Standard Reference Source

Received: 12-1-17 12:00

SRS Number: 108018

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8229

Customer: GEL Laboratories LLC

P.O. Number: GEL1718798, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 29-November-2017 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Th-229	2.897E+06	1.999E+04	0.5	1.5	3.1	4π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 108018

Comments:

5.21561 g of 0.5 M HNO₃ solution, carrier free.

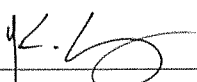
Impurities:

γ-impurities (other than decay products) < 0.1%

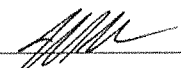
α-impurities: Th-228 6.6E+00 Bq, Th-230 1.2E+02 Bq, Th-232 8.0E+00 Bq

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Hardley, Radiochemist

QC Approved by:


J. Lahr, Spectroscopist

Date: 27-Nov-17

Standard Logbook

Serial ID: 1845 **Open/Reference Date:** 29-NOV-17 **Aliquot :** 5.21561 g
Name: Thorium-229 **Received:** 01-DEC-17 **Density :** Hand Calculated
Type: Source Material **Expires:** 01-DEC-18 **Logbook Num :** GL-CED-297-138
Employee: Tim Chandler **Lot Number :** 108018
Supplier: Eckert & Ziegler **Solvent :** 0.5M HNO₃
Uncertainty : 1.55 percent
Description: 1 ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-229	19990 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1845
Prepared By:	Tim Chandler
Carrier Conc:	0.5M HNO3
Reference Date:	11/29/2017
Ampoule Mass (g):	5.21561 g
Uncertainty:	+/- 1.55 %
LogBook No:	GL-CED-297-138
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-229		
Prepared By:	Tim Chandler		
Prep Date:	06/08/2018		
Verification Date:	07/07/2020		
Expiration Date:	11/10/2022		
Primary Code:	1845-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1906 g		
Density(g/mL):	1.0291	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11936.4861 \text{ dpm/mL}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0291 \text{ g/mL}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11598.7987 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/08/2018	Tim Chandler	2.0385	1000	1845-B	23.6442 dpm/mL	06/01/2020	06/01/2021
07/10/2019	Tim Chandler	4.0198	1000	1845-C	46.62485 dpm/mL	07/07/2020	07/07/2021
10/26/2020	Tim Chandler	4.0184	1000	1845-D	46.6086 dpm/mL	10/27/2020	10/27/2021
04/23/2021	Tim Chandler	4.2911	1000	1845-E	49.7716 dpm/mL	04/26/2021	04/26/2022
11/10/2021	Matelon DeFreese	4.211	1000	1845-F	48.8425 dpm/mL	11/10/2021	11/10/2022
05/11/2022	Matelon DeFreese	4.1951	1000	1845-G	48.6581 dpm/mL	05/12/2022	05/11/2023
01/11/2023	Matelon DeFreese	4.1664	1000	1845-H	48.3252 dpm/mL	01/11/2023	01/11/2024

Verification for Th-229 Standard 1845-G

v1.2

Analyst	MXS2
Verification Prep Date	5/12/2022

Tracer Information	
Isotope	Th-232
Serial Number	1513-C
Amount of Std. (mL)	0.1
Expiration Date	12/22/2022

Standard Information	
Isotope	Th-229
Serial Number	1845-G
Isotope Halflife	7.3400E+03 Y
Reference Date	11/29/2017
Ref. Act. (dpm/mL)	48.6581
Amount of Std. (mL)	0.1
Standard Prep Date	5/11/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	5/12/2022	2.190	48.62
2	5/12/2022	2.070	45.95
3	5/12/2022	2.120	47.06

Mean Value = 2.127 47.212
Stdev = 0.060277138 1.338152458

	pCi	dpm/mL
Certificate Value* =	2.1909	48.6377
Two sigma =	0.1206	2.6763
10 % of Mean =	0.2127	4.7212
Rule A (Pass/Fail)	Pass	Pass
% Recovery	97.07%	97.07%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	5/12/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-229 standard 1845-G using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-232 standard 1513-C and was diluted in a centrifuge tube containing 10 mL 8M HNO₃. The standard was isolated following the standard operating procedure for the separation of thorium (GL-RAD-A-038). After dissolving the sources in 5 mL of 2M HCl, the sources were diluted to 40 mL with deionized water. 100 micrograms of neodymium carrier and five mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-229 were calculated by comparison to Th-232 certified values.

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Th-232	Customer:	GEL LABORATORIES, LLC
Half-life:	(1.405 ± 0.006)E+10 years	P.O. No.:	7347RD
Catalog No.:	7232	Reference Date:	1-Nov-10 12:00 PST
Source No.:	1451-62	Contained Radioactivity:	50.26 nCi 1860 Bq
		(Th-232 only)	

Physical Description:

A. Mass of solution:	5.73256 g in 5 mL flame-sealed ampoule
B. Chemical form:	Th(NO ₃) ₄ in H ₂ O
C. Carrier content:	None
D. Density:	1.15 g/mL @ 20°C

Radioimpurities:

Not determined

Radionuclide Concentration: 8.767 nCi/g, 324.4 Bq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.


Quality Control

15-OCT-10
Date

EZIP Ref. No.: 1451-62

RC-S-060-058

ISO 9001 CERTIFIED

Standard Logbook

Serial ID: 1513 **Open/Reference Date:** 01-NOV-10 **Aliquot :** 5.73256 g
Name: Thorium-232 **Received:** 21-OCT-10 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 30-NOV-11 **Logbook Num :** RC-S-060-058
Employee: Gregory Ramsay **Verified:** 28-APR-11 **Lot Number :** 1451-62
Supplier: Eckert & Ziegler **Solvent :** DI water
Uncertainty : 1.172 PERCENT

Description: in water
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-232	324.4 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1513
Prepared By:	Gregory Ramsay
Carrier Conc:	DI water
Reference Date:	11/01/2010
Ampoule Mass (g):	5.73256 g
Uncertainty:	+/- 1.172 %
LogBook No:	RC-S-060-058
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-232		
Prepared By:	Christina Kimball		
Prep Date:	04/19/2011		
Verification Date:	12/27/2022		
Expiration Date:	12/27/2023		
Primary Code:	1513-A		
Dilution(mL):	250 mL		
Mass of Parent(g):	5.672 g		
Density(g/mL):	1.0020	Balance ID:	60108592

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (250 \text{ mL}) = 441.5992 \text{ dpm/mL}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0020 \text{ g/mL}) / (250 \text{ mL}) = 440.7354 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
04/19/2011	Christina Kimball	5.0665	100	1513-B	22.3299 dpm/mL	04/11/2013	04/11/2014
02/26/2014	Matelon DeFreese	100.0316	1000	1513-C	44.08747 dpm/mL	12/14/2022	12/14/2023
04/18/2014	Christina Kimball	5.0477	100	1513-D	22.247 dpm/mL	06/28/2022	06/28/2023
01/04/2016	Christina Kimball	.2487	100	1513-E	1.096117 dpm/mL	02/11/2020	02/11/2021
08/01/2016	Christina Kimball	2.053	250	1513-F	3.61932 dpm/mL	07/21/2022	07/21/2023
02/21/2020	Christina Kimball	.248	100	1513-G	1.093 dpm/mL	02/23/2022	02/23/2023
11/11/2022	Christina Kimball	.3	100	1513-H	1.3222 dpm/mL	11/14/2022	11/14/2023
12/13/2022	Christina Kimball	.23	100	1513-I	1.0137 dpm/mL	12/27/2022	12/27/2023

Verification for Th-232 Standard 1513-C

v1.2

Analyst	MXS2
Verification Prep Date	12/14/2022

Tracer Information	
Isotope	Th-229
Serial Number	1845-G
Amount of Std. (mL)	0.1
Expiration Date	3/11/2023

Standard Information	
Isotope	Th-232
Serial Number	1513-C
Isotope Halflife	1.4050E+10 Y
Reference Date	11/1/2010
Ref. Act. (dpm/mL)	44.08747
Amount of Std. (mL)	0.1
Standard Prep Date	2/26/2014

Std #	Count Date	Activity pCi	Standard dpm/mL
1	12/14/2022	1.890	41.96
2	12/14/2022	1.880	41.74
3	12/14/2022	2.010	44.62

Mean Value = 1.927 42.772
Stdev = 0.072341781 1.605987547

	pCi	dpm/mL
Certificate Value* =	1.9859	44.0875
Two sigma =	0.1447	3.2120
10 % of Mean =	0.1927	4.2772
Rule A (Pass/Fail)	Pass	Pass
% Recovery	97.02%	97.02%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	12/14/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-232 standard 1513-C using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-229 standard 1845-G and was diluted in a centrifuge tube containing 4 mL 2M HCl, diluted to 40 mL with DI water. 0.1 mL of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-232 were calculated by comparison to Th-229 certified values.

Handwritten signature
12/15/22



Eckert & Ziegler

Analytics

1564

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION Standard Radionuclide Source

85621-278

5 mL Liquid in Flame Sealed Vial

Customer: General Engineering Labs/Charleston, SC
P.O. No.: 936814RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
U-232	2.517E+04	3.393E+04	0.5	2.4	4.9	09/12/2011

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

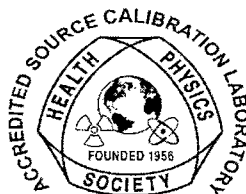
Impurities: γ -impurities (other than decay products) < 0.1 %, U-233 < 1.20E2 Bq, Am-241 < 5.8E1 Bq. 5.06048 grams 2M HNO₃ solution.

Source Prepared by: M. I. Taskaeva
M. I. Taskaeva, Radiochemist

QA Approved: J. D. McCorvey
J. D. McCorvey, QA Manager Alternate

Date: 9/12/11

RECEIVED
9/14/11
AM



Standard Logbook

Serial ID: 1564 **Open/Reference Date:** 12-SEP-11 **Aliquot :** 5.06048 g
Name: Uranium-232 **Received:** 14-SEP-11 **Density :** Hand Calculated
Type: Source Material **Expires:** 26-SEP-14 **Logbook Num :** RC-S-060-109
Employee: Ashley Drochter **Lot Number :** 85621-278
Supplier: Eckert & Ziegler **Solvent :** 2M HNO3
 Uncertainty : 2.45 PERCENT

Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-232	33930 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1564
Prepared By:	Ashley Drochter
Carrier Conc:	2M HNO3
Reference Date:	09/12/2011
Ampoule Mass (g):	5.06048 g
Uncertainty:	+/- 2.45 %
LogBook No:	RC-S-060-109
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-232		
Prepared By:	Ashley Drochter		
Prep Date:	11/15/2012		
Verification Date:	12/28/2022		
Expiration Date:	12/28/2023		
Primary Code:	1564-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9067 g		
Density(g/mL):	1.0615	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.06048 \text{ g} * 100 \text{ mL}) = 19739.3525 \text{ dpm/mL}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0615 \text{ g/mL}) / (5.06048 \text{ g} * 100 \text{ mL}) = 18595.7160 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/16/2012	Ashley Drochter	2.6179	1000	1564-B	48.6817 dpm/mL	11/13/2013	11/13/2014
07/26/2021	Christina Kimball	.635	500	1564-BB	23.6166 dpm/mL	07/21/2022	07/21/2023
07/26/2021	Christina Kimball	.635	500	1564-BB Spike	23.6166 dpm/mL	07/21/2022	07/21/2023
01/15/2013	Christina Kimball	.265	250	1564-C	19.7115 dpm/mL	01/13/2014	01/13/2015
12/14/2021	Tim Chandler	2.6412	1000	1564-CC	49.115 dpm/mL	12/15/2021	12/15/2022
02/18/2013	Christina Kimball	.116	500	1564-D	4.31421 dpm/mL	02/16/2015	02/13/2016
04/13/2022	Matelon DeFreese	2.7103	1000	1564-DD	50.4 dpm/mL	04/13/2022	04/13/2023
01/02/2014	Gregory Ramsay	2.6936	1000	1564-E	50.08942 dpm/mL	12/10/2014	12/10/2015

09/21/2022	Tim Chandler	2.6897	1000	1564-EE	50.0169 dpm/mL	09/21/2022	09/21/2023
03/17/2014	Christina Kimball	.266	250	1564-F	19.78584 dpm/mL	03/25/2015	03/25/2016
12/27/2022	Christina Kimball	.61	500	1564-FF	22.6868 dpm/mL	12/28/2022	12/28/2023
12/27/2022	Christina Kimball	.61	500	1564-FF Spike	22.6868 dpm/mL	12/28/2022	12/28/2023
12/10/2014	Tim Chandler	2.6312	1000	1564-G	48.929 dpm/mL	12/10/2014	12/10/2015
01/19/2023	Matelon DeFreese	2.689	1000	1564-GG	50.0039 dpm/mL	01/20/2023	01/20/2024
07/20/2015	Christina Kimball	.266	250	1564-H	19.78584 dpm/mL	07/25/2016	07/25/2017
11/23/2015	Tim Chandler	2.6117	1000	1564-I	48.5664 dpm/mL	11/23/2015	11/23/2016
01/05/2016	Christina Kimball	.119	500	1564-J	4.4258 dpm/mL	12/27/2017	12/27/2018
01/05/2016	Christina Kimball	.119	500	1564-J Spike	4.4258 dpm/mL	12/27/2017	12/27/2018
09/20/2016	Tim Chandler	2.6389	1000	1564-K	49.0722 dpm/mL	09/18/2017	09/18/2018
12/20/2016	Christina Kimball	.276	250	1564-L	20.52974 dpm/mL	12/21/2017	12/21/2018
06/20/2017	Tim Chandler	2.6611	1000	1564-M	49.4851 dpm/mL	06/19/2018	06/19/2019
01/18/2018	Tim Chandler	2.6367	1000	1564-N	49.0313 dpm/mL	04/25/2018	04/25/2019
04/25/2018	Tim Chandler	2.6505	1000	1564-O	49.2879 dpm/mL	04/25/2018	04/25/2019
08/06/2018	Christina Kimball	.106	500	1564-P	3.9423 dpm/mL	12/19/2019	12/19/2020
08/06/2018	Christina Kimball	.106	500	1564-P Spike	3.9423 dpm/mL	12/19/2019	12/19/2020
12/13/2018	Tim Chandler	2.6502	1000	1564-Q	49.2824 dpm/mL	12/13/2018	12/13/2019
01/08/2019	Christina Kimball	.29	250	1564-R	21.571 dpm/mL	01/08/2019	01/08/2020
01/08/2019	Christina Kimball	.29	250	1564-R Spike	21.571 dpm/mL	01/08/2019	01/08/2020
10/01/2019	Tim Chandler	2.6957	1000	1564-S	50.1285 dpm/mL	10/01/2019	10/01/2020
12/18/2019	Christina Kimball	.307	250	1564-T	22.83554 dpm/mL	12/19/2019	12/19/2020

12/18/2019	Christina Kimball	.307	250	1564-T Spike	22.83554 dpm/mL	12/19/2019	12/19/2020
03/31/2020	Tim Chandler	2.6645	1000	1564-U	49.5483 dpm/mL	03/31/2020	03/31/2021
08/14/2020	Christina Kimball	.111	500	1564-V	4.1282 dpm/mL	08/14/2020	08/14/2021
08/14/2020	Christina Kimball	.111	500	1564-V Spike	4.1282 dpm/mL	08/14/2020	08/14/2021
10/13/2020	Tim Chandler	2.6983	1000	1564-W	50.1768 dpm/mL	10/13/2020	10/13/2021
11/04/2020	Christina Kimball	.315	250	1564-X	23.4306 dpm/mL	11/04/2020	11/04/2021
11/04/2020	Christina Kimball	.315	250	1564-X Spike	23.4306 dpm/mL	11/04/2020	11/04/2021
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Y	51.32232 dpm/mL	03/19/2021	03/19/2022
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Z	51.32232 dpm/mL	03/20/2021	03/20/2022

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-232 Standard 1564-EE

v1.2

Analyst	MXS2
Verification Prep Date	9/21/2022

Tracer Information	
Isotope	U-238
Serial Number	1600-M
Amount of Std. (mL)	0.2
Expiration Date	1/21/2023

Standard Information	
Isotope	U-232
Serial Number	1564-EE
Isotope Halflife	68.9000 Y
Reference Date	9/12/2011
Ref. Act. (dpm/mL)	50.0169
Amount of Std. (mL)	0.2
Standard Prep Date	9/21/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	9/22/2022	4.030	44.73
2	9/22/2022	3.960	43.96
3	9/22/2022	3.920	43.51

Mean Value = 3.970 44.067
Stdev = 0.055677644 0.618021844

	pCi	dpm/mL
Certificate Value* =	4.0330	44.7658
Two sigma =	0.1114	1.2360
10 % of Mean =	0.3970	4.4067
Rule A (Pass/Fail)	Pass	Pass
% Recovery	98.44%	98.44%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	9/21/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-232 standard 1564-EE using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-238 standard 1600-M and was diluted in a centrifuge tube containing 20 mL of 0.1M HCL diluted to 40 mL with DI water. 0.1 mL of neodymium carrier, 0.5 mL of titanium (III) chloride, and 5 mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-232 were calculated by comparison to U-238 certified values.

9/20/22

15 Apr 3/24/12
1600

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	U-238 (Nat)	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	(4.468 ± 0.005)E+09 years	P.O. No.:	936823 RD	
Catalog No.:	7338	Reference Date:	15-Apr-12 12:00 PST	
Source No.:	1577-71-2	Contained Radioactivity:	1.023 µCi 37.85 kBq	
		(Total Uranium)		

Physical Description:

A. Mass of solution:	7.05210 g in 10 mL flame-sealed ampoule
B. Chemical form:	UO ₂ (NO ₃) ₂ in dilute HNO ₃
C. Carrier content:	None
D. Density:	Approximately 1.41 g/mL @ 20°C

Radioimpurities:

See Technical Data Sheet

Radionuclide Concentration: 0.1451 µCi/g, 5.369 kBq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.


Quality Control

21-Mar-12
Date

EZIP Ref. No.: 1577-71

RC-S-065-030a

ISO 9001 CERTIFIED

Medical Imaging Laboratory

24937 Avenue Tibbitts Valencia, California 91355

Industrial Gauging Laboratory

1800 North Keystone Street Burbank, California 91504

U-238 Natural Technical Data

The U-238 Natural used to prepare your order was taken from Eckert & Ziegler Isotope Products Lot #4550102. It had the following composition as of 9 Feb 10:

<u>Nuclide</u>	<u>Atom %</u>	<u>Activity %</u>
U-234	0.0055	49.086
U-235	0.7200	2.241
U-238	99.274	48.673

Isotopic composition provided by New Brunswick Laboratory.

If you have any question, please contact Eckert & Ziegler Isotope Products Technical Service: (661) 309-1010

Standard Logbook

Serial ID: 1600 **Open/Reference Date:** 15-APR-12 **Aliquot :** 7.0521 g
Name: Uranium-238 **Received:** 24-MAR-12 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 26-MAR-15 **Logbook Num :** RC-S-065-030
Employee: Ashley Drochter **Lot Number :** 4550102
Supplier: Eckert & Ziegler **Solvent :** UO₂(NO₃)₂ in dilute HNO₃
Uncertainty : 1.17 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-238	18.42 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1600
Prepared By:	Ashley Drochter
Carrier Conc:	UO ₂ (NO ₃) ₂ in dilute HNO ₃
Reference Date:	04/15/2012
Ampoule Mass (g):	7.0521 g
Uncertainty:	+/- 1.17 %
LogBook No:	RC-S-065-030
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-238		
Prepared By:	Ashley Drochter		
Prep Date:	09/04/2012		
Verification Date:	05/20/2022		
Expiration Date:	05/20/2023		
Primary Code:	1600-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	6.8204 g		
Density(g/mL):	1.0789	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (7.0521 \text{ g} * 100 \text{ mL}) = 10688.8814 \text{ dpm/mL}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0789 \text{ g/mL}) / (7.0521 \text{ g} * 100 \text{ mL}) = 9907.0626 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
09/04/2012	Ashley Drochter	1.4579	500	1600-B	28.8913 dpm/mL	09/04/2012	09/04/2013
09/11/2012	Ashley Drochter	3.0288	500	1600-C	60.0219 dpm/mL	09/04/2013	09/04/2014
03/27/2014	Tim Chandler	3.0445	500	1600-D	60.3241 dpm/mL	03/18/2015	03/18/2016
07/24/2015	Tim Chandler	3.0177	500	1600-E	59.7931 dpm/mL	07/10/2017	07/10/2018
02/16/2017	Tim Chandler	3.0261	500	1600-F	59.9595 dpm/mL	02/06/2018	02/06/2019
10/10/2017	Christina Kimball	.539	250	1600-G	21.3596 dpm/mL	12/28/2022	12/28/2023

04/02/2018	Tim Chandler	3.0544	500	1600-H	60.5203 dpm/mL	03/29/2019	03/29/2020
06/21/2019	Tim Chandler	3.0536	500	1600-I	60.5044 dpm/mL	06/21/2019	06/21/2020
01/30/2020	Tim Chandler	3.0563	500	1600-J	60.5579 dpm/mL	01/26/2021	01/26/2022
03/13/2020	Christina Kimball	.01222	500	1600-K	.24207 dpm/mL	03/15/2022	03/15/2023
04/23/2021	Tim Chandler	3.0507	500	1600-L	60.4469 dpm/mL	04/26/2021	04/26/2022
01/21/2022	Matelon DeFreese	3.1075	500	1600-M	61.5723941 dpm/mL	01/21/2022	01/21/2023
05/19/2022	Christina Kimball	.01275	500	1600-N	.2527 dpm/mL	05/20/2022	05/20/2023
09/06/2022	Matelon DeFreese	3.1499	500	1600-O	62.412513 dpm/mL	09/06/2022	09/06/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-238 Standard 1600-O

v1.2

Analyst	MXS2
Verification Prep Date	9/6/2022

Tracer Information	
Isotope	U-232
Serial Number	1564-DD
Amount of Std. (mL)	0.2
Expiration Date	4/13/2023

Standard Information	
Isotope	U-238
Serial Number	1600-O
Isotope Halflife	4.4680E+09 Y
Reference Date	4/15/2012
Ref. Act. (dpm/mL)	62.412513
Amount of Std. (mL)	0.2
Standard Prep Date	9/6/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	9/6/2022	5.560	61.72
2	9/6/2022	5.840	64.82
3	9/6/2022	5.440	60.38

Mean Value = 5.613 62.308
Stdev = 0.205264058 2.278431039

	pCi	dpm/mL
Certificate Value* =	5.6227	62.4125
Two sigma =	0.4105	4.5569
10 % of Mean =	0.5613	6.2308
Rule A (Pass/Fail)	Pass	Pass
% Recovery	99.83%	99.83%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	9/6/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-238 standard 1600-O using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-232 standard 1564-DD and was diluted in a centrifuge tube containing 15 mL of 0.1M HCl, diluted to 40 mL with DI water. 0.1 mL of neodymium carrier, 0.5 mL of titanium (III) chloride, and 5 mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-238 were calculated by comparison to U-232 certified values.

LM
9/7/22

Runlogs

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2368289

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
606487001	SAMPLE	EJ1	1079	JAN-23-23 11:36:40	DONE		10-JAN-23 15:44
606487002	SAMPLE	EJ1	1080	JAN-23-23 11:36:40	DONE		10-JAN-23 18:02
606487003	SAMPLE	EJ1	1081	JAN-23-23 11:36:40	DONE		10-JAN-23 15:45
606488001	SAMPLE	EJ1	1082	JAN-23-23 11:36:40	DONE		10-JAN-23 15:45
606488002	SAMPLE	EJ1	1083	JAN-23-23 11:36:41	DONE		10-JAN-23 10:37
606488003	SAMPLE	EJ1	1084	JAN-23-23 11:36:41	DONE		10-JAN-23 10:37
606488004	SAMPLE	EJ1	1085	JAN-23-23 11:36:41	DONE		10-JAN-23 10:37
606488005	SAMPLE	EJ1	1086	JAN-23-23 11:36:41	DONE		10-JAN-23 10:38
1205293606	MB	EJ1	1088	JAN-23-23 11:36:41	DONE		10-JAN-23 10:38
1205293607	LCS	EJ1	1089	JAN-23-23 11:41:30	DONE		11-JAN-23 11:00
1205293608	LCSD	EJ1	1090	JAN-23-23 11:41:30	DONE		11-JAN-23 11:00

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2368291

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
606487001	SAMPLE	EJ1	1065	JAN-23-23 11:36:38	DONE		10-JAN-23 10:36
606487002	SAMPLE	EJ1	1066	JAN-23-23 11:36:38	DONE		10-JAN-23 10:36
606487003	SAMPLE	EJ1	1067	JAN-23-23 11:36:38	DONE		10-JAN-23 10:36
606488001	SAMPLE	EJ1	1068	JAN-23-23 11:36:38	DONE		10-JAN-23 10:36
606488002	SAMPLE	EJ1	1069	JAN-23-23 11:36:38	DONE		10-JAN-23 10:36
606488003	SAMPLE	EJ1	1070	JAN-23-23 11:36:38	DONE		10-JAN-23 15:42
606488004	SAMPLE	EJ1	1071	JAN-23-23 11:36:39	DONE		10-JAN-23 10:36
606488005	SAMPLE	EJ1	1072	JAN-23-23 11:36:39	DONE		10-JAN-23 10:37
1205293621	MB	EJ1	1074	JAN-23-23 11:36:39	DONE		10-JAN-23 10:37
1205293622	LCS	EJ1	1075	JAN-23-23 11:36:39	DONE		10-JAN-23 10:37
1205293623	LCSD	EJ1	1076	JAN-23-23 11:36:39	DONE		10-JAN-23 10:37

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2368293

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205293629	LCSD	EJ1	1024	JAN-23-23 10:02:48	DONE		06-JAN-23 11:35
606487001	SAMPLE	EJ1	1113	JAN-23-23 10:19:40	DONE		12-JAN-23 13:27
606487002	SAMPLE	EJ1	1114	JAN-23-23 10:19:43	DONE		12-JAN-23 13:22
606487003	SAMPLE	EJ1	1117	JAN-23-23 10:19:45	DONE		12-JAN-23 11:33
606488001	SAMPLE	EJ1	1121	JAN-23-23 10:19:47	DONE		12-JAN-23 12:42
606488002	SAMPLE	EJ1	1124	JAN-23-23 10:19:49	DONE		12-JAN-23 12:42
606488003	SAMPLE	EJ1	1125	JAN-23-23 10:21:19	DONE		12-JAN-23 12:42
606488004	SAMPLE	EJ1	1126	JAN-23-23 10:21:21	DONE		12-JAN-23 12:54
606488005	SAMPLE	EJ1	1128	JAN-23-23 10:21:24	DONE		12-JAN-23 12:43
1205293627	MB	EJ1	1130	JAN-23-23 10:21:26	DONE		12-JAN-23 12:43
1205293628	LCS	EJ1	1136	JAN-23-23 10:21:30	DONE		12-JAN-23 12:44

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2368294

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
606487001	SAMPLE	EJ1	1194	JAN-22-23 18:50:42	DONE		18-JAN-23 11:13
606487002	SAMPLE	EJ1	1195	JAN-22-23 18:50:44	DONE		18-JAN-23 11:13
606487003	SAMPLE	EJ1	1196	JAN-22-23 18:50:47	DONE		18-JAN-23 11:13
606488001	SAMPLE	EJ1	1201	JAN-22-23 18:50:49	DONE		18-JAN-23 11:13
606488002	SAMPLE	EJ1	1202	JAN-22-23 18:50:50	DONE		18-JAN-23 11:14
606488003	SAMPLE	EJ1	1205	JAN-22-23 18:50:53	DONE		18-JAN-23 11:14
606488004	SAMPLE	EJ1	1207	JAN-22-23 18:50:55	DONE		18-JAN-23 13:04
606488005	SAMPLE	EJ1	1026	JAN-23-23 10:06:21	DONE		07-JAN-23 13:05
1205293630	MB	EJ1	1027	JAN-23-23 10:06:21	DONE		07-JAN-23 13:05
1205293631	LCS	EJ1	1028	JAN-23-23 10:06:21	DONE		07-JAN-23 13:05
1205293632	LCSD	EJ1	1029	JAN-23-23 10:06:21	DONE		07-JAN-23 13:05

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2368295

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
606487001	SAMPLE	BV1	1179	JAN-19-23 16:19:46	DONE		17-JAN-23 12:34
606487002	SAMPLE	BV1	1180	JAN-19-23 16:19:49	DONE		17-JAN-23 12:34
606487003	SAMPLE	BV1	1181	JAN-19-23 16:19:51	DONE		17-JAN-23 12:34
606488001	SAMPLE	BV1	1182	JAN-19-23 16:19:53	DONE		17-JAN-23 12:34
606488002	SAMPLE	BV1	1174	JAN-19-23 16:19:55	DONE		17-JAN-23 12:50
606488003	SAMPLE	BV1	1178	JAN-19-23 16:19:58	DONE		17-JAN-23 12:34
606488004	SAMPLE	BV1	1185	JAN-19-23 16:20:00	DONE		18-JAN-23 13:04
606488005	SAMPLE	BV1	1186	JAN-19-23 16:20:02	DONE		18-JAN-23 12:14
1205293634	MB	BV1	1191	JAN-19-23 16:20:04	DONE		18-JAN-23 12:20
1205293635	LCS	BV1	1194	JAN-19-23 16:20:07	DONE		18-JAN-23 11:13
1205293636	LCSD	BV1	1192	JAN-19-23 16:20:09	DONE		18-JAN-23 12:20

Gamma Spectroscopy Raw Data

Batch 2367950 Check-list

This check-list was completed on 20-JAN-23 by Tim Winters

This batch was reviewed by Spencer Collins on 20-JAN-23 and Tim Winters on 20-JAN-23.

Batch ID: 2367950

Product: GSCGAMMF

Description: Gamma Spec Filter RAD A-013

#	Criteria	Yes	No	Comments
Preparation Information				
1	Did any sample(s) require dilution?		No	
2	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
3	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
4	Are instrument source checks within limits?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were any additional radionuclides added that were not requested by the client?		No	
7	Were all the samples prepared/analyzed within the required holding time period?	Yes		
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Gamma Spectroscopy

Batch ID: 2367950
Analyst: Maggie Stamps (MXR1)
Method: DOE HASL 300, 4.5.2.3/Ga-01-R
Lab SOP: GL-RAD-A-013 REV# 27
Instrument: No instrument-manual method

Due Dates for Lab: 23-JAN-2023			Package: 24-JAN-2023	SDG: 24-JAN-2023		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205292908	78962-278		1298	1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	606487001	19-JAN-2023	20	200	0.74829
2	606487002	19-JAN-2023	20	200	0.73913
3	606487003	19-JAN-2023	20	200	0.75
4	606488001	19-JAN-2023	20	200	0.76489
5	606488002	19-JAN-2023	20	200	0.74719
6	606488003	19-JAN-2023	20	200	0.71812
7	606488004	19-JAN-2023	20	200	0.73883
8	606488005	19-JAN-2023	20	200	0.72663
9	1205292906 MB	19-JAN-2023	20		0.76489
10	1205292907 DUP (606487002)	19-JAN-2023	20	200	0.73913
11	1205292908 LCS	19-JAN-2023	20		0.76489

Reagent/Solvent Lot ID	Description	Amount	Comments:
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VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 17:21:15.36

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                   *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487001.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM08.CNF;637
Background date    : 15-JAN-2023 11:17:28
Sample date       : 26-DEC-2022 07:15:00 Acquisition date : 19-JAN-2023 15:20:50
Sample ID        : G606487001 Sample quantity : 7.48290E-01 FILTER
Detector name    : GAM08 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:00.88 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : MXR1
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID        : 2367950 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
```

BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.86*	16	117	1.18	128.22	123	12	2.17E-03	152.5	
2	3	99.21*	13	45	1.12	199.00	180	24	1.83E-03	105.9	1.29E+00
3	0	186.35*	11	81	0.93	373.51	369	11	1.58E-03	184.6	
4	0	195.52	10	44	1.26	391.86	388	6	1.35E-03	111.7	
5	0	478.03	19	30	1.50	957.56	952	11	2.66E-03	60.1	
6	0	486.10	12	12	0.67	973.71	969	8	1.67E-03	57.7	
7	0	511.31*	25	29	2.04	1024.19	1016	17	3.41E-03	80.5	
8	0	527.09	16	17	3.86	1055.77	1050	11	2.15E-03	56.8	
9	0	583.45*	11	14	1.50	1168.64	1164	11	1.49E-03	94.7	
10	0	695.52	27	29	4.40	1393.02	1381	23	3.78E-03	54.7	
11	0	854.37	9	8	0.71	1711.07	1704	11	1.23E-03	71.4	
12	0	866.15	8	18	3.84	1734.65	1723	14	1.04E-03	123.8	
13	0	910.63*	19	8	3.74	1823.71	1815	15	2.69E-03	45.2	
14	0	941.09	5	3	0.51	1884.70	1881	6	6.94E-04	70.7	
15	0	1015.76	5	14	3.00	2034.20	2025	13	6.65E-04	163.4	
16	0	1231.47	11	5	0.57	2466.07	2460	11	1.55E-03	49.9	
17	0	1659.79	5	3	0.86	3323.54	3313	12	6.42E-04	89.1	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 19-JAN-2023 17:21:16

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487001.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MXR1		
Sample date	: 26-DEC-2022 07:15:00	Acquisition date	: 19-JAN-2023 15:20:50
Sample ID	: G606487001	Sample quantity	: 0.74829 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA8	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.88 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide Type:					Uncorrected	Decay Corr	2-Sigma
Nuclide	Energy	Area	%Abn	%Eff	pCi/FILTER	pCi/FILTER	%Error
BE-7	477.60	19	10.44*	1.846E+00	4.983E+01	6.845E+01	120.12
PR-144	696.51	27	1.34*	1.388E+00	7.333E+02	7.781E+02	109.44
TL-208	1489.16	-----	0.28	7.270E-01	-----	Line Not Found	-----
	277.37	-----	6.60	2.692E+00	-----	Line Not Found	-----
	583.19	11	85.00*	1.593E+00	3.977E+00	4.074E+00	189.39
	860.56	-----	12.50	1.161E+00	-----	Line Not Found	-----
RA-226	186.21	11	3.59*	3.451E+00	4.613E+01	4.613E+01	369.19
TH-232	63.81	16	0.26*	1.446E+00	2.086E+03	2.086E+03	305.09
CF-252	140.88	-----	0.02	3.847E+00	-----	Line Not Found	-----
	100.20	13	0.01*	3.537E+00	1.436E+04	1.461E+04	211.89
ANH-511	511.00	25	100.00*	1.758E+00	7.008E+00	7.008E+00	161.00

Flag: "*" = Keyline

```

*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487001.CNF;1  *
* Acquisition date   : 19-JAN-2023 15:20:50 Sensitivity      : 3.000          *
* Detector ID        : GAM08 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000      *
* Elapsed real time  : 0 02:00:00.88 Half life ratio : *****      *
* Sample date        : 26-DEC-2022 07:15:00 Analyst initials: MXR1      *
* Sample ID          : G606487001 Sample Quantity : 7.4829E-01 FILTER *
* Batch Number       : 2367950 Wet Weight : 0.00000        *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000         *
* Nuclide Library    : LIQUID.NLB;28                                         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 17-MAR-2022 05:13:31 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM08_JAR.CNF;20          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	6.845E+01	8.058E+01	8.698E+01
PR-144	7.781E+02	8.345E+02	6.729E+02
TL-208	4.074E+00	7.562E+00	7.293E+00
RA-226	4.613E+01	1.669E+02	1.374E+02
TH-232	2.086E+03	6.236E+03	4.422E+03
CF-252	1.461E+04	3.034E+04	3.774E+04
ANH-511	7.008E+00	1.106E+01	5.178E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	1.862E+00	5.007E+00	1.064E+01	NOT IDENT.
NA-24	0.000E+00	2.243E+12	0.000E+00	SHORT HLIF
AL-26	1.561E+00	4.314E+00	1.021E+01	NOT IDENT.
K-40	1.217E+01	6.985E+01	1.446E+02	NOT IDENT.
SC-46	4.663E+00	5.439E+00	1.202E+01	NOT IDENT.
V-48	1.227E+00	1.137E+01	2.329E+01	NOT IDENT.
CR-51	-2.213E+01	5.753E+01	1.028E+02	NOT IDENT.
MN-52	5.581E+01	8.259E+01	2.046E+02	NOT IDENT.
MN-54	2.641E+00	3.808E+00	8.558E+00	NOT IDENT.
CO-56	2.188E+00	5.433E+00	1.104E+01	NOT IDENT.
CO-57	-7.381E-01	3.259E+00	5.556E+00	NOT IDENT.
NI-57	0.000E+00	3.145E+05	0.000E+00	SHORT HLIF
CO-58	-3.547E+00	4.501E+00	7.653E+00	NOT IDENT.
FE-59	-7.696E+00	1.157E+01	1.956E+01	NOT IDENT.
CO-60	2.970E+00	5.087E+00	1.124E+01	NOT IDENT.
ZN-65	-7.290E-01	8.597E+00	1.701E+01	NOT IDENT.
CU-67	-9.802E+03	5.287E+03	8.419E+03	NOT IDENT.
GE-68	5.409E+01	1.360E+02	2.949E+02	NOT IDENT.
AS-73	3.491E+01	1.751E+02	3.241E+02	NOT IDENT.
AS-74	-1.839E+00	1.760E+01	3.173E+01	NOT IDENT.
SE-75	2.012E+00	5.477E+00	1.071E+01	NOT IDENT.
BR-77	0.000E+00	1.981E+04	0.000E+00	SHORT HLIF
SR-82	-3.711E+01	5.406E+01	9.448E+01	NOT IDENT.

RB-83	4.183E-01	8.835E+00	1.668E+01	NOT IDENT.
RB-84	-1.836E+00	9.729E+00	1.867E+01	NOT IDENT.
KR-85	1.555E+03	9.642E+02	2.018E+03	NOT IDENT.
SR-85	8.998E+00	5.581E+00	1.168E+01	NOT IDENT.
RB-86	7.529E+01	1.169E+02	2.650E+02	NOT IDENT.
Y-88	9.471E-02	4.484E+00	1.008E+01	NOT IDENT.
ZR-88	-6.708E-01	3.935E+00	7.200E+00	NOT IDENT.
Y-91	1.399E+03	2.336E+03	5.217E+03	NOT IDENT.
NB-94	1.134E+00	4.661E+00	8.412E+00	NOT IDENT.
NB-95	2.417E+00	5.141E+00	1.086E+01	NOT IDENT.
NB-95M	-7.821E+00	1.555E+01	2.780E+01	NOT IDENT.
TC-95M	2.851E+00	5.725E+00	1.125E+01	FAIL ABUN
ZR-95	3.912E+00	9.852E+00	2.042E+01	NOT IDENT.
MO-99	2.172E+04	1.687E+04	3.810E+04	NOT IDENT.
TC-99M	0.000E+00	5.009E+29	0.000E+00	SHORT HLIF
RH-100	0.000E+00	1.905E+09	0.000E+00	SHORT HLIF
RH-101	-1.943E+00	3.824E+00	6.305E+00	NOT IDENT.
RH-102M	-2.655E+00	4.633E+00	6.771E+00	NOT IDENT.
RU-103	1.637E+00	5.521E+00	1.080E+01	NOT IDENT.
RH-106	-1.504E+01	4.326E+01	8.074E+01	NOT IDENT.
RU-106	-1.504E+01	4.326E+01	8.074E+01	NOT IDENT.
AG-108M	2.601E+00	3.639E+00	7.422E+00	NOT IDENT.
CD-109	7.156E+01	9.569E+01	1.707E+02	NOT IDENT.
AG-110	-1.215E+01	7.574E+01	1.490E+02	NOT IDENT.
AG-110M	-8.205E-01	5.981E+00	1.157E+01	NOT IDENT.
IN-111	-1.407E+03	1.365E+03	2.116E+03	NOT IDENT.
SN-113	3.607E+00	5.328E+00	1.092E+01	NOT IDENT.
IN-114M	5.853E+00	2.502E+01	4.407E+01	NOT IDENT.
CD-115	0.000E+00	3.605E+04	0.000E+00	SHORT HLIF
SN-117M	6.647E+00	1.062E+01	1.955E+01	NOT IDENT.
SB-122	-1.682E+03	2.863E+03	4.225E+03	NOT IDENT.
I-123	0.000E+00	6.172E+13	0.000E+00	SHORT HLIF
TE-123M	4.036E+00	3.350E+00	6.602E+00	NOT IDENT.
SB-124	-3.964E+00	9.857E+00	1.939E+01	NOT IDENT.
SB-125	4.738E+00	9.718E+00	1.977E+01	NOT IDENT.
TE-125M	-3.842E+02	1.248E+03	2.129E+03	NOT IDENT.
I-126	-6.113E+00	4.014E+01	7.801E+01	NOT IDENT.
SB-126	-1.009E+01	2.813E+01	5.253E+01	FAIL ABUN
SN-126	8.401E+00	9.274E+00	1.681E+01	FAIL ABUN
SB-127	-3.170E+02	7.712E+02	1.385E+03	NOT IDENT.
TE-129	1.089E+01	7.915E+01	1.485E+02	NOT IDENT.
I-131	9.498E+00	3.210E+01	6.204E+01	NOT IDENT.
I-132	0.000E+00	1.593E+41	0.000E+00	SHORT HLIF
TE-132	-3.778E+02	6.242E+02	1.108E+03	NOT IDENT.
BA-133	4.869E+00	5.127E+00	1.061E+01	NOT IDENT.
I-133	0.000E+00	1.259E+09	0.000E+00	SHORT HLIF
CS-134	6.477E-01	4.763E+00	9.612E+00	NOT IDENT.
I-135	0.000E+00	7.440E+27	0.000E+00	SHORT HLIF
CS-136	1.721E+00	2.016E+01	4.047E+01	NOT IDENT.
BA-137M	-2.136E+00	3.910E+00	7.134E+00	NOT IDENT.
CS-137	-2.257E+00	4.131E+00	7.536E+00	NOT IDENT.
LA-138	1.415E+00	6.953E+00	1.530E+01	NOT IDENT.
CE-139	-2.508E+00	3.989E+00	6.364E+00	NOT IDENT.
BA-140	2.744E+01	6.246E+01	1.210E+02	NOT IDENT.
LA-140	-6.137E+00	1.850E+01	3.603E+01	FAIL ABUN
CE-141	-1.706E+01	1.190E+01	1.704E+01	NOT IDENT.
CE-143	0.000E+00	1.628E+06	0.000E+00	SHORT HLIF
CE-144	-1.832E+01	2.633E+01	4.231E+01	NOT IDENT.
PM-144	0.000E+00	1.110E+01	8.969E+00	FAIL ABUN
PM-146	3.234E+00	4.518E+00	9.483E+00	NOT IDENT.
ND-147	6.201E+00	1.443E+02	2.398E+02	NOT IDENT.
PM-147	-3.464E+03	9.527E+04	1.656E+05	NOT IDENT.
PM-149	0.000E+00	2.071E+05	0.000E+00	SHORT HLIF
EU-152	-1.026E+00	1.128E+01	2.094E+01	NOT IDENT.
GD-153	-7.546E+00	1.099E+01	1.692E+01	NOT IDENT.
EU-154	5.603E+00	1.420E+01	3.026E+01	NOT IDENT.
EU-155	6.185E+00	1.369E+01	2.472E+01	NOT IDENT.
TB-160	9.786E+00	1.649E+01	3.611E+01	NOT IDENT.
HO-166M	2.569E+00	7.918E+00	1.607E+01	NOT IDENT.
TM-171	1.243E+03	3.408E+03	6.437E+03	NOT IDENT.
LU-176	-1.692E+00	3.074E+00	5.407E+00	NOT IDENT.
LU-177	1.153E+02	3.388E+02	6.572E+02	NOT IDENT.
HF-181	4.265E+00	7.011E+00	1.141E+01	NOT IDENT.
W-181	2.801E+00	3.523E+01	6.448E+01	FAIL ABUN
TA-182	5.371E+00	1.656E+01	3.671E+01	FAIL ABUN
RE-183	7.991E+00	3.568E+01	6.610E+01	NOT IDENT.
RE-184	-5.196E+00	2.037E+01	3.302E+01	NOT IDENT.
RE-188	2.019E+01	2.115E+01	4.030E+01	FAIL ABUN

W-188	1.276E+02	1.002E+03	1.892E+03	FAIL ABUN
OS-191	4.715E+00	2.985E+01	5.275E+01	FAIL ABUN
IR-192	9.260E-01	4.478E+00	8.613E+00	NOT IDENT.
PB-201	0.000E+00	3.051E+19	0.000E+00	SHORT HLIF
TL-201	1.962E+03	7.327E+03	1.293E+04	NOT IDENT.
TL-202	-8.229E+00	1.515E+01	2.596E+01	NOT IDENT.
HG-203	-8.582E-01	5.675E+00	9.316E+00	NOT IDENT.
PB-203	0.000E+00	9.826E+03	0.000E+00	SHORT HLIF
TL-204	5.197E+02	6.447E+02	1.237E+03	NOT IDENT.
BI-207	-5.726E+00	6.022E+00	9.381E+00	NOT IDENT.
PB-210	5.117E+02	7.209E+02	1.427E+03	NOT IDENT.
BI-211	6.655E+00	2.804E+01	5.113E+01	NOT IDENT.
PB-211	5.050E+01	9.233E+01	1.821E+02	NOT IDENT.
BI-212	-2.456E+01	7.270E+01	1.205E+02	NOT IDENT.
PB-212	-7.539E+00	8.843E+00	1.584E+01	NOT IDENT.
BI-213	-4.058E+00	1.343E+01	2.387E+01	NOT IDENT.
BI-214	-3.385E+00	1.098E+01	1.813E+01	NOT IDENT.
PB-214	-1.855E+00	1.080E+01	1.880E+01	NOT IDENT.
RN-219	6.021E+00	4.718E+01	8.996E+01	NOT IDENT.
FR-221	-9.124E+00	2.343E+01	4.268E+01	NOT IDENT.
RA-223	5.594E+01	7.421E+01	1.512E+02	NOT IDENT.
RA-224	-5.523E+01	8.477E+01	1.488E+02	NOT IDENT.
AC-225	-4.944E+01	1.270E+02	2.313E+02	NOT IDENT.
AC-227	2.293E+00	3.091E+01	5.843E+01	NOT IDENT.
TH-227	2.293E+00	3.091E+01	5.843E+01	NOT IDENT.
AC-228	3.434E+01	3.045E+01	4.418E+01	FAIL ABUN
RA-228	3.434E+01	3.045E+01	4.418E+01	FAIL ABUN
TH-228	-7.539E+00	8.843E+00	1.584E+01	NOT IDENT.
TH-229	3.071E+00	6.022E+01	1.042E+02	NOT IDENT.
TH-230	-8.600E+02	1.562E+03	2.421E+03	NOT IDENT.
PA-231	4.342E-01	5.321E+01	1.004E+02	NOT IDENT.
TH-231	9.064E+00	4.967E+01	9.025E+01	NOT IDENT.
PA-233	-2.214E+00	8.686E+00	1.570E+01	FAIL ABUN
PA-234	1.577E+01	3.068E+01	6.819E+01	FAIL ABUN
PA-234M	-2.405E+01	6.828E+02	1.222E+03	NOT IDENT.
TH-234	1.466E+02	4.382E+02	4.343E+02	FAIL ABUN
U-234	2.175E+03	1.244E+04	2.299E+04	NOT IDENT.
U-235	-9.860E+00	2.982E+01	4.795E+01	FAIL ABUN
NP-237	-2.214E+00	8.686E+00	1.570E+01	FAIL ABUN
NP-238	0.000E+00	4.683E+04	0.000E+00	SHORT HLIF
U-238	1.466E+02	4.382E+02	4.343E+02	FAIL ABUN
NP-239	5.603E+00	2.895E+01	5.236E+01	FAIL ABUN
AM-241	4.513E+00	2.625E+01	4.480E+01	NOT IDENT.
AM-242	5.187E+01	1.077E+02	1.431E+02	FAIL ABUN
AM-243	7.248E+00	6.417E+00	1.265E+01	NOT IDENT.
CM-243	2.002E+00	1.394E+01	2.309E+01	FAIL ABUN
BK-247	3.991E+00	9.284E+00	1.828E+01	NOT IDENT.
CM-247	9.951E-01	4.387E+00	8.454E+00	NOT IDENT.
CF-249	-1.133E+00	4.849E+00	8.778E+00	NOT IDENT.
CF-251	1.689E+01	1.487E+01	3.073E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.86	56	117	1.18	128.22	123	12	7.73E-03	41.1	1.29E+00
2	3	92.81	107	73	1.47	186.19	180	24	1.48E-02	18.1	
3	3	99.21	21	45	1.12	199.00	180	24	2.86E-03	64.1	
4	0	186.35	84	81	0.93	373.51	369	11	1.16E-02	23.7	
5	0	195.52	10	44	1.26	391.86	388	6	1.35E-03	111.7	
6	0	239.60	35	109	2.27	480.13	472	15	4.81E-03	67.9	
7	0	478.03	19	30	1.50	957.56	952	11	2.66E-03	60.1	
8	0	486.10	12	12	0.67	973.71	969	8	1.67E-03	57.7	
9	0	511.31	166	29	2.04	1024.19	1016	17	2.31E-02	10.8	
10	0	527.09	16	17	3.86	1055.77	1050	11	2.15E-03	56.8	
11	0	583.45	31	14	1.50	1168.64	1164	11	4.29E-03	29.5	
12	0	695.52	27	29	4.40	1393.02	1381	23	3.78E-03	54.7	
13	0	854.37	9	8	0.71	1711.07	1704	11	1.23E-03	71.4	
14	0	866.15	8	18	3.84	1734.65	1723	14	1.04E-03	123.8	
15	0	910.63	25	8	3.74	1823.71	1815	15	3.40E-03	31.6	
16	0	941.09	5	3	0.51	1884.70	1881	6	6.94E-04	70.7	
17	0	1002.73	5	15	0.82	2008.11	2000	12	6.53E-04	171.5	
18	0	1015.76	5	14	3.00	2034.20	2025	13	6.65E-04	163.4	
19	0	1231.47	11	5	0.57	2466.07	2460	11	1.55E-03	49.9	
20	0	1659.79	5	3	0.86	3323.54	3313	12	6.42E-04	89.1	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	19	10.44*	1.846E+00	4.983E+01	6.845E+01	120.12
PR-144	696.51	27	1.34*	1.388E+00	7.333E+02	7.781E+02	109.44
TL-208	1489.16	-----	0.28	7.270E-01	-----	Line Not Found	-----
	277.37	-----	6.60	2.692E+00	-----	Line Not Found	-----
	583.19	11	85.00*	1.593E+00	3.977E+00	4.074E+00	189.39
	860.56	-----	12.50	1.161E+00	-----	Line Not Found	-----
RA-226	186.21	11	3.59*	3.451E+00	4.613E+01	4.613E+01	369.19
TH-232	63.81	16	0.26*	1.446E+00	2.086E+03	2.086E+03	305.09
	140.88	-----	0.02	3.847E+00	-----	Line Not Found	-----
CF-252	100.20	13	0.01*	3.537E+00	1.436E+04	1.461E+04	211.89
ANH-511	511.00	25	100.00*	1.758E+00	7.008E+00	7.008E+00	161.00

Flag: "*" = Keyline

Total number of lines in spectrum 17
Number of unidentified lines 6
Number of lines tentatively identified by NID 11 64.71%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.37	4.983E+01	6.845E+01	8.222E+01	120.12	
PR-144	284.91D	1.06	7.333E+02	7.781E+02	8.515E+02	109.44	
TL-208	1.91Y	1.02	3.977E+00	4.074E+00	7.716E+00	189.39	
RA-226	1600.00Y	1.00	4.613E+01	4.613E+01	17.03E+01	369.19	
TH-232	1.41E+10Y	1.00	2.086E+03	2.086E+03	6.363E+03	305.09	
CF-252	2.65Y	1.02	1.436E+04	1.461E+04	3.096E+04	211.89	
ANH-511	1.00E+09Y	1.00	7.008E+00	7.008E+00	11.28E+00	161.00	
Total Activity :			1.728E+04	1.760E+04			

Grand Total Activity : 1.728E+04 1.760E+04

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	195.52	10	44	1.26	391.86	388	6	1.35E-03	****	3.36E+00	
0	486.10	12	12	0.67	973.71	969	8	1.67E-03	****	1.82E+00	T
0	527.09	16	17	3.86	1055.77	1050	11	2.15E-03	****	1.72E+00	T
0	854.37	9	8	0.71	1711.07	1704	11	1.23E-03	****	1.17E+00	
0	866.15	8	18	3.84	1734.65	1723	14	1.04E-03	****	1.15E+00	
0	910.63	19	8	3.74	1823.71	1815	15	2.69E-03	90.5	1.11E+00	T
0	941.09	5	3	0.51	1884.70	1881	6	6.94E-04	****	1.07E+00	
0	1015.76	5	14	3.00	2034.20	2025	13	6.65E-04	****	1.00E+00	
0	1231.47	11	5	0.57	2466.07	2460	11	1.55E-03	99.7	8.47E-01	T
0	1659.79	5	3	0.86	3323.54	3313	12	6.42E-04	****	6.76E-01	

Flags: "T" = Tentatively associated

```

*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487001.CNF;1  *
* Acquisition date   : 19-JAN-2023 15:20:50 Sensitivity      : 3.000          *
* Detector ID        : GAM08 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:00.88 Half life ratio : *****      *
* Sample date        : 26-DEC-2022 07:15:00 Nuclide Library : LIQUID      *
* Sample ID          : G606487001 Analyst initials: MXR1         *
* Batch Number       : 2367950 Sample Quantity : 7.4829E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 17-MAR-2022 05:13:31 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM08_JAR.CNF;20          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.867E+01
PR-144	2.978E+02
TL-208	3.134E+00
RA-226	6.323E+01
TH-232	2.031E+03
CF-252	1.739E+04
ANH-511	2.204E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	4.480E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	4.051E+00	NOT IDENT.
K-40	6.367E+01	NOT IDENT.
SC-46	5.277E+00	NOT IDENT.
V-48	9.753E+00	NOT IDENT.
CR-51	4.627E+01	NOT IDENT.
MN-52	8.367E+01	NOT IDENT.
MN-54	3.679E+00	NOT IDENT.
CO-56	4.803E+00	NOT IDENT.
CO-57	2.561E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.118E+00	NOT IDENT.
FE-59	7.903E+00	NOT IDENT.
CO-60	4.756E+00	NOT IDENT.
ZN-65	6.953E+00	NOT IDENT.
CU-67	3.928E+03	NOT IDENT.
GE-68	1.239E+02	NOT IDENT.
AS-73	1.496E+02	NOT IDENT.
AS-74	1.397E+01	NOT IDENT.
SE-75	4.879E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	4.034E+01	NOT IDENT.
RB-83	7.286E+00	NOT IDENT.

RB-84	7.886E+00	NOT IDENT.
KR-85	9.187E+02	NOT IDENT.
SR-85	5.317E+00	NOT IDENT.
RB-86	1.121E+02	NOT IDENT.
Y-88	3.791E+00	NOT IDENT.
ZR-88	3.198E+00	NOT IDENT.
Y-91	2.206E+03	NOT IDENT.
NB-94	3.714E+00	NOT IDENT.
NB-95	4.741E+00	NOT IDENT.
NB-95M	1.272E+01	NOT IDENT.
TC-95M	5.196E+00	FAIL ABUN
ZR-95	8.960E+00	NOT IDENT.
MO-99	1.707E+04	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-100	0.000E+00	SHORT HLIF
RH-101	2.893E+00	NOT IDENT.
RH-102M	2.997E+00	NOT IDENT.
RU-103	4.764E+00	NOT IDENT.
RH-106	3.567E+01	NOT IDENT.
RU-106	3.567E+01	NOT IDENT.
AG-108M	3.333E+00	NOT IDENT.
CD-109	7.925E+01	NOT IDENT.
AG-110	6.339E+01	NOT IDENT.
AG-110M	4.904E+00	NOT IDENT.
IN-111	9.550E+02	NOT IDENT.
SN-113	4.890E+00	NOT IDENT.
IN-114M	2.025E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	9.050E+00	NOT IDENT.
SB-122	1.820E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	3.052E+00	NOT IDENT.
SB-124	6.871E+00	NOT IDENT.
SB-125	8.728E+00	NOT IDENT.
TE-125M	9.754E+02	NOT IDENT.
I-126	3.371E+01	NOT IDENT.
SB-126	2.260E+01	FAIL ABUN
SN-126	7.817E+00	FAIL ABUN
SB-127	5.867E+02	NOT IDENT.
TE-129	6.661E+01	NOT IDENT.
I-131	2.797E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	5.048E+02	NOT IDENT.
BA-133	4.821E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	4.153E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.710E+01	NOT IDENT.
BA-137M	3.045E+00	NOT IDENT.
CS-137	3.216E+00	NOT IDENT.
LA-138	6.264E+00	NOT IDENT.
CE-139	2.921E+00	NOT IDENT.
BA-140	5.433E+01	NOT IDENT.
LA-140	1.415E+01	FAIL ABUN
CE-141	7.905E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.949E+01	NOT IDENT.
PM-144	3.971E+00	FAIL ABUN
PM-146	4.194E+00	NOT IDENT.
ND-147	1.058E+02	NOT IDENT.
PM-147	7.655E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	9.371E+00	NOT IDENT.
GD-153	7.745E+00	NOT IDENT.
EU-154	1.277E+01	NOT IDENT.
EU-155	1.149E+01	NOT IDENT.
TB-160	1.556E+01	NOT IDENT.
HO-166M	7.119E+00	NOT IDENT.
TM-171	2.965E+03	NOT IDENT.
LU-176	2.416E+00	NOT IDENT.
LU-177	3.031E+02	NOT IDENT.
HF-181	5.021E+00	NOT IDENT.
W-181	2.966E+01	FAIL ABUN
TA-182	1.494E+01	FAIL ABUN
RE-183	3.048E+01	NOT IDENT.
RE-184	1.394E+01	NOT IDENT.
RE-188	1.868E+01	FAIL ABUN
W-188	8.640E+02	FAIL ABUN

OS-191	2.441E+01	FAIL ABUN
IR-192	3.889E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	5.981E+03	NOT IDENT.
TL-202	1.149E+01	NOT IDENT.
HG-203	4.213E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	5.755E+02	NOT IDENT.
BI-207	3.746E+00	NOT IDENT.
PB-210	6.546E+02	NOT IDENT.
BI-211	2.328E+01	NOT IDENT.
PB-211	8.244E+01	NOT IDENT.
BI-212	5.249E+01	NOT IDENT.
PB-212	7.385E+00	NOT IDENT.
BI-213	1.060E+01	NOT IDENT.
BI-214	8.098E+00	NOT IDENT.
PB-214	8.571E+00	NOT IDENT.
RN-219	4.006E+01	NOT IDENT.
FR-221	1.946E+01	NOT IDENT.
RA-223	6.862E+01	NOT IDENT.
RA-224	6.867E+01	NOT IDENT.
AC-225	1.054E+02	NOT IDENT.
AC-227	2.671E+01	NOT IDENT.
TH-227	2.671E+01	NOT IDENT.
AC-228	1.970E+01	FAIL ABUN
RA-228	1.970E+01	FAIL ABUN
TH-228	7.385E+00	NOT IDENT.
TH-229	4.759E+01	NOT IDENT.
TH-230	1.109E+03	NOT IDENT.
PA-231	4.521E+01	NOT IDENT.
TH-231	4.162E+01	NOT IDENT.
PA-233	7.144E+00	FAIL ABUN
PA-234	2.881E+01	FAIL ABUN
PA-234M	5.317E+02	NOT IDENT.
TH-234	2.041E+02	FAIL ABUN
U-234	1.061E+04	NOT IDENT.
U-235	2.237E+01	FAIL ABUN
NP-237	7.144E+00	FAIL ABUN
NP-238	0.000E+00	SHORT HLIF
U-238	2.041E+02	FAIL ABUN
NP-239	2.397E+01	FAIL ABUN
AM-241	2.069E+01	NOT IDENT.
AM-242	6.629E+01	FAIL ABUN
AM-243	5.888E+00	NOT IDENT.
CM-243	1.066E+01	FAIL ABUN
BK-247	8.327E+00	NOT IDENT.
CM-247	3.776E+00	NOT IDENT.
CF-249	3.909E+00	NOT IDENT.
CF-251	1.426E+01	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487001.CNF;1
Acquisition date : 19-JAN-2023 15:20:50 Sensitivity : 3.000
Detector ID : GAM08 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.88 Half life ratio : *****
Sample date : 26-DEC-2022 07:15:00 Nuclide Library : LIQUID
Sample ID : G606487001 Analyst initials: MXR1
Batch Number : 2367950 Sample Quantity : 7.4829E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 17-MAR-2022 05:13:31 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM08_JAR.CNF;20

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	6.845E+01	8.078E+01	8.080E+01
PR-144	7.781E+02	8.371E+02	8.372E+02
TL-208	4.074E+00	7.570E+00	7.570E+00
RA-226	4.613E+01	1.670E+02	1.670E+02
TH-232	2.086E+03	6.243E+03	6.243E+03
CF-252	1.461E+04	3.312E+04	3.312E+04
ANH-511	7.008E+00	1.107E+01	1.107E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	1.862E+00	5.010E+00	5.080E+00	NOT IDENT.
NA-24	-2.353E+10	2.243E+12	2.243E+12	SHORT HLIF
AL-26	1.561E+00	4.316E+00	4.373E+00	NOT IDENT.
K-40	1.217E+01	6.986E+01	7.008E+01	NOT IDENT.
SC-46	4.663E+00	5.458E+00	5.849E+00	NOT IDENT.
V-48	1.227E+00	1.137E+01	1.138E+01	NOT IDENT.
CR-51	-2.213E+01	5.756E+01	5.842E+01	NOT IDENT.
MN-52	5.581E+01	8.278E+01	8.652E+01	NOT IDENT.
MN-54	2.641E+00	3.816E+00	3.998E+00	NOT IDENT.
CO-56	2.188E+00	5.437E+00	5.526E+00	NOT IDENT.
CO-57	-7.381E-01	3.260E+00	3.276E+00	NOT IDENT.
NI-57	-5.198E+02	3.145E+05	3.145E+05	SHORT HLIF
CO-58	-3.547E+00	4.513E+00	4.788E+00	NOT IDENT.
FE-59	-7.696E+00	1.160E+01	1.211E+01	NOT IDENT.
CO-60	2.970E+00	5.096E+00	5.269E+00	NOT IDENT.
ZN-65	-7.290E-01	8.598E+00	8.604E+00	NOT IDENT.
CU-67	-9.802E+03	5.345E+03	6.938E+03	NOT IDENT.
GE-68	5.409E+01	1.361E+02	1.383E+02	NOT IDENT.
AS-73	3.491E+01	1.753E+02	1.760E+02	NOT IDENT.
AS-74	-1.839E+00	1.760E+01	1.762E+01	NOT IDENT.
SE-75	2.012E+00	5.479E+00	5.554E+00	NOT IDENT.
BR-77	-1.882E+04	1.988E+04	2.162E+04	SHORT HLIF
SR-82	-3.711E+01	5.416E+01	5.669E+01	NOT IDENT.

RB-83	4.183E-01	8.836E+00	8.838E+00	NOT IDENT.
RB-84	-1.836E+00	9.731E+00	9.766E+00	NOT IDENT.
KR-85	1.555E+03	9.730E+02	1.200E+03	NOT IDENT.
SR-85	8.998E+00	5.632E+00	6.943E+00	NOT IDENT.
RB-86	7.529E+01	1.171E+02	1.220E+02	NOT IDENT.
Y-88	9.471E-02	4.484E+00	4.484E+00	NOT IDENT.
ZR-88	-6.708E-01	3.936E+00	3.947E+00	NOT IDENT.
Y-91	1.399E+03	2.339E+03	2.423E+03	NOT IDENT.
NB-94	1.134E+00	4.662E+00	4.690E+00	NOT IDENT.
NB-95	2.417E+00	5.146E+00	5.260E+00	NOT IDENT.
NB-95M	-7.821E+00	1.557E+01	1.596E+01	NOT IDENT.
TC-95M	2.851E+00	5.730E+00	5.872E+00	FAIL ABUN
ZR-95	3.912E+00	9.858E+00	1.001E+01	NOT IDENT.
MO-99	2.172E+04	1.700E+04	1.962E+04	NOT IDENT.
TC-99M	3.756E+29	5.028E+29	0.000E+00	SHORT HLIF
RH-100	6.913E+07	1.905E+09	1.905E+09	SHORT HLIF
RH-101	-1.943E+00	3.841E+00	3.940E+00	NOT IDENT.
RH-102M	-2.655E+00	4.644E+00	4.796E+00	NOT IDENT.
RU-103	1.637E+00	5.523E+00	5.572E+00	NOT IDENT.
RH-106	-1.504E+01	4.328E+01	4.381E+01	NOT IDENT.
RU-106	-1.504E+01	4.328E+01	4.381E+01	NOT IDENT.
AG-108M	2.601E+00	3.645E+00	3.830E+00	NOT IDENT.
CD-109	7.156E+01	9.600E+01	1.013E+02	NOT IDENT.
AG-110	-1.215E+01	7.574E+01	7.594E+01	NOT IDENT.
AG-110M	-8.205E-01	5.982E+00	5.993E+00	NOT IDENT.
IN-111	-1.407E+03	1.370E+03	1.510E+03	NOT IDENT.
SN-113	3.607E+00	5.336E+00	5.579E+00	NOT IDENT.
IN-114M	5.853E+00	2.502E+01	2.516E+01	NOT IDENT.
CD-115	3.241E+04	3.619E+04	3.903E+04	SHORT HLIF
SN-117M	6.647E+00	1.063E+01	1.104E+01	NOT IDENT.
SB-122	-1.682E+03	2.866E+03	2.965E+03	NOT IDENT.
I-123	7.491E+13	6.196E+13	7.058E+13	SHORT HLIF
TE-123M	4.036E+00	3.362E+00	3.824E+00	NOT IDENT.
SB-124	-3.964E+00	9.863E+00	1.002E+01	NOT IDENT.
SB-125	4.738E+00	9.725E+00	9.958E+00	NOT IDENT.
TE-125M	-3.842E+02	1.249E+03	1.261E+03	NOT IDENT.
I-126	-6.113E+00	4.014E+01	4.024E+01	NOT IDENT.
SB-126	-1.009E+01	2.816E+01	2.853E+01	FAIL ABUN
SN-126	8.401E+00	9.308E+00	1.005E+01	FAIL ABUN
SB-127	-3.170E+02	7.725E+02	7.856E+02	NOT IDENT.
TE-129	1.089E+01	7.917E+01	7.933E+01	NOT IDENT.
I-131	9.498E+00	3.211E+01	3.239E+01	NOT IDENT.
I-132	-1.000E+41	2.191E+41	0.000E+00	SHORT HLIF
TE-132	-3.778E+02	6.256E+02	6.484E+02	NOT IDENT.
BA-133	4.869E+00	5.143E+00	5.593E+00	NOT IDENT.
I-133	-2.446E+08	1.260E+09	1.264E+09	SHORT HLIF
CS-134	6.477E-01	4.763E+00	4.772E+00	NOT IDENT.
I-135	3.192E+27	7.653E+27	0.000E+00	SHORT HLIF
CS-136	1.721E+00	2.016E+01	2.017E+01	NOT IDENT.
BA-137M	-2.136E+00	3.914E+00	4.031E+00	NOT IDENT.
CS-137	-2.257E+00	4.135E+00	4.259E+00	NOT IDENT.
LA-138	1.415E+00	6.954E+00	6.984E+00	NOT IDENT.
CE-139	-2.508E+00	4.024E+00	4.180E+00	NOT IDENT.
BA-140	2.744E+01	6.250E+01	6.372E+01	NOT IDENT.
LA-140	-6.137E+00	1.851E+01	1.872E+01	FAIL ABUN
CE-141	-1.706E+01	1.197E+01	1.423E+01	NOT IDENT.
CE-143	1.412E+05	1.628E+06	1.629E+06	SHORT HLIF
CE-144	-1.832E+01	2.638E+01	2.764E+01	NOT IDENT.
PM-144	1.035E+01	1.113E+01	1.207E+01	FAIL ABUN
PM-146	3.234E+00	4.530E+00	4.760E+00	NOT IDENT.
ND-147	6.201E+00	1.443E+02	1.444E+02	NOT IDENT.
PM-147	-3.464E+03	9.527E+04	9.528E+04	NOT IDENT.
PM-149	7.970E+04	2.075E+05	2.106E+05	SHORT HLIF
EU-152	-1.026E+00	1.128E+01	1.129E+01	NOT IDENT.
GD-153	-7.546E+00	1.100E+01	1.152E+01	NOT IDENT.
EU-154	5.603E+00	1.421E+01	1.444E+01	NOT IDENT.
EU-155	6.185E+00	1.370E+01	1.398E+01	NOT IDENT.
TB-160	9.786E+00	1.652E+01	1.710E+01	NOT IDENT.
HO-166M	2.569E+00	7.921E+00	8.006E+00	NOT IDENT.
TM-171	1.243E+03	3.412E+03	3.458E+03	NOT IDENT.
LU-176	-1.692E+00	3.078E+00	3.171E+00	NOT IDENT.
LU-177	1.153E+02	3.389E+02	3.429E+02	NOT IDENT.
HF-181	4.265E+00	7.021E+00	7.280E+00	NOT IDENT.
W-181	2.801E+00	3.524E+01	3.526E+01	FAIL ABUN
TA-182	5.371E+00	1.657E+01	1.675E+01	FAIL ABUN
RE-183	7.991E+00	3.570E+01	3.588E+01	NOT IDENT.
RE-184	-5.196E+00	2.038E+01	2.052E+01	NOT IDENT.
RE-188	2.019E+01	2.121E+01	2.308E+01	FAIL ABUN

W-188	1.276E+02	1.002E+03	1.003E+03	FAIL ABUN
OS-191	4.715E+00	2.985E+01	2.993E+01	FAIL ABUN
IR-192	9.260E-01	4.479E+00	4.498E+00	NOT IDENT.
PB-201	-2.081E+18	3.052E+19	0.000E+00	SHORT HLIF
TL-201	1.962E+03	7.328E+03	7.382E+03	NOT IDENT.
TL-202	-8.229E+00	1.517E+01	1.562E+01	NOT IDENT.
HG-203	-8.582E-01	5.676E+00	5.689E+00	NOT IDENT.
PB-203	-1.486E+03	9.827E+03	9.849E+03	SHORT HLIF
TL-204	5.197E+02	6.473E+02	6.885E+02	NOT IDENT.
BI-207	-5.726E+00	6.045E+00	6.574E+00	NOT IDENT.
PB-210	5.117E+02	7.232E+02	7.592E+02	NOT IDENT.
BI-211	6.655E+00	2.804E+01	2.821E+01	NOT IDENT.
PB-211	5.050E+01	9.243E+01	9.520E+01	NOT IDENT.
BI-212	-2.456E+01	7.273E+01	7.357E+01	NOT IDENT.
PB-212	-7.539E+00	8.867E+00	9.497E+00	NOT IDENT.
BI-213	-4.058E+00	1.344E+01	1.356E+01	NOT IDENT.
BI-214	-3.385E+00	1.098E+01	1.109E+01	NOT IDENT.
PB-214	-1.855E+00	1.080E+01	1.083E+01	NOT IDENT.
RN-219	6.021E+00	4.719E+01	4.727E+01	NOT IDENT.
FR-221	-9.124E+00	2.345E+01	2.381E+01	NOT IDENT.
RA-223	5.594E+01	7.441E+01	7.857E+01	NOT IDENT.
RA-224	-5.523E+01	8.490E+01	8.848E+01	NOT IDENT.
AC-225	-4.944E+01	1.271E+02	1.290E+02	NOT IDENT.
AC-227	2.293E+00	3.092E+01	3.093E+01	NOT IDENT.
TH-227	2.293E+00	3.092E+01	3.093E+01	NOT IDENT.
AC-228	3.434E+01	3.066E+01	3.435E+01	FAIL ABUN
RA-228	3.434E+01	3.066E+01	3.435E+01	FAIL ABUN
TH-228	-7.539E+00	8.867E+00	9.497E+00	NOT IDENT.
TH-229	3.071E+00	6.022E+01	6.024E+01	NOT IDENT.
TH-230	-8.600E+02	1.570E+03	1.617E+03	NOT IDENT.
PA-231	4.342E-01	5.321E+01	5.321E+01	NOT IDENT.
TH-231	9.064E+00	4.969E+01	4.986E+01	NOT IDENT.
PA-233	-2.214E+00	8.688E+00	8.745E+00	FAIL ABUN
PA-234	1.577E+01	3.562E+01	3.632E+01	FAIL ABUN
PA-234M	-2.405E+01	6.828E+02	6.829E+02	NOT IDENT.
TH-234	1.466E+02	4.395E+02	4.445E+02	FAIL ABUN
U-234	2.175E+03	1.245E+04	1.249E+04	NOT IDENT.
U-235	-9.860E+00	2.983E+01	3.016E+01	FAIL ABUN
NP-237	-2.214E+00	8.688E+00	8.745E+00	FAIL ABUN
NP-238	-2.711E+02	4.683E+04	4.683E+04	SHORT HLIF
U-238	1.466E+02	4.395E+02	4.445E+02	FAIL ABUN
NP-239	5.603E+00	2.896E+01	2.907E+01	FAIL ABUN
AM-241	4.513E+00	2.625E+01	2.633E+01	NOT IDENT.
AM-242	5.187E+01	1.081E+02	1.106E+02	FAIL ABUN
AM-243	7.248E+00	6.453E+00	7.234E+00	NOT IDENT.
CM-243	2.002E+00	1.394E+01	1.397E+01	FAIL ABUN
BK-247	3.991E+00	9.323E+00	9.496E+00	NOT IDENT.
CM-247	9.951E-01	4.391E+00	4.414E+00	NOT IDENT.
CF-249	-1.133E+00	4.850E+00	4.877E+00	NOT IDENT.
CF-251	1.689E+01	1.502E+01	1.685E+01	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	28.3834	133.52	44.2016	116.30	26.5760
879.38	47.2936	364.49	44.2081	116.74	35.8466
46.54	29.6463	80.22	44.2116	117.23	42.8199
228.16	41.9111	711.68	46.4033	119.76	39.5148
52.39	48.1307	356.01	43.2062	120.54	40.7296
53.20	44.3575	323.87	38.8913	120.90	44.2471
53.44	44.3881	82.35	0.0000	264.66	51.2520
57.53	45.7611	82.47	41.1763	121.22	51.2604
293.27	0.0000	82.47	41.1766	344.28	51.3077
57.53	42.8573	83.79	48.8988	122.06	51.3312
482.18	42.8575	265.00	43.4851	1274.44	49.0787
57.98	42.9097	84.21	43.5043	123.68	42.1092
59.32	38.2800	84.86	0.0000	1377.63	0.0000
59.54	45.1420	193.51	38.1643	127.23	51.7611
155.04	38.5000	105.31	63.3915	129.43	48.4003
63.00	42.4468	86.79	65.6099	131.20	54.4530
129.43	42.4784	86.94	52.5044	133.02	60.5423
63.29	42.4784	87.09	48.1438	133.52	60.5890
290.67	42.5099	87.57	39.4294	135.34	47.6532
63.81	42.5349	88.03	40.9285	136.00	39.3537
87.57	42.5856	306.78	46.8050	136.28	41.7564
64.99	42.6622	88.47	45.3547	136.47	41.7681
65.08	42.6716	531.02	45.2301	739.50	36.0187
66.73	40.4093	184.58	45.2445	140.51	0.0000
66.98	46.0111	92.59	45.3636	140.88	45.6486
67.24	46.0407	93.31	45.4281	143.76	53.0805
67.67	51.6759	94.56	45.5397	144.24	49.4964
1221.41	51.6861	311.90	45.5479	145.44	72.5601
439.51	54.6315	946.00	45.5498	152.32	45.1858
70.82	54.6315	97.43	45.7934	152.43	45.1926
167.43	54.6319	98.43	45.8807	1048.07	61.1412
97.43	45.2613	98.44	45.8816	154.21	52.6516
70.82	43.2744	99.53	45.9764	155.04	35.5500
70.82	43.2744	103.37	45.9764	158.56	51.5560
279.20	0.0000	116.74	45.9764	158.97	0.0000
1063.66	51.9612	100.11	46.0268	159.00	28.3482
72.87	0.0000	100.20	46.0346	162.33	43.3329
351.06	51.9687	102.03	51.0740	537.26	40.8749
74.66	38.3393	103.18	46.6665	163.33	40.9111
238.63	38.3533	103.37	45.1770	165.86	54.7314
351.93	38.3533	105.31	40.8036	167.43	46.1190
238.63	38.3533	106.12	44.2687	245.35	46.7681
74.97	52.2210	106.47	49.9757	427.87	44.5468
77.11	50.3330	109.28	45.6610	176.60	44.5635
256.23	43.0829	111.00	48.0892	177.52	35.3550
79.82	43.0954	111.76	36.6882	181.07	41.4305
80.02	43.1140	208.37	49.4015	184.41	39.4785
80.03	43.1143	116.24	33.5056	184.58	39.4865

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	45.0687	300.09	37.2195	475.06	29.1665
186.21	45.0956	300.13	37.2211	696.49	21.6268
190.27	38.4760	301.36	27.7061	477.60	21.6374
193.51	36.0493	302.85	27.7409	477.99	21.6427
197.03	58.1754	304.50	27.7799	482.18	9.7634
198.01	47.8878	304.85	27.7881	487.02	26.1099
201.83	49.3984	306.78	31.6720	492.35	0.0000
204.12	39.9697	308.46	22.1053	497.08	15.3202
205.31	46.9841	311.90	38.5539	511.00	11.0302
208.37	41.0342	316.51	26.1227	514.00	11.6014
210.85	45.5249	319.41	29.0942	520.40	15.5238
215.65	39.6048	320.08	32.9908	520.69	0.0000
218.12	42.3584	321.04	25.2483	667.71	0.0000
222.11	28.3600	323.87	21.4128	527.90	0.0000
227.09	31.1826	325.23	34.1028	529.59	21.7328
227.38	28.5182	1596.21	23.4507	529.87	0.0000
228.16	45.4883	331.15	0.0000	531.02	18.4034
228.18	45.4893	333.37	32.3622	537.26	20.1445
235.69	47.6409	334.37	25.5176	539.51	0.0000
235.96	55.7460	338.28	37.4093	1260.41	0.0000
238.63	45.9801	911.20	37.4101	552.55	18.0540
238.98	0.0000	340.48	34.5144	795.86	17.0215
240.99	61.4528	340.55	34.5165	564.24	15.8947
242.00	37.9946	344.28	25.7144	569.33	11.3835
244.70	42.6320	345.93	25.7472	569.50	11.3843
245.35	41.7516	351.06	21.8711	569.70	20.4939
459.60	35.5818	351.93	29.8438	582.08	10.3125
685.70	35.6437	356.01	19.9569	583.19	12.6113
388.16	37.4857	361.25	0.0000	595.83	19.6147
256.23	36.6927	364.49	24.0991	600.60	19.6611
527.90	0.0000	366.42	20.1111	604.72	20.8601
264.66	29.5892	383.85	20.3642	609.32	16.2616
265.00	28.6740	388.16	25.5325	610.33	20.9180
269.46	31.5789	666.33	25.5407	614.28	12.8078
401.81	27.9095	391.70	16.3812	618.01	16.3305
273.65	30.7683	392.87	23.5671	621.93	23.6662
276.40	26.1720	400.66	20.6030	630.19	0.0000
583.19	29.9368	401.32	0.0000	631.29	22.0116
277.60	29.9434	401.81	20.6193	632.98	14.9798
402.40	29.0177	402.40	20.6274	633.25	13.2193
278.43	25.2834	404.85	22.7282	634.78	12.3470
279.20	0.0000	410.95	21.7844	635.95	11.4714
279.54	30.9328	720.70	25.9984	636.99	19.4225
280.46	32.8346	423.72	25.1074	657.50	12.4790
301.36	38.5743	427.09	18.8719	884.68	12.4807
284.31	38.5960	427.87	13.6366	661.66	16.9683
285.41	36.7490	433.94	16.8493	664.57	0.0000
285.90	0.0000	439.51	27.4779	666.33	15.2148
287.50	34.9284	440.45	25.3794	666.50	15.2159
290.67	35.0255	539.51	0.0000	667.71	0.0000
293.27	0.0000	453.88	11.7305	677.62	6.2970
295.22	39.9159	459.60	23.5437	685.70	14.4453
316.51	35.1866	463.37	32.1790	692.65	19.9241
298.58	35.2656	468.07	27.9683	695.00	19.9449
299.98	37.2163	473.00	17.8018	696.49	19.9576

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
696.51	19.9583	884.68	11.7352	1238.28	4.3716
697.00	19.9623	889.28	8.8163	1260.41	0.0000
697.49	19.9664	894.76	16.6856	1271.87	6.6174
702.65	16.0096	1836.06	11.7920	1274.44	6.6218
706.68	14.5796	903.28	12.6016	1274.54	6.6222
711.68	16.4377	907.67	0.0000	1291.59	4.4348
720.70	16.5020	911.20	9.8727	1298.22	0.0000
721.93	0.0000	984.45	0.0000	1312.11	7.8028
1690.97	13.7640	926.36	8.9330	1332.49	5.6030
722.91	14.6821	935.54	11.9487	1362.15	0.0000
723.31	14.6846	937.49	11.1597	1365.19	6.3280
756.73	14.6904	983.53	7.9895	1368.63	0.0000
727.33	12.8712	945.96	0.0000	1377.63	0.0000
733.00	12.9024	946.00	5.9960	1384.29	2.7250
735.93	16.6091	949.00	9.0033	1408.01	7.3098
739.50	10.1651	954.55	0.0000	1434.09	2.7587
1434.09	15.7414	962.31	13.0639	1435.80	5.5198
747.24	6.4899	964.08	8.0442	1457.56	0.0000
752.31	13.9362	966.17	12.0747	1460.82	8.3294
753.82	12.0855	968.97	11.0789	1489.16	5.5904
756.73	13.0306	983.53	8.0967	1553.35	0.0000
763.94	13.0695	984.45	0.0000	1596.21	6.6832
765.80	11.2108	996.26	8.1309	1620.50	5.7592
1001.03	10.2793	1001.03	10.1794	1678.03	0.0000
766.84	12.1502	1004.73	13.2495	1690.97	3.8979
772.60	0.0000	1025.87	0.0000	1757.55	0.0000
776.52	18.7665	1028.54	0.0000	1764.49	4.9470
777.92	10.3273	1037.84	5.1505	1770.23	4.9529
778.90	8.4529	1038.76	0.0000	1771.35	4.9541
783.70	8.4691	1046.59	13.4285	1791.20	0.0000
1435.80	14.1440	1048.07	9.3010	1808.65	2.9947
903.28	16.9953	1050.41	8.2739	1836.06	3.0110
795.86	12.2926	1063.66	13.5007		
801.95	12.3224	1077.00	5.2142		
802.10	12.3228	1077.34	6.2578		
810.29	9.5096	1083.85	6.2703		
810.45	9.5102	1085.87	3.1370		
810.76	13.3160	1099.25	11.5492		
815.77	9.5300	1107.22	0.0000		
818.51	18.1262	1111.64	4.2156		
822.65	0.0000	1112.07	5.2701		
832.01	13.4254	1112.84	9.4883		
834.85	6.7199	1115.54	7.3858		
835.15	6.7208	1120.29	5.2832		
836.80	0.0000	1120.55	4.2268		
846.77	11.0212	1121.30	6.3417		
856.80	10.3249	1808.65	7.4170		
860.56	9.3056	1131.51	0.0000		
871.09	8.7580	1332.49	6.4387		
873.19	9.7385	1177.95	11.8204		
875.33	0.0000	1189.05	7.5460		
879.38	7.8083	1204.77	5.4138		
880.51	10.7412	1221.41	4.3513		
881.60	11.7220	1231.02	3.2721		
883.24	9.7742	1235.36	8.7363		

VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 17:21:50.53

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                    *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487002.CNF;1
Background file : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM18.CNF;811
Background date  : 15-JAN-2023 11:19:15
Sample date     : 26-DEC-2022 07:23:00 Acquisition date : 19-JAN-2023 15:21:15
Sample ID      : G606487002 Sample quantity : 7.39130E-01 FILTER
Detector name   : GAM18 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:00.57 0.0%
Energy tolerance: 1.50000 keV Analyst Initials : MXR1
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2367950 Detector SN# :
Matrix Spike ID : LCS ID :
*****

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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	185.97*	25	99	1.36	371.56	367	10	3.54E-03	86.4	
2	0	198.30*	31	54	0.84	396.19	393	7	4.35E-03	47.5	
3	0	239.06*	44	125	1.30	477.64	471	15	6.08E-03	62.1	
4	0	295.77*	18	85	1.46	590.95	585	12	2.53E-03	110.2	
5	0	329.38	16	42	0.58	658.09	654	6	2.25E-03	69.1	
6	0	428.97	33	43	4.53	857.10	851	15	4.60E-03	45.8	
7	0	477.44	78	55	1.81	953.95	947	14	1.08E-02	23.4	
8	0	482.99	32	16	5.21	965.05	960	13	4.47E-03	32.8	
9	0	584.39*	6	36	0.63	1167.69	1157	13	8.32E-04	234.7	
10	0	597.28	29	32	2.00	1193.46	1189	9	3.96E-03	40.1	
11	0	644.80	85	49	17.31	1288.43	1270	39	1.18E-02	29.1	
12	0	704.99	19	48	3.82	1408.74	1401	14	2.63E-03	81.7	
13	0	910.29*	2	22	1.76	1819.13	1813	13	2.32E-04	692.0	
14	0	941.14	10	18	0.96	1880.80	1875	9	1.32E-03	89.9	
15	0	1001.86*	14	13	1.45	2002.19	1994	16	1.99E-03	73.0	
16	0	1008.06	9	6	1.42	2014.58	2009	8	1.24E-03	58.4	
17	0	1182.66	8	15	0.89	2363.67	2355	11	1.08E-03	106.5	
18	0	1237.08*	8	13	6.34	2472.49	2463	17	1.17E-03	116.7	
19	0	1413.42	9	11	5.28	2825.13	2816	15	1.29E-03	84.8	
20	0	1461.33*	4	28	1.08	2920.96	2911	16	5.13E-04	365.4	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 19-JAN-2023 17:21:51

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487002.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MXR1		
Sample date	: 26-DEC-2022 07:23:00	Acquisition date	: 19-JAN-2023 15:21:15
Sample ID	: G606487002	Sample quantity	: 0.73913 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA18	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.57 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	78	10.44*	3.329E+00	1.135E+02	1.559E+02	46.70
K-40	1460.82	4	10.66*	1.441E+00	1.222E+01	1.222E+01	730.78
AS-74	595.83	29	59.00*	2.889E+00	8.492E+00	2.197E+01	80.28
	634.78	-----	15.40	2.770E+00	-----	Line Not Found	-----
TL-208	277.37	-----	6.60	4.452E+00	-----	Line Not Found	-----
	583.19	6	85.00*	2.931E+00	1.221E+00	1.251E+00	469.35
	860.56	-----	12.50	2.198E+00	-----	Line Not Found	-----
RA-226	186.21	25	3.59*	5.317E+00	6.784E+01	6.784E+01	172.74

Flag: "*" = Keyline

```

*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                           *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*                                     *                                               *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487002.CNF;1        *
* Acquisition date   : 19-JAN-2023 15:21:15 Sensitivity      : 3.000                *
* Detector ID        : GAM18 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:00.57 Half life ratio : *****      *
* Sample date        : 26-DEC-2022 07:23:00 Analyst initials: MXR1        *
* Sample ID          : G606487002 Sample Quantity : 7.3913E-01 FILTER *
* Batch Number       : 2367950 Wet Weight : 0.00000        *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000         *
* Nuclide Library    : LIQUID.NLB;28                                             *
*****
*                                     CALIBRATION INFORMATION                       *
*                                     *                                               *
* Eff. Cal. date     : 8-JUN-2022 11:06:14 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19          *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.559E+02	7.137E+01	6.707E+01
K-40	1.222E+01	8.750E+01	7.092E+01
AS-74	2.197E+01	1.729E+01	2.120E+01
TL-208	1.251E+00	5.752E+00	5.368E+00
RA-226	6.784E+01	1.148E+02	1.104E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-7.351E-01		3.828E+00	6.960E+00	NOT IDENT.
NA-24	0.000E+00		1.919E+12	0.000E+00	SHORT HLIF
AL-26	-5.033E-01		2.609E+00	5.126E+00	NOT IDENT.
SC-46	9.206E-01		3.392E+00	6.815E+00	NOT IDENT.
V-48	4.397E-01		9.082E+00	1.748E+01	NOT IDENT.
CR-51	-3.300E+01		4.017E+01	6.636E+01	NOT IDENT.
MN-52	-7.990E+00		7.712E+01	1.482E+02	NOT IDENT.
MN-54	-1.146E+00		3.316E+00	6.091E+00	NOT IDENT.
CO-56	8.603E-01		3.729E+00	7.362E+00	FAIL ABUN
CO-57	3.953E-01		2.469E+00	4.391E+00	NOT IDENT.
NI-57	0.000E+00		3.950E+05	0.000E+00	SHORT HLIF
CO-58	2.020E+00		3.399E+00	6.856E+00	NOT IDENT.
FE-59	-1.587E+00		8.953E+00	1.651E+01	NOT IDENT.
CO-60	-9.233E-01		3.725E+00	7.029E+00	NOT IDENT.
ZN-65	5.451E-01		8.112E+00	1.531E+01	NOT IDENT.
CU-67	3.524E+03		5.966E+03	6.797E+03	FAIL ABUN
GE-68	-8.872E+01		1.003E+02	1.639E+02	NOT IDENT.
AS-73	9.008E+01		1.549E+02	2.976E+02	NOT IDENT.
SE-75	-2.157E+00		4.494E+00	7.848E+00	NOT IDENT.
BR-77	0.000E+00		2.998E+04	0.000E+00	SHORT HLIF
SR-82	-1.620E+01		3.705E+01	6.377E+01	NOT IDENT.
RB-83	1.158E+00		7.309E+00	1.384E+01	NOT IDENT.
RB-84	2.811E+00		7.153E+00	1.444E+01	NOT IDENT.
KR-85	-3.268E+03		1.091E+03	1.581E+03	NOT IDENT.
SR-85	-1.891E+01		6.312E+00	9.149E+00	NOT IDENT.

RB-86	-7.986E+01	8.915E+01	1.456E+02	NOT IDENT.
Y-88	2.216E+00	4.468E+00	9.381E+00	NOT IDENT.
ZR-88	3.624E-01	3.029E+00	5.470E+00	NOT IDENT.
Y-91	-1.063E+03	1.862E+03	3.188E+03	NOT IDENT.
NB-94	-8.992E-01	4.594E+00	6.425E+00	NOT IDENT.
NB-95	4.583E+00	4.016E+00	8.331E+00	NOT IDENT.
NB-95M	1.744E+00	1.175E+01	1.983E+01	NOT IDENT.
TC-95M	1.981E-03	4.255E+00	7.911E+00	NOT IDENT.
ZR-95	2.158E+00	6.911E+00	1.322E+01	NOT IDENT.
MO-99	-4.004E+03	1.058E+04	1.850E+04	NOT IDENT.
TC-99M	0.000E+00	4.405E+29	0.000E+00	SHORT HLIF
RH-100	0.000E+00	1.138E+09	0.000E+00	SHORT HLIF
RH-101	1.484E+00	2.826E+00	5.195E+00	FAIL ABUN
RH-102M	2.440E+00	3.237E+00	5.838E+00	NOT IDENT.
RU-103	1.619E+00	4.543E+00	8.770E+00	NOT IDENT.
RH-106	-1.573E+01	3.224E+01	5.605E+01	NOT IDENT.
RU-106	-1.573E+01	3.224E+01	5.605E+01	NOT IDENT.
AG-108M	-1.609E+00	2.902E+00	4.134E+00	NOT IDENT.
CD-109	4.866E+01	7.498E+01	1.409E+02	NOT IDENT.
AG-110	-4.221E+01	7.935E+01	1.163E+02	NOT IDENT.
AG-110M	-2.962E+00	4.493E+00	7.884E+00	NOT IDENT.
IN-111	-1.514E+02	9.486E+02	1.545E+03	NOT IDENT.
SN-113	-4.815E+00	4.572E+00	7.145E+00	NOT IDENT.
IN-114M	9.040E+00	2.094E+01	3.657E+01	NOT IDENT.
CD-115	0.000E+00	1.679E+04	0.000E+00	SHORT HLIF
SN-117M	6.178E-01	8.047E+00	1.391E+01	NOT IDENT.
SB-122	1.407E+03	1.943E+03	3.871E+03	NOT IDENT.
I-123	0.000E+00	5.076E+13	0.000E+00	SHORT HLIF
TE-123M	1.501E+00	2.781E+00	5.011E+00	NOT IDENT.
SB-124	5.214E+00	8.106E+00	1.849E+01	NOT IDENT.
SB-125	0.000E+00	1.457E+01	1.560E+01	FAIL ABUN
TE-125M	-3.049E+02	1.029E+03	1.770E+03	NOT IDENT.
I-126	4.593E-01	3.154E+01	5.833E+01	NOT IDENT.
SB-126	1.837E+01	2.549E+01	4.733E+01	NOT IDENT.
SN-126	1.204E+01	6.848E+00	1.400E+01	NOT IDENT.
SB-127	5.257E+00	6.324E+02	1.165E+03	NOT IDENT.
TE-129	-5.391E+00	5.297E+01	9.902E+01	NOT IDENT.
I-131	-1.435E+00	2.264E+01	4.042E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	-3.403E+01	4.689E+02	8.604E+02	NOT IDENT.
BA-133	-1.457E+00	4.136E+00	7.111E+00	NOT IDENT.
I-133	0.000E+00	8.122E+08	0.000E+00	SHORT HLIF
CS-134	1.642E+00	3.280E+00	6.494E+00	NOT IDENT.
I-135	0.000E+00	7.142E+27	0.000E+00	SHORT HLIF
CS-136	-5.693E-02	1.399E+01	2.681E+01	NOT IDENT.
BA-137M	2.610E-01	3.408E+00	6.294E+00	NOT IDENT.
CS-137	2.757E-01	3.600E+00	6.649E+00	NOT IDENT.
LA-138	-1.325E+00	5.784E+00	1.089E+01	NOT IDENT.
CE-139	3.737E-01	3.065E+00	5.273E+00	NOT IDENT.
BA-140	2.869E+01	3.643E+01	7.465E+01	NOT IDENT.
LA-140	-7.584E+00	1.362E+01	2.407E+01	FAIL ABUN
CE-141	-8.124E+00	8.689E+00	1.287E+01	NOT IDENT.
CE-143	0.000E+00	1.088E+06	0.000E+00	SHORT HLIF
CE-144	1.157E+01	1.990E+01	3.623E+01	NOT IDENT.
PM-144	-1.381E+00	3.850E+00	6.681E+00	FAIL ABUN
PR-144	-1.039E+02	2.896E+02	5.024E+02	NOT IDENT.
PM-146	-1.107E+00	3.560E+00	6.551E+00	NOT IDENT.
ND-147	-8.102E+00	8.325E+01	1.555E+02	NOT IDENT.
PM-147	-4.313E+04	7.222E+04	1.195E+05	NOT IDENT.
PM-149	0.000E+00	1.540E+05	0.000E+00	SHORT HLIF
EU-152	4.854E-01	9.943E+00	1.778E+01	NOT IDENT.
GD-153	-2.278E+00	8.054E+00	1.403E+01	NOT IDENT.
EU-154	-2.257E+00	1.077E+01	1.952E+01	NOT IDENT.
EU-155	2.420E+00	1.051E+01	1.894E+01	NOT IDENT.
TB-160	1.083E+01	1.216E+01	2.598E+01	FAIL ABUN
HO-166M	-3.656E+00	5.461E+00	8.733E+00	NOT IDENT.
TM-171	-8.747E+02	3.079E+03	5.591E+03	NOT IDENT.
LU-176	7.333E-01	2.310E+00	4.330E+00	NOT IDENT.
LU-177	1.419E+02	2.529E+02	4.891E+02	NOT IDENT.
HF-181	0.000E+00	5.881E+00	8.788E+00	FAIL ABUN
W-181	-6.137E+00	3.030E+01	5.511E+01	NOT IDENT.
TA-182	-1.071E+01	1.350E+01	2.202E+01	NOT IDENT.
RE-183	1.511E+01	2.936E+01	5.641E+01	NOT IDENT.
RE-184	1.157E+01	1.522E+01	2.927E+01	NOT IDENT.
RE-188	-3.353E+00	1.545E+01	2.604E+01	FAIL ABUN
W-188	-5.476E+02	7.858E+02	1.160E+03	NOT IDENT.
OS-191	4.792E+00	2.086E+01	3.739E+01	NOT IDENT.
IR-192	4.479E+00	3.355E+00	6.846E+00	FAIL ABUN

PB-201	0.000E+00	2.338E+19	0.000E+00	SHORT HLIF
TL-201	1.765E+03	5.573E+03	9.760E+03	NOT IDENT.
TL-202	2.741E+00	9.560E+00	1.876E+01	NOT IDENT.
HG-203	-2.017E-01	4.057E+00	7.338E+00	NOT IDENT.
PB-203	0.000E+00	7.013E+03	0.000E+00	SHORT HLIF
TL-204	-4.038E+02	5.360E+02	9.172E+02	NOT IDENT.
BI-207	-2.975E+00	4.479E+00	7.671E+00	NOT IDENT.
PB-210	1.518E+02	8.169E+02	1.404E+03	NOT IDENT.
BI-211	-2.551E+01	2.368E+01	3.854E+01	NOT IDENT.
PB-211	5.125E+01	6.624E+01	1.272E+02	NOT IDENT.
BI-212	2.946E+01	4.188E+01	8.451E+01	NOT IDENT.
PB-212	1.093E+01	1.331E+01	1.276E+01	FAIL ABUN
BI-213	4.602E+00	8.829E+00	1.763E+01	NOT IDENT.
BI-214	-5.144E+00	9.123E+00	1.629E+01	NOT IDENT.
PB-214	-3.185E-01	8.192E+00	1.466E+01	FAIL ABUN
RN-219	-1.470E+01	3.680E+01	6.244E+01	NOT IDENT.
FR-221	1.436E+01	1.773E+01	3.499E+01	NOT IDENT.
RA-223	-3.092E+01	5.976E+01	1.021E+02	NOT IDENT.
RA-224	2.760E+01	5.579E+01	1.062E+02	NOT IDENT.
AC-225	7.778E+01	9.606E+01	1.895E+02	NOT IDENT.
AC-227	-9.766E+00	1.981E+01	3.488E+01	NOT IDENT.
TH-227	-9.766E+00	1.981E+01	3.488E+01	NOT IDENT.
AC-228	1.579E+00	2.141E+01	2.742E+01	FAIL ABUN
RA-228	1.579E+00	2.141E+01	2.742E+01	FAIL ABUN
TH-228	1.093E+01	1.331E+01	1.276E+01	FAIL ABUN
TH-229	1.152E+01	4.572E+01	8.687E+01	NOT IDENT.
TH-230	-1.644E+03	1.340E+03	2.028E+03	NOT IDENT.
PA-231	-1.235E+01	4.591E+01	7.684E+01	NOT IDENT.
TH-231	1.004E+01	4.678E+01	7.981E+01	NOT IDENT.
TH-232	-8.693E+02	2.618E+03	4.439E+03	NOT IDENT.
PA-233	-2.098E-01	5.094E+00	9.290E+00	NOT IDENT.
PA-234	2.915E+01	3.138E+01	6.133E+01	NOT IDENT.
PA-234M	4.471E+02	6.401E+02	8.063E+02	FAIL ABUN
TH-234	3.759E+01	1.885E+02	3.316E+02	NOT IDENT.
U-234	6.820E+03	1.086E+04	2.097E+04	NOT IDENT.
U-235	-4.966E-01	2.162E+01	3.481E+01	FAIL ABUN
NP-237	-2.098E-01	5.094E+00	9.290E+00	NOT IDENT.
NP-238	0.000E+00	3.628E+04	0.000E+00	SHORT HLIF
U-238	3.759E+01	1.885E+02	3.316E+02	NOT IDENT.
NP-239	9.873E+00	2.235E+01	4.141E+01	NOT IDENT.
AM-241	3.761E+00	1.985E+01	3.715E+01	NOT IDENT.
AM-242	-7.783E-01	6.052E+01	1.077E+02	NOT IDENT.
AM-243	7.192E-01	5.892E+00	1.033E+01	NOT IDENT.
CM-243	-6.832E+00	1.062E+01	1.775E+01	NOT IDENT.
BK-247	1.710E+00	7.440E+00	1.385E+01	NOT IDENT.
CM-247	-1.847E+00	3.467E+00	5.778E+00	NOT IDENT.
CF-249	5.725E-01	4.122E+00	7.377E+00	NOT IDENT.
CF-251	-3.810E+00	1.084E+01	1.986E+01	NOT IDENT.
CF-252	1.068E+03	1.616E+04	2.906E+04	NOT IDENT.
ANH-511	-1.483E+01	5.898E+00	1.130E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	93.12	45	137	1.46	186.05	181	8	6.25E-03	47.7	
2	0	185.97	90	99	1.36	371.56	367	10	1.24E-02	23.4	
3	0	198.30	42	54	0.84	396.19	393	7	5.85E-03	32.5	
4	0	239.06	81	125	1.30	477.64	471	15	1.12E-02	32.1	
5	0	295.77	42	85	1.46	590.95	585	12	5.86E-03	46.2	
6	0	329.38	16	42	0.58	658.09	654	6	2.25E-03	69.1	
7	0	428.97	33	43	4.53	857.10	851	15	4.60E-03	45.8	
8	0	477.44	78	55	1.81	953.95	947	14	1.08E-02	23.4	
9	0	482.99	32	16	5.21	965.05	960	13	4.47E-03	32.8	
10	0	510.73	225	91	2.67	1020.48	1011	20	3.13E-02	12.3	
11	0	584.39	19	36	0.63	1167.69	1157	13	2.58E-03	72.6	
12	0	597.28	29	32	2.00	1193.46	1189	9	3.96E-03	40.1	
13	0	610.50	33	65	1.14	1219.89	1214	14	4.55E-03	56.5	
14	0	644.80	85	49	17.31	1288.43	1270	39	1.18E-02	29.1	
15	0	704.99	19	48	3.82	1408.74	1401	14	2.63E-03	81.7	
16	0	910.29	19	22	1.76	1819.13	1813	13	2.60E-03	57.3	
17	0	941.14	10	18	0.96	1880.80	1875	9	1.32E-03	89.9	
18	0	1001.86	22	13	1.45	2002.19	1994	16	3.08E-03	44.9	
19	0	1008.06	9	6	1.42	2014.58	2009	8	1.24E-03	58.4	
20	0	1182.66	8	15	0.89	2363.67	2355	11	1.08E-03	106.5	
21	0	1237.08	16	13	6.34	2472.49	2463	17	2.22E-03	57.1	
22	0	1413.42	9	11	5.28	2825.13	2816	15	1.29E-03	84.8	
23	0	1461.33	25	28	1.08	2920.96	2911	16	3.50E-03	50.9	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	78	10.44*	3.329E+00	1.135E+02	1.559E+02	46.70
K-40	1460.82	4	10.66*	1.441E+00	1.222E+01	1.222E+01	730.78
AS-74	595.83	29	59.00*	2.889E+00	8.492E+00	2.197E+01	80.28
	634.78	-----	15.40	2.770E+00	-----	Line Not Found	-----
TL-208	277.37	-----	6.60	4.452E+00	-----	Line Not Found	-----
	583.19	6	85.00*	2.931E+00	1.221E+00	1.251E+00	469.35
	860.56	-----	12.50	2.198E+00	-----	Line Not Found	-----
RA-226	186.21	25	3.59*	5.317E+00	6.784E+01	6.784E+01	172.74

Flag: "*" = Keyline

Total number of lines in spectrum 20
Number of unidentified lines 6
Number of lines tentatively identified by NID 14 70.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.37	1.135E+02	1.559E+02	0.728E+02	46.70	
K-40	1.25E+09Y	1.00	1.222E+01	1.222E+01	8.929E+01	730.78	
AS-74	17.77D	2.59	8.492E+00	2.197E+01	1.764E+01	80.28	
TL-208	1.91Y	1.02	1.221E+00	1.251E+00	5.870E+00	469.35	
RA-226	1600.00Y	1.00	6.784E+01	6.784E+01	11.72E+01	172.74	

Total Activity : 2.033E+02 2.592E+02

Grand Total Activity : 2.033E+02 2.592E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	198.30	31	54	0.84	396.19	393	7	4.35E-03	95.1	5.19E+00	T
0	239.06	44	125	1.30	477.64	471	15	6.08E-03	****	4.78E+00	T
0	295.77	18	85	1.46	590.95	585	12	2.53E-03	****	4.31E+00	T
0	329.38	16	42	0.58	658.09	654	6	2.25E-03	****	4.08E+00	T
0	428.97	33	43	4.53	857.10	851	15	4.60E-03	91.7	3.54E+00	T
0	482.99	32	16	5.21	965.05	960	13	4.47E-03	65.5	3.31E+00	T
0	644.80	85	49	17.31	1288.43	1270	39	1.18E-02	58.2	2.74E+00	
0	704.99	19	48	3.82	1408.74	1401	14	2.63E-03	****	2.57E+00	
0	910.29	2	22	1.76	1819.13	1813	13	2.32E-04	****	2.10E+00	T
0	941.14	10	18	0.96	1880.80	1875	9	1.32E-03	****	2.04E+00	
0	1001.86	14	13	1.45	2002.19	1994	16	1.99E-03	****	1.94E+00	T
0	1008.06	9	6	1.42	2014.58	2009	8	1.24E-03	****	1.93E+00	
0	1182.66	8	15	0.89	2363.67	2355	11	1.08E-03	****	1.69E+00	
0	1237.08	8	13	6.34	2472.49	2463	17	1.17E-03	****	1.63E+00	T
0	1413.42	9	11	5.28	2825.13	2816	15	1.29E-03	****	1.47E+00	

Flags: "T" = Tentatively associated

```
*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                       *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487002.CNF;1  *
* Acquisition date   : 19-JAN-2023 15:21:15 Sensitivity      : 3.000          *
* Detector ID        : GAM18 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:00.57 Half life ratio : *****      *
* Sample date        : 26-DEC-2022 07:23:00 Nuclide Library : LIQUID      *
* Sample ID          : G606487002 Analyst initials: MXR1         *
* Batch Number       : 2367950 Sample Quantity : 7.3913E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                       *
* Eff. Cal. date     : 8-JUN-2022 11:06:14 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19          *
*****
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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.083E+01
K-40	3.100E+01
AS-74	9.561E+00
TL-208	2.403E+00
RA-226	5.165E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	3.041E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.034E+00	NOT IDENT.
SC-46	3.016E+00	NOT IDENT.
V-48	7.736E+00	NOT IDENT.
CR-51	3.011E+01	NOT IDENT.
MN-52	6.443E+01	NOT IDENT.
MN-54	2.725E+00	NOT IDENT.
CO-56	3.298E+00	FAIL ABUN
CO-57	2.044E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.049E+00	NOT IDENT.
FE-59	7.268E+00	NOT IDENT.
CO-60	3.065E+00	NOT IDENT.
ZN-65	6.836E+00	NOT IDENT.
CU-67	3.214E+03	FAIL ABUN
GE-68	6.951E+01	NOT IDENT.
AS-73	1.397E+02	NOT IDENT.
SE-75	3.631E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	2.818E+01	NOT IDENT.
RB-83	6.336E+00	NOT IDENT.
RB-84	6.449E+00	NOT IDENT.
KR-85	7.404E+02	NOT IDENT.
SR-85	4.285E+00	NOT IDENT.
RB-86	6.201E+01	NOT IDENT.

Y-88	4.066E+00	NOT IDENT.
ZR-88	2.503E+00	NOT IDENT.
Y-91	1.382E+03	NOT IDENT.
NB-94	2.946E+00	NOT IDENT.
NB-95	3.796E+00	NOT IDENT.
NB-95M	9.172E+00	NOT IDENT.
TC-95M	3.678E+00	NOT IDENT.
ZR-95	5.937E+00	NOT IDENT.
MO-99	8.183E+03	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-100	0.000E+00	SHORT HLIF
RH-101	2.417E+00	FAIL ABUN
RH-102M	2.701E+00	NOT IDENT.
RU-103	4.030E+00	NOT IDENT.
RH-106	2.546E+01	NOT IDENT.
RU-106	2.546E+01	NOT IDENT.
AG-108M	1.852E+00	NOT IDENT.
CD-109	6.607E+01	NOT IDENT.
AG-110	5.212E+01	NOT IDENT.
AG-110M	3.473E+00	NOT IDENT.
IN-111	7.082E+02	NOT IDENT.
SN-113	3.245E+00	NOT IDENT.
IN-114M	1.711E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	6.462E+00	NOT IDENT.
SB-122	1.775E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.337E+00	NOT IDENT.
SB-124	7.810E+00	NOT IDENT.
SB-125	7.144E+00	FAIL ABUN
TE-125M	8.219E+02	NOT IDENT.
I-126	2.630E+01	NOT IDENT.
SB-126	2.169E+01	NOT IDENT.
SN-126	6.574E+00	NOT IDENT.
SB-127	5.252E+02	NOT IDENT.
TE-129	4.519E+01	NOT IDENT.
I-131	1.843E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	3.990E+02	NOT IDENT.
BA-133	3.273E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	2.897E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.175E+01	NOT IDENT.
BA-137M	2.864E+00	NOT IDENT.
CS-137	3.025E+00	NOT IDENT.
LA-138	4.726E+00	NOT IDENT.
CE-139	2.461E+00	NOT IDENT.
BA-140	3.391E+01	NOT IDENT.
LA-140	1.006E+01	FAIL ABUN
CE-141	6.013E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.696E+01	NOT IDENT.
PM-144	3.063E+00	FAIL ABUN
PR-144	2.303E+02	NOT IDENT.
PM-146	2.966E+00	NOT IDENT.
ND-147	6.996E+01	NOT IDENT.
PM-147	5.539E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.245E+00	NOT IDENT.
GD-153	6.502E+00	NOT IDENT.
EU-154	8.521E+00	NOT IDENT.
EU-155	8.846E+00	NOT IDENT.
TB-160	1.166E+01	FAIL ABUN
HO-166M	3.870E+00	NOT IDENT.
TM-171	2.611E+03	NOT IDENT.
LU-176	1.993E+00	NOT IDENT.
LU-177	2.281E+02	NOT IDENT.
HF-181	4.012E+00	FAIL ABUN
W-181	2.567E+01	NOT IDENT.
TA-182	9.218E+00	NOT IDENT.
RE-183	2.633E+01	NOT IDENT.
RE-184	1.327E+01	NOT IDENT.
RE-188	1.203E+01	FAIL ABUN
W-188	5.302E+02	NOT IDENT.
OS-191	1.733E+01	NOT IDENT.
IR-192	3.174E+00	FAIL ABUN
PB-201	0.000E+00	SHORT HLIF

TL-201	4.558E+03	NOT IDENT.
TL-202	8.536E+00	NOT IDENT.
HG-203	3.398E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	4.272E+02	NOT IDENT.
BI-207	3.336E+00	NOT IDENT.
PB-210	6.590E+02	NOT IDENT.
BI-211	1.793E+01	NOT IDENT.
PB-211	5.863E+01	NOT IDENT.
BI-212	3.807E+01	NOT IDENT.
PB-212	6.048E+00	FAIL ABUN
BI-213	8.060E+00	NOT IDENT.
BI-214	7.617E+00	NOT IDENT.
PB-214	6.843E+00	FAIL ABUN
RN-219	2.839E+01	NOT IDENT.
FR-221	1.629E+01	NOT IDENT.
RA-223	4.686E+01	NOT IDENT.
RA-224	4.953E+01	NOT IDENT.
AC-225	8.824E+01	NOT IDENT.
AC-227	1.588E+01	NOT IDENT.
TH-227	1.588E+01	NOT IDENT.
AC-228	1.244E+01	FAIL ABUN
RA-228	1.244E+01	FAIL ABUN
TH-228	6.048E+00	FAIL ABUN
TH-229	4.048E+01	NOT IDENT.
TH-230	9.404E+02	NOT IDENT.
PA-231	3.543E+01	NOT IDENT.
TH-231	3.737E+01	NOT IDENT.
TH-232	2.088E+03	NOT IDENT.
PA-233	4.222E+00	NOT IDENT.
PA-234	2.786E+01	NOT IDENT.
PA-234M	3.611E+02	FAIL ABUN
TH-234	1.563E+02	NOT IDENT.
U-234	9.837E+03	NOT IDENT.
U-235	1.631E+01	FAIL ABUN
NP-237	4.222E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.563E+02	NOT IDENT.
NP-239	1.915E+01	NOT IDENT.
AM-241	1.732E+01	NOT IDENT.
AM-242	5.008E+01	NOT IDENT.
AM-243	4.847E+00	NOT IDENT.
CM-243	8.244E+00	NOT IDENT.
BK-247	6.423E+00	NOT IDENT.
CM-247	2.630E+00	NOT IDENT.
CF-249	3.412E+00	NOT IDENT.
CF-251	9.201E+00	NOT IDENT.
CF-252	1.347E+04	NOT IDENT.
ANH-511	5.436E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487002.CNF;1
Acquisition date : 19-JAN-2023 15:21:15 Sensitivity : 3.000
Detector ID : GAM18 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.57 Half life ratio : *****
Sample date : 26-DEC-2022 07:23:00 Nuclide Library : LIQUID
Sample ID : G606487002 Analyst initials: MXR1
Batch Number : 2367950 Sample Quantity : 7.3913E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 8-JUN-2022 11:06:14 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.559E+02	7.256E+01	7.262E+01
K-40	1.222E+01	8.751E+01	8.751E+01
AS-74	2.197E+01	1.745E+01	1.745E+01
TL-208	1.251E+00	5.753E+00	5.753E+00
RA-226	6.784E+01	1.150E+02	1.150E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-7.351E-01	3.829E+00	3.843E+00	NOT IDENT.
NA-24	1.200E+12	1.922E+12	1.997E+12	SHORT HLIF
AL-26	-5.033E-01	2.610E+00	2.619E+00	NOT IDENT.
SC-46	9.206E-01	3.394E+00	3.419E+00	NOT IDENT.
V-48	4.397E-01	9.082E+00	9.084E+00	NOT IDENT.
CR-51	-3.300E+01	4.026E+01	4.293E+01	NOT IDENT.
MN-52	-7.990E+00	7.713E+01	7.721E+01	NOT IDENT.
MN-54	-1.146E+00	3.318E+00	3.358E+00	NOT IDENT.
CO-56	8.603E-01	3.730E+00	3.751E+00	FAIL ABUN
CO-57	3.953E-01	2.469E+00	2.476E+00	NOT IDENT.
NI-57	1.194E+05	3.952E+05	3.989E+05	SHORT HLIF
CO-58	2.020E+00	3.404E+00	3.524E+00	NOT IDENT.
FE-59	-1.587E+00	8.955E+00	8.984E+00	NOT IDENT.
CO-60	-9.233E-01	3.726E+00	3.749E+00	NOT IDENT.
ZN-65	5.451E-01	8.112E+00	8.116E+00	NOT IDENT.
CU-67	3.524E+03	5.973E+03	6.181E+03	FAIL ABUN
GE-68	-8.872E+01	1.006E+02	1.083E+02	NOT IDENT.
AS-73	9.008E+01	1.562E+02	1.614E+02	NOT IDENT.
SE-75	-2.157E+00	4.498E+00	4.602E+00	NOT IDENT.
BR-77	2.462E+04	3.005E+04	3.204E+04	SHORT HLIF
SR-82	-1.620E+01	3.708E+01	3.779E+01	NOT IDENT.
RB-83	1.158E+00	7.311E+00	7.330E+00	NOT IDENT.
RB-84	2.811E+00	7.159E+00	7.270E+00	NOT IDENT.
KR-85	-3.268E+03	1.125E+03	1.854E+03	NOT IDENT.
SR-85	-1.891E+01	6.508E+00	1.073E+01	NOT IDENT.

RB-86	-7.986E+01	8.949E+01	9.647E+01	NOT IDENT.
Y-88	2.216E+00	4.471E+00	4.581E+00	NOT IDENT.
ZR-88	3.624E-01	3.029E+00	3.034E+00	NOT IDENT.
Y-91	-1.063E+03	1.864E+03	1.925E+03	NOT IDENT.
NB-94	-8.992E-01	4.594E+00	4.612E+00	NOT IDENT.
NB-95	4.583E+00	4.038E+00	4.537E+00	NOT IDENT.
NB-95M	1.744E+00	1.175E+01	1.177E+01	NOT IDENT.
TC-95M	1.981E-03	4.255E+00	4.255E+00	NOT IDENT.
ZR-95	2.158E+00	6.914E+00	6.982E+00	NOT IDENT.
MO-99	-4.004E+03	1.059E+04	1.074E+04	NOT IDENT.
TC-99M	-3.437E+29	4.423E+29	0.000E+00	SHORT HLIF
RH-100	-7.622E+08	1.219E+09	1.267E+09	SHORT HLIF
RH-101	1.484E+00	2.840E+00	2.918E+00	FAIL ABUN
RH-102M	2.440E+00	3.250E+00	3.431E+00	NOT IDENT.
RU-103	1.619E+00	4.545E+00	4.603E+00	NOT IDENT.
RH-106	-1.573E+01	3.227E+01	3.304E+01	NOT IDENT.
RU-106	-1.573E+01	3.227E+01	3.304E+01	NOT IDENT.
AG-108M	-1.609E+00	2.905E+00	2.994E+00	NOT IDENT.
CD-109	4.866E+01	7.516E+01	7.830E+01	NOT IDENT.
AG-110	-4.221E+01	7.943E+01	8.168E+01	NOT IDENT.
AG-110M	-2.962E+00	4.505E+00	4.699E+00	NOT IDENT.
IN-111	-1.514E+02	9.487E+02	9.512E+02	NOT IDENT.
SN-113	-4.815E+00	4.589E+00	5.077E+00	NOT IDENT.
IN-114M	9.040E+00	2.095E+01	2.134E+01	NOT IDENT.
CD-115	3.597E+03	1.679E+04	1.687E+04	SHORT HLIF
SN-117M	6.178E-01	8.047E+00	8.052E+00	NOT IDENT.
SB-122	1.407E+03	1.947E+03	2.048E+03	NOT IDENT.
I-123	2.648E+13	5.080E+13	5.219E+13	SHORT HLIF
TE-123M	1.501E+00	2.783E+00	2.864E+00	NOT IDENT.
SB-124	5.214E+00	8.118E+00	8.452E+00	NOT IDENT.
SB-125	1.622E+01	1.463E+01	1.636E+01	FAIL ABUN
TE-125M	-3.049E+02	1.029E+03	1.038E+03	NOT IDENT.
I-126	4.593E-01	3.154E+01	3.154E+01	NOT IDENT.
SB-126	1.837E+01	2.559E+01	2.690E+01	NOT IDENT.
SN-126	1.204E+01	6.936E+00	8.810E+00	NOT IDENT.
SB-127	5.257E+00	6.324E+02	6.324E+02	NOT IDENT.
TE-129	-5.391E+00	5.298E+01	5.303E+01	NOT IDENT.
I-131	-1.435E+00	2.264E+01	2.265E+01	NOT IDENT.
I-132	-1.000E+41	6.113E+41	0.000E+00	SHORT HLIF
TE-132	-3.403E+01	4.689E+02	4.692E+02	NOT IDENT.
BA-133	-1.457E+00	4.138E+00	4.190E+00	NOT IDENT.
I-133	-7.756E+08	8.237E+08	8.950E+08	SHORT HLIF
CS-134	1.642E+00	3.284E+00	3.366E+00	NOT IDENT.
I-135	-3.358E+27	7.386E+27	0.000E+00	SHORT HLIF
CS-136	-5.693E-02	1.399E+01	1.399E+01	NOT IDENT.
BA-137M	2.610E-01	3.408E+00	3.410E+00	NOT IDENT.
CS-137	2.757E-01	3.600E+00	3.602E+00	NOT IDENT.
LA-138	-1.325E+00	5.785E+00	5.816E+00	NOT IDENT.
CE-139	3.737E-01	3.066E+00	3.071E+00	NOT IDENT.
BA-140	2.869E+01	3.651E+01	3.874E+01	NOT IDENT.
LA-140	-7.584E+00	1.363E+01	1.406E+01	FAIL ABUN
CE-141	-8.124E+00	8.709E+00	9.449E+00	NOT IDENT.
CE-143	8.210E+05	1.091E+06	1.152E+06	SHORT HLIF
CE-144	1.157E+01	1.992E+01	2.059E+01	NOT IDENT.
PM-144	-1.381E+00	3.852E+00	3.902E+00	FAIL ABUN
PR-144	-1.039E+02	2.897E+02	2.935E+02	NOT IDENT.
PM-146	-1.107E+00	3.561E+00	3.596E+00	NOT IDENT.
ND-147	-8.102E+00	8.326E+01	8.334E+01	NOT IDENT.
PM-147	-4.313E+04	7.229E+04	7.487E+04	NOT IDENT.
PM-149	2.115E+04	1.540E+05	1.543E+05	SHORT HLIF
EU-152	4.854E-01	9.944E+00	9.946E+00	NOT IDENT.
GD-153	-2.278E+00	8.056E+00	8.122E+00	NOT IDENT.
EU-154	-2.257E+00	1.077E+01	1.082E+01	NOT IDENT.
EU-155	2.420E+00	1.051E+01	1.057E+01	NOT IDENT.
TB-160	1.083E+01	1.222E+01	1.316E+01	FAIL ABUN
HO-166M	-3.656E+00	5.471E+00	5.715E+00	NOT IDENT.
TM-171	-8.747E+02	3.081E+03	3.106E+03	NOT IDENT.
LU-176	7.333E-01	2.311E+00	2.334E+00	NOT IDENT.
LU-177	1.419E+02	2.531E+02	2.611E+02	NOT IDENT.
HF-181	9.157E+00	5.931E+00	7.228E+00	FAIL ABUN
W-181	-6.137E+00	3.034E+01	3.047E+01	NOT IDENT.
TA-182	-1.071E+01	1.354E+01	1.438E+01	NOT IDENT.
RE-183	1.511E+01	2.943E+01	3.021E+01	NOT IDENT.
RE-184	1.157E+01	1.529E+01	1.615E+01	NOT IDENT.
RE-188	-3.353E+00	1.545E+01	1.552E+01	FAIL ABUN
W-188	-5.476E+02	7.891E+02	8.268E+02	NOT IDENT.
OS-191	4.792E+00	2.087E+01	2.098E+01	NOT IDENT.
IR-192	4.479E+00	3.376E+00	3.934E+00	FAIL ABUN

PB-201	-1.008E+18	2.338E+19	0.000E+00	SHORT HLIF
TL-201	1.765E+03	5.575E+03	5.631E+03	NOT IDENT.
TL-202	2.741E+00	9.563E+00	9.642E+00	NOT IDENT.
HG-203	-2.017E-01	4.057E+00	4.058E+00	NOT IDENT.
PB-203	-3.486E+02	7.013E+03	7.015E+03	SHORT HLIF
TL-204	-4.038E+02	5.379E+02	5.679E+02	NOT IDENT.
BI-207	-2.975E+00	4.489E+00	4.685E+00	NOT IDENT.
PB-210	1.518E+02	8.171E+02	8.199E+02	NOT IDENT.
BI-211	-2.551E+01	2.378E+01	2.642E+01	NOT IDENT.
PB-211	5.125E+01	6.640E+01	7.031E+01	NOT IDENT.
BI-212	2.946E+01	4.197E+01	4.402E+01	NOT IDENT.
PB-212	1.093E+01	1.334E+01	1.423E+01	FAIL ABUN
BI-213	4.602E+00	8.838E+00	9.079E+00	NOT IDENT.
BI-214	-5.144E+00	9.134E+00	9.424E+00	NOT IDENT.
PB-214	-3.185E-01	8.192E+00	8.193E+00	FAIL ABUN
RN-219	-1.470E+01	3.686E+01	3.746E+01	NOT IDENT.
FR-221	1.436E+01	1.779E+01	1.893E+01	NOT IDENT.
RA-223	-3.092E+01	5.983E+01	6.144E+01	NOT IDENT.
RA-224	2.760E+01	5.583E+01	5.720E+01	NOT IDENT.
AC-225	7.778E+01	9.637E+01	1.026E+02	NOT IDENT.
AC-227	-9.766E+00	1.986E+01	2.035E+01	NOT IDENT.
TH-227	-9.766E+00	1.986E+01	2.035E+01	NOT IDENT.
AC-228	1.579E+00	2.141E+01	2.143E+01	FAIL ABUN
RA-228	1.579E+00	2.141E+01	2.143E+01	FAIL ABUN
TH-228	1.093E+01	1.334E+01	1.423E+01	FAIL ABUN
TH-229	1.152E+01	4.573E+01	4.603E+01	NOT IDENT.
TH-230	-1.644E+03	1.372E+03	1.560E+03	NOT IDENT.
PA-231	-1.235E+01	4.600E+01	4.633E+01	NOT IDENT.
TH-231	1.004E+01	4.681E+01	4.702E+01	NOT IDENT.
TH-232	-8.693E+02	2.621E+03	2.650E+03	NOT IDENT.
PA-233	-2.098E-01	5.094E+00	5.095E+00	NOT IDENT.
PA-234	2.915E+01	4.587E+01	4.772E+01	NOT IDENT.
PA-234M	4.471E+02	6.418E+02	6.727E+02	FAIL ABUN
TH-234	3.759E+01	1.887E+02	1.894E+02	NOT IDENT.
U-234	6.820E+03	1.089E+04	1.132E+04	NOT IDENT.
U-235	-4.966E-01	2.162E+01	2.162E+01	FAIL ABUN
NP-237	-2.098E-01	5.094E+00	5.095E+00	NOT IDENT.
NP-238	1.918E+04	3.633E+04	3.734E+04	SHORT HLIF
U-238	3.759E+01	1.887E+02	1.894E+02	NOT IDENT.
NP-239	9.873E+00	2.236E+01	2.280E+01	NOT IDENT.
AM-241	3.761E+00	1.985E+01	1.992E+01	NOT IDENT.
AM-242	-7.783E-01	6.052E+01	6.052E+01	NOT IDENT.
AM-243	7.192E-01	5.893E+00	5.902E+00	NOT IDENT.
CM-243	-6.832E+00	1.064E+01	1.108E+01	NOT IDENT.
BK-247	1.710E+00	7.448E+00	7.488E+00	NOT IDENT.
CM-247	-1.847E+00	3.484E+00	3.582E+00	NOT IDENT.
CF-249	5.725E-01	4.123E+00	4.131E+00	NOT IDENT.
CF-251	-3.810E+00	1.085E+01	1.099E+01	NOT IDENT.
CF-252	1.068E+03	1.619E+04	1.620E+04	NOT IDENT.
ANH-511	-1.483E+01	6.028E+00	9.007E+00	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	52.6122	133.52	56.2190	116.30	49.6836
879.38	65.9160	364.49	56.2333	116.74	42.0049
46.54	66.2630	80.22	56.2407	117.23	45.3805
228.16	57.9048	711.68	56.3112	119.76	53.4869
52.39	75.8306	356.01	59.3669	120.54	55.8300
53.20	62.4684	323.87	59.3820	120.90	58.1180
53.44	65.1861	82.35	0.0000	264.66	67.0976
57.53	63.4180	82.47	73.6059	121.22	67.1150
293.27	0.0000	82.47	73.6065	344.28	58.2513
57.53	66.4914	83.79	56.9613	122.06	57.1727
482.18	66.4920	265.00	48.0029	1274.44	55.0742
57.98	54.9266	84.21	48.0381	123.68	49.5319
59.32	64.3299	84.86	0.0000	1377.63	0.0000
59.54	59.8602	193.51	72.3636	127.23	48.8435
155.04	79.6071	105.31	81.7237	129.43	49.1125
63.00	59.8763	86.79	81.7898	131.20	59.6505
129.43	59.0300	86.94	68.6988	133.02	57.6103
63.29	59.0300	87.09	68.7341	133.52	58.8341
290.67	61.8755	87.57	41.5102	135.34	72.9947
63.81	67.4841	88.03	60.8414	136.00	66.1463
87.57	80.5906	306.78	73.0860	136.28	68.5131
64.99	90.1286	88.47	88.3507	136.47	68.5437
65.08	90.1634	531.02	91.1783	739.50	59.8123
66.73	53.3549	184.58	91.2258	140.51	0.0000
66.98	67.4665	92.59	61.7661	140.88	73.9483
67.24	67.5401	93.31	59.8466	143.76	50.8066
67.67	68.6007	94.56	98.4181	144.24	59.1415
1221.41	68.6230	311.90	98.4464	145.44	71.1621
439.51	58.5578	946.00	98.4522	152.32	48.1659
70.82	58.5578	97.43	59.5871	152.43	48.1775
167.43	58.5588	98.43	52.4315	1048.07	54.2951
97.43	54.9547	98.44	52.4334	154.21	53.1980
70.82	79.0068	99.53	58.9224	155.04	53.2927
70.82	79.0074	103.37	58.9224	158.56	42.4800
279.20	0.0000	116.74	58.9224	158.97	0.0000
1063.66	67.1609	100.11	52.7023	159.00	52.5178
72.87	0.0000	100.20	52.7168	162.33	62.7189
351.06	72.9344	102.03	54.0692	537.26	61.5311
74.66	63.7799	103.18	65.9573	163.33	60.3827
238.63	60.9183	103.37	71.3168	165.86	63.1702
351.93	60.9183	105.31	62.0910	167.43	59.6418
238.63	60.9183	106.12	48.2880	245.35	50.9165
74.97	60.9534	106.47	53.7075	427.87	54.7862
77.11	72.1792	109.28	62.8052	176.60	54.8166
256.23	63.0244	111.00	53.3175	177.52	59.9821
79.82	59.1142	111.76	52.3403	181.07	51.0297
80.02	56.1985	208.37	50.3255	184.41	64.1838
80.03	56.1998	116.24	60.7148	184.58	64.2044

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	69.4858	300.09	48.7734	475.06	36.2305
186.21	69.5484	300.13	48.7764	696.49	43.5374
190.27	60.9797	301.36	52.5123	477.60	43.5667
193.51	57.4177	302.85	47.9170	477.99	43.5798
197.03	53.8344	304.50	40.8618	482.18	26.2367
198.01	60.5027	304.85	41.9009	487.02	21.9485
201.83	56.9303	306.78	38.9246	492.35	0.0000
204.12	58.4811	308.46	41.0555	497.08	36.8726
205.31	59.4865	311.90	34.0091	511.00	58.7015
208.37	52.6525	316.51	30.0484	514.00	160.6306
210.85	53.7653	319.41	59.2590	520.40	36.5982
215.65	55.9939	320.08	46.8192	520.69	0.0000
218.12	45.3359	321.04	37.4971	667.71	0.0000
222.11	51.0986	323.87	52.2481	527.90	0.0000
227.09	60.6934	325.23	42.3861	529.59	34.0148
227.38	65.3202	1596.21	49.3848	529.87	0.0000
228.16	56.1878	331.15	0.0000	531.02	28.3759
228.18	56.1897	333.37	39.0784	537.26	21.8545
235.69	47.5168	334.37	45.4662	539.51	0.0000
235.96	50.3322	338.28	41.4145	1260.41	0.0000
238.63	53.3401	911.20	41.4161	552.55	34.5861
238.98	0.0000	340.48	55.3526	795.86	29.0396
240.99	53.5262	340.55	54.2923	564.24	29.0598
242.00	52.1944	344.28	53.4434	569.33	32.0785
244.70	26.9084	345.93	56.7514	569.50	33.0547
245.35	43.9443	351.06	61.3696	569.70	33.0599
459.60	40.9450	351.93	43.1063	582.08	24.5155
685.70	63.0043	356.01	51.9502	583.19	24.5338
388.16	51.5781	361.25	0.0000	595.83	28.5038
256.23	43.1891	364.49	37.1232	600.60	38.1258
527.90	0.0000	366.42	43.7606	604.72	54.7549
264.66	61.1697	383.85	54.5518	609.32	39.9426
265.00	50.5125	388.16	48.0741	610.33	31.9746
269.46	52.7706	666.33	52.5700	614.28	47.0832
401.81	56.8129	391.70	52.7258	618.01	27.1129
273.65	56.9958	392.87	37.0626	621.93	41.2753
276.40	59.1736	400.66	41.8644	630.19	0.0000
583.19	42.4611	401.32	0.0000	631.29	18.2291
277.60	38.5231	401.81	40.7776	632.98	29.1973
402.40	38.5430	402.40	44.2003	633.25	29.2025
278.43	41.5309	404.85	32.9424	634.78	37.3503
279.20	0.0000	410.95	33.1300	635.95	30.8769
279.54	49.5127	720.70	47.0009	636.99	29.2711
280.46	57.5032	423.72	36.4078	657.50	34.5844
301.36	46.7915	427.09	29.5622	884.68	34.5905
284.31	36.8645	427.87	30.1630	661.66	33.0215
285.41	49.8871	433.94	34.9908	664.57	0.0000
285.90	0.0000	439.51	29.8880	666.33	27.9402
287.50	45.0174	440.45	29.9124	666.50	25.8728
290.67	52.7296	539.51	0.0000	667.71	0.0000
293.27	0.0000	453.88	35.5994	677.62	29.1707
295.22	44.4431	459.60	38.4537	685.70	28.2632
316.51	44.4834	463.37	36.7809	692.65	34.6838
298.58	51.7263	468.07	20.7135	695.00	32.6263
299.98	50.2906	473.00	20.2552	696.49	47.4019

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
696.51	47.4019	884.68	26.9369	1238.28	10.6880
697.00	48.1682	889.28	16.7550	1260.41	0.0000
697.49	44.9701	894.76	20.5305	1271.87	22.7001
702.65	38.9023	1836.06	21.4957	1274.44	18.3920
706.68	28.8203	903.28	20.0752	1274.54	18.3929
711.68	30.3589	907.67	0.0000	1291.59	16.3206
720.70	23.4958	911.20	14.1035	1298.22	0.0000
721.93	0.0000	984.45	0.0000	1312.11	16.4304
1690.97	27.7996	926.36	15.1465	1332.49	18.3765
722.91	27.8019	935.54	11.0893	1362.15	0.0000
723.31	36.3647	937.49	26.9547	1365.19	13.9252
756.73	47.0830	983.53	28.6238	1368.63	0.0000
727.33	18.2228	945.96	0.0000	1377.63	0.0000
733.00	25.8076	946.00	19.0981	1384.29	18.6768
735.93	20.4641	949.00	25.8161	1408.01	9.6751
739.50	24.8207	954.55	0.0000	1434.09	16.1173
1434.09	27.0485	962.31	23.0807	1435.80	17.0735
747.24	26.0090	964.08	29.8352	1457.56	0.0000
752.31	27.1675	966.17	26.0086	1460.82	16.2446
753.82	31.5400	968.97	27.9684	1489.16	13.4890
756.73	21.7853	983.53	19.4087	1553.35	0.0000
763.94	22.9630	984.45	0.0000	1596.21	13.8975
765.80	18.6072	996.26	14.6345	1620.50	17.9846
1001.03	22.9931	1001.03	11.4049	1678.03	0.0000
766.84	19.7128	1004.73	0.0000	1690.97	5.0885
772.60	0.0000	1025.87	0.0000	1757.55	0.0000
776.52	25.3177	1028.54	0.0000	1764.49	8.2933
777.92	24.2344	1037.84	30.7639	1770.23	15.5713
778.90	24.2471	1038.76	0.0000	1771.35	16.6139
783.70	17.6782	1046.59	22.9045	1791.20	0.0000
1435.80	22.1558	1048.07	16.9394	1808.65	6.2869
903.28	29.9614	1050.41	13.9631	1836.06	9.4922
795.86	16.6777	1063.66	23.0606		
801.95	23.4212	1077.00	21.1651		
802.10	23.4231	1077.34	20.1602		
810.29	15.6804	1083.85	15.1582		
810.45	15.6816	1085.87	16.1812		
810.76	14.5635	1099.25	20.3301		
815.77	16.8466	1107.22	0.0000		
818.51	19.1188	1111.64	21.4471		
822.65	0.0000	1112.07	21.4512		
832.01	24.4556	1112.84	25.5444		
834.85	29.0242	1115.54	22.5017		
835.15	29.0289	1120.29	14.3452		
836.80	0.0000	1120.55	13.3218		
846.77	21.8953	1121.30	15.3750		
856.80	28.4184	1808.65	16.4516		
860.56	20.2039	1131.51	0.0000		
871.09	22.1508	1332.49	24.3770		
873.19	19.4014	1177.95	13.9531		
875.33	0.0000	1189.05	13.6583		
879.38	14.8250	1204.77	21.1299		
880.51	19.4681	1221.41	17.0016		
881.60	18.5503	1231.02	24.8771		
883.24	25.9902	1235.36	12.8127		

VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 17:22:26.09

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                    *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487003.CNF;1
Background file  : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM38.CNF;44
Background date  : 15-JAN-2023 11:46:19
Sample date      : 26-DEC-2022 09:00:00 Acquisition date : 19-JAN-2023 15:21:35
Sample ID        : G606487003 Sample quantity : 7.50000E-01 FILTER
Detector name     : GAM38 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:00.32 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : MXR1
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2367950 Detector SN# :
Matrix Spike ID   : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	41.74	21	37	0.93	83.46	81	18	2.94E-03	53.2	1.58E+00
2	1	76.92*	6	46	0.89	153.84	148	10	8.53E-04	208.3	1.70E+00
3	0	93.18*	24	86	1.46	186.38	182	12	3.37E-03	93.0	
4	0	187.26*	18	108	1.44	374.58	368	15	2.55E-03	132.6	
5	0	201.85	11	39	0.58	403.79	400	7	1.49E-03	102.5	
6	0	238.96*	2	36	1.08	478.01	475	7	3.02E-04	587.0	
7	0	250.89	25	24	2.33	501.89	498	8	3.53E-03	38.7	
8	0	269.65	29	25	2.27	539.41	536	8	4.08E-03	34.4	
9	0	315.56	11	20	1.33	631.25	628	6	1.57E-03	68.7	
10	0	488.42	21	15	0.63	977.02	972	10	2.89E-03	41.2	
11	0	511.43*	17	45	3.19	1023.04	1013	18	2.35E-03	120.7	
12	0	518.58	7	14	1.05	1037.33	1034	8	9.09E-04	106.9	
13	0	524.40	15	12	0.49	1048.98	1041	12	2.06E-03	53.4	
14	0	537.50	19	6	0.99	1075.19	1071	8	2.71E-03	31.2	
15	0	615.15*	3	42	5.33	1230.48	1215	20	4.24E-04	549.6	
16	0	660.98	32	3	1.70	1322.13	1316	13	4.45E-03	21.1	
17	0	769.05	5	9	0.88	1538.28	1528	12	7.49E-04	118.7	
18	0	822.73	12	3	2.87	1645.62	1641	10	1.71E-03	37.5	
19	0	839.68	10	0	1.18	1679.50	1676	7	1.39E-03	31.6	
20	0	894.65	4	7	1.31	1789.43	1783	9	5.81E-04	122.4	
21	0	935.76	14	2	1.32	1871.64	1868	8	1.92E-03	32.4	
22	0	1500.08	6	2	1.40	2999.82	2993	10	7.99E-04	65.7	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 19-JAN-2023 17:22:27

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487003.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MXR1		
Sample date	: 26-DEC-2022 09:00:00	Acquisition date	: 19-JAN-2023 15:21:35
Sample ID	: G606487003	Sample quantity	: 0.75000 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA38	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.32 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BA-137M	661.66	32	89.90*	1.140E+00	1.566E+01	1.568E+01	42.11
CS-137	661.66	32	85.10*	1.140E+00	1.654E+01	1.657E+01	42.11
PB-212	74.82	-----	10.28	5.195E+00	-----	Line Not Found	-----
	77.11	6	17.10	5.192E+00	3.463E+00	3.548E+00	416.61
	238.63	2	43.60*	2.913E+00	8.573E-01	8.782E-01	1174.06
	300.09	-----	3.30	2.392E+00	-----	Line Not Found	-----
RA-226	186.21	18	3.59*	3.527E+00	7.249E+01	7.250E+01	265.13
TH-228	74.82	-----	10.28	5.195E+00	-----	Line Not Found	-----
	77.11	6	17.10	5.192E+00	3.463E+00	3.548E+00	416.61
	238.63	2	43.60*	2.913E+00	8.573E-01	8.782E-01	1174.06
	300.09	-----	3.30	2.392E+00	-----	Line Not Found	-----
ANH-511	511.00	17	100.00*	1.455E+00	5.820E+00	5.820E+00	241.42

Flag: "*" = Keyline

```

*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                     *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487003.CNF;1 *
* Acquisition date   : 19-JAN-2023 15:21:35 Sensitivity      : 3.000          *
* Detector ID       : GAM38 Energy tolerance: 1.500          *
* Elapsed live time : 0 02:00:00.00 Abundance limit : 75.000      *
* Elapsed real time : 0 02:00:00.32 Half life ratio : *****          *
* Sample date       : 26-DEC-2022 09:00:00 Analyst initials: MXR1          *
* Sample ID        : G606487003 Sample Quantity : 7.5000E-01 FILTER *
* Batch Number     : 2367950 Wet Weight      : 0.00000          *
* Wet wt corr      : 1.00000 Dry Weight      : 0.00000          *
* Nuclide Library  : LIQUID.NLB;28                                           *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                     *
* Eff. Cal. date    : 22-APR-2022 08:42:40 Eff. Geometry   : JAR          *
* Eff. File        : DKA100:[CANBERRA.GAMMA]EFF_GAM38_JAR.CNF;2          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BA-137M	1.568E+01	6.471E+00	8.427E+00
CS-137	1.657E+01	6.836E+00	8.903E+00
PB-212	8.782E-01	1.010E+01	1.163E+01
RA-226	7.250E+01	1.884E+02	1.212E+02
TH-228	8.782E-01	1.010E+01	1.163E+01
ANH-511	5.820E+00	1.377E+01	7.457E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	5.109E-01	4.410E+01	8.642E+01	NOT IDENT.
NA-22	3.745E+00	4.776E+00	1.204E+01	NOT IDENT.
NA-24	0.000E+00	3.174E+12	0.000E+00	SHORT HLIF
AL-26	-1.982E+00	6.611E+00	1.304E+01	NOT IDENT.
K-40	1.237E+01	8.178E+01	1.720E+02	NOT IDENT.
SC-46	4.439E-01	5.365E+00	1.029E+01	NOT IDENT.
V-48	5.722E+00	1.513E+01	3.274E+01	NOT IDENT.
CR-51	2.253E+01	5.866E+01	1.098E+02	NOT IDENT.
MN-52	-9.049E+01	1.306E+02	2.138E+02	FAIL ABUN
MN-54	-1.981E+00	5.351E+00	9.341E+00	NOT IDENT.
CO-56	3.705E+00	6.128E+00	1.361E+01	NOT IDENT.
CO-57	-3.890E-01	2.349E+00	4.325E+00	NOT IDENT.
NI-57	0.000E+00	5.536E+05	0.000E+00	SHORT HLIF
CO-58	1.469E+00	5.480E+00	1.185E+01	NOT IDENT.
FE-59	-1.274E-01	1.411E+01	2.861E+01	NOT IDENT.
CO-60	3.310E+00	4.090E+00	1.104E+01	NOT IDENT.
ZN-65	9.050E+00	1.319E+01	2.936E+01	NOT IDENT.
CU-67	-5.925E+03	4.273E+03	6.441E+03	FAIL ABUN
GE-68	-3.935E+01	1.542E+02	3.027E+02	NOT IDENT.
AS-73	4.953E+00	1.912E+01	3.352E+01	NOT IDENT.
AS-74	1.135E+00	1.942E+01	3.732E+01	NOT IDENT.
SE-75	-2.721E+00	5.482E+00	9.143E+00	NOT IDENT.
BR-77	0.000E+00	2.232E+04	0.000E+00	SHORT HLIF
SR-82	-2.740E+01	6.194E+01	1.071E+02	NOT IDENT.

RB-83	-2.379E+00	1.235E+01	1.598E+01	NOT IDENT.
RB-84	-5.718E+00	9.920E+00	1.823E+01	NOT IDENT.
KR-85	1.778E+03	1.195E+03	2.402E+03	NOT IDENT.
SR-85	1.028E+01	6.909E+00	1.389E+01	NOT IDENT.
RB-86	-1.746E+01	1.270E+02	2.588E+02	NOT IDENT.
Y-88	-3.736E+00	6.604E+00	1.202E+01	NOT IDENT.
ZR-88	-4.910E+00	3.776E+00	5.968E+00	NOT IDENT.
Y-91	7.774E+02	2.701E+03	5.920E+03	NOT IDENT.
NB-94	-2.052E+00	4.646E+00	8.108E+00	NOT IDENT.
NB-95	-7.947E-01	5.146E+00	9.752E+00	NOT IDENT.
NB-95M	1.079E+01	1.319E+01	2.515E+01	NOT IDENT.
TC-95M	2.107E+00	5.018E+00	9.029E+00	NOT IDENT.
ZR-95	9.506E+00	1.049E+01	2.374E+01	NOT IDENT.
MO-99	-2.259E+02	2.318E+04	4.068E+04	NOT IDENT.
TC-99M	0.000E+00	3.430E+29	0.000E+00	SHORT HLIF
RH-100	0.000E+00	1.935E+09	0.000E+00	SHORT HLIF
RH-101	6.699E-01	2.798E+00	5.351E+00	NOT IDENT.
RH-102M	-1.476E+00	3.848E+00	7.034E+00	NOT IDENT.
RU-103	-1.175E-01	6.107E+00	1.182E+01	NOT IDENT.
RH-106	-1.456E+01	4.078E+01	7.387E+01	NOT IDENT.
RU-106	-1.456E+01	4.078E+01	7.387E+01	NOT IDENT.
AG-108M	4.753E+00	4.182E+00	9.080E+00	FAIL ABUN
CD-109	1.287E+01	4.220E+01	8.362E+01	NOT IDENT.
AG-110	-4.823E+00	1.099E+02	1.873E+02	NOT IDENT.
AG-110M	3.230E+00	6.268E+00	1.431E+01	NOT IDENT.
IN-111	5.291E+02	1.120E+03	2.148E+03	NOT IDENT.
SN-113	1.350E+00	5.639E+00	1.135E+01	NOT IDENT.
IN-114M	2.277E+01	2.094E+01	4.095E+01	NOT IDENT.
CD-115	0.000E+00	2.011E+04	0.000E+00	SHORT HLIF
SN-117M	1.516E+00	8.056E+00	1.522E+01	NOT IDENT.
SB-122	-9.178E+02	2.681E+03	4.884E+03	NOT IDENT.
I-123	0.000E+00	4.811E+13	0.000E+00	SHORT HLIF
TE-123M	-4.453E-01	2.861E+00	5.192E+00	NOT IDENT.
SB-124	1.006E+01	1.840E+01	4.351E+01	NOT IDENT.
SB-125	-5.433E-01	1.201E+01	2.312E+01	NOT IDENT.
TE-125M	-5.854E+01	7.805E+02	1.476E+03	NOT IDENT.
I-126	1.114E+01	5.120E+01	9.315E+01	NOT IDENT.
SB-126	-8.011E+00	3.136E+01	5.734E+01	NOT IDENT.
SN-126	2.832E-01	4.337E+00	8.360E+00	NOT IDENT.
SB-127	-2.299E+02	8.743E+02	1.607E+03	NOT IDENT.
TE-129	3.587E+00	7.353E+01	1.442E+02	FAIL ABUN
I-131	6.859E+00	2.768E+01	5.658E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	-3.232E+00	5.232E+02	9.520E+02	NOT IDENT.
BA-133	1.741E+00	4.885E+00	9.963E+00	NOT IDENT.
I-133	0.000E+00	1.090E+09	0.000E+00	SHORT HLIF
CS-134	4.142E+00	4.612E+00	1.094E+01	NOT IDENT.
I-135	0.000E+00	1.018E+28	0.000E+00	SHORT HLIF
CS-136	3.031E+00	2.398E+01	4.993E+01	NOT IDENT.
LA-138	3.087E+00	8.093E+00	1.861E+01	NOT IDENT.
CE-139	6.104E-01	2.693E+00	5.144E+00	NOT IDENT.
BA-140	1.080E+02	6.608E+01	1.369E+02	FAIL ABUN
LA-140	-1.387E+01	1.397E+01	1.496E+01	FAIL ABUN
CE-141	-5.916E+00	7.200E+00	1.156E+01	NOT IDENT.
CE-143	0.000E+00	1.349E+06	0.000E+00	SHORT HLIF
CE-144	7.340E+00	1.604E+01	3.177E+01	NOT IDENT.
PM-144	-1.301E+00	4.772E+00	8.652E+00	NOT IDENT.
PR-144	-5.492E+01	3.506E+02	6.525E+02	NOT IDENT.
PM-146	-1.432E+00	4.773E+00	8.970E+00	NOT IDENT.
ND-147	-9.561E+01	1.221E+02	1.921E+02	NOT IDENT.
PM-147	-3.600E+04	6.591E+04	1.169E+05	NOT IDENT.
PM-149	0.000E+00	2.078E+05	0.000E+00	SHORT HLIF
EU-152	-1.343E+00	1.165E+01	2.244E+01	NOT IDENT.
GD-153	-9.849E+00	7.149E+00	1.022E+01	NOT IDENT.
EU-154	8.717E+00	1.285E+01	3.224E+01	NOT IDENT.
EU-155	-3.063E+00	7.246E+00	1.325E+01	NOT IDENT.
TB-160	9.132E+00	1.774E+01	4.051E+01	NOT IDENT.
HO-166M	-1.064E+00	7.146E+00	1.357E+01	NOT IDENT.
TM-171	8.130E+01	3.383E+02	5.950E+02	NOT IDENT.
LU-176	-2.466E+00	2.959E+00	4.546E+00	FAIL ABUN
LU-177	1.018E+02	3.103E+02	5.551E+02	NOT IDENT.
HF-181	-2.533E+00	6.417E+00	1.173E+01	NOT IDENT.
W-181	-1.117E+00	4.899E+00	9.545E+00	NOT IDENT.
TA-182	-1.465E+01	2.472E+01	4.303E+01	NOT IDENT.
RE-183	-1.428E-01	5.194E+00	1.029E+01	NOT IDENT.
RE-184	-6.565E+00	2.278E+01	4.357E+01	FAIL ABUN
RE-188	-4.443E+00	1.468E+01	2.648E+01	NOT IDENT.
W-188	-1.274E+03	1.060E+03	1.553E+03	NOT IDENT.

OS-191	-2.315E+00	2.108E+01	3.897E+01	NOT IDENT.
IR-192	3.754E+00	5.058E+00	8.666E+00	FAIL ABUN
PB-201	0.000E+00	2.598E+19	0.000E+00	SHORT HLIF
TL-201	1.709E+03	4.983E+03	9.615E+03	NOT IDENT.
TL-202	1.489E+01	1.403E+01	3.127E+01	NOT IDENT.
HG-203	2.765E+00	5.131E+00	9.821E+00	NOT IDENT.
PB-203	0.000E+00	8.690E+03	0.000E+00	SHORT HLIF
TL-204	-8.169E+01	2.006E+02	3.755E+02	NOT IDENT.
BI-207	-3.379E+00	8.309E+00	1.528E+01	NOT IDENT.
TL-208	-1.409E+00	6.203E+00	1.130E+01	NOT IDENT.
PB-210	-3.169E+01	6.698E+01	1.237E+02	NOT IDENT.
BI-211	-3.341E+01	2.892E+01	4.974E+01	NOT IDENT.
PB-211	-4.574E+01	7.808E+01	1.407E+02	NOT IDENT.
BI-212	2.505E-01	6.696E+01	1.292E+02	NOT IDENT.
BI-213	1.630E-01	1.353E+01	2.626E+01	NOT IDENT.
BI-214	2.446E-01	1.250E+01	2.297E+01	NOT IDENT.
PB-214	-1.416E+01	1.092E+01	1.846E+01	FAIL ABUN
RN-219	-4.411E+00	5.254E+01	1.007E+02	NOT IDENT.
FR-221	8.885E+00	2.109E+01	4.034E+01	NOT IDENT.
RA-223	-8.096E+01	6.188E+01	1.006E+02	FAIL ABUN
RA-224	2.819E+01	6.743E+01	1.203E+02	NOT IDENT.
AC-225	4.790E+01	1.137E+02	2.175E+02	NOT IDENT.
AC-227	3.512E+00	3.073E+01	5.566E+01	NOT IDENT.
TH-227	3.512E+00	3.073E+01	5.566E+01	NOT IDENT.
AC-228	-2.447E+01	2.265E+01	3.676E+01	NOT IDENT.
RA-228	-2.447E+01	2.265E+01	3.676E+01	NOT IDENT.
TH-229	2.076E+01	5.024E+01	9.655E+01	NOT IDENT.
TH-230	-2.703E+02	4.013E+02	7.351E+02	NOT IDENT.
PA-231	2.479E+01	5.847E+01	1.098E+02	NOT IDENT.
TH-231	-2.784E+01	2.978E+01	4.986E+01	NOT IDENT.
TH-232	-1.089E+03	9.067E+02	1.667E+03	NOT IDENT.
PA-233	4.354E+00	7.194E+00	1.349E+01	FAIL ABUN
PA-234	7.816E+00	3.519E+01	7.732E+01	FAIL ABUN
PA-234M	-4.894E+02	7.592E+02	1.231E+03	NOT IDENT.
TH-234	-7.026E+01	6.343E+01	1.174E+02	FAIL ABUN
U-234	3.860E+02	1.337E+03	2.354E+03	NOT IDENT.
U-235	-1.008E+01	2.136E+01	3.604E+01	NOT IDENT.
NP-237	4.354E+00	7.194E+00	1.349E+01	FAIL ABUN
NP-238	0.000E+00	6.521E+04	0.000E+00	SHORT HLIF
U-238	-7.026E+01	6.343E+01	1.174E+02	FAIL ABUN
NP-239	-1.061E+00	1.948E+01	3.692E+01	NOT IDENT.
AM-241	2.762E+00	4.263E+00	8.832E+00	NOT IDENT.
AM-242	5.145E-01	5.202E+01	9.381E+01	NOT IDENT.
AM-243	-2.932E+00	2.918E+00	5.485E+00	NOT IDENT.
CM-243	4.090E+00	7.376E+00	1.487E+01	NOT IDENT.
BK-247	1.407E-01	9.164E+00	1.650E+01	NOT IDENT.
CM-247	2.985E+00	4.634E+00	9.707E+00	NOT IDENT.
CF-249	-1.482E+00	5.561E+00	1.037E+01	NOT IDENT.
CF-251	-7.910E+00	1.285E+01	2.190E+01	NOT IDENT.
CF-252	8.073E+03	1.268E+04	2.557E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	41.74	21	37	0.93	83.46	81	18	2.94E-03	53.2	1.58E+00
2	3	46.70	69	40	0.95	93.37	81	18	9.51E-03	19.7	
3	0	63.55	45	74	0.73	127.08	123	7	6.32E-03	34.6	1.70E+00
4	1	75.08	36	53	0.88	150.16	148	10	5.02E-03	33.4	
5	1	76.92	24	46	0.89	153.84	148	10	3.37E-03	48.5	
6	0	93.18	116	86	1.46	186.38	182	12	1.61E-02	18.7	
7	0	187.26	50	108	1.44	374.58	368	15	6.90E-03	47.9	
8	0	201.85	11	39	0.58	403.79	400	7	1.49E-03	102.5	
9	0	238.96	31	36	1.08	478.01	475	7	4.34E-03	36.7	
10	0	250.89	25	24	2.33	501.89	498	8	3.53E-03	38.7	
11	0	269.65	29	25	2.27	539.41	536	8	4.08E-03	34.4	
12	0	315.56	11	20	1.33	631.25	628	6	1.57E-03	68.7	
13	0	488.42	21	15	0.63	977.02	972	10	2.89E-03	41.2	
14	0	511.43	121	45	3.19	1023.04	1013	18	1.68E-02	15.9	
15	0	518.58	7	14	1.05	1037.33	1034	8	9.09E-04	106.9	
16	0	524.40	15	12	0.49	1048.98	1041	12	2.06E-03	53.4	
17	0	537.50	19	6	0.99	1075.19	1071	8	2.71E-03	31.2	
18	0	615.15	8	42	5.33	1230.48	1215	20	1.11E-03	207.3	
19	0	660.98	32	3	1.70	1322.13	1316	13	4.45E-03	21.1	
20	0	769.05	5	9	0.88	1538.28	1528	12	7.49E-04	118.7	
21	0	822.73	12	3	2.87	1645.62	1641	10	1.71E-03	37.5	
22	0	839.68	10	0	1.18	1679.50	1676	7	1.39E-03	31.6	
23	0	894.65	4	7	1.31	1789.43	1783	9	5.81E-04	122.4	
24	0	935.76	14	2	1.32	1871.64	1868	8	1.92E-03	32.4	
25	0	1500.08	6	2	1.40	2999.82	2993	10	7.99E-04	65.7	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BA-137M	661.66	32	89.90*	1.140E+00	1.566E+01	1.568E+01	42.11
CS-137	661.66	32	85.10*	1.140E+00	1.654E+01	1.657E+01	42.11
PB-212	74.82	-----	10.28	5.195E+00	-----	Line Not Found	-----
	77.11	6	17.10	5.192E+00	3.463E+00	3.548E+00	416.61
	238.63	2	43.60*	2.913E+00	8.573E-01	8.782E-01	1174.06
	300.09	-----	3.30	2.392E+00	-----	Line Not Found	-----
RA-226	186.21	18	3.59*	3.527E+00	7.249E+01	7.250E+01	265.13
TH-228	74.82	-----	10.28	5.195E+00	-----	Line Not Found	-----
	77.11	6	17.10	5.192E+00	3.463E+00	3.548E+00	416.61
	238.63	2	43.60*	2.913E+00	8.573E-01	8.782E-01	1174.06
	300.09	-----	3.30	2.392E+00	-----	Line Not Found	-----
ANH-511	511.00	17	100.00*	1.455E+00	5.820E+00	5.820E+00	241.42

Flag: "*" = Keyline

Total number of lines in spectrum 22
Number of unidentified lines 6
Number of lines tentatively identified by NID 16 72.73%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-137M	30.08Y	1.00	1.566E+01	1.568E+01	0.660E+01	42.11	
CS-137	30.08Y	1.00	1.654E+01	1.657E+01	0.698E+01	42.11	
PB-212	1.91Y	1.02	8.573E-01	8.782E-01	103.1E-01	1174.06	
RA-226	1600.00Y	1.00	7.249E+01	7.250E+01	19.22E+01	265.13	
TH-228	1.91Y	1.02	8.573E-01	8.782E-01	103.1E-01	1174.06	
ANH-511	1.00E+09Y	1.00	5.820E+00	5.820E+00	14.05E+00	241.42	
Total Activity :			1.122E+02	1.123E+02			

Grand Total Activity : 1.122E+02 1.123E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
3	41.74	21	37	0.93	83.46	81	18	2.94E-03	****	4.16E+00	
0	93.18	24	86	1.46	186.38	182	12	3.37E-03	****	5.05E+00	T
0	201.85	11	39	0.58	403.79	400	7	1.49E-03	****	3.33E+00	T
0	250.89	25	24	2.33	501.89	498	8	3.53E-03	77.5	2.80E+00	T
0	269.65	29	25	2.27	539.41	536	8	4.08E-03	68.8	2.63E+00	T
0	315.56	11	20	1.33	631.25	628	6	1.57E-03	****	2.29E+00	T
0	488.42	21	15	0.63	977.02	972	10	2.89E-03	82.3	1.52E+00	T
0	518.58	7	14	1.05	1037.33	1034	8	9.09E-04	****	1.44E+00	
0	524.40	15	12	0.49	1048.98	1041	12	2.06E-03	****	1.42E+00	
0	537.50	19	6	0.99	1075.19	1071	8	2.71E-03	62.5	1.39E+00	T
0	615.15	3	42	5.33	1230.48	1215	20	4.24E-04	****	1.22E+00	T
0	769.05	5	9	0.88	1538.28	1528	12	7.49E-04	****	9.88E-01	
0	822.73	12	3	2.87	1645.62	1641	10	1.71E-03	75.0	9.28E-01	T
0	839.68	10	0	1.18	1679.50	1676	7	1.39E-03	63.2	9.10E-01	
0	894.65	4	7	1.31	1789.43	1783	9	5.81E-04	****	8.58E-01	T
0	935.76	14	2	1.32	1871.64	1868	8	1.92E-03	64.8	8.24E-01	T
0	1500.08	6	2	1.40	2999.82	2993	10	7.99E-04	****	5.41E-01	

Flags: "T" = Tentatively associated


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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487003.CNF;1  *
* Acquisition date   : 19-JAN-2023 15:21:35 Sensitivity      : 3.000          *
* Detector ID        : GAM38 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:00.32 Half life ratio : *****      *
* Sample date        : 26-DEC-2022 09:00:00 Nuclide Library : LIQUID      *
* Sample ID          : G606487003 Analyst initials: MXR1         *
* Batch Number       : 2367950 Sample Quantity : 7.5000E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 22-APR-2022 08:42:40 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM38_JAR.CNF;2          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BA-137M	3.552E+00
CS-137	3.753E+00
PB-212	5.273E+00
RA-226	5.530E+01
TH-228	5.273E+00
ANH-511	3.265E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	3.749E+01	NOT IDENT.
NA-22	4.916E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	5.051E+00	NOT IDENT.
K-40	7.454E+01	NOT IDENT.
SC-46	4.188E+00	NOT IDENT.
V-48	1.390E+01	NOT IDENT.
CR-51	4.936E+01	NOT IDENT.
MN-52	8.238E+01	FAIL ABUN
MN-54	3.890E+00	NOT IDENT.
CO-56	5.872E+00	NOT IDENT.
CO-57	1.980E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	5.006E+00	NOT IDENT.
FE-59	1.185E+01	NOT IDENT.
CO-60	4.380E+00	NOT IDENT.
ZN-65	1.264E+01	NOT IDENT.
CU-67	2.952E+03	FAIL ABUN
GE-68	1.205E+02	NOT IDENT.
AS-73	1.510E+01	NOT IDENT.
AS-74	1.631E+01	NOT IDENT.
SE-75	4.078E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	4.464E+01	NOT IDENT.
RB-83	6.715E+00	NOT IDENT.

RB-84	7.227E+00	NOT IDENT.
KR-85	1.092E+03	NOT IDENT.
SR-85	6.316E+00	NOT IDENT.
RB-86	1.027E+02	NOT IDENT.
Y-88	4.259E+00	NOT IDENT.
ZR-88	2.529E+00	NOT IDENT.
Y-91	2.431E+03	NOT IDENT.
NB-94	3.424E+00	NOT IDENT.
NB-95	3.987E+00	NOT IDENT.
NB-95M	1.137E+01	NOT IDENT.
TC-95M	4.089E+00	NOT IDENT.
ZR-95	1.026E+01	NOT IDENT.
MO-99	1.784E+04	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-100	0.000E+00	SHORT HLIF
RH-101	2.452E+00	NOT IDENT.
RH-102M	3.056E+00	NOT IDENT.
RU-103	5.146E+00	NOT IDENT.
RH-106	3.104E+01	NOT IDENT.
RU-106	3.104E+01	NOT IDENT.
AG-108M	4.102E+00	FAIL ABUN
CD-109	3.812E+01	NOT IDENT.
AG-110	7.961E+01	NOT IDENT.
AG-110M	6.007E+00	NOT IDENT.
IN-111	9.709E+02	NOT IDENT.
SN-113	5.033E+00	NOT IDENT.
IN-114M	1.873E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	6.927E+00	NOT IDENT.
SB-122	2.089E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.362E+00	NOT IDENT.
SB-124	1.791E+01	NOT IDENT.
SB-125	1.022E+01	NOT IDENT.
TE-125M	6.684E+02	NOT IDENT.
I-126	3.989E+01	NOT IDENT.
SB-126	2.399E+01	NOT IDENT.
SN-126	3.824E+00	NOT IDENT.
SB-127	6.708E+02	NOT IDENT.
TE-129	6.311E+01	FAIL ABUN
I-131	2.492E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	4.270E+02	NOT IDENT.
BA-133	4.448E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	4.626E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	2.087E+01	NOT IDENT.
LA-138	7.469E+00	NOT IDENT.
CE-139	2.324E+00	NOT IDENT.
BA-140	6.098E+01	FAIL ABUN
LA-140	2.292E+00	FAIL ABUN
CE-141	5.216E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.441E+01	NOT IDENT.
PM-144	3.670E+00	NOT IDENT.
PR-144	2.769E+02	NOT IDENT.
PM-146	3.842E+00	NOT IDENT.
ND-147	7.897E+01	NOT IDENT.
PM-147	5.323E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	1.001E+01	NOT IDENT.
GD-153	4.611E+00	NOT IDENT.
EU-154	1.301E+01	NOT IDENT.
EU-155	5.962E+00	NOT IDENT.
TB-160	1.701E+01	NOT IDENT.
HO-166M	5.607E+00	NOT IDENT.
TM-171	2.669E+02	NOT IDENT.
LU-176	1.965E+00	FAIL ABUN
LU-177	2.524E+02	NOT IDENT.
HF-181	5.055E+00	NOT IDENT.
W-181	4.287E+00	NOT IDENT.
TA-182	1.703E+01	NOT IDENT.
RE-183	4.644E+00	NOT IDENT.
RE-184	1.843E+01	FAIL ABUN
RE-188	1.187E+01	NOT IDENT.
W-188	6.896E+02	NOT IDENT.
OS-191	1.778E+01	NOT IDENT.

IR-192	3.884E+00	FAIL ABUN
PB-201	0.000E+00	SHORT HLIF
TL-201	4.357E+03	NOT IDENT.
TL-202	1.391E+01	NOT IDENT.
HG-203	4.445E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	1.711E+02	NOT IDENT.
BI-207	6.399E+00	NOT IDENT.
TL-208	5.017E+00	NOT IDENT.
PB-210	5.832E+01	NOT IDENT.
BI-211	2.234E+01	NOT IDENT.
PB-211	6.050E+01	NOT IDENT.
BI-212	5.463E+01	NOT IDENT.
BI-213	1.158E+01	NOT IDENT.
BI-214	1.028E+01	NOT IDENT.
PB-214	8.313E+00	FAIL ABUN
RN-219	4.473E+01	NOT IDENT.
FR-221	1.828E+01	NOT IDENT.
RA-223	4.268E+01	FAIL ABUN
RA-224	5.431E+01	NOT IDENT.
AC-225	9.857E+01	NOT IDENT.
AC-227	2.524E+01	NOT IDENT.
TH-227	2.524E+01	NOT IDENT.
AC-228	1.525E+01	NOT IDENT.
RA-228	1.525E+01	NOT IDENT.
TH-229	4.383E+01	NOT IDENT.
TH-230	3.332E+02	NOT IDENT.
PA-231	4.959E+01	NOT IDENT.
TH-231	2.295E+01	NOT IDENT.
TH-232	7.831E+02	NOT IDENT.
PA-233	5.984E+00	FAIL ABUN
PA-234	3.175E+01	FAIL ABUN
PA-234M	5.116E+02	NOT IDENT.
TH-234	5.513E+01	FAIL ABUN
U-234	1.061E+03	NOT IDENT.
U-235	1.656E+01	NOT IDENT.
NP-237	5.984E+00	FAIL ABUN
NP-238	0.000E+00	SHORT HLIF
U-238	5.513E+01	FAIL ABUN
NP-239	1.664E+01	NOT IDENT.
AM-241	4.044E+00	NOT IDENT.
AM-242	4.313E+01	NOT IDENT.
AM-243	2.550E+00	NOT IDENT.
CM-243	6.778E+00	NOT IDENT.
BK-247	7.405E+00	NOT IDENT.
CM-247	4.340E+00	NOT IDENT.
CF-249	4.644E+00	NOT IDENT.
CF-251	9.885E+00	NOT IDENT.
CF-252	1.172E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487003.CNF;1
Acquisition date : 19-JAN-2023 15:21:35 Sensitivity : 3.000
Detector ID : GAM38 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.32 Half life ratio : *****
Sample date : 26-DEC-2022 09:00:00 Nuclide Library : LIQUID
Sample ID : G606487003 Analyst initials: MXR1
Batch Number : 2367950 Sample Quantity : 7.5000E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 22-APR-2022 08:42:40 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM38_JAR.CNF;2

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BA-137M	1.568E+01	6.608E+00	6.615E+00
CS-137	1.657E+01	6.980E+00	6.988E+00
PB-212	8.782E-01	1.011E+01	1.011E+01
RA-226	7.250E+01	1.885E+02	1.885E+02
TH-228	8.782E-01	1.011E+01	1.011E+01
ANH-511	5.820E+00	1.378E+01	1.378E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	5.109E-01	4.410E+01	4.410E+01	NOT IDENT.
NA-22	3.745E+00	4.786E+00	5.076E+00	NOT IDENT.
NA-24	1.130E+12	3.175E+12	3.216E+12	SHORT HLIF
AL-26	-1.982E+00	6.613E+00	6.673E+00	NOT IDENT.
K-40	1.237E+01	8.179E+01	8.198E+01	NOT IDENT.
SC-46	4.439E-01	5.366E+00	5.369E+00	NOT IDENT.
V-48	5.722E+00	1.514E+01	1.536E+01	NOT IDENT.
CR-51	2.253E+01	5.869E+01	5.956E+01	NOT IDENT.
MN-52	-9.049E+01	1.309E+02	1.371E+02	FAIL ABUN
MN-54	-1.981E+00	5.354E+00	5.428E+00	NOT IDENT.
CO-56	3.705E+00	6.135E+00	6.359E+00	NOT IDENT.
CO-57	-3.890E-01	2.349E+00	2.356E+00	NOT IDENT.
NI-57	-3.351E+05	5.548E+05	5.750E+05	SHORT HLIF
CO-58	1.469E+00	5.481E+00	5.521E+00	NOT IDENT.
FE-59	-1.274E-01	1.411E+01	1.411E+01	NOT IDENT.
CO-60	3.310E+00	4.100E+00	4.363E+00	NOT IDENT.
ZN-65	9.050E+00	1.321E+01	1.383E+01	NOT IDENT.
CU-67	-5.925E+03	4.310E+03	5.072E+03	FAIL ABUN
GE-68	-3.935E+01	1.543E+02	1.553E+02	NOT IDENT.
AS-73	4.953E+00	1.915E+01	1.928E+01	NOT IDENT.
AS-74	1.135E+00	1.942E+01	1.943E+01	NOT IDENT.
SE-75	-2.721E+00	5.486E+00	5.622E+00	NOT IDENT.
BR-77	1.939E+03	2.232E+04	2.233E+04	SHORT HLIF
SR-82	-2.740E+01	6.198E+01	6.321E+01	NOT IDENT.

RB-83	-2.379E+00	1.235E+01	1.240E+01	NOT IDENT.
RB-84	-5.718E+00	9.931E+00	1.026E+01	NOT IDENT.
KR-85	1.778E+03	1.205E+03	1.448E+03	NOT IDENT.
SR-85	1.028E+01	6.969E+00	8.373E+00	NOT IDENT.
RB-86	-1.746E+01	1.270E+02	1.272E+02	NOT IDENT.
Y-88	-3.736E+00	6.610E+00	6.821E+00	NOT IDENT.
ZR-88	-4.910E+00	3.798E+00	4.397E+00	NOT IDENT.
Y-91	7.774E+02	2.702E+03	2.725E+03	NOT IDENT.
NB-94	-2.052E+00	4.650E+00	4.741E+00	NOT IDENT.
NB-95	-7.947E-01	5.146E+00	5.159E+00	NOT IDENT.
NB-95M	1.079E+01	1.324E+01	1.411E+01	NOT IDENT.
TC-95M	2.107E+00	5.022E+00	5.112E+00	NOT IDENT.
ZR-95	9.506E+00	1.053E+01	1.137E+01	NOT IDENT.
MO-99	-2.259E+02	2.318E+04	2.318E+04	NOT IDENT.
TC-99M	-1.450E+29	3.434E+29	0.000E+00	SHORT HLIF
RH-100	9.275E+08	2.007E+09	2.050E+09	SHORT HLIF
RH-101	6.699E-01	2.801E+00	2.817E+00	NOT IDENT.
RH-102M	-1.476E+00	3.852E+00	3.910E+00	NOT IDENT.
RU-103	-1.175E-01	6.107E+00	6.107E+00	NOT IDENT.
RH-106	-1.456E+01	4.081E+01	4.133E+01	NOT IDENT.
RU-106	-1.456E+01	4.081E+01	4.133E+01	NOT IDENT.
AG-108M	4.753E+00	4.202E+00	4.718E+00	FAIL ABUN
CD-109	1.287E+01	4.222E+01	4.262E+01	NOT IDENT.
AG-110	-4.823E+00	1.099E+02	1.099E+02	NOT IDENT.
AG-110M	3.230E+00	6.274E+00	6.441E+00	NOT IDENT.
IN-111	5.291E+02	1.121E+03	1.146E+03	NOT IDENT.
SN-113	1.350E+00	5.640E+00	5.673E+00	NOT IDENT.
IN-114M	2.277E+01	2.105E+01	2.342E+01	NOT IDENT.
CD-115	1.478E+04	2.017E+04	2.124E+04	SHORT HLIF
SN-117M	1.516E+00	8.057E+00	8.086E+00	NOT IDENT.
SB-122	-9.178E+02	2.682E+03	2.714E+03	NOT IDENT.
I-123	-7.310E+12	4.811E+13	4.822E+13	SHORT HLIF
TE-123M	-4.453E-01	2.861E+00	2.868E+00	NOT IDENT.
SB-124	1.006E+01	1.842E+01	1.897E+01	NOT IDENT.
SB-125	-5.433E-01	1.201E+01	1.202E+01	NOT IDENT.
TE-125M	-5.854E+01	7.805E+02	7.809E+02	NOT IDENT.
I-126	1.114E+01	5.121E+01	5.146E+01	NOT IDENT.
SB-126	-8.011E+00	3.138E+01	3.159E+01	NOT IDENT.
SN-126	2.832E-01	4.338E+00	4.339E+00	NOT IDENT.
SB-127	-2.299E+02	8.749E+02	8.810E+02	NOT IDENT.
TE-129	3.587E+00	7.354E+01	7.356E+01	FAIL ABUN
I-131	6.859E+00	2.769E+01	2.786E+01	NOT IDENT.
I-132	-1.000E+41	2.674E+41	0.000E+00	SHORT HLIF
TE-132	-3.232E+00	5.232E+02	5.232E+02	NOT IDENT.
BA-133	1.741E+00	4.887E+00	4.950E+00	NOT IDENT.
I-133	-6.616E+08	1.097E+09	1.137E+09	SHORT HLIF
CS-134	4.142E+00	4.625E+00	4.989E+00	NOT IDENT.
I-135	-5.941E+27	1.070E+28	0.000E+00	SHORT HLIF
CS-136	3.031E+00	2.398E+01	2.402E+01	NOT IDENT.
LA-138	3.087E+00	8.097E+00	8.216E+00	NOT IDENT.
CE-139	6.104E-01	2.696E+00	2.710E+00	NOT IDENT.
BA-140	1.080E+02	6.678E+01	8.267E+01	FAIL ABUN
LA-140	-1.387E+01	1.402E+01	1.535E+01	FAIL ABUN
CE-141	-5.916E+00	7.218E+00	7.696E+00	NOT IDENT.
CE-143	-2.256E+05	1.349E+06	1.353E+06	SHORT HLIF
CE-144	7.340E+00	1.605E+01	1.639E+01	NOT IDENT.
PM-144	-1.301E+00	4.773E+00	4.809E+00	NOT IDENT.
PR-144	-5.492E+01	3.506E+02	3.515E+02	NOT IDENT.
PM-146	-1.432E+00	4.775E+00	4.819E+00	NOT IDENT.
ND-147	-9.561E+01	1.224E+02	1.298E+02	NOT IDENT.
PM-147	-3.600E+04	6.597E+04	6.794E+04	NOT IDENT.
PM-149	-1.080E+04	2.078E+05	2.079E+05	SHORT HLIF
EU-152	-1.343E+00	1.165E+01	1.167E+01	NOT IDENT.
GD-153	-9.849E+00	7.196E+00	8.457E+00	NOT IDENT.
EU-154	8.717E+00	1.287E+01	1.346E+01	NOT IDENT.
EU-155	-3.063E+00	7.252E+00	7.382E+00	NOT IDENT.
TB-160	9.132E+00	1.776E+01	1.823E+01	NOT IDENT.
HO-166M	-1.064E+00	7.147E+00	7.163E+00	NOT IDENT.
TM-171	8.130E+01	3.384E+02	3.404E+02	NOT IDENT.
LU-176	-2.466E+00	2.966E+00	3.167E+00	FAIL ABUN
LU-177	1.018E+02	3.104E+02	3.138E+02	NOT IDENT.
HF-181	-2.533E+00	6.421E+00	6.522E+00	NOT IDENT.
W-181	-1.117E+00	4.907E+00	4.933E+00	NOT IDENT.
TA-182	-1.465E+01	2.475E+01	2.561E+01	NOT IDENT.
RE-183	-1.428E-01	5.194E+00	5.195E+00	NOT IDENT.
RE-184	-6.565E+00	2.279E+01	2.298E+01	FAIL ABUN
RE-188	-4.443E+00	1.468E+01	1.482E+01	NOT IDENT.
W-188	-1.274E+03	1.073E+03	1.217E+03	NOT IDENT.

OS-191	-2.315E+00	2.108E+01	2.110E+01	NOT IDENT.
IR-192	3.754E+00	5.068E+00	5.343E+00	FAIL ABUN
PB-201	-1.730E+19	2.658E+19	0.000E+00	SHORT HLIF
TL-201	1.709E+03	4.986E+03	5.045E+03	NOT IDENT.
TL-202	1.489E+01	1.409E+01	1.561E+01	NOT IDENT.
HG-203	2.765E+00	5.136E+00	5.286E+00	NOT IDENT.
PB-203	4.683E+03	8.698E+03	8.951E+03	SHORT HLIF
TL-204	-8.169E+01	2.008E+02	2.042E+02	NOT IDENT.
BI-207	-3.379E+00	8.314E+00	8.452E+00	NOT IDENT.
TL-208	-1.409E+00	6.205E+00	6.237E+00	NOT IDENT.
PB-210	-3.169E+01	6.705E+01	6.856E+01	NOT IDENT.
BI-211	-3.341E+01	2.906E+01	3.274E+01	NOT IDENT.
PB-211	-4.574E+01	7.819E+01	8.087E+01	NOT IDENT.
BI-212	2.505E-01	6.696E+01	6.696E+01	NOT IDENT.
BI-213	1.630E-01	1.353E+01	1.353E+01	NOT IDENT.
BI-214	2.446E-01	1.250E+01	1.250E+01	NOT IDENT.
PB-214	-1.416E+01	1.098E+01	1.270E+01	FAIL ABUN
RN-219	-4.411E+00	5.254E+01	5.258E+01	NOT IDENT.
FR-221	8.885E+00	2.111E+01	2.149E+01	NOT IDENT.
RA-223	-8.096E+01	6.234E+01	7.225E+01	FAIL ABUN
RA-224	2.819E+01	6.747E+01	6.866E+01	NOT IDENT.
AC-225	4.790E+01	1.138E+02	1.159E+02	NOT IDENT.
AC-227	3.512E+00	3.073E+01	3.078E+01	NOT IDENT.
TH-227	3.512E+00	3.073E+01	3.078E+01	NOT IDENT.
AC-228	-2.447E+01	2.275E+01	2.529E+01	NOT IDENT.
RA-228	-2.447E+01	2.275E+01	2.529E+01	NOT IDENT.
TH-229	2.076E+01	5.028E+01	5.114E+01	NOT IDENT.
TH-230	-2.703E+02	4.041E+02	4.221E+02	NOT IDENT.
PA-231	2.479E+01	5.873E+01	5.979E+01	NOT IDENT.
TH-231	-2.784E+01	3.005E+01	3.257E+01	NOT IDENT.
TH-232	-1.089E+03	9.170E+02	1.040E+03	NOT IDENT.
PA-233	4.354E+00	7.203E+00	7.467E+00	FAIL ABUN
PA-234	7.816E+00	3.631E+01	3.649E+01	FAIL ABUN
PA-234M	-4.894E+02	7.603E+02	7.917E+02	NOT IDENT.
TH-234	-7.026E+01	6.539E+01	7.267E+01	FAIL ABUN
U-234	3.860E+02	1.338E+03	1.349E+03	NOT IDENT.
U-235	-1.008E+01	2.138E+01	2.186E+01	NOT IDENT.
NP-237	4.354E+00	7.203E+00	7.467E+00	FAIL ABUN
NP-238	1.015E+04	6.522E+04	6.538E+04	SHORT HLIF
U-238	-7.026E+01	6.539E+01	7.267E+01	FAIL ABUN
NP-239	-1.061E+00	1.948E+01	1.949E+01	NOT IDENT.
AM-241	2.762E+00	4.269E+00	4.447E+00	NOT IDENT.
AM-242	5.145E-01	5.202E+01	5.202E+01	NOT IDENT.
AM-243	-2.932E+00	2.927E+00	3.212E+00	NOT IDENT.
CM-243	4.090E+00	7.390E+00	7.617E+00	NOT IDENT.
BK-247	1.407E-01	9.164E+00	9.165E+00	NOT IDENT.
CM-247	2.985E+00	4.666E+00	4.857E+00	NOT IDENT.
CF-249	-1.482E+00	5.564E+00	5.604E+00	NOT IDENT.
CF-251	-7.910E+00	1.290E+01	1.338E+01	NOT IDENT.
CF-252	8.073E+03	1.465E+04	1.509E+04	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	19.6920	81.00	29.4681	121.12	43.9098
45.60	19.9003	81.07	33.5684	121.22	43.9200
46.54	19.9933	82.35	0.0000	121.78	42.1462
49.72	15.9510	82.47	38.6554	122.06	42.1743
51.35	24.8387	82.47	38.6558	123.07	36.7609
52.39	22.0204	83.79	42.1223	123.68	46.0171
53.20	23.5740	84.00	35.5385	127.16	0.0000
53.44	23.5992	84.21	38.8702	127.23	36.1895
56.28	25.3869	84.86	0.0000	129.43	38.2367
57.36	0.0000	85.43	44.0010	131.20	30.8987
57.53	29.2754	86.55	40.8222	133.02	29.1439
57.53	29.2756	86.79	41.6859	133.52	25.4114
57.98	29.3308	86.94	45.0422	135.34	31.1827
59.32	20.4193	87.09	38.3868	136.00	35.0127
59.54	29.5212	87.57	37.6079	136.28	30.2998
61.49	38.9115	88.03	30.9655	136.47	35.9955
63.00	32.2375	88.34	32.6703	140.51	44.9080
63.29	32.2743	88.47	36.0352	140.88	36.3370
63.58	34.6189	91.11	36.0410	143.76	37.5194
63.81	34.6501	91.27	36.0583	144.24	37.5563
64.28	33.1706	92.59	29.6947	145.44	36.6844
64.99	69.6176	93.31	29.7574	152.32	32.3041
65.08	74.2844	94.56	29.8658	152.43	32.3112
66.73	38.9336	94.65	29.8736	153.25	25.4985
66.98	46.7642	94.67	29.8752	154.21	27.5121
67.24	37.4480	97.43	43.5904	155.04	29.5253
67.67	42.1970	98.43	29.9091	156.02	27.6095
67.75	42.2093	98.44	29.9099	158.56	31.7095
68.89	30.6137	99.53	32.0202	158.97	0.0000
68.89	30.6143	100.11	30.3382	159.00	36.6951
69.67	33.8506	100.20	30.3457	162.33	29.9419
70.82	41.8967	102.03	31.3698	162.66	29.9606
70.82	41.8967	103.18	23.6009	163.33	35.9978
70.83	0.0000	103.37	27.1113	165.86	26.1214
72.81	31.8457	105.31	33.4063	167.43	26.1972
72.87	0.0000	106.12	24.6681	171.28	26.3820
74.66	39.2641	106.47	25.5728	176.31	29.6912
74.82	39.2861	109.28	31.9793	176.60	29.7067
74.97	39.3063	111.00	37.4742	177.52	38.9892
77.11	39.5949	111.76	27.7132	181.07	39.2304
79.69	33.6887	112.95	37.6600	184.41	38.7638
79.82	33.7035	116.24	28.9292	184.58	38.7751
80.02	31.5494	116.30	28.9336	185.72	36.4217
80.03	31.5500	116.74	28.9648	186.21	36.4521
80.12	35.9128	117.23	33.5307	190.27	20.9717
80.19	35.9212	119.76	30.0898	193.51	26.3550
80.22	35.9252	120.54	42.0220	197.03	26.5060
80.57	26.1570	120.90	43.8867	198.01	25.4861

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
201.83	26.7097	306.78	24.5428	492.35	0.0000
204.12	24.3043	308.46	20.9008	497.08	15.5361
205.31	37.5987	311.90	13.1641	511.00	16.6758
208.37	23.7456	316.51	28.1154	514.00	11.7964
210.85	29.2536	319.41	23.6410	520.40	11.8506
215.65	29.4666	320.08	21.1680	520.69	0.0000
218.12	25.1935	321.04	14.9575	522.65	0.0000
222.11	23.1383	323.87	25.0049	527.90	0.0000
227.09	29.9647	325.23	18.3633	529.59	8.9458
227.38	28.8668	328.76	22.6214	529.87	0.0000
228.16	25.5644	331.15	0.0000	531.02	10.9445
228.18	25.5651	333.37	21.0470	537.26	12.9905
235.69	17.9739	334.37	21.9116	539.51	0.0000
235.96	19.4788	338.28	22.0004	546.56	0.0000
238.63	31.5825	338.32	22.0010	552.55	18.1758
238.98	0.0000	340.48	18.6574	563.25	16.2721
240.99	22.6318	340.55	18.6587	564.24	15.2649
242.00	25.6850	344.28	24.6894	569.33	12.2529
244.70	27.2955	345.93	23.0251	569.50	12.2544
245.35	22.7661	351.06	23.1438	569.70	12.2559
250.62	27.5120	351.93	27.4531	582.08	19.5621
252.40	19.9166	356.01	18.9506	583.19	13.3941
252.80	18.3940	361.25	0.0000	595.83	15.5798
256.23	30.0244	364.49	15.6335	600.60	12.5015
260.90	0.0000	366.42	13.0521	604.72	23.5007
264.66	30.3505	383.85	22.1135	609.32	15.7117
265.00	25.6920	388.16	28.4173	610.33	15.7214
269.46	22.3132	388.63	26.6528	614.28	15.7599
271.23	25.1081	391.70	17.8182	618.01	12.6367
273.65	20.4617	392.87	24.9722	621.93	12.6670
276.40	29.6112	400.66	19.7585	630.19	0.0000
277.37	26.0887	401.32	0.0000	631.29	11.6772
277.60	21.3514	401.81	22.4757	632.98	11.6888
278.00	18.9883	402.40	16.1913	633.25	10.6278
278.43	27.3097	404.85	18.9304	634.78	11.7014
279.20	0.0000	410.95	17.2195	635.95	10.6449
279.54	23.7793	414.70	10.9109	636.99	10.6519
280.46	23.8055	423.72	19.2419	657.50	11.3199
283.69	16.7288	427.09	13.7836	657.76	11.3216
284.31	14.3492	427.87	20.2289	661.66	9.7258
285.41	31.1313	433.94	14.7868	664.57	0.0000
285.90	0.0000	439.51	10.2129	666.33	9.7522
287.50	21.6057	440.45	18.5832	666.50	9.7529
290.67	40.9623	446.15	0.0000	667.71	0.0000
293.27	0.0000	453.88	15.0290	677.62	8.7243
295.22	14.5338	459.60	16.0413	685.70	10.9546
295.96	20.6072	463.37	15.1426	692.65	9.8972
298.58	27.9646	468.07	18.9978	695.00	12.1123
299.98	21.9199	473.00	16.2100	696.49	13.2246
300.09	21.9227	475.06	19.1007	696.51	12.1226
300.13	21.9238	476.78	12.4319	697.00	12.1257
301.36	23.1742	477.60	14.3536	697.49	12.1293
302.85	21.9913	477.99	18.1867	702.65	14.3748
304.50	17.1364	482.18	17.2844	706.68	6.6492
304.85	17.1428	487.02	17.3478	711.68	8.8896

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
720.70	11.1658	911.20	10.0933	1298.22	0.0000
721.93	0.0000	923.98	0.0000	1312.11	7.4371
722.78	15.6497	926.36	5.5415	1332.49	1.0692
722.91	11.1792	935.54	6.4903	1362.15	0.0000
723.31	7.8269	937.49	4.4542	1365.19	6.4790
724.19	5.5933	944.13	5.5833	1368.63	0.0000
727.33	10.0847	945.96	0.0000	1377.63	0.0000
733.00	12.3629	946.00	5.5876	1384.29	5.4300
735.93	11.2561	949.00	9.3243	1408.01	4.3745
739.50	12.4050	954.55	0.0000	1434.09	8.8154
744.23	2.2610	962.31	14.0643	1435.80	3.3074
747.24	15.8514	964.08	4.6915	1457.56	0.0000
752.31	12.4873	966.17	10.3303	1460.82	3.3311
753.82	12.4972	968.97	7.5215	1489.16	6.7152
756.73	5.6889	983.53	7.5662	1553.35	0.0000
763.94	6.8518	984.45	0.0000	1596.21	3.6861
765.80	8.0015	996.26	6.6544	1620.50	3.7094
766.42	8.0037	1001.03	9.5245	1678.03	0.0000
766.84	8.0055	1004.73	9.5383	1690.97	3.7758
772.60	0.0000	1025.87	0.0000	1757.55	0.0000
776.52	12.6413	1028.54	0.0000	1764.49	3.8438
777.92	9.2002	1037.84	3.8650	1770.23	4.8113
778.90	10.3553	1038.76	0.0000	1771.35	4.8125
783.70	8.0732	1046.59	9.6954	1791.20	0.0000
788.74	10.4059	1048.07	7.7607	1808.65	5.8257
792.07	11.5812	1050.41	8.7385	1836.06	4.8855
795.86	3.4807	1063.66	12.6858		
801.95	8.1459	1077.00	5.8843		
802.10	8.1464	1077.34	6.8658		
810.29	8.7631	1083.85	7.8657		
810.45	7.8874	1085.87	0.9839		
810.76	7.8885	1099.25	7.9106		
815.77	11.4218	1107.22	0.0000		
818.51	7.0381	1111.64	11.9194		
822.65	0.0000	1112.07	10.9275		
832.01	13.2811	1112.84	8.9434		
834.85	11.8209	1115.54	6.9628		
835.15	9.9309	1120.29	9.9640		
836.80	0.0000	1120.55	9.9646		
846.77	8.0236	1121.30	9.9677		
856.80	8.9563	1129.67	7.9980		
860.56	6.2801	1131.51	0.0000		
871.09	7.2117	1173.23	6.0908		
873.19	5.4139	1177.95	4.0671		
875.33	0.0000	1189.05	3.0621		
879.38	5.4289	1204.77	5.1306		
880.51	11.7686	1221.41	9.2867		
881.60	9.0573	1231.02	6.2109		
883.24	7.2510	1235.36	12.4395		
884.68	5.4417	1238.28	5.1880		
889.28	5.8164	1260.41	0.0000		
894.76	11.6609	1271.87	4.1960		
898.04	11.6777	1274.44	2.0997		
903.28	12.8020	1274.54	2.0997		
907.67	0.0000	1291.59	6.3336		

VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 18:37:39.70

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292906.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM23.CNF;824
Background date    : 15-JAN-2023 11:33:49
Sample date       : 19-JAN-2023 00:00:00 Acquisition date : 19-JAN-2023 16:37:07
Sample ID        : G1205292906 Sample quantity   : 7.64890E-01 FILTER
Detector name     : GAM23 Detector geometry      : JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:02.05 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials  : MXR1
Abundance limit   : 75.00000 Sensitivity      : 3.00000
Batch ID          : 2367950 Detector SN#      :
Matrix Spike ID   : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	58.87	22	51	1.04	117.39	114	8	3.09E-03	59.1	
2	0	63.49*	13	64	1.01	126.62	123	8	1.78E-03	122.4	
3	0	92.65*	28	50	1.38	184.90	182	8	3.94E-03	57.5	
4	0	97.77	40	40	2.43	195.13	191	8	5.56E-03	31.6	
5	0	173.21	26	85	4.97	345.90	336	15	3.60E-03	80.4	
6	0	185.74*	10	77	0.92	370.93	367	9	1.33E-03	193.3	
7	0	238.53*	17	46	0.88	476.43	473	10	2.42E-03	85.2	
8	0	368.37	16	26	3.28	735.94	730	11	2.27E-03	64.1	
9	0	392.11	11	25	0.75	783.37	777	10	1.51E-03	91.4	
10	0	433.54	16	14	2.07	866.18	862	9	2.17E-03	49.8	
11	0	511.06*	16	36	1.36	1021.11	1013	16	2.18E-03	125.7	
12	0	581.97*	11	12	1.79	1162.83	1156	12	1.56E-03	76.6	
13	0	608.84*	17	14	2.13	1216.53	1212	11	2.41E-03	55.1	
14	0	676.65	11	10	0.66	1352.08	1348	10	1.51E-03	66.6	
15	0	698.36	15	12	3.33	1395.47	1390	9	2.04E-03	51.5	
16	0	714.11	9	4	0.80	1426.94	1424	7	1.18E-03	50.1	
17	0	728.48	11	6	2.35	1455.67	1450	11	1.46E-03	53.1	
18	0	750.81	15	6	1.84	1500.31	1495	10	2.02E-03	43.3	
19	0	765.76	16	8	3.03	1530.18	1524	11	2.20E-03	43.2	
20	0	896.08	15	0	1.56	1790.67	1783	13	2.08E-03	25.8	
21	0	940.89	4	12	0.54	1880.23	1872	10	5.30E-04	180.3	
22	0	1038.36	10	3	0.87	2075.07	2071	10	1.40E-03	43.4	
23	0	1047.36	6	8	1.41	2093.06	2085	12	7.84E-04	113.5	
24	0	1141.60	20	4	5.14	2281.43	2272	15	2.75E-03	31.1	
25	0	1334.79	13	0	0.83	2667.62	2662	12	1.81E-03	27.7	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 19-JAN-2023 18:37:40

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292906.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MXR1		
Sample date	: 19-JAN-2023 00:00:00	Acquisition date	: 19-JAN-2023 16:37:07
Sample ID	: G1205292906	Sample quantity	: 0.76489 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA23	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:02.05 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
CU-67	91.27	28	7.00	3.545E+00	5.606E+01	6.830E+01	115.08
	93.31	28	16.10	3.545E+00	2.437E+01	2.970E+01	115.08
	184.58	10	48.70*	3.618E+00	2.670E+00	3.253E+00	386.62
ZR-88	392.87	11	97.29*	2.161E+00	2.535E+00	2.550E+00	182.76
NB-95	765.80	16	99.81*	1.282E+00	6.073E+00	6.122E+00	86.31
SN-113	391.70	11	64.97*	2.161E+00	3.796E+00	3.813E+00	182.76
TL-208	277.37	-----	6.60	2.772E+00	-----	Line Not Found	-----
	583.19	11	85.00*	1.607E+00	4.044E+00	4.047E+00	153.22
	860.56	-----	12.50	1.157E+00	-----	Line Not Found	-----
BI-212	727.33	11	6.67*	1.338E+00	5.774E+01	5.779E+01	106.27
	1620.50	-----	1.47	6.671E-01	-----	Line Not Found	-----
RA-226	186.21	10	3.59*	3.618E+00	3.622E+01	3.622E+01	386.62
TH-232	63.81	13	0.26*	1.500E+00	1.614E+03	1.614E+03	244.86
	140.88	-----	0.02	4.072E+00	-----	Line Not Found	-----
TH-234	63.29	13	3.70*	1.500E+00	1.134E+02	1.134E+02	244.86
	92.59	28	4.23	3.545E+00	9.277E+01	9.277E+01	115.08
U-238	63.29	13	3.70*	1.500E+00	1.134E+02	1.134E+02	244.86
	92.59	28	4.23	3.545E+00	9.277E+01	9.277E+01	115.08
AM-241	59.54	22	35.90*	1.101E+00	2.761E+01	2.761E+01	118.28
ANH-511	511.00	16	100.00*	1.777E+00	4.330E+00	4.330E+00	251.48

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292906.CNF;1
Acquisition date : 19-JAN-2023 16:37:07 Sensitivity : 3.000
Detector ID : GAM23 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:02.05 Half life ratio : *****
Sample date : 19-JAN-2023 00:00:00 Analyst initials: MXR1
Sample ID : G1205292906 Sample Quantity : 7.6489E-01 FILTER
Batch Number : 2367950 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;28

CALIBRATION INFORMATION

Eff. Cal. date : 3-MAY-2022 06:48:20 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM23_JAR.CNF;20

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
CU-67	3.253E+00	1.233E+01	1.010E+01
ZR-88	2.550E+00	4.568E+00	4.300E+00
NB-95	6.122E+00	5.178E+00	5.909E+00
SN-113	3.813E+00	6.828E+00	7.450E+00
TL-208	4.047E+00	6.077E+00	6.643E+00
BI-212	5.779E+01	6.018E+01	9.508E+01
RA-226	3.622E+01	1.372E+02	1.194E+02
TH-232	1.614E+03	3.873E+03	3.425E+03
TH-234	1.134E+02	2.722E+02	2.612E+02
U-238	1.134E+02	2.722E+02	2.612E+02
AM-241	2.761E+01	3.201E+01	2.921E+01
ANH-511	4.330E+00	1.067E+01	5.460E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	1.695E+01	2.582E+01	5.520E+01	NOT IDENT.
NA-22	2.056E+00	3.483E+00	8.622E+00	NOT IDENT.
NA-24	6.652E+00	1.052E+01	2.453E+01	NOT IDENT.
AL-26	-3.358E+00	3.948E+00	5.797E+00	NOT IDENT.
K-40	-3.970E+01	5.776E+01	9.591E+01	NOT IDENT.
SC-46	-3.727E-01	3.759E+00	6.573E+00	NOT IDENT.
V-48	1.992E+00	3.910E+00	8.652E+00	NOT IDENT.
CR-51	-1.633E+01	2.559E+01	4.603E+01	NOT IDENT.
MN-52	4.091E+00	3.925E+00	1.072E+01	NOT IDENT.
MN-54	2.049E+00	3.427E+00	7.668E+00	NOT IDENT.
CO-56	9.224E-01	4.087E+00	8.369E+00	FAIL ABUN
CO-57	2.831E-01	2.006E+00	3.865E+00	NOT IDENT.
NI-57	-5.597E+00	7.944E+00	1.390E+01	NOT IDENT.
CO-58	-2.525E+00	2.539E+00	3.931E+00	NOT IDENT.
FE-59	2.105E+00	6.756E+00	1.469E+01	NOT IDENT.
CO-60	1.099E+00	4.535E+00	9.107E+00	NOT IDENT.
ZN-65	1.984E+00	5.233E+00	1.279E+01	NOT IDENT.
GE-68	-1.305E+01	1.005E+02	2.031E+02	NOT IDENT.

AS-73	-3.273E+01	1.325E+02	1.957E+02	NOT IDENT.
AS-74	4.332E-01	6.124E+00	1.163E+01	NOT IDENT.
SE-75	-7.525E-01	4.084E+00	7.106E+00	NOT IDENT.
BR-77	1.491E+01	2.489E+01	2.963E+01	FAIL ABUN
SR-82	4.450E+00	2.360E+01	4.900E+01	NOT IDENT.
RB-83	-1.534E+00	6.420E+00	1.184E+01	NOT IDENT.
RB-84	9.798E-01	5.132E+00	1.079E+01	NOT IDENT.
KR-85	1.009E+03	1.068E+03	2.011E+03	NOT IDENT.
SR-85	4.557E+00	4.823E+00	9.076E+00	NOT IDENT.
RB-86	7.413E+00	3.809E+01	8.376E+01	NOT IDENT.
Y-88	-1.747E+00	3.285E+00	5.901E+00	NOT IDENT.
Y-91	-1.129E+03	1.871E+03	3.156E+03	NOT IDENT.
NB-94	3.397E+00	3.988E+00	8.401E+00	NOT IDENT.
NB-95M	2.818E+00	1.034E+01	1.786E+01	NOT IDENT.
TC-95M	-4.422E+00	3.708E+00	5.201E+00	FAIL ABUN
ZR-95	5.384E+00	5.531E+00	1.313E+01	NOT IDENT.
MO-99	-3.191E+01	3.664E+01	6.030E+01	NOT IDENT.
TC-99M	6.762E+00	1.585E+01	3.091E+01	NOT IDENT.
RH-100	2.134E+00	8.486E+00	1.633E+01	NOT IDENT.
RH-101	2.744E-01	2.446E+00	4.699E+00	NOT IDENT.
RH-102M	-5.254E-01	2.975E+00	5.569E+00	FAIL ABUN
RU-103	-3.339E-01	3.749E+00	6.979E+00	FAIL ABUN
RH-106	2.060E+01	4.003E+01	7.963E+01	NOT IDENT.
RU-106	2.060E+01	4.003E+01	7.963E+01	NOT IDENT.
AG-108M	4.212E+00	4.112E+00	6.765E+00	FAIL ABUN
CD-109	1.415E-01	5.742E+01	1.113E+02	NOT IDENT.
AG-110	5.910E+01	6.600E+01	1.489E+02	NOT IDENT.
AG-110M	3.821E+00	4.399E+00	1.055E+01	FAIL ABUN
IN-111	1.576E+00	3.246E+00	6.133E+00	NOT IDENT.
IN-114M	-4.548E+00	1.474E+01	2.574E+01	NOT IDENT.
CD-115	-4.153E+00	1.510E+01	2.732E+01	NOT IDENT.
SN-117M	1.611E+00	2.353E+00	4.666E+00	NOT IDENT.
SB-122	-7.044E-01	4.802E+00	9.025E+00	NOT IDENT.
I-123	3.436E+00	5.852E+00	1.151E+01	NOT IDENT.
TE-123M	1.493E+00	2.294E+00	4.548E+00	NOT IDENT.
SB-124	5.453E+00	8.628E+00	2.175E+01	NOT IDENT.
SB-125	9.573E+00	1.003E+01	2.057E+01	NOT IDENT.
TE-125M	-1.481E+02	6.516E+02	1.215E+03	NOT IDENT.
I-126	5.132E+00	1.097E+01	2.239E+01	NOT IDENT.
SB-126	1.543E+00	6.776E+00	1.406E+01	FAIL ABUN
SN-126	-2.054E+00	5.904E+00	1.102E+01	FAIL ABUN
SB-127	1.425E+00	1.191E+01	2.259E+01	NOT IDENT.
TE-129	1.495E+01	4.174E+01	8.301E+01	NOT IDENT.
I-131	-8.342E-01	2.815E+00	4.757E+00	NOT IDENT.
I-132	-1.215E+01	7.026E+02	1.319E+03	NOT IDENT.
TE-132	1.842E+00	3.143E+00	6.060E+00	NOT IDENT.
BA-133	1.206E+00	4.111E+00	8.291E+00	NOT IDENT.
I-133	5.267E+00	7.196E+00	1.487E+01	NOT IDENT.
CS-134	-5.912E-01	4.085E+00	8.027E+00	NOT IDENT.
I-135	7.525E+01	1.100E+02	2.510E+02	FAIL ABUN
CS-136	3.721E+00	8.275E+00	1.237E+01	FAIL ABUN
BA-137M	-7.865E-01	4.040E+00	7.294E+00	NOT IDENT.
CS-137	-8.308E-01	4.268E+00	7.705E+00	NOT IDENT.
LA-138	2.939E+00	5.840E+00	1.419E+01	NOT IDENT.
CE-139	5.588E-01	2.342E+00	4.462E+00	NOT IDENT.
BA-140	1.037E+01	1.496E+01	3.078E+01	NOT IDENT.
LA-140	-4.090E+00	5.248E+00	8.219E+00	NOT IDENT.
CE-141	-7.822E+00	4.757E+00	7.089E+00	NOT IDENT.
CE-143	1.196E+00	8.331E+00	1.652E+01	NOT IDENT.
CE-144	-4.737E+00	1.725E+01	3.125E+01	NOT IDENT.
PM-144	-1.160E+00	5.292E+00	8.727E+00	NOT IDENT.
PR-144	-8.193E+01	3.936E+02	6.503E+02	NOT IDENT.
PM-146	3.226E+00	4.806E+00	9.934E+00	NOT IDENT.
ND-147	2.617E+01	2.803E+01	5.922E+01	NOT IDENT.
PM-147	-1.860E+04	5.744E+04	1.053E+05	NOT IDENT.
PM-149	6.475E+00	9.722E+01	1.757E+02	NOT IDENT.
EU-152	2.331E+00	1.003E+01	1.994E+01	NOT IDENT.
GD-153	0.000E+00	1.125E+01	1.399E+01	FAIL ABUN
EU-154	2.558E+00	1.080E+01	2.445E+01	NOT IDENT.
EU-155	5.910E+00	8.726E+00	1.781E+01	NOT IDENT.
TB-160	-1.377E+01	1.238E+01	1.897E+01	NOT IDENT.
HO-166M	-9.341E+00	8.330E+00	1.090E+01	FAIL ABUN
TM-171	9.906E+02	3.282E+03	5.294E+03	NOT IDENT.
LU-176	1.286E+00	2.502E+00	5.202E+00	NOT IDENT.
LU-177	-1.807E+01	2.405E+01	3.919E+01	NOT IDENT.
HF-181	-2.083E+00	3.342E+00	5.771E+00	FAIL ABUN
W-181	3.111E+01	3.606E+01	3.856E+01	FAIL ABUN
TA-182	3.865E+00	1.083E+01	2.610E+01	NOT IDENT.

RE-183	2.911E+01	3.375E+01	4.069E+01	FAIL ABUN
RE-184	-9.896E+00	8.909E+00	1.325E+01	FAIL ABUN
RE-188	-8.647E+00	1.367E+01	2.055E+01	FAIL ABUN
W-188	4.073E+02	5.867E+02	1.238E+03	FAIL ABUN
OS-191	-9.743E-01	6.154E+00	1.150E+01	FAIL ABUN
IR-192	1.642E+00	3.395E+00	6.865E+00	NOT IDENT.
PB-201	1.880E+00	1.288E+01	2.534E+01	NOT IDENT.
TL-201	5.257E+00	2.346E+01	4.159E+01	NOT IDENT.
TL-202	-9.731E-01	2.985E+00	5.500E+00	NOT IDENT.
HG-203	-1.204E+00	3.130E+00	5.235E+00	NOT IDENT.
PB-203	-1.520E+00	3.948E+00	6.604E+00	NOT IDENT.
TL-204	1.328E+01	4.233E+02	8.329E+02	NOT IDENT.
BI-207	1.413E+00	5.587E+00	1.170E+01	NOT IDENT.
PB-210	-6.527E+02	8.090E+02	1.080E+03	NOT IDENT.
BI-211	-7.389E+00	2.531E+01	4.606E+01	NOT IDENT.
PB-211	1.137E+01	7.128E+01	1.409E+02	NOT IDENT.
PB-212	6.382E+00	1.066E+01	1.293E+01	FAIL ABUN
BI-213	-3.832E+00	9.686E+00	1.768E+01	NOT IDENT.
BI-214	1.205E+01	1.301E+01	1.970E+01	FAIL ABUN
PB-214	-4.222E+00	8.886E+00	1.586E+01	NOT IDENT.
RN-219	-1.182E+01	4.275E+01	7.919E+01	NOT IDENT.
FR-221	9.691E+00	2.080E+01	3.947E+01	NOT IDENT.
RA-223	-1.794E+01	6.644E+01	1.248E+02	NOT IDENT.
RA-224	1.787E+01	5.119E+01	9.237E+01	NOT IDENT.
AC-225	1.020E+01	2.188E+01	4.153E+01	NOT IDENT.
AC-227	2.161E+01	2.891E+01	5.567E+01	NOT IDENT.
TH-227	2.161E+01	2.891E+01	5.567E+01	NOT IDENT.
AC-228	-1.100E+01	2.000E+01	3.501E+01	NOT IDENT.
RA-228	-1.100E+01	2.000E+01	3.501E+01	NOT IDENT.
TH-228	6.382E+00	1.066E+01	1.293E+01	FAIL ABUN
TH-229	-3.685E+00	4.773E+01	8.617E+01	NOT IDENT.
TH-230	-6.159E+02	9.990E+02	1.849E+03	NOT IDENT.
PA-231	-3.069E+01	4.420E+01	7.943E+01	NOT IDENT.
TH-231	-2.394E+01	4.352E+01	6.973E+01	NOT IDENT.
PA-233	-7.432E+00	8.369E+00	1.354E+01	FAIL ABUN
PA-234	1.532E+01	3.369E+01	7.237E+01	FAIL ABUN
PA-234M	4.087E+02	4.444E+02	1.056E+03	FAIL ABUN
U-234	-1.965E+03	1.168E+04	1.750E+04	NOT IDENT.
U-235	-6.427E+00	2.047E+01	3.584E+01	FAIL ABUN
NP-237	-7.432E+00	8.369E+00	1.354E+01	FAIL ABUN
NP-238	7.291E+00	1.973E+01	4.233E+01	NOT IDENT.
NP-239	1.329E+01	1.960E+01	4.065E+01	NOT IDENT.
AM-242	7.287E+00	5.556E+01	1.011E+02	NOT IDENT.
AM-243	-3.133E+00	4.959E+00	8.356E+00	NOT IDENT.
CM-243	-1.598E+00	8.246E+00	1.556E+01	NOT IDENT.
BK-247	-8.147E+00	8.916E+00	1.368E+01	NOT IDENT.
CM-247	1.055E-01	3.736E+00	7.256E+00	NOT IDENT.
CF-249	-1.481E+00	4.532E+00	7.397E+00	NOT IDENT.
CF-251	-1.240E+00	1.284E+01	2.100E+01	NOT IDENT.
CF-252	6.031E+03	1.458E+04	2.765E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	58.87	22	51	1.04	117.39	114	8	3.09E-03	59.1	
2	0	63.49	30	64	1.01	126.62	123	8	4.11E-03	50.4	
3	0	92.65	74	50	1.38	184.90	182	8	1.02E-02	20.3	
4	0	97.77	40	40	2.43	195.13	191	8	5.56E-03	31.6	
5	0	173.21	26	85	4.97	345.90	336	15	3.60E-03	80.4	
6	0	185.74	61	77	0.92	370.93	367	9	8.48E-03	28.9	
7	0	238.53	31	46	0.88	476.43	473	10	4.33E-03	44.9	
8	0	368.37	16	26	3.28	735.94	730	11	2.27E-03	64.1	
9	0	392.11	11	25	0.75	783.37	777	10	1.51E-03	91.4	
10	0	433.54	16	14	2.07	866.18	862	9	2.17E-03	49.8	
11	0	511.06	157	36	1.36	1021.11	1013	16	2.18E-02	11.7	
12	0	581.97	18	12	1.79	1162.83	1156	12	2.50E-03	45.1	
13	0	608.84	26	14	2.13	1216.53	1212	11	3.57E-03	34.3	
14	0	676.65	11	10	0.66	1352.08	1348	10	1.51E-03	66.6	
15	0	698.36	15	12	3.33	1395.47	1390	9	2.04E-03	51.5	
16	0	714.11	9	4	0.80	1426.94	1424	7	1.18E-03	50.1	
17	0	728.48	11	6	2.35	1455.67	1450	11	1.46E-03	53.1	
18	0	750.81	15	6	1.84	1500.31	1495	10	2.02E-03	43.3	
19	0	765.76	16	8	3.03	1530.18	1524	11	2.20E-03	43.2	
20	0	896.08	15	0	1.56	1790.67	1783	13	2.08E-03	25.8	
21	0	940.89	4	12	0.54	1880.23	1872	10	5.30E-04	180.3	
22	0	1038.36	10	3	0.87	2075.07	2071	10	1.40E-03	43.4	
23	0	1047.36	6	8	1.41	2093.06	2085	12	7.84E-04	113.5	
24	0	1141.60	20	4	5.14	2281.43	2272	15	2.75E-03	31.1	
25	0	1334.79	13	0	0.83	2667.62	2662	12	1.81E-03	27.7	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
CU-67	91.27	28	7.00	3.545E+00	5.606E+01	6.830E+01	115.08
	93.31	28	16.10	3.545E+00	2.437E+01	2.970E+01	115.08
	184.58	10	48.70*	3.618E+00	2.670E+00	3.253E+00	386.62
ZR-88	392.87	11	97.29*	2.161E+00	2.535E+00	2.550E+00	182.76
NB-95	765.80	16	99.81*	1.282E+00	6.073E+00	6.122E+00	86.31
SN-113	391.70	11	64.97*	2.161E+00	3.796E+00	3.813E+00	182.76
TL-208	277.37	-----	6.60	2.772E+00	-----	Line Not Found	-----
	583.19	11	85.00*	1.607E+00	4.044E+00	4.047E+00	153.22
	860.56	-----	12.50	1.157E+00	-----	Line Not Found	-----
BI-212	727.33	11	6.67*	1.338E+00	5.774E+01	5.779E+01	106.27
	1620.50	-----	1.47	6.671E-01	-----	Line Not Found	-----
RA-226	186.21	10	3.59*	3.618E+00	3.622E+01	3.622E+01	386.62
TH-232	63.81	13	0.26*	1.500E+00	1.614E+03	1.614E+03	244.86
	140.88	-----	0.02	4.072E+00	-----	Line Not Found	-----
TH-234	63.29	13	3.70*	1.500E+00	1.134E+02	1.134E+02	244.86
	92.59	28	4.23	3.545E+00	9.277E+01	9.277E+01	115.08
U-238	63.29	13	3.70*	1.500E+00	1.134E+02	1.134E+02	244.86
	92.59	28	4.23	3.545E+00	9.277E+01	9.277E+01	115.08
AM-241	59.54	22	35.90*	1.101E+00	2.761E+01	2.761E+01	118.28
ANH-511	511.00	16	100.00*	1.777E+00	4.330E+00	4.330E+00	251.48

Flag: "*" = Keyline

Total number of lines in spectrum 25
Number of unidentified lines 6
Number of lines tentatively identified by NID 19 76.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
CU-67	61.83H	1.22	2.670E+00	3.253E+00	12.58E+00	386.62	
ZR-88	83.40D	1.01	2.535E+00	2.550E+00	4.661E+00	182.76	
NB-95	64.03D	1.01	6.073E+00	6.122E+00	5.284E+00	86.31	
SN-113	115.09D	1.00	3.796E+00	3.813E+00	6.968E+00	182.76	
TL-208	1.91Y	1.00	4.044E+00	4.047E+00	6.201E+00	153.22	
BI-212	1.91Y	1.00	5.774E+01	5.779E+01	6.141E+01	106.27	
RA-226	1600.00Y	1.00	3.622E+01	3.622E+01	14.00E+01	386.62	
TH-232	1.41E+10Y	1.00	1.614E+03	1.614E+03	3.952E+03	244.86	
TH-234	4.47E+09Y	1.00	1.134E+02	1.134E+02	2.777E+02	244.86	
U-238	4.47E+09Y	1.00	1.134E+02	1.134E+02	2.777E+02	244.86	
AM-241	432.60Y	1.00	2.761E+01	2.761E+01	3.266E+01	118.28	
ANH-511	1.00E+09Y	1.00	4.330E+00	4.330E+00	10.89E+00	251.48	

Total Activity : 1.986E+03 1.987E+03

Grand Total Activity : 1.986E+03 1.987E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	97.77	40	40	2.43	195.13	191	8	5.56E-03	63.2	3.74E+00	T
0	173.21	26	85	4.97	345.90	336	15	3.60E-03	****	3.76E+00	
0	238.53	17	46	0.88	476.43	473	10	2.42E-03	****	3.08E+00	T
0	368.37	16	26	3.28	735.94	730	11	2.27E-03	****	2.26E+00	
0	433.54	16	14	2.07	866.18	862	9	2.17E-03	99.6	2.01E+00	T
0	608.84	17	14	2.13	1216.53	1212	11	2.41E-03	****	1.55E+00	T
0	676.65	11	10	0.66	1352.08	1348	10	1.51E-03	****	1.42E+00	T
0	698.36	15	12	3.33	1395.47	1390	9	2.04E-03	****	1.39E+00	T
0	714.11	9	4	0.80	1426.94	1424	7	1.18E-03	****	1.36E+00	
0	750.81	15	6	1.84	1500.31	1495	10	2.02E-03	86.5	1.30E+00	T
0	896.08	15	0	1.56	1790.67	1783	13	2.08E-03	51.6	1.12E+00	T
0	940.89	4	12	0.54	1880.23	1872	10	5.30E-04	****	1.07E+00	
0	1038.36	10	3	0.87	2075.07	2071	10	1.40E-03	86.7	9.75E-01	T
0	1047.36	6	8	1.41	2093.06	2085	12	7.84E-04	****	9.67E-01	T
0	1141.60	20	4	5.14	2281.43	2272	15	2.75E-03	62.2	8.93E-01	
0	1334.79	13	0	0.83	2667.62	2662	12	1.81E-03	55.5	7.77E-01	

Flags: "T" = Tentatively associated

```

*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                           *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292906.CNF;1      *
* Acquisition date   : 19-JAN-2023 16:37:07 Sensitivity      : 3.000                *
* Detector ID       : GAM23 Energy tolerance: 1.500          *
* Elapsed live time : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time : 0 02:00:02.05 Half life ratio : *****          *
* Sample date       : 19-JAN-2023 00:00:00 Nuclide Library : LIQUID          *
* Sample ID         : G1205292906 Analyst initials: MXR1          *
* Batch Number      : 2367950 Sample Quantity : 7.6489E-01 FILTER *
* Wet wt corr       : 1.00000 Wet Weight      : 0.00000          *
*                                     Dry Weight      : 0.00000          *
*****
*                                     CALIBRATION INFORMATION                       *
*
* Eff. Cal. date    : 3-MAY-2022 06:48:20 Eff. Geometry    : JAR              *
* Eff. File         : DKA100:[CANBERRA.GAMMA]EFF_GAM23_JAR.CNF;20          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
CU-67	4.593E+00
ZR-88	1.832E+00
NB-95	2.432E+00
SN-113	3.252E+00
TL-208	2.835E+00
BI-212	4.012E+01
RA-226	5.460E+01
TH-232	1.546E+03
TH-234	1.185E+02
U-238	1.185E+02
AM-241	1.301E+01
ANH-511	2.357E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	2.418E+01	NOT IDENT.
NA-22	3.490E+00	NOT IDENT.
NA-24	1.030E+01	NOT IDENT.
AL-26	1.832E+00	NOT IDENT.
K-40	3.932E+01	NOT IDENT.
SC-46	2.692E+00	NOT IDENT.
V-48	3.658E+00	NOT IDENT.
CR-51	2.029E+01	NOT IDENT.
MN-52	4.365E+00	NOT IDENT.
MN-54	3.275E+00	NOT IDENT.
CO-56	3.616E+00	FAIL ABUN
CO-57	1.745E+00	NOT IDENT.
NI-57	5.435E+00	NOT IDENT.
CO-58	1.414E+00	NOT IDENT.
FE-59	6.063E+00	NOT IDENT.
CO-60	3.701E+00	NOT IDENT.
ZN-65	4.956E+00	NOT IDENT.
GE-68	7.963E+01	NOT IDENT.
AS-73	8.833E+01	NOT IDENT.

AS-74	5.081E+00	NOT IDENT.
SE-75	3.159E+00	NOT IDENT.
BR-77	1.366E+01	FAIL ABUN
SR-82	2.096E+01	NOT IDENT.
RB-83	5.076E+00	NOT IDENT.
RB-84	4.529E+00	NOT IDENT.
KR-85	9.184E+02	NOT IDENT.
SR-85	4.146E+00	NOT IDENT.
RB-86	3.351E+01	NOT IDENT.
Y-88	1.865E+00	NOT IDENT.
Y-91	1.276E+03	NOT IDENT.
NB-94	3.720E+00	NOT IDENT.
NB-95M	8.065E+00	NOT IDENT.
TC-95M	2.292E+00	FAIL ABUN
ZR-95	5.619E+00	NOT IDENT.
MO-99	2.517E+01	NOT IDENT.
TC-99M	1.408E+01	NOT IDENT.
RH-100	7.290E+00	NOT IDENT.
RH-101	2.114E+00	NOT IDENT.
RH-102M	2.413E+00	FAIL ABUN
RU-103	3.083E+00	FAIL ABUN
RH-106	3.544E+01	NOT IDENT.
RU-106	3.544E+01	NOT IDENT.
AG-108M	3.018E+00	FAIL ABUN
CD-109	5.028E+01	NOT IDENT.
AG-110	6.435E+01	NOT IDENT.
AG-110M	4.465E+00	FAIL ABUN
IN-111	2.788E+00	NOT IDENT.
IN-114M	1.167E+01	NOT IDENT.
CD-115	1.191E+01	NOT IDENT.
SN-117M	2.130E+00	NOT IDENT.
SB-122	3.826E+00	NOT IDENT.
I-123	5.246E+00	NOT IDENT.
TE-123M	2.072E+00	NOT IDENT.
SB-124	8.705E+00	NOT IDENT.
SB-125	9.189E+00	NOT IDENT.
TE-125M	5.461E+02	NOT IDENT.
I-126	9.740E+00	NOT IDENT.
SB-126	6.080E+00	FAIL ABUN
SN-126	4.971E+00	FAIL ABUN
SB-127	9.837E+00	NOT IDENT.
TE-129	3.697E+01	NOT IDENT.
I-131	1.998E+00	NOT IDENT.
I-132	5.663E+02	NOT IDENT.
TE-132	2.753E+00	NOT IDENT.
BA-133	3.685E+00	NOT IDENT.
I-133	6.644E+00	NOT IDENT.
CS-134	3.387E+00	NOT IDENT.
I-135	1.074E+02	FAIL ABUN
CS-136	5.294E+00	FAIL ABUN
BA-137M	3.138E+00	NOT IDENT.
CS-137	3.315E+00	NOT IDENT.
LA-138	5.707E+00	NOT IDENT.
CE-139	2.015E+00	NOT IDENT.
BA-140	1.374E+01	NOT IDENT.
LA-140	3.035E+00	NOT IDENT.
CE-141	3.200E+00	NOT IDENT.
CE-143	7.419E+00	NOT IDENT.
CE-144	1.417E+01	NOT IDENT.
PM-144	3.884E+00	NOT IDENT.
PR-144	2.896E+02	NOT IDENT.
PM-146	4.443E+00	NOT IDENT.
ND-147	2.654E+01	NOT IDENT.
PM-147	4.702E+04	NOT IDENT.
PM-149	7.793E+01	NOT IDENT.
EU-152	8.920E+00	NOT IDENT.
GD-153	6.380E+00	FAIL ABUN
EU-154	9.880E+00	NOT IDENT.
EU-155	8.110E+00	NOT IDENT.
TB-160	7.528E+00	NOT IDENT.
HO-166M	4.549E+00	FAIL ABUN
TM-171	2.414E+03	NOT IDENT.
LU-176	2.327E+00	NOT IDENT.
LU-177	1.755E+01	NOT IDENT.
HF-181	2.436E+00	FAIL ABUN
W-181	1.718E+01	FAIL ABUN
TA-182	1.011E+01	NOT IDENT.
RE-183	1.846E+01	FAIL ABUN

RE-184	5.027E+00	FAIL ABUN
RE-188	9.196E+00	FAIL ABUN
W-188	5.570E+02	FAIL ABUN
OS-191	5.122E+00	FAIL ABUN
IR-192	3.113E+00	NOT IDENT.
PB-201	1.137E+01	NOT IDENT.
TL-201	1.875E+01	NOT IDENT.
TL-202	2.370E+00	NOT IDENT.
HG-203	2.320E+00	NOT IDENT.
PB-203	2.927E+00	NOT IDENT.
TL-204	3.773E+02	NOT IDENT.
BI-207	4.917E+00	NOT IDENT.
PB-210	4.837E+02	NOT IDENT.
BI-211	2.085E+01	NOT IDENT.
PB-211	6.215E+01	NOT IDENT.
PB-212	5.974E+00	FAIL ABUN
BI-213	7.555E+00	NOT IDENT.
BI-214	8.914E+00	FAIL ABUN
PB-214	7.133E+00	NOT IDENT.
RN-219	3.487E+01	NOT IDENT.
FR-221	1.796E+01	NOT IDENT.
RA-223	5.571E+01	NOT IDENT.
RA-224	4.090E+01	NOT IDENT.
AC-225	1.890E+01	NOT IDENT.
AC-227	2.546E+01	NOT IDENT.
TH-227	2.546E+01	NOT IDENT.
AC-228	1.517E+01	NOT IDENT.
RA-228	1.517E+01	NOT IDENT.
TH-228	5.974E+00	FAIL ABUN
TH-229	3.884E+01	NOT IDENT.
TH-230	8.315E+02	NOT IDENT.
PA-231	3.498E+01	NOT IDENT.
TH-231	3.165E+01	NOT IDENT.
PA-233	6.094E+00	FAIL ABUN
PA-234	3.098E+01	FAIL ABUN
PA-234M	4.499E+02	FAIL ABUN
U-234	7.914E+03	NOT IDENT.
U-235	1.643E+01	FAIL ABUN
NP-237	6.094E+00	FAIL ABUN
NP-238	1.790E+01	NOT IDENT.
NP-239	1.829E+01	NOT IDENT.
AM-242	4.571E+01	NOT IDENT.
AM-243	3.777E+00	NOT IDENT.
CM-243	6.965E+00	NOT IDENT.
BK-247	6.071E+00	NOT IDENT.
CM-247	3.195E+00	NOT IDENT.
CF-249	3.238E+00	NOT IDENT.
CF-251	9.471E+00	NOT IDENT.
CF-252	1.249E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292906.CNF;1
Acquisition date : 19-JAN-2023 16:37:07 Sensitivity : 3.000
Detector ID : GAM23 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:02.05 Half life ratio : *****
Sample date : 19-JAN-2023 00:00:00 Nuclide Library : LIQUID
Sample ID : G1205292906 Analyst initials: MXR1
Batch Number : 2367950 Sample Quantity : 7.6489E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 3-MAY-2022 06:48:20 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM23_JAR.CNF;20

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
CU-67	3.253E+00	1.233E+01	1.233E+01
ZR-88	2.550E+00	4.572E+00	4.573E+00
NB-95	6.122E+00	5.207E+00	5.208E+00
SN-113	3.813E+00	6.835E+00	6.836E+00
TL-208	4.047E+00	6.087E+00	6.088E+00
BI-212	5.779E+01	6.041E+01	6.042E+01
RA-226	3.622E+01	1.373E+02	1.373E+02
TH-232	1.614E+03	3.880E+03	3.880E+03
TH-234	1.134E+02	2.735E+02	2.735E+02
U-238	1.134E+02	2.735E+02	2.735E+02
AM-241	2.761E+01	3.215E+01	3.216E+01
ANH-511	4.330E+00	1.068E+01	1.068E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	1.695E+01	2.586E+01	2.697E+01	NOT IDENT.
NA-22	2.056E+00	3.489E+00	3.610E+00	NOT IDENT.
NA-24	6.652E+00	1.055E+01	1.097E+01	NOT IDENT.
AL-26	-3.358E+00	3.957E+00	4.237E+00	NOT IDENT.
K-40	-3.970E+01	5.793E+01	6.064E+01	NOT IDENT.
SC-46	-3.727E-01	3.759E+00	3.763E+00	NOT IDENT.
V-48	1.992E+00	3.915E+00	4.017E+00	NOT IDENT.
CR-51	-1.633E+01	2.563E+01	2.667E+01	NOT IDENT.
MN-52	4.091E+00	3.950E+00	4.360E+00	NOT IDENT.
MN-54	2.049E+00	3.432E+00	3.554E+00	NOT IDENT.
CO-56	9.224E-01	4.088E+00	4.109E+00	FAIL ABUN
CO-57	2.831E-01	2.007E+00	2.011E+00	NOT IDENT.
NI-57	-5.597E+00	7.974E+00	8.364E+00	NOT IDENT.
CO-58	-2.525E+00	2.549E+00	2.792E+00	NOT IDENT.
FE-59	2.105E+00	6.760E+00	6.827E+00	NOT IDENT.
CO-60	1.099E+00	4.537E+00	4.564E+00	NOT IDENT.
ZN-65	1.984E+00	5.236E+00	5.312E+00	NOT IDENT.
GE-68	-1.305E+01	1.005E+02	1.007E+02	NOT IDENT.

AS-73	-3.273E+01	1.327E+02	1.336E+02	NOT IDENT.
AS-74	4.332E-01	6.124E+00	6.128E+00	NOT IDENT.
SE-75	-7.525E-01	4.085E+00	4.099E+00	NOT IDENT.
BR-77	1.491E+01	2.493E+01	2.582E+01	FAIL ABUN
SR-82	4.450E+00	2.361E+01	2.369E+01	NOT IDENT.
RB-83	-1.534E+00	6.425E+00	6.462E+00	NOT IDENT.
RB-84	9.798E-01	5.133E+00	5.152E+00	NOT IDENT.
KR-85	1.009E+03	1.072E+03	1.165E+03	NOT IDENT.
SR-85	4.557E+00	4.838E+00	5.257E+00	NOT IDENT.
RB-86	7.413E+00	3.809E+01	3.824E+01	NOT IDENT.
Y-88	-1.747E+00	3.287E+00	3.381E+00	NOT IDENT.
Y-91	-1.129E+03	1.874E+03	1.942E+03	NOT IDENT.
NB-94	3.397E+00	3.998E+00	4.282E+00	NOT IDENT.
NB-95M	2.818E+00	1.034E+01	1.042E+01	NOT IDENT.
TC-95M	-4.422E+00	3.727E+00	4.227E+00	FAIL ABUN
ZR-95	5.384E+00	5.553E+00	6.061E+00	NOT IDENT.
MO-99	-3.191E+01	3.677E+01	3.949E+01	NOT IDENT.
TC-99M	6.762E+00	1.587E+01	1.616E+01	NOT IDENT.
RH-100	2.134E+00	8.488E+00	8.543E+00	NOT IDENT.
RH-101	2.744E-01	2.446E+00	2.449E+00	NOT IDENT.
RH-102M	-5.254E-01	2.976E+00	2.985E+00	FAIL ABUN
RU-103	-3.339E-01	3.750E+00	3.753E+00	FAIL ABUN
RH-106	2.060E+01	4.007E+01	4.114E+01	NOT IDENT.
RU-106	2.060E+01	4.007E+01	4.114E+01	NOT IDENT.
AG-108M	4.212E+00	4.127E+00	4.543E+00	FAIL ABUN
CD-109	1.415E-01	5.742E+01	5.742E+01	NOT IDENT.
AG-110	5.910E+01	6.618E+01	7.135E+01	NOT IDENT.
AG-110M	3.821E+00	4.415E+00	4.740E+00	FAIL ABUN
IN-111	1.576E+00	3.250E+00	3.327E+00	NOT IDENT.
IN-114M	-4.548E+00	1.475E+01	1.489E+01	NOT IDENT.
CD-115	-4.153E+00	1.511E+01	1.522E+01	NOT IDENT.
SN-117M	1.611E+00	2.356E+00	2.466E+00	NOT IDENT.
SB-122	-7.044E-01	4.803E+00	4.813E+00	NOT IDENT.
I-123	3.436E+00	5.858E+00	6.060E+00	NOT IDENT.
TE-123M	1.493E+00	2.297E+00	2.393E+00	NOT IDENT.
SB-124	5.453E+00	8.642E+00	8.985E+00	NOT IDENT.
SB-125	9.573E+00	1.007E+01	1.095E+01	NOT IDENT.
TE-125M	-1.481E+02	6.517E+02	6.551E+02	NOT IDENT.
I-126	5.132E+00	1.099E+01	1.123E+01	NOT IDENT.
SB-126	1.543E+00	6.779E+00	6.815E+00	FAIL ABUN
SN-126	-2.054E+00	5.907E+00	5.979E+00	FAIL ABUN
SB-127	1.425E+00	1.191E+01	1.193E+01	NOT IDENT.
TE-129	1.495E+01	4.182E+01	4.236E+01	NOT IDENT.
I-131	-8.342E-01	2.816E+00	2.841E+00	NOT IDENT.
I-132	-1.215E+01	7.026E+02	7.026E+02	NOT IDENT.
TE-132	1.842E+00	3.150E+00	3.257E+00	NOT IDENT.
BA-133	1.206E+00	4.113E+00	4.148E+00	NOT IDENT.
I-133	5.267E+00	7.215E+00	7.596E+00	NOT IDENT.
CS-134	-5.912E-01	4.085E+00	4.094E+00	NOT IDENT.
I-135	7.525E+01	1.103E+02	1.154E+02	FAIL ABUN
CS-136	3.721E+00	8.286E+00	8.455E+00	FAIL ABUN
BA-137M	-7.865E-01	4.041E+00	4.057E+00	NOT IDENT.
CS-137	-8.308E-01	4.269E+00	4.285E+00	NOT IDENT.
LA-138	2.939E+00	5.849E+00	5.997E+00	NOT IDENT.
CE-139	5.588E-01	2.345E+00	2.359E+00	NOT IDENT.
BA-140	1.037E+01	1.499E+01	1.570E+01	NOT IDENT.
LA-140	-4.090E+00	5.263E+00	5.577E+00	NOT IDENT.
CE-141	-7.822E+00	4.796E+00	5.955E+00	NOT IDENT.
CE-143	1.196E+00	8.332E+00	8.350E+00	NOT IDENT.
CE-144	-4.737E+00	1.725E+01	1.738E+01	NOT IDENT.
PM-144	-1.160E+00	5.293E+00	5.318E+00	NOT IDENT.
PR-144	-8.193E+01	3.937E+02	3.954E+02	NOT IDENT.
PM-146	3.226E+00	4.818E+00	5.033E+00	NOT IDENT.
ND-147	2.617E+01	2.812E+01	3.050E+01	NOT IDENT.
PM-147	-1.860E+04	5.746E+04	5.807E+04	NOT IDENT.
PM-149	6.475E+00	9.723E+01	9.727E+01	NOT IDENT.
EU-152	2.331E+00	1.003E+01	1.008E+01	NOT IDENT.
GD-153	1.816E+01	1.135E+01	1.400E+01	FAIL ABUN
EU-154	2.558E+00	1.080E+01	1.086E+01	NOT IDENT.
EU-155	5.910E+00	8.743E+00	9.141E+00	NOT IDENT.
TB-160	-1.377E+01	1.246E+01	1.392E+01	NOT IDENT.
HO-166M	-9.341E+00	8.375E+00	9.376E+00	FAIL ABUN
TM-171	9.906E+02	3.284E+03	3.315E+03	NOT IDENT.
LU-176	1.286E+00	2.505E+00	2.572E+00	NOT IDENT.
LU-177	-1.807E+01	2.410E+01	2.544E+01	NOT IDENT.
HF-181	-2.083E+00	3.347E+00	3.476E+00	FAIL ABUN
W-181	3.111E+01	3.701E+01	3.958E+01	FAIL ABUN
TA-182	3.865E+00	1.084E+01	1.098E+01	NOT IDENT.

RE-183	2.911E+01	3.396E+01	3.641E+01	FAIL	ABUN
RE-184	-9.896E+00	8.981E+00	1.003E+01	FAIL	ABUN
RE-188	-8.647E+00	1.369E+01	1.423E+01	FAIL	ABUN
W-188	4.073E+02	5.895E+02	6.175E+02	FAIL	ABUN
OS-191	-9.743E-01	6.154E+00	6.170E+00	FAIL	ABUN
IR-192	1.642E+00	3.398E+00	3.478E+00	NOT	IDENT.
PB-201	1.880E+00	1.289E+01	1.292E+01	NOT	IDENT.
TL-201	5.257E+00	2.346E+01	2.358E+01	NOT	IDENT.
TL-202	-9.731E-01	2.986E+00	3.018E+00	NOT	IDENT.
HG-203	-1.204E+00	3.132E+00	3.179E+00	NOT	IDENT.
PB-203	-1.520E+00	3.951E+00	4.010E+00	NOT	IDENT.
TL-204	1.328E+01	4.233E+02	4.234E+02	NOT	IDENT.
BI-207	1.413E+00	5.588E+00	5.624E+00	NOT	IDENT.
PB-210	-6.527E+02	8.121E+02	8.638E+02	NOT	IDENT.
BI-211	-7.389E+00	2.531E+01	2.553E+01	NOT	IDENT.
PB-211	1.137E+01	7.129E+01	7.147E+01	NOT	IDENT.
PB-212	6.382E+00	1.067E+01	1.105E+01	FAIL	ABUN
BI-213	-3.832E+00	9.691E+00	9.844E+00	NOT	IDENT.
BI-214	1.205E+01	1.305E+01	1.414E+01	FAIL	ABUN
PB-214	-4.222E+00	8.894E+00	9.095E+00	NOT	IDENT.
RN-219	-1.182E+01	4.278E+01	4.311E+01	NOT	IDENT.
FR-221	9.691E+00	2.082E+01	2.127E+01	NOT	IDENT.
RA-223	-1.794E+01	6.647E+01	6.696E+01	NOT	IDENT.
RA-224	1.787E+01	5.122E+01	5.185E+01	NOT	IDENT.
AC-225	1.020E+01	2.190E+01	2.238E+01	NOT	IDENT.
AC-227	2.161E+01	2.910E+01	3.069E+01	NOT	IDENT.
TH-227	2.161E+01	2.910E+01	3.069E+01	NOT	IDENT.
AC-228	-1.100E+01	2.003E+01	2.064E+01	NOT	IDENT.
RA-228	-1.100E+01	2.003E+01	2.064E+01	NOT	IDENT.
TH-228	6.382E+00	1.067E+01	1.105E+01	FAIL	ABUN
TH-229	-3.685E+00	4.773E+01	4.776E+01	NOT	IDENT.
TH-230	-6.159E+02	1.005E+03	1.043E+03	NOT	IDENT.
PA-231	-3.069E+01	4.476E+01	4.685E+01	NOT	IDENT.
TH-231	-2.394E+01	4.366E+01	4.498E+01	NOT	IDENT.
PA-233	-7.432E+00	8.400E+00	9.044E+00	FAIL	ABUN
PA-234	1.532E+01	3.800E+01	3.862E+01	FAIL	ABUN
PA-234M	4.087E+02	4.461E+02	4.827E+02	FAIL	ABUN
U-234	-1.965E+03	1.168E+04	1.171E+04	NOT	IDENT.
U-235	-6.427E+00	2.048E+01	2.068E+01	FAIL	ABUN
NP-237	-7.432E+00	8.400E+00	9.044E+00	FAIL	ABUN
NP-238	7.291E+00	1.974E+01	2.001E+01	NOT	IDENT.
NP-239	1.329E+01	1.963E+01	2.053E+01	NOT	IDENT.
AM-242	7.287E+00	5.558E+01	5.567E+01	NOT	IDENT.
AM-243	-3.133E+00	4.966E+00	5.163E+00	NOT	IDENT.
CM-243	-1.598E+00	8.248E+00	8.279E+00	NOT	IDENT.
BK-247	-8.147E+00	9.091E+00	9.806E+00	NOT	IDENT.
CM-247	1.055E-01	3.736E+00	3.736E+00	NOT	IDENT.
CF-249	-1.481E+00	4.535E+00	4.584E+00	NOT	IDENT.
CF-251	-1.240E+00	1.284E+01	1.285E+01	NOT	IDENT.
CF-252	6.031E+03	1.558E+04	1.581E+04	NOT	IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	24.7302	81.00	36.7644	121.12	27.7661
45.60	13.9069	81.07	36.7736	121.22	27.7734
46.54	32.1583	82.35	24.6309	121.78	31.5235
49.72	22.7679	82.47	24.6416	122.06	26.9076
51.35	20.0957	82.47	24.6419	123.07	31.6306
52.39	24.5348	83.79	32.1868	123.68	31.6812
53.20	27.5359	84.00	32.2109	127.16	25.3860
53.44	27.5698	84.21	33.0618	127.23	25.3900
56.28	27.9641	84.86	24.0254	129.43	24.5865
57.36	17.7546	85.43	26.5642	131.20	29.4447
57.53	17.7692	86.55	31.6691	133.02	29.5776
57.53	17.7694	86.79	31.6955	133.52	36.3011
57.98	22.2596	86.94	31.7123	135.34	39.3409
59.32	22.4016	87.09	31.7288	136.00	31.7155
59.54	22.4248	87.57	33.4543	136.28	25.9663
61.49	24.1368	88.03	29.3190	136.47	25.9783
63.00	32.4035	88.34	29.3502	140.51	28.1721
63.29	32.4456	88.47	29.3633	140.88	32.0861
63.58	28.9344	91.11	32.7312	143.76	28.3862
63.81	28.9640	91.27	32.7486	144.24	30.3775
64.28	29.0245	92.59	26.0872	145.44	41.2701
64.99	31.6692	93.31	26.1492	152.32	27.9406
65.08	31.6818	94.56	17.1237	152.43	27.9474
66.73	26.7625	94.65	17.1288	153.25	29.9973
66.98	26.7911	94.67	17.1298	154.21	30.0600
67.24	37.1367	97.43	24.1952	155.04	30.1144
67.67	35.6546	98.43	24.2716	156.02	30.1781
67.75	34.1158	98.44	24.2725	158.56	26.2971
68.89	28.8264	99.53	27.8350	158.97	26.3198
68.89	28.8269	100.11	23.2377	159.00	25.3090
69.67	25.7941	100.20	23.2442	162.33	26.5062
70.82	30.6282	102.03	29.8037	162.66	24.4841
70.82	30.6285	103.18	27.2693	163.33	20.4318
70.83	30.6297	103.37	27.2849	165.86	25.6733
72.81	31.6681	105.31	24.7884	167.43	24.7255
72.87	31.6757	106.12	35.4971	171.28	20.7648
74.66	31.1037	106.47	31.0923	176.31	23.7672
74.82	26.3351	109.28	29.5573	176.60	26.5784
74.97	26.3505	111.00	27.9034	177.52	23.8232
77.11	20.9338	111.76	35.1804	181.07	31.7459
79.69	26.8299	112.95	34.3937	184.41	34.0762
79.82	26.0300	116.24	29.2292	184.58	34.0874
80.02	26.0488	116.30	29.2341	185.72	38.4296
80.03	26.0493	116.74	18.2933	186.21	38.4648
80.12	26.0586	117.23	15.5702	190.27	36.6002
80.19	24.4363	119.76	21.2103	193.51	29.2359
80.22	24.4395	120.54	25.8751	197.03	23.9715
80.57	26.1021	120.90	24.9749	198.01	33.8367

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
201.83	29.6680	306.78	17.8905	492.35	19.3912
204.12	34.1981	308.46	30.7317	497.08	20.4887
205.31	23.2139	311.90	35.1451	511.00	13.4631
208.37	36.6688	316.51	24.9944	514.00	21.7981
210.85	37.9377	319.41	36.3219	520.40	14.6033
215.65	40.4896	320.08	26.8301	520.69	14.6067
218.12	27.1022	321.04	18.1956	522.65	10.4488
222.11	35.2326	323.87	26.9484	527.90	18.8818
227.09	26.3470	325.23	26.1200	529.59	18.9060
227.38	27.5050	328.76	24.4772	529.87	14.7075
228.16	24.0964	331.15	23.6673	531.02	13.6686
228.18	24.0970	333.37	27.2417	537.26	14.7884
235.69	24.7643	334.37	24.6327	539.51	20.1032
235.96	20.1292	338.28	28.2747	546.56	19.1433
238.63	25.6520	338.32	23.8579	552.55	18.1586
238.98	25.6654	340.48	22.1436	563.25	12.9155
240.99	15.6016	340.55	22.1456	564.24	11.8477
242.00	20.3125	344.28	21.3467	569.33	11.8903
244.70	35.2968	345.93	27.6226	569.50	11.8916
245.35	25.9091	351.06	21.5044	569.70	11.8934
250.62	18.9878	351.93	20.6276	582.08	10.9049
252.40	26.1750	356.01	18.0151	583.19	11.4592
252.80	28.5710	361.25	12.6807	595.83	15.4105
256.23	26.3182	364.49	12.2693	600.60	19.8765
260.90	33.7157	366.42	9.5618	604.72	19.9314
264.66	24.2084	383.85	24.0989	609.32	15.5489
265.00	35.1190	388.16	20.9441	610.33	13.3364
269.46	37.7694	388.63	16.7629	614.28	23.3994
271.23	34.1959	391.70	15.8794	618.01	14.5208
273.65	28.1808	392.87	11.2217	621.93	15.6777
276.40	17.2163	400.66	16.0174	630.19	16.8866
277.37	22.1638	401.32	21.6842	631.29	13.5190
277.60	22.1704	401.81	21.6945	632.98	14.6610
278.00	22.1819	402.40	17.9316	633.25	13.5356
278.43	19.7285	404.85	17.0273	634.78	14.6779
279.20	25.9200	410.95	19.9797	635.95	14.6890
279.54	25.9315	414.70	20.0498	636.99	7.9146
280.46	24.7266	423.72	16.3660	657.50	5.7259
283.69	21.1058	427.09	23.1753	657.76	9.1631
284.31	19.8804	427.87	8.6970	661.66	14.9255
285.41	23.6416	433.94	15.5456	664.57	12.6516
285.90	19.9214	439.51	16.5991	666.33	10.3627
287.50	24.9524	440.45	15.6354	666.50	10.3636
290.67	18.3727	446.15	15.7135	667.71	12.6758
293.27	24.2982	453.88	15.8190	677.62	10.4333
295.22	23.5173	459.60	17.8832	685.70	13.9780
295.96	36.9907	463.37	17.9403	692.65	14.0352
298.58	25.3027	468.07	18.0110	695.00	21.0820
299.98	21.9671	473.00	13.0611	696.49	25.3204
300.09	21.9703	475.06	16.1025	696.51	25.3204
300.13	21.9714	476.78	9.0705	697.00	23.9212
301.36	27.0827	477.60	10.0850	697.49	21.9925
302.85	27.1322	477.99	6.0530	702.65	10.5879
304.50	19.5405	482.18	16.1966	706.68	19.4568
304.85	17.8491	487.02	18.2926	711.68	22.7055

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
720.70	11.5892	911.20	11.7828	1298.22	2.7362
721.93	13.2544	923.98	12.8389	1312.11	6.4135
722.78	15.7088	926.36	9.8865	1332.49	4.6116
722.91	15.7099	935.54	9.5303	1362.15	6.5174
723.31	11.4277	937.49	12.7180	1365.19	8.3874
724.19	7.1460	944.13	9.5666	1368.63	4.6648
727.33	9.8432	945.96	7.9785	1377.63	9.3555
733.00	5.7451	946.00	7.9788	1384.29	11.2500
735.93	8.9911	949.00	5.9919	1408.01	10.3882
739.50	10.8109	954.55	10.0110	1434.09	0.9519
744.23	10.3230	962.31	7.0314	1435.80	2.8570
747.24	11.5809	964.08	10.0525	1457.56	7.6684
752.31	11.6129	966.17	10.0616	1460.82	6.7163
753.82	10.1695	968.97	6.0443	1489.16	5.8049
756.73	4.1574	983.53	6.0822	1553.35	5.9118
763.94	5.8430	984.45	7.0987	1596.21	5.9818
765.80	7.3110	996.26	10.1917	1620.50	7.0246
766.42	7.3135	1001.03	4.0848	1678.03	3.0565
766.84	11.7043	1004.73	8.1824	1690.97	2.0445
772.60	8.2549	1025.87	8.2543	1757.55	6.2379
776.52	10.1101	1028.54	10.3290	1764.49	8.3316
777.92	13.7965	1037.84	8.2944	1770.23	8.3434
778.90	7.3621	1038.76	3.1117	1771.35	6.2593
783.70	12.9161	1046.59	5.2023	1791.20	2.0966
788.74	15.7253	1048.07	6.6629	1808.65	5.2637
792.07	12.9725	1050.41	6.6691	1836.06	3.1792
795.86	11.1412	1063.66	7.3333		
801.95	15.8327	1077.00	4.2124		
802.10	12.1086	1077.34	5.2664		
810.29	7.4827	1083.85	5.2795		
810.45	8.4185	1085.87	9.5109		
810.76	8.4199	1099.25	5.3113		
815.77	8.4413	1107.22	3.1965		
818.51	13.1489	1111.64	7.4708		
822.65	8.4707	1112.07	6.4047		
832.01	11.3470	1112.84	5.3387		
834.85	6.6283	1115.54	2.1377		
835.15	7.5764	1120.29	4.2832		
836.80	12.3216	1120.55	4.2837		
846.77	11.4298	1121.30	4.2847		
856.80	6.6999	1129.67	5.3729		
860.56	7.6709	1131.51	7.5272		
871.09	13.4920	1173.23	7.6434		
873.19	8.6819	1177.95	5.4691		
875.33	6.7595	1189.05	6.5889		
879.38	14.5125	1204.77	11.0431		
880.51	8.7122	1221.41	2.2216		
881.60	7.7480	1231.02	5.5725		
883.24	5.8156	1235.36	4.4646		
884.68	3.8796	1238.28	6.7039		
889.28	7.7761	1260.41	6.3044		
894.76	9.7449	1271.87	7.2328		
898.04	6.2463	1274.44	4.5244		
903.28	11.7400	1274.54	2.7148		
907.67	11.7638	1291.59	4.5503		

VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 19:31:38.93

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                    *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292907.CNF;1
Background file  : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM38.CNF;44
Background date  : 15-JAN-2023 11:46:19
Sample date     : 26-DEC-2022 07:23:00 Acquisition date : 19-JAN-2023 17:31:14
Sample ID      : G1205292907 Sample quantity : 7.39130E-01 FILTER
Detector name   : GAM38 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:00.31 0.0%
Energy tolerance: 1.50000 keV Analyst Initials : MXR1
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2367950 Detector SN# :
Matrix Spike ID : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.89*	30	87	0.96	93.77	88	11	4.14E-03	75.0	
2	1	84.91*	5	39	0.91	169.83	164	14	7.32E-04	236.1	2.07E+00
3	1	87.41	17	43	0.92	174.83	164	14	2.41E-03	66.7	
4	0	186.31*	29	58	0.89	372.69	369	9	4.03E-03	57.6	
5	0	239.02*	5	58	0.89	478.13	474	10	7.16E-04	317.1	
6	0	273.31	23	17	1.73	546.74	543	7	3.17E-03	36.8	
7	0	329.18	16	23	1.46	658.49	656	6	2.20E-03	53.8	
8	0	477.55	36	16	1.59	955.27	951	10	5.03E-03	26.1	
9	0	511.21*	7	17	3.21	1022.61	1014	17	1.02E-03	215.9	
10	0	584.16*	7	15	1.68	1168.51	1163	13	9.49E-04	143.6	
11	0	609.78*	4	15	1.43	1219.75	1214	10	5.45E-04	219.9	
12	0	662.97*	3	10	1.18	1326.13	1322	7	3.62E-04	275.0	
13	0	721.46	11	3	1.51	1443.09	1440	6	1.53E-03	39.1	
14	0	863.64	8	4	0.92	1727.41	1724	8	1.06E-03	58.3	
15	0	897.30	11	6	0.78	1794.74	1790	10	1.59E-03	52.3	
16	0	941.38	16	6	3.80	1882.86	1875	13	2.17E-03	42.0	
17	0	962.52	10	7	2.49	1925.15	1920	9	1.45E-03	54.3	
18	0	1001.30*	10	3	0.52	2002.67	1996	13	1.36E-03	61.8	
19	0	1013.24	9	0	1.46	2026.56	2023	7	1.25E-03	33.3	
20	0	1188.53	6	7	1.11	2377.02	2370	10	8.01E-04	97.7	
21	0	1243.61	12	5	2.71	2487.15	2480	13	1.63E-03	52.7	
22	0	1462.79*	3	7	2.23	2925.28	2917	13	4.17E-04	226.6	
23	0	1847.83	6	0	1.37	3694.83	3691	8	8.33E-04	40.8	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 19-JAN-2023 19:31:39

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292907.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MXR1		
Sample date	: 26-DEC-2022 07:23:00	Acquisition date	: 19-JAN-2023 17:31:14
Sample ID	: G1205292907	Sample quantity	: 0.73913 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA38	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.31 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	36	10.44*	1.553E+00	1.133E+02	1.559E+02	52.28
CD-109	88.03	17	3.70*	5.120E+00	4.648E+01	4.822E+01	133.42
SN-126	64.28	-----	9.60	5.130E+00	-----	Line Not Found	-----
	86.94	17	8.90	5.120E+00	1.932E+01	1.932E+01	133.42
	87.57	17	37.00*	5.120E+00	4.648E+00	4.648E+00	133.42
BA-137M	661.66	3	89.90*	1.137E+00	1.295E+00	1.297E+00	550.01
CS-137	661.66	3	85.10*	1.137E+00	1.368E+00	1.370E+00	550.01
TL-208	277.37	-----	6.60	2.565E+00	-----	Line Not Found	-----
	583.19	7	85.00*	1.282E+00	3.185E+00	3.263E+00	287.23
	860.56	-----	12.50	8.897E-01	-----	Line Not Found	-----
PB-210	46.54	30	4.25*	4.529E+00	7.873E+01	7.890E+01	149.98
RA-226	186.21	29	3.59*	3.540E+00	1.161E+02	1.161E+02	115.20
TH-229	85.43	5	14.70	5.144E+00	3.540E+00	3.540E+00	472.17
	88.47	17	24.00	5.120E+00	7.165E+00	7.165E+00	133.42
	193.51	-----	4.41*	3.442E+00	-----	Line Not Found	-----
	210.85	-----	2.80	3.223E+00	-----	Line Not Found	-----
TH-231	84.21	5	6.60*	5.144E+00	7.886E+00	7.886E+00	472.17
ANH-511	511.00	7	100.00*	1.456E+00	2.549E+00	2.549E+00	431.78

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                           *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*                                     *                                               *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292907.CNF;1      *
* Acquisition date   : 19-JAN-2023 17:31:14 Sensitivity      : 3.000                *
* Detector ID        : GAM38 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000  *
* Elapsed real time  : 0 02:00:00.31 Half life ratio : ***** *
* Sample date        : 26-DEC-2022 07:23:00 Analyst initials: MXR1          *
* Sample ID          : G1205292907 Sample Quantity : 7.3913E-01 FILTER *
* Batch Number       : 2367950 Wet Weight : 0.00000        *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000         *
* Nuclide Library    : LIQUID.NLB;28                                             *
*****
*                                     CALIBRATION INFORMATION                       *
*                                     *                                               *
* Eff. Cal. date     : 22-APR-2022 08:42:40 Eff. Geometry   : JAR              *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM38_JAR.CNF;2              *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.559E+02	7.986E+01	9.245E+01
CD-109	4.822E+01	6.305E+01	8.493E+01
SN-126	4.648E+00	6.077E+00	7.754E+00
BA-137M	1.297E+00	6.990E+00	1.065E+01
CS-137	1.370E+00	7.384E+00	1.125E+01
TL-208	3.263E+00	9.186E+00	9.406E+00
PB-210	7.890E+01	1.160E+02	7.323E+01
RA-226	1.161E+02	1.310E+02	1.164E+02
TH-229	4.096E+01	5.922E+01	1.146E+02
TH-231	7.886E+00	3.649E+01	4.300E+01
ANH-511	2.549E+00	1.079E+01	7.165E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	4.587E+00	6.113E+00	1.428E+01	NOT IDENT.
NA-24	0.000E+00	3.349E+12	0.000E+00	SHORT HLIF
AL-26	1.133E+00	3.703E+00	1.023E+01	NOT IDENT.
K-40	3.491E+00	8.899E+01	1.806E+02	NOT IDENT.
SC-46	1.186E+00	4.903E+00	1.088E+01	NOT IDENT.
V-48	-2.171E+00	1.746E+01	3.402E+01	NOT IDENT.
CR-51	-9.280E+00	5.693E+01	9.886E+01	NOT IDENT.
MN-52	8.981E+01	1.128E+02	2.813E+02	NOT IDENT.
MN-54	-1.600E+00	5.009E+00	9.670E+00	NOT IDENT.
CO-56	-4.933E-01	6.327E+00	1.265E+01	NOT IDENT.
CO-57	-9.893E-01	2.022E+00	3.629E+00	NOT IDENT.
NI-57	0.000E+00	7.976E+05	0.000E+00	SHORT HLIF
CO-58	1.917E+00	5.669E+00	1.235E+01	NOT IDENT.
FE-59	-5.529E+00	1.391E+01	2.592E+01	NOT IDENT.
CO-60	-1.182E-01	3.467E+00	7.934E+00	NOT IDENT.
ZN-65	3.049E+00	1.120E+01	2.426E+01	NOT IDENT.
CU-67	-5.719E+03	4.695E+03	7.221E+03	NOT IDENT.
GE-68	-1.721E+01	1.501E+02	3.072E+02	NOT IDENT.
AS-73	8.278E+00	1.808E+01	3.302E+01	NOT IDENT.

AS-74	-7.038E+00	1.531E+01	2.739E+01	NOT IDENT.
SE-75	1.081E+00	4.939E+00	9.256E+00	NOT IDENT.
BR-77	0.000E+00	3.037E+04	0.000E+00	SHORT HLIF
SR-82	-6.748E+00	6.731E+01	1.247E+02	NOT IDENT.
RB-83	4.122E+00	8.817E+00	1.881E+01	NOT IDENT.
RB-84	5.707E-01	1.279E+01	2.602E+01	NOT IDENT.
KR-85	9.521E+02	1.155E+03	2.232E+03	NOT IDENT.
SR-85	5.516E+00	6.690E+00	1.293E+01	NOT IDENT.
RB-86	-3.758E+01	1.353E+02	2.641E+02	NOT IDENT.
Y-88	-1.526E+00	5.549E+00	1.170E+01	FAIL ABUN
ZR-88	-2.971E+00	4.076E+00	7.178E+00	NOT IDENT.
Y-91	-2.493E+03	2.975E+03	4.783E+03	NOT IDENT.
NB-94	9.960E-01	4.881E+00	9.589E+00	NOT IDENT.
NB-95	2.461E+00	5.229E+00	1.134E+01	NOT IDENT.
NB-95M	-7.067E+00	1.494E+01	2.294E+01	NOT IDENT.
TC-95M	1.625E-01	5.157E+00	9.403E+00	NOT IDENT.
ZR-95	1.006E+01	8.624E+00	2.162E+01	NOT IDENT.
MO-99	-2.156E+04	2.094E+04	2.801E+04	NOT IDENT.
TC-99M	0.000E+00	5.473E+29	0.000E+00	SHORT HLIF
RH-100	0.000E+00	1.881E+09	0.000E+00	SHORT HLIF
RH-101	2.359E+00	2.571E+00	5.298E+00	NOT IDENT.
RH-102M	1.515E+00	4.062E+00	7.638E+00	NOT IDENT.
RU-103	-1.336E+00	6.574E+00	1.229E+01	FAIL ABUN
RH-106	2.725E+01	4.759E+01	9.886E+01	NOT IDENT.
RU-106	2.725E+01	4.759E+01	9.886E+01	NOT IDENT.
AG-108M	2.764E+00	4.018E+00	8.424E+00	FAIL ABUN
AG-110	-3.743E+01	9.982E+01	1.788E+02	NOT IDENT.
AG-110M	1.604E-01	7.065E+00	1.453E+01	NOT IDENT.
IN-111	-3.531E+02	1.336E+03	2.309E+03	NOT IDENT.
SN-113	-3.983E+00	5.651E+00	9.996E+00	NOT IDENT.
IN-114M	-9.707E+00	2.210E+01	3.496E+01	NOT IDENT.
CD-115	0.000E+00	2.476E+04	0.000E+00	SHORT HLIF
SN-117M	1.256E+00	7.825E+00	1.482E+01	NOT IDENT.
SB-122	-4.912E+02	3.215E+03	5.979E+03	NOT IDENT.
I-123	0.000E+00	5.634E+13	0.000E+00	SHORT HLIF
TE-123M	-3.223E-02	2.747E+00	5.089E+00	NOT IDENT.
SB-124	-7.708E+00	1.639E+01	3.115E+01	FAIL ABUN
SB-125	1.154E+01	1.126E+01	2.491E+01	NOT IDENT.
TE-125M	-4.264E+02	7.210E+02	1.292E+03	NOT IDENT.
I-126	-2.976E+01	4.863E+01	6.897E+01	NOT IDENT.
SB-126	3.906E+01	2.994E+01	7.465E+01	FAIL ABUN
SB-127	-7.216E+02	9.599E+02	1.558E+03	NOT IDENT.
TE-129	3.200E+01	7.104E+01	1.483E+02	NOT IDENT.
I-131	-3.888E+01	2.773E+01	4.319E+01	NOT IDENT.
I-132	0.000E+00	1.501E+41	0.000E+00	SHORT HLIF
TE-132	-5.721E+02	6.647E+02	1.067E+03	NOT IDENT.
BA-133	8.144E-01	5.203E+00	1.031E+01	NOT IDENT.
I-133	0.000E+00	1.302E+09	0.000E+00	SHORT HLIF
CS-134	3.873E+00	5.723E+00	1.239E+01	NOT IDENT.
I-135	0.000E+00	1.352E+28	0.000E+00	SHORT HLIF
CS-136	-2.377E+01	2.519E+01	4.047E+01	FAIL ABUN
LA-138	3.714E+00	8.397E+00	1.945E+01	NOT IDENT.
CE-139	9.801E-01	3.059E+00	5.823E+00	NOT IDENT.
BA-140	-2.490E+01	5.836E+01	1.052E+02	NOT IDENT.
LA-140	-2.998E+00	1.639E+01	3.641E+01	FAIL ABUN
CE-141	-1.071E+01	8.351E+00	1.287E+01	NOT IDENT.
CE-143	0.000E+00	1.716E+06	0.000E+00	SHORT HLIF
CE-144	1.436E+00	1.707E+01	3.235E+01	NOT IDENT.
PM-144	-3.761E+00	5.033E+00	8.177E+00	FAIL ABUN
PR-144	-3.269E+02	3.863E+02	6.125E+02	NOT IDENT.
PM-146	2.246E+00	5.201E+00	1.079E+01	NOT IDENT.
ND-147	-1.270E+02	1.390E+02	2.152E+02	NOT IDENT.
PM-147	9.230E+03	5.909E+04	1.138E+05	NOT IDENT.
PM-149	0.000E+00	2.047E+05	0.000E+00	SHORT HLIF
EU-152	2.403E-01	9.249E+00	1.865E+01	NOT IDENT.
GD-153	-1.116E+01	6.403E+00	9.294E+00	NOT IDENT.
EU-154	1.340E+01	1.736E+01	4.061E+01	NOT IDENT.
EU-155	-2.632E+00	7.415E+00	1.366E+01	FAIL ABUN
TB-160	1.118E+01	2.149E+01	4.719E+01	FAIL ABUN
HO-166M	-1.672E+00	9.258E+00	1.694E+01	NOT IDENT.
TM-171	-4.086E+02	3.944E+02	5.458E+02	NOT IDENT.
LU-176	2.755E-01	3.389E+00	6.084E+00	FAIL ABUN
LU-177	-3.685E+02	3.204E+02	4.631E+02	NOT IDENT.
HF-181	-1.587E+00	7.541E+00	1.256E+01	NOT IDENT.
W-181	4.551E-01	5.809E+00	1.148E+01	NOT IDENT.
TA-182	-3.906E+00	2.016E+01	4.046E+01	FAIL ABUN
RE-183	4.644E-01	5.996E+00	1.184E+01	NOT IDENT.
RE-184	-2.176E+01	2.047E+01	3.021E+01	NOT IDENT.

RE-188	2.040E+00	1.602E+01	3.020E+01	FAIL ABUN
W-188	-1.335E+02	9.634E+02	1.683E+03	NOT IDENT.
OS-191	6.707E+00	2.151E+01	4.143E+01	NOT IDENT.
IR-192	1.200E+00	4.466E+00	8.332E+00	NOT IDENT.
PB-201	0.000E+00	4.057E+19	0.000E+00	SHORT HLIF
TL-201	4.762E+03	6.025E+03	1.191E+04	NOT IDENT.
TL-202	1.650E+00	1.445E+01	2.869E+01	NOT IDENT.
HG-203	-1.675E+00	4.863E+00	8.295E+00	NOT IDENT.
PB-203	0.000E+00	8.641E+03	0.000E+00	SHORT HLIF
TL-204	-4.078E+01	1.869E+02	3.579E+02	NOT IDENT.
BI-207	-1.715E+00	5.092E+00	1.006E+01	NOT IDENT.
BI-211	-4.432E+01	2.803E+01	4.548E+01	NOT IDENT.
PB-211	-3.728E+01	7.625E+01	1.400E+02	NOT IDENT.
BI-212	1.860E+01	6.807E+01	1.382E+02	NOT IDENT.
PB-212	2.114E+00	1.314E+01	1.497E+01	FAIL ABUN
BI-213	3.503E+00	1.173E+01	2.424E+01	NOT IDENT.
BI-214	3.560E+00	1.535E+01	2.261E+01	FAIL ABUN
PB-214	-1.733E+01	1.072E+01	1.736E+01	FAIL ABUN
RN-219	-7.051E+00	4.831E+01	9.274E+01	NOT IDENT.
FR-221	2.885E+00	2.454E+01	4.465E+01	NOT IDENT.
RA-223	-3.136E+00	8.145E+01	1.576E+02	FAIL ABUN
RA-224	4.721E+01	6.660E+01	1.243E+02	NOT IDENT.
AC-225	1.572E+01	1.338E+02	2.433E+02	NOT IDENT.
AC-227	-7.290E+00	2.861E+01	4.970E+01	NOT IDENT.
TH-227	-7.290E+00	2.861E+01	4.970E+01	NOT IDENT.
AC-228	-1.618E+01	2.463E+01	4.374E+01	NOT IDENT.
RA-228	-1.618E+01	2.463E+01	4.374E+01	NOT IDENT.
TH-228	2.114E+00	1.314E+01	1.497E+01	FAIL ABUN
TH-230	-6.759E-01	3.874E+02	7.586E+02	NOT IDENT.
PA-231	1.971E+01	6.002E+01	1.111E+02	NOT IDENT.
TH-232	-5.945E+02	9.438E+02	1.791E+03	NOT IDENT.
PA-233	-1.369E-02	7.430E+00	1.334E+01	NOT IDENT.
PA-234	3.218E+01	4.235E+01	9.291E+01	NOT IDENT.
PA-234M	7.657E+02	9.269E+02	1.574E+03	FAIL ABUN
TH-234	-2.273E+01	6.618E+01	1.276E+02	NOT IDENT.
U-234	6.593E+02	1.269E+03	2.336E+03	NOT IDENT.
U-235	-5.767E+00	2.230E+01	3.848E+01	FAIL ABUN
NP-237	-1.369E-02	7.430E+00	1.334E+01	NOT IDENT.
NP-238	0.000E+00	7.471E+04	0.000E+00	SHORT HLIF
U-238	-2.273E+01	6.618E+01	1.276E+02	NOT IDENT.
NP-239	-7.469E+00	2.193E+01	3.999E+01	NOT IDENT.
AM-241	2.959E+00	4.437E+00	9.174E+00	NOT IDENT.
AM-242	-1.090E+01	5.011E+01	8.831E+01	NOT IDENT.
AM-243	-3.659E+00	3.185E+00	5.879E+00	NOT IDENT.
CM-243	-5.102E-01	7.409E+00	1.408E+01	NOT IDENT.
BK-247	1.021E+00	8.541E+00	1.575E+01	FAIL ABUN
CM-247	1.533E-01	4.225E+00	8.360E+00	NOT IDENT.
CF-249	-1.999E+00	5.072E+00	9.375E+00	NOT IDENT.
CF-251	1.582E+00	1.239E+01	2.315E+01	NOT IDENT.
CF-252	4.072E+03	1.299E+04	2.545E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.89	114	87	0.96	93.77	88	11	1.58E-02	18.7	2.07E+00
2	0	63.55	70	65	0.73	127.09	124	7	9.72E-03	22.5	
3	0	76.45	15	116	1.66	152.90	147	8	2.08E-03	128.1	
4	1	84.91	30	39	0.91	169.83	164	14	4.19E-03	37.1	
5	1	87.41	17	43	0.92	174.83	164	14	2.41E-03	66.7	
6	0	92.56	76	111	1.01	185.13	182	9	1.06E-02	27.2	
7	0	186.31	60	58	0.89	372.69	369	9	8.38E-03	26.4	
8	0	239.02	34	58	0.89	478.13	474	10	4.75E-03	44.9	
9	0	273.31	23	17	1.73	546.74	543	7	3.17E-03	36.8	
10	0	329.18	16	23	1.46	658.49	656	6	2.20E-03	53.8	
11	0	477.55	36	16	1.59	955.27	951	10	5.03E-03	26.1	
12	0	511.21	111	17	3.21	1022.61	1014	17	1.54E-02	12.7	
13	0	584.16	18	15	1.68	1168.51	1163	13	2.43E-03	52.9	
14	0	609.78	12	15	1.43	1219.75	1214	10	1.72E-03	64.7	
15	0	662.97	12	10	1.18	1326.13	1322	7	1.60E-03	54.6	
16	0	721.46	11	3	1.51	1443.09	1440	6	1.53E-03	39.1	
17	0	863.64	8	4	0.92	1727.41	1724	8	1.06E-03	58.3	
18	0	897.30	11	6	0.78	1794.74	1790	10	1.59E-03	52.3	
19	0	941.38	16	6	3.80	1882.86	1875	13	2.17E-03	42.0	
20	0	962.52	10	7	2.49	1925.15	1920	9	1.45E-03	54.3	
21	0	970.29	6	7	0.60	1940.68	1936	8	8.01E-04	93.3	
22	0	1001.30	15	3	0.52	2002.67	1996	13	2.06E-03	36.1	
23	0	1013.24	9	0	1.46	2026.56	2023	7	1.25E-03	33.3	
24	0	1188.53	6	7	1.11	2377.02	2370	10	8.01E-04	97.7	
25	0	1243.61	12	5	2.71	2487.15	2480	13	1.63E-03	52.7	
26	0	1462.79	13	7	2.23	2925.28	2917	13	1.74E-03	50.7	
27	0	1847.83	6	0	1.37	3694.83	3691	8	8.33E-04	40.8	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	36	10.44*	1.553E+00	1.133E+02	1.559E+02	52.28
CD-109	88.03	17	3.70*	5.120E+00	4.648E+01	4.822E+01	133.42
SN-126	64.28	-----	9.60	5.130E+00	-----	Line Not Found	-----
	86.94	17	8.90	5.120E+00	1.932E+01	1.932E+01	133.42
	87.57	17	37.00*	5.120E+00	4.648E+00	4.648E+00	133.42
BA-137M	661.66	3	89.90*	1.137E+00	1.295E+00	1.297E+00	550.01
CS-137	661.66	3	85.10*	1.137E+00	1.368E+00	1.370E+00	550.01
TL-208	277.37	-----	6.60	2.565E+00	-----	Line Not Found	-----
	583.19	7	85.00*	1.282E+00	3.185E+00	3.263E+00	287.23
	860.56	-----	12.50	8.897E-01	-----	Line Not Found	-----
PB-210	46.54	30	4.25*	4.529E+00	7.873E+01	7.890E+01	149.98
RA-226	186.21	29	3.59*	3.540E+00	1.161E+02	1.161E+02	115.20
TH-229	85.43	5	14.70	5.144E+00	3.540E+00	3.540E+00	472.17
	88.47	17	24.00	5.120E+00	7.165E+00	7.165E+00	133.42
	193.51	-----	4.41*	3.442E+00	-----	Line Not Found	-----
	210.85	-----	2.80	3.223E+00	-----	Line Not Found	-----
TH-231	84.21	5	6.60*	5.144E+00	7.886E+00	7.886E+00	472.17
ANH-511	511.00	7	100.00*	1.456E+00	2.549E+00	2.549E+00	431.78

Flag: "*" = Keyline

Total number of lines in spectrum 23
Number of unidentified lines 6
Number of lines tentatively identified by NID 17 73.91%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.38	1.133E+02	1.559E+02	0.815E+02	52.28	
CD-109	461.40D	1.04	4.648E+01	4.822E+01	6.433E+01	133.42	
SN-126	2.30E+05Y	1.00	4.648E+00	4.648E+00	6.201E+00	133.42	
BA-137M	30.08Y	1.00	1.295E+00	1.297E+00	7.132E+00	550.01	
CS-137	30.08Y	1.00	1.368E+00	1.370E+00	7.535E+00	550.01	
TL-208	1.91Y	1.02	3.185E+00	3.263E+00	9.373E+00	287.23	
PB-210	22.20Y	1.00	7.873E+01	7.890E+01	11.83E+01	149.98	
RA-226	1600.00Y	1.00	1.161E+02	1.161E+02	1.337E+02	115.20	
TH-229	7340.00Y	1.00	7.165E+00	7.165E+00	9.560E+00	133.42	K
TH-231	7.04E+08Y	1.00	7.886E+00	7.886E+00	37.23E+00	472.17	
ANH-511	1.00E+09Y	1.00	2.549E+00	2.549E+00	11.01E+00	431.78	
Total Activity :			3.827E+02	4.272E+02			

Grand Total Activity : 3.827E+02 4.272E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	239.02	5	58	0.89	478.13	474	10	7.16E-04	****	2.91E+00	T
0	273.31	23	17	1.73	546.74	543	7	3.17E-03	73.6	2.60E+00	T
0	329.18	16	23	1.46	658.49	656	6	2.20E-03	****	2.20E+00	T
0	609.78	4	15	1.43	1219.75	1214	10	5.45E-04	****	1.23E+00	T
0	721.46	11	3	1.51	1443.09	1440	6	1.53E-03	78.2	1.05E+00	T
0	863.64	8	4	0.92	1727.41	1724	8	1.06E-03	****	8.87E-01	
0	897.30	11	6	0.78	1794.74	1790	10	1.59E-03	****	8.56E-01	T
0	941.38	16	6	3.80	1882.86	1875	13	2.17E-03	84.0	8.19E-01	
0	962.52	10	7	2.49	1925.15	1920	9	1.45E-03	****	8.02E-01	T
0	1001.30	10	3	0.52	2002.67	1996	13	1.36E-03	****	7.74E-01	T
0	1013.24	9	0	1.46	2026.56	2023	7	1.25E-03	66.7	7.66E-01	
0	1188.53	6	7	1.11	2377.02	2370	10	8.01E-04	****	6.63E-01	T
0	1243.61	12	5	2.71	2487.15	2480	13	1.63E-03	****	6.37E-01	
0	1462.79	3	7	2.23	2925.28	2917	13	4.17E-04	****	5.53E-01	
0	1847.83	6	0	1.37	3694.83	3691	8	8.33E-04	81.6	4.54E-01	

Flags: "T" = Tentatively associated

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292907.CNF;1
Acquisition date : 19-JAN-2023 17:31:14 Sensitivity : 3.000
Detector ID : GAM38 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.31 Half life ratio : *****
Sample date : 26-DEC-2022 07:23:00 Nuclide Library : LIQUID
Sample ID : G1205292907 Analyst initials: MXR1
Batch Number : 2367950 Sample Quantity : 7.3913E-01 FILTER
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 22-APR-2022 08:42:40 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM38_JAR.CNF;2

Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	4.041E+01
CD-109	3.871E+01
SN-126	3.516E+00
BA-137M	4.653E+00
CS-137	4.916E+00
TL-208	4.059E+00
PB-210	3.303E+01
RA-226	5.281E+01
TH-229	5.278E+01
TH-231	1.949E+01
ANH-511	3.112E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	6.019E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	3.624E+00	NOT IDENT.
K-40	7.867E+01	NOT IDENT.
SC-46	4.466E+00	NOT IDENT.
V-48	1.449E+01	NOT IDENT.
CR-51	4.378E+01	NOT IDENT.
MN-52	1.153E+02	NOT IDENT.
MN-54	4.043E+00	NOT IDENT.
CO-56	5.379E+00	NOT IDENT.
CO-57	1.629E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	5.241E+00	NOT IDENT.
FE-59	1.046E+01	NOT IDENT.
CO-60	2.811E+00	NOT IDENT.
ZN-65	1.006E+01	NOT IDENT.
CU-67	3.326E+03	NOT IDENT.
GE-68	1.223E+02	NOT IDENT.
AS-73	1.482E+01	NOT IDENT.
AS-74	1.129E+01	NOT IDENT.

SE-75	4.126E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	5.328E+01	NOT IDENT.
RB-83	8.108E+00	NOT IDENT.
RB-84	1.109E+01	NOT IDENT.
KR-85	1.005E+03	NOT IDENT.
SR-85	5.824E+00	NOT IDENT.
RB-86	1.048E+02	NOT IDENT.
Y-88	4.071E+00	FAIL ABUN
ZR-88	3.127E+00	NOT IDENT.
Y-91	1.853E+03	NOT IDENT.
NB-94	4.156E+00	NOT IDENT.
NB-95	4.767E+00	NOT IDENT.
NB-95M	1.025E+01	NOT IDENT.
TC-95M	4.269E+00	NOT IDENT.
ZR-95	9.173E+00	NOT IDENT.
MO-99	1.136E+04	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-100	0.000E+00	SHORT HLIF
RH-101	2.422E+00	NOT IDENT.
RH-102M	3.351E+00	NOT IDENT.
RU-103	5.371E+00	FAIL ABUN
RH-106	4.345E+01	NOT IDENT.
RU-106	4.345E+01	NOT IDENT.
AG-108M	3.767E+00	FAIL ABUN
AG-110	7.515E+01	NOT IDENT.
AG-110M	6.102E+00	NOT IDENT.
IN-111	1.046E+03	NOT IDENT.
SN-113	4.346E+00	NOT IDENT.
IN-114M	1.570E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	6.714E+00	NOT IDENT.
SB-122	2.617E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.307E+00	NOT IDENT.
SB-124	1.166E+01	FAIL ABUN
SB-125	1.110E+01	NOT IDENT.
TE-125M	5.751E+02	NOT IDENT.
I-126	2.764E+01	NOT IDENT.
SB-126	3.254E+01	FAIL ABUN
SB-127	6.404E+02	NOT IDENT.
TE-129	6.502E+01	NOT IDENT.
I-131	1.812E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	4.822E+02	NOT IDENT.
BA-133	4.616E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	5.339E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.604E+01	FAIL ABUN
LA-138	7.860E+00	NOT IDENT.
CE-139	2.660E+00	NOT IDENT.
BA-140	4.492E+01	NOT IDENT.
LA-140	1.290E+01	FAIL ABUN
CE-141	5.864E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.468E+01	NOT IDENT.
PM-144	3.423E+00	FAIL ABUN
PR-144	2.561E+02	NOT IDENT.
PM-146	4.743E+00	NOT IDENT.
ND-147	9.013E+01	NOT IDENT.
PM-147	5.160E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.102E+00	NOT IDENT.
GD-153	4.139E+00	NOT IDENT.
EU-154	1.715E+01	NOT IDENT.
EU-155	6.156E+00	FAIL ABUN
TB-160	2.029E+01	FAIL ABUN
HO-166M	7.280E+00	NOT IDENT.
TM-171	2.419E+02	NOT IDENT.
LU-176	2.730E+00	FAIL ABUN
LU-177	2.055E+02	NOT IDENT.
HF-181	5.452E+00	NOT IDENT.
W-181	5.248E+00	NOT IDENT.
TA-182	1.568E+01	FAIL ABUN
RE-183	5.414E+00	NOT IDENT.
RE-184	1.168E+01	NOT IDENT.
RE-188	1.371E+01	FAIL ABUN

W-188	7.532E+02	NOT IDENT.
OS-191	1.897E+01	NOT IDENT.
IR-192	3.709E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	5.479E+03	NOT IDENT.
TL-202	1.258E+01	NOT IDENT.
HG-203	3.674E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	1.620E+02	NOT IDENT.
BI-207	3.771E+00	NOT IDENT.
BI-211	2.018E+01	NOT IDENT.
PB-211	5.999E+01	NOT IDENT.
BI-212	5.896E+01	NOT IDENT.
PB-212	6.932E+00	FAIL ABUN
BI-213	1.054E+01	NOT IDENT.
BI-214	1.008E+01	FAIL ABUN
PB-214	7.751E+00	FAIL ABUN
RN-219	4.068E+01	NOT IDENT.
FR-221	2.041E+01	NOT IDENT.
RA-223	7.109E+01	FAIL ABUN
RA-224	5.626E+01	NOT IDENT.
AC-225	1.113E+02	NOT IDENT.
AC-227	2.222E+01	NOT IDENT.
TH-227	2.222E+01	NOT IDENT.
AC-228	1.870E+01	NOT IDENT.
RA-228	1.870E+01	NOT IDENT.
TH-228	6.932E+00	FAIL ABUN
TH-230	3.445E+02	NOT IDENT.
PA-231	5.019E+01	NOT IDENT.
TH-232	8.442E+02	NOT IDENT.
PA-233	5.898E+00	NOT IDENT.
PA-234	3.944E+01	NOT IDENT.
PA-234M	6.815E+02	FAIL ABUN
TH-234	6.021E+01	NOT IDENT.
U-234	1.050E+03	NOT IDENT.
U-235	1.775E+01	FAIL ABUN
NP-237	5.898E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	6.021E+01	NOT IDENT.
NP-239	1.815E+01	NOT IDENT.
AM-241	4.209E+00	NOT IDENT.
AM-242	4.033E+01	NOT IDENT.
AM-243	2.744E+00	NOT IDENT.
CM-243	6.373E+00	NOT IDENT.
BK-247	7.021E+00	FAIL ABUN
CM-247	3.659E+00	NOT IDENT.
CF-249	4.138E+00	NOT IDENT.
CF-251	1.050E+01	NOT IDENT.
CF-252	1.165E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292907.CNF;1
Acquisition date : 19-JAN-2023 17:31:14 Sensitivity : 3.000
Detector ID : GAM38 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.31 Half life ratio : *****
Sample date : 26-DEC-2022 07:23:00 Nuclide Library : LIQUID
Sample ID : G1205292907 Analyst initials: MXR1
Batch Number : 2367950 Sample Quantity : 7.3913E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 22-APR-2022 08:42:40 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM38_JAR.CNF;2

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.559E+02	8.103E+01	8.109E+01
CD-109	4.822E+01	6.323E+01	6.324E+01
SN-126	4.648E+00	6.090E+00	6.090E+00
BA-137M	1.297E+00	6.991E+00	6.991E+00
CS-137	1.370E+00	7.385E+00	7.385E+00
TL-208	3.263E+00	9.191E+00	9.191E+00
PB-210	7.890E+01	1.162E+02	1.162E+02
RA-226	1.161E+02	1.315E+02	1.315E+02
TH-229	4.096E+01	5.933E+01	5.934E+01
TH-231	7.886E+00	3.651E+01	3.651E+01
ANH-511	2.549E+00	1.079E+01	1.079E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	4.587E+00	6.125E+00	6.465E+00	NOT IDENT.
NA-24	8.212E+11	3.350E+12	3.370E+12	SHORT HLIF
AL-26	1.133E+00	3.704E+00	3.740E+00	NOT IDENT.
K-40	3.491E+00	8.899E+01	8.901E+01	NOT IDENT.
SC-46	1.186E+00	4.904E+00	4.933E+00	NOT IDENT.
V-48	-2.171E+00	1.746E+01	1.748E+01	NOT IDENT.
CR-51	-9.280E+00	5.693E+01	5.708E+01	NOT IDENT.
MN-52	8.981E+01	1.130E+02	1.201E+02	NOT IDENT.
MN-54	-1.600E+00	5.010E+00	5.062E+00	NOT IDENT.
CO-56	-4.933E-01	6.327E+00	6.331E+00	NOT IDENT.
CO-57	-9.893E-01	2.024E+00	2.073E+00	NOT IDENT.
NI-57	1.280E+05	7.977E+05	7.998E+05	SHORT HLIF
CO-58	1.917E+00	5.671E+00	5.737E+00	NOT IDENT.
FE-59	-5.529E+00	1.392E+01	1.414E+01	NOT IDENT.
CO-60	-1.182E-01	3.467E+00	3.468E+00	NOT IDENT.
ZN-65	3.049E+00	1.120E+01	1.128E+01	NOT IDENT.
CU-67	-5.719E+03	4.726E+03	5.385E+03	NOT IDENT.
GE-68	-1.721E+01	1.501E+02	1.503E+02	NOT IDENT.
AS-73	8.278E+00	1.816E+01	1.855E+01	NOT IDENT.

AS-74	-7.038E+00	1.533E+01	1.566E+01	NOT IDENT.
SE-75	1.081E+00	4.940E+00	4.964E+00	NOT IDENT.
BR-77	4.887E+03	3.037E+04	3.045E+04	SHORT HLIF
SR-82	-6.748E+00	6.731E+01	6.738E+01	NOT IDENT.
RB-83	4.122E+00	8.841E+00	9.034E+00	NOT IDENT.
RB-84	5.707E-01	1.279E+01	1.279E+01	NOT IDENT.
KR-85	9.521E+02	1.158E+03	1.235E+03	NOT IDENT.
SR-85	5.516E+00	6.708E+00	7.155E+00	NOT IDENT.
RB-86	-3.758E+01	1.353E+02	1.364E+02	NOT IDENT.
Y-88	-1.526E+00	5.550E+00	5.593E+00	FAIL ABUN
ZR-88	-2.971E+00	4.083E+00	4.298E+00	NOT IDENT.
Y-91	-2.493E+03	2.982E+03	3.187E+03	NOT IDENT.
NB-94	9.960E-01	4.881E+00	4.902E+00	NOT IDENT.
NB-95	2.461E+00	5.233E+00	5.349E+00	NOT IDENT.
NB-95M	-7.067E+00	1.496E+01	1.529E+01	NOT IDENT.
TC-95M	1.625E-01	5.157E+00	5.158E+00	NOT IDENT.
ZR-95	1.006E+01	8.667E+00	9.783E+00	NOT IDENT.
MO-99	-2.156E+04	2.104E+04	2.318E+04	NOT IDENT.
TC-99M	2.046E+29	5.479E+29	0.000E+00	SHORT HLIF
RH-100	-1.337E+08	1.882E+09	1.883E+09	SHORT HLIF
RH-101	2.359E+00	2.610E+00	2.819E+00	NOT IDENT.
RH-102M	1.515E+00	4.066E+00	4.123E+00	NOT IDENT.
RU-103	-1.336E+00	6.575E+00	6.603E+00	FAIL ABUN
RH-106	2.725E+01	4.767E+01	4.923E+01	NOT IDENT.
RU-106	2.725E+01	4.767E+01	4.923E+01	NOT IDENT.
AG-108M	2.764E+00	4.025E+00	4.214E+00	FAIL ABUN
AG-110	-3.743E+01	9.987E+01	1.013E+02	NOT IDENT.
AG-110M	1.604E-01	7.065E+00	7.065E+00	NOT IDENT.
IN-111	-3.531E+02	1.336E+03	1.346E+03	NOT IDENT.
SN-113	-3.983E+00	5.661E+00	5.939E+00	NOT IDENT.
IN-114M	-9.707E+00	2.212E+01	2.255E+01	NOT IDENT.
CD-115	-7.807E+03	2.477E+04	2.502E+04	SHORT HLIF
SN-117M	1.256E+00	7.826E+00	7.847E+00	NOT IDENT.
SB-122	-4.912E+02	3.215E+03	3.223E+03	NOT IDENT.
I-123	2.087E+11	5.634E+13	5.634E+13	SHORT HLIF
TE-123M	-3.223E-02	2.747E+00	2.747E+00	NOT IDENT.
SB-124	-7.708E+00	1.640E+01	1.676E+01	FAIL ABUN
SB-125	1.154E+01	1.130E+01	1.245E+01	NOT IDENT.
TE-125M	-4.264E+02	7.219E+02	7.471E+02	NOT IDENT.
I-126	-2.976E+01	4.871E+01	5.053E+01	NOT IDENT.
SB-126	3.906E+01	3.032E+01	3.507E+01	FAIL ABUN
SB-127	-7.216E+02	9.653E+02	1.019E+03	NOT IDENT.
TE-129	3.200E+01	7.126E+01	7.271E+01	NOT IDENT.
I-131	-3.888E+01	2.793E+01	3.298E+01	NOT IDENT.
I-132	-1.000E+41	2.129E+41	0.000E+00	SHORT HLIF
TE-132	-5.721E+02	6.679E+02	7.161E+02	NOT IDENT.
BA-133	8.144E-01	5.203E+00	5.216E+00	NOT IDENT.
I-133	-7.809E+08	1.309E+09	1.356E+09	SHORT HLIF
CS-134	3.873E+00	5.732E+00	5.993E+00	NOT IDENT.
I-135	-2.762E+27	1.361E+28	0.000E+00	SHORT HLIF
CS-136	-2.377E+01	2.533E+01	2.750E+01	FAIL ABUN
LA-138	3.714E+00	8.403E+00	8.568E+00	NOT IDENT.
CE-139	9.801E-01	3.067E+00	3.098E+00	NOT IDENT.
BA-140	-2.490E+01	5.840E+01	5.947E+01	NOT IDENT.
LA-140	-2.998E+00	1.639E+01	1.645E+01	FAIL ABUN
CE-141	-1.071E+01	8.402E+00	9.692E+00	NOT IDENT.
CE-143	1.257E+06	1.719E+06	1.810E+06	SHORT HLIF
CE-144	1.436E+00	1.707E+01	1.708E+01	NOT IDENT.
PM-144	-3.761E+00	5.043E+00	5.321E+00	FAIL ABUN
PR-144	-3.269E+02	3.873E+02	4.144E+02	NOT IDENT.
PM-146	2.246E+00	5.207E+00	5.305E+00	NOT IDENT.
ND-147	-1.270E+02	1.395E+02	1.508E+02	NOT IDENT.
PM-147	9.230E+03	5.909E+04	5.924E+04	NOT IDENT.
PM-149	3.976E+04	2.048E+05	2.056E+05	SHORT HLIF
EU-152	2.403E-01	9.249E+00	9.250E+00	NOT IDENT.
GD-153	-1.116E+01	6.470E+00	8.198E+00	NOT IDENT.
EU-154	1.340E+01	1.740E+01	1.842E+01	NOT IDENT.
EU-155	-2.632E+00	7.419E+00	7.514E+00	FAIL ABUN
TB-160	1.118E+01	2.151E+01	2.209E+01	FAIL ABUN
HO-166M	-1.672E+00	9.260E+00	9.290E+00	NOT IDENT.
TM-171	-4.086E+02	3.963E+02	4.371E+02	NOT IDENT.
LU-176	2.755E-01	3.389E+00	3.391E+00	FAIL ABUN
LU-177	-3.685E+02	3.221E+02	3.625E+02	NOT IDENT.
HF-181	-1.587E+00	7.542E+00	7.576E+00	NOT IDENT.
W-181	4.551E-01	5.810E+00	5.814E+00	NOT IDENT.
TA-182	-3.906E+00	2.017E+01	2.024E+01	FAIL ABUN
RE-183	4.644E-01	5.996E+00	6.000E+00	NOT IDENT.
RE-184	-2.176E+01	2.060E+01	2.282E+01	NOT IDENT.

RE-188	2.040E+00	1.602E+01	1.605E+01	FAIL ABUN
W-188	-1.335E+02	9.636E+02	9.655E+02	NOT IDENT.
OS-191	6.707E+00	2.152E+01	2.173E+01	NOT IDENT.
IR-192	1.200E+00	4.467E+00	4.499E+00	NOT IDENT.
PB-201	-1.134E+19	4.073E+19	0.000E+00	SHORT HLIF
TL-201	4.762E+03	6.040E+03	6.411E+03	NOT IDENT.
TL-202	1.650E+00	1.445E+01	1.447E+01	NOT IDENT.
HG-203	-1.675E+00	4.865E+00	4.923E+00	NOT IDENT.
PB-203	-2.975E+03	8.644E+03	8.748E+03	SHORT HLIF
TL-204	-4.078E+01	1.869E+02	1.878E+02	NOT IDENT.
BI-207	-1.715E+00	5.094E+00	5.152E+00	NOT IDENT.
BI-211	-4.432E+01	2.828E+01	3.463E+01	NOT IDENT.
PB-211	-3.728E+01	7.632E+01	7.816E+01	NOT IDENT.
BI-212	1.860E+01	6.809E+01	6.861E+01	NOT IDENT.
PB-212	2.114E+00	1.314E+01	1.317E+01	FAIL ABUN
BI-213	3.503E+00	1.174E+01	1.184E+01	NOT IDENT.
BI-214	3.560E+00	1.535E+01	1.544E+01	FAIL ABUN
PB-214	-1.733E+01	1.081E+01	1.334E+01	FAIL ABUN
RN-219	-7.051E+00	4.832E+01	4.843E+01	NOT IDENT.
FR-221	2.885E+00	2.455E+01	2.458E+01	NOT IDENT.
RA-223	-3.136E+00	8.145E+01	8.146E+01	FAIL ABUN
RA-224	4.721E+01	6.674E+01	7.006E+01	NOT IDENT.
AC-225	1.572E+01	1.338E+02	1.340E+02	NOT IDENT.
AC-227	-7.290E+00	2.863E+01	2.881E+01	NOT IDENT.
TH-227	-7.290E+00	2.863E+01	2.881E+01	NOT IDENT.
AC-228	-1.618E+01	2.467E+01	2.572E+01	NOT IDENT.
RA-228	-1.618E+01	2.467E+01	2.572E+01	NOT IDENT.
TH-228	2.114E+00	1.314E+01	1.317E+01	FAIL ABUN
TH-230	-6.759E-01	3.874E+02	3.874E+02	NOT IDENT.
PA-231	1.971E+01	6.018E+01	6.083E+01	NOT IDENT.
TH-232	-5.945E+02	9.468E+02	9.840E+02	NOT IDENT.
PA-233	-1.369E-02	7.430E+00	7.430E+00	NOT IDENT.
PA-234	3.218E+01	5.616E+01	5.801E+01	NOT IDENT.
PA-234M	7.657E+02	9.291E+02	9.913E+02	FAIL ABUN
TH-234	-2.273E+01	6.638E+01	6.716E+01	NOT IDENT.
U-234	6.593E+02	1.271E+03	1.305E+03	NOT IDENT.
U-235	-5.767E+00	2.231E+01	2.246E+01	FAIL ABUN
NP-237	-1.369E-02	7.430E+00	7.430E+00	NOT IDENT.
NP-238	-6.483E+03	7.472E+04	7.477E+04	SHORT HLIF
U-238	-2.273E+01	6.638E+01	6.716E+01	NOT IDENT.
NP-239	-7.469E+00	2.194E+01	2.220E+01	NOT IDENT.
AM-241	2.959E+00	4.443E+00	4.640E+00	NOT IDENT.
AM-242	-1.090E+01	5.015E+01	5.039E+01	NOT IDENT.
AM-243	-3.659E+00	3.198E+00	3.599E+00	NOT IDENT.
CM-243	-5.102E-01	7.409E+00	7.413E+00	NOT IDENT.
BK-247	1.021E+00	8.544E+00	8.556E+00	FAIL ABUN
CM-247	1.533E-01	4.225E+00	4.225E+00	NOT IDENT.
CF-249	-1.999E+00	5.077E+00	5.156E+00	NOT IDENT.
CF-251	1.582E+00	1.239E+01	1.241E+01	NOT IDENT.
CF-252	4.072E+03	1.351E+04	1.363E+04	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	33.7577	133.52	26.1184	116.30	28.9336
879.38	28.4290	364.49	26.1245	116.74	38.0164
46.54	28.5619	80.22	26.1274	117.23	44.4055
228.16	30.4519	711.68	28.3367	119.76	36.4725
52.39	29.2220	356.01	33.8337	120.54	30.1462
53.20	19.1539	323.87	37.1162	120.90	27.4292
53.44	19.1744	82.35	0.0000	264.66	27.4436
57.53	37.3337	82.47	28.5118	121.22	29.2800
293.27	0.0000	82.47	28.5121	344.28	37.5651
57.53	36.7820	83.79	31.3853	122.06	33.0060
482.18	36.7822	265.00	31.4061	1274.44	31.2467
57.98	36.8515	84.21	31.4270	123.68	24.8492
59.32	37.8136	84.86	0.0000	1377.63	0.0000
59.54	31.0351	193.51	31.5479	127.23	24.1264
155.04	51.1190	105.31	31.6581	129.43	34.5063
63.00	26.8646	86.79	31.6813	131.20	34.6440
129.43	26.8952	86.94	31.6963	133.02	32.9044
63.29	26.8952	87.09	31.7108	133.52	31.0583
290.67	31.5416	87.57	31.7578	135.34	31.1827
63.81	31.5701	88.03	35.7080	136.00	35.0127
87.57	47.0560	306.78	35.7419	136.28	32.1935
64.99	73.4853	88.47	39.1080	136.47	31.2593
65.08	74.2844	531.02	97.1418	739.50	39.1751
66.73	29.5895	184.58	97.1883	140.51	0.0000
66.98	30.3967	92.59	33.9368	140.88	38.2495
67.24	35.8877	93.31	45.0612	143.76	38.4814
67.67	32.8199	94.56	94.7174	144.24	37.5563
1221.41	32.8295	311.90	78.5248	145.44	54.0612
439.51	31.3986	946.00	78.5291	152.32	27.4095
70.82	31.3986	97.43	40.4358	152.43	27.4155
167.43	31.3992	98.43	28.4712	1048.07	34.3250
97.43	29.9145	98.44	28.4719	154.21	34.3901
70.82	33.9917	99.53	29.4239	155.04	30.5095
70.82	33.9917	103.37	29.4239	158.56	26.6234
279.20	0.0000	116.74	29.4239	158.97	0.0000
1063.66	42.1956	100.11	33.8054	159.00	31.7363
72.87	0.0000	100.20	33.8138	162.33	30.9399
351.06	42.2045	102.03	29.6270	537.26	30.9593
74.66	51.2837	103.18	32.3420	163.33	20.9987
238.63	51.3125	103.37	31.4841	165.86	32.1494
351.93	51.3125	105.31	33.4063	167.43	31.2351
238.63	51.3125	106.12	24.6681	245.35	26.3820
74.97	44.9215	106.47	30.8637	427.87	29.6912
77.11	45.2513	109.28	30.2027	176.60	29.7067
256.23	30.1568	111.00	27.6595	177.52	29.7549
79.82	30.1701	111.76	30.3951	181.07	30.9714
80.02	32.6373	208.37	34.0734	184.41	41.5326
80.03	32.6379	116.24	28.9292	184.58	41.5448

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	32.2592	300.09	28.0123	475.06	12.8930
186.21	32.2861	300.13	28.0137	696.49	16.2571
190.27	33.5547	301.36	24.3939	477.60	16.2675
193.51	33.7344	302.85	20.7696	477.99	16.2723
197.03	40.2892	304.50	24.4806	482.18	17.2844
198.01	35.0434	304.85	24.4897	487.02	12.5290
201.83	33.1201	306.78	24.5428	492.35	0.0000
204.12	32.1675	308.46	19.6714	497.08	18.4492
205.31	24.7077	311.90	19.7461	511.00	14.7139
208.37	35.6184	316.51	18.6058	514.00	16.2200
210.85	19.5024	319.41	24.8853	520.40	8.8879
215.65	33.8320	320.08	22.4132	520.69	0.0000
218.12	36.1471	321.04	23.6827	667.71	0.0000
222.11	33.0547	323.87	29.1724	527.90	0.0000
227.09	29.9647	325.23	19.0311	529.59	7.9518
227.38	27.7565	1596.21	23.8781	529.87	0.0000
228.16	44.4598	331.15	0.0000	531.02	14.9243
228.18	44.4611	333.37	24.2461	537.26	15.9883
235.69	31.4543	334.37	24.4398	539.51	0.0000
235.96	22.4756	338.28	20.3081	1260.41	0.0000
238.63	21.4310	911.20	20.3086	552.55	14.1367
238.98	0.0000	340.48	24.5938	795.86	17.2891
240.99	19.6143	340.55	24.5956	564.24	18.3179
242.00	30.2177	344.28	14.4731	569.33	21.4426
244.70	26.1582	345.93	19.6140	569.50	21.4452
245.35	35.2875	351.06	23.1438	569.70	17.3625
459.60	18.3413	351.93	27.4531	582.08	12.3550
685.70	25.2787	356.01	22.3961	583.19	13.3941
388.16	21.8429	361.25	0.0000	595.83	11.4252
256.23	27.7148	364.49	24.3188	600.60	16.6686
527.90	0.0000	366.42	19.1430	604.72	7.8336
264.66	19.8446	383.85	15.9218	609.32	11.5219
265.00	21.0207	388.16	23.9771	610.33	15.7214
269.46	34.4484	666.33	17.7686	614.28	11.3471
401.81	21.9696	391.70	23.1637	618.01	11.5837
273.65	20.4617	392.87	24.0804	621.93	11.6114
276.40	20.5304	400.66	14.3698	630.19	0.0000
583.19	16.6019	401.32	0.0000	631.29	4.2463
277.60	18.9790	401.81	18.8796	632.98	11.6888
402.40	23.7354	402.40	16.1913	633.25	10.6278
278.43	27.3097	404.85	17.1275	634.78	14.8927
279.20	0.0000	410.95	17.2195	635.95	9.5804
279.54	19.0234	720.70	14.5479	636.99	7.4563
280.46	21.4250	423.72	15.5768	657.50	12.9370
301.36	22.7034	427.09	13.7836	884.68	14.2329
284.31	26.3069	427.87	11.0339	661.66	16.2097
285.41	21.5524	433.94	15.7110	664.57	0.0000
285.90	0.0000	439.51	15.7836	666.33	11.3776
287.50	28.8076	440.45	12.0791	666.50	11.3784
290.67	26.5050	539.51	0.0000	667.71	0.0000
293.27	0.0000	453.88	13.1503	677.62	9.8148
295.22	29.0676	459.60	12.2668	685.70	14.2410
316.51	30.3047	463.37	18.9282	692.65	9.8972
298.58	21.8853	468.07	16.1481	695.00	14.3145
299.98	28.0088	473.00	12.8727	696.49	16.5308

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
696.51	17.6328	884.68	9.0695	1238.28	8.3008
697.00	17.6374	889.28	5.4529	1260.41	0.0000
697.49	17.6426	894.76	7.2881	1271.87	11.5391
702.65	12.1633	1836.06	8.7583	1274.44	4.1995
706.68	16.6229	903.28	12.5407	1274.54	4.1995
711.68	14.4457	907.67	0.0000	1291.59	4.2224
720.70	10.0492	911.20	10.0933	1298.22	0.0000
721.93	0.0000	984.45	0.0000	1312.11	5.3122
1690.97	8.3838	926.36	8.3123	1332.49	2.1383
722.91	8.3844	935.54	20.7689	1362.15	0.0000
723.31	11.7403	937.49	5.9389	1365.19	6.4790
756.73	13.4238	983.53	10.4221	1368.63	0.0000
727.33	8.9642	945.96	0.0000	1377.63	0.0000
733.00	7.8673	946.00	4.4701	1384.29	6.5160
735.93	12.3817	949.00	8.3919	1408.01	5.4681
739.50	12.4050	954.55	0.0000	1434.09	2.2039
1434.09	16.9574	962.31	8.4386	1435.80	3.3074
747.24	12.4547	964.08	10.5089	1457.56	0.0000
752.31	12.4873	966.17	15.0259	1460.82	5.5518
753.82	9.0889	968.97	5.6411	1489.16	5.5960
756.73	2.2756	983.53	12.2950	1553.35	0.0000
763.94	9.1357	984.45	0.0000	1596.21	2.7646
765.80	5.7153	996.26	9.1260	1620.50	2.7820
1001.03	4.5736	1001.03	7.6196	1678.03	0.0000
766.84	8.0055	1004.73	7.6306	1690.97	5.6637
772.60	0.0000	1025.87	0.0000	1757.55	0.0000
776.52	12.6413	1028.54	0.0000	1764.49	1.9219
777.92	11.5002	1037.84	5.7975	1770.23	5.7735
778.90	11.5059	1038.76	0.0000	1771.35	3.8500
783.70	12.6865	1046.59	5.8173	1791.20	0.0000
1435.80	12.7183	1048.07	12.6112	1808.65	0.9709
903.28	10.4231	1050.41	5.8257	1836.06	2.9313
795.86	6.9614	1063.66	4.8792		
801.95	9.3096	1077.00	6.8650		
802.10	9.3102	1077.34	5.8850		
810.29	8.7631	1083.85	3.9329		
810.45	7.8874	1085.87	8.8555		
810.76	7.8885	1099.25	8.8995		
815.77	11.4218	1107.22	0.0000		
818.51	7.9178	1111.64	6.9530		
822.65	0.0000	1112.07	8.9407		
832.01	8.8541	1112.84	7.9497		
834.85	11.5254	1115.54	5.9681		
835.15	7.9802	1120.29	8.9676		
836.80	0.0000	1120.55	8.9681		
846.77	11.5896	1121.30	5.9806		
856.80	8.9563	1808.65	7.9980		
860.56	7.1772	1131.51	0.0000		
871.09	6.3102	1332.49	7.1060		
873.19	9.9254	1177.95	6.1007		
875.33	0.0000	1189.05	3.2662		
879.38	8.1433	1204.77	10.2612		
880.51	12.6738	1221.41	5.1593		
881.60	10.8688	1231.02	7.2461		
883.24	9.0637	1235.36	6.2197		

VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 16:36:53.56

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292908.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM28.CNF;597
Background date    : 15-JAN-2023 11:20:08
Sample date       : 19-JAN-2023 00:00:00 Acquisition date : 19-JAN-2023 16:21:23
Sample ID        : G1205292908 Sample quantity : 7.64890E-01 FILTER
Detector name     : GAM28 Detector geometry: JAR
Elapsed live time : 0 00:15:00.00 Elapsed real time: 0 00:15:02.24 0.2%
Energy tolerance  : 1.50000 keV Analyst Initials : MXR1
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2367950 Detector SN# :
Matrix Spike ID   : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.49*	3908	2178	1.11	93.41	88	10	4.34E+00	2.7	
2	0	50.02	83	1119	1.11	100.47	99	5	9.18E-02	61.4	
3	0	59.51	11985	2376	1.10	119.45	113	12	1.33E+01	1.2	
4	0	121.17	16	371	0.81	242.69	242	6	1.83E-02	186.1	
5	0	135.20	49	313	1.04	270.73	269	6	5.42E-02	59.1	
6	0	334.92	50	367	2.31	669.99	664	11	5.56E-02	75.8	
7	0	433.28	21	304	0.73	866.62	866	8	2.33E-02	145.5	
8	0	661.48*	9113	179	1.52	1322.87	1317	15	1.01E+01	1.1	
9	0	679.44	35	34	1.16	1358.77	1355	8	3.91E-02	33.2	
10	0	746.08	15	69	0.63	1492.01	1485	9	1.66E-02	103.9	
11	0	753.63	32	43	1.89	1507.11	1503	8	3.54E-02	40.5	
12	0	1127.45	15	42	1.23	2254.64	2251	8	1.70E-02	76.7	
13	0	1172.78	2439	32	1.93	2345.30	2337	16	2.71E+00	2.1	
14	0	1177.76	11	18	0.96	2355.24	2352	8	1.26E-02	71.0	
15	0	1331.98	2280	20	2.00	2663.68	2653	20	2.53E+00	2.1	

Flag: "*" = Peak area was modified by background subtraction

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292908.CNF;1
Analyses by : PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4,INTERF V2.4
Sample title : MXR1
Sample date : 19-JAN-2023 00:00:00 Acquisition date : 19-JAN-2023 16:21:23
Sample ID : G1205292908 Sample quantity : 0.76489 FILTER
Sample type : LIQUID Sample geometry :
Detector name : GAMMA28 Detector geometry: JAR
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:02.24 0.2%
Energy tolerance : 1.50 keV Half life ratio : 10.00
Errors propagated: No Systematic Error : 0.00 %
Efficiency type : Empirical Efficiencies at : Peak Energy
Abundance limit : 75.00

Interference Report

Interfering		Interfered	
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Nuclide	Line	Nuclide	Line
CO-57	122.06	PM-147	121.22

Nuclide Type:

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error	Status
CO-57	122.06	85.60*	4.666E+00	1.616E+01	1.619E+01	372.15	OK
	136.47	10.68	4.654E+00	3.855E+02	3.861E+02	118.22	OK
CO-60	1173.23	99.85	1.139E+00	8.419E+03	8.422E+03	4.18	OK
	1332.49	99.98*	1.026E+00	8.730E+03	8.732E+03	4.30	OK
BA-137M	661.66	89.90*	1.836E+00	2.168E+04	2.168E+04	2.20	OK
CS-137	661.66	85.10*	1.836E+00	2.290E+04	2.290E+04	2.20	OK
PB-210	46.54	4.25*	4.477E-01	8.065E+05	8.065E+05	5.50	OK
AM-241	59.54	35.90*	1.555E+00	8.427E+04	8.427E+04	2.45	OK

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292908.CNF;1
Acquisition date : 19-JAN-2023 16:21:23 Sensitivity : 3.000
Detector ID : GAM28 Energy tolerance: 1.500
Elapsed live time: 0 00:15:00.00 Abundance limit : 75.000
Elapsed real time: 0 00:15:02.24 Half life ratio : *****
Sample date : 19-JAN-2023 00:00:00 Analyst initials: MXR1
Sample ID : G1205292908 Sample Quantity : 7.6489E-01 FILTER
Batch Number : 2367950 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;28

CALIBRATION INFORMATION

Eff. Cal. date : 4-APR-2022 06:19:42 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM28_JAR.CNF;15

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
CO-57	1.619E+01	5.904E+01	7.685E+01
CO-60	8.732E+03	3.678E+02	6.826E+01
BA-137M	2.168E+04	4.675E+02	1.091E+02
CS-137	2.290E+04	4.938E+02	1.153E+02
PB-210	8.065E+05	4.345E+04	2.799E+04
AM-241	8.427E+04	2.021E+03	8.982E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	-1.325E+02	6.789E+02	1.187E+03	NOT IDENT.
NA-22	-7.880E-01	3.530E+01	6.981E+01	NOT IDENT.
NA-24	-2.893E+01	4.636E+01	8.246E+01	NOT IDENT.
AL-26	1.418E+00	2.402E+01	5.329E+01	NOT IDENT.
K-40	8.239E+01	2.491E+02	5.754E+02	NOT IDENT.
SC-46	2.602E+01	6.903E+01	1.232E+02	NOT IDENT.
V-48	-8.421E+00	7.652E+01	1.305E+02	NOT IDENT.
CR-51	-4.820E+02	4.837E+02	8.377E+02	NOT IDENT.
MN-52	-1.293E+01	1.907E+01	3.248E+01	NOT IDENT.
MN-54	-3.947E+01	6.679E+01	1.107E+02	NOT IDENT.
CO-56	-3.555E+01	6.280E+01	1.043E+02	NOT IDENT.
NI-57	-4.824E+01	5.142E+01	8.238E+01	NOT IDENT.
CO-58	-8.524E+00	5.498E+01	9.554E+01	NOT IDENT.
FE-59	5.624E+01	1.177E+02	2.263E+02	NOT IDENT.
ZN-65	-2.242E+01	1.380E+02	2.516E+02	NOT IDENT.
CU-67	2.925E+01	1.110E+02	1.894E+02	NOT IDENT.
GE-68	2.151E+02	2.153E+03	4.008E+03	NOT IDENT.
AS-73	-3.889E+03	3.709E+03	5.812E+03	NOT IDENT.
AS-74	-5.504E+01	9.060E+01	1.541E+02	NOT IDENT.
SE-75	-2.655E+01	8.434E+01	1.367E+02	FAIL ABUN
BR-77	-6.332E+01	2.604E+02	4.269E+02	NOT IDENT.
SR-82	1.998E+02	3.602E+02	6.665E+02	NOT IDENT.
RB-83	9.798E+01	1.248E+02	2.314E+02	NOT IDENT.
RB-84	-4.632E-01	9.566E+01	1.663E+02	NOT IDENT.

KR-85	-4.199E+03	1.290E+04	2.249E+04	NOT IDENT.
SR-85	-1.894E+01	5.818E+01	1.015E+02	NOT IDENT.
RB-86	2.552E+02	8.196E+02	1.549E+03	NOT IDENT.
Y-88	1.333E+01	2.859E+01	6.705E+01	NOT IDENT.
ZR-88	-4.292E+00	5.895E+01	1.051E+02	NOT IDENT.
Y-91	3.217E+03	1.695E+04	3.343E+04	NOT IDENT.
NB-94	-8.851E+00	4.987E+01	8.727E+01	NOT IDENT.
NB-95	-1.187E+01	5.336E+01	9.256E+01	NOT IDENT.
NB-95M	-3.802E+01	1.933E+02	3.172E+02	NOT IDENT.
TC-95M	3.765E+01	7.191E+01	1.230E+02	NOT IDENT.
ZR-95	-3.960E+01	1.018E+02	1.533E+02	NOT IDENT.
MO-99	-7.506E+01	5.262E+02	8.752E+02	NOT IDENT.
TC-99M	2.177E+01	2.965E+02	5.057E+02	NOT IDENT.
RH-100	-6.269E+01	1.078E+02	1.849E+02	NOT IDENT.
RH-101	-1.483E+01	5.632E+01	9.506E+01	NOT IDENT.
RH-102M	5.465E+01	7.408E+01	1.347E+02	NOT IDENT.
RU-103	5.054E+01	6.233E+01	1.156E+02	NOT IDENT.
RH-106	-6.517E+01	5.226E+02	9.196E+02	NOT IDENT.
RU-106	-6.517E+01	5.226E+02	9.196E+02	NOT IDENT.
AG-108M	3.669E+01	1.046E+02	1.312E+02	FAIL ABUN
CD-109	1.092E+03	1.264E+03	2.266E+03	NOT IDENT.
AG-110	6.669E+02	1.543E+03	2.508E+03	NOT IDENT.
AG-110M	-3.181E+01	9.162E+01	1.545E+02	NOT IDENT.
IN-111	-3.721E+01	6.171E+01	9.886E+01	NOT IDENT.
SN-113	-2.289E+01	8.650E+01	1.531E+02	NOT IDENT.
IN-114M	-6.187E+01	3.076E+02	5.092E+02	NOT IDENT.
CD-115	3.629E+02	2.422E+02	4.679E+02	NOT IDENT.
SN-117M	7.067E+00	4.732E+01	8.058E+01	NOT IDENT.
SB-122	-1.388E+01	8.555E+01	1.507E+02	NOT IDENT.
I-123	-1.615E+01	1.145E+02	1.922E+02	NOT IDENT.
TE-123M	-5.370E+00	4.799E+01	8.069E+01	NOT IDENT.
SB-124	3.118E+01	4.346E+01	1.181E+02	NOT IDENT.
SB-125	-1.255E+02	2.104E+02	3.644E+02	NOT IDENT.
TE-125M	-9.410E+03	1.415E+04	2.364E+04	NOT IDENT.
I-126	-2.523E+01	1.432E+02	2.253E+02	FAIL ABUN
SB-126	-8.880E+00	9.253E+01	1.634E+02	NOT IDENT.
SN-126	8.439E+01	1.260E+02	2.242E+02	NOT IDENT.
SB-127	4.811E+01	1.391E+02	2.566E+02	NOT IDENT.
TE-129	3.461E+02	9.400E+02	1.683E+03	NOT IDENT.
I-131	4.166E+01	6.978E+01	1.286E+02	NOT IDENT.
I-132	-5.236E+03	7.245E+03	1.053E+04	NOT IDENT.
TE-132	3.952E+01	6.327E+01	1.081E+02	FAIL ABUN
BA-133	-2.341E+01	8.459E+01	1.504E+02	NOT IDENT.
I-133	-8.067E+01	1.094E+02	1.858E+02	NOT IDENT.
CS-134	8.943E+00	5.920E+01	1.064E+02	NOT IDENT.
I-135	4.514E+01	5.545E+02	1.158E+03	NOT IDENT.
CS-136	7.215E+00	8.317E+01	1.556E+02	NOT IDENT.
LA-138	6.407E+00	2.695E+01	6.666E+01	NOT IDENT.
CE-139	2.615E+01	4.885E+01	8.461E+01	NOT IDENT.
BA-140	1.005E+02	2.202E+02	4.034E+02	NOT IDENT.
LA-140	9.332E+00	2.293E+01	5.702E+01	NOT IDENT.
CE-141	-1.421E+01	7.887E+01	1.329E+02	NOT IDENT.
CE-143	2.734E+01	1.483E+02	2.721E+02	NOT IDENT.
CE-144	-1.259E+02	3.818E+02	5.897E+02	NOT IDENT.
PM-144	-1.652E+01	4.983E+01	8.605E+01	NOT IDENT.
PR-144	-1.214E+03	3.702E+03	6.396E+03	NOT IDENT.
PM-146	5.470E+01	1.087E+02	1.958E+02	FAIL ABUN
ND-147	-5.266E+02	4.333E+02	7.120E+02	NOT IDENT.
PM-147	4.856E+05	1.771E+06	2.391E+06	FAIL ABUN
PM-149	-7.099E+02	1.801E+03	3.226E+03	NOT IDENT.
EU-152	-6.521E+01	1.896E+02	3.370E+02	FAIL ABUN
GD-153	6.602E+01	1.489E+02	2.617E+02	NOT IDENT.
EU-154	4.407E+00	9.815E+01	1.970E+02	NOT IDENT.
EU-155	1.490E+01	1.830E+02	3.164E+02	NOT IDENT.
TB-160	5.721E+01	2.213E+02	3.925E+02	FAIL ABUN
HO-166M	6.234E+01	8.551E+01	1.626E+02	FAIL ABUN
TM-171	-3.655E+04	8.679E+04	1.384E+05	FAIL ABUN
LU-176	3.653E+00	4.946E+01	9.012E+01	NOT IDENT.
LU-177	-1.009E+02	4.636E+02	7.652E+02	NOT IDENT.
HF-181	-1.978E+01	7.814E+01	1.367E+02	NOT IDENT.
W-181	0.000E+00	8.506E+02	1.716E+03	FAIL ABUN
TA-182	-1.020E+02	1.471E+02	2.570E+02	NOT IDENT.
RE-183	0.000E+00	8.858E+02	1.871E+03	FAIL ABUN
RE-184	-1.614E+01	1.831E+02	3.149E+02	NOT IDENT.
RE-188	-5.889E+01	2.500E+02	4.188E+02	NOT IDENT.
W-188	3.615E+02	1.150E+04	2.095E+04	NOT IDENT.
OS-191	4.015E+01	1.524E+02	2.628E+02	NOT IDENT.
IR-192	3.802E+01	5.610E+01	1.048E+02	NOT IDENT.

PB-201	2.391E+01	2.426E+02	3.972E+02	NOT IDENT.
TL-201	-1.623E+02	4.565E+02	7.576E+02	FAIL ABUN
TL-202	1.887E+01	7.912E+01	1.354E+02	NOT IDENT.
HG-203	-1.481E+01	5.697E+01	1.027E+02	NOT IDENT.
PB-203	-1.841E+01	7.084E+01	1.277E+02	NOT IDENT.
TL-204	2.854E+03	8.222E+03	1.459E+04	NOT IDENT.
BI-207	7.804E+01	9.685E+01	1.883E+02	NOT IDENT.
TL-208	-2.475E+01	6.026E+01	1.047E+02	NOT IDENT.
BI-211	4.224E+02	4.004E+02	7.541E+02	NOT IDENT.
PB-211	-5.633E+02	1.560E+03	2.740E+03	NOT IDENT.
BI-212	-1.846E+02	7.076E+02	1.231E+03	NOT IDENT.
PB-212	-1.438E+01	1.120E+02	1.847E+02	NOT IDENT.
BI-213	5.514E+01	2.593E+02	4.633E+02	NOT IDENT.
BI-214	6.680E+01	1.149E+02	2.127E+02	NOT IDENT.
PB-214	1.487E+02	1.489E+02	2.793E+02	NOT IDENT.
RN-219	-2.461E+02	8.595E+02	1.517E+03	NOT IDENT.
FR-221	-2.535E+02	4.380E+02	7.075E+02	NOT IDENT.
RA-223	5.959E+02	1.208E+03	2.234E+03	NOT IDENT.
RA-224	-3.981E+02	1.214E+03	1.974E+03	NOT IDENT.
AC-225	-2.659E+02	4.594E+02	7.420E+02	NOT IDENT.
RA-226	-5.774E+02	1.327E+03	2.191E+03	NOT IDENT.
AC-227	3.735E+02	4.857E+02	8.374E+02	FAIL ABUN
TH-227	3.735E+02	4.857E+02	8.374E+02	FAIL ABUN
AC-228	-2.916E+01	2.781E+02	4.779E+02	NOT IDENT.
RA-228	-2.916E+01	2.781E+02	4.779E+02	NOT IDENT.
TH-228	-1.438E+01	1.120E+02	1.847E+02	NOT IDENT.
TH-229	-4.265E+02	1.051E+03	1.724E+03	NOT IDENT.
TH-230	2.545E+03	2.003E+04	3.522E+04	NOT IDENT.
PA-231	6.957E+02	8.707E+02	1.634E+03	NOT IDENT.
TH-231	7.581E+02	7.404E+02	1.339E+03	NOT IDENT.
TH-232	-1.426E+04	3.696E+04	5.917E+04	NOT IDENT.
PA-233	2.006E+02	1.263E+02	2.434E+02	NOT IDENT.
PA-234	-3.808E+02	6.889E+02	1.131E+03	NOT IDENT.
PA-234M	-1.074E+04	7.510E+03	1.243E+04	NOT IDENT.
TH-234	1.167E+03	2.611E+03	4.359E+03	NOT IDENT.
U-234	-3.538E+05	3.230E+05	5.056E+05	FAIL ABUN
U-235	-1.624E+02	3.475E+02	5.789E+02	NOT IDENT.
NP-237	2.006E+02	1.263E+02	2.434E+02	NOT IDENT.
NP-238	-1.442E+01	3.714E+02	6.368E+02	NOT IDENT.
U-238	1.167E+03	2.611E+03	4.359E+03	NOT IDENT.
NP-239	-3.239E+02	4.785E+02	7.960E+02	NOT IDENT.
AM-242	-7.451E+02	1.171E+03	1.967E+03	FAIL ABUN
AM-243	4.366E+01	8.683E+01	1.547E+02	NOT IDENT.
CM-243	6.210E+01	1.884E+02	3.294E+02	NOT IDENT.
BK-247	2.650E+01	1.629E+02	2.709E+02	FAIL ABUN
CM-247	-3.273E+01	7.873E+01	1.381E+02	NOT IDENT.
CF-249	1.944E+01	8.529E+01	1.542E+02	NOT IDENT.
CF-251	1.678E+02	2.388E+02	4.147E+02	NOT IDENT.
CF-252	-1.553E+05	3.188E+05	5.384E+05	NOT IDENT.
ANH-511	1.894E+01	5.838E+01	1.087E+02	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.49	3909	2178	1.11	93.41	88	10	4.34E+00	2.7	
2	0	50.02	83	1119	1.11	100.47	99	5	9.18E-02	61.4	
3	0	59.51	11985	2376	1.10	119.45	113	12	1.33E+01	1.2	
4	0	121.17	16	371	0.81	242.69	242	6	1.83E-02	186.1	
5	0	135.20	49	313	1.04	270.73	269	6	5.42E-02	59.1	
6	0	334.92	50	367	2.31	669.99	664	11	5.56E-02	75.8	
7	0	433.28	21	304	0.73	866.62	866	8	2.33E-02	145.5	
8	0	661.48	9114	179	1.52	1322.87	1317	15	1.01E+01	1.1	
9	0	679.44	35	34	1.16	1358.77	1355	8	3.91E-02	33.2	
10	0	746.08	15	69	0.63	1492.01	1485	9	1.66E-02	103.9	
11	0	753.63	32	43	1.89	1507.11	1503	8	3.54E-02	40.5	
12	0	1127.45	15	42	1.23	2254.64	2251	8	1.70E-02	76.7	
13	0	1172.78	2439	32	1.93	2345.30	2337	16	2.71E+00	2.1	
14	0	1177.76	11	18	0.96	2355.24	2352	8	1.26E-02	71.0	
15	0	1331.98	2280	20	2.00	2663.68	2653	20	2.53E+00	2.1	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
CO-57	122.06	16	85.60*	4.666E+00	1.616E+01	1.619E+01	372.15
	136.47	49	10.68	4.654E+00	3.855E+02	3.861E+02	118.22
CO-60	1173.23	2439	99.85	1.139E+00	8.419E+03	8.422E+03	4.18
	1332.49	2280	99.98*	1.026E+00	8.730E+03	8.732E+03	4.30
BA-137M	661.66	9113	89.90*	1.836E+00	2.168E+04	2.168E+04	2.20
CS-137	661.66	9113	85.10*	1.836E+00	2.290E+04	2.290E+04	2.20
PM-147	121.22	16	0.00*	4.666E+00	4.854E+05	4.856E+05	372.15
PB-210	46.54	3908	4.25*	4.477E-01	8.065E+05	8.065E+05	5.50
AM-241	59.54	11985	35.90*	1.555E+00	8.427E+04	8.427E+04	2.45

Flag: "*" = Keyline

Total number of lines in spectrum 15
Number of unidentified lines 2
Number of lines tentatively identified by NID 13 86.67%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
CO-57	271.74D	1.00	1.616E+01	1.619E+01	6.025E+01	372.15	
CO-60	1925.28D	1.00	8.730E+03	8.732E+03	0.375E+03	4.30	
BA-137M	30.08Y	1.00	2.168E+04	2.168E+04	0.048E+04	2.20	
CS-137	30.08Y	1.00	2.290E+04	2.290E+04	0.050E+04	2.20	
PM-147	2.62Y	1.00	4.854E+05	4.856E+05	18.07E+05	372.15	
PB-210	22.20Y	1.00	8.065E+05	8.065E+05	0.443E+05	5.50	
AM-241	432.60Y	1.00	8.427E+04	8.427E+04	0.206E+04	2.45	
Total Activity :			1.429E+06	1.430E+06			

Grand Total Activity : 1.429E+06 1.430E+06

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	50.02	83	1119	1.11	100.47	99	5	9.18E-02	****	6.95E-01	T
0	334.92	50	367	2.31	669.99	664	11	5.56E-02	****	2.94E+00	T
0	433.28	21	304	0.73	866.62	866	8	2.33E-02	****	2.48E+00	T
0	679.44	35	34	1.16	1358.77	1355	8	3.91E-02	66.5	1.80E+00	
0	746.08	15	69	0.63	1492.01	1485	9	1.66E-02	****	1.67E+00	T
0	753.63	32	43	1.89	1507.11	1503	8	3.54E-02	81.1	1.66E+00	T
0	1127.45	15	42	1.23	2254.64	2251	8	1.70E-02	****	1.18E+00	
0	1177.76	11	18	0.96	2355.24	2352	8	1.26E-02	****	1.14E+00	T

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292908.CNF;1
* Acquisition date   : 19-JAN-2023 16:21:23 Sensitivity      : 3.000
* Detector ID        : GAM28 Energy tolerance: 1.500
* Elapsed live time  : 0 00:15:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 00:15:02.24 Half life ratio : *****
* Sample date        : 19-JAN-2023 00:00:00 Nuclide Library : LIQUID
* Sample ID          : G1205292908 Analyst initials: MXR1
* Batch Number       : 2367950 Sample Quantity : 7.6489E-01 FILTER
* Wet wt corr        : 1.00000 Wet Weight : 0.00000
*                                     Dry Weight : 0.00000
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 4-APR-2022 06:19:42 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM28_JAR.CNF;15
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
CO-57	3.711E+01
CO-60	2.895E+01
BA-137M	5.137E+01
CS-137	5.427E+01
PB-210	1.373E+04
AM-241	4.399E+02

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	5.719E+02	NOT IDENT.
NA-22	2.991E+01	NOT IDENT.
NA-24	2.990E+01	NOT IDENT.
AL-26	2.032E+01	NOT IDENT.
K-40	2.356E+02	NOT IDENT.
SC-46	5.793E+01	NOT IDENT.
V-48	6.113E+01	NOT IDENT.
CR-51	4.010E+02	NOT IDENT.
MN-52	1.027E+01	NOT IDENT.
MN-54	5.186E+01	NOT IDENT.
CO-56	4.861E+01	NOT IDENT.
NI-57	3.222E+01	NOT IDENT.
CO-58	4.435E+01	NOT IDENT.
FE-59	1.053E+02	NOT IDENT.
ZN-65	1.170E+02	NOT IDENT.
CU-67	9.161E+01	NOT IDENT.
GE-68	1.870E+03	NOT IDENT.
AS-73	2.855E+03	NOT IDENT.
AS-74	7.241E+01	NOT IDENT.
SE-75	6.571E+01	FAIL ABUN
BR-77	2.058E+02	NOT IDENT.
SR-82	3.112E+02	NOT IDENT.
RB-83	1.103E+02	NOT IDENT.
RB-84	7.782E+01	NOT IDENT.
KR-85	1.069E+04	NOT IDENT.

SR-85	4.824E+01	NOT IDENT.
RB-86	7.236E+02	NOT IDENT.
Y-88	2.710E+01	NOT IDENT.
ZR-88	5.052E+01	NOT IDENT.
Y-91	1.487E+04	NOT IDENT.
NB-94	4.061E+01	NOT IDENT.
NB-95	4.302E+01	NOT IDENT.
NB-95M	1.528E+02	NOT IDENT.
TC-95M	5.942E+01	NOT IDENT.
ZR-95	7.071E+01	NOT IDENT.
MO-99	4.068E+02	NOT IDENT.
TC-99M	2.444E+02	NOT IDENT.
RH-100	8.711E+01	NOT IDENT.
RH-101	4.589E+01	NOT IDENT.
RH-102M	6.497E+01	NOT IDENT.
RU-103	5.523E+01	NOT IDENT.
RH-106	4.322E+02	NOT IDENT.
RU-106	4.322E+02	NOT IDENT.
AG-108M	6.328E+01	FAIL ABUN
CD-109	1.097E+03	NOT IDENT.
AG-110	1.191E+03	NOT IDENT.
AG-110M	7.223E+01	NOT IDENT.
IN-111	4.758E+01	NOT IDENT.
SN-113	7.347E+01	NOT IDENT.
IN-114M	2.464E+02	NOT IDENT.
CD-115	2.230E+02	NOT IDENT.
SN-117M	3.889E+01	NOT IDENT.
SB-122	7.107E+01	NOT IDENT.
I-123	9.278E+01	NOT IDENT.
TE-123M	3.895E+01	NOT IDENT.
SB-124	4.613E+01	NOT IDENT.
SB-125	1.752E+02	NOT IDENT.
TE-125M	1.139E+04	NOT IDENT.
I-126	1.035E+02	FAIL ABUN
SB-126	7.575E+01	NOT IDENT.
SN-126	1.085E+02	NOT IDENT.
SB-127	1.192E+02	NOT IDENT.
TE-129	8.128E+02	NOT IDENT.
I-131	6.185E+01	NOT IDENT.
I-132	4.844E+03	NOT IDENT.
TE-132	5.220E+01	FAIL ABUN
BA-133	7.222E+01	NOT IDENT.
I-133	8.804E+01	NOT IDENT.
CS-134	4.931E+01	NOT IDENT.
I-135	4.812E+02	NOT IDENT.
CS-136	7.232E+01	NOT IDENT.
LA-138	2.495E+01	NOT IDENT.
CE-139	4.081E+01	NOT IDENT.
BA-140	1.912E+02	NOT IDENT.
LA-140	2.209E+01	NOT IDENT.
CE-141	6.407E+01	NOT IDENT.
CE-143	1.306E+02	NOT IDENT.
CE-144	2.847E+02	NOT IDENT.
PM-144	4.002E+01	NOT IDENT.
PR-144	2.974E+03	NOT IDENT.
PM-146	9.456E+01	FAIL ABUN
ND-147	3.366E+02	NOT IDENT.
PM-147	1.156E+06	FAIL ABUN
PM-149	1.548E+03	NOT IDENT.
EU-152	1.617E+02	FAIL ABUN
GD-153	1.266E+02	NOT IDENT.
EU-154	8.425E+01	NOT IDENT.
EU-155	1.527E+02	NOT IDENT.
TB-160	1.842E+02	FAIL ABUN
HO-166M	7.569E+01	FAIL ABUN
TM-171	6.795E+04	FAIL ABUN
LU-176	4.326E+01	NOT IDENT.
LU-177	3.688E+02	NOT IDENT.
HF-181	6.551E+01	NOT IDENT.
W-181	8.461E+02	FAIL ABUN
TA-182	1.106E+02	NOT IDENT.
RE-183	9.250E+02	FAIL ABUN
RE-184	1.476E+02	NOT IDENT.
RE-188	2.019E+02	NOT IDENT.
W-188	1.007E+04	NOT IDENT.
OS-191	1.271E+02	NOT IDENT.
IR-192	5.033E+01	NOT IDENT.
PB-201	1.908E+02	NOT IDENT.

TL-201	3.648E+02	FAIL ABUN
TL-202	6.529E+01	NOT IDENT.
HG-203	4.939E+01	NOT IDENT.
PB-203	6.141E+01	NOT IDENT.
TL-204	7.045E+03	NOT IDENT.
BI-207	8.845E+01	NOT IDENT.
TL-208	4.927E+01	NOT IDENT.
BI-211	3.628E+02	NOT IDENT.
PB-211	1.317E+03	NOT IDENT.
BI-212	5.689E+02	NOT IDENT.
PB-212	8.906E+01	NOT IDENT.
BI-213	2.234E+02	NOT IDENT.
BI-214	1.004E+02	NOT IDENT.
PB-214	1.345E+02	NOT IDENT.
RN-219	7.281E+02	NOT IDENT.
FR-221	3.417E+02	NOT IDENT.
RA-223	1.073E+03	NOT IDENT.
RA-224	9.518E+02	NOT IDENT.
AC-225	3.584E+02	NOT IDENT.
RA-226	1.061E+03	NOT IDENT.
AC-227	4.028E+02	FAIL ABUN
TH-227	4.028E+02	FAIL ABUN
AC-228	2.245E+02	NOT IDENT.
RA-228	2.245E+02	NOT IDENT.
TH-228	8.906E+01	NOT IDENT.
TH-229	8.330E+02	NOT IDENT.
TH-230	1.703E+04	NOT IDENT.
PA-231	7.858E+02	NOT IDENT.
TH-231	6.477E+02	NOT IDENT.
TH-232	2.857E+04	NOT IDENT.
PA-233	1.173E+02	NOT IDENT.
PA-234	5.334E+02	NOT IDENT.
PA-234M	5.732E+03	NOT IDENT.
TH-234	2.106E+03	NOT IDENT.
U-234	2.483E+05	FAIL ABUN
U-235	2.791E+02	NOT IDENT.
NP-237	1.173E+02	NOT IDENT.
NP-238	2.986E+02	NOT IDENT.
U-238	2.106E+03	NOT IDENT.
NP-239	3.838E+02	NOT IDENT.
AM-242	9.503E+02	FAIL ABUN
AM-243	7.473E+01	NOT IDENT.
CM-243	1.591E+02	NOT IDENT.
BK-247	1.303E+02	FAIL ABUN
CM-247	6.628E+01	NOT IDENT.
CF-249	7.414E+01	NOT IDENT.
CF-251	2.003E+02	NOT IDENT.
CF-252	2.600E+05	NOT IDENT.
ANH-511	5.197E+01	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

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* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292908.CNF;1
* Acquisition date   : 19-JAN-2023 16:21:23 Sensitivity      : 3.000
* Detector ID        : GAM28 Energy tolerance: 1.500
* Elapsed live time  : 0 00:15:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 00:15:02.24 Half life ratio  : *****
* Sample date        : 19-JAN-2023 00:00:00 Nuclide Library : LIQUID
* Sample ID          : G1205292908 Analyst initials: MXR1
* Batch Number       : 2367950 Sample Quantity : 7.6489E-01 FILTER
* Quantity Err(%)    : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000
* Dry Weight         : 0.00000

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CALIBRATION INFORMATION

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* Eff. Cal. date     : 4-APR-2022 06:19:42 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM28_JAR.CNF;15

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
CO-57	1.619E+01	5.906E+01	5.906E+01
CO-60	8.732E+03	8.848E+02	9.012E+02
BA-137M	2.168E+04	1.830E+03	1.879E+03
CS-137	2.290E+04	1.932E+03	1.984E+03
PB-210	8.065E+05	8.863E+04	9.003E+04
AM-241	8.427E+04	7.110E+03	7.300E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	-1.325E+02	6.790E+02	6.816E+02	NOT IDENT.
NA-22	-7.880E-01	3.530E+01	3.530E+01	NOT IDENT.
NA-24	-2.893E+01	4.644E+01	4.823E+01	NOT IDENT.
AL-26	1.418E+00	2.402E+01	2.402E+01	NOT IDENT.
K-40	8.239E+01	2.492E+02	2.520E+02	NOT IDENT.
SC-46	2.602E+01	6.907E+01	7.006E+01	NOT IDENT.
V-48	-8.421E+00	7.653E+01	7.662E+01	NOT IDENT.
CR-51	-4.820E+02	4.853E+02	5.318E+02	NOT IDENT.
MN-52	-1.293E+01	1.910E+01	1.997E+01	NOT IDENT.
MN-54	-3.947E+01	6.689E+01	6.922E+01	NOT IDENT.
CO-56	-3.555E+01	6.288E+01	6.490E+01	NOT IDENT.
NI-57	-4.824E+01	5.168E+01	5.608E+01	NOT IDENT.
CO-58	-8.524E+00	5.498E+01	5.512E+01	NOT IDENT.
FE-59	5.624E+01	1.178E+02	1.205E+02	NOT IDENT.
ZN-65	-2.242E+01	1.380E+02	1.384E+02	NOT IDENT.
CU-67	2.925E+01	1.110E+02	1.118E+02	NOT IDENT.
GE-68	2.151E+02	2.153E+03	2.155E+03	NOT IDENT.
AS-73	-3.889E+03	3.797E+03	4.182E+03	NOT IDENT.
AS-74	-5.504E+01	9.079E+01	9.413E+01	NOT IDENT.
SE-75	-2.655E+01	8.436E+01	8.521E+01	FAIL ABUN
BR-77	-6.332E+01	2.605E+02	2.620E+02	NOT IDENT.
SR-82	1.998E+02	3.606E+02	3.717E+02	NOT IDENT.
RB-83	9.798E+01	1.258E+02	1.333E+02	NOT IDENT.
RB-84	-4.632E-01	9.566E+01	9.566E+01	NOT IDENT.

KR-85	-4.199E+03	1.290E+04	1.304E+04	NOT IDENT.
SR-85	-1.894E+01	5.820E+01	5.883E+01	NOT IDENT.
RB-86	2.552E+02	8.199E+02	8.280E+02	NOT IDENT.
Y-88	1.333E+01	2.861E+01	2.923E+01	NOT IDENT.
ZR-88	-4.292E+00	5.896E+01	5.899E+01	NOT IDENT.
Y-91	3.217E+03	1.695E+04	1.701E+04	NOT IDENT.
NB-94	-8.851E+00	4.988E+01	5.004E+01	NOT IDENT.
NB-95	-1.187E+01	5.337E+01	5.363E+01	NOT IDENT.
NB-95M	-3.802E+01	1.933E+02	1.941E+02	NOT IDENT.
TC-95M	3.765E+01	7.197E+01	7.395E+01	NOT IDENT.
ZR-95	-3.960E+01	1.019E+02	1.034E+02	NOT IDENT.
MO-99	-7.506E+01	5.263E+02	5.274E+02	NOT IDENT.
TC-99M	2.177E+01	2.965E+02	2.967E+02	NOT IDENT.
RH-100	-6.269E+01	1.079E+02	1.116E+02	NOT IDENT.
RH-101	-1.483E+01	5.639E+01	5.679E+01	NOT IDENT.
RH-102M	5.465E+01	7.436E+01	7.834E+01	NOT IDENT.
RU-103	5.054E+01	6.249E+01	6.652E+01	NOT IDENT.
RH-106	-6.517E+01	5.227E+02	5.235E+02	NOT IDENT.
RU-106	-6.517E+01	5.227E+02	5.235E+02	NOT IDENT.
AG-108M	3.669E+01	1.046E+02	1.059E+02	FAIL ABUN
CD-109	1.092E+03	1.269E+03	1.362E+03	NOT IDENT.
AG-110	6.669E+02	1.544E+03	1.573E+03	NOT IDENT.
AG-110M	-3.181E+01	9.168E+01	9.280E+01	NOT IDENT.
IN-111	-3.721E+01	6.178E+01	6.402E+01	NOT IDENT.
SN-113	-2.289E+01	8.652E+01	8.713E+01	NOT IDENT.
IN-114M	-6.187E+01	3.076E+02	3.089E+02	NOT IDENT.
CD-115	3.629E+02	2.446E+02	2.944E+02	NOT IDENT.
SN-117M	7.067E+00	4.733E+01	4.743E+01	NOT IDENT.
SB-122	-1.388E+01	8.556E+01	8.579E+01	NOT IDENT.
I-123	-1.615E+01	1.145E+02	1.147E+02	NOT IDENT.
TE-123M	-5.370E+00	4.799E+01	4.805E+01	NOT IDENT.
SB-124	3.118E+01	4.353E+01	4.575E+01	NOT IDENT.
SB-125	-1.255E+02	2.107E+02	2.182E+02	NOT IDENT.
TE-125M	-9.410E+03	1.418E+04	1.480E+04	NOT IDENT.
I-126	-2.523E+01	1.432E+02	1.437E+02	FAIL ABUN
SB-126	-8.880E+00	9.254E+01	9.263E+01	NOT IDENT.
SN-126	8.439E+01	1.262E+02	1.318E+02	NOT IDENT.
SB-127	4.811E+01	1.392E+02	1.408E+02	NOT IDENT.
TE-129	3.461E+02	9.419E+02	9.548E+02	NOT IDENT.
I-131	4.166E+01	6.987E+01	7.236E+01	NOT IDENT.
I-132	-5.236E+03	7.261E+03	7.636E+03	NOT IDENT.
TE-132	3.952E+01	6.340E+01	6.586E+01	FAIL ABUN
BA-133	-2.341E+01	8.461E+01	8.527E+01	NOT IDENT.
I-133	-8.067E+01	1.097E+02	1.156E+02	NOT IDENT.
CS-134	8.943E+00	5.921E+01	5.934E+01	NOT IDENT.
I-135	4.514E+01	5.545E+02	5.549E+02	NOT IDENT.
CS-136	7.215E+00	8.318E+01	8.324E+01	NOT IDENT.
LA-138	6.407E+00	2.696E+01	2.711E+01	NOT IDENT.
CE-139	2.615E+01	4.915E+01	5.055E+01	NOT IDENT.
BA-140	1.005E+02	2.203E+02	2.249E+02	NOT IDENT.
LA-140	9.332E+00	2.294E+01	2.333E+01	NOT IDENT.
CE-141	-1.421E+01	7.888E+01	7.914E+01	NOT IDENT.
CE-143	2.734E+01	1.483E+02	1.488E+02	NOT IDENT.
CE-144	-1.259E+02	3.820E+02	3.862E+02	NOT IDENT.
PM-144	-1.652E+01	4.985E+01	5.040E+01	NOT IDENT.
PR-144	-1.214E+03	3.704E+03	3.744E+03	NOT IDENT.
PM-146	5.470E+01	1.088E+02	1.116E+02	FAIL ABUN
ND-147	-5.266E+02	4.356E+02	4.962E+02	NOT IDENT.
PM-147	4.856E+05	1.772E+06	1.785E+06	FAIL ABUN
PM-149	-7.099E+02	1.804E+03	1.832E+03	NOT IDENT.
EU-152	-6.521E+01	1.897E+02	1.920E+02	FAIL ABUN
GD-153	6.602E+01	1.490E+02	1.520E+02	NOT IDENT.
EU-154	4.407E+00	9.816E+01	9.818E+01	NOT IDENT.
EU-155	1.490E+01	1.830E+02	1.831E+02	NOT IDENT.
TB-160	5.721E+01	2.213E+02	2.228E+02	FAIL ABUN
HO-166M	6.234E+01	8.570E+01	9.020E+01	FAIL ABUN
TM-171	-3.655E+04	8.686E+04	8.842E+04	FAIL ABUN
LU-176	3.653E+00	4.946E+01	4.949E+01	NOT IDENT.
LU-177	-1.009E+02	4.637E+02	4.659E+02	NOT IDENT.
HF-181	-1.978E+01	7.815E+01	7.866E+01	NOT IDENT.
W-181	8.080E+03	2.250E+03	4.284E+03	FAIL ABUN
TA-182	-1.020E+02	1.473E+02	1.544E+02	NOT IDENT.
RE-183	1.334E+04	1.701E+03	6.255E+03	FAIL ABUN
RE-184	-1.614E+01	1.831E+02	1.833E+02	NOT IDENT.
RE-188	-5.889E+01	2.500E+02	2.514E+02	NOT IDENT.
W-188	3.615E+02	1.150E+04	1.150E+04	NOT IDENT.
OS-191	4.015E+01	1.525E+02	1.535E+02	NOT IDENT.
IR-192	3.802E+01	5.619E+01	5.875E+01	NOT IDENT.

PB-201	2.391E+01	2.426E+02	2.428E+02	NOT IDENT.
TL-201	-1.623E+02	4.566E+02	4.625E+02	FAIL ABUN
TL-202	1.887E+01	7.914E+01	7.960E+01	NOT IDENT.
HG-203	-1.481E+01	5.698E+01	5.737E+01	NOT IDENT.
PB-203	-1.841E+01	7.086E+01	7.135E+01	NOT IDENT.
TL-204	2.854E+03	8.227E+03	8.327E+03	NOT IDENT.
BI-207	7.804E+01	9.710E+01	1.033E+02	NOT IDENT.
TL-208	-2.475E+01	6.030E+01	6.132E+01	NOT IDENT.
BI-211	4.224E+02	4.020E+02	4.449E+02	NOT IDENT.
PB-211	-5.633E+02	1.560E+03	1.581E+03	NOT IDENT.
BI-212	-1.846E+02	7.078E+02	7.127E+02	NOT IDENT.
PB-212	-1.438E+01	1.120E+02	1.122E+02	NOT IDENT.
BI-213	5.514E+01	2.593E+02	2.605E+02	NOT IDENT.
BI-214	6.680E+01	1.150E+02	1.189E+02	NOT IDENT.
PB-214	1.487E+02	1.494E+02	1.638E+02	NOT IDENT.
RN-219	-2.461E+02	8.602E+02	8.674E+02	NOT IDENT.
FR-221	-2.535E+02	4.387E+02	4.534E+02	NOT IDENT.
RA-223	5.959E+02	1.209E+03	1.239E+03	NOT IDENT.
RA-224	-3.981E+02	1.214E+03	1.227E+03	NOT IDENT.
AC-225	-2.659E+02	4.601E+02	4.755E+02	NOT IDENT.
RA-226	-5.774E+02	1.327E+03	1.353E+03	NOT IDENT.
AC-227	3.735E+02	4.889E+02	5.171E+02	FAIL ABUN
TH-227	3.735E+02	4.889E+02	5.171E+02	FAIL ABUN
AC-228	-2.916E+01	2.781E+02	2.784E+02	NOT IDENT.
RA-228	-2.916E+01	2.781E+02	2.784E+02	NOT IDENT.
TH-228	-1.438E+01	1.120E+02	1.122E+02	NOT IDENT.
TH-229	-4.265E+02	1.052E+03	1.069E+03	NOT IDENT.
TH-230	2.545E+03	2.003E+04	2.007E+04	NOT IDENT.
PA-231	6.957E+02	8.846E+02	9.386E+02	NOT IDENT.
TH-231	7.581E+02	7.489E+02	8.233E+02	NOT IDENT.
TH-232	-1.426E+04	3.700E+04	3.756E+04	NOT IDENT.
PA-233	2.006E+02	1.274E+02	1.563E+02	NOT IDENT.
PA-234	-3.808E+02	8.157E+02	8.336E+02	NOT IDENT.
PA-234M	-1.074E+04	7.578E+03	8.995E+03	NOT IDENT.
TH-234	1.167E+03	2.624E+03	2.676E+03	NOT IDENT.
U-234	-3.538E+05	3.246E+05	3.618E+05	FAIL ABUN
U-235	-1.624E+02	3.478E+02	3.554E+02	NOT IDENT.
NP-237	2.006E+02	1.274E+02	1.563E+02	NOT IDENT.
NP-238	-1.442E+01	3.714E+02	3.715E+02	NOT IDENT.
U-238	1.167E+03	2.624E+03	2.676E+03	NOT IDENT.
NP-239	-3.239E+02	4.794E+02	5.011E+02	NOT IDENT.
AM-242	-7.451E+02	1.179E+03	1.226E+03	FAIL ABUN
AM-243	4.366E+01	8.690E+01	8.911E+01	NOT IDENT.
CM-243	6.210E+01	1.886E+02	1.906E+02	NOT IDENT.
BK-247	2.650E+01	1.630E+02	1.634E+02	FAIL ABUN
CM-247	-3.273E+01	7.896E+01	8.033E+01	NOT IDENT.
CF-249	1.944E+01	8.532E+01	8.577E+01	NOT IDENT.
CF-251	1.678E+02	2.397E+02	2.514E+02	NOT IDENT.
CF-252	-1.553E+05	3.486E+05	3.556E+05	NOT IDENT.
ANH-511	1.894E+01	5.840E+01	5.903E+01	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	849.9544	81.00	292.6071	121.12	255.0256
45.60	827.8130	81.07	305.5853	121.22	246.5602
46.54	829.9072	82.35	295.3383	121.78	262.7126
49.72	680.6262	82.47	295.4061	122.06	262.8182
51.35	936.1560	82.47	295.4061	123.07	264.2606
52.39	1002.2429	83.79	259.1087	123.68	265.9115
53.20	1081.7823	84.00	259.2095	127.16	266.8564
53.44	1082.4203	84.21	247.2940	127.23	266.8811
56.28	1152.8438	84.86	274.6522	129.43	266.6182
57.36	721.8891	85.43	280.9570	131.20	296.3627
57.53	722.1740	86.55	301.6319	133.02	275.1260
57.53	722.1797	86.79	288.6860	133.52	275.3125
57.98	722.9326	86.94	288.7649	135.34	265.5052
59.32	725.1708	87.09	282.8030	136.00	267.5484
59.54	725.5371	87.57	256.8560	136.28	267.6463
61.49	272.8803	88.03	257.0661	136.47	267.7141
63.00	234.1355	88.34	259.2255	140.51	268.4094
63.29	245.8071	88.47	259.2843	140.88	245.6131
63.58	274.1467	91.11	294.9474	143.76	256.3874
63.81	274.2849	91.27	295.0296	144.24	248.8701
64.28	280.9814	92.59	270.2983	145.44	242.6630
64.99	289.1235	93.31	237.0584	152.32	235.8939
65.08	289.1808	94.56	296.6969	152.43	235.9264
66.73	250.5427	94.65	296.7435	153.25	240.5986
66.98	250.6770	94.67	296.7524	154.21	215.3490
67.24	273.0864	97.43	272.5165	155.04	248.9033
67.67	273.3360	98.43	282.2027	156.02	245.8598
67.75	273.3811	98.44	282.2090	158.56	245.4959
68.89	278.8940	99.53	292.9952	158.97	260.1305
68.89	278.8961	100.11	282.9832	159.00	259.0211
69.67	264.7451	100.20	283.0231	162.33	230.9013
70.82	244.8817	102.03	268.3809	162.66	224.2645
70.82	244.8836	103.18	247.1598	163.33	236.7858
70.83	244.8874	103.37	247.2346	165.86	221.7272
72.81	257.6285	105.31	246.9591	167.43	239.0402
72.87	257.6586	106.12	247.2733	171.28	241.2273
74.66	246.7813	106.47	247.4095	176.31	246.0092
74.82	246.8579	109.28	261.0188	176.60	260.8991
74.97	246.9326	111.00	269.0351	177.52	230.3723
77.11	285.5074	111.76	259.9145	181.07	277.0689
79.69	264.0863	112.95	262.4817	184.41	270.0298
79.82	264.1532	116.24	297.5338	184.58	267.7779
80.02	264.2506	116.30	297.5596	185.72	303.7797
80.03	264.2547	116.74	270.3008	186.21	315.4495
80.12	261.3205	117.23	253.5901	190.27	304.0938
80.19	261.3546	119.76	296.9467	193.51	290.0429
80.22	261.3727	120.54	264.7226	197.03	261.9896
80.57	292.3693	120.90	254.9451	198.01	279.7375

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
201.83	239.8715	306.78	187.0580	492.35	132.3118
204.12	238.0796	308.46	195.8464	497.08	124.9510
205.31	214.8804	311.90	170.6229	511.00	126.8210
208.37	243.8005	316.51	166.0400	514.00	133.8054
210.85	266.8266	319.41	181.9120	520.40	115.7558
215.65	257.3994	320.08	203.5615	520.69	115.7703
218.12	294.8708	321.04	202.8424	522.65	114.9127
222.11	269.7337	323.87	179.9010	527.90	93.7344
227.09	286.5805	325.23	222.5012	529.59	117.2656
227.38	273.4636	328.76	191.8148	529.87	131.9458
228.16	232.8527	331.15	191.7083	531.02	135.9288
228.18	232.8586	333.37	191.5735	537.26	98.0957
235.69	235.6716	334.37	191.7078	539.51	104.0936
235.96	206.7181	338.28	193.9790	546.56	115.2957
238.63	241.1466	338.32	193.9835	552.55	88.9453
238.98	247.2803	340.48	196.0273	563.25	107.2793
240.99	252.5828	340.55	210.0391	564.24	95.4063
242.00	222.4253	344.28	197.4197	569.33	94.6405
244.70	263.1610	345.93	172.1699	569.50	94.6482
245.35	245.0270	351.06	173.6535	569.70	94.6560
250.62	233.9091	351.93	183.4600	582.08	80.1725
252.40	207.2865	356.01	202.5368	583.19	94.2524
252.80	203.6752	361.25	212.1203	595.83	97.8249
256.23	180.8935	364.49	186.7834	600.60	71.7569
260.90	212.4962	366.42	191.4713	604.72	66.8298
264.66	220.6042	383.85	191.8352	609.32	79.1426
265.00	205.7877	388.16	195.9720	610.33	86.2832
269.46	199.0869	388.63	194.2226	614.28	88.4691
271.23	201.8672	391.70	200.9346	618.01	83.5248
273.65	203.5112	392.87	203.7964	621.93	84.6886
276.40	201.0491	400.66	180.2069	630.19	67.5872
277.37	203.7106	401.32	176.6414	631.29	75.8157
277.60	197.0652	401.81	199.4623	632.98	78.9457
278.00	204.6502	402.40	201.3559	633.25	74.8535
278.43	200.5420	404.85	214.4318	634.78	94.3996
279.20	216.5500	410.95	197.8242	635.95	66.7297
279.54	210.7537	414.70	226.7282	636.99	84.2188
280.46	207.5648	423.72	232.5586	657.50	102.5731
283.69	192.9909	427.09	206.2042	657.76	102.5852
284.31	199.8053	427.87	228.5021	661.66	86.1442
285.41	207.5369	433.94	215.8496	664.57	38.9679
285.90	204.2551	439.51	229.1185	666.33	46.7963
287.50	198.6208	440.45	233.8980	666.50	46.7999
290.67	199.1154	446.15	227.1797	667.71	60.8708
293.27	185.1466	453.88	240.3802	677.62	42.3144
295.22	194.7363	459.60	243.9718	685.70	50.3164
295.96	175.3638	463.37	250.1466	692.65	60.9713
298.58	199.4861	468.07	250.7882	695.00	56.8213
299.98	188.6494	473.00	252.4110	696.49	66.3300
300.09	188.6675	475.06	217.5435	696.51	66.3300
300.13	188.6720	476.78	249.1271	697.00	56.8652
301.36	179.4908	477.60	234.9646	697.49	53.7164
302.85	199.2799	477.99	217.8882	702.65	64.3831
304.50	180.7685	482.18	183.0977	706.68	66.6017
304.85	180.8159	487.02	130.9823	711.68	45.5493

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
720.70	56.3405	911.20	81.9229	1298.22	9.5148
721.93	54.2415	923.98	83.4052	1312.11	9.5471
722.78	63.8354	926.36	78.8969	1332.49	10.5535
722.91	63.8379	935.54	87.1545	1362.15	5.7975
723.31	59.5911	937.49	90.6526	1365.19	3.8677
724.19	51.0957	944.13	98.8951	1368.63	5.8063
727.33	55.4214	945.96	108.1558	1377.63	11.6367
733.00	67.2938	946.00	108.1558	1384.29	8.7413
735.93	52.3995	949.00	103.6523	1408.01	3.9063
739.50	61.6805	954.55	95.7594	1434.09	3.9294
744.23	48.2739	962.31	91.3663	1435.80	1.9655
747.24	54.7748	964.08	98.3573	1457.56	5.9253
752.31	64.5654	966.17	78.7384	1460.82	3.9531
753.82	48.4515	968.97	71.8515	1489.16	1.9889
756.73	56.5887	983.53	76.8335	1553.35	6.0498
763.94	57.2830	984.45	76.8550	1596.21	2.0347
765.80	62.7295	996.26	78.0081	1620.50	5.1123
766.42	55.1732	1001.03	76.3666	1678.03	0.0000
766.84	53.0175	1004.73	55.3615	1690.97	1.0370
772.60	58.5527	1025.87	68.9772	1757.55	2.1008
776.52	54.2948	1028.54	62.8357	1764.49	0.0000
777.92	70.6177	1037.84	70.1086	1770.23	0.0000
778.90	66.2968	1038.76	63.9141	1771.35	0.0000
783.70	56.6147	1046.59	59.6105	1791.20	2.1143
788.74	50.1759	1048.07	56.9648	1808.65	3.1818
792.07	53.5120	1050.41	55.2225	1836.06	3.1979
795.86	50.3050	1063.66	61.6932		
801.95	53.7054	1077.00	60.1381		
802.10	52.6113	1077.34	62.8351		
810.29	61.5599	1083.85	68.3462		
810.45	61.5644	1085.87	70.1876		
810.76	59.3723	1099.25	50.5791		
815.77	69.3907	1107.22	66.0805		
818.51	58.4346	1111.64	74.3225		
822.65	70.6654	1112.07	72.5146		
832.01	69.7906	1112.84	61.6499		
834.85	89.8198	1115.54	62.6071		
835.15	87.6117	1120.29	52.6935		
836.80	73.2375	1120.55	52.6970		
846.77	76.8304	1121.30	51.7989		
856.80	69.2757	1129.67	52.4672		
860.56	67.1265	1131.51	33.5364		
871.09	88.6982	1173.23	30.9668		
873.19	89.8861	1177.95	28.0528		
875.33	61.8414	1189.05	26.8406		
879.38	70.9340	1204.77	19.5157		
880.51	65.3279	1221.41	20.5337		
881.60	70.9852	1231.02	14.9707		
883.24	69.8963	1235.36	18.7341		
884.68	77.8271	1238.28	11.2485		
889.28	73.4265	1260.41	7.5410		
894.76	73.5614	1271.87	10.3984		
898.04	77.0396	1274.44	11.3511		
903.28	77.1724	1274.54	12.2978		
907.67	79.5561	1291.59	10.4495		

Continuing Calibration Data

Review of Gamma Spectrometer QA results (Daily calibration & background checks)
19-JAN-2023 09:09:00

Run Date	Detector	Parameter	Flag	Status	Comments
19-JAN-23	GAM01	All Parameters Passed			
19-JAN-23	GAM02	All Parameters Passed			
19-JAN-23	GAM03	Cal Check PSFWHM-59	Action	Lockout	Detector locked out.
19-JAN-23	GAM03	Cal Check PSFWHM-662	Action	Lockout	Detector locked out.
19-JAN-23	GAM04	Cal Check NLACTVTY-59	Investigate		
19-JAN-23	GAM05	All Parameters Passed			
19-JAN-23	GAM06	All Parameters Passed			
19-JAN-23	GAM07	All Parameters Passed			
19-JAN-23	GAM08	Cal Check PSFWHM-662	Action	Approved	Low FWHM, approved for use.
19-JAN-23	GAM08	Cal Check NLACTVTY-662	Investigate		
19-JAN-23	GAM09	All Parameters Passed			
19-JAN-23	GAM10	All Parameters Passed			
19-JAN-23	GAM11	All Parameters Passed			
19-JAN-23	GAM12	Bkg Check BACKRATE	Investigate		
19-JAN-23	GAM14	All Parameters Passed			
19-JAN-23	GAM16	All Parameters Passed			
19-JAN-23	GAM18	Cal Check NLACTVTY-662	Investigate		
19-JAN-23	GAM19	All Parameters Passed			
19-JAN-23	GAM20	All Parameters Passed			
	GAM21	Cal Check may not have run since 19-JAN-2023			Detector locked out.
	GAM21	Bkg Check may not have run since 19-JAN-2023			Detector locked out.
	GAM22	Cal Check may not have run since 19-JAN-2023			Detector locked out.
05-APR-20	GAM22	Bkg Check may not have run since 19-JAN-2023			Detector locked out.
19-JAN-23	GAM23	Bkg Check BACKRATE	Investigate		
19-JAN-23	GAM24	All Parameters Passed			
19-JAN-23	GAM27	All Parameters Passed			
19-JAN-23	GAM28	All Parameters Passed			
19-JAN-23	GAM29	All Parameters Passed			
19-JAN-23	GAM30	All Parameters Passed			
19-JAN-23	GAM31	All Parameters Passed			
19-JAN-23	GAM32	All Parameters Passed			
19-JAN-23	GAM33	All Parameters Passed			
19-JAN-23	GAM34	All Parameters Passed			
21-DEC-22	GAM36	Cal Check may not have run since 19-JAN-2023			Detector locked out.
01-JAN-23	GAM36	Bkg Check may not have run since 19-JAN-2023			Detector locked out.
19-JAN-23	GAM38	All Parameters Passed			
19-JAN-23	GAM40	All Parameters Passed			
19-JAN-23	GAM41	Cal Check PSFWHM-59	Investigate		
19-JAN-23	GAM43	All Parameters Passed			

31-DEC-22	GAM44	Cal Check may not have run since 19-JAN-2023			Detector locked out.
15-JAN-23	GAM44	Bkg Check may not have run since 19-JAN-2023			Detector locked out.
19-JAN-23	GAM45	All Parameters Passed			
19-JAN-23	GAM46	Cal Check PSFWHM-1332	Action	Approved	Low FWHM, approved for use.
19-JAN-23	GAM47	All Parameters Passed			
19-JAN-23	XRAY1	All Parameters Passed			
19-JAN-23	XRAY2	Cal Check PSFWHM-40	Investigate		
19-JAN-23	XRAY3	All Parameters Passed			
19-JAN-23	XRAY4	All Parameters Passed			
19-JAN-23	XRAY6	Cal Check PSFWHM-40	Investigate		
19-JAN-23	XRAY7	All Parameters Passed			

APPROVAL DATE: 19-JAN-2023

APPROVAL TIME: 10:25:27

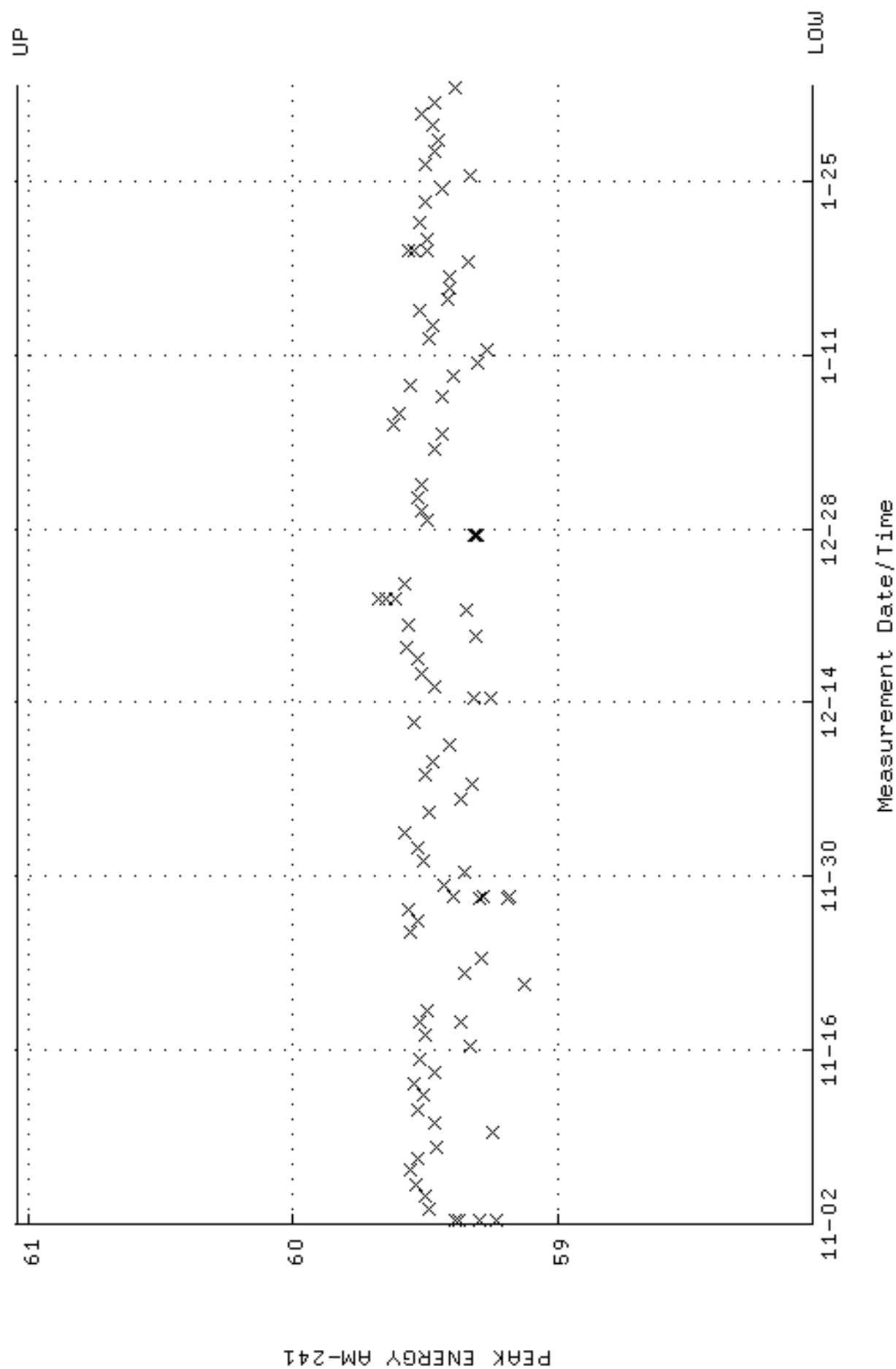
APPROVED BY: Rebekah Futch

PROCEDURE # GL-RAD-I-001

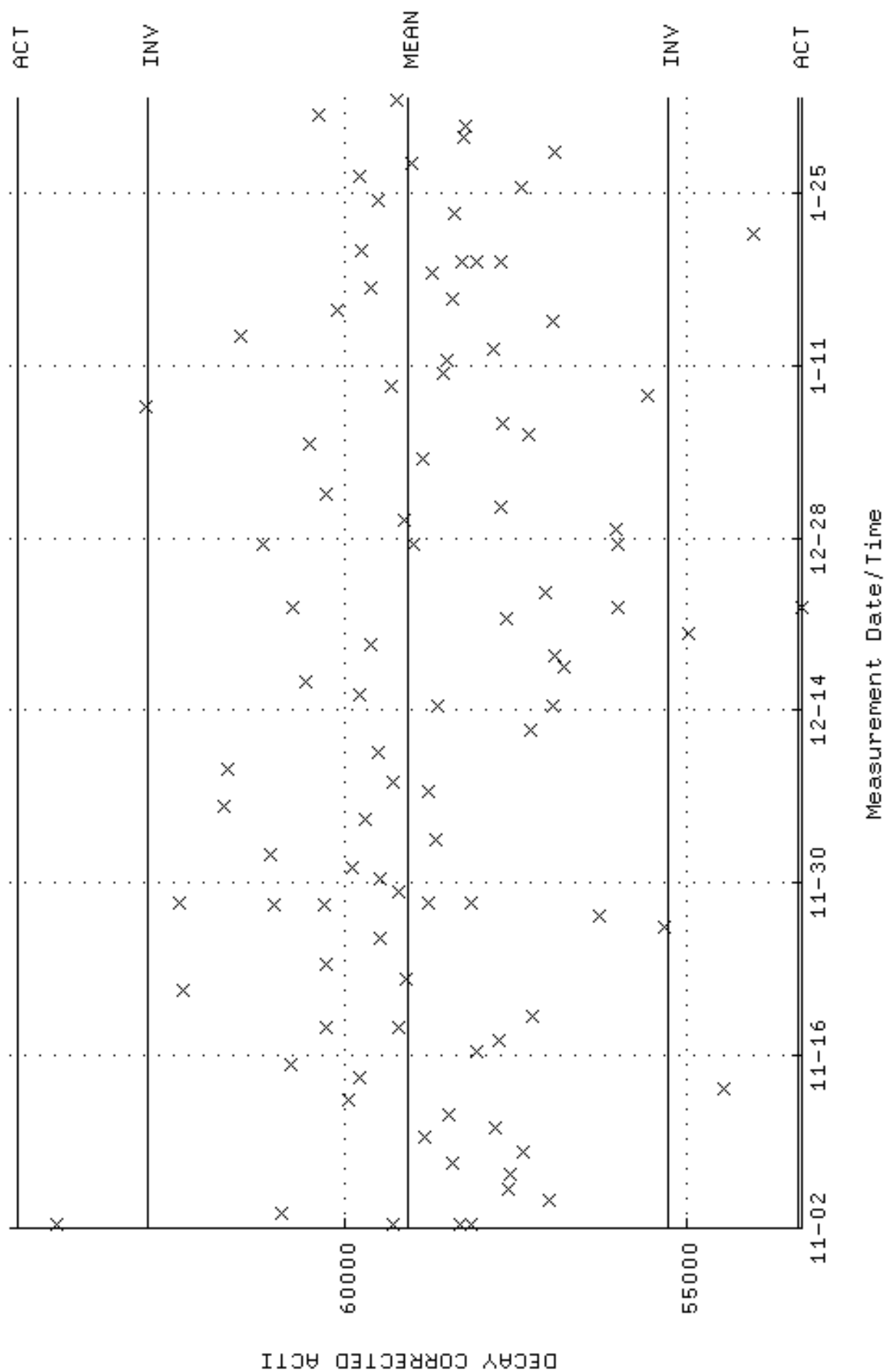
The Investigate flag does not indicate a lockout and is approved for use. Action flags that have not been approved are locked out of service.

Background and Efficiency Data

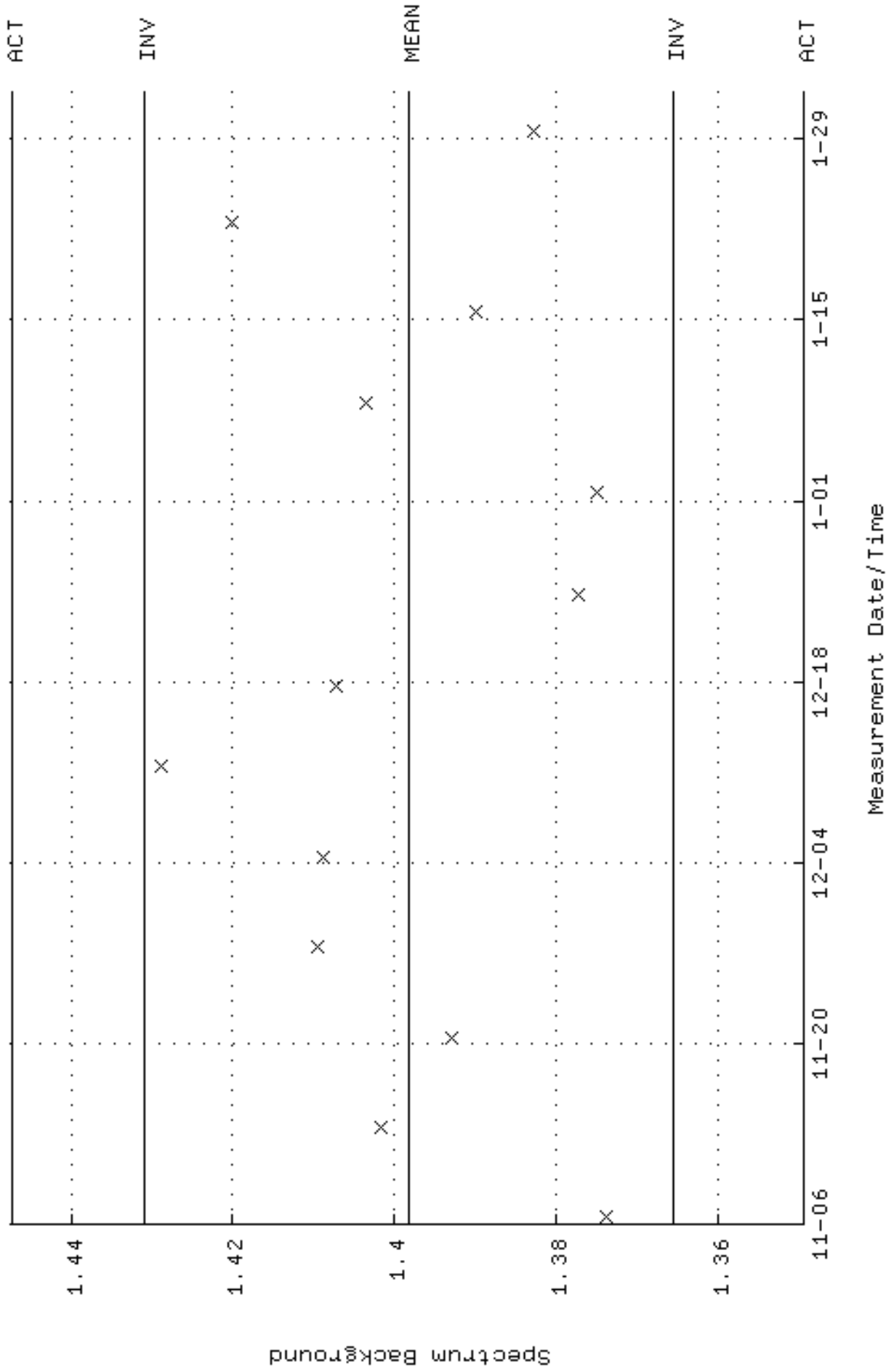
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM08_JAR.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-NOV-2022 06:43:35 through 1-FEB-2023 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



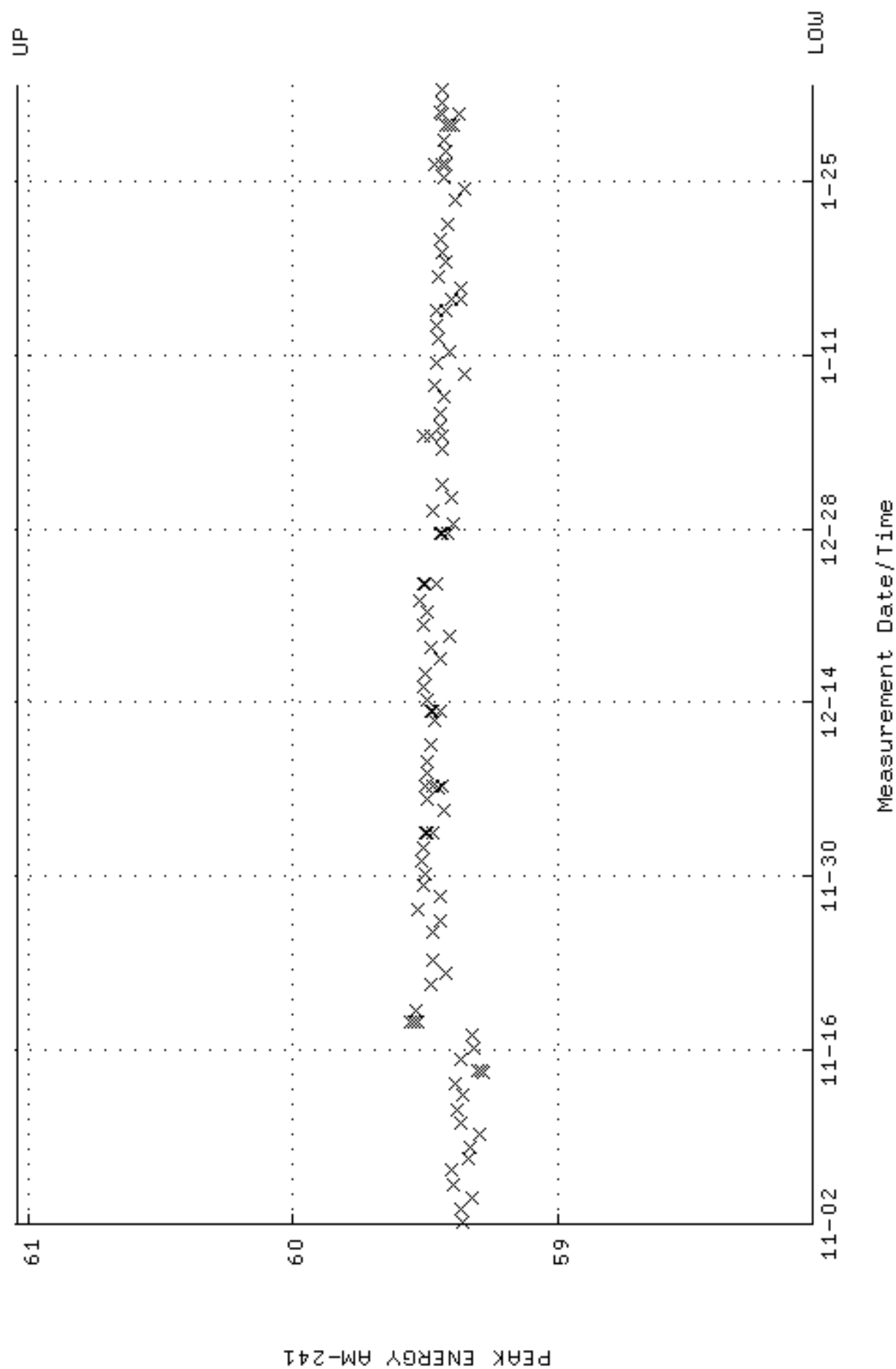
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM08-JAR.QAF;1
 Parameter Name : NLACTIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-NOV-2022 06:43:35 through 1-FEB-2023 12:00:00
 Mean +- Std Dev : 59094.1 +- 1904.09 (3.22 %)



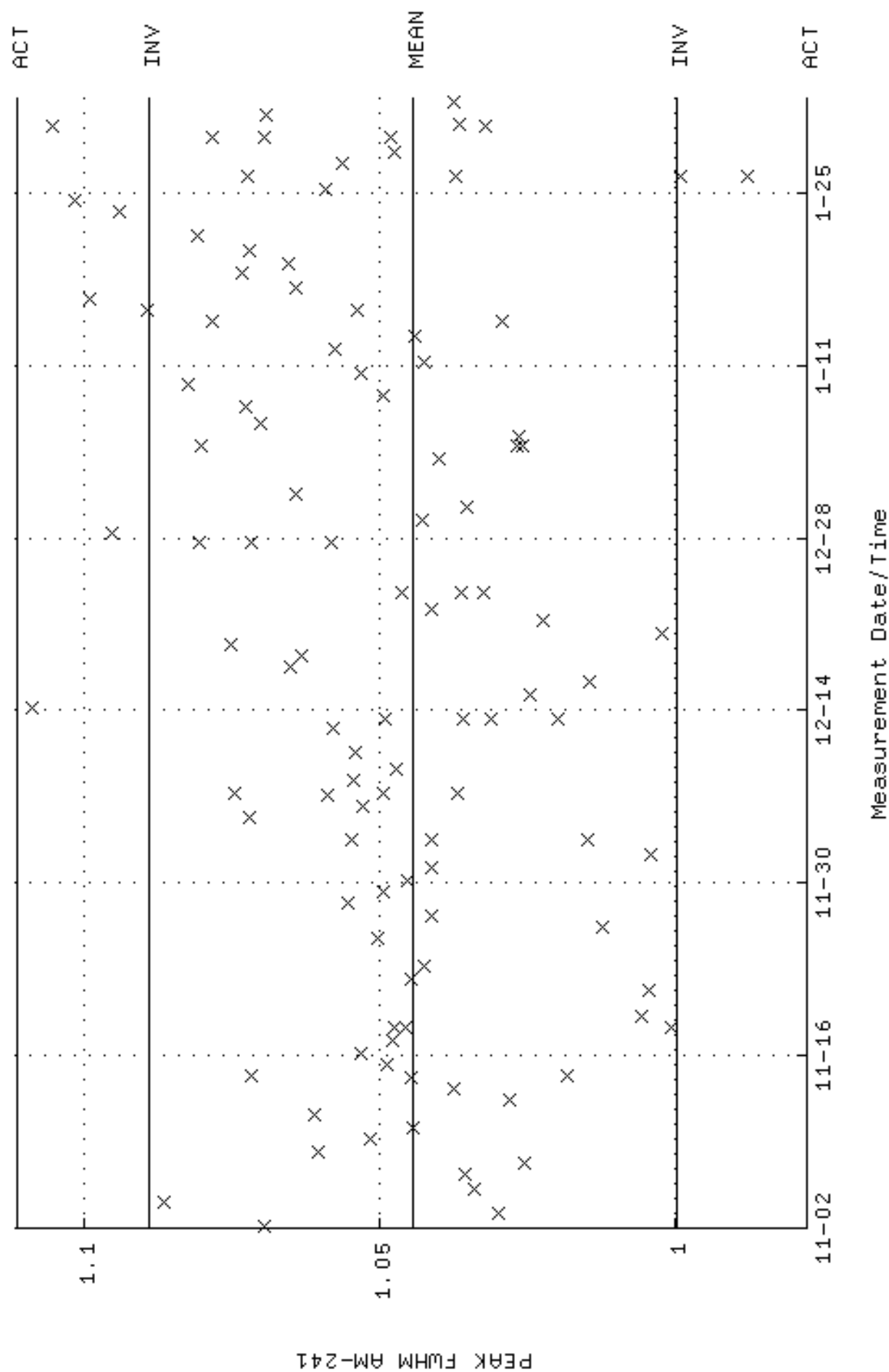
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM08.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-NOV-2022 12:17:12 through 1-FEB-2023 12:00:00
Mean +- Std Dev : 1.39831 +- 1.633876E-02 (1.17 %)



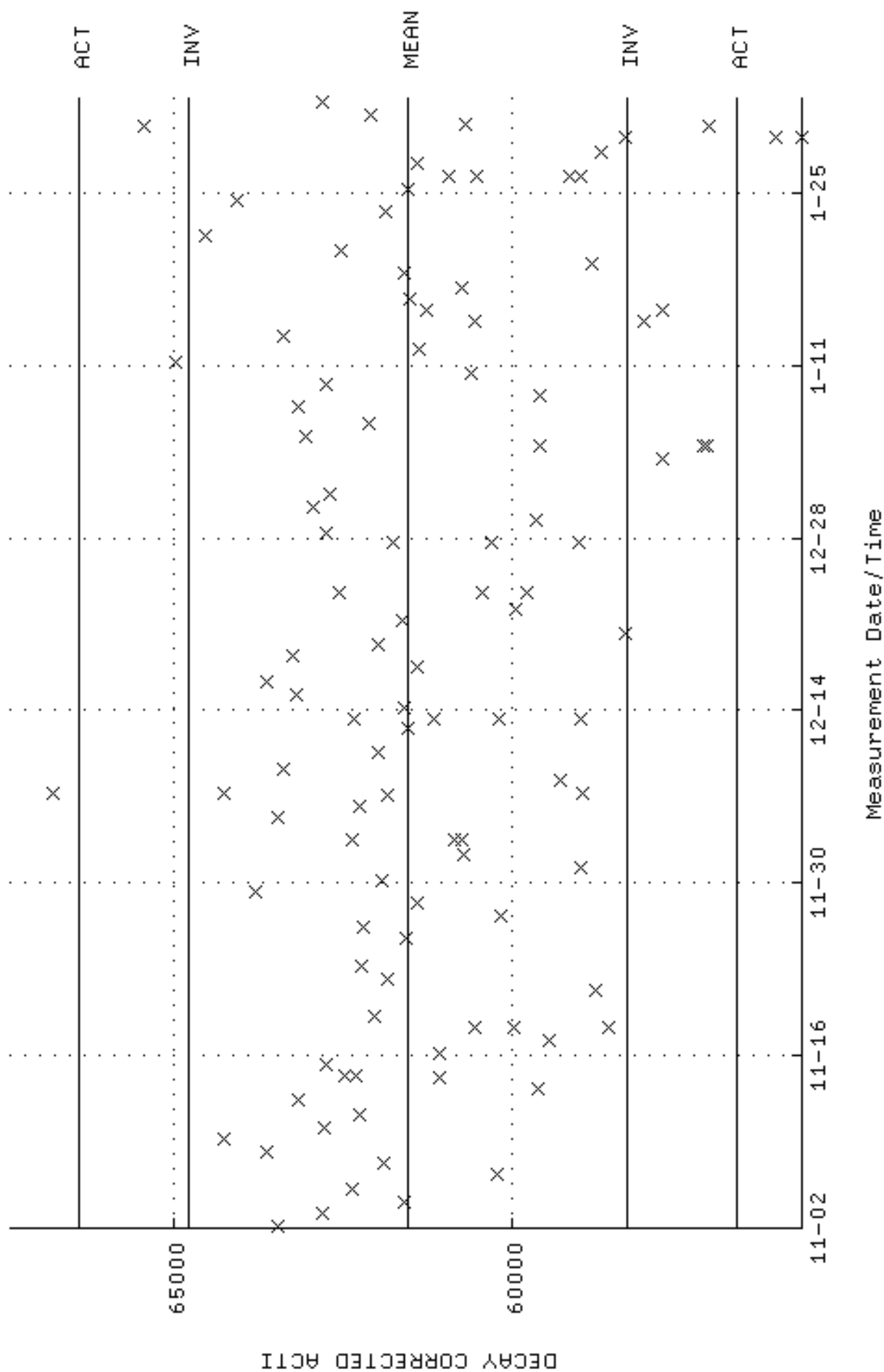
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM18_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-NOV-2022 04:21:00 through 1-FEB-2023 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



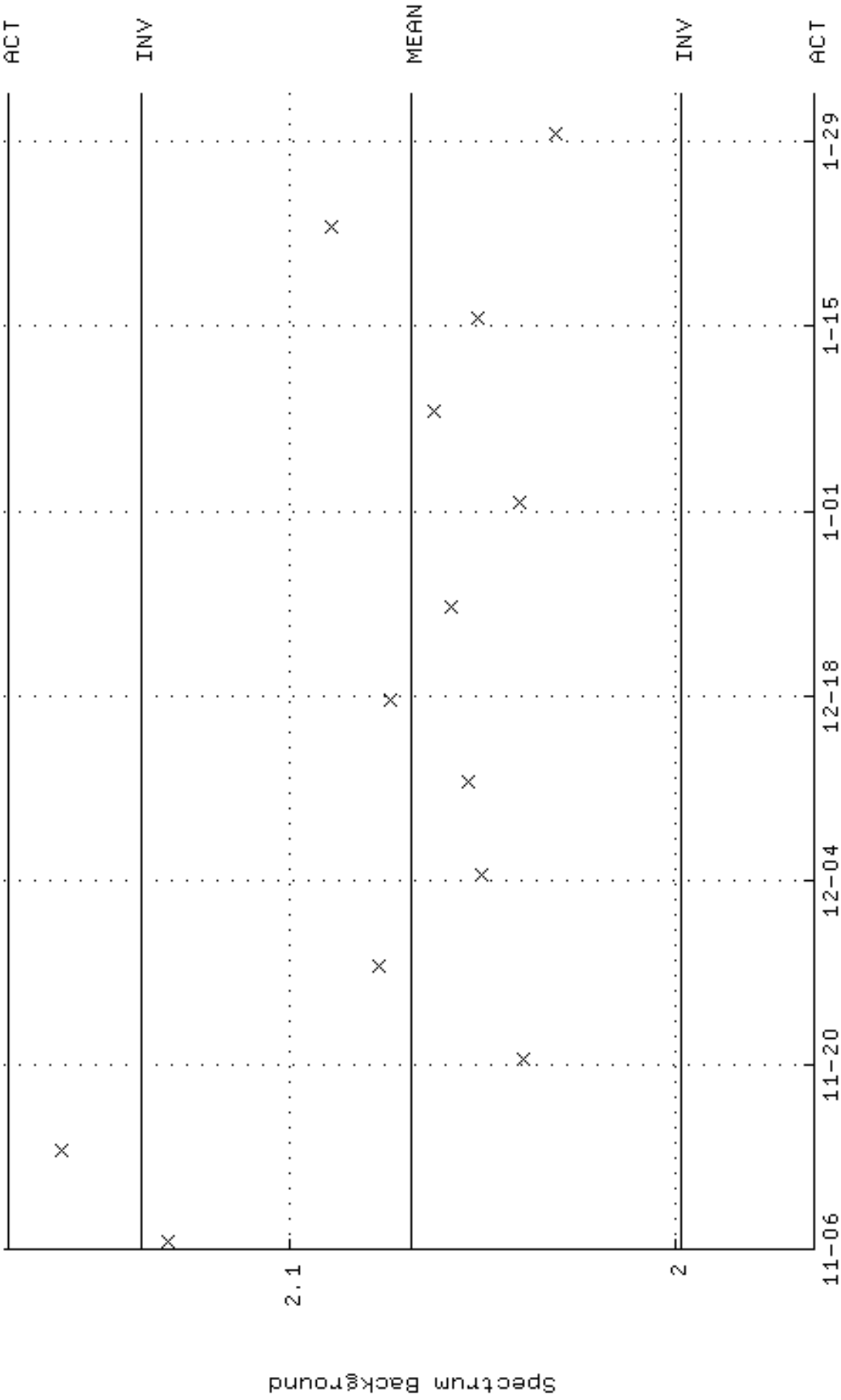
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM18-CAN.QAF;1
 Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
 Start/End Dates : 2-NOV-2022 04:21:00 through 1-FEB-2023 12:00:00
 Mean +- Std Dev : 1.04459 +- 2.228501E-02 (2.13 %)



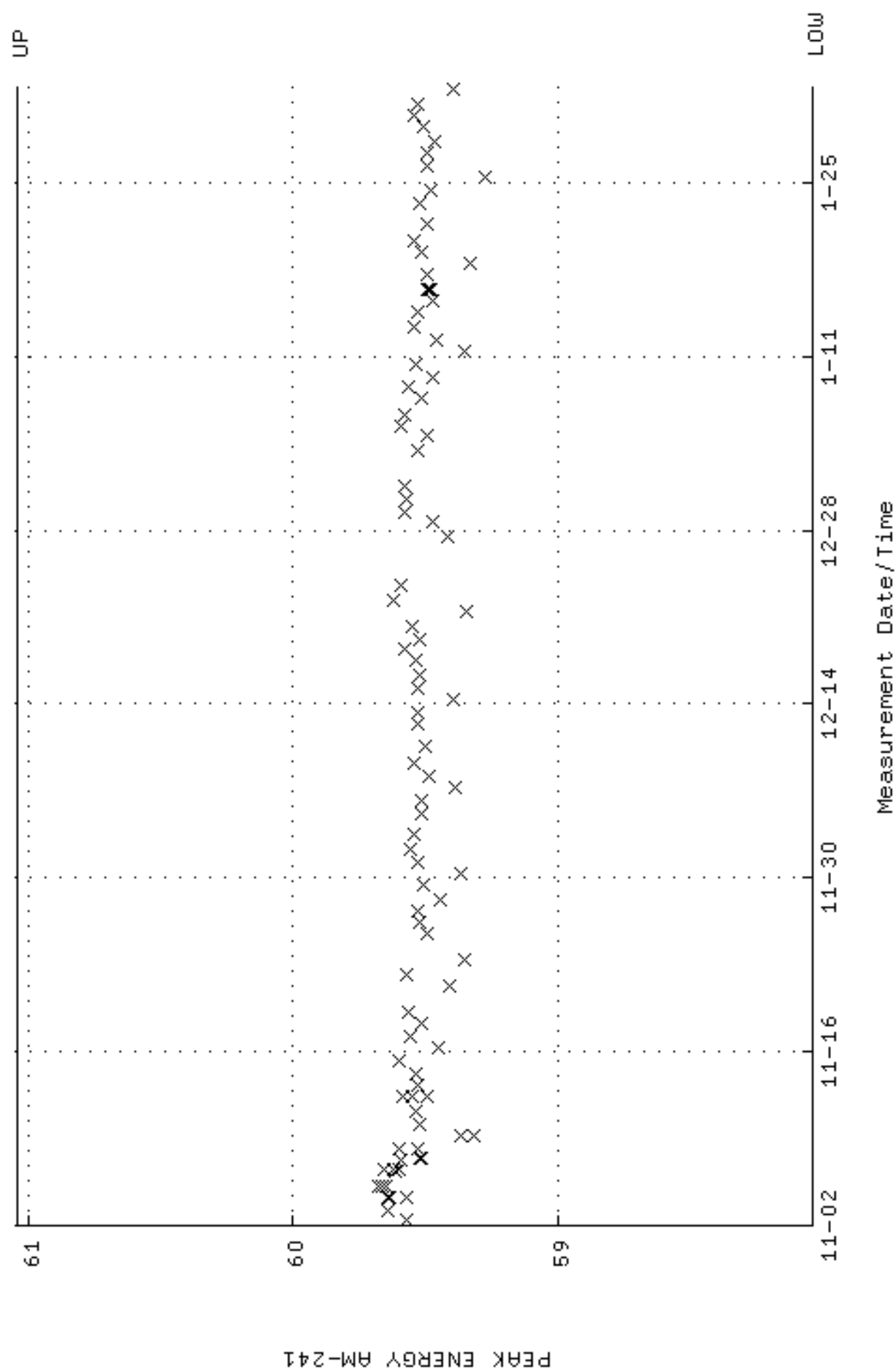
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM18-CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-NOV-2022 04:21:00 through 1-FEB-2023 12:00:00
 Mean +- Std Dev : 61551.9 +- 1620.98 (2.63 %)



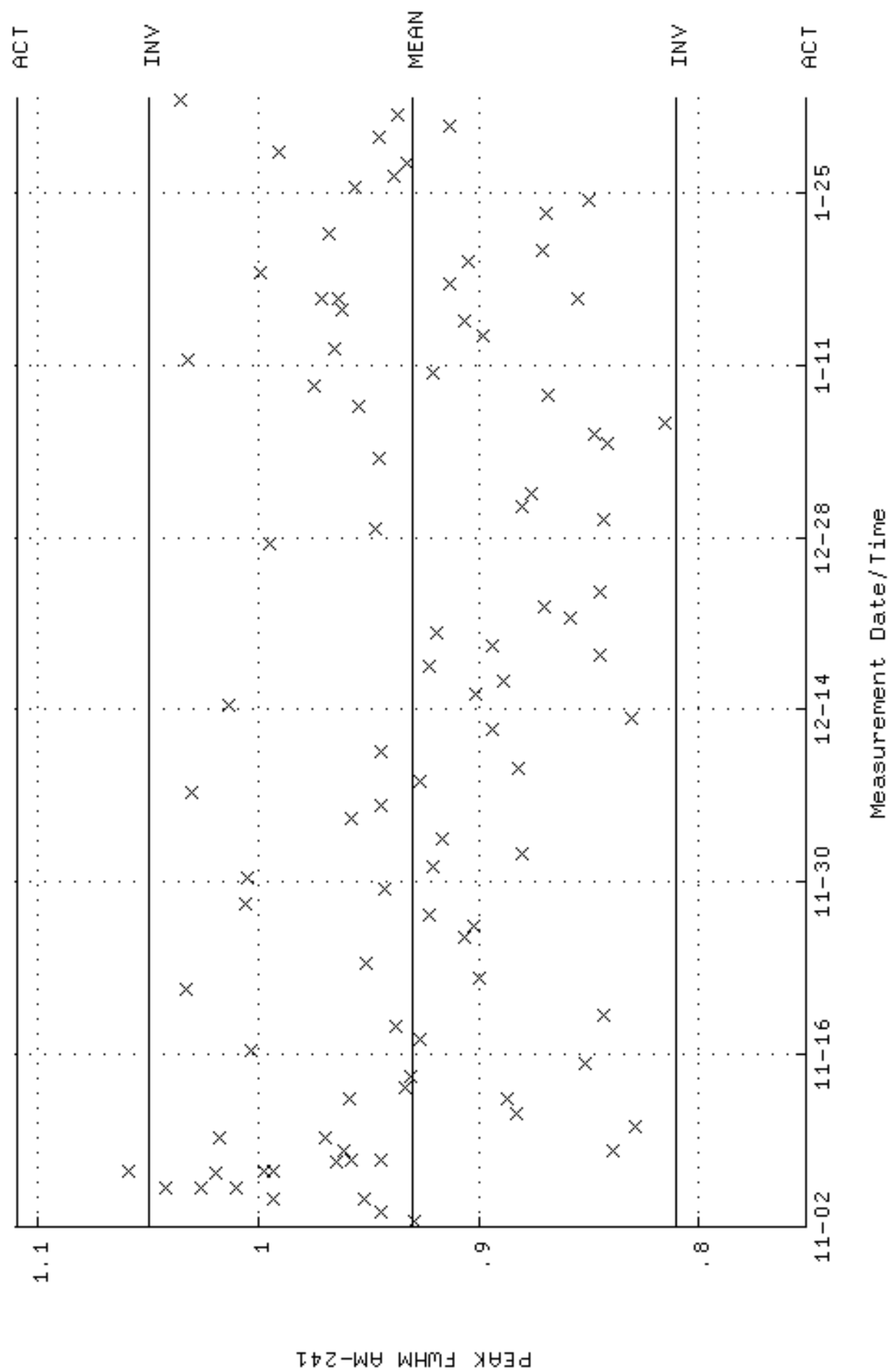
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM18.QAF;1
 Parameter Name : BACKRATE (Spectrum Background Rate)
 Start/End Dates : 6-NOV-2022 12:20:06 through 1-FEB-2023 12:00:00
 Mean +- Std Dev : 2.06891 +- 3.494266E-02 (1.69 %)



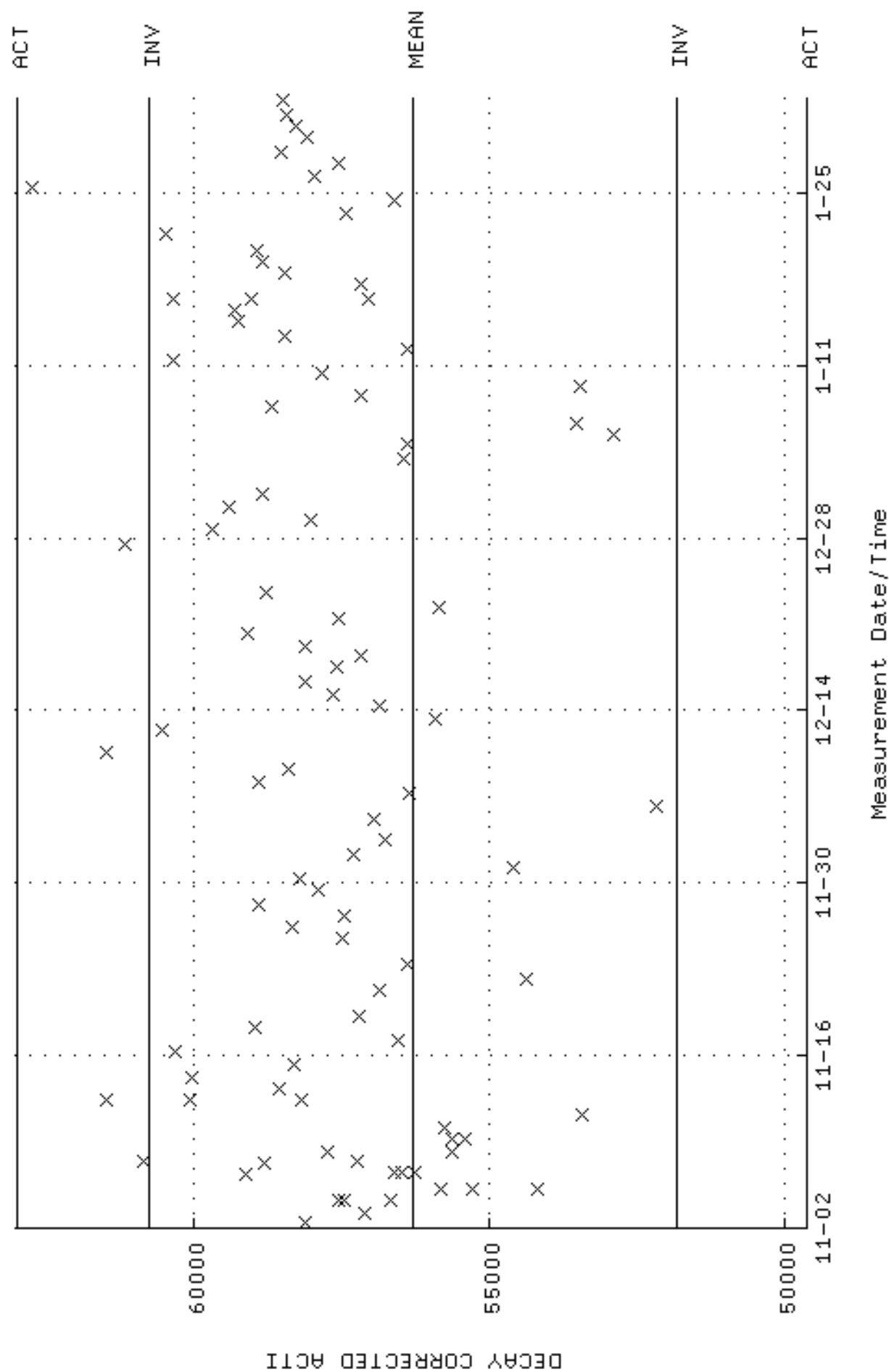
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM23_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-NOV-2022 10:25:18 through 1-FEB-2023 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



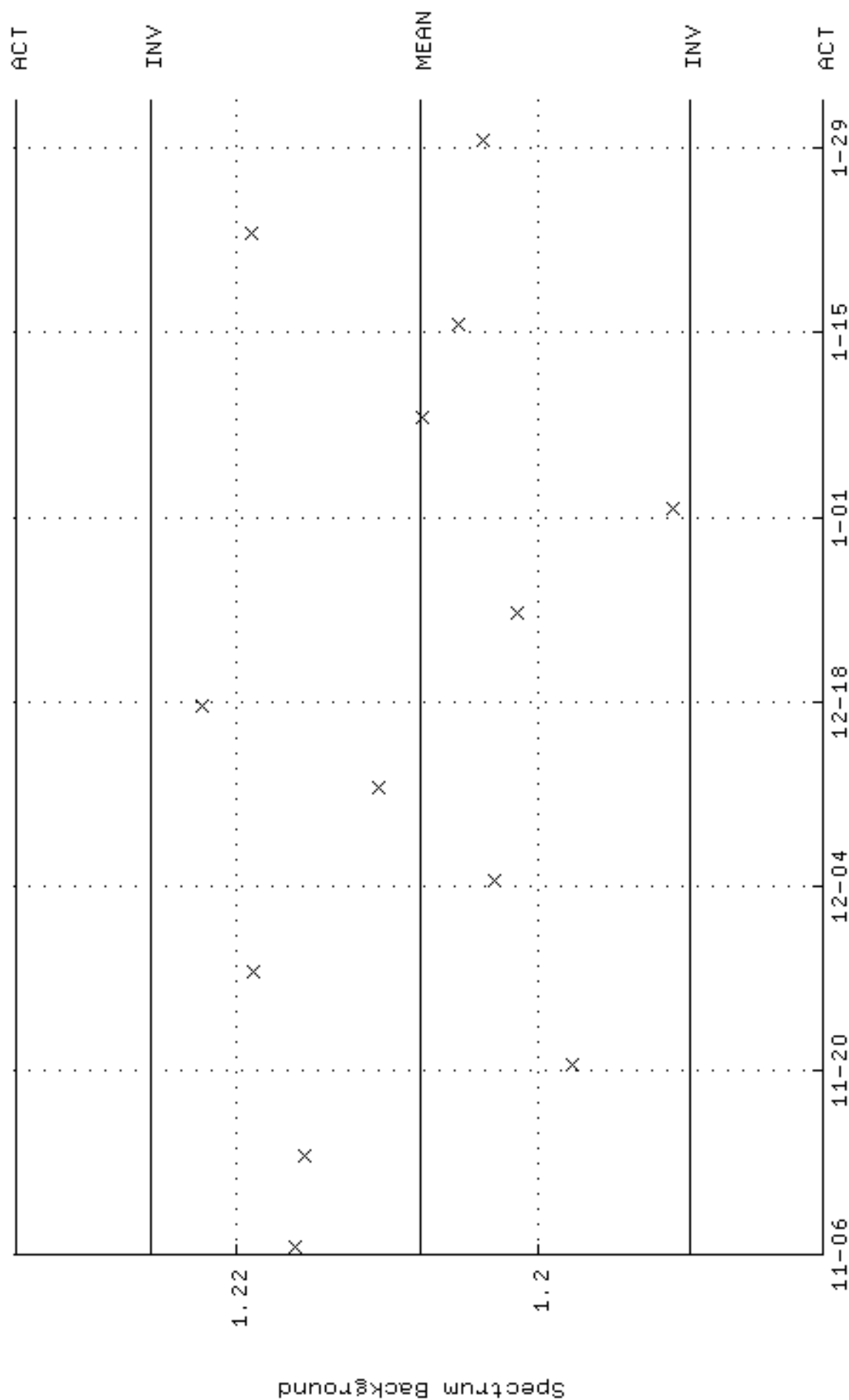
QA filename : DKA100:[CANSERRA.GAMMA.SCUSR.QA]QCC_GAM23_CAN.QAF;1
 Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
 Start/End Dates : 2-NOV-2022 10:25:18 through 1-FEB-2023 12:00:00
 Mean +- Std Dev : 0.930295 +- 5.954588E-02 (6.40 %)



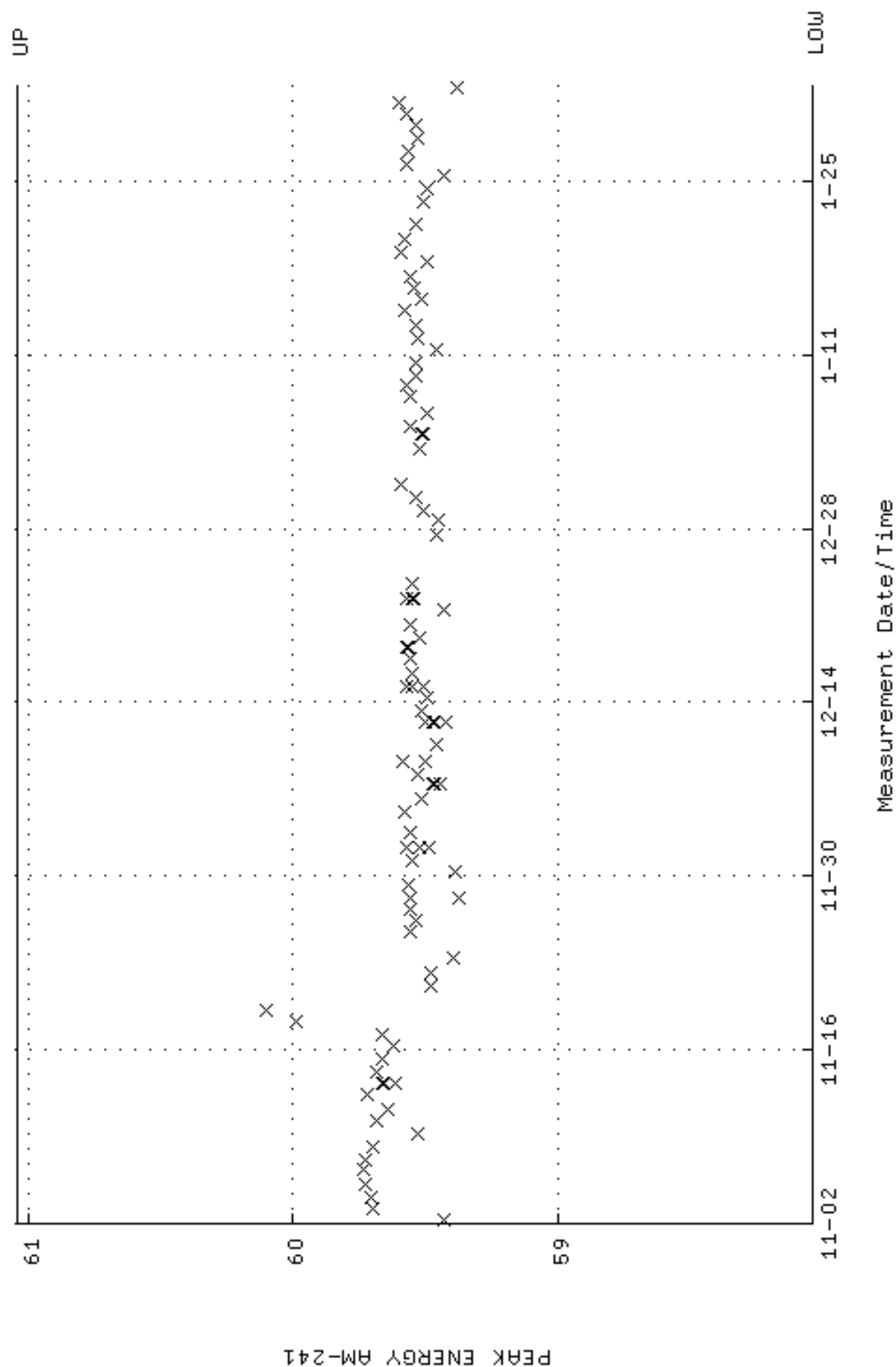
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM23-CAN.QAF;1
 Parameter Name : NLACTIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-NOV-2022 10:25:18 through 1-FEB-2023 12:00:00
 Mean +- Std Dev : 56301.4 +- 2221.15 (3.95 %)



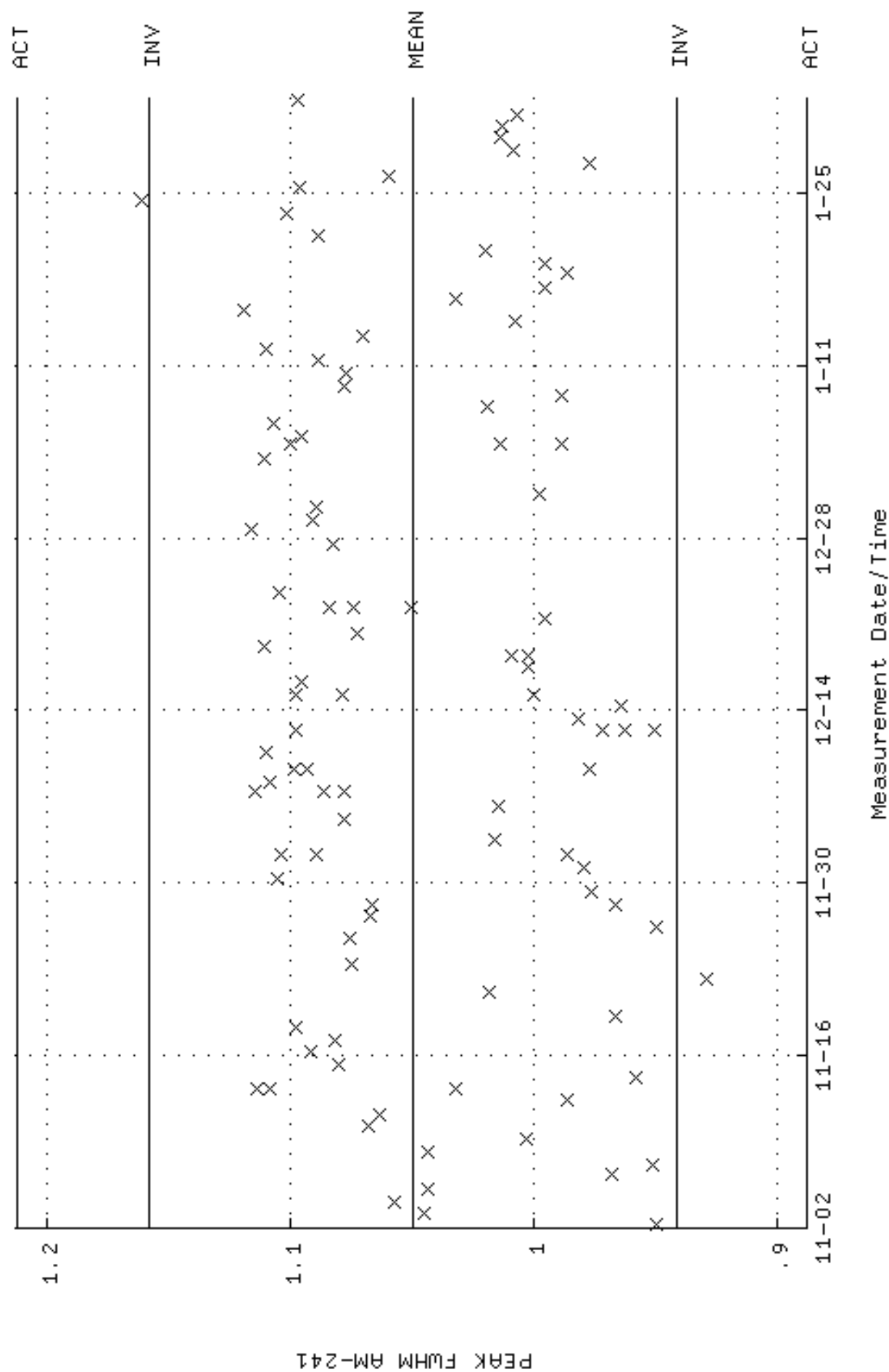
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM23.QAF;1
 Parameter Name : BACKRATE (Spectrum Background Rate)
 Start/End Dates : 6-NOV-2022 12:12:46 through 1-FEB-2023 12:00:00
 Mean +- Std Dev : 1.20785 +- 8.929818E-03 (0.74 %)



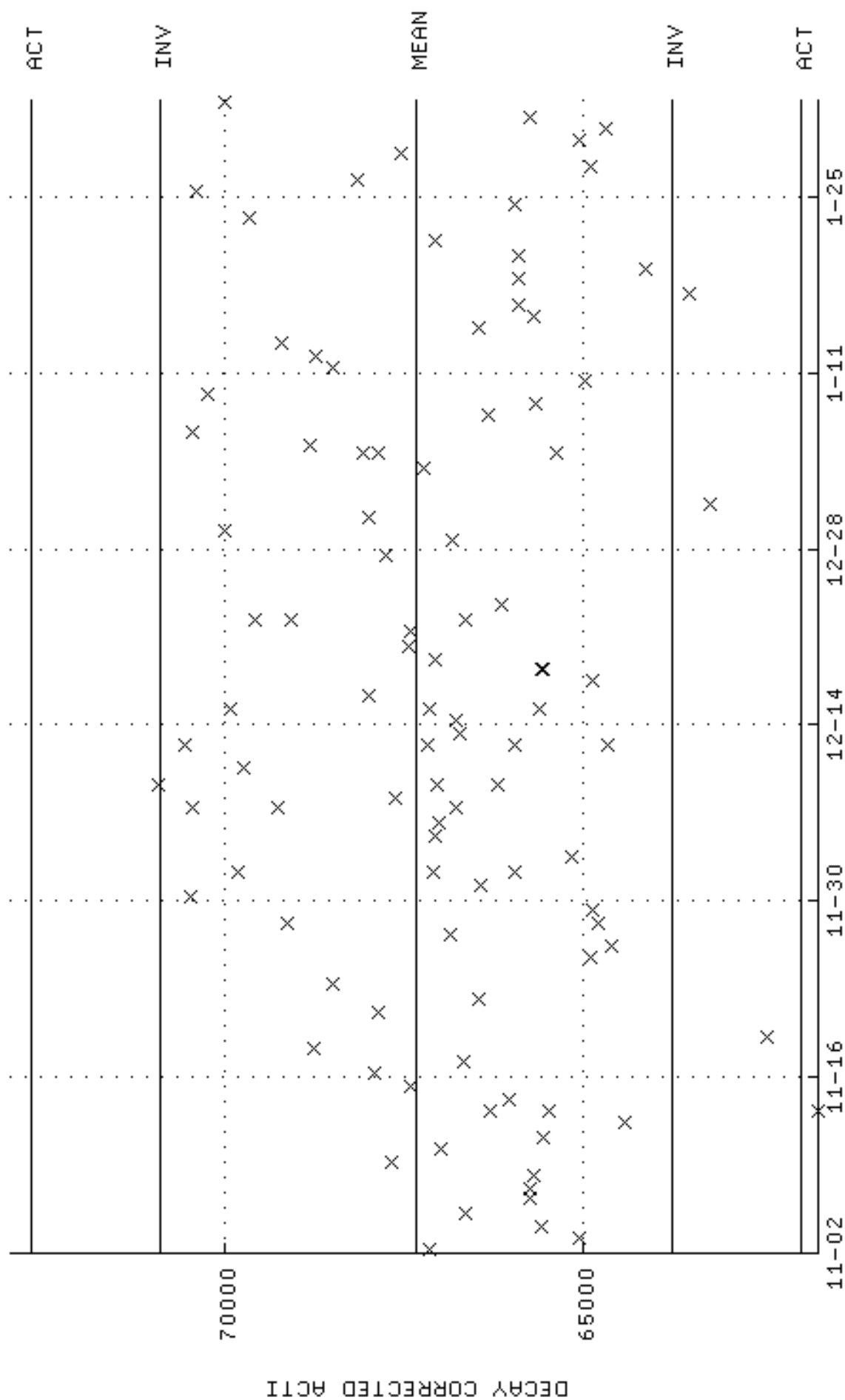
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM28_JAR.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-NOV-2022 06:22:27 through 1-FEB-2023 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



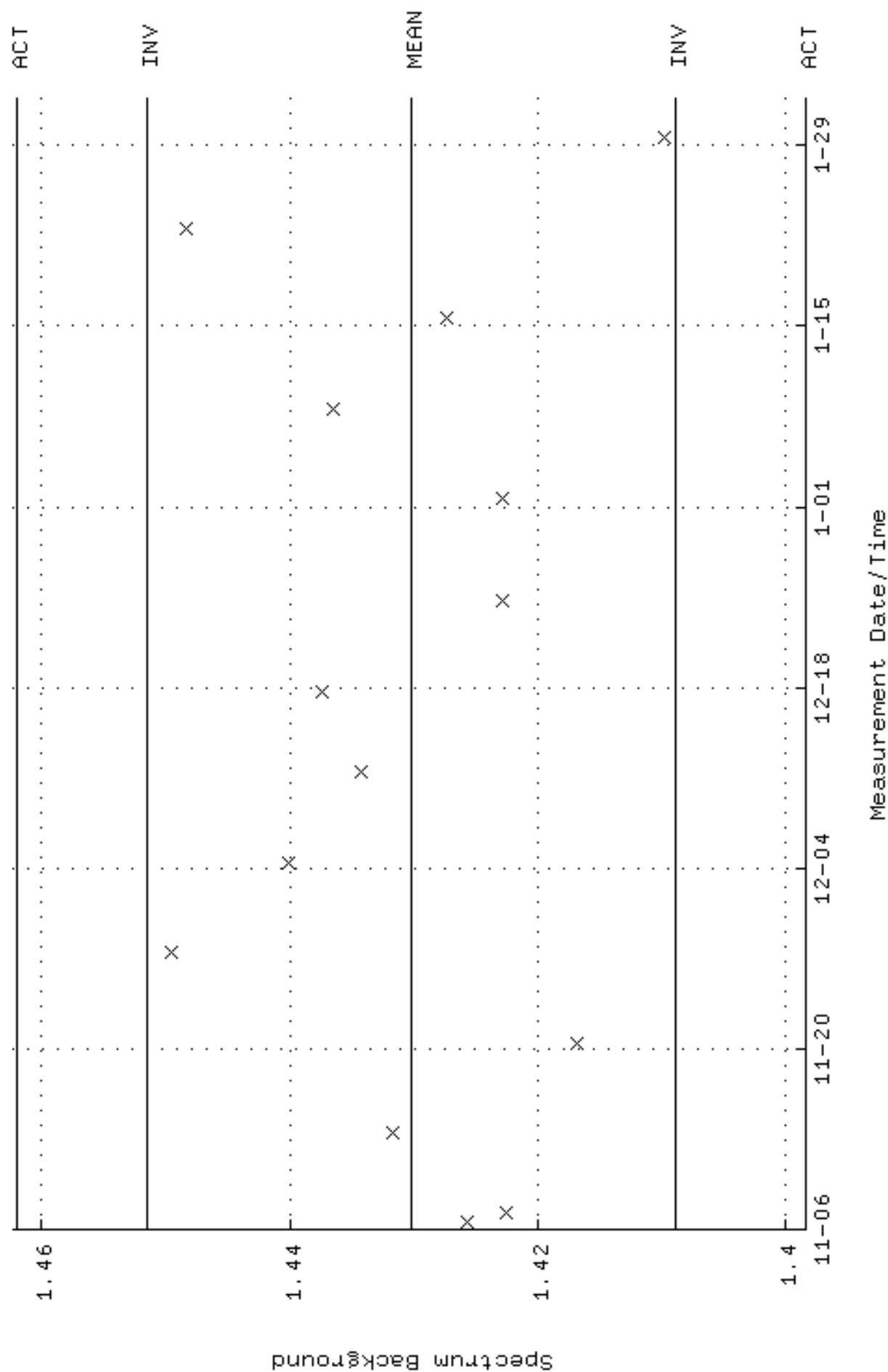
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM28_JAR.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-NOV-2022 06:22:27 through 1-FEB-2023 12:00:00
 Mean +- Std Dev : 1.05013 +- 5.399733E-02 (5.14 %)



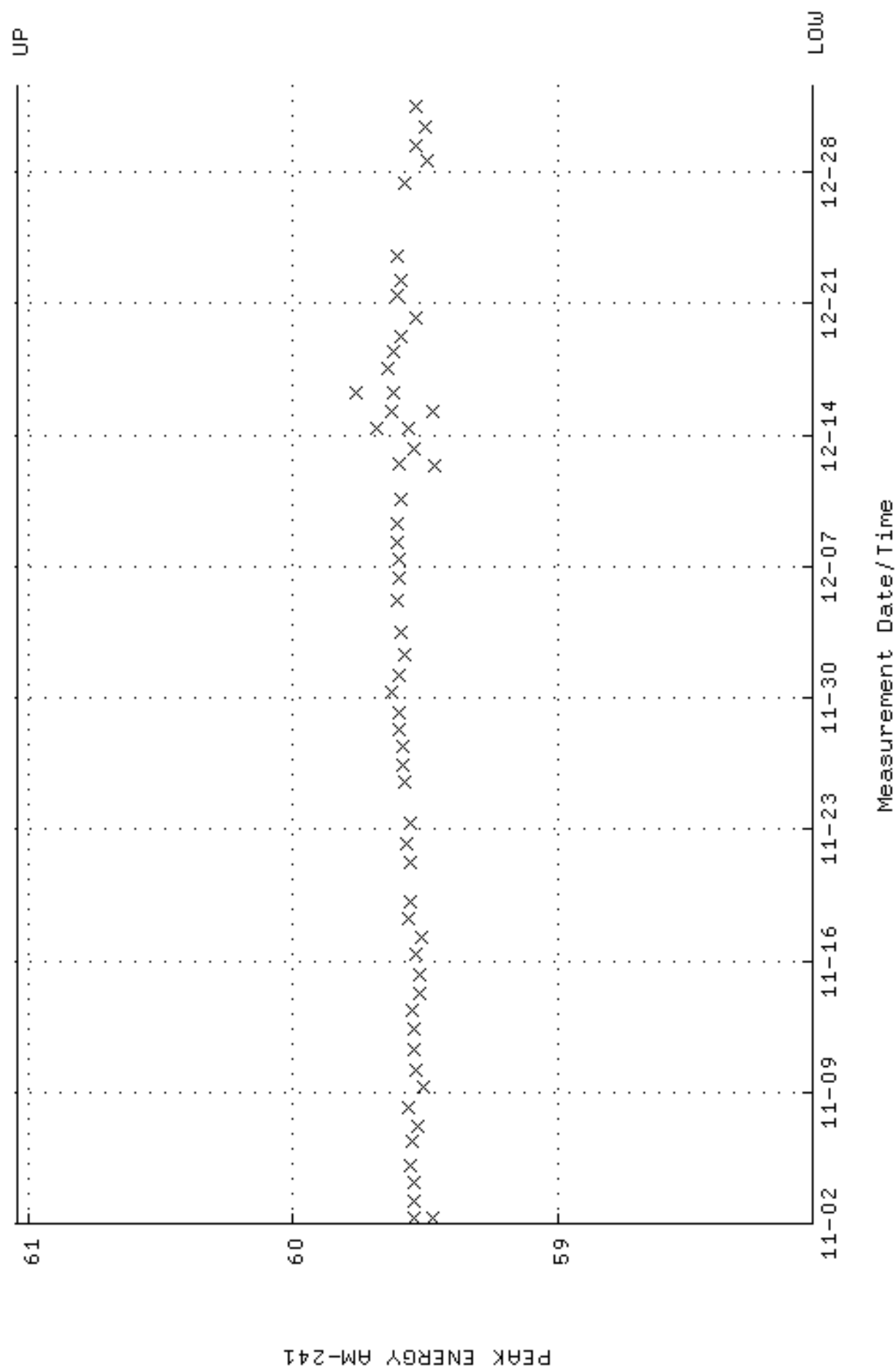
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM28-JAR.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-NOV-2022 06:22:27 through 1-FEB-2023 12:00:00
 Mean +- Std Dev : 67333.5 +- 1791.13 (2.66 %)



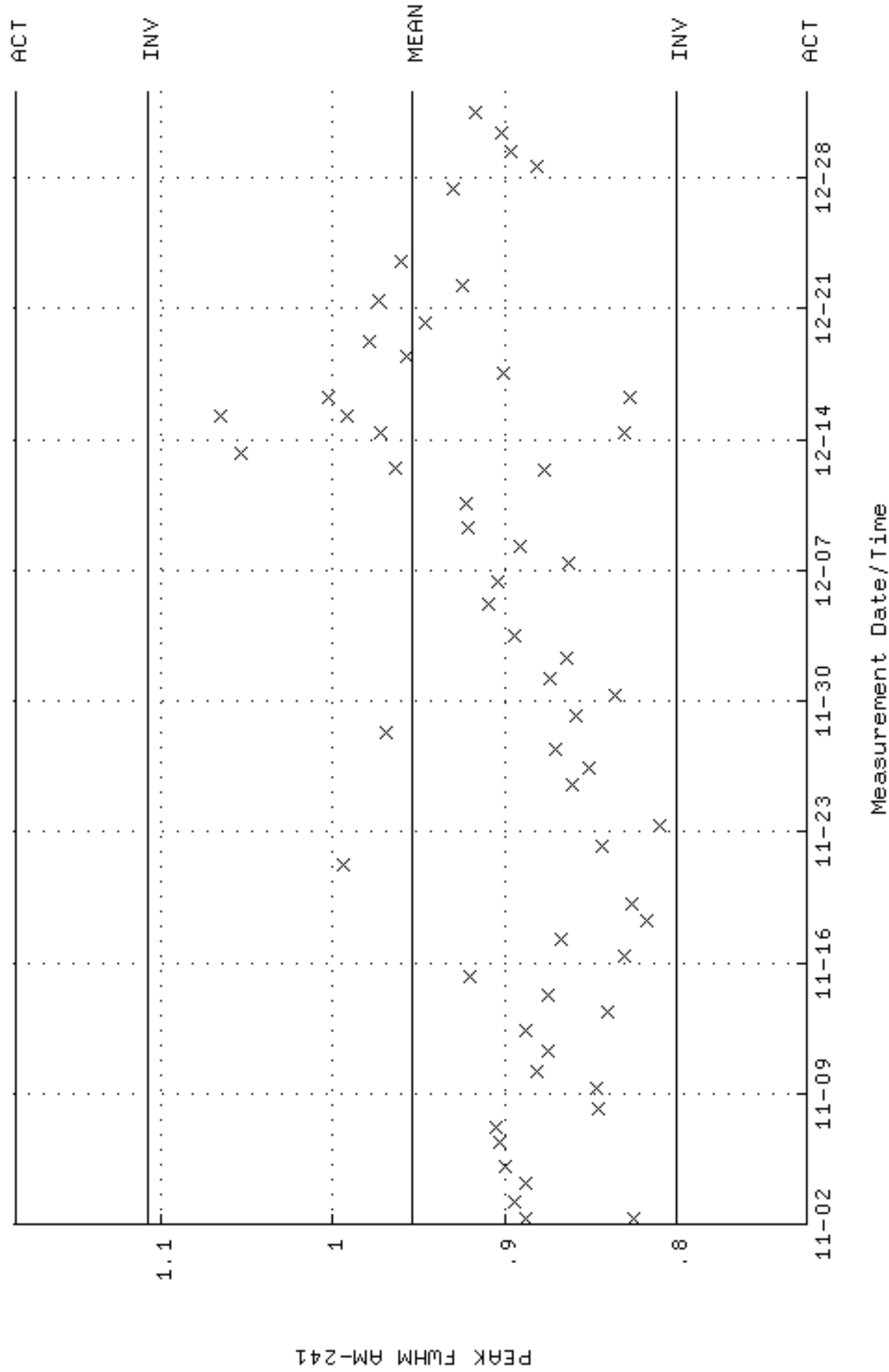
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM28.QAF;1
 Parameter Name : BACKRATE (Spectrum Background Rate)
 Start/End Dates : 6-NOV-2022 12:17:32 through 1-FEB-2023 12:00:00
 Mean +- Std Dev : 1.43025 +- 1.062964E-02 (0.74 %)



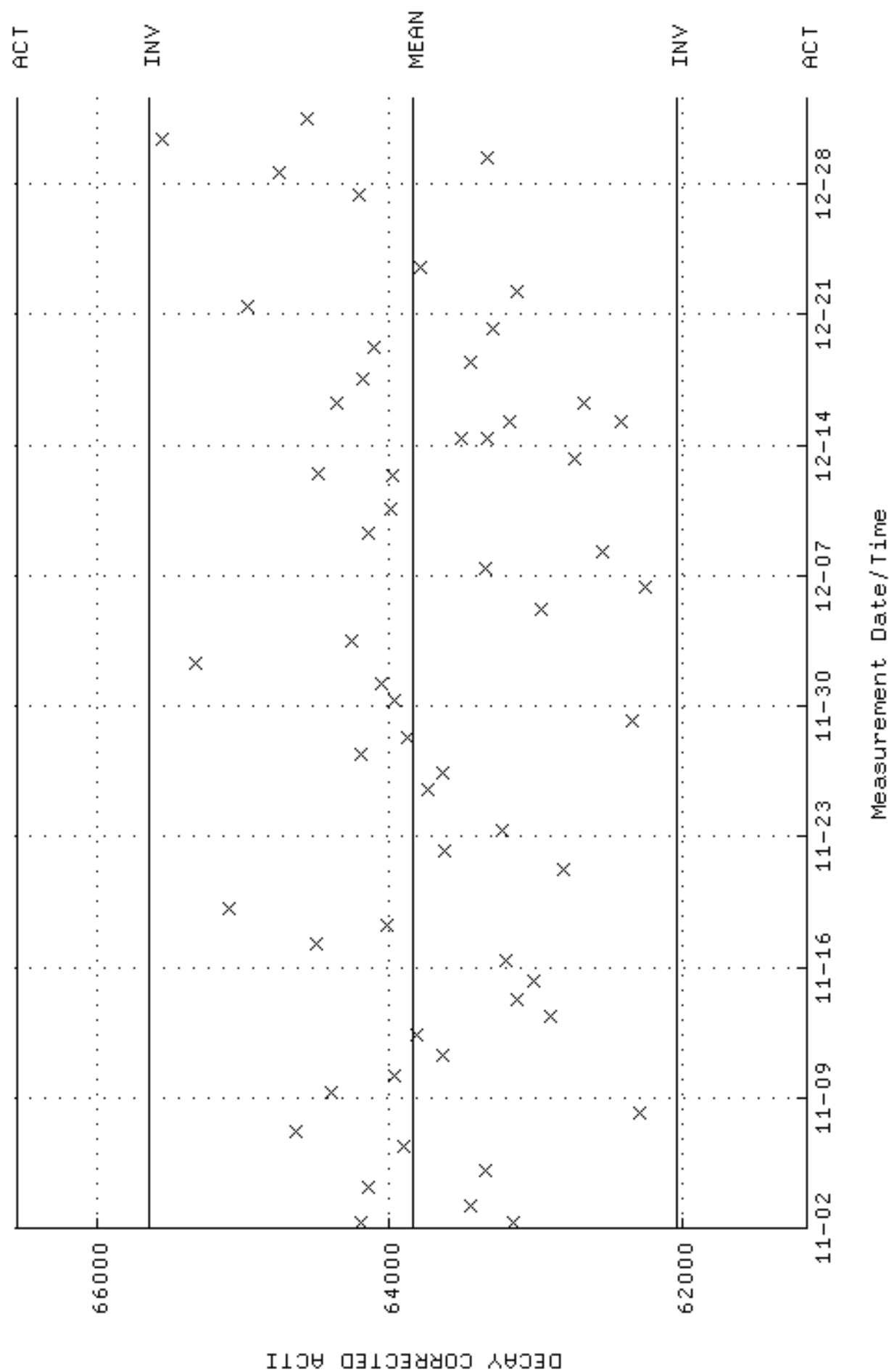
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM38_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-NOV-2022 06:43:39 through 1-JAN-2023 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



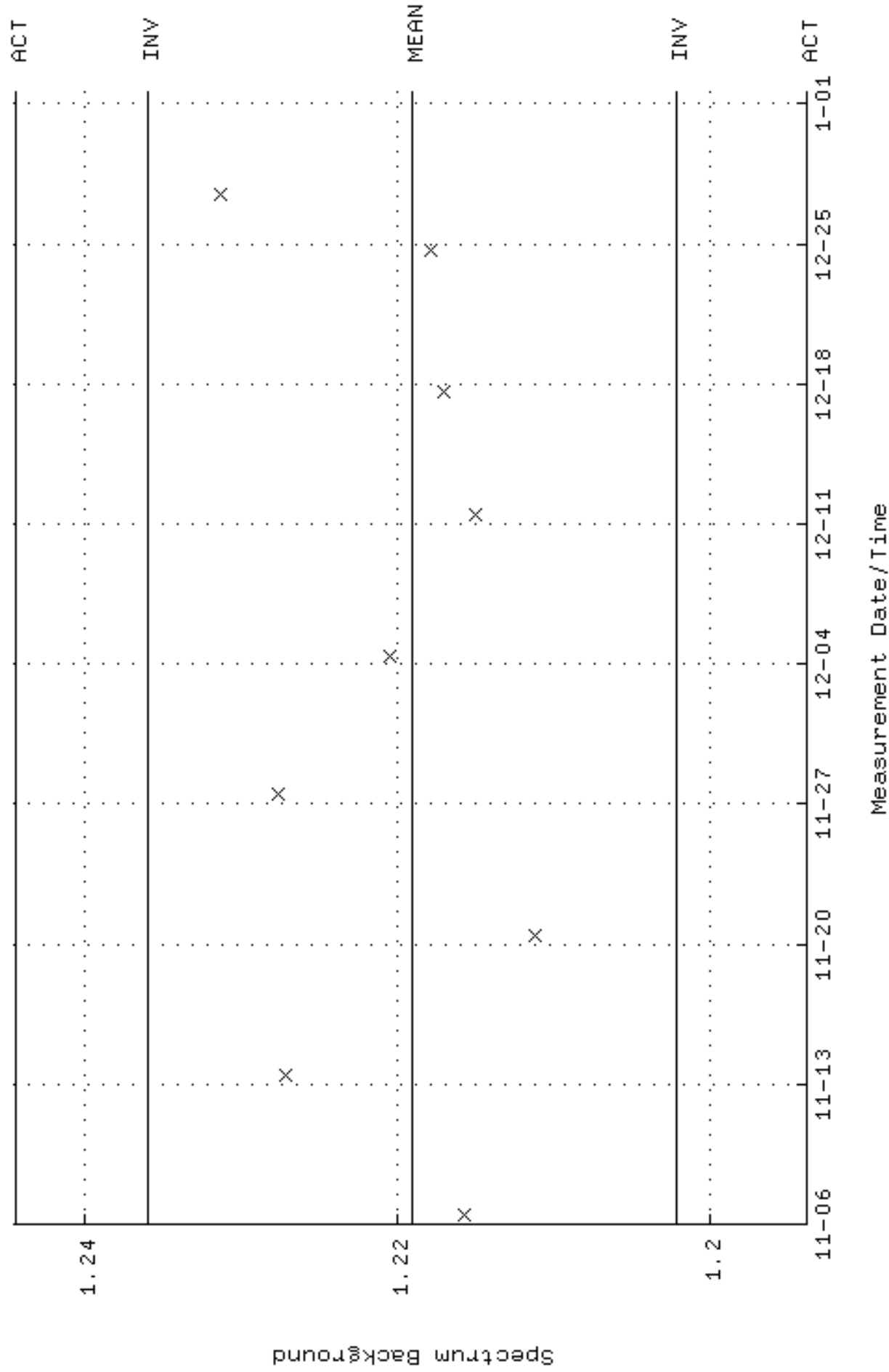
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM38_CAN.QAF;1
Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
Start/End Dates : 2-NOV-2022 06:43:39 through 1-JAN-2023 12:00:00
Mean +- Std Dev : 0.954240 +- 7.673284E-02 (8.04 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM38-CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-NOV-2022 06:43:39 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 63846.7 +- 900.227 (1.41 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM38.QAF;2
 Parameter Name : BACKRATE (Spectrum Background Rate)
 Start/End Dates : 6-NOV-2022 11:24:41 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 1.21913 +- 8.426066E-03 (0.69 %)



RAD Standards Traceability

1298

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

78962-278

200 mL Solid in 250 mL PP MRP Jar

Customer: GEL Laboratories, LLC

P.O. No.: 88007 RD, Item 1

Calibration Date: 01-Jan-2009 12:00 EST **Grams of Master Source:** 0.0068241

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* cps/gram	This Source cps	Uncertainty, %			Calibration Method
					Type	u _A	u _F	U
Pb-210	46.5	8145.1	————	1.305E+03	0.30	1.50	3.06	4π LS
Am-241	59.5	157860	————	7.746E+02	0.3	1.5	3.1	4π LS
Cd-109	88.0	462.60	1.694E+05	1.156E+03	0.6	1.7	3.6	HPGe
Co-57	122.1	271.79	8.597E+04	5.867E+02	0.7	1.3	3.0	HPGe
Ce-139	165.9	137.6	1.217E+05	8.305E+02	0.5	1.1	2.4	HPGe
Hg-203	279.2	46.61	2.692E+05	1.837E+03	0.5	1.1	2.4	HPGe
Sn-113	391.7	115.1	1.709E+05	1.166E+03	0.6	1.1	2.5	HPGe
Cs-137	661.7	10983	1.071E+05	7.309E+02	0.7	1.2	2.8	HPGe
Y-88	898.0	106.6	4.084E+05	2.787E+03	0.7	1.1	2.6	HPGe
Co-60	1173.2	1925.4	2.084E+05	1.422E+03	0.8	1.1	2.7	HPGe
Co-60	1332.5	1925.4	2.086E+05	1.424E+03	1.0	1.1	3.0	HPGe
Y-88	1836.1	106.6	4.320E+05	2.948E+03	0.8	1.1	2.7	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4 π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

This standard will expire one year after the calibration date.

Source Prepared by:

W. Mao, Radiochemist

QA Approved:

D. M. Montgomery, QA Manager

Date:

2-10-07

End of Certificate

RC-S-051-017

Corporate Office

Laboratory

Standard Logbook

Serial ID: 1298 Open/Reference Date: 01-JAN-09 Aliquot : 1 mL
Name: Mixed Gamma LCS JAR Received: 12-FEB-09 Density : Hand Calculated
Type: Source Material Expires: 01-JAN-35 Lot Number : 78962-278
Employee: Maggie Stamps Verified: 07-NOV-11
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

Verification for Mixed Gamma Standard 1298 JAR

M. Stamps 11/7/2011	Isotope Am-241	Result pCi/L	Isotopic Abundance: Certificate Value (dps):
	Mixed Gamma N1	60560	0.359
	Mixed Gamma N2	56920	774.6
	Mixed Gamma N3	59450	

Mean Value (Counting) = 101.1344 Pass
 Stdev = 1865.592 Rule 3 (Pass/Fail)

Certificate Value = 58315.1 pCi/L
 Lower Limit = 55245.48276 pCi/L
 Upper Limit = 62707.85057 pCi/L
 Rule 1 Pass/Fail Pass
 Two sigma = 3731.183905
 10 % of Mean = 5897.666667
 Rule 2 (Pass/Fail) Pass

Stamp 11/7/11
Rec'd 11/11/11

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard 1298 JAR

M. Stamps 11/7/2011	Isotope Cs-137	Result pCi/L	Isotopic Abundance: Certificate Value (dps):	0.851 730.9
	Mixed Gamma N1	24390		
	Mixed Gamma N2	24610		
	Mixed Gamma N3	24450		
Mean Value (Counting) =	24483.33	pCi/L	105.4736	
Stdev =	113.725	pCi/L		
Certificate Value =	23212.8	pCi/L		
Lower Limit =	24255.88371	pCi/L		
Upper Limit =	24710.78296	pCi/L		
Rule 1 Pass/Fail	Fail			
Two sigma =	227.4496281			
10 % of Mean =	2448.333333			
Rule 2 (Pass/Fail)	Pass			

*Exception taken due to the high uncertainty of the certified value
Rule 3 (Pass/Fail)

*exception taken due to full recovery of standard

Stamp
11/7/11

R. Futch
11/8/11

Verification Rules

Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements

Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard

1298

JAR

M. Stamps 11/7/2011	Isotope Co-60 (1332.50) Mixed Gamma N1 Mixed Gamma N2 Mixed Gamma N3	Result pCi/L 41290 40800 41060	Isotopic Abundance: Certificate Value (dps): 0.9998 1424
Mean Value (Counting) = Stdev =	41050.00 245.153	pCi/L pCi/L	106.6395
Certificate Value = Lower Limit = Upper Limit = Rule 1 Pass/Fail Two sigma = 10 % of Mean = Rule 2 (Pass/Fail)	38494.2 40559.69397 41540.30603 Fail 490.3060269 4105 Pass	pCi/L pCi/L pCi/L	Fail Rule 3 (Pass/Fail)

*Exception taken due to the high uncertainty of the certified value

*exception taken due to full recovery of standard

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

J. Stamp
11/7/11

R. Fatch
11/8/11

Standard Logbook

Serial ID: 1298 **Open/Reference Date:** 01-JAN-09 **Aliquot :** 1 mL
Name: Mixed Gamma LCS JAR **Received:** 12-FEB-09 **Density :** Hand Calculated
Type: Source Material **Expires:** 01-JAN-35 **Lot Number :** 78962-278
Employee: Maggie Stamps **Verified:** 07-NOV-11
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

Runlogs

Instrument Run Log

Instrument Type: GAMMA SPECTROMETER

Batch ID: 2367950

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
606487001	SAMPLE	MXR1	GAM08	JAN-19-23 15:20:50	DONE JAR		17-MAR-22 00:00
606487002	SAMPLE	MXR1	GAM18	JAN-19-23 15:21:15	DONE JAR		08-JUN-22 00:00
606487003	SAMPLE	MXR1	GAM38	JAN-19-23 15:21:35	DONE JAR		22-APR-22 00:00
606488001	SAMPLE	MXR1	GAM41	JAN-19-23 15:21:58	DONE JAR		16-MAY-22 00:00
1205292908	LCS	MXR1	GAM28	JAN-19-23 16:21:23	DONE JAR		04-APR-22 00:00
606488002	SAMPLE	MXR1	GAM01	JAN-19-23 16:30:09	DONE JAR		11-MAY-22 00:00
606488003	SAMPLE	MXR1	GAM02	JAN-19-23 16:33:39	DONE JAR		22-SEP-22 00:00
606488004	SAMPLE	MXR1	GAM04	JAN-19-23 16:34:35	DONE JAR		14-DEC-22 00:00
606488005	SAMPLE	MXR1	GAM16	JAN-19-23 16:35:57	DONE JAR		07-MAR-22 00:00
1205292906	MB	MXR1	GAM23	JAN-19-23 16:37:07	DONE JAR		03-MAY-22 00:00
1205292907	DUP	MXR1	GAM38	JAN-19-23 17:31:14	DONE JAR		22-APR-22 00:00

Gas Flow Raw Data

Batch 2368082 Check-list

This check-list was completed on 30-JAN-23 by Nat Long

This batch was reviewed by Kenshalla Oston on 30-JAN-23 and Nat Long on 30-JAN-23.

Batch ID:
2368082

Product:
GFC90SRF

Description: Gas Flow Strontium 90
GL-RAD-A-004

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
8	Are there any equilibrium assumptions?		No	
Quality Control (QC) Information				
9	Was the method blank (MB) within the acceptance criteria?	Yes		
10	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
11	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Strontium-90 in Filter

Batch ID:	2368082	Due Dates for Lab:	22-JAN-2023	Package:	24-JAN-2023	SDG:	24-JAN-2023		
Analyst:	Sierra Turbeville (ST2)	Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units	
Method:	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	LCS	1205293195	Strontium-90 SPIKE		1943-D	.1	mL	
Lab SOP:	GL-RAD-A-004 REV# 22	LCSD	1205293196	Strontium-90 SPIKE		1943-D	.1	mL	
Instrument:	GFC-C045440487								

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Initial Wt (g)	Final Wt (g)	Net Weight (mg)	Sr Separation (date)	Strontium Carrier Yield (percent)
1	606487001	20-JAN-2023	3	30	0.11224	0.0354	0.0379	2.5	01/23/23 13:00	65
2	606487002	20-JAN-2023	3	30	0.11087	0.0343	0.0372	2.9	01/23/23 13:00	76
3	606487003	20-JAN-2023	3	30	0.1125	0.0354	0.0386	3.2	01/23/23 13:00	84
4	606488001	20-JAN-2023	3	30	0.11473	0.0342	0.038	3.8	01/23/23 13:00	99
5	606488002	20-JAN-2023	3	30	0.11208	0.0338	0.0366	2.8	01/23/23 13:00	73
6	606488003	20-JAN-2023	3	30	0.10772	0.0353	0.038	2.7	01/23/23 13:00	71
7	606488004	20-JAN-2023	3	30	0.11082	0.0356	0.0389	3.3	01/23/23 13:00	86
8	606488005	20-JAN-2023	3	30	0.10899	0.0362	0.0395	3.3	01/23/23 13:00	86
9	1205293194 MB	20-JAN-2023	3		0.11473	0.0355	0.0382	2.7	01/23/23 13:00	71
10	1205293195 LCS	20-JAN-2023	3		0.11473	0.0356	0.038	2.4	01/23/23 13:00	63
11	1205293196 LCSD	20-JAN-2023	3		0.11473	0.0361	0.0383	2.2	01/23/23 13:00	58

Reagent/Solvent Lot ID	Description	Amount	Comments:
CARR 3535520	Strontium Carrier 0.5mL=3.825 mg/mL	.5 mL	Spike Pipet ID: RAD-GFC-1795419
REGNT 3432260	RGF-0.05M Nitric Acid	15 mL	Carrier Pipet ID: RAD-GFC-2154115
REGNT 3495604	0.75M Sodium Carbonate	13 mL	Data Entry Date2: 20-JAN-2023 00:00
REGNT 3644775	RGF-6M Sodium Hydroxide	10 mL	
REGNT 3487134	80% ethanol	3 mL	
REGNT 3424102.2	Phenolphthalein	2 mL	
REGNT 3460243.3	Thymol Blue Indicator0.0.04%	1 mL	
REGNT 3517710	3M HNO3 0.05M Oxalic	10 mL	
REGNT 3501767	8M HNO3	40 mL	
REGNT SR0068	2356218	2 g	

Strontium-90 Filter

Filename : SR90.XLS
 File type : Excel
 Version # : 1.3.10

Carrier S/N : 3535520
 Carrier Exp Date : 11/20/2023
 Carrier Volume Added: 0.50
 Carrier Weight (mg/ml): 7.65
 Carrier Weight StDev.: 0.06

Batch : 2368082
 Analyst : SIE02513
 Prep Date : 1/20/2023
 Method Uncertainty : 0.1315

Procedure Code : GFC90SRF
 Parmname : Strontium-90
 Required MDA : 3 pCi/F
 Sr-90 Abundance : 1.00
 Halflife of Sr-90 : 28.90 years
 Halflife of Y-90 : 64.053 hours

Geometry: Tuffryn Filter

Sample Characteristics					Carrier Calculations				
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Carrier Weight (mg) (Standard)	Net Weight (mg) (Sample)	Net Weight StDev. (mg)	Carrier Aliquot (mL)	Carrier Aliquot StDev. (mL)
1	606487001.1	0.1122	1.2096E-05	12/26/2022 7:15	7.65	2.50	0.018075	0.5	0.001000
2	606487002.1	0.1109	1.2017E-05	12/26/2022 7:23	7.65	2.90	0.019794	0.5	0.001000
3	606487003.1	0.1125	1.2111E-05	12/26/2022 9:00	7.65	3.20	0.021084	0.5	0.001000
4	606488001.1	0.1147	1.2237E-05	12/26/2022 7:41	7.65	3.80	0.023662	0.5	0.001000
5	606488002.1	0.1121	1.2086E-05	12/26/2022 7:49	7.65	2.80	0.019364	0.5	0.001000
6	606488003.1	0.1077	1.1834E-05	12/26/2022 7:58	7.65	2.70	0.018935	0.5	0.001000
7	606488004.1	0.1108	1.2014E-05	12/26/2022 8:04	7.65	3.30	0.021513	0.5	0.001000
8	606488005.1	0.1090	1.1908E-05	12/26/2022 9:00	7.65	3.30	0.021513	0.5	0.001000
9	1205293194.1	0.1147	1.2237E-05	1/20/2023 0:00	7.65	2.70	0.018935	0.5	0.001000
10	1205293195.1	0.1147	1.2237E-05	1/20/2023 0:00	7.65	2.40	0.017645	0.5	0.001000
11	1205293196.1	0.1147	1.2237E-05	1/20/2023 0:00	7.65	2.20	0.016786	0.5	0.001000

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-004
 Instrument SOP: GL-RAD-I-016

Count Raw Data											
	Detector	Counting Time	Gross Counts		Gross Beta	Count Start	Strontium Separation	Yttrium	Sr-90	Calculated Sample Recovery	Sample Recovery
Pos.	ID	(min.)	Alpha	Beta	CPM	Date/Time	Date/Time	Ingrowth	Decay	%	Error %
1	1A	80	12	39	0.482	1/26/2023 9:47	1/23/2023 13:00	0.528	0.998	65.4%	1.30%
2	1B	60	12	49	0.797	1/28/2023 9:10	1/23/2023 13:00	0.717	0.998	75.8%	1.26%
3	3C	500	63	735	1.456	1/25/2023 18:32	1/23/2023 13:00	0.464	0.998	83.7%	1.23%
4	11D	110	6	53	0.478	1/23/2023 16:33	1/23/2023 13:00	0.047	0.998	99.3%	1.20%
5	7D	70	6	43	0.608	1/26/2023 9:53	1/23/2023 13:00	0.529	0.998	73.2%	1.27%
6	4D	500	65	471	0.938	1/25/2023 18:33	1/23/2023 13:00	0.465	0.998	70.6%	1.28%
7	2A	60	11	52	0.856	1/26/2023 9:48	1/23/2023 13:00	0.528	0.998	86.3%	1.23%
8	3B	70	11	54	0.760	1/28/2023 9:12	1/23/2023 13:00	0.717	0.998	86.3%	1.23%
9	6C	500	41	451	0.896	1/25/2023 18:32	1/23/2023 13:00	0.464	1.000	70.6%	1.28%
10	1C	60	18	1411	23.499	1/26/2023 9:47	1/23/2023 13:00	0.528	1.000	62.7%	1.32%
11	2B	60	2	1323	22.048	1/26/2023 9:47	1/23/2023 13:00	0.528	1.000	57.5%	1.35%

Calibration Data										
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)		Detector Efficiency Error (cpm/dpm)	Alpha X-Talk	Weekly Bkg CPM	Weekly Bkg Count Start Date/Time	Weekly Bkg Count Time (min.)
1	PIC	4/1/2021	3/31/2023	0.3610	0.5155	0.00738	0.03336	0.426	1/20/2023 18:22	500
2	PIC	4/1/2021	3/31/2023	0.3550	0.5012	0.00711	0.09925	0.552	1/27/2023 16:35	500
3	PIC	4/1/2021	3/31/2023	0.3493	0.4728	0.00988	0.10757	1.498	1/20/2023 18:23	500
4	PIC	4/1/2021	3/31/2023	0.3537	0.5255	0.01068	0.06092	0.424	1/20/2023 18:25	500
5	PIC	4/1/2021	3/31/2023	0.3490	0.4994	0.01113	0.06839	0.420	1/20/2023 18:25	500
6	PIC	4/1/2021	3/31/2023	0.3475	0.5081	0.00773	0.03094	0.932	1/20/2023 18:24	500
7	PIC	4/1/2021	3/31/2023	0.3571	0.5073	0.01914	0.05557	0.556	1/20/2023 18:23	500
8	PIC	4/1/2021	3/31/2023	0.3501	0.4820	0.01614	0.07003	0.584	1/27/2023 16:35	500
9	PIC	4/1/2021	3/31/2023	0.3500	0.4867	0.01970	0.06899	0.978	1/20/2023 18:25	500
10	PIC	4/1/2021	3/31/2023	0.3615	0.5106	0.00847	0.05831	1.104	1/20/2023 18:23	500
11	PIC	4/1/2021	3/31/2023	0.3571	0.5059	0.02111	0.06683	1.578	1/20/2023 18:23	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1943-D
LCS Exp Date : 6/4/2023
LCS Activity (dpm/ml): 512.10
LCS Volume Added: 0.10

Results																	Scanned Detector
Pos.	Decision Level pCi/F	Critical Level pCi/F	Required MDA pCi/F	MDA pCi/F	Sample Act. Conc. pCi/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/F	2 SIGMA Total Prop. Uncertainty pCi/F	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery	
1	1.7787	1.2558	3	2.8758	0.5488	146.86%	0.0565	0.0830	1.5795	1.5859		SAMPLE					
2	1.7778	1.2551	3	2.8861	1.8402	49.01%	0.2448	0.1199	1.7670	1.8304		SAMPLE					
3	1.5203	1.0733	3	2.1972	-0.3503	184.99%	-0.0416	0.0769	1.2700	1.2700		SAMPLE					
4	1.6711	1.1798	3	2.6449	0.5700	132.31%	0.0545	0.0721	1.4779	1.4854		SAMPLE					
5	1.7297	1.2212	3	2.8271	1.6913	51.84%	0.1884	0.0976	1.7176	1.7734		SAMPLE					
6	1.4472	1.0218	3	2.1045	0.0608	1022.94%	0.0060	0.0612	1.2194	1.2195		SAMPLE					
7	1.7935	1.2662	3	2.9103	2.2704	41.34%	0.3005	0.1240	1.8370	1.9325		SAMPLE					
8	1.5675	1.1067	3	2.5090	1.2170	62.21%	0.1764	0.1097	1.4830	1.5171		SAMPLE					
9	1.4076	0.9938	3	2.0455	-0.7887	75.02%	-0.0817	0.0612	1.1591	1.1591		MB					
10	3.3186	2.3430	3	5.1820	222.1957	3.21%	22.3952	0.6276	12.2042	59.0658		LCS			201.0529	110.5%	
11	4.3764	3.0898	3	6.7268	224.0221	3.89%	20.4698	0.6088	13.0586	60.9197		LCSD	0.8%		201.0529	111.4%	

Results (DPM)															
Decision Level DPM/F	Critical Level DPM/F	Required MDA DPM/F	MDA DPM/F	Sample Act. Conc. DPM/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	1 SIGMA Counting Uncertainty DPM/F	1 SIGMA Total Prop. Uncertainty DPM/F	Sample QC	Sample Type	RPD	RER	Nominal DPM/F	Recovery
3.9487	2.7878	6.66	6.3843	1.2182	146.86%	0.0565	0.0830	3.5064	3.5207		SAMPLE				
3.9467	2.7864	6.66	6.4072	4.0853	49.01%	0.2448	0.1199	3.9227	4.0636		SAMPLE				
3.3750	2.3828	6.66	4.8778	-0.7776	184.99%	-0.0416	0.0769	2.8193	2.8193		SAMPLE				
3.7099	2.6192	6.66	5.8716	1.2653	132.31%	0.0545	0.0721	3.2810	3.2975		SAMPLE				
3.8400	2.7110	6.66	6.2761	3.7547	51.84%	0.1884	0.0976	3.8132	3.9369		SAMPLE				
3.2128	2.2683	6.66	4.6721	0.1350	1022.94%	0.0060	0.0612	2.7070	2.7072		SAMPLE				
3.9816	2.8111	6.66	6.4608	5.0402	41.34%	0.3005	0.1240	4.0782	4.2901		SAMPLE				
3.4799	2.4568	6.66	5.5700	2.7018	62.21%	0.1764	0.1097	3.2924	3.3680		SAMPLE				
3.1249	2.2062	6.66	4.5411	-1.7510	75.02%	-0.0817	0.0612	2.5732	2.5733		MB				
7.3673	5.2014	6.66	11.5040	493.2745	3.21%	22.3952	0.6276	27.0933	131.1261		LCS			446.34	110.5%
9.7157	6.8594	6.66	14.9335	497.3290	3.89%	20.4698	0.6088	28.9902	135.2418		LCSD	0.8%		446.34	111.4%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
606487001	1A	80	12	39	1/26/2023 9:47	1/26/2023 11:07	PIC	2368082
606487002	1B	60	12	49	1/28/2023 9:10	1/28/2023 10:10	PIC	2368082
606487003	3C	500	63	735	1/25/2023 18:32	1/26/2023 2:52	PIC	2368082
606488001	11D	110	6	53	1/23/2023 16:33	1/23/2023 18:23	PIC	2368082
606488002	7D	70	6	43	1/26/2023 9:53	1/26/2023 11:03	PIC	2368082
606488003	4D	500	65	471	1/25/2023 18:33	1/26/2023 2:53	PIC	2368082
606488004	2A	60	11	52	1/26/2023 9:48	1/26/2023 10:48	PIC	2368082
606488005	3B	70	11	54	1/28/2023 9:12	1/28/2023 10:22	PIC	2368082
1205293194	6C	500	41	451	1/25/2023 18:32	1/26/2023 2:52	PIC	2368082
1205293195	1C	60	18	1411	1/26/2023 9:47	1/26/2023 10:47	PIC	2368082
1205293196	2B	60	2	1323	1/26/2023 9:47	1/26/2023 10:47	PIC	2368082

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 25-Jan-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

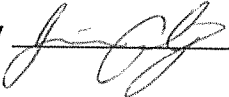
Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
G5400W1W	Above	Beta bkg	25-Jan 08:28	60	6.900	0.599	1.990	+24.17
LB4100E2	Above	Beta bkg	25-Jan 05:50	60	2.383	1.385	3.072	+0.55
LB4100F2	Below	Alpha eff	25-Jan 05:35	5	5534	6533	7372	-10.14
LB4100F2	Above	Alpha XTalk	25-Jan 05:35	5	0.425	0.318	0.366	+10.46
LB4100F2	Above	Beta bkg	25-Jan 05:50	60	13.900	1.173	1.833	+112.70
LB4100F3	Above	Alpha bkg	25-Jan 07:07	60	0.533	0.119	0.404	+5.73
LB4100G1	Above	Beta bkg	25-Jan 05:44	60	2403	0.380	1.675	+11,129.54
LB4100G2	Above	Beta bkg	25-Jan 05:44	60	2.250	1.168	2.328	+2.60
LB4100G3	Below	Alpha eff	25-Jan 05:29	5	5451	5785	8229	-3.82
LB4100G3	Above	Alpha XTalk	25-Jan 05:29	5	0.422	0.275	0.391	+4.59
LB4100G3	Above	Beta bkg	25-Jan 05:44	60	2.333	0.987	2.738	+1.61
LB4100H1	Above	Beta bkg	25-Jan 05:44	60	2.917	0.216	2.462	+4.21
PIC1D	Above	Alpha bkg	25-Jan 05:02	60	0.500	-1.03E-1	0.386	+4.40
PIC3D	Above	Alpha bkg	25-Jan 05:08	60	0.917	-1.75E-1	0.473	+7.10
PIC3D	need 2nd	Alpha XTalk	25-Jan 04:54	5	0.261	0.260	0.381	-2.94
PIC3D	Above	Beta XTalk	25-Jan 05:02	5	0.010	-4.26E-4	0.001	+38.61
PIC4B	Above	Alpha bkg	25-Jan 05:08	60	0.317	-9.02E-2	0.287	+3.47
PIC5D	Above	Alpha bkg	25-Jan 05:14	60	0.317	-9.04E-2	0.400	+1.99
PIC6A	Above	Beta bkg	25-Jan 07:30	60	4.267	0.669	2.752	+7.36
PIC14B	Above	Alpha eff	25-Jan 05:22	5	8995	8474	8989	+3.07
PIC14B	Below	Alpha XTalk	25-Jan 05:22	5	0.264	0.279	0.316	-5.33
PIC14B	Above	Beta bkg	25-Jan 05:37	60	2.483	0.370	3.004	+1.81
PIC14B	Above	Beta eff	25-Jan 05:31	5	22652	19940	22170	+4.30

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC8D	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by _____

Date 1-25-23_____

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 26-Jan-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

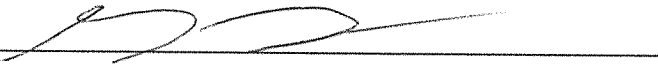
Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	26-Jan 04:08	60	3.300	1.385	3.072	+3.81
LB4100F2	Below	Alpha eff	26-Jan 05:16	5	5996	6533	7372	-6.84
LB4100F2	Above	Alpha XTalk	26-Jan 05:16	5	0.404	0.318	0.366	+7.79
LB4100F2	Above	Beta bkg	26-Jan 04:08	60	24.133	1.173	1.833	+205.73
LB4100F3	Above	Alpha bkg	26-Jan 05:33	60	0.317	0.119	0.404	+1.16
LB4100G1	Above	Beta bkg	26-Jan 04:08	60	224	0.380	1.675	+1,031.85
LB4100G2	Above	Beta bkg	26-Jan 04:08	60	3.333	1.168	2.328	+8.20
LB4100G3	Above	Beta bkg	26-Jan 06:06	60	3.633	0.987	2.738	+6.07
LB4100H1	Above	Beta bkg	26-Jan 04:08	60	2.850	0.216	2.462	+4.04
PIC1D	Above	Alpha bkg	26-Jan 04:29	60	0.350	-1.03E-1	0.386	+2.56
PIC3D	Above	Alpha bkg	26-Jan 04:34	60	0.683	-1.75E-1	0.473	+4.94
PIC3D	Below	Alpha XTalk	26-Jan 04:20	5	0.258	0.260	0.381	-3.09
PIC3D	Above	Beta XTalk	26-Jan 04:27	5	0.011	-4.26E-4	0.001	+45.75
PIC5D	Above	Alpha bkg	26-Jan 04:41	60	0.367	-9.04E-2	0.400	+2.60
PIC6A	Above	Beta bkg	26-Jan 04:41	60	4.333	0.669	2.752	+7.55
PIC14B	Above	Alpha eff	26-Jan 06:09	5	8994	8474	8989	+3.06
PIC14B	Below	Alpha XTalk	26-Jan 06:09	5	0.268	0.279	0.316	-4.83
PIC14B	Above	Beta bkg	26-Jan 05:07	60	2.550	0.370	3.004	+1.97
PIC14B	need 2nd	Beta eff	26-Jan 05:00	5	20931	19940	22170	-0.33
PIC14B	Above	Beta XTalk	26-Jan 05:00	5	8.62E-4	1.39E-4	8.60E-4	+3.01

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC8D	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 1/26/2023

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 28-Jan-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	27-Jan 16:29	500	2.302	1.385	3.072	+0.26
LB4100E4	Below	Alpha eff	28-Jan 10:23	5	8078	8193	10600	-3.29
LB4100E4	need 2nd	Alpha XTalk	28-Jan 10:23	5	0.302	0.231	0.304	+2.81
LB4100F2	Below	Alpha eff	28-Jan 09:50	5	4853	6533	7372	-15.01
LB4100F2	Above	Alpha XTalk	28-Jan 09:50	5	0.486	0.318	0.366	+18.06
LB4100F2	Above	Beta bkg	27-Jan 16:30	500	10.268	1.173	1.833	+79.68
LB4100G3	Below	Alpha eff	28-Jan 09:43	5	4881	5785	8229	-5.22
LB4100G3	Above	Alpha XTalk	28-Jan 09:43	5	0.483	0.275	0.391	+7.75
LB4100G3	need 2nd	Beta eff	28-Jan 09:50	5	22745	19160	24060	+1.39
LB4100G3	need 2nd	Beta XTalk	28-Jan 09:50	5	2.60E-4	1.05E-4	4.95E-4	-0.62
LB4100H1	Above	Beta bkg	27-Jan 16:29	500	2.720	0.216	2.462	+3.69
PIC1D	Above	Alpha bkg	27-Jan 16:35	500	0.304	-1.03E-1	0.386	+2.00
PIC3D	Above	Alpha bkg	27-Jan 16:36	500	0.720	-1.75E-1	0.473	+5.28
PIC3D	Below	Alpha XTalk	28-Jan 08:05	5	0.254	0.260	0.381	-3.32
PIC3D	Above	Beta XTalk	28-Jan 08:12	5	0.006	-4.26E-4	0.001	+25.26
PIC4B	Above	Alpha bkg	28-Jan 08:19	60	0.367	-9.02E-2	0.287	+4.27
PIC5D	Above	Alpha bkg	27-Jan 16:37	500	0.378	-9.04E-2	0.400	+2.74
PIC6A	Above	Beta bkg	27-Jan 16:35	500	4.054	0.669	2.752	+6.75
PIC9A	Below	Alpha eff	28-Jan 08:49	5	10183	10200	11420	-3.08
PIC14B	need 2nd	Alpha eff	28-Jan 08:35	5	8889	8474	8989	+1.84
PIC14B	Below	Alpha XTalk	28-Jan 08:35	5	0.271	0.279	0.316	-4.25
PIC14B	Above	Beta bkg	27-Jan 16:36	500	2.322	0.370	3.004	+1.45

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

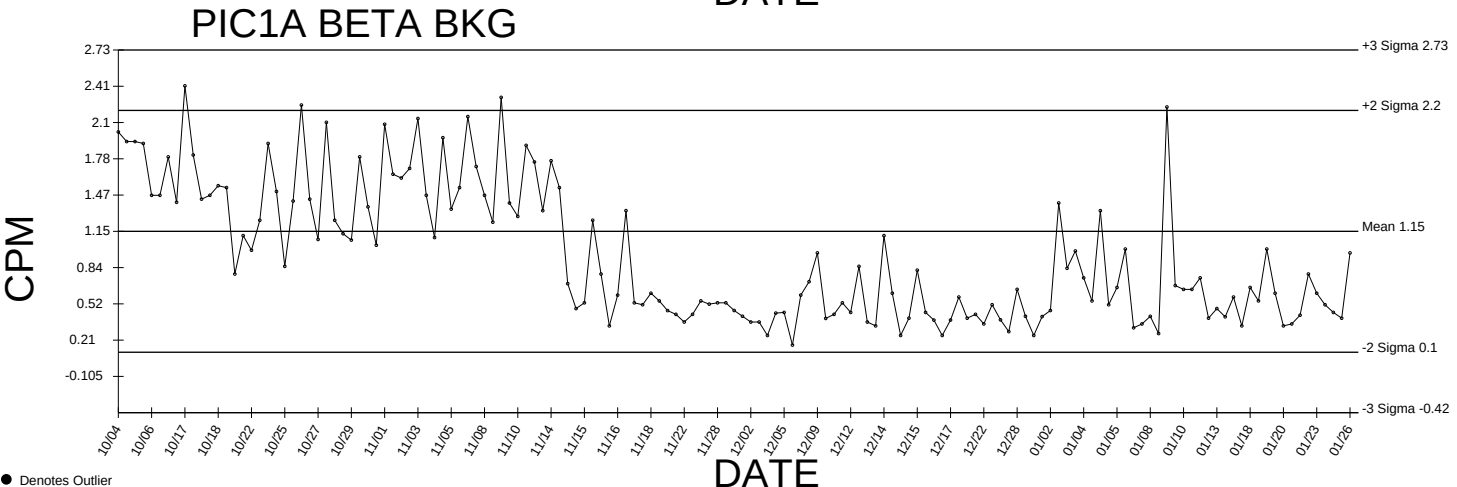
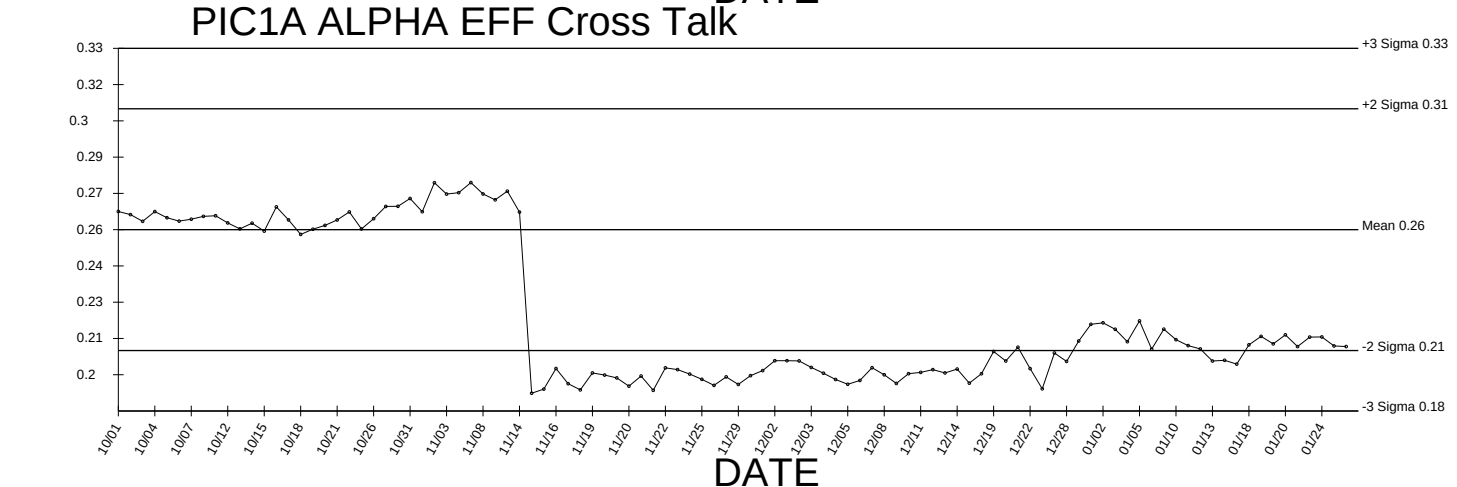
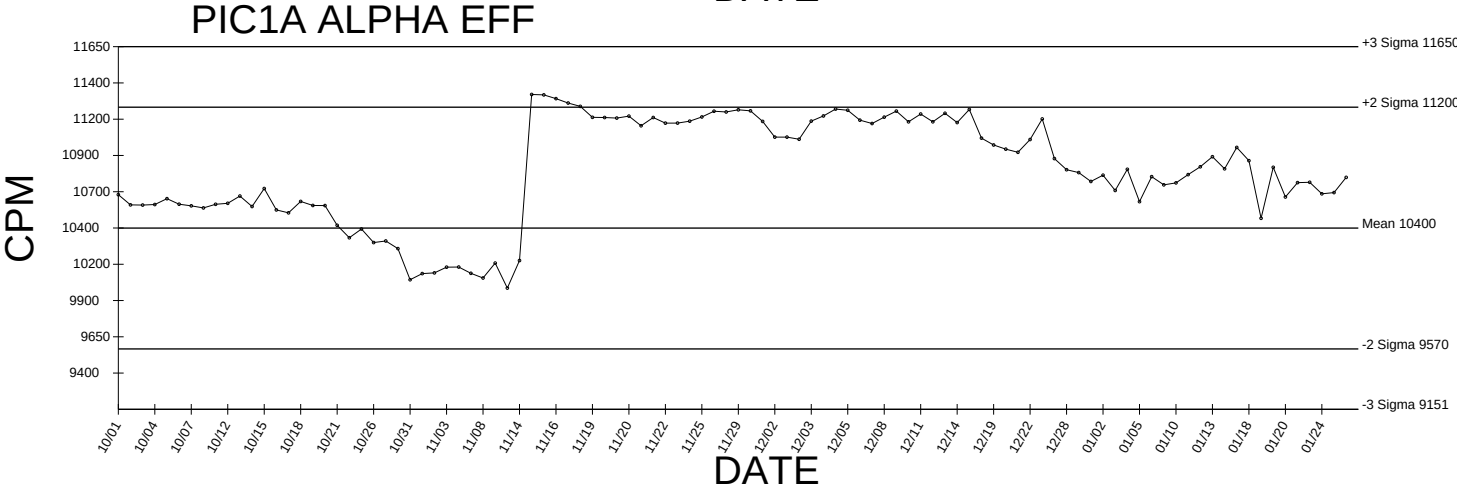
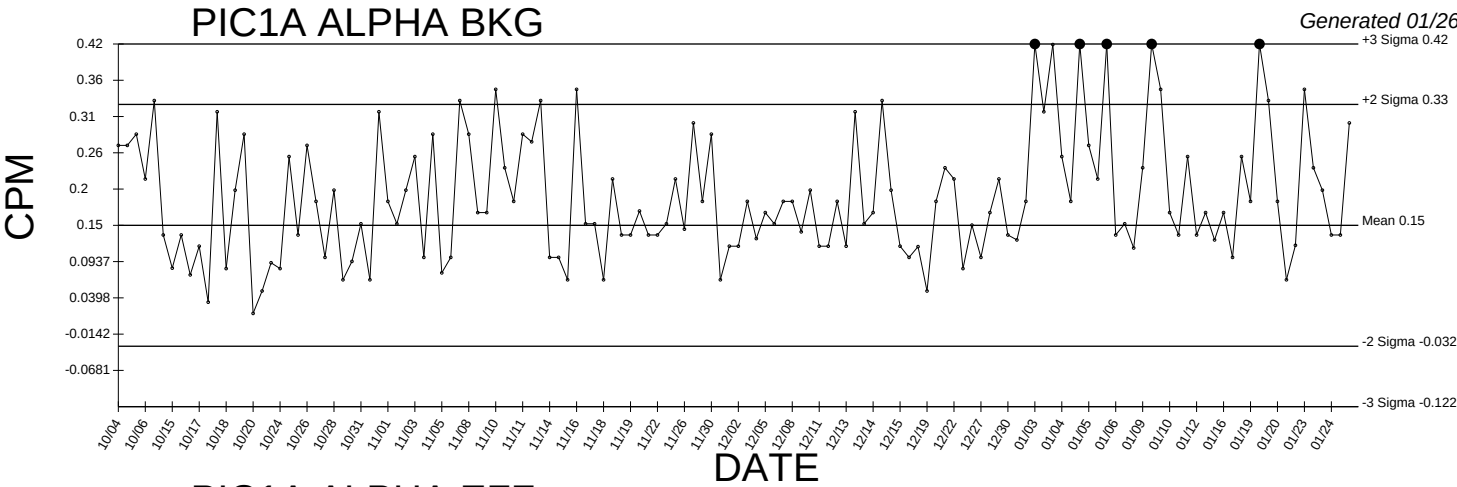
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC8D	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by R. Smith-Harmon

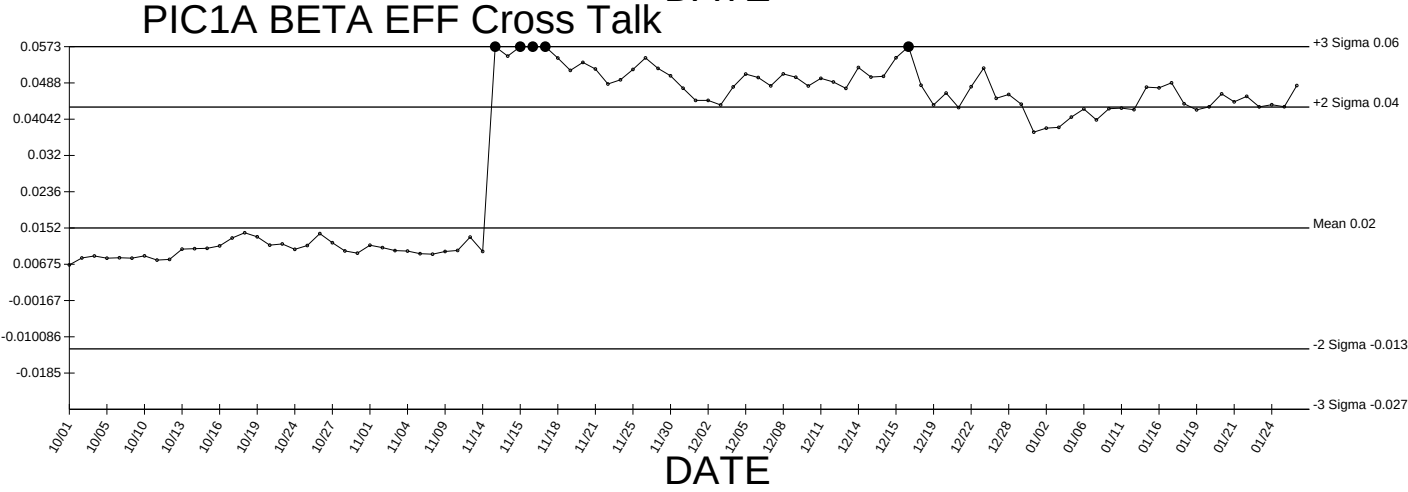
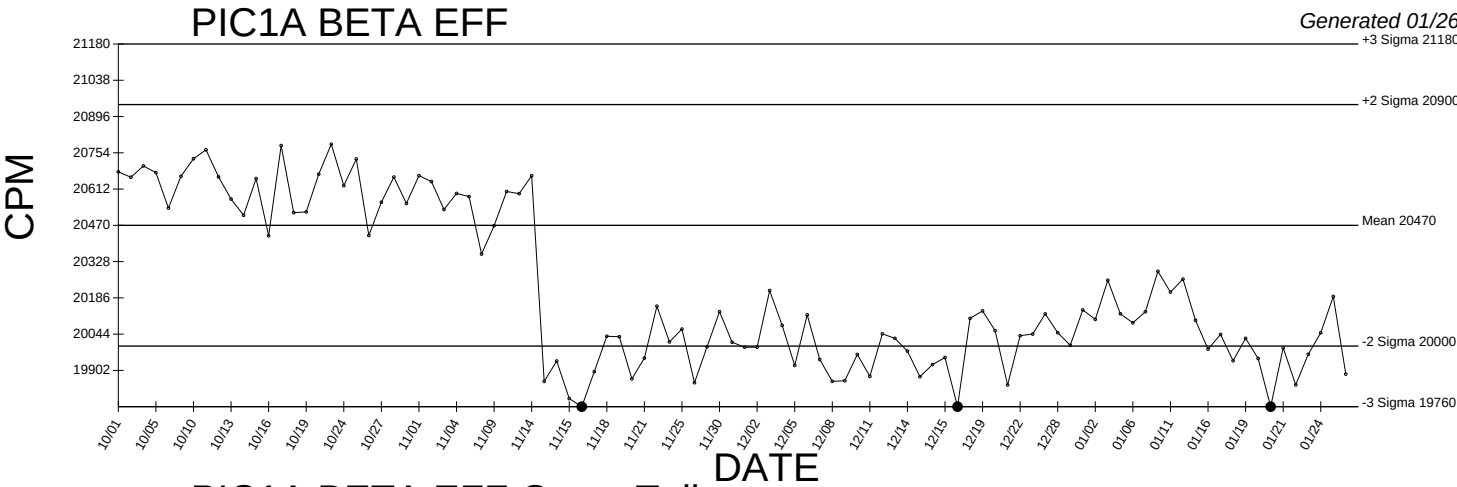
Date 1-28-23

GEL Laboratories LLC

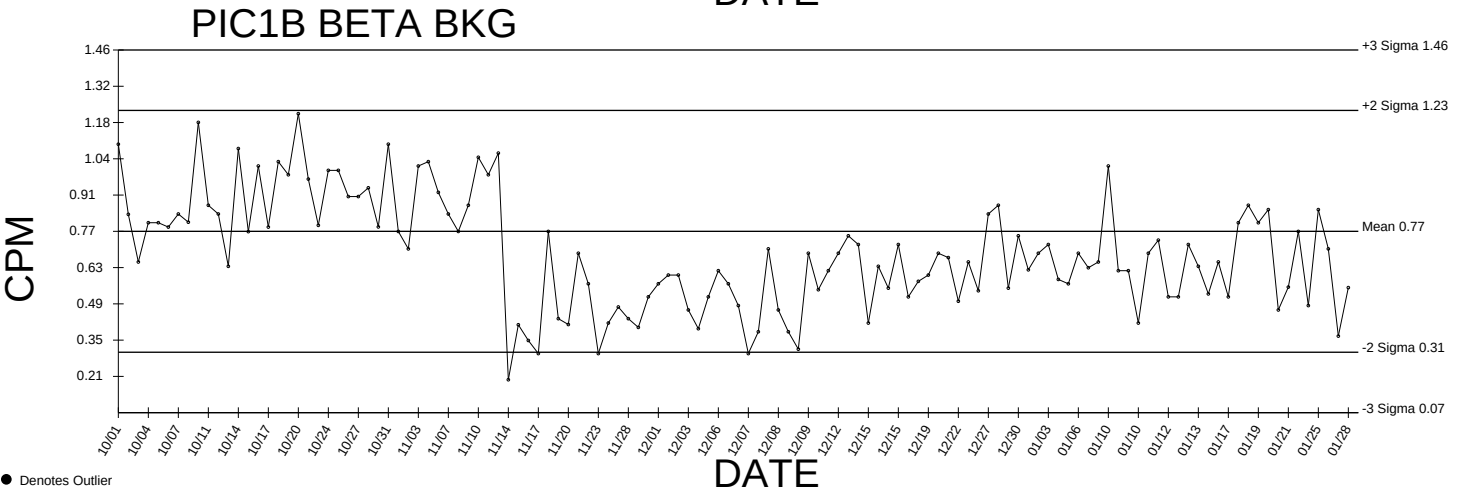
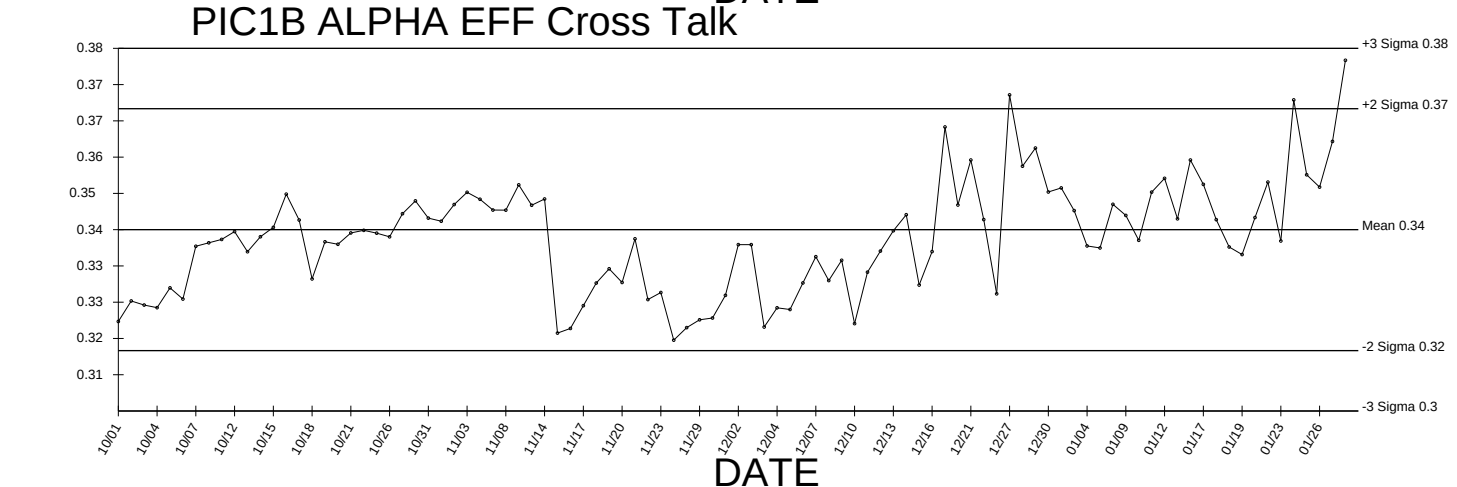
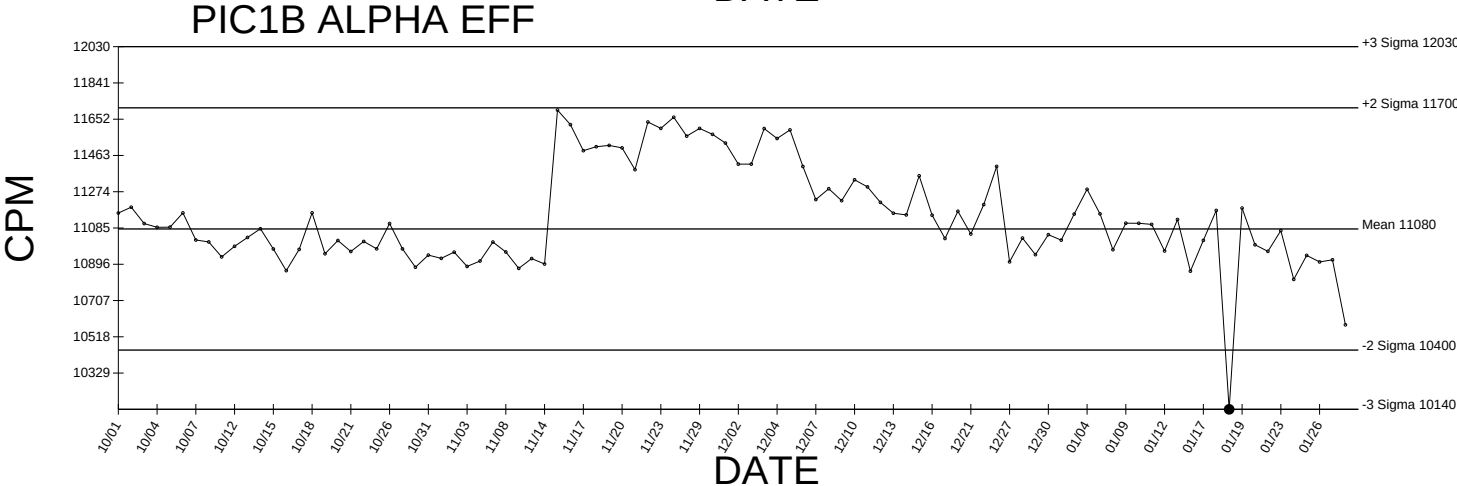
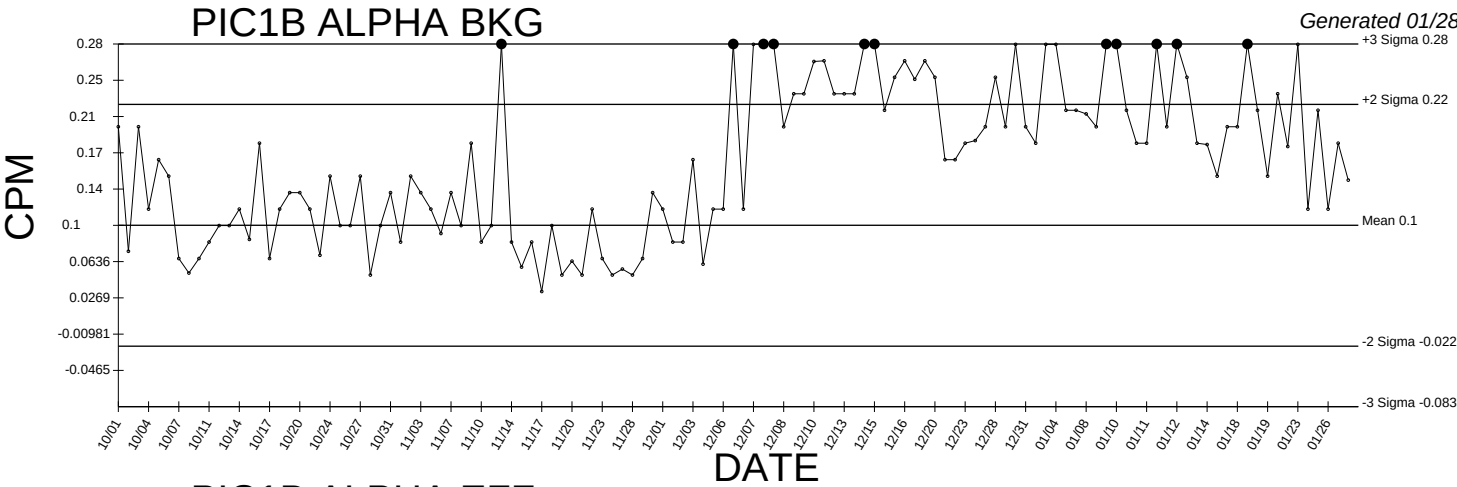
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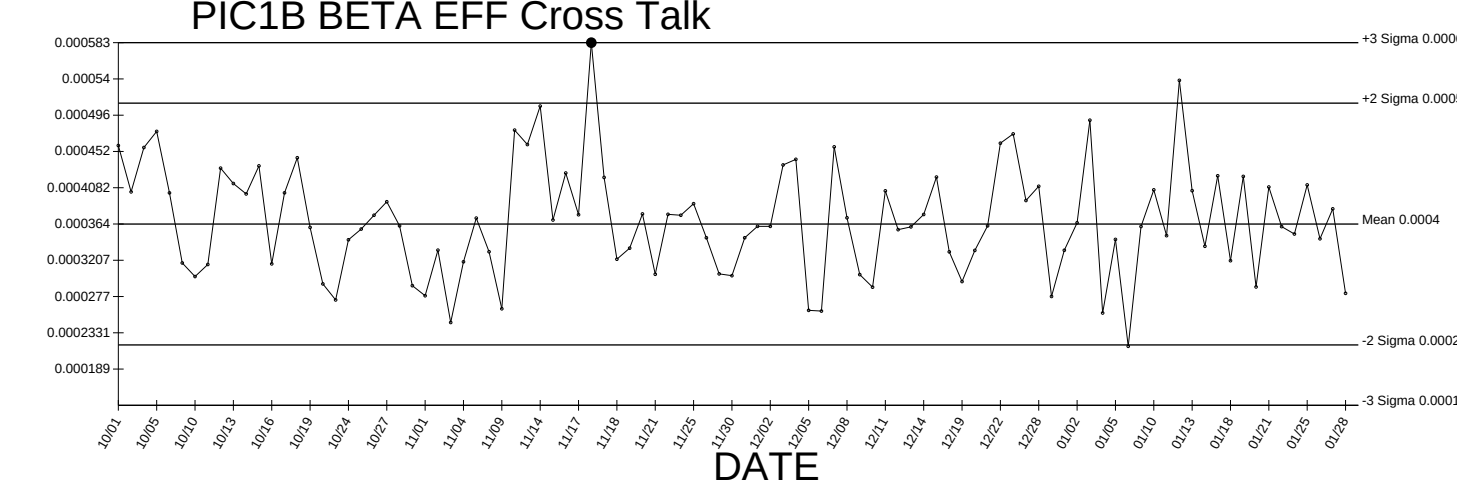
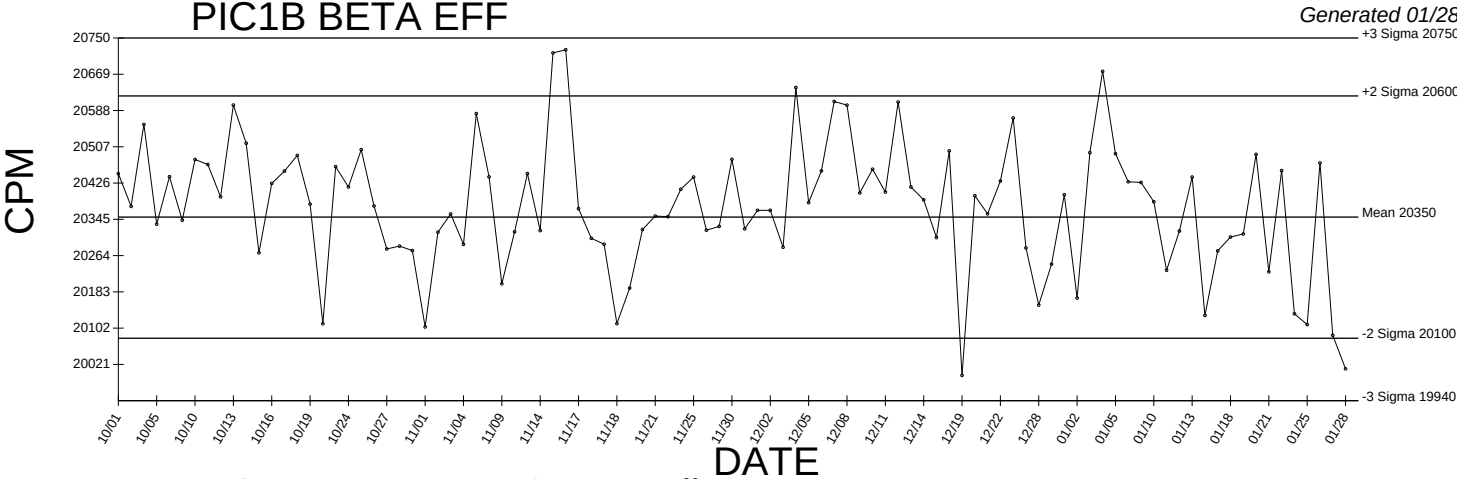
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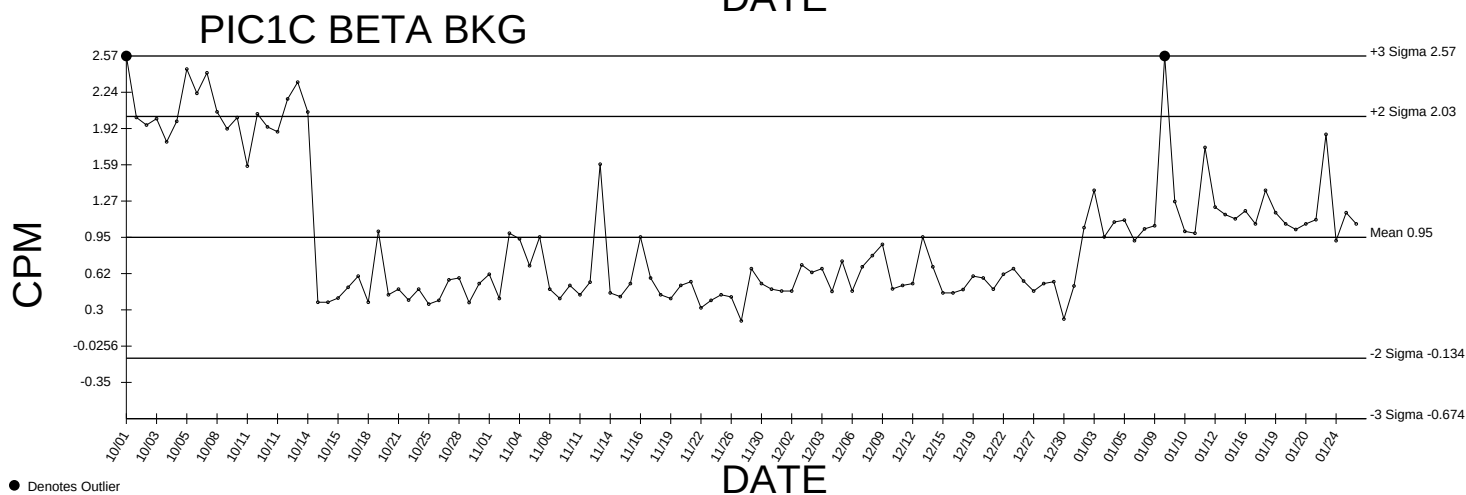
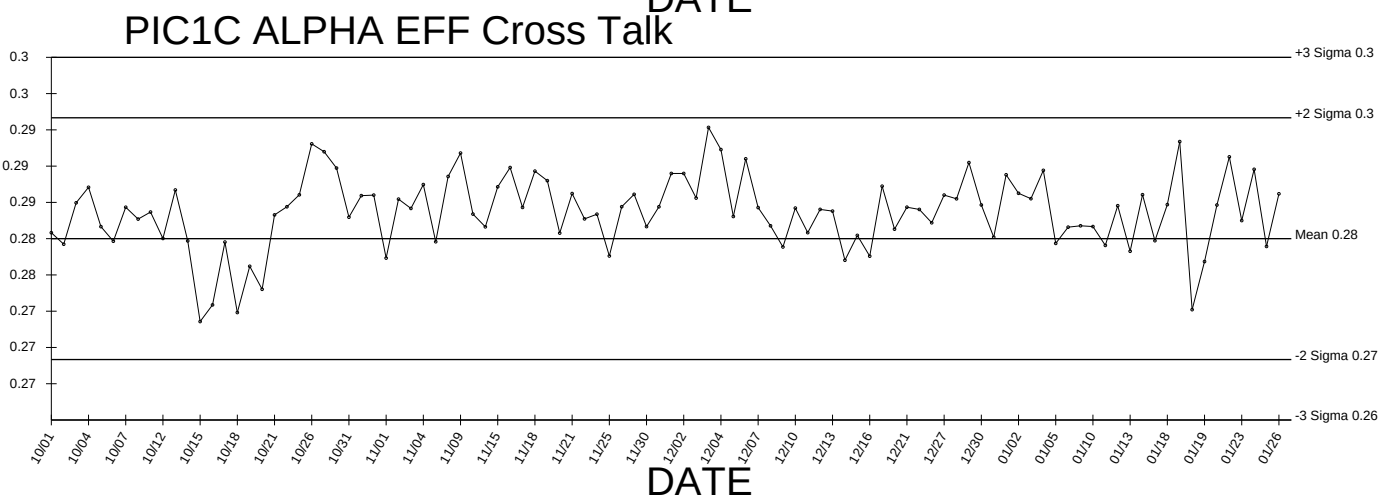
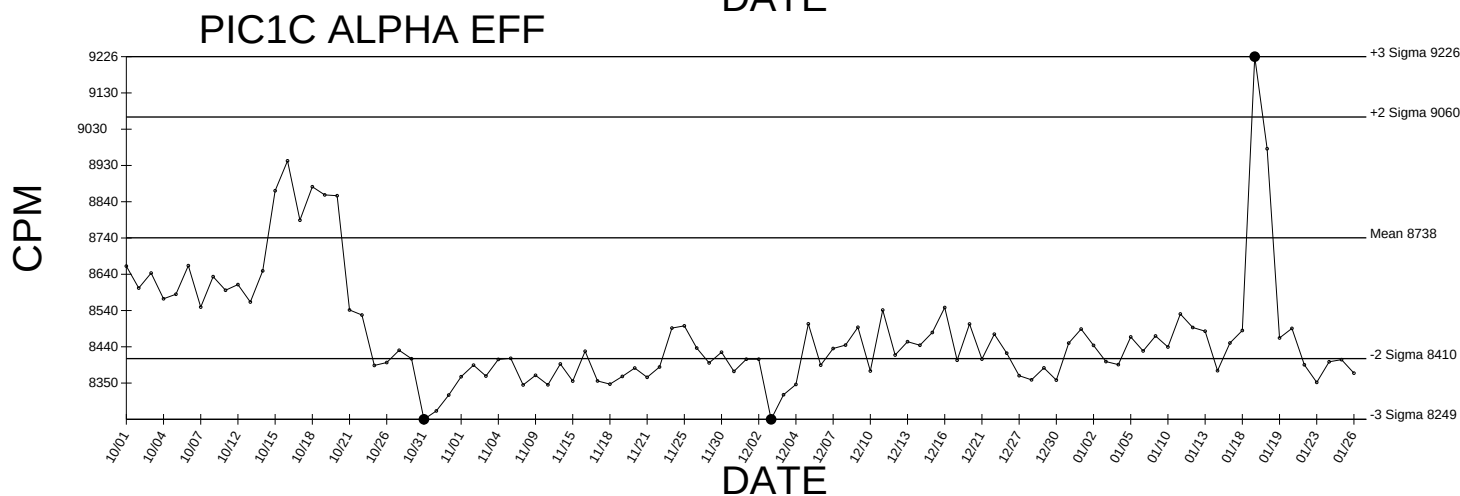
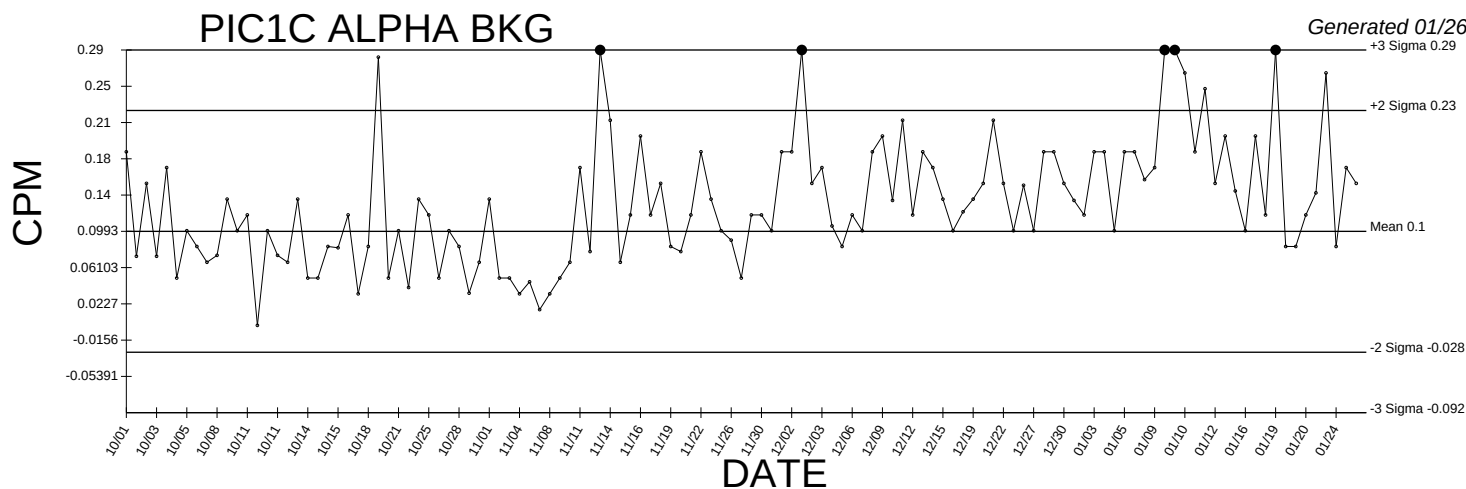
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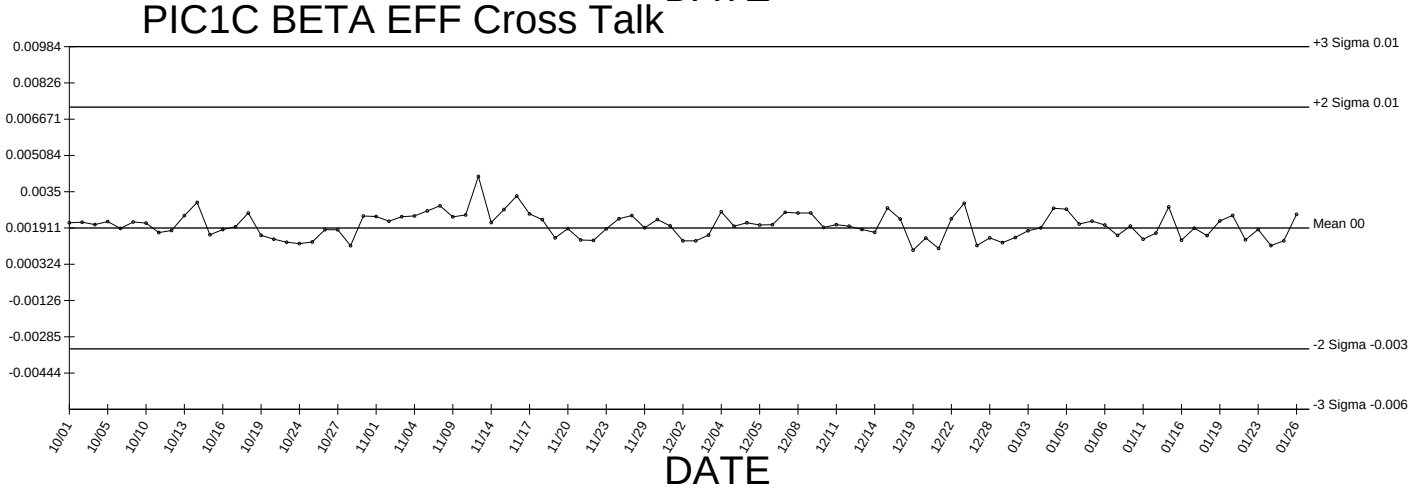
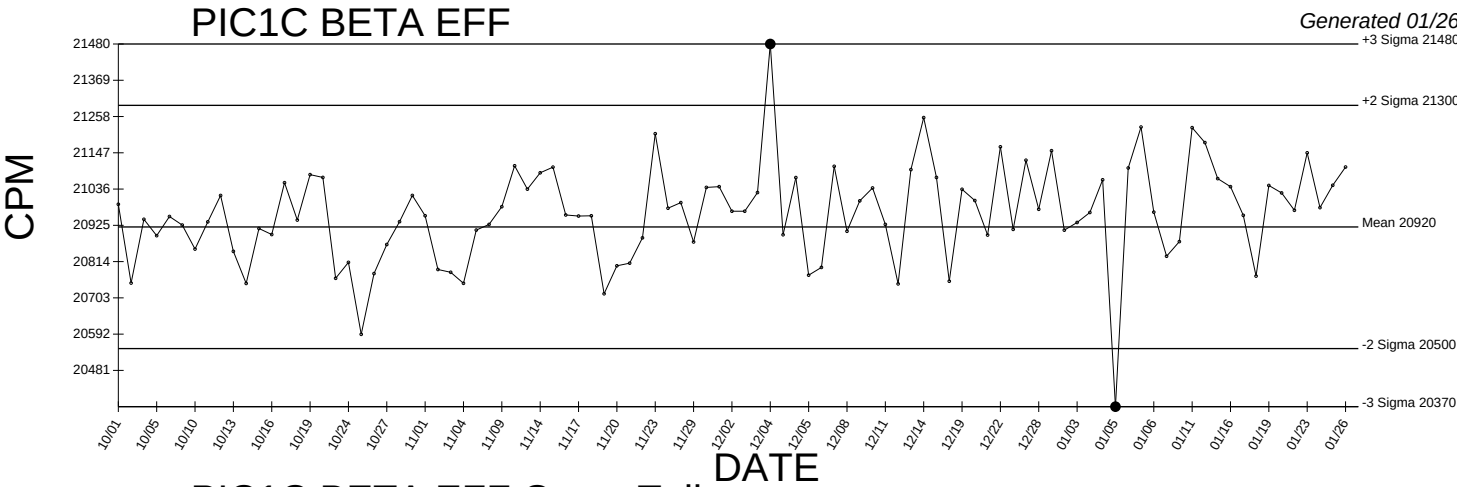
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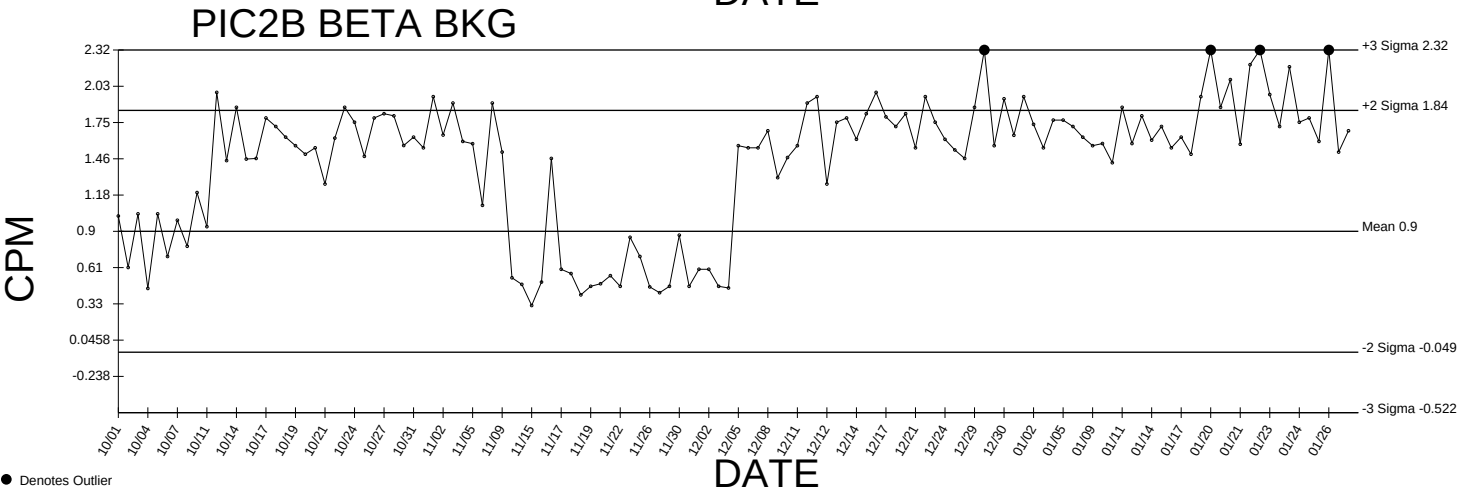
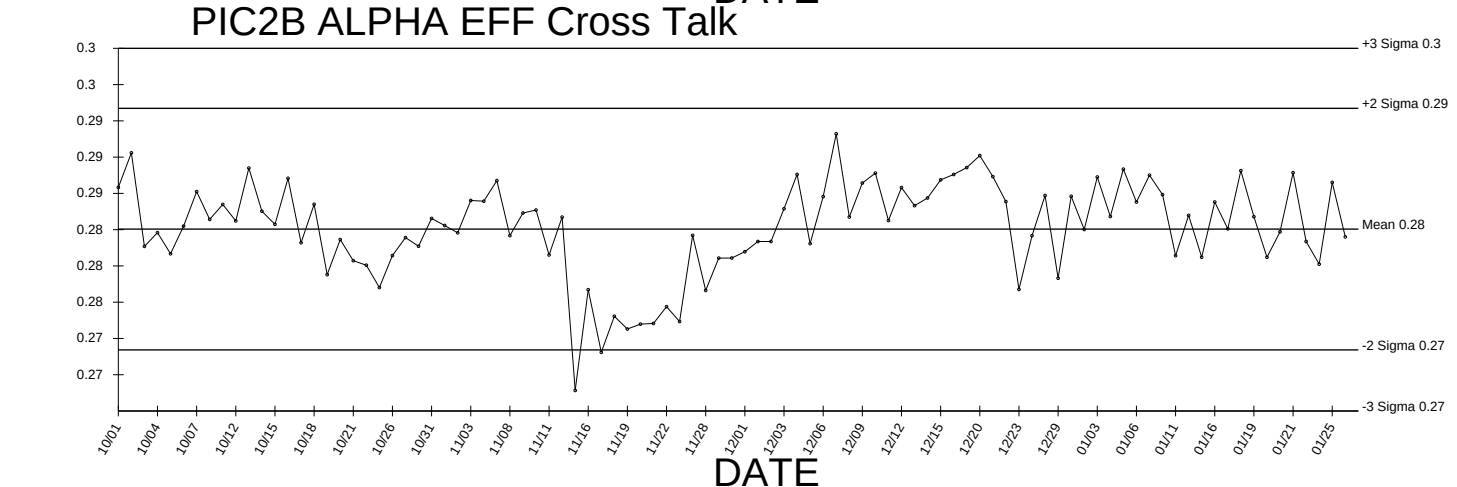
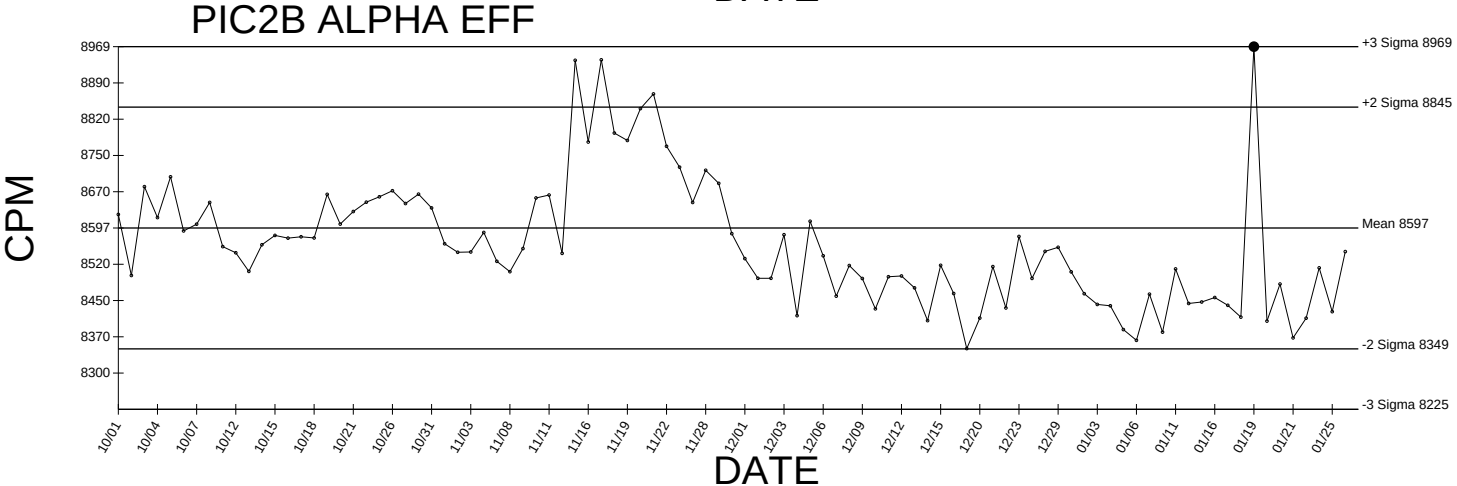
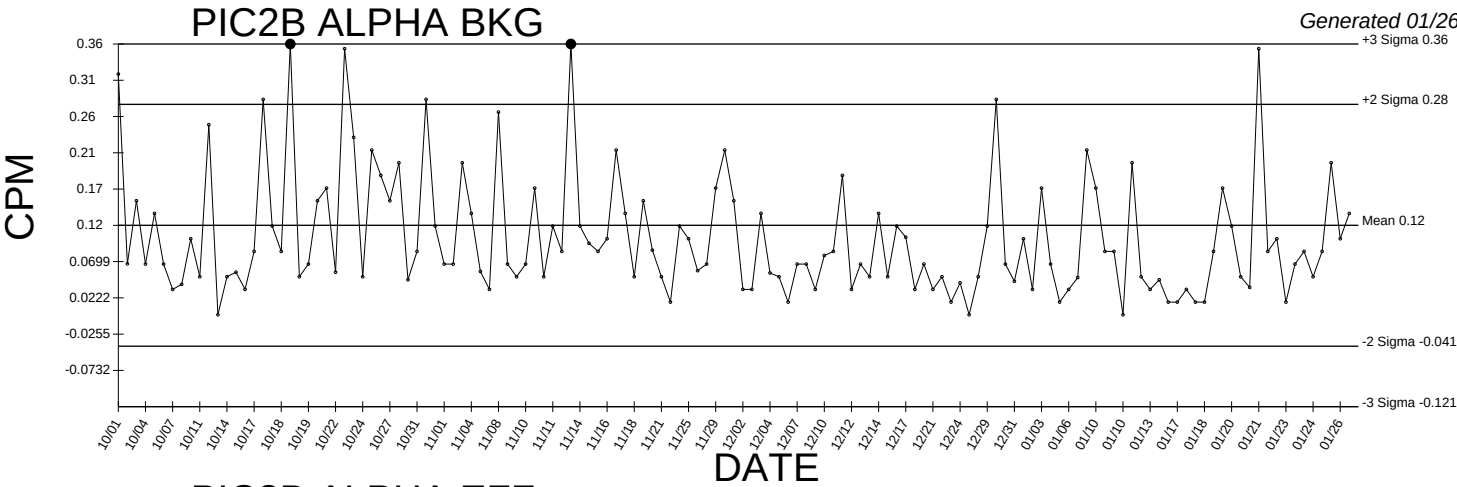
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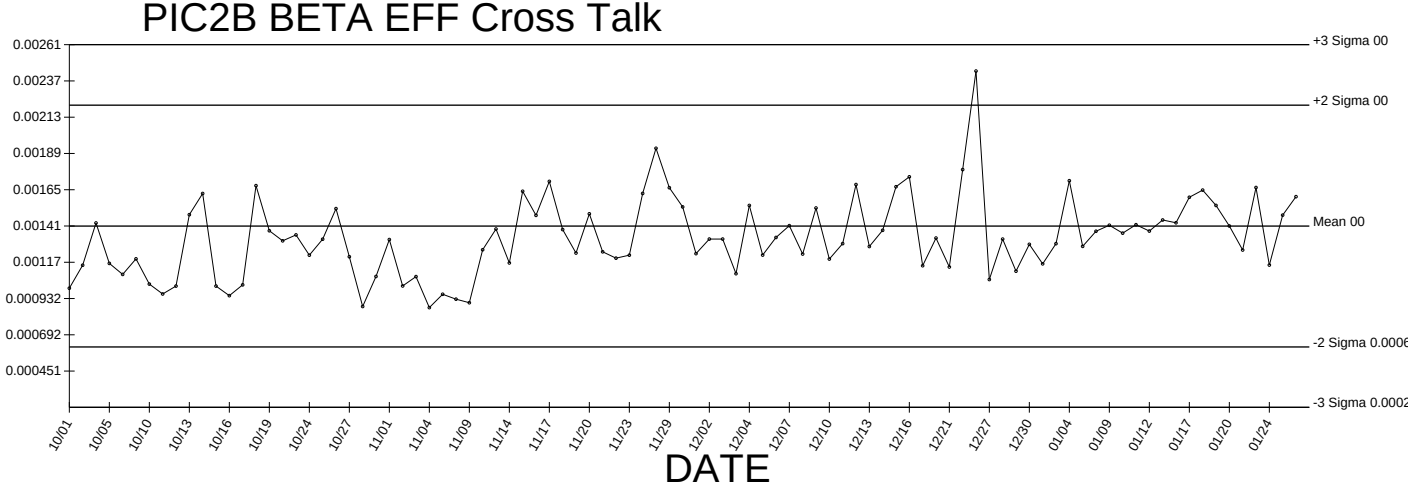
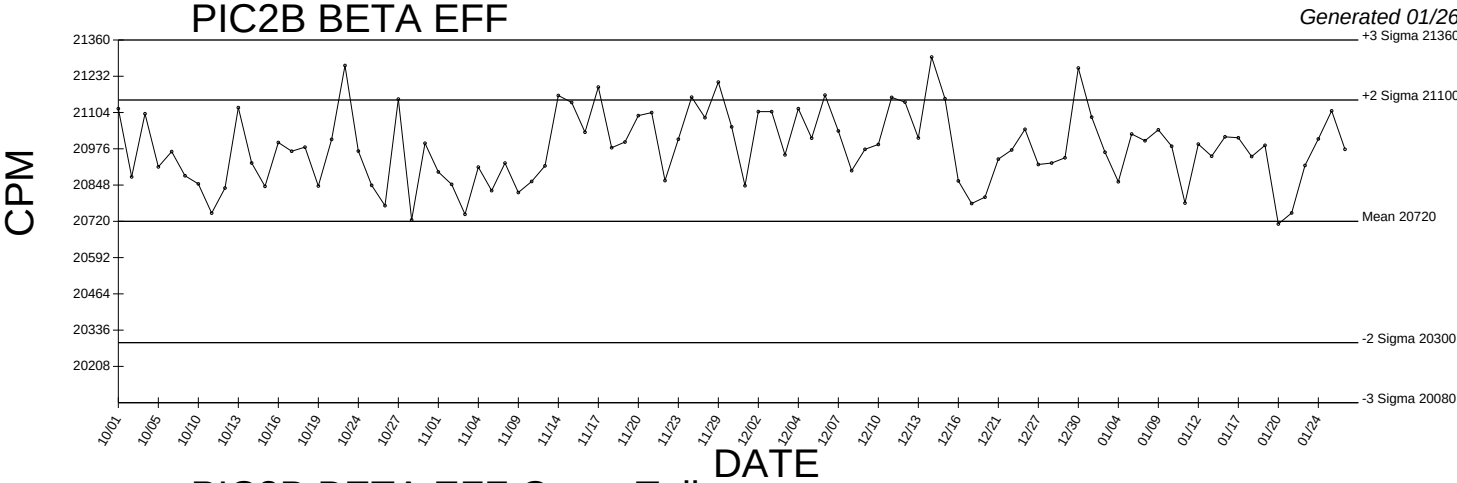
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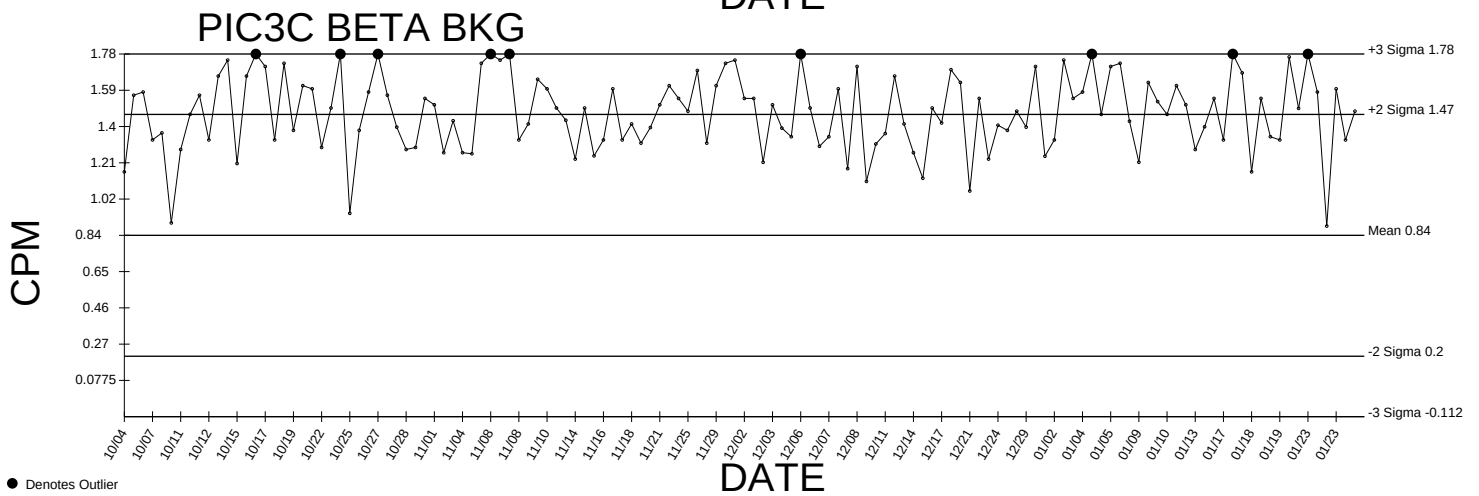
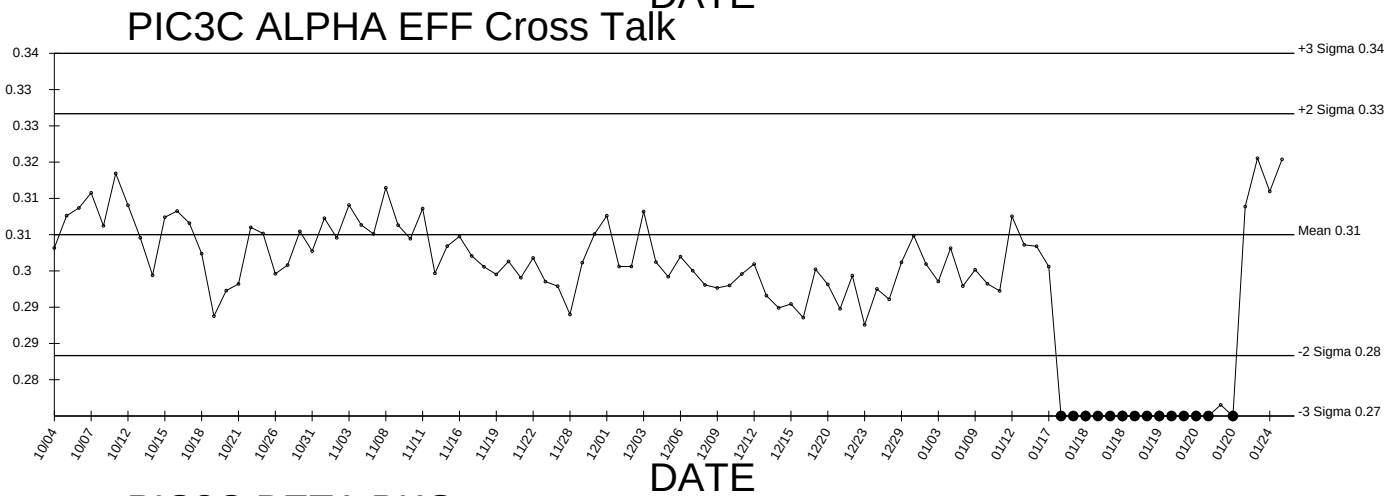
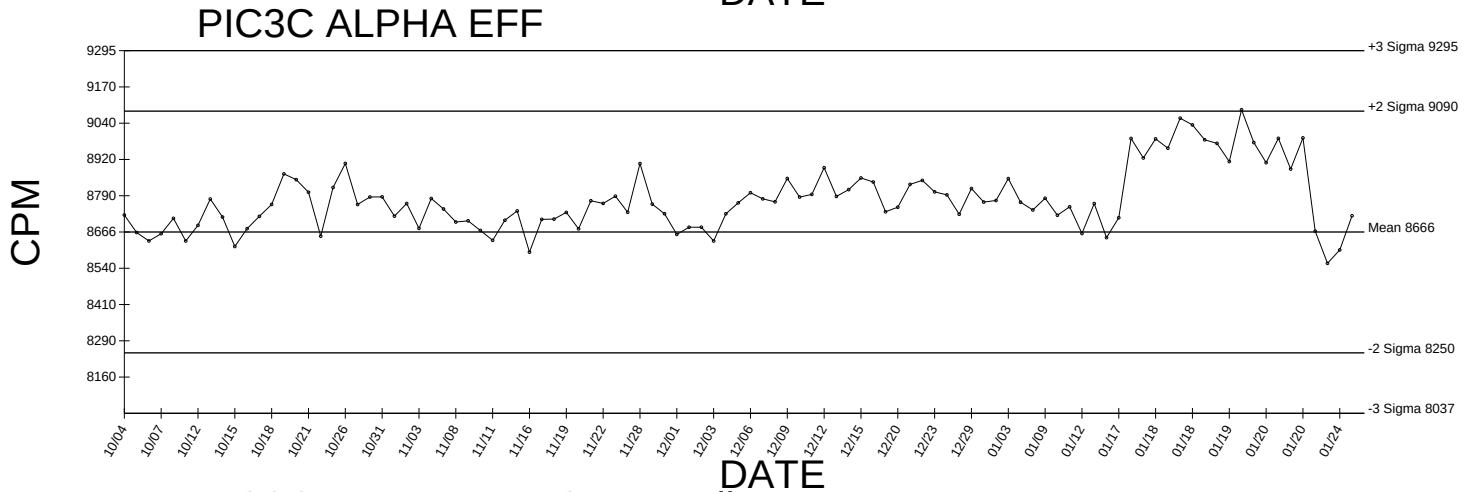
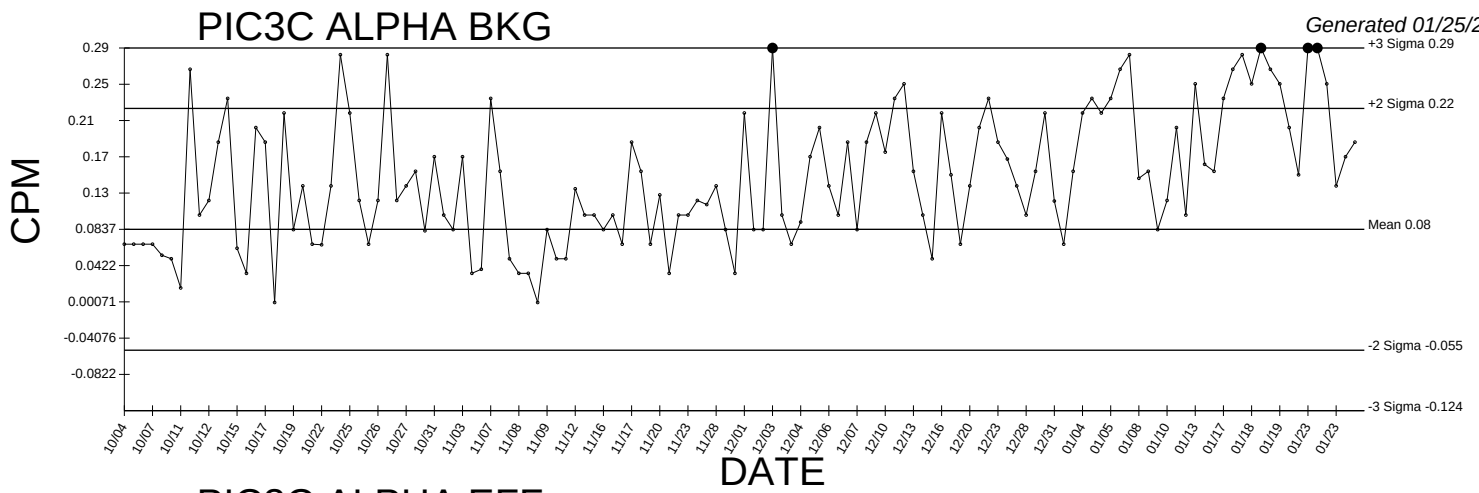
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● Denotes Outlier

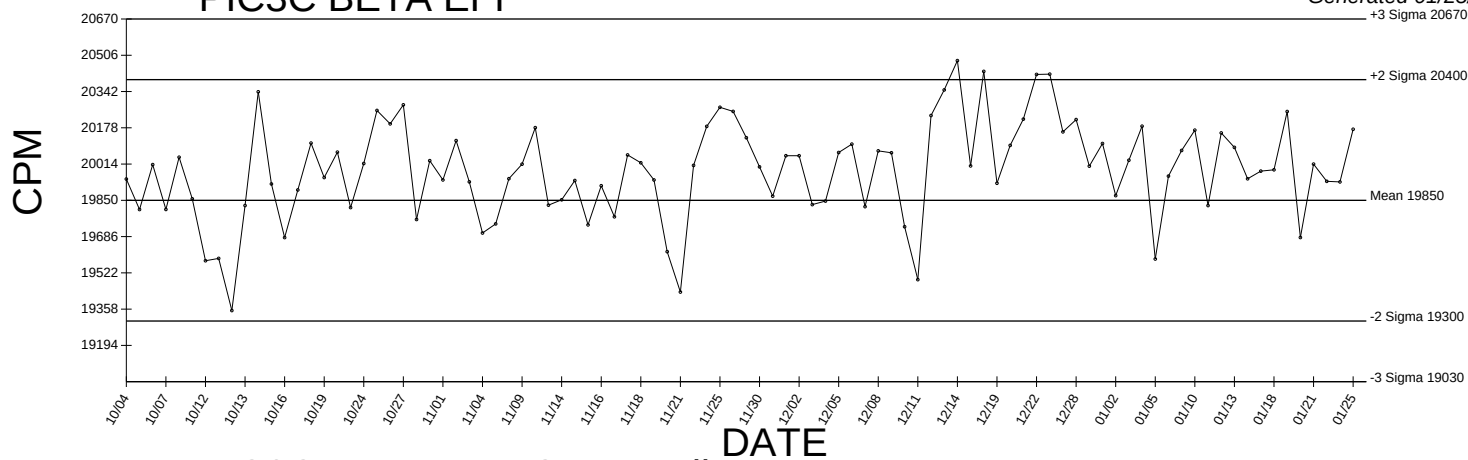


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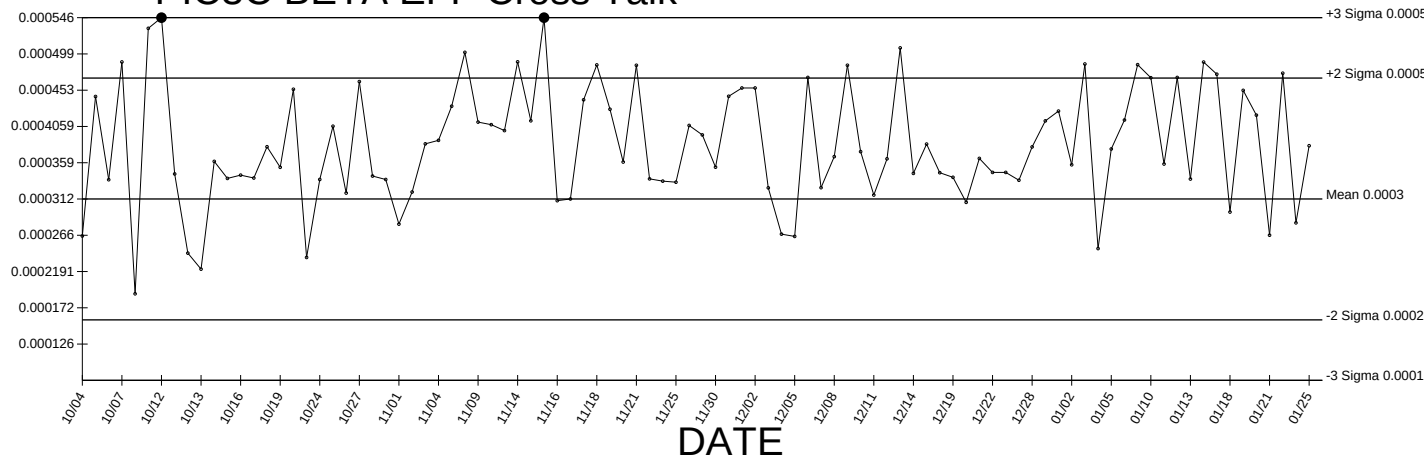


PIC3C BETA EFF

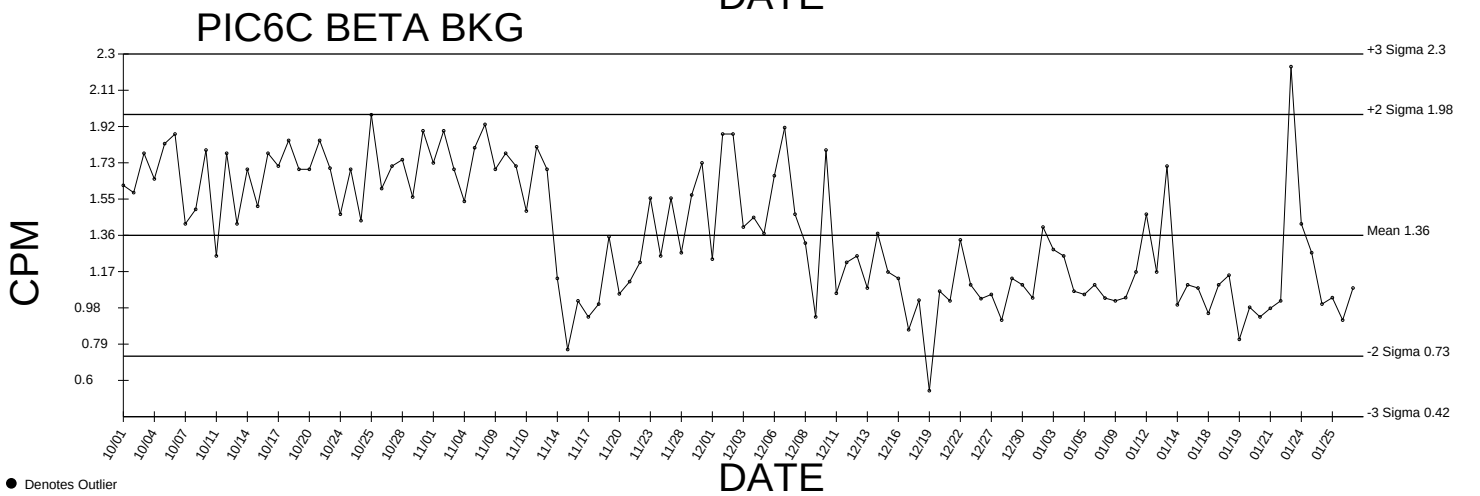
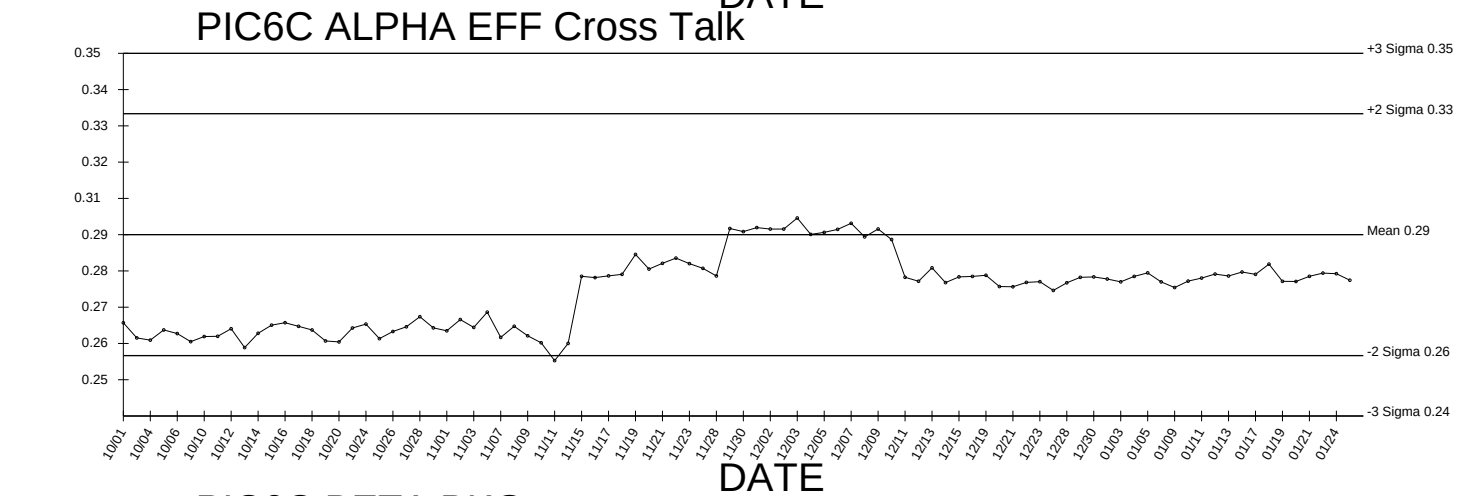
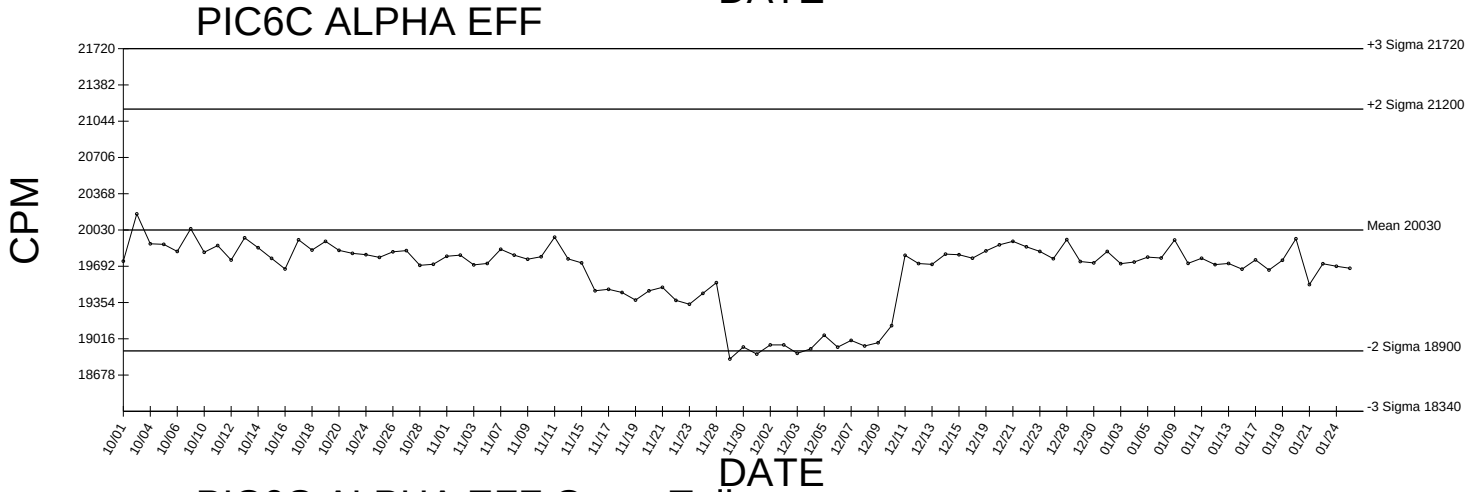
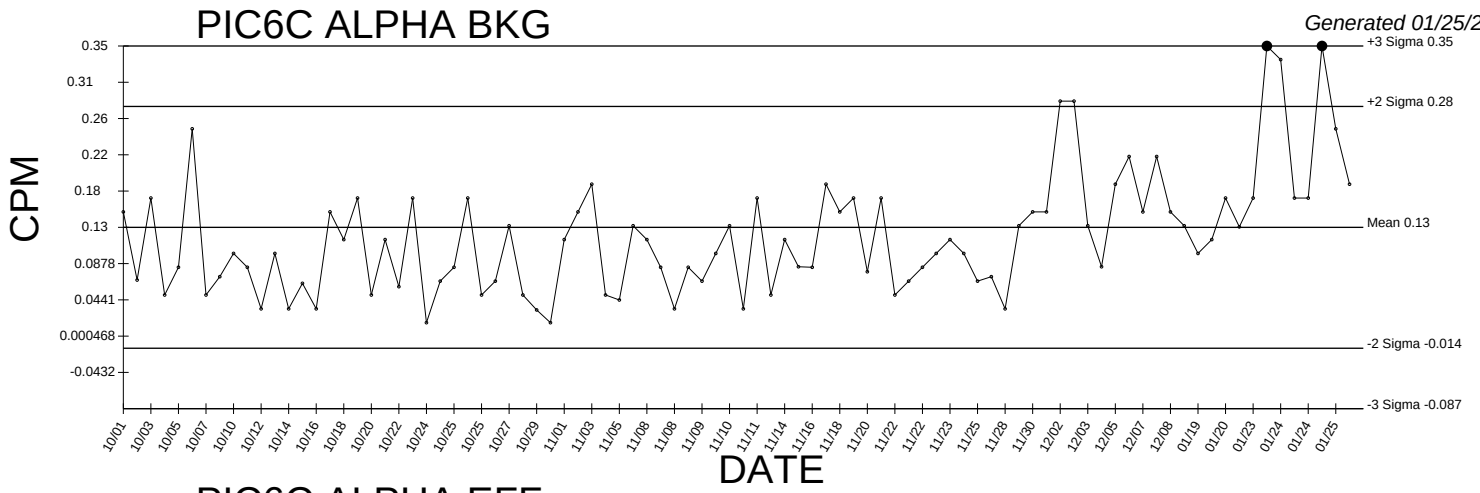
Generated 01/25/2023



PIC3C BETA EFF Cross Talk



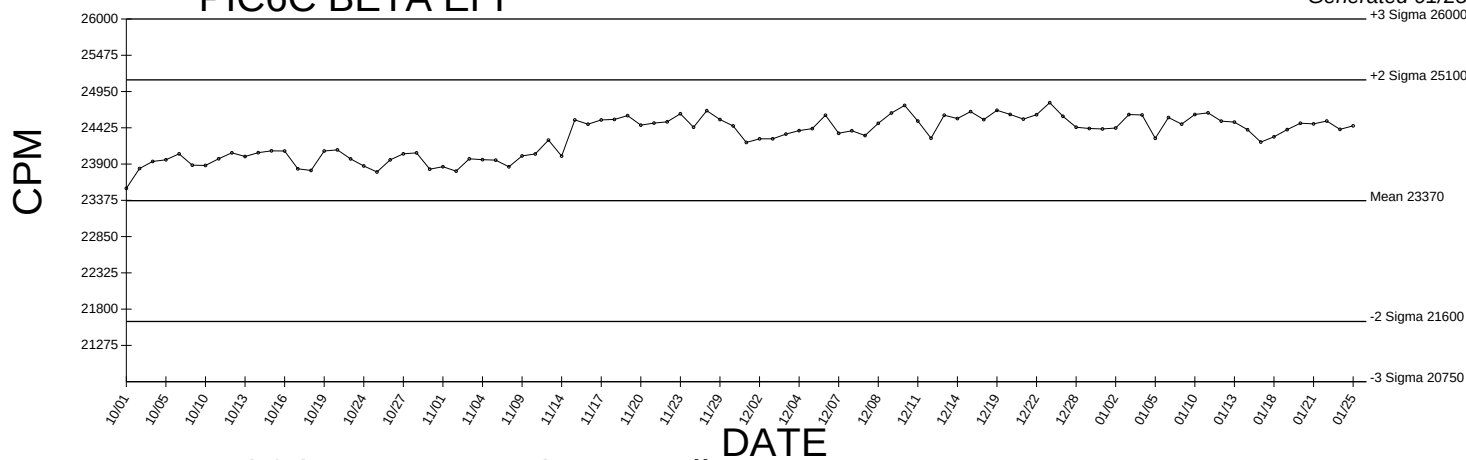
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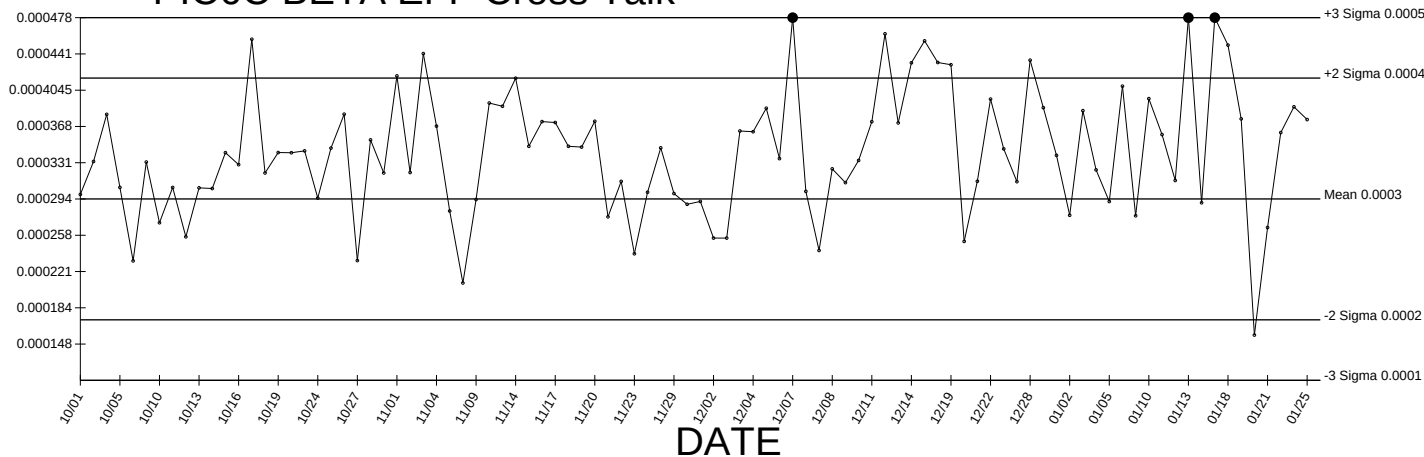
● Denotes Outlier

PIC6C BETA EFF

Generated 01/25/2023



PIC6C BETA EFF Cross Talk



● Denotes Outlier

RAD Standards Traceability

Standardization of Strontium Carrier 3535520

v1.2.1

Analyst	JXK3
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Standard Information	
Isotope	Strontium
Serial Number	3535520
Amount of Std. (mL)	1.0
Standard Prepared	11/20/2022

Parent Information	
Parent Serial #	3426824.2
Parent Exp. Date	4/18/2024

Std #	Weight of carrier added (g)	Weight of crucible or filter (g)	Weight of crucible or filter + ppt. (g)	Weight of ppt. (g)	mg Strontium/mL	mg Strontium/g
1	1.0221	0.0346	0.0422	0.0076	7.60	7.44
2	1.0220	0.0345	0.0422	0.0077	7.70	7.53
3	1.0233	0.0347	0.0423	0.0076	7.60	7.43
4	1.0203	0.0342	0.0419	0.0077	7.70	7.55

Standardization Rule

A satisfactory standardization is obtained when results give a standard deviation of less than 1.0% of the mean value.

Mean Value (mg/mL) = 7.65
 Stdev (mg/mL) = ± 0.06
 1.0% of Mean Value = 0.076500
 Pass
 Expiration Date 11/20/2023
 Mean Value (mg/1.0mL) = 7.65

M 11/22/22



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

1943

SRS Number: 115036

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8090-5FSA-37kBq

Customer: GEL Laboratories LLC

P.O. Number: GEL1924879, Item 4

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 23-January-2020 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Sr-90	1.052E+04	3.705E+04	0.1	1.0	2.1	4 π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4 π LS - 4 π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

GL-CED-297-236a

EZA Certificate Program Rev. 1, 01-FEB-2019

Dec
4-8-20

Page 1 of 2

SRS Number: 115036

Comments:

5.00204 g of 0.1 M HCl solution with approximately 30 µg/g each Sr and Y carriers.

Impurities:

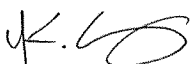
γ-impurities < 0.1%

Note:

This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total activity for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Eardley, Radiochemist

QC Approved by:


A. Chen, Spectroscopist

Date: 16 Jan 20

Standard Logbook

Serial ID: 1943 **Open/Reference Date:** 23-JAN-20 **Aliquot :** 5.00204 g
Name: Strontium-90 **Received:** 23-JAN-20 **Density :** Hand Calculated
Type: Source Material **Expires:** 23-JAN-35 **Logbook Num :** GL-CED-297-236
Employee: Tim Chandler **Lot Number :** 115036
Supplier: Eckert & Zeigler **Solvent :** 0.1M HCl
Uncertainty : 1.05 percent
Description: Strontium-90
Comments: None

Analyte	Concentration	Analyte	Concentration
Strontium-90	37050 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1943
Prepared By:	Tim Chandler
Carrier Conc:	0.1M HCl
Reference Date:	01/23/2020
Ampoule Mass (g):	5.00204 g
Uncertainty:	+/- 1.05 %
LogBook No:	GL-CED-297-236
Supplier:	Eckert & Zeigler

A Solution Material Info			
Isotope:	Strontium-90		
Prepared By:	Jennie Kill-Bowden		
Prep Date:	08/13/2020		
Verification Date:	01/16/2023		
Expiration Date:	01/16/2024		
Primary Code:	1943-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9536 g		
Density(g/mL):	0.9995	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22014.7236 \text{ dpm/mL}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (0.9995 \text{ g/mL}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22025.6704 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/16/2021	Bethany Fiem	24.8842	1000	1943-B	548.091187 dpm/mL	02/16/2021	02/16/2022
01/04/2022	Jennie Kill-Bowden	25.0633	1000	1943-C	552.035985 dpm/ml	01/13/2023	01/13/2024
06/06/2022	Jennie Kill-Bowden	24.9802	1000	1943-D	550.2057 dpm/ml	06/03/2022	06/03/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Sr-90 Standard 1943-D

v1.0.2

Instrument	BROWN
Analyst	JXX3
Verification Prep Date	6/3/2022

Standard Information	
Isotope	Sr-90
Serial Number	1943-D
Isotope Halflife	28.9000 Y
Reference Date	1/23/2020
Ref. Act. (DPM/mL)	550.2057
Amount of Std. (mL)	1.0
Standard Prep Date	6/3/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	6/4/2022	92.40	1086.20	47.20
2	6/4/2022	91.60	1093.60	47.20
3	6/4/2022	91.70	1107.60	47.20

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	1039.00	2.018286	514.79	514.79
2	1046.40	2.018286	518.46	518.46
3	1060.40	2.018286	525.40	525.40

	dpm/mL
Mean Value =	519.55
Stdev =	5.384916401
Certificate Value* =	519.9
Two sigma =	10.770
10 % of Mean =	51.955
Rule A (Pass/Fail)	Pass
% Recovery	99.93%
Rule B (Pass/Fail)	Pass
Expiration Date	6/3/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Sr-90 source 1943-D by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCBROWN for Sr-90 source standard verification. The Sr-90 efficiency calibration which was used for verification calculations was performed on 6/3/2022 using Sr-90 source 1689-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency (cpm/dpm), and
- D = volume used for standard verification.

RAD-M-001

Las Bruise 6/13/22
Jxxk 6/6/22

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2368082

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
606488001	SAMPLE	ST2	PIC11D	JAN-23-23 16:33:32	DONE	Tuffryn Filter	01-APR-21 00:00
1205293194	MB	ST2	PIC6C	JAN-25-23 18:32:12	DONE	Tuffryn Filter	01-APR-21 00:00
606487003	SAMPLE	ST2	PIC3C	JAN-25-23 18:32:51	DONE	Tuffryn Filter	01-APR-21 00:00
606488003	SAMPLE	ST2	PIC4D	JAN-25-23 18:33:12	DONE	Tuffryn Filter	01-APR-21 00:00
1205293195	LCS	ST2	PIC1C	JAN-26-23 09:47:36	DONE	Tuffryn Filter	01-APR-21 00:00
1205293196	LCSD	ST2	PIC2B	JAN-26-23 09:47:36	DONE	Tuffryn Filter	01-APR-21 00:00
606487001	SAMPLE	ST2	PIC1A	JAN-26-23 09:47:45	DONE	Tuffryn Filter	01-APR-21 00:00
606488004	SAMPLE	ST2	PIC2A	JAN-26-23 09:48:19	DONE	Tuffryn Filter	01-APR-21 00:00
606488002	SAMPLE	ST2	PIC7D	JAN-26-23 09:53:45	DONE	Tuffryn Filter	01-APR-21 00:00
606487002	SAMPLE	ST2	PIC1B	JAN-28-23 09:10:34	DONE	Tuffryn Filter	01-APR-21 00:00
606488005	SAMPLE	ST2	PIC3B	JAN-28-23 09:12:05	DONE	Tuffryn Filter	01-APR-21 00:00

Liquid Scintillation Raw Data

Batch 2368292 Check-list

This check-list was completed on 25-JAN-23 by Jessica Downey

This batch was reviewed by Jessica Downey on 25-JAN-23 and Jessica Davis on 25-JAN-23.

Batch ID: 2368292

Product: LSC41PUF

Description: LSC Plutonium Filter

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have client special requirements have been reviewed and met?	Yes		
4	Have samples been blank corrected?		No	
5	Has a hit notification been completed?		No	
6	Has an Aliquot Correction been completed for this batch?	Yes		
7	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
8	Were all the samples prepared/analyzed within the required holding time period?	Yes		
9	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
10	Was the method blank (MB) within the acceptance criteria?	Yes		
11	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
12	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
13	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
14	Has the method required detection limit been met?		No	
Miscellaneous Information				
15	Were manual integrations performed on any sample or QC data files in this batch?	Yes		
16	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium-241 in Filter per Liter

Batch ID:	2368292	Due Dates for Lab:	23-JAN-2023	Package:	24-JAN-2023	SDG:	24-JAN-2023		
Analyst:	Evan Johnson (EJ1)	Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units	
Method:	DOE EML HASL-300, Pu-11-RC	LCS	1205293625	Plutonium-241	AS SPIKE	1714-C	.2	mL	
	Modified	LCSD	1205293626	Plutonium-241	AS SPIKE	1714-C	.2	mL	
Lab SOP:	GL-RAD-A-035 REV# 24								
Instrument:	BAL-C236871727								

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	606487001	20-JAN-2023	5	30.3	0.11337
2	606487002	20-JAN-2023	5	30.45	0.11253
3	606487003	20-JAN-2023	5	30.13	0.11299
4	606488001	20-JAN-2023	5	30.35	0.11607
5	606488002	20-JAN-2023	5	30.3	0.1132
6	606488003	20-JAN-2023	5	30.15	0.10826
7	606488004	20-JAN-2023	5	30.41	0.11234
8	606488005	20-JAN-2023	5	30.03	0.1091
9	1205293624 MB	20-JAN-2023	5		0.11607
10	1205293625 LCS	20-JAN-2023	5		0.11607
11	1205293626 LCSD	20-JAN-2023	5		0.11607

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2044-A	Plutonium-242 AS TRACER	.2 mL	

Plutonium-241 Filter

Filename : PU241.XLS
File type : Excel
Version # : 1.3.4

Tracer S/N : 2044-A
Tracer Exp Date : 7/18/2023
Tracer Volume Added: 0.20
Tracer Error: 0.37%

Batch : 2368292
Analyst : EVA02518
Prep Date : 1/20/2023
Method Uncertainty : 0.0935

Procedure Code : LSC41PUF
Parmname : Plutonium-241
Required MDA : 5 pCi/F
Halflife of Pu-241 : 14.290 years
Pu-241 Abundance : 1.00
Tracer Abundance : 1.00
Halflife of Tracer : 373500.000 years

Geometry:

2mL DI/1 drop HNO3/13mL Ecoscint Ultra

Sample Characteristics					Tracer Calculations									
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Tracer Concentration DPM	Tracer Counts	Tracer Bkg Counts	Tracer Net CPM	Tracer Count Start Date/Time	Tracer Count Time (sec.)	Tracer Decay	Detector Serial #	Detector Efficiency (cpm/dpm)	Detector Efficiency StDev. (cpm/dpm)
1	606487001.1	0.1134	1.2160E-05	12/26/2022 7:15	8.3959	673	1.920	2.796	1/23/2023 11:36	14400	1.000	148999	0.331710	0.006404
2	606487002.1	0.1125	1.2113E-05	12/26/2022 7:23	8.3959	606	1.920	2.517	1/23/2023 11:36	14400	1.000	101447	0.323574	0.006250
3	606487003.1	0.1130	1.2138E-05	12/26/2022 9:00	8.3959	555	2.400	2.302	1/23/2023 11:36	14400	1.000	149000	0.318801	0.006161
4	606488001.1	0.1161	1.2313E-05	12/26/2022 7:41	8.3959	520	0.960	2.163	1/23/2023 11:36	14400	1.000	149010	0.308893	0.005974
5	606488002.1	0.1132	1.2150E-05	12/26/2022 7:49	8.3959	590	0.480	2.456	1/23/2023 11:36	14400	1.000	140586	0.339975	0.006560
6	606488003.1	0.1083	1.1865E-05	12/26/2022 7:58	8.3959	638	0.000	2.658	1/23/2023 11:36	14400	1.000	158092	0.357535	0.006891
7	606488004.1	0.1123	1.2101E-05	12/26/2022 8:04	8.3959	620	2.160	2.574	1/23/2023 11:36	14400	1.000	80020	0.331415	0.006399
8	606488005.1	0.1091	1.1915E-05	12/26/2022 9:00	8.3959	533	0.960	2.217	1/23/2023 11:36	14400	1.000	155835	0.315810	0.006104
9	1205293624.1	0.1161	1.2313E-05	1/20/2023 0:00	8.3959	547	1.680	2.272	1/23/2023 11:36	14400	1.000	149001	0.323334	0.006246
10	1205293625.1	0.1161	1.2313E-05	1/20/2023 0:00	8.3959	638	1.200	2.653	1/23/2023 11:36	14400	1.000	53053	0.358956	0.006918
11	1205293626.1	0.1161	1.2313E-05	1/20/2023 0:00	8.3959	616	0.240	2.566	1/23/2023 11:36	14400	1.000	149002	0.336631	0.006497

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-035
 Instrument SOP:

Count raw Data													Calibration Data						
Pos.	Rack Position #	Counting Time (min.)	Quench#	Gross cpm	Bkg cpm	Bkg Count Time (min.)	Bkg Quench#	Corrected Bkg cpm	Count Start Date/Time	Sample Decay	Calculated Sample Recovery %	Sample Recovery Error %	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Background Rack Position #	Background Count Start Date/Time
1	17-2	30	319.04	23.06	24.08	30	339.12	23.9464	1/24/2023 20:26	0.996	100%	4.34%	LSCNAVY	1/24/2022	1/31/2023	0.2802	0.00792	17-1	1/24/2023 19:55
2	17-3	30	319	23.99	24.08	30	339.12	23.9460	1/24/2023 20:57	0.996	92.6%	4.53%	LSCNAVY	1/24/2022	1/31/2023	0.2802	0.00792	17-1	1/24/2023 19:55
3	17-4	30	330.93	23.27	24.08	30	339.12	24.0357	1/24/2023 21:28	0.996	86.0%	4.70%	LSCNAVY	1/24/2022	1/31/2023	0.2897	0.00792	17-1	1/24/2023 19:55
4	17-5	30	339.64	24.39	24.08	30	339.12	24.0824	1/24/2023 21:58	0.996	83.4%	4.82%	LSCNAVY	1/24/2022	1/31/2023	0.2966	0.00792	17-1	1/24/2023 19:55
5	17-6	30	316.23	23.75	24.08	30	339.12	23.9206	1/24/2023 22:29	0.996	86.1%	4.57%	LSCNAVY	1/24/2022	1/31/2023	0.2780	0.00792	17-1	1/24/2023 19:55
6	17-7	30	338.56	24.06	24.08	30	339.12	24.0774	1/24/2023 23:00	0.996	88.6%	4.42%	LSCNAVY	1/24/2022	1/31/2023	0.2957	0.00792	17-1	1/24/2023 19:55
7	17-8	30	328	23.54	24.08	30	339.12	24.0165	1/24/2023 23:31	0.996	92.5%	4.49%	LSCNAVY	1/24/2022	1/31/2023	0.2874	0.00792	17-1	1/24/2023 19:55
8	17-9	30	338.07	22.19	24.08	30	339.12	24.0751	1/25/2023 0:02	0.996	83.6%	4.77%	LSCNAVY	1/24/2022	1/31/2023	0.2953	0.00792	17-1	1/24/2023 19:55
9	17-10	30	333.48	22.09	24.08	30	339.12	24.0509	1/25/2023 0:32	0.999	83.7%	4.72%	LSCNAVY	1/24/2022	1/31/2023	0.2917	0.00792	17-1	1/24/2023 19:55
10	17-11	30	335.11	108.91	24.08	30	339.12	24.0600	1/25/2023 1:03	0.999	88.0%	4.43%	LSCNAVY	1/24/2022	1/31/2023	0.2930	0.00792	17-1	1/24/2023 19:55
11	17-12	30	324.73	106.26	24.08	30	339.12	23.9930	1/25/2023 1:34	0.999	90.8%	4.49%	LSCNAVY	1/24/2022	1/31/2023	0.2848	0.00792	17-1	1/24/2023 19:55

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1714-C
LCS Exp Date : 10/28/2023
LCS Activity (dpm/ml): 1549.28
LCS Volume Added: 0.20

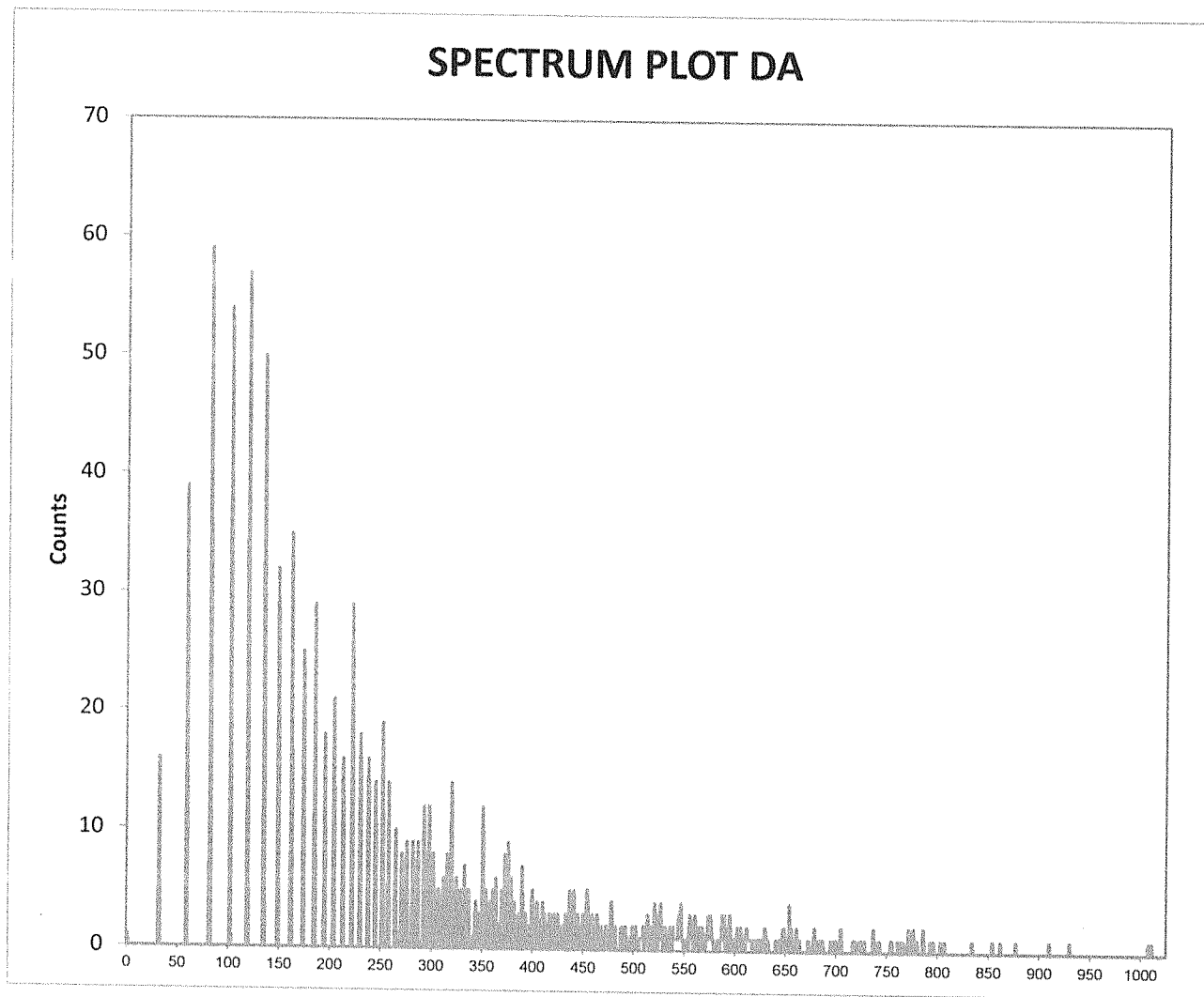
Results																
Pos.	Decision Level pCi/F	Critical Level pCi/F	Required MDA pCi/F	MDA pCi/F	Sample Act. Conc. pCi/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/F	2 SIGMA Total Prop. Uncertainty pCi/F	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery
1	41.7367	29.4665	5	60.3506	-12.5662	141.29%	-0.8864	1.2518	34.7826	34.7827		SAMPLE				
2	45.5684	32.1717	5	65.8913	0.6808	2874.07%	0.0440	1.2641	38.3498	38.3501		SAMPLE				
3	47.3642	33.4395	5	68.4850	-12.2957	164.07%	-0.7657	1.2557	39.5243	39.5244		SAMPLE				
4	46.5097	32.8363	5	67.2479	4.8463	413.23%	0.3076	1.2711	39.2488	39.2616		SAMPLE				
5	49.1383	34.6921	5	71.0542	-2.8499	738.70%	-0.1706	1.2606	41.2614	41.2616		SAMPLE				
6	47.0872	33.2439	5	68.0830	-0.2774	7284.74%	-0.0174	1.2667	39.6027	39.6028		SAMPLE				
7	44.6337	31.5118	5	64.5375	-7.2138	264.27%	-0.4765	1.2591	37.3593	37.3594		SAMPLE				
8	49.5504	34.9830	5	71.6446	-31.6429	66.06%	-1.8851	1.2418	40.8578	40.8580		SAMPLE				
9	46.9205	33.1263	5	67.8428	-31.1849	63.43%	-1.9609	1.2402	38.6567	38.6569		MB				
10	44.4202	31.3610	5	64.2274	1277.2465	5.14%	84.8500	2.1053	62.1148	267.0868		LCS			1202.4823	106.2%
11	44.2620	31.2494	5	64.0008	1235.6770	5.21%	82.2670	2.0837	61.3435	259.2772		LCSD	3.3%		1202.4823	102.8%

SampleID	Rack	Time (min.)	SQPE#	CPM Iso1	CPM Iso2	LumEx	Count	Start Time	Count	End Time	Machine
1	17-1	30	339.12	24.08			1/24/2023 19:55	1/24/2023 20:25	NAVY		
2	17-2	30	319.04	23.06			1/24/2023 20:26	1/24/2023 20:56	NAVY		
3	17-3	30	319	23.99			1/24/2023 20:57	1/24/2023 21:27	NAVY		
4	17-4	30	330.93	23.27			1/24/2023 21:28	1/24/2023 21:58	NAVY		
5	17-5	30	339.64	24.39			1/24/2023 21:58	1/24/2023 22:28	NAVY		
6	17-6	30	316.23	23.75			1/24/2023 22:29	1/24/2023 22:59	NAVY		
7	17-7	30	338.56	24.06			1/24/2023 23:00	1/24/2023 23:30	NAVY		
8	17-8	30	328	23.54			1/24/2023 23:31	1/25/2023 0:01	NAVY		
9	17-9	30	338.07	22.19			1/25/2023 0:02	1/25/2023 0:32	NAVY		
10	17-10	30	333.48	22.09			1/25/2023 0:32	1/25/2023 1:02	NAVY		
11	17-11	30	335.11	108.91			1/25/2023 1:03	1/25/2023 1:33	NAVY		
12	17-12	30	324.73	106.26			1/25/2023 1:34	1/25/2023 2:04	NAVY		

Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
24 Jan 2023 19:55:42
M:\LSC\FILES\navy\2368292A\SPu241_S0001_R01_20230124.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
1, 17, 30:

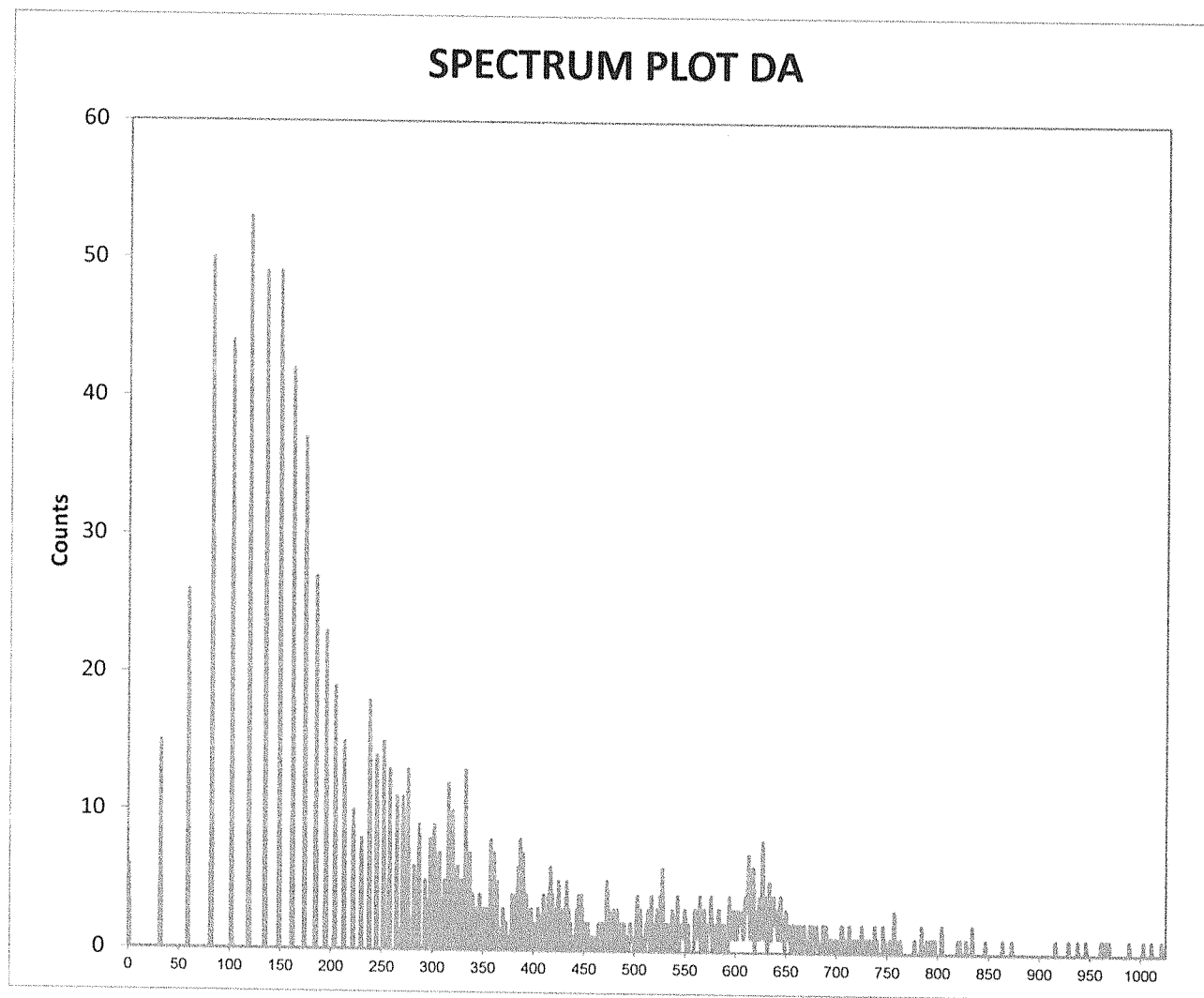
Quench:
Start, End, X-Axis 339.12



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
24 Jan 2023 20:26:31
M:\LSC\FILES\navy\2368292A\SPu241_S0002_R01_20230124.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
2, 17, 30:

Quench: 319.04
Start, End, X-Axis

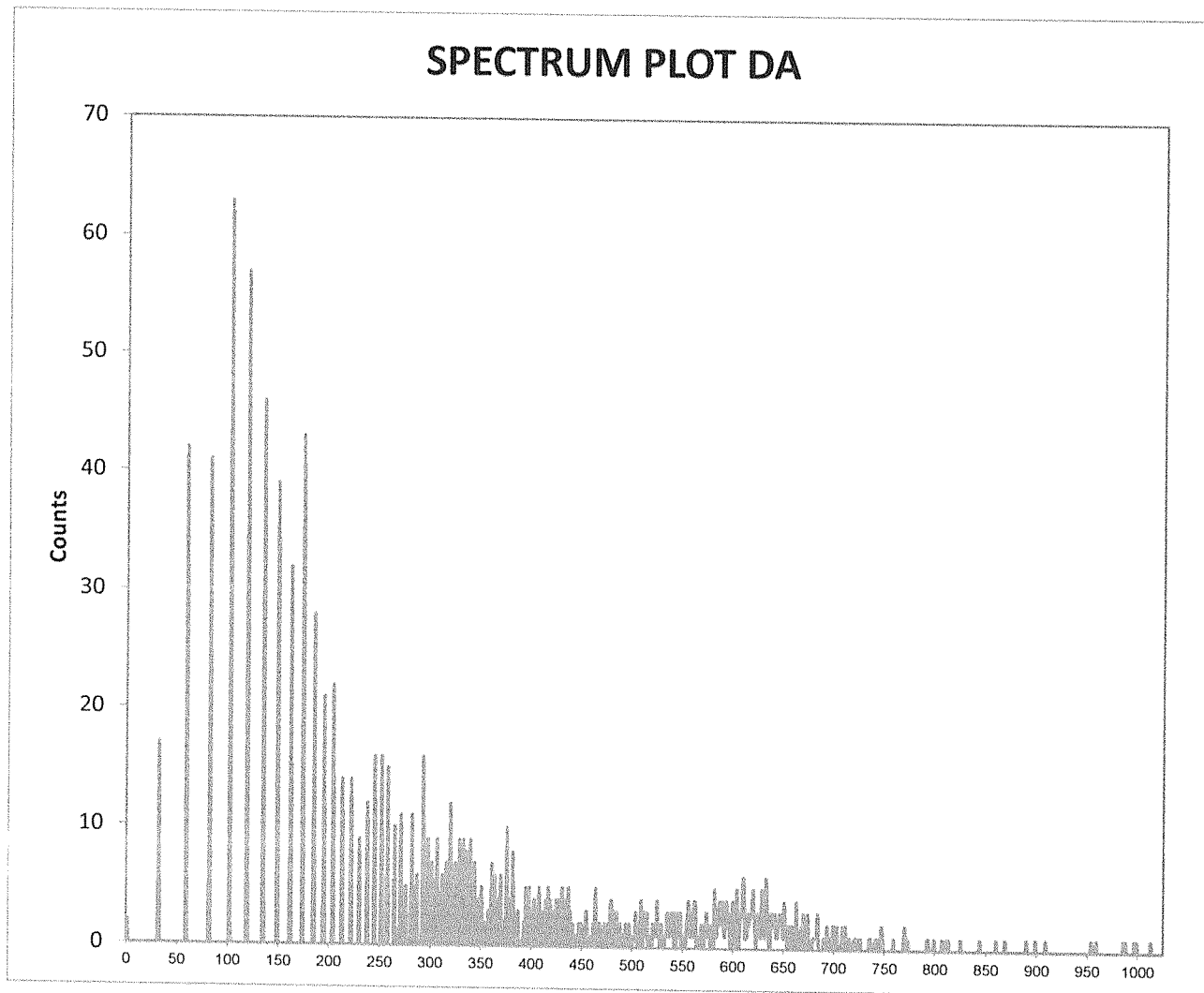


Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
24 Jan 2023 20:57:20
M:\LSC\FILES\navy\2368292A\SPu241_S0003_R01_20230124.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
3, 17, 30:

Quench:
Start, End, X-Axis

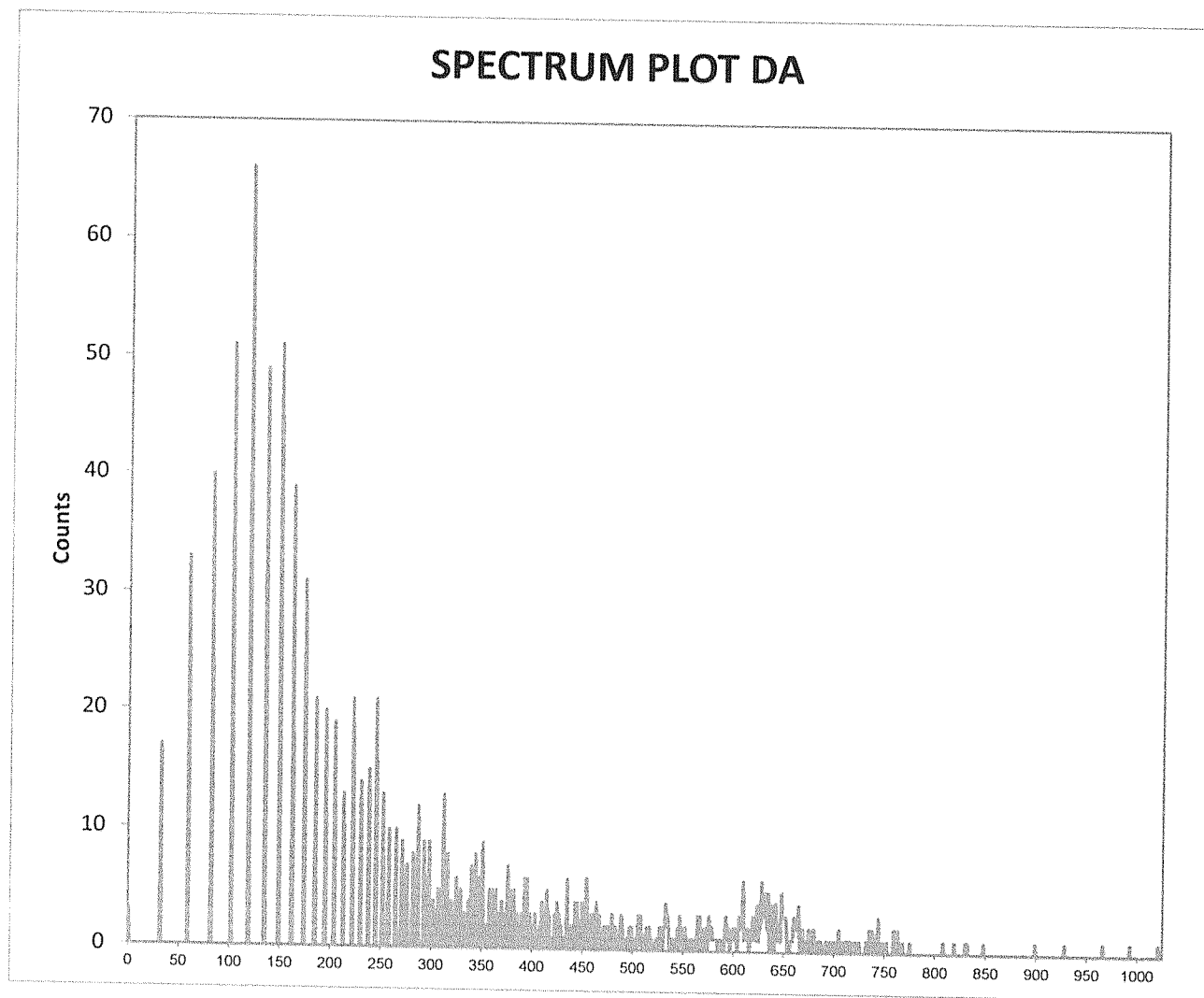
319



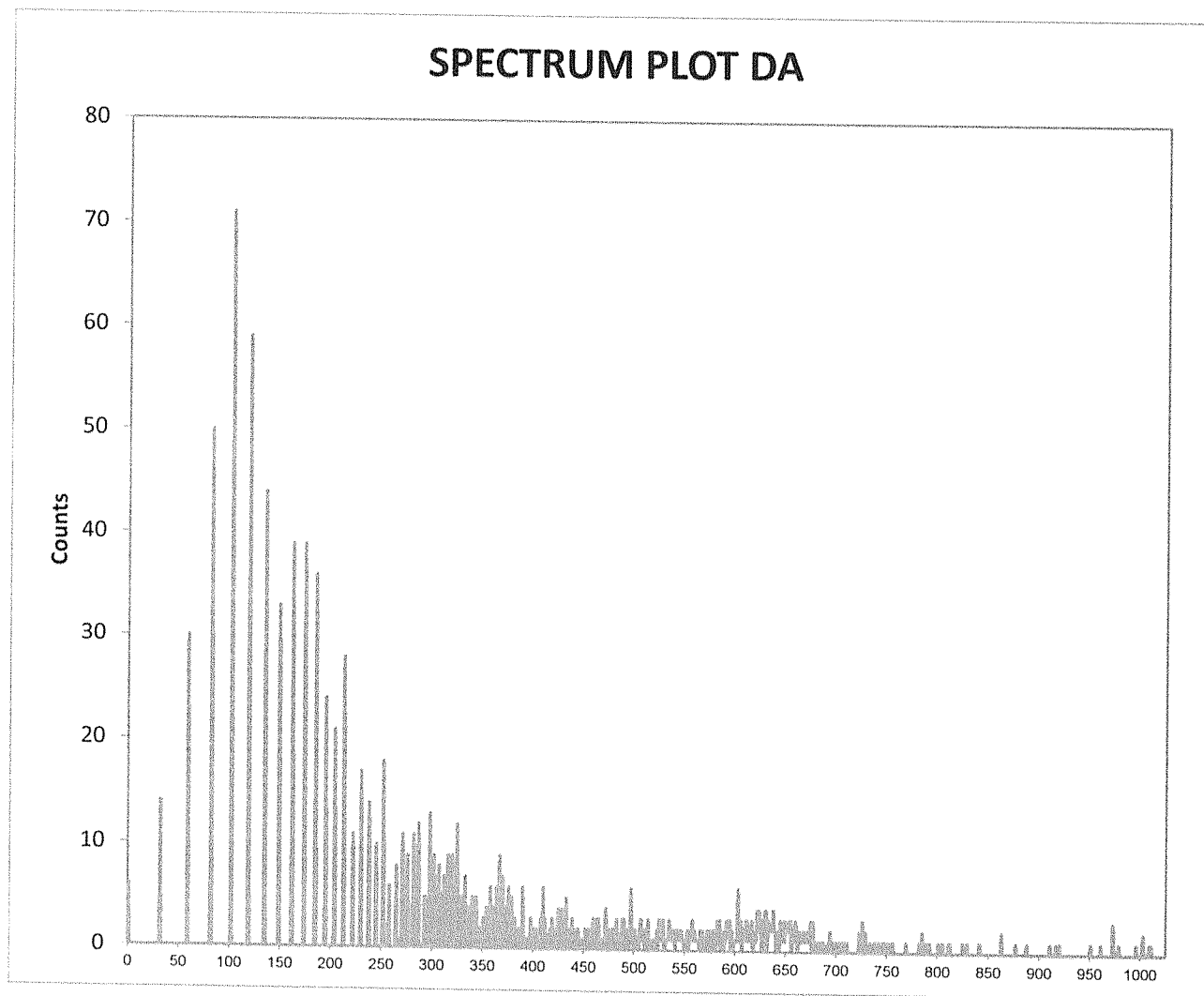
Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
24 Jan 2023 21:28:09
M:\LSC\FILES\navy\2368292A\SPu241_S0004_R01_20230124.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
4, 17, 30:

Quench:
Start, End, X-Axis 330.93



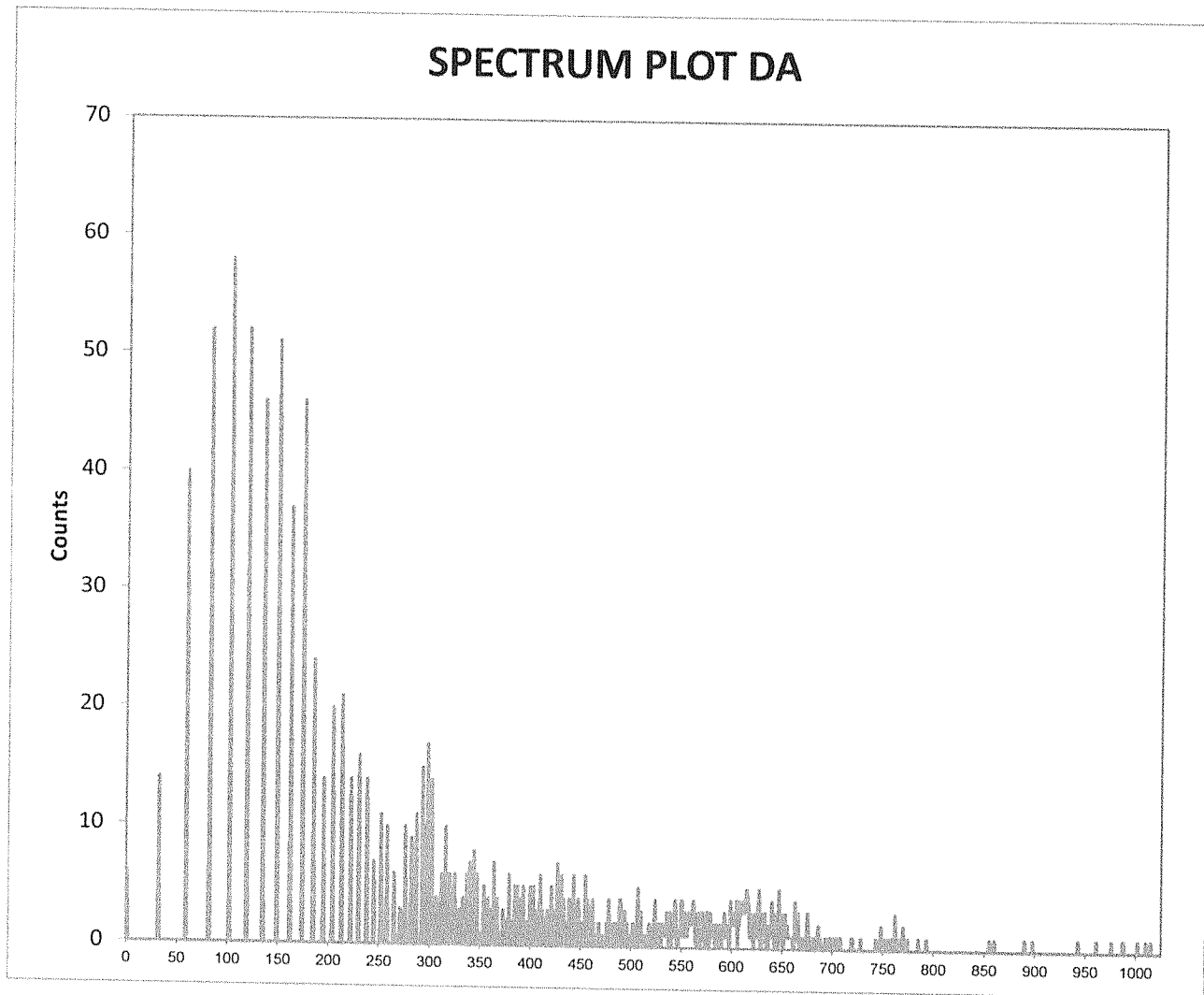
Instrument Type: PE
Sample Count Start Time: 24 Jan 2023 21:58:57
FileName: M:\LSC\FILES\navy\2368292A\SPu241_S0005_R01_20230124.
File Info: M:\LSC\FILES\navy\2368292A\U2368292A.xls
ID: DA
Comments: NAVY
5, 17, 30:
Quench: 339.64
Start, End, X-Axis



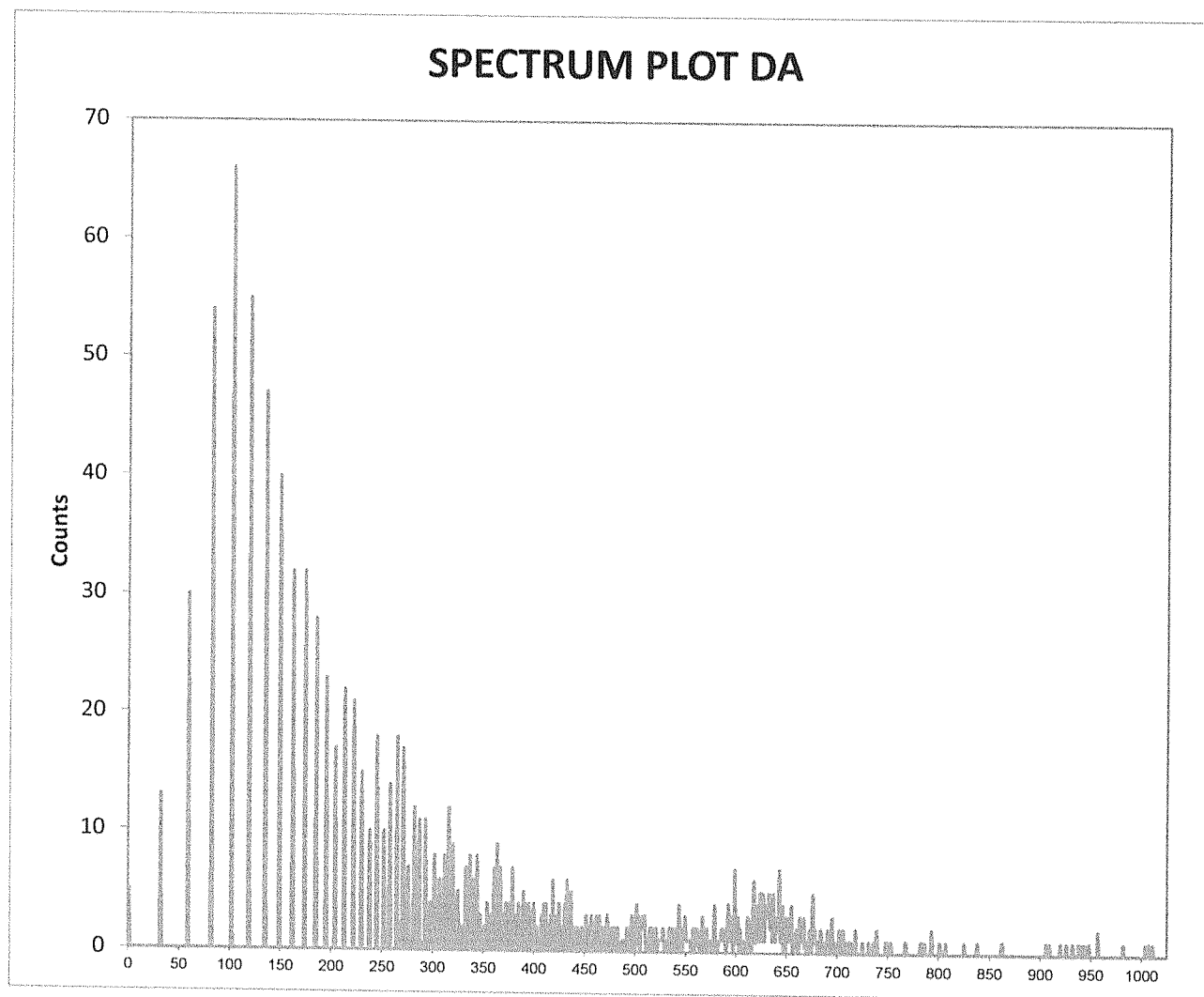
Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
24 Jan 2023 22:29:45
M:\LSC\FILES\navy\2368292A\SPu241_S0006_R01_20230124.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
6, 17, 30:

Quench:
Start, End, X-Axis 316.23



Instrument Type: PE
Sample Count Start Time: 24 Jan 2023 23:00:34
FileName: M:\LSC\FILES\navy\2368292A\SPu241_S0007_R01_20230124
File Info: M:\LSC\FILES\navy\2368292A\U2368292A.xls
ID: DA
Comments: NAVY
7, 17, 30:
Quench: 338.56
Start, End, X-Axis

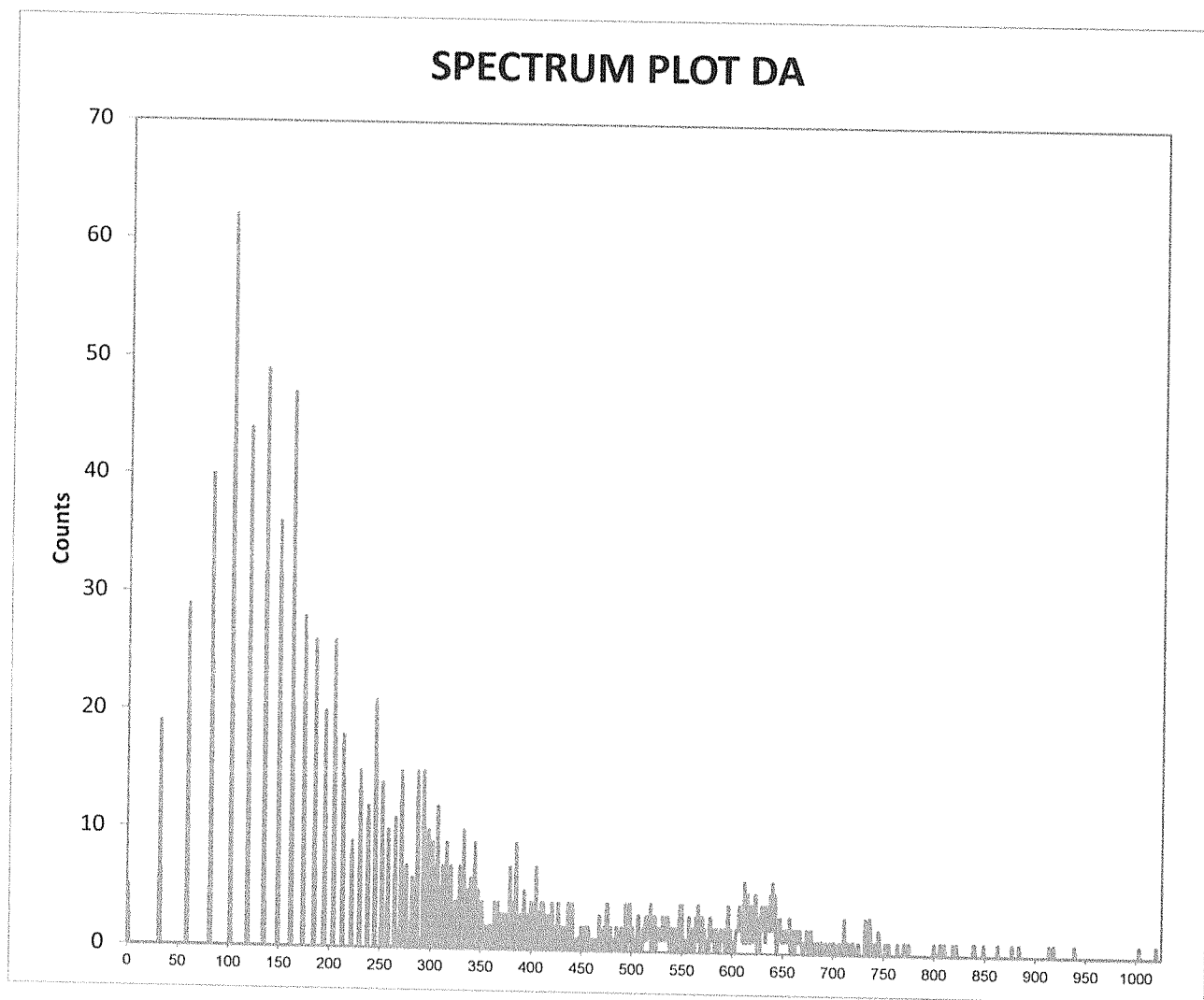


Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
24 Jan 2023 23:31:22
M:\LSC\FILES\navy\2368292A\SPu241_S0008_R01_20230125.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
8, 17, 30:

Quench:
Start, End, X-Axis

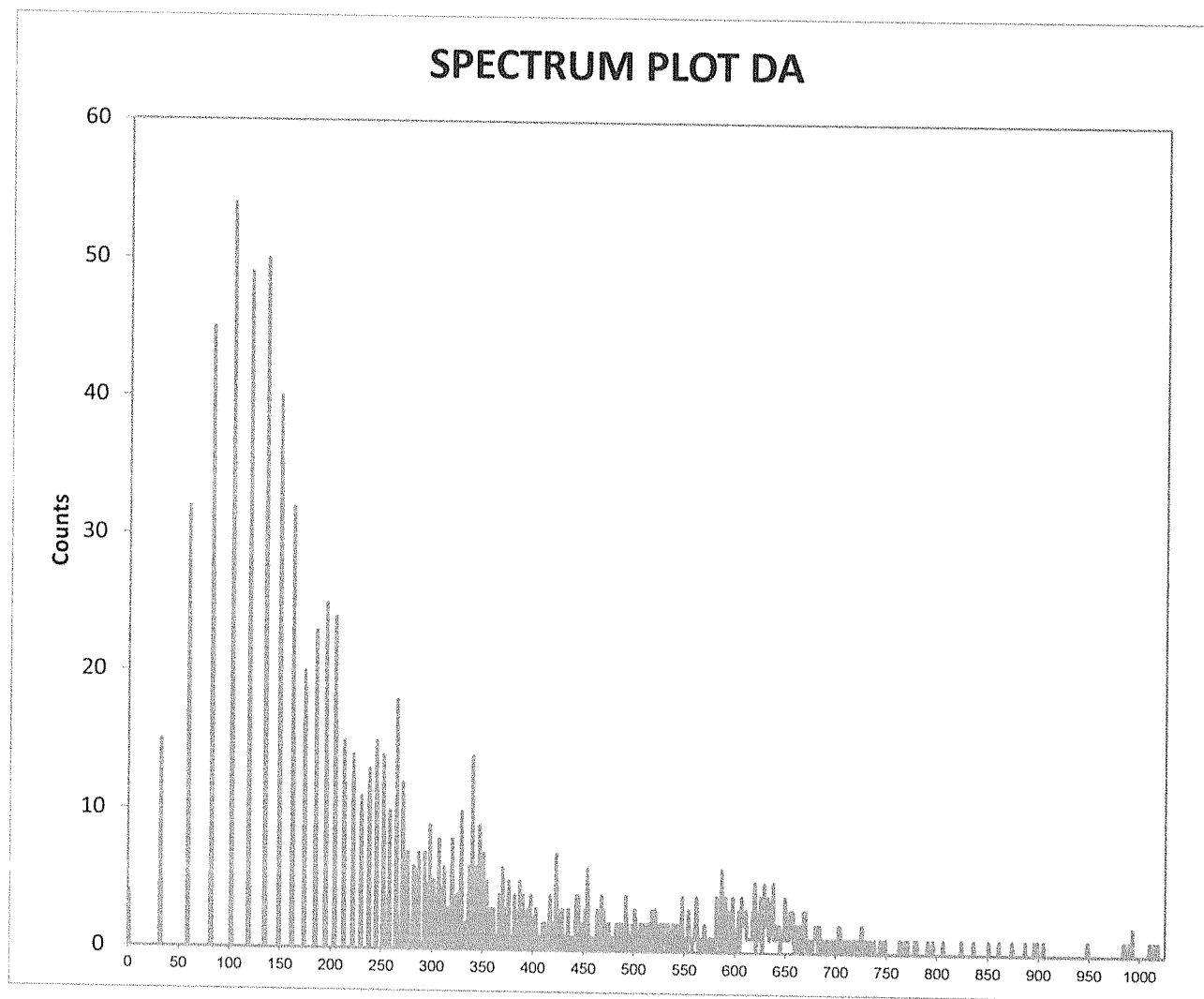
328



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
25 Jan 2023 00:02:10
M:\LSC\FILES\navy\2368292A\SPu241_S0009_R01_20230125.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
9, 17, 30:

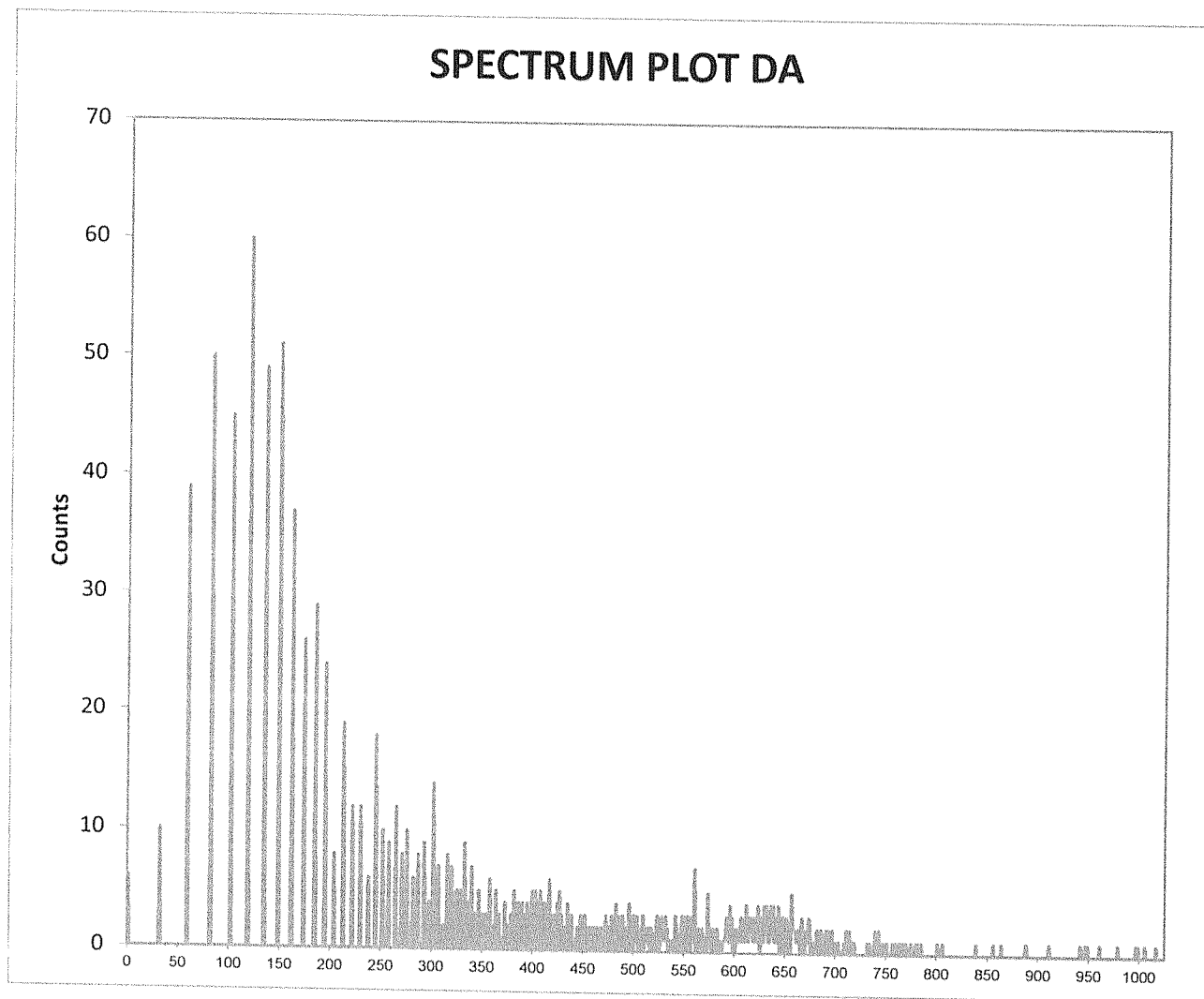
Quench: 338.07
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
25 Jan 2023 00:32:58
M:\LSC\FILES\navy\2368292A\SPu241_S0010_R01_20230125.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
10, 17, 30:

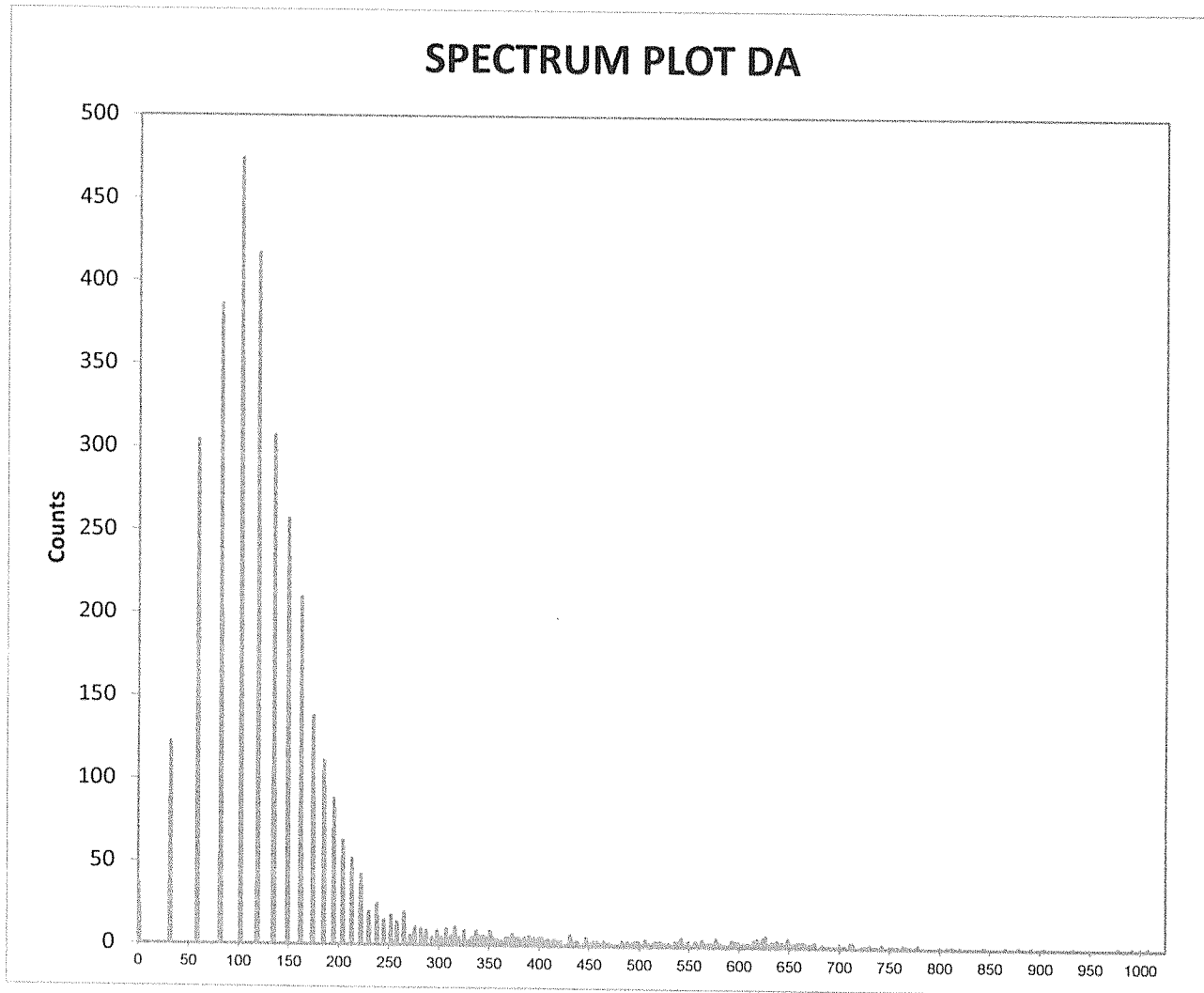
Quench:
Start, End, X-Axis 333.48



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
25 Jan 2023 01:03:47
M:\LSC\FILES\navy\2368292A\SPu241_S0011_R01_20230125.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
11, 17, 30:

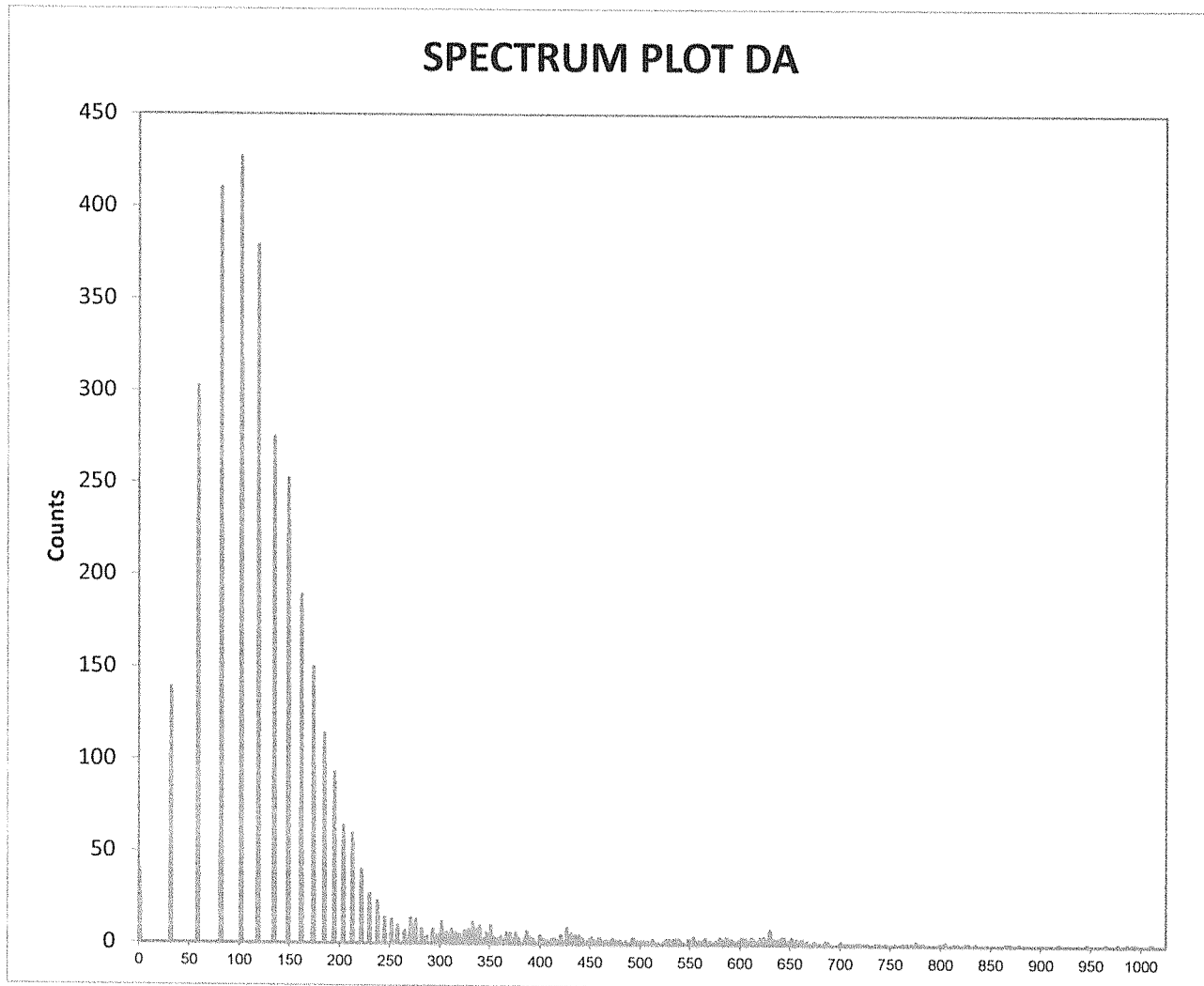
Quench: 335.11
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
25 Jan 2023 01:34:35
M:\LSC\FILES\navy\2368292A\SPu241_S0012_R01_20230125.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
12, 17, 30:

Quench: 324.73
Start, End, X-Axis

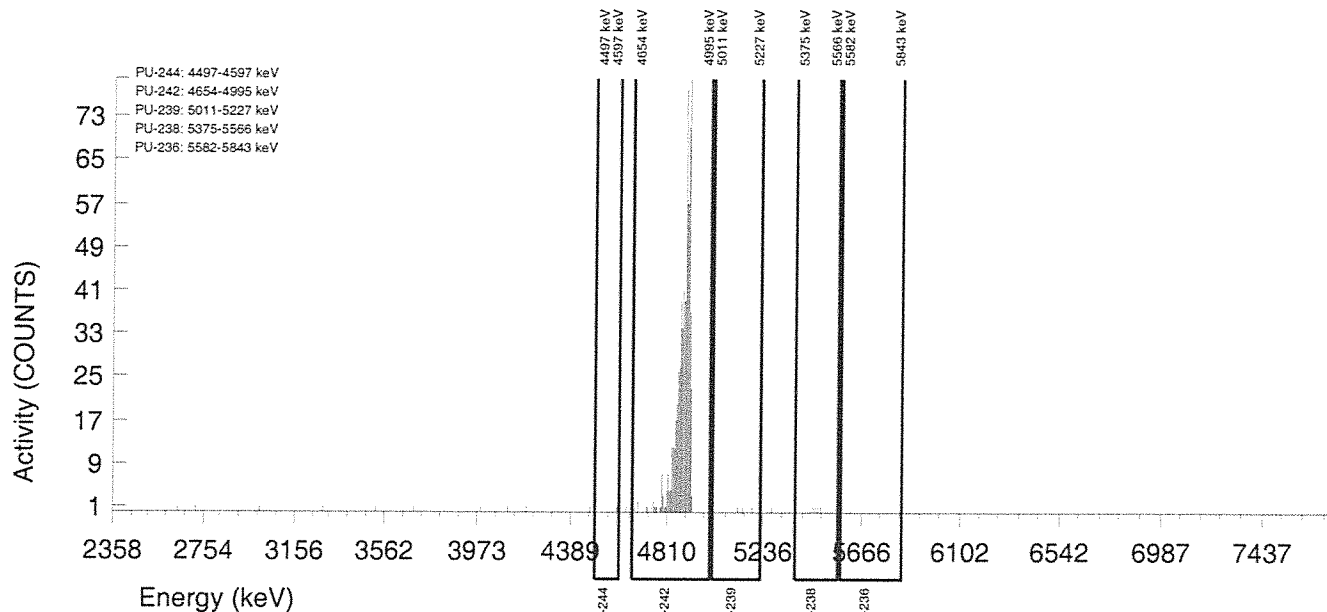


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2368292 SAMPLE ID : R0606487001_PU SAMPLE QTY : 0.113 F +/-0.882 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 100 +/-4.341 %	CHAMBER : 065 DETECTOR S/N : 148999 AVERAGE %EFFICIENCY : 33.1710 AVERAGE %EFF ERROR : 0.6404 COUNT DATE : 23-Jan-2023 11:36:38 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B065.CNF;3359 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W065.CNF;690 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 8.4296E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma	MDA pCi/F	Lc pCi/F	1.96-sigma
										TPU pCi/F			cnt Unc pCi/F
PU-236	5749.00	5712.23	0.000	0.000	-0.480	0.480	0.6928	100.000	-2.43E-02	1.08E-01	2.81E-01	6.43E-02	1.08E-01
PU-238	5486.00	5471.88	34.484	4.000	-0.560	4.560	2.1354	99.900	-2.79E-02	2.42E-01	5.39E-01	1.95E-01	2.42E-01
PU-239	5155.00	5151.95	64.042	3.000	2.040	0.960	0.9798	99.900	1.02E-01	2.02E-01	3.28E-01	8.93E-02	2.02E-01
PU-242	4870.00	4877.79	29.918	673.000	671.080	1.920	1.3856	100.000	3.34E+01	4.05E+00	4.01E-01	1.26E-01	2.53E+00
PU-244	4589.00	4588.50	4.926	1.000	1.000	0.000	1.0000	99.900	4.98E-02	1.40E-01	1.49E-01	9.12E-02	1.40E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2368292
SAMPLE ID : R0606487002_PU
SAMPLE QTY : 0.113 F +/-0.889 %
SAMPLE DATE : 26-Dec-2022 00:00:00
ANALYST : EJ1
% YIELD : 92.6 +/-4.530 %

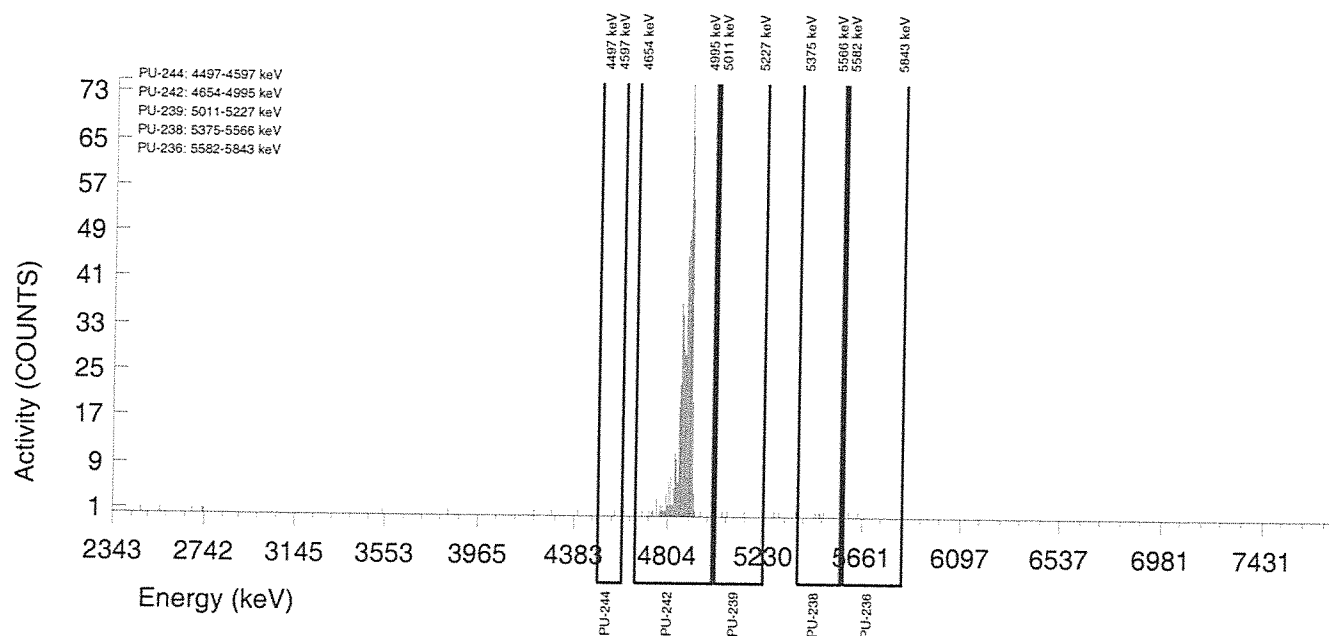
CHAMBER : 066
DETECTOR S/N : 101447
AVERAGE %EFFICIENCY : 32.3574
AVERAGE %EFF ERROR : 0.6250
COUNT DATE : 23-Jan-2023 11:36:38
ELAPSED LIVE TIME(SEC) : 14400.00

LIB FILE : PU
BKG FILE : B066.CNF;2508
BKG DATE : 20-Jan-2023
BKG LIVE TIME(SEC) : 59999.99
EFF FILE : W066.CNF;673
CAL DATE : 10-Jan-2023

TRACER
ID : 2044-A
NUCLIDE : PU-242
NOMINAL : 8.3959E+00 dpm
RESULTS : 7.7788E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5623.39	44.587	2.000	1.280	0.720	0.8485	100.000	7.26E-02	2.00E-01	3.46E-01	8.81E-02	2.00E-01
PU-238	5486.00	5474.91	39.633	4.000	-8.480	12.480	3.5327	99.900	-4.73E-01	3.10E-01	8.88E-01	3.61E-01	3.10E-01
PU-239	5155.00	5082.50	94.128	3.000	1.560	1.440	1.2000	99.900	8.69E-02	2.29E-01	4.12E-01	1.22E-01	2.29E-01
PU-242	4870.00	4874.78	29.433	606.000	604.080	1.920	1.3856	100.000	3.36E+01	4.25E+00	4.49E-01	1.41E-01	2.69E+00
PU-244	4589.00	4582.24	0.000	2.000	0.800	1.200	1.0954	99.900	4.46E-02	2.00E-01	3.91E-01	1.12E-01	2.00E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2368292
SAMPLE ID : R0606487003_PU
SAMPLE QTY : 0.113 F +/-0.885 %
SAMPLE DATE : 26-Dec-2022 00:00:00
ANALYST : EJ1
% YIELD : 86.0 +/-4.701 %

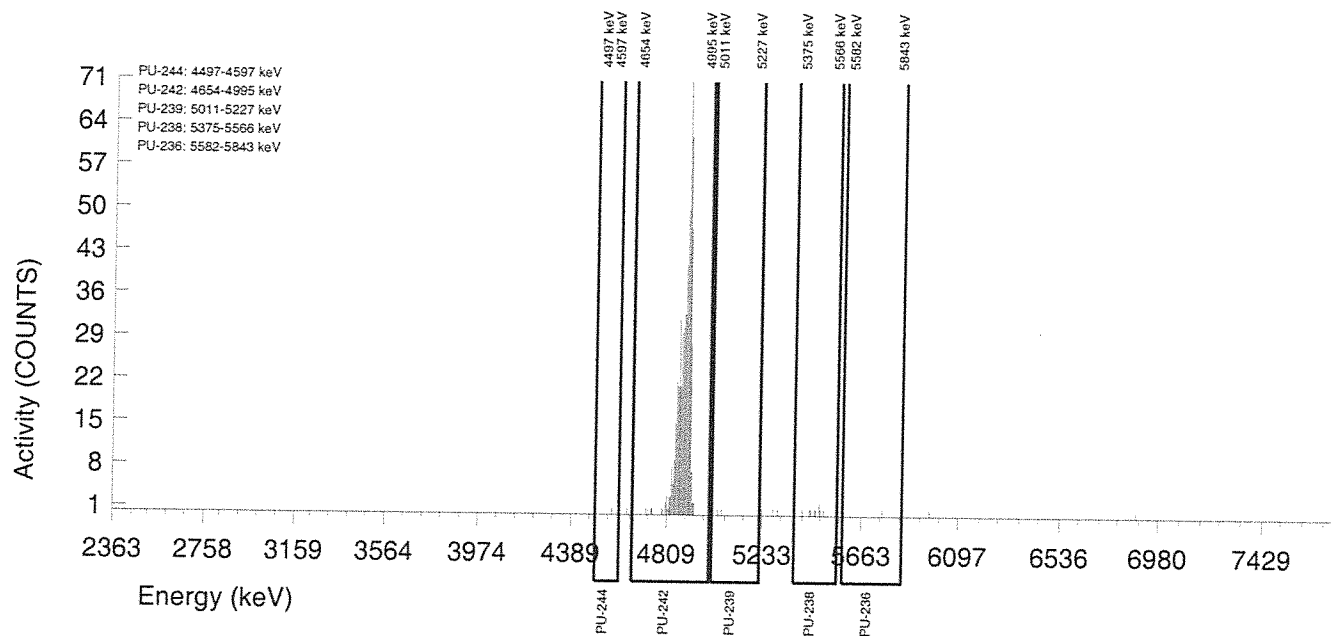
CHAMBER : 067
DETECTOR S/N : 149000
AVERAGE %EFFICIENCY : 31.8801
AVERAGE %EFF ERROR : 0.6161
COUNT DATE : 23-Jan-2023 11:36:38
ELAPSED LIVE TIME(SEC) : 14400.00

LIB FILE : PU
BKG FILE : B067.CNF;2505
BKG DATE : 20-Jan-2023
BKG LIVE TIME(SEC) : 59999.99
EFF FILE : W067.CNF;676
CAL DATE : 10-Jan-2023

TRACER
ID : 2044-A
NUCLIDE : PU-242
NOMINAL : 8.3959E+00 dpm
RESULTS : 7.2224E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5760.20	4.913	1.000	1.000	0.000	1.0000	100.000	6.17E-02	1.74E-01	1.85E-01	1.13E-01	1.74E-01
PU-238	5486.00	5457.23	7.370	10.000	4.240	5.760	2.4000	99.900	2.57E-01	4.20E-01	7.15E-01	2.67E-01	4.19E-01
PU-239	5155.00	5044.42	19.654	2.000	0.320	1.680	1.2961	99.900	1.94E-02	2.21E-01	4.70E-01	1.44E-01	2.21E-01
PU-242	4870.00	4882.45	26.006	555.000	552.600	2.400	1.5492	100.000	3.35E+01	4.39E+00	5.25E-01	1.72E-01	2.80E+00
PU-244	4589.00	4566.87	4.913	1.000	0.520	0.480	0.6928	99.900	3.15E-02	1.75E-01	3.36E-01	7.69E-02	1.75E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2368292
SAMPLE ID : R1205293624_PU
SAMPLE QTY : 0.116 F +/-0.862 %
SAMPLE DATE : 20-Jan-2023 00:00:00
ANALYST : EJ1
% YIELD : 83.7 +/-4.724 %

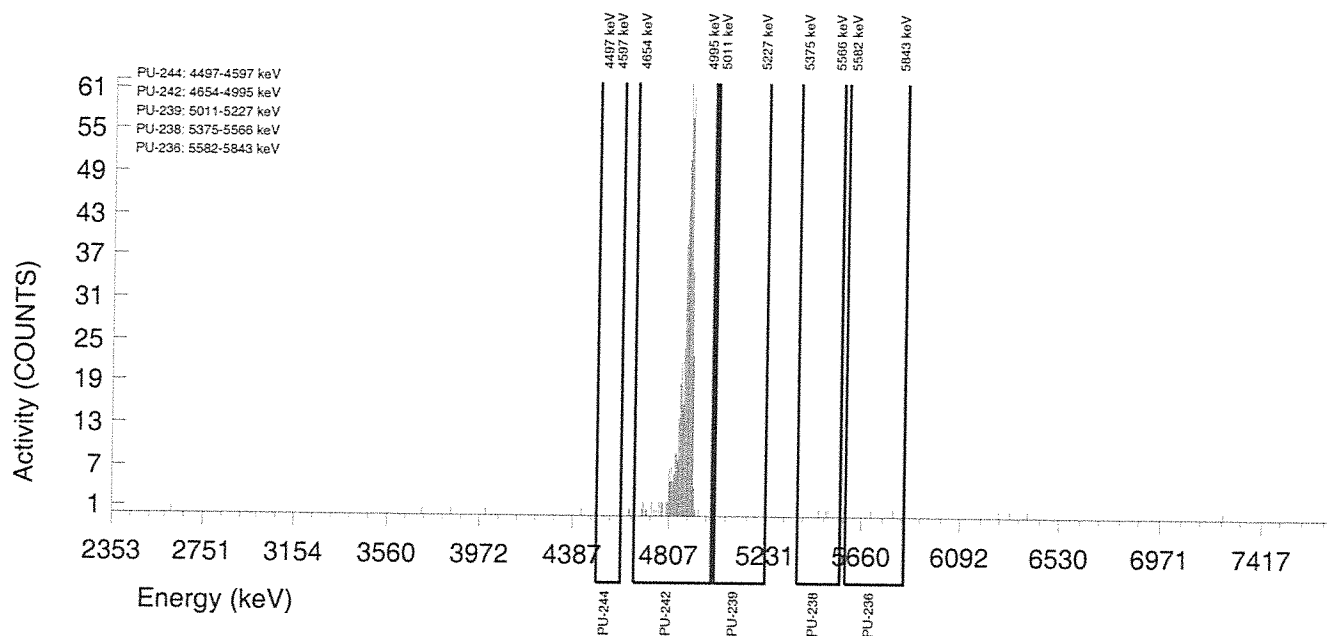
CHAMBER : 074
DETECTOR S/N : 149001
AVERAGE %EFFICIENCY : 32.3334
AVERAGE %EFF ERROR : 0.6246
COUNT DATE : 23-Jan-2023 11:36:39
ELAPSED LIVE TIME(SEC) : 14400.00

LIB FILE : PU
BKG FILE : B074.CNF;2521
BKG DATE : 20-Jan-2023
BKG LIVE TIME(SEC) : 59999.99
EFF FILE : W074.CNF;697
CAL DATE : 10-Jan-2023

TRACER
ID : 2044-A
NUCLIDE : PU-242
NOMINAL : 8.3959E+00 dpm
RESULTS : 7.0273E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5745.88	94.065	2.000	0.800	1.200	1.0954	100.000	4.79E-02	2.15E-01	4.20E-01	1.20E-01	2.15E-01
PU-238	5486.00	5491.34	44.557	3.000	1.560	1.440	1.2000	99.900	9.33E-02	2.46E-01	4.42E-01	1.31E-01	2.46E-01
PU-239	5155.00	5118.69	0.000	0.000	-0.960	0.960	0.9798	99.900	-5.74E-02	1.33E-01	3.94E-01	1.07E-01	1.33E-01
PU-242	4870.00	4876.25	33.995	547.000	545.320	1.680	1.2961	100.000	3.26E+01	4.30E+00	4.63E-01	1.42E-01	2.74E+00
PU-244	4589.00	4591.34	4.951	1.000	1.000	0.000	1.0000	99.900	5.98E-02	1.68E-01	1.79E-01	1.10E-01	1.68E-01

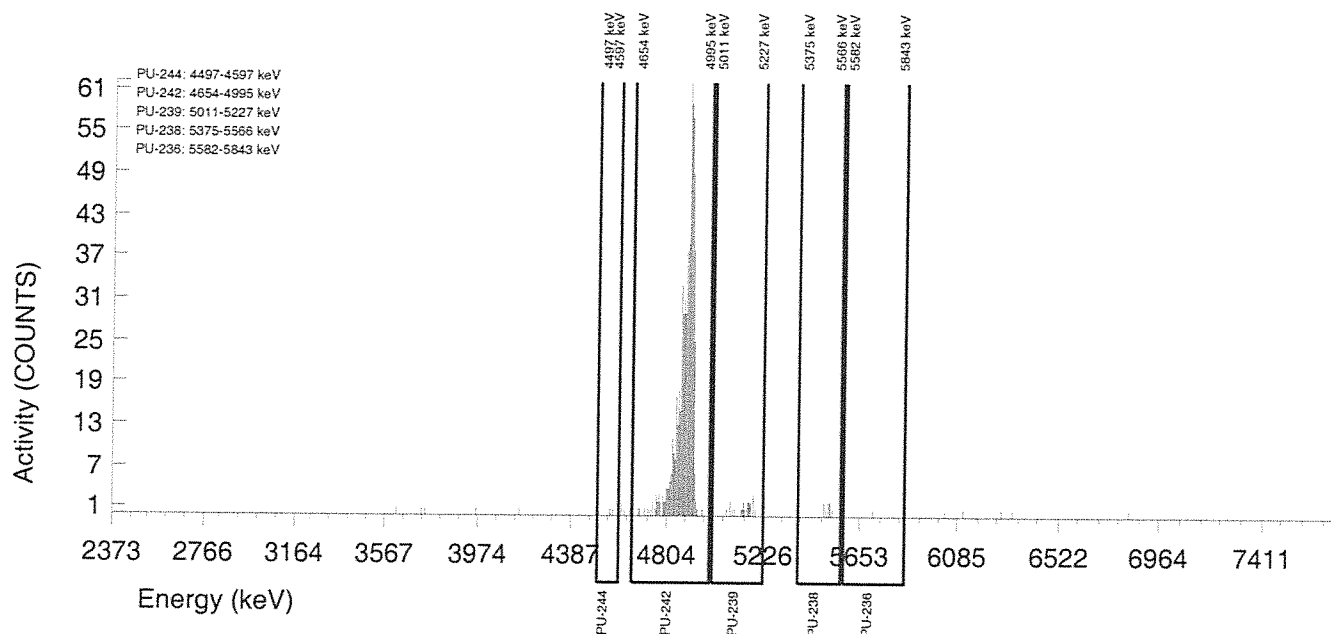


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2368292 SAMPLE ID : R1205293625_PU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 88.0 +/-4.429 %			CHAMBER : 077 DETECTOR S/N : 53053 AVERAGE %EFFICIENCY : 35.8956 AVERAGE %EFF ERROR : 0.6918 COUNT DATE : 23-Jan-2023 11:36:40 ELAPSED LIVE TIME(SEC) : 14399.99			LIB FILE : PU BKG FILE : B077.CNF;2416 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W077.CNF;650 CAL DATE : 10-Jan-2023		
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 7.3918E+00 dpm			LCS ID NUCLIDE NOMINAL (pCi/F) % RECOVERY					

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5707.15	4.881	1.000	1.000	0.000	1.0000	100.000	5.13E-02	1.44E-01	1.54E-01	9.39E-02	1.44E-01
PU-238	5486.00	5510.71	29.283	8.000	7.760	0.240	0.4899	99.900	3.97E-01	3.06E-01	2.46E-01	4.60E-02	3.03E-01
PU-239	5155.00	5145.28	96.390	22.000	21.280	0.720	0.8485	99.900	1.09E+00	4.95E-01	3.13E-01	7.96E-02	4.84E-01
PU-242	4870.00	4882.98	51.975	638.000	636.800	1.200	1.0954	100.000	3.26E+01	4.03E+00	3.59E-01	1.03E-01	2.54E+00
PU-244	4589.00	4563.42	14.642	2.000	2.000	0.000	1.0000	99.900	1.02E-01	1.76E-01	1.54E-01	9.38E-02	1.76E-01

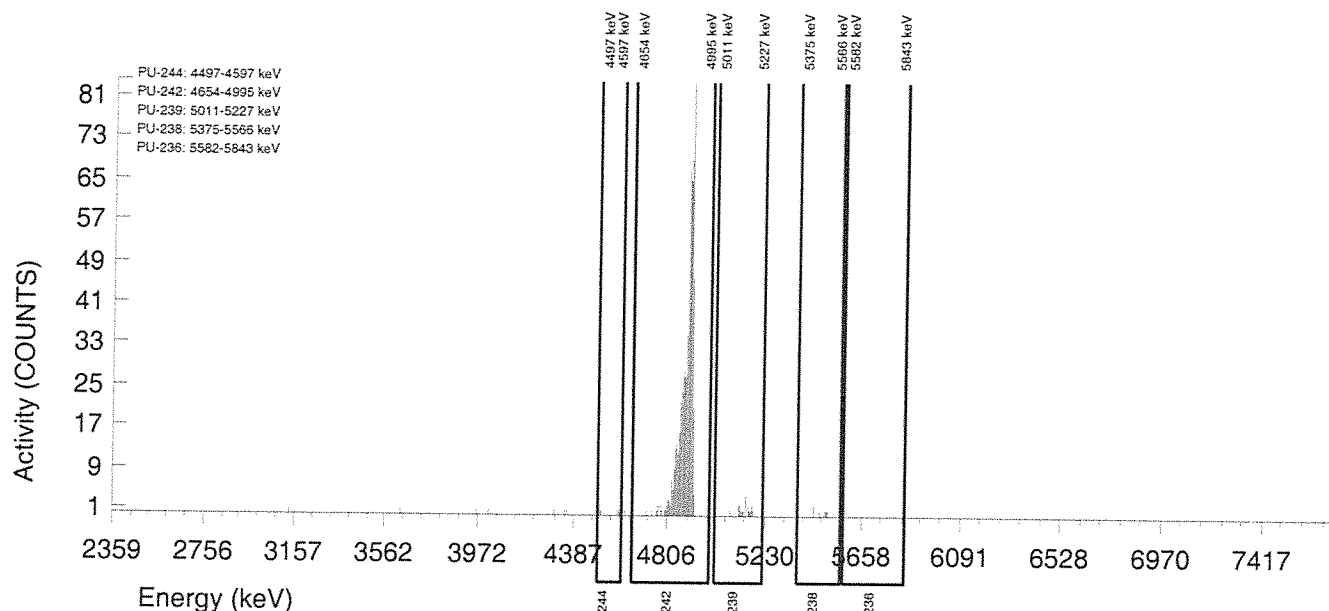


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2368292 SAMPLE ID : R1205293626_PU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 90.8 +/-4.488 %	CHAMBER : 078 DETECTOR S/N : 149002 AVERAGE %EFFICIENCY : 33.6631 AVERAGE %EFF ERROR : 0.6497 COUNT DATE : 23-Jan-2023 11:36:40 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : PU BKG FILE : B078.CNF;2423 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W078.CNF;640 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 7.6216E+00 dpm	LCSD ID NUCLIDE NOMINAL (pCi/F) % RECOVERY	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.24	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.27E-02	1.10E-01	2.54E-01	4.76E-02	1.10E-01
PU-238	5486.00	5479.74	4.924	6.000	5.280	0.720	0.8485	99.900	2.80E-01	2.80E-01	3.24E-01	8.23E-02	2.79E-01
PU-239	5155.00	5144.98	4.924	19.000	18.520	0.480	0.6928	99.900	9.81E-01	4.76E-01	2.93E-01	6.72E-02	4.66E-01
PU-242	4870.00	4882.31	24.331	616.000	615.760	0.240	0.4899	100.000	3.26E+01	4.08E+00	2.54E-01	4.75E-02	2.58E+00
PU-244	4589.00	4557.91	0.000	5.000	5.000	0.000	1.0000	99.900	2.65E-01	2.57E-01	1.59E-01	9.70E-02	2.56E-01



Continuing Calibration Data

Liquid Scintillation Counter Checks for 24-JAN-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LSCBLUE	Carbon-14	02:13	1.3		123681	0.25		
	Carbon-14	02:14	1.3		123219	-1.17		
	Tritium	02:16	1.2		153236	-0.15		
	Tritium	02:18	1.2		153599	0.69		
	BKG	02:20	30		22	-0.11		
	BKG	02:51	30		21	-1.35		
LSCBROWN	Carbon-14	02:48	3.7		43422	0.37		
	Carbon-14	02:52	3.7		43492	0.97		
	Tritium	02:56	3.45		48515	1.47		
	Tritium	03:00	3.45		48557	1.68		
	BKG	03:04	30		24	1.25		
	BKG	03:35	30		22	-0.92		
LSCGOLD	Carbon-14	02:24	1.3		123437	-1.52		
	Carbon-14	02:26	1.3		123951	0.17		
	Tritium	02:28	1.2		152880	0.25		
	Tritium	02:29	1.2		152502	-0.09		
	BKG	02:33	30		23	-0.76		
	BKG	03:04	30		21	-1.19		
LSCJADE	Carbon-14	01:01	1.32		124005	1.04		
	Carbon-14	01:03	1.32		123751	0.17		
	Tritium	01:06	1.06		162900	0.31		
	Tritium	01:08	1.06		162323	-0.29		
	BKG	01:13	30		5.6	0.83		
	BKG	01:46	30		4.72	-0.64		
LSCMOCHA	BKG	00:09	30		21	2.58		
	Carbon-14	02:24	1.35		121428	0.09		
	Carbon-14	02:26	1.35		121500	0.32		
	Tritium	02:27	1.3		136753	0.1		
	Tritium	02:29	1.35		136353	-0.29		
	BKG	02:31	30		20	0.74		
	BKG	03:02	30		17	-1.95		

LSCNAVY	Carbon-14	03:47	1.3	125301	0.27
	Carbon-14	03:49	1.3	125059	-0.38
	Tritium	03:51	1.11	170102	-0.3
	Tritium	03:52	1.11	170045	-0.39
	BKG	03:54	30	21	2.31
	BKG	04:25	30	17	-2.37
LSCPINK	Carbon-14	04:24	1.012433	123561	-0.68
	Tritium	04:28	1.012433	138065	0.12
	BKG	05:00	30.01243	7.12	-0.83
	Carbon-14	05:02	1.012433	123283	-1.47
	Tritium	05:03	1.012433	138356	0.63
	BKG	05:34	30.01243	6.85	-1.36
LSCPURPLE	Carbon-14	03:56	.45	123167	-0.68
	Carbon-14	03:57	.45	123098	-0.82
	Tritium	03:58	.4	150633	-0.2
	Tritium	03:59	.4	149525	-1.03
	BKG	04:01	30	22	-0.74
	BKG	04:32	30	22	-0.67

Reviewed by:



Lyndsey Pace

Date: 24-JAN-23

GEL Laboratories LLC

Liquid Scintillation Counter Checks for 25-JAN-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LSCBLUE	Carbon-14	02:30	1.3		123377	-0.68		
	Carbon-14	02:31	1.3		123564	-0.11		
	Tritium	02:33	1.2		153957	1.52		
	Tritium	02:35	1.2		153235	-0.15		
	BKG	02:37	30		23	0.8		
	BKG	03:08	30		22	-0.47		
LSCBROWN	Carbon-14	02:34	3.7		43372	-0.07		
	Carbon-14	02:38	3.7		43380	00		
	Tritium	02:43	3.45		48595	1.88		
	Tritium	02:46	3.45		48467	1.22		
	BKG	02:51	30		22	-1.25		
	BKG	03:21	30		23	0.11		
LSCGOLD	Carbon-14	03:45	1.3		124393	1.62		
	Carbon-14	03:46	1.3		123862	-0.12		
	Tritium	03:48	1.2		153023	0.38		
	Tritium	03:50	1.2		152080	-0.47		
	BKG	03:53	30		20	-1.67		
	BKG	04:25	30		23	-0.68		
LSCJADE	Carbon-14	04:57	1.32		123763	0.22		
	Carbon-14	04:59	1.32		123356	-1.18		
	Tritium	05:02	1.07		162062	-0.56		
	Tritium	05:04	1.07		162071	-0.56		
	BKG	05:08	30		4.56	-0.91		
	BKG	05:42	30		5.93	1.39		
LSCMOCHA	Carbon-14	02:38	1.35		121600	0.64		
	Carbon-14	02:40	1.35		121818	1.33		
	Tritium	02:42	1.3		137089	0.43		
	Tritium	02:44	1.3		137283	0.62		
	BKG	02:46	30		18	-1.34		
	BKG	03:16	30		19	0.36		
LSCNAVY	Carbon-14	02:05	1.3		125264	0.17		

	Carbon-14	02:06	1.3	125303	0.28
	Tritium	02:08	1.11	169779	-0.79
	Tritium	02:10	1.11	169868	-0.65
	BKG	02:12	30	20	1.39
	BKG	02:42	30	17	-2.95
LSCPINK	Carbon-14	08:18	1.012433	123115	-1.94
	Tritium	08:22	1.012433	137201	-1.41
	BKG	08:54	30.01243	8.13	1.12
	Carbon-14	08:56	1.012433	123971	0.49
	Tritium	08:57	1.012333	137675	-0.57
	BKG	09:27	30.01243	8.47	1.77
LSCPURPLE	Carbon-14	03:27	.45	123192	-0.63
	Carbon-14	03:28	.45	123483	-0.03
	Tritium	03:29	.4	148522	-1.79
	Tritium	03:30	.4	150514	-0.29
	BKG	03:32	30	21	-1.15
	BKG	04:04	30	21	-1.23

Reviewed by:



Lyndsey Pace

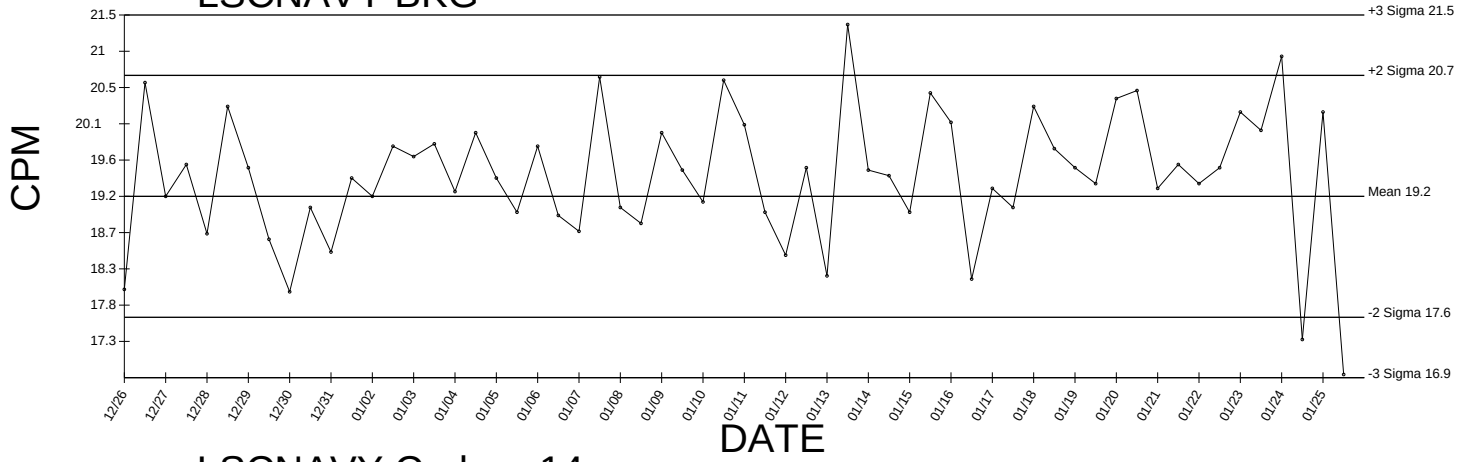
Date: 25-JAN-23

GEL Laboratories LLC

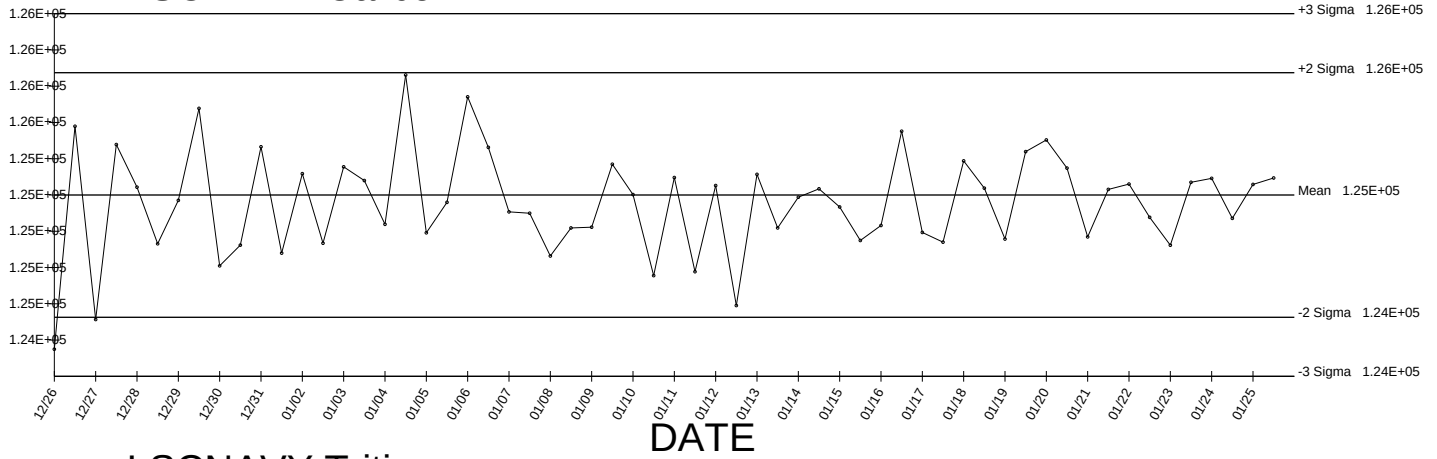
Background and Efficiency Data

LSCNAVY BKG

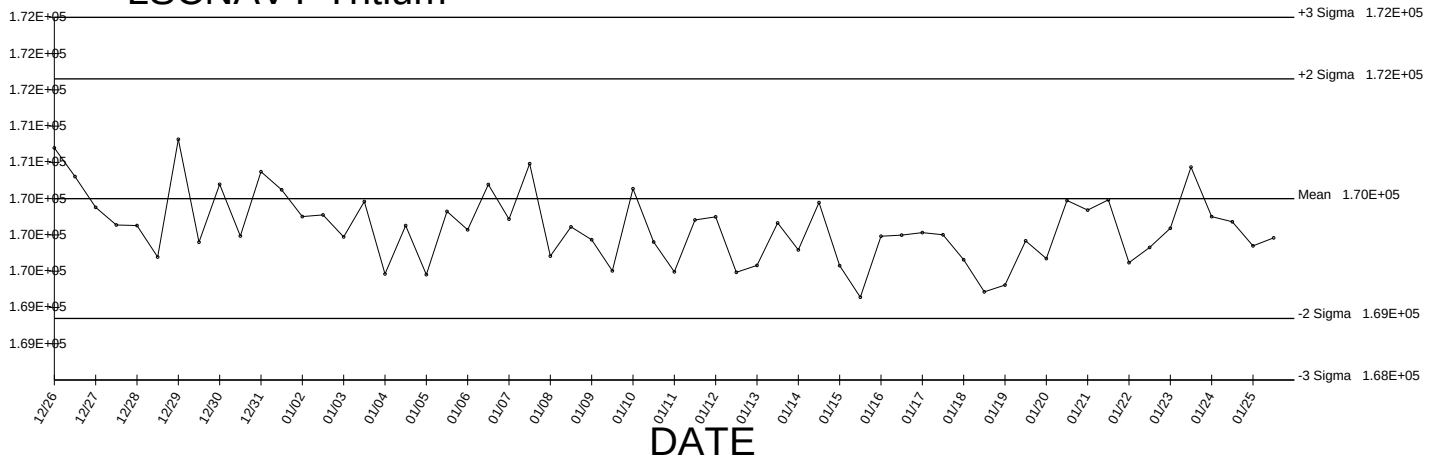
Generated 01/25/2023



LSCNAVY Carbon-14



LSCNAVY Tritium



● Denotes Outlier

RAD Standards Traceability



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

1714

98366

Pu-241 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL 1408580, Item 6 **Product Code:** 8341

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u_A	u_B	U	
Pu-241	5.232E+03	4.016E+04	0.2	1.7	3.5	09/09/2014

*Uncertainty: U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: α -impurities < 0.08%, γ -impurities (other than decay products) < 0.1%.
5.46647 g 3M HNO₃ solution. Carrier free.

Source Prepared by:

R. Ormsby, Radiochemist

QC Approved:

J. S. Lahr, Spectroscopist

Date: 9/5/14



Standard Logbook

Serial ID: 1714 **Open/Reference Date:** 09-SEP-14 **Aliquot :** 5.46647 g
Name: Plutonium-241 **Received:** 10-SEP-14 **Density :** Hand Calculated
Type: Source Material **Expires:** 11-SEP-75 **Logbook Num :** GL-CED-297-007
Employee: Gregory Ramsay **Lot Number :** 98366
Supplier: Eckert & Ziegler **Solvent :** 3M HNO3
Uncertainty : 1.75 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-241	40160 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1714
Prepared By:	Gregory Ramsay
Carrier Conc:	3M HNO3
Reference Date:	09/09/2014
Ampoule Mass (g):	5.46647 g
Uncertainty:	+/- 1.75 %
LogBook No:	GL-CED-297-007
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Plutonium-241		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2019		
Verification Date:	01/25/2021		
Expiration Date:	01/25/2023		
Primary Code:	1714-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.4425 g		
Density(g/mL):	1.0331	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23990.3411 \text{ dpm/mL}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0331 \text{ g/mL}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23220.6511 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
07/22/2019	Tim Chandler	50.7721	500	1714-B	2357.9224 dpm/mL	01/19/2022	01/19/2023
07/18/2022	Matelon DeFreese	25.0261	250	1714-C	2324.48935 dpm/mL	10/28/2022	10/28/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-241 Standard 1714-C

v1.0.2

Instrument	MOCHA
Analyst	TC1
Verification Prep Date	10/28/2022

Standard Information	
Isotope	Pu-241
Serial Number	1714-C
Isotope Halflife	14.2900 Y
Reference Date	9/9/2014
Ref. Act. (DPM/mL)	2324.48935
Amount of Std. (mL)	1.0
Standard Prep Date	7/18/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	11/1/2022	119.20	310.47	9.20
2	11/1/2022	119.20	314.17	9.20
3	11/1/2022	119.10	310.03	9.20

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	301.27	0.185033	1628.20	1628.20
2	304.97	0.185033	1648.19	1648.19
3	300.83	0.185033	1625.82	1625.82

Mean Value =	dpm/mL 1634.07
Stdev =	12.28907248
Certificate Value* =	1565.8
Two sigma =	24.578
10 % of Mean =	163.407
Rule A (Pass/Fail)	Pass
% Recovery	104.36%
Rule B (Pass/Fail)	Pass
Expiration Date	10/28/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Pu-241 source 1714-C by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCMOCHA for Pu-241 source standard verification. The Pu-241 efficiency calibration which was used for verification calculations was performed on 10/28/2022 using Pu-241 source 1628-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency (cpm/dpm), and
- D = volume used for standard verification.

RAD-M-001

TC1
11-1-22



National Institute of Standards & Technology

Certificate

2044

Standard Reference Material® 4334j

Received
8-18-22

Plutonium-242 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}$.

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterwiesing, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

Steven J. Choquette, Director
Office of Reference Materials

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq•g^{-1(a)}
Relative expanded uncertainty ($k = 2$)	0.51 %^(b)

^(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

^(b) The uncertainties on certified values are expanded uncertainties, $U = k u_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

GL-CEA-297-3366

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ^{-1(a,b,c,d)}
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ^{-1(a,d)}
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π α liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

(a) The stated uncertainty is two times the standard uncertainty [5].

(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

- 0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,
- 0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and
- 0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclidic impurities follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ^{-6 (3)}	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ^{-5 (3)}	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

- 1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,
- 6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,
- 5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,
- 4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV
- 4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV
- 6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and
- 3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

(f) The stated uncertainty is the standard uncertainty. See reference 6.

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ²⁴² Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	²⁴² Pu decay corrections for half-life uncertainty of 0.22 %.	B	< 10 ⁻¹⁰
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty (k = 2)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

Standard Logbook

Serial ID: 2044 **Open/Reference Date:** 09-AUG-17 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 18-AUG-22 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 22-AUG-35 **Logbook Num :** GL-CED-297-336
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
 Uncertainty : .255 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2044
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO3
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-336
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	10/19/2022		
Verification Date:	10/19/2022		
Expiration Date:	10/19/2023		
Primary Code:	2044-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.3655 g		
Density(g/mL):	1.0314	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.3655 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 41.9797 \text{ dpm/mL}$
$(5.3655 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0314 \text{ g/mL}) / (200 \text{ mL}) = 40.7016 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
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GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2044-A

v1.2

Analyst	MXS2
Verification Prep Date	10/19/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.2
Expiration Date	8/11/2023

Standard Information	
Isotope	Pu-242
Serial Number	2044-A
Isotope Halflife	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	41.9797
Amount of Std. (mL)	0.2
Standard Prep Date	10/19/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	10/23/2022	3.830	42.51
2	10/24/2022	4.020	44.62
3	10/23/2022	3.850	42.74

Mean Value = 3.900 43.290
Stdev = 0.104403065 1.158874022

	pCi	dpm/mL
Certificate Value* =	3.7819	41.9793
Two sigma =	0.2088	2.3177
10 % of Mean =	0.3900	4.3290
Rule A (Pass/Fail)	Pass	Pass
% Recovery	103.12%	103.12%
Rule B (Pass/Fail)	Pass	Pass
Expiration Date	10/19/2023	

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2044-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. Added 0.1mL of neodymium carrier and 3-4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

10/25/22

Runlogs

Instrument Run Log

Instrument Type: LSC

Batch ID: 2368292

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
606487001	SAMPLE	EJ1	LSCNAVY	JAN-24-23 20:26:31	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
606487002	SAMPLE	EJ1	LSCNAVY	JAN-24-23 20:57:20	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
606487003	SAMPLE	EJ1	LSCNAVY	JAN-24-23 21:28:09	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
606488001	SAMPLE	EJ1	LSCNAVY	JAN-24-23 21:58:57	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
606488002	SAMPLE	EJ1	LSCNAVY	JAN-24-23 22:29:45	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
606488003	SAMPLE	EJ1	LSCNAVY	JAN-24-23 23:00:34	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
606488004	SAMPLE	EJ1	LSCNAVY	JAN-24-23 23:31:22	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
606488005	SAMPLE	EJ1	LSCNAVY	JAN-25-23 00:02:10	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205293624	MB	EJ1	LSCNAVY	JAN-25-23 00:32:58	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205293625	LCS	EJ1	LSCNAVY	JAN-25-23 01:03:47	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205293626	LCSD	EJ1	LSCNAVY	JAN-25-23 01:34:35	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00



January 30, 2023

Ms. Candace Christensen
Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607

Re: Project # 080153.007 Air Monitoring at SSFL
Work Order: 606488

Dear Ms. Christensen:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on January 10, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4422.

Sincerely,

Jake Crook
Project Manager

Purchase Order: 8-00000942
Chain of Custody: 01092023-2
Enclosures



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Case Narrative

**Receipt Narrative
for
North Wind Solutions
SDG: 606488**

January 30, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on January 10, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
606488001	DOE-1_Qtr 19_S
606488002	DOE-2_Qtr 19_S
606488003	DOE-3_Qtr 19_S
606488004	DOE-4_Qtr 19_S
606488005	BLANK_Qtr 19_S

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink, appearing to read "Jake N. Crook". The signature is written in a cursive, flowing style.

Jake Crook
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: <u>NORW</u>		SDG/AR/COC/Work Order: <u>1110/2</u> ¹¹⁰¹²³ <u>606487/606488</u>	
Received By: <u>[Signature]</u>		Date Received: <u>1/10/23</u>	
Carrier and Tracking Number		Circle Applicable: ☐ FedEx Express ☐ FedEx Ground ☐ UPS ☐ Field Services ☐ Courier ☐ Other	
Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		☒	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		☒	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		☒	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM/mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		☒	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		☒	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____
Sample Receipt Criteria		Yes	NA
1	Shipping containers received intact and sealed?	☒	☒
2	Chain of custody documents included with shipment?	☒	☒
3	Samples requiring cold preservation within (0 ≤ deg. C)?*	☒	☒
4	Daily check performed and passed on IR temperature gun?	☒	☒
5	Sample containers intact and sealed?	☒	☒
6	Samples requiring chemical preservation at proper pH?	☒	☒
7	Do any samples require Volatile Analysis?	☒	☒
8	Samples received within holding time?	☒	☒
9	Sample ID's on COC match ID's on bottles?	☒	☒
10	Date & time on COC match date & time on bottles?	☒	☒
11	Number of containers received match number indicated on COC?	☒	☒
12	Are sample containers identifiable as GEL provided by use of GEL labels?	☒	☒
13	COC form is properly signed in relinquished/received sections?	☒	☒
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials

Date

1/13/23

Page

of

1

Laboratory Certifications

List of current GEL Certifications as of 30 January 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
North Wind Solutions
SDG #: 606488**

Product: Alphaspec Am241, Filter

Analytical Method: DOE EML HASL-300, Am-05-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2368289

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606488001	DOE-1_Qtr 19_S
606488002	DOE-2_Qtr 19_S
606488003	DOE-3_Qtr 19_S
606488004	DOE-4_Qtr 19_S
606488005	BLANK_Qtr 19_S
1205293606	Method Blank (MB)
1205293607	Laboratory Control Sample (LCS)
1205293608	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec Pu, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2368291

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606488001	DOE-1_Qtr 19_S

606488002	DOE-2_Qtr 19_S
606488003	DOE-3_Qtr 19_S
606488004	DOE-4_Qtr 19_S
606488005	BLANK_Qtr 19_S
1205293621	Method Blank (MB)
1205293622	Laboratory Control Sample (LCS)
1205293623	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Manual Integration

Manual integration of alpha spectroscopy spectra 606488003 (DOE-3_Qtr 19_S) was performed to fully separate counts in Regions of Interest which would have been biased.

Additional Comments

The tracer peak centroid for sample 606488003 (DOE-3_Qtr 19_S) is greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest.

Product: Alphaspec U, Filter

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 28

Analytical Batch: 2368293

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606488001	DOE-1_Qtr 19_S
606488002	DOE-2_Qtr 19_S
606488003	DOE-3_Qtr 19_S
606488004	DOE-4_Qtr 19_S
606488005	BLANK_Qtr 19_S
1205293627	Method Blank (MB)
1205293628	Laboratory Control Sample (LCS)
1205293629	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information**Additional Comments**

The tracer peak centroid for sample 606488004 (DOE-4_Qtr 19_S) is greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest.

Product: Alphaspec Th, Filter

Analytical Method: DOE EML HASL-300, Th-01-RC Modified

Analytical Procedure: GL-RAD-A-038 REV# 18

Analytical Batch: 2368294

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606488001	DOE-1_Qtr 19_S
606488002	DOE-2_Qtr 19_S
606488003	DOE-3_Qtr 19_S
606488004	DOE-4_Qtr 19_S
606488005	BLANK_Qtr 19_S
1205293630	Method Blank (MB)
1205293631	Laboratory Control Sample (LCS)
1205293632	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information**Manual Integration**

Manual integration of alpha spectroscopy spectra 1205293630 (MB) was performed to fully separate counts in Regions of Interest which would have been biased.

Product: Alphaspec Po210, Filter

Analytical Method: DOE EML HASL-300, Po-01-RC Modified

Analytical Procedure: GL-RAD-A-016 REV# 19

Analytical Batch: 2368295

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606488001	DOE-1_Qtr 19_S
606488002	DOE-2_Qtr 19_S
606488003	DOE-3_Qtr 19_S
606488004	DOE-4_Qtr 19_S
606488005	BLANK_Qtr 19_S
1205293634	Method Blank (MB)
1205293635	Laboratory Control Sample (LCS)
1205293636	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Manual Integration

Manual integrations of alpha spectroscopy spectra 606488003 (DOE-3_Qtr 19_S) and 606488004 (DOE-4_Qtr 19_S) were performed to fully separate counts in Regions of Interest which would have been biased.

Additional Comments

Samples 606488002 (DOE-2_Qtr 19_S) and 606488004 (DOE-4_Qtr 19_S) did not meet the resolution requirement of having a full width half maximum of 100 keV or less for the tracer; however, the tracer yield requirement was met and the tracer peaks are within the tracer region of interest. The tracer peak centroid for samples 606488001 (DOE-1_Qtr 19_S), 606488002 (DOE-2_Qtr 19_S), 606488003 (DOE-3_Qtr 19_S), 606488004 (DOE-4_Qtr 19_S) and 606488005 (BLANK_Qtr 19_S) are greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peaks are within the tracer region of interest.

Product: Gammaspec, Gamma, Filter

Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R

Analytical Procedure: GL-RAD-A-013 REV# 27

Analytical Batch: 2367950

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606488001	DOE-1_Qtr 19_S
606488002	DOE-2_Qtr 19_S
606488003	DOE-3_Qtr 19_S
606488004	DOE-4_Qtr 19_S
606488005	BLANK_Qtr 19_S
1205292906	Method Blank (MB)
1205292907	606487002(A-2-Area 20-2022-Qtr-4) Sample Duplicate (DUP)
1205292908	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Qualifier Information

Qualifier	Reason	Analyte	Sample	Client Sample
UI	Results are considered a false positive due to no valid peak.	Potassium-40	606488001	DOE-1_Qtr 19_S
		Potassium-40	606488002	DOE-2_Qtr 19_S

Product: GFPC Ra228, Filter

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2368080

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606488001	DOE-1_Qtr 19_S
606488002	DOE-2_Qtr 19_S
606488003	DOE-3_Qtr 19_S
606488004	DOE-4_Qtr 19_S

606488005	BLANK_Qtr 19_S
1205293188	Method Blank (MB)
1205293189	Laboratory Control Sample (LCS)
1205293190	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205293188 (MB)	Radium-228	Result 1.78 < MDA 3.28 > RDL 1 pCi/Sample

Samples (See Below) did not meet the detection limits due to limited sample volume. Samples were counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
606488001 (DOE-1_Qtr 19_S)	Radium-228	Result -0.528 < MDA 4.3 > RDL 1 pCi/Sample
606488002 (DOE-2_Qtr 19_S)	Radium-228	Result 2.24 < MDA 3.01 > RDL 1 pCi/Sample
606488003 (DOE-3_Qtr 19_S)	Radium-228	Result 2.99 < MDA 3.76 > RDL 1 pCi/Sample
606488005 (BLANK_Qtr 19_S)	Radium-228	Result 2.47 < MDA 3.92 > RDL 1 pCi/Sample

Technical Information

Recounts

Sample 606488005 (BLANK_Qtr 19_S) was re-eluted and recounted due to suspected false positive. The recount is reported.

Product: GFPC Total Alpha Radium, Filter

Analytical Method: EPA 900.1 Mod/ EPA 903.0 Mod

Analytical Procedure: GL-RAD-A-010 REV# 21

Analytical Batch: 2368081

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606488001	DOE-1_Qtr 19_S
606488002	DOE-2_Qtr 19_S
606488003	DOE-3_Qtr 19_S
606488004	DOE-4_Qtr 19_S
606488005	BLANK_Qtr 19_S
1205293191	Method Blank (MB)
1205293193	Laboratory Control Sample (LCS)
1205293374	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205293191 (MB)	Total Radium	Result -0.355 < MDA 1.93 > RDL 1 pCi/Sample

Samples (See Below) did not meet the detection limits due to limited sample volume. Samples were counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
606488001 (DOE-1_Qtr 19_S)	Total Radium	Result 1.73 < MDA 1.74 > RDL 1 pCi/Sample
606488002 (DOE-2_Qtr 19_S)	Total Radium	Result 1.56 < MDA 1.69 > RDL 1 pCi/Sample
606488003 (DOE-3_Qtr 19_S)	Total Radium	Result 1.37 < MDA 1.91 > RDL 1 pCi/Sample
606488005 (BLANK_Qtr 19_S)	Total Radium	Result 0.848 < MDA 1.81 > RDL 1 pCi/Sample

Product: GFPC, Sr90, Filter

Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified

Analytical Procedure: GL-RAD-A-004 REV# 22

Analytical Batch: 2368082

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606488001	DOE-1_Qtr 19_S
606488002	DOE-2_Qtr 19_S
606488003	DOE-3_Qtr 19_S
606488004	DOE-4_Qtr 19_S
606488005	BLANK_Qtr 19_S
1205293194	Method Blank (MB)
1205293195	Laboratory Control Sample (LCS)
1205293196	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Samples 1205293195 (LCS) and 1205293196 (LCSD) were recounted due to high recovery. The recounts are reported. Samples 606488002 (DOE-2_Qtr 19_S), 606488004 (DOE-4_Qtr 19_S) and 606488005 (BLANK_Qtr 19_S) were recounted due to a suspected false positive. The recounts are reported.

Product: Liquid Scint Pu241, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-035 REV# 24

Analytical Batch: 2368292

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 18

Preparation Batch: 2367521

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
606488001	DOE-1_Qtr 19_S
606488002	DOE-2_Qtr 19_S
606488003	DOE-3_Qtr 19_S
606488004	DOE-4_Qtr 19_S
606488005	BLANK_Qtr 19_S
1205293624	Method Blank (MB)
1205293625	Laboratory Control Sample (LCS)
1205293626	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1205293624 (MB)	Plutonium-241	Result -31.2 < MDA 67.8 > RDL 5 pCi/Sample

Samples (See Below) did not meet the detection limits due to limited sample volume.

Sample	Analyte	Value
606488001 (DOE-1_Qtr 19_S)	Plutonium-241	Result 4.85 < MDA 67.2 > RDL 5 pCi/Sample
606488002 (DOE-2_Qtr 19_S)	Plutonium-241	Result -2.85 < MDA 71.1 > RDL 5 pCi/Sample
606488003 (DOE-3_Qtr 19_S)	Plutonium-241	Result -0.277 < MDA 68.1 > RDL 5 pCi/Sample
606488004 (DOE-4_Qtr 19_S)	Plutonium-241	Result -7.21 < MDA 64.5 > RDL 5 pCi/Sample
606488005 (BLANK_Qtr 19_S)	Plutonium-241	Result -31.6 < MDA 71.6 > RDL 5 pCi/Sample

Miscellaneous Information

Manual Integration

Manual integration of alpha spectroscopy spectra 606488003 (DOE-3_Qtr 19_S) was performed to fully separate counts in Regions of Interest which would have been biased.

Additional Comments

The tracer peak centroid for sample 606488003 (DOE-3_Qtr 19_S) is greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Prep Logbook

The Preparation of Special Matrices for the Determination of Radionuclides

Batch ID: 2367521

Analyst: Christine Carter (CXC1)

Method: Filter Prep

Lab SOP: GL-RAD-A-026 REV# 18

Instrument: NONE

SP-15750050

Due Dates for Lab: 22-JAN-2023

Package: 24-JAN-2023

SDG: 24-JAN-2023

Type Sample Id Description Serial Number Spike Amount Spike Units

#	Sample ID	Prep Date	Min RDL ()	Number of Filters	Container Wt (g)	Weight of total filter with container (g)	Weight of filter Diluted with container (g)	Not Saved Final Volume of filter diluted to in Liters (mL)	Total Filter Weight (g)	Weight of Filter Diluted (g)
1	606487001	16-JAN-2023		1	82.818	85.011	84.459	200	2.193	1.641
2	606487002	16-JAN-2023		1	83.452	85.66	85.084	200	2.208	1.632
3	606487003	16-JAN-2023		1	81.587	83.767	83.222	200	2.18	1.635
4	606488001	16-JAN-2023		1	79.891	83.366	82.549	200	3.475	2.658
5	606488002	16-JAN-2023		1	83.433	86.898	86.022	200	3.465	2.589
6	606488003	16-JAN-2023		1	82.547	86.013	85.036	200	3.466	2.489
7	606488004	16-JAN-2023		1	82.118	85.587	84.681	200	3.469	2.563
8	606488005	16-JAN-2023		1	84.439	87.808	86.887	200	3.369	2.448
9	1205292390 MFB	16-JAN-2023		1	0	1	1	200	1	1

Reagent/Solvent Lot ID	Description	Amount	Comments:
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Qualifier Definition Report for

NORW002 North Wind Solutions

Client SDG: 606488 GEL Work Order: 606488

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- * A quality control analyte recovery is outside of specified acceptance criteria
- UI Gamma Spectroscopy--Uncertain identification
- ** Analyte is a Tracer compound

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Theresa Austin

Date: 30 JAN 2023

Title: Group Leader

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: January 30, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-1_Qtr 19_S
Sample ID: 606488001
Matrix: Filter
Collect Date: 26-DEC-22 07:41
Receive Date: 10-JAN-23
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0614	+/-0.172	0.184	1.00	pCi/Sample		EJ1	01/23/23	1136	2368289		1
Alphaspec Po210, Filter "As Received"													
Polonium-210		12.8	+/-2.48	0.745	0.500	pCi/Sample		BV1	01/19/23	1619	2368295		2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.143	+/-0.253	0.384	1.00	pCi/Sample		EJ1	01/23/23	1136	2368291		3
Plutonium-239/240	U	-0.0251	+/-0.235	0.545	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.528	+/-0.555	0.693	1.00	pCi/Sample		EJ1	01/22/23	1850	2368294		4
Thorium-230		1.04	+/-0.730	0.783	1.00	pCi/Sample							
Thorium-232		0.580	+/-0.533	0.511	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.434	+/-0.418	0.537	1.00	pCi/Sample		EJ1	01/23/23	1019	2368293		5
Uranium-235/236	U	0.0657	+/-0.246	0.414	1.00	pCi/Sample							
Uranium-238		0.599	+/-0.463	0.517	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	4.85	+/-39.2	67.2	5.00	pCi/Sample		EJ1	01/24/23	2158	2368292		6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-2.18	+/-20.0	37.3		pCi/Sample		MXR1	01/19/23	1521	2367950		7
Beryllium-7		151	+/-90.9	82.7		pCi/Sample							
Cesium-137	U	-3.46	+/-4.56	7.32	20.0	pCi/Sample							
Cobalt-60	U	2.68	+/-5.30	11.7		pCi/Sample							
Potassium-40	UI	108	+/-86.7	78.3		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228	U	-0.528	+/-2.34	4.30	1.00	pCi/Sample		JE1	01/25/23	1206	2368080		8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium	U	1.73	+/-1.13	1.74	1.00	pCi/Sample		JE1	01/23/23	1752	2368081		9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	0.570	+/-1.48	2.64	3.00	pCi/Sample		ST2	01/23/23	1633	2368082		10

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	01/16/23	0741	2367521

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: January 30, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-1_Qtr 19_S
Sample ID: 606488001
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			79.2	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			63.7	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			83.4	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			62.4	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			91.4	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			83.4	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			71.6	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			117	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			99.3	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: January 30, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-2_Qtr 19_S
Sample ID: 606488002
Matrix: Filter
Collect Date: 26-DEC-22 07:49
Receive Date: 10-JAN-23
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0690	+/-0.190	0.329	1.00	pCi/Sample		EJ1	01/23/23	1136	2368289		1
Alphaspec Po210, Filter "As Received"													
Polonium-210		11.1	+/-2.19	0.613	0.500	pCi/Sample		BV1	01/19/23	1619	2368295		2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	-0.0114	+/-0.170	0.398	1.00	pCi/Sample		EJ1	01/23/23	1136	2368291		3
Plutonium-239/240	U	-0.0272	+/-0.120	0.314	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.525	+/-0.616	0.855	1.00	pCi/Sample		EJ1	01/22/23	1850	2368294		4
Thorium-230	U	0.793	+/-0.749	1.02	1.00	pCi/Sample							
Thorium-232		0.836	+/-0.666	0.638	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		0.777	+/-0.541	0.578	1.00	pCi/Sample		EJ1	01/23/23	1019	2368293		5
Uranium-235/236	U	0.0936	+/-0.263	0.281	1.00	pCi/Sample							
Uranium-238		1.19	+/-0.614	0.363	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	-2.85	+/-41.3	71.1	5.00	pCi/Sample		EJ1	01/24/23	2229	2368292		6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-22.3	+/-21.9	39.0		pCi/Sample		MXR1	01/19/23	1630	2367950		7
Beryllium-7		237	+/-81.8	70.4		pCi/Sample							
Cesium-137	U	-3.34	+/-5.55	10.9	20.0	pCi/Sample							
Cobalt-60	U	4.78	+/-5.62	12.7		pCi/Sample							
Potassium-40	UI	91.3	+/-78.5	80.4		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228	U	2.24	+/-1.87	3.01	1.00	pCi/Sample		JE1	01/25/23	1206	2368080		8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium	U	1.56	+/-1.10	1.69	1.00	pCi/Sample		JE1	01/23/23	1849	2368081		9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	1.69	+/-1.72	2.83	3.00	pCi/Sample		ST2	01/26/23	0953	2368082		10

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	01/16/23	0741	2367521

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: January 30, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-2_Qtr 19_S
Sample ID: 606488002
Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			83.9	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			69.4	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			86.1	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			56.1	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			83.3	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			86.1	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			72.1	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			111	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			73.2	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: January 30, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-3_Qtr 19_S
Sample ID: 606488003
Matrix: Filter
Collect Date: 26-DEC-22 07:58
Receive Date: 10-JAN-23
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0328	+/-0.182	0.349	1.00	pCi/Sample		EJ1	01/23/23	1136	2368289		1
Alphaspec Po210, Filter "As Received"													
Polonium-210		10.1	+/-1.97	0.545	0.500	pCi/Sample		BV1	01/19/23	1619	2368295		2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.000	+/-0.106	0.158	1.00	pCi/Sample		EJ1	01/23/23	1136	2368291		3
Plutonium-239/240	U	0.0525	+/-0.148	0.158	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.402	+/-0.510	0.636	1.00	pCi/Sample		EJ1	01/22/23	1850	2368294		4
Thorium-230	U	0.717	+/-0.662	0.811	1.00	pCi/Sample							
Thorium-232	U	0.410	+/-0.493	0.556	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		0.915	+/-0.635	0.623	1.00	pCi/Sample		EJ1	01/23/23	1021	2368293		5
Uranium-235/236	U	0.000	+/-0.231	0.344	1.00	pCi/Sample							
Uranium-238		0.676	+/-0.553	0.567	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	-0.277	+/-39.6	68.1	5.00	pCi/Sample		EJ1	01/24/23	2300	2368292		6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	12.2	+/-22.2	41.8		pCi/Sample		MXR1	01/19/23	1633	2367950		7
Beryllium-7	U	98.4	+/-89.1	103		pCi/Sample							
Cesium-137	U	-0.546	+/-5.68	10.1	20.0	pCi/Sample							
Cobalt-60	U	3.49	+/-4.57	10.6		pCi/Sample							
Potassium-40		122	+/-79.8	83.2		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228	U	2.99	+/-2.31	3.76	1.00	pCi/Sample		JE1	01/25/23	1206	2368080		8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium	U	1.37	+/-1.21	1.91	1.00	pCi/Sample		JE1	01/23/23	1751	2368081		9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	0.0608	+/-1.22	2.10	3.00	pCi/Sample		ST2	01/25/23	1833	2368082		10

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	01/16/23	0741	2367521

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: January 30, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-3_Qtr 19_S Project: NORW00219
Sample ID: 606488003 Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			78.7	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			80.4	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			92.4	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			58.4	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			71.1	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			88.6	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			86.3	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			84.2	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			70.6	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: January 30, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136
Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-4_Qtr 19_S
Sample ID: 606488004
Matrix: Filter
Collect Date: 26-DEC-22 08:04
Receive Date: 10-JAN-23
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.00442	+/-0.203	0.446	1.00	pCi/Sample		EJ1	01/23/23	1136	2368289		1
Alphaspec Po210, Filter "As Received"													
Polonium-210		7.06	+/-1.67	0.555	0.500	pCi/Sample		BV1	01/19/23	1620	2368295		2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	-0.0655	+/-0.124	0.383	1.00	pCi/Sample		EJ1	01/23/23	1136	2368291		3
Plutonium-239/240	U	-0.0371	+/-0.168	0.423	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.487	+/-0.558	0.698	1.00	pCi/Sample		EJ1	01/22/23	1850	2368294		4
Thorium-230	U	0.189	+/-0.442	0.759	1.00	pCi/Sample							
Thorium-232	U	-0.00784	+/-0.223	0.429	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		0.712	+/-0.500	0.540	1.00	pCi/Sample		EJ1	01/23/23	1021	2368293		5
Uranium-235/236	U	-0.0415	+/-0.184	0.479	1.00	pCi/Sample							
Uranium-238		0.509	+/-0.417	0.428	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	-7.21	+/-37.4	64.5	5.00	pCi/Sample		EJ1	01/24/23	2331	2368292		6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-17.2	+/-20.0	31.8		pCi/Sample		MXR1	01/19/23	1634	2367950		7
Beryllium-7		173	+/-94.6	85.7		pCi/Sample							
Cesium-137	U	0.411	+/-4.66	9.11	20.0	pCi/Sample							
Cobalt-60	U	-2.86	+/-3.02	4.25		pCi/Sample							
Potassium-40	U	34.8	+/-82.4	172		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228		3.67	+/-2.06	3.17	1.00	pCi/Sample		JE1	01/25/23	1206	2368080		8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium		2.61	+/-1.20	1.72	1.00	pCi/Sample		JE1	01/23/23	1821	2368081		9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	2.27	+/-1.84	2.91	3.00	pCi/Sample		ST2	01/26/23	0948	2368082		10

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	01/16/23	0741	2367521

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Certificate of Analysis

Report Date: January 30, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: DOE-4_Qtr 19_S Project: NORW00219
Sample ID: 606488004 Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			90.1	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			79	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			92.5	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			56.7	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			92.5	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			92.5	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			83	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			115	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			86.3	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: January 30, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: BLANK_Qtr 19_S
Sample ID: 606488005
Matrix: Filter
Collect Date: 26-DEC-22 09:00
Receive Date: 10-JAN-23
Collector: Client

Project: NORW00219
Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.155	+/-0.274	0.415	1.00	pCi/Sample		EJ1	01/23/23	1136	2368289		1
Alphaspec Po210, Filter "As Received"													
Polonium-210		1.40	+/-0.760	0.534	0.500	pCi/Sample		BV1	01/19/23	1620	2368295		2
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.133	+/-0.265	0.430	1.00	pCi/Sample		EJ1	01/23/23	1136	2368291		3
Plutonium-239/240	U	-0.0783	+/-0.148	0.457	1.00	pCi/Sample							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.510	+/-0.699	1.07	1.00	pCi/Sample		EJ1	01/23/23	1006	2368294		4
Thorium-230		1.31	+/-0.907	0.952	1.00	pCi/Sample							
Thorium-232		0.960	+/-0.751	0.681	1.00	pCi/Sample							
Alphaspec U, Filter "As Received"													
Uranium-233/234		1.08	+/-0.646	0.620	1.00	pCi/Sample		EJ1	01/23/23	1021	2368293		5
Uranium-235/236	U	0.000	+/-0.203	0.303	1.00	pCi/Sample							
Uranium-238		1.37	+/-0.681	0.391	1.00	pCi/Sample							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	-31.6	+/-40.9	71.6	5.00	pCi/Sample		EJ1	01/25/23	0002	2368292		6
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Filter "As Received"													
Actinium-228	U	-8.07	+/-19.3	33.5		pCi/Sample		MXR1	01/19/23	1635	2367950		7
Beryllium-7	U	-8.84	+/-42.8	77.6		pCi/Sample							
Cesium-137	U	0.861	+/-4.99	8.38	20.0	pCi/Sample							
Cobalt-60	U	3.42	+/-5.37	11.3		pCi/Sample							
Potassium-40	U	33.5	+/-81.0	83.8		pCi/Sample							
Rad Gas Flow Proportional Counting													
GFPC Ra228, Filter "As Received"													
Radium-228	U	2.47	+/-2.36	3.92	1.00	pCi/Sample		JE1	01/27/23	0907	2368080		8
GFPC Total Alpha Radium, Filter "As Received"													
Total Radium	U	0.848	+/-1.07	1.81	1.00	pCi/Sample		JE1	01/23/23	1805	2368081		9
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	1.22	+/-1.48	2.51	3.00	pCi/Sample		ST2	01/28/23	0912	2368082		10

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	01/16/23	0741	2367521

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: January 30, 2023

Company : Northwind Solutions
Address : 535 North Pleasantburg, Suite 136

Greenville, South Carolina 29607
Contact: Ms. Candace Christensen
Project: Project # 080153.007 Air Monitoring at SSFL

Client Sample ID: BLANK_Qtr 19_S Project: NORW00219
Sample ID: 606488005 Client ID: NORW002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Po-01-RC Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Th-01-RC Modified	
5	DOE EML HASL-300, U-02-RC Modified	
6	DOE EML HASL-300, Pu-11-RC Modified	
7	DOE HASL 300, 4.5.2.3/Ga-01-R	
8	EPA 904.0/SW846 9320 Modified	
9	EPA 900.1 Mod/ EPA 903.0 Mod	
10	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			86.5	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			79.9	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			83.6	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			48.7	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			80.1	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			83.6	(15%-125%)
Barium-133 Tracer	GFPC Ra228, Filter "As Received"			93.4	(15%-125%)
Barium Carrier	GFPC Total Alpha Radium, Filter "As Received"			118	(25%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			86.3	(25%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: January 30, 2023

Page 1 of 6

Northwind Solutions
535 North Pleasantburg, Suite 136
Greenville, South Carolina
Ms. Candace Christensen

Contact:
Workorder: 606488

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2368289										
QC1205293607	LCS										
Americium-241	17.0			15.2 pCi/Sample			89	(75%-125%)	EJ1	01/23/23	11:41
	Uncertainty			+/-1.80							
QC1205293608	LCSD										
Americium-241	17.0			15.5 pCi/Sample	2.41		91.2	(0%-20%)		01/23/23	11:41
	Uncertainty			+/-1.66							
QC1205293606	MB										
Americium-241			U	0.0516 pCi/Sample						01/23/23	11:36
	Uncertainty			+/-0.145							
Batch	2368291										
QC1205293622	LCS										
Plutonium-238			U	0.148 pCi/Sample					EJ1	01/23/23	11:36
	Uncertainty			+/-0.214							
Plutonium-239/240	17.7			18.1 pCi/Sample			102	(75%-125%)			
	Uncertainty			+/-1.94							
QC1205293623	LCSD										
Plutonium-238			U	0.0424 pCi/Sample	0					01/23/23	11:36
	Uncertainty			+/-0.159							
Plutonium-239/240	17.7			16.8 pCi/Sample	7.25		94.7	(0%-20%)			
	Uncertainty			+/-1.90							
QC1205293621	MB										
Plutonium-238			U	0.0933 pCi/Sample						01/23/23	11:36
	Uncertainty			+/-0.246							
Plutonium-239/240			U	-0.0574 pCi/Sample							
	Uncertainty			+/-0.133							
Batch	2368292										
QC1205293625	LCS										
Plutonium-241	1200			1280 pCi/Sample			106	(75%-125%)	EJ1	01/25/23	01:03
	Uncertainty			+/-62.1							
QC1205293626	LCSD										
Plutonium-241	1200			1240 pCi/Sample	3.31		103	(0%-20%)		01/25/23	01:34
	Uncertainty			+/-61.3							

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 606488

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2368292										
QC1205293624	MB										
Plutonium-241			U	-31.2 pCi/Sample					EJ1	01/25/23	00:32
	Uncertainty			+/-38.7							
Batch	2368293										
QC1205293628	LCS										
Uranium-233/234				25.7 pCi/Sample					EJ1	01/23/23	10:21
	Uncertainty			+/-2.69							
Uranium-235/236				1.43 pCi/Sample							
	Uncertainty			+/-0.725							
Uranium-238	24.2			25.8 pCi/Sample			107	(75%-125%)			
	Uncertainty			+/-2.69							
QC1205293629	LCSD										
Uranium-233/234				22.5 pCi/Sample		13.4				01/23/23	10:02
	Uncertainty			+/-2.22							
Uranium-235/236				1.24 pCi/Sample		14.3					
	Uncertainty			+/-0.599							
Uranium-238	24.2			24.5 pCi/Sample		5.16	101	(0%-20%)			
	Uncertainty			+/-2.31							
QC1205293627	MB										
Uranium-233/234			U	0.0664 pCi/Sample						01/23/23	10:21
	Uncertainty			+/-0.313							
Uranium-235/236			U	-0.0201 pCi/Sample							
	Uncertainty			+/-0.173							
Uranium-238			U	0.119 pCi/Sample							
	Uncertainty			+/-0.234							
Batch	2368294										
QC1205293631	LCS										
Thorium-228				19.2 pCi/Sample					EJ1	01/23/23	10:06
	Uncertainty			+/-2.47							
Thorium-230				2.72 pCi/Sample				(75%-125%)			
	Uncertainty			+/-0.964							
Thorium-232	17.1			21.0 pCi/Sample			122	(75%-125%)			
	Uncertainty			+/-2.58							

GEL LABORATORIES LLC

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QC Summary

Workorder: 606488

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	2368294										
QC1205293632	LCSD										
Thorium-228				15.1 pCi/Sample		23.4			EJ1	01/23/23	10:06
	Uncertainty			+/-1.90							
Thorium-230				2.66 pCi/Sample		2.16		(0%-20%)			
	Uncertainty			+/-0.820							
Thorium-232	17.1			17.8 pCi/Sample		16.2	104	(0%-20%)			
	Uncertainty			+/-2.06							
QC1205293630	MB										
Thorium-228			U	-0.0511 pCi/Sample						01/23/23	10:06
	Uncertainty			+/-0.184							
Thorium-230			U	0.187 pCi/Sample							
	Uncertainty			+/-0.390							
Thorium-232			U	0.167 pCi/Sample							
	Uncertainty			+/-0.299							
Batch	2368295										
QC1205293635	LCS										
Polonium-210	13.5			13.2 pCi/Sample			97.9	(75%-125%)	BV1	01/19/23	16:20
	Uncertainty			+/-2.18							
QC1205293636	LCSD										
Polonium-210	13.5			13.3 pCi/Sample		0.297	98.2	(0%-20%)		01/19/23	16:20
	Uncertainty			+/-2.31							
QC1205293634	MB										
Polonium-210			U	0.245 pCi/Sample						01/19/23	16:20
	Uncertainty			+/-0.390							
Rad Gamma Spec											
Batch	2367950										
QC1205292907	606487002	DUP									
Actinium-228			U	156							
	Uncertainty			+/-21.4							
					-16.2 pCi/Sample	N/A			N/A	MXR1	01/19/23 17:31
					+/-24.6						
Beryllium-7				156	156 pCi/Sample	0		(0% - 100%)			
	Uncertainty			+/-71.4	+/-79.9						
Cesium-137			U	0.276	1.37 pCi/Sample	N/A			N/A		
	Uncertainty			+/-3.60	+/-7.38						

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QC Summary

Workorder: 606488

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	2367950										
Cobalt-60	U	-0.923	U	-0.118	pCi/Sample	N/A		N/A	MXR1	01/19/23	17:31
	Uncertainty	+/-3.73		+/-3.47							
Potassium-40	U	12.2	U	3.49	pCi/Sample	N/A		N/A			
	Uncertainty	+/-87.5		+/-89.0							
QC1205292908	LCS										
Americium-241	74500			84300	pCi/Sample		113	(75%-125%)		01/19/23	16:21
	Uncertainty			+/-2020							
Actinium-228			U	-29.2	pCi/Sample						
	Uncertainty			+/-278							
Beryllium-7			U	-133	pCi/Sample						
	Uncertainty			+/-679							
Cesium-137	22000			22900	pCi/Sample		104	(75%-125%)			
	Uncertainty			+/-494							
Cobalt-60	7930			8730	pCi/Sample		110	(75%-125%)			
	Uncertainty			+/-368							
Potassium-40			U	82.4	pCi/Sample						
	Uncertainty			+/-249							
QC1205292906	MB										
Actinium-228			U	-11.0	pCi/Sample					01/19/23	16:37
	Uncertainty			+/-20.0							
Beryllium-7			U	17.0	pCi/Sample						
	Uncertainty			+/-25.8							
Cesium-137			U	-0.831	pCi/Sample						
	Uncertainty			+/-4.27							
Cobalt-60			U	1.10	pCi/Sample						
	Uncertainty			+/-4.54							
Potassium-40			U	-39.7	pCi/Sample						
	Uncertainty			+/-57.8							
Rad Gas Flow											
Batch	2368080										
QC1205293189	LCS										
Radium-228	170			169	pCi/Sample		99.8	(75%-125%)	JE1	01/25/23	12:05
	Uncertainty			+/-10.6							

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QC Summary

Workorder: 606488

Page 5 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2368080										
QC1205293190	LCSD										
Radium-228	170			167 pCi/Sample		1.11	98.7	(0%-20%)	JE1	01/25/23	12:05
	Uncertainty			+/-11.0							
QC1205293188	MB										
Radium-228			U	1.78 pCi/Sample						01/25/23	12:06
	Uncertainty			+/-1.96							
Batch	2368081										
QC1205293193	LCS										
Total Radium	5660			4600 pCi/Sample			81.3	(75%-125%)	JE1	01/23/23	16:48
	Uncertainty			+/-97.6							
QC1205293374	LCSD										
Total Radium	5660			4480 pCi/Sample		2.7	79.1	(0%-20%)		01/23/23	16:48
	Uncertainty			+/-95.1							
QC1205293191	MB										
Total Radium			U	-0.355 pCi/Sample						01/23/23	18:49
	Uncertainty			+/-1.05							
Batch	2368082										
QC1205293195	LCS										
Strontium-90	201			222 pCi/Sample			111	(75%-125%)	ST2	01/26/23	09:47
	Uncertainty			+/-12.2							
QC1205293196	LCSD										
Strontium-90	201			224 pCi/Sample		0.819	111	(0%-20%)		01/26/23	09:47
	Uncertainty			+/-13.1							
QC1205293194	MB										
Strontium-90			U	-0.789 pCi/Sample						01/25/23	18:32
	Uncertainty			+/-1.16							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

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QC Summary

Workorder: 606488

Page 6 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI	Gamma Spectroscopy--Uncertain identification										
BD	Results are either below the MDC or tracer recovery is low										
h	Preparation or preservation holding time was exceeded										
R	Sample results are rejected										
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.										
N/A	RPD or %Recovery limits do not apply.										
ND	Analyte concentration is not detected above the detection limit										
M	M if above MDC and less than LLD										
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
FA	Failed analysis.										
UJ	Gamma Spectroscopy--Uncertain identification										
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.										
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.										
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.										
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.										
N1	See case narrative										
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.										
**	Analyte is a Tracer compound										
M	REMP Result > MDC/CL and < RDL										
J	See case narrative for an explanation										

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Alpha Spectroscopy Raw Data

Batch 2368293 Check-list

This check-list was completed on 23-JAN-23 by Melanie Aycock

This batch was reviewed by Jessica Davis on 23-JAN-23 and Melanie Aycock on 23-JAN-23.

Batch ID:
2368293

Product:
ASP__UUF

Description: Alpha Spec Uranium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Uranium

Batch ID: 2368293

Analyst: Evan Johnson (EJ1)

Method: DOE EML HASL-300, U-02-RC
Modified

Lab SOP: GL-RAD-A-011 REV# 28

Instrument: BAL-C236871727

Due Dates for Lab: 23-JAN-2023

Package: 24-JAN-2023

SDG: 24-JAN-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205293628	Uranium-238 AS SPIKE	1600-O	.1	mL
LCSD	1205293629	Uranium-238 AS SPIKE	1600-O	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	606487001	20-JAN-2023	1	30.3	0.11337
2	606487002	20-JAN-2023	1	30.45	0.11253
3	606487003	20-JAN-2023	1	30.13	0.11299
4	606488001	20-JAN-2023	1	30.35	0.11607
5	606488002	20-JAN-2023	1	30.3	0.1132
6	606488003	20-JAN-2023	1	30.15	0.10826
7	606488004	20-JAN-2023	1	30.41	0.11234
8	606488005	20-JAN-2023	1	30.03	0.1091
9	1205293627 MB	20-JAN-2023	1		0.11607
10	1205293628 LCS	20-JAN-2023	1		0.11607
11	1205293629 LCSD	20-JAN-2023	1		0.11607

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1564-EE	Uranium-232 AS TRACER	.1 ml	Pipet ID: R2-428724 Pu-236 Tracer Used: No Analyzed With: Am , Pu Data Entry Date2: 20-JAN-2023 00:00

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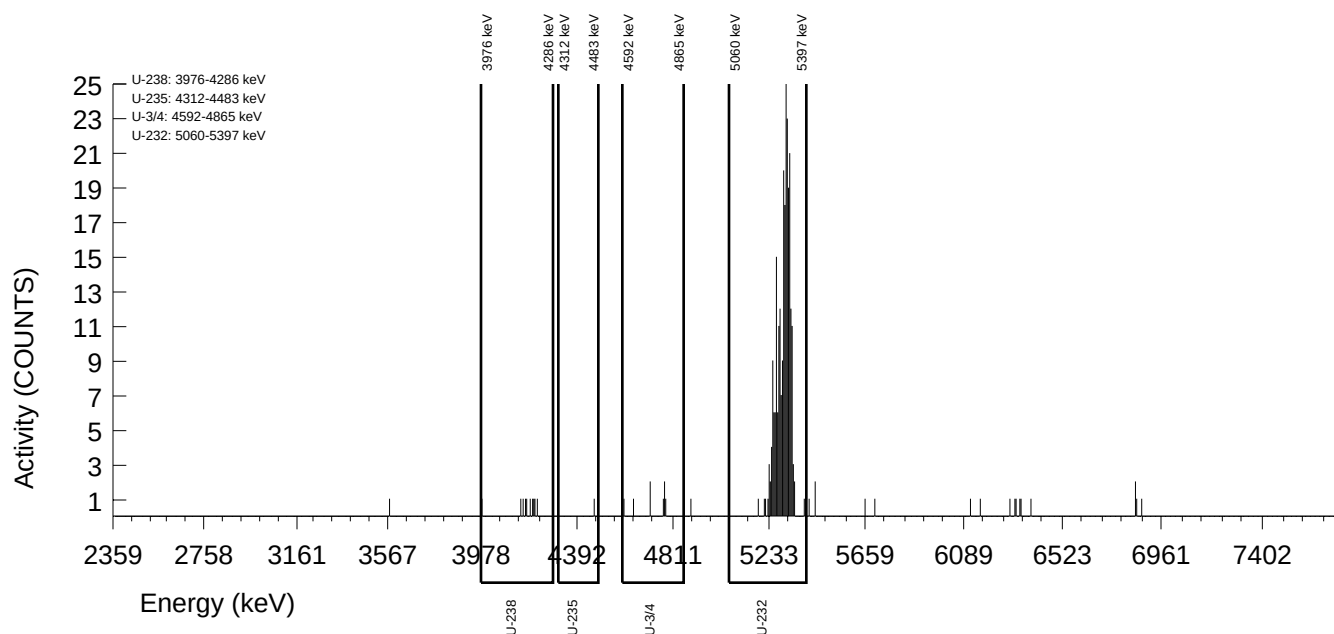
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368293 SAMPLE ID : S0606488001_UU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 91.4 +/-7.136 %	CHAMBER : 121 DETECTOR S/N : 155765 AVERAGE %EFFICIENCY : 25.2875 AVERAGE %EFF ERROR : 0.4917 COUNT DATE : 23-Jan-2023 10:19:47 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B121.CNF;1811 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W121.CNF;488 CAL DATE : 12-Jan-2023
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4648E+00 dpm RESULTS : 4.0830E+00 dpm		

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
U-232	5302.10	5301.52	60.631	250.000	247.600	2.400	1.5492	100.000	1.73E+01	3.34E+00	6.07E-01	1.99E-01	2.18E+00	2.18E+00
U-3/4	4763.02	4724.01	66.969	8.000	6.207	0.960	0.9798	100.000	4.34E-01	4.24E-01	5.37E-01	1.64E-01	4.18E-01	4.18E-01
U-235	4391.00	4470.42	4.961	1.000	0.760	0.240	0.4899	80.900	6.57E-02	2.47E-01	4.14E-01	7.76E-02	2.46E-01	2.46E-01
U-238	4184.73	4165.42	0.000	10.000	8.560	1.440	1.2000	100.000	5.99E-01	4.71E-01	5.17E-01	1.54E-01	4.63E-01	4.63E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.833 +/-0.025)



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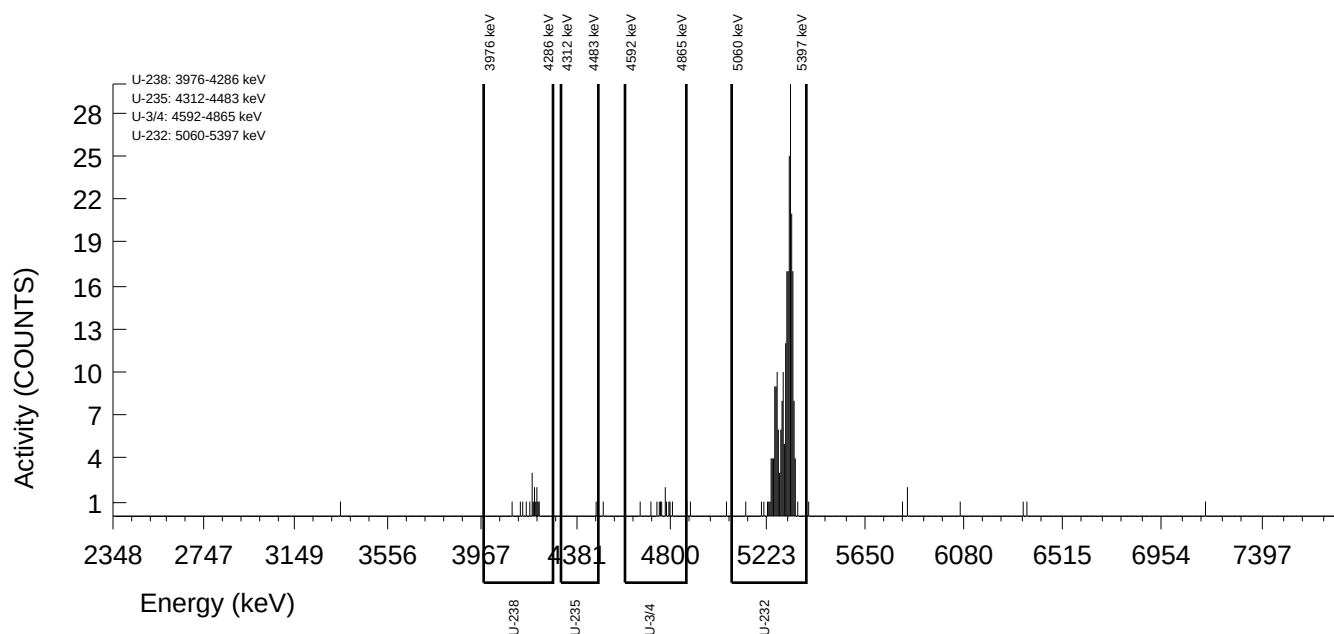
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368293 SAMPLE ID : S0606488002_UU SAMPLE QTY : 0.113 F +/-0.883 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 83.3 +/-7.288 %	CHAMBER : 124 DETECTOR S/N : 155771 AVERAGE %EFFICIENCY : 26.2761 AVERAGE %EFF ERROR : 0.5103 COUNT DATE : 23-Jan-2023 10:19:49 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B124.CNF;1831 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W124.CNF;472 CAL DATE : 12-Jan-2023
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4648E+00 dpm RESULTS : 3.7186E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5301.70	27.876	236.000	234.320	1.680	1.2961	100.000	1.78E+01	3.50E+00	5.88E-01	1.80E-01	2.29E+00
U-3/4	4763.02	4757.28	7.437	12.000	10.252	0.960	0.9798	100.000	7.77E-01	5.55E-01	5.78E-01	1.75E-01	5.41E-01
U-235	4391.00	4470.13	4.958	1.000	1.000	0.000	1.0000	80.900	9.36E-02	2.64E-01	2.81E-01	1.72E-01	2.63E-01
U-238	4184.73	4184.33	24.791	16.000	15.760	0.240	0.4899	100.000	1.19E+00	6.40E-01	3.63E-01	6.80E-02	6.14E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.788 +/-0.024)



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ALPHA SPECTROSCOPY REPORT

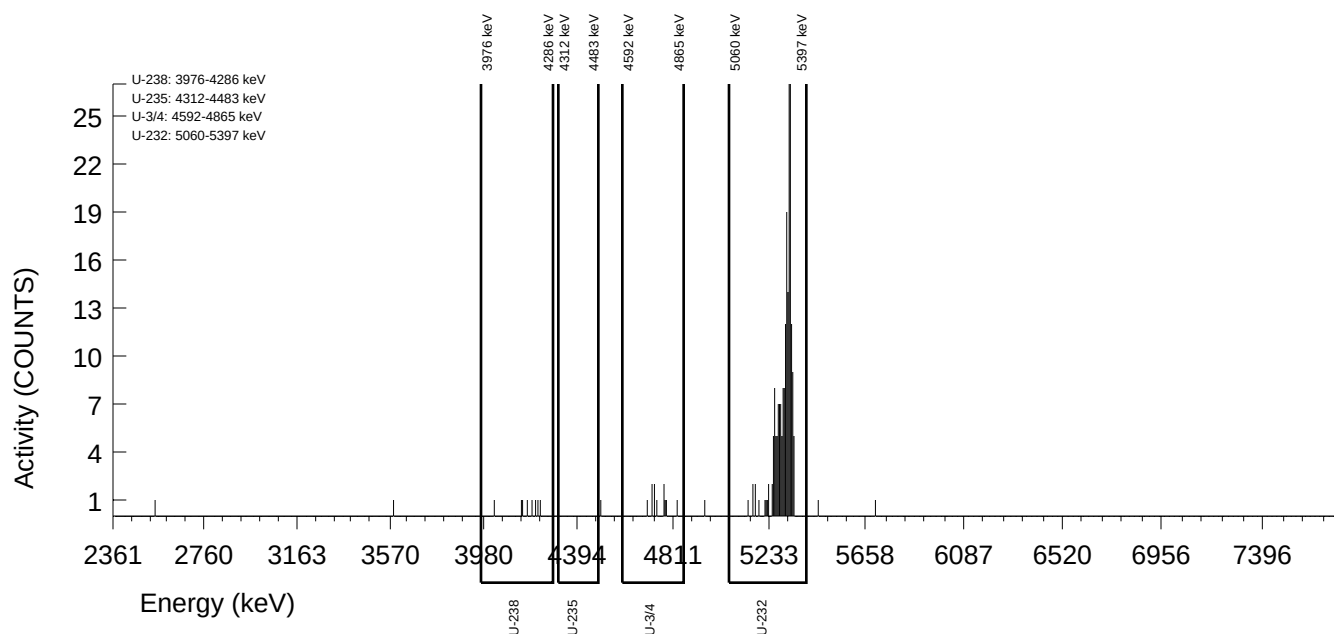
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368293 SAMPLE ID : S0606488003_UU SAMPLE QTY : 0.108 F +/-0.924 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 71.1 +/-7.818 %	CHAMBER : 125 DETECTOR S/N : 84060 AVERAGE %EFFICIENCY : 26.2707 AVERAGE %EFF ERROR : 0.5104 COUNT DATE : 23-Jan-2023 10:21:19 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B125.CNF;1834 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W125.CNF;508 CAL DATE : 12-Jan-2023
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4648E+00 dpm RESULTS : 3.1727E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
U-232	5302.10	5301.47	23.254	203.000	199.880	3.120	1.7664	100.000	1.86E+01	3.94E+00	8.80E-01	3.01E-01	2.61E+00
U-3/4	4763.02	4754.67	57.073	11.000	9.848	0.480	0.6928	100.000	9.15E-01	6.54E-01	6.23E-01	1.72E-01	6.35E-01
U-235	4391.00	4397.19	0.000	0.000	0.000	0.000	1.0000	80.900	0.00E+00	2.32E-01	3.44E-01	2.10E-01	2.31E-01
U-238	4184.73	4171.99	198.514	8.000	7.280	0.720	0.8485	100.000	6.76E-01	5.63E-01	5.67E-01	1.44E-01	5.53E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.672 +/-0.020)



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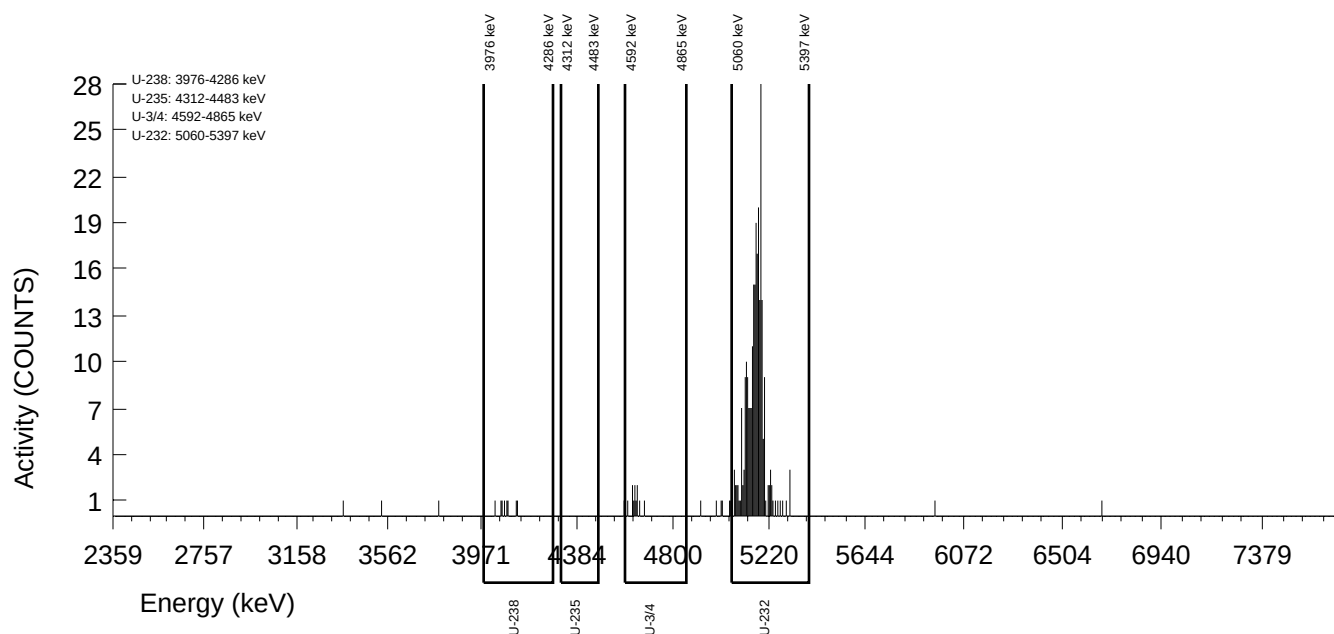
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368293 SAMPLE ID : S0606488004_UU SAMPLE QTY : 0.112 F +/-0.890 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 92.5 +/-7.043 %	CHAMBER : 126 DETECTOR S/N : 126133 AVERAGE %EFFICIENCY : 25.7991 AVERAGE %EFF ERROR : 0.5013 COUNT DATE : 23-Jan-2023 10:21:21 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B126.CNF;1824 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W126.CNF;79 CAL DATE : 12-Jan-2023
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4648E+00 dpm RESULTS : 4.1313E+00 dpm		

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
U-232	5302.10	5166.89	35.814	258.000	255.600	2.400	1.5492	100.000	1.79E+01	3.40E+00	6.08E-01	1.99E-01	2.21E+00	
U-3/4	4763.02	4637.00	24.700	12.000	10.180	0.960	0.9798	100.000	7.12E-01	5.12E-01	5.40E-01	1.65E-01	5.00E-01	
U-235	4391.00	4397.19	0.000	0.000	-0.480	0.480	0.6928	80.900	-4.15E-02	1.84E-01	4.79E-01	1.10E-01	1.84E-01	
U-238	4184.73	4077.17	98.798	8.000	7.280	0.720	0.8485	100.000	5.09E-01	4.23E-01	4.28E-01	1.09E-01	4.17E-01	

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.860 +/-0.026)



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ALPHA SPECTROSCOPY REPORT

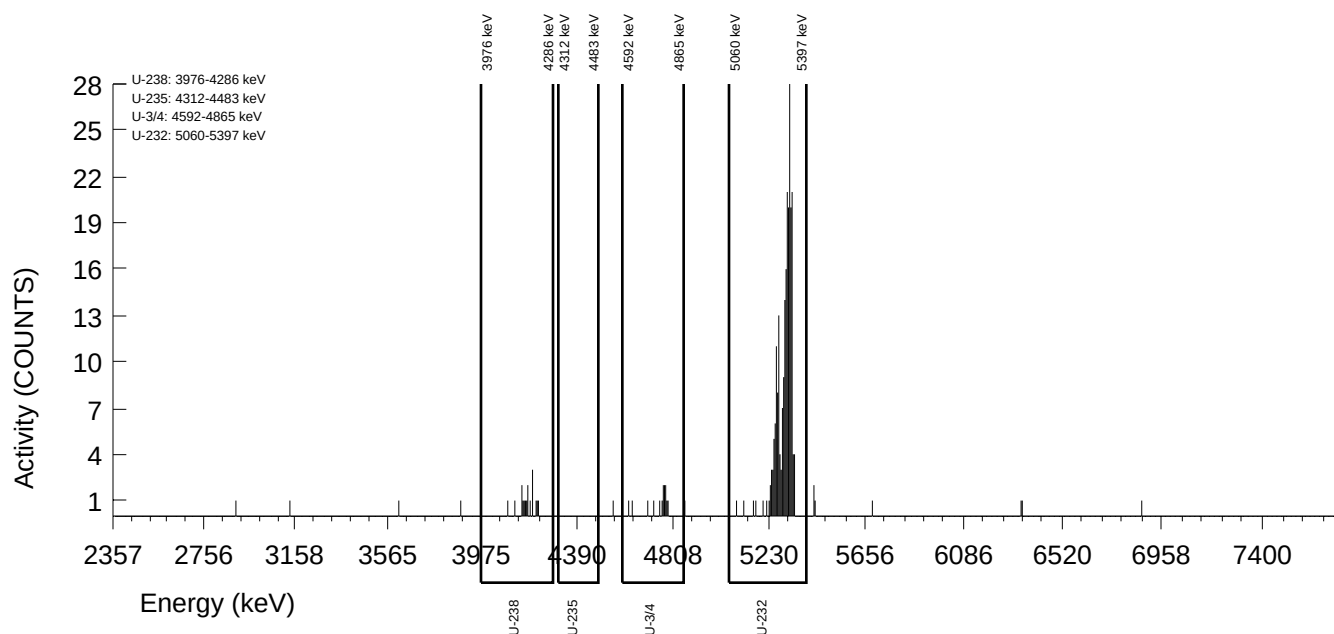
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368293 SAMPLE ID : S0606488005_UU SAMPLE QTY : 0.109 F +/-0.917 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 80.1 +/-7.430 %	CHAMBER : 128 DETECTOR S/N : 101458 AVERAGE %EFFICIENCY : 26.2943 AVERAGE %EFF ERROR : 0.5107 COUNT DATE : 23-Jan-2023 10:21:24 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B128.CNF;1826 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W128.CNF;84 CAL DATE : 12-Jan-2023
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4648E+00 dpm RESULTS : 3.5784E+00 dpm		

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
U-232	5302.10	5302.71	31.793	229.000	225.640	3.360	1.8330	100.000	1.84E+01	3.71E+00	7.94E-01	2.74E-01	2.43E+00	2.43E+00
U-3/4	4763.02	4754.02	19.834	15.000	13.281	0.960	0.9798	100.000	1.08E+00	6.69E-01	6.20E-01	1.87E-01	6.46E-01	6.46E-01
U-235	4391.00	4397.19	0.000	0.000	0.000	0.000	1.0000	80.900	0.00E+00	2.04E-01	3.03E-01	1.85E-01	2.03E-01	2.03E-01
U-238	4184.73	4173.77	48.346	17.000	16.760	0.240	0.4899	100.000	1.37E+00	7.12E-01	3.91E-01	7.33E-02	6.81E-01	6.81E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.759 +/-0.023)



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ALPHA SPECTROSCOPY REPORT

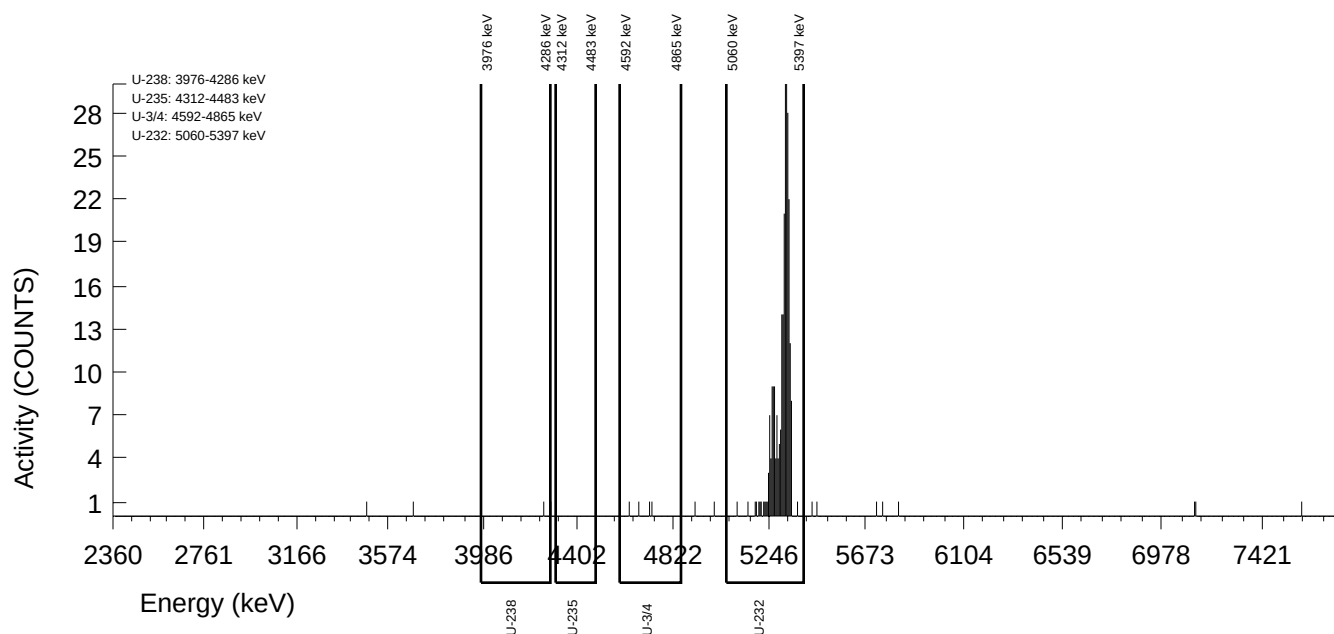
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368293 SAMPLE ID : S1205293627_UU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 93.3 +/-7.043 %	CHAMBER : 130 DETECTOR S/N : 101451 AVERAGE %EFFICIENCY : 25.6000 AVERAGE %EFF ERROR : 0.4976 COUNT DATE : 23-Jan-2023 10:21:26 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B130.CNF;606 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W130.CNF;92 CAL DATE : 12-Jan-2023
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4617E+00 dpm RESULTS : 4.1606E+00 dpm		

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
U-232	5302.10	5305.91	27.706	258.000	255.600	2.400	1.5492	100.000	1.73E+01	3.29E+00	5.88E-01	1.92E-01	2.14E+00	2.14E+00
U-3/4	4763.02	4690.58	99.714	4.000	0.980	2.160	1.4697	100.000	6.64E-02	3.14E-01	6.22E-01	2.10E-01	3.13E-01	3.13E-01
U-235	4391.00	4397.19	0.000	0.000	-0.240	0.240	0.4899	80.900	-2.01E-02	1.74E-01	4.01E-01	7.51E-02	1.73E-01	1.73E-01
U-238	4184.73	4271.98	0.000	2.000	1.760	0.240	0.4899	100.000	1.19E-01	2.35E-01	3.25E-01	6.08E-02	2.34E-01	2.34E-01

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.860 +/-0.026)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

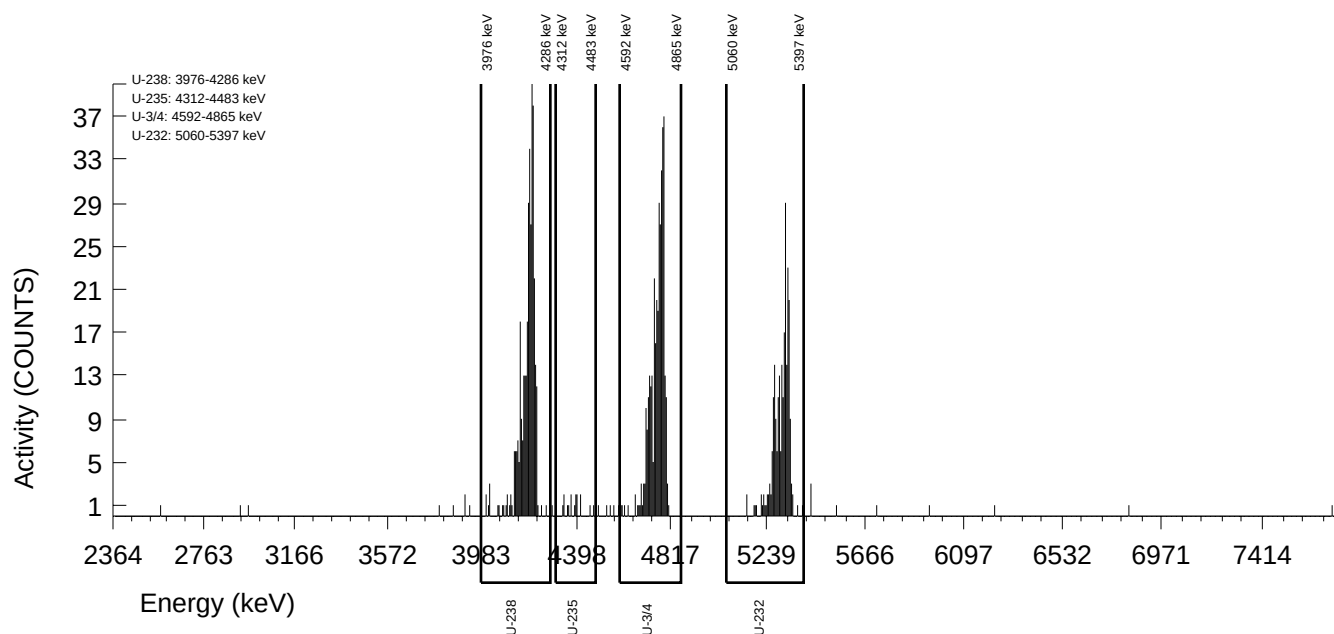
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368293 SAMPLE ID : S1205293628_UU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 85.8 +/-7.231 %	CHAMBER : 136 DETECTOR S/N : 140243 AVERAGE %EFFICIENCY : 26.0206 AVERAGE %EFF ERROR : 0.5055 COUNT DATE : 23-Jan-2023 10:21:30 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : UU BKG FILE : B136.CNF;446 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W136.CNF;89 CAL DATE : 12-Jan-2023
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4617E+00 dpm RESULTS : 3.8287E+00 dpm	LCS ID : 1600-O NUCLIDE : U-238 NOMINAL (pCi/F) : 2.4221E+01 % RECOVERY : 106.592	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5300.76	24.368	241.000	239.080	1.920	1.3856	100.000	1.73E+01	3.38E+00	5.85E-01	1.84E-01	2.21E+00
U-3/4	4763.02	4755.01	44.491	357.000	355.236	0.960	0.9798	100.000	2.57E+01	4.66E+00	5.54E-01	1.68E-01	2.69E+00
U-235	4391.00	4392.57	76.823	16.000	16.000	0.000	1.0000	80.900	1.43E+00	7.55E-01	2.69E-01	1.64E-01	7.25E-01
U-238	4184.73	4184.19	30.076	357.000	356.520	0.480	0.6928	100.000	2.58E+01	4.67E+00	4.01E-01	9.19E-02	2.69E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (0.804 +/-0.024)



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

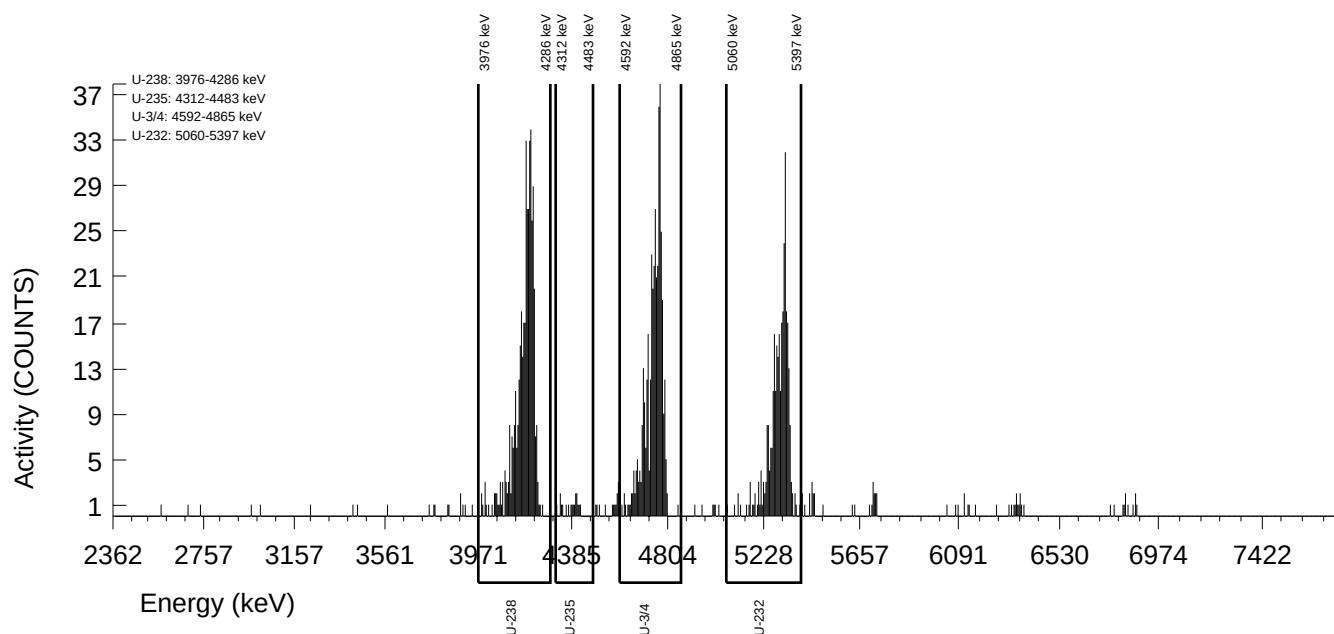
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368293 SAMPLE ID : S1205293629_UU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 91.6 +/-6.603 %	CHAMBER : 024 DETECTOR S/N : 57490 AVERAGE %EFFICIENCY : 31.2491 AVERAGE %EFF ERROR : 0.6042 COUNT DATE : 23-Jan-2023 10:02:48 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : UU BKG FILE : B024.CNF;2507 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W024.CNF;693 CAL DATE : 06-Jan-2023
TRACER ID : 1564-EE NUCLIDE : U-232 NOMINAL : 4.4617E+00 dpm RESULTS : 4.0848E+00 dpm	LCSD ID 1600-O NUCLIDE U-238 NOMINAL (pCi/F) 2.4221E+01 % RECOVERY 101.228	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
U-232	5302.10	5293.88	26.559	314.000	306.320	7.680	2.7713	100.000	1.73E+01	3.07E+00	7.43E-01	2.87E-01	1.97E+00
U-3/4	4763.02	4744.41	45.911	399.000	397.970	0.000	1.0000	100.000	2.25E+01	3.78E+00	3.58E-01	1.40E-01	2.22E+00
U-235	4391.00	4378.20	75.998	18.000	17.760	0.240	0.4899	80.900	1.24E+00	6.22E-01	3.35E-01	6.27E-02	5.99E-01
U-238	4184.73	4173.13	56.700	435.000	433.800	1.200	1.0954	100.000	2.45E+01	4.06E+00	3.96E-01	1.13E-01	2.31E+00

NOTES:

* Correction made to the following net area due to tracer impurity:
U-3/4 (1.030 +/-0.031)



Batch 2368294 Check-list

This check-list was completed on 23-JAN-23 by Melanie Aycock

This batch was reviewed by Jessica Davis on 23-JAN-23 and Melanie Aycock on 23-JAN-23.

Batch ID:
2368294

Product:
ASP__THF

Description: Alpha Spec Thorium
GL-RAD-A-038

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?	Yes		
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Thorium

Batch ID: 2368294

Analyst: Evan Johnson (EJ1)

Method: DOE EML HASL-300, Th-01-RC
Modified

Lab SOP: GL-RAD-A-038 REV# 18

Instrument: BAL-C236871727

Due Dates for Lab: 23-JAN-2023

Package: 24-JAN-2023

SDG: 24-JAN-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205293631	Thorium-232 AS SPIKE	1513-C	.1	mL
LCSD	1205293632	Thorium-232 AS SPIKE	1513-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	606487001	20-JAN-2023	1	30.06	0.11247
2	606487002	20-JAN-2023	1	30.18	0.11153
3	606487003	20-JAN-2023	1	30.12	0.11295
4	606488001	20-JAN-2023	1	30.31	0.11592
5	606488002	20-JAN-2023	1	30.19	0.11279
6	606488003	20-JAN-2023	1	30.12	0.10815
7	606488004	20-JAN-2023	1	30.29	0.1119
8	606488005	20-JAN-2023	1	30.24	0.10987
9	1205293630 MB	20-JAN-2023	1		0.11592
10	1205293631 LCS	20-JAN-2023	1		0.11592
11	1205293632 LCSD	20-JAN-2023	1		0.11592

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1845-G	Thorium-229 AS TRACER, RASP	.1 mL	Data Entry Date2: 20-JAN-2023 00:00

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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

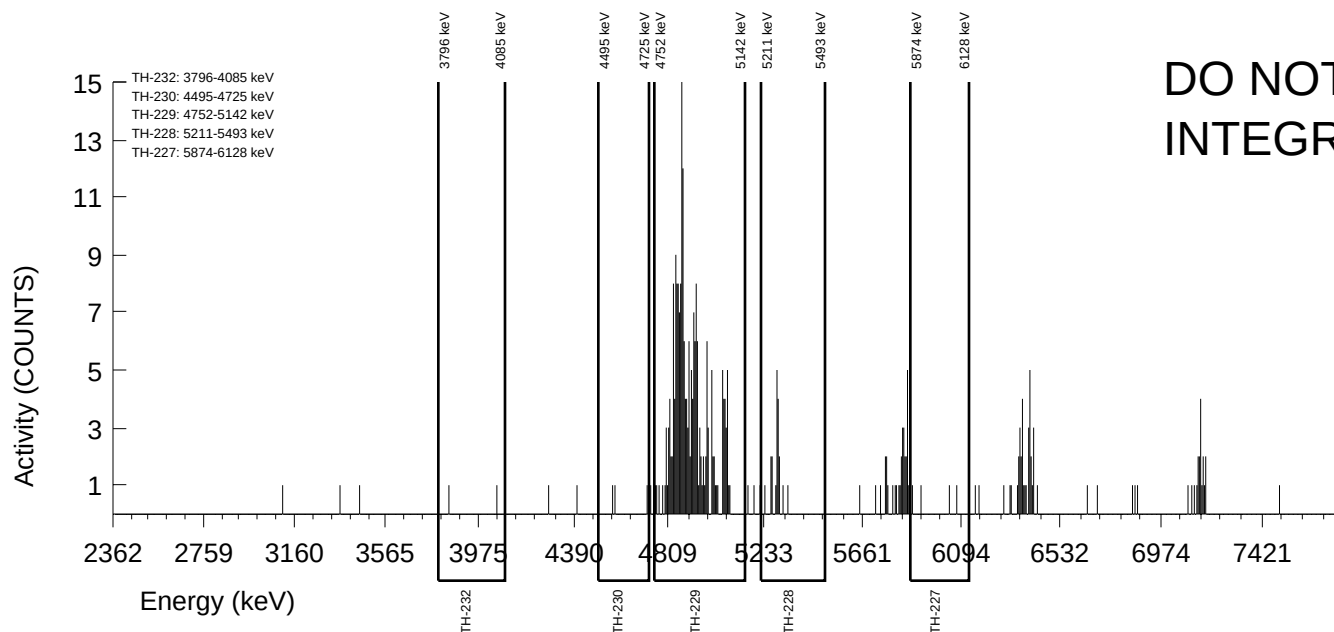
BATCH NUMBER : 2368294 SAMPLE ID : S1205293630_TH SAMPLE QTY : 0.116 F +/-0.863 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 68.8 +/-7.292 %	CHAMBER : 027 DETECTOR S/N : 140238 AVERAGE %EFFICIENCY : 33.9490 AVERAGE %EFF ERROR : 0.6551 COUNT DATE : 23-Jan-2023 10:06:21 ELAPSED LIVE TIME(SEC) : 11420.92	LIB FILE : TH BKG FILE : B027.CNF;2533 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W027.CNF;743 CAL DATE : 07-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8634E+00 dpm RESULTS : 3.3439E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5959.59	0.000	5.000	1.574	3.426	1.8510	57.440	2.73E-01	8.79E-01	1.67E+00	5.76E-01	8.78E-01
TH-228	5363.00	5277.60	11.698	21.000	20.228	0.761	0.8726	99.940	1.78E+00	8.53E-01	5.40E-01	1.38E-01	8.11E-01
TH-229	4900.00	4906.16	95.223	216.000	215.048	0.952	0.9756	99.520	1.89E+01	3.79E+00	5.71E-01	1.54E-01	2.54E+00
TH-230	4671.39	4643.49	0.000	4.000	2.135	0.571	0.7557	99.700	1.87E-01	3.93E-01	6.69E-01	2.03E-01	3.90E-01
TH-232	3972.00	3946.86	206.863	2.000	1.913	0.000	1.0000	100.000	1.67E-01	3.00E-01	3.47E-01	1.63E-01	2.99E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.011 +/-0.000)
TH-230 (1.294 +/-0.020)
TH-232 (0.087 +/-0.001)



DO NOT REPORT
INTEGRATED

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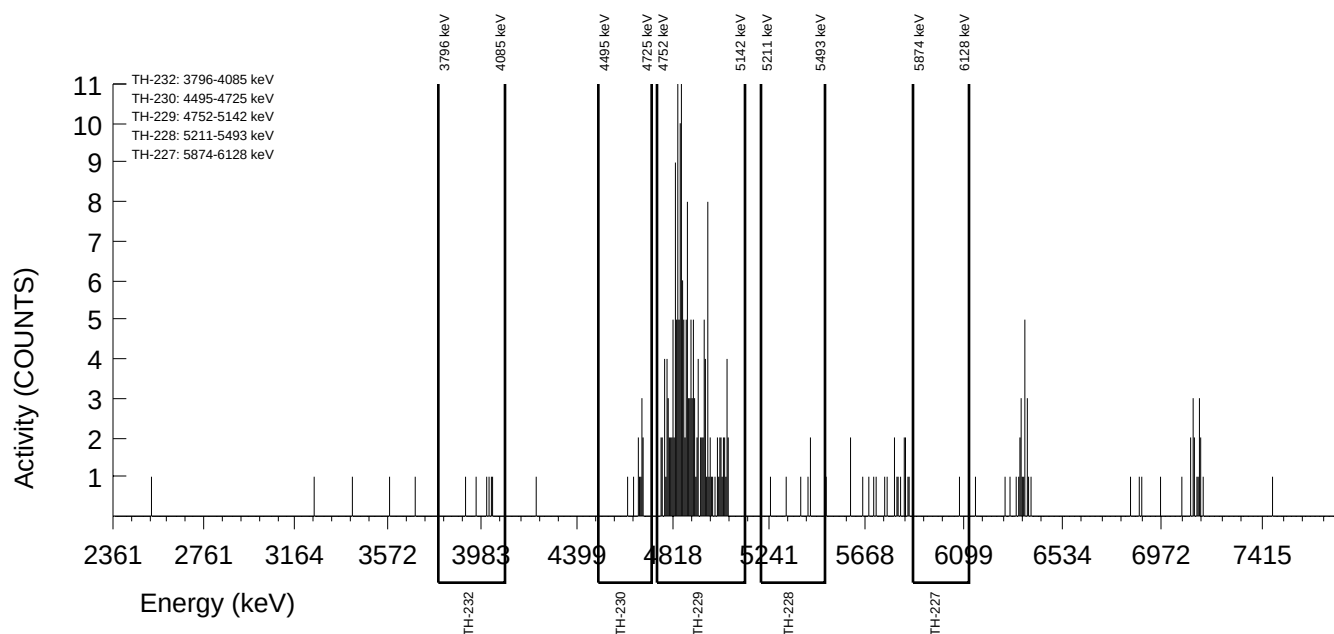
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2368294 SAMPLE ID : S0606488001_TH SAMPLE QTY : 0.116 F +/-0.863 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 62.4 +/-7.839 %	CHAMBER : 201 DETECTOR S/N : 140624 AVERAGE %EFFICIENCY : 25.4178 AVERAGE %EFF ERROR : 0.4942 COUNT DATE : 22-Jan-2023 18:50:49 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH BKG FILE : B201.CNF;1486 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W201.CNF;85 CAL DATE : 18-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8635E+00 dpm RESULTS : 3.0361E+00 dpm		

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
TH-227	5994.04	6082.68	4.973	1.000	0.040	0.960	0.9798	57.440	2.00E-02	1.48E+00	3.29E+00	8.96E-01	1.48E+00	
TH-228	5363.00	5371.43	4.973	6.000	5.031	0.960	0.9798	99.940	5.28E-01	5.62E-01	6.93E-01	1.89E-01	5.55E-01	
TH-229	4900.00	4893.49	138.547	186.000	184.320	1.680	1.2961	99.520	1.89E+01	4.08E+00	7.94E-01	2.43E-01	2.75E+00	
TH-230	4671.39	4659.00	22.381	12.000	10.171	0.720	0.8485	99.700	1.04E+00	7.52E-01	7.83E-01	2.38E-01	7.30E-01	
TH-232	3972.00	3990.28	119.363	6.000	5.686	0.240	0.4899	100.000	5.80E-01	5.42E-01	5.11E-01	1.02E-01	5.33E-01	

NOTES:

* Corrections made to the following net areas due to tracer impurity:
 TH-228 (0.009 +/-0.000)
 TH-230 (1.109 +/-0.017)
 TH-232 (0.074 +/-0.001)



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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-038

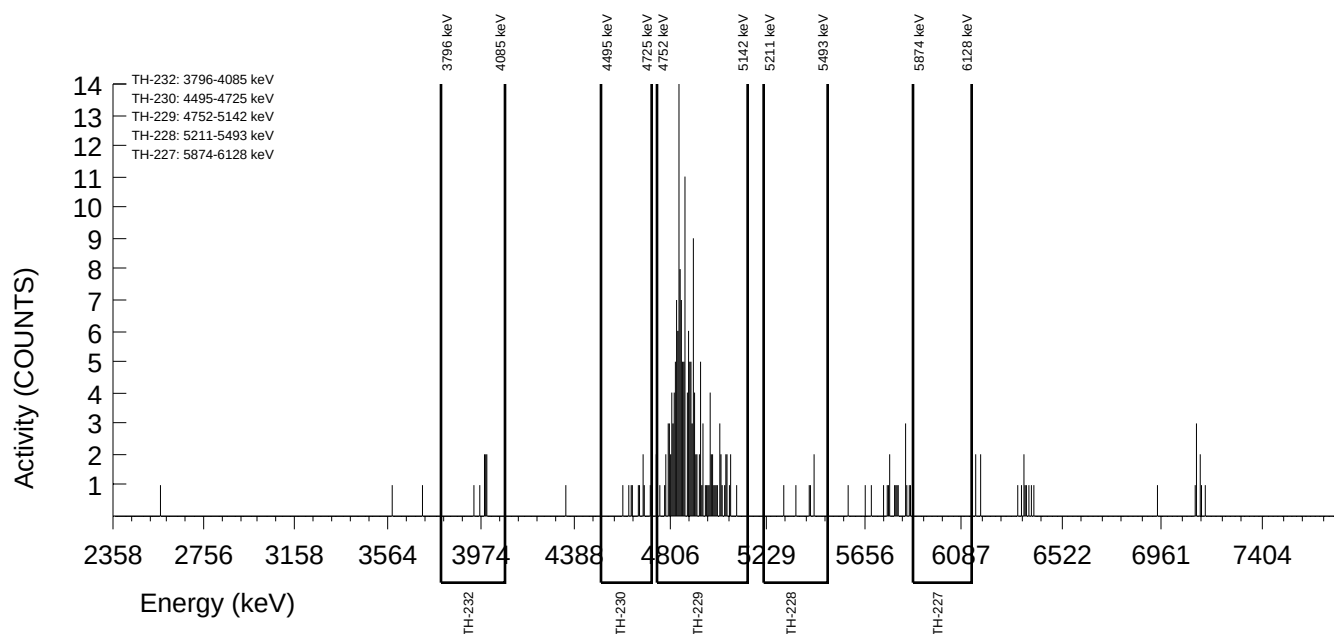
BATCH NUMBER : 2368294 SAMPLE ID : S0606488002_TH SAMPLE QTY : 0.113 F +/-0.887 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 56.1 +/-8.060 %	CHAMBER : 202 DETECTOR S/N : 104625 AVERAGE %EFFICIENCY : 26.4292 AVERAGE %EFF ERROR : 0.5133 COUNT DATE : 22-Jan-2023 18:50:50 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH BKG FILE : B202.CNF;1492 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W202.CNF;394 CAL DATE : 18-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8635E+00 dpm RESULTS : 2.7292E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	6000.75	0.000	0.000	-0.480	0.480	0.6928	57.440	-2.63E-01	1.17E+00	3.04E+00	6.97E-01	1.17E+00
TH-228	5363.00	5394.74	4.944	6.000	4.551	1.440	1.2000	99.940	5.25E-01	6.22E-01	8.55E-01	2.54E-01	6.16E-01
TH-229	4900.00	4890.15	65.635	173.000	172.280	0.720	0.8485	99.520	1.94E+01	4.31E+00	6.89E-01	1.75E-01	2.92E+00
TH-230	4671.39	4660.56	7.416	10.000	7.043	1.920	1.3856	99.700	7.93E-01	7.63E-01	1.02E+00	3.42E-01	7.49E-01
TH-232	3972.00	3984.69	14.833	8.000	7.451	0.480	0.6928	100.000	8.36E-01	6.80E-01	6.38E-01	1.50E-01	6.66E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.009 +/-0.000)
TH-230 (1.037 +/-0.016)
TH-232 (0.069 +/-0.001)



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ALPHA SPECTROSCOPY REPORT

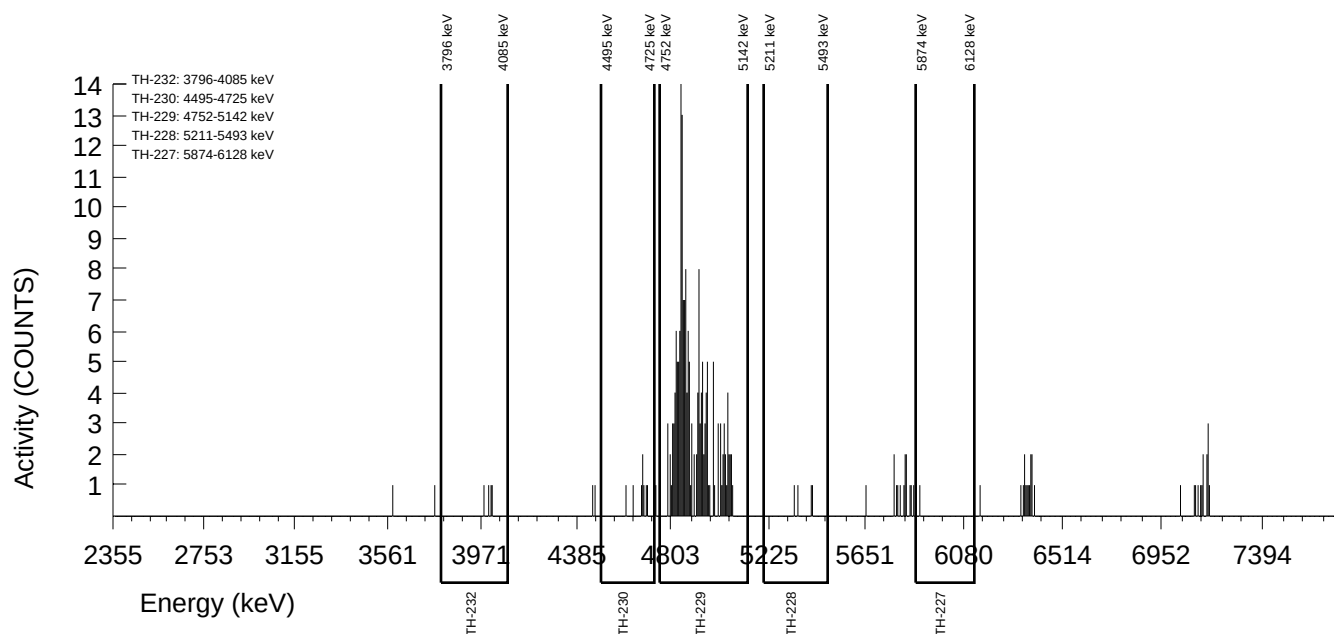
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2368294 SAMPLE ID : S0606488003_TH SAMPLE QTY : 0.108 F +/-0.925 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 58.4 +/-7.875 %	CHAMBER : 205 DETECTOR S/N : 140628 AVERAGE %EFFICIENCY : 26.7254 AVERAGE %EFF ERROR : 0.5188 COUNT DATE : 22-Jan-2023 18:50:53 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH BKG FILE : B205.CNF;1483 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W205.CNF;378 CAL DATE : 18-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8635E+00 dpm RESULTS : 2.8399E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5891.94	4.951	1.000	1.000	0.000	1.0000	57.440	5.44E-01	1.53E+00	1.63E+00	9.97E-01	1.53E+00
TH-228	5363.00	5384.02	79.208	4.000	3.511	0.480	0.6928	99.940	4.02E-01	5.14E-01	6.36E-01	1.46E-01	5.10E-01
TH-229	4900.00	4900.53	79.580	182.000	181.280	0.720	0.8485	99.520	2.03E+01	4.39E+00	6.83E-01	1.74E-01	2.96E+00
TH-230	4671.39	4667.28	9.901	8.000	6.429	0.480	0.6928	99.700	7.17E-01	6.76E-01	8.11E-01	2.38E-01	6.62E-01
TH-232	3972.00	4003.20	39.604	4.000	3.687	0.240	0.4899	100.000	4.10E-01	4.97E-01	5.56E-01	1.11E-01	4.93E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.009 +/-0.000)
TH-230 (1.091 +/-0.017)
TH-232 (0.073 +/-0.001)



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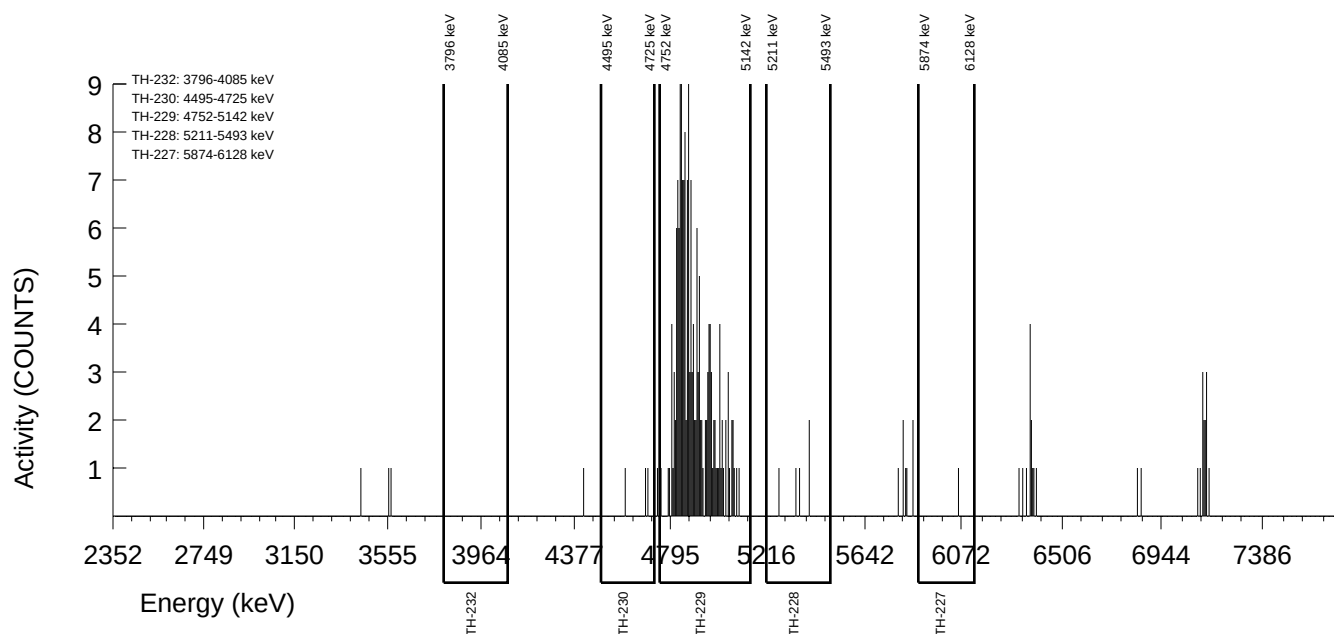
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2368294 SAMPLE ID : S0606488004_TH SAMPLE QTY : 0.112 F +/-0.894 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 56.7 +/-7.998 %	CHAMBER : 207 DETECTOR S/N : 158102 AVERAGE %EFFICIENCY : 26.6716 AVERAGE %EFF ERROR : 0.5178 COUNT DATE : 22-Jan-2023 18:50:55 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : TH BKG FILE : B207.CNF;1492 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W207.CNF;369 CAL DATE : 18-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8635E+00 dpm RESULTS : 2.7596E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	6055.55	4.934	1.000	1.000	0.000	1.0000	57.440	5.42E-01	1.53E+00	1.63E+00	9.93E-01	1.52E+00
TH-228	5363.00	5355.18	4.934	5.000	4.271	0.720	0.8485	99.940	4.87E-01	5.63E-01	6.98E-01	1.78E-01	5.58E-01
TH-229	4900.00	4897.66	96.410	177.000	175.800	1.200	1.0954	99.520	1.96E+01	4.31E+00	7.81E-01	2.23E-01	2.92E+00
TH-230	4671.39	4658.53	98.671	3.000	1.702	0.240	0.4899	99.700	1.89E-01	4.45E-01	7.59E-01	2.13E-01	4.42E-01
TH-232	3972.00	3940.43	0.000	0.000	-0.071	0.000	1.0000	100.000	-7.84E-03	2.24E-01	4.29E-01	2.09E-01	2.23E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.009 +/-0.000)
TH-230 (1.058 +/-0.016)
TH-232 (0.071 +/-0.001)



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Instrument SOP:
Analytical SOP: GL-RAD-A-038

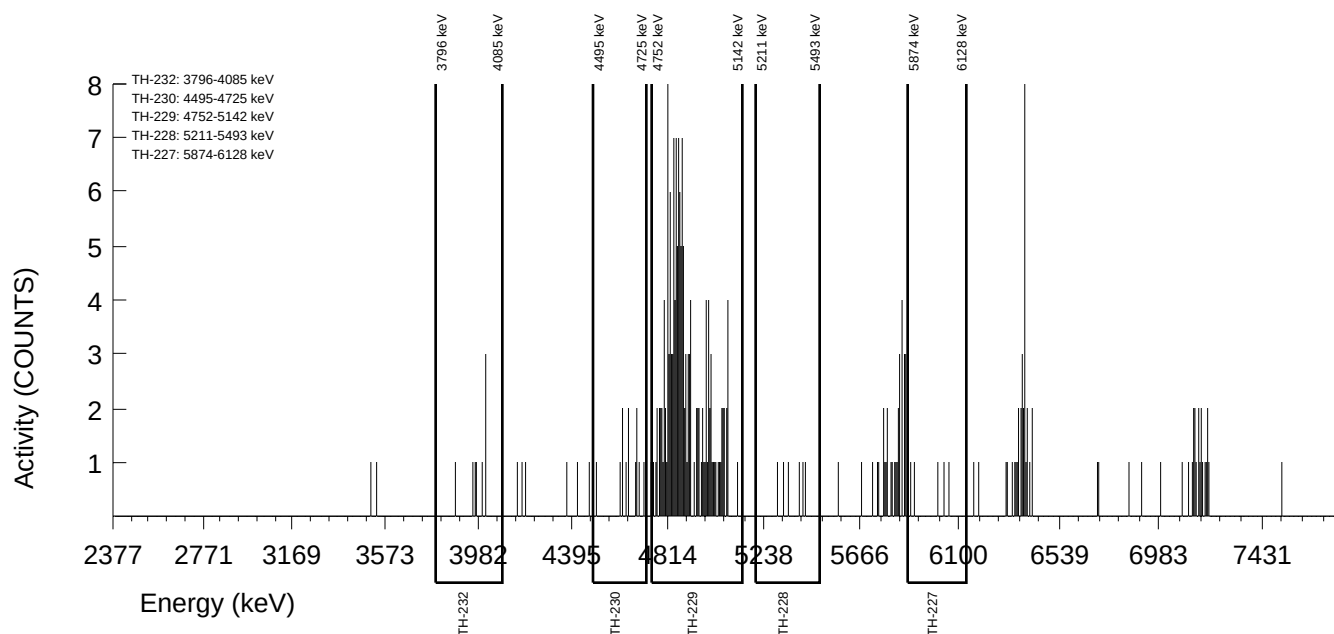
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TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8635E+00 dpm RESULTS : 2.3709E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5949.32	4.889	7.000	4.336	2.664	1.6322	57.440	2.76E+00	3.67E+00	5.63E+00	1.86E+00	3.64E+00
TH-228	5363.00	5369.35	117.327	6.000	3.899	2.093	1.4468	99.940	5.10E-01	7.04E-01	1.07E+00	3.40E-01	6.99E-01
TH-229	4900.00	4899.17	67.975	157.000	156.239	0.761	0.8725	99.520	1.99E+01	4.63E+00	7.83E-01	2.00E-01	3.15E+00
TH-230	4671.39	4644.16	63.552	12.000	10.299	0.761	0.8725	99.700	1.31E+00	9.39E-01	9.52E-01	2.85E-01	9.07E-01
TH-232	3972.00	3980.95	4.889	8.000	7.557	0.381	0.6169	100.000	9.60E-01	7.69E-01	6.81E-01	1.50E-01	7.51E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.008 +/-0.000)
TH-230 (0.940 +/-0.015)
TH-232 (0.063 +/-0.001)



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Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2368294 SAMPLE ID : S1205293630_TH SAMPLE QTY : 0.116 F +/-0.863 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 68.8 +/-7.292 %	CHAMBER : 027 DETECTOR S/N : 140238 AVERAGE %EFFICIENCY : 33.9490 AVERAGE %EFF ERROR : 0.6551 COUNT DATE : 23-Jan-2023 10:06:21 ELAPSED LIVE TIME(SEC) : 11420.92	LIB FILE : TH BKG FILE : B027.CNF;2533 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W027.CNF;743 CAL DATE : 07-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8634E+00 dpm RESULTS : 3.3439E+00 dpm		

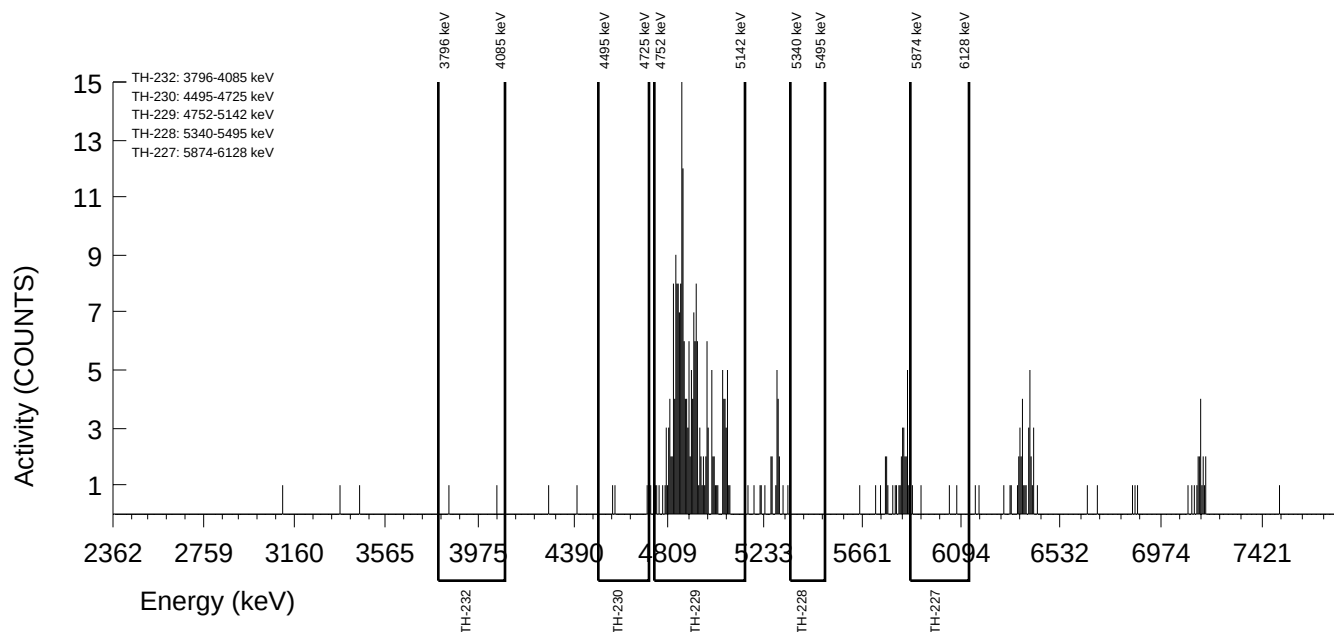
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5959.59	0.000	5.000	1.574	3.426	1.8510	57.440	2.73E-01	8.79E-01	1.67E+00	5.76E-01	8.78E-01
TH-228	5363.00	5417.12	0.000	0.000	-0.582	0.571	0.7557	99.940	-5.11E-02	1.85E-01	5.04E-01	1.20E-01	1.84E-01
TH-229	4900.00	4906.16	95.223	216.000	215.048	0.952	0.9756	99.520	1.89E+01	3.79E+00	5.71E-01	1.54E-01	2.54E+00
TH-230	4671.39	4643.49	0.000	4.000	2.135	0.571	0.7557	99.700	1.87E-01	3.93E-01	6.69E-01	2.03E-01	3.90E-01
TH-232	3972.00	3946.86	206.863	2.000	1.913	0.000	1.0000	100.000	1.67E-01	3.00E-01	3.47E-01	1.63E-01	2.99E-01

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.011 +/-0.000)
TH-230 (1.294 +/-0.020)
TH-232 (0.087 +/-0.001)

* Regions have been manually adjusted



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ALPHA SPECTROSCOPY REPORT

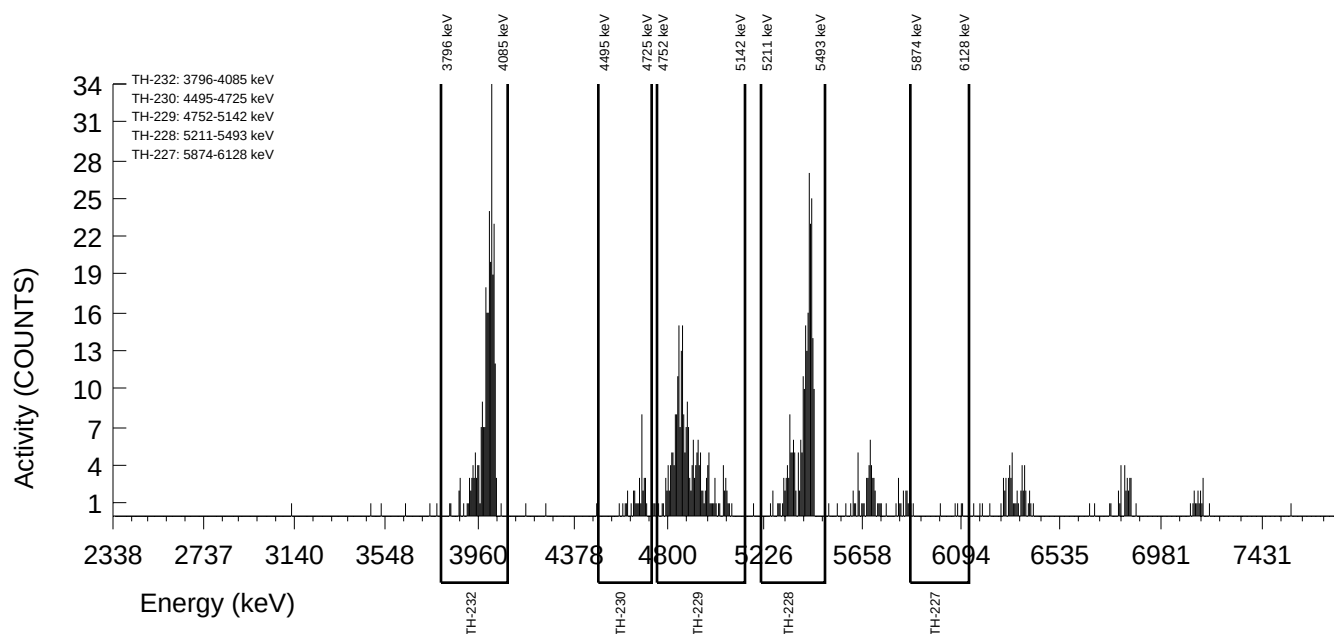
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2368294 SAMPLE ID : S1205293631_TH SAMPLE QTY : 0.116 F +/-0.863 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 78.1 +/-7.081 %	CHAMBER : 028 DETECTOR S/N : 78792 AVERAGE %EFFICIENCY : 32.0261 AVERAGE %EFF ERROR : 0.6188 COUNT DATE : 23-Jan-2023 10:06:21 ELAPSED LIVE TIME(SEC) : 11424.35	LIB FILE : TH BKG FILE : B028.CNF;2515 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W028.CNF;683 CAL DATE : 07-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8634E+00 dpm RESULTS : 3.7978E+00 dpm	LCS ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.7132E+01 % RECOVERY 122.487	

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
TH-227	5994.04	6018.25	0.000	7.000	4.144	2.856	1.6900	57.440	6.70E-01	9.33E-01	1.47E+00	4.90E-01	9.28E-01	9.28E-01
TH-228	5363.00	5400.99	31.802	235.000	233.846	1.142	1.0688	99.940	1.92E+01	3.71E+00	5.62E-01	1.58E-01	2.47E+00	2.47E+00
TH-229	4900.00	4889.31	53.828	232.000	230.477	1.523	1.2342	99.520	1.89E+01	3.68E+00	6.09E-01	1.82E-01	2.45E+00	2.45E+00
TH-230	4671.39	4665.18	6.128	35.000	33.233	0.381	0.6171	99.700	2.72E+00	1.05E+00	6.11E-01	1.83E-01	9.64E-01	9.64E-01
TH-232	3972.00	3995.06	37.798	258.000	257.146	0.762	0.8727	100.000	2.10E+01	3.98E+00	5.13E-01	1.34E-01	2.58E+00	2.58E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.012 +/-0.000)
TH-230 (1.387 +/-0.021)
TH-232 (0.093 +/-0.001)



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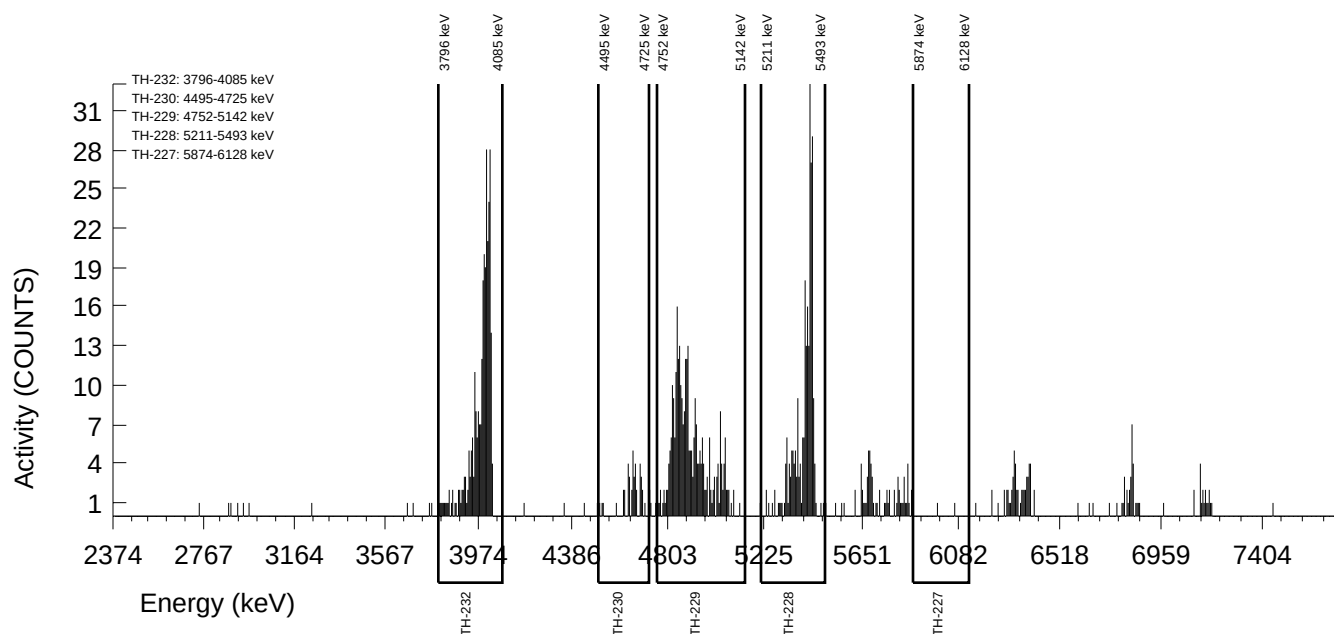
Instrument SOP:
Analytical SOP: GL-RAD-A-038

BATCH NUMBER : 2368294 SAMPLE ID : S1205293632_TH SAMPLE QTY : 0.116 F +/-0.863 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 94.5 +/-6.257 %	CHAMBER : 029 DETECTOR S/N : 125038 AVERAGE %EFFICIENCY : 35.1133 AVERAGE %EFF ERROR : 0.6771 COUNT DATE : 23-Jan-2023 10:06:21 ELAPSED LIVE TIME(SEC) : 11427.82	LIB FILE : TH BKG FILE : B029.CNF;2529 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W029.CNF;742 CAL DATE : 07-Jan-2023
TRACER ID : 1845-G NUCLIDE : TH-229 NOMINAL : 4.8634E+00 dpm RESULTS : 4.5954E+00 dpm	LCSD ID 1513-C NUCLIDE TH-232 NOMINAL (pCi/F) 1.7132E+01 % RECOVERY 104.134	

NUCLIDE ACTIVITY SUMMARY										1.96-sigma			
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
TH-227	5994.04	5946.89	0.000	4.000	-1.714	5.714	2.3904	57.440	-2.09E-01	5.91E-01	1.41E+00	5.23E-01	5.91E-01
TH-228	5363.00	5400.66	32.954	246.000	245.222	0.762	0.8728	99.940	1.51E+01	2.73E+00	3.80E-01	9.76E-02	1.90E+00
TH-229	4900.00	4902.98	97.641	307.000	305.857	1.143	1.0690	99.520	1.89E+01	3.24E+00	4.22E-01	1.19E-01	2.13E+00
TH-230	4671.39	4645.54	57.975	45.000	43.160	0.000	1.0000	99.700	2.66E+00	8.95E-01	4.60E-01	1.77E-01	8.20E-01
TH-232	3972.00	3984.07	37.429	291.000	290.115	0.762	0.8728	100.000	1.78E+01	3.10E+00	3.90E-01	1.03E-01	2.06E+00

NOTES:

* Corrections made to the following net areas due to tracer impurity:
TH-228 (0.016 +/-0.000)
TH-230 (1.840 +/-0.029)
TH-232 (0.123 +/-0.002)



Batch 2368291 Check-list

This check-list was completed on 25-JAN-23 by Jessica Downey

This batch was reviewed by Jessica Downey on 24-JAN-23, Jessica Davis on 24-JAN-23 and Jessica Downey on 25-JAN-23.

Batch ID:
2368291

Product:
ASP_PUF

Description: Alpha Spec Plutonium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?	Yes		
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium

Batch ID: 2368291

Analyst: Evan Johnson (EJ1)

Method: DOE EML HASL-300, Pu-11-RC
Modified

Lab SOP: GL-RAD-A-011 REV# 28

Instrument: BAL-C236871727

Due Dates for Lab: 23-JAN-2023

Package: 24-JAN-2023

SDG: 24-JAN-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205293622	Plutonium-239 AS SPIKE	1472-C	.1	mL
LCSD	1205293623	Plutonium-239 AS SPIKE	1472-C	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	606487001	20-JAN-2023	1	30.3	0.11337
2	606487002	20-JAN-2023	1	30.45	0.11253
3	606487003	20-JAN-2023	1	30.13	0.11299
4	606488001	20-JAN-2023	1	30.35	0.11607
5	606488002	20-JAN-2023	1	30.3	0.1132
6	606488003	20-JAN-2023	1	30.15	0.10826
7	606488004	20-JAN-2023	1	30.41	0.11234
8	606488005	20-JAN-2023	1	30.03	0.1091
9	1205293621 MB	20-JAN-2023	1		0.11607
10	1205293622 LCS	20-JAN-2023	1		0.11607
11	1205293623 LCSD	20-JAN-2023	1		0.11607

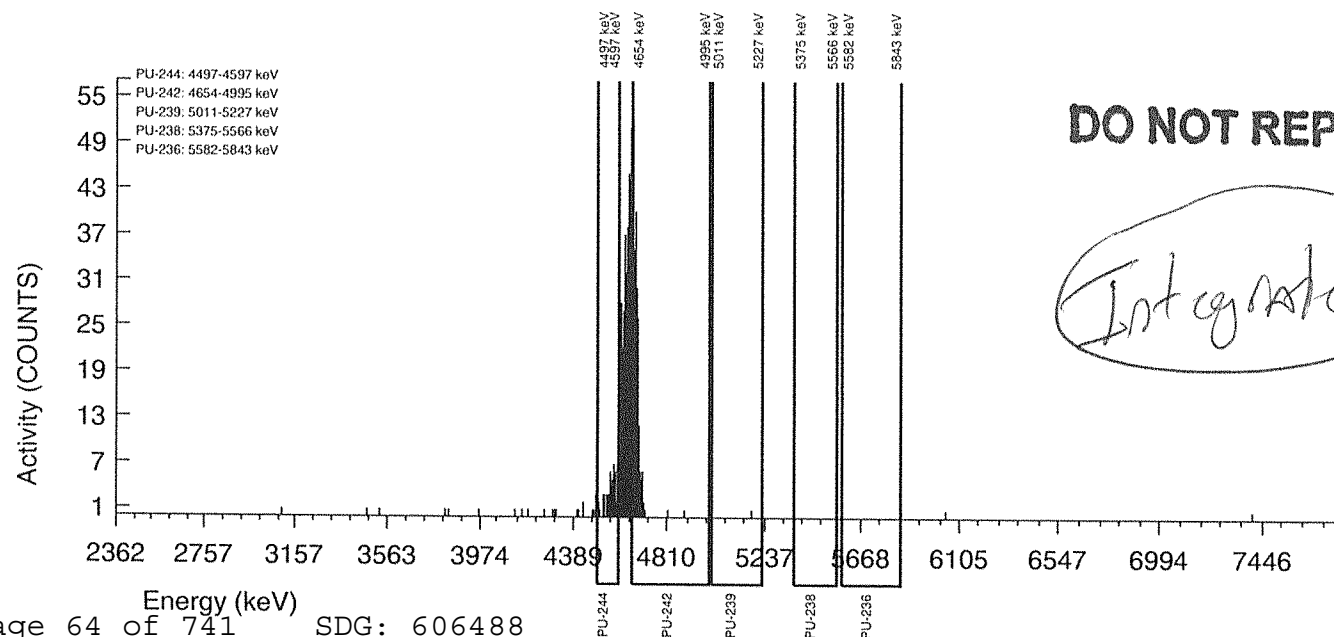
Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2044-A	Plutonium-242 AS TRACER	.2 ml	Pipet ID: RAD-ASP-184002Z Analyzed With: Am , U Data Entry Date2: 20-JAN-2023 00:00

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Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S0606488003_PU SAMPLE QTY : 0.108 F +/-0.924 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 38.0 +/-6.363 %	CHAMBER : 070 DETECTOR S/N : 158092 AVERAGE %EFFICIENCY : 35.7535 AVERAGE %EFF ERROR : 0.6891 COUNT DATE : 23-Jan-2023 11:36:38 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B070.CNF;2510 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W070.CNF;699 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 3.1932E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.22	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	2.62E-01	3.90E-01	2.38E-01	2.62E-01
PU-238	5486.00	5470.33	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00	2.58E-01	3.83E-01	2.34E-01	2.57E-01
PU-239	5155.00	5183.17	4.907	1.000	1.000	0.000	1.0000	99.900	1.28E-01	3.59E-01	3.83E-01	2.34E-01	3.59E-01
PU-242	4870.00	4667.46	0.000	274.000	274.000	0.000	1.0000	100.000	3.49E+01	6.19E+00	3.82E-01	2.34E-01	4.14E+00
PU-244	4589.00	4573.54	0.000	86.000	86.000	0.000	1.0000	99.900	1.10E+01	2.74E+00	3.83E-01	2.34E-01	2.33E+00



DO NOT REPORT

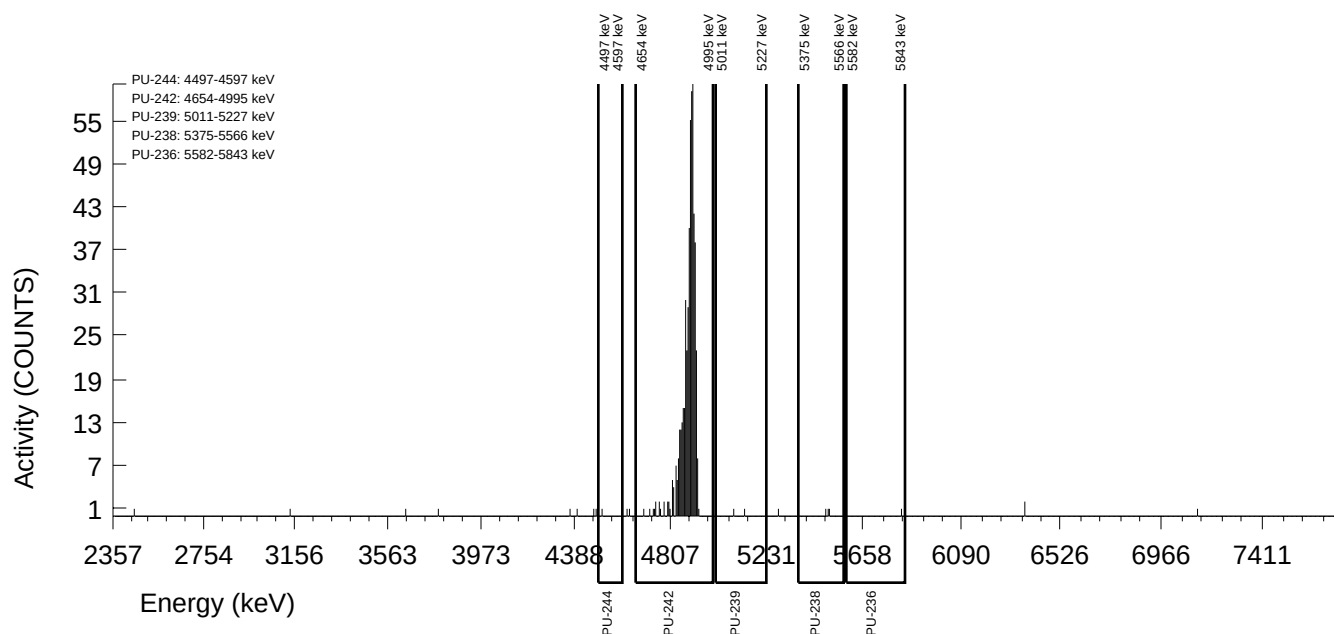
Integrated

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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S0606488001_PU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 83.4 +/-4.820 %	CHAMBER : 068 DETECTOR S/N : 149010 AVERAGE %EFFICIENCY : 30.8893 AVERAGE %EFF ERROR : 0.5974 COUNT DATE : 23-Jan-2023 11:36:38 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B068.CNF;2500 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W068.CNF;644 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 7.0013E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5824.98	4.945	1.000	0.040	0.960	0.9798	100.000	2.56E-03	1.90E-01	4.22E-01	1.15E-01	1.90E-01
PU-238	5486.00	5500.87	19.782	3.000	2.280	0.720	0.8485	99.900	1.43E-01	2.54E-01	3.84E-01	9.77E-02	2.53E-01
PU-239	5155.00	5111.06	49.454	2.000	-0.400	2.400	1.5492	99.900	-2.51E-02	2.35E-01	5.45E-01	1.78E-01	2.35E-01
PU-242	4870.00	4887.95	31.860	520.000	519.040	0.960	0.9798	100.000	3.26E+01	4.38E+00	4.14E-01	1.13E-01	2.81E+00
PU-244	4589.00	4508.18	4.945	1.000	1.000	0.000	1.0000	99.900	6.28E-02	1.77E-01	1.89E-01	1.15E-01	1.77E-01

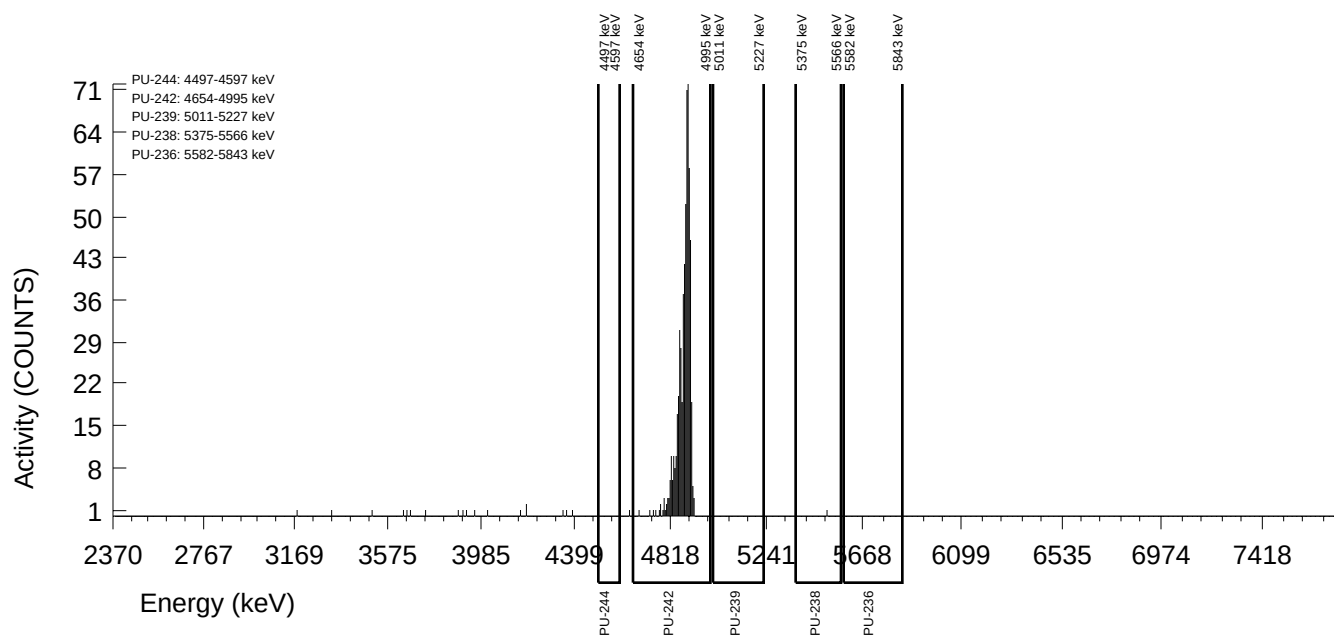


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Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S0606488002_PU SAMPLE QTY : 0.113 F +/-0.883 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 86.1 +/-4.569 %	CHAMBER : 069 DETECTOR S/N : 140586 AVERAGE %EFFICIENCY : 33.9975 AVERAGE %EFF ERROR : 0.6560 COUNT DATE : 23-Jan-2023 11:36:38 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B069.CNF;2516 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W069.CNF;681 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 7.2250E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.26	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.17E-01	1.73E-01	1.06E-01	1.16E-01
PU-238	5486.00	5507.06	4.940	1.000	-0.200	1.200	1.0954	99.900	-1.14E-02	1.70E-01	3.98E-01	1.14E-01	1.70E-01
PU-239	5155.00	5118.69	0.000	0.000	-0.480	0.480	0.6928	99.900	-2.72E-02	1.21E-01	3.14E-01	7.20E-02	1.20E-01
PU-242	4870.00	4878.44	31.747	590.000	589.520	0.480	0.6928	100.000	3.34E+01	4.26E+00	3.14E-01	7.19E-02	2.70E+00
PU-244	4589.00	4546.97	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00	1.14E-01	1.70E-01	1.04E-01	1.14E-01



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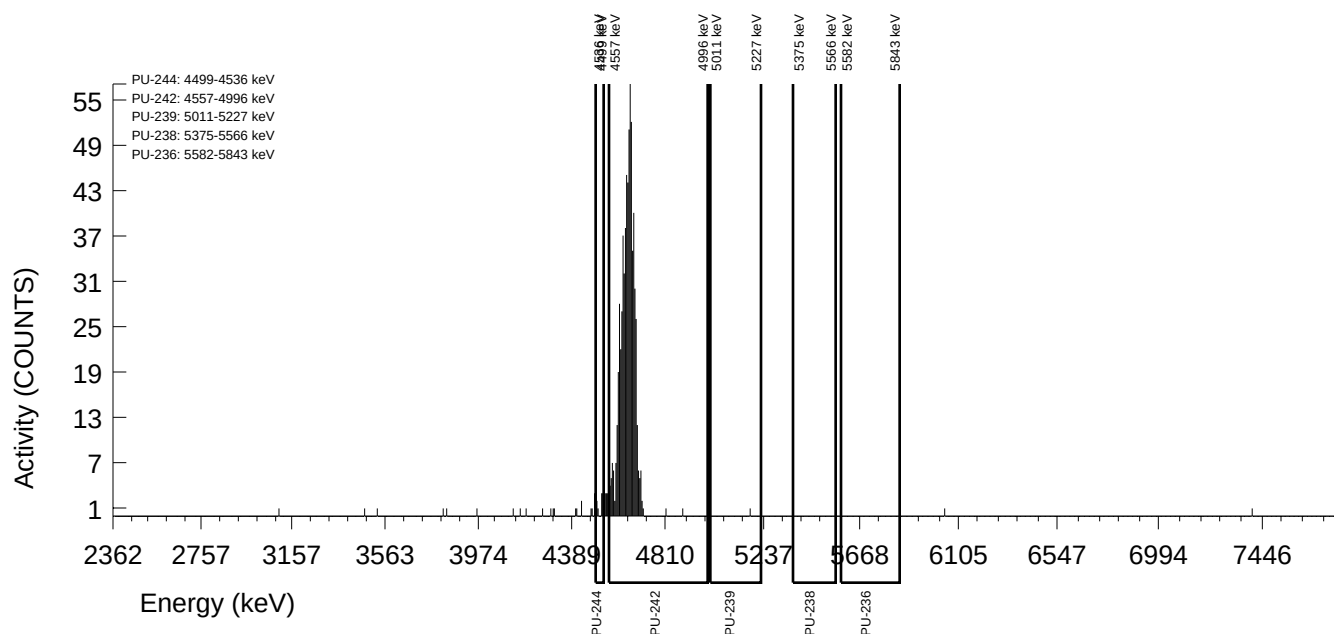
Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S0606488003_PU SAMPLE QTY : 0.108 F +/-0.924 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 92.4 +/-4.347 %	CHAMBER : 070 DETECTOR S/N : 158092 AVERAGE %EFFICIENCY : 35.7535 AVERAGE %EFF ERROR : 0.6891 COUNT DATE : 23-Jan-2023 11:36:38 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B070.CNF;2510 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W070.CNF;699 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 7.7615E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.22	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.08E-01	1.60E-01	9.79E-02	1.08E-01
PU-238	5486.00	5470.33	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00	1.06E-01	1.58E-01	9.62E-02	1.06E-01
PU-239	5155.00	5183.17	4.907	1.000	1.000	0.000	1.0000	99.900	5.25E-02	1.48E-01	1.58E-01	9.62E-02	1.48E-01
PU-242	4870.00	4640.12	55.076	666.000	666.000	0.000	1.0000	100.000	3.49E+01	4.25E+00	1.57E-01	9.61E-02	2.66E+00
PU-244	4589.00	4521.02	28.213	9.000	9.000	0.000	1.0000	99.900	4.73E-01	3.29E-01	1.58E-01	9.62E-02	3.26E-01

NOTES:

* Regions have been manually adjusted

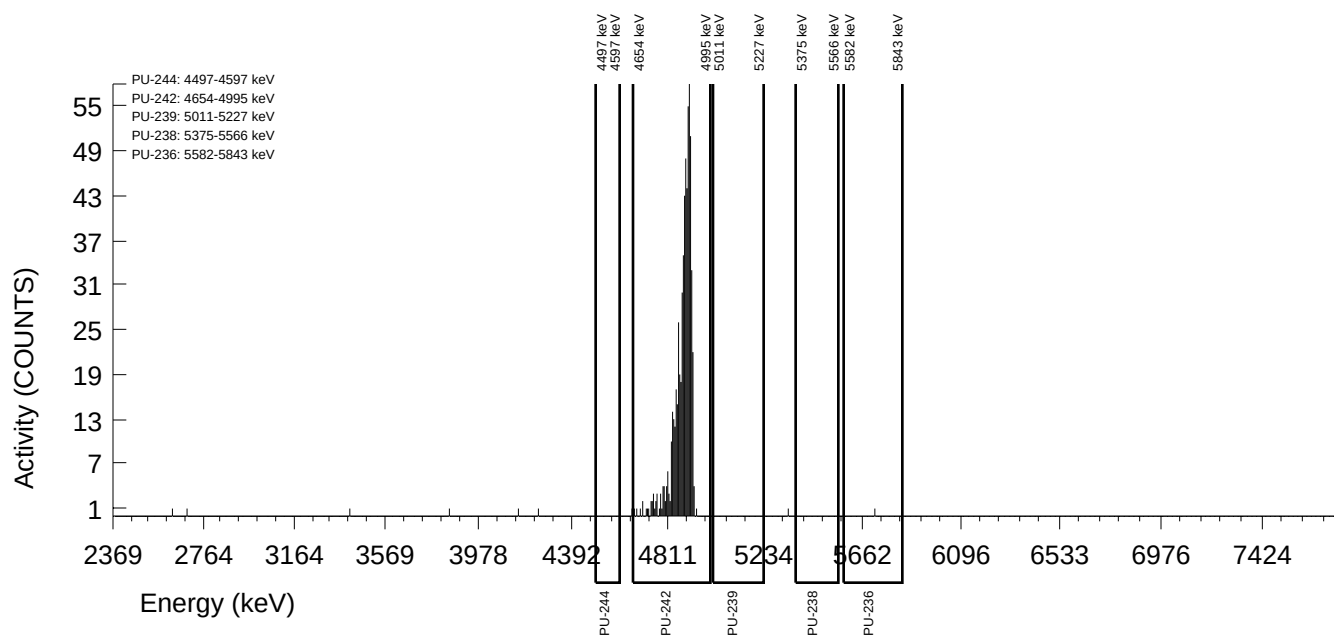


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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S0606488004_PU SAMPLE QTY : 0.112 F +/-0.890 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 92.5 +/-4.489 %	CHAMBER : 071 DETECTOR S/N : 80020 AVERAGE %EFFICIENCY : 33.1415 AVERAGE %EFF ERROR : 0.6399 COUNT DATE : 23-Jan-2023 11:36:39 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B071.CNF;2487 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W071.CNF;629 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 7.7677E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5721.73	4.906	1.000	0.280	0.720	0.8485	100.000	1.55E-02	1.63E-01	3.39E-01	8.63E-02	1.63E-01
PU-238	5486.00	5470.33	0.000	0.000	-1.200	1.200	1.0954	99.900	-6.55E-02	1.24E-01	3.83E-01	1.10E-01	1.24E-01
PU-239	5155.00	5011.15	0.000	1.000	-0.680	1.680	1.2961	99.900	-3.71E-02	1.68E-01	4.23E-01	1.30E-01	1.68E-01
PU-242	4870.00	4875.99	41.439	620.000	617.840	2.160	1.4697	100.000	3.37E+01	4.22E+00	4.57E-01	1.47E-01	2.66E+00
PU-244	4589.00	4546.97	0.000	0.000	-0.240	0.240	0.4899	99.900	-1.31E-02	1.13E-01	2.62E-01	4.89E-02	1.13E-01

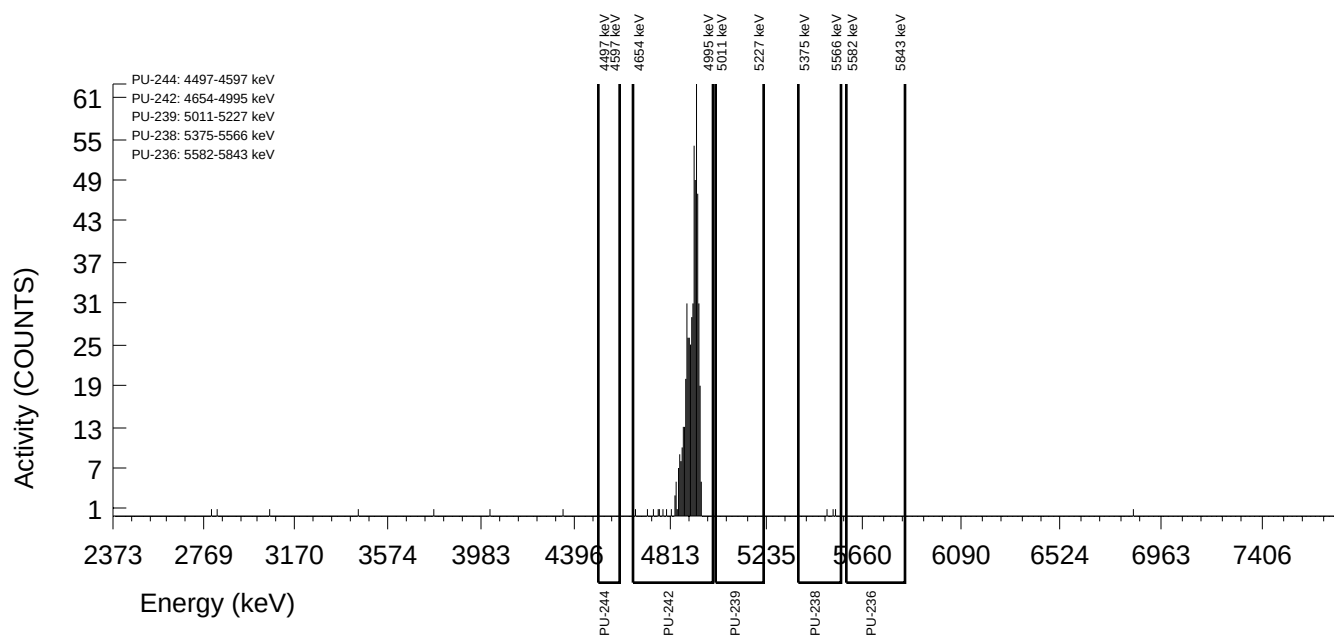


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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S0606488005_PU SAMPLE QTY : 0.109 F +/-0.917 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 83.6 +/-4.770 %	CHAMBER : 072 DETECTOR S/N : 155835 AVERAGE %EFFICIENCY : 31.5810 AVERAGE %EFF ERROR : 0.6104 COUNT DATE : 23-Jan-2023 11:36:39 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B072.CNF;2501 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W072.CNF;664 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 7.0195E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.26	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.59E-02	1.38E-01	3.18E-01	5.96E-02	1.37E-01
PU-238	5486.00	5521.46	39.382	3.000	2.040	0.960	0.9798	99.900	1.33E-01	2.65E-01	4.30E-01	1.17E-01	2.65E-01
PU-239	5155.00	5118.69	0.000	0.000	-1.200	1.200	1.0954	99.900	-7.83E-02	1.48E-01	4.57E-01	1.31E-01	1.48E-01
PU-242	4870.00	4906.72	24.353	533.000	532.040	0.960	0.9798	100.000	3.47E+01	4.62E+00	4.29E-01	1.17E-01	2.95E+00
PU-244	4589.00	4546.97	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00	1.32E-01	1.96E-01	1.19E-01	1.31E-01

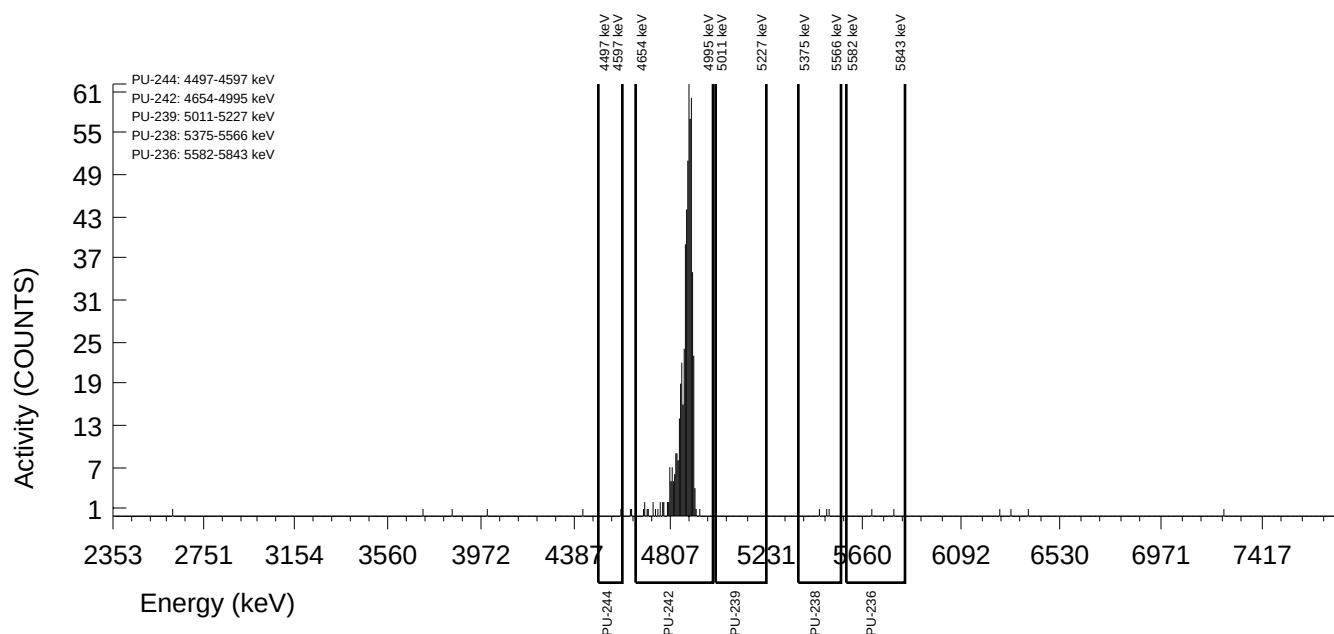


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ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S1205293621_PU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 83.7 +/-4.724 %	CHAMBER : 074 DETECTOR S/N : 149001 AVERAGE %EFFICIENCY : 32.3334 AVERAGE %EFF ERROR : 0.6246 COUNT DATE : 23-Jan-2023 11:36:39 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B074.CNF;2521 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W074.CNF;697 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 7.0273E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5745.88	94.065	2.000	0.800	1.200	1.0954	100.000	4.79E-02	2.15E-01	4.20E-01	1.20E-01	2.15E-01
PU-238	5486.00	5491.34	44.557	3.000	1.560	1.440	1.2000	99.900	9.33E-02	2.46E-01	4.42E-01	1.31E-01	2.46E-01
PU-239	5155.00	5118.69	0.000	0.000	-0.960	0.960	0.9798	99.900	-5.74E-02	1.33E-01	3.94E-01	1.07E-01	1.33E-01
PU-242	4870.00	4876.25	33.995	547.000	545.320	1.680	1.2961	100.000	3.26E+01	4.30E+00	4.63E-01	1.42E-01	2.74E+00
PU-244	4589.00	4591.34	4.951	1.000	1.000	0.000	1.0000	99.900	5.98E-02	1.68E-01	1.79E-01	1.10E-01	1.68E-01

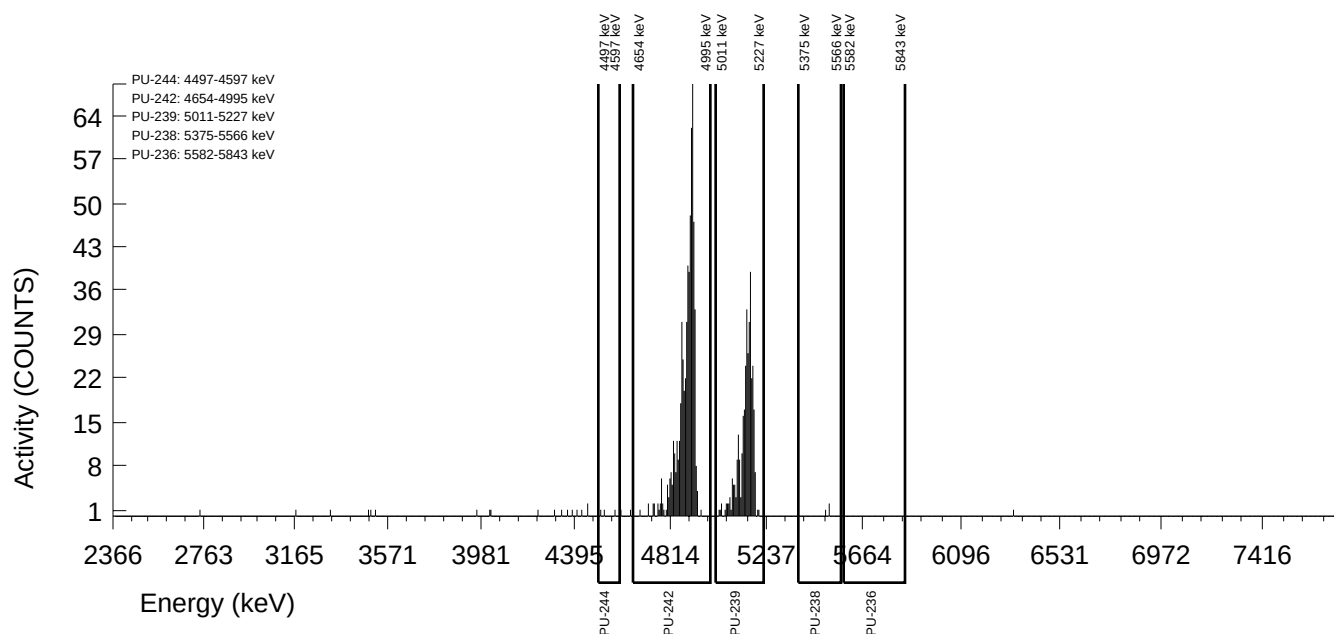


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S1205293622_PU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 96.3 +/-4.523 %	CHAMBER : 075 DETECTOR S/N : 80010 AVERAGE %EFFICIENCY : 31.2381 AVERAGE %EFF ERROR : 0.6039 COUNT DATE : 23-Jan-2023 11:36:39 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PU BKG FILE : B075.CNF;2494 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W075.CNF;664 CAL DATE : 10-Jan-2023
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 8.0874E+00 dpm	LCS ID 1472-C NUCLIDE PU-239 NOMINAL (pCi/F) 1.7734E+01 % RECOVERY 101.782	

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.25	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.29E-02	1.12E-01	2.58E-01	4.83E-02	1.11E-01
PU-238	5486.00	5508.54	4.937	3.000	2.760	0.240	0.4899	99.900	1.48E-01	2.14E-01	2.58E-01	4.83E-02	2.14E-01
PU-239	5155.00	5147.27	35.969	337.000	335.560	1.440	1.2000	99.900	1.81E+01	2.62E+00	3.98E-01	1.18E-01	1.94E+00
PU-242	4870.00	4884.87	32.109	608.000	606.320	1.680	1.2961	100.000	3.26E+01	4.11E+00	4.16E-01	1.28E-01	2.60E+00
PU-244	4589.00	4551.46	0.000	4.000	4.000	0.000	1.0000	99.900	2.15E-01	2.38E-01	1.61E-01	9.85E-02	2.37E-01

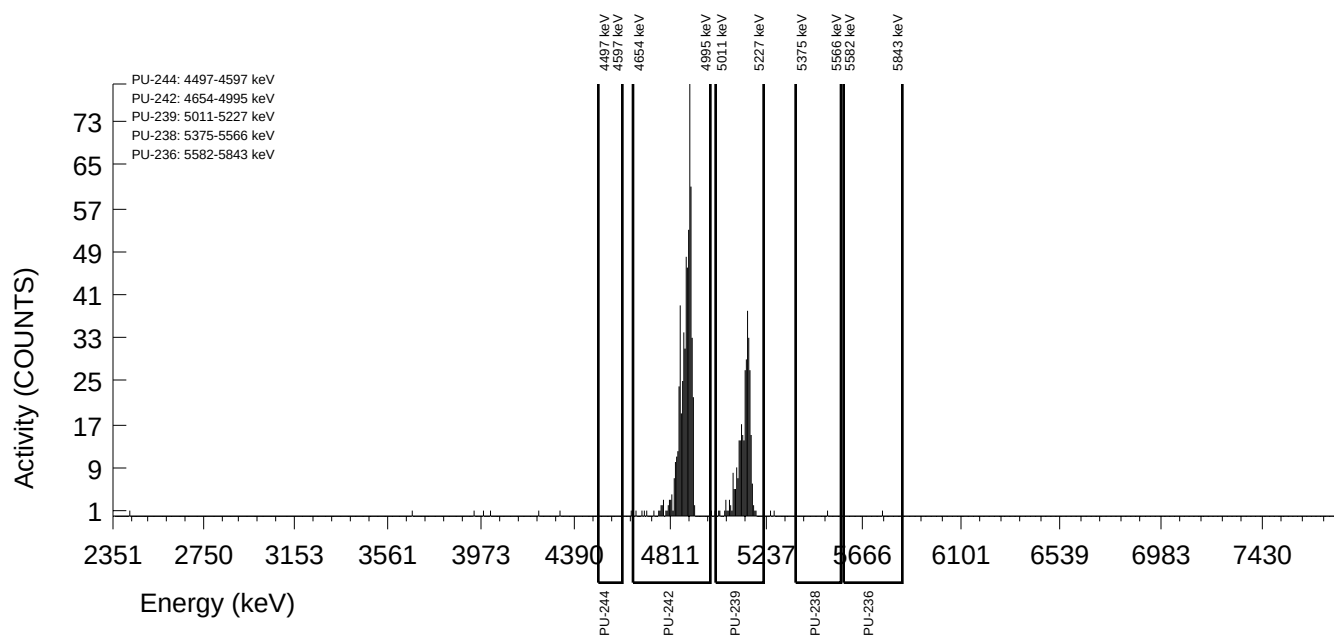


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368291 SAMPLE ID : S1205293623_PU SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 88.2 +/-4.587 %			CHAMBER : 076 DETECTOR S/N : 158161 AVERAGE %EFFICIENCY : 32.9212 AVERAGE %EFF ERROR : 0.6357 COUNT DATE : 23-Jan-2023 11:36:39 ELAPSED LIVE TIME(SEC) : 14400.00			LIB FILE : PU BKG FILE : B076.CNF;2513 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W076.CNF;639 CAL DATE : 10-Jan-2023		
TRACER ID : 2044-A NUCLIDE : PU-242 NOMINAL : 8.3959E+00 dpm RESULTS : 7.4081E+00 dpm			LCSD ID 1472-C NUCLIDE PU-239 NOMINAL (pCi/F) 1.7734E+01 % RECOVERY 94.663					

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5752.98	4.960	1.000	0.760	0.240	0.4899	100.000	4.24E-02	1.59E-01	2.68E-01	5.01E-02	1.59E-01
PU-238	5486.00	5510.13	4.960	1.000	0.760	0.240	0.4899	99.900	4.24E-02	1.59E-01	2.67E-01	5.00E-02	1.59E-01
PU-239	5155.00	5140.98	26.198	302.000	301.280	0.720	0.8485	99.900	1.68E+01	2.53E+00	3.40E-01	8.66E-02	1.90E+00
PU-242	4870.00	4880.61	25.893	587.000	585.320	1.680	1.2961	100.000	3.26E+01	4.17E+00	4.31E-01	1.32E-01	2.65E+00
PU-244	4589.00	4546.97	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00	1.12E-01	1.67E-01	1.02E-01	1.12E-01



Batch 2368289 Check-list

This check-list was completed on 24-JAN-23 by Melanie Aycock

This batch was reviewed by Jessica Davis on 24-JAN-23 and Melanie Aycock on 24-JAN-23.

Batch ID:
2368289

Product:
ASPAMCMF

Description: Alpha Spec Am241Curium
GL-RAD-A-011

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?		No	
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Americium/Curium

Batch ID: 2368289
Analyst: Evan Johnson (EJ1)
Method: DOE EML HASL-300, Am-05-RC Modified
Lab SOP: GL-RAD-A-011 REV# 28
Instrument: BAL-C236871727

Due Dates for Lab: 23-JAN-2023			Package: 24-JAN-2023	SDG: 24-JAN-2023		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205293607	Americium-241 SPIKE		0533-JJ	.1	mL
LCSD	1205293608	Americium-241 SPIKE		0533-JJ	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	606487001	20-JAN-2023	1	30.3	0.11337
2	606487002	20-JAN-2023	1	30.45	0.11253
3	606487003	20-JAN-2023	1	30.13	0.11299
4	606488001	20-JAN-2023	1	30.35	0.11607
5	606488002	20-JAN-2023	1	30.3	0.1132
6	606488003	20-JAN-2023	1	30.15	0.10826
7	606488004	20-JAN-2023	1	30.41	0.11234
8	606488005	20-JAN-2023	1	30.03	0.1091
9	1205293606 MB	20-JAN-2023	1		0.11607
10	1205293607 LCS	20-JAN-2023	1		0.11607
11	1205293608 LCSD	20-JAN-2023	1		0.11607

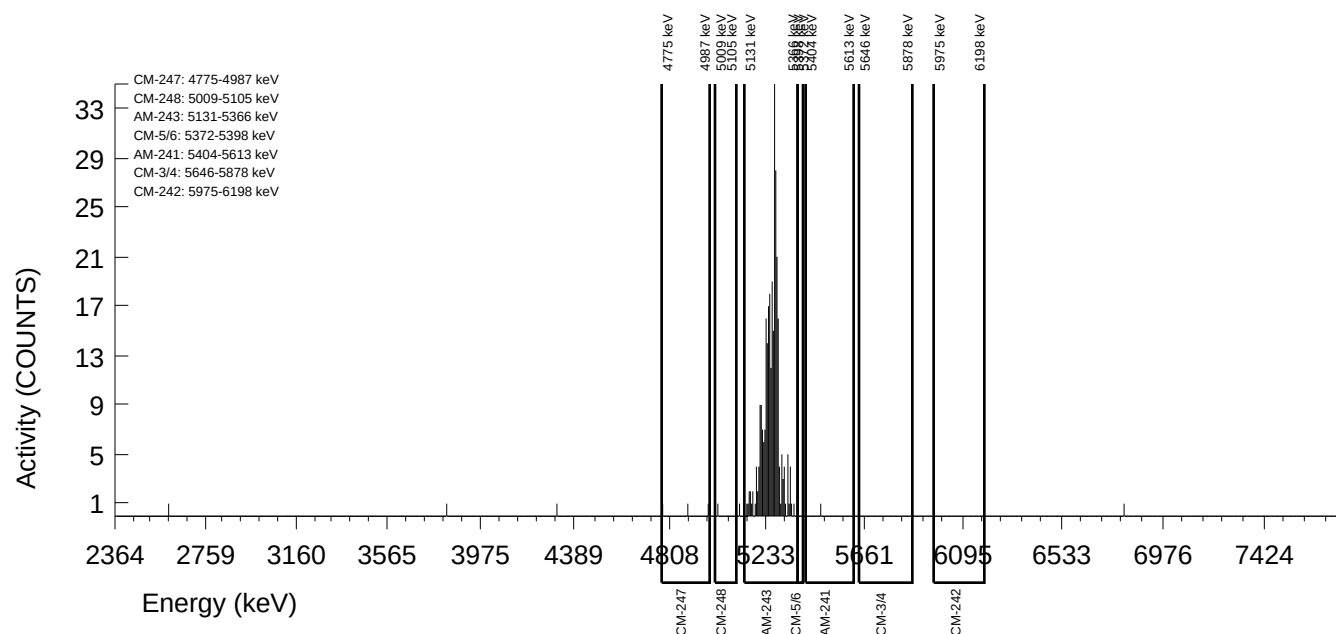
Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1752-J	Americium-243 AS TRACER	.1 ml	Pipet ID: R2-428724 Analyzed With: Pu , U Data Entry Date2: 20-JAN-2023 00:00

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368289 SAMPLE ID : S0606488001_AM SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 79.2 +/-6.401 %	CHAMBER : 082 DETECTOR S/N : 149008 AVERAGE %EFFICIENCY : 33.7719 AVERAGE %EFF ERROR : 0.6517 COUNT DATE : 23-Jan-2023 11:36:40 ELAPSED LIVE TIME(SEC) : 14399.99	LIB FILE : AM BKG FILE : B082.CNF;2428 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 59999.99 EFF FILE : W082.CNF;625 CAL DATE : 10-Jan-2023
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6467E+00 dpm RESULTS : 3.6808E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5473.22	4.915	1.000	1.000	0.000	1.0000	98.525	6.14E-02	1.73E-01	1.84E-01	1.12E-01	1.72E-01
AM-243	5269.50	5255.88	35.387	299.000	298.280	0.720	0.8485	99.980	1.80E+01	3.15E+00	3.69E-01	9.40E-02	2.05E+00
CM-242	6102.00	6086.56	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.38E-01	2.05E-01	1.25E-01	1.38E-01
CM-3/4	5795.02	5761.58	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.45E-02	1.26E-01	2.91E-01	5.44E-02	1.25E-01
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	1.42E-01	2.11E-01	1.29E-01	1.42E-01
CM-247	4946.00	4880.61	0.000	3.000	2.040	0.960	0.9798	79.300	1.55E-01	3.10E-01	5.02E-01	1.37E-01	3.09E-01
CM-248	5078.60	5019.95	4.915	1.000	0.760	0.240	0.4899	91.000	5.05E-02	1.90E-01	3.18E-01	5.96E-02	1.89E-01

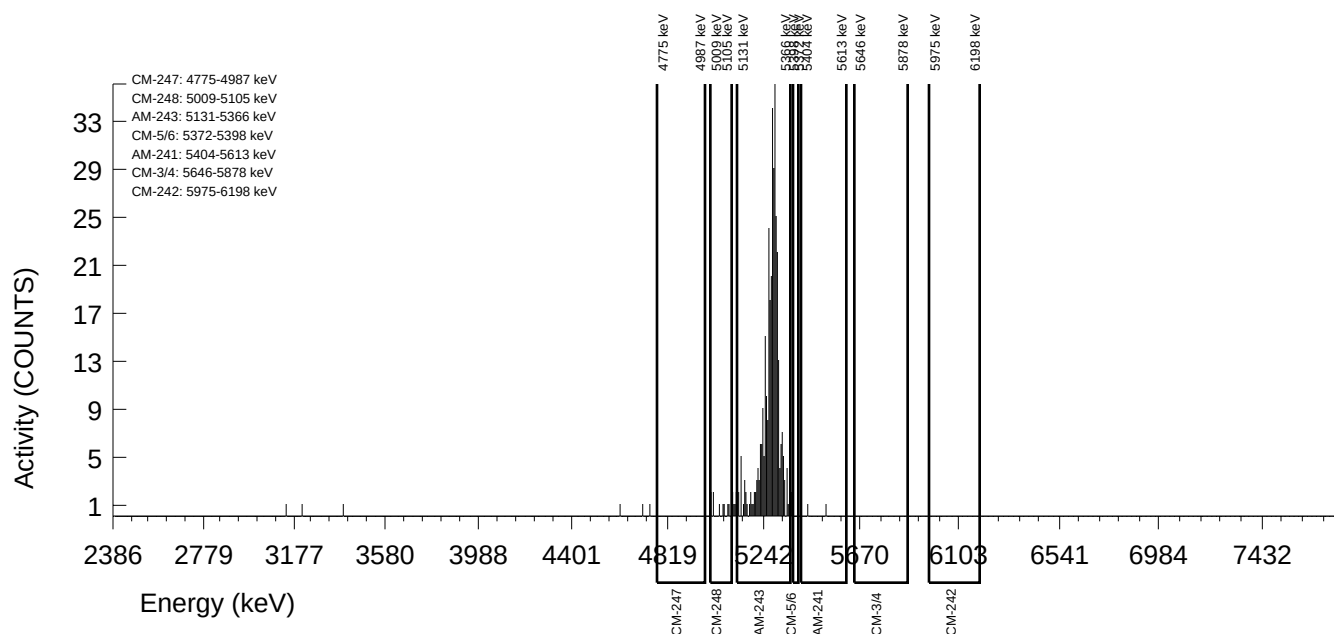


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368289 SAMPLE ID : S0606488002_AM SAMPLE QTY : 0.113 F +/-0.883 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 83.9 +/-6.011 %	CHAMBER : 083 DETECTOR S/N : 78785 AVERAGE %EFFICIENCY : 37.1943 AVERAGE %EFF ERROR : 0.7163 COUNT DATE : 23-Jan-2023 11:36:41 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B083.CNF;2416 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W083.CNF;647 CAL DATE : 10-Jan-2023
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6467E+00 dpm RESULTS : 3.8997E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5479.08	78.057	2.000	1.280	0.720	0.8485	98.525	6.90E-02	1.90E-01	3.29E-01	8.38E-02	1.90E-01
AM-243	5269.50	5276.57	38.147	349.000	348.040	0.960	0.9798	99.980	1.85E+01	3.02E+00	3.50E-01	9.54E-02	1.95E+00
CM-242	6102.00	6086.55	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.44E-02	1.24E-01	2.88E-01	5.38E-02	1.24E-01
CM-3/4	5795.02	5761.57	0.000	0.000	-0.720	0.720	0.8485	100.000	-3.84E-02	1.16E-01	3.25E-01	8.28E-02	1.16E-01
CM-5/6	5386.00	5369.50	0.000	2.000	2.000	0.000	1.0000	86.090	1.23E-01	2.12E-01	1.85E-01	1.13E-01	2.11E-01
CM-247	4946.00	4881.16	0.000	0.000	-0.960	0.960	0.9798	79.300	-6.43E-02	1.49E-01	4.41E-01	1.20E-01	1.49E-01
CM-248	5078.60	5054.92	14.636	10.000	10.000	0.000	1.0000	91.000	5.84E-01	3.87E-01	1.75E-01	1.07E-01	3.80E-01

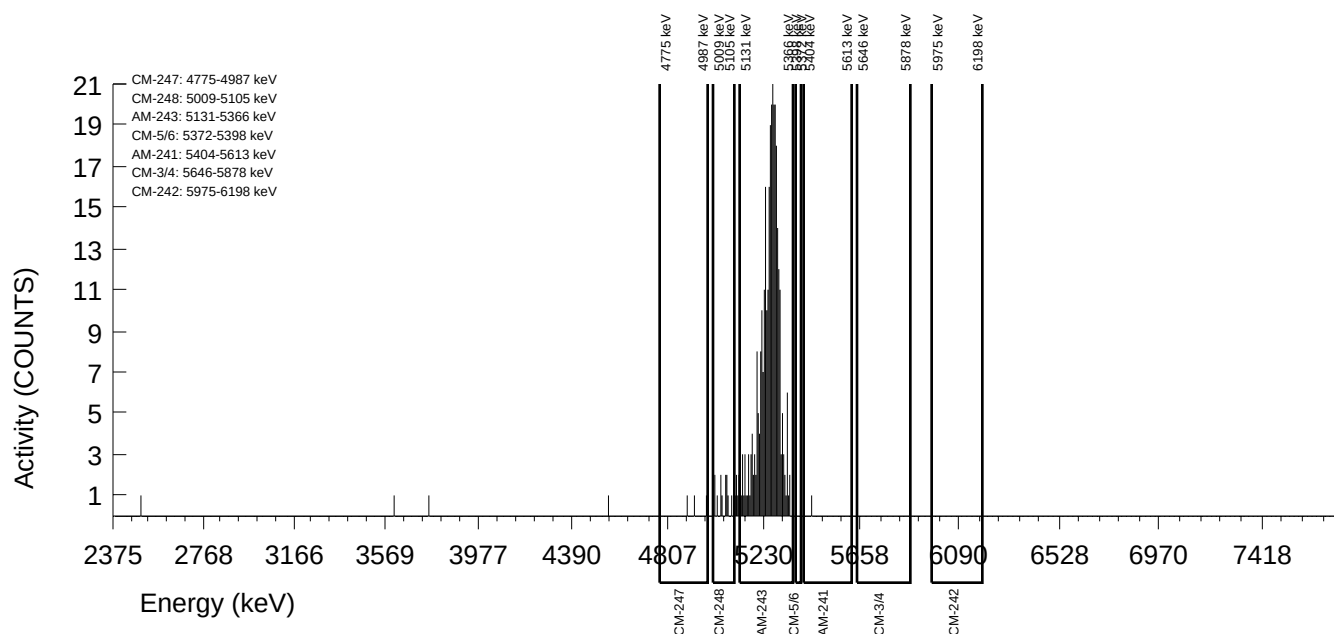


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368289 SAMPLE ID : S0606488003_AM SAMPLE QTY : 0.108 F +/-0.924 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 78.7 +/-6.294 %	CHAMBER : 084 DETECTOR S/N : 78265 AVERAGE %EFFICIENCY : 35.5000 AVERAGE %EFF ERROR : 0.6844 COUNT DATE : 23-Jan-2023 11:36:41 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B084.CNF;2406 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W084.CNF;657 CAL DATE : 10-Jan-2023
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6467E+00 dpm RESULTS : 3.6576E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5443.36	4.880	1.000	0.520	0.480	0.6928	98.525	3.28E-02	1.82E-01	3.49E-01	7.99E-02	1.82E-01
AM-243	5269.50	5258.27	64.355	313.000	311.560	1.440	1.2000	99.980	1.93E+01	3.32E+00	4.59E-01	1.36E-01	2.16E+00
CM-242	6102.00	6086.55	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.42E-01	2.10E-01	1.28E-01	1.41E-01
CM-3/4	5795.02	5761.58	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.49E-02	1.29E-01	2.98E-01	5.58E-02	1.29E-01
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	1.46E-01	2.16E-01	1.32E-01	1.45E-01
CM-247	4946.00	4935.52	82.960	3.000	2.280	0.720	0.8485	79.300	1.78E-01	3.16E-01	4.78E-01	1.22E-01	3.15E-01
CM-248	5078.60	5057.64	56.120	13.000	13.000	0.000	1.0000	91.000	8.86E-01	5.14E-01	2.05E-01	1.25E-01	5.01E-01

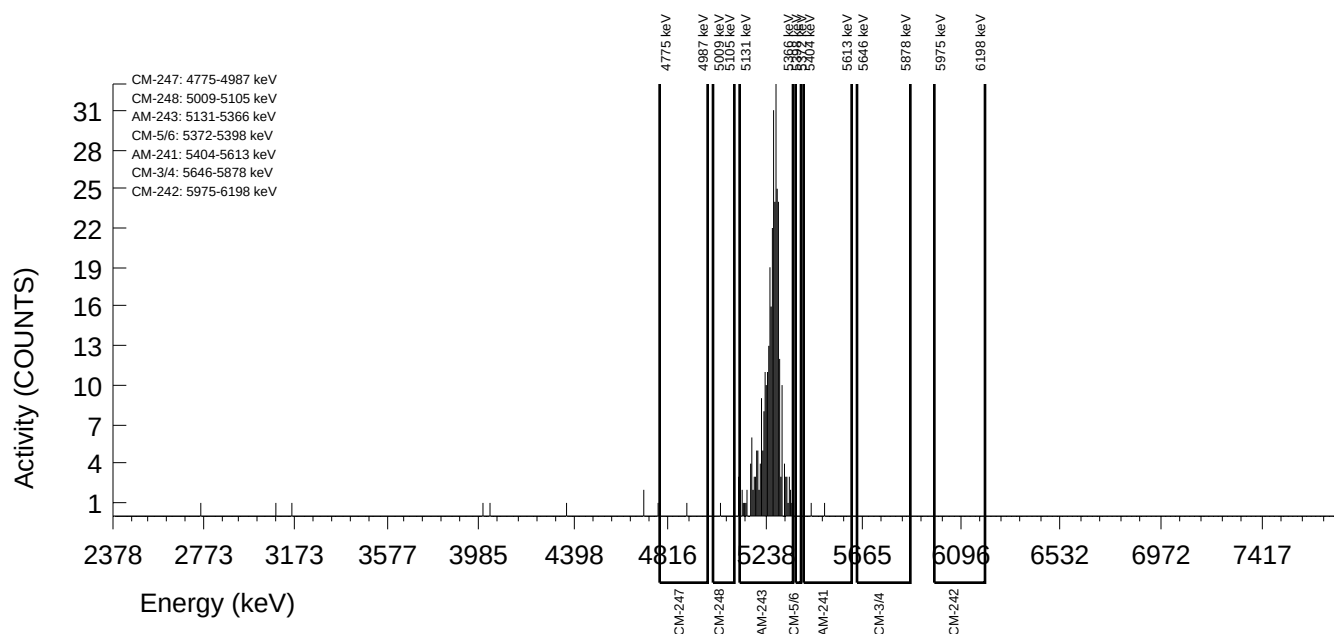


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368289 SAMPLE ID : S0606488004_AM SAMPLE QTY : 0.112 F +/-0.890 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 90.1 +/-6.063 %	CHAMBER : 085 DETECTOR S/N : 83294 AVERAGE %EFFICIENCY : 34.1099 AVERAGE %EFF ERROR : 0.6581 COUNT DATE : 23-Jan-2023 11:36:41 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B085.CNF;2412 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W085.CNF;646 CAL DATE : 10-Jan-2023
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6467E+00 dpm RESULTS : 4.1859E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5469.73	58.916	2.000	0.080	1.920	1.3856	98.525	4.42E-03	2.03E-01	4.46E-01	1.40E-01	2.03E-01
AM-243	5269.50	5265.93	39.482	345.000	342.600	2.400	1.5492	99.980	1.86E+01	3.07E+00	4.72E-01	1.54E-01	1.98E+00
CM-242	6102.00	6086.56	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.24E-01	1.84E-01	1.12E-01	1.24E-01
CM-3/4	5795.02	5761.59	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.31E-02	1.13E-01	2.61E-01	4.89E-02	1.13E-01
CM-5/6	5386.00	5371.13	0.000	1.000	0.760	0.240	0.4899	86.090	4.80E-02	1.80E-01	3.03E-01	5.67E-02	1.80E-01
CM-247	4946.00	4894.94	4.910	1.000	0.280	0.720	0.8485	79.300	1.92E-02	2.01E-01	4.19E-01	1.07E-01	2.01E-01
CM-248	5078.60	5042.48	4.910	1.000	-0.440	1.440	1.2000	91.000	-2.63E-02	1.82E-01	4.42E-01	1.31E-01	1.82E-01

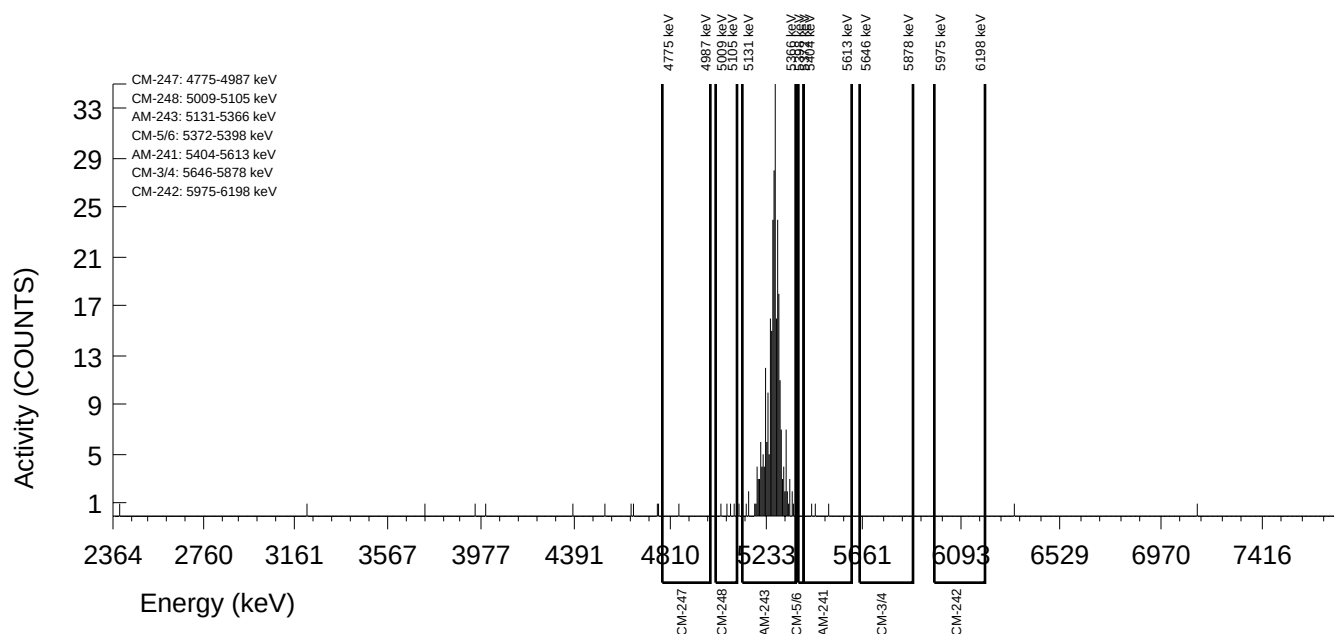


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368289 SAMPLE ID : S0606488005_AM SAMPLE QTY : 0.109 F +/-0.917 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : EJ1 % YIELD : 86.5 +/-6.519 %	CHAMBER : 086 DETECTOR S/N : 78779 AVERAGE %EFFICIENCY : 29.7096 AVERAGE %EFF ERROR : 0.5752 COUNT DATE : 23-Jan-2023 11:36:41 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B086.CNF;2414 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W086.CNF;640 CAL DATE : 10-Jan-2023
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6467E+00 dpm RESULTS : 4.0197E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5466.01	73.939	3.000	2.280	0.720	0.8485	98.525	1.55E-01	2.75E-01	4.15E-01	1.06E-01	2.74E-01
AM-243	5269.50	5266.95	28.558	288.000	286.560	1.440	1.2000	99.980	1.92E+01	3.41E+00	4.95E-01	1.47E-01	2.23E+00
CM-242	6102.00	6086.57	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.81E-02	1.57E-01	3.62E-01	6.78E-02	1.56E-01
CM-3/4	5795.02	5761.59	0.000	0.000	-0.480	0.480	0.6928	100.000	-3.22E-02	1.43E-01	3.72E-01	8.52E-02	1.42E-01
CM-5/6	5386.00	5385.09	0.000	0.000	-0.240	0.240	0.4899	86.090	-1.87E-02	1.61E-01	3.73E-01	6.98E-02	1.61E-01
CM-247	4946.00	4852.06	4.929	1.000	0.280	0.720	0.8485	79.300	2.36E-02	2.47E-01	5.16E-01	1.31E-01	2.47E-01
CM-248	5078.60	5068.63	59.151	4.000	3.520	0.480	0.6928	91.000	2.59E-01	3.30E-01	4.07E-01	9.33E-02	3.28E-01

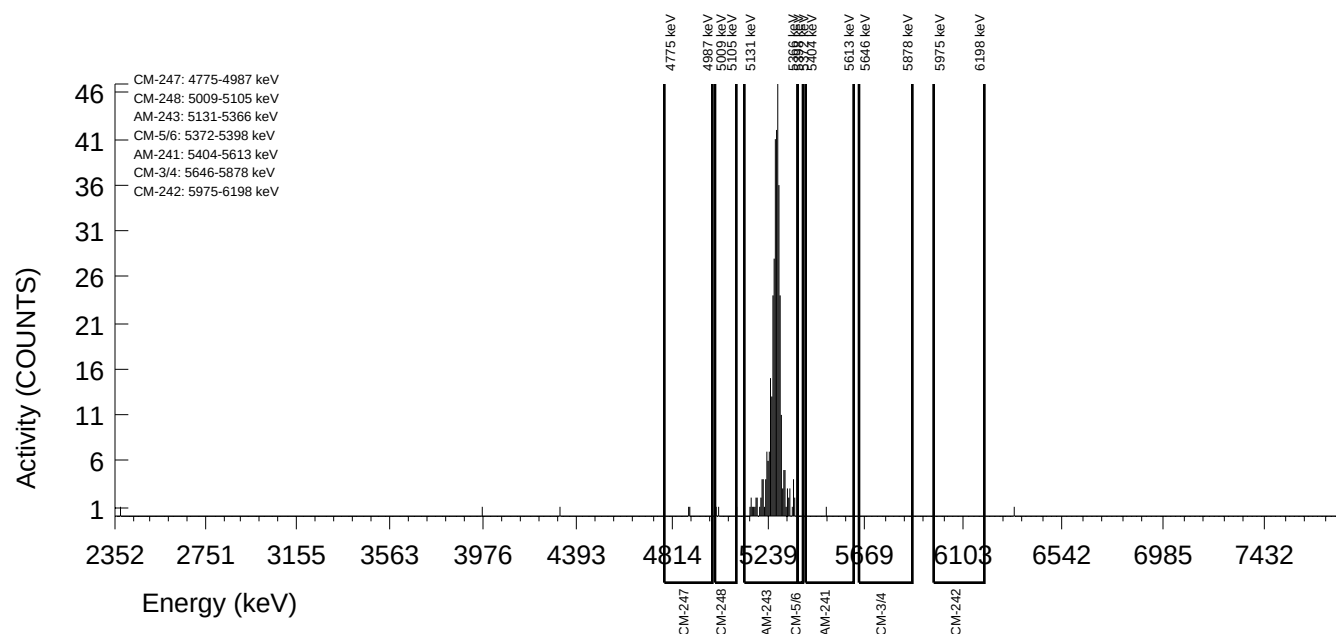


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368289 SAMPLE ID : S1205293606_AM SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 102 +/-5.969 %	CHAMBER : 088 DETECTOR S/N : 83291 AVERAGE %EFFICIENCY : 31.3166 AVERAGE %EFF ERROR : 0.6054 COUNT DATE : 23-Jan-2023 11:36:41 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : AM BKG FILE : B088.CNF;2413 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W088.CNF;634 CAL DATE : 10-Jan-2023
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6466E+00 dpm RESULTS : 4.7216E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5496.76	4.967	1.000	1.000	0.000	1.0000	98.525	5.16E-02	1.45E-01	1.55E-01	9.45E-02	1.45E-01
AM-243	5269.50	5272.31	30.218	356.000	354.800	1.200	1.0954	99.980	1.80E+01	2.93E+00	3.56E-01	1.02E-01	1.88E+00
CM-242	6102.00	6086.57	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.04E-01	1.55E-01	9.45E-02	1.04E-01
CM-3/4	5795.02	5761.60	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.22E-02	1.05E-01	2.44E-01	4.56E-02	1.05E-01
CM-5/6	5386.00	5385.09	0.000	0.000	0.000	0.000	1.0000	86.090	0.00E+00	1.19E-01	1.77E-01	1.08E-01	1.19E-01
CM-247	4946.00	4890.64	9.934	2.000	1.520	0.480	0.6928	79.300	9.74E-02	2.24E-01	3.55E-01	8.13E-02	2.24E-01
CM-248	5078.60	5043.79	0.000	3.000	3.000	0.000	1.0000	91.000	1.68E-01	2.21E-01	1.68E-01	1.02E-01	2.20E-01

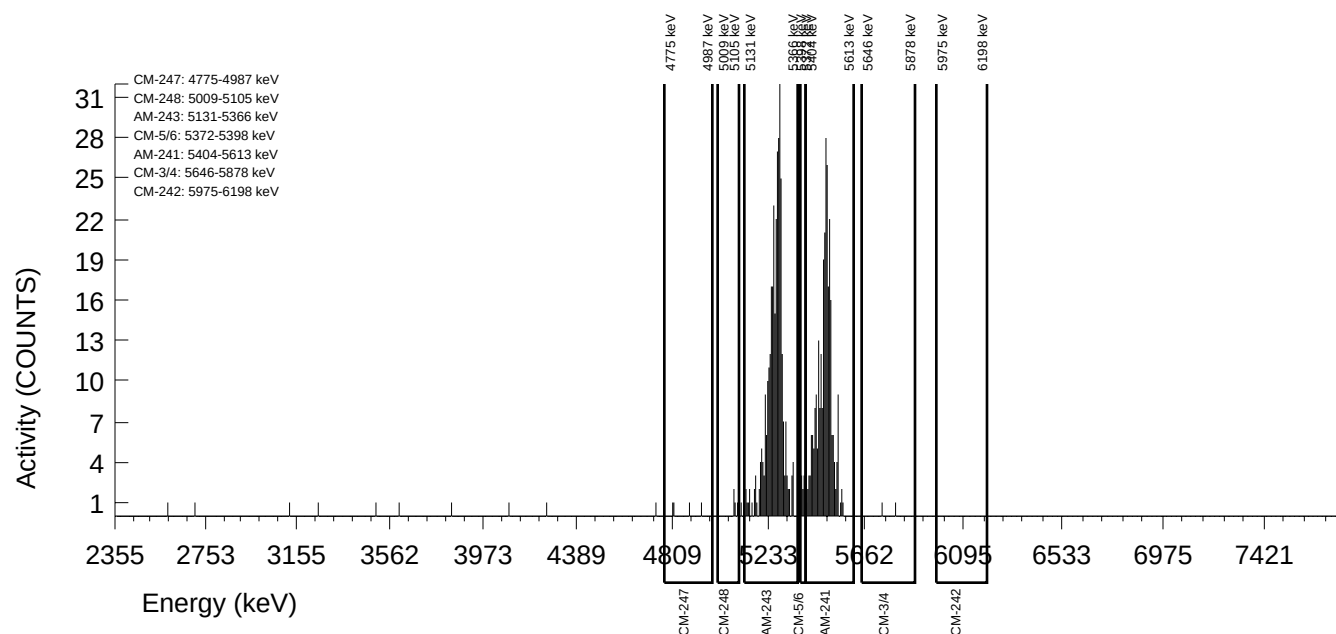


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368289 SAMPLE ID : S1205293607_AM SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 96.5 +/-6.152 %			CHAMBER : 089 DETECTOR S/N : 79988 AVERAGE %EFFICIENCY : 30.5819 AVERAGE %EFF ERROR : 0.5916 COUNT DATE : 23-Jan-2023 11:41:30 ELAPSED LIVE TIME(SEC) : 14399.99			LIB FILE : AM BKG FILE : B089.CNF;2116 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W089.CNF;554 CAL DATE : 11-Jan-2023		
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6466E+00 dpm RESULTS : 4.4840E+00 dpm			LCS ID 0533-JJ NUCLIDE AM-241 NOMINAL (pCi/F) 1.7042E+01 % RECOVERY 89.013					

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5484.96	32.927	273.000	272.760	0.240	0.4899	98.525	1.52E+01	2.65E+00	2.67E-01	4.99E-02	1.80E+00
AM-243	5269.50	5265.49	44.000	330.000	329.040	0.960	0.9798	99.980	1.80E+01	3.02E+00	3.61E-01	9.84E-02	1.96E+00
CM-242	6102.00	6086.57	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.12E-01	1.67E-01	1.02E-01	1.12E-01
CM-3/4	5795.02	5767.42	59.377	2.000	1.040	0.960	0.9798	100.000	5.70E-02	1.95E-01	3.61E-01	9.84E-02	1.95E-01
CM-5/6	5386.00	5391.27	0.000	11.000	10.760	0.240	0.4899	86.090	6.85E-01	4.43E-01	3.05E-01	5.71E-02	4.34E-01
CM-247	4946.00	4890.33	0.000	5.000	4.040	0.960	0.9798	79.300	2.79E-01	3.41E-01	4.55E-01	1.24E-01	3.40E-01
CM-248	5078.60	5079.92	7.422	6.000	5.760	0.240	0.4899	91.000	3.47E-01	3.18E-01	2.89E-01	5.40E-02	3.15E-01

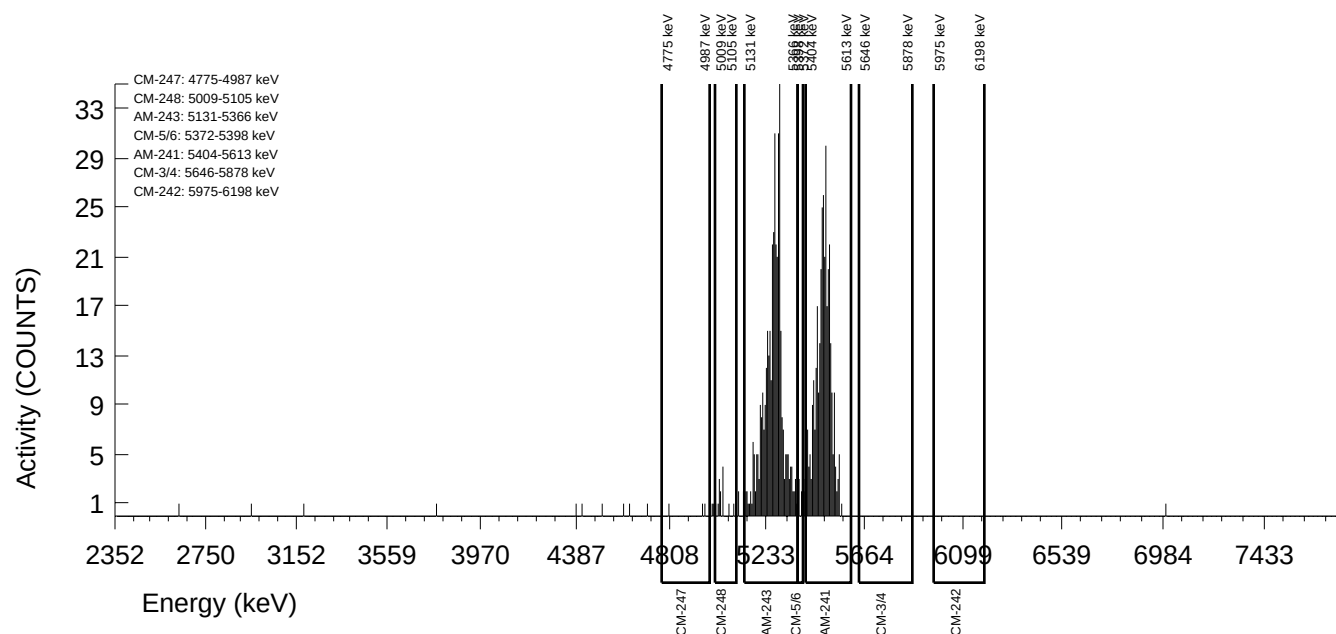


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-011

BATCH NUMBER : 2368289 SAMPLE ID : S1205293608_AM SAMPLE QTY : 0.116 F +/-0.862 % SAMPLE DATE : 20-Jan-2023 00:00:00 ANALYST : EJ1 % YIELD : 100 +/-5.697 %			CHAMBER : 090 DETECTOR S/N : 158119 AVERAGE %EFFICIENCY : 35.5801 AVERAGE %EFF ERROR : 0.6858 COUNT DATE : 23-Jan-2023 11:41:30 ELAPSED LIVE TIME(SEC) : 14399.99			LIB FILE : AM BKG FILE : B090.CNF;2117 BKG DATE : 20-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W090.CNF;546 CAL DATE : 11-Jan-2023		
TRACER ID : 1752-J NUCLIDE : AM-243 NOMINAL : 4.6466E+00 dpm RESULTS : 4.6590E+00 dpm			LCSD ID : 0533-JJ NUCLIDE : AM-241 NOMINAL (pCi/F) : 1.7042E+01 % RECOVERY : 91.182					

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
AM-241	5480.15	5485.46	55.670	338.000	337.760	0.240	0.4899	98.525	1.55E+01	2.49E+00	2.21E-01	4.13E-02	1.66E+00
AM-243	5269.50	5263.26	35.965	398.000	397.760	0.240	0.4899	99.980	1.80E+01	2.79E+00	2.17E-01	4.07E-02	1.78E+00
CM-242	6102.00	6086.56	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	9.29E-02	1.38E-01	8.43E-02	9.28E-02
CM-3/4	5795.02	5761.59	0.000	0.000	-0.720	0.720	0.8485	100.000	-3.26E-02	9.87E-02	2.77E-01	7.05E-02	9.86E-02
CM-5/6	5386.00	5387.16	0.000	12.000	12.000	0.000	1.0000	86.090	6.32E-01	3.80E-01	1.58E-01	9.64E-02	3.73E-01
CM-247	4946.00	4904.83	153.062	3.000	3.000	0.000	1.0000	79.300	1.71E-01	2.27E-01	1.71E-01	1.05E-01	2.26E-01
CM-248	5078.60	5042.02	19.750	14.000	14.000	0.000	1.0000	91.000	6.97E-01	3.88E-01	1.49E-01	9.12E-02	3.79E-01



Batch 2368295 Check-list

This check-list was completed on 20-JAN-23 by Jessica Davis

This batch was reviewed by Jessica Downey on 20-JAN-23 and Jessica Davis on 20-JAN-23.

Batch ID: 2368295

Product: ASP10POF

Description: Alpha Spec Polonium

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have samples been blank corrected?		No	
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Were manual integrations performed on any sample or QC data files in this batch?	Yes		
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Polonium

Batch ID: 2368295

Analyst: Brendon Viquez (BV1)

Method: DOE EML HASL-300, Po-01-RC
Modified

Lab SOP: GL-RAD-A-016 REV# 19

Instrument: BAL-18550299

Due Dates for Lab: 23-JAN-2023

Package: 24-JAN-2023

SDG: 24-JAN-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205293635	Polonium-210 AS SPIKE	2012-A	.1	mL
LCSD	1205293636	Polonium-210 AS SPIKE	2012-A	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (g)	Aliquot (Filter)
1	606487001	17-JAN-2023	.5	0.224	0.10214
2	606487002	17-JAN-2023	.5	0.235	0.10643
3	606487003	17-JAN-2023	.5	0.227	0.10413
4	606488001	17-JAN-2023	.5	0.361	0.10388
5	606488002	17-JAN-2023	.5	0.354	0.10216
6	606488003	17-JAN-2023	.5	0.353	0.10185
7	606488004	17-JAN-2023	.5	0.355	0.10234
8	606488005	17-JAN-2023	.5	0.355	0.10537
9	1205293634 MB	17-JAN-2023	.5		0.10643
10	1205293635 LCS	17-JAN-2023	.5		0.10643
11	1205293636 LCSD	17-JAN-2023	.5		0.10643

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1720-D	Polonium-209 AS TRACER	.1 ml	Data Entry Date2: 16-JAN-2023 00:00

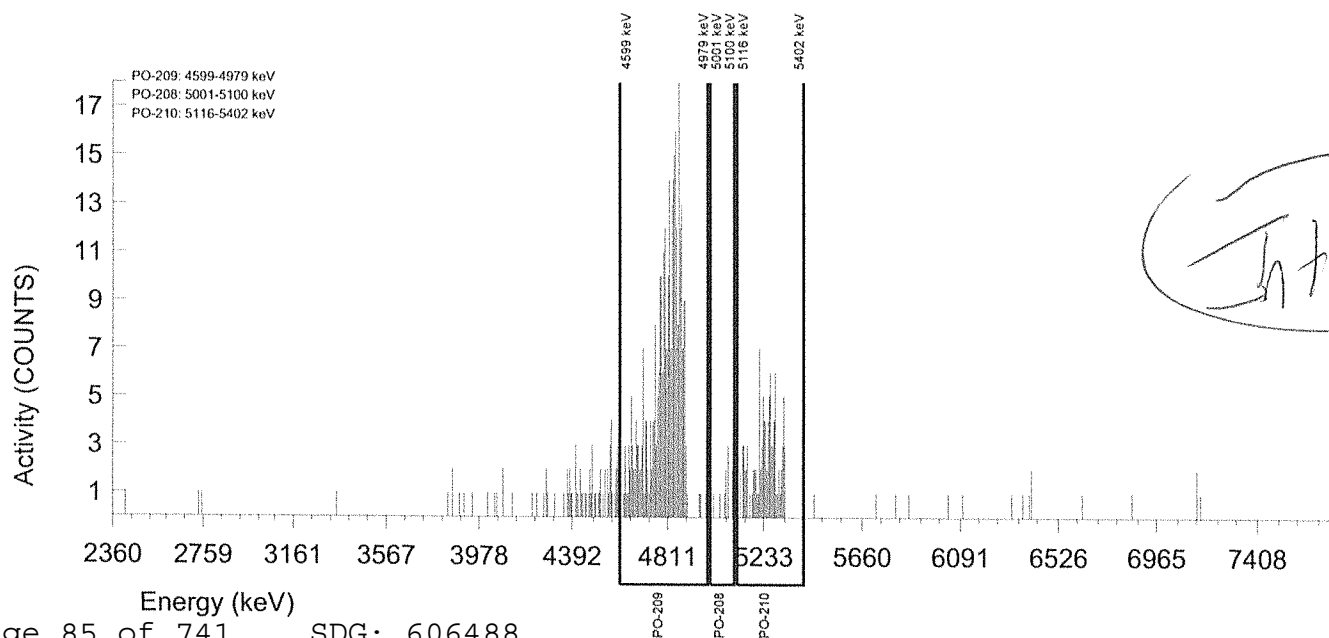
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2368295 SAMPLE ID : S0606488003_PO SAMPLE QTY : 0.102 G +/-0.982 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : BV1 % YIELD : 69.6 +/-5.876 %	CHAMBER : 178 DETECTOR S/N : 92562 AVERAGE %EFFICIENCY : 26.3757 AVERAGE %EFF ERROR : 0.5123 COUNT DATE : 19-Jan-2023 16:19:58 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B178.CNF;1558 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W178.CNF;410 CAL DATE : 17-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8577E+00 dpm RESULTS : 5.4670E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/G	1.96-sigma TPU pCi/G	MDA pCi/G	Lc pCi/G	1.96-sigma cnt Unc pCi/G
PO-208	5080.00	5067.15	28.471	11.000	11.000	0.000	1.0000	100.000	1.12E+00	7.08E-01	3.06E-01	1.87E-01	6.95E-01
PO-209	4882.00	4795.47	93.664	346.000	345.040	0.960	0.9798	99.740	3.48E+01	5.64E+00	6.64E-01	1.81E-01	3.68E+00
PO-210	5304.38	5235.30	105.630	103.000	102.520	0.480	0.6928	100.000	1.17E+01	2.69E+00	6.30E-01	1.44E-01	2.27E+00



DO NOT REPORT

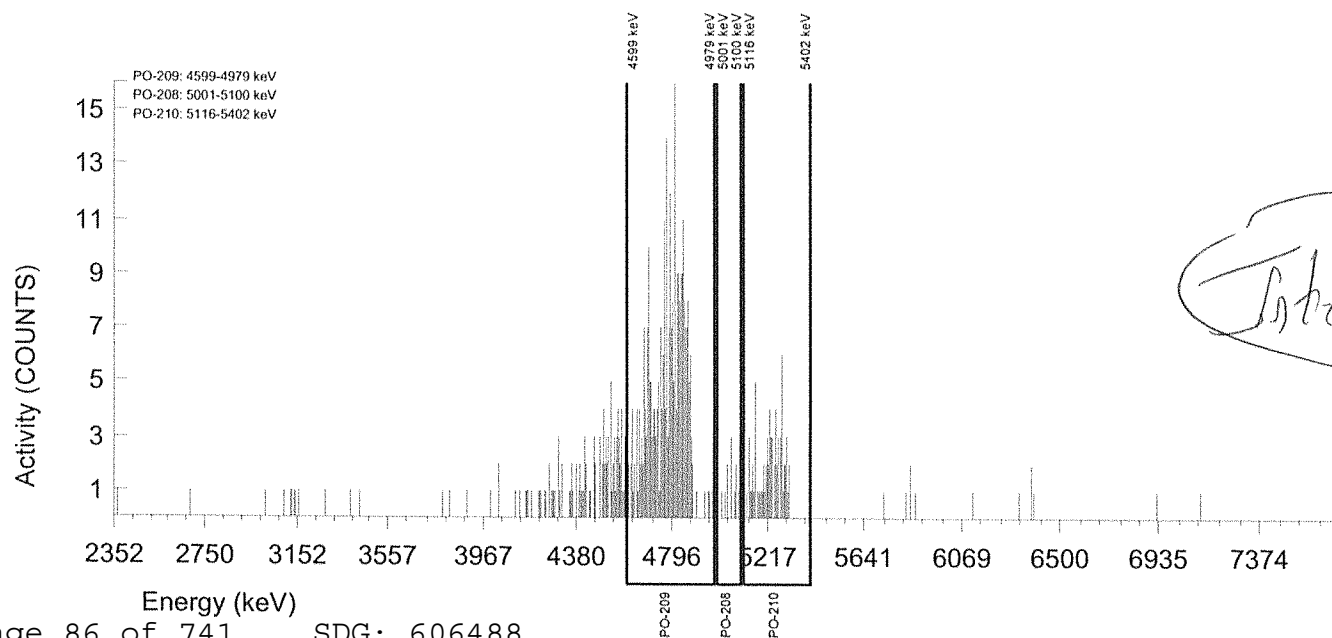
Integrated

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2368295 SAMPLE ID : S0606488004_PO SAMPLE QTY : 0.102 G +/-0.977 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : BV1 % YIELD : 63.4 +/-6.150 %	CHAMBER : 185 DETECTOR S/N : 140610 AVERAGE %EFFICIENCY : 26.2407 AVERAGE %EFF ERROR : 0.5097 COUNT DATE : 19-Jan-2023 16:20:00 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B185.CNF;1546 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W185.CNF;413 CAL DATE : 18-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8577E+00 dpm RESULTS : 4.9829E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/G	1.96-sigma TPU pCi/G	MDA pCi/G	Lc pCi/G	1.96-sigma cnt Unc pCi/G
PO-208	5080.00	5059.06	52.018	14.000	14.000	0.000	1.0000	100.000	1.57E+00	8.75E-01	3.36E-01	2.05E-01	8.52E-01
PO-209	4882.00	4775.52	151.927	316.000	312.880	3.120	1.7664	99.740	3.46E+01	5.87E+00	1.05E+00	3.58E-01	3.86E+00
PO-210	5304.38	5228.50	114.440	71.000	70.520	0.480	0.6928	100.000	8.80E+00	2.36E+00	6.91E-01	1.58E-01	2.08E+00



DO NOT REPORT

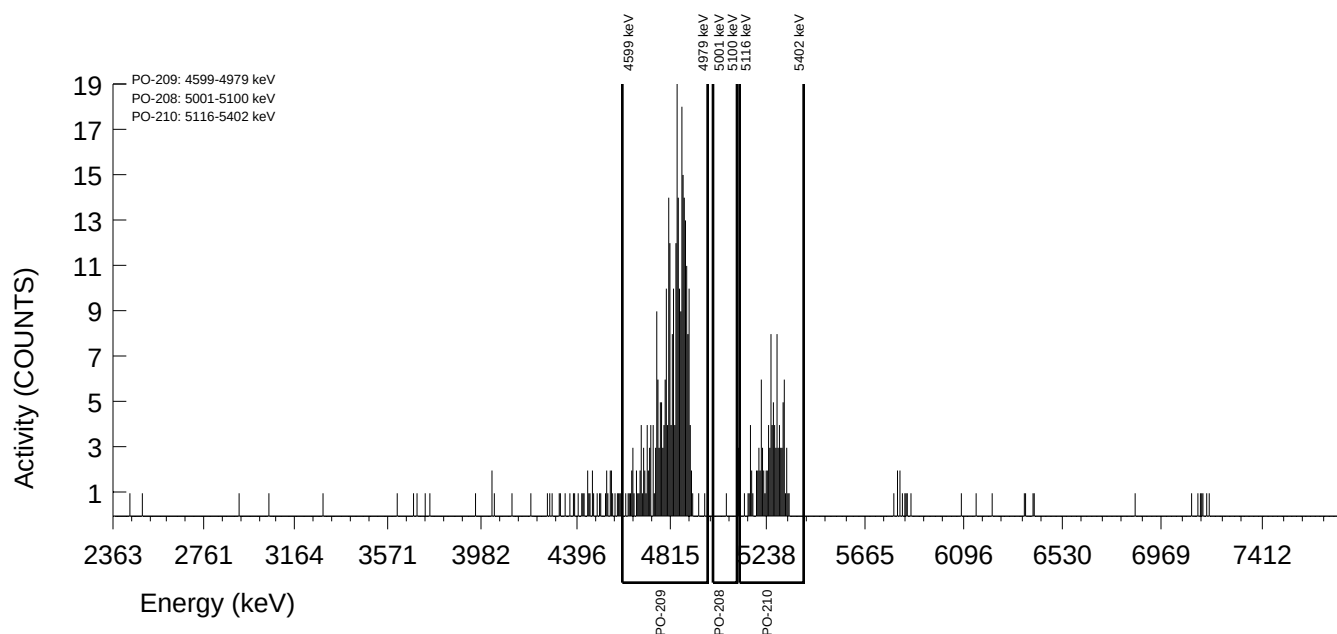
Integrated

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2368295 SAMPLE ID : S0606488001_PO SAMPLE QTY : 0.104 F +/-0.963 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : BV1 % YIELD : 63.7 +/-6.115 %	CHAMBER : 182 DETECTOR S/N : 92566 AVERAGE %EFFICIENCY : 26.3190 AVERAGE %EFF ERROR : 0.5111 COUNT DATE : 19-Jan-2023 16:19:53 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B182.CNF;998 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W182.CNF;261 CAL DATE : 17-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8577E+00 dpm RESULTS : 5.0068E+00 dpm		

NUCLIDE ACTIVITY SUMMARY										1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt Unc pCi/F
PO-208	5080.00	5057.72	4.957	1.000	1.000	0.000	1.0000	100.000	1.09E-01	3.08E-01	3.28E-01	2.01E-01	3.08E-01
PO-209	4882.00	4815.69	95.223	317.000	315.320	1.680	1.2961	99.740	3.41E+01	5.75E+00	8.37E-01	2.57E-01	3.78E+00
PO-210	5304.38	5250.83	98.651	106.000	105.280	0.720	0.8485	100.000	1.28E+01	2.97E+00	7.45E-01	1.90E-01	2.48E+00

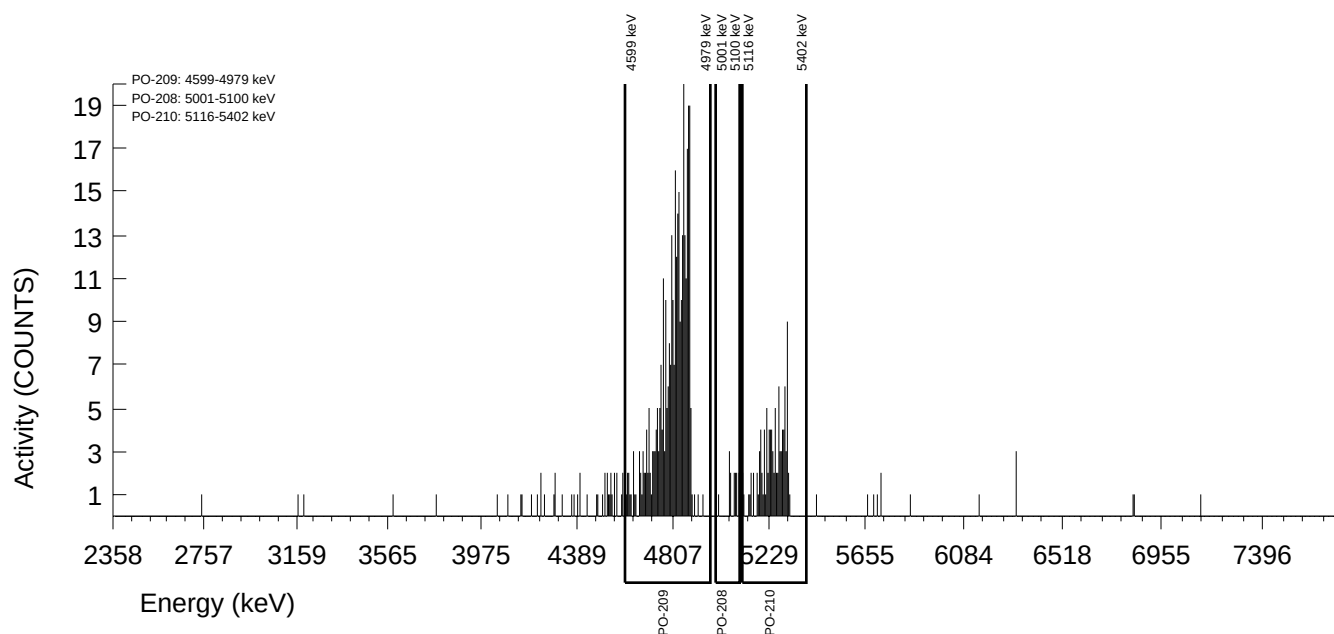


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2368295 SAMPLE ID : S0606488002_PO SAMPLE QTY : 0.102 F +/-0.979 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : BV1 % YIELD : 69.4 +/-5.812 %	CHAMBER : 174 DETECTOR S/N : 92548 AVERAGE %EFFICIENCY : 27.0832 AVERAGE %EFF ERROR : 0.5256 COUNT DATE : 19-Jan-2023 16:19:55 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B174.CNF;1537 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W174.CNF;77 CAL DATE : 17-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8577E+00 dpm RESULTS : 5.4550E+00 dpm		

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
PO-208	5080.00	5074.39	0.000	14.000	14.000	0.000	1.0000	100.000	1.39E+00	7.74E-01	2.98E-01	1.82E-01	7.55E-01	
PO-209	4882.00	4811.22	112.898	354.000	353.520	0.480	0.6928	99.740	3.46E+01	5.55E+00	5.43E-01	1.24E-01	3.62E+00	
PO-210	5304.38	5249.79	88.035	101.000	100.520	0.480	0.6928	100.000	1.11E+01	2.58E+00	6.13E-01	1.40E-01	2.19E+00	



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

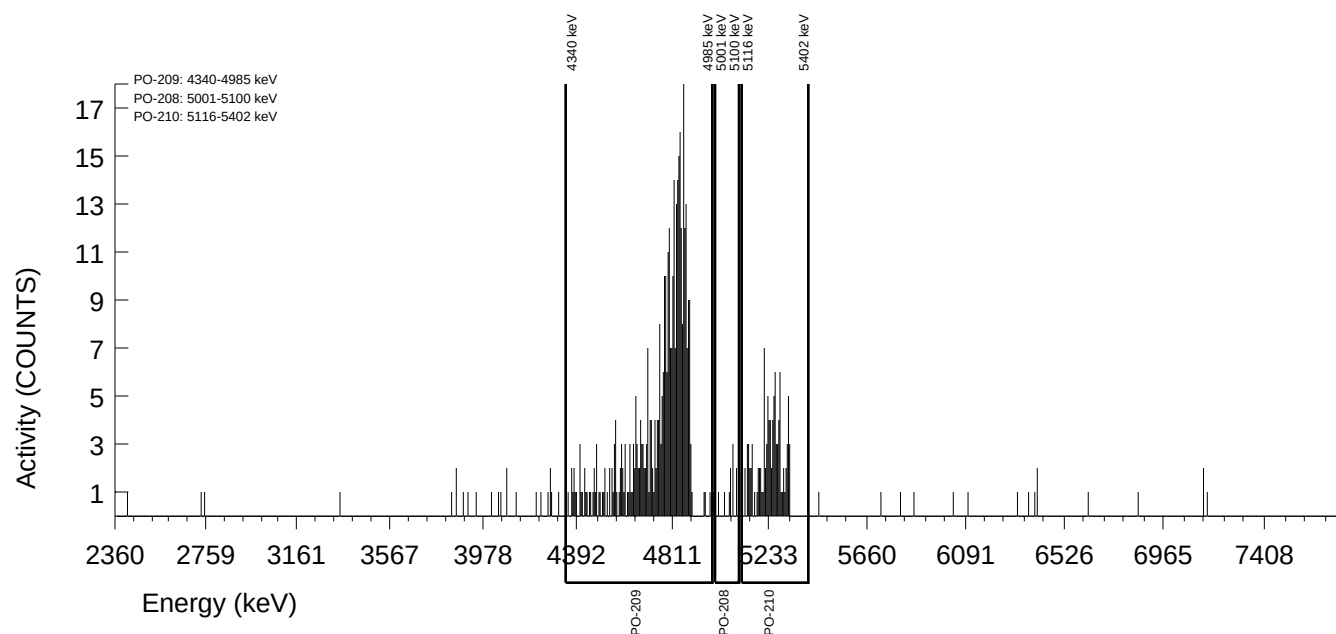
BATCH NUMBER : 2368295 SAMPLE ID : S0606488003_PO SAMPLE QTY : 0.102 F +/-0.982 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : BV1 % YIELD : 80.4 +/-5.541 %	CHAMBER : 178 DETECTOR S/N : 92562 AVERAGE %EFFICIENCY : 26.3757 AVERAGE %EFF ERROR : 0.5123 COUNT DATE : 19-Jan-2023 16:19:58 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B178.CNF;1558 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W178.CNF;410 CAL DATE : 17-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8577E+00 dpm RESULTS : 6.3156E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5067.15	28.471	11.000	11.000	0.000	1.0000	100.000	9.72E-01	6.12E-01	2.65E-01	1.62E-01	6.01E-01
PO-209	4882.00	4753.20	93.664	401.000	398.600	2.400	1.5492	99.740	3.48E+01	5.31E+00	7.56E-01	2.47E-01	3.43E+00
PO-210	5304.38	5235.30	105.630	103.000	102.520	0.480	0.6928	100.000	1.01E+01	2.29E+00	5.45E-01	1.25E-01	1.97E+00

NOTES:

* Regions have been manually adjusted



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

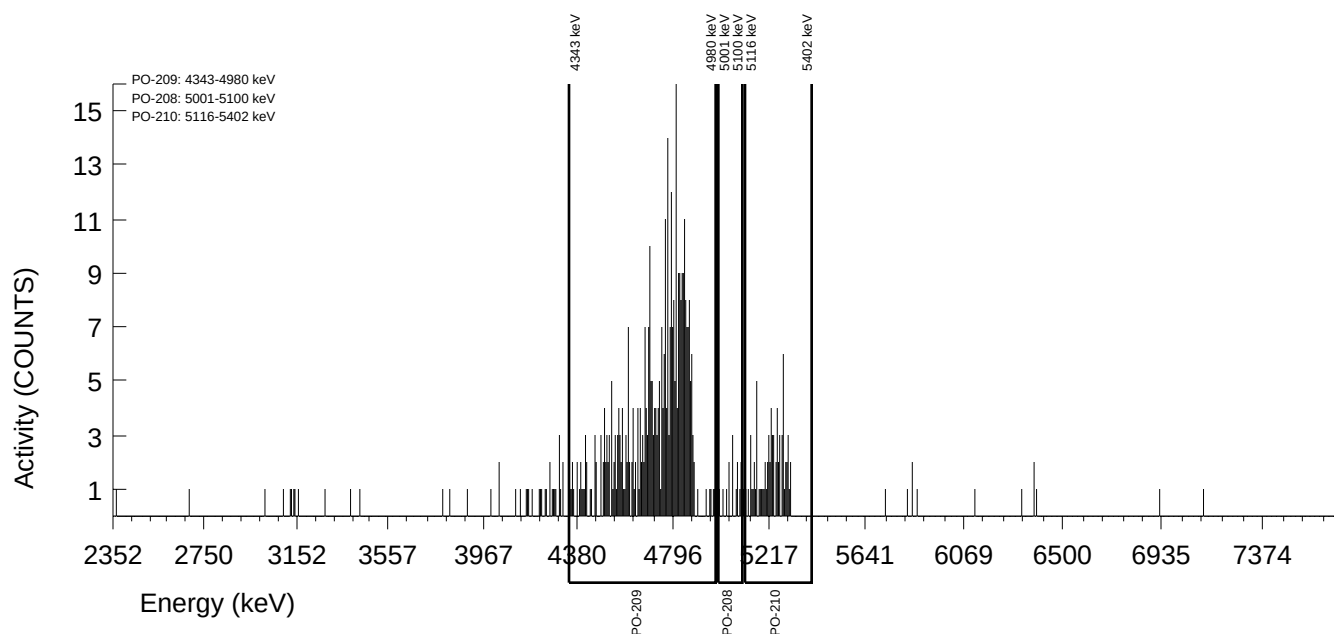
BATCH NUMBER : 2368295 SAMPLE ID : S0606488004_PO SAMPLE QTY : 0.102 F +/-0.977 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : BV1 % YIELD : 79.0 +/-5.598 %	CHAMBER : 185 DETECTOR S/N : 140610 AVERAGE %EFFICIENCY : 26.2407 AVERAGE %EFF ERROR : 0.5097 COUNT DATE : 19-Jan-2023 16:20:00 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B185.CNF;1546 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W185.CNF;413 CAL DATE : 18-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8577E+00 dpm RESULTS : 6.2092E+00 dpm		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5059.06	52.018	14.000	14.000	0.000	1.0000	100.000	1.26E+00	7.00E-01	2.70E-01	1.65E-01	6.84E-01
PO-209	4882.00	4720.75	151.927	393.000	389.880	3.120	1.7664	99.740	3.46E+01	5.34E+00	8.40E-01	2.87E-01	3.45E+00
PO-210	5304.38	5228.50	114.440	71.000	70.520	0.480	0.6928	100.000	7.06E+00	1.86E+00	5.55E-01	1.27E-01	1.67E+00

NOTES:

* Regions have been manually adjusted

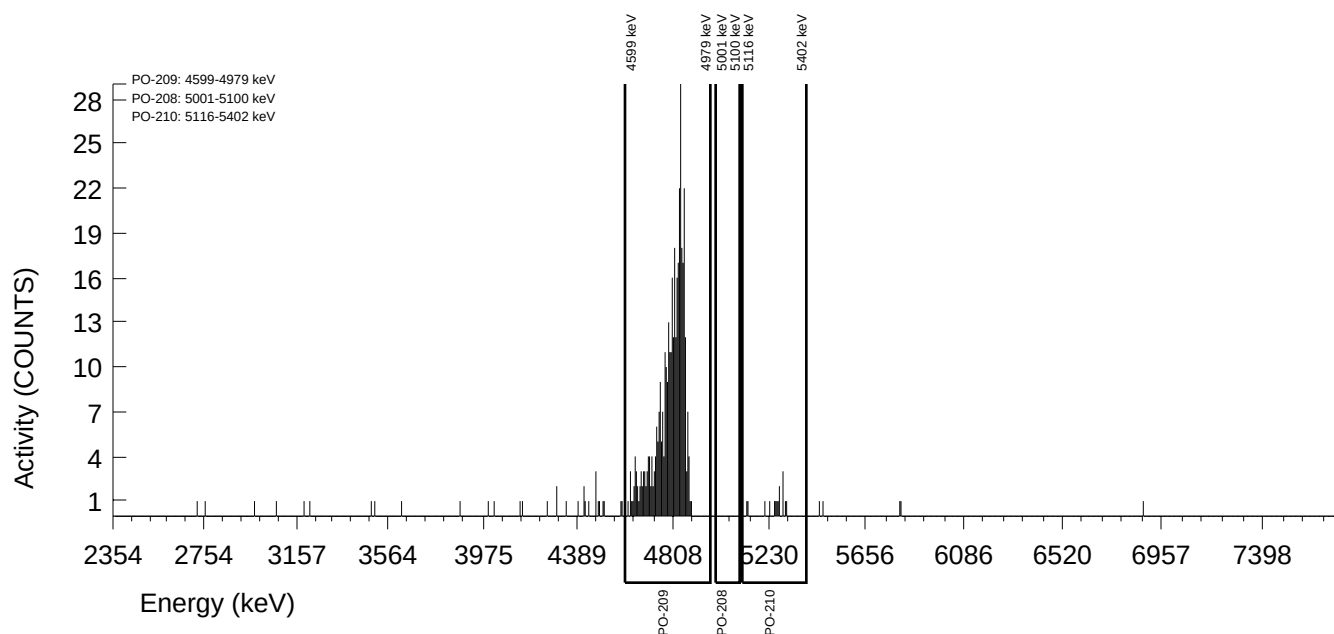


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2368295 SAMPLE ID : S0606488005_PO SAMPLE QTY : 0.105 F +/-0.949 % SAMPLE DATE : 26-Dec-2022 00:00:00 ANALYST : BV1 % YIELD : 79.9 +/-5.563 %	CHAMBER : 186 DETECTOR S/N : 140611 AVERAGE %EFFICIENCY : 26.1483 AVERAGE %EFF ERROR : 0.5080 COUNT DATE : 19-Jan-2023 16:20:02 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B186.CNF;1511 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W186.CNF;101 CAL DATE : 18-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8577E+00 dpm RESULTS : 6.2817E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5103.11	0.000	1.000	1.000	0.000	1.0000	100.000	8.66E-02	2.44E-01	2.60E-01	1.59E-01	2.43E-01
PO-209	4882.00	4799.64	54.915	394.000	393.040	0.960	0.9798	99.740	3.36E+01	5.15E+00	5.63E-01	1.53E-01	3.33E+00
PO-210	5304.38	5255.63	19.879	15.000	14.520	0.480	0.6928	100.000	1.40E+00	7.78E-01	5.34E-01	1.22E-01	7.60E-01

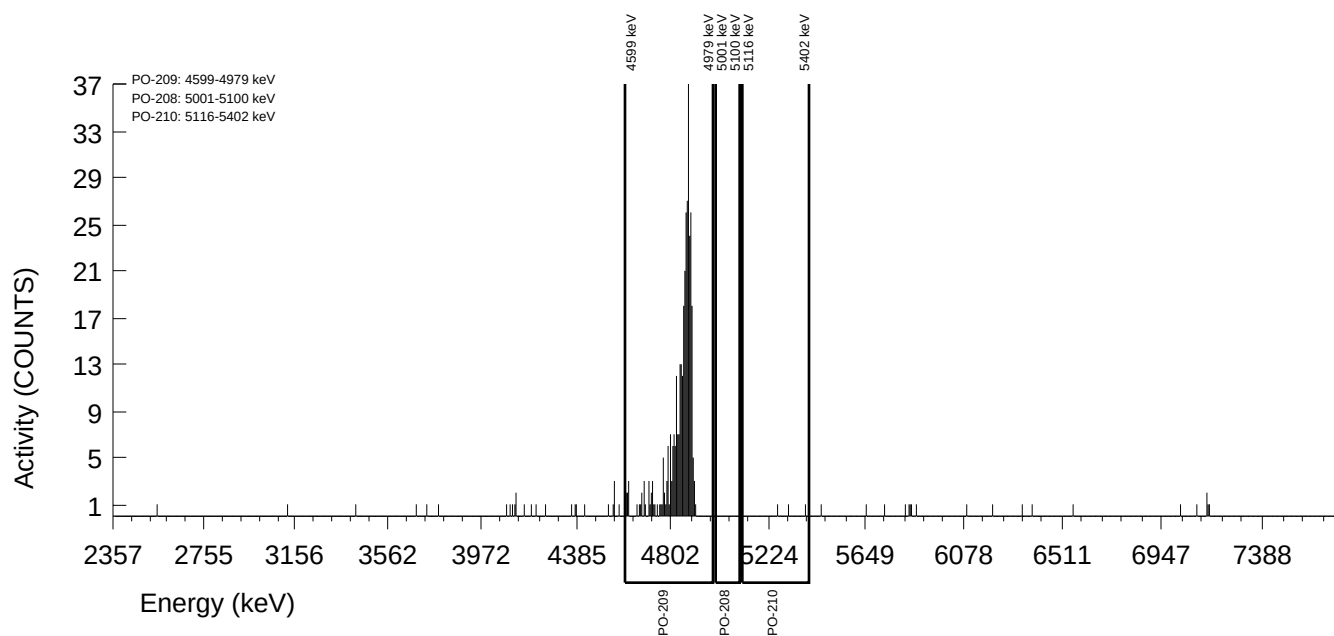


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2368295 SAMPLE ID : S1205293634_PO SAMPLE QTY : 0.106 F +/-0.940 % SAMPLE DATE : 16-Jan-2023 00:00:00 ANALYST : BV1 % YIELD : 67.3 +/-5.861 %	CHAMBER : 191 DETECTOR S/N : 140615 AVERAGE %EFFICIENCY : 27.4228 AVERAGE %EFF ERROR : 0.5320 COUNT DATE : 19-Jan-2023 16:20:04 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B191.CNF;1549 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W191.CNF;464 CAL DATE : 18-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8552E+00 dpm RESULTS : 5.2870E+00 dpm		

NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PO-208	5080.00	5050.47	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.93E-01	2.87E-01	1.75E-01	1.93E-01
PO-209	4882.00	4840.28	33.509	348.000	347.040	0.960	0.9798	99.740	3.32E+01	5.37E+00	6.31E-01	1.72E-01	3.51E+00
PO-210	5304.38	5322.53	118.775	3.000	2.520	0.480	0.6928	100.000	2.45E-01	3.91E-01	5.39E-01	1.24E-01	3.90E-01

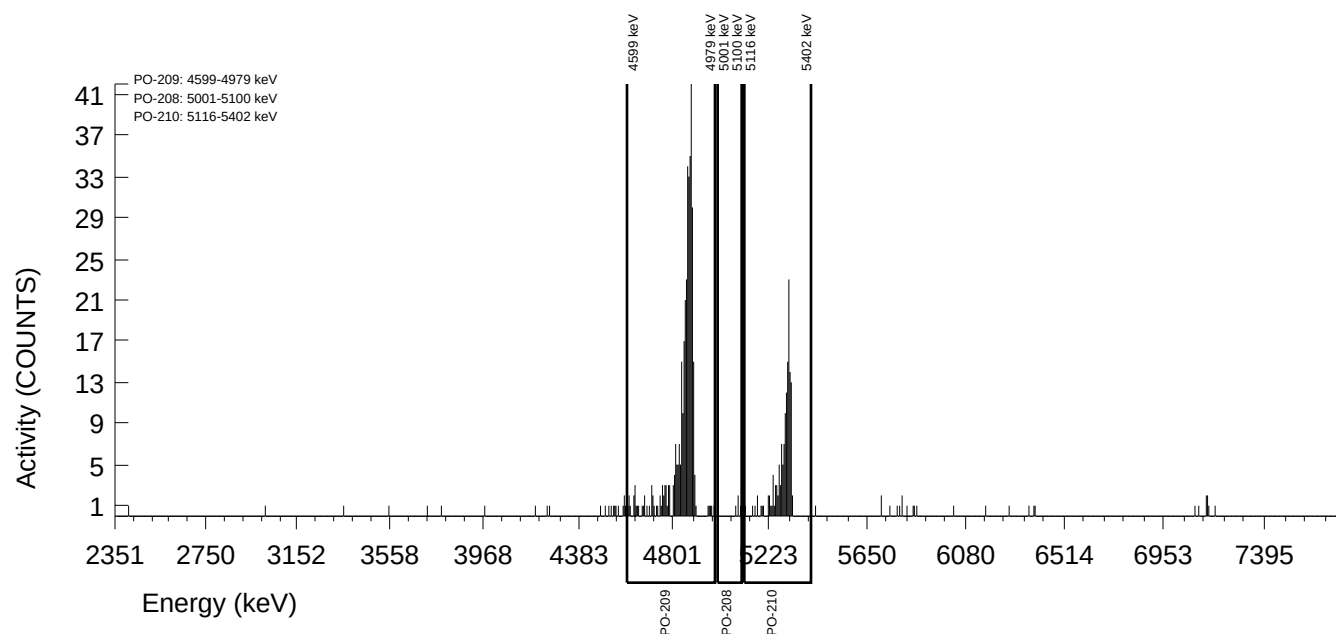


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2368295 SAMPLE ID : S1205293635_PO SAMPLE QTY : 0.106 F +/-0.940 % SAMPLE DATE : 16-Jan-2023 00:00:00 ANALYST : BV1 % YIELD : 76.4 +/-5.736 %	CHAMBER : 194 DETECTOR S/N : 140618 AVERAGE %EFFICIENCY : 25.5079 AVERAGE %EFF ERROR : 0.4959 COUNT DATE : 19-Jan-2023 16:20:07 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B194.CNF;1545 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W194.CNF;450 CAL DATE : 18-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8552E+00 dpm RESULTS : 5.9997E+00 dpm	LCS ID 2012-A NUCLIDE PO-210 NOMINAL (pCi/F) 1.3516E+01 % RECOVERY 97.939	

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
PO-208	5080.00	5085.72	4.953	4.000	3.760	0.240	0.4899	100.000	3.41E-01	4.04E-01	4.35E-01	8.14E-02	4.02E-01	4.02E-01
PO-209	4882.00	4844.60	32.688	368.000	366.320	1.680	1.2961	99.740	3.32E+01	5.26E+00	7.03E-01	2.15E-01	3.42E+00	3.42E+00
PO-210	5304.38	5285.74	21.725	144.000	143.520	0.480	0.6928	100.000	1.32E+01	2.70E+00	5.11E-01	1.17E-01	2.18E+00	2.18E+00

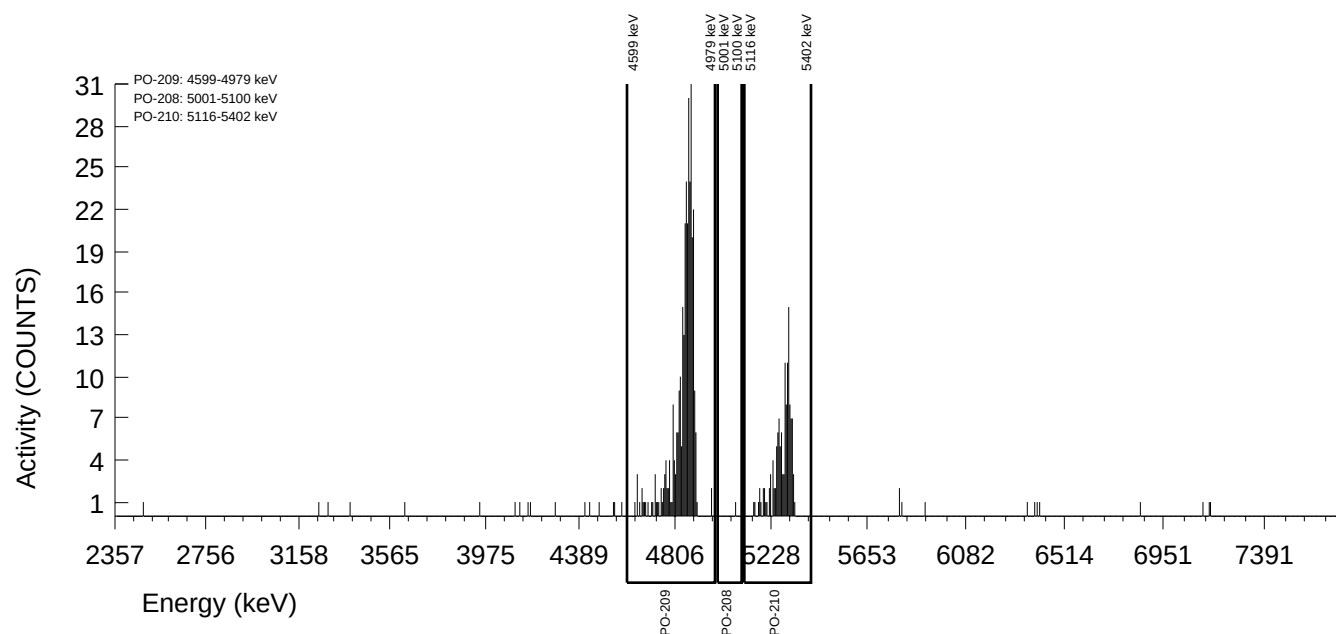


GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-016

BATCH NUMBER : 2368295 SAMPLE ID : S1205293636_PO SAMPLE QTY : 0.106 F +/-0.940 % SAMPLE DATE : 16-Jan-2023 00:00:00 ANALYST : BV1 % YIELD : 64.9 +/-5.993 %	CHAMBER : 192 DETECTOR S/N : 140616 AVERAGE %EFFICIENCY : 27.0513 AVERAGE %EFF ERROR : 0.5250 COUNT DATE : 19-Jan-2023 16:20:09 ELAPSED LIVE TIME(SEC) : 14400.00	LIB FILE : PO BKG FILE : B192.CNF;1555 BKG DATE : 13-Jan-2023 BKG LIVE TIME(SEC) : 60000.00 EFF FILE : W192.CNF;484 CAL DATE : 18-Jan-2023
TRACER ID : 1720-D NUCLIDE : PO-209 NOMINAL : 7.8552E+00 dpm RESULTS : 5.1014E+00 dpm	LCSD ID 2012-A NUCLIDE PO-210 NOMINAL (pCi/F) 1.3516E+01 % RECOVERY 98.230	

NUCLIDE ACTIVITY SUMMARY											1.96-sigma		1.96-sigma	
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	TPU pCi/F	MDA pCi/F	Lc pCi/F	cnt	Unc pCi/F
PO-208	5080.00	5074.53	4.961	1.000	-0.200	1.200	1.0954	100.000	-2.01E-02	3.02E-01	7.06E-01	2.02E-01	3.02E-01	
PO-209	4882.00	4845.70	40.622	332.000	330.320	1.680	1.2961	99.740	3.32E+01	5.50E+00	7.80E-01	2.39E-01	3.60E+00	
PO-210	5304.38	5278.64	24.497	131.000	129.800	1.200	1.0954	100.000	1.33E+01	2.84E+00	7.17E-01	2.05E-01	2.31E+00	



Continuing Calibration Data

Review of Alpha Spectrometer QA results (Daily checks) 19-JAN-2023 10:52:29.41

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
19-JAN-2023	23	PSFWHM-5000	Above
19-JAN-2023	46	PSFWHM-5000	Below
19-JAN-2023	46	PSCTSS-5000	Below
19-JAN-2023	91	PSFWHM-5000	Below
19-JAN-2023	91	PSCTSS-5000	Below
19-JAN-2023	94	PSFWHM-5000	Below
19-JAN-2023	94	PSCTSS-5000	Below
19-JAN-2023	101	PSFWHM-5000	Below
19-JAN-2023	101	PSCTSS-5000	Below
21-SEP-2022	115	PSCTSS-5000	Below
19-JAN-2023	143	PSFWHM-5000	Below
19-JAN-2023	143	PSCENTRD-5000	Below
19-JAN-2023	143	PSCTSS-5000	Below
19-JAN-2023	167	PSENERGY-5000	Above
19-JAN-2023	171	PSENERGY-5000	Above
19-JAN-2023	171	PSCENTRD-5000	Above
19-JAN-2023	171	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
19-JAN-2023	214	PSENERGY-5000	Above
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below
15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below
19-JAN-2023	239	PSENERGY-5000	Above
19-JAN-2023	239	PSCENTRD-5000	Above

The following detectors that may not have properly transferred to the QA file

115 may not have run since 19-JAN-2023

116 may not have run since 19-JAN-2023

119 may not have run since 19-JAN-2023
120 may not have run since 19-JAN-2023
137 may not have run since 19-JAN-2023
147 may not have run since 19-JAN-2023
148 may not have run since 19-JAN-2023
163 may not have run since 19-JAN-2023
164 may not have run since 19-JAN-2023
183 may not have run since 19-JAN-2023
184 may not have run since 19-JAN-2023
198 may not have run since 19-JAN-2023
221 may not have run since 19-JAN-2023
227 may not have run since 19-JAN-2023
228 may not have run since 19-JAN-2023
241 may not have run since 19-JAN-2023
242 may not have run since 19-JAN-2023
247 may not have run since 19-JAN-2023
248 may not have run since 19-JAN-2023

APPROVAL DATE: 1/19/23

APPROVAL TIME: 1056

APPROVED BY: 

PROCEDURE # GL-RAD-I-009

Report completed at 19-JAN-2023 10:56:13.02

Review of Alpha Spectrometer QA results (Daily checks) 22-JAN-2023 23:00:00.73

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
22-JAN-2023	46	PSFWHM-5000	Below
22-JAN-2023	46	PSCTSS-5000	Below
22-JAN-2023	70	Second Check Required for D	
22-JAN-2023	91	PSFWHM-5000	Below
22-JAN-2023	91	PSCTSS-5000	Below
22-JAN-2023	94	PSFWHM-5000	Below
22-JAN-2023	94	PSCTSS-5000	Below
22-JAN-2023	101	PSFWHM-5000	Below
22-JAN-2023	101	PSCTSS-5000	Below
21-SEP-2022	115	PSCTSS-5000	Below
22-JAN-2023	143	PSFWHM-5000	Below
22-JAN-2023	143	PSCENTRD-5000	Below
22-JAN-2023	143	PSCTSS-5000	Below
22-JAN-2023	156	PSENERGY-5000	Above
22-JAN-2023	161	PSFWHM-5000	Above
22-JAN-2023	171	PSENERGY-5000	Above
22-JAN-2023	171	PSCENTRD-5000	Above
22-JAN-2023	173	PSCTSS-5000	Below
22-JAN-2023	175	PSFWHM-5000	Below
22-JAN-2023	175	PSCTSS-5000	Below
22-JAN-2023	177	PSCTSS-5000	Below
22-JAN-2023	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
22-JAN-2023	217	PSENERGY-5000	Above
22-JAN-2023	219	PSENERGY-5000	Above
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below

15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transferred to the QA file

115	may not have run since 22-JAN-2023
116	may not have run since 22-JAN-2023
119	may not have run since 22-JAN-2023
120	may not have run since 22-JAN-2023
137	may not have run since 22-JAN-2023
147	may not have run since 22-JAN-2023
148	may not have run since 22-JAN-2023
183	may not have run since 22-JAN-2023
184	may not have run since 22-JAN-2023
198	may not have run since 22-JAN-2023
209	may not have run since 22-JAN-2023
210	may not have run since 22-JAN-2023
211	may not have run since 22-JAN-2023
212	may not have run since 22-JAN-2023
221	may not have run since 22-JAN-2023
227	may not have run since 22-JAN-2023
228	may not have run since 22-JAN-2023
241	may not have run since 22-JAN-2023
242	may not have run since 22-JAN-2023
244	may not have run since 22-JAN-2023
247	may not have run since 22-JAN-2023
248	may not have run since 22-JAN-2023

APPROVAL DATE: 1/22/2023

APPROVAL TIME: 23:10

APPROVED BY:



PROCEDURE # GL-RAD-I-009

Report completed at 22-JAN-2023 23:02:31.15

Review of Alpha Spectrometer QA results (Daily checks) 23-JAN-2023 23:00:00.71

Bank 1 through bank 29 (detectors 1 through 256)

DETECTORS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

	Detector	Parameter	Flag
	-----	-----	-----
23-JAN-2023	46	PSFWHM-5000	Below
23-JAN-2023	46	PSCTSS-5000	Below
23-JAN-2023	91	PSFWHM-5000	Below
23-JAN-2023	91	PSCTSS-5000	Below
23-JAN-2023	94	PSFWHM-5000	Below
23-JAN-2023	94	PSCTSS-5000	Below
23-JAN-2023	101	PSFWHM-5000	Below
23-JAN-2023	101	PSCTSS-5000	Below
21-SEP-2022	115	PSCTSS-5000	Below
23-JAN-2023	143	PSFWHM-5000	Below
23-JAN-2023	143	PSCENTRD-5000	Below
23-JAN-2023	143	PSCTSS-5000	Below
23-JAN-2023	144	Second Check Required for D	
23-JAN-2023	156	PSENERGY-5000	Above
23-JAN-2023	161	PSFWHM-5000	Above
23-JAN-2023	171	PSENERGY-5000	Above
23-JAN-2023	171	PSCENTRD-5000	Above
23-JAN-2023	173	PSCTSS-5000	Below
23-JAN-2023	175	PSFWHM-5000	Below
23-JAN-2023	175	PSCTSS-5000	Below
23-JAN-2023	177	PSCTSS-5000	Below
23-JAN-2023	193	PSCTSS-5000	Below
28-NOV-2020	198	PSFWHM-5000	Below
28-NOV-2020	198	PSCTSS-5000	Below
23-JAN-2023	217	PSENERGY-5000	Above
23-JAN-2023	219	PSENERGY-5000	Above
24-OCT-2021	221	PSENERGY-5000	Below
24-OCT-2021	221	PSCTSS-5000	Below
15-FEB-2021	227	PSFWHM-5000	Below

15-FEB-2021	227	PSCTSS-5000	Below
20-APR-2021	228	PSENERGY-5000	Below
20-APR-2021	228	PSCTSS-5000	Below

The following detectors that may not have properly transfered to the QA file

115	may not have run since 23-JAN-2023
116	may not have run since 23-JAN-2023
119	may not have run since 23-JAN-2023
120	may not have run since 23-JAN-2023
137	may not have run since 23-JAN-2023
145	may not have run since 23-JAN-2023
146	may not have run since 23-JAN-2023
147	may not have run since 23-JAN-2023
148	may not have run since 23-JAN-2023
183	may not have run since 23-JAN-2023
184	may not have run since 23-JAN-2023
198	may not have run since 23-JAN-2023
221	may not have run since 23-JAN-2023
227	may not have run since 23-JAN-2023
228	may not have run since 23-JAN-2023
241	may not have run since 23-JAN-2023
242	may not have run since 23-JAN-2023
247	may not have run since 23-JAN-2023
248	may not have run since 23-JAN-2023

APPROVAL DATE: 1/23/23

APPROVAL TIME: 23:30

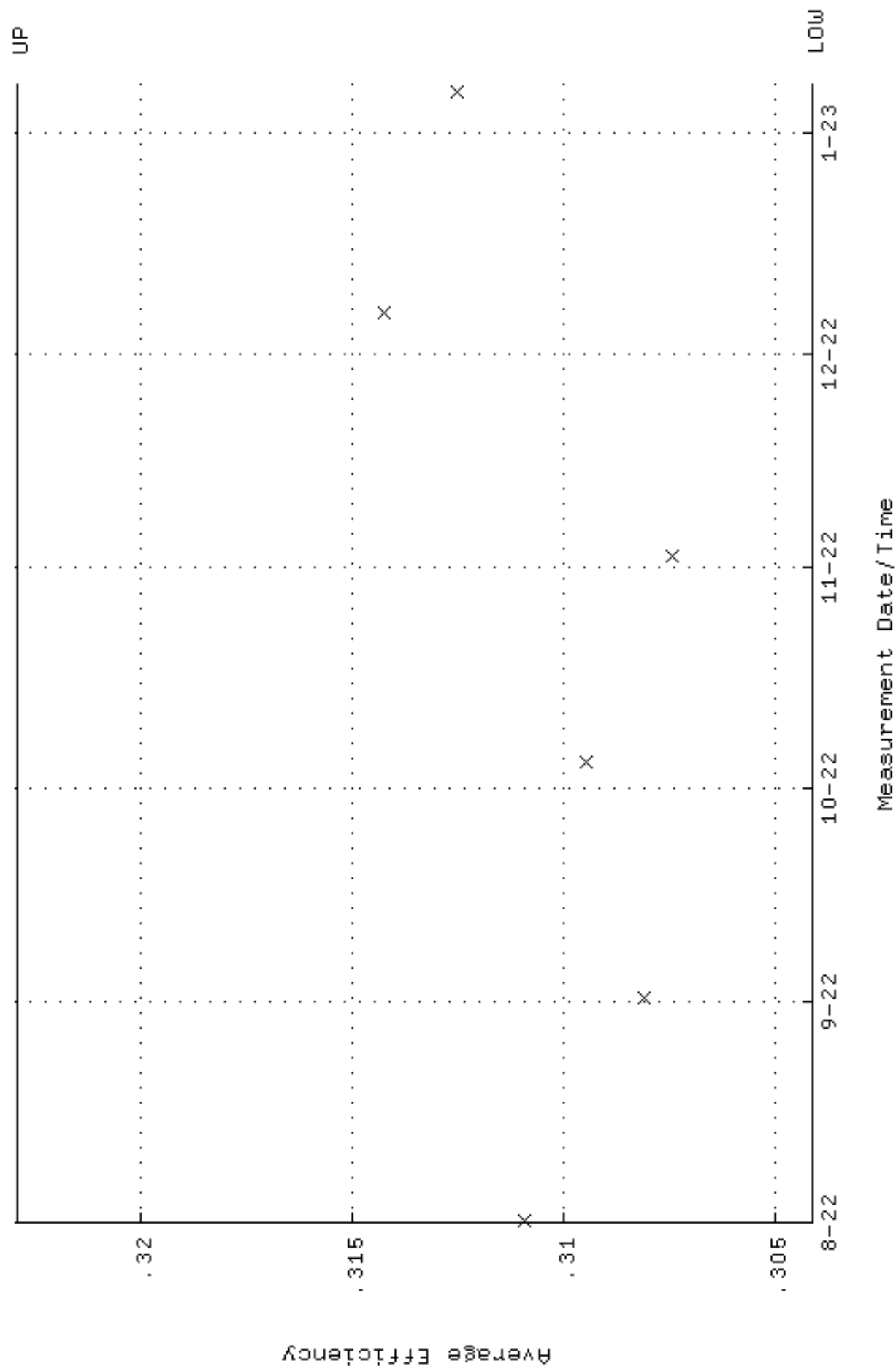
APPROVED BY: 

PROCEDURE # GL-RAD-I-009

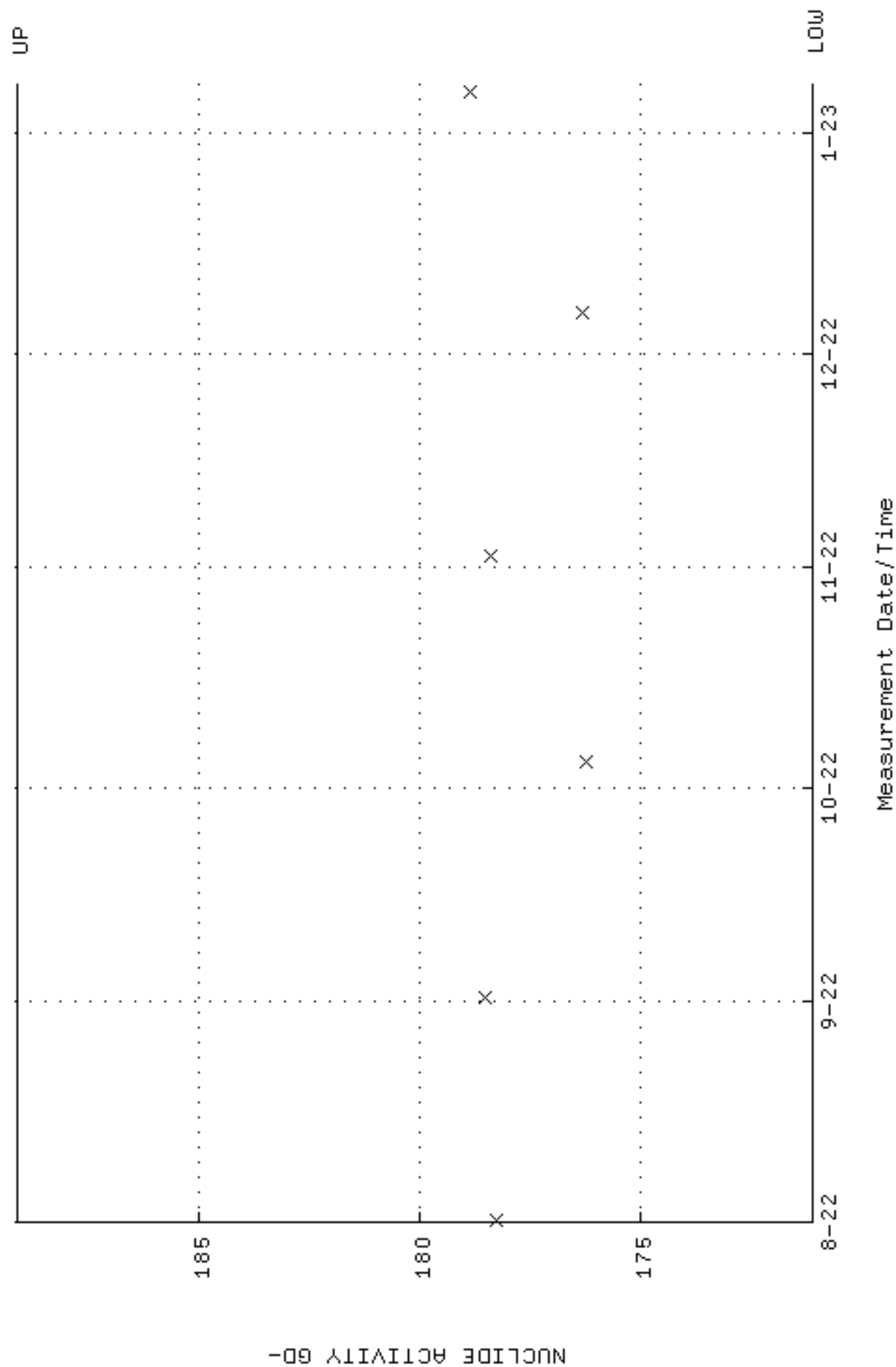
Report completed at 23-JAN-2023 23:02:31.63

Background and Efficiency Data

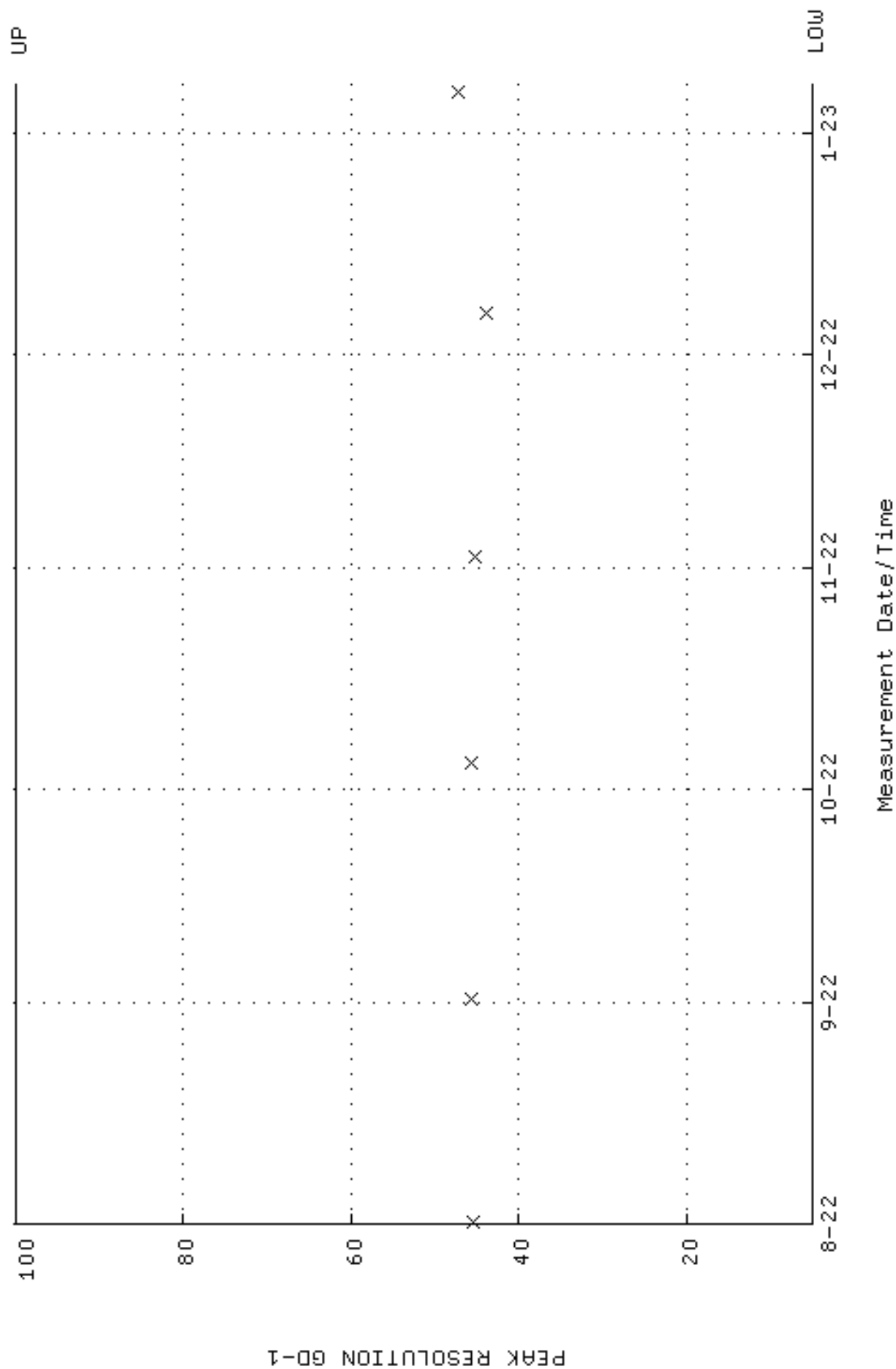
QA filename : DKA100:[ENV_ALPHA.QA.W]W024.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 1-AUG-2022 09:15:00 through 7-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.304118 through 0.322930



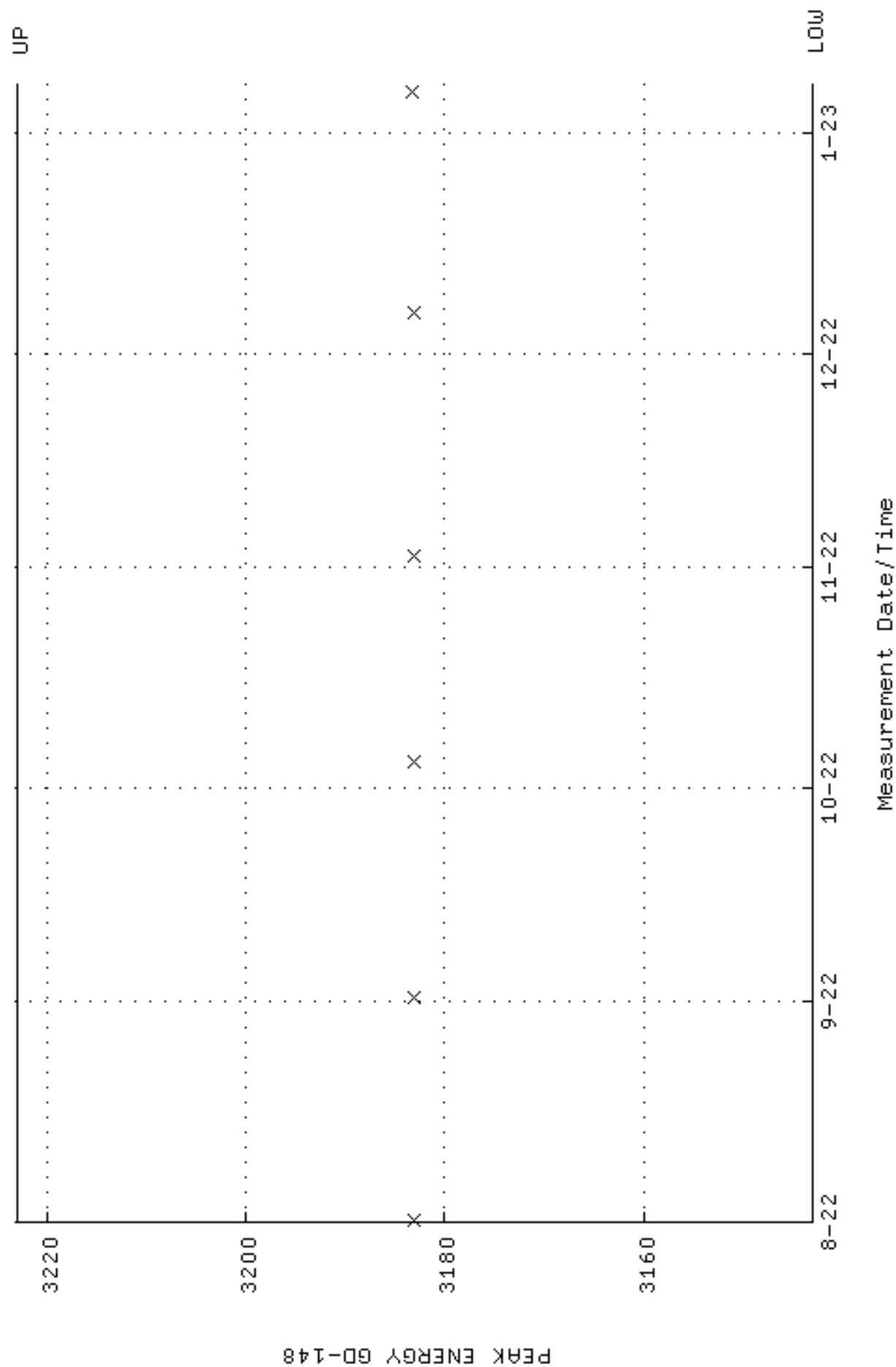
QA filename : DKA100:[ENV_ALPHA.QA.W]W024.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 1-AUG-2022 09:15:00 through 7-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



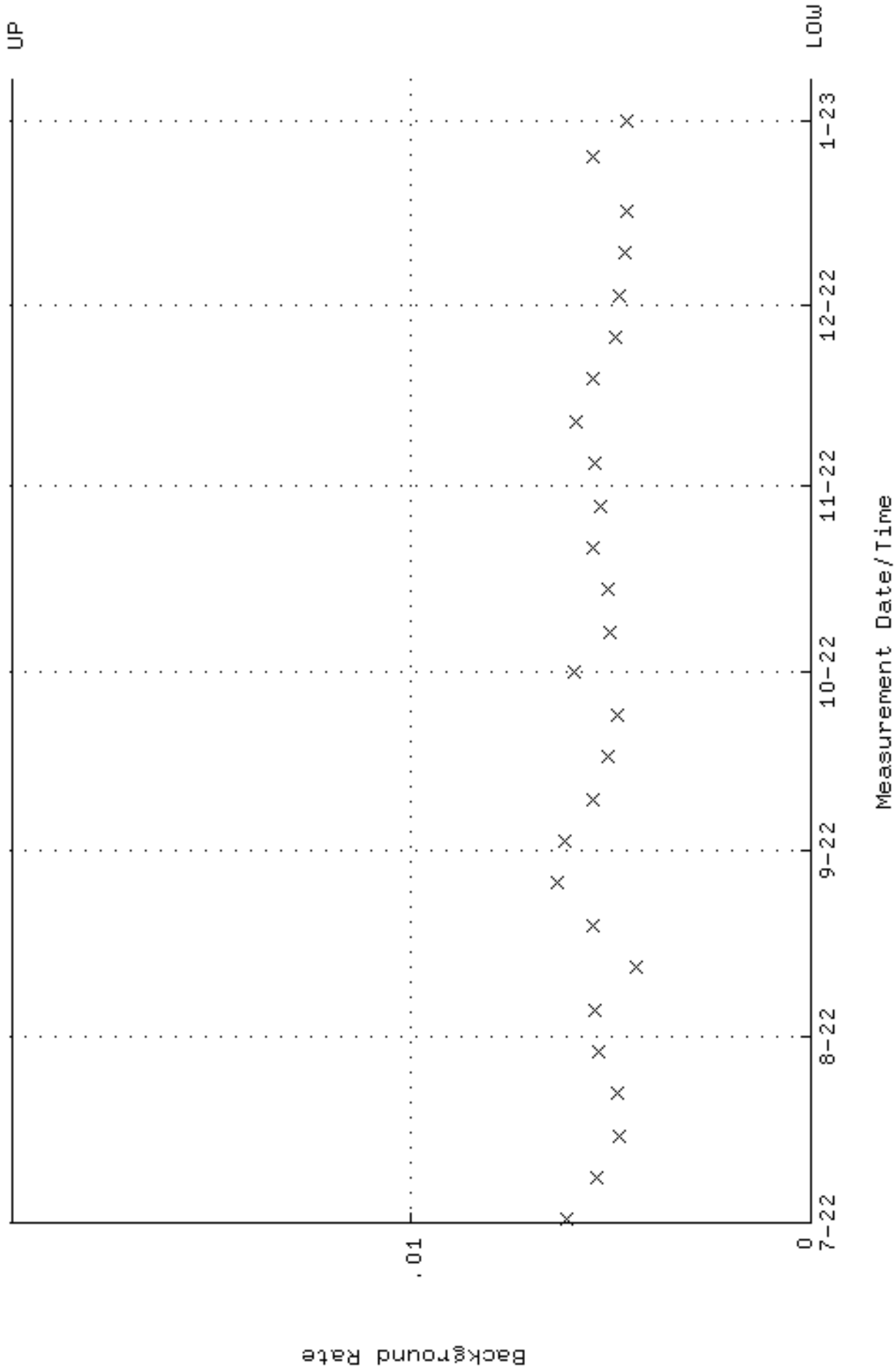
QA filename : DKA100:[ENV_ALPHA.QA.W]W024.QAF;4
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 1-AUG-2022 09:15:00 through 7-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



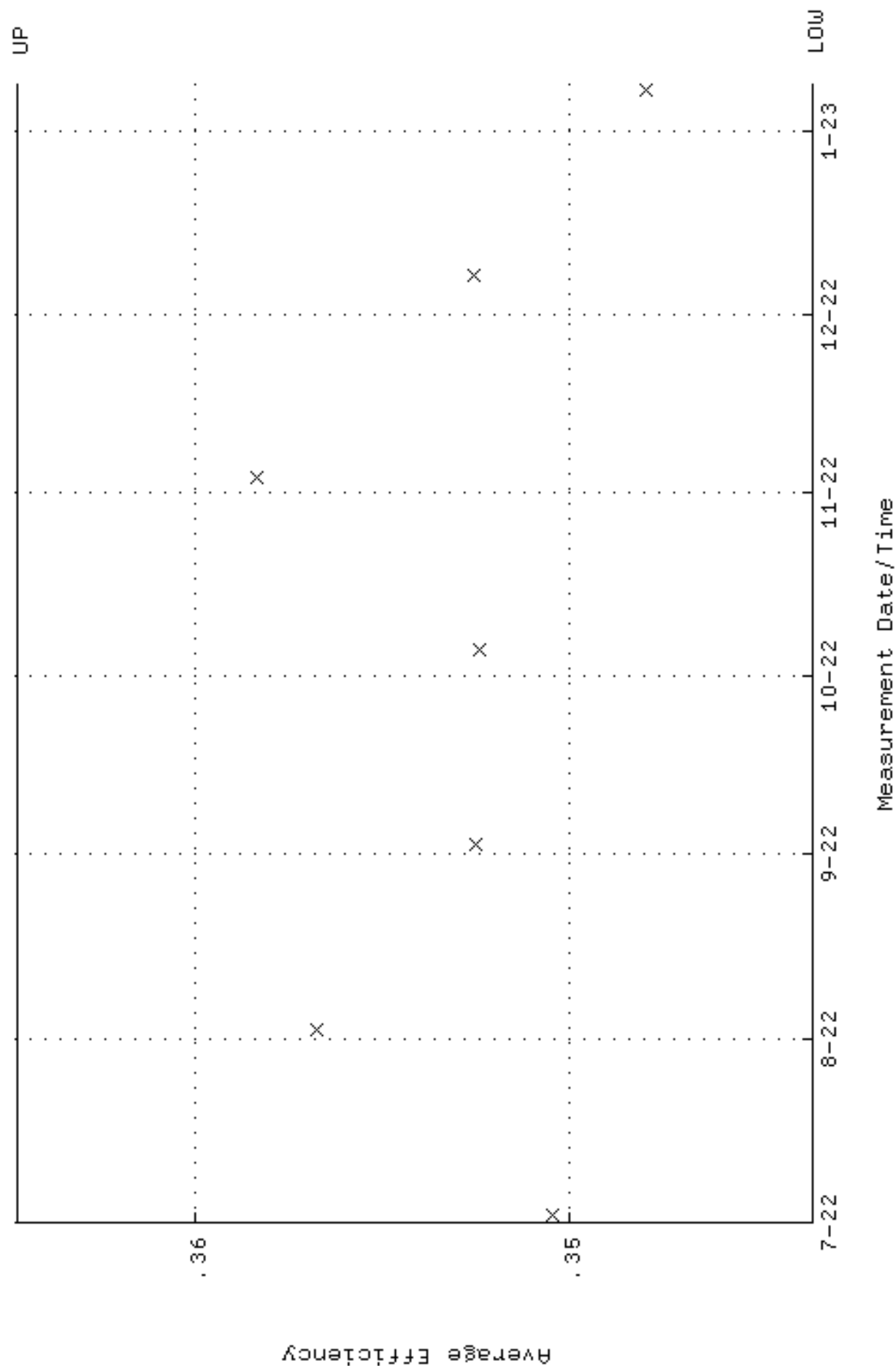
QA filename : DKA100:[ENV_ALPHA.QA.W]W024.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 1-AUG-2022 09:15:00 through 7-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



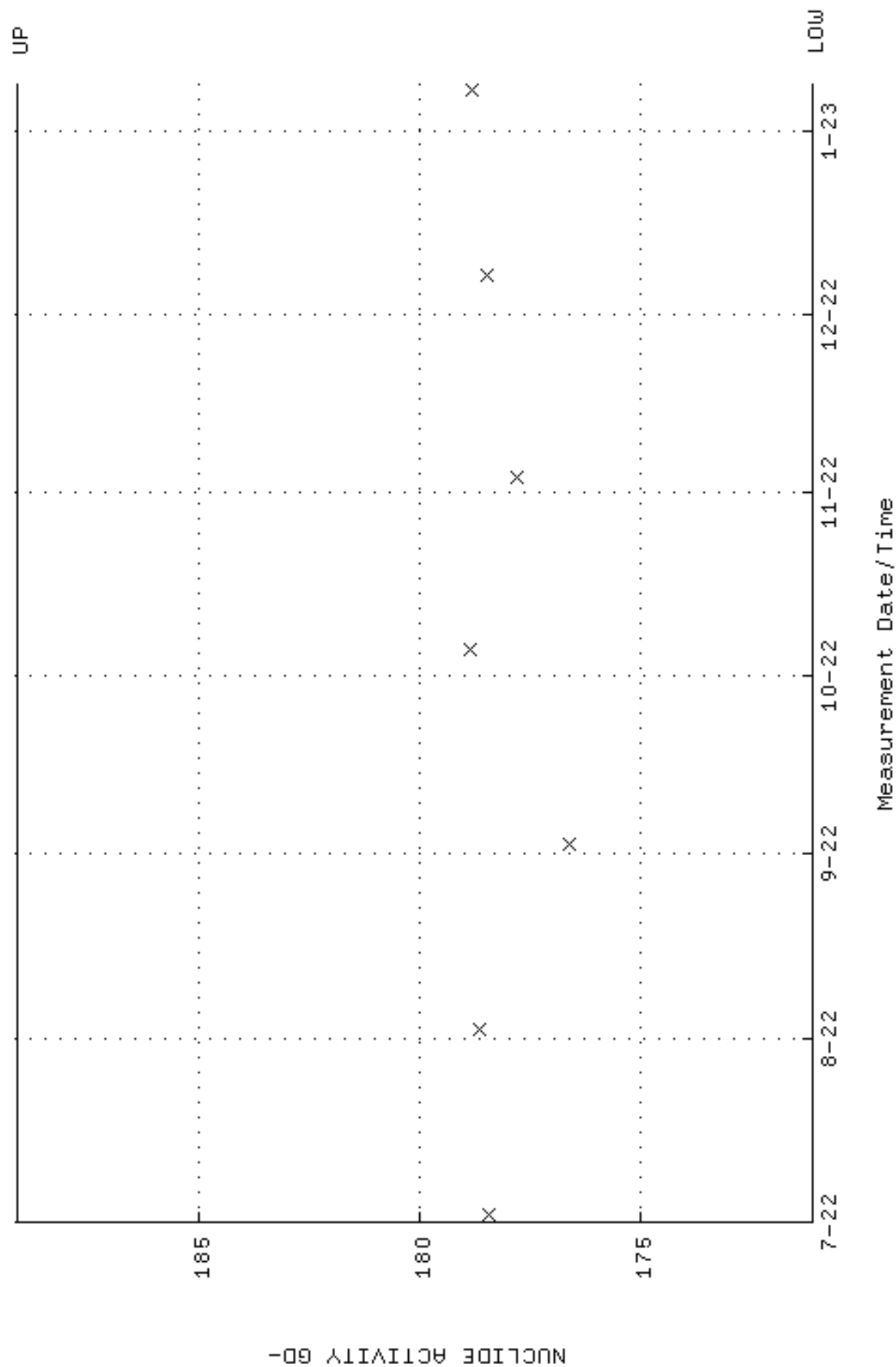
QA filename : DKA100:[ENV_ALPHA.QA.B]B024.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JUL-2022 12:30:08 through 7-JAN-2023 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



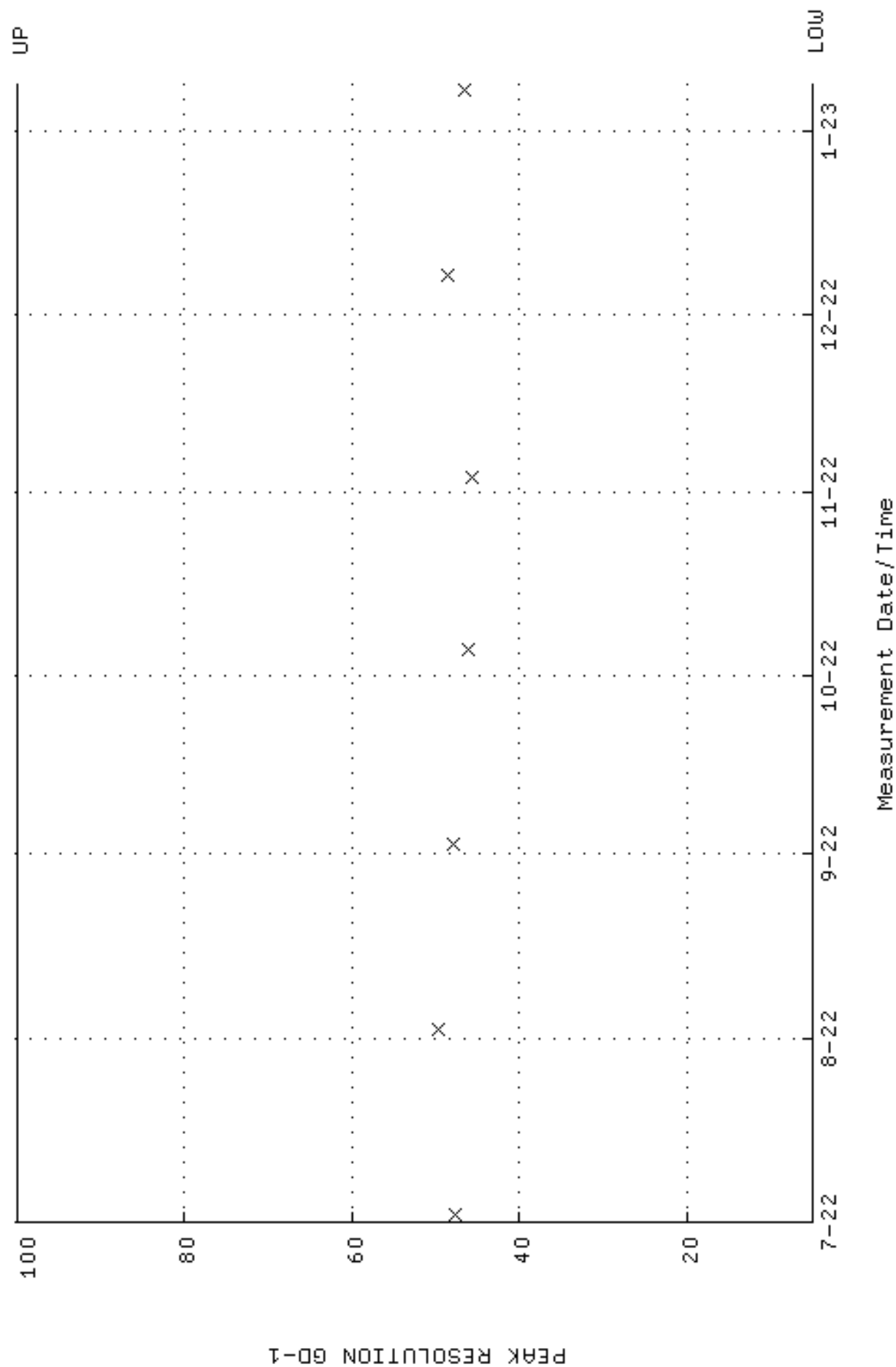
QA filename : DKA100:[ENV_ALPHA.QA.W]W026.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.343525 through 0.364774



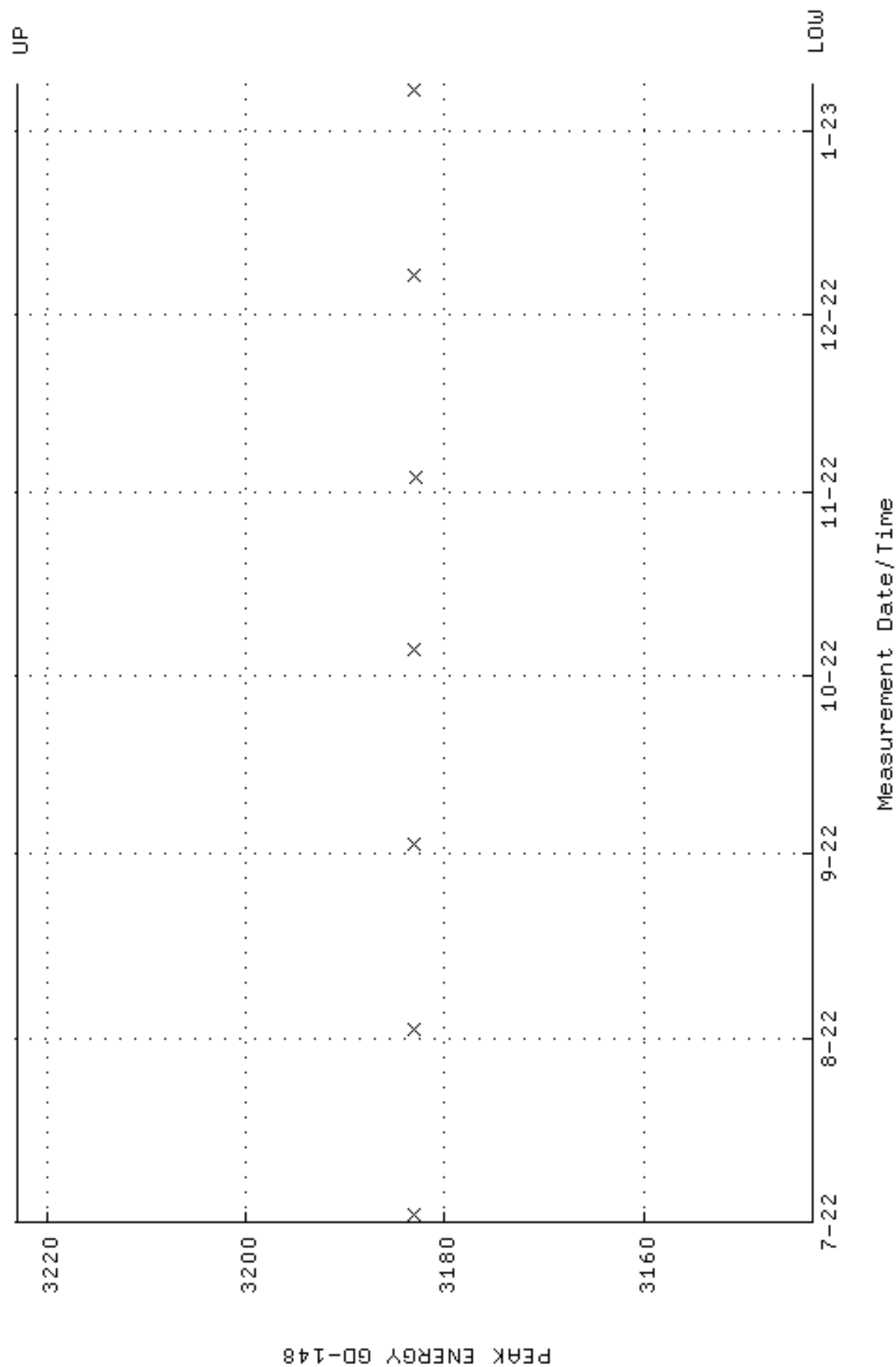
QA filename : DKA100:[ENV_ALPHA.QA.W]W026.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



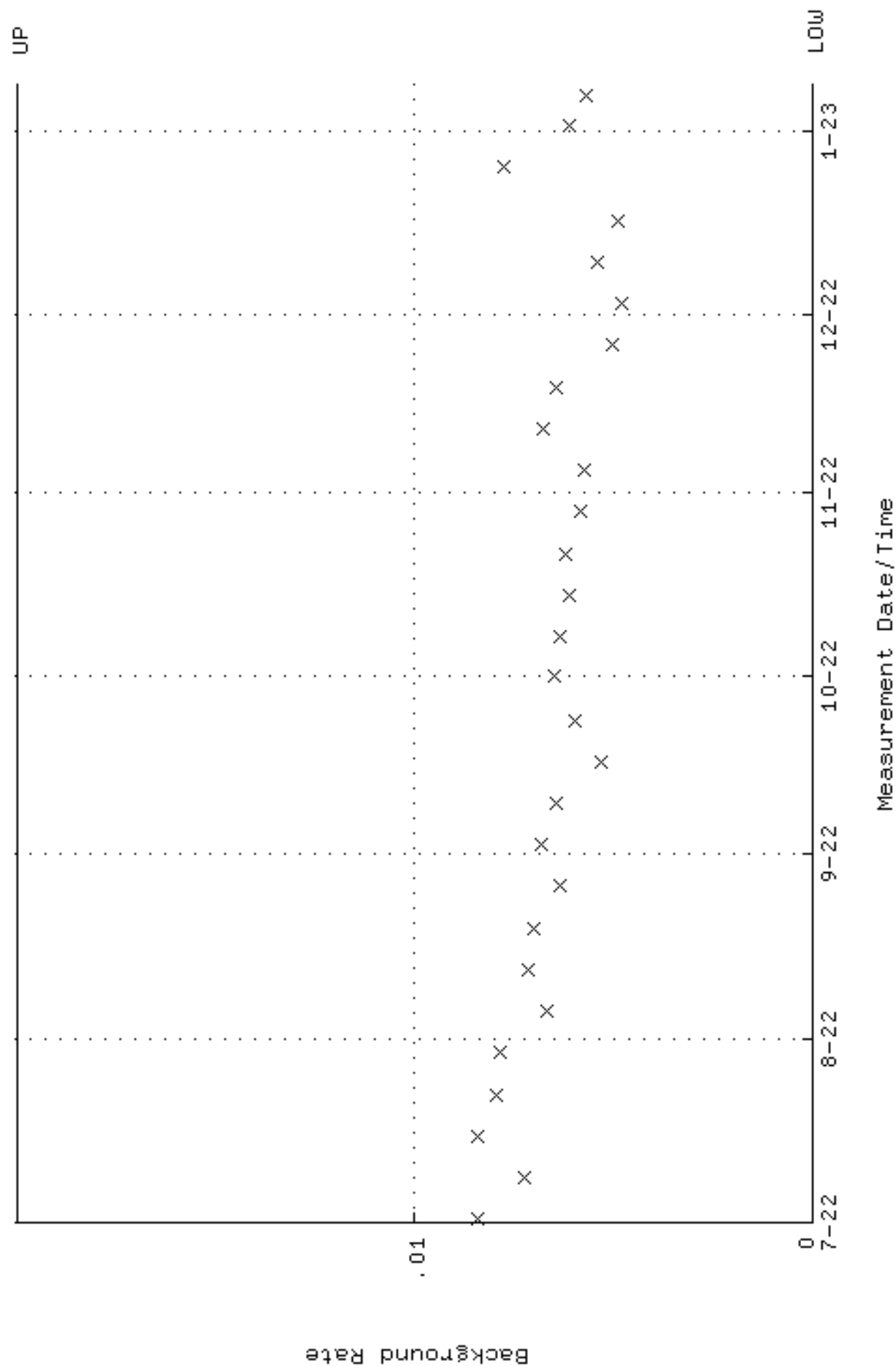
QA filename : DKA100:[ENV_ALPHA.QA.W]W026.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



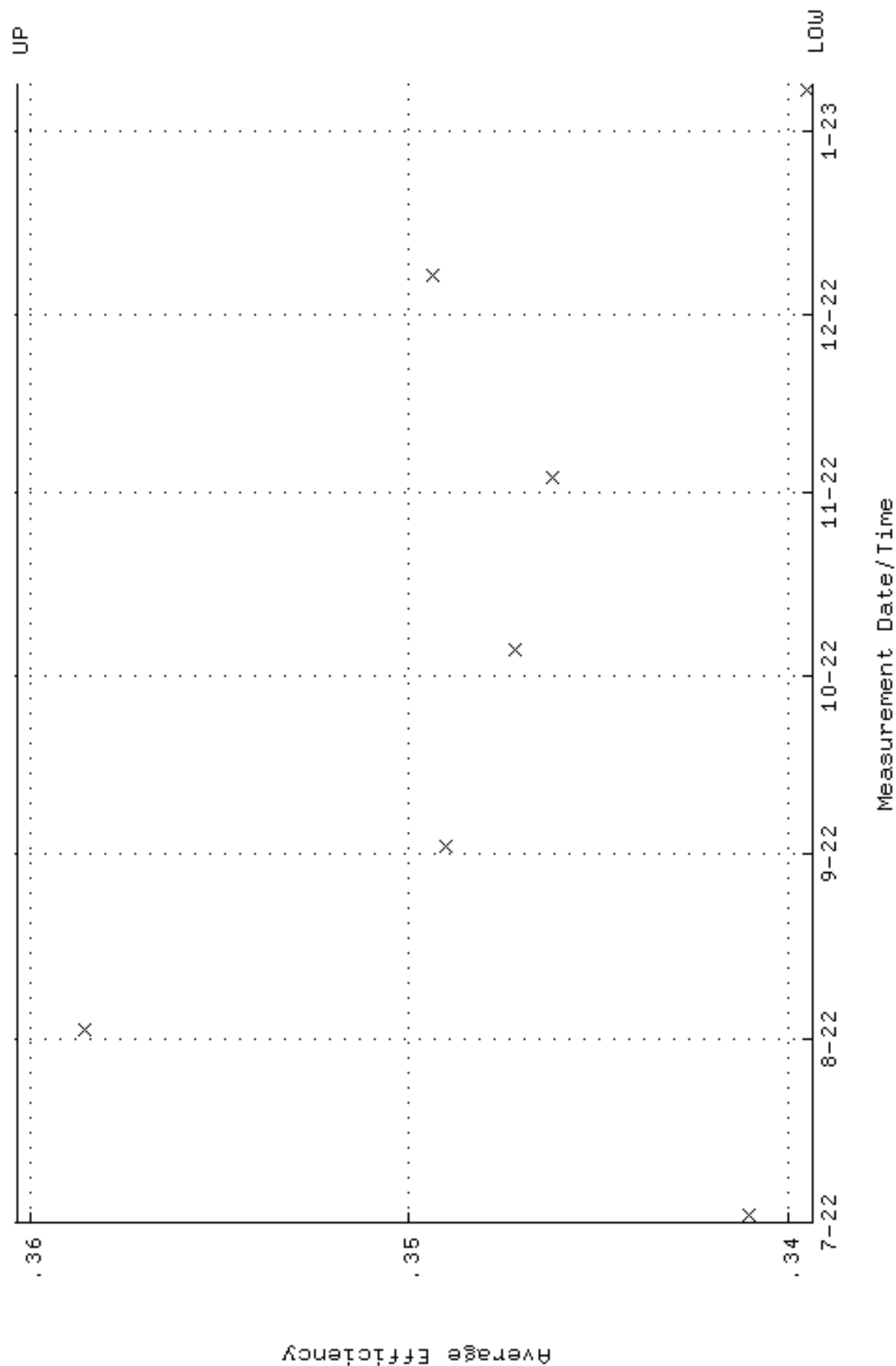
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



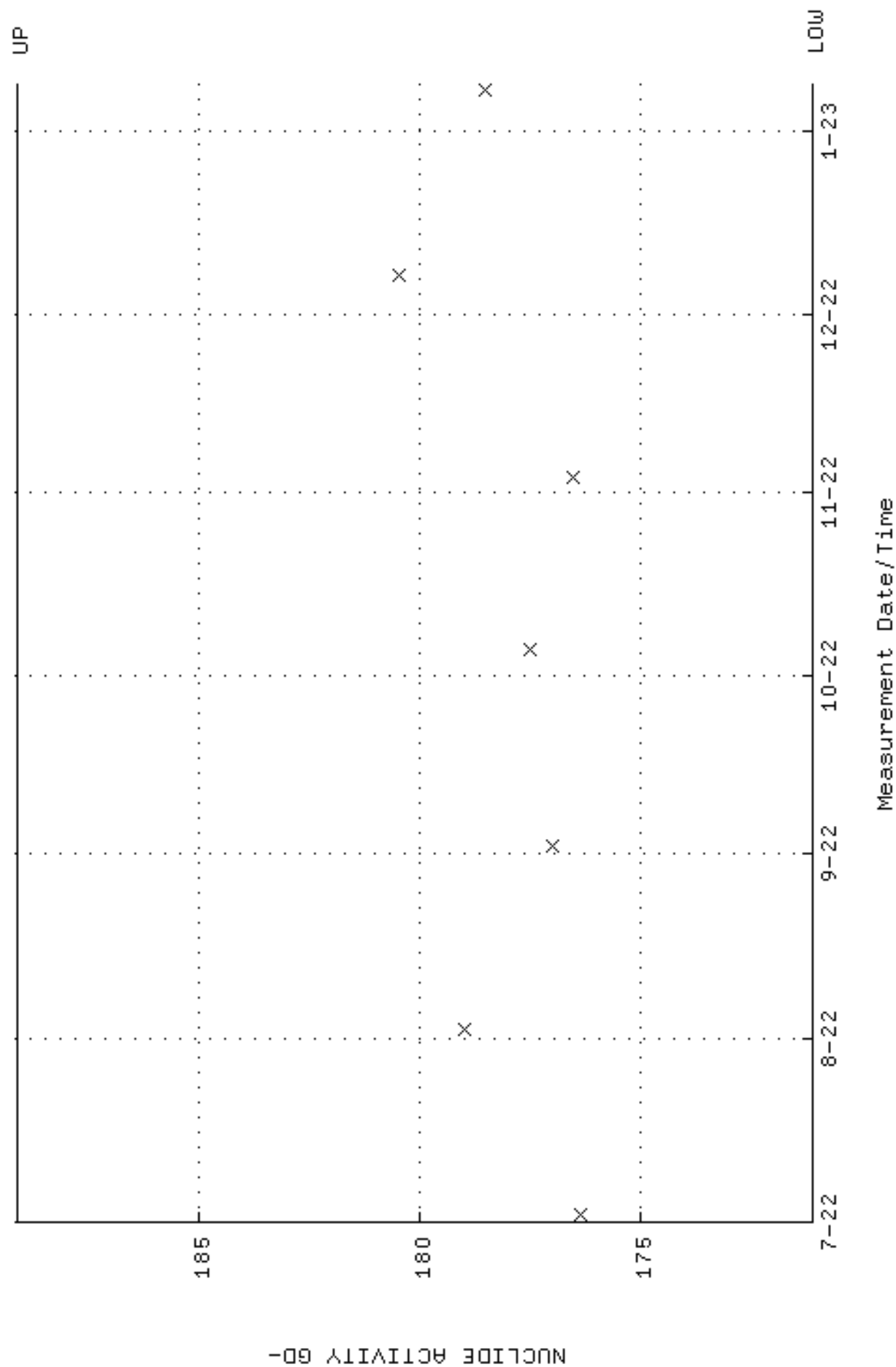
QA filename : DKA100:[ENV_ALPHA.QA.B]B026.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 12:46:03 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



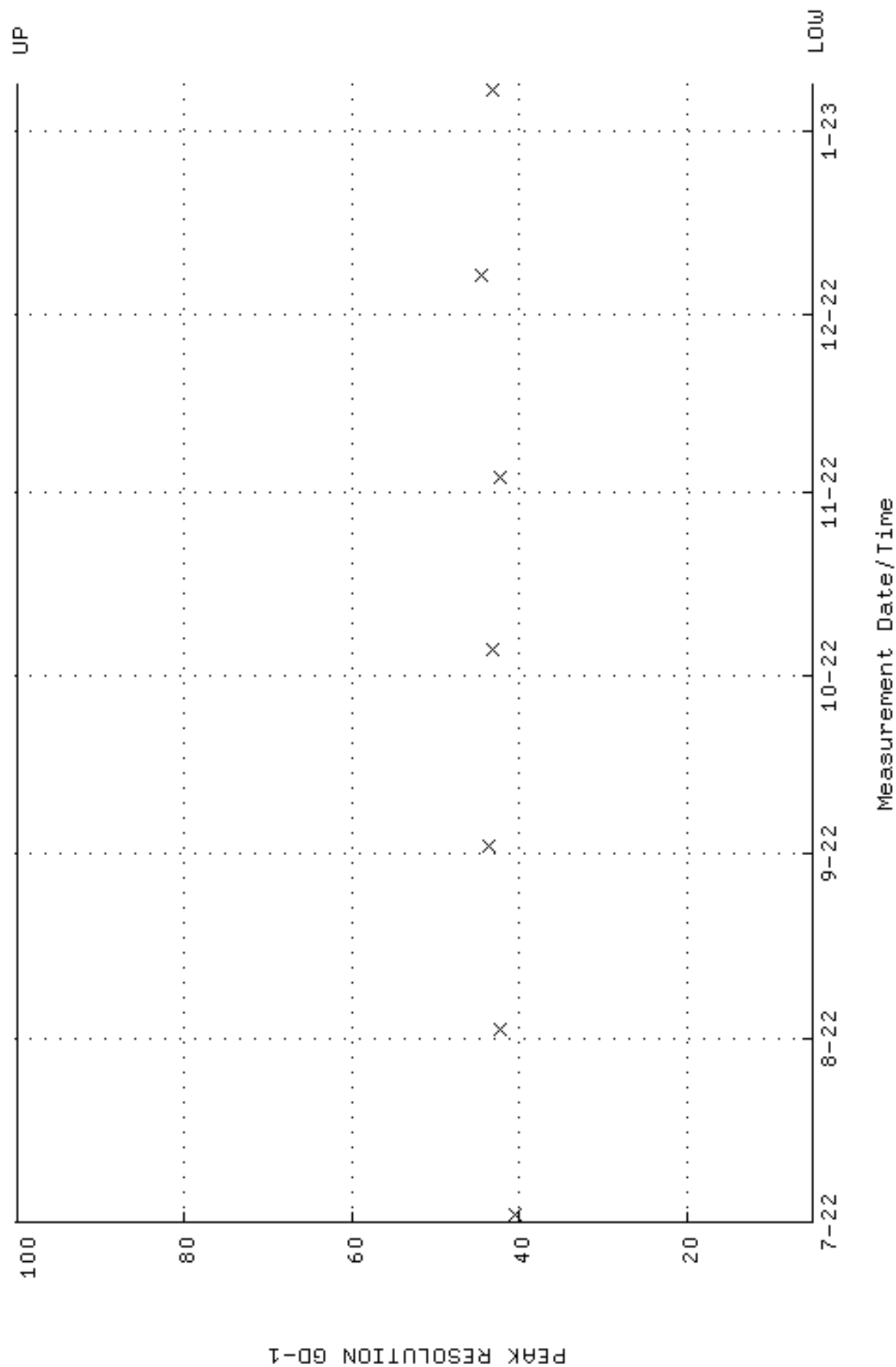
QA filename : DKA100:[ENV_ALPHA.QA.W]W027.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.339350 through 0.360340



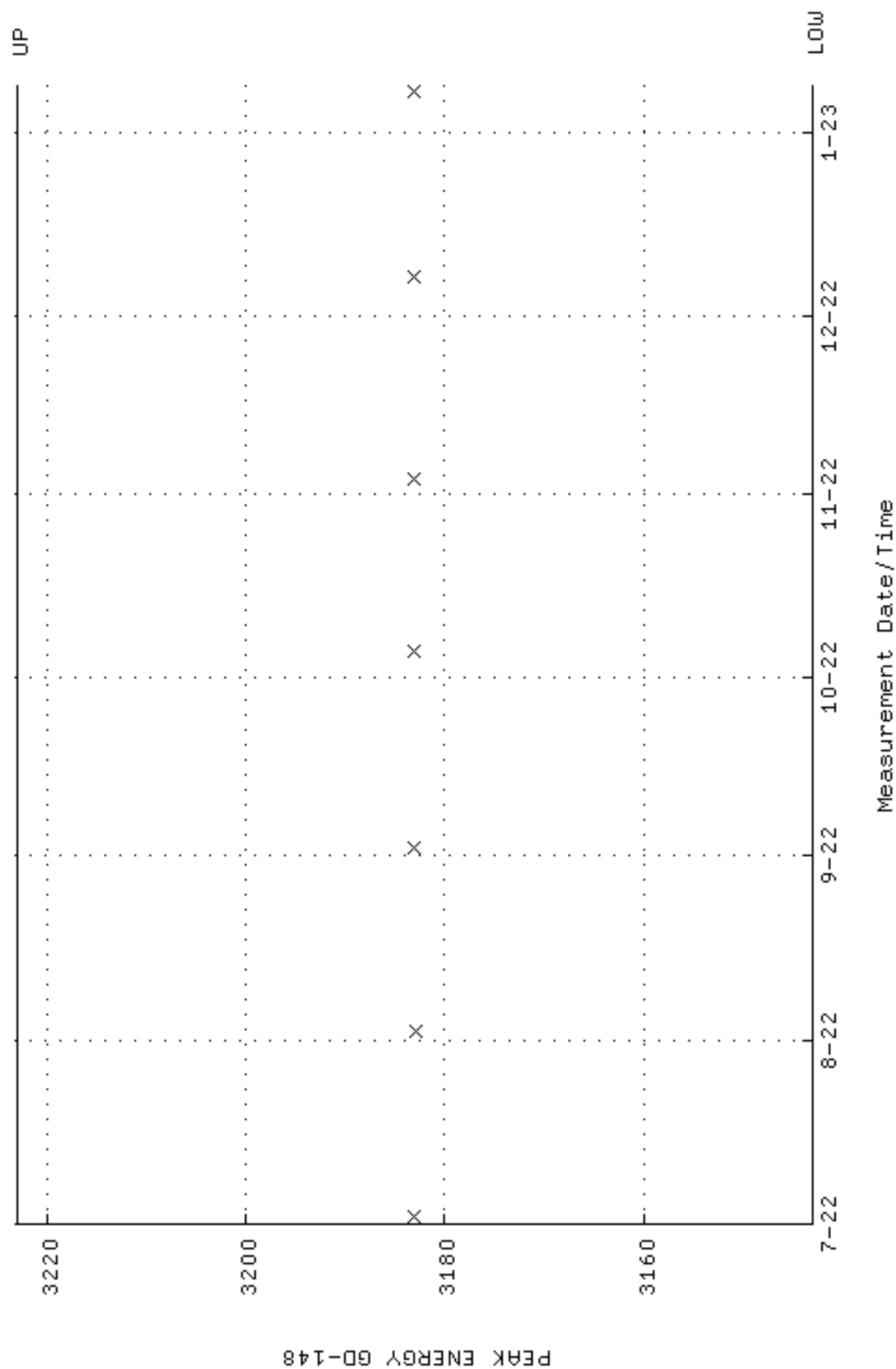
QA filename : DKA100:[ENV_ALPHA.QA.W]W027.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



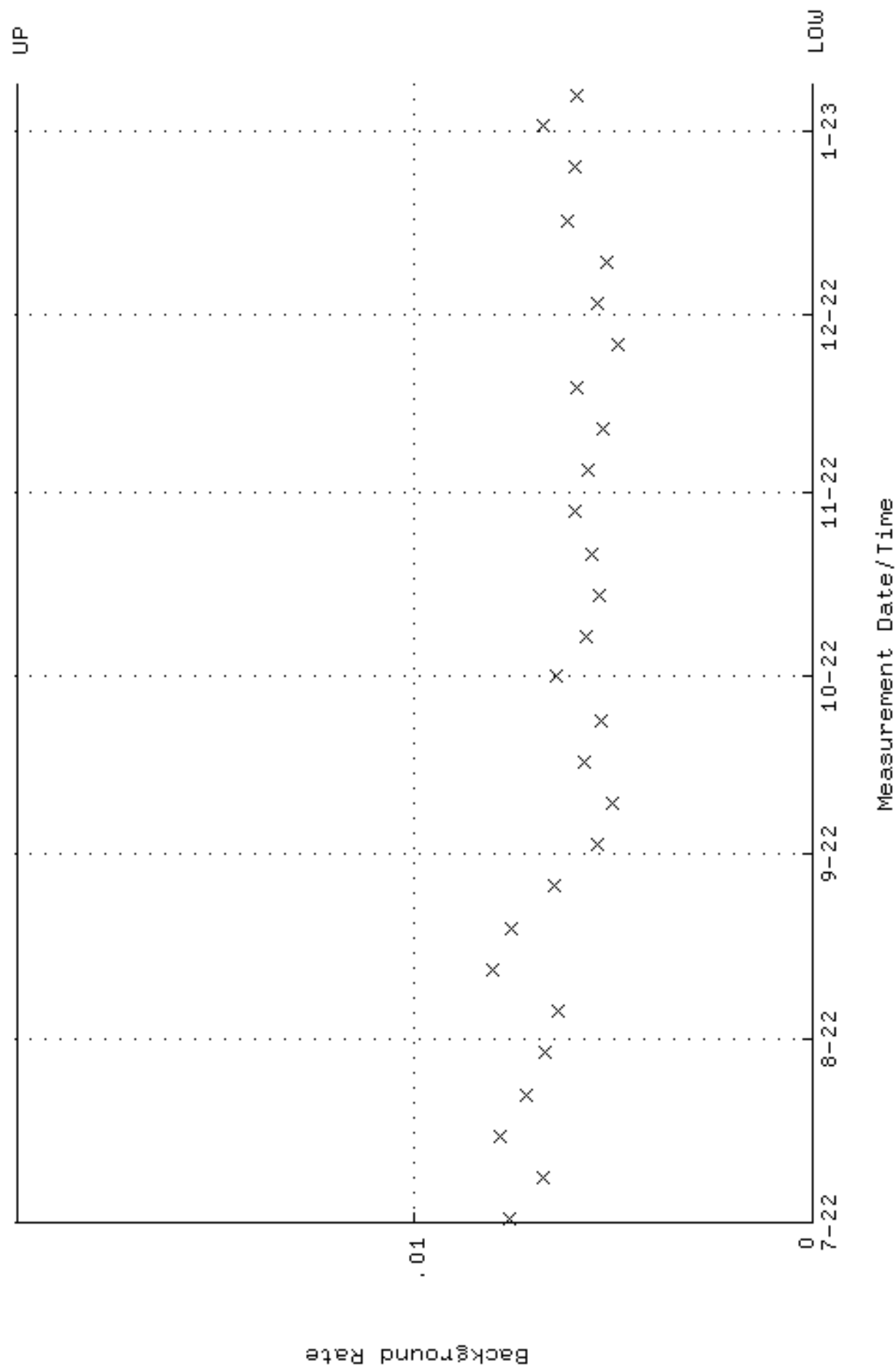
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



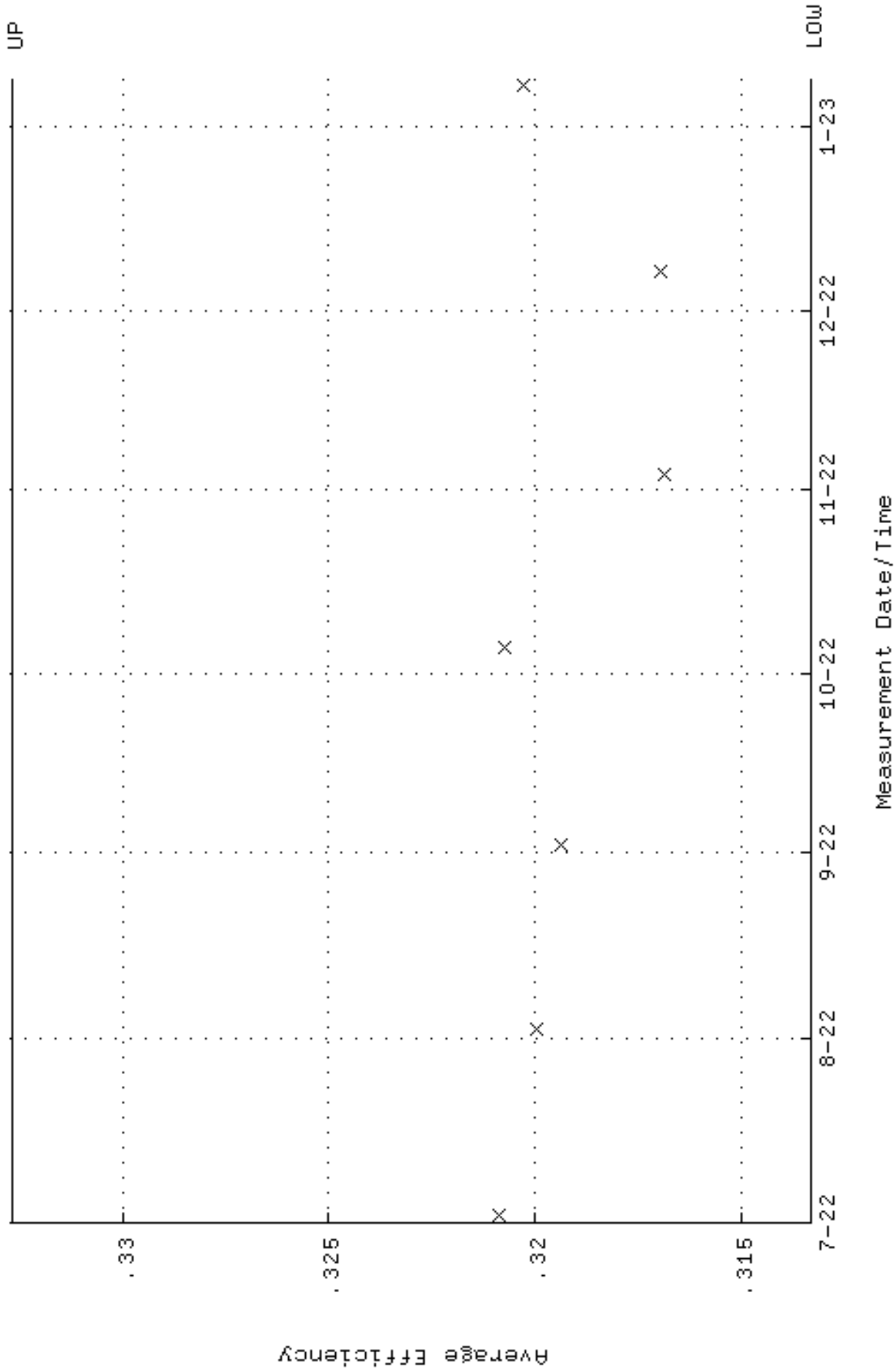
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



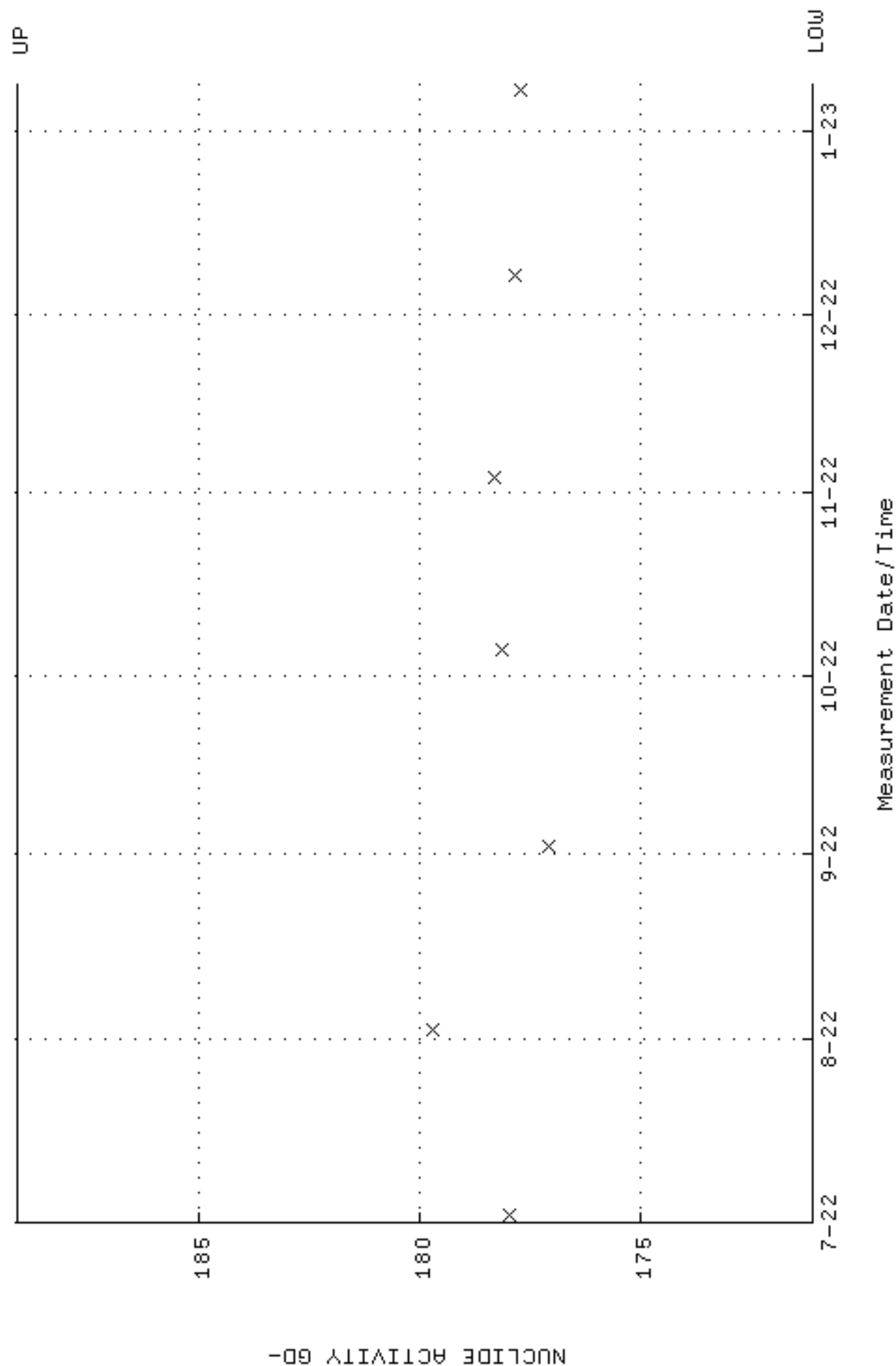
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 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 12:46:03 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



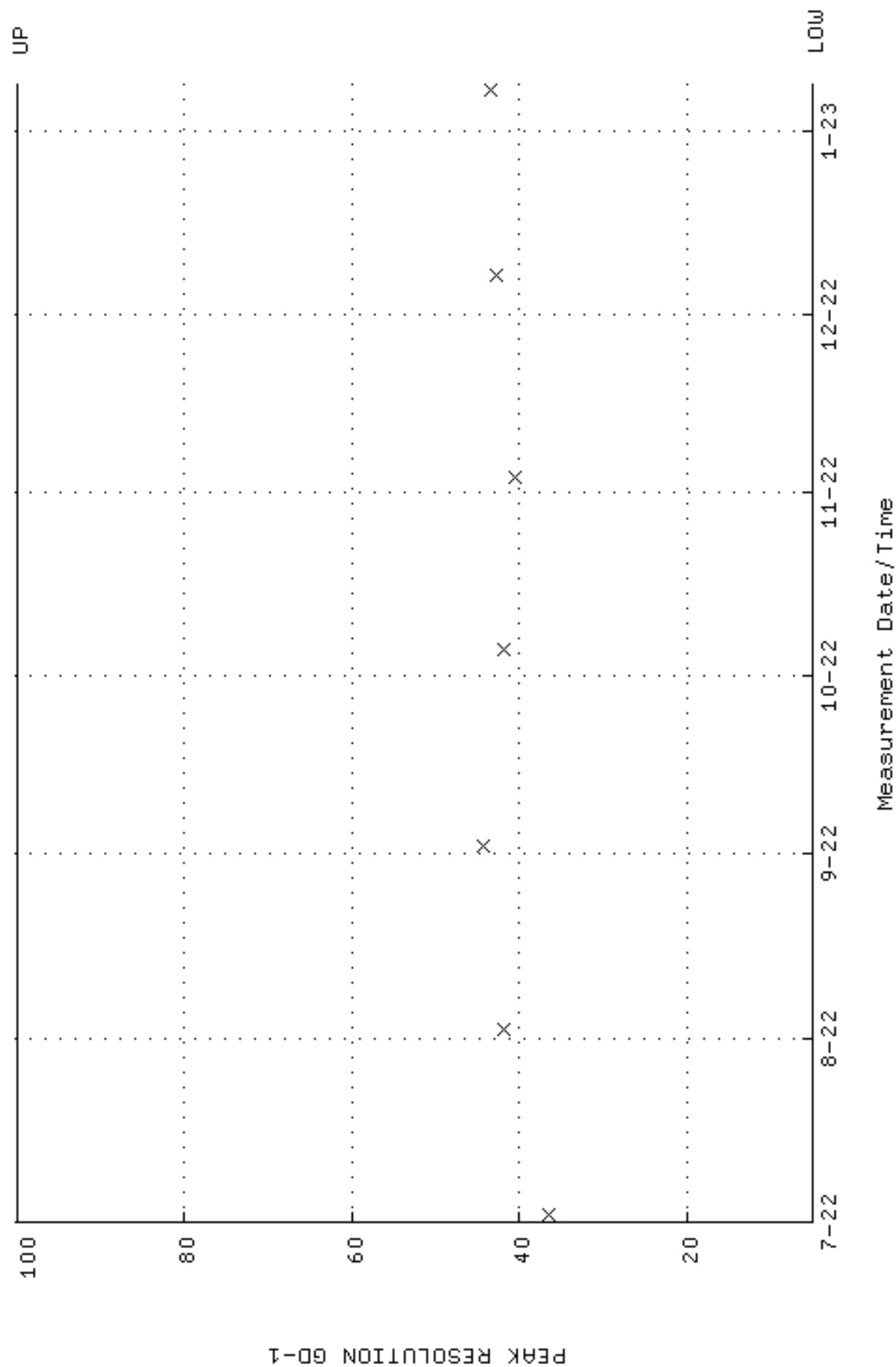
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Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
Lower/Upper Lmts: 0.313300 through 0.332680



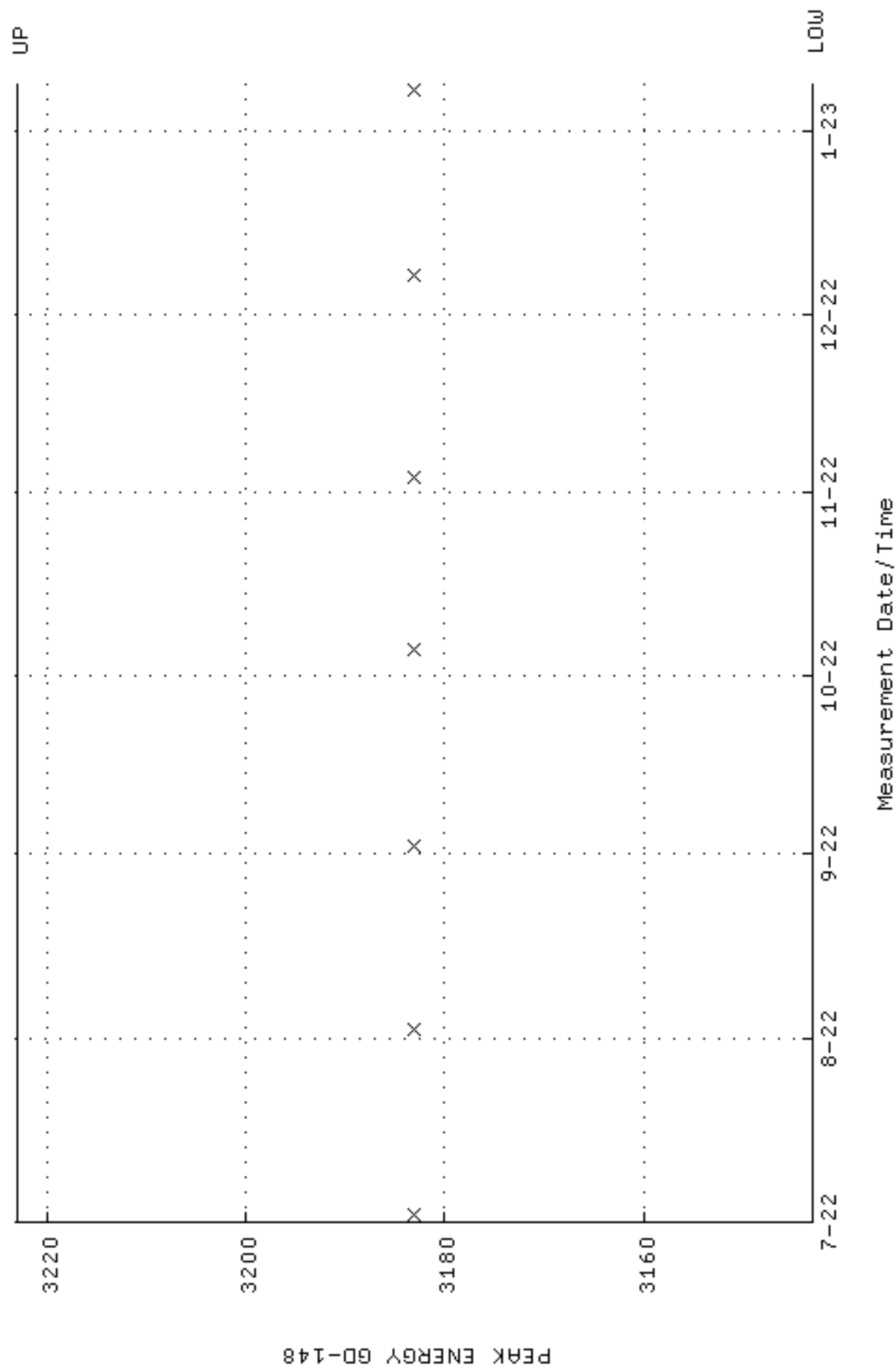
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



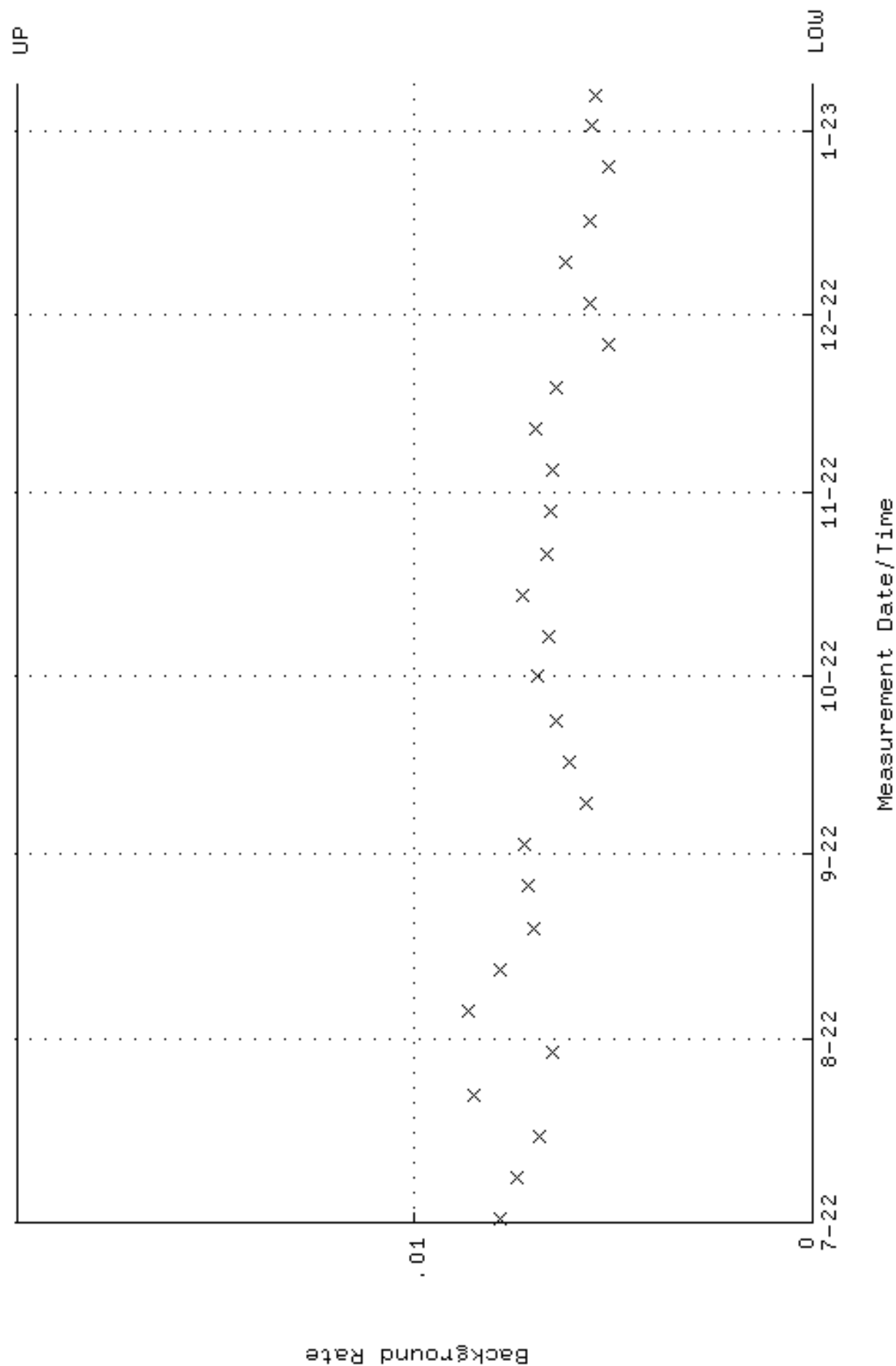
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



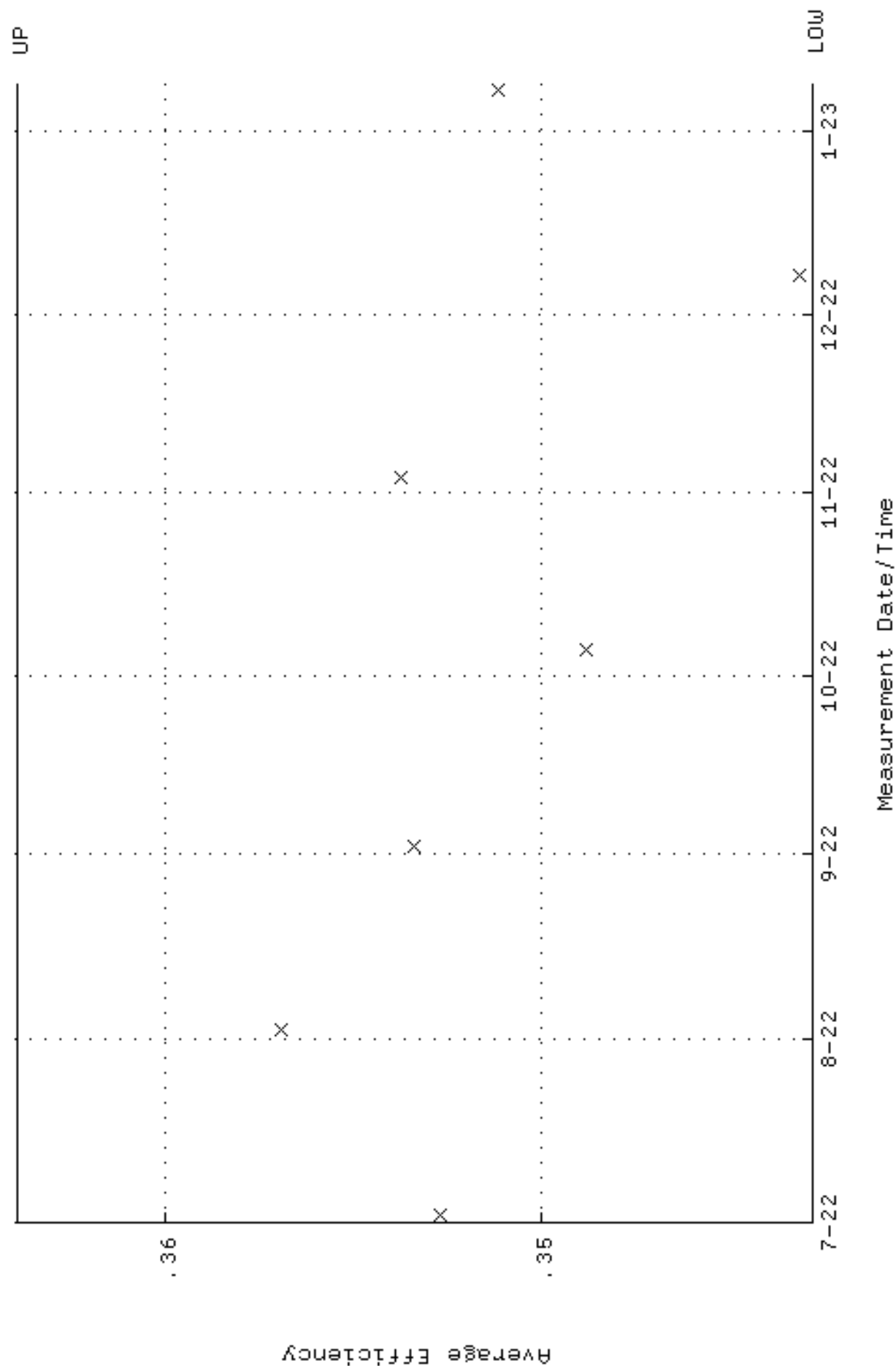
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 Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



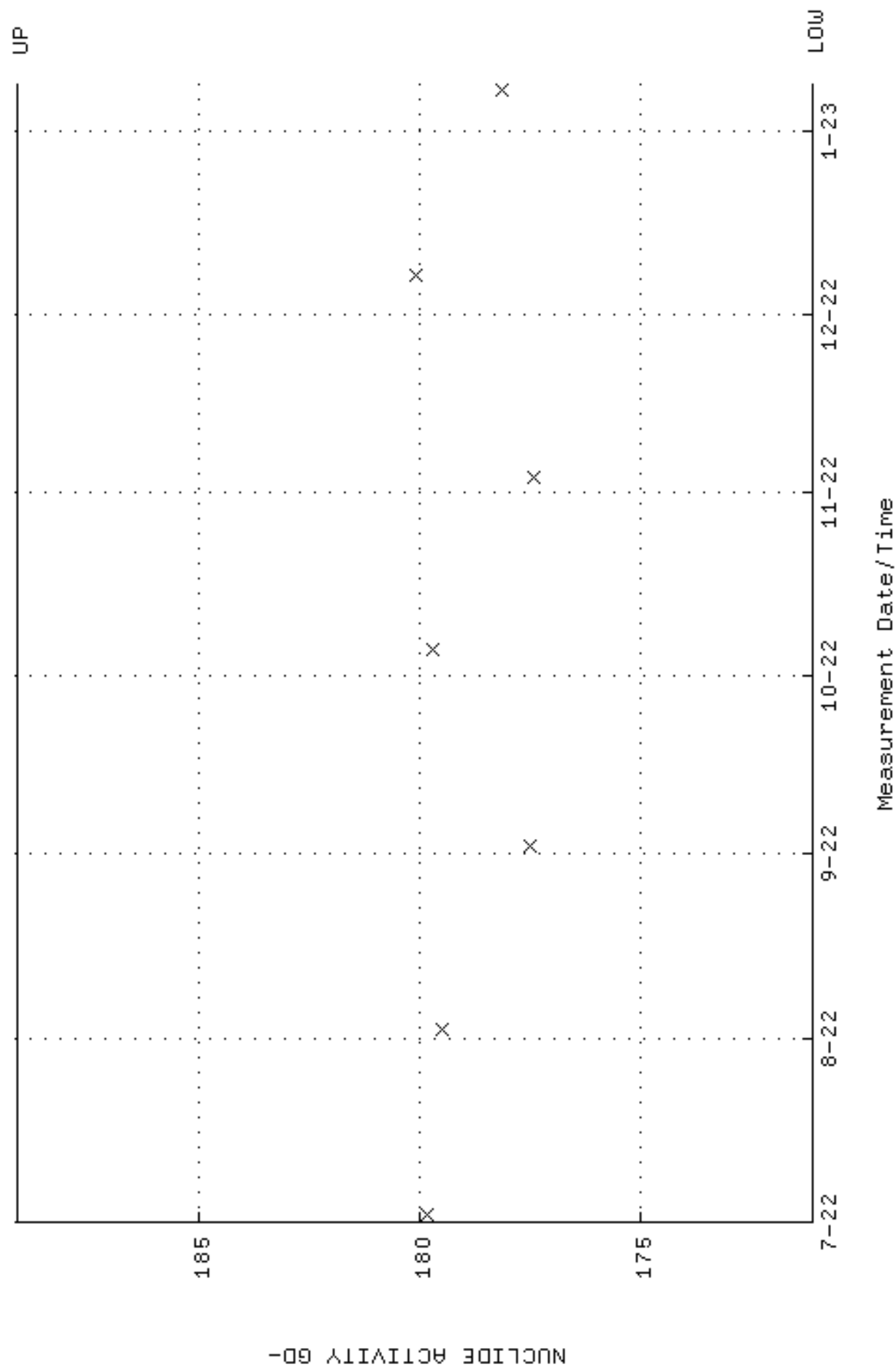
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 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 12:46:03 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



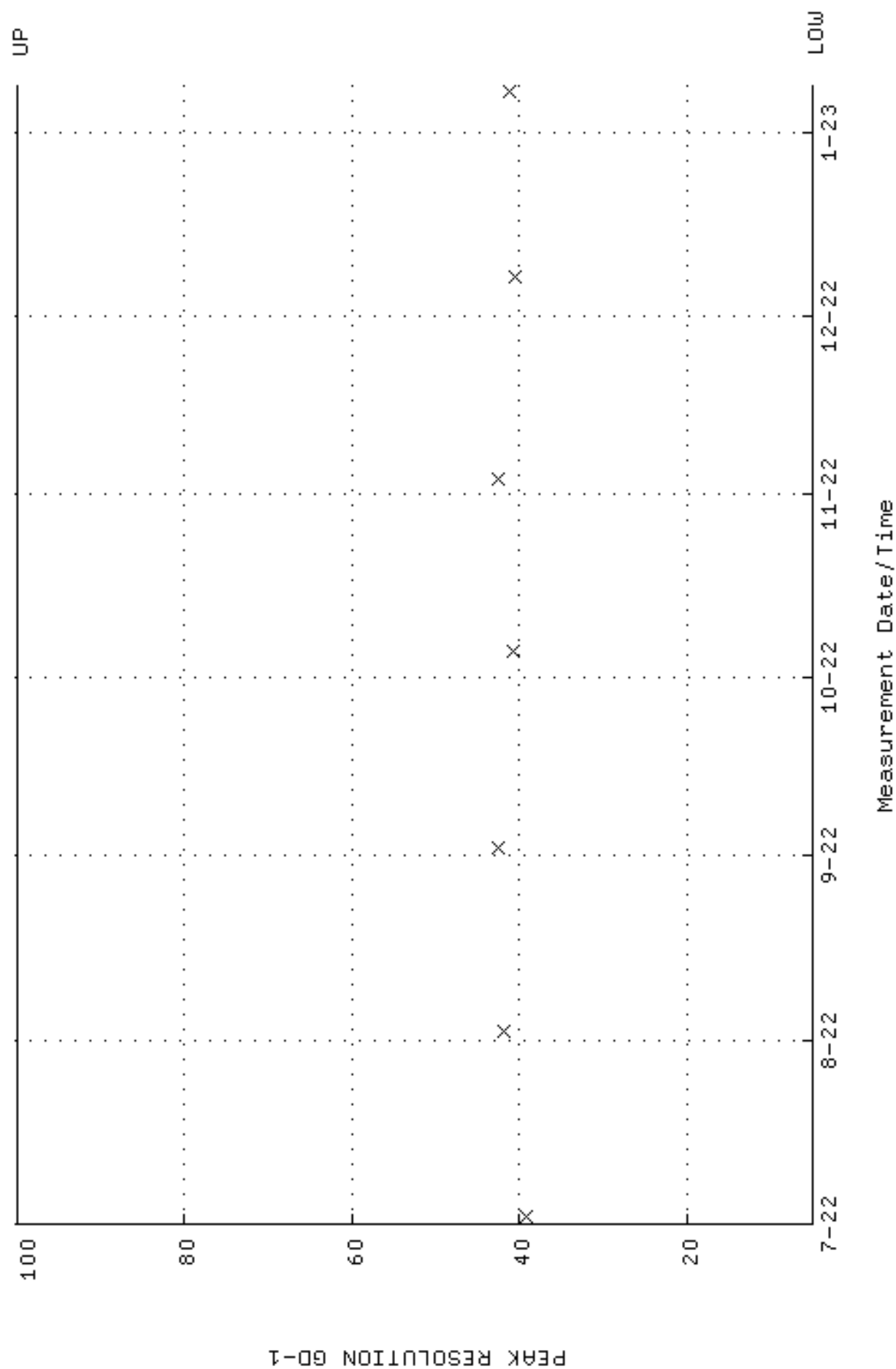
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.342750 through 0.363950



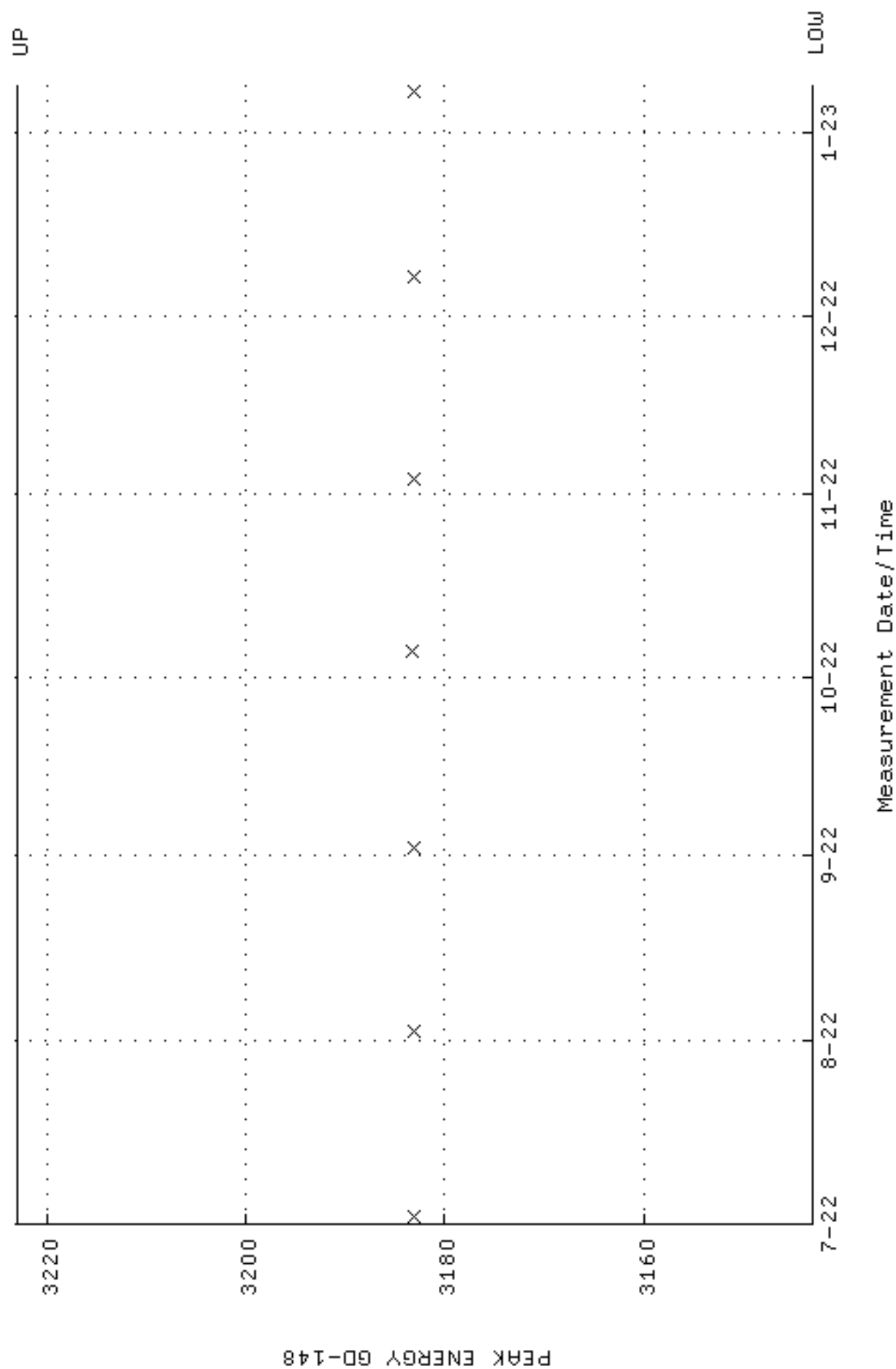
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



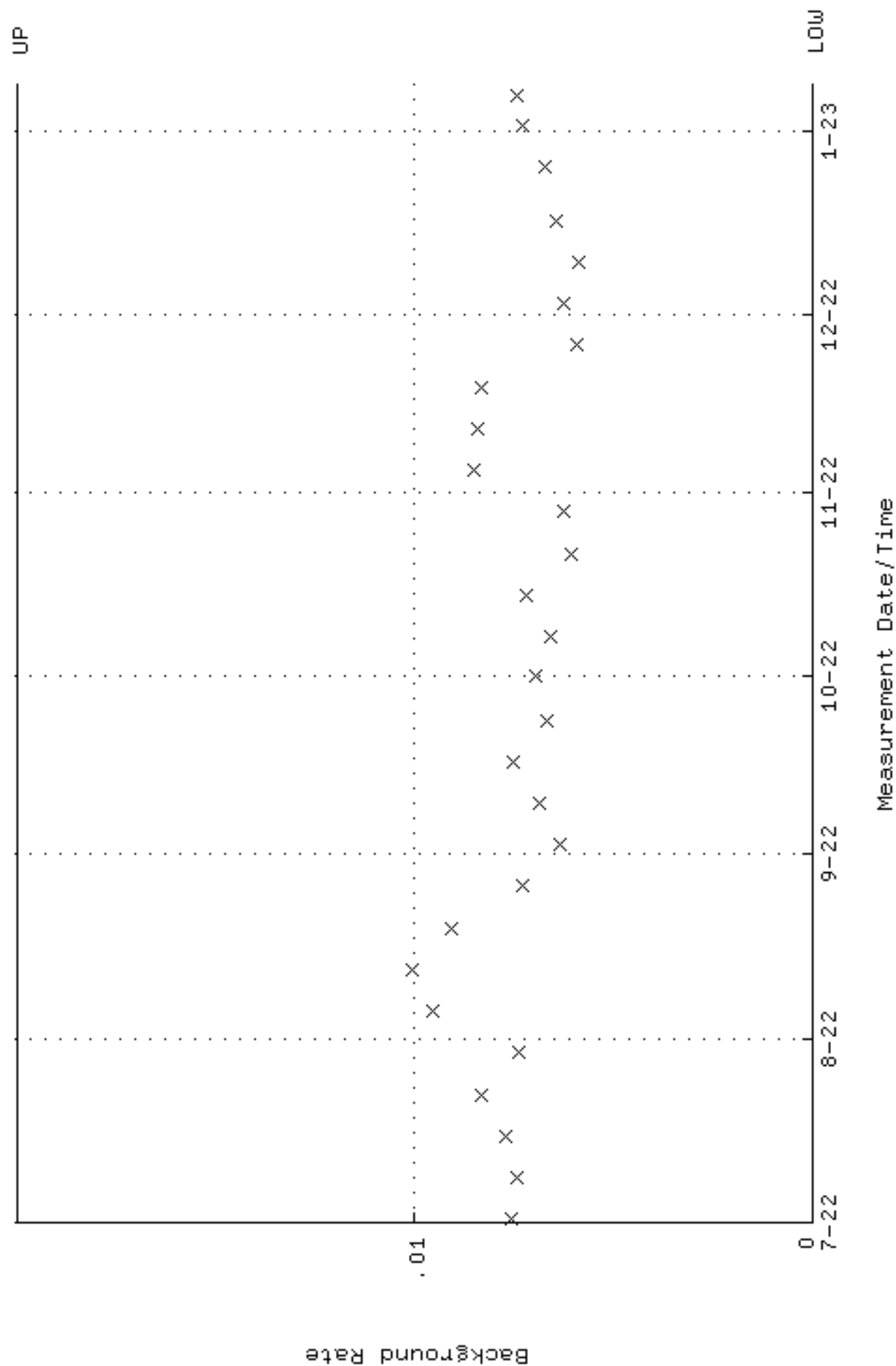
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Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



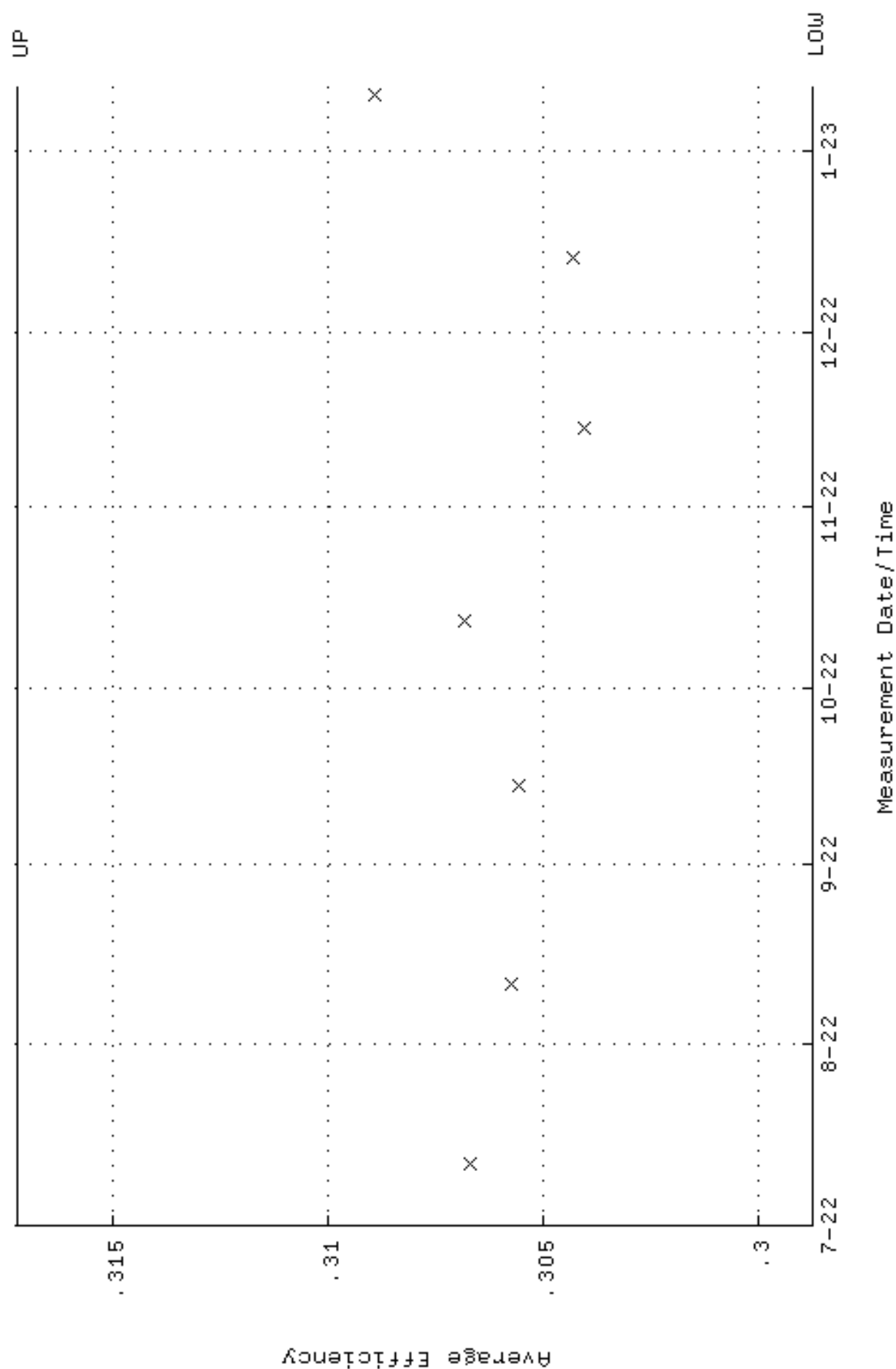
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 2-JUL-2022 08:10:42 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



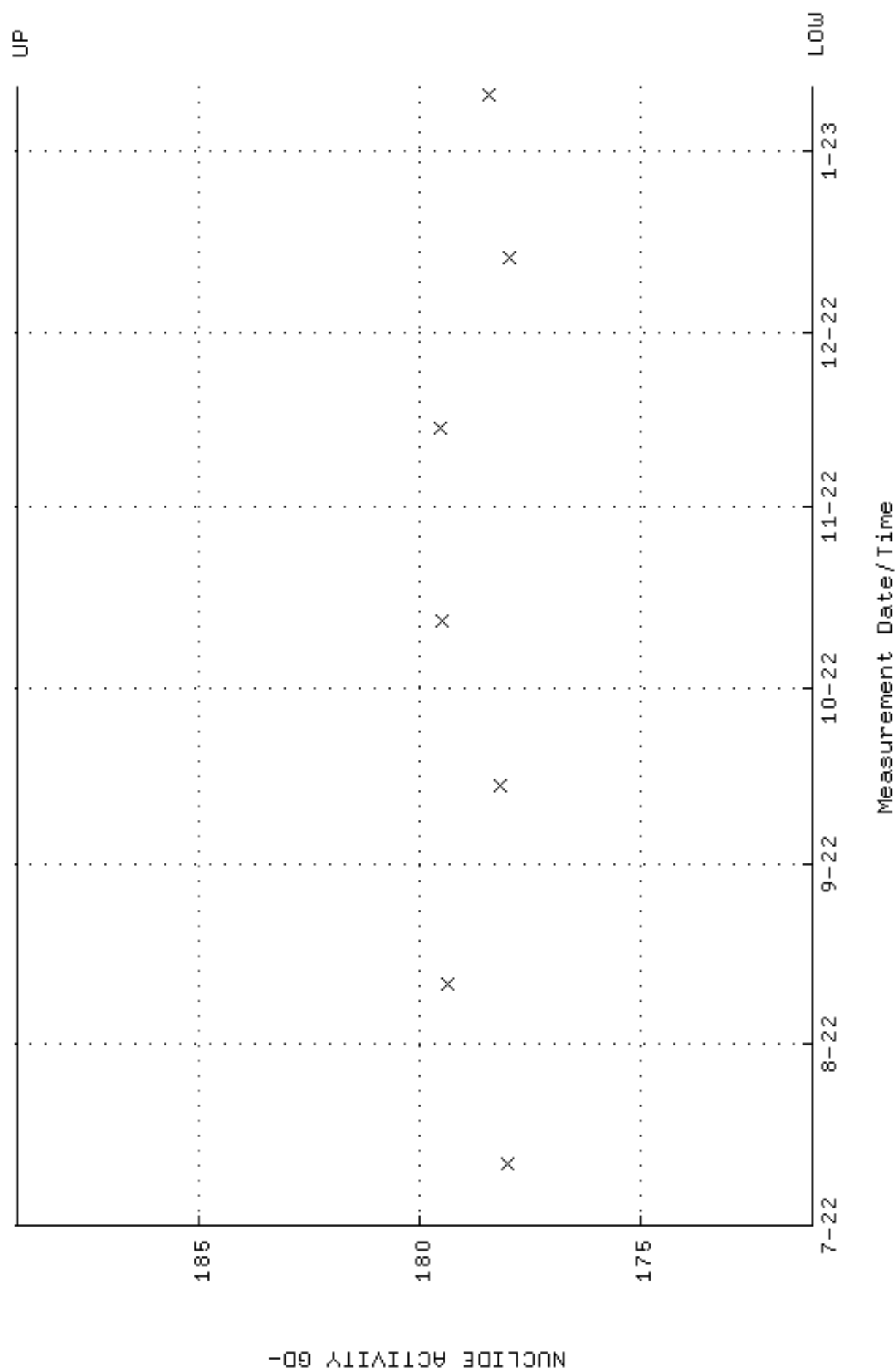
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 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 12:46:03 through 8-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



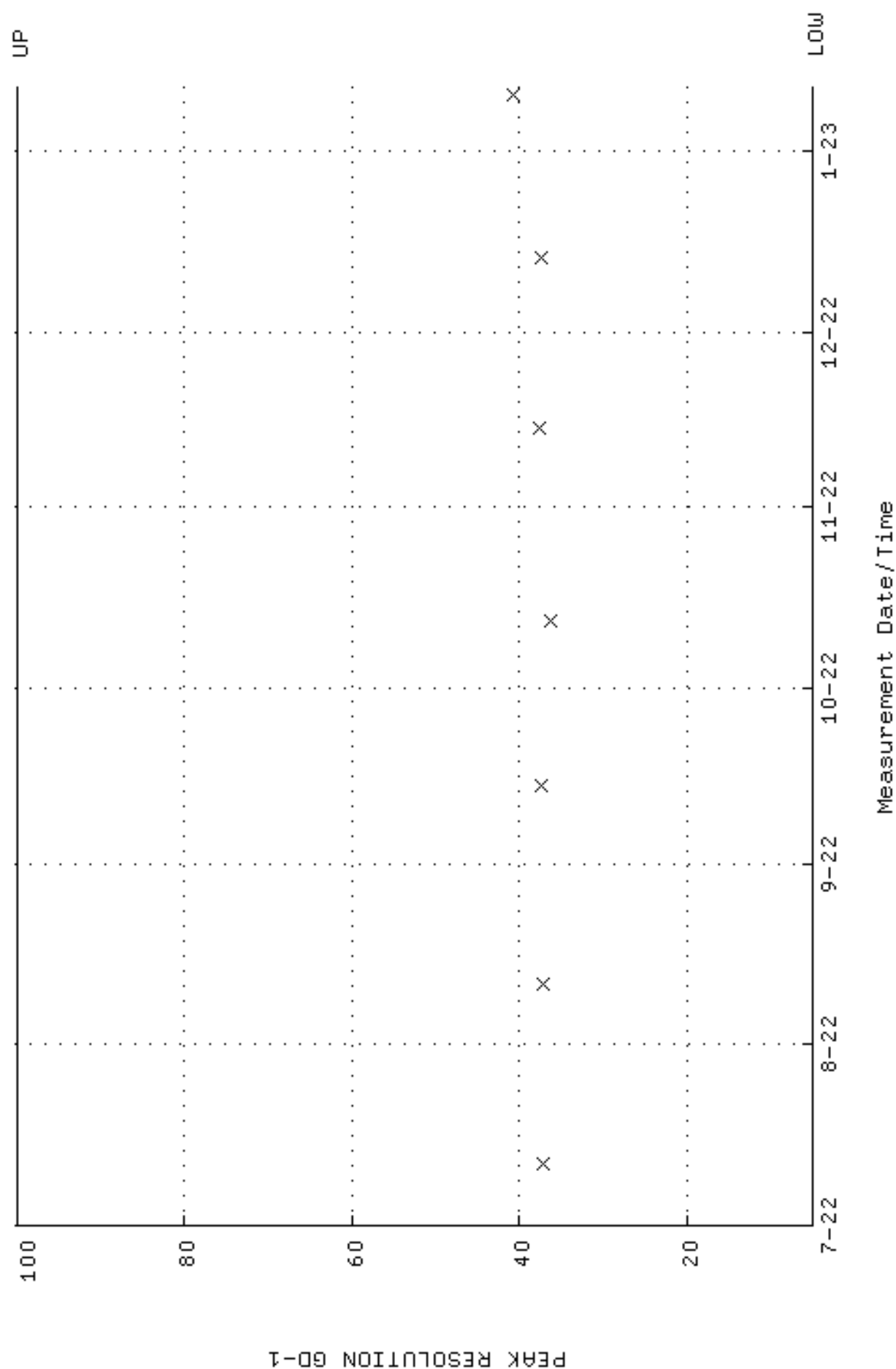
QA filename : DKA100:[ENV_ALPHA.QA.W]W068.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.298730 through 0.317200



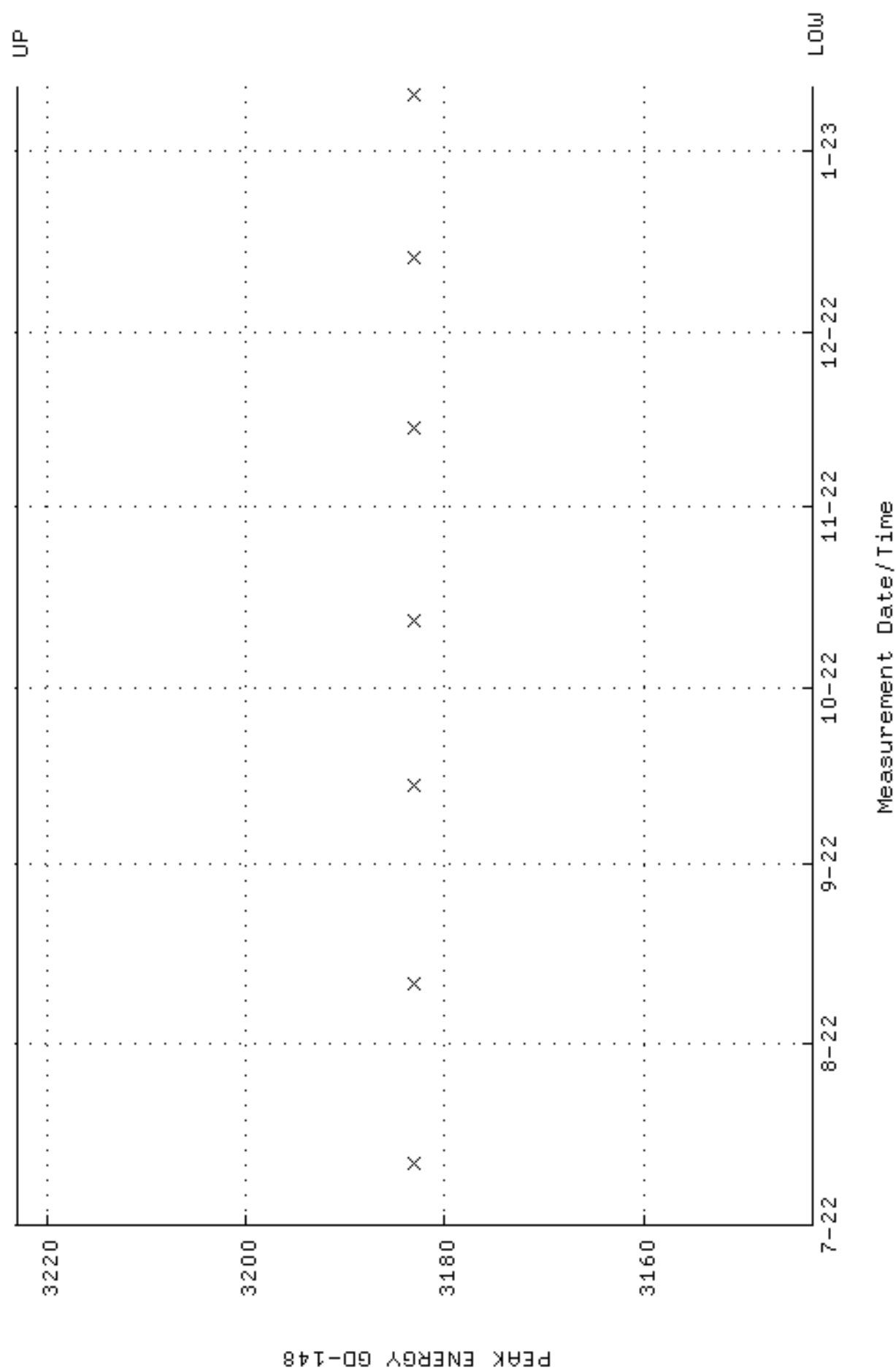
QA filename : DKA100:[ENV_ALPHA.QA.W]W068.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



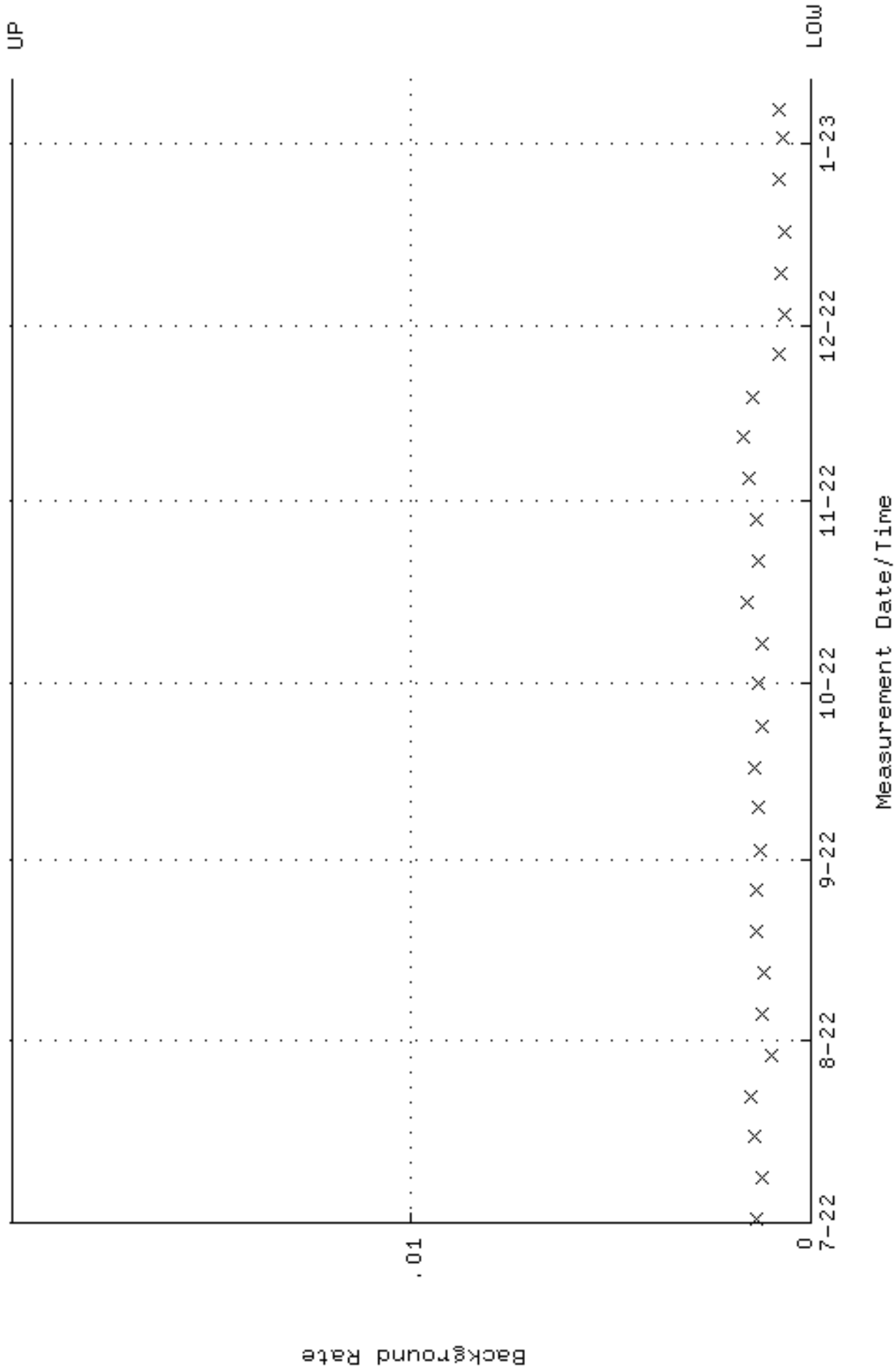
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 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



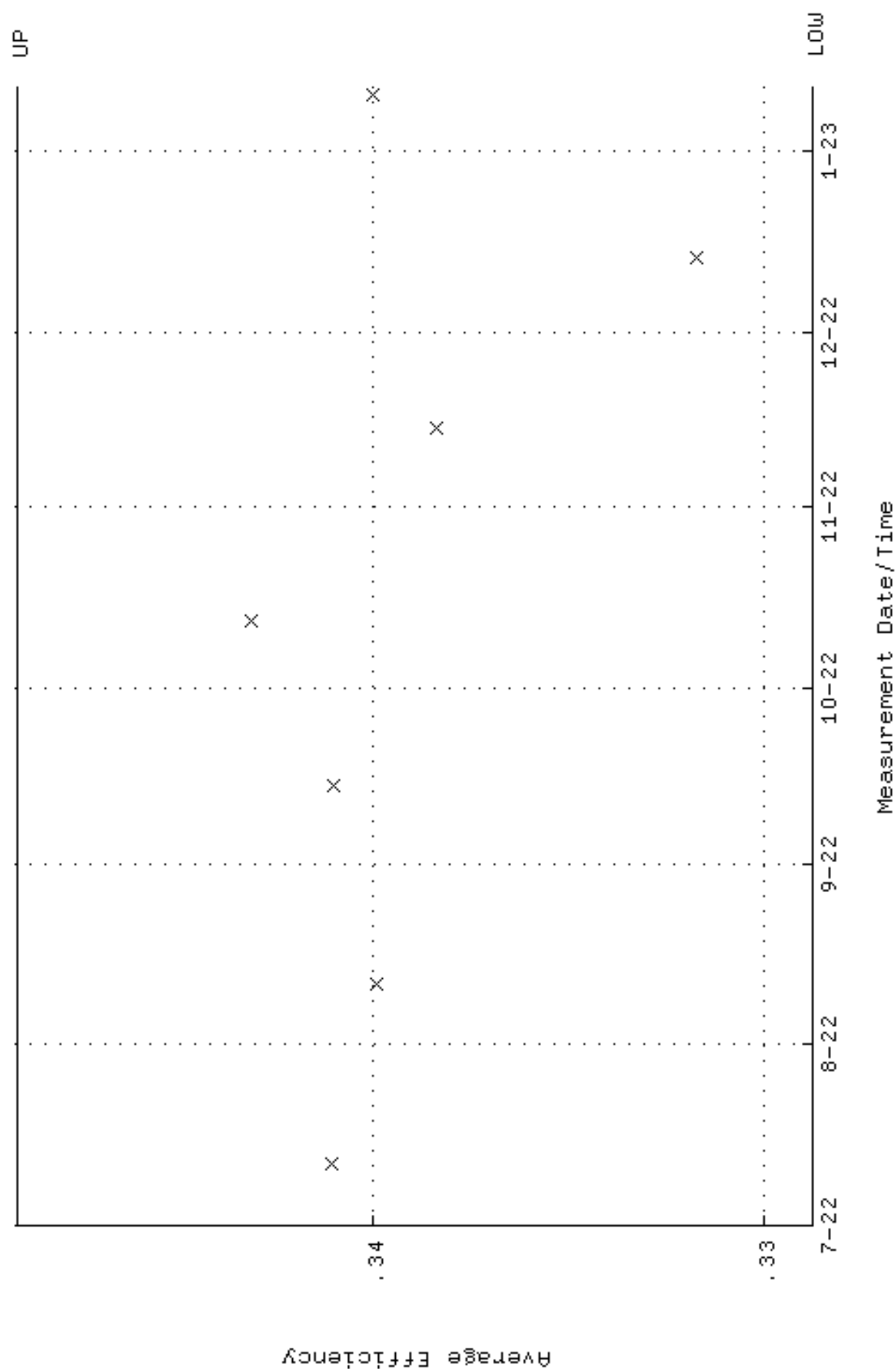
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



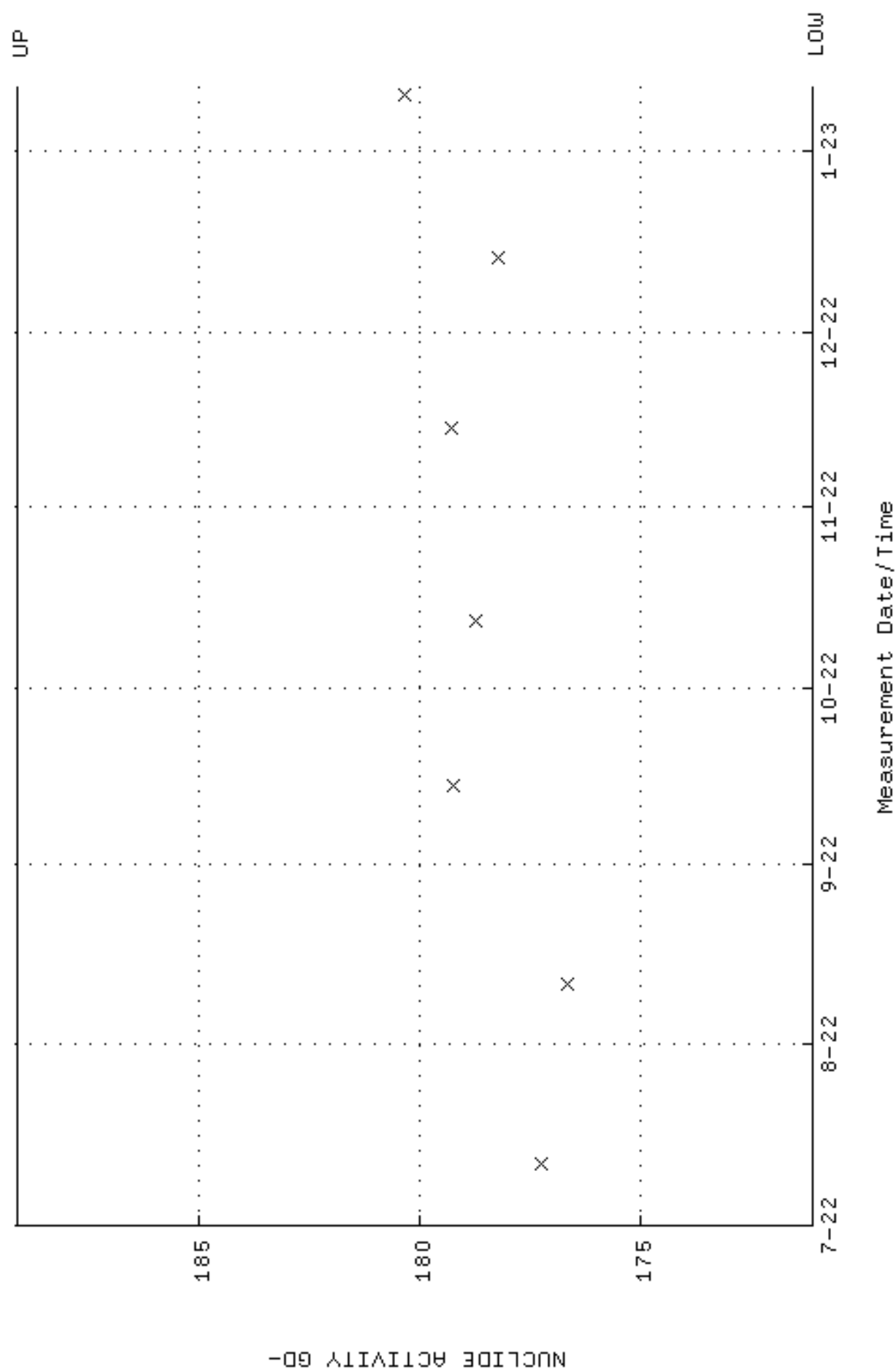
QA filename : DKA100:[ENV_ALPHA.QA.B]B068.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JUL-2022 13:24:38 through 11-JAN-2023 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



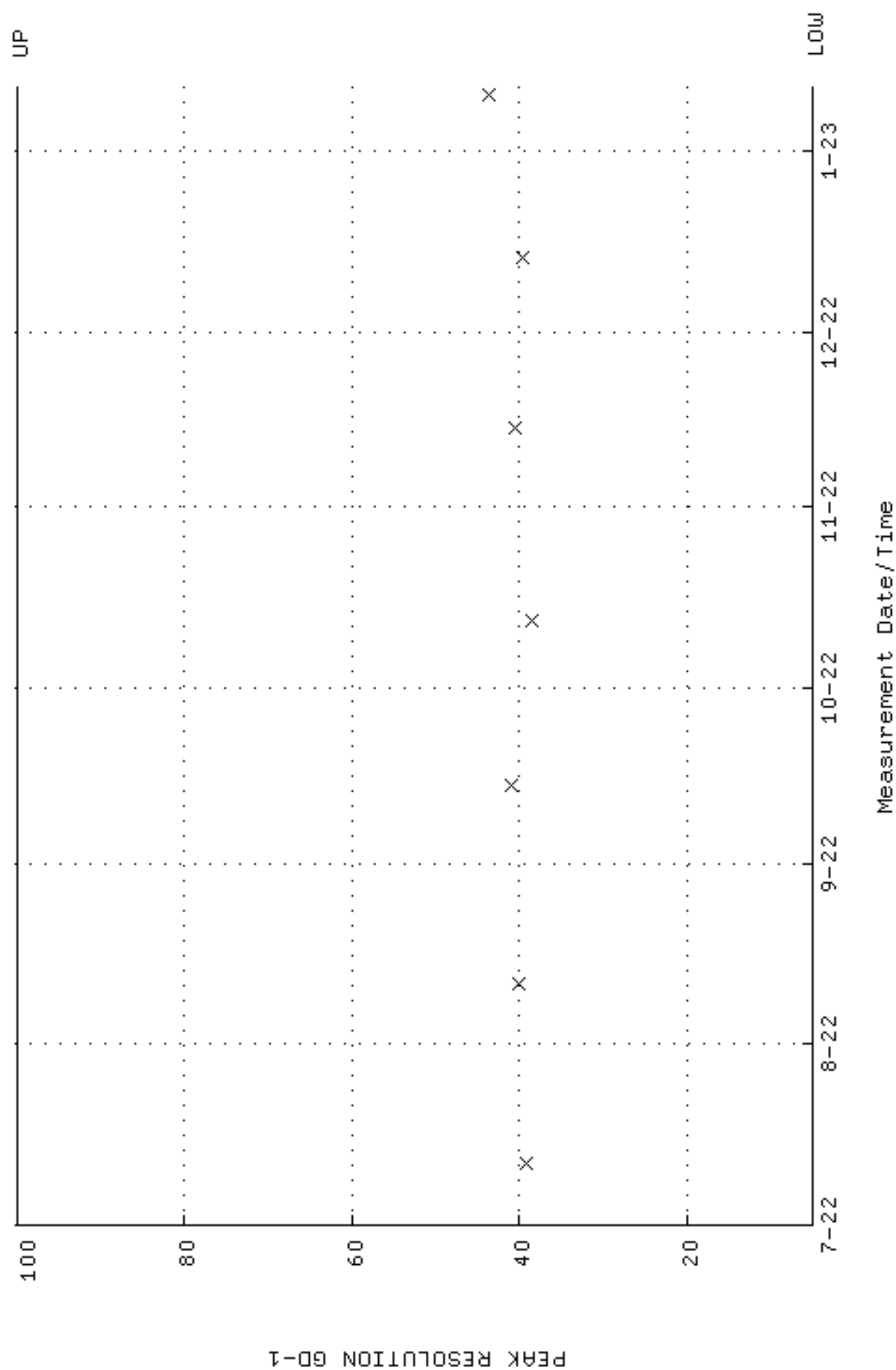
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.328749 through 0.349084



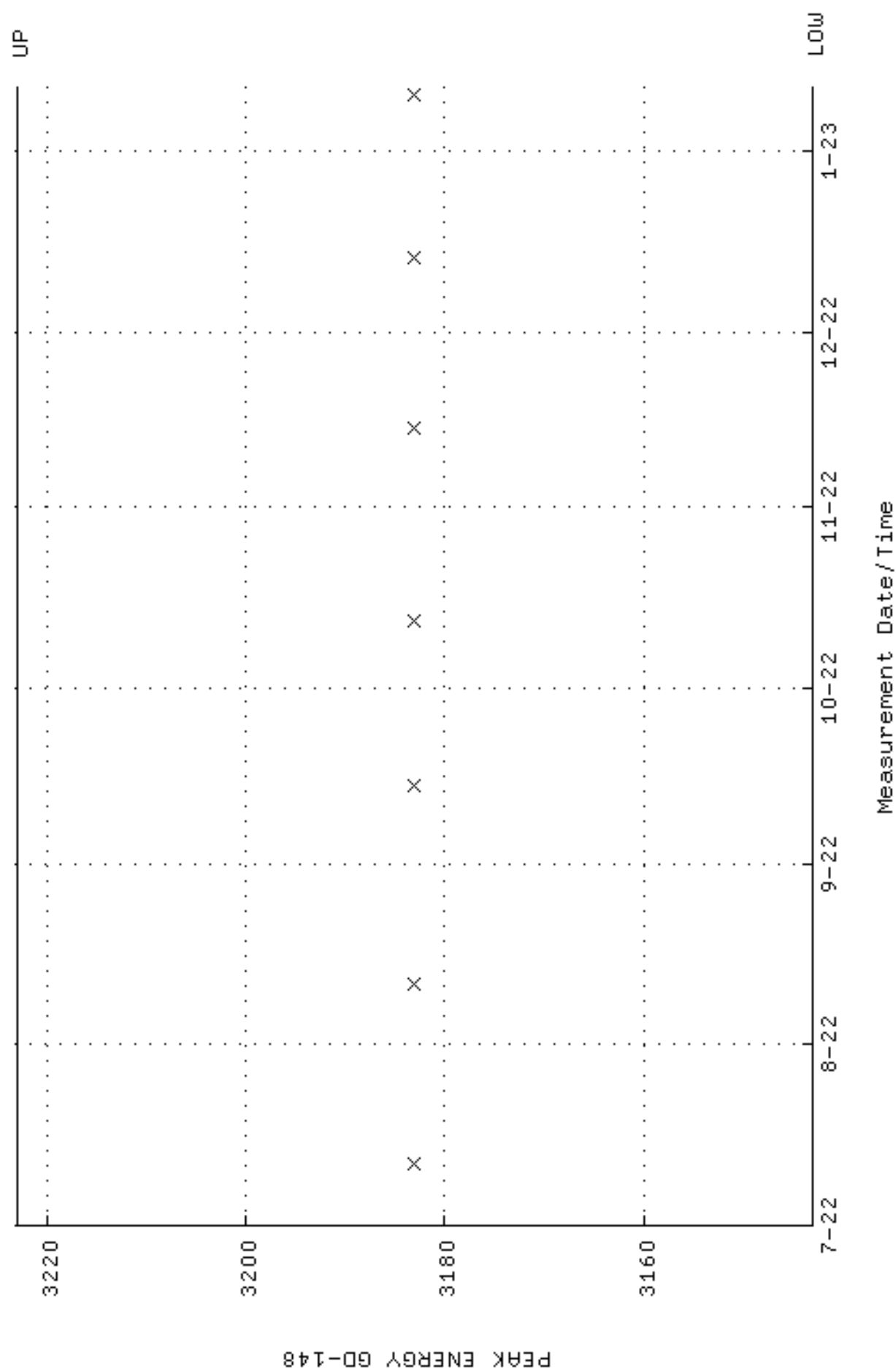
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



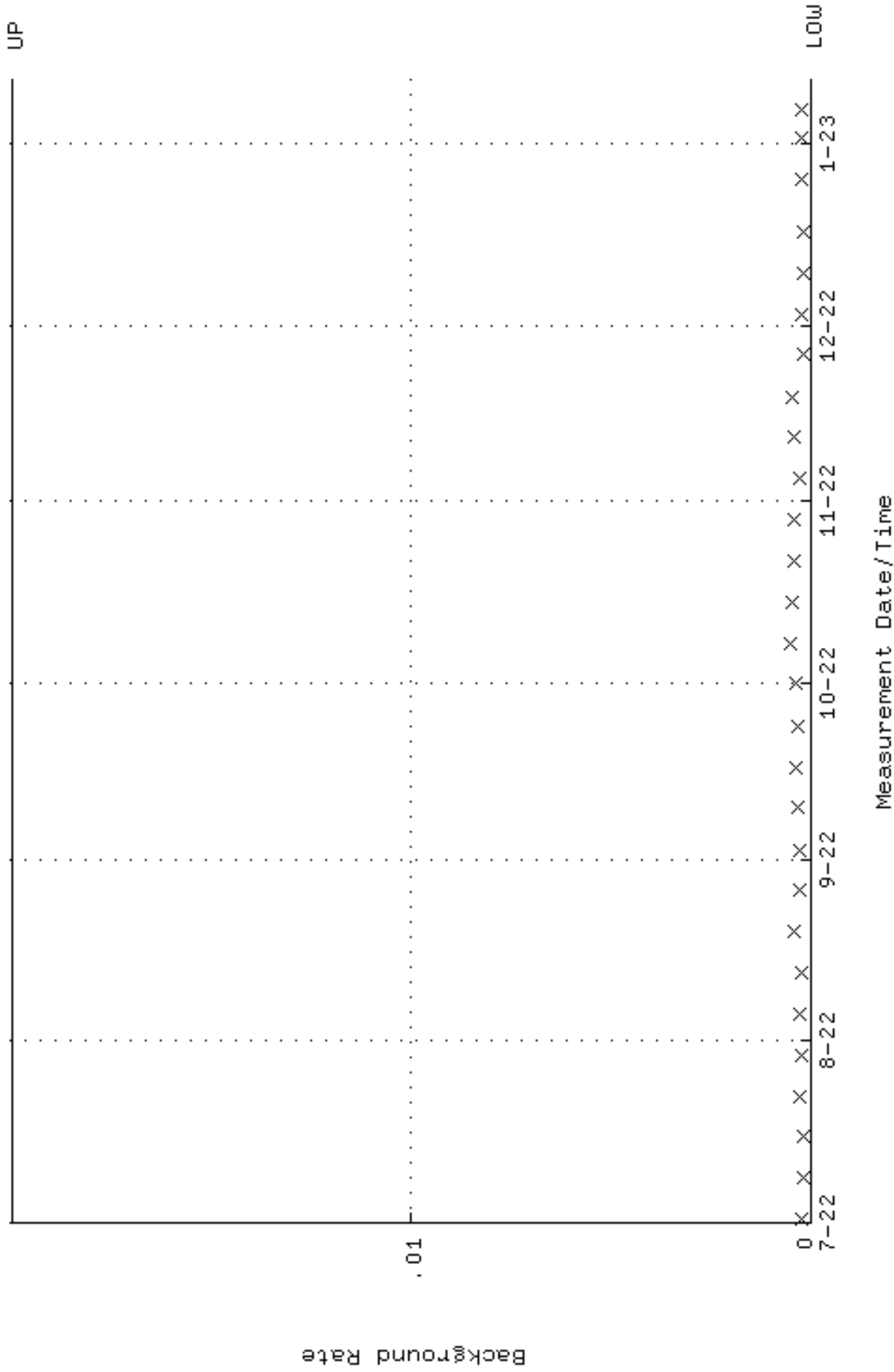
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



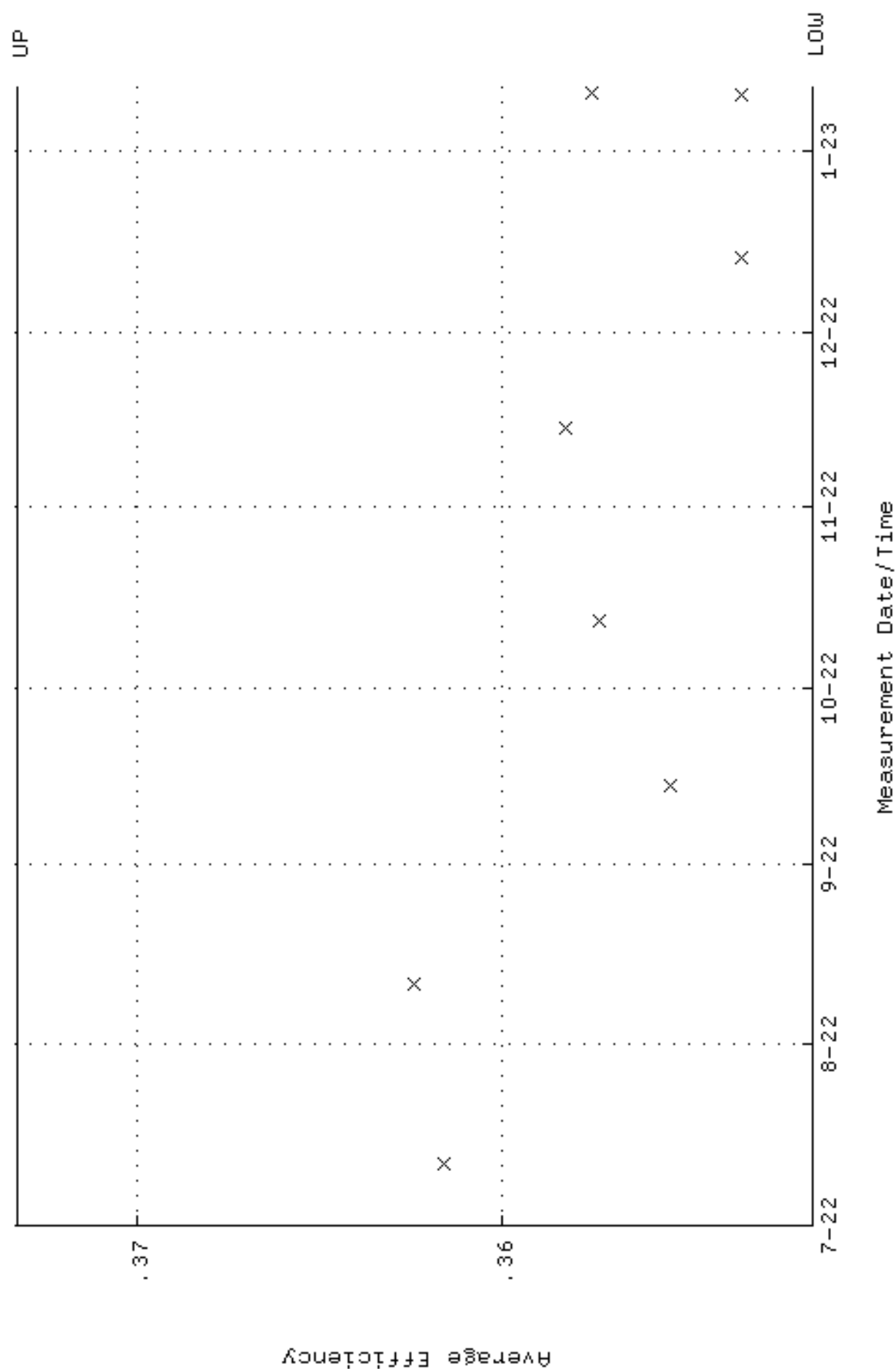
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



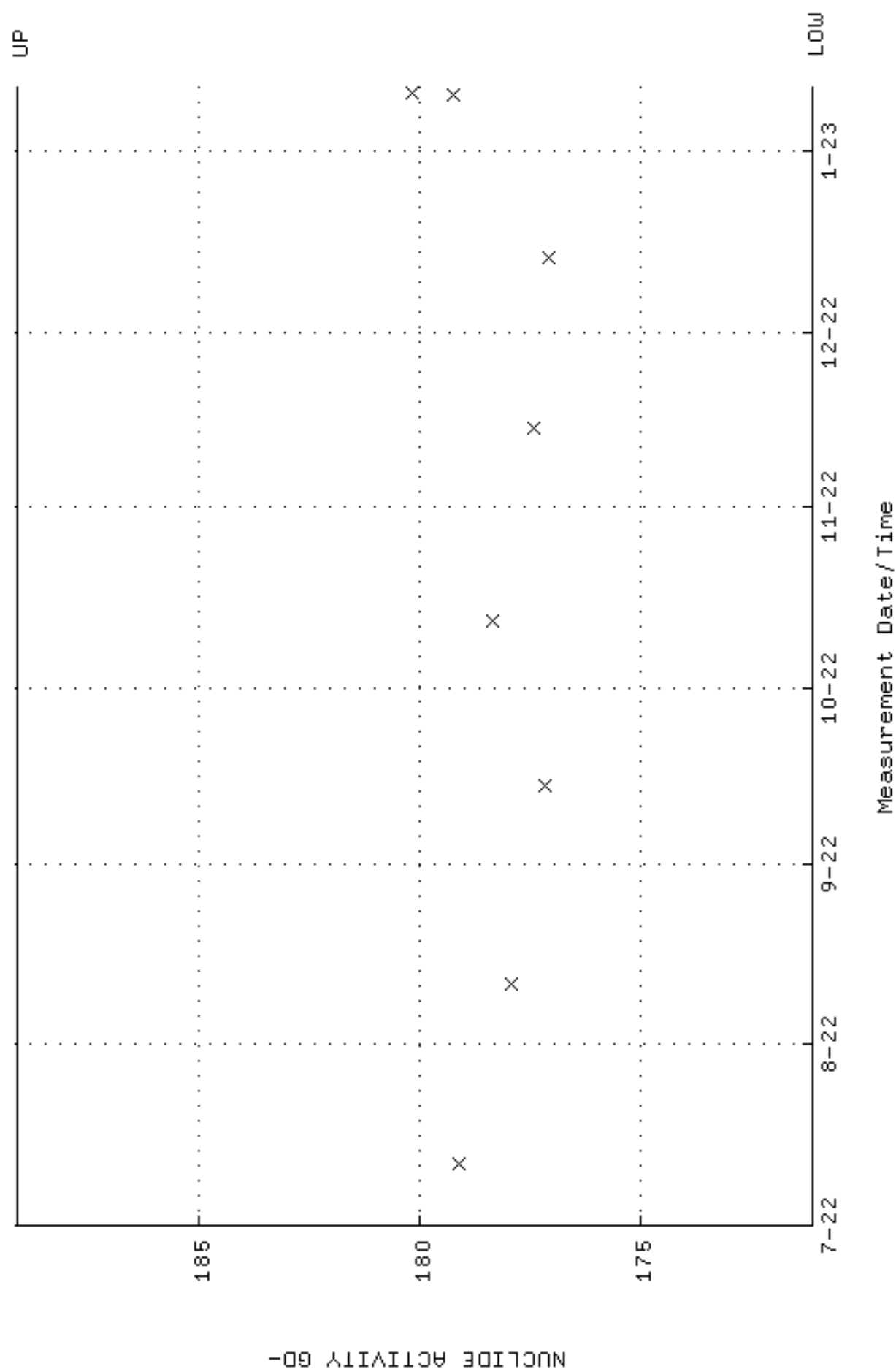
QA filename : DKA100:[ENV_ALPHA.QA.B]B069.QAF;7
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:24:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



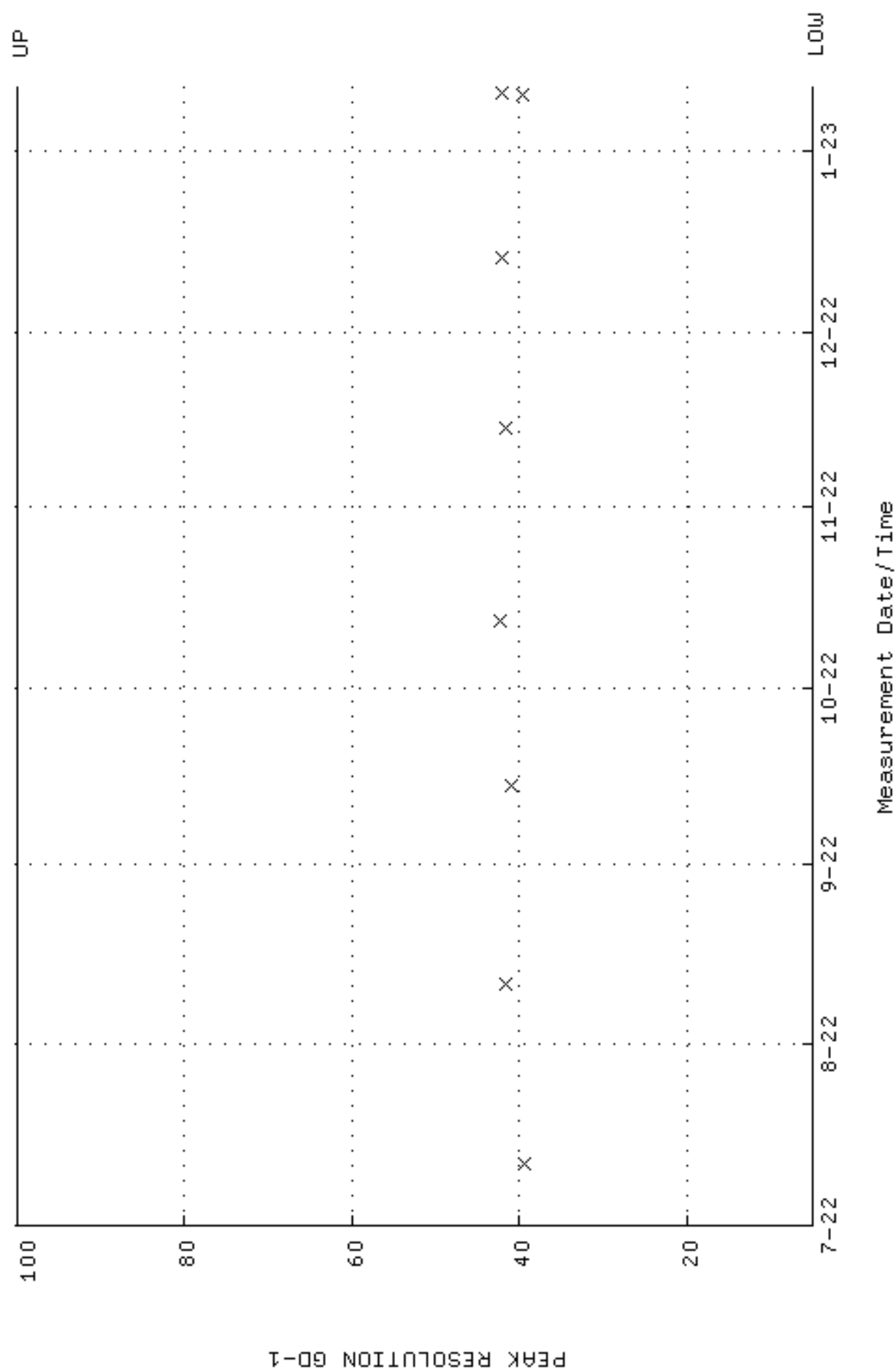
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.351510 through 0.373250



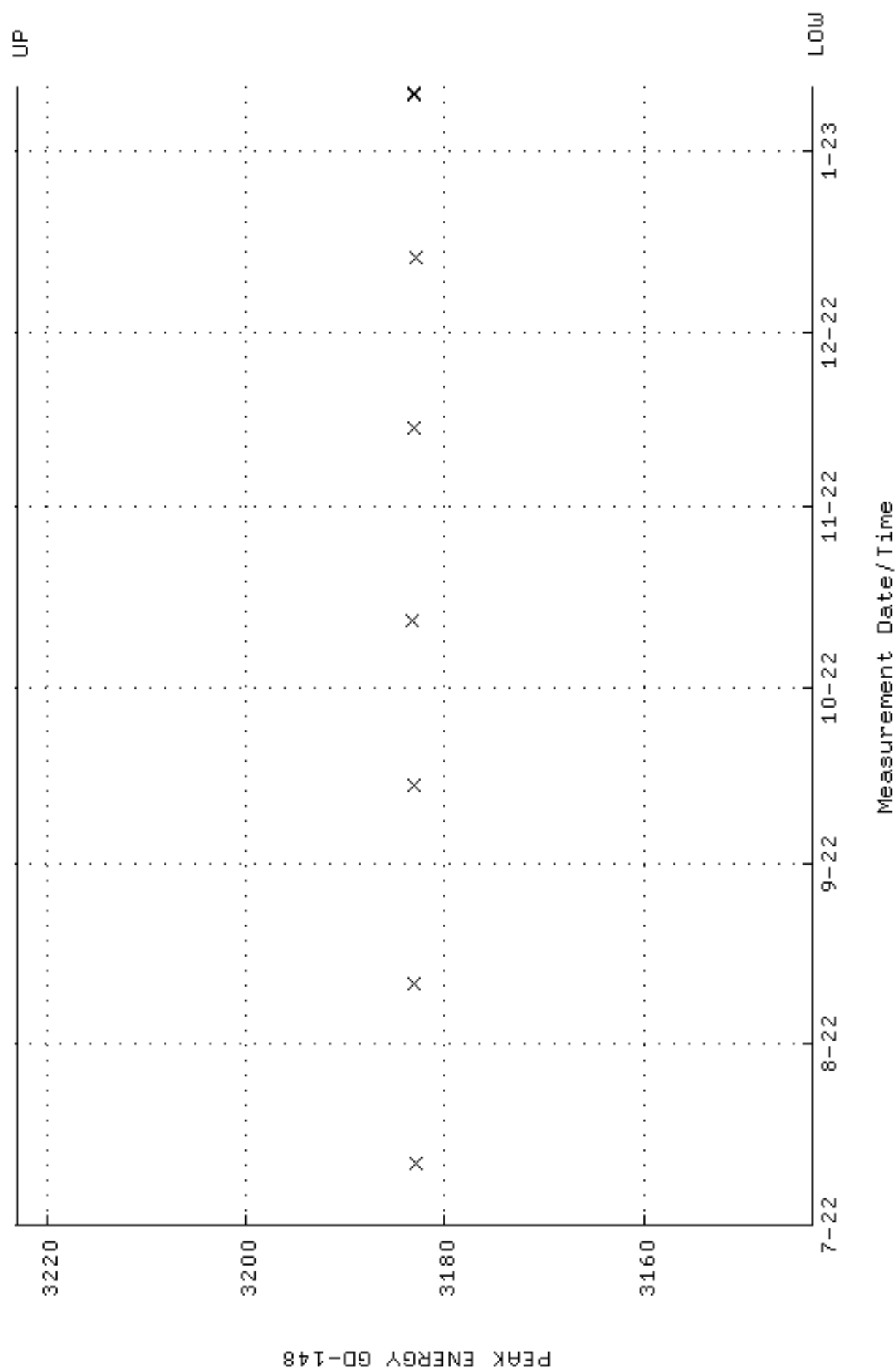
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



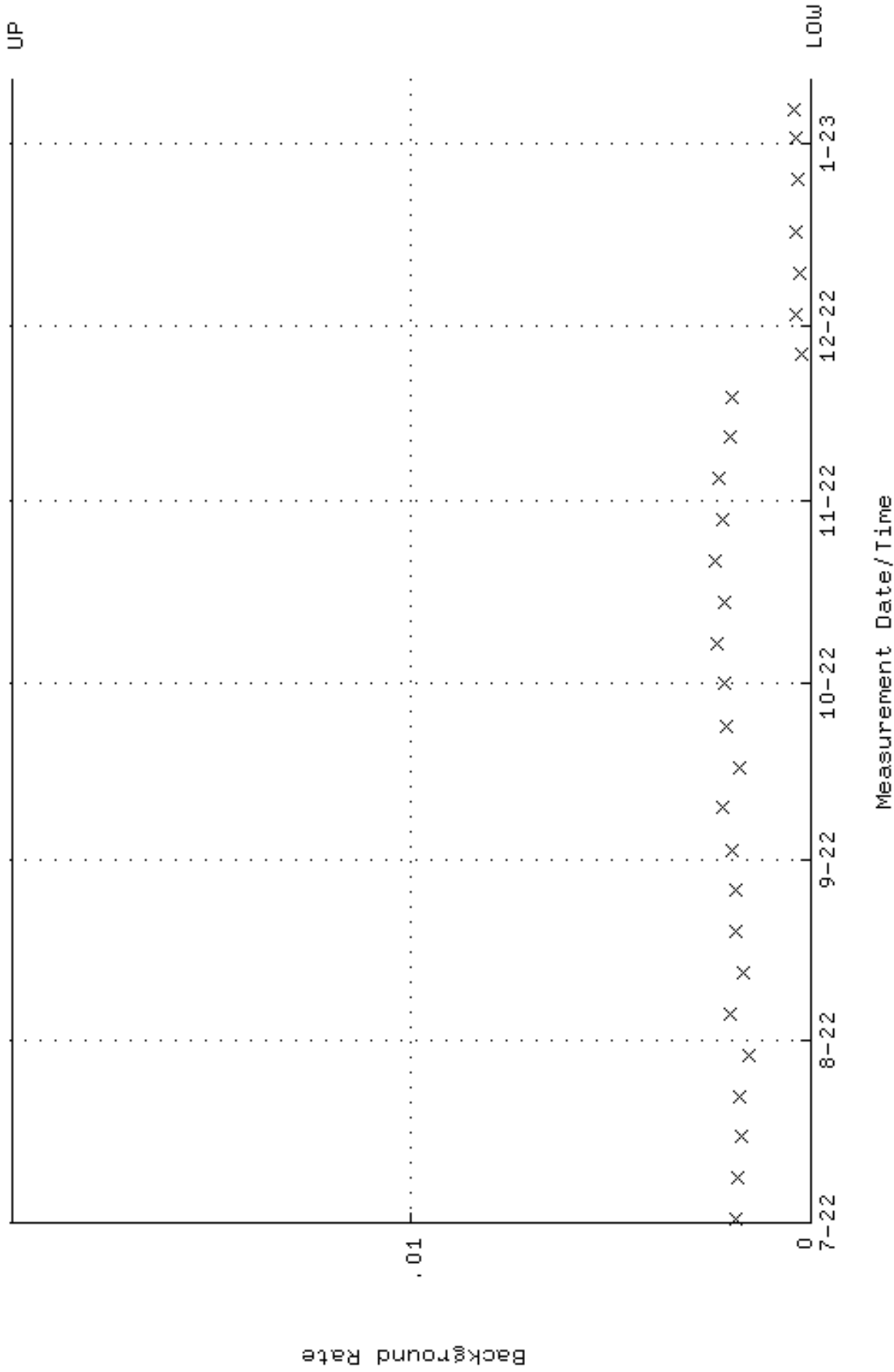
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



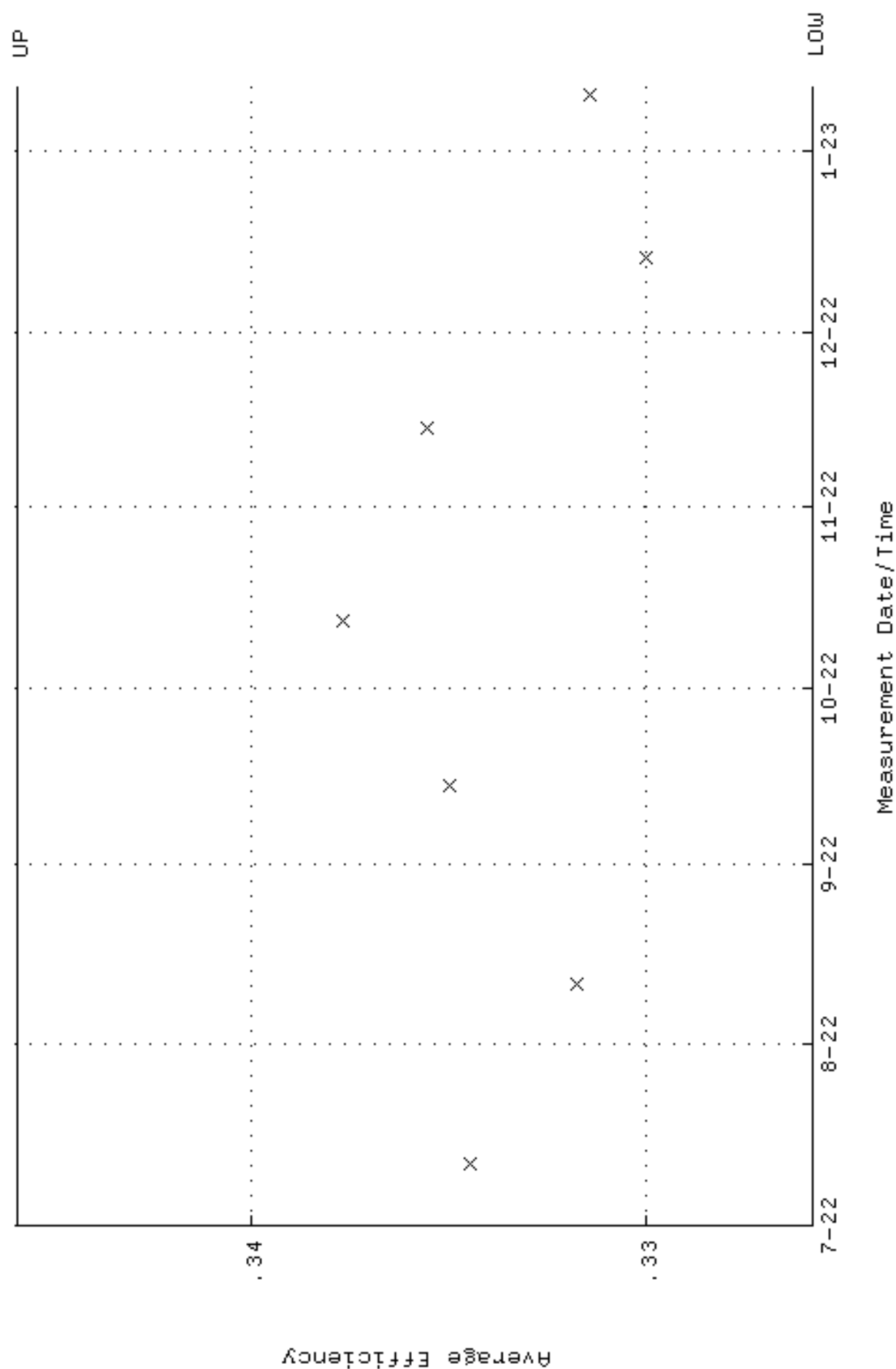
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:21:08 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



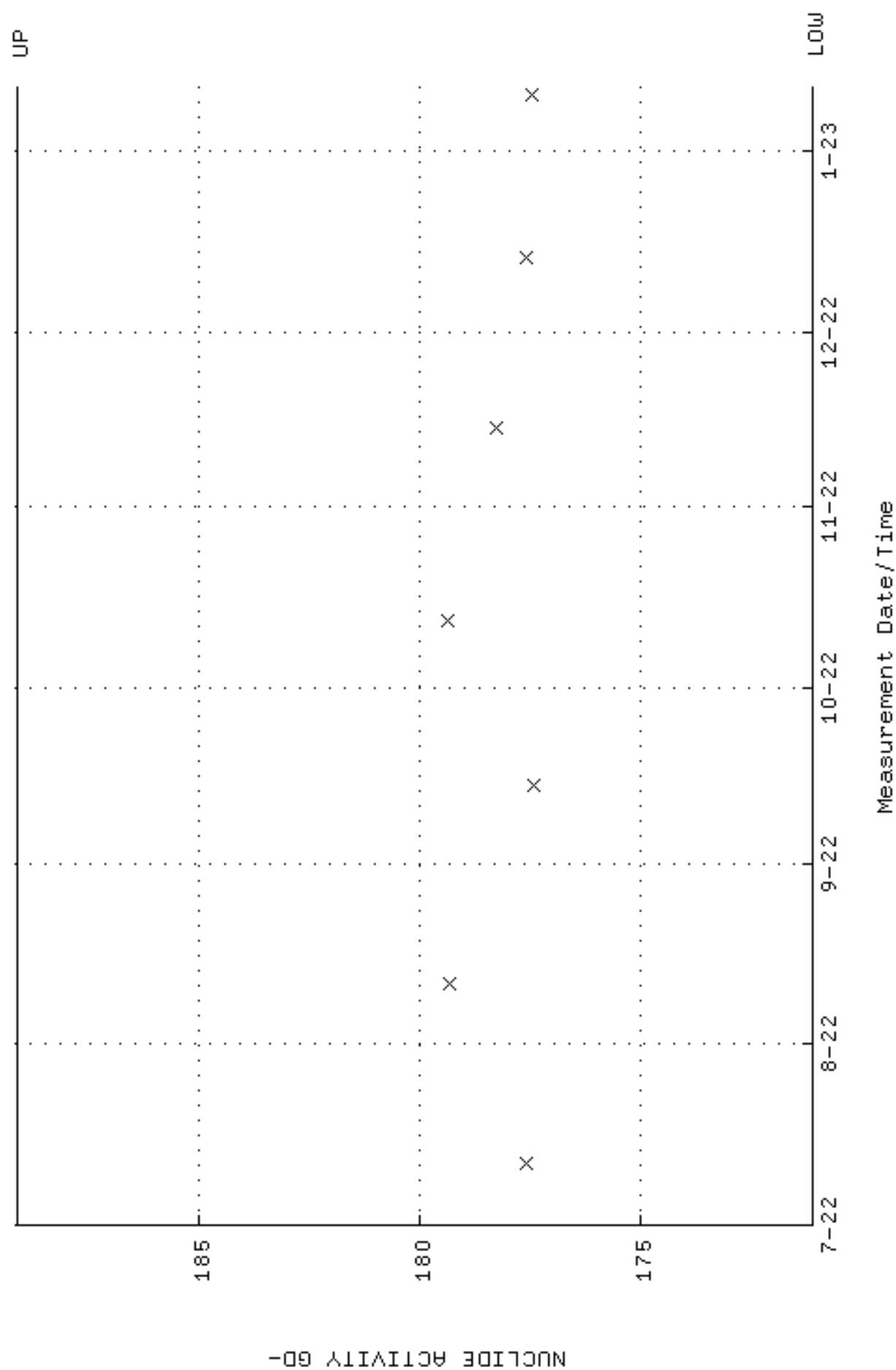
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Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JUL-2022 13:24:38 through 11-JAN-2023 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



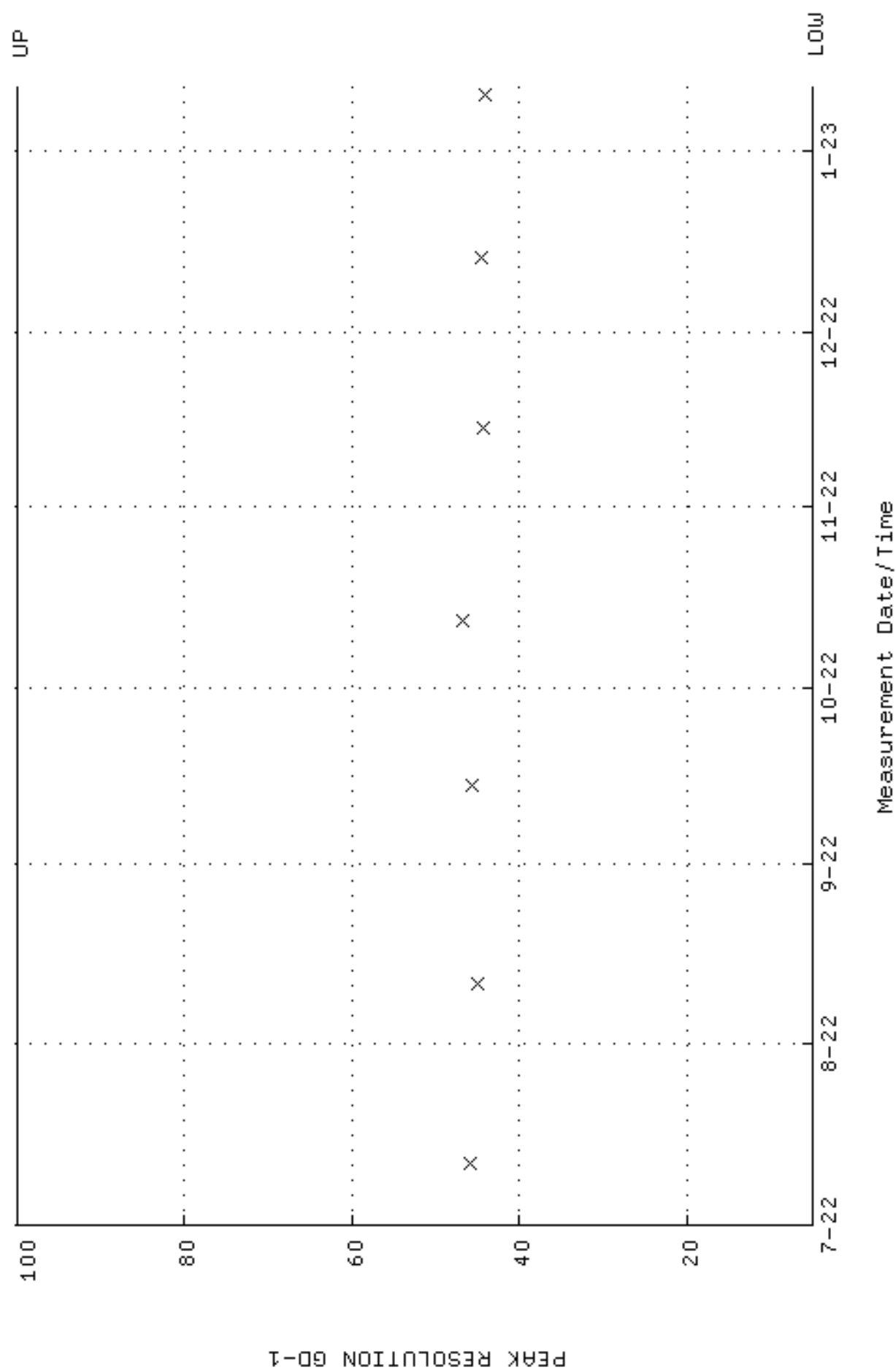
QA filename : DKA100:[ENV_ALPHA.QA.W]W071.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.325770 through 0.345920



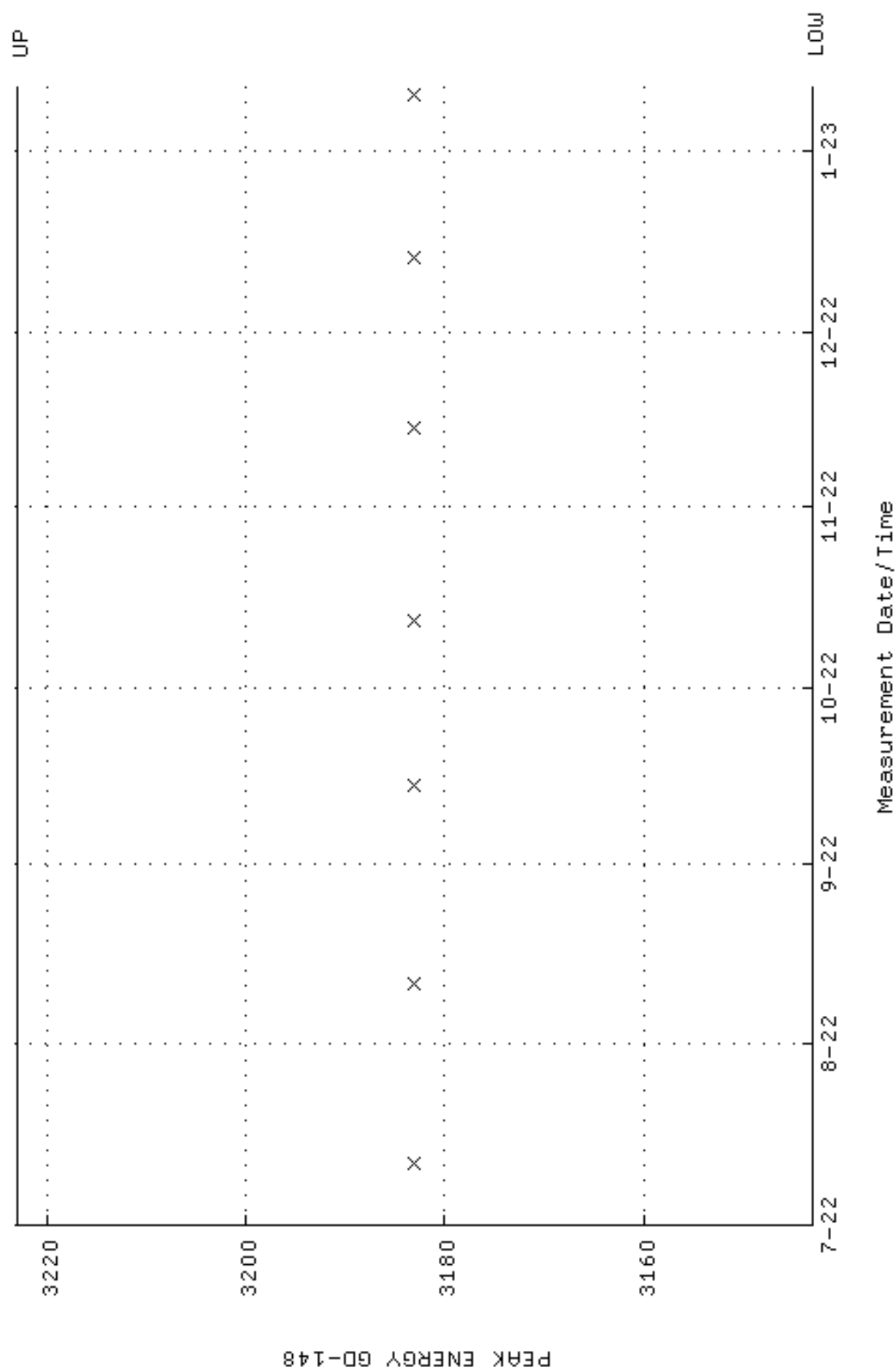
QA filename : DKA100:[ENV_ALPHA.QA.W]W071.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



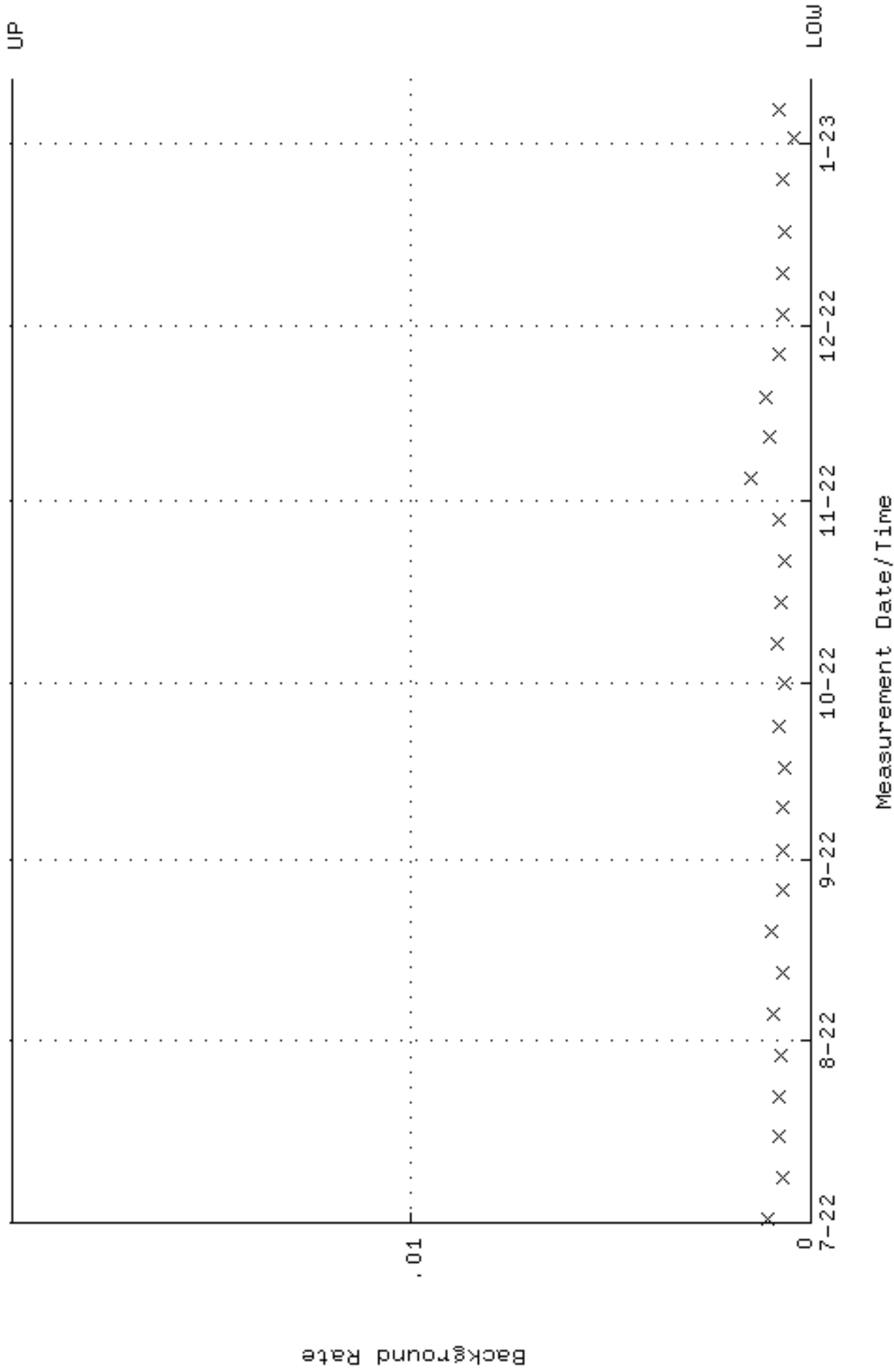
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Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
Lower/Upper Lmts: 5.00000 through 100.000



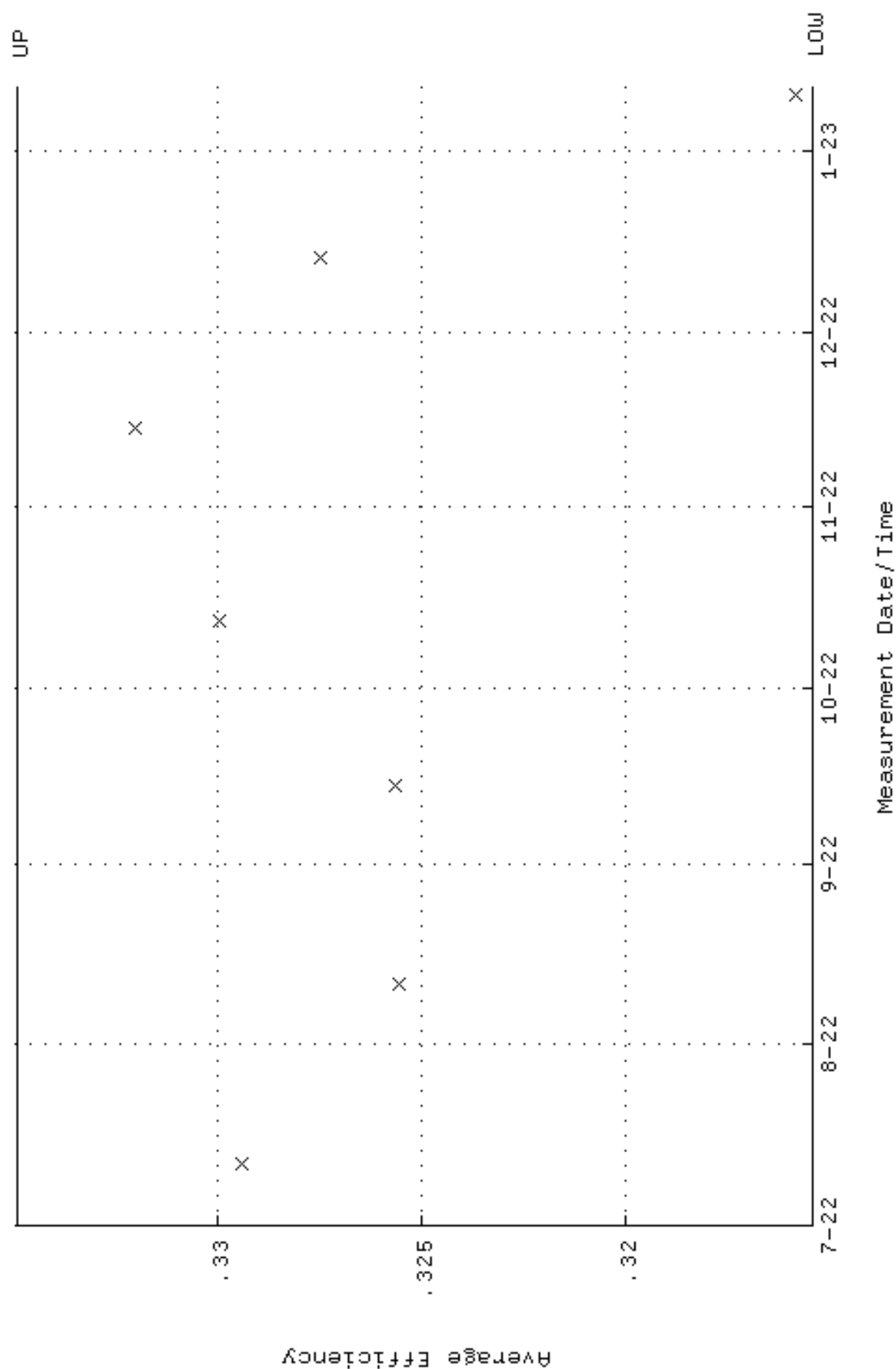
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



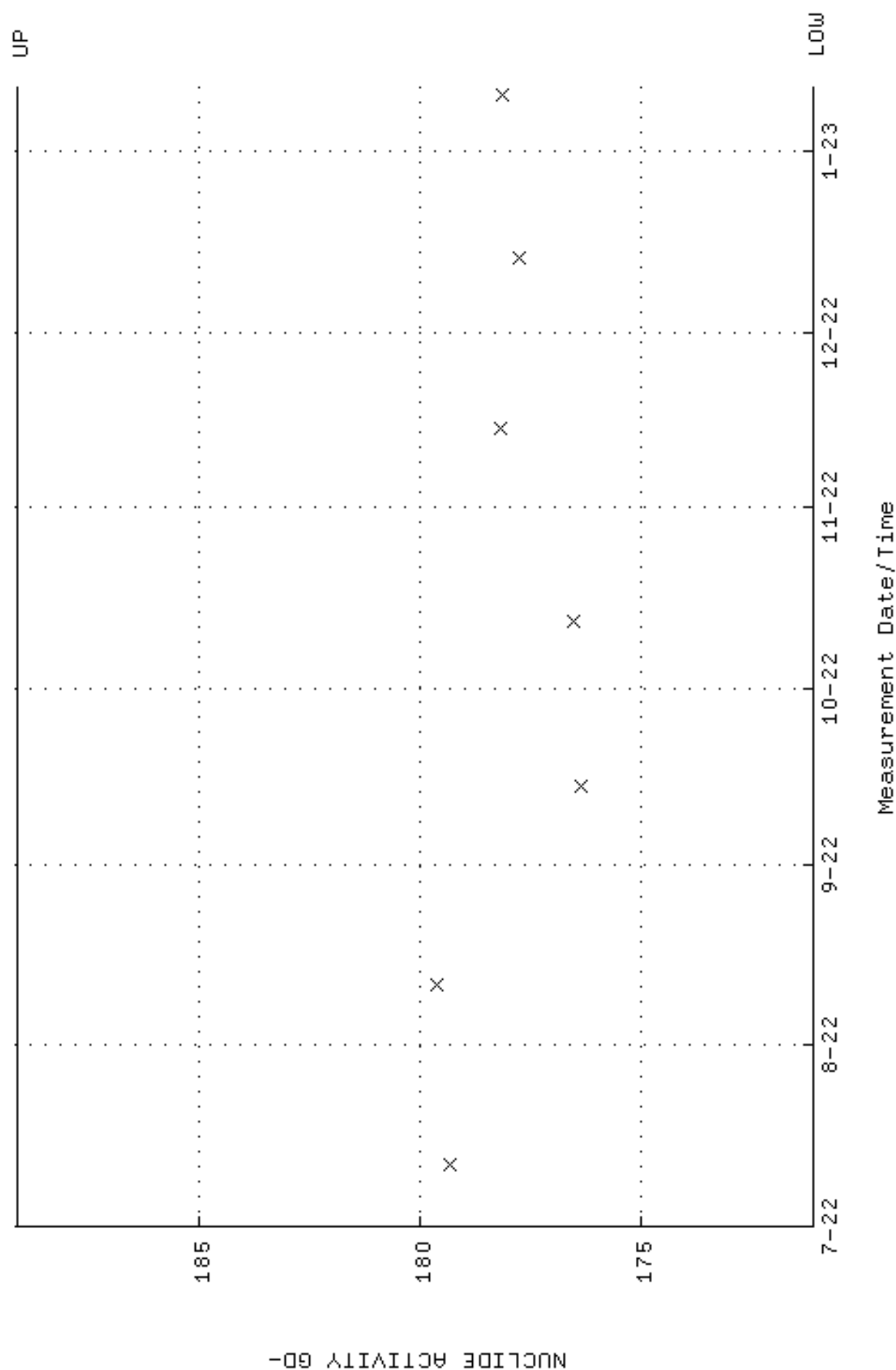
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Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JUL-2022 13:24:38 through 11-JAN-2023 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



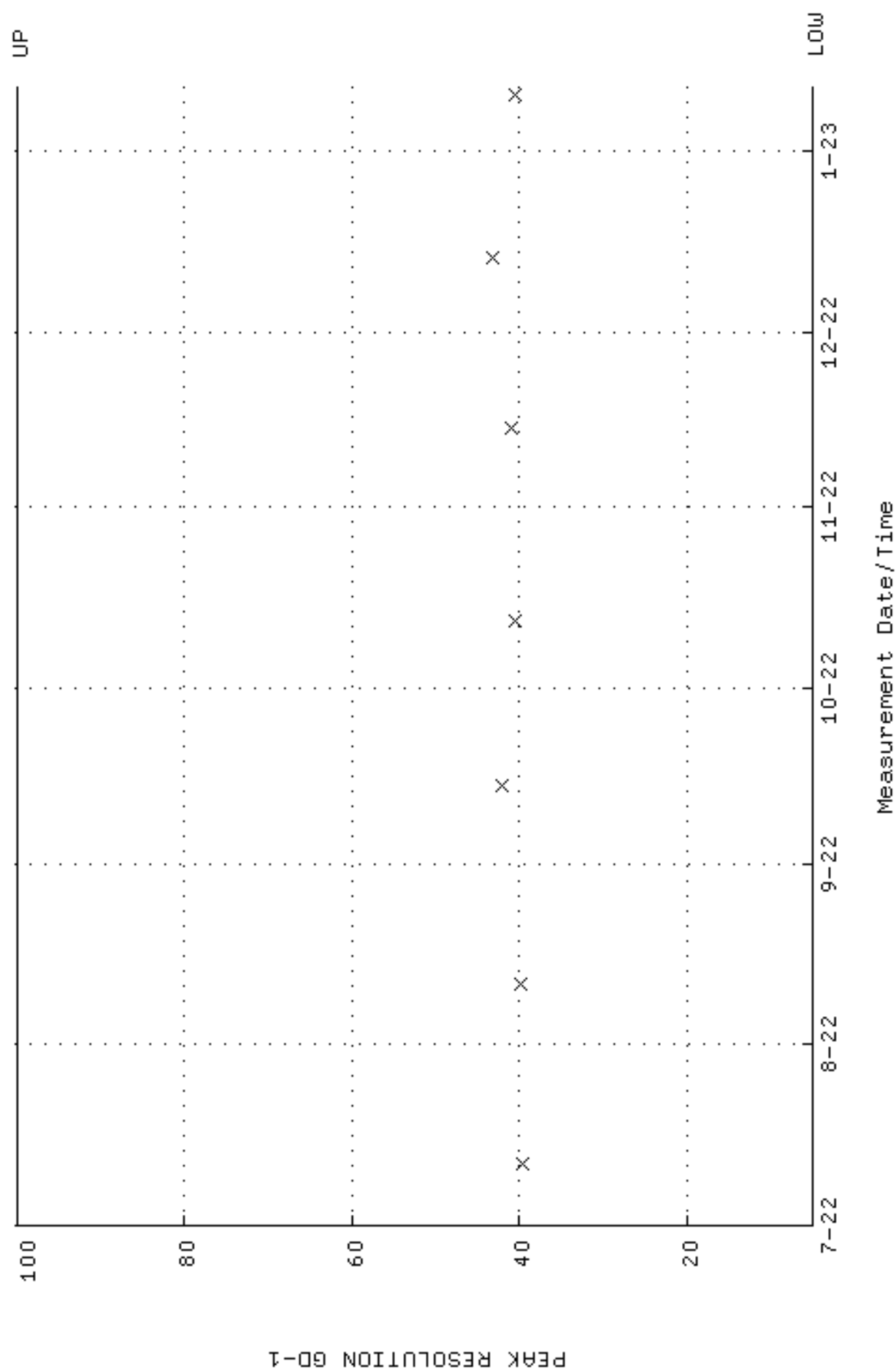
QA filename : DKA100:[ENV_ALPHA.QA.W]W072.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.315390 through 0.334900



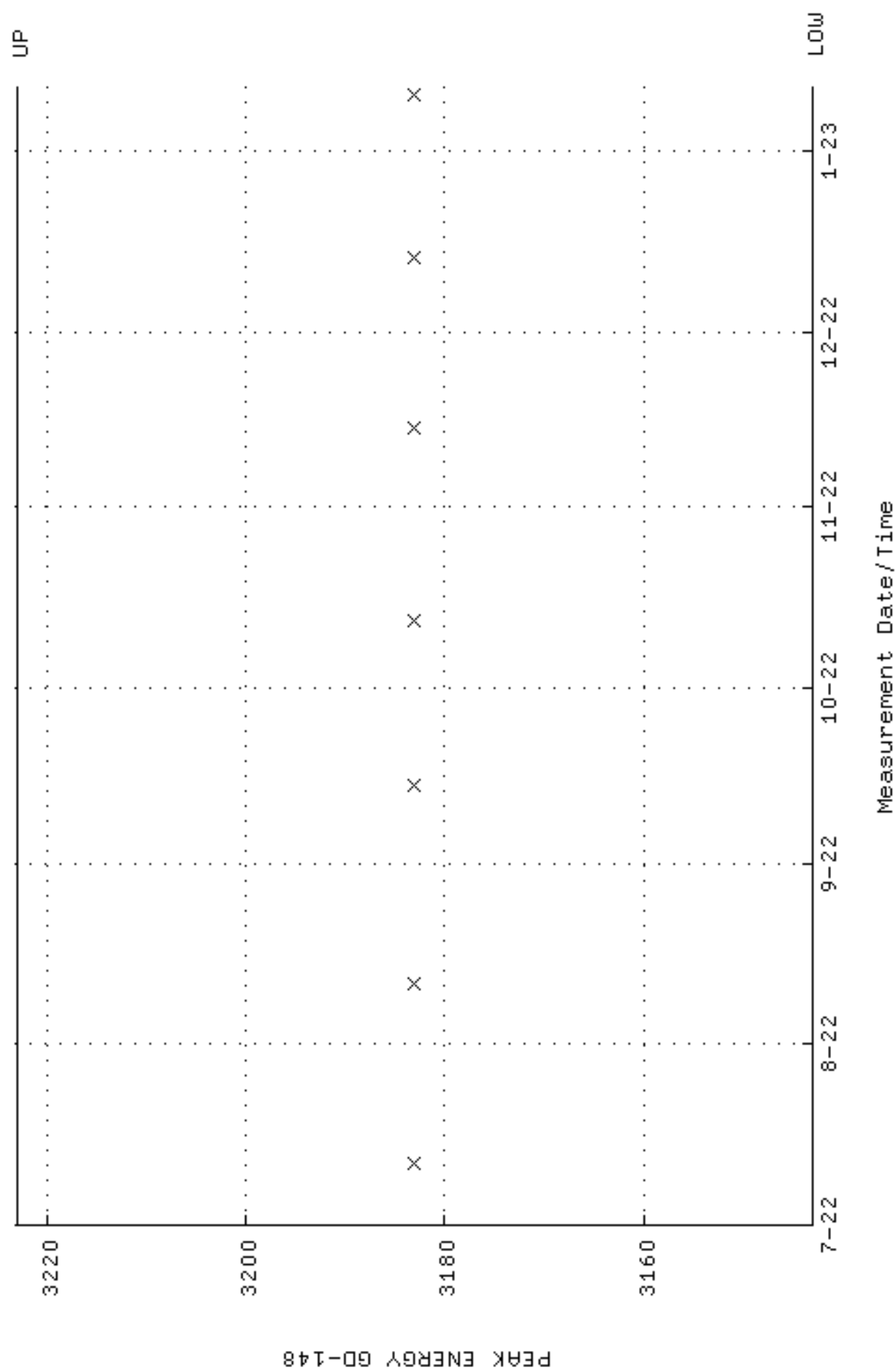
QA filename : DKA100:[ENV_ALPHA.QA.W]W072.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



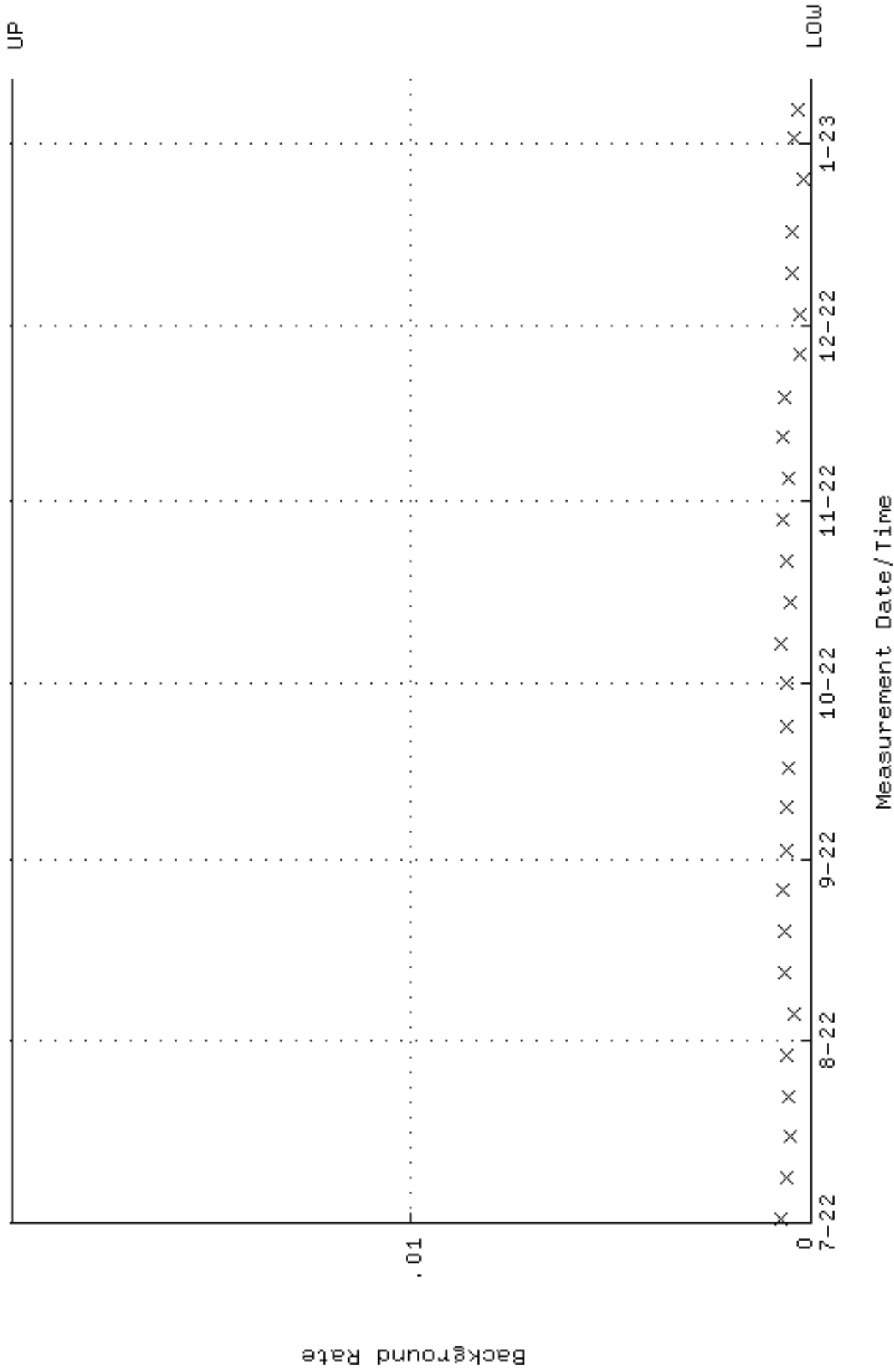
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



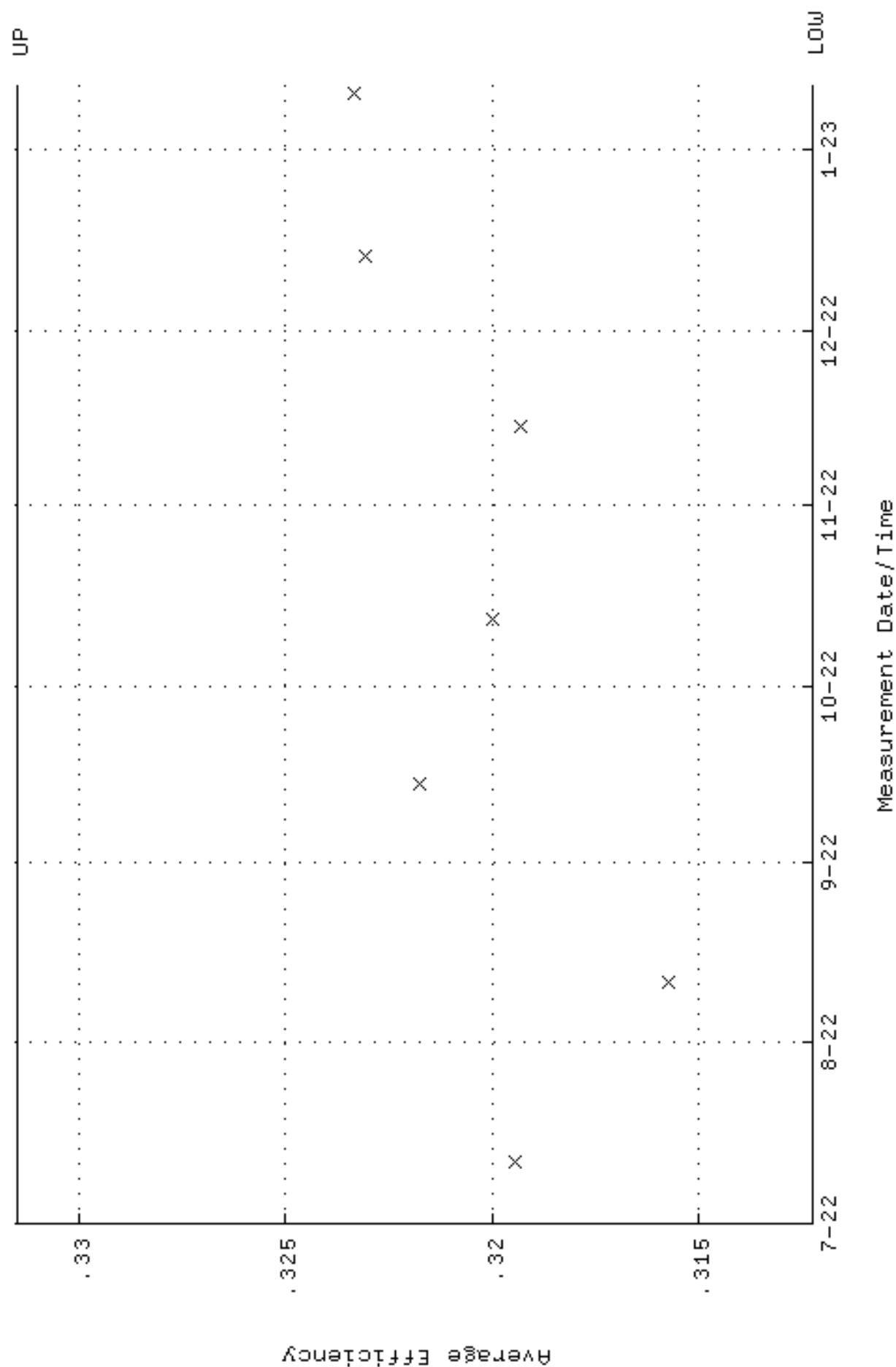
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



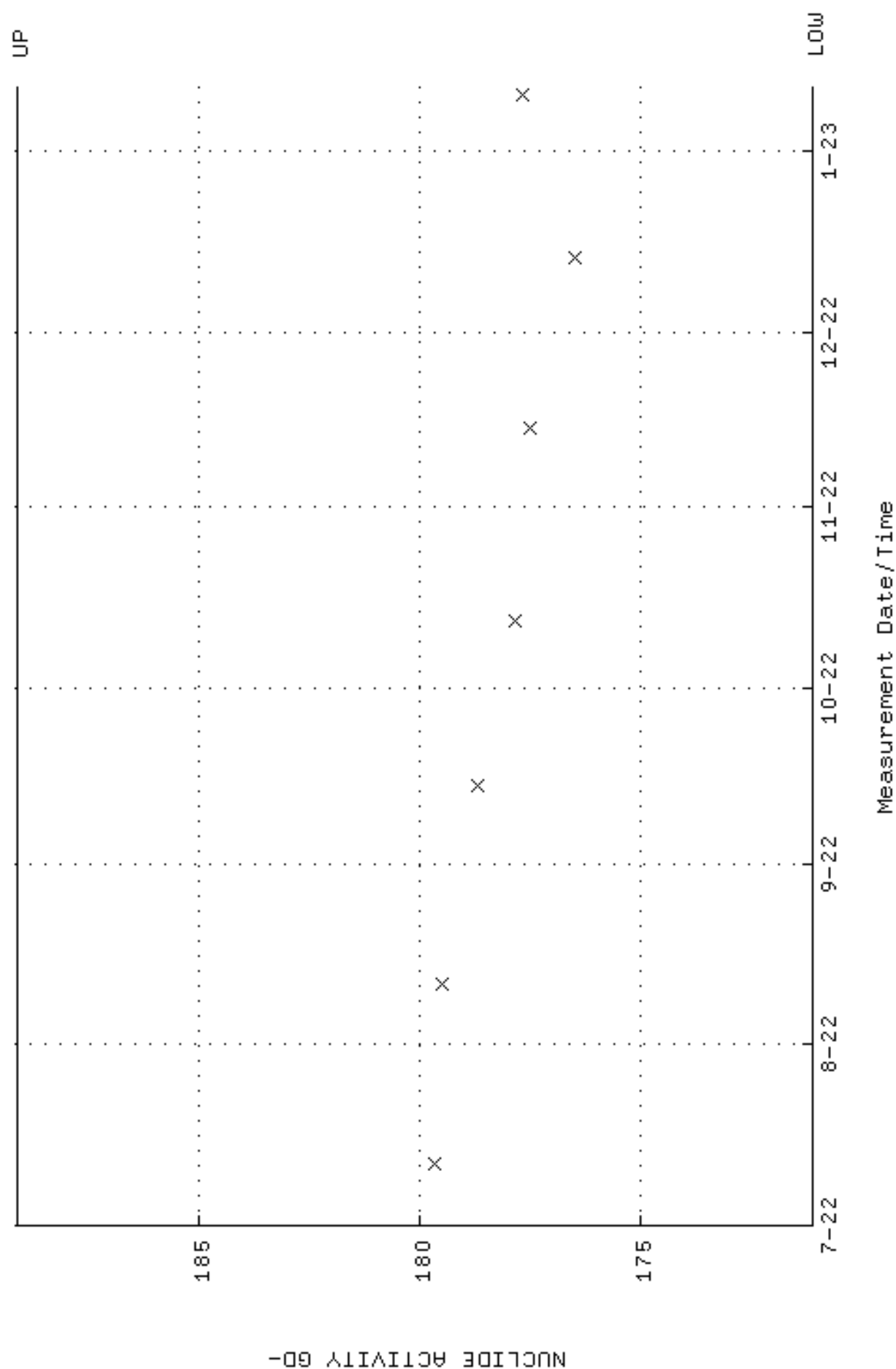
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Start/End Dates : 1-JUL-2022 13:24:38 through 11-JAN-2023 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



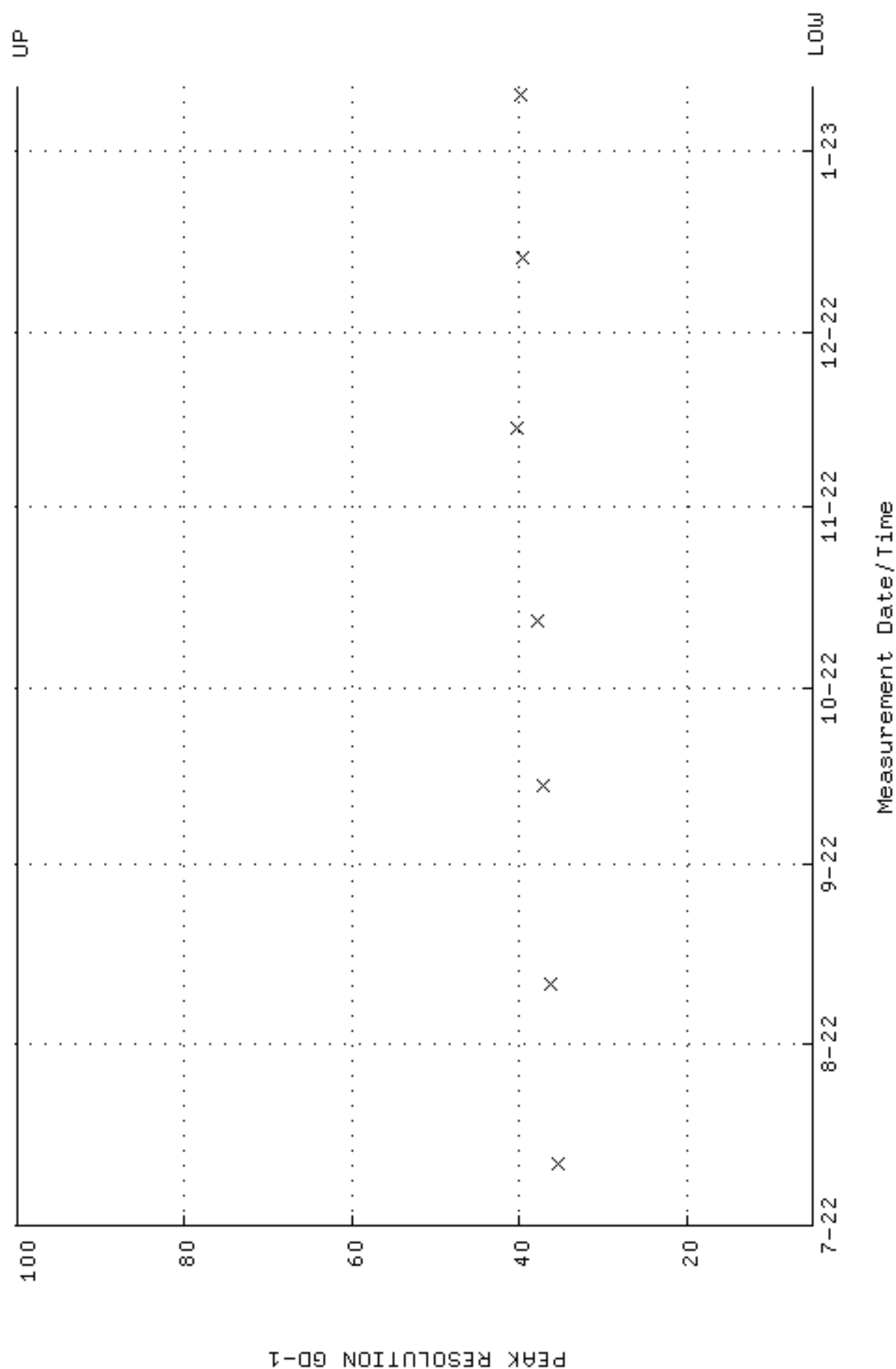
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 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.312208 through 0.331520



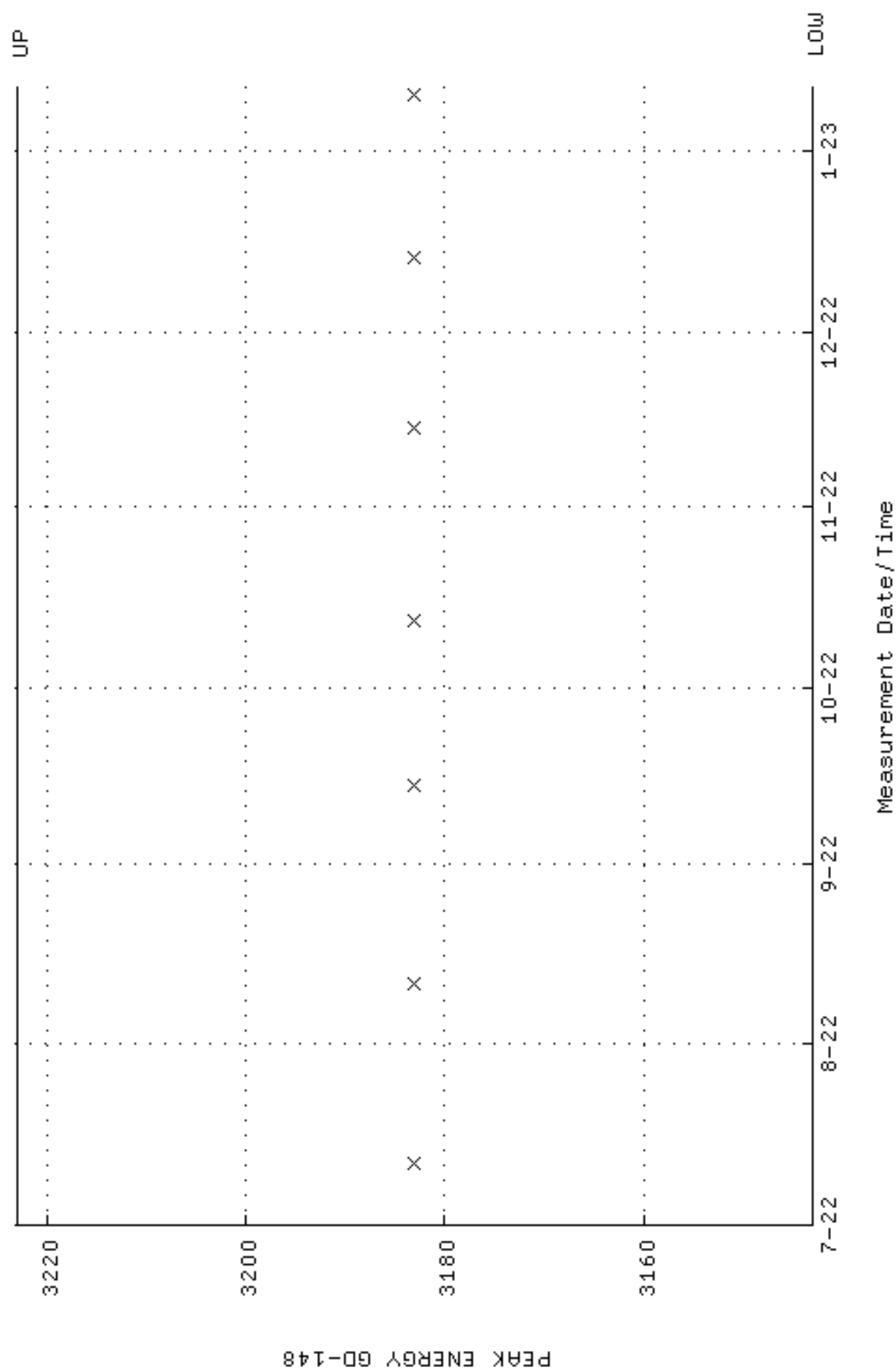
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 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



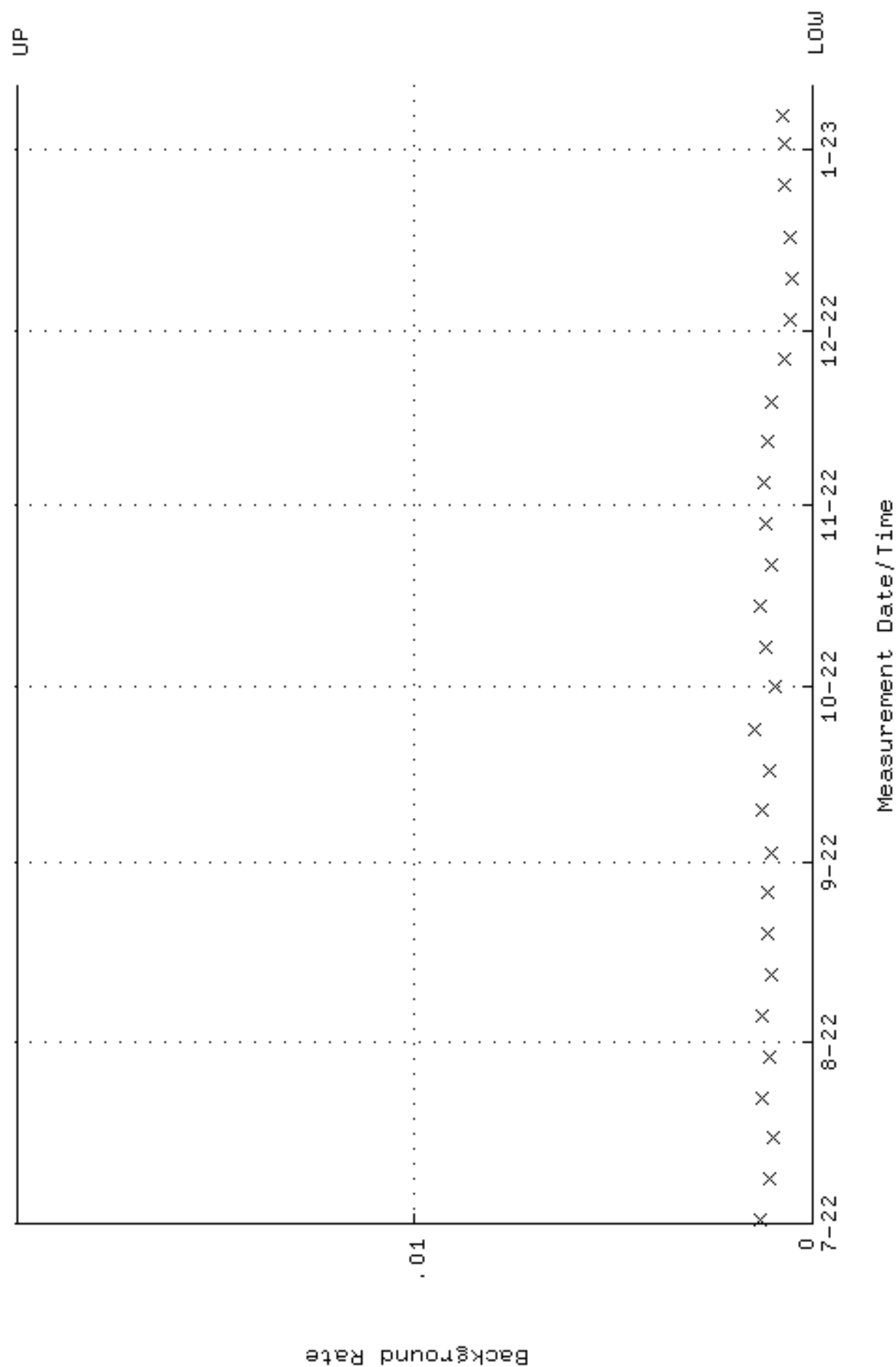
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 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



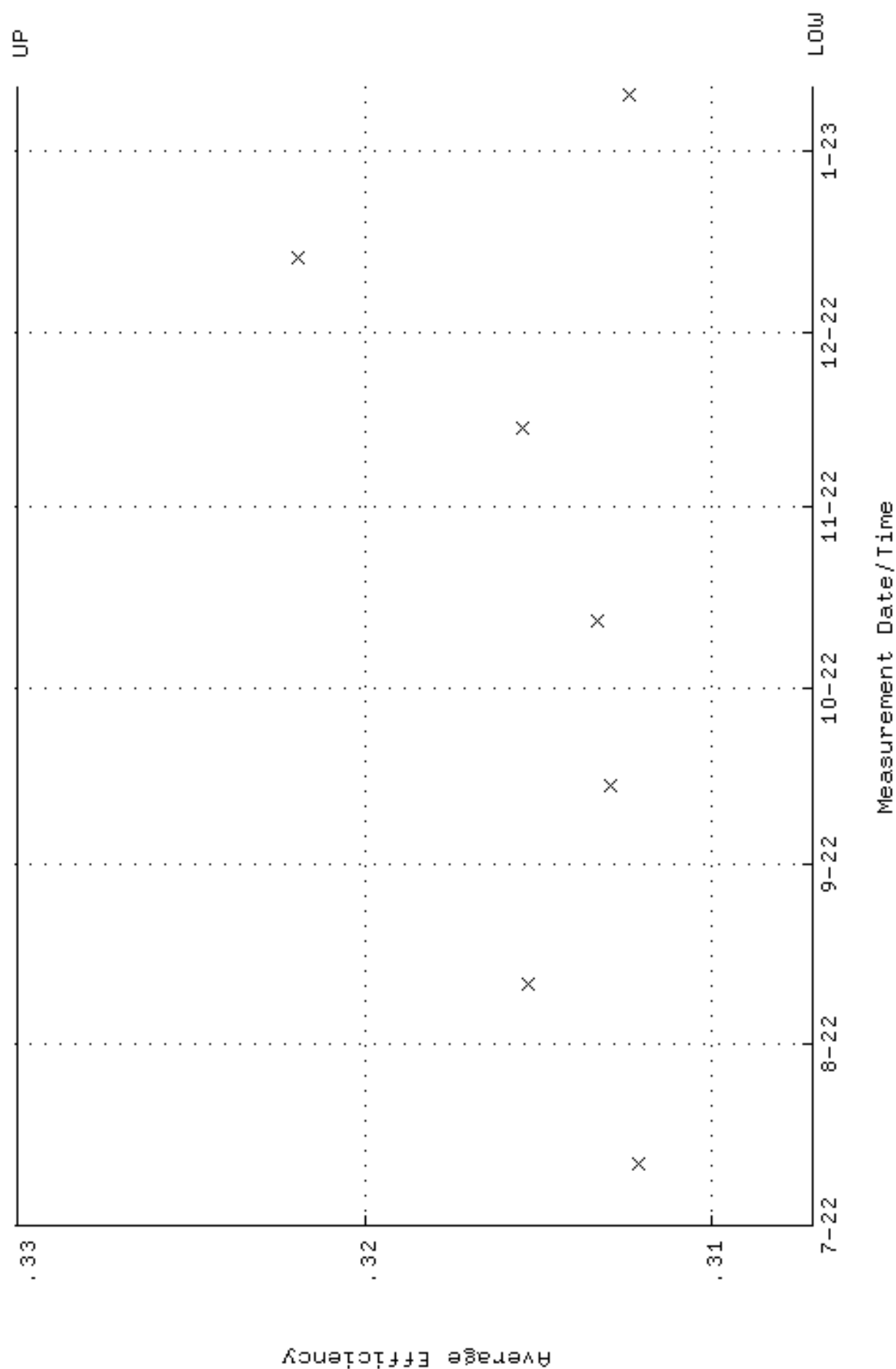
QA filename : DKA100:[ENV_ALPHA.QA.W]W074.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



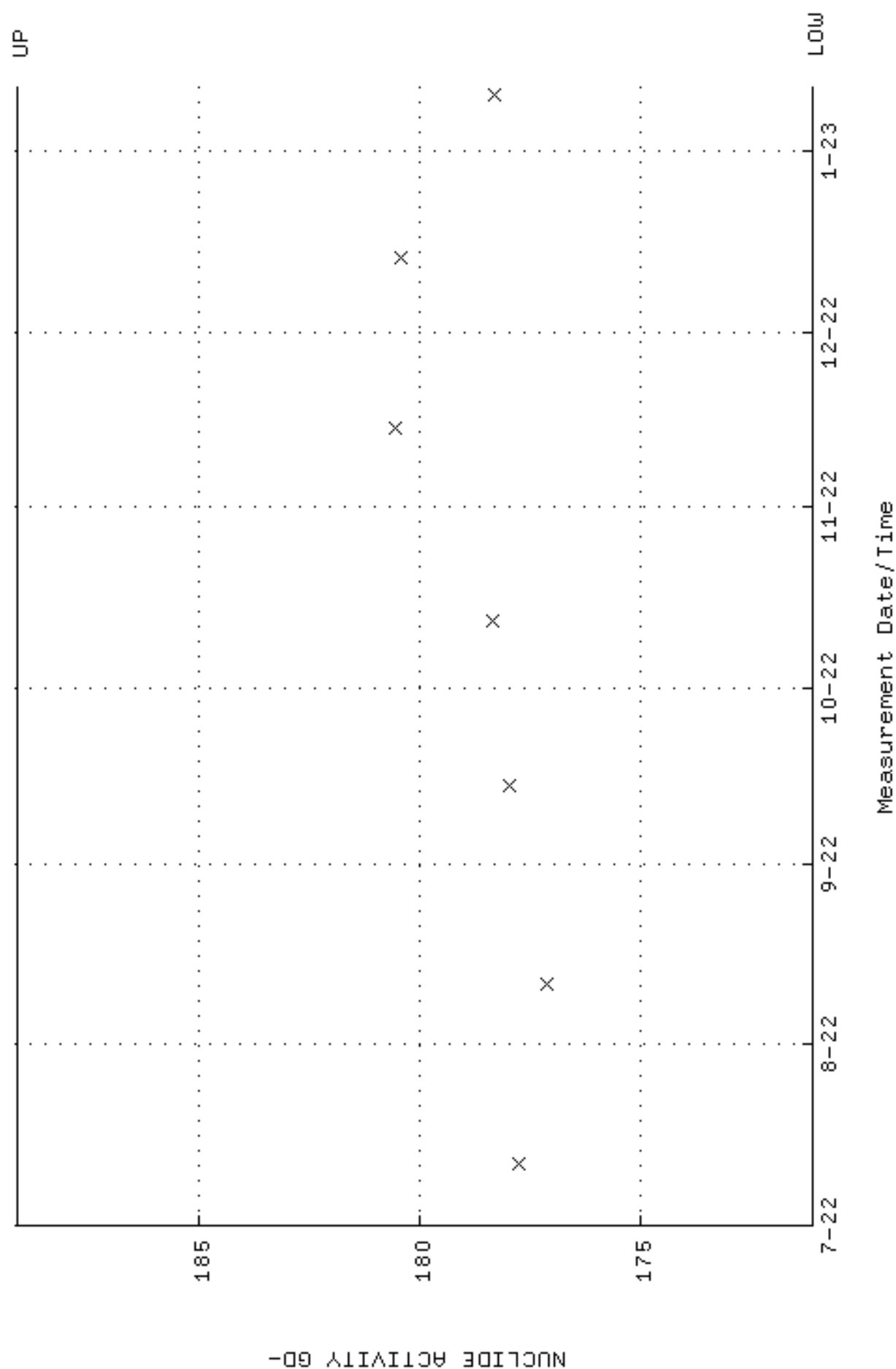
QA filename : DKA100:[ENV_ALPHA.QA.B]B074.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:24:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



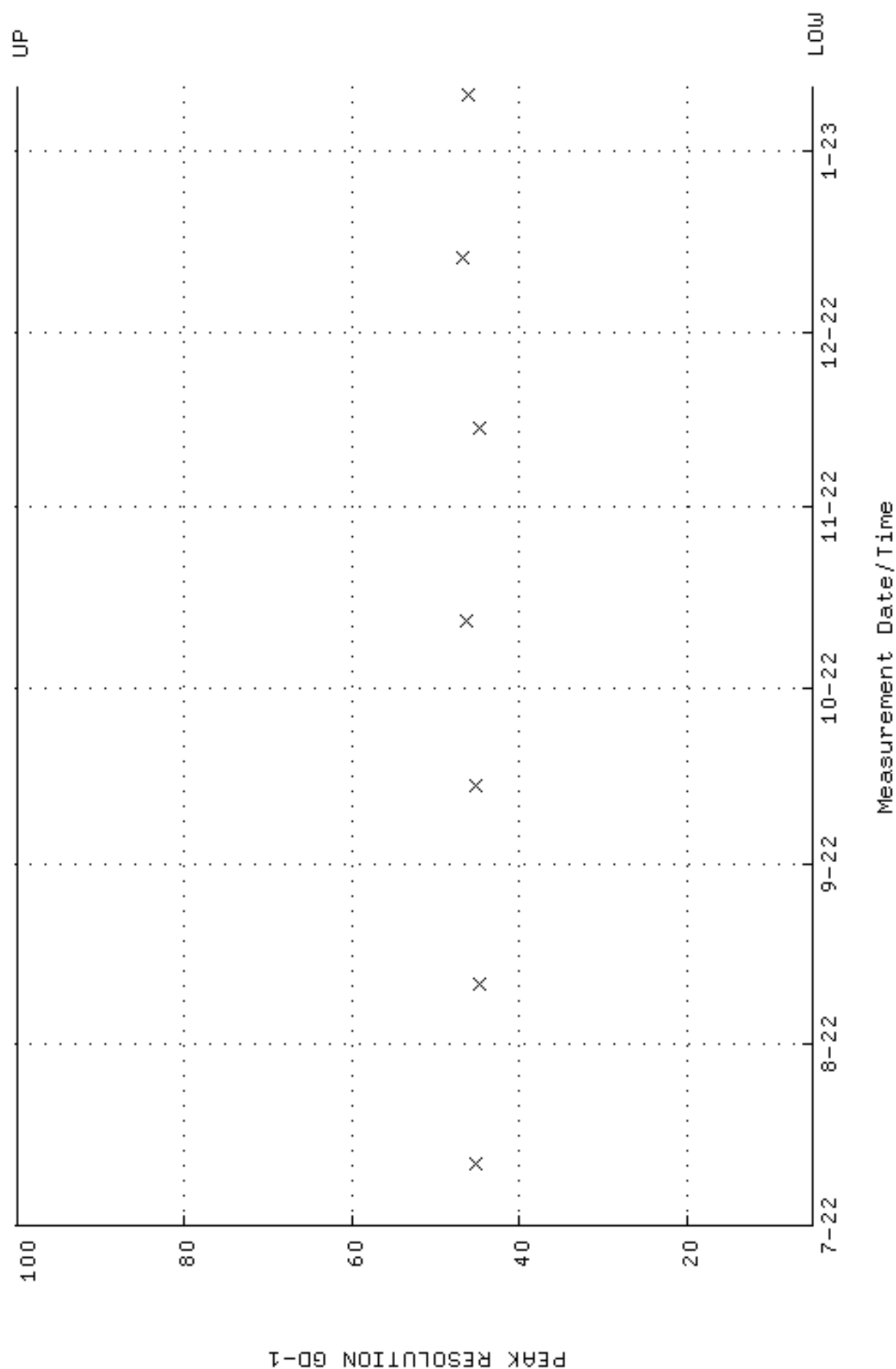
QA filename : DKA100:[ENV_ALPHA.QA.W]W075.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.307100 through 0.330000



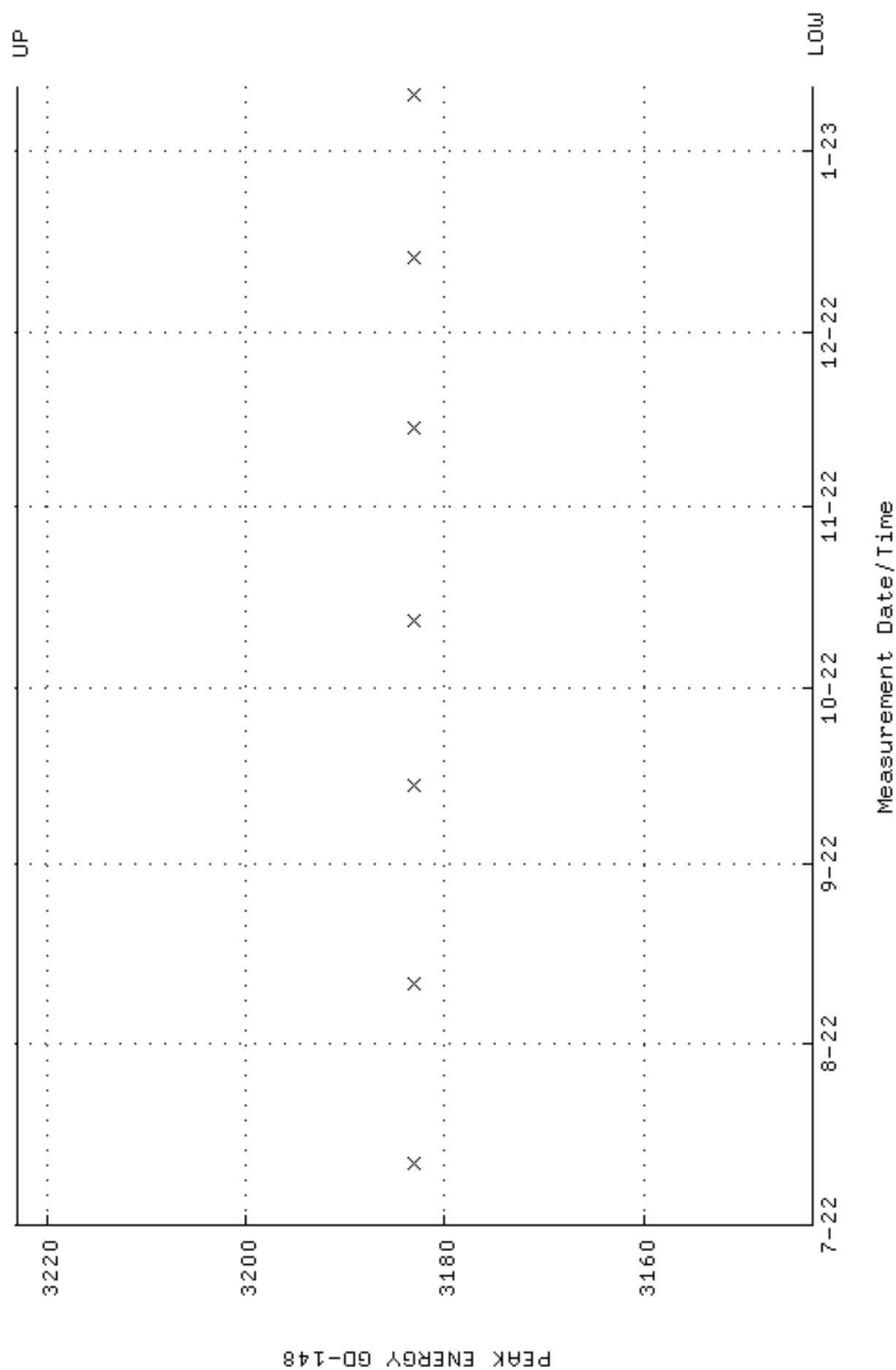
QA filename : DKA100:[ENV_ALPHA.QA.W]W075.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



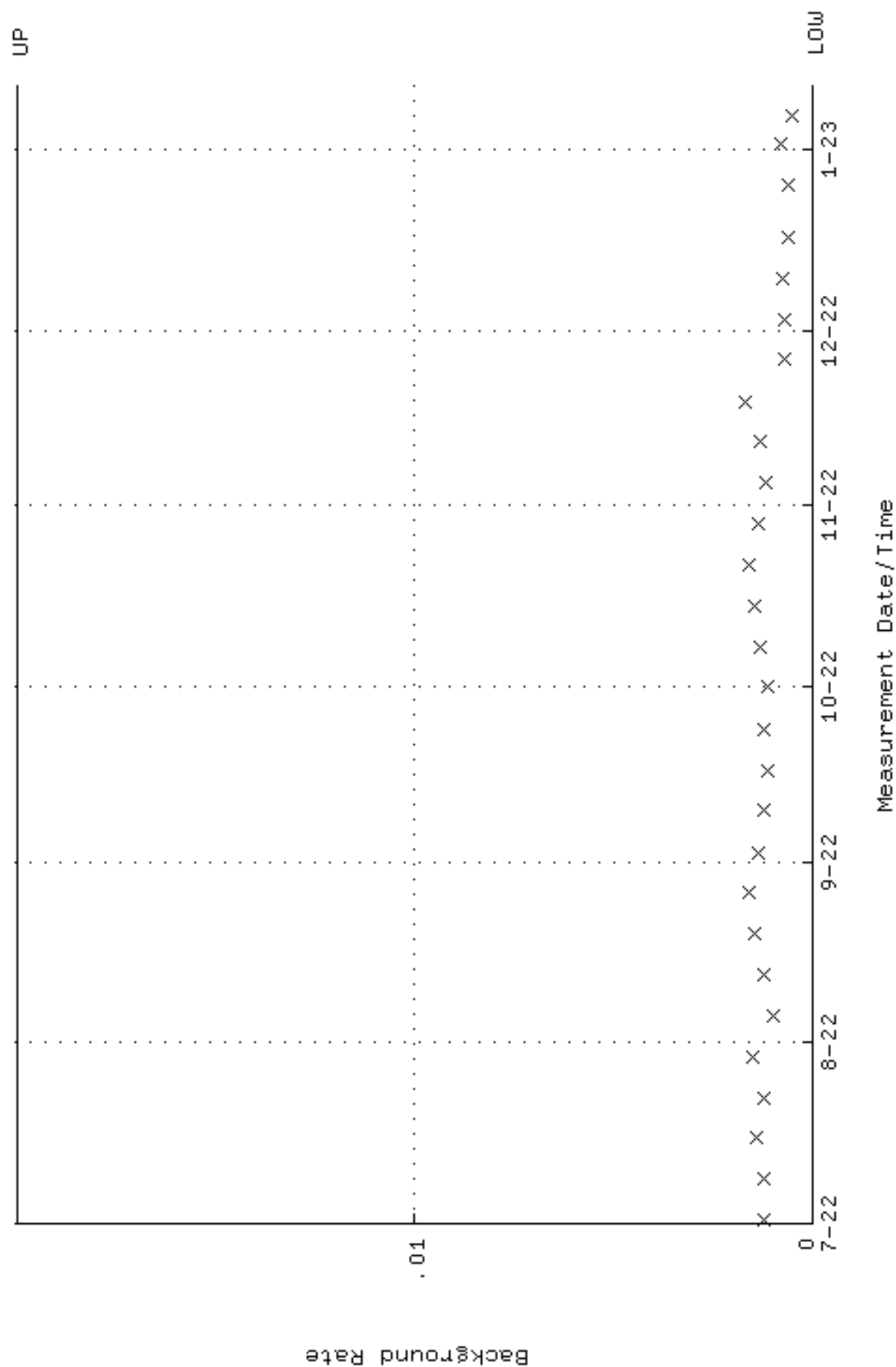
QA filename : DKA100:[ENV_ALPHA.QA.W]W075.QAF;11
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



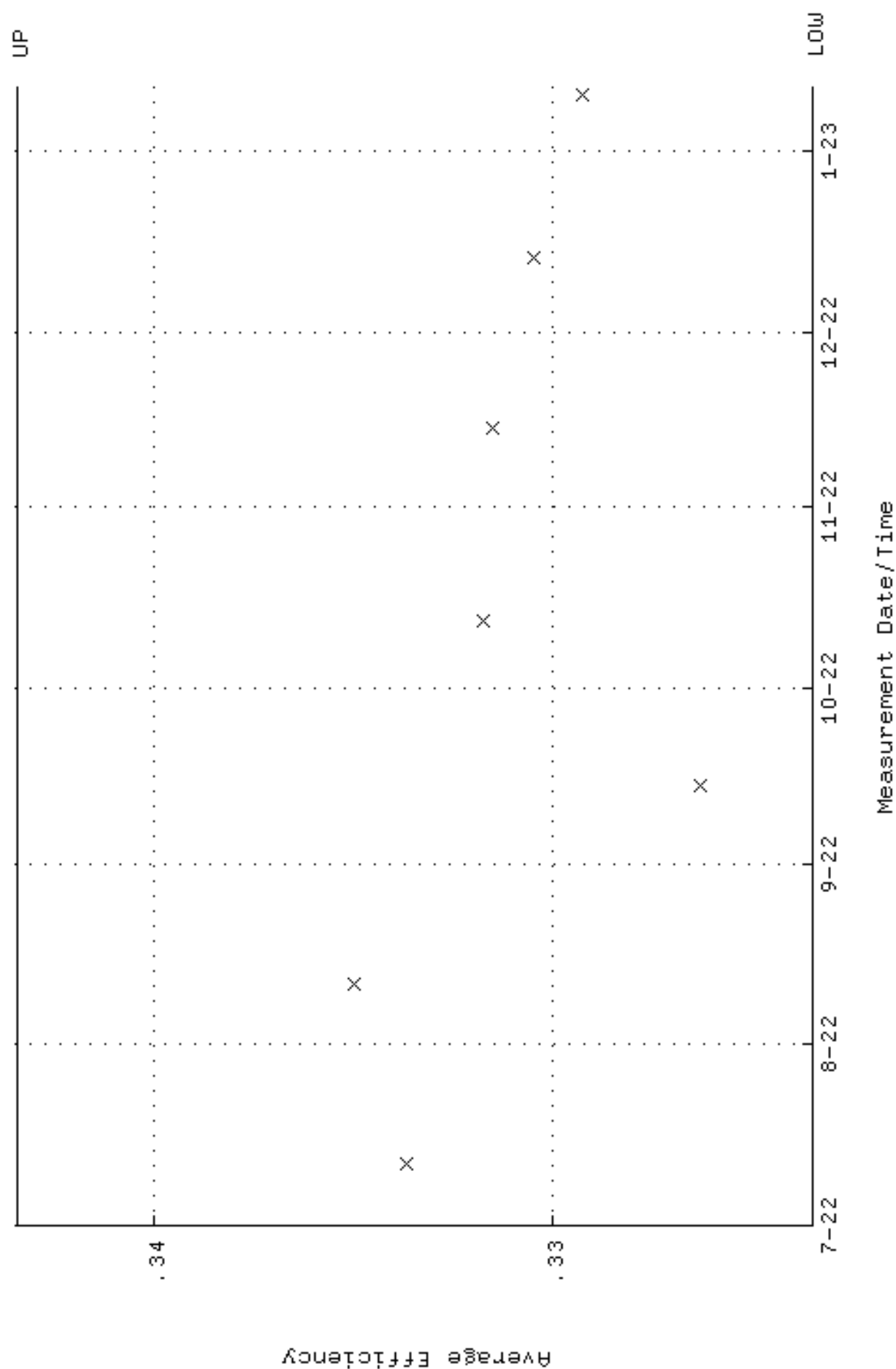
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



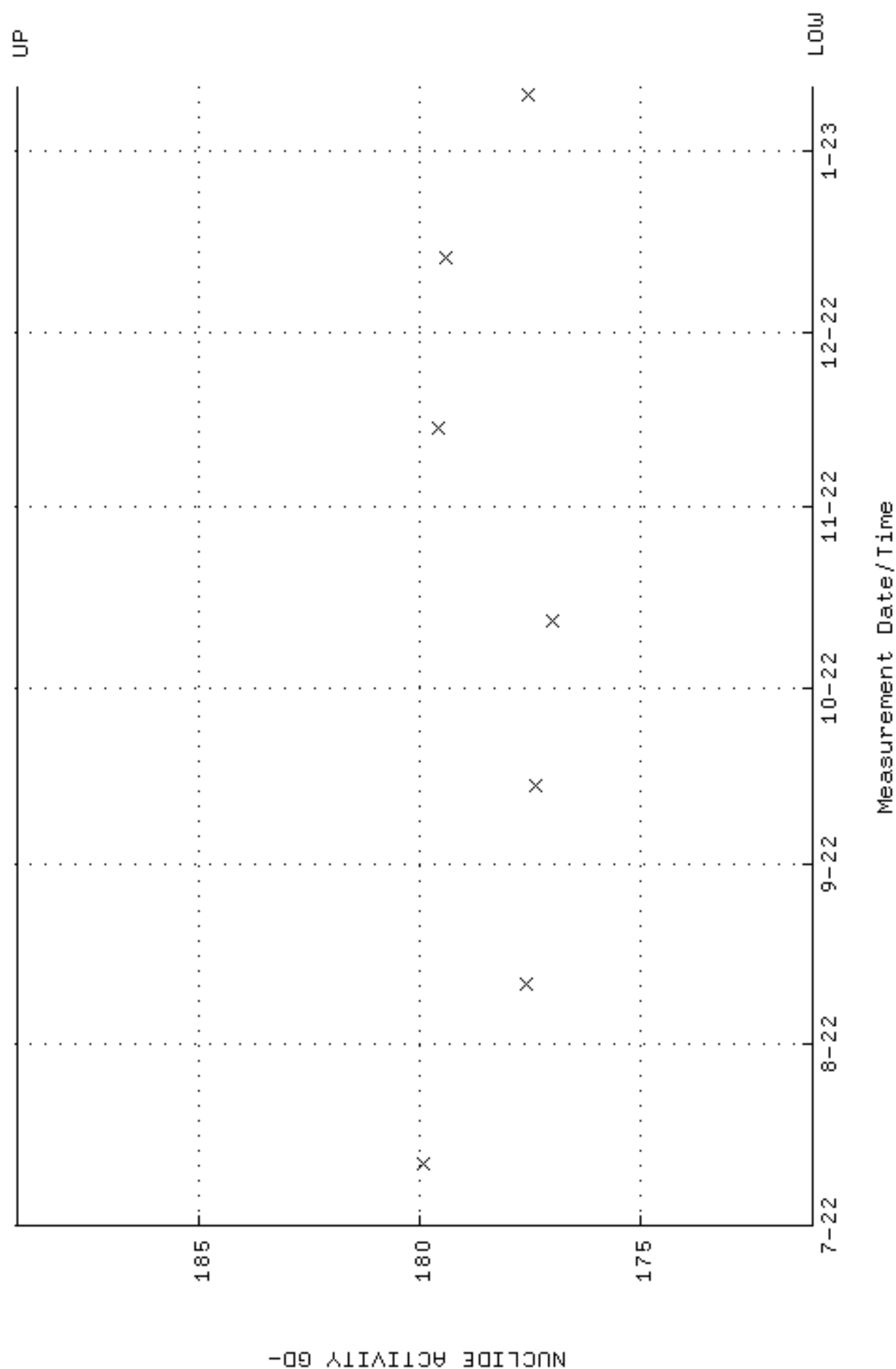
QA filename : DKA100:[ENV_ALPHA.QA.B]B075.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:24:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



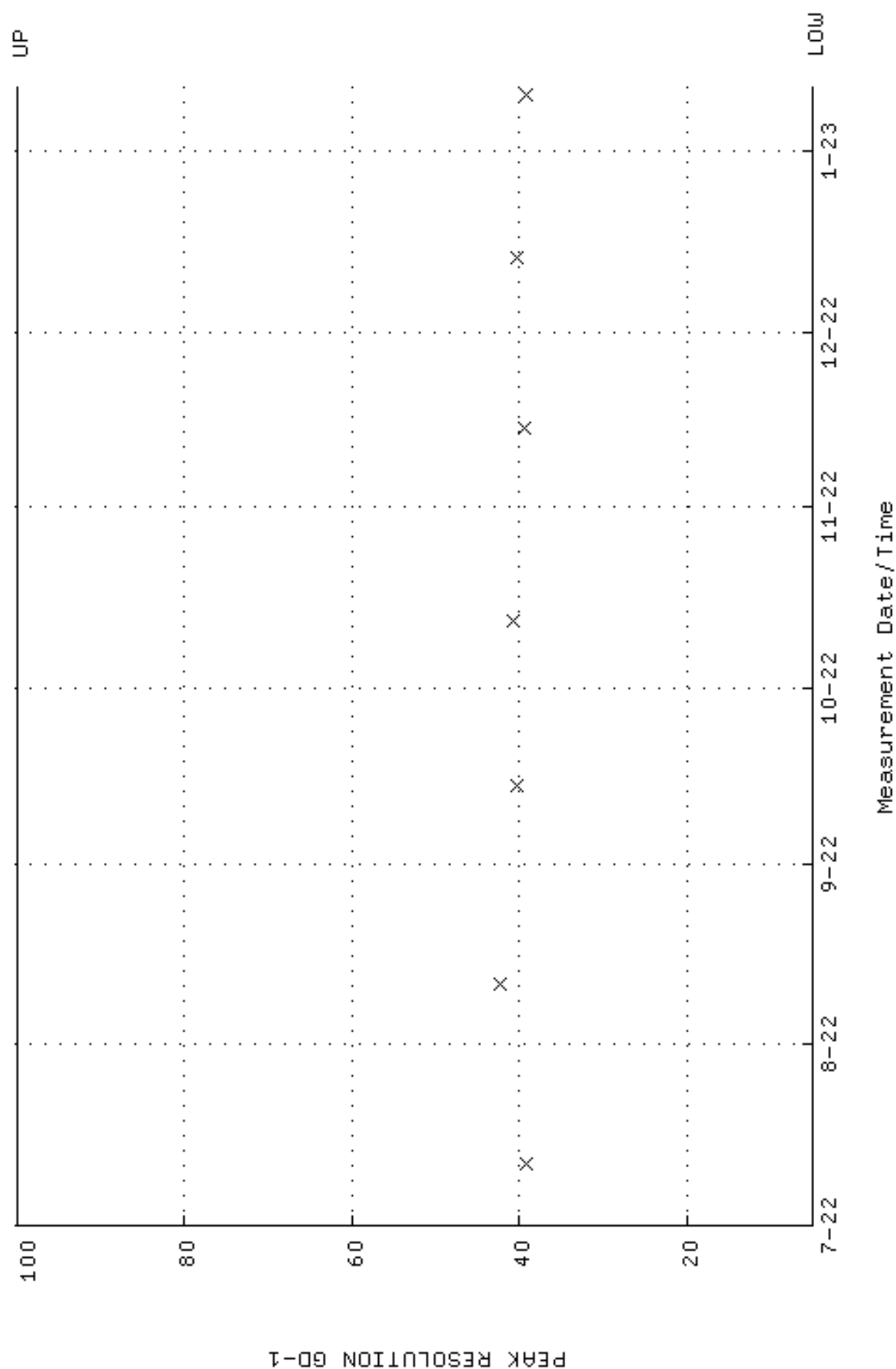
QA filename : DKA100:[ENV_ALPHA.QA.W]W076.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.323450 through 0.343450



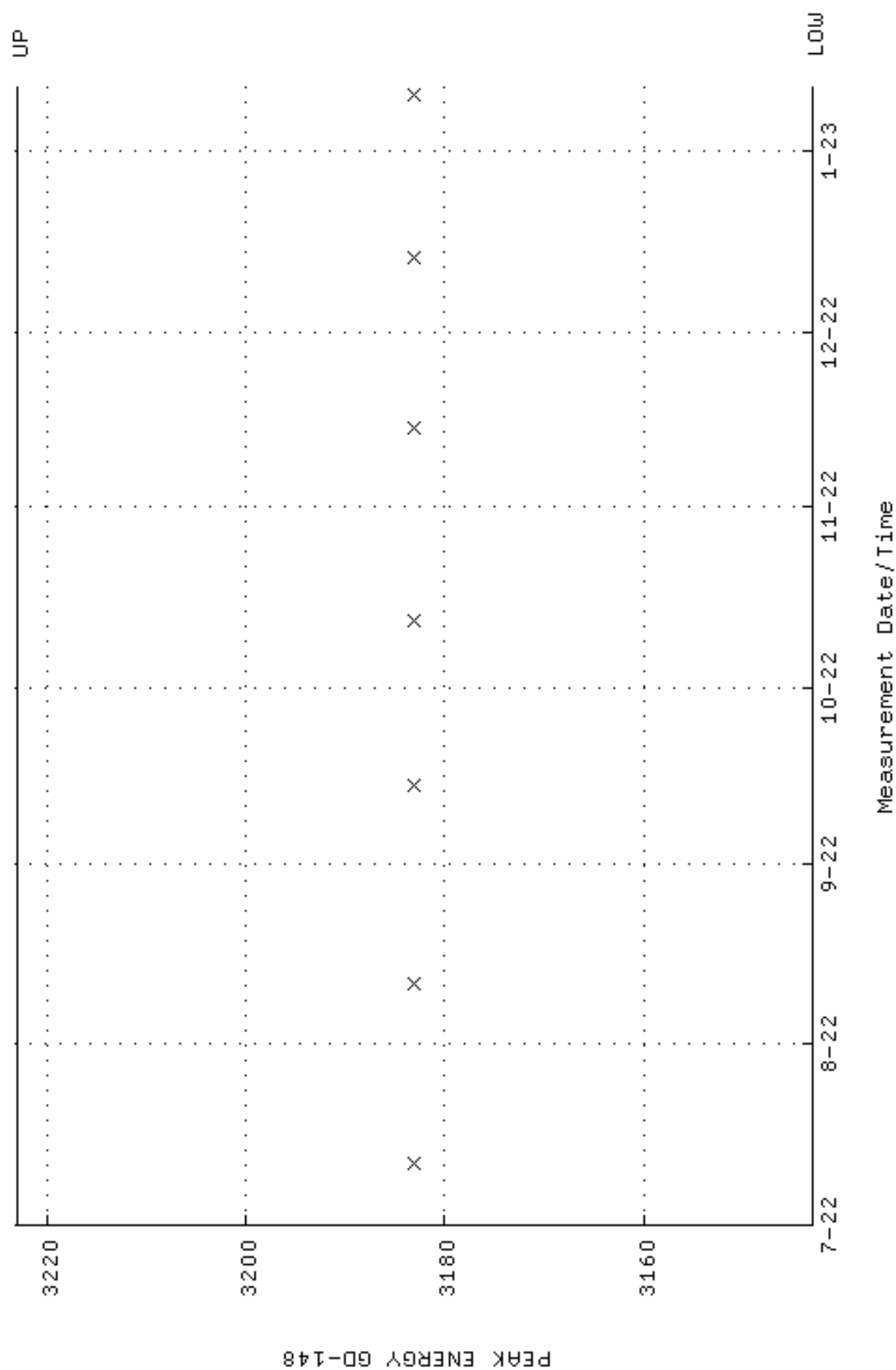
QA filename : DKA100:[ENV_ALPHA.QA.W]W076.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



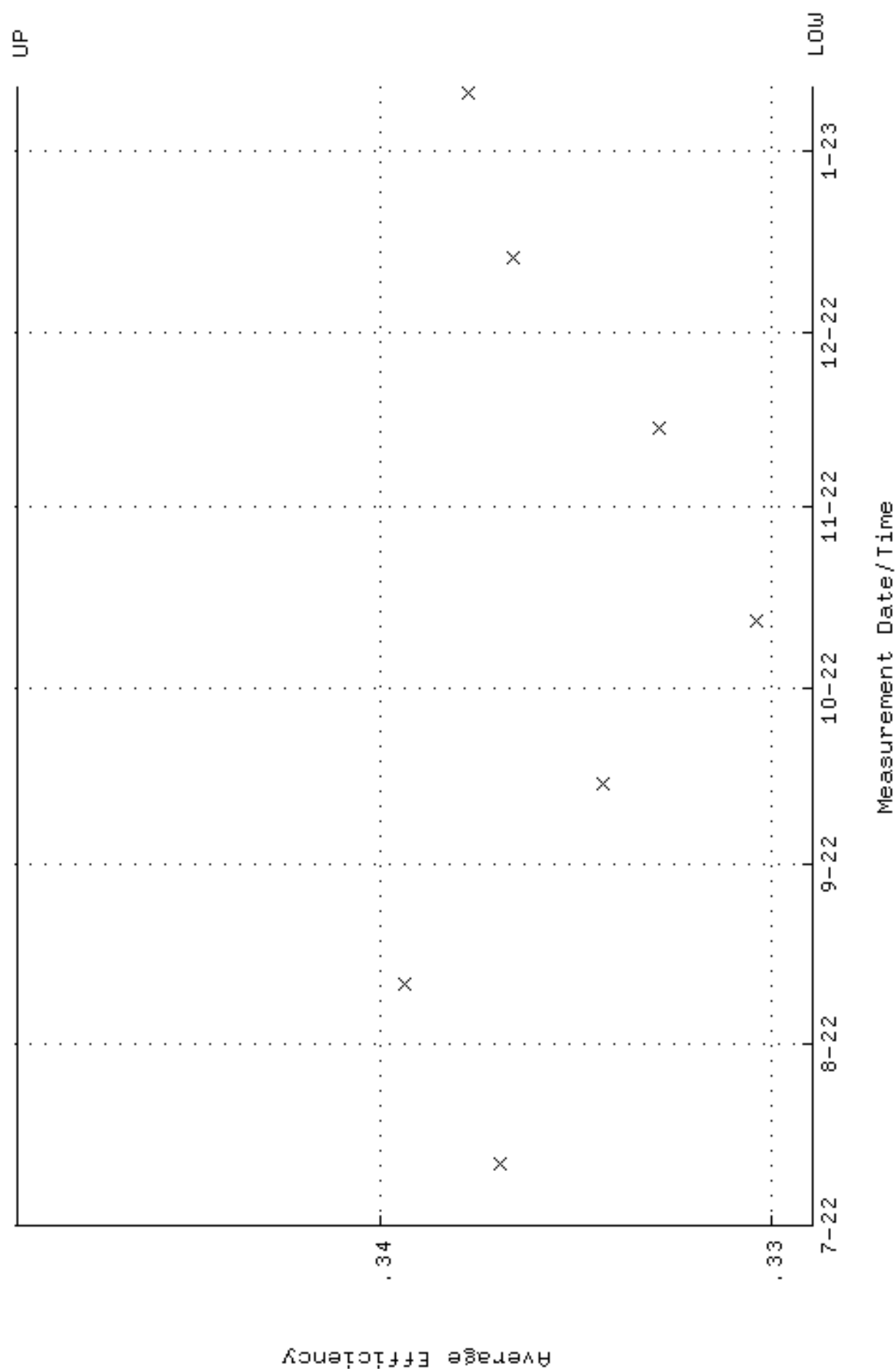
QA filename : DKA100:[ENV_ALPHA.QA.W]W076.QAF;10
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



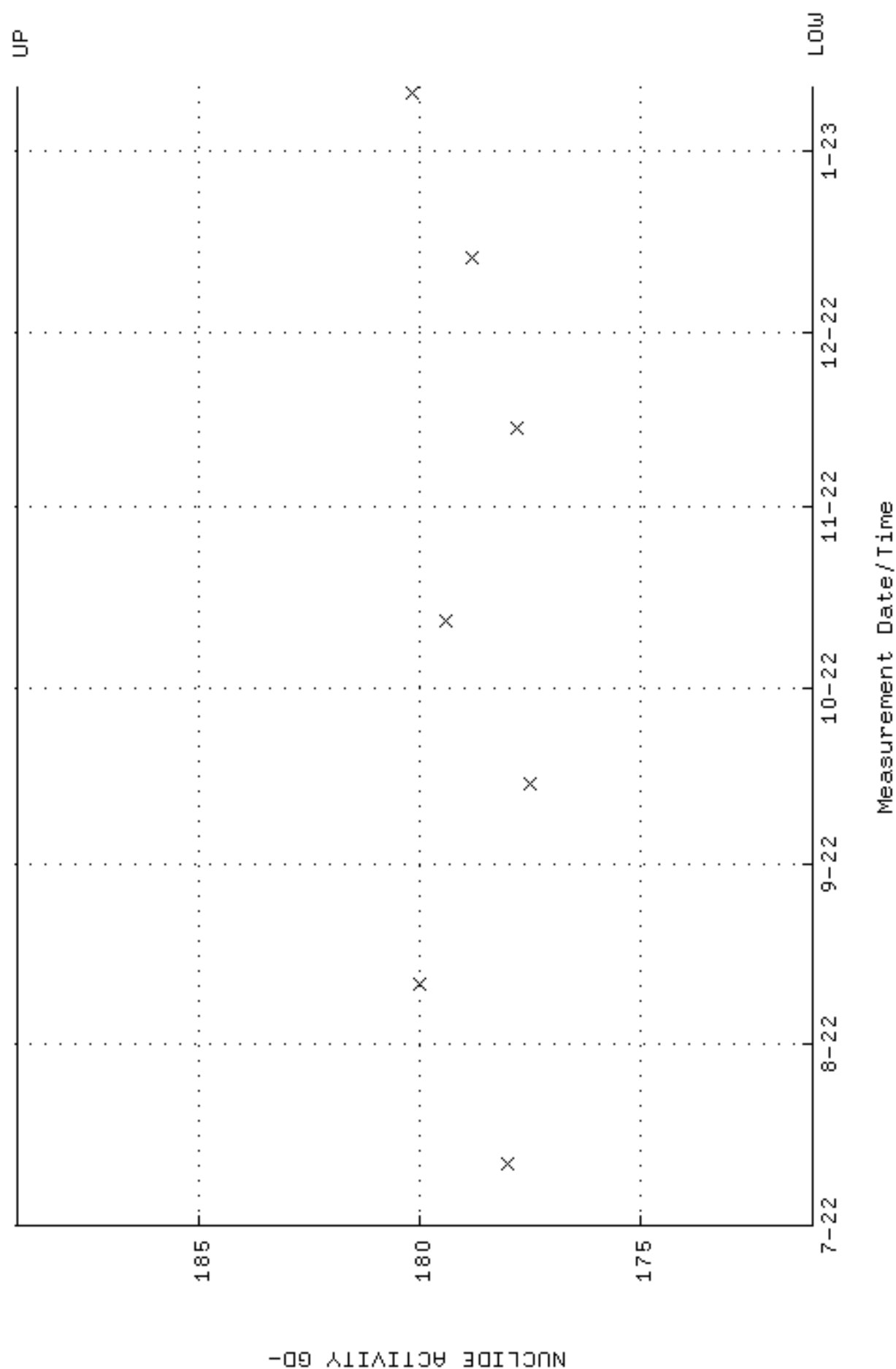
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:19:26 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



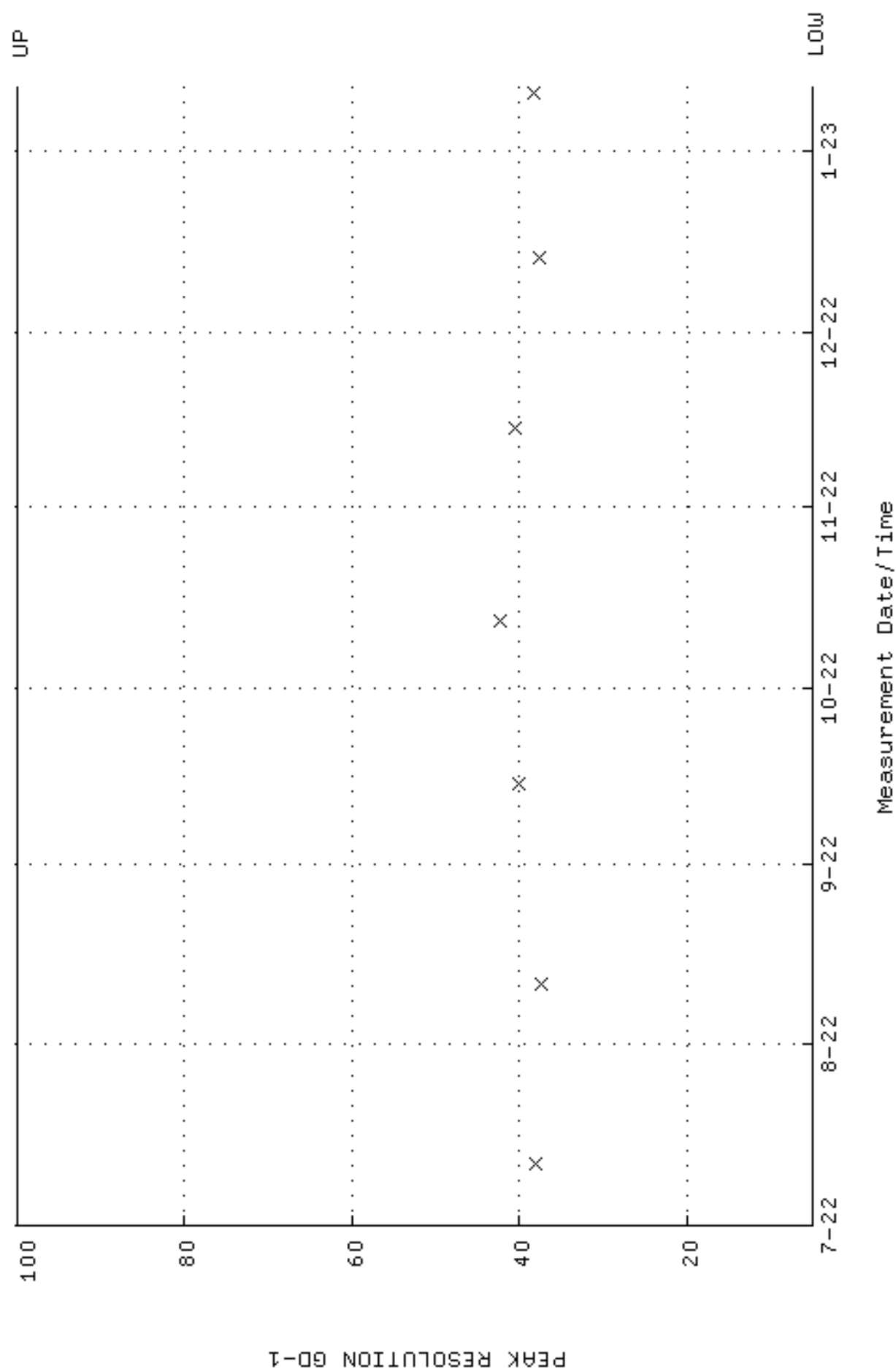
QA filename : DKA100:[ENV_ALPHA.QA.W]W082.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.328935 through 0.349281



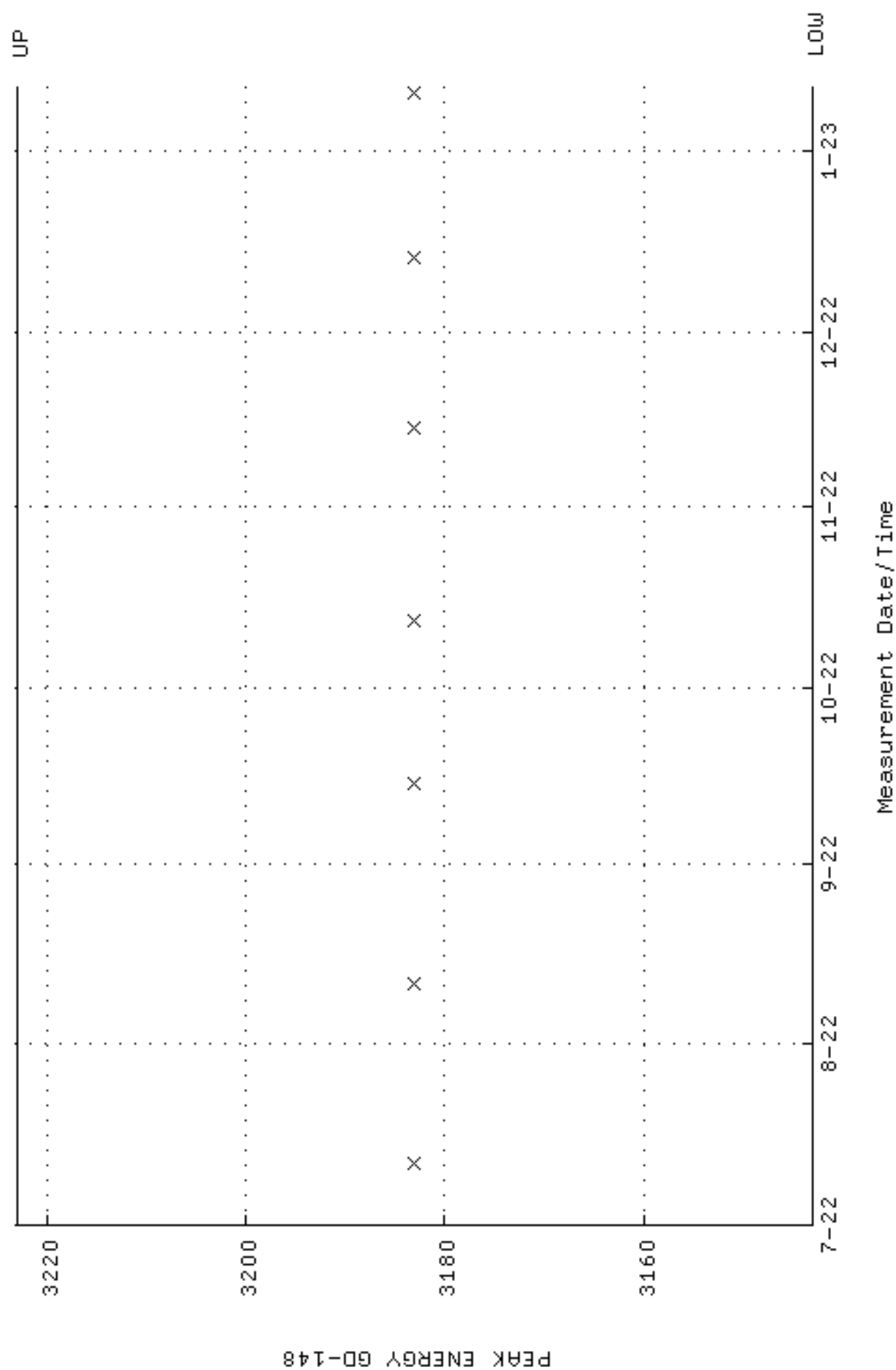
QA filename : DKA100:[ENV_ALPHA.QA.W]W082.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



QA filename : DKA100:[ENV_ALPHA.QA.W]W082.QAF;9
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



QA filename : DKA100:[ENV_ALPHA.QA.W]W082.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 10:17:38 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



UP

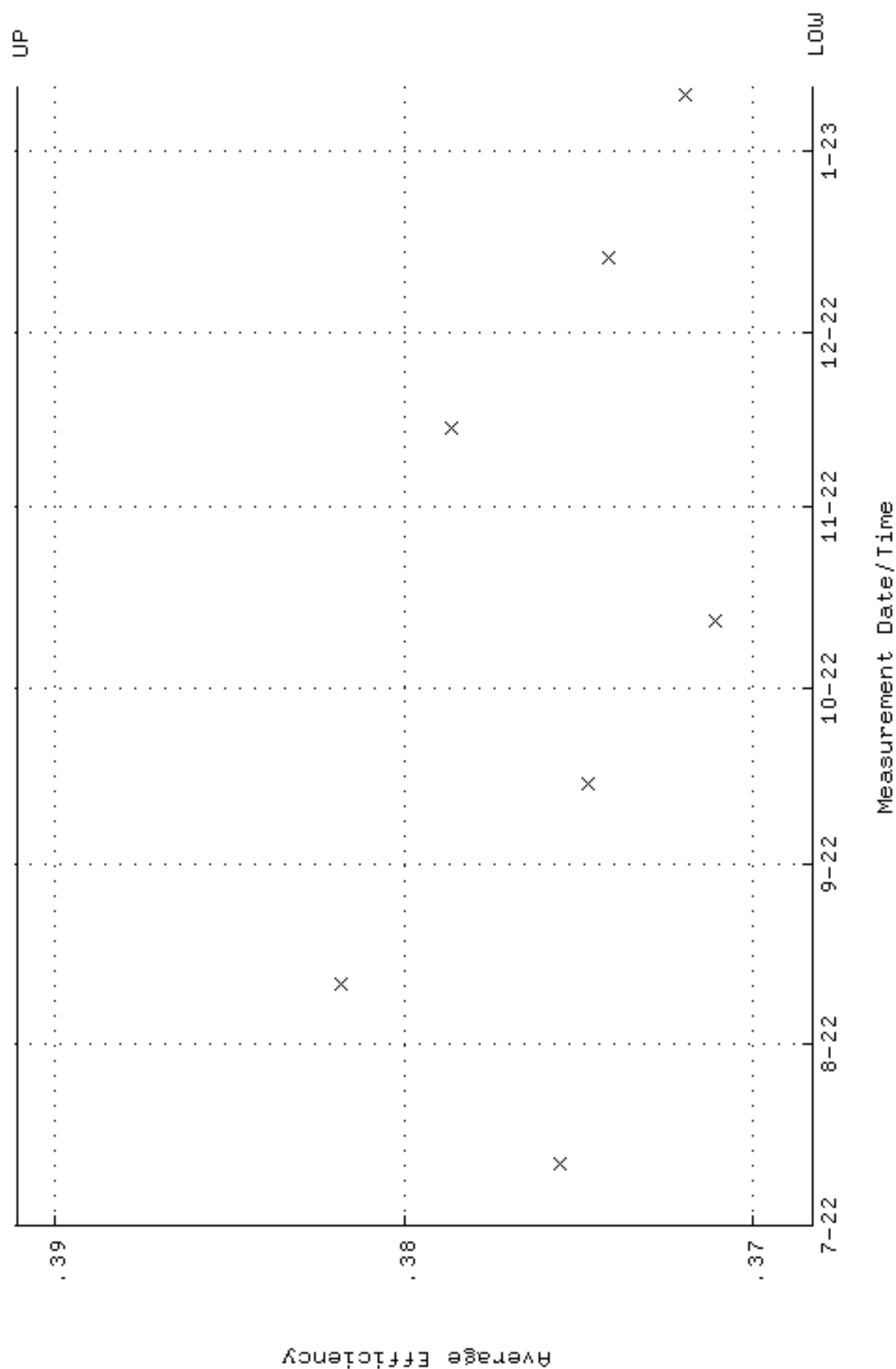
Background Rate

Measurement Date/Time

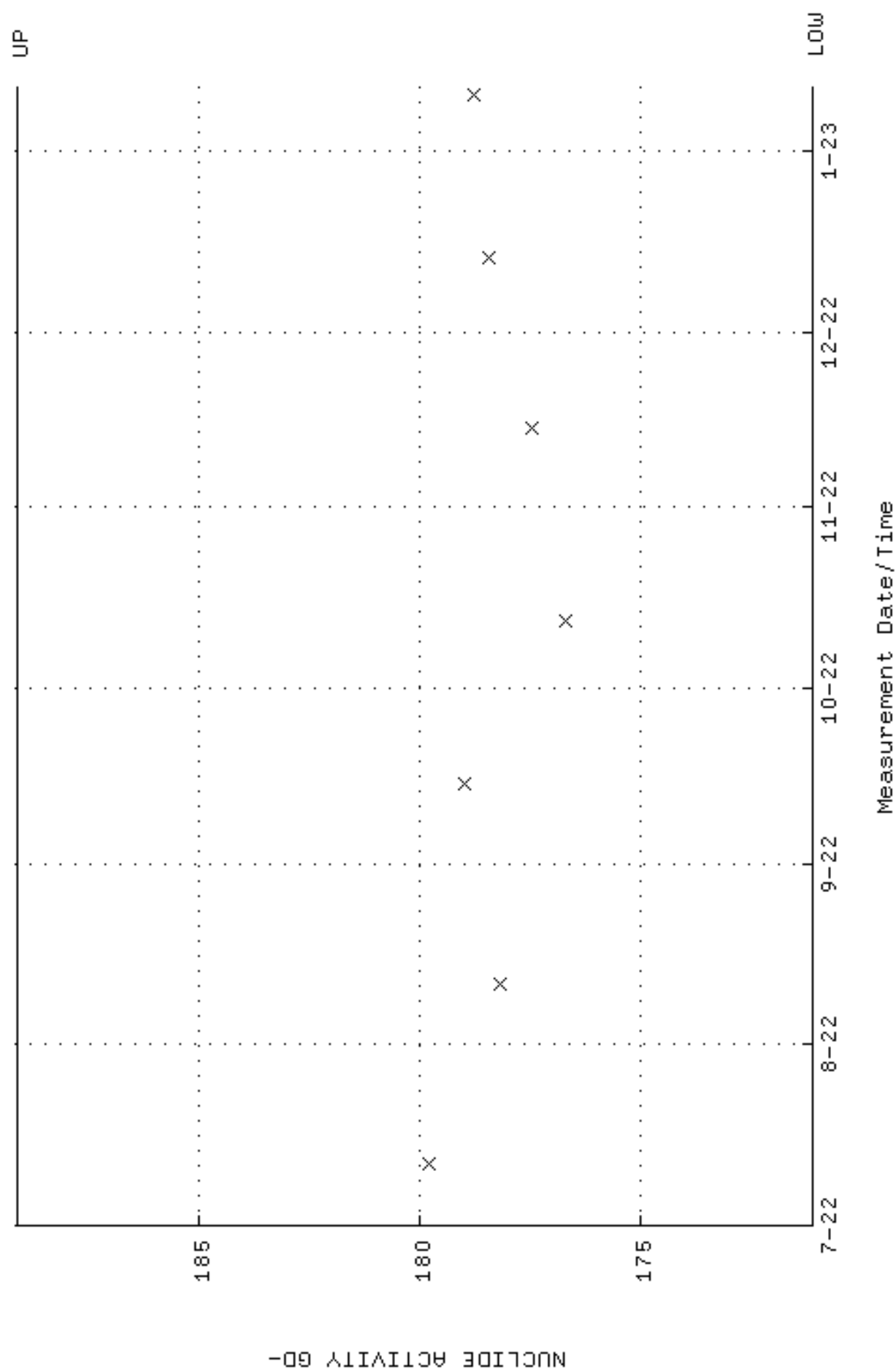
LOW

7-22 8-22 9-22 10-22 11-22 12-22 1-23

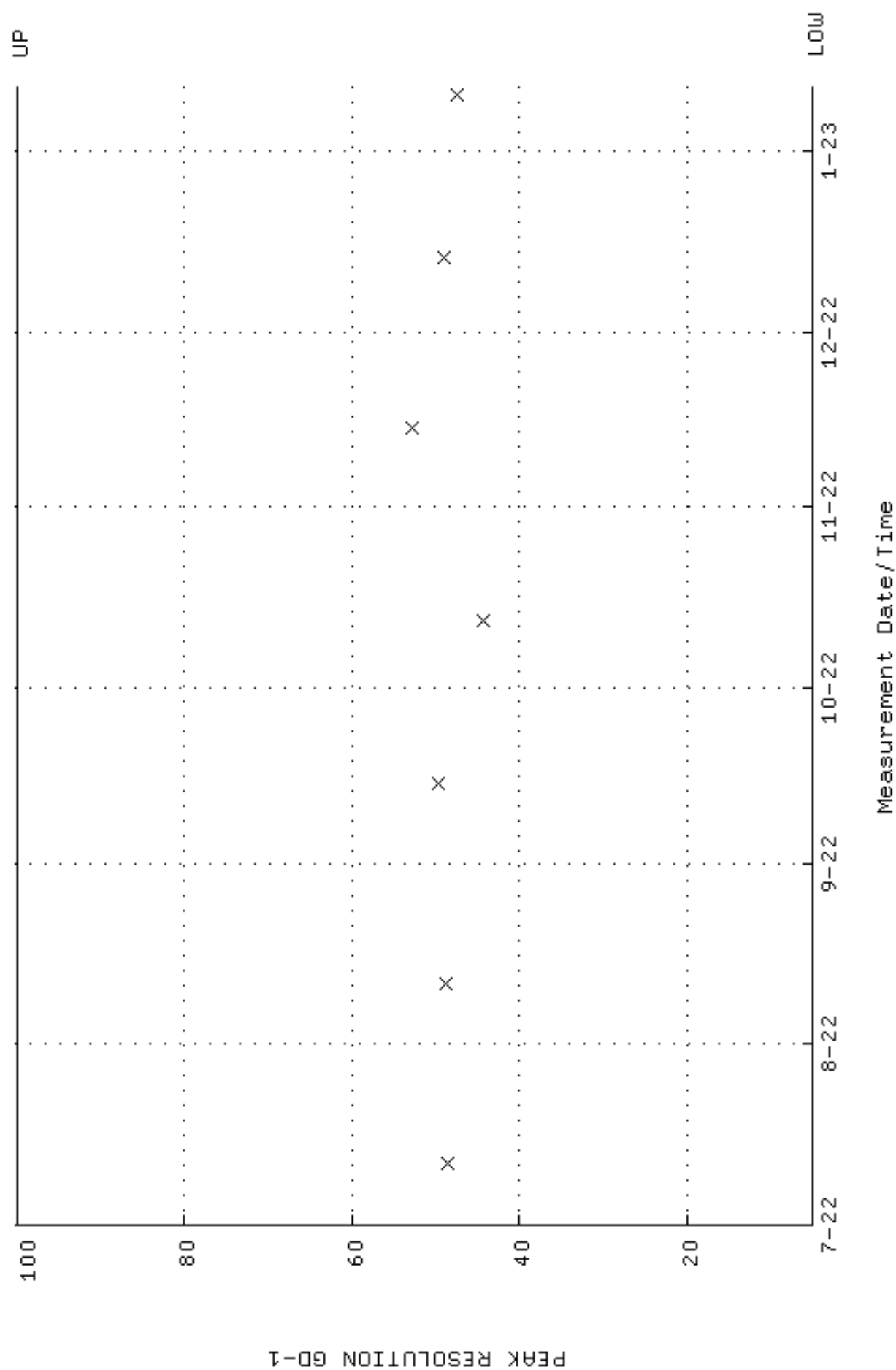
QA filename : DKA100:[ENV_ALPHA.QA.W]W083.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.368300 through 0.391080



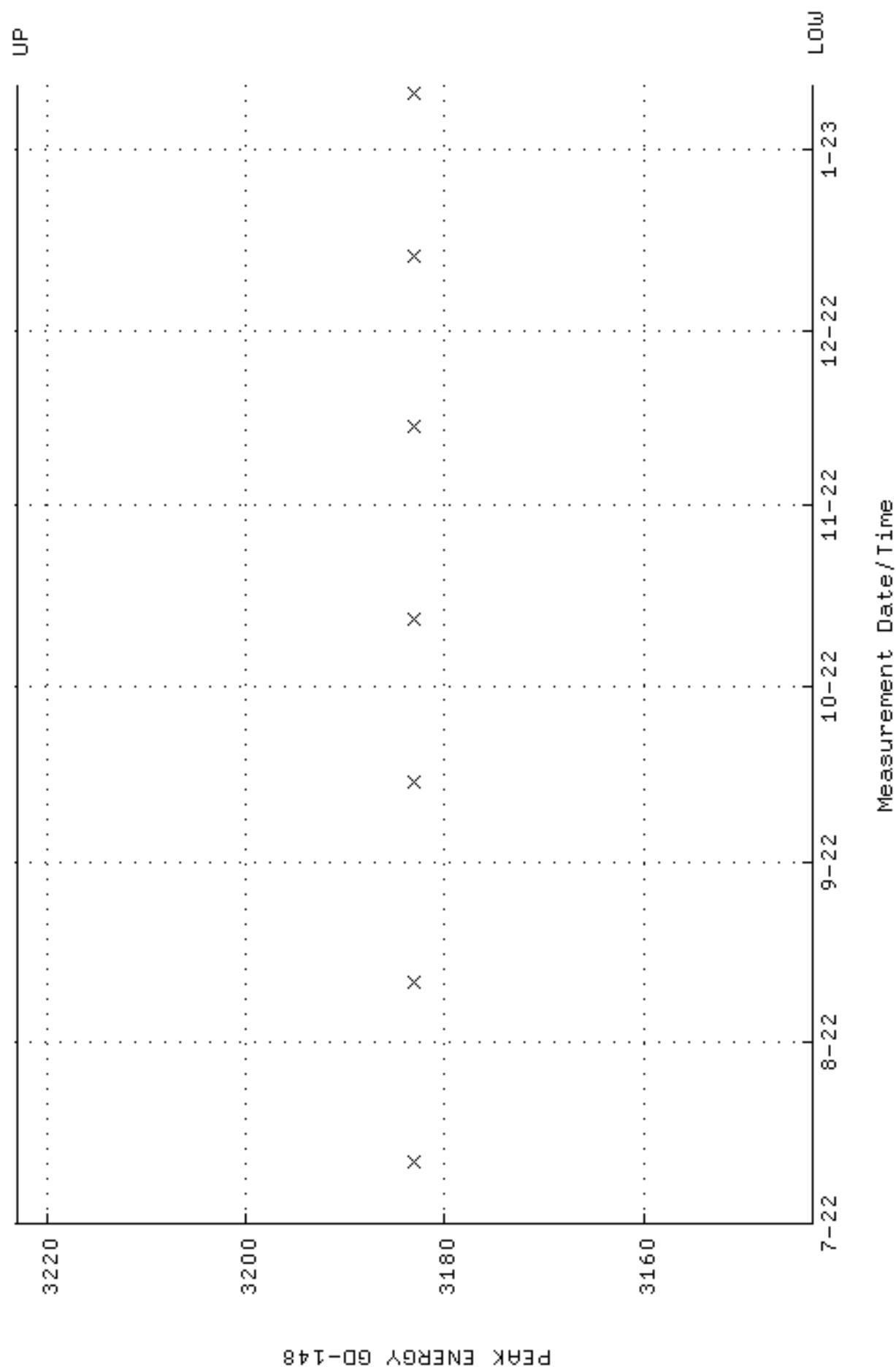
QA filename : DKA100:[ENV_ALPHA.QA.W]W083.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



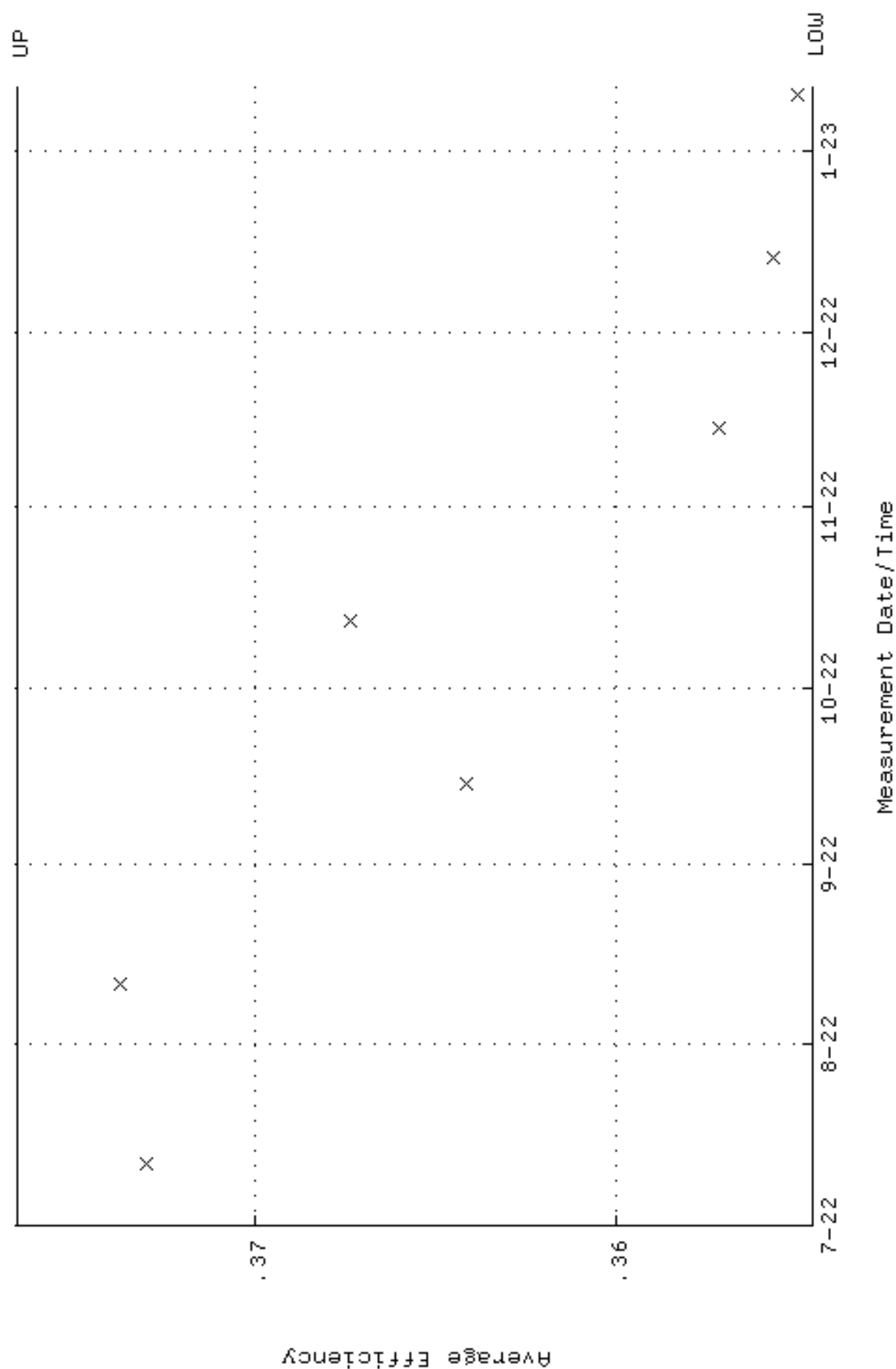
QA filename : DKA100:[ENV_ALPHA.QA.W]W083.QAF;10
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



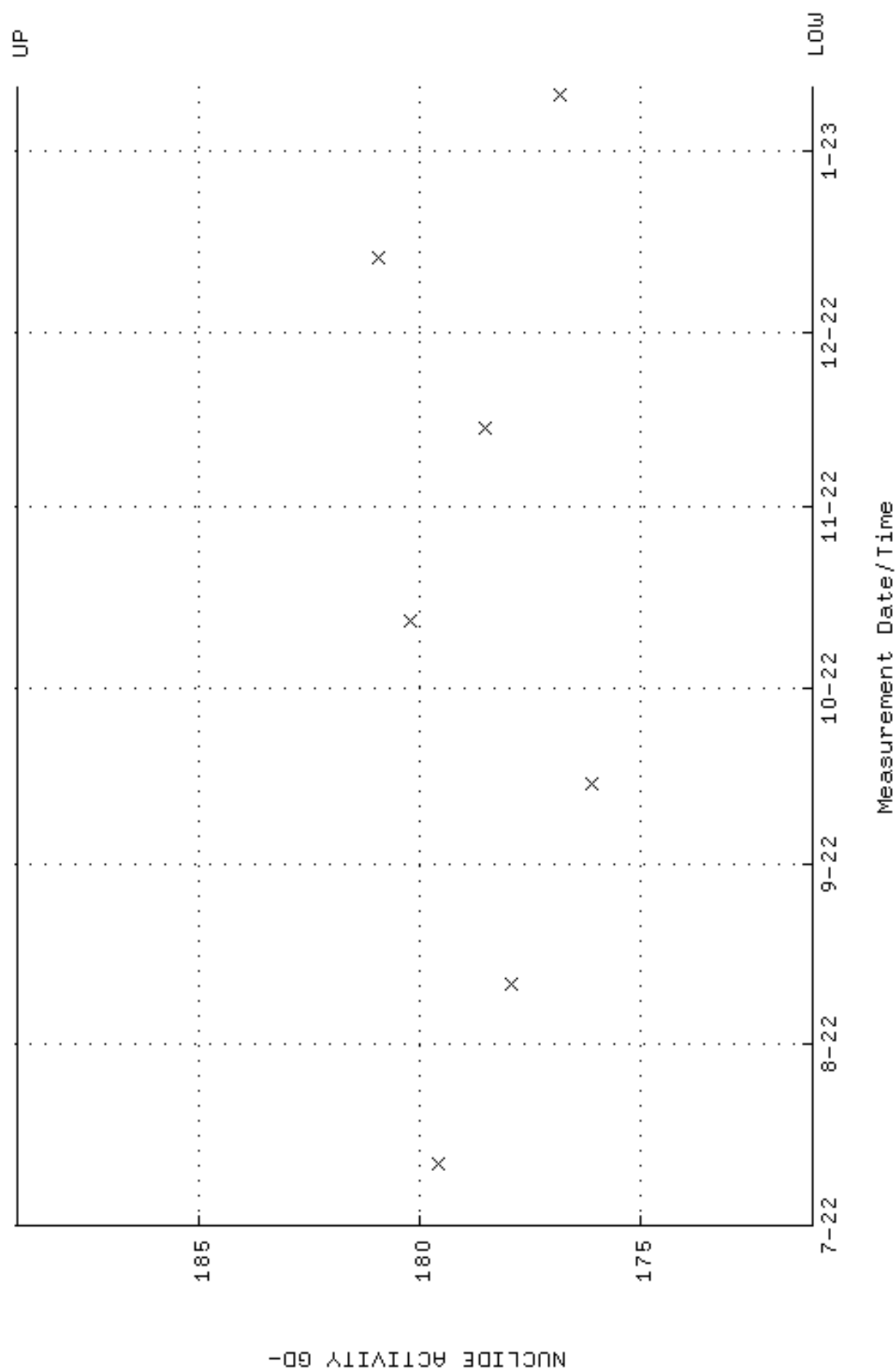
QA filename : DKA100:[ENV_ALPHA.QA.W]W083.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



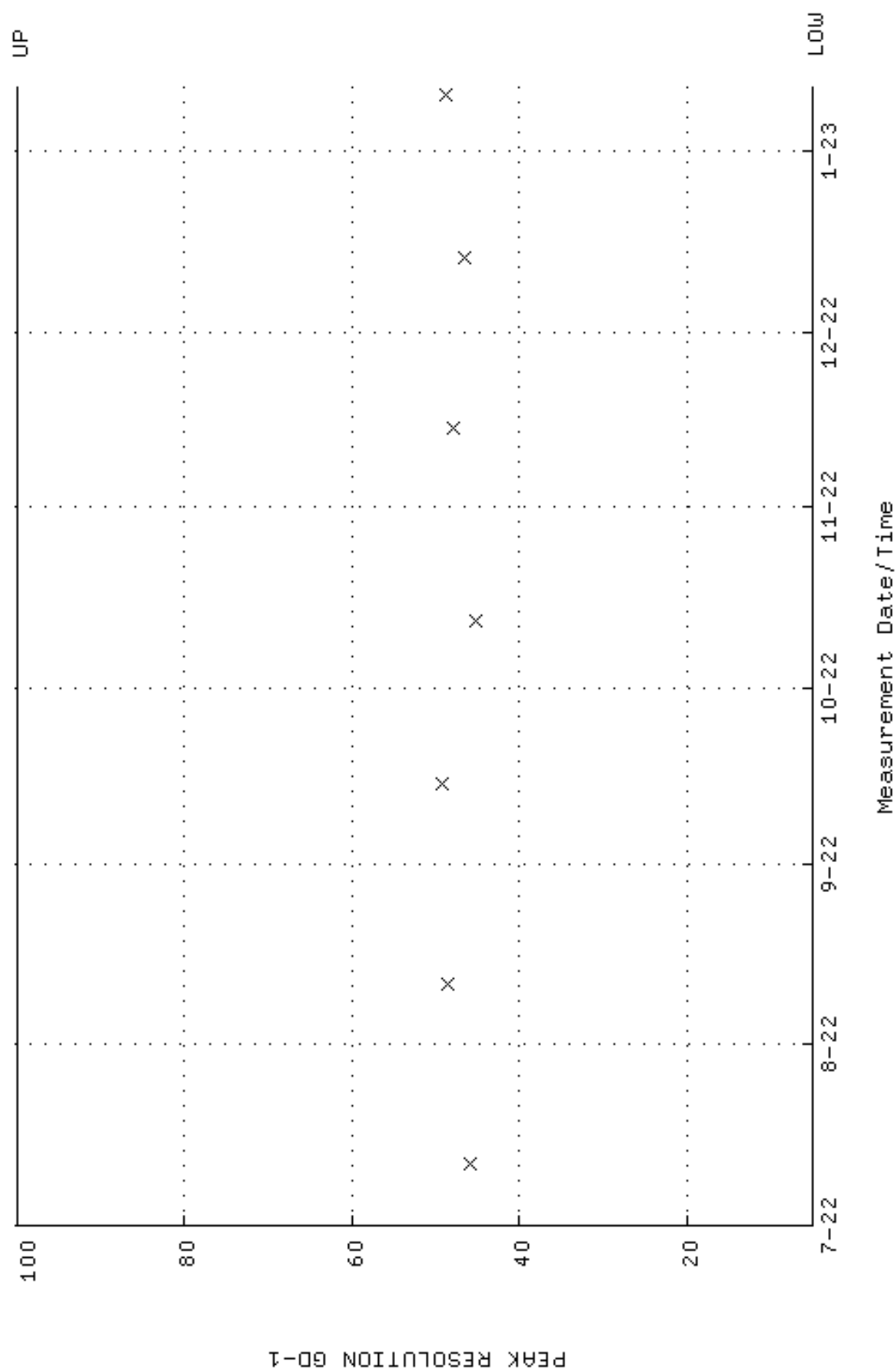
QA filename : DKA100:[ENV_ALPHA.QA.W]W084.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.354600 through 0.376530



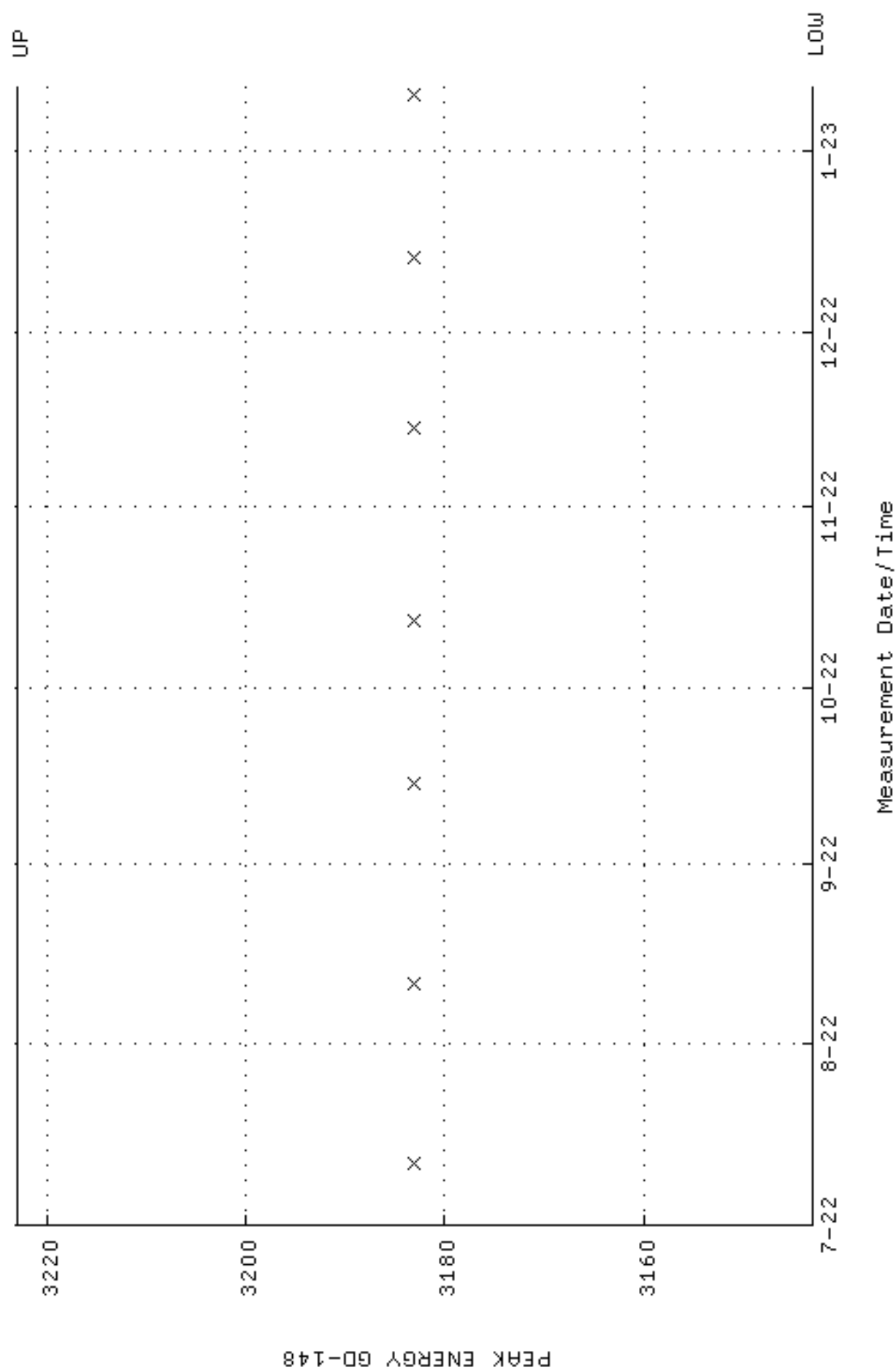
QA filename : DKA100:[ENV_ALPHA.QA.W]W084.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



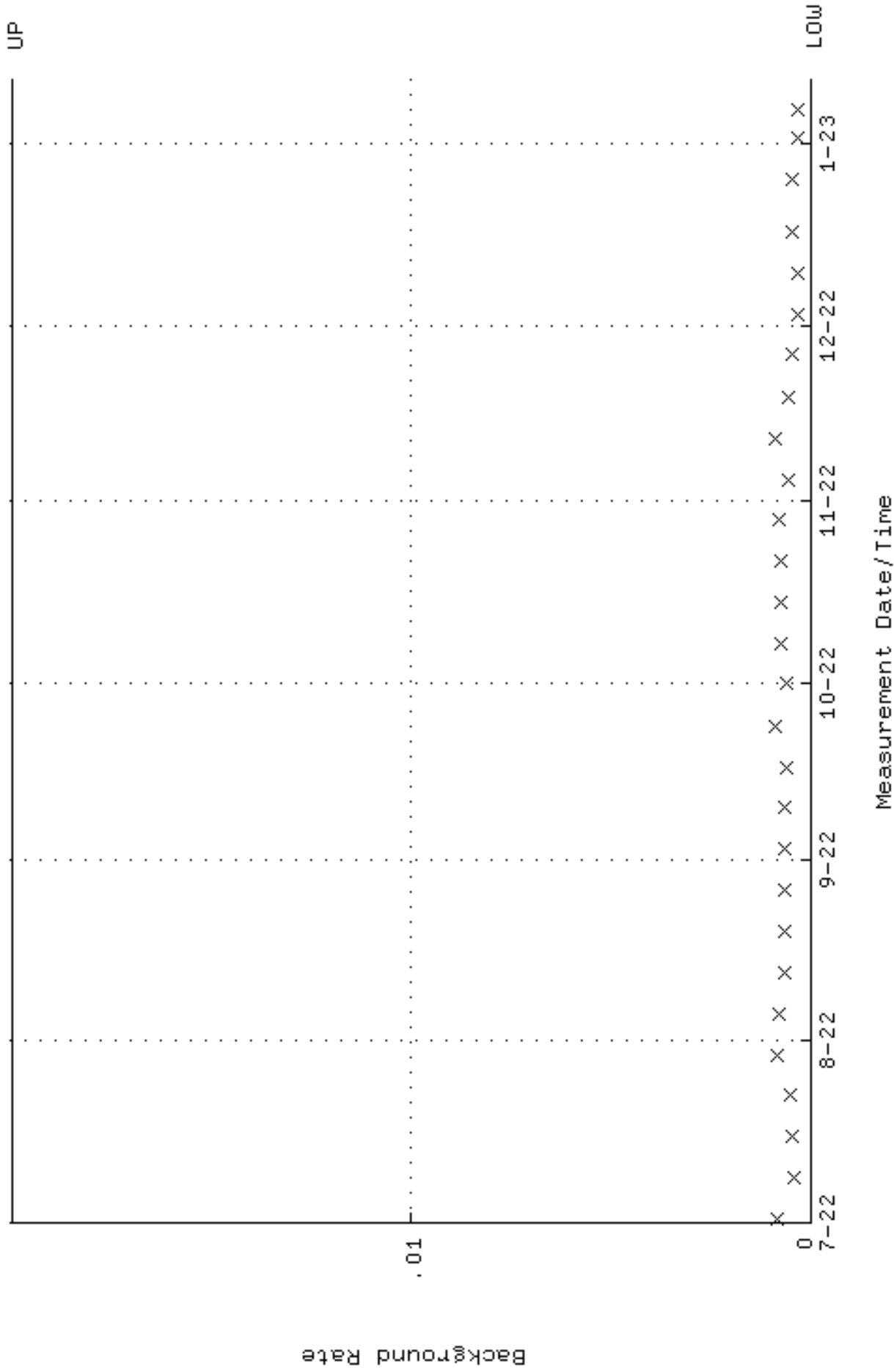
QA filename : DKA100:[ENV_ALPHA.QA.W]W084.QAF;9
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



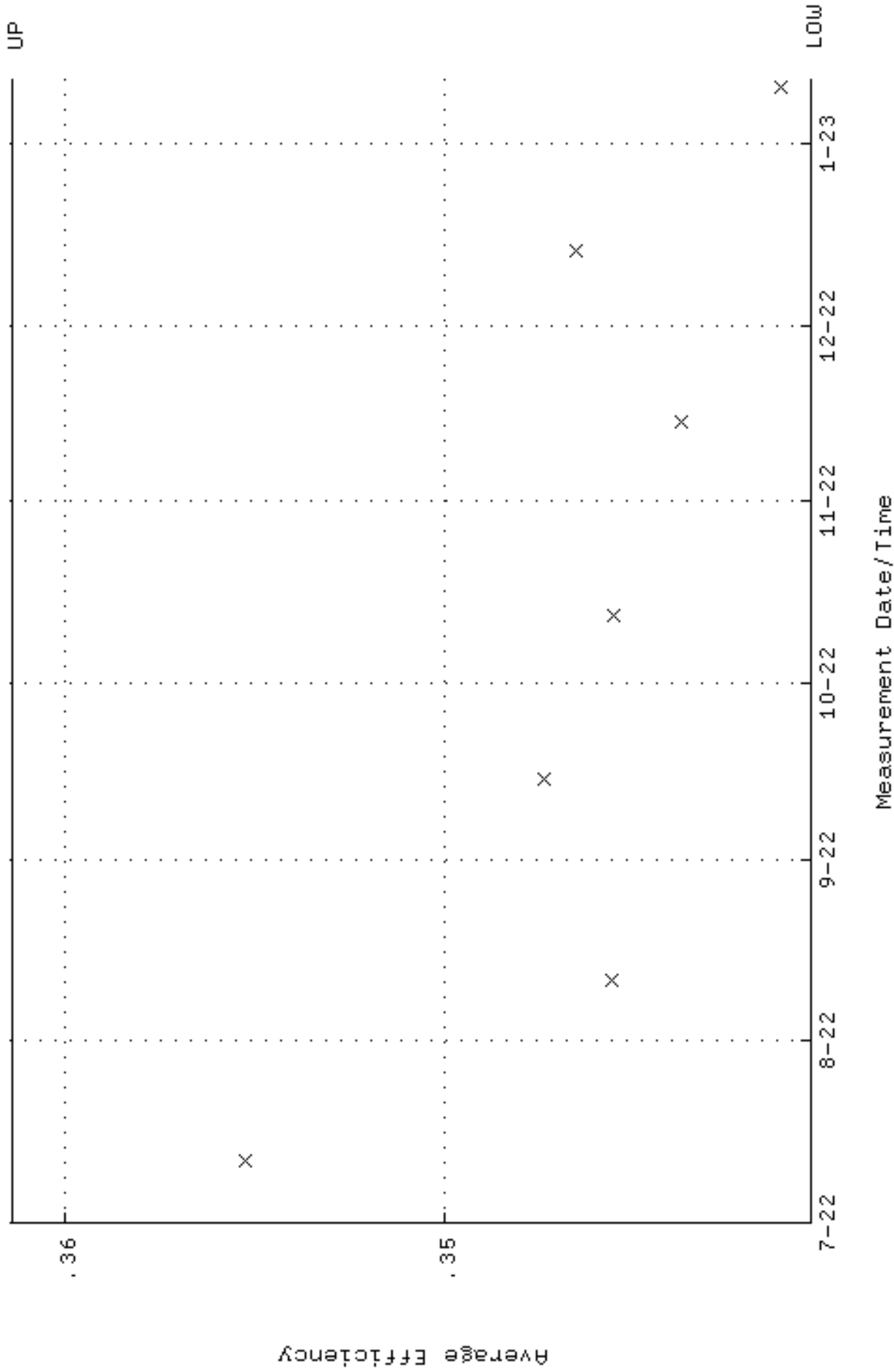
QA filename : DKA100:[ENV_ALPHA.QA.W]W084.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



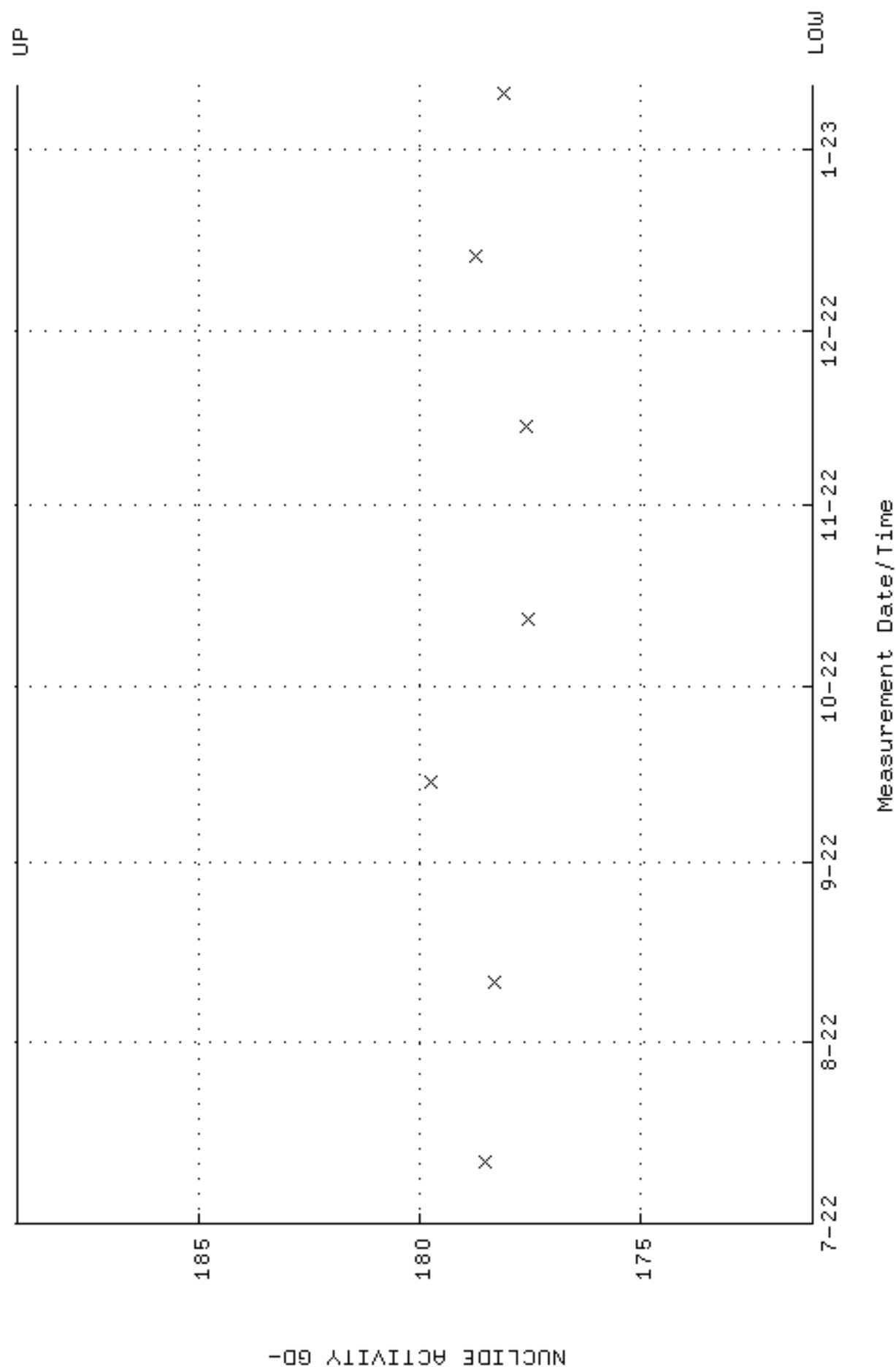
QA filename : DKA100:[ENV_ALPHA.QA.B]B084.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JUL-2022 13:50:14 through 11-JAN-2023 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



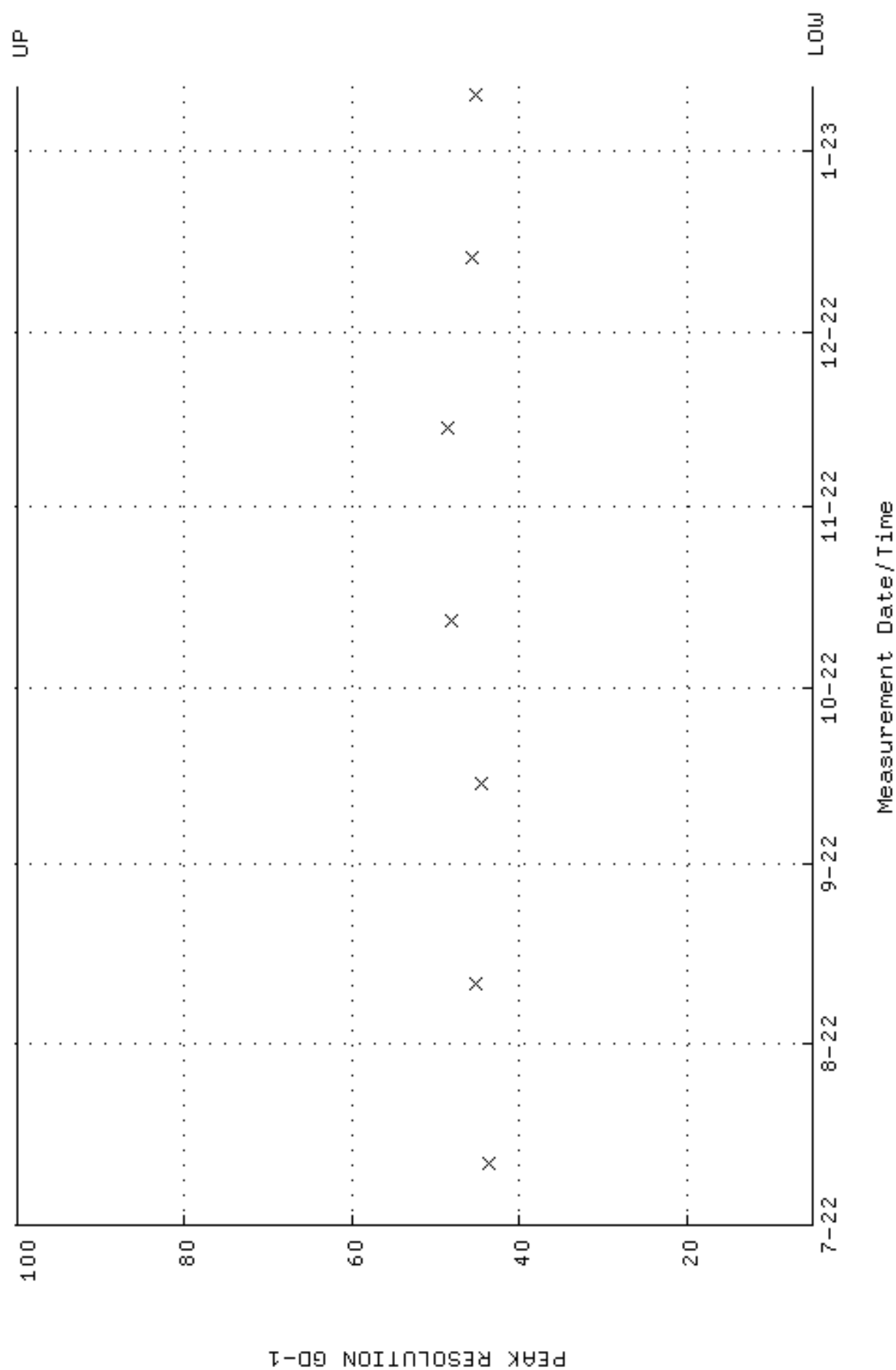
QA filename : DKA100:[ENV_ALPHA.QA.W]W085.QAF;10
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
Lower/Upper Lmts: 0.340330 through 0.361370



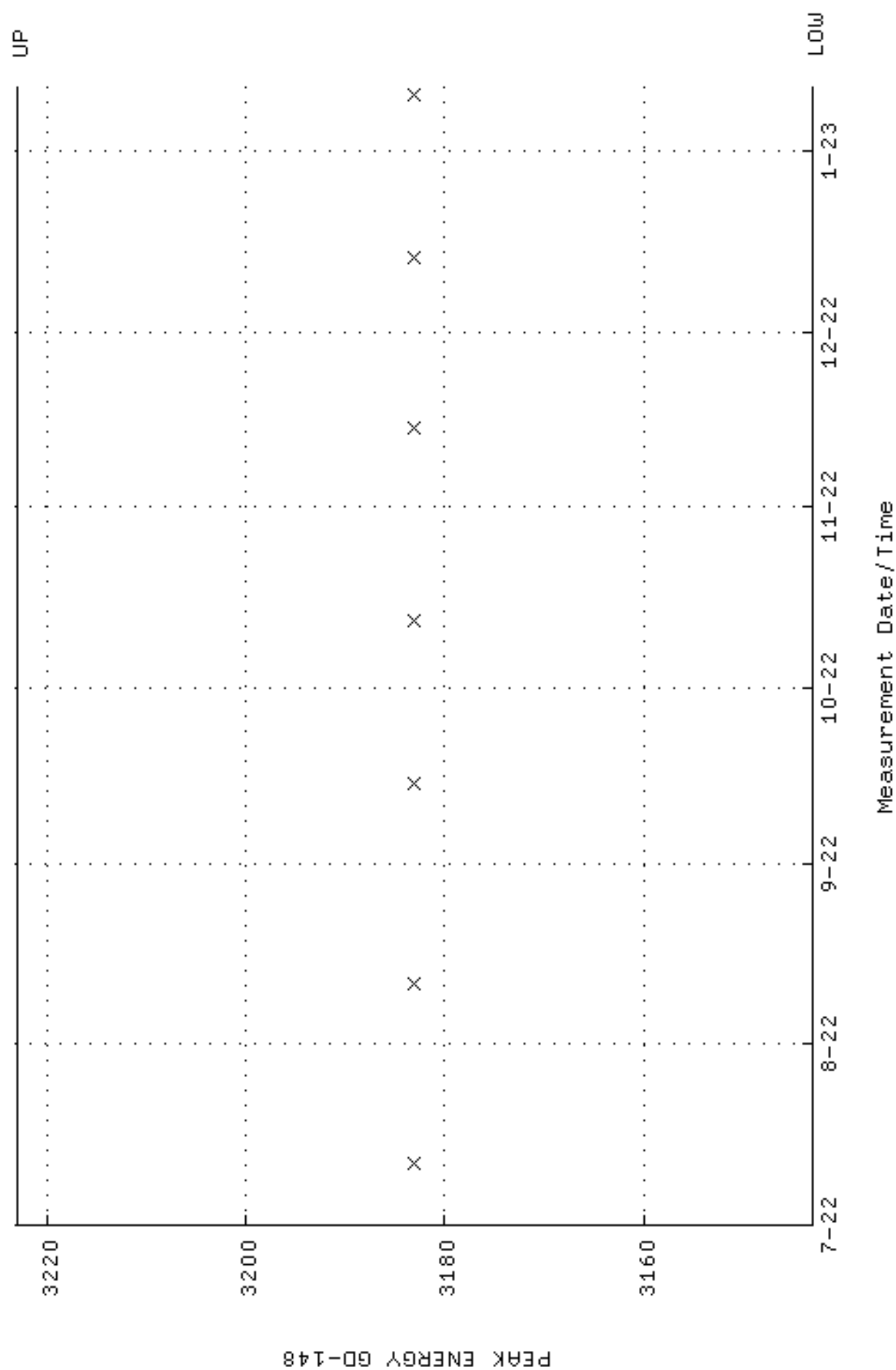
QA filename : DKA100:[ENV_ALPHA.QA.W]W085.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



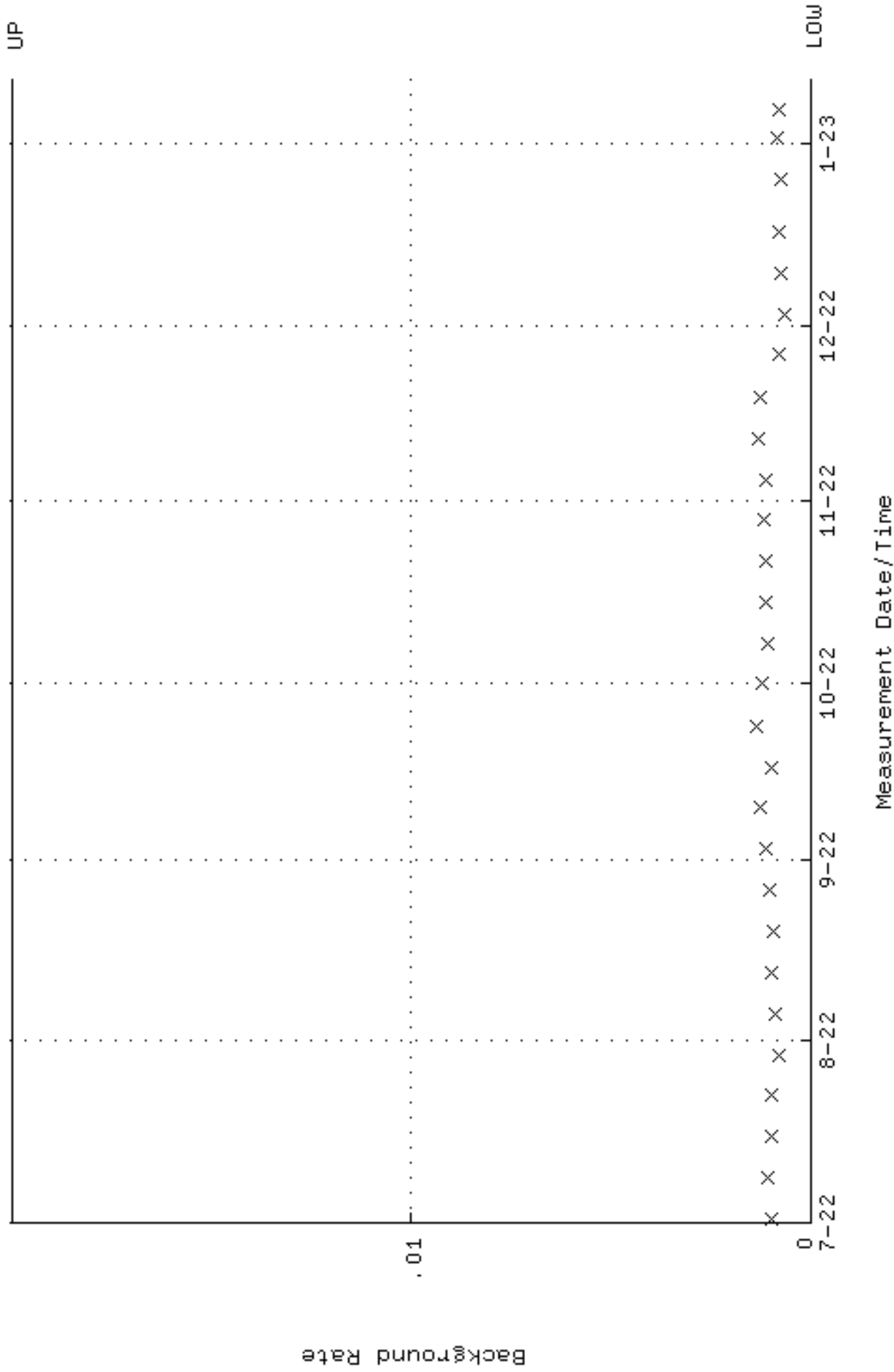
QA filename : DKA100:[ENV_ALPHA.QA.W]W085.QAF;10
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



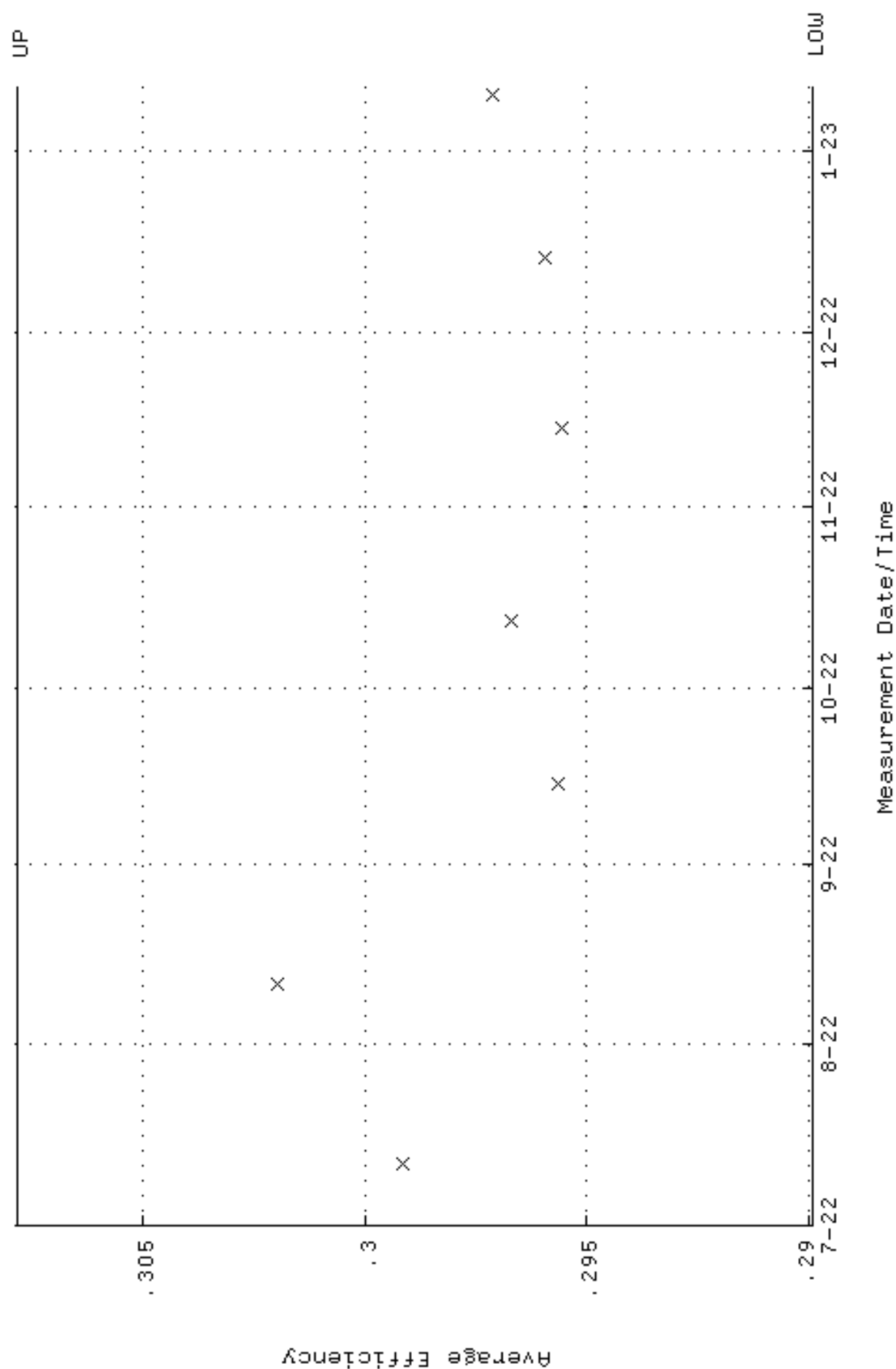
QA filename : DKA100:[ENV_ALPHA.QA.W]W085.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



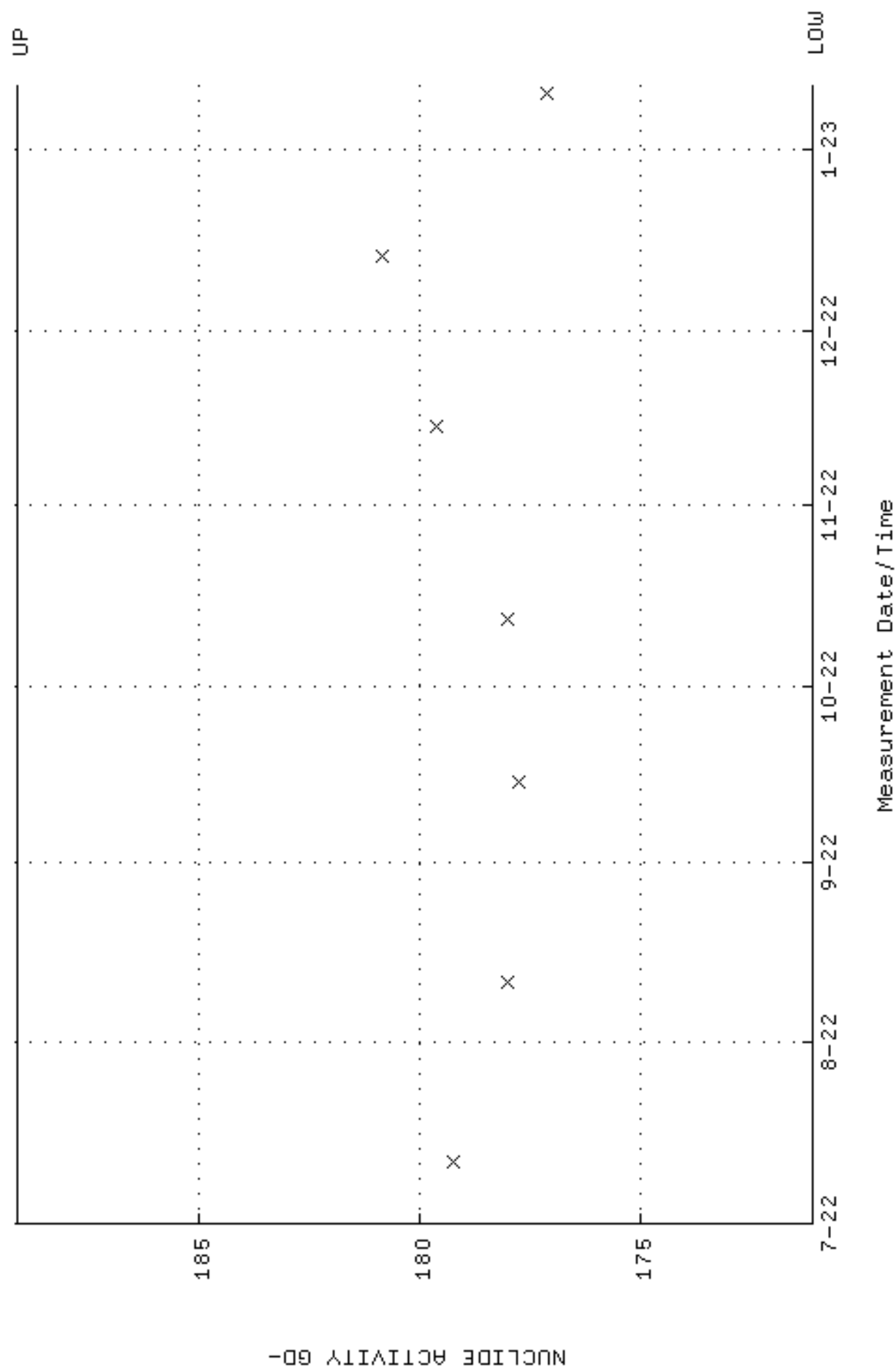
QA filename : DKA100:[ENV_ALPHA.QA.B]B085.QAF;5
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JUL-2022 13:50:14 through 11-JAN-2023 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



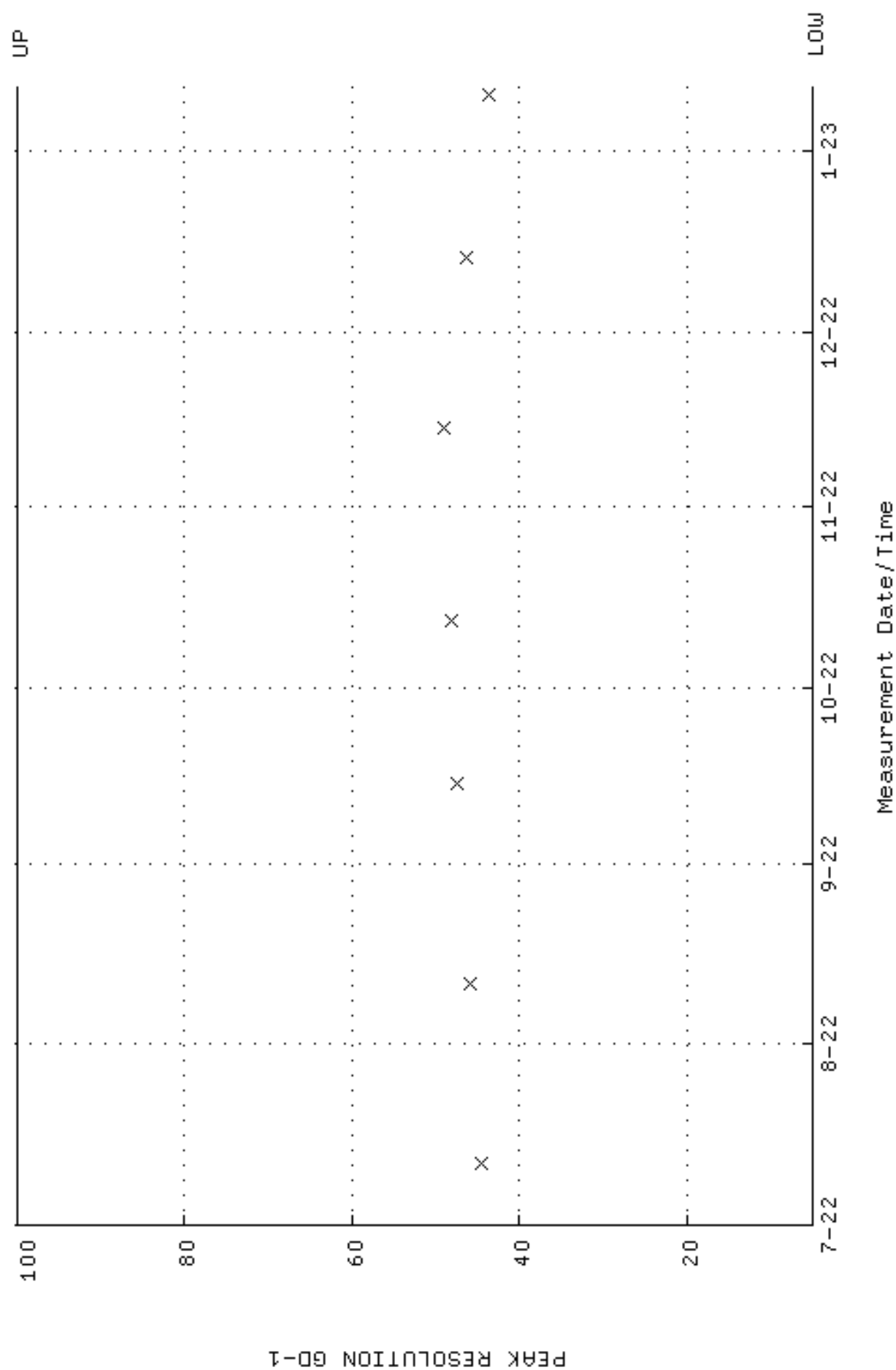
QA filename : DKA100:[ENV_ALPHA.QA.W]W086.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.289900 through 0.307830



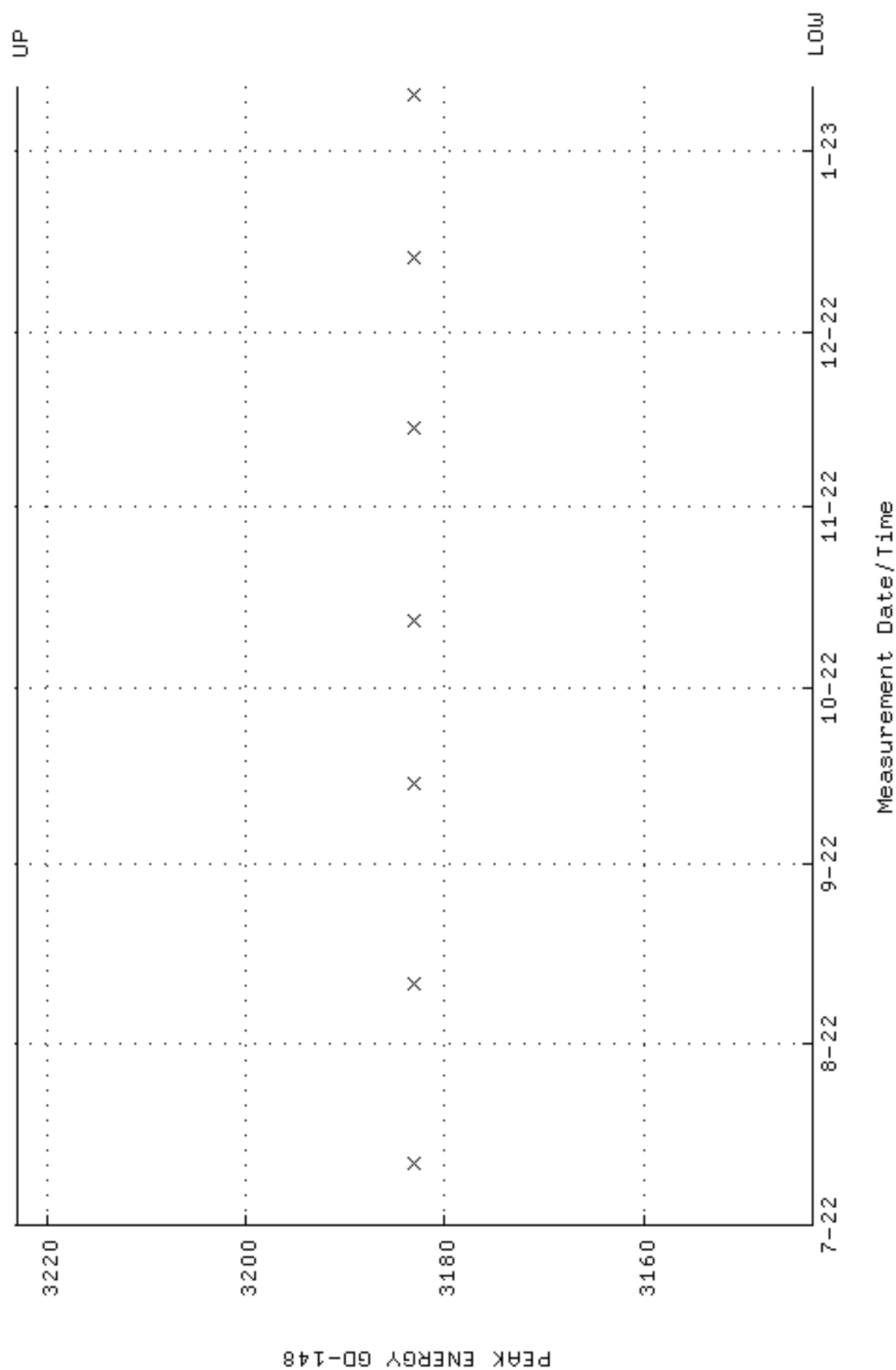
QA filename : DKA100:[ENV_ALPHA.QA.W]W086.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



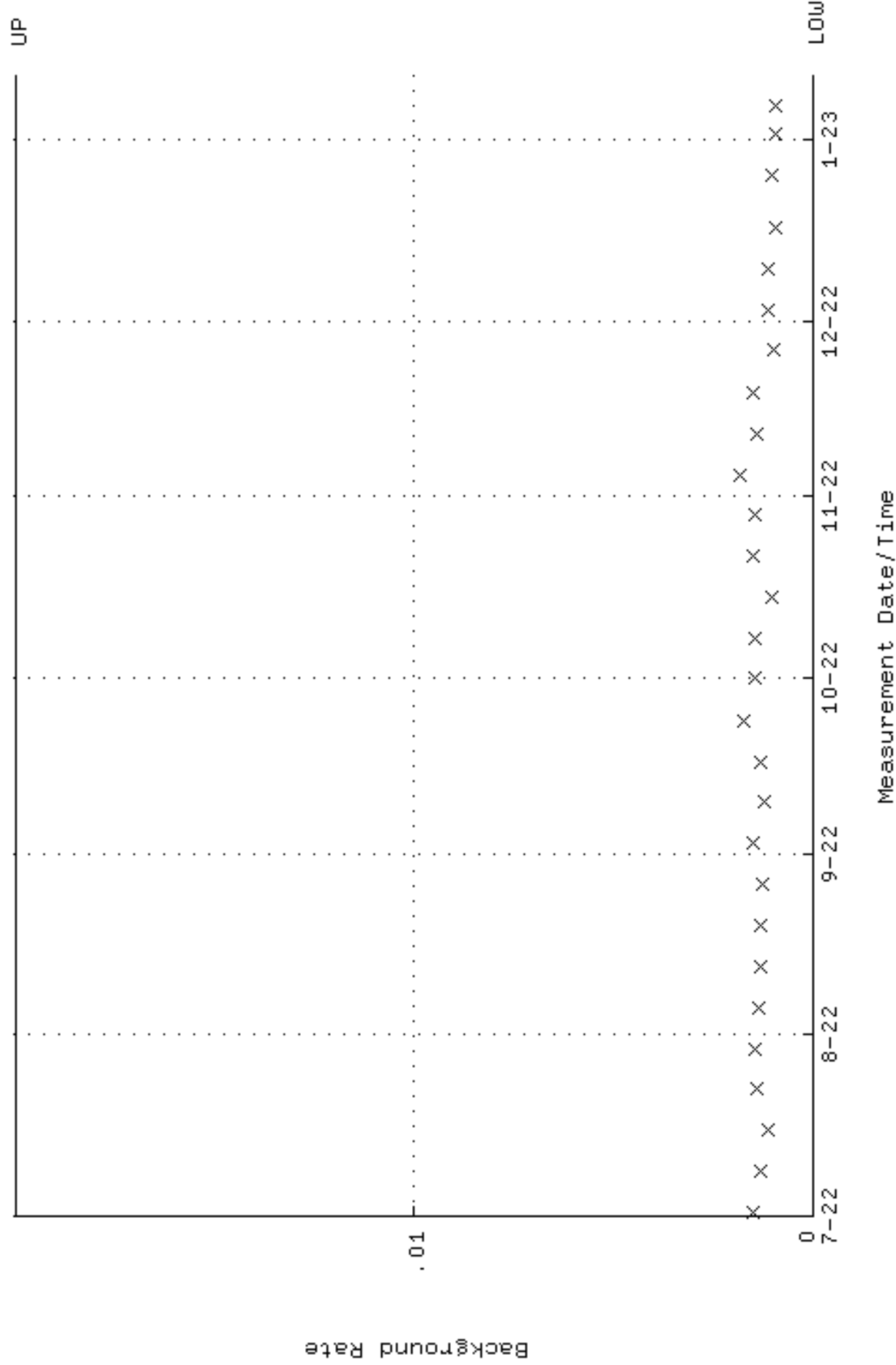
QA filename : DKA100:[ENV_ALPHA.QA.W]W086.QAF;9
 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



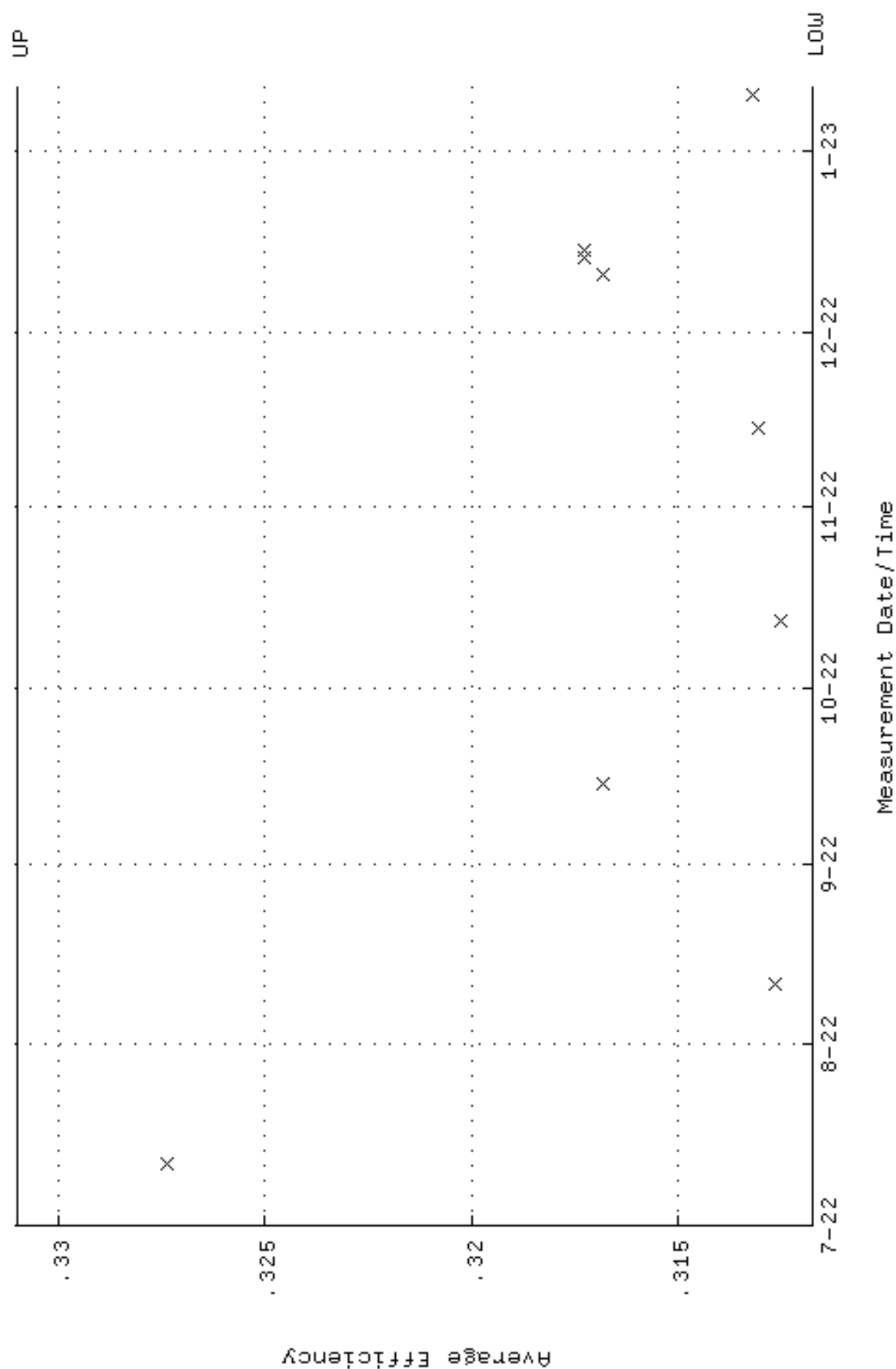
QA filename : DKA100:[ENV_ALPHA.QA.W]W086.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



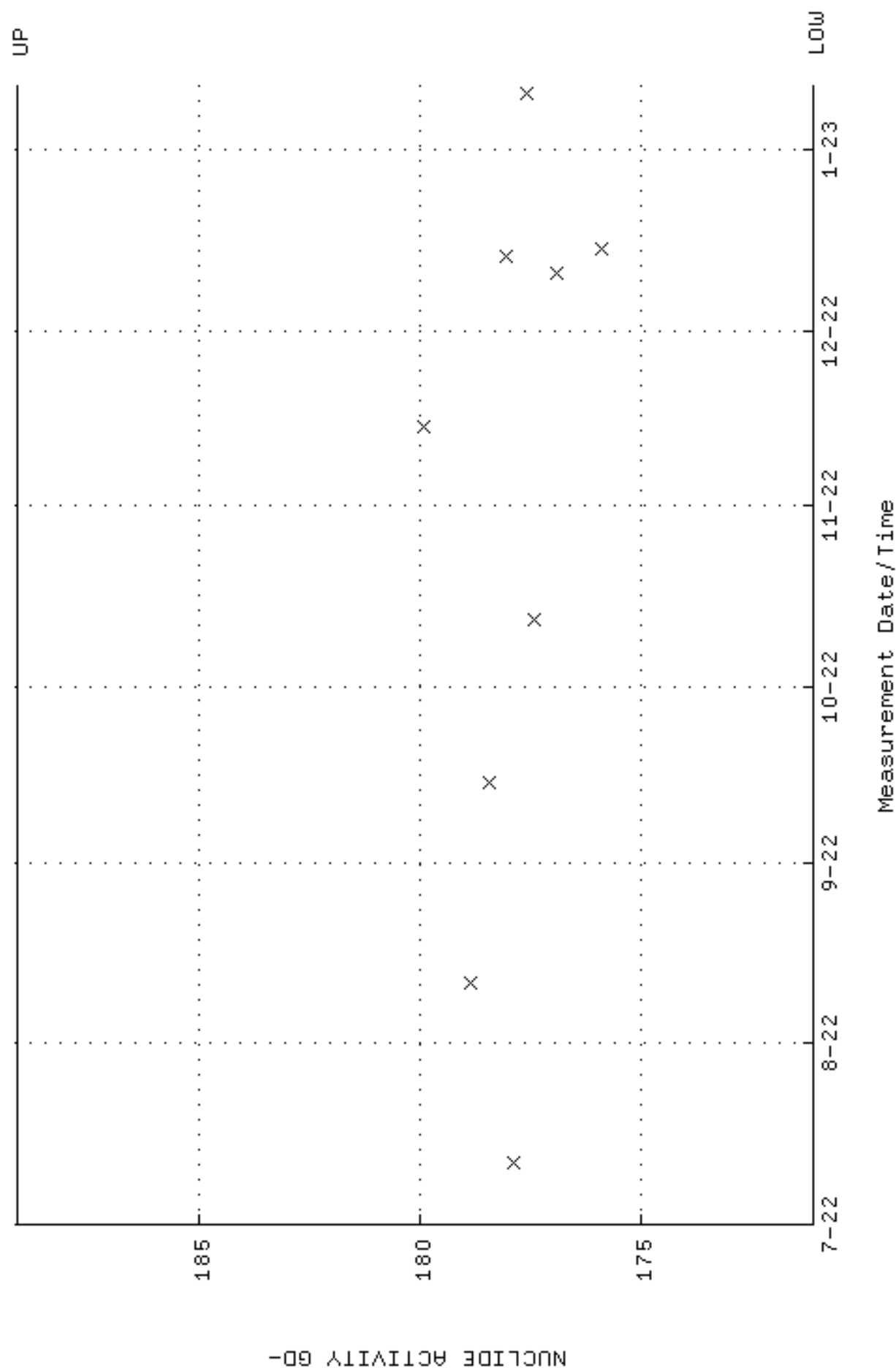
QA filename : DKA100:[ENV_ALPHA.QA.B]B086.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:50:14 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



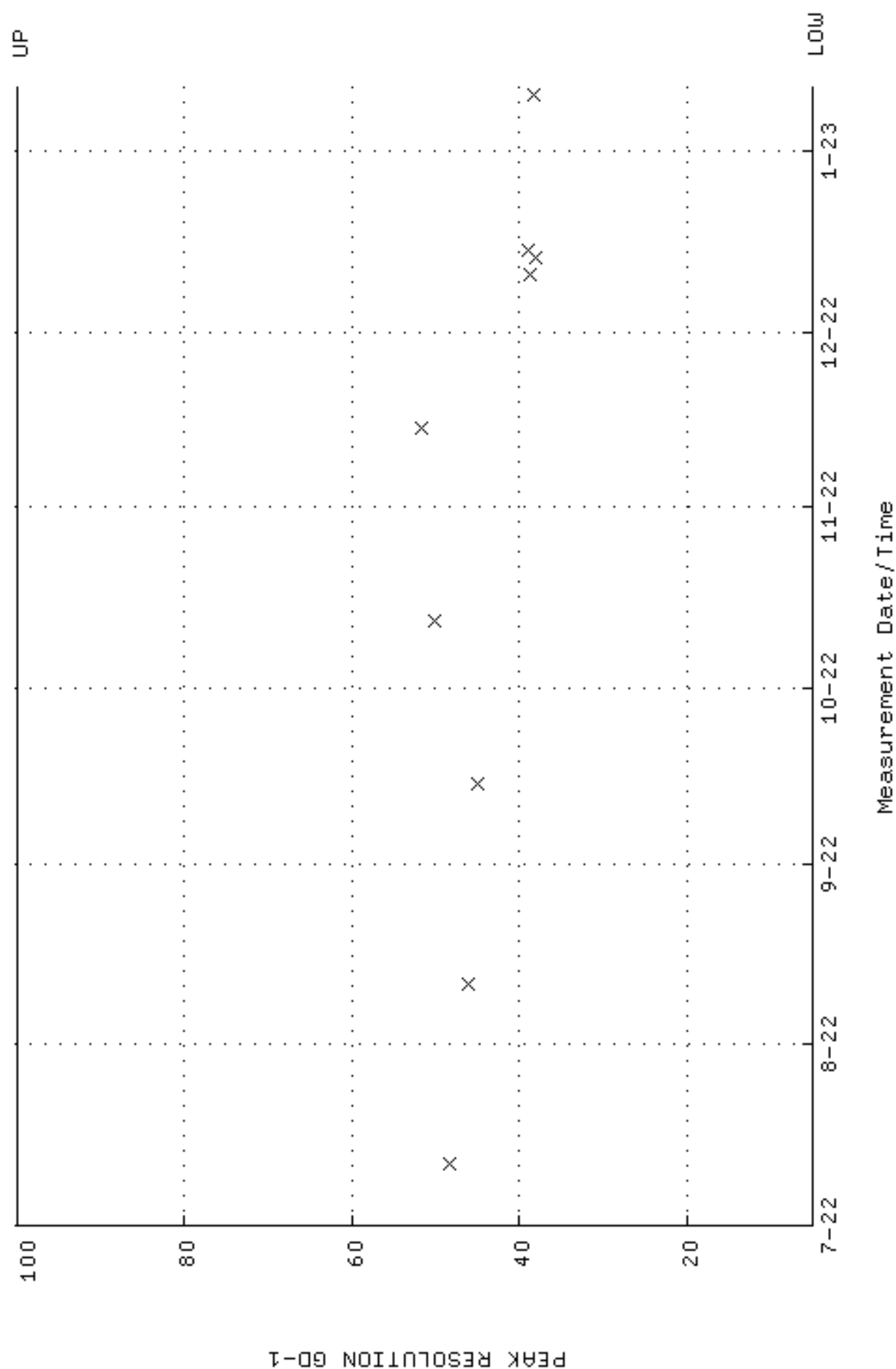
QA filename : DKA100:[ENV_ALPHA.QA.W]W088.QAF;11
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.311720 through 0.331010



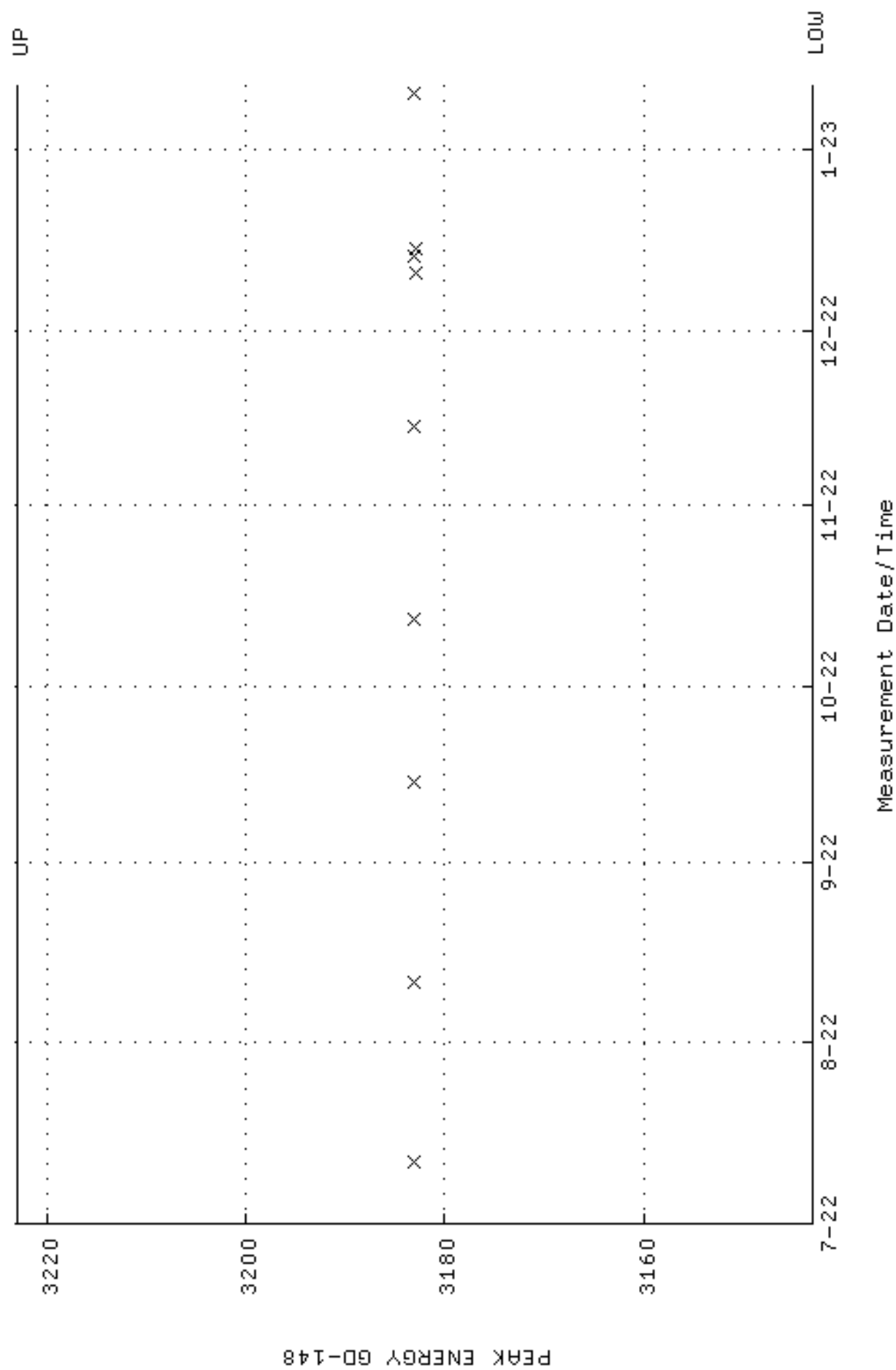
QA filename : DKA100:[ENV_ALPHA.QA.W]W088.QAF;11
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



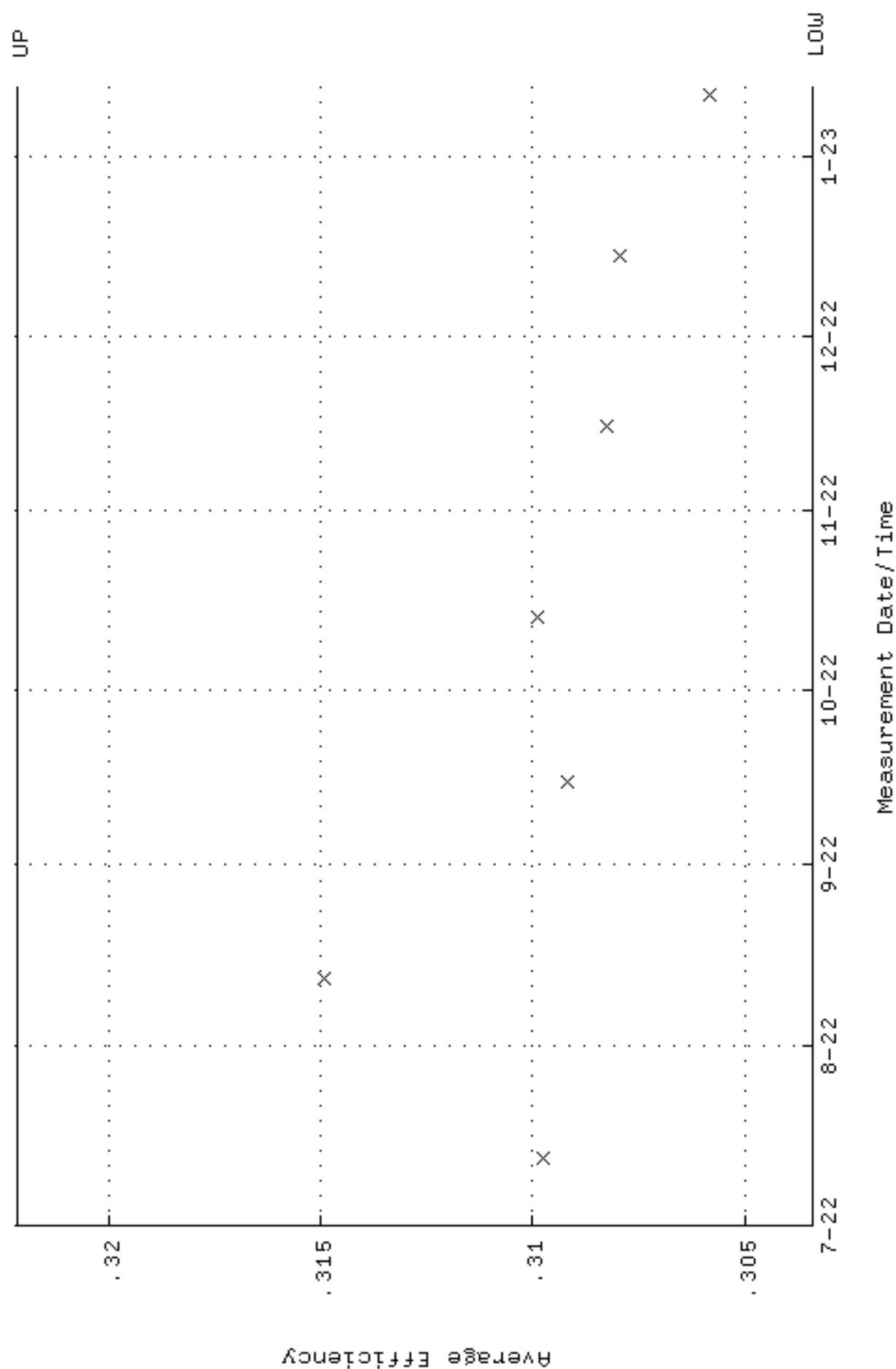
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



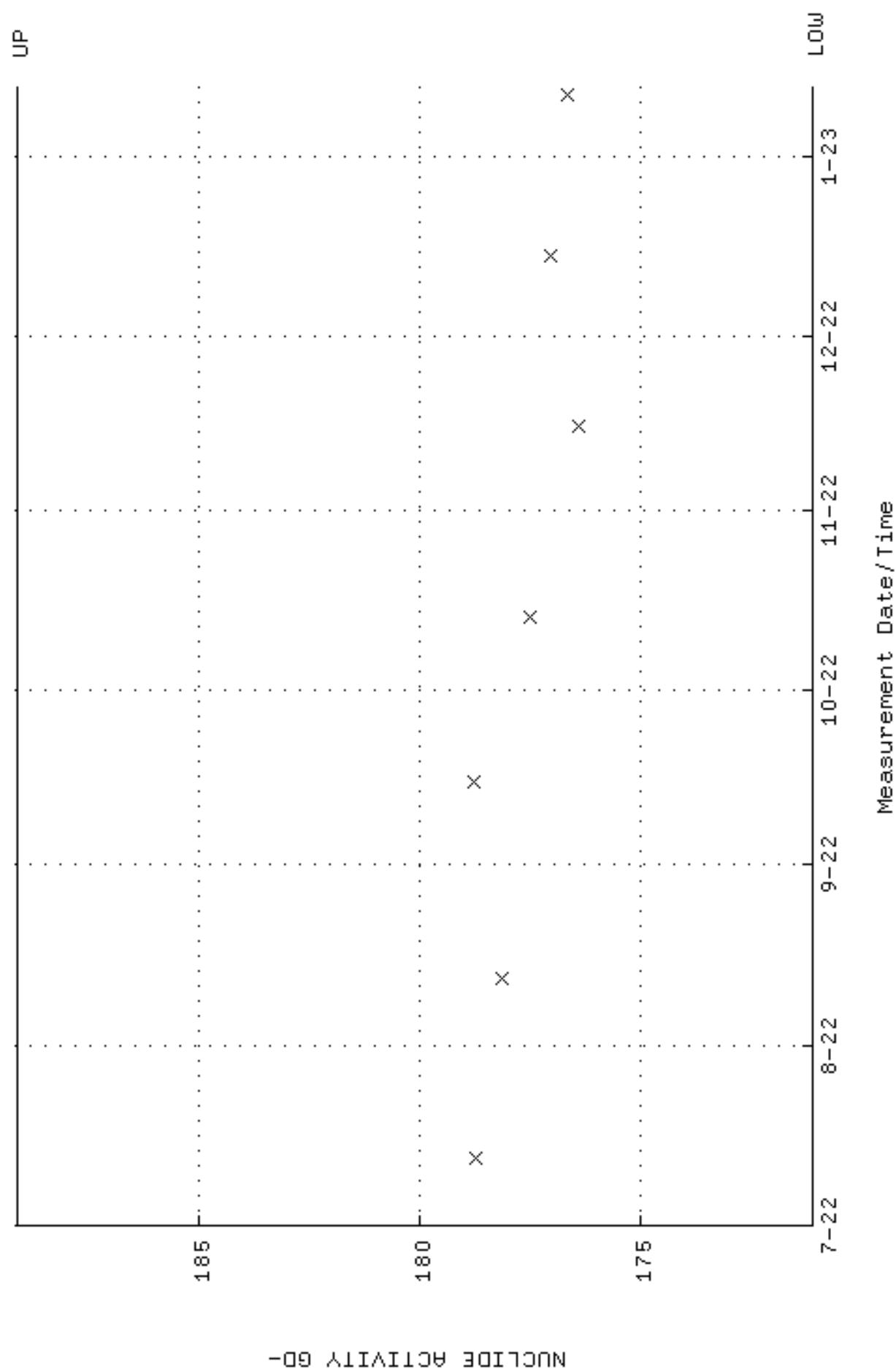
QA filename : DKA100:[ENV_ALPHA.QA.W]W088.QAF;11
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 11-JUL-2022 09:41:19 through 11-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



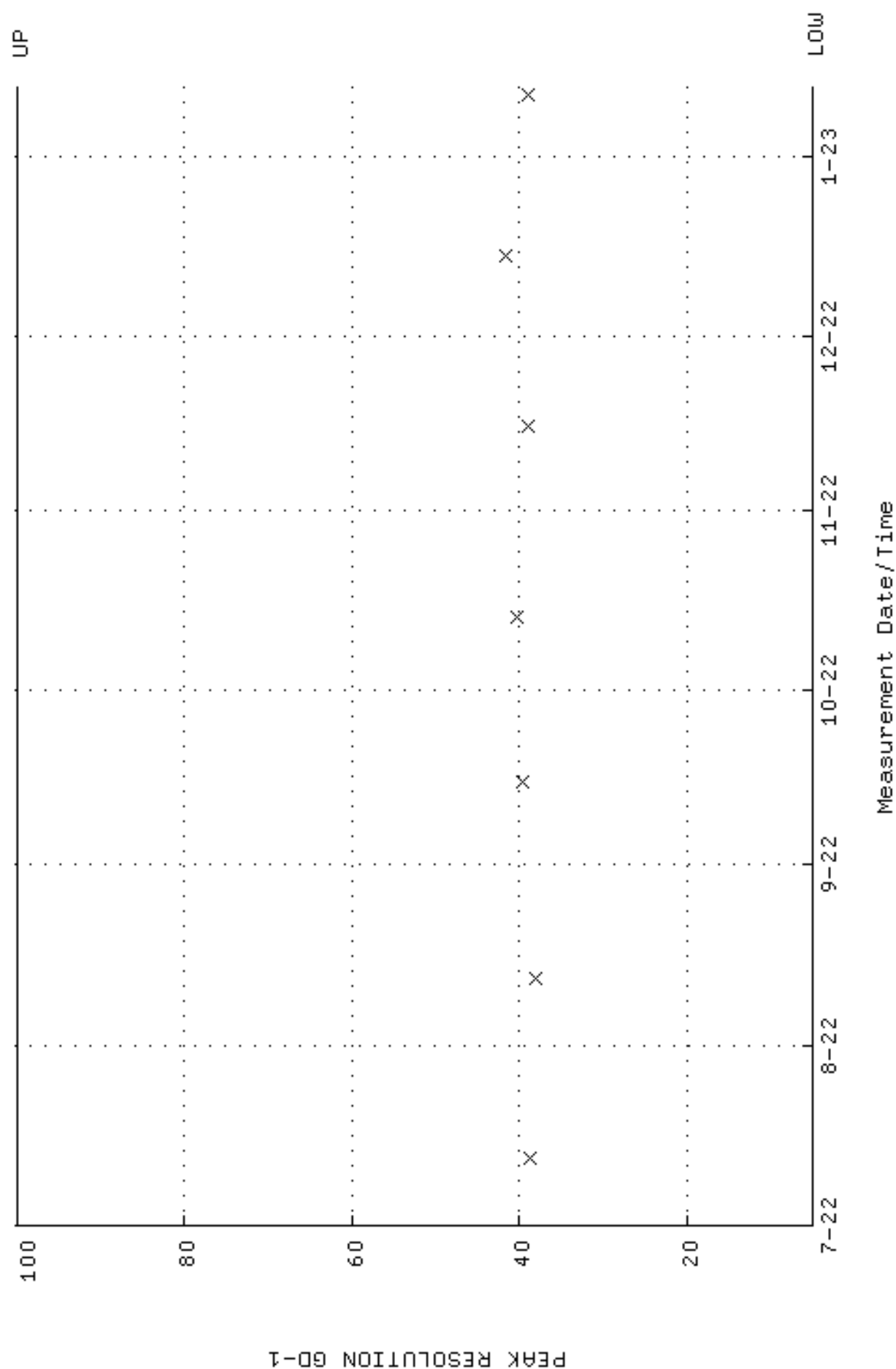
QA filename : DKA100:[ENV_ALPHA.QA.W]W089.QAF;10
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.303389 through 0.322155



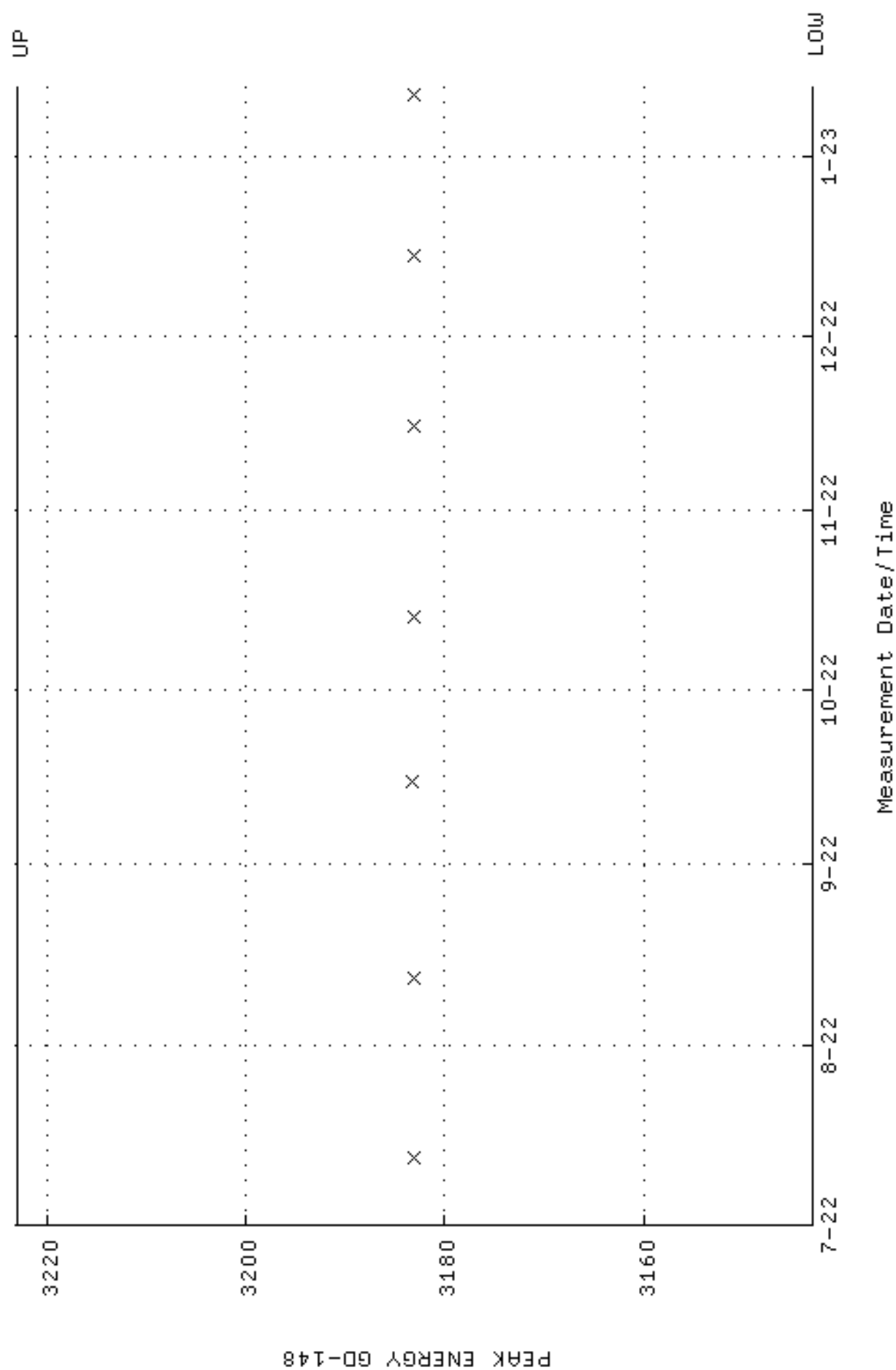
QA filename : DKA100:[ENV_ALPHA.QA.W]W089.QAF;10
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



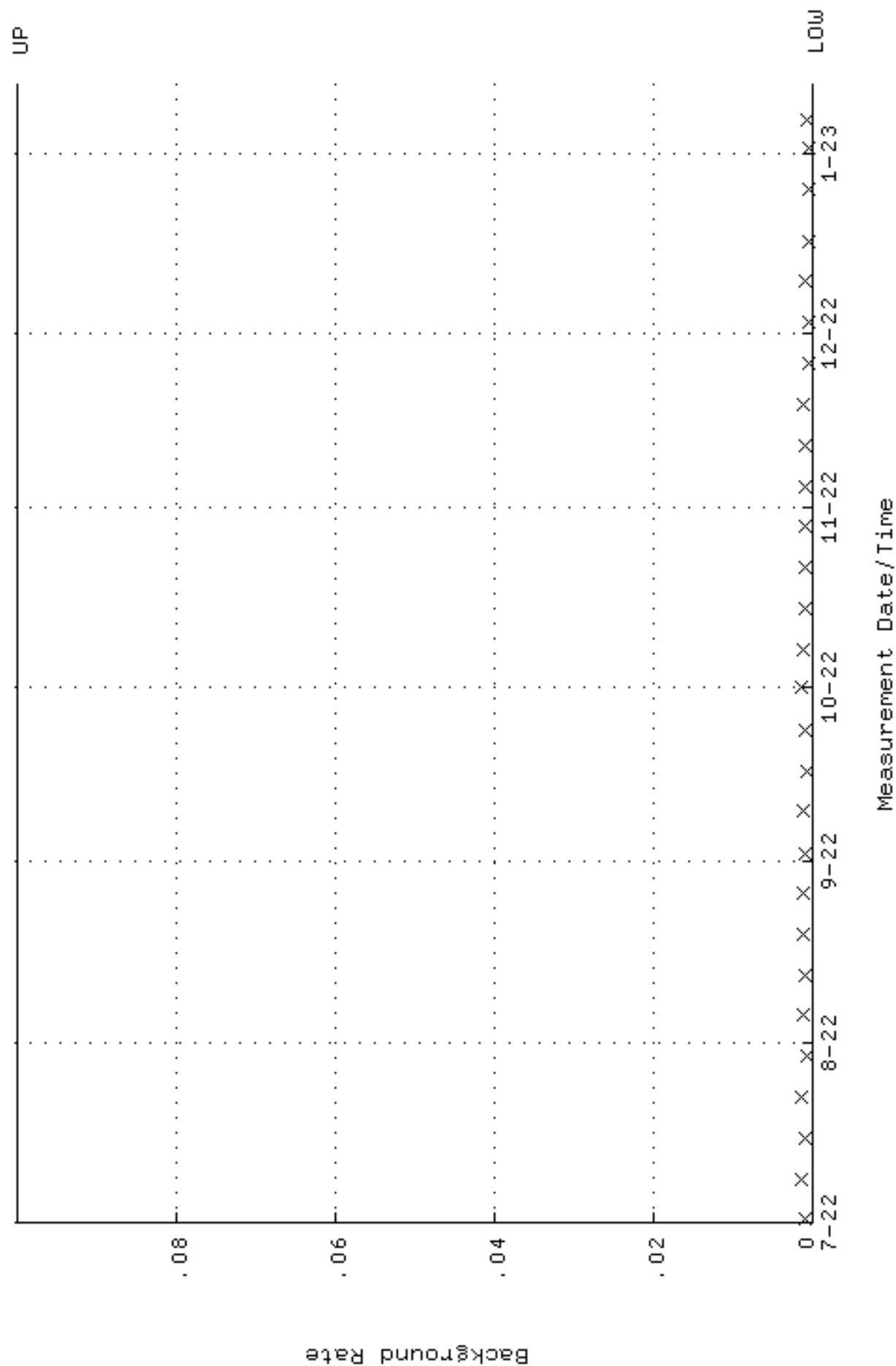
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 Parameter Name : PSFVHM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



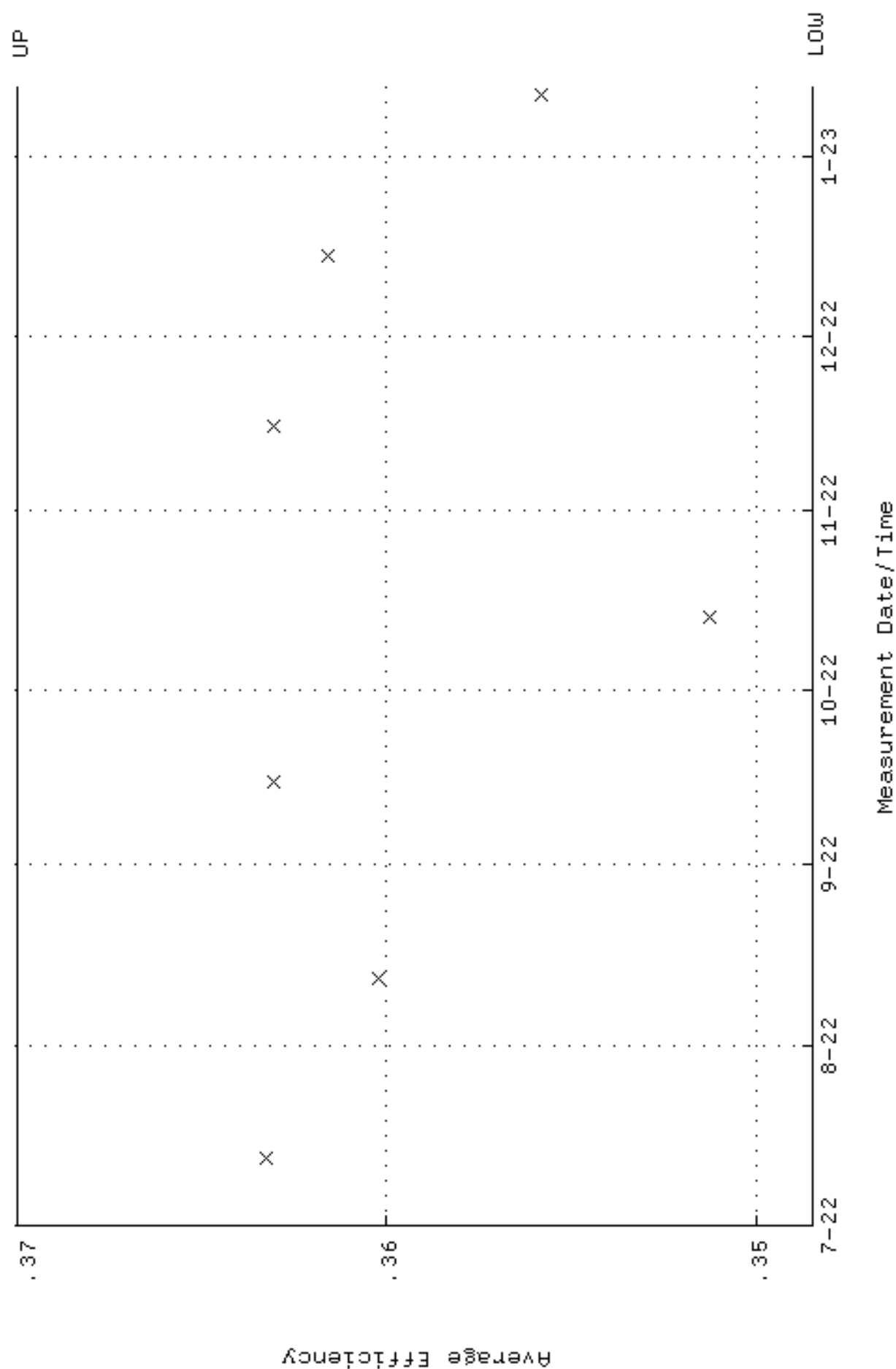
QA filename : DKA100:[ENV_ALPHA.QA.W]W089.QAF;10
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



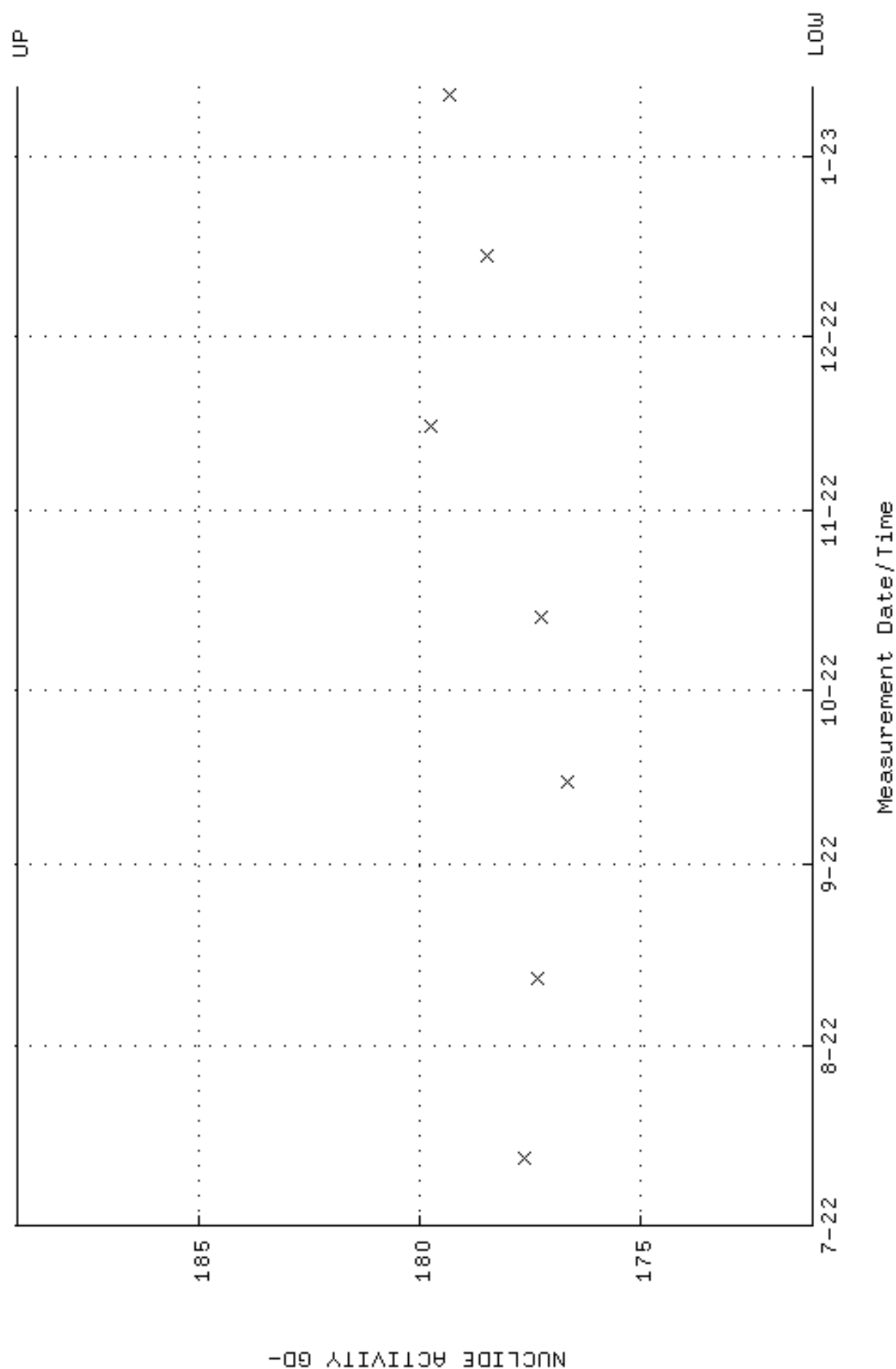
QA filename : DKA100:[ENV_ALPHA.QA.B]B089.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:50:15 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



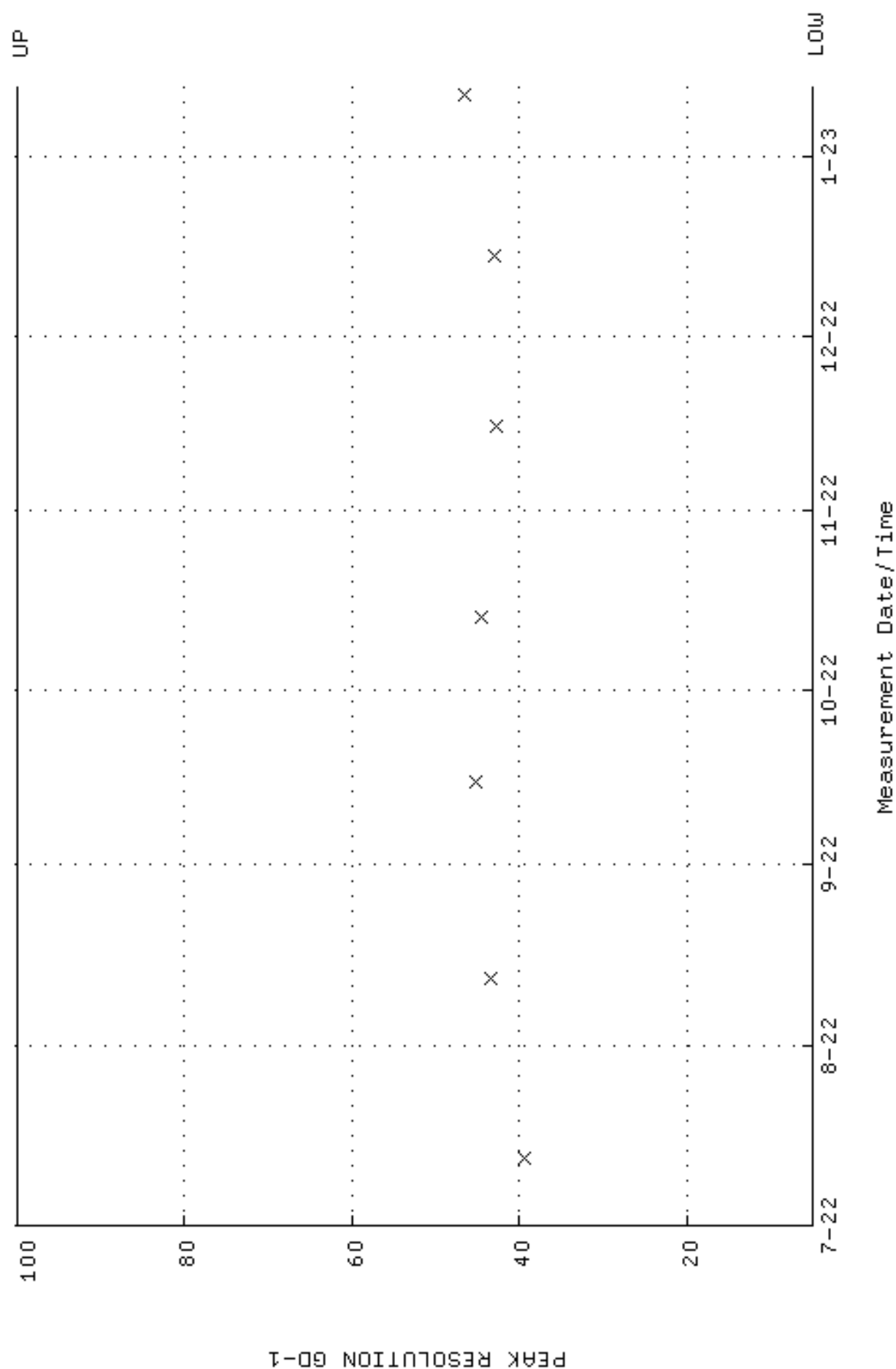
QA filename : DKA100:[ENV_ALPHA.QA.W]W090.QAF;9
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.348461 through 0.370015



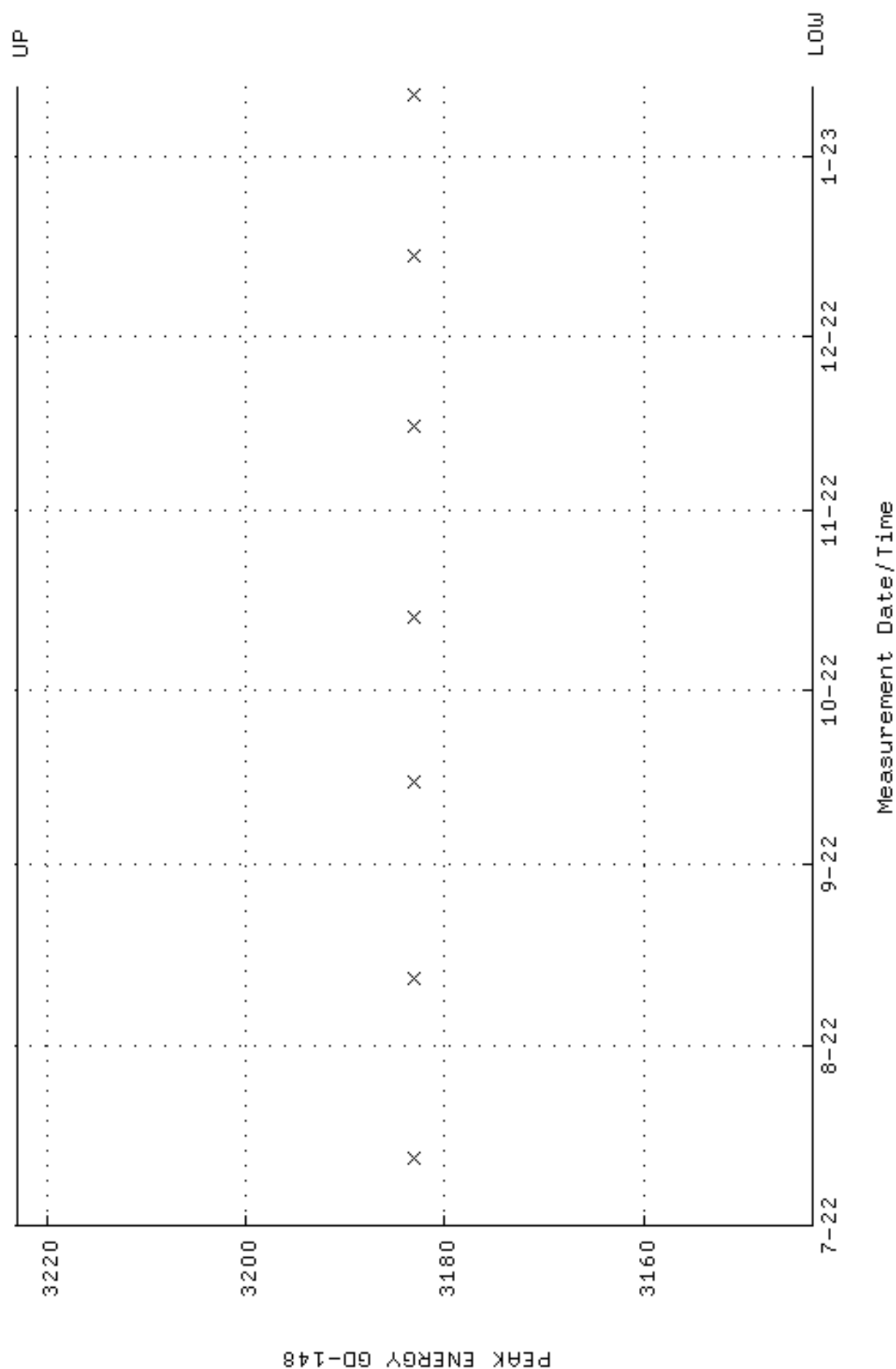
QA filename : DKA100:[ENV_ALPHA.QA.W]W090.QAF;9
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



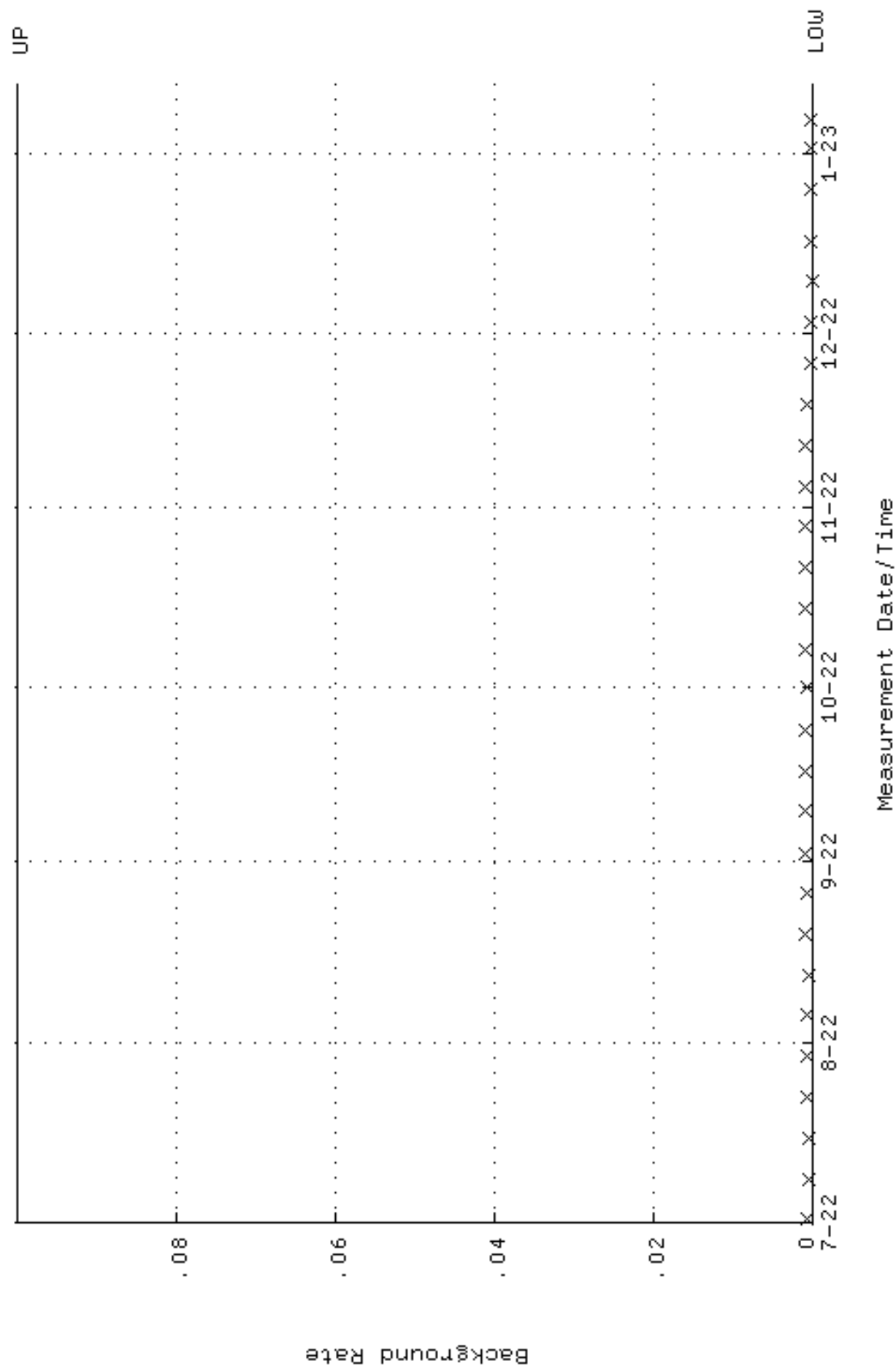
QA filename : DKA100:[ENV_ALPHA.QA.W]W090.QAF;9
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



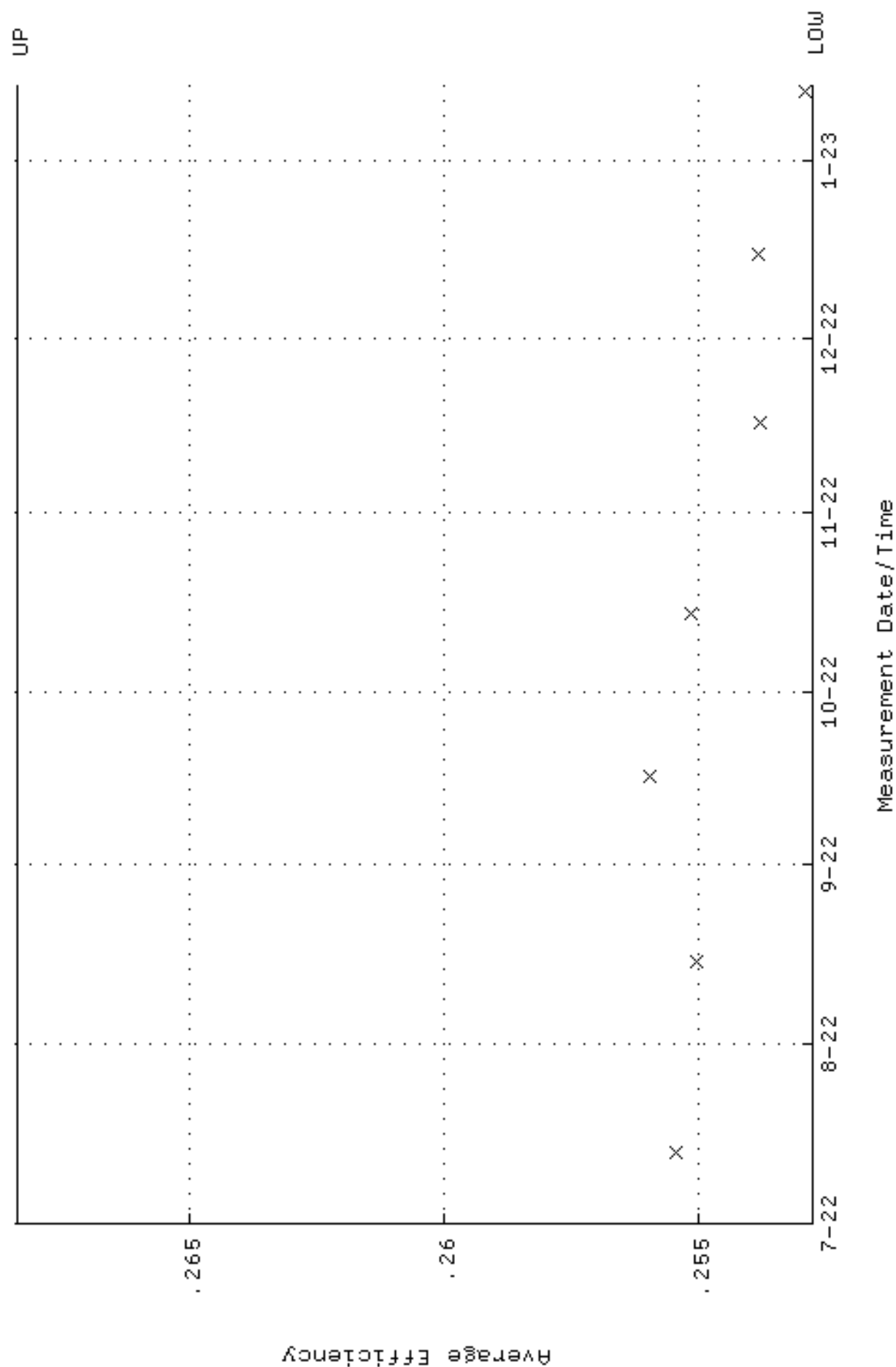
QA filename : DKA100:[ENV_ALPHA.QA.W]W090.QAF;9
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 12-JUL-2022 09:59:44 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



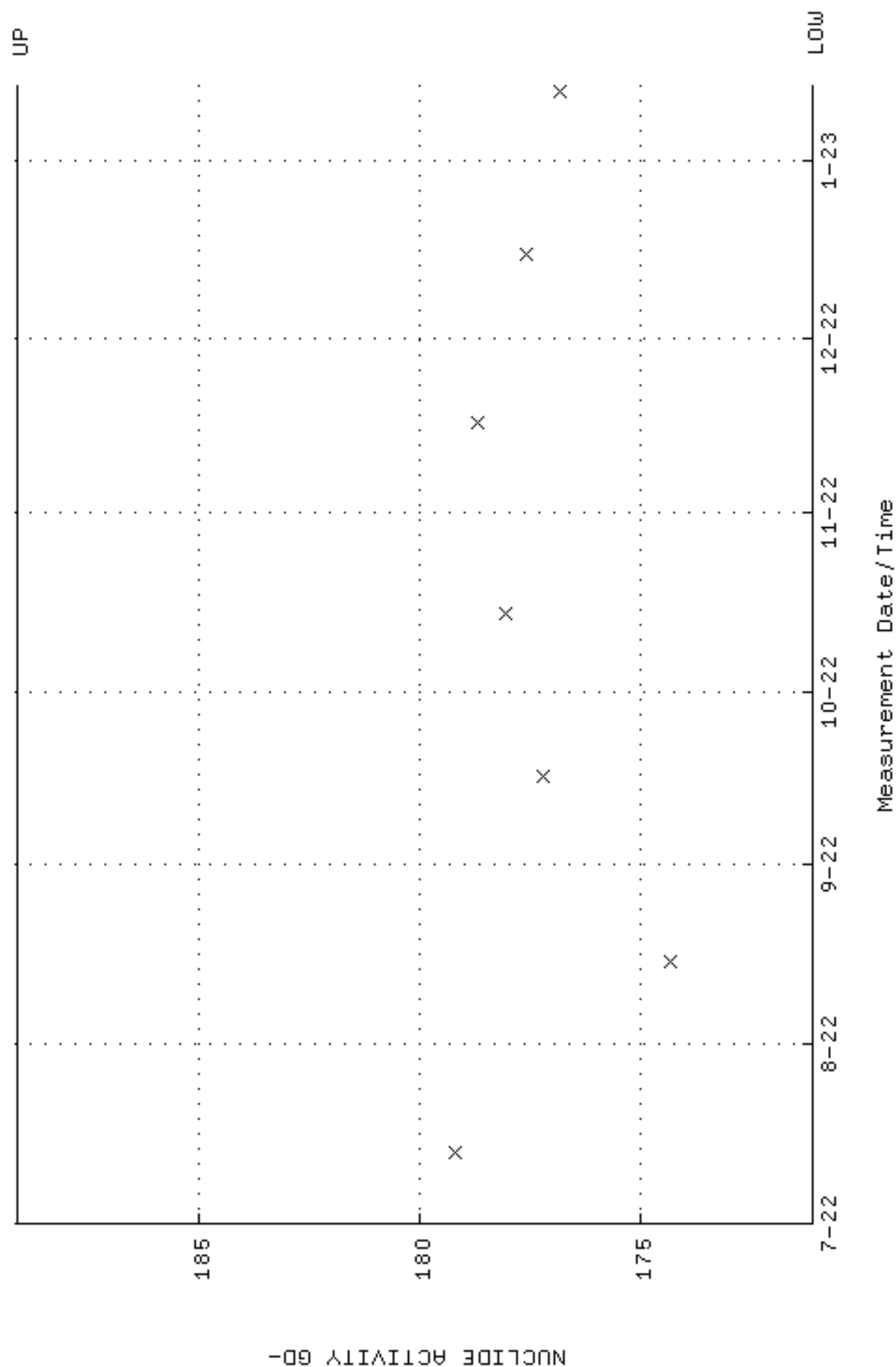
QA filename : DKA100:[ENV_ALPHA.QA.B]B090.QAF;5
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:50:15 through 12-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



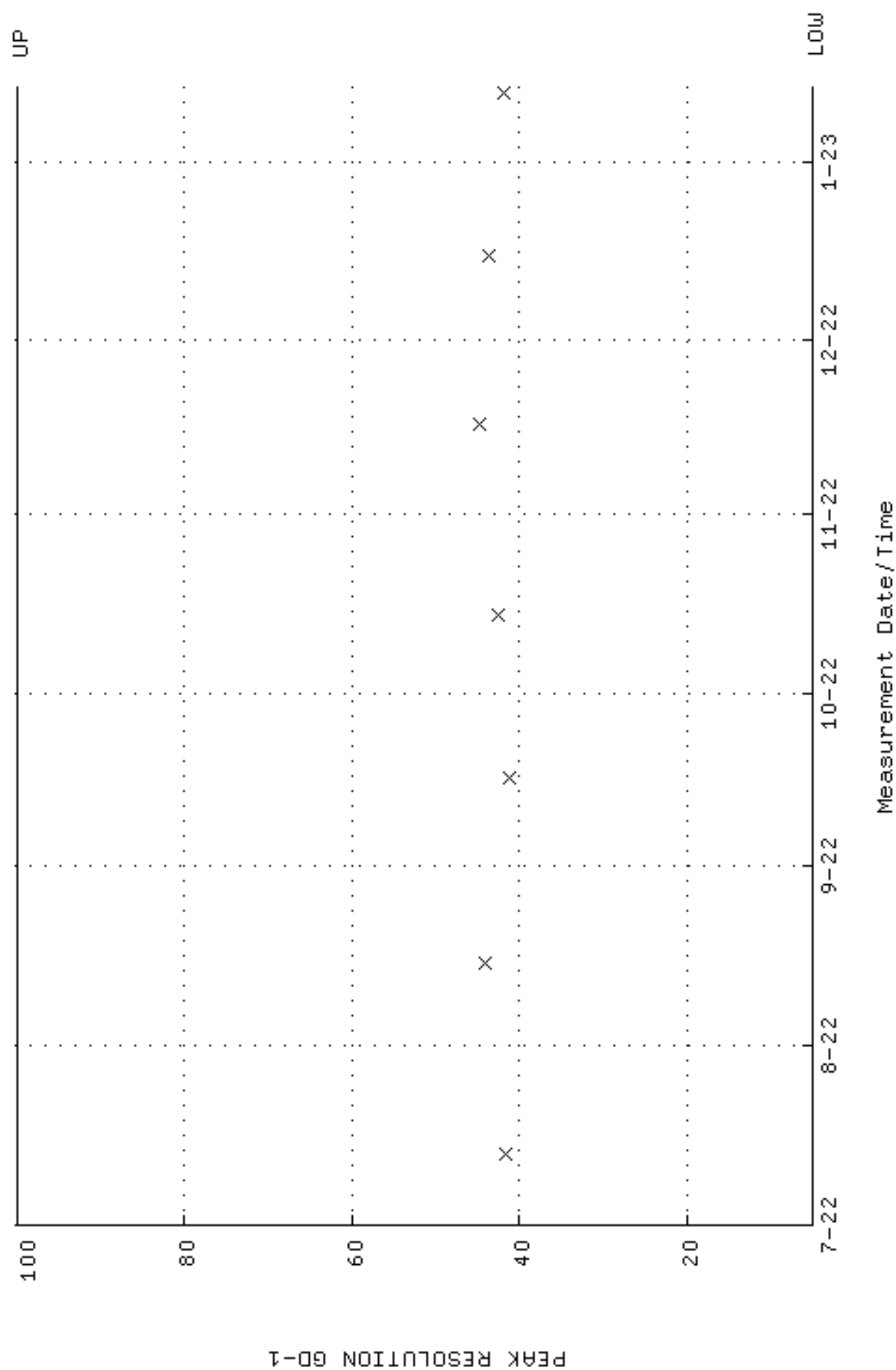
QA filename : DKA100:[ENV_ALPHA.QA.W]W121.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-JUL-2022 09:43:41 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.252740 through 0.268370



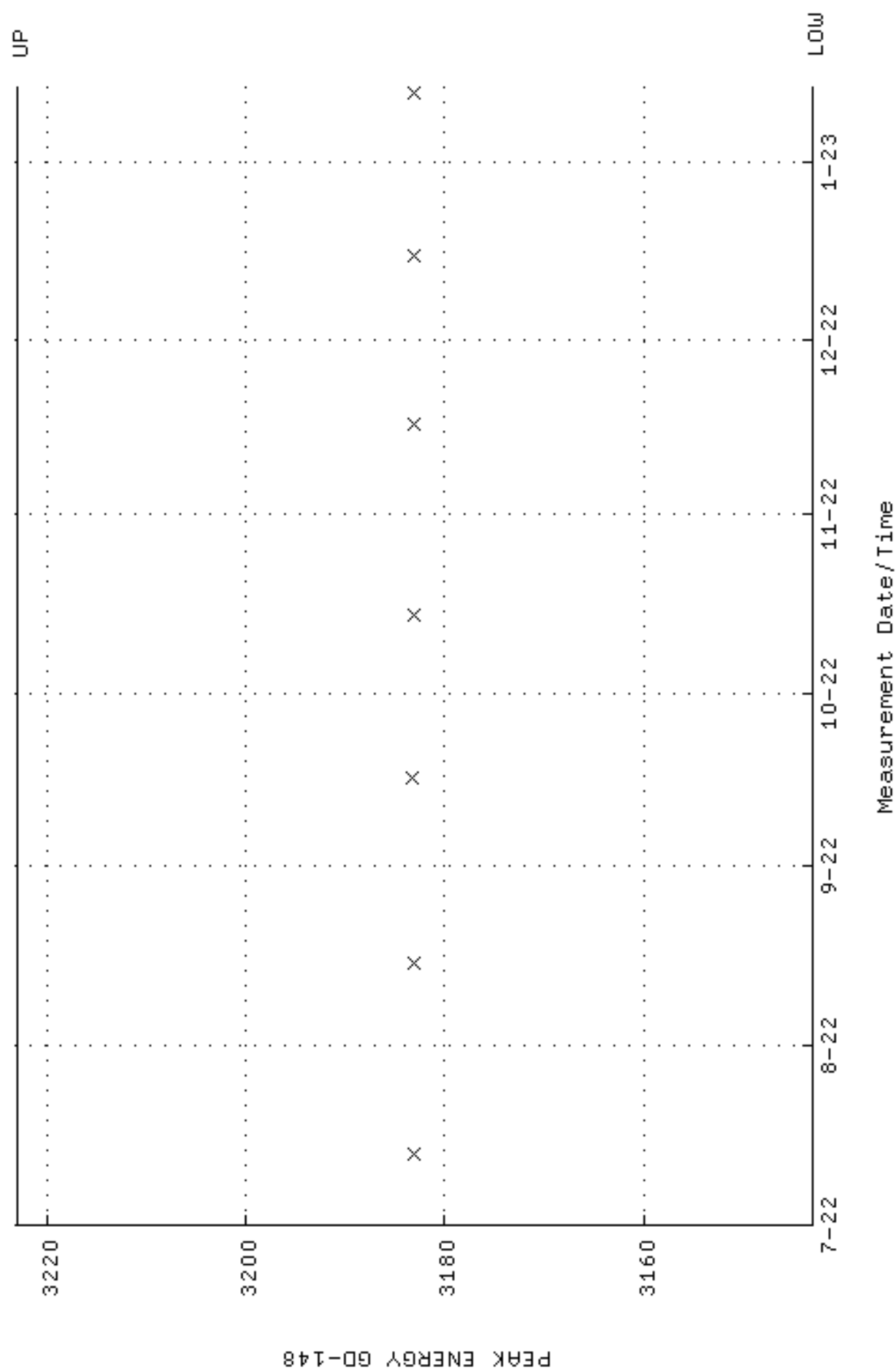
QA filename : DKA100:[ENV_ALPHA.QA.W]W121.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-JUL-2022 09:43:41 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



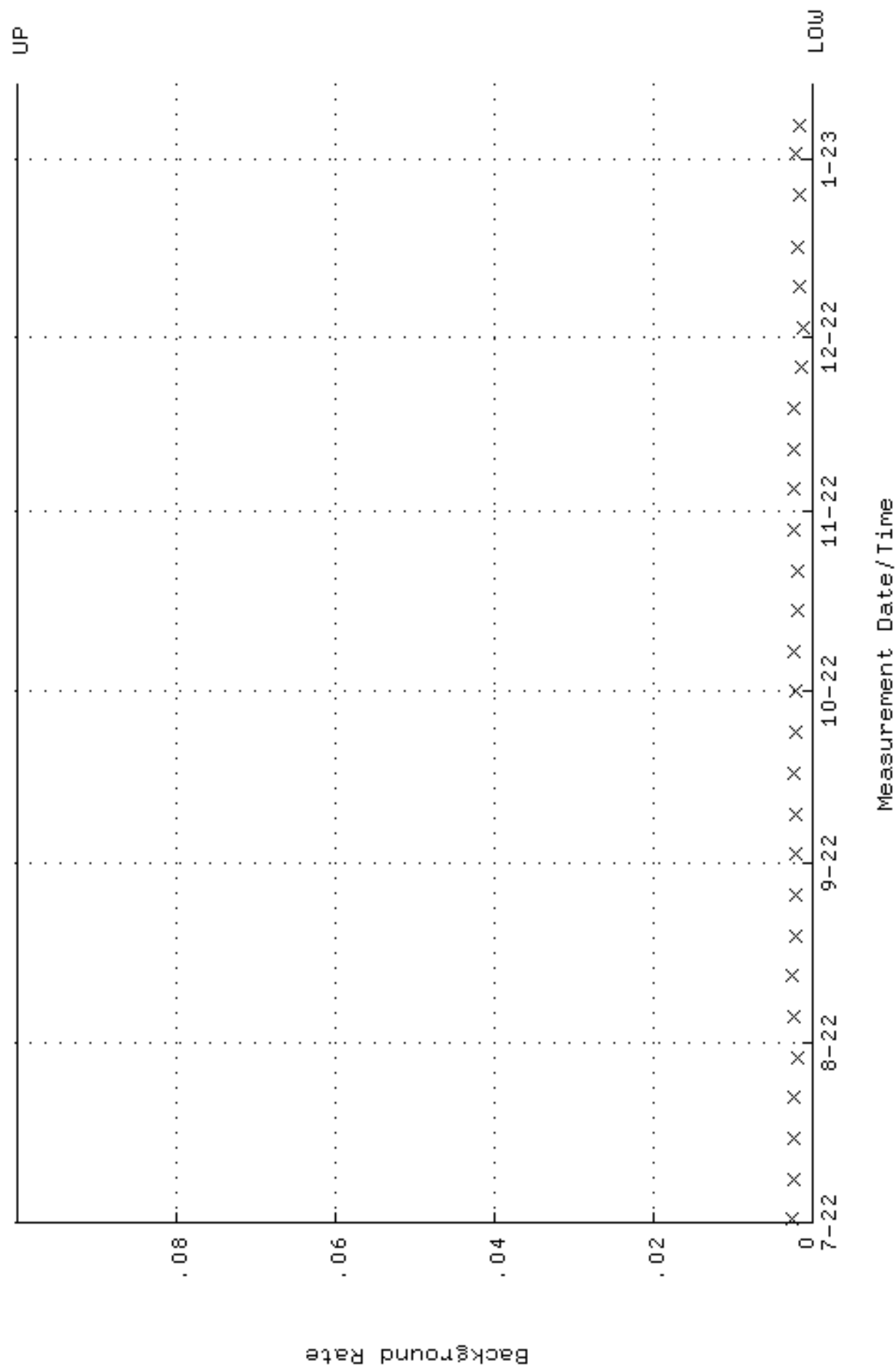
QA filename : DKA100:[ENV_ALPHA.QA.W]W121.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-JUL-2022 09:43:41 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



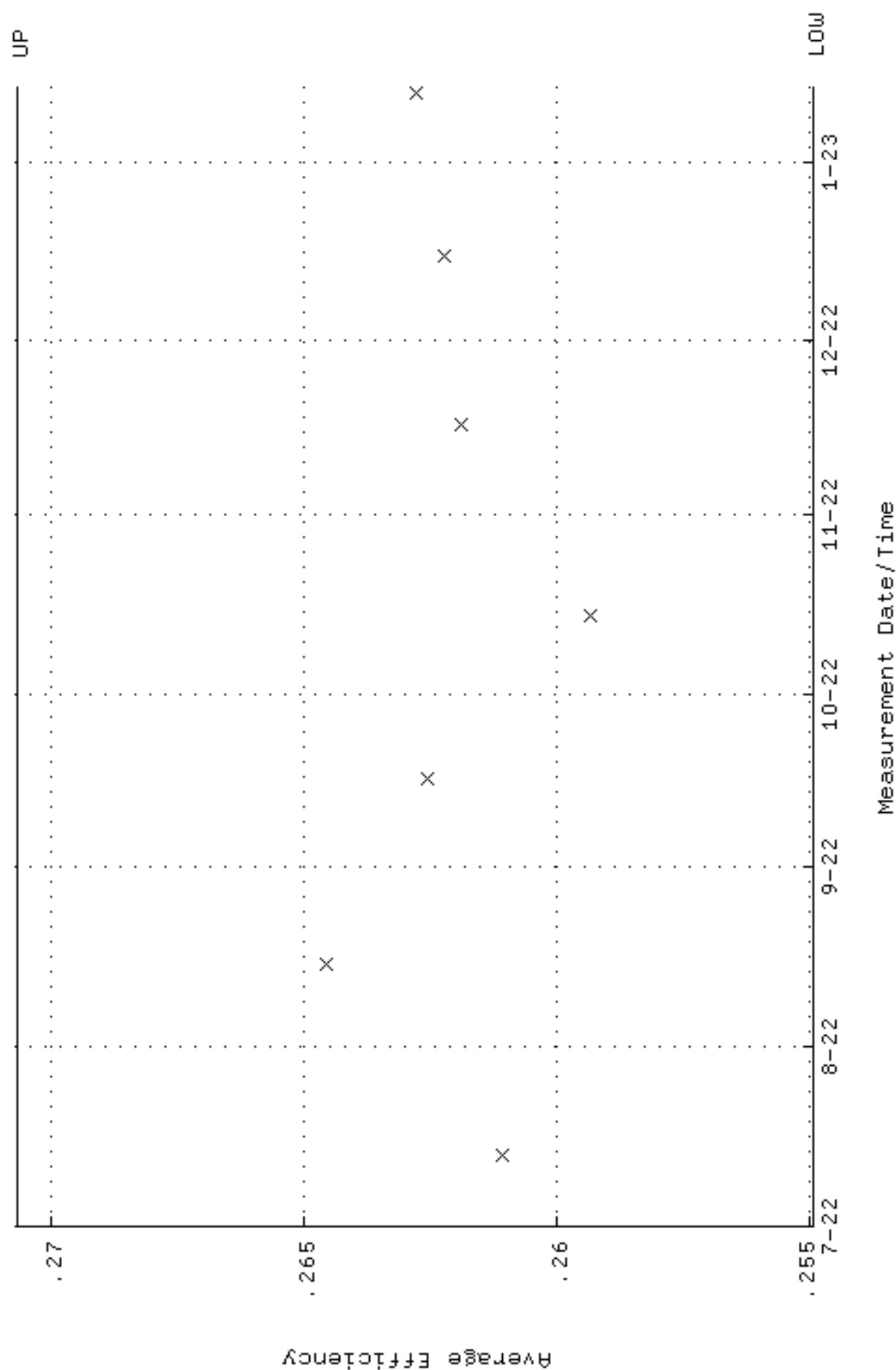
QA filename : DKA100:[ENV_ALPHA.QA.W]W121.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-JUL-2022 09:43:41 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



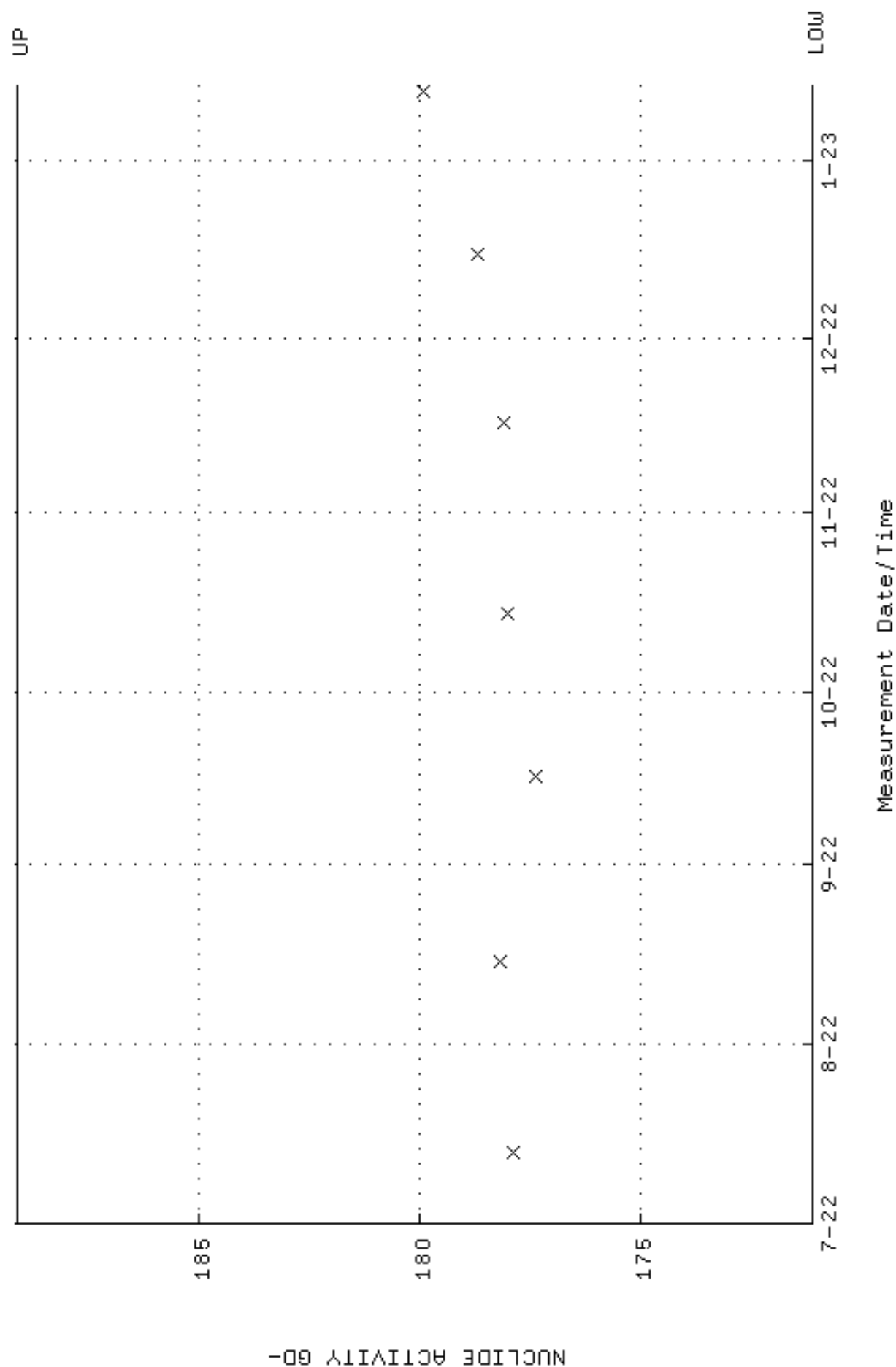
QA filename : DKA100:[ENV_ALPHA.QA.B]B121.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:28:37 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



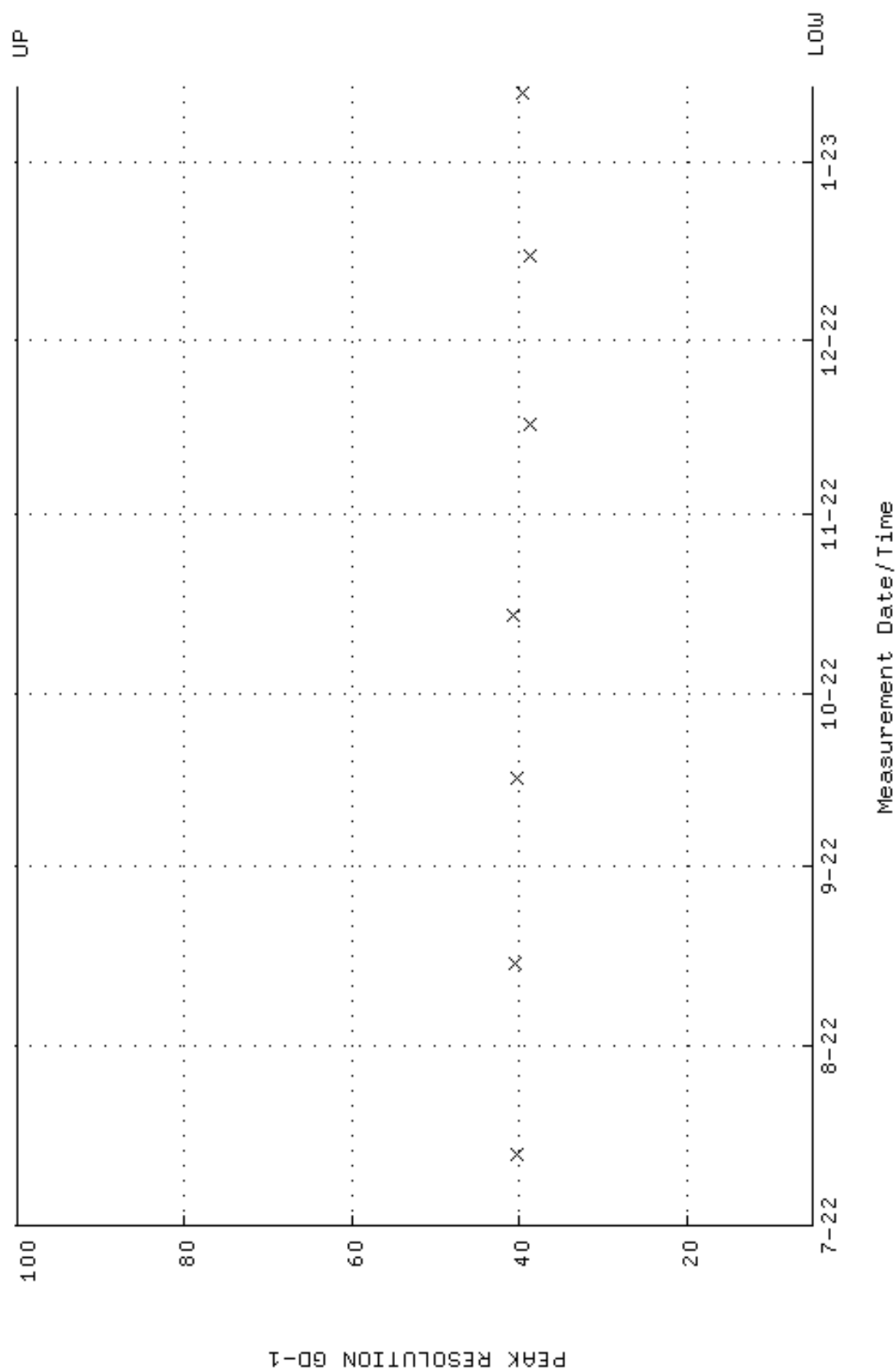
QA filename : DKA100:[ENV_ALPHA.QA.W]W124.QAF;8
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-JUL-2022 09:44:01 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.254910 through 0.270680



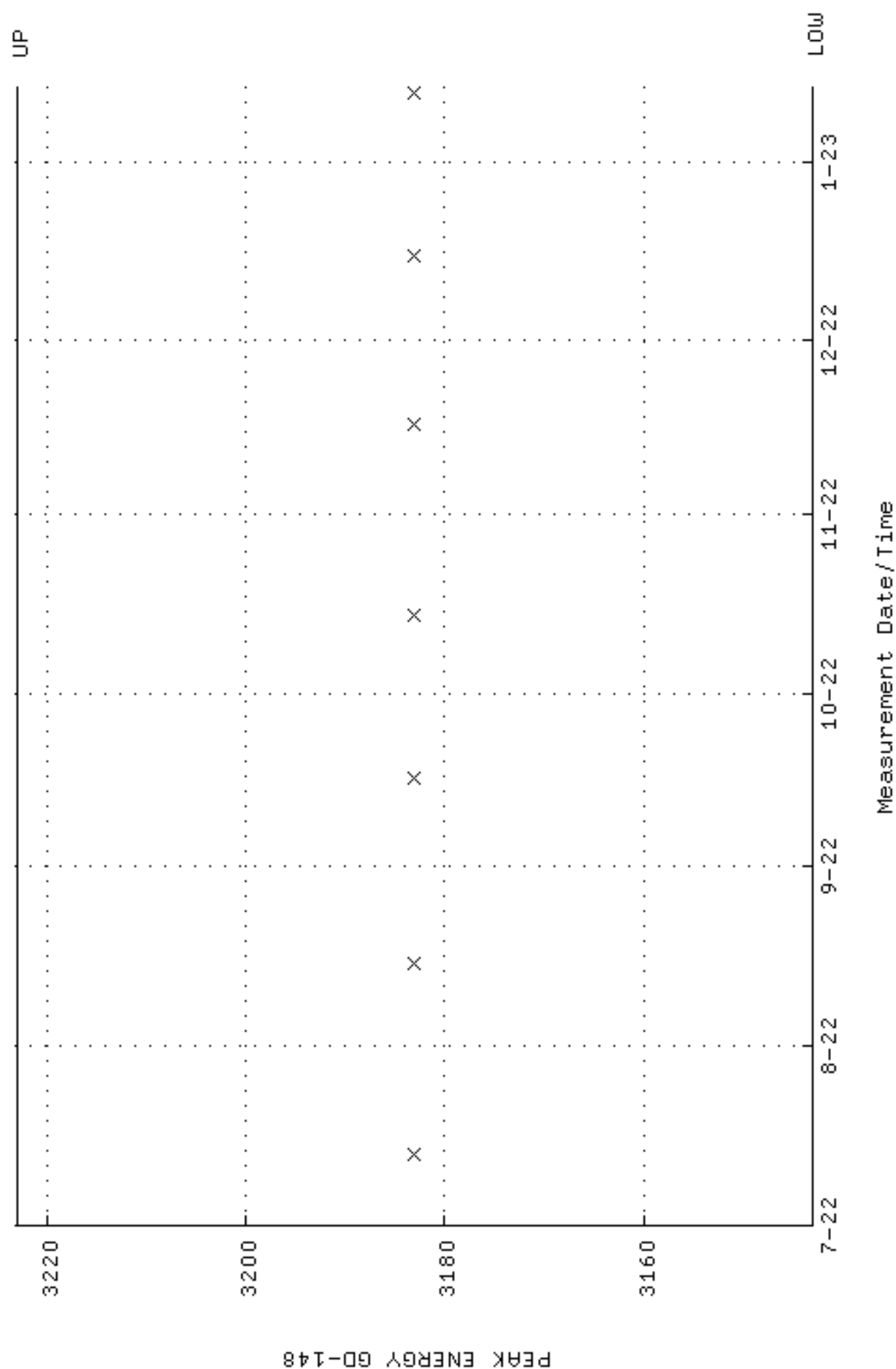
QA filename : DKA100:[ENV_ALPHA.QA.W]W124.QAF;8
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-JUL-2022 09:44:01 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



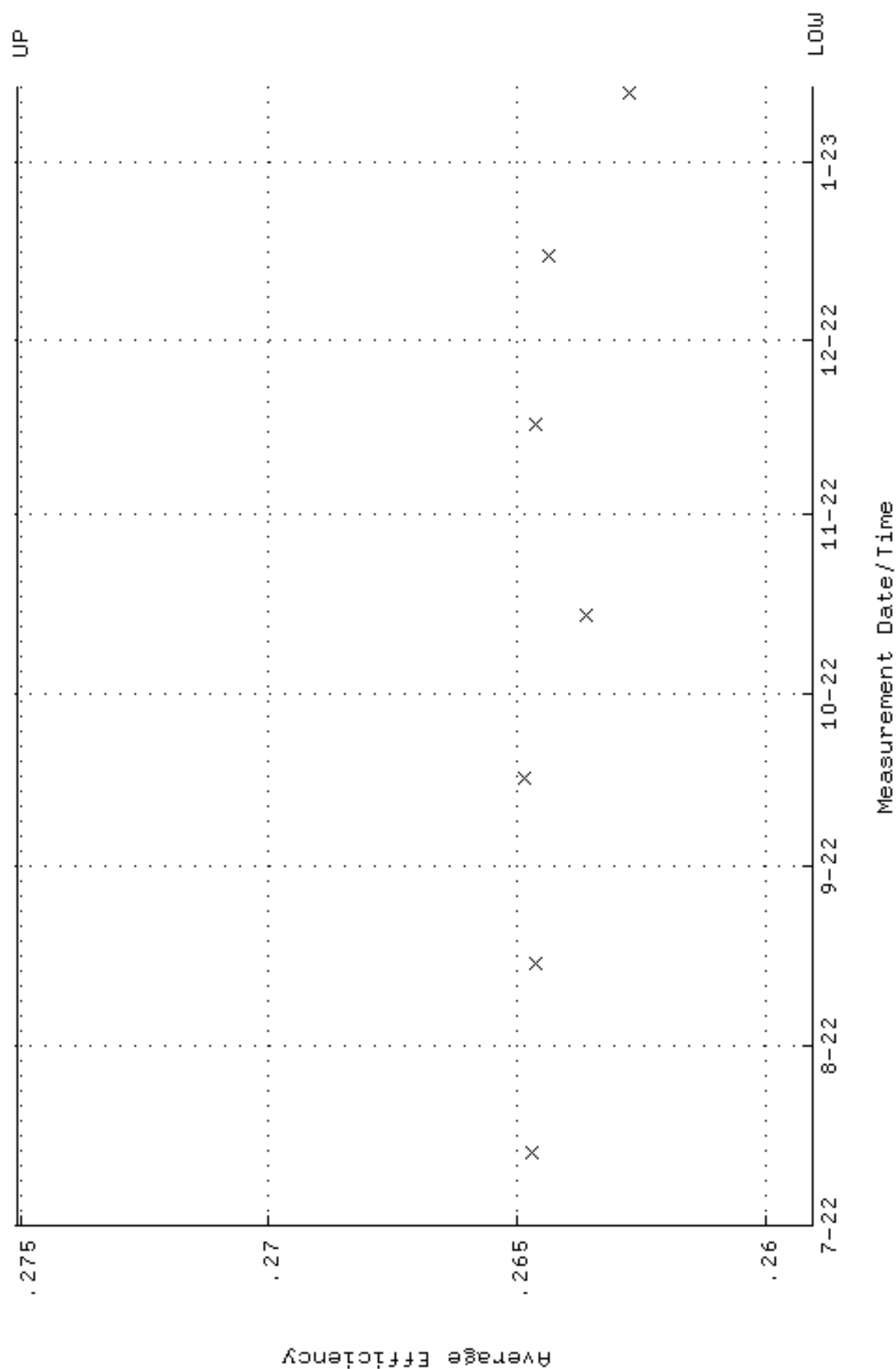
QA filename : DKA100:[ENV_ALPHA.QA.W]W124.QAF;8
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-JUL-2022 09:44:01 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



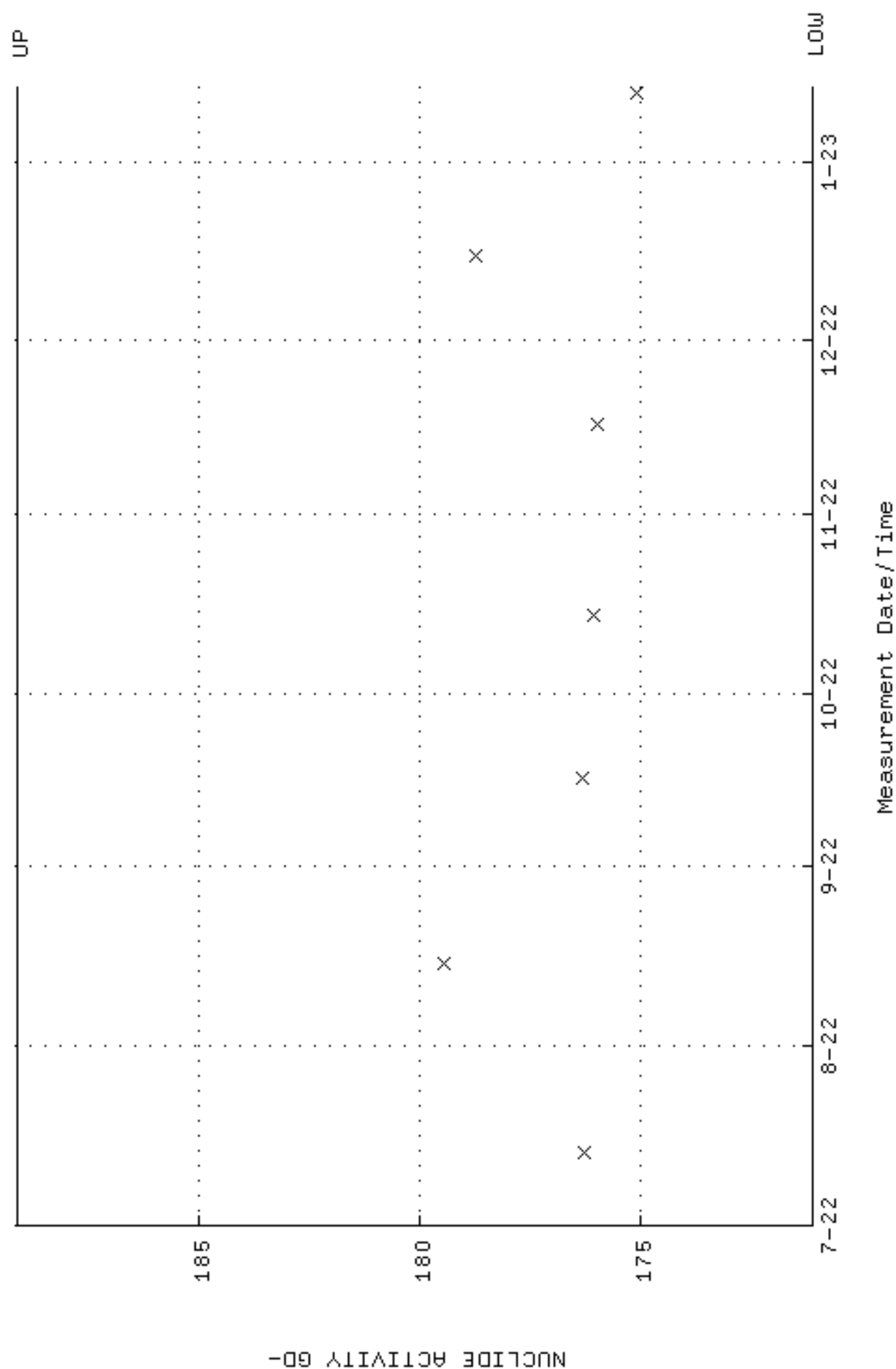
QA filename : DKA100:[ENV_ALPHA.QA.W]W124.QAF;8
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-JUL-2022 09:44:01 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



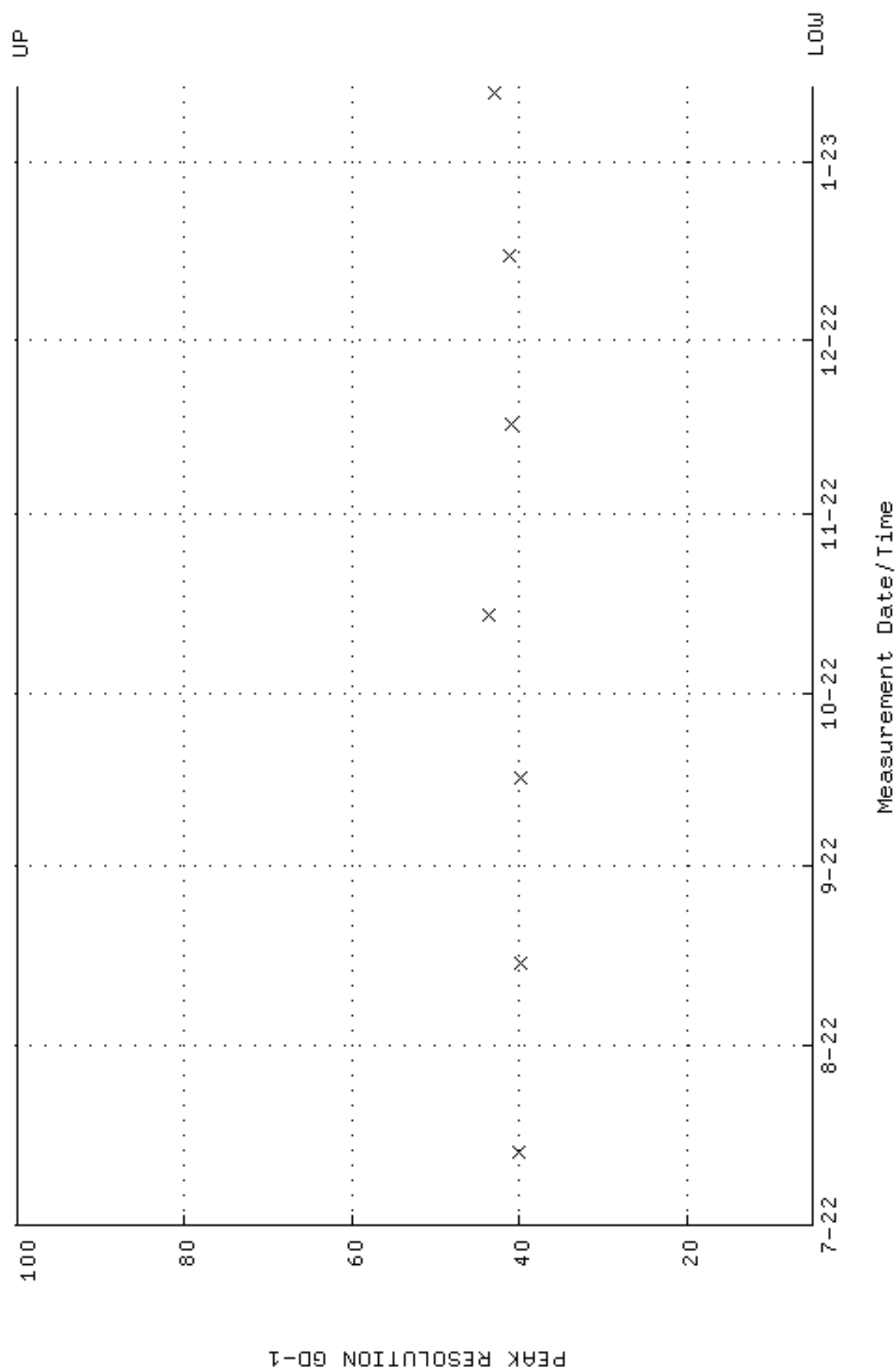
QA filename : DKA100:[ENV_ALPHA.QA.W]W125.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-JUL-2022 10:51:02 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.259040 through 0.275060



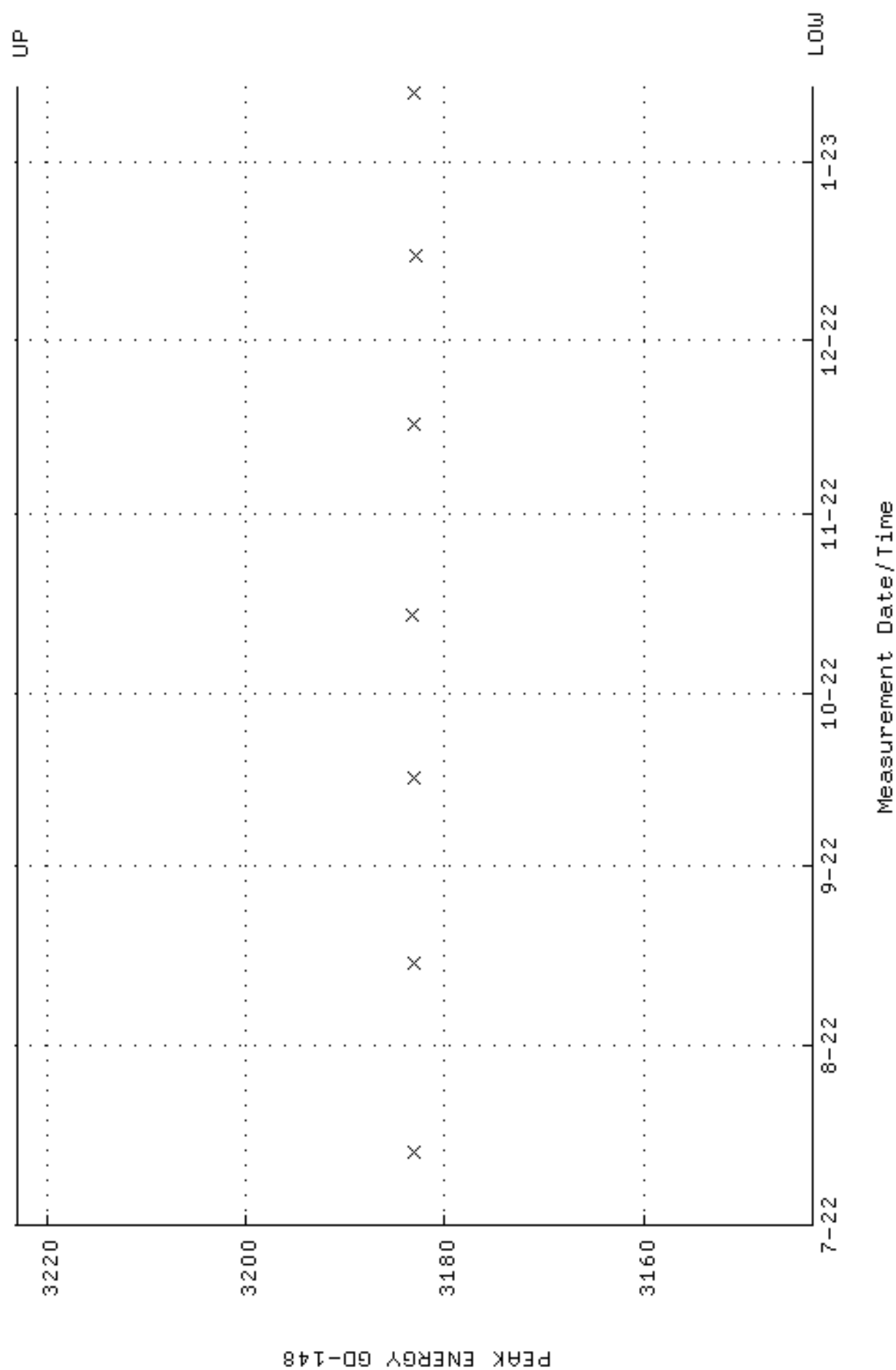
QA filename : DKA100:[ENV_ALPHA.QA.W]W125.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-JUL-2022 10:51:02 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



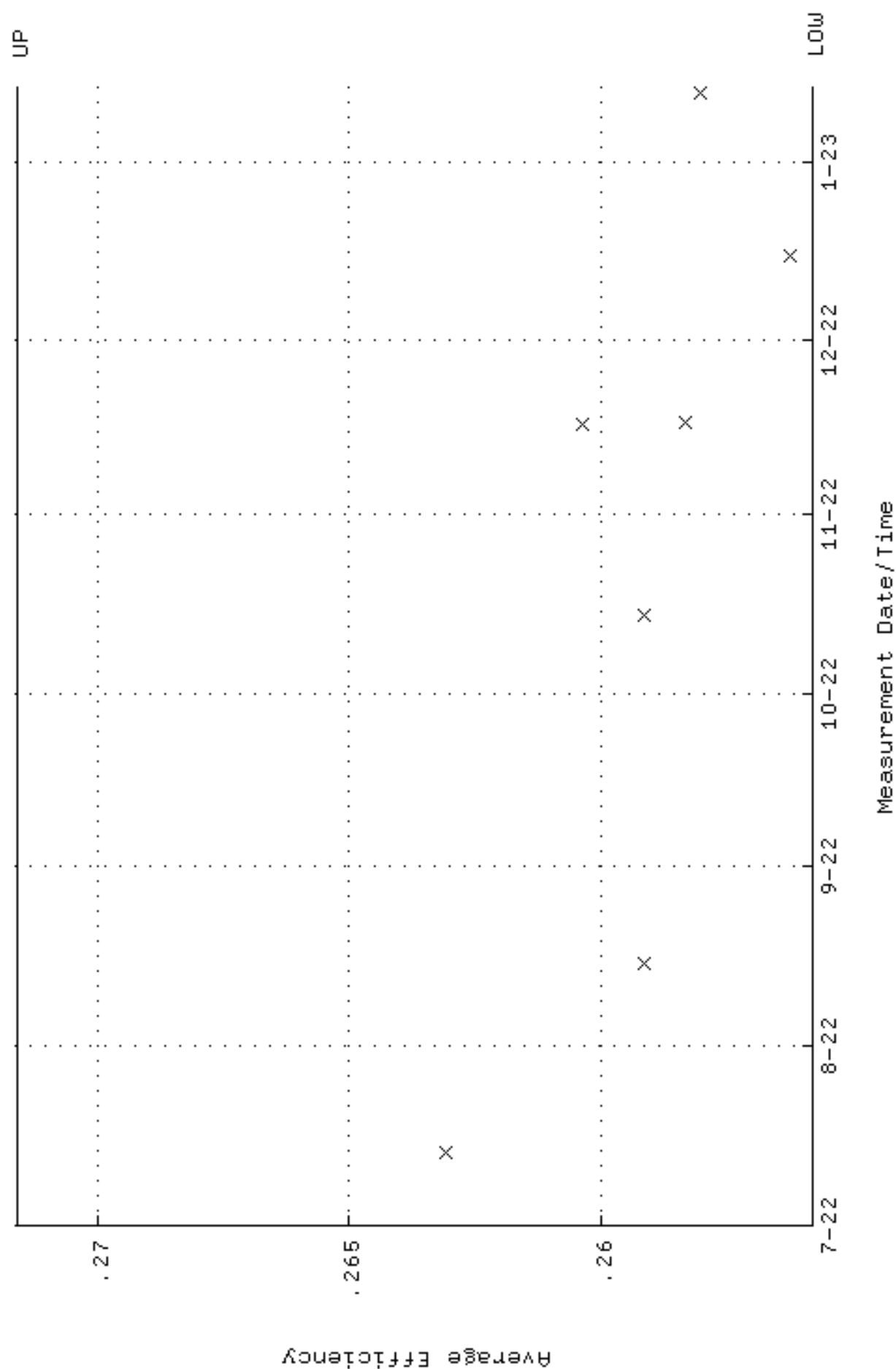
QA filename : DKA100:[ENV_ALPHA.QA.W]W125.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-JUL-2022 10:51:02 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



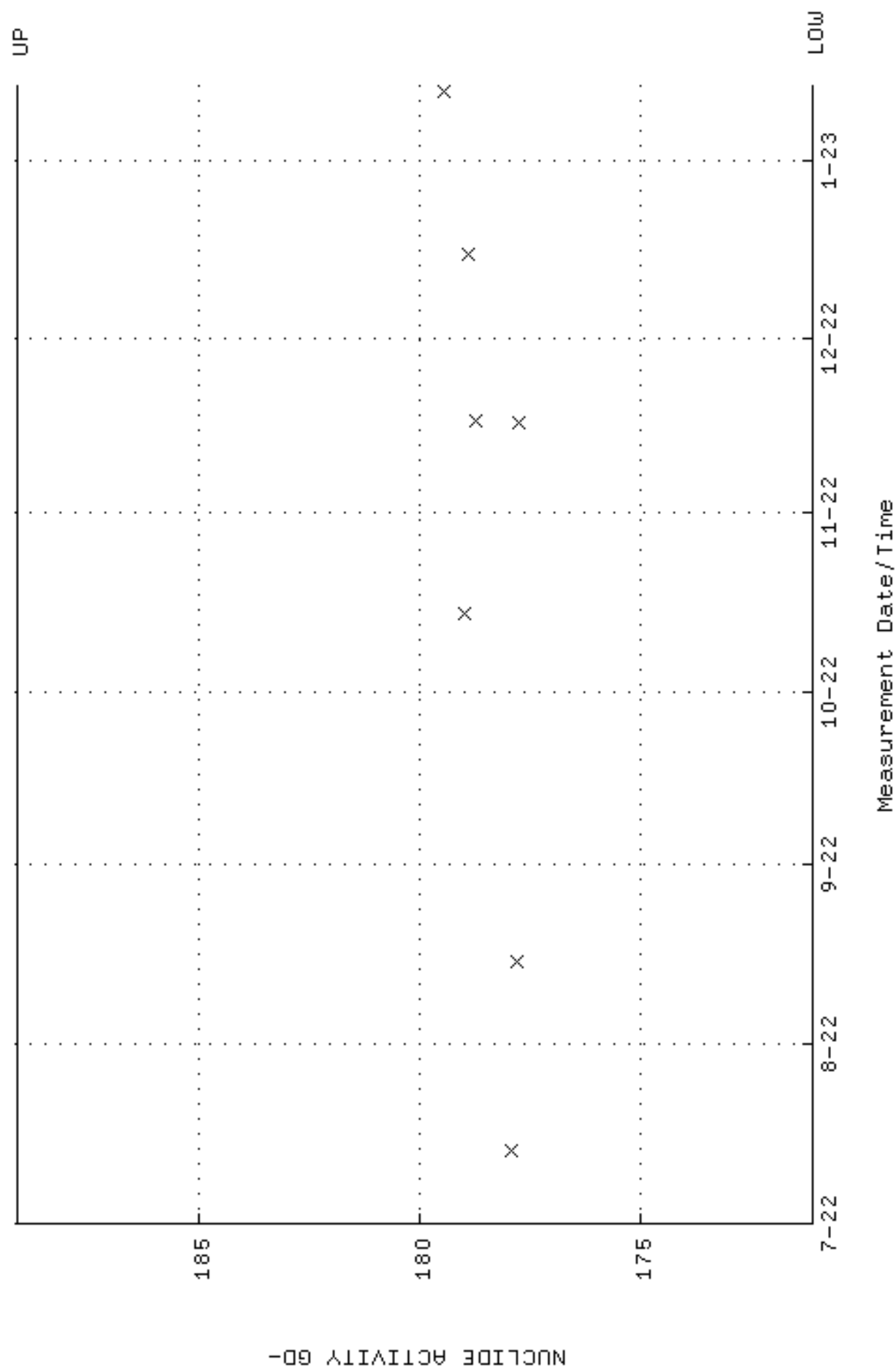
QA filename : DKA100:[ENV_ALPHA.QA.W]W125.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-JUL-2022 10:51:02 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



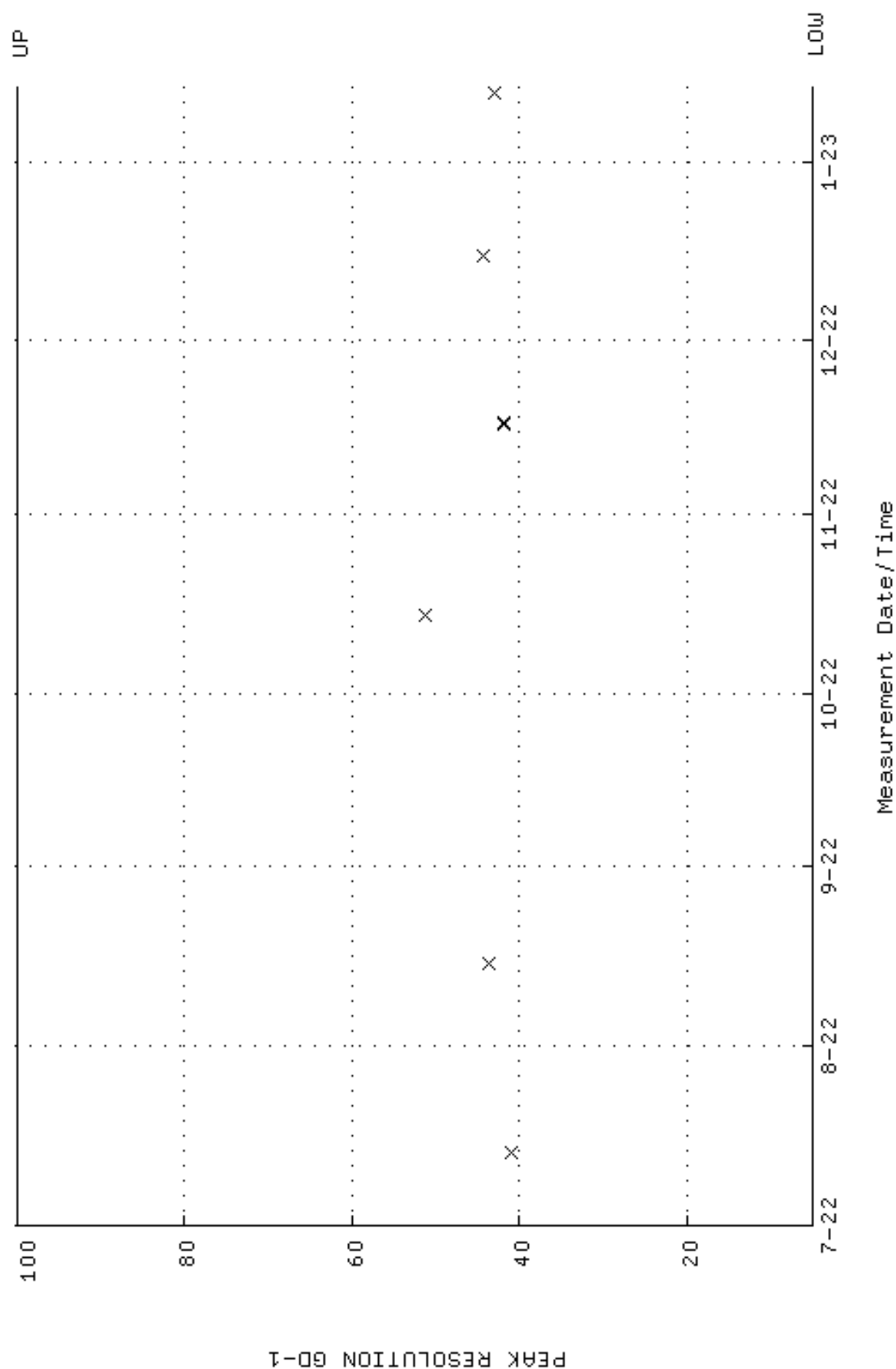
QA filename : DKA100:[ENV_ALPHA.QA.W]W126.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-JUL-2022 10:51:08 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.255780 through 0.271600



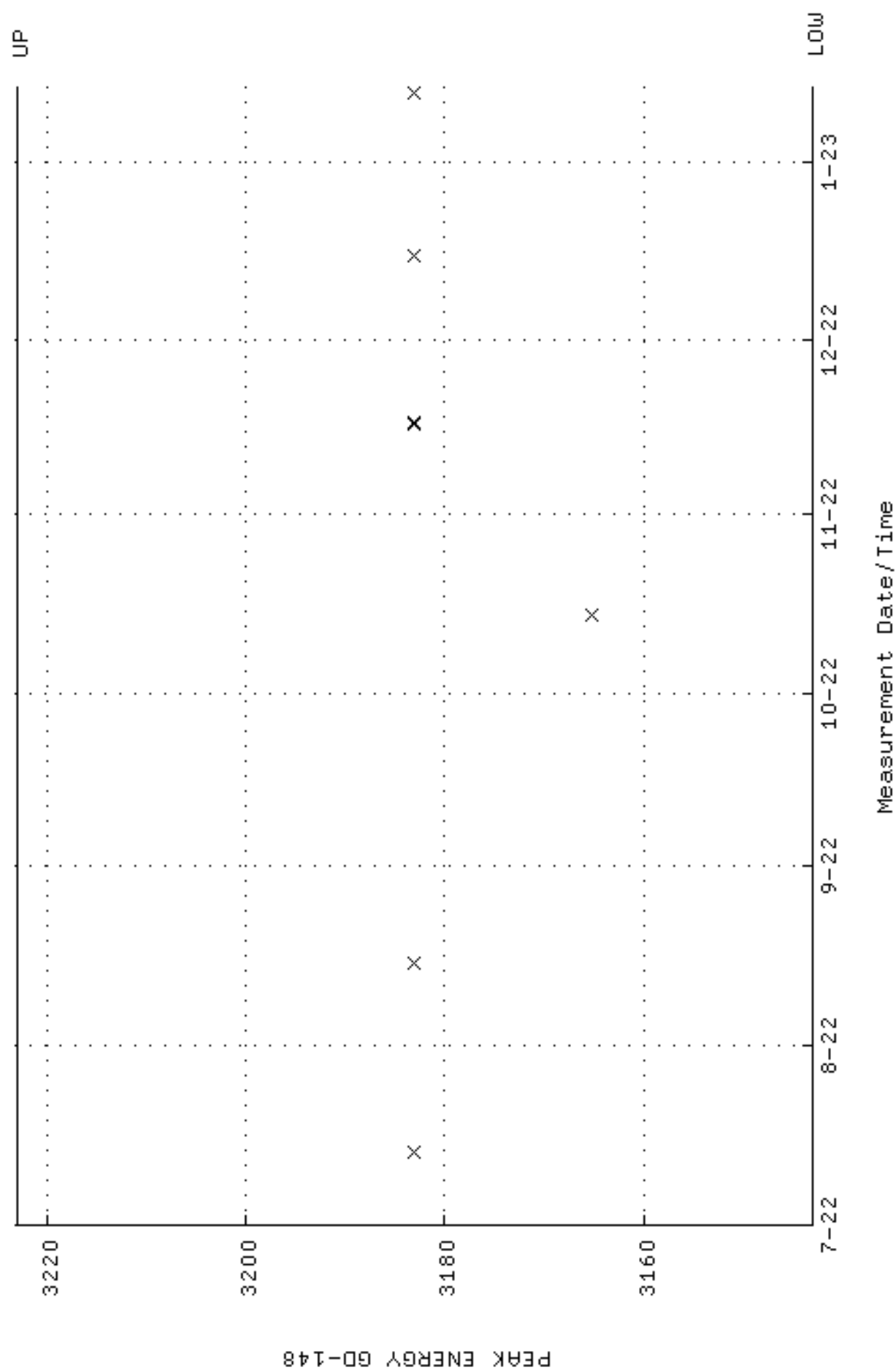
QA filename : DKA100:[ENV_ALPHA.QA.W]W126.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-JUL-2022 10:51:08 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



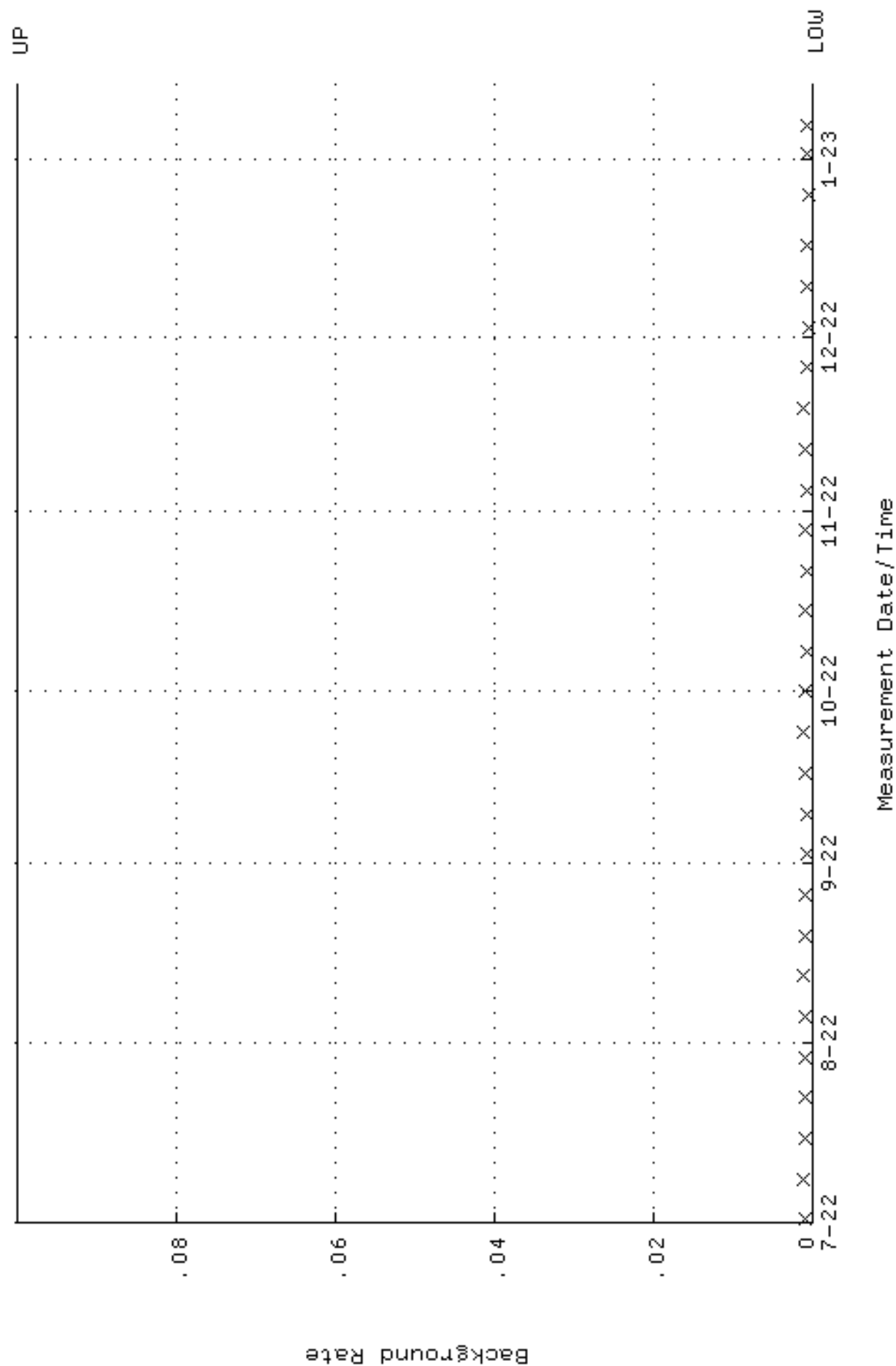
QA filename : DKA100:[ENV_ALPHA.QA.W]W126.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-JUL-2022 10:51:08 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



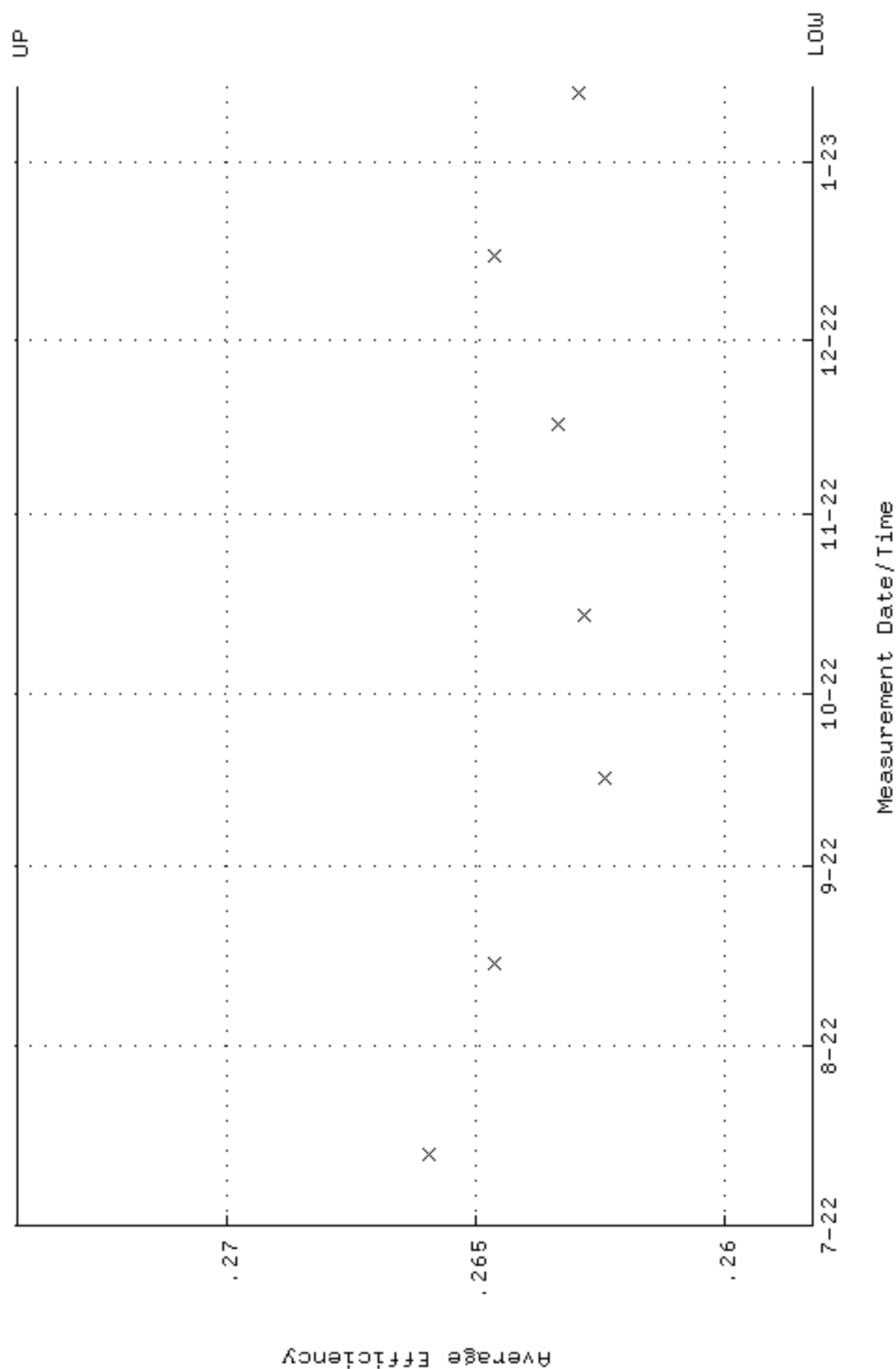
QA filename : DKA100:[ENV_ALPHA.QA.W]W126.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-JUL-2022 10:51:08 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



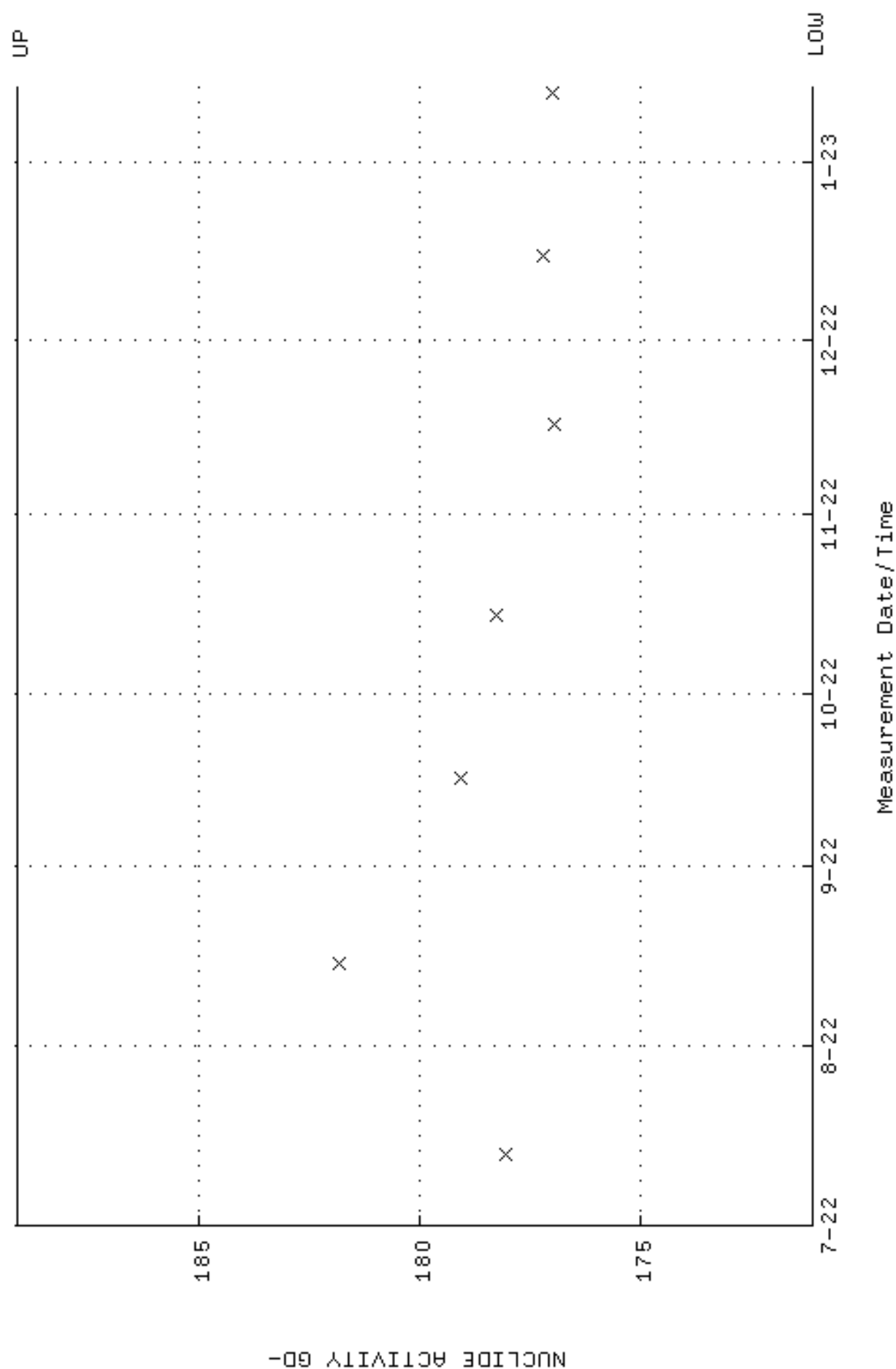
QA filename : DKA100:[ENV_ALPHA.QA.B]B126.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:29:01 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



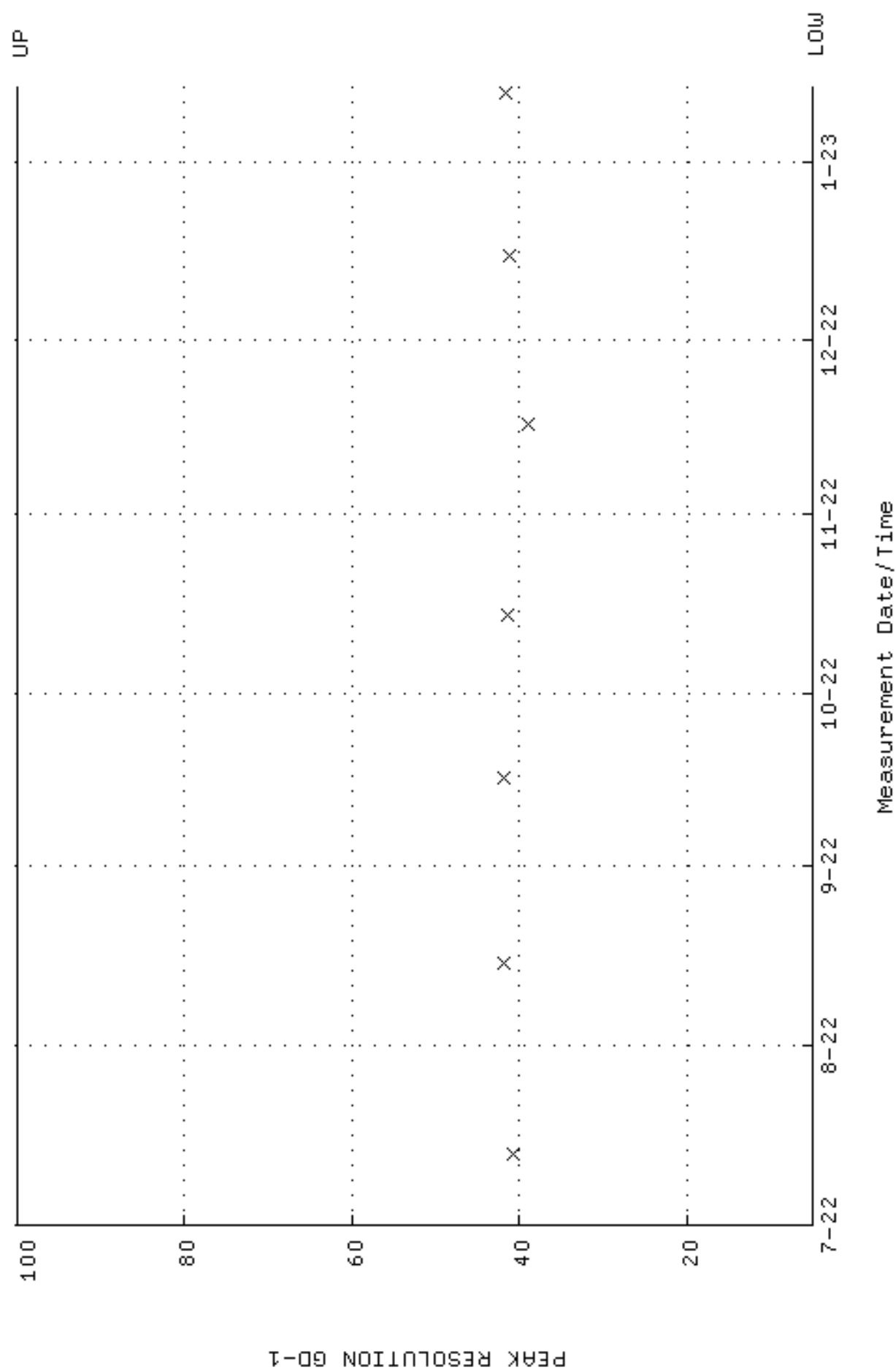
QA filename : DKA100:[ENV_ALPHA.QA.W]W128.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-JUL-2022 09:50:51 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.258250 through 0.274220



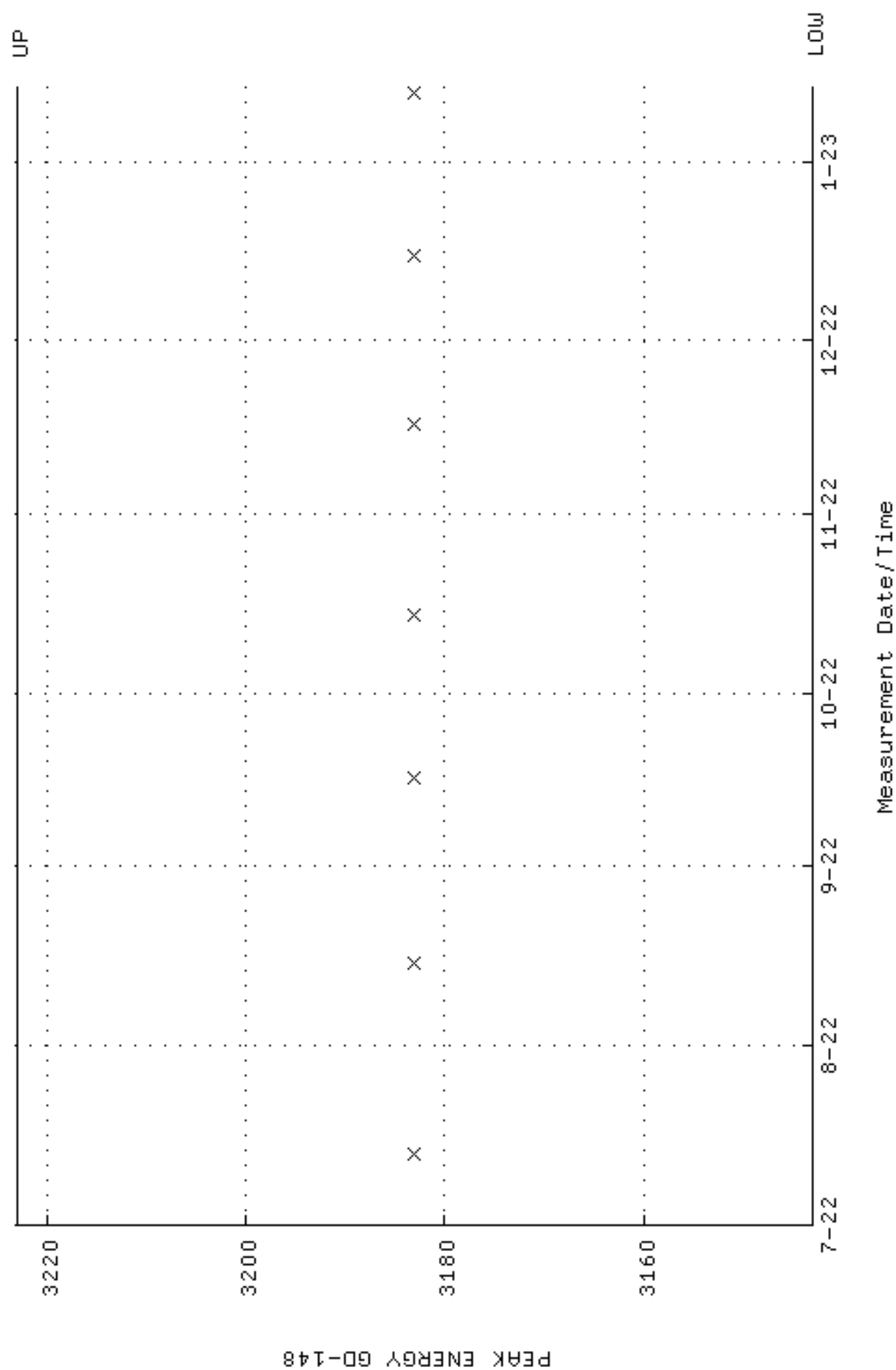
QA filename : DKA100:[ENV_ALPHA.QA.W]W128.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-JUL-2022 09:50:51 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



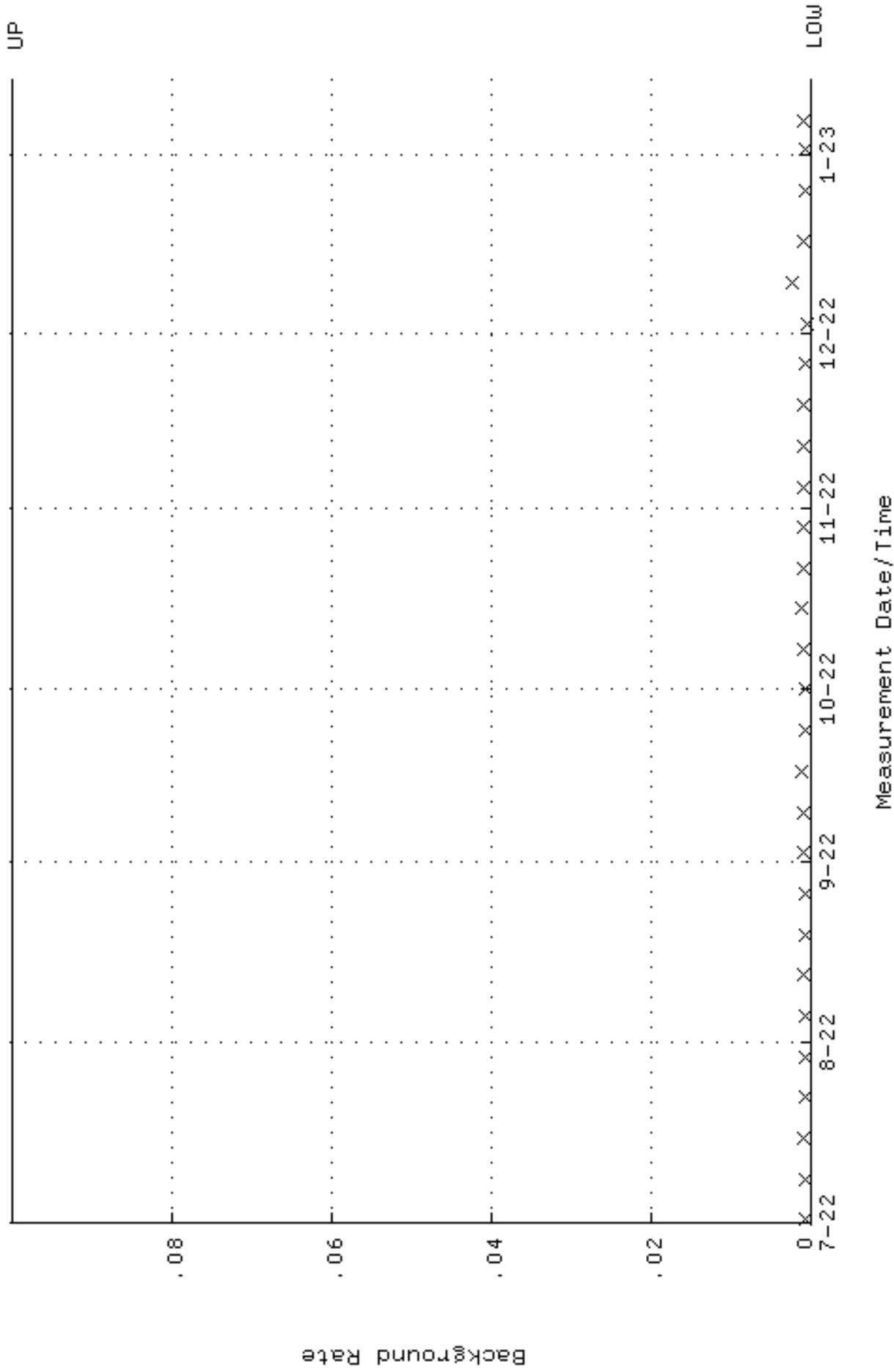
QA filename : DKA100:[ENV_ALPHA.QA.W]W128.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-JUL-2022 09:50:51 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



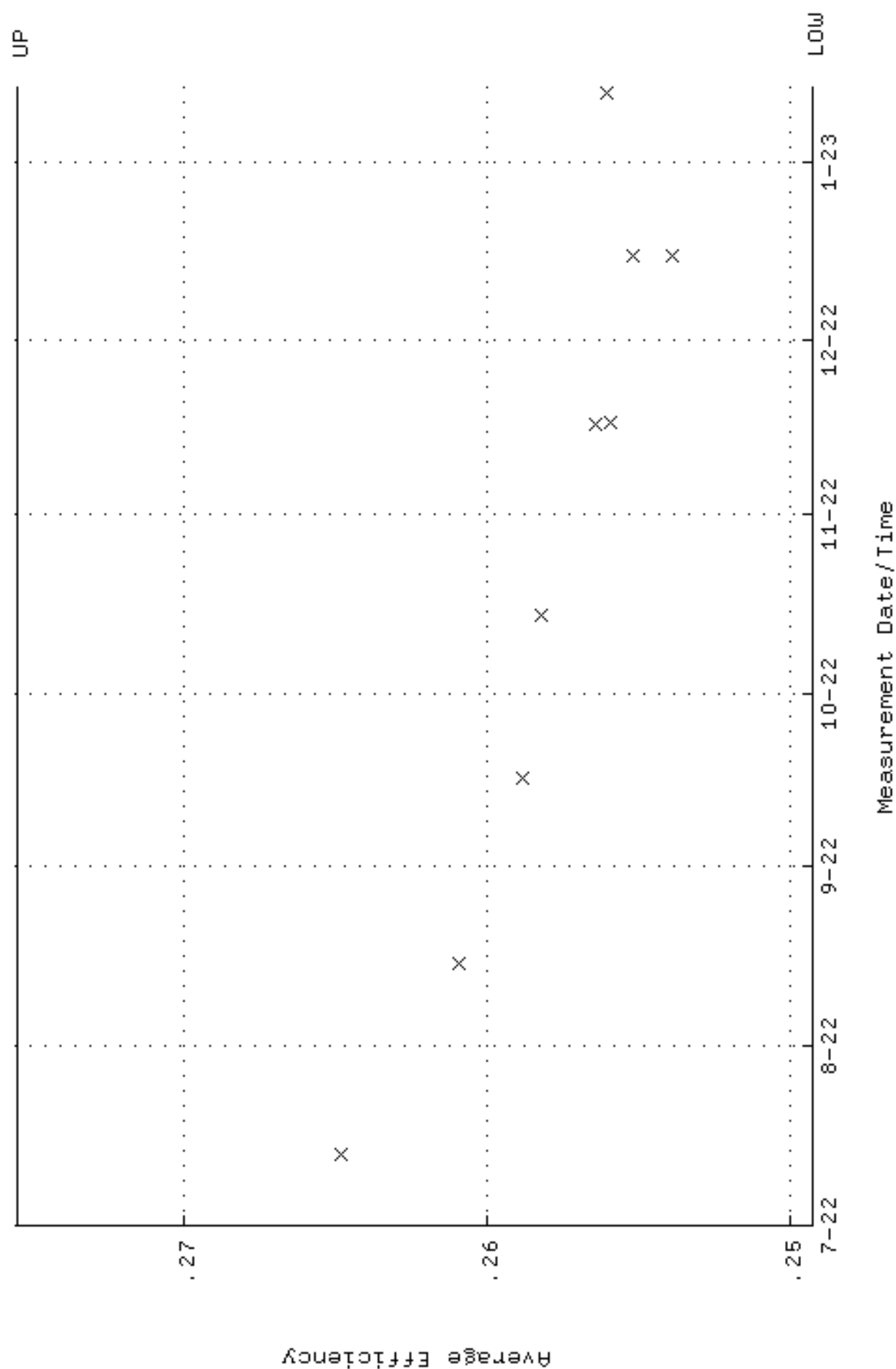
QA filename : DKA100:[ENV_ALPHA.QA.W]W128.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-JUL-2022 09:50:51 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



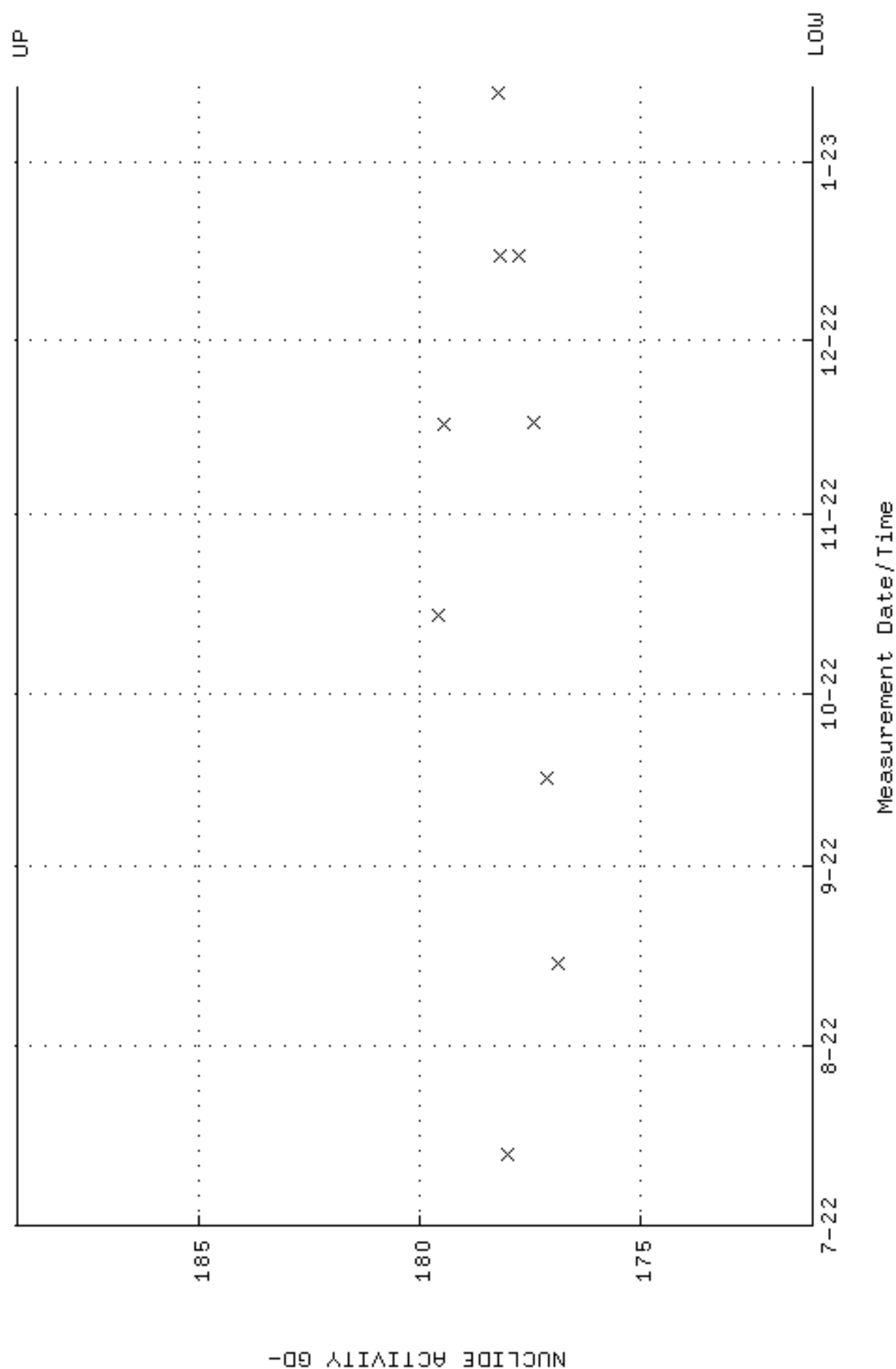
QA filename : DKA100:[ENV_ALPHA.QA.B]B128.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JUL-2022 13:29:10 through 13-JAN-2023 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 0.100000



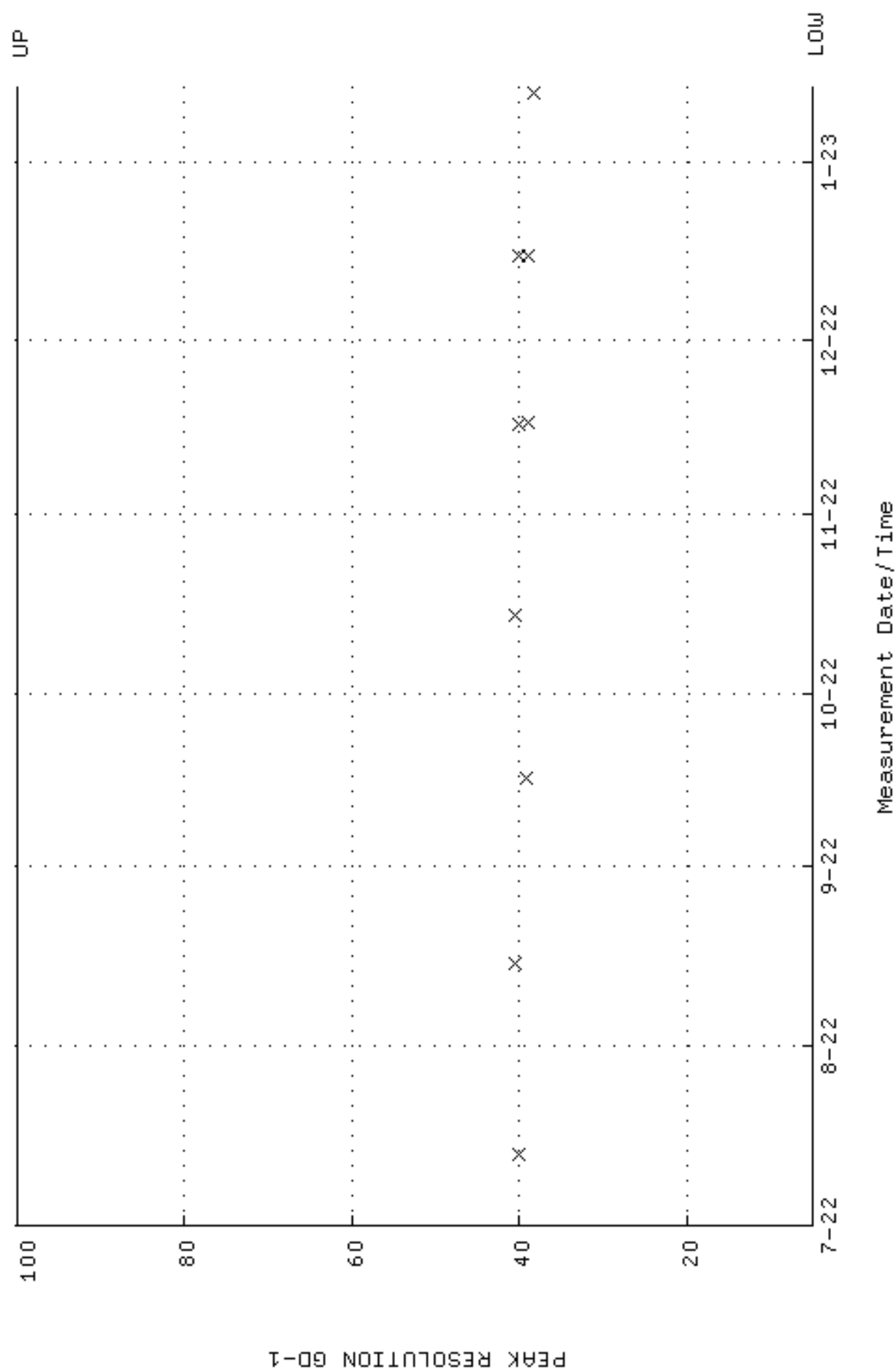
QA filename : DKA100:[ENV_ALPHA.QA.W]W130.QAF;7
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-JUL-2022 09:51:04 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.249246 through 0.275482



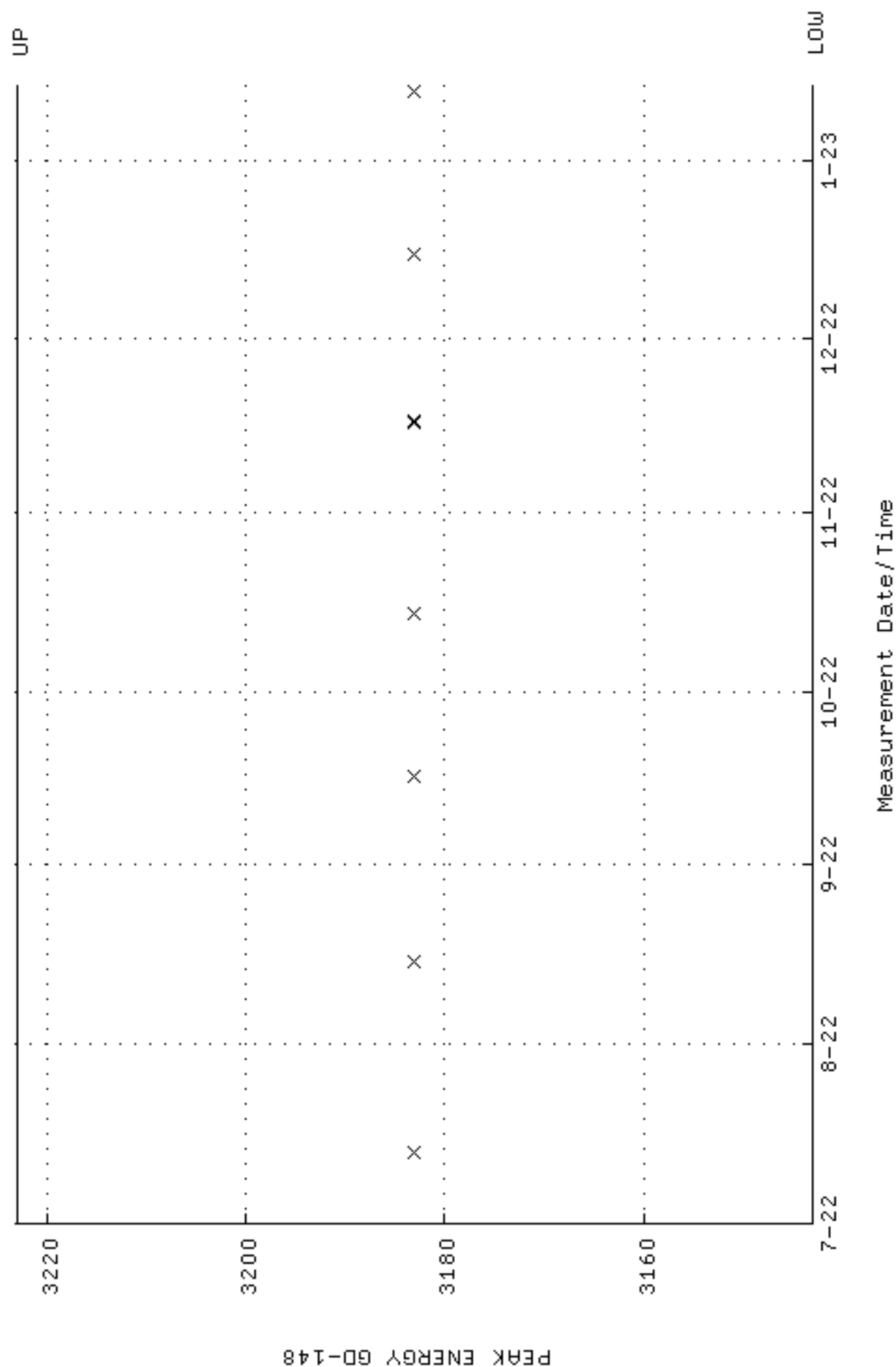
QA filename : DKA100:[ENV_ALPHA.QA.W]W130.QAF;7
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-JUL-2022 09:51:04 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



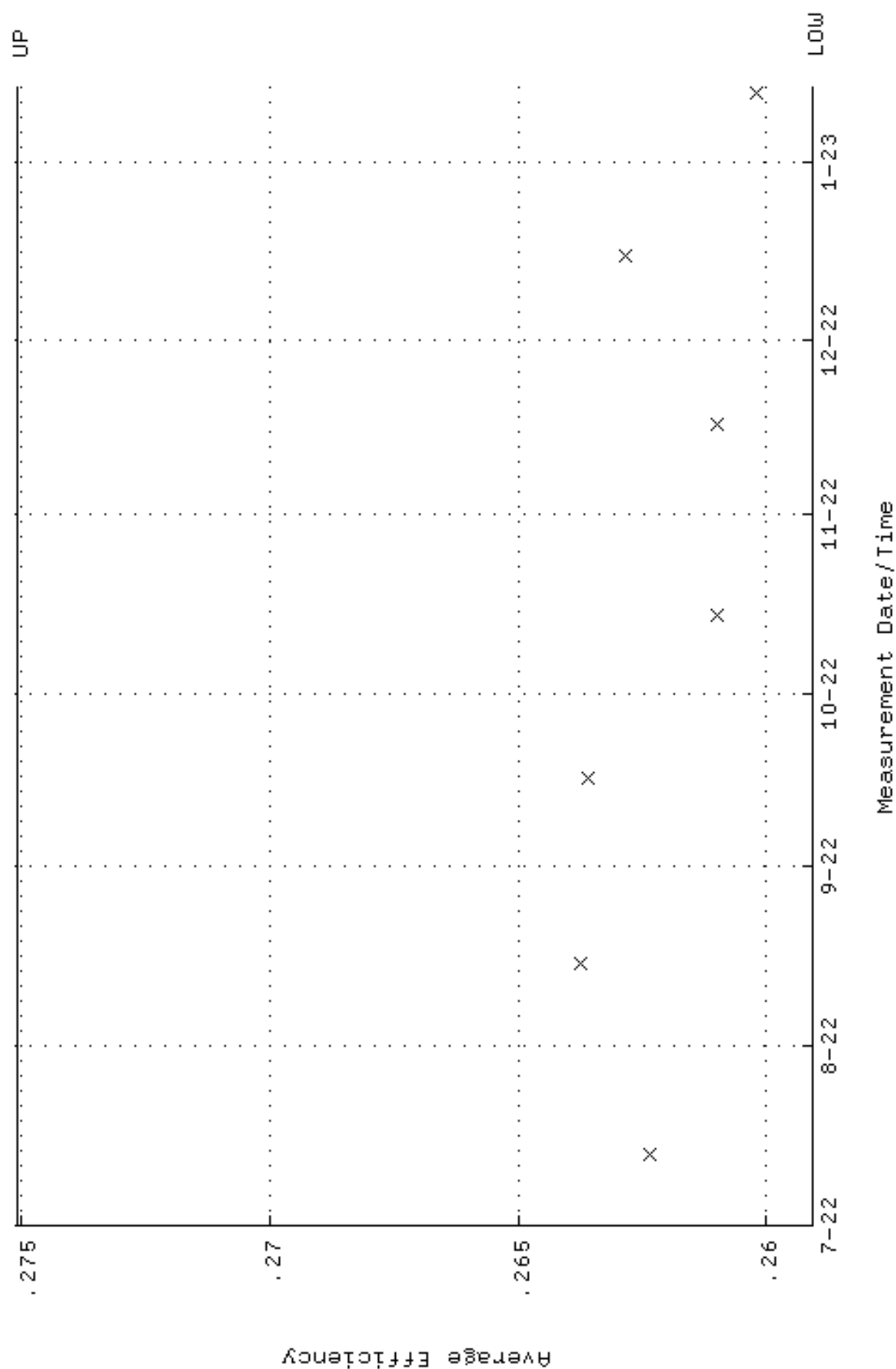
QA filename : DKA100:[ENV_ALPHA.QA.W]W130.QAF;7
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-JUL-2022 09:51:04 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



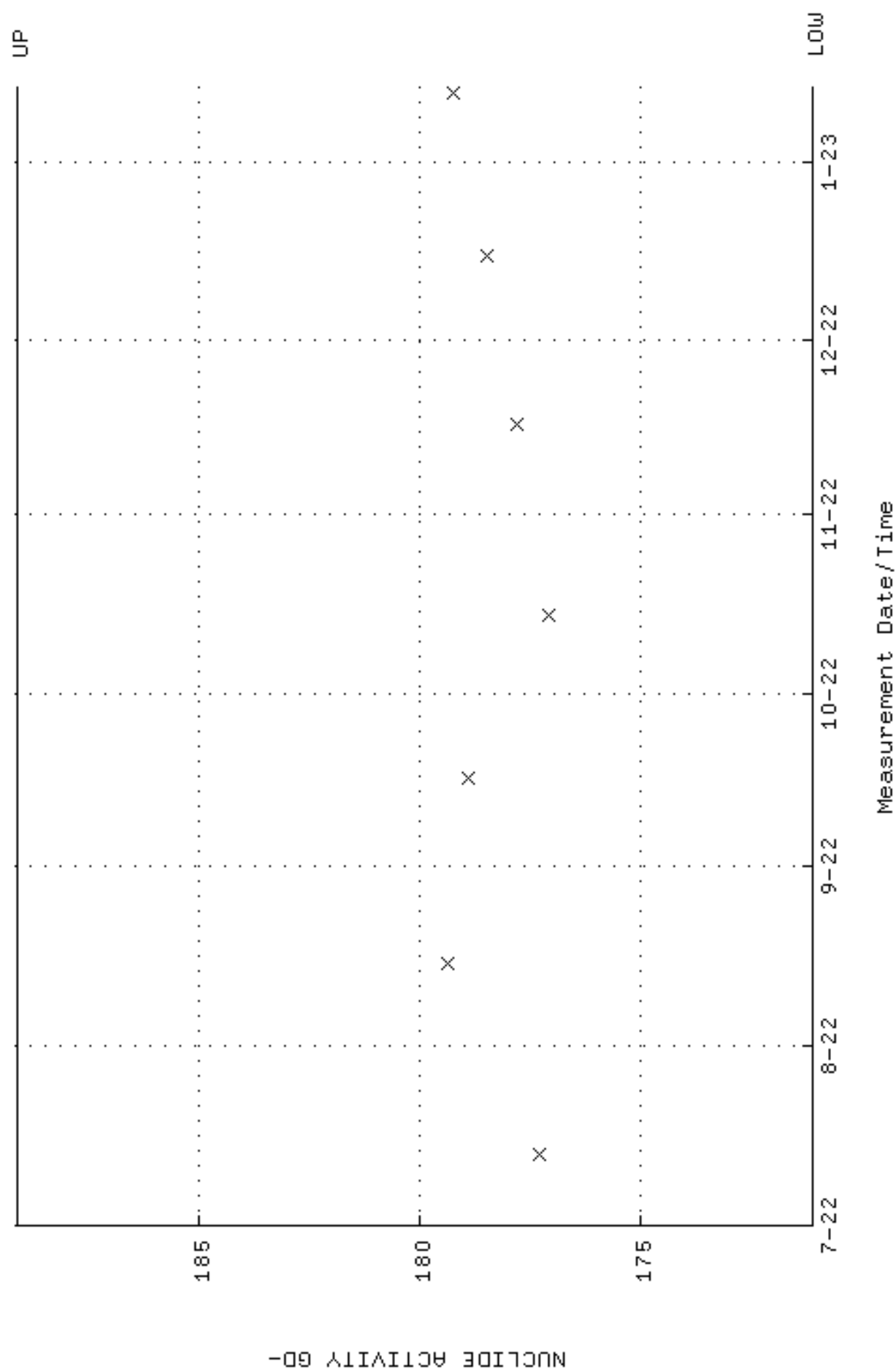
QA filename : DKA100:[ENV_ALPHA.QA.W]W130.QAF;7
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-JUL-2022 09:51:04 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



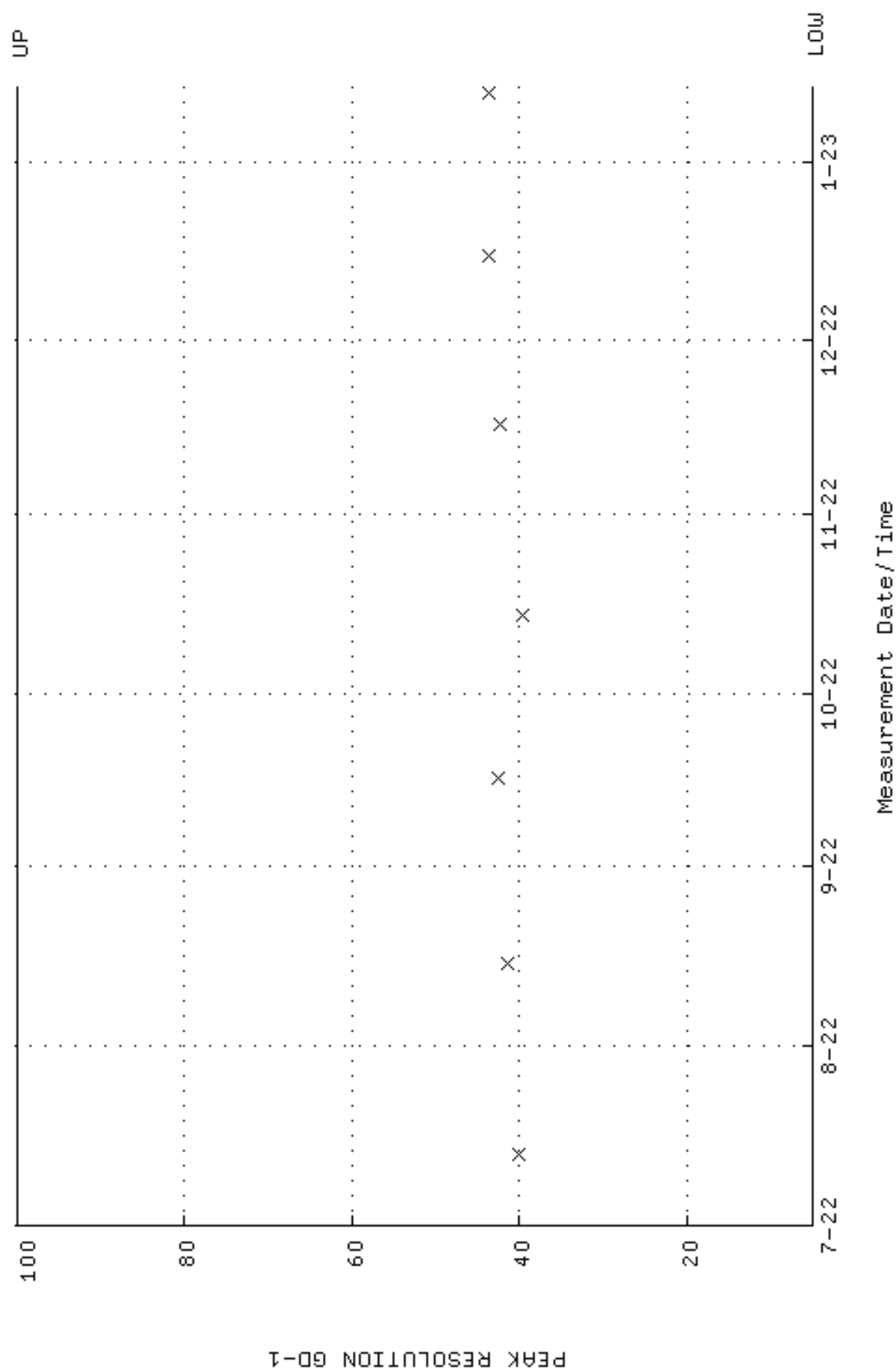
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 13-JUL-2022 09:51:32 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.259070 through 0.275090



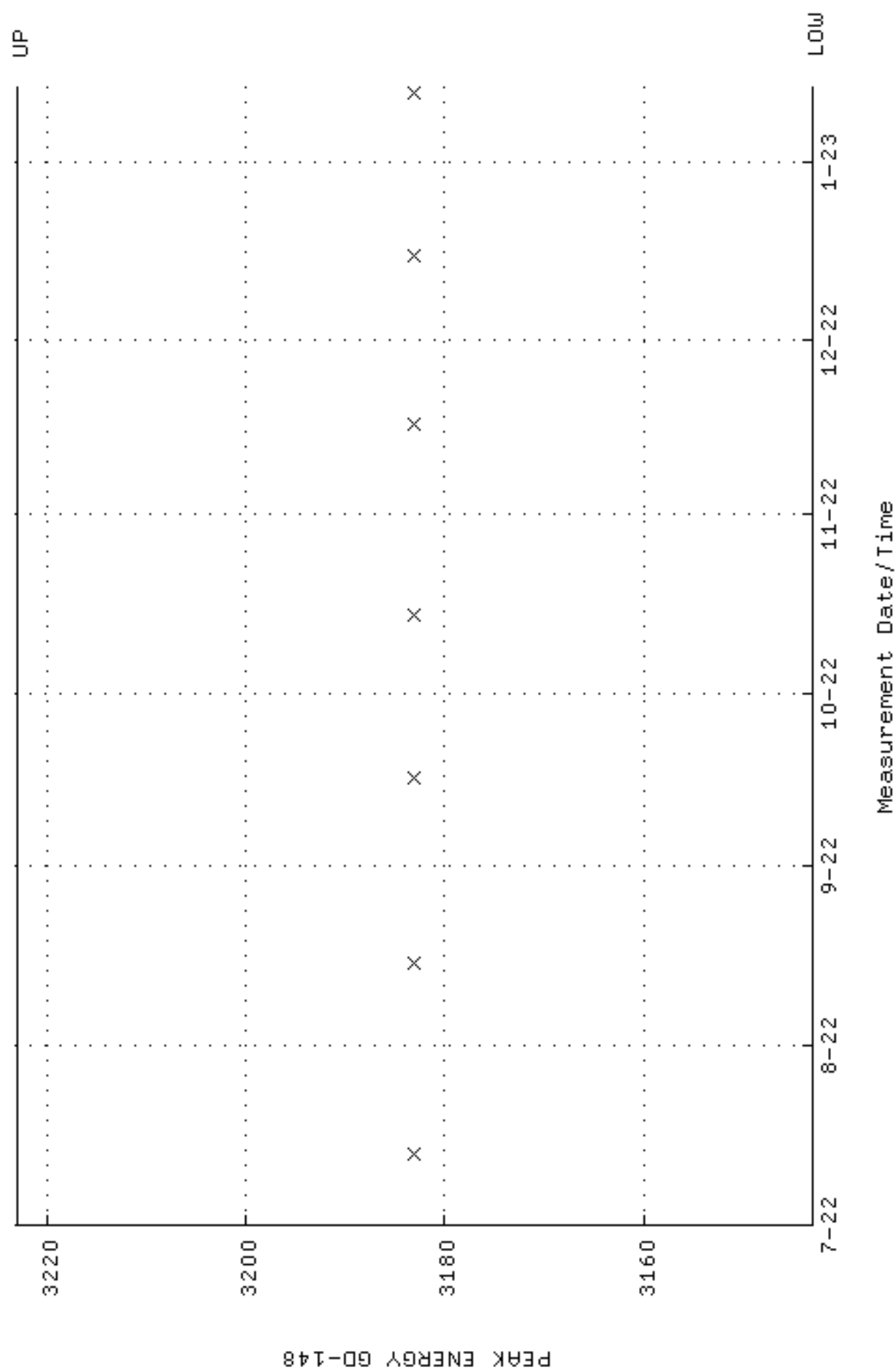
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 13-JUL-2022 09:51:32 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



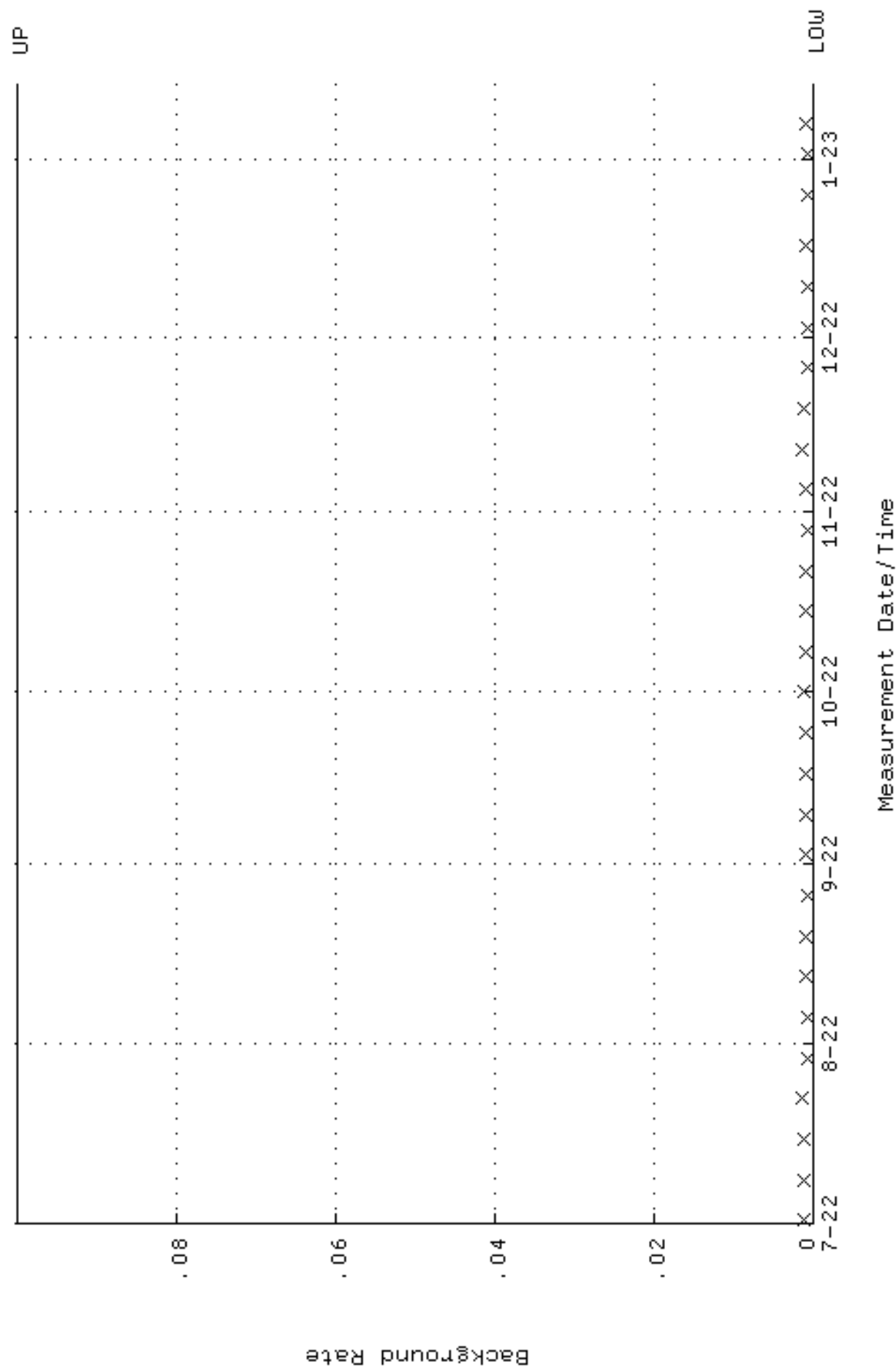
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 13-JUL-2022 09:51:32 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



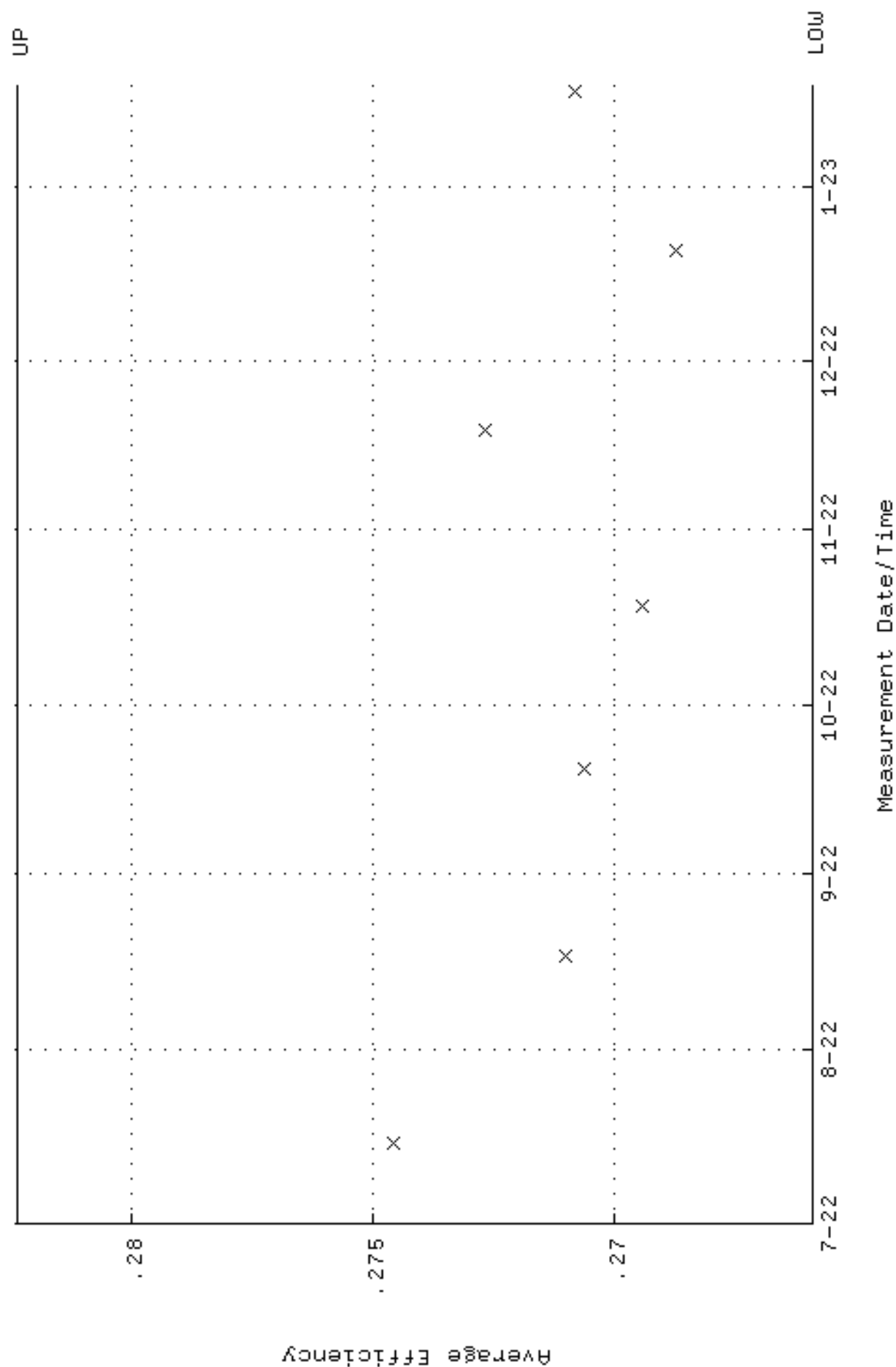
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;6
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 13-JUL-2022 09:51:32 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



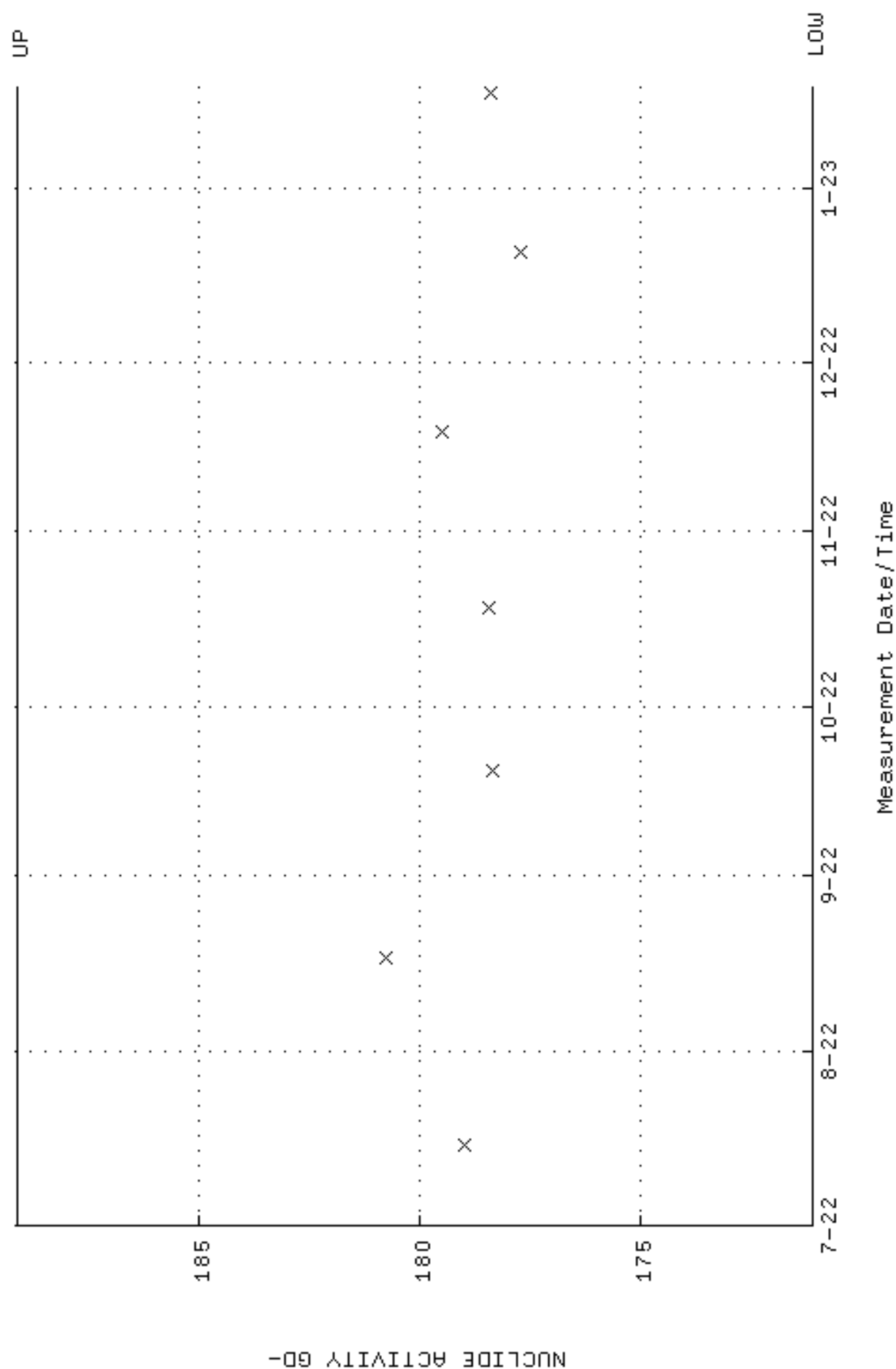
QA filename : DKA100:[ENV_ALPHA.QA.B]B136.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:29:49 through 13-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



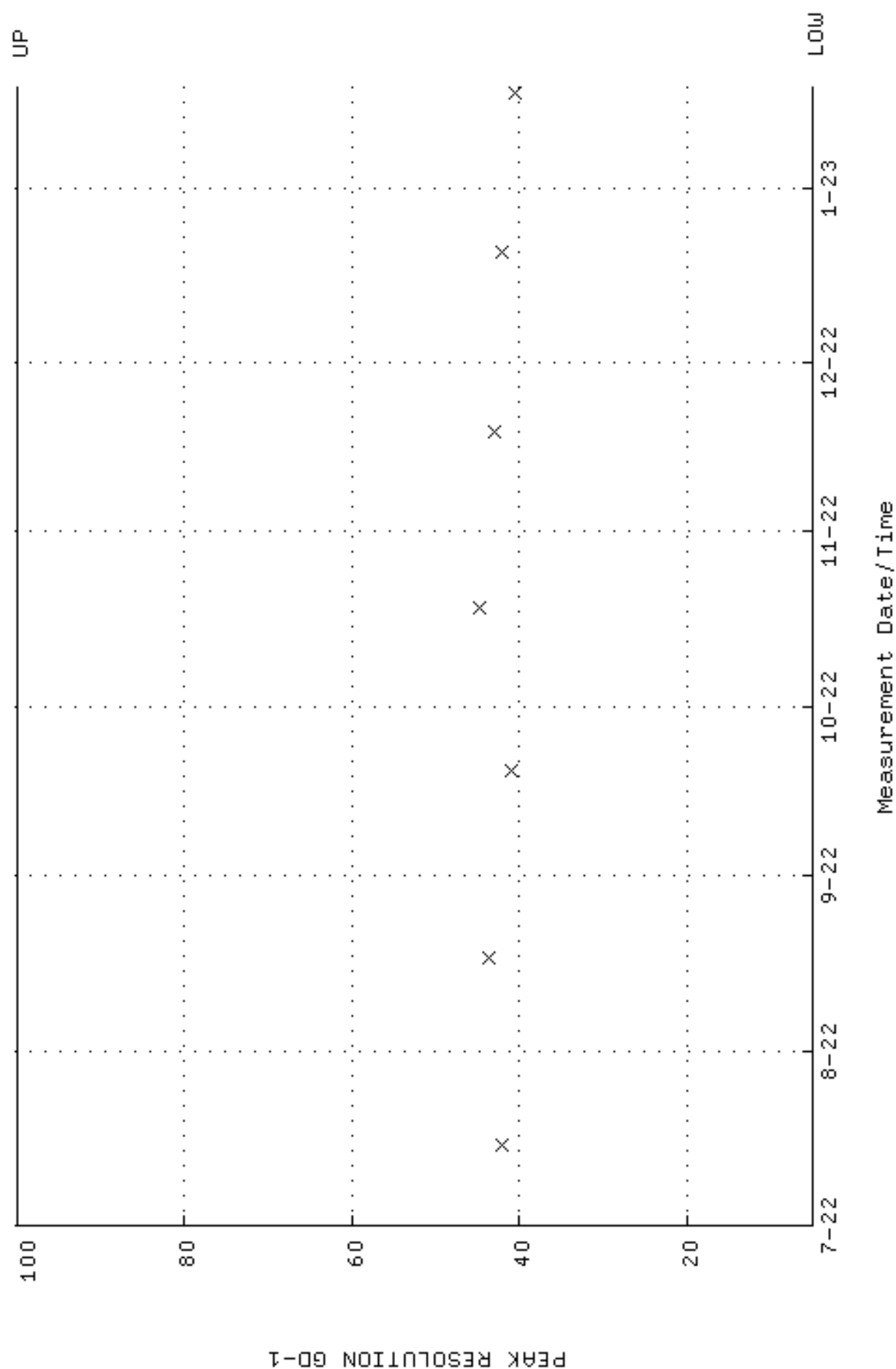
QA filename : DKA100:[ENV_ALPHA.QA.W]W174.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 15-JUL-2022 09:27:05 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.265910 through 0.282360



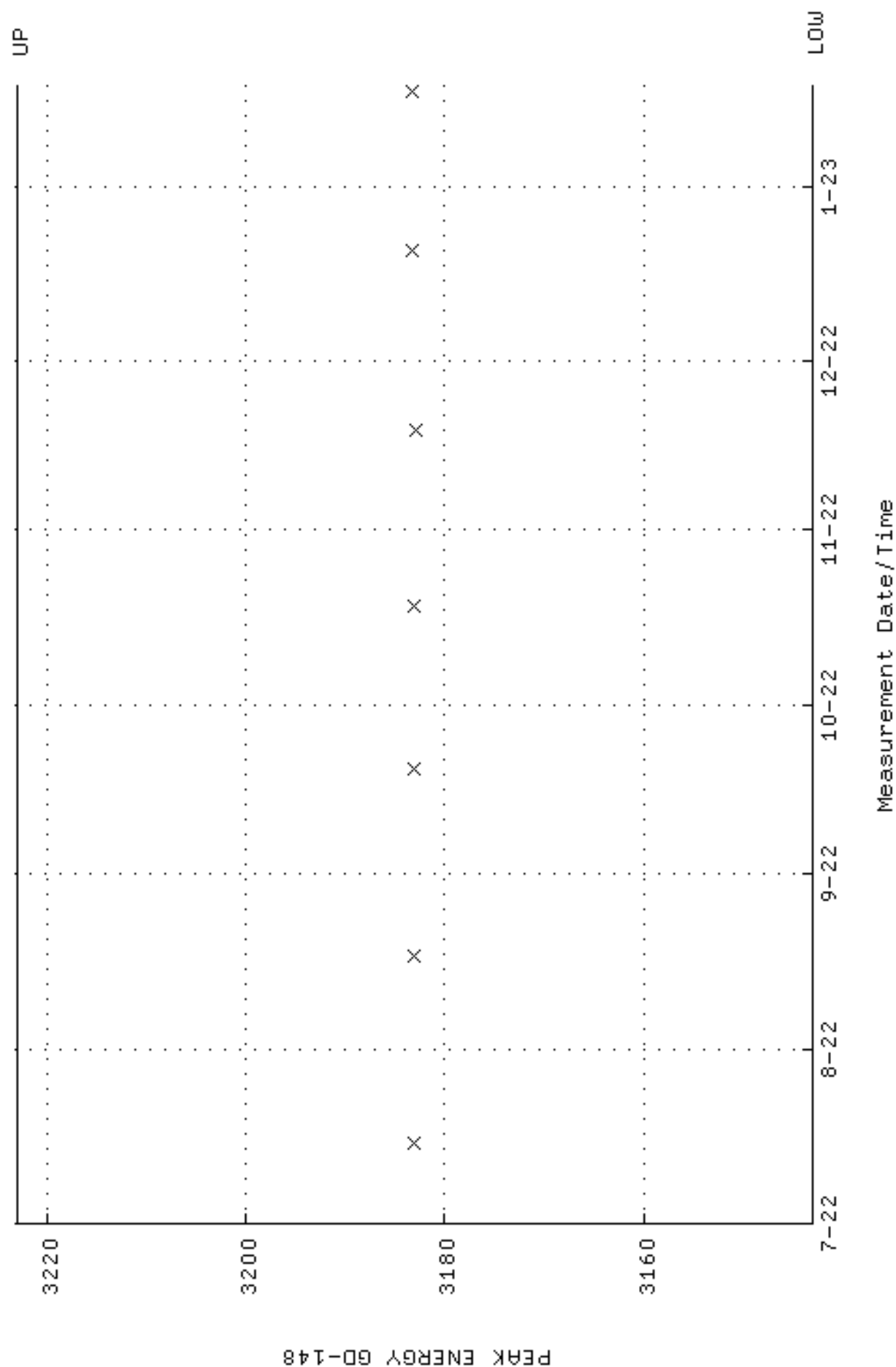
QA filename : DKA100:[ENV_ALPHA.QA.W]W174.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 15-JUL-2022 09:27:05 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



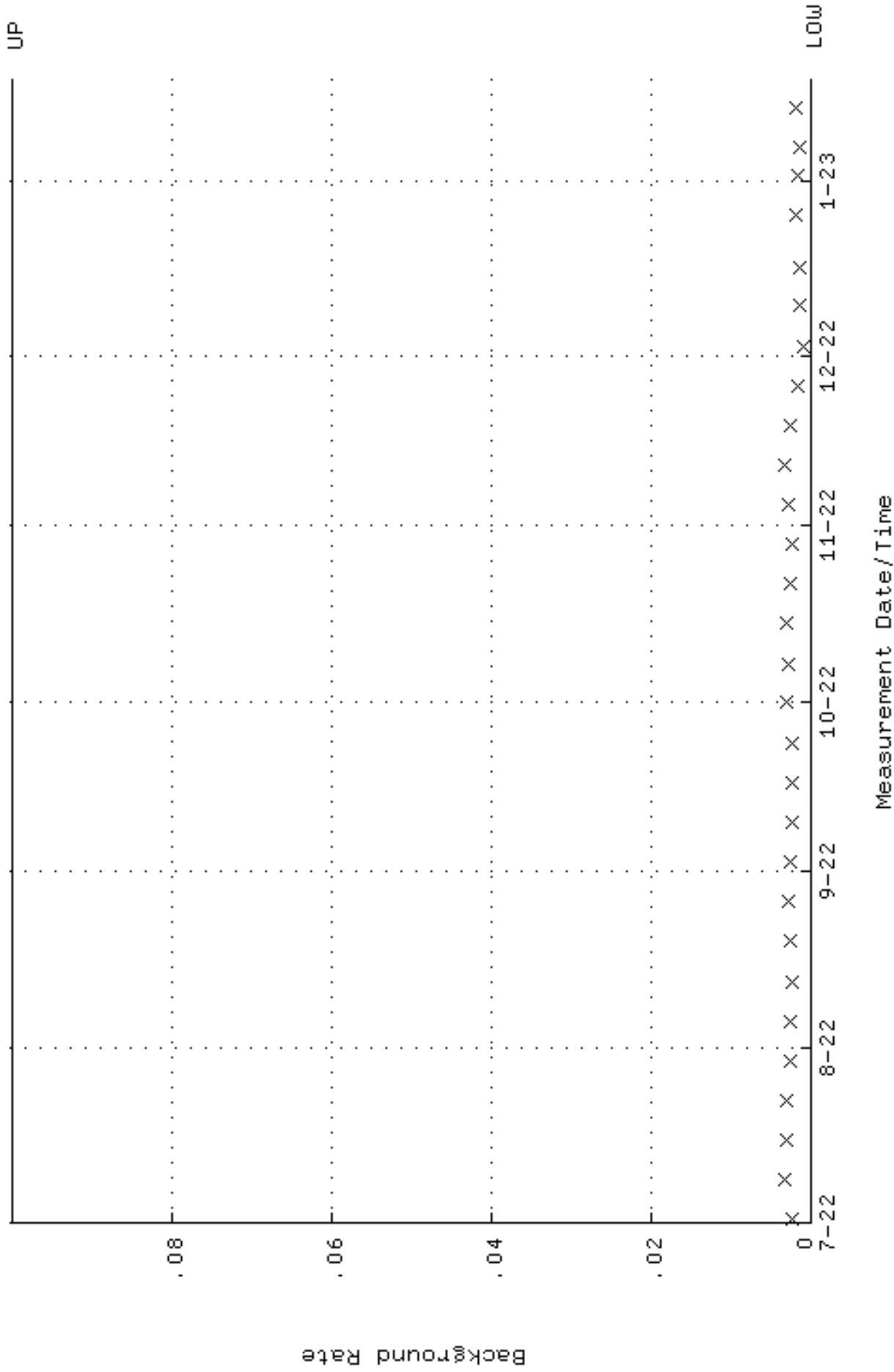
QA filename : DKA100:[ENV_ALPHA.QA.W]W174.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 15-JUL-2022 09:27:05 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



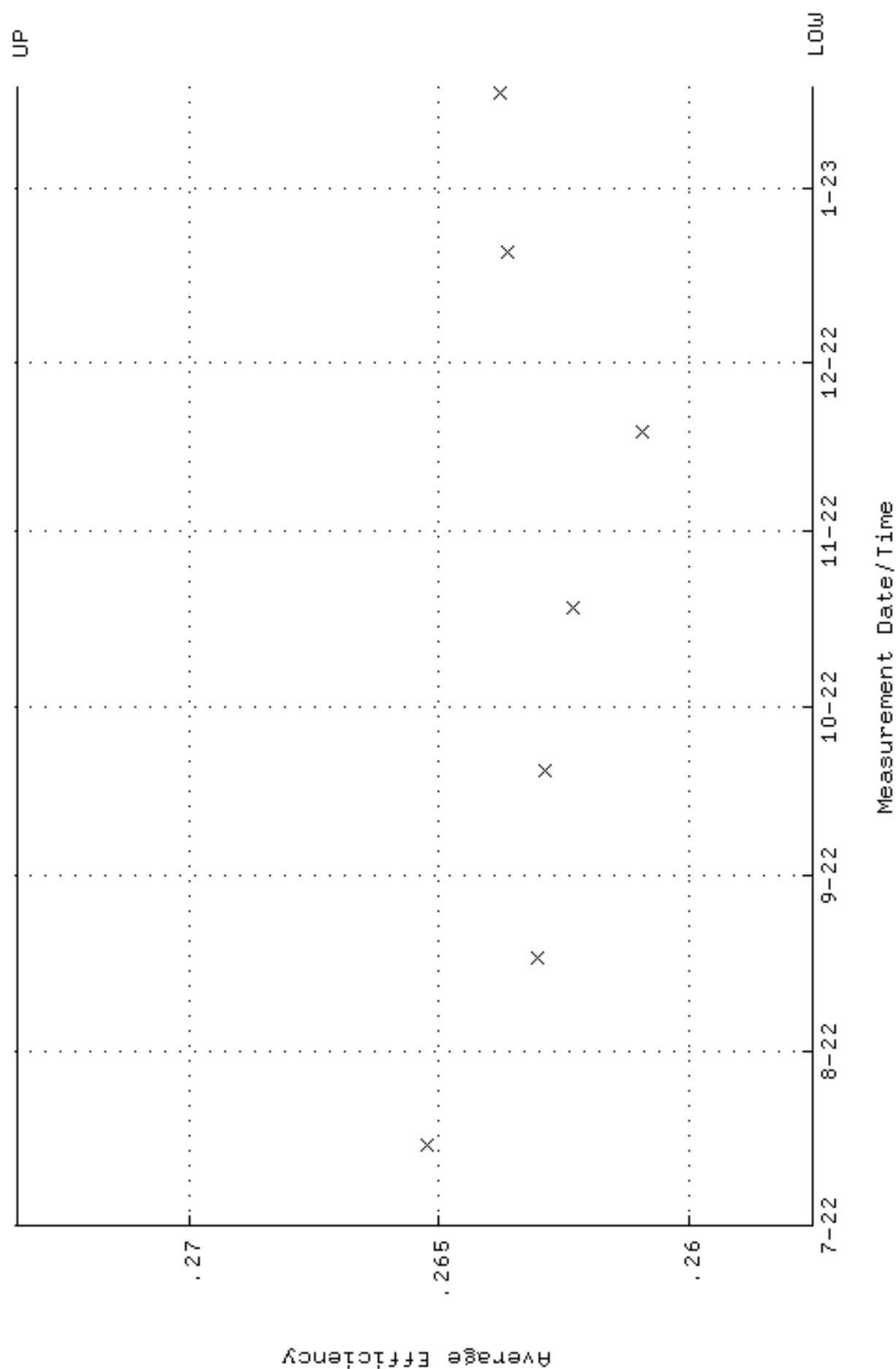
QA filename : DKA100:[ENV_ALPHA.QA.W]W174.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 15-JUL-2022 09:27:05 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



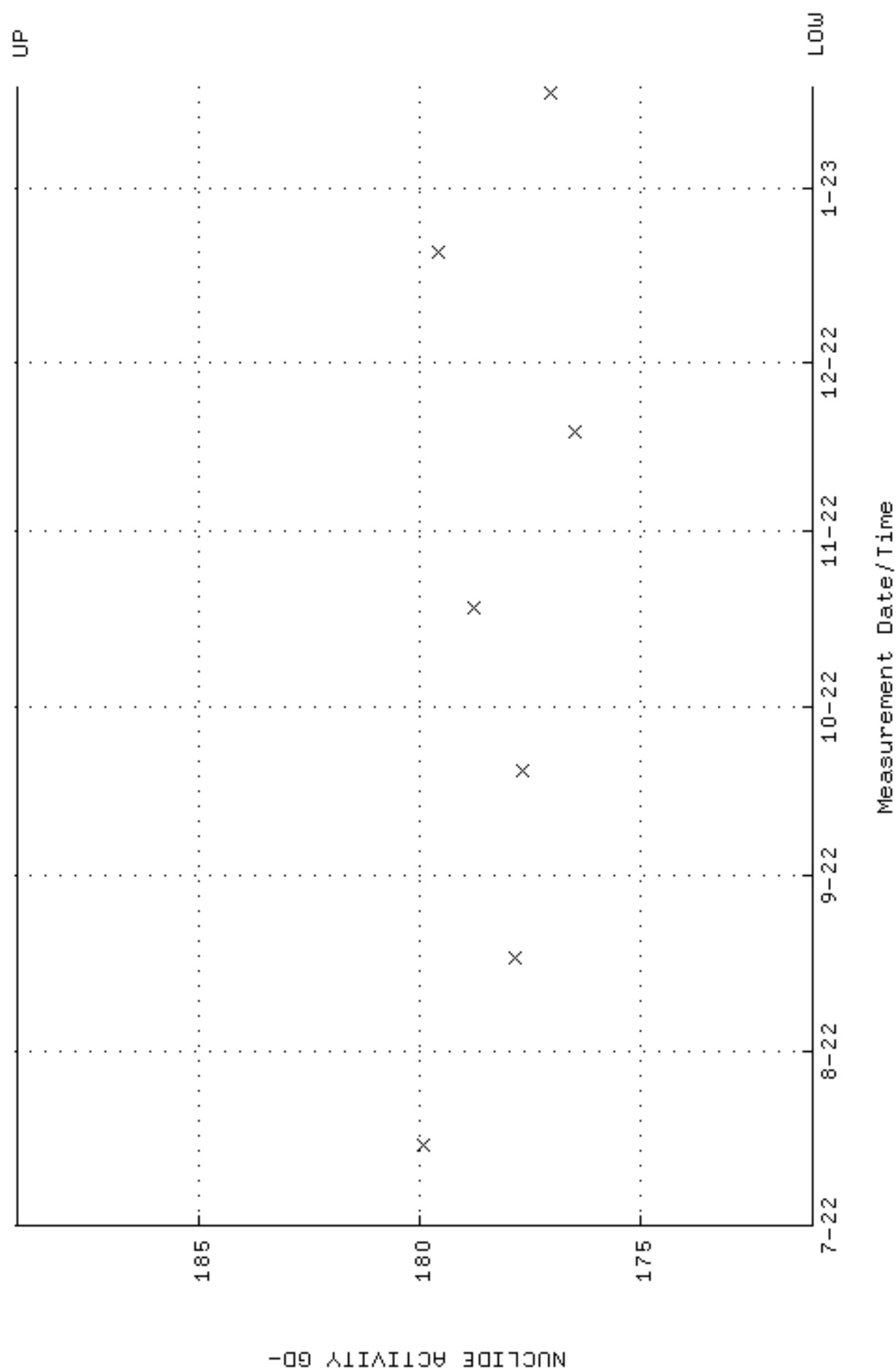
QA filename : DKA100:[ENV_ALPHA.QA.B]B174.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JUL-2022 13:43:46 through 18-JAN-2023 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 0.100000



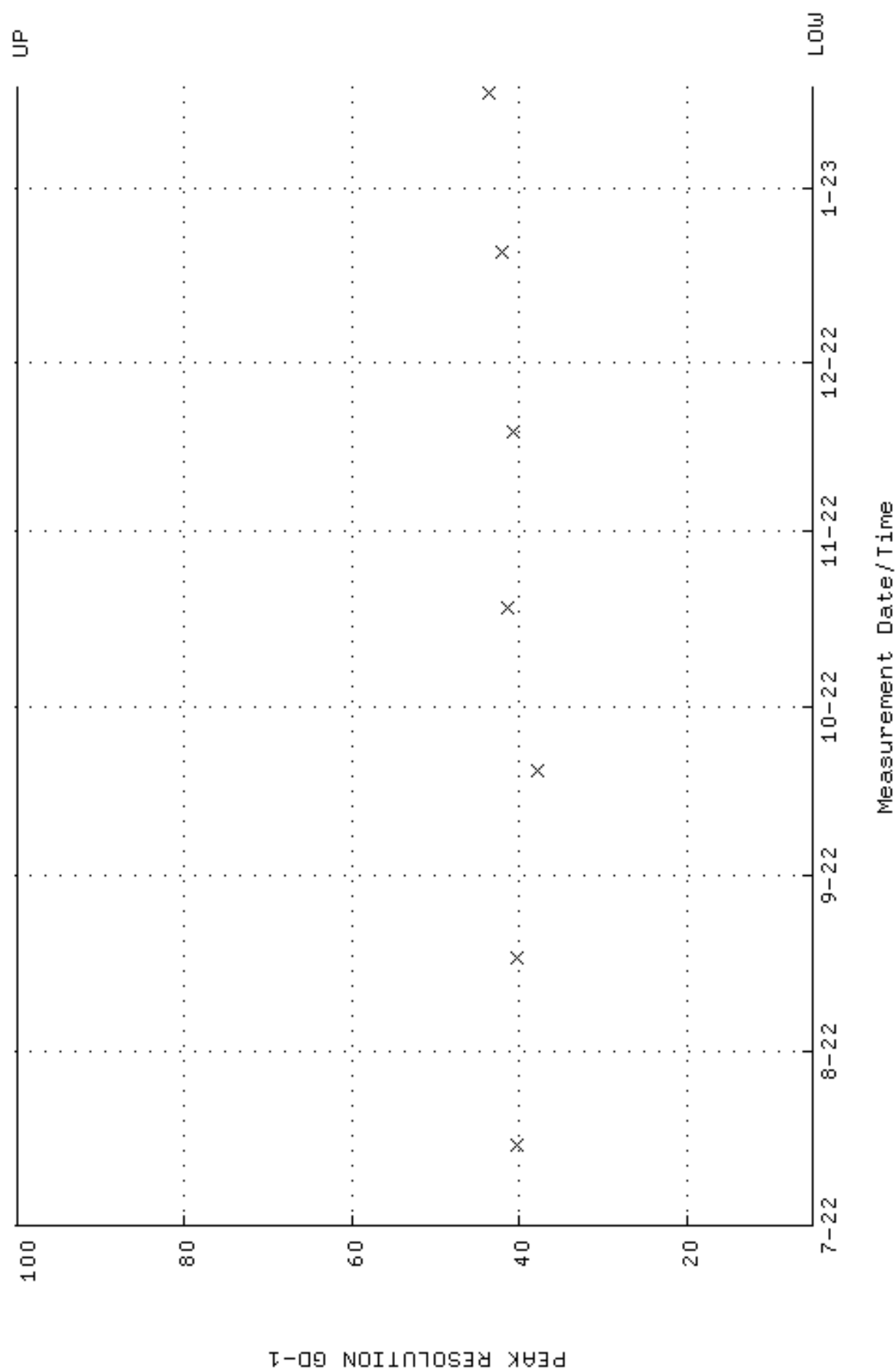
QA filename : DKA100:[ENV_ALPHA.QA.W]W178.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 15-JUL-2022 09:27:20 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.257520 through 0.273450



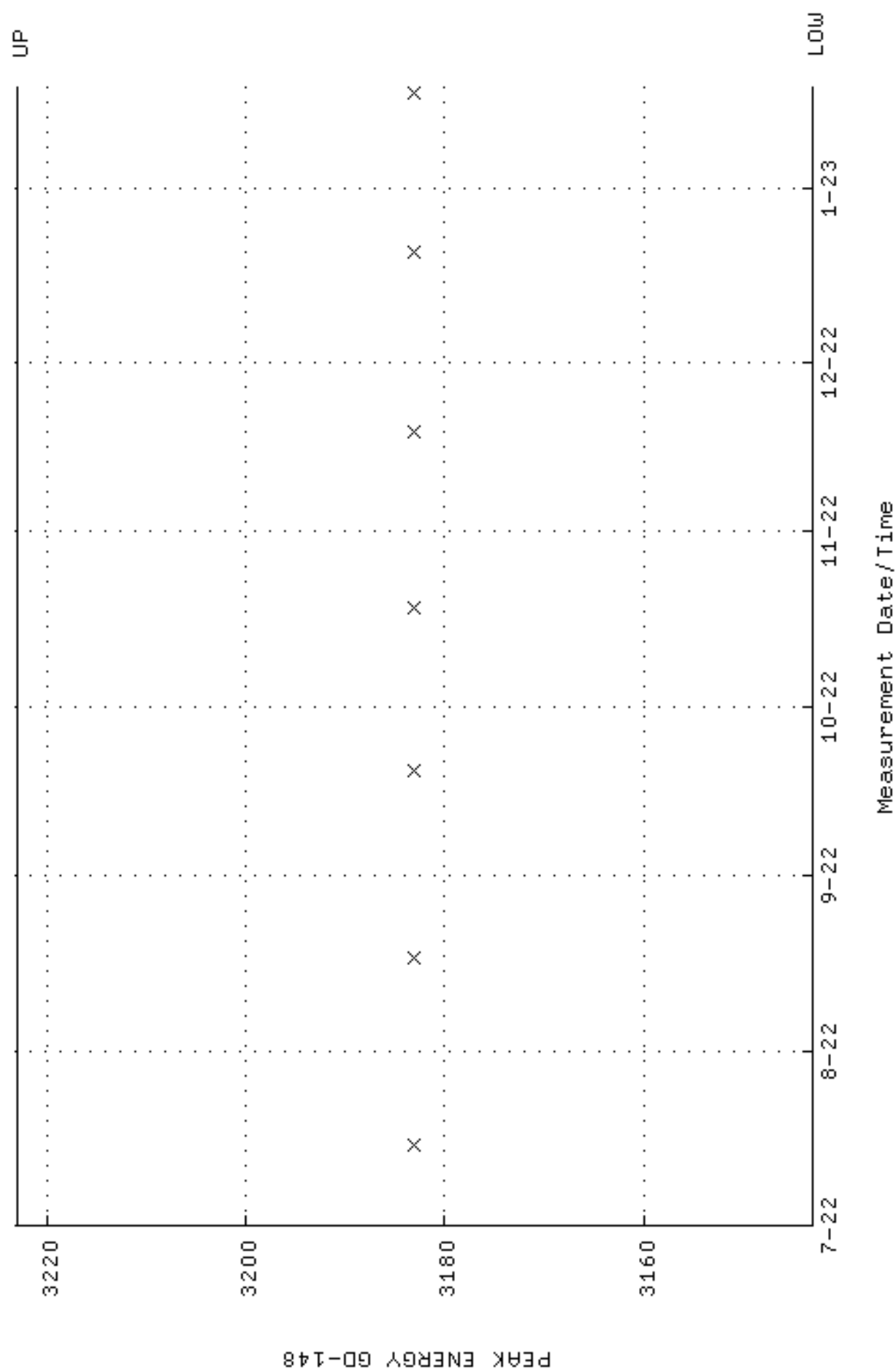
QA filename : DKA100:[ENV_ALPHA.QA.W]W178.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 15-JUL-2022 09:27:20 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



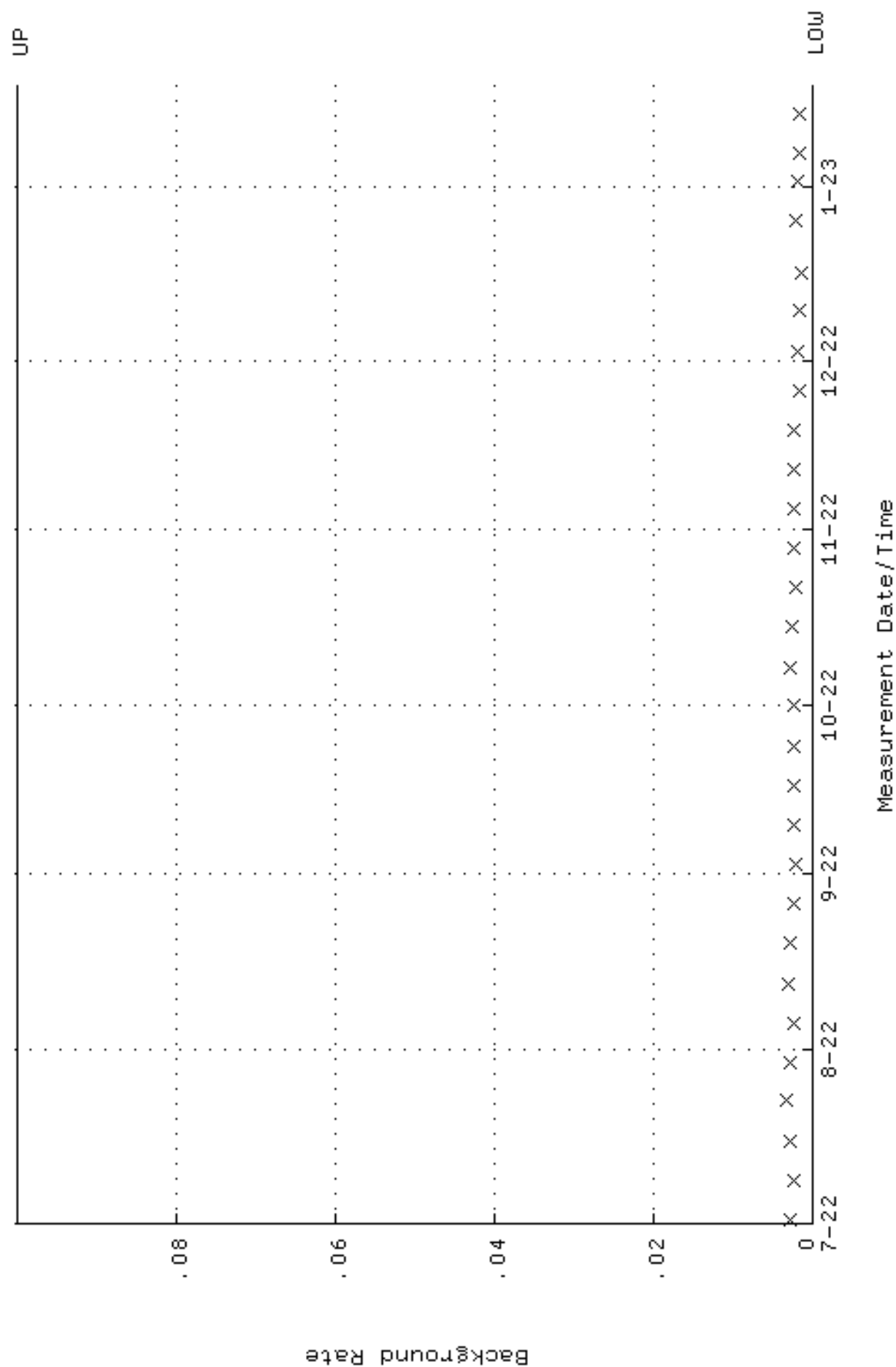
QA filename : DKA100:[ENV_ALPHA.QA.W]W178.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 15-JUL-2022 09:27:20 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



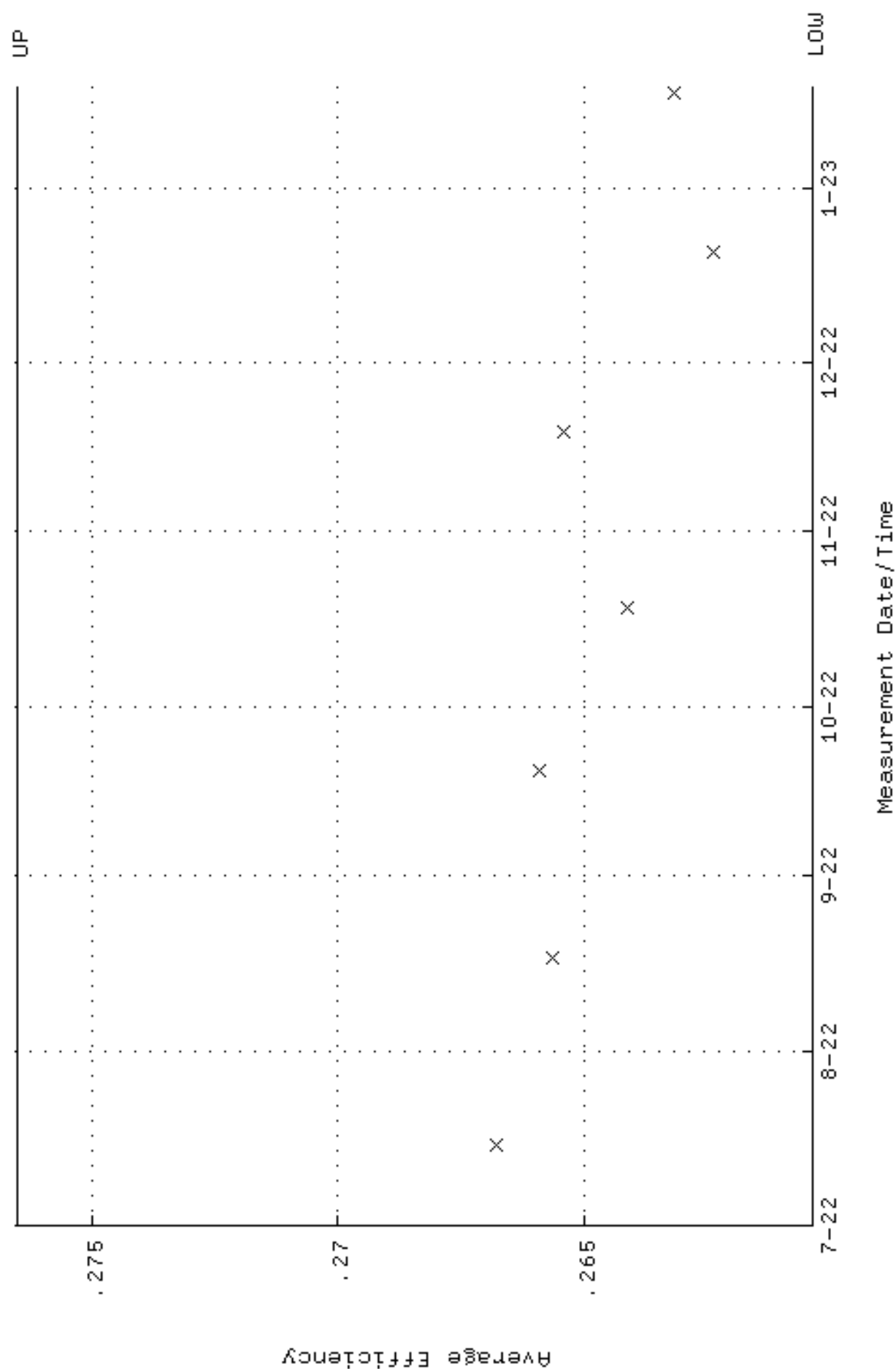
QA filename : DKA100:[ENV_ALPHA.QA.W]W178.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 15-JUL-2022 09:27:20 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



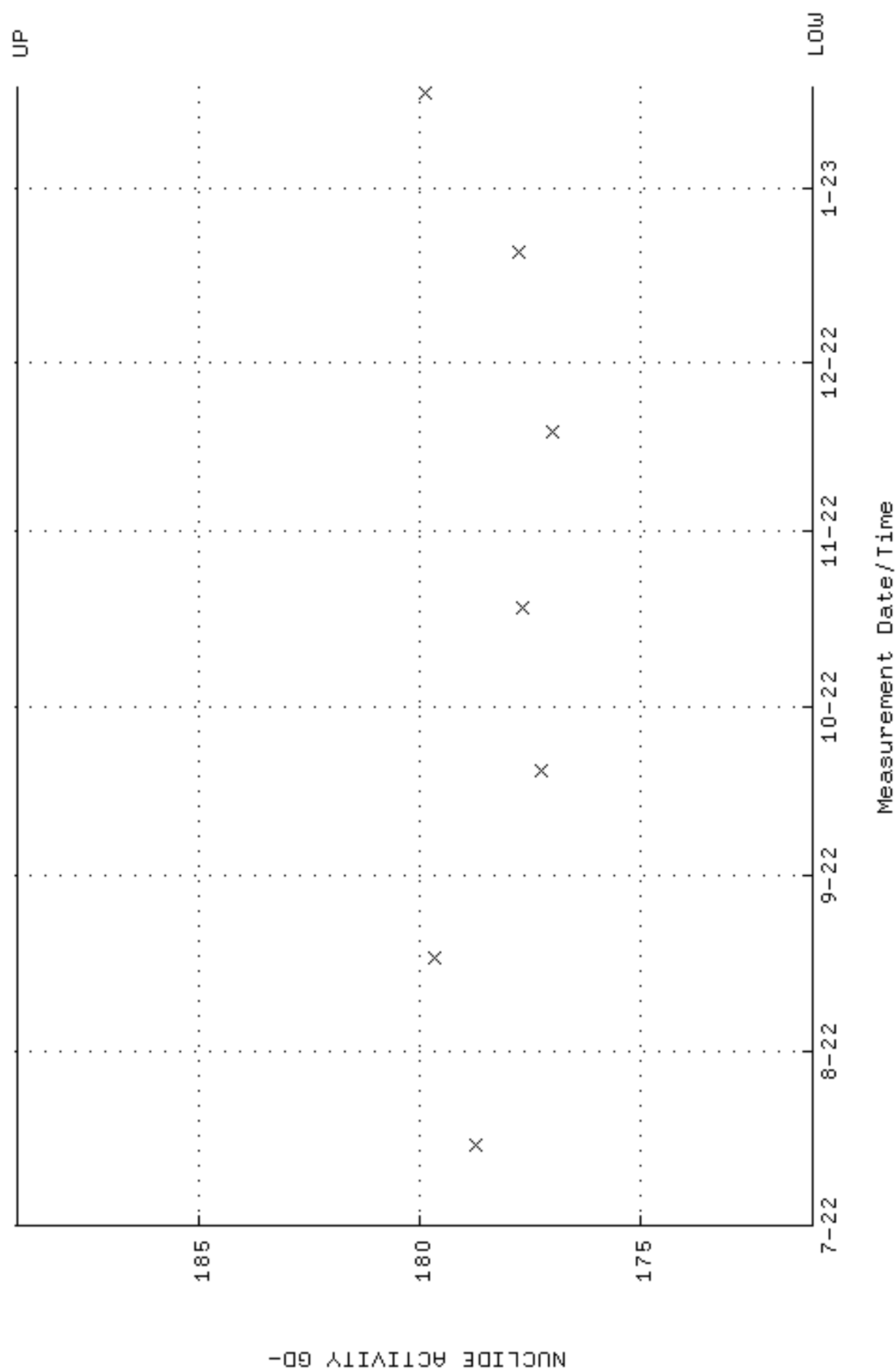
QA filename : DKA100:[ENV_ALPHA.QA.B]B178.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:44:01 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



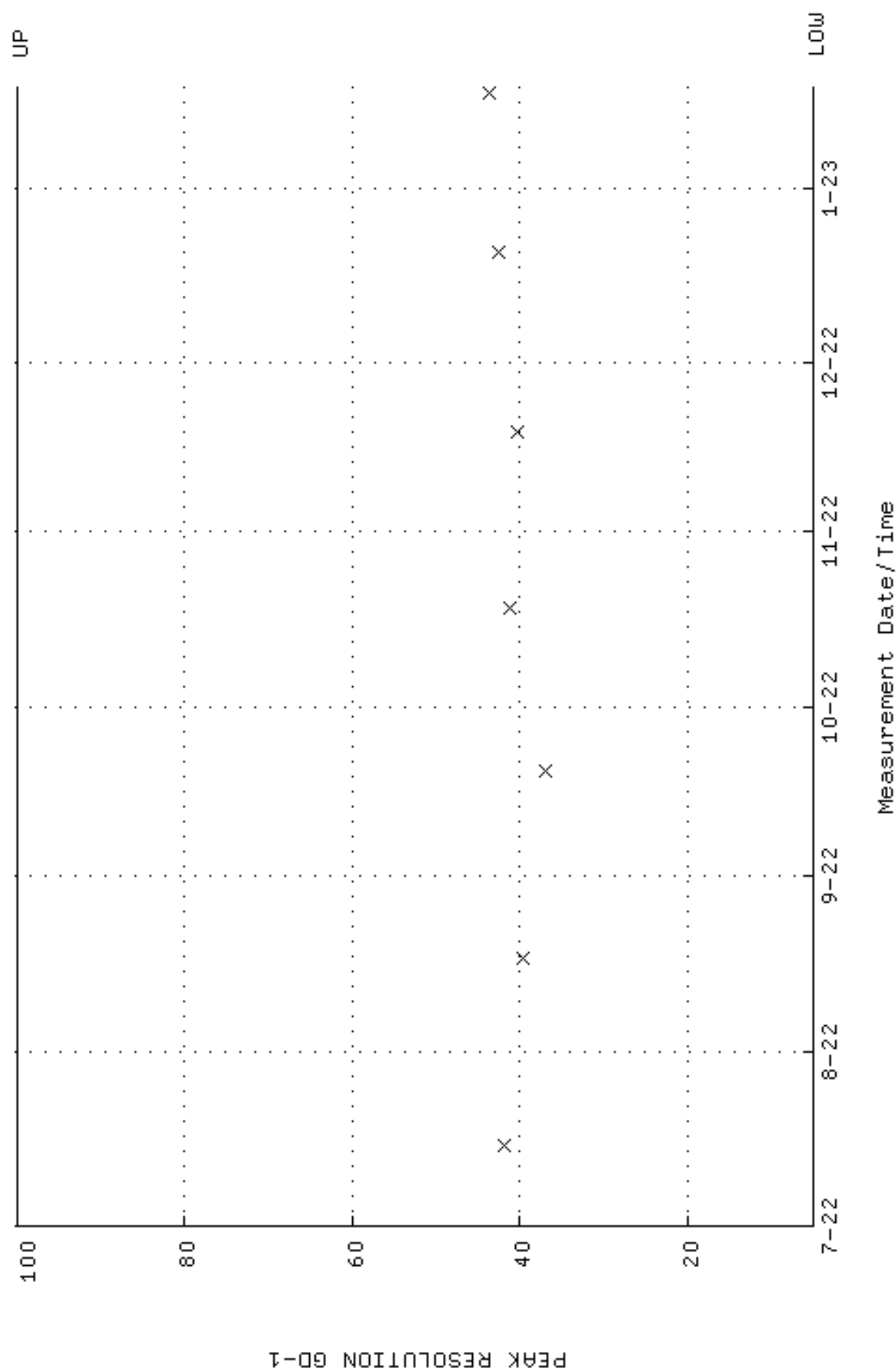
QA filename : DKA100:[ENV_ALPHA.QA.W]W182.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 15-JUL-2022 09:27:39 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.260390 through 0.276500



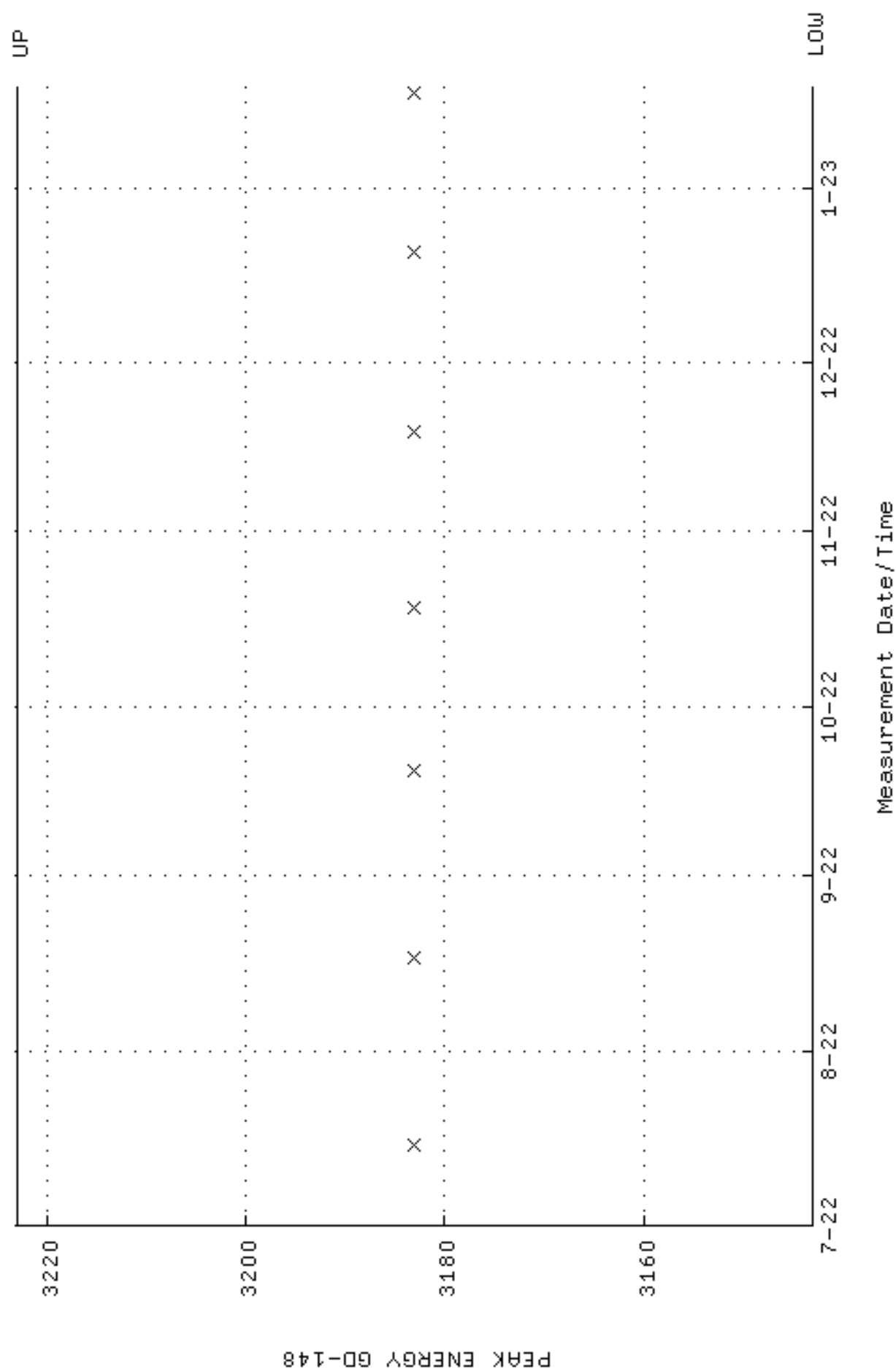
QA filename : DKA100:[ENV_ALPHA.QA.W]W182.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 15-JUL-2022 09:27:39 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



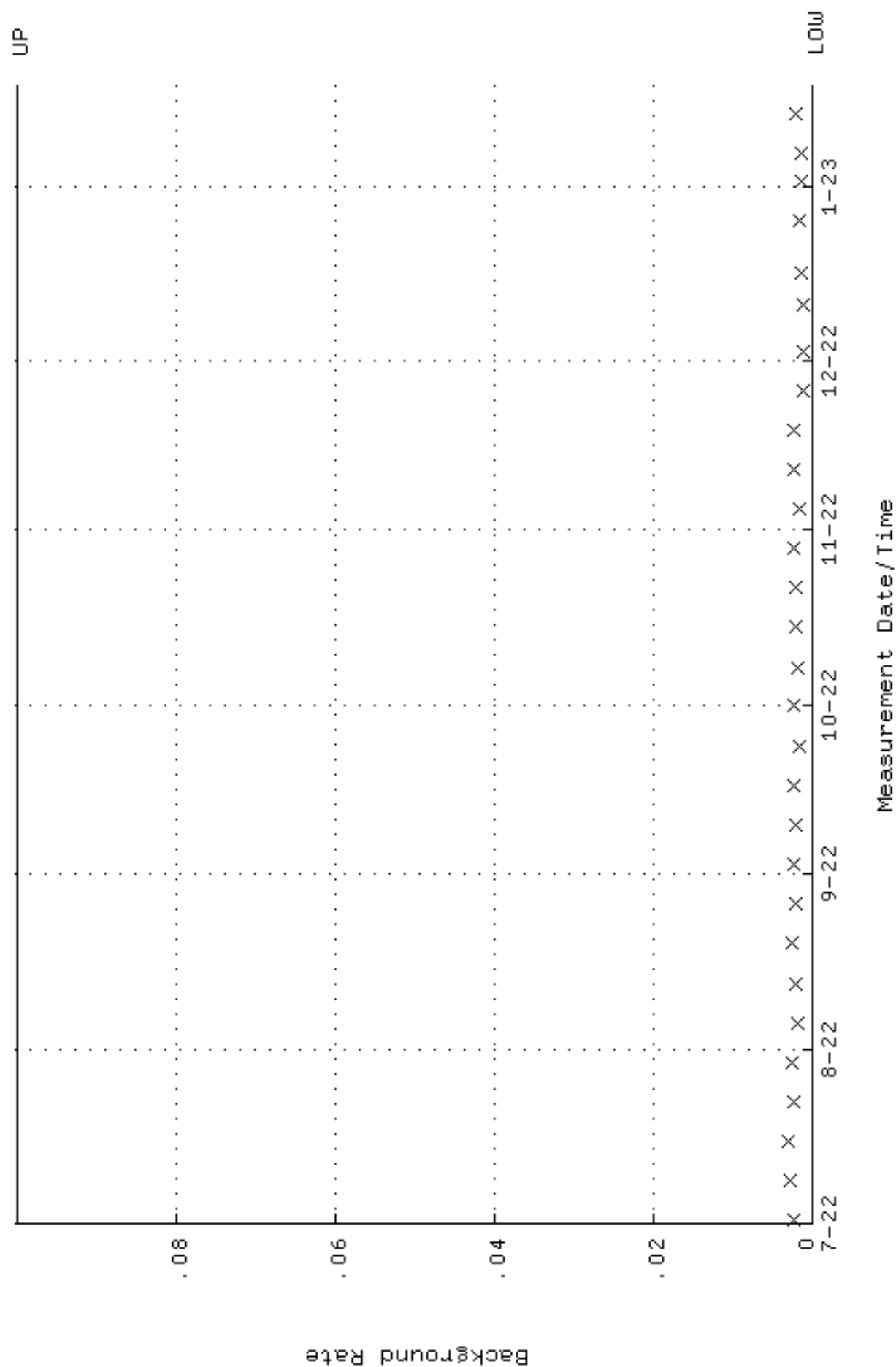
QA filename : DKA100:[ENV_ALPHA.QA.W]W182.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 15-JUL-2022 09:27:39 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



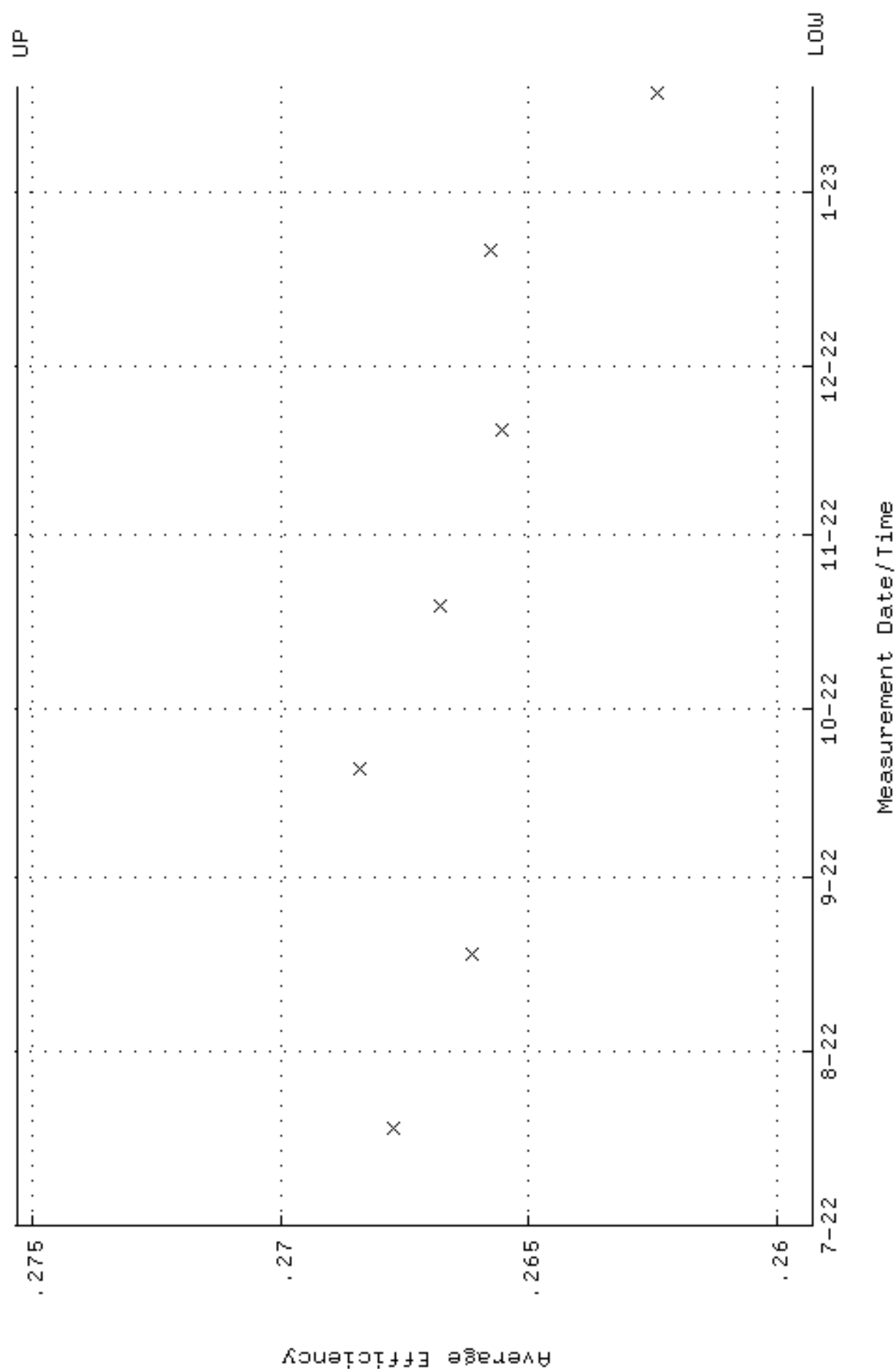
QA filename : DKA100:[ENV_ALPHA.QA.W]W182.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 15-JUL-2022 09:27:39 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



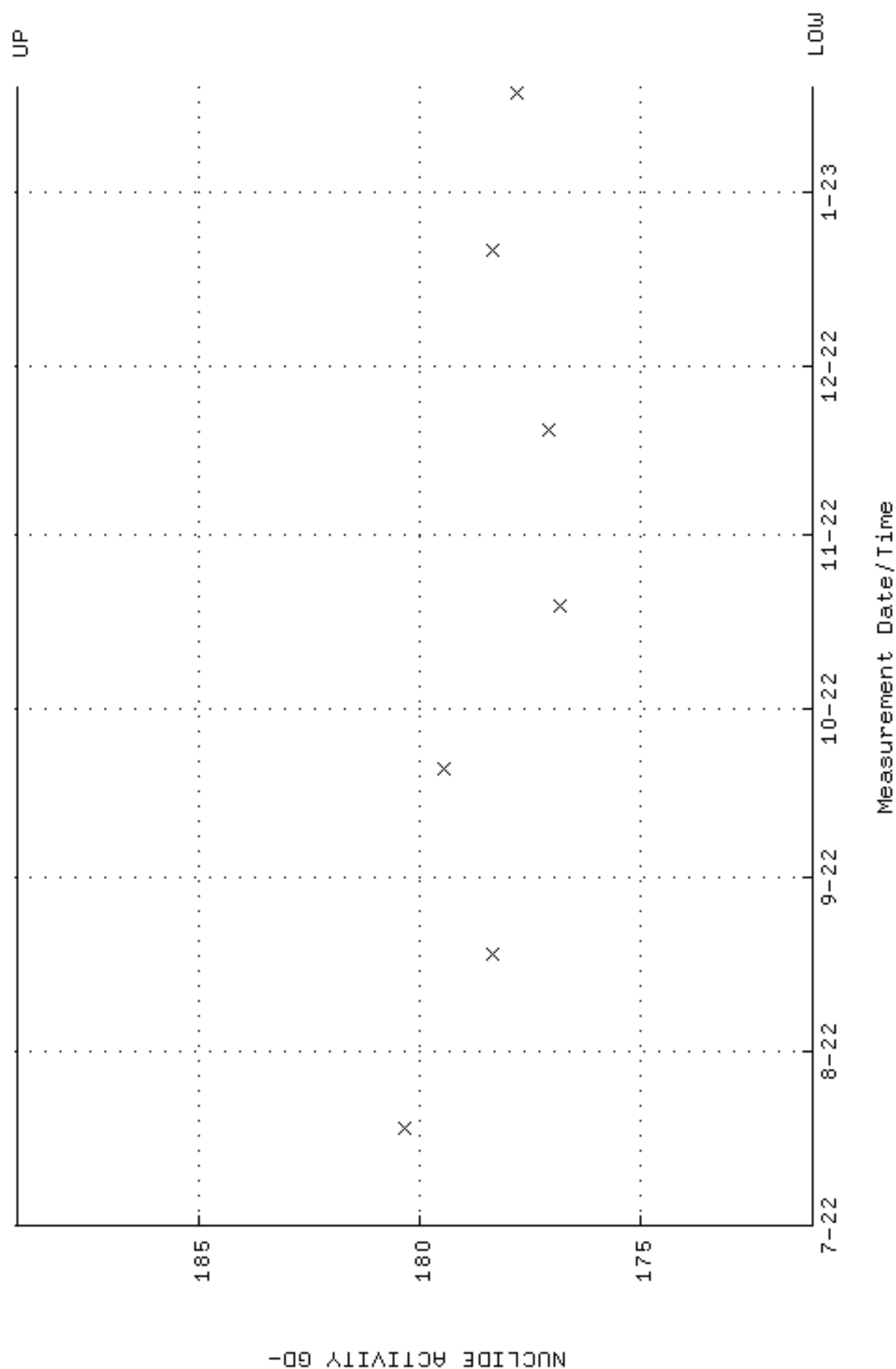
QA filename : DKA100:[ENV_ALPHA.QA.B]B182.QAF;3
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:44:17 through 18-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



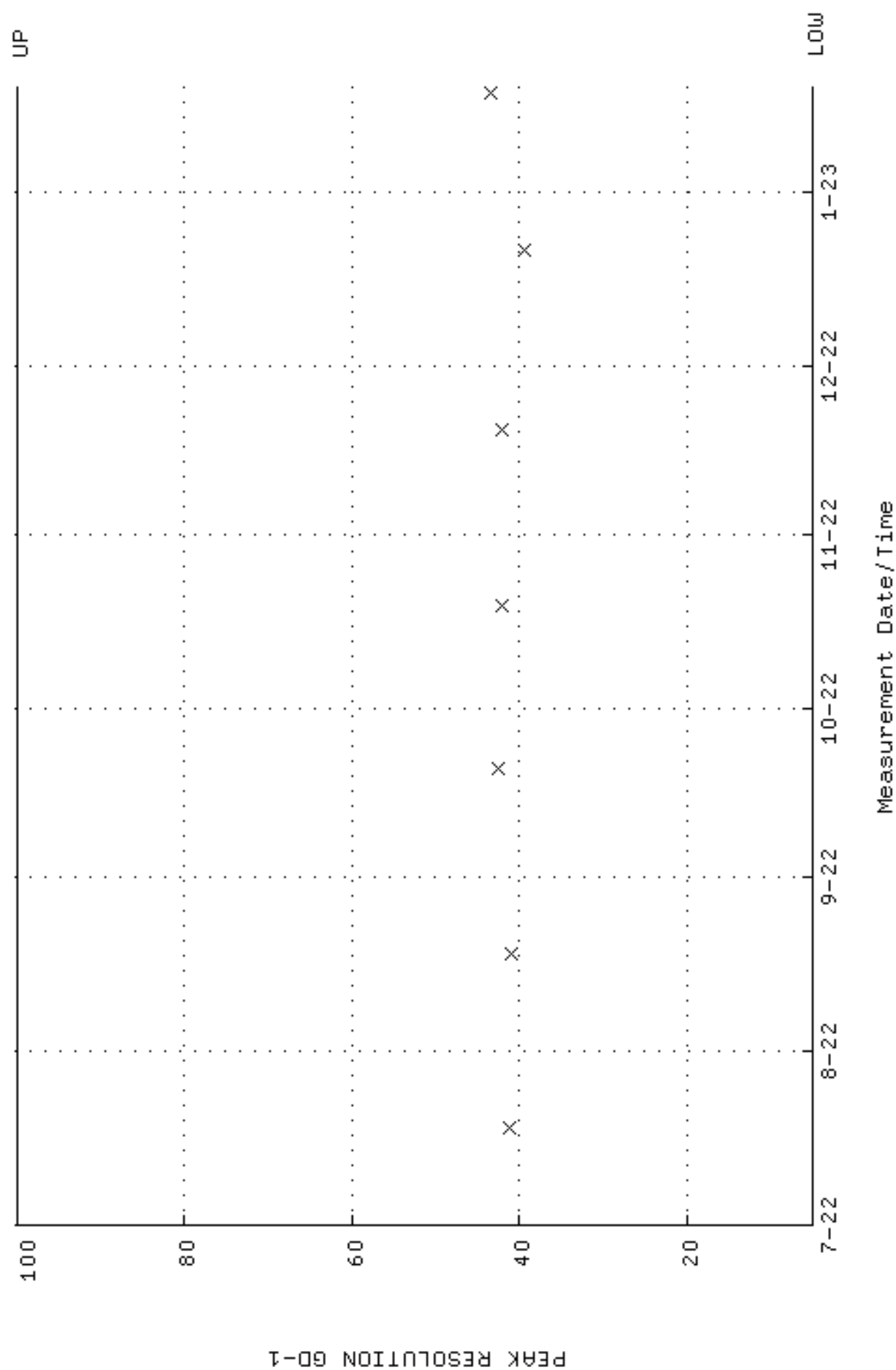
QA filename : DKA100:[ENV_ALPHA.QA.W]W185.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUL-2022 09:35:56 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.259270 through 0.275310



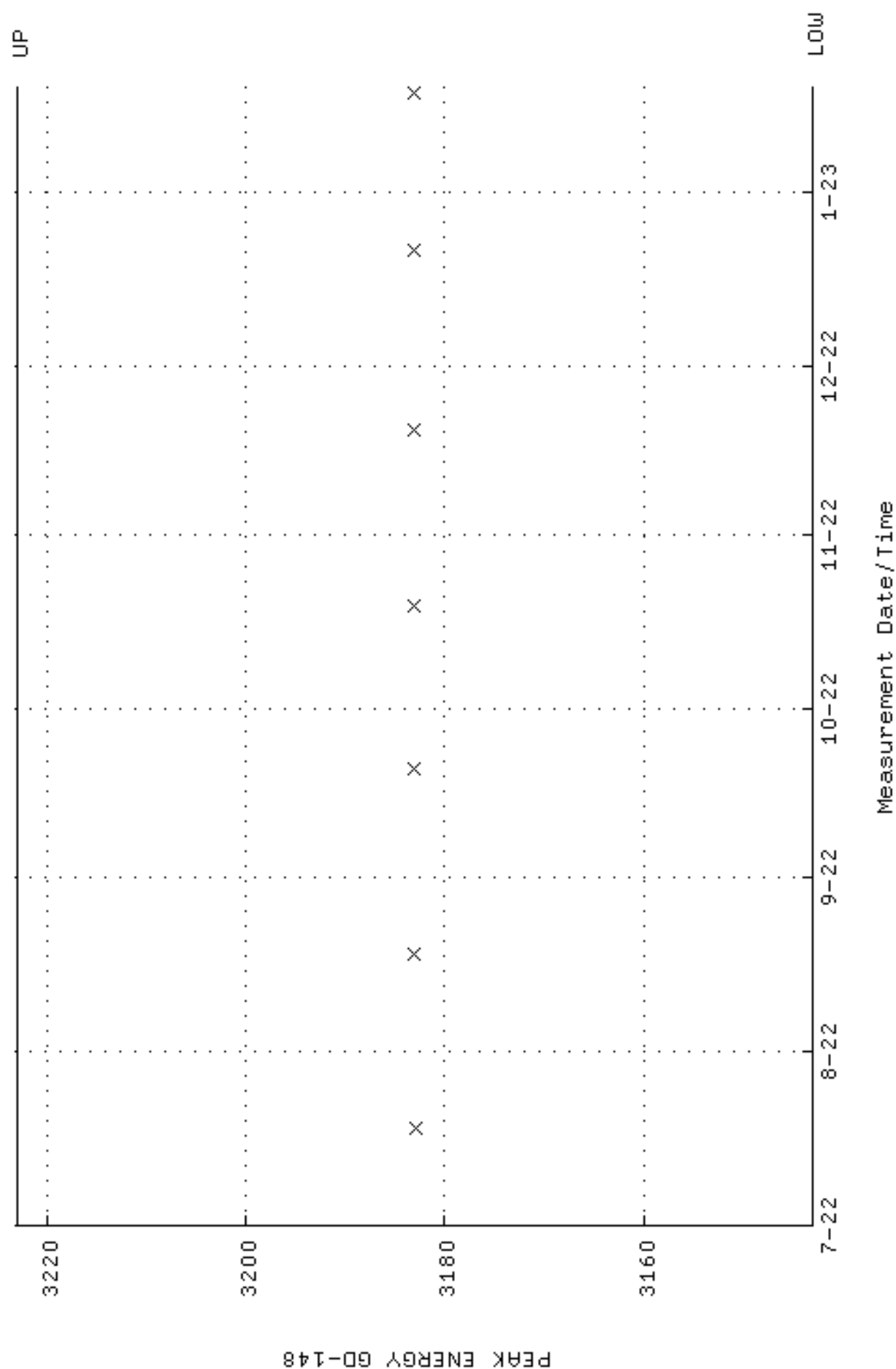
QA filename : DKA100:[ENV_ALPHA.QA.W]W185.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUL-2022 09:35:56 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



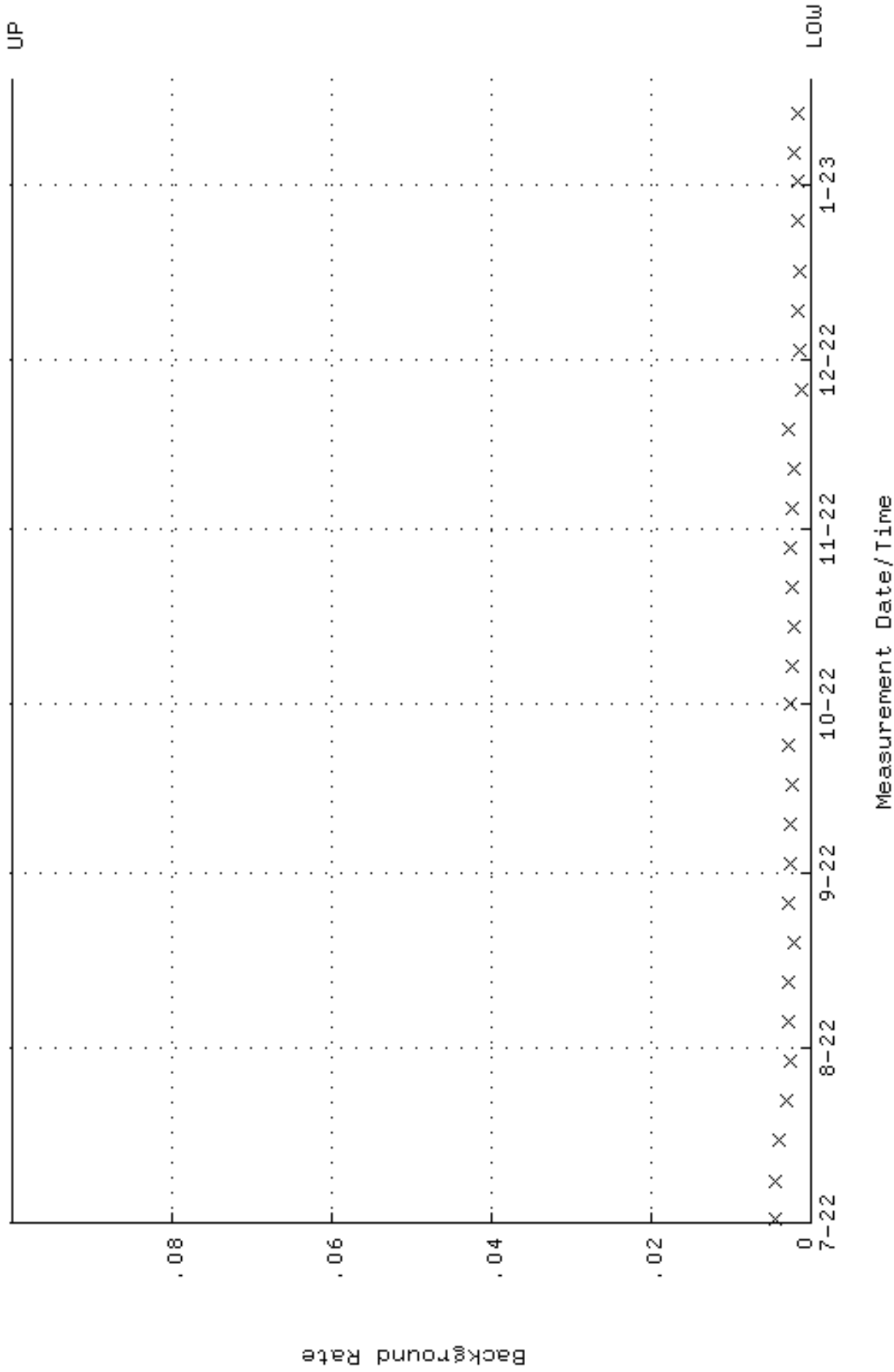
QA filename : DKA100:[ENV_ALPHA.QA.W]W185.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUL-2022 09:35:56 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



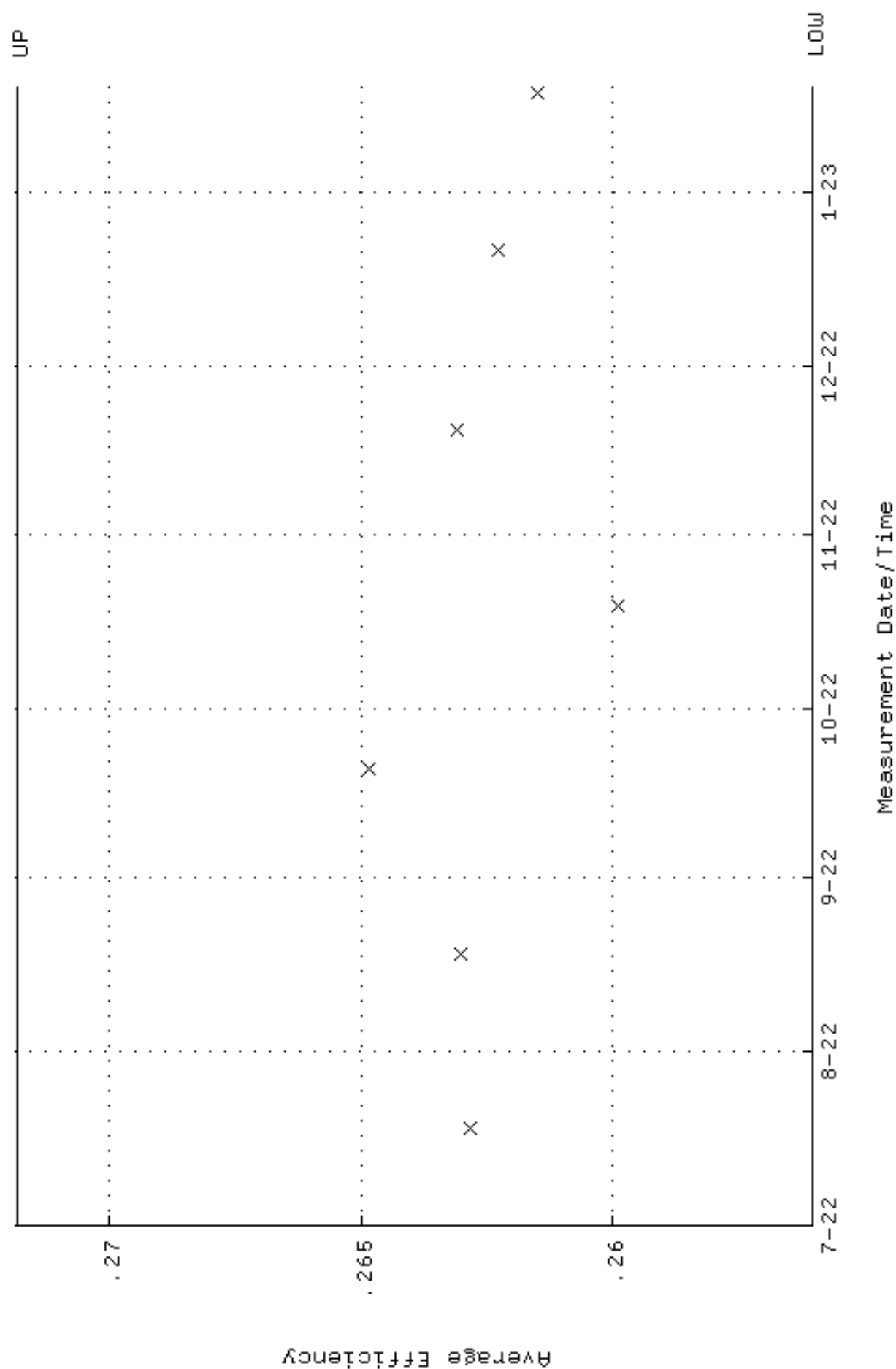
QA filename : DKA100:[ENV_ALPHA.QA.W]W185.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUL-2022 09:35:56 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



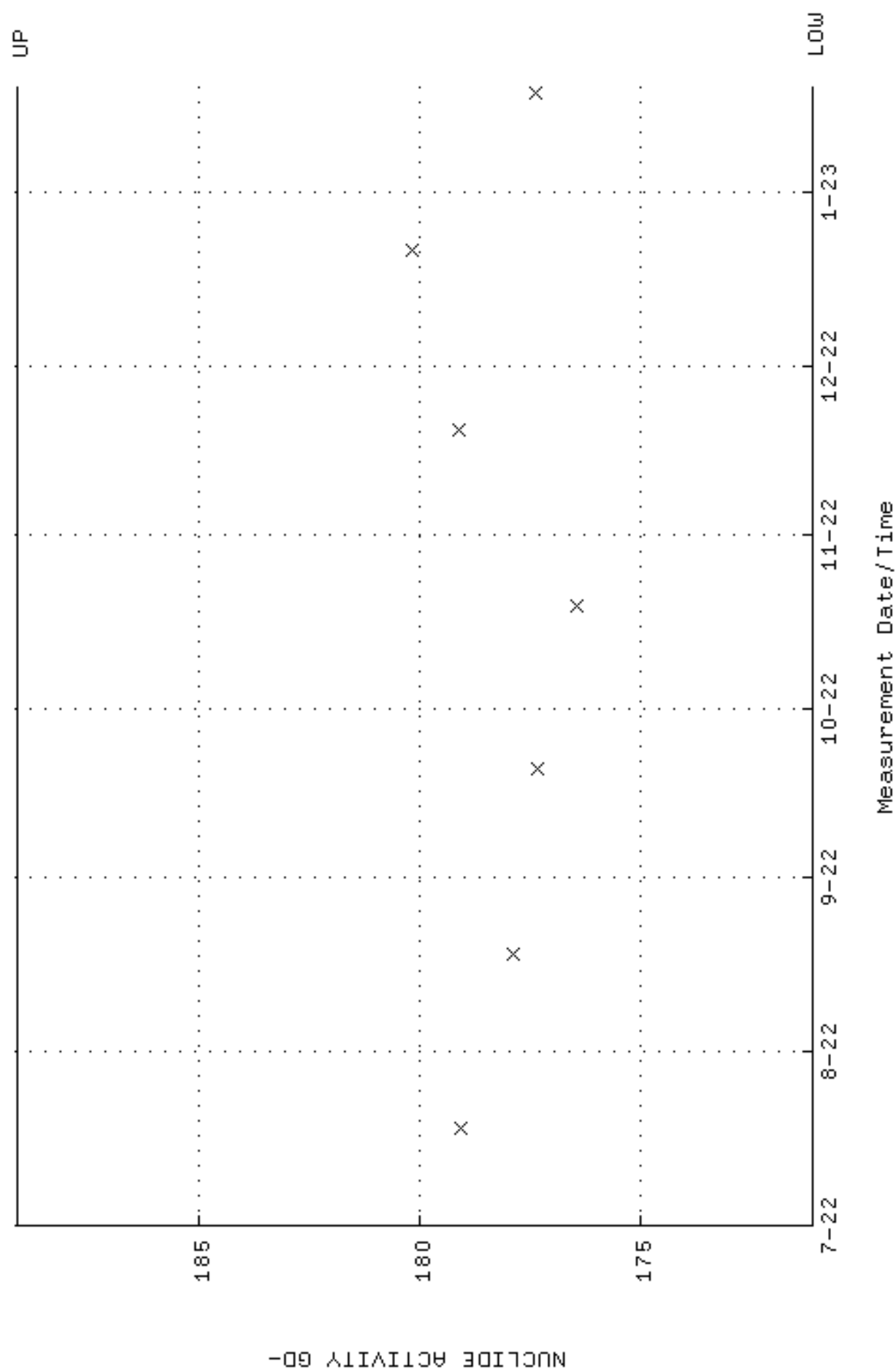
QA filename : DKA100:[ENV_ALPHA.QA.B]B185.QAF;4
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 1-JUL-2022 13:44:59 through 19-JAN-2023 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 0.100000



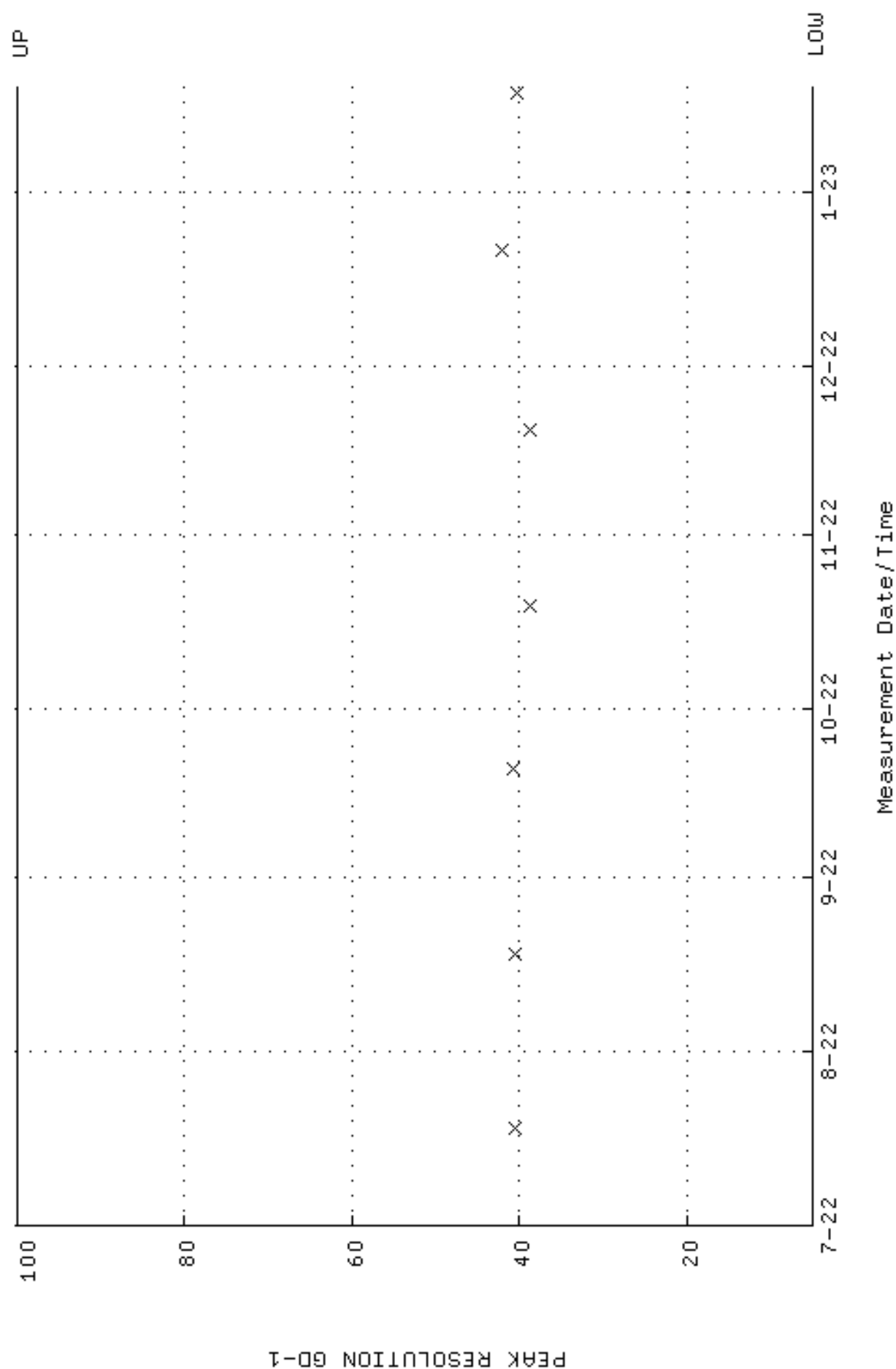
QA filename : DKA100:[ENV_ALPHA.QA.W]W186.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUL-2022 09:36:00 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.256010 through 0.271840



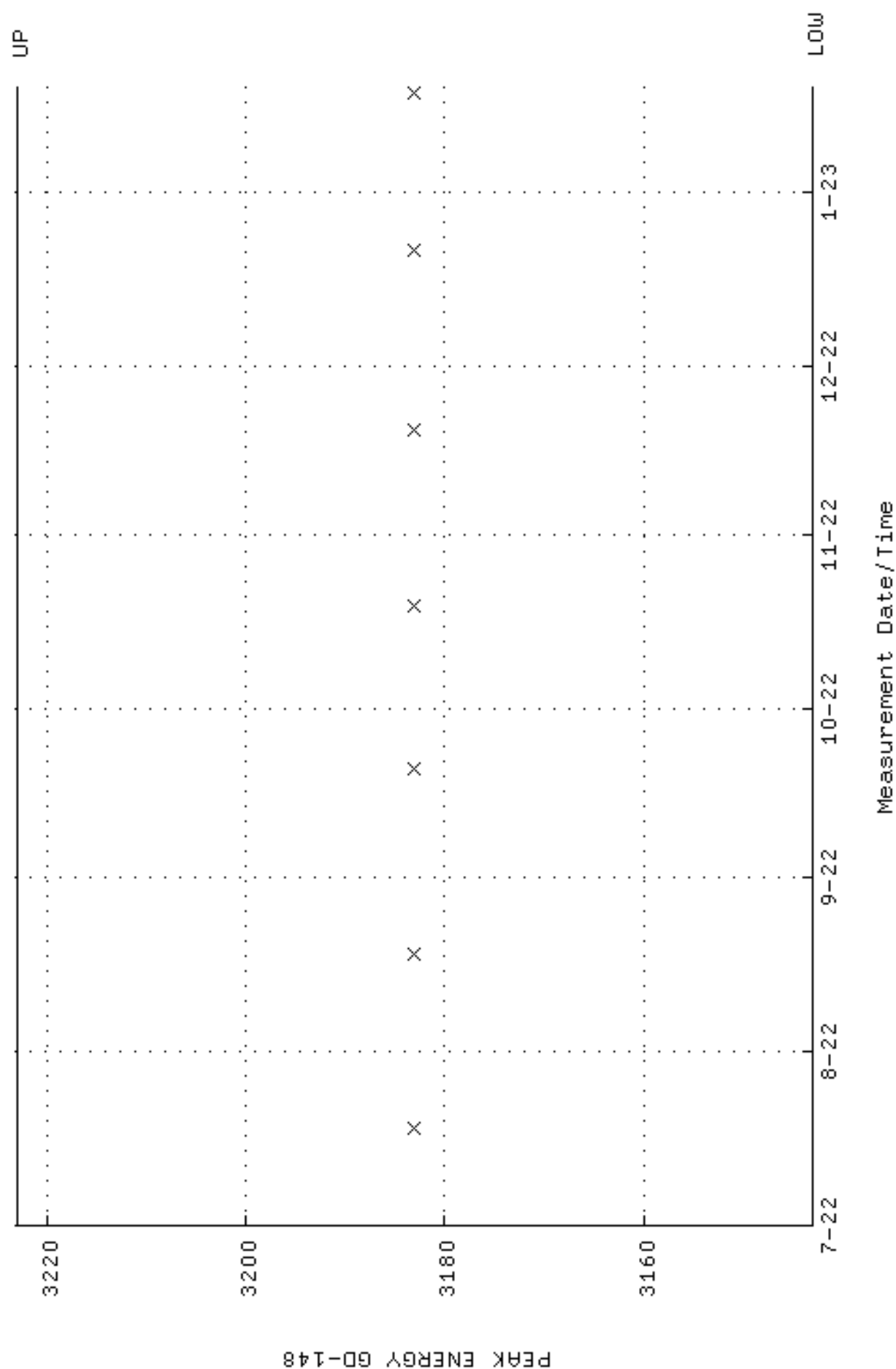
QA filename : DKA100:[ENV_ALPHA.QA.W]W186.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:00 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



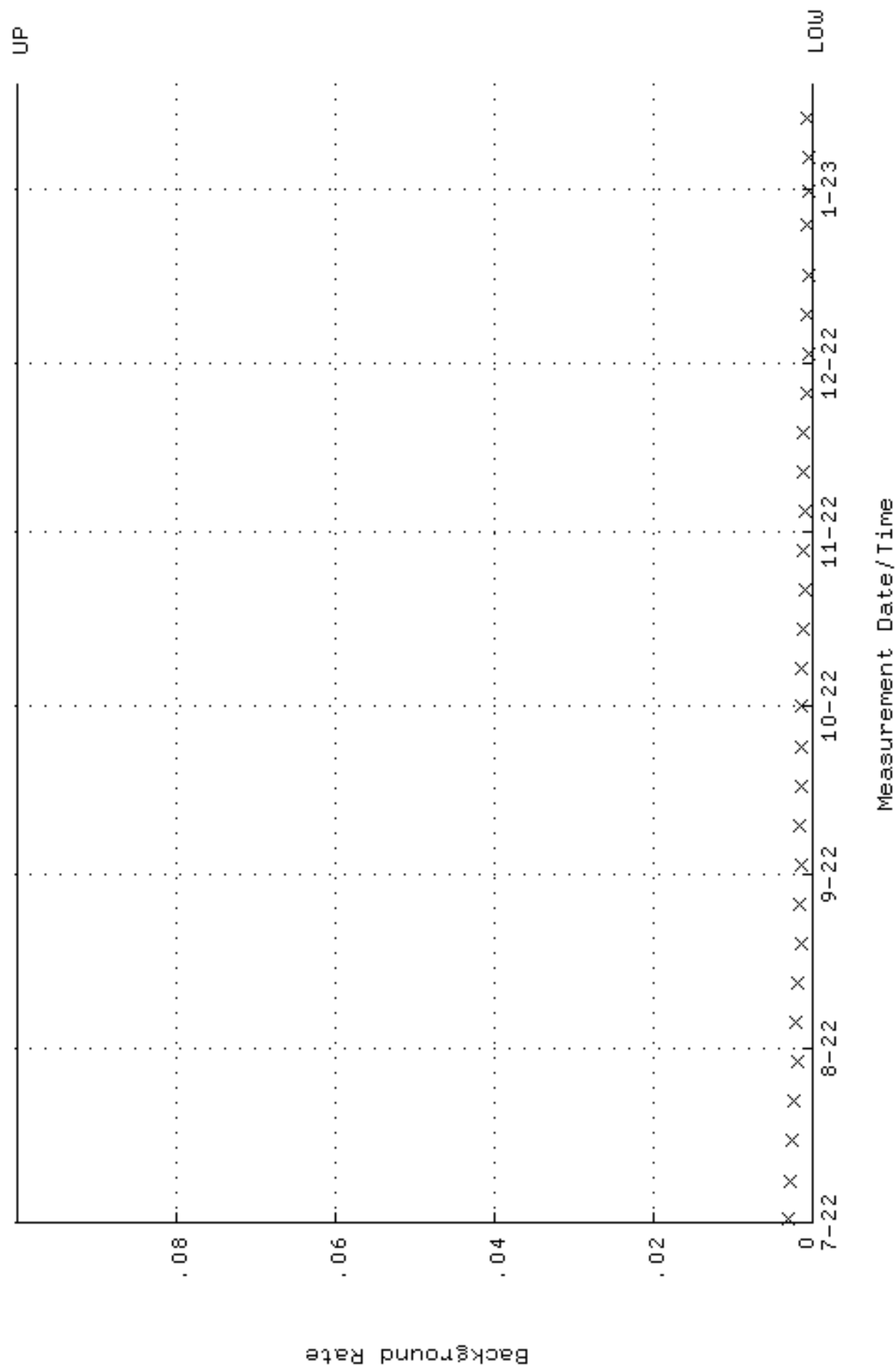
QA filename : DKA100:[ENV_ALPHA.QA.W]W186.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUL-2022 09:36:00 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



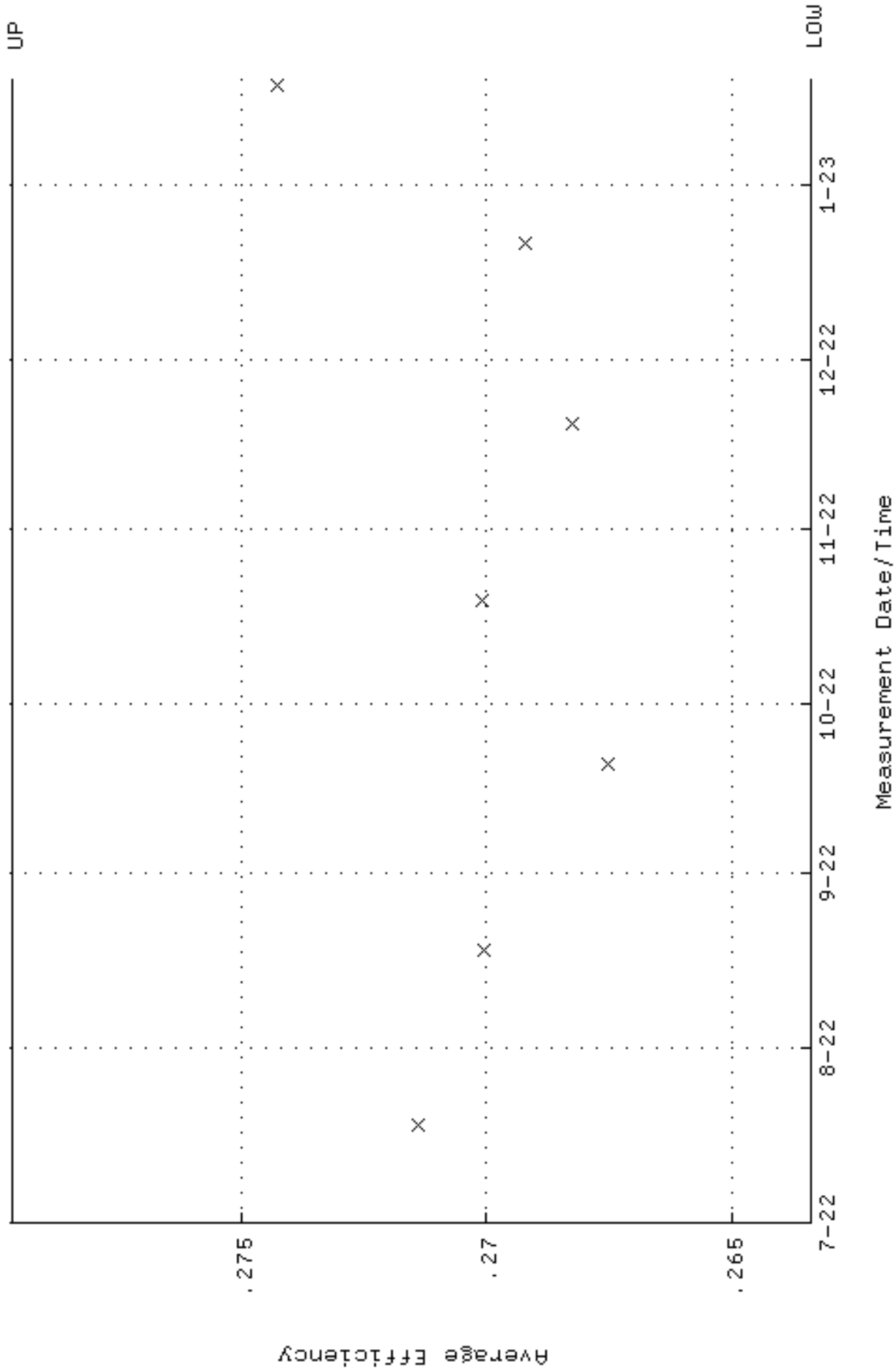
QA filename : DKA100:[ENV_ALPHA.QA.W]W186.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:00 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



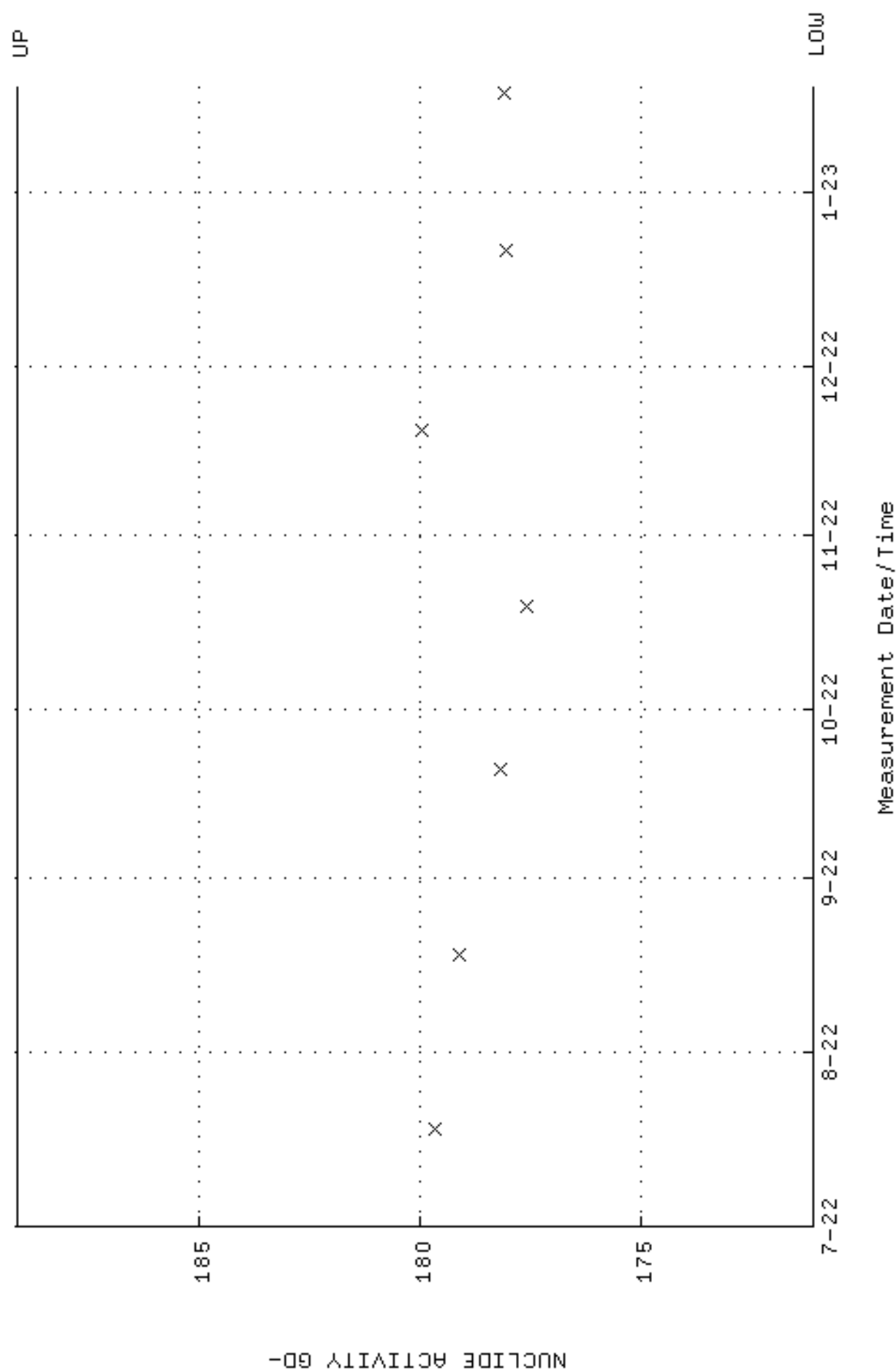
QA filename : DKA100:[ENV_ALPHA.QA.B]B186.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:45:04 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



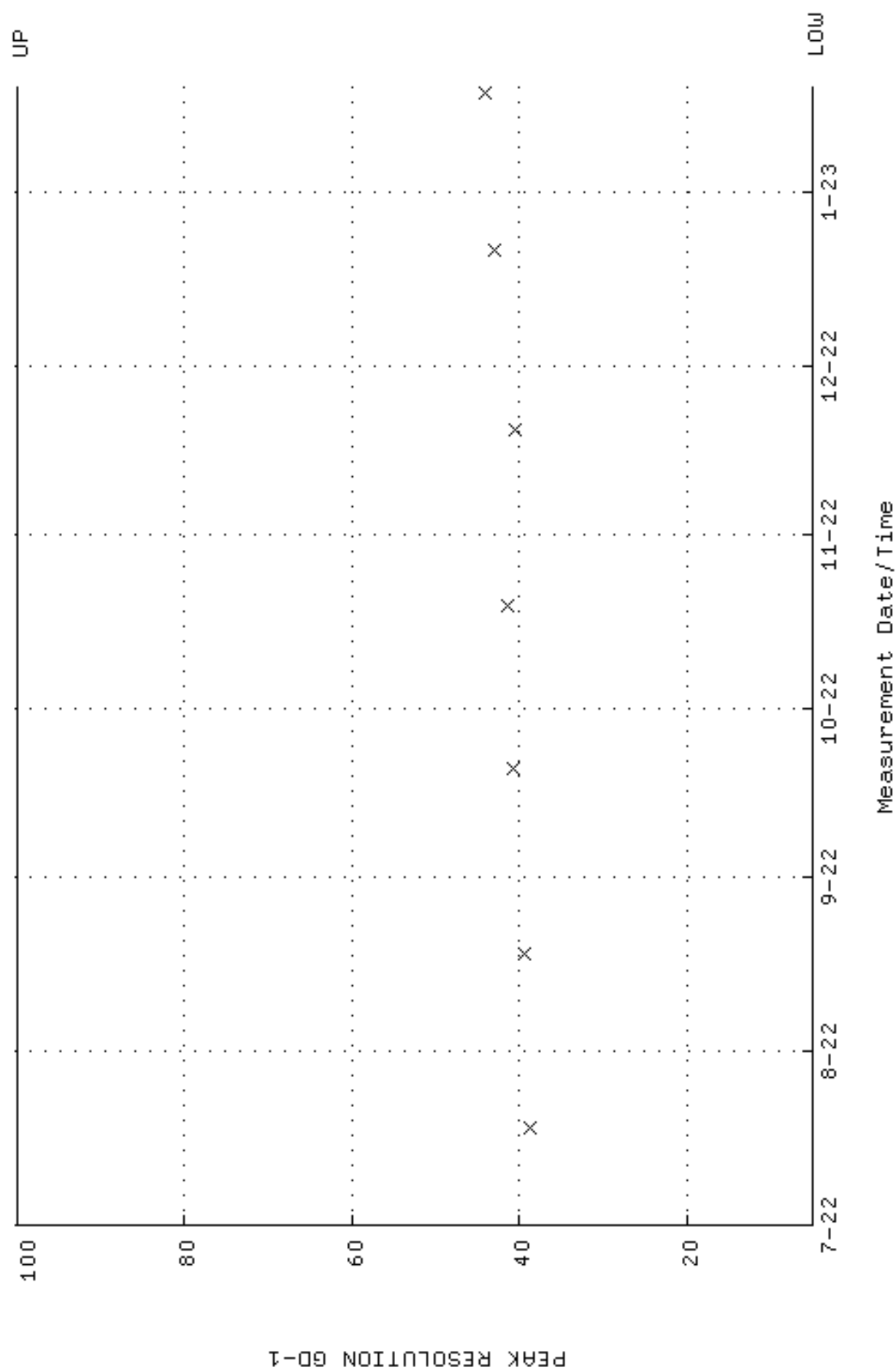
QA filename : DKA100:[ENV_ALPHA.QA.W]W191.QAF;4
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 18-JUL-2022 09:36:11 through 19-JAN-2023 12:00:00
Lower/Upper Lmts: 0.263380 through 0.279670



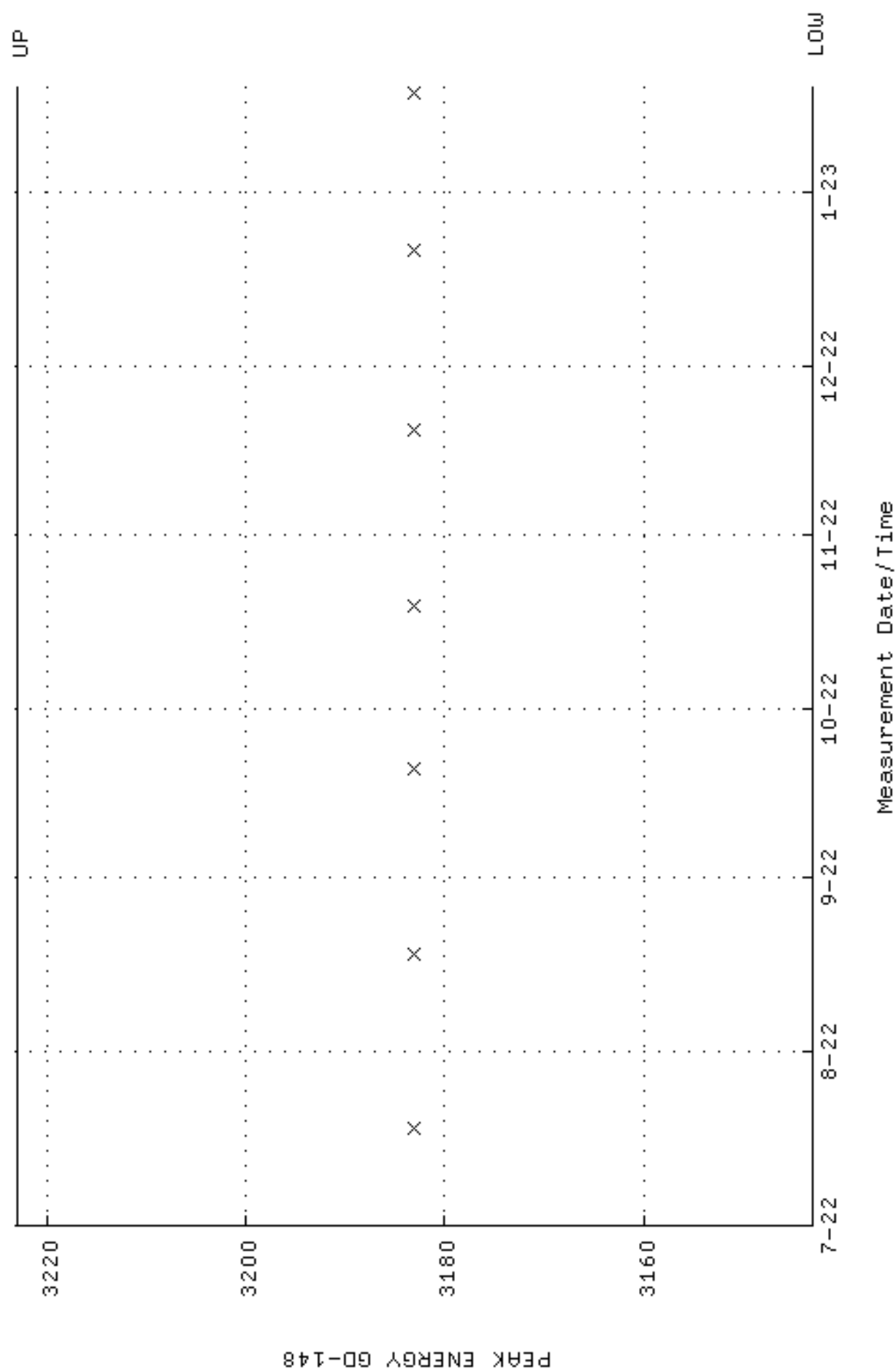
QA filename : DKA100:[ENV_ALPHA.QA.W]W191.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:11 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



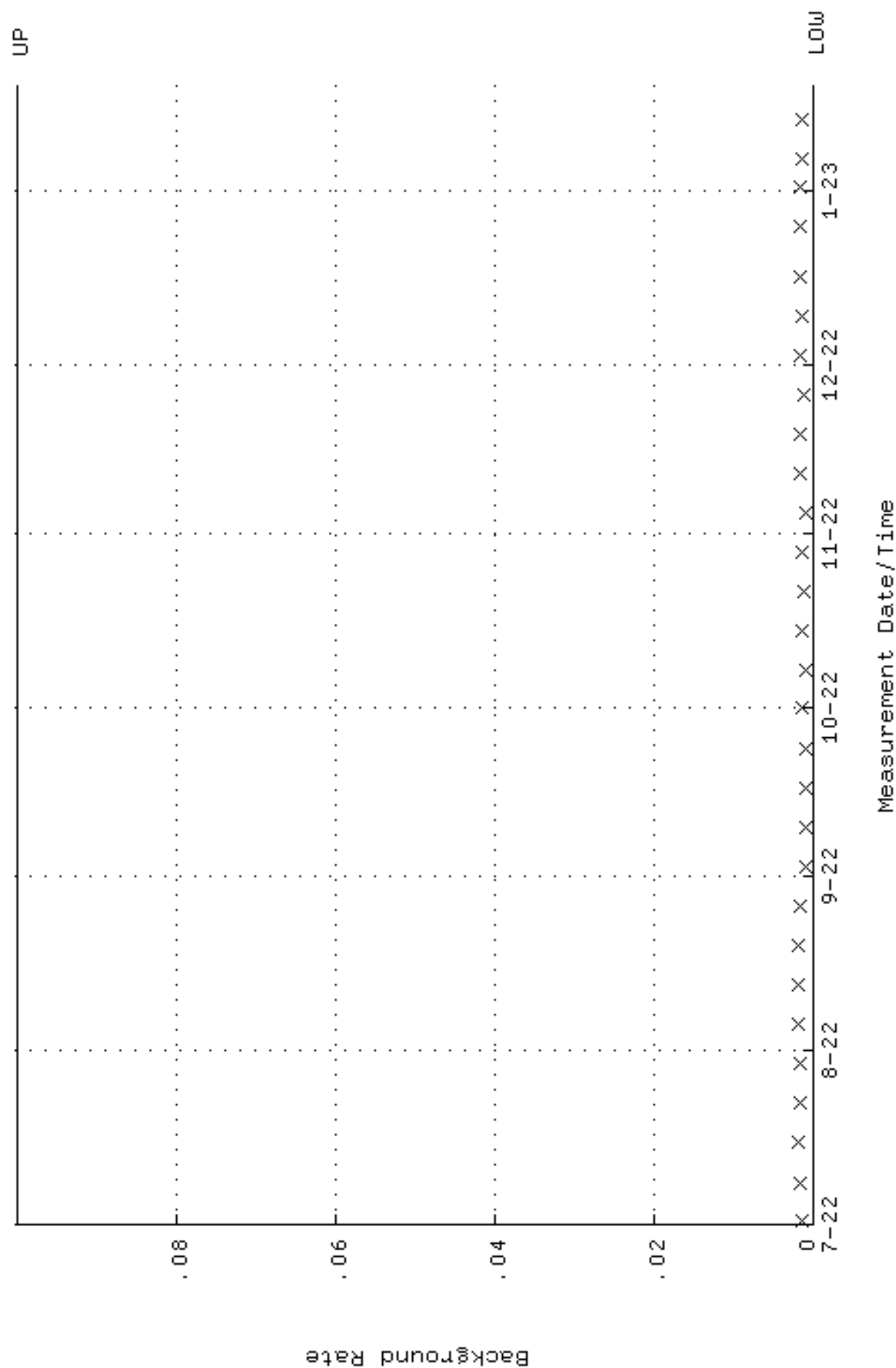
QA filename : DKA100:[ENV_ALPHA.QA.W]W191.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUL-2022 09:36:11 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



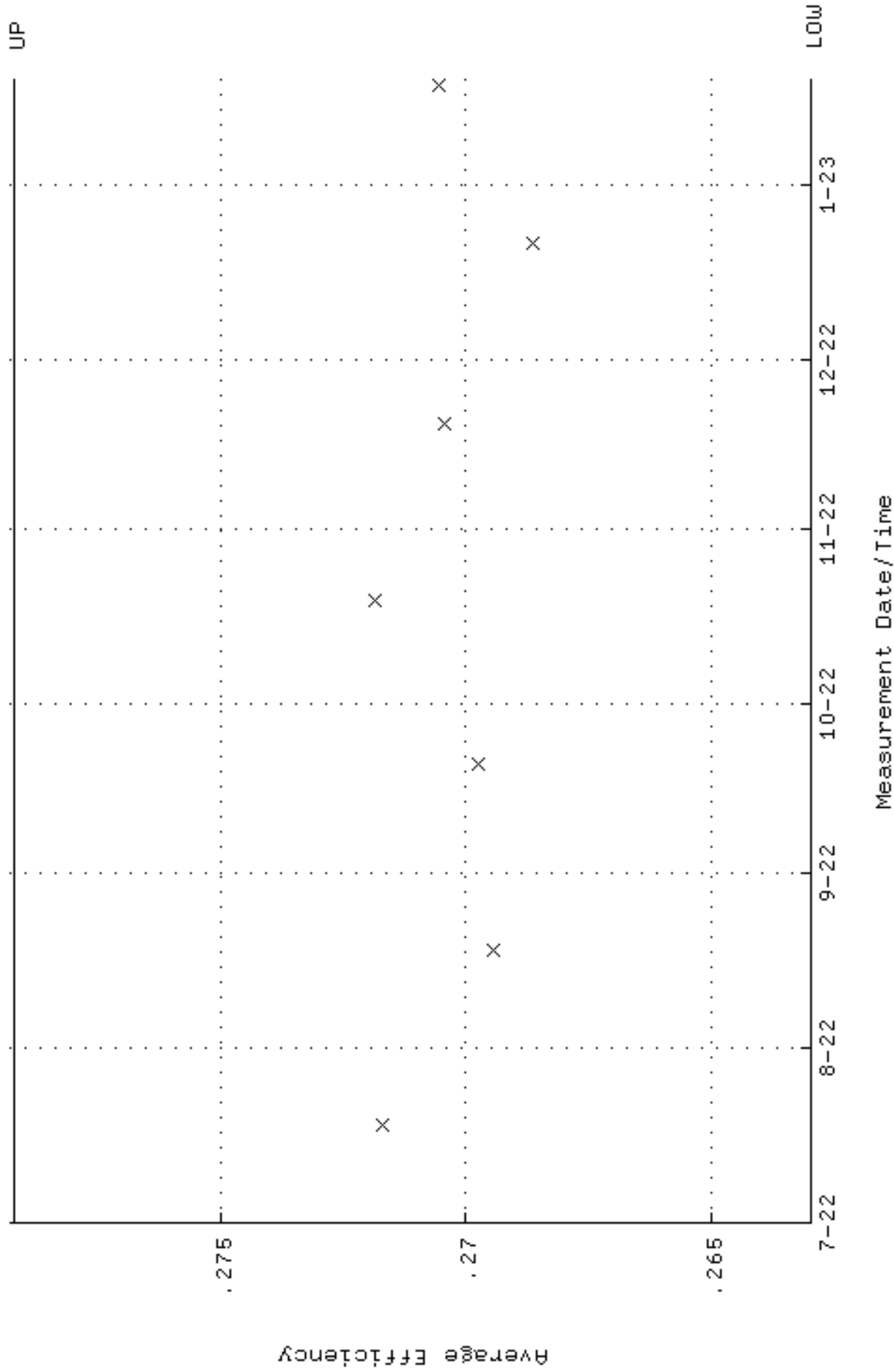
QA filename : DKA100:[ENV_ALPHA.QA.W]W191.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:11 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



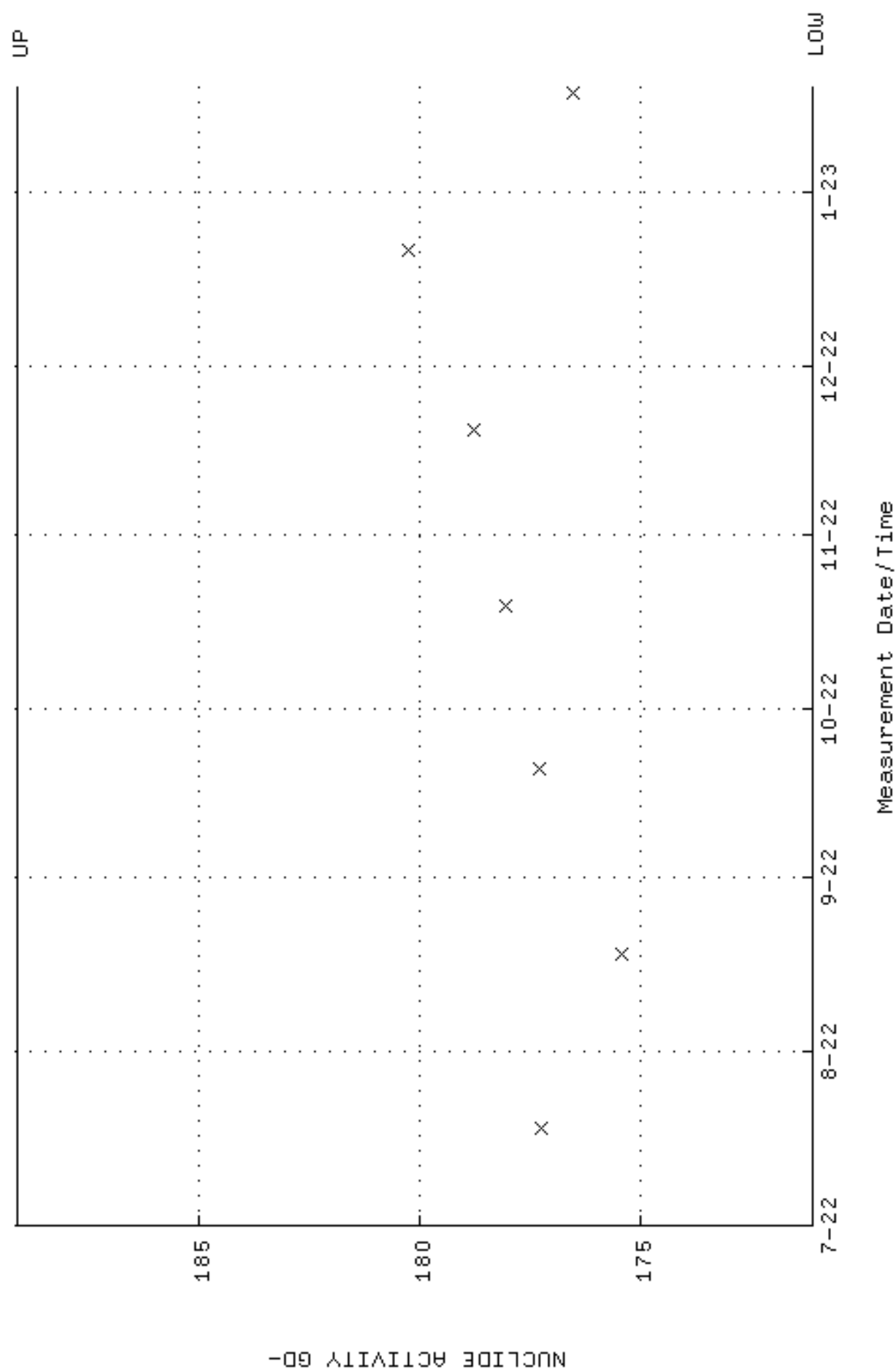
QA filename : DKA100:[ENV_ALPHA.QA.B]B191.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:45:24 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



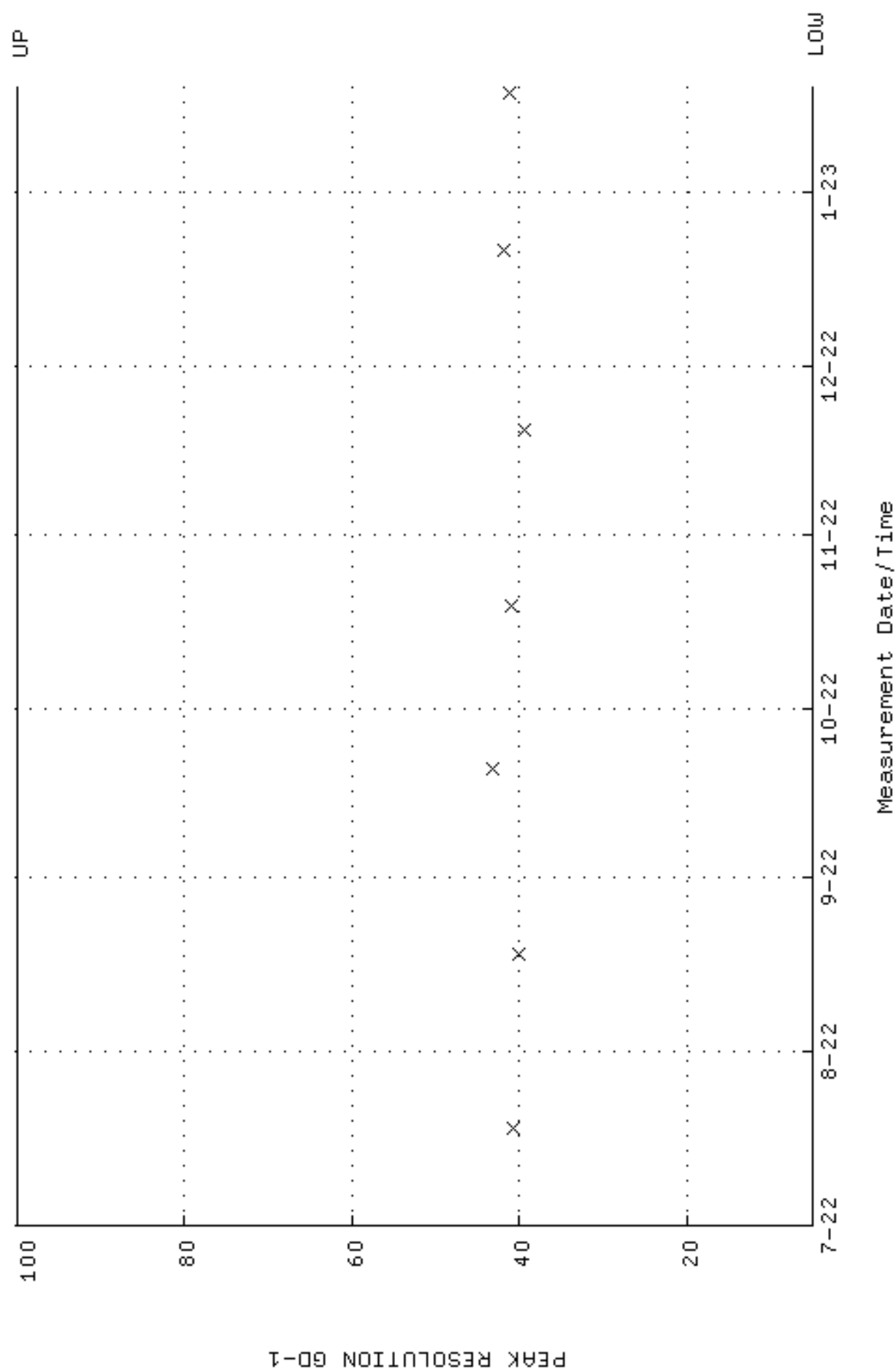
QA filename : DKA100:[ENV_ALPHA.QA.W]W192.QAF;4
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 18-JUL-2022 09:36:16 through 19-JAN-2023 12:00:00
Lower/Upper Lmts: 0.262970 through 0.279240



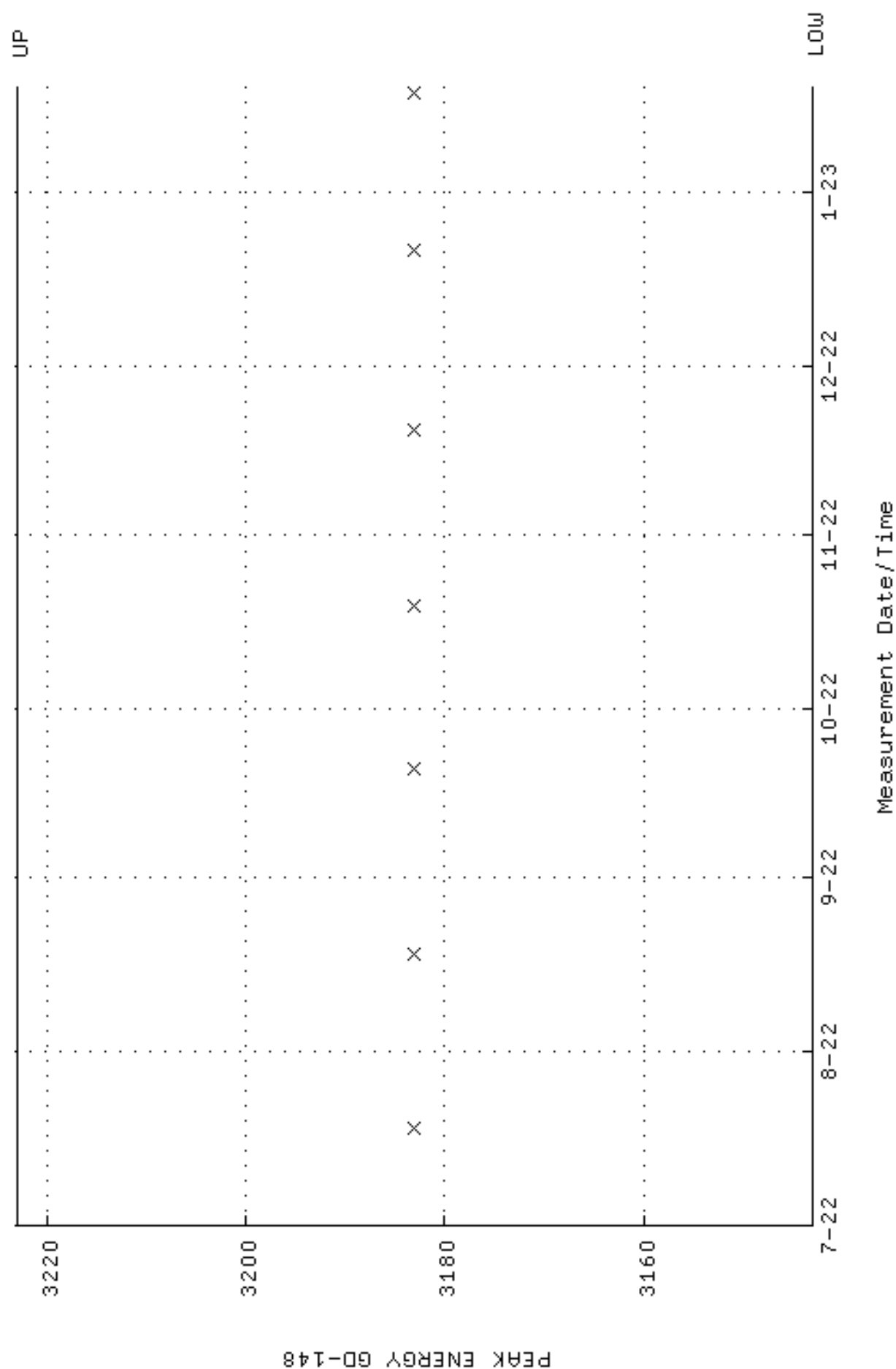
QA filename : DKA100:[ENV_ALPHA.QA.W]W192.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:16 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



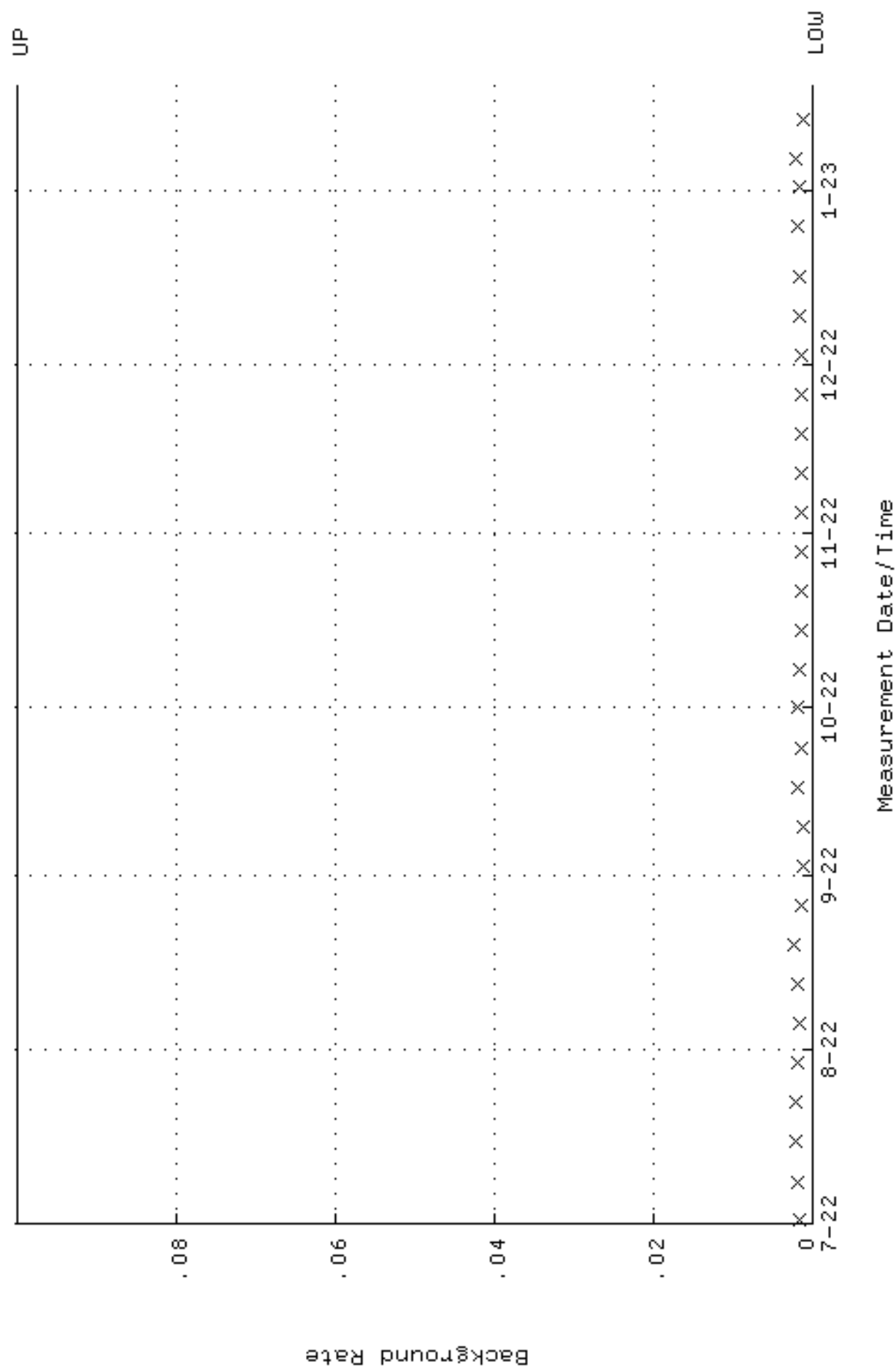
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 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUL-2022 09:36:16 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



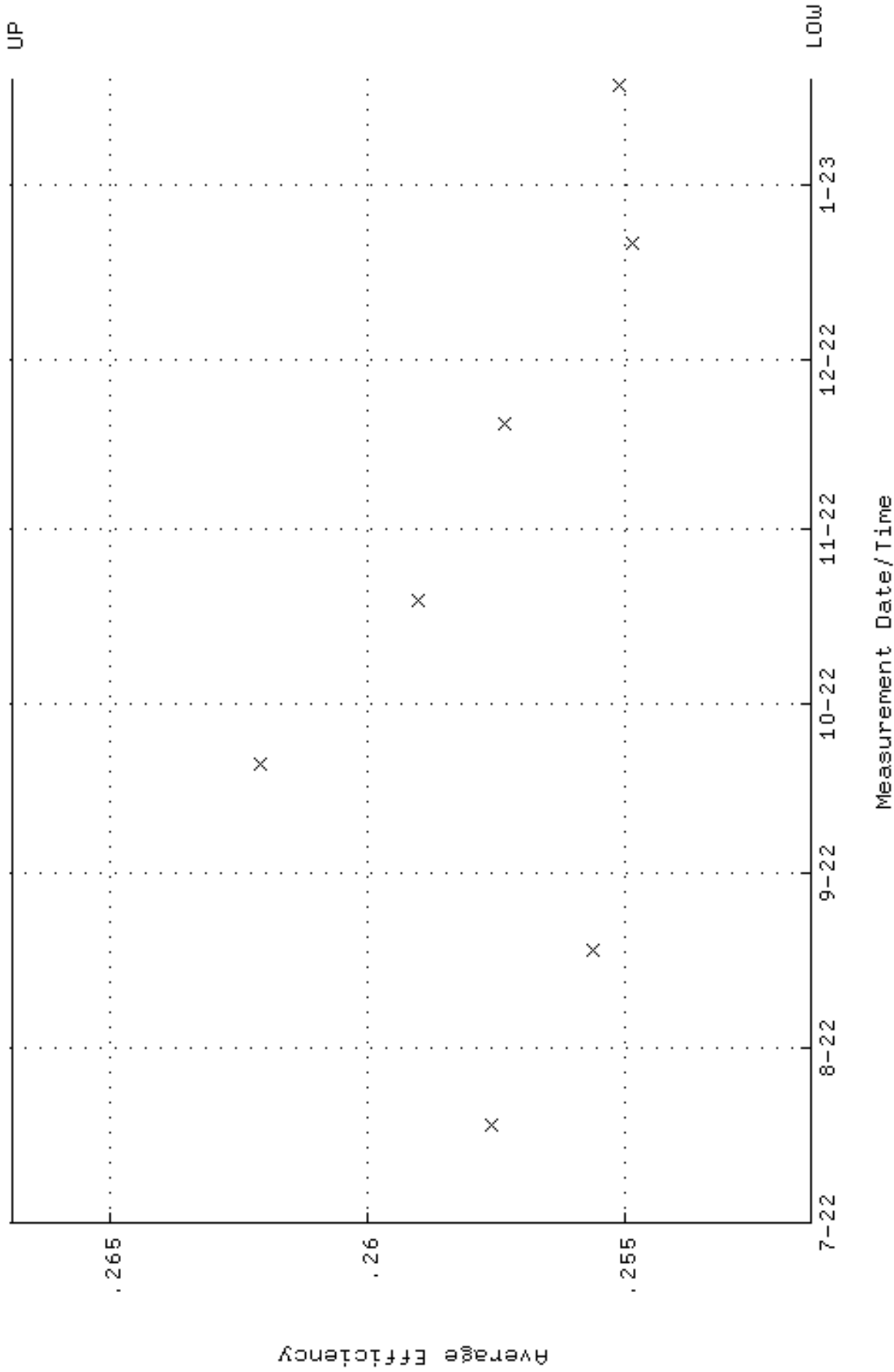
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 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:16 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



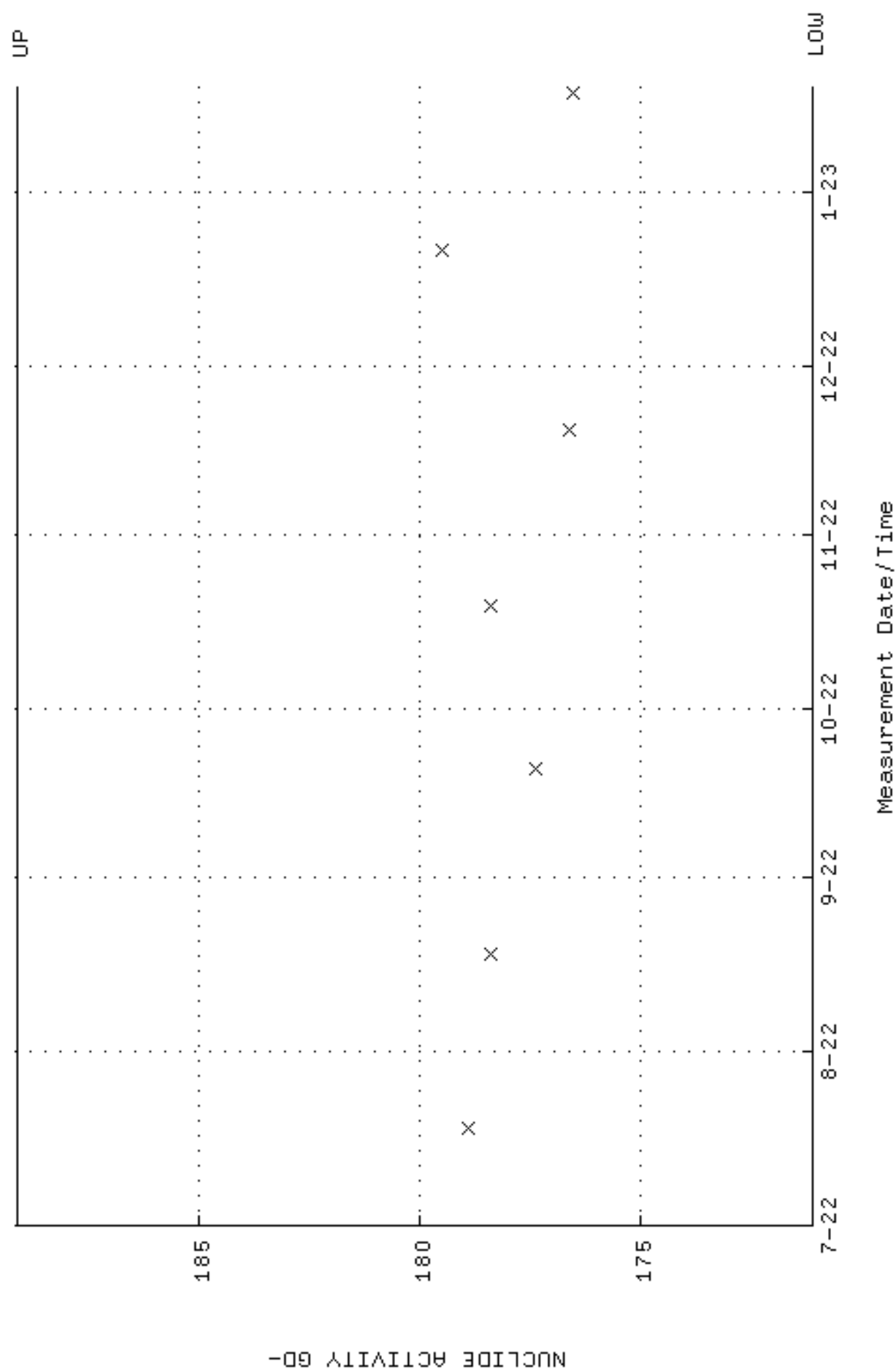
QA filename : DKA100:[ENV_ALPHA.QA.B]B192.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:45:28 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



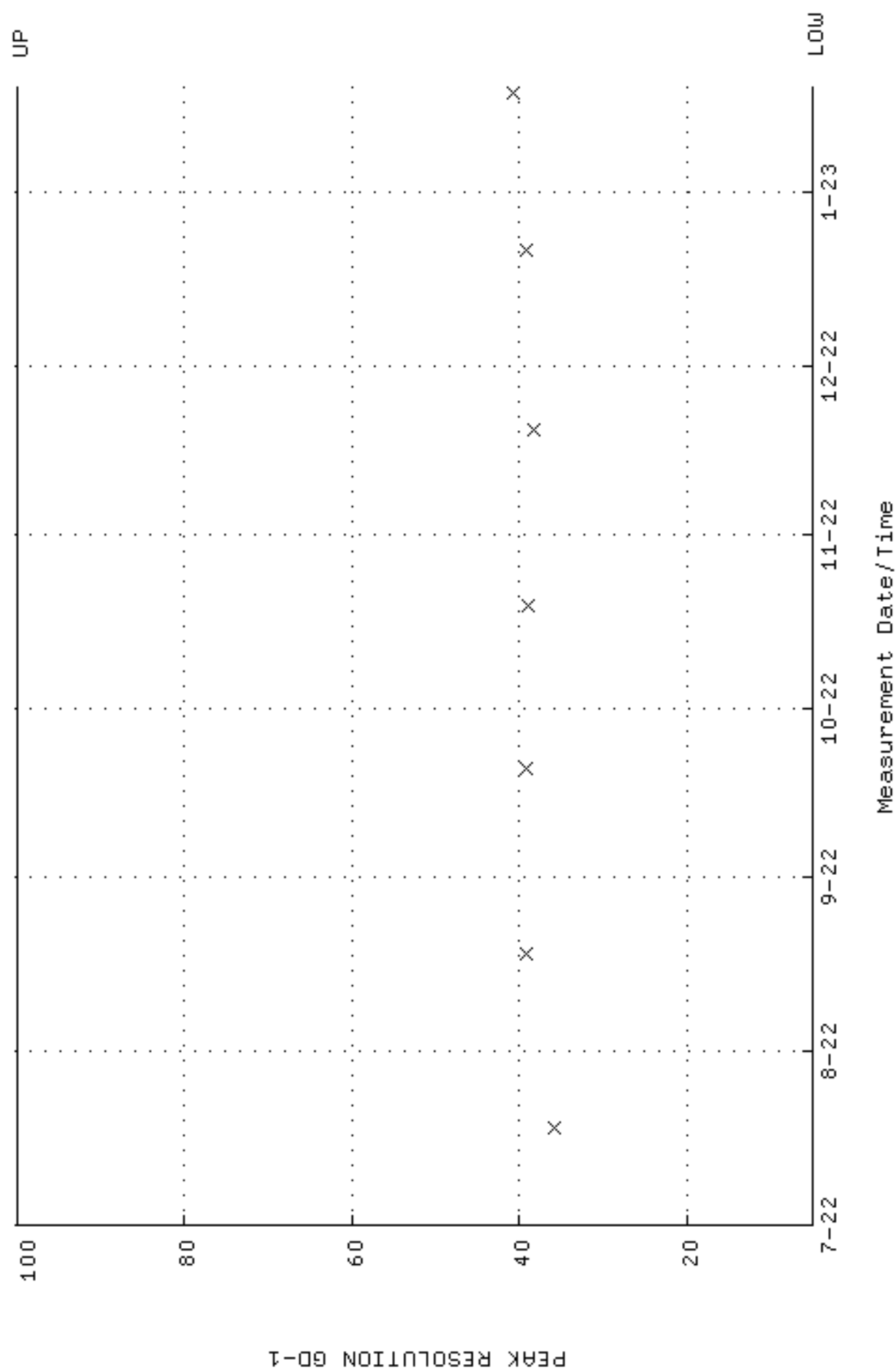
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 18-JUL-2022 09:36:24 through 19-JAN-2023 12:00:00
Lower/Upper Lmts: 0.251370 through 0.266910



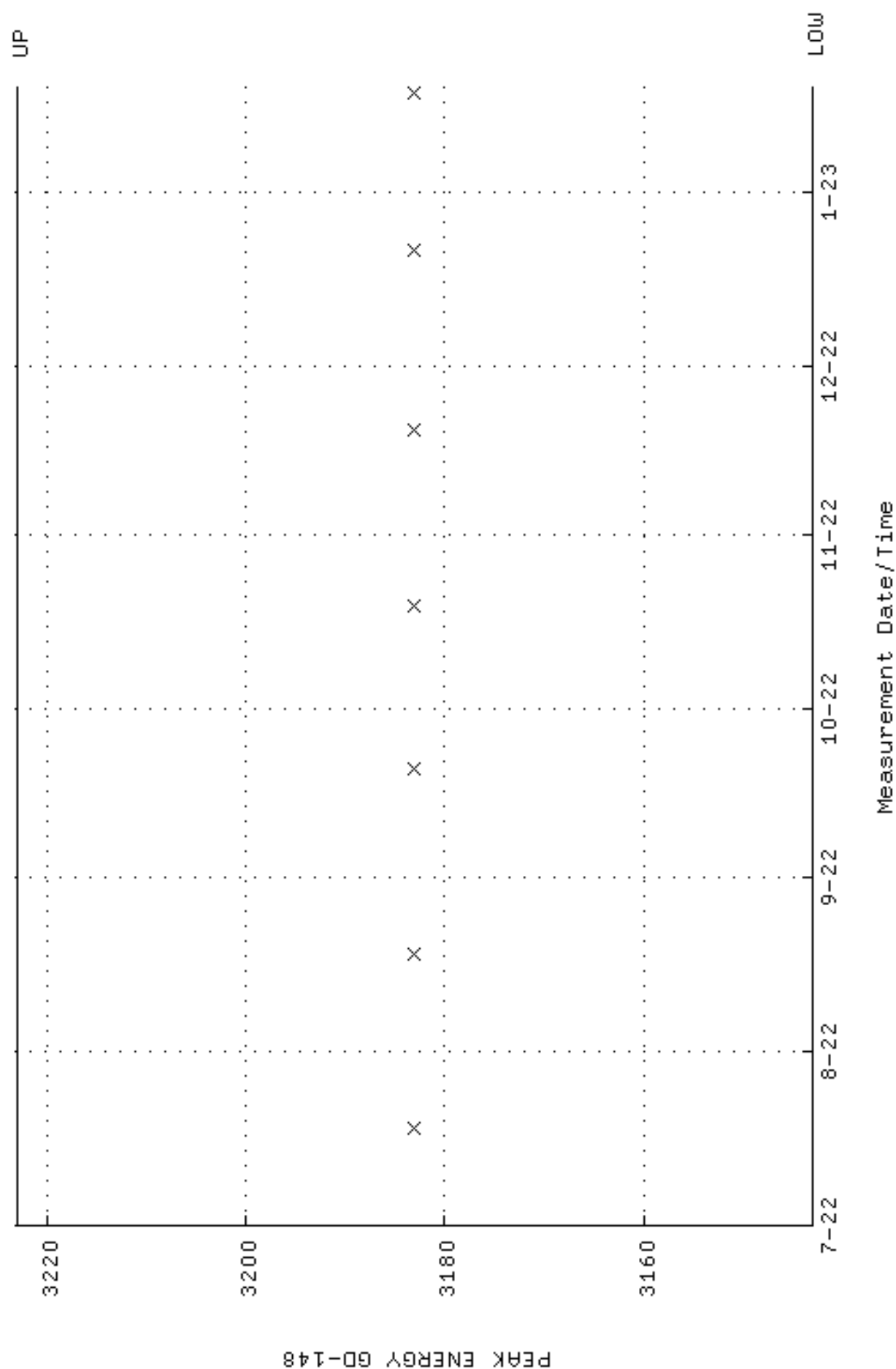
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:24 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



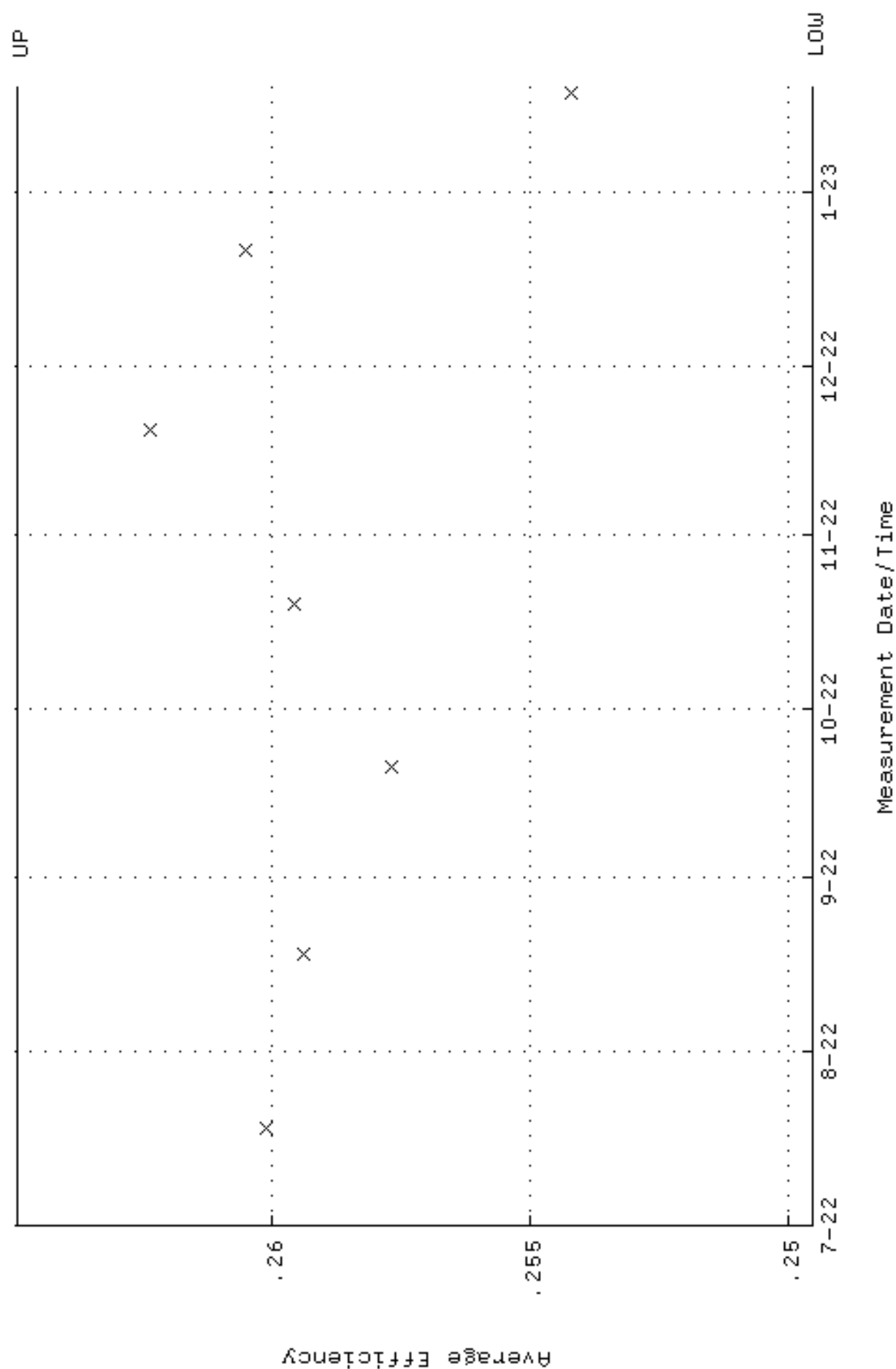
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUL-2022 09:36:24 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



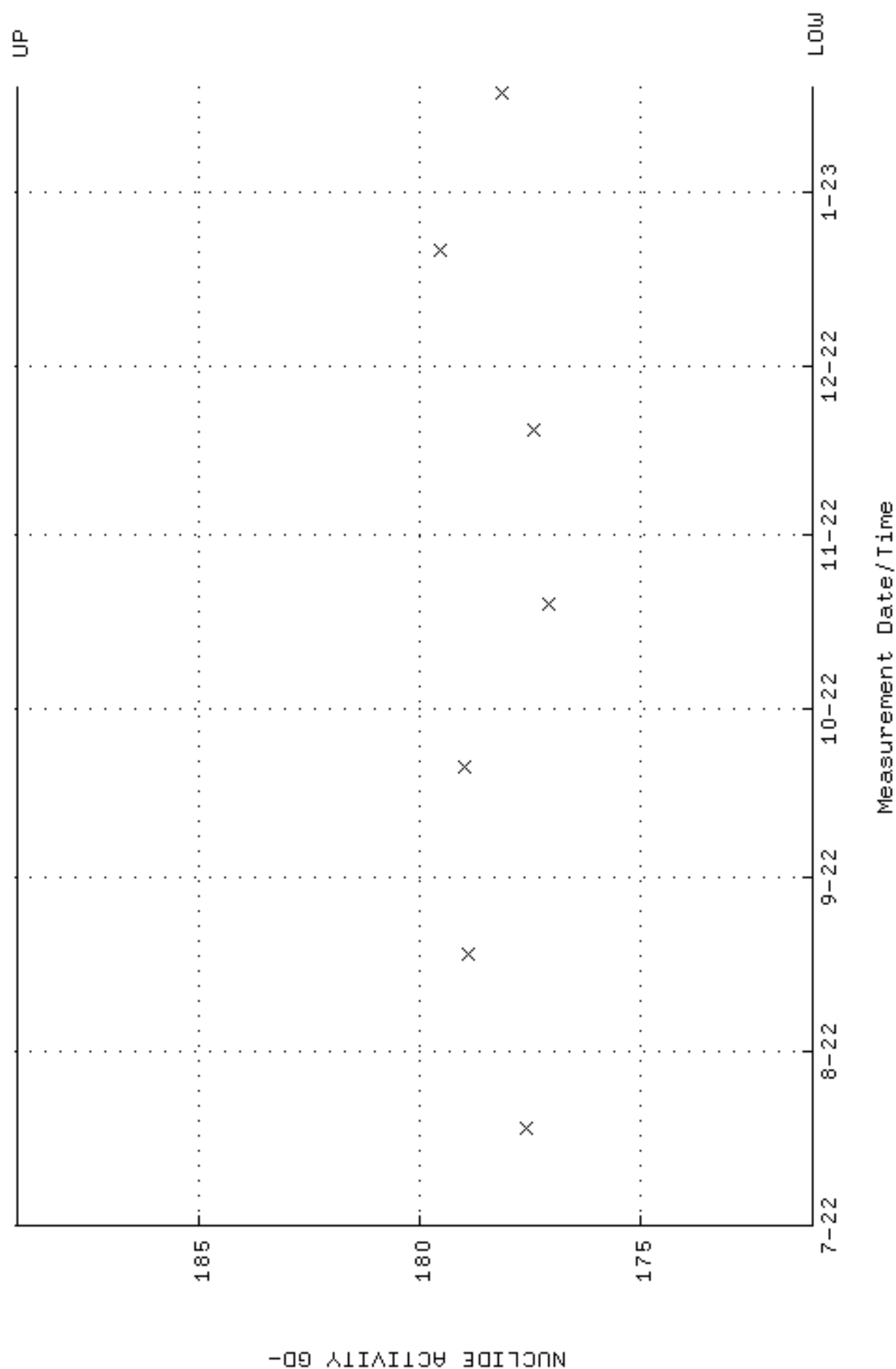
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:24 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



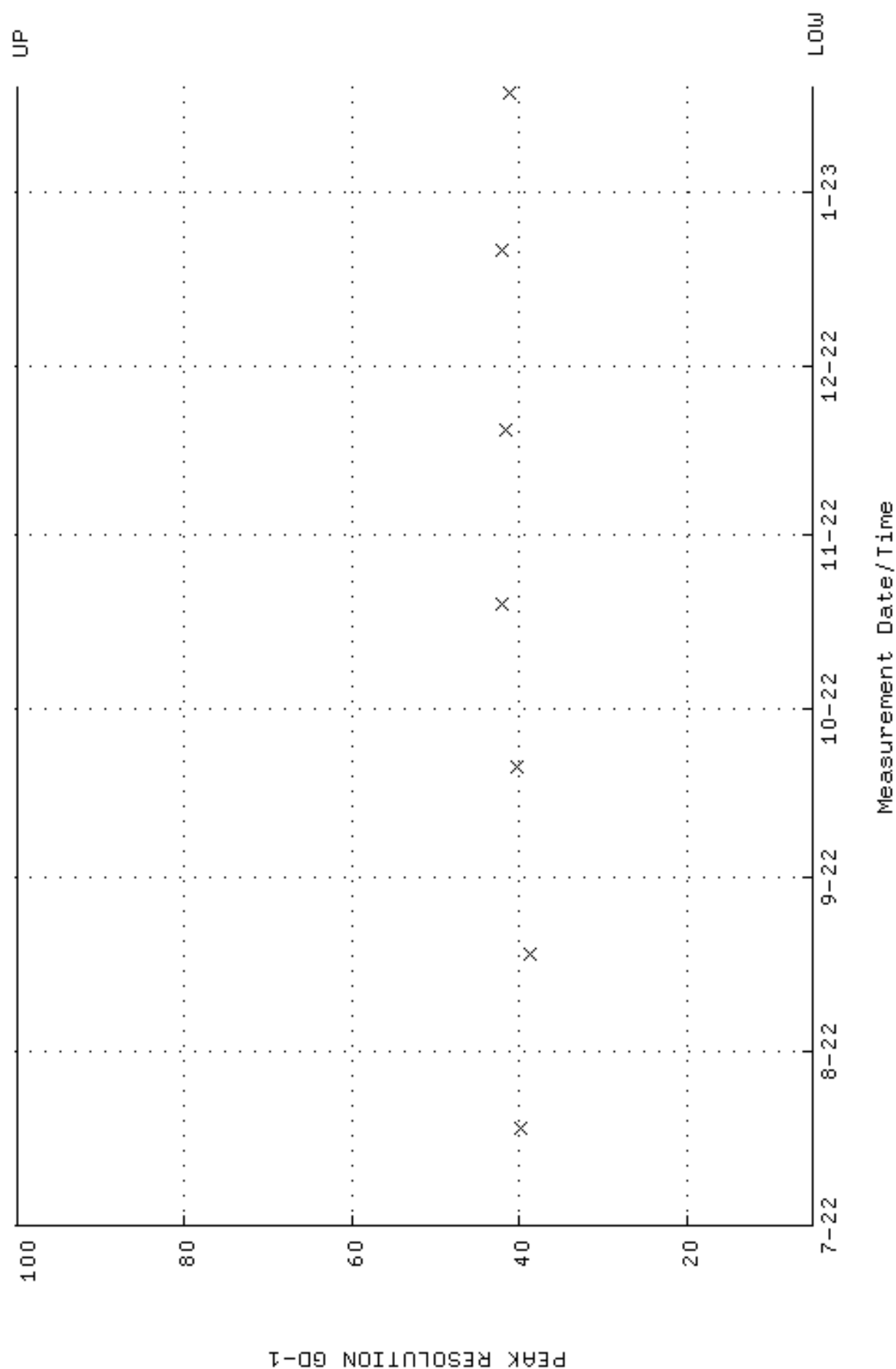
QA filename : DKA100:[ENV_ALPHA.QA.W]W201.QAF;4
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUL-2022 09:36:48 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.249520 through 0.264950



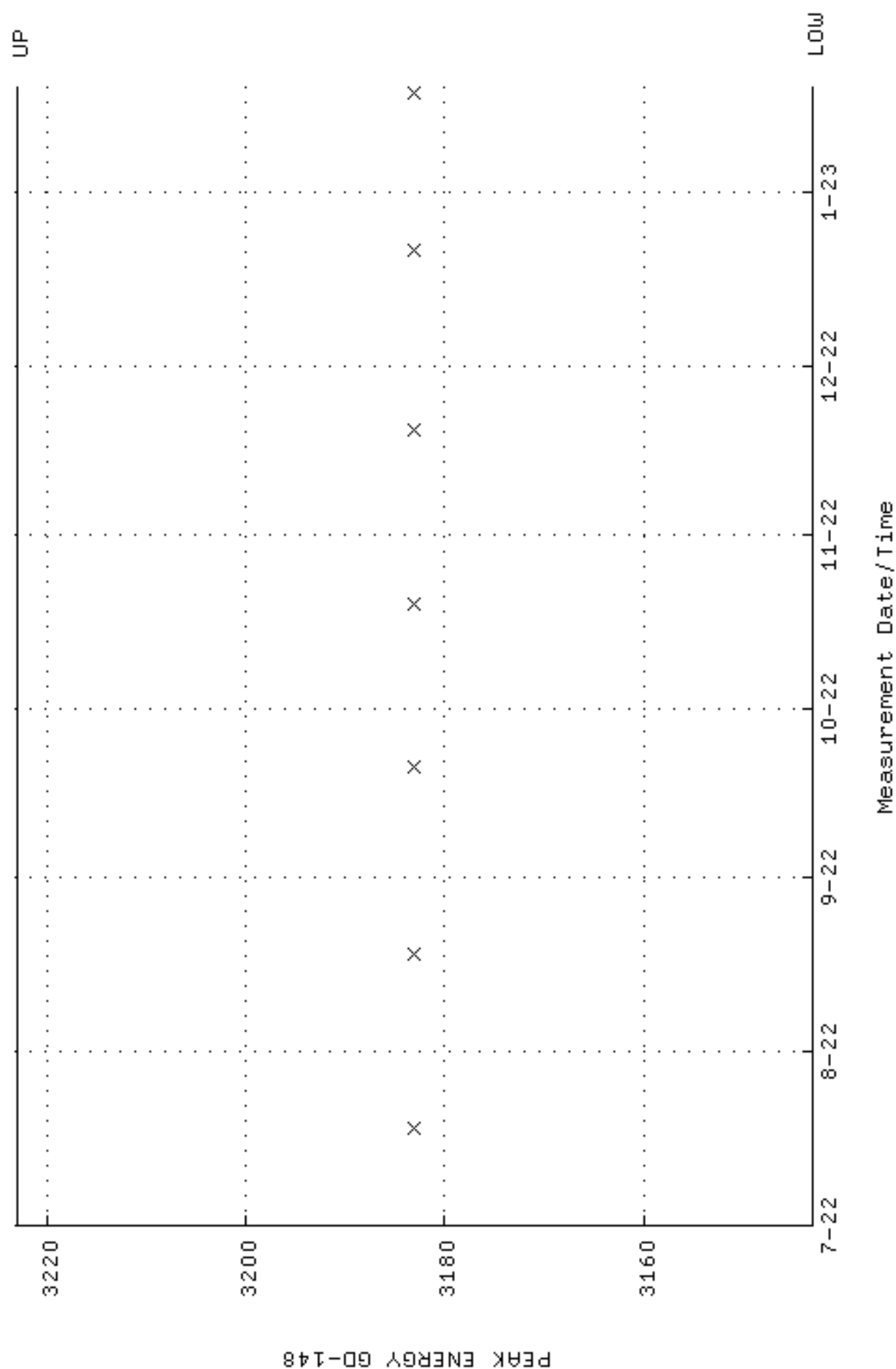
QA filename : DKA100:[ENV_ALPHA.QA.W]W201.QAF;4
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:48 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



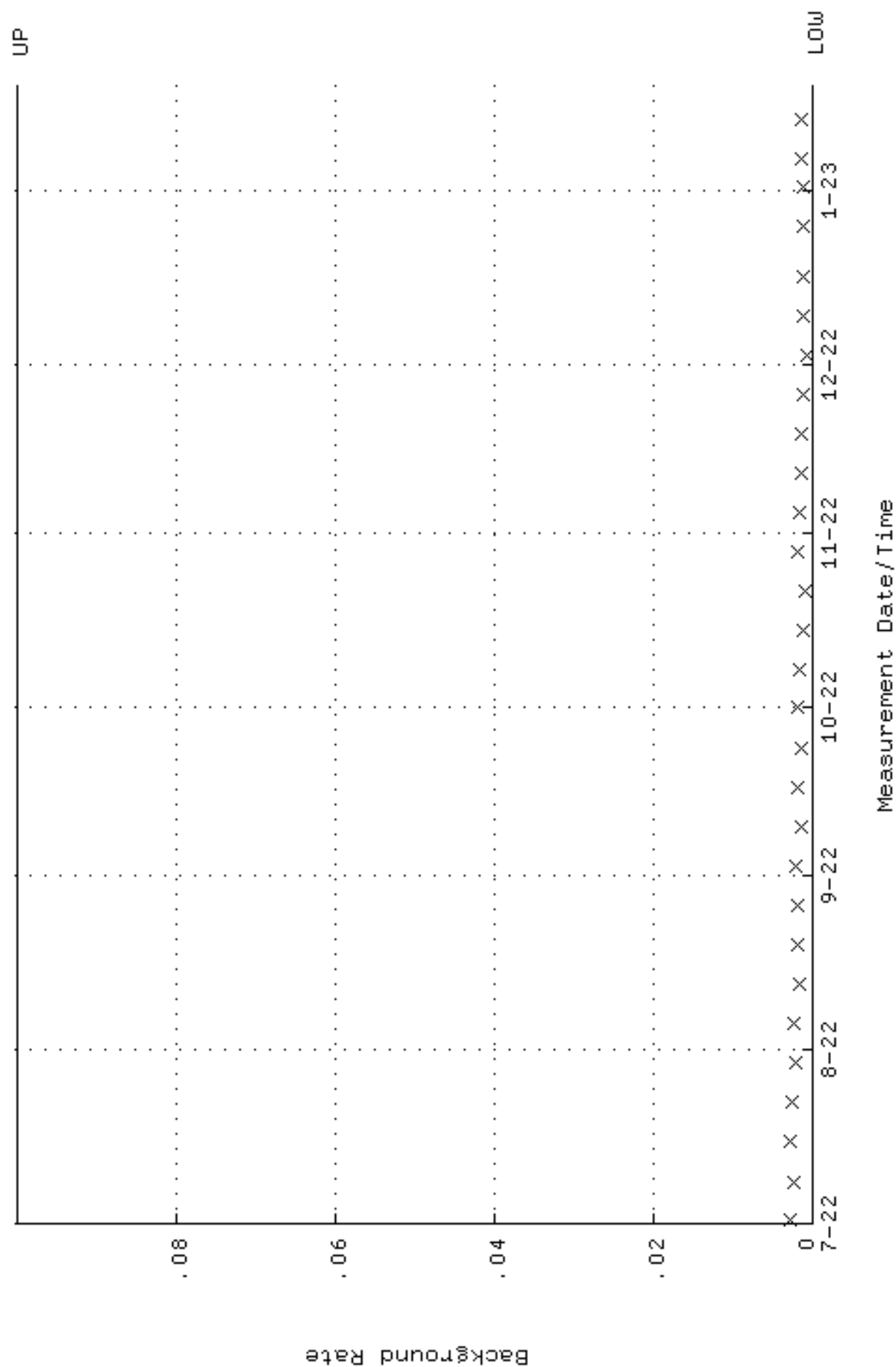
QA filename : DKA100:[ENV_ALPHA.QA.W]W201.QAF;4
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUL-2022 09:36:48 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



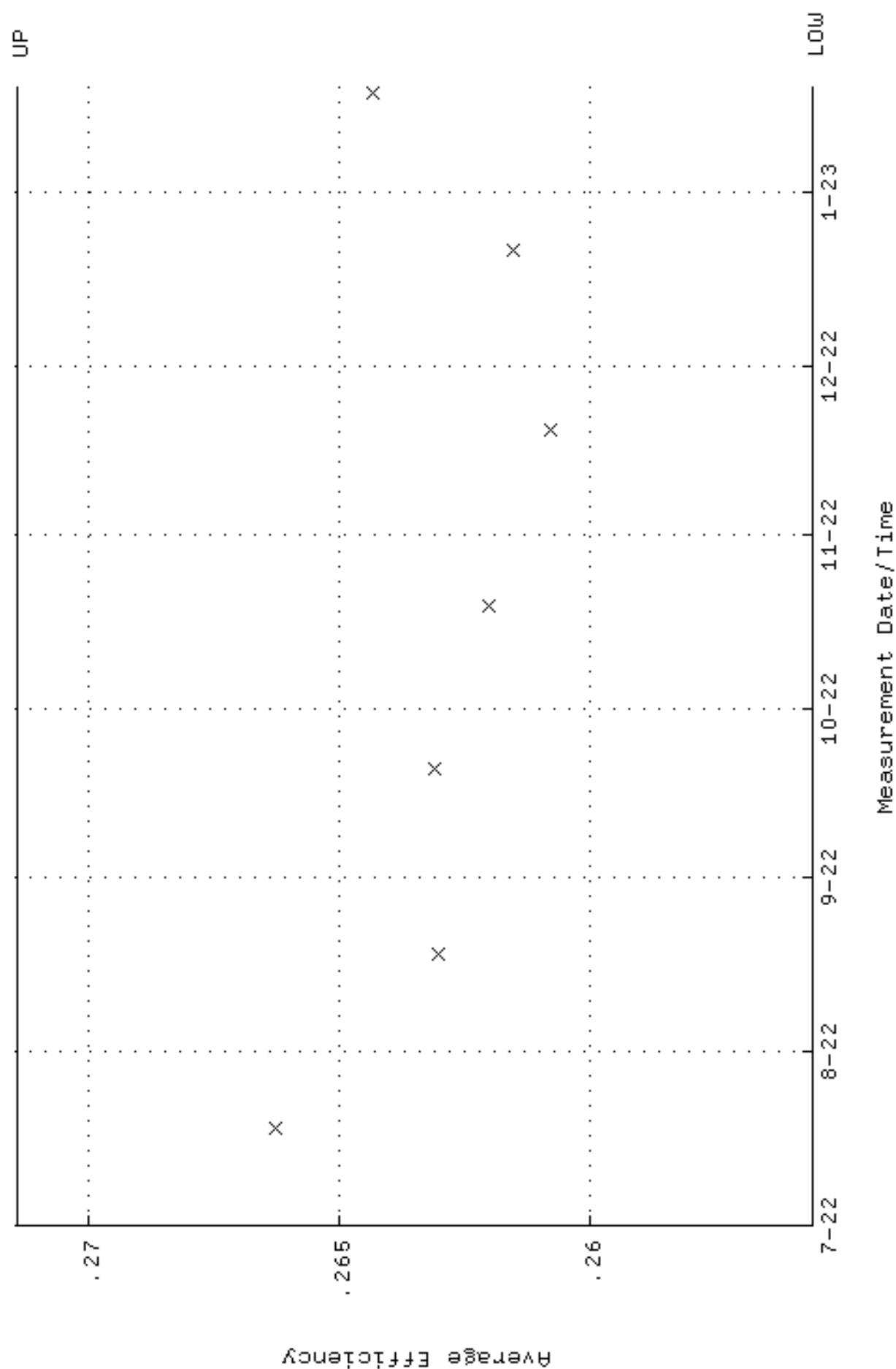
QA filename : DKA100:[ENV_ALPHA.QA.W]W201.QAF;4
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:48 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



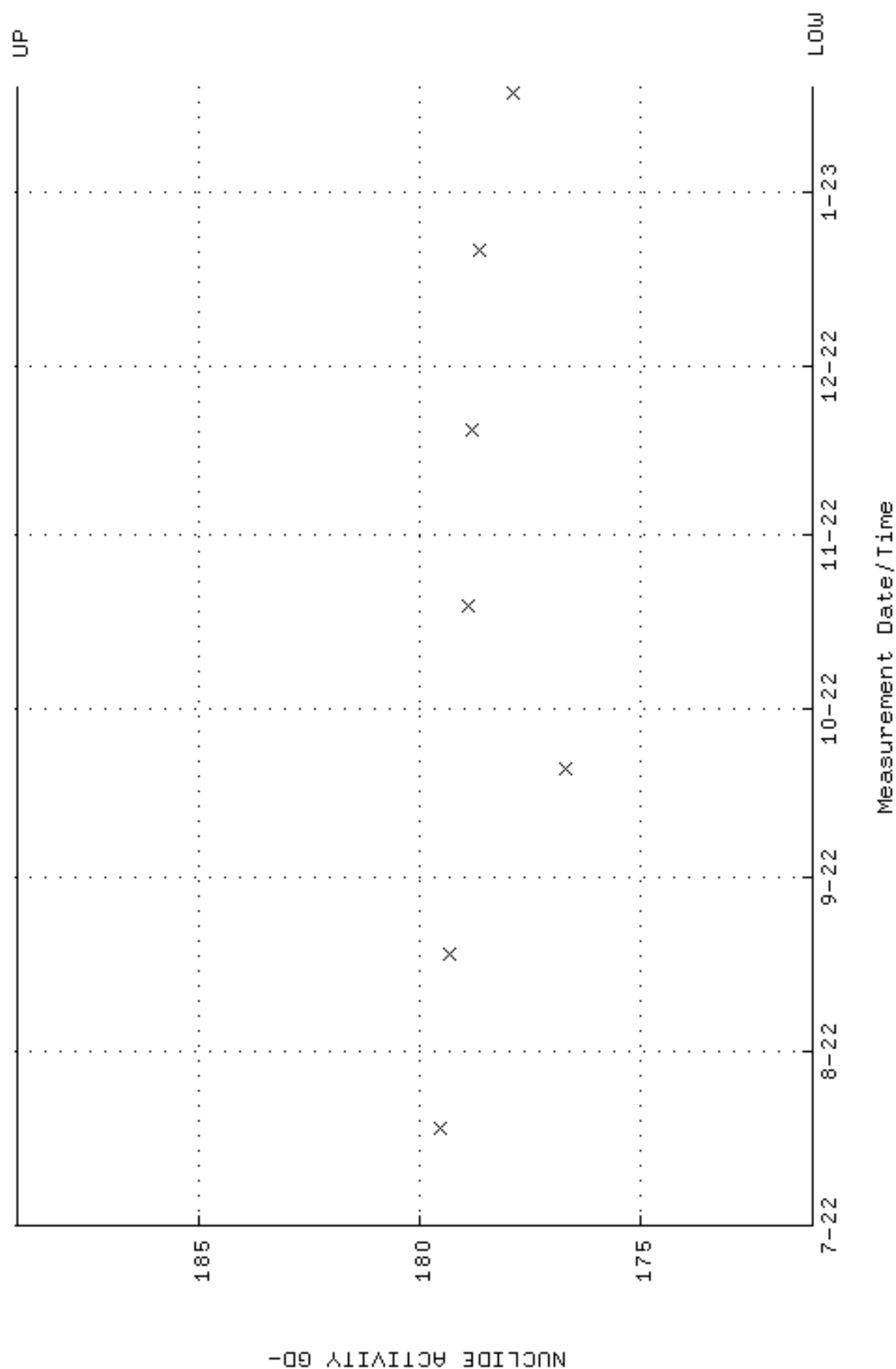
QA filename : DKA100:[ENV_ALPHA.QA.B]B201.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:46:14 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



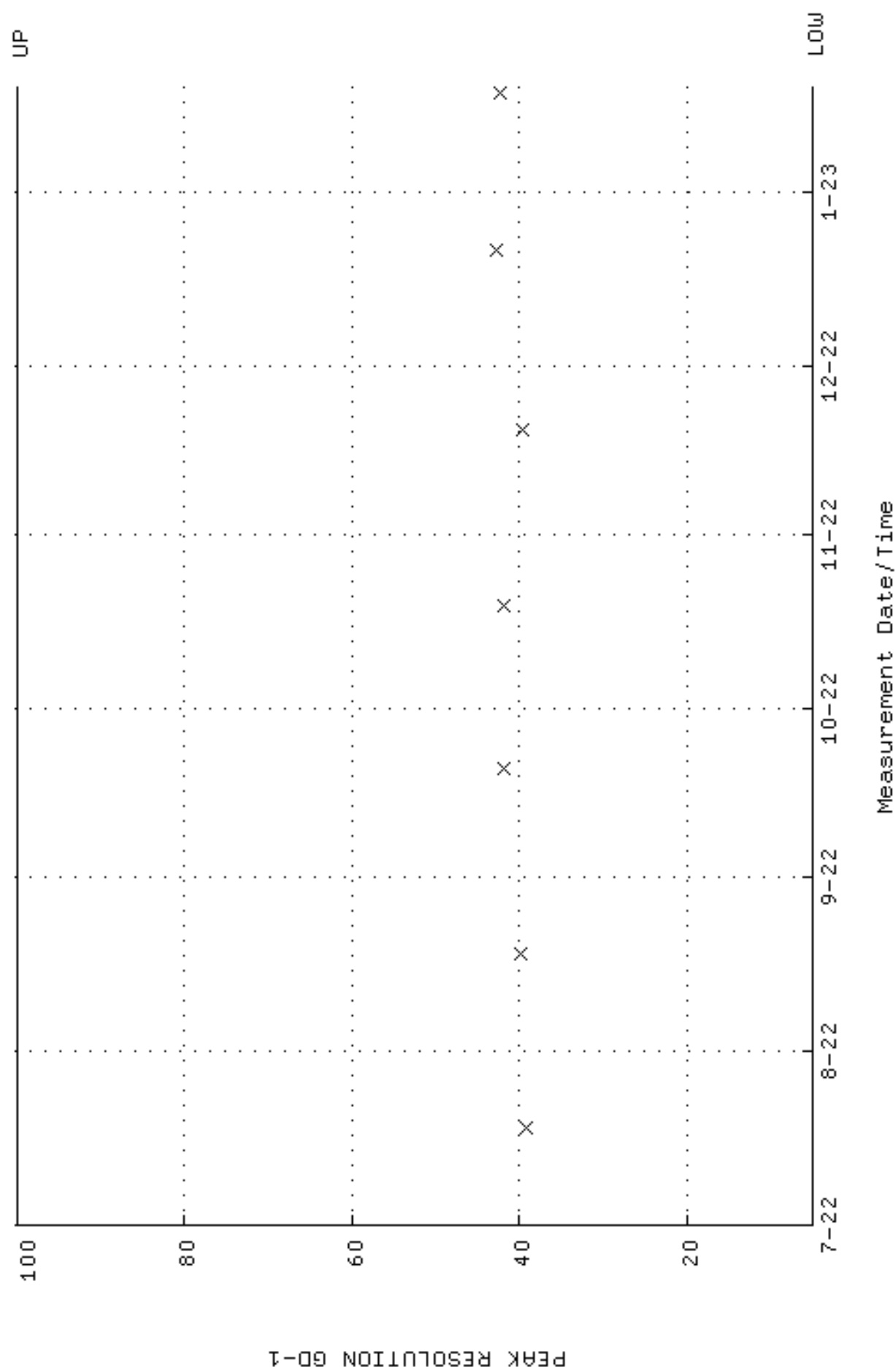
QA filename : DKA100:[ENV_ALPHA.QA.W]W202.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUL-2022 09:36:52 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.255586 through 0.271396



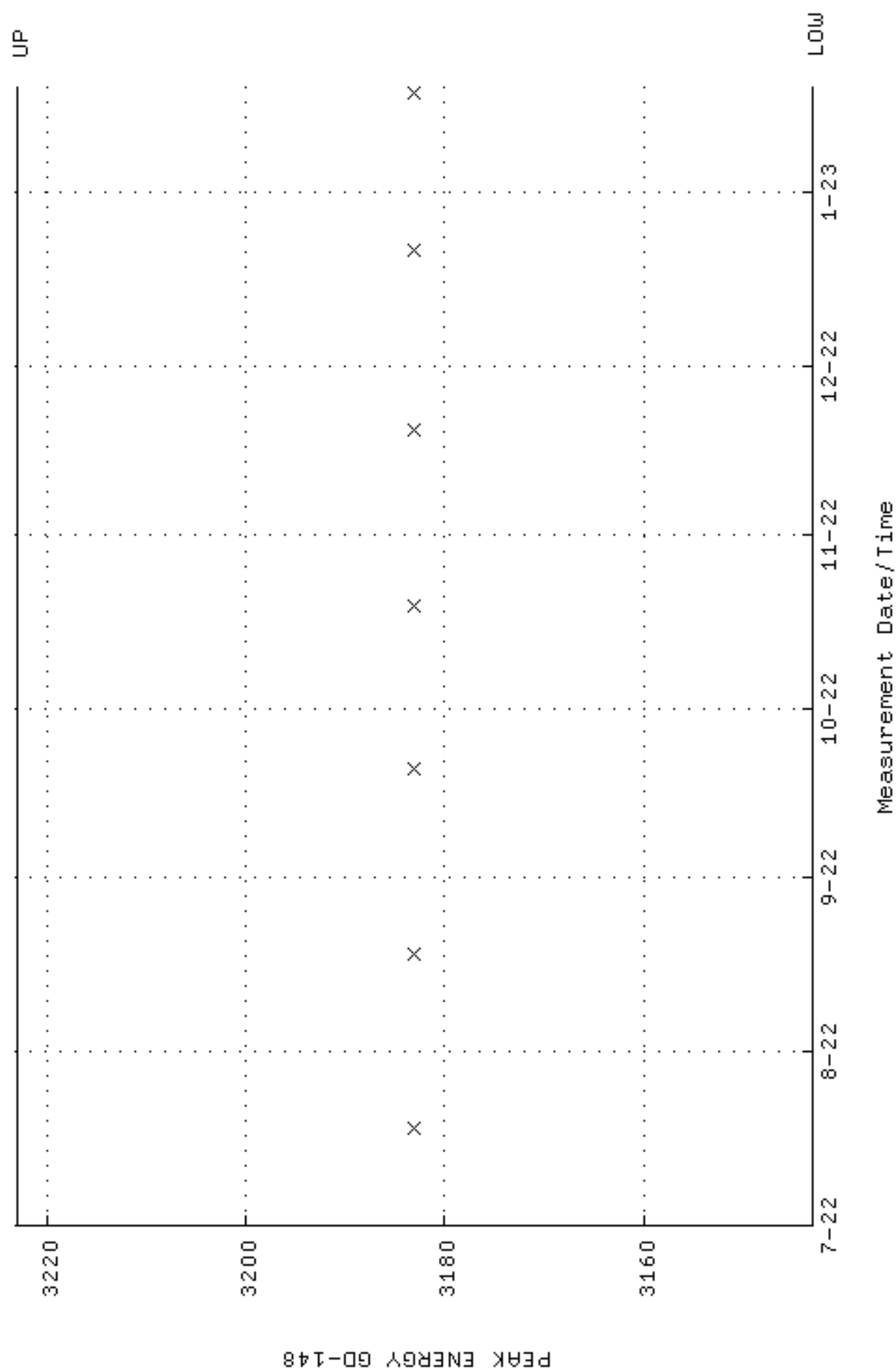
QA filename : DKA100:[ENV_ALPHA.QA.W]W202.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:52 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



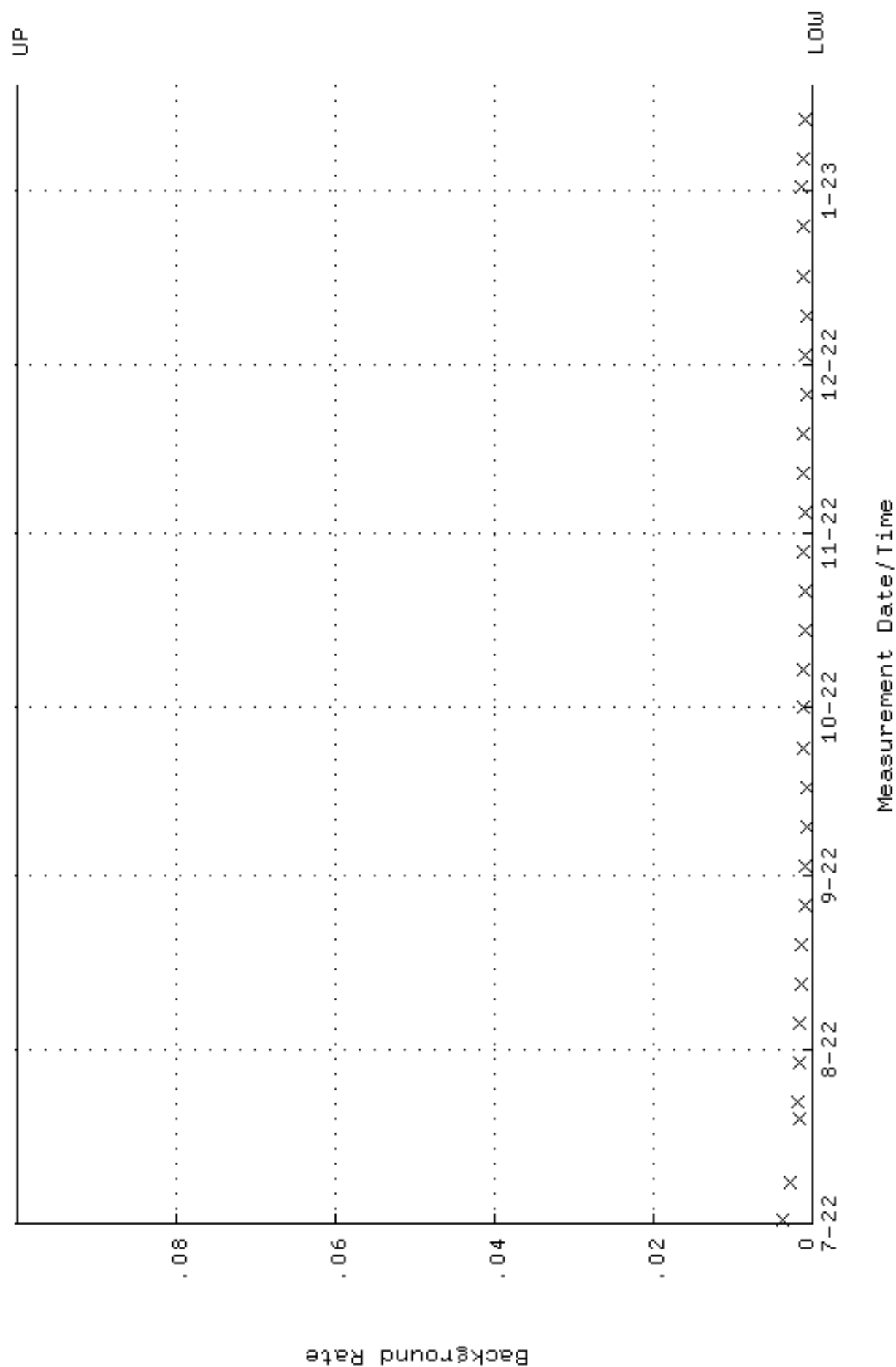
QA filename : DKA100:[ENV_ALPHA.QA.W]W202.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUL-2022 09:36:52 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



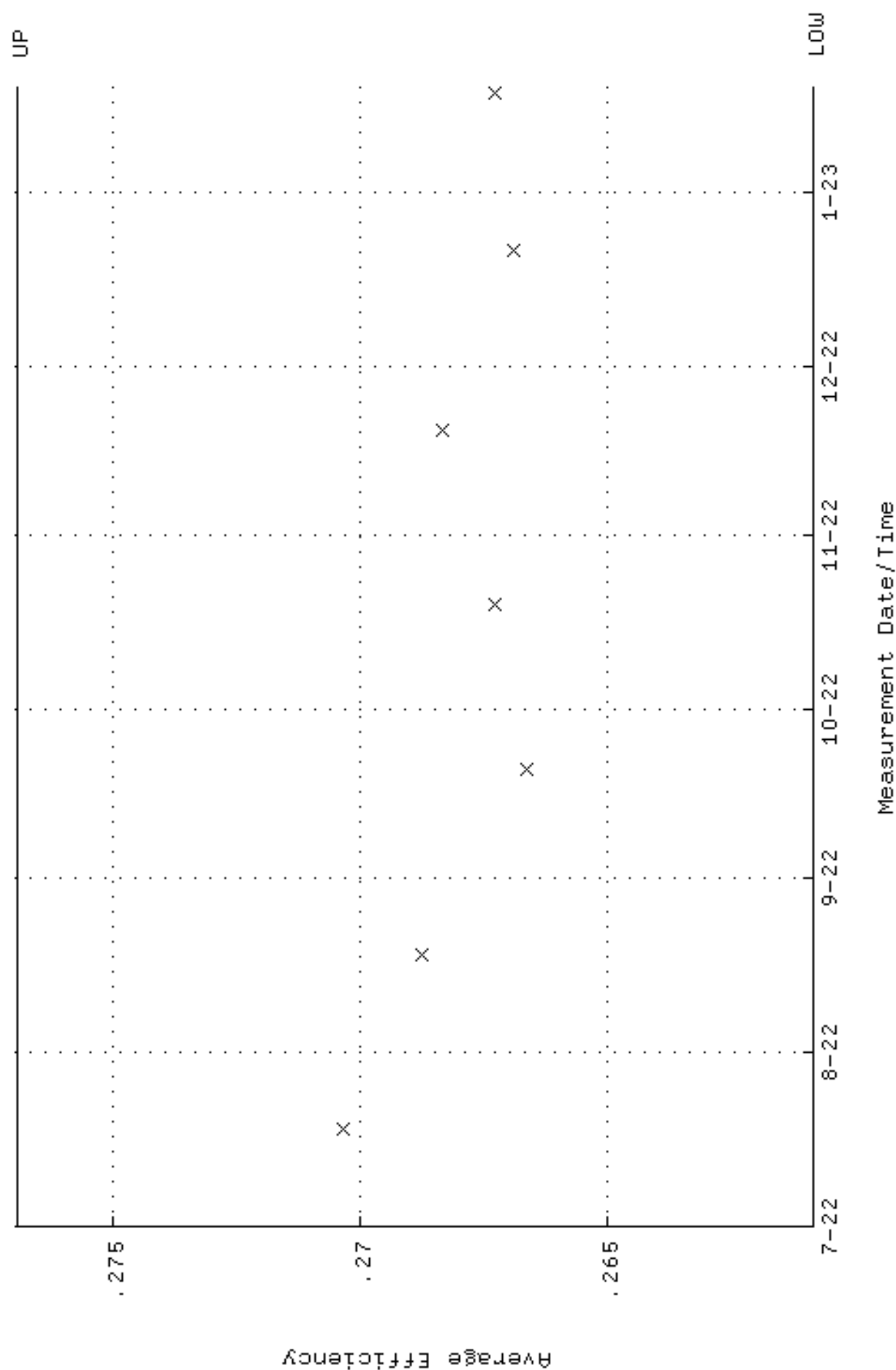
QA filename : DKA100:[ENV_ALPHA.QA.W]W202.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUL-2022 09:36:52 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



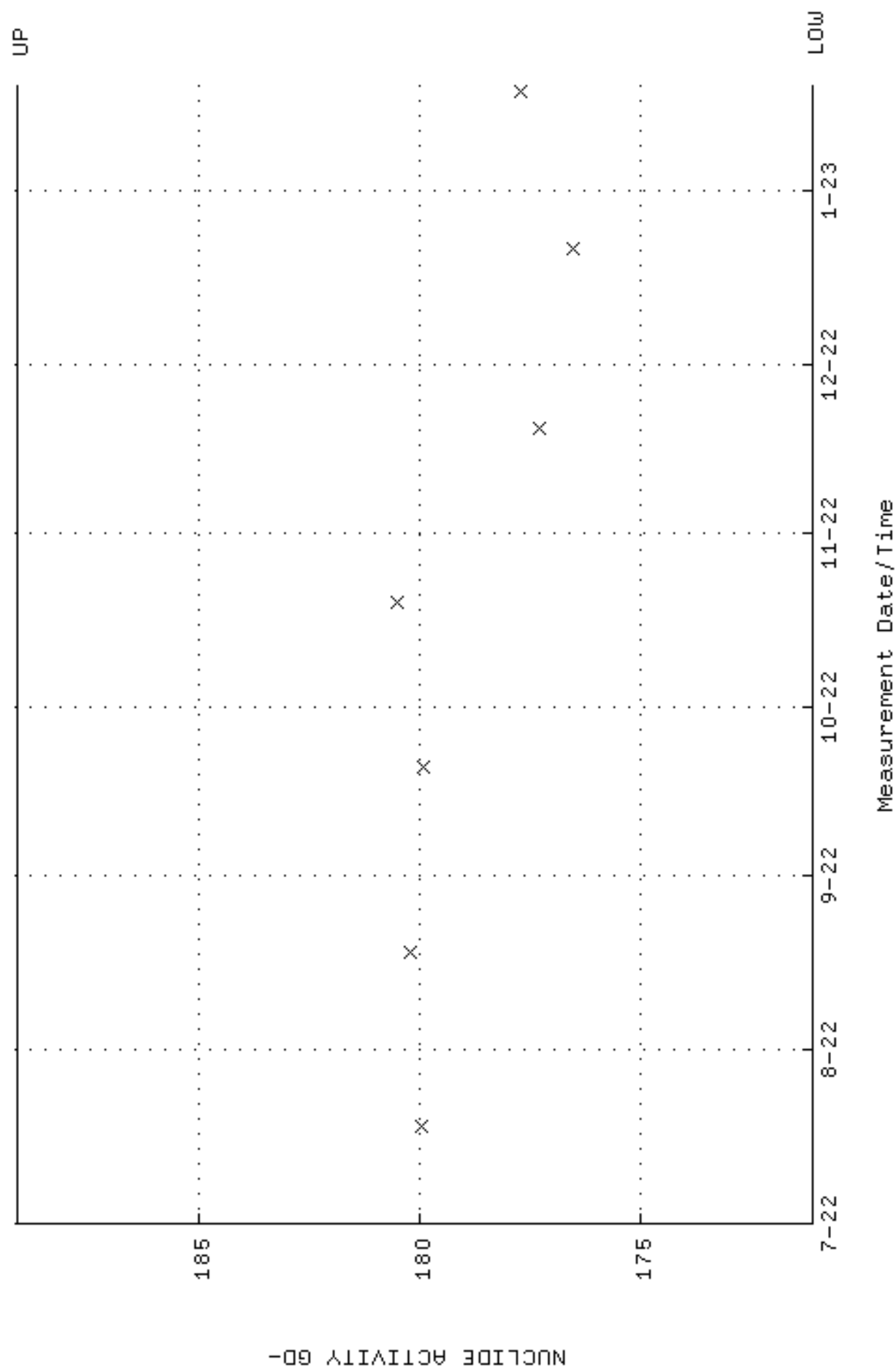
QA filename : DKA100:[ENV_ALPHA.QA.B]B202.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:46:21 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



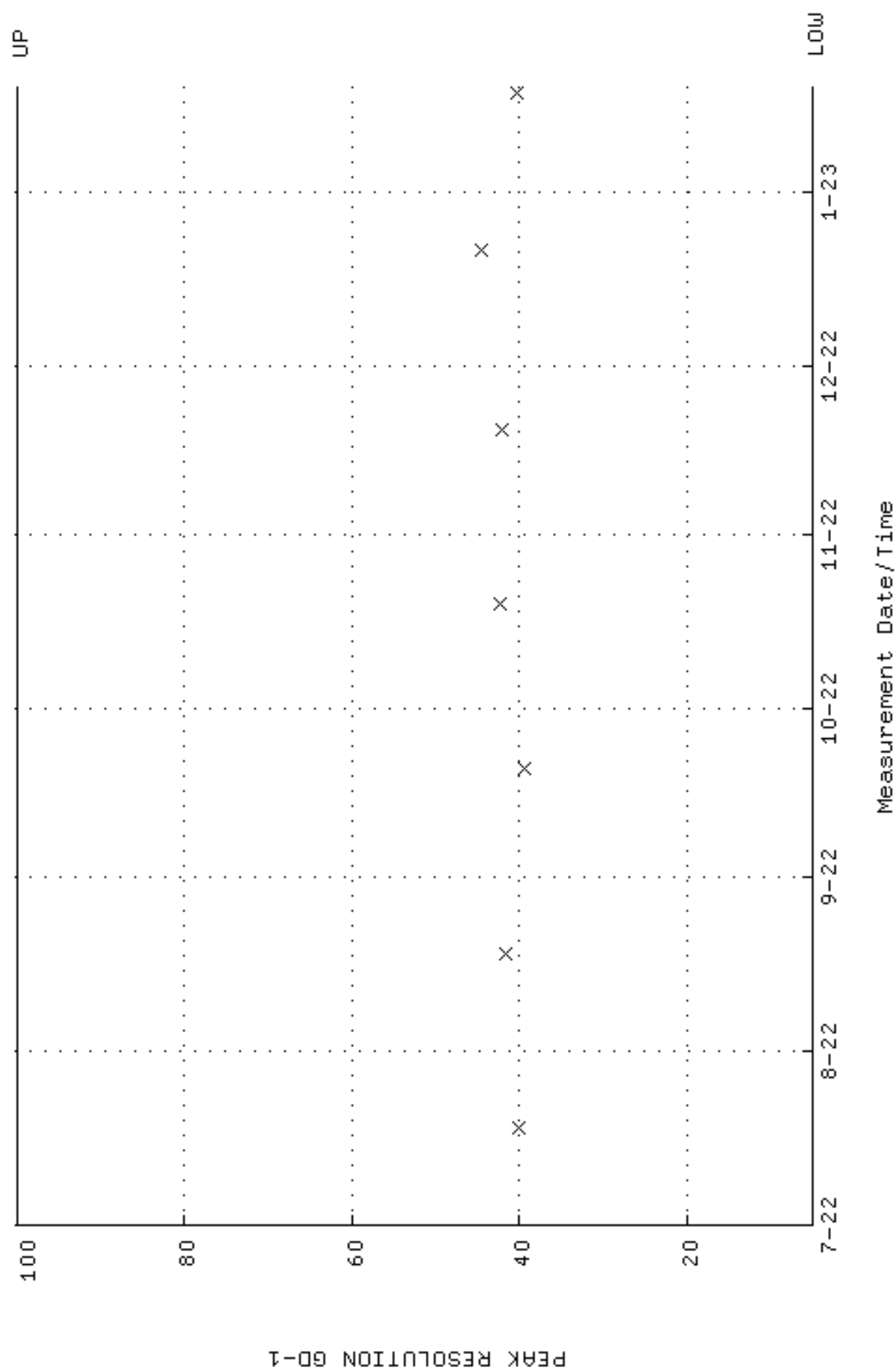
QA filename : DKA100:[ENV_ALPHA.QA.W]W205.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUL-2022 09:37:04 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.260820 through 0.276950



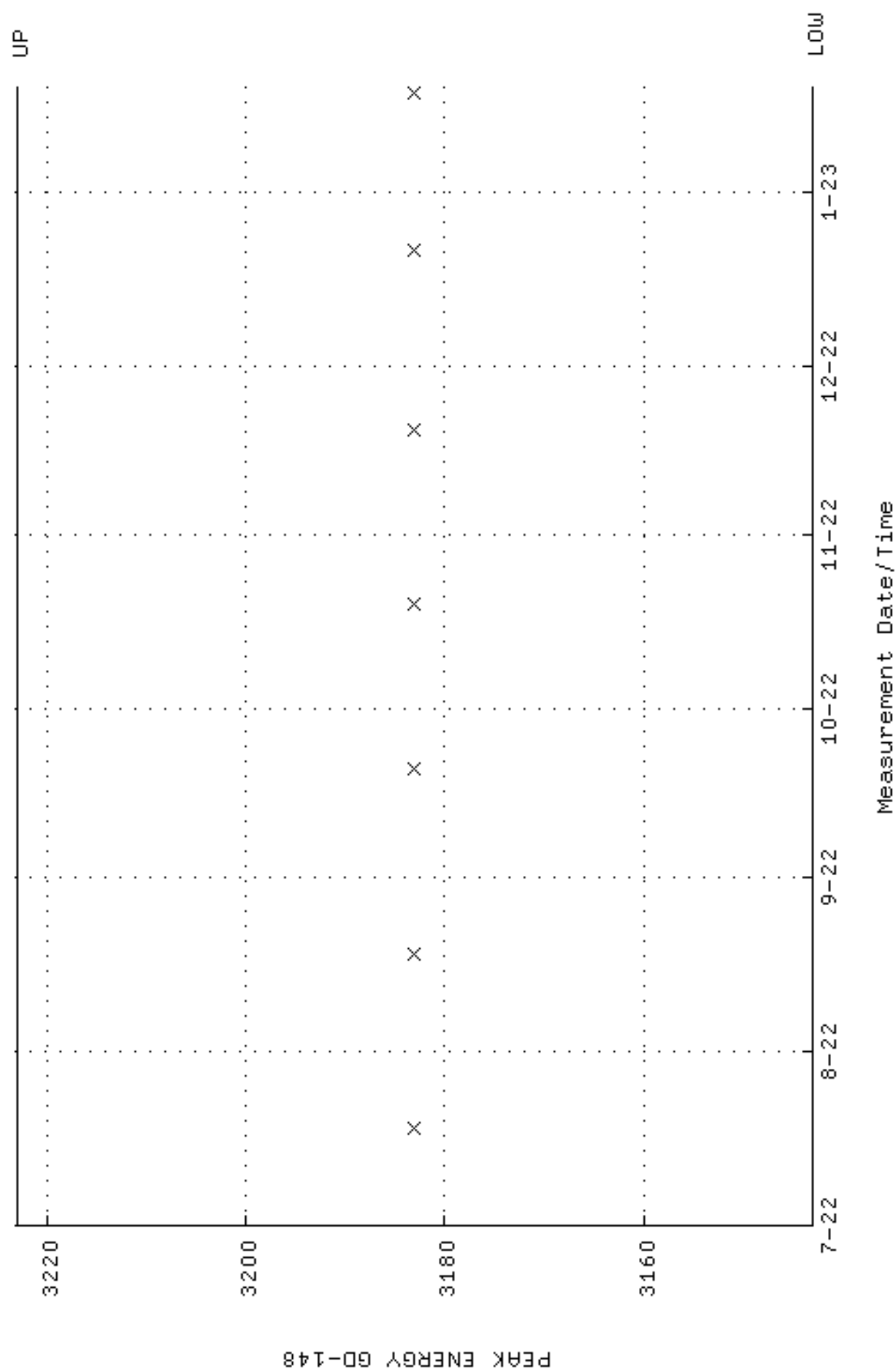
QA filename : DKA100:[ENV_ALPHA.QA.W]W205.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUL-2022 09:37:04 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



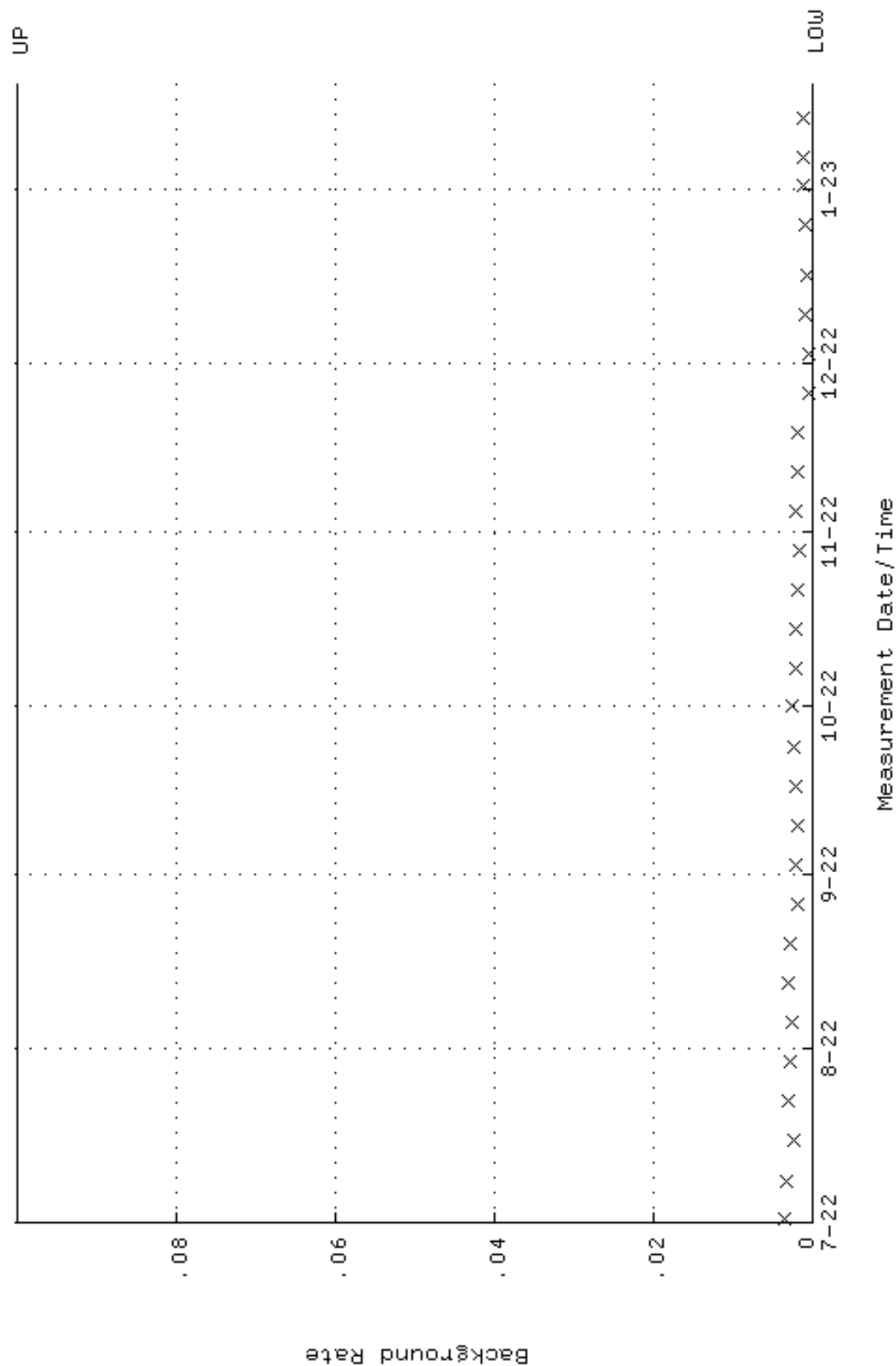
QA filename : DKA100:[ENV_ALPHA.QA.W]W205.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUL-2022 09:37:04 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



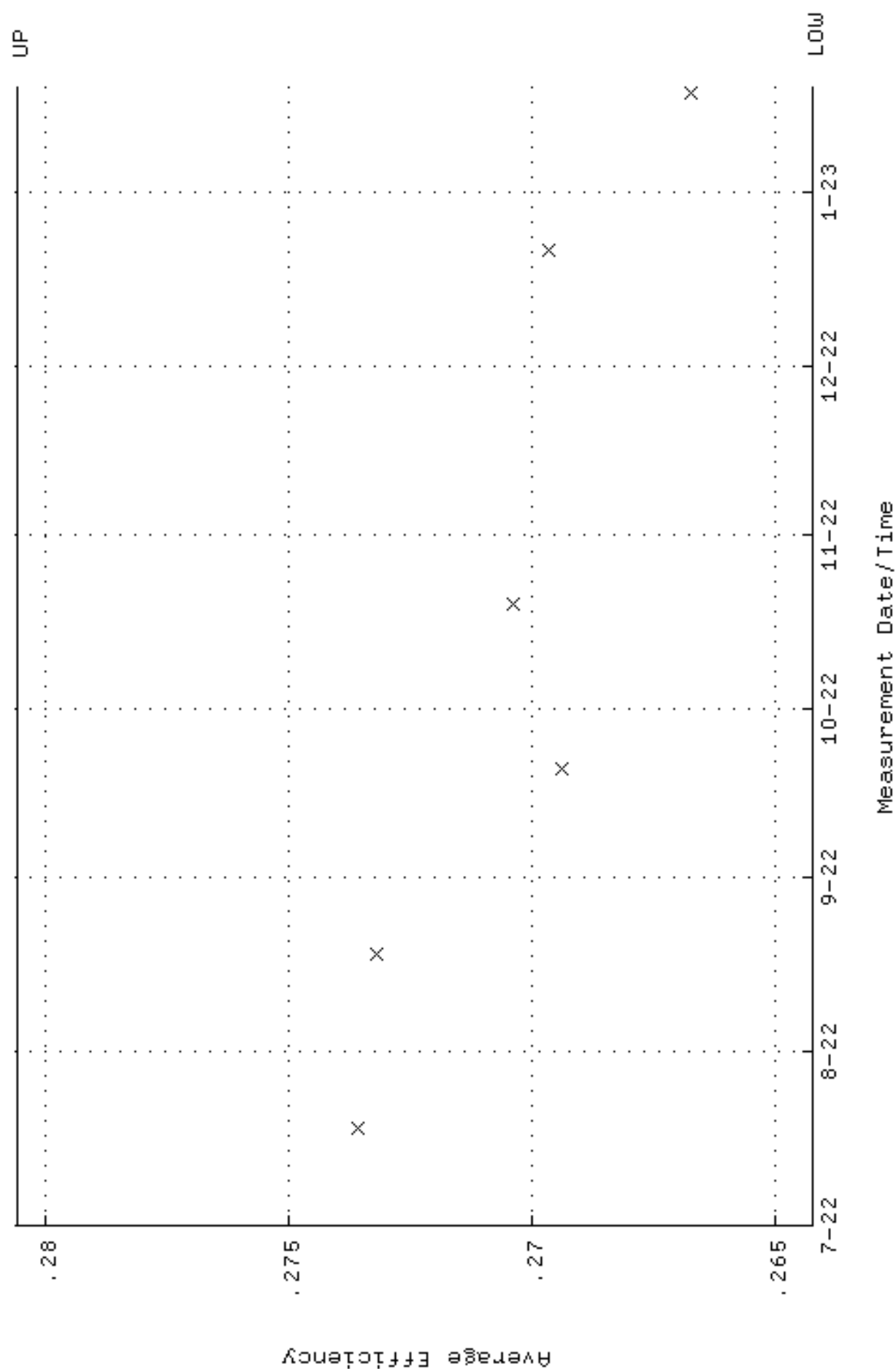
QA filename : DKA100:[ENV_ALPHA.QA.W]W205.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUL-2022 09:37:04 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



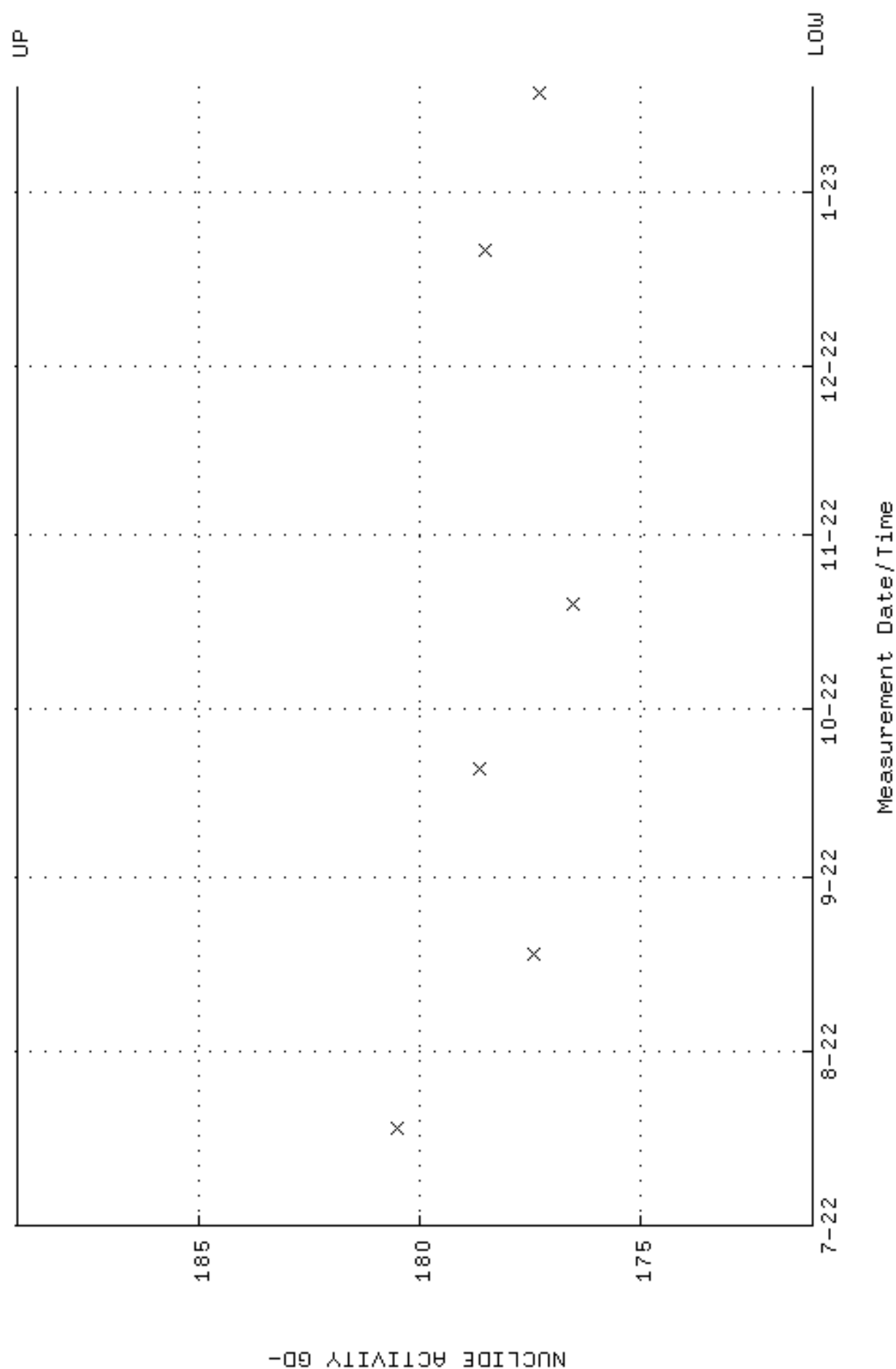
QA filename : DKA100:[ENV_ALPHA.QA.B]B205.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 15:03:01 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



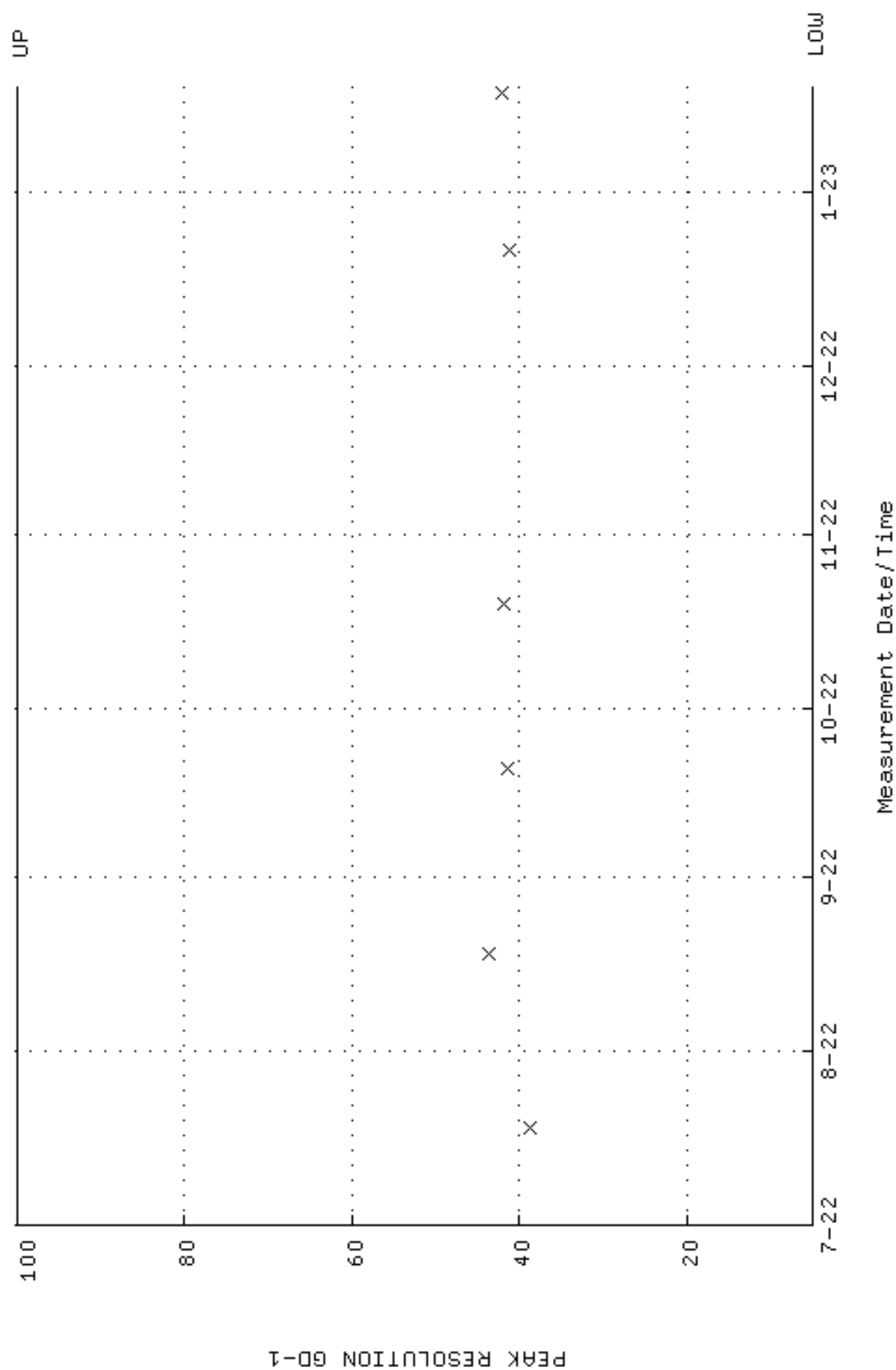
QA filename : DKA100:[ENV_ALPHA.QA.W]W207.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 18-JUL-2022 10:10:16 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.264230 through 0.280580



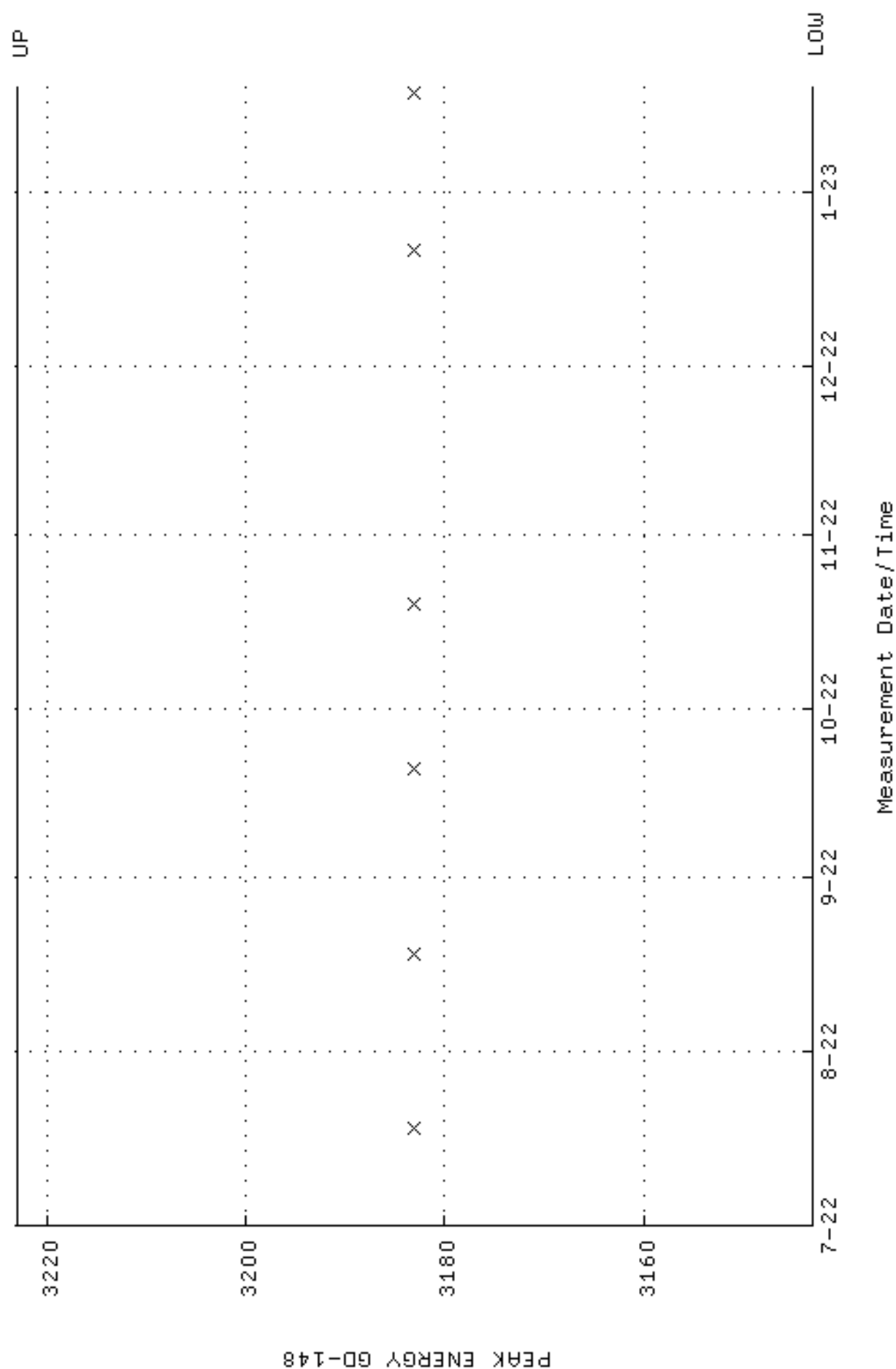
QA filename : DKA100:[ENV_ALPHA.QA.W]W207.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 18-JUL-2022 10:10:16 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 171.090 through 189.100



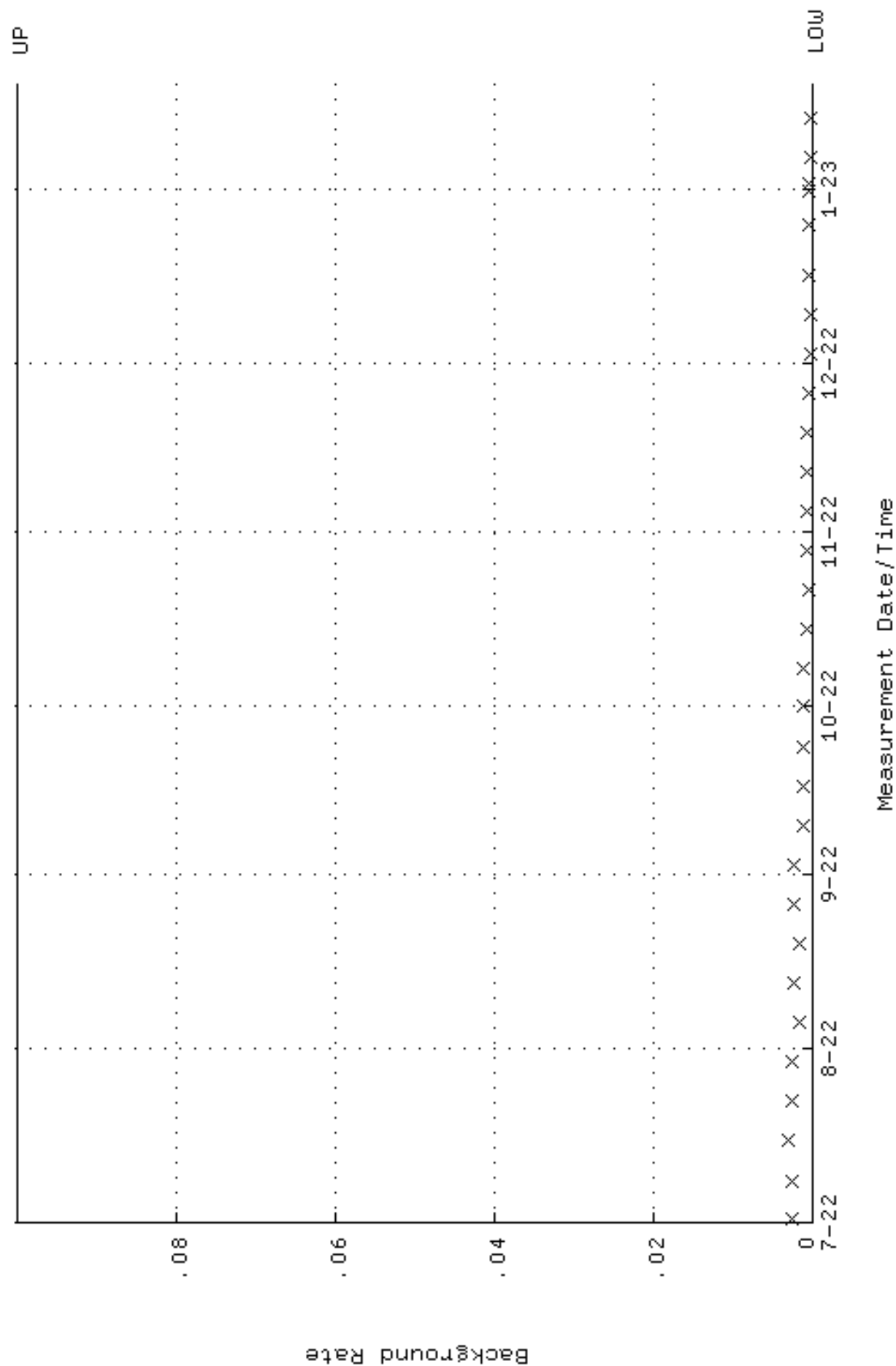
QA filename : DKA100:[ENV_ALPHA.QA.W]W207.QAF;3
 Parameter Name : PSFWM-GD148 (PEAK RESOLUTION GD-148)
 Start/End Dates : 18-JUL-2022 10:10:16 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 5.00000 through 100.000



QA filename : DKA100:[ENV_ALPHA.QA.W]W207.QAF;3
 Parameter Name : PSENERGY-GD148 (PEAK ENERGY GD-148)
 Start/End Dates : 18-JUL-2022 10:10:16 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 3143.00 through 3223.00



QA filename : DKA100:[ENV_ALPHA.QA.B]B207.QAF;4
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-JUL-2022 13:46:29 through 19-JAN-2023 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



RAD Standards Traceability

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

65338-278

Am-241 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Am-241
ACTIVITY (dps):	3.920 E4
HALF-LIFE:	4.322 E2 years
CALIBRATION DATE:	January 15, 2003 12:00 EST
TOTAL UNCERTAINTY*:	3.2%
SYSTEMATIC:	2.2%
RANDOM:	1.0%

*99% confidence level.

5.10649 grams 1M HCl solution.

Impurities: γ -impurities <0.1%
 α -impurities <0.1%

P O NUMBER 3213 RD, Item 1

SOURCE PREPARED BY: M. Taskaeva
M. Taskaeva, Radiochemist

Q A APPROVED:

UM [Signature] 1-16-03

RC-S-035-046a

Standard Logbook

Serial ID: 0533 **Open/Reference Date:** 15-JAN-03 **Aliquot :** 5.10649 g
Name: Americium-241 **Received:** 27-JAN-03 **Density :** Hand Calculated
Type: Source Material **Expires:** 05-FEB-20 **Logbook Num :** RC S 035 048
Employee: Angela Johnson **Lot Number :** 65338-278
Supplier: Analytics **Solvent :** 1 M HCL
Uncertainty : 1.25 percent
Description: 65338-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	39200 dps		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	0533
Prepared By:	Angela Johnson
Carrier Conc:	1 M HCL
Reference Date:	01/15/2003
Ampoule Mass (g):	5.10649 g
Uncertainty:	+/- 1.25 %
LogBook No:	RC S 035 048
Supplier:	Analytics

A Solution Material Info		
Isotope:	Americium-241	
Prepared By:	Angela Johnson	
Prep Date:	02/05/2003	
Verification Date:	07/08/2022	
Expiration Date:	07/08/2023	
Primary Code:	0533-A	
Dilution(mL):	100 mL	
Mass of Parent(g):	4.8225 g	
Density(g/mL):	1.0139	Balance ID:

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (5.10649 \text{ g} * 100 \text{ mL}) = 22211.9695 \text{ dpm/mL}$
$(4.8225 \text{ g}) * (39200 \text{ dps}) * (60 \text{ dpm/dps}) / (1.0139 \text{ g/mL}) / (5.10649 \text{ g} * 100 \text{ mL}) = 21907.2185 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/20/2003	Angela Johnson	1.0151	100	0533-B	222.38 dpm/mL	03/01/2006	03/01/2007
01/16/2015	Christina Kimball	.005081	500	0533-BB	.22263 dpm/mL	01/14/2016	01/14/2017
02/20/2003	Angela Johnson	.6819	250	0533-C	59.754 dpm/mL	02/20/2004	02/20/2005
05/04/2015	Tim Chandler	1.02	500	0533-CC	44.6907 dpm/mL	04/17/2017	04/17/2018
05/07/2003	Tim Chandler	.1245	100	0533-D	27.2745 dpm/mL	05/03/2004	05/03/2005
01/22/2016	Christina Kimball	.103	500	0533-DD	4.51289 dpm/mL	01/03/2022	01/03/2024
09/10/2004	Amanda Fehr	.6933	250	0533-E	60.753 dpm/mL	09/10/2005	09/10/2006
10/31/2016	Christina Kimball	.00508	500	0533-EE	.22259 dpm/mL	10/30/2017	10/30/2018

12/17/2004	Brenda Burke	.0093	100	0533-F	2.0374 dpm/mL	12/20/2004	12/20/2005
10/13/2017	Tim Chandler	1.0219	500	0533-FF	44.774 dpm/mL	10/01/2019	10/01/2020
12/21/2004	Brenda Burke	.009273	100	0533-G	2.0315 dpm/mL	12/07/2005	12/07/2006
11/13/2017	Christina Kimball	.00507	500	0533-GG	.2222 dpm/mL	11/09/2018	11/09/2019
04/28/2005	Brenda Burke	.1347	100	0533-H	29.4598 dpm/mL	04/27/2006	04/27/2007
01/23/2018	Tim Chandler	1.2536	100	0533-HH	274.6289 dpm/mL	01/23/2018	01/23/2019
10/19/2005	Mary Aders	.6948	250	0533-I	60.7831 dpm/mL	10/18/2006	10/18/2007
01/30/2020	Tim Chandler	1.0284	500	0533-II	45.0588 dpm/mL	01/18/2022	01/18/2023
05/08/2006	Julie Strock	.0711	100	0533-J	15.576 dpm/mL	05/10/2008	05/10/2009
07/08/2022	Matelon DeFreese	1.0349	500	0533-JJ	45.3435609 dpm/mL	07/18/2022	07/18/2023
05/11/2006	Brenda Burke	.00092601	100	0533-K	.20286 dpm/mL	08/02/2007	07/28/2007
11/15/2006	Tara Sides	.132	1000	0533-L	2.88586 dpm/mL	09/15/2015	09/15/2016
06/12/2007	Julie Strock	.000979	100	0533-M	.21448 dpm/mL	05/20/2009	05/20/2010
08/03/2007	Daniel Roy	.7042	250	0533-N	61.7083 dpm/ml	08/02/2008	08/02/2009
09/25/2008	Daniel Roy	1.4561	500	0533-O	63.7982 dpm/ml	09/07/2010	09/07/2011
09/29/2008	Tara Sides	.1004	100	0533-P	21.9948 dpm/mL	09/07/2010	09/07/2011
06/03/2009	Julie Strock	.0009751	100	0533-Q	.2136 dpm/mL	06/01/2010	06/01/2011
11/08/2010	Ashley Drochter	1.4675	500	0533-R	64.2977 dpm/mL	11/08/2010	11/08/2011
11/09/2010	Ashley Drochter	.7295	500	0533-S	31.9626 dpm/mL	10/31/2011	10/31/2012
01/03/2011	Christina Kimball	.097	100	0533-T	21.25 dpm/mL	01/03/2011	01/03/2012
01/05/2011	Christina Kimball	.1009	100	0533-U	22.10438 dpm/mL	12/18/2013	12/18/2014
05/23/2011	Christina Kimball	.001008999	100	0533-V	.2210438 dpm/mL	05/11/2012	05/11/2013
05/11/2012	Christina Kimball	.001016	100	0533-W	.222676 dpm/mL	05/01/2014	05/01/2015

06/13/2012	Ashley Drochter	.728	500	0533-X	31.8969 dpm/mL	06/02/2014	06/02/2015
01/23/2013	Salina Pizarro	2	500	1641	.1498555 dpm/mL	12/19/2013	12/01/2038
07/16/2013	Julie Strock	1	500	1641-A	.07492775 dpm/mL	07/16/2038	07/16/2039
03/17/2014	Christina Kimball	.1013	100	0533-Y	22.19201 dpm/mL	02/26/2019	02/26/2020
05/05/2014	Christina Kimball	.00101595	100	0533-Z	.222567 dpm/mL	05/05/2014	05/05/2015

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Am-243 Standard 0533-JJ

v1.2

Analyst	MXS2
Verification Prep Date	7/18/2022

Tracer Information	
Isotope	Cm-244
Serial Number	1216-N2
Amount of Std. (mL)	0.2
Expiration Date	4/7/2023

Standard Information	
Isotope	Am-243
Serial Number	0533-JJ
Isotope Half-life	7.3700E+03 Y
Reference Date	1/15/2003
Ref. Act. (dpm/mL)	45.3435609
Amount of Std. (mL)	0.2
Standard Prep Date	7/8/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	7/21/2022	3.880	43.07
2	7/23/2022	3.980	44.18
3	7/21/2022	3.790	42.07

Mean Value = 3.883 43.105
Stdev = 0.09504385 1.05498673

Certificate Value* = 4.0775 dpm/mL
Two sigma = 0.1901
10 % of Mean = 0.3883
Rule A (Pass/Fail) Pass
% Recovery 95.24%
Rule B (Pass/Fail) Pass
Expiration Date 7/18/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Am-243 standard 0533-JJ using 0.2 mL for each source. Each standard was combined with 0.2 mL of Cm-244 standard 1216-N2 and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. 0.1mL of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-243 were calculated by comparison to Cm-244 certified values.

7/25/22

CERTIFICATE OF CALIBRATION
Standard Reference Source

1752

101294

Am-243 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL1511998, Item 1 **Product Code:** 8243



This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
Am-243	2.692E+06	3.809E+04	0.5	1.8	3.7	09/01/2015

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities (other than decay products) < 0.1%.
5.10528 g 1M HCl solution, carrier free.

Source Prepared by: _____

Z. Dimitrova, Radiochemist

QC Approved: _____

J. S. Lehr, Spectroscopist

Date: 28 AUG 15

Standard Logbook

Serial ID: 1752 **Open/Reference Date:** 01-SEP-15 **Aliquot :** 5.10528 g
Name: Americium-243 **Received:** 01-SEP-15 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 18-SEP-25 **Logbook Num :** GL-CED-297-045
Employee: Gregory Ramsay **Lot Number :** 101294
Supplier: Eckert & Ziegler **Solvent :** 1M HCl
Uncertainty : 1.85 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-243	38090 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1752
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HCl
Reference Date:	09/01/2015
Ampoule Mass (g):	5.10528 g
Uncertainty:	+/- 1.85 %
LogBook No:	GL-CED-297-045
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Americium-243		
Prepared By:	Tim Chandler		
Prep Date:	11/23/2015		
Verification Date:	01/06/2017		
Expiration Date:	01/20/2022		
Primary Code:	1752-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0826 g		
Density(g/mL):	1.0282	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22752.4720 \text{ dpm/mL}$
$(5.0826 \text{ g}) * (38090 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0282 \text{ g/mL}) / (5.10528 \text{ g} * 100 \text{ mL}) = 22128.4498 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/23/2015	Tim Chandler	1.0432	500	1752-B	46.1688 dpm/mL	11/24/2015	11/23/2016
05/26/2016	Tim Chandler	1.072	500	1752-C	47.4434 dpm/mL	05/26/2016	05/26/2017
01/06/2017	Tim Chandler	2.1043	1000	1752-D	46.5649 dpm/mL	12/20/2017	12/20/2018
05/30/2018	Tim Chandler	2.3853	1000	1752-E	52.783 dpm/mL	05/21/2019	05/21/2020
08/05/2019	Tim Chandler	2.2432	1000	1752-F	49.6385 dpm/mL	08/03/2020	08/03/2021
08/12/2020	Tim Chandler	2.2247	1000	1752-G	49.2292 dpm/mL	08/12/2020	08/12/2021
06/18/2021	Tim Chandler	2.2608	1000	1752-H	50.028 dpm/mL	06/18/2021	06/18/2022
01/20/2022	Matelon DeFreese	2.0841	1000	1752-I	46.1179022 dpm/mL	01/21/2022	01/21/2023
09/06/2022	Matelon DeFreese	2.1013	1000	1752-J	46.4985116 dpm/mL	09/06/2022	09/06/2023

Verification for Am-243 Standard 1752-J

v1.2

Analyst	MXS2
Verification Prep Date	9/6/2022

Tracer Information	
Isotope	Am-241
Serial Number	0533-JJ
Amount of Std. (mL)	0.2
Expiration Date	7/18/2023

Standard Information	
Isotope	Am-243
Serial Number	1752-J
Isotope Half-life	7.3700E+03 Y
Reference Date	9/1/2015
Ref. Act. (dpm/mL)	46.4985116
Amount of Std. (mL)	0.2
Standard Prep Date	9/6/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	9/7/2022	4.280	47.51
2	9/8/2022	4.310	47.84
3	9/8/2022	4.200	46.62

Mean Value = 4.263 47.323
Stdev = 0.056862407 0.631172718

Certificate Value* = 4.1863 pCi
Two sigma = 0.1137
10 % of Mean = 0.4263
Rule A (Pass/Fail) Pass
% Recovery 101.84%
Rule B (Pass/Fail) Pass
Expiration Date 9/6/2023

dpm/mL
46.4678
1.2623
4.7323
Pass
101.84%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Am-243 standard 1752-J using 0.2 mL for each source. Each standard was combined with 0.2 mL of Am-241 standard 0533-JJ and was diluted in a centrifuge tube containing 20 mL 3M HCl, diluted to 40 mL with DI water. 0.1 mL of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Americium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Am-243 were calculated by comparison to Am-241 certified values.

8-21/22



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010

Fax 661•257•8303

1521

CERTIFICATE OF CALIBRATION GAMMA STANDARD SOLUTION

Radionuclide:	Pb-210	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	22.3 ± 0.2 years	P.O. No.:	936803 RD	
Catalog No.:	7210	Reference Date:	15-Feb-11	12:00 PST
Source No.:	1476-99	Contained Radioactivity:	4.973 μCi	184.0 kBq

Physical Description:

A. Mass of solution:	5.21292 g in 5 mL flame-sealed ampoule
B. Chemical form:	Pb(NO ₃) ₂ in 1M HNO ₃
C. Carrier content:	10 μg Pb/mL of solution
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.9540 μCi/g, 35.30 kBq/g

Method of Calibration:

This source was prepared from a weighed aliquot of solution whose activity in μCi/g was determined using gamma ray spectrometry.

Peak energy used for integration:	46.5 keV
Branching ratio used:	0.0418 gammas per decay

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5 %
B. Type B (systematic) uncertainty:	± 7.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 7.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.



Quality Control

11-Jan-11
Date

EZIP Ref. No.: 1476-99

ISO 9001 CERTIFIED

Medical Imaging Laboratory

Industrial Gauging Laboratory

Standard Logbook

Serial ID: 1521 **Open/Reference Date:** 15-FEB-11 **Aliquot :** 5.21292 g
Name: Lead-210 **Received:** 14-JAN-11 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 02-MAR-13 **Logbook Num :** RC-S-060-066
Employee: Gregory Ramsay **Lot Number :** 1426-99
Supplier: Eckert & Ziegler **Solvent :** 1M HNO₃
 Uncertainty : 7 percent
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Lead-210	35.3 kBq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1521
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	02/15/2011
Ampoule Mass (g):	5.21292 g
Uncertainty:	+/- 7 %
LogBook No:	RC-S-060-066
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Lead-210		
Prepared By:	Bethany Fiem		
Prep Date:	03/22/2011		
Verification Date:	12/03/2020		
Expiration Date:	12/23/2021		
Primary Code:	1521-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.0705 g		
Density(g/mL):	1.0272	Balance ID:	1113021018

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 107393.1900 \text{ dpm/mL}$
$(5.0705 \text{ g}) * (35.3 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0272 \text{ g/mL}) / (100 \text{ mL}) = 104549.4451 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/07/2013	Ashley Drochter	.5177	100	1521-B	541.2525 dpm/mL	10/29/2013	10/29/2014
10/29/2013	Tim Chandler	5.1002	100	1521-C	5332.2308 dpm/mL	08/09/2018	08/09/2019
02/01/2019	Jennie Kill-Bowden	5.0359	100	1521-D	5265.0055 dpm/mL	11/29/2022	11/29/2023
06/05/2018	Tim Chandler	.6059	200	1867-A		06/06/2018	06/05/2019
06/14/2018	Tim Chandler	.6646	200	1867-B		06/15/2018	06/14/2019
06/14/2018	Tim Chandler	.6646	200	1868-A		06/14/2018	06/14/2019
06/13/2019	Tim Chandler	.6984	200	1907-A		06/15/2021	06/15/2022
06/13/2019	Tim Chandler	.6984	200	1907-A1		06/15/2021	06/15/2022
11/06/2019	Tim Chandler	15.0553	100	1920-A		11/07/2019	11/07/2020
12/14/2021	Matelon DeFreese	.6276	200	2012-A		11/23/2022	11/05/2023

Verification for Po-210 Standard 2012-A

v1.2

Analyst	MXS2
Verification Prep Date	11/23/2022

Tracer Information	
Isotope	Po-209
Serial Number	1720-D
Amount of Std. (mL)	0.2
Expiration Date	3/7/2023

Standard Information	
Isotope	Po-210
Serial Number	2012-A
Isotope Half-life	138.3800 D
Reference Date	12/14/2021
Ref. Act. (dpm/mL)	233.932217
Amount of Std. (mL)	0.2
Standard Prep Date	12/14/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	11/27/2022	3.960	43.96
2	11/27/2022	3.910	43.40
3	11/27/2022	3.880	43.07

Mean Value = 3.917 43.475
Stdev = 0.040414519 0.448601159

Certificate Value* = 3.7621 pCi
Two sigma = 0.0808
10 % of Mean = 0.3917
Rule A (Pass/Fail) Pass
% Recovery 104.11%
Rule B (Pass/Fail) Pass
Expiration Date 11/5/2023

dpm/mL
41.7597
0.8972
4.3475
Pass
104.11%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-210 standard 2012-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-209 standard 1720-D and was diluted in a centrifuge tube containing 15 mL of 0.05M HNO₃. Precipitated by adding 0.1mL of 30% H₂O₂, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-210 were calculated by comparison to Po-209 certified values.

Signature

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

82308-278

Pu-239 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: 7340 RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u_A	u_B	U	
Pu-239	8.803E+06	3.758E+04	0.1	0.9	1.8	05/07/2010

***Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities < 0.1 %, α -impurities < 0.1 %, Am-241 330.1 Bq. 5.56111 g 3M HNO₃ solution, carrier free.

Source Prepared by: W. Mao

W. Mao, Radiochemist

QA Approved: J. D. McCorvey

J. D. McCorvey, QA Manager Alternate

Date: 5/10/10



Standard Logbook

Serial ID: 1472 **Open/Reference Date:** 07-MAY-10 **Aliquot :** 5.56111 g
Name: Plutonium-239 **Received:** 12-MAY-10 **Density :** Hand Calculated
Type: Source Material **Expires:** 03-JUN-30 **Logbook Num :** RC-S-060-019
Employee: Ashley Drochter **Lot Number :** 82308-278
Supplier: Eckert & Zeigler Analytics **Solvent :** 3M HNO₃
Uncertainty : .9 PERCENT
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-239	37580 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1472
Prepared By:	Ashley Drochter
Carrier Conc:	3M HNO3
Reference Date:	05/07/2010
Ampoule Mass (g):	5.56111 g
Uncertainty:	+/- .9 %
LogBook No:	RC-S-060-019
Supplier:	Eckert & Zeigler Analytics

A Solution Material Info			
Isotope:	Plutonium-239		
Prepared By:	Julie Strock		
Prep Date:	10/20/2020		
Verification Date:	08/17/2021		
Expiration Date:	08/17/2022		
Primary Code:	1472-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.5071 g		
Density(g/mL):	1.1056	Balance ID:	BIOFA-B952846238

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.56111 \text{ g} * 100 \text{ mL}) = 22329.0118 \text{ dpm/mL}$
$(5.5071 \text{ g}) * (37580 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.1056 \text{ g/mL}) / (5.56111 \text{ g} * 100 \text{ mL}) = 20195.4985 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
10/20/2020	Julie Strock	.0117	1000	1472-B	.2363 dpm/mL	10/14/2021	10/14/2022
08/17/2021	Tim Chandler	1.1318	500	1472-C	45.7145 dpm/mL	08/11/2022	08/11/2023
04/07/2022	Christina Kimball	.01	1000	1472-D	.20195 dpm/mL	04/07/2022	04/07/2023
04/15/2022	Christina Kimball	.011283	1000	1472-E	.2279 dpm/mL	04/15/2022	04/15/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-239 Standard 1472-C

v1.2

Analyst	MXS2
Verification Prep Date	8/11/2022

Tracer Information	
Isotope	Pu-242
Serial Number	2021-A
Amount of Std. (mL)	0.2
Expiration Date	7/19/2023

Standard Information	
Isotope	Pu-239
Serial Number	1472-C
Isotope Half-life	2.4131E+04 Y
Reference Date	5/7/2010
Ref. Act. (dpm/mL)	45.7145
Amount of Std. (mL)	0.2
Standard Prep Date	8/17/2021

Std #	Count Date	Activity pCi	Standard dpm/mL
1	8/11/2022	3.960	43.96
2	8/11/2022	4.190	46.51
3	8/15/2022	4.220	46.84

Certificate Value* =	pCi	dpm/mL
Two sigma =	4.1170	45.6984
10 % of Mean =	0.2845	3.1578
Rule A (Pass/Fail)	0.4123	4.5769
% Recovery	Pass	Pass
Rule B (Pass/Fail)	100.15%	100.15%
Expiration Date	Pass	Pass
	8/11/2023	

Mean Value = 4.123 45.769
Stdev = 0.142243922 1.578907534

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-239 standard 1472-C using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-242 standard 2021-A and was diluted in a centrifuge tube containing 20 mL of 0.1M HCl, diluted to 40 mL with DI water. 0.1 mL of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-239 were calculated by comparison to Pu-242 certified values.

8/16/22



National Institute of Standards & Technology

Certificate

2044

Standard Reference Material[®] 4334j

Received
8-18-22

Plutonium-242 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}$.

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterwiesing, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

Steven J. Choquette, Director
Office of Reference Materials

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq•g⁻¹(a)
Relative expanded uncertainty ($k = 2$)	0.51 %^(b)

(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

(b) The uncertainties on certified values are expanded uncertainties, $U = k u_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

GL-CEA-297-3366

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ^{-1(a,b,c,d)}
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ^{-1(a,d)}
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π α liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

(a) The stated uncertainty is two times the standard uncertainty [5].

(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

- 0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,
- 0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and
- 0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclidic impurities follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ⁻⁶ (3)	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ⁻⁵ (3)	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

- 1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,
- 6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,
- 5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,
- 4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV
- 4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV
- 6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and
- 3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

(f) The stated uncertainty is the standard uncertainty. See reference 6.

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ²⁴² Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	²⁴² Pu decay corrections for half-life uncertainty of 0.22 %.	B	< 10 ⁻¹⁰
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty (k = 2)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

Standard Logbook

Serial ID: 2044 **Open/Reference Date:** 09-AUG-17 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 18-AUG-22 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 22-AUG-35 **Logbook Num :** GL-CED-297-336
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
Uncertainty : .255 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2044
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO3
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-336
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	10/19/2022		
Verification Date:	10/19/2022		
Expiration Date:	10/19/2023		
Primary Code:	2044-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.3655 g		
Density(g/mL):	1.0314	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.3655 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 41.9797 \text{ dpm/mL}$
$(5.3655 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0314 \text{ g/mL}) / (200 \text{ mL}) = 40.7016 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
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GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2044-A

v1.2

Analyst	MXS2
Verification Prep Date	10/19/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.2
Expiration Date	8/11/2023

Standard Information	
Isotope	Pu-242
Serial Number	2044-A
Isotope Half-life	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	41.9797
Amount of Std. (mL)	0.2
Standard Prep Date	10/19/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	10/23/2022	3.830	42.51
2	10/24/2022	4.020	44.62
3	10/23/2022	3.850	42.74

Mean Value = 3.900 43.290
Stdev = 0.104403065 1.158874022

Certificate Value* = 3.7819 pCi
Two sigma = 0.2088
10 % of Mean = 0.3900
Rule A (Pass/Fail) Pass
% Recovery 103.12%
Rule B (Pass/Fail) Pass
Expiration Date 10/19/2023

dpm/mL
41.9793
2.3177
4.3290
Pass
103.12%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2044-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. Added 0.1mL of neodymium carrier and 3-4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

Signature



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661-309-1010

Fax 661-257-8303

1720

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Po-209	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	102 ± 5 years	P.O. No.:	GEL1408569	
Catalog No.:	7209	Reference Date:	1-Oct-14	12:00 PST
Source No.:	1760-53-1	Contained Radioactivity:	0.05281 µCi	1.954 kBq

Physical Description:

A. Mass of solution:	5.21650 g in 5 mL flame-sealed ampoule
B. Chemical form:	Po(NO ₃) ₄ in 1M HNO ₃
C. Carrier content:	None
D. Density:	1.0318 g/mL @ 20°C

Radioimpurities:

None detected

Radionuclide Concentration: 0.01012 µCi/g, 0.3744 kBq/g

Method of Calibration:

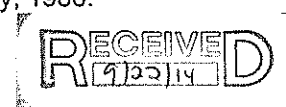
This source was prepared from a weighed aliquot of solution whose activity in µCi/g was determined using a liquid scintillation counter.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.4 %
D. Total uncertainty at the 99% confidence level:	± 3.1 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.



Daniel James Van Dorem
Quality Control

11-Sep-14
Date

EZIP Ref. No.: 1760-53

ISO 9001 CERTIFIED

GL-CED-297-013

Standard Logbook

Serial ID: 1720 **Open/Reference Date:** 01-OCT-14 **Aliquot :** 5.2165 g
Name: Polonium-209 **Received:** 22-SEP-14 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 22-SEP-35 **Logbook Num :** GL-CED-297-013
Employee: Gregory Ramsay **Lot Number :** 1760-53-1
Supplier: Eckert & Ziegler **Solvent :** 1M HNO3
Uncertainty : 1.211 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Polonium-209	1.954 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1720
Prepared By:	Gregory Ramsay
Carrier Conc:	1M HNO3
Reference Date:	10/01/2014
Ampoule Mass (g):	5.2165 g
Uncertainty:	+/- 1.211 %
LogBook No:	GL-CED-297-013
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Polonium-209		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2016		
Verification Date:	07/12/2017		
Expiration Date:	12/06/2019		
Primary Code:	1720-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1896 g		
Density(g/mL):	1.0290	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1166.3543 \text{ dpm/mL}$
$(5.1896 \text{ g}) * (1.954 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0290 \text{ g/mL}) / (5.2165 \text{ g} * 100 \text{ mL}) = 1133.4833 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
12/06/2018	Tim Chandler	14.42	200	1720-B	81.7241 dpm/mL	12/07/2018	12/07/2019
11/26/2019	Tim Chandler	14.5183	200	1720-C	82.2813 dpm/mL	11/11/2021	11/11/2022
11/26/2019	Tim Chandler	14.5183	200	1720-C1	82.2813 dpm/mL	11/11/2021	11/11/2022
02/21/2022	Matelon DeFreese	14.5109	200	1720-D	82.239314 dpm/mL	03/07/2022	03/07/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Po-209 Standard 1720-D

v1.2

Analyst	MXS2
Verification Prep Date	3/7/2022

Tracer Information	
Isotope	Po-210
Serial Number	2012-A
Amount of Std. (mL)	0.2
Expiration Date	12/15/2022

Standard Information	
Isotope	Po-209
Serial Number	1720-D
Isotope Half-life	125.3000 Y
Reference Date	10/1/2014
Ref. Act. (dpm/mL)	82.239314
Amount of Std. (mL)	0.2
Standard Prep Date	2/21/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	3/7/2022	7.180	79.70
2	3/7/2022	7.480	83.03
3	3/7/2022	7.700	85.47

Mean Value = 7.453 82.732
Stdev = 0.261023626 2.897362249

Certificate Value* = 7.1106 pCi
Two sigma = 0.5220
10 % of Mean = 0.7453
Rule A (Pass/Fail) Pass
% Recovery 104.82%
Rule B (Pass/Fail) Pass
Expiration Date 3/7/2023

dpm/mL
78.9274
5.7947
8.2732
Pass
104.82%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Po-209 standard 1720-D using 0.2 mL for each source. Each standard was combined with 0.2 mL of Po-210 standard 2012-A and was diluted in a centrifuge tube containing 15mL of 0.05M HNO3. Precipitated by adding 0.1mL of 30% H2O2, 0.150 mL of 1000mg/L bismuth carrier, 0.2 mL of ammonium hydroxide, and 0.75mL of 3.2M ammonium phosphate. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Po-209 were calculated by comparison to Po-210 certified values.

3/15/22



Eckert & Ziegler

Analytics

1845

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION

Standard Reference Source

Received: 12-1-17 12:00

SRS Number: 108018

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8229

Customer: GEL Laboratories LLC

P.O. Number: GEL1718798, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 29-November-2017 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Th-229	2.897E+06	1.999E+04	0.5	1.5	3.1	4π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 108018

Comments:

5.21561 g of 0.5 M HNO₃ solution, carrier free.

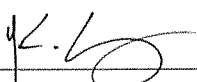
Impurities:

γ-impurities (other than decay products) < 0.1%

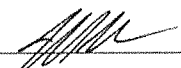
α-impurities: Th-228 6.6E+00 Bq, Th-230 1.2E+02 Bq, Th-232 8.0E+00 Bq

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Hardley, Radiochemist

QC Approved by:


J. Lahr, Spectroscopist

Date: 27-Nov-17

Standard Logbook

Serial ID: 1845 **Open/Reference Date:** 29-NOV-17 **Aliquot :** 5.21561 g
Name: Thorium-229 **Received:** 01-DEC-17 **Density :** Hand Calculated
Type: Source Material **Expires:** 01-DEC-18 **Logbook Num :** GL-CED-297-138
Employee: Tim Chandler **Lot Number :** 108018
Supplier: Eckert & Ziegler **Solvent :** 0.5M HNO₃
 Uncertainty : 1.55 percent
Description: 1 ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-229	19990 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1845
Prepared By:	Tim Chandler
Carrier Conc:	0.5M HNO3
Reference Date:	11/29/2017
Ampoule Mass (g):	5.21561 g
Uncertainty:	+/- 1.55 %
LogBook No:	GL-CED-297-138
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-229		
Prepared By:	Tim Chandler		
Prep Date:	06/08/2018		
Verification Date:	07/07/2020		
Expiration Date:	11/10/2022		
Primary Code:	1845-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.1906 g		
Density(g/mL):	1.0291	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11936.4861 \text{ dpm/mL}$
$(5.1906 \text{ g}) * (19990 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0291 \text{ g/mL}) / (5.21561 \text{ g} * 100 \text{ mL}) = 11598.7987 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
06/08/2018	Tim Chandler	2.0385	1000	1845-B	23.6442 dpm/mL	06/01/2020	06/01/2021
07/10/2019	Tim Chandler	4.0198	1000	1845-C	46.62485 dpm/mL	07/07/2020	07/07/2021
10/26/2020	Tim Chandler	4.0184	1000	1845-D	46.6086 dpm/mL	10/27/2020	10/27/2021
04/23/2021	Tim Chandler	4.2911	1000	1845-E	49.7716 dpm/mL	04/26/2021	04/26/2022
11/10/2021	Matelon DeFreese	4.211	1000	1845-F	48.8425 dpm/mL	11/10/2021	11/10/2022
05/11/2022	Matelon DeFreese	4.1951	1000	1845-G	48.6581 dpm/mL	05/12/2022	05/11/2023
01/11/2023	Matelon DeFreese	4.1664	1000	1845-H	48.3252 dpm/mL	01/11/2023	01/11/2024

Verification for Th-229 Standard 1845-G

v1.2

Analyst	MXS2
Verification Prep Date	5/12/2022

Tracer Information	
Isotope	Th-232
Serial Number	1513-C
Amount of Std. (mL)	0.1
Expiration Date	12/22/2022

Standard Information	
Isotope	Th-229
Serial Number	1845-G
Isotope Half-life	7.3400E+03 Y
Reference Date	11/29/2017
Ref. Act. (dpm/mL)	48.6581
Amount of Std. (mL)	0.1
Standard Prep Date	5/11/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	5/12/2022	2.190	48.62
2	5/12/2022	2.070	45.95
3	5/12/2022	2.120	47.06

Mean Value = 2.127 47.212
Stdev = 0.060277138 1.338152458

Certificate Value* = 2.1909 pCi
Two sigma = 0.1206
10 % of Mean = 0.2127
Rule A (Pass/Fail) Pass
% Recovery 97.07%
Rule B (Pass/Fail) Pass
Expiration Date 5/12/2023
dpm/mL
48.6377
2.6763
4.7212
Pass
97.07%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-229 standard 1845-G using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-232 standard 1513-C and was diluted in a centrifuge tube containing 10 mL 8M HNO₃. The standard was isolated following the standard operating procedure for the separation of thorium (GL-RAD-A-038). After dissolving the sources in 5 mL of 2M HCl, the sources were diluted to 40 mL with deionized water. 100 micrograms of neodymium carrier and five mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-229 were calculated by comparison to Th-232 certified values.

5/16/22

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Th-232	Customer:	GEL LABORATORIES, LLC		
Half-life:	(1.405 ± 0.006)E+10 years	P.O. No.:	7347RD		
Catalog No.:	7232	Reference Date:	1-Nov-10	12:00	PST
Source No.:	1451-62	Contained Radioactivity:	50.26	nCi	1860 Bq
		(Th-232 only)			

Physical Description:

A. Mass of solution:	5.73256 g in 5 mL flame-sealed ampoule
B. Chemical form:	Th(NO ₃) ₄ in H ₂ O
C. Carrier content:	None
D. Density:	1.15 g/mL @ 20°C

Radioimpurities:

Not determined

Radionuclide Concentration: 8.767 nCi/g, 324.4 Bq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.


Quality Control

15-OCT-10
Date

EZIP Ref. No.: 1451-62

RC-S-060-058

ISO 9001 CERTIFIED

Standard Logbook

Serial ID: 1513 **Open/Reference Date:** 01-NOV-10 **Aliquot :** 5.73256 g
Name: Thorium-232 **Received:** 21-OCT-10 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 30-NOV-11 **Logbook Num :** RC-S-060-058
Employee: Gregory Ramsay **Verified:** 28-APR-11 **Lot Number :** 1451-62
Supplier: Eckert & Ziegler **Solvent :** DI water
Uncertainty : 1.172 PERCENT

Description: in water
Comments: None

Analyte	Concentration	Analyte	Concentration
Thorium-232	324.4 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1513
Prepared By:	Gregory Ramsay
Carrier Conc:	DI water
Reference Date:	11/01/2010
Ampoule Mass (g):	5.73256 g
Uncertainty:	+/- 1.172 %
LogBook No:	RC-S-060-058
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Thorium-232		
Prepared By:	Christina Kimball		
Prep Date:	04/19/2011		
Verification Date:	12/27/2022		
Expiration Date:	12/27/2023		
Primary Code:	1513-A		
Dilution(mL):	250 mL		
Mass of Parent(g):	5.672 g		
Density(g/mL):	1.0020	Balance ID:	60108592

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (250 \text{ mL}) = 441.5992 \text{ dpm/mL}$
$(5.672 \text{ g}) * (324.4 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0020 \text{ g/mL}) / (250 \text{ mL}) = 440.7354 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
04/19/2011	Christina Kimball	5.0665	100	1513-B	22.3299 dpm/mL	04/11/2013	04/11/2014
02/26/2014	Matelon DeFreese	100.0316	1000	1513-C	44.08747 dpm/mL	12/14/2022	12/14/2023
04/18/2014	Christina Kimball	5.0477	100	1513-D	22.247 dpm/mL	06/28/2022	06/28/2023
01/04/2016	Christina Kimball	.2487	100	1513-E	1.096117 dpm/mL	02/11/2020	02/11/2021
08/01/2016	Christina Kimball	2.053	250	1513-F	3.61932 dpm/mL	07/21/2022	07/21/2023
02/21/2020	Christina Kimball	.248	100	1513-G	1.093 dpm/mL	02/23/2022	02/23/2023
11/11/2022	Christina Kimball	.3	100	1513-H	1.3222 dpm/mL	11/14/2022	11/14/2023
12/13/2022	Christina Kimball	.23	100	1513-I	1.0137 dpm/mL	12/27/2022	12/27/2023

Verification for Th-232 Standard 1513-C

v1.2

Analyst	MXS2
Verification Prep Date	12/14/2022

Tracer Information	
Isotope	Th-229
Serial Number	1845-G
Amount of Std. (mL)	0.1
Expiration Date	3/11/2023

Standard Information	
Isotope	Th-232
Serial Number	1513-C
Isotope Half-life	1.4050E+10 Y
Reference Date	11/1/2010
Ref. Act. (dpm/mL)	44.08747
Amount of Std. (mL)	0.1
Standard Prep Date	2/26/2014

Std #	Count Date	Activity pCi	Standard dpm/mL
1	12/14/2022	1.890	41.96
2	12/14/2022	1.880	41.74
3	12/14/2022	2.010	44.62

Mean Value = 1.927 42.772

Stdev = 0.072341781 1.605987547

Certificate Value* = 1.9859 pCi
 Two sigma = 0.1447
 10 % of Mean = 0.1927
 Rule A (Pass/Fail) Pass
 % Recovery 97.02%
 Rule B (Pass/Fail) Pass
 Expiration Date 12/14/2023

dpm/mL
 44.0875
 3.2120
 4.2772
 Pass
 97.02%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Th-232 standard 1513-C using 0.1 mL for each source. Each standard was combined with 0.1 mL of Th-229 standard 1845-G and was diluted in a centrifuge tube containing 4 mL 2M HCl, diluted to 40 mL with DI water. 0.1 mL of neodymium carrier and 5 mL of 48% HF was added to precipitate neodymium (and Thorium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Th-232 were calculated by comparison to Th-229 certified values.

12/15/22



Eckert & Ziegler

Analytics

1564

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

85621-278

5 mL Liquid in Flame Sealed Vial

Customer: General Engineering Labs/Charleston, SC
P.O. No.: 936814RD, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
U-232	2.517E+04	3.393E+04	0.5	2.4	4.9	09/12/2011

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

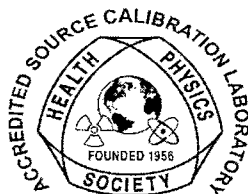
Impurities: γ -impurities (other than decay products) < 0.1 %, U-233 < 1.20E2 Bq, Am-241 < 5.8E1 Bq. 5.06048 grams 2M HNO₃ solution.

Source Prepared by: M. I. Taskaeva
M. I. Taskaeva, Radiochemist

QA Approved: J. D. McCorvey
J. D. McCorvey, QA Manager Alternate

Date: 9/12/11

RECEIVED
9/14/11
AM



Standard Logbook

Serial ID: 1564 **Open/Reference Date:** 12-SEP-11 **Aliquot :** 5.06048 g
Name: Uranium-232 **Received:** 14-SEP-11 **Density :** Hand Calculated
Type: Source Material **Expires:** 26-SEP-14 **Logbook Num :** RC-S-060-109
Employee: Ashley Drochter **Lot Number :** 85621-278
Supplier: Eckert & Ziegler **Solvent :** 2M HNO3
 Uncertainty : 2.45 PERCENT

Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-232	33930 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1564
Prepared By:	Ashley Drochter
Carrier Conc:	2M HNO3
Reference Date:	09/12/2011
Ampoule Mass (g):	5.06048 g
Uncertainty:	+/- 2.45 %
LogBook No:	RC-S-060-109
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-232		
Prepared By:	Ashley Drochter		
Prep Date:	11/15/2012		
Verification Date:	12/28/2022		
Expiration Date:	12/28/2023		
Primary Code:	1564-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9067 g		
Density(g/mL):	1.0615	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.06048 \text{ g} * 100 \text{ mL}) = 19739.3525 \text{ dpm/mL}$
$(4.9067 \text{ g}) * (33930 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0615 \text{ g/mL}) / (5.06048 \text{ g} * 100 \text{ mL}) = 18595.7160 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
11/16/2012	Ashley Drochter	2.6179	1000	1564-B	48.6817 dpm/mL	11/13/2013	11/13/2014
07/26/2021	Christina Kimball	.635	500	1564-BB	23.6166 dpm/mL	07/21/2022	07/21/2023
07/26/2021	Christina Kimball	.635	500	1564-BB Spike	23.6166 dpm/mL	07/21/2022	07/21/2023
01/15/2013	Christina Kimball	.265	250	1564-C	19.7115 dpm/mL	01/13/2014	01/13/2015
12/14/2021	Tim Chandler	2.6412	1000	1564-CC	49.115 dpm/mL	12/15/2021	12/15/2022
02/18/2013	Christina Kimball	.116	500	1564-D	4.31421 dpm/mL	02/16/2015	02/13/2016
04/13/2022	Matelon DeFreese	2.7103	1000	1564-DD	50.4 dpm/mL	04/13/2022	04/13/2023
01/02/2014	Gregory Ramsay	2.6936	1000	1564-E	50.08942 dpm/mL	12/10/2014	12/10/2015

09/21/2022	Tim Chandler	2.6897	1000	1564-EE	50.0169 dpm/mL	09/21/2022	09/21/2023
03/17/2014	Christina Kimball	.266	250	1564-F	19.78584 dpm/mL	03/25/2015	03/25/2016
12/27/2022	Christina Kimball	.61	500	1564-FF	22.6868 dpm/mL	12/28/2022	12/28/2023
12/27/2022	Christina Kimball	.61	500	1564-FF Spike	22.6868 dpm/mL	12/28/2022	12/28/2023
12/10/2014	Tim Chandler	2.6312	1000	1564-G	48.929 dpm/mL	12/10/2014	12/10/2015
01/19/2023	Matelon DeFreese	2.689	1000	1564-GG	50.0039 dpm/mL	01/20/2023	01/20/2024
07/20/2015	Christina Kimball	.266	250	1564-H	19.78584 dpm/mL	07/25/2016	07/25/2017
11/23/2015	Tim Chandler	2.6117	1000	1564-I	48.5664 dpm/mL	11/23/2015	11/23/2016
01/05/2016	Christina Kimball	.119	500	1564-J	4.4258 dpm/mL	12/27/2017	12/27/2018
01/05/2016	Christina Kimball	.119	500	1564-J Spike	4.4258 dpm/mL	12/27/2017	12/27/2018
09/20/2016	Tim Chandler	2.6389	1000	1564-K	49.0722 dpm/mL	09/18/2017	09/18/2018
12/20/2016	Christina Kimball	.276	250	1564-L	20.52974 dpm/mL	12/21/2017	12/21/2018
06/20/2017	Tim Chandler	2.6611	1000	1564-M	49.4851 dpm/mL	06/19/2018	06/19/2019
01/18/2018	Tim Chandler	2.6367	1000	1564-N	49.0313 dpm/mL	04/25/2018	04/25/2019
04/25/2018	Tim Chandler	2.6505	1000	1564-O	49.2879 dpm/mL	04/25/2018	04/25/2019
08/06/2018	Christina Kimball	.106	500	1564-P	3.9423 dpm/mL	12/19/2019	12/19/2020
08/06/2018	Christina Kimball	.106	500	1564-P Spike	3.9423 dpm/mL	12/19/2019	12/19/2020
12/13/2018	Tim Chandler	2.6502	1000	1564-Q	49.2824 dpm/mL	12/13/2018	12/13/2019
01/08/2019	Christina Kimball	.29	250	1564-R	21.571 dpm/mL	01/08/2019	01/08/2020
01/08/2019	Christina Kimball	.29	250	1564-R Spike	21.571 dpm/mL	01/08/2019	01/08/2020
10/01/2019	Tim Chandler	2.6957	1000	1564-S	50.1285 dpm/mL	10/01/2019	10/01/2020
12/18/2019	Christina Kimball	.307	250	1564-T	22.83554 dpm/mL	12/19/2019	12/19/2020

12/18/2019	Christina Kimball	.307	250	1564-T Spike	22.83554 dpm/mL	12/19/2019	12/19/2020
03/31/2020	Tim Chandler	2.6645	1000	1564-U	49.5483 dpm/mL	03/31/2020	03/31/2021
08/14/2020	Christina Kimball	.111	500	1564-V	4.1282 dpm/mL	08/14/2020	08/14/2021
08/14/2020	Christina Kimball	.111	500	1564-V Spike	4.1282 dpm/mL	08/14/2020	08/14/2021
10/13/2020	Tim Chandler	2.6983	1000	1564-W	50.1768 dpm/mL	10/13/2020	10/13/2021
11/04/2020	Christina Kimball	.315	250	1564-X	23.4306 dpm/mL	11/04/2020	11/04/2021
11/04/2020	Christina Kimball	.315	250	1564-X Spike	23.4306 dpm/mL	11/04/2020	11/04/2021
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Y	51.32232 dpm/mL	03/19/2021	03/19/2022
03/19/2021	Matelon DeFreese	2.7599	1000	1564-Z	51.32232 dpm/mL	03/20/2021	03/20/2022

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-232 Standard 1564-EE

v1.2

Analyst	MXS2
Verification Prep Date	9/21/2022

Tracer Information	
Isotope	U-238
Serial Number	1600-M
Amount of Std. (mL)	0.2
Expiration Date	1/21/2023

Standard Information	
Isotope	U-232
Serial Number	1564-EE
Isotope Half-life	68.9000 Y
Reference Date	9/12/2011
Ref. Act. (dpm/mL)	50.0169
Amount of Std. (mL)	0.2
Standard Prep Date	9/21/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	9/22/2022	4.030	44.73
2	9/22/2022	3.960	43.96
3	9/22/2022	3.920	43.51

Mean Value = 3.970 44.067
 Stdev = 0.055677644 0.618021844

Certificate Value* = 4.0330 pCi
 Two sigma = 0.1114
 10 % of Mean = 0.3970
 Rule A (Pass/Fail) Pass
 % Recovery 98.44%
 Rule B (Pass/Fail) Pass
 Expiration Date 9/21/2023

dpm/mL
 44.7658
 1.2360
 4.4067
 Pass
 98.44%
 Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-232 standard 1564-EE using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-238 standard 1600-M and was diluted in a centrifuge tube containing 20 mL of 0.1M HCL diluted to 40 mL with DI water. 0.1 mL of neodymium carrier, 0.5 mL of titanium (III) chloride, and 5 mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-232 were calculated by comparison to U-238 certified values.

9/20/22

15 Apr 3/24/12
1600

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	U-238 (Nat)	Customer:	GENERAL ENGINEERING LABS.	
Half-life:	(4.468 ± 0.005)E+09 years	P.O. No.:	936823 RD	
Catalog No.:	7338	Reference Date:	15-Apr-12 12:00 PST	
Source No.:	1577-71-2	Contained Radioactivity:	1.023 µCi 37.85 kBq	
		(Total Uranium)		

Physical Description:

A. Mass of solution:	7.05210 g in 10 mL flame-sealed ampoule
B. Chemical form:	UO ₂ (NO ₃) ₂ in dilute HNO ₃
C. Carrier content:	None
D. Density:	Approximately 1.41 g/mL @ 20°C

Radioimpurities:

See Technical Data Sheet

Radionuclide Concentration: 0.1451 µCi/g, 5.369 kBq/g

Method of Calibration:

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.0 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.


Quality Control

21-Mar-12
Date

EZIP Ref. No.: 1577-71

RC-S-065-030a

ISO 9001 CERTIFIED

Medical Imaging Laboratory

24937 Avenue Tibbitts Valencia, California 91355

Industrial Gauging Laboratory

1800 North Keystone Street Burbank, California 91504

SDG: 606488

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U-238 Natural Technical Data

The U-238 Natural used to prepare your order was taken from Eckert & Ziegler Isotope Products Lot #4550102. It had the following composition as of 9 Feb 10:

<u>Nuclide</u>	<u>Atom %</u>	<u>Activity %</u>
U-234	0.0055	49.086
U-235	0.7200	2.241
U-238	99.274	48.673

Isotopic composition provided by New Brunswick Laboratory.

If you have any question, please contact Eckert & Ziegler Isotope Products Technical Service: (661) 309-1010

Standard Logbook

Serial ID: 1600 **Open/Reference Date:** 15-APR-12 **Aliquot :** 7.0521 g
Name: Uranium-238 **Received:** 24-MAR-12 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 26-MAR-15 **Logbook Num :** RC-S-065-030
Employee: Ashley Drochter **Lot Number :** 4550102
Supplier: Eckert & Ziegler **Solvent :** UO₂(NO₃)₂ in dilute HNO₃
Uncertainty : 1.17 percent
Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Uranium-238	18.42 kbq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1600
Prepared By:	Ashley Drochter
Carrier Conc:	UO ₂ (NO ₃) ₂ in dilute HNO ₃
Reference Date:	04/15/2012
Ampoule Mass (g):	7.0521 g
Uncertainty:	+/- 1.17 %
LogBook No:	RC-S-065-030
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Uranium-238		
Prepared By:	Ashley Drochter		
Prep Date:	09/04/2012		
Verification Date:	05/20/2022		
Expiration Date:	05/20/2023		
Primary Code:	1600-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	6.8204 g		
Density(g/mL):	1.0789	Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (kbq)}) * (\text{conversion dpm to kbq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (7.0521 \text{ g} * 100 \text{ mL}) = 10688.8814 \text{ dpm/mL}$
$(6.8204 \text{ g}) * (18.42 \text{ kbq}) * (60000 \text{ dpm/kbq}) / (1.0789 \text{ g/mL}) / (7.0521 \text{ g} * 100 \text{ mL}) = 9907.0626 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
09/04/2012	Ashley Drochter	1.4579	500	1600-B	28.8913 dpm/mL	09/04/2012	09/04/2013
09/11/2012	Ashley Drochter	3.0288	500	1600-C	60.0219 dpm/mL	09/04/2013	09/04/2014
03/27/2014	Tim Chandler	3.0445	500	1600-D	60.3241 dpm/mL	03/18/2015	03/18/2016
07/24/2015	Tim Chandler	3.0177	500	1600-E	59.7931 dpm/mL	07/10/2017	07/10/2018
02/16/2017	Tim Chandler	3.0261	500	1600-F	59.9595 dpm/mL	02/06/2018	02/06/2019
10/10/2017	Christina Kimball	.539	250	1600-G	21.3596 dpm/mL	12/28/2022	12/28/2023

04/02/2018	Tim Chandler	3.0544	500	1600-H	60.5203 dpm/mL	03/29/2019	03/29/2020
06/21/2019	Tim Chandler	3.0536	500	1600-I	60.5044 dpm/mL	06/21/2019	06/21/2020
01/30/2020	Tim Chandler	3.0563	500	1600-J	60.5579 dpm/mL	01/26/2021	01/26/2022
03/13/2020	Christina Kimball	.01222	500	1600-K	.24207 dpm/mL	03/15/2022	03/15/2023
04/23/2021	Tim Chandler	3.0507	500	1600-L	60.4469 dpm/mL	04/26/2021	04/26/2022
01/21/2022	Matelon DeFreese	3.1075	500	1600-M	61.5723941 dpm/mL	01/21/2022	01/21/2023
05/19/2022	Christina Kimball	.01275	500	1600-N	.2527 dpm/mL	05/20/2022	05/20/2023
09/06/2022	Matelon DeFreese	3.1499	500	1600-O	62.412513 dpm/mL	09/06/2022	09/06/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for U-238 Standard 1600-O

v1.2

Analyst	MXS2
Verification Prep Date	9/6/2022

Tracer Information	
Isotope	U-232
Serial Number	1564-DD
Amount of Std. (mL)	0.2
Expiration Date	4/13/2023

Standard Information	
Isotope	U-238
Serial Number	1600-O
Isotope Half-life	4.4680E+09 Y
Reference Date	4/15/2012
Ref. Act. (dpm/mL)	62.412513
Amount of Std. (mL)	0.2
Standard Prep Date	9/6/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	9/6/2022	5.560	61.72
2	9/6/2022	5.840	64.82
3	9/6/2022	5.440	60.38

Mean Value = 5.613 62.308
Stdev = 0.205264058 2.278431039

pCi
5.6227
0.4105
0.5613
Pass
99.83%
Pass

Certificate Value* =
Two sigma =
10 % of Mean =
Rule A (Pass/Fail)
% Recovery
Rule B (Pass/Fail)
Expiration Date

dpm/mL
62.4125
4.5569
6.2308
Pass
99.83%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for U-238 standard 1600-O using 0.2 mL for each source. Each standard was combined with 0.2 mL of U-232 standard 1564-DD and was diluted in a centrifuge tube containing 15 mL of 0.1M HCl, diluted to 40 mL with DI water. 0.1 mL of neodymium carrier, 0.5 mL of titanium (III) chloride, and 5 mL of 48% HF was added to precipitate neodymium (and Uranium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for U-238 were calculated by comparison to U-232 certified values.

for
9/7/22

Runlogs

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2368289

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
606487001	SAMPLE	EJ1	1079	JAN-23-23 11:36:40	DONE		10-JAN-23 15:44
606487002	SAMPLE	EJ1	1080	JAN-23-23 11:36:40	DONE		10-JAN-23 18:02
606487003	SAMPLE	EJ1	1081	JAN-23-23 11:36:40	DONE		10-JAN-23 15:45
606488001	SAMPLE	EJ1	1082	JAN-23-23 11:36:40	DONE		10-JAN-23 15:45
606488002	SAMPLE	EJ1	1083	JAN-23-23 11:36:41	DONE		10-JAN-23 10:37
606488003	SAMPLE	EJ1	1084	JAN-23-23 11:36:41	DONE		10-JAN-23 10:37
606488004	SAMPLE	EJ1	1085	JAN-23-23 11:36:41	DONE		10-JAN-23 10:37
606488005	SAMPLE	EJ1	1086	JAN-23-23 11:36:41	DONE		10-JAN-23 10:38
1205293606	MB	EJ1	1088	JAN-23-23 11:36:41	DONE		10-JAN-23 10:38
1205293607	LCS	EJ1	1089	JAN-23-23 11:41:30	DONE		11-JAN-23 11:00
1205293608	LCSD	EJ1	1090	JAN-23-23 11:41:30	DONE		11-JAN-23 11:00

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2368291

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
606487001	SAMPLE	EJ1	1065	JAN-23-23 11:36:38	DONE		10-JAN-23 10:36
606487002	SAMPLE	EJ1	1066	JAN-23-23 11:36:38	DONE		10-JAN-23 10:36
606487003	SAMPLE	EJ1	1067	JAN-23-23 11:36:38	DONE		10-JAN-23 10:36
606488001	SAMPLE	EJ1	1068	JAN-23-23 11:36:38	DONE		10-JAN-23 10:36
606488002	SAMPLE	EJ1	1069	JAN-23-23 11:36:38	DONE		10-JAN-23 10:36
606488003	SAMPLE	EJ1	1070	JAN-23-23 11:36:38	DONE		10-JAN-23 15:42
606488004	SAMPLE	EJ1	1071	JAN-23-23 11:36:39	DONE		10-JAN-23 10:36
606488005	SAMPLE	EJ1	1072	JAN-23-23 11:36:39	DONE		10-JAN-23 10:37
1205293621	MB	EJ1	1074	JAN-23-23 11:36:39	DONE		10-JAN-23 10:37
1205293622	LCS	EJ1	1075	JAN-23-23 11:36:39	DONE		10-JAN-23 10:37
1205293623	LCSD	EJ1	1076	JAN-23-23 11:36:39	DONE		10-JAN-23 10:37

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2368293

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205293629	LCSD	EJ1	1024	JAN-23-23 10:02:48	DONE		06-JAN-23 11:35
606487001	SAMPLE	EJ1	1113	JAN-23-23 10:19:40	DONE		12-JAN-23 13:27
606487002	SAMPLE	EJ1	1114	JAN-23-23 10:19:43	DONE		12-JAN-23 13:22
606487003	SAMPLE	EJ1	1117	JAN-23-23 10:19:45	DONE		12-JAN-23 11:33
606488001	SAMPLE	EJ1	1121	JAN-23-23 10:19:47	DONE		12-JAN-23 12:42
606488002	SAMPLE	EJ1	1124	JAN-23-23 10:19:49	DONE		12-JAN-23 12:42
606488003	SAMPLE	EJ1	1125	JAN-23-23 10:21:19	DONE		12-JAN-23 12:42
606488004	SAMPLE	EJ1	1126	JAN-23-23 10:21:21	DONE		12-JAN-23 12:54
606488005	SAMPLE	EJ1	1128	JAN-23-23 10:21:24	DONE		12-JAN-23 12:43
1205293627	MB	EJ1	1130	JAN-23-23 10:21:26	DONE		12-JAN-23 12:43
1205293628	LCS	EJ1	1136	JAN-23-23 10:21:30	DONE		12-JAN-23 12:44

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2368294

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
606487001	SAMPLE	EJ1	1194	JAN-22-23 18:50:42	DONE		18-JAN-23 11:13
606487002	SAMPLE	EJ1	1195	JAN-22-23 18:50:44	DONE		18-JAN-23 11:13
606487003	SAMPLE	EJ1	1196	JAN-22-23 18:50:47	DONE		18-JAN-23 11:13
606488001	SAMPLE	EJ1	1201	JAN-22-23 18:50:49	DONE		18-JAN-23 11:13
606488002	SAMPLE	EJ1	1202	JAN-22-23 18:50:50	DONE		18-JAN-23 11:14
606488003	SAMPLE	EJ1	1205	JAN-22-23 18:50:53	DONE		18-JAN-23 11:14
606488004	SAMPLE	EJ1	1207	JAN-22-23 18:50:55	DONE		18-JAN-23 13:04
606488005	SAMPLE	EJ1	1026	JAN-23-23 10:06:21	DONE		07-JAN-23 13:05
1205293630	MB	EJ1	1027	JAN-23-23 10:06:21	DONE		07-JAN-23 13:05
1205293631	LCS	EJ1	1028	JAN-23-23 10:06:21	DONE		07-JAN-23 13:05
1205293632	LCSD	EJ1	1029	JAN-23-23 10:06:21	DONE		07-JAN-23 13:05

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 2368295

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
606487001	SAMPLE	BV1	1179	JAN-19-23 16:19:46	DONE		17-JAN-23 12:34
606487002	SAMPLE	BV1	1180	JAN-19-23 16:19:49	DONE		17-JAN-23 12:34
606487003	SAMPLE	BV1	1181	JAN-19-23 16:19:51	DONE		17-JAN-23 12:34
606488001	SAMPLE	BV1	1182	JAN-19-23 16:19:53	DONE		17-JAN-23 12:34
606488002	SAMPLE	BV1	1174	JAN-19-23 16:19:55	DONE		17-JAN-23 12:50
606488003	SAMPLE	BV1	1178	JAN-19-23 16:19:58	DONE		17-JAN-23 12:34
606488004	SAMPLE	BV1	1185	JAN-19-23 16:20:00	DONE		18-JAN-23 13:04
606488005	SAMPLE	BV1	1186	JAN-19-23 16:20:02	DONE		18-JAN-23 12:14
1205293634	MB	BV1	1191	JAN-19-23 16:20:04	DONE		18-JAN-23 12:20
1205293635	LCS	BV1	1194	JAN-19-23 16:20:07	DONE		18-JAN-23 11:13
1205293636	LCSD	BV1	1192	JAN-19-23 16:20:09	DONE		18-JAN-23 12:20

Gamma Spectroscopy Raw Data

Batch 2367950 Check-list

This check-list was completed on 20-JAN-23 by Tim Winters

This batch was reviewed by Spencer Collins on 20-JAN-23 and Tim Winters on 20-JAN-23.

Batch ID: 2367950

Product: GSCGAMMF

Description: Gamma Spec Filter RAD A-013

#	Criteria	Yes	No	Comments
Preparation Information				
1	Did any sample(s) require dilution?		No	
2	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
3	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
4	Are instrument source checks within limits?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were any additional radionuclides added that were not requested by the client?		No	
7	Were all the samples prepared/analyzed within the required holding time period?	Yes		
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Gamma Spectroscopy

Batch ID: 2367950
Analyst: Maggie Stamps (MXR1)
Method: DOE HASL 300, 4.5.2.3/Ga-01-R
Lab SOP: GL-RAD-A-013 REV# 27
Instrument: No instrument-manual method

Due Dates for Lab: 23-JAN-2023			Package: 24-JAN-2023	SDG: 24-JAN-2023		
Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
LCS	1205292908	78962-278		1298	1	mL

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	606487001	19-JAN-2023	20	200	0.74829
2	606487002	19-JAN-2023	20	200	0.73913
3	606487003	19-JAN-2023	20	200	0.75
4	606488001	19-JAN-2023	20	200	0.76489
5	606488002	19-JAN-2023	20	200	0.74719
6	606488003	19-JAN-2023	20	200	0.71812
7	606488004	19-JAN-2023	20	200	0.73883
8	606488005	19-JAN-2023	20	200	0.72663
9	1205292906 MB	19-JAN-2023	20		0.76489
10	1205292907 DUP (606487002)	19-JAN-2023	20	200	0.73913
11	1205292908 LCS	19-JAN-2023	20		0.76489

Reagent/Solvent Lot ID	Description	Amount	Comments:
------------------------	-------------	--------	-----------

VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 17:21:50.53

```

*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487002.CNF;1
Background file : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM18.CNF;811
Background date  : 15-JAN-2023 11:19:15
Sample date     : 26-DEC-2022 07:23:00 Acquisition date : 19-JAN-2023 15:21:15
Sample ID      : G606487002 Sample quantity : 7.39130E-01 FILTER
Detector name   : GAM18 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:00.57 0.0%
Energy tolerance: 1.50000 keV Analyst Initials : MXR1
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2367950 Detector SN# :
Matrix Spike ID : LCS ID :
*****

```

BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	185.97*	25	99	1.36	371.56	367	10	3.54E-03	86.4	
2	0	198.30*	31	54	0.84	396.19	393	7	4.35E-03	47.5	
3	0	239.06*	44	125	1.30	477.64	471	15	6.08E-03	62.1	
4	0	295.77*	18	85	1.46	590.95	585	12	2.53E-03	110.2	
5	0	329.38	16	42	0.58	658.09	654	6	2.25E-03	69.1	
6	0	428.97	33	43	4.53	857.10	851	15	4.60E-03	45.8	
7	0	477.44	78	55	1.81	953.95	947	14	1.08E-02	23.4	
8	0	482.99	32	16	5.21	965.05	960	13	4.47E-03	32.8	
9	0	584.39*	6	36	0.63	1167.69	1157	13	8.32E-04	234.7	
10	0	597.28	29	32	2.00	1193.46	1189	9	3.96E-03	40.1	
11	0	644.80	85	49	17.31	1288.43	1270	39	1.18E-02	29.1	
12	0	704.99	19	48	3.82	1408.74	1401	14	2.63E-03	81.7	
13	0	910.29*	2	22	1.76	1819.13	1813	13	2.32E-04	692.0	
14	0	941.14	10	18	0.96	1880.80	1875	9	1.32E-03	89.9	
15	0	1001.86*	14	13	1.45	2002.19	1994	16	1.99E-03	73.0	
16	0	1008.06	9	6	1.42	2014.58	2009	8	1.24E-03	58.4	
17	0	1182.66	8	15	0.89	2363.67	2355	11	1.08E-03	106.5	
18	0	1237.08*	8	13	6.34	2472.49	2463	17	1.17E-03	116.7	
19	0	1413.42	9	11	5.28	2825.13	2816	15	1.29E-03	84.8	
20	0	1461.33*	4	28	1.08	2920.96	2911	16	5.13E-04	365.4	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 19-JAN-2023 17:21:51

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487002.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MXR1		
Sample date	: 26-DEC-2022 07:23:00	Acquisition date	: 19-JAN-2023 15:21:15
Sample ID	: G606487002	Sample quantity	: 0.73913 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA18	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.57 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	78	10.44*	3.329E+00	1.135E+02	1.559E+02	46.70
K-40	1460.82	4	10.66*	1.441E+00	1.222E+01	1.222E+01	730.78
AS-74	595.83	29	59.00*	2.889E+00	8.492E+00	2.197E+01	80.28
	634.78	-----	15.40	2.770E+00	-----	Line Not Found	-----
TL-208	277.37	-----	6.60	4.452E+00	-----	Line Not Found	-----
	583.19	-----	85.00*	2.931E+00	1.221E+00	1.251E+00	469.35
	860.56	-----	12.50	2.198E+00	-----	Line Not Found	-----
RA-226	186.21	25	3.59*	5.317E+00	6.784E+01	6.784E+01	172.74

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                     *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487002.CNF;1  *
* Acquisition date   : 19-JAN-2023 15:21:15 Sensitivity      : 3.000          *
* Detector ID       : GAM18 Energy tolerance: 1.500          *
* Elapsed live time : 0 02:00:00.00 Abundance limit : 75.000          *
* Elapsed real time : 0 02:00:00.57 Half life ratio : *****          *
* Sample date       : 26-DEC-2022 07:23:00 Analyst initials: MXR1          *
* Sample ID          : G606487002 Sample Quantity : 7.3913E-01 FILTER *
* Batch Number      : 2367950 Wet Weight : 0.00000          *
* Wet wt corr       : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library   : LIQUID.NLB;28                                         *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                     *
* Eff. Cal. date    : 8-JUN-2022 11:06:14 Eff. Geometry   : JAR          *
* Eff. File         : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.559E+02	7.137E+01	6.707E+01
K-40	1.222E+01	8.750E+01	7.092E+01
AS-74	2.197E+01	1.729E+01	2.120E+01
TL-208	1.251E+00	5.752E+00	5.368E+00
RA-226	6.784E+01	1.148E+02	1.104E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-7.351E-01		3.828E+00	6.960E+00	NOT IDENT.
NA-24	0.000E+00		1.919E+12	0.000E+00	SHORT HLIF
AL-26	-5.033E-01		2.609E+00	5.126E+00	NOT IDENT.
SC-46	9.206E-01		3.392E+00	6.815E+00	NOT IDENT.
V-48	4.397E-01		9.082E+00	1.748E+01	NOT IDENT.
CR-51	-3.300E+01		4.017E+01	6.636E+01	NOT IDENT.
MN-52	-7.990E+00		7.712E+01	1.482E+02	NOT IDENT.
MN-54	-1.146E+00		3.316E+00	6.091E+00	NOT IDENT.
CO-56	8.603E-01		3.729E+00	7.362E+00	FAIL ABUN
CO-57	3.953E-01		2.469E+00	4.391E+00	NOT IDENT.
NI-57	0.000E+00		3.950E+05	0.000E+00	SHORT HLIF
CO-58	2.020E+00		3.399E+00	6.856E+00	NOT IDENT.
FE-59	-1.587E+00		8.953E+00	1.651E+01	NOT IDENT.
CO-60	-9.233E-01		3.725E+00	7.029E+00	NOT IDENT.
ZN-65	5.451E-01		8.112E+00	1.531E+01	NOT IDENT.
CU-67	3.524E+03		5.966E+03	6.797E+03	FAIL ABUN
GE-68	-8.872E+01		1.003E+02	1.639E+02	NOT IDENT.
AS-73	9.008E+01		1.549E+02	2.976E+02	NOT IDENT.
SE-75	-2.157E+00		4.494E+00	7.848E+00	NOT IDENT.
BR-77	0.000E+00		2.998E+04	0.000E+00	SHORT HLIF
SR-82	-1.620E+01		3.705E+01	6.377E+01	NOT IDENT.
RB-83	1.158E+00		7.309E+00	1.384E+01	NOT IDENT.
RB-84	2.811E+00		7.153E+00	1.444E+01	NOT IDENT.
KR-85	-3.268E+03		1.091E+03	1.581E+03	NOT IDENT.
SR-85	-1.891E+01		6.312E+00	9.149E+00	NOT IDENT.

RB-86	-7.986E+01	8.915E+01	1.456E+02	NOT IDENT.
Y-88	2.216E+00	4.468E+00	9.381E+00	NOT IDENT.
ZR-88	3.624E-01	3.029E+00	5.470E+00	NOT IDENT.
Y-91	-1.063E+03	1.862E+03	3.188E+03	NOT IDENT.
NB-94	-8.992E-01	4.594E+00	6.425E+00	NOT IDENT.
NB-95	4.583E+00	4.016E+00	8.331E+00	NOT IDENT.
NB-95M	1.744E+00	1.175E+01	1.983E+01	NOT IDENT.
TC-95M	1.981E-03	4.255E+00	7.911E+00	NOT IDENT.
ZR-95	2.158E+00	6.911E+00	1.322E+01	NOT IDENT.
MO-99	-4.004E+03	1.058E+04	1.850E+04	NOT IDENT.
TC-99M	0.000E+00	4.405E+29	0.000E+00	SHORT HLIF
RH-100	0.000E+00	1.138E+09	0.000E+00	SHORT HLIF
RH-101	1.484E+00	2.826E+00	5.195E+00	FAIL ABUN
RH-102M	2.440E+00	3.237E+00	5.838E+00	NOT IDENT.
RU-103	1.619E+00	4.543E+00	8.770E+00	NOT IDENT.
RH-106	-1.573E+01	3.224E+01	5.605E+01	NOT IDENT.
RU-106	-1.573E+01	3.224E+01	5.605E+01	NOT IDENT.
AG-108M	-1.609E+00	2.902E+00	4.134E+00	NOT IDENT.
CD-109	4.866E+01	7.498E+01	1.409E+02	NOT IDENT.
AG-110	-4.221E+01	7.935E+01	1.163E+02	NOT IDENT.
AG-110M	-2.962E+00	4.493E+00	7.884E+00	NOT IDENT.
IN-111	-1.514E+02	9.486E+02	1.545E+03	NOT IDENT.
SN-113	-4.815E+00	4.572E+00	7.145E+00	NOT IDENT.
IN-114M	9.040E+00	2.094E+01	3.657E+01	NOT IDENT.
CD-115	0.000E+00	1.679E+04	0.000E+00	SHORT HLIF
SN-117M	6.178E-01	8.047E+00	1.391E+01	NOT IDENT.
SB-122	1.407E+03	1.943E+03	3.871E+03	NOT IDENT.
I-123	0.000E+00	5.076E+13	0.000E+00	SHORT HLIF
TE-123M	1.501E+00	2.781E+00	5.011E+00	NOT IDENT.
SB-124	5.214E+00	8.106E+00	1.849E+01	NOT IDENT.
SB-125	0.000E+00	1.457E+01	1.560E+01	FAIL ABUN
TE-125M	-3.049E+02	1.029E+03	1.770E+03	NOT IDENT.
I-126	4.593E-01	3.154E+01	5.833E+01	NOT IDENT.
SB-126	1.837E+01	2.549E+01	4.733E+01	NOT IDENT.
SN-126	1.204E+01	6.848E+00	1.400E+01	NOT IDENT.
SB-127	5.257E+00	6.324E+02	1.165E+03	NOT IDENT.
TE-129	-5.391E+00	5.297E+01	9.902E+01	NOT IDENT.
I-131	-1.435E+00	2.264E+01	4.042E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	-3.403E+01	4.689E+02	8.604E+02	NOT IDENT.
BA-133	-1.457E+00	4.136E+00	7.111E+00	NOT IDENT.
I-133	0.000E+00	8.122E+08	0.000E+00	SHORT HLIF
CS-134	1.642E+00	3.280E+00	6.494E+00	NOT IDENT.
I-135	0.000E+00	7.142E+27	0.000E+00	SHORT HLIF
CS-136	-5.693E-02	1.399E+01	2.681E+01	NOT IDENT.
BA-137M	2.610E-01	3.408E+00	6.294E+00	NOT IDENT.
CS-137	2.757E-01	3.600E+00	6.649E+00	NOT IDENT.
LA-138	-1.325E+00	5.784E+00	1.089E+01	NOT IDENT.
CE-139	3.737E-01	3.065E+00	5.273E+00	NOT IDENT.
BA-140	2.869E+01	3.643E+01	7.465E+01	NOT IDENT.
LA-140	-7.584E+00	1.362E+01	2.407E+01	FAIL ABUN
CE-141	-8.124E+00	8.689E+00	1.287E+01	NOT IDENT.
CE-143	0.000E+00	1.088E+06	0.000E+00	SHORT HLIF
CE-144	1.157E+01	1.990E+01	3.623E+01	NOT IDENT.
PM-144	-1.381E+00	3.850E+00	6.681E+00	FAIL ABUN
PR-144	-1.039E+02	2.896E+02	5.024E+02	NOT IDENT.
PM-146	-1.107E+00	3.560E+00	6.551E+00	NOT IDENT.
ND-147	-8.102E+00	8.325E+01	1.555E+02	NOT IDENT.
PM-147	-4.313E+04	7.222E+04	1.195E+05	NOT IDENT.
PM-149	0.000E+00	1.540E+05	0.000E+00	SHORT HLIF
EU-152	4.854E-01	9.943E+00	1.778E+01	NOT IDENT.
GD-153	-2.278E+00	8.054E+00	1.403E+01	NOT IDENT.
EU-154	-2.257E+00	1.077E+01	1.952E+01	NOT IDENT.
EU-155	2.420E+00	1.051E+01	1.894E+01	NOT IDENT.
TB-160	1.083E+01	1.216E+01	2.598E+01	FAIL ABUN
HO-166M	-3.656E+00	5.461E+00	8.733E+00	NOT IDENT.
TM-171	-8.747E+02	3.079E+03	5.591E+03	NOT IDENT.
LU-176	7.333E-01	2.310E+00	4.330E+00	NOT IDENT.
LU-177	1.419E+02	2.529E+02	4.891E+02	NOT IDENT.
HF-181	0.000E+00	5.881E+00	8.788E+00	FAIL ABUN
W-181	-6.137E+00	3.030E+01	5.511E+01	NOT IDENT.
TA-182	-1.071E+01	1.350E+01	2.202E+01	NOT IDENT.
RE-183	1.511E+01	2.936E+01	5.641E+01	NOT IDENT.
RE-184	1.157E+01	1.522E+01	2.927E+01	NOT IDENT.
RE-188	-3.353E+00	1.545E+01	2.604E+01	FAIL ABUN
W-188	-5.476E+02	7.858E+02	1.160E+03	NOT IDENT.
OS-191	4.792E+00	2.086E+01	3.739E+01	NOT IDENT.
IR-192	4.479E+00	3.355E+00	6.846E+00	FAIL ABUN

PB-201	0.000E+00	2.338E+19	0.000E+00	SHORT HLIF
TL-201	1.765E+03	5.573E+03	9.760E+03	NOT IDENT.
TL-202	2.741E+00	9.560E+00	1.876E+01	NOT IDENT.
HG-203	-2.017E-01	4.057E+00	7.338E+00	NOT IDENT.
PB-203	0.000E+00	7.013E+03	0.000E+00	SHORT HLIF
TL-204	-4.038E+02	5.360E+02	9.172E+02	NOT IDENT.
BI-207	-2.975E+00	4.479E+00	7.671E+00	NOT IDENT.
PB-210	1.518E+02	8.169E+02	1.404E+03	NOT IDENT.
BI-211	-2.551E+01	2.368E+01	3.854E+01	NOT IDENT.
PB-211	5.125E+01	6.624E+01	1.272E+02	NOT IDENT.
BI-212	2.946E+01	4.188E+01	8.451E+01	NOT IDENT.
PB-212	1.093E+01	1.331E+01	1.276E+01	FAIL ABUN
BI-213	4.602E+00	8.829E+00	1.763E+01	NOT IDENT.
BI-214	-5.144E+00	9.123E+00	1.629E+01	NOT IDENT.
PB-214	-3.185E-01	8.192E+00	1.466E+01	FAIL ABUN
RN-219	-1.470E+01	3.680E+01	6.244E+01	NOT IDENT.
FR-221	1.436E+01	1.773E+01	3.499E+01	NOT IDENT.
RA-223	-3.092E+01	5.976E+01	1.021E+02	NOT IDENT.
RA-224	2.760E+01	5.579E+01	1.062E+02	NOT IDENT.
AC-225	7.778E+01	9.606E+01	1.895E+02	NOT IDENT.
AC-227	-9.766E+00	1.981E+01	3.488E+01	NOT IDENT.
TH-227	-9.766E+00	1.981E+01	3.488E+01	NOT IDENT.
AC-228	1.579E+00	2.141E+01	2.742E+01	FAIL ABUN
RA-228	1.579E+00	2.141E+01	2.742E+01	FAIL ABUN
TH-228	1.093E+01	1.331E+01	1.276E+01	FAIL ABUN
TH-229	1.152E+01	4.572E+01	8.687E+01	NOT IDENT.
TH-230	-1.644E+03	1.340E+03	2.028E+03	NOT IDENT.
PA-231	-1.235E+01	4.591E+01	7.684E+01	NOT IDENT.
TH-231	1.004E+01	4.678E+01	7.981E+01	NOT IDENT.
TH-232	-8.693E+02	2.618E+03	4.439E+03	NOT IDENT.
PA-233	-2.098E-01	5.094E+00	9.290E+00	NOT IDENT.
PA-234	2.915E+01	3.138E+01	6.133E+01	NOT IDENT.
PA-234M	4.471E+02	6.401E+02	8.063E+02	FAIL ABUN
TH-234	3.759E+01	1.885E+02	3.316E+02	NOT IDENT.
U-234	6.820E+03	1.086E+04	2.097E+04	NOT IDENT.
U-235	-4.966E-01	2.162E+01	3.481E+01	FAIL ABUN
NP-237	-2.098E-01	5.094E+00	9.290E+00	NOT IDENT.
NP-238	0.000E+00	3.628E+04	0.000E+00	SHORT HLIF
U-238	3.759E+01	1.885E+02	3.316E+02	NOT IDENT.
NP-239	9.873E+00	2.235E+01	4.141E+01	NOT IDENT.
AM-241	3.761E+00	1.985E+01	3.715E+01	NOT IDENT.
AM-242	-7.783E-01	6.052E+01	1.077E+02	NOT IDENT.
AM-243	7.192E-01	5.892E+00	1.033E+01	NOT IDENT.
CM-243	-6.832E+00	1.062E+01	1.775E+01	NOT IDENT.
BK-247	1.710E+00	7.440E+00	1.385E+01	NOT IDENT.
CM-247	-1.847E+00	3.467E+00	5.778E+00	NOT IDENT.
CF-249	5.725E-01	4.122E+00	7.377E+00	NOT IDENT.
CF-251	-3.810E+00	1.084E+01	1.986E+01	NOT IDENT.
CF-252	1.068E+03	1.616E+04	2.906E+04	NOT IDENT.
ANH-511	-1.483E+01	5.898E+00	1.130E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	93.12	45	137	1.46	186.05	181	8	6.25E-03	47.7	
2	0	185.97	90	99	1.36	371.56	367	10	1.24E-02	23.4	
3	0	198.30	42	54	0.84	396.19	393	7	5.85E-03	32.5	
4	0	239.06	81	125	1.30	477.64	471	15	1.12E-02	32.1	
5	0	295.77	42	85	1.46	590.95	585	12	5.86E-03	46.2	
6	0	329.38	16	42	0.58	658.09	654	6	2.25E-03	69.1	
7	0	428.97	33	43	4.53	857.10	851	15	4.60E-03	45.8	
8	0	477.44	78	55	1.81	953.95	947	14	1.08E-02	23.4	
9	0	482.99	32	16	5.21	965.05	960	13	4.47E-03	32.8	
10	0	510.73	225	91	2.67	1020.48	1011	20	3.13E-02	12.3	
11	0	584.39	19	36	0.63	1167.69	1157	13	2.58E-03	72.6	
12	0	597.28	29	32	2.00	1193.46	1189	9	3.96E-03	40.1	
13	0	610.50	33	65	1.14	1219.89	1214	14	4.55E-03	56.5	
14	0	644.80	85	49	17.31	1288.43	1270	39	1.18E-02	29.1	
15	0	704.99	19	48	3.82	1408.74	1401	14	2.63E-03	81.7	
16	0	910.29	19	22	1.76	1819.13	1813	13	2.60E-03	57.3	
17	0	941.14	10	18	0.96	1880.80	1875	9	1.32E-03	89.9	
18	0	1001.86	22	13	1.45	2002.19	1994	16	3.08E-03	44.9	
19	0	1008.06	9	6	1.42	2014.58	2009	8	1.24E-03	58.4	
20	0	1182.66	8	15	0.89	2363.67	2355	11	1.08E-03	106.5	
21	0	1237.08	16	13	6.34	2472.49	2463	17	2.22E-03	57.1	
22	0	1413.42	9	11	5.28	2825.13	2816	15	1.29E-03	84.8	
23	0	1461.33	25	28	1.08	2920.96	2911	16	3.50E-03	50.9	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	78	10.44*	3.329E+00	1.135E+02	1.559E+02	46.70
K-40	1460.82	4	10.66*	1.441E+00	1.222E+01	1.222E+01	730.78
AS-74	595.83	29	59.00*	2.889E+00	8.492E+00	2.197E+01	80.28
	634.78	-----	15.40	2.770E+00	-----	Line Not Found	-----
TL-208	277.37	-----	6.60	4.452E+00	-----	Line Not Found	-----
	583.19	6	85.00*	2.931E+00	1.221E+00	1.251E+00	469.35
	860.56	-----	12.50	2.198E+00	-----	Line Not Found	-----
RA-226	186.21	25	3.59*	5.317E+00	6.784E+01	6.784E+01	172.74

Flag: "*" = Keyline

Total number of lines in spectrum 20
Number of unidentified lines 6
Number of lines tentatively identified by NID 14 70.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.37	1.135E+02	1.559E+02	0.728E+02	46.70	
K-40	1.25E+09Y	1.00	1.222E+01	1.222E+01	8.929E+01	730.78	
AS-74	17.77D	2.59	8.492E+00	2.197E+01	1.764E+01	80.28	
TL-208	1.91Y	1.02	1.221E+00	1.251E+00	5.870E+00	469.35	
RA-226	1600.00Y	1.00	6.784E+01	6.784E+01	11.72E+01	172.74	

Total Activity : 2.033E+02 2.592E+02

Grand Total Activity : 2.033E+02 2.592E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	198.30	31	54	0.84	396.19	393	7	4.35E-03	95.1	5.19E+00	T
0	239.06	44	125	1.30	477.64	471	15	6.08E-03	****	4.78E+00	T
0	295.77	18	85	1.46	590.95	585	12	2.53E-03	****	4.31E+00	T
0	329.38	16	42	0.58	658.09	654	6	2.25E-03	****	4.08E+00	T
0	428.97	33	43	4.53	857.10	851	15	4.60E-03	91.7	3.54E+00	T
0	482.99	32	16	5.21	965.05	960	13	4.47E-03	65.5	3.31E+00	T
0	644.80	85	49	17.31	1288.43	1270	39	1.18E-02	58.2	2.74E+00	
0	704.99	19	48	3.82	1408.74	1401	14	2.63E-03	****	2.57E+00	
0	910.29	2	22	1.76	1819.13	1813	13	2.32E-04	****	2.10E+00	T
0	941.14	10	18	0.96	1880.80	1875	9	1.32E-03	****	2.04E+00	
0	1001.86	14	13	1.45	2002.19	1994	16	1.99E-03	****	1.94E+00	T
0	1008.06	9	6	1.42	2014.58	2009	8	1.24E-03	****	1.93E+00	
0	1182.66	8	15	0.89	2363.67	2355	11	1.08E-03	****	1.69E+00	
0	1237.08	8	13	6.34	2472.49	2463	17	1.17E-03	****	1.63E+00	T
0	1413.42	9	11	5.28	2825.13	2816	15	1.29E-03	****	1.47E+00	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487002.CNF;1  *
* Acquisition date   : 19-JAN-2023 15:21:15 Sensitivity      : 3.000          *
* Detector ID       : GAM18 Energy tolerance: 1.500          *
* Elapsed live time : 0 02:00:00.00 Abundance limit : 75.000          *
* Elapsed real time : 0 02:00:00.57 Half life ratio : *****          *
* Sample date       : 26-DEC-2022 07:23:00 Nuclide Library : LIQUID          *
* Sample ID        : G606487002 Analyst initials: MXR1          *
* Batch Number     : 2367950 Sample Quantity : 7.3913E-01 FILTER *
* Wet wt corr      : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date    : 8-JUN-2022 11:06:14 Eff. Geometry    : JAR          *
* Eff. File         : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.083E+01
K-40	3.100E+01
AS-74	9.561E+00
TL-208	2.403E+00
RA-226	5.165E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	3.041E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.034E+00	NOT IDENT.
SC-46	3.016E+00	NOT IDENT.
V-48	7.736E+00	NOT IDENT.
CR-51	3.011E+01	NOT IDENT.
MN-52	6.443E+01	NOT IDENT.
MN-54	2.725E+00	NOT IDENT.
CO-56	3.298E+00	FAIL ABUN
CO-57	2.044E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.049E+00	NOT IDENT.
FE-59	7.268E+00	NOT IDENT.
CO-60	3.065E+00	NOT IDENT.
ZN-65	6.836E+00	NOT IDENT.
CU-67	3.214E+03	FAIL ABUN
GE-68	6.951E+01	NOT IDENT.
AS-73	1.397E+02	NOT IDENT.
SE-75	3.631E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	2.818E+01	NOT IDENT.
RB-83	6.336E+00	NOT IDENT.
RB-84	6.449E+00	NOT IDENT.
KR-85	7.404E+02	NOT IDENT.
SR-85	4.285E+00	NOT IDENT.
RB-86	6.201E+01	NOT IDENT.

Y-88	4.066E+00	NOT IDENT.
ZR-88	2.503E+00	NOT IDENT.
Y-91	1.382E+03	NOT IDENT.
NB-94	2.946E+00	NOT IDENT.
NB-95	3.796E+00	NOT IDENT.
NB-95M	9.172E+00	NOT IDENT.
TC-95M	3.678E+00	NOT IDENT.
ZR-95	5.937E+00	NOT IDENT.
MO-99	8.183E+03	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-100	0.000E+00	SHORT HLIF
RH-101	2.417E+00	FAIL ABUN
RH-102M	2.701E+00	NOT IDENT.
RU-103	4.030E+00	NOT IDENT.
RH-106	2.546E+01	NOT IDENT.
RU-106	2.546E+01	NOT IDENT.
AG-108M	1.852E+00	NOT IDENT.
CD-109	6.607E+01	NOT IDENT.
AG-110	5.212E+01	NOT IDENT.
AG-110M	3.473E+00	NOT IDENT.
IN-111	7.082E+02	NOT IDENT.
SN-113	3.245E+00	NOT IDENT.
IN-114M	1.711E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	6.462E+00	NOT IDENT.
SB-122	1.775E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.337E+00	NOT IDENT.
SB-124	7.810E+00	NOT IDENT.
SB-125	7.144E+00	FAIL ABUN
TE-125M	8.219E+02	NOT IDENT.
I-126	2.630E+01	NOT IDENT.
SB-126	2.169E+01	NOT IDENT.
SN-126	6.574E+00	NOT IDENT.
SB-127	5.252E+02	NOT IDENT.
TE-129	4.519E+01	NOT IDENT.
I-131	1.843E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	3.990E+02	NOT IDENT.
BA-133	3.273E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	2.897E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.175E+01	NOT IDENT.
BA-137M	2.864E+00	NOT IDENT.
CS-137	3.025E+00	NOT IDENT.
LA-138	4.726E+00	NOT IDENT.
CE-139	2.461E+00	NOT IDENT.
BA-140	3.391E+01	NOT IDENT.
LA-140	1.006E+01	FAIL ABUN
CE-141	6.013E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.696E+01	NOT IDENT.
PM-144	3.063E+00	FAIL ABUN
PR-144	2.303E+02	NOT IDENT.
PM-146	2.966E+00	NOT IDENT.
ND-147	6.996E+01	NOT IDENT.
PM-147	5.539E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.245E+00	NOT IDENT.
GD-153	6.502E+00	NOT IDENT.
EU-154	8.521E+00	NOT IDENT.
EU-155	8.846E+00	NOT IDENT.
TB-160	1.166E+01	FAIL ABUN
HO-166M	3.870E+00	NOT IDENT.
TM-171	2.611E+03	NOT IDENT.
LU-176	1.993E+00	NOT IDENT.
LU-177	2.281E+02	NOT IDENT.
HF-181	4.012E+00	FAIL ABUN
W-181	2.567E+01	NOT IDENT.
TA-182	9.218E+00	NOT IDENT.
RE-183	2.633E+01	NOT IDENT.
RE-184	1.327E+01	NOT IDENT.
RE-188	1.203E+01	FAIL ABUN
W-188	5.302E+02	NOT IDENT.
OS-191	1.733E+01	NOT IDENT.
IR-192	3.174E+00	FAIL ABUN
PB-201	0.000E+00	SHORT HLIF

TL-201	4.558E+03	NOT IDENT.
TL-202	8.536E+00	NOT IDENT.
HG-203	3.398E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	4.272E+02	NOT IDENT.
BI-207	3.336E+00	NOT IDENT.
PB-210	6.590E+02	NOT IDENT.
BI-211	1.793E+01	NOT IDENT.
PB-211	5.863E+01	NOT IDENT.
BI-212	3.807E+01	NOT IDENT.
PB-212	6.048E+00	FAIL ABUN
BI-213	8.060E+00	NOT IDENT.
BI-214	7.617E+00	NOT IDENT.
PB-214	6.843E+00	FAIL ABUN
RN-219	2.839E+01	NOT IDENT.
FR-221	1.629E+01	NOT IDENT.
RA-223	4.686E+01	NOT IDENT.
RA-224	4.953E+01	NOT IDENT.
AC-225	8.824E+01	NOT IDENT.
AC-227	1.588E+01	NOT IDENT.
TH-227	1.588E+01	NOT IDENT.
AC-228	1.244E+01	FAIL ABUN
RA-228	1.244E+01	FAIL ABUN
TH-228	6.048E+00	FAIL ABUN
TH-229	4.048E+01	NOT IDENT.
TH-230	9.404E+02	NOT IDENT.
PA-231	3.543E+01	NOT IDENT.
TH-231	3.737E+01	NOT IDENT.
TH-232	2.088E+03	NOT IDENT.
PA-233	4.222E+00	NOT IDENT.
PA-234	2.786E+01	NOT IDENT.
PA-234M	3.611E+02	FAIL ABUN
TH-234	1.563E+02	NOT IDENT.
U-234	9.837E+03	NOT IDENT.
U-235	1.631E+01	FAIL ABUN
NP-237	4.222E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.563E+02	NOT IDENT.
NP-239	1.915E+01	NOT IDENT.
AM-241	1.732E+01	NOT IDENT.
AM-242	5.008E+01	NOT IDENT.
AM-243	4.847E+00	NOT IDENT.
CM-243	8.244E+00	NOT IDENT.
BK-247	6.423E+00	NOT IDENT.
CM-247	2.630E+00	NOT IDENT.
CF-249	3.412E+00	NOT IDENT.
CF-251	9.201E+00	NOT IDENT.
CF-252	1.347E+04	NOT IDENT.
ANH-511	5.436E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606487002.CNF;1
Acquisition date : 19-JAN-2023 15:21:15 Sensitivity : 3.000
Detector ID : GAM18 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.57 Half life ratio : *****
Sample date : 26-DEC-2022 07:23:00 Nuclide Library : LIQUID
Sample ID : G606487002 Analyst initials: MXR1
Batch Number : 2367950 Sample Quantity : 7.3913E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 8-JUN-2022 11:06:14 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM18_JAR.CNF;19

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.559E+02	7.256E+01	7.262E+01
K-40	1.222E+01	8.751E+01	8.751E+01
AS-74	2.197E+01	1.745E+01	1.745E+01
TL-208	1.251E+00	5.753E+00	5.753E+00
RA-226	6.784E+01	1.150E+02	1.150E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-7.351E-01	3.829E+00	3.843E+00	NOT IDENT.
NA-24	1.200E+12	1.922E+12	1.997E+12	SHORT HLIF
AL-26	-5.033E-01	2.610E+00	2.619E+00	NOT IDENT.
SC-46	9.206E-01	3.394E+00	3.419E+00	NOT IDENT.
V-48	4.397E-01	9.082E+00	9.084E+00	NOT IDENT.
CR-51	-3.300E+01	4.026E+01	4.293E+01	NOT IDENT.
MN-52	-7.990E+00	7.713E+01	7.721E+01	NOT IDENT.
MN-54	-1.146E+00	3.318E+00	3.358E+00	NOT IDENT.
CO-56	8.603E-01	3.730E+00	3.751E+00	FAIL ABUN
CO-57	3.953E-01	2.469E+00	2.476E+00	NOT IDENT.
NI-57	1.194E+05	3.952E+05	3.989E+05	SHORT HLIF
CO-58	2.020E+00	3.404E+00	3.524E+00	NOT IDENT.
FE-59	-1.587E+00	8.955E+00	8.984E+00	NOT IDENT.
CO-60	-9.233E-01	3.726E+00	3.749E+00	NOT IDENT.
ZN-65	5.451E-01	8.112E+00	8.116E+00	NOT IDENT.
CU-67	3.524E+03	5.973E+03	6.181E+03	FAIL ABUN
GE-68	-8.872E+01	1.006E+02	1.083E+02	NOT IDENT.
AS-73	9.008E+01	1.562E+02	1.614E+02	NOT IDENT.
SE-75	-2.157E+00	4.498E+00	4.602E+00	NOT IDENT.
BR-77	2.462E+04	3.005E+04	3.204E+04	SHORT HLIF
SR-82	-1.620E+01	3.708E+01	3.779E+01	NOT IDENT.
RB-83	1.158E+00	7.311E+00	7.330E+00	NOT IDENT.
RB-84	2.811E+00	7.159E+00	7.270E+00	NOT IDENT.
KR-85	-3.268E+03	1.125E+03	1.854E+03	NOT IDENT.
SR-85	-1.891E+01	6.508E+00	1.073E+01	NOT IDENT.

RB-86	-7.986E+01	8.949E+01	9.647E+01	NOT IDENT.
Y-88	2.216E+00	4.471E+00	4.581E+00	NOT IDENT.
ZR-88	3.624E-01	3.029E+00	3.034E+00	NOT IDENT.
Y-91	-1.063E+03	1.864E+03	1.925E+03	NOT IDENT.
NB-94	-8.992E-01	4.594E+00	4.612E+00	NOT IDENT.
NB-95	4.583E+00	4.038E+00	4.537E+00	NOT IDENT.
NB-95M	1.744E+00	1.175E+01	1.177E+01	NOT IDENT.
TC-95M	1.981E-03	4.255E+00	4.255E+00	NOT IDENT.
ZR-95	2.158E+00	6.914E+00	6.982E+00	NOT IDENT.
MO-99	-4.004E+03	1.059E+04	1.074E+04	NOT IDENT.
TC-99M	-3.437E+29	4.423E+29	0.000E+00	SHORT HLIF
RH-100	-7.622E+08	1.219E+09	1.267E+09	SHORT HLIF
RH-101	1.484E+00	2.840E+00	2.918E+00	FAIL ABUN
RH-102M	2.440E+00	3.250E+00	3.431E+00	NOT IDENT.
RU-103	1.619E+00	4.545E+00	4.603E+00	NOT IDENT.
RH-106	-1.573E+01	3.227E+01	3.304E+01	NOT IDENT.
RU-106	-1.573E+01	3.227E+01	3.304E+01	NOT IDENT.
AG-108M	-1.609E+00	2.905E+00	2.994E+00	NOT IDENT.
CD-109	4.866E+01	7.516E+01	7.830E+01	NOT IDENT.
AG-110	-4.221E+01	7.943E+01	8.168E+01	NOT IDENT.
AG-110M	-2.962E+00	4.505E+00	4.699E+00	NOT IDENT.
IN-111	-1.514E+02	9.487E+02	9.512E+02	NOT IDENT.
SN-113	-4.815E+00	4.589E+00	5.077E+00	NOT IDENT.
IN-114M	9.040E+00	2.095E+01	2.134E+01	NOT IDENT.
CD-115	3.597E+03	1.679E+04	1.687E+04	SHORT HLIF
SN-117M	6.178E-01	8.047E+00	8.052E+00	NOT IDENT.
SB-122	1.407E+03	1.947E+03	2.048E+03	NOT IDENT.
I-123	2.648E+13	5.080E+13	5.219E+13	SHORT HLIF
TE-123M	1.501E+00	2.783E+00	2.864E+00	NOT IDENT.
SB-124	5.214E+00	8.118E+00	8.452E+00	NOT IDENT.
SB-125	1.622E+01	1.463E+01	1.636E+01	FAIL ABUN
TE-125M	-3.049E+02	1.029E+03	1.038E+03	NOT IDENT.
I-126	4.593E-01	3.154E+01	3.154E+01	NOT IDENT.
SB-126	1.837E+01	2.559E+01	2.690E+01	NOT IDENT.
SN-126	1.204E+01	6.936E+00	8.810E+00	NOT IDENT.
SB-127	5.257E+00	6.324E+02	6.324E+02	NOT IDENT.
TE-129	-5.391E+00	5.298E+01	5.303E+01	NOT IDENT.
I-131	-1.435E+00	2.264E+01	2.265E+01	NOT IDENT.
I-132	-1.000E+41	6.113E+41	0.000E+00	SHORT HLIF
TE-132	-3.403E+01	4.689E+02	4.692E+02	NOT IDENT.
BA-133	-1.457E+00	4.138E+00	4.190E+00	NOT IDENT.
I-133	-7.756E+08	8.237E+08	8.950E+08	SHORT HLIF
CS-134	1.642E+00	3.284E+00	3.366E+00	NOT IDENT.
I-135	-3.358E+27	7.386E+27	0.000E+00	SHORT HLIF
CS-136	-5.693E-02	1.399E+01	1.399E+01	NOT IDENT.
BA-137M	2.610E-01	3.408E+00	3.410E+00	NOT IDENT.
CS-137	2.757E-01	3.600E+00	3.602E+00	NOT IDENT.
LA-138	-1.325E+00	5.785E+00	5.816E+00	NOT IDENT.
CE-139	3.737E-01	3.066E+00	3.071E+00	NOT IDENT.
BA-140	2.869E+01	3.651E+01	3.874E+01	NOT IDENT.
LA-140	-7.584E+00	1.363E+01	1.406E+01	FAIL ABUN
CE-141	-8.124E+00	8.709E+00	9.449E+00	NOT IDENT.
CE-143	8.210E+05	1.091E+06	1.152E+06	SHORT HLIF
CE-144	1.157E+01	1.992E+01	2.059E+01	NOT IDENT.
PM-144	-1.381E+00	3.852E+00	3.902E+00	FAIL ABUN
PR-144	-1.039E+02	2.897E+02	2.935E+02	NOT IDENT.
PM-146	-1.107E+00	3.561E+00	3.596E+00	NOT IDENT.
ND-147	-8.102E+00	8.326E+01	8.334E+01	NOT IDENT.
PM-147	-4.313E+04	7.229E+04	7.487E+04	NOT IDENT.
PM-149	2.115E+04	1.540E+05	1.543E+05	SHORT HLIF
EU-152	4.854E-01	9.944E+00	9.946E+00	NOT IDENT.
GD-153	-2.278E+00	8.056E+00	8.122E+00	NOT IDENT.
EU-154	-2.257E+00	1.077E+01	1.082E+01	NOT IDENT.
EU-155	2.420E+00	1.051E+01	1.057E+01	NOT IDENT.
TB-160	1.083E+01	1.222E+01	1.316E+01	FAIL ABUN
HO-166M	-3.656E+00	5.471E+00	5.715E+00	NOT IDENT.
TM-171	-8.747E+02	3.081E+03	3.106E+03	NOT IDENT.
LU-176	7.333E-01	2.311E+00	2.334E+00	NOT IDENT.
LU-177	1.419E+02	2.531E+02	2.611E+02	NOT IDENT.
HF-181	9.157E+00	5.931E+00	7.228E+00	FAIL ABUN
W-181	-6.137E+00	3.034E+01	3.047E+01	NOT IDENT.
TA-182	-1.071E+01	1.354E+01	1.438E+01	NOT IDENT.
RE-183	1.511E+01	2.943E+01	3.021E+01	NOT IDENT.
RE-184	1.157E+01	1.529E+01	1.615E+01	NOT IDENT.
RE-188	-3.353E+00	1.545E+01	1.552E+01	FAIL ABUN
W-188	-5.476E+02	7.891E+02	8.268E+02	NOT IDENT.
OS-191	4.792E+00	2.087E+01	2.098E+01	NOT IDENT.
IR-192	4.479E+00	3.376E+00	3.934E+00	FAIL ABUN

PB-201	-1.008E+18	2.338E+19	0.000E+00	SHORT HLIF
TL-201	1.765E+03	5.575E+03	5.631E+03	NOT IDENT.
TL-202	2.741E+00	9.563E+00	9.642E+00	NOT IDENT.
HG-203	-2.017E-01	4.057E+00	4.058E+00	NOT IDENT.
PB-203	-3.486E+02	7.013E+03	7.015E+03	SHORT HLIF
TL-204	-4.038E+02	5.379E+02	5.679E+02	NOT IDENT.
BI-207	-2.975E+00	4.489E+00	4.685E+00	NOT IDENT.
PB-210	1.518E+02	8.171E+02	8.199E+02	NOT IDENT.
BI-211	-2.551E+01	2.378E+01	2.642E+01	NOT IDENT.
PB-211	5.125E+01	6.640E+01	7.031E+01	NOT IDENT.
BI-212	2.946E+01	4.197E+01	4.402E+01	NOT IDENT.
PB-212	1.093E+01	1.334E+01	1.423E+01	FAIL ABUN
BI-213	4.602E+00	8.838E+00	9.079E+00	NOT IDENT.
BI-214	-5.144E+00	9.134E+00	9.424E+00	NOT IDENT.
PB-214	-3.185E-01	8.192E+00	8.193E+00	FAIL ABUN
RN-219	-1.470E+01	3.686E+01	3.746E+01	NOT IDENT.
FR-221	1.436E+01	1.779E+01	1.893E+01	NOT IDENT.
RA-223	-3.092E+01	5.983E+01	6.144E+01	NOT IDENT.
RA-224	2.760E+01	5.583E+01	5.720E+01	NOT IDENT.
AC-225	7.778E+01	9.637E+01	1.026E+02	NOT IDENT.
AC-227	-9.766E+00	1.986E+01	2.035E+01	NOT IDENT.
TH-227	-9.766E+00	1.986E+01	2.035E+01	NOT IDENT.
AC-228	1.579E+00	2.141E+01	2.143E+01	FAIL ABUN
RA-228	1.579E+00	2.141E+01	2.143E+01	FAIL ABUN
TH-228	1.093E+01	1.334E+01	1.423E+01	FAIL ABUN
TH-229	1.152E+01	4.573E+01	4.603E+01	NOT IDENT.
TH-230	-1.644E+03	1.372E+03	1.560E+03	NOT IDENT.
PA-231	-1.235E+01	4.600E+01	4.633E+01	NOT IDENT.
TH-231	1.004E+01	4.681E+01	4.702E+01	NOT IDENT.
TH-232	-8.693E+02	2.621E+03	2.650E+03	NOT IDENT.
PA-233	-2.098E-01	5.094E+00	5.095E+00	NOT IDENT.
PA-234	2.915E+01	4.587E+01	4.772E+01	NOT IDENT.
PA-234M	4.471E+02	6.418E+02	6.727E+02	FAIL ABUN
TH-234	3.759E+01	1.887E+02	1.894E+02	NOT IDENT.
U-234	6.820E+03	1.089E+04	1.132E+04	NOT IDENT.
U-235	-4.966E-01	2.162E+01	2.162E+01	FAIL ABUN
NP-237	-2.098E-01	5.094E+00	5.095E+00	NOT IDENT.
NP-238	1.918E+04	3.633E+04	3.734E+04	SHORT HLIF
U-238	3.759E+01	1.887E+02	1.894E+02	NOT IDENT.
NP-239	9.873E+00	2.236E+01	2.280E+01	NOT IDENT.
AM-241	3.761E+00	1.985E+01	1.992E+01	NOT IDENT.
AM-242	-7.783E-01	6.052E+01	6.052E+01	NOT IDENT.
AM-243	7.192E-01	5.893E+00	5.902E+00	NOT IDENT.
CM-243	-6.832E+00	1.064E+01	1.108E+01	NOT IDENT.
BK-247	1.710E+00	7.448E+00	7.488E+00	NOT IDENT.
CM-247	-1.847E+00	3.484E+00	3.582E+00	NOT IDENT.
CF-249	5.725E-01	4.123E+00	4.131E+00	NOT IDENT.
CF-251	-3.810E+00	1.085E+01	1.099E+01	NOT IDENT.
CF-252	1.068E+03	1.619E+04	1.620E+04	NOT IDENT.
ANH-511	-1.483E+01	6.028E+00	9.007E+00	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	52.6122	133.52	56.2190	116.30	49.6836
879.38	65.9160	364.49	56.2333	116.74	42.0049
46.54	66.2630	80.22	56.2407	117.23	45.3805
228.16	57.9048	711.68	56.3112	119.76	53.4869
52.39	75.8306	356.01	59.3669	120.54	55.8300
53.20	62.4684	323.87	59.3820	120.90	58.1180
53.44	65.1861	82.35	0.0000	264.66	67.0976
57.53	63.4180	82.47	73.6059	121.22	67.1150
293.27	0.0000	82.47	73.6065	344.28	58.2513
57.53	66.4914	83.79	56.9613	122.06	57.1727
482.18	66.4920	265.00	48.0029	1274.44	55.0742
57.98	54.9266	84.21	48.0381	123.68	49.5319
59.32	64.3299	84.86	0.0000	1377.63	0.0000
59.54	59.8602	193.51	72.3636	127.23	48.8435
155.04	79.6071	105.31	81.7237	129.43	49.1125
63.00	59.8763	86.79	81.7898	131.20	59.6505
129.43	59.0300	86.94	68.6988	133.02	57.6103
63.29	59.0300	87.09	68.7341	133.52	58.8341
290.67	61.8755	87.57	41.5102	135.34	72.9947
63.81	67.4841	88.03	60.8414	136.00	66.1463
87.57	80.5906	306.78	73.0860	136.28	68.5131
64.99	90.1286	88.47	88.3507	136.47	68.5437
65.08	90.1634	531.02	91.1783	739.50	59.8123
66.73	53.3549	184.58	91.2258	140.51	0.0000
66.98	67.4665	92.59	61.7661	140.88	73.9483
67.24	67.5401	93.31	59.8466	143.76	50.8066
67.67	68.6007	94.56	98.4181	144.24	59.1415
1221.41	68.6230	311.90	98.4464	145.44	71.1621
439.51	58.5578	946.00	98.4522	152.32	48.1659
70.82	58.5578	97.43	59.5871	152.43	48.1775
167.43	58.5588	98.43	52.4315	1048.07	54.2951
97.43	54.9547	98.44	52.4334	154.21	53.1980
70.82	79.0068	99.53	58.9224	155.04	53.2927
70.82	79.0074	103.37	58.9224	158.56	42.4800
279.20	0.0000	116.74	58.9224	158.97	0.0000
1063.66	67.1609	100.11	52.7023	159.00	52.5178
72.87	0.0000	100.20	52.7168	162.33	62.7189
351.06	72.9344	102.03	54.0692	537.26	61.5311
74.66	63.7799	103.18	65.9573	163.33	60.3827
238.63	60.9183	103.37	71.3168	165.86	63.1702
351.93	60.9183	105.31	62.0910	167.43	59.6418
238.63	60.9183	106.12	48.2880	245.35	50.9165
74.97	60.9534	106.47	53.7075	427.87	54.7862
77.11	72.1792	109.28	62.8052	176.60	54.8166
256.23	63.0244	111.00	53.3175	177.52	59.9821
79.82	59.1142	111.76	52.3403	181.07	51.0297
80.02	56.1985	208.37	50.3255	184.41	64.1838
80.03	56.1998	116.24	60.7148	184.58	64.2044

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	69.4858	300.09	48.7734	475.06	36.2305
186.21	69.5484	300.13	48.7764	696.49	43.5374
190.27	60.9797	301.36	52.5123	477.60	43.5667
193.51	57.4177	302.85	47.9170	477.99	43.5798
197.03	53.8344	304.50	40.8618	482.18	26.2367
198.01	60.5027	304.85	41.9009	487.02	21.9485
201.83	56.9303	306.78	38.9246	492.35	0.0000
204.12	58.4811	308.46	41.0555	497.08	36.8726
205.31	59.4865	311.90	34.0091	511.00	58.7015
208.37	52.6525	316.51	30.0484	514.00	160.6306
210.85	53.7653	319.41	59.2590	520.40	36.5982
215.65	55.9939	320.08	46.8192	520.69	0.0000
218.12	45.3359	321.04	37.4971	667.71	0.0000
222.11	51.0986	323.87	52.2481	527.90	0.0000
227.09	60.6934	325.23	42.3861	529.59	34.0148
227.38	65.3202	1596.21	49.3848	529.87	0.0000
228.16	56.1878	331.15	0.0000	531.02	28.3759
228.18	56.1897	333.37	39.0784	537.26	21.8545
235.69	47.5168	334.37	45.4662	539.51	0.0000
235.96	50.3322	338.28	41.4145	1260.41	0.0000
238.63	53.3401	911.20	41.4161	552.55	34.5861
238.98	0.0000	340.48	55.3526	795.86	29.0396
240.99	53.5262	340.55	54.2923	564.24	29.0598
242.00	52.1944	344.28	53.4434	569.33	32.0785
244.70	26.9084	345.93	56.7514	569.50	33.0547
245.35	43.9443	351.06	61.3696	569.70	33.0599
459.60	40.9450	351.93	43.1063	582.08	24.5155
685.70	63.0043	356.01	51.9502	583.19	24.5338
388.16	51.5781	361.25	0.0000	595.83	28.5038
256.23	43.1891	364.49	37.1232	600.60	38.1258
527.90	0.0000	366.42	43.7606	604.72	54.7549
264.66	61.1697	383.85	54.5518	609.32	39.9426
265.00	50.5125	388.16	48.0741	610.33	31.9746
269.46	52.7706	666.33	52.5700	614.28	47.0832
401.81	56.8129	391.70	52.7258	618.01	27.1129
273.65	56.9958	392.87	37.0626	621.93	41.2753
276.40	59.1736	400.66	41.8644	630.19	0.0000
583.19	42.4611	401.32	0.0000	631.29	18.2291
277.60	38.5231	401.81	40.7776	632.98	29.1973
402.40	38.5430	402.40	44.2003	633.25	29.2025
278.43	41.5309	404.85	32.9424	634.78	37.3503
279.20	0.0000	410.95	33.1300	635.95	30.8769
279.54	49.5127	720.70	47.0009	636.99	29.2711
280.46	57.5032	423.72	36.4078	657.50	34.5844
301.36	46.7915	427.09	29.5622	884.68	34.5905
284.31	36.8645	427.87	30.1630	661.66	33.0215
285.41	49.8871	433.94	34.9908	664.57	0.0000
285.90	0.0000	439.51	29.8880	666.33	27.9402
287.50	45.0174	440.45	29.9124	666.50	25.8728
290.67	52.7296	539.51	0.0000	667.71	0.0000
293.27	0.0000	453.88	35.5994	677.62	29.1707
295.22	44.4431	459.60	38.4537	685.70	28.2632
316.51	44.4834	463.37	36.7809	692.65	34.6838
298.58	51.7263	468.07	20.7135	695.00	32.6263
299.98	50.2906	473.00	20.2552	696.49	47.4019

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
696.51	47.4019	884.68	26.9369	1238.28	10.6880
697.00	48.1682	889.28	16.7550	1260.41	0.0000
697.49	44.9701	894.76	20.5305	1271.87	22.7001
702.65	38.9023	1836.06	21.4957	1274.44	18.3920
706.68	28.8203	903.28	20.0752	1274.54	18.3929
711.68	30.3589	907.67	0.0000	1291.59	16.3206
720.70	23.4958	911.20	14.1035	1298.22	0.0000
721.93	0.0000	984.45	0.0000	1312.11	16.4304
1690.97	27.7996	926.36	15.1465	1332.49	18.3765
722.91	27.8019	935.54	11.0893	1362.15	0.0000
723.31	36.3647	937.49	26.9547	1365.19	13.9252
756.73	47.0830	983.53	28.6238	1368.63	0.0000
727.33	18.2228	945.96	0.0000	1377.63	0.0000
733.00	25.8076	946.00	19.0981	1384.29	18.6768
735.93	20.4641	949.00	25.8161	1408.01	9.6751
739.50	24.8207	954.55	0.0000	1434.09	16.1173
1434.09	27.0485	962.31	23.0807	1435.80	17.0735
747.24	26.0090	964.08	29.8352	1457.56	0.0000
752.31	27.1675	966.17	26.0086	1460.82	16.2446
753.82	31.5400	968.97	27.9684	1489.16	13.4890
756.73	21.7853	983.53	19.4087	1553.35	0.0000
763.94	22.9630	984.45	0.0000	1596.21	13.8975
765.80	18.6072	996.26	14.6345	1620.50	17.9846
1001.03	22.9931	1001.03	11.4049	1678.03	0.0000
766.84	19.7128	1004.73	0.0000	1690.97	5.0885
772.60	0.0000	1025.87	0.0000	1757.55	0.0000
776.52	25.3177	1028.54	0.0000	1764.49	8.2933
777.92	24.2344	1037.84	30.7639	1770.23	15.5713
778.90	24.2471	1038.76	0.0000	1771.35	16.6139
783.70	17.6782	1046.59	22.9045	1791.20	0.0000
1435.80	22.1558	1048.07	16.9394	1808.65	6.2869
903.28	29.9614	1050.41	13.9631	1836.06	9.4922
795.86	16.6777	1063.66	23.0606		
801.95	23.4212	1077.00	21.1651		
802.10	23.4231	1077.34	20.1602		
810.29	15.6804	1083.85	15.1582		
810.45	15.6816	1085.87	16.1812		
810.76	14.5635	1099.25	20.3301		
815.77	16.8466	1107.22	0.0000		
818.51	19.1188	1111.64	21.4471		
822.65	0.0000	1112.07	21.4512		
832.01	24.4556	1112.84	25.5444		
834.85	29.0242	1115.54	22.5017		
835.15	29.0289	1120.29	14.3452		
836.80	0.0000	1120.55	13.3218		
846.77	21.8953	1121.30	15.3750		
856.80	28.4184	1808.65	16.4516		
860.56	20.2039	1131.51	0.0000		
871.09	22.1508	1332.49	24.3770		
873.19	19.4014	1177.95	13.9531		
875.33	0.0000	1189.05	13.6583		
879.38	14.8250	1204.77	21.1299		
880.51	19.4681	1221.41	17.0016		
881.60	18.5503	1231.02	24.8771		
883.24	25.9902	1235.36	12.8127		

VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 17:23:00.17

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488001.CNF:1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM41.CNF:517
Background date    : 15-JAN-2023 11:25:02
Sample date       : 26-DEC-2022 07:41:00 Acquisition date : 19-JAN-2023 15:21:58
Sample ID        : G606488001 Sample quantity : 7.64890E-01 FILTER
Detector name    : GAM41 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:09.24 0.1%
Energy tolerance : 1.50000 keV Analyst Initials : MXR1
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID         : 2367950 Detector SN# :
Matrix Spike ID  : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.60*	32	97	1.07	94.23	89	11	4.50E-03	69.9	
2	1	92.58*	24	72	1.02	186.09	181	13	3.36E-03	91.5	3.17E+00
3	1	94.64	21	58	1.09	190.20	181	13	2.85E-03	84.5	
4	0	98.29*	12	44	1.45	197.50	195	7	1.63E-03	114.1	
5	0	146.70	60	118	6.71	294.21	282	20	8.33E-03	48.7	
6	0	160.12	38	109	4.38	321.02	308	17	5.28E-03	65.3	
7	0	163.36*	20	39	1.49	327.49	324	7	2.75E-03	61.9	
8	0	185.79*	13	56	1.02	372.32	367	10	1.82E-03	138.4	
9	0	238.18*	24	45	1.47	476.98	471	10	3.36E-03	63.7	
10	0	264.05	14	37	1.03	528.69	524	9	1.91E-03	83.5	
11	0	305.96	14	40	4.08	612.41	606	10	2.00E-03	86.4	
12	0	416.49	19	14	0.67	833.28	827	12	2.68E-03	45.7	
13	0	465.07	12	8	0.62	930.34	927	6	1.65E-03	48.6	
14	0	477.61	41	29	1.18	955.41	948	12	5.73E-03	30.7	
15	0	532.37*	12	22	0.48	1064.84	1057	16	1.69E-03	97.4	
16	0	581.66*	28	12	3.25	1163.34	1157	12	3.90E-03	33.6	
17	0	646.48	17	5	1.80	1292.88	1289	9	2.29E-03	33.8	
18	0	696.50	8	14	1.08	1392.86	1388	8	1.16E-03	84.8	
19	0	786.34	13	2	0.91	1572.41	1567	10	1.75E-03	36.7	
20	0	802.59*	11	2	1.93	1604.89	1601	8	1.56E-03	46.9	
21	0	806.32	8	9	0.82	1612.34	1609	8	1.04E-03	75.4	
22	0	898.92	11	5	1.41	1797.44	1793	8	1.48E-03	49.7	
23	0	922.70	14	3	3.87	1844.97	1839	10	1.99E-03	33.7	
24	0	1017.57	5	8	1.41	2034.60	2029	8	6.94E-04	107.7	
25	0	1100.82	7	7	0.64	2201.04	2196	9	1.03E-03	78.8	
26	0	1127.09	9	0	0.63	2253.56	2250	8	1.25E-03	33.3	
27	0	1317.30	18	0	1.18	2633.83	2628	12	2.50E-03	23.6	
28	0	1460.53*	16	3	1.64	2920.21	2914	12	2.16E-03	40.8	
29	0	1769.89	7	0	0.99	3538.86	3532	12	9.72E-04	37.8	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 19-JAN-2023 17:23:01

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488001.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MXR1		
Sample date	: 26-DEC-2022 07:41:00	Acquisition date	: 19-JAN-2023 15:21:58
Sample ID	: G606488001	Sample quantity	: 0.76489 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA41	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:09.24 0.1%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	41	10.44*	1.761E+00	1.102E+02	1.513E+02	61.32
K-40	1460.82	16	10.66*	6.596E-01	1.084E+02	1.084E+02	81.63
CU-67	91.27	24	7.00	4.957E+00	3.417E+01	2.401E+04	182.93
	93.31	24	16.10	4.957E+00	1.486E+01	1.044E+04	182.93
	184.58	13	48.70*	3.665E+00	3.610E+00	2.536E+03	276.76
TE-123M	159.00	38	84.00*	3.997E+00	5.554E+00	6.400E+00	130.69
CE-141	145.44	60	48.29*	4.185E+00	1.457E+01	2.449E+01	97.35
PR-144	696.51	8	1.34*	1.255E+00	2.435E+02	2.584E+02	169.55
	1489.16	-----	0.28	6.495E-01	-----	Line Not Found	-----
ND-147	91.11	24	27.90	4.957E+00	8.574E+00	3.991E+01	182.93
	319.41	-----	1.95	2.479E+00	-----	Line Not Found	-----
	531.02	12	13.10*	1.599E+00	2.848E+01	1.326E+02	194.86
PB-210	46.54	32	4.25*	4.813E+00	7.780E+01	7.796E+01	139.80
RA-226	186.21	13	3.59*	3.665E+00	4.897E+01	4.897E+01	276.76
U-235	143.76	-----	10.96*	4.227E+00	-----	Line Not Found	-----
	163.33	20	5.08	3.953E+00	4.834E+01	4.834E+01	123.71
	185.72	13	57.20	3.665E+00	3.074E+00	3.074E+00	276.76
	205.31	-----	5.01	3.439E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488001.CNF;1
Acquisition date : 19-JAN-2023 15:21:58 Sensitivity : 3.000
Detector ID : GAM41 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:09.24 Half life ratio : *****
Sample date : 26-DEC-2022 07:41:00 Analyst initials: MXR1
Sample ID : G606488001 Sample Quantity : 7.6489E-01 FILTER
Batch Number : 2367950 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;28

CALIBRATION INFORMATION

Eff. Cal. date : 16-MAY-2022 08:10:27 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM41_JAR.CNF;8

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.513E+02	9.091E+01	8.272E+01
K-40	1.084E+02	8.668E+01	7.828E+01
CU-67	2.536E+03	6.878E+03	5.239E+03
TE-123M	6.400E+00	8.197E+00	5.214E+00
CE-141	2.449E+01	2.337E+01	1.137E+01
PR-144	2.584E+02	4.293E+02	6.175E+02
ND-147	1.326E+02	2.532E+02	2.089E+02
PB-210	7.796E+01	1.068E+02	7.631E+01
RA-226	4.897E+01	1.328E+02	1.018E+02
U-235	2.087E+01	2.336E+01	4.398E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	7.490E-01	4.607E+00	9.815E+00	NOT IDENT.
NA-24	0.000E+00	2.791E+12	0.000E+00	SHORT HLIF
AL-26	3.511E+00	4.184E+00	1.149E+01	NOT IDENT.
SC-46	2.860E+00	4.342E+00	1.014E+01	NOT IDENT.
V-48	-1.429E+00	1.277E+01	2.523E+01	NOT IDENT.
CR-51	9.838E+00	4.270E+01	8.599E+01	NOT IDENT.
MN-52	-6.981E+01	9.013E+01	1.396E+02	NOT IDENT.
MN-54	-5.243E-01	3.855E+00	7.730E+00	NOT IDENT.
CO-56	-2.353E+00	5.376E+00	9.984E+00	FAIL ABUN
CO-57	-1.858E+00	2.165E+00	3.545E+00	NOT IDENT.
NI-57	0.000E+00	3.989E+05	0.000E+00	SHORT HLIF
CO-58	-2.536E-01	6.627E+00	1.151E+01	NOT IDENT.
FE-59	1.551E+01	1.421E+01	3.149E+01	NOT IDENT.
CO-60	2.684E+00	5.297E+00	1.174E+01	NOT IDENT.
ZN-65	2.635E+00	9.964E+00	2.113E+01	NOT IDENT.
GE-68	4.562E+01	1.416E+02	3.083E+02	NOT IDENT.
AS-73	-2.062E+00	2.471E+01	4.193E+01	NOT IDENT.
AS-74	8.555E+00	1.675E+01	3.404E+01	NOT IDENT.
SE-75	4.590E+00	7.509E+00	9.498E+00	FAIL ABUN
BR-77	0.000E+00	2.517E+04	0.000E+00	SHORT HLIF

SR-82	-1.188E+01	4.638E+01	9.082E+01	NOT IDENT.
RB-83	4.943E+00	7.652E+00	1.655E+01	NOT IDENT.
RB-84	3.360E+00	1.094E+01	2.293E+01	NOT IDENT.
KR-85	-3.486E+03	1.443E+03	1.946E+03	NOT IDENT.
SR-85	-2.017E+01	8.350E+00	1.126E+01	NOT IDENT.
RB-86	4.911E+01	1.251E+02	2.746E+02	NOT IDENT.
Y-88	3.200E+00	5.388E+00	1.373E+01	FAIL ABUN
ZR-88	6.333E-01	3.725E+00	7.281E+00	NOT IDENT.
Y-91	3.760E+02	1.981E+03	4.374E+03	NOT IDENT.
NB-94	-8.246E-01	4.058E+00	7.348E+00	NOT IDENT.
NB-95	-3.449E+00	5.207E+00	8.579E+00	NOT IDENT.
NB-95M	5.747E+00	1.374E+01	2.380E+01	NOT IDENT.
TC-95M	-2.347E+00	5.819E+00	9.380E+00	FAIL ABUN
ZR-95	2.741E+00	9.750E+00	2.041E+01	NOT IDENT.
MO-99	-4.300E+03	1.710E+04	3.274E+04	NOT IDENT.
TC-99M	0.000E+00	4.727E+29	0.000E+00	SHORT HLIF
RH-100	0.000E+00	1.272E+09	0.000E+00	SHORT HLIF
RH-101	-1.971E+00	2.741E+00	4.561E+00	NOT IDENT.
RH-102M	1.727E+00	3.305E+00	6.377E+00	FAIL ABUN
RU-103	1.912E+00	4.946E+00	1.017E+01	NOT IDENT.
RH-106	-2.207E+01	4.634E+01	7.952E+01	NOT IDENT.
RU-106	-2.207E+01	4.634E+01	7.952E+01	NOT IDENT.
AG-108M	-2.404E+00	3.433E+00	5.883E+00	NOT IDENT.
CD-109	-1.440E+01	5.612E+01	9.239E+01	NOT IDENT.
AG-110	2.340E+01	8.491E+01	1.705E+02	NOT IDENT.
AG-110M	1.078E+00	6.453E+00	1.331E+01	NOT IDENT.
IN-111	8.470E+01	1.034E+03	1.852E+03	NOT IDENT.
SN-113	4.042E+00	5.145E+00	1.084E+01	NOT IDENT.
IN-114M	1.282E+01	1.958E+01	3.766E+01	NOT IDENT.
CD-115	0.000E+00	2.518E+04	0.000E+00	SHORT HLIF
SN-117M	3.964E+00	9.620E+00	1.664E+01	NOT IDENT.
SB-122	-1.183E+03	2.354E+03	4.092E+03	NOT IDENT.
I-123	0.000E+00	1.477E+14	0.000E+00	SHORT HLIF
SB-124	-1.919E+00	9.824E+00	2.155E+01	NOT IDENT.
SB-125	6.957E+00	8.863E+00	1.930E+01	NOT IDENT.
TE-125M	-1.197E+02	9.288E+02	1.667E+03	NOT IDENT.
I-126	-4.501E+00	3.955E+01	7.405E+01	NOT IDENT.
SB-126	8.348E+00	2.901E+01	5.779E+01	FAIL ABUN
SN-126	-4.153E+00	5.233E+00	8.859E+00	NOT IDENT.
SB-127	5.602E+02	8.431E+02	1.782E+03	NOT IDENT.
TE-129	-6.410E+01	6.506E+01	1.046E+02	FAIL ABUN
I-131	3.667E+00	2.731E+01	5.353E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	-2.655E+02	6.106E+02	9.525E+02	NOT IDENT.
BA-133	-3.568E+00	4.229E+00	7.217E+00	NOT IDENT.
I-133	0.000E+00	1.129E+09	0.000E+00	SHORT HLIF
CS-134	-5.041E-01	3.922E+00	7.981E+00	FAIL ABUN
I-135	0.000E+00	8.455E+27	0.000E+00	SHORT HLIF
CS-136	2.789E+00	2.041E+01	4.232E+01	NOT IDENT.
BA-137M	-3.272E+00	4.312E+00	6.931E+00	NOT IDENT.
CS-137	-3.456E+00	4.555E+00	7.322E+00	NOT IDENT.
LA-138	-1.482E+00	5.234E+00	1.040E+01	NOT IDENT.
CE-139	2.804E-01	3.671E+00	5.737E+00	NOT IDENT.
BA-140	-1.486E+01	4.311E+01	6.881E+01	FAIL ABUN
LA-140	-5.308E+00	1.432E+01	2.921E+01	NOT IDENT.
CE-143	0.000E+00	1.123E+06	0.000E+00	SHORT HLIF
CE-144	-1.075E+01	1.839E+01	3.101E+01	NOT IDENT.
PM-144	3.436E+00	5.709E+00	9.593E+00	FAIL ABUN
PM-146	-3.070E+00	4.749E+00	8.184E+00	NOT IDENT.
PM-147	-1.374E+04	5.660E+04	1.011E+05	NOT IDENT.
PM-149	0.000E+00	1.712E+05	0.000E+00	SHORT HLIF
EU-152	-4.396E-01	9.823E+00	1.888E+01	NOT IDENT.
GD-153	4.357E+00	9.747E+00	1.160E+01	FAIL ABUN
EU-154	4.043E+00	1.234E+01	2.759E+01	NOT IDENT.
EU-155	-2.358E+00	8.650E+00	1.534E+01	NOT IDENT.
TB-160	-2.891E+00	1.611E+01	3.188E+01	FAIL ABUN
HO-166M	1.800E-03	7.547E+00	1.420E+01	FAIL ABUN
TM-171	1.960E+02	4.356E+02	7.731E+02	NOT IDENT.
LU-176	2.936E+00	4.969E+00	5.603E+00	FAIL ABUN
LU-177	-2.129E+02	3.036E+02	4.860E+02	NOT IDENT.
HF-181	-1.995E+00	7.476E+00	1.195E+01	NOT IDENT.
W-181	3.199E+00	6.005E+00	1.182E+01	NOT IDENT.
TA-182	-1.930E+00	1.879E+01	3.770E+01	NOT IDENT.
RE-183	3.419E+00	6.350E+00	1.247E+01	FAIL ABUN
RE-184	2.278E+01	1.757E+01	4.189E+01	NOT IDENT.
RE-188	7.781E+00	1.926E+01	3.335E+01	FAIL ABUN
W-188	2.991E+02	7.457E+02	1.516E+03	NOT IDENT.
OS-191	-5.760E+00	2.203E+01	3.865E+01	NOT IDENT.

IR-192	-7.317E-01	3.775E+00	7.143E+00	NOT IDENT.
PB-201	0.000E+00	2.886E+19	0.000E+00	SHORT HLIF
TL-201	3.255E+03	5.436E+03	1.038E+04	NOT IDENT.
TL-202	-2.954E+00	1.425E+01	2.626E+01	NOT IDENT.
HG-203	1.937E+00	4.112E+00	8.411E+00	NOT IDENT.
PB-203	0.000E+00	7.082E+03	0.000E+00	SHORT HLIF
TL-204	-5.032E+01	2.066E+02	3.764E+02	NOT IDENT.
BI-207	-1.136E+00	6.065E+00	1.180E+01	FAIL ABUN
TL-208	4.537E+00	5.552E+00	9.837E+00	NOT IDENT.
BI-211	-1.839E+01	2.617E+01	4.377E+01	NOT IDENT.
PB-211	-1.109E+01	7.325E+01	1.383E+02	NOT IDENT.
BI-212	4.975E+01	5.874E+01	1.292E+02	NOT IDENT.
PB-212	8.978E+00	1.122E+01	1.421E+01	FAIL ABUN
BI-213	-9.623E+00	1.200E+01	2.017E+01	NOT IDENT.
BI-214	-1.265E+00	9.666E+00	1.756E+01	NOT IDENT.
PB-214	-1.003E+01	9.611E+00	1.536E+01	NOT IDENT.
RN-219	1.035E+00	3.933E+01	7.681E+01	NOT IDENT.
FR-221	1.301E+00	2.187E+01	3.872E+01	NOT IDENT.
RA-223	-1.000E+01	6.424E+01	1.218E+02	FAIL ABUN
RA-224	6.925E+00	6.837E+01	1.121E+02	NOT IDENT.
AC-225	7.042E+00	1.184E+02	2.096E+02	NOT IDENT.
AC-227	-8.293E-01	2.221E+01	4.339E+01	FAIL ABUN
TH-227	-8.293E-01	2.221E+01	4.339E+01	FAIL ABUN
AC-228	-2.178E+00	1.995E+01	3.733E+01	NOT IDENT.
RA-228	-2.178E+00	1.995E+01	3.733E+01	NOT IDENT.
TH-228	8.978E+00	1.122E+01	1.421E+01	FAIL ABUN
TH-229	-9.192E+00	5.235E+01	9.068E+01	NOT IDENT.
TH-230	-1.307E+02	4.759E+02	8.605E+02	NOT IDENT.
PA-231	2.236E+00	5.033E+01	8.854E+01	NOT IDENT.
TH-231	-2.840E+01	3.399E+01	5.610E+01	NOT IDENT.
TH-232	-1.814E+03	1.174E+03	2.289E+03	NOT IDENT.
PA-233	3.331E-01	7.073E+00	1.364E+01	FAIL ABUN
PA-234	1.882E+01	3.691E+01	8.075E+01	FAIL ABUN
PA-234M	-1.139E+02	6.728E+02	1.356E+03	NOT IDENT.
TH-234	-1.372E+01	8.496E+01	1.741E+02	FAIL ABUN
U-234	-2.140E+02	1.725E+03	2.919E+03	NOT IDENT.
NP-237	3.331E-01	7.073E+00	1.364E+01	FAIL ABUN
NP-238	0.000E+00	5.288E+04	0.000E+00	SHORT HLIF
U-238	-1.372E+01	8.496E+01	1.741E+02	FAIL ABUN
NP-239	-2.002E+00	2.198E+01	3.974E+01	FAIL ABUN
AM-241	1.259E+00	4.675E+00	8.979E+00	NOT IDENT.
AM-242	3.273E+01	7.322E+01	8.674E+01	FAIL ABUN
AM-243	2.377E+00	3.146E+00	5.790E+00	NOT IDENT.
CM-243	6.366E+00	8.882E+00	1.728E+01	FAIL ABUN
BK-247	7.827E+00	1.280E+01	1.564E+01	FAIL ABUN
CM-247	-1.554E+00	3.753E+00	6.815E+00	NOT IDENT.
CF-249	-2.357E+00	4.248E+00	7.539E+00	NOT IDENT.
CF-251	1.548E+00	1.107E+01	2.033E+01	NOT IDENT.
CF-252	2.066E+03	1.338E+04	2.338E+04	NOT IDENT.
ANH-511	-2.044E+01	8.733E+00	1.578E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.60	108	97	1.07	94.23	89	11	1.50E-02	20.2	3.17E+00
2	0	63.04	129	138	0.94	127.06	123	10	1.79E-02	19.0	
3	1	92.58	248	72	1.02	186.09	181	13	3.45E-02	8.2	
4	1	94.64	21	58	1.09	190.20	181	13	2.85E-03	84.5	
5	0	98.29	29	44	1.45	197.50	195	7	4.09E-03	41.1	
6	0	146.70	60	118	6.71	294.21	282	20	8.33E-03	48.7	
7	0	160.12	38	109	4.38	321.02	308	17	5.28E-03	65.3	
8	0	163.36	27	39	1.49	327.49	324	7	3.68E-03	43.4	
9	0	185.79	95	56	1.02	372.32	367	10	1.31E-02	18.1	
10	0	238.18	48	45	1.47	476.98	471	10	6.67E-03	29.9	
11	0	264.05	14	37	1.03	528.69	524	9	1.91E-03	83.5	
12	0	305.96	14	40	4.08	612.41	606	10	2.00E-03	86.4	
13	0	416.49	19	14	0.67	833.28	827	12	2.68E-03	45.7	
14	0	465.07	12	8	0.62	930.34	927	6	1.65E-03	48.6	
15	0	477.61	41	29	1.18	955.41	948	12	5.73E-03	30.7	
16	0	510.56	132	36	2.10	1021.25	1013	15	1.84E-02	13.3	
17	0	532.37	15	22	0.48	1064.84	1057	16	2.05E-03	78.0	
18	0	581.66	29	12	3.25	1163.34	1157	12	4.03E-03	30.3	
19	0	646.48	17	5	1.80	1292.88	1289	9	2.29E-03	33.8	
20	0	696.50	8	14	1.08	1392.86	1388	8	1.16E-03	84.8	
21	0	786.34	13	2	0.91	1572.41	1567	10	1.75E-03	36.7	
22	0	802.59	16	2	1.93	1604.89	1601	8	2.21E-03	29.5	
23	0	806.32	8	9	0.82	1612.34	1609	8	1.04E-03	75.4	
24	0	898.92	11	5	1.41	1797.44	1793	8	1.48E-03	49.7	
25	0	922.70	14	3	3.87	1844.97	1839	10	1.99E-03	33.7	
26	0	1017.57	5	8	1.41	2034.60	2029	8	6.94E-04	107.7	
27	0	1100.82	7	7	0.64	2201.04	2196	9	1.03E-03	78.8	
28	0	1127.09	9	0	0.63	2253.56	2250	8	1.25E-03	33.3	
29	0	1317.30	18	0	1.18	2633.83	2628	12	2.50E-03	23.6	
30	0	1460.53	23	3	1.64	2920.21	2914	12	3.21E-03	25.6	
31	0	1769.89	7	0	0.99	3538.86	3532	12	9.72E-04	37.8	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	41	10.44*	1.761E+00	1.102E+02	1.513E+02	61.32
K-40	1460.82	16	10.66*	6.596E-01	1.084E+02	1.084E+02	81.63
CU-67	91.27	24	7.00	4.957E+00	3.417E+01	2.401E+04	182.93
	93.31	24	16.10	4.957E+00	1.486E+01	1.044E+04	182.93
	184.58	13	48.70*	3.665E+00	3.610E+00	2.536E+03	276.76
TE-123M	159.00	38	84.00*	3.997E+00	5.554E+00	6.400E+00	130.69
CE-141	145.44	60	48.29*	4.185E+00	1.457E+01	2.449E+01	97.35
PR-144	696.51	8	1.34*	1.255E+00	2.435E+02	2.584E+02	169.55
	1489.16	-----	0.28	6.495E-01	-----	Line Not Found	-----
ND-147	91.11	24	27.90	4.957E+00	8.574E+00	3.991E+01	182.93
	319.41	-----	1.95	2.479E+00	-----	Line Not Found	-----
	531.02	12	13.10*	1.599E+00	2.848E+01	1.326E+02	194.86
PB-210	46.54	32	4.25*	4.813E+00	7.780E+01	7.796E+01	139.80
RA-226	186.21	13	3.59*	3.665E+00	4.897E+01	4.897E+01	276.76
U-235	143.76	-----	10.96*	4.227E+00	-----	Line Not Found	-----
	163.33	20	5.08	3.953E+00	4.834E+01	4.834E+01	123.71
	185.72	13	57.20	3.665E+00	3.074E+00	3.074E+00	276.76
	205.31	-----	5.01	3.439E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

Total number of lines in spectrum 29
Number of unidentified lines 9
Number of lines tentatively identified by NID 20 68.97%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.37	1.102E+02	1.513E+02	0.928E+02	61.32	
K-40	1.25E+09Y	1.00	1.084E+02	1.084E+02	0.885E+02	81.63	
CU-67	61.83H	702.	3.610E+00	2.536E+03	7.018E+03	276.76	
TE-123M	119.20D	1.15	5.554E+00	6.400E+00	8.364E+00	130.69	
CE-141	32.51D	1.68	1.457E+01	2.449E+01	2.385E+01	97.35	
PR-144	284.91D	1.06	2.435E+02	2.584E+02	4.380E+02	169.55	
ND-147	10.98D	4.65	2.848E+01	1.326E+02	2.584E+02	194.86	
PB-210	22.20Y	1.00	7.780E+01	7.796E+01	10.90E+01	139.80	
RA-226	1600.00Y	1.00	4.897E+01	4.897E+01	13.55E+01	276.76	
U-235	7.04E+08Y	1.00	3.074E+00	3.074E+00	8.506E+00	276.76	K
Total Activity :			6.441E+02	3.347E+03			

Grand Total Activity : 6.441E+02 3.347E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
1	94.64	21	58	1.09	190.20	181	13	2.85E-03	****	4.93E+00	T
0	98.29	12	44	1.45	197.50	195	7	1.63E-03	****	4.89E+00	T
0	238.18	24	45	1.47	476.98	471	10	3.36E-03	****	3.10E+00	T
0	264.05	14	37	1.03	528.69	524	9	1.91E-03	****	2.88E+00	T
0	305.96	14	40	4.08	612.41	606	10	2.00E-03	****	2.57E+00	T
0	416.49	19	14	0.67	833.28	827	12	2.68E-03	91.4	1.98E+00	
0	465.07	12	8	0.62	930.34	927	6	1.65E-03	97.3	1.80E+00	
0	581.66	28	12	3.25	1163.34	1157	12	3.90E-03	67.3	1.48E+00	T
0	646.48	17	5	1.80	1292.88	1289	9	2.29E-03	67.6	1.34E+00	
0	786.34	13	2	0.91	1572.41	1567	10	1.75E-03	73.4	1.12E+00	
0	802.59	11	2	1.93	1604.89	1601	8	1.56E-03	93.9	1.10E+00	T
0	806.32	8	9	0.82	1612.34	1609	8	1.04E-03	****	1.10E+00	
0	898.92	11	5	1.41	1797.44	1793	8	1.48E-03	99.3	9.97E-01	T
0	922.70	14	3	3.87	1844.97	1839	10	1.99E-03	67.3	9.75E-01	T
0	1017.57	5	8	1.41	2034.60	2029	8	6.94E-04	****	8.94E-01	
0	1100.82	7	7	0.64	2201.04	2196	9	1.03E-03	****	8.35E-01	
0	1127.09	9	0	0.63	2253.56	2250	8	1.25E-03	66.7	8.18E-01	
0	1317.30	18	0	1.18	2633.83	2628	12	2.50E-03	47.1	7.17E-01	
0	1769.89	7	0	0.99	3538.86	3532	12	9.72E-04	75.6	5.69E-01	T

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488001.CNF;1  *
* Acquisition date   : 19-JAN-2023 15:21:58 Sensitivity      : 3.000          *
* Detector ID        : GAM41 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 02:00:09.24 Half life ratio  : *****          *
* Sample date        : 26-DEC-2022 07:41:00 Nuclide Library : LIQUID         *
* Sample ID          : G606488001 Analyst initials: MXR1          *
* Batch Number       : 2367950 Sample Quantity : 7.6489E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000         *
*                                     Dry Weight    : 0.00000         *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 16-MAY-2022 08:10:27 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM41_JAR.CNF;8          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.641E+01
K-40	2.970E+01
CU-67	2.360E+03
TE-123M	2.381E+00
CE-141	5.136E+00
PR-144	2.669E+02
ND-147	8.974E+01
PB-210	3.491E+01
RA-226	4.588E+01
U-235	2.056E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	3.991E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	4.555E+00	NOT IDENT.
SC-46	4.266E+00	NOT IDENT.
V-48	1.054E+01	NOT IDENT.
CR-51	3.803E+01	NOT IDENT.
MN-52	4.947E+01	NOT IDENT.
MN-54	3.208E+00	NOT IDENT.
CO-56	4.208E+00	FAIL ABUN
CO-57	1.592E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	4.984E+00	NOT IDENT.
FE-59	1.370E+01	NOT IDENT.
CO-60	4.927E+00	NOT IDENT.
ZN-65	8.866E+00	NOT IDENT.
GE-68	1.284E+02	NOT IDENT.
AS-73	1.938E+01	NOT IDENT.
AS-74	1.501E+01	NOT IDENT.
SE-75	4.299E+00	FAIL ABUN
BR-77	0.000E+00	SHORT HLIF
SR-82	3.788E+01	NOT IDENT.

RB-83	7.178E+00	NOT IDENT.
RB-84	9.880E+00	NOT IDENT.
KR-85	8.795E+02	NOT IDENT.
SR-85	5.090E+00	NOT IDENT.
RB-86	1.150E+02	NOT IDENT.
Y-88	5.448E+00	FAIL ABUN
ZR-88	3.241E+00	NOT IDENT.
Y-91	1.746E+03	NOT IDENT.
NB-94	3.140E+00	NOT IDENT.
NB-95	3.538E+00	NOT IDENT.
NB-95M	1.079E+01	NOT IDENT.
TC-95M	4.291E+00	FAIL ABUN
ZR-95	8.842E+00	NOT IDENT.
MO-99	1.422E+04	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-100	0.000E+00	SHORT HLIF
RH-101	2.060E+00	NOT IDENT.
RH-102M	2.790E+00	FAIL ABUN
RU-103	4.424E+00	NOT IDENT.
RH-106	3.474E+01	NOT IDENT.
RU-106	3.474E+01	NOT IDENT.
AG-108M	2.559E+00	NOT IDENT.
CD-109	4.250E+01	NOT IDENT.
AG-110	7.333E+01	NOT IDENT.
AG-110M	5.692E+00	NOT IDENT.
IN-111	8.295E+02	NOT IDENT.
SN-113	4.854E+00	NOT IDENT.
IN-114M	1.718E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	7.661E+00	NOT IDENT.
SB-122	1.739E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
SB-124	7.636E+00	NOT IDENT.
SB-125	8.487E+00	NOT IDENT.
TE-125M	7.641E+02	NOT IDENT.
I-126	3.133E+01	NOT IDENT.
SB-126	2.492E+01	FAIL ABUN
SN-126	4.073E+00	NOT IDENT.
SB-127	7.774E+02	NOT IDENT.
TE-129	4.447E+01	FAIL ABUN
I-131	2.377E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	4.303E+02	NOT IDENT.
BA-133	3.136E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.277E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	1.773E+01	NOT IDENT.
BA-137M	2.903E+00	NOT IDENT.
CS-137	3.067E+00	NOT IDENT.
LA-138	3.686E+00	NOT IDENT.
CE-139	2.630E+00	NOT IDENT.
BA-140	2.796E+01	FAIL ABUN
LA-140	1.035E+01	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.406E+01	NOT IDENT.
PM-144	4.241E+00	FAIL ABUN
PM-146	3.534E+00	NOT IDENT.
PM-147	4.537E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.368E+00	NOT IDENT.
GD-153	5.301E+00	FAIL ABUN
EU-154	1.121E+01	NOT IDENT.
EU-155	7.012E+00	NOT IDENT.
TB-160	1.320E+01	FAIL ABUN
HO-166M	6.106E+00	FAIL ABUN
TM-171	3.576E+02	NOT IDENT.
LU-176	2.526E+00	FAIL ABUN
LU-177	2.193E+02	NOT IDENT.
HF-181	5.275E+00	NOT IDENT.
W-181	5.442E+00	NOT IDENT.
TA-182	1.513E+01	NOT IDENT.
RE-183	5.749E+00	FAIL ABUN
RE-184	1.812E+01	NOT IDENT.
RE-188	1.535E+01	FAIL ABUN
W-188	6.798E+02	NOT IDENT.
OS-191	1.764E+01	NOT IDENT.
IR-192	3.169E+00	NOT IDENT.

PB-201	0.000E+00	SHORT HLIF
TL-201	4.751E+03	NOT IDENT.
TL-202	1.163E+01	NOT IDENT.
HG-203	3.783E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	1.717E+02	NOT IDENT.
BI-207	4.864E+00	FAIL ABUN
TL-208	4.377E+00	NOT IDENT.
BI-211	1.965E+01	NOT IDENT.
PB-211	6.053E+01	NOT IDENT.
BI-212	5.616E+01	NOT IDENT.
PB-212	6.606E+00	FAIL ABUN
BI-213	8.734E+00	NOT IDENT.
BI-214	7.754E+00	NOT IDENT.
PB-214	6.870E+00	NOT IDENT.
RN-219	3.349E+01	NOT IDENT.
FR-221	1.761E+01	NOT IDENT.
RA-223	5.414E+01	FAIL ABUN
RA-224	5.070E+01	NOT IDENT.
AC-225	9.528E+01	NOT IDENT.
AC-227	1.932E+01	FAIL ABUN
TH-227	1.932E+01	FAIL ABUN
AC-228	1.604E+01	NOT IDENT.
RA-228	1.604E+01	NOT IDENT.
TH-228	6.606E+00	FAIL ABUN
TH-229	4.115E+01	NOT IDENT.
TH-230	3.964E+02	NOT IDENT.
PA-231	3.951E+01	NOT IDENT.
TH-231	2.607E+01	NOT IDENT.
TH-232	1.095E+03	NOT IDENT.
PA-233	6.140E+00	FAIL ABUN
PA-234	3.458E+01	FAIL ABUN
PA-234M	5.909E+02	NOT IDENT.
TH-234	8.359E+01	FAIL ABUN
U-234	1.349E+03	NOT IDENT.
NP-237	6.140E+00	FAIL ABUN
NP-238	0.000E+00	SHORT HLIF
U-238	8.359E+01	FAIL ABUN
NP-239	1.807E+01	FAIL ABUN
AM-241	4.128E+00	NOT IDENT.
AM-242	3.960E+01	FAIL ABUN
AM-243	2.703E+00	NOT IDENT.
CM-243	7.983E+00	FAIL ABUN
BK-247	7.052E+00	FAIL ABUN
CM-247	2.958E+00	NOT IDENT.
CF-249	3.294E+00	NOT IDENT.
CF-251	9.153E+00	NOT IDENT.
CF-252	1.062E+04	NOT IDENT.
ANH-511	7.495E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488001.CNF;1
Acquisition date : 19-JAN-2023 15:21:58 Sensitivity : 3.000
Detector ID : GAM41 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:09.24 Half life ratio : *****
Sample date : 26-DEC-2022 07:41:00 Nuclide Library : LIQUID
Sample ID : G606488001 Analyst initials: MXR1
Batch Number : 2367950 Sample Quantity : 7.6489E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 16-MAY-2022 08:10:27 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM41_JAR.CNF;8

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.513E+02	9.199E+01	9.204E+01
K-40	1.084E+02	8.723E+01	8.725E+01
CU-67	2.536E+03	6.882E+03	6.883E+03
TE-123M	6.400E+00	8.219E+00	8.220E+00
CE-141	2.449E+01	2.349E+01	2.349E+01
PR-144	2.584E+02	4.299E+02	4.299E+02
ND-147	1.326E+02	2.535E+02	2.535E+02
PB-210	7.796E+01	1.072E+02	1.072E+02
RA-226	4.897E+01	1.329E+02	1.329E+02
U-235	2.087E+01	2.346E+01	2.346E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	7.490E-01	4.608E+00	4.620E+00	NOT IDENT.
NA-24	-1.648E+12	2.795E+12	2.892E+12	SHORT HLIF
AL-26	3.511E+00	4.192E+00	4.482E+00	NOT IDENT.
SC-46	2.860E+00	4.349E+00	4.536E+00	NOT IDENT.
V-48	-1.429E+00	1.278E+01	1.279E+01	NOT IDENT.
CR-51	9.838E+00	4.270E+01	4.293E+01	NOT IDENT.
MN-52	-6.981E+01	9.032E+01	9.566E+01	NOT IDENT.
MN-54	-5.243E-01	3.856E+00	3.863E+00	NOT IDENT.
CO-56	-2.353E+00	5.380E+00	5.483E+00	FAIL ABUN
CO-57	-1.858E+00	2.173E+00	2.329E+00	NOT IDENT.
NI-57	1.943E+05	3.995E+05	4.090E+05	SHORT HLIF
CO-58	-2.536E-01	6.627E+00	6.628E+00	NOT IDENT.
FE-59	1.551E+01	1.430E+01	1.592E+01	NOT IDENT.
CO-60	2.684E+00	5.302E+00	5.438E+00	NOT IDENT.
ZN-65	2.635E+00	9.967E+00	1.004E+01	NOT IDENT.
GE-68	4.562E+01	1.416E+02	1.431E+02	NOT IDENT.
AS-73	-2.062E+00	2.471E+01	2.473E+01	NOT IDENT.
AS-74	8.555E+00	1.678E+01	1.722E+01	NOT IDENT.
SE-75	4.590E+00	7.519E+00	7.799E+00	FAIL ABUN
BR-77	2.015E+04	2.524E+04	2.683E+04	SHORT HLIF

SR-82	-1.188E+01	4.639E+01	4.670E+01	NOT IDENT.
RB-83	4.943E+00	7.693E+00	8.010E+00	NOT IDENT.
RB-84	3.360E+00	1.094E+01	1.105E+01	NOT IDENT.
KR-85	-3.486E+03	1.479E+03	2.159E+03	NOT IDENT.
SR-85	-2.017E+01	8.558E+00	1.249E+01	NOT IDENT.
RB-86	4.911E+01	1.251E+02	1.271E+02	NOT IDENT.
Y-88	3.200E+00	5.394E+00	5.584E+00	FAIL ABUN
ZR-88	6.333E-01	3.726E+00	3.737E+00	NOT IDENT.
Y-91	3.760E+02	1.981E+03	1.989E+03	NOT IDENT.
NB-94	-8.246E-01	4.059E+00	4.076E+00	NOT IDENT.
NB-95	-3.449E+00	5.216E+00	5.443E+00	NOT IDENT.
NB-95M	5.747E+00	1.375E+01	1.400E+01	NOT IDENT.
TC-95M	-2.347E+00	5.823E+00	5.919E+00	FAIL ABUN
ZR-95	2.741E+00	9.753E+00	9.832E+00	NOT IDENT.
MO-99	-4.300E+03	1.710E+04	1.721E+04	NOT IDENT.
TC-99M	-3.622E+29	4.751E+29	0.000E+00	SHORT HLIF
RH-100	-4.631E+07	1.273E+09	1.273E+09	SHORT HLIF
RH-101	-1.971E+00	2.769E+00	2.908E+00	NOT IDENT.
RH-102M	1.727E+00	3.312E+00	3.403E+00	FAIL ABUN
RU-103	1.912E+00	4.949E+00	5.024E+00	NOT IDENT.
RH-106	-2.207E+01	4.639E+01	4.745E+01	NOT IDENT.
RU-106	-2.207E+01	4.639E+01	4.745E+01	NOT IDENT.
AG-108M	-2.404E+00	3.440E+00	3.607E+00	NOT IDENT.
CD-109	-1.440E+01	5.614E+01	5.651E+01	NOT IDENT.
AG-110	2.340E+01	8.493E+01	8.559E+01	NOT IDENT.
AG-110M	1.078E+00	6.454E+00	6.472E+00	NOT IDENT.
IN-111	8.470E+01	1.034E+03	1.035E+03	NOT IDENT.
SN-113	4.042E+00	5.158E+00	5.471E+00	NOT IDENT.
IN-114M	1.282E+01	1.962E+01	2.046E+01	NOT IDENT.
CD-115	6.106E+03	2.519E+04	2.534E+04	SHORT HLIF
SN-117M	3.964E+00	9.628E+00	9.792E+00	NOT IDENT.
SB-122	-1.183E+03	2.356E+03	2.416E+03	NOT IDENT.
I-123	1.153E+14	1.481E+14	1.569E+14	SHORT HLIF
SB-124	-1.919E+00	9.825E+00	9.863E+00	NOT IDENT.
SB-125	6.957E+00	8.886E+00	9.424E+00	NOT IDENT.
TE-125M	-1.197E+02	9.288E+02	9.304E+02	NOT IDENT.
I-126	-4.501E+00	3.955E+01	3.960E+01	NOT IDENT.
SB-126	8.348E+00	2.903E+01	2.927E+01	FAIL ABUN
SN-126	-4.153E+00	5.245E+00	5.570E+00	NOT IDENT.
SB-127	5.602E+02	8.469E+02	8.838E+02	NOT IDENT.
TE-129	-6.410E+01	6.606E+01	7.211E+01	FAIL ABUN
I-131	3.667E+00	2.731E+01	2.736E+01	NOT IDENT.
I-132	1.000E+41	4.486E+41	0.000E+00	SHORT HLIF
TE-132	-2.655E+02	6.114E+02	6.231E+02	NOT IDENT.
BA-133	-3.568E+00	4.241E+00	4.536E+00	NOT IDENT.
I-133	6.495E+08	1.136E+09	1.173E+09	SHORT HLIF
CS-134	-5.041E-01	3.922E+00	3.929E+00	FAIL ABUN
I-135	-5.073E+27	8.920E+27	0.000E+00	SHORT HLIF
CS-136	2.789E+00	2.041E+01	2.045E+01	NOT IDENT.
BA-137M	-3.272E+00	4.321E+00	4.566E+00	NOT IDENT.
CS-137	-3.456E+00	4.565E+00	4.824E+00	NOT IDENT.
LA-138	-1.482E+00	5.235E+00	5.278E+00	NOT IDENT.
CE-139	2.804E-01	3.672E+00	3.674E+00	NOT IDENT.
BA-140	-1.486E+01	4.313E+01	4.365E+01	FAIL ABUN
LA-140	-5.308E+00	1.433E+01	1.453E+01	NOT IDENT.
CE-143	-1.892E+05	1.123E+06	1.126E+06	SHORT HLIF
CE-144	-1.075E+01	1.842E+01	1.905E+01	NOT IDENT.
PM-144	3.436E+00	5.717E+00	5.923E+00	FAIL ABUN
PM-146	-3.070E+00	4.761E+00	4.958E+00	NOT IDENT.
PM-147	-1.374E+04	5.662E+04	5.696E+04	NOT IDENT.
PM-149	1.001E+05	1.719E+05	1.777E+05	SHORT HLIF
EU-152	-4.396E-01	9.823E+00	9.825E+00	NOT IDENT.
GD-153	4.357E+00	9.755E+00	9.951E+00	FAIL ABUN
EU-154	4.043E+00	1.235E+01	1.248E+01	NOT IDENT.
EU-155	-2.358E+00	8.653E+00	8.718E+00	NOT IDENT.
TB-160	-2.891E+00	1.611E+01	1.616E+01	FAIL ABUN
HO-166M	1.800E-03	7.547E+00	7.547E+00	FAIL ABUN
TM-171	1.960E+02	4.362E+02	4.451E+02	NOT IDENT.
LU-176	2.936E+00	4.975E+00	5.148E+00	FAIL ABUN
LU-177	-2.129E+02	3.043E+02	3.191E+02	NOT IDENT.
HF-181	-1.995E+00	7.479E+00	7.533E+00	NOT IDENT.
W-181	3.199E+00	6.065E+00	6.234E+00	NOT IDENT.
TA-182	-1.930E+00	1.879E+01	1.881E+01	NOT IDENT.
RE-183	3.419E+00	6.365E+00	6.549E+00	FAIL ABUN
RE-184	2.278E+01	1.774E+01	2.050E+01	NOT IDENT.
RE-188	7.781E+00	1.928E+01	1.960E+01	FAIL ABUN
W-188	2.991E+02	7.467E+02	7.588E+02	NOT IDENT.
OS-191	-5.760E+00	2.204E+01	2.219E+01	NOT IDENT.

IR-192	-7.317E-01	3.776E+00	3.790E+00	NOT IDENT.
PB-201	-8.538E+18	2.899E+19	0.000E+00	SHORT HLIF
TL-201	3.255E+03	5.444E+03	5.639E+03	NOT IDENT.
TL-202	-2.954E+00	1.425E+01	1.432E+01	NOT IDENT.
HG-203	1.937E+00	4.115E+00	4.207E+00	NOT IDENT.
PB-203	3.337E+03	7.087E+03	7.246E+03	SHORT HLIF
TL-204	-5.032E+01	2.067E+02	2.079E+02	NOT IDENT.
BI-207	-1.136E+00	6.066E+00	6.088E+00	FAIL ABUN
TL-208	4.537E+00	5.568E+00	5.932E+00	NOT IDENT.
BI-211	-1.839E+01	2.622E+01	2.750E+01	NOT IDENT.
PB-211	-1.109E+01	7.326E+01	7.343E+01	NOT IDENT.
BI-212	4.975E+01	5.892E+01	6.305E+01	NOT IDENT.
PB-212	8.978E+00	1.125E+01	1.195E+01	FAIL ABUN
BI-213	-9.623E+00	1.204E+01	1.280E+01	NOT IDENT.
BI-214	-1.265E+00	9.666E+00	9.683E+00	NOT IDENT.
PB-214	-1.003E+01	9.651E+00	1.066E+01	NOT IDENT.
RN-219	1.035E+00	3.933E+01	3.933E+01	NOT IDENT.
FR-221	1.301E+00	2.187E+01	2.188E+01	NOT IDENT.
RA-223	-1.000E+01	6.425E+01	6.441E+01	FAIL ABUN
RA-224	6.925E+00	6.837E+01	6.844E+01	NOT IDENT.
AC-225	7.042E+00	1.184E+02	1.184E+02	NOT IDENT.
AC-227	-8.293E-01	2.221E+01	2.221E+01	FAIL ABUN
TH-227	-8.293E-01	2.221E+01	2.221E+01	FAIL ABUN
AC-228	-2.178E+00	1.995E+01	1.998E+01	NOT IDENT.
RA-228	-2.178E+00	1.995E+01	1.998E+01	NOT IDENT.
TH-228	8.978E+00	1.125E+01	1.195E+01	FAIL ABUN
TH-229	-9.192E+00	5.236E+01	5.252E+01	NOT IDENT.
TH-230	-1.307E+02	4.765E+02	4.802E+02	NOT IDENT.
PA-231	2.236E+00	5.034E+01	5.035E+01	NOT IDENT.
TH-231	-2.840E+01	3.425E+01	3.657E+01	NOT IDENT.
TH-232	-1.814E+03	1.201E+03	1.454E+03	NOT IDENT.
PA-233	3.331E-01	7.073E+00	7.074E+00	FAIL ABUN
PA-234	1.882E+01	4.275E+01	4.359E+01	FAIL ABUN
PA-234M	-1.139E+02	6.729E+02	6.749E+02	NOT IDENT.
TH-234	-1.372E+01	8.502E+01	8.524E+01	FAIL ABUN
U-234	-2.140E+02	1.726E+03	1.728E+03	NOT IDENT.
NP-237	3.331E-01	7.073E+00	7.074E+00	FAIL ABUN
NP-238	3.679E+03	5.288E+04	5.290E+04	SHORT HLIF
U-238	-1.372E+01	8.502E+01	8.524E+01	FAIL ABUN
NP-239	-2.002E+00	2.198E+01	2.200E+01	FAIL ABUN
AM-241	1.259E+00	4.677E+00	4.711E+00	NOT IDENT.
AM-242	3.273E+01	7.347E+01	7.494E+01	FAIL ABUN
AM-243	2.377E+00	3.154E+00	3.331E+00	NOT IDENT.
CM-243	6.366E+00	8.914E+00	9.365E+00	FAIL ABUN
BK-247	7.827E+00	1.291E+01	1.339E+01	FAIL ABUN
CM-247	-1.554E+00	3.764E+00	3.829E+00	NOT IDENT.
CF-249	-2.357E+00	4.257E+00	4.388E+00	NOT IDENT.
CF-251	1.548E+00	1.107E+01	1.110E+01	NOT IDENT.
CF-252	2.066E+03	1.351E+04	1.354E+04	NOT IDENT.
ANH-511	-2.044E+01	8.938E+00	1.284E+01	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	25.0929	133.52	39.2655	116.30	31.1206
879.38	38.7979	364.49	39.2724	116.74	35.3001
46.54	38.9333	80.22	39.2758	117.23	36.3728
228.16	42.0070	711.68	41.2278	119.76	29.2397
52.39	45.7666	356.01	47.0314	120.54	34.5121
53.20	46.9413	323.87	47.0396	120.90	29.3029
53.44	46.0927	82.35	0.0000	264.66	29.3151
57.53	48.3154	82.47	60.6914	121.22	29.3206
293.27	0.0000	82.47	60.6919	344.28	36.6895
57.53	35.9332	83.79	48.3250	122.06	39.8552
482.18	35.9335	265.00	50.2841	1274.44	31.5241
57.98	37.7839	84.21	50.3099	123.68	35.7678
59.32	44.2676	84.86	0.0000	1377.63	0.0000
59.54	38.8736	193.51	57.2521	127.23	41.2959
155.04	164.6168	105.31	44.7580	129.43	41.4607
63.00	33.8049	86.79	45.7572	131.20	35.1934
129.43	43.8930	86.94	49.6693	133.02	41.7267
63.29	43.8930	87.09	49.6872	133.52	41.7630
290.67	45.7615	87.57	59.4977	135.34	33.3022
63.81	58.6147	88.03	49.4730	136.00	41.9439
87.57	132.0667	306.78	45.6007	136.28	39.8127
64.99	168.1865	88.47	45.6146	136.47	34.4438
65.08	168.2298	531.02	47.2086	739.50	54.9141
66.73	41.5668	184.58	47.2262	140.51	0.0000
66.98	41.5966	92.59	47.3698	140.88	54.9482
67.24	49.9535	93.31	47.4474	143.76	29.4233
67.67	50.9410	94.56	47.5822	144.24	29.4468
1221.41	48.1732	311.90	47.5917	145.44	29.5053
439.51	44.6115	946.00	47.5939	152.32	30.9412
70.82	44.6115	97.43	29.9297	152.43	30.9463
167.43	44.6122	98.43	27.9959	1048.07	36.8891
97.43	40.9838	98.44	27.9964	154.21	38.4229
70.82	40.1800	99.53	38.7537	155.04	36.9934
70.82	40.1803	103.37	38.7537	158.56	37.0504
279.20	0.0000	116.74	38.7537	158.97	0.0000
1063.66	45.0972	100.11	30.7745	159.00	37.2223
72.87	0.0000	100.20	30.7804	162.33	8.9790
351.06	48.8635	102.03	41.6503	537.26	35.9341
74.66	39.6567	103.18	43.4357	163.33	37.4695
238.63	50.0644	103.37	36.3793	165.86	33.0985
351.93	50.0644	105.31	42.6159	167.43	29.4063
238.63	50.0644	106.12	46.7531	245.35	28.4359
74.97	65.2039	106.47	39.6674	427.87	37.8088
77.11	56.0687	109.28	42.9658	176.60	30.9473
256.23	48.7891	111.00	49.2744	177.52	25.2495
79.82	39.2361	111.76	37.0121	181.07	30.7589
80.02	39.2555	208.37	40.1917	184.41	27.8119
80.03	39.2561	116.24	35.2659	184.58	27.8185

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	27.8621	300.09	27.4866	475.06	10.6109
186.21	27.8807	300.13	27.4879	696.49	18.2106
190.27	25.6990	301.36	22.4925	477.60	18.2205
193.51	35.1965	302.85	21.1992	477.99	18.2252
197.03	36.5391	304.50	22.1166	482.18	22.8438
198.01	29.5052	304.85	22.1237	487.02	7.1292
201.83	30.8377	306.78	21.2773	492.35	0.0000
204.12	41.6346	308.46	26.6382	497.08	11.2753
205.31	30.9758	311.90	26.7230	511.00	45.4963
208.37	40.6637	316.51	23.2578	514.00	79.7666
210.85	32.3921	319.41	17.9378	520.40	8.3200
215.65	28.9644	320.08	17.0514	520.69	0.0000
218.12	32.6834	321.04	16.1678	667.71	0.0000
222.11	35.2738	323.87	23.4128	527.90	0.0000
227.09	31.8125	325.23	27.0477	529.59	17.2560
227.38	33.0476	1596.21	26.2281	529.87	0.0000
228.16	30.6274	331.15	0.0000	531.02	12.5605
228.18	30.6282	333.37	21.7939	537.26	9.4556
235.69	24.7168	334.37	28.1751	539.51	0.0000
235.96	24.7244	338.28	19.1513	1260.41	0.0000
238.63	24.7998	911.20	19.1522	552.55	13.7813
238.98	0.0000	340.48	26.4972	795.86	11.7336
240.99	28.1815	340.55	26.4990	564.24	16.0089
242.00	29.8733	344.28	21.0833	569.33	17.1263
244.70	28.7149	345.93	18.3590	569.50	18.1981
245.35	23.7381	351.06	22.1265	569.70	20.3414
459.60	23.4575	351.93	25.8330	582.08	16.1713
685.70	24.3425	356.01	24.9955	583.19	9.7086
388.16	22.6733	361.25	0.0000	595.83	13.0352
256.23	22.7576	364.49	19.5768	600.60	18.5149
527.90	0.0000	366.42	28.0103	604.72	16.3733
264.66	30.6160	383.85	19.8810	609.32	20.7905
265.00	34.4553	388.16	22.7974	610.33	17.5176
269.46	35.8972	666.33	20.9052	614.28	9.8741
401.81	20.5498	391.70	15.2399	618.01	16.4899
273.65	34.3351	392.87	20.0203	621.93	22.0321
276.40	27.5449	400.66	12.4673	630.19	0.0000
583.19	28.4332	401.32	0.0000	631.29	8.8561
277.60	28.4399	401.81	15.3574	632.98	9.9719
402.40	25.0027	402.40	19.2053	633.25	9.9734
278.43	25.8765	404.85	18.2787	634.78	11.0901
279.20	0.0000	410.95	21.7442	635.95	11.0970
279.54	20.7241	720.70	19.3819	636.99	9.9928
280.46	25.0647	423.72	14.6320	657.50	10.0979
301.36	24.2784	427.09	9.7784	884.68	7.8548
284.31	26.8961	427.87	9.7837	661.66	16.8646
285.41	27.7943	433.94	23.5830	664.57	0.0000
285.90	0.0000	439.51	22.6888	666.33	11.2695
287.50	32.2034	440.45	23.6909	666.50	12.3974
290.67	20.0801	539.51	0.0000	667.71	0.0000
293.27	0.0000	453.88	20.9227	677.62	9.0661
295.22	24.5535	459.60	22.0045	685.70	9.1019
316.51	27.2032	463.37	7.5206	692.65	10.2740
298.58	21.1133	468.07	13.5797	695.00	13.7144
299.98	27.4841	473.00	15.1379	696.49	13.7241

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
696.51	13.7241	884.68	10.2366	1238.28	10.4889
697.00	13.7275	889.28	4.6614	1260.41	0.0000
697.49	8.5818	894.76	4.4845	1271.87	4.2368
702.65	13.7646	1836.06	10.4771	1274.44	4.2400
706.68	10.3433	903.28	2.9995	1274.54	5.3000
711.68	12.6718	907.67	0.0000	1291.59	9.5867
720.70	10.4117	911.20	8.4619	1298.22	0.0000
721.93	0.0000	984.45	0.0000	1312.11	11.9991
1690.97	12.7375	926.36	6.0521	1332.49	5.3873
722.91	12.7384	935.54	8.5402	1362.15	0.0000
723.31	13.8989	937.49	7.5969	1365.19	4.3486
756.73	17.3810	983.53	10.4716	1368.63	0.0000
727.33	6.9626	945.96	0.0000	1377.63	0.0000
733.00	10.4711	946.00	7.6208	1384.29	4.3708
735.93	16.3105	949.00	8.5831	1408.01	9.8965
739.50	17.5037	954.55	0.0000	1434.09	6.6427
1434.09	14.9103	962.31	10.5418	1435.80	3.3228
747.24	12.2961	964.08	16.3027	1457.56	0.0000
752.31	10.5634	966.17	14.3958	1460.82	3.3442
753.82	12.3325	968.97	12.4890	1489.16	4.4912
756.73	11.4666	983.53	9.6573	1553.35	0.0000
763.94	7.0791	984.45	0.0000	1596.21	3.6877
765.80	9.7418	996.26	17.4628	1620.50	4.6360
1001.03	10.6304	1001.03	7.7742	1678.03	0.0000
766.84	10.6322	1004.73	11.6766	1690.97	2.8267
772.60	0.0000	1025.87	0.0000	1757.55	0.0000
776.52	10.6776	1028.54	0.0000	1764.49	4.7881
777.92	9.7939	1037.84	8.8588	1770.23	1.5980
778.90	8.0167	1038.76	0.0000	1771.35	1.5984
783.70	7.1409	1046.59	5.9235	1791.20	0.0000
1435.80	5.7252	1048.07	7.9019	1808.65	0.9667
903.28	9.2144	1050.41	9.8853	1836.06	1.9445
795.86	8.0758	1063.66	8.9368		
801.95	8.6364	1077.00	5.9843		
802.10	10.0765	1077.34	5.9850		
810.29	14.4453	1083.85	8.9967		
810.45	14.4463	1085.87	4.0012		
810.76	14.4482	1099.25	4.8226		
815.77	9.9540	1107.22	0.0000		
818.51	9.9654	1111.64	8.0703		
822.65	0.0000	1112.07	8.0713		
832.01	14.5771	1112.84	10.0916		
834.85	9.1214	1115.54	7.0701		
835.15	8.2101	1120.29	6.0696		
836.80	0.0000	1120.55	5.0583		
846.77	13.7489	1121.30	2.3129		
856.80	14.7251	1808.65	0.0000		
860.56	11.9824	1131.51	0.0000		
871.09	6.4794	1332.49	9.2571		
873.19	5.5583	1177.95	8.2402		
875.33	0.0000	1189.05	10.3357		
879.38	9.2865	1204.77	4.1541		
880.51	9.2908	1221.41	6.2622		
881.60	10.2242	1231.02	12.5603		
883.24	8.3708	1235.36	11.5284		

VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 18:30:32.87

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                   *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488002.CNF;1
Background file  : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM01.CNF;770
Background date  : 15-JAN-2023 11:12:30
Sample date     : 26-DEC-2022 07:49:00 Acquisition date : 19-JAN-2023 16:30:09
Sample ID      : G606488002 Sample quantity : 7.47190E-01 FILTER
Detector name   : GAM01 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:00.43 0.0%
Energy tolerance: 1.50000 keV Analyst Initials : MXR1
Abundance limit : 75.00000 Sensitivity : 3.00000
Batch ID       : 2367950 Detector SN# :
Matrix Spike ID : LCS ID :
*****

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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.91	23	85	0.64	93.91	88	9	3.22E-03	75.3	
2	1	66.60	21	64	1.34	133.24	123	14	2.89E-03	72.4	9.34E-01
3	0	156.86	17	95	2.70	313.62	310	9	2.31E-03	108.5	
4	0	286.92	71	162	16.53	573.51	552	36	9.90E-03	57.7	
5	0	392.52	24	13	0.54	784.55	780	9	3.27E-03	34.8	
6	0	450.05	27	10	1.95	899.53	894	10	3.82E-03	28.6	
7	0	457.05	20	24	1.96	913.51	908	10	2.71E-03	52.8	
8	0	476.95	67	18	1.27	953.28	947	12	9.31E-03	17.6	
9	4	528.10	17	8	2.35	1055.50	1051	20	2.42E-03	37.7	9.79E-01
10	4	533.04	22	12	2.35	1065.37	1051	20	3.04E-03	40.3	
11	0	681.04	18	18	2.30	1361.18	1352	18	2.51E-03	59.9	
12	0	693.83	27	16	3.02	1386.74	1379	16	3.78E-03	38.0	
13	0	731.50	9	14	4.24	1462.02	1453	12	1.27E-03	89.9	
14	0	743.52	12	15	3.80	1486.05	1477	12	1.65E-03	71.4	
15	0	802.93*	3	11	3.21	1604.79	1599	9	4.20E-04	249.8	
16	0	1038.85	11	6	3.91	2076.36	2070	12	1.53E-03	53.8	
17	0	1108.96	7	2	1.42	2216.51	2213	6	9.03E-04	49.3	
18	0	1115.94	16	8	2.83	2230.45	2222	15	2.15E-03	46.1	
19	0	1136.82	8	4	1.30	2272.19	2267	8	1.11E-03	55.9	
20	0	1306.05	8	3	1.10	2610.49	2607	7	1.14E-03	50.6	
21	0	1460.38*	15	3	2.39	2919.01	2913	11	2.03E-03	43.9	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 19-JAN-2023 18:30:33

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488002.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MXR1		
Sample date	: 26-DEC-2022 07:49:00	Acquisition date	: 19-JAN-2023 16:30:09
Sample ID	: G606488002	Sample quantity	: 0.74719 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA1	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.43 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	67	10.44*	1.869E+00	1.727E+02	2.373E+02	35.16
K-40	1460.82	15	10.66*	7.560E-01	9.126E+01	9.126E+01	87.80
ZN-65	1115.54	16	50.60*	9.395E-01	1.638E+01	1.756E+01	92.26
ZR-88	392.87	24	97.29*	2.188E+00	5.562E+00	6.813E+00	69.66
SN-113	391.70	24	64.97*	2.188E+00	8.329E+00	9.648E+00	69.66
PB-210	46.54	23	4.25*	4.603E-01	5.960E+02	5.973E+02	150.61
TH-230	67.67	21	0.38*	1.819E+00	1.510E+03	1.510E+03	144.70

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488002.CNF;1
Acquisition date : 19-JAN-2023 16:30:09 Sensitivity : 3.000
Detector ID : GAM01 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.43 Half life ratio : *****
Sample date : 26-DEC-2022 07:49:00 Analyst initials: MXR1
Sample ID : G606488002 Sample Quantity : 7.4719E-01 FILTER
Batch Number : 2367950 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;28

CALIBRATION INFORMATION

Eff. Cal. date : 11-MAY-2022 07:03:12 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM01_JAR.CNF;24

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	2.373E+02	8.176E+01	7.042E+01
K-40	9.126E+01	7.853E+01	8.038E+01
ZN-65	1.756E+01	1.587E+01	1.847E+01
ZR-88	6.813E+00	4.651E+00	6.841E+00
SN-113	9.648E+00	6.586E+00	9.663E+00
PB-210	5.973E+02	8.815E+02	1.014E+03
TH-230	1.510E+03	2.142E+03	2.633E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	1.659E+00	3.821E+00	8.889E+00	NOT IDENT.
NA-24	0.000E+00	2.486E+12	0.000E+00	SHORT HLIF
AL-26	1.361E+00	5.474E+00	1.183E+01	NOT IDENT.
SC-46	4.177E+00	4.906E+00	1.121E+01	NOT IDENT.
V-48	-2.627E-01	1.073E+01	2.209E+01	NOT IDENT.
CR-51	-3.848E+01	5.739E+01	9.853E+01	NOT IDENT.
MN-52	4.285E-01	1.119E+02	2.247E+02	FAIL ABUN
MN-54	5.738E+00	4.321E+00	1.026E+01	NOT IDENT.
CO-56	-3.384E-01	4.579E+00	9.249E+00	FAIL ABUN
CO-57	2.765E+00	2.788E+00	5.704E+00	NOT IDENT.
NI-57	0.000E+00	3.841E+05	0.000E+00	SHORT HLIF
CO-58	1.828E-01	5.218E+00	9.912E+00	NOT IDENT.
FE-59	-7.381E+00	8.822E+00	1.472E+01	NOT IDENT.
CO-60	4.781E+00	5.619E+00	1.272E+01	NOT IDENT.
CU-67	-1.070E+04	5.402E+03	9.523E+03	NOT IDENT.
GE-68	5.924E+00	1.121E+02	2.409E+02	NOT IDENT.
AS-73	-3.705E+01	1.341E+02	2.265E+02	NOT IDENT.
AS-74	3.060E+00	1.872E+01	3.531E+01	NOT IDENT.
SE-75	1.352E+00	5.318E+00	1.018E+01	NOT IDENT.
BR-77	0.000E+00	2.001E+04	0.000E+00	SHORT HLIF
SR-82	-3.564E+01	4.830E+01	7.698E+01	NOT IDENT.
RB-83	-4.862E+00	9.398E+00	1.620E+01	FAIL ABUN
RB-84	4.301E+00	8.783E+00	1.955E+01	NOT IDENT.

KR-85	-2.772E+03	1.370E+03	1.930E+03	NOT IDENT.
SR-85	-1.605E+01	7.931E+00	1.117E+01	NOT IDENT.
RB-86	-7.465E+00	1.013E+02	2.101E+02	NOT IDENT.
Y-88	-2.531E+00	5.274E+00	9.588E+00	NOT IDENT.
Y-91	1.361E+03	2.533E+03	5.554E+03	NOT IDENT.
NB-94	7.208E-01	4.454E+00	8.447E+00	NOT IDENT.
NB-95	8.623E-01	4.931E+00	9.689E+00	NOT IDENT.
NB-95M	-1.911E+01	1.606E+01	2.642E+01	NOT IDENT.
TC-95M	-7.713E-01	5.979E+00	1.093E+01	NOT IDENT.
ZR-95	1.319E+00	8.898E+00	1.743E+01	NOT IDENT.
MO-99	-7.858E+03	1.875E+04	2.790E+04	NOT IDENT.
TC-99M	0.000E+00	5.746E+29	0.000E+00	SHORT HLIF
RH-100	0.000E+00	1.897E+09	0.000E+00	SHORT HLIF
RH-101	2.638E+00	3.514E+00	7.003E+00	NOT IDENT.
RH-102M	2.667E+00	4.545E+00	8.208E+00	NOT IDENT.
RU-103	-1.933E+00	5.778E+00	1.029E+01	NOT IDENT.
RH-106	-4.391E+00	4.120E+01	7.563E+01	NOT IDENT.
RU-106	-4.391E+00	4.120E+01	7.563E+01	NOT IDENT.
AG-108M	2.851E+00	3.486E+00	7.248E+00	NOT IDENT.
CD-109	-3.047E+01	9.202E+01	1.692E+02	NOT IDENT.
AG-110	-8.307E+01	9.577E+01	1.512E+02	NOT IDENT.
AG-110M	-2.899E+00	5.580E+00	1.034E+01	NOT IDENT.
IN-111	-1.016E+03	1.219E+03	2.077E+03	NOT IDENT.
IN-114M	-1.393E+01	2.393E+01	4.222E+01	NOT IDENT.
CD-115	0.000E+00	2.710E+04	0.000E+00	SHORT HLIF
SN-117M	-2.649E-01	1.214E+01	2.021E+01	FAIL ABUN
SB-122	-3.485E+03	3.023E+03	4.728E+03	FAIL ABUN
I-123	0.000E+00	7.917E+13	0.000E+00	SHORT HLIF
TE-123M	1.582E-01	4.174E+00	6.985E+00	NOT IDENT.
SB-124	-6.762E+00	1.382E+01	2.495E+01	NOT IDENT.
SB-125	1.173E+01	1.182E+01	2.454E+01	NOT IDENT.
TE-125M	-5.907E+02	1.335E+03	2.421E+03	NOT IDENT.
I-126	-1.312E+01	4.240E+01	7.544E+01	NOT IDENT.
SB-126	5.651E+00	2.629E+01	5.216E+01	FAIL ABUN
SN-126	8.994E-01	9.996E+00	1.714E+01	NOT IDENT.
SB-127	6.684E+02	7.292E+02	1.569E+03	NOT IDENT.
TE-129	-3.581E+00	8.468E+01	1.396E+02	FAIL ABUN
I-131	-1.227E+01	3.902E+01	6.335E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	2.566E+02	6.387E+02	1.224E+03	NOT IDENT.
BA-133	2.613E+00	4.542E+00	9.168E+00	NOT IDENT.
I-133	0.000E+00	1.228E+09	0.000E+00	SHORT HLIF
CS-134	-2.224E+00	5.183E+00	8.904E+00	FAIL ABUN
I-135	0.000E+00	8.884E+27	0.000E+00	SHORT HLIF
CS-136	2.913E+00	1.554E+01	3.409E+01	NOT IDENT.
BA-137M	-3.159E+00	5.257E+00	1.028E+01	NOT IDENT.
CS-137	-3.337E+00	5.554E+00	1.086E+01	NOT IDENT.
LA-138	-2.446E+00	7.699E+00	1.458E+01	NOT IDENT.
CE-139	-6.058E-01	3.710E+00	6.803E+00	NOT IDENT.
BA-140	9.957E+00	6.231E+01	1.072E+02	NOT IDENT.
LA-140	8.222E+00	1.846E+01	4.231E+01	NOT IDENT.
CE-141	3.866E+00	9.118E+00	1.750E+01	NOT IDENT.
CE-143	0.000E+00	1.800E+06	0.000E+00	SHORT HLIF
CE-144	9.807E-01	2.423E+01	4.540E+01	NOT IDENT.
PM-144	-1.976E+00	5.989E+00	9.085E+00	FAIL ABUN
PR-144	-1.474E+02	4.505E+02	6.838E+02	NOT IDENT.
PM-146	2.498E+00	5.253E+00	8.441E+00	NOT IDENT.
ND-147	3.925E+01	1.317E+02	2.559E+02	NOT IDENT.
PM-147	2.468E+04	8.511E+04	1.640E+05	NOT IDENT.
PM-149	0.000E+00	9.788E+05	0.000E+00	SHORT HLIF
EU-152	8.248E+00	1.164E+01	2.338E+01	NOT IDENT.
GD-153	-4.639E+00	1.208E+01	2.104E+01	NOT IDENT.
EU-154	3.651E+00	1.046E+01	2.412E+01	NOT IDENT.
EU-155	1.018E+01	1.298E+01	2.579E+01	NOT IDENT.
TB-160	7.969E+00	1.527E+01	3.408E+01	FAIL ABUN
HO-166M	1.788E+00	6.641E+00	1.329E+01	NOT IDENT.
TM-171	8.607E+02	2.516E+03	4.578E+03	FAIL ABUN
LU-176	1.327E+00	3.356E+00	6.461E+00	NOT IDENT.
LU-177	-2.724E+02	4.426E+02	6.857E+02	NOT IDENT.
HF-181	1.113E+00	6.168E+00	1.143E+01	NOT IDENT.
W-181	4.964E-01	3.383E+01	5.842E+01	FAIL ABUN
TA-182	3.888E+00	1.855E+01	3.973E+01	FAIL ABUN
RE-183	-1.512E+00	3.381E+01	5.805E+01	FAIL ABUN
RE-184	-2.149E+00	1.636E+01	3.263E+01	NOT IDENT.
RE-188	1.340E+01	2.297E+01	4.084E+01	FAIL ABUN
W-188	-3.648E+01	1.049E+03	1.924E+03	NOT IDENT.
OS-191	1.019E+01	2.774E+01	5.347E+01	NOT IDENT.
IR-192	2.842E+00	4.610E+00	9.128E+00	NOT IDENT.

PB-201	0.000E+00	3.264E+19	0.000E+00	SHORT HLIF
TL-201	-2.226E+03	6.547E+03	1.186E+04	NOT IDENT.
TL-202	8.903E+00	1.306E+01	2.700E+01	NOT IDENT.
HG-203	-4.479E+00	5.162E+00	8.701E+00	NOT IDENT.
PB-203	0.000E+00	9.003E+03	0.000E+00	SHORT HLIF
TL-204	-1.640E+01	6.932E+02	1.182E+03	NOT IDENT.
BI-207	2.450E+00	6.760E+00	1.416E+01	NOT IDENT.
TL-208	2.793E-01	4.965E+00	9.304E+00	NOT IDENT.
BI-211	-1.287E+01	2.868E+01	4.687E+01	NOT IDENT.
PB-211	-6.984E+01	8.147E+01	1.342E+02	NOT IDENT.
BI-212	-1.825E+01	7.701E+01	1.267E+02	NOT IDENT.
PB-212	-2.938E+00	8.895E+00	1.571E+01	NOT IDENT.
BI-213	2.492E-01	1.239E+01	2.330E+01	NOT IDENT.
BI-214	-1.118E+01	1.082E+01	1.686E+01	NOT IDENT.
PB-214	1.510E-01	1.067E+01	1.846E+01	NOT IDENT.
RN-219	-6.791E+00	4.896E+01	8.977E+01	NOT IDENT.
FR-221	5.504E+00	2.514E+01	4.735E+01	NOT IDENT.
RA-223	-1.910E+01	8.124E+01	1.466E+02	NOT IDENT.
RA-224	-8.840E+01	8.744E+01	1.468E+02	NOT IDENT.
AC-225	2.987E+01	1.364E+02	2.570E+02	NOT IDENT.
RA-226	-8.840E+01	1.067E+02	2.005E+02	NOT IDENT.
AC-227	-2.992E+00	2.710E+01	5.019E+01	NOT IDENT.
TH-227	-2.992E+00	2.710E+01	5.019E+01	NOT IDENT.
AC-228	-2.234E+01	2.187E+01	3.895E+01	NOT IDENT.
RA-228	-2.234E+01	2.187E+01	3.895E+01	NOT IDENT.
TH-228	-2.938E+00	8.895E+00	1.571E+01	NOT IDENT.
TH-229	2.265E+01	5.642E+01	1.091E+02	NOT IDENT.
PA-231	7.367E+01	5.827E+01	1.209E+02	NOT IDENT.
TH-231	1.714E+00	5.624E+01	9.633E+01	NOT IDENT.
TH-232	-8.564E+00	3.007E+03	5.503E+03	NOT IDENT.
PA-233	-4.711E+00	7.425E+00	1.283E+01	NOT IDENT.
PA-234	9.402E+00	3.380E+01	7.185E+01	NOT IDENT.
PA-234M	-3.865E+00	6.029E+02	1.176E+03	NOT IDENT.
TH-234	-1.191E+01	2.156E+02	3.933E+02	NOT IDENT.
U-234	-2.689E+03	9.497E+03	1.603E+04	NOT IDENT.
U-235	4.013E+00	2.670E+01	4.615E+01	NOT IDENT.
NP-237	-4.711E+00	7.425E+00	1.283E+01	NOT IDENT.
NP-238	0.000E+00	4.166E+04	0.000E+00	SHORT HLIF
U-238	-1.191E+01	2.156E+02	3.933E+02	NOT IDENT.
NP-239	1.012E+01	2.851E+01	5.561E+01	NOT IDENT.
AM-241	-8.543E+00	2.541E+01	3.856E+01	NOT IDENT.
AM-242	-5.013E+01	8.730E+01	1.496E+02	NOT IDENT.
AM-243	4.347E+00	7.889E+00	1.401E+01	NOT IDENT.
CM-243	-3.540E+00	1.338E+01	2.464E+01	NOT IDENT.
BK-247	-1.131E+00	9.651E+00	1.771E+01	NOT IDENT.
CM-247	-4.853E-01	4.503E+00	8.287E+00	FAIL ABUN
CF-249	3.548E+00	5.398E+00	9.939E+00	NOT IDENT.
CF-251	-6.081E+00	1.373E+01	2.467E+01	NOT IDENT.
CF-252	-7.780E+03	2.182E+04	3.997E+04	NOT IDENT.
ANH-511	-1.084E+01	8.338E+00	1.603E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.91	23	85	0.64	93.91	88	9	3.22E-03	75.3	9.34E-01
2	1	63.59	43	73	1.34	127.24	123	14	6.03E-03	37.0	
3	1	66.60	21	64	1.34	133.24	123	14	2.89E-03	72.4	
4	0	92.83	87	128	1.64	185.67	181	9	1.21E-02	25.8	
5	0	156.86	17	95	2.70	313.62	310	9	2.31E-03	108.5	
6	0	185.96	73	111	1.34	371.78	366	12	1.02E-02	31.0	
7	0	286.92	71	162	16.53	573.51	552	36	9.90E-03	57.7	
8	0	392.52	24	13	0.54	784.55	780	9	3.27E-03	34.8	
9	0	450.05	27	10	1.95	899.53	894	10	3.82E-03	28.6	
10	0	457.05	20	24	1.96	913.51	908	10	2.71E-03	52.8	
11	0	476.95	67	18	1.27	953.28	947	12	9.31E-03	17.6	9.79E-01
12	0	510.95	119	57	2.04	1021.23	1015	14	1.65E-02	16.5	
13	4	528.10	17	8	2.35	1055.50	1051	20	2.42E-03	37.7	
14	4	533.04	22	12	2.35	1065.37	1051	20	3.04E-03	40.3	
15	0	661.23	20	15	1.48	1321.57	1314	12	2.78E-03	44.7	
16	0	681.04	18	18	2.30	1361.18	1352	18	2.51E-03	59.9	
17	0	693.83	27	16	3.02	1386.74	1379	16	3.78E-03	38.0	
18	0	731.50	9	14	4.24	1462.02	1453	12	1.27E-03	89.9	
19	0	743.52	12	15	3.80	1486.05	1477	12	1.65E-03	71.4	
20	0	802.93	11	11	3.21	1604.79	1599	9	1.58E-03	60.5	
21	0	1038.85	11	6	3.91	2076.36	2070	12	1.53E-03	53.8	
22	0	1108.96	7	2	1.42	2216.51	2213	6	9.03E-04	49.3	
23	0	1115.94	16	8	2.83	2230.45	2222	15	2.15E-03	46.1	
24	0	1136.82	8	4	1.30	2272.19	2267	8	1.11E-03	55.9	
25	0	1306.05	8	3	1.10	2610.49	2607	7	1.14E-03	50.6	
26	0	1460.38	22	3	2.39	2919.01	2913	11	3.08E-03	25.7	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	67	10.44*	1.869E+00	1.727E+02	2.373E+02	35.16
K-40	1460.82	15	10.66*	7.560E-01	9.126E+01	9.126E+01	87.80
ZN-65	1115.54	16	50.60*	9.395E-01	1.638E+01	1.756E+01	92.26
ZR-88	392.87	24	97.29*	2.188E+00	5.562E+00	6.813E+00	69.66
SN-113	391.70	24	64.97*	2.188E+00	8.329E+00	9.648E+00	69.66
PB-210	46.54	23	4.25*	4.603E-01	5.960E+02	5.973E+02	150.61
TH-230	67.67	21	0.38*	1.819E+00	1.510E+03	1.510E+03	144.70

Flag: "*" = Keyline

Total number of lines in spectrum 21
Number of unidentified lines 8
Number of lines tentatively identified by NID 13 61.90%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.37	1.727E+02	2.373E+02	0.834E+02	35.16	
K-40	1.25E+09Y	1.00	9.126E+01	9.126E+01	8.013E+01	87.80	
ZN-65	244.06D	1.07	1.638E+01	1.756E+01	1.620E+01	92.26	
ZR-88	83.40D	1.22	5.562E+00	6.813E+00	4.746E+00	69.66	
SN-113	115.09D	1.16	8.329E+00	9.648E+00	6.721E+00	69.66	
PB-210	22.20Y	1.00	5.960E+02	5.973E+02	8.995E+02	150.61	
TH-230	7.54E+04Y	1.00	1.510E+03	1.510E+03	2.185E+03	144.70	
Total Activity :			2.400E+03	2.470E+03			

Grand Total Activity : 2.400E+03 2.470E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	156.86	17	95	2.70	313.62	310	9	2.31E-03	****	3.94E+00	T
0	286.92	71	162	16.53	573.51	552	36	9.90E-03	****	2.80E+00	T
0	450.05	27	10	1.95	899.53	894	10	3.82E-03	57.3	1.96E+00	
0	457.05	20	24	1.96	913.51	908	10	2.71E-03	****	1.93E+00	
4	528.10	17	8	2.35	1055.50	1051	20	2.42E-03	75.4	1.72E+00	T
4	533.04	22	12	2.35	1065.37	1051	20	3.04E-03	80.7	1.71E+00	
0	681.04	18	18	2.30	1361.18	1352	18	2.51E-03	****	1.40E+00	
0	693.83	27	16	3.02	1386.74	1379	16	3.78E-03	76.0	1.38E+00	T
0	731.50	9	14	4.24	1462.02	1453	12	1.27E-03	****	1.32E+00	
0	743.52	12	15	3.80	1486.05	1477	12	1.65E-03	****	1.30E+00	T
0	802.93	3	11	3.21	1604.79	1599	9	4.20E-04	****	1.23E+00	T
0	1038.85	11	6	3.91	2076.36	2070	12	1.53E-03	****	9.96E-01	T
0	1108.96	7	2	1.42	2216.51	2213	6	9.03E-04	98.5	9.44E-01	
0	1136.82	8	4	1.30	2272.19	2267	8	1.11E-03	****	9.25E-01	
0	1306.05	8	3	1.10	2610.49	2607	7	1.14E-03	****	8.27E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488002.CNF;1  *
* Acquisition date   : 19-JAN-2023 16:30:09 Sensitivity      : 3.000          *
* Detector ID        : GAM01 Energy tolerance: 1.500         *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000        *
* Elapsed real time  : 0 02:00:00.43 Half life ratio  : *****          *
* Sample date        : 26-DEC-2022 07:49:00 Nuclide Library : LIQUID         *
* Sample ID          : G606488002 Analyst initials: MXR1           *
* Batch Number       : 2367950 Sample Quantity : 7.4719E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000          *
*                                     Dry Weight    : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 11-MAY-2022 07:03:12 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM01_JAR.CNF;24          *
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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.043E+01
K-40	3.176E+01
ZN-65	7.707E+00
ZR-88	3.031E+00
SN-113	4.280E+00
PB-210	4.710E+02
TH-230	1.223E+03

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	3.625E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	4.850E+00	NOT IDENT.
SC-46	4.872E+00	NOT IDENT.
V-48	9.162E+00	NOT IDENT.
CR-51	4.437E+01	NOT IDENT.
MN-52	9.411E+01	FAIL ABUN
MN-54	4.527E+00	NOT IDENT.
CO-56	3.905E+00	FAIL ABUN
CO-57	2.640E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	4.244E+00	NOT IDENT.
FE-59	5.509E+00	NOT IDENT.
CO-60	5.520E+00	NOT IDENT.
CU-67	4.497E+03	NOT IDENT.
GE-68	9.722E+01	NOT IDENT.
AS-73	1.038E+02	NOT IDENT.
AS-74	1.575E+01	NOT IDENT.
SE-75	4.646E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	3.153E+01	NOT IDENT.
RB-83	7.047E+00	FAIL ABUN
RB-84	8.325E+00	NOT IDENT.
KR-85	8.751E+02	NOT IDENT.

SR-85	5.066E+00	NOT IDENT.
RB-86	8.491E+01	NOT IDENT.
Y-88	3.523E+00	NOT IDENT.
Y-91	2.383E+03	NOT IDENT.
NB-94	3.727E+00	NOT IDENT.
NB-95	4.150E+00	NOT IDENT.
NB-95M	1.211E+01	NOT IDENT.
TC-95M	5.065E+00	NOT IDENT.
ZR-95	7.452E+00	NOT IDENT.
MO-99	1.194E+04	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-100	0.000E+00	SHORT HLIF
RH-101	3.250E+00	NOT IDENT.
RH-102M	3.719E+00	NOT IDENT.
RU-103	4.510E+00	NOT IDENT.
RH-106	3.308E+01	NOT IDENT.
RU-106	3.308E+01	NOT IDENT.
AG-108M	3.253E+00	NOT IDENT.
CD-109	7.854E+01	NOT IDENT.
AG-110	6.440E+01	NOT IDENT.
AG-110M	4.291E+00	NOT IDENT.
IN-111	9.421E+02	NOT IDENT.
IN-114M	1.944E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	9.413E+00	FAIL ABUN
SB-122	2.069E+03	FAIL ABUN
I-123	0.000E+00	SHORT HLIF
TE-123M	3.256E+00	NOT IDENT.
SB-124	9.668E+00	NOT IDENT.
SB-125	1.114E+01	NOT IDENT.
TE-125M	1.122E+03	NOT IDENT.
I-126	3.237E+01	NOT IDENT.
SB-126	2.238E+01	FAIL ABUN
SN-126	7.985E+00	NOT IDENT.
SB-127	6.775E+02	NOT IDENT.
TE-129	6.226E+01	FAIL ABUN
I-131	2.874E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	5.660E+02	NOT IDENT.
BA-133	4.121E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	3.795E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	1.394E+01	NOT IDENT.
BA-137M	4.612E+00	NOT IDENT.
CS-137	4.872E+00	NOT IDENT.
LA-138	5.939E+00	NOT IDENT.
CE-139	3.155E+00	NOT IDENT.
BA-140	4.743E+01	NOT IDENT.
LA-140	1.735E+01	NOT IDENT.
CE-141	8.160E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	2.109E+01	NOT IDENT.
PM-144	4.024E+00	FAIL ABUN
PR-144	3.029E+02	NOT IDENT.
PM-146	3.680E+00	NOT IDENT.
ND-147	1.138E+02	NOT IDENT.
PM-147	7.591E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	1.064E+01	NOT IDENT.
GD-153	9.809E+00	NOT IDENT.
EU-154	9.746E+00	NOT IDENT.
EU-155	1.203E+01	NOT IDENT.
TB-160	1.454E+01	FAIL ABUN
HO-166M	5.716E+00	NOT IDENT.
TM-171	2.101E+03	FAIL ABUN
LU-176	2.959E+00	NOT IDENT.
LU-177	3.190E+02	NOT IDENT.
HF-181	5.039E+00	NOT IDENT.
W-181	2.709E+01	FAIL ABUN
TA-182	1.653E+01	FAIL ABUN
RE-183	2.690E+01	FAIL ABUN
RE-184	1.374E+01	NOT IDENT.
RE-188	1.902E+01	FAIL ABUN
W-188	8.849E+02	NOT IDENT.
OS-191	2.483E+01	NOT IDENT.
IR-192	4.168E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF

TL-201	5.471E+03	NOT IDENT.
TL-202	1.203E+01	NOT IDENT.
HG-203	3.933E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	5.502E+02	NOT IDENT.
BI-207	6.150E+00	NOT IDENT.
TL-208	4.138E+00	NOT IDENT.
BI-211	2.124E+01	NOT IDENT.
PB-211	5.866E+01	NOT IDENT.
BI-212	5.552E+01	NOT IDENT.
PB-212	7.358E+00	NOT IDENT.
BI-213	1.034E+01	NOT IDENT.
BI-214	7.459E+00	NOT IDENT.
PB-214	8.432E+00	NOT IDENT.
RN-219	4.009E+01	NOT IDENT.
FR-221	2.192E+01	NOT IDENT.
RA-223	6.661E+01	NOT IDENT.
RA-224	6.809E+01	NOT IDENT.
AC-225	1.190E+02	NOT IDENT.
RA-226	9.519E+01	NOT IDENT.
AC-227	2.275E+01	NOT IDENT.
TH-227	2.275E+01	NOT IDENT.
AC-228	1.708E+01	NOT IDENT.
RA-228	1.708E+01	NOT IDENT.
TH-228	7.358E+00	NOT IDENT.
TH-229	5.030E+01	NOT IDENT.
PA-231	5.578E+01	NOT IDENT.
TH-231	4.470E+01	NOT IDENT.
TH-232	2.590E+03	NOT IDENT.
PA-233	5.747E+00	NOT IDENT.
PA-234	3.066E+01	NOT IDENT.
PA-234M	5.091E+02	NOT IDENT.
TH-234	1.851E+02	NOT IDENT.
U-234	7.342E+03	NOT IDENT.
U-235	2.154E+01	NOT IDENT.
NP-237	5.747E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.851E+02	NOT IDENT.
NP-239	2.563E+01	NOT IDENT.
AM-241	1.782E+01	NOT IDENT.
AM-242	6.952E+01	NOT IDENT.
AM-243	6.585E+00	NOT IDENT.
CM-243	1.144E+01	NOT IDENT.
BK-247	8.094E+00	NOT IDENT.
CM-247	3.705E+00	FAIL ABUN
CF-249	4.505E+00	NOT IDENT.
CF-251	1.130E+01	NOT IDENT.
CF-252	1.851E+04	NOT IDENT.
ANH-511	7.636E+00	NOT IDENT.

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488002.CNF;1
* Acquisition date   : 19-JAN-2023 16:30:09 Sensitivity      : 3.000
* Detector ID        : GAM01 Energy tolerance: 1.500
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000
* Elapsed real time  : 0 02:00:00.43 Half life ratio : *****
* Sample date        : 26-DEC-2022 07:49:00 Nuclide Library : LIQUID
* Sample ID          : G606488002 Analyst initials: MXR1
* Batch Number       : 2367950 Sample Quantity : 7.4719E-01 FILTER
*                               Quantity Err(%) : 1.0000E+00 %
* Wet wt corr        : 1.00000 Wet Weight : 0.00000
*                               Dry Weight  : 0.00000
*****
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 11-MAY-2022 07:03:12 Eff. Geometry   : JAR
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM01_JAR.CNF;24
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	2.373E+02	8.453E+01	8.466E+01
K-40	9.126E+01	7.892E+01	7.894E+01
ZN-65	1.756E+01	1.594E+01	1.594E+01
ZR-88	6.813E+00	4.684E+00	4.686E+00
SN-113	9.648E+00	6.633E+00	6.636E+00
PB-210	5.973E+02	8.835E+02	8.836E+02
TH-230	1.510E+03	2.158E+03	2.159E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	1.659E+00	3.824E+00	3.896E+00	NOT IDENT.
NA-24	2.404E+12	2.495E+12	2.721E+12	SHORT HLIF
AL-26	1.361E+00	5.475E+00	5.509E+00	NOT IDENT.
SC-46	4.177E+00	4.919E+00	5.268E+00	NOT IDENT.
V-48	-2.627E-01	1.073E+01	1.073E+01	NOT IDENT.
CR-51	-3.848E+01	5.747E+01	6.004E+01	NOT IDENT.
MN-52	4.285E-01	1.119E+02	1.119E+02	FAIL ABUN
MN-54	5.738E+00	4.354E+00	5.066E+00	NOT IDENT.
CO-56	-3.384E-01	4.579E+00	4.582E+00	FAIL ABUN
CO-57	2.765E+00	2.795E+00	3.061E+00	NOT IDENT.
NI-57	1.444E+05	3.844E+05	3.899E+05	SHORT HLIF
CO-58	1.828E-01	5.218E+00	5.219E+00	NOT IDENT.
FE-59	-7.381E+00	8.854E+00	9.460E+00	NOT IDENT.
CO-60	4.781E+00	5.632E+00	6.031E+00	NOT IDENT.
CU-67	-1.070E+04	5.472E+03	7.299E+03	NOT IDENT.
GE-68	5.924E+00	1.121E+02	1.122E+02	NOT IDENT.
AS-73	-3.705E+01	1.344E+02	1.354E+02	NOT IDENT.
AS-74	3.060E+00	1.872E+01	1.877E+01	NOT IDENT.
SE-75	1.352E+00	5.319E+00	5.354E+00	NOT IDENT.
BR-77	5.962E+03	2.002E+04	2.020E+04	SHORT HLIF
SR-82	-3.564E+01	4.842E+01	5.102E+01	NOT IDENT.
RB-83	-4.862E+00	9.431E+00	9.683E+00	FAIL ABUN
RB-84	4.301E+00	8.792E+00	9.003E+00	NOT IDENT.

KR-85	-2.772E+03	1.394E+03	1.873E+03	NOT IDENT.
SR-85	-1.605E+01	8.071E+00	1.084E+01	NOT IDENT.
RB-86	-7.465E+00	1.013E+02	1.014E+02	NOT IDENT.
Y-88	-2.531E+00	5.277E+00	5.399E+00	NOT IDENT.
Y-91	1.361E+03	2.535E+03	2.608E+03	NOT IDENT.
NB-94	7.208E-01	4.455E+00	4.466E+00	NOT IDENT.
NB-95	8.623E-01	4.932E+00	4.947E+00	NOT IDENT.
NB-95M	-1.911E+01	1.617E+01	1.832E+01	NOT IDENT.
TC-95M	-7.713E-01	5.979E+00	5.989E+00	NOT IDENT.
ZR-95	1.319E+00	8.899E+00	8.919E+00	NOT IDENT.
MO-99	-7.858E+03	1.876E+04	1.910E+04	NOT IDENT.
TC-99M	3.772E+28	5.746E+29	0.000E+00	SHORT HLIF
RH-100	-1.458E+09	2.074E+09	2.176E+09	SHORT HLIF
RH-101	2.638E+00	3.548E+00	3.743E+00	NOT IDENT.
RH-102M	2.667E+00	4.557E+00	4.713E+00	NOT IDENT.
RU-103	-1.933E+00	5.781E+00	5.846E+00	NOT IDENT.
RH-106	-4.391E+00	4.121E+01	4.126E+01	NOT IDENT.
RU-106	-4.391E+00	4.121E+01	4.126E+01	NOT IDENT.
AG-108M	2.851E+00	3.495E+00	3.724E+00	NOT IDENT.
CD-109	-3.047E+01	9.208E+01	9.310E+01	NOT IDENT.
AG-110	-8.307E+01	9.614E+01	1.032E+02	NOT IDENT.
AG-110M	-2.899E+00	5.587E+00	5.738E+00	NOT IDENT.
IN-111	-1.016E+03	1.222E+03	1.305E+03	NOT IDENT.
IN-114M	-1.393E+01	2.395E+01	2.477E+01	NOT IDENT.
CD-115	3.666E+04	2.737E+04	3.198E+04	SHORT HLIF
SN-117M	-2.649E-01	1.214E+01	1.214E+01	FAIL ABUN
SB-122	-3.485E+03	3.042E+03	3.424E+03	FAIL ABUN
I-123	2.206E+12	7.917E+13	7.918E+13	SHORT HLIF
TE-123M	1.582E-01	4.174E+00	4.175E+00	NOT IDENT.
SB-124	-6.762E+00	1.383E+01	1.416E+01	NOT IDENT.
SB-125	1.173E+01	1.186E+01	1.299E+01	NOT IDENT.
TE-125M	-5.907E+02	1.336E+03	1.362E+03	NOT IDENT.
I-126	-1.312E+01	4.243E+01	4.284E+01	NOT IDENT.
SB-126	5.651E+00	2.630E+01	2.642E+01	FAIL ABUN
SN-126	8.994E-01	9.997E+00	1.001E+01	NOT IDENT.
SB-127	6.684E+02	7.362E+02	7.956E+02	NOT IDENT.
TE-129	-3.581E+00	8.469E+01	8.470E+01	FAIL ABUN
I-131	-1.227E+01	3.904E+01	3.943E+01	NOT IDENT.
I-132	-1.000E+41	1.115E+42	0.000E+00	SHORT HLIF
TE-132	2.566E+02	6.392E+02	6.497E+02	NOT IDENT.
BA-133	2.613E+00	4.547E+00	4.697E+00	NOT IDENT.
I-133	1.063E+08	1.228E+09	1.229E+09	SHORT HLIF
CS-134	-2.224E+00	5.187E+00	5.283E+00	FAIL ABUN
I-135	-5.723E+27	9.445E+27	0.000E+00	SHORT HLIF
CS-136	2.913E+00	1.555E+01	1.560E+01	NOT IDENT.
BA-137M	-3.159E+00	5.267E+00	5.457E+00	NOT IDENT.
CS-137	-3.337E+00	5.564E+00	5.764E+00	NOT IDENT.
LA-138	-2.446E+00	7.702E+00	7.781E+00	NOT IDENT.
CE-139	-6.058E-01	3.712E+00	3.722E+00	NOT IDENT.
BA-140	9.957E+00	6.231E+01	6.247E+01	NOT IDENT.
LA-140	8.222E+00	1.847E+01	1.884E+01	NOT IDENT.
CE-141	3.866E+00	9.122E+00	9.288E+00	NOT IDENT.
CE-143	-7.488E+05	1.801E+06	1.832E+06	SHORT HLIF
CE-144	9.807E-01	2.423E+01	2.423E+01	NOT IDENT.
PM-144	-1.976E+00	5.992E+00	6.058E+00	FAIL ABUN
PR-144	-1.474E+02	4.507E+02	4.556E+02	NOT IDENT.
PM-146	2.498E+00	5.260E+00	5.380E+00	NOT IDENT.
ND-147	3.925E+01	1.318E+02	1.330E+02	NOT IDENT.
PM-147	2.468E+04	8.513E+04	8.586E+04	NOT IDENT.
PM-149	8.652E+05	9.870E+05	1.061E+06	SHORT HLIF
EU-152	8.248E+00	1.166E+01	1.224E+01	NOT IDENT.
GD-153	-4.639E+00	1.209E+01	1.227E+01	NOT IDENT.
EU-154	3.651E+00	1.046E+01	1.059E+01	NOT IDENT.
EU-155	1.018E+01	1.301E+01	1.380E+01	NOT IDENT.
TB-160	7.969E+00	1.529E+01	1.570E+01	FAIL ABUN
HO-166M	1.788E+00	6.644E+00	6.693E+00	NOT IDENT.
TM-171	8.607E+02	2.517E+03	2.547E+03	FAIL ABUN
LU-176	1.327E+00	3.357E+00	3.410E+00	NOT IDENT.
LU-177	-2.724E+02	4.431E+02	4.598E+02	NOT IDENT.
HF-181	1.113E+00	6.168E+00	6.189E+00	NOT IDENT.
W-181	4.964E-01	3.383E+01	3.383E+01	FAIL ABUN
TA-182	3.888E+00	1.855E+01	1.863E+01	FAIL ABUN
RE-183	-1.512E+00	3.381E+01	3.382E+01	FAIL ABUN
RE-184	-2.149E+00	1.636E+01	1.639E+01	NOT IDENT.
RE-188	1.340E+01	2.299E+01	2.377E+01	FAIL ABUN
W-188	-3.648E+01	1.049E+03	1.049E+03	NOT IDENT.
OS-191	1.019E+01	2.775E+01	2.812E+01	NOT IDENT.
IR-192	2.842E+00	4.615E+00	4.790E+00	NOT IDENT.

PB-201	-2.157E+19	3.338E+19	0.000E+00	SHORT HLIF
TL-201	-2.226E+03	6.549E+03	6.626E+03	NOT IDENT.
TL-202	8.903E+00	1.308E+01	1.369E+01	NOT IDENT.
HG-203	-4.479E+00	5.172E+00	5.553E+00	NOT IDENT.
PB-203	-7.813E+03	9.021E+03	9.685E+03	SHORT HLIF
TL-204	-1.640E+01	6.932E+02	6.932E+02	NOT IDENT.
BI-207	2.450E+00	6.763E+00	6.852E+00	NOT IDENT.
TL-208	2.793E-01	4.966E+00	4.967E+00	NOT IDENT.
BI-211	-1.287E+01	2.870E+01	2.928E+01	NOT IDENT.
PB-211	-6.984E+01	8.171E+01	8.757E+01	NOT IDENT.
BI-212	-1.825E+01	7.703E+01	7.747E+01	NOT IDENT.
PB-212	-2.938E+00	8.898E+00	8.996E+00	NOT IDENT.
BI-213	2.492E-01	1.239E+01	1.239E+01	NOT IDENT.
BI-214	-1.118E+01	1.088E+01	1.199E+01	NOT IDENT.
PB-214	1.510E-01	1.067E+01	1.067E+01	NOT IDENT.
RN-219	-6.791E+00	4.897E+01	4.906E+01	NOT IDENT.
FR-221	5.504E+00	2.514E+01	2.526E+01	NOT IDENT.
RA-223	-1.910E+01	8.126E+01	8.172E+01	NOT IDENT.
RA-224	-8.840E+01	8.771E+01	9.636E+01	NOT IDENT.
AC-225	2.987E+01	1.365E+02	1.371E+02	NOT IDENT.
RA-226	-8.840E+01	1.070E+02	1.142E+02	NOT IDENT.
AC-227	-2.992E+00	2.710E+01	2.714E+01	NOT IDENT.
TH-227	-2.992E+00	2.710E+01	2.714E+01	NOT IDENT.
AC-228	-2.234E+01	2.196E+01	2.416E+01	NOT IDENT.
RA-228	-2.234E+01	2.196E+01	2.416E+01	NOT IDENT.
TH-228	-2.938E+00	8.898E+00	8.996E+00	NOT IDENT.
TH-229	2.265E+01	5.645E+01	5.737E+01	NOT IDENT.
PA-231	7.367E+01	6.052E+01	6.904E+01	NOT IDENT.
TH-231	1.714E+00	5.624E+01	5.624E+01	NOT IDENT.
TH-232	-8.564E+00	3.007E+03	3.007E+03	NOT IDENT.
PA-233	-4.711E+00	7.434E+00	7.732E+00	NOT IDENT.
PA-234	9.402E+00	3.547E+01	3.573E+01	NOT IDENT.
PA-234M	-3.865E+00	6.029E+02	6.029E+02	NOT IDENT.
TH-234	-1.191E+01	2.156E+02	2.157E+02	NOT IDENT.
U-234	-2.689E+03	9.501E+03	9.578E+03	NOT IDENT.
U-235	4.013E+00	2.670E+01	2.676E+01	NOT IDENT.
NP-237	-4.711E+00	7.434E+00	7.732E+00	NOT IDENT.
NP-238	3.207E+04	4.175E+04	4.419E+04	SHORT HLIF
U-238	-1.191E+01	2.156E+02	2.157E+02	NOT IDENT.
NP-239	1.012E+01	2.852E+01	2.888E+01	NOT IDENT.
AM-241	-8.543E+00	2.542E+01	2.571E+01	NOT IDENT.
AM-242	-5.013E+01	8.779E+01	9.065E+01	NOT IDENT.
AM-243	4.347E+00	7.898E+00	8.138E+00	NOT IDENT.
CM-243	-3.540E+00	1.339E+01	1.348E+01	NOT IDENT.
BK-247	-1.131E+00	9.654E+00	9.667E+00	NOT IDENT.
CM-247	-4.853E-01	4.504E+00	4.509E+00	FAIL ABUN
CF-249	3.548E+00	5.412E+00	5.643E+00	NOT IDENT.
CF-251	-6.081E+00	1.375E+01	1.402E+01	NOT IDENT.
CF-252	-7.780E+03	2.294E+04	2.321E+04	NOT IDENT.
ANH-511	-1.084E+01	8.399E+00	9.719E+00	NOT IDENT.

* GEL Laboratories LLC *
* 2040 Savage Road *
* Charleston, SC 29407 *
* GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	53.4102	133.52	52.0434	116.30	44.6031
879.38	56.7448	364.49	52.0479	116.74	40.3309
46.54	56.8308	80.22	52.0498	117.23	39.4908
228.16	38.0773	711.68	58.2699	119.76	53.3513
52.39	46.5224	356.01	64.5009	120.54	52.5280
53.20	45.4555	323.87	64.5061	120.90	47.3770
53.44	45.4717	82.35	0.0000	264.66	46.5249
57.53	50.4668	82.47	67.0954	121.22	46.5290
293.27	0.0000	82.47	67.0956	344.28	37.9320
57.53	54.1683	83.79	55.9973	122.06	34.4924
482.18	54.1684	265.00	54.7660	1274.44	50.9228
57.98	54.2028	84.21	54.7791	123.68	51.8143
59.32	56.3160	84.86	0.0000	1377.63	0.0000
59.54	57.9428	193.51	66.0745	127.23	41.5825
155.04	58.0986	105.31	48.6822	129.43	49.4749
63.00	42.4504	86.79	48.6950	131.20	55.6367
129.43	42.4670	86.94	48.7033	133.02	58.3360
63.29	42.4670	87.09	42.4663	133.52	56.6191
290.67	42.4834	87.57	59.9843	135.34	59.3243
63.81	42.4965	88.03	63.3492	136.00	55.8665
87.57	42.5231	306.78	63.3708	136.28	56.7527
64.99	42.5631	88.47	63.3797	136.47	56.7619
65.08	42.5682	531.02	90.3257	739.50	61.3354
66.73	42.6603	184.58	90.3417	140.51	0.0000
66.98	42.6741	92.59	65.3392	140.88	65.7372
67.24	52.0394	93.31	62.0363	143.76	51.8363
67.67	56.9498	94.56	142.7051	144.24	47.4620
1221.41	56.9555	311.90	142.7190	145.44	55.4262
439.51	58.6688	946.00	142.7216	152.32	61.5719
70.82	58.6688	97.43	59.7799	152.43	61.5769
167.43	58.6692	98.43	52.2564	1048.07	57.1022
97.43	45.6766	98.44	52.2570	154.21	53.1580
70.82	61.2629	99.53	59.0661	155.04	49.2033
70.82	61.2629	103.37	59.0661	158.56	55.8953
279.20	0.0000	116.74	59.0661	158.97	0.0000
1063.66	78.6113	100.11	59.9453	159.00	62.6937
72.87	0.0000	100.20	59.9510	162.33	59.7339
351.06	78.6172	102.03	57.5248	537.26	61.5321
74.66	67.7098	103.18	61.8258	163.33	57.9944
238.63	67.7232	103.37	61.8377	165.86	58.1049
351.93	67.7232	105.31	48.3779	167.43	54.5937
238.63	67.7232	106.12	48.4164	245.35	46.6717
74.97	62.8092	106.47	48.4332	427.87	45.0414
77.11	75.3187	109.28	63.0510	176.60	42.3475
256.23	50.7789	111.00	45.2334	177.52	47.7854
79.82	50.7867	111.76	52.0989	181.07	46.0989
80.02	52.0373	208.37	56.4331	184.41	73.3889
80.03	52.0376	116.24	44.6005	184.58	63.4297

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	56.2260	300.09	38.8273	475.06	22.0066
186.21	53.5234	300.13	38.8281	696.49	13.6321
190.27	56.4032	301.36	26.2255	477.60	13.6364
193.51	40.1171	302.85	42.7709	477.99	12.5891
197.03	50.2662	304.50	44.7525	482.18	16.3919
198.01	43.8975	304.85	44.7600	487.02	22.1057
201.83	51.3442	306.78	33.1160	492.35	0.0000
204.12	56.0135	308.46	31.1947	497.08	21.1312
205.31	53.3000	311.90	34.1783	511.00	29.7340
208.37	66.2981	316.51	27.4053	514.00	73.3518
210.85	58.1038	319.41	40.1867	520.40	21.3102
215.65	53.6570	320.08	38.2391	520.69	0.0000
218.12	48.1819	321.04	32.3716	667.71	0.0000
222.11	46.4447	323.87	37.3282	527.90	0.0000
227.09	43.7928	325.23	39.3188	529.59	18.1725
227.38	43.8010	1596.21	32.4938	529.87	0.0000
228.16	42.8892	331.15	0.0000	531.02	18.1815
228.18	42.8901	333.37	23.6841	537.26	17.6850
235.69	63.6919	334.37	34.5564	539.51	0.0000
235.96	59.9551	338.28	28.6855	1260.41	0.0000
238.63	55.3593	911.20	28.6861	552.55	17.2396
238.98	0.0000	340.48	36.6372	795.86	14.0579
240.99	77.0485	340.55	36.6379	564.24	16.2262
242.00	50.7695	344.28	23.8071	569.33	10.8362
244.70	47.0835	345.93	31.7676	569.50	10.8366
245.35	46.1593	351.06	25.8725	569.70	16.2561
459.60	44.4110	351.93	23.8921	582.08	21.7635
685.70	41.6188	356.01	18.9501	583.19	14.1516
388.16	44.4670	361.25	0.0000	595.83	20.7689
256.23	33.1785	364.49	34.0422	600.60	21.8953
527.90	0.0000	366.42	33.0698	604.72	21.9246
264.66	32.3841	383.85	24.2373	609.32	25.2498
265.00	40.0116	388.16	21.2474	610.33	21.9637
269.46	37.2457	666.33	24.2876	614.28	17.5931
401.81	42.0610	391.70	20.2665	618.01	22.0174
273.65	35.8955	392.87	20.2767	621.93	17.6354
276.40	43.1387	400.66	28.4819	630.19	0.0000
583.19	44.1208	401.32	0.0000	631.29	17.6875
277.60	44.1259	401.81	25.4425	632.98	11.0604
402.40	44.1357	402.40	25.4491	633.25	14.3796
278.43	44.1460	404.85	27.5131	634.78	12.1731
279.20	0.0000	410.95	27.5839	635.95	16.6058
279.54	44.1722	720.70	23.5339	636.99	11.0742
280.46	44.1938	423.72	23.6214	657.50	21.1732
301.36	44.2705	427.09	21.5969	884.68	27.8615
284.31	44.2845	427.87	18.5175	661.66	8.9261
285.41	44.3107	433.94	15.4694	664.57	0.0000
285.90	0.0000	439.51	14.4703	666.33	15.6429
287.50	44.3604	440.45	20.6795	666.50	16.7609
290.67	44.4343	539.51	0.0000	667.71	0.0000
293.27	0.0000	453.88	9.3550	677.62	6.7266
295.22	37.7614	459.60	23.4398	685.70	5.0570
316.51	36.3235	463.37	27.1251	692.65	12.3866
298.58	42.6769	468.07	20.9033	695.00	12.3951
299.98	38.8257	473.00	14.1361	696.49	25.3647

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
696.51	25.3647	884.68	12.4448	1238.28	7.6758
697.00	27.0596	889.28	7.1194	1260.41	0.0000
697.49	21.9891	894.76	8.9111	1271.87	4.8279
702.65	16.9397	1836.06	5.3509	1274.44	3.8643
706.68	15.8286	903.28	10.7153	1274.54	3.8643
711.68	10.1902	907.67	0.0000	1291.59	7.7534
720.70	10.2166	911.20	13.4198	1298.22	0.0000
721.93	0.0000	984.45	0.0000	1312.11	4.8642
1690.97	21.5806	926.36	7.1831	1332.49	6.8355
722.91	21.5814	935.54	11.6979	1362.15	0.0000
723.31	18.1758	937.49	11.7031	1365.19	3.9290
756.73	10.2264	983.53	11.7213	1368.63	0.0000
727.33	13.6475	945.96	0.0000	1377.63	0.0000
733.00	10.2521	946.00	9.0204	1384.29	3.9424
735.93	8.5504	949.00	9.9295	1408.01	4.9484
739.50	17.1173	954.55	0.0000	1434.09	8.9473
1434.09	5.1420	962.31	9.9600	1435.80	8.9500
747.24	13.7236	964.08	5.4349	1457.56	0.0000
752.31	17.1783	966.17	13.5938	1460.82	4.7938
753.82	11.4571	968.97	4.5343	1489.16	4.0139
756.73	10.3195	983.53	8.1887	1553.35	0.0000
763.94	16.0844	984.45	0.0000	1596.21	4.0847
765.80	10.3451	996.26	6.3873	1620.50	6.1505
1001.03	8.0476	1001.03	5.4807	1678.03	0.0000
766.84	6.8987	1004.73	13.7132	1690.97	7.2542
772.60	0.0000	1025.87	0.0000	1757.55	0.0000
776.52	13.8335	1028.54	0.0000	1764.49	1.0477
777.92	9.2259	1037.84	6.4467	1770.23	1.0486
778.90	5.7676	1038.76	0.0000	1771.35	1.0488
783.70	10.3949	1046.59	3.6907	1791.20	0.0000
1435.80	15.0355	1048.07	5.5378	1808.65	5.2725
903.28	10.4183	1050.41	11.0815	1836.06	5.2933
795.86	12.7461	1063.66	11.1130		
801.95	13.9272	1077.00	6.5010		
802.10	13.9277	1077.34	5.5726		
810.29	9.3050	1083.85	8.3705		
810.45	9.3057	1085.87	5.5829		
810.76	11.6329	1099.25	8.3979		
815.77	9.3184	1107.22	0.0000		
818.51	9.3249	1111.64	0.0000		
822.65	0.0000	1112.07	0.0000		
832.01	16.6679	1112.84	4.9906		
834.85	6.1453	1115.54	8.5603		
835.15	4.3898	1120.29	13.4956		
836.80	0.0000	1120.55	13.4965		
846.77	10.5667	1121.30	13.4982		
856.80	17.6556	1808.65	5.6342		
860.56	10.6033	1131.51	0.0000		
871.09	11.5170	1332.49	9.4733		
873.19	10.6370	1177.95	3.7927		
875.33	0.0000	1189.05	8.5529		
879.38	7.1021	1204.77	7.6260		
880.51	7.1040	1221.41	6.6945		
881.60	7.1060	1231.02	7.6650		
883.24	12.4406	1235.36	6.7125		

VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 18:34:05.62

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488003.CNF:1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM02.CNF:555
Background date    : 15-JAN-2023 11:29:45
Sample date       : 26-DEC-2022 07:58:00 Acquisition date : 19-JAN-2023 16:33:39
Sample ID        : G606488003 Sample quantity : 7.18120E-01 FILTER
Detector name    : GAM02 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:01.51 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : MXR1
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID         : 2367950 Detector SN# :
Matrix Spike ID  : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	5	75.28*	70	148	1.78	151.35	144	18	9.66E-03	39.2	2.06E+00
2	5	77.12	35	112	1.62	155.03	144	18	4.84E-03	69.9	
3	6	94.80	38	132	2.00	190.40	181	14	5.27E-03	70.1	8.50E-01
4	0	140.84	36	91	1.15	282.51	276	9	4.93E-03	52.2	
5	0	143.61*	36	117	1.38	288.06	285	11	4.95E-03	64.4	
6	0	153.04	34	60	1.57	306.92	304	7	4.77E-03	41.6	
7	0	185.71*	0	88	1.12	372.28	369	8	4.68E-05	*****	
8	0	199.62	29	73	1.37	400.10	397	8	4.00E-03	54.5	
9	0	205.66*	8	55	1.52	412.20	409	7	1.17E-03	172.0	
10	0	233.68	28	34	0.94	468.25	465	6	3.90E-03	37.9	
11	0	239.29*	7	79	1.28	479.47	474	11	9.83E-04	271.4	
12	0	253.48	28	99	3.79	507.86	501	12	3.85E-03	74.3	
13	0	321.68	25	48	2.22	644.27	640	9	3.50E-03	53.2	
14	0	478.64	28	43	1.29	958.22	954	9	3.95E-03	46.2	
15	1	481.44	15	5	1.49	963.82	962	28	2.09E-03	29.7	1.75E+00
16	1	484.19	23	19	1.72	969.32	962	28	3.20E-03	43.3	
17	0	609.96*	1	27	1.87	1220.85	1214	11	1.49E-04	*****	
18	0	797.38	19	11	1.95	1595.62	1588	11	2.58E-03	41.7	
19	0	828.31	17	15	3.87	1657.47	1651	15	2.36E-03	55.3	
20	0	840.17	8	11	1.37	1681.18	1674	9	1.10E-03	83.8	
21	0	867.72	16	0	1.74	1736.25	1733	7	2.22E-03	25.0	
22	0	906.26	16	6	1.78	1813.32	1806	13	2.22E-03	41.0	
23	0	911.60*	7	2	1.87	1823.99	1819	9	9.92E-04	93.1	
24	0	994.22	15	4	1.39	1989.15	1984	10	2.03E-03	38.4	
25	0	1001.34*	18	3	1.12	2003.39	1996	13	2.48E-03	40.4	
26	0	1121.61	14	23	3.99	2243.82	2228	18	1.97E-03	82.7	
27	0	1127.54	12	0	3.32	2255.67	2250	11	1.67E-03	28.9	
28	0	1460.78*	20	0	1.61	2921.66	2914	15	2.78E-03	33.4	
29	0	1540.46	16	0	5.49	3080.88	3074	15	2.22E-03	25.0	
30	0	1764.34*	6	0	1.85	3528.18	3522	12	7.84E-04	81.3	
31	5	1793.80	7	2	2.10	3587.03	3585	11	1.03E-03	31.9	3.47E-01
32	5	1796.06	10	1	2.44	3591.54	3585	11	1.42E-03	36.8	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 19-JAN-2023 18:34:06

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488003.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MXR1		
Sample date	: 26-DEC-2022 07:58:00	Acquisition date	: 19-JAN-2023 16:33:39
Sample ID	: G606488003	Sample quantity	: 0.71812 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA2	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:01.51 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	28	10.44*	1.986E+00	7.163E+01	9.842E+01	92.40
K-40	1460.82	20	10.66*	8.045E-01	1.220E+02	1.220E+02	66.72
CU-67	91.27	-----	7.00	3.572E+00	-----	Line Not Found	-----
	93.31	38	16.10	3.716E+00	3.318E+01	2.355E+04	140.29
	184.58	0	48.70*	3.729E+00	9.700E-02	6.884E+01	12802.66
PB-212	74.82	70	10.28	2.603E+00	1.358E+02	1.392E+02	78.35
	77.11	35	17.10	2.741E+00	3.885E+01	3.980E+01	139.85
	238.63	7	43.60*	3.197E+00	2.654E+00	2.719E+00	542.77
	300.09	-----	3.30	2.746E+00	-----	Line Not Found	-----
BI-214	609.32	1	45.49*	1.661E+00	7.433E-01	7.433E-01	2340.05
	1120.29	14	14.92	1.001E+00	4.975E+01	4.976E+01	165.42
	1764.49	6	15.30	7.112E-01	2.712E+01	2.712E+01	162.62
RA-226	186.21	0	3.59*	3.729E+00	1.316E+00	1.316E+00	12802.66
TH-228	74.82	70	10.28	2.603E+00	1.358E+02	1.392E+02	78.35
	77.11	35	17.10	2.741E+00	3.885E+01	3.980E+01	139.85
	238.63	7	43.60*	3.197E+00	2.654E+00	2.719E+00	542.77
	300.09	-----	3.30	2.746E+00	-----	Line Not Found	-----
U-235	143.76	36	10.96*	4.144E+00	4.101E+01	4.101E+01	128.79
	163.33	-----	5.08	3.968E+00	-----	Line Not Found	-----
	185.72	0	57.20	3.729E+00	8.258E-02	8.258E-02	12802.66
	205.31	8	5.01	3.517E+00	2.507E+01	2.507E+01	344.04
AM-243	43.53	-----	5.90	1.964E-01	-----	Line Not Found	-----
	74.66	70	67.20*	2.603E+00	2.078E+01	2.078E+01	78.35

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488003.CNF;1
Acquisition date : 19-JAN-2023 16:33:39 Sensitivity : 3.000
Detector ID : GAM02 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:01.51 Half life ratio : *****
Sample date : 26-DEC-2022 07:58:00 Analyst initials: MXR1
Sample ID : G606488003 Sample Quantity : 7.1812E-01 FILTER
Batch Number : 2367950 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;28

CALIBRATION INFORMATION

Eff. Cal. date : 22-SEP-2022 10:31:08 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM02_JAR.CNF;13

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	9.842E+01	8.912E+01	1.026E+02
K-40	1.220E+02	7.978E+01	8.319E+01
CU-67	6.884E+01	8.637E+03	8.232E+03
PB-212	2.719E+00	1.446E+01	1.191E+01
BI-214	7.433E-01	1.705E+01	1.641E+01
RA-226	1.316E+00	1.651E+02	1.606E+02
TH-228	2.719E+00	1.446E+01	1.191E+01
U-235	4.101E+01	5.176E+01	3.940E+01
AM-243	2.078E+01	1.596E+01	1.282E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-3.002E+00	4.440E+00	7.445E+00	NOT IDENT.
NA-24	0.000E+00	2.837E+12	0.000E+00	SHORT HLIF
AL-26	1.239E+00	3.387E+00	8.568E+00	NOT IDENT.
SC-46	-1.410E+00	3.825E+00	7.290E+00	FAIL ABUN
V-48	-4.236E+00	1.059E+01	1.972E+01	NOT IDENT.
CR-51	2.264E+00	6.434E+01	1.081E+02	NOT IDENT.
MN-52	-4.884E+01	9.136E+01	1.585E+02	NOT IDENT.
MN-54	-2.129E+00	8.405E+00	9.441E+00	NOT IDENT.
CO-56	-3.968E+00	5.332E+00	9.226E+00	NOT IDENT.
CO-57	8.151E-01	3.674E+00	6.427E+00	NOT IDENT.
NI-57	0.000E+00	5.872E+05	0.000E+00	SHORT HLIF
CO-58	-3.069E-01	5.212E+00	1.019E+01	NOT IDENT.
FE-59	-1.905E+00	1.003E+01	1.953E+01	NOT IDENT.
CO-60	3.488E+00	4.572E+00	1.063E+01	NOT IDENT.
ZN-65	7.305E+00	1.080E+01	2.332E+01	NOT IDENT.
GE-68	-3.887E+01	1.299E+02	2.460E+02	NOT IDENT.
AS-73	4.242E+01	1.798E+02	3.266E+02	NOT IDENT.
AS-74	1.825E+01	1.731E+01	3.647E+01	NOT IDENT.
SE-75	-1.141E+00	5.948E+00	1.089E+01	NOT IDENT.
BR-77	0.000E+00	3.282E+04	0.000E+00	SHORT HLIF
SR-82	-8.384E-01	5.687E+01	1.107E+02	NOT IDENT.

RB-83	-2.540E+00	1.014E+01	1.802E+01	NOT IDENT.
RB-84	-8.044E-01	1.046E+01	2.033E+01	NOT IDENT.
KR-85	-3.934E+03	1.578E+03	2.137E+03	NOT IDENT.
SR-85	-2.277E+01	9.133E+00	1.237E+01	NOT IDENT.
RB-86	-5.336E+01	1.077E+02	1.947E+02	NOT IDENT.
Y-88	-1.016E+00	3.661E+00	7.794E+00	NOT IDENT.
ZR-88	2.430E+00	4.655E+00	9.037E+00	NOT IDENT.
Y-91	1.076E+03	2.272E+03	4.970E+03	NOT IDENT.
NB-94	3.037E+00	4.387E+00	9.216E+00	NOT IDENT.
NB-95	1.352E+00	5.853E+00	1.196E+01	NOT IDENT.
NB-95M	-1.540E+01	2.128E+01	2.421E+01	NOT IDENT.
TC-95M	5.170E+00	7.430E+00	1.135E+01	NOT IDENT.
ZR-95	-2.259E+00	1.017E+01	1.929E+01	NOT IDENT.
MO-99	-1.102E+03	1.527E+04	2.983E+04	FAIL ABUN
TC-99M	0.000E+00	9.801E+29	0.000E+00	SHORT HLIF
RH-100	0.000E+00	1.928E+09	0.000E+00	SHORT HLIF
RH-101	-3.663E+00	4.444E+00	7.017E+00	NOT IDENT.
RH-102M	-1.549E+00	5.185E+00	8.003E+00	NOT IDENT.
RU-103	-3.185E+00	6.297E+00	1.016E+01	FAIL ABUN
RH-106	-1.435E+00	3.977E+01	7.313E+01	NOT IDENT.
RU-106	-1.435E+00	3.977E+01	7.313E+01	NOT IDENT.
AG-108M	1.197E-01	3.969E+00	7.354E+00	NOT IDENT.
CD-109	-6.164E+01	1.244E+02	1.913E+02	NOT IDENT.
AG-110	-8.564E+01	9.108E+01	1.386E+02	NOT IDENT.
AG-110M	3.991E+00	5.639E+00	1.257E+01	NOT IDENT.
IN-111	-7.409E+01	1.403E+03	2.597E+03	NOT IDENT.
SN-113	-1.597E-01	6.644E+00	1.218E+01	NOT IDENT.
IN-114M	-1.498E+01	2.729E+01	4.643E+01	NOT IDENT.
CD-115	0.000E+00	2.804E+04	0.000E+00	SHORT HLIF
SN-117M	-3.290E+00	1.075E+01	1.979E+01	NOT IDENT.
SB-122	9.456E+01	2.469E+03	4.628E+03	NOT IDENT.
I-123	0.000E+00	7.076E+13	0.000E+00	SHORT HLIF
TE-123M	-2.623E+00	3.744E+00	6.678E+00	NOT IDENT.
SB-124	-8.994E+00	1.110E+01	1.856E+01	NOT IDENT.
SB-125	5.103E+00	1.271E+01	2.445E+01	FAIL ABUN
TE-125M	4.997E+02	1.629E+03	2.864E+03	NOT IDENT.
I-126	1.195E+01	5.174E+01	9.678E+01	NOT IDENT.
SB-126	-2.079E+01	3.011E+01	5.336E+01	NOT IDENT.
SN-126	-8.069E+00	1.166E+01	1.895E+01	NOT IDENT.
SB-127	5.449E+00	8.338E+02	1.649E+03	FAIL ABUN
TE-129	-7.667E+01	8.483E+01	1.374E+02	NOT IDENT.
I-131	1.046E+01	3.506E+01	6.687E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	-1.091E+02	6.637E+02	1.222E+03	NOT IDENT.
BA-133	-5.157E-01	6.491E+00	1.176E+01	NOT IDENT.
I-133	0.000E+00	1.285E+09	0.000E+00	SHORT HLIF
CS-134	6.612E+00	5.424E+00	1.213E+01	NOT IDENT.
I-135	0.000E+00	6.796E+27	0.000E+00	SHORT HLIF
CS-136	1.550E+01	1.793E+01	4.179E+01	FAIL ABUN
BA-137M	-5.164E-01	5.374E+00	9.550E+00	NOT IDENT.
CS-137	-5.456E-01	5.677E+00	1.009E+01	NOT IDENT.
LA-138	-2.197E+00	5.077E+00	9.340E+00	NOT IDENT.
CE-139	-2.119E+00	4.382E+00	7.907E+00	NOT IDENT.
BA-140	-3.808E+00	6.262E+01	1.136E+02	NOT IDENT.
LA-140	5.080E+00	1.880E+01	4.181E+01	NOT IDENT.
CE-141	-5.213E+00	1.165E+01	1.835E+01	NOT IDENT.
CE-143	0.000E+00	1.761E+06	0.000E+00	SHORT HLIF
CE-144	-5.336E+00	2.549E+01	4.293E+01	NOT IDENT.
PM-144	1.752E+00	4.636E+00	9.405E+00	NOT IDENT.
PR-144	1.318E+02	3.487E+02	7.073E+02	NOT IDENT.
PM-146	-4.595E+00	5.619E+00	9.223E+00	NOT IDENT.
ND-147	-7.059E+01	1.407E+02	2.398E+02	NOT IDENT.
PM-147	2.458E+03	1.066E+05	1.832E+05	NOT IDENT.
PM-149	0.000E+00	2.349E+05	0.000E+00	SHORT HLIF
EU-152	-3.156E+00	1.259E+01	2.270E+01	NOT IDENT.
GD-153	3.989E+00	1.257E+01	2.080E+01	NOT IDENT.
EU-154	-8.466E+00	1.252E+01	2.099E+01	NOT IDENT.
EU-155	2.702E+00	1.421E+01	2.502E+01	NOT IDENT.
TB-160	-1.843E+01	1.910E+01	3.147E+01	NOT IDENT.
HO-166M	-5.303E+00	8.699E+00	1.556E+01	FAIL ABUN
TM-171	1.745E+03	3.773E+03	6.960E+03	NOT IDENT.
LU-176	-2.287E+00	3.283E+00	5.658E+00	NOT IDENT.
LU-177	-7.737E+01	4.172E+02	6.857E+02	NOT IDENT.
HF-181	7.375E+00	4.296E+00	1.361E+01	FAIL ABUN
W-181	3.079E+00	3.706E+01	6.638E+01	FAIL ABUN
TA-182	-8.411E+00	2.000E+01	3.615E+01	FAIL ABUN
RE-183	-1.768E+01	3.822E+01	6.502E+01	NOT IDENT.
RE-184	-1.121E+01	2.161E+01	3.277E+01	NOT IDENT.

RE-188	-7.663E+00	2.434E+01	3.667E+01	FAIL ABUN
W-188	-2.611E+02	1.150E+03	2.073E+03	NOT IDENT.
OS-191	8.507E+00	3.220E+01	5.659E+01	NOT IDENT.
IR-192	-3.819E-01	4.875E+00	8.602E+00	NOT IDENT.
PB-201	0.000E+00	3.576E+19	0.000E+00	SHORT HLIF
TL-201	3.392E+03	7.215E+03	1.400E+04	NOT IDENT.
TL-202	2.035E+00	1.810E+01	3.333E+01	NOT IDENT.
HG-203	-3.009E-01	5.998E+00	1.104E+01	NOT IDENT.
PB-203	0.000E+00	1.045E+04	0.000E+00	SHORT HLIF
TL-204	-1.132E+01	8.083E+02	1.301E+03	NOT IDENT.
BI-207	-3.242E-01	6.889E+00	1.326E+01	FAIL ABUN
TL-208	-4.051E+00	5.790E+00	1.015E+01	NOT IDENT.
PB-210	-2.390E+01	9.742E+02	1.579E+03	NOT IDENT.
BI-211	-3.114E+01	3.549E+01	5.877E+01	NOT IDENT.
PB-211	-2.810E+01	1.061E+02	1.883E+02	NOT IDENT.
BI-212	3.270E+01	6.252E+01	1.310E+02	NOT IDENT.
BI-213	-3.114E+00	1.586E+01	2.827E+01	NOT IDENT.
PB-214	-1.377E+00	1.282E+01	2.278E+01	FAIL ABUN
RN-219	-2.003E+01	6.074E+01	1.070E+02	NOT IDENT.
FR-221	-4.802E+00	2.680E+01	4.920E+01	NOT IDENT.
RA-223	6.891E+01	9.665E+01	1.745E+02	FAIL ABUN
RA-224	-2.620E+01	8.168E+01	1.318E+02	NOT IDENT.
AC-225	-2.606E+01	1.454E+02	2.670E+02	NOT IDENT.
AC-227	6.038E+00	4.005E+01	6.758E+01	NOT IDENT.
TH-227	6.038E+00	4.005E+01	6.758E+01	NOT IDENT.
AC-228	1.217E+01	2.220E+01	4.177E+01	FAIL ABUN
RA-228	1.217E+01	2.220E+01	4.177E+01	FAIL ABUN
TH-229	1.870E+01	6.721E+01	1.281E+02	NOT IDENT.
TH-230	-1.675E+03	1.629E+03	2.604E+03	NOT IDENT.
PA-231	6.298E-01	6.759E+01	1.245E+02	NOT IDENT.
TH-231	-6.302E+01	7.559E+01	1.297E+02	NOT IDENT.
TH-232	-7.243E+01	4.011E+03	7.317E+03	FAIL ABUN
PA-233	-4.882E-01	8.255E+00	1.526E+01	FAIL ABUN
PA-234	7.162E+00	4.303E+01	8.489E+01	FAIL ABUN
PA-234M	1.005E+03	7.964E+02	1.510E+03	FAIL ABUN
TH-234	-2.090E+01	2.938E+02	5.335E+02	NOT IDENT.
U-234	3.924E+03	1.288E+04	2.352E+04	NOT IDENT.
NP-237	-4.882E-01	8.255E+00	1.526E+01	FAIL ABUN
NP-238	0.000E+00	4.281E+04	0.000E+00	SHORT HLIF
U-238	-2.090E+01	2.938E+02	5.335E+02	NOT IDENT.
NP-239	2.262E+01	3.395E+01	6.248E+01	NOT IDENT.
AM-241	6.506E-01	2.632E+01	4.665E+01	NOT IDENT.
AM-242	-3.575E+01	9.430E+01	1.574E+02	NOT IDENT.
CM-243	-1.859E+01	1.469E+01	2.233E+01	NOT IDENT.
BK-247	-4.068E+00	1.082E+01	1.938E+01	NOT IDENT.
CM-247	-2.823E+00	5.375E+00	9.270E+00	NOT IDENT.
CF-249	8.952E-01	5.558E+00	1.041E+01	FAIL ABUN
CF-251	6.781E+00	1.637E+01	3.160E+01	NOT IDENT.
CF-252	2.935E+03	2.501E+04	4.370E+04	NOT IDENT.
ANH-511	-1.459E+01	8.570E+00	1.609E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.42	64	176	1.13	127.62	123	10	8.88E-03	40.9	
2	5	75.28	127	148	1.78	151.35	144	18	1.77E-02	21.0	2.06E+00
3	5	77.12	35	112	1.62	155.03	144	18	4.84E-03	69.9	
4	0	84.81	55	110	1.84	170.42	167	7	7.63E-03	34.4	
5	6	92.61	184	103	1.14	186.02	181	14	2.55E-02	11.8	8.50E-01
6	6	94.80	38	132	2.00	190.40	181	14	5.27E-03	70.1	
7	0	140.84	36	91	1.15	282.51	276	9	4.93E-03	52.2	
8	0	143.61	71	117	1.38	288.06	285	11	9.92E-03	31.0	
9	0	153.04	34	60	1.57	306.92	304	7	4.77E-03	41.6	
10	0	163.68	10	101	0.60	328.20	324	7	1.45E-03	162.9	
11	0	185.71	143	88	1.12	372.28	369	8	1.98E-02	14.1	
12	0	199.62	29	73	1.37	400.10	397	8	4.00E-03	54.5	
13	0	205.66	24	55	1.52	412.20	409	7	3.28E-03	55.8	
14	0	233.68	28	34	0.94	468.25	465	6	3.90E-03	37.9	
15	0	239.29	43	79	1.28	479.47	474	11	5.91E-03	43.4	
16	0	253.48	28	99	3.79	507.86	501	12	3.85E-03	74.3	
17	0	321.68	25	48	2.22	644.27	640	9	3.50E-03	53.2	
18	0	353.38	19	99	0.59	707.68	702	14	2.58E-03	115.4	
19	0	478.64	28	43	1.29	958.22	954	9	3.95E-03	46.2	
20	1	481.44	15	5	1.49	963.82	962	28	2.09E-03	29.7	1.75E+00
21	1	484.19	23	19	1.72	969.32	962	28	3.20E-03	43.3	
22	0	511.09	131	59	1.94	1023.12	1015	14	1.82E-02	15.3	
23	0	609.96	27	27	1.87	1220.85	1214	11	3.76E-03	43.2	
24	0	767.45	7	12	0.54	1535.77	1530	7	9.76E-04	90.5	
25	0	797.38	19	11	1.95	1595.62	1588	11	2.58E-03	41.7	
26	0	828.31	17	15	3.87	1657.47	1651	15	2.36E-03	55.3	
27	0	840.17	8	11	1.37	1681.18	1674	9	1.10E-03	83.8	
28	0	867.72	16	0	1.74	1736.25	1733	7	2.22E-03	25.0	
29	0	906.26	16	6	1.78	1813.32	1806	13	2.22E-03	41.0	
30	0	911.60	20	2	1.87	1823.99	1819	9	2.77E-03	26.1	
31	0	994.22	15	4	1.39	1989.15	1984	10	2.03E-03	38.4	
32	0	1001.34	26	3	1.12	2003.39	1996	13	3.55E-03	24.6	
33	0	1121.61	14	23	3.99	2243.82	2228	18	1.97E-03	82.7	
34	0	1127.54	12	0	3.32	2255.67	2250	11	1.67E-03	28.9	
35	0	1460.78	38	0	1.61	2921.66	2914	15	5.28E-03	16.2	
36	0	1540.46	16	0	5.49	3080.88	3074	15	2.22E-03	25.0	
37	0	1764.34	17	0	1.85	3528.18	3522	12	2.36E-03	24.3	
38	5	1793.80	7	2	2.10	3587.03	3585	11	1.03E-03	31.9	3.47E-01
39	5	1796.06	10	1	2.44	3591.54	3585	11	1.42E-03	36.8	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	28	10.44*	1.986E+00	7.163E+01	9.842E+01	92.40
K-40	1460.82	20	10.66*	8.045E-01	1.220E+02	1.220E+02	66.72
CU-67	91.27	-----	7.00	3.572E+00	-----	Line Not Found	-----
	93.31	38	16.10	3.716E+00	3.318E+01	2.355E+04	140.29
	184.58	0	48.70*	3.729E+00	9.700E-02	6.884E+01	12802.66
PB-212	74.82	70	10.28	2.603E+00	1.358E+02	1.392E+02	78.35
	77.11	35	17.10	2.741E+00	3.885E+01	3.980E+01	139.85
	238.63	7	43.60*	3.197E+00	2.654E+00	2.719E+00	542.77
	300.09	-----	3.30	2.746E+00	-----	Line Not Found	-----
BI-214	609.32	1	45.49*	1.661E+00	7.433E-01	7.433E-01	2340.05
	1120.29	14	14.92	1.001E+00	4.975E+01	4.976E+01	165.42
	1764.49	6	15.30	7.112E-01	2.712E+01	2.712E+01	162.62
RA-226	186.21	0	3.59*	3.729E+00	1.316E+00	1.316E+00	12802.66
TH-228	74.82	70	10.28	2.603E+00	1.358E+02	1.392E+02	78.35
	77.11	35	17.10	2.741E+00	3.885E+01	3.980E+01	139.85
	238.63	7	43.60*	3.197E+00	2.654E+00	2.719E+00	542.77
	300.09	-----	3.30	2.746E+00	-----	Line Not Found	-----
U-235	143.76	36	10.96*	4.144E+00	4.101E+01	4.101E+01	128.79
	163.33	-----	5.08	3.968E+00	-----	Line Not Found	-----
	185.72	0	57.20	3.729E+00	8.258E-02	8.258E-02	12802.66
	205.31	8	5.01	3.517E+00	2.507E+01	2.507E+01	344.04
AM-243	43.53	-----	5.90	1.964E-01	-----	Line Not Found	-----
	74.66	70	67.20*	2.603E+00	2.078E+01	2.078E+01	78.35

Flag: "*" = Keyline

Total number of lines in spectrum 32
Number of unidentified lines 12
Number of lines tentatively identified by NID 20 62.50%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.37	7.163E+01	9.842E+01	9.094E+01	92.40	
K-40	1.25E+09Y	1.00	1.220E+02	1.220E+02	0.814E+02	66.72	
CU-67	61.83H	710.	9.700E-02	6.884E+01	881.3E+01	12802.66	
PB-212	1.91Y	1.02	2.654E+00	2.719E+00	14.76E+00	542.77	
BI-214	1600.00Y	1.00	7.433E-01	7.433E-01	173.9E-01	2340.05	
RA-226	1600.00Y	1.00	1.316E+00	1.316E+00	168.5E+00	12802.66	
TH-228	1.91Y	1.02	2.654E+00	2.719E+00	14.76E+00	542.77	
U-235	7.04E+08Y	1.00	4.101E+01	4.101E+01	5.282E+01	128.79	
AM-243	7370.00Y	1.00	2.078E+01	2.078E+01	1.628E+01	78.35	
Total Activity :			2.629E+02	3.586E+02			

Grand Total Activity : 2.629E+02 3.586E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	140.84	36	91	1.15	282.51	276	9	4.93E-03	****	4.16E+00	T
0	153.04	34	60	1.57	306.92	304	7	4.77E-03	83.2	4.07E+00	T
0	199.62	29	73	1.37	400.10	397	8	4.00E-03	****	3.58E+00	
0	233.68	28	34	0.94	468.25	465	6	3.90E-03	75.9	3.25E+00	
0	253.48	28	99	3.79	507.86	501	12	3.85E-03	****	3.08E+00	T
0	321.68	25	48	2.22	644.27	640	9	3.50E-03	****	2.62E+00	T
1	481.44	15	5	1.49	963.82	962	28	2.09E-03	59.4	1.98E+00	T
1	484.19	23	19	1.72	969.32	962	28	3.20E-03	86.6	1.97E+00	
0	797.38	19	11	1.95	1595.62	1588	11	2.58E-03	83.5	1.34E+00	
0	828.31	17	15	3.87	1657.47	1651	15	2.36E-03	****	1.30E+00	
0	840.17	8	11	1.37	1681.18	1674	9	1.10E-03	****	1.28E+00	
0	867.72	16	0	1.74	1736.25	1733	7	2.22E-03	50.0	1.25E+00	
0	906.26	16	6	1.78	1813.32	1806	13	2.22E-03	82.1	1.20E+00	T
0	911.60	7	2	1.87	1823.99	1819	9	9.92E-04	****	1.20E+00	T
0	994.22	15	4	1.39	1989.15	1984	10	2.03E-03	76.7	1.11E+00	
0	1001.34	18	3	1.12	2003.39	1996	13	2.48E-03	80.9	1.11E+00	T
0	1127.54	12	0	3.32	2255.67	2250	11	1.67E-03	57.7	9.96E-01	
0	1540.46	16	0	5.49	3080.88	3074	15	2.22E-03	50.0	7.74E-01	
5	1793.80	7	2	2.10	3587.03	3585	11	1.03E-03	63.7	7.05E-01	
5	1796.06	10	1	2.44	3591.54	3585	11	1.42E-03	73.5	7.05E-01	

Flags: "T" = Tentatively associated

```

*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488003.CNF;1  *
* Acquisition date   : 19-JAN-2023 16:33:39 Sensitivity      : 3.000          *
* Detector ID        : GAM02 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000      *
* Elapsed real time  : 0 02:00:01.51 Half life ratio  : *****        *
* Sample date        : 26-DEC-2022 07:58:00 Nuclide Library : LIQUID      *
* Sample ID          : G606488003 Analyst initials: MXR1          *
* Batch Number       : 2367950 Sample Quantity : 7.1812E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 22-SEP-2022 10:31:08 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM02_JAR.CNF;13          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	4.664E+01
K-40	3.335E+01
CU-67	3.842E+03
PB-212	5.439E+00
BI-214	7.274E+00
RA-226	7.506E+01
TH-228	5.439E+00
U-235	1.815E+01
AM-243	6.001E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	2.920E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	3.275E+00	NOT IDENT.
SC-46	2.939E+00	FAIL ABUN
V-48	8.043E+00	NOT IDENT.
CR-51	4.905E+01	NOT IDENT.
MN-52	6.142E+01	NOT IDENT.
MN-54	4.144E+00	NOT IDENT.
CO-56	3.924E+00	NOT IDENT.
CO-57	3.006E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	4.415E+00	NOT IDENT.
FE-59	7.972E+00	NOT IDENT.
CO-60	4.490E+00	NOT IDENT.
ZN-65	1.017E+01	NOT IDENT.
GE-68	1.005E+02	NOT IDENT.
AS-73	1.522E+02	NOT IDENT.
AS-74	1.641E+01	NOT IDENT.
SE-75	4.985E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	4.870E+01	NOT IDENT.
RB-83	7.988E+00	NOT IDENT.

RB-84	8.776E+00	NOT IDENT.
KR-85	9.812E+02	NOT IDENT.
SR-85	5.680E+00	NOT IDENT.
RB-86	7.783E+01	NOT IDENT.
Y-88	2.699E+00	NOT IDENT.
ZR-88	4.130E+00	NOT IDENT.
Y-91	2.100E+03	NOT IDENT.
NB-94	4.133E+00	NOT IDENT.
NB-95	5.318E+00	NOT IDENT.
NB-95M	1.096E+01	NOT IDENT.
TC-95M	5.261E+00	NOT IDENT.
ZR-95	8.439E+00	NOT IDENT.
MO-99	1.300E+04	FAIL ABUN
TC-99M	0.000E+00	SHORT HLIF
RH-100	0.000E+00	SHORT HLIF
RH-101	3.259E+00	NOT IDENT.
RH-102M	3.626E+00	NOT IDENT.
RU-103	4.463E+00	FAIL ABUN
RH-106	3.202E+01	NOT IDENT.
RU-106	3.202E+01	NOT IDENT.
AG-108M	3.311E+00	NOT IDENT.
CD-109	8.989E+01	NOT IDENT.
AG-110	5.860E+01	NOT IDENT.
AG-110M	5.438E+00	NOT IDENT.
IN-111	1.199E+03	NOT IDENT.
SN-113	5.539E+00	NOT IDENT.
IN-114M	2.148E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	9.191E+00	NOT IDENT.
SB-122	2.030E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	3.099E+00	NOT IDENT.
SB-124	6.575E+00	NOT IDENT.
SB-125	1.111E+01	FAIL ABUN
TE-125M	1.347E+03	NOT IDENT.
I-126	4.328E+01	NOT IDENT.
SB-126	2.314E+01	NOT IDENT.
SN-126	8.917E+00	NOT IDENT.
SB-127	7.223E+02	FAIL ABUN
TE-129	6.131E+01	NOT IDENT.
I-131	3.048E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	5.631E+02	NOT IDENT.
BA-133	5.414E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	5.438E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.789E+01	FAIL ABUN
BA-137M	4.272E+00	NOT IDENT.
CS-137	4.513E+00	NOT IDENT.
LA-138	3.345E+00	NOT IDENT.
CE-139	3.702E+00	NOT IDENT.
BA-140	5.083E+01	NOT IDENT.
LA-140	1.721E+01	NOT IDENT.
CE-141	8.581E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.986E+01	NOT IDENT.
PM-144	4.207E+00	NOT IDENT.
PR-144	3.164E+02	NOT IDENT.
PM-146	4.081E+00	NOT IDENT.
ND-147	1.062E+02	NOT IDENT.
PM-147	8.565E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	1.029E+01	NOT IDENT.
GD-153	9.720E+00	NOT IDENT.
EU-154	8.234E+00	NOT IDENT.
EU-155	1.168E+01	NOT IDENT.
TB-160	1.334E+01	NOT IDENT.
HO-166M	6.894E+00	FAIL ABUN
TM-171	3.254E+03	NOT IDENT.
LU-176	2.551E+00	NOT IDENT.
LU-177	3.181E+02	NOT IDENT.
HF-181	6.147E+00	FAIL ABUN
W-181	3.085E+01	FAIL ABUN
TA-182	1.482E+01	FAIL ABUN
RE-183	3.018E+01	NOT IDENT.
RE-184	1.391E+01	NOT IDENT.
RE-188	1.692E+01	FAIL ABUN

W-188	9.573E+02	NOT IDENT.
OS-191	2.641E+01	NOT IDENT.
IR-192	3.897E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	6.534E+03	NOT IDENT.
TL-202	1.522E+01	NOT IDENT.
HG-203	5.089E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	6.106E+02	NOT IDENT.
BI-207	5.729E+00	FAIL ABUN
TL-208	4.581E+00	NOT IDENT.
PB-210	7.385E+02	NOT IDENT.
BI-211	2.717E+01	NOT IDENT.
PB-211	8.582E+01	NOT IDENT.
BI-212	5.804E+01	NOT IDENT.
BI-213	1.285E+01	NOT IDENT.
PB-214	1.059E+01	FAIL ABUN
RN-219	4.876E+01	NOT IDENT.
FR-221	2.278E+01	NOT IDENT.
RA-223	8.046E+01	FAIL ABUN
RA-224	6.035E+01	NOT IDENT.
AC-225	1.236E+02	NOT IDENT.
AC-227	3.136E+01	NOT IDENT.
TH-227	3.136E+01	NOT IDENT.
AC-228	1.859E+01	FAIL ABUN
RA-228	1.859E+01	FAIL ABUN
TH-229	5.966E+01	NOT IDENT.
TH-230	1.208E+03	NOT IDENT.
PA-231	5.744E+01	NOT IDENT.
TH-231	6.155E+01	NOT IDENT.
TH-232	3.494E+03	FAIL ABUN
PA-233	6.949E+00	FAIL ABUN
PA-234	3.739E+01	FAIL ABUN
PA-234M	6.789E+02	FAIL ABUN
TH-234	2.548E+02	NOT IDENT.
U-234	1.097E+04	NOT IDENT.
NP-237	6.949E+00	FAIL ABUN
NP-238	0.000E+00	SHORT HLIF
U-238	2.548E+02	NOT IDENT.
NP-239	2.912E+01	NOT IDENT.
AM-241	2.176E+01	NOT IDENT.
AM-242	7.366E+01	NOT IDENT.
CM-243	1.032E+01	NOT IDENT.
BK-247	8.907E+00	NOT IDENT.
CM-247	4.199E+00	NOT IDENT.
CF-249	4.739E+00	FAIL ABUN
CF-251	1.474E+01	NOT IDENT.
CF-252	2.044E+04	NOT IDENT.
ANH-511	7.675E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488003.CNF;1
Acquisition date : 19-JAN-2023 16:33:39 Sensitivity : 3.000
Detector ID : GAM02 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:01.51 Half life ratio : *****
Sample date : 26-DEC-2022 07:58:00 Nuclide Library : LIQUID
Sample ID : G606488003 Analyst initials: MXR1
Batch Number : 2367950 Sample Quantity : 7.1812E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 22-SEP-2022 10:31:08 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM02_JAR.CNF;13

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	9.842E+01	8.958E+01	8.960E+01
K-40	1.220E+02	8.081E+01	8.085E+01
CU-67	6.884E+01	8.637E+03	8.637E+03
PB-212	2.719E+00	1.446E+01	1.446E+01
BI-214	7.433E-01	1.705E+01	1.705E+01
RA-226	1.316E+00	1.651E+02	1.651E+02
TH-228	2.719E+00	1.446E+01	1.446E+01
U-235	4.101E+01	5.185E+01	5.186E+01
AM-243	2.078E+01	1.607E+01	1.607E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-3.002E+00	4.449E+00	4.651E+00	NOT IDENT.
NA-24	4.899E+11	2.837E+12	2.846E+12	SHORT HLIF
AL-26	1.239E+00	3.388E+00	3.434E+00	NOT IDENT.
SC-46	-1.410E+00	3.828E+00	3.881E+00	FAIL ABUN
V-48	-4.236E+00	1.060E+01	1.077E+01	NOT IDENT.
CR-51	2.264E+00	6.434E+01	6.435E+01	NOT IDENT.
MN-52	-4.884E+01	9.150E+01	9.412E+01	NOT IDENT.
MN-54	-2.129E+00	8.408E+00	8.462E+00	NOT IDENT.
CO-56	-3.968E+00	5.346E+00	5.638E+00	NOT IDENT.
CO-57	8.151E-01	3.674E+00	3.692E+00	NOT IDENT.
NI-57	3.962E+05	5.893E+05	6.158E+05	SHORT HLIF
CO-58	-3.069E-01	5.212E+00	5.214E+00	NOT IDENT.
FE-59	-1.905E+00	1.003E+01	1.007E+01	NOT IDENT.
CO-60	3.488E+00	4.587E+00	4.849E+00	NOT IDENT.
ZN-65	7.305E+00	1.082E+01	1.131E+01	NOT IDENT.
GE-68	-3.887E+01	1.299E+02	1.311E+02	NOT IDENT.
AS-73	4.242E+01	1.801E+02	1.811E+02	NOT IDENT.
AS-74	1.825E+01	1.742E+01	1.927E+01	NOT IDENT.
SE-75	-1.141E+00	5.949E+00	5.971E+00	NOT IDENT.
BR-77	6.169E+03	3.282E+04	3.294E+04	SHORT HLIF
SR-82	-8.384E-01	5.687E+01	5.687E+01	NOT IDENT.

RB-83	-2.540E+00	1.014E+01	1.021E+01	NOT IDENT.
RB-84	-8.044E-01	1.046E+01	1.047E+01	NOT IDENT.
KR-85	-3.934E+03	1.617E+03	2.401E+03	NOT IDENT.
SR-85	-2.277E+01	9.362E+00	1.390E+01	NOT IDENT.
RB-86	-5.336E+01	1.078E+02	1.105E+02	NOT IDENT.
Y-88	-1.016E+00	3.662E+00	3.691E+00	NOT IDENT.
ZR-88	2.430E+00	4.660E+00	4.788E+00	NOT IDENT.
Y-91	1.076E+03	2.274E+03	2.325E+03	NOT IDENT.
NB-94	3.037E+00	4.394E+00	4.603E+00	NOT IDENT.
NB-95	1.352E+00	5.854E+00	5.886E+00	NOT IDENT.
NB-95M	-1.540E+01	2.134E+01	2.244E+01	NOT IDENT.
TC-95M	5.170E+00	7.443E+00	7.800E+00	NOT IDENT.
ZR-95	-2.259E+00	1.017E+01	1.022E+01	NOT IDENT.
MO-99	-1.102E+03	1.527E+04	1.528E+04	FAIL ABUN
TC-99M	9.575E+29	9.861E+29	0.000E+00	SHORT HLIF
RH-100	-3.585E+08	1.939E+09	1.946E+09	SHORT HLIF
RH-101	-3.663E+00	4.497E+00	4.791E+00	NOT IDENT.
RH-102M	-1.549E+00	5.189E+00	5.236E+00	NOT IDENT.
RU-103	-3.185E+00	6.304E+00	6.466E+00	FAIL ABUN
RH-106	-1.435E+00	3.977E+01	3.977E+01	NOT IDENT.
RU-106	-1.435E+00	3.977E+01	3.977E+01	NOT IDENT.
AG-108M	1.197E-01	3.969E+00	3.970E+00	NOT IDENT.
CD-109	-6.164E+01	1.245E+02	1.276E+02	NOT IDENT.
AG-110	-8.564E+01	9.135E+01	9.918E+01	NOT IDENT.
AG-110M	3.991E+00	5.654E+00	5.934E+00	NOT IDENT.
IN-111	-7.409E+01	1.403E+03	1.404E+03	NOT IDENT.
SN-113	-1.597E-01	6.644E+00	6.644E+00	NOT IDENT.
IN-114M	-1.498E+01	2.731E+01	2.814E+01	NOT IDENT.
CD-115	-6.991E+03	2.805E+04	2.823E+04	SHORT HLIF
SN-117M	-3.290E+00	1.075E+01	1.085E+01	NOT IDENT.
SB-122	9.456E+01	2.469E+03	2.469E+03	NOT IDENT.
I-123	-4.915E+13	7.085E+13	7.424E+13	SHORT HLIF
TE-123M	-2.623E+00	3.749E+00	3.931E+00	NOT IDENT.
SB-124	-8.994E+00	1.113E+01	1.185E+01	NOT IDENT.
SB-125	5.103E+00	1.272E+01	1.293E+01	FAIL ABUN
TE-125M	4.997E+02	1.630E+03	1.645E+03	NOT IDENT.
I-126	1.195E+01	5.175E+01	5.203E+01	NOT IDENT.
SB-126	-2.079E+01	3.022E+01	3.164E+01	NOT IDENT.
SN-126	-8.069E+00	1.169E+01	1.224E+01	NOT IDENT.
SB-127	5.449E+00	8.338E+02	8.338E+02	FAIL ABUN
TE-129	-7.667E+01	8.592E+01	9.262E+01	NOT IDENT.
I-131	1.046E+01	3.508E+01	3.539E+01	NOT IDENT.
I-132	1.000E+41	1.198E+42	0.000E+00	SHORT HLIF
TE-132	-1.091E+02	6.638E+02	6.656E+02	NOT IDENT.
BA-133	-5.157E-01	6.491E+00	6.495E+00	NOT IDENT.
I-133	8.479E+08	1.294E+09	1.349E+09	SHORT HLIF
CS-134	6.612E+00	5.458E+00	6.220E+00	NOT IDENT.
I-135	1.639E+27	6.859E+27	0.000E+00	SHORT HLIF
CS-136	1.550E+01	1.803E+01	1.933E+01	FAIL ABUN
BA-137M	-5.164E-01	5.374E+00	5.379E+00	NOT IDENT.
CS-137	-5.456E-01	5.677E+00	5.683E+00	NOT IDENT.
LA-138	-2.197E+00	5.082E+00	5.178E+00	NOT IDENT.
CE-139	-2.119E+00	4.405E+00	4.508E+00	NOT IDENT.
BA-140	-3.808E+00	6.263E+01	6.265E+01	NOT IDENT.
LA-140	5.080E+00	1.880E+01	1.894E+01	NOT IDENT.
CE-141	-5.213E+00	1.165E+01	1.189E+01	NOT IDENT.
CE-143	-1.110E+06	1.764E+06	1.834E+06	SHORT HLIF
CE-144	-5.336E+00	2.549E+01	2.560E+01	NOT IDENT.
PM-144	1.752E+00	4.639E+00	4.706E+00	NOT IDENT.
PR-144	1.318E+02	3.488E+02	3.539E+02	NOT IDENT.
PM-146	-4.595E+00	5.642E+00	6.011E+00	NOT IDENT.
ND-147	-7.059E+01	1.409E+02	1.444E+02	NOT IDENT.
PM-147	2.458E+03	1.066E+05	1.066E+05	NOT IDENT.
PM-149	-1.218E+05	2.357E+05	2.420E+05	SHORT HLIF
EU-152	-3.156E+00	1.259E+01	1.267E+01	NOT IDENT.
GD-153	3.989E+00	1.257E+01	1.270E+01	NOT IDENT.
EU-154	-8.466E+00	1.255E+01	1.311E+01	NOT IDENT.
EU-155	2.702E+00	1.421E+01	1.427E+01	NOT IDENT.
TB-160	-1.843E+01	1.920E+01	2.092E+01	NOT IDENT.
HO-166M	-5.303E+00	8.712E+00	9.035E+00	FAIL ABUN
TM-171	1.745E+03	3.779E+03	3.860E+03	NOT IDENT.
LU-176	-2.287E+00	3.289E+00	3.447E+00	NOT IDENT.
LU-177	-7.737E+01	4.172E+02	4.187E+02	NOT IDENT.
HF-181	7.375E+00	4.349E+00	5.476E+00	FAIL ABUN
W-181	3.079E+00	3.707E+01	3.709E+01	FAIL ABUN
TA-182	-8.411E+00	2.002E+01	2.037E+01	FAIL ABUN
RE-183	-1.768E+01	3.829E+01	3.911E+01	NOT IDENT.
RE-184	-1.121E+01	2.166E+01	2.224E+01	NOT IDENT.

RE-188	-7.663E+00	2.435E+01	2.459E+01	FAIL ABUN
W-188	-2.611E+02	1.150E+03	1.156E+03	NOT IDENT.
OS-191	8.507E+00	3.221E+01	3.243E+01	NOT IDENT.
IR-192	-3.819E-01	4.876E+00	4.879E+00	NOT IDENT.
PB-201	-1.067E+19	3.593E+19	0.000E+00	SHORT HLIF
TL-201	3.392E+03	7.220E+03	7.380E+03	NOT IDENT.
TL-202	2.035E+00	1.810E+01	1.812E+01	NOT IDENT.
HG-203	-3.009E-01	5.998E+00	6.000E+00	NOT IDENT.
PB-203	-5.242E+02	1.045E+04	1.045E+04	SHORT HLIF
TL-204	-1.132E+01	8.083E+02	8.083E+02	NOT IDENT.
BI-207	-3.242E-01	6.889E+00	6.891E+00	FAIL ABUN
TL-208	-4.051E+00	5.801E+00	6.082E+00	NOT IDENT.
PB-210	-2.390E+01	9.742E+02	9.742E+02	NOT IDENT.
BI-211	-3.114E+01	3.559E+01	3.827E+01	NOT IDENT.
PB-211	-2.810E+01	1.062E+02	1.069E+02	NOT IDENT.
BI-212	3.270E+01	6.259E+01	6.431E+01	NOT IDENT.
BI-213	-3.114E+00	1.586E+01	1.592E+01	NOT IDENT.
PB-214	-1.377E+00	1.282E+01	1.284E+01	FAIL ABUN
RN-219	-2.003E+01	6.081E+01	6.148E+01	NOT IDENT.
FR-221	-4.802E+00	2.680E+01	2.689E+01	NOT IDENT.
RA-223	6.891E+01	9.688E+01	1.017E+02	FAIL ABUN
RA-224	-2.620E+01	8.171E+01	8.256E+01	NOT IDENT.
AC-225	-2.606E+01	1.454E+02	1.459E+02	NOT IDENT.
AC-227	6.038E+00	4.006E+01	4.016E+01	NOT IDENT.
TH-227	6.038E+00	4.006E+01	4.016E+01	NOT IDENT.
AC-228	1.217E+01	2.223E+01	2.290E+01	FAIL ABUN
RA-228	1.217E+01	2.223E+01	2.290E+01	FAIL ABUN
TH-229	1.870E+01	6.722E+01	6.775E+01	NOT IDENT.
TH-230	-1.675E+03	1.656E+03	1.821E+03	NOT IDENT.
PA-231	6.298E-01	6.759E+01	6.759E+01	NOT IDENT.
TH-231	-6.302E+01	7.619E+01	8.132E+01	NOT IDENT.
TH-232	-7.243E+01	4.011E+03	4.011E+03	FAIL ABUN
PA-233	-4.882E-01	8.255E+00	8.258E+00	FAIL ABUN
PA-234	7.162E+00	4.380E+01	4.392E+01	FAIL ABUN
PA-234M	1.005E+03	8.023E+02	9.215E+02	FAIL ABUN
TH-234	-2.090E+01	2.938E+02	2.940E+02	NOT IDENT.
U-234	3.924E+03	1.289E+04	1.301E+04	NOT IDENT.
NP-237	-4.882E-01	8.255E+00	8.258E+00	FAIL ABUN
NP-238	-1.595E+04	4.283E+04	4.343E+04	SHORT HLIF
U-238	-2.090E+01	2.938E+02	2.940E+02	NOT IDENT.
NP-239	2.262E+01	3.400E+01	3.550E+01	NOT IDENT.
AM-241	6.506E-01	2.632E+01	2.632E+01	NOT IDENT.
AM-242	-3.575E+01	9.453E+01	9.589E+01	NOT IDENT.
CM-243	-1.859E+01	1.482E+01	1.703E+01	NOT IDENT.
BK-247	-4.068E+00	1.085E+01	1.100E+01	NOT IDENT.
CM-247	-2.823E+00	5.401E+00	5.549E+00	NOT IDENT.
CF-249	8.952E-01	5.559E+00	5.573E+00	FAIL ABUN
CF-251	6.781E+00	1.640E+01	1.668E+01	NOT IDENT.
CF-252	2.935E+03	2.515E+04	2.518E+04	NOT IDENT.
ANH-511	-1.459E+01	8.671E+00	1.089E+01	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	64.7671	133.52	65.4857	116.30	41.4725
879.38	69.2686	364.49	65.4942	116.74	48.6134
46.54	63.2238	80.22	65.4987	117.23	62.8866
228.16	59.5675	711.68	59.5825	119.76	70.2628
52.39	65.0590	356.01	61.1211	120.54	51.2659
53.20	56.9233	323.87	61.1292	120.90	54.8707
53.44	56.9566	82.35	0.0000	264.66	63.2404
57.53	57.3445	82.47	109.1220	121.22	68.0232
293.27	0.0000	82.47	109.1228	344.28	59.7168
57.53	56.4472	83.79	86.5345	122.06	64.5201
482.18	56.4474	265.00	82.0710	1274.44	69.3985
57.98	66.1013	84.21	82.1022	123.68	64.6680
59.32	66.3045	84.86	0.0000	1377.63	0.0000
59.54	64.1977	193.51	81.1560	127.23	77.0232
155.04	133.2575	105.31	107.2961	129.43	59.1490
63.00	77.6338	86.79	100.5623	131.20	64.1320
129.43	67.9726	86.94	100.5894	133.02	55.7979
63.29	67.9726	87.09	94.9633	133.52	55.8351
290.67	58.2991	87.57	82.5978	135.34	58.4041
63.81	63.7290	88.03	73.9835	136.00	56.8316
87.57	87.5815	306.78	71.0025	136.28	61.7253
64.99	136.4465	88.47	71.0188	136.47	61.7407
65.08	136.4724	531.02	70.5868	739.50	68.6003
66.73	65.2153	184.58	70.6062	140.51	0.0000
66.98	65.2496	92.59	70.7661	140.88	26.9629
67.24	65.2853	93.31	70.8531	143.76	45.9244
67.67	79.5023	94.56	71.0026	144.24	45.9523
1221.41	79.5152	311.90	71.0134	145.44	46.0218
439.51	78.6121	946.00	71.0158	152.32	64.6509
70.82	78.6121	97.43	59.8362	152.43	64.6596
167.43	78.6132	98.43	64.5449	1048.07	48.5435
97.43	62.6996	98.44	64.5458	154.21	63.1385
70.82	77.4620	99.53	80.8261	155.04	54.8859
70.82	77.4626	103.37	80.8261	158.56	61.6110
279.20	0.0000	116.74	80.8261	158.97	0.0000
1063.66	71.5366	100.11	78.5908	159.00	70.1863
72.87	0.0000	100.20	67.0430	162.33	67.1069
351.06	71.5450	102.03	56.8069	537.26	67.1322
74.66	71.7989	103.18	81.3017	163.33	74.7434
238.63	71.8217	103.37	79.0027	165.86	83.3852
351.93	71.8217	105.31	60.5987	167.43	55.6902
238.63	71.8217	106.12	66.5099	245.35	49.1540
74.97	71.8426	106.47	61.8761	427.87	54.5443
77.11	72.1416	109.28	75.0425	176.60	52.8568
256.23	71.3813	111.00	76.4149	177.52	55.4706
79.82	65.4490	111.76	71.7948	181.07	56.5422
80.02	65.4732	208.37	58.9533	184.41	65.7741
80.03	65.4741	116.24	41.4688	184.58	65.7858

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	68.0184	300.09	46.7121	475.06	36.7440
186.21	68.0538	300.13	46.7131	696.49	30.3816
190.27	63.3277	301.36	47.7112	477.60	33.5944
193.51	56.4240	302.85	44.8982	477.99	43.2018
197.03	49.6587	304.50	33.4762	482.18	22.4514
198.01	48.3999	304.85	36.3556	487.02	22.5090
201.83	36.7688	306.78	39.2825	492.35	0.0000
204.12	36.8534	308.46	33.5751	497.08	24.5673
205.31	52.7100	311.90	35.5840	511.00	42.3250
208.37	59.4779	316.51	32.4235	514.00	103.2568
210.85	61.8303	319.41	30.4612	520.40	23.9891
215.65	51.4692	320.08	31.9271	520.69	0.0000
218.12	56.0382	321.04	34.8538	667.71	0.0000
222.11	46.4283	323.87	33.4689	527.90	0.0000
227.09	51.1292	325.23	42.2415	529.59	14.2410
227.38	53.8348	1596.21	29.2053	529.87	0.0000
228.16	49.3839	331.15	0.0000	531.02	27.4058
228.18	49.3850	333.37	33.2066	537.26	25.2901
235.69	48.8194	334.37	41.0490	539.51	0.0000
235.96	48.8315	338.28	32.3407	1260.41	0.0000
238.63	37.1646	911.20	34.3015	552.55	13.2935
238.98	0.0000	340.48	32.3897	795.86	28.9495
240.99	46.3261	340.55	32.3911	564.24	16.7090
242.00	42.2764	344.28	35.4265	569.33	21.2157
244.70	47.3890	345.93	33.4964	569.50	16.7505
245.35	49.2396	351.06	45.4759	569.70	17.8691
459.60	54.9615	351.93	36.6003	582.08	25.8348
685.70	47.7063	356.01	46.6194	583.19	22.4764
388.16	47.7227	361.25	0.0000	595.83	13.5640
256.23	52.4645	364.49	30.9218	600.60	19.2571
527.90	0.0000	366.42	39.9495	604.72	30.6409
264.66	42.6402	383.85	44.4395	609.32	20.4697
265.00	50.0691	388.16	32.4069	610.33	15.3589
269.46	38.1556	666.33	35.4557	614.28	11.9667
401.81	49.3942	391.70	34.5091	618.01	19.4065
273.65	43.8885	392.87	29.4555	621.93	17.1533
276.40	47.7295	400.66	28.5765	630.19	0.0000
583.19	47.7668	401.32	0.0000	631.29	20.6682
277.60	48.7119	401.81	40.8521	632.98	20.6829
402.40	48.7278	402.40	39.8450	633.25	17.2382
278.43	46.8699	404.85	39.9045	634.78	16.0992
279.20	0.0000	410.95	35.9442	635.95	18.4082
279.54	48.7876	720.70	39.1125	636.99	23.0208
280.46	46.9452	423.72	26.9040	657.50	20.9004
301.36	42.3587	427.09	22.8101	884.68	22.0638
284.31	39.5544	427.87	26.9696	661.66	25.5888
285.41	53.7274	433.94	27.0643	664.57	0.0000
285.90	0.0000	439.51	35.5052	666.33	20.9773
287.50	56.6479	440.45	36.5687	666.50	20.9788
290.67	53.0013	539.51	0.0000	667.71	0.0000
293.27	0.0000	453.88	31.5826	677.62	27.2224
295.22	41.7898	459.60	36.9639	685.70	16.7398
316.51	43.7146	463.37	27.5155	692.65	17.6703
298.58	64.7502	468.07	31.8304	695.00	23.8771
299.98	46.7081	473.00	30.8520	696.49	19.4675

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
696.51	19.4675	884.68	7.5815	1238.28	18.8954
697.00	19.4716	889.28	8.5421	1260.41	0.0000
697.49	23.9010	894.76	17.1156	1271.87	8.4688
702.65	16.8540	1836.06	13.3262	1274.44	9.5334
706.68	26.6547	903.28	16.7820	1274.54	9.5339
711.68	28.4873	907.67	0.0000	1291.59	5.3189
720.70	22.3351	911.20	15.2959	1298.22	0.0000
721.93	0.0000	984.45	0.0000	1312.11	6.4146
1690.97	16.0944	926.36	5.7640	1332.49	4.2974
722.91	16.0950	935.54	18.3059	1362.15	0.0000
723.31	18.7807	937.49	7.7126	1365.19	7.5789
756.73	17.8925	983.53	13.5253	1368.63	0.0000
727.33	14.3311	945.96	0.0000	1377.63	0.0000
733.00	11.6698	946.00	16.4335	1384.29	6.5251
735.93	24.2644	949.00	12.5787	1408.01	12.0279
739.50	16.1982	954.55	0.0000	1434.09	7.6994
1434.09	18.0310	962.31	15.5459	1435.80	4.4014
747.24	19.8569	964.08	14.5825	1457.56	0.0000
752.31	20.7988	966.17	23.3467	1460.82	5.5325
753.82	17.1915	968.97	12.6572	1489.16	8.9072
756.73	19.0223	983.53	9.7800	1553.35	0.0000
763.94	19.9818	984.45	0.0000	1596.21	5.4671
765.80	9.9980	996.26	3.9271	1620.50	5.4943
1001.03	11.8185	1001.03	7.8657	1678.03	0.0000
766.84	12.7294	1004.73	4.7246	1690.97	6.5010
772.60	0.0000	1025.87	0.0000	1757.55	0.0000
776.52	18.2501	1028.54	0.0000	1764.49	2.8258
777.92	16.4339	1037.84	7.9521	1770.23	1.5716
778.90	16.4394	1038.76	0.0000	1771.35	3.5369
783.70	13.7238	1046.59	10.9617	1791.20	0.0000
1435.80	14.6655	1048.07	4.9847	1808.65	1.8995
903.28	17.6203	1050.41	8.9786	1836.06	2.8638
795.86	11.0277	1063.66	14.0205		
801.95	8.5959	1077.00	9.0478		
802.10	9.8245	1077.34	9.0483		
810.29	12.9323	1083.85	8.0581		
810.45	12.9332	1085.87	15.1172		
810.76	14.7822	1099.25	8.0928		
815.77	20.3618	1107.22	0.0000		
818.51	16.6761	1111.64	11.3688		
822.65	0.0000	1112.07	11.3702		
832.01	22.3403	1112.84	12.9977		
834.85	22.3623	1115.54	9.1456		
835.15	22.3645	1120.29	9.1577		
836.80	0.0000	1120.55	4.0703		
846.77	18.7122	1121.30	5.4284		
856.80	11.2661	1808.65	6.5289		
860.56	23.5008	1131.51	0.0000		
871.09	10.5660	1332.49	7.2252		
873.19	18.3418	1177.95	10.3345		
875.33	0.0000	1189.05	5.1825		
879.38	20.8123	1204.77	6.2443		
880.51	16.0885	1221.41	10.4523		
881.60	14.2007	1231.02	11.5257		
883.24	9.4724	1235.36	10.4895		

VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 18:35:09.72

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488004.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM04.CNF;683
Background date    : 15-JAN-2023 11:30:48
Sample date       : 26-DEC-2022 08:04:00 Acquisition date : 19-JAN-2023 16:34:35
Sample ID        : G606488004 Sample quantity : 7.38830E-01 FILTER
Detector name     : GAM04 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:00.40 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : MXR1
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2367950 Detector SN# :
Matrix Spike ID   : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	92.98*	24	72	1.14	186.50	182	9	3.36E-03	79.7	
2	0	145.14*	5	55	0.49	290.79	286	6	6.40E-04	282.5	
3	0	163.92*	24	55	1.05	328.32	325	8	3.36E-03	61.2	
4	0	178.40	23	29	1.29	357.27	355	5	3.24E-03	42.0	
5	0	185.91*	13	83	1.01	372.28	366	11	1.75E-03	158.3	
6	3	291.94	24	30	1.60	584.27	580	16	3.39E-03	43.9	8.75E-01
7	3	294.42*	6	27	1.32	589.24	580	16	8.26E-04	194.6	
8	0	353.60*	16	60	1.39	707.56	700	15	2.23E-03	114.6	
9	2	376.36	15	31	1.55	753.08	742	31	2.09E-03	68.6	2.32E+00
10	2	379.59	21	25	1.56	759.54	742	31	2.86E-03	51.6	
11	0	389.68	10	26	0.56	779.72	774	9	1.39E-03	95.8	
12	0	409.95*	15	35	1.13	820.24	815	11	2.03E-03	87.2	
13	0	477.90	45	25	1.76	956.10	949	13	6.20E-03	27.9	
14	5	516.71	13	9	2.26	1033.71	1015	22	1.75E-03	50.4	1.04E+00
15	0	566.95	10	10	1.41	1134.18	1131	6	1.45E-03	57.1	
16	0	569.95*	14	5	1.04	1140.18	1137	8	1.89E-03	48.9	
17	0	758.84	7	5	0.62	1517.91	1515	7	1.01E-03	63.5	
18	0	770.16	11	12	3.73	1540.54	1532	12	1.57E-03	67.9	
19	0	777.86	20	3	2.93	1555.94	1548	14	2.77E-03	29.8	
20	0	860.03	14	5	2.82	1720.27	1715	11	1.92E-03	42.2	
21	0	886.58	11	11	0.65	1773.37	1765	15	1.49E-03	74.8	
22	0	994.23	8	7	1.78	1988.68	1982	10	1.14E-03	70.8	
23	0	1471.14	11	0	4.75	2942.64	2937	12	1.53E-03	30.2	
24	0	1529.59	6	1	1.34	3059.56	3054	8	7.74E-04	59.5	
25	0	1558.80	9	0	2.94	3118.00	3113	11	1.25E-03	33.3	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 19-JAN-2023 18:35:10

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488004.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MXR1		
Sample date	: 26-DEC-2022 08:04:00	Acquisition date	: 19-JAN-2023 16:34:35
Sample ID	: G606488004	Sample quantity	: 0.73883 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA4	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.40 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	45	10.44*	1.722E+00	1.261E+02	1.733E+02	55.70
CU-67	91.27	-----	7.00	2.780E+00	-----	Line Not Found	-----
	93.31	24	16.10	2.857E+00	2.675E+01	1.896E+04	159.43
	184.58	13	48.70*	3.203E+00	4.111E+00	2.914E+03	316.51
SR-82	776.52	20	15.08*	1.196E+00	5.608E+01	1.093E+02	59.63
CE-141	145.44	5	48.29*	3.527E+00	1.374E+00	2.312E+00	565.04
RA-226	186.21	13	3.59*	3.203E+00	5.576E+01	5.576E+01	316.51
U-235	143.76	5	10.96*	3.527E+00	6.055E+00	6.055E+00	565.04
	163.33	24	5.08	3.399E+00	7.120E+01	7.120E+01	122.46
	185.72	13	57.20	3.203E+00	3.500E+00	3.500E+00	316.51
	205.31	-----	5.01	3.027E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488004.CNF;1
Acquisition date : 19-JAN-2023 16:34:35 Sensitivity : 3.000
Detector ID : GAM04 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.40 Half life ratio : *****
Sample date : 26-DEC-2022 08:04:00 Analyst initials: MXR1
Sample ID : G606488004 Sample Quantity : 7.3883E-01 FILTER
Batch Number : 2367950 Wet Weight : 0.00000
Wet wt corr : 1.00000 Dry Weight : 0.00000
Nuclide Library : LIQUID.NLB;28

CALIBRATION INFORMATION

Eff. Cal. date : 14-DEC-2022 03:37:18 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM04_JAR.CNF;17

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.733E+02	9.458E+01	8.571E+01
CU-67	2.914E+03	9.040E+03	7.084E+03
SR-82	1.093E+02	6.386E+01	7.346E+01
CE-141	2.312E+00	1.280E+01	1.790E+01
RA-226	5.576E+01	1.730E+02	1.363E+02
U-235	6.055E+00	3.353E+01	4.387E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	-1.114E+00	3.542E+00	7.166E+00	NOT IDENT.
NA-24	0.000E+00	1.836E+12	0.000E+00	SHORT HLIF
AL-26	-3.648E+00	4.856E+00	7.795E+00	NOT IDENT.
K-40	3.482E+01	8.242E+01	1.723E+02	NOT IDENT.
SC-46	-3.188E+00	5.744E+00	8.275E+00	NOT IDENT.
V-48	-2.561E+00	9.522E+00	1.799E+01	NOT IDENT.
CR-51	-1.011E+01	5.921E+01	1.027E+02	NOT IDENT.
MN-52	-5.806E+01	8.988E+01	1.579E+02	NOT IDENT.
MN-54	-9.205E-01	4.216E+00	7.923E+00	NOT IDENT.
CO-56	1.762E+00	4.232E+00	9.257E+00	NOT IDENT.
CO-57	2.192E-01	3.122E+00	5.788E+00	NOT IDENT.
NI-57	0.000E+00	5.223E+05	0.000E+00	SHORT HLIF
CO-58	-3.335E-01	4.255E+00	8.381E+00	NOT IDENT.
FE-59	-4.787E+00	1.255E+01	2.395E+01	NOT IDENT.
CO-60	-2.864E+00	3.022E+00	4.248E+00	NOT IDENT.
ZN-65	-8.092E-01	9.207E+00	1.889E+01	NOT IDENT.
GE-68	6.308E+01	1.248E+02	2.923E+02	NOT IDENT.
AS-73	1.972E+01	2.635E+02	5.081E+02	NOT IDENT.
AS-74	-1.523E+01	1.688E+01	2.788E+01	NOT IDENT.
SE-75	-5.904E-01	6.318E+00	1.109E+01	NOT IDENT.
BR-77	0.000E+00	2.311E+04	0.000E+00	SHORT HLIF
RB-83	3.919E+00	1.028E+01	1.931E+01	NOT IDENT.
RB-84	1.792E-01	9.455E+00	1.698E+01	NOT IDENT.
KR-85	6.759E+02	1.031E+03	2.095E+03	NOT IDENT.

SR-85	3.912E+00	5.966E+00	1.213E+01	NOT IDENT.
RB-86	2.176E+01	9.836E+01	2.240E+02	NOT IDENT.
Y-88	-3.303E+00	5.400E+00	9.248E+00	NOT IDENT.
ZR-88	5.274E-01	4.194E+00	7.603E+00	NOT IDENT.
Y-91	-9.228E+02	2.528E+03	4.492E+03	NOT IDENT.
NB-94	3.132E+00	3.811E+00	8.398E+00	NOT IDENT.
NB-95	1.981E+00	4.787E+00	9.503E+00	NOT IDENT.
NB-95M	-1.715E+00	1.642E+01	2.890E+01	NOT IDENT.
TC-95M	-4.982E+00	6.128E+00	9.950E+00	NOT IDENT.
ZR-95	4.352E+00	8.843E+00	1.780E+01	NOT IDENT.
MO-99	7.222E+03	1.441E+04	3.071E+04	FAIL ABUN
TC-99M	0.000E+00	6.902E+29	0.000E+00	SHORT HLIF
RH-100	0.000E+00	1.709E+09	0.000E+00	SHORT HLIF
RH-101	-2.179E+00	3.750E+00	6.476E+00	NOT IDENT.
RH-102M	-1.158E+00	4.400E+00	7.288E+00	NOT IDENT.
RU-103	-2.411E+00	5.076E+00	9.296E+00	NOT IDENT.
RH-106	-2.308E+01	4.108E+01	7.220E+01	NOT IDENT.
RU-106	-2.308E+01	4.108E+01	7.220E+01	NOT IDENT.
AG-108M	-1.662E+00	3.934E+00	7.226E+00	NOT IDENT.
CD-109	4.771E+01	9.505E+01	1.855E+02	NOT IDENT.
AG-110	-5.286E+01	9.206E+01	1.608E+02	NOT IDENT.
AG-110M	3.751E+00	6.000E+00	1.311E+01	NOT IDENT.
IN-111	1.004E+03	1.479E+03	2.816E+03	NOT IDENT.
SN-113	5.261E-01	6.287E+00	1.124E+01	NOT IDENT.
IN-114M	-7.113E+00	2.727E+01	4.748E+01	NOT IDENT.
CD-115	0.000E+00	2.346E+04	0.000E+00	SHORT HLIF
SN-117M	-1.690E+00	1.008E+01	1.802E+01	NOT IDENT.
SB-122	2.441E+03	2.278E+03	5.030E+03	NOT IDENT.
I-123	0.000E+00	6.660E+13	0.000E+00	SHORT HLIF
TE-123M	-1.032E+00	3.543E+00	6.239E+00	NOT IDENT.
SB-124	1.137E+01	9.914E+00	2.962E+01	NOT IDENT.
SB-125	-8.174E+00	1.200E+01	2.130E+01	NOT IDENT.
TE-125M	3.208E+02	1.404E+03	2.636E+03	NOT IDENT.
I-126	-1.260E+00	4.975E+01	9.436E+01	FAIL ABUN
SB-126	2.452E+01	2.622E+01	5.976E+01	NOT IDENT.
SN-126	6.918E+00	9.184E+00	1.832E+01	NOT IDENT.
SB-127	1.004E+02	8.058E+02	1.608E+03	NOT IDENT.
TE-129	-2.002E+01	7.288E+01	1.369E+02	NOT IDENT.
I-131	-3.248E+00	3.043E+01	5.906E+01	NOT IDENT.
I-132	0.000E+00	1.960E+41	0.000E+00	SHORT HLIF
TE-132	-6.549E+02	7.237E+02	1.150E+03	NOT IDENT.
BA-133	8.273E-01	6.179E+00	1.100E+01	NOT IDENT.
I-133	0.000E+00	1.245E+09	0.000E+00	SHORT HLIF
CS-134	-9.450E-01	5.257E+00	9.759E+00	FAIL ABUN
I-135	0.000E+00	9.110E+27	0.000E+00	SHORT HLIF
CS-136	-4.266E+00	1.785E+01	3.327E+01	NOT IDENT.
BA-137M	3.889E-01	4.407E+00	8.626E+00	NOT IDENT.
CS-137	4.109E-01	4.655E+00	9.112E+00	NOT IDENT.
LA-138	9.439E-02	6.021E+00	1.321E+01	NOT IDENT.
CE-139	-6.778E-01	3.733E+00	6.135E+00	NOT IDENT.
BA-140	1.995E+01	5.290E+01	1.090E+02	FAIL ABUN
LA-140	-6.400E+00	2.104E+01	4.036E+01	NOT IDENT.
CE-143	0.000E+00	2.433E+06	0.000E+00	SHORT HLIF
CE-144	6.579E+00	2.465E+01	4.622E+01	NOT IDENT.
PM-144	2.781E+00	4.204E+00	8.960E+00	FAIL ABUN
PR-144	2.030E+02	3.150E+02	6.703E+02	NOT IDENT.
PM-146	-1.321E+00	4.970E+00	9.393E+00	NOT IDENT.
ND-147	2.002E+01	1.160E+02	2.340E+02	NOT IDENT.
PM-147	4.135E+04	8.694E+04	1.681E+05	NOT IDENT.
PM-149	0.000E+00	2.271E+05	0.000E+00	SHORT HLIF
EU-152	-1.105E+01	1.181E+01	2.062E+01	FAIL ABUN
GD-153	-3.096E+00	1.102E+01	1.991E+01	NOT IDENT.
EU-154	-3.141E+00	9.988E+00	2.021E+01	NOT IDENT.
EU-155	-5.946E+00	1.236E+01	2.184E+01	NOT IDENT.
TB-160	-1.643E+01	2.143E+01	2.938E+01	NOT IDENT.
HO-166M	-2.832E+00	7.214E+00	1.301E+01	FAIL ABUN
TM-171	2.180E+03	5.107E+03	1.026E+04	NOT IDENT.
LU-176	-2.918E+00	3.777E+00	5.941E+00	NOT IDENT.
LU-177	-1.055E+02	3.916E+02	6.772E+02	NOT IDENT.
HF-181	1.466E+00	6.399E+00	1.184E+01	NOT IDENT.
W-181	-4.144E+00	4.622E+01	8.809E+01	NOT IDENT.
TA-182	1.447E+01	1.730E+01	4.314E+01	NOT IDENT.
RE-183	-2.844E+01	4.510E+01	8.106E+01	NOT IDENT.
RE-184	3.869E+00	1.817E+01	3.667E+01	NOT IDENT.
RE-188	-4.689E+00	1.924E+01	3.429E+01	FAIL ABUN
W-188	1.637E+03	1.407E+03	1.957E+03	FAIL ABUN
OS-191	1.622E+01	2.857E+01	5.525E+01	NOT IDENT.
IR-192	1.416E+00	4.849E+00	8.995E+00	NOT IDENT.

PB-201	0.000E+00	3.681E+19	0.000E+00	SHORT HLIF
TL-201	-1.694E+03	7.292E+03	1.185E+04	NOT IDENT.
TL-202	3.364E+00	1.578E+01	2.968E+01	NOT IDENT.
HG-203	1.708E+00	5.563E+00	1.030E+01	NOT IDENT.
PB-203	0.000E+00	9.682E+03	0.000E+00	SHORT HLIF
TL-204	-3.595E+02	7.977E+02	1.324E+03	NOT IDENT.
BI-207	1.103E+00	5.616E+00	1.217E+01	FAIL ABUN
TL-208	-6.007E+00	5.755E+00	9.023E+00	FAIL ABUN
PB-210	-8.480E+02	1.689E+03	2.779E+03	NOT IDENT.
BI-211	-1.335E+01	3.023E+01	4.913E+01	NOT IDENT.
PB-211	1.234E+01	9.975E+01	1.781E+02	NOT IDENT.
BI-212	6.774E+01	7.152E+01	1.464E+02	NOT IDENT.
PB-212	-7.122E+00	9.777E+00	1.483E+01	NOT IDENT.
BI-213	-5.599E+00	1.419E+01	2.460E+01	NOT IDENT.
BI-214	4.204E+00	1.255E+01	2.341E+01	NOT IDENT.
PB-214	-3.331E-01	1.149E+01	1.976E+01	FAIL ABUN
RN-219	-1.778E+01	5.474E+01	1.019E+02	NOT IDENT.
FR-221	-1.986E+01	2.623E+01	4.267E+01	NOT IDENT.
RA-223	-6.061E+01	8.700E+01	1.378E+02	FAIL ABUN
RA-224	1.958E+01	9.521E+01	1.703E+02	NOT IDENT.
AC-225	-1.077E+02	1.423E+02	2.315E+02	NOT IDENT.
AC-227	-1.271E+01	3.611E+01	6.118E+01	NOT IDENT.
TH-227	-1.271E+01	3.611E+01	6.118E+01	NOT IDENT.
AC-228	-1.723E+01	1.999E+01	3.182E+01	NOT IDENT.
RA-228	-1.723E+01	1.999E+01	3.182E+01	NOT IDENT.
TH-228	-7.122E+00	9.777E+00	1.483E+01	NOT IDENT.
TH-229	1.230E+00	6.331E+01	1.142E+02	NOT IDENT.
TH-230	1.029E+03	1.690E+03	3.390E+03	NOT IDENT.
PA-231	1.964E+01	5.455E+01	1.032E+02	NOT IDENT.
TH-231	2.199E+01	5.235E+01	1.024E+02	NOT IDENT.
TH-232	-1.018E+03	3.509E+03	6.430E+03	NOT IDENT.
PA-233	-1.054E+00	8.342E+00	1.457E+01	NOT IDENT.
PA-234	2.157E+01	3.840E+01	8.159E+01	FAIL ABUN
PA-234M	6.711E+02	6.216E+02	1.395E+03	NOT IDENT.
TH-234	-1.835E+02	2.615E+02	4.608E+02	FAIL ABUN
U-234	4.274E+03	1.833E+04	3.598E+04	NOT IDENT.
NP-237	-1.054E+00	8.342E+00	1.457E+01	NOT IDENT.
NP-238	0.000E+00	3.998E+04	0.000E+00	SHORT HLIF
U-238	-1.835E+02	2.615E+02	4.608E+02	FAIL ABUN
NP-239	1.692E+01	3.269E+01	6.314E+01	NOT IDENT.
AM-241	9.127E+00	2.704E+01	5.431E+01	NOT IDENT.
AM-242	6.052E+01	7.647E+01	1.531E+02	NOT IDENT.
AM-243	1.572E-01	6.683E+00	1.270E+01	NOT IDENT.
CM-243	8.845E+00	1.127E+01	2.296E+01	NOT IDENT.
BK-247	3.665E-01	1.075E+01	1.918E+01	NOT IDENT.
CM-247	3.801E-01	5.127E+00	9.959E+00	NOT IDENT.
CF-249	9.451E-01	5.682E+00	1.020E+01	NOT IDENT.
CF-251	2.092E+01	1.722E+01	3.286E+01	FAIL ABUN
CF-252	5.961E+03	2.227E+04	4.237E+04	NOT IDENT.
ANH-511	-1.412E+01	7.901E+00	1.535E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	92.98	90	72	1.14	186.50	182	9	1.25E-02	20.1	
2	0	145.14	8	55	0.49	290.79	286	6	1.18E-03	141.6	
3	0	163.92	29	55	1.05	328.32	325	8	3.98E-03	48.9	
4	0	178.40	23	29	1.29	357.27	355	5	3.24E-03	42.0	
5	0	185.91	65	83	1.01	372.28	366	11	8.96E-03	30.0	
6	3	291.94	24	30	1.60	584.27	580	16	3.39E-03	43.9	8.75E-01
7	3	294.42	14	27	1.32	589.24	580	16	2.00E-03	72.3	
8	0	353.60	28	60	1.39	707.56	700	15	3.82E-03	64.3	
9	2	376.36	15	31	1.55	753.08	742	31	2.09E-03	68.6	2.32E+00
10	2	379.59	21	25	1.56	759.54	742	31	2.86E-03	51.6	
11	0	389.68	10	26	0.56	779.72	774	9	1.39E-03	95.8	
12	0	409.95	18	35	1.13	820.24	815	11	2.46E-03	69.5	
13	0	477.90	45	25	1.76	956.10	949	13	6.20E-03	27.9	
14	5	511.56	96	31	2.25	1023.40	1015	22	1.34E-02	17.0	1.04E+00
15	5	516.71	13	9	2.26	1033.71	1015	22	1.75E-03	50.4	
16	0	566.95	10	10	1.41	1134.18	1131	6	1.45E-03	57.1	
17	0	569.95	16	5	1.04	1140.18	1137	8	2.16E-03	37.0	
18	0	758.84	7	5	0.62	1517.91	1515	7	1.01E-03	63.5	
19	0	770.16	11	12	3.73	1540.54	1532	12	1.57E-03	67.9	
20	0	777.86	20	3	2.93	1555.94	1548	14	2.77E-03	29.8	
21	0	860.03	14	5	2.82	1720.27	1715	11	1.92E-03	42.2	
22	0	886.58	11	11	0.65	1773.37	1765	15	1.49E-03	74.8	
23	0	994.23	8	7	1.78	1988.68	1982	10	1.14E-03	70.8	
24	0	1471.14	11	0	4.75	2942.64	2937	12	1.53E-03	30.2	
25	0	1529.59	6	1	1.34	3059.56	3054	8	7.74E-04	59.5	
26	0	1558.80	9	0	2.94	3118.00	3113	11	1.25E-03	33.3	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	45	10.44*	1.722E+00	1.261E+02	1.733E+02	55.70
CU-67	91.27	-----	7.00	2.780E+00	-----	Line Not Found	-----
	93.31	24	16.10	2.857E+00	2.675E+01	1.896E+04	159.43
	184.58	13	48.70*	3.203E+00	4.111E+00	2.914E+03	316.51
SR-82	776.52	20	15.08*	1.196E+00	5.608E+01	1.093E+02	59.63
CE-141	145.44	5	48.29*	3.527E+00	1.374E+00	2.312E+00	565.04
RA-226	186.21	13	3.59*	3.203E+00	5.576E+01	5.576E+01	316.51
U-235	143.76	5	10.96*	3.527E+00	6.055E+00	6.055E+00	565.04
	163.33	24	5.08	3.399E+00	7.120E+01	7.120E+01	122.46
	185.72	13	57.20	3.203E+00	3.500E+00	3.500E+00	316.51
	205.31	-----	5.01	3.027E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

Total number of lines in spectrum 25
Number of unidentified lines 12
Number of lines tentatively identified by NID 13 52.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.37	1.261E+02	1.733E+02	0.965E+02	55.70	
CU-67	61.83H	709.	4.111E+00	2.914E+03	9.225E+03	316.51	
SR-82	25.35D	1.95	5.608E+01	1.093E+02	0.652E+02	59.63	
CE-141	32.51D	1.68	1.374E+00	2.312E+00	13.06E+00	565.04	
RA-226	1600.00Y	1.00	5.576E+01	5.576E+01	17.65E+01	316.51	
U-235	7.04E+08Y	1.00	6.055E+00	6.055E+00	34.21E+00	565.04	
Total Activity :			2.495E+02	3.261E+03			

Grand Total Activity : 2.495E+02 3.261E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	178.40	23	29	1.29	357.27	355	5	3.24E-03	84.0	3.27E+00	T
3	291.94	24	30	1.60	584.27	580	16	3.39E-03	87.8	2.40E+00	T
3	294.42	6	27	1.32	589.24	580	16	8.26E-04	****	2.39E+00	T
0	353.60	16	60	1.39	707.56	700	15	2.23E-03	****	2.11E+00	
2	376.36	15	31	1.55	753.08	742	31	2.09E-03	****	2.03E+00	
2	379.59	21	25	1.56	759.54	742	31	2.86E-03	****	2.01E+00	
0	389.68	10	26	0.56	779.72	774	9	1.39E-03	****	1.98E+00	T
0	409.95	15	35	1.13	820.24	815	11	2.03E-03	****	1.91E+00	T
5	516.71	13	9	2.26	1033.71	1015	22	1.75E-03	****	1.63E+00	
0	566.95	10	10	1.41	1134.18	1131	6	1.45E-03	****	1.53E+00	
0	569.95	14	5	1.04	1140.18	1137	8	1.89E-03	97.8	1.52E+00	T
0	758.84	7	5	0.62	1517.91	1515	7	1.01E-03	****	1.22E+00	
0	770.16	11	12	3.73	1540.54	1532	12	1.57E-03	****	1.21E+00	
0	860.03	14	5	2.82	1720.27	1715	11	1.92E-03	84.4	1.10E+00	T
0	886.58	11	11	0.65	1773.37	1765	15	1.49E-03	****	1.07E+00	
0	994.23	8	7	1.78	1988.68	1982	10	1.14E-03	****	9.69E-01	
0	1471.14	11	0	4.75	2942.64	2937	12	1.53E-03	60.3	6.91E-01	
0	1529.59	6	1	1.34	3059.56	3054	8	7.74E-04	****	6.71E-01	
0	1558.80	9	0	2.94	3118.00	3113	11	1.25E-03	66.7	6.62E-01	

Flags: "T" = Tentatively associated


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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488004.CNF;1  *
* Acquisition date   : 19-JAN-2023 16:34:35 Sensitivity      : 3.000          *
* Detector ID        : GAM04 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000      *
* Elapsed real time  : 0 02:00:00.40 Half life ratio  : *****        *
* Sample date        : 26-DEC-2022 08:04:00 Nuclide Library : LIQUID      *
* Sample ID          : G606488004 Analyst initials: MXR1          *
* Batch Number       : 2367950 Sample Quantity : 7.3883E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 14-DEC-2022 03:37:18 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM04_JAR.CNF;17          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	3.762E+01
CU-67	3.232E+03
SR-82	2.932E+01
CE-141	8.276E+00
RA-226	6.219E+01
U-235	2.017E+01

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	2.683E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.762E+00	NOT IDENT.
K-40	7.688E+01	NOT IDENT.
SC-46	3.351E+00	NOT IDENT.
V-48	6.969E+00	NOT IDENT.
CR-51	4.572E+01	NOT IDENT.
MN-52	5.886E+01	NOT IDENT.
MN-54	3.319E+00	NOT IDENT.
CO-56	3.861E+00	NOT IDENT.
CO-57	2.653E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.432E+00	NOT IDENT.
FE-59	9.967E+00	NOT IDENT.
CO-60	1.197E+00	NOT IDENT.
ZN-65	7.780E+00	NOT IDENT.
GE-68	1.210E+02	NOT IDENT.
AS-73	2.319E+02	NOT IDENT.
AS-74	1.190E+01	NOT IDENT.
SE-75	5.025E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
RB-83	8.511E+00	NOT IDENT.
RB-84	6.940E+00	NOT IDENT.
KR-85	9.497E+02	NOT IDENT.
SR-85	5.498E+00	NOT IDENT.

RB-86	9.017E+01	NOT IDENT.
Y-88	3.276E+00	NOT IDENT.
ZR-88	3.363E+00	NOT IDENT.
Y-91	1.814E+03	NOT IDENT.
NB-94	3.670E+00	NOT IDENT.
NB-95	4.013E+00	NOT IDENT.
NB-95M	1.315E+01	NOT IDENT.
TC-95M	4.505E+00	NOT IDENT.
ZR-95	7.558E+00	NOT IDENT.
MO-99	1.322E+04	FAIL ABUN
TC-99M	0.000E+00	SHORT HLIF
RH-100	0.000E+00	SHORT HLIF
RH-101	2.951E+00	NOT IDENT.
RH-102M	3.222E+00	NOT IDENT.
RU-103	3.956E+00	NOT IDENT.
RH-106	3.103E+01	NOT IDENT.
RU-106	3.103E+01	NOT IDENT.
AG-108M	3.202E+00	NOT IDENT.
CD-109	8.542E+01	NOT IDENT.
AG-110	6.848E+01	NOT IDENT.
AG-110M	5.616E+00	NOT IDENT.
IN-111	1.295E+03	NOT IDENT.
SN-113	4.999E+00	NOT IDENT.
IN-114M	2.178E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	8.215E+00	NOT IDENT.
SB-122	2.198E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.846E+00	NOT IDENT.
SB-124	1.177E+01	NOT IDENT.
SB-125	9.389E+00	NOT IDENT.
TE-125M	1.217E+03	NOT IDENT.
I-126	4.149E+01	FAIL ABUN
SB-126	2.594E+01	NOT IDENT.
SN-126	8.448E+00	NOT IDENT.
SB-127	6.902E+02	NOT IDENT.
TE-129	6.011E+01	NOT IDENT.
I-131	2.619E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	5.209E+02	NOT IDENT.
BA-133	4.975E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	4.180E+00	FAIL ABUN
I-135	0.000E+00	SHORT HLIF
CS-136	1.328E+01	NOT IDENT.
BA-137M	3.751E+00	NOT IDENT.
CS-137	3.963E+00	NOT IDENT.
LA-138	5.114E+00	NOT IDENT.
CE-139	2.781E+00	NOT IDENT.
BA-140	4.781E+01	FAIL ABUN
LA-140	1.602E+01	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	2.127E+01	NOT IDENT.
PM-144	3.928E+00	FAIL ABUN
PR-144	2.936E+02	NOT IDENT.
PM-146	4.100E+00	NOT IDENT.
ND-147	1.018E+02	NOT IDENT.
PM-147	7.713E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	9.108E+00	FAIL ABUN
GD-153	9.120E+00	NOT IDENT.
EU-154	7.565E+00	NOT IDENT.
EU-155	9.922E+00	NOT IDENT.
TB-160	1.202E+01	NOT IDENT.
HO-166M	5.518E+00	FAIL ABUN
TM-171	4.666E+03	NOT IDENT.
LU-176	2.656E+00	NOT IDENT.
LU-177	3.106E+02	NOT IDENT.
HF-181	5.178E+00	NOT IDENT.
W-181	3.986E+01	NOT IDENT.
TA-182	1.792E+01	NOT IDENT.
RE-183	3.639E+01	NOT IDENT.
RE-184	1.558E+01	NOT IDENT.
RE-188	1.553E+01	FAIL ABUN
W-188	8.886E+02	FAIL ABUN
OS-191	2.545E+01	NOT IDENT.
IR-192	4.040E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF

TL-201	5.396E+03	NOT IDENT.
TL-202	1.322E+01	NOT IDENT.
HG-203	4.665E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	6.035E+02	NOT IDENT.
BI-207	5.073E+00	FAIL ABUN
TL-208	3.959E+00	FAIL ABUN
PB-210	1.261E+03	NOT IDENT.
BI-211	2.206E+01	NOT IDENT.
PB-211	7.961E+01	NOT IDENT.
BI-212	6.487E+01	NOT IDENT.
PB-212	6.830E+00	NOT IDENT.
BI-213	1.085E+01	NOT IDENT.
BI-214	1.067E+01	NOT IDENT.
PB-214	8.974E+00	FAIL ABUN
RN-219	4.560E+01	NOT IDENT.
FR-221	1.927E+01	NOT IDENT.
RA-223	6.122E+01	FAIL ABUN
RA-224	7.888E+01	NOT IDENT.
AC-225	1.046E+02	NOT IDENT.
AC-227	2.784E+01	NOT IDENT.
TH-227	2.784E+01	NOT IDENT.
AC-228	1.334E+01	NOT IDENT.
RA-228	1.334E+01	NOT IDENT.
TH-228	6.830E+00	NOT IDENT.
TH-229	5.217E+01	NOT IDENT.
TH-230	1.554E+03	NOT IDENT.
PA-231	4.618E+01	NOT IDENT.
TH-231	4.689E+01	NOT IDENT.
TH-232	2.951E+03	NOT IDENT.
PA-233	6.509E+00	NOT IDENT.
PA-234	3.515E+01	FAIL ABUN
PA-234M	6.126E+02	NOT IDENT.
TH-234	2.112E+02	FAIL ABUN
U-234	1.640E+04	NOT IDENT.
NP-237	6.509E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	2.112E+02	FAIL ABUN
NP-239	2.909E+01	NOT IDENT.
AM-241	2.447E+01	NOT IDENT.
AM-242	7.044E+01	NOT IDENT.
AM-243	5.777E+00	NOT IDENT.
CM-243	1.046E+01	NOT IDENT.
BK-247	8.701E+00	NOT IDENT.
CM-247	4.489E+00	NOT IDENT.
CF-249	4.577E+00	NOT IDENT.
CF-251	1.522E+01	FAIL ABUN
CF-252	1.948E+04	NOT IDENT.
ANH-511	7.262E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488004.CNF;1
Acquisition date : 19-JAN-2023 16:34:35 Sensitivity : 3.000
Detector ID : GAM04 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.40 Half life ratio : *****
Sample date : 26-DEC-2022 08:04:00 Nuclide Library : LIQUID
Sample ID : G606488004 Analyst initials: MXR1
Batch Number : 2367950 Sample Quantity : 7.3883E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 14-DEC-2022 03:37:18 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM04_JAR.CNF;17

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.733E+02	9.589E+01	9.595E+01
CU-67	2.914E+03	9.044E+03	9.044E+03
SR-82	1.093E+02	6.465E+01	6.468E+01
CE-141	2.312E+00	1.280E+01	1.280E+01
RA-226	5.576E+01	1.730E+02	1.730E+02
U-235	6.055E+00	3.353E+01	3.353E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	-1.114E+00	3.544E+00	3.579E+00	NOT IDENT.
NA-24	4.928E+10	1.836E+12	1.836E+12	SHORT HLIF
AL-26	-3.648E+00	4.865E+00	5.136E+00	NOT IDENT.
K-40	3.482E+01	8.250E+01	8.399E+01	NOT IDENT.
SC-46	-3.188E+00	5.753E+00	5.931E+00	NOT IDENT.
V-48	-2.561E+00	9.526E+00	9.595E+00	NOT IDENT.
CR-51	-1.011E+01	5.921E+01	5.939E+01	NOT IDENT.
MN-52	-5.806E+01	9.008E+01	9.381E+01	NOT IDENT.
MN-54	-9.205E-01	4.217E+00	4.238E+00	NOT IDENT.
CO-56	1.762E+00	4.236E+00	4.310E+00	NOT IDENT.
CO-57	2.192E-01	3.122E+00	3.124E+00	NOT IDENT.
NI-57	2.126E+05	5.230E+05	5.317E+05	SHORT HLIF
CO-58	-3.335E-01	4.255E+00	4.258E+00	NOT IDENT.
FE-59	-4.787E+00	1.256E+01	1.274E+01	NOT IDENT.
CO-60	-2.864E+00	3.038E+00	3.301E+00	NOT IDENT.
ZN-65	-8.092E-01	9.207E+00	9.214E+00	NOT IDENT.
GE-68	6.308E+01	1.250E+02	1.282E+02	NOT IDENT.
AS-73	1.972E+01	2.636E+02	2.637E+02	NOT IDENT.
AS-74	-1.523E+01	1.696E+01	1.830E+01	NOT IDENT.
SE-75	-5.904E-01	6.318E+00	6.323E+00	NOT IDENT.
BR-77	-2.670E+04	2.325E+04	2.618E+04	SHORT HLIF
RB-83	3.919E+00	1.030E+01	1.045E+01	NOT IDENT.
RB-84	1.792E-01	9.455E+00	9.455E+00	NOT IDENT.
KR-85	6.759E+02	1.032E+03	1.077E+03	NOT IDENT.

SR-85	3.912E+00	5.976E+00	6.232E+00	NOT IDENT.
RB-86	2.176E+01	9.838E+01	9.887E+01	NOT IDENT.
Y-88	-3.303E+00	5.406E+00	5.607E+00	NOT IDENT.
ZR-88	5.274E-01	4.194E+00	4.201E+00	NOT IDENT.
Y-91	-9.228E+02	2.529E+03	2.563E+03	NOT IDENT.
NB-94	3.132E+00	3.821E+00	4.074E+00	NOT IDENT.
NB-95	1.981E+00	4.790E+00	4.873E+00	NOT IDENT.
NB-95M	-1.715E+00	1.642E+01	1.644E+01	NOT IDENT.
TC-95M	-4.982E+00	6.145E+00	6.544E+00	NOT IDENT.
ZR-95	4.352E+00	8.852E+00	9.067E+00	NOT IDENT.
MO-99	7.222E+03	1.443E+04	1.479E+04	FAIL ABUN
TC-99M	-1.971E+29	6.906E+29	0.000E+00	SHORT HLIF
RH-100	-4.171E+08	1.726E+09	1.736E+09	SHORT HLIF
RH-101	-2.179E+00	3.773E+00	3.899E+00	NOT IDENT.
RH-102M	-1.158E+00	4.402E+00	4.433E+00	NOT IDENT.
RU-103	-2.411E+00	5.081E+00	5.196E+00	NOT IDENT.
RH-106	-2.308E+01	4.114E+01	4.243E+01	NOT IDENT.
RU-106	-2.308E+01	4.114E+01	4.243E+01	NOT IDENT.
AG-108M	-1.662E+00	3.937E+00	4.008E+00	NOT IDENT.
CD-109	4.771E+01	9.519E+01	9.759E+01	NOT IDENT.
AG-110	-5.286E+01	9.216E+01	9.520E+01	NOT IDENT.
AG-110M	3.751E+00	6.014E+00	6.247E+00	NOT IDENT.
IN-111	1.004E+03	1.481E+03	1.549E+03	NOT IDENT.
SN-113	5.261E-01	6.287E+00	6.292E+00	NOT IDENT.
IN-114M	-7.113E+00	2.727E+01	2.746E+01	NOT IDENT.
CD-115	1.714E+04	2.352E+04	2.476E+04	SHORT HLIF
SN-117M	-1.690E+00	1.008E+01	1.011E+01	NOT IDENT.
SB-122	2.441E+03	2.288E+03	2.539E+03	NOT IDENT.
I-123	-1.963E+13	6.662E+13	6.721E+13	SHORT HLIF
TE-123M	-1.032E+00	3.544E+00	3.574E+00	NOT IDENT.
SB-124	1.137E+01	9.964E+00	1.121E+01	NOT IDENT.
SB-125	-8.174E+00	1.202E+01	1.257E+01	NOT IDENT.
TE-125M	3.208E+02	1.404E+03	1.412E+03	NOT IDENT.
I-126	-1.260E+00	4.975E+01	4.975E+01	FAIL ABUN
SB-126	2.452E+01	2.639E+01	2.862E+01	NOT IDENT.
SN-126	6.918E+00	9.207E+00	9.722E+00	NOT IDENT.
SB-127	1.004E+02	8.059E+02	8.072E+02	NOT IDENT.
TE-129	-2.002E+01	7.297E+01	7.352E+01	NOT IDENT.
I-131	-3.248E+00	3.043E+01	3.047E+01	NOT IDENT.
I-132	-1.000E+41	6.459E+41	0.000E+00	SHORT HLIF
TE-132	-6.549E+02	7.277E+02	7.854E+02	NOT IDENT.
BA-133	8.273E-01	6.180E+00	6.191E+00	NOT IDENT.
I-133	-6.465E+08	1.250E+09	1.284E+09	SHORT HLIF
CS-134	-9.450E-01	5.258E+00	5.275E+00	FAIL ABUN
I-135	-4.133E+27	9.402E+27	0.000E+00	SHORT HLIF
CS-136	-4.266E+00	1.785E+01	1.796E+01	NOT IDENT.
BA-137M	3.889E-01	4.407E+00	4.410E+00	NOT IDENT.
CS-137	4.109E-01	4.656E+00	4.659E+00	NOT IDENT.
LA-138	9.439E-02	6.021E+00	6.021E+00	NOT IDENT.
CE-139	-6.778E-01	3.735E+00	3.748E+00	NOT IDENT.
BA-140	1.995E+01	5.293E+01	5.369E+01	FAIL ABUN
LA-140	-6.400E+00	2.105E+01	2.125E+01	NOT IDENT.
CE-143	6.380E+05	2.434E+06	2.451E+06	SHORT HLIF
CE-144	6.579E+00	2.466E+01	2.483E+01	NOT IDENT.
PM-144	2.781E+00	4.211E+00	4.394E+00	FAIL ABUN
PR-144	2.030E+02	3.155E+02	3.285E+02	NOT IDENT.
PM-146	-1.321E+00	4.972E+00	5.007E+00	NOT IDENT.
ND-147	2.002E+01	1.160E+02	1.164E+02	NOT IDENT.
PM-147	4.135E+04	8.700E+04	8.898E+04	NOT IDENT.
PM-149	-3.686E+04	2.272E+05	2.278E+05	SHORT HLIF
EU-152	-1.105E+01	1.186E+01	1.287E+01	FAIL ABUN
GD-153	-3.096E+00	1.102E+01	1.111E+01	NOT IDENT.
EU-154	-3.141E+00	9.993E+00	1.009E+01	NOT IDENT.
EU-155	-5.946E+00	1.237E+01	1.265E+01	NOT IDENT.
TB-160	-1.643E+01	2.150E+01	2.275E+01	NOT IDENT.
HO-166M	-2.832E+00	7.219E+00	7.331E+00	FAIL ABUN
TM-171	2.180E+03	5.115E+03	5.209E+03	NOT IDENT.
LU-176	-2.918E+00	3.786E+00	4.009E+00	NOT IDENT.
LU-177	-1.055E+02	3.917E+02	3.946E+02	NOT IDENT.
HF-181	1.466E+00	6.400E+00	6.434E+00	NOT IDENT.
W-181	-4.144E+00	4.623E+01	4.627E+01	NOT IDENT.
TA-182	1.447E+01	1.735E+01	1.854E+01	NOT IDENT.
RE-183	-2.844E+01	4.526E+01	4.705E+01	NOT IDENT.
RE-184	3.869E+00	1.817E+01	1.826E+01	NOT IDENT.
RE-188	-4.689E+00	1.925E+01	1.936E+01	FAIL ABUN
W-188	1.637E+03	1.425E+03	1.605E+03	FAIL ABUN
OS-191	1.622E+01	2.860E+01	2.952E+01	NOT IDENT.
IR-192	1.416E+00	4.851E+00	4.893E+00	NOT IDENT.

PB-201	-1.588E+19	3.717E+19	0.000E+00	SHORT HLIF
TL-201	-1.694E+03	7.293E+03	7.333E+03	NOT IDENT.
TL-202	3.364E+00	1.578E+01	1.586E+01	NOT IDENT.
HG-203	1.708E+00	5.565E+00	5.618E+00	NOT IDENT.
PB-203	2.972E+03	9.686E+03	9.778E+03	SHORT HLIF
TL-204	-3.595E+02	7.987E+02	8.150E+02	NOT IDENT.
BI-207	1.103E+00	5.617E+00	5.639E+00	FAIL ABUN
TL-208	-6.007E+00	5.779E+00	6.383E+00	FAIL ABUN
PB-210	-8.480E+02	1.691E+03	1.734E+03	NOT IDENT.
BI-211	-1.335E+01	3.026E+01	3.085E+01	NOT IDENT.
PB-211	1.234E+01	9.976E+01	9.992E+01	NOT IDENT.
BI-212	6.774E+01	7.178E+01	7.802E+01	NOT IDENT.
PB-212	-7.122E+00	9.799E+00	1.031E+01	NOT IDENT.
BI-213	-5.599E+00	1.420E+01	1.442E+01	NOT IDENT.
BI-214	4.204E+00	1.255E+01	1.269E+01	NOT IDENT.
PB-214	-3.331E-01	1.149E+01	1.149E+01	FAIL ABUN
RN-219	-1.778E+01	5.481E+01	5.539E+01	NOT IDENT.
FR-221	-1.986E+01	2.630E+01	2.779E+01	NOT IDENT.
RA-223	-6.061E+01	8.722E+01	9.141E+01	FAIL ABUN
RA-224	1.958E+01	9.523E+01	9.563E+01	NOT IDENT.
AC-225	-1.077E+02	1.427E+02	1.508E+02	NOT IDENT.
AC-227	-1.271E+01	3.616E+01	3.661E+01	NOT IDENT.
TH-227	-1.271E+01	3.616E+01	3.661E+01	NOT IDENT.
AC-228	-1.723E+01	2.008E+01	2.153E+01	NOT IDENT.
RA-228	-1.723E+01	2.008E+01	2.153E+01	NOT IDENT.
TH-228	-7.122E+00	9.799E+00	1.031E+01	NOT IDENT.
TH-229	1.230E+00	6.331E+01	6.332E+01	NOT IDENT.
TH-230	1.029E+03	1.701E+03	1.763E+03	NOT IDENT.
PA-231	1.964E+01	5.473E+01	5.544E+01	NOT IDENT.
TH-231	2.199E+01	5.245E+01	5.338E+01	NOT IDENT.
TH-232	-1.018E+03	3.512E+03	3.542E+03	NOT IDENT.
PA-233	-1.054E+00	8.342E+00	8.356E+00	NOT IDENT.
PA-234	2.157E+01	4.570E+01	4.672E+01	FAIL ABUN
PA-234M	6.711E+02	6.252E+02	6.946E+02	NOT IDENT.
TH-234	-1.835E+02	2.650E+02	2.777E+02	FAIL ABUN
U-234	4.274E+03	1.834E+04	1.844E+04	NOT IDENT.
NP-237	-1.054E+00	8.342E+00	8.356E+00	NOT IDENT.
NP-238	-4.276E+03	3.998E+04	4.003E+04	SHORT HLIF
U-238	-1.835E+02	2.650E+02	2.777E+02	FAIL ABUN
NP-239	1.692E+01	3.272E+01	3.360E+01	NOT IDENT.
AM-241	9.127E+00	2.705E+01	2.737E+01	NOT IDENT.
AM-242	6.052E+01	7.727E+01	8.195E+01	NOT IDENT.
AM-243	1.572E-01	6.683E+00	6.683E+00	NOT IDENT.
CM-243	8.845E+00	1.132E+01	1.200E+01	NOT IDENT.
BK-247	3.665E-01	1.075E+01	1.075E+01	NOT IDENT.
CM-247	3.801E-01	5.128E+00	5.131E+00	NOT IDENT.
CF-249	9.451E-01	5.683E+00	5.699E+00	NOT IDENT.
CF-251	2.092E+01	1.744E+01	1.983E+01	FAIL ABUN
CF-252	5.961E+03	2.292E+04	2.307E+04	NOT IDENT.
ANH-511	-1.412E+01	8.002E+00	1.023E+01	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	32.8448	133.52	36.2350	116.30	35.9603
879.38	35.5484	364.49	36.2405	116.74	36.9601
46.54	32.3388	80.22	36.2436	117.23	41.8583
228.16	28.4735	711.68	34.4575	119.76	38.1279
52.39	28.6139	356.01	37.2132	120.54	39.1568
53.20	32.1553	323.87	41.7580	120.90	39.1803
53.44	35.5650	82.35	0.0000	264.66	33.3154
57.53	28.1718	82.47	37.3333	121.22	33.3212
293.27	0.0000	82.47	37.3336	344.28	35.3142
57.53	31.6969	83.79	29.2217	122.06	39.2563
482.18	31.6971	265.00	32.8892	1274.44	43.2541
57.98	35.1674	84.21	32.9041	123.68	49.2020
59.32	27.5486	84.86	0.0000	1377.63	0.0000
59.54	23.2579	193.51	45.8195	127.23	45.5280
155.04	32.9050	105.31	36.7426	129.43	35.7567
63.00	28.6891	86.79	33.0848	131.20	48.8056
129.43	27.8408	86.94	32.1762	133.02	30.9655
63.29	27.8408	87.09	28.5079	133.52	39.9866
290.67	26.1203	87.57	34.0597	135.34	33.0821
63.81	21.7800	88.03	36.8567	136.00	45.1579
87.57	30.5289	306.78	39.6465	136.28	48.1890
64.99	44.5662	88.47	47.0351	136.47	48.2036
65.08	44.5764	531.02	44.5093	739.50	51.1947
66.73	35.9860	184.58	44.5236	140.51	0.0000
66.98	31.6173	92.59	46.5027	140.88	57.9632
67.24	30.7590	93.31	46.5702	143.76	43.6591
67.67	30.7919	94.56	41.0838	144.24	43.6902
1221.41	30.7980	311.90	41.0912	145.44	50.2133
439.51	39.7094	946.00	41.0929	152.32	37.0080
70.82	39.7094	97.43	45.0718	152.43	37.0135
167.43	39.7097	98.43	48.9226	1048.07	32.9395
97.43	36.2491	98.44	48.9234	154.21	43.2914
70.82	39.0096	99.53	31.1127	155.04	35.0864
70.82	39.0099	103.37	31.1127	158.56	28.9344
279.20	0.0000	116.74	31.1127	158.97	0.0000
1063.66	36.5234	100.11	38.6981	159.00	41.5057
72.87	0.0000	100.20	38.7046	162.33	38.9153
351.06	38.3107	102.03	39.7864	537.26	43.1037
74.66	33.9986	103.18	23.7333	163.33	32.3571
238.63	34.0110	103.37	23.7419	165.86	34.9111
351.93	34.0110	105.31	40.9831	167.43	39.1825
238.63	34.0110	106.12	48.6802	245.35	34.8102
74.97	32.2322	106.47	40.1152	427.87	36.8064
77.11	32.3915	109.28	44.1600	176.60	35.4039
256.23	34.3902	111.00	34.6663	177.52	38.2808
79.82	34.4007	111.76	43.3912	181.07	21.3626
80.02	36.2271	208.37	37.6845	184.41	36.4679
80.03	36.2274	116.24	35.9567	184.58	36.4757

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	36.5266	300.09	22.9406	475.06	23.2645
186.21	36.5489	300.13	22.9417	696.49	17.3521
190.27	46.4525	301.36	19.3394	477.60	17.3606
193.51	36.8731	302.85	27.8361	477.99	17.3649
197.03	40.2943	304.50	26.6635	482.18	13.7436
198.01	37.0703	304.85	19.3975	487.02	21.1339
201.83	33.9502	306.78	36.4297	492.35	0.0000
204.12	45.0202	308.46	27.9688	497.08	15.7134
205.31	34.0860	311.90	25.6111	511.00	22.3623
208.37	46.3425	316.51	22.0364	514.00	22.4004
210.85	37.6202	319.41	28.2250	520.40	14.0509
215.65	25.5851	320.08	24.5569	520.69	0.0000
218.12	42.3859	321.04	22.1188	667.71	0.0000
222.11	41.4494	323.87	32.0231	527.90	0.0000
227.09	36.0396	325.23	24.6600	529.59	21.6552
227.38	27.0381	1596.21	33.3858	529.87	0.0000
228.16	47.3557	331.15	0.0000	531.02	13.1922
228.18	47.3564	333.37	18.6163	537.26	13.2372
235.69	36.3652	334.37	26.0834	539.51	0.0000
235.96	30.6918	338.28	21.1805	1260.41	0.0000
238.63	50.1539	911.20	27.4107	552.55	15.2546
238.98	0.0000	340.48	37.4423	795.86	14.3823
240.99	49.1315	340.55	37.4442	564.24	5.7561
242.00	41.1757	344.28	31.7115	569.33	5.7715
244.70	33.2596	345.93	15.0403	569.50	5.7720
245.35	32.1336	351.06	21.8105	569.70	14.4312
459.60	24.2268	351.93	21.8254	582.08	13.5559
685.70	33.5149	356.01	27.7874	583.19	21.3143
388.16	30.0597	361.25	0.0000	595.83	21.4521
256.23	40.6001	364.49	22.0322	600.60	23.4580
527.90	0.0000	366.42	19.5181	604.72	22.5274
264.66	32.7433	383.85	19.3369	609.32	16.6887
265.00	31.5846	388.16	23.2751	610.33	19.6436
269.46	23.4943	666.33	23.2831	614.28	15.7454
401.81	38.8290	391.70	20.7407	618.01	20.7035
273.65	25.9444	392.87	18.1631	621.93	18.7681
276.40	29.5570	400.66	25.2186	630.19	0.0000
583.19	27.2163	401.32	0.0000	631.29	8.9304
277.60	27.2220	401.81	28.7199	632.98	10.9239
402.40	29.5998	402.40	26.9900	633.25	12.9117
278.43	26.0585	404.85	22.2388	634.78	10.9333
279.20	0.0000	410.95	19.2661	635.95	12.9286
279.54	33.1987	720.70	18.4370	636.99	20.8949
280.46	28.4795	423.72	22.9642	657.50	17.0795
301.36	32.1334	427.09	23.0150	884.68	17.0816
284.31	25.0061	427.87	27.4555	661.66	14.0929
285.41	26.2230	433.94	25.7856	664.57	0.0000
285.90	0.0000	439.51	16.9551	666.33	18.1582
287.50	27.0682	440.45	21.4297	666.50	18.1597
290.67	28.7410	539.51	0.0000	667.71	0.0000
293.27	0.0000	453.88	18.9112	677.62	16.2240
295.22	21.6420	459.60	20.7862	685.70	11.1952
316.51	21.6557	463.37	9.9643	692.65	17.3555
298.58	20.9012	468.07	11.8101	695.00	17.3735
299.98	22.9382	473.00	13.6679	696.49	10.2266

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
696.51	10.2266	884.68	6.6189	1238.28	8.3287
697.00	16.3665	889.28	11.6027	1260.41	0.0000
697.49	20.4622	894.76	7.7505	1271.87	6.5377
702.65	8.2038	1836.06	11.0852	1274.44	4.6732
706.68	14.3817	903.28	8.8851	1274.54	4.6732
711.68	14.4136	907.67	0.0000	1291.59	4.6945
720.70	6.2014	911.20	10.0239	1298.22	0.0000
721.93	0.0000	984.45	0.0000	1312.11	6.6082
1690.97	12.4141	926.36	4.4792	1332.49	4.7455
722.91	12.4146	935.54	13.4810	1362.15	0.0000
723.31	12.4170	937.49	8.9932	1365.19	3.8284
756.73	19.6680	983.53	12.3942	1368.63	0.0000
727.33	8.2923	945.96	0.0000	1377.63	0.0000
733.00	11.4297	946.00	7.8924	1384.29	4.8087
735.93	11.4440	949.00	7.9006	1408.01	7.7397
739.50	8.3356	954.55	0.0000	1434.09	6.8159
1434.09	7.3082	962.31	4.5353	1435.80	3.8965
747.24	7.3173	964.08	9.0762	1457.56	0.0000
752.31	4.1903	966.17	6.8120	1460.82	7.8403
753.82	9.4340	968.97	10.2275	1489.16	6.9064
756.73	6.2969	983.53	5.7100	1553.35	0.0000
763.94	7.8949	984.45	0.0000	1596.21	7.0786
765.80	6.3206	996.26	15.4825	1620.50	4.0667
1001.03	6.3223	1001.03	6.8921	1678.03	0.0000
766.84	7.9041	1004.73	10.3506	1690.97	0.0000
772.60	0.0000	1025.87	0.0000	1757.55	0.0000
776.52	5.2903	1028.54	0.0000	1764.49	4.1926
777.92	5.2934	1037.84	5.8126	1770.23	4.1978
778.90	5.2954	1038.76	0.0000	1771.35	3.1489
783.70	8.9137	1046.59	10.4919	1791.20	0.0000
1435.80	17.0130	1048.07	6.9980	1808.65	6.3457
903.28	9.5826	1050.41	8.7537	1836.06	5.3168
795.86	13.8628	1063.66	7.0322		
801.95	17.1029	1077.00	4.4138		
802.10	18.1732	1077.34	4.4141		
810.29	9.6522	1083.85	6.1921		
810.45	9.6530	1085.87	7.0811		
810.76	7.5087	1099.25	11.5543		
815.77	8.5983	1107.22	0.0000		
818.51	9.6833	1111.64	7.1372		
822.65	0.0000	1112.07	8.9227		
832.01	8.6527	1112.84	8.0321		
834.85	7.5793	1115.54	8.0387		
835.15	8.6631	1120.29	8.0502		
836.80	0.0000	1120.55	8.9453		
846.77	5.4384	1121.30	13.4216		
856.80	4.9131	1808.65	3.5879		
860.56	6.5601	1131.51	0.0000		
871.09	8.7813	1332.49	7.2686		
873.19	7.6896	1177.95	6.3685		
875.33	0.0000	1189.05	8.2145		
879.38	14.5331	1204.77	6.4177		
880.51	11.5656	1221.41	2.7632		
881.60	6.6116	1231.02	5.5415		
883.24	6.6155	1235.36	9.2468		

VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 18:36:27.01

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                    *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488005.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM16.CNF;805
Background date    : 15-JAN-2023 11:19:09
Sample date       : 26-DEC-2022 09:00:00 Acquisition date : 19-JAN-2023 16:35:57
Sample ID        : G606488005 Sample quantity : 7.26630E-01 FILTER
Detector name     : GAM16 Detector geometry: JAR
Elapsed live time : 0 02:00:00.00 Elapsed real time: 0 02:00:00.43 0.0%
Energy tolerance  : 1.50000 keV Analyst Initials : MXR1
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2367950 Detector SN# :
Matrix Spike ID   : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	109.96	28	156	4.66	219.57	215	14	3.93E-03	95.1	
2	0	144.66*	7	70	0.75	288.91	284	7	9.14E-04	238.0	
3	0	193.72	21	111	1.46	386.97	382	10	2.98E-03	94.2	
4	0	239.02*	21	117	1.43	477.51	471	14	2.86E-03	118.9	
5	0	288.80	15	29	0.62	577.01	574	6	2.05E-03	63.1	
6	0	499.86	28	40	5.67	998.89	989	16	3.85E-03	54.4	
7	0	583.32*	1	18	1.53	1165.72	1162	7	1.04E-04	*****	
8	0	668.30	42	41	5.40	1335.60	1322	29	5.79E-03	47.9	
9	0	768.53	14	21	3.85	1535.99	1530	12	1.91E-03	72.1	
10	0	835.80	7	8	1.22	1670.46	1666	7	9.86E-04	77.5	
11	0	844.08	6	14	2.46	1687.03	1678	11	8.75E-04	120.7	
12	0	866.56	9	12	0.69	1731.97	1725	9	1.27E-03	78.4	
13	0	889.95	8	1	1.23	1778.73	1776	6	1.08E-03	43.1	
14	0	894.11	16	3	0.64	1787.06	1782	11	2.23E-03	32.1	
15	1	969.61*	10	14	1.96	1938.00	1931	17	1.39E-03	89.3	4.59E+00
16	1	972.11	20	4	1.96	1943.00	1931	17	2.73E-03	36.4	
17	0	976.33	5	5	1.39	1951.44	1947	7	6.46E-04	94.2	
18	0	1012.42	11	10	0.61	2023.61	2017	10	1.59E-03	59.1	
19	0	1088.39	16	7	4.16	2175.50	2167	15	2.25E-03	44.2	
20	0	1131.12	19	3	3.44	2260.95	2254	12	2.62E-03	29.5	
21	0	1289.20	10	3	0.78	2577.05	2569	13	1.35E-03	49.9	
22	0	1462.20*	6	9	2.36	2923.00	2916	12	8.93E-04	123.3	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 19-JAN-2023 18:36:28

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488005.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MXR1		
Sample date	: 26-DEC-2022 09:00:00	Acquisition date	: 19-JAN-2023 16:35:57
Sample ID	: G606488005	Sample quantity	: 0.72663 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA16	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.43 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	6	10.66*	9.301E-01	3.350E+01	3.350E+01	246.59
MN-54	834.85	7	99.98*	1.495E+00	2.454E+00	2.590E+00	155.09
TE-125M	109.28	28	0.27*	4.761E+00	1.136E+03	1.524E+03	190.29
CE-141	145.44	7	48.29*	4.797E+00	1.467E+00	2.466E+00	476.01
TL-208	277.37	-----	6.60	3.396E+00	-----	Line Not Found	-----
	583.19	1	85.00*	2.001E+00	2.280E-01	2.336E-01	2422.85
	860.56	-----	12.50	1.458E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                    *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                     *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488005.CNF;1 *
* Acquisition date   : 19-JAN-2023 16:35:57 Sensitivity      : 3.000          *
* Detector ID        : GAM16 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 02:00:00.43 Half life ratio : *****          *
* Sample date        : 26-DEC-2022 09:00:00 Analyst initials: MXR1          *
* Sample ID          : G606488005 Sample Quantity : 7.2663E-01 FILTER *
* Batch Number       : 2367950 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;28                                         *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                     *
* Eff. Cal. date     : 7-MAR-2022 08:22:40 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM16_JAR.CNF;15          *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
K-40	3.350E+01	8.095E+01	8.377E+01
MN-54	2.590E+00	3.936E+00	6.396E+00
TE-125M	1.524E+03	2.842E+03	1.946E+03
CE-141	2.466E+00	1.150E+01	1.355E+01
TL-208	2.336E-01	5.545E+00	7.404E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L.	Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	-8.840E+00		4.282E+01	7.760E+01	NOT IDENT.
NA-22	-2.256E+00		3.366E+00	5.573E+00	NOT IDENT.
NA-24	0.000E+00		2.071E+12	0.000E+00	SHORT HLIF
AL-26	-1.545E+00		3.878E+00	7.351E+00	FAIL ABUN
SC-46	3.470E+00		2.933E+00	8.017E+00	FAIL ABUN
V-48	-7.002E+00		1.250E+01	2.200E+01	NOT IDENT.
CR-51	-2.324E+01		5.363E+01	9.711E+01	NOT IDENT.
MN-52	-8.678E+01		1.045E+02	1.486E+02	NOT IDENT.
CO-56	5.433E+00		4.456E+00	9.866E+00	NOT IDENT.
CO-57	-1.400E+00		2.884E+00	4.989E+00	NOT IDENT.
NI-57	0.000E+00		4.524E+05	0.000E+00	SHORT HLIF
CO-58	-1.859E+00		4.104E+00	7.584E+00	NOT IDENT.
FE-59	5.126E+00		8.591E+00	1.946E+01	NOT IDENT.
CO-60	3.424E+00		5.365E+00	1.127E+01	NOT IDENT.
ZN-65	1.833E-01		8.491E+00	1.674E+01	NOT IDENT.
CU-67	-1.161E+04		4.764E+03	7.221E+03	NOT IDENT.
GE-68	4.486E+01		1.300E+02	2.710E+02	NOT IDENT.
AS-73	-1.633E+00		9.678E+01	1.867E+02	NOT IDENT.
AS-74	-6.213E+00		1.547E+01	2.685E+01	NOT IDENT.
SE-75	3.714E-01		5.786E+00	1.001E+01	NOT IDENT.
BR-77	0.000E+00		3.491E+04	0.000E+00	SHORT HLIF
SR-82	-2.934E+01		3.712E+01	6.444E+01	NOT IDENT.
RB-83	-1.340E+00		8.574E+00	1.564E+01	NOT IDENT.
RB-84	9.311E+00		9.554E+00	2.109E+01	NOT IDENT.
KR-85	-3.576E+03		1.333E+03	1.809E+03	NOT IDENT.

SR-85	-2.069E+01	7.713E+00	1.047E+01	NOT IDENT.
RB-86	4.723E+01	1.143E+02	2.402E+02	NOT IDENT.
Y-88	7.252E-01	4.941E+00	1.068E+01	NOT IDENT.
ZR-88	-2.648E-01	3.735E+00	6.960E+00	NOT IDENT.
Y-91	-2.389E+03	1.945E+03	2.614E+03	NOT IDENT.
NB-94	-1.545E+00	3.821E+00	6.530E+00	NOT IDENT.
NB-95	9.963E-01	5.519E+00	1.019E+01	NOT IDENT.
NB-95M	2.291E+00	1.401E+01	2.307E+01	NOT IDENT.
TC-95M	2.774E+00	6.300E+00	1.071E+01	FAIL ABUN
ZR-95	-8.692E-01	8.296E+00	1.613E+01	NOT IDENT.
MO-99	-1.724E+03	1.362E+04	2.634E+04	NOT IDENT.
TC-99M	0.000E+00	4.171E+29	0.000E+00	SHORT HLIF
RH-100	0.000E+00	1.221E+09	0.000E+00	SHORT HLIF
RH-101	-1.533E+00	3.148E+00	5.445E+00	NOT IDENT.
RH-102M	-9.719E-01	3.352E+00	6.026E+00	NOT IDENT.
RU-103	1.207E+00	5.509E+00	1.051E+01	NOT IDENT.
RH-106	1.798E+01	3.169E+01	6.489E+01	NOT IDENT.
RU-106	1.798E+01	3.169E+01	6.489E+01	NOT IDENT.
AG-108M	8.775E-01	3.639E+00	6.935E+00	NOT IDENT.
CD-109	2.924E+01	7.209E+01	1.376E+02	NOT IDENT.
AG-110	-1.158E+01	7.473E+01	1.360E+02	NOT IDENT.
AG-110M	-2.450E+00	6.072E+00	1.067E+01	NOT IDENT.
IN-111	-1.677E+02	1.147E+03	1.961E+03	NOT IDENT.
SN-113	-9.534E-01	5.121E+00	9.446E+00	NOT IDENT.
IN-114M	3.617E+00	2.225E+01	3.708E+01	NOT IDENT.
CD-115	0.000E+00	2.144E+04	0.000E+00	SHORT HLIF
SN-117M	-2.096E+00	9.411E+00	1.638E+01	NOT IDENT.
SB-122	1.016E+01	2.249E+03	4.190E+03	NOT IDENT.
I-123	0.000E+00	5.702E+13	0.000E+00	SHORT HLIF
TE-123M	-1.587E+00	3.180E+00	5.390E+00	NOT IDENT.
SB-124	3.297E+00	1.039E+01	2.380E+01	NOT IDENT.
SB-125	-6.388E-03	1.076E+01	2.007E+01	NOT IDENT.
I-126	-8.217E+00	4.157E+01	7.390E+01	NOT IDENT.
SB-126	-8.420E+00	2.547E+01	4.794E+01	NOT IDENT.
SN-126	1.600E+00	6.987E+00	1.316E+01	NOT IDENT.
SB-127	4.542E+02	7.592E+02	1.532E+03	NOT IDENT.
TE-129	-5.256E+01	6.593E+01	1.030E+02	NOT IDENT.
I-131	7.148E-01	2.891E+01	5.462E+01	NOT IDENT.
I-132	0.000E+00	9.384E+40	0.000E+00	SHORT HLIF
TE-132	1.410E+02	5.949E+02	1.060E+03	NOT IDENT.
BA-133	0.000E+00	4.147E+00	7.903E+00	NOT IDENT.
I-133	0.000E+00	1.067E+09	0.000E+00	SHORT HLIF
CS-134	3.101E+00	4.407E+00	9.436E+00	NOT IDENT.
I-135	0.000E+00	6.705E+27	0.000E+00	SHORT HLIF
CS-136	1.169E+00	1.856E+01	3.659E+01	NOT IDENT.
BA-137M	8.145E-01	4.722E+00	7.932E+00	NOT IDENT.
CS-137	8.605E-01	4.989E+00	8.380E+00	NOT IDENT.
LA-138	1.687E-02	5.738E+00	1.212E+01	NOT IDENT.
CE-139	-2.344E+00	3.405E+00	5.321E+00	NOT IDENT.
BA-140	8.934E+00	4.705E+01	9.039E+01	NOT IDENT.
LA-140	-1.976E+01	1.581E+01	2.164E+01	NOT IDENT.
CE-143	0.000E+00	1.323E+06	0.000E+00	SHORT HLIF
CE-144	-1.927E+01	1.955E+01	3.194E+01	NOT IDENT.
PM-144	-5.282E-01	4.462E+00	7.925E+00	NOT IDENT.
PR-144	-1.502E+02	3.518E+02	5.951E+02	NOT IDENT.
PM-146	-2.286E+00	4.441E+00	7.796E+00	NOT IDENT.
ND-147	6.489E+01	1.084E+02	2.191E+02	NOT IDENT.
PM-147	4.359E+04	7.671E+04	1.459E+05	NOT IDENT.
PM-149	0.000E+00	1.690E+05	0.000E+00	SHORT HLIF
EU-152	1.329E-01	1.013E+01	1.925E+01	NOT IDENT.
GD-153	3.347E+00	7.812E+00	1.503E+01	NOT IDENT.
EU-154	-6.933E+00	9.325E+00	1.494E+01	NOT IDENT.
EU-155	1.261E+01	9.809E+00	2.006E+01	NOT IDENT.
TB-160	-5.426E+00	1.507E+01	2.801E+01	NOT IDENT.
HO-166M	-1.855E+00	7.094E+00	1.242E+01	NOT IDENT.
TM-171	-2.081E+02	1.891E+03	3.627E+03	NOT IDENT.
LU-176	3.003E-01	3.140E+00	5.967E+00	NOT IDENT.
LU-177	-3.522E+01	3.190E+02	5.510E+02	NOT IDENT.
HF-181	-8.931E-01	6.016E+00	1.098E+01	NOT IDENT.
W-181	2.579E+01	2.067E+01	4.419E+01	NOT IDENT.
TA-182	1.246E+00	2.108E+01	4.074E+01	NOT IDENT.
RE-183	1.940E+01	2.066E+01	4.314E+01	NOT IDENT.
RE-184	1.235E+01	1.337E+01	3.104E+01	FAIL ABUN
RE-188	9.765E+00	2.098E+01	3.847E+01	NOT IDENT.
W-188	-4.786E+02	8.947E+02	1.432E+03	NOT IDENT.
OS-191	-7.505E+00	2.747E+01	4.583E+01	NOT IDENT.
IR-192	2.467E+00	4.270E+00	8.489E+00	NOT IDENT.
PB-201	0.000E+00	2.724E+19	0.000E+00	SHORT HLIF

TL-201	1.278E+03	5.654E+03	1.030E+04	NOT IDENT.
TL-202	8.003E+00	1.536E+01	2.677E+01	NOT IDENT.
HG-203	1.207E+00	4.880E+00	9.440E+00	NOT IDENT.
PB-203	0.000E+00	8.395E+03	0.000E+00	SHORT HLIF
TL-204	-5.408E+02	4.621E+02	7.805E+02	NOT IDENT.
BI-207	3.724E+00	5.360E+00	1.172E+01	NOT IDENT.
PB-210	-3.140E+02	5.114E+02	8.417E+02	NOT IDENT.
BI-211	-1.029E+01	2.542E+01	4.376E+01	NOT IDENT.
PB-211	-4.661E+01	7.828E+01	1.370E+02	NOT IDENT.
BI-212	-2.648E+01	5.716E+01	9.706E+01	NOT IDENT.
PB-212	6.680E+00	1.557E+01	1.324E+01	FAIL ABUN
BI-213	-3.462E+00	1.483E+01	2.387E+01	NOT IDENT.
BI-214	-7.258E+00	1.007E+01	1.659E+01	NOT IDENT.
PB-214	-4.726E+00	9.303E+00	1.585E+01	NOT IDENT.
RN-219	1.198E+01	4.723E+01	9.061E+01	NOT IDENT.
FR-221	-6.585E+00	2.257E+01	3.818E+01	NOT IDENT.
RA-223	-1.689E+01	6.597E+01	1.222E+02	FAIL ABUN
RA-224	3.468E+01	6.550E+01	1.205E+02	NOT IDENT.
AC-225	-3.563E+01	1.221E+02	2.066E+02	NOT IDENT.
RA-226	3.871E+00	9.326E+01	1.710E+02	NOT IDENT.
AC-227	-9.109E+00	2.751E+01	4.585E+01	NOT IDENT.
TH-227	-9.109E+00	2.751E+01	4.585E+01	NOT IDENT.
AC-228	-8.072E+00	1.931E+01	3.349E+01	FAIL ABUN
RA-228	-8.072E+00	1.931E+01	3.349E+01	FAIL ABUN
TH-228	6.680E+00	1.557E+01	1.324E+01	FAIL ABUN
TH-229	5.910E+01	1.091E+02	1.152E+02	FAIL ABUN
TH-230	-1.009E+03	1.035E+03	1.787E+03	NOT IDENT.
PA-231	-9.496E+00	5.508E+01	1.023E+02	NOT IDENT.
TH-231	1.742E+01	4.535E+01	7.879E+01	NOT IDENT.
TH-232	-2.623E+03	2.232E+03	3.668E+03	NOT IDENT.
PA-233	2.637E+00	7.346E+00	1.433E+01	NOT IDENT.
PA-234	-7.280E+00	3.108E+01	5.879E+01	FAIL ABUN
PA-234M	2.070E+02	4.429E+02	9.435E+02	NOT IDENT.
TH-234	-1.460E+02	1.636E+02	2.757E+02	NOT IDENT.
U-234	2.382E+03	6.625E+03	1.327E+04	NOT IDENT.
U-235	6.463E+00	3.015E+01	3.888E+01	FAIL ABUN
NP-237	2.637E+00	7.346E+00	1.433E+01	NOT IDENT.
NP-238	0.000E+00	4.423E+04	0.000E+00	SHORT HLIF
U-238	-1.460E+02	1.636E+02	2.757E+02	NOT IDENT.
NP-239	-5.037E+00	2.682E+01	4.800E+01	NOT IDENT.
AM-241	-1.897E+01	1.363E+01	2.248E+01	NOT IDENT.
AM-242	-6.531E+01	5.519E+01	9.009E+01	NOT IDENT.
AM-243	3.823E+00	5.157E+00	1.012E+01	NOT IDENT.
CM-243	-5.442E+00	1.027E+01	1.798E+01	NOT IDENT.
BK-247	3.809E+00	9.378E+00	1.691E+01	NOT IDENT.
CM-247	3.263E-01	4.294E+00	8.096E+00	FAIL ABUN
CF-249	-3.171E-01	4.310E+00	8.062E+00	NOT IDENT.
CF-251	7.084E-01	1.355E+01	2.410E+01	NOT IDENT.
CF-252	-1.301E+04	1.608E+04	2.743E+04	NOT IDENT.
ANH-511	-1.477E+01	7.428E+00	1.367E+01	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	92.89	102	99	1.41	185.44	181	9	1.41E-02	20.5	
2	0	109.96	28	156	4.66	219.57	215	14	3.93E-03	95.1	
3	0	144.66	22	70	0.75	288.91	284	7	3.06E-03	66.6	
4	0	186.41	58	118	0.92	372.35	367	10	7.99E-03	38.2	
5	0	193.72	21	111	1.46	386.97	382	10	2.98E-03	94.2	
6	0	239.02	37	117	1.43	477.51	471	14	5.16E-03	63.5	
7	0	288.80	15	29	0.62	577.01	574	6	2.05E-03	63.1	
8	0	499.86	28	40	5.67	998.89	989	16	3.85E-03	54.4	
9	0	511.49	128	78	2.08	1022.13	1015	18	1.77E-02	18.0	
10	0	583.32	14	18	1.53	1165.72	1162	7	2.01E-03	54.8	
11	0	668.30	42	41	5.40	1335.60	1322	29	5.79E-03	47.9	
12	0	768.53	14	21	3.85	1535.99	1530	12	1.91E-03	72.1	
13	0	835.80	7	8	1.22	1670.46	1666	7	9.86E-04	77.5	
14	0	844.08	6	14	2.46	1687.03	1678	11	8.75E-04	120.7	
15	0	866.56	9	12	0.69	1731.97	1725	9	1.27E-03	78.4	
16	0	889.95	8	1	1.23	1778.73	1776	6	1.08E-03	43.1	
17	0	894.11	16	3	0.64	1787.06	1782	11	2.23E-03	32.1	
18	1	969.61	20	14	1.96	1938.00	1931	17	2.79E-03	40.4	4.59E+00
19	1	972.11	20	4	1.96	1943.00	1931	17	2.73E-03	36.4	
20	0	976.33	5	5	1.39	1951.44	1947	7	6.46E-04	94.2	
21	0	1012.42	11	10	0.61	2023.61	2017	10	1.59E-03	59.1	
22	0	1088.39	16	7	4.16	2175.50	2167	15	2.25E-03	44.2	
23	0	1131.12	19	3	3.44	2260.95	2254	12	2.62E-03	29.5	
24	0	1289.20	10	3	0.78	2577.05	2569	13	1.35E-03	49.9	
25	0	1462.20	22	9	2.36	2923.00	2916	12	3.05E-03	34.7	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
K-40	1460.82	6	10.66*	9.301E-01	3.350E+01	3.350E+01	246.59
MN-54	834.85	7	99.98*	1.495E+00	2.454E+00	2.590E+00	155.09
TE-125M	109.28	28	0.27*	4.761E+00	1.136E+03	1.524E+03	190.29
CE-141	145.44	7	48.29*	4.797E+00	1.467E+00	2.466E+00	476.01
TL-208	277.37	-----	6.60	3.396E+00	-----	Line Not Found	-----
	583.19	1	85.00*	2.001E+00	2.280E-01	2.336E-01	2422.85
	860.56	-----	12.50	1.458E+00	-----	Line Not Found	-----

Flag: "*" = Keyline

Total number of lines in spectrum 22
Number of unidentified lines 9
Number of lines tentatively identified by NID 13 59.09%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
K-40	1.25E+09Y	1.00	3.350E+01	3.350E+01	8.260E+01	246.59	
MN-54	312.05D	1.06	2.454E+00	2.590E+00	4.017E+00	155.09	
TE-125M	57.40D	1.34	1.136E+03	1.524E+03	2.900E+03	190.29	
CE-141	32.51D	1.68	1.467E+00	2.466E+00	11.74E+00	476.01	
TL-208	1.91Y	1.02	2.280E-01	2.336E-01	56.59E-01	2422.85	

Total Activity : 1.173E+03 1.563E+03

Grand Total Activity : 1.173E+03 1.563E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	193.72	21	111	1.46	386.97	382	10	2.98E-03	****	4.25E+00	T
0	239.02	21	117	1.43	477.51	471	14	2.86E-03	****	3.74E+00	T
0	288.80	15	29	0.62	577.01	574	6	2.05E-03	****	3.30E+00	T
0	499.86	28	40	5.67	998.89	989	16	3.85E-03	****	2.25E+00	
0	668.30	42	41	5.40	1335.60	1322	29	5.79E-03	95.8	1.80E+00	T
0	768.53	14	21	3.85	1535.99	1530	12	1.91E-03	****	1.60E+00	
0	844.08	6	14	2.46	1687.03	1678	11	8.75E-04	****	1.48E+00	
0	866.56	9	12	0.69	1731.97	1725	9	1.27E-03	****	1.45E+00	
0	889.95	8	1	1.23	1778.73	1776	6	1.08E-03	86.2	1.42E+00	T
0	894.11	16	3	0.64	1787.06	1782	11	2.23E-03	64.2	1.41E+00	T
1	969.61	10	14	1.96	1938.00	1931	17	1.39E-03	****	1.32E+00	T
1	972.11	20	4	1.96	1943.00	1931	17	2.73E-03	72.7	1.31E+00	
0	976.33	5	5	1.39	1951.44	1947	7	6.46E-04	****	1.31E+00	
0	1012.42	11	10	0.61	2023.61	2017	10	1.59E-03	****	1.27E+00	
0	1088.39	16	7	4.16	2175.50	2167	15	2.25E-03	88.4	1.19E+00	
0	1131.12	19	3	3.44	2260.95	2254	12	2.62E-03	59.0	1.15E+00	T
0	1289.20	10	3	0.78	2577.05	2569	13	1.35E-03	99.8	1.03E+00	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488005.CNF;1  *
* Acquisition date   : 19-JAN-2023 16:35:57 Sensitivity      : 3.000          *
* Detector ID        : GAM16 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:00.43 Half life ratio : *****      *
* Sample date        : 26-DEC-2022 09:00:00 Nuclide Library : LIQUID      *
* Sample ID          : G606488005 Analyst initials: MXR1        *
* Batch Number       : 2367950 Sample Quantity : 7.2663E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000        *
*                                     Dry Weight    : 0.00000        *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 7-MAR-2022 08:22:40 Eff. Geometry    : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM16_JAR.CNF;15          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
K-40	3.485E+01
MN-54	2.706E+00
TE-125M	9.004E+02
CE-141	6.268E+00
TL-208	3.282E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	3.486E+01	NOT IDENT.
NA-22	2.101E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	2.813E+00	FAIL ABUN
SC-46	3.407E+00	FAIL ABUN
V-48	9.456E+00	NOT IDENT.
CR-51	4.437E+01	NOT IDENT.
MN-52	5.911E+01	NOT IDENT.
CO-56	4.346E+00	NOT IDENT.
CO-57	2.317E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	3.212E+00	NOT IDENT.
FE-59	8.199E+00	NOT IDENT.
CO-60	4.930E+00	NOT IDENT.
ZN-65	7.100E+00	NOT IDENT.
CU-67	3.381E+03	NOT IDENT.
GE-68	1.163E+02	NOT IDENT.
AS-73	8.508E+01	NOT IDENT.
AS-74	1.187E+01	NOT IDENT.
SE-75	4.617E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	2.656E+01	NOT IDENT.
RB-83	6.957E+00	NOT IDENT.
RB-84	9.360E+00	NOT IDENT.
KR-85	8.307E+02	NOT IDENT.
SR-85	4.807E+00	NOT IDENT.

RB-86	1.035E+02	NOT IDENT.
Y-88	4.315E+00	NOT IDENT.
ZR-88	3.152E+00	NOT IDENT.
Y-91	9.774E+02	NOT IDENT.
NB-94	2.861E+00	NOT IDENT.
NB-95	4.528E+00	NOT IDENT.
NB-95M	1.057E+01	NOT IDENT.
TC-95M	5.005E+00	FAIL ABUN
ZR-95	7.038E+00	NOT IDENT.
MO-99	1.155E+04	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-100	0.000E+00	SHORT HLIF
RH-101	2.510E+00	NOT IDENT.
RH-102M	2.695E+00	NOT IDENT.
RU-103	4.734E+00	NOT IDENT.
RH-106	2.859E+01	NOT IDENT.
RU-106	2.859E+01	NOT IDENT.
AG-108M	3.159E+00	NOT IDENT.
CD-109	6.398E+01	NOT IDENT.
AG-110	5.889E+01	NOT IDENT.
AG-110M	4.613E+00	NOT IDENT.
IN-111	8.969E+02	NOT IDENT.
SN-113	4.260E+00	NOT IDENT.
IN-114M	1.707E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	7.594E+00	NOT IDENT.
SB-122	1.857E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.490E+00	NOT IDENT.
SB-124	9.590E+00	NOT IDENT.
SB-125	9.091E+00	NOT IDENT.
I-126	3.261E+01	NOT IDENT.
SB-126	2.097E+01	NOT IDENT.
SN-126	6.112E+00	NOT IDENT.
SB-127	6.797E+02	NOT IDENT.
TE-129	4.523E+01	NOT IDENT.
I-131	2.483E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	4.898E+02	NOT IDENT.
BA-133	3.558E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	4.183E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.574E+01	NOT IDENT.
BA-137M	3.538E+00	NOT IDENT.
CS-137	3.738E+00	NOT IDENT.
LA-138	4.927E+00	NOT IDENT.
CE-139	2.446E+00	NOT IDENT.
BA-140	4.015E+01	NOT IDENT.
LA-140	7.666E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.460E+01	NOT IDENT.
PM-144	3.541E+00	NOT IDENT.
PR-144	2.658E+02	NOT IDENT.
PM-146	3.449E+00	NOT IDENT.
ND-147	9.806E+01	NOT IDENT.
PM-147	6.784E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.730E+00	NOT IDENT.
GD-153	6.936E+00	NOT IDENT.
EU-154	5.538E+00	NOT IDENT.
EU-155	9.321E+00	NOT IDENT.
TB-160	1.196E+01	NOT IDENT.
HO-166M	5.454E+00	NOT IDENT.
TM-171	1.648E+03	NOT IDENT.
LU-176	2.749E+00	NOT IDENT.
LU-177	2.547E+02	NOT IDENT.
HF-181	4.932E+00	NOT IDENT.
W-181	2.031E+01	NOT IDENT.
TA-182	1.759E+01	NOT IDENT.
RE-183	1.979E+01	NOT IDENT.
RE-184	1.341E+01	FAIL ABUN
RE-188	1.803E+01	NOT IDENT.
W-188	6.491E+02	NOT IDENT.
OS-191	2.131E+01	NOT IDENT.
IR-192	3.904E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	4.757E+03	NOT IDENT.

TL-202	1.217E+01	NOT IDENT.
HG-203	4.358E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	3.576E+02	NOT IDENT.
BI-207	5.088E+00	NOT IDENT.
PB-210	3.858E+02	NOT IDENT.
BI-211	2.001E+01	NOT IDENT.
PB-211	6.142E+01	NOT IDENT.
BI-212	4.215E+01	NOT IDENT.
PB-212	6.184E+00	FAIL ABUN
BI-213	1.085E+01	NOT IDENT.
BI-214	7.503E+00	NOT IDENT.
PB-214	7.249E+00	NOT IDENT.
RN-219	4.129E+01	NOT IDENT.
FR-221	1.755E+01	NOT IDENT.
RA-223	5.540E+01	FAIL ABUN
RA-224	5.559E+01	NOT IDENT.
AC-225	9.498E+01	NOT IDENT.
RA-226	8.107E+01	NOT IDENT.
AC-227	2.088E+01	NOT IDENT.
TH-227	2.088E+01	NOT IDENT.
AC-228	1.478E+01	FAIL ABUN
RA-228	1.478E+01	FAIL ABUN
TH-228	6.184E+00	FAIL ABUN
TH-229	5.390E+01	FAIL ABUN
TH-230	8.181E+02	NOT IDENT.
PA-231	4.710E+01	NOT IDENT.
TH-231	3.663E+01	NOT IDENT.
TH-232	1.703E+03	NOT IDENT.
PA-233	6.587E+00	NOT IDENT.
PA-234	2.507E+01	FAIL ABUN
PA-234M	4.069E+02	NOT IDENT.
TH-234	1.284E+02	NOT IDENT.
U-234	6.048E+03	NOT IDENT.
U-235	1.812E+01	FAIL ABUN
NP-237	6.587E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	1.284E+02	NOT IDENT.
NP-239	2.219E+01	NOT IDENT.
AM-241	1.003E+01	NOT IDENT.
AM-242	4.076E+01	NOT IDENT.
AM-243	4.727E+00	NOT IDENT.
CM-243	8.272E+00	NOT IDENT.
BK-247	7.795E+00	NOT IDENT.
CM-247	3.680E+00	FAIL ABUN
CF-249	3.639E+00	NOT IDENT.
CF-251	1.114E+01	NOT IDENT.
CF-252	1.251E+04	NOT IDENT.
ANH-511	6.521E+00	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G606488005.CNF;1
Acquisition date : 19-JAN-2023 16:35:57 Sensitivity : 3.000
Detector ID : GAM16 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.43 Half life ratio : *****
Sample date : 26-DEC-2022 09:00:00 Nuclide Library : LIQUID
Sample ID : G606488005 Analyst initials: MXR1
Batch Number : 2367950 Sample Quantity : 7.2663E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 7-MAR-2022 08:22:40 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM16_JAR.CNF;15

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
K-40	3.350E+01	8.101E+01	8.102E+01
MN-54	2.590E+00	3.945E+00	3.945E+00
TE-125M	1.524E+03	2.845E+03	2.845E+03
CE-141	2.466E+00	1.150E+01	1.150E+01
TL-208	2.336E-01	5.545E+00	5.545E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	-8.840E+00	4.282E+01	4.301E+01	NOT IDENT.
NA-22	-2.256E+00	3.372E+00	3.523E+00	NOT IDENT.
NA-24	-8.088E+11	2.073E+12	2.105E+12	SHORT HLIF
AL-26	-1.545E+00	3.880E+00	3.942E+00	FAIL ABUN
SC-46	3.470E+00	2.954E+00	3.344E+00	FAIL ABUN
V-48	-7.002E+00	1.252E+01	1.292E+01	NOT IDENT.
CR-51	-2.324E+01	5.366E+01	5.468E+01	NOT IDENT.
MN-52	-8.678E+01	1.048E+02	1.118E+02	NOT IDENT.
CO-56	5.433E+00	4.489E+00	5.115E+00	NOT IDENT.
CO-57	-1.400E+00	2.886E+00	2.954E+00	NOT IDENT.
NI-57	2.560E+05	4.533E+05	4.678E+05	SHORT HLIF
CO-58	-1.859E+00	4.107E+00	4.192E+00	NOT IDENT.
FE-59	5.126E+00	8.611E+00	8.916E+00	NOT IDENT.
CO-60	3.424E+00	5.374E+00	5.591E+00	NOT IDENT.
ZN-65	1.833E-01	8.491E+00	8.492E+00	NOT IDENT.
CU-67	-1.161E+04	4.856E+03	7.145E+03	NOT IDENT.
GE-68	4.486E+01	1.300E+02	1.316E+02	NOT IDENT.
AS-73	-1.633E+00	9.678E+01	9.678E+01	NOT IDENT.
AS-74	-6.213E+00	1.548E+01	1.573E+01	NOT IDENT.
SE-75	3.714E-01	5.786E+00	5.788E+00	NOT IDENT.
BR-77	1.498E+04	3.493E+04	3.558E+04	SHORT HLIF
SR-82	-2.934E+01	3.722E+01	3.950E+01	NOT IDENT.
RB-83	-1.340E+00	8.577E+00	8.598E+00	NOT IDENT.
RB-84	9.311E+00	9.602E+00	1.048E+01	NOT IDENT.
KR-85	-3.576E+03	1.367E+03	2.115E+03	NOT IDENT.

SR-85	-2.069E+01	7.909E+00	1.224E+01	NOT IDENT.
RB-86	4.723E+01	1.144E+02	1.164E+02	NOT IDENT.
Y-88	7.252E-01	4.941E+00	4.952E+00	NOT IDENT.
ZR-88	-2.648E-01	3.735E+00	3.737E+00	NOT IDENT.
Y-91	-2.389E+03	1.957E+03	2.234E+03	NOT IDENT.
NB-94	-1.545E+00	3.823E+00	3.886E+00	NOT IDENT.
NB-95	9.963E-01	5.520E+00	5.538E+00	NOT IDENT.
NB-95M	2.291E+00	1.401E+01	1.405E+01	NOT IDENT.
TC-95M	2.774E+00	6.305E+00	6.428E+00	FAIL ABUN
ZR-95	-8.692E-01	8.296E+00	8.306E+00	NOT IDENT.
MO-99	-1.724E+03	1.362E+04	1.365E+04	NOT IDENT.
TC-99M	-7.688E+28	4.172E+29	0.000E+00	SHORT HLIF
RH-100	9.040E+07	1.222E+09	1.223E+09	SHORT HLIF
RH-101	-1.533E+00	3.162E+00	3.236E+00	NOT IDENT.
RH-102M	-9.719E-01	3.354E+00	3.383E+00	NOT IDENT.
RU-103	1.207E+00	5.510E+00	5.537E+00	NOT IDENT.
RH-106	1.798E+01	3.174E+01	3.276E+01	NOT IDENT.
RU-106	1.798E+01	3.174E+01	3.276E+01	NOT IDENT.
AG-108M	8.775E-01	3.640E+00	3.662E+00	NOT IDENT.
CD-109	2.924E+01	7.214E+01	7.334E+01	NOT IDENT.
AG-110	-1.158E+01	7.473E+01	7.492E+01	NOT IDENT.
AG-110M	-2.450E+00	6.078E+00	6.178E+00	NOT IDENT.
IN-111	-1.677E+02	1.147E+03	1.149E+03	NOT IDENT.
SN-113	-9.534E-01	5.121E+00	5.139E+00	NOT IDENT.
IN-114M	3.617E+00	2.226E+01	2.231E+01	NOT IDENT.
CD-115	1.192E+04	2.147E+04	2.213E+04	SHORT HLIF
SN-117M	-2.096E+00	9.412E+00	9.460E+00	NOT IDENT.
SB-122	1.016E+01	2.249E+03	2.249E+03	NOT IDENT.
I-123	-2.846E+13	5.706E+13	5.849E+13	SHORT HLIF
TE-123M	-1.587E+00	3.182E+00	3.261E+00	NOT IDENT.
SB-124	3.297E+00	1.039E+01	1.050E+01	NOT IDENT.
SB-125	-6.388E-03	1.076E+01	1.076E+01	NOT IDENT.
I-126	-8.217E+00	4.157E+01	4.174E+01	NOT IDENT.
SB-126	-8.420E+00	2.549E+01	2.577E+01	NOT IDENT.
SN-126	1.600E+00	6.988E+00	7.025E+00	NOT IDENT.
SB-127	4.542E+02	7.618E+02	7.889E+02	NOT IDENT.
TE-129	-5.256E+01	6.657E+01	7.066E+01	NOT IDENT.
I-131	7.148E-01	2.891E+01	2.892E+01	NOT IDENT.
I-132	1.000E+41	1.772E+41	0.000E+00	SHORT HLIF
TE-132	1.410E+02	5.951E+02	5.985E+02	NOT IDENT.
BA-133	0.000E+00	4.147E+00	0.000E+00	NOT IDENT.
I-133	1.339E+08	1.067E+09	1.069E+09	SHORT HLIF
CS-134	3.101E+00	4.416E+00	4.633E+00	NOT IDENT.
I-135	1.504E+27	6.758E+27	0.000E+00	SHORT HLIF
CS-136	1.169E+00	1.856E+01	1.857E+01	NOT IDENT.
BA-137M	8.145E-01	4.723E+00	4.737E+00	NOT IDENT.
CS-137	8.605E-01	4.989E+00	5.004E+00	NOT IDENT.
LA-138	1.687E-02	5.738E+00	5.738E+00	NOT IDENT.
CE-139	-2.344E+00	3.440E+00	3.599E+00	NOT IDENT.
BA-140	8.934E+00	4.705E+01	4.722E+01	NOT IDENT.
LA-140	-1.976E+01	1.590E+01	1.823E+01	NOT IDENT.
CE-143	-5.355E+05	1.324E+06	1.346E+06	SHORT HLIF
CE-144	-1.927E+01	1.962E+01	2.146E+01	NOT IDENT.
PM-144	-5.282E-01	4.462E+00	4.469E+00	NOT IDENT.
PR-144	-1.502E+02	3.520E+02	3.585E+02	NOT IDENT.
PM-146	-2.286E+00	4.447E+00	4.565E+00	NOT IDENT.
ND-147	6.489E+01	1.085E+02	1.124E+02	NOT IDENT.
PM-147	4.359E+04	7.678E+04	7.926E+04	NOT IDENT.
PM-149	8.600E+04	1.695E+05	1.739E+05	SHORT HLIF
EU-152	1.329E-01	1.013E+01	1.013E+01	NOT IDENT.
GD-153	3.347E+00	7.817E+00	7.961E+00	NOT IDENT.
EU-154	-6.933E+00	9.347E+00	9.857E+00	NOT IDENT.
EU-155	1.261E+01	9.873E+00	1.140E+01	NOT IDENT.
TB-160	-5.426E+00	1.508E+01	1.528E+01	NOT IDENT.
HO-166M	-1.855E+00	7.096E+00	7.145E+00	NOT IDENT.
TM-171	-2.081E+02	1.891E+03	1.893E+03	NOT IDENT.
LU-176	3.003E-01	3.141E+00	3.143E+00	NOT IDENT.
LU-177	-3.522E+01	3.190E+02	3.194E+02	NOT IDENT.
HF-181	-8.931E-01	6.016E+00	6.030E+00	NOT IDENT.
W-181	2.579E+01	2.174E+01	2.466E+01	NOT IDENT.
TA-182	1.246E+00	2.108E+01	2.108E+01	NOT IDENT.
RE-183	1.940E+01	2.078E+01	2.255E+01	NOT IDENT.
RE-184	1.235E+01	1.346E+01	1.457E+01	FAIL ABUN
RE-188	9.765E+00	2.100E+01	2.145E+01	NOT IDENT.
W-188	-4.786E+02	8.970E+02	9.226E+02	NOT IDENT.
OS-191	-7.505E+00	2.748E+01	2.769E+01	NOT IDENT.
IR-192	2.467E+00	4.275E+00	4.418E+00	NOT IDENT.
PB-201	-9.427E+18	2.741E+19	0.000E+00	SHORT HLIF

TL-201	1.278E+03	5.654E+03	5.684E+03	NOT IDENT.
TL-202	8.003E+00	1.537E+01	1.579E+01	NOT IDENT.
HG-203	1.207E+00	4.881E+00	4.911E+00	NOT IDENT.
PB-203	2.076E+03	8.397E+03	8.449E+03	SHORT HLIF
TL-204	-5.408E+02	4.652E+02	5.253E+02	NOT IDENT.
BI-207	3.724E+00	5.372E+00	5.629E+00	NOT IDENT.
PB-210	-3.140E+02	5.124E+02	5.317E+02	NOT IDENT.
BI-211	-1.029E+01	2.543E+01	2.585E+01	NOT IDENT.
PB-211	-4.661E+01	7.838E+01	8.116E+01	NOT IDENT.
BI-212	-2.648E+01	5.721E+01	5.845E+01	NOT IDENT.
PB-212	6.680E+00	1.558E+01	1.587E+01	FAIL ABUN
BI-213	-3.462E+00	1.483E+01	1.492E+01	NOT IDENT.
BI-214	-7.258E+00	1.008E+01	1.060E+01	NOT IDENT.
PB-214	-4.726E+00	9.312E+00	9.553E+00	NOT IDENT.
RN-219	1.198E+01	4.726E+01	4.757E+01	NOT IDENT.
FR-221	-6.585E+00	2.258E+01	2.278E+01	NOT IDENT.
RA-223	-1.689E+01	6.599E+01	6.643E+01	FAIL ABUN
RA-224	3.468E+01	6.557E+01	6.741E+01	NOT IDENT.
AC-225	-3.563E+01	1.222E+02	1.232E+02	NOT IDENT.
RA-226	3.871E+00	9.326E+01	9.327E+01	NOT IDENT.
AC-227	-9.109E+00	2.754E+01	2.785E+01	NOT IDENT.
TH-227	-9.109E+00	2.754E+01	2.785E+01	NOT IDENT.
AC-228	-8.072E+00	1.933E+01	1.967E+01	FAIL ABUN
RA-228	-8.072E+00	1.933E+01	1.967E+01	FAIL ABUN
TH-228	6.680E+00	1.558E+01	1.587E+01	FAIL ABUN
TH-229	5.910E+01	1.092E+02	1.124E+02	FAIL ABUN
TH-230	-1.009E+03	1.049E+03	1.144E+03	NOT IDENT.
PA-231	-9.496E+00	5.512E+01	5.528E+01	NOT IDENT.
TH-231	1.742E+01	4.542E+01	4.609E+01	NOT IDENT.
TH-232	-2.623E+03	2.257E+03	2.548E+03	NOT IDENT.
PA-233	2.637E+00	7.350E+00	7.446E+00	NOT IDENT.
PA-234	-7.280E+00	3.219E+01	3.235E+01	FAIL ABUN
PA-234M	2.070E+02	4.434E+02	4.531E+02	NOT IDENT.
TH-234	-1.460E+02	1.669E+02	1.794E+02	NOT IDENT.
U-234	2.382E+03	6.629E+03	6.716E+03	NOT IDENT.
U-235	6.463E+00	3.016E+01	3.030E+01	FAIL ABUN
NP-237	2.637E+00	7.350E+00	7.446E+00	NOT IDENT.
NP-238	-3.020E+04	4.433E+04	4.638E+04	SHORT HLIF
U-238	-1.460E+02	1.669E+02	1.794E+02	NOT IDENT.
NP-239	-5.037E+00	2.682E+01	2.692E+01	NOT IDENT.
AM-241	-1.897E+01	1.374E+01	1.619E+01	NOT IDENT.
AM-242	-6.531E+01	5.644E+01	6.367E+01	NOT IDENT.
AM-243	3.823E+00	5.166E+00	5.446E+00	NOT IDENT.
CM-243	-5.442E+00	1.029E+01	1.058E+01	NOT IDENT.
BK-247	3.809E+00	9.413E+00	9.569E+00	NOT IDENT.
CM-247	3.263E-01	4.295E+00	4.297E+00	FAIL ABUN
CF-249	-3.171E-01	4.310E+00	4.313E+00	NOT IDENT.
CF-251	7.084E-01	1.355E+01	1.355E+01	NOT IDENT.
CF-252	-1.301E+04	1.995E+04	2.080E+04	NOT IDENT.
ANH-511	-1.477E+01	7.532E+00	1.006E+01	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	46.1660	81.00	44.8845	120.90	53.6432
45.60	35.5459	81.07	42.2004	121.12	47.7059
46.54	40.4548	82.35	0.0000	121.22	47.7166
49.72	31.3648	82.47	53.1937	121.78	56.7330
51.35	33.1986	167.43	53.1942	122.06	67.7224
52.39	34.9670	82.47	53.1942	123.07	51.9016
53.20	30.1868	83.79	43.4429	265.00	55.9680
53.44	35.9326	84.00	41.6580	127.16	0.0000
56.28	42.9439	84.21	40.7771	127.23	56.3929
57.36	0.0000	84.86	0.0000	129.43	51.5961
57.53	24.0647	85.43	54.5604	131.20	50.7698
57.53	24.0650	86.55	55.6461	133.02	51.9790
57.98	26.5996	86.79	55.6838	133.52	57.1331
59.32	44.2780	86.94	47.4884	135.34	36.8641
59.54	44.3144	87.09	47.5086	136.00	35.8876
61.49	45.4750	87.57	52.1468	57.53	35.9079
63.00	43.1828	88.03	50.3817	136.47	42.0792
63.29	49.1605	88.34	58.6768	140.51	46.9001
63.58	52.6049	88.47	58.6982	140.88	46.9340
63.81	50.1004	91.11	109.0126	143.76	45.8080
64.28	55.2870	91.27	109.0603	144.24	45.8503
64.99	59.6879	92.59	46.3772	145.44	51.5261
65.08	52.8830	93.31	49.2544	152.32	68.7679
66.73	39.4600	94.56	100.7021	152.43	63.4909
66.98	42.9279	94.65	100.7260	153.25	51.9287
67.24	43.8254	94.67	100.7309	323.87	77.4990
67.67	57.6589	97.43	40.3965	155.04	63.7939
67.75	57.6742	98.43	36.7330	156.02	71.3623
68.89	36.2931	98.44	36.7339	158.56	58.8487
68.89	36.2934	99.53	51.0044	158.97	0.0000
69.67	44.1849	100.11	51.0794	159.00	59.9657
70.82	62.6149	100.20	51.0910	162.33	56.0093
70.82	62.6155	102.03	38.0197	162.66	49.5755
70.83	0.0000	103.18	54.3333	163.33	57.1867
72.81	54.2680	103.37	54.3590	165.86	49.8513
72.87	0.0000	105.31	33.5378	167.43	44.5522
74.66	51.0664	106.12	48.6458	171.28	49.2181
74.82	44.9258	106.47	52.5304	176.31	57.3495
74.97	44.9472	109.28	51.2730	176.60	56.2738
77.11	56.7808	111.00	51.4812	177.52	49.7276
79.69	45.6036	111.76	51.5726	181.07	57.7938
79.82	45.6219	112.95	51.7154	184.41	79.3311
80.02	42.9635	116.24	57.6770	184.58	79.3528
80.03	42.9642	116.30	57.6851	185.72	53.7437
80.12	42.9763	116.74	54.1335	186.21	48.1821
80.19	42.9855	117.23	44.3398	190.27	42.0974
80.22	42.9899	119.76	54.4998	193.51	48.7287
80.57	43.0342	99.53	53.6008	197.03	54.6848

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
198.01	48.6797	256.23	41.6953	482.18	28.3583
201.83	52.7811	304.85	40.8410	487.02	24.3916
204.12	50.6555	306.78	44.4071	492.35	0.0000
205.31	56.5097	308.46	57.5687	497.08	24.5659
208.37	52.1267	311.90	37.6416	511.00	33.0716
210.85	45.3365	316.51	34.3019	514.00	107.7028
215.65	46.8140	319.41	41.4606	520.40	23.9228
218.12	49.3239	320.08	45.0193	520.69	0.0000
222.11	44.8716	321.04	39.7614	522.65	0.0000
227.09	41.6079	323.87	35.4443	527.90	0.0000
227.38	40.4347	325.23	31.9438	529.59	25.1162
228.16	45.2386	328.76	36.5081	529.87	0.0000
228.18	45.2398	331.15	0.0000	531.02	16.7598
116.74	45.2398	333.37	41.1466	537.26	18.9331
235.69	36.8720	334.37	38.5007	539.51	0.0000
235.96	43.2999	338.28	37.7489	546.56	0.0000
238.63	37.4147	338.32	37.7498	552.55	22.3082
238.98	0.0000	311.90	36.9285	563.25	14.9736
240.99	37.5282	340.55	36.9310	564.24	20.3336
242.00	45.2533	344.28	31.6390	569.33	18.2513
244.70	42.1648	345.93	31.6888	946.00	18.2534
245.35	41.3877	351.06	32.7524	569.70	21.4771
250.62	39.2100	351.93	34.5999	582.08	22.7244
252.40	49.1205	356.01	27.4200	583.19	20.5741
252.80	47.9157	361.25	0.0000	595.83	25.0973
256.23	40.7145	364.49	33.1611	427.87	32.8284
260.90	0.0000	366.42	28.6052	604.72	29.6180
264.66	46.1134	356.01	34.6740	609.32	24.1995
265.00	38.6507	388.16	30.1009	610.33	23.1132
269.46	38.4353	388.63	26.3486	614.28	19.8567
271.23	36.8403	391.70	31.1356	618.01	16.5833
273.65	47.8583	392.87	32.1116	621.93	12.1888
276.40	48.0091	264.66	37.0775	630.19	0.0000
277.37	49.7488	401.32	0.0000	631.29	20.0530
277.60	49.7620	401.81	31.4034	155.04	16.7273
278.00	41.3467	402.40	32.3710	633.25	17.8451
278.43	46.4320	404.85	34.3455	634.78	15.6281
279.20	0.0000	410.95	24.9310	635.95	11.1702
279.54	44.7996	414.70	27.8931	636.99	12.2944
280.46	43.1547	423.72	24.2218	657.50	15.8280
283.69	46.7084	427.09	26.2299	657.76	14.6996
284.31	38.7524	427.87	31.1068	661.66	20.3972
285.41	30.6313	433.94	31.2565	664.57	0.0000
285.90	0.0000	439.51	18.6393	666.33	21.5853
287.50	33.2609	440.45	31.4154	666.50	21.5868
290.67	41.0791	446.15	0.0000	667.71	0.0000
293.27	0.0000	453.88	26.7808	677.62	13.7163
351.93	36.9829	459.60	21.9159	685.70	13.7754
295.96	41.3164	463.37	17.9817	692.65	19.5878
879.38	44.8864	468.07	28.0689	695.00	14.9974
299.98	44.0886	473.00	28.1703	696.49	25.3999
300.09	44.0938	475.06	28.2131	696.51	30.0181
300.13	44.0958	476.78	28.2484	697.00	30.0255
301.36	48.4827	477.60	29.2744	697.49	33.4994
302.85	59.8317	477.99	31.3021	702.65	22.0066

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
706.68	18.5710	907.67	0.0000	1291.59	14.0141
711.68	20.9465	911.20	10.5260	1298.22	0.0000
720.70	20.1664	923.98	0.0000	1312.11	3.3051
721.93	0.0000	926.36	7.7031	1332.49	9.9756
722.78	11.4107	935.54	13.5313	539.51	0.0000
722.91	11.4111	937.49	11.6074	1365.19	10.0717
723.31	13.1694	944.13	12.6084	1368.63	0.0000
724.19	15.8104	945.96	0.0000	1377.63	0.0000
727.33	15.8357	946.00	13.5886	1384.29	4.5010
733.00	22.9388	949.00	10.6895	1408.01	4.5315
735.93	19.4387	667.71	0.0000	1434.09	9.1294
739.50	18.5878	962.31	15.6309	1435.80	6.3937
744.23	18.6320	964.08	10.9491	1457.56	0.0000
747.24	10.6626	966.17	7.8274	1460.82	8.2771
752.31	14.2524	968.97	14.1047	1489.16	6.4873
753.82	14.2627	983.53	18.7165	1553.35	0.0000
756.73	16.9613	984.45	0.0000	1596.21	10.4817
763.94	15.7668	996.26	10.8892	1620.50	7.6695
765.80	12.9116	1001.03	8.9258	1678.03	0.0000
766.42	11.4805	1274.44	14.8975	1690.97	3.9012
766.84	15.7889	1025.87	0.0000	1757.55	0.0000
772.60	0.0000	1028.54	0.0000	1764.49	2.9769
776.52	14.4204	1037.84	8.0444	1063.66	5.9616
739.50	10.8226	1038.76	0.0000	1771.35	4.9692
778.90	4.5114	475.06	11.0974	1791.20	0.0000
783.70	13.5654	1048.07	12.1128	1808.65	6.0138
788.74	17.2234	1050.41	11.1128	1836.06	5.0422
792.07	16.3427	1063.66	8.1211		
795.86	12.7336	1077.00	9.1802		
802.10	10.0342	1077.34	9.1813		
810.29	10.0721	459.60	9.8162		
344.28	10.0728	1085.87	13.0977		
810.76	14.6533	1099.25	5.1404		
815.77	11.0153	1107.22	0.0000		
1048.07	15.6247	1111.64	6.1956		
822.65	0.0000	1112.07	5.1636		
832.01	10.3571	1112.84	11.3632		
834.85	10.1849	1115.54	10.3400		
835.15	11.1123	1120.29	13.4634		
836.80	0.0000	1120.55	14.5007		
846.77	5.9574	1221.41	13.4681		
856.80	16.8294	1129.67	8.3120		
860.56	14.9839	1131.51	0.0000		
871.09	10.7520	1173.23	10.5444		
873.19	8.4749	1177.95	9.5048		
875.33	0.0000	1189.05	11.6593		
879.38	15.1064	1204.77	12.7844		
880.51	7.5569	1221.41	12.8533		
881.60	10.3954	1231.02	6.4464		
883.24	17.9685	1235.36	9.6828		
884.68	18.3850	1238.28	6.4614		
889.28	13.6534	1260.41	0.0000		
894.76	10.6439	1271.87	8.7061		
898.04	7.6133	1274.44	7.6238		
903.28	5.7226	1274.54	7.6242		

VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 18:37:39.70

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                    *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292906.CNF;1
Background file : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM23.CNF;824
Background date  : 15-JAN-2023 11:33:49
Sample date      : 19-JAN-2023 00:00:00 Acquisition date : 19-JAN-2023 16:37:07
Sample ID        : G1205292906 Sample quantity : 7.64890E-01 FILTER
Detector name     : GAM23 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:02.05 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : MXR1
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID         : 2367950 Detector SN# :
Matrix Spike ID  : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	58.87	22	51	1.04	117.39	114	8	3.09E-03	59.1	
2	0	63.49*	13	64	1.01	126.62	123	8	1.78E-03	122.4	
3	0	92.65*	28	50	1.38	184.90	182	8	3.94E-03	57.5	
4	0	97.77	40	40	2.43	195.13	191	8	5.56E-03	31.6	
5	0	173.21	26	85	4.97	345.90	336	15	3.60E-03	80.4	
6	0	185.74*	10	77	0.92	370.93	367	9	1.33E-03	193.3	
7	0	238.53*	17	46	0.88	476.43	473	10	2.42E-03	85.2	
8	0	368.37	16	26	3.28	735.94	730	11	2.27E-03	64.1	
9	0	392.11	11	25	0.75	783.37	777	10	1.51E-03	91.4	
10	0	433.54	16	14	2.07	866.18	862	9	2.17E-03	49.8	
11	0	511.06*	16	36	1.36	1021.11	1013	16	2.18E-03	125.7	
12	0	581.97*	11	12	1.79	1162.83	1156	12	1.56E-03	76.6	
13	0	608.84*	17	14	2.13	1216.53	1212	11	2.41E-03	55.1	
14	0	676.65	11	10	0.66	1352.08	1348	10	1.51E-03	66.6	
15	0	698.36	15	12	3.33	1395.47	1390	9	2.04E-03	51.5	
16	0	714.11	9	4	0.80	1426.94	1424	7	1.18E-03	50.1	
17	0	728.48	11	6	2.35	1455.67	1450	11	1.46E-03	53.1	
18	0	750.81	15	6	1.84	1500.31	1495	10	2.02E-03	43.3	
19	0	765.76	16	8	3.03	1530.18	1524	11	2.20E-03	43.2	
20	0	896.08	15	0	1.56	1790.67	1783	13	2.08E-03	25.8	
21	0	940.89	4	12	0.54	1880.23	1872	10	5.30E-04	180.3	
22	0	1038.36	10	3	0.87	2075.07	2071	10	1.40E-03	43.4	
23	0	1047.36	6	8	1.41	2093.06	2085	12	7.84E-04	113.5	
24	0	1141.60	20	4	5.14	2281.43	2272	15	2.75E-03	31.1	
25	0	1334.79	13	0	0.83	2667.62	2662	12	1.81E-03	27.7	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 19-JAN-2023 18:37:40

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292906.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MXR1		
Sample date	: 19-JAN-2023 00:00:00	Acquisition date	: 19-JAN-2023 16:37:07
Sample ID	: G1205292906	Sample quantity	: 0.76489 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA23	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:02.05 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
CU-67	91.27	28	7.00	3.545E+00	5.606E+01	6.830E+01	115.08
	93.31	28	16.10	3.545E+00	2.437E+01	2.970E+01	115.08
	184.58	10	48.70*	3.618E+00	2.670E+00	3.253E+00	386.62
ZR-88	392.87	11	97.29*	2.161E+00	2.535E+00	2.550E+00	182.76
NB-95	765.80	16	99.81*	1.282E+00	6.073E+00	6.122E+00	86.31
SN-113	391.70	11	64.97*	2.161E+00	3.796E+00	3.813E+00	182.76
TL-208	277.37	-----	6.60	2.772E+00	-----	Line Not Found	-----
	583.19	11	85.00*	1.607E+00	4.044E+00	4.047E+00	153.22
	860.56	-----	12.50	1.157E+00	-----	Line Not Found	-----
BI-212	727.33	11	6.67*	1.338E+00	5.774E+01	5.779E+01	106.27
	1620.50	-----	1.47	6.671E-01	-----	Line Not Found	-----
RA-226	186.21	10	3.59*	3.618E+00	3.622E+01	3.622E+01	386.62
TH-232	63.81	13	0.26*	1.500E+00	1.614E+03	1.614E+03	244.86
	140.88	-----	0.02	4.072E+00	-----	Line Not Found	-----
TH-234	63.29	13	3.70*	1.500E+00	1.134E+02	1.134E+02	244.86
	92.59	28	4.23	3.545E+00	9.277E+01	9.277E+01	115.08
U-238	63.29	13	3.70*	1.500E+00	1.134E+02	1.134E+02	244.86
	92.59	28	4.23	3.545E+00	9.277E+01	9.277E+01	115.08
AM-241	59.54	22	35.90*	1.101E+00	2.761E+01	2.761E+01	118.28
ANH-511	511.00	16	100.00*	1.777E+00	4.330E+00	4.330E+00	251.48

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                           *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*                                     *                                               *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292906.CNF;1      *
* Acquisition date   : 19-JAN-2023 16:37:07 Sensitivity      : 3.000                *
* Detector ID        : GAM23 Energy tolerance: 1.500        *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 02:00:02.05 Half life ratio : *****      *
* Sample date        : 19-JAN-2023 00:00:00 Analyst initials: MXR1      *
* Sample ID          : G1205292906 Sample Quantity : 7.6489E-01 FILTER *
* Batch Number       : 2367950 Wet Weight : 0.00000        *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000         *
* Nuclide Library    : LIQUID.NLB;28                                             *
*****
*                                     CALIBRATION INFORMATION                       *
*                                     *                                               *
* Eff. Cal. date     : 3-MAY-2022 06:48:20 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM23_JAR.CNF;20          *
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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
CU-67	3.253E+00	1.233E+01	1.010E+01
ZR-88	2.550E+00	4.568E+00	4.300E+00
NB-95	6.122E+00	5.178E+00	5.909E+00
SN-113	3.813E+00	6.828E+00	7.450E+00
TL-208	4.047E+00	6.077E+00	6.643E+00
BI-212	5.779E+01	6.018E+01	9.508E+01
RA-226	3.622E+01	1.372E+02	1.194E+02
TH-232	1.614E+03	3.873E+03	3.425E+03
TH-234	1.134E+02	2.722E+02	2.612E+02
U-238	1.134E+02	2.722E+02	2.612E+02
AM-241	2.761E+01	3.201E+01	2.921E+01
ANH-511	4.330E+00	1.067E+01	5.460E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	1.695E+01	2.582E+01	5.520E+01	NOT IDENT.
NA-22	2.056E+00	3.483E+00	8.622E+00	NOT IDENT.
NA-24	6.652E+00	1.052E+01	2.453E+01	NOT IDENT.
AL-26	-3.358E+00	3.948E+00	5.797E+00	NOT IDENT.
K-40	-3.970E+01	5.776E+01	9.591E+01	NOT IDENT.
SC-46	-3.727E-01	3.759E+00	6.573E+00	NOT IDENT.
V-48	1.992E+00	3.910E+00	8.652E+00	NOT IDENT.
CR-51	-1.633E+01	2.559E+01	4.603E+01	NOT IDENT.
MN-52	4.091E+00	3.925E+00	1.072E+01	NOT IDENT.
MN-54	2.049E+00	3.427E+00	7.668E+00	NOT IDENT.
CO-56	9.224E-01	4.087E+00	8.369E+00	FAIL ABUN
CO-57	2.831E-01	2.006E+00	3.865E+00	NOT IDENT.
NI-57	-5.597E+00	7.944E+00	1.390E+01	NOT IDENT.
CO-58	-2.525E+00	2.539E+00	3.931E+00	NOT IDENT.
FE-59	2.105E+00	6.756E+00	1.469E+01	NOT IDENT.
CO-60	1.099E+00	4.535E+00	9.107E+00	NOT IDENT.
ZN-65	1.984E+00	5.233E+00	1.279E+01	NOT IDENT.
GE-68	-1.305E+01	1.005E+02	2.031E+02	NOT IDENT.

AS-73	-3.273E+01	1.325E+02	1.957E+02	NOT IDENT.
AS-74	4.332E-01	6.124E+00	1.163E+01	NOT IDENT.
SE-75	-7.525E-01	4.084E+00	7.106E+00	NOT IDENT.
BR-77	1.491E+01	2.489E+01	2.963E+01	FAIL ABUN
SR-82	4.450E+00	2.360E+01	4.900E+01	NOT IDENT.
RB-83	-1.534E+00	6.420E+00	1.184E+01	NOT IDENT.
RB-84	9.798E-01	5.132E+00	1.079E+01	NOT IDENT.
KR-85	1.009E+03	1.068E+03	2.011E+03	NOT IDENT.
SR-85	4.557E+00	4.823E+00	9.076E+00	NOT IDENT.
RB-86	7.413E+00	3.809E+01	8.376E+01	NOT IDENT.
Y-88	-1.747E+00	3.285E+00	5.901E+00	NOT IDENT.
Y-91	-1.129E+03	1.871E+03	3.156E+03	NOT IDENT.
NB-94	3.397E+00	3.988E+00	8.401E+00	NOT IDENT.
NB-95M	2.818E+00	1.034E+01	1.786E+01	NOT IDENT.
TC-95M	-4.422E+00	3.708E+00	5.201E+00	FAIL ABUN
ZR-95	5.384E+00	5.531E+00	1.313E+01	NOT IDENT.
MO-99	-3.191E+01	3.664E+01	6.030E+01	NOT IDENT.
TC-99M	6.762E+00	1.585E+01	3.091E+01	NOT IDENT.
RH-100	2.134E+00	8.486E+00	1.633E+01	NOT IDENT.
RH-101	2.744E-01	2.446E+00	4.699E+00	NOT IDENT.
RH-102M	-5.254E-01	2.975E+00	5.569E+00	FAIL ABUN
RU-103	-3.339E-01	3.749E+00	6.979E+00	FAIL ABUN
RH-106	2.060E+01	4.003E+01	7.963E+01	NOT IDENT.
RU-106	2.060E+01	4.003E+01	7.963E+01	NOT IDENT.
AG-108M	4.212E+00	4.112E+00	6.765E+00	FAIL ABUN
CD-109	1.415E-01	5.742E+01	1.113E+02	NOT IDENT.
AG-110	5.910E+01	6.600E+01	1.489E+02	NOT IDENT.
AG-110M	3.821E+00	4.399E+00	1.055E+01	FAIL ABUN
IN-111	1.576E+00	3.246E+00	6.133E+00	NOT IDENT.
IN-114M	-4.548E+00	1.474E+01	2.574E+01	NOT IDENT.
CD-115	-4.153E+00	1.510E+01	2.732E+01	NOT IDENT.
SN-117M	1.611E+00	2.353E+00	4.666E+00	NOT IDENT.
SB-122	-7.044E-01	4.802E+00	9.025E+00	NOT IDENT.
I-123	3.436E+00	5.852E+00	1.151E+01	NOT IDENT.
TE-123M	1.493E+00	2.294E+00	4.548E+00	NOT IDENT.
SB-124	5.453E+00	8.628E+00	2.175E+01	NOT IDENT.
SB-125	9.573E+00	1.003E+01	2.057E+01	NOT IDENT.
TE-125M	-1.481E+02	6.516E+02	1.215E+03	NOT IDENT.
I-126	5.132E+00	1.097E+01	2.239E+01	NOT IDENT.
SB-126	1.543E+00	6.776E+00	1.406E+01	FAIL ABUN
SN-126	-2.054E+00	5.904E+00	1.102E+01	FAIL ABUN
SB-127	1.425E+00	1.191E+01	2.259E+01	NOT IDENT.
TE-129	1.495E+01	4.174E+01	8.301E+01	NOT IDENT.
I-131	-8.342E-01	2.815E+00	4.757E+00	NOT IDENT.
I-132	-1.215E+01	7.026E+02	1.319E+03	NOT IDENT.
TE-132	1.842E+00	3.143E+00	6.060E+00	NOT IDENT.
BA-133	1.206E+00	4.111E+00	8.291E+00	NOT IDENT.
I-133	5.267E+00	7.196E+00	1.487E+01	NOT IDENT.
CS-134	-5.912E-01	4.085E+00	8.027E+00	NOT IDENT.
I-135	7.525E+01	1.100E+02	2.510E+02	FAIL ABUN
CS-136	3.721E+00	8.275E+00	1.237E+01	FAIL ABUN
BA-137M	-7.865E-01	4.040E+00	7.294E+00	NOT IDENT.
CS-137	-8.308E-01	4.268E+00	7.705E+00	NOT IDENT.
LA-138	2.939E+00	5.840E+00	1.419E+01	NOT IDENT.
CE-139	5.588E-01	2.342E+00	4.462E+00	NOT IDENT.
BA-140	1.037E+01	1.496E+01	3.078E+01	NOT IDENT.
LA-140	-4.090E+00	5.248E+00	8.219E+00	NOT IDENT.
CE-141	-7.822E+00	4.757E+00	7.089E+00	NOT IDENT.
CE-143	1.196E+00	8.331E+00	1.652E+01	NOT IDENT.
CE-144	-4.737E+00	1.725E+01	3.125E+01	NOT IDENT.
PM-144	-1.160E+00	5.292E+00	8.727E+00	NOT IDENT.
PR-144	-8.193E+01	3.936E+02	6.503E+02	NOT IDENT.
PM-146	3.226E+00	4.806E+00	9.934E+00	NOT IDENT.
ND-147	2.617E+01	2.803E+01	5.922E+01	NOT IDENT.
PM-147	-1.860E+04	5.744E+04	1.053E+05	NOT IDENT.
PM-149	6.475E+00	9.722E+01	1.757E+02	NOT IDENT.
EU-152	2.331E+00	1.003E+01	1.994E+01	NOT IDENT.
GD-153	0.000E+00	1.125E+01	1.399E+01	FAIL ABUN
EU-154	2.558E+00	1.080E+01	2.445E+01	NOT IDENT.
EU-155	5.910E+00	8.726E+00	1.781E+01	NOT IDENT.
TB-160	-1.377E+01	1.238E+01	1.897E+01	NOT IDENT.
HO-166M	-9.341E+00	8.330E+00	1.090E+01	FAIL ABUN
TM-171	9.906E+02	3.282E+03	5.294E+03	NOT IDENT.
LU-176	1.286E+00	2.502E+00	5.202E+00	NOT IDENT.
LU-177	-1.807E+01	2.405E+01	3.919E+01	NOT IDENT.
HF-181	-2.083E+00	3.342E+00	5.771E+00	FAIL ABUN
W-181	3.111E+01	3.606E+01	3.856E+01	FAIL ABUN
TA-182	3.865E+00	1.083E+01	2.610E+01	NOT IDENT.

RE-183	2.911E+01	3.375E+01	4.069E+01	FAIL ABUN
RE-184	-9.896E+00	8.909E+00	1.325E+01	FAIL ABUN
RE-188	-8.647E+00	1.367E+01	2.055E+01	FAIL ABUN
W-188	4.073E+02	5.867E+02	1.238E+03	FAIL ABUN
OS-191	-9.743E-01	6.154E+00	1.150E+01	FAIL ABUN
IR-192	1.642E+00	3.395E+00	6.865E+00	NOT IDENT.
PB-201	1.880E+00	1.288E+01	2.534E+01	NOT IDENT.
TL-201	5.257E+00	2.346E+01	4.159E+01	NOT IDENT.
TL-202	-9.731E-01	2.985E+00	5.500E+00	NOT IDENT.
HG-203	-1.204E+00	3.130E+00	5.235E+00	NOT IDENT.
PB-203	-1.520E+00	3.948E+00	6.604E+00	NOT IDENT.
TL-204	1.328E+01	4.233E+02	8.329E+02	NOT IDENT.
BI-207	1.413E+00	5.587E+00	1.170E+01	NOT IDENT.
PB-210	-6.527E+02	8.090E+02	1.080E+03	NOT IDENT.
BI-211	-7.389E+00	2.531E+01	4.606E+01	NOT IDENT.
PB-211	1.137E+01	7.128E+01	1.409E+02	NOT IDENT.
PB-212	6.382E+00	1.066E+01	1.293E+01	FAIL ABUN
BI-213	-3.832E+00	9.686E+00	1.768E+01	NOT IDENT.
BI-214	1.205E+01	1.301E+01	1.970E+01	FAIL ABUN
PB-214	-4.222E+00	8.886E+00	1.586E+01	NOT IDENT.
RN-219	-1.182E+01	4.275E+01	7.919E+01	NOT IDENT.
FR-221	9.691E+00	2.080E+01	3.947E+01	NOT IDENT.
RA-223	-1.794E+01	6.644E+01	1.248E+02	NOT IDENT.
RA-224	1.787E+01	5.119E+01	9.237E+01	NOT IDENT.
AC-225	1.020E+01	2.188E+01	4.153E+01	NOT IDENT.
AC-227	2.161E+01	2.891E+01	5.567E+01	NOT IDENT.
TH-227	2.161E+01	2.891E+01	5.567E+01	NOT IDENT.
AC-228	-1.100E+01	2.000E+01	3.501E+01	NOT IDENT.
RA-228	-1.100E+01	2.000E+01	3.501E+01	NOT IDENT.
TH-228	6.382E+00	1.066E+01	1.293E+01	FAIL ABUN
TH-229	-3.685E+00	4.773E+01	8.617E+01	NOT IDENT.
TH-230	-6.159E+02	9.990E+02	1.849E+03	NOT IDENT.
PA-231	-3.069E+01	4.420E+01	7.943E+01	NOT IDENT.
TH-231	-2.394E+01	4.352E+01	6.973E+01	NOT IDENT.
PA-233	-7.432E+00	8.369E+00	1.354E+01	FAIL ABUN
PA-234	1.532E+01	3.369E+01	7.237E+01	FAIL ABUN
PA-234M	4.087E+02	4.444E+02	1.056E+03	FAIL ABUN
U-234	-1.965E+03	1.168E+04	1.750E+04	NOT IDENT.
U-235	-6.427E+00	2.047E+01	3.584E+01	FAIL ABUN
NP-237	-7.432E+00	8.369E+00	1.354E+01	FAIL ABUN
NP-238	7.291E+00	1.973E+01	4.233E+01	NOT IDENT.
NP-239	1.329E+01	1.960E+01	4.065E+01	NOT IDENT.
AM-242	7.287E+00	5.556E+01	1.011E+02	NOT IDENT.
AM-243	-3.133E+00	4.959E+00	8.356E+00	NOT IDENT.
CM-243	-1.598E+00	8.246E+00	1.556E+01	NOT IDENT.
BK-247	-8.147E+00	8.916E+00	1.368E+01	NOT IDENT.
CM-247	1.055E-01	3.736E+00	7.256E+00	NOT IDENT.
CF-249	-1.481E+00	4.532E+00	7.397E+00	NOT IDENT.
CF-251	-1.240E+00	1.284E+01	2.100E+01	NOT IDENT.
CF-252	6.031E+03	1.458E+04	2.765E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	58.87	22	51	1.04	117.39	114	8	3.09E-03	59.1	
2	0	63.49	30	64	1.01	126.62	123	8	4.11E-03	50.4	
3	0	92.65	74	50	1.38	184.90	182	8	1.02E-02	20.3	
4	0	97.77	40	40	2.43	195.13	191	8	5.56E-03	31.6	
5	0	173.21	26	85	4.97	345.90	336	15	3.60E-03	80.4	
6	0	185.74	61	77	0.92	370.93	367	9	8.48E-03	28.9	
7	0	238.53	31	46	0.88	476.43	473	10	4.33E-03	44.9	
8	0	368.37	16	26	3.28	735.94	730	11	2.27E-03	64.1	
9	0	392.11	11	25	0.75	783.37	777	10	1.51E-03	91.4	
10	0	433.54	16	14	2.07	866.18	862	9	2.17E-03	49.8	
11	0	511.06	157	36	1.36	1021.11	1013	16	2.18E-02	11.7	
12	0	581.97	18	12	1.79	1162.83	1156	12	2.50E-03	45.1	
13	0	608.84	26	14	2.13	1216.53	1212	11	3.57E-03	34.3	
14	0	676.65	11	10	0.66	1352.08	1348	10	1.51E-03	66.6	
15	0	698.36	15	12	3.33	1395.47	1390	9	2.04E-03	51.5	
16	0	714.11	9	4	0.80	1426.94	1424	7	1.18E-03	50.1	
17	0	728.48	11	6	2.35	1455.67	1450	11	1.46E-03	53.1	
18	0	750.81	15	6	1.84	1500.31	1495	10	2.02E-03	43.3	
19	0	765.76	16	8	3.03	1530.18	1524	11	2.20E-03	43.2	
20	0	896.08	15	0	1.56	1790.67	1783	13	2.08E-03	25.8	
21	0	940.89	4	12	0.54	1880.23	1872	10	5.30E-04	180.3	
22	0	1038.36	10	3	0.87	2075.07	2071	10	1.40E-03	43.4	
23	0	1047.36	6	8	1.41	2093.06	2085	12	7.84E-04	113.5	
24	0	1141.60	20	4	5.14	2281.43	2272	15	2.75E-03	31.1	
25	0	1334.79	13	0	0.83	2667.62	2662	12	1.81E-03	27.7	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
CU-67	91.27	28	7.00	3.545E+00	5.606E+01	6.830E+01	115.08
	93.31	28	16.10	3.545E+00	2.437E+01	2.970E+01	115.08
	184.58	10	48.70*	3.618E+00	2.670E+00	3.253E+00	386.62
ZR-88	392.87	11	97.29*	2.161E+00	2.535E+00	2.550E+00	182.76
NB-95	765.80	16	99.81*	1.282E+00	6.073E+00	6.122E+00	86.31
SN-113	391.70	11	64.97*	2.161E+00	3.796E+00	3.813E+00	182.76
TL-208	277.37	-----	6.60	2.772E+00	-----	Line Not Found	-----
	583.19	11	85.00*	1.607E+00	4.044E+00	4.047E+00	153.22
	860.56	-----	12.50	1.157E+00	-----	Line Not Found	-----
BI-212	727.33	11	6.67*	1.338E+00	5.774E+01	5.779E+01	106.27
	1620.50	-----	1.47	6.671E-01	-----	Line Not Found	-----
RA-226	186.21	10	3.59*	3.618E+00	3.622E+01	3.622E+01	386.62
TH-232	63.81	13	0.26*	1.500E+00	1.614E+03	1.614E+03	244.86
	140.88	-----	0.02	4.072E+00	-----	Line Not Found	-----
TH-234	63.29	13	3.70*	1.500E+00	1.134E+02	1.134E+02	244.86
	92.59	28	4.23	3.545E+00	9.277E+01	9.277E+01	115.08
U-238	63.29	13	3.70*	1.500E+00	1.134E+02	1.134E+02	244.86
	92.59	28	4.23	3.545E+00	9.277E+01	9.277E+01	115.08
AM-241	59.54	22	35.90*	1.101E+00	2.761E+01	2.761E+01	118.28
ANH-511	511.00	16	100.00*	1.777E+00	4.330E+00	4.330E+00	251.48

Flag: "*" = Keyline

Total number of lines in spectrum 25
Number of unidentified lines 6
Number of lines tentatively identified by NID 19 76.00%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
CU-67	61.83H	1.22	2.670E+00	3.253E+00	12.58E+00	386.62	
ZR-88	83.40D	1.01	2.535E+00	2.550E+00	4.661E+00	182.76	
NB-95	64.03D	1.01	6.073E+00	6.122E+00	5.284E+00	86.31	
SN-113	115.09D	1.00	3.796E+00	3.813E+00	6.968E+00	182.76	
TL-208	1.91Y	1.00	4.044E+00	4.047E+00	6.201E+00	153.22	
BI-212	1.91Y	1.00	5.774E+01	5.779E+01	6.141E+01	106.27	
RA-226	1600.00Y	1.00	3.622E+01	3.622E+01	14.00E+01	386.62	
TH-232	1.41E+10Y	1.00	1.614E+03	1.614E+03	3.952E+03	244.86	
TH-234	4.47E+09Y	1.00	1.134E+02	1.134E+02	2.777E+02	244.86	
U-238	4.47E+09Y	1.00	1.134E+02	1.134E+02	2.777E+02	244.86	
AM-241	432.60Y	1.00	2.761E+01	2.761E+01	3.266E+01	118.28	
ANH-511	1.00E+09Y	1.00	4.330E+00	4.330E+00	10.89E+00	251.48	
Total Activity :			1.986E+03	1.987E+03			

Grand Total Activity : 1.986E+03 1.987E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	97.77	40	40	2.43	195.13	191	8	5.56E-03	63.2	3.74E+00	T
0	173.21	26	85	4.97	345.90	336	15	3.60E-03	****	3.76E+00	
0	238.53	17	46	0.88	476.43	473	10	2.42E-03	****	3.08E+00	T
0	368.37	16	26	3.28	735.94	730	11	2.27E-03	****	2.26E+00	
0	433.54	16	14	2.07	866.18	862	9	2.17E-03	99.6	2.01E+00	T
0	608.84	17	14	2.13	1216.53	1212	11	2.41E-03	****	1.55E+00	T
0	676.65	11	10	0.66	1352.08	1348	10	1.51E-03	****	1.42E+00	T
0	698.36	15	12	3.33	1395.47	1390	9	2.04E-03	****	1.39E+00	T
0	714.11	9	4	0.80	1426.94	1424	7	1.18E-03	****	1.36E+00	
0	750.81	15	6	1.84	1500.31	1495	10	2.02E-03	86.5	1.30E+00	T
0	896.08	15	0	1.56	1790.67	1783	13	2.08E-03	51.6	1.12E+00	T
0	940.89	4	12	0.54	1880.23	1872	10	5.30E-04	****	1.07E+00	
0	1038.36	10	3	0.87	2075.07	2071	10	1.40E-03	86.7	9.75E-01	T
0	1047.36	6	8	1.41	2093.06	2085	12	7.84E-04	****	9.67E-01	T
0	1141.60	20	4	5.14	2281.43	2272	15	2.75E-03	62.2	8.93E-01	
0	1334.79	13	0	0.83	2667.62	2662	12	1.81E-03	55.5	7.77E-01	

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                    *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292906.CNF;1 *
* Acquisition date   : 19-JAN-2023 16:37:07 Sensitivity      : 3.000          *
* Detector ID        : GAM23 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 02:00:02.05 Half life ratio : *****          *
* Sample date        : 19-JAN-2023 00:00:00 Nuclide Library : LIQUID          *
* Sample ID          : G1205292906 Analyst initials: MXR1          *
* Batch Number       : 2367950 Sample Quantity : 7.6489E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 3-MAY-2022 06:48:20 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM23_JAR.CNF;20          *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
CU-67	4.593E+00
ZR-88	1.832E+00
NB-95	2.432E+00
SN-113	3.252E+00
TL-208	2.835E+00
BI-212	4.012E+01
RA-226	5.460E+01
TH-232	1.546E+03
TH-234	1.185E+02
U-238	1.185E+02
AM-241	1.301E+01
ANH-511	2.357E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	2.418E+01	NOT IDENT.
NA-22	3.490E+00	NOT IDENT.
NA-24	1.030E+01	NOT IDENT.
AL-26	1.832E+00	NOT IDENT.
K-40	3.932E+01	NOT IDENT.
SC-46	2.692E+00	NOT IDENT.
V-48	3.658E+00	NOT IDENT.
CR-51	2.029E+01	NOT IDENT.
MN-52	4.365E+00	NOT IDENT.
MN-54	3.275E+00	NOT IDENT.
CO-56	3.616E+00	FAIL ABUN
CO-57	1.745E+00	NOT IDENT.
NI-57	5.435E+00	NOT IDENT.
CO-58	1.414E+00	NOT IDENT.
FE-59	6.063E+00	NOT IDENT.
CO-60	3.701E+00	NOT IDENT.
ZN-65	4.956E+00	NOT IDENT.
GE-68	7.963E+01	NOT IDENT.
AS-73	8.833E+01	NOT IDENT.

AS-74	5.081E+00	NOT IDENT.
SE-75	3.159E+00	NOT IDENT.
BR-77	1.366E+01	FAIL ABUN
SR-82	2.096E+01	NOT IDENT.
RB-83	5.076E+00	NOT IDENT.
RB-84	4.529E+00	NOT IDENT.
KR-85	9.184E+02	NOT IDENT.
SR-85	4.146E+00	NOT IDENT.
RB-86	3.351E+01	NOT IDENT.
Y-88	1.865E+00	NOT IDENT.
Y-91	1.276E+03	NOT IDENT.
NB-94	3.720E+00	NOT IDENT.
NB-95M	8.065E+00	NOT IDENT.
TC-95M	2.292E+00	FAIL ABUN
ZR-95	5.619E+00	NOT IDENT.
MO-99	2.517E+01	NOT IDENT.
TC-99M	1.408E+01	NOT IDENT.
RH-100	7.290E+00	NOT IDENT.
RH-101	2.114E+00	NOT IDENT.
RH-102M	2.413E+00	FAIL ABUN
RU-103	3.083E+00	FAIL ABUN
RH-106	3.544E+01	NOT IDENT.
RU-106	3.544E+01	NOT IDENT.
AG-108M	3.018E+00	FAIL ABUN
CD-109	5.028E+01	NOT IDENT.
AG-110	6.435E+01	NOT IDENT.
AG-110M	4.465E+00	FAIL ABUN
IN-111	2.788E+00	NOT IDENT.
IN-114M	1.167E+01	NOT IDENT.
CD-115	1.191E+01	NOT IDENT.
SN-117M	2.130E+00	NOT IDENT.
SB-122	3.826E+00	NOT IDENT.
I-123	5.246E+00	NOT IDENT.
TE-123M	2.072E+00	NOT IDENT.
SB-124	8.705E+00	NOT IDENT.
SB-125	9.189E+00	NOT IDENT.
TE-125M	5.461E+02	NOT IDENT.
I-126	9.740E+00	NOT IDENT.
SB-126	6.080E+00	FAIL ABUN
SN-126	4.971E+00	FAIL ABUN
SB-127	9.837E+00	NOT IDENT.
TE-129	3.697E+01	NOT IDENT.
I-131	1.998E+00	NOT IDENT.
I-132	5.663E+02	NOT IDENT.
TE-132	2.753E+00	NOT IDENT.
BA-133	3.685E+00	NOT IDENT.
I-133	6.644E+00	NOT IDENT.
CS-134	3.387E+00	NOT IDENT.
I-135	1.074E+02	FAIL ABUN
CS-136	5.294E+00	FAIL ABUN
BA-137M	3.138E+00	NOT IDENT.
CS-137	3.315E+00	NOT IDENT.
LA-138	5.707E+00	NOT IDENT.
CE-139	2.015E+00	NOT IDENT.
BA-140	1.374E+01	NOT IDENT.
LA-140	3.035E+00	NOT IDENT.
CE-141	3.200E+00	NOT IDENT.
CE-143	7.419E+00	NOT IDENT.
CE-144	1.417E+01	NOT IDENT.
PM-144	3.884E+00	NOT IDENT.
PR-144	2.896E+02	NOT IDENT.
PM-146	4.443E+00	NOT IDENT.
ND-147	2.654E+01	NOT IDENT.
PM-147	4.702E+04	NOT IDENT.
PM-149	7.793E+01	NOT IDENT.
EU-152	8.920E+00	NOT IDENT.
GD-153	6.380E+00	FAIL ABUN
EU-154	9.880E+00	NOT IDENT.
EU-155	8.110E+00	NOT IDENT.
TB-160	7.528E+00	NOT IDENT.
HO-166M	4.549E+00	FAIL ABUN
TM-171	2.414E+03	NOT IDENT.
LU-176	2.327E+00	NOT IDENT.
LU-177	1.755E+01	NOT IDENT.
HF-181	2.436E+00	FAIL ABUN
W-181	1.718E+01	FAIL ABUN
TA-182	1.011E+01	NOT IDENT.
RE-183	1.846E+01	FAIL ABUN

RE-184	5.027E+00	FAIL ABUN
RE-188	9.196E+00	FAIL ABUN
W-188	5.570E+02	FAIL ABUN
OS-191	5.122E+00	FAIL ABUN
IR-192	3.113E+00	NOT IDENT.
PB-201	1.137E+01	NOT IDENT.
TL-201	1.875E+01	NOT IDENT.
TL-202	2.370E+00	NOT IDENT.
HG-203	2.320E+00	NOT IDENT.
PB-203	2.927E+00	NOT IDENT.
TL-204	3.773E+02	NOT IDENT.
BI-207	4.917E+00	NOT IDENT.
PB-210	4.837E+02	NOT IDENT.
BI-211	2.085E+01	NOT IDENT.
PB-211	6.215E+01	NOT IDENT.
PB-212	5.974E+00	FAIL ABUN
BI-213	7.555E+00	NOT IDENT.
BI-214	8.914E+00	FAIL ABUN
PB-214	7.133E+00	NOT IDENT.
RN-219	3.487E+01	NOT IDENT.
FR-221	1.796E+01	NOT IDENT.
RA-223	5.571E+01	NOT IDENT.
RA-224	4.090E+01	NOT IDENT.
AC-225	1.890E+01	NOT IDENT.
AC-227	2.546E+01	NOT IDENT.
TH-227	2.546E+01	NOT IDENT.
AC-228	1.517E+01	NOT IDENT.
RA-228	1.517E+01	NOT IDENT.
TH-228	5.974E+00	FAIL ABUN
TH-229	3.884E+01	NOT IDENT.
TH-230	8.315E+02	NOT IDENT.
PA-231	3.498E+01	NOT IDENT.
TH-231	3.165E+01	NOT IDENT.
PA-233	6.094E+00	FAIL ABUN
PA-234	3.098E+01	FAIL ABUN
PA-234M	4.499E+02	FAIL ABUN
U-234	7.914E+03	NOT IDENT.
U-235	1.643E+01	FAIL ABUN
NP-237	6.094E+00	FAIL ABUN
NP-238	1.790E+01	NOT IDENT.
NP-239	1.829E+01	NOT IDENT.
AM-242	4.571E+01	NOT IDENT.
AM-243	3.777E+00	NOT IDENT.
CM-243	6.965E+00	NOT IDENT.
BK-247	6.071E+00	NOT IDENT.
CM-247	3.195E+00	NOT IDENT.
CF-249	3.238E+00	NOT IDENT.
CF-251	9.471E+00	NOT IDENT.
CF-252	1.249E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292906.CNF;1
Acquisition date : 19-JAN-2023 16:37:07 Sensitivity : 3.000
Detector ID : GAM23 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:02.05 Half life ratio : *****
Sample date : 19-JAN-2023 00:00:00 Nuclide Library : LIQUID
Sample ID : G1205292906 Analyst initials: MXR1
Batch Number : 2367950 Sample Quantity : 7.6489E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 3-MAY-2022 06:48:20 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM23_JAR.CNF;20

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
CU-67	3.253E+00	1.233E+01	1.233E+01
ZR-88	2.550E+00	4.572E+00	4.573E+00
NB-95	6.122E+00	5.207E+00	5.208E+00
SN-113	3.813E+00	6.835E+00	6.836E+00
TL-208	4.047E+00	6.087E+00	6.088E+00
BI-212	5.779E+01	6.041E+01	6.042E+01
RA-226	3.622E+01	1.373E+02	1.373E+02
TH-232	1.614E+03	3.880E+03	3.880E+03
TH-234	1.134E+02	2.735E+02	2.735E+02
U-238	1.134E+02	2.735E+02	2.735E+02
AM-241	2.761E+01	3.215E+01	3.216E+01
ANH-511	4.330E+00	1.068E+01	1.068E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	1.695E+01	2.586E+01	2.697E+01	NOT IDENT.
NA-22	2.056E+00	3.489E+00	3.610E+00	NOT IDENT.
NA-24	6.652E+00	1.055E+01	1.097E+01	NOT IDENT.
AL-26	-3.358E+00	3.957E+00	4.237E+00	NOT IDENT.
K-40	-3.970E+01	5.793E+01	6.064E+01	NOT IDENT.
SC-46	-3.727E-01	3.759E+00	3.763E+00	NOT IDENT.
V-48	1.992E+00	3.915E+00	4.017E+00	NOT IDENT.
CR-51	-1.633E+01	2.563E+01	2.667E+01	NOT IDENT.
MN-52	4.091E+00	3.950E+00	4.360E+00	NOT IDENT.
MN-54	2.049E+00	3.432E+00	3.554E+00	NOT IDENT.
CO-56	9.224E-01	4.088E+00	4.109E+00	FAIL ABUN
CO-57	2.831E-01	2.007E+00	2.011E+00	NOT IDENT.
NI-57	-5.597E+00	7.974E+00	8.364E+00	NOT IDENT.
CO-58	-2.525E+00	2.549E+00	2.792E+00	NOT IDENT.
FE-59	2.105E+00	6.760E+00	6.827E+00	NOT IDENT.
CO-60	1.099E+00	4.537E+00	4.564E+00	NOT IDENT.
ZN-65	1.984E+00	5.236E+00	5.312E+00	NOT IDENT.
GE-68	-1.305E+01	1.005E+02	1.007E+02	NOT IDENT.

AS-73	-3.273E+01	1.327E+02	1.336E+02	NOT IDENT.
AS-74	4.332E-01	6.124E+00	6.128E+00	NOT IDENT.
SE-75	-7.525E-01	4.085E+00	4.099E+00	NOT IDENT.
BR-77	1.491E+01	2.493E+01	2.582E+01	FAIL ABUN
SR-82	4.450E+00	2.361E+01	2.369E+01	NOT IDENT.
RB-83	-1.534E+00	6.425E+00	6.462E+00	NOT IDENT.
RB-84	9.798E-01	5.133E+00	5.152E+00	NOT IDENT.
KR-85	1.009E+03	1.072E+03	1.165E+03	NOT IDENT.
SR-85	4.557E+00	4.838E+00	5.257E+00	NOT IDENT.
RB-86	7.413E+00	3.809E+01	3.824E+01	NOT IDENT.
Y-88	-1.747E+00	3.287E+00	3.381E+00	NOT IDENT.
Y-91	-1.129E+03	1.874E+03	1.942E+03	NOT IDENT.
NB-94	3.397E+00	3.998E+00	4.282E+00	NOT IDENT.
NB-95M	2.818E+00	1.034E+01	1.042E+01	NOT IDENT.
TC-95M	-4.422E+00	3.727E+00	4.227E+00	FAIL ABUN
ZR-95	5.384E+00	5.553E+00	6.061E+00	NOT IDENT.
MO-99	-3.191E+01	3.677E+01	3.949E+01	NOT IDENT.
TC-99M	6.762E+00	1.587E+01	1.616E+01	NOT IDENT.
RH-100	2.134E+00	8.488E+00	8.543E+00	NOT IDENT.
RH-101	2.744E-01	2.446E+00	2.449E+00	NOT IDENT.
RH-102M	-5.254E-01	2.976E+00	2.985E+00	FAIL ABUN
RU-103	-3.339E-01	3.750E+00	3.753E+00	FAIL ABUN
RH-106	2.060E+01	4.007E+01	4.114E+01	NOT IDENT.
RU-106	2.060E+01	4.007E+01	4.114E+01	NOT IDENT.
AG-108M	4.212E+00	4.127E+00	4.543E+00	FAIL ABUN
CD-109	1.415E-01	5.742E+01	5.742E+01	NOT IDENT.
AG-110	5.910E+01	6.618E+01	7.135E+01	NOT IDENT.
AG-110M	3.821E+00	4.415E+00	4.740E+00	FAIL ABUN
IN-111	1.576E+00	3.250E+00	3.327E+00	NOT IDENT.
IN-114M	-4.548E+00	1.475E+01	1.489E+01	NOT IDENT.
CD-115	-4.153E+00	1.511E+01	1.522E+01	NOT IDENT.
SN-117M	1.611E+00	2.356E+00	2.466E+00	NOT IDENT.
SB-122	-7.044E-01	4.803E+00	4.813E+00	NOT IDENT.
I-123	3.436E+00	5.858E+00	6.060E+00	NOT IDENT.
TE-123M	1.493E+00	2.297E+00	2.393E+00	NOT IDENT.
SB-124	5.453E+00	8.642E+00	8.985E+00	NOT IDENT.
SB-125	9.573E+00	1.007E+01	1.095E+01	NOT IDENT.
TE-125M	-1.481E+02	6.517E+02	6.551E+02	NOT IDENT.
I-126	5.132E+00	1.099E+01	1.123E+01	NOT IDENT.
SB-126	1.543E+00	6.779E+00	6.815E+00	FAIL ABUN
SN-126	-2.054E+00	5.907E+00	5.979E+00	FAIL ABUN
SB-127	1.425E+00	1.191E+01	1.193E+01	NOT IDENT.
TE-129	1.495E+01	4.182E+01	4.236E+01	NOT IDENT.
I-131	-8.342E-01	2.816E+00	2.841E+00	NOT IDENT.
I-132	-1.215E+01	7.026E+02	7.026E+02	NOT IDENT.
TE-132	1.842E+00	3.150E+00	3.257E+00	NOT IDENT.
BA-133	1.206E+00	4.113E+00	4.148E+00	NOT IDENT.
I-133	5.267E+00	7.215E+00	7.596E+00	NOT IDENT.
CS-134	-5.912E-01	4.085E+00	4.094E+00	NOT IDENT.
I-135	7.525E+01	1.103E+02	1.154E+02	FAIL ABUN
CS-136	3.721E+00	8.286E+00	8.455E+00	FAIL ABUN
BA-137M	-7.865E-01	4.041E+00	4.057E+00	NOT IDENT.
CS-137	-8.308E-01	4.269E+00	4.285E+00	NOT IDENT.
LA-138	2.939E+00	5.849E+00	5.997E+00	NOT IDENT.
CE-139	5.588E-01	2.345E+00	2.359E+00	NOT IDENT.
BA-140	1.037E+01	1.499E+01	1.570E+01	NOT IDENT.
LA-140	-4.090E+00	5.263E+00	5.577E+00	NOT IDENT.
CE-141	-7.822E+00	4.796E+00	5.955E+00	NOT IDENT.
CE-143	1.196E+00	8.332E+00	8.350E+00	NOT IDENT.
CE-144	-4.737E+00	1.725E+01	1.738E+01	NOT IDENT.
PM-144	-1.160E+00	5.293E+00	5.318E+00	NOT IDENT.
PR-144	-8.193E+01	3.937E+02	3.954E+02	NOT IDENT.
PM-146	3.226E+00	4.818E+00	5.033E+00	NOT IDENT.
ND-147	2.617E+01	2.812E+01	3.050E+01	NOT IDENT.
PM-147	-1.860E+04	5.746E+04	5.807E+04	NOT IDENT.
PM-149	6.475E+00	9.723E+01	9.727E+01	NOT IDENT.
EU-152	2.331E+00	1.003E+01	1.008E+01	NOT IDENT.
GD-153	1.816E+01	1.135E+01	1.400E+01	FAIL ABUN
EU-154	2.558E+00	1.080E+01	1.086E+01	NOT IDENT.
EU-155	5.910E+00	8.743E+00	9.141E+00	NOT IDENT.
TB-160	-1.377E+01	1.246E+01	1.392E+01	NOT IDENT.
HO-166M	-9.341E+00	8.375E+00	9.376E+00	FAIL ABUN
TM-171	9.906E+02	3.284E+03	3.315E+03	NOT IDENT.
LU-176	1.286E+00	2.505E+00	2.572E+00	NOT IDENT.
LU-177	-1.807E+01	2.410E+01	2.544E+01	NOT IDENT.
HF-181	-2.083E+00	3.347E+00	3.476E+00	FAIL ABUN
W-181	3.111E+01	3.701E+01	3.958E+01	FAIL ABUN
TA-182	3.865E+00	1.084E+01	1.098E+01	NOT IDENT.

RE-183	2.911E+01	3.396E+01	3.641E+01	FAIL ABUN
RE-184	-9.896E+00	8.981E+00	1.003E+01	FAIL ABUN
RE-188	-8.647E+00	1.369E+01	1.423E+01	FAIL ABUN
W-188	4.073E+02	5.895E+02	6.175E+02	FAIL ABUN
OS-191	-9.743E-01	6.154E+00	6.170E+00	FAIL ABUN
IR-192	1.642E+00	3.398E+00	3.478E+00	NOT IDENT.
PB-201	1.880E+00	1.289E+01	1.292E+01	NOT IDENT.
TL-201	5.257E+00	2.346E+01	2.358E+01	NOT IDENT.
TL-202	-9.731E-01	2.986E+00	3.018E+00	NOT IDENT.
HG-203	-1.204E+00	3.132E+00	3.179E+00	NOT IDENT.
PB-203	-1.520E+00	3.951E+00	4.010E+00	NOT IDENT.
TL-204	1.328E+01	4.233E+02	4.234E+02	NOT IDENT.
BI-207	1.413E+00	5.588E+00	5.624E+00	NOT IDENT.
PB-210	-6.527E+02	8.121E+02	8.638E+02	NOT IDENT.
BI-211	-7.389E+00	2.531E+01	2.553E+01	NOT IDENT.
PB-211	1.137E+01	7.129E+01	7.147E+01	NOT IDENT.
PB-212	6.382E+00	1.067E+01	1.105E+01	FAIL ABUN
BI-213	-3.832E+00	9.691E+00	9.844E+00	NOT IDENT.
BI-214	1.205E+01	1.305E+01	1.414E+01	FAIL ABUN
PB-214	-4.222E+00	8.894E+00	9.095E+00	NOT IDENT.
RN-219	-1.182E+01	4.278E+01	4.311E+01	NOT IDENT.
FR-221	9.691E+00	2.082E+01	2.127E+01	NOT IDENT.
RA-223	-1.794E+01	6.647E+01	6.696E+01	NOT IDENT.
RA-224	1.787E+01	5.122E+01	5.185E+01	NOT IDENT.
AC-225	1.020E+01	2.190E+01	2.238E+01	NOT IDENT.
AC-227	2.161E+01	2.910E+01	3.069E+01	NOT IDENT.
TH-227	2.161E+01	2.910E+01	3.069E+01	NOT IDENT.
AC-228	-1.100E+01	2.003E+01	2.064E+01	NOT IDENT.
RA-228	-1.100E+01	2.003E+01	2.064E+01	NOT IDENT.
TH-228	6.382E+00	1.067E+01	1.105E+01	FAIL ABUN
TH-229	-3.685E+00	4.773E+01	4.776E+01	NOT IDENT.
TH-230	-6.159E+02	1.005E+03	1.043E+03	NOT IDENT.
PA-231	-3.069E+01	4.476E+01	4.685E+01	NOT IDENT.
TH-231	-2.394E+01	4.366E+01	4.498E+01	NOT IDENT.
PA-233	-7.432E+00	8.400E+00	9.044E+00	FAIL ABUN
PA-234	1.532E+01	3.800E+01	3.862E+01	FAIL ABUN
PA-234M	4.087E+02	4.461E+02	4.827E+02	FAIL ABUN
U-234	-1.965E+03	1.168E+04	1.171E+04	NOT IDENT.
U-235	-6.427E+00	2.048E+01	2.068E+01	FAIL ABUN
NP-237	-7.432E+00	8.400E+00	9.044E+00	FAIL ABUN
NP-238	7.291E+00	1.974E+01	2.001E+01	NOT IDENT.
NP-239	1.329E+01	1.963E+01	2.053E+01	NOT IDENT.
AM-242	7.287E+00	5.558E+01	5.567E+01	NOT IDENT.
AM-243	-3.133E+00	4.966E+00	5.163E+00	NOT IDENT.
CM-243	-1.598E+00	8.248E+00	8.279E+00	NOT IDENT.
BK-247	-8.147E+00	9.091E+00	9.806E+00	NOT IDENT.
CM-247	1.055E-01	3.736E+00	3.736E+00	NOT IDENT.
CF-249	-1.481E+00	4.535E+00	4.584E+00	NOT IDENT.
CF-251	-1.240E+00	1.284E+01	1.285E+01	NOT IDENT.
CF-252	6.031E+03	1.558E+04	1.581E+04	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	24.7302	81.00	36.7644	121.12	27.7661
45.60	13.9069	81.07	36.7736	121.22	27.7734
46.54	32.1583	82.35	24.6309	121.78	31.5235
49.72	22.7679	82.47	24.6416	122.06	26.9076
51.35	20.0957	82.47	24.6419	123.07	31.6306
52.39	24.5348	83.79	32.1868	123.68	31.6812
53.20	27.5359	84.00	32.2109	127.16	25.3860
53.44	27.5698	84.21	33.0618	127.23	25.3900
56.28	27.9641	84.86	24.0254	129.43	24.5865
57.36	17.7546	85.43	26.5642	131.20	29.4447
57.53	17.7692	86.55	31.6691	133.02	29.5776
57.53	17.7694	86.79	31.6955	133.52	36.3011
57.98	22.2596	86.94	31.7123	135.34	39.3409
59.32	22.4016	87.09	31.7288	136.00	31.7155
59.54	22.4248	87.57	33.4543	136.28	25.9663
61.49	24.1368	88.03	29.3190	136.47	25.9783
63.00	32.4035	88.34	29.3502	140.51	28.1721
63.29	32.4456	88.47	29.3633	140.88	32.0861
63.58	28.9344	91.11	32.7312	143.76	28.3862
63.81	28.9640	91.27	32.7486	144.24	30.3775
64.28	29.0245	92.59	26.0872	145.44	41.2701
64.99	31.6692	93.31	26.1492	152.32	27.9406
65.08	31.6818	94.56	17.1237	152.43	27.9474
66.73	26.7625	94.65	17.1288	153.25	29.9973
66.98	26.7911	94.67	17.1298	154.21	30.0600
67.24	37.1367	97.43	24.1952	155.04	30.1144
67.67	35.6546	98.43	24.2716	156.02	30.1781
67.75	34.1158	98.44	24.2725	158.56	26.2971
68.89	28.8264	99.53	27.8350	158.97	26.3198
68.89	28.8269	100.11	23.2377	159.00	25.3090
69.67	25.7941	100.20	23.2442	162.33	26.5062
70.82	30.6282	102.03	29.8037	162.66	24.4841
70.82	30.6285	103.18	27.2693	163.33	20.4318
70.83	30.6297	103.37	27.2849	165.86	25.6733
72.81	31.6681	105.31	24.7884	167.43	24.7255
72.87	31.6757	106.12	35.4971	171.28	20.7648
74.66	31.1037	106.47	31.0923	176.31	23.7672
74.82	26.3351	109.28	29.5573	176.60	26.5784
74.97	26.3505	111.00	27.9034	177.52	23.8232
77.11	20.9338	111.76	35.1804	181.07	31.7459
79.69	26.8299	112.95	34.3937	184.41	34.0762
79.82	26.0300	116.24	29.2292	184.58	34.0874
80.02	26.0488	116.30	29.2341	185.72	38.4296
80.03	26.0493	116.74	18.2933	186.21	38.4648
80.12	26.0586	117.23	15.5702	190.27	36.6002
80.19	24.4363	119.76	21.2103	193.51	29.2359
80.22	24.4395	120.54	25.8751	197.03	23.9715
80.57	26.1021	120.90	24.9749	198.01	33.8367

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
201.83	29.6680	306.78	17.8905	492.35	19.3912
204.12	34.1981	308.46	30.7317	497.08	20.4887
205.31	23.2139	311.90	35.1451	511.00	13.4631
208.37	36.6688	316.51	24.9944	514.00	21.7981
210.85	37.9377	319.41	36.3219	520.40	14.6033
215.65	40.4896	320.08	26.8301	520.69	14.6067
218.12	27.1022	321.04	18.1956	522.65	10.4488
222.11	35.2326	323.87	26.9484	527.90	18.8818
227.09	26.3470	325.23	26.1200	529.59	18.9060
227.38	27.5050	328.76	24.4772	529.87	14.7075
228.16	24.0964	331.15	23.6673	531.02	13.6686
228.18	24.0970	333.37	27.2417	537.26	14.7884
235.69	24.7643	334.37	24.6327	539.51	20.1032
235.96	20.1292	338.28	28.2747	546.56	19.1433
238.63	25.6520	338.32	23.8579	552.55	18.1586
238.98	25.6654	340.48	22.1436	563.25	12.9155
240.99	15.6016	340.55	22.1456	564.24	11.8477
242.00	20.3125	344.28	21.3467	569.33	11.8903
244.70	35.2968	345.93	27.6226	569.50	11.8916
245.35	25.9091	351.06	21.5044	569.70	11.8934
250.62	18.9878	351.93	20.6276	582.08	10.9049
252.40	26.1750	356.01	18.0151	583.19	11.4592
252.80	28.5710	361.25	12.6807	595.83	15.4105
256.23	26.3182	364.49	12.2693	600.60	19.8765
260.90	33.7157	366.42	9.5618	604.72	19.9314
264.66	24.2084	383.85	24.0989	609.32	15.5489
265.00	35.1190	388.16	20.9441	610.33	13.3364
269.46	37.7694	388.63	16.7629	614.28	23.3994
271.23	34.1959	391.70	15.8794	618.01	14.5208
273.65	28.1808	392.87	11.2217	621.93	15.6777
276.40	17.2163	400.66	16.0174	630.19	16.8866
277.37	22.1638	401.32	21.6842	631.29	13.5190
277.60	22.1704	401.81	21.6945	632.98	14.6610
278.00	22.1819	402.40	17.9316	633.25	13.5356
278.43	19.7285	404.85	17.0273	634.78	14.6779
279.20	25.9200	410.95	19.9797	635.95	14.6890
279.54	25.9315	414.70	20.0498	636.99	7.9146
280.46	24.7266	423.72	16.3660	657.50	5.7259
283.69	21.1058	427.09	23.1753	657.76	9.1631
284.31	19.8804	427.87	8.6970	661.66	14.9255
285.41	23.6416	433.94	15.5456	664.57	12.6516
285.90	19.9214	439.51	16.5991	666.33	10.3627
287.50	24.9524	440.45	15.6354	666.50	10.3636
290.67	18.3727	446.15	15.7135	667.71	12.6758
293.27	24.2982	453.88	15.8190	677.62	10.4333
295.22	23.5173	459.60	17.8832	685.70	13.9780
295.96	36.9907	463.37	17.9403	692.65	14.0352
298.58	25.3027	468.07	18.0110	695.00	21.0820
299.98	21.9671	473.00	13.0611	696.49	25.3204
300.09	21.9703	475.06	16.1025	696.51	25.3204
300.13	21.9714	476.78	9.0705	697.00	23.9212
301.36	27.0827	477.60	10.0850	697.49	21.9925
302.85	27.1322	477.99	6.0530	702.65	10.5879
304.50	19.5405	482.18	16.1966	706.68	19.4568
304.85	17.8491	487.02	18.2926	711.68	22.7055

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
720.70	11.5892	911.20	11.7828	1298.22	2.7362
721.93	13.2544	923.98	12.8389	1312.11	6.4135
722.78	15.7088	926.36	9.8865	1332.49	4.6116
722.91	15.7099	935.54	9.5303	1362.15	6.5174
723.31	11.4277	937.49	12.7180	1365.19	8.3874
724.19	7.1460	944.13	9.5666	1368.63	4.6648
727.33	9.8432	945.96	7.9785	1377.63	9.3555
733.00	5.7451	946.00	7.9788	1384.29	11.2500
735.93	8.9911	949.00	5.9919	1408.01	10.3882
739.50	10.8109	954.55	10.0110	1434.09	0.9519
744.23	10.3230	962.31	7.0314	1435.80	2.8570
747.24	11.5809	964.08	10.0525	1457.56	7.6684
752.31	11.6129	966.17	10.0616	1460.82	6.7163
753.82	10.1695	968.97	6.0443	1489.16	5.8049
756.73	4.1574	983.53	6.0822	1553.35	5.9118
763.94	5.8430	984.45	7.0987	1596.21	5.9818
765.80	7.3110	996.26	10.1917	1620.50	7.0246
766.42	7.3135	1001.03	4.0848	1678.03	3.0565
766.84	11.7043	1004.73	8.1824	1690.97	2.0445
772.60	8.2549	1025.87	8.2543	1757.55	6.2379
776.52	10.1101	1028.54	10.3290	1764.49	8.3316
777.92	13.7965	1037.84	8.2944	1770.23	8.3434
778.90	7.3621	1038.76	3.1117	1771.35	6.2593
783.70	12.9161	1046.59	5.2023	1791.20	2.0966
788.74	15.7253	1048.07	6.6629	1808.65	5.2637
792.07	12.9725	1050.41	6.6691	1836.06	3.1792
795.86	11.1412	1063.66	7.3333		
801.95	15.8327	1077.00	4.2124		
802.10	12.1086	1077.34	5.2664		
810.29	7.4827	1083.85	5.2795		
810.45	8.4185	1085.87	9.5109		
810.76	8.4199	1099.25	5.3113		
815.77	8.4413	1107.22	3.1965		
818.51	13.1489	1111.64	7.4708		
822.65	8.4707	1112.07	6.4047		
832.01	11.3470	1112.84	5.3387		
834.85	6.6283	1115.54	2.1377		
835.15	7.5764	1120.29	4.2832		
836.80	12.3216	1120.55	4.2837		
846.77	11.4298	1121.30	4.2847		
856.80	6.6999	1129.67	5.3729		
860.56	7.6709	1131.51	7.5272		
871.09	13.4920	1173.23	7.6434		
873.19	8.6819	1177.95	5.4691		
875.33	6.7595	1189.05	6.5889		
879.38	14.5125	1204.77	11.0431		
880.51	8.7122	1221.41	2.2216		
881.60	7.7480	1231.02	5.5725		
883.24	5.8156	1235.36	4.4646		
884.68	3.8796	1238.28	6.7039		
889.28	7.7761	1260.41	6.3044		
894.76	9.7449	1271.87	7.2328		
898.04	6.2463	1274.44	4.5244		
903.28	11.7400	1274.54	2.7148		
907.67	11.7638	1291.59	4.5503		

VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 19:31:38.93

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*****
*                               GEL Laboratories LLC                               *
*                               2040 Savage Road                               *
*                               Charleston, SC 29407                           *
*****
Configuration   : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292907.CNF;1
Background file  : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM38.CNF;44
Background date  : 15-JAN-2023 11:46:19
Sample date      : 26-DEC-2022 07:23:00 Acquisition date : 19-JAN-2023 17:31:14
Sample ID        : G1205292907 Sample quantity : 7.39130E-01 FILTER
Detector name    : GAM38 Detector geometry: JAR
Elapsed live time: 0 02:00:00.00 Elapsed real time: 0 02:00:00.31 0.0%
Energy tolerance : 1.50000 keV Analyst Initials : MXR1
Abundance limit  : 75.00000 Sensitivity : 3.00000
Batch ID         : 2367950 Detector SN# :
Matrix Spike ID  : LCS ID :
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.89*	30	87	0.96	93.77	88	11	4.14E-03	75.0	
2	1	84.91*	5	39	0.91	169.83	164	14	7.32E-04	236.1	2.07E+00
3	1	87.41	17	43	0.92	174.83	164	14	2.41E-03	66.7	
4	0	186.31*	29	58	0.89	372.69	369	9	4.03E-03	57.6	
5	0	239.02*	5	58	0.89	478.13	474	10	7.16E-04	317.1	
6	0	273.31	23	17	1.73	546.74	543	7	3.17E-03	36.8	
7	0	329.18	16	23	1.46	658.49	656	6	2.20E-03	53.8	
8	0	477.55	36	16	1.59	955.27	951	10	5.03E-03	26.1	
9	0	511.21*	7	17	3.21	1022.61	1014	17	1.02E-03	215.9	
10	0	584.16*	7	15	1.68	1168.51	1163	13	9.49E-04	143.6	
11	0	609.78*	4	15	1.43	1219.75	1214	10	5.45E-04	219.9	
12	0	662.97*	3	10	1.18	1326.13	1322	7	3.62E-04	275.0	
13	0	721.46	11	3	1.51	1443.09	1440	6	1.53E-03	39.1	
14	0	863.64	8	4	0.92	1727.41	1724	8	1.06E-03	58.3	
15	0	897.30	11	6	0.78	1794.74	1790	10	1.59E-03	52.3	
16	0	941.38	16	6	3.80	1882.86	1875	13	2.17E-03	42.0	
17	0	962.52	10	7	2.49	1925.15	1920	9	1.45E-03	54.3	
18	0	1001.30*	10	3	0.52	2002.67	1996	13	1.36E-03	61.8	
19	0	1013.24	9	0	1.46	2026.56	2023	7	1.25E-03	33.3	
20	0	1188.53	6	7	1.11	2377.02	2370	10	8.01E-04	97.7	
21	0	1243.61	12	5	2.71	2487.15	2480	13	1.63E-03	52.7	
22	0	1462.79*	3	7	2.23	2925.28	2917	13	4.17E-04	226.6	
23	0	1847.83	6	0	1.37	3694.83	3691	8	8.33E-04	40.8	

Flag: "*" = Peak area was modified by background subtraction

VMS Nuclide Identification Report V3.1 Generated 19-JAN-2023 19:31:39

Configuration	: DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292907.CNF;1		
Analyses by	: PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4		
Sample title	: MXR1		
Sample date	: 26-DEC-2022 07:23:00	Acquisition date	: 19-JAN-2023 17:31:14
Sample ID	: G1205292907	Sample quantity	: 0.73913 FILTER
Sample type	: LIQUID	Sample geometry	:
Detector name	: GAMMA38	Detector geometry	: JAR
Elapsed live time	: 0 02:00:00.00	Elapsed real time	: 0 02:00:00.31 0.0%
Energy tolerance	: 1.50 keV	Half life ratio	: 10.00
Errors propagated	: No	Systematic Error	: 0.00 %
Efficiency type	: Empirical	Efficiencies at	: Peak Energy
Abundance limit	: 75.00		

Interference Report

No interference correction performed

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	36	10.44*	1.553E+00	1.133E+02	1.559E+02	52.28
CD-109	88.03	17	3.70*	5.120E+00	4.648E+01	4.822E+01	133.42
SN-126	64.28	-----	9.60	5.130E+00	-----	Line Not Found	-----
	86.94	17	8.90	5.120E+00	1.932E+01	1.932E+01	133.42
	87.57	17	37.00*	5.120E+00	4.648E+00	4.648E+00	133.42
BA-137M	661.66	3	89.90*	1.137E+00	1.295E+00	1.297E+00	550.01
CS-137	661.66	3	85.10*	1.137E+00	1.368E+00	1.370E+00	550.01
TL-208	277.37	-----	6.60	2.565E+00	-----	Line Not Found	-----
	583.19	7	85.00*	1.282E+00	3.185E+00	3.263E+00	287.23
	860.56	-----	12.50	8.897E-01	-----	Line Not Found	-----
PB-210	46.54	30	4.25*	4.529E+00	7.873E+01	7.890E+01	149.98
RA-226	186.21	29	3.59*	3.540E+00	1.161E+02	1.161E+02	115.20
TH-229	85.43	5	14.70	5.144E+00	3.540E+00	3.540E+00	472.17
	88.47	17	24.00	5.120E+00	7.165E+00	7.165E+00	133.42
	193.51	-----	4.41*	3.442E+00	-----	Line Not Found	-----
	210.85	-----	2.80	3.223E+00	-----	Line Not Found	-----
TH-231	84.21	5	6.60*	5.144E+00	7.886E+00	7.886E+00	472.17
ANH-511	511.00	7	100.00*	1.456E+00	2.549E+00	2.549E+00	431.78

Flag: "*" = Keyline

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                    *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292907.CNF;1 *
* Acquisition date   : 19-JAN-2023 17:31:14 Sensitivity      : 3.000          *
* Detector ID        : GAM38 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 02:00:00.31 Half life ratio : *****          *
* Sample date        : 26-DEC-2022 07:23:00 Analyst initials: MXR1          *
* Sample ID          : G1205292907 Sample Quantity : 7.3913E-01 FILTER *
* Batch Number       : 2367950 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000          *
* Nuclide Library    : LIQUID.NLB;28
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 22-APR-2022 08:42:40 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM38_JAR.CNF;2          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
BE-7	1.559E+02	7.986E+01	9.245E+01
CD-109	4.822E+01	6.305E+01	8.493E+01
SN-126	4.648E+00	6.077E+00	7.754E+00
BA-137M	1.297E+00	6.990E+00	1.065E+01
CS-137	1.370E+00	7.384E+00	1.125E+01
TL-208	3.263E+00	9.186E+00	9.406E+00
PB-210	7.890E+01	1.160E+02	7.323E+01
RA-226	1.161E+02	1.310E+02	1.164E+02
TH-229	4.096E+01	5.922E+01	1.146E+02
TH-231	7.886E+00	3.649E+01	4.300E+01
ANH-511	2.549E+00	1.079E+01	7.165E+00

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
NA-22	4.587E+00	6.113E+00	1.428E+01	NOT IDENT.
NA-24	0.000E+00	3.349E+12	0.000E+00	SHORT HLIF
AL-26	1.133E+00	3.703E+00	1.023E+01	NOT IDENT.
K-40	3.491E+00	8.899E+01	1.806E+02	NOT IDENT.
SC-46	1.186E+00	4.903E+00	1.088E+01	NOT IDENT.
V-48	-2.171E+00	1.746E+01	3.402E+01	NOT IDENT.
CR-51	-9.280E+00	5.693E+01	9.886E+01	NOT IDENT.
MN-52	8.981E+01	1.128E+02	2.813E+02	NOT IDENT.
MN-54	-1.600E+00	5.009E+00	9.670E+00	NOT IDENT.
CO-56	-4.933E-01	6.327E+00	1.265E+01	NOT IDENT.
CO-57	-9.893E-01	2.022E+00	3.629E+00	NOT IDENT.
NI-57	0.000E+00	7.976E+05	0.000E+00	SHORT HLIF
CO-58	1.917E+00	5.669E+00	1.235E+01	NOT IDENT.
FE-59	-5.529E+00	1.391E+01	2.592E+01	NOT IDENT.
CO-60	-1.182E-01	3.467E+00	7.934E+00	NOT IDENT.
ZN-65	3.049E+00	1.120E+01	2.426E+01	NOT IDENT.
CU-67	-5.719E+03	4.695E+03	7.221E+03	NOT IDENT.
GE-68	-1.721E+01	1.501E+02	3.072E+02	NOT IDENT.
AS-73	8.278E+00	1.808E+01	3.302E+01	NOT IDENT.

AS-74	-7.038E+00	1.531E+01	2.739E+01	NOT IDENT.
SE-75	1.081E+00	4.939E+00	9.256E+00	NOT IDENT.
BR-77	0.000E+00	3.037E+04	0.000E+00	SHORT HLIF
SR-82	-6.748E+00	6.731E+01	1.247E+02	NOT IDENT.
RB-83	4.122E+00	8.817E+00	1.881E+01	NOT IDENT.
RB-84	5.707E-01	1.279E+01	2.602E+01	NOT IDENT.
KR-85	9.521E+02	1.155E+03	2.232E+03	NOT IDENT.
SR-85	5.516E+00	6.690E+00	1.293E+01	NOT IDENT.
RB-86	-3.758E+01	1.353E+02	2.641E+02	NOT IDENT.
Y-88	-1.526E+00	5.549E+00	1.170E+01	FAIL ABUN
ZR-88	-2.971E+00	4.076E+00	7.178E+00	NOT IDENT.
Y-91	-2.493E+03	2.975E+03	4.783E+03	NOT IDENT.
NB-94	9.960E-01	4.881E+00	9.589E+00	NOT IDENT.
NB-95	2.461E+00	5.229E+00	1.134E+01	NOT IDENT.
NB-95M	-7.067E+00	1.494E+01	2.294E+01	NOT IDENT.
TC-95M	1.625E-01	5.157E+00	9.403E+00	NOT IDENT.
ZR-95	1.006E+01	8.624E+00	2.162E+01	NOT IDENT.
MO-99	-2.156E+04	2.094E+04	2.801E+04	NOT IDENT.
TC-99M	0.000E+00	5.473E+29	0.000E+00	SHORT HLIF
RH-100	0.000E+00	1.881E+09	0.000E+00	SHORT HLIF
RH-101	2.359E+00	2.571E+00	5.298E+00	NOT IDENT.
RH-102M	1.515E+00	4.062E+00	7.638E+00	NOT IDENT.
RU-103	-1.336E+00	6.574E+00	1.229E+01	FAIL ABUN
RH-106	2.725E+01	4.759E+01	9.886E+01	NOT IDENT.
RU-106	2.725E+01	4.759E+01	9.886E+01	NOT IDENT.
AG-108M	2.764E+00	4.018E+00	8.424E+00	FAIL ABUN
AG-110	-3.743E+01	9.982E+01	1.788E+02	NOT IDENT.
AG-110M	1.604E-01	7.065E+00	1.453E+01	NOT IDENT.
IN-111	-3.531E+02	1.336E+03	2.309E+03	NOT IDENT.
SN-113	-3.983E+00	5.651E+00	9.996E+00	NOT IDENT.
IN-114M	-9.707E+00	2.210E+01	3.496E+01	NOT IDENT.
CD-115	0.000E+00	2.476E+04	0.000E+00	SHORT HLIF
SN-117M	1.256E+00	7.825E+00	1.482E+01	NOT IDENT.
SB-122	-4.912E+02	3.215E+03	5.979E+03	NOT IDENT.
I-123	0.000E+00	5.634E+13	0.000E+00	SHORT HLIF
TE-123M	-3.223E-02	2.747E+00	5.089E+00	NOT IDENT.
SB-124	-7.708E+00	1.639E+01	3.115E+01	FAIL ABUN
SB-125	1.154E+01	1.126E+01	2.491E+01	NOT IDENT.
TE-125M	-4.264E+02	7.210E+02	1.292E+03	NOT IDENT.
I-126	-2.976E+01	4.863E+01	6.897E+01	NOT IDENT.
SB-126	3.906E+01	2.994E+01	7.465E+01	FAIL ABUN
SB-127	-7.216E+02	9.599E+02	1.558E+03	NOT IDENT.
TE-129	3.200E+01	7.104E+01	1.483E+02	NOT IDENT.
I-131	-3.888E+01	2.773E+01	4.319E+01	NOT IDENT.
I-132	0.000E+00	1.501E+41	0.000E+00	SHORT HLIF
TE-132	-5.721E+02	6.647E+02	1.067E+03	NOT IDENT.
BA-133	8.144E-01	5.203E+00	1.031E+01	NOT IDENT.
I-133	0.000E+00	1.302E+09	0.000E+00	SHORT HLIF
CS-134	3.873E+00	5.723E+00	1.239E+01	NOT IDENT.
I-135	0.000E+00	1.352E+28	0.000E+00	SHORT HLIF
CS-136	-2.377E+01	2.519E+01	4.047E+01	FAIL ABUN
LA-138	3.714E+00	8.397E+00	1.945E+01	NOT IDENT.
CE-139	9.801E-01	3.059E+00	5.823E+00	NOT IDENT.
BA-140	-2.490E+01	5.836E+01	1.052E+02	NOT IDENT.
LA-140	-2.998E+00	1.639E+01	3.641E+01	FAIL ABUN
CE-141	-1.071E+01	8.351E+00	1.287E+01	NOT IDENT.
CE-143	0.000E+00	1.716E+06	0.000E+00	SHORT HLIF
CE-144	1.436E+00	1.707E+01	3.235E+01	NOT IDENT.
PM-144	-3.761E+00	5.033E+00	8.177E+00	FAIL ABUN
PR-144	-3.269E+02	3.863E+02	6.125E+02	NOT IDENT.
PM-146	2.246E+00	5.201E+00	1.079E+01	NOT IDENT.
ND-147	-1.270E+02	1.390E+02	2.152E+02	NOT IDENT.
PM-147	9.230E+03	5.909E+04	1.138E+05	NOT IDENT.
PM-149	0.000E+00	2.047E+05	0.000E+00	SHORT HLIF
EU-152	2.403E-01	9.249E+00	1.865E+01	NOT IDENT.
GD-153	-1.116E+01	6.403E+00	9.294E+00	NOT IDENT.
EU-154	1.340E+01	1.736E+01	4.061E+01	NOT IDENT.
EU-155	-2.632E+00	7.415E+00	1.366E+01	FAIL ABUN
TB-160	1.118E+01	2.149E+01	4.719E+01	FAIL ABUN
HO-166M	-1.672E+00	9.258E+00	1.694E+01	NOT IDENT.
TM-171	-4.086E+02	3.944E+02	5.458E+02	NOT IDENT.
LU-176	2.755E-01	3.389E+00	6.084E+00	FAIL ABUN
LU-177	-3.685E+02	3.204E+02	4.631E+02	NOT IDENT.
HF-181	-1.587E+00	7.541E+00	1.256E+01	NOT IDENT.
W-181	4.551E-01	5.809E+00	1.148E+01	NOT IDENT.
TA-182	-3.906E+00	2.016E+01	4.046E+01	FAIL ABUN
RE-183	4.644E-01	5.996E+00	1.184E+01	NOT IDENT.
RE-184	-2.176E+01	2.047E+01	3.021E+01	NOT IDENT.

RE-188	2.040E+00	1.602E+01	3.020E+01	FAIL ABUN
W-188	-1.335E+02	9.634E+02	1.683E+03	NOT IDENT.
OS-191	6.707E+00	2.151E+01	4.143E+01	NOT IDENT.
IR-192	1.200E+00	4.466E+00	8.332E+00	NOT IDENT.
PB-201	0.000E+00	4.057E+19	0.000E+00	SHORT HLIF
TL-201	4.762E+03	6.025E+03	1.191E+04	NOT IDENT.
TL-202	1.650E+00	1.445E+01	2.869E+01	NOT IDENT.
HG-203	-1.675E+00	4.863E+00	8.295E+00	NOT IDENT.
PB-203	0.000E+00	8.641E+03	0.000E+00	SHORT HLIF
TL-204	-4.078E+01	1.869E+02	3.579E+02	NOT IDENT.
BI-207	-1.715E+00	5.092E+00	1.006E+01	NOT IDENT.
BI-211	-4.432E+01	2.803E+01	4.548E+01	NOT IDENT.
PB-211	-3.728E+01	7.625E+01	1.400E+02	NOT IDENT.
BI-212	1.860E+01	6.807E+01	1.382E+02	NOT IDENT.
PB-212	2.114E+00	1.314E+01	1.497E+01	FAIL ABUN
BI-213	3.503E+00	1.173E+01	2.424E+01	NOT IDENT.
BI-214	3.560E+00	1.535E+01	2.261E+01	FAIL ABUN
PB-214	-1.733E+01	1.072E+01	1.736E+01	FAIL ABUN
RN-219	-7.051E+00	4.831E+01	9.274E+01	NOT IDENT.
FR-221	2.885E+00	2.454E+01	4.465E+01	NOT IDENT.
RA-223	-3.136E+00	8.145E+01	1.576E+02	FAIL ABUN
RA-224	4.721E+01	6.660E+01	1.243E+02	NOT IDENT.
AC-225	1.572E+01	1.338E+02	2.433E+02	NOT IDENT.
AC-227	-7.290E+00	2.861E+01	4.970E+01	NOT IDENT.
TH-227	-7.290E+00	2.861E+01	4.970E+01	NOT IDENT.
AC-228	-1.618E+01	2.463E+01	4.374E+01	NOT IDENT.
RA-228	-1.618E+01	2.463E+01	4.374E+01	NOT IDENT.
TH-228	2.114E+00	1.314E+01	1.497E+01	FAIL ABUN
TH-230	-6.759E-01	3.874E+02	7.586E+02	NOT IDENT.
PA-231	1.971E+01	6.002E+01	1.111E+02	NOT IDENT.
TH-232	-5.945E+02	9.438E+02	1.791E+03	NOT IDENT.
PA-233	-1.369E-02	7.430E+00	1.334E+01	NOT IDENT.
PA-234	3.218E+01	4.235E+01	9.291E+01	NOT IDENT.
PA-234M	7.657E+02	9.269E+02	1.574E+03	FAIL ABUN
TH-234	-2.273E+01	6.618E+01	1.276E+02	NOT IDENT.
U-234	6.593E+02	1.269E+03	2.336E+03	NOT IDENT.
U-235	-5.767E+00	2.230E+01	3.848E+01	FAIL ABUN
NP-237	-1.369E-02	7.430E+00	1.334E+01	NOT IDENT.
NP-238	0.000E+00	7.471E+04	0.000E+00	SHORT HLIF
U-238	-2.273E+01	6.618E+01	1.276E+02	NOT IDENT.
NP-239	-7.469E+00	2.193E+01	3.999E+01	NOT IDENT.
AM-241	2.959E+00	4.437E+00	9.174E+00	NOT IDENT.
AM-242	-1.090E+01	5.011E+01	8.831E+01	NOT IDENT.
AM-243	-3.659E+00	3.185E+00	5.879E+00	NOT IDENT.
CM-243	-5.102E-01	7.409E+00	1.408E+01	NOT IDENT.
BK-247	1.021E+00	8.541E+00	1.575E+01	FAIL ABUN
CM-247	1.533E-01	4.225E+00	8.360E+00	NOT IDENT.
CF-249	-1.999E+00	5.072E+00	9.375E+00	NOT IDENT.
CF-251	1.582E+00	1.239E+01	2.315E+01	NOT IDENT.
CF-252	4.072E+03	1.299E+04	2.545E+04	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.89	114	87	0.96	93.77	88	11	1.58E-02	18.7	2.07E+00
2	0	63.55	70	65	0.73	127.09	124	7	9.72E-03	22.5	
3	0	76.45	15	116	1.66	152.90	147	8	2.08E-03	128.1	
4	1	84.91	30	39	0.91	169.83	164	14	4.19E-03	37.1	
5	1	87.41	17	43	0.92	174.83	164	14	2.41E-03	66.7	
6	0	92.56	76	111	1.01	185.13	182	9	1.06E-02	27.2	
7	0	186.31	60	58	0.89	372.69	369	9	8.38E-03	26.4	
8	0	239.02	34	58	0.89	478.13	474	10	4.75E-03	44.9	
9	0	273.31	23	17	1.73	546.74	543	7	3.17E-03	36.8	
10	0	329.18	16	23	1.46	658.49	656	6	2.20E-03	53.8	
11	0	477.55	36	16	1.59	955.27	951	10	5.03E-03	26.1	
12	0	511.21	111	17	3.21	1022.61	1014	17	1.54E-02	12.7	
13	0	584.16	18	15	1.68	1168.51	1163	13	2.43E-03	52.9	
14	0	609.78	12	15	1.43	1219.75	1214	10	1.72E-03	64.7	
15	0	662.97	12	10	1.18	1326.13	1322	7	1.60E-03	54.6	
16	0	721.46	11	3	1.51	1443.09	1440	6	1.53E-03	39.1	
17	0	863.64	8	4	0.92	1727.41	1724	8	1.06E-03	58.3	
18	0	897.30	11	6	0.78	1794.74	1790	10	1.59E-03	52.3	
19	0	941.38	16	6	3.80	1882.86	1875	13	2.17E-03	42.0	
20	0	962.52	10	7	2.49	1925.15	1920	9	1.45E-03	54.3	
21	0	970.29	6	7	0.60	1940.68	1936	8	8.01E-04	93.3	
22	0	1001.30	15	3	0.52	2002.67	1996	13	2.06E-03	36.1	
23	0	1013.24	9	0	1.46	2026.56	2023	7	1.25E-03	33.3	
24	0	1188.53	6	7	1.11	2377.02	2370	10	8.01E-04	97.7	
25	0	1243.61	12	5	2.71	2487.15	2480	13	1.63E-03	52.7	
26	0	1462.79	13	7	2.23	2925.28	2917	13	1.74E-03	50.7	
27	0	1847.83	6	0	1.37	3694.83	3691	8	8.33E-04	40.8	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
BE-7	477.60	36	10.44*	1.553E+00	1.133E+02	1.559E+02	52.28
CD-109	88.03	17	3.70*	5.120E+00	4.648E+01	4.822E+01	133.42
SN-126	64.28	-----	9.60	5.130E+00	-----	Line Not Found	-----
	86.94	17	8.90	5.120E+00	1.932E+01	1.932E+01	133.42
	87.57	17	37.00*	5.120E+00	4.648E+00	4.648E+00	133.42
BA-137M	661.66	3	89.90*	1.137E+00	1.295E+00	1.297E+00	550.01
CS-137	661.66	3	85.10*	1.137E+00	1.368E+00	1.370E+00	550.01
TL-208	277.37	-----	6.60	2.565E+00	-----	Line Not Found	-----
	583.19	7	85.00*	1.282E+00	3.185E+00	3.263E+00	287.23
	860.56	-----	12.50	8.897E-01	-----	Line Not Found	-----
PB-210	46.54	30	4.25*	4.529E+00	7.873E+01	7.890E+01	149.98
RA-226	186.21	29	3.59*	3.540E+00	1.161E+02	1.161E+02	115.20
TH-229	85.43	5	14.70	5.144E+00	3.540E+00	3.540E+00	472.17
	88.47	17	24.00	5.120E+00	7.165E+00	7.165E+00	133.42
	193.51	-----	4.41*	3.442E+00	-----	Line Not Found	-----
	210.85	-----	2.80	3.223E+00	-----	Line Not Found	-----
TH-231	84.21	5	6.60*	5.144E+00	7.886E+00	7.886E+00	472.17
ANH-511	511.00	7	100.00*	1.456E+00	2.549E+00	2.549E+00	431.78

Flag: "*" = Keyline

Total number of lines in spectrum 23
Number of unidentified lines 6
Number of lines tentatively identified by NID 17 73.91%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BE-7	53.22D	1.38	1.133E+02	1.559E+02	0.815E+02	52.28	
CD-109	461.40D	1.04	4.648E+01	4.822E+01	6.433E+01	133.42	
SN-126	2.30E+05Y	1.00	4.648E+00	4.648E+00	6.201E+00	133.42	
BA-137M	30.08Y	1.00	1.295E+00	1.297E+00	7.132E+00	550.01	
CS-137	30.08Y	1.00	1.368E+00	1.370E+00	7.535E+00	550.01	
TL-208	1.91Y	1.02	3.185E+00	3.263E+00	9.373E+00	287.23	
PB-210	22.20Y	1.00	7.873E+01	7.890E+01	11.83E+01	149.98	
RA-226	1600.00Y	1.00	1.161E+02	1.161E+02	1.337E+02	115.20	
TH-229	7340.00Y	1.00	7.165E+00	7.165E+00	9.560E+00	133.42	K
TH-231	7.04E+08Y	1.00	7.886E+00	7.886E+00	37.23E+00	472.17	
ANH-511	1.00E+09Y	1.00	2.549E+00	2.549E+00	11.01E+00	431.78	
Total Activity :			3.827E+02	4.272E+02			

Grand Total Activity : 3.827E+02 4.272E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	239.02	5	58	0.89	478.13	474	10	7.16E-04	****	2.91E+00	T
0	273.31	23	17	1.73	546.74	543	7	3.17E-03	73.6	2.60E+00	T
0	329.18	16	23	1.46	658.49	656	6	2.20E-03	****	2.20E+00	T
0	609.78	4	15	1.43	1219.75	1214	10	5.45E-04	****	1.23E+00	T
0	721.46	11	3	1.51	1443.09	1440	6	1.53E-03	78.2	1.05E+00	T
0	863.64	8	4	0.92	1727.41	1724	8	1.06E-03	****	8.87E-01	
0	897.30	11	6	0.78	1794.74	1790	10	1.59E-03	****	8.56E-01	T
0	941.38	16	6	3.80	1882.86	1875	13	2.17E-03	84.0	8.19E-01	
0	962.52	10	7	2.49	1925.15	1920	9	1.45E-03	****	8.02E-01	T
0	1001.30	10	3	0.52	2002.67	1996	13	1.36E-03	****	7.74E-01	T
0	1013.24	9	0	1.46	2026.56	2023	7	1.25E-03	66.7	7.66E-01	
0	1188.53	6	7	1.11	2377.02	2370	10	8.01E-04	****	6.63E-01	T
0	1243.61	12	5	2.71	2487.15	2480	13	1.63E-03	****	6.37E-01	
0	1462.79	3	7	2.23	2925.28	2917	13	4.17E-04	****	5.53E-01	
0	1847.83	6	0	1.37	3694.83	3691	8	8.33E-04	81.6	4.54E-01	

Flags: "T" = Tentatively associated

```
*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*                                     DETECTOR AND SAMPLE DATA                *
*                                     *                                       *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292907.CNF;1 *
* Acquisition date   : 19-JAN-2023 17:31:14 Sensitivity      : 3.000          *
* Detector ID        : GAM38 Energy tolerance: 1.500          *
* Elapsed live time  : 0 02:00:00.00 Abundance limit : 75.000          *
* Elapsed real time  : 0 02:00:00.31 Half life ratio : *****          *
* Sample date        : 26-DEC-2022 07:23:00 Nuclide Library : LIQUID          *
* Sample ID          : G1205292907 Analyst initials: MXR1          *
* Batch Number       : 2367950 Sample Quantity : 7.3913E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight : 0.00000          *
*                                     Dry Weight : 0.00000          *
*****
*                                     CALIBRATION INFORMATION                  *
*                                     *                                       *
* Eff. Cal. date     : 22-APR-2022 08:42:40 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM38_JAR.CNF;2          *
*****
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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
BE-7	4.041E+01
CD-109	3.871E+01
SN-126	3.516E+00
BA-137M	4.653E+00
CS-137	4.916E+00
TL-208	4.059E+00
PB-210	3.303E+01
RA-226	5.281E+01
TH-229	5.278E+01
TH-231	1.949E+01
ANH-511	3.112E+00

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
NA-22	6.019E+00	NOT IDENT.
NA-24	0.000E+00	SHORT HLIF
AL-26	3.624E+00	NOT IDENT.
K-40	7.867E+01	NOT IDENT.
SC-46	4.466E+00	NOT IDENT.
V-48	1.449E+01	NOT IDENT.
CR-51	4.378E+01	NOT IDENT.
MN-52	1.153E+02	NOT IDENT.
MN-54	4.043E+00	NOT IDENT.
CO-56	5.379E+00	NOT IDENT.
CO-57	1.629E+00	NOT IDENT.
NI-57	0.000E+00	SHORT HLIF
CO-58	5.241E+00	NOT IDENT.
FE-59	1.046E+01	NOT IDENT.
CO-60	2.811E+00	NOT IDENT.
ZN-65	1.006E+01	NOT IDENT.
CU-67	3.326E+03	NOT IDENT.
GE-68	1.223E+02	NOT IDENT.
AS-73	1.482E+01	NOT IDENT.
AS-74	1.129E+01	NOT IDENT.

SE-75	4.126E+00	NOT IDENT.
BR-77	0.000E+00	SHORT HLIF
SR-82	5.328E+01	NOT IDENT.
RB-83	8.108E+00	NOT IDENT.
RB-84	1.109E+01	NOT IDENT.
KR-85	1.005E+03	NOT IDENT.
SR-85	5.824E+00	NOT IDENT.
RB-86	1.048E+02	NOT IDENT.
Y-88	4.071E+00	FAIL ABUN
ZR-88	3.127E+00	NOT IDENT.
Y-91	1.853E+03	NOT IDENT.
NB-94	4.156E+00	NOT IDENT.
NB-95	4.767E+00	NOT IDENT.
NB-95M	1.025E+01	NOT IDENT.
TC-95M	4.269E+00	NOT IDENT.
ZR-95	9.173E+00	NOT IDENT.
MO-99	1.136E+04	NOT IDENT.
TC-99M	0.000E+00	SHORT HLIF
RH-100	0.000E+00	SHORT HLIF
RH-101	2.422E+00	NOT IDENT.
RH-102M	3.351E+00	NOT IDENT.
RU-103	5.371E+00	FAIL ABUN
RH-106	4.345E+01	NOT IDENT.
RU-106	4.345E+01	NOT IDENT.
AG-108M	3.767E+00	FAIL ABUN
AG-110	7.515E+01	NOT IDENT.
AG-110M	6.102E+00	NOT IDENT.
IN-111	1.046E+03	NOT IDENT.
SN-113	4.346E+00	NOT IDENT.
IN-114M	1.570E+01	NOT IDENT.
CD-115	0.000E+00	SHORT HLIF
SN-117M	6.714E+00	NOT IDENT.
SB-122	2.617E+03	NOT IDENT.
I-123	0.000E+00	SHORT HLIF
TE-123M	2.307E+00	NOT IDENT.
SB-124	1.166E+01	FAIL ABUN
SB-125	1.110E+01	NOT IDENT.
TE-125M	5.751E+02	NOT IDENT.
I-126	2.764E+01	NOT IDENT.
SB-126	3.254E+01	FAIL ABUN
SB-127	6.404E+02	NOT IDENT.
TE-129	6.502E+01	NOT IDENT.
I-131	1.812E+01	NOT IDENT.
I-132	0.000E+00	SHORT HLIF
TE-132	4.822E+02	NOT IDENT.
BA-133	4.616E+00	NOT IDENT.
I-133	0.000E+00	SHORT HLIF
CS-134	5.339E+00	NOT IDENT.
I-135	0.000E+00	SHORT HLIF
CS-136	1.604E+01	FAIL ABUN
LA-138	7.860E+00	NOT IDENT.
CE-139	2.660E+00	NOT IDENT.
BA-140	4.492E+01	NOT IDENT.
LA-140	1.290E+01	FAIL ABUN
CE-141	5.864E+00	NOT IDENT.
CE-143	0.000E+00	SHORT HLIF
CE-144	1.468E+01	NOT IDENT.
PM-144	3.423E+00	FAIL ABUN
PR-144	2.561E+02	NOT IDENT.
PM-146	4.743E+00	NOT IDENT.
ND-147	9.013E+01	NOT IDENT.
PM-147	5.160E+04	NOT IDENT.
PM-149	0.000E+00	SHORT HLIF
EU-152	8.102E+00	NOT IDENT.
GD-153	4.139E+00	NOT IDENT.
EU-154	1.715E+01	NOT IDENT.
EU-155	6.156E+00	FAIL ABUN
TB-160	2.029E+01	FAIL ABUN
HO-166M	7.280E+00	NOT IDENT.
TM-171	2.419E+02	NOT IDENT.
LU-176	2.730E+00	FAIL ABUN
LU-177	2.055E+02	NOT IDENT.
HF-181	5.452E+00	NOT IDENT.
W-181	5.248E+00	NOT IDENT.
TA-182	1.568E+01	FAIL ABUN
RE-183	5.414E+00	NOT IDENT.
RE-184	1.168E+01	NOT IDENT.
RE-188	1.371E+01	FAIL ABUN

W-188	7.532E+02	NOT IDENT.
OS-191	1.897E+01	NOT IDENT.
IR-192	3.709E+00	NOT IDENT.
PB-201	0.000E+00	SHORT HLIF
TL-201	5.479E+03	NOT IDENT.
TL-202	1.258E+01	NOT IDENT.
HG-203	3.674E+00	NOT IDENT.
PB-203	0.000E+00	SHORT HLIF
TL-204	1.620E+02	NOT IDENT.
BI-207	3.771E+00	NOT IDENT.
BI-211	2.018E+01	NOT IDENT.
PB-211	5.999E+01	NOT IDENT.
BI-212	5.896E+01	NOT IDENT.
PB-212	6.932E+00	FAIL ABUN
BI-213	1.054E+01	NOT IDENT.
BI-214	1.008E+01	FAIL ABUN
PB-214	7.751E+00	FAIL ABUN
RN-219	4.068E+01	NOT IDENT.
FR-221	2.041E+01	NOT IDENT.
RA-223	7.109E+01	FAIL ABUN
RA-224	5.626E+01	NOT IDENT.
AC-225	1.113E+02	NOT IDENT.
AC-227	2.222E+01	NOT IDENT.
TH-227	2.222E+01	NOT IDENT.
AC-228	1.870E+01	NOT IDENT.
RA-228	1.870E+01	NOT IDENT.
TH-228	6.932E+00	FAIL ABUN
TH-230	3.445E+02	NOT IDENT.
PA-231	5.019E+01	NOT IDENT.
TH-232	8.442E+02	NOT IDENT.
PA-233	5.898E+00	NOT IDENT.
PA-234	3.944E+01	NOT IDENT.
PA-234M	6.815E+02	FAIL ABUN
TH-234	6.021E+01	NOT IDENT.
U-234	1.050E+03	NOT IDENT.
U-235	1.775E+01	FAIL ABUN
NP-237	5.898E+00	NOT IDENT.
NP-238	0.000E+00	SHORT HLIF
U-238	6.021E+01	NOT IDENT.
NP-239	1.815E+01	NOT IDENT.
AM-241	4.209E+00	NOT IDENT.
AM-242	4.033E+01	NOT IDENT.
AM-243	2.744E+00	NOT IDENT.
CM-243	6.373E+00	NOT IDENT.
BK-247	7.021E+00	FAIL ABUN
CM-247	3.659E+00	NOT IDENT.
CF-249	4.138E+00	NOT IDENT.
CF-251	1.050E+01	NOT IDENT.
CF-252	1.165E+04	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292907.CNF;1
Acquisition date : 19-JAN-2023 17:31:14 Sensitivity : 3.000
Detector ID : GAM38 Energy tolerance: 1.500
Elapsed live time: 0 02:00:00.00 Abundance limit : 75.000
Elapsed real time: 0 02:00:00.31 Half life ratio : *****
Sample date : 26-DEC-2022 07:23:00 Nuclide Library : LIQUID
Sample ID : G1205292907 Analyst initials: MXR1
Batch Number : 2367950 Sample Quantity : 7.3913E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 22-APR-2022 08:42:40 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM38_JAR.CNF;2

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
BE-7	1.559E+02	8.103E+01	8.109E+01
CD-109	4.822E+01	6.323E+01	6.324E+01
SN-126	4.648E+00	6.090E+00	6.090E+00
BA-137M	1.297E+00	6.991E+00	6.991E+00
CS-137	1.370E+00	7.385E+00	7.385E+00
TL-208	3.263E+00	9.191E+00	9.191E+00
PB-210	7.890E+01	1.162E+02	1.162E+02
RA-226	1.161E+02	1.315E+02	1.315E+02
TH-229	4.096E+01	5.933E+01	5.934E+01
TH-231	7.886E+00	3.651E+01	3.651E+01
ANH-511	2.549E+00	1.079E+01	1.079E+01

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
NA-22	4.587E+00	6.125E+00	6.465E+00	NOT IDENT.
NA-24	8.212E+11	3.350E+12	3.370E+12	SHORT HLIF
AL-26	1.133E+00	3.704E+00	3.740E+00	NOT IDENT.
K-40	3.491E+00	8.899E+01	8.901E+01	NOT IDENT.
SC-46	1.186E+00	4.904E+00	4.933E+00	NOT IDENT.
V-48	-2.171E+00	1.746E+01	1.748E+01	NOT IDENT.
CR-51	-9.280E+00	5.693E+01	5.708E+01	NOT IDENT.
MN-52	8.981E+01	1.130E+02	1.201E+02	NOT IDENT.
MN-54	-1.600E+00	5.010E+00	5.062E+00	NOT IDENT.
CO-56	-4.933E-01	6.327E+00	6.331E+00	NOT IDENT.
CO-57	-9.893E-01	2.024E+00	2.073E+00	NOT IDENT.
NI-57	1.280E+05	7.977E+05	7.998E+05	SHORT HLIF
CO-58	1.917E+00	5.671E+00	5.737E+00	NOT IDENT.
FE-59	-5.529E+00	1.392E+01	1.414E+01	NOT IDENT.
CO-60	-1.182E-01	3.467E+00	3.468E+00	NOT IDENT.
ZN-65	3.049E+00	1.120E+01	1.128E+01	NOT IDENT.
CU-67	-5.719E+03	4.726E+03	5.385E+03	NOT IDENT.
GE-68	-1.721E+01	1.501E+02	1.503E+02	NOT IDENT.
AS-73	8.278E+00	1.816E+01	1.855E+01	NOT IDENT.

AS-74	-7.038E+00	1.533E+01	1.566E+01	NOT IDENT.
SE-75	1.081E+00	4.940E+00	4.964E+00	NOT IDENT.
BR-77	4.887E+03	3.037E+04	3.045E+04	SHORT HLIF
SR-82	-6.748E+00	6.731E+01	6.738E+01	NOT IDENT.
RB-83	4.122E+00	8.841E+00	9.034E+00	NOT IDENT.
RB-84	5.707E-01	1.279E+01	1.279E+01	NOT IDENT.
KR-85	9.521E+02	1.158E+03	1.235E+03	NOT IDENT.
SR-85	5.516E+00	6.708E+00	7.155E+00	NOT IDENT.
RB-86	-3.758E+01	1.353E+02	1.364E+02	NOT IDENT.
Y-88	-1.526E+00	5.550E+00	5.593E+00	FAIL ABUN
ZR-88	-2.971E+00	4.083E+00	4.298E+00	NOT IDENT.
Y-91	-2.493E+03	2.982E+03	3.187E+03	NOT IDENT.
NB-94	9.960E-01	4.881E+00	4.902E+00	NOT IDENT.
NB-95	2.461E+00	5.233E+00	5.349E+00	NOT IDENT.
NB-95M	-7.067E+00	1.496E+01	1.529E+01	NOT IDENT.
TC-95M	1.625E-01	5.157E+00	5.158E+00	NOT IDENT.
ZR-95	1.006E+01	8.667E+00	9.783E+00	NOT IDENT.
MO-99	-2.156E+04	2.104E+04	2.318E+04	NOT IDENT.
TC-99M	2.046E+29	5.479E+29	0.000E+00	SHORT HLIF
RH-100	-1.337E+08	1.882E+09	1.883E+09	SHORT HLIF
RH-101	2.359E+00	2.610E+00	2.819E+00	NOT IDENT.
RH-102M	1.515E+00	4.066E+00	4.123E+00	NOT IDENT.
RU-103	-1.336E+00	6.575E+00	6.603E+00	FAIL ABUN
RH-106	2.725E+01	4.767E+01	4.923E+01	NOT IDENT.
RU-106	2.725E+01	4.767E+01	4.923E+01	NOT IDENT.
AG-108M	2.764E+00	4.025E+00	4.214E+00	FAIL ABUN
AG-110	-3.743E+01	9.987E+01	1.013E+02	NOT IDENT.
AG-110M	1.604E-01	7.065E+00	7.065E+00	NOT IDENT.
IN-111	-3.531E+02	1.336E+03	1.346E+03	NOT IDENT.
SN-113	-3.983E+00	5.661E+00	5.939E+00	NOT IDENT.
IN-114M	-9.707E+00	2.212E+01	2.255E+01	NOT IDENT.
CD-115	-7.807E+03	2.477E+04	2.502E+04	SHORT HLIF
SN-117M	1.256E+00	7.826E+00	7.847E+00	NOT IDENT.
SB-122	-4.912E+02	3.215E+03	3.223E+03	NOT IDENT.
I-123	2.087E+11	5.634E+13	5.634E+13	SHORT HLIF
TE-123M	-3.223E-02	2.747E+00	2.747E+00	NOT IDENT.
SB-124	-7.708E+00	1.640E+01	1.676E+01	FAIL ABUN
SB-125	1.154E+01	1.130E+01	1.245E+01	NOT IDENT.
TE-125M	-4.264E+02	7.219E+02	7.471E+02	NOT IDENT.
I-126	-2.976E+01	4.871E+01	5.053E+01	NOT IDENT.
SB-126	3.906E+01	3.032E+01	3.507E+01	FAIL ABUN
SB-127	-7.216E+02	9.653E+02	1.019E+03	NOT IDENT.
TE-129	3.200E+01	7.126E+01	7.271E+01	NOT IDENT.
I-131	-3.888E+01	2.793E+01	3.298E+01	NOT IDENT.
I-132	-1.000E+41	2.129E+41	0.000E+00	SHORT HLIF
TE-132	-5.721E+02	6.679E+02	7.161E+02	NOT IDENT.
BA-133	8.144E-01	5.203E+00	5.216E+00	NOT IDENT.
I-133	-7.809E+08	1.309E+09	1.356E+09	SHORT HLIF
CS-134	3.873E+00	5.732E+00	5.993E+00	NOT IDENT.
I-135	-2.762E+27	1.361E+28	0.000E+00	SHORT HLIF
CS-136	-2.377E+01	2.533E+01	2.750E+01	FAIL ABUN
LA-138	3.714E+00	8.403E+00	8.568E+00	NOT IDENT.
CE-139	9.801E-01	3.067E+00	3.098E+00	NOT IDENT.
BA-140	-2.490E+01	5.840E+01	5.947E+01	NOT IDENT.
LA-140	-2.998E+00	1.639E+01	1.645E+01	FAIL ABUN
CE-141	-1.071E+01	8.402E+00	9.692E+00	NOT IDENT.
CE-143	1.257E+06	1.719E+06	1.810E+06	SHORT HLIF
CE-144	1.436E+00	1.707E+01	1.708E+01	NOT IDENT.
PM-144	-3.761E+00	5.043E+00	5.321E+00	FAIL ABUN
PR-144	-3.269E+02	3.873E+02	4.144E+02	NOT IDENT.
PM-146	2.246E+00	5.207E+00	5.305E+00	NOT IDENT.
ND-147	-1.270E+02	1.395E+02	1.508E+02	NOT IDENT.
PM-147	9.230E+03	5.909E+04	5.924E+04	NOT IDENT.
PM-149	3.976E+04	2.048E+05	2.056E+05	SHORT HLIF
EU-152	2.403E-01	9.249E+00	9.250E+00	NOT IDENT.
GD-153	-1.116E+01	6.470E+00	8.198E+00	NOT IDENT.
EU-154	1.340E+01	1.740E+01	1.842E+01	NOT IDENT.
EU-155	-2.632E+00	7.419E+00	7.514E+00	FAIL ABUN
TB-160	1.118E+01	2.151E+01	2.209E+01	FAIL ABUN
HO-166M	-1.672E+00	9.260E+00	9.290E+00	NOT IDENT.
TM-171	-4.086E+02	3.963E+02	4.371E+02	NOT IDENT.
LU-176	2.755E-01	3.389E+00	3.391E+00	FAIL ABUN
LU-177	-3.685E+02	3.221E+02	3.625E+02	NOT IDENT.
HF-181	-1.587E+00	7.542E+00	7.576E+00	NOT IDENT.
W-181	4.551E-01	5.810E+00	5.814E+00	NOT IDENT.
TA-182	-3.906E+00	2.017E+01	2.024E+01	FAIL ABUN
RE-183	4.644E-01	5.996E+00	6.000E+00	NOT IDENT.
RE-184	-2.176E+01	2.060E+01	2.282E+01	NOT IDENT.

RE-188	2.040E+00	1.602E+01	1.605E+01	FAIL ABUN
W-188	-1.335E+02	9.636E+02	9.655E+02	NOT IDENT.
OS-191	6.707E+00	2.152E+01	2.173E+01	NOT IDENT.
IR-192	1.200E+00	4.467E+00	4.499E+00	NOT IDENT.
PB-201	-1.134E+19	4.073E+19	0.000E+00	SHORT HLIF
TL-201	4.762E+03	6.040E+03	6.411E+03	NOT IDENT.
TL-202	1.650E+00	1.445E+01	1.447E+01	NOT IDENT.
HG-203	-1.675E+00	4.865E+00	4.923E+00	NOT IDENT.
PB-203	-2.975E+03	8.644E+03	8.748E+03	SHORT HLIF
TL-204	-4.078E+01	1.869E+02	1.878E+02	NOT IDENT.
BI-207	-1.715E+00	5.094E+00	5.152E+00	NOT IDENT.
BI-211	-4.432E+01	2.828E+01	3.463E+01	NOT IDENT.
PB-211	-3.728E+01	7.632E+01	7.816E+01	NOT IDENT.
BI-212	1.860E+01	6.809E+01	6.861E+01	NOT IDENT.
PB-212	2.114E+00	1.314E+01	1.317E+01	FAIL ABUN
BI-213	3.503E+00	1.174E+01	1.184E+01	NOT IDENT.
BI-214	3.560E+00	1.535E+01	1.544E+01	FAIL ABUN
PB-214	-1.733E+01	1.081E+01	1.334E+01	FAIL ABUN
RN-219	-7.051E+00	4.832E+01	4.843E+01	NOT IDENT.
FR-221	2.885E+00	2.455E+01	2.458E+01	NOT IDENT.
RA-223	-3.136E+00	8.145E+01	8.146E+01	FAIL ABUN
RA-224	4.721E+01	6.674E+01	7.006E+01	NOT IDENT.
AC-225	1.572E+01	1.338E+02	1.340E+02	NOT IDENT.
AC-227	-7.290E+00	2.863E+01	2.881E+01	NOT IDENT.
TH-227	-7.290E+00	2.863E+01	2.881E+01	NOT IDENT.
AC-228	-1.618E+01	2.467E+01	2.572E+01	NOT IDENT.
RA-228	-1.618E+01	2.467E+01	2.572E+01	NOT IDENT.
TH-228	2.114E+00	1.314E+01	1.317E+01	FAIL ABUN
TH-230	-6.759E-01	3.874E+02	3.874E+02	NOT IDENT.
PA-231	1.971E+01	6.018E+01	6.083E+01	NOT IDENT.
TH-232	-5.945E+02	9.468E+02	9.840E+02	NOT IDENT.
PA-233	-1.369E-02	7.430E+00	7.430E+00	NOT IDENT.
PA-234	3.218E+01	5.616E+01	5.801E+01	NOT IDENT.
PA-234M	7.657E+02	9.291E+02	9.913E+02	FAIL ABUN
TH-234	-2.273E+01	6.638E+01	6.716E+01	NOT IDENT.
U-234	6.593E+02	1.271E+03	1.305E+03	NOT IDENT.
U-235	-5.767E+00	2.231E+01	2.246E+01	FAIL ABUN
NP-237	-1.369E-02	7.430E+00	7.430E+00	NOT IDENT.
NP-238	-6.483E+03	7.472E+04	7.477E+04	SHORT HLIF
U-238	-2.273E+01	6.638E+01	6.716E+01	NOT IDENT.
NP-239	-7.469E+00	2.194E+01	2.220E+01	NOT IDENT.
AM-241	2.959E+00	4.443E+00	4.640E+00	NOT IDENT.
AM-242	-1.090E+01	5.015E+01	5.039E+01	NOT IDENT.
AM-243	-3.659E+00	3.198E+00	3.599E+00	NOT IDENT.
CM-243	-5.102E-01	7.409E+00	7.413E+00	NOT IDENT.
BK-247	1.021E+00	8.544E+00	8.556E+00	FAIL ABUN
CM-247	1.533E-01	4.225E+00	4.225E+00	NOT IDENT.
CF-249	-1.999E+00	5.077E+00	5.156E+00	NOT IDENT.
CF-251	1.582E+00	1.239E+01	1.241E+01	NOT IDENT.
CF-252	4.072E+03	1.351E+04	1.363E+04	NOT IDENT.

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
74.66	33.7577	133.52	26.1184	116.30	28.9336
879.38	28.4290	364.49	26.1245	116.74	38.0164
46.54	28.5619	80.22	26.1274	117.23	44.4055
228.16	30.4519	711.68	28.3367	119.76	36.4725
52.39	29.2220	356.01	33.8337	120.54	30.1462
53.20	19.1539	323.87	37.1162	120.90	27.4292
53.44	19.1744	82.35	0.0000	264.66	27.4436
57.53	37.3337	82.47	28.5118	121.22	29.2800
293.27	0.0000	82.47	28.5121	344.28	37.5651
57.53	36.7820	83.79	31.3853	122.06	33.0060
482.18	36.7822	265.00	31.4061	1274.44	31.2467
57.98	36.8515	84.21	31.4270	123.68	24.8492
59.32	37.8136	84.86	0.0000	1377.63	0.0000
59.54	31.0351	193.51	31.5479	127.23	24.1264
155.04	51.1190	105.31	31.6581	129.43	34.5063
63.00	26.8646	86.79	31.6813	131.20	34.6440
129.43	26.8952	86.94	31.6963	133.02	32.9044
63.29	26.8952	87.09	31.7108	133.52	31.0583
290.67	31.5416	87.57	31.7578	135.34	31.1827
63.81	31.5701	88.03	35.7080	136.00	35.0127
87.57	47.0560	306.78	35.7419	136.28	32.1935
64.99	73.4853	88.47	39.1080	136.47	31.2593
65.08	74.2844	531.02	97.1418	739.50	39.1751
66.73	29.5895	184.58	97.1883	140.51	0.0000
66.98	30.3967	92.59	33.9368	140.88	38.2495
67.24	35.8877	93.31	45.0612	143.76	38.4814
67.67	32.8199	94.56	94.7174	144.24	37.5563
1221.41	32.8295	311.90	78.5248	145.44	54.0612
439.51	31.3986	946.00	78.5291	152.32	27.4095
70.82	31.3986	97.43	40.4358	152.43	27.4155
167.43	31.3992	98.43	28.4712	1048.07	34.3250
97.43	29.9145	98.44	28.4719	154.21	34.3901
70.82	33.9917	99.53	29.4239	155.04	30.5095
70.82	33.9917	103.37	29.4239	158.56	26.6234
279.20	0.0000	116.74	29.4239	158.97	0.0000
1063.66	42.1956	100.11	33.8054	159.00	31.7363
72.87	0.0000	100.20	33.8138	162.33	30.9399
351.06	42.2045	102.03	29.6270	537.26	30.9593
74.66	51.2837	103.18	32.3420	163.33	20.9987
238.63	51.3125	103.37	31.4841	165.86	32.1494
351.93	51.3125	105.31	33.4063	167.43	31.2351
238.63	51.3125	106.12	24.6681	245.35	26.3820
74.97	44.9215	106.47	30.8637	427.87	29.6912
77.11	45.2513	109.28	30.2027	176.60	29.7067
256.23	30.1568	111.00	27.6595	177.52	29.7549
79.82	30.1701	111.76	30.3951	181.07	30.9714
80.02	32.6373	208.37	34.0734	184.41	41.5326
80.03	32.6379	116.24	28.9292	184.58	41.5448

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
185.72	32.2592	300.09	28.0123	475.06	12.8930
186.21	32.2861	300.13	28.0137	696.49	16.2571
190.27	33.5547	301.36	24.3939	477.60	16.2675
193.51	33.7344	302.85	20.7696	477.99	16.2723
197.03	40.2892	304.50	24.4806	482.18	17.2844
198.01	35.0434	304.85	24.4897	487.02	12.5290
201.83	33.1201	306.78	24.5428	492.35	0.0000
204.12	32.1675	308.46	19.6714	497.08	18.4492
205.31	24.7077	311.90	19.7461	511.00	14.7139
208.37	35.6184	316.51	18.6058	514.00	16.2200
210.85	19.5024	319.41	24.8853	520.40	8.8879
215.65	33.8320	320.08	22.4132	520.69	0.0000
218.12	36.1471	321.04	23.6827	667.71	0.0000
222.11	33.0547	323.87	29.1724	527.90	0.0000
227.09	29.9647	325.23	19.0311	529.59	7.9518
227.38	27.7565	1596.21	23.8781	529.87	0.0000
228.16	44.4598	331.15	0.0000	531.02	14.9243
228.18	44.4611	333.37	24.2461	537.26	15.9883
235.69	31.4543	334.37	24.4398	539.51	0.0000
235.96	22.4756	338.28	20.3081	1260.41	0.0000
238.63	21.4310	911.20	20.3086	552.55	14.1367
238.98	0.0000	340.48	24.5938	795.86	17.2891
240.99	19.6143	340.55	24.5956	564.24	18.3179
242.00	30.2177	344.28	14.4731	569.33	21.4426
244.70	26.1582	345.93	19.6140	569.50	21.4452
245.35	35.2875	351.06	23.1438	569.70	17.3625
459.60	18.3413	351.93	27.4531	582.08	12.3550
685.70	25.2787	356.01	22.3961	583.19	13.3941
388.16	21.8429	361.25	0.0000	595.83	11.4252
256.23	27.7148	364.49	24.3188	600.60	16.6686
527.90	0.0000	366.42	19.1430	604.72	7.8336
264.66	19.8446	383.85	15.9218	609.32	11.5219
265.00	21.0207	388.16	23.9771	610.33	15.7214
269.46	34.4484	666.33	17.7686	614.28	11.3471
401.81	21.9696	391.70	23.1637	618.01	11.5837
273.65	20.4617	392.87	24.0804	621.93	11.6114
276.40	20.5304	400.66	14.3698	630.19	0.0000
583.19	16.6019	401.32	0.0000	631.29	4.2463
277.60	18.9790	401.81	18.8796	632.98	11.6888
402.40	23.7354	402.40	16.1913	633.25	10.6278
278.43	27.3097	404.85	17.1275	634.78	14.8927
279.20	0.0000	410.95	17.2195	635.95	9.5804
279.54	19.0234	720.70	14.5479	636.99	7.4563
280.46	21.4250	423.72	15.5768	657.50	12.9370
301.36	22.7034	427.09	13.7836	884.68	14.2329
284.31	26.3069	427.87	11.0339	661.66	16.2097
285.41	21.5524	433.94	15.7110	664.57	0.0000
285.90	0.0000	439.51	15.7836	666.33	11.3776
287.50	28.8076	440.45	12.0791	666.50	11.3784
290.67	26.5050	539.51	0.0000	667.71	0.0000
293.27	0.0000	453.88	13.1503	677.62	9.8148
295.22	29.0676	459.60	12.2668	685.70	14.2410
316.51	30.3047	463.37	18.9282	692.65	9.8972
298.58	21.8853	468.07	16.1481	695.00	14.3145
299.98	28.0088	473.00	12.8727	696.49	16.5308

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
696.51	17.6328	884.68	9.0695	1238.28	8.3008
697.00	17.6374	889.28	5.4529	1260.41	0.0000
697.49	17.6426	894.76	7.2881	1271.87	11.5391
702.65	12.1633	1836.06	8.7583	1274.44	4.1995
706.68	16.6229	903.28	12.5407	1274.54	4.1995
711.68	14.4457	907.67	0.0000	1291.59	4.2224
720.70	10.0492	911.20	10.0933	1298.22	0.0000
721.93	0.0000	984.45	0.0000	1312.11	5.3122
1690.97	8.3838	926.36	8.3123	1332.49	2.1383
722.91	8.3844	935.54	20.7689	1362.15	0.0000
723.31	11.7403	937.49	5.9389	1365.19	6.4790
756.73	13.4238	983.53	10.4221	1368.63	0.0000
727.33	8.9642	945.96	0.0000	1377.63	0.0000
733.00	7.8673	946.00	4.4701	1384.29	6.5160
735.93	12.3817	949.00	8.3919	1408.01	5.4681
739.50	12.4050	954.55	0.0000	1434.09	2.2039
1434.09	16.9574	962.31	8.4386	1435.80	3.3074
747.24	12.4547	964.08	10.5089	1457.56	0.0000
752.31	12.4873	966.17	15.0259	1460.82	5.5518
753.82	9.0889	968.97	5.6411	1489.16	5.5960
756.73	2.2756	983.53	12.2950	1553.35	0.0000
763.94	9.1357	984.45	0.0000	1596.21	2.7646
765.80	5.7153	996.26	9.1260	1620.50	2.7820
1001.03	4.5736	1001.03	7.6196	1678.03	0.0000
766.84	8.0055	1004.73	7.6306	1690.97	5.6637
772.60	0.0000	1025.87	0.0000	1757.55	0.0000
776.52	12.6413	1028.54	0.0000	1764.49	1.9219
777.92	11.5002	1037.84	5.7975	1770.23	5.7735
778.90	11.5059	1038.76	0.0000	1771.35	3.8500
783.70	12.6865	1046.59	5.8173	1791.20	0.0000
1435.80	12.7183	1048.07	12.6112	1808.65	0.9709
903.28	10.4231	1050.41	5.8257	1836.06	2.9313
795.86	6.9614	1063.66	4.8792		
801.95	9.3096	1077.00	6.8650		
802.10	9.3102	1077.34	5.8850		
810.29	8.7631	1083.85	3.9329		
810.45	7.8874	1085.87	8.8555		
810.76	7.8885	1099.25	8.8995		
815.77	11.4218	1107.22	0.0000		
818.51	7.9178	1111.64	6.9530		
822.65	0.0000	1112.07	8.9407		
832.01	8.8541	1112.84	7.9497		
834.85	11.5254	1115.54	5.9681		
835.15	7.9802	1120.29	8.9676		
836.80	0.0000	1120.55	8.9681		
846.77	11.5896	1121.30	5.9806		
856.80	8.9563	1808.65	7.9980		
860.56	7.1772	1131.51	0.0000		
871.09	6.3102	1332.49	7.1060		
873.19	9.9254	1177.95	6.1007		
875.33	0.0000	1189.05	3.2662		
879.38	8.1433	1204.77	10.2612		
880.51	12.6738	1221.41	5.1593		
881.60	10.8688	1231.02	7.2461		
883.24	9.0637	1235.36	6.2197		

VAX/VMS Nuclide Identification Report Generated 19-JAN-2023 16:36:53.56

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*****
*                               GEL Laboratories LLC                      *
*                               2040 Savage Road                        *
*                               Charleston, SC 29407                    *
*****
Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292908.CNF;1
Background file    : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]BKG_GAM28.CNF;597
Background date    : 15-JAN-2023 11:20:08
Sample date       : 19-JAN-2023 00:00:00 Acquisition date : 19-JAN-2023 16:21:23
Sample ID        : G1205292908 Sample quantity : 7.64890E-01 FILTER
Detector name     : GAM28 Detector geometry: JAR
Elapsed live time : 0 00:15:00.00 Elapsed real time: 0 00:15:02.24 0.2%
Energy tolerance  : 1.50000 keV Analyst Initials : MXR1
Abundance limit   : 75.00000 Sensitivity : 3.00000
Batch ID          : 2367950 Detector SN# :
Matrix Spike ID   : LCS ID :
*****
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BACKGROUND CORRECTED SAMPLE PEAK REPORT

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.49*	3908	2178	1.11	93.41	88	10	4.34E+00	2.7	
2	0	50.02	83	1119	1.11	100.47	99	5	9.18E-02	61.4	
3	0	59.51	11985	2376	1.10	119.45	113	12	1.33E+01	1.2	
4	0	121.17	16	371	0.81	242.69	242	6	1.83E-02	186.1	
5	0	135.20	49	313	1.04	270.73	269	6	5.42E-02	59.1	
6	0	334.92	50	367	2.31	669.99	664	11	5.56E-02	75.8	
7	0	433.28	21	304	0.73	866.62	866	8	2.33E-02	145.5	
8	0	661.48*	9113	179	1.52	1322.87	1317	15	1.01E+01	1.1	
9	0	679.44	35	34	1.16	1358.77	1355	8	3.91E-02	33.2	
10	0	746.08	15	69	0.63	1492.01	1485	9	1.66E-02	103.9	
11	0	753.63	32	43	1.89	1507.11	1503	8	3.54E-02	40.5	
12	0	1127.45	15	42	1.23	2254.64	2251	8	1.70E-02	76.7	
13	0	1172.78	2439	32	1.93	2345.30	2337	16	2.71E+00	2.1	
14	0	1177.76	11	18	0.96	2355.24	2352	8	1.26E-02	71.0	
15	0	1331.98	2280	20	2.00	2663.68	2653	20	2.53E+00	2.1	

Flag: "*" = Peak area was modified by background subtraction

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292908.CNF;1
Analyses by : PEAK V16.9,PEAKEFF V2.2,ENBACK V1.6,NID V3.4,INTERF V2.4
Sample title : MXR1
Sample date : 19-JAN-2023 00:00:00 Acquisition date : 19-JAN-2023 16:21:23
Sample ID : G1205292908 Sample quantity : 0.76489 FILTER
Sample type : LIQUID Sample geometry :
Detector name : GAMMA28 Detector geometry: JAR
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:02.24 0.2%
Energy tolerance : 1.50 keV Half life ratio : 10.00
Errors propagated: No Systematic Error : 0.00 %
Efficiency type : Empirical Efficiencies at : Peak Energy
Abundance limit : 75.00

Interference Report

Interfering		Interfered	
Nuclide	Line	Nuclide	Line
CO-57	122.06	PM-147	121.22

Nuclide Type:

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error	Status
CO-57	122.06	85.60*	4.666E+00	1.616E+01	1.619E+01	372.15	OK
	136.47	10.68	4.654E+00	3.855E+02	3.861E+02	118.22	OK
CO-60	1173.23	99.85	1.139E+00	8.419E+03	8.422E+03	4.18	OK
	1332.49	99.98*	1.026E+00	8.730E+03	8.732E+03	4.30	OK
BA-137M	661.66	89.90*	1.836E+00	2.168E+04	2.168E+04	2.20	OK
CS-137	661.66	85.10*	1.836E+00	2.290E+04	2.290E+04	2.20	OK
PB-210	46.54	4.25*	4.477E-01	8.065E+05	8.065E+05	5.50	OK
AM-241	59.54	35.90*	1.555E+00	8.427E+04	8.427E+04	2.45	OK

Flag: "*" = Keyline

```

*****
*                                     GEL Laboratories LLC                               *
*                                     2040 Savage Road                               *
*                                     Charleston, SC 29407                           *
*****
*                                     DETECTOR AND SAMPLE DATA                       *
*                                     *                                               *
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292908.CNF;1      *
* Acquisition date   : 19-JAN-2023 16:21:23 Sensitivity      : 3.000                *
* Detector ID        : GAM28 Energy tolerance: 1.500          *
* Elapsed live time  : 0 00:15:00.00 Abundance limit : 75.000    *
* Elapsed real time  : 0 00:15:02.24 Half life ratio : *****      *
* Sample date        : 19-JAN-2023 00:00:00 Analyst initials: MXR1      *
* Sample ID          : G1205292908 Sample Quantity : 7.6489E-01 FILTER *
* Batch Number       : 2367950 Wet Weight : 0.00000          *
* Wet wt corr        : 1.00000 Dry Weight : 0.00000           *
* Nuclide Library    : LIQUID.NLB;28                                             *
*****
*                                     CALIBRATION INFORMATION                       *
*                                     *                                               *
* Eff. Cal. date     : 4-APR-2022 06:19:42 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM28_JAR.CNF;15          *
*****

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Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Cnt uncert (1.96-sigma)	MDA (pCi/FILTER)
CO-57	1.619E+01	5.904E+01	7.685E+01
CO-60	8.732E+03	3.678E+02	6.826E+01
BA-137M	2.168E+04	4.675E+02	1.091E+02
CS-137	2.290E+04	4.938E+02	1.153E+02
PB-210	8.065E+05	4.345E+04	2.799E+04
AM-241	8.427E+04	2.021E+03	8.982E+02

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L. Cnt Uncert (1.96-sigma)	MDA (pCi/FILTER)	
BE-7	-1.325E+02	6.789E+02	1.187E+03	NOT IDENT.
NA-22	-7.880E-01	3.530E+01	6.981E+01	NOT IDENT.
NA-24	-2.893E+01	4.636E+01	8.246E+01	NOT IDENT.
AL-26	1.418E+00	2.402E+01	5.329E+01	NOT IDENT.
K-40	8.239E+01	2.491E+02	5.754E+02	NOT IDENT.
SC-46	2.602E+01	6.903E+01	1.232E+02	NOT IDENT.
V-48	-8.421E+00	7.652E+01	1.305E+02	NOT IDENT.
CR-51	-4.820E+02	4.837E+02	8.377E+02	NOT IDENT.
MN-52	-1.293E+01	1.907E+01	3.248E+01	NOT IDENT.
MN-54	-3.947E+01	6.679E+01	1.107E+02	NOT IDENT.
CO-56	-3.555E+01	6.280E+01	1.043E+02	NOT IDENT.
NI-57	-4.824E+01	5.142E+01	8.238E+01	NOT IDENT.
CO-58	-8.524E+00	5.498E+01	9.554E+01	NOT IDENT.
FE-59	5.624E+01	1.177E+02	2.263E+02	NOT IDENT.
ZN-65	-2.242E+01	1.380E+02	2.516E+02	NOT IDENT.
CU-67	2.925E+01	1.110E+02	1.894E+02	NOT IDENT.
GE-68	2.151E+02	2.153E+03	4.008E+03	NOT IDENT.
AS-73	-3.889E+03	3.709E+03	5.812E+03	NOT IDENT.
AS-74	-5.504E+01	9.060E+01	1.541E+02	NOT IDENT.
SE-75	-2.655E+01	8.434E+01	1.367E+02	FAIL ABUN
BR-77	-6.332E+01	2.604E+02	4.269E+02	NOT IDENT.
SR-82	1.998E+02	3.602E+02	6.665E+02	NOT IDENT.
RB-83	9.798E+01	1.248E+02	2.314E+02	NOT IDENT.
RB-84	-4.632E-01	9.566E+01	1.663E+02	NOT IDENT.

KR-85	-4.199E+03	1.290E+04	2.249E+04	NOT IDENT.
SR-85	-1.894E+01	5.818E+01	1.015E+02	NOT IDENT.
RB-86	2.552E+02	8.196E+02	1.549E+03	NOT IDENT.
Y-88	1.333E+01	2.859E+01	6.705E+01	NOT IDENT.
ZR-88	-4.292E+00	5.895E+01	1.051E+02	NOT IDENT.
Y-91	3.217E+03	1.695E+04	3.343E+04	NOT IDENT.
NB-94	-8.851E+00	4.987E+01	8.727E+01	NOT IDENT.
NB-95	-1.187E+01	5.336E+01	9.256E+01	NOT IDENT.
NB-95M	-3.802E+01	1.933E+02	3.172E+02	NOT IDENT.
TC-95M	3.765E+01	7.191E+01	1.230E+02	NOT IDENT.
ZR-95	-3.960E+01	1.018E+02	1.533E+02	NOT IDENT.
MO-99	-7.506E+01	5.262E+02	8.752E+02	NOT IDENT.
TC-99M	2.177E+01	2.965E+02	5.057E+02	NOT IDENT.
RH-100	-6.269E+01	1.078E+02	1.849E+02	NOT IDENT.
RH-101	-1.483E+01	5.632E+01	9.506E+01	NOT IDENT.
RH-102M	5.465E+01	7.408E+01	1.347E+02	NOT IDENT.
RU-103	5.054E+01	6.233E+01	1.156E+02	NOT IDENT.
RH-106	-6.517E+01	5.226E+02	9.196E+02	NOT IDENT.
RU-106	-6.517E+01	5.226E+02	9.196E+02	NOT IDENT.
AG-108M	3.669E+01	1.046E+02	1.312E+02	FAIL ABUN
CD-109	1.092E+03	1.264E+03	2.266E+03	NOT IDENT.
AG-110	6.669E+02	1.543E+03	2.508E+03	NOT IDENT.
AG-110M	-3.181E+01	9.162E+01	1.545E+02	NOT IDENT.
IN-111	-3.721E+01	6.171E+01	9.886E+01	NOT IDENT.
SN-113	-2.289E+01	8.650E+01	1.531E+02	NOT IDENT.
IN-114M	-6.187E+01	3.076E+02	5.092E+02	NOT IDENT.
CD-115	3.629E+02	2.422E+02	4.679E+02	NOT IDENT.
SN-117M	7.067E+00	4.732E+01	8.058E+01	NOT IDENT.
SB-122	-1.388E+01	8.555E+01	1.507E+02	NOT IDENT.
I-123	-1.615E+01	1.145E+02	1.922E+02	NOT IDENT.
TE-123M	-5.370E+00	4.799E+01	8.069E+01	NOT IDENT.
SB-124	3.118E+01	4.346E+01	1.181E+02	NOT IDENT.
SB-125	-1.255E+02	2.104E+02	3.644E+02	NOT IDENT.
TE-125M	-9.410E+03	1.415E+04	2.364E+04	NOT IDENT.
I-126	-2.523E+01	1.432E+02	2.253E+02	FAIL ABUN
SB-126	-8.880E+00	9.253E+01	1.634E+02	NOT IDENT.
SN-126	8.439E+01	1.260E+02	2.242E+02	NOT IDENT.
SB-127	4.811E+01	1.391E+02	2.566E+02	NOT IDENT.
TE-129	3.461E+02	9.400E+02	1.683E+03	NOT IDENT.
I-131	4.166E+01	6.978E+01	1.286E+02	NOT IDENT.
I-132	-5.236E+03	7.245E+03	1.053E+04	NOT IDENT.
TE-132	3.952E+01	6.327E+01	1.081E+02	FAIL ABUN
BA-133	-2.341E+01	8.459E+01	1.504E+02	NOT IDENT.
I-133	-8.067E+01	1.094E+02	1.858E+02	NOT IDENT.
CS-134	8.943E+00	5.920E+01	1.064E+02	NOT IDENT.
I-135	4.514E+01	5.545E+02	1.158E+03	NOT IDENT.
CS-136	7.215E+00	8.317E+01	1.556E+02	NOT IDENT.
LA-138	6.407E+00	2.695E+01	6.666E+01	NOT IDENT.
CE-139	2.615E+01	4.885E+01	8.461E+01	NOT IDENT.
BA-140	1.005E+02	2.202E+02	4.034E+02	NOT IDENT.
LA-140	9.332E+00	2.293E+01	5.702E+01	NOT IDENT.
CE-141	-1.421E+01	7.887E+01	1.329E+02	NOT IDENT.
CE-143	2.734E+01	1.483E+02	2.721E+02	NOT IDENT.
CE-144	-1.259E+02	3.818E+02	5.897E+02	NOT IDENT.
PM-144	-1.652E+01	4.983E+01	8.605E+01	NOT IDENT.
PR-144	-1.214E+03	3.702E+03	6.396E+03	NOT IDENT.
PM-146	5.470E+01	1.087E+02	1.958E+02	FAIL ABUN
ND-147	-5.266E+02	4.333E+02	7.120E+02	NOT IDENT.
PM-147	4.856E+05	1.771E+06	2.391E+06	FAIL ABUN
PM-149	-7.099E+02	1.801E+03	3.226E+03	NOT IDENT.
EU-152	-6.521E+01	1.896E+02	3.370E+02	FAIL ABUN
GD-153	6.602E+01	1.489E+02	2.617E+02	NOT IDENT.
EU-154	4.407E+00	9.815E+01	1.970E+02	NOT IDENT.
EU-155	1.490E+01	1.830E+02	3.164E+02	NOT IDENT.
TB-160	5.721E+01	2.213E+02	3.925E+02	FAIL ABUN
HO-166M	6.234E+01	8.551E+01	1.626E+02	FAIL ABUN
TM-171	-3.655E+04	8.679E+04	1.384E+05	FAIL ABUN
LU-176	3.653E+00	4.946E+01	9.012E+01	NOT IDENT.
LU-177	-1.009E+02	4.636E+02	7.652E+02	NOT IDENT.
HF-181	-1.978E+01	7.814E+01	1.367E+02	NOT IDENT.
W-181	0.000E+00	8.506E+02	1.716E+03	FAIL ABUN
TA-182	-1.020E+02	1.471E+02	2.570E+02	NOT IDENT.
RE-183	0.000E+00	8.858E+02	1.871E+03	FAIL ABUN
RE-184	-1.614E+01	1.831E+02	3.149E+02	NOT IDENT.
RE-188	-5.889E+01	2.500E+02	4.188E+02	NOT IDENT.
W-188	3.615E+02	1.150E+04	2.095E+04	NOT IDENT.
OS-191	4.015E+01	1.524E+02	2.628E+02	NOT IDENT.
IR-192	3.802E+01	5.610E+01	1.048E+02	NOT IDENT.

PB-201	2.391E+01	2.426E+02	3.972E+02	NOT IDENT.
TL-201	-1.623E+02	4.565E+02	7.576E+02	FAIL ABUN
TL-202	1.887E+01	7.912E+01	1.354E+02	NOT IDENT.
HG-203	-1.481E+01	5.697E+01	1.027E+02	NOT IDENT.
PB-203	-1.841E+01	7.084E+01	1.277E+02	NOT IDENT.
TL-204	2.854E+03	8.222E+03	1.459E+04	NOT IDENT.
BI-207	7.804E+01	9.685E+01	1.883E+02	NOT IDENT.
TL-208	-2.475E+01	6.026E+01	1.047E+02	NOT IDENT.
BI-211	4.224E+02	4.004E+02	7.541E+02	NOT IDENT.
PB-211	-5.633E+02	1.560E+03	2.740E+03	NOT IDENT.
BI-212	-1.846E+02	7.076E+02	1.231E+03	NOT IDENT.
PB-212	-1.438E+01	1.120E+02	1.847E+02	NOT IDENT.
BI-213	5.514E+01	2.593E+02	4.633E+02	NOT IDENT.
BI-214	6.680E+01	1.149E+02	2.127E+02	NOT IDENT.
PB-214	1.487E+02	1.489E+02	2.793E+02	NOT IDENT.
RN-219	-2.461E+02	8.595E+02	1.517E+03	NOT IDENT.
FR-221	-2.535E+02	4.380E+02	7.075E+02	NOT IDENT.
RA-223	5.959E+02	1.208E+03	2.234E+03	NOT IDENT.
RA-224	-3.981E+02	1.214E+03	1.974E+03	NOT IDENT.
AC-225	-2.659E+02	4.594E+02	7.420E+02	NOT IDENT.
RA-226	-5.774E+02	1.327E+03	2.191E+03	NOT IDENT.
AC-227	3.735E+02	4.857E+02	8.374E+02	FAIL ABUN
TH-227	3.735E+02	4.857E+02	8.374E+02	FAIL ABUN
AC-228	-2.916E+01	2.781E+02	4.779E+02	NOT IDENT.
RA-228	-2.916E+01	2.781E+02	4.779E+02	NOT IDENT.
TH-228	-1.438E+01	1.120E+02	1.847E+02	NOT IDENT.
TH-229	-4.265E+02	1.051E+03	1.724E+03	NOT IDENT.
TH-230	2.545E+03	2.003E+04	3.522E+04	NOT IDENT.
PA-231	6.957E+02	8.707E+02	1.634E+03	NOT IDENT.
TH-231	7.581E+02	7.404E+02	1.339E+03	NOT IDENT.
TH-232	-1.426E+04	3.696E+04	5.917E+04	NOT IDENT.
PA-233	2.006E+02	1.263E+02	2.434E+02	NOT IDENT.
PA-234	-3.808E+02	6.889E+02	1.131E+03	NOT IDENT.
PA-234M	-1.074E+04	7.510E+03	1.243E+04	NOT IDENT.
TH-234	1.167E+03	2.611E+03	4.359E+03	NOT IDENT.
U-234	-3.538E+05	3.230E+05	5.056E+05	FAIL ABUN
U-235	-1.624E+02	3.475E+02	5.789E+02	NOT IDENT.
NP-237	2.006E+02	1.263E+02	2.434E+02	NOT IDENT.
NP-238	-1.442E+01	3.714E+02	6.368E+02	NOT IDENT.
U-238	1.167E+03	2.611E+03	4.359E+03	NOT IDENT.
NP-239	-3.239E+02	4.785E+02	7.960E+02	NOT IDENT.
AM-242	-7.451E+02	1.171E+03	1.967E+03	FAIL ABUN
AM-243	4.366E+01	8.683E+01	1.547E+02	NOT IDENT.
CM-243	6.210E+01	1.884E+02	3.294E+02	NOT IDENT.
BK-247	2.650E+01	1.629E+02	2.709E+02	FAIL ABUN
CM-247	-3.273E+01	7.873E+01	1.381E+02	NOT IDENT.
CF-249	1.944E+01	8.529E+01	1.542E+02	NOT IDENT.
CF-251	1.678E+02	2.388E+02	4.147E+02	NOT IDENT.
CF-252	-1.553E+05	3.188E+05	5.384E+05	NOT IDENT.
ANH-511	1.894E+01	5.838E+01	1.087E+02	NOT IDENT.

PEAK REPORT WITHOUT BACKGROUND SUBTRACTION

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	46.49	3909	2178	1.11	93.41	88	10	4.34E+00	2.7	
2	0	50.02	83	1119	1.11	100.47	99	5	9.18E-02	61.4	
3	0	59.51	11985	2376	1.10	119.45	113	12	1.33E+01	1.2	
4	0	121.17	16	371	0.81	242.69	242	6	1.83E-02	186.1	
5	0	135.20	49	313	1.04	270.73	269	6	5.42E-02	59.1	
6	0	334.92	50	367	2.31	669.99	664	11	5.56E-02	75.8	
7	0	433.28	21	304	0.73	866.62	866	8	2.33E-02	145.5	
8	0	661.48	9114	179	1.52	1322.87	1317	15	1.01E+01	1.1	
9	0	679.44	35	34	1.16	1358.77	1355	8	3.91E-02	33.2	
10	0	746.08	15	69	0.63	1492.01	1485	9	1.66E-02	103.9	
11	0	753.63	32	43	1.89	1507.11	1503	8	3.54E-02	40.5	
12	0	1127.45	15	42	1.23	2254.64	2251	8	1.70E-02	76.7	
13	0	1172.78	2439	32	1.93	2345.30	2337	16	2.71E+00	2.1	
14	0	1177.76	11	18	0.96	2355.24	2352	8	1.26E-02	71.0	
15	0	1331.98	2280	20	2.00	2663.68	2653	20	2.53E+00	2.1	

Nuclide Line Activity Report

Nuclide Type:

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	2-Sigma %Error
CO-57	122.06	16	85.60*	4.666E+00	1.616E+01	1.619E+01	372.15
	136.47	49	10.68	4.654E+00	3.855E+02	3.861E+02	118.22
CO-60	1173.23	2439	99.85	1.139E+00	8.419E+03	8.422E+03	4.18
	1332.49	2280	99.98*	1.026E+00	8.730E+03	8.732E+03	4.30
BA-137M	661.66	9113	89.90*	1.836E+00	2.168E+04	2.168E+04	2.20
CS-137	661.66	9113	85.10*	1.836E+00	2.290E+04	2.290E+04	2.20
PM-147	121.22	16	0.00*	4.666E+00	4.854E+05	4.856E+05	372.15
PB-210	46.54	3908	4.25*	4.477E-01	8.065E+05	8.065E+05	5.50
AM-241	59.54	11985	35.90*	1.555E+00	8.427E+04	8.427E+04	2.45

Flag: "*" = Keyline

Total number of lines in spectrum 15
Number of unidentified lines 2
Number of lines tentatively identified by NID 13 86.67%

Nuclide Type :

Nuclide	Hlife	Decay	Uncorrected pCi/FILTER	Decay Corr pCi/FILTER	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
CO-57	271.74D	1.00	1.616E+01	1.619E+01	6.025E+01	372.15	
CO-60	1925.28D	1.00	8.730E+03	8.732E+03	0.375E+03	4.30	
BA-137M	30.08Y	1.00	2.168E+04	2.168E+04	0.048E+04	2.20	
CS-137	30.08Y	1.00	2.290E+04	2.290E+04	0.050E+04	2.20	
PM-147	2.62Y	1.00	4.854E+05	4.856E+05	18.07E+05	372.15	
PB-210	22.20Y	1.00	8.065E+05	8.065E+05	0.443E+05	5.50	
AM-241	432.60Y	1.00	8.427E+04	8.427E+04	0.206E+04	2.45	
Total Activity :			1.429E+06	1.430E+06			

Grand Total Activity : 1.429E+06 1.430E+06

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	50.02	83	1119	1.11	100.47	99	5	9.18E-02	****	6.95E-01	T
0	334.92	50	367	2.31	669.99	664	11	5.56E-02	****	2.94E+00	T
0	433.28	21	304	0.73	866.62	866	8	2.33E-02	****	2.48E+00	T
0	679.44	35	34	1.16	1358.77	1355	8	3.91E-02	66.5	1.80E+00	
0	746.08	15	69	0.63	1492.01	1485	9	1.66E-02	****	1.67E+00	T
0	753.63	32	43	1.89	1507.11	1503	8	3.54E-02	81.1	1.66E+00	T
0	1127.45	15	42	1.23	2254.64	2251	8	1.70E-02	****	1.18E+00	
0	1177.76	11	18	0.96	2355.24	2352	8	1.26E-02	****	1.14E+00	T

Flags: "T" = Tentatively associated

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*****
*                                     GEL Laboratories LLC                      *
*                                     2040 Savage Road                        *
*                                     Charleston, SC 29407                     *
*****
*
*                                     DETECTOR AND SAMPLE DATA                *
*
* Configuration      : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292908.CNF;1 *
* Acquisition date   : 19-JAN-2023 16:21:23 Sensitivity      : 3.000          *
* Detector ID        : GAM28 Energy tolerance: 1.500        *
* Elapsed live time  : 0 00:15:00.00 Abundance limit : 75.000      *
* Elapsed real time  : 0 00:15:02.24 Half life ratio  : *****        *
* Sample date        : 19-JAN-2023 00:00:00 Nuclide Library : LIQUID      *
* Sample ID          : G1205292908 Analyst initials: MXR1         *
* Batch Number       : 2367950 Sample Quantity : 7.6489E-01 FILTER *
* Wet wt corr        : 1.00000 Wet Weight      : 0.00000        *
*                                     Dry Weight    : 0.00000        *
*****
*
*                                     CALIBRATION INFORMATION                  *
*
* Eff. Cal. date     : 4-APR-2022 06:19:42 Eff. Geometry   : JAR          *
* Eff. File          : DKA100:[CANBERRA.GAMMA]EFF_GAM28_JAR.CNF;15        *
*****

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Combined Critical Level Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)
CO-57	3.711E+01
CO-60	2.895E+01
BA-137M	5.137E+01
CS-137	5.427E+01
PB-210	1.373E+04
AM-241	4.399E+02

---- Non-Identified Nuclides ----

Nuclide	Lc (pCi/FILTER)	
BE-7	5.719E+02	NOT IDENT.
NA-22	2.991E+01	NOT IDENT.
NA-24	2.990E+01	NOT IDENT.
AL-26	2.032E+01	NOT IDENT.
K-40	2.356E+02	NOT IDENT.
SC-46	5.793E+01	NOT IDENT.
V-48	6.113E+01	NOT IDENT.
CR-51	4.010E+02	NOT IDENT.
MN-52	1.027E+01	NOT IDENT.
MN-54	5.186E+01	NOT IDENT.
CO-56	4.861E+01	NOT IDENT.
NI-57	3.222E+01	NOT IDENT.
CO-58	4.435E+01	NOT IDENT.
FE-59	1.053E+02	NOT IDENT.
ZN-65	1.170E+02	NOT IDENT.
CU-67	9.161E+01	NOT IDENT.
GE-68	1.870E+03	NOT IDENT.
AS-73	2.855E+03	NOT IDENT.
AS-74	7.241E+01	NOT IDENT.
SE-75	6.571E+01	FAIL ABUN
BR-77	2.058E+02	NOT IDENT.
SR-82	3.112E+02	NOT IDENT.
RB-83	1.103E+02	NOT IDENT.
RB-84	7.782E+01	NOT IDENT.
KR-85	1.069E+04	NOT IDENT.

SR-85	4.824E+01	NOT IDENT.
RB-86	7.236E+02	NOT IDENT.
Y-88	2.710E+01	NOT IDENT.
ZR-88	5.052E+01	NOT IDENT.
Y-91	1.487E+04	NOT IDENT.
NB-94	4.061E+01	NOT IDENT.
NB-95	4.302E+01	NOT IDENT.
NB-95M	1.528E+02	NOT IDENT.
TC-95M	5.942E+01	NOT IDENT.
ZR-95	7.071E+01	NOT IDENT.
MO-99	4.068E+02	NOT IDENT.
TC-99M	2.444E+02	NOT IDENT.
RH-100	8.711E+01	NOT IDENT.
RH-101	4.589E+01	NOT IDENT.
RH-102M	6.497E+01	NOT IDENT.
RU-103	5.523E+01	NOT IDENT.
RH-106	4.322E+02	NOT IDENT.
RU-106	4.322E+02	NOT IDENT.
AG-108M	6.328E+01	FAIL ABUN
CD-109	1.097E+03	NOT IDENT.
AG-110	1.191E+03	NOT IDENT.
AG-110M	7.223E+01	NOT IDENT.
IN-111	4.758E+01	NOT IDENT.
SN-113	7.347E+01	NOT IDENT.
IN-114M	2.464E+02	NOT IDENT.
CD-115	2.230E+02	NOT IDENT.
SN-117M	3.889E+01	NOT IDENT.
SB-122	7.107E+01	NOT IDENT.
I-123	9.278E+01	NOT IDENT.
TE-123M	3.895E+01	NOT IDENT.
SB-124	4.613E+01	NOT IDENT.
SB-125	1.752E+02	NOT IDENT.
TE-125M	1.139E+04	NOT IDENT.
I-126	1.035E+02	FAIL ABUN
SB-126	7.575E+01	NOT IDENT.
SN-126	1.085E+02	NOT IDENT.
SB-127	1.192E+02	NOT IDENT.
TE-129	8.128E+02	NOT IDENT.
I-131	6.185E+01	NOT IDENT.
I-132	4.844E+03	NOT IDENT.
TE-132	5.220E+01	FAIL ABUN
BA-133	7.222E+01	NOT IDENT.
I-133	8.804E+01	NOT IDENT.
CS-134	4.931E+01	NOT IDENT.
I-135	4.812E+02	NOT IDENT.
CS-136	7.232E+01	NOT IDENT.
LA-138	2.495E+01	NOT IDENT.
CE-139	4.081E+01	NOT IDENT.
BA-140	1.912E+02	NOT IDENT.
LA-140	2.209E+01	NOT IDENT.
CE-141	6.407E+01	NOT IDENT.
CE-143	1.306E+02	NOT IDENT.
CE-144	2.847E+02	NOT IDENT.
PM-144	4.002E+01	NOT IDENT.
PR-144	2.974E+03	NOT IDENT.
PM-146	9.456E+01	FAIL ABUN
ND-147	3.366E+02	NOT IDENT.
PM-147	1.156E+06	FAIL ABUN
PM-149	1.548E+03	NOT IDENT.
EU-152	1.617E+02	FAIL ABUN
GD-153	1.266E+02	NOT IDENT.
EU-154	8.425E+01	NOT IDENT.
EU-155	1.527E+02	NOT IDENT.
TB-160	1.842E+02	FAIL ABUN
HO-166M	7.569E+01	FAIL ABUN
TM-171	6.795E+04	FAIL ABUN
LU-176	4.326E+01	NOT IDENT.
LU-177	3.688E+02	NOT IDENT.
HF-181	6.551E+01	NOT IDENT.
W-181	8.461E+02	FAIL ABUN
TA-182	1.106E+02	NOT IDENT.
RE-183	9.250E+02	FAIL ABUN
RE-184	1.476E+02	NOT IDENT.
RE-188	2.019E+02	NOT IDENT.
W-188	1.007E+04	NOT IDENT.
OS-191	1.271E+02	NOT IDENT.
IR-192	5.033E+01	NOT IDENT.
PB-201	1.908E+02	NOT IDENT.

TL-201	3.648E+02	FAIL ABUN
TL-202	6.529E+01	NOT IDENT.
HG-203	4.939E+01	NOT IDENT.
PB-203	6.141E+01	NOT IDENT.
TL-204	7.045E+03	NOT IDENT.
BI-207	8.845E+01	NOT IDENT.
TL-208	4.927E+01	NOT IDENT.
BI-211	3.628E+02	NOT IDENT.
PB-211	1.317E+03	NOT IDENT.
BI-212	5.689E+02	NOT IDENT.
PB-212	8.906E+01	NOT IDENT.
BI-213	2.234E+02	NOT IDENT.
BI-214	1.004E+02	NOT IDENT.
PB-214	1.345E+02	NOT IDENT.
RN-219	7.281E+02	NOT IDENT.
FR-221	3.417E+02	NOT IDENT.
RA-223	1.073E+03	NOT IDENT.
RA-224	9.518E+02	NOT IDENT.
AC-225	3.584E+02	NOT IDENT.
RA-226	1.061E+03	NOT IDENT.
AC-227	4.028E+02	FAIL ABUN
TH-227	4.028E+02	FAIL ABUN
AC-228	2.245E+02	NOT IDENT.
RA-228	2.245E+02	NOT IDENT.
TH-228	8.906E+01	NOT IDENT.
TH-229	8.330E+02	NOT IDENT.
TH-230	1.703E+04	NOT IDENT.
PA-231	7.858E+02	NOT IDENT.
TH-231	6.477E+02	NOT IDENT.
TH-232	2.857E+04	NOT IDENT.
PA-233	1.173E+02	NOT IDENT.
PA-234	5.334E+02	NOT IDENT.
PA-234M	5.732E+03	NOT IDENT.
TH-234	2.106E+03	NOT IDENT.
U-234	2.483E+05	FAIL ABUN
U-235	2.791E+02	NOT IDENT.
NP-237	1.173E+02	NOT IDENT.
NP-238	2.986E+02	NOT IDENT.
U-238	2.106E+03	NOT IDENT.
NP-239	3.838E+02	NOT IDENT.
AM-242	9.503E+02	FAIL ABUN
AM-243	7.473E+01	NOT IDENT.
CM-243	1.591E+02	NOT IDENT.
BK-247	1.303E+02	FAIL ABUN
CM-247	6.628E+01	NOT IDENT.
CF-249	7.414E+01	NOT IDENT.
CF-251	2.003E+02	NOT IDENT.
CF-252	2.600E+05	NOT IDENT.
ANH-511	5.197E+01	NOT IDENT.

GEL Laboratories LLC
2040 Savage Road
Charleston, SC 29407

DETECTOR AND SAMPLE DATA

Configuration : DKA100:[CANBERRA.GAMMA.ARCHIVE.GAMMA]G1205292908.CNF;1
Acquisition date : 19-JAN-2023 16:21:23 Sensitivity : 3.000
Detector ID : GAM28 Energy tolerance: 1.500
Elapsed live time: 0 00:15:00.00 Abundance limit : 75.000
Elapsed real time: 0 00:15:02.24 Half life ratio : *****
Sample date : 19-JAN-2023 00:00:00 Nuclide Library : LIQUID
Sample ID : G1205292908 Analyst initials: MXR1
Batch Number : 2367950 Sample Quantity : 7.6489E-01 FILTER
Quantity Err(%) : 1.0000E+00 %
Wet wt corr : 1.00000 Wet Weight : 0.00000
Dry Weight : 0.00000

CALIBRATION INFORMATION

Eff. Cal. date : 4-APR-2022 06:19:42 Eff. Geometry : JAR
Eff. File : DKA100:[CANBERRA.GAMMA]EFF_GAM28_JAR.CNF;15

Combined Activity-MDA Report

NOTE: Not all "Identified Nuclides" are valid.
Please refer to Certificate of Analysis.

---- Identified Nuclides ----

Nuclide	Activity (pCi/FILTER)	Act Error (1.96-sigma)	TPU (1.96-sigma)
CO-57	1.619E+01	5.906E+01	5.906E+01
CO-60	8.732E+03	8.848E+02	9.012E+02
BA-137M	2.168E+04	1.830E+03	1.879E+03
CS-137	2.290E+04	1.932E+03	1.984E+03
PB-210	8.065E+05	8.863E+04	9.003E+04
AM-241	8.427E+04	7.110E+03	7.300E+03

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/FILTER)	K.L Act error (1.96-sigma)	TPU (1.96-sigma)	
BE-7	-1.325E+02	6.790E+02	6.816E+02	NOT IDENT.
NA-22	-7.880E-01	3.530E+01	3.530E+01	NOT IDENT.
NA-24	-2.893E+01	4.644E+01	4.823E+01	NOT IDENT.
AL-26	1.418E+00	2.402E+01	2.402E+01	NOT IDENT.
K-40	8.239E+01	2.492E+02	2.520E+02	NOT IDENT.
SC-46	2.602E+01	6.907E+01	7.006E+01	NOT IDENT.
V-48	-8.421E+00	7.653E+01	7.662E+01	NOT IDENT.
CR-51	-4.820E+02	4.853E+02	5.318E+02	NOT IDENT.
MN-52	-1.293E+01	1.910E+01	1.997E+01	NOT IDENT.
MN-54	-3.947E+01	6.689E+01	6.922E+01	NOT IDENT.
CO-56	-3.555E+01	6.288E+01	6.490E+01	NOT IDENT.
NI-57	-4.824E+01	5.168E+01	5.608E+01	NOT IDENT.
CO-58	-8.524E+00	5.498E+01	5.512E+01	NOT IDENT.
FE-59	5.624E+01	1.178E+02	1.205E+02	NOT IDENT.
ZN-65	-2.242E+01	1.380E+02	1.384E+02	NOT IDENT.
CU-67	2.925E+01	1.110E+02	1.118E+02	NOT IDENT.
GE-68	2.151E+02	2.153E+03	2.155E+03	NOT IDENT.
AS-73	-3.889E+03	3.797E+03	4.182E+03	NOT IDENT.
AS-74	-5.504E+01	9.079E+01	9.413E+01	NOT IDENT.
SE-75	-2.655E+01	8.436E+01	8.521E+01	FAIL ABUN
BR-77	-6.332E+01	2.605E+02	2.620E+02	NOT IDENT.
SR-82	1.998E+02	3.606E+02	3.717E+02	NOT IDENT.
RB-83	9.798E+01	1.258E+02	1.333E+02	NOT IDENT.
RB-84	-4.632E-01	9.566E+01	9.566E+01	NOT IDENT.

KR-85	-4.199E+03	1.290E+04	1.304E+04	NOT IDENT.
SR-85	-1.894E+01	5.820E+01	5.883E+01	NOT IDENT.
RB-86	2.552E+02	8.199E+02	8.280E+02	NOT IDENT.
Y-88	1.333E+01	2.861E+01	2.923E+01	NOT IDENT.
ZR-88	-4.292E+00	5.896E+01	5.899E+01	NOT IDENT.
Y-91	3.217E+03	1.695E+04	1.701E+04	NOT IDENT.
NB-94	-8.851E+00	4.988E+01	5.004E+01	NOT IDENT.
NB-95	-1.187E+01	5.337E+01	5.363E+01	NOT IDENT.
NB-95M	-3.802E+01	1.933E+02	1.941E+02	NOT IDENT.
TC-95M	3.765E+01	7.197E+01	7.395E+01	NOT IDENT.
ZR-95	-3.960E+01	1.019E+02	1.034E+02	NOT IDENT.
MO-99	-7.506E+01	5.263E+02	5.274E+02	NOT IDENT.
TC-99M	2.177E+01	2.965E+02	2.967E+02	NOT IDENT.
RH-100	-6.269E+01	1.079E+02	1.116E+02	NOT IDENT.
RH-101	-1.483E+01	5.639E+01	5.679E+01	NOT IDENT.
RH-102M	5.465E+01	7.436E+01	7.834E+01	NOT IDENT.
RU-103	5.054E+01	6.249E+01	6.652E+01	NOT IDENT.
RH-106	-6.517E+01	5.227E+02	5.235E+02	NOT IDENT.
RU-106	-6.517E+01	5.227E+02	5.235E+02	NOT IDENT.
AG-108M	3.669E+01	1.046E+02	1.059E+02	FAIL ABUN
CD-109	1.092E+03	1.269E+03	1.362E+03	NOT IDENT.
AG-110	6.669E+02	1.544E+03	1.573E+03	NOT IDENT.
AG-110M	-3.181E+01	9.168E+01	9.280E+01	NOT IDENT.
IN-111	-3.721E+01	6.178E+01	6.402E+01	NOT IDENT.
SN-113	-2.289E+01	8.652E+01	8.713E+01	NOT IDENT.
IN-114M	-6.187E+01	3.076E+02	3.089E+02	NOT IDENT.
CD-115	3.629E+02	2.446E+02	2.944E+02	NOT IDENT.
SN-117M	7.067E+00	4.733E+01	4.743E+01	NOT IDENT.
SB-122	-1.388E+01	8.556E+01	8.579E+01	NOT IDENT.
I-123	-1.615E+01	1.145E+02	1.147E+02	NOT IDENT.
TE-123M	-5.370E+00	4.799E+01	4.805E+01	NOT IDENT.
SB-124	3.118E+01	4.353E+01	4.575E+01	NOT IDENT.
SB-125	-1.255E+02	2.107E+02	2.182E+02	NOT IDENT.
TE-125M	-9.410E+03	1.418E+04	1.480E+04	NOT IDENT.
I-126	-2.523E+01	1.432E+02	1.437E+02	FAIL ABUN
SB-126	-8.880E+00	9.254E+01	9.263E+01	NOT IDENT.
SN-126	8.439E+01	1.262E+02	1.318E+02	NOT IDENT.
SB-127	4.811E+01	1.392E+02	1.408E+02	NOT IDENT.
TE-129	3.461E+02	9.419E+02	9.548E+02	NOT IDENT.
I-131	4.166E+01	6.987E+01	7.236E+01	NOT IDENT.
I-132	-5.236E+03	7.261E+03	7.636E+03	NOT IDENT.
TE-132	3.952E+01	6.340E+01	6.586E+01	FAIL ABUN
BA-133	-2.341E+01	8.461E+01	8.527E+01	NOT IDENT.
I-133	-8.067E+01	1.097E+02	1.156E+02	NOT IDENT.
CS-134	8.943E+00	5.921E+01	5.934E+01	NOT IDENT.
I-135	4.514E+01	5.545E+02	5.549E+02	NOT IDENT.
CS-136	7.215E+00	8.318E+01	8.324E+01	NOT IDENT.
LA-138	6.407E+00	2.696E+01	2.711E+01	NOT IDENT.
CE-139	2.615E+01	4.915E+01	5.055E+01	NOT IDENT.
BA-140	1.005E+02	2.203E+02	2.249E+02	NOT IDENT.
LA-140	9.332E+00	2.294E+01	2.333E+01	NOT IDENT.
CE-141	-1.421E+01	7.888E+01	7.914E+01	NOT IDENT.
CE-143	2.734E+01	1.483E+02	1.488E+02	NOT IDENT.
CE-144	-1.259E+02	3.820E+02	3.862E+02	NOT IDENT.
PM-144	-1.652E+01	4.985E+01	5.040E+01	NOT IDENT.
PR-144	-1.214E+03	3.704E+03	3.744E+03	NOT IDENT.
PM-146	5.470E+01	1.088E+02	1.116E+02	FAIL ABUN
ND-147	-5.266E+02	4.356E+02	4.962E+02	NOT IDENT.
PM-147	4.856E+05	1.772E+06	1.785E+06	FAIL ABUN
PM-149	-7.099E+02	1.804E+03	1.832E+03	NOT IDENT.
EU-152	-6.521E+01	1.897E+02	1.920E+02	FAIL ABUN
GD-153	6.602E+01	1.490E+02	1.520E+02	NOT IDENT.
EU-154	4.407E+00	9.816E+01	9.818E+01	NOT IDENT.
EU-155	1.490E+01	1.830E+02	1.831E+02	NOT IDENT.
TB-160	5.721E+01	2.213E+02	2.228E+02	FAIL ABUN
HO-166M	6.234E+01	8.570E+01	9.020E+01	FAIL ABUN
TM-171	-3.655E+04	8.686E+04	8.842E+04	FAIL ABUN
LU-176	3.653E+00	4.946E+01	4.949E+01	NOT IDENT.
LU-177	-1.009E+02	4.637E+02	4.659E+02	NOT IDENT.
HF-181	-1.978E+01	7.815E+01	7.866E+01	NOT IDENT.
W-181	8.080E+03	2.250E+03	4.284E+03	FAIL ABUN
TA-182	-1.020E+02	1.473E+02	1.544E+02	NOT IDENT.
RE-183	1.334E+04	1.701E+03	6.255E+03	FAIL ABUN
RE-184	-1.614E+01	1.831E+02	1.833E+02	NOT IDENT.
RE-188	-5.889E+01	2.500E+02	2.514E+02	NOT IDENT.
W-188	3.615E+02	1.150E+04	1.150E+04	NOT IDENT.
OS-191	4.015E+01	1.525E+02	1.535E+02	NOT IDENT.
IR-192	3.802E+01	5.619E+01	5.875E+01	NOT IDENT.

PB-201	2.391E+01	2.426E+02	2.428E+02	NOT IDENT.
TL-201	-1.623E+02	4.566E+02	4.625E+02	FAIL ABUN
TL-202	1.887E+01	7.914E+01	7.960E+01	NOT IDENT.
HG-203	-1.481E+01	5.698E+01	5.737E+01	NOT IDENT.
PB-203	-1.841E+01	7.086E+01	7.135E+01	NOT IDENT.
TL-204	2.854E+03	8.227E+03	8.327E+03	NOT IDENT.
BI-207	7.804E+01	9.710E+01	1.033E+02	NOT IDENT.
TL-208	-2.475E+01	6.030E+01	6.132E+01	NOT IDENT.
BI-211	4.224E+02	4.020E+02	4.449E+02	NOT IDENT.
PB-211	-5.633E+02	1.560E+03	1.581E+03	NOT IDENT.
BI-212	-1.846E+02	7.078E+02	7.127E+02	NOT IDENT.
PB-212	-1.438E+01	1.120E+02	1.122E+02	NOT IDENT.
BI-213	5.514E+01	2.593E+02	2.605E+02	NOT IDENT.
BI-214	6.680E+01	1.150E+02	1.189E+02	NOT IDENT.
PB-214	1.487E+02	1.494E+02	1.638E+02	NOT IDENT.
RN-219	-2.461E+02	8.602E+02	8.674E+02	NOT IDENT.
FR-221	-2.535E+02	4.387E+02	4.534E+02	NOT IDENT.
RA-223	5.959E+02	1.209E+03	1.239E+03	NOT IDENT.
RA-224	-3.981E+02	1.214E+03	1.227E+03	NOT IDENT.
AC-225	-2.659E+02	4.601E+02	4.755E+02	NOT IDENT.
RA-226	-5.774E+02	1.327E+03	1.353E+03	NOT IDENT.
AC-227	3.735E+02	4.889E+02	5.171E+02	FAIL ABUN
TH-227	3.735E+02	4.889E+02	5.171E+02	FAIL ABUN
AC-228	-2.916E+01	2.781E+02	2.784E+02	NOT IDENT.
RA-228	-2.916E+01	2.781E+02	2.784E+02	NOT IDENT.
TH-228	-1.438E+01	1.120E+02	1.122E+02	NOT IDENT.
TH-229	-4.265E+02	1.052E+03	1.069E+03	NOT IDENT.
TH-230	2.545E+03	2.003E+04	2.007E+04	NOT IDENT.
PA-231	6.957E+02	8.846E+02	9.386E+02	NOT IDENT.
TH-231	7.581E+02	7.489E+02	8.233E+02	NOT IDENT.
TH-232	-1.426E+04	3.700E+04	3.756E+04	NOT IDENT.
PA-233	2.006E+02	1.274E+02	1.563E+02	NOT IDENT.
PA-234	-3.808E+02	8.157E+02	8.336E+02	NOT IDENT.
PA-234M	-1.074E+04	7.578E+03	8.995E+03	NOT IDENT.
TH-234	1.167E+03	2.624E+03	2.676E+03	NOT IDENT.
U-234	-3.538E+05	3.246E+05	3.618E+05	FAIL ABUN
U-235	-1.624E+02	3.478E+02	3.554E+02	NOT IDENT.
NP-237	2.006E+02	1.274E+02	1.563E+02	NOT IDENT.
NP-238	-1.442E+01	3.714E+02	3.715E+02	NOT IDENT.
U-238	1.167E+03	2.624E+03	2.676E+03	NOT IDENT.
NP-239	-3.239E+02	4.794E+02	5.011E+02	NOT IDENT.
AM-242	-7.451E+02	1.179E+03	1.226E+03	FAIL ABUN
AM-243	4.366E+01	8.690E+01	8.911E+01	NOT IDENT.
CM-243	6.210E+01	1.886E+02	1.906E+02	NOT IDENT.
BK-247	2.650E+01	1.630E+02	1.634E+02	FAIL ABUN
CM-247	-3.273E+01	7.896E+01	8.033E+01	NOT IDENT.
CF-249	1.944E+01	8.532E+01	8.577E+01	NOT IDENT.
CF-251	1.678E+02	2.397E+02	2.514E+02	NOT IDENT.
CF-252	-1.553E+05	3.486E+05	3.556E+05	NOT IDENT.
ANH-511	1.894E+01	5.840E+01	5.903E+01	NOT IDENT.

 * GEL Laboratories LLC *
 * 2040 Savage Road *
 * Charleston, SC 29407 *
 * GAMMA SPECTROSCOPY BACKGROUND REPORT *

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
43.53	849.9544	81.00	292.6071	121.12	255.0256
45.60	827.8130	81.07	305.5853	121.22	246.5602
46.54	829.9072	82.35	295.3383	121.78	262.7126
49.72	680.6262	82.47	295.4061	122.06	262.8182
51.35	936.1560	82.47	295.4061	123.07	264.2606
52.39	1002.2429	83.79	259.1087	123.68	265.9115
53.20	1081.7823	84.00	259.2095	127.16	266.8564
53.44	1082.4203	84.21	247.2940	127.23	266.8811
56.28	1152.8438	84.86	274.6522	129.43	266.6182
57.36	721.8891	85.43	280.9570	131.20	296.3627
57.53	722.1740	86.55	301.6319	133.02	275.1260
57.53	722.1797	86.79	288.6860	133.52	275.3125
57.98	722.9326	86.94	288.7649	135.34	265.5052
59.32	725.1708	87.09	282.8030	136.00	267.5484
59.54	725.5371	87.57	256.8560	136.28	267.6463
61.49	272.8803	88.03	257.0661	136.47	267.7141
63.00	234.1355	88.34	259.2255	140.51	268.4094
63.29	245.8071	88.47	259.2843	140.88	245.6131
63.58	274.1467	91.11	294.9474	143.76	256.3874
63.81	274.2849	91.27	295.0296	144.24	248.8701
64.28	280.9814	92.59	270.2983	145.44	242.6630
64.99	289.1235	93.31	237.0584	152.32	235.8939
65.08	289.1808	94.56	296.6969	152.43	235.9264
66.73	250.5427	94.65	296.7435	153.25	240.5986
66.98	250.6770	94.67	296.7524	154.21	215.3490
67.24	273.0864	97.43	272.5165	155.04	248.9033
67.67	273.3360	98.43	282.2027	156.02	245.8598
67.75	273.3811	98.44	282.2090	158.56	245.4959
68.89	278.8940	99.53	292.9952	158.97	260.1305
68.89	278.8961	100.11	282.9832	159.00	259.0211
69.67	264.7451	100.20	283.0231	162.33	230.9013
70.82	244.8817	102.03	268.3809	162.66	224.2645
70.82	244.8836	103.18	247.1598	163.33	236.7858
70.83	244.8874	103.37	247.2346	165.86	221.7272
72.81	257.6285	105.31	246.9591	167.43	239.0402
72.87	257.6586	106.12	247.2733	171.28	241.2273
74.66	246.7813	106.47	247.4095	176.31	246.0092
74.82	246.8579	109.28	261.0188	176.60	260.8991
74.97	246.9326	111.00	269.0351	177.52	230.3723
77.11	285.5074	111.76	259.9145	181.07	277.0689
79.69	264.0863	112.95	262.4817	184.41	270.0298
79.82	264.1532	116.24	297.5338	184.58	267.7779
80.02	264.2506	116.30	297.5596	185.72	303.7797
80.03	264.2547	116.74	270.3008	186.21	315.4495
80.12	261.3205	117.23	253.5901	190.27	304.0938
80.19	261.3546	119.76	296.9467	193.51	290.0429
80.22	261.3727	120.54	264.7226	197.03	261.9896
80.57	292.3693	120.90	254.9451	198.01	279.7375

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
201.83	239.8715	306.78	187.0580	492.35	132.3118
204.12	238.0796	308.46	195.8464	497.08	124.9510
205.31	214.8804	311.90	170.6229	511.00	126.8210
208.37	243.8005	316.51	166.0400	514.00	133.8054
210.85	266.8266	319.41	181.9120	520.40	115.7558
215.65	257.3994	320.08	203.5615	520.69	115.7703
218.12	294.8708	321.04	202.8424	522.65	114.9127
222.11	269.7337	323.87	179.9010	527.90	93.7344
227.09	286.5805	325.23	222.5012	529.59	117.2656
227.38	273.4636	328.76	191.8148	529.87	131.9458
228.16	232.8527	331.15	191.7083	531.02	135.9288
228.18	232.8586	333.37	191.5735	537.26	98.0957
235.69	235.6716	334.37	191.7078	539.51	104.0936
235.96	206.7181	338.28	193.9790	546.56	115.2957
238.63	241.1466	338.32	193.9835	552.55	88.9453
238.98	247.2803	340.48	196.0273	563.25	107.2793
240.99	252.5828	340.55	210.0391	564.24	95.4063
242.00	222.4253	344.28	197.4197	569.33	94.6405
244.70	263.1610	345.93	172.1699	569.50	94.6482
245.35	245.0270	351.06	173.6535	569.70	94.6560
250.62	233.9091	351.93	183.4600	582.08	80.1725
252.40	207.2865	356.01	202.5368	583.19	94.2524
252.80	203.6752	361.25	212.1203	595.83	97.8249
256.23	180.8935	364.49	186.7834	600.60	71.7569
260.90	212.4962	366.42	191.4713	604.72	66.8298
264.66	220.6042	383.85	191.8352	609.32	79.1426
265.00	205.7877	388.16	195.9720	610.33	86.2832
269.46	199.0869	388.63	194.2226	614.28	88.4691
271.23	201.8672	391.70	200.9346	618.01	83.5248
273.65	203.5112	392.87	203.7964	621.93	84.6886
276.40	201.0491	400.66	180.2069	630.19	67.5872
277.37	203.7106	401.32	176.6414	631.29	75.8157
277.60	197.0652	401.81	199.4623	632.98	78.9457
278.00	204.6502	402.40	201.3559	633.25	74.8535
278.43	200.5420	404.85	214.4318	634.78	94.3996
279.20	216.5500	410.95	197.8242	635.95	66.7297
279.54	210.7537	414.70	226.7282	636.99	84.2188
280.46	207.5648	423.72	232.5586	657.50	102.5731
283.69	192.9909	427.09	206.2042	657.76	102.5852
284.31	199.8053	427.87	228.5021	661.66	86.1442
285.41	207.5369	433.94	215.8496	664.57	38.9679
285.90	204.2551	439.51	229.1185	666.33	46.7963
287.50	198.6208	440.45	233.8980	666.50	46.7999
290.67	199.1154	446.15	227.1797	667.71	60.8708
293.27	185.1466	453.88	240.3802	677.62	42.3144
295.22	194.7363	459.60	243.9718	685.70	50.3164
295.96	175.3638	463.37	250.1466	692.65	60.9713
298.58	199.4861	468.07	250.7882	695.00	56.8213
299.98	188.6494	473.00	252.4110	696.49	66.3300
300.09	188.6675	475.06	217.5435	696.51	66.3300
300.13	188.6720	476.78	249.1271	697.00	56.8652
301.36	179.4908	477.60	234.9646	697.49	53.7164
302.85	199.2799	477.99	217.8882	702.65	64.3831
304.50	180.7685	482.18	183.0977	706.68	66.6017
304.85	180.8159	487.02	130.9823	711.68	45.5493

ENERGY	MDA COUNTS	ENERGY	MDA COUNTS	ENERGY	MDA COUNTS
720.70	56.3405	911.20	81.9229	1298.22	9.5148
721.93	54.2415	923.98	83.4052	1312.11	9.5471
722.78	63.8354	926.36	78.8969	1332.49	10.5535
722.91	63.8379	935.54	87.1545	1362.15	5.7975
723.31	59.5911	937.49	90.6526	1365.19	3.8677
724.19	51.0957	944.13	98.8951	1368.63	5.8063
727.33	55.4214	945.96	108.1558	1377.63	11.6367
733.00	67.2938	946.00	108.1558	1384.29	8.7413
735.93	52.3995	949.00	103.6523	1408.01	3.9063
739.50	61.6805	954.55	95.7594	1434.09	3.9294
744.23	48.2739	962.31	91.3663	1435.80	1.9655
747.24	54.7748	964.08	98.3573	1457.56	5.9253
752.31	64.5654	966.17	78.7384	1460.82	3.9531
753.82	48.4515	968.97	71.8515	1489.16	1.9889
756.73	56.5887	983.53	76.8335	1553.35	6.0498
763.94	57.2830	984.45	76.8550	1596.21	2.0347
765.80	62.7295	996.26	78.0081	1620.50	5.1123
766.42	55.1732	1001.03	76.3666	1678.03	0.0000
766.84	53.0175	1004.73	55.3615	1690.97	1.0370
772.60	58.5527	1025.87	68.9772	1757.55	2.1008
776.52	54.2948	1028.54	62.8357	1764.49	0.0000
777.92	70.6177	1037.84	70.1086	1770.23	0.0000
778.90	66.2968	1038.76	63.9141	1771.35	0.0000
783.70	56.6147	1046.59	59.6105	1791.20	2.1143
788.74	50.1759	1048.07	56.9648	1808.65	3.1818
792.07	53.5120	1050.41	55.2225	1836.06	3.1979
795.86	50.3050	1063.66	61.6932		
801.95	53.7054	1077.00	60.1381		
802.10	52.6113	1077.34	62.8351		
810.29	61.5599	1083.85	68.3462		
810.45	61.5644	1085.87	70.1876		
810.76	59.3723	1099.25	50.5791		
815.77	69.3907	1107.22	66.0805		
818.51	58.4346	1111.64	74.3225		
822.65	70.6654	1112.07	72.5146		
832.01	69.7906	1112.84	61.6499		
834.85	89.8198	1115.54	62.6071		
835.15	87.6117	1120.29	52.6935		
836.80	73.2375	1120.55	52.6970		
846.77	76.8304	1121.30	51.7989		
856.80	69.2757	1129.67	52.4672		
860.56	67.1265	1131.51	33.5364		
871.09	88.6982	1173.23	30.9668		
873.19	89.8861	1177.95	28.0528		
875.33	61.8414	1189.05	26.8406		
879.38	70.9340	1204.77	19.5157		
880.51	65.3279	1221.41	20.5337		
881.60	70.9852	1231.02	14.9707		
883.24	69.8963	1235.36	18.7341		
884.68	77.8271	1238.28	11.2485		
889.28	73.4265	1260.41	7.5410		
894.76	73.5614	1271.87	10.3984		
898.04	77.0396	1274.44	11.3511		
903.28	77.1724	1274.54	12.2978		
907.67	79.5561	1291.59	10.4495		

Continuing Calibration Data

Review of Gamma Spectrometer QA results (Daily calibration & background checks)
19-JAN-2023 09:09:00

Run Date	Detector	Parameter	Flag	Status	Comments
19-JAN-23	GAM01	All Parameters Passed			
19-JAN-23	GAM02	All Parameters Passed			
19-JAN-23	GAM03	Cal Check PSFWHM-59	Action	Lockout	Detector locked out.
19-JAN-23	GAM03	Cal Check PSFWHM-662	Action	Lockout	Detector locked out.
19-JAN-23	GAM04	Cal Check NLACTVTY-59	Investigate		
19-JAN-23	GAM05	All Parameters Passed			
19-JAN-23	GAM06	All Parameters Passed			
19-JAN-23	GAM07	All Parameters Passed			
19-JAN-23	GAM08	Cal Check PSFWHM-662	Action	Approved	Low FWHM, approved for use.
19-JAN-23	GAM08	Cal Check NLACTVTY-662	Investigate		
19-JAN-23	GAM09	All Parameters Passed			
19-JAN-23	GAM10	All Parameters Passed			
19-JAN-23	GAM11	All Parameters Passed			
19-JAN-23	GAM12	Bkg Check BACKRATE	Investigate		
19-JAN-23	GAM14	All Parameters Passed			
19-JAN-23	GAM16	All Parameters Passed			
19-JAN-23	GAM18	Cal Check NLACTVTY-662	Investigate		
19-JAN-23	GAM19	All Parameters Passed			
19-JAN-23	GAM20	All Parameters Passed			
	GAM21	Cal Check may not have run since 19-JAN-2023			Detector locked out.
	GAM21	Bkg Check may not have run since 19-JAN-2023			Detector locked out.
	GAM22	Cal Check may not have run since 19-JAN-2023			Detector locked out.
05-APR-20	GAM22	Bkg Check may not have run since 19-JAN-2023			Detector locked out.
19-JAN-23	GAM23	Bkg Check BACKRATE	Investigate		
19-JAN-23	GAM24	All Parameters Passed			
19-JAN-23	GAM27	All Parameters Passed			
19-JAN-23	GAM28	All Parameters Passed			
19-JAN-23	GAM29	All Parameters Passed			
19-JAN-23	GAM30	All Parameters Passed			
19-JAN-23	GAM31	All Parameters Passed			
19-JAN-23	GAM32	All Parameters Passed			
19-JAN-23	GAM33	All Parameters Passed			
19-JAN-23	GAM34	All Parameters Passed			
21-DEC-22	GAM36	Cal Check may not have run since 19-JAN-2023			Detector locked out.
01-JAN-23	GAM36	Bkg Check may not have run since 19-JAN-2023			Detector locked out.
19-JAN-23	GAM38	All Parameters Passed			
19-JAN-23	GAM40	All Parameters Passed			
19-JAN-23	GAM41	Cal Check PSFWHM-59	Investigate		
19-JAN-23	GAM43	All Parameters Passed			

31-DEC-22	GAM44	Cal Check may not have run since 19-JAN-2023			Detector locked out.
15-JAN-23	GAM44	Bkg Check may not have run since 19-JAN-2023			Detector locked out.
19-JAN-23	GAM45	All Parameters Passed			
19-JAN-23	GAM46	Cal Check PSFWHM-1332	Action	Approved	Low FWHM, approved for use.
19-JAN-23	GAM47	All Parameters Passed			
19-JAN-23	XRAY1	All Parameters Passed			
19-JAN-23	XRAY2	Cal Check PSFWHM-40	Investigate		
19-JAN-23	XRAY3	All Parameters Passed			
19-JAN-23	XRAY4	All Parameters Passed			
19-JAN-23	XRAY6	Cal Check PSFWHM-40	Investigate		
19-JAN-23	XRAY7	All Parameters Passed			

APPROVAL DATE: 19-JAN-2023

APPROVAL TIME: 10:25:27

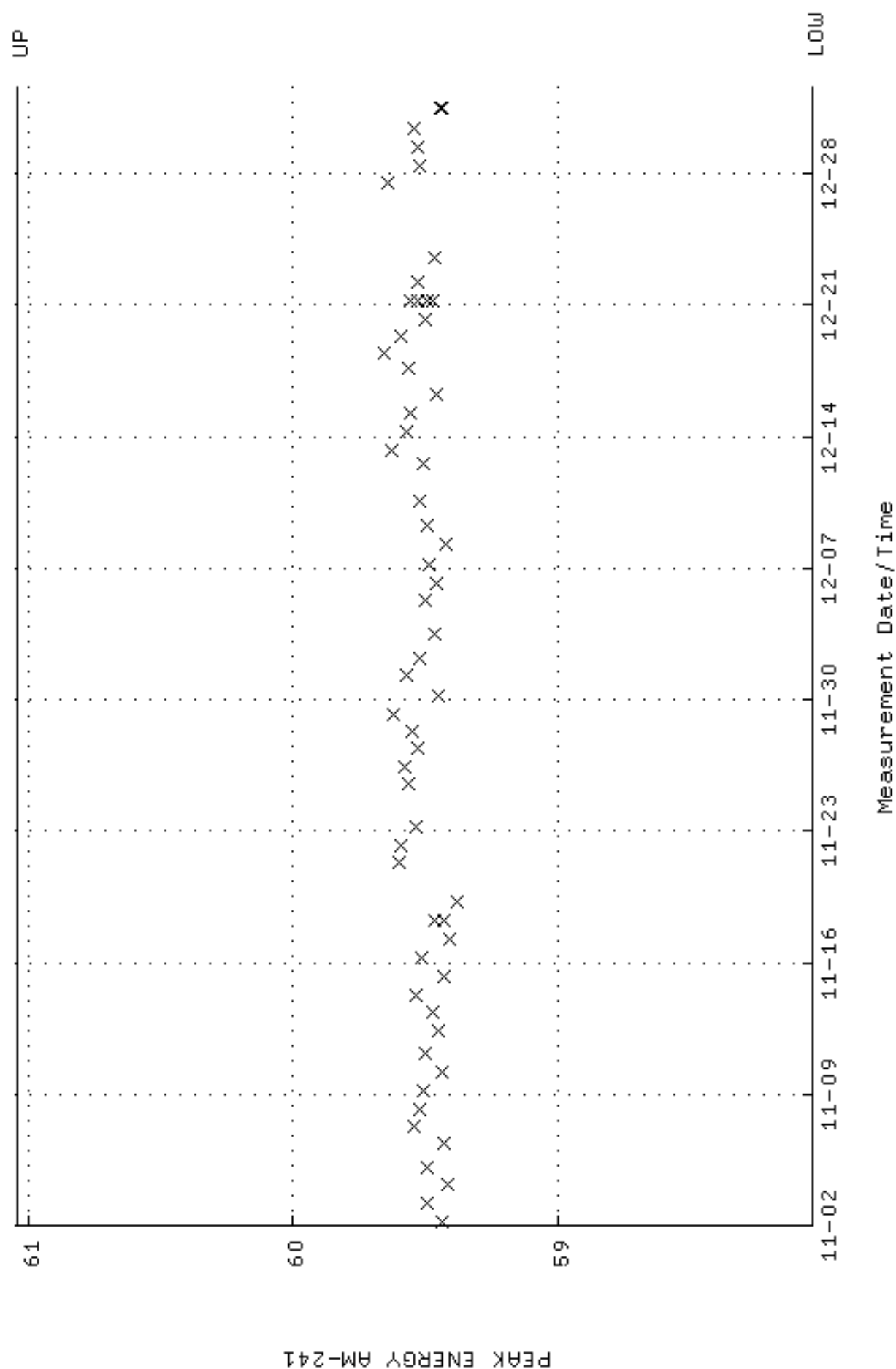
APPROVED BY: Rebekah Futch

PROCEDURE # GL-RAD-I-001

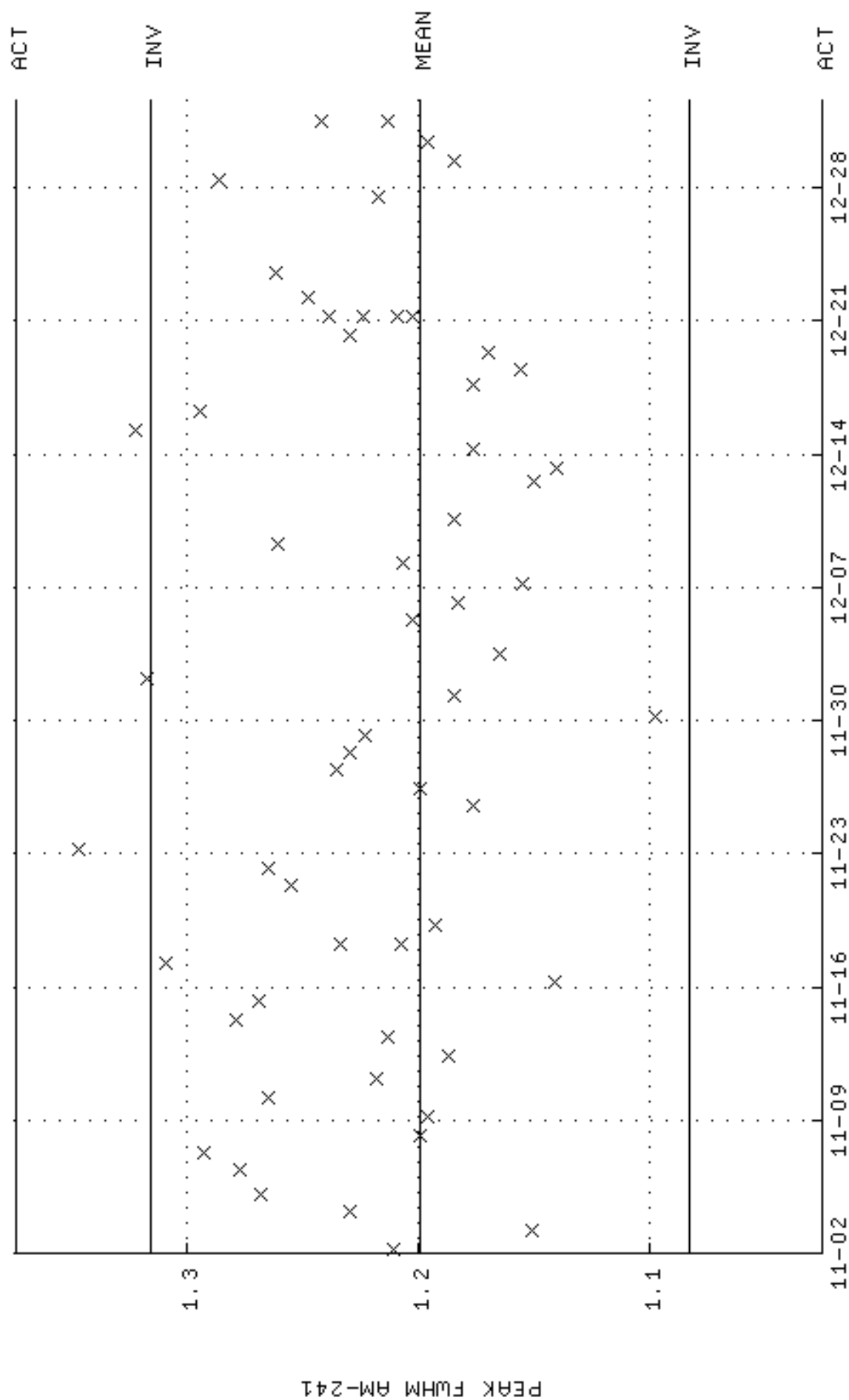
The Investigate flag does not indicate a lockout and is approved for use. Action flags that have not been approved are locked out of service.

Background and Efficiency Data

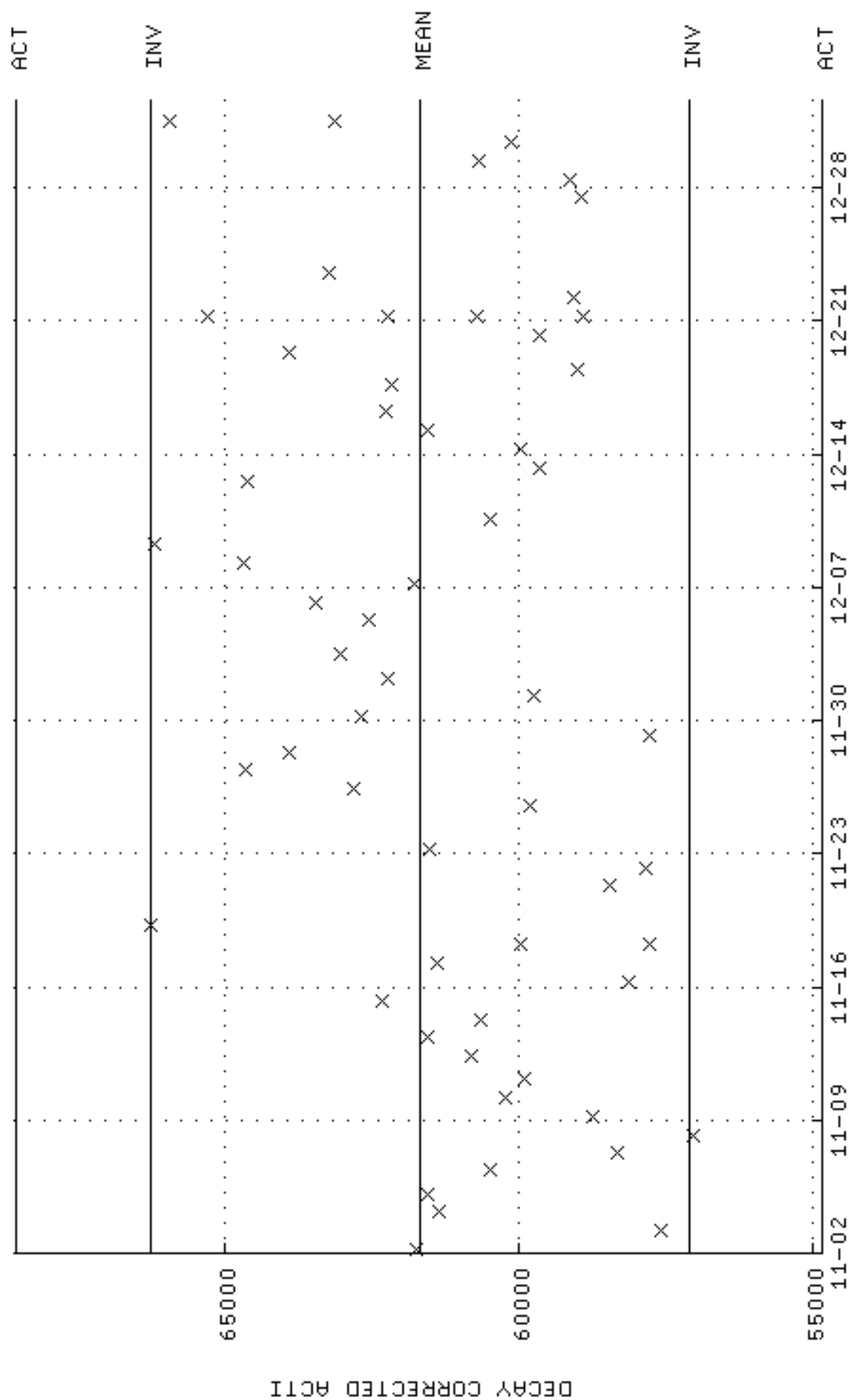
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM01_JAR.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-NOV-2022 04:20:34 through 1-JAN-2023 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



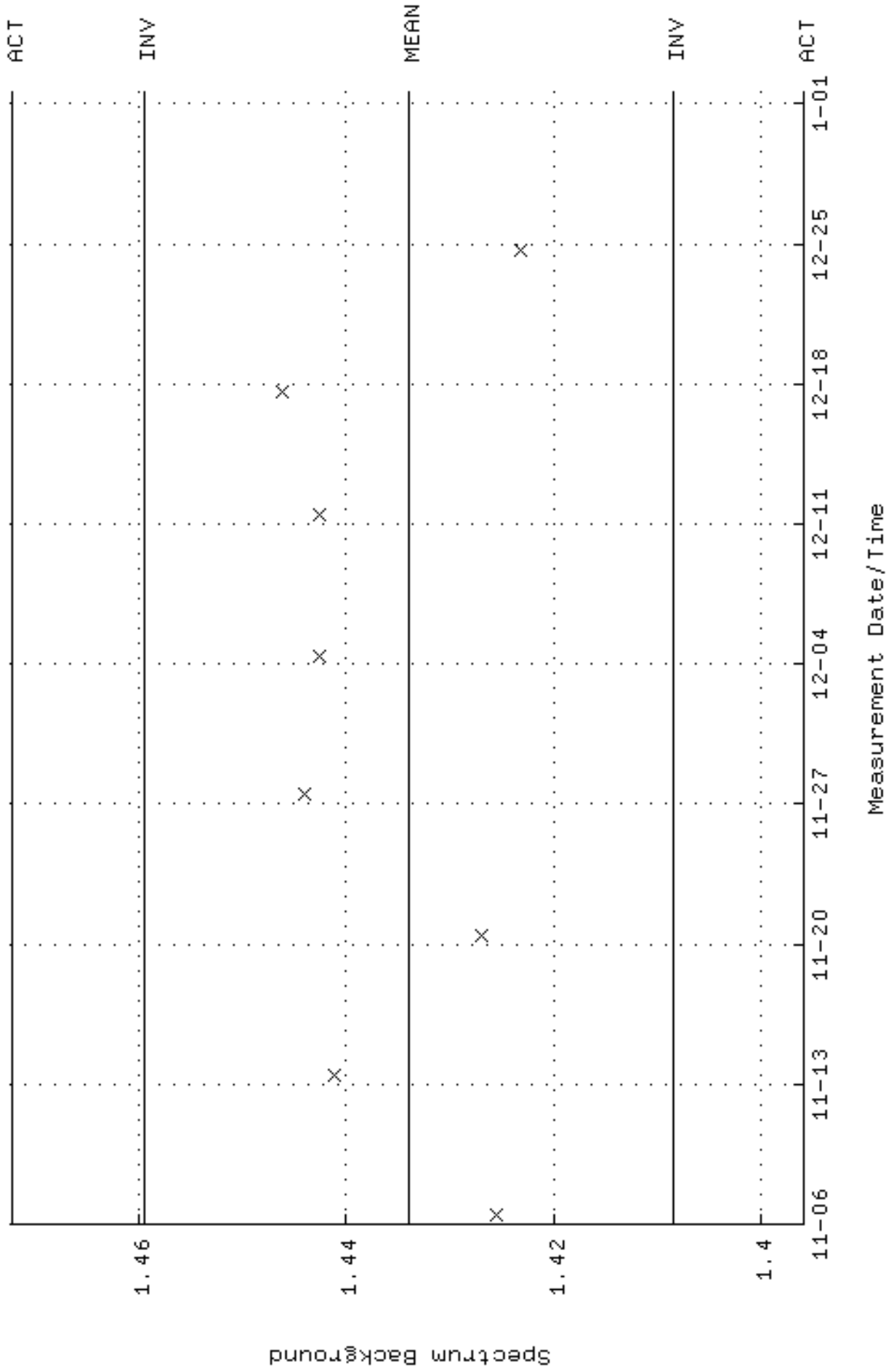
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC_GAM01_JAR.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-NOV-2022 04:20:34 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 1.19943 +- 5.813222E-02 (4.85 %)



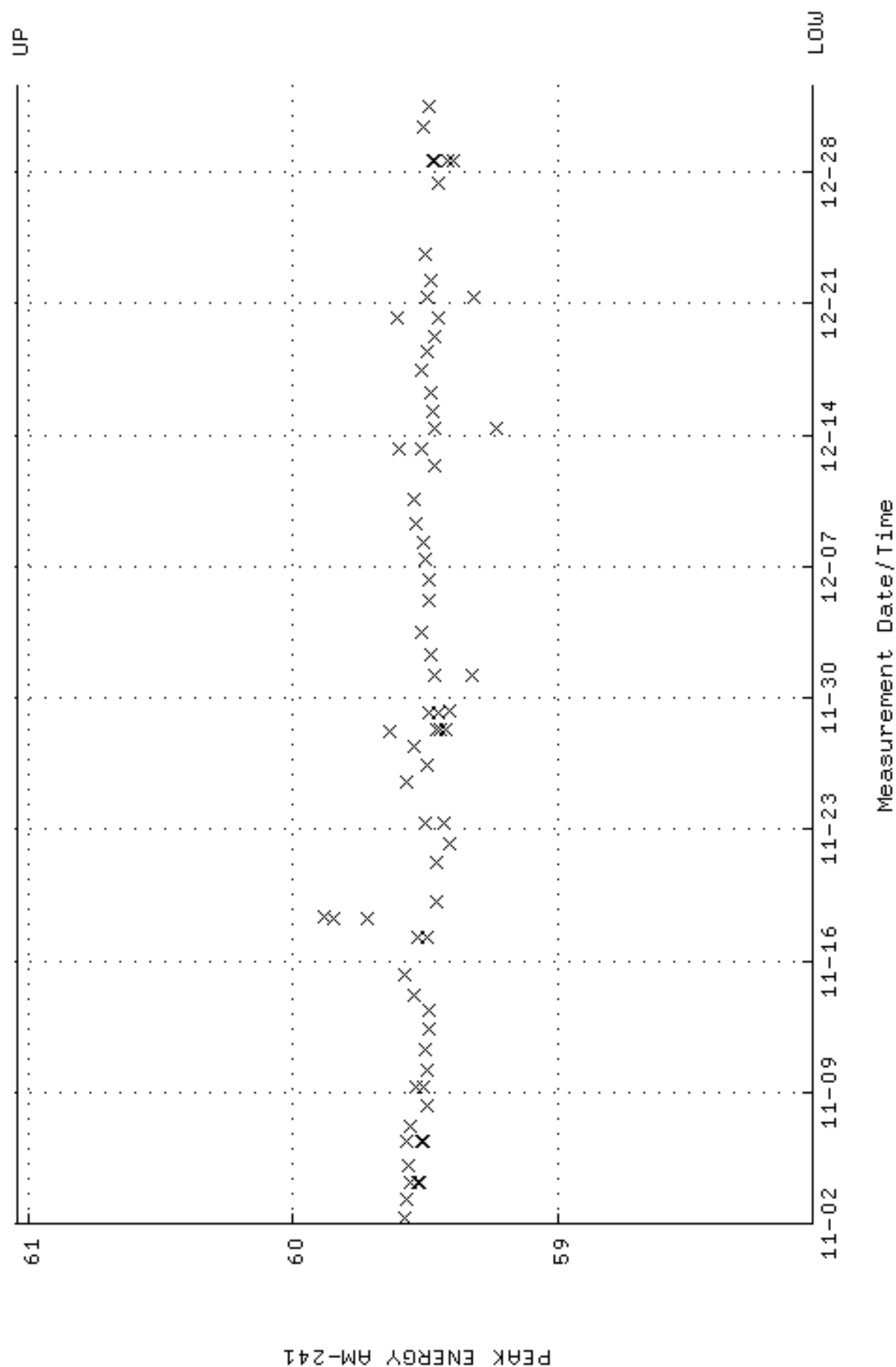
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM01_JAR.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-NOV-2022 04:20:34 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 61689.2 +- 2285.37 (3.70 %)



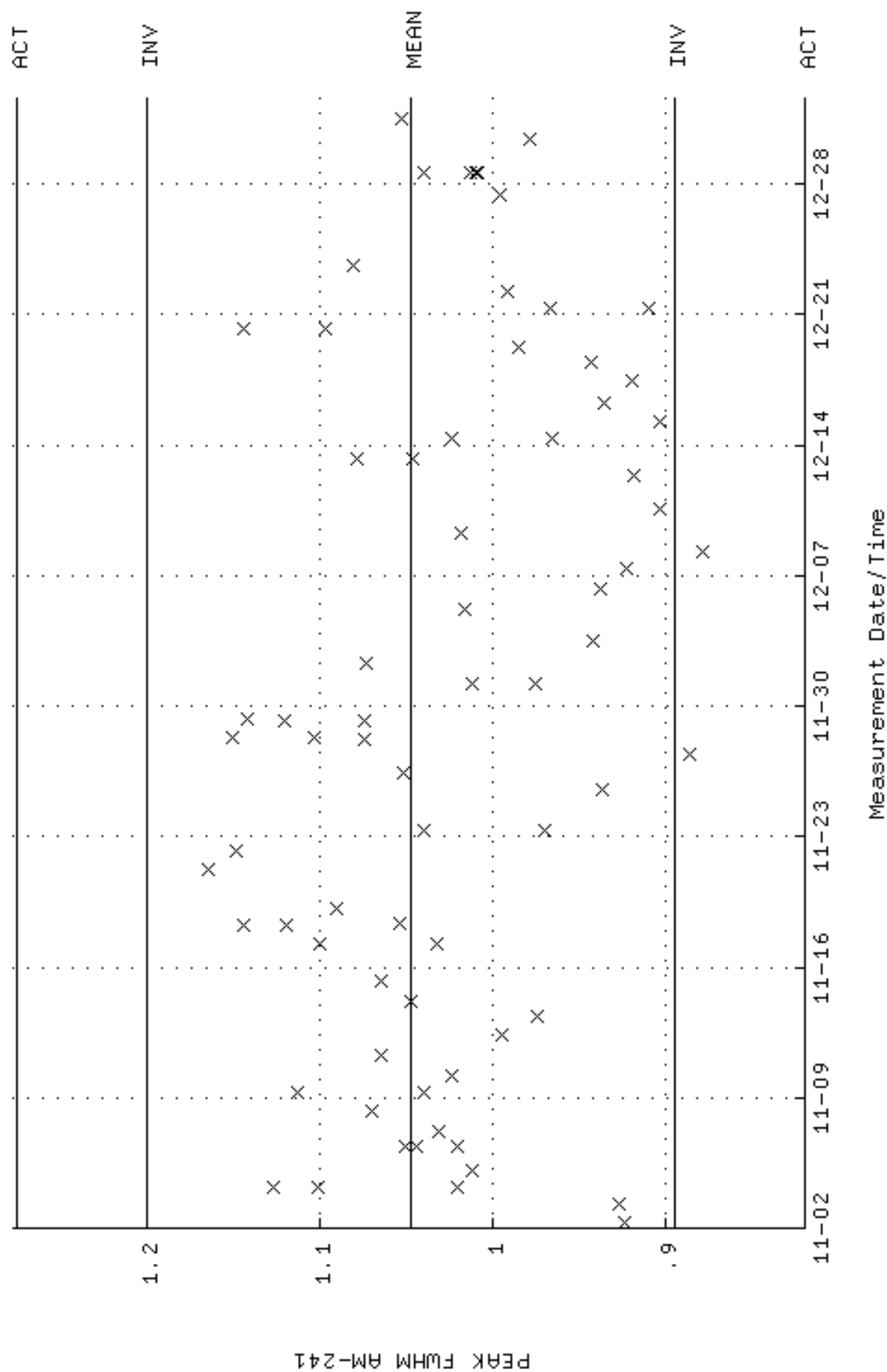
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM01.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-NOV-2022 12:09:11 through 1-JAN-2023 12:00:00
Mean +- Std Dev : 1.43406 +- 1.272884E-02 (0.89 %)



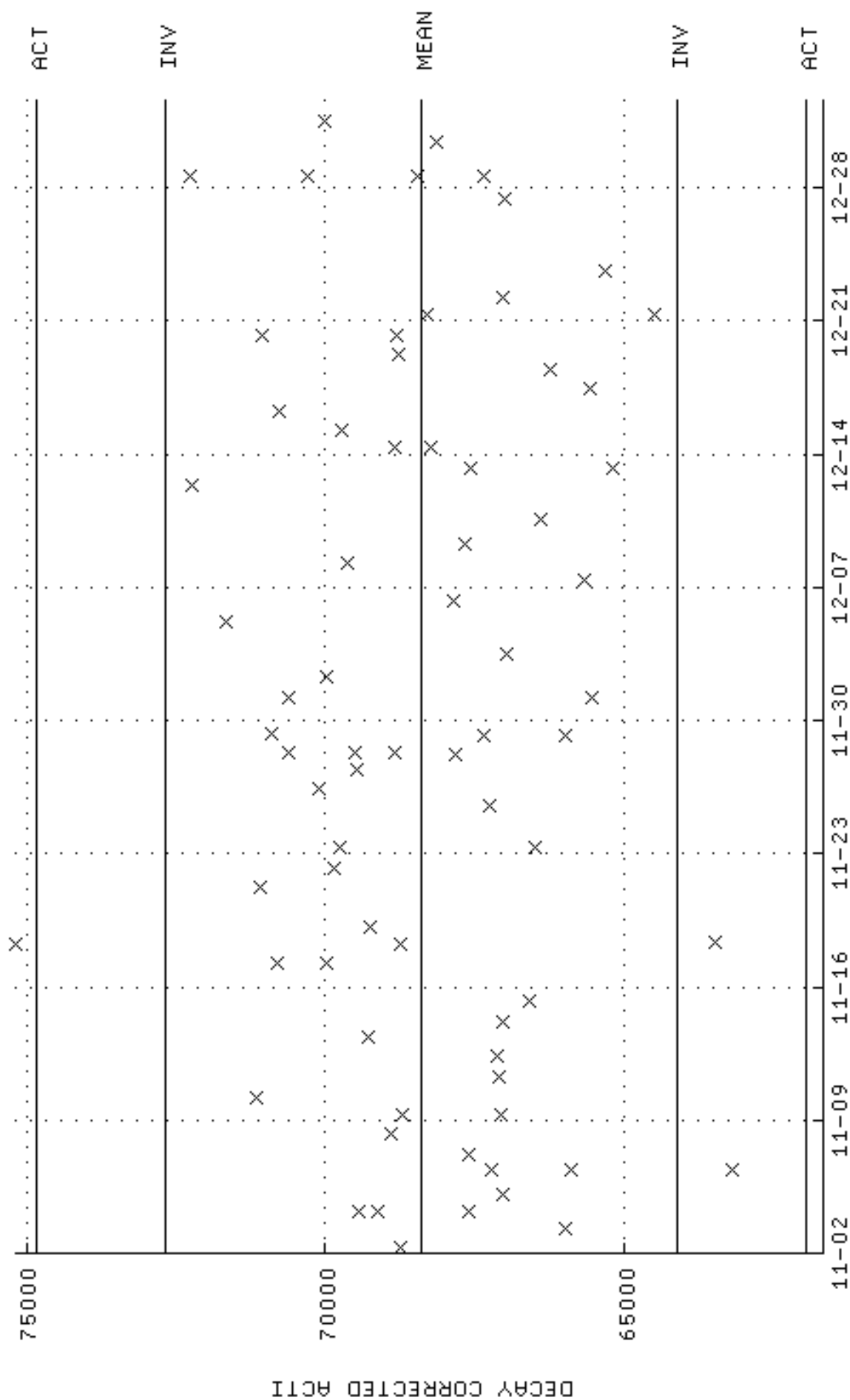
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM02_JAR.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-NOV-2022 06:43:25 through 1-JAN-2023 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



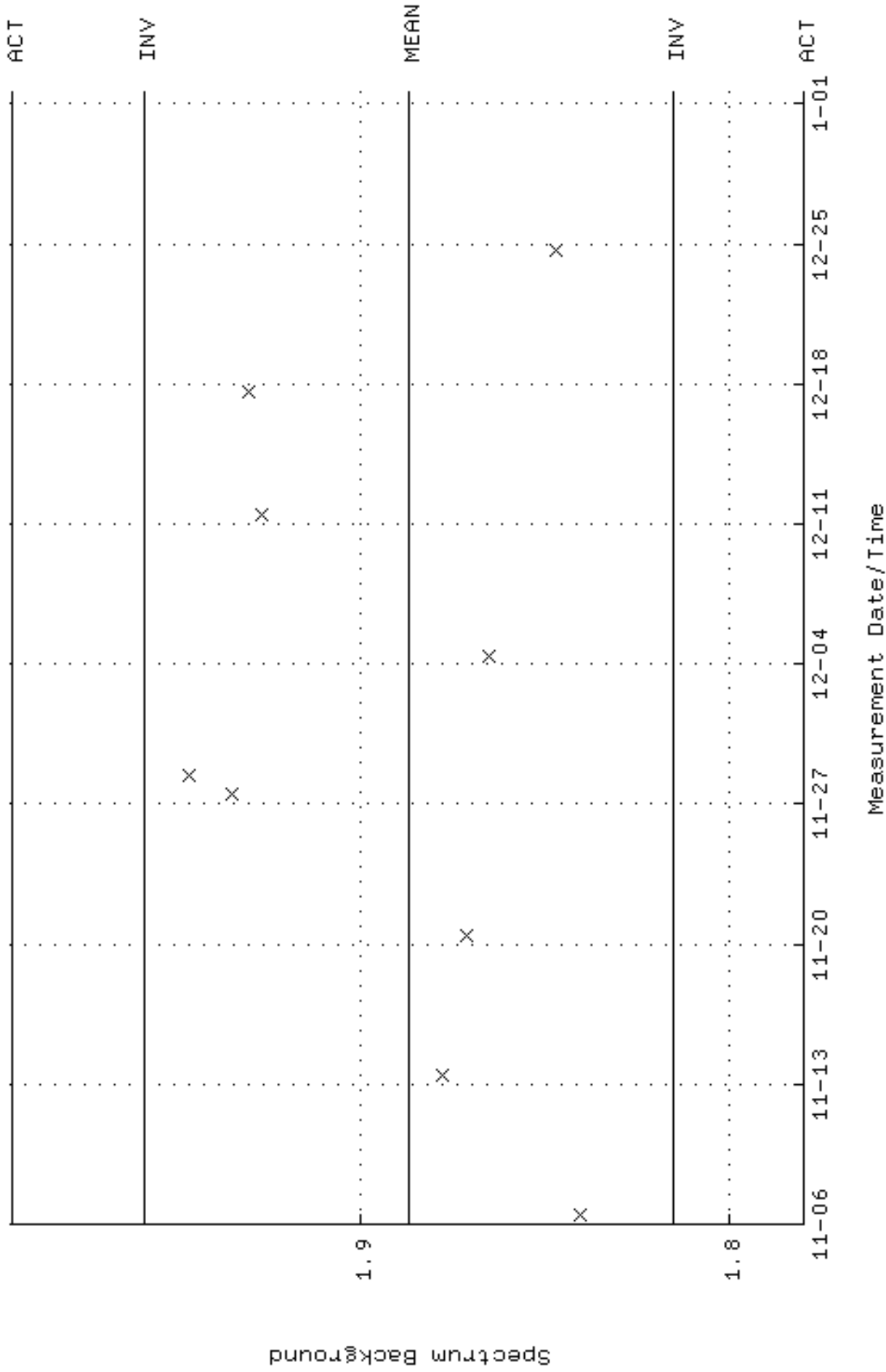
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC_GAM02_JAR.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-NOV-2022 06:43:25 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 1.04787 +- 7.633989E-02 (7.29 %)



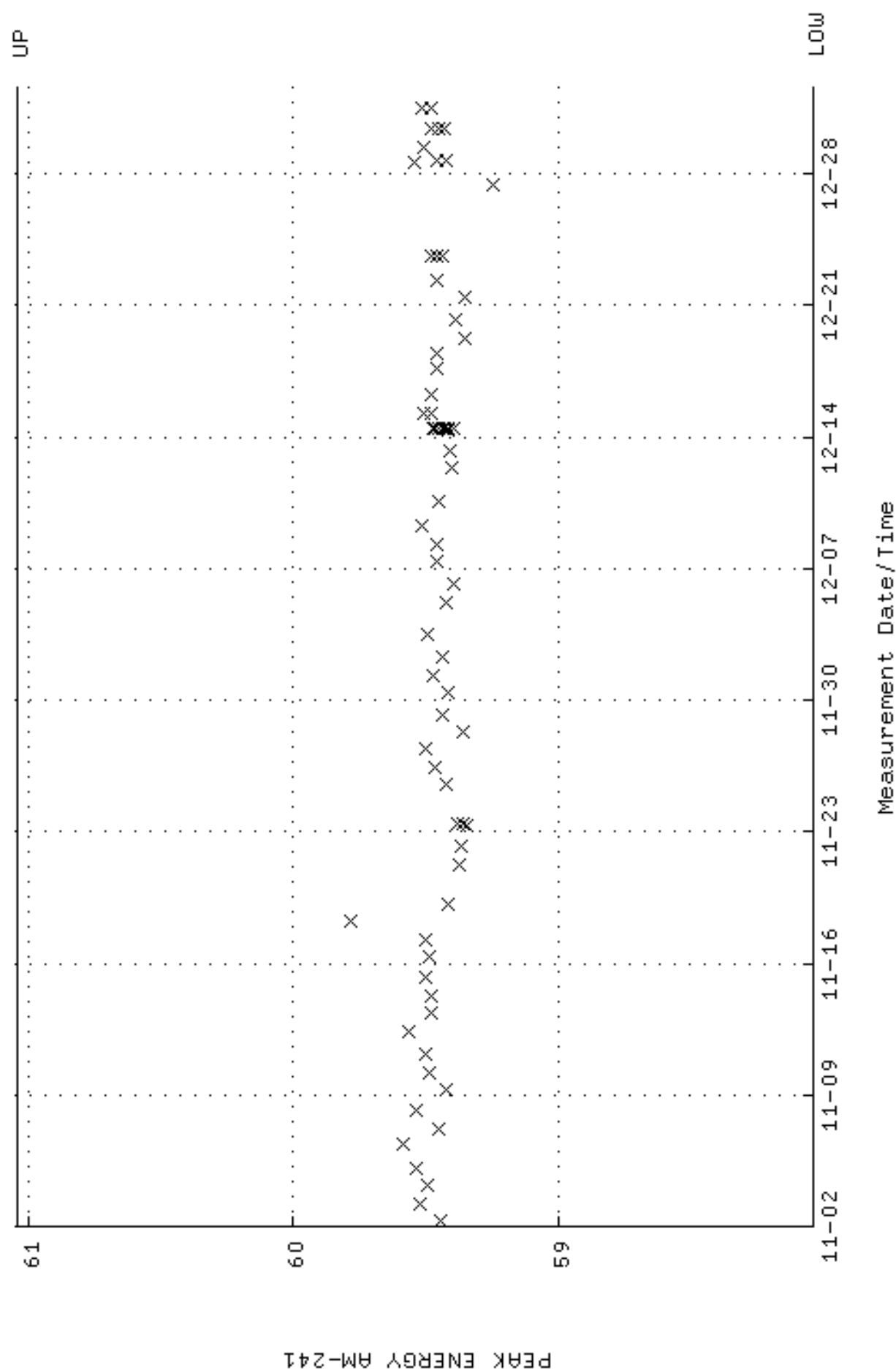
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM02_JAR.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-NOV-2022 06:43:25 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 68413.7 +- 2142.42 (3.13 %)



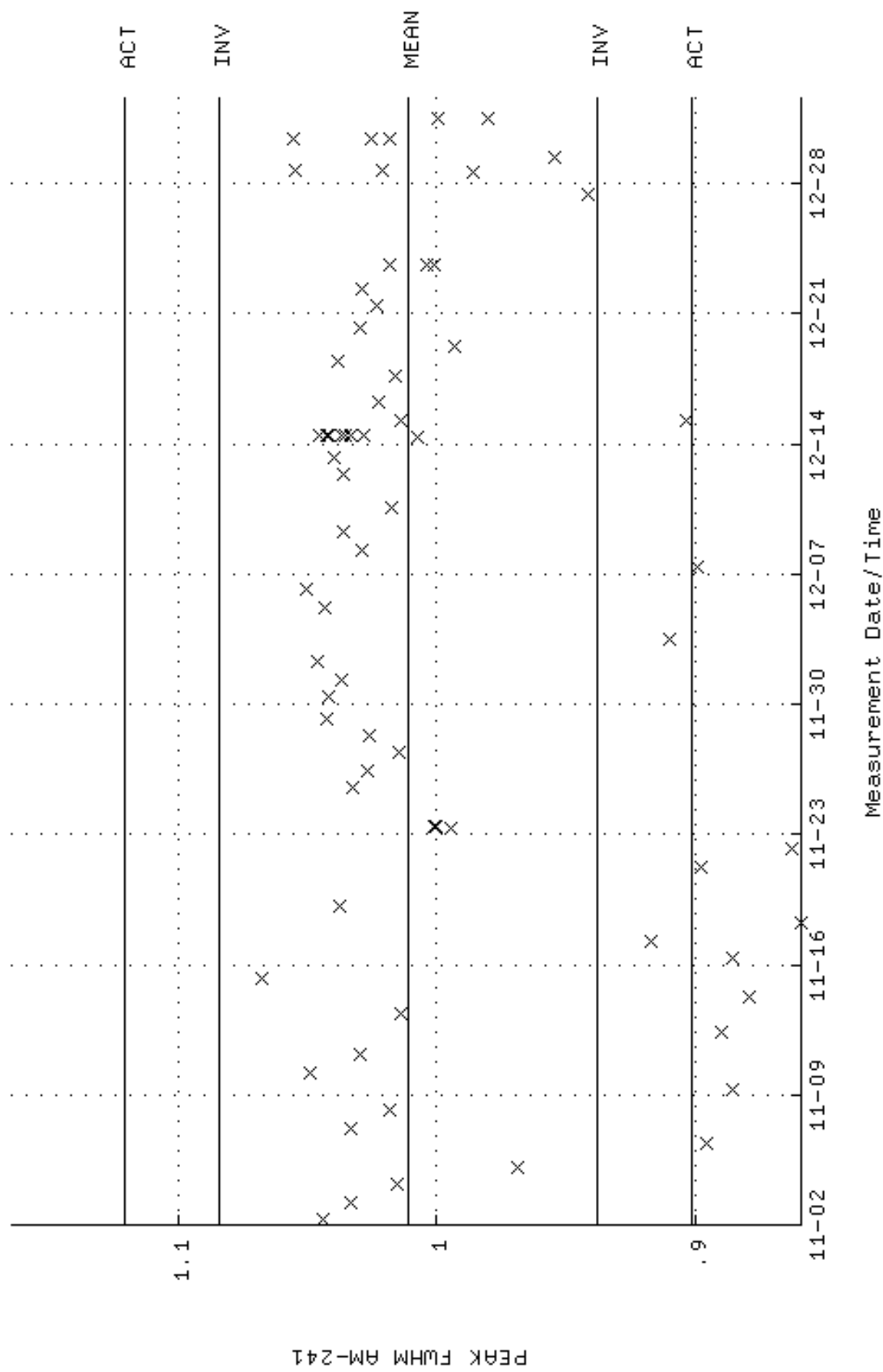
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM02.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-NOV-2022 12:13:35 through 1-JAN-2023 12:00:00
Mean +- Std Dev : 1.88731 +- 3.580330E-02 (1.90 %)



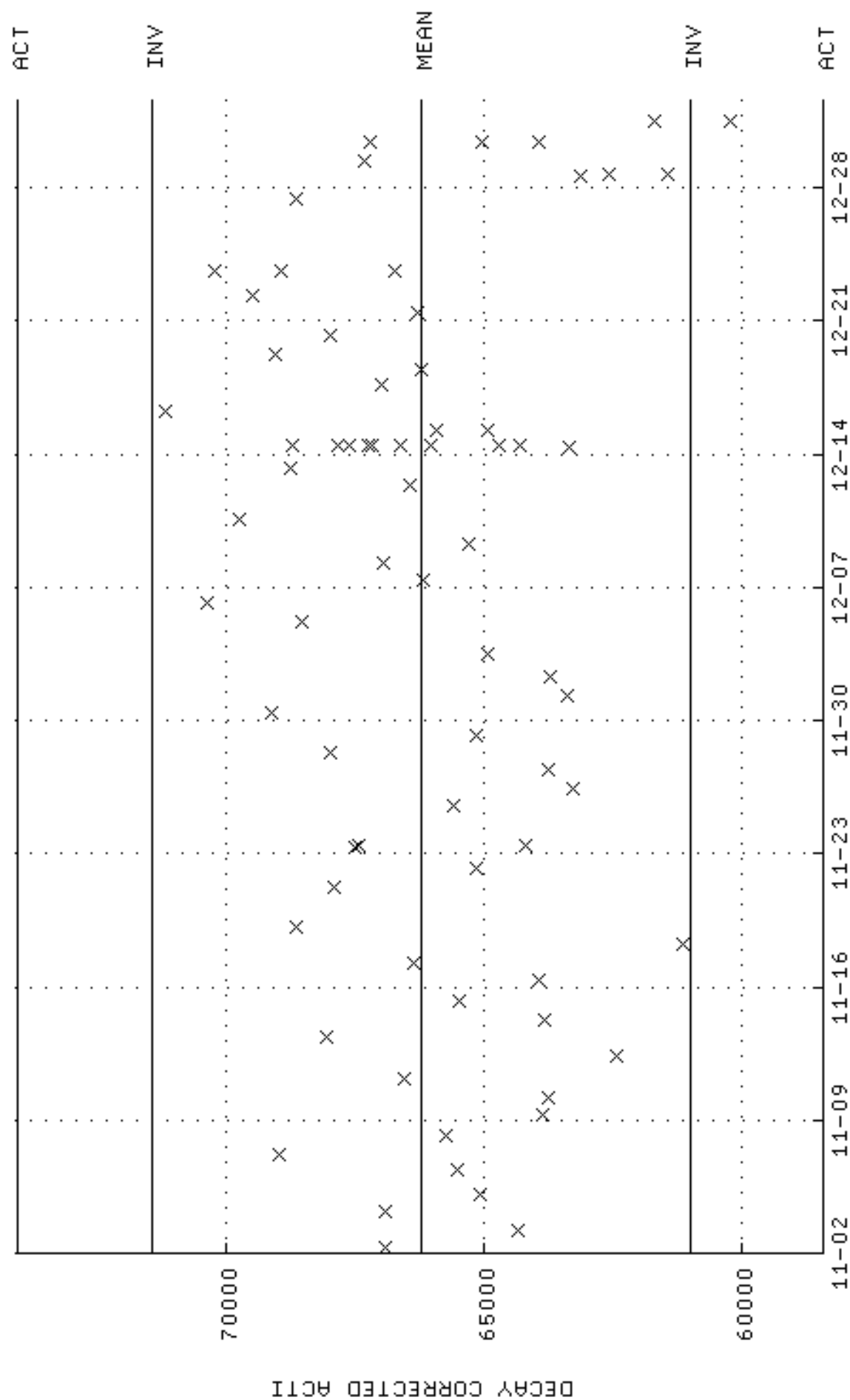
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM04_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-NOV-2022 06:43:30 through 1-JAN-2023 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



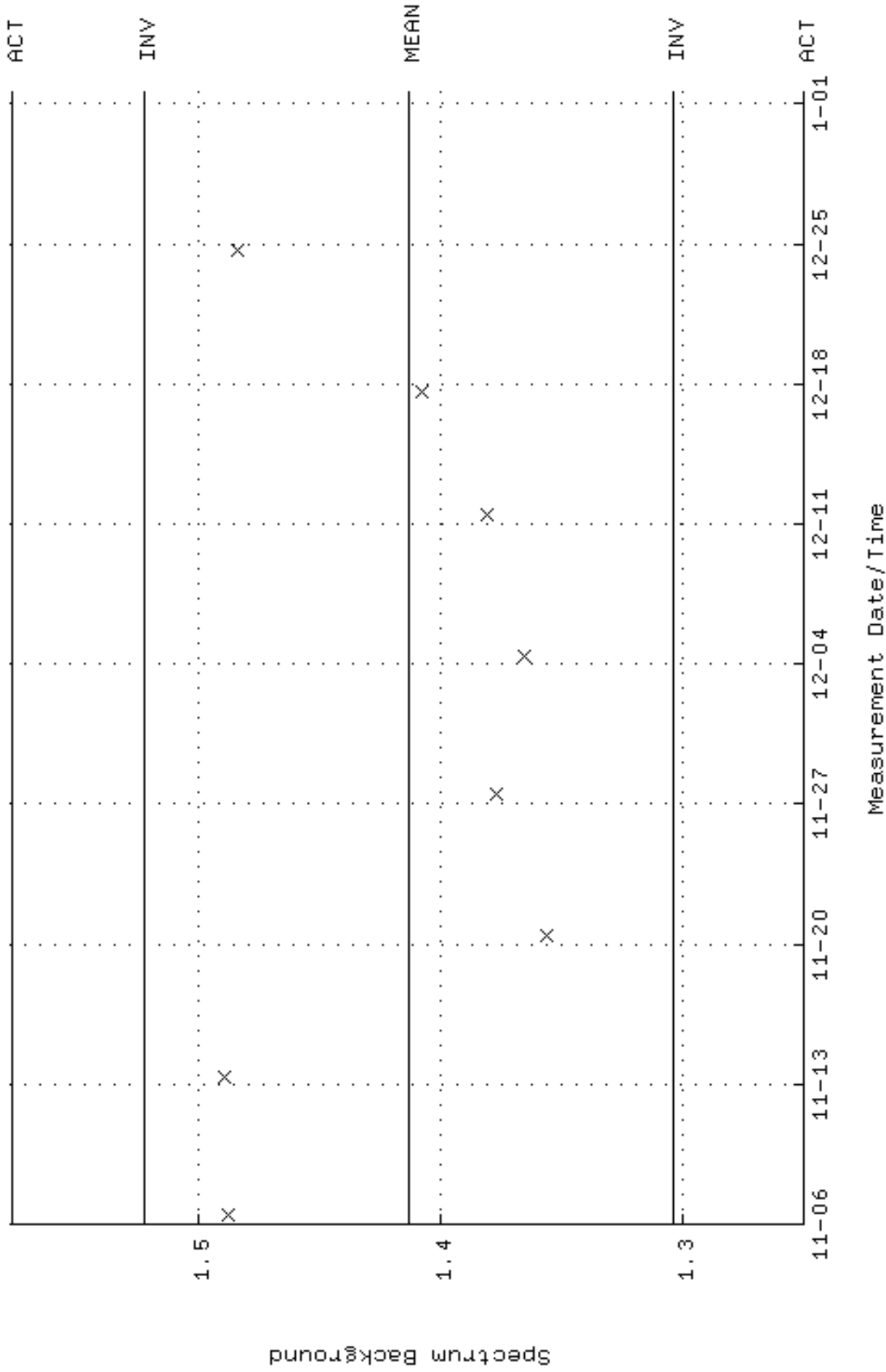
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM04-CAN.QAF;1
 Parameter Name : PSFWM-59 (PEAK FWHM AM-241)
 Start/End Dates : 2-NOV-2022 06:43:30 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 1.01121 +- 3.661174E-02 (3.62 %)



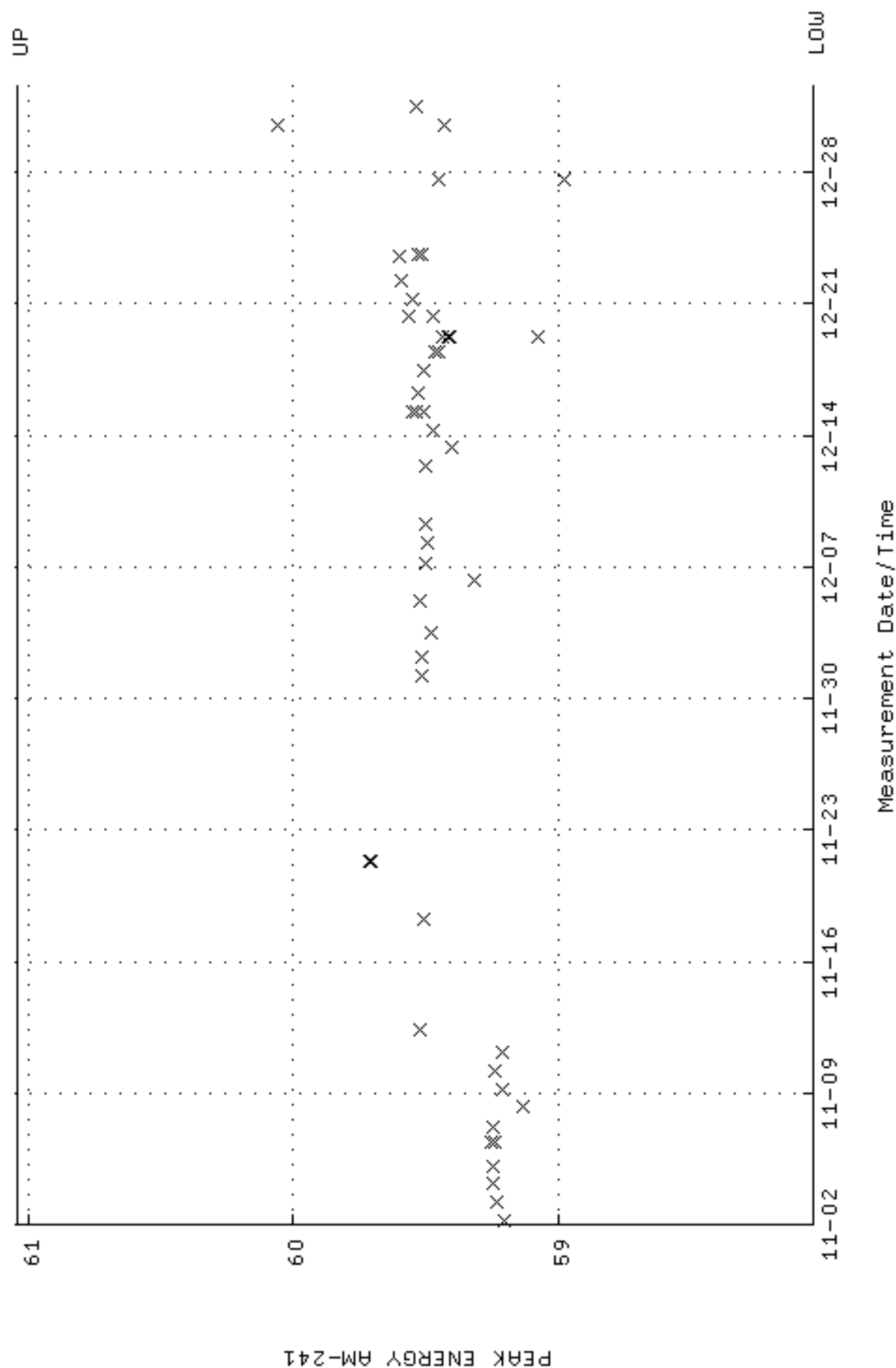
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM04-CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-NOV-2022 06:43:30 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 66219.4 +- 2602.73 (3.93 %)



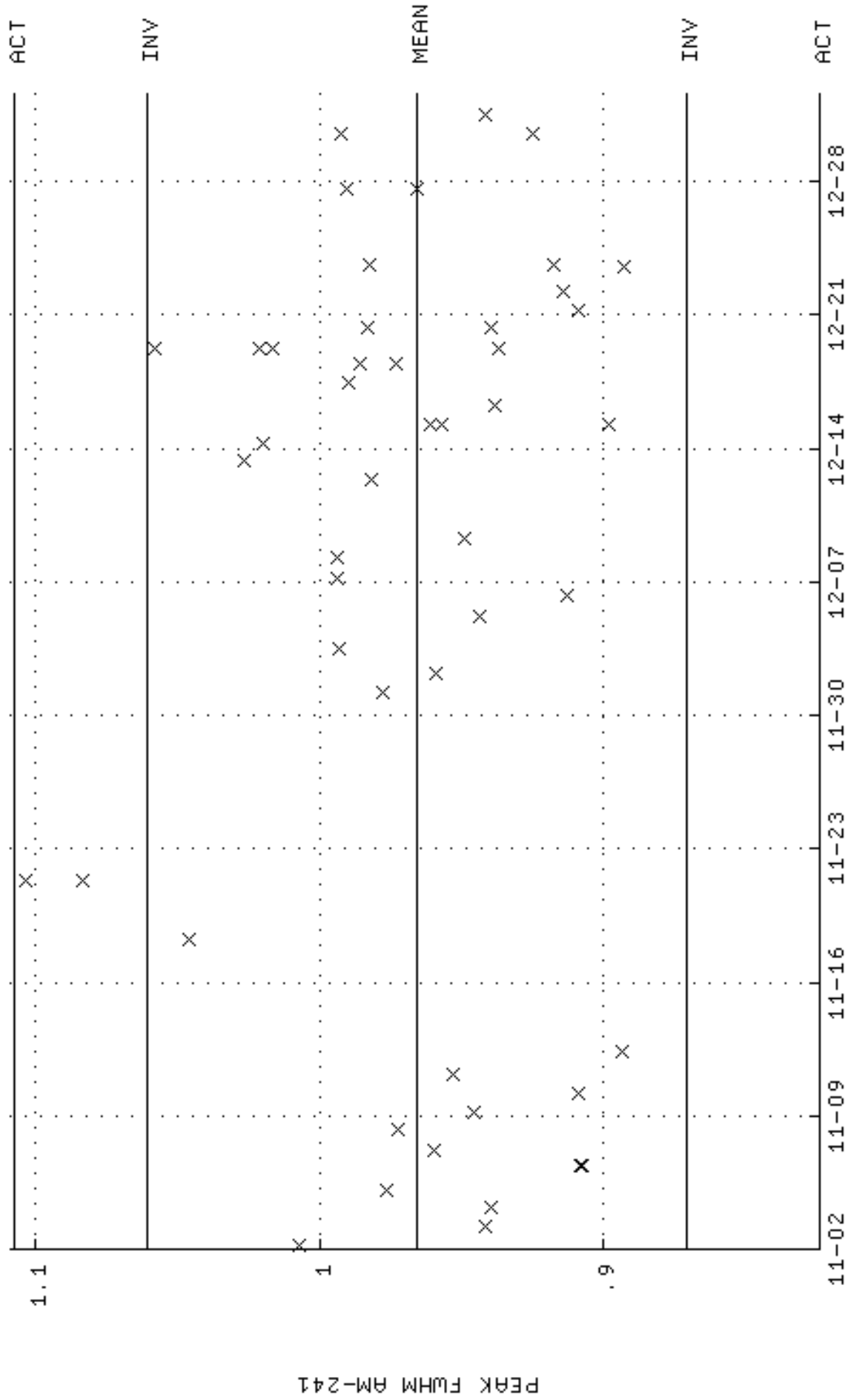
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM04.QAF;2
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-NOV-2022 12:12:19 through 1-JAN-2023 12:00:00
Mean +- Std Dev : 1.41319 +- 5.453611E-02 (3.86 %)



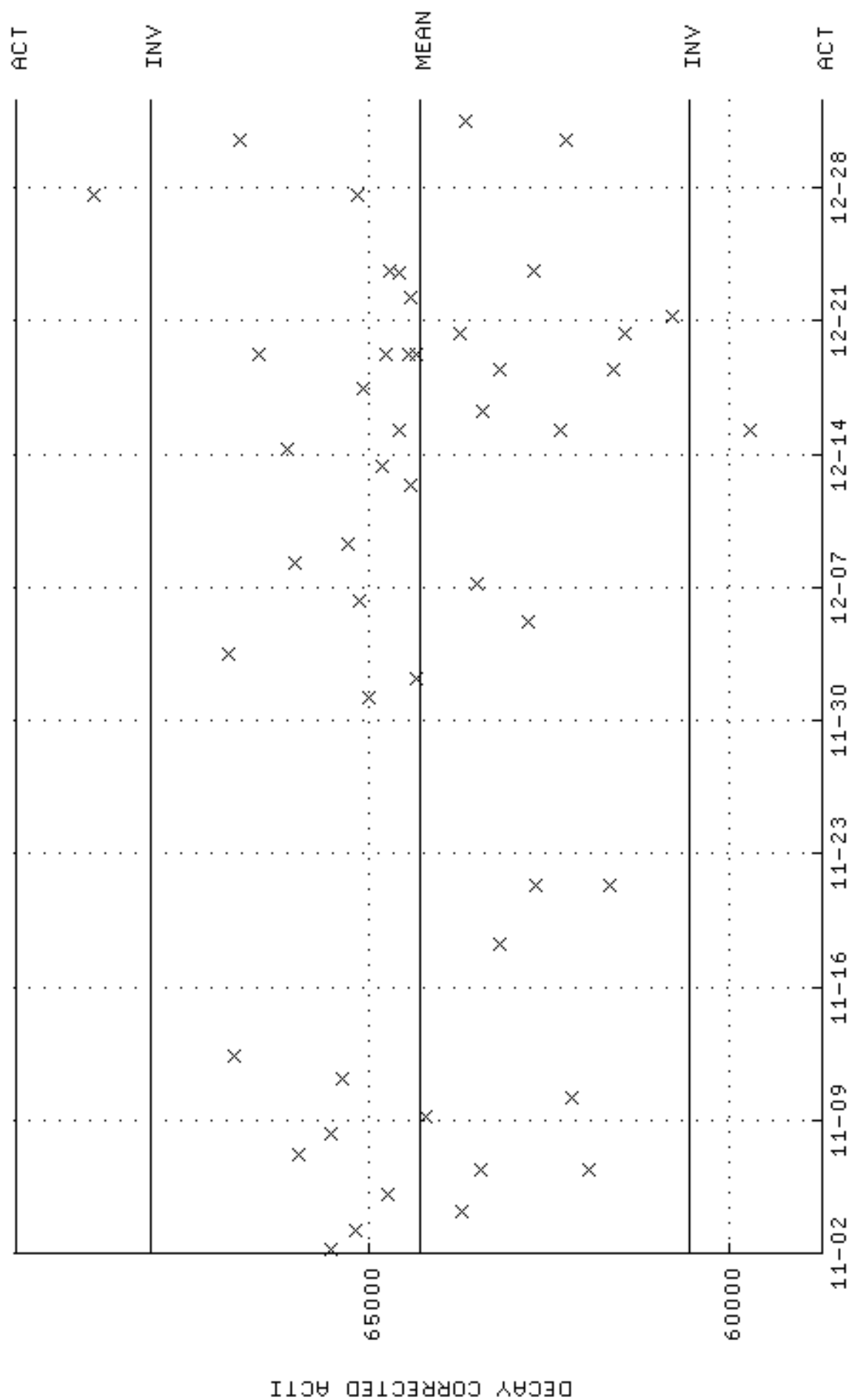
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM16_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-NOV-2022 04:20:54 through 1-JAN-2023 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



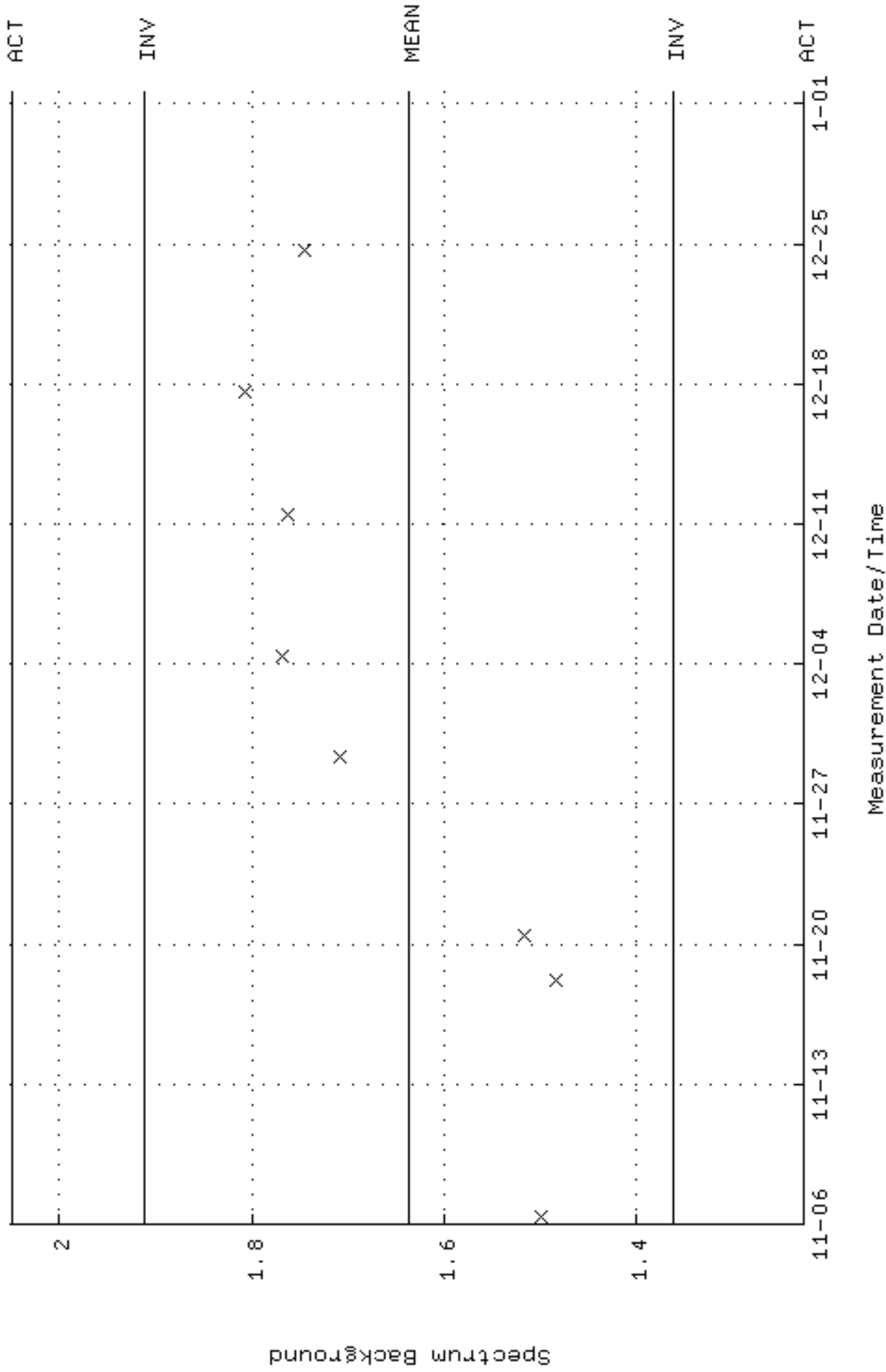
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM16_CAN.QAF;1
Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
Start/End Dates : 2-NOV-2022 04:20:54 through 1-JAN-2023 12:00:00
Mean +- Std Dev : 0.965802 +- 4.750798E-02 (4.92 %)



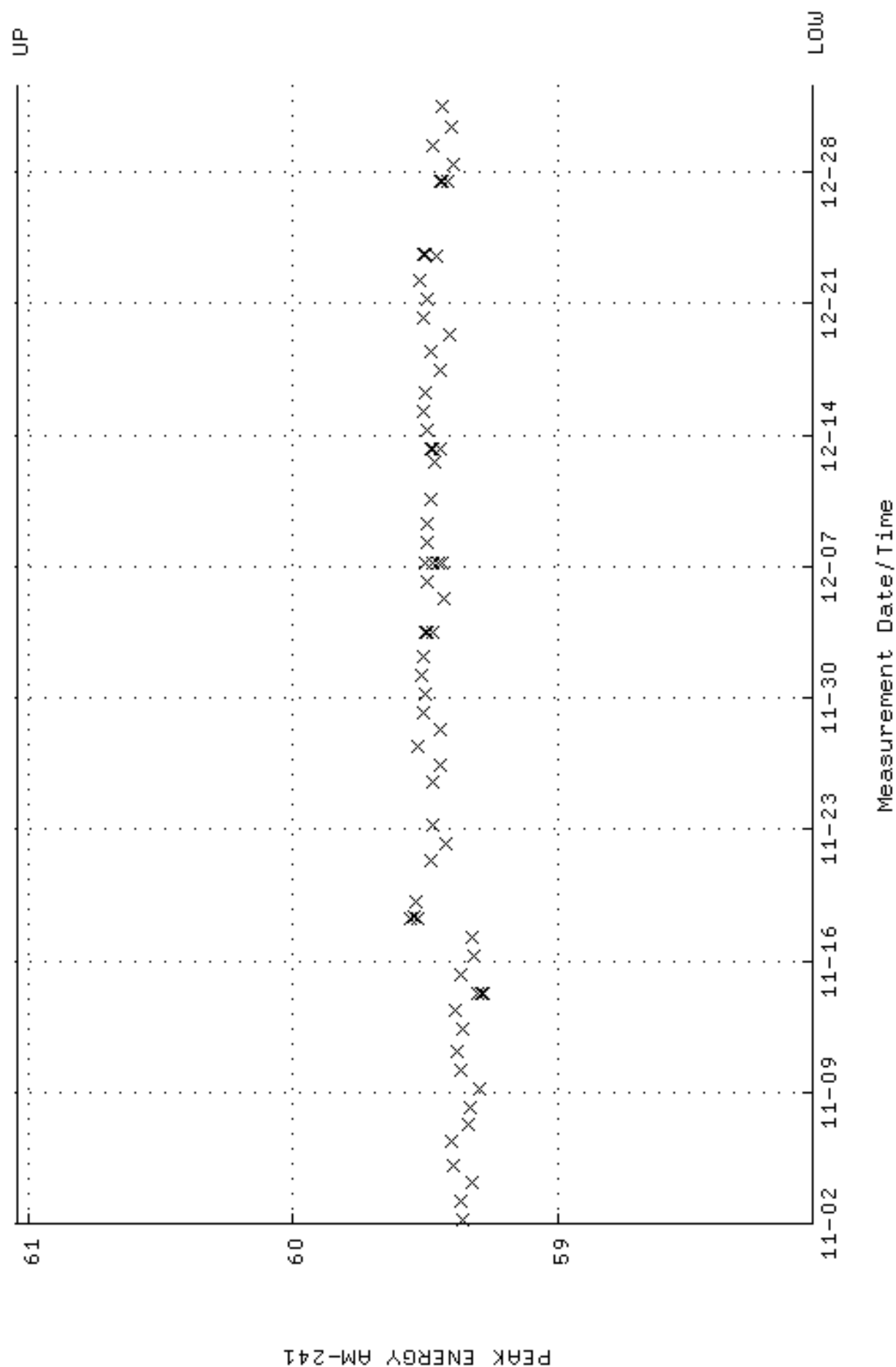
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM16-CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-NOV-2022 04:20:54 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 64294.7 +- 1857.56 (2.89 %)



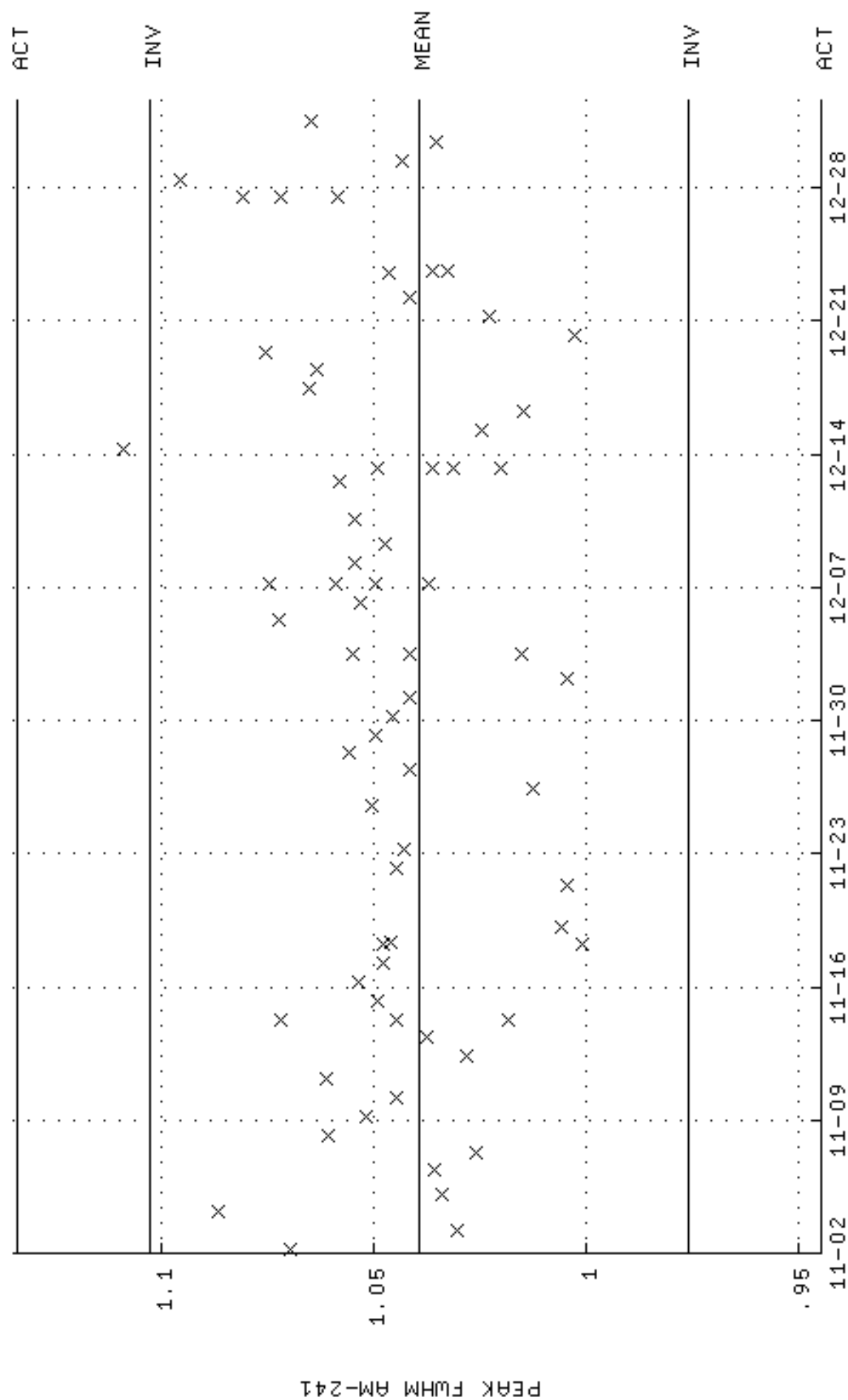
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM16.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-NOV-2022 09:58:09 through 1-JAN-2023 12:00:00
Mean +- Std Dev : 1.63722 +- 0.137400 (8.39 %)



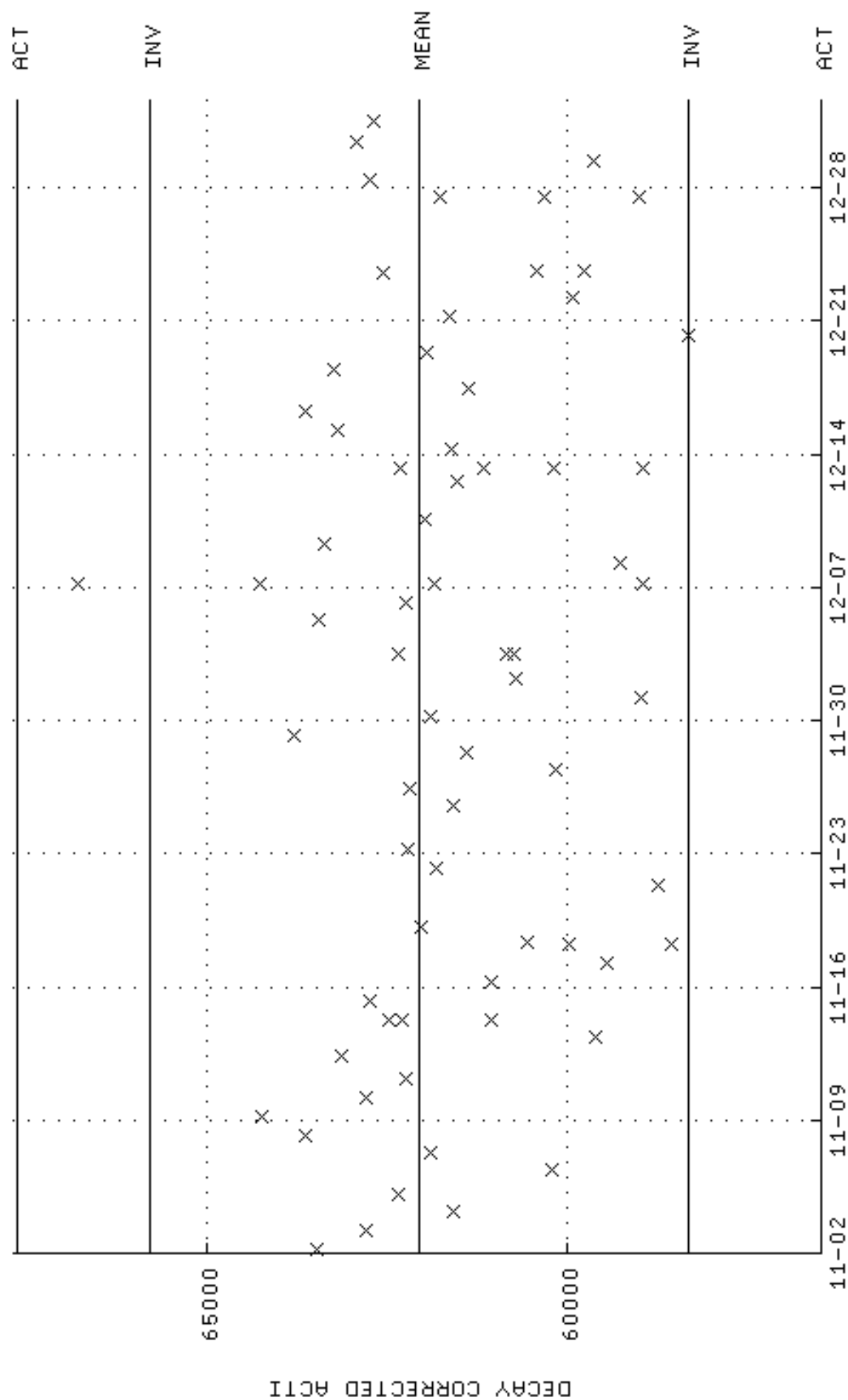
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM18_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-NOV-2022 04:21:00 through 1-JAN-2023 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



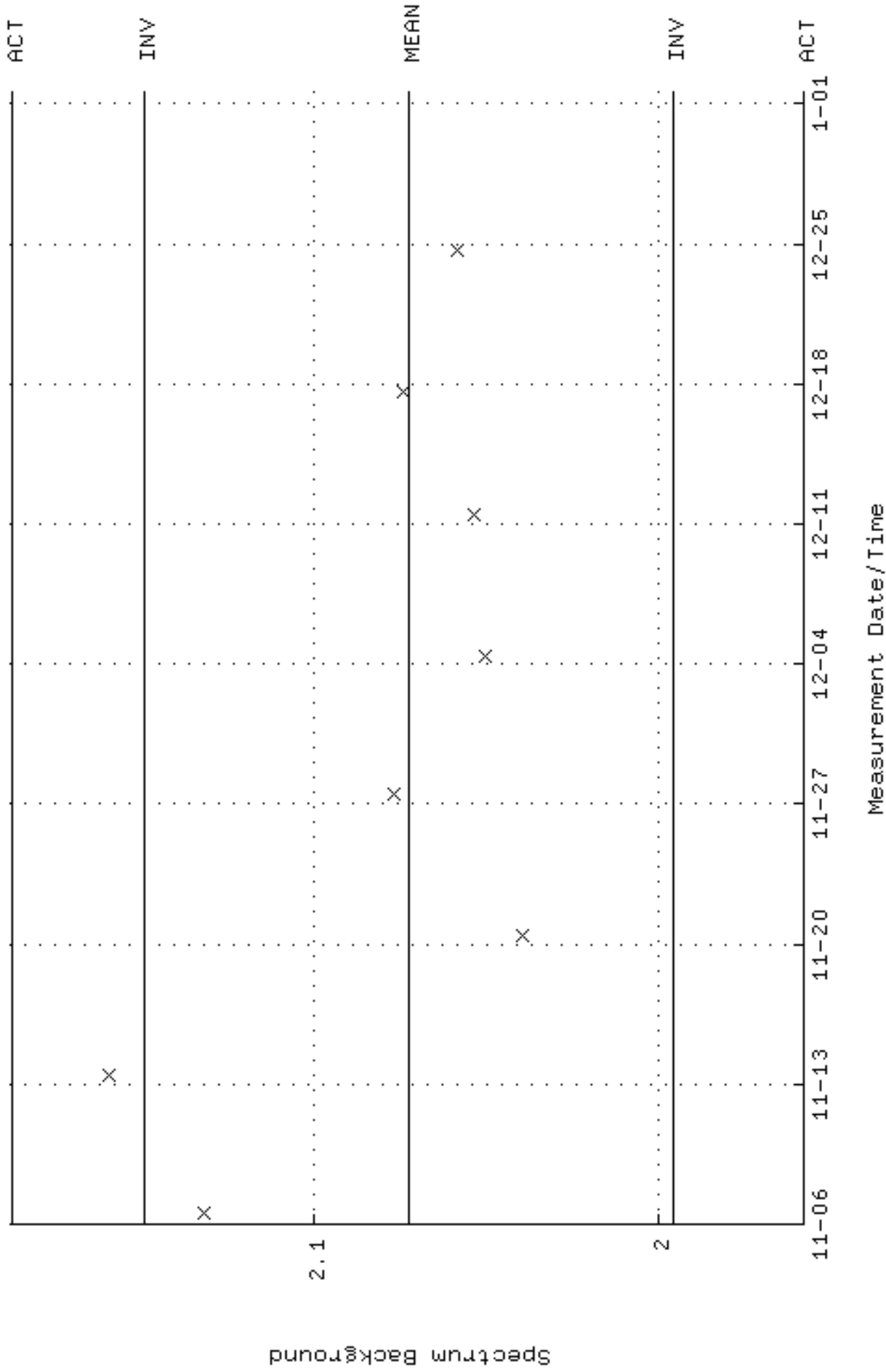
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM18-CAN.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-NOV-2022 04:21:00 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 1.03944 +- 3.165008E-02 (3.04 %)



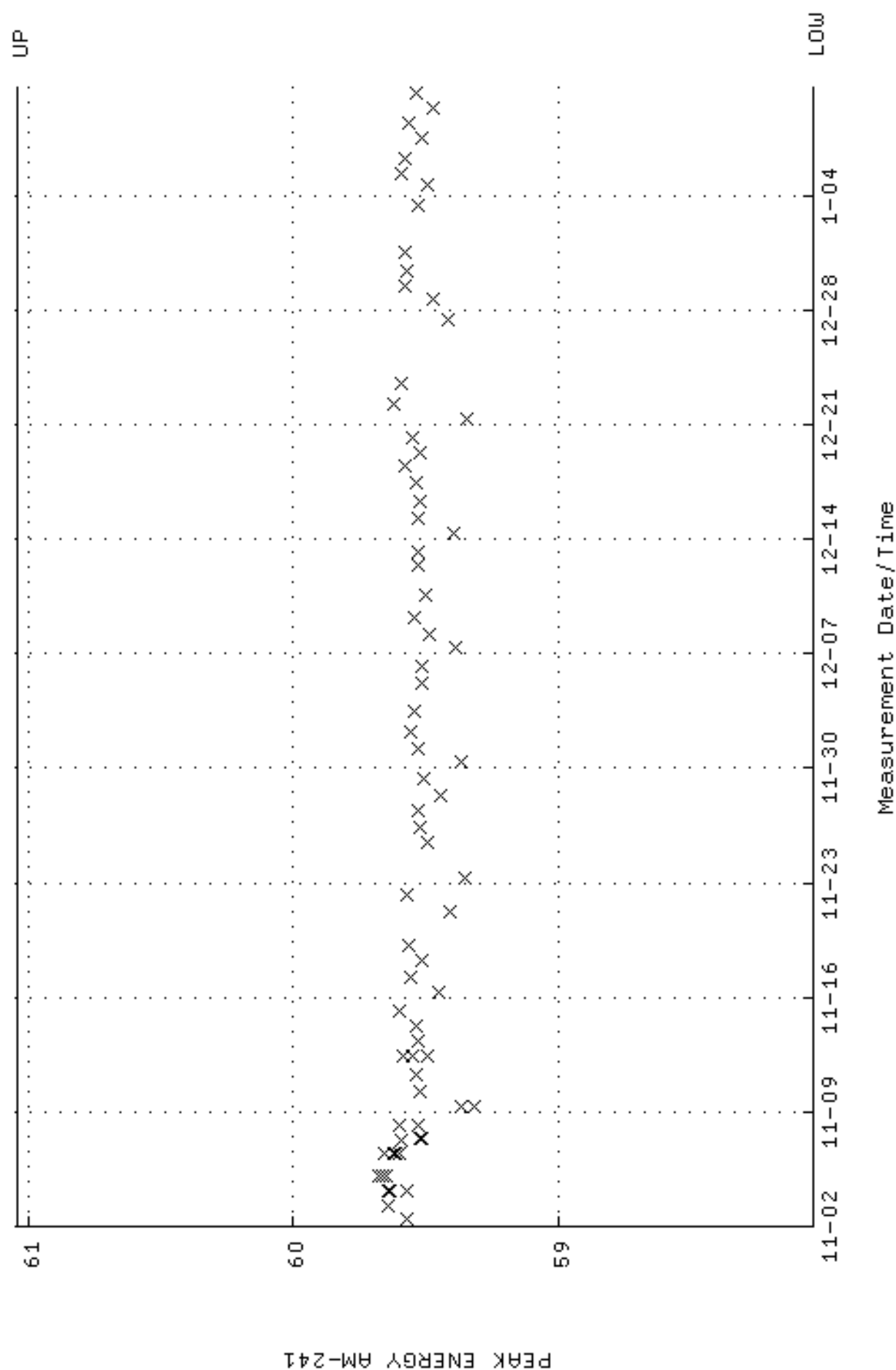
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM18-CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-NOV-2022 04:21:00 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 62072.8 +- 1861.17 (3.00 %)



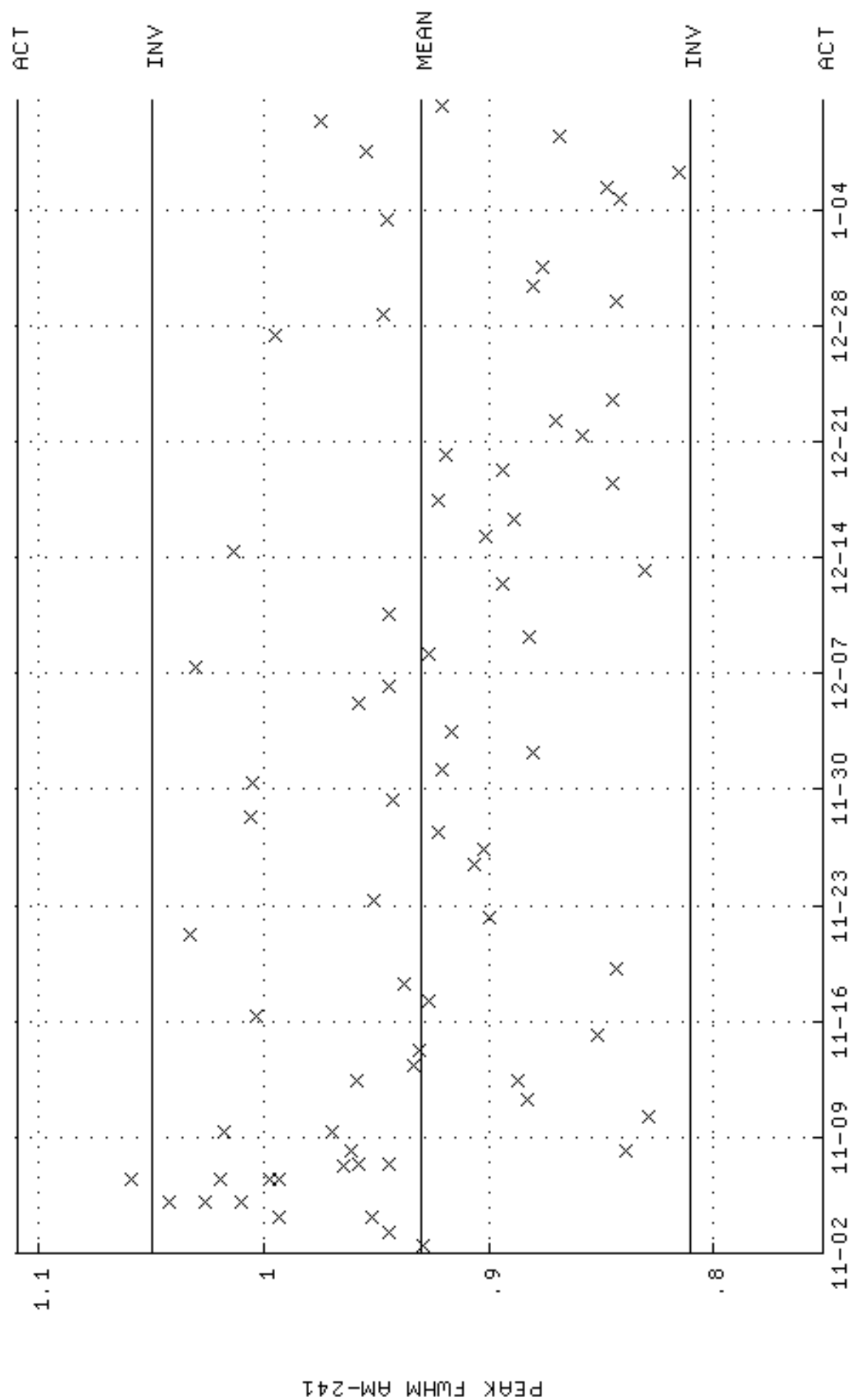
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM18.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-NOV-2022 12:20:06 through 1-JAN-2023 12:00:00
Mean +- Std Dev : 2.07274 +- 3.836630E-02 (1.85 %)



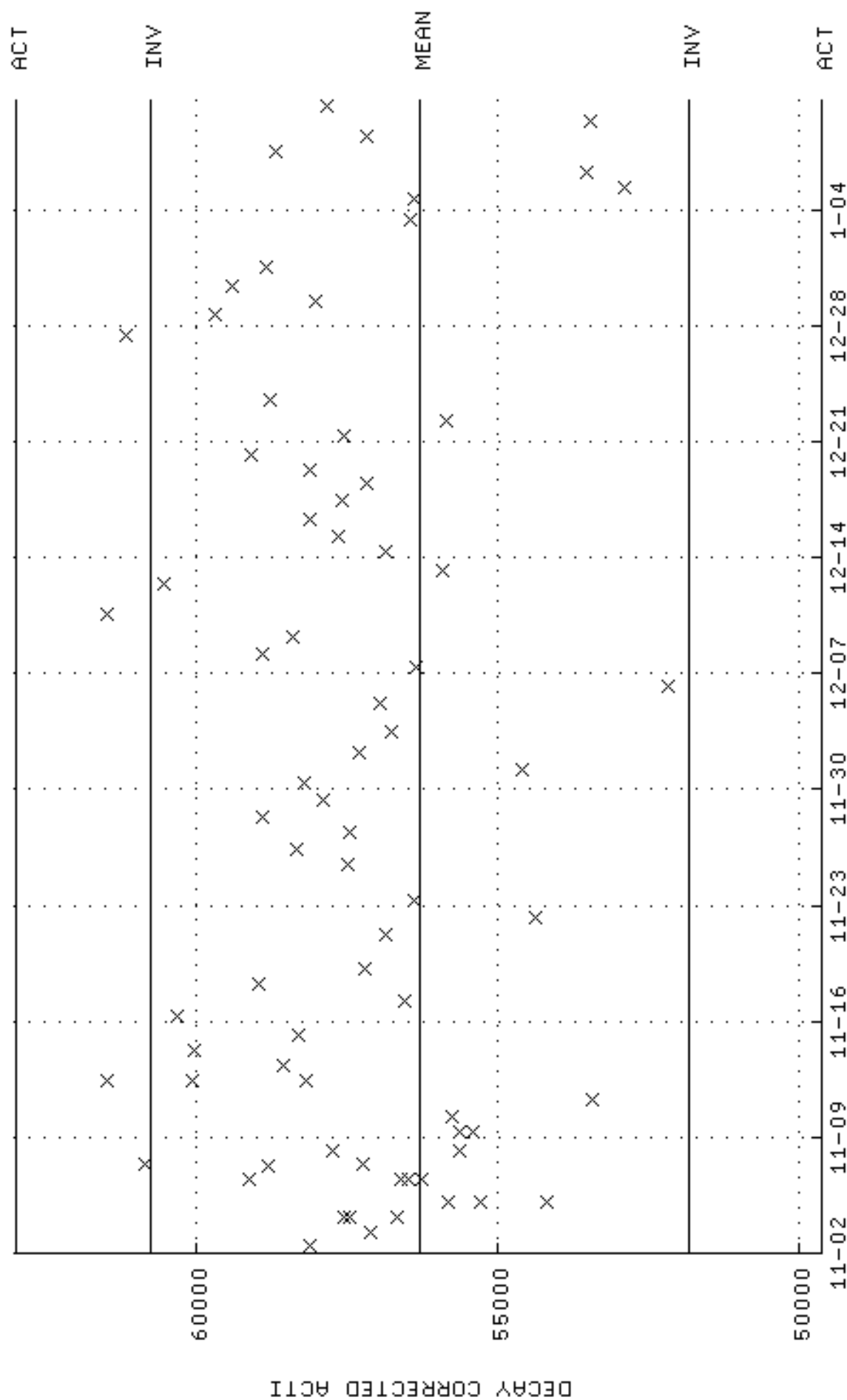
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM23_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-NOV-2022 10:25:18 through 10-JAN-2023 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



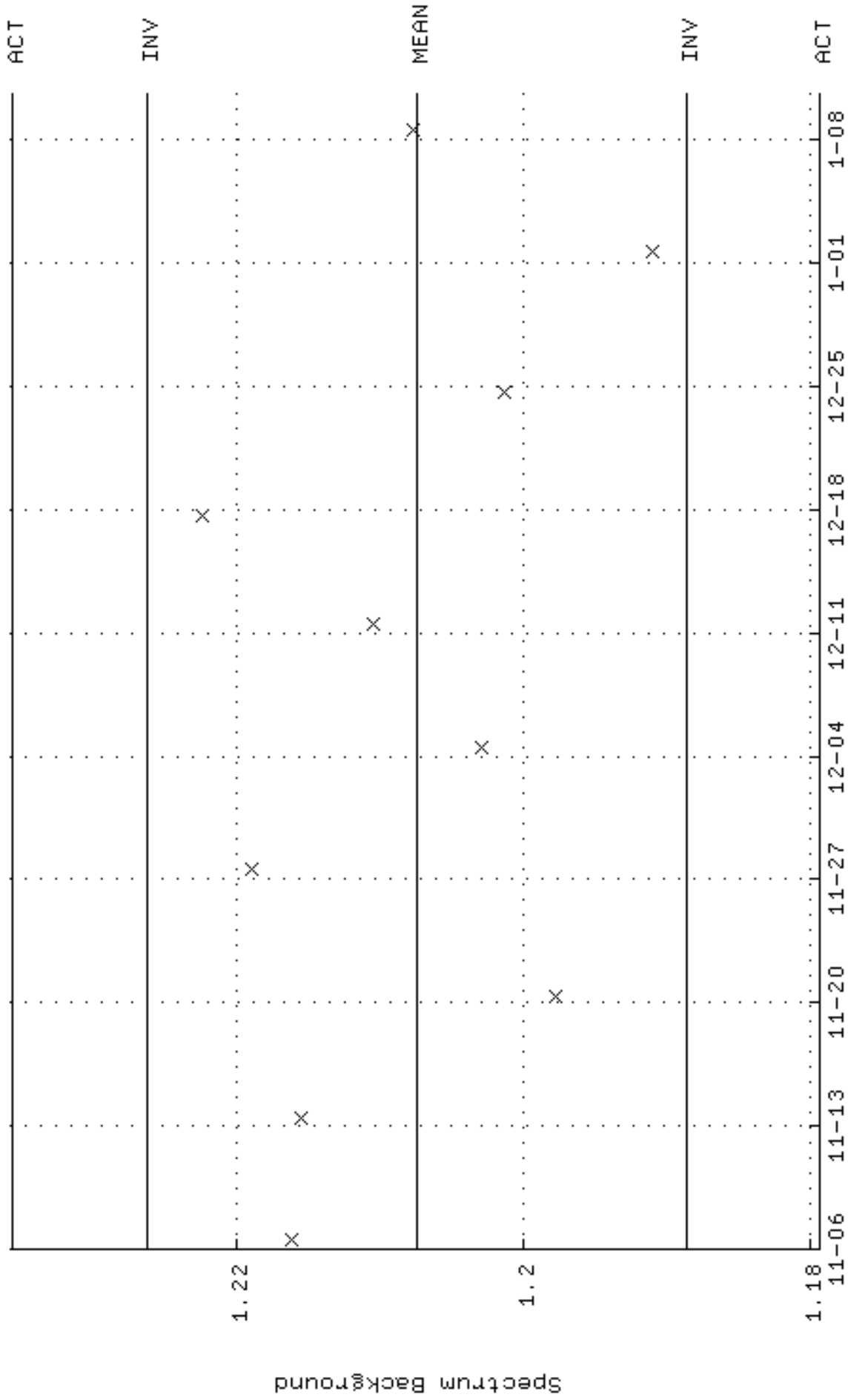
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC_GAM23_CAN.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-NOV-2022 10:25:18 through 10-JAN-2023 12:00:00
 Mean +- Std Dev : 0.930295 +- 5.954588E-02 (6.40 %)



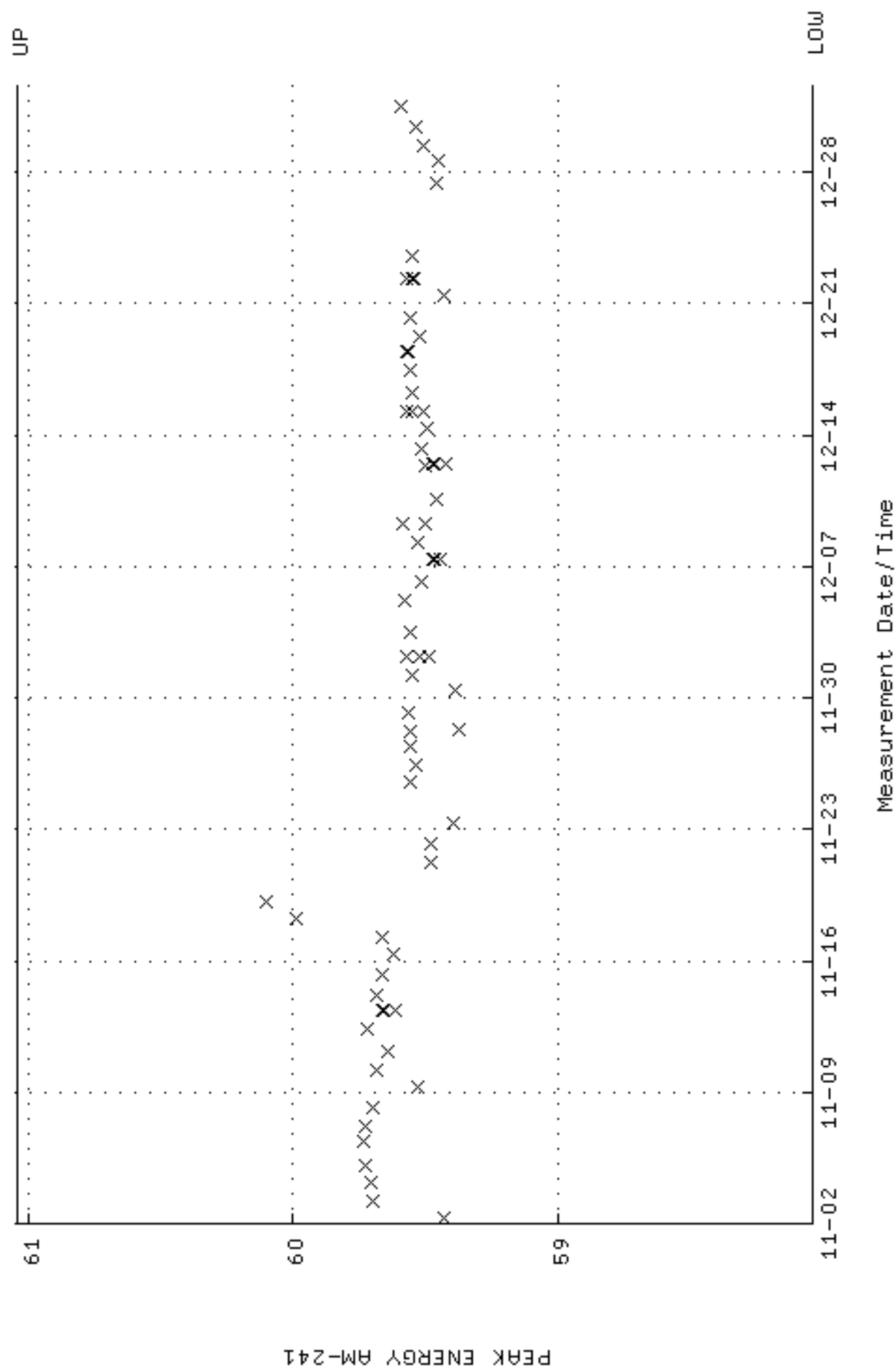
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM23_CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-NOV-2022 10:25:18 through 10-JAN-2023 12:00:00
 Mean +- Std Dev : 56301.4 +- 2221.15 (3.95 %)



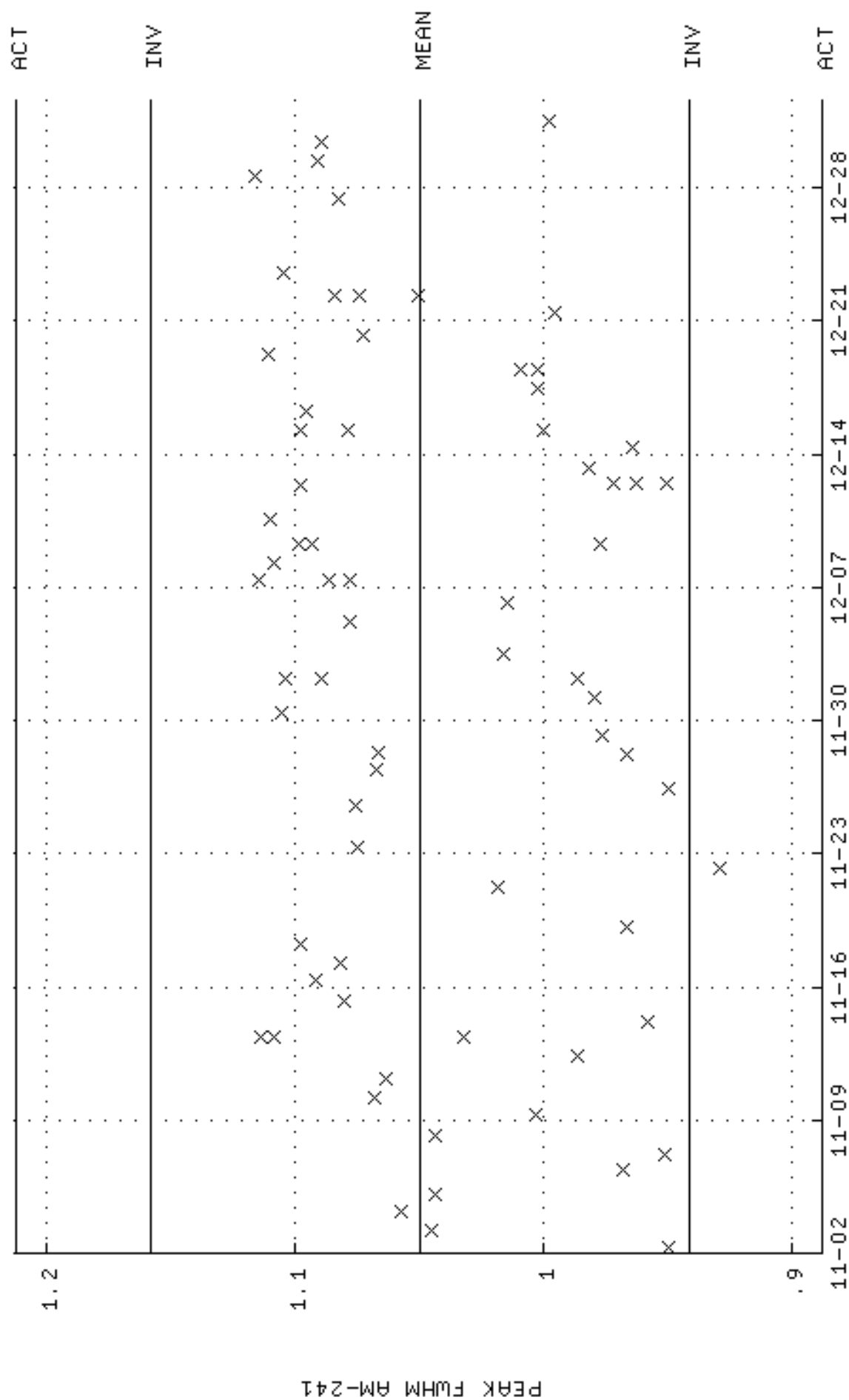
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM23.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-NOV-2022 12:12:46 through 10-JAN-2023 12:00:00
Mean +- Std Dev : 1.20750 +- 9.374767E-03 (0.78 %)



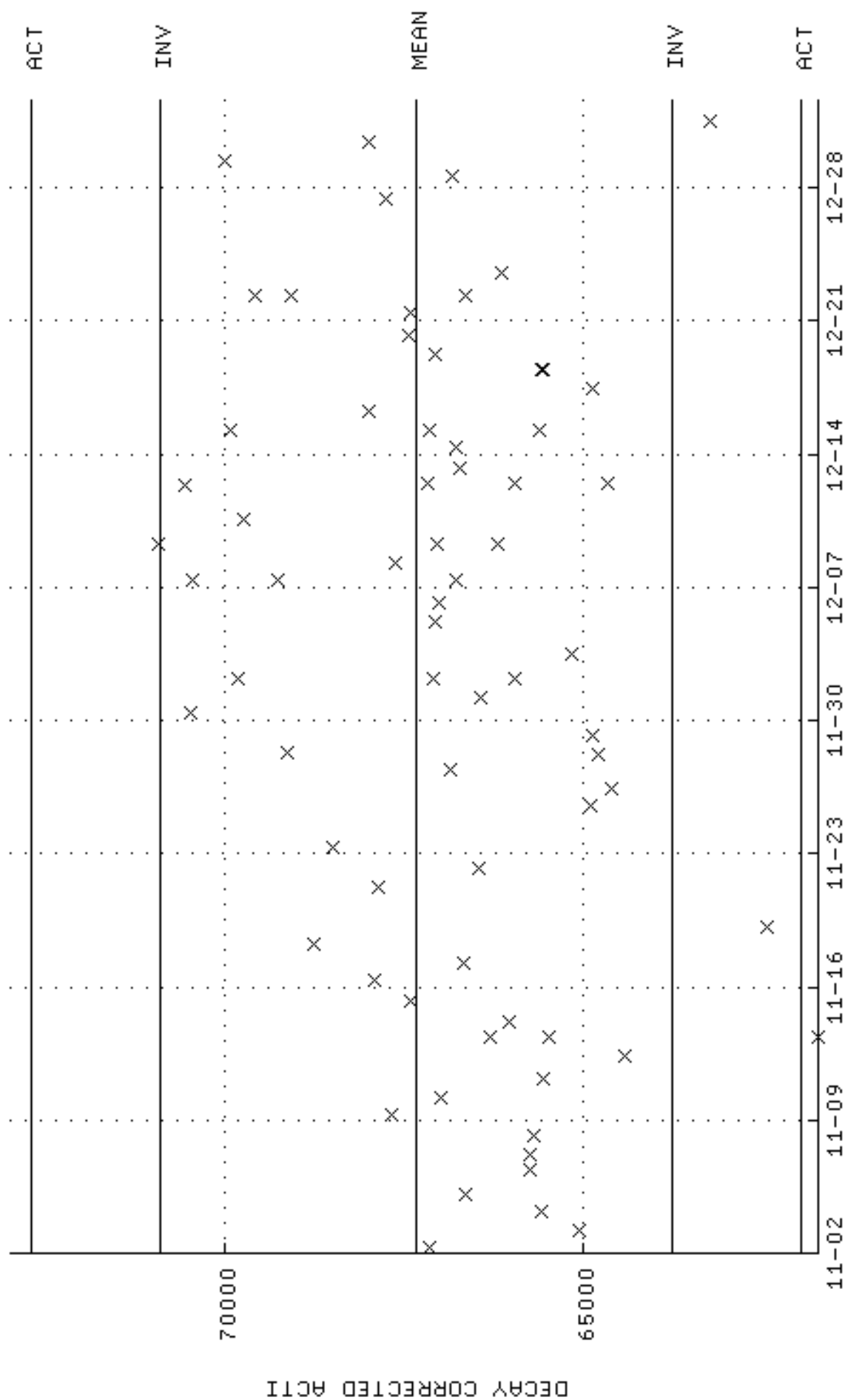
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM28_JAR.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-NOV-2022 06:22:27 through 1-JAN-2023 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



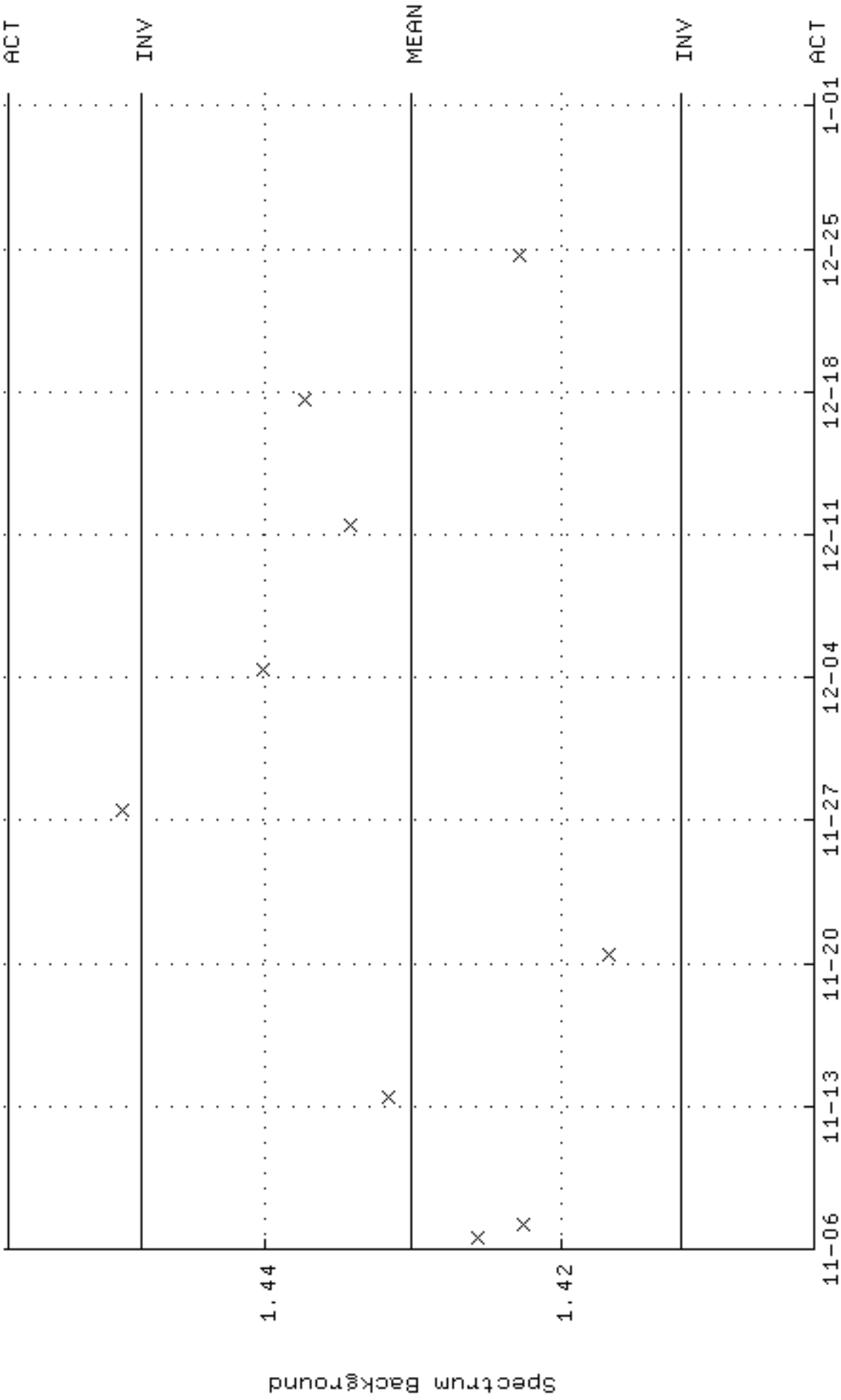
QA filename : DKA100:[CANBERRA,GAMMA,SCUSR,QA]QCC_GAM28_JAR.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 2-NOV-2022 06:22:27 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 1.05013 +- 5.399733E-02 (5.14 %)



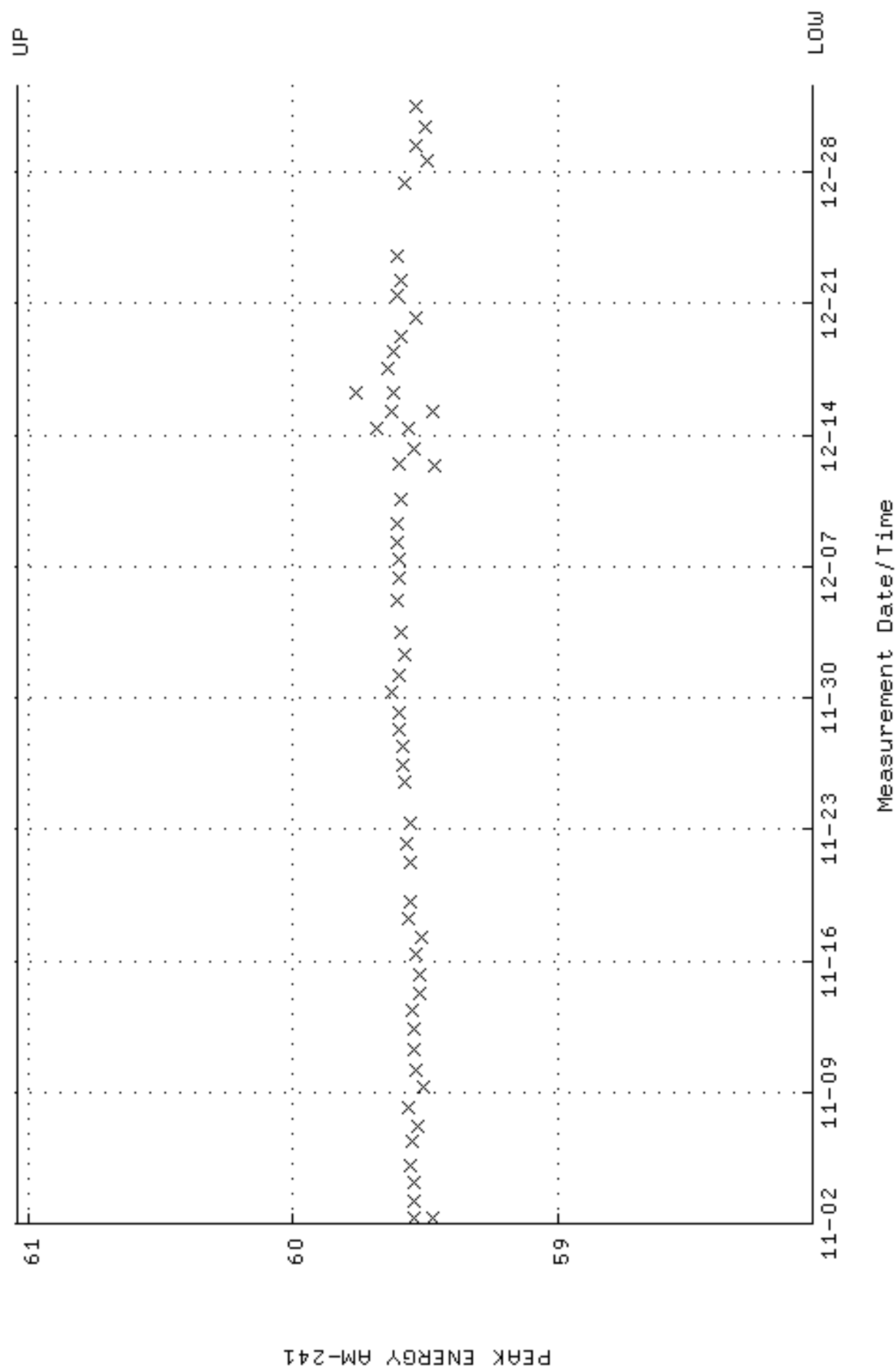
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM28-JAR.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-NOV-2022 06:22:27 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 67333.5 +- 1791.13 (2.66 %)



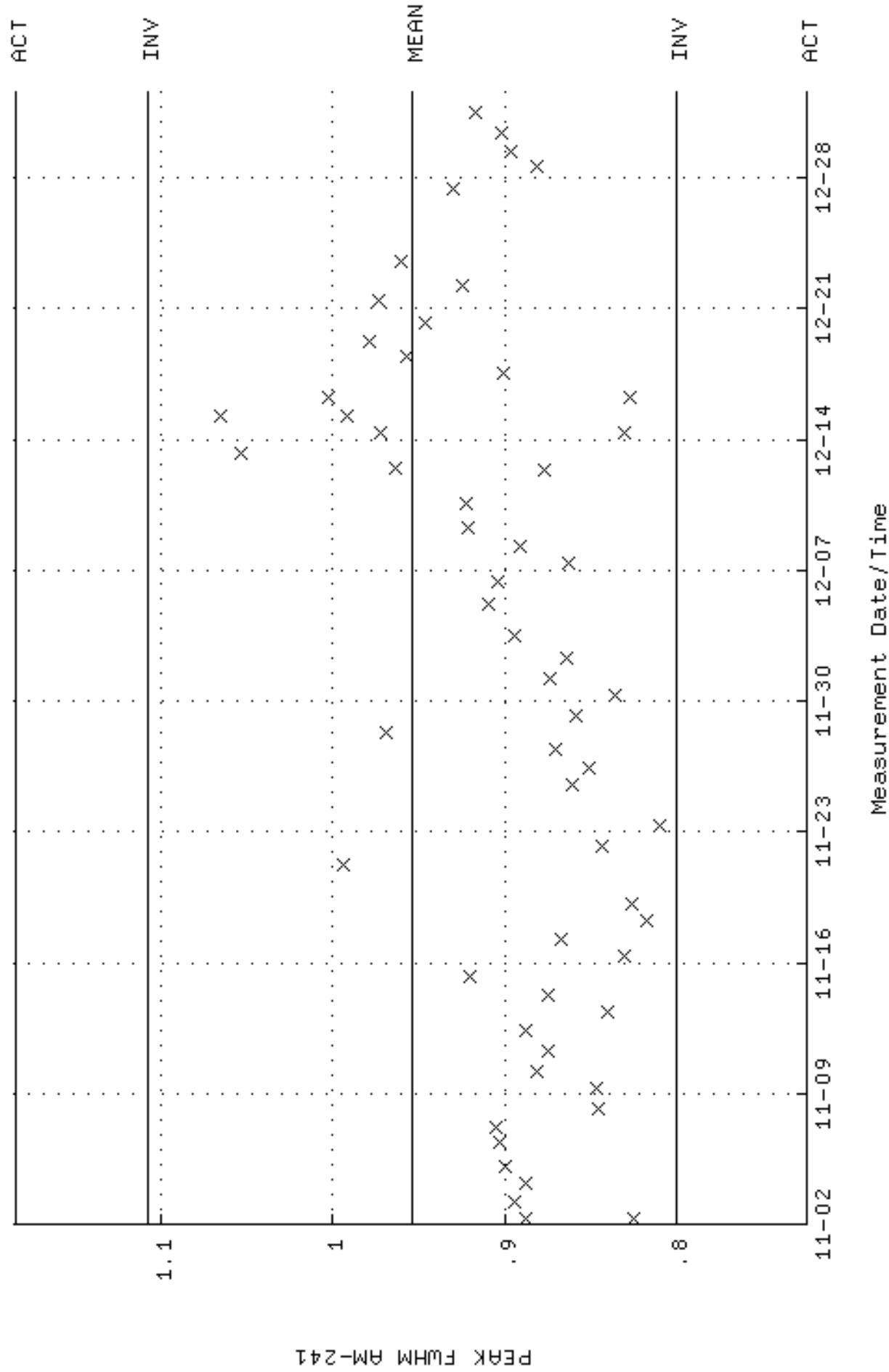
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM28.QAF;1
 Parameter Name : BACKRATE (Spectrum Background Rate)
 Start/End Dates : 6-NOV-2022 12:17:32 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 1.43018 +- 9.086142E-03 (0.64 %)



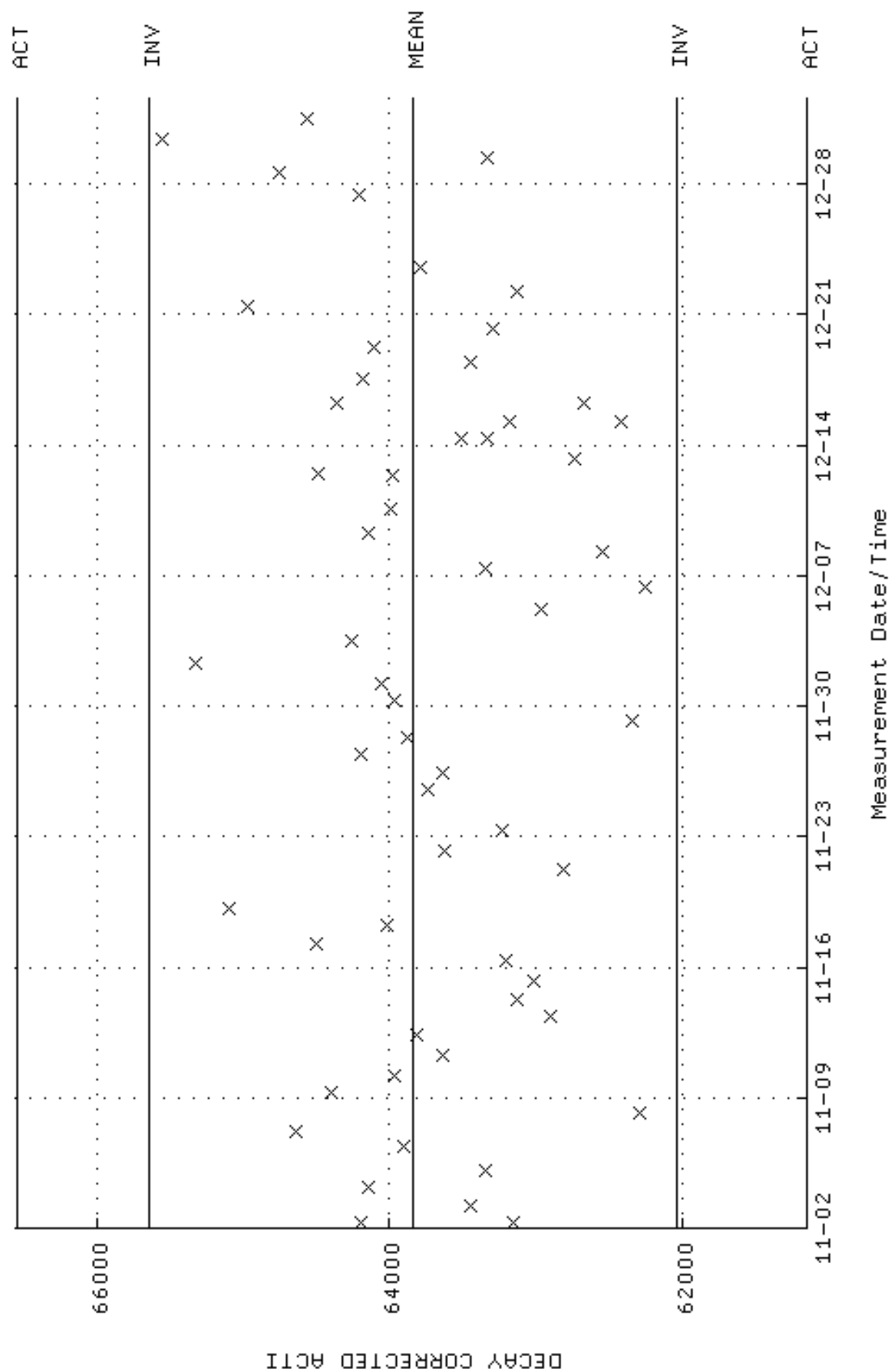
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM38_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 2-NOV-2022 06:43:39 through 1-JAN-2023 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



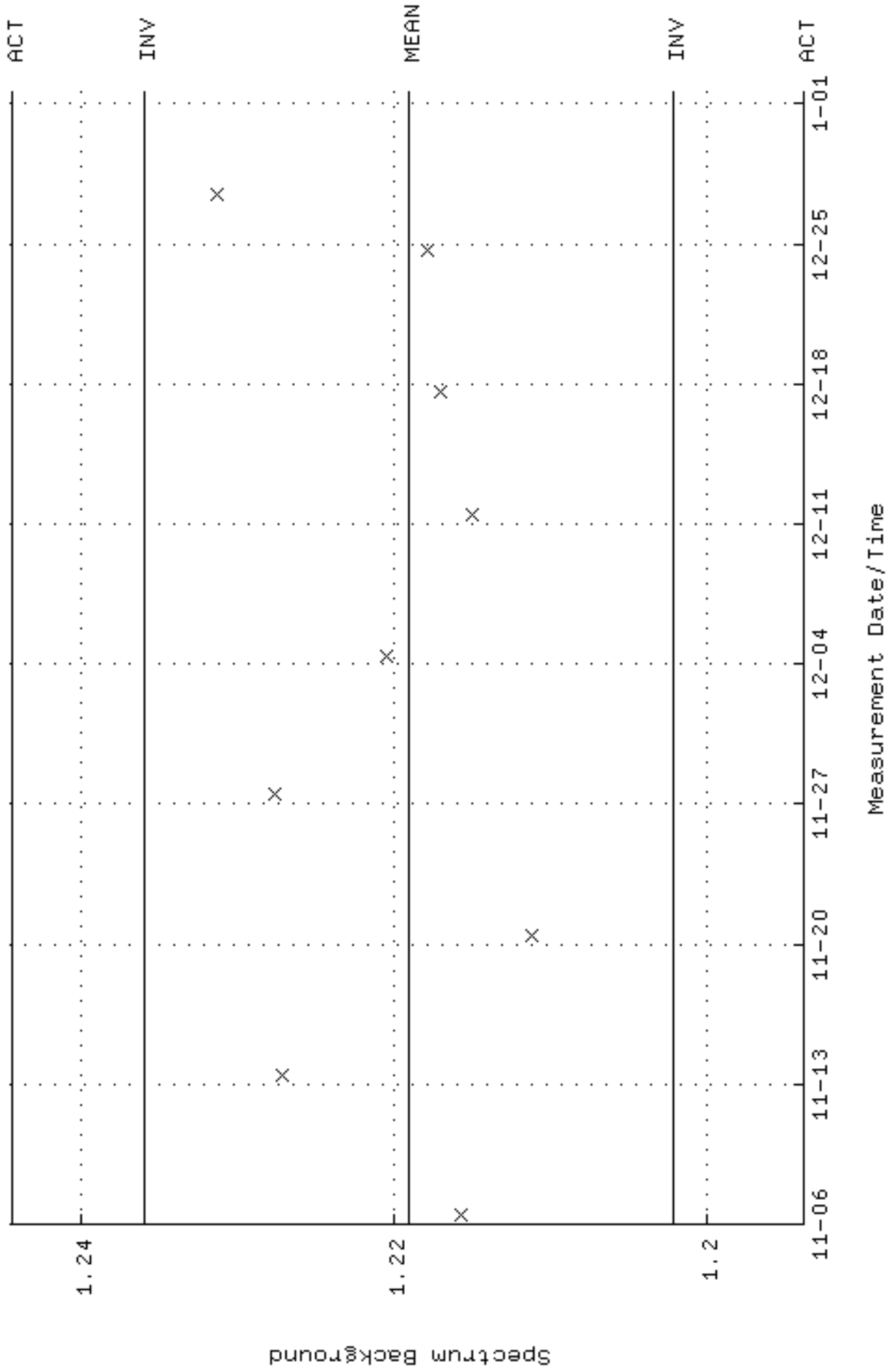
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC-GAM38_CAN.QAF;1
Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
Start/End Dates : 2-NOV-2022 06:43:39 through 1-JAN-2023 12:00:00
Mean +- Std Dev : 0.954240 +- 7.673284E-02 (8.04 %)



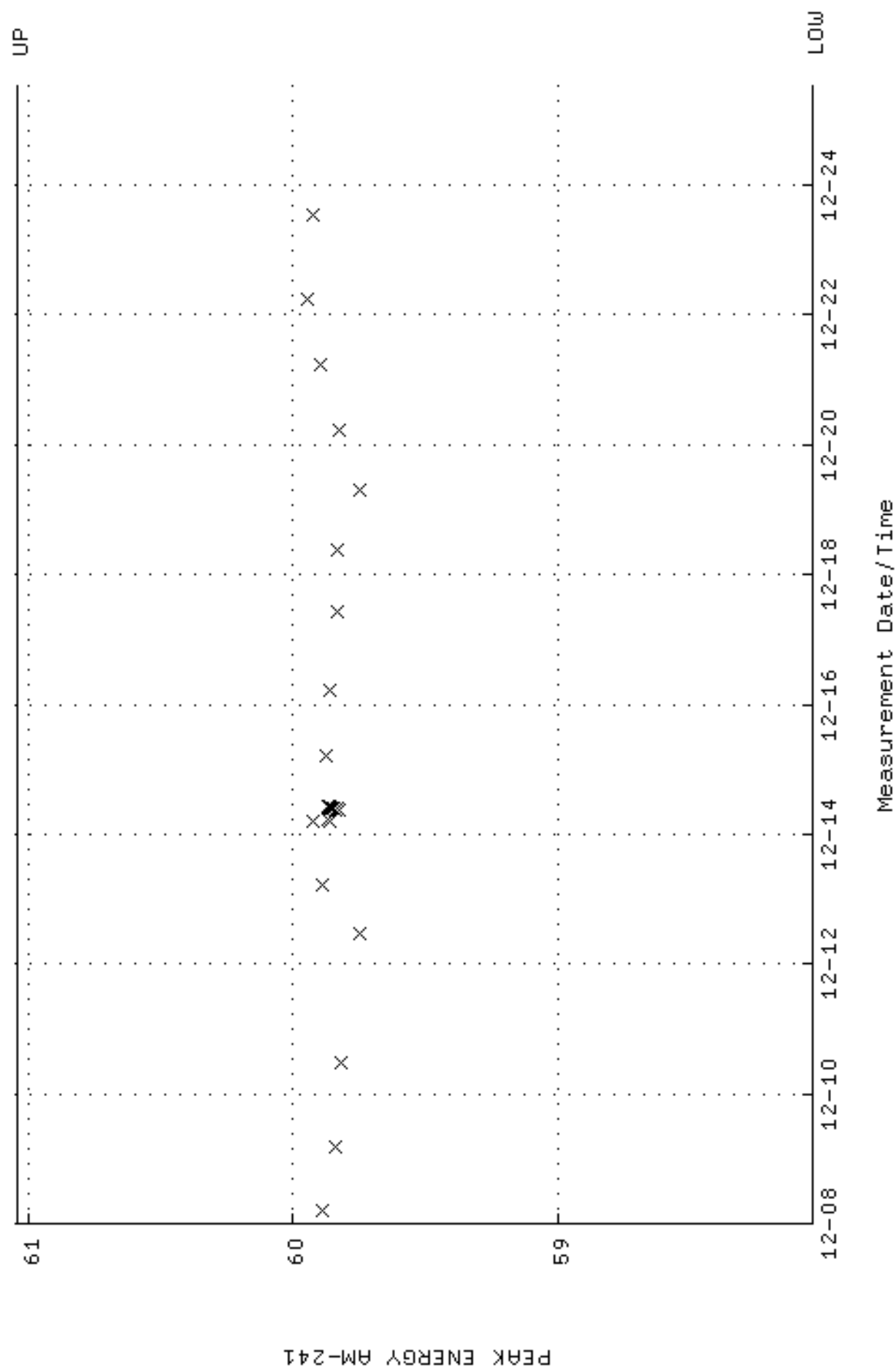
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM38_CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 2-NOV-2022 06:43:39 through 1-JAN-2023 12:00:00
 Mean +- Std Dev : 63846.7 +- 900.227 (1.41 %)



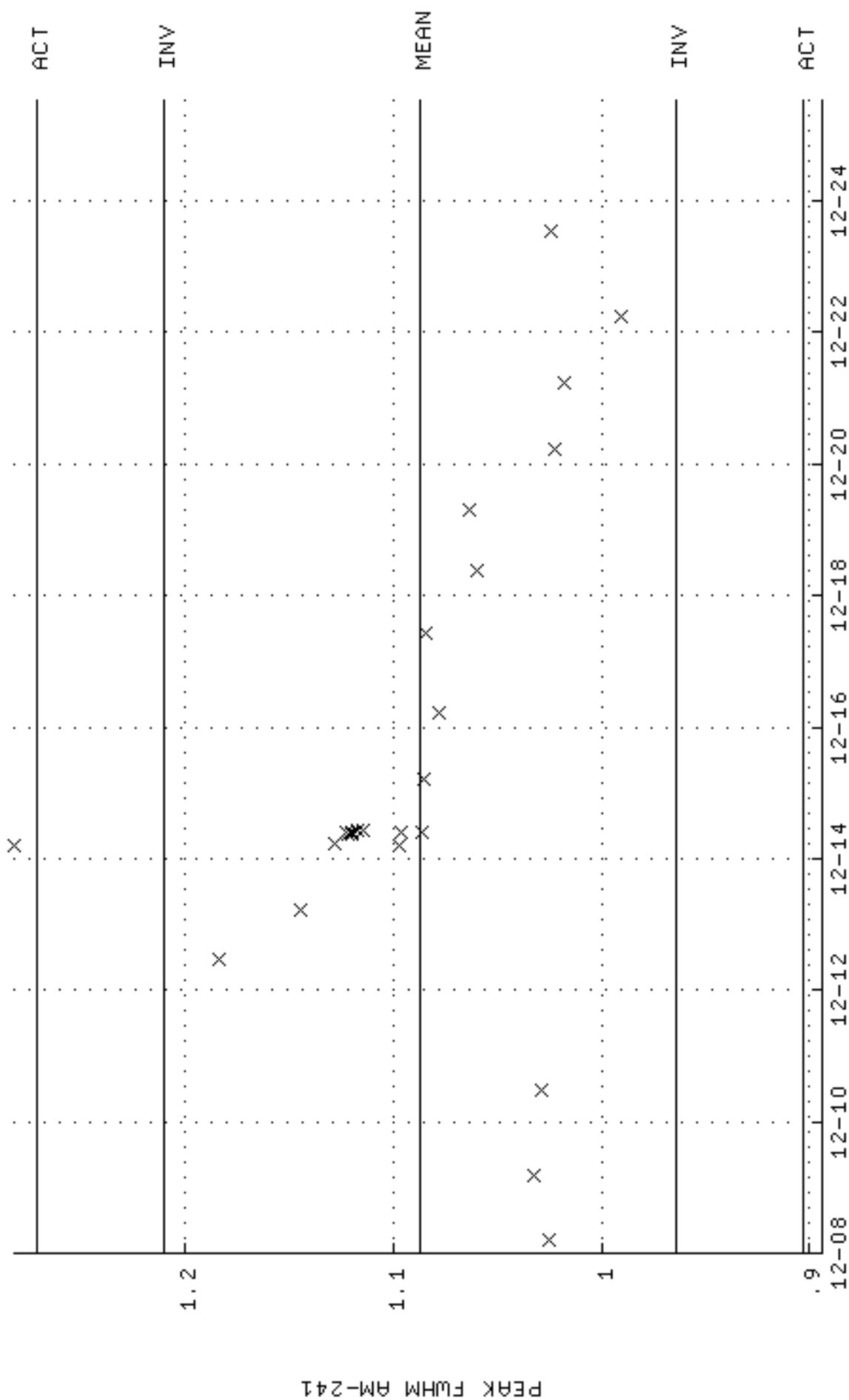
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM38.QAF;2
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 6-NOV-2022 11:24:41 through 1-JAN-2023 12:00:00
Mean +- Std Dev : 1.21913 +- 8.426066E-03 (0.69 %)



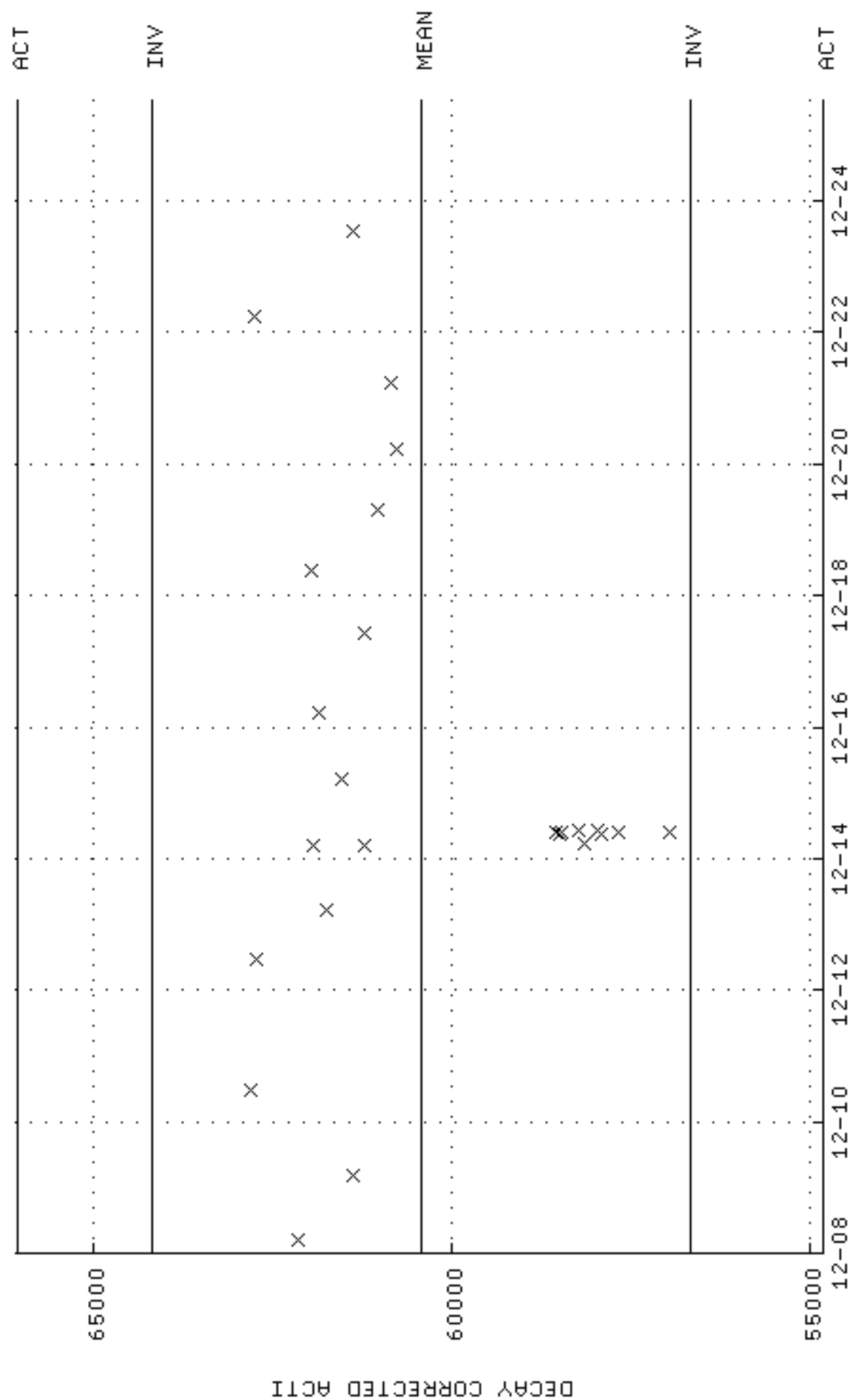
QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM41_CAN.QAF;1
 Parameter Name : PSENERGY-59 (PEAK ENERGY AM-241)
 Start/End Dates : 8-DEC-2022 04:40:10 through 25-DEC-2022 12:00:00
 Lower/Upper Lmts: 58.0400 through 61.0400



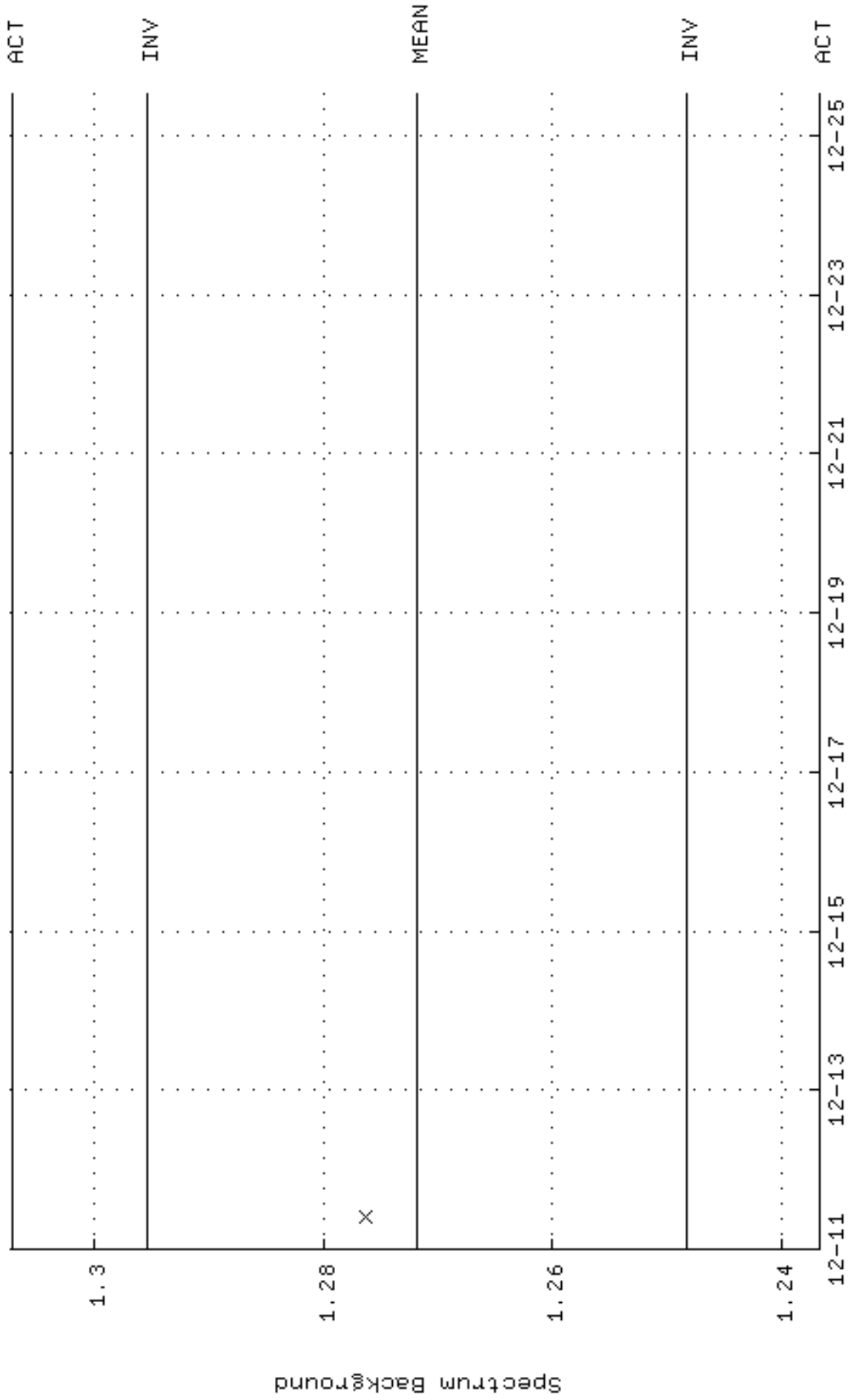
QA filename : DKA100:[CANSERRA.GAMMA.SCUSR.QA]QCC_GAM41_CAN.QAF;1
 Parameter Name : PSFUHM-59 (PEAK FUHM AM-241)
 Start/End Dates : 8-DEC-2022 04:40:10 through 25-DEC-2022 12:00:00
 Mean +- Std Dev : 1.08760 +- 6.146454E-02 (5.65 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]QCC_GAM41_CAN.QAF;1
 Parameter Name : NLAIVITY-59 (DECAY CORRECTED ACTIVITY AM-241)
 Start/End Dates : 8-DEC-2022 04:40:10 through 25-DEC-2022 12:00:00
 Mean +- Std Dev : 60445.3 +- 1873.07 (3.10 %)



QA filename : DKA100:[CANBERRA.GAMMA.SCUSR.QA]LBC_GAM41.QAF;1
Parameter Name : BACKRATE (Spectrum Background Rate)
Start/End Dates : 11-DEC-2022 09:35:21 through 25-DEC-2022 12:00:00
Mean +- Std Dev : 1.27191 +- 1.175869E-02 (0.92 %)



RAD Standards Traceability

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

78962-278

200 mL Solid in 250 mL PP MRP Jar

Customer: GEL Laboratories, LLC

P.O. No.: 88007 RD, Item 1

Calibration Date: 01-Jan-2009 12:00 EST **Grams of Master Source:** 0.0068241

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." Density of solid matrix 1.15 g/cc.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* cps/gram	This Source cps	Uncertainty, %			Calibration Method
					Type	u _A	u _F	U
Pb-210	46.5	8145.1	————	1.305E+03	0.30	1.50	3.06	4π LS
Am-241	59.5	157860	————	7.746E+02	0.3	1.5	3.1	4π LS
Cd-109	88.0	462.60	1.694E+05	1.156E+03	0.6	1.7	3.6	HPGe
Co-57	122.1	271.79	8.597E+04	5.867E+02	0.7	1.3	3.0	HPGe
Ce-139	165.9	137.6	1.217E+05	8.305E+02	0.5	1.1	2.4	HPGe
Hg-203	279.2	46.61	2.692E+05	1.837E+03	0.5	1.1	2.4	HPGe
Sn-113	391.7	115.1	1.709E+05	1.166E+03	0.6	1.1	2.5	HPGe
Cs-137	661.7	10983	1.071E+05	7.309E+02	0.7	1.2	2.8	HPGe
Y-88	898.0	106.6	4.084E+05	2.787E+03	0.7	1.1	2.6	HPGe
Co-60	1173.2	1925.4	2.084E+05	1.422E+03	0.8	1.1	2.7	HPGe
Co-60	1332.5	1925.4	2.086E+05	1.424E+03	1.0	1.1	3.0	HPGe
Y-88	1836.1	106.6	4.320E+05	2.948E+03	0.8	1.1	2.7	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4 π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

This standard will expire one year after the calibration date.

Source Prepared by:

W. Mao, Radiochemist

QA Approved:

D. M. Montgomery, QA Manager

Date: 2-10-07

Date: 2-10-07

End of Certificate

RC-S-051-017

Corporate Office

Laboratory

Standard Logbook

Serial ID: 1298 Open/Reference Date: 01-JAN-09 Aliquot : 1 mL
Name: Mixed Gamma LCS JAR Received: 12-FEB-09 Density : Hand Calculated
Type: Source Material Expires: 01-JAN-35 Lot Number : 78962-278
Employee: Maggie Stamps Verified: 07-NOV-11
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

Verification for Mixed Gamma Standard

1298

JAR

M. Stamps 11/7/2011	Isotope Am-241	Result pCi/L	Isotopic Abundance: Certificate Value (dps):
	Mixed Gamma N1	60560	0.359
	Mixed Gamma N2	56920	774.6
	Mixed Gamma N3	59450	

Mean Value (Counting) =	58976.67	pCi/L	101.1344	Pass
Stdev =	1865.592	pCi/L		Rule 3 (Pass/Fail)
Certificate Value =	58315.1	pCi/L		
Lower Limit =	55245.48276	pCi/L		
Upper Limit =	62707.85057	pCi/L		
Rule 1 Pass/Fail	Pass			
Two sigma =	3731.183905			
10 % of Mean =	5897.666667			
Rule 2 (Pass/Fail)	Pass			

Stamp
11/7/11
R. F. Smith
11/11/11

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard 1298 JAR

M. Stamps 11/7/2011	Isotope Cs-137	Result pCi/L	Isotopic Abundance: Certificate Value (dps):	0.851 730.9
	Mixed Gamma N1	24390		
	Mixed Gamma N2	24610		
	Mixed Gamma N3	24450		
Mean Value (Counting) =	24483.33	pCi/L	105.4736	
Stdev =	113.725	pCi/L		
Certificate Value =	23212.8	pCi/L		
Lower Limit =	24255.88371	pCi/L		
Upper Limit =	24710.78296	pCi/L		
Rule 1 Pass/Fail	Fail			
Two sigma =	227.4496281			
10 % of Mean =	2448.333333			
Rule 2 (Pass/Fail)	Pass			

*Exception taken due to the high uncertainty of the certified value
Rule 3 (Pass/Fail)

*exception taken due to full recovery of standard

Stamp
11/7/11

R. Futch
11/8/11

Verification Rules

Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements

Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule 3 = The determined mean value shall be within 5% of the certificate value.

Verification for Mixed Gamma Standard

M. Stamps
11/7/2011

Isotope	Result
Co-60 (1332.50)	pCi/L
Mixed Gamma N1	41290
Mixed Gamma N2	40800
Mixed Gamma N3	41060

Result	
pCi/L	
41290	
40800	
41060	

Isotopic Abundance:	0.9998
Certificate Value (dps):	1424

Mean Value (Counting) =
Stdev =

pCi/L
106.6395

Fail
Rule 3 (Pass/Fail)

*Exception taken due to the high uncertainty of the certified value

Certificate Value =
Lower Limit =
Upper Limit =
Rule 1 Pass/Fail
Two sigma =
10 % of Mean =
Rule 2 (Pass/Fail)

38494.2
40559.69397
41540.30603
Fail
490.3060269
4105
Pass

*exception taken due to full recovery of standard

Verification Rules

Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements

Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Stamp
11/17/11

R. Fuchs
11/8/11

Standard Logbook

Serial ID: 1298 **Open/Reference Date:** 01-JAN-09 **Aliquot :** 1 mL
Name: Mixed Gamma LCS JAR **Received:** 12-FEB-09 **Density :** Hand Calculated
Type: Source Material **Expires:** 01-JAN-35 **Lot Number :** 78962-278
Employee: Maggie Stamps **Verified:** 07-NOV-11
Supplier: Eckert & Zeigler Analytics
Description: 78962-278
Comments: None

Analyte	Concentration	Analyte	Concentration
Americium-241	129459.61 dpm/mL	Cesium-137	51532.32 dpm/mL
Cobalt-60	85457.09 dpm/mL		

Runlogs

Instrument Run Log

Instrument Type: GAMMA SPECTROMETER

Batch ID: 2367950

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
606487001	SAMPLE	MXR1	GAM08	JAN-19-23 15:20:50	DONE JAR		17-MAR-22 00:00
606487002	SAMPLE	MXR1	GAM18	JAN-19-23 15:21:15	DONE JAR		08-JUN-22 00:00
606487003	SAMPLE	MXR1	GAM38	JAN-19-23 15:21:35	DONE JAR		22-APR-22 00:00
606488001	SAMPLE	MXR1	GAM41	JAN-19-23 15:21:58	DONE JAR		16-MAY-22 00:00
1205292908	LCS	MXR1	GAM28	JAN-19-23 16:21:23	DONE JAR		04-APR-22 00:00
606488002	SAMPLE	MXR1	GAM01	JAN-19-23 16:30:09	DONE JAR		11-MAY-22 00:00
606488003	SAMPLE	MXR1	GAM02	JAN-19-23 16:33:39	DONE JAR		22-SEP-22 00:00
606488004	SAMPLE	MXR1	GAM04	JAN-19-23 16:34:35	DONE JAR		14-DEC-22 00:00
606488005	SAMPLE	MXR1	GAM16	JAN-19-23 16:35:57	DONE JAR		07-MAR-22 00:00
1205292906	MB	MXR1	GAM23	JAN-19-23 16:37:07	DONE JAR		03-MAY-22 00:00
1205292907	DUP	MXR1	GAM38	JAN-19-23 17:31:14	DONE JAR		22-APR-22 00:00

Gas Flow Raw Data

Batch 2368082 Check-list

This check-list was completed on 30-JAN-23 by Nat Long

This batch was reviewed by Kenshalla Oston on 30-JAN-23 and Nat Long on 30-JAN-23.

Batch ID:
2368082

Product:
GFC90SRF

Description: Gas Flow Strontium 90
GL-RAD-A-004

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
8	Are there any equilibrium assumptions?		No	
Quality Control (QC) Information				
9	Was the method blank (MB) within the acceptance criteria?	Yes		
10	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
11	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Strontium-90 in Filter

Batch ID:	2368082	Due Dates for Lab:	22-JAN-2023	Package:	24-JAN-2023	SDG:	24-JAN-2023		
Analyst:	Sierra Turbeville (ST2)	Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units	
Method:	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	LCS	1205293195	Strontium-90 SPIKE		1943-D	.1	mL	
Lab SOP:	GL-RAD-A-004 REV# 22	LCSD	1205293196	Strontium-90 SPIKE		1943-D	.1	mL	
Instrument:	GFC-C045440487								

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Initial Wt (g)	Final Wt (g)	Net Weight (mg)	Sr Separation (date)	Strontium Carrier Yield (percent)
1	606487001	20-JAN-2023	3	30	0.11224	0.0354	0.0379	2.5	01/23/23 13:00	65
2	606487002	20-JAN-2023	3	30	0.11087	0.0343	0.0372	2.9	01/23/23 13:00	76
3	606487003	20-JAN-2023	3	30	0.1125	0.0354	0.0386	3.2	01/23/23 13:00	84
4	606488001	20-JAN-2023	3	30	0.11473	0.0342	0.038	3.8	01/23/23 13:00	99
5	606488002	20-JAN-2023	3	30	0.11208	0.0338	0.0366	2.8	01/23/23 13:00	73
6	606488003	20-JAN-2023	3	30	0.10772	0.0353	0.038	2.7	01/23/23 13:00	71
7	606488004	20-JAN-2023	3	30	0.11082	0.0356	0.0389	3.3	01/23/23 13:00	86
8	606488005	20-JAN-2023	3	30	0.10899	0.0362	0.0395	3.3	01/23/23 13:00	86
9	1205293194 MB	20-JAN-2023	3		0.11473	0.0355	0.0382	2.7	01/23/23 13:00	71
10	1205293195 LCS	20-JAN-2023	3		0.11473	0.0356	0.038	2.4	01/23/23 13:00	63
11	1205293196 LCSD	20-JAN-2023	3		0.11473	0.0361	0.0383	2.2	01/23/23 13:00	58

Reagent/Solvent Lot ID	Description	Amount	Comments:
CARR 3535520	Strontium Carrier 0.5mL=3.825 mg/mL	.5 mL	Spike Pipet ID: RAD-GFC-1795419
REGNT 3432260	RGF-0.05M Nitric Acid	15 mL	Carrier Pipet ID: RAD-GFC-2154115
REGNT 3495604	0.75M Sodium Carbonate	13 mL	Data Entry Date2: 20-JAN-2023 00:00
REGNT 3644775	RGF-6M Sodium Hydroxide	10 mL	
REGNT 3487134	80% ethanol	3 mL	
REGNT 3424102.2	Phenolphthalein	2 mL	
REGNT 3460243.3	Thymol Blue Indicator0.0.04%	1 mL	
REGNT 3517710	3M HNO3 0.05M Oxalic	10 mL	
REGNT 3501767	8M HNO3	40 mL	
REGNT SR0068	2356218	2 g	

Strontium-90 Filter

Filename : SR90.XLS
 File type : Excel
 Version # : 1.3.10

Carrier S/N : 3535520
 Carrier Exp Date : 11/20/2023
 Carrier Volume Added: 0.50
 Carrier Weight (mg/ml): 7.65
 Carrier Weight StDev.: 0.06

Batch : 2368082
 Analyst : SIE02513
 Prep Date : 1/20/2023
 Method Uncertainty : 0.1315

Procedure Code : GFC90SRF
 Parmname : Strontium-90
 Required MDA : 3 pCi/F
 Sr-90 Abundance : 1.00
 Halflife of Sr-90 : 28.90 years
 Halflife of Y-90 : 64.053 hours

Geometry: Tuffryn Filter

Sample Characteristics					Carrier Calculations				
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Carrier Weight (mg) (Standard)	Net Weight (mg) (Sample)	Net Weight StDev. (mg)	Carrier Aliquot (mL)	Carrier Aliquot StDev. (mL)
1	606487001.1	0.1122	1.2096E-05	12/26/2022 7:15	7.65	2.50	0.018075	0.5	0.001000
2	606487002.1	0.1109	1.2017E-05	12/26/2022 7:23	7.65	2.90	0.019794	0.5	0.001000
3	606487003.1	0.1125	1.2111E-05	12/26/2022 9:00	7.65	3.20	0.021084	0.5	0.001000
4	606488001.1	0.1147	1.2237E-05	12/26/2022 7:41	7.65	3.80	0.023662	0.5	0.001000
5	606488002.1	0.1121	1.2086E-05	12/26/2022 7:49	7.65	2.80	0.019364	0.5	0.001000
6	606488003.1	0.1077	1.1834E-05	12/26/2022 7:58	7.65	2.70	0.018935	0.5	0.001000
7	606488004.1	0.1108	1.2014E-05	12/26/2022 8:04	7.65	3.30	0.021513	0.5	0.001000
8	606488005.1	0.1090	1.1908E-05	12/26/2022 9:00	7.65	3.30	0.021513	0.5	0.001000
9	1205293194.1	0.1147	1.2237E-05	1/20/2023 0:00	7.65	2.70	0.018935	0.5	0.001000
10	1205293195.1	0.1147	1.2237E-05	1/20/2023 0:00	7.65	2.40	0.017645	0.5	0.001000
11	1205293196.1	0.1147	1.2237E-05	1/20/2023 0:00	7.65	2.20	0.016786	0.5	0.001000

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-004
 Instrument SOP: GL-RAD-I-016

Count Raw Data											
	Counting			Gross Counts		Gross Beta	Count	Strontium		Calculated	
	Detector	Time		Alpha	Beta	CPM	Start	Separation	Yttrium	Sr-90	Sample
Pos.	ID	(min.)					Date/Time	Date/Time	Ingrowth	Decay	Recovery %
											Sample Recovery Error %
1	1A	80	12	39	0.482	1/26/2023 9:47	1/23/2023 13:00	0.528	0.998	65.4%	1.30%
2	1B	60	12	49	0.797	1/28/2023 9:10	1/23/2023 13:00	0.717	0.998	75.8%	1.26%
3	3C	500	63	735	1.456	1/25/2023 18:32	1/23/2023 13:00	0.464	0.998	83.7%	1.23%
4	11D	110	6	53	0.478	1/23/2023 16:33	1/23/2023 13:00	0.047	0.998	99.3%	1.20%
5	7D	70	6	43	0.608	1/26/2023 9:53	1/23/2023 13:00	0.529	0.998	73.2%	1.27%
6	4D	500	65	471	0.938	1/25/2023 18:33	1/23/2023 13:00	0.465	0.998	70.6%	1.28%
7	2A	60	11	52	0.856	1/26/2023 9:48	1/23/2023 13:00	0.528	0.998	86.3%	1.23%
8	3B	70	11	54	0.760	1/28/2023 9:12	1/23/2023 13:00	0.717	0.998	86.3%	1.23%
9	6C	500	41	451	0.896	1/25/2023 18:32	1/23/2023 13:00	0.464	1.000	70.6%	1.28%
10	1C	60	18	1411	23.499	1/26/2023 9:47	1/23/2023 13:00	0.528	1.000	62.7%	1.32%
11	2B	60	2	1323	22.048	1/26/2023 9:47	1/23/2023 13:00	0.528	1.000	57.5%	1.35%

Calibration Data										
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)		Detector Efficiency Error (cpm/dpm)	Alpha X-Talk	Weekly Bkg CPM	Weekly Bkg Count Start Date/Time	Weekly Bkg Count Time (min.)
1	PIC	4/1/2021	3/31/2023	0.3610	0.5155	0.00738	0.03336	0.426	1/20/2023 18:22	500
2	PIC	4/1/2021	3/31/2023	0.3550	0.5012	0.00711	0.09925	0.552	1/27/2023 16:35	500
3	PIC	4/1/2021	3/31/2023	0.3493	0.4728	0.00988	0.10757	1.498	1/20/2023 18:23	500
4	PIC	4/1/2021	3/31/2023	0.3537	0.5255	0.01068	0.06092	0.424	1/20/2023 18:25	500
5	PIC	4/1/2021	3/31/2023	0.3490	0.4994	0.01113	0.06839	0.420	1/20/2023 18:25	500
6	PIC	4/1/2021	3/31/2023	0.3475	0.5081	0.00773	0.03094	0.932	1/20/2023 18:24	500
7	PIC	4/1/2021	3/31/2023	0.3571	0.5073	0.01914	0.05557	0.556	1/20/2023 18:23	500
8	PIC	4/1/2021	3/31/2023	0.3501	0.4820	0.01614	0.07003	0.584	1/27/2023 16:35	500
9	PIC	4/1/2021	3/31/2023	0.3500	0.4867	0.01970	0.06899	0.978	1/20/2023 18:25	500
10	PIC	4/1/2021	3/31/2023	0.3615	0.5106	0.00847	0.05831	1.104	1/20/2023 18:23	500
11	PIC	4/1/2021	3/31/2023	0.3571	0.5059	0.02111	0.06683	1.578	1/20/2023 18:23	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1943-D
LCS Exp Date : 6/4/2023
LCS Activity (dpm/ml): 512.10
LCS Volume Added: 0.10

Results																	Scanned Detector
Pos.	Decision Level pCi/F	Critical Level pCi/F	Required MDA pCi/F	MDA pCi/F	Sample Act. Conc. pCi/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/F	2 SIGMA Total Prop. Uncertainty pCi/F	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery	
1	1.7787	1.2558	3	2.8758	0.5488	146.86%	0.0565	0.0830	1.5795	1.5859		SAMPLE					
2	1.7778	1.2551	3	2.8861	1.8402	49.01%	0.2448	0.1199	1.7670	1.8304		SAMPLE					
3	1.5203	1.0733	3	2.1972	-0.3503	184.99%	-0.0416	0.0769	1.2700	1.2700		SAMPLE					
4	1.6711	1.1798	3	2.6449	0.5700	132.31%	0.0545	0.0721	1.4779	1.4854		SAMPLE					
5	1.7297	1.2212	3	2.8271	1.6913	51.84%	0.1884	0.0976	1.7176	1.7734		SAMPLE					
6	1.4472	1.0218	3	2.1045	0.0608	1022.94%	0.0060	0.0612	1.2194	1.2195		SAMPLE					
7	1.7935	1.2662	3	2.9103	2.2704	41.34%	0.3005	0.1240	1.8370	1.9325		SAMPLE					
8	1.5675	1.1067	3	2.5090	1.2170	62.21%	0.1764	0.1097	1.4830	1.5171		SAMPLE					
9	1.4076	0.9938	3	2.0455	-0.7887	75.02%	-0.0817	0.0612	1.1591	1.1591		MB					
10	3.3186	2.3430	3	5.1820	222.1957	3.21%	22.3952	0.6276	12.2042	59.0658		LCS			201.0529	110.5%	
11	4.3764	3.0898	3	6.7268	224.0221	3.89%	20.4698	0.6088	13.0586	60.9197		LCSD	0.8%		201.0529	111.4%	

Results (DPM)															
Decision Level DPM/F	Critical Level DPM/F	Required MDA DPM/F	MDA DPM/F	Sample Act. Conc. DPM/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	1 SIGMA Counting Uncertainty DPM/F	1 SIGMA Total Prop. Uncertainty DPM/F	Sample QC	Sample Type	RPD	RER	Nominal DPM/F	Recovery
3.9487	2.7878	6.66	6.3843	1.2182	146.86%	0.0565	0.0830	3.5064	3.5207		SAMPLE				
3.9467	2.7864	6.66	6.4072	4.0853	49.01%	0.2448	0.1199	3.9227	4.0636		SAMPLE				
3.3750	2.3828	6.66	4.8778	-0.7776	184.99%	-0.0416	0.0769	2.8193	2.8193		SAMPLE				
3.7099	2.6192	6.66	5.8716	1.2653	132.31%	0.0545	0.0721	3.2810	3.2975		SAMPLE				
3.8400	2.7110	6.66	6.2761	3.7547	51.84%	0.1884	0.0976	3.8132	3.9369		SAMPLE				
3.2128	2.2683	6.66	4.6721	0.1350	1022.94%	0.0060	0.0612	2.7070	2.7072		SAMPLE				
3.9816	2.8111	6.66	6.4608	5.0402	41.34%	0.3005	0.1240	4.0782	4.2901		SAMPLE				
3.4799	2.4568	6.66	5.5700	2.7018	62.21%	0.1764	0.1097	3.2924	3.3680		SAMPLE				
3.1249	2.2062	6.66	4.5411	-1.7510	75.02%	-0.0817	0.0612	2.5732	2.5733		MB				
7.3673	5.2014	6.66	11.5040	493.2745	3.21%	22.3952	0.6276	27.0933	131.1261		LCS			446.34	110.5%
9.7157	6.8594	6.66	14.9335	497.3290	3.89%	20.4698	0.6088	28.9902	135.2418		LCSD	0.8%		446.34	111.4%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
606487001	1A	80	12	39	1/26/2023 9:47	1/26/2023 11:07	PIC	2368082
606487002	1B	60	12	49	1/28/2023 9:10	1/28/2023 10:10	PIC	2368082
606487003	3C	500	63	735	1/25/2023 18:32	1/26/2023 2:52	PIC	2368082
606488001	11D	110	6	53	1/23/2023 16:33	1/23/2023 18:23	PIC	2368082
606488002	7D	70	6	43	1/26/2023 9:53	1/26/2023 11:03	PIC	2368082
606488003	4D	500	65	471	1/25/2023 18:33	1/26/2023 2:53	PIC	2368082
606488004	2A	60	11	52	1/26/2023 9:48	1/26/2023 10:48	PIC	2368082
606488005	3B	70	11	54	1/28/2023 9:12	1/28/2023 10:22	PIC	2368082
1205293194	6C	500	41	451	1/25/2023 18:32	1/26/2023 2:52	PIC	2368082
1205293195	1C	60	18	1411	1/26/2023 9:47	1/26/2023 10:47	PIC	2368082
1205293196	2B	60	2	1323	1/26/2023 9:47	1/26/2023 10:47	PIC	2368082

Batch 2368081 Check-list

This check-list was completed on 25-JAN-23 by Kenshalla Oston

This batch was reviewed by Nat Long on 24-JAN-23 and Kenshalla Oston on 25-JAN-23.

Batch ID:
2368081

Product:
GFCTORAF

Description: Gas Flow Total Radium
GL-RAD-A-010

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
12	Has the method required detection limit been met?		No	
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Total Radium in Filter

Batch ID:	2368081	Due Dates for Lab: 22-JAN-2023			Package: 24-JAN-2023	SDG: 24-JAN-2023		
Analyst:	Jacqueline Emond (JE1)	Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
Method:	EPA 900.1 Mod/ EPA 903.0 Mod	LCSD	1205293374			1926-C	.1	mL
Lab SOP:	GL-RAD-A-010 REV# 21	LCS	1205293193			1926-C	.1	mL
Instrument:	ASP-33005595							

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Precipitation (date)	Initial Weight (g)	Final Weight (g)	Net Weight (mg)	Barium Carrier Yield (percent)
1	606488001	20-JAN-2023	1	5	0.01912	01/20/23 14:30	0.0752	0.1035	28.3	117
2	606488002	20-JAN-2023	1	5	0.01868	01/20/23 14:30	0.0743	0.1012	26.9	111
3	606488003	20-JAN-2023	1	5	0.01795	01/20/23 14:30	0.0751	0.0955	20.4	84
4	606488004	20-JAN-2023	1	5	0.01847	01/20/23 14:30	0.0761	0.104	27.9	115
5	606488005	20-JAN-2023	1	5	0.01817	01/20/23 14:30	0.0764	0.1049	28.5	118
6	1205293191 MB	20-JAN-2023	1		0.01912	01/20/23 14:30	0.0749	0.1016	26.7	110
7	1205293193 LCS	20-JAN-2023	1		0.01912	01/20/23 14:30	0.0763	0.1028	26.5	109
8	1205293374 LCSD	20-JAN-2023	1		0.01912	01/20/23 14:30	0.0766	0.1026	26	107

Reagent/Solvent Lot ID	Description	Amount	Comments:
CARR 3651269	Barium Carrier TR 1ml=24.23mg	1 mL	Pipet ID: RAD-GFC-1795419
REGNT 3491695	1:1 Sulfuric Acid	10 mL	Pipet ID: RAD-GFC-1608405
			Data Entry Date2: 20-JAN-2023 11:09 GFC-C008029151 Jacqueline Emond
			Data Entry Date3: 20-JAN-2023 00:00

Total Radium Filter

Filename : TOTRA.XLS
 File type : Excel
 Version # : 1.3.9

Carrier S/N : 3651269
 Carrier Exp Date : 12/19/2023
 Carrier Volume Added: 1.00
 Carrier Weight (mg/ml): 24.23
 Carrier Weight StDev.: 0.05

Batch : 2368081
 Analyst : JAC02417
 Prep Date : 1/20/2023
 Method Uncertainty: 0.0802

Procedure Code : GFCTORAF
 Parmname : Total Radium
 Required MDA : 1 pCi/F
 Halflife of Rn-222 : 3.8235 days

Geometry: 47mm Filter

Sample Characteristics					Carrier Calculations				
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Carrier Weight (mg) (Standard)	Residue Weight (mg) (Sample)	Residue Weight StDev. (mg)	Carrier Aliquot (mL)	Carrier Aliquot StDev. (mL)
1	606488001.1	0.0191	5.1256E-06	12/26/2022 7:41	24.23	28.30	0.128963	1.0	0.002000
2	606488002.1	0.0187	5.0835E-06	12/26/2022 7:49	24.23	26.90	0.122946	1.0	0.002000
3	606488003.1	0.0180	5.0142E-06	12/26/2022 7:58	24.23	20.40	0.095009	1.0	0.002000
4	606488004.1	0.0185	5.0636E-06	12/26/2022 8:04	24.23	27.90	0.127244	1.0	0.002000
5	606488005.1	0.0182	5.0345E-06	12/26/2022 9:00	24.23	28.50	0.129823	1.0	0.002000
6	1205293191.1	0.0191	5.1256E-06	1/20/2023 0:00	24.23	26.70	0.122087	1.0	0.002000
7	1205293193.1	0.0191	5.1256E-06	1/20/2023 0:00	24.23	26.50	0.121227	1.0	0.002000
8	1205293374.1	0.0191	5.1256E-06	1/20/2023 0:00	24.23	26.00	0.119078	1.0	0.002000

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml
 Pipet, 5 ml Stdev : +/- 0.010000 ml

Analytical SOP: GL-RAD-A-010
 Instrument SOP: GL-RAD-I-016

Count Raw Data										
Pos.	Detector ID	Counting	Gross Counts		Gross Alpha	Count	Precipitation	Ingrowth	Calculated	Sample
		Time (min.)	Alpha	Beta	CPM	Start Date/Time			Recovery %	
1	4C	500	69	469	0.138	1/23/2023 17:52	1/20/2023 14:30	2.355	117%	0.71%
2	5A	500	59	719	0.118	1/23/2023 18:49	1/20/2023 14:30	2.367	111%	0.71%
3	2B	500	36	1043	0.072	1/23/2023 17:51	1/20/2023 14:30	2.355	84.2%	0.72%
4	7A	500	75	407	0.150	1/23/2023 18:21	1/20/2023 14:30	2.361	115%	0.71%
5	7D	500	47	258	0.094	1/23/2023 18:05	1/20/2023 14:30	2.358	118%	0.71%
6	2D	500	43	656	0.086	1/23/2023 18:49	1/20/2023 14:30	2.367	110%	0.71%
7	1C	60	8612	8170	143.533	1/23/2023 16:48	1/20/2023 14:30	2.295	109%	0.71%
8	5C	60	8572	7673	142.867	1/23/2023 16:48	1/20/2023 14:30	2.295	107%	0.71%

Calibration Data									
Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Beta X-Talk	Weekly Bkg Count CPM	Weekly Bkg Count Start Date/Time	Weekly Bkg Count Time (min.)	
PIC	6/1/2022	5/31/2023	0.3043	0.01587	0.00492	0.072	1/20/2023 18:24	500	
PIC	6/1/2022	5/31/2023	0.3086	0.00491	0.00389	0.060	1/20/2023 18:24	500	
PIC	6/1/2022	5/31/2023	0.3014	0.02011	0.00164	0.036	1/20/2023 18:23	500	
PIC	6/1/2022	5/31/2023	0.3019	0.00525	0.00028	0.062	1/20/2023 18:25	500	
PIC	6/1/2022	5/31/2023	0.2934	0.00619	0.00031	0.066	1/20/2023 18:25	500	
PIC	6/1/2022	5/31/2023	0.3077	0.01278	0.01226	0.082	1/20/2023 18:23	500	
PIC	6/1/2022	5/31/2023	0.2917	0.00967	0.00320	0.140	1/20/2023 18:23	500	
PIC	6/1/2022	5/31/2023	0.3042	0.01161	0.00243	0.138	1/20/2023 18:24	500	

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1926-C
LCS Exp Date : 9/9/2023
LCS Activity (dpm/ml): 2403.31
LCS Volume Added: 0.10

Results																	
	Decision	Critical	Required		Sample Act.	Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA							
Pos.	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate	Counting	Total Prop.		Sample	Sample			Nominal	
	pCi/F	pCi/F	pCi/F	pCi/F	pCi/F	%	CPM	CPM	Uncertainty	Uncertainty		QC	Type	RPD	RER	pCi/F	Recovery
1	1.1129	0.7857	1	1.7403	1.7278	31.10%	0.0660	0.0205	1.1305	1.1694			SAMPLE				
2	1.0735	0.7579	1	1.6943	1.5585	32.54%	0.0580	0.0189	1.0999	1.1332			SAMPLE				
3	1.1740	0.8289	1	1.9097	1.3683	40.88%	0.0360	0.0147	1.2095	1.2343			SAMPLE				
4	1.0901	0.7696	1	1.7176	2.6076	23.42%	0.0880	0.0206	1.1991	1.2683			SAMPLE				
5	1.1537	0.8145	1	1.8119	0.8485	63.89%	0.0280	0.0179	1.0685	1.0770			SAMPLE				
6	1.2389	0.8747	1	1.9255	-0.3549	458.26%	0.0040	0.0183	1.0548	1.0550			MB				
7	3.8328	2.7060	1	7.0209	4600.1648	1.61%	143.3933	1.5468	97.5546	739.8252			LCS			5661.3119	81.3%
8	3.7179	2.6249	1	6.8217	4477.5225	1.74%	142.7287	1.5432	95.0917	721.7326			LCSD	2.7%		5661.3119	79.1%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
606488001	4C	500	69	469	1/23/2023 17:52	1/24/2023 2:12	PIC	2368081
606488002	5A	500	59	719	1/23/2023 18:49	1/24/2023 3:09	PIC	2368081
606488003	2B	500	36	1043	1/23/2023 17:51	1/24/2023 2:11	PIC	2368081
606488004	7A	500	75	407	1/23/2023 18:21	1/24/2023 2:41	PIC	2368081
606488005	7D	500	47	258	1/23/2023 18:05	1/24/2023 2:25	PIC	2368081
1205293191	2D	500	43	656	1/23/2023 18:49	1/24/2023 3:09	PIC	2368081
1205293193	1C	60	8612	8170	1/23/2023 16:48	1/23/2023 17:48	PIC	2368081
1205293374	5C	60	8572	7673	1/23/2023 16:48	1/23/2023 17:48	PIC	2368081

Batch 2368080 Check-list

This check-list was completed on 27-JAN-23 by Kenshalla Oston

This batch was reviewed by Kenshalla Oston on 27-JAN-23 and Rhonda Birch on 27-JAN-23.

Batch ID:
2368080

Product:
GFC28RAF

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?	Yes		
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
11	Has the method required detection limit been met?		No	
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Filter

Batch ID:	2368080	Due Dates for Lab: 22-JAN-2023			Package: 24-JAN-2023	SDG: 24-JAN-2023		
Analyst:	Jacqueline Emond (JE1)	Type	Sample Id	Description		Serial Number	Spike Amount	Spike Units
Method:	EPA 904.0/SW846 9320 Modified	LCSD	1205293190	228		1952-B	.1	mL
Lab SOP:	GL-RAD-A-063 REV# 5	LCS	1205293189	228		1952-B	.1	mL
Instrument:	ASP-33005595							

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	606488001	20-JAN-2023	1	30	0.11473	01/23/23 14:01	01/25/23 10:15
2	606488002	20-JAN-2023	1	30	0.11208	01/23/23 14:01	01/25/23 10:15
3	606488003	20-JAN-2023	1	30	0.10772	01/23/23 14:01	01/25/23 10:15
4	606488004	20-JAN-2023	1	30	0.11082	01/23/23 14:01	01/25/23 10:15
5	606488005	20-JAN-2023	1	30	0.10899	01/25/23 10:15	01/27/23 06:56
6	1205293188 MB	20-JAN-2023	1		0.11473	01/23/23 14:01	01/25/23 10:15
7	1205293189 LCS	20-JAN-2023	1		0.11473	01/23/23 14:01	01/25/23 10:15
8	1205293190 LCSD	20-JAN-2023	1		0.11473	01/23/23 14:01	01/25/23 10:15

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 20-JAN-2023 00:00
REGNT 3853116	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3532398	RGF-1M Citric Acid	5 mL	
REGNT 3851489	RGF-50% Potassium Carbonate	2 mL	
REGNT 3648549	RGF-7M Nitric Acid	25 mL	
REGNT DGA0041	2355308	2 g	
REGNT 3418276.6	29M HF (48-50%)	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3521298	RGF-Neodymium Substrate	5 mL	
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3850768	2M HCl	20 mL	
REGNT 3645221.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	

Radium-228 Filter

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.2

Tracer S/N : 1951-D
 Tracer Exp Date : 6/3/2023
 Tracer Volume Added: 0.10

Batch : 2368080
 Analyst : JAC02417
 Prep Date : 1/20/2023
 Ra-228 Method Uncertainty : 0

Procedure Code : GFC28RAF
 Parmname : Radium-228
 Required MDA : 1 pCi/F
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations					
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	606488001.1	0.1147	1.2237E-05	12/26/2022 7:41	1207.5	1.66%	864.2	1.96%	0.1	0.000200
2	606488002.1	0.1121	1.2086E-05	12/26/2022 7:49	1207.5	1.66%	870.3	1.96%	0.1	0.000200
3	606488003.1	0.1077	1.1834E-05	12/26/2022 7:58	1207.5	1.66%	1041.8	1.79%	0.1	0.000200
4	606488004.1	0.1108	1.2014E-05	12/26/2022 8:04	1207.5	1.66%	1002.4	1.82%	0.1	0.000200
5	606488005.1	0.1090	1.1908E-05	12/26/2022 9:00	990.5	1.83%	924.7	1.90%	0.1	0.000200
6	1205293188.1	0.1147	1.2237E-05	1/20/2023 0:00	1207.5	1.66%	861.9	1.97%	0.1	0.000200
7	1205293189.1	0.1147	1.2237E-05	1/20/2023 0:00	1207.5	1.66%	991.9	1.83%	0.1	0.000200
8	1205293190.1	0.1147	1.2237E-05	1/20/2023 0:00	1207.5	1.66%	926.9	1.90%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Beta	Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
1	7C	120	17	114	0.950	1/25/2023 12:06	1/23/2023 14:01	1/25/2023 10:15	0.990	0.811	0.993	1.117	71.6%	1.32%
2	7D	120	5	72	0.600	1/25/2023 12:06	1/23/2023 14:01	1/25/2023 10:15	0.990	0.811	0.993	1.117	72.1%	1.32%
3	8A	120	31	150	1.250	1/25/2023 12:06	1/23/2023 14:01	1/25/2023 10:15	0.990	0.811	0.993	1.117	86.3%	1.25%
4	8B	120	25	121	1.008	1/25/2023 12:06	1/23/2023 14:01	1/25/2023 10:15	0.990	0.811	0.993	1.117	83.0%	1.26%
5	1C	120	18	161	1.342	1/27/2023 9:07	1/25/2023 10:15	1/27/2023 6:56	0.989	0.781	0.994	1.117	93.4%	1.35%
6	9A	120	8	83	0.692	1/25/2023 12:06	1/23/2023 14:01	1/25/2023 10:15	0.998	0.811	0.993	1.117	71.4%	1.32%
7	9B	60	20	1061	17.683	1/25/2023 12:05	1/23/2023 14:01	1/25/2023 10:15	0.998	0.812	0.993	1.057	82.1%	1.27%
8	9C	60	33	963	16.050	1/25/2023 12:05	1/23/2023 14:01	1/25/2023 10:15	0.998	0.812	0.993	1.057	76.8%	1.29%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6407	0.00790	0.994	1/20/2023 18:25	500
2	PIC	6/1/2022	5/31/2023	0.6270	0.01113	0.420	1/20/2023 18:25	500
3	PIC	6/1/2022	5/31/2023	0.6398	0.01579	0.968	1/20/2023 18:25	500
4	PIC	6/1/2022	5/31/2023	0.6437	0.02148	0.664	1/20/2023 18:25	500
5	PIC	6/1/2022	5/31/2023	0.6190	0.00847	1.104	1/20/2023 18:23	500
6	PIC	6/1/2022	5/31/2023	0.6336	0.00758	0.544	1/20/2023 18:25	500
7	PIC	6/1/2022	5/31/2023	0.6318	0.00754	0.656	1/20/2023 18:26	500
8	PIC	6/1/2022	5/31/2023	0.6184	0.00584	0.650	1/20/2023 18:26	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1952-B
LCS Exp Date : 8/9/2023
LCS Activity (dpm/ml): 431.84
LCS Volume Added: 0.10

Results																
	Decision	Critical	Required		Sample Act.	Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA						
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
Pos.	pCi/F	pCi/F	pCi/F	pCi/F	pCi/F	%	CPM	CPM	Uncertainty	Uncertainty	Sample	Sample	RPD	RER	Nominal	Recovery
									pCi/F	pCi/F	QC	Type			pCi/F	
1	2.8314	1.9990	1	4.2977	-0.5276	226.19%	-0.0440	0.0995	2.3389	2.3389		SAMPLE				
2	1.9123	1.3501	1	3.0116	2.2425	42.49%	0.1800	0.0764	1.8660	1.8675		SAMPLE				
3	2.4731	1.7460	1	3.7573	2.9928	39.46%	0.2820	0.1111	2.3119	2.3149		SAMPLE				
4	2.0566	1.4520	1	3.1704	3.6692	28.76%	0.3443	0.0986	2.0603	2.0681		SAMPLE				
5	2.5893	1.8281	1	3.9162	2.4728	48.71%	0.2377	0.1157	2.3596	2.3609		SAMPLE				
6	2.1059	1.4868	1	3.2750	1.7801	56.08%	0.1477	0.0828	1.9558	1.9566		MB				
7	2.5614	1.8084	1	4.1135	169.1541	3.52%	17.0273	0.5441	10.5941	11.6675		LCS			169.5407	99.8%
8	2.7879	1.9683	1	4.4797	167.2851	3.65%	15.4000	0.5185	11.0384	11.9785		LCSD	1.1%		169.5407	98.7%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
606488001	7C	120	17	114	1/25/2023 12:06	1/25/2023 14:06	PIC	2368080
606488002	7D	120	5	72	1/25/2023 12:06	1/25/2023 14:06	PIC	2368080
606488003	8A	120	31	150	1/25/2023 12:06	1/25/2023 14:06	PIC	2368080
606488004	8B	120	25	121	1/25/2023 12:06	1/25/2023 14:06	PIC	2368080
606488005	1C	120	18	161	1/27/2023 9:07	1/27/2023 11:07	PIC	2368080
1205293188	9A	120	8	83	1/25/2023 12:06	1/25/2023 14:06	PIC	2368080
1205293189	9B	60	20	1061	1/25/2023 12:05	1/25/2023 13:05	PIC	2368080
1205293190	9C	60	33	963	1/25/2023 12:05	1/25/2023 13:05	PIC	2368080

ASSAY 25-Jan-23 11:43:55
 Wizard 2480 s/n 46190630
 Protocol id 9 Ba-133_1
 Time limit
 Count limit
 Isotope Ba-133_1
 Protocol date 1/25/2023
 Run id. 6098

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF	1	92	1	180	3623	1207.53	1.66		11:43:55
606488001	2	92	2	180	2593	864.15	1.96	71.56	11:47:09
606488002	3	92	3	180	2611.28	870.27	1.96	72.07	11:50:23
606488003	4	92	4	180	3126	1041.78	1.79	86.27	11:53:37
606488004	5	92	5	180	3007.57	1002.39	1.82	83.01	11:56:51
606488005	1	5	1	180	2968.28	989.15	1.84	81.92	12:00:27
1205293188	2	5	2	180	2586.28	861.93	1.97	71.38	12:03:41
1205293189	3	5	3	180	2976.28	991.91	1.83	82.14	12:06:55
1205293190	4	5	4	180	2781	926.91	1.9	76.76	12:10:09

END OF ASSAY

ASSAY 27-Jan-23 8:45:43
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 1/27/2023
 Run id. 6108

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	93	1	180	2972	990.54	1.83	08:45:43
606488005		2	93	2	180	2774.28	924.67	1.9	93.35
									08:48:57

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 23-Jan-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	23-Jan 06:17	60	2.833	1.385	3.072	+2.15
LB4100F2	Below	Alpha eff	23-Jan 07:38	5	5602	6533	7372	-9.66
LB4100F2	Above	Alpha XTalk	23-Jan 07:38	5	0.422	0.318	0.366	+9.98
LB4100F2	Above	Beta bkg	23-Jan 06:17	60	18.217	1.173	1.833	+151.94
LB4100F3	Above	Alpha bkg	23-Jan 09:25	60	0.500	0.119	0.404	+5.03
LB4100G1	Above	Alpha XTalk	23-Jan 07:45	5	0.480	0.088	0.447	+3.55
LB4100G1	Above	Beta bkg	23-Jan 06:17	60	2282	0.380	1.675	+10,568.99
LB4100G2	Above	Beta bkg	23-Jan 06:17	60	3.033	1.168	2.328	+6.65
LB4100G3	Above	Alpha XTalk	23-Jan 08:25	5	0.392	0.275	0.391	+3.05
LB4100G3	Above	Beta bkg	23-Jan 06:17	60	3.367	0.987	2.738	+5.15
LB4100H1	Above	Beta bkg	23-Jan 06:17	60	2.650	0.216	2.462	+3.50
PIC1D	Above	Alpha bkg	23-Jan 07:00	60	0.333	-1.03E-1	0.386	+2.36
PIC3D	Above	Alpha bkg	23-Jan 07:05	60	1.050	-1.75E-1	0.473	+8.34
PIC3D	Below	Alpha XTalk	23-Jan 06:51	5	0.256	0.260	0.381	-3.17
PIC3D	Above	Beta XTalk	23-Jan 06:59	5	0.010	-4.26E-4	0.001	+40.65
PIC5D	Above	Alpha bkg	23-Jan 07:14	60	0.567	-9.04E-2	0.400	+5.05
PIC6A	Above	Alpha bkg	23-Jan 07:14	60	0.400	0.001	0.390	+3.15
PIC6A	Above	Beta bkg	23-Jan 07:14	60	4.883	0.669	2.752	+9.14
PIC8D	Above	Alpha bkg	23-Jan 07:21	60	0.367	-4.22E-2	0.367	+2.99
PIC13A	Above	Beta bkg	23-Jan 10:24	60	4.567	-8.16E-2	2.573	+7.51
PIC14B	Above	Alpha eff	23-Jan 09:00	5	9008	8474	8989	+3.22
PIC14B	Below	Alpha XTalk	23-Jan 09:00	5	0.270	0.279	0.316	-4.43
PIC14D	Above	Alpha bkg	23-Jan 09:12	60	0.417	-1.18E-1	0.348	+3.89

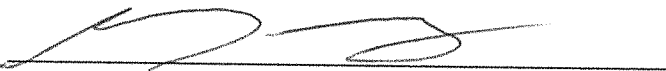
INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC8D	Alpha eff, Alpha XTalk

Reviewed by



Date

1/23/23

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 25-Jan-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

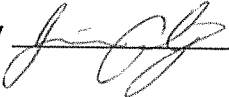
Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
G5400W1W	Above	Beta bkg	25-Jan 08:28	60	6.900	0.599	1.990	+24.17
LB4100E2	Above	Beta bkg	25-Jan 05:50	60	2.383	1.385	3.072	+0.55
LB4100F2	Below	Alpha eff	25-Jan 05:35	5	5534	6533	7372	-10.14
LB4100F2	Above	Alpha XTalk	25-Jan 05:35	5	0.425	0.318	0.366	+10.46
LB4100F2	Above	Beta bkg	25-Jan 05:50	60	13.900	1.173	1.833	+112.70
LB4100F3	Above	Alpha bkg	25-Jan 07:07	60	0.533	0.119	0.404	+5.73
LB4100G1	Above	Beta bkg	25-Jan 05:44	60	2403	0.380	1.675	+11,129.54
LB4100G2	Above	Beta bkg	25-Jan 05:44	60	2.250	1.168	2.328	+2.60
LB4100G3	Below	Alpha eff	25-Jan 05:29	5	5451	5785	8229	-3.82
LB4100G3	Above	Alpha XTalk	25-Jan 05:29	5	0.422	0.275	0.391	+4.59
LB4100G3	Above	Beta bkg	25-Jan 05:44	60	2.333	0.987	2.738	+1.61
LB4100H1	Above	Beta bkg	25-Jan 05:44	60	2.917	0.216	2.462	+4.21
PIC1D	Above	Alpha bkg	25-Jan 05:02	60	0.500	-1.03E-1	0.386	+4.40
PIC3D	Above	Alpha bkg	25-Jan 05:08	60	0.917	-1.75E-1	0.473	+7.10
PIC3D	need 2nd	Alpha XTalk	25-Jan 04:54	5	0.261	0.260	0.381	-2.94
PIC3D	Above	Beta XTalk	25-Jan 05:02	5	0.010	-4.26E-4	0.001	+38.61
PIC4B	Above	Alpha bkg	25-Jan 05:08	60	0.317	-9.02E-2	0.287	+3.47
PIC5D	Above	Alpha bkg	25-Jan 05:14	60	0.317	-9.04E-2	0.400	+1.99
PIC6A	Above	Beta bkg	25-Jan 07:30	60	4.267	0.669	2.752	+7.36
PIC14B	Above	Alpha eff	25-Jan 05:22	5	8995	8474	8989	+3.07
PIC14B	Below	Alpha XTalk	25-Jan 05:22	5	0.264	0.279	0.316	-5.33
PIC14B	Above	Beta bkg	25-Jan 05:37	60	2.483	0.370	3.004	+1.81
PIC14B	Above	Beta eff	25-Jan 05:31	5	22652	19940	22170	+4.30

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC8D	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by _____

Date 1-25-23_____

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 26-Jan-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

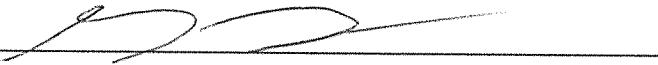
Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	26-Jan 04:08	60	3.300	1.385	3.072	+3.81
LB4100F2	Below	Alpha eff	26-Jan 05:16	5	5996	6533	7372	-6.84
LB4100F2	Above	Alpha XTalk	26-Jan 05:16	5	0.404	0.318	0.366	+7.79
LB4100F2	Above	Beta bkg	26-Jan 04:08	60	24.133	1.173	1.833	+205.73
LB4100F3	Above	Alpha bkg	26-Jan 05:33	60	0.317	0.119	0.404	+1.16
LB4100G1	Above	Beta bkg	26-Jan 04:08	60	224	0.380	1.675	+1,031.85
LB4100G2	Above	Beta bkg	26-Jan 04:08	60	3.333	1.168	2.328	+8.20
LB4100G3	Above	Beta bkg	26-Jan 06:06	60	3.633	0.987	2.738	+6.07
LB4100H1	Above	Beta bkg	26-Jan 04:08	60	2.850	0.216	2.462	+4.04
PIC1D	Above	Alpha bkg	26-Jan 04:29	60	0.350	-1.03E-1	0.386	+2.56
PIC3D	Above	Alpha bkg	26-Jan 04:34	60	0.683	-1.75E-1	0.473	+4.94
PIC3D	Below	Alpha XTalk	26-Jan 04:20	5	0.258	0.260	0.381	-3.09
PIC3D	Above	Beta XTalk	26-Jan 04:27	5	0.011	-4.26E-4	0.001	+45.75
PIC5D	Above	Alpha bkg	26-Jan 04:41	60	0.367	-9.04E-2	0.400	+2.60
PIC6A	Above	Beta bkg	26-Jan 04:41	60	4.333	0.669	2.752	+7.55
PIC14B	Above	Alpha eff	26-Jan 06:09	5	8994	8474	8989	+3.06
PIC14B	Below	Alpha XTalk	26-Jan 06:09	5	0.268	0.279	0.316	-4.83
PIC14B	Above	Beta bkg	26-Jan 05:07	60	2.550	0.370	3.004	+1.97
PIC14B	need 2nd	Beta eff	26-Jan 05:00	5	20931	19940	22170	-0.33
PIC14B	Above	Beta XTalk	26-Jan 05:00	5	8.62E-4	1.39E-4	8.60E-4	+3.01

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC8D	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 1/26/2023

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 27-Jan-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	27-Jan 05:53	60	2.300	1.385	3.072	+0.25
LB4100F2	Below	Alpha eff	27-Jan 05:46	5	5247	6533	7372	-12.20
LB4100F2	Above	Alpha XTalk	27-Jan 05:46	5	0.459	0.318	0.366	+14.66
LB4100F2	Above	Beta bkg	27-Jan 05:53	60	9.717	1.173	1.833	+74.67
LB4100F3	Above	Alpha bkg	27-Jan 08:03	60	0.317	0.119	0.404	+1.16
LB4100G1	need 2nd	Beta bkg	27-Jan 05:53	60	1.233	0.380	1.675	+0.95
LB4100G2	Above	Beta bkg	27-Jan 05:53	60	2.350	1.168	2.328	+3.11
LB4100G3	Below	Alpha eff	27-Jan 05:32	5	4998	5785	8229	-4.93
LB4100G3	Above	Alpha XTalk	27-Jan 05:32	5	0.461	0.275	0.391	+6.60
LB4100G3	Above	Beta bkg	27-Jan 05:53	60	2.083	0.987	2.738	+0.76
LB4100G3	Below	Beta eff	27-Jan 08:31	5	1.774	19160	24060	-26.46
LB4100G3	Above	Beta XTalk	27-Jan 08:31	5	0.333	1.05E-4	4.95E-4	+5,119.65
LB4100G4	Below	Beta eff	27-Jan 08:46	5	15102	16330	19880	-5.08
LB4100H1	Above	Beta bkg	27-Jan 05:53	60	2.350	0.216	2.462	+2.70
LB4100H2	need 2nd	Beta bkg	27-Jan 08:03	60	1.217	0.950	1.925	-1.36
PIC1D	Above	Alpha bkg	27-Jan 04:48	60	0.550	-1.03E-1	0.386	+5.02
PIC3D	Above	Alpha bkg	27-Jan 04:54	60	0.600	-1.75E-1	0.473	+4.17
PIC3D	Below	Alpha XTalk	27-Jan 04:40	5	0.258	0.260	0.381	-3.11
PIC3D	Above	Beta XTalk	27-Jan 04:47	5	0.008	-4.26E-4	0.001	+30.71
PIC4B	Above	Alpha bkg	27-Jan 04:54	60	0.400	-9.02E-2	0.287	+4.80
PIC5D	Above	Alpha bkg	27-Jan 05:00	60	0.350	-9.04E-2	0.400	+2.39
PIC6A	Above	Beta bkg	27-Jan 05:00	60	4.717	0.669	2.752	+8.66
PIC14B	Above	Alpha eff	27-Jan 05:07	5	9055	8474	8989	+3.77
PIC14B	Below	Alpha XTalk	27-Jan 05:07	5	0.267	0.279	0.316	-4.93
PIC14B	Above	Beta bkg	27-Jan 05:21	60	2.900	0.370	3.004	+2.76
PIC14B	need 2nd	Beta XTalk	27-Jan 05:14	5	5.62E-4	1.39E-4	8.60E-4	+0.52

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC8D	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by _____

Date 1-27-23

GEL Laboratories LLC

Gas Flow Proportional Counter Checks for 28-Jan-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	27-Jan 16:29	500	2.302	1.385	3.072	+0.26
LB4100E4	Below	Alpha eff	28-Jan 10:23	5	8078	8193	10600	-3.29
LB4100E4	need 2nd	Alpha XTalk	28-Jan 10:23	5	0.302	0.231	0.304	+2.81
LB4100F2	Below	Alpha eff	28-Jan 09:50	5	4853	6533	7372	-15.01
LB4100F2	Above	Alpha XTalk	28-Jan 09:50	5	0.486	0.318	0.366	+18.06
LB4100F2	Above	Beta bkg	27-Jan 16:30	500	10.268	1.173	1.833	+79.68
LB4100G3	Below	Alpha eff	28-Jan 09:43	5	4881	5785	8229	-5.22
LB4100G3	Above	Alpha XTalk	28-Jan 09:43	5	0.483	0.275	0.391	+7.75
LB4100G3	need 2nd	Beta eff	28-Jan 09:50	5	22745	19160	24060	+1.39
LB4100G3	need 2nd	Beta XTalk	28-Jan 09:50	5	2.60E-4	1.05E-4	4.95E-4	-0.62
LB4100H1	Above	Beta bkg	27-Jan 16:29	500	2.720	0.216	2.462	+3.69
PIC1D	Above	Alpha bkg	27-Jan 16:35	500	0.304	-1.03E-1	0.386	+2.00
PIC3D	Above	Alpha bkg	27-Jan 16:36	500	0.720	-1.75E-1	0.473	+5.28
PIC3D	Below	Alpha XTalk	28-Jan 08:05	5	0.254	0.260	0.381	-3.32
PIC3D	Above	Beta XTalk	28-Jan 08:12	5	0.006	-4.26E-4	0.001	+25.26
PIC4B	Above	Alpha bkg	28-Jan 08:19	60	0.367	-9.02E-2	0.287	+4.27
PIC5D	Above	Alpha bkg	27-Jan 16:37	500	0.378	-9.04E-2	0.400	+2.74
PIC6A	Above	Beta bkg	27-Jan 16:35	500	4.054	0.669	2.752	+6.75
PIC9A	Below	Alpha eff	28-Jan 08:49	5	10183	10200	11420	-3.08
PIC14B	need 2nd	Alpha eff	28-Jan 08:35	5	8889	8474	8989	+1.84
PIC14B	Below	Alpha XTalk	28-Jan 08:35	5	0.271	0.279	0.316	-4.25
PIC14B	Above	Beta bkg	27-Jan 16:36	500	2.322	0.370	3.004	+1.45

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

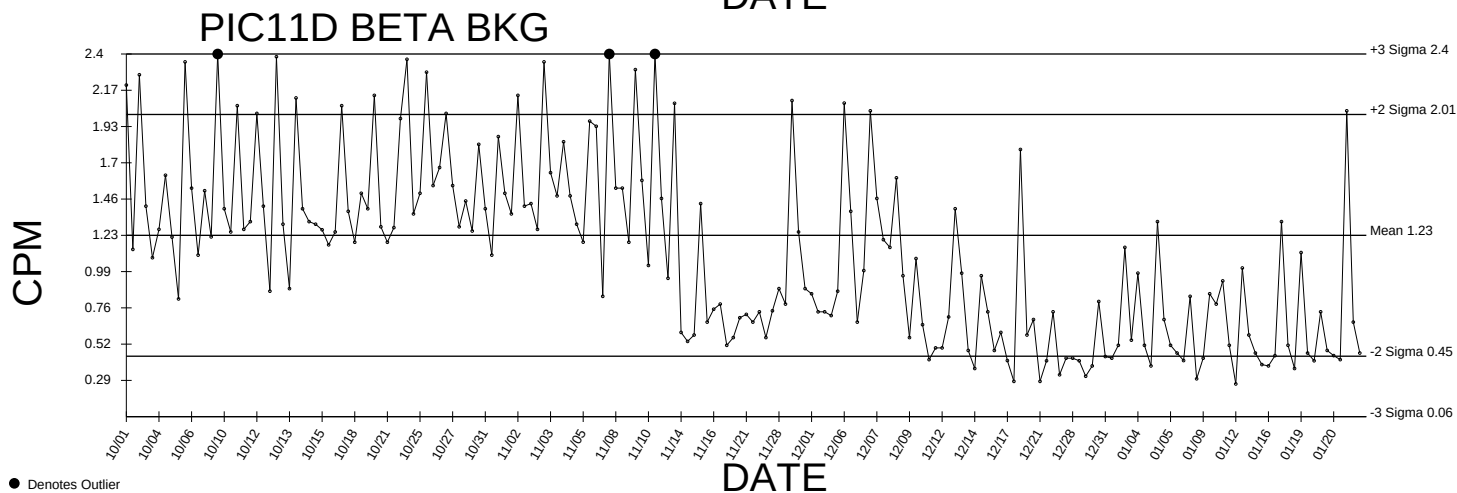
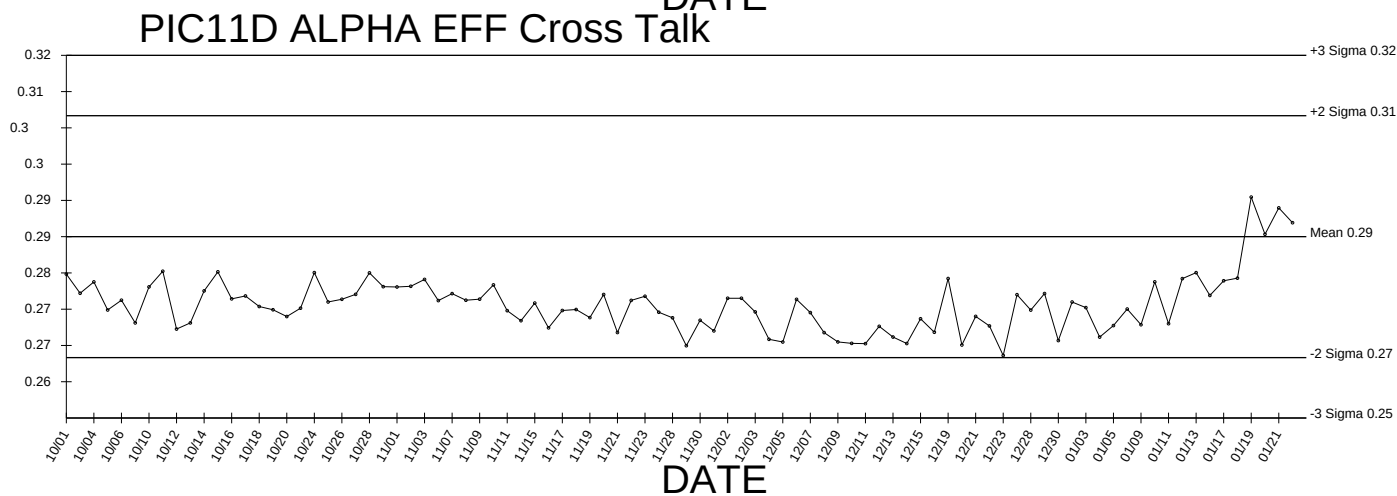
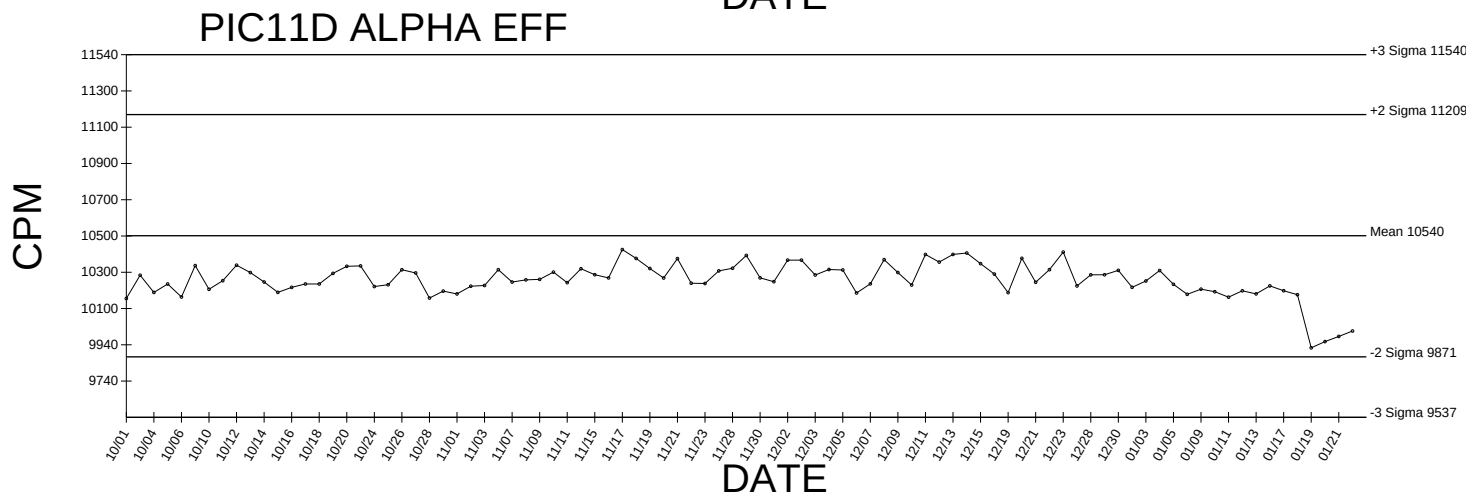
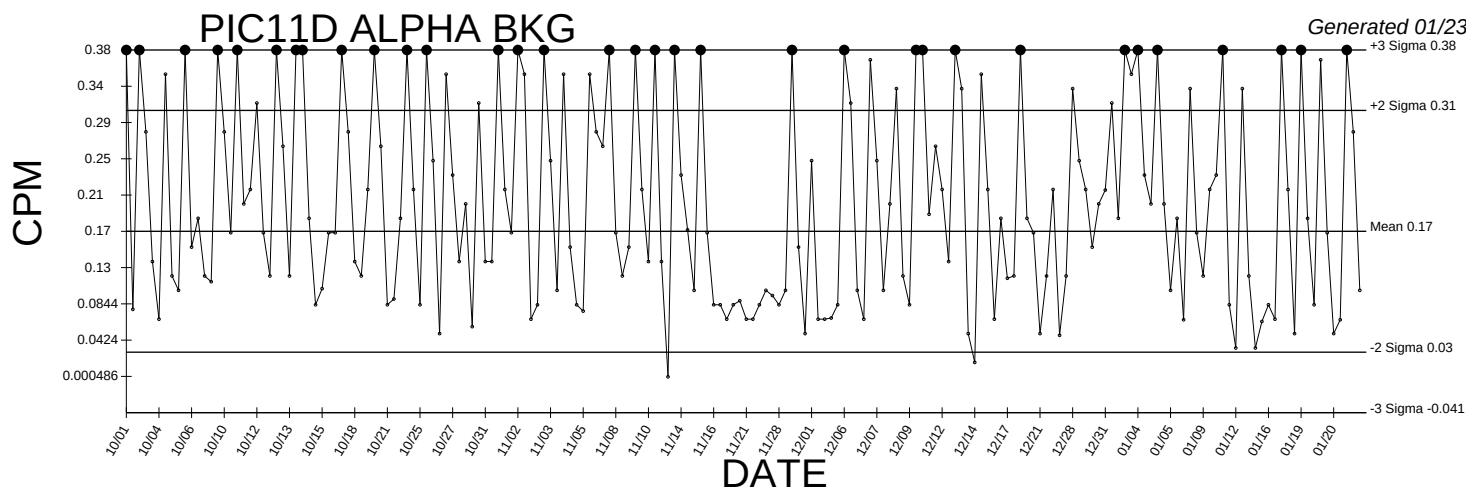
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC8D	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by R. Smith-Harmon

Date 1-28-23

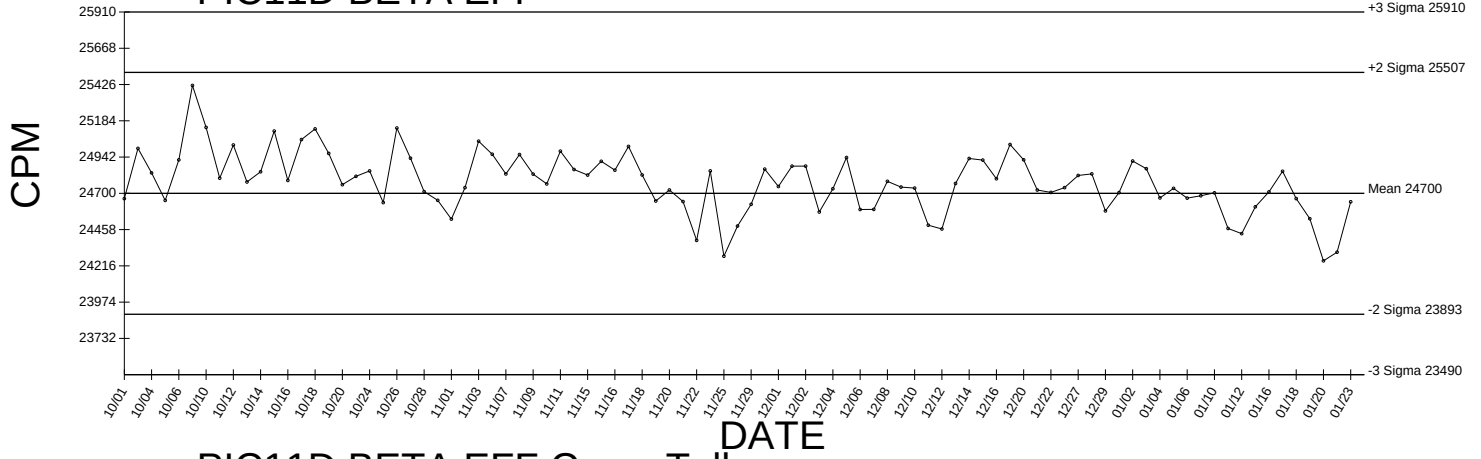
GEL Laboratories LLC

Background and Efficiency Data

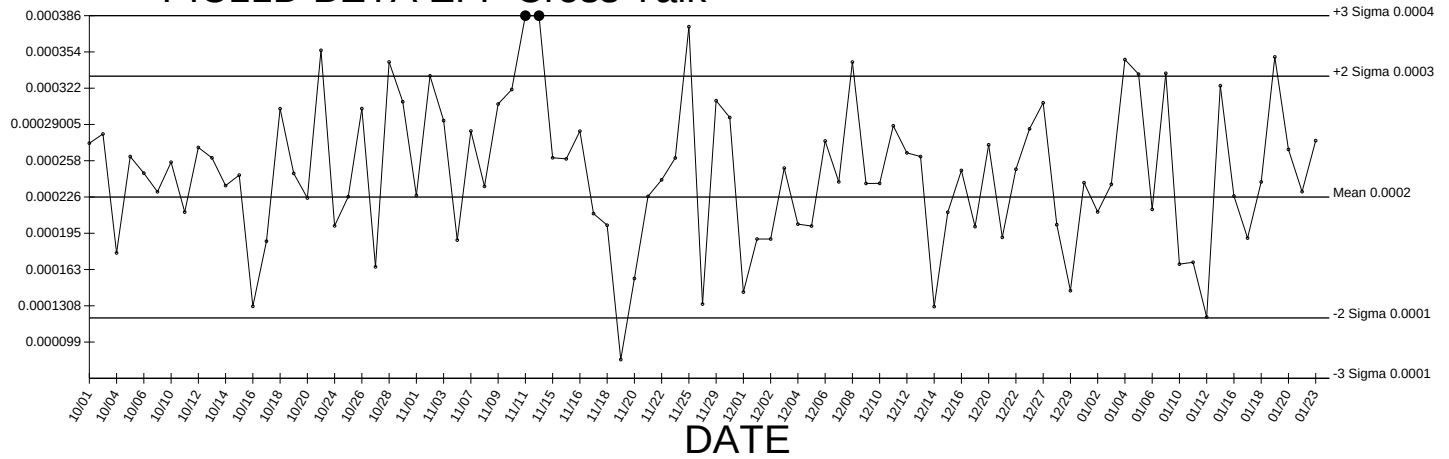


PIC11D BETA EFF

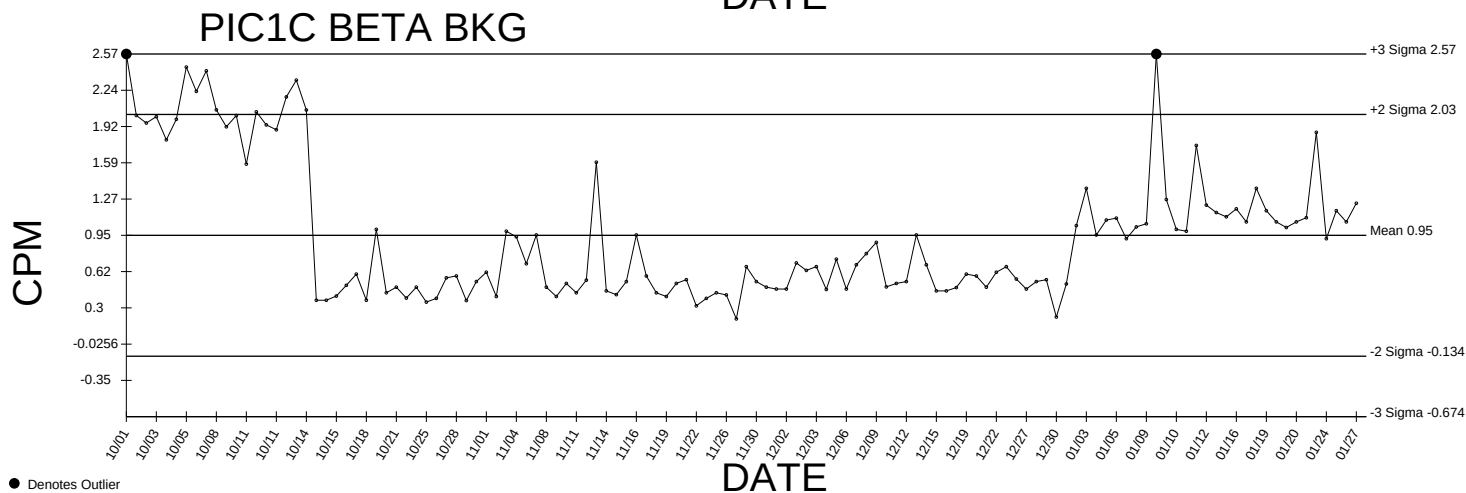
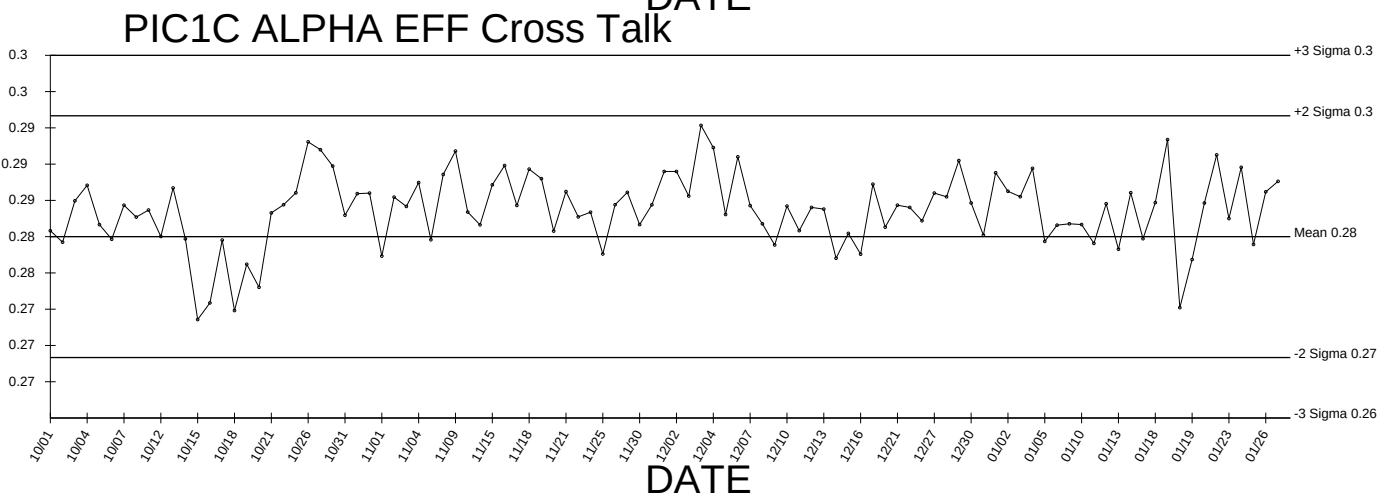
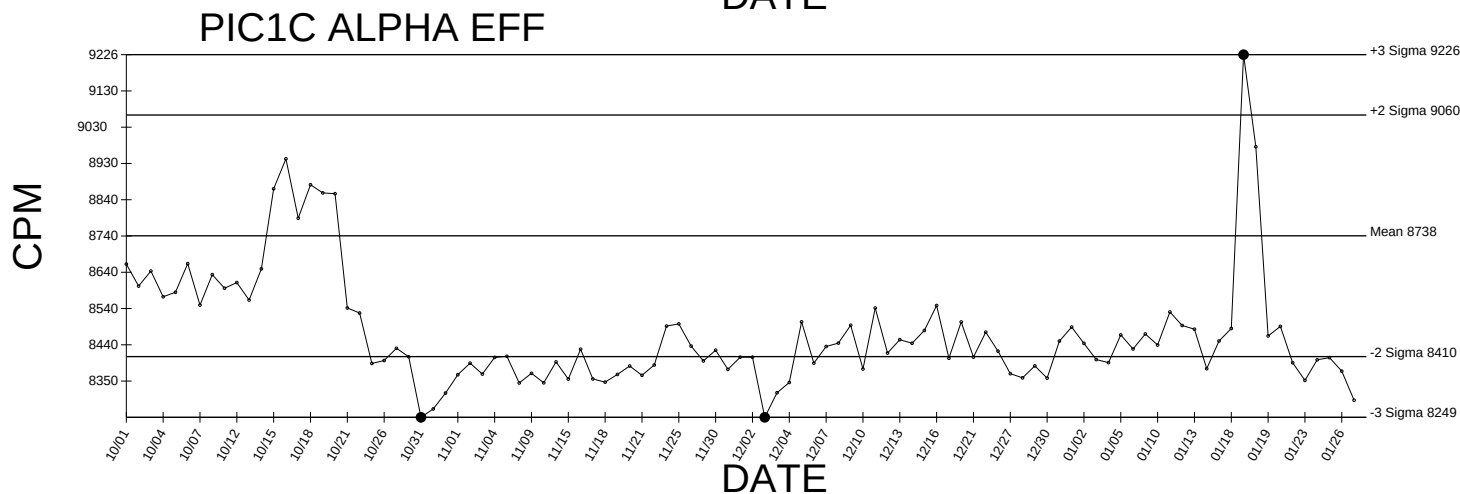
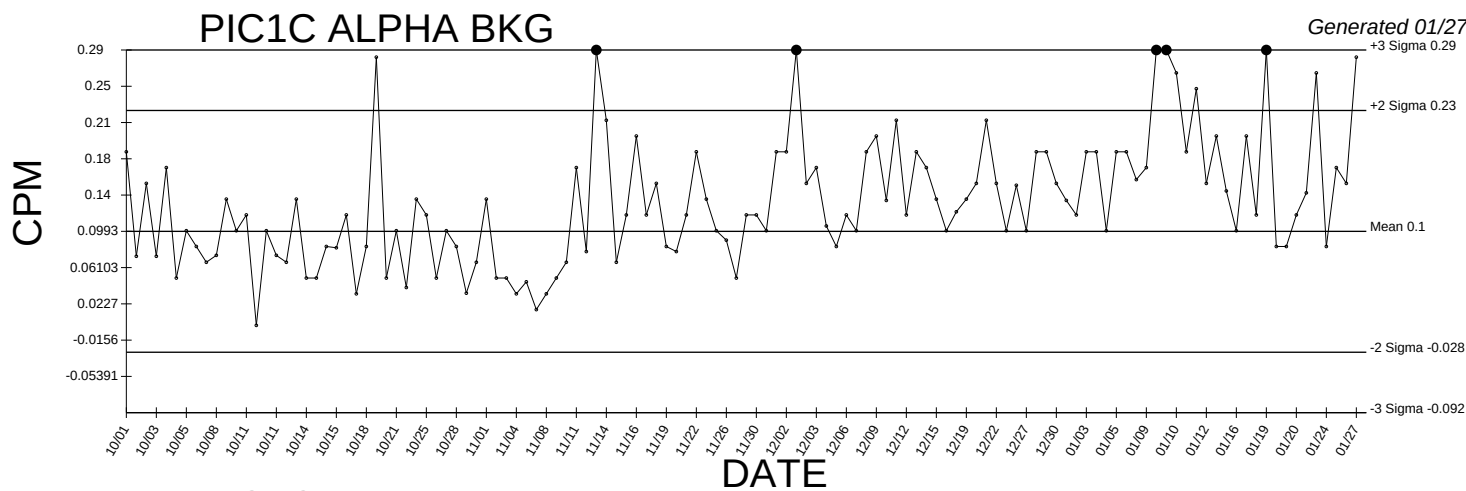
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+3 Sigma 25910



PIC11D BETA EFF Cross Talk



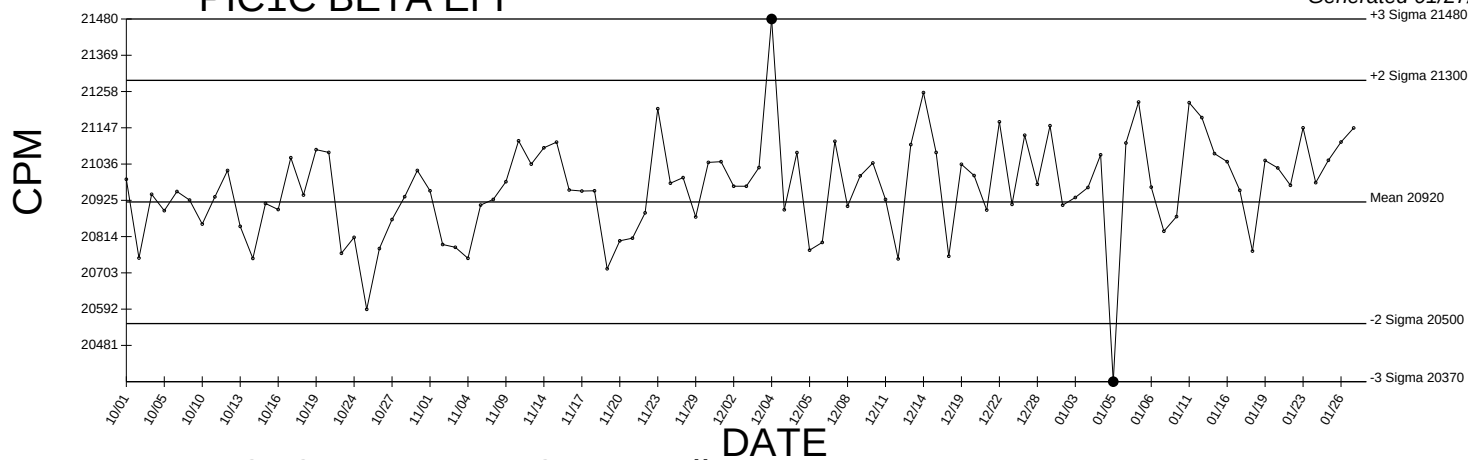
● Denotes Outlier



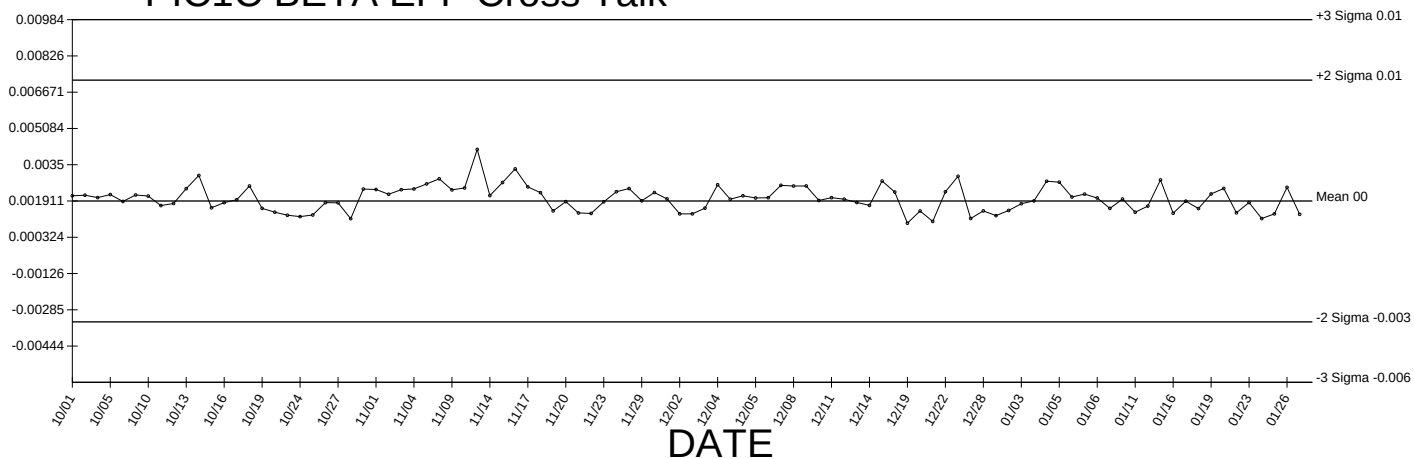
● Denotes Outlier

PIC1C BETA EFF

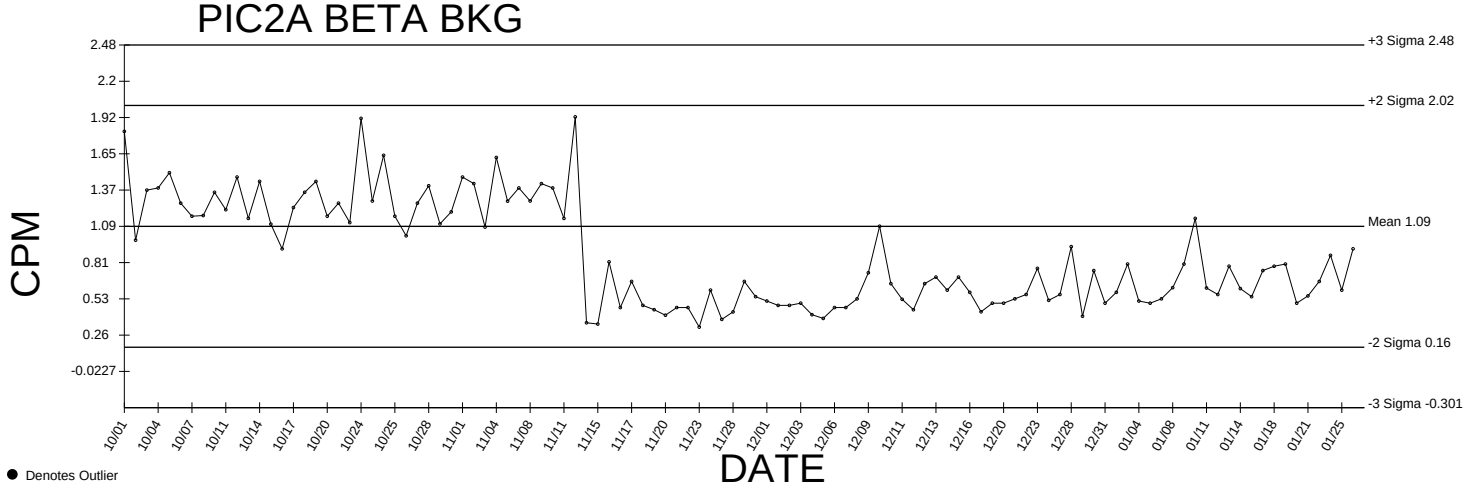
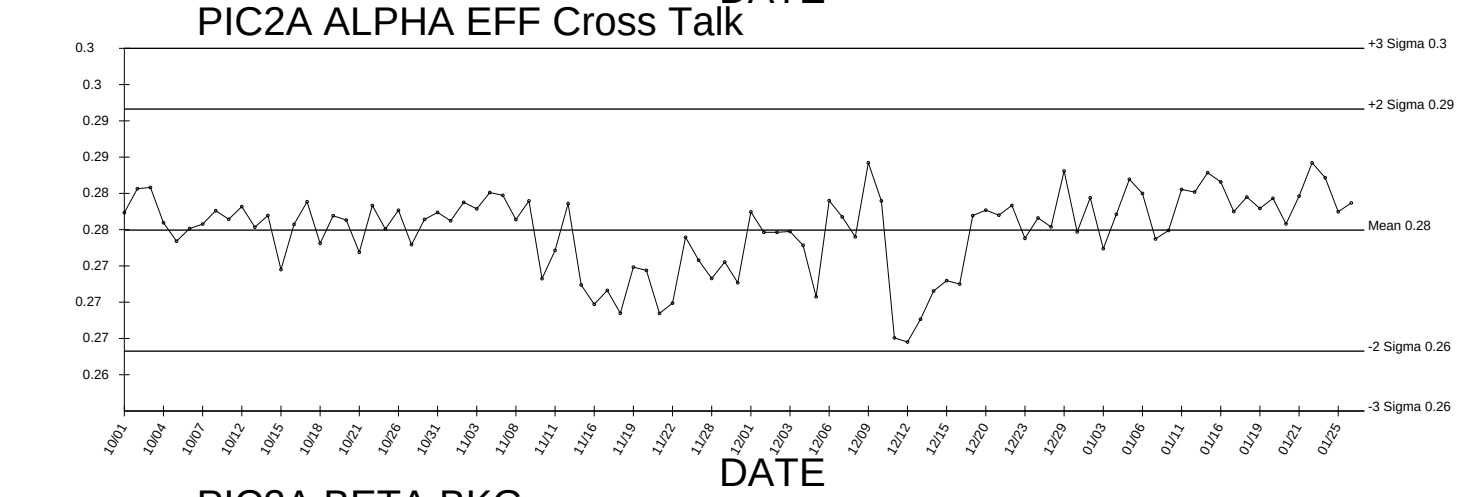
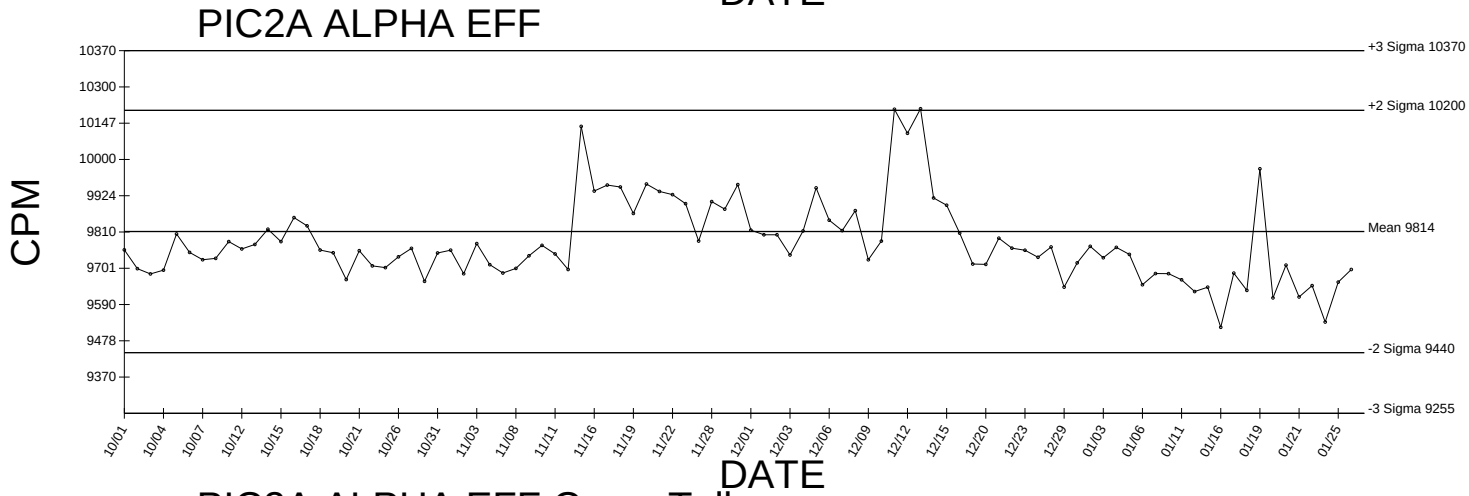
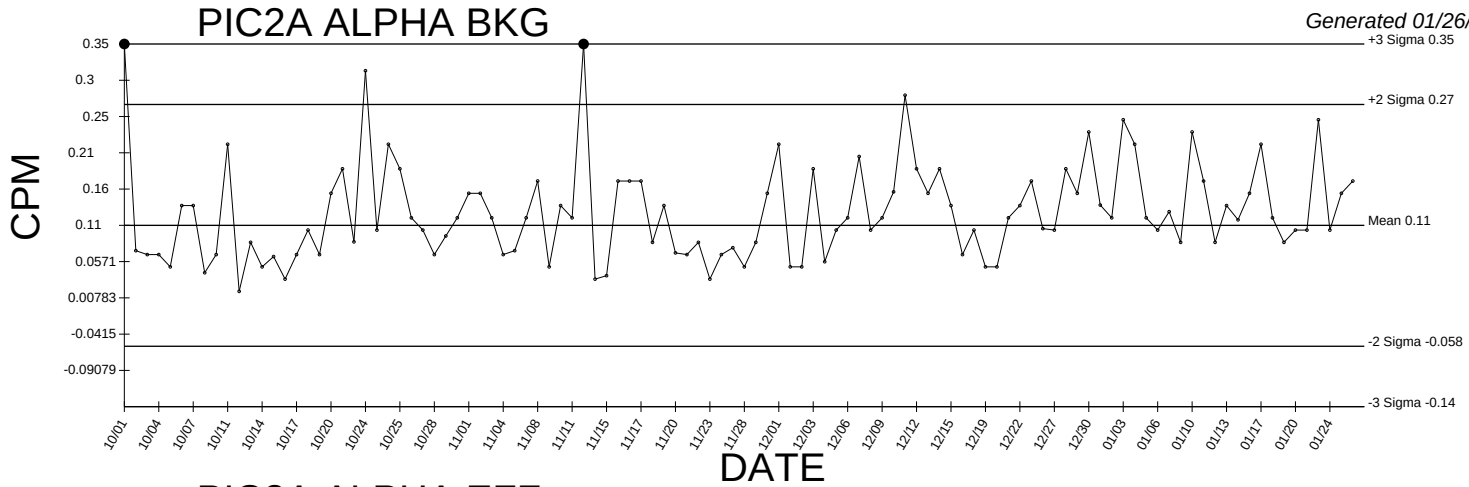
Generated 01/27/2023



PIC1C BETA EFF Cross Talk



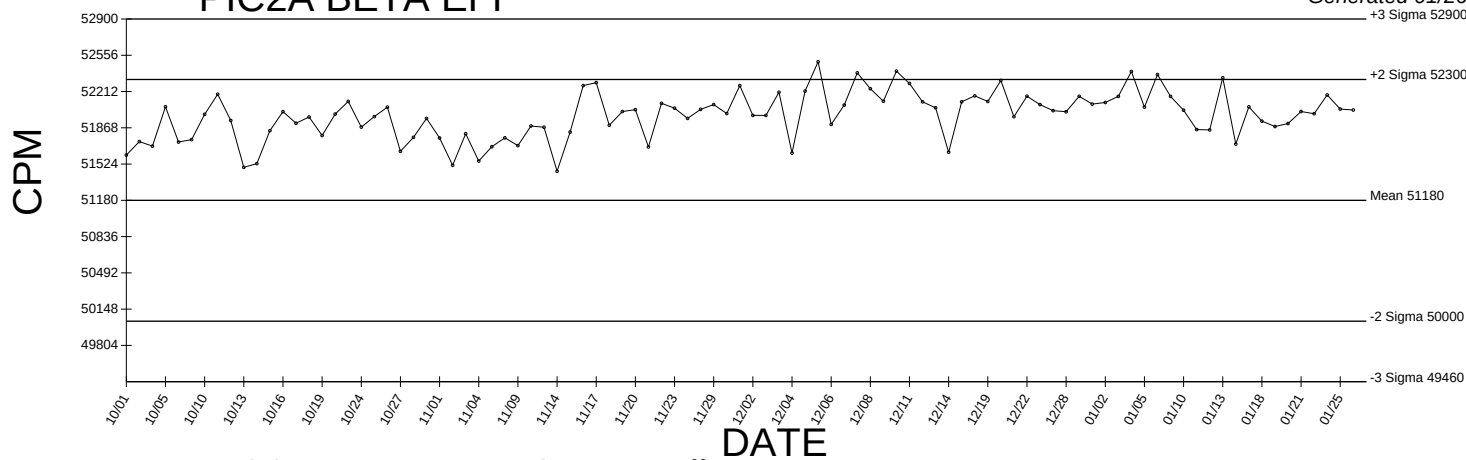
● Denotes Outlier



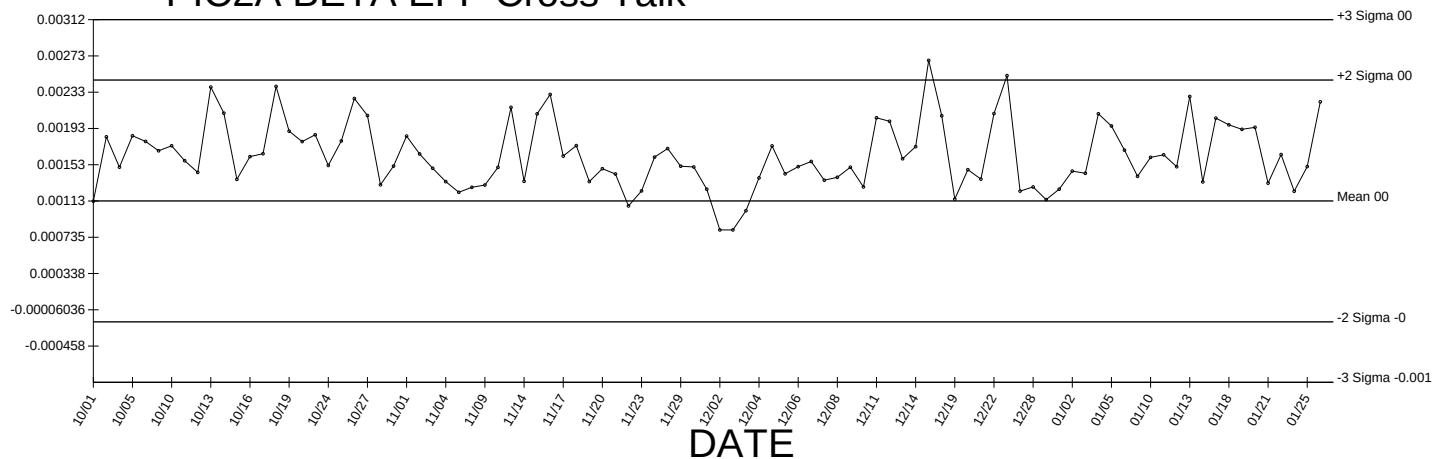
● Denotes Outlier

PIC2A BETA EFF

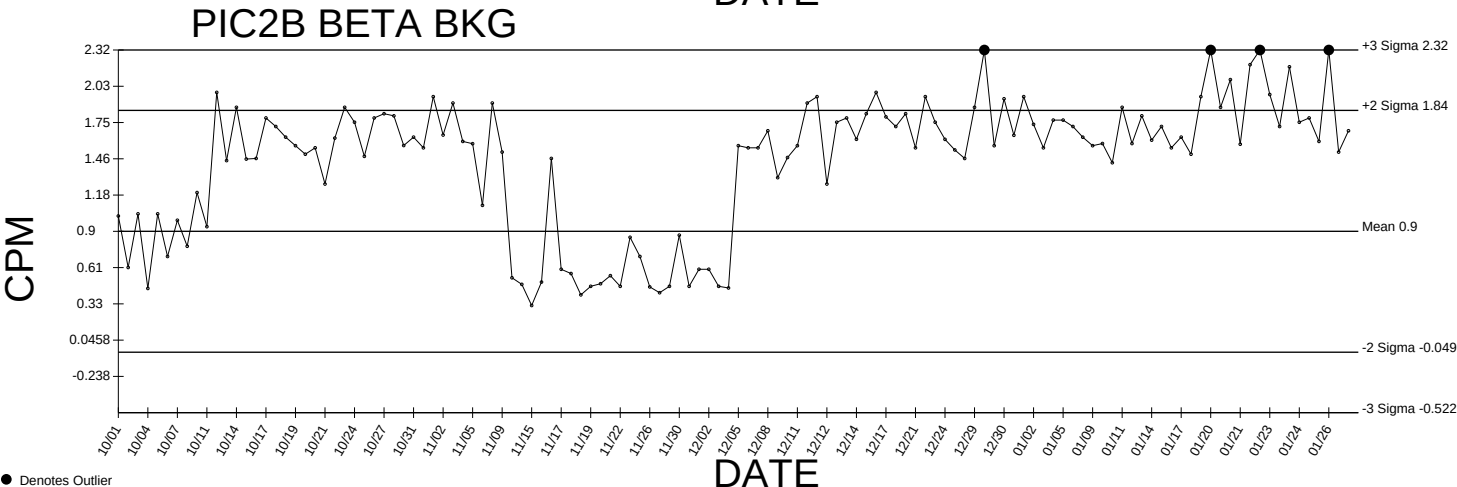
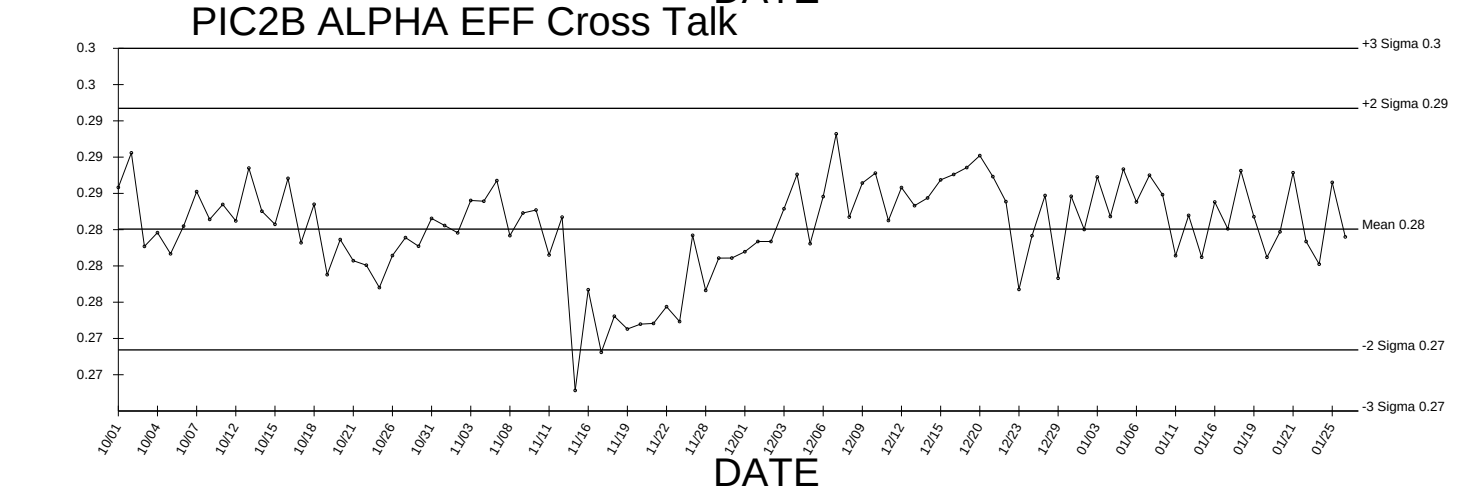
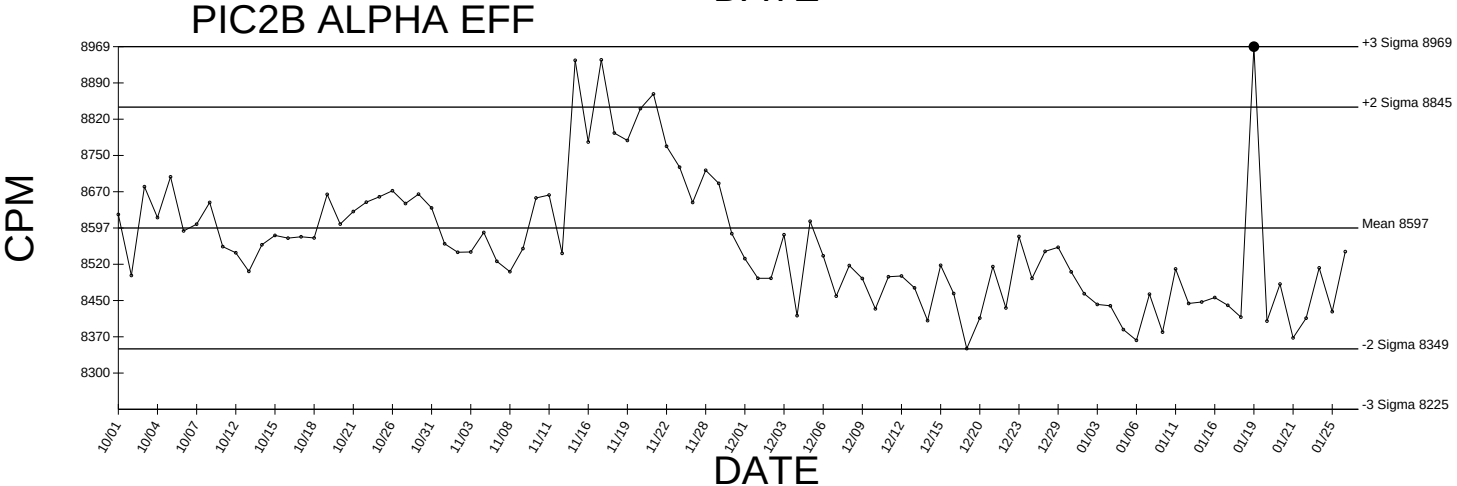
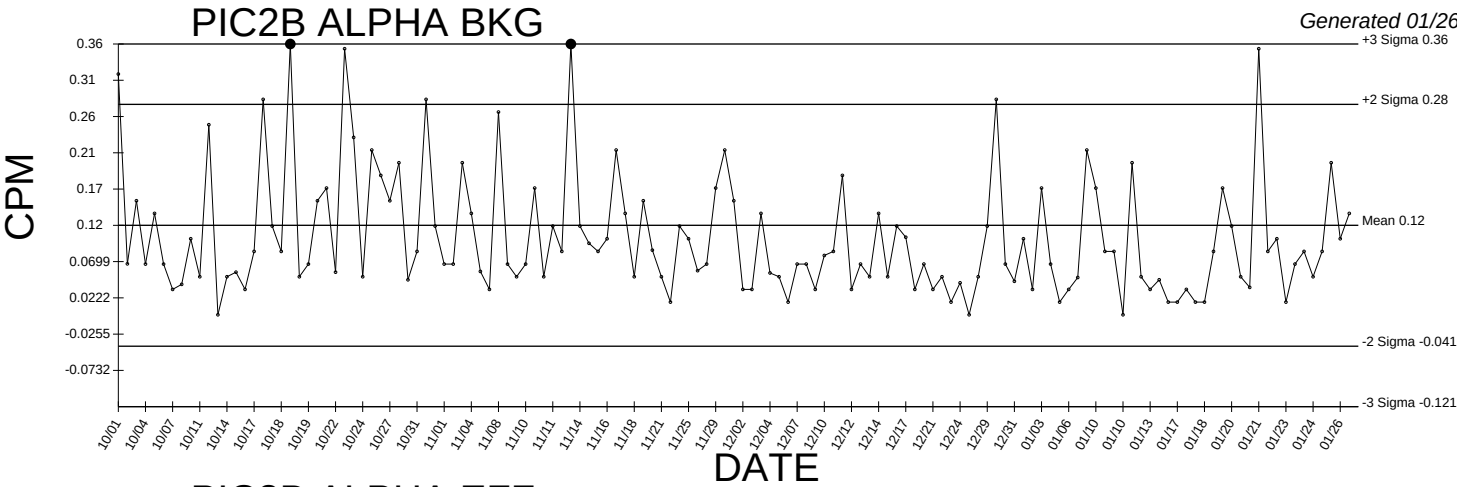
Generated 01/26/2023



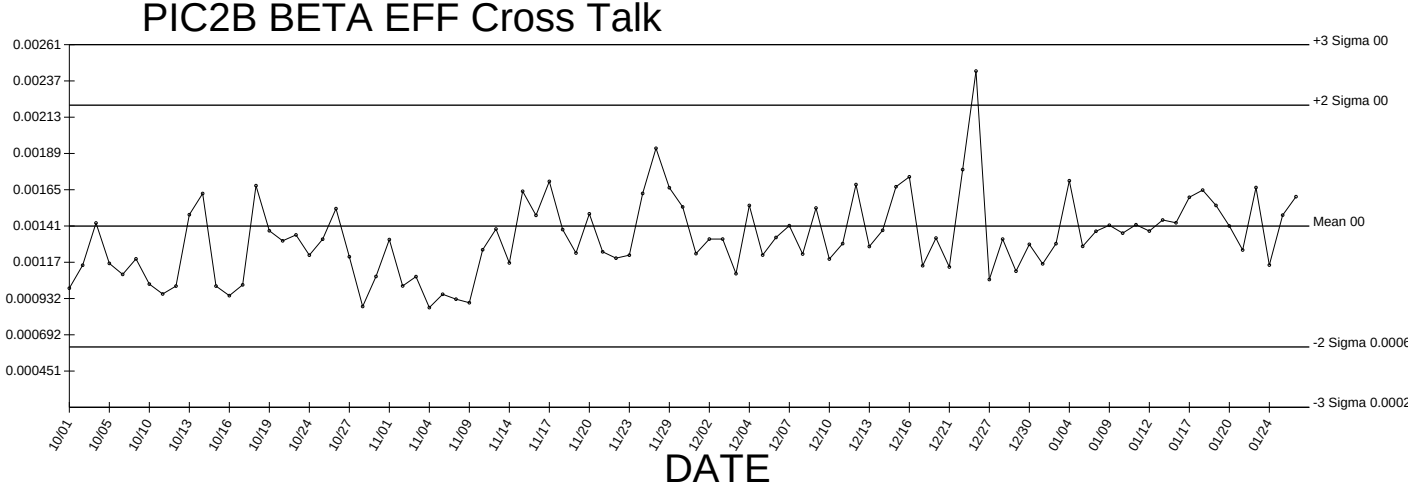
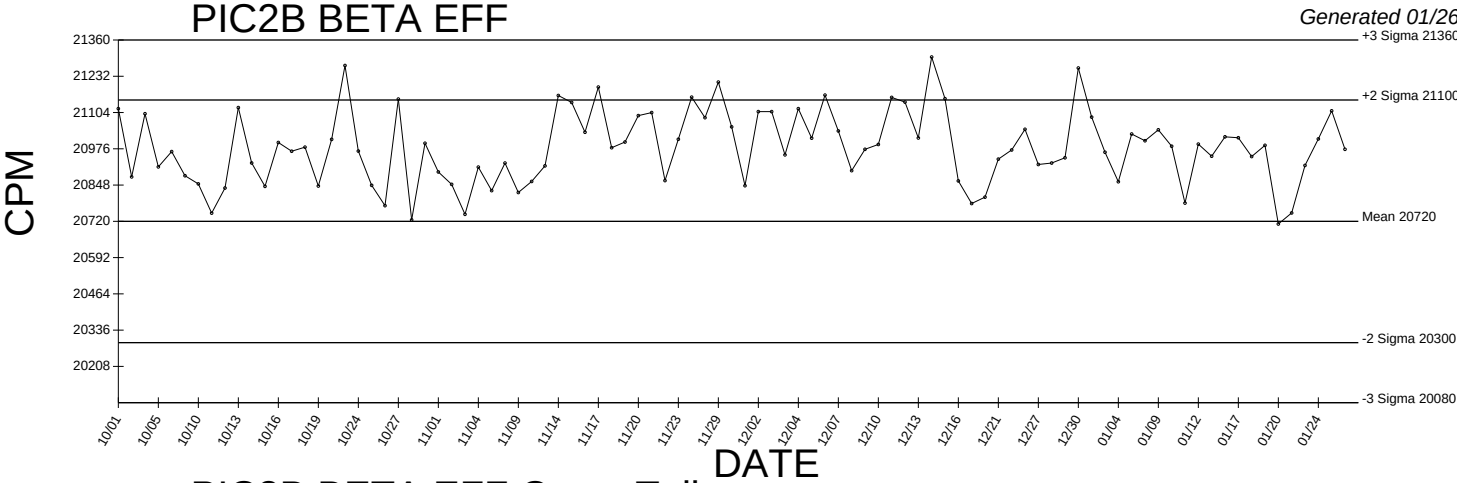
PIC2A BETA EFF Cross Talk



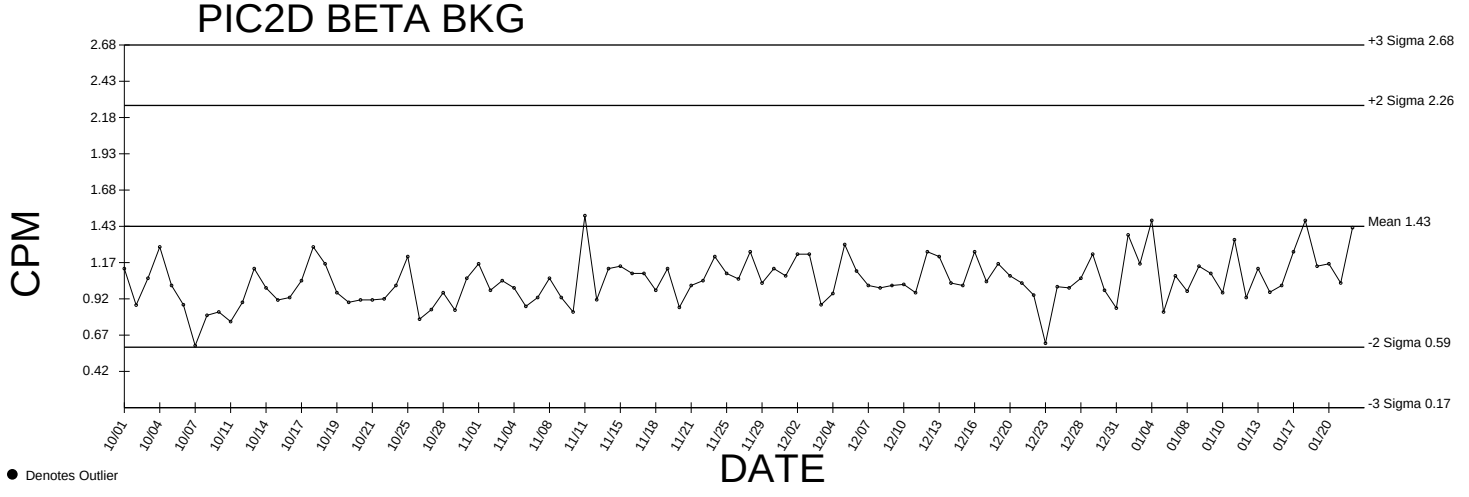
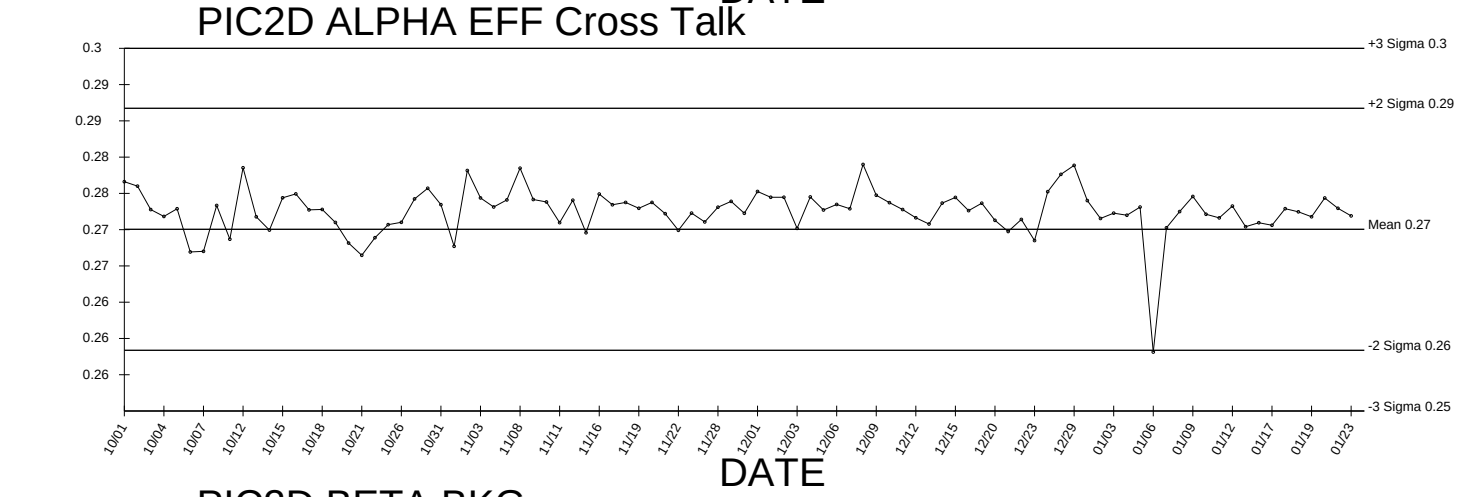
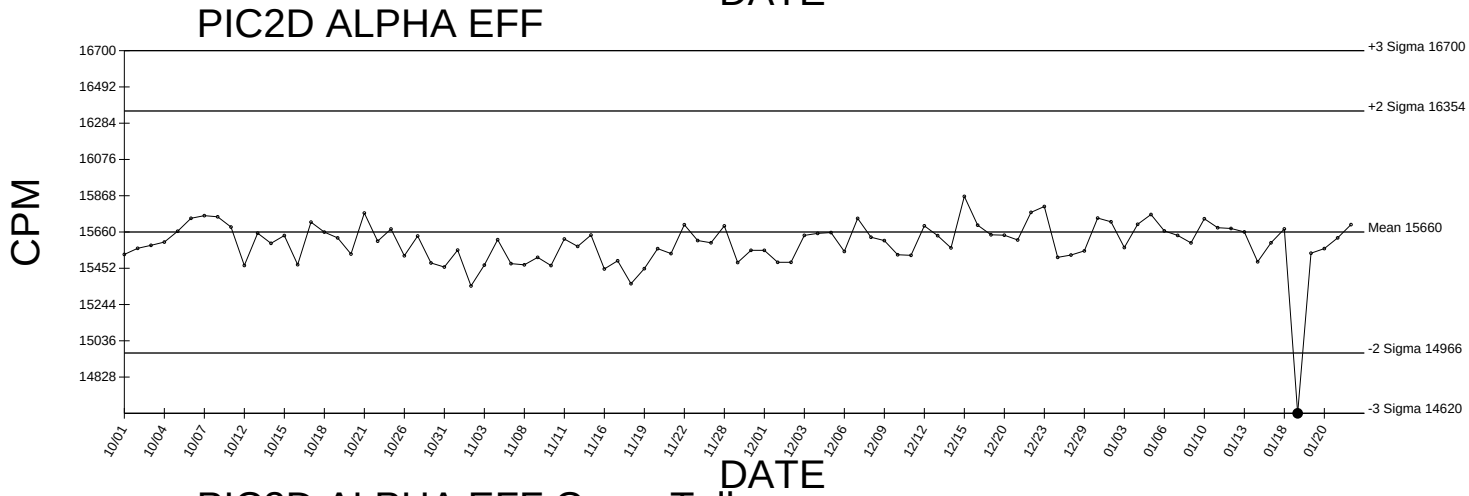
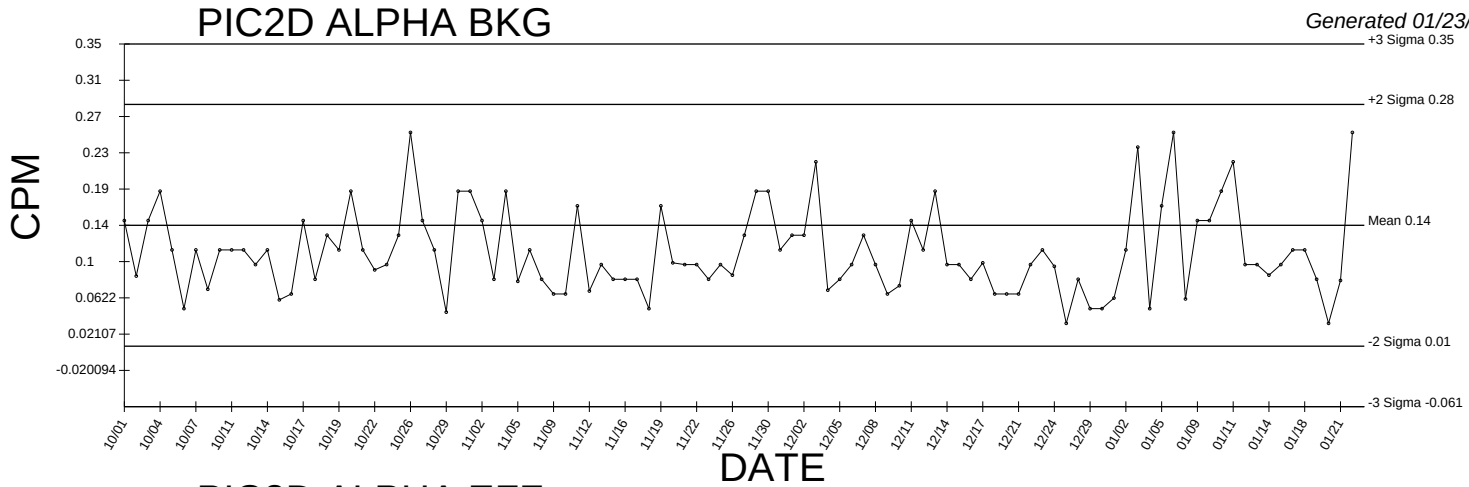
● Denotes Outlier



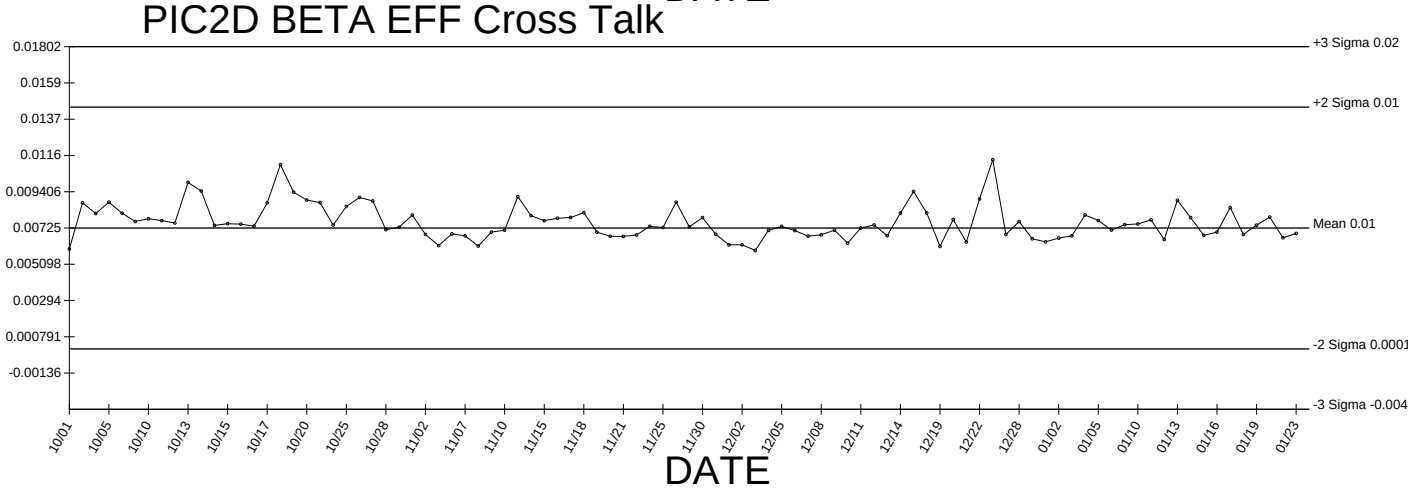
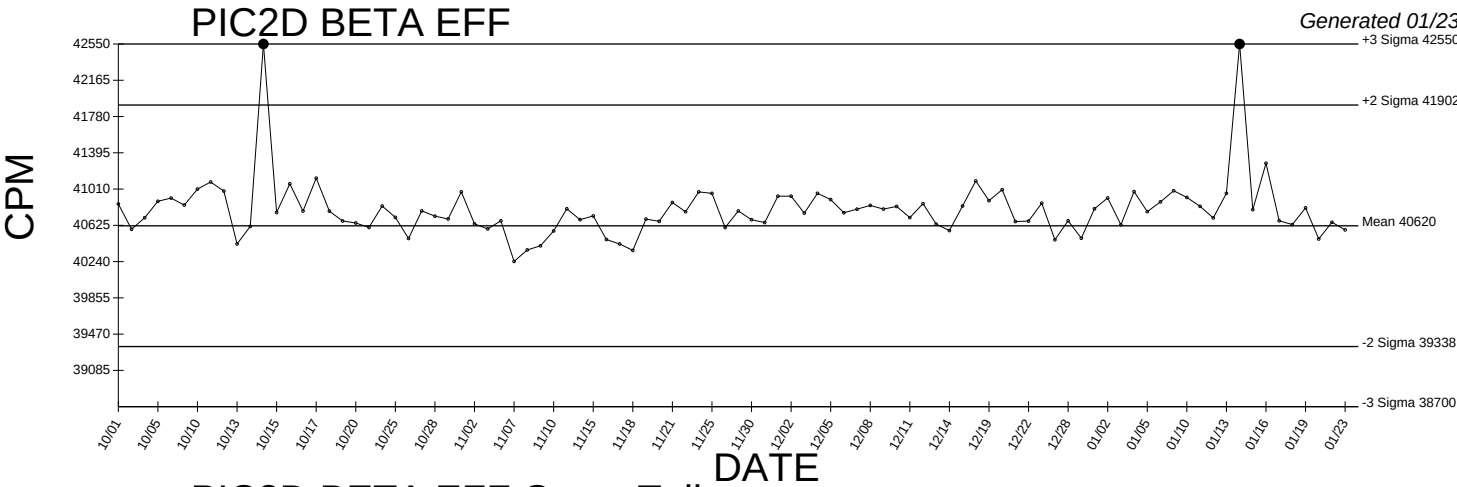
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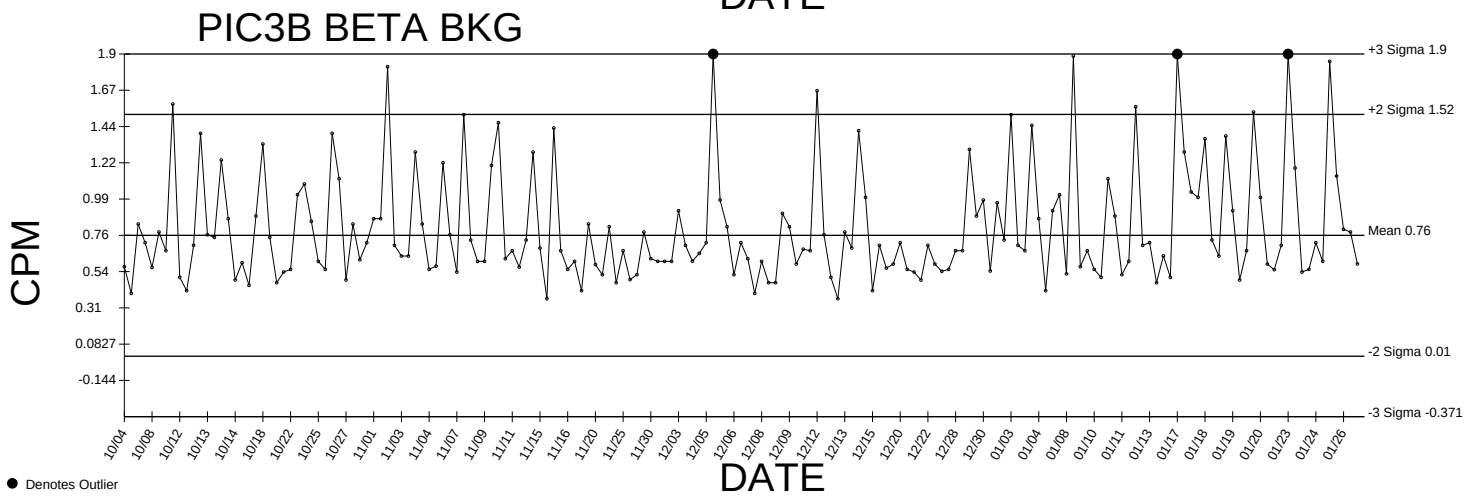
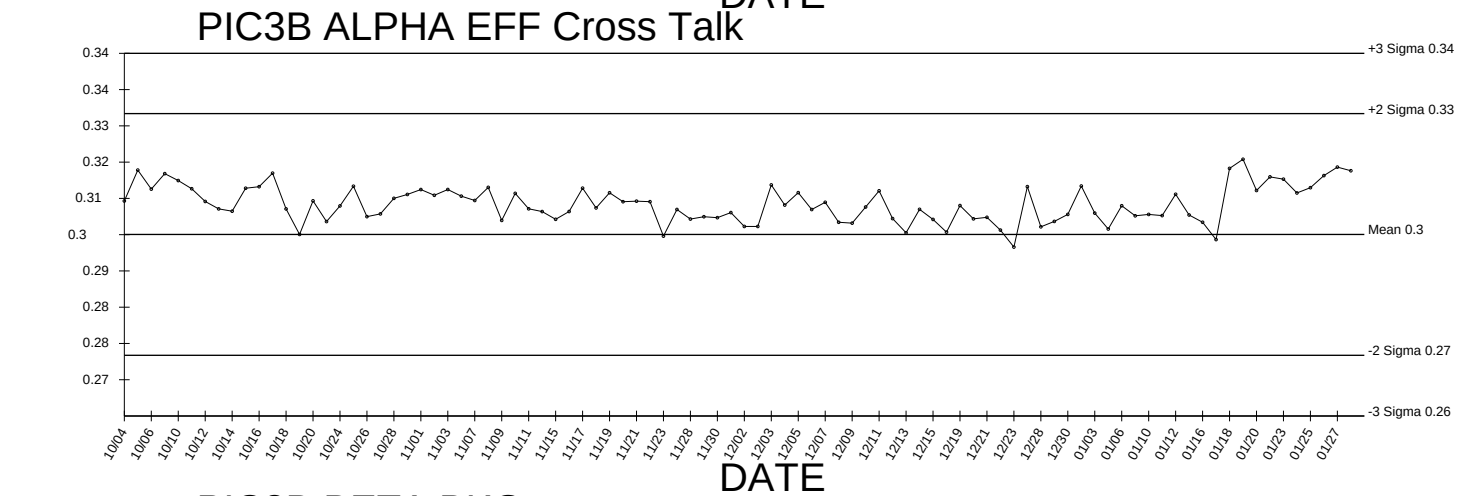
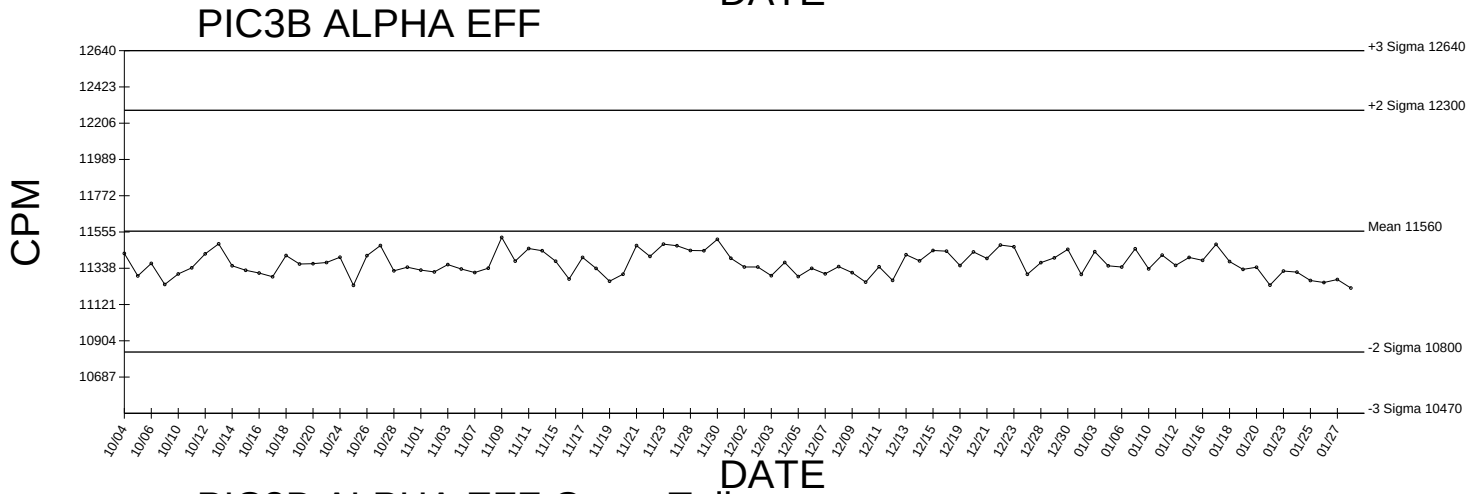
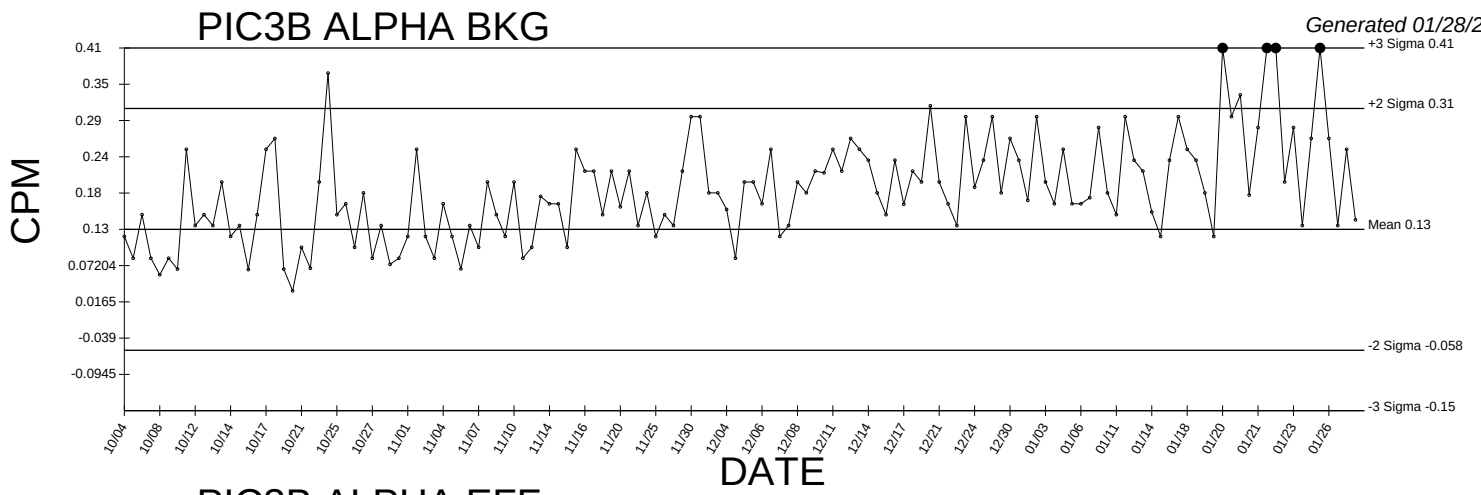
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● Denotes Outlier



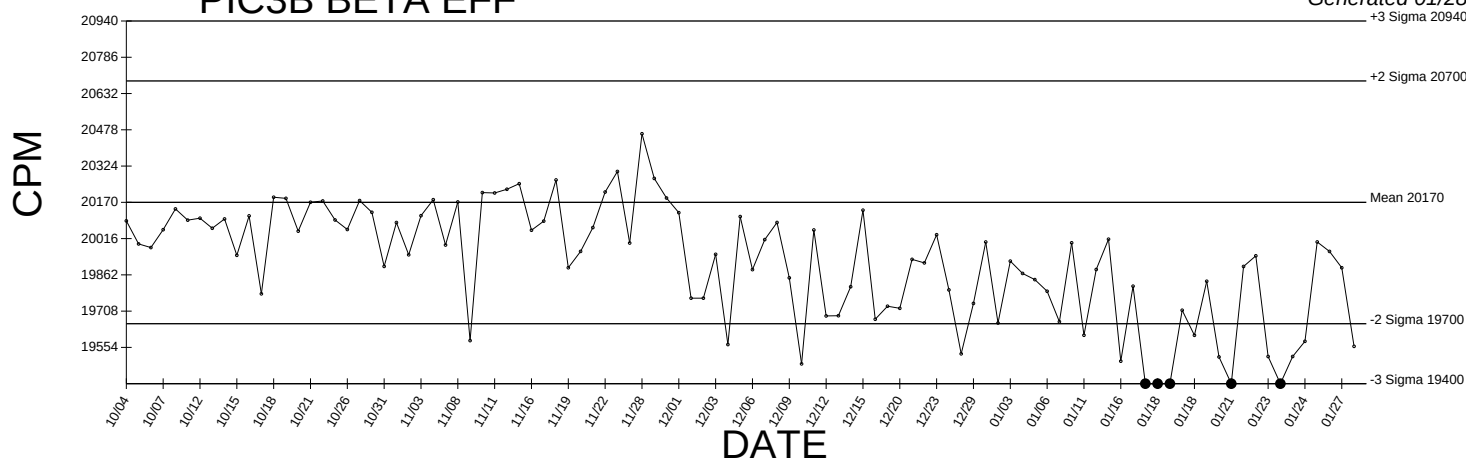
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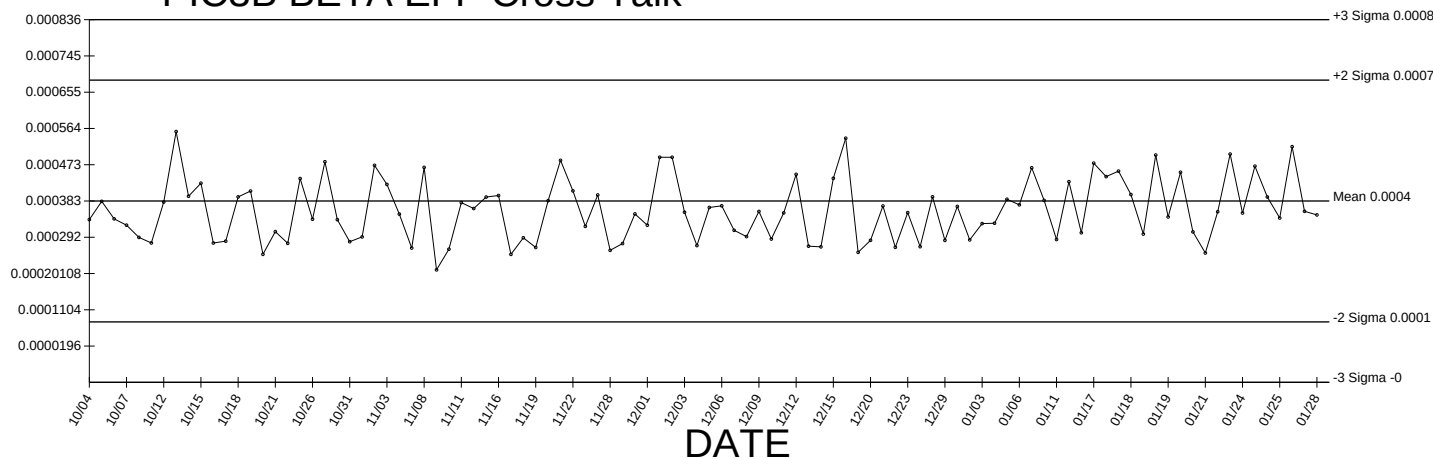
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PIC3B BETA EFF

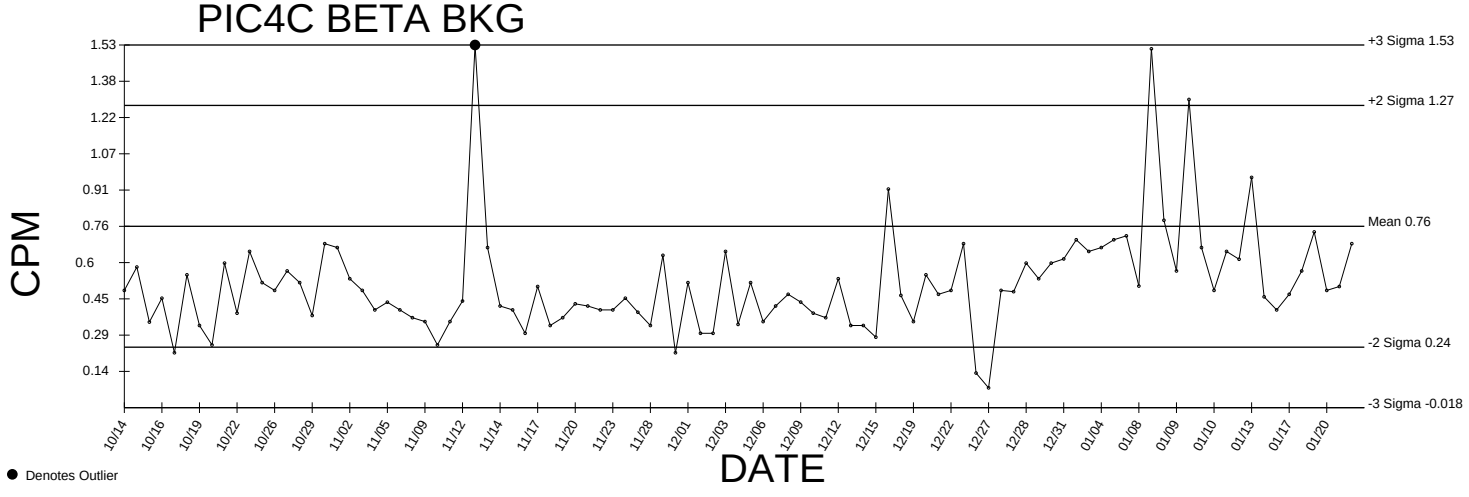
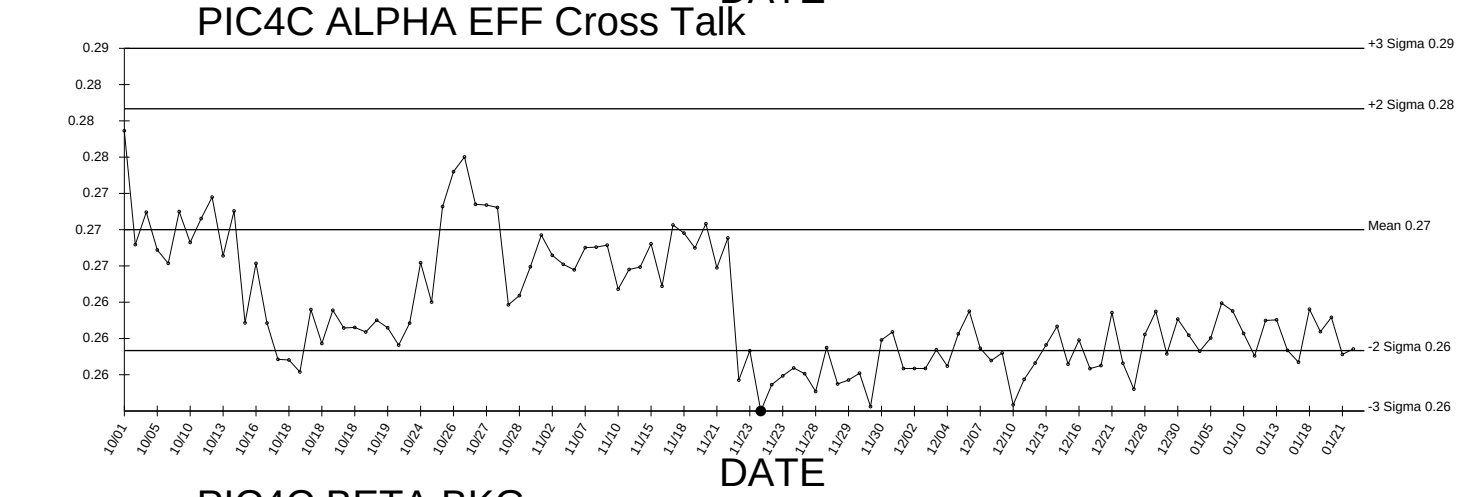
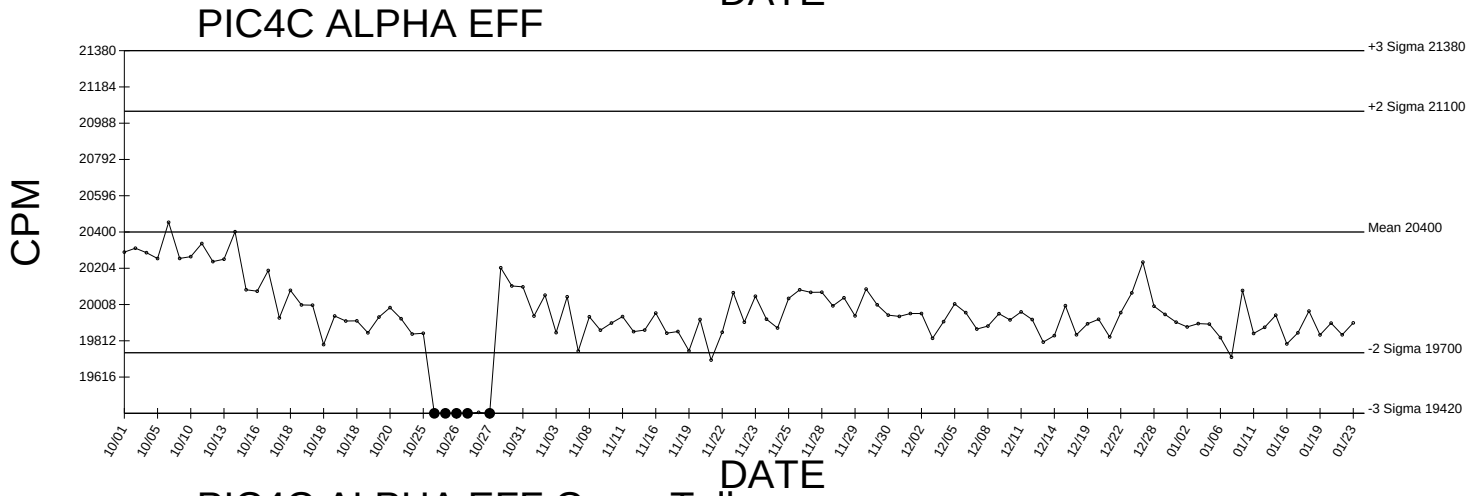
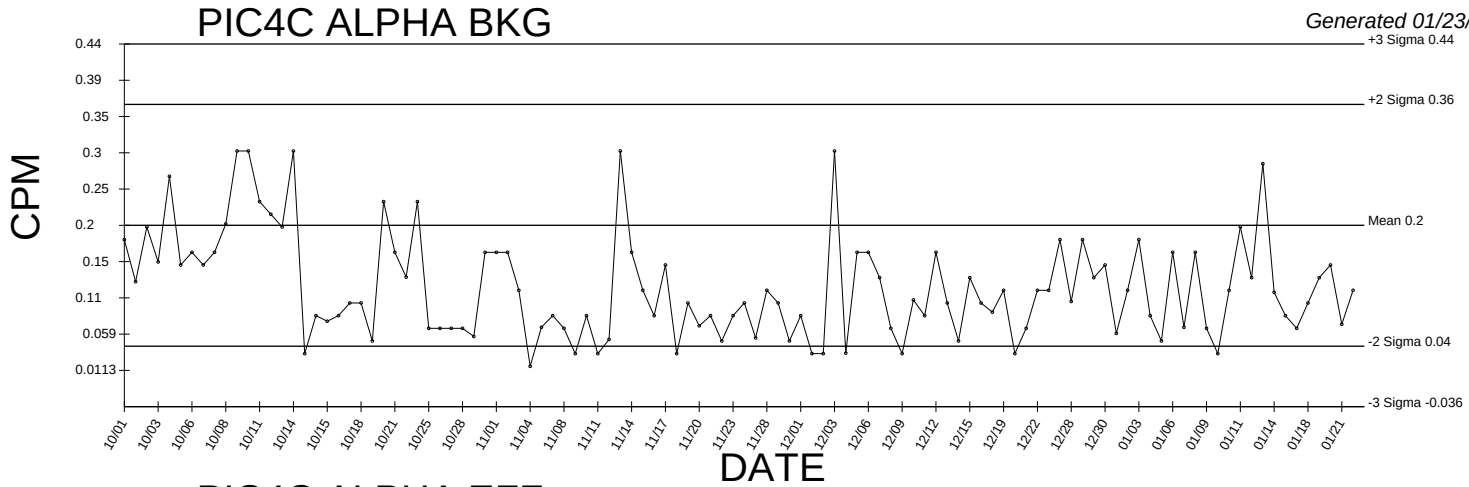
Generated 01/28/2023



PIC3B BETA EFF Cross Talk



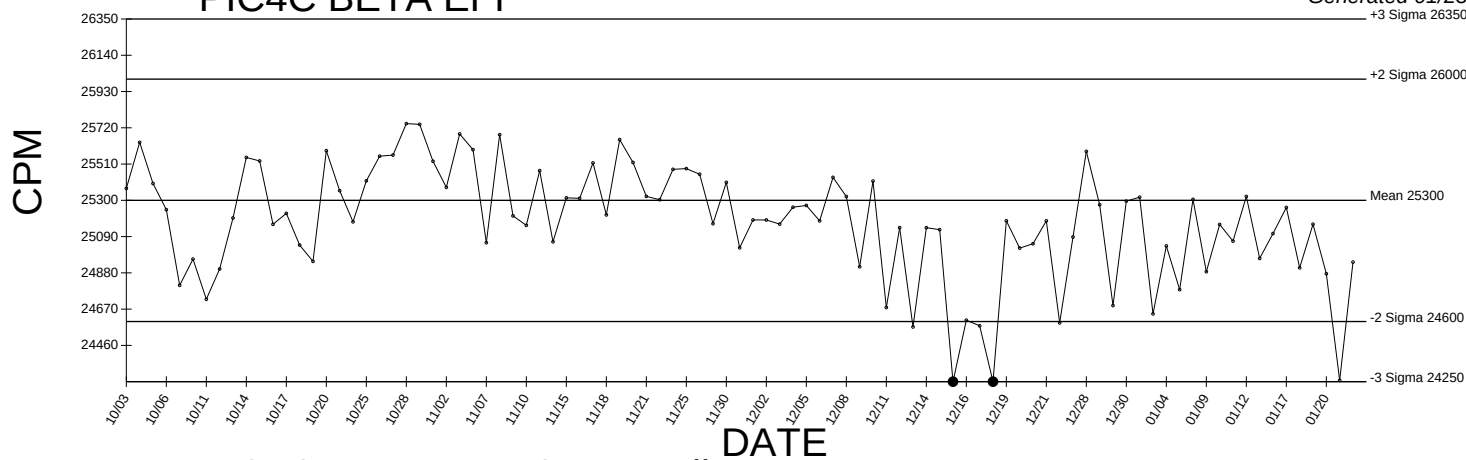
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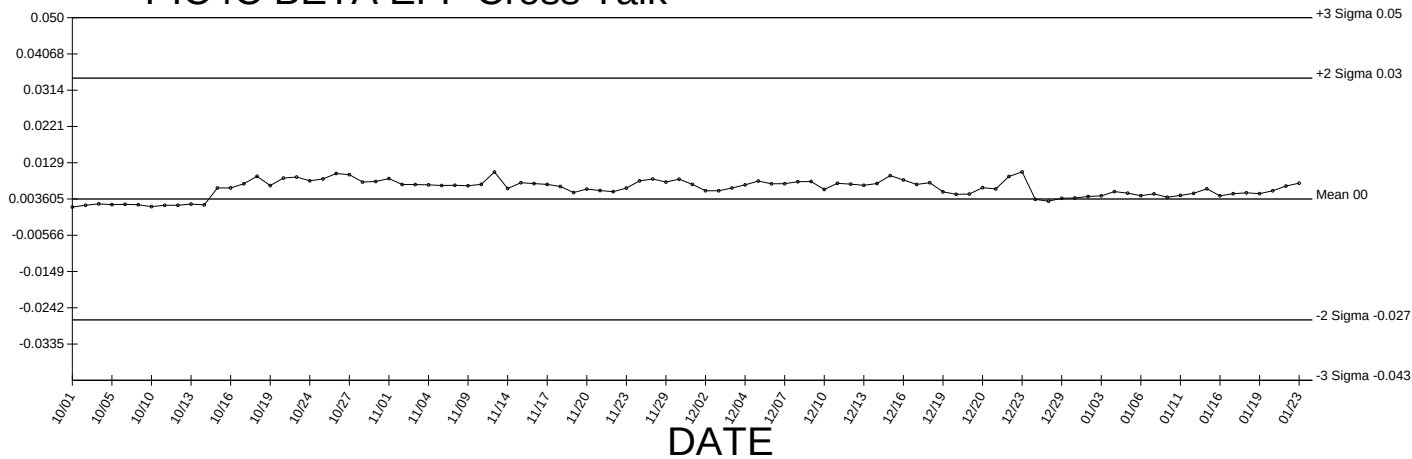
● Denotes Outlier

PIC4C BETA EFF

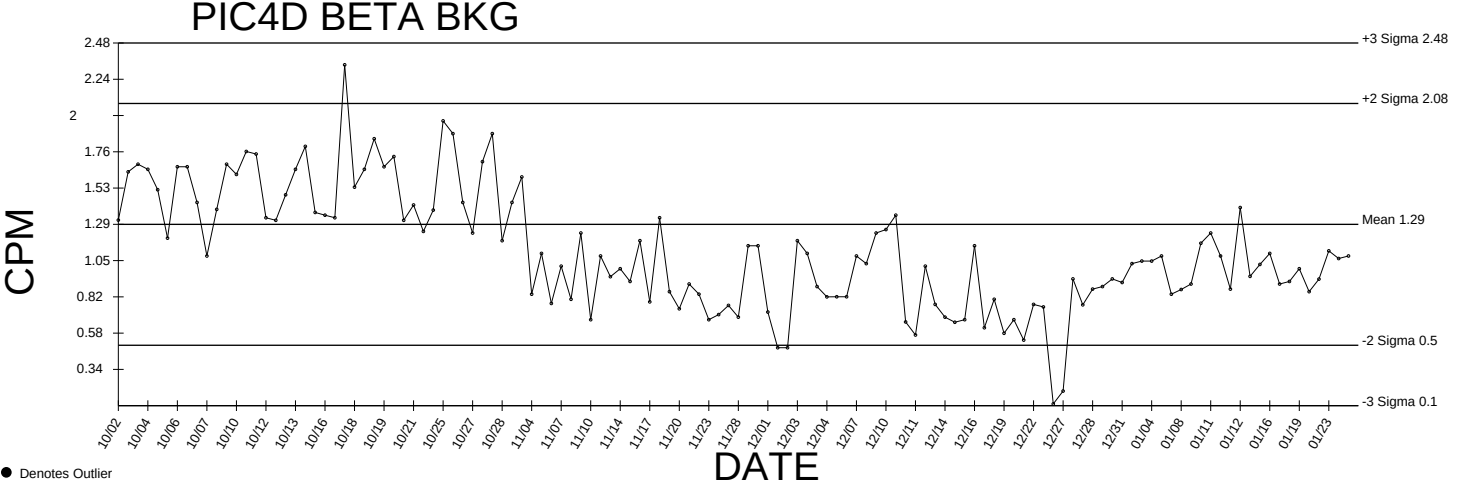
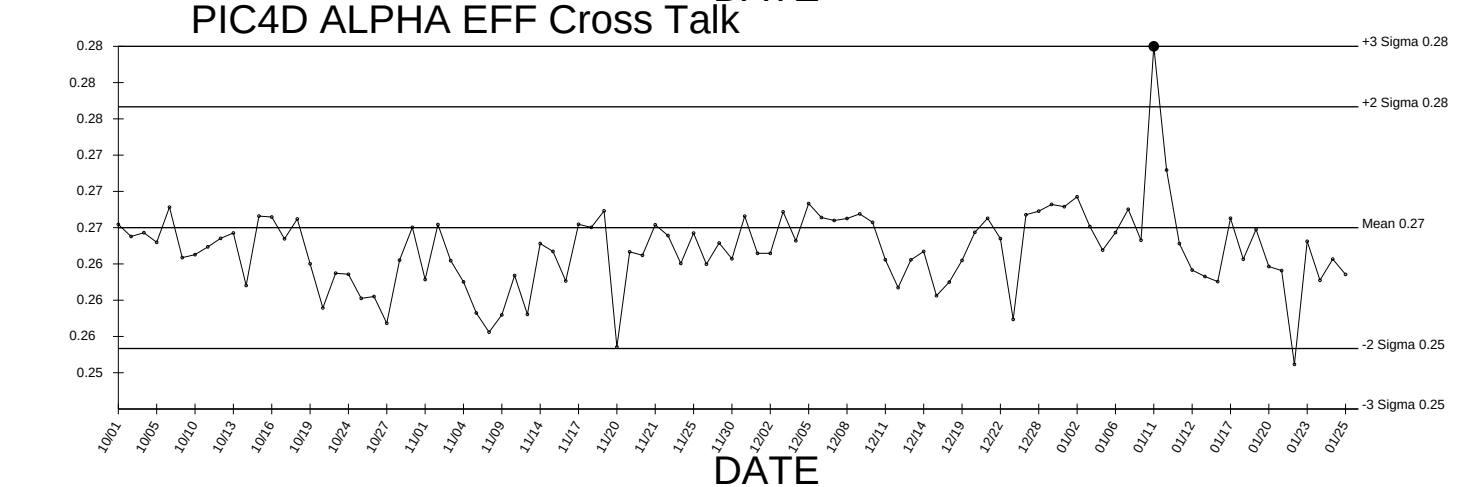
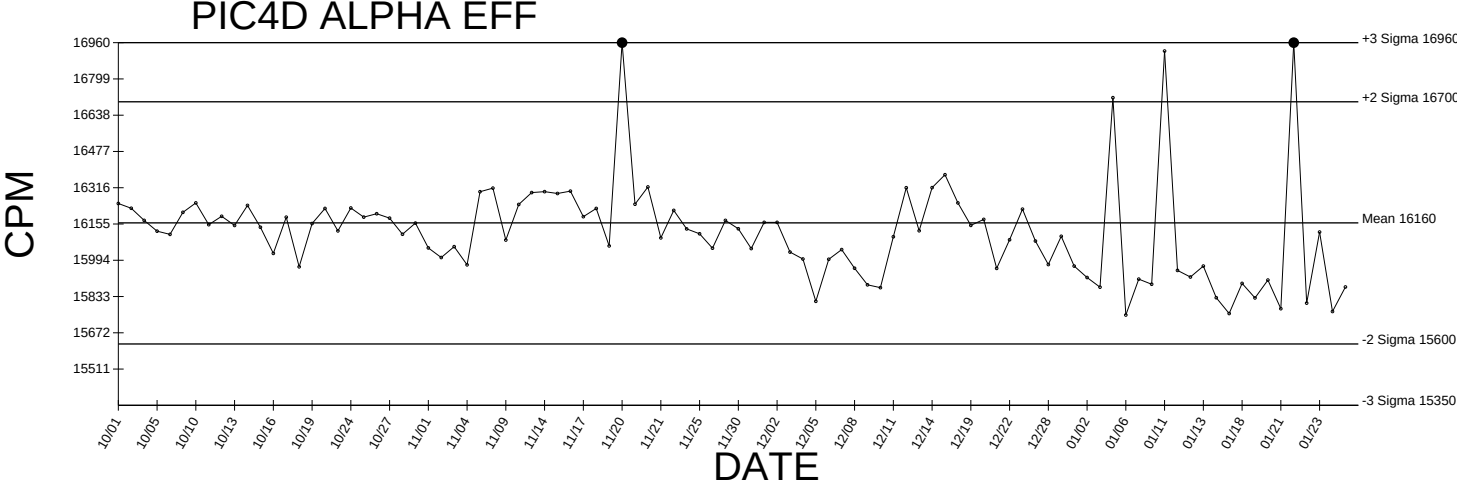
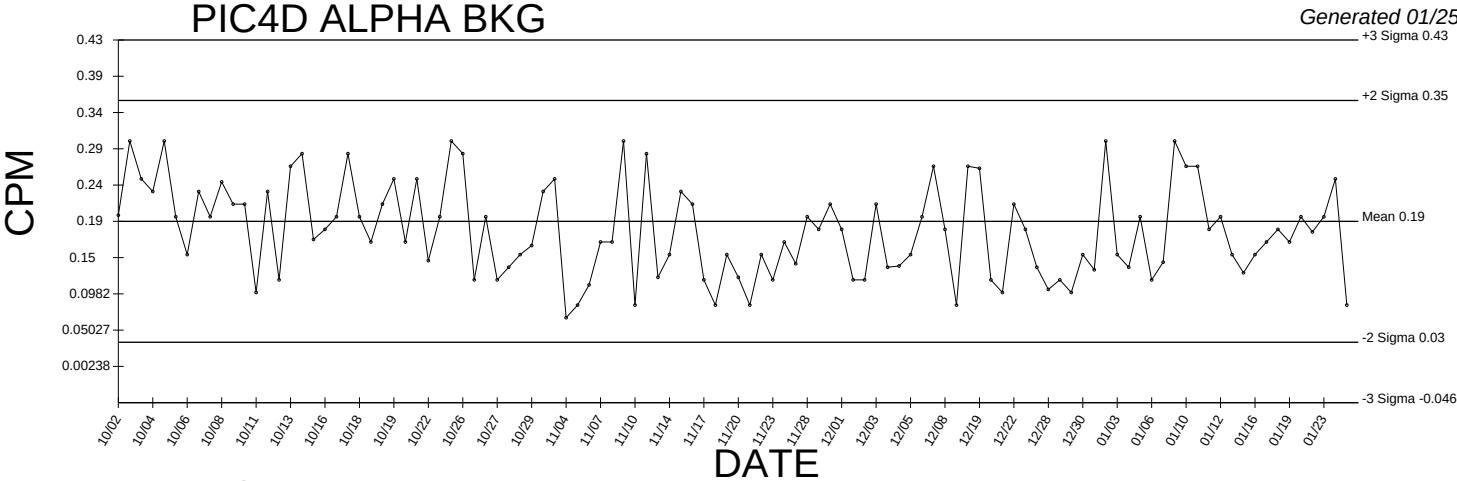
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+3 Sigma 26350



PIC4C BETA EFF Cross Talk



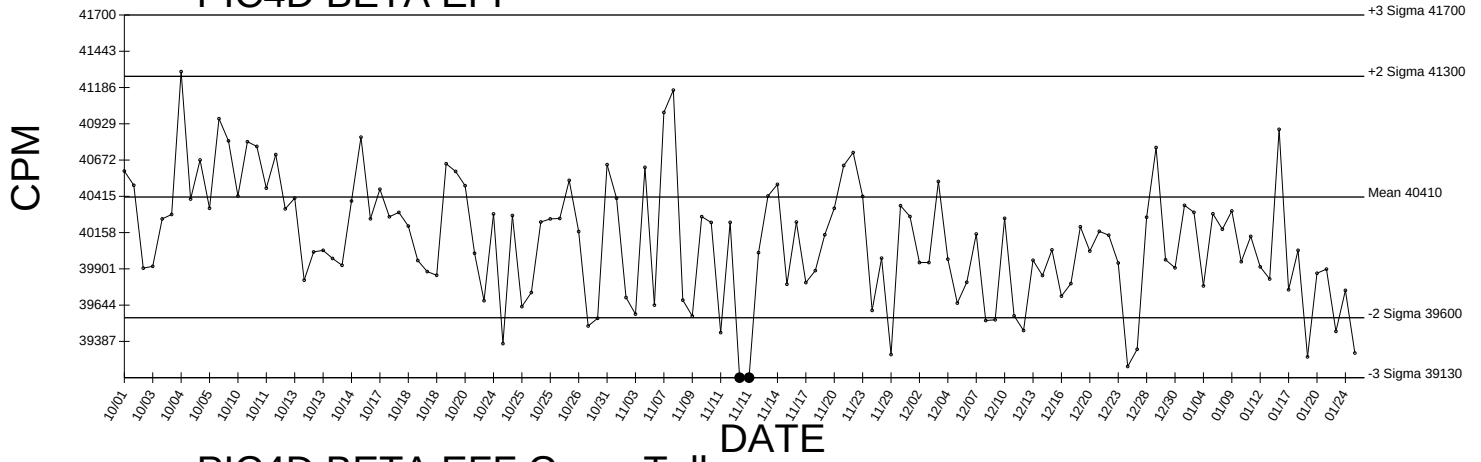
● Denotes Outlier



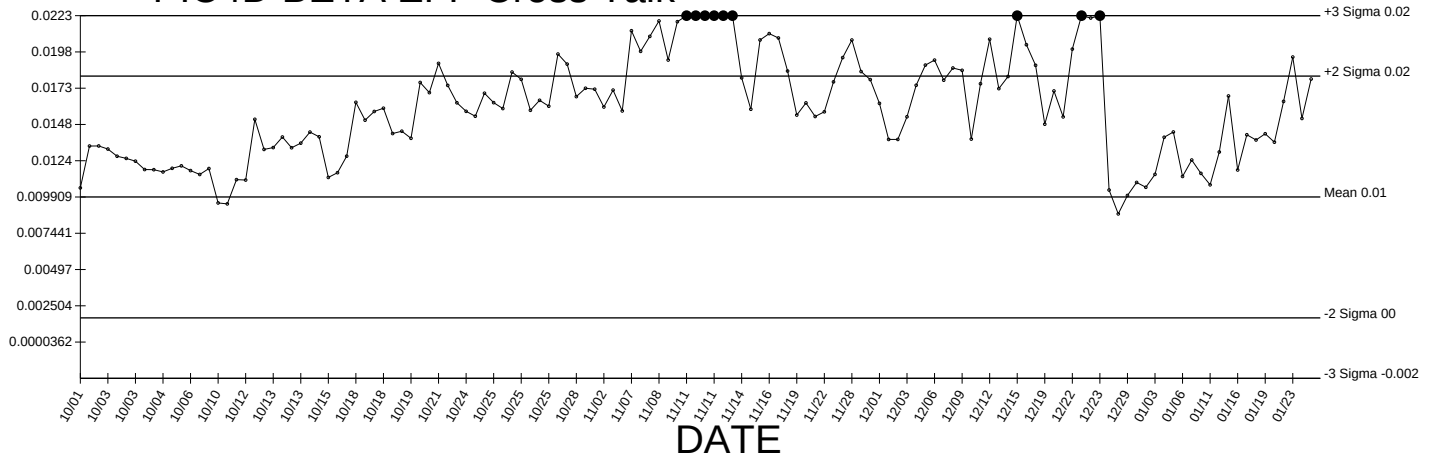
● Denotes Outlier

PIC4D BETA EFF

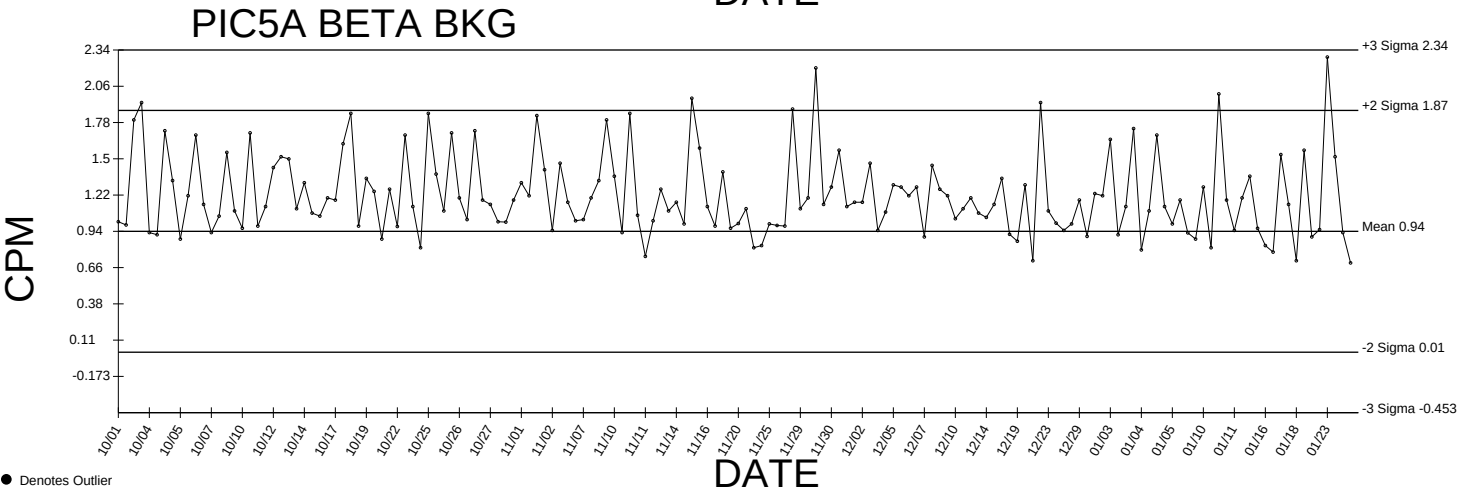
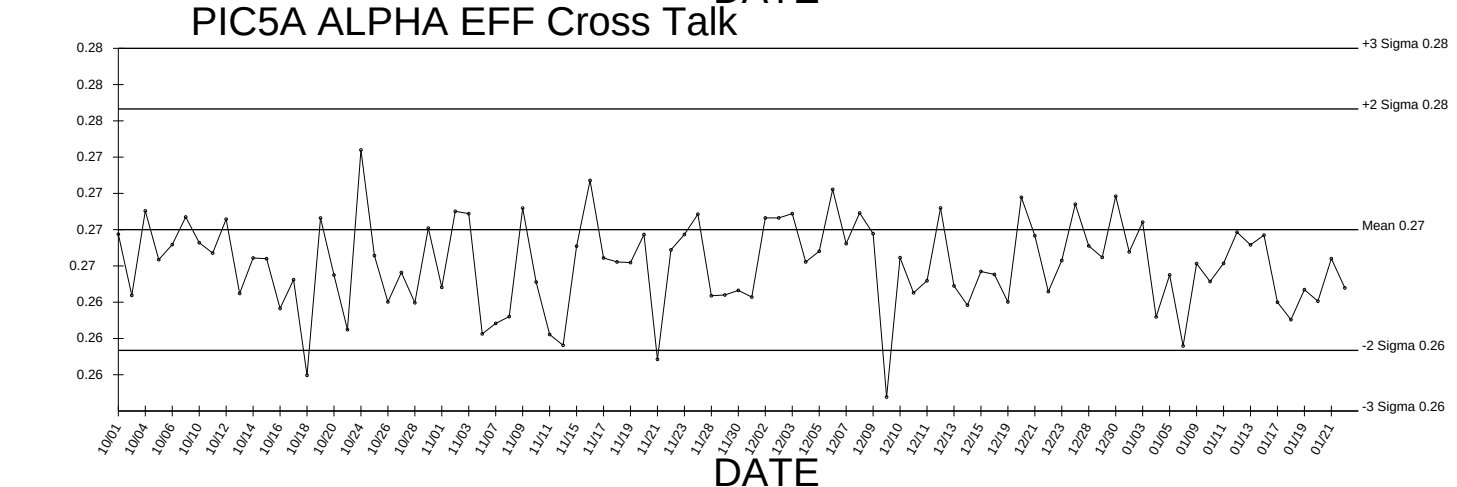
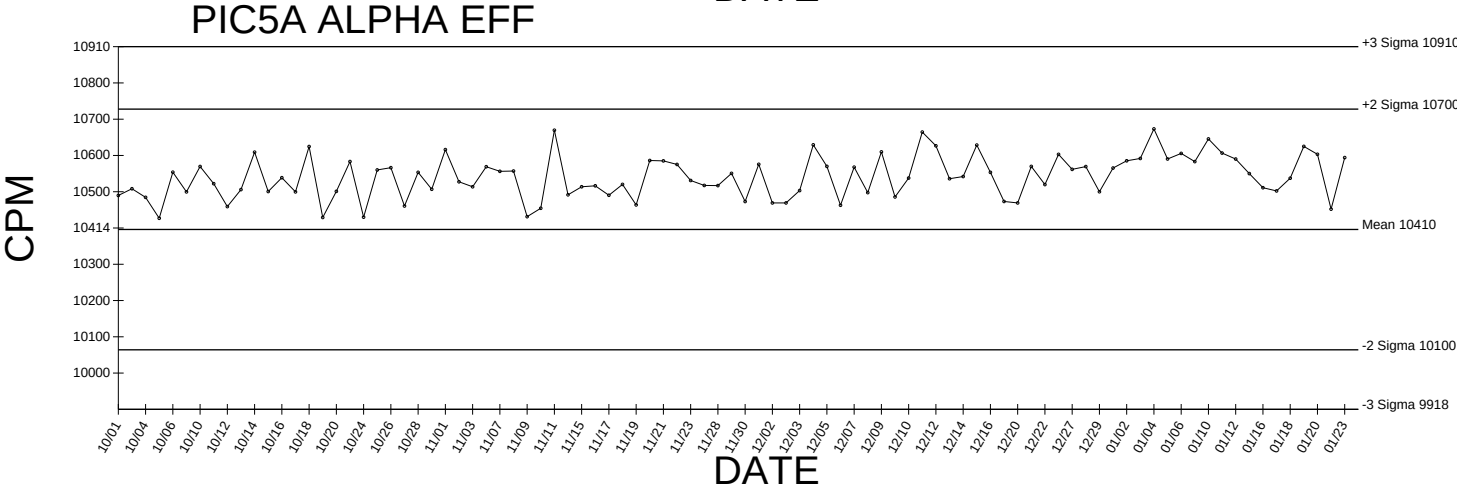
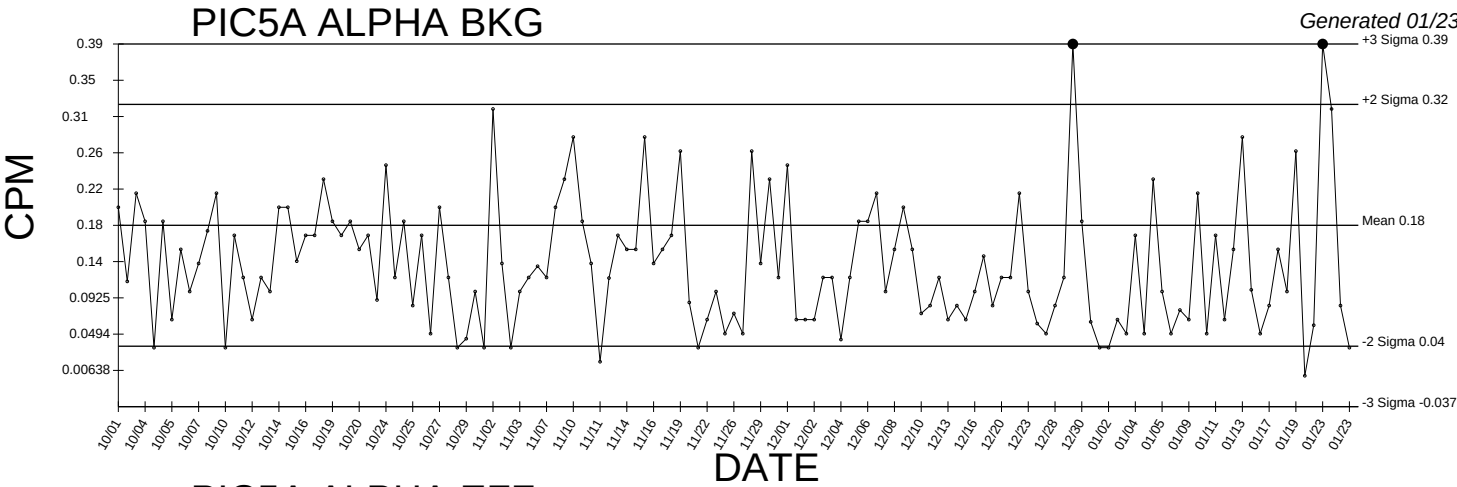
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+3 Sigma 41700



PIC4D BETA EFF Cross Talk



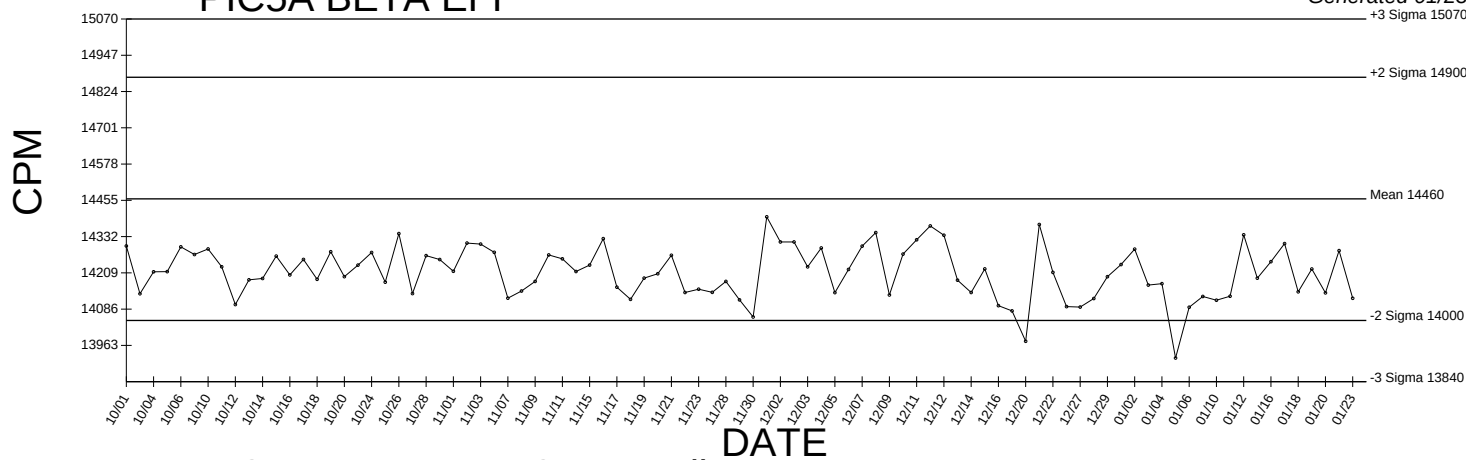
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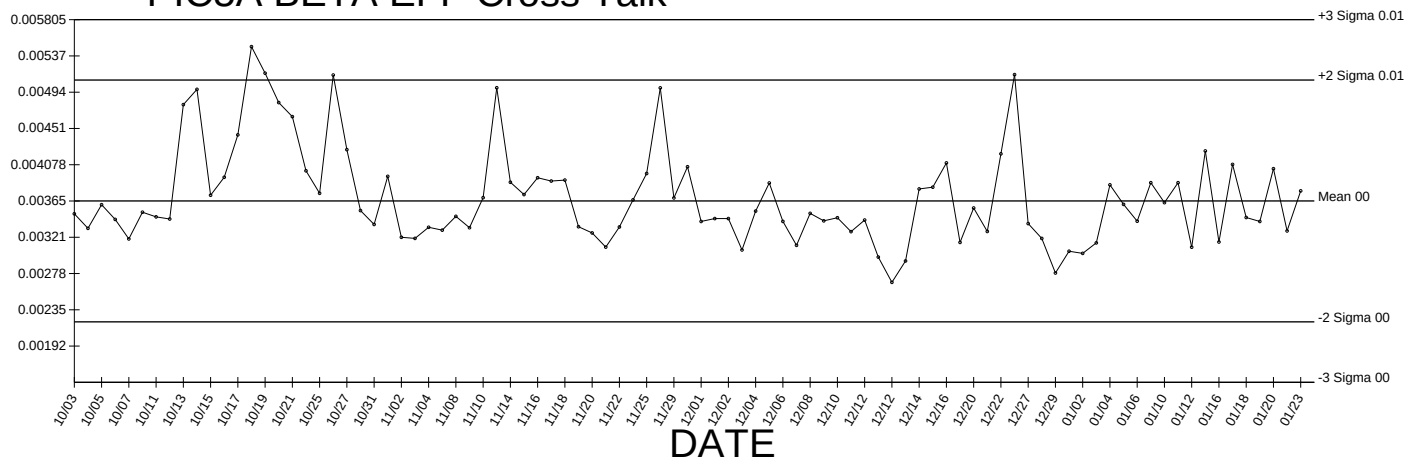
● Denotes Outlier

PIC5A BETA EFF

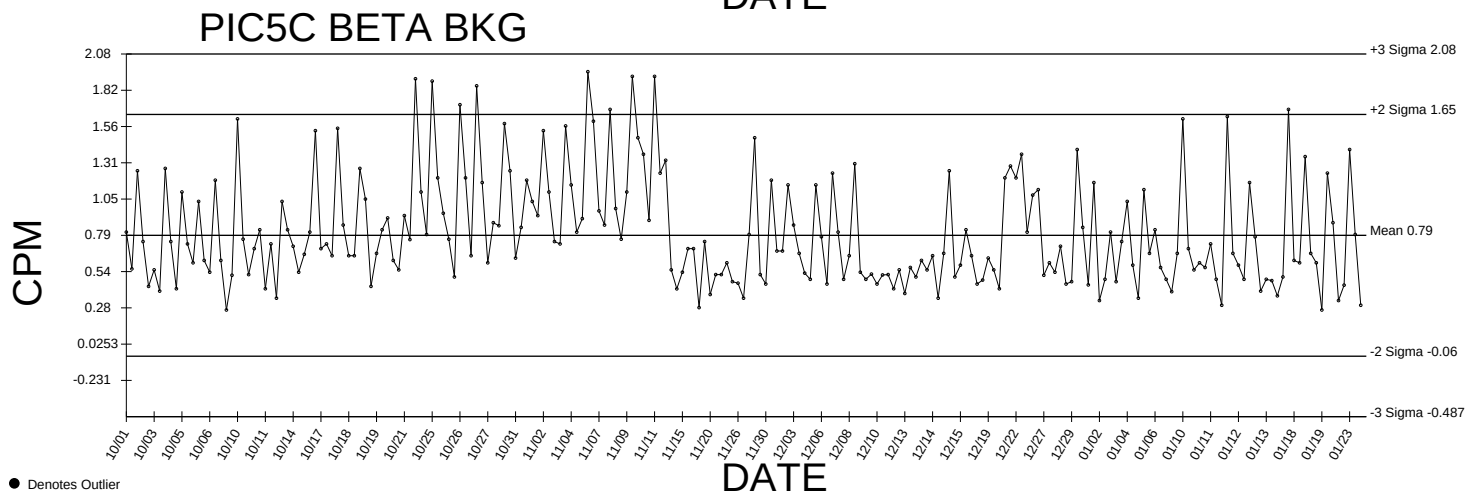
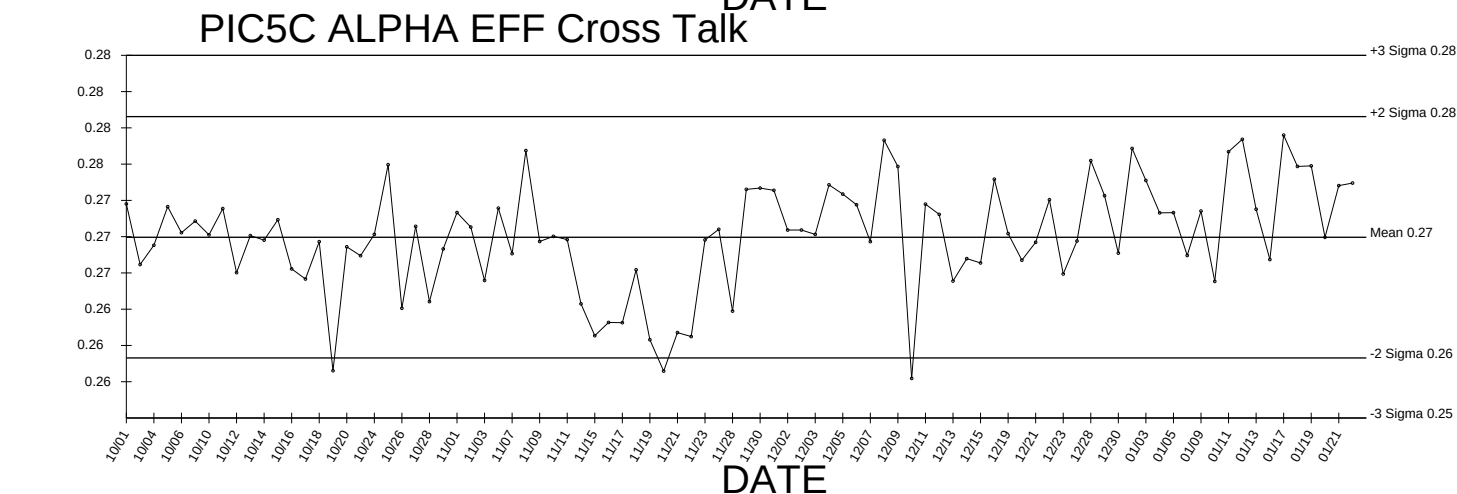
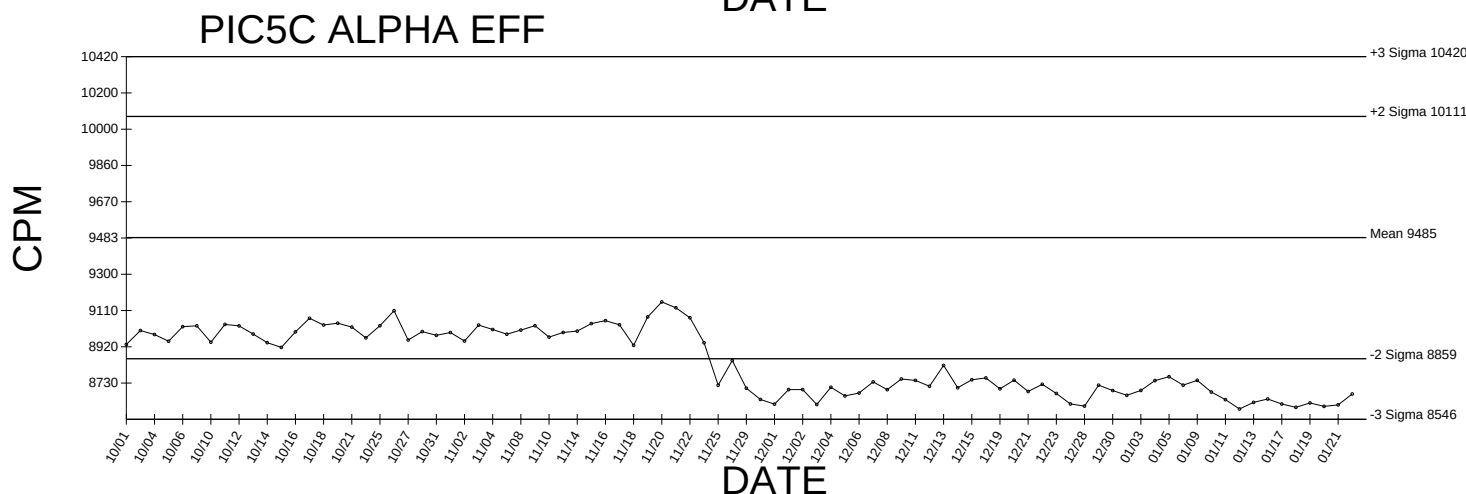
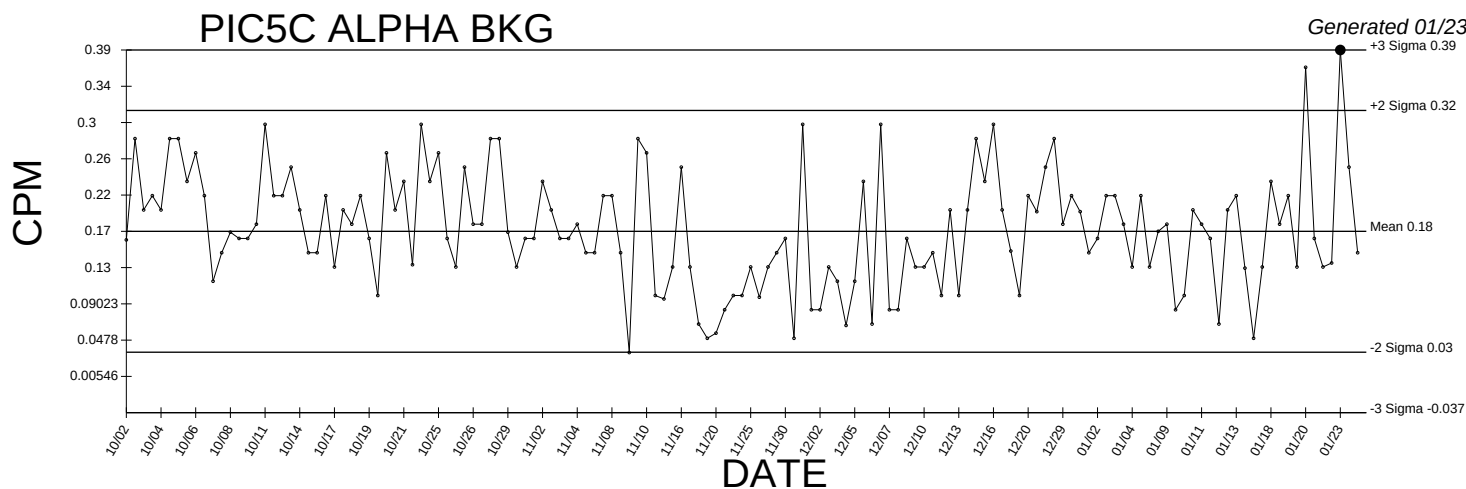
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+3 Sigma 15070



PIC5A BETA EFF Cross Talk



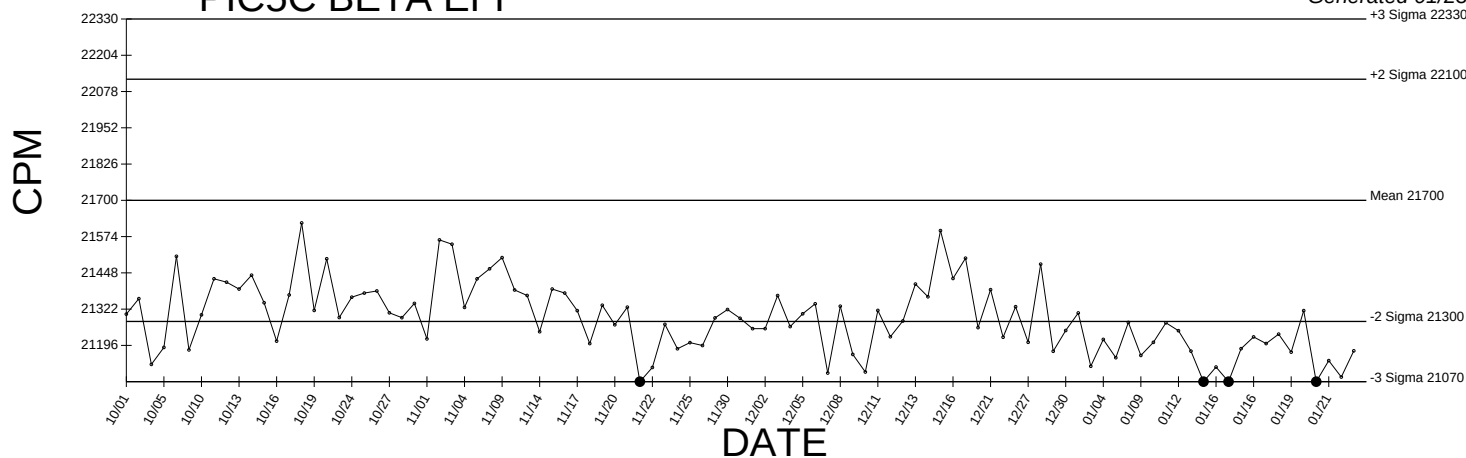
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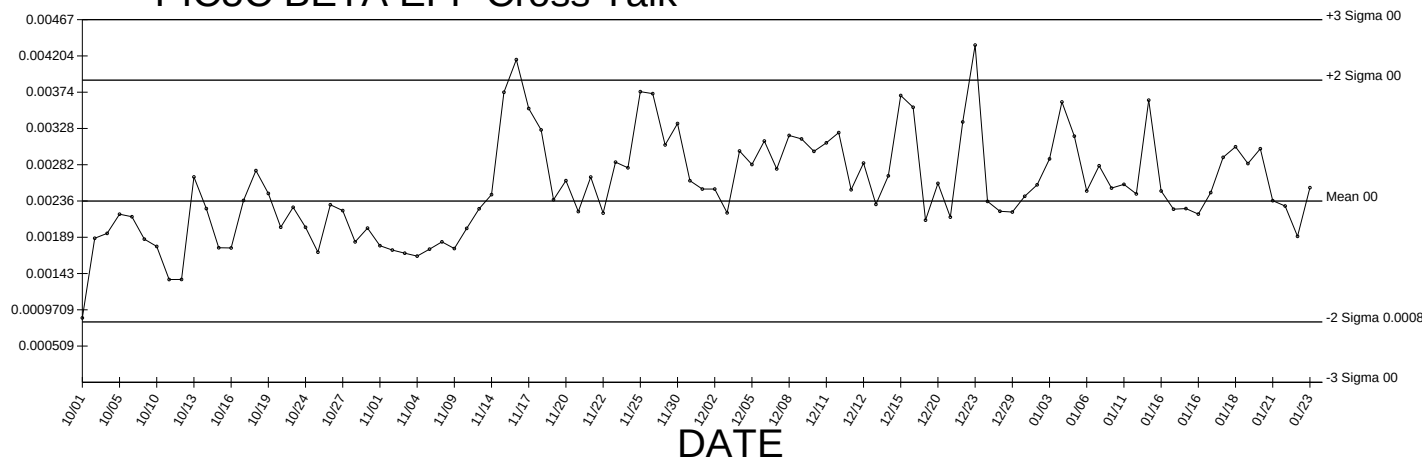
● Denotes Outlier

PIC5C BETA EFF

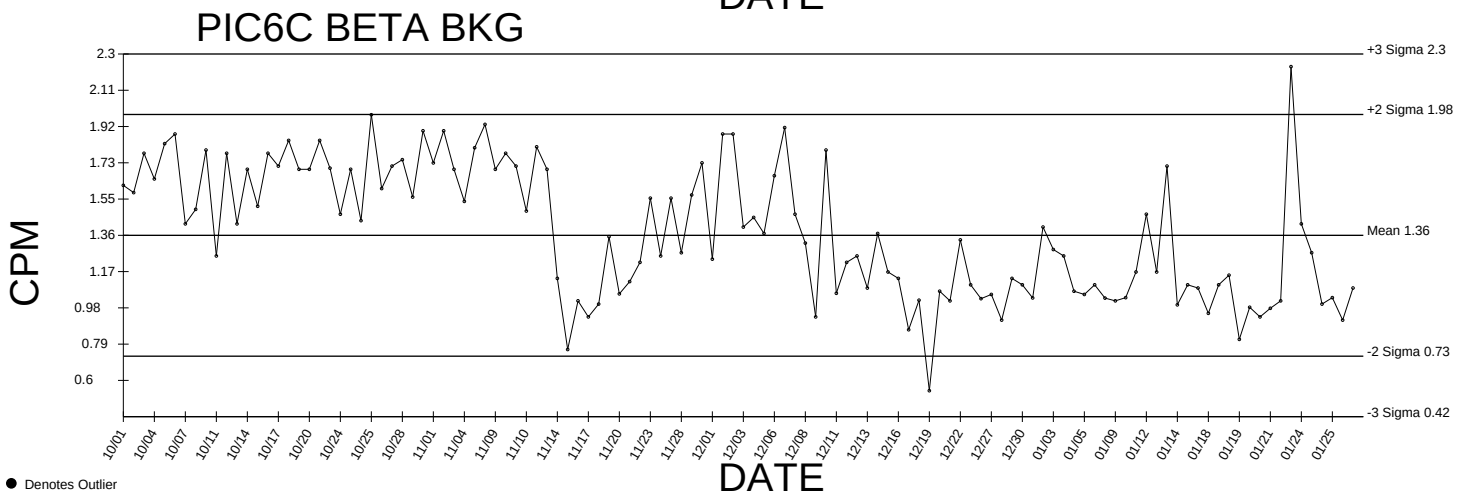
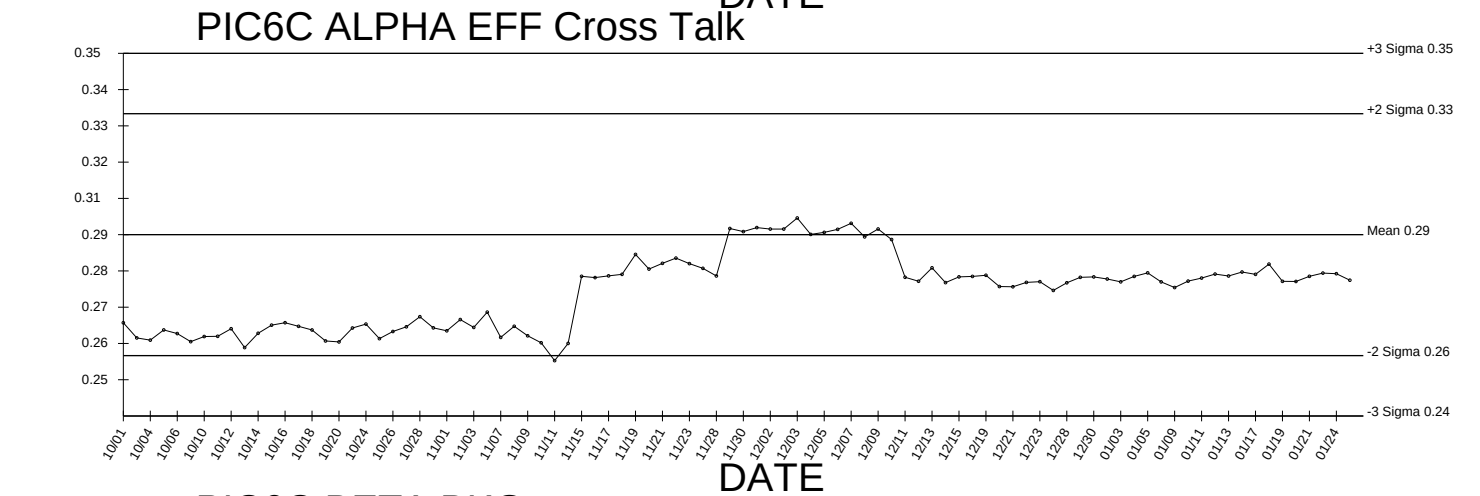
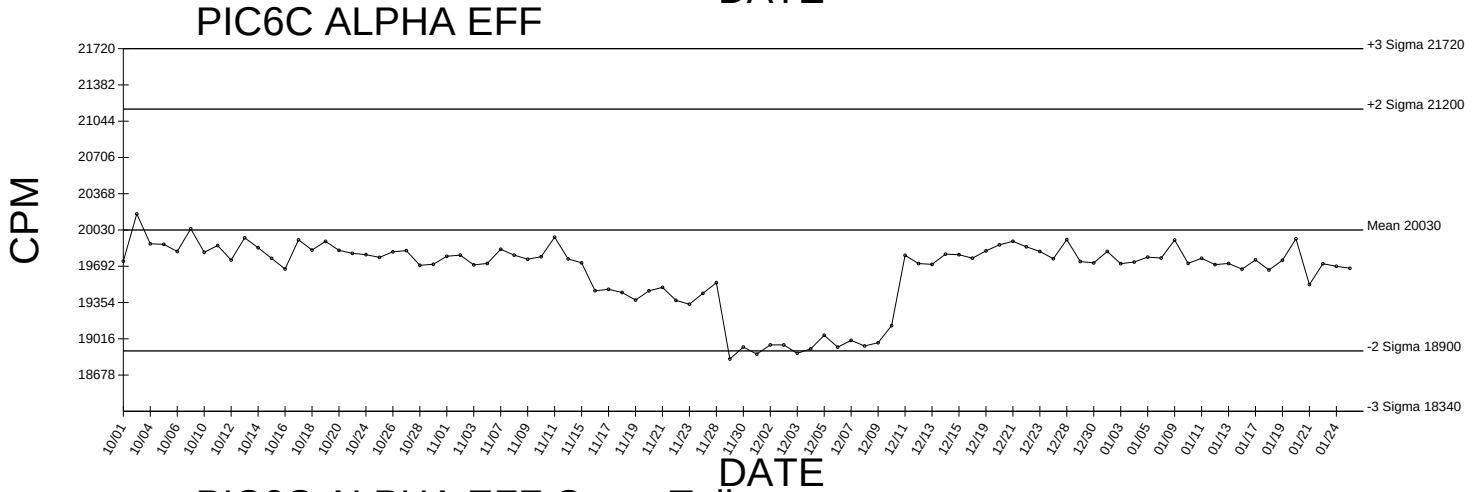
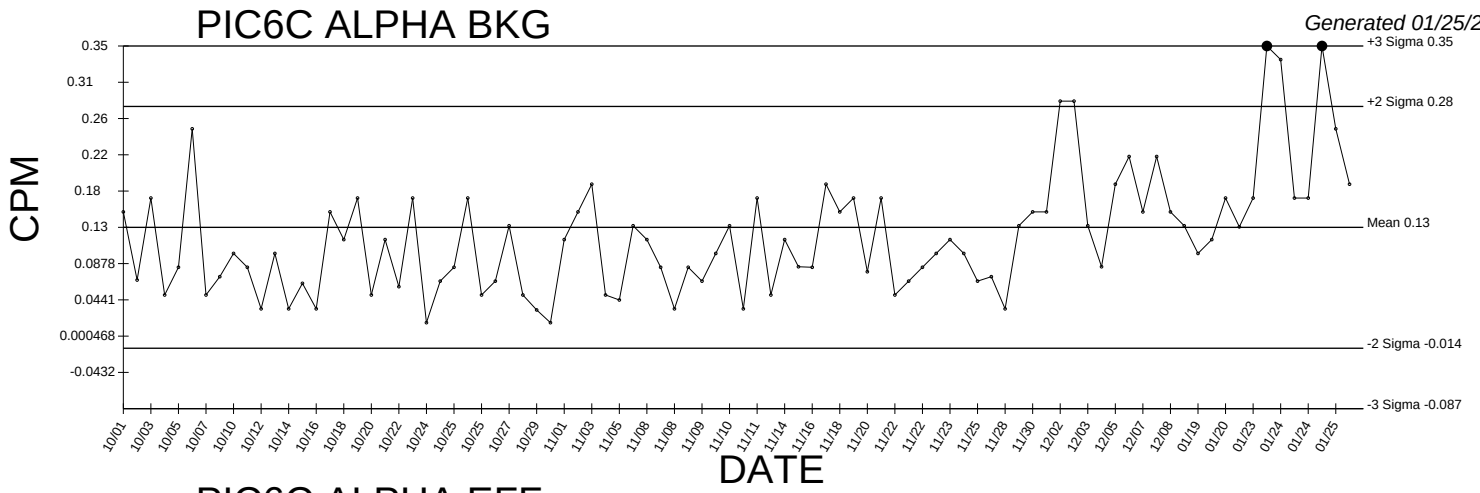
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PIC5C BETA EFF Cross Talk



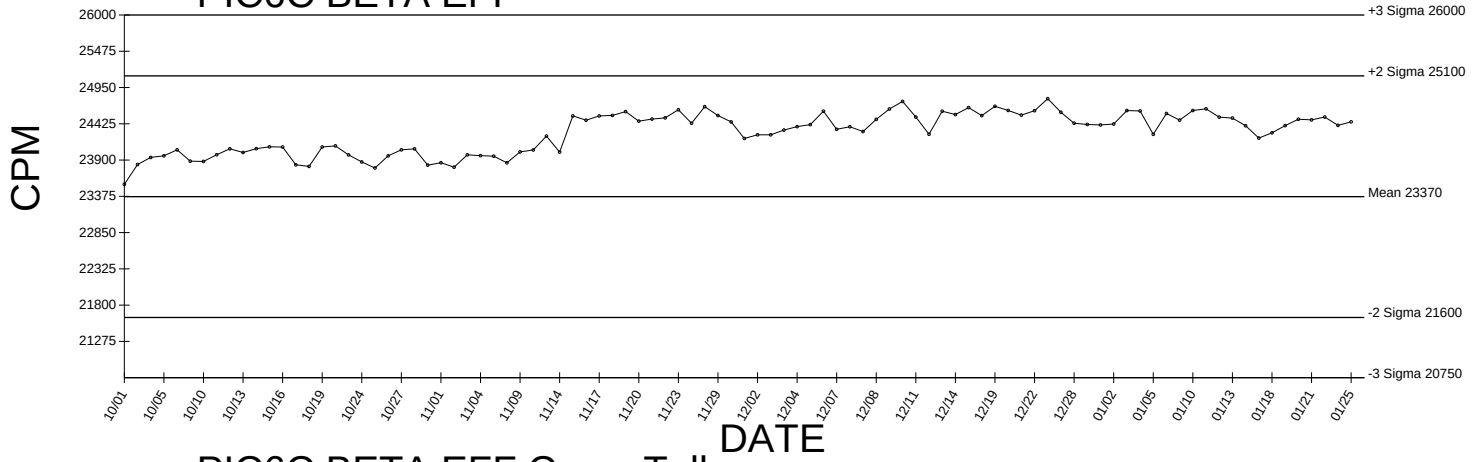
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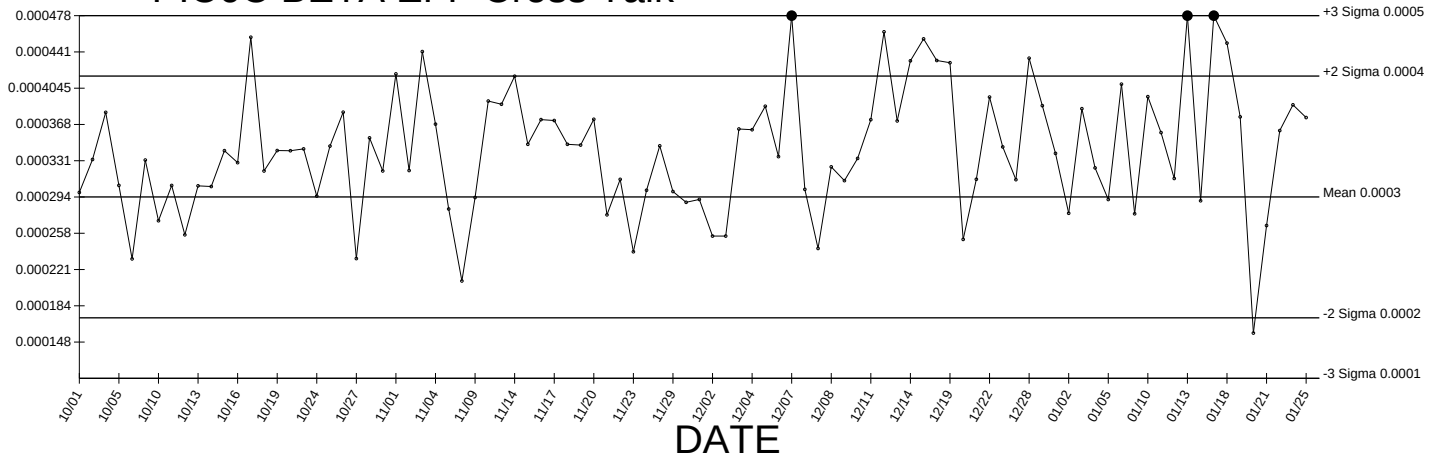
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PIC6C BETA EFF

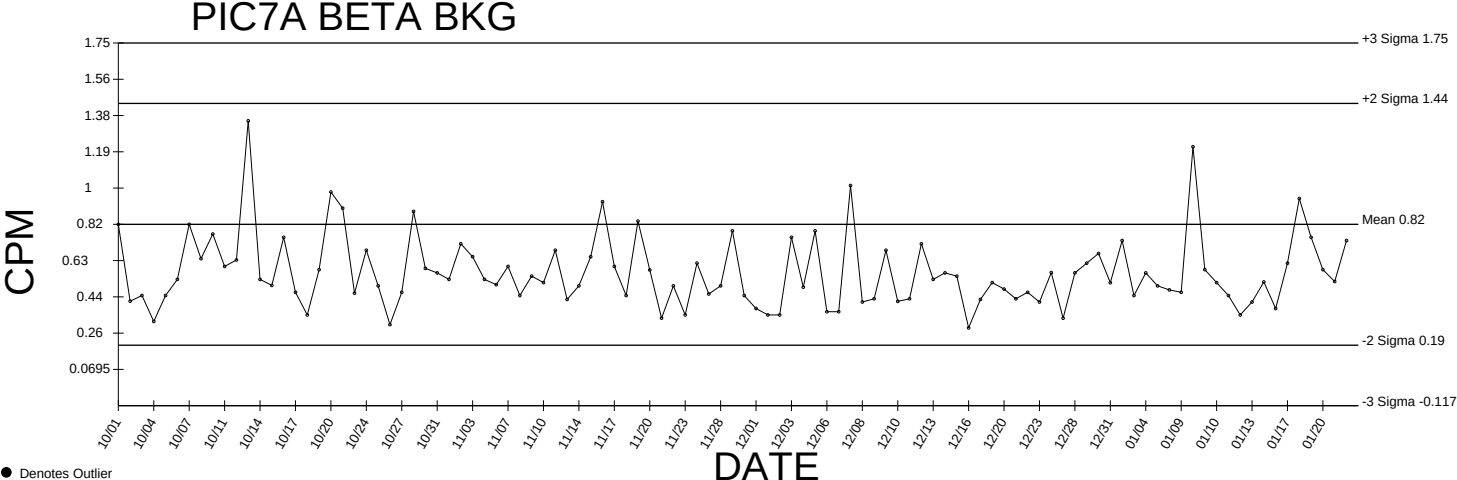
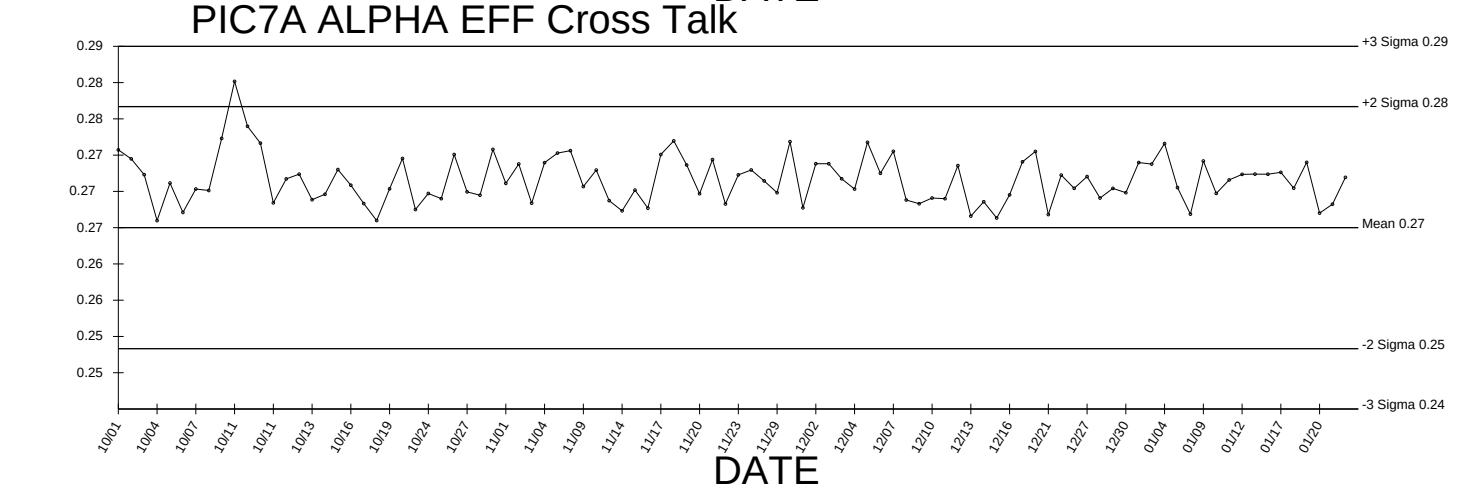
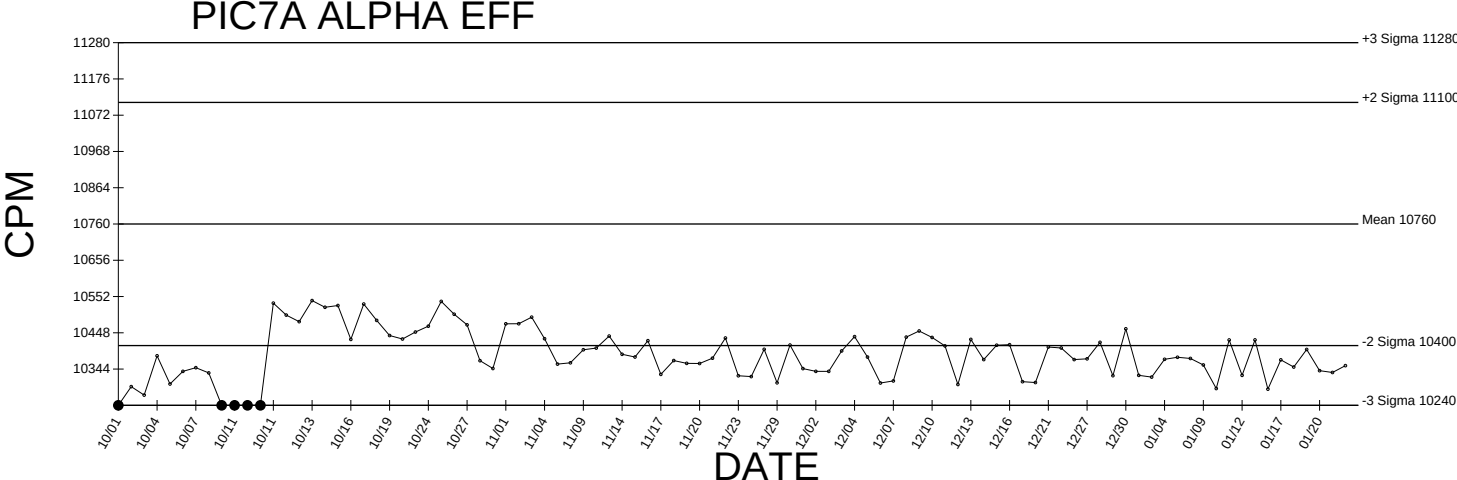
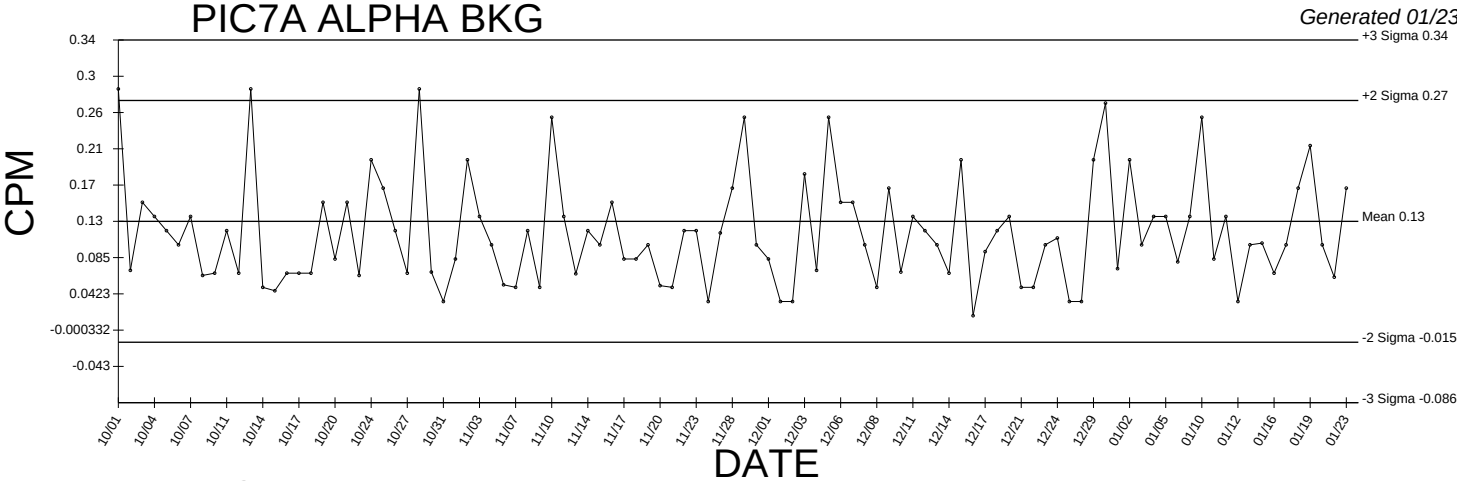
Generated 01/25/2023



PIC6C BETA EFF Cross Talk



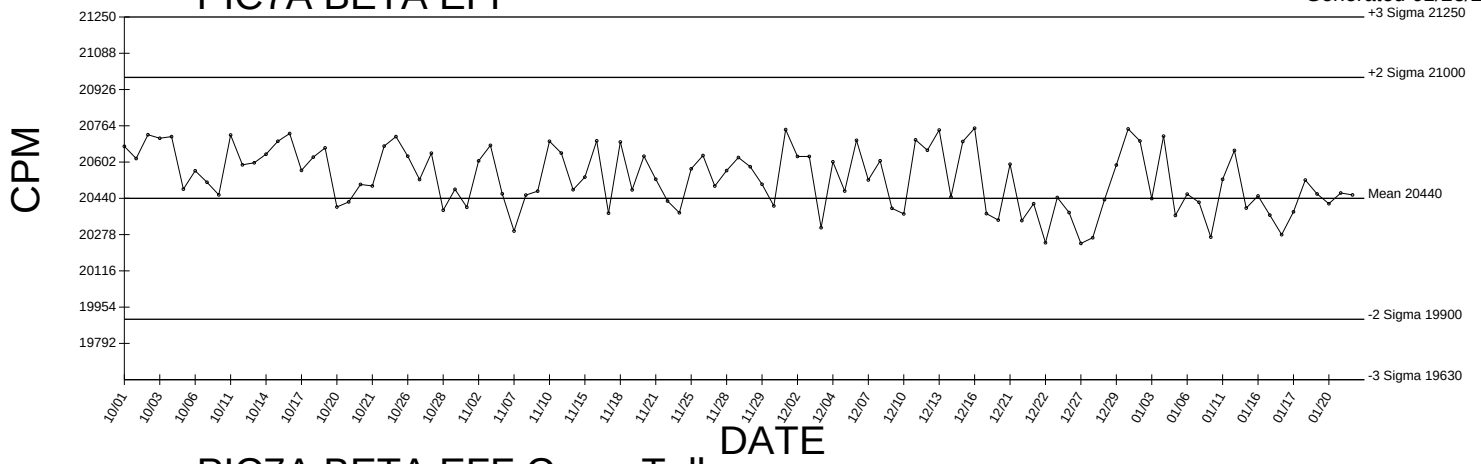
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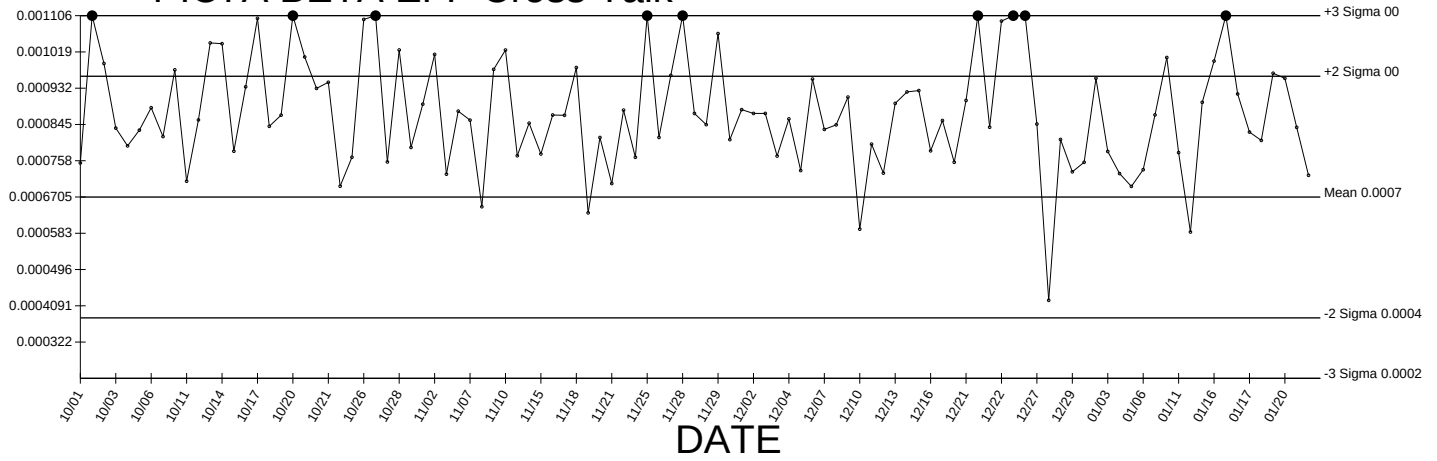
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PIC7A BETA EFF

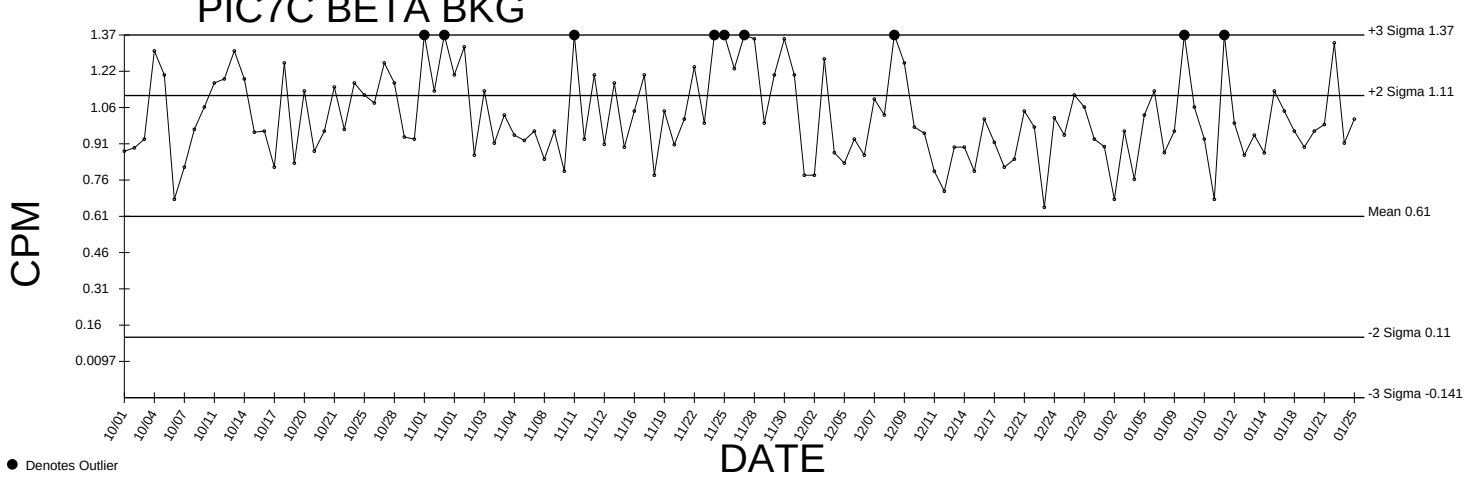
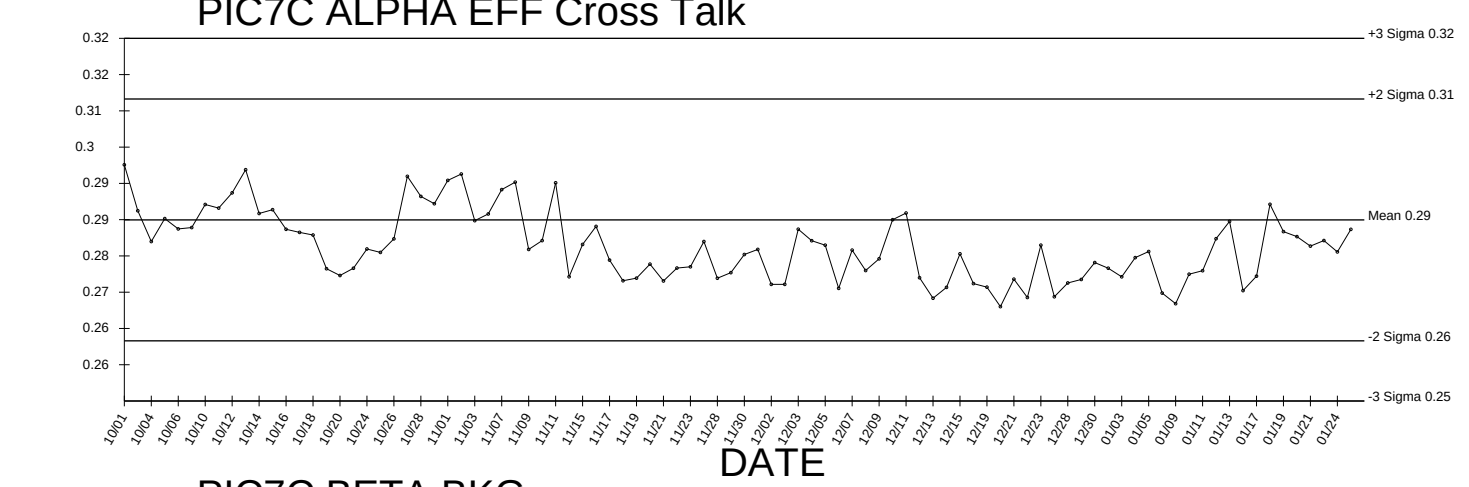
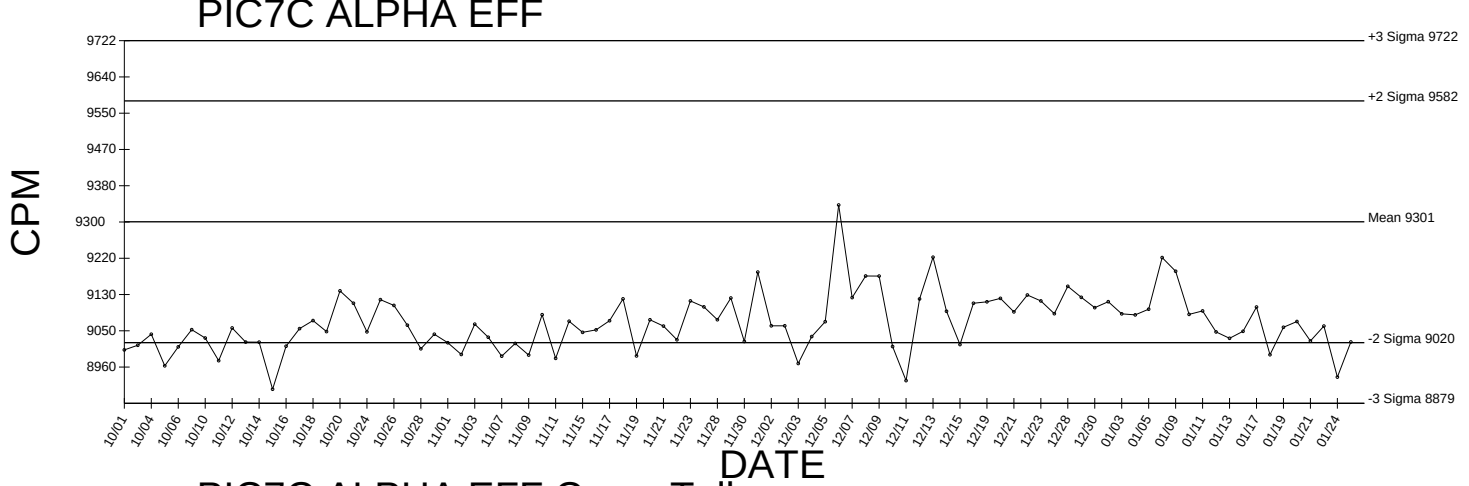
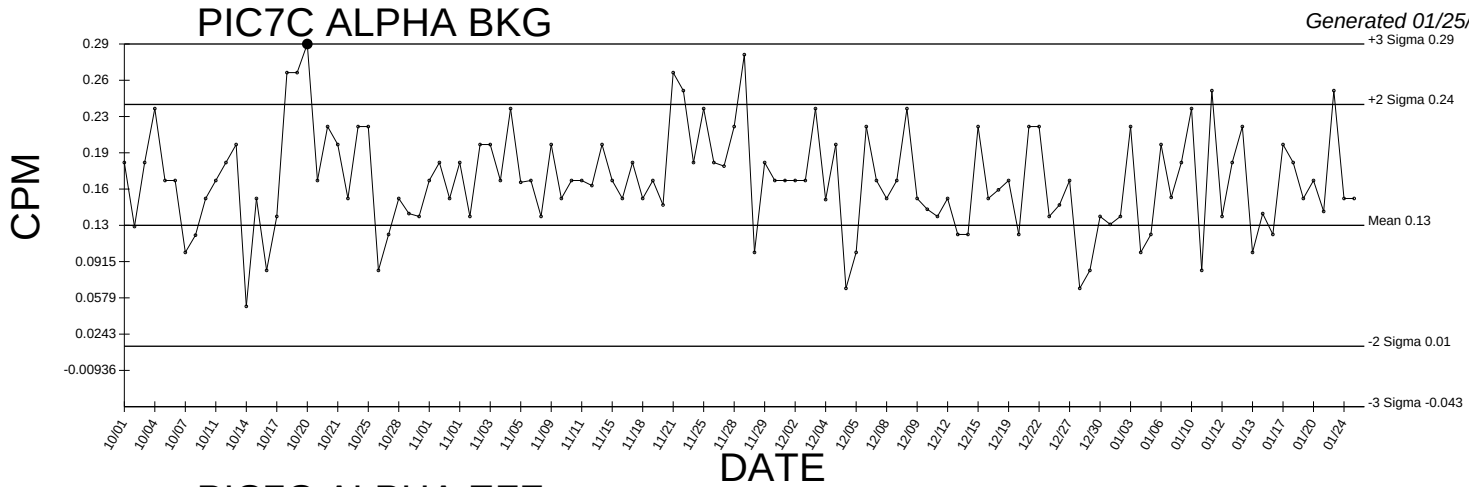
Generated 01/23/2023



PIC7A BETA EFF Cross Talk

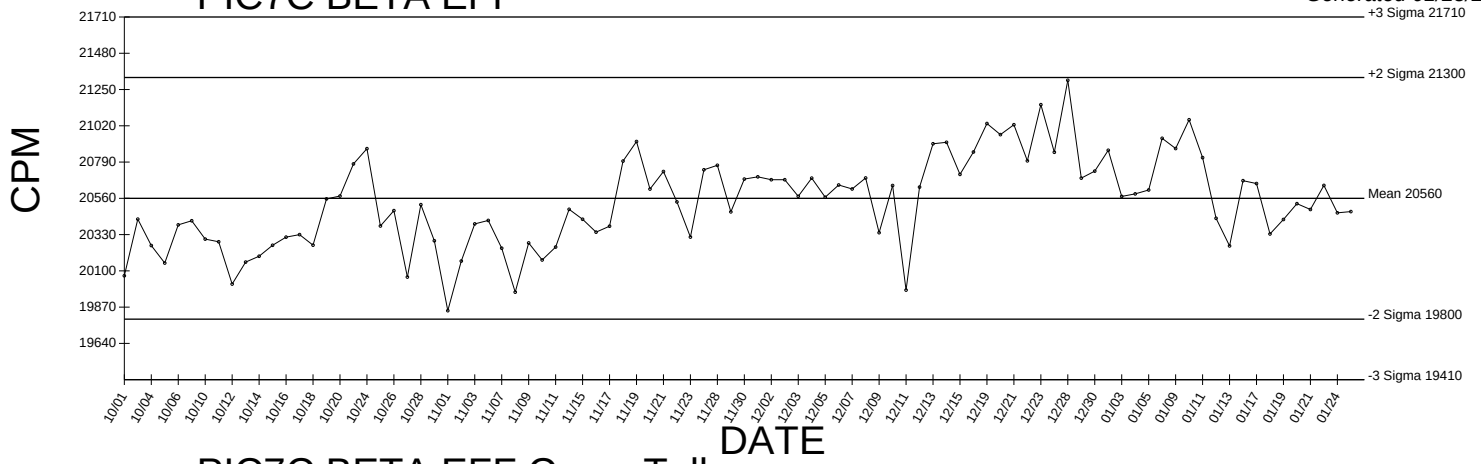


● Denotes Outlier

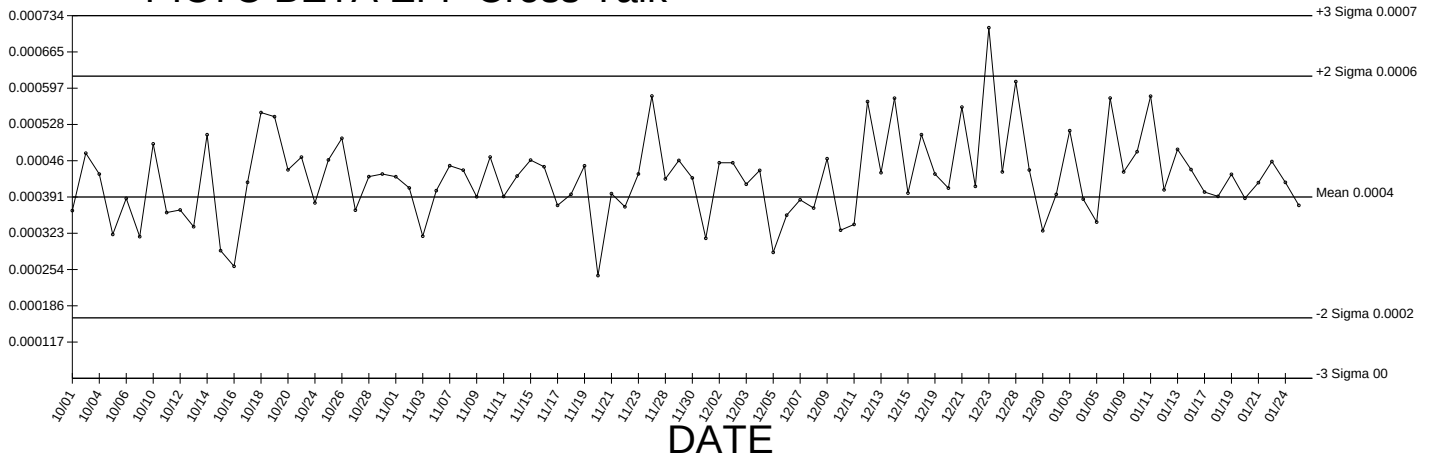


PIC7C BETA EFF

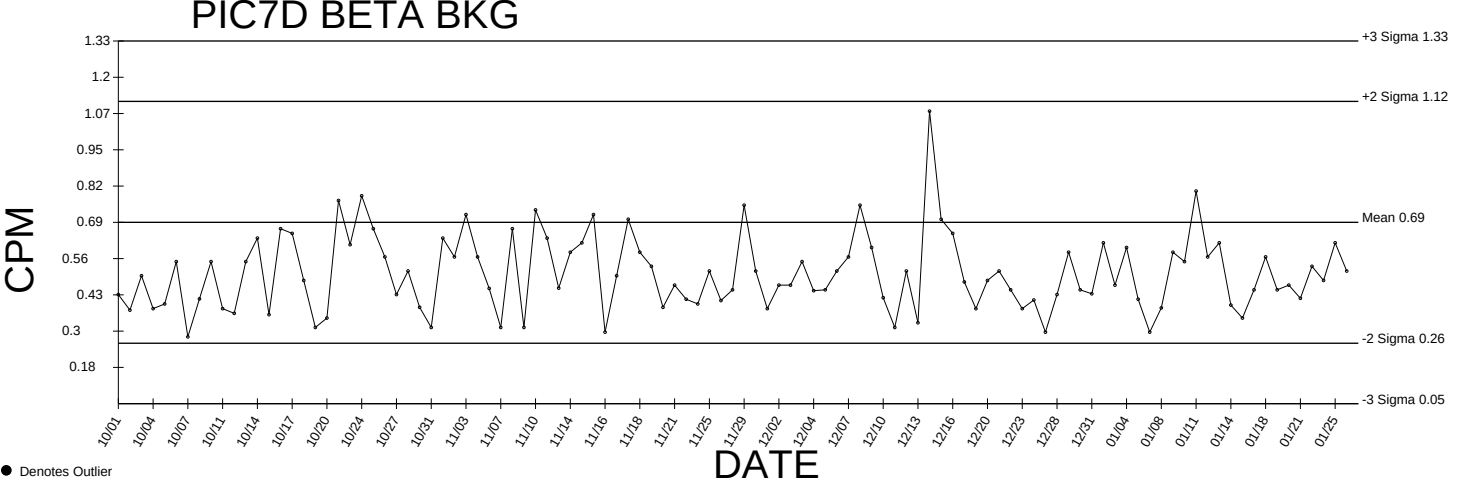
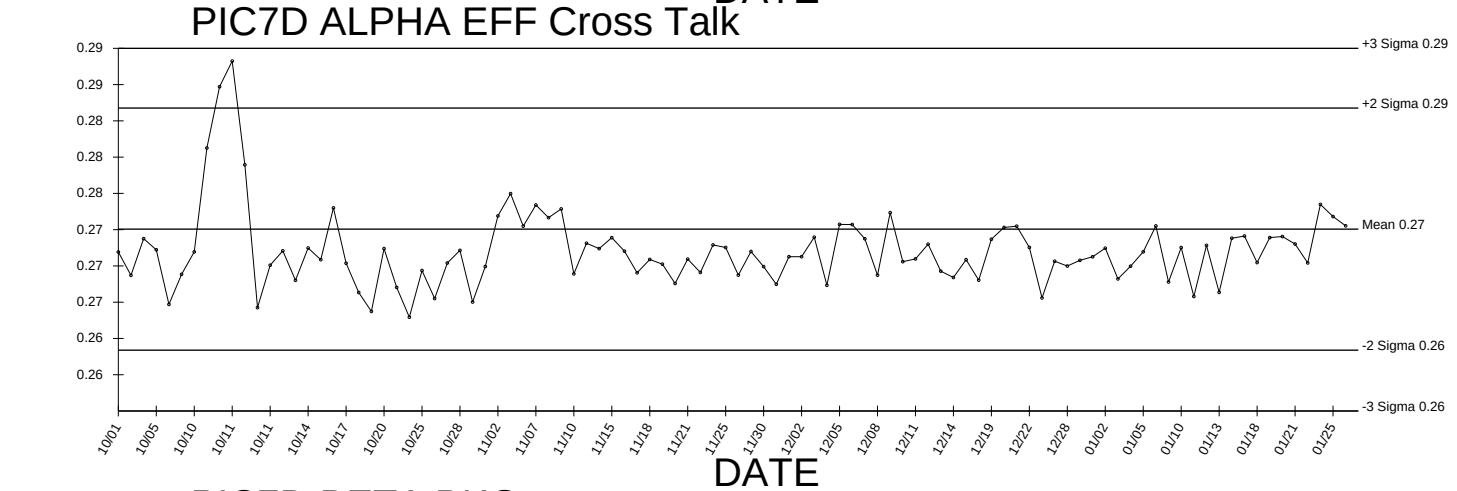
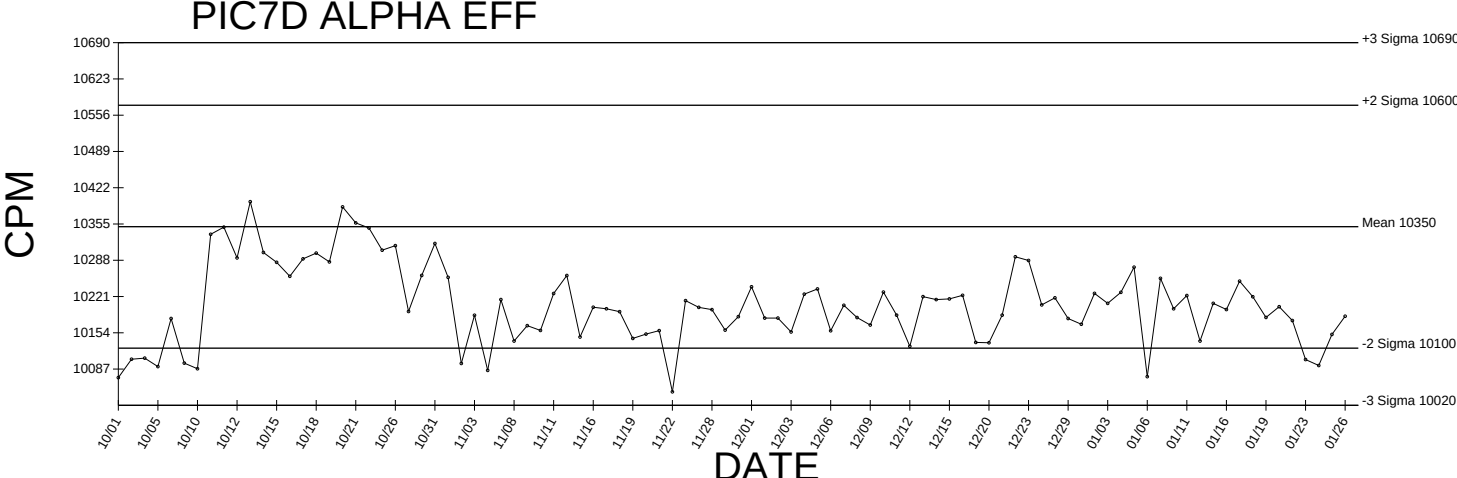
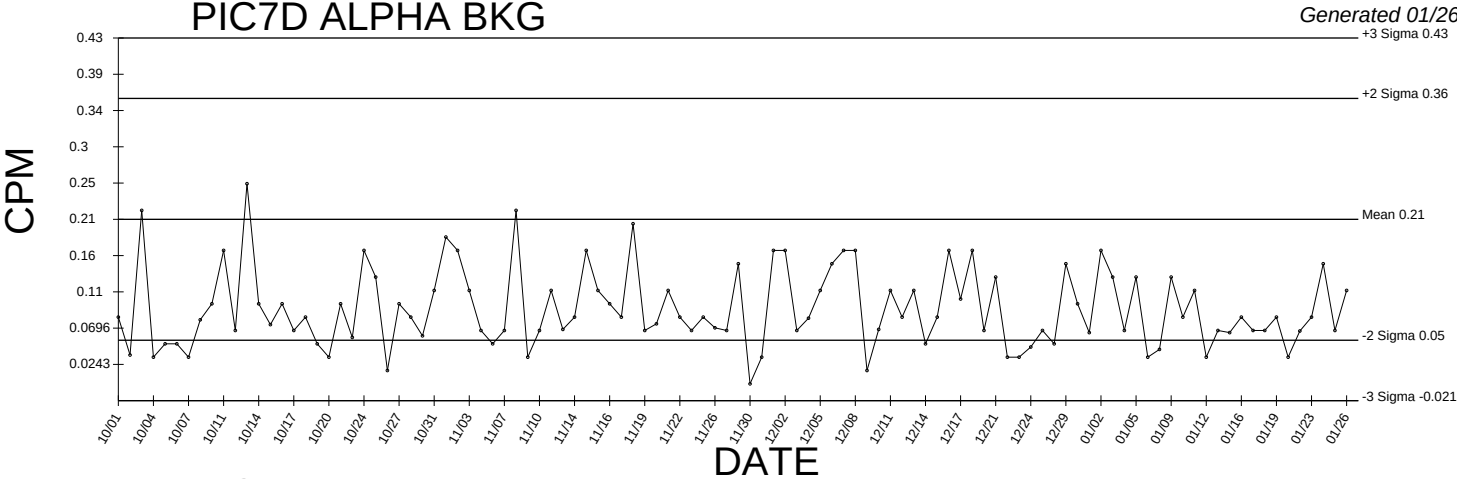
Generated 01/25/2023



PIC7C BETA EFF Cross Talk



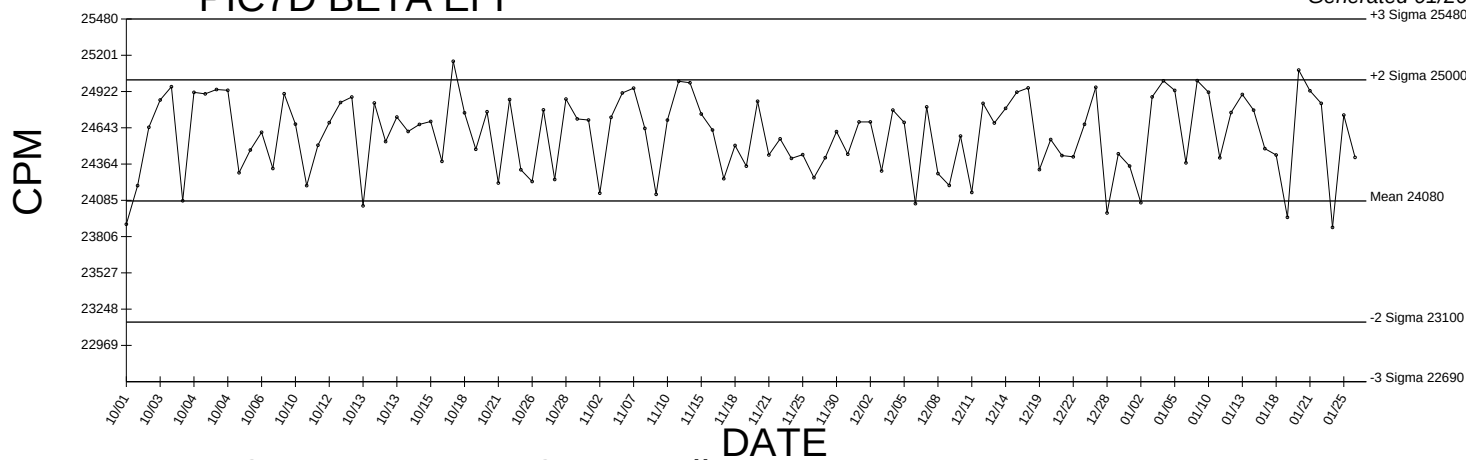
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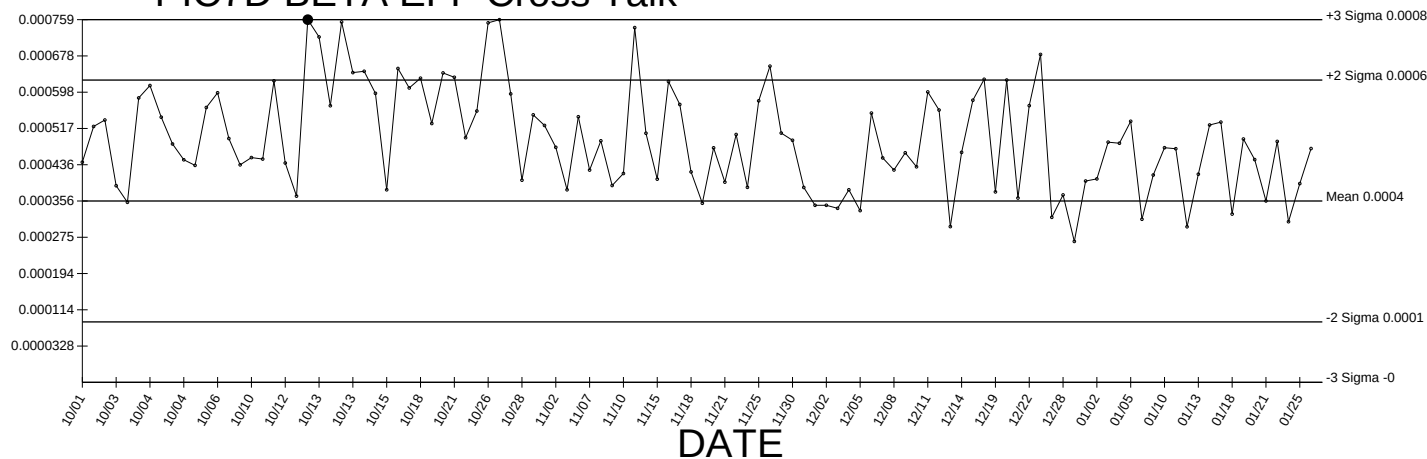
● Denotes Outlier

PIC7D BETA EFF

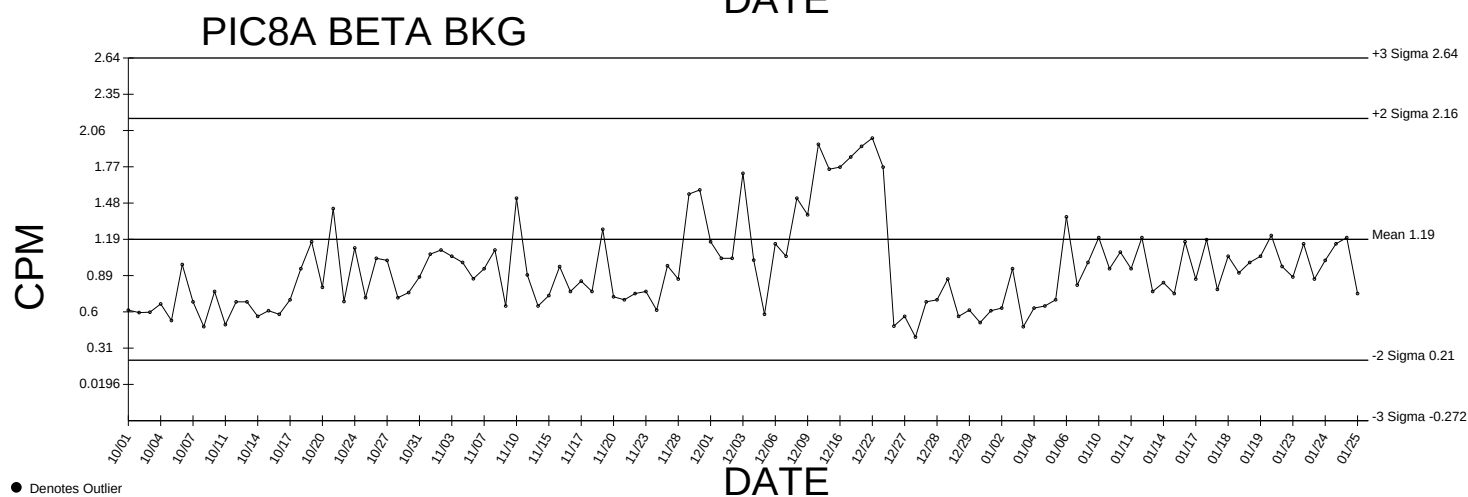
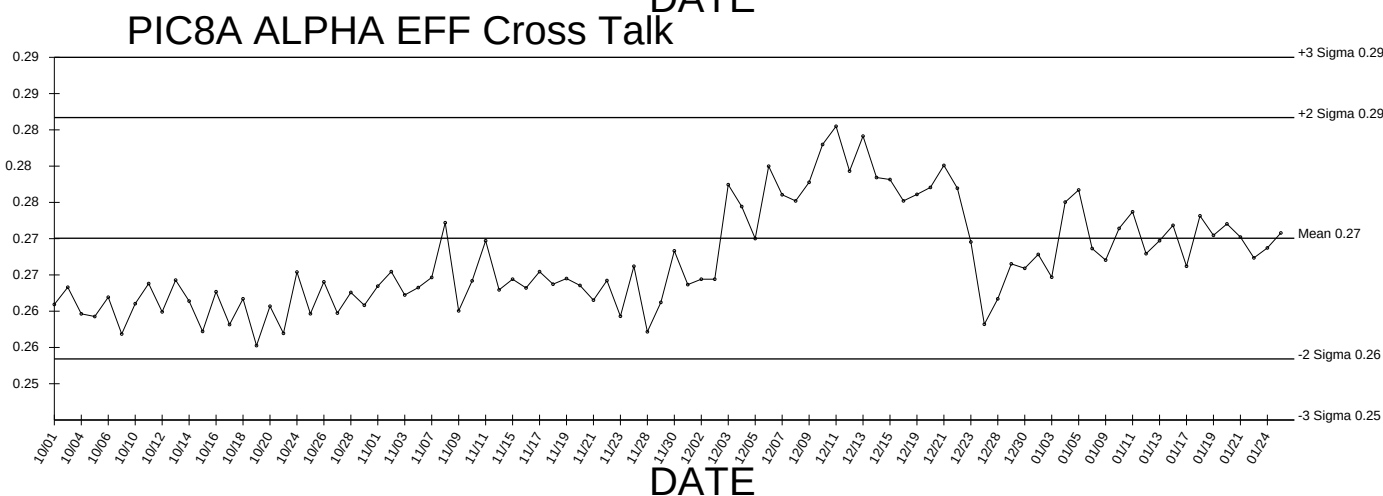
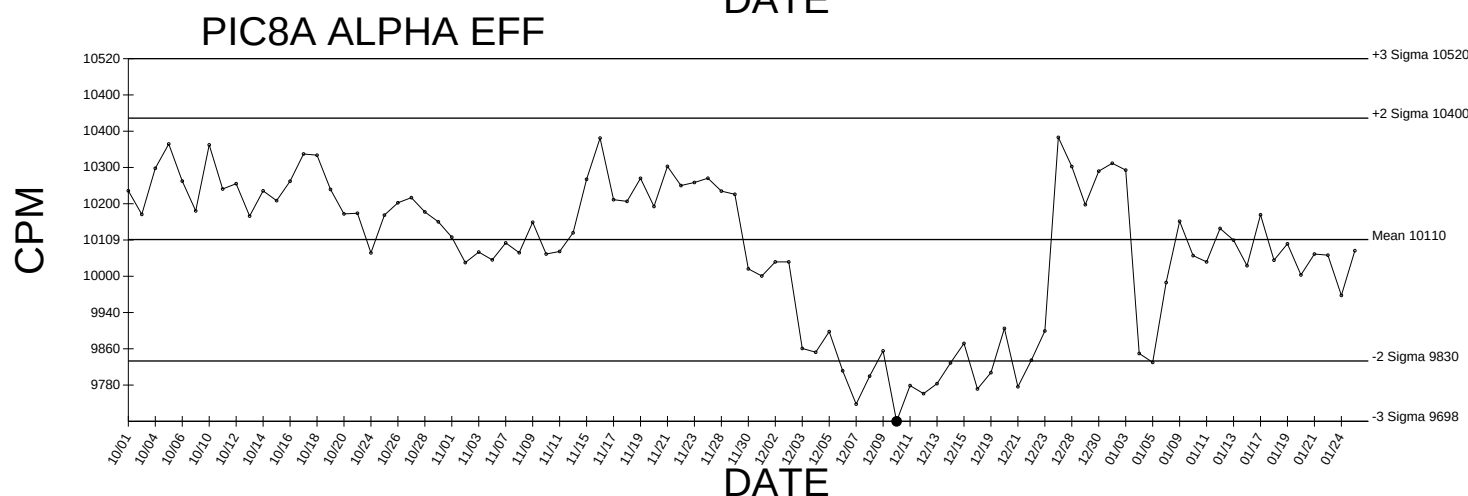
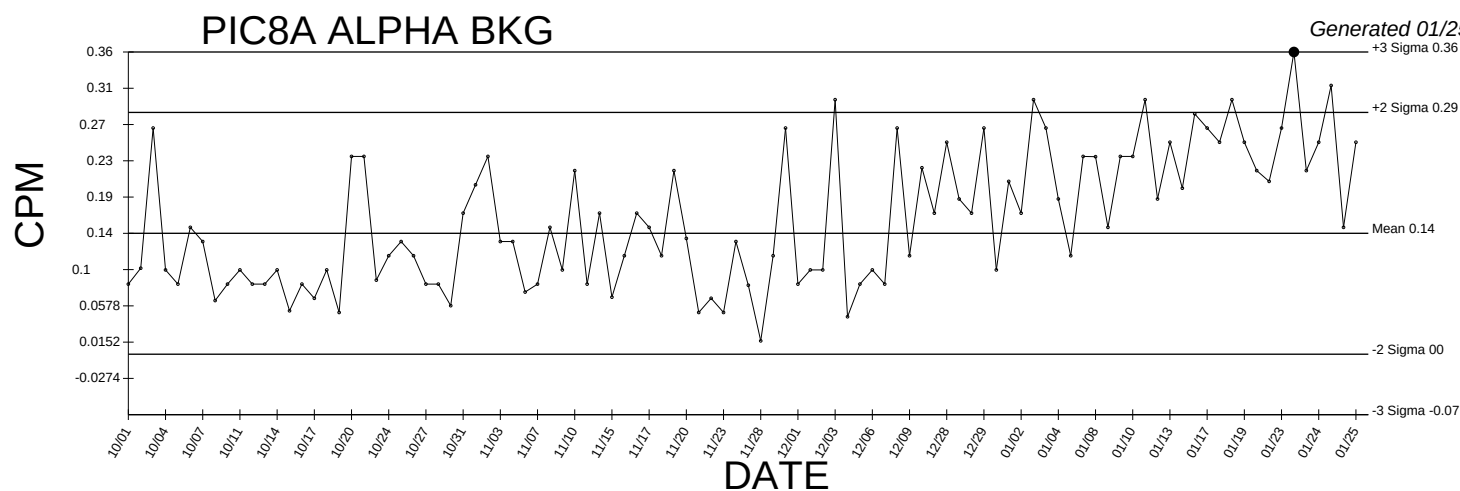
Generated 01/26/2023
+3 Sigma 25480



PIC7D BETA EFF Cross Talk



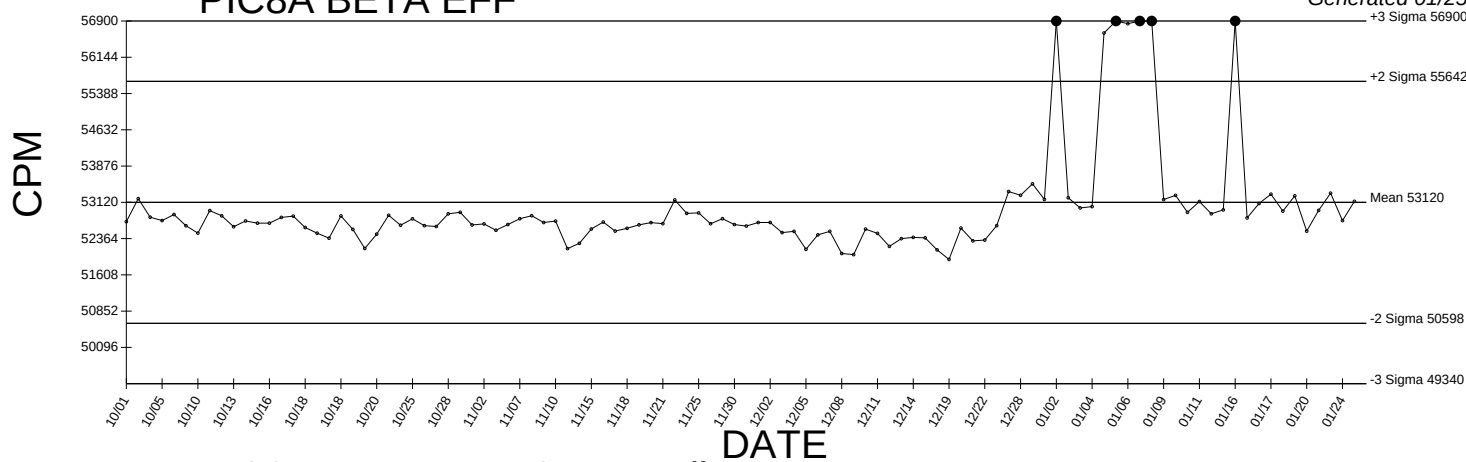
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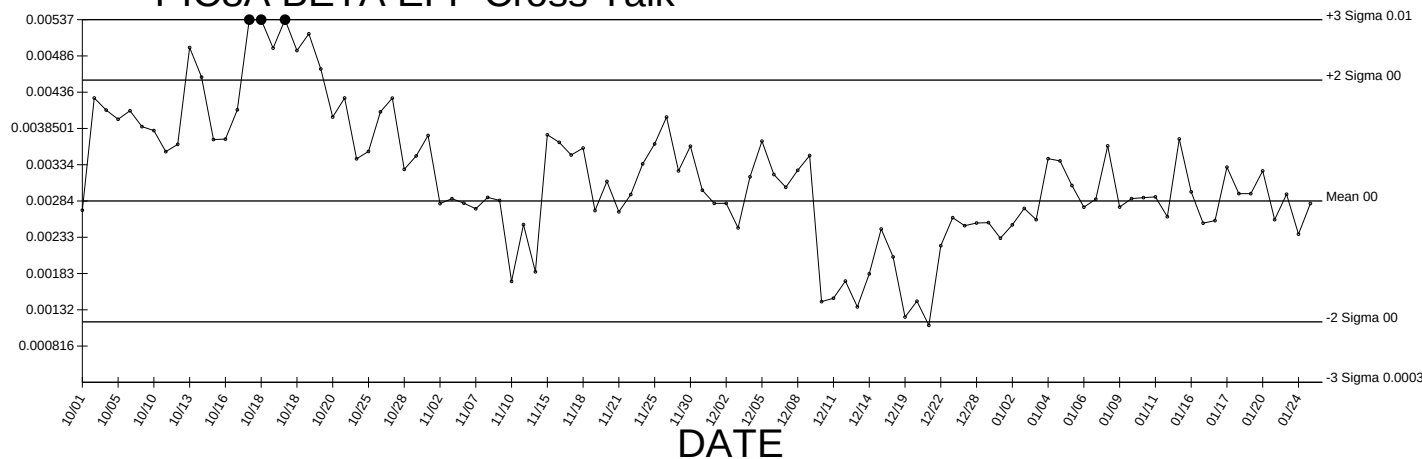
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PIC8A BETA EFF

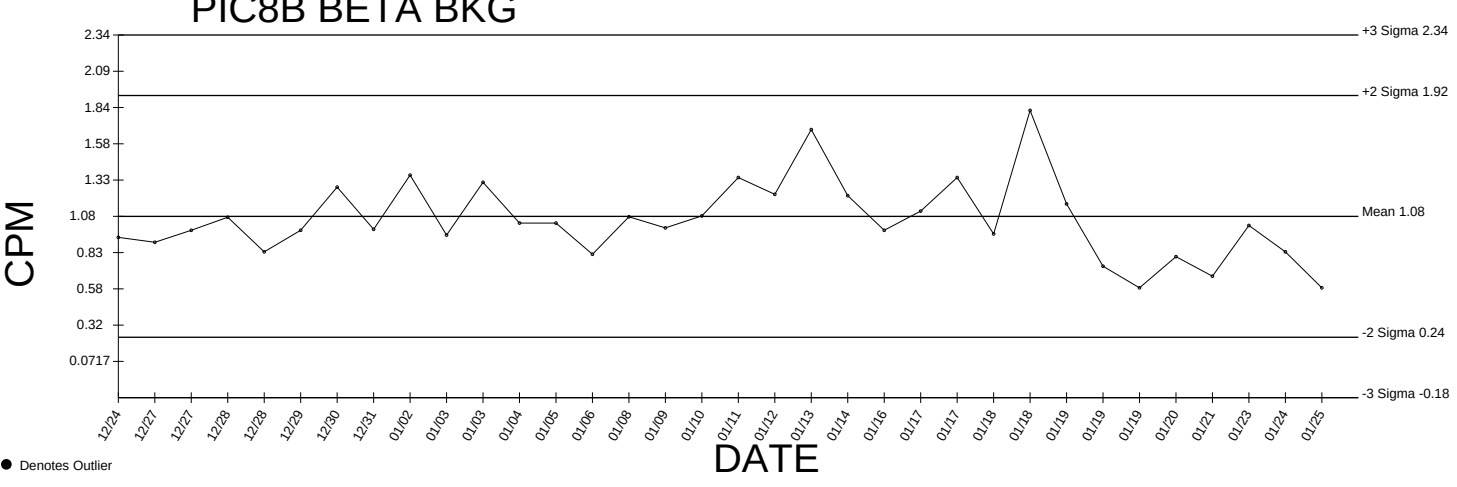
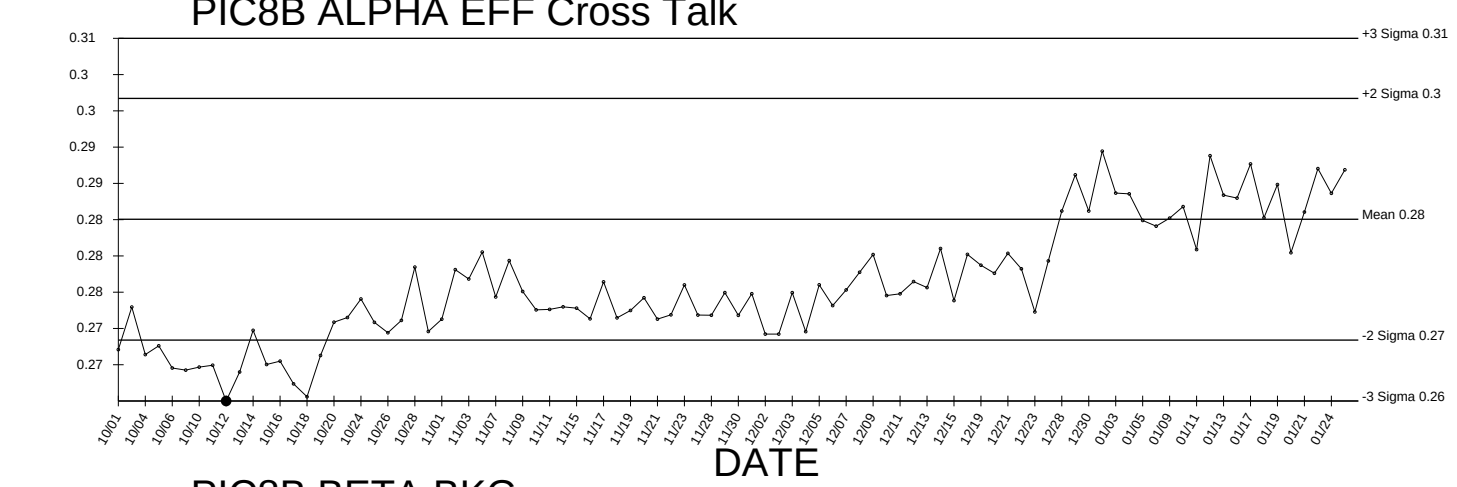
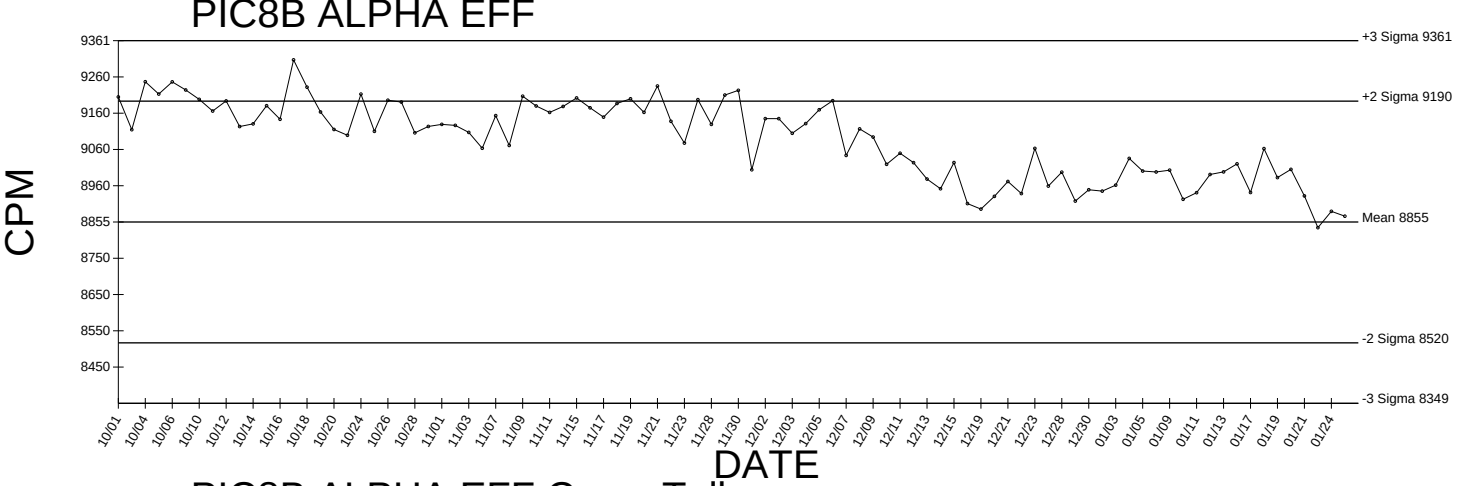
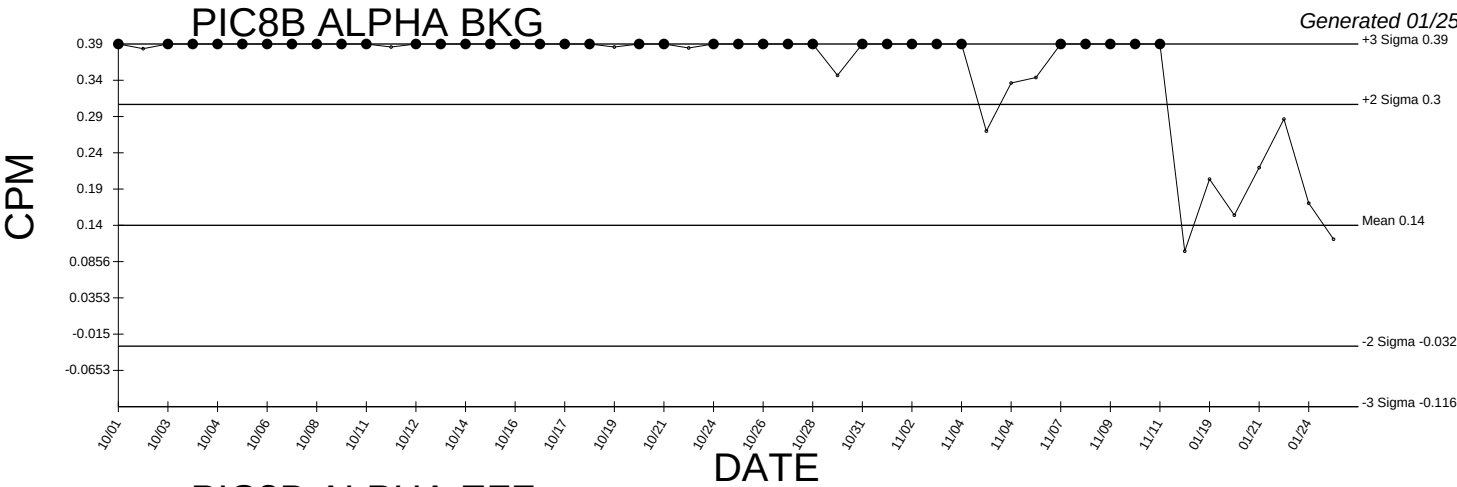
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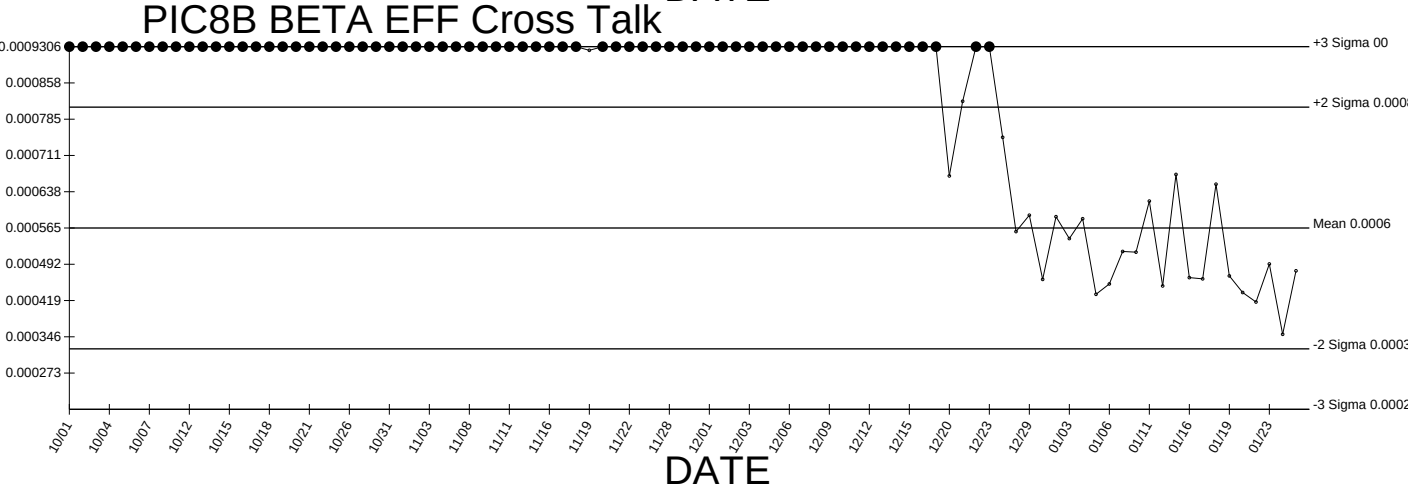
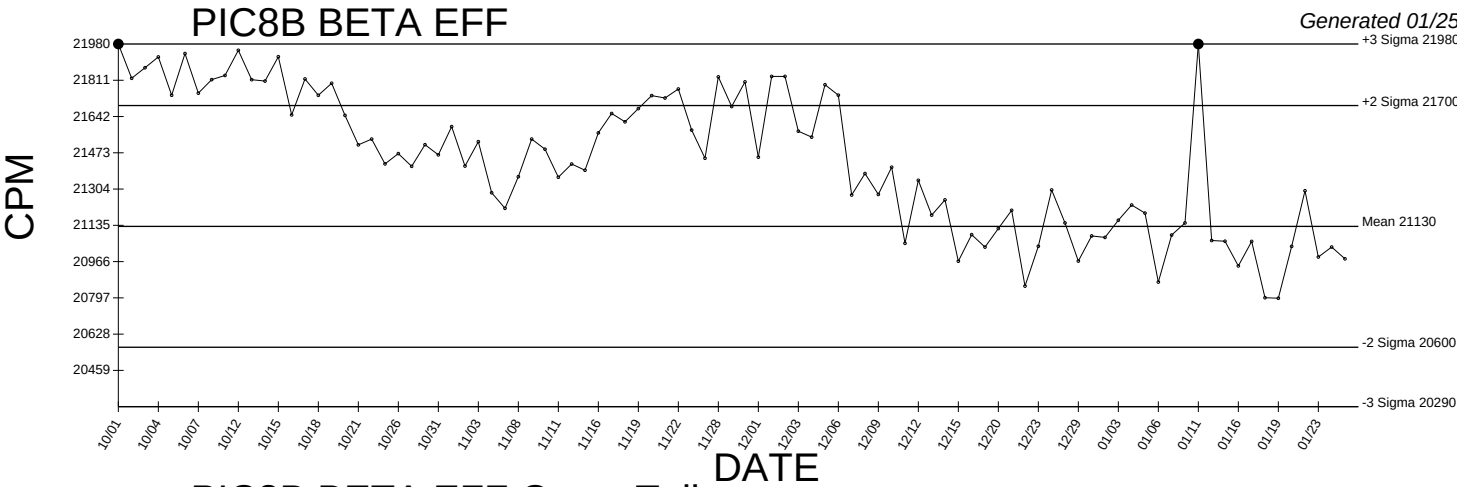
PIC8A BETA EFF Cross Talk



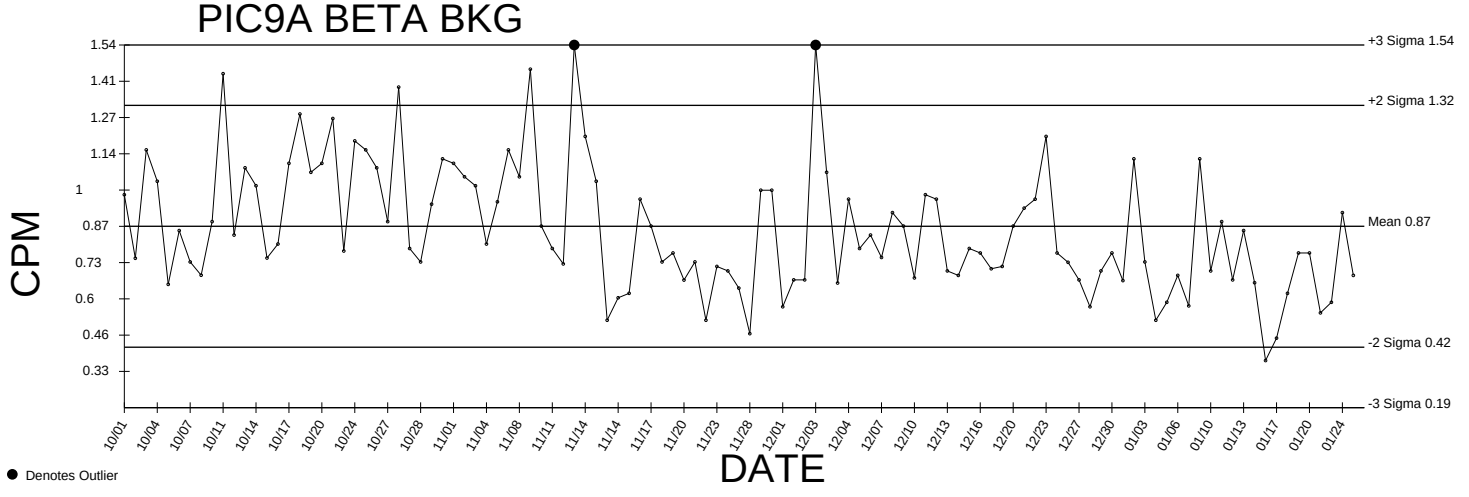
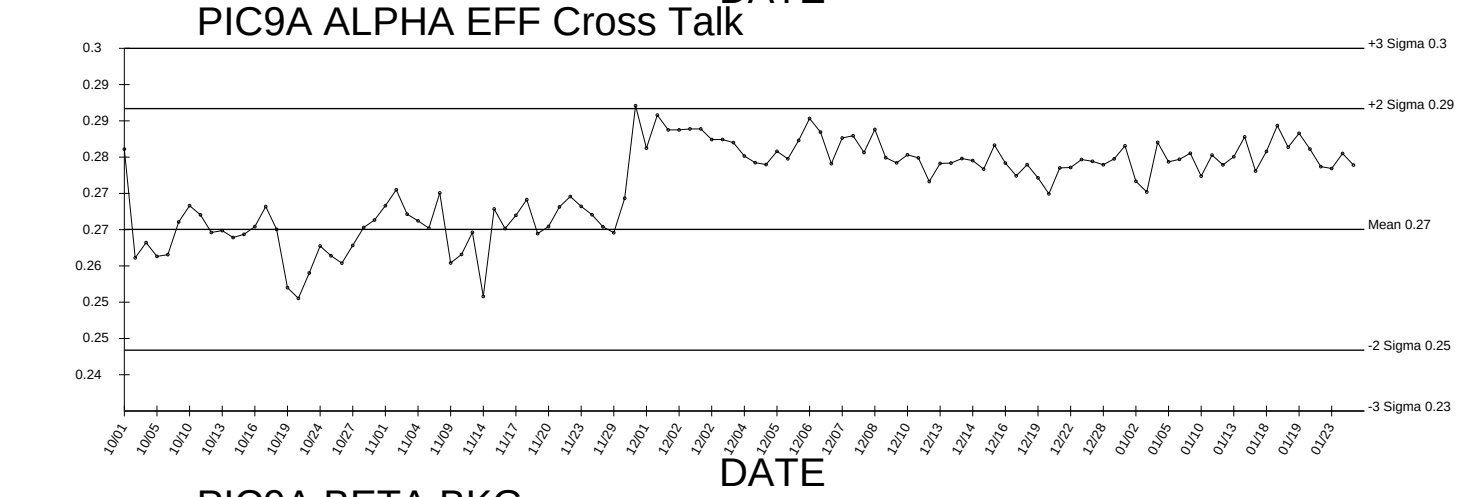
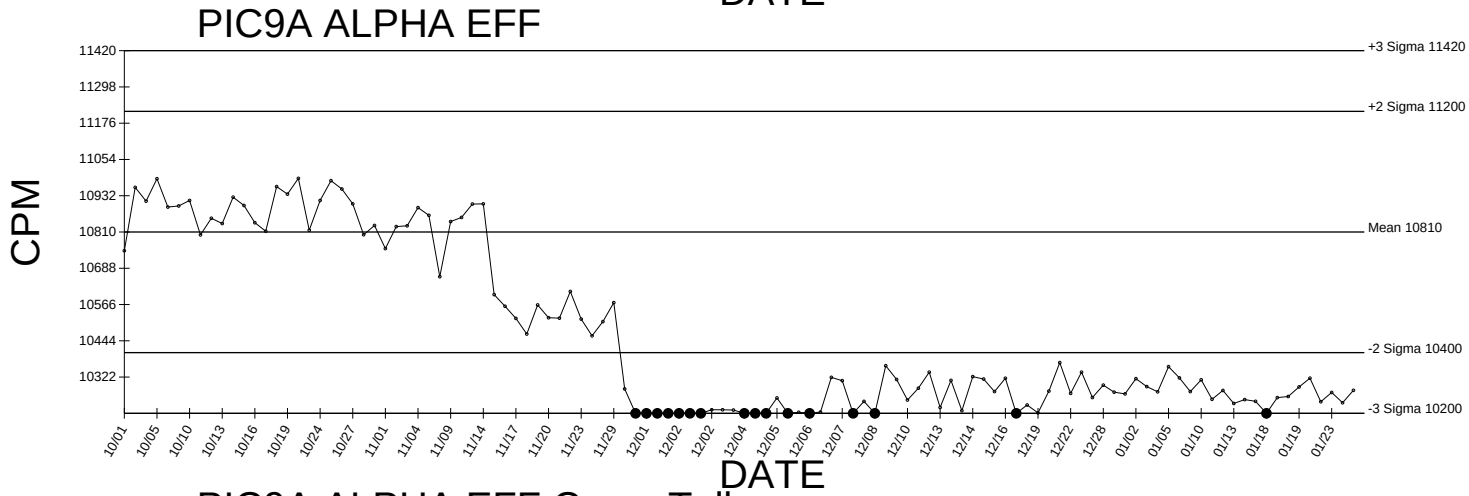
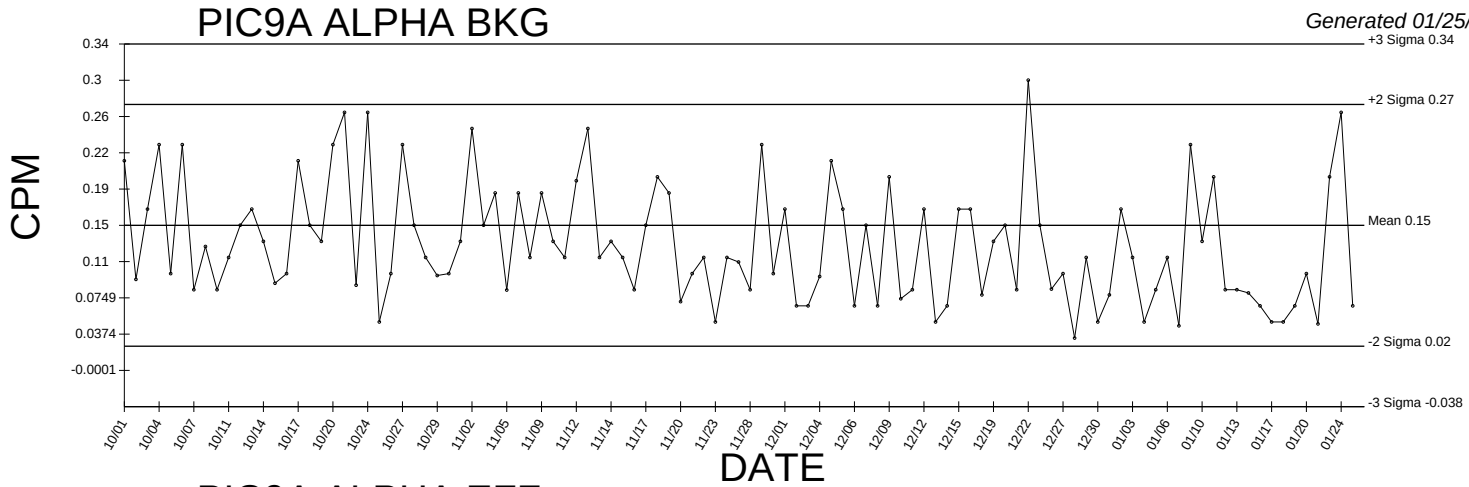
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● Denotes Outlier



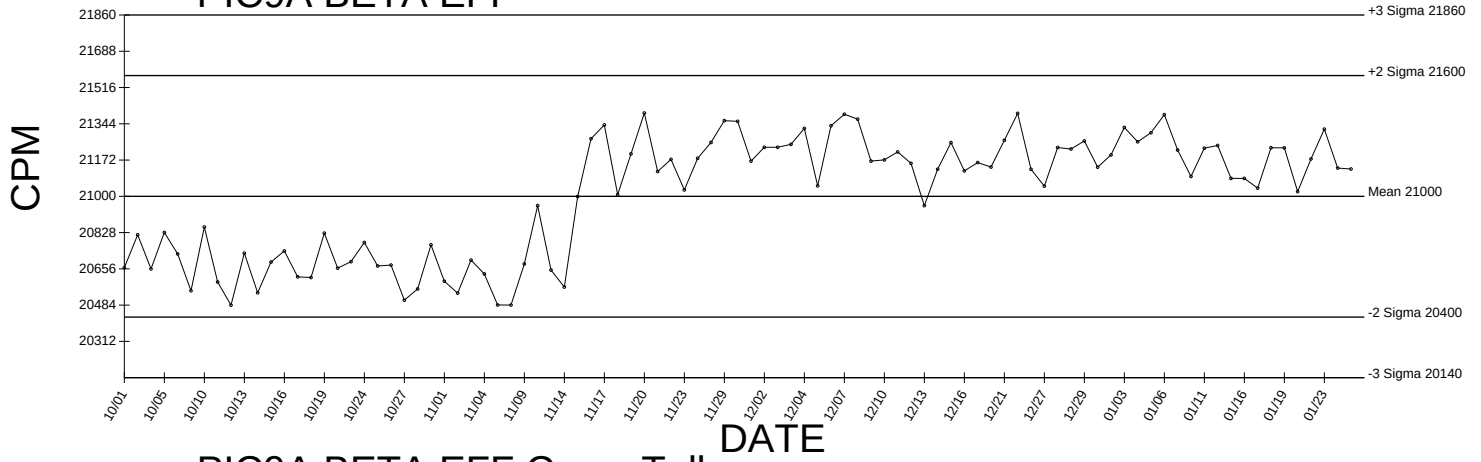
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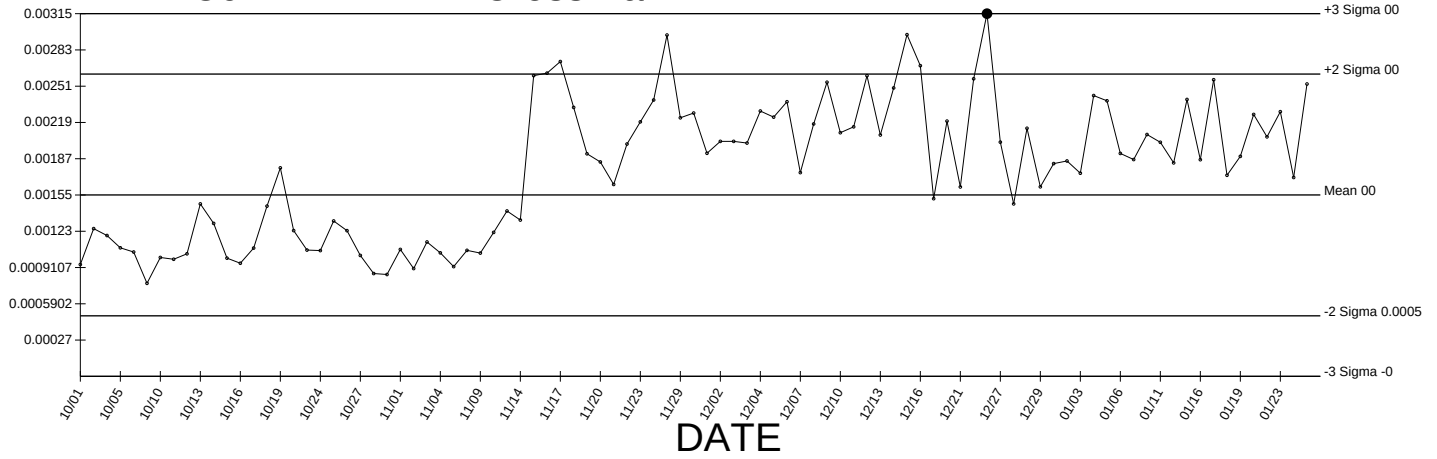
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PIC9A BETA EFF

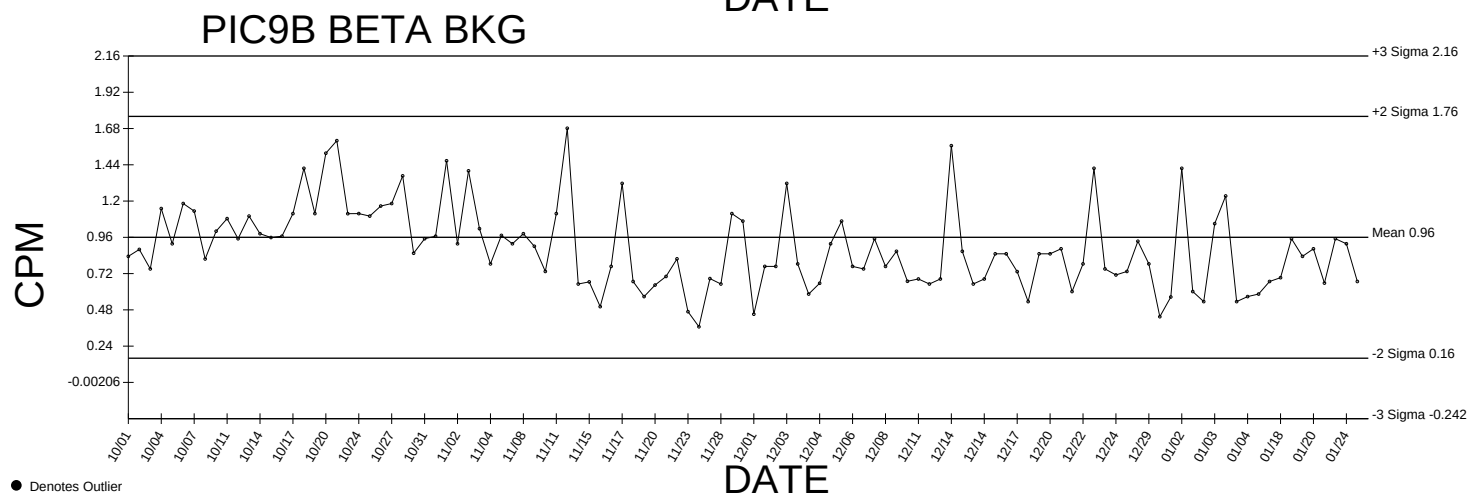
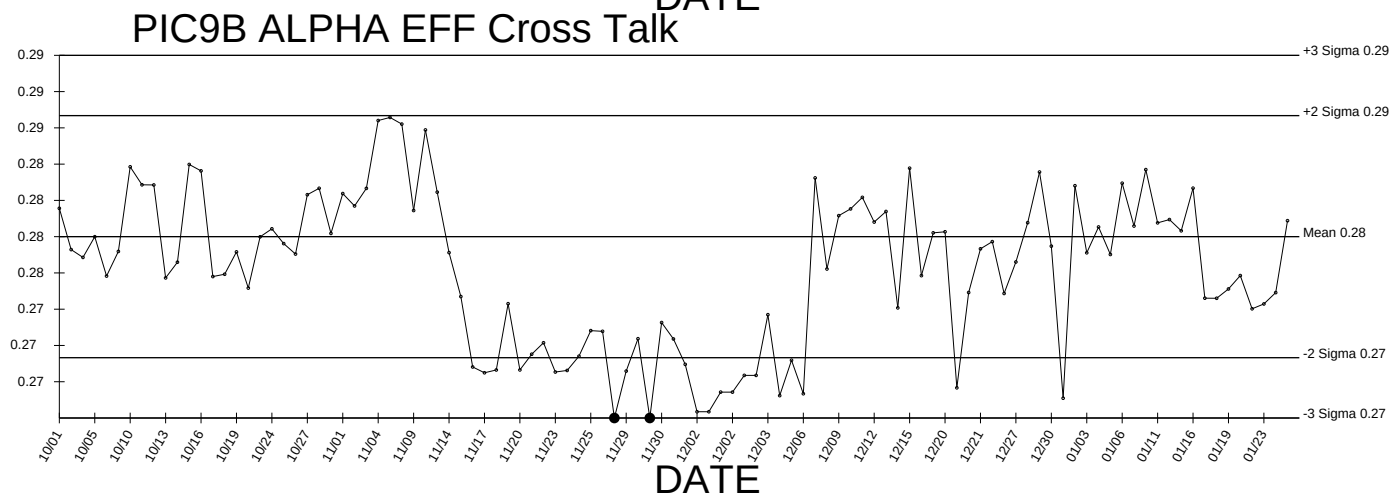
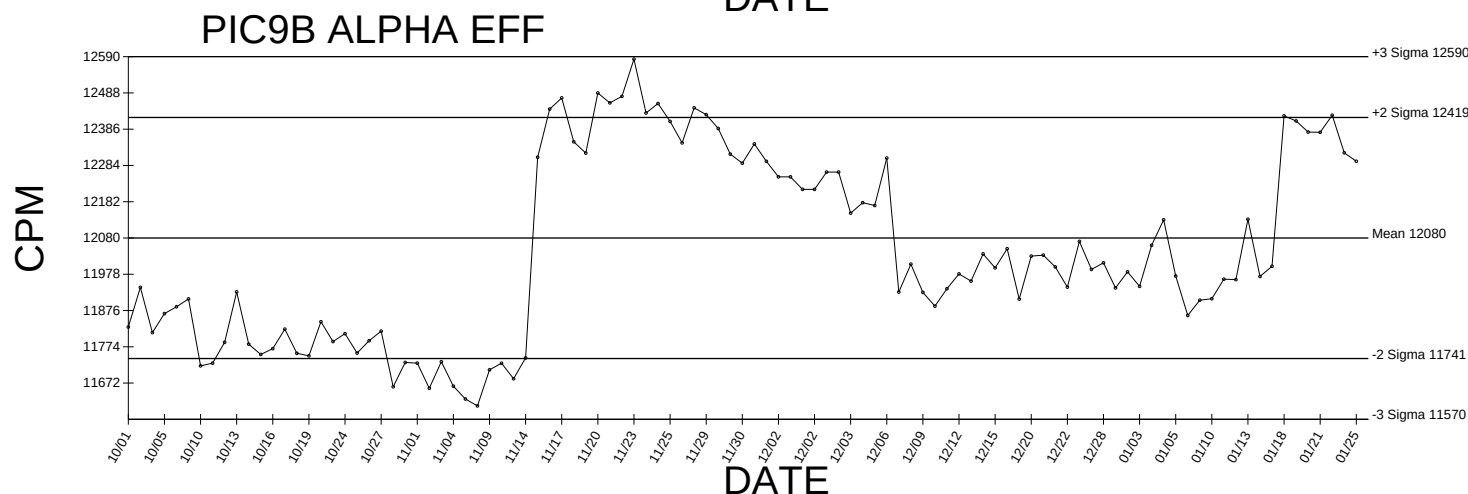
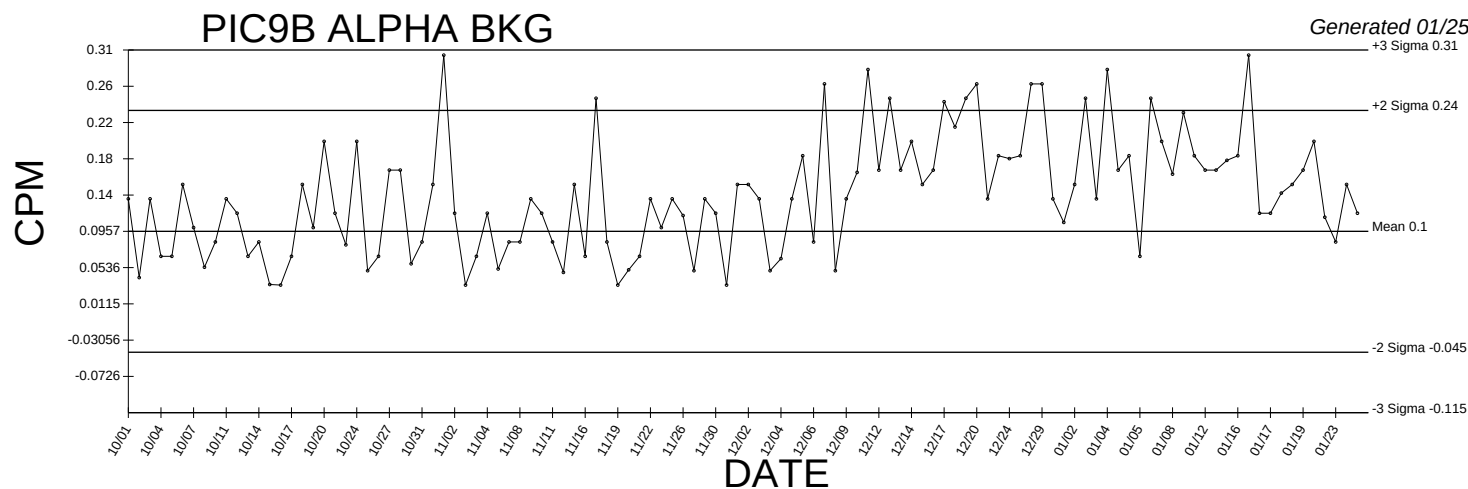
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PIC9A BETA EFF Cross Talk



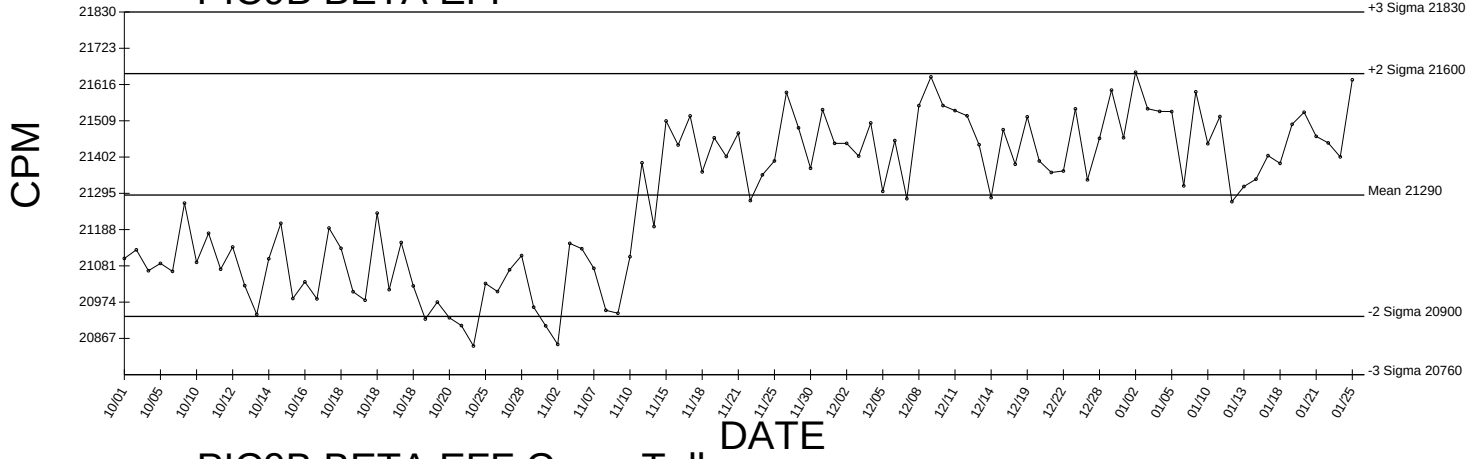
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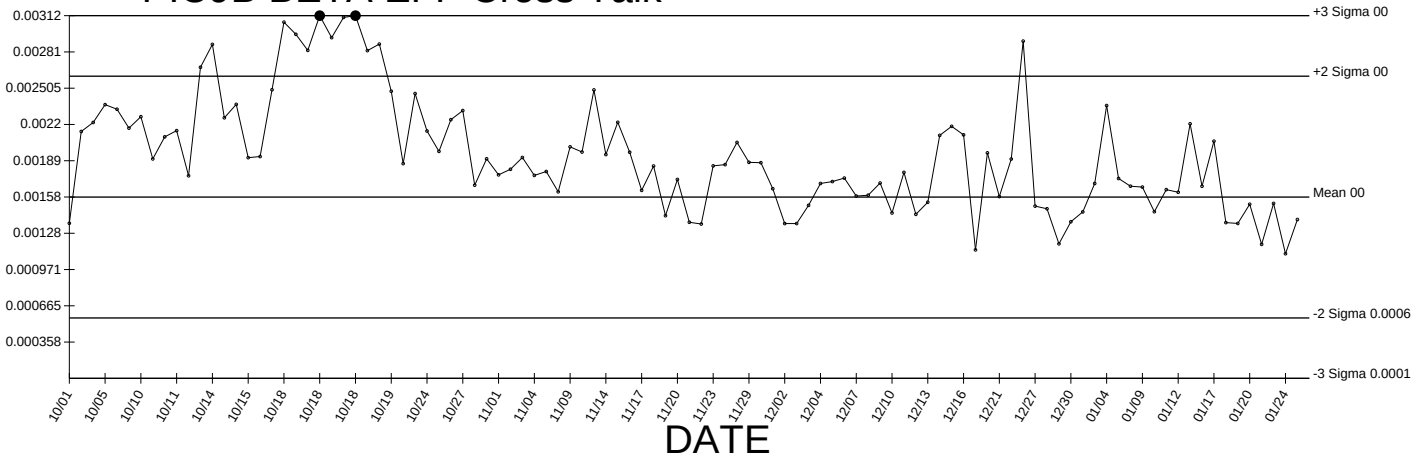
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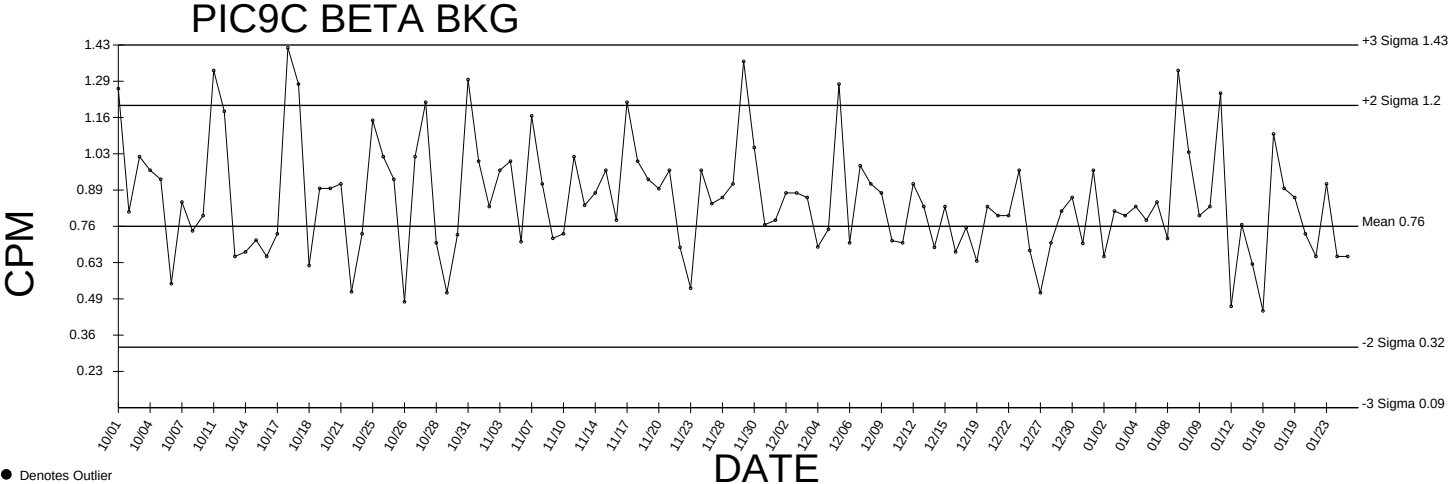
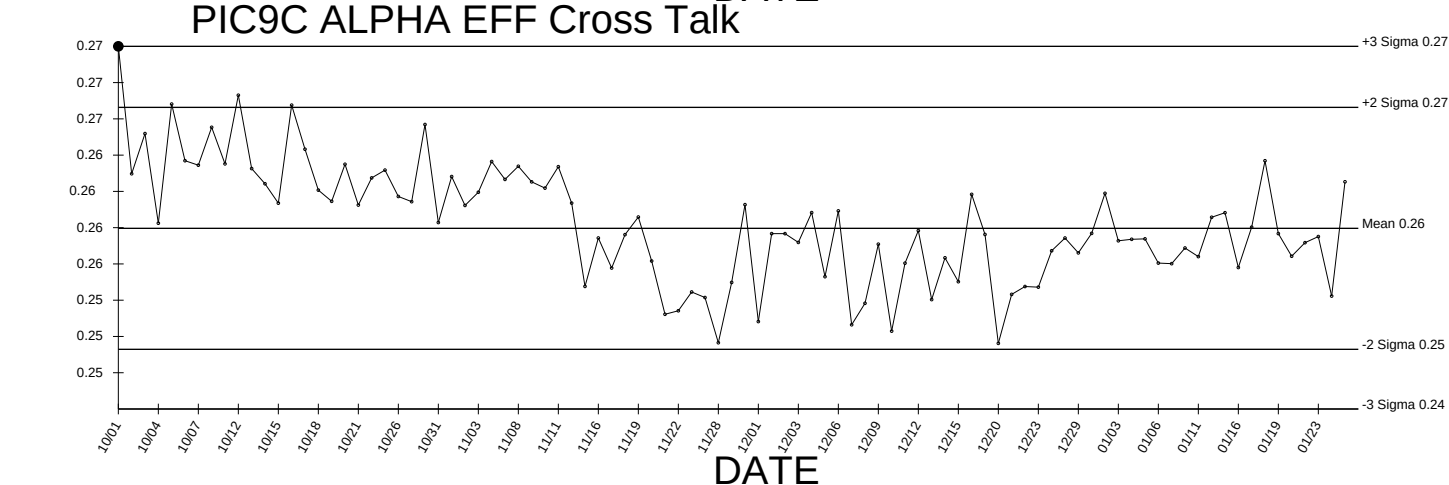
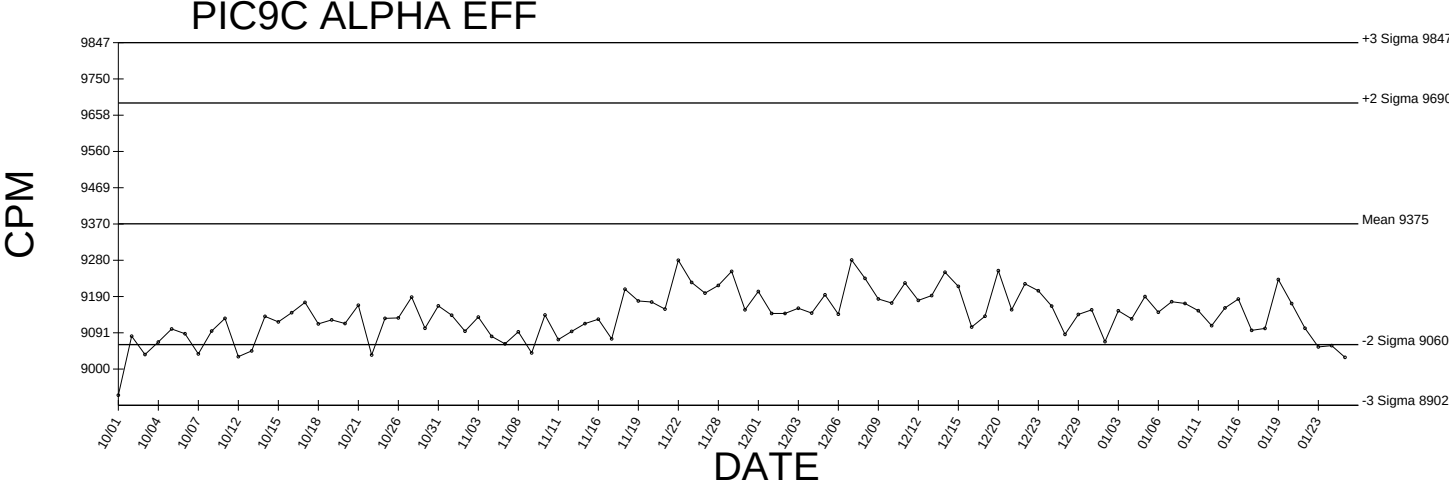
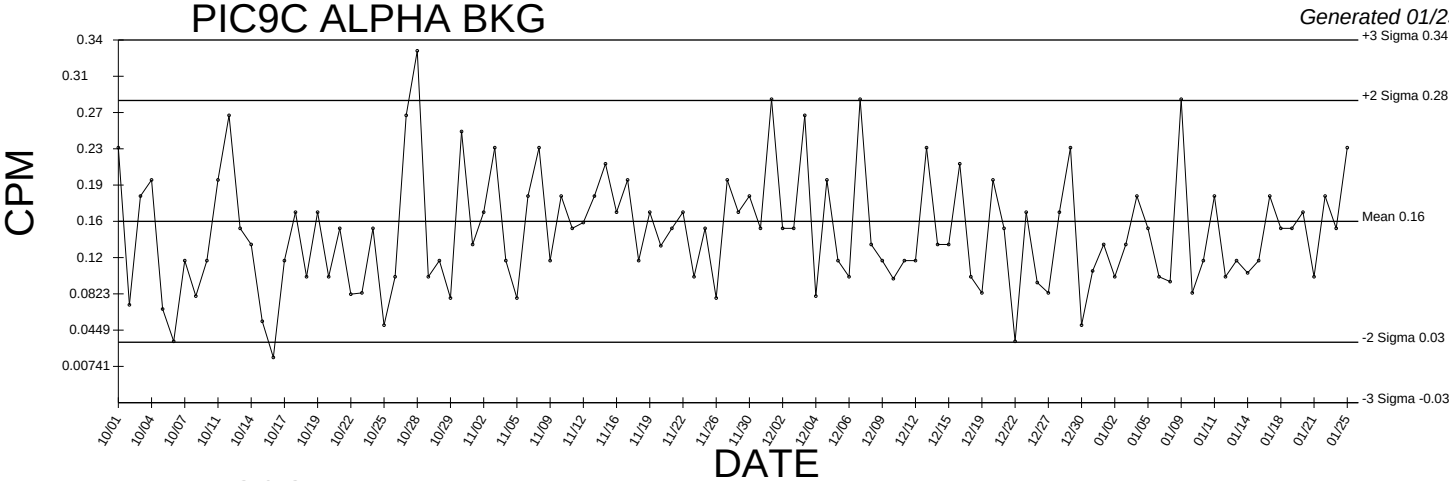
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+3 Sigma 21830



PIC9B BETA EFF Cross Talk



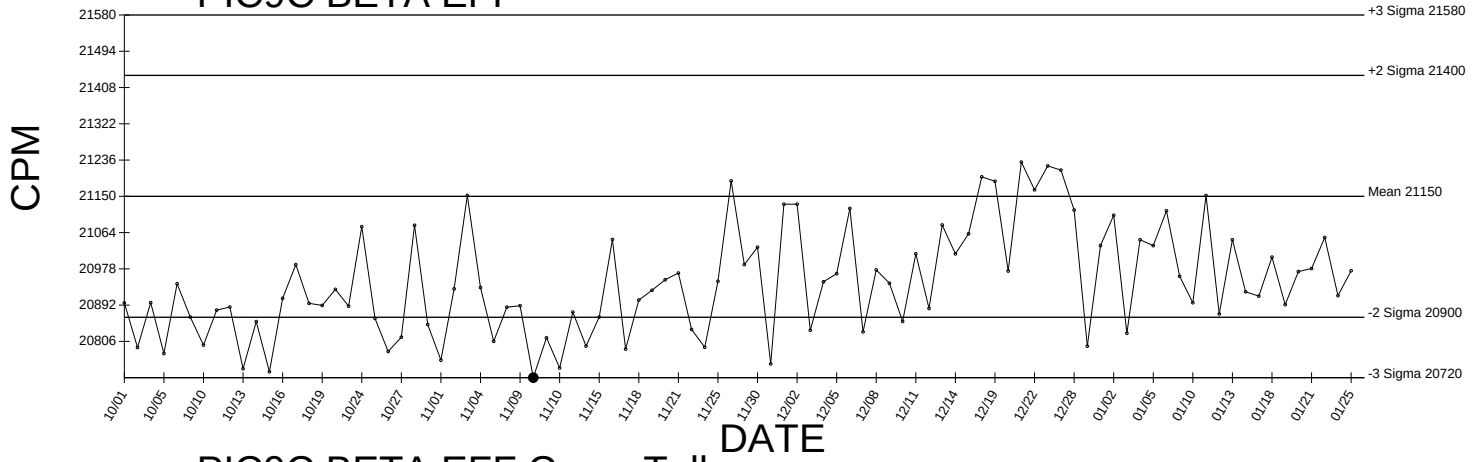
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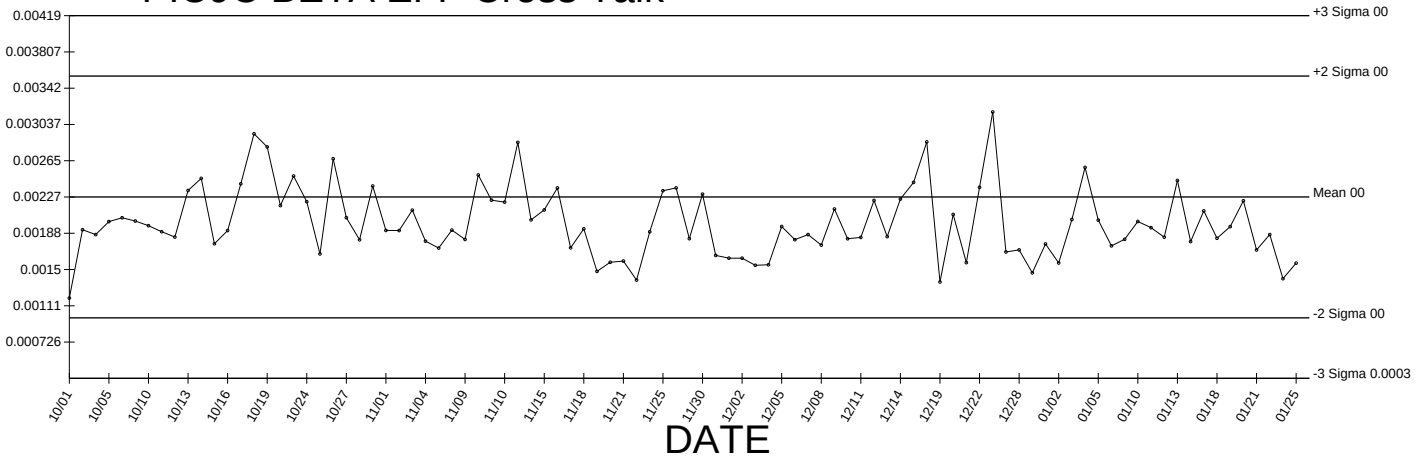
● Denotes Outlier

PIC9C BETA EFF

Generated 01/25/2023
+3 Sigma 21580



PIC9C BETA EFF Cross Talk



● Denotes Outlier

RAD Standards Traceability



National Institute of Standards & Technology

Certificate

1951

Standard Reference Material® 4251d

Received
3-31-20

Barium-133 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive Barium-133 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4251d consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Barium-133** massic activity, at a **Reference Time of 1200 EST, 13 July 2018**, is:

$(382.6 \pm 4.6) \text{ kBq} \cdot \text{g}^{-1}$.

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4251d** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Use and Handling"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared by the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of B.E. Zimmerman, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Fitzgerald, R. Collé and L. Laureano-Pérez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida of the NIST Radiation Physics Division, Radioactivity Group.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

James M. Adams, Chief
Radiation Physics Division

Steven J. Choquette, Director
Office of Reference Materials

Gaithersburg, Maryland 20899
Certificate Issue Date: 17 October 2019

Table 1. Certified Massic Activity of SRM 4251d

Radionuclide	Barium-133
Reference time	1200 EST, 13 July 2018
Massic activity of the solution	382.6 kBq·g ⁻¹
Relative expanded uncertainty ($k = 2$)	1.2 % ^(a)

^(a) The uncertainties on certified values are expanded uncertainties, $U = ku_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO and NIST Guides [4, 5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

Table 2. Uncertified Information of SRM 4251d

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	88 µg·g ⁻¹ Ba ⁺² in 0.98 mol·L ⁻¹ HCl
Solution density	(1.015 ± 0.002) g·mL ⁻¹ at 22.6 °C ^(a)
Solution mass	(5.063 ± 0.003) g ^(a)
Photon-emitting impurities	None detected ^(b)
Half-lives used [6]	¹³³ Ba: (10.539 ± 0.006) a ^(c)
Calibration methods (and instruments)	The certified massic activity for ¹³³ Ba was obtained by 4π (e, X) - γ(NaI) live-timed anti-coincidence (LTAC) counting. Confirmatory measurements were performed by five other methods: (i) 4παβ liquid scintillation (LS) spectrometry (with ³ H standard efficiency tracing for β efficiencies) and two counters; (ii) 4παβ liquid scintillation (LS) spectrometry (with ⁵⁵ Fe standard efficiency tracing for β efficiencies) and two counters; (iii) an LS-based 4παβ triple-to-double coincidence ratio (TDCR) method; (iv) 4πγ ionization chamber measurements using NIST chamber "A"; and (v) HPGe γ-ray spectrometry. ^(d)

^(a) The stated uncertainty is two times the standard uncertainty [5].

^(b) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

336 s⁻¹·g⁻¹ for energies between 15 keV and 95 keV,

150 s⁻¹·g⁻¹ for energies between 100 keV and 280 keV,

276 s⁻¹·g⁻¹ for energies between 285 keV and 370 keV,

142 s⁻¹·g⁻¹ for energies between 380 keV and 400 keV,

16 s⁻¹·g⁻¹ for energies between 410 keV and 1430 keV,

24 s⁻¹·g⁻¹ for energies between 1440 keV and 1480 keV, and

13 s⁻¹·g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ¹³³Ba.

^(c) The stated uncertainty is the standard uncertainty. See reference 6.

^(d) The expanded ($k = 2$) uncertainties for the five confirmatory methods were: (i) 2.4 %; (ii) 2.4 %; (iii) 1.2 %; (iv) 1.6 %; and (v) 1.7 %, respectively. All of the confirmatory measurements agreed with the certified value within their respective measurement uncertainties. The results for methods (iii) and (iv) agreed with the certified anti-coincidence value to better than 0.2 %.

Table 2. Uncertainty evaluation for the massic activity of SRM 4251d

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ¹³³ Ba (%)
1	Measurement repeatability; standard deviation of the distribution for 6 samples, each measured once	A	0.35
2	Background; estimated by half the difference of using the middle background measurement rather than the background measurement closest in time to each sample measurement	A	0.06
3	Extrapolation fit; median uncertainty on least-squares intercept value for a single set of γ -ray gates	A	0.05
4	Analysis model, standard deviation between extrapolation intercept for two gate settings	A	0.46
5	Dead time; from previous systematic studies	B	0.1
6	Gravimetric (mass) measurements; includes uncertainty on average sample mass and dilution to SRM solution. From previous systematic studies.	B	0.05
7	¹³³ Ba decay corrections; from DDEP half-life of ¹³³ Ba of (10.539 $\pm$ 0.006) a	B	0.00004
8	Impurity limit, from limit (no impurities seen) from γ -ray spectrometry	A	0.04
Relative combined standard uncertainty			0.60
Relative expanded uncertainty ($k = 2$)			1.2

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4251d should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to the SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed Oct 2019). Note: This SRM is contained in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM); BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed Oct 2019).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed Oct 2019).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Oct 2019).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Oct 2019).
- [6] Chechev, V.P. and N.K. Kuzmenko ; *LNE-LNHB/CEA Table of Radionuclides*, ¹³³Ba; (October 2016); available at www.lnhb.fr/nuclides/Ba-133_tables.pdf (accessed Oct 2019).

Users of this SRM should ensure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

Standard Logbook

Serial ID: 1951 **Open/Reference Date:** 13-JUL-18 **Aliquot :** 5.063 g
Name: Barium-133 **Received:** 31-MAR-20 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 31-MAR-35 **Logbook Num :** GL-CED-297-244
Employee: Tim Chandler **Lot Number :** 4251d
Supplier: NIST **Solvent :** 0.98M HCl
Uncertainty : .6 percent

Description: Barium-133
Comments: None

Analyte	Concentration	Analyte	Concentration
Barium-133	382.6 kBq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1951
Prepared By:	Tim Chandler
Carrier Conc:	0.98M HCl
Reference Date:	07/13/2018
Ampoule Mass (g):	5.063 g
Uncertainty:	+/- .6 %
LogBook No:	GL-CED-297-244
Supplier:	NIST

A Solution Material Info			
Isotope:	Barium-133		
Prepared By:	Bethany Fiem		
Prep Date:	09/23/2020		
Verification Date:	09/16/2023		
Expiration Date:	09/16/2023		
Primary Code:	1951-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.034 g		
Density(g/mL):	1.0167	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.034 \text{ g}) * (382.6 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 1155605.0400 \text{ dpm/mL}$
$(5.034 \text{ g}) * (382.6 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0167 \text{ g/mL}) / (100 \text{ mL}) = 1136603.3060 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
09/23/2020	Bethany Fiem	19.301	1000	1951-B	21937.5804 dpm/mL	09/16/2021	09/16/2022
09/16/2021	Bethany Fiem	19.02	1000	1951-C	21618.1948 dpm/mL	09/16/2021	09/16/2022
06/02/2022	Jennie Kill-Bowden	19.0813	1000	1951-D	21687.8687 dpm/mL	06/03/2022	06/02/2023
01/10/2023	Jennie Kill-Bowden	19.1	1000	1951-E	21709.1231 dpm/mL	01/10/2023	01/10/2024

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ba-133 Standard 1951-D

v1.0.2

Instrument	Purple
Analyst	JXK3
Verification Prep Date	6/2/2022

Standard Information	
Isotope	Ba-133
Serial Number	1951-D
Isotope Half-life	3.8410E+03 D
Reference Date	7/13/2018
Ref. Act. (DPM/mL)	21687.8687
Amount of Std. (mL)	1.0
Standard Prep Date	6/2/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	6/3/2022	104.40	13752.00	42.40
2	6/3/2022	104.90	13833.33	42.40
3	6/3/2022	104.10	13909.33	42.40

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	13709.60	0.826295	16591.66	16591.66
2	13790.93	0.826295	16690.09	16690.09
3	13866.93	0.826295	16782.07	16782.07

dpm/mL
16687.94
95.22033877

Mean Value =
Stddev =

Certificate Value* = 16782.2
Two sigma = 190.441
10 % of Mean = 1668.794
Rule A (Pass/Fail) Pass
% Recovery 99.44%
Rule B (Pass/Fail) Pass
Expiration Date 6/2/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Ba-133 source 1951-D by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCPurple for Ba-133 source standard verification. The Ba-133 efficiency calibration which was used for verification calculations was performed on 6/2/2022 using Ba-133 source 1601-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

A = Ver. source cpm,

B = BKG cpm,

C = System efficiency (cpm/dpm), and

D = volume used for standard verification.

RAD-M-001

Standardization of Barium Carrier 3651269

v1.2.1

Analyst	JXK3
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Standard Information	
Isotope	Barium
Serial Number	3651269
Amount of Std. (mL)	1.0
Standard Prepared	12/19/2022

Parent Information	
Parent Serial #	3268061.2
Parent Exp. Date	9/12/2024

Std #	Weight of carrier added (g)	Weight of crucible or filter (g)	Weight of crucible or filter + ppt. (g)	Weight of ppt. (g)	mg Barium/mL	mg Barium/g
1	1.0190	0.0736	0.0978	0.0242	24.20	23.75
2	1.0323	0.0728	0.0970	0.0242	24.20	23.44
3	1.0117	0.0730	0.0972	0.0242	24.20	23.92
4	1.0286	0.0725	0.0968	0.0243	24.30	23.62

Mean Value (mg/mL) = 24.23
 Stdev (mg/mL) = ± 0.05
 1.0% of Mean Value = 0.242250
 Pass
 Expiration Date 12/19/2023
 Mean Value (mg/1.0mL) = 24.23

Standardization Rule

A satisfactory standardization is obtained when results give a standard deviation of less than 1.0% of the mean value.

12/20/22



Standardization of Strontium Carrier 3535520

v1.2.1

Analyst	JXK3
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Standard Information	
Isotope	Strontium
Serial Number	3535520
Amount of Std. (mL)	1.0
Standard Prepared	11/20/2022

Parent Information	
Parent Serial #	3426824.2
Parent Exp. Date	4/18/2024

Std #	Weight of carrier added (g)	Weight of crucible or filter (g)	Weight of crucible or filter + ppt. (g)	Weight of ppt. (g)	mg Strontium/mL	mg Strontium/g
1	1.0221	0.0346	0.0422	0.0076	7.60	7.44
2	1.0220	0.0345	0.0422	0.0077	7.70	7.53
3	1.0233	0.0347	0.0423	0.0076	7.60	7.43
4	1.0203	0.0342	0.0419	0.0077	7.70	7.55

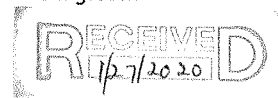
Mean Value (mg/mL) = 7.65
 Stdev (mg/mL) = ± 0.06
 1.0% of Mean Value = 0.076500
 Pass
 Expiration Date 11/20/2023
 Mean Value (mg/1.0mL) = 7.65

Standardization Rule

A satisfactory standardization is obtained when results give a standard deviation of less than 1.0% of the mean value.

11/22/22

CERTIFICATE OF CALIBRATION
Standard Reference Source



1926

SRS Number: 115032

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8226

Customer: GEL Laboratories LLC

P.O. Number: GEL1924879, Item 8

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated using a germanium gamma-ray spectrometer system. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 23-January-2020

12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Ra-226	5.844E+05	3.733E+04	1.0	2.1	4.7	HPGe

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 115032

Comments:

5.00345 g of 0.1 M HCl solution with approximately 30 µg/g Ba carrier.

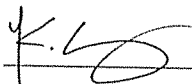
Impurities:

α-impurities (other than decay products) < 0.1%

γ-impurities (other than decay products) < 0.1%

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Eardley, Radiochemist

QC Approved by:


A. Chen, Spectroscopist

Date: 16 Jan 20

Standard Logbook

Serial ID: 1926 **Open/Reference Date:** 23-JAN-20 **Aliquot :** 5.00345 g
Name: Radium-226 **Received:** 27-JAN-20 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 26-JAN-30 **Logbook Num :** GL-CED-297-219
Employee: Gregory Ramsay **Lot Number :** 115032
Supplier: Eckert and Ziegler **Solvent :** 0.1M HCl
Uncertainty : 4.7 PERCENT
Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Radium-226	37330 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1926
Prepared By:	Gregory Ramsay
Carrier Conc:	0.1M HCl
Reference Date:	01/23/2020
Ampoule Mass (g):	5.00345 g
Uncertainty:	+/- 4.7 %
LogBook No:	GL-CED-297-219
Supplier:	Eckert and Ziegler

A Solution Material Info			
Isotope:	Radium-226		
Prepared By:	Bethany Fiem		
Prep Date:	03/10/2020		
Verification Date:	09/15/2021		
Expiration Date:	09/15/2022		
Primary Code:	1926-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9415 g		
Density(g/mL):	0.9974	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9415 \text{ g}) * (37330 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00345 \text{ g} * 100 \text{ mL}) = 22120.6801 \text{ dpm/mL}$
$(4.9415 \text{ g}) * (37330 \text{ Bq}) * (60 \text{ dpm/Bq}) / (0.9974 \text{ g/mL}) / (5.00345 \text{ g} * 100 \text{ mL}) = 22178.3439 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
03/10/2020	Bethany Fiem	11.4143	100	1926-B	2531.50269 dpm/mL	04/06/2021	04/06/2022
09/14/2021	Gregory Ramsay	27.1259	250	1926-C	2406.4301 dpm/mL	09/09/2022	09/09/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-226 Standard 1926-C

v1.0.2

Instrument	BLUE
Analyst	GXR1
Verification Prep Date	9/9/2022

Standard Information	
Isotope	Ra-226
Serial Number	1926-C
Isotope Half-life	1,600E+03 Y
Reference Date	1/23/2020
Ref. Act. (DPM/mL)	2406.4301
Amount of Std. (mL)	1.0
Standard Prep Date	9/14/2021

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	9/13/2022	63.80	5530.81	10.00
2	9/13/2022	65.10	5297.37	10.00
3	9/13/2022	66.30	5358.95	10.00

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	5520.81	2.327410	2372.08	2372.08
2	5287.37	2.327410	2271.78	2271.78
3	5348.95	2.327410	2298.24	2298.24

Mean Value = 2314.04 dpm/mL
 Stdev = 51.98208109
 Certificate Value* = 2403.7
 Two sigma = 103.964
 10 % of Mean = 231.404
 Rule A (Pass/Fail) Pass
 % Recovery 96.27%
 Rule B (Pass/Fail) Pass
 Expiration Date 9/9/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Ra-226 source 1926-C by transferring 1 mL portions of the standard into glass liquid scintillation vials. 15 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 15 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCBLUE for Ra-226 source standard verification. The Ra-226 efficiency calibration which was used for verification calculations was performed on 9/9/2022 using Ra-226 source 1715-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

A = Ver. source cpm,

B = BKG cpm,

C = System efficiency (cpm/dpm), and

D = volume used for standard verification.

RAD-M-001

[Handwritten signature]
 9/13/22

1952

akkreditiert durch die / accredited by the

Deutsche Akkreditierungsstelle GmbH

als Kalibrierlaboratorium im / as calibration laboratory in the

Deutschen Kalibrierdienst

DKD



Deutsche
Akkreditierungsstelle
D-K-19023-01-00

Kalibrierschein
Calibration certificate

Kalibrierzeichen
Calibration mark

001391
D-K- 19023-01-00
2020-05

Gegenstand
Object **5 mL Liquid in Flame Sealed Ampoule**

Hersteller
Manufacturer **Eckert & Ziegler Analytics, Inc.**

Typ
Type **8328-5FSA-3700BQ-D**

Fabrikat/Serien-Nr.
Serial number **114436**

Auftraggeber
Customer **GEL Laboratories LLC**

Auftragsnummer
Order No. **CO-046016**

Anzahl der Seiten des Kalibrierscheines
Number of pages of the certificate **2**

Datum der Kalibrierung
Date of calibration **01-May-2020 1200 EST
(1700 UTC)**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).

Die DAkkS ist Unterzeichner des multilateralen Übereinkommens der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.

Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

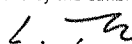
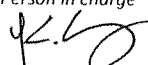
This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).

The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.

The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung sowohl der Deutschen Akkreditierungsstelle GmbH als auch des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine ohne Unterschrift haben keine Gültigkeit.

This calibration certificate may not be reproduced other than in full except with the permission of both the Deutsche Akkreditierungsstelle GmbH and the issuing laboratory. Calibration certificates without signature are not valid.

Datum Date	Leiter des Kalibrierlaboratoriums Head of the calibration laboratory	Bearbeiter Person in charge
22-Apr-20	 Levan Tkavdze	 Karlee Eardley

001391
D-K- 19023-01-00
2020-05

- **Customer Purchase Order No.:**
GEL2025843, Item 1

- **Calibration Results:**

Nuclide	Half-Life *, d	Activity, Bq	Uncertainty, %	Calibration Method
Ra-228	2.100E+03	3.319E+03	4.9	HPGe

- **Calibration Method(s):**

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics using a germanium gamma-ray spectrometer system (HPGe).

- **Uncertainty:**

The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k = 2$. It has been determined in accordance with EA-4/02 M. The value of the measurand lies within the assigned range of values with a probability of approximately 95%. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

- **Traceability:**

Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

- **Impurities:**

γ -impurities (other than decay products) < 0.1 %

- **Expiration Date:**

No expiration date has been given for this source.

- **Wipe Test *:**

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

- **Additional Information:**

- 5.00384 g of 0.1 M HCl solution with approximately 30 $\mu\text{g/g}$ Ba carrier.
- Separation date: 01-March-2018
- *Values not calibrated by EZA (i.e. published nuclear data, uncertified values, etc.)
- Date of Calibration corresponds to Reference Date for this source.
- Expiration Date refers to useful life of this source.

End of Certificate

Standard Logbook

Serial ID: 1952 **Open/Reference Date:** 01-MAY-20 **Aliquot :** 5.00384 g
Name: Radium-228 **Received:** 01-MAY-20 **Density :** Hand Calculated
Type: Source Material **Expires:** 01-MAY-35 **Logbook Num :** GL-CED-297-245
Employee: Tim Chandler **Lot Number :** 114436
Supplier: Eckert & Zeigler **Solvent :** 0.1M HCl
Uncertainty : 2.45 percent
Description: Radium-228
Comments: None

Analyte	Concentration	Analyte	Concentration
Radium-228	3319 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1952
Prepared By:	Tim Chandler
Carrier Conc:	0.1M HCl
Reference Date:	05/01/2020
Ampoule Mass (g):	5.00384 g
Uncertainty:	+/- 2.45 %
LogBook No:	GL-CED-297-245
Supplier:	Eckert & Zeigler

A Solution Material Info			
Isotope:	Radium-228		
Prepared By:	Jennie Kill-Bowden		
Prep Date:	05/27/2020		
Verification Date:	08/05/2022		
Expiration Date:	08/04/2023		
Primary Code:	1952-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.958 g		
Density(g/mL):	1.0281	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.958 \text{ g}) * (3319 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00384 \text{ g} * 100 \text{ mL}) = 1973.1569 \text{ dpm/mL}$
$(4.958 \text{ g}) * (3319 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0281 \text{ g/mL}) / (5.00384 \text{ g} * 100 \text{ mL}) = 1919.2771 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
08/10/2022	Jennie Kill-Bowden	31.236	100	1952-B	599.5054 dpm/mL	08/10/2022	08/09/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-228 Standard 1952-B

v1.0.2

Instrument	BROWN
Analyst	JXK3
Verification Prep Date	8/9/2022

Standard Information	
Isotope	Ra-228
Serial Number	1952-B
Isotope Halflife	5.7500 Y
Reference Date	5/1/2020
Ref. Act. (DPM/mL)	599.5054
Amount of Std. (mL)	1.0
Standard Prep Date	8/9/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	8/10/2022	96.80	3714.81	41.20
2	8/10/2022	98.80	3700.36	41.20
3	8/10/2022	98.60	3773.96	41.20

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	3673.61	8.004187	458.96	458.96
2	3659.16	8.004187	457.16	457.16
3	3732.76	8.004187	466.35	466.35

Mean Value = 460.82
 Stdev = 4.872045215
 Certificate Value* = 455.7
 Two sigma = 9.744
 10 % of Mean = 46.082
 Rule A (Pass/Fail) Pass
 % Recovery 101.12%
 Rule B (Pass/Fail) Pass
 Expiration Date 8/9/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Ra-228 source 1952-B by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCBROWN for Ra-228 source standard verification. The Ra-228 efficiency calibration which was used for verification calculations was performed on 8/9/2022 using Ra-228 source 1965-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency (cpm/dpm), and
- D = volume used for standard verification.

RAD-M-001

Lois Brink 8/10/22
John 9/10/2022



Eckert & Ziegler

Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

1943

SRS Number: 115036

Source Description: 5 mL Liquid in Flame Sealed Ampoule

Product Code: 8090-5FSA-37kBq

Customer: GEL Laboratories LLC

P.O. Number: GEL1924879, Item 4

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 23-January-2020 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A , %	u_B , %	U , %*	
Sr-90	1.052E+04	3.705E+04	0.1	1.0	2.1	4 π LS

Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." *Calibration Methods:** 4 π LS - 4 π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

GL-CED-297-236a

EZA Certificate Program Rev. 1, 01-FEB-2019

Dec
4-8-20

Page 1 of 2

SRS Number: 115036

Comments:

5.00204 g of 0.1 M HCl solution with approximately 30 µg/g each Sr and Y carriers.

Impurities:

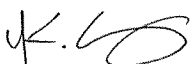
γ-impurities < 0.1%

Note:

This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total activity for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:


K. Eardley, Radiochemist

QC Approved by:


A. Chen, Spectroscopist

Date: 16 Jan 20

Standard Logbook

Serial ID: 1943 **Open/Reference Date:** 23-JAN-20 **Aliquot :** 5.00204 g
Name: Strontium-90 **Received:** 23-JAN-20 **Density :** Hand Calculated
Type: Source Material **Expires:** 23-JAN-35 **Logbook Num :** GL-CED-297-236
Employee: Tim Chandler **Lot Number :** 115036
Supplier: Eckert & Zeigler **Solvent :** 0.1M HCl
Uncertainty : 1.05 percent
Description: Strontium-90
Comments: None

Analyte	Concentration	Analyte	Concentration
Strontium-90	37050 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1943
Prepared By:	Tim Chandler
Carrier Conc:	0.1M HCl
Reference Date:	01/23/2020
Ampoule Mass (g):	5.00204 g
Uncertainty:	+/- 1.05 %
LogBook No:	GL-CED-297-236
Supplier:	Eckert & Zeigler

A Solution Material Info			
Isotope:	Strontium-90		
Prepared By:	Jennie Kill-Bowden		
Prep Date:	08/13/2020		
Verification Date:	01/16/2023		
Expiration Date:	01/16/2024		
Primary Code:	1943-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9536 g		
Density(g/mL):	0.9995	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22014.7236 \text{ dpm/mL}$
$(4.9536 \text{ g}) * (37050 \text{ Bq}) * (60 \text{ dpm/Bq}) / (0.9995 \text{ g/mL}) / (5.00204 \text{ g} * 100 \text{ mL}) = 22025.6704 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
02/16/2021	Bethany Fiem	24.8842	1000	1943-B	548.091187 dpm/mL	02/16/2021	02/16/2022
01/04/2022	Jennie Kill-Bowden	25.0633	1000	1943-C	552.035985 dpm/ml	01/13/2023	01/13/2024
06/06/2022	Jennie Kill-Bowden	24.9802	1000	1943-D	550.2057 dpm/ml	06/03/2022	06/03/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Sr-90 Standard 1943-D

v1.0.2

Instrument	BROWN
Analyst	JXK3
Verification Prep Date	6/3/2022

Standard Information	
Isotope	Sr-90
Serial Number	1943-D
Isotope Half-life	28.9000 Y
Reference Date	1/23/2020
Ref. Act. (DPM/mL)	550.2057
Amount of Std. (mL)	1.0
Standard Prep Date	6/3/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	6/4/2022	92.40	1086.20	47.20
2	6/4/2022	91.60	1093.60	47.20
3	6/4/2022	91.70	1107.60	47.20

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	1039.00	2.018286	514.79	514.79
2	1046.40	2.018286	518.46	518.46
3	1060.40	2.018286	525.40	525.40

dpm/mL
519.55
5.384916401

Mean Value =
Stdev =

Certificate Value* = 519.9
Two sigma = 10.770
10 % of Mean = 51.955
Rule A (Pass/Fail) Pass
% Recovery 99.93%
Rule B (Pass/Fail) Pass
Expiration Date 6/3/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Sr-90 source 1943-D by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCBROWN for Sr-90 source standard verification. The Sr-90 efficiency calibration which was used for verification calculations was performed on 6/3/2022 using Sr-90 source 1689-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

A = Ver. source cpm,

B = BKG cpm,

C = System efficiency (cpm/dpm), and

D = volume used for standard verification.

RAD-M-001

Handwritten: 6/16/22
6/16/22
Luo B. B. B.

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2368080

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205293189	LCS	JE1	PIC9B	JAN-25-23 12:05:42	DONE	25mm Filter	01-JUN-22 00:00
1205293190	LCSD	JE1	PIC9C	JAN-25-23 12:05:49	DONE	25mm Filter	01-JUN-22 00:00
1205293188	MB	JE1	PIC9A	JAN-25-23 12:06:17	DONE	25mm Filter	01-JUN-22 00:00
606488001	SAMPLE	JE1	PIC7C	JAN-25-23 12:06:24	DONE	25mm Filter	01-JUN-22 00:00
606488002	SAMPLE	JE1	PIC7D	JAN-25-23 12:06:32	DONE	25mm Filter	01-JUN-22 00:00
606488003	SAMPLE	JE1	PIC8A	JAN-25-23 12:06:36	DONE	25mm Filter	01-JUN-22 00:00
606488004	SAMPLE	JE1	PIC8B	JAN-25-23 12:06:40	DONE	25mm Filter	01-JUN-22 00:00
606488005	SAMPLE	JE1	PIC1C	JAN-27-23 09:07:31	DONE	25mm Filter	01-JUN-22 00:00

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2368081

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205293193	LCS	JE1	PIC1C	JAN-23-23 16:48:15	DONE	47mm Filter	01-JUN-22 00:00
1205293374	LCSD	JE1	PIC5C	JAN-23-23 16:48:28	DONE	47mm Filter	01-JUN-22 00:00
606488003	SAMPLE	JE1	PIC2B	JAN-23-23 17:51:46	DONE	47mm Filter	01-JUN-22 00:00
606488001	SAMPLE	JE1	PIC4C	JAN-23-23 17:52:37	DONE	47mm Filter	01-JUN-22 00:00
606488005	SAMPLE	JE1	PIC7D	JAN-23-23 18:05:31	DONE	47mm Filter	01-JUN-22 00:00
606488004	SAMPLE	JE1	PIC7A	JAN-23-23 18:21:51	DONE	47mm Filter	01-JUN-22 00:00
1205293191	MB	JE1	PIC2D	JAN-23-23 18:49:22	DONE	47mm Filter	01-JUN-22 00:00
606488002	SAMPLE	JE1	PIC5A	JAN-23-23 18:49:38	DONE	47mm Filter	01-JUN-22 00:00

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2368082

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
606488001	SAMPLE	ST2	PIC11D	JAN-23-23 16:33:32	DONE	Tuffryn Filter	01-APR-21 00:00
1205293194	MB	ST2	PIC6C	JAN-25-23 18:32:12	DONE	Tuffryn Filter	01-APR-21 00:00
606487003	SAMPLE	ST2	PIC3C	JAN-25-23 18:32:51	DONE	Tuffryn Filter	01-APR-21 00:00
606488003	SAMPLE	ST2	PIC4D	JAN-25-23 18:33:12	DONE	Tuffryn Filter	01-APR-21 00:00
1205293195	LCS	ST2	PIC1C	JAN-26-23 09:47:36	DONE	Tuffryn Filter	01-APR-21 00:00
1205293196	LCSD	ST2	PIC2B	JAN-26-23 09:47:36	DONE	Tuffryn Filter	01-APR-21 00:00
606487001	SAMPLE	ST2	PIC1A	JAN-26-23 09:47:45	DONE	Tuffryn Filter	01-APR-21 00:00
606488004	SAMPLE	ST2	PIC2A	JAN-26-23 09:48:19	DONE	Tuffryn Filter	01-APR-21 00:00
606488002	SAMPLE	ST2	PIC7D	JAN-26-23 09:53:45	DONE	Tuffryn Filter	01-APR-21 00:00
606487002	SAMPLE	ST2	PIC1B	JAN-28-23 09:10:34	DONE	Tuffryn Filter	01-APR-21 00:00
606488005	SAMPLE	ST2	PIC3B	JAN-28-23 09:12:05	DONE	Tuffryn Filter	01-APR-21 00:00

Liquid Scintillation Raw Data

Batch 2368292 Check-list

This check-list was completed on 25-JAN-23 by Jessica Downey

This batch was reviewed by Jessica Downey on 25-JAN-23 and Jessica Davis on 25-JAN-23.

Batch ID: 2368292

Product: LSC41PUF

Description: LSC Plutonium Filter

#	Criteria	Yes	No	Comments
Preparation Information				
1	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
2	Are instrument source checks within limits?	Yes		
3	Have client special requirements have been reviewed and met?	Yes		
4	Have samples been blank corrected?		No	
5	Has a hit notification been completed?		No	
6	Has an Aliquot Correction been completed for this batch?	Yes		
7	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
8	Were all the samples prepared/analyzed within the required holding time period?	Yes		
9	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
10	Was the method blank (MB) within the acceptance criteria?	Yes		
11	Were all tracer/carrier recoveries within the required acceptance limits?	Yes		
12	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
13	Were the relative percent differences and/or error (RPD/RER) between the LCS and the LCSD recoveries within the acceptance limits?	Yes		
14	Has the method required detection limit been met?		No	
Miscellaneous Information				
15	Were manual integrations performed on any sample or QC data files in this batch?	Yes		
16	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Plutonium-241 in Filter per Liter

Batch ID:	2368292	Due Dates for Lab: 23-JAN-2023		Package: 24-JAN-2023	SDG: 24-JAN-2023		
Analyst:	Evan Johnson (EJ1)	Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
Method:	DOE EML HASL-300, Pu-11-RC	LCS	1205293625	Plutonium-241 AS SPIKE	1714-C	.2	mL
	Modified	LCSD	1205293626	Plutonium-241 AS SPIKE	1714-C	.2	mL
Lab SOP:	GL-RAD-A-035 REV# 24						
Instrument:	BAL-C236871727						

#	Sample ID	Prep Date	Min RDL (pCi/Filter)	Unadjusted Aliquot (mL)	Aliquot (Filter)
1	606487001	20-JAN-2023	5	30.3	0.11337
2	606487002	20-JAN-2023	5	30.45	0.11253
3	606487003	20-JAN-2023	5	30.13	0.11299
4	606488001	20-JAN-2023	5	30.35	0.11607
5	606488002	20-JAN-2023	5	30.3	0.1132
6	606488003	20-JAN-2023	5	30.15	0.10826
7	606488004	20-JAN-2023	5	30.41	0.11234
8	606488005	20-JAN-2023	5	30.03	0.1091
9	1205293624 MB	20-JAN-2023	5		0.11607
10	1205293625 LCS	20-JAN-2023	5		0.11607
11	1205293626 LCSD	20-JAN-2023	5		0.11607

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2044-A	Plutonium-242 AS TRACER	.2 mL	

Plutonium-241 Filter

Filename : PU241.XLS
File type : Excel
Version # : 1.3.4

Tracer S/N : 2044-A
Tracer Exp Date : 7/18/2023
Tracer Volume Added: 0.20
Tracer Error: 0.37%

Batch : 2368292
Analyst : EVA02518
Prep Date : 1/20/2023
Method Uncertainty : 0.0935

Procedure Code : LSC41PUF
Parmname : Plutonium-241
Required MDA : 5 pCi/F
Halflife of Pu-241 : 14.290 years
Pu-241 Abundance : 1.00
Tracer Abundance : 1.00
Halflife of Tracer : 373500.000 years

Geometry:

2mL DI/1 drop HNO3/13mL Ecoscint Ultra

Sample Characteristics					Tracer Calculations									
Pos.	Sample ID	Sample Aliquot F	Sample Aliquot StDev. F	Sample Date/Time	Tracer Concentration DPM	Tracer Counts	Tracer Bkg Counts	Tracer Net CPM	Tracer Count Start Date/Time	Tracer Count Time (sec.)	Tracer Decay	Detector Serial #	Detector Efficiency (cpm/dpm)	Detector Efficiency StDev. (cpm/dpm)
1	606487001.1	0.1134	1.2160E-05	12/26/2022 7:15	8.3959	673	1.920	2.796	1/23/2023 11:36	14400	1.000	148999	0.331710	0.006404
2	606487002.1	0.1125	1.2113E-05	12/26/2022 7:23	8.3959	606	1.920	2.517	1/23/2023 11:36	14400	1.000	101447	0.323574	0.006250
3	606487003.1	0.1130	1.2138E-05	12/26/2022 9:00	8.3959	555	2.400	2.302	1/23/2023 11:36	14400	1.000	149000	0.318801	0.006161
4	606488001.1	0.1161	1.2313E-05	12/26/2022 7:41	8.3959	520	0.960	2.163	1/23/2023 11:36	14400	1.000	149010	0.308893	0.005974
5	606488002.1	0.1132	1.2150E-05	12/26/2022 7:49	8.3959	590	0.480	2.456	1/23/2023 11:36	14400	1.000	140586	0.339975	0.006560
6	606488003.1	0.1083	1.1865E-05	12/26/2022 7:58	8.3959	638	0.000	2.658	1/23/2023 11:36	14400	1.000	158092	0.357535	0.006891
7	606488004.1	0.1123	1.2101E-05	12/26/2022 8:04	8.3959	620	2.160	2.574	1/23/2023 11:36	14400	1.000	80020	0.331415	0.006399
8	606488005.1	0.1091	1.1915E-05	12/26/2022 9:00	8.3959	533	0.960	2.217	1/23/2023 11:36	14400	1.000	155835	0.315810	0.006104
9	1205293624.1	0.1161	1.2313E-05	1/20/2023 0:00	8.3959	547	1.680	2.272	1/23/2023 11:36	14400	1.000	149001	0.323334	0.006246
10	1205293625.1	0.1161	1.2313E-05	1/20/2023 0:00	8.3959	638	1.200	2.653	1/23/2023 11:36	14400	1.000	53053	0.358956	0.006918
11	1205293626.1	0.1161	1.2313E-05	1/20/2023 0:00	8.3959	616	0.240	2.566	1/23/2023 11:36	14400	1.000	149002	0.336631	0.006497

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-035
 Instrument SOP:

Count raw Data													Calibration Data						
Pos.	Rack Position #	Counting Time (min.)	Quench#	Gross cpm	Bkg cpm	Bkg Count Time (min.)	Bkg Quench#	Corrected Bkg cpm	Count Start Date/Time	Sample Decay	Calculated Sample Recovery %	Sample Recovery Error %	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Background Rack Position #	Background Count Start Date/Time
1	17-2	30	319.04	23.06	24.08	30	339.12	23.9464	1/24/2023 20:26	0.996	100%	4.34%	LSCNAVY	1/24/2022	1/31/2023	0.2802	0.00792	17-1	1/24/2023 19:55
2	17-3	30	319	23.99	24.08	30	339.12	23.9460	1/24/2023 20:57	0.996	92.6%	4.53%	LSCNAVY	1/24/2022	1/31/2023	0.2802	0.00792	17-1	1/24/2023 19:55
3	17-4	30	330.93	23.27	24.08	30	339.12	24.0357	1/24/2023 21:28	0.996	86.0%	4.70%	LSCNAVY	1/24/2022	1/31/2023	0.2897	0.00792	17-1	1/24/2023 19:55
4	17-5	30	339.64	24.39	24.08	30	339.12	24.0824	1/24/2023 21:58	0.996	83.4%	4.82%	LSCNAVY	1/24/2022	1/31/2023	0.2966	0.00792	17-1	1/24/2023 19:55
5	17-6	30	316.23	23.75	24.08	30	339.12	23.9206	1/24/2023 22:29	0.996	86.1%	4.57%	LSCNAVY	1/24/2022	1/31/2023	0.2780	0.00792	17-1	1/24/2023 19:55
6	17-7	30	338.56	24.06	24.08	30	339.12	24.0774	1/24/2023 23:00	0.996	88.6%	4.42%	LSCNAVY	1/24/2022	1/31/2023	0.2957	0.00792	17-1	1/24/2023 19:55
7	17-8	30	328	23.54	24.08	30	339.12	24.0165	1/24/2023 23:31	0.996	92.5%	4.49%	LSCNAVY	1/24/2022	1/31/2023	0.2874	0.00792	17-1	1/24/2023 19:55
8	17-9	30	338.07	22.19	24.08	30	339.12	24.0751	1/25/2023 0:02	0.996	83.6%	4.77%	LSCNAVY	1/24/2022	1/31/2023	0.2953	0.00792	17-1	1/24/2023 19:55
9	17-10	30	333.48	22.09	24.08	30	339.12	24.0509	1/25/2023 0:32	0.999	83.7%	4.72%	LSCNAVY	1/24/2022	1/31/2023	0.2917	0.00792	17-1	1/24/2023 19:55
10	17-11	30	335.11	108.91	24.08	30	339.12	24.0600	1/25/2023 1:03	0.999	88.0%	4.43%	LSCNAVY	1/24/2022	1/31/2023	0.2930	0.00792	17-1	1/24/2023 19:55
11	17-12	30	324.73	106.26	24.08	30	339.12	23.9930	1/25/2023 1:34	0.999	90.8%	4.49%	LSCNAVY	1/24/2022	1/31/2023	0.2848	0.00792	17-1	1/24/2023 19:55

Notes:

- 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1714-C
LCS Exp Date : 10/28/2023
LCS Activity (dpm/ml): 1549.28
LCS Volume Added: 0.20

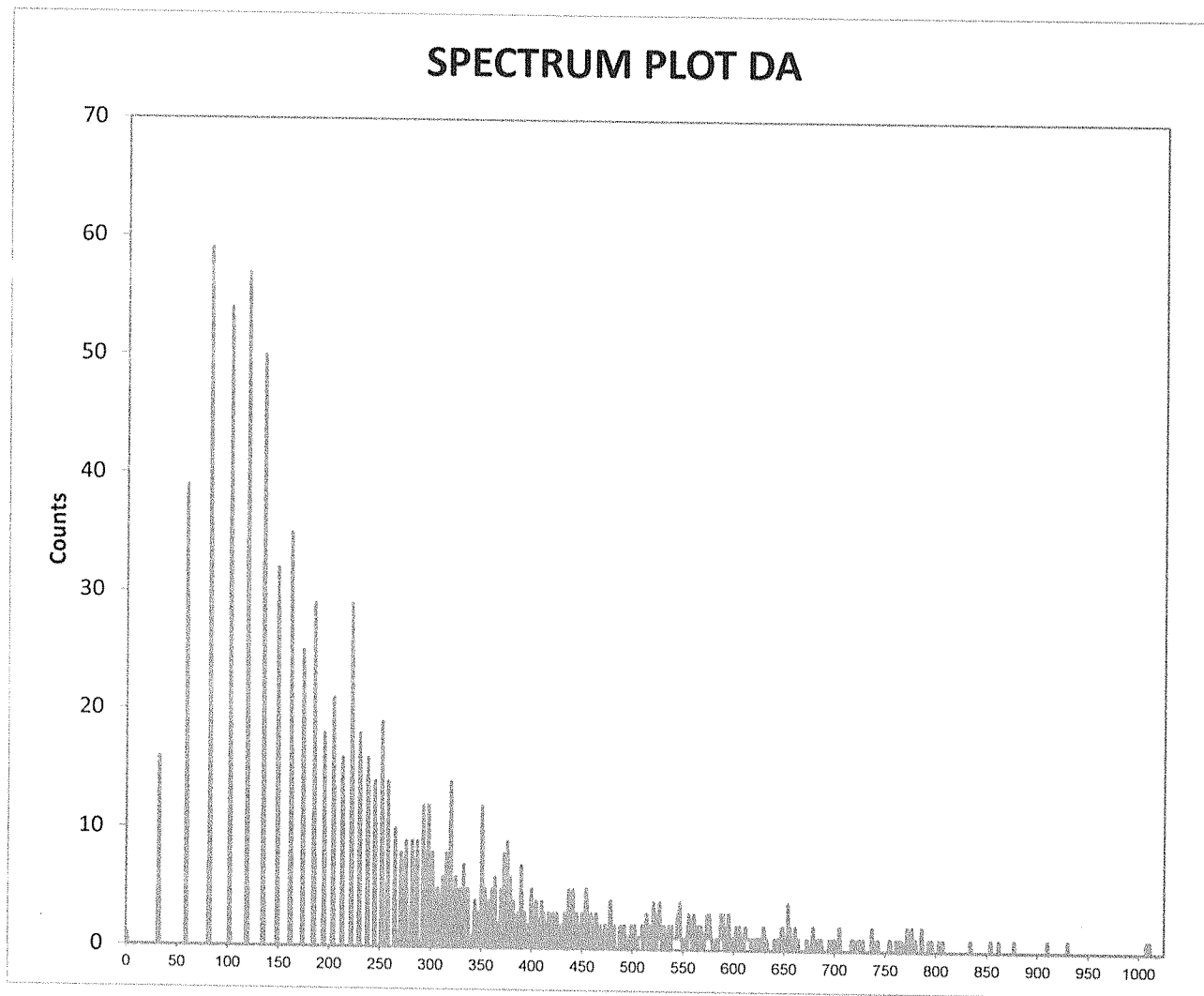
Results																
Pos.	Decision Level pCi/F	Critical Level pCi/F	Required MDA pCi/F	MDA pCi/F	Sample Act. Conc. pCi/F	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/F	2 SIGMA Total Prop. Uncertainty pCi/F	Sample QC	Sample Type	RPD	RER	Nominal pCi/F	Recovery
1	41.7367	29.4665	5	60.3506	-12.5662	141.29%	-0.8864	1.2518	34.7826	34.7827		SAMPLE				
2	45.5684	32.1717	5	65.8913	0.6808	2874.07%	0.0440	1.2641	38.3498	38.3501		SAMPLE				
3	47.3642	33.4395	5	68.4850	-12.2957	164.07%	-0.7657	1.2557	39.5243	39.5244		SAMPLE				
4	46.5097	32.8363	5	67.2479	4.8463	413.23%	0.3076	1.2711	39.2488	39.2616		SAMPLE				
5	49.1383	34.6921	5	71.0542	-2.8499	738.70%	-0.1706	1.2606	41.2614	41.2616		SAMPLE				
6	47.0872	33.2439	5	68.0830	-0.2774	7284.74%	-0.0174	1.2667	39.6027	39.6028		SAMPLE				
7	44.6337	31.5118	5	64.5375	-7.2138	264.27%	-0.4765	1.2591	37.3593	37.3594		SAMPLE				
8	49.5504	34.9830	5	71.6446	-31.6429	66.06%	-1.8851	1.2418	40.8578	40.8580		SAMPLE				
9	46.9205	33.1263	5	67.8428	-31.1849	63.43%	-1.9609	1.2402	38.6567	38.6569		MB				
10	44.4202	31.3610	5	64.2274	1277.2465	5.14%	84.8500	2.1053	62.1148	267.0868		LCS			1202.4823	106.2%
11	44.2620	31.2494	5	64.0008	1235.6770	5.21%	82.2670	2.0837	61.3435	259.2772		LCSD	3.3%		1202.4823	102.8%

SampleID	Rack	Time (min.)	SQPE#	CPM Iso1	CPM Iso2	LumEx	Count Start Time	Count End Time	Machine
1	17-1	30	339.12	24.08			1/24/2023 19:55	1/24/2023 20:25	NAVY
2	17-2	30	319.04	23.06			1/24/2023 20:26	1/24/2023 20:56	NAVY
3	17-3	30	319	23.99			1/24/2023 20:57	1/24/2023 21:27	NAVY
4	17-4	30	330.93	23.27			1/24/2023 21:28	1/24/2023 21:58	NAVY
5	17-5	30	339.64	24.39			1/24/2023 21:58	1/24/2023 22:28	NAVY
6	17-6	30	316.23	23.75			1/24/2023 22:29	1/24/2023 22:59	NAVY
7	17-7	30	338.56	24.06			1/24/2023 23:00	1/24/2023 23:30	NAVY
8	17-8	30	328	23.54			1/24/2023 23:31	1/25/2023 0:01	NAVY
9	17-9	30	338.07	22.19			1/25/2023 0:02	1/25/2023 0:32	NAVY
10	17-10	30	333.48	22.09			1/25/2023 0:32	1/25/2023 1:02	NAVY
11	17-11	30	335.11	108.91			1/25/2023 1:03	1/25/2023 1:33	NAVY
12	17-12	30	324.73	106.26			1/25/2023 1:34	1/25/2023 2:04	NAVY

Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
24 Jan 2023 19:55:42
M:\LSC\FILES\navy\2368292A\SPu241_S0001_R01_20230124.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
1, 17, 30:

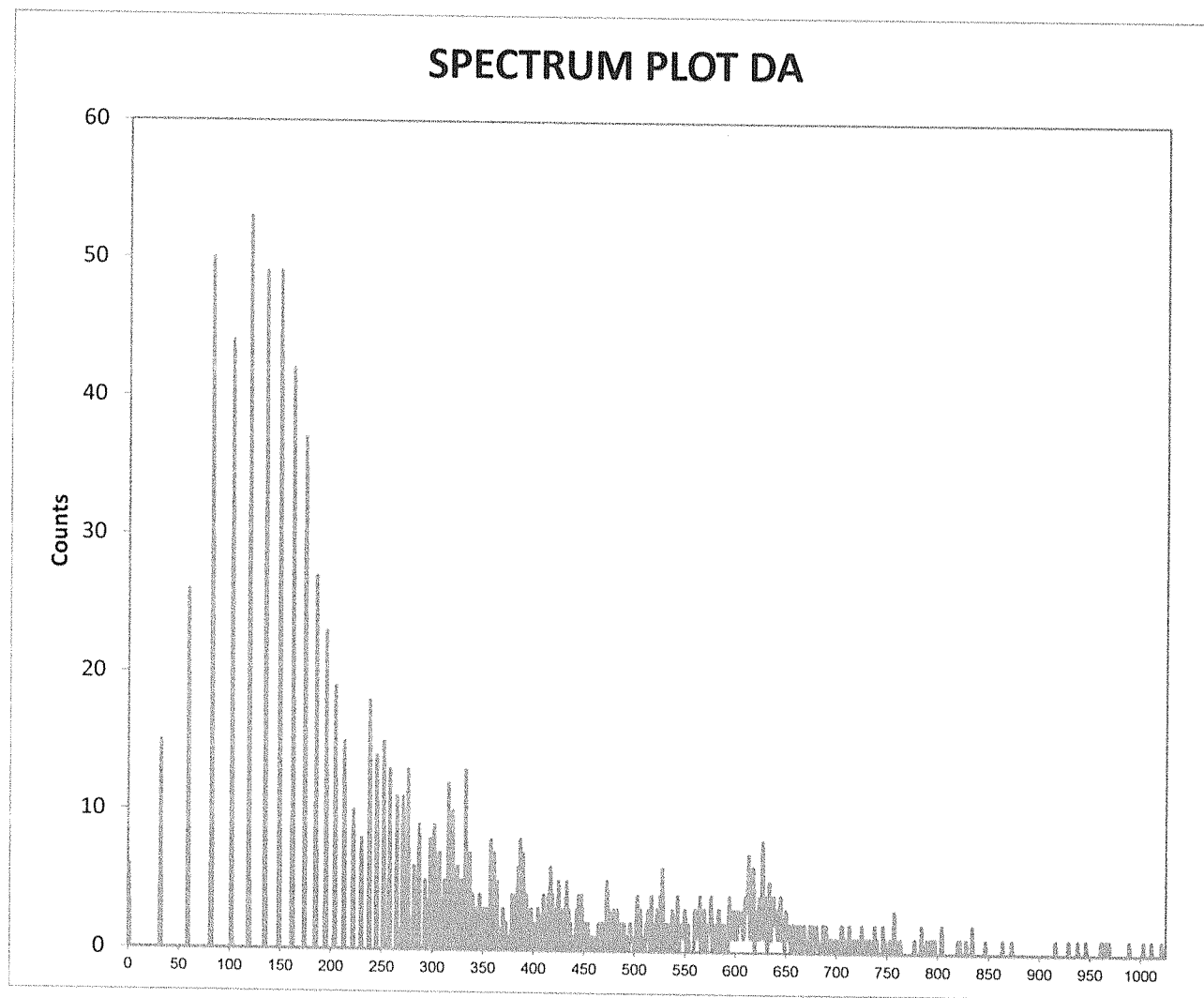
Quench: 339.12
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
24 Jan 2023 20:26:31
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DA
NAVY
2, 17, 30:

Quench: 319.04
Start, End, X-Axis

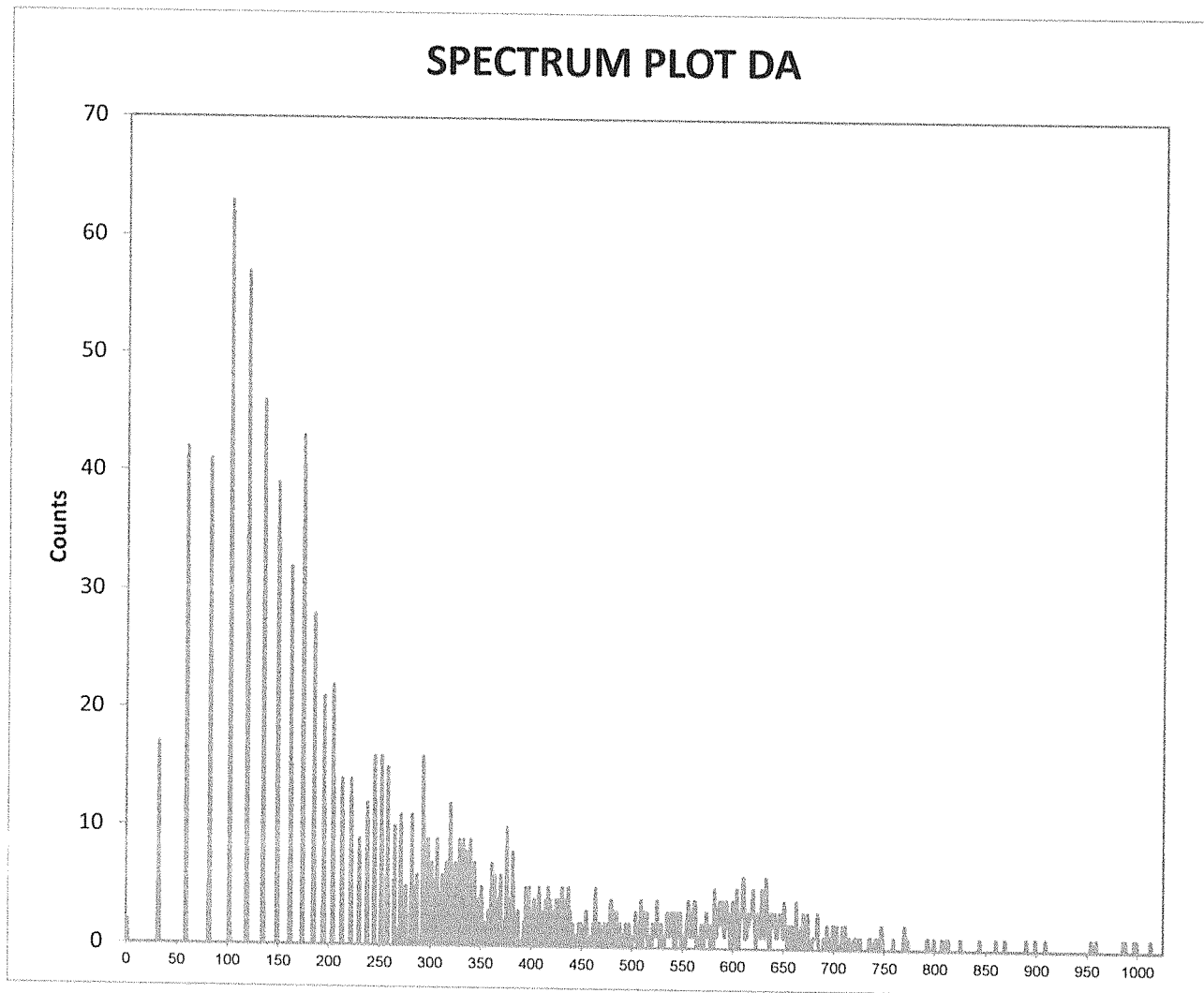


Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
24 Jan 2023 20:57:20
M:\LSC\FILES\navy\2368292A\SPu241_S0003_R01_20230124.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
3, 17, 30:

Quench:
Start, End, X-Axis

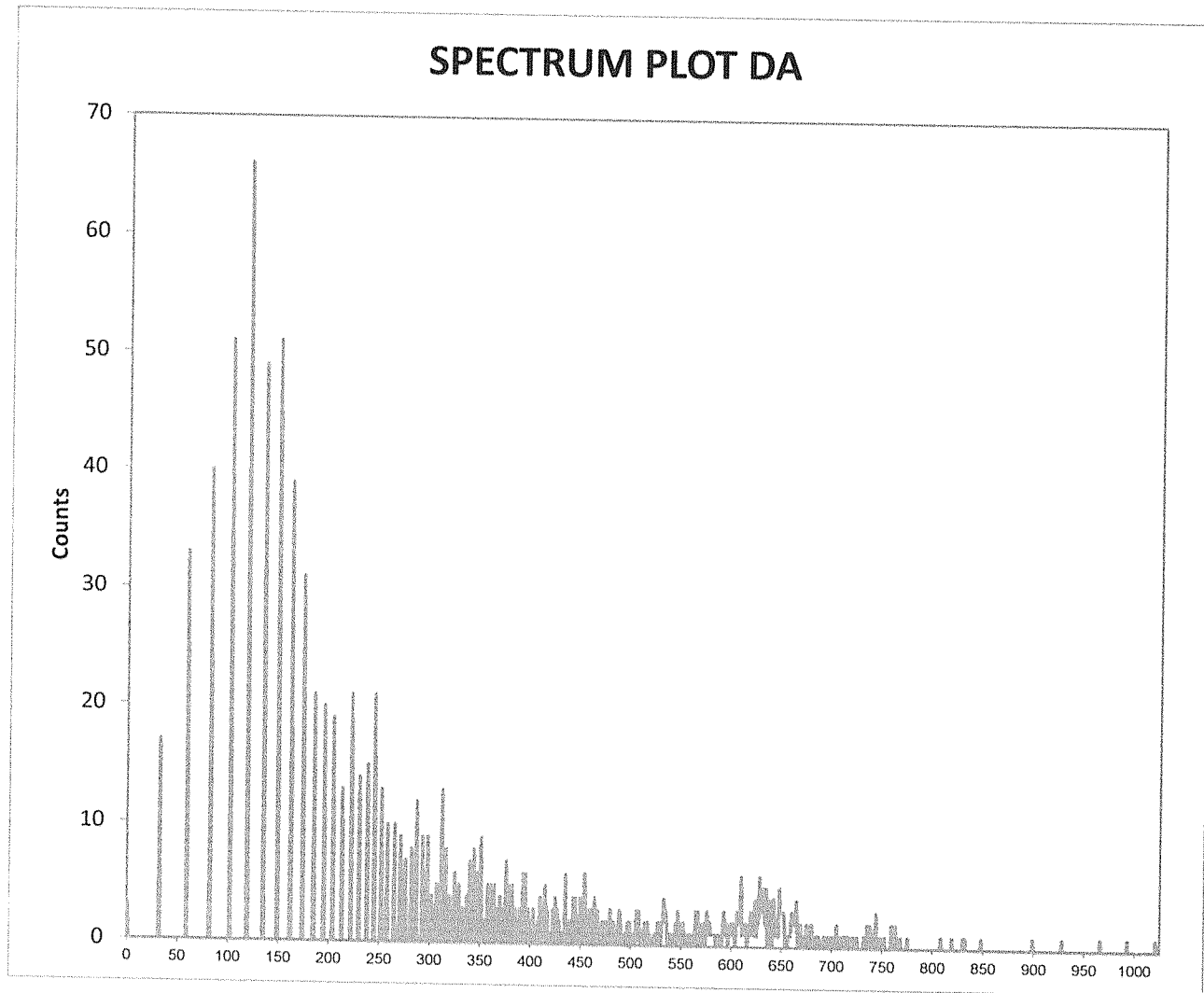
319



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
24 Jan 2023 21:28:09
M:\LSC\FILES\navy\2368292A\SPu241_S0004_R01_20230124.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
4, 17, 30:

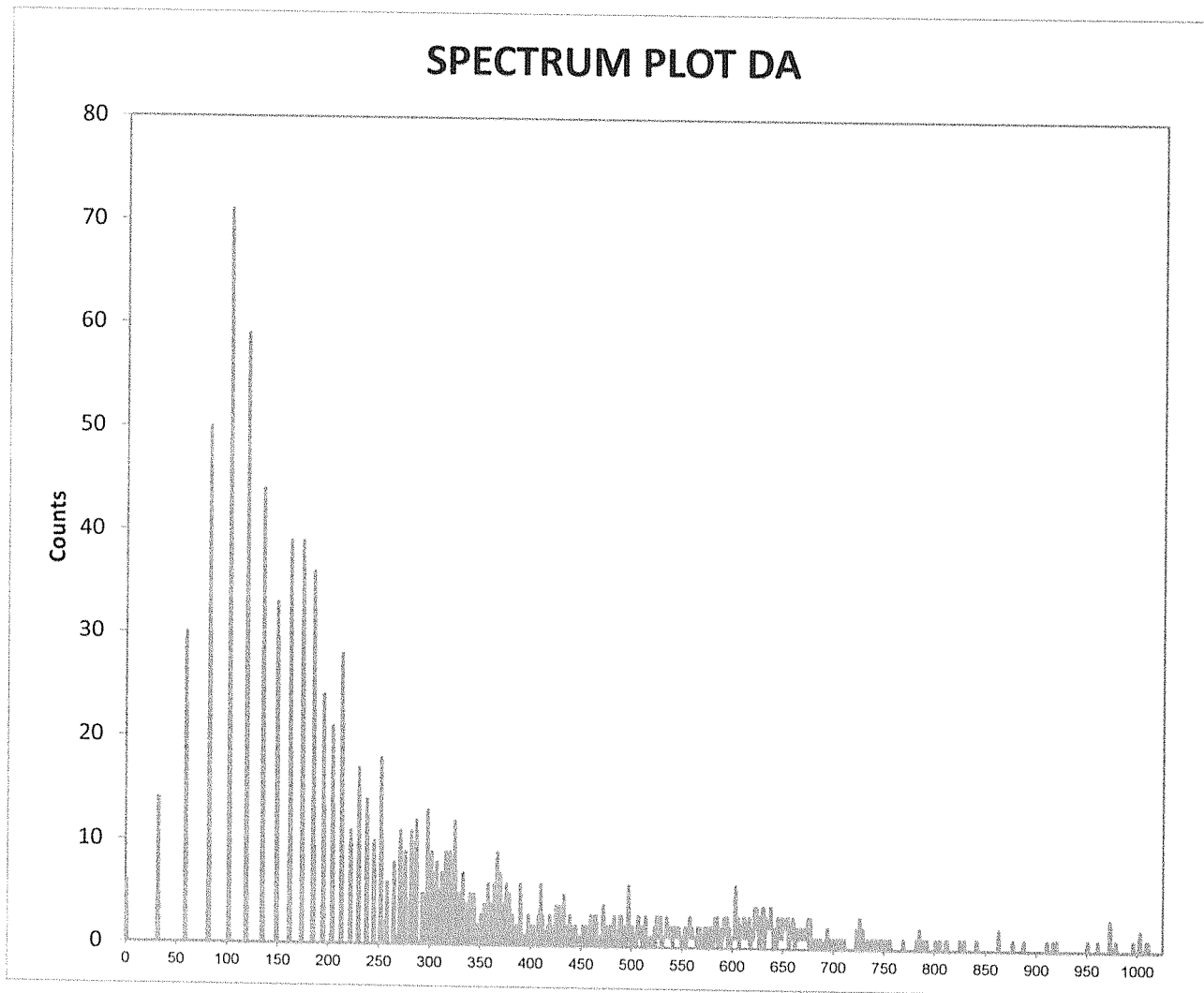
Quench:
Start, End, X-Axis 330.93



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
24 Jan 2023 21:58:57
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DA
NAVY
5, 17, 30:

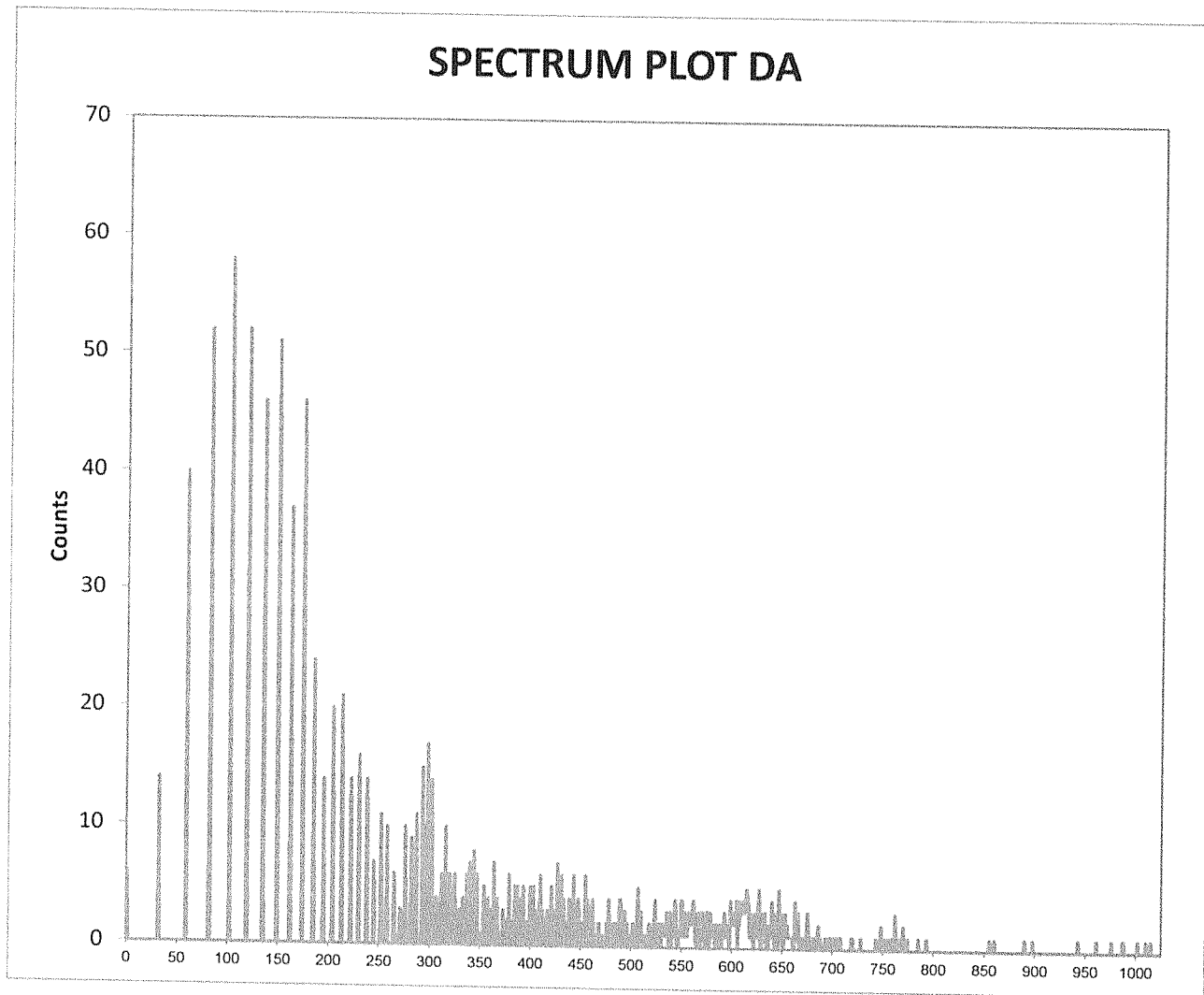
Quench: 339.64
Start, End, X-Axis



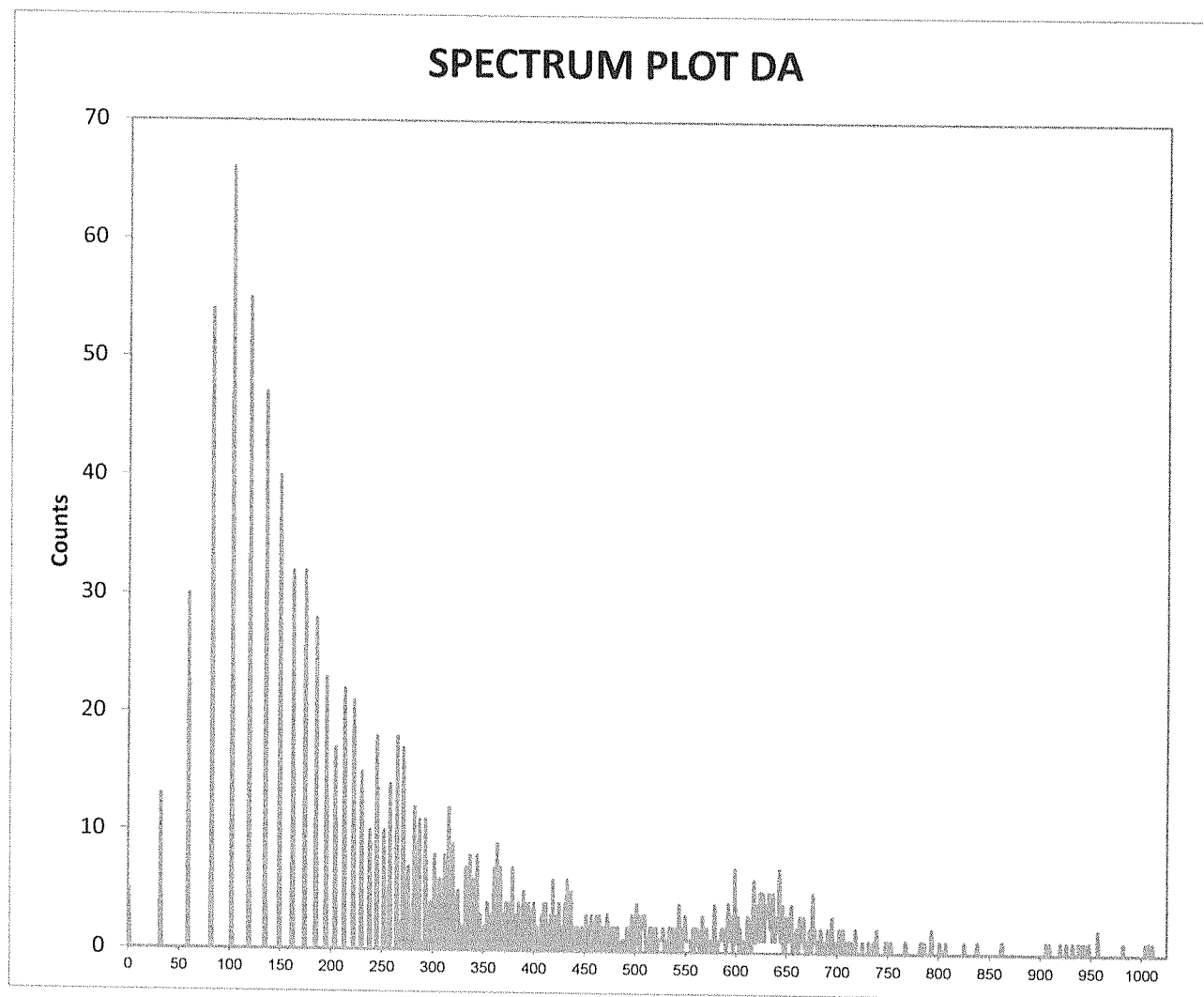
Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
24 Jan 2023 22:29:45
M:\LSC\FILES\navy\2368292A\SPu241_S0006_R01_20230124.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
6, 17, 30:

Quench:
Start, End, X-Axis 316.23



Instrument Type: PE
Sample Count Start Time: 24 Jan 2023 23:00:34
FileName: M:\LSC\FILES\navy\2368292A\SPu241_S0007_R01_20230124
File Info: M:\LSC\FILES\navy\2368292A\U2368292A.xls
ID: DA
Comments: NAVY
7, 17, 30:
Quench: 338.56
Start, End, X-Axis

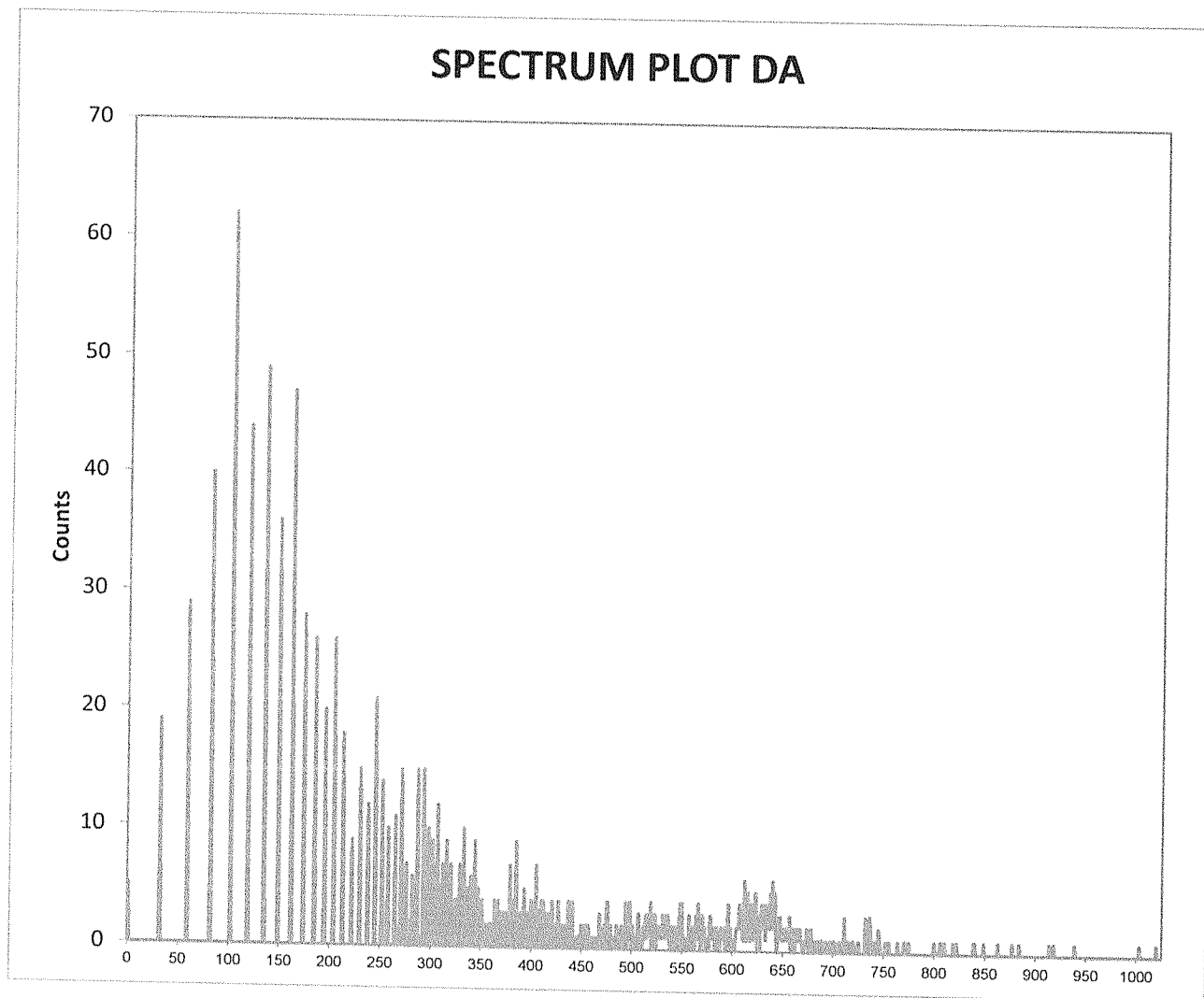


Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
24 Jan 2023 23:31:22
M:\LSC\FILES\navy\2368292A\SPu241_S0008_R01_20230125.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
8, 17, 30:

Quench:
Start, End, X-Axis

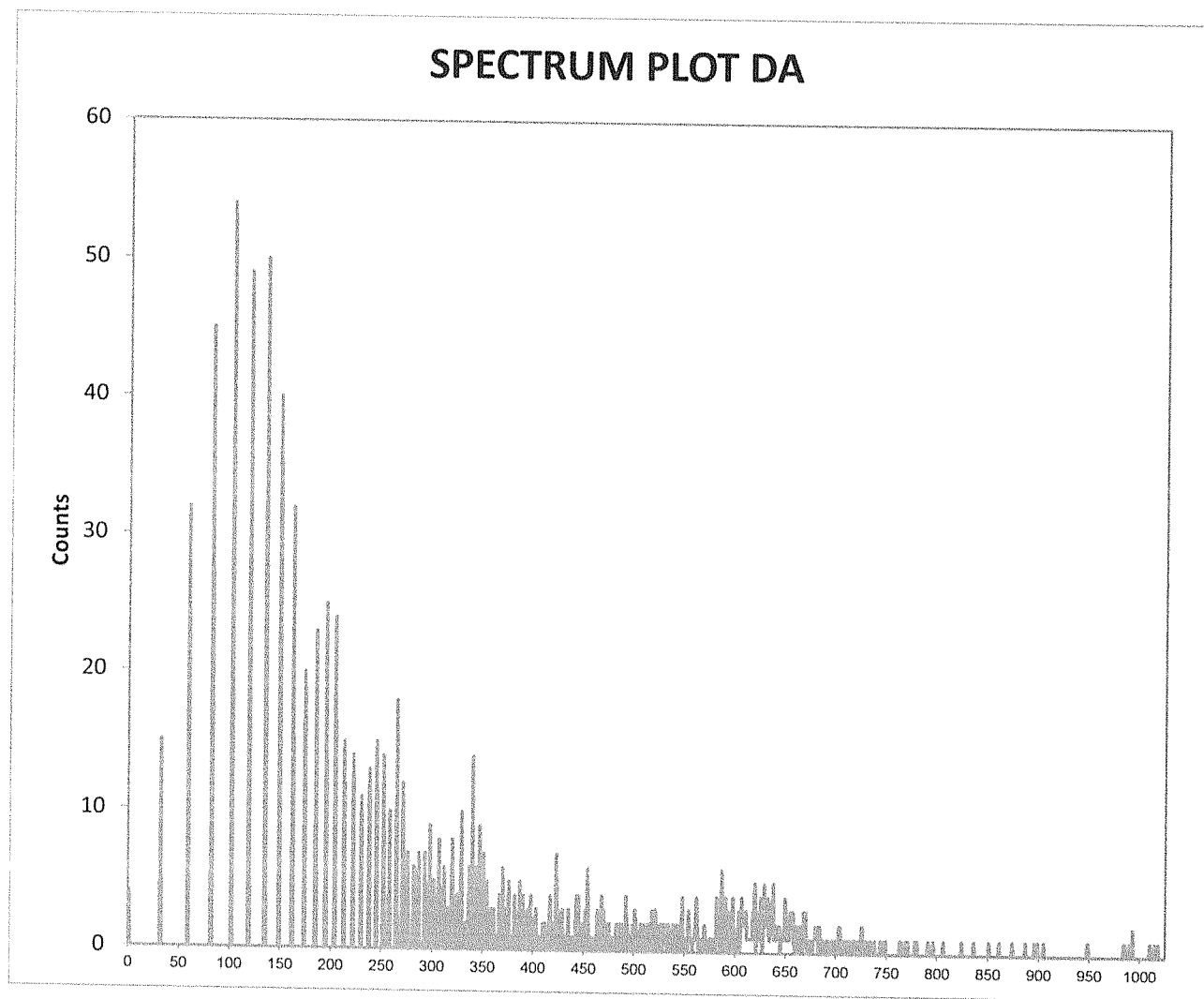
328



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
25 Jan 2023 00:02:10
M:\LSC\FILES\navy\2368292A\SPu241_S0009_R01_20230125.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
9, 17, 30:

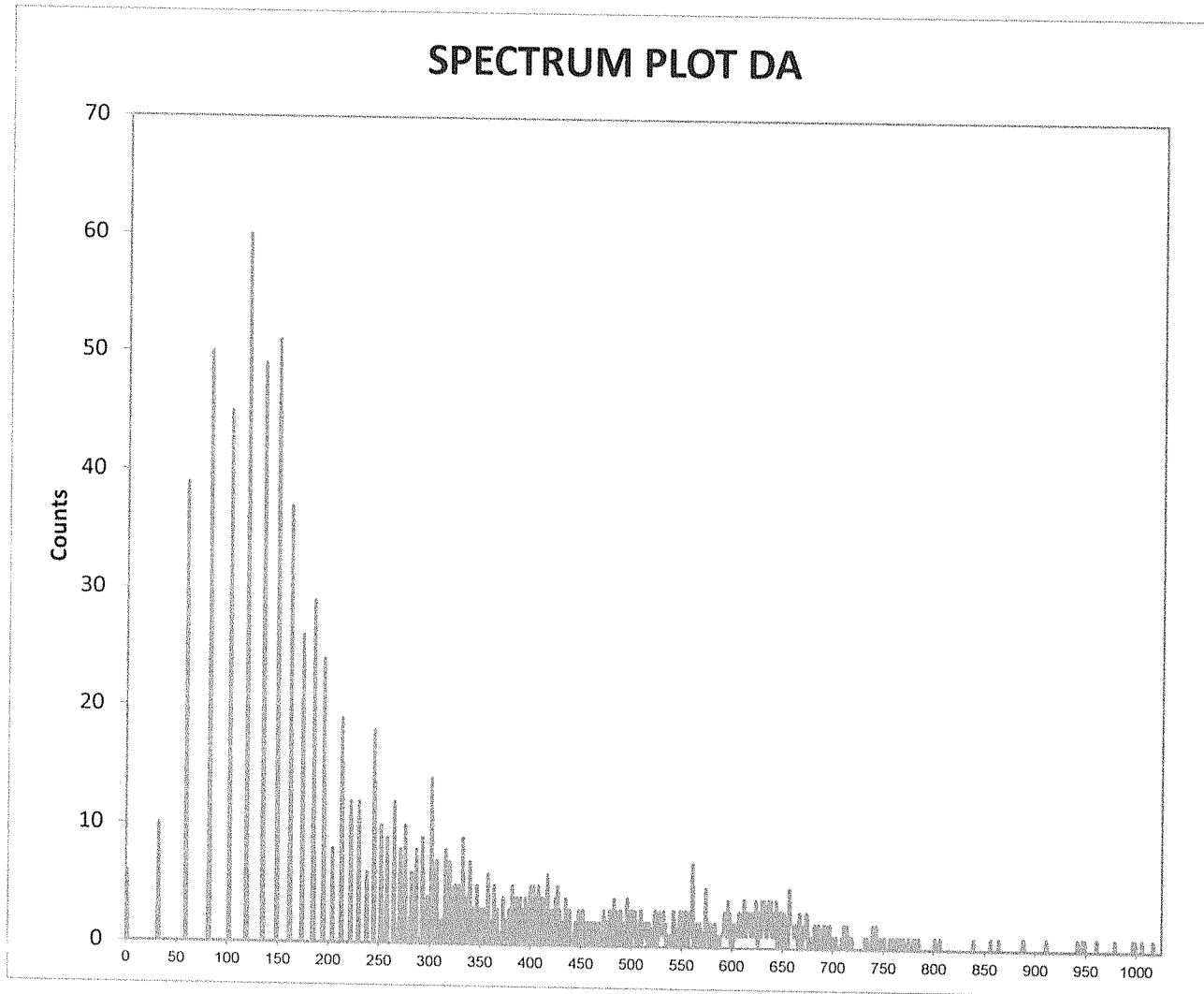
Quench: 338.07
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
25 Jan 2023 00:32:58
M:\LSC\FILES\navy\2368292A\SPu241_S0010_R01_20230125.
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DA
NAVY
10, 17, 30:

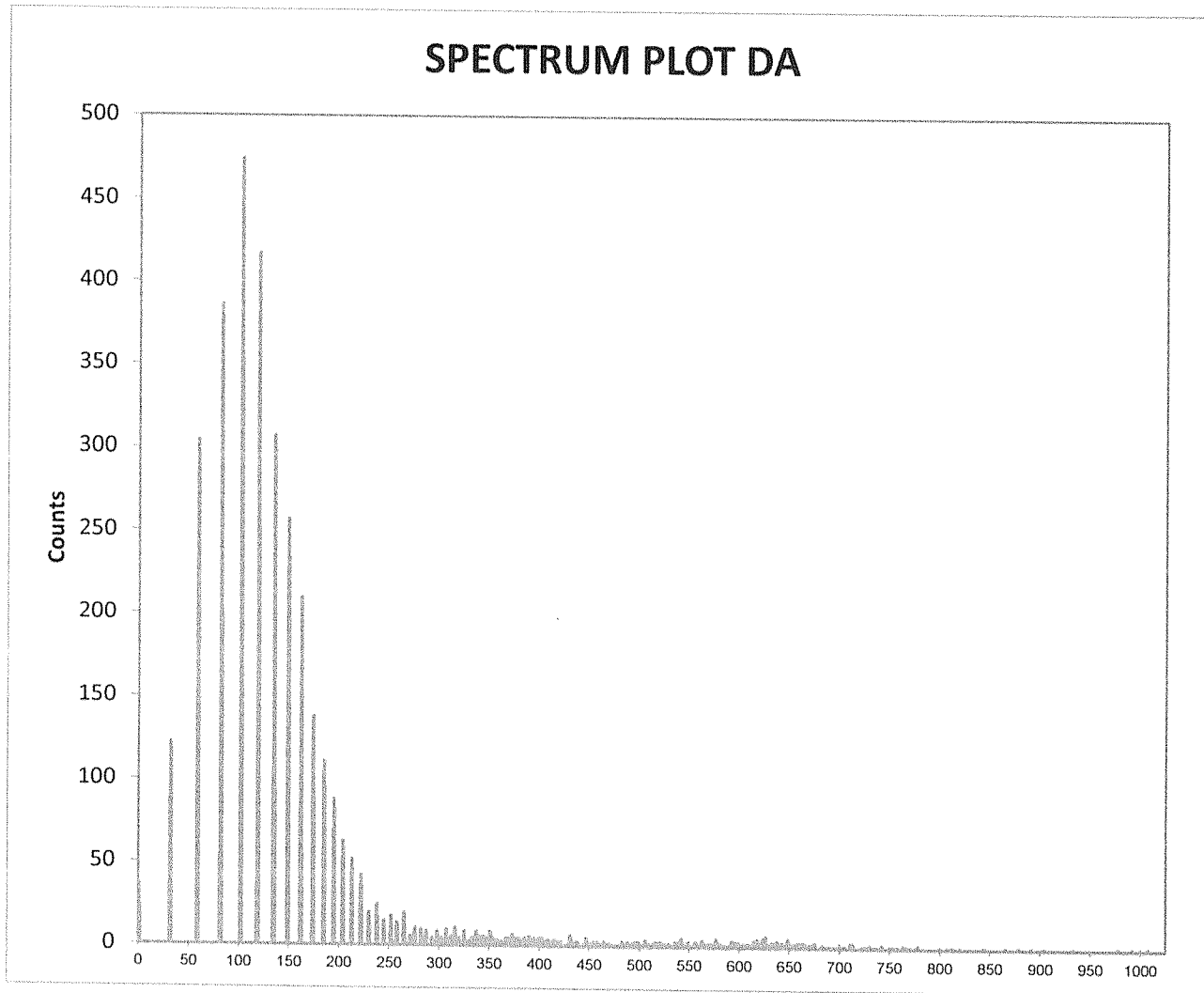
Quench: 333.48
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
25 Jan 2023 01:03:47
M:\LSC\FILES\navy\2368292A\SPu241_S0011_R01_20230125.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
11, 17, 30:

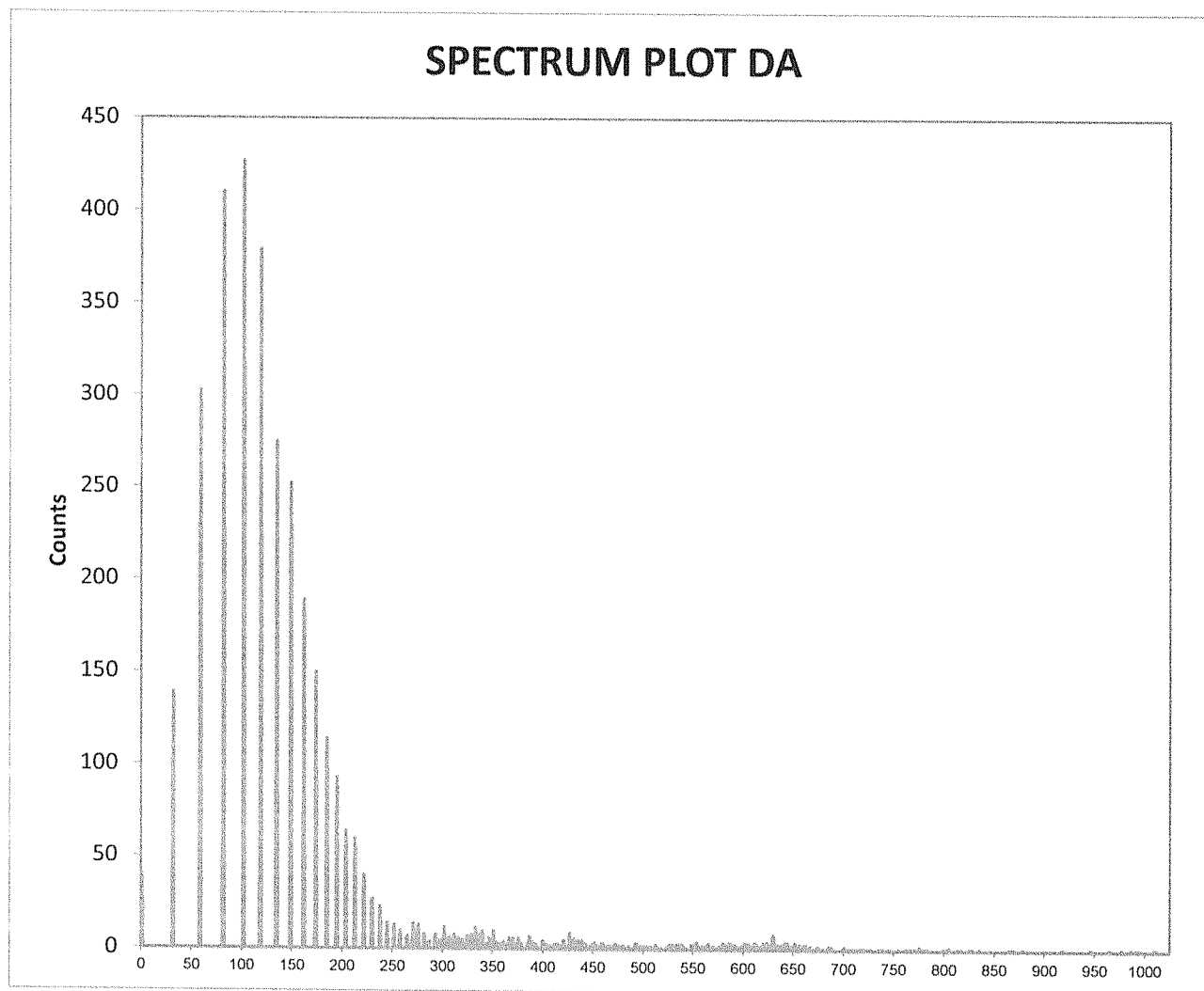
Quench: 335.11
Start, End, X-Axis



Instrument Type:
Sample Count Start Time:
FileName:
File Info:
ID:
Comments:

PE
25 Jan 2023 01:34:35
M:\LSC\FILES\navy\2368292A\SPu241_S0012_R01_20230125.
M:\LSC\FILES\navy\2368292A\U2368292A.xls
DA
NAVY
12, 17, 30:

Quench: 324.73
Start, End, X-Axis



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2368292
SAMPLE ID : R0606488003_PU
SAMPLE QTY : 0.108 F +/-0.924 %
SAMPLE DATE : 26-Dec-2022 00:00:00
ANALYST : EJ1
% YIELD : 38.0 +/-6.363 %

CHAMBER : 070
DETECTOR S/N : 158092
AVERAGE %EFFICIENCY : 35.7535
AVERAGE %EFF ERROR : 0.6891
COUNT DATE : 23-Jan-2023 11:36:38
ELAPSED LIVE TIME(SEC) : 14400.00

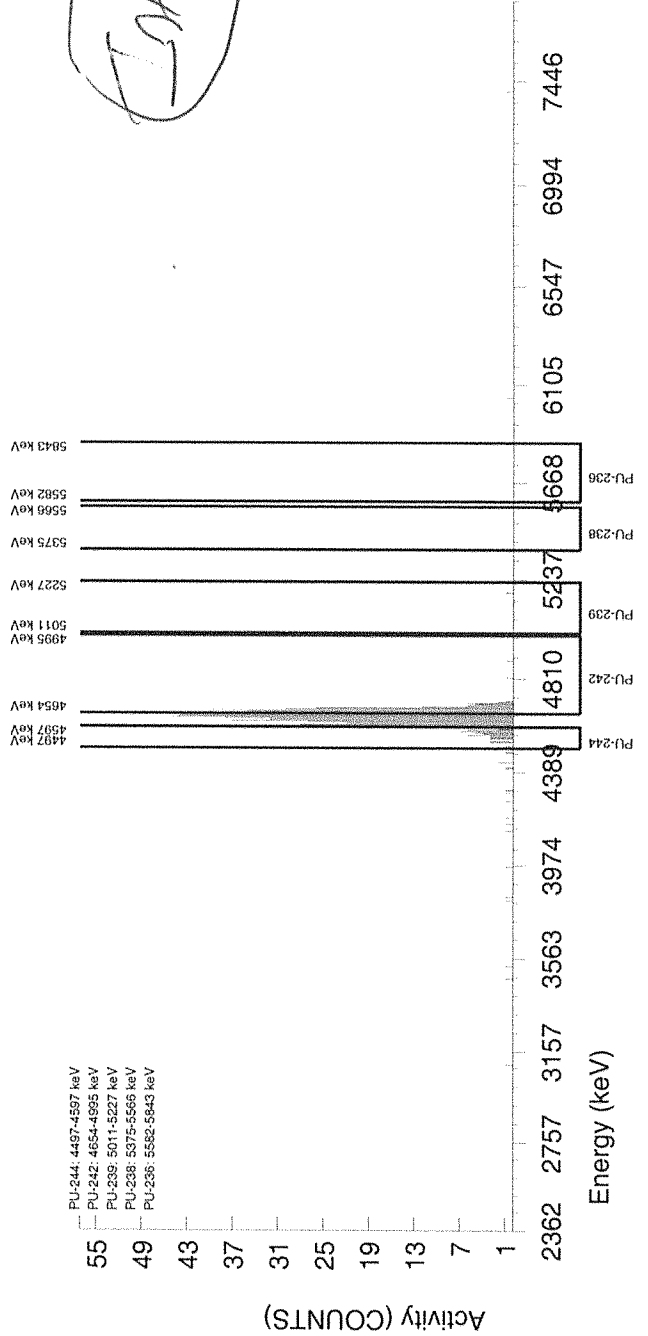
LIB FILE : PU
BKG FILE : B070.CNF;2510
BKG DATE : 20-Jan-2023
BKG LIVE TIME(SEC) : 59999.99
EFF FILE : W070.CNF;699
CAL DATE : 10-Jan-2023

TRACER

ID : 2044-A
NUCLIDE : PU-242
NOMINAL : 8.3959E+00 dpm
RESULTS : 3.1932E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.22	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	2.62E-01	3.90E-01	2.38E-01	2.62E-01
PU-238	5486.00	5470.33	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00	2.58E-01	3.83E-01	2.34E-01	2.57E-01
PU-239	5155.00	5183.17	4.907	1.000	1.000	0.000	1.0000	99.900	1.28E-01	3.59E-01	3.83E-01	2.34E-01	3.59E-01
PU-242	4870.00	4667.46	0.000	274.000	274.000	0.000	1.0000	100.000	3.49E+01	6.19E+00	3.82E-01	2.34E-01	4.14E+00
PU-244	4589.00	4573.54	0.000	86.000	86.000	0.000	1.0000	99.900	1.10E+01	2.74E+00	3.83E-01	2.34E-01	2.33E+00



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2368292		CHAMBER : 068		LIB FILE : PU	
SAMPLE ID : R0606488001_PU		DETECTOR S/N : 149010		BKG FILE : B068.CNF;2500	
SAMPLE QTY : 0.116 F		AVERAGE %EFFICIENCY : 30.8893		BKG DATE : 20-Jan-2023	
SAMPLE DATE : 26-Dec-2022 00:00:00		AVERAGE %EFF ERROR : 0.5974		BKG LIVE TIME(SEC) : 59999.99	
ANALYST : EJ1		COUNT DATE : 23-Jan-2023 11:36:38		EFF FILE : W068.CNF;644	
% YIELD : 83.4 +/-4.820 %		ELAPSED LIVE TIME(SEC) : 14400.00		CAL DATE : 10-Jan-2023	

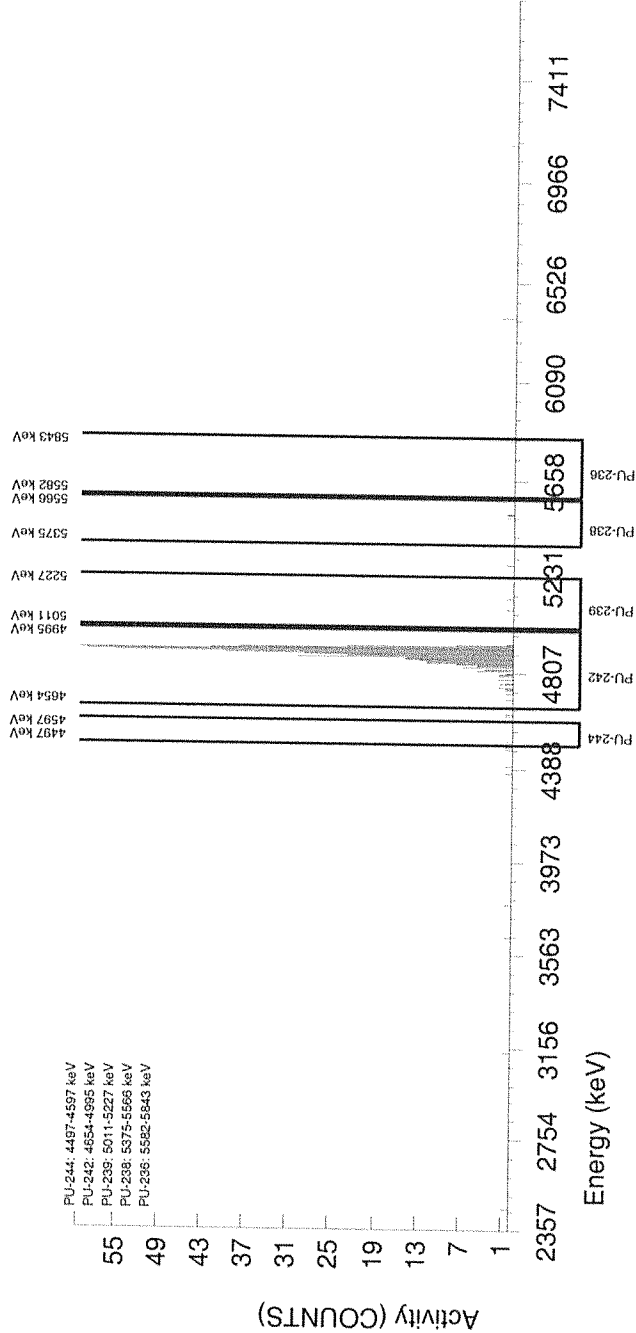
TRACER

ID : 2044-A
NUCLIDE : PU-242
NOMINAL : 8.3959E+00 dpm
RESULTS : 7.0013E+00 dpm

SDG: 606488

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG SDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5824.98	4.945	1.000	0.040	0.960	0.9798	100.000	2.56E-03	1.90E-01	4.22E-01	1.15E-01	1.90E-01
PU-238	5486.00	5500.87	19.782	3.000	2.280	0.720	0.8485	99.900	1.43E-01	2.54E-01	3.84E-01	9.77E-02	2.53E-01
PU-239	5155.00	5111.06	49.454	2.000	-0.400	2.400	1.5492	99.900	-2.51E-02	2.35E-01	5.45E-01	1.78E-01	2.35E-01
PU-242	4870.00	4887.95	31.860	520.000	519.040	0.960	0.9798	100.000	3.26E+01	4.38E+00	4.14E-01	1.13E-01	2.81E+00
PU-244	4589.00	4508.18	4.945	1.000	1.000	0.000	1.0000	99.900	6.28E-02	1.77E-01	1.89E-01	1.15E-01	1.77E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2368292
SAMPLE ID : R0606488002_PU
SAMPLE QTY : 0.113 F +/-0.883 %
SAMPLE DATE : 26-Dec-2022 00:00:00
ANALYST : EJ1
% YIELD : 86.1 +/-4.569 %

CHAMBER : 069
DETECTOR S/N : 140586
AVERAGE %EFFICIENCY : 33.9975
AVERAGE %EFF ERROR : 0.6560
COUNT DATE : 23-Jan-2023 11:36:38
ELAPSED LIVE TIME(SEC) : 14400.00

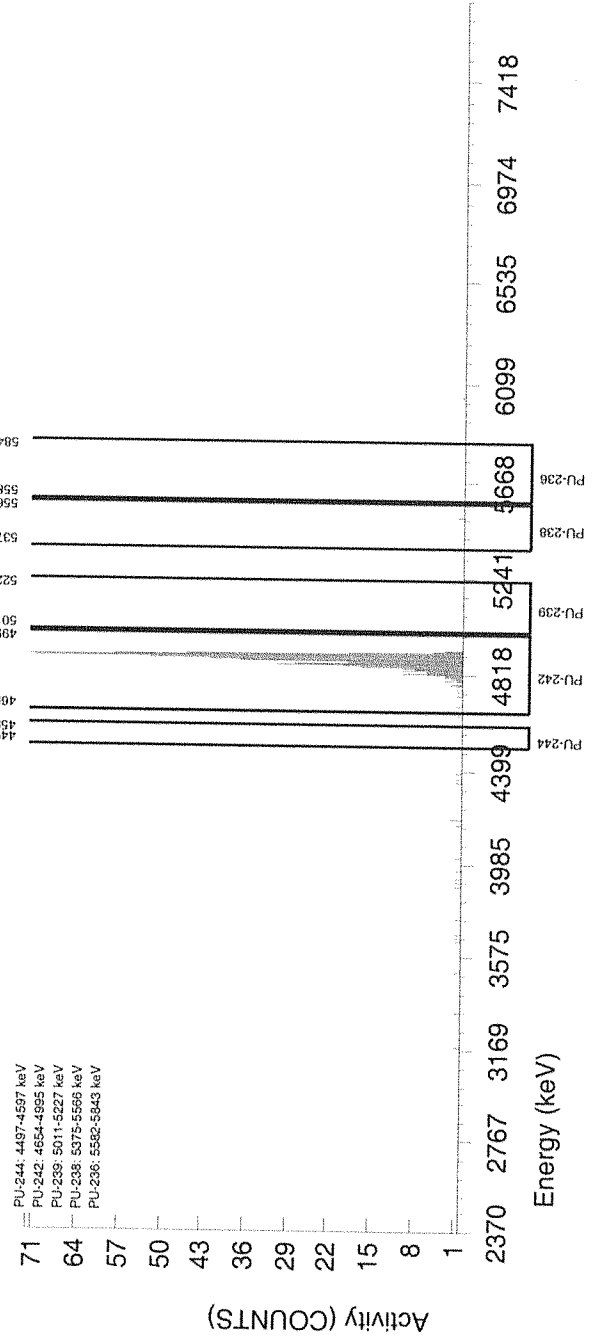
LIB FILE : PU
BKG FILE : B069.CNF;2516
BKG DATE : 20-Jan-2023
BKG LIVE TIME(SEC) : 59999.99
EFF FILE : W069.CNF;681
CAL DATE : 10-Jan-2023

TRACER

ID : 2044-A
NUCLIDE : PU-242
NOMINAL : 8.3959E+00 dpm
RESULTS : 7.2250E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cont Unc pCi/F
PU-236	5749.00	5712.26	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.17E-01	1.73E-01	1.06E-01	1.16E-01
PU-238	5486.00	5507.06	4.940	1.000	-0.200	1.200	1.0954	99.900	-1.14E-02	1.70E-01	3.98E-01	1.14E-01	1.70E-01
PU-239	5155.00	5118.69	0.000	0.000	-0.480	0.480	0.6928	99.900	-2.72E-02	1.21E-01	3.14E-01	7.20E-02	1.20E-01
PU-242	4870.00	4878.44	31.747	590.000	589.520	0.480	0.6928	100.000	3.34E+01	4.26E+00	3.14E-01	7.19E-02	2.70E+00
PU-244	4589.00	4546.97	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00	1.14E-01	1.70E-01	1.04E-01	1.14E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2368292
SAMPLE ID : R0606488003_PU
SAMPLE QTY : 0.108 F +/-0.924 %
SAMPLE DATE : 26-Dec-2022 00:00:00
ANALYST : EJ1
% YIELD : 88.6 +/-4.422 %

CHAMBER : 070
DETECTOR S/N : 158092
AVERAGE %EFFICIENCY : 35.7535
AVERAGE %EFF ERROR : 0.6891
COUNT DATE : 23-Jan-2023 11:36:38
ELAPSED LIVE TIME(SEC) : 14400.00

LIB FILE : PU
BKG FILE : B070.CNF;2510
BKG DATE : 20-Jan-2023
BKG LIVE TIME(SEC) : 59999.99
EFF FILE : W070.CNF;699
CAL DATE : 10-Jan-2023

TRACER

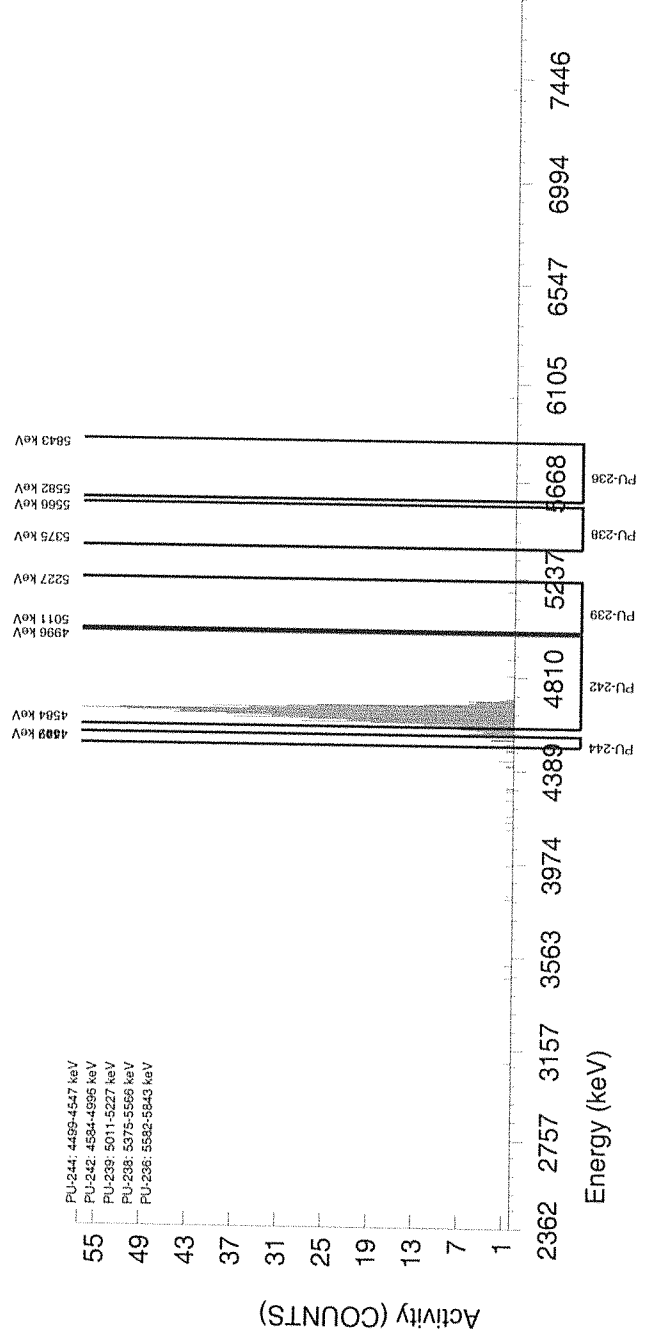
ID : 2044-A
NUCLIDE : PU-242
NOMINAL : 8.3959E+00 dpm
RESULTS : 7.4352E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG SDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5712.22	0.000	0.000	0.000	0.000	1.0000	100.000	0.00E+00	1.13E-01	1.67E-01	1.02E-01	1.12E-01
PU-238	5486.00	5470.33	0.000	0.000	0.000	0.000	1.0000	99.900	0.00E+00	1.11E-01	1.65E-01	1.00E-01	1.11E-01
PU-239	5155.00	5183.17	4.907	1.000	1.000	0.000	1.0000	99.900	5.48E-02	1.54E-01	1.64E-01	1.00E-01	1.54E-01
PU-242	4870.00	4643.28	55.076	638.000	638.000	0.000	1.0000	100.000	3.49E+01	4.32E+00	1.64E-01	1.00E-01	2.71E+00
PU-244	4589.00	4530.24	0.000	15.000	15.000	0.000	1.0000	99.900	8.22E-01	4.38E-01	1.64E-01	1.00E-01	4.30E-01

NOTES:

* Regions have been manually adjusted



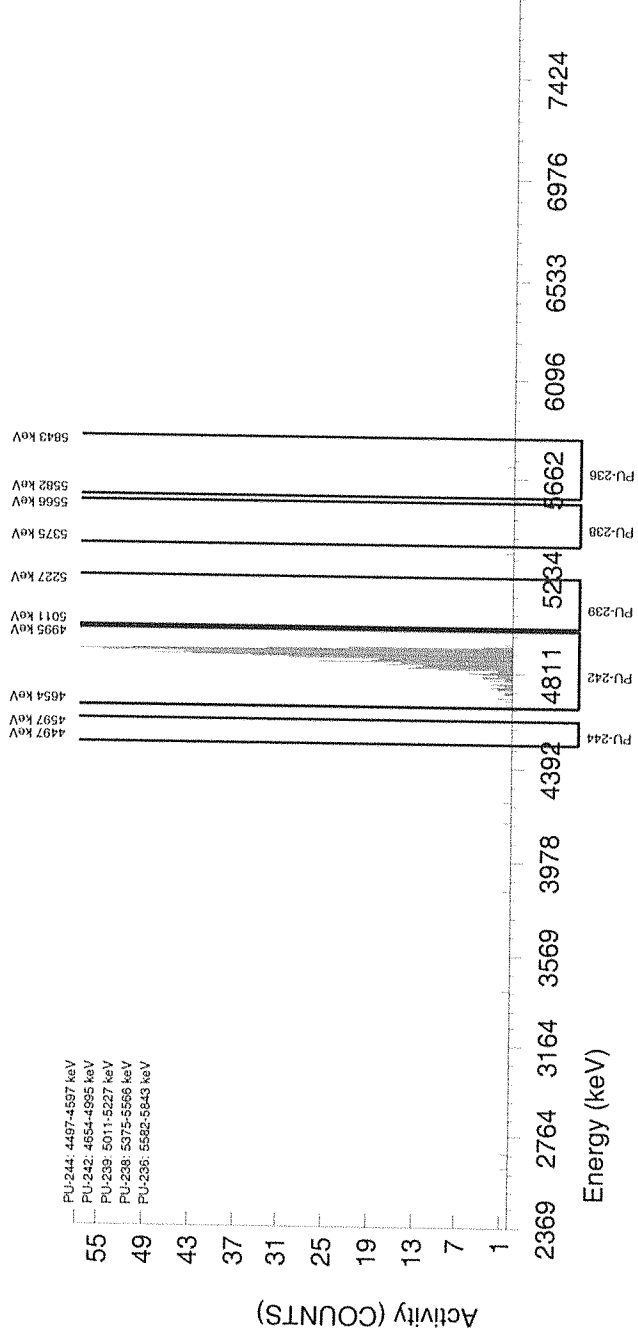
BATCH NUMBER : 2368292
SAMPLE ID : R0606488004_PU
SAMPLE QTY : 0.112 F +/-0.890 %
SAMPLE DATE : 26-Dec-2022 00:00:00
ANALYST : EJ1
% YIELD : 92.5 +/-4.489 %

CHAMBER : 071
DETECTOR S/N : 80020
AVERAGE %EFFICIENCY : 33.1415
AVERAGE %EFF ERROR : 0.6399
COUNT DATE : 23-Jan-2023 11:36:39
ELAPSED LIVE TIME(SEC) : 14400.00

LIB FILE : PU
BKG FILE : B071.CNF;2487
BKG DATE : 20-Jan-2023
BKG LIVE TIME(SEC) : 59999.99
EFF FILE : W071.CNF;629
CAL DATE : 10-Jan-2023

TRACER
ID : 2044-A
NUCLIDE : PU-242
NOMINAL : 8.3959E+00 dpm
RESULTS : 7.7677E+00 dpm

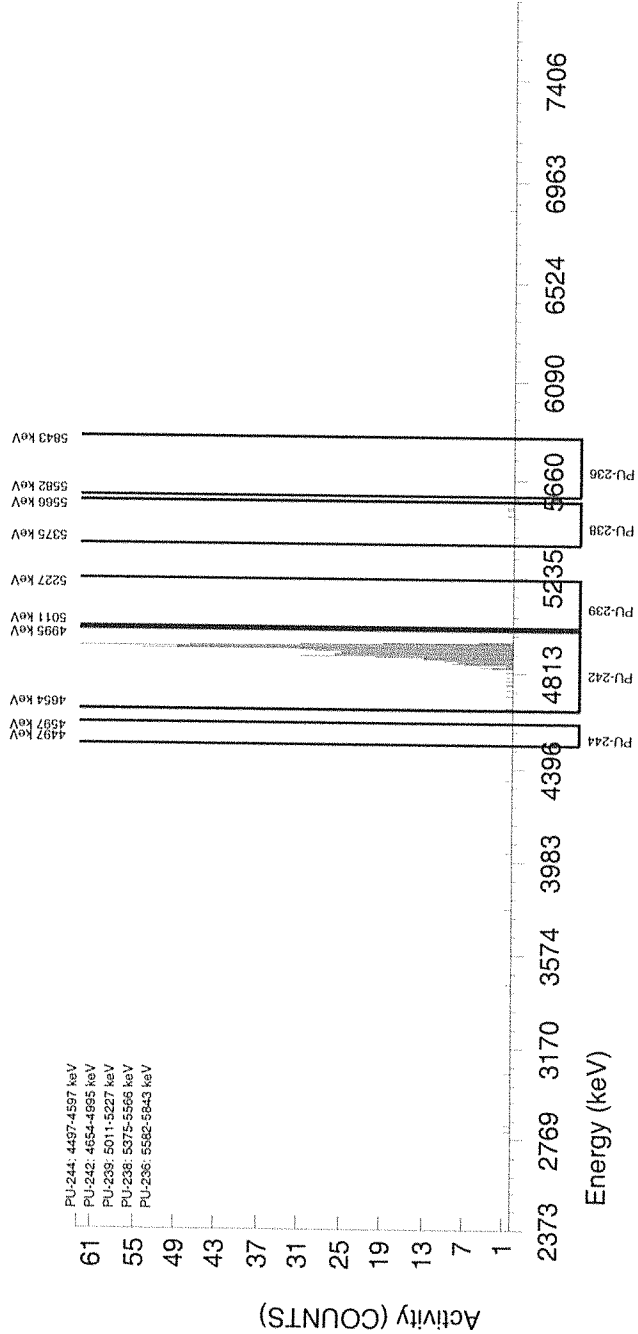
NUCLIDE ACTIVITY SUMMARY													
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5721.73	4.906	1.000	0.280	0.720	0.8485	100.000	1.55E-02	1.63E-01	3.39E-01	8.63E-02	1.63E-01
PU-238	5486.00	5470.33	0.000	0.000	-1.200	1.200	1.0954	99.900	-6.55E-02	1.24E-01	3.83E-01	1.10E-01	1.24E-01
PU-239	5155.00	5011.15	0.000	1.000	-0.680	1.680	1.2961	99.900	-3.71E-02	1.68E-01	4.23E-01	1.30E-01	1.68E-01
PU-242	4870.00	4875.99	41.439	620.000	617.840	2.160	1.4697	100.000	3.37E+01	4.22E+00	4.57E-01	1.47E-01	2.66E+00
PU-244	4589.00	4546.97	0.000	0.000	-0.240	0.240	0.4899	99.900	-1.31E-02	1.13E-01	2.62E-01	4.89E-02	1.13E-01



BATCH NUMBER : 2368292	CHAMBER : 072
SAMPLE ID : R0606488005_PU	LIB FILE : PU
SAMPLE QTY : 0.109 F	BKG FILE : B072.CNF;2501
SAMPLE DATE : 26-Dec-2022 00:00:00	BKG DATE : 20-Jan-2023
ANALYST : EJ1	BKG LIVE TIME(SEC) : 59999.99
% YIELD : 83.6	EFF FILE : W072.CNF;664
	CAL DATE : 10-Jan-2023

TRACER	
ID : 2044-A	
NUCLIDE : PU-242	
NOMINAL : 8.3959E+00 dpm	
RESULTS : 7.0195E+00 dpm	

NUCLIDE ACTIVITY SUMMARY									
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F
PU-236	5749.00	5712.26	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.59E-02
PU-238	5486.00	5521.46	39.382	3.000	2.040	0.960	0.9798	99.900	1.33E-01
PU-239	5155.00	5118.69	0.000	0.000	-1.200	1.200	1.0954	99.900	-7.83E-02
PU-242	4870.00	4906.72	24.353	533.000	532.040	0.960	0.9798	100.000	3.47E+01
PU-244	4589.00	4546.97	0.000	0.000	0.000	1.000	1.0000	99.900	0.00E+00
1.96-sigma									TPU pCi/F
									1.38E-01
									2.65E-01
									1.48E-01
									4.62E+00
									1.32E-01
									MDA pCi/F
									3.18E-01
									4.30E-01
									4.57E-01
									4.29E-01
									1.96E-01
									Lc pCi/F
									5.96E-02
									1.17E-01
									1.31E-01
									1.17E-01
									1.19E-01
									1.96-sigma
									cnt Unc
									pCi/F
									1.37E-01
									2.65E-01
									1.48E-01
									2.95E+00
									1.31E-01



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2368292
SAMPLE ID : R1205293624_PU
SAMPLE QTY : 0.116 F +/-0.862 %
SAMPLE DATE : 20-Jan-2023 00:00:00
ANALYST : EJ1
% YIELD : 83.7 +/-4.724 %

CHAMBER : 074
DETECTOR S/N : 149001
AVERAGE %EFFICIENCY : 32.3334
AVERAGE %EFF ERROR : 0.6246
COUNT DATE : 23-Jan-2023 11:36:39
ELAPSED LIVE TIME(SEC) : 14400.00

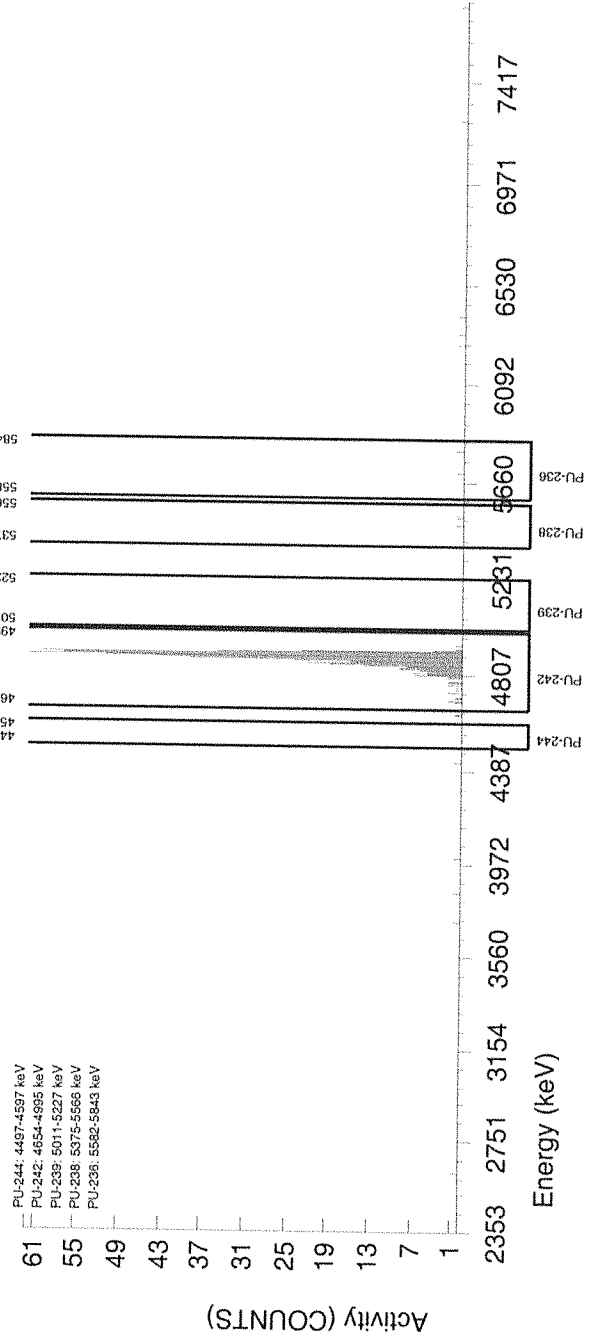
LIB FILE : PU
BKG FILE : B074.CNF;2521
BKG DATE : 20-Jan-2023
BKG LIVE TIME(SEC) : 59999.99
EFF FILE : W074.CNF;697
CAL DATE : 10-Jan-2023

TRACER

ID : 2044-A
NUCLIDE : PU-242
NOMINAL : 8.3959E+00 dpm
RESULTS : 7.0273E+00 dpm

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG SDev	%ABUN	ACTIVITY pCi/F	1.96-sigma TPU pCi/F	MDA pCi/F	Lc pCi/F	1.96-sigma cnt Unc pCi/F
PU-236	5749.00	5745.88	94.065	2.000	0.800	1.200	1.0954	100.000	4.79E-02	2.15E-01	4.20E-01	1.20E-01	2.15E-01
PU-238	5486.00	5491.34	44.557	3.000	1.560	1.440	1.2000	99.900	9.33E-02	2.46E-01	4.42E-01	1.31E-01	2.46E-01
PU-239	5155.00	5118.69	0.000	0.000	-0.960	0.960	0.9798	99.900	-5.74E-02	1.33E-01	3.94E-01	1.07E-01	1.33E-01
PU-242	4870.00	4876.25	33.995	547.000	545.320	1.680	1.2961	100.000	3.26E+01	4.30E+00	4.63E-01	1.42E-01	2.74E+00
PU-244	4589.00	4591.34	4.951	1.000	1.000	0.000	1.0000	99.900	5.98E-02	1.68E-01	1.79E-01	1.10E-01	1.68E-01



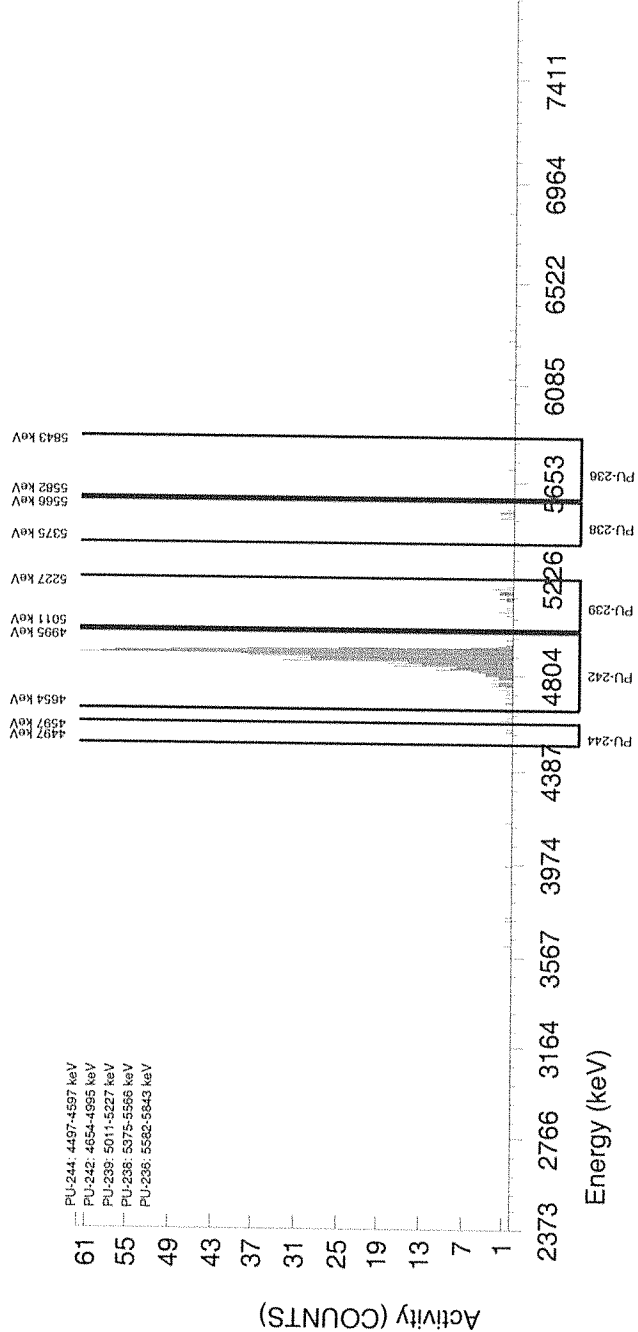
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2368292		CHAMBER : 077		LIB FILE : PU	
SAMPLE ID : R1205293625_PU		DETECTOR S/N : 53053		BKG FILE : B077.CNF;2416	
SAMPLE QTY : 0.116 F		AVERAGE %EFFICIENCY : 35.8956		BKG DATE : 20-Jan-2023	
SAMPLE DATE : 20-Jan-2023 00:00:00		AVERAGE %EFF ERROR : 0.6918		BKG LIVE TIME(SEC) : 59999.99	
ANALYST : EJ1		COUNT DATE : 23-Jan-2023 11:36:40		EFF FILE : W077.CNF;650	
% YIELD : 88.0 +/-4.429 %		ELAPSED LIVE TIME(SEC) : 14399.99		CAL DATE : 10-Jan-2023	

TRACER		LCS	
ID : 2044-A		ID	
NUCLIDE : PU-242		NUCLIDE	
NOMINAL : 8.3959E+00 dpm		NOMINAL (pCi/F)	
RESULTS : 7.3918E+00 dpm		% RECOVERY	

NUCLIDE ACTIVITY SUMMARY									
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F
PU-236	5749.00	5707.15	4.881	1.000	1.000	0.000	1.0000	100.000	5.13E-02
PU-238	5486.00	5510.71	29.283	8.000	7.760	0.240	0.4899	99.900	3.97E-01
PU-239	5155.00	5145.28	96.390	22.000	21.280	0.720	0.8485	99.900	1.09E+00
PU-242	4870.00	4882.98	51.975	638.000	636.800	1.200	1.0954	100.000	3.26E+01
PU-244	4589.00	4563.42	14.642	2.000	2.000	0.000	1.0000	99.900	1.02E-01
1.96-sigma TPU pCi/F									1.76E-01
MDA pCi/F									1.54E-01
Lc pCi/F									9.39E-02
1.96-sigma cnt Unc pCi/F									1.44E-01
									3.03E-01
									4.84E-01
									2.54E+00
									1.76E-01



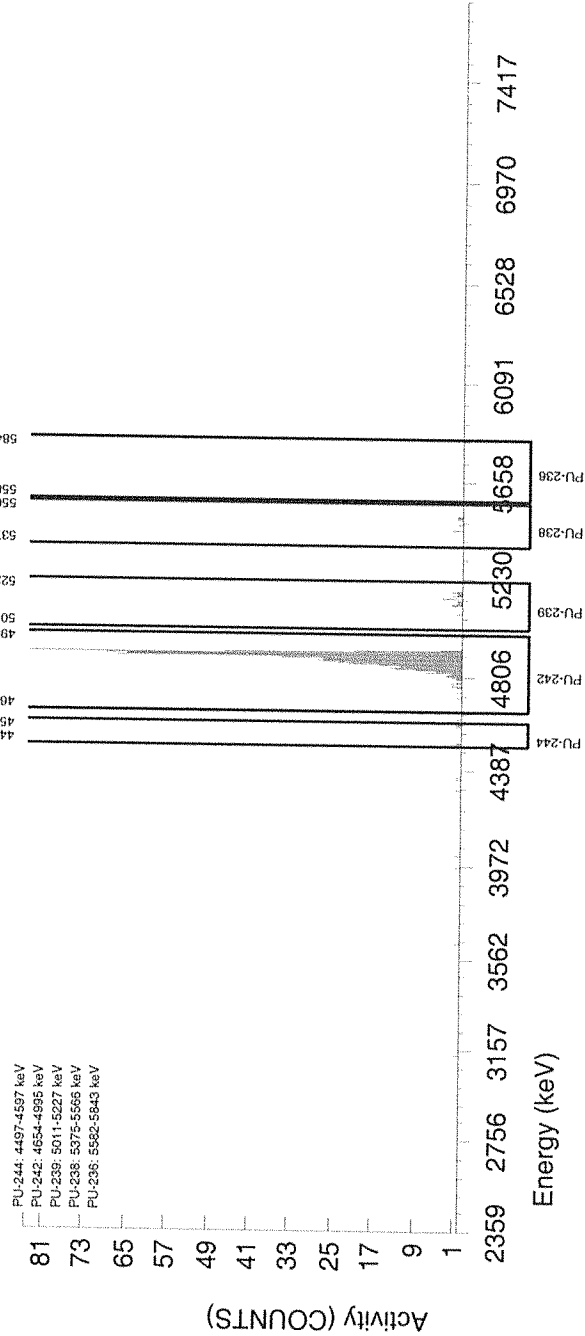
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

Instrument SOP:
Analytical SOP: GL-RAD-A-035

BATCH NUMBER : 2368292	CHAMBER : 078	LIB FILE : PU
SAMPLE ID : R1205293626_PU	DETECTOR S/N : 149002	BKG FILE : B078.CNF;2423
SAMPLE QTY : 0.116 F	AVERAGE %EFFICIENCY : 33.6631	BKG DATE : 20-Jan-2023
SAMPLE DATE : 20-Jan-2023 00:00:00	AVERAGE %EFF ERROR : 0.6497	BKG LIVE TIME(SEC) : 59999.99
ANALYST : EJ1	COUNT DATE : 23-Jan-2023 11:36:40	EFF FILE : W078.CNF;640
% YIELD : 90.8 +/-4.488 %	ELAPSED LIVE TIME(SEC) : 14399.99	CAL DATE : 10-Jan-2023

TRACER	LCSD
ID : 2044-A	ID
NUCLIDE : PU-242	NUCLIDE
NOMINAL : 8.3959E+00 dpm	NOMINAL (pCi/F)
RESULTS : 7.6216E+00 dpm	% RECOVERY

NUCLIDE ACTIVITY SUMMARY									
NUCLIDE	LIBRARY ENERGY	PEAK ENERGY	PEAK FWHM	GROSS AREA	NET AREA	BKG AREA	BKG StDev	%ABUN	ACTIVITY pCi/F
PU-236	5749.00	5712.24	0.000	0.000	-0.240	0.240	0.4899	100.000	-1.27E-02
PU-238	5486.00	5479.74	4.924	6.000	5.280	0.720	0.8485	99.900	2.80E-01
PU-239	5155.00	5144.98	4.924	19.000	18.520	0.480	0.6928	99.900	9.81E-01
PU-242	4870.00	4882.31	24.331	616.000	615.760	0.240	0.4899	100.000	3.26E+01
PU-244	4589.00	4557.91	0.000	5.000	5.000	0.000	1.0000	99.900	2.65E-01
									1.96-sigma TPU pCi/F
									1.10E-01
									2.80E-01
									4.76E-01
									4.08E+00
									2.57E-01
									MDA pCi/F
									2.54E-01
									3.24E-01
									2.93E-01
									2.54E-01
									1.59E-01
									Lc pCi/F
									4.76E-02
									8.23E-02
									6.72E-02
									4.66E-01
									2.58E+00
									2.56E-01
									1.96-sigma cnt Unc pCi/F
									1.10E-01
									2.79E-01
									4.66E-01
									2.58E+00
									2.56E-01



Continuing Calibration Data

Liquid Scintillation Counter Checks for 24-JAN-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LSCBLUE	Carbon-14	02:13	1.3		123681	0.25		
	Carbon-14	02:14	1.3		123219	-1.17		
	Tritium	02:16	1.2		153236	-0.15		
	Tritium	02:18	1.2		153599	0.69		
	BKG	02:20	30		22	-0.11		
	BKG	02:51	30		21	-1.35		
LSCBROWN	Carbon-14	02:48	3.7		43422	0.37		
	Carbon-14	02:52	3.7		43492	0.97		
	Tritium	02:56	3.45		48515	1.47		
	Tritium	03:00	3.45		48557	1.68		
	BKG	03:04	30		24	1.25		
	BKG	03:35	30		22	-0.92		
LSCGOLD	Carbon-14	02:24	1.3		123437	-1.52		
	Carbon-14	02:26	1.3		123951	0.17		
	Tritium	02:28	1.2		152880	0.25		
	Tritium	02:29	1.2		152502	-0.09		
	BKG	02:33	30		23	-0.76		
	BKG	03:04	30		21	-1.19		
LSCJADE	Carbon-14	01:01	1.32		124005	1.04		
	Carbon-14	01:03	1.32		123751	0.17		
	Tritium	01:06	1.06		162900	0.31		
	Tritium	01:08	1.06		162323	-0.29		
	BKG	01:13	30		5.6	0.83		
	BKG	01:46	30		4.72	-0.64		
LSCMOCHA	BKG	00:09	30		21	2.58		
	Carbon-14	02:24	1.35		121428	0.09		
	Carbon-14	02:26	1.35		121500	0.32		
	Tritium	02:27	1.3		136753	0.1		
	Tritium	02:29	1.35		136353	-0.29		
	BKG	02:31	30		20	0.74		
	BKG	03:02	30		17	-1.95		

LSCNAVY	Carbon-14	03:47	1.3	125301	0.27
	Carbon-14	03:49	1.3	125059	-0.38
	Tritium	03:51	1.11	170102	-0.3
	Tritium	03:52	1.11	170045	-0.39
	BKG	03:54	30	21	2.31
	BKG	04:25	30	17	-2.37
LSCPINK	Carbon-14	04:24	1.012433	123561	-0.68
	Tritium	04:28	1.012433	138065	0.12
	BKG	05:00	30.01243	7.12	-0.83
	Carbon-14	05:02	1.012433	123283	-1.47
	Tritium	05:03	1.012433	138356	0.63
	BKG	05:34	30.01243	6.85	-1.36
LSCPURPLE	Carbon-14	03:56	.45	123167	-0.68
	Carbon-14	03:57	.45	123098	-0.82
	Tritium	03:58	.4	150633	-0.2
	Tritium	03:59	.4	149525	-1.03
	BKG	04:01	30	22	-0.74
	BKG	04:32	30	22	-0.67

Reviewed by:



Lyndsey Pace

Date: 24-JAN-23

GEL Laboratories LLC

Liquid Scintillation Counter Checks for 25-JAN-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LSCBLUE	Carbon-14	02:30	1.3		123377	-0.68		
	Carbon-14	02:31	1.3		123564	-0.11		
	Tritium	02:33	1.2		153957	1.52		
	Tritium	02:35	1.2		153235	-0.15		
	BKG	02:37	30		23	0.8		
	BKG	03:08	30		22	-0.47		
LSCBROWN	Carbon-14	02:34	3.7		43372	-0.07		
	Carbon-14	02:38	3.7		43380	00		
	Tritium	02:43	3.45		48595	1.88		
	Tritium	02:46	3.45		48467	1.22		
	BKG	02:51	30		22	-1.25		
	BKG	03:21	30		23	0.11		
LSCGOLD	Carbon-14	03:45	1.3		124393	1.62		
	Carbon-14	03:46	1.3		123862	-0.12		
	Tritium	03:48	1.2		153023	0.38		
	Tritium	03:50	1.2		152080	-0.47		
	BKG	03:53	30		20	-1.67		
	BKG	04:25	30		23	-0.68		
LSCJADE	Carbon-14	04:57	1.32		123763	0.22		
	Carbon-14	04:59	1.32		123356	-1.18		
	Tritium	05:02	1.07		162062	-0.56		
	Tritium	05:04	1.07		162071	-0.56		
	BKG	05:08	30		4.56	-0.91		
	BKG	05:42	30		5.93	1.39		
LSCMOCHA	Carbon-14	02:38	1.35		121600	0.64		
	Carbon-14	02:40	1.35		121818	1.33		
	Tritium	02:42	1.3		137089	0.43		
	Tritium	02:44	1.3		137283	0.62		
	BKG	02:46	30		18	-1.34		
	BKG	03:16	30		19	0.36		
LSCNAVY	Carbon-14	02:05	1.3		125264	0.17		

	Carbon-14	02:06	1.3	125303	0.28
	Tritium	02:08	1.11	169779	-0.79
	Tritium	02:10	1.11	169868	-0.65
	BKG	02:12	30	20	1.39
	BKG	02:42	30	17	-2.95
LSCPINK	Carbon-14	08:18	1.012433	123115	-1.94
	Tritium	08:22	1.012433	137201	-1.41
	BKG	08:54	30.01243	8.13	1.12
	Carbon-14	08:56	1.012433	123971	0.49
	Tritium	08:57	1.012333	137675	-0.57
	BKG	09:27	30.01243	8.47	1.77
LSCPURPLE	Carbon-14	03:27	.45	123192	-0.63
	Carbon-14	03:28	.45	123483	-0.03
	Tritium	03:29	.4	148522	-1.79
	Tritium	03:30	.4	150514	-0.29
	BKG	03:32	30	21	-1.15
	BKG	04:04	30	21	-1.23

Reviewed by:



Lyndsey Pace

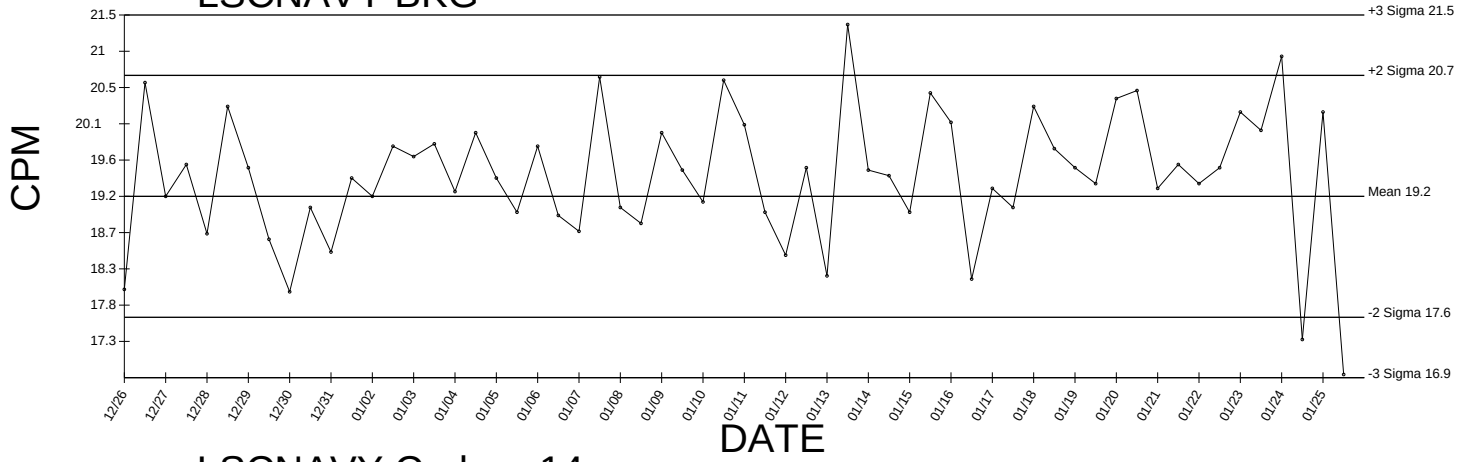
Date: 25-JAN-23

GEL Laboratories LLC

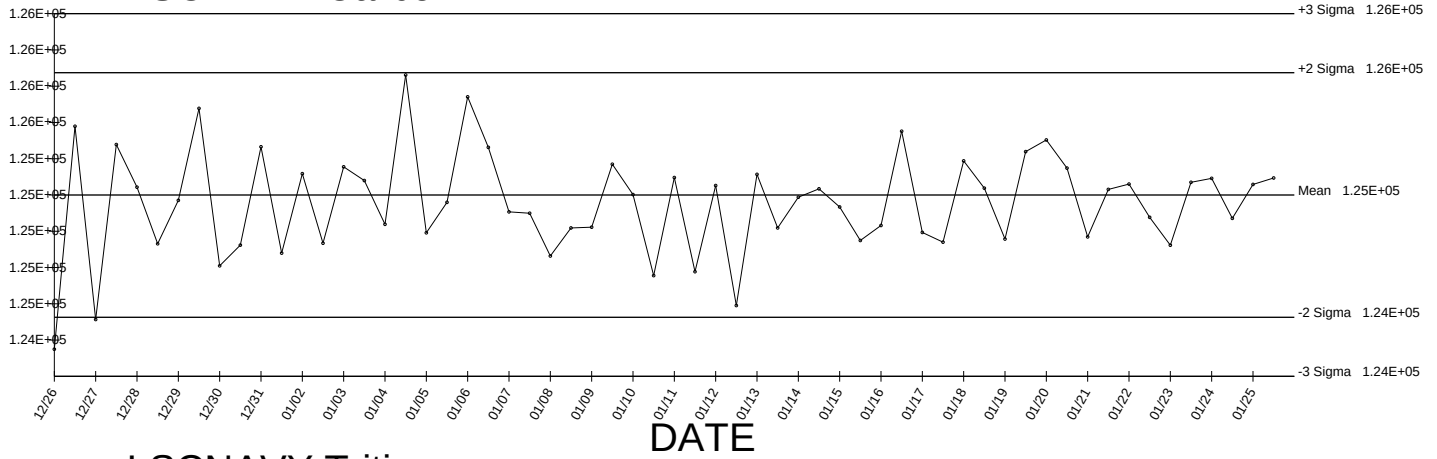
Background and Efficiency Data

LSCNAVY BKG

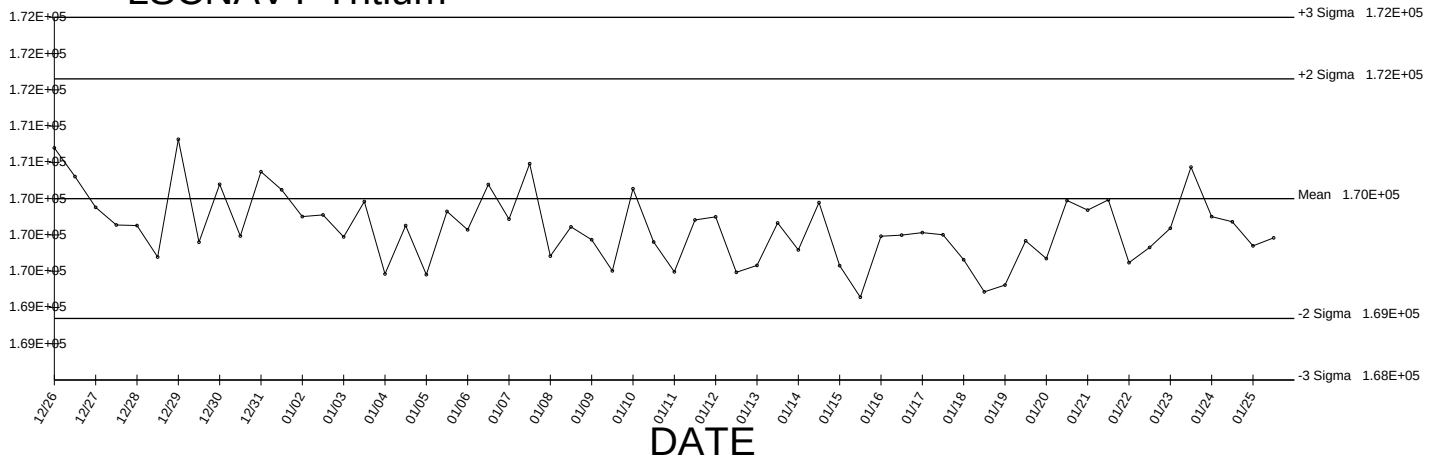
Generated 01/25/2023



LSCNAVY Carbon-14



LSCNAVY Tritium



● Denotes Outlier

RAD Standards Traceability



Eckert & Ziegler

Analytics

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Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

1714

98366

Pu-241 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL 1408580, Item 6 **Product Code:** 8341

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u _A	u _B	U	
Pu-241	5.232E+03	4.016E+04	0.2	1.7	3.5	09/09/2014

*Uncertainty: U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: α -impurities < 0.08%, γ -impurities (other than decay products) < 0.1%.
5.46647 g 3M HNO₃ solution. Carrier free.

Source Prepared by:

R. Ormsby, Radiochemist

QC Approved:

J. S. Lahr, Spectroscopist

Date: 9/5/14



Standard Logbook

Serial ID: 1714 **Open/Reference Date:** 09-SEP-14 **Aliquot :** 5.46647 g
Name: Plutonium-241 **Received:** 10-SEP-14 **Density :** Hand Calculated
Type: Source Material **Expires:** 11-SEP-75 **Logbook Num :** GL-CED-297-007
Employee: Gregory Ramsay **Lot Number :** 98366
Supplier: Eckert & Ziegler **Solvent :** 3M HNO3
 Uncertainty : 1.75 PERCENT

Description: ampule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-241	40160 Bq		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	1714
Prepared By:	Gregory Ramsay
Carrier Conc:	3M HNO3
Reference Date:	09/09/2014
Ampoule Mass (g):	5.46647 g
Uncertainty:	+/- 1.75 %
LogBook No:	GL-CED-297-007
Supplier:	Eckert & Ziegler

A Solution Material Info			
Isotope:	Plutonium-241		
Prepared By:	Tim Chandler		
Prep Date:	07/19/2019		
Verification Date:	01/25/2021		
Expiration Date:	01/25/2023		
Primary Code:	1714-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	5.4425 g		
Density(g/mL):	1.0331	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq)}) * (\text{conversion dpm to Bq}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23990.3411 \text{ dpm/mL}$
$(5.4425 \text{ g}) * (40160 \text{ Bq}) * (60 \text{ dpm/Bq}) / (1.0331 \text{ g/mL}) / (5.46647 \text{ g} * 100 \text{ mL}) = 23220.6511 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
07/22/2019	Tim Chandler	50.7721	500	1714-B	2357.9224 dpm/mL	01/19/2022	01/19/2023
07/18/2022	Matelon DeFreese	25.0261	250	1714-C	2324.48935 dpm/mL	10/28/2022	10/28/2023

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-241 Standard 1714-C

v1.0.2

Instrument	MOCHA
Analyst	TC1
Verification Prep Date	10/28/2022

Standard Information	
Isotope	Pu-241
Serial Number	1714-C
Isotope Halflife	14.2900 Y
Reference Date	9/9/2014
Ref. Act. (DPM/mL)	2324.48935
Amount of Std. (mL)	1.0
Standard Prep Date	7/18/2022

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	11/1/2022	119.20	310.47	9.20
2	11/1/2022	119.20	314.17	9.20
3	11/1/2022	119.10	310.03	9.20

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	301.27	0.185033	1628.20	1628.20
2	304.97	0.185033	1648.19	1648.19
3	300.83	0.185033	1625.82	1625.82

Mean Value =	dpm/mL 1634.07
Stdev =	12.28907248
Certificate Value* =	1565.8
Two sigma =	24.578
10 % of Mean =	163.407
Rule A (Pass/Fail)	Pass
% Recovery	104.36%
Rule B (Pass/Fail)	Pass
Expiration Date	10/28/2023

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Count Date.

The analyst prepared three standard verification sources for Pu-241 source 1714-C by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCMOCHA for Pu-241 source standard verification. The Pu-241 efficiency calibration which was used for verification calculations was performed on 10/28/2022 using Pu-241 source 1628-A.

Standard results for each verification source was calculated as follows:

$$\text{Source dpm/mL} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency (cpm/dpm), and
- D = volume used for standard verification.

RAD-M-001

TC1
11-1-22



National Institute of Standards & Technology

Certificate

2044

Standard Reference Material[®] 4334j

Received
8-18-22

Plutonium-242 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive plutonium-242 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4334j consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **Plutonium-242** massic activity, at a **Reference Time of 1200 EST, 9 August 2017**, is:

$(26.08 \pm 0.13) \text{ Bq} \cdot \text{g}^{-1}$.

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO/JCGM and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analysis.

Expiration of Certification: The certification of **SRM 4334j** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterwiesing, Group Leader of the Radioactivity Group. Overall technical direction and physical measurement leading to certification were provided by R. Collé and L. Laureano-Perez of the NIST Radiation Physics Division, Radioactivity Group. Photon-emitting-impurity analyses were provided by L. Pibida.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Michael G. Mitch, Acting Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 30 May 2018

Steven J. Choquette, Director
Office of Reference Materials

Table 1. Certified Massic Activity of SRM 4334j

Radionuclide	Plutonium-242
Reference time	1200 EST, 09 August 2017
Massic activity of the solution	26.08 Bq·g⁻¹(a)
Relative expanded uncertainty ($k = 2$)	0.51 %^(b)

(a) Both SRM 4334j and SRM 4334i (a previous issue of ²⁴²Pu) were derived from two independent gravimetric dilutions of the identical standard master solution. The massic activity of SRM 4334j is in agreement with the decay corrected massic activity of SRM 4334i to ± 0.12 %.

(b) The uncertainties on certified values are expanded uncertainties, $U = k u_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO/JCGM and NIST Guides [4-5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

GL-CEA-297-3366

Table 2. Uncertified Information of SRM 4334j

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	3.1 mol•L ⁻¹ HNO ₃
Solution density	(1.099 ± 0.002) g•mL ⁻¹ at 24.4 °C ^(a)
Solution mass	(5.499 ± 0.003) g ^(a)
Alpha-particle- emitting impurities	²⁴¹ Am: (0.0021 ± 0.0003) Bq•g ^{-1(a,b,c,d)}
Beta-particle- emitting impurities	²⁴¹ Pu: (0.039 ± 0.009) Bq•g ^{-1(a,d)}
Photon-emitting impurities	None detected ^(e) , excepting ²⁴¹ Am
Half-lives used [6]	²⁴² Pu: (3.73 ± 0.03) × 10 ⁵ a ^(f) ²⁴¹ Pu: (14.33 ± 0.04) a ²⁴⁰ Pu: (6 561 ± 7) a ²³⁹ Pu: (24 100 ± 11) a ²³⁸ Pu: (87.74 ± 0.03) a ²⁴¹ Am: (432.6 ± 0.6) a
Calibration methods (and instruments)	The certified massic activity for ²⁴² Pu was obtained by 4π α liquid scintillation (LS) spectrometry with two commercial LS counters. Four separate measurement trials using nine LS cocktails prepared directly from the SRM solution and six cocktails prepared from a master stock solution with known gravimetric dilution factor.

(a) The stated uncertainty is two times the standard uncertainty [5].

(b) The ²⁴²Pu was chemically purified 07 June 1994 at the Lawrence Livermore National Laboratory (LLNL). Americium-241, the daughter of ²⁴¹Pu, was removed but has been growing in since that time. Photonic emission measurements of the ²⁴¹Am ingrowth were made at NIST in 1998-1999 and 2017.

(c) The estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rates (number of alpha-particles emission rates per second per gram), are:

- 0.003 s⁻¹•g⁻¹ for energies less than 3.1 MeV,
- 0.03 s⁻¹•g⁻¹ for energies between 3.1 MeV and 4.4 MeV, and
- 0.003 s⁻¹•g⁻¹ for energies greater than 5.0 MeV

(d) The ²⁴²Pu was chemically purified 07 June 1994. The relative massic activities of radionuclidic impurities follow:

Radionuclide	Relative Activity at Purification Time (07 June 1994) As Measured By		
	LLNL in 1994	NIST in 1998-1999	NIST in 2017
²⁴² Pu	1	1	1
²⁴¹ Pu	--	(3.5 ± 0.4) × 10 ^{-3(1,2)}	(3.6 ± 1.1) × 10 ^{-3(1,5)}
²⁴⁰ Pu + ²³⁹ Pu	< 10 ⁻⁶ (3)	(2.0 ± 2.1) × 10 ^{-5(1,4)}	--
²³⁸ Pu + ²⁴¹ Am	< 1.6 × 10 ⁻⁵ (3)	(9 ± 16) × 10 ^{-6(1,4)}	--
²⁴¹ Am	--	assumed 0 ⁽²⁾	assumed 0 ⁽⁵⁾

1) The stated uncertainty is the standard uncertainty.

2) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 25 November 1998, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

3) Using alpha-particle spectrometry. The value shown is an estimated upper limit based upon background and counting statistics. Measurements were made at LLNL in July of 1994.

4) Alpha-particle spectrometry measurements were made at the National Institute of Standards and Technology (NIST) in June and July 1999.

5) The ²⁴¹Pu activity was calculated from a gamma-ray measurement of the ²⁴¹Am ingrowth as of 01 September 2017, assuming that ²⁴¹Am was completely removed at the time of chemical purification.

(e) The estimated limits of detection for photon-emitting impurities, expressed as massic photon emission rates (numbers of photons per second per gram), are:

- 1 × 10⁻³ s⁻¹•g⁻¹ for energies between 20 keV and 35 keV,
- 6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 40 keV and 50 keV,
- 5 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 55 keV and 95 keV,
- 4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 100 keV and 600 keV
- 4 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 610 keV and 1440 keV
- 6 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1450 keV and 1480 keV, and
- 3 × 10⁻⁴ s⁻¹•g⁻¹ for energies between 1490 keV and 2000 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ²⁴²Pu, ²⁴¹Pu, or ²⁴¹Am.

(f) The stated uncertainty is the standard uncertainty. See reference 6.

Table 2. Uncertainty evaluation for the massic activity of SRM 4334j

Uncertainty component		Assessment Type ^(a)	Relative standard uncertainty contribution on massic activity of ²⁴² Pu (%)
1	LS measurement precision: Relative standard deviation of the mean on the great-grand mean for 4 LS measurement trials, considering all of the within-trial and between-trial components of variance. Each of the 4 grand mean values was based on 5 replicate measurements on each of either 6 or 9 LS counting sources. The typical within-trial relative standard deviation of the mean (considering the variations for the between 5 measurements and the between 6 to 9 sources) for each trial was 0.08 %. The between-trial relative standard deviation across the 4 trials was 0.18 %.	A	0.22
2	Background; LS measurement variability and cocktail composition stability effects; wholly embodied in component 1.	A	--
3	LS counters dependencies; wholly embodied in components 1 & 2	A	--
4	Live time determinations for LS counting time intervals, includes uncorrected dead time effects	B	0.07
5	Aliquant mass determinations by gravimetric measurements for preparation of counting sources; includes mass measurement precision partially embodied in component 1.	B	0.05
6	LS detection inefficiency, includes wall effect; partially embodied in component 1.	B	0.01
7	²⁴² Pu decay corrections for half-life uncertainty of 0.22 %.	B	< 10 ⁻¹⁰
8	Potential alpha- and photon-emitting impurities	B	0.1
Relative combined standard uncertainty			0.26
Relative expanded uncertainty (k = 2)			0.51

^(a) Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

INSTRUCTIONS FOR USE AND HANDLING

Storage: SRM 4334j should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

REFERENCES

- [1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*; available at <https://www.nist.gov/pml/radiation-physics/ampoule-specifications-and-opening-procedure> (accessed May 2018). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.
- [2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology (JCGM): BIPM, Sevres Cedex, France; p. 19 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)*; (2008 version with Minor Corrections), 3rd edition; JCGM: BIPM, Sevres Cedex, France; p. 18 (2012); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_200_2012.pdf (accessed May 2018).
- [4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), JCGM: BIPM, Sevres Cedex, France (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed May 2018).
- [5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Apr 2018).
- [6] Chechev, V.P.; *LNE-LNHB/CEA Table of Radionuclides, ²⁴²Pu*; (June 2009); available at http://www.nucleide.org/DDEP_WG/Nuclides/Pu-242_tables.pdf (accessed May 2018).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

Standard Logbook

Serial ID: 2044 **Open/Reference Date:** 09-AUG-17 **Aliquot :** 5.499 g
Name: Plutonium-242 **Received:** 18-AUG-22 **Density :** Hand Calculated g/mL
Type: Source Material **Expires:** 22-AUG-35 **Logbook Num :** GL-CED-297-336
Employee: Tim Chandler **Lot Number :** 4334j
Supplier: NIST **Solvent :** 3.1M HNO₃
 Uncertainty : .255 percent

Description: Ampoule
Comments: None

Analyte	Concentration	Analyte	Concentration
Plutonium-242	26.08 Bq/g		



Standard Traceability Log Rad

Source Material Info	
Parent Code:	2044
Prepared By:	Tim Chandler
Carrier Conc:	3.1M HNO3
Reference Date:	08/09/2017
Ampoule Mass (g):	5.499 g
Uncertainty:	+/- .255 %
LogBook No:	GL-CED-297-336
Supplier:	NIST

A Solution Material Info			
Isotope:	Plutonium-242 AS TRACER		
Prepared By:	Matelon DeFreese		
Prep Date:	10/19/2022		
Verification Date:	10/19/2022		
Expiration Date:	10/19/2023		
Primary Code:	2044-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.3655 g		
Density(g/mL):	1.0314	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (Bq/g)}) * (\text{conversion dpm to Bq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(5.3655 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (200 \text{ mL}) = 41.9797 \text{ dpm/mL}$
$(5.3655 \text{ g}) * (26.08 \text{ Bq/g}) * (60 \text{ dpm/Bq}) / (1.0314 \text{ g/mL}) / (200 \text{ mL}) = 40.7016 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
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GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Pu-242 Standard 2044-A

v1.2

Analyst	MXS2
Verification Prep Date	10/19/2022

Tracer Information	
Isotope	Pu-239
Serial Number	1472-C
Amount of Std. (mL)	0.2
Expiration Date	8/11/2023

Standard Information	
Isotope	Pu-242
Serial Number	2044-A
Isotope Half-life	3.7350E+05 Y
Reference Date	8/9/2017
Ref. Act. (dpm/mL)	41.9797
Amount of Std. (mL)	0.2
Standard Prep Date	10/19/2022

Std #	Count Date	Activity pCi	Standard dpm/mL
1	10/23/2022	3.830	42.51
2	10/24/2022	4.020	44.62
3	10/23/2022	3.850	42.74

Mean Value = 3.900 43.290
Stdev = 0.104403065 1.158874022

Certificate Value* = 3.7819 pCi
Two sigma = 0.2088
10 % of Mean = 0.3900
Rule A (Pass/Fail) Pass
% Recovery 103.12%
Rule B (Pass/Fail) Pass
Expiration Date 10/19/2023

dpm/mL
41.9793
2.3177
4.3290
Pass
103.12%
Pass

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

* Certificate Value is decay corrected to Verification Prep Date.

The analyst prepared three standard verification sources for Pu-242 standard 2044-A using 0.2 mL for each source. Each standard was combined with 0.2 mL of Pu-239 standard 1472-C and was diluted in a centrifuge tube containing 4 mL 2M HCL diluted to 40 mL with DI water. Added 0.1mL of neodymium carrier and 3-4 drops of 25% hydrazine dihydrochloride and waited 10 minutes. 5 mL of 48% HF was added to precipitate neodymium (and Plutonium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. DPM values for Pu-242 were calculated by comparison to Pu-239 certified values.

Handwritten signature

Runlogs

Instrument Run Log

Instrument Type: LSC

Batch ID: 2368292

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
606487001	SAMPLE	EJ1	LSCNAVY	JAN-24-23 20:26:31	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
606487002	SAMPLE	EJ1	LSCNAVY	JAN-24-23 20:57:20	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
606487003	SAMPLE	EJ1	LSCNAVY	JAN-24-23 21:28:09	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
606488001	SAMPLE	EJ1	LSCNAVY	JAN-24-23 21:58:57	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
606488002	SAMPLE	EJ1	LSCNAVY	JAN-24-23 22:29:45	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
606488003	SAMPLE	EJ1	LSCNAVY	JAN-24-23 23:00:34	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
606488004	SAMPLE	EJ1	LSCNAVY	JAN-24-23 23:31:22	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
606488005	SAMPLE	EJ1	LSCNAVY	JAN-25-23 00:02:10	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205293624	MB	EJ1	LSCNAVY	JAN-25-23 00:32:58	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205293625	LCS	EJ1	LSCNAVY	JAN-25-23 01:03:47	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00
1205293626	LCSD	EJ1	LSCNAVY	JAN-25-23 01:34:35	DONE	2mL DI/1 drop HNO3/13mL Ecoscint Ultra	24-JAN-22 00:00